LORD HOWE ISLAND BOARD

Development Application

Section 4.12, Environmental Planning and Assessment Act 1979

Development Application No.:DA2025.2.1... Date Lodged: 30/04/2025

Use this form to apply for development consent to:

- Erect, alter or demolish a building or structure;
- Change the use of land or a building; •
- Subdivide land; .

ADDUCANT DETAILS

- Display an advertisement;
- Any other development that requires consent from the Lord Howe Island Board.

To minimise delay in receiving a decision about your application, please ensure you submit all relevant information. To complete the form, please place a cross in the boxes 🗌 and fill out the sections provided as appropriate. When your application has been assessed, you will receive a Notice of Determination. If you need help please phone or call the Board's office and discuss your queries with a development officer.

Mr Mrs X Ms Other:
ame: Christie Mills
rganisation:
ostal Address:
elephone:
mail:
WNER CONSENT as Owner Consent been issued? X Yes No Owner Consent No.:
DENTIFY THE LAND YOU PROPOSE TO DEVELOP
ortion/Lot No.: Lot 44, Lot 49 & Road Reserve Deposited Plan No.: DP757515
ease No.:
Lot 44: Corner of Neds Beach Road and Lagoon Road, Lord Howe Island ^{ddress:} Lot 49: Along Lagoon Road Road Reserve: North east of Lot 44
ROPOSED DEVELOPMENT
Describe the proposed development; give a detailed outline of what you are going to do. If it involves a building, indicated what it will be used for. The works are proposed to be undertaken in 2 stages. Stage 1 involves the installation of a new wastewater treatment system and associated underground infrastructure on Lot 44.

This will include pipework from existing and proposed buildings on Lot 44, passing through the adjoining unnamed public road corridor, and returning to the wastewater treatment unit near the southern boundary of Lot 44. Treated effluent will be dispersed via an irrigation system located within Lot 49 and the unnamed public road corridor adjacent to Lot 44.

Stage 2 involves the construction of an amenities block on the northern side of the historic Old Post Office building on Lot 44. The building will contain three toilets (including a fully accessible toilet) and a urinal, along with wash basins and associated infrastructure.

Building Material: Lightweight cladding to match existing Roofing Material: Metal roof sheeting to match existing

Lord Howe Island Board

Date Received:

PAST/PRESENT LAND USES

State the past known uses of the site:	Commercial
State the present known uses of the site:	Commercial

STAGED DEVELOPMENT

You can apply for development consent for only part of your proposal now, and for the remaining part/s at a later time.

Are you applying for development consent in stages? 🔀 Yes	🗌 No
If yes please attach:	

- Information which describes the stages of your development;
- A copy of any development consents you already have which relate to your development.

PLANS OF THE LAND AND DEVELOPMENT

You need to provide a number of different plans that show what you intend to do. Step 4 of the Development Application Guide sets out which plans to provide and the details to include. Please submit 1 copy of the plans with the application. Please attach:

- A site plan of the land, drawn to scale;
- · Plans or drawings of the proposal, drawn to scale and, where relevant;
- An A4 size plan of the proposed building and other structures on the site;
- A plan of any existing buildings (and uses), drawn to scale.

ENVIRONMENTAL EFFECTS OF YOUR DEVELOPMENT

To assess your proposal, we need to understand the impacts it will have. Depending upon the nature and scale of your proposal, you need to provide one or more of the statements listed below to explain the environmental effects of your proposal.

Is your proposal likely to cause a major environmental impact (e.g. designated development)?

- Yes Please attach an environmental impact statement.
- X No
- Please attach a statement of environmental effects (SEE).

Is your proposal likely to cause have significant effect on threatened species, populations, ecological communities or their habitats?

X Yes Please attach a species impact statement.

No No

SUPPORTING INFORMATION

You can support your application with additional material such as photographs (including aerial photographs), slides and models to illustrate your proposal.

Please list what you have attached.

- Attachment 01 Statement of Environmental Effects
- Attachment 02 Threatened Species Assessment
- Attachment 03 Architectural Plans Proposed Amenities Lot 44
- Attachment 04 Geo technical Report
- Attachment 05 On-site Wastewater Report & Design
- Attachment 06 Waste Management Plan
- Attachment 07 Preliminary Construction Management Plan
- Attachment 08 Electrical Supply
- Attachment 09 Preliminary Site Investigation

NOTE: It will be necessary for you to place pegs showing the location of all building extremities and height of buildings within seven days of lodging your development application. These pegs will allows inspection by Board staff at an early stage of your development assessment.

APPLICATION FEE

For development that involves a building or other work, the fee for your application is based on the estimated cost of the development. If your development needs to be advertised to the public you may also need to include an advertising fee. Clauses 246 to 263 of the Environmental Planning and Assessment Regulation 2000 provide a schedule of fees.

NOTE: Fees will be calculated in accordance with Cordell's Building estimates and will form the basis for the fee. To save time and any delays in processing your application, please contact us if you need help to calculate the fee for your application.

Estimated cost of the development: \$310,000.00 (excluding GST),\$342,100 - fees paid on DA portal amount

Total fees lodged:\$1726.62...... Date: ..30/04/2025 Receipt No.: 28721

APPLICANT/S OR APPLICANT'S AGENT DECLARATION

Have you or any associated persons with a financial interest in this a	application i	in the last two years mad	e any political donations
or given any gifts to any local Board Member or Board employee?	Yes	X No	

If you ticked yes please fill out a Political Donations and Gift Disclosure Statement. IMPORTANT NOTICE: It is an offence under the EP&A Act 1979 if you fail to disclose reportable donations and gifts.

LEASEHOLDER AUTHORISATION - All leaseholder/s of the land must sign this application.

As the least the interview of the second s	sent to this application.		
Signature:	Signature:		
LHIB on behalf of the Crown			
Name:Suzie Christensen - LHIB CEO	Name:		
Date: 24.04.25	Date:		

APPLICANT AUTHORISATION - The applicant/s or the applicant's agent must sign the application.

I apply for consent to carry out the development described in this application. I declare that all the information given is true and correct. I also understand that, if incomplete, the application may be delayed or rejected and more information may be requested within 21 days of lodgement.

Signature	Signature:
Name:Christie Mills on behalf of LHIB	Name:
Date: .23/04/2025	Date:
State the capacity in which you are signing if you are not the	applicant:

PRIVACY POLICY

The information you provide in this application will enable us, and any relevant state agency, to assess your application under the Environmental Planning and Assessment Act 1979 and other applicable state legislation. If the information is not provided, your application may not be accepted.

If your application is for designated development or advertised development, it will be available for public inspection and copying during a submission period. Your application, and any attached plans will be published on the Lord Howe Island Board website. Written notification of the application will also be provided to the neighbourhood. You have the right to access and have corrected information provided in your application. Please ensure that the information is accurate and advise us of any changes. Documentation provided with an application may also be accessed in accordance with the requirements of the Government Information Access (GIPA) Act 2009.

LODGEMENT

Before submitting your application, please ensure you have attached all the information the consent authority needs to assess your proposal. You can use the following checklist. Please place a cross in the box in the box is you have attached:

Plans

- X A site plan of the land all applications
- X Plans or drawings of the proposal showing all dimensions all applications
- An A4 size plan of the proposed building and other structures on the site all applications
- X A plan which is drawn to scale of all existing buildings.

Environmental effects

- An environmental impact statement for a designated development proposal and an electronic version of the executive summary
- X A statement of environmental effects required for all applications that are not designated development
- An environmental report if required under clause 42 of the LHI LEP 2010. Contact the Board to see if you need to prepare an environmental report.
- X A species impact statement
 - A Basix Certificate The Building Sustainability Index (BASIX) applies to all residential dwelling types and is part of the development application process in NSW. A BASIX certificate <u>MUST</u> be obtained for "BASIX affected development". For further information please refer to <u>www.basix.nsw.gov.au</u>
- Electrical supply form must be completed (for new / alteration / addition to existing supply).

Staged development

- X Information which describes the stages of the development
- A copy of any consents already granted for part of the development

Supporting information

X Other material to support your application, such as photos, slides and models. *Please ensure any items listed as an Advisory Note as part of the Owner Consent approval have been addressed.*

Application fee

Your application fee — required for all applications.

Where to lodge your application

You can lodge your completed application form, together with attachments and fees at the Lord Howe Island Board's office.

Fire Safety Provisions Statement

Project: Lot 44 Amenities and Wastewater System Development

Applicant: Lord Howe Island Board

Location: Lot 44, Lord Howe Island

This Fire Safety Provisions Statement has been prepared to accompany the Development Application for the Lot 44 Amenities and Wastewater System project, submitted by the Lord Howe Island Board.

It identifies the proposed Category 1 Fire Safety Measures for the development, in accordance with the requirements of the Environmental Planning and Assessment Regulation 2021 and relevant provisions of the National Construction Code (NCC).

The measures outlined are appropriate to the type and scale of the development and will be confirmed and installed in compliance with the Building Code of Australia at the Construction Certificate stage.

This development proposes the following Category 1 Fire Safety Measures:

Smoke Alarms: Battery-operated smoke alarms installed in accordance with AS 3786.

Emergency Lighting: Emergency lighting installed internally in accordance with NCC Volume 1, Part E4.

Fire Extinguishers: Fire extinguishers to be located adjacent to the main entry, installed in accordance with AS 2444.

No other Category 1 Fire Safety Measures are required for the type and scale of this development.

Prepared by: Christie Mills (On behalf of the Lord Howe Island Board)

Date: April 2025

LORD HOWE SLAND BOARD

ELECTRICAL SUPPLY

NOTIFICATION OF PROPOSED ADDITIONS AND/OR ALTERATIONS TO EXISTING ELECTRICAL SUPPLY

To be submitted in duplicate and signed by the customer or the electrical contractor.

Lord Howe Island Board NAME OF APPLICANT:

ADDRESS OF PREMISES: Corner of Neds Beach Road and Lagoon Road

PORTION NO. Lot 44 SERVICE NO. SN.147, Meter No.2600529

PARTICULARS OF PROPOSED ADDITIONS AND/OR ALTERATIONS:

	LIGHTING POINTS		LIGHTING POINTS GPO'S		OTHER APPARATUS (Motors, Solar Heaters etc.)		
	NO.	WATTS	SINGLE	DOUBLE	TYPE	NO.	WATTS
VYXX	9	100	3		Wastewater pump – to be sized and confirmed by the wastewate		be sized wastewater-
Y Y					treatment = appointed. of up to 2,0 included fo	supplier onc Preliminary 000W has b or design put	e allowance ⁻ een rposes.

Particulars of any work to be disconnected: Nil

Name and Address of Electrical Contractor:

To be appointed

Licence No.

Signature of Applicant

_____ Date: _____23/04/25



Lord Howe Island Board

Preliminary Construction Management Plan

LHIB CBD Amenities

April 2025 Version 01

LHIB CBD Amenities – Preliminary Construction Plan

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1.Executive Summary

This document serves as a preliminary Construction Management Plan (CMP) developed to support the Development Application (DA) for the project. A final CMP will be prepared and implemented by the appointed contractor to ensure the construction methodology, operational requirements and legislative requirements are addressed.

1.1. Project Background

The existing public toilet servicing the Lord Howe Island (LHI) Central Business District (CBD) and associated sewerage treatment system is utilised by tourists, local residents, and local businesses. This project seeks to address operational issues stemming from an underperforming and aging wastewater system, while also providing additional amenities in the LHI CBD.

The LHI CBD is predominantly spread across Lot 44 & Lot 61. Six local business and the community hall rely explicitly on the existing toilets located on Lot 61 for their patrons. The public toilets (on Lot 61) are overwhelmed due to usage beyond its capacity as well as two commercial kitchens on Lot 44, which feeds into the same wastewater system. It is believed the grease traps (serving the commercial kitchens) are contributing towards blockages and interrupting the wastewater treatment process.

The figure below illustrates the Lot configuration for the LHI CBD, and key features of the existing wastewater system.



The project aims to deliver public toilet facilities and related treatment infrastructure that includes sufficient capacity to service the Lord Howe Island CBD, mitigates identified risks and ensures lease obligations are met. Key functional objectives minimising odors and ensuring legislative compliance is achieved, including requirements for accessible facilities.

2. Stakeholders

The below table outlines the key stakeholders for the project.

Stakeholder	Contact Details
Client	Lord Howe Island Board
Client Representative	Lord Howe Island Board
Lease holders	To be contacted via the Lord Howe Island Board
Principal Contractor	To be appointed

3.Construction Activities

3.1. Work Methodology

The works are proposed to be undertaken in 2 stages as outlined in the below table and figure. The sequence of works will ensure the wastewater treatment system & irrigation (stage 1) is fully operational prior to the completion of the new facilities (stage 2).

Stage	Scope
1	Installation of new wastewater treatment system and irrigation to service new and existing building on Lot 44
2	Construction of new toilet block on Lot 44

A preliminary site establishment plan for Stage 2 can be found under Appendix 1.

The appointed contractor is to determine the appropriate level of site establishment based on the size and scale of the wastewater treatment system and irrigation system. Final sizing of tanks and pumps for wastewater treatment system will be determined by the manufacturer and supplier.



- WATERWAYS (NAMED & UNNAMED) AND DRAINAGE ELEMENTS DERIVED FROM NSW DOV, HYDRODRAPY

3.2. Construction Hours and Duration

The duration of works will be confirmed by the appointed contractor.

Commencement Date	The commencement of the Works is subject to the appointment of a
	contractor through the applicable government procurement pathway.
Work Duration	The duration of the overall works program will be confirmed by the
	appointed contractor.
Work Hours	The work hours will be in accordance with the DA approval
	Working hours is anticipated to be:
	Monday to Friday: 7:30am to 5:30pm
	Saturday: 7:30am to 3:30pm
	Sunday and Public Holidays: No Work.
	High noise activities should last a maximum of four hours, with at least
	one-hour breaks in between.
	Some tasks may need to be performed outside of the standard working
	hours. If necessary, these will be scheduled in consultation with
	stakeholders and the LHIB to ensure all aspects of the work are clearly
	understood by everyone. This may include tasks that are best conducted
	outside of regular working hours to further reduce any potential
	disruptions to the LHI CBD.

3.3. Plan Equipment

The following plant and equipment are anticipated to be used for the works:

- Small scale earthmoving equipment;
- Mobile cranes;
- General power tools

3.4. Earthworks

No significant earthworks are expected for the project. Trenches will be needed for services related to the wastewater system, and any surplus fill will be managed according to LHIB policy.

3.5. Traffic Management and Access

Disruption to traffic due to the construction works is expected to be minimal. The additional vehicles are not expected to cause delays on local roads or create subsequent impacts to other roads.

No road closures are currently anticipated for the construction of the site; however, this will be reassessed upon the engagement of a Contractor.

If necessary, traffic management will be implemented to ensure:

- Provide safe and uninterrupted access for pedestrians and vehicles accessing adjacent driveways and business on the LHI CBD;
- safety of site personnel, pedestrians, cyclists, and drivers;
- Minimise environmental impact as a result of construction traffic;
- Ensure construction traffic does not unduly interrupt existing traffic flows on the local road network;
- Have no vehicles arrive at the site, without prior arrangement, outside the approved working hours;
- Timely and effective implementation of traffic management measures;

3.6. Ancillary Facilities

Due to the nature of the works and limited space at the LHI CBD, ancillary facilities such as an ablutions block and lunch facilities will not be provided for the project.

An area for parking for contractors and subcontractors during the works needs to be approved by the LHIB. Contractors and subcontractors are required to park only in the designated spots.

4. Environmental Health and Safety

4.1. Dust

Management of dust prevention to be developed by the Main Contractor and will form part of the final CMP. The need for measures to prevent tracking of soil onto roadways outside of the site will be assessed by the Main Contractor and provided if deemed necessary. These may include requirements to wash wheels, hosing dirty vehicles and general manual cleaning.

Additional precautions that would be implemented during the works include the covering of stock piles with tarpaulins, monitoring of weather conditions (including wind). Management and contingency plans will be developed to prevent any foreseeable impacts from dust.

4.2. Hazardous Materials (As applicable)

Prior to any construction works, a Hazardous Management Plan (HMP) will be prepared for the site in consultation with nominated project stakeholders to manage (if required) the removal or treatment of hazardous material. The HMP will include removal control plans for any Synthetic Mineral Fibre (SMF), Polychlorinated Biphenyl (PCB), Lead Containing Paint, Pre- and polyfluoroalkyl substances (PFAS) and an Asbestos Removal Control Plan as appropriate.

These control plans will be developed by specialist hazardous materials contractors and will detail such items as:

- The design, installation and testing of an appropriate enclosure to prevent asbestos fibre release during construction and removal;
- Using & Maintaining RPE (Respiratory Protective Equipment);
- Management of entering & leaving the removal area;
- Decontamination of the removal work area including tools and persons;
- Transport & disposal of asbestos waste; and
- Negative pressure units / dust suppression techniques to be employed (sizing and strategy for these units will be determined by the accredited demolition/hazardous materials removal contractor and will be included within the HMP).

Specialist Class A licensed contractors will be used to remove material classified as hazardous in the HMP. These materials will be removed separately first and disposed of in accordance with EPA requirements and statutory requirements. If identified hazardous material is to be removed by a qualified Occupational Hygienist. Certification must be provided that identified hazardous material has been removed from the building and/or site.

4.3. Storage of Dangerous Goods

Dangerous goods (such as petrol, diesel, oxy-acetylene, oils, etc.) will be stored in a lockable compound with sufficient ventilation in accordance with relevant codes of practice and standards. Material safety data sheets on all flammable and potentially harmful liquids will be provided by the contractor undertaking the works.

4.4. Odour Control

In terms of the construction activity for the site, it is expected that odour problems will be minimal. All plant and machinery involved in the works will be regularly serviced and checked for exhaust emissions and catalytic converters.

4.5. Stormwater Run-off

Stormwater flow and drainage flow lines will have appropriate sediment controls such as hay bales or sedimentation socks. All such controls will be required to be consistent with the Blue Book.

Erosion and sediment controls for the works will be designed, installed and maintained in accordance with the requirements of *Managing Urban Stormwater: Soils and Construction* (4th Edition) ("The Blue Book") and / or details provided by project engineering consultants.

Stormwater grate inlets surrounding works areas will be covered with geotextile fabric to allow water to enter into drains while retaining sediments.

Controls will be implemented to manage runoff from outside the site ('run on') entering the site.

Where this is not be possible, appropriate controls will be implemented to maintain separation of 'clean' run on water from runoff from the works site.

All drainage control devices will be regularly checked including during and immediately following heavy rainfall periods. Any remedial work required to maintain the effectiveness of controls will be undertaken as a priority.

4.6. Noise and Vibration Management

Noise from the construction site shall not exceed the limits set out by the EPA and Australian Standards. No machine work will occur outside the approved working hours set unless prior approval has been obtained from the LHIB.

The noise and vibration from the use of any plant equipment and/or building services associated with the premises shall not give rise to an offensive noise as defined under the provisions of the Interim Construction Noise Guidelines, EPA and Australian Standards.

As part of noise mitigation for the project, the contractor will be responsible for the management, checking of compliant maintenance regimes and statutory supervision of all equipment, such as making sure all trucks and machinery involved in the Works will be checked for defective exhaust systems and general servicing.

Guidelines for operational limits, identification of at-risk receivers and implementation of mitigation measures will be provided in a project Nosie and Vibration Management Plan. The objectives of the Construction Noise and Vibration Management will be to:

- Ensure that construction works do not significantly impact background noise levels around the LHI CBD precinct, and that applicable guidelines and regulations are met;
- Ensure all equipment operates within the applicable noise levels;
- Ensure that construction works do not cause sufficient vibration to damage surrounding buildings, and comply with the applicable guidelines and regulations;
- Vibration does not affect occupiers of the adjoining buildings; and
- Ensure construction methodologies adopted minimise the impact of noise, dust and vibration.

4.7. Public and Property Protection

Appropriate hoarding / fencing (as specified in Australian Standards and Work safe NSW requirements) and safety barriers will be installed to the entire work areas prior to commencement of the works. Site Hoardings will be erected around the perimeter of the construction site and maintained to prevent public access. Site signage will provide 24-hour emergency contact details including contact name and telephone number.

Construction vehicle access / egress gates / Signage will be installed.

These public and property protection measures will be reviewed at the time of contract award for the works to ensure alignment with proposed methodologies and sequencing to ensure the safety of the public is maintained at all times during the works.

4.8. Waste Management and Recycling Principles

A waste management plan has been developed to support the DA submission. The contractor will be responsible to review and produce a final version of the waste management plan aligned with the construction methodology and relevel legislation.

5.Dilapidation Report

Prior to commencing the works onsite and at completion, the appointed Principal Contractor will generate a Pre and Post Dilapidation Report. The report shall cover as a minimum the following areas:

- Existing roads and access roads;
- Infrastructure;
- Adjoining properties;
- Existing landscape, including trees to be retained;
- Services mains;
- Stormwater systems; and
- Existing utilities and authority services.

The full extent of the Dilapidation reports will be agreed with the Principal prior to investigations proceeding.

APPENDIX A – Preliminary Site Establishment Plan



Note, the preliminary site compound is indicative only and will be developed by the appointed contractor to align with the construction methodology and sequencing of works. The contractor is to consider public safety and ensure appropriate separation is provided between the public and construction activities.



Lord Howe Island Board

Waste Management Plan

LHIB CBD Amenities

April 2025 Version 01

LHIB CBD Amenities – Waste Management Plan

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1.Executive Summary

The Lord Howe Island Group (LHIG) was inscribed on the World Heritage Register under the United Nations' World Heritage Convention in recognition of its superlative natural phenomena and its rich terrestrial and marine biodiversity as an outstanding example of an island ecosystem developed from submarine volcanic activity.

The ecologically unique destination attracts tourists due to its natural beauty and biodiversity. The island's small community and businesses rely heavily on the effective management of waste to maintain the health of its environment and the well-being of its residents and visitors.

This document serves as a Waste Management Plan (WMP), developed to accompany the Development Application (DA) for the Lord Howe Island (LHI) CBD Amenities project on Lot 44 on LHI to ensure the responsible management of waste is adhered to in accordance with the Lord Howe Island Board's (LHIB) waste management policy and preserve the natural environment.

1.1. Project Background

The existing public toilet servicing the Lord Howe Island (LHI) Central Business District (CBD) and associated sewerage treatment system is utilised by tourists, local residents, and local businesses. This project seeks to address operational issues stemming from an underperforming and aging wastewater system, while also providing additional amenities in the LHI CBD.

The LHI CBD is predominantly spread across Lot 44 & Lot 61. Six local business and the community hall rely explicitly on the existing toilets located on Lot 61 for their patrons. The public toilets (on Lot 61) are overwhelmed due to usage beyond its capacity as well as two commercial kitchens on Lot 44, which feeds into the same wastewater system. It is believed the grease traps (serving the commercial kitchens) are contributing towards blockages and interrupting the wastewater treatment process.

The figure below illustrates the Lot configuration for the LHI CBD, and key features of the existing wastewater system.



The project aims to deliver public toilet facilities and related treatment infrastructure that includes sufficient capacity to service the Lord Howe Island CBD, mitigates identified risks and ensures lease obligations are met. Key functional objectives minimising odors and ensuring legislative compliance is achieved, including requirements for accessible facilities.

1.2. Waste management on Lord Howe Island

The Lord Howe Island Board (LHIB) is responsible for the management and disposal of waste produced on the island. The Waste Management Facility (WMF) operated by the LHIB receives all waste and is sorted into the following waste streams:

- Compostable materials including food waste, paper/cardboard, bio-solid and green waste;
- Recyclable materials including glass, aluminum, plastics, concrete/masonry rubble, scrap metal, oils, paints, photocopy/printer cartridges, batteries, whitegoods, tires, plus others;
- Re-useable materials including building materials and unwanted household items including furniture, toys, books etc;
- General waste materials including household refuse, nappies, treated timber, mixed waste and other non-recyclable waste;
- Incineration materials being untreated wood.

There is no waste collection service on LHI. The contractor will be responsible to sort waste on site and deliver it to the WMF. The WMF is located approximately 8 mins from Lot 44 via road. As there is no land fill on LHI, therefore all waste that cannot be composted or used on the island is sent to a Material Recovery Facility on the mainland for recycling, reuse, or landfill disposal.

The WMF has the following operating hours to receive waste:

	Day	Winter	Summer
	Monday	OPEN	OPEN
		10:30am – 3:00pm	10:00am – 3:00pm
	Tuesday	BY APPOINTMENT	BY APPOINTMENT
		6:30am – 3:00pm	6:30am – 3:00pm
	Wednesday	OPEN	OPEN
Builder's and		10:30am – 3:00pm	10:00am – 3:00pm
other waste	Thursday	BY APPOINTMENT	BY APPOINTMENT
		6:30am – 3:00pm	6:30am – 3:00pm
	Friday	BY APPOINTMENT	OPEN
		6:30am – 3:00pm	10:00am – 3:00pm
	Saturday	OPEN	OPEN
		10:30am – 3:00pm	10:00am – 3:00pm
	Sunday	CLOSED	CLOSED

*operating hours and days should be confirmed on the LHIB website



Route from Lot 44 to the WMF – Approximate travel time by road is 8 mins

2. Demolition and Construction Waste

Management Principles

2.1. Waste Management Principals

The waste hierarchy published by the Environmental Protection Agency (EPA) sets out the priorities for the efficient use of resources and is used to underpin the waste management principals outlined below.

The approach will be taken identifies avoidance and reduction of waste as the most preferable, whilst the least preferable is the disposal of waste. The principal is critical as all disposed waste on LHI is sorted and delivered to the WMF for shipping to the main land.



Avoid and Reduce

Minimise the production of waste materials in the demolition and construction process by:

- Assessing demolition practices to ensure materiles can be recycled or re-pourposed where possible
- Being mindfull of quantities and not over ordering products and/or materials

Reuse

Ensure that wherever possible, materials are reused either on site or offsite:

- Identify all waste products that can be reused
- Provide separate bins and signage for materiales to be reused on site vs items to be reused by the WMF
- Identify the potential applications for reuse on site

Recycling

Identify all recyclable waste products to be produced on site in accordance with the LHIB WMF's catagories

• Provide clear signage to ensure recyclable materials are defined in accordance with the

WMF's definition

• Process the material for recycling onsite prior to transportation to the WMF

Disposal

Waste products which cannot be reused or recycled to be put in a separate bin for disposal. The following will need to be considered:

- Ensure items for disposal is seperated by compostable materials, general waste and incineration as required by the WMF
- Ensure waste is regularly taken to the WMF for disposal during the operating hours for *'builder's waste'*

2.2. Liquid Waste

Liquid waste may be produced on site for environmental control measures when undertaking:

- Site and vehicle cleaning
- Dust control waste

The following measures will be taken to minimise the impact of liquid waste and conserve water on LHI:

- Ensure water is used in moderation and no taps are left continuously running
- Use grey water where available for dust suppression
- Ensure errosion and sediment control plans are implemented to ensure only clean water is discharged from site

2.3. Stormwater Pollution Prevention

All actions will be undertaken to avoid pollution entering stormwater drains and for litter generation. The following will be initiated:

- Prior to commencement of any works a consider the potential for stormwater pollution and/or litter generation and implement steps to mitigate the risk
- Site inspections to be conducted during the working day to monitor potential for stormwater pollution generation and where identified, works will cease until appropriate controls are implemented
- Wastewater and storm water will be managed and disposed of in accordance with the LHIB requirements.

2.4. Litter Management

Daily site inspections will be conducted to identify litter, remedy the situation and investigate the cause so as to reduce the potential for the issue to occur in the future.

- Sufficient quantities of bins (and/or bin space), will be made available to avoid dumping of materials outside bins
- All waste/recycling bins will have covers to ensure that waste cannot be blown out during windy conditions. This will also apply to relevant stocks of materials to be used in construction.

2.5. Hazardous Material Management

Note, the Construction Management Plan outlines the requirement for a Hazardous Management Plan (HMP) which is outside the scope of this Waste Management Plan.

Drawing Index				
Dwg No Drawing Name		Rev	Date	
01	Cover Sheet	D	2/04/2025	
02	Site Plan	D	2/04/2025	
03	Demolition Floor Plan	D	2/04/2025	
04	Roof and Part Site Plan	D	2/04/2025	
05	Floor Plan	D	2/04/2025	
06	Elevations	D	2/04/2025	
07	Sections	D	2/04/2025	
08	Access Notes	D	2/04/2025	
09	Access Plans	D	2/04/2025	
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24362 GENERAL BCA 2022 ACCESS SPECIFICATIONS

Applies to New areas, modified areas and areas within the affected path (ie from main entry doorways to the new and modified areas) and ramp and steps from deck

All dimensions noted below are net (CLEAR) dimensions and are not to be reduced by projecting skirting, kerbs, handrails, lights, fire safety equipment, door handles less than 900mm above FFL (finished floor level) or any other fixtures/fit out elements All works are to comply with Access related requirements of Part D2, D3, D4, E3D7 and F2D5 under the NCC 2022. Refer to Access Report by Vista Access Architects for details for the requirements to ensure compliance. BCA Clause D3D15

Slip resistance requirements

- Slip resistance to be as per BCA Table D3D15 when tested in accordance with AS4586 (applies to flooring, ramps, stairways, etc)

- Refer to guide HB 197/198 for details in regard to slip resistance requirements.

- Obtain Certificate stating that the Slip resistance complies with BCA requirements when tested as per AS4586.

BCA Clause D4D3

Floor or ground surfaces

- The texture of the surface is to be traversable by people who use a wheelchair and those with an ambulant or sensory disability.

- Abutment of surfaces is to have a smooth transition (this includes door thresholds of accessible sanitary facilities).
- Construction tolerances to be +/- 3mm vertical or +/-5mm (provided the edges have a bevelled or rounded edge).

- Grates (if used in the accessible path of travel) are required to comply with AS1428.1. Circular openings maximum of 13 mm in diameter. Slotted openings maximum of 13 mm wide and be oriented so that the long dimension is transverse to the dominant direction of travel. Recommend that Timber decking and boardwalks to be as per AS1428.1-2021 with max 6mm gaps (for decking boards max 150 width) and max 3mm vertical tolerances.

All Common use Doors (excluding doors to non-accessible sanitary facilities, doors to stairways, doors to level not serviced by ramp or lift and doors to areas exempted from access):

All single hinged doors and in case of multiple leaf doorways, at least 1 operable leaf is required to provide a clear opening of 850mm with the door circulations spaces as per AS1428.1. Door reveal to have max 300mm depth. As noted on plans, 850c indicates door with a clear - All doorways to have a minimum luminance contrast of 30% provided between, Door leaf and adjacent wall or Architrave and wall or Door leaf and architrave or Door jamb and adjacent wall. The minimum width of the luminance contrast to be 50mi - All external doorways can either have flush door thresholds or can have a max drop of 35mm at threshold when used in combination with a doorway threshold ramp of 1:8 grade within 20mm of the door leaf and max depth of 280mm

Door hardware requirements:

D shaped door handles to be used, located at 900-1100mm above FFL.

- Clearance between the handle and the back plate or the door face at the center grip section of the handle to be between 35-45mm with a minimum of 20mm turn at the end of the handle

Doors to accessible and ambulant sanitary facilities shall be provided with an in-use indicator and a bolt or catch. Where a snib catch is used, the snib handle shall have a minimum length of 45 mm from the centre of the spindle. In an emergency, the latch mechanism shall be o BCA Clause D4D4

All common use stairways require the following: - All stairways to be compliant with: AS1428.1, including but not limited to opaque risers, with 1M clear space (handrail to handrail /wall)

- Stair nosings shall not project beyond the face of the riser and the riser may be vertical or have a splay backwards up to a maximum 25 mm, have a sharp intersection; be rounded up to 5 mm radius; or be chamfered up to 5 mm × 5 mm.
- Each tread to have a nosing strip between 50mm-75mm for the full width of the stair, which can be setback for a maximum of 15mm from the front of the nosing. This strip is to have a minimum luminance contrast of 30% to the background and to comply with any change in le - Handrails to be located between 865mm-1000mm above FFL, with no vertical sections. Diameter of handrails to be between 30mm-50mm and located not less than 50mm from adjacent walls with no obstructions to top 270° arc
- In addition to the above all non-fire-isolated stairways require the following:

Handrails to be provided to both sides and to extend a minimum of 300mm horizontally past the nosing on the top riser. At the bottom of the stairs the handrail is to extend at least one tread depth parallel to the line of the nosing, plus a minimum of 300mm horizontally from t All common use 1.20 walkways and any passageways require the following

- Min 1 M clear widths (increase to 1.2M for NDIS SDA HPS and FA projects) with vertical clearance of min 2M
- For 1:20 grade walkways, 1.2M length (in direction of travel) landings at max grade of 1:40 are required every 15M.
- The floor surface abutting the sides of the walkway to be provided with a firm and level surface (of a different material) at the same level and grade of the walkway and extend horizontally for a minimum of 600mm unless one of the following is provided: 150mm high kerb, kerb 450mm height
- At 60° to 90° bends in pathways provide a 1500mmx1500mm space with maximum 500mm splay at internal corner.
- At 30° to<60° bends in pathways that are less than 1200mm provide a splay of 500mm at internal corner.

All ramps to be compliant with: AS1428.1

All 1:14 ramps require the following:

Compliance is required with AS1428.1, handrails on both sides with 1M clearance between handrails (increase to 1.5M clearance between handrails where ramp is curved and 1.2M for NDIS SDA HPS and FA projects).
1.2M landings (at max 1:40 grade) required every 9M intervation to not exceed 3.6M.

- Handrail to extend a minimum of 300mm horizontally past the transition point at the top and bottom of the ramp except where the inner handrail is continuous at an intermediate landing
- Handrails to be provided on both sides with 1M clearance between them and located between 865mm-1000mm above FFL with no vertical sections
- Kerbs or kerb rails shall be located as required under AS1428.1
- Diameter of handrails to be between 30mm-50mm (30mm preferred) and located not less than 50mm from adjacent walls with no obstructions to top 270°arc.
- At 90 / 180 degree bends the mid-landings are required to be minimum of 1540mm when measured in between handrails.
- Turning space of 1540mm x 2070mm at maximum of 1:40 grade is to be provided at or within 2M of the end of the passageway and at max 20M intervals of walkways

BCA Clause D4D7

- Braille / Tactile Signage as per BCA requirements to be provided as noted in BCA Specification 15 Braille and Tactile signs to:
- All doors nominated as Exit doors require signage
- All Sanitary Facilities and airlocks to sanitary facilities including accessible and ambulant toilets require signage
- Location of the Braille / tactile components between 1200mm-1600mm above FFL.
- Location of lines of characters between 1250mm-1350mm above FFL
- Locate signage on the wall on the latch side of the door with the leading edge of the sign located between 50-300mm from the architrave, except for ambulant toilet cubicle where it is to be mounted on the door itself.

BCA Clause D4D9

- TGSIs are required in the following locations - At top and bottom landings (of ramps, stairways, escalators), 600-800mm depth or min 12 discrete cones are required at 300+/-10mm from edge of hazard (unless the landings are less than 3M, in which case, provide 300mm depth)
- At mid landings, 300-400mm depth or min 6 discrete cones are required only where handrails are not continuous or landing or if landing is less than 3M.
- Under an overhead obstruction of <2M if no barrier is provided. 600-800mm depth or min 12 discrete cones are required at 300+/-10mm from edge of hazard
- When accessway meets a vehicular way adjacent to a pedestrian entry (if no kerb / kerb ramp provided at the location). 600-800mm depth or min 12 discrete cones are required at 300+/-10mm from edge of hazard
- Compliance is required with AS1428.4.1. Luminance contrast requirements of TGSIs are to be as listed below.
- Integrated TGSIs require min of 30%. Discrete TGSIs require min of 45%. Discrete with 2 colours require the raised surface to have a min of 60%

Accessible unisex toilet is to be designed in accordance with AS1428.1

- Floor is to be slip resistant
- WC pan requires a circulation space of 1.9M(back of pan) x2.3M. Front setout of WC pan is 800+/-10mm from rear wall with minimum 600 clear of any back wall mounted fixture except the backrest, and the C/L of pan is to be 450-460mm from side wall. Top of seat of WC pan Fixtures such as hand dryers, towel / soap dispensers, shelves, cabinets etc can encroach into WC circulation to maximum of 150mm as ling as minimum 900mm clear space is provided below.
- Wash basin requires an additional minimum 330mm when placed on opposite wall of pan and additional minimum 430mm when placed on adjacent side. The top of the washbasin is to be between 800-830mm above FFL. Width of basin to be min 450mm with centreline of tar
- Water taps to be lever or sensor with minimum 50mm clear from an adjacent surface. Circulation space to be as per AS1428.1. Front of basin to operable parts of tap to be maximum 300mm throughout its arc of movement or where sensor is provided, where the sensor is activ Seat to be full round, take 150kg weight and provide 30% luminance contrast to either pan or wall or floor and remain in upright position when fully raised.
- Backrest to be centred with WC pan, be able to withstand force of 1100M in any direction, have 150-200mm height, 350-400mm width and 120-150mm above the seat, 430-495 from front of pan, at an angle of 95°-100back from seat hinge
- Flushing control to be proud of surface and located between 900-1100mm above FFL at back or side wall (refer to diagram) and minimum 50mm clear of backrest or grabrail.
- Top of **Toilet paper dispenser** is to be located maximum of 700mm above FFL and maximum of 300mm from edge of pan.
- Grabrails, 30-40mm diameter, placed 50-60mm clearance from wall, with no obstructions to top 270° arc, are to be provided to rear and side wall (90° or 30° 45°). Horizontal component to be 800-810mm above FFL. Fastenings and construction of grabrails to be capable to withsta for minimum 600mm above horizontal grabrail.
- Back wall horizontal grabrail to be a minimum of 300mm and located at a maximum of 50mm from the cistern. Where the cistern is concealed, there rear grabrail to be continuous
- Mirror minimum 350mm wide to be located above the washbasin and to start from 900mm above FFL, till minimum of 1850mm above FFL
- Clothes hanging device to be at height of 1200-1350mm above FFL and at least 500mm from any internal corner
- A portable sanitary waste disposal unit is to be provided. Shelf is required to be either integrated (min 120 x 300mm) with the basin/vanity or as a separate fixture 300-400mm length, 120-150mm wide and located 900-1000mm above FFL
- Baby change tables where provided cannot encroach into the circulation space when folded up and to have a max height of 820mm with 720mm underneath when in open position
- Soap and paper towel dispensers where provided, to be installed with height of the operative component between 900-1100mm above FFL and no closer than 500mm from an internal corner. Door to the Accessible toilet requires AS1428.1 compliant door circulation spaces. When door swings next to the washbasin a clear 300mm is required between the door swing and the washbasin. When door swings out, the door is to have a mechanism that holds the door in a
- An in-use indicator and a bolt or catch is required. Where a snib catch is used, the snib handle to have a minimum length of 45mm from the centre of the spindle. In an emergency, the latch mechanism to be openable from the outside.
- Light switches to be located between 900-1100mm above FFL and not less than 500mm from internal corners. Rocker action / toggle switches to be provided in with a minimum size of 30mmx30mm. Push pad switches if used to have a minimum size of 30mmx30mm. um dimension of 25mm diamete GPOs to be located between 600-1100mm above FFL and minimum of 500mm from any internal corners. Rocker action / toggle switches to be provided in with a minimum size of 30mmx30mm.
- Refer to AS1428.1 and provided diagrams for further details

Ambulant toilet is to be designed in accordance with AS1428.1

- Floor is to be slip resistant
- Size of cubicle to be such that the finished walls to be 900-920mm wide after tiling or any other finishes. Circulation space of 900x900mm is to be provided inside the cubicle (excluding door swing) and outside the door of the cubicle.
- WC pan to have top of seat between 460-480 above FFL.
- Door to cubicle to provide 700mm clear opening space and provided with an in-use indicator and a bolt or catch. Where a snib catch is used, the snib handle shall have a minimum length of 45 mm from the centre of the spindle. In an emergency, the latch mechanism shall be o Top of toilet paper dispenser is to be located maximum 700mm above FFL and maximum of 300mm from the front edge of pan.
- Grabrails of minimum 400-450 length and height, 30-40mm diameter, placed 50-60mm clearance from wall, with no obstructions to top 270°arc, provided to rear and side wall (90°or30°-45°). Horizontal component to be 800-810mm above FFL. Fastenings and construction of gra of force. Vertical grabrail to be 200-250mm from front edge of WC pan.
- Clothes hanging device to be at height of 1350-1500mm above FFL. Refer to AS1428.1 and provided diagrams for further

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Broadcrest Environmental Pty Ltd

Lot 44 Lord Howe Island

On-Site Wastewater Report

April 2025

REF: 3939-WW-A-01

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Approval and Authorisation

Title	Lot 44 Lord Howe Island, On-Site Wastewater Report
Authored on behalf of Broadcrest	K. Ryan
Environmental Pty Ltd by:	Engineer Environmental & Civil
Signed:	
Dated:	8/04/2025

Document Status

Date	Internal Reference	Document Status	Prepared by	Reviewed by
8/04/2025	3939-WW-A-01	For Release	K. Ryan	C. Hudson

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1 INTRODUCTION

1.1 Foreword

An On-Site Wastewater Report is a technical document which specifies how the sewage produced on-site will be managed, treated, and then disposed. An On-Site Wastewater Report carefully considers the environment, health, cost, and long-term management options for the on-site management of sewage.

1.2 Background

Broadcrest Environmental Pty. Ltd. was engaged by Lord Howe Island Board to produce an On-Site Wastewater Management Report at Lot 44 Lord Howe Island (the site). The report will accompany a proposal to construct a proposed bathroom amenities to service the allotment. A site inspection was carried out on the 17th of March 2025 by assessing officer Cheyne Hudson which involved a visual assessment of the site and soil sampling. The assessment of the results, system design and recommendations are detailed in this report.

1.3 Objectives

The performance objectives of the On-Site Wastewater Assessment are to:

- Protect human health
- Protect ground and surface water
- Maintain and enhance the quality of the land and vegetation
- Maintain and enhance community amenity
- Ensure maximum re-use of resources
- Promote an ecologically sustainable development.

1.4 Scope of Works

The scope of works included the following:

- A site inspection
- Soil sampling and analysis
- Wastewater management assessment
- Drafting of the proposed system
- Reporting in accordance with the associated legislations and guidelines.

1.5 Compliance

This report has been produced in accordance with the following guiding documents:

- DLG 1998, On-site Sewerage Management for Single Households
- SCA 2012, Designing and Installing On-Site Wastewater Systems
- Australian Standard AS 1289.3.8.1:2006 Methods for testing soils for engineering purposes
- Australian Standard AS 1546.1-3:2008 On-site domestic wastewater treatment units
- Australian Standard AS 1547:2012 On-site domestic wastewater management
- LHIB 2015, On-Site Wastewater Management Design Guidelines

2.1 Site Information

Address / Locality	Lot 44 Lord Howe Island (Corner Neds Beach Rd & Lagoon Rd)
Lot Area:	2257m ²
Zoning:	Settlement & Recreation
Council / LGA:	Lord Howe Island
Intended Water Supply:	Tank water
Inspection Officer:	Cheyne Hudson - 18 March 2025

2.2 General

The proposed development consists of the construction of new male, female and disabled toilets to service customer and staff use on the site. At the time of inspection, Lot 44 was occupied by:

- a small boutuiqe clothing store
- a small deli
- a massage palour
- a bar
- a post office and
- a marine park office.

Currently, there are no toilet facilities on Lot 44. Accordingly, all staff and visitors on the site are required to use the public toilets across the road on Lot 61 – to the rear of the community hall. It is proposed to cease this methodology, by providing facilities for staff and visitors on site.

At the time of inspection, wastewater generated within the bar and deli was being pre-treated within grease traps prior to collection and maceration within a 3,000L macerating collection well. The macerating collection well then pumped wastewater via a distribution line beneath Neds Beach Road to an Aqua Nova AWTS on Lot 61 – the same AWTS servicing the public toilets and community hall. It is proposed to cease this methodology, by providing an independent wastewater management system for staff and visitors of Lot 44.

Specifically, it is proposed to install a new Commercial Aerated Wastewater Treatment System (AWTS) to service all facilities on site. Secondary treated effluent will then be disposed via drip irrigation within a corridor of land east of Lot 44. Disposal is proposed to occur within two zones separated by a driveway totalling 2021m². The western zone (Zone A per Figures 2.1 and Appendix A) is zoned Settlement and vegetated with a mixture of pine trees and palm trees. The eastern zone (Zone B per Figure 2.2 and Appendix A) is zoned Recreation and vegetated primarily with palm trees.

The site is constrained by the presence of protected native vegetation, limited available space and highly permeable soils and nearby backup potable supply Groundwater Bores. The potential occupancy of the site shall be restricted by the available land for effluent disposal. For the purposes of this assessment, we have asumed 2 staff at each of the premesis listed above and a maximim of 80 persons x3 sessions per day within the current bar premesis (or 240 customers per day total at 20L wastewater loading per customer).



Figure 2-1: South facing photograph of Proposed EMA Zone A



Figure 2-2: East facing photograph of Proposed EMA Zone B

2.3 Assessment Methodology

The assessment methodology of this report follows that prescribed in DLG (1998), whereby the restriction imposed by a site/soil features are categorised by severity, and their impact forms the basis for subsequent system selection, design, and recommendations (Table 2.3.1).

Limitation	Description
Minor	This feature has been assessed and deemed to pose no obstacle to OSSM, given the recommended system and measures are implemented.
Moderate	This feature requires consideration. It may typically be overcome by site modifications or by appropriate selection, design and sizing of treatment / application systems.
Major	This feature precludes the use of a given treatment, land application method, or Effluent Management Area (EMA). Particular Major Limitations may prevent OSSM entirely, require an off-site management approach, or re-evaluation of the development scope.

2.4 Assessment Summary

A summary of limitations pertinent to the suitability of the site for On-Site Sewerage Management (OSSM) is provided in Table 2.4.1 below.

Factor Assessed	Description	Limitation
Climate	Rainfall exceeds evaporation during June, April, May, July, August.	Moderate
Temperature	Annual mean daytime maximum > 15°C.	Minor
Flood Potential	No flood study or flood levels have been provided. The site is located above any anticipated flood level.	Minor
Exposure	The proposed effluent management area (EMA) is moderately exposed to sun and wind	Moderate
Slope	Gently Inclined: 1.5 – 9.5%	Minor
Landform	Landform Slope Classification: Linear planar Morphological Type: Mid-slope	
Run-on and Seepage	Stormwater run-on is not anticipated to have an impact on the proposed EMA.	Minor
Site-drainage	Site-drainage Soils are Rapidly drained - excess water flows downward into highly permeable subsoil material	
Erosion Potential	The Landform within the proposed EMA is stabilised - no evidence of sediment movement, surface is vegetated	Minor
Site and Soil Disturbances	No unplanned Site / Soil Disturbance Identified or anticipated	Minor
Groundwater Bores	The nearest bore is Domestic Water Supply Bore ID:174 located approximately 69 m from the site with a standing water level of 3.5m	Moderate
Rock Outcropping	No rock outcrop - no bedrock exposed within the proposed EMA	Minor
Geology & Regolith	No geological discontinuities, fractures, or highly porous regolith are expected within and surrounding the EMA	Minor
Buffer Distances & Available land area	Reduced Buffers area proposed to: High Tide Water line	Moderate

Table 2.4.1 – Assessment summary of site features

2.5 Climate

Lot 44 Lord Howe Island has a temperate climate with dry winters and a wetter summer. Median annual rainfall of 1,511.8mm and evaporation 1,460.0mm. (Appendix B1) (*Moderate Limitation*). The proposed EMA has been sized with the inclusion of water balance calculations to account for months where rainfall exceeds evaporation (See Appendix B2)

Average maximum temperatures range from 19.1°C to 25.5°C in July and January respectively. Average minimum temperatures range from 14.0°C to 20.8°C in July and January respectively. The mean annual daytime maximum of 22.3°C proves suitable for biological wastewater treatment systems (i.e. AWTS) (*Minor Limitation*).

2.6 Flood potential

No flood study or flood levels have been provided. The site is located above any anticipated flood level. (*Minor Limitation*).

2.7 Exposure

The proposed effluent management area (EMA) is moderately exposed to sun and wind.

Table 2.7.1 –	Site Exposure
---------------	---------------

Landform Feature	Aspect	Solar Exposure	Wind Exposure	Limitation
A + B	Southern	Moderate	Moderate	Moderate

Moderate to poor exposure limits effluent uptake via evapotranspiration. However, rapidly draining soils have a reduced reliance on evapotranspiration. Drip irrigation within densely vegetated palm tree plantations has been proven a successful wastewater disposal method on the Island.

2.8 Slope

Slope has the potential to become a restrictive landform feature for OSSM with increased slope increasing the risk of run-off and/or erosion. Slope within the proposed effluent management was determined via survey/lidar mapping (See Table 2.8.1).

Table 2.8.1	– Site Slope
-------------	--------------

Landform Feature	Approximate Slope Tangent (%)	Slope Classification	Limitation
A + B	1.5 – 9.5%	Gently Inclined	Minor

				Limitation		
Slope Range [%]	Slope Classification	Surface Irrigation (Spray & Drip)	Absorption Systems	Mounds	Conventional Trenches & LPEDs	Sub-surface Irrigation
0 – 1	Level	Minor	Minor	Minor	Minor	Minor
1 – 3	Very Gently Inclined	Minor	Minor	Minor	Minor	Minor
3 - 10	Gently Inclined	Minor	Minor	Minor	Minor	Minor
10 – 15	Moderately	Major	Major	Moderate	Moderate	Minor
15 – 20	Inclined	Major	Major	Major	Moderate ^[2]	Minor
> 20	Steeply Inclined	Major	Major	Major	Moderate ^[3]	Moderate ^[1]

[1] 30% maximum slope without specific design (AS 1547:2012, p.133)

[2] >15% slope increase difficulty in construction (AS 1547:2012, Table K1)

[3] >25% slope creates difficulty in trenching, risk of erosion during construction (AS 1547:2012, Table K1)

2.9 Landform

The landform describes the surface shape and topographic position at the proposed EMA. Typical landform descriptors per AS1547:2012 are detailed below.

Table 2.9.1 – Landform Configuration

Landform Feature	Slope Configuration	Morphology	Limitation
A + B	Linear planar	Mid-slope	Minor

2.10 Surface Water and Seepage

Surface water and seepage flow is determined by the catchment preceding the EMA and the prevailing landform features. General assessment of the likely surface water interaction with the landform and EMA has been provided.

Table 2.10 – Site surface water

Landform Feature Size	Catchment		Surface Flow		Soil	Seenage	
	Size	Surface Coverage	Run-on	Run-off	Moisture	Potential	Limitation
A + B	Minor	Grass	Minor	Minor	Slightly Moist	Minor	Minor

Stormwater run-on is not anticipated to have an impact on the proposed EMA.

2.11 Site drainage

At the time of inspection soils appeared to be rapidly drained, with excess water expected to infiltrate into subsoils and move laterally as subsurface flows, no noted presence of macrophytes were observed (i.e. sedges, ferns, juncus) (*Minor Limitation*).

2.12 Erosion potential

Erosion and surface soil movement results from the interaction of the existing landform, surface flows and surface coverage. The following existing erosion conditions were identified and assessed in proposing additional hydraulic loading in the form of effluent.

Table 2.12.1 – Site erosion potential

Landform Foaturo	Surface Flow Type	Erosic	Limitation	
	Surface Flow Type	Surface Flow	Wind	
A	Unconcentrated	Minor	Minor	Minor

The Landform within the proposed EMA is stabilised - no evidence of sediment movement, surface is vegetated.

2.13 Site & Soil Disturbances

No unplanned Site / Soil Disturbance Identified or anticipated. The LHIB is to ensure that the irrigation drippers within the EMA are covered with vegetation, mulch and palm fronds prior to commissioning and vehicle traffic is to be eliminated to protect irrigation equipment. (*Minor Limitation*).

2.14 Domestic Bore

An assessment of nearby groundwater bores was produced for the development (See Table 2.14). The nearest bore is Domestic Water Supply Bore ID:174 located approximately 69 m from the site with a standing water level of 3.5m (*Moderate Limitation*).

ldnt	Description	X_coord	Y_coord	System	Depth of Bore (m)	AHD of Perm Mark	Comments on Use		described	in sample list DSI
							augment house in draught (top-up rain tanks). Gardens			
							(incl veg. & fruit) Don't believe using at present (no pump			
169		505766.09	6512378.00	well	6.5		and well silted)	minimal u	se	DP40096-209
· · · · · · · · · · · · · · · · · · ·		10					Lodge - everything, desal, feeds - everything,			No DP - In stevens reserve
174	Blue Lagoon	505962.26	6512309.54	well	3.5		feeds - garden irrigation & augment in draught			closest to Lot 44
							, & use so does - augment			No DP - In stevens reserve
175	Stevens Reserve	505997.07	6512309.52	well	2.5		houses in drought			furthest to right
192		505954.32	6512270.75	well	3		not used at present. No pump			DP757515-3

A Viral die-off assessment was produced to determine travel distance required for effective viral die-off to occur within the effluent. Viral die-off is achieved in the existing site/soil conditions

within 49m of dispersal (See Appendix D). Groundwater bores within this radius should not be permitted.

2.15 Rock Outcropping

No rock outcrop - no bedrock exposed within the proposed EMA (*Minor Limitation*).

2.16 Geology / Regolith

No geological discontinuities, fractures, or highly porous regolith are expected within and surrounding the EMA (*Minor Limitation*).

2.17 Buffer Distances & Available Land Area

Minimum offset distances are designated by local approval authorities within their guiding documents to ensure the ongoing protection of community health, sensitive ecosystems, and the maintenance of community amenity. Where LGA guidance on a constraint is not available, appropriate offsets have been nominated in accordance with AS1547:2012 and Table 5 DLG (1998).

The site-specific constraints for the proposed EMA and land application method have been assessed as per Table 2.17.1.

	Minimu	m Setback	Proposed	
Site Feature	If EMA is upslope of feature	If EMA is downslope / level with feature	EMA Upslope/Downslope	Limitation
Dwellings	20	0m ^[1]	>20m	Minor
Property Boundaries	6m	3m	>6/3m	Minor
Driveways	6m 3m		>6/3m	Minor
Buildings	6m	3m	>5/3m	Minor
Pools / recreation	(бm	>6m	Minor
Inground Potable Rainwater Tanks	1	0m	>10m	Minor
Watercourses	10	00m	68m	Moderate
Domestic Bore / Well	2!	50m	69m	Moderate
Dam / Drainage Depression	40m from h	igh water level	>40m	Minor

Table 2.17.1 – Minimum buffer distances from sensitive site features

[1] LHIB On-site Wastewater Management Strategy Section 1.2 Pg 3: A 20-metre buffer must occur between irrigation areas and residences on an adjacent block unless there is an agreement with affected Leaseholders.

2.18 Constraint factors associated with proposed reduced buffers.

Reduced buffers to site features are proposed to accommodate the EMA. The constraints associated with the reduced buffers are evaluated in accordance with Table R1 & R2 of Appendix R of AS1547 – 2012 – excerpt below.

Impacted Buffer			Reduced S	etback (m)	Setback Distance Range (m)	
	impacted bui	ier	EMA is upslope of feature	EMA downslope/level	(Table R1 AS1547)	
High Tide Water line		68.5	-	15 - 100		
	Site/System	Cor	nstraint Scale			
ltem	Feature	Lov	ver	Higher	Sensitive Features	
A	Microbial Quality of Effluent	Effluent quality consistently producing ≤ 10 /100 mL E. coli (secondary treated effluent with disinfection)		Effluent quality consistently producing ≥ 10 cfu/100 mL E. coli (primary treated effluent)	 Groundwater and surface pollution hazard, public health hazard 	
в	Surface Water	Cat sur gra low	egory 1 to 3 soils, no face water down dient within > 100 m, rainfall area	"Category 4 to 6 soils, permanent surface water <50 m down gradient, high rainfall area,	• Surface water pollution hazard for low permeable soils, low lying or poorly draining areas	
D	Slope	0 – effl	10% (subsurface uent application)	 > 10% (surface effluent application), > 30% subsurface effluent application 	 Off-site export of effluent erosion	
E	Position of land application area in landscape	Dov wat bou are	wngradient of surface er, property Indary, recreational a	Upgradient of surface water, property boundary, recreational area	 Surface water pollution hazard, off-site export of effluent 	
G	Flood potential	Above 1 in 20-year ial contour		Below 1 in 20-year flood contour	 Off-site export of effluent, system failure, mechanical faults 	
J	Application method	Drij sub of e	o irrigation or surface application ffluent	Surface/above ground application of effluent	 Off-site export of effluent, surface water pollution	

 Table 2.18.2 – System constraints on impacted buffer & associated sensitive site features.

2.19 Mitigations to proposed reduction in EMA setbacks

The matrix indicates a moderate and high constraint factor for items D, E, J concerning surface water pollution and off-site export hazard resulting from surface application of effluent.

Surface Drip Irrigation has been selected for install over subsurface application to minimise the destructive impact of install upon the root zones of dense vegetation within the proposed EMA's

The following mitigations to the surface water pollution hazard have been applied:

- Even effluent distribution over the entire EMA is proposed via alternating dosing between smaller subfields with closely spaced sprinklers to achieve an even spread/distribution within each zone for maximising uptake by the receiving soils
- Sandy soil is rapidly draining, it is not susceptible to run-off
- Effluent Management Area sizing is based on annual water balance considering the wettest month of the year (Appendix B2)
- Viral die-off is achieved in the existing site/soil conditions within 49m of dispersal (See Appendix D).

It is proposed that the selected reduced buffer is justified on this basis of presence and implementation of these mitigating design features.

3 SOIL ASSESSMENT

3.1 Soil Assessment Summary

Investigation of the site for suitability for OSSM was accompanied by soil assessment within the proposed EMA. Soil characteristics were assessed and determined by ALS Environmental laboratories Testing. A summary of the soil investigation is presented in Table 3.1.1.

Factor Assessed	Description	Limitation
Depth to bedrock / hardpan	A depth of >1000mm was encountered before termination due to max auger depth being reached	Minor
Depth to high watertable	No free water or waterlogging characteristics	Minor
Coarse Fragments	< 10% across all upper strata	Minor
рН	>8 across all samples	Minor
Electrical Conductivity (EC)	3.5-8 dS/m across all samples.	Minor
Dispersiveness (EAT _m)	Not assessed, structureless sandy soil non able to disperse	Minor

Table 3.1.1 – Assessment summary of site features

3.2 Soil Landscape Map

The following information was obtained within NSW Government: Geology of Lord Howe Island, 1:15,000, 2022. The Geological mapping indicates the Effluent management area is within the Backbarrier Flat and the Ned's Beach Formation Detailed Below.



3.3 Depth to Bedrock / Hardpan

Soil depth was ascertained via extraction of four (4) boreholes within the potential EMA's identified. Borehole drilling was conducted using a UD50 thin wall tube. A depth of >1000mm was encountered before termination due to max auger depth being reached (*Minor Limitation*).

3.4 Depth to High Watertable

No free water or waterlogging characteristics; no soil saturation, grey mottling or similar was encountered within the sampling depth *(Minor Limitation).*

3.5 Soil Permeability Category

Soil permeability has been assigned per Table 5.2 of AS1547:2012 for the excavation site(s) most representative of the EMA location. The hydraulically limiting strata for the application system is bolded within Table 3.5.1 below.

Excavation #		All Samples		
Lower Depth (mm)	Field Texture	Structure	Indicative Permeability K _{sat} (m/day)	Design Irrigation Rate (DIR) (Secondary) (mm/day)
>1000	Sand	Structureless	3 - >	5

Table 3 5 1. Soil	oermeability	and Design	Irrigation	Rate (DIR)	(Secondary	λ
Table 3.3.1. 3011	permeaning	i anu Design	IIIIgation	rale (Dir)	(Secondar)	()

3.6 Soil Profiles

Table 3.6.1									
Excavation #	WW1	Sample size:	50	[mm]		Date Completed:	01/03/2025		
Inspection Method:	thin wall tu	ıbe	-		Water-1	table Encountered:	No		
Layer Horizon	Lowe [r	r Depth nm]	Moist	ure	Colour	Field Texture	Structure	Coarse Fragment	
1	4	200	Slightly	moist	Dull Brown	Sand	Structureless	<5%	
2	1	000	Slightly moist		Light Brown	Sand	Structureless	<5%	
Refusal:	Refusal no	t encountered					·		
Photo:									

Table 3.6.2						
Excavation #	WW2	Sample size:	50	[mm]	Date Completed:	01/03/2025
Inspection Method:	thin wall tu	ıbe			Water-table Encountered:	No

Layer Horizon	Lower Depth [mm]	Moisture	Colour	Field Texture	Structure	Coarse Fragment
1	200	Slightly moist	Dull brown	Sand	Structureless	<5%
2	1000	Slightly moist	Light brown	Sand	Structureless	<5%
Refusal:	Refusal not encountered					
Photo:						



Table 3.6.3						
Excavation #	WW3	Sample size:	50	[mm]	Date Completed:	01/03/2025
Inspection Method:	thin wall tu	ıbe			Water-table Encountered:	No

Layer Horizon	Lower Depth [mm]	Moisture	Colour	Field Texture	Structure	Coarse Fragment
1	100	Slightly moist	Dull brown	Sand	Structureless	<5%
2	1000	Slightly moist	Light brown	Sand	Structureless	<5%
Refusal:	Refusal not encountered					
Photo:						



Table 3.6.4						
Excavation #	WW4	Sample size:	50	[mm]	Date Completed:	01/03/2025
Inspection Method:	thin wall tu	ıbe			Water-table Encountered:	No

Layer Horizon	Lower Depth [mm]	Moisture	Colour	Field Texture	Structure	Coarse Fragment
1	100	Slightly moist	Dull brown	Sand	Structureless	<5%
2	1000	Slightly moist	Light brown	Sand	Structureless	<5%
Refusal:	Refusal not encountered					
Photo:						



3.7 Soil Chemistry

Topsoil and sub-soil samples were collected (Eight (8) each total) for Third-party soil property analysis at ALS laboratories. A full copy of the results is provided in Appendix F. A summary is shown below:

Sample	Test	Result	Category	Limitation
	рН	8.1	Moderately Alkaline	Minor
	ECe (dS/m)	7.45	Moderately Saline	Moderate
WW 1_1	CEC (cmol⁺/kg)	11.5	Moderate Exchange Capacity	Moderate
	ESP (%)	0.2	Non-Sodic	Minor
	P-Sorp (mg/kg)	2160	Excellent P-Sorption	Minor
	рН	8.4	Moderately Alkaline	Minor
	ECe (dS/m)	6.371	Moderately Saline	Moderate
WW 1_2	CEC (cmol⁺/kg)	6.9	Moderate Exchange Capacity	Moderate
	ESP (%)	0.2	Non-Sodic	Minor
	P-Sorp (mg/kg)	2990	Excellent P-Sorption	Minor
	рН	8.2	Moderately Alkaline	Minor
	ECe (dS/m)	4.3	Moderately Saline	Moderate
WW 3_1	CEC (cmol⁺/kg)	10	Moderate Exchange Capacity	Moderate
	ESP (%)	0.2	Non-Sodic	Minor
	P-Sorp (mg/kg)	2180	Excellent P-Sorption	Minor
	рН	8.5	Strongly Alkaline	Minor
	ECe (dS/m)	3.4	Moderately Saline	Minor
WW 3_2	CEC (cmol⁺/kg)	8.9	Moderate Exchange Capacity	Moderate
	ESP (%)	0.2	Non-Sodic	Minor
	P-Sorp (mg/kg)	2900	Excellent P-Sorption	Minor
	рН	8.6	Moderately Alkaline	Minor
	ECe (dS/m)	4.5	Moderately Saline	Moderate
WW 7_1	CEC (cmol⁺/kg)	6.4	Moderate Exchange Capacity	Moderate
	ESP (%)	0.2	Non-Sodic	Minor
	P-Sorp (mg/kg)	2840	Excellent P-Sorption	Minor
	рН	8.7	Moderately Alkaline	Minor
	ECe (dS/m)	3.4	Slightly Saline	Minor
WW 7_2	CEC (cmol ⁺ /kg)	15.3	Moderate Capacity	Minor
	ESP (%)	0.2	Non-Sodic	Minor
	P-Sorp (mg/kg)	2890	Excellent P-Sorption	Minor

Table 3.7.1: Soil Chemistry results

3.7.1 Mitigation of reduced CEC (Cation exchange capacity) soil conditions

The results indicate Alkaline soil, Saline Soil, Moderate Cation Exchange Capacity, Non-Sodic and Very High Phosphorus Sorption.

Low Cation Exchange Capacity indicates limited capacity to hold on to effluent nutrients, this hinders the plant's ability to utilise these nutrients and presents the risk of cations leaching into the soil moisture.

Salinity is the measure of the concentration of dissolved salts in water. Addition of Effluent to a management area increases this concentration, impacting upon plant growth.

To mitigate against the impacts of salinity and to improve cation exchange of the upper soil layer, it is proposed to employ the following:

- Secondary treatment of effluent to reduce the nutrient loading imparted by the effluent
- Flush the Irrigation Zones with freshwater periodically during dry and low use periods to remove excess salts from the root zone.
- Add compost, or organic mulch into the upper layer to improve water retention and reduces salinity.
- Plant salt tolerant locally native surface vegetation species within the EMA where inhibited vegetation growth is observed
- Closer emitter spacing and higher flow-rate drippers installed over smaller sub-field with frequent alternation to ensure uniform moisture distribution to the total EMA.
- Monitoring vegetation health and where considered necessary, soil testing to track electrical conductivity (EC) adjusting the preceding recommendations accordingly.

4 NOMINATED WASTEWATER MANAGEMENT

4.1 Proposed OSSM Summary

Site and soil constraints were evaluated in selection of appropriate treatment and effluent management method. A summary of the recommended OSSM system and application sizing is presented below:

Treatment	Treatment	\rightarrow	Effluent Management
Lot 44	Proposed Commercial Aerated	(Pumped	2,021m ² Surface Drip Irrigation
	Wastewater Treatment System (AWTS)	Dosing)	6x 336m ² Irrigation Sub-field(s)

4.2 Site Wastewater Loading

 Table 4.2.1: Site Wastewater Loading

I.D.	Persons	L/person/day ^[1]	Total (L/day)	Cumulative (L/day)
Bar Breakfast	80	20	1600	1600
Bar lunch	80	20	1600	3200
Bar Dinner	80	20	1600	4800
Bar Staff	3	20	60	4860
Grocer staff	2	20	40	4900
Massage	2	20	40	4940
Marine Park Office staff	2	20	40	4980
Post Office staff	2	20	40	5,020

[1] LHI On-site Wastewater Management Strategy – Design Guidelines, Appendix 2: Commercial Wastewater Design Page 22 - Bar Trade (per customer) = 20L/person

4.3 Wastewater Treatment

It is proposed to discontinue use of the existing macerating collection pump-well. This pump well presently pumps primary treated liquid effluent generated on lot 44 to an AWTS on Lot 61 for secondary treatment and disposal - this practice is to be discontinued. Note, if desired, the tank can remain in place as a back-up and / or temporary storage mechanism only.

Existing pretreatment of kitchen wastewater shall continue within the existing grease traps identified at the grocery and the bar.

It is proposed that all wastewater generated within the various business applications of Lot 44 be treated to a Secondary standard via a single Proposed Commercial Aerated Wastewater Treatment System (AWTS).

The proposed treatment unit shall be capable of sustainably treating the Design Wastewater Loading Rate of **5,020 L/day** to the Secondary Treatment Targets set out in Table 4.3.1.

Justification for the proposed Secondary treatment method is as follows:

- Higher quality effluent produced enables disposal via irrigation.
- Accidental or deliberate discharges are less detrimental to the environment and have less potential to adversely impact on health
- High commercial availability

Biochemical Oxygen Demand (BOD ⁵)	Suspended Solids (TSS)	Total Nitrogen (TN)	Total Phosphorus (TP)	Faecal c Non- disinfected	oliforms Disinfected effluent	Dissolved Oxygen (DO)
< 20 mg/L	< 30 mg/L	25 - 50 mg/L	10 - 15 mg/L	Up to 10 ⁴ cfu/100 mL	< 30 cfu/100 mL	> 2 mg/L

 Table 4.3.1: - Secondary Treatment Targets (per DLG 1998)

4.4 Effluent Management

Given the development proposed and site and soil conditions encountered, it is proposed to dispose of effluent from Lot 44 via Surface Drip Irrigation.

Sizing of the Effluent Management Area (EMA) was undertaken by a water and nutrient balance in accordance with DLG 1998 (see Appendix B). A minimum EMA sized 2021m² is proposed.

It is proposed to install 6x 336m² Irrigation Sub-field(s) within the locations delineated in Appendix, and to manually or automatically alternate dosing between irrigation fields via an irrigation manifold to achieve even effluent distribution.

Justification of the proposed dispersal method is as follows:

- Irrigation maximises the surface disposal area and evapo-transpiration.
- An irrigation area is available onsite meeting the minimum buffer distances.
- Irrigation is a suitable OSSM method for the site landform and soil properties.

4.5 **Recommended Site Modifications & Maintenance**

To address present site constraints, the following modifications and maintenance practices are recommended:

- Following the implementation of the EMA, the field is to be maintained with dense grass coverage and excluded from vehicle and livestock traffic.
- Flush the Irrigation Zones with freshwater periodically during dry and low use periods to remove excess salts from the root zone.
- Add compost, or organic mulch into the upper layer to improve water retention and reduces salinity.
- Plant salt resistant locally native surface vegetation species within the EMA where inhibited vegetation growth is observed
- Closer drip line spacings installed over smaller sub-fields with frequent alternation to ensure uniform moisture distribution to the total EMA.
- Monitoring vegetation health and where necessary, soil testing to track electrical conductivity (EC) adjusting the preceding recommendations accordingly.

5 ADDITIONAL INFORMATION

5.1 Pipework Detail

All associated plumbing / drainage work is to be in accordance with AS 3500.2:2015 *Sanitary Plumbing Drainage*. Positioning of the receiving treatment system is to ensure drainage from internal plumbing fixtures achieves the minimum grade and cover of the excerpts below.

Nominal Pipe Diameter (DN)	Minimum Grade						
(mm)	(%)	(Ratio)					
65	2.50	1:40					
80	1.65	1:60					
100	1.65*	1:60*					
125	1.25	1:80					
150	1.00	1:100					

Table 6	5.1 -	Excerpts	of AS35	0.2:2015
10010 0		EXCCIPES	, 01, , (333)	50.2.2015

	Minimum depth of cover (mm)						
Location	Cast iron & Ductile iron	Other materials					
Subject to	300	500					
All other		300					
locations	NIL						

*Drains from treatment plants may be 1.00% Min.

5.2 Licensing

Operating a system of sewage management is a Prescribed Activity under the Local Government Act 1993 and clause 45 of the Local Government (Approvals) Regulation 1999. This means that an 'Approval to Operate' a system of sewage management must be obtained from Council.

5.3 Detailed Design

A detailed system design may still be requested at the 'Application to Install' stage. This design will include the size and location of all system components including tanks, distribution lines, valves, etc. These additional requirements will be furnished by the nominated treatment system suppliers / licensed installers. Additional information for the property owner is available in Appendix C.

6 CONCLUSION

It is proposed to construct bathroom amenities to service staff and patrons at Lot 44 Lord Howe Island.

- It is proposed to decommission the existing Collection pump well. This pump well presently pumps primary treated liquid effluent generated on lot 44 to an AWTS on Lot 61 for secondary treatment and disposal, this is to be discontinued.
- Existing pretreatment of kitchen wastewater shall continue within the existing grease traps identified at the grocery and the bar/massage.
- It is proposed that all wastewater generated within the various business applications of Lot 44 be treated to a Secondary standard via a single Proposed Commercial Aerated Wastewater Treatment System (AWTS).
- The proposed treatment unit shall be capable of sustainably treating the Design Wastewater Loading Rate of **5,320L/day** to the Secondary Treatment Targets set out in Table 4.3.1.
- Effluent from the Treatment Unit shall be disposed of within 2,021m² of Surface Drip Irrigation serviced by 6x 336m² Irrigation Sub-field(s)
- To manually or automatically alternate dosing between irrigation fields via an irrigation manifold to achieve even effluent distribution.
 - The irrigation field shall be vegetated/mulched and/or covered with native palm fronds
 - Irrigation Subfields sizing is subject to pump and dripper capacities. However, in this instance it is proposed to install at-least 6 irrigation subfields to assist with even effluent distribution within rapidly draining soils.
 - Site modification and maintenance practices outline in section 4.5 should be adhered to.
- The bathroom amenities should be fitted with standard-water reductive fixtures.

APPENDIX A: SITE PLAN

		KEY		138 J
	EXISTING GREASE TRAPS SERVICING THE BAR AND THE		SITE BOUNDARY	
	GROCERY STORE TO CONTINUE PRE-TREATMENT OF KITCHEN		NEIGHBOURING LOT BOUNDARIES	
1	WASTESTREAMS	-3.000 45 DP757515	— — — WATERWAYS / FLOWPATH	
	10.400		BH1 BORE HOLE LOCATION 1	1.3
	25.500		> SURFACE FLOW DIRECTION	5-2-12-
		21.200	BUILDING (PROPOSED)	135-12
1			BUILDING (EXISTING)	82.60
	BOUTIQUE		EFFLUENT MANAGEMENT AREA (EMA)	IRRI/
			SIGNIFICANT NATURAL VEGETATION	- Sm
	STORE VISITOR			
	BOL INFORMATION			144 / 14
	BOL BOL B		All and an and	State 1
	MASSAGE		Addies / Addies	
/	O BOL	SURFACE DRIP IRRIGATION FI		1-1-394
	BAR	-SANDY SOILS REQUIRE CLO	SELY SPACED DRIP EMMITTERS	
/	O BOL	ZONE A:		
		962m ⁺	RIPPER CAPACITIEIS	3
14.141	DP757515			
	Z238m ² (DEED)			
				2- /
	5	MARINE WWW3 TO S.000		
414		OFFICE 3000 A.800		1
	PUBLIC SPACE	EMPTY BUILDING	21.900	
1		18.800		
<i></i>		John Star	44.900	\sim
in Al		5.00 DP/5/515	ZONE B: 20.00	0
- 20	LAGOUN	Pour Contraction of the Contract		
* R	4	KUAD	1.8%	
ຂ	and the second sec			
2	PROPOSED COMMERCIAL AERATED WASTEWATER TREATMENT SYSTEM (AW SERVICE ALL WASTEWATER GENERATED ON LOT 44	TS) TO EXISTING COLLECTION PUMP WELL CURRENTLY		
•	(APPROX LOCATION ONLY; TBD BY INSTALLER) 	AND DISPOSAL		
	TO THE SECONDARY TREATMENT TARGETS OUTLINE IN TABLE 4.2.1 OF REPO	-PROCESS TO BE DISCONTINUED		
ę (WASTEWATER - GENERAL NOTES		68.900m	0
<u>8</u>	1. UNDERLYING CONTOURS DERIVED FROM NSW GOV. 1m LIDAR DATA - THIS F	PLAN IS NOT A SURVEY.	WATER LEVEL	
4	2. UNDERLYING SATELLITE IMAGERY DERIVED FROM NEARMAP.			
×	3. WATERWAYS (NAMED & UNNAMED) AND DRAINAGE ELEMENTS DERIVED FROM SATELLITE IMAGERY AND STRAHLER ANALYSIS.	NSW GOV. HYDROGRAPY,	3	100
<u>8</u>	ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.		PROJECT DESCRIPTION	SHEET
2		📲 BROADCREST	PROPOSED ON-SITE WASTEWATER MANAGEMENT SYSTEM	APPENDIX A
5 2		ENGINEERING AND ENVIRONMENTAL CONSULTANTS	PROJECT SITE LOT 44 NEDS BEACH ROAD, LORD HOWE ISLAND	ON-SITE WAS
₽	A-01 3/04/25 KR KR CH ISSUE FOR RELEASE	broadcrest.com.au c environmental floor stormwater acquistics wastewater	IGA	
<u>~</u>	REV DATE DES. DRN. APP. REVISION DETAILS	BROADCREST ENVIRONMENTAL PTY LTD ABN 11 677 727 749	LORD HOWE ISLAND	LORD HOWE I

Ë





- SITE LAYOUT PLAN

STEWATER MANAGEMENT PLAN

ISLAND BOARD

SCALE 1:500 @ A3 - @ A1 SHEET NO. 1 o⊧ 1



APPENDIX B: CLIMATE AND NUTRIENT DATA

Appendix B - Climate, Irrigation Water and Nutrient Balances

Broadcrest Consulting Pty Ltd

B1. - Climate Statistics

Table B1.1. Weather Stations

St	tatistic	Station No.	Station Name	Distance from site [km]
	Temperature	200839	LORD HOW ISLAND AERO	4.20
	Precipitation	200839	LORD HOW ISLAND AERO	4.20
	Evaporation	200288	NORFOLK ISLAND AERO	900



Table B1.2. Site Climate Statistics

Site Factors	Symbol	Units	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ОСТ	NOV	DEC	ANNUAL
Mean Max. Temperature	[T]	[°C]	25.5	25.8	25	23.4	21.6	19.9	19.1	19.1	20	21.1	22.4	24.2	22.3
Mean Min. Temperature	[T]	[°C]	20.8	21.1	20.2	18.2	16.4	14.8	14	13.6	14.7	15.8	17.4	19.4	17.2
Days	[D]		31	28	31	30	31	30	31	31	30	31	30	31	365
Precipitation ¹	[P]	[mm/month]	117.5	116.2	134.9	134.2	157.7	173.1	141	107.7	110.7	106.1	110.3	102.4	1511.8
Evaporation	[E]	[mm/day]	5.4	5.3	4.9	4	3.3	3	3	3.4	3.9	4.5	5.1	5.5	4
		[mm/month]	167.4	148.4	151.9	120	102.3	90	93	105.4	117	139.5	153	170.5	1460
Natural Site Balance ²	[P-E]	[mm/month]	-49.9	-32.2	-17	14.2	55.4	83.1	48	2.3	-6.3	-33.4	-42.7	-68.1	

¹ Median historic precipitation. Note: total is not equivalent to annual median.

² Negative value indicates monthly mean evaporation > precipitation

B2. - Water Balance: Lot 44

Table B2.1. Site & Soil Parameters

Parameter	Symbols	Values	Units
Design Wastewater Flowrate	Q	5,020	L/day
Soil Texture		Sand	
Soil Structure	St	tructureless	
Indicative Permeability	K _{sat}	3 to >	m/day
Design Irrigation Rate	DIR_{day}	5	mm/day

Table B2.2. Effluent water balance

Site Factors	Symbol	Units	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ОСТ	NOV	DEC	TOTAL
Days per Month	D	days	31	28	31	30	31	30	31	31	30	31	30	31	365
Crop Factor	С		0.80	0.80	0.80	0.70	0.70	0.70	0.70	0.70	0.70	0.80	0.80	0.80	0.8
Run-off Coefficient	C _{RO}		0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.69
Effluent Irrigation	(Q x D)	mm/month	155620	140560	155620	150600	155620	150600	155620	155620	150600	155620	150600	155620	1832300
Evapotranspiration	(E xC)	mm/month	133.92	118.72	121.52	84	71.61	63	65.1	73.78	81.9	111.6	122.4	136.4	1168
Design Irrigation Rate	DIR _{Month}	mm/month	155	140	155	150	155	150	155	155	150	155	150	155	1825
Minmum Area Required	A _{wb.min}	m ²	798	848	923	1189	1549	2021	1450	1091	1051	856	818	743	940

Table B2.3. Water Balance Minimum Area Requirement

	Symbols	Area m²
Minimum Area Required to Satisfy Water Balance:	A _{wb}	2,021

Page B-2
B3. - Nutrient Balance & Minimum irrigation area: Lot 44

Table B3.1. Nitrogen Balance

Parameter	Symbols	Values	Units
Design Wastewater Flowrate	Q	5,020	L/day
Surface Vegetation	Lawn - fully ma	naged (clip	pings removed)
Effluent Total Nitrogen (TN) Concentration ¹	TN	25	mg/L
Critical TN Loading Rate ²	L _{n.sfc}	55	mg/m²/day
Total N = Flow Rate Q * Critical TN		125500	mg/day
% Loss to Soil Processes (Geary & Gardner 1996)		0.2	
Total N Loss to Soil Processes		25100	mg/day
Remaining N		100400	mg/day
Minimum Application Area	A _{n.sfc}	1833	m ²

^{1.}Nominal ATWS Nutrient Concerntrations (DLG 1998, AS1547.3:2012)

²Appendix 6, Within Kenita Palm Plantations - ' (LHI Water and Nutirnet Balance Spreadsheet)

² Processes include Mineralization, volatilization and denitrification in the soil when applying secondary treated effluent

Table B3.2. Phosphorus Balance

Parameter	Symbols	Values	Units
Design Wastewater Flowrate	Q	5020	L/day
Surface Vegetation	Lawn - fully ma	naged (clip	pings removed)
Effluent Total Phosphorus (TP) Concentration ¹	TP	12	mg/L
Phosphorus Generated 50 _{YR}	P_{gen}	1099.38	kg
Soil Phosphorus Sorption Capacity	P _{sorp}	50,400	kg/Ha
Phosphorus Absorped 50 _{YR}	P_{absorb}	1.680	kg/m ²
Critical TP Loading Rate ²	L _{p.sfc}	8	mg/m²/day
Phosphorus Uptake 50YR	$P_{uptake.sfc}$	0.150	kg/m ²
Minimum Application Area	A _{p.sfc}	600	m ²

¹Nominal ATWS Nutrient Concerntrations (DLG 1998, AS1547.3:2012)

²Appendix 6, 'On-site sewage management for single households' (DLG 1998, AS1547.3:2012)

B4. - Minimum Effluent Irrigation Areas

Table B4.1. Minimum Irrigation Area Requirement

Balance	Area Required (m ²)	
Water	2021	
Nitrogen	1833	
Phosphorus	600	
Minimum Irrigation Area	2021	

APPENDIX C: INFORMATION FOR THE PROPERTY OWNER

APPENDIX C - Information For the Property Owner

ON-SITE SEWAGE MANAGEMENT SYSTEMS

If you live in or rent a house that is not connected to the main sewer then chances are that your yard contains an on-site sewage management system. If this is the case then you have a special responsibility to ensure that it is working as well as it can.

The aim of this pamphlet is to introduce you to some of the most popular types of on-site sewage management systems and provide some general information to help you maintain your system effectively. You should find out what type of system you have and how it works.

More information can be obtained from the pamphlets:

Your Septic System

Your Aerated Wastewater Treatment System

Your Composting Toilet Your Land Application Area

You can get a copy of these pamphlets from your local council or the address marked on the back of this pamphlet.

It is important to keep in mind that maintenance needs to be performed properly and regularly. Poorly maintained on-site sewage management systems can significantly affect you and your family's health as well as the local environment

What is an on-site sewage management system?

A domestic on-site sewage management system is made up of various components which - if properly designed, installed and maintained - allow the treatment and utilisation of wastewater from a house, completely within the boundary of the property.

Wastewater may be blackwater (toilet waste), or greywater (water from showers, sinks, and washing machines), or a combination of both.

DO

- Learn how your sewage management system works and its operational and maintenance requirements.
- Learn the location and layout of your sewage management system.
- Have your AWTS (if installed) inspected and serviced four times per year by an approved contractor. Other systems should be inspected at least once every year. Assessment should be applicable to the system design.
- Keep a record of desludgings, inspections, and other maintenance.
- Have your septic tank or AWTS desludged every three years to prevent sludge build up, which may 'clog' the pipes.
- Conserve water. Conservative water use around the house will reduce the amount of wastewater which is produced and needs to be treated.
- \checkmark Discuss with your local council the adequacy of your existing sewage management system if you are considering house extensions for increased occupancy.

DON'T

- * Don't let children or pets play on land application areas
- Don't water fruit and vegetables with effluent.
- Don't extract untreated groundwater for cooking and drinking
- Don't put large quantities of bleaches, disinfectants, whiteners, nappy soakers and spot removers into your system via the sink, washing machine or toilet.
- Don't allow any foreign materials such as nappies, sanitary napkins, condoms and other hygiene products to enter the system.
- Don't put fats and oils down the drain and keep food waste out of your system.
- × Don't install or use a garbage grinder or spa bath if your system is not designed for it.

Partial on-site systems - eg. pump out and common effluent systems (CES) - also exist. These usually involve the preliminary on-site treatment of wastewater in a septic tank, followed by collection and transport of the treated wastewater to an off-site management facility. Pump out systems use road tankers to transport the effluent, and CES use a network of small diameter pipes.

How does an on-site sewage management system work?

For complete on-site systems there are two main processes:

 treatment of wastewater to a certain standard 2. its application to a dedicated area of land

The type of application permitted depends on the quality of treatment, although you should try to avoid contact with all treated and untreated wastewater, and thoroughly wash affected areas if contact does occur.

Treatment and application can be carried out using various methods

Septic Tank Septic tanks treat both greywater and blackwater, but they provide only limited treatment through the settling of solids and the flotation of fats and greases. Bacteria in the tank break down the solids over a period of time. Wastewater that has been treated in a septic tank can only be applied to land through a covered soil absorption system, as the effluent is still too contaminated for above ground or near surface irrigation.

AWTS

Aerated wastewater treatment systems (AWTS) treat all household wastewater and have several treatment compartments. The first is like a septic tank, but in the second compartment air is mixed with the wastewater to assist bacteria to break down solids. A third compartment allows settling of more solids and a final chlorination contact chamber allows disinfection. Some AWTS are constructed with all the compartments inside a single tank. The effluent produced may be surface or sub-surface irrigated in a dedicated area.

Composting Toilets

Composting toilets collect and treat toilet waste only. Water from the shower, sinks and the washing

machine needs to be treated separately (for example in a septic tank or AWTS as above). The compost produced by a composting toilet has special requirements but is usually buried on-site. These are just some of the treatment and application methods available, and there are many other types such as sand filter beds, wetlands, and amended earth mounds. Your local council or the NSW Department of Health have more information on these systems if you need it.

SOURCE: NSW DLG, 1998

Regulations and recommendations

The NSW Department of Health determines the design and structural requirements for treatment systems for single households. Local councils are primarily responsible for approving the installation of smaller domestic septic tank systems, composting toilets and AWTSs in their area, and are also responsible for approving land application areas. The NSW Environment Protection Authority approves larger systems.

The design and installation of on-site sewage management systems, including plumbing and drainage, should only be carried out by suitably qualified or experienced people. Care is needed to ensure correct sizing of the treatment system and application area

Heavy fines may be imposed under the Clean Waters Act if wastewater is not managed properly.

Keeping your on-site sewage management system operating well

What you put down your drains and toilets has a lot to do with how well your system performs. Maintenance of your sewage management system also needs to be done well and on-time. The following is a guide to the types of things you should and should not do with your system.

Reducing water usage

Reducing water usage will lessen the likelihood of problems such as overloading with your septic system. Overloading may result in wastewater backing up into your house, contamination of your yard with improperly treated effluent, and effluent from your system contaminating groundwater or a nearby waterway.

Your sewage management system is also unable to cope with large volumes of water such as several showers or loads of washing over a short period of time. You should try to avoid these 'shock loads' by ensuring water use is spread more evenly throughout the day and week.

HELP PROTECT YOUR HEALTH AND THE ENVIRONMENT

Poorly maintained sewage management systems are a serious source of water pollution and may present health risks, cause odours and attract vermin and insects

By looking after your management system you can do your part in helping to protect the environment and the health of you and your community.

For more information please contact:

Managing Wastewater In Your Backyard



Aerated Wastewater Treatment Systems (AWTS)

In unsewered areas, the proper treatment and utilisation of household wastewater on-site is critical in preserving the health of the public and the environment. AWTS have been developed as a way of achieving this.

What is an AWTS?

An AWTS is a purpose built system used for the treatment of sewage and liquid wastes from a single household or multiple dwellings.

It consists of a series of treatment chambers combined with an irrigation system. An AWTS enables people living in unsewered areas to treat and utilise their wastewater.

How does an AWTS work?

Wastewater from a household is treated in stages in several separate chambers. The first chamber is similar to a conventional septic tank. The wastewater enters the chamber where the solids settle to the bottom and are retained in the tank forming a sludge layer. Scum collects at the top, and the partially clarified wastewater flows into a second chamber. Here the wastewater is mixed with air



to assist bacteria to further treat it. A third chamber allows additional clarification through the settling of solids, which are returned for further treatment to either the septic chamber (as shown) or to the aeration chamber. The clarified effluent is disinfected in another chamber (usually by chlorination) before irrigation can take place.

Bacteria in the first chamber break down the solid matter in the sludge and scum layers. Material that cannot be fully broken down gradually builds up in the chamber and must be pumped out periodically.

Regulations and recommendations

Local councils are primarily responsible for approving the smaller, domestic AWTSs in their area. The Environment Protection Authority (EPA) approves larger units, whilst the NSW Department of Health determines the design and structural requirements for all AWTSs.

At present AWTSs need to be serviced quarterly by an approved contractor at a cost to the owner. Local councils should also maintain a register of the servicing of each system within their area.

AWTSs should be fitted with an alarm having visual and audible components to indicate mechanical and electrical equipment malfunctions. The alarm should provide a signal adjacent to the alarm and at a

relevant to the solution inside the house. The alarm should incorporate a warning lamp which may only be reset by the service agent.

Maintaining your AWTS

The effectiveness of the system will, in part, depend on how it is used and maintained. The following is a guide on good maintenance procedures that you should follow:

DO

- Have your AWTS inspected and serviced four times per year by an approved contractor. Assessment should be applicable to the system design.
- Have your system service include assessment of sludge and scum levels in all tanks, and performance of irrigation areas.
- Have all your tanks desludged at least every three years.
- Have your disinfection chamber inspected and tested quarterly to ensure correct disinfectant levels.
- Have your grease trap (if installed) cleaned out at least every two months.
- Keep a record of pumping, inspections, and other maintenance.
- Learn the location and layout of your AWTS and land application area.
- Use biodegradable liquid detergents such as concentrates with low sodium and phosphorous levels.
- Conserve water.

DON'T

- Don't put bleaches, disinfectants, whiteners, nappy soakers and spot removers in large quantities into your AWTS via the sink, washing machine or toilet.
- Don't allow any foreign materials such as nappies, sanitary napkins, condoms and other hygiene products to enter the system.
- Don't use more than the recommended amounts of detergents.
- Don't put fats and oils down the drain and keep food waste out of your system.
- Don't switch off power to the AWTS, even if you are going on holidays

Reducing water usage

Reducing water usage will lessen the likelihood of problems such as overloading with your AWTS. Overloading may result in wastewater backing up into your house, contamination of your yard with improperly treated effluent, and effluent from your system entering a nearby river, creek or dam.

Conservative water use around the house will reduce the amount of wastewater which is produced and needs to be treated.

Your AWTS is also unable to cope with large volumes of water such as several showers or loads of washing over a short period of time. You should try to avoid these 'shock loads' by ensuring water use is spread more evenly throughout the day and week.

Warning signs

You can look out for a few warning signs that signal to you that there are troubles with your AWTS. Ensure that these problems are attended to immediately to protect your health and the environment.

Look out for the following warning signs:

- A Water that drains too slowly.
- ${\mathbb A}\,$ Drain pipes that gurgle or make noises when air bubbles are forced back through the system.
- ${\mathbb A}$ Sewage smells, this indicates a serious problem. ${\mathbb A}$ Water backing up into your sink which may
- indicate that your system is already failing.
- $\ensuremath{\mathbb A}$ Wastewater pooling over the land application area.
- A Black coloured effluent in the aerated tank.
- Excess noise from the blower or pumping equipment
- Poor vegetation growth in irrigated area.

Odour problems from a vent on the AWTS can be a result of slow or inadequate breakdown of solids. Call a technician to service the system.

HELP PROTECT YOUR HEALTH AND THE ENVIRONMENT

Poorly maintained AWTSs are a serious source of water pollution and may present health risks, cause odours and attract vermin and insects.

By looking after your treatment system you can do your part in helping to protect the environment and the health of you and your family.

If you would like more information please contact:

Your Aerated Wastewater Treatment System



LAND APPLICATION AREAS

The reuse of domestic wastewater on-site can be an economical and environmentally sound use of resources.

What are land application areas?

These are areas that allow treated domestic wastewater to be managed entirely on-site.

The area must be able to utilise the wastewater and treat any organic matter and wastes it may contain. The wastewater is rich in nutrients, and can provide excellent nourishment for flower gardens, lawns, certain shrubs and trees. The vegetation should be suitably tolerant of high water and nutrient loads.

How does a land application area work?

Treated wastewater applied to a land application area may be utilised or simply disposed, depending on the type of application system that is used. The application of the wastewater can be through a soil absorption system (based on disposal) or through an irrigation system (based on utilisation).

Soil absorption systems do not require highly treated effluent, and wastewater treated by a septic tank is reasonable as the solids content in the effluent has been reduced. Absorption systems release the effluent into the soil at a depth that cannot be reached by the roots of most small shrubs and grasses. They rely mainly on the processes of soil treatment and then transmission to the water table, with minimal evaporation and up-take by plants. These systems are not recommended in sensitive areas as they may lead to contamination of surface water and groundwater.

Irrigation systems may be classed as either subsurface or surface irrigation. If an irrigation system is to be used, wastewater needs to be pre-treated to at least the quality produced by an aerated wastewater treatment system (AWTS).

Subsurface irrigation requires highly treated effluent that is introduced into the soil close to the surface. The effluent is utilised mainly by plants and evaporation.

Maintaining your land application area

The effectiveness of the application area, is governed by the activities of the owner.

DÔ

- Construct and maintain diversion drains around the top side of the application area to divert surface water.
- Ensure that your application area is kept level by filling any depressions with good quality top soil (not clay).
- Keep the grass regularly mowed and plant small trees around the perimeter to aid absorption and transpiration of the effluent.
- Ensure that any run off from the roof, driveway and other impermeable surfaces is directed away from the application area.
- Fence irrigation areas.
- Ensure appropriate warning signs are visible at all times in the vicinity of a spray irrigation area.
- Have your irrigation system checked by the service agent when they are carrying out service on the treatment system.

DON'T

- Don't erect any structures, construct paths, graze animals or drive over the land application area.
- Don't plant large trees that shade the land application area, as the area needs sunlight to aid in the evaporation and transpiration of the effluent.
- Don't plant trees or shrubs near or on house drains.
- Don't alter stormwater lines to discharge into or near the land application area.
- Don't flood the land application area through the use of hoses or sprinklers.
- Don't let children or pets play on land application areas.
- Don't water fruit and vegetables with the effluent.
- Don't extract untreated groundwater for potable use.

Surface irrigation requires highly treated effluent that has undergone aeration and disinfection treatments, so as to reduce the possibility of bacteria and virus contamination.

Typical Site Layout (not to scale)



The effluent is then applied to the land area through a series of drip, trickle, or spray points which are designed to eliminate airborne drift and run-off into neighbouring properties.

There are some public health and environmental concerns about surface irrigation. There is the risk of contact with treated effluent and the potential for surface run-off. Given these problems, subsurface irrigation is arguably the safest, most efficient and effective method of effluent utilisation.

Regulations and recommendations

The design and installation of land application areas should only be carried out by suitably qualified or experienced people, and only after a site and soil evaluation is done by a soil scientist. Care should be

Warning signs

Regular visual checking of the system will ensure that problems are located and fixed early.

The visual signs of system failure include:

- surface ponding and run-off of treated wastewater
- Soil quality deterioration
- poor vegetation growth unusual odours

Volume of water

Land application areas and systems for on-site application are designed and constructed in anticipation of the volume of waste to be discharged. Uncontrolled use of water may lead to poorly treated effluent being released from the system.

If the land application area is waterlogged and soggy the following are possible reasons:

- Overloading the treatment system with
- wastewater.
- The clogging of the trench with solids not trapped by the septic tank. The tank may require decludging
- desludging. A The application area has been poorly designed.
- A Stormwater is running onto the area.

HELP PROTECT YOUR HEALTH AND THE ENVIRONMENT

Poorly maintained land application areas are a serious source of water pollution and may present health risks, cause odours and attract vermin and insects.

vermin and insects. By looking after your sewage management system you can do your part in helping to protect the environment and the health of you and your

For more information please contact:

family

taken to ensure correct buffer distances are left between the application area and bores, waterways, buildings, and neighbouring properties.

Heavy fines may be imposed under the Clean Waters Act if effluent is managed improperly.

At least two warning signs should be installed along the boundary of a land application area. The signs should comprise of 20mm high Series C lettering in black or white on a green background with the words:



Depending on the requirements of your local council, wet weather storage and soil moisture sensors may need to be installed to ensure that effluent is only irrigated when the soil is not saturated.

Regular checks should be undertaken of any mechanical equipment to ensure that it is operating correctly. Local councils may require periodic analysis of soil or groundwater characteristics

Humans and animals should be excluded from land application areas during and immediately after the application of treated wastewater. The longer the period of exclusion from an area, the lower the risk to public health.

The householder is required to enter into a service contract with the installation company, its agent or the manufacturer of their sewage management system, this will ensure that the system operates efficiently.

Location of the application area

Treated wastewater has the potential to have negative impacts on public health and the environment. For this reason the application area must be located in accordance with the results of a site evaluation, and approved landscaping must be completed prior to occupation of the building. Sandy soil and clayey soils may present special problems.

The system must allow even distribution of treated wastewater over the land application area.

Your Land Application Area



APPENDIX D: VIRAL DIE-OFF ASSESSMENT

Viral Die-Off Calculation - Groundwater Setback, Drawdown & Seepage Distance (Cromer, Gardner & Beavers, 2001)

Climate Data - 200288 NORFOLK ISLAND AERO

Maximum Mean Annual Temperature for Coldest Month (°C):

1. Calculated Time For Viral Die-off:

$$\frac{M_t}{M_o} = e^{-kt}$$
; And where T > 8.5°C: $k = \frac{T - 8.5}{20}$

Ratio of Viral Concerntration (M_t/M_o)

Greywater	1.00E-05
Primary	1.00E-07
Secondary	1.00E-03

Time for Viral Die-Off Calculator

Parameter	Value	Unit	Parameter Discriptor
Treat _{LVL}	Secondary		Effluent Treatment Level
T _{m.m}	19.1	[°C]	Groundwater Temp. (Appoximate to Max. Mean. Air Temp.)
k (Max)	0.53		First Order rate of Viral Die-off Coefficient
M _t /M _o	0.001		Dimsionless ratio of viral concentrations

19.1

t (max)	13.0 [0	days]	Travel Time

2. Calculated Horizontal Setback Distance:

$$d_g = \frac{t - d_v \cdot \frac{P}{K}}{\frac{P}{K \cdot i}}$$

Parameter	Value	Unit	Parameter Discriptor
t (max.)	13.0	[days]	Travel Time
d _v	5	[m]	Vertical Distance (to water table)
Р	0.25		Effective Porosity (Coarse Sand)
К	10	[m/day]	Saturated Hydraulic Conductivity (permeability)
i	0.095	[m/m]	Gradient of Groundwater table

d _g	49.000	[m]	Estimated Horizontal Setback Distance



Preliminary site investigation

Lord Howe Island Lot 44

Prepared for Lord Howe Island Board

April 2025

Preliminary site investigation

Lord Howe Island Lot 44

Lord Howe Island Board

E241081 RP1

April 2025

Version	Date	Prepared by	Reviewed by	Comments
1	17 April 2025	Jude Lewis	Anthony Davis	Final

Approved by



Anthony Davis Associate Director 17 April 2025



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Executive Summary

ES1 Introduction

EMM Consulting Pty Limited (EMM) has been commissioned by KPMG Australia Pty Ltd (KPMG), on behalf of the Lord Howe Island Board (LHIB) to undertake a contamination Preliminary Site Investigation (PSI) with limited soil sampling within the footprint of the proposed central business district (CBD) toilets at Lot 44 (the Site). The Site is located at the corner of Lagoon Road and Neds Beach Road, Lord Howe Island NSW and encompasses an area of approximately 2,250 meters squared (m²). Refer to Figure 2.1 for the Site layout.

A PSI is required to evaluate potential contamination risks as part of the development application (DA) for the proposed CBD toilet development.

ES2 Objectives and scope of work

Based on the requirements outlined by LHIB, EMM understands the specific objectives of the PSI are to:

- assess the potential for contamination at the Site
- evaluate concentrations of contaminants of potential concern (CoPC) in soil
- provide recommendations for further investigation or appropriate management, if required.

To achieve the objectives, EMM completed a desktop review of available information relating to the Site to assess current and historical potential contamination sources. The desktop assessment included a review of relevant contamination related background information relating to the Site and surrounding area.

Additionally, targeted soil sampling was conducted by a third-party contractor (Broadcrest Pty Ltd) on behalf of LHIB. This involved the completion of six boreholes by hand auger to a maximum depth of 1.2 metres below ground level (m bgl). Selected samples were analysed for total recoverable hydrocarbons (TRH), total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAHs), per- and polyfluoroalkyl substances (PFAS), select metals and asbestos. Based on the information obtained as part of the PSI and targeted soil sampling data, a conceptual Site model (CSM) was developed to further understand risk at the Site.

ES3 Findings

Concentrations of CoPC were reported below the adopted site assessment criteria (SAC) for the intended future land use (public open space).

During Site works, a small fragment of potential bonded cement material was observed on the ground surface near the corner of a building in the northern portion of the Site, which could potentially contain asbestos.

Based on the information reviewed and the targeted soil sampling data, the CSM identified potentially complete contamination source, pathway and receptor (S-P-R) linkages at the Site. Contamination present on the Site would most likely be attributed to:

- residual contamination that may be present following the fire that historically occurred at the Site
- potential former use of asbestos containing material (ACM) on Site buildings.

Key pathways include the vertical migration of CoPC through the soil profile and atmospheric dispersion of dust and fibres. Potential receptors include current and future land users, intrusive maintenance workers and ecological receptors.

ES4 Recommendations

Based on the reported results, the PSI has identified an overall contamination risk rating of **low** for the proposed CBD toilets development. Notwithstanding, given that reported concentrations of CoPC including PFAS were detected at concentrations above the laboratory LOR and with consideration to the sensitive environment at Lord Howe Island, the following recommendations are made with regards to managing potential contamination risks during redevelopment works at the Site:

- Preparation and implementation of a construction environmental management plan (CEMP) incorporating an unexpected contamination finds protocol (including asbestos). The CEMP would outline recommended management actions in the event of potential contamination being encountered during Lot 44 construction work activities.
- Should potential ACM be encountered at the Site during construction, samples should be collected and analysed by a suitably qualified and experienced professional and managed in accordance with the requirements outlined in the CEMP.

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Abbreviations

Abbreviation	Term
ACM	asbestos containing materials
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999
ASLP	Australian Standard Leaching Potential
ASS	acid sulfate soils
AST	aboveground storage tank
bgl	below ground level
BTEXN	benzene, toluene, ethylbenzene, xylene, naphthalene
CBD	central business district
CoPC	Contaminants of Potential Concern
CSM	conceptual site model
DP	Deposited Plan
DQI	data quality indicators
DQO	data quality objective
DSI	Detailed Site Investigation
EMM	EMM Consulting Pty Limited
EPA	Environment Protection Authority
ESL	Ecological screening limits
GDE	groundwater dependant ecosystems
HSL	health screening levels
KPMG	KPMG Australia Pty Ltd
Ľ,	litre
LHIB	Lord Howe Island Board
LOR	limit of reporting
m	metre
m ²	square metre
NATA	National Association of Testing Authorities
NSW	New South Wales
ОСР	organochlorine pesticides
OPP	organophosphate pesticides
PAHs	polycyclic aromatic hydrocarbons
PFAS	per- and polyfluoroalkyl substances
PFHxS	sum of perfluorohexane sulfonic acid

Abbreviation	Term	
PFOA	perfluorooctanoic acid	
PFOS	perfluorooctane sulfonic acid	
POEO Act	NSW Protection of the Environment Operations Act 1997	
PSI	Preliminary Site Investigation	
QA/QC	quality assurance and quality control	
RPD	relative percent differences	
SAC	site assessment criteria	
SEPP	State Environmental Planning Policy	
S-P-R	Source, pathway and receptor	
ТРН	total petroleum hydrocarbons	
TRH	total recoverable hydrocarbons	
VOCs	volatile organic compounds	

1 Introduction

1.1 Introduction

EMM Consulting Pty Limited (EMM) was commissioned by KPMG Australia Pty Ltd (KPMG), on behalf of the Lord Howe Island Board (LHIB) to undertake a contamination Preliminary Site Investigation (PSI) with limited soil sampling within the footprint of the proposed central business district (CBD) toilets at Lot 44 (the Site). The Site is located at the corner of Lagoon Road and Neds Beach Road, Lord Howe Island NSW and encompasses an area of approximately 2,250 metres squared (m²). Refer to Figure 2.1 for the Site layout.

The Site is currently zoned SET Settlement. A PSI is required to evaluate potential contamination risks associated with the potential development of the Site for CBD toilets.

1.2 Background

Based on anecdotal information, it is understood that a fire has previously occurred on the Site on 13 November 2009 that burnt down the power house formerly present on the Site. The fire was reportedly extinguished using C02, powder dump and water. It is unknown what happened to residual waste materials post fire, including potential asbestos containing materials (ACM) that may have been present in building structures. Furthermore, previous investigations undertaken on other parts of the island have identified elevated concentrations of per- and poly-fluoroalkyl substances (PFAS), primarily associated with the historic storage and use of firefighting foams.

As such, the LHIB require preparation of this PSI, including targeted soil sampling and analysis, to assess potential contamination risks and management considerations at the Site.

1.3 Objectives

The overall objective of this PSI is to undertake appropriate assessment and identification of potential contamination risk to evaluate the suitability of the Site for the proposed CBD toilets.

Based on the requirements outlined by LHIB/KPMG, EMM understands the specific objectives of the PSI are to:

- assess the potential for contamination at the Site
- evaluate concentrations of contaminants of potential concern (CoPC) in soil
- provide recommendations for any further investigation or appropriate management, if required.

2 Scope of work

To achieve the objectives, EMM completed a desktop review of available information relating to the Site to assess current and historical potential contamination sources. Targeted soil sampling was conducted by Broadcrest Pty Ltd (Broadcrest) on behalf of LHIB, with this data being incorporated into the PSI. Refer to Figure 2.1 for the Site layout and sampling locations.

The methodology for the desktop review included:

- summarising relevant contamination related background information relating to the Site and surrounding area, including review of:
 - the NSW Environment Protection Authority (EPA) Contaminated Land Record register
 - database searches to assess elements of environmental inputs including historical land use, land zoning, geology, soils, hydrogeology and topography
 - historical aerial imagery (for changes over time)
 - online searches for specific historical information and other relevant documents
 - review of acid sulfate soil maps for the Site and surrounding land
 - review of previous investigation reports and other information provided by KPMG and LHIB
- comparison of analytical results from the targeted soil sampling conducted by Broadcrest on behalf of LHIB against relevant assessment criteria
- development of a conceptual Site model (CSM) and qualitative risk assessment to assess the potential contamination risks and evaluate whether further targeted or detailed Site investigation (DSI) or management is required.

The methodology for the targeted soil sampling conducted by Broadcrest included:

- collection of soil samples at predetermined locations in accordance with a field brief prepared by EMM
- collection of Quality Assurance/Quality Control (QA/QC) samples to assess the data quality
- laboratory analysis of samples for contaminants of potential concern (CoPC)
- preparation of this PSI report.



Note, location BH04 was abandoned due to the presence of underground services within the area.

Figure 2.1 Site layout and sampling locations

3 Regulatory framework

Applicable legislation and environmental planning instruments informing this assessment includes:

- NSW Contaminated Land Management Act 1997 (CLM Act)
- NSW Protection of the Environment Operations Act 1997 (POEO Act)
- NSW Environmental Planning and Assessment Act 1979 (EP&A Act)
- NSW State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021 (formerly SEPP no.55 Remediation of Land).

Applicable guidelines supporting this assessment include:

- National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), including 20 Schedules and Appendices (B1 to B9), and the NEPM Toolbox, updated April 2014 (the ASC NEPM)
- Standards Australia (2005) Australian Standard AS4482.1 Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds
- Standards Australia (1999) Australian Standard AS 4482.2 Guide to the sampling and investigation of potentially contaminated soil. Part 2: Volatile substances; and other relevant guidelines and legislation
- Heads of EPA Australia and New Zealand (HEPA) (2025) *PFAS National Environmental Management Plan* (*NEMP*) 3.0
- NSW EPA (2017) Guidelines for the NSW Site Auditor Scheme
- NSW EPA (2022) Contaminated Land Guidelines, Sampling design part 1 application
- NSW EPA (2020) Contaminated Land Guidelines, Consultants reporting on contaminated land.

4 Environmental setting

4.1 Site identification

Site identification details are presented in Table 4.1 below.

Table 4.1 Site description

Site description	Public amphitheatre with grassed areas, multiple businesses (grocery store, bar, massage parlou Australia Post)
Site location	Corner of Lagoon Road and Neds Beach Road, Lord Howe Island NSW 2898
Site layout	Refer to Figure 2.1
Title identification details	Lot 44 in Deposited Plan (DP) 757515
Lease/ownership details	LHIB
Area	Approximately 2,250 m ² .
Local government area	Lord Howe Island Board
Current land use and zoning	Zoning: SET Settlement
	Land use: Public amphitheatre, grocery store, bar, massage parlour, Australia Post
Proposed land use	CBD toilets
Surrounding land	North: Neds Beach Road, Thompsons General Store and residential properties.
	South: Directly south is Lagoon Road followed by a foreshore park and Lagoon Beach.
	East: Stevens Reserve Track and Stevens Reserve followed by residential properties.
	West: Directly west is Neds Beach Road followed by Lord Howe Island Community Hall and The Anchorage (restaurant).
Climate	Based on information available from the Bureau of Meteorology (Lord Howe Island Aero (200839)), the region experiences moderate to warm summers and cool to moderate winters with an average maximum temperature in the summer (February) of 25.7°C and an average minimum temperature in winter (August) of 13.5°C. The region experiences an annual average rainfall of 1495.7 mm. On average, June experiences the highest rainfall of 170.6 mm whereas October experiences the lowest of 102.4 mm.

4.2 Database search results

A review of publicly available data is summarised in Table 4.2 with search results provided in Appendix A together with accompanying mapping.

Table 4.2 Summary of the environmental setting

Aspect	Summary details		
Geology and soils			
Soil and geology	The underlying geology in the south-east portion of the Site is expected to be coastal deposits (backbarrier flat facies) of the Holocene to present. The dominant lithology is sand described as fine- to medium-grained quartz-lithic sand with carbonate and humic components (marine-deposited), indurated sand, silt, clay, gravel, organic mud and peat.		
	The underlying geology in the remaining area of the Site is expected to be Neds Beach Formation of the Upper Pleistocene age. The dominant lithology is carbonate sedimentary rock described as brown to yellow, fine- to coarse-grained cross-bedded calcarenite consisting of coralline algae fragments, less abundant coral, foraminifera and molluscs.		
	The Site is mapped as having mainly Calcareous soils that are rich in calcium carbonate and typically alkaline with a pH above 7.0. They are light coloured and formed from weathered limestone, and can hinder nutrient availability, requiring careful management for optimal crop growth.		
Acid sulfate soils	The State and Local Acid Sulfate Soils (ASS) Registers and the National ASS Register did not identify any ASS at the Site of within the 500 m buffer.		
Salinity	There is no Dryland Salinity – National Assessment data available for the Site.		
Naturally occurring asbestos	There is no naturally occurring asbestos potential data available for the Site.		
Topography	The Site elevation is approximately 10 metres Australian Height Datum (m AHD).		
Hydrology and hydrogeology			
Aquifer	No aquifer type was identified for the Site. Published hydrogeological information indicated up to two different groundwater bearing zones attributed to the geology on the Site.		
Groundwater protection areas	There are no identified groundwater protection areas within the Site or immediate surrounds.		
Groundwater restricted use zones	There are no identified groundwater restricted use zones within the Site or immediate surrounds.		
Groundwater dependant ecosystems (GDE)	There were no aquatic or terrestrial GDEs identified within the Site or surrounding areas.		
Groundwater bores	A search of the various state and national datasets did not identify any registered groundwater bores within 2 km of the Site. Shallow groundwater flow is inferred to flow towards the ocean approximately 70 m from the Site, in a north to south direction.		
Borehole investigations	The database search did not return any borehole locations with information from driller's logs within 2 km of the Site.		
Other known borehole investigations (coal seam gas,	The database search returned three (3) borehole locations within the surrounding area of the Site:		
petroleum wells and other boreholes)	 Borehole GT0001700 located 882.8 m east of the Site, drilled in 1988 for an intrusive investigation related to soil sample analysis located at Lord Howe Island roadworks. 		
	 Borehole GT0001697 located 924.1 m east of the Site, drilled in 2004 for an intrusive investigation related to a geological assessment for geothermal power potential. 		
	 Borehole GT0001698 located 924.1 m east of the Site, drilled in 2010 for an intrusive investigation related to soil sample analysis at Lord Howe Island. 		
	 It is understood contamination investigations have previously been undertaken in other parts of the Island. This information was not available at the time this report was prepared. 		
Groundwater salinity	No groundwater salinity data was available for the Site.		
Ecology and natural hazards			
• Wetlands	No wetlands were identified at the Site of immediate surrounds.		

Aspect	Summary details		
 Sensitive receptors 	 Lord Howe Island Community Hall is located 31.7 m west of the Site. 		
	 Stevens Reserve is located 93.4 m east of the Site. 		
	 Thompson Memorial Park is located 114.4 m west of the Site. 		
	 A public park is located 141.5 m north of the Site. 		
	 Lord Howe Island Protection Zone is located 191.1 m south-west of the Site. 		
Bushfire prone land	None reported.		
Bushfire history	None reported.		
 Flood planning area 	Located 24.5 m north-west and 150 m east of the Site is a Flood Prone Area – 1 in 100 (1%) annual exceedance probability (AEP) floodplain as identified in ED21 5584.01 Flood Study – Community Newsletter – June 2021.		
Flood studies	None reported.		
Flood history	None reported.		
Erosion hazard	None reported.		
Heritage (Australian Government	Department of the Environment and Energy – Heritage Branch)		
Within 500 m of the Site:			
Environmental Planning	On-Site:		
Instruments	SEPP land Application.		
	Minimum Water Use Standard (40%).		
	Surrounding areas:		
	Significant Native Vegetation.		
	Additional Permitted Uses.		
 Australian heritage database register 	Lord Howe Island, including the area of the Site, is on the National Heritage List and is a World Heritage Area.		
State and Local Heritage Degister	Lord Howe Island, including the area of the Site, is on the State Heritage Register.		

5 Site history

A review of historical aerials for the period 1965–2023 provided insights into the historical and current land uses at the Site as described in Table 5.1. The historical aerials are provided in Appendix A.

5.1 Aerial review

Table 5.1 Aerial photograph review

Year/image type	Site	Surrounding area	
1965 Black and white	The Site is cleared of vegetation. Four buildings are present, three in the west of the Site and one in the east of the Site. Two are located at the current locations of The Crooked Bar restaurant and the Australia Post building. The remaining two buildings are located at the current open grass area in the south-west corner of the Site. Adjacent to these buildings are five small structures of unknown origin. Poor image quality restricted review.	Lagoon Road and Neds Beach Road run along the southern and western Site boundary. Lord Howe Island Community Hall is at its current location to the west of the Site. Directly east of the Site is a highly vegetated area, similar to present day. North of the Site are buildings at the current location of the residential houses and Thompsons General Store.	
2006 Colour	The building in the east of the Site appears to have been redeveloped, similar to the current layout. One of the buildings in the west of the Site has been removed, with another being built at the current location of Diamond's grocery store. Trees have been planted throughout the Site. The five small structures visible in the 1965 photograph are no longer visible. Poor image quality restricted review.	Generally consistent with the previous aerial photograph. Further development has occurred at the properties to the north and west of the Site.	
2008 Colour	Generally consistent with the previous aerial photograph.	Generally consistent with the previous aerial photograph.	
2012 Colour	Generally consistent with the previous aerial photograph.	Generally consistent with the previous aerial photograph. The building of the current Anchorage restaurant has been built to the west of the Site.	
2014 Colour	Generally consistent with the previous aerial photograph.	Generally consistent with the previous aerial photograph.	
2016 Colour	The building in the south-west corner of the Site has been removed.	Generally consistent with the previous aerial photograph.	
2019 Colour	Generally consistent with the previous aerial photograph.	Generally consistent with the previous aerial photograph.	
2021 Colour	The amphitheatre and the building at the current location of The Crooked Post bar have been built. The Site is generally consistent with its current layout.	Generally consistent with the previous aerial photograph.	
2023 Colour	Generally consistent with the previous aerial photograph.	Generally consistent with the previous aerial photograph.	

5.2 Review of historical maps and plans

No historical maps or plans were available to EMM for review.

5.3 Previous investigations

No previous investigation reports relating to contamination at the Site were available to EMM for review.

6 Potential regulatory contamination issues

A review of publicly available data is summarised in Table 6.1 with search results provided in Appendix A together with accompanying mapping.

Aspect	Summary details
NSW EPA records	The following NSW EPA records/databases were searched:
	 List of NSW contaminated sites notified to EPA.
	Clean up, Penalty Notices and Orders.
	Licensed Activities under the POEO Act 1997.
	 Delicensed POEO Activities still regulated by the EPA.
	 Former POEO Licensed Activities now revoked or surrendered.
	Audits.
	NSW EPA records identified from these searches are listed below.
List of NSW contaminated sites notified to EPA	There were no sites which have been notified as contaminated to the NSW EPA within 1 km of the Site.
Clean up, penalty notices and orders	There were no clean up, penalty notices or orders within 1 km of the Site.
POEO Activities – Licenses, Approvals & Assessments	There were no POEO activities within 1 km of the Site.
Audits	There were no audited sites listed to the EPA within 1 km of the Site.
Other potentially contaminating activities	The following datasets from various sources containing other potential regulatory contamination issues within a minimum 500 m radius of the Site were searched:
	 per- and poly-fluoroalkyl substances (PFAS) site investigations or management programs
	Department of Defence sites
	contaminated legacy areas
	• gasworks
	landfills
	National Pollutant Inventory (NPI)
	mining/exploration titles
	 potentially contaminating activities
	 dry cleaners, motor garages and service stations.
	The records identified from these searches are listed below.
PFAS sites	There is one PFAS site identified within 2 km of the Site. Lord Howe Island Airport (PFAS investigation site) is located approximately 1,500 m south-east of the Site. Investigations have identified PFAS in soil and groundwater samples close to the airport, lagoon and depot. The detection of PFAS is not unexpected given the past use of PFAS-containing firefighting foams at these locations. PFAS has also been used in many domestic and industrial products and background concentrations may be present from these other sources.
Defence, Military sites and UXO areas.	There were no sites recorded as Defence, military sites or UXO areas within 2 km of the Site.
Contaminated legacy areas	There were no contaminated legacy areas recorded within 2 km of the Site.
Gasworks	There were no former gasworks sites recorded within 2 km of the Site.

There were no landfills recorded within 500 m of the Site.

Table 6.1 Summary of potential regulatory contamination issues

Landfills

Aspect	Summary detail	s				
National Pollutant Inventory (NPI)	There were no sites listed in the NPI within 500 m of the Site.					
Mining	There were no mines or quarries (current or historical) recorded within 500 m of the Site.					
Potentially contaminating activities	There is one potentially contaminating activity within 200 m of the Site. For full details refer to Appendix A.					
	Site name	Category	Description	Status	Distance (m)	Direction
	Thompson Family Cemetery	Other Potentially Contaminating Activities	Null	Current	183.2	North- west
Dry cleaners, motor garages and service stations	There were no s	ites on the UBD Busine	ss Directories wit	hin 200 m of th	e Site.	
Historical business directories	There were no historical businesses identified for the Site or within 200 m.					
Site-specific documentation:	A summary of potential regulatory contamination considerations based on EMM's review of available documentation and SafeWork NSW reports for the Site is summarised below.					
EMPs or related documents applying to the Site	There are no known EMPs or related documents applying to the Site.					
Existing contamination monitoring programs	There are no known existing contamination monitoring programs related to the Site.					

7 Methodology

7.1 Field work summary

The field program consisted of the completion of six hand auger boreholes across the Site. All field work was completed by Broadcrest on behalf of LHIB on 19 March 2025.

7.2 Soil boring and hand auguring

Hand augering was conducted to facilitate sample collection to the target depth of 1.2 metres below ground level (m bgl). Representative samples were collected directly from the hand auger, at consistent intervals, changes in lithology and when indicators of contamination were observed. During the advancement of the hand augers, Broadcrest field staff recorded observations of the presence of fill material, anthropogenic inclusions, soil structure and condition.

Hand augers were backfilled in chronological order, ensuring materials were placed back in the subsurface layer and not within surficial soils to avoid introducing contamination from sampling. Hand augers were reinstated to their general original level.

7.3 Sample analysis

Up to three soil samples were selected for analysis from each borehole location based on the location, rationale for collection and field observations (such as indicators of contamination). The analytical suite shown in Table 7.1 was adopted for the investigation.

Table 7.1 Analytical suite

CoPC	No. of samples analysed
Heavy metals	10 primary samples
Per- and polyfluoroalkyl substances (PFAS) – 12 compounds	10 primary samples
Polycyclic Aromatic Hydrocarbons (PAHs)	10 primary samples
Total Recoverable Hydrocarbons (TRH) and Total Petroleum Hydrocarbons (TPH)	10 primary samples
Benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN)	10 primary samples
PFAS Australian Standard Leaching Potential (ASLP) analysis	5 primary samples
Asbestos (Absence/Presence)	6 primary samples

Note: All percentages are approximate.

8 Assessment criteria and QA/QC

8.1 Site assessment criteria

Analytical results from samples obtained during the Site investigation were screened against the adopted site assessment criteria (SAC), which have been selected based on the current and proposed future land use of public open space. The assessment criteria are outlined in Table 8.1.

Table 8.1 Adopted Site assessment criteria

Adopted criteria	Rational for selection
Health Investigation Levels (HILs), Amended ASC NEPM (NEPC 2013)	The ASC NEPM HILs provides a framework for the use of investigation and screening levels. The framework is applicable for assessing human health risk via all relevant pathways of exposure and covers a broad range of metals and organic substances.
	The Site land use is public open space. Analytical results from this investigation were compared to the ASC NEPM Recreational C which includes developed open spaces as this best matches the Site land use.
Health Screening Levels (HSLs), ASC NEPM	The ASC NEPM HSLs for petroleum compounds have been derived through consideration of risks to human health, with the main focus being on the vapour exposure pathway. The HSLs have been calculated using parameters that generally correspond to data available and as such aim to provide levels that are realistic rather than overly conservative.
	The Site land use is public open space. Analytical results from this investigation were compared to the ASC NEPM Recreation C which includes developed open spaces as this best matches the Site land use. The screening strata were selected based on the subsurface conditions encountered (predominantly sands).
PFAS National Environmental Management Plan 3.0 (NEMP, 2025)	National guidelines for three PFAS compounds (PFOS, PFHxS and PFOA) are presented in the PFAS NEMP 3.0 (2025) to protect human health and the environment under different exposure scenarios.
	Analytical results were compared to HIL C (Public open space).
	The PFAS NEMP present interim ecological investigation levels for PFAS which covers direct and indirect (secondary consumer) exposure for ecological receptors. Both values will be adopted for this assessment.
Management Limits, ASC NEPM	The ASC NEPM Management Limits for TRH are applied after the consideration of the relevant HSLs and Ecological Screening Levels (ESLs) as there are a number of policy considerations which reflect the nature and properties of petroleum hydrocarbons. There are Management Limits for specific soil types (coarse and fine) and land uses in the ASC NEPM. The Management Limits avoid or minimise the potential effects of the following and require consideration of Site-specific factors to determine the maximum depth to which the limits should apply:
	 formation of observable light non-aqueous phase liquid
	fire and explosive hazards
	 effects on buried infrastructure, e.g. penetration of, or damage to, in-ground services by hydrocarbons.
	The criteria for residential, parkland and public open space (HIL Recreation C) scenarios within coarse sands are considered relevant for the upper 2 m of soil.

Adopted criteria	Rational for selection
Cooperative Research Centre of Contamination Assessment	For intrusive works dermal contact pathway, the adoption the CRC CARE Technical Report no. 10 HSL for petroleum compounds is proposed.
and Remediation of the Environment (CRC CARE) Technical Report No. 10 – <i>HSLs</i> <i>for Petroleum hydrocarbons in</i> <i>Soil and Groundwater</i> , September 2011. (Friebel, E. and Nadebaum, P., 2011)	EMM acknowledges that this report is not recognised by the NSW EPA as a statutory or non-statutory guideline, however in the absence of a criteria established by the NSW EPA and considering that the NEPM HSLs were derived and adopted from CRC CARE Tech Report 10, this guideline is proposed as a site-specific criteria to be adopted for the above-mentioned scenario.
	CRC CARE presents HSLs for petroleum compounds which have been derived through consideration of risks to human health, with the main focus being on the direct contact and vapour exposure pathways. HSLs were derived based on solubilities of standard petroleum sources in Australia (i.e. petrol and diesel).
Ecological Investigation Levels (EILs) ASC NEPM	The ASC NEPM EILs have been developed for selected metals and organic substances and are applicable for assessing risk to terrestrial ecosystems. EILs depend on specific soil physicochemical properties and land use scenarios. It is noted that EILs take into consideration the depth of contamination, soil texture and age of the impacts. EILs apply principally to contaminants in the top 2 m of soil at the surface/ground level which corresponds to the root zone and habitation zone of many terrestrial species.
	The analytical results from this investigation will be compared to the guideline for 'urban residential areas and public open space'.
	As samples within the top 2 m bgl will be analysed, these guidelines have been adopted for this investigation.

8.2 Quality assurance and quality control

Data quality assurance and quality control (QA/QC) procedures have been adopted to provide a consistent approach to evaluation of whether the data quality objectives (DQOs) of the project have been achieved. The process focuses on assessment of the useability of the data in terms of accuracy and reliability in forming conclusions on the condition of the elements of the environment being investigated.

All stages of the works (i.e. data gathering, sample handling, laboratory analysis) were conducted in accordance with the QA/QC program outlined in the following sections.

8.2.1 Field methods and quality control measures

The following QA/QC procedures were incorporated into the sampling and analysis program adhered to by Broadcrest during sampling works:

- Intra-laboratory duplicates (at a rate one per 20 samples analysed) were submitted to the primary National Association of Testing Authorities (NATA) accredited external analytical laboratory for analysis for TPH/TRH, BTEXN, PAHs, PFAS and heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc).
- One rinsate blank was collected at the end of each day of sampling where non-dedicated equipment was used and submitted to the primary laboratory for analysis for TPH/TRH, BTEXN, PAHs and heavy metals.

8.2.2 Data quality objectives

To ensure that data of adequate type and reliability was collected and assessed for the investigation, the seven-step DQO approach, endorsed in the NSW EPA Guidelines for the NSW Site Auditor Scheme 3rd Edition (2017), was adopted. The DQOs have set QA/QC parameters for the field and laboratory programs to ensure data of appropriate reliability will be used to assess contamination risks at the Site. The DQOs are outlined in Table 8.2.

Table 8.2 Data quality objectives

DQO step	DQO measure			
Step 1 – State the Problem	LHIB/KPMG aims to develop an understanding of the contamination status at the Site to assess suitability of the Site for development of the proposed CBD toilets.			
	A Site investigation was required evaluate soil and fill material at the Site.			
Step 2 – Identification of the goals (decision of the study)	The following information informs the aims and goals of the Site investigation:			
	Assess condition of soil and fill material at selected locations within the Site boundary.			
Step 3 – Identify information inputs to the decision or goal of	The following information inputs were obtained to undertake the PSI and targeted soil sampling:			
the study	 Field observations and analytical data pertaining to soil at investigation locations. 			
	 Comparison of concentrations of contaminants relative to relevant site assessment criteria (SAC). 			
	 Identification of potential receptors and pathways based on the presence of CoPC in the environment from the data collected. 			
Step 4 – Define the study	The study boundaries include:			
boundaries	• Spatial – The overall study boundary is defined as the Site boundary as shown in Figure 2.1.			
	 Vertical – The vertical boundaries of the soil study are from surface to depths of up to 1.2 m bgl. 			
	 Temporal – The data collected from the targeted sampling program was collected on 19 March 2025. 			
Step 5 – Develop a decision rule	The data must be of sufficient representativeness to identify if contamination exists and determine if sampling and analysis is required to delineate the nature and/or extent of contamination to inform risk management.			
	The decision rules for the investigations are:			
	 If the contaminant concentrations were less than the adopted SAC, then any potential risk i assumed to be negligible and acceptable. 			
	 If the concentrations are equal to or greater than the adopted SAC, then risks will be document or further investigations recommended. 			
	The decision on the acceptance of the analytical data will be made on the basis of the data quality indicators (DQIs).			
Step 6 – Specify the performance or acceptance criteria that the data needs to achieve	Acceptable limits on decision errors must be applied based on the DQIs of, precision, accuracy representativeness, comparability and completeness (PARCC).			
	The tolerable limits on decision errors for data that EMM considers acceptable are:			
	 Probability that 95% of data satisfied the DQIs, therefore the limit on the decision error is 5% that a conclusive statement may be incorrect. 			
	• A robust QA/QC program will be implemented and that appropriate sampling and analytical density for the purposes of the investigations and representative sampling is undertaken.			
	Relevant performance and/or acceptance criteria were determined for QA/QC purposes and comparison of groundwater and soil analytical results to appropriate SAC.			
Step 7 – Optimisation of the design of the collection of data	The collection of data has been optimised by the development of an appropriate sampling and analytical strategy. Given access constraints associated with EMM attending Site, samples were collected by Broadcrest on behalf of LHIB.			

8.2.3 Laboratory QA/QC

Details of the specific analytical techniques utilised by the laboratories have been provided in the laboratory reports. Chain of Custody (COC) documentation accompanies all analytical data provided by the laboratories which are included in Appendix C.

As part of the QA/QC program, relative percent differences (RPD) between the duplicate and its primary sample were calculated. To be acceptable, the RPD must be less than 50%, which is recommended in Australian Standard 4482.1-2005. The RPD results and an EMM data QA/QC report is presented in Appendix D.

9 Field observations and analytical results

9.1 Field observations

9.1.1 Hand auger locations

Six borehole locations (BH01-BH03, BH05-BH07) were advanced within various areas of the Site (refer Figure 2.1). All boreholes were advanced using a hand auger. BH04 was aborted due to the unexpected find of buried power lines. A material observations log is provided in Table 9.1. A photographic log can be found in Appendix B.

The following field observations were noted by Broadcrest during the sampling program:

- Encountered geology was predominantly brown sands. Organic material comprising roots were generally
 observed from surface to 0.2 m bgl.
- Carbonaceous fragments of coral and shells were identified between 1.0–1.2 m bgl at BH02 and BH03.
- Cement fragments and trace plastic were identified between 0–0.3 m bgl at BH07. Traces of concrete fragments were identified between 0–0.2 m bgl at BH05.
- Hand auger refusal was reached at 0.3 m bgl at BH01 and 0.7 m bgl at BH07.
- A fragment of bonded fibre cement material (approximately 20x15x5 mm) was observed on the ground surface adjacent to BH06, near the corner of a building in the northern portion of the Site. Refer to Plates 7 and 8, Appendix B.
- 1 x 3,000 L aboveground storage tank (AST) and a macerator pump were observed adjacent to the Australia Post building in the south-east corner of the Site. Refer to Plate 12, Appendix B.

Borehole ID	Depth (m bgl)	Description			
BH1	0–0.3	Dull brown sand with organics and traces of gravel. Refusal on hard layer.			
BH2	0-0.3	Dull brown sand with organics.			
	0.3–0.8	Dull brown sand.			
	0.8–1.2	Light brown sand with carbonaceous pieces of coral/shell etc.			
ВНЗ	0–0.3	Dull brown sand with organics.			
	0.3–0.8	Dull brown sand.			
	0.8–1.2	Light brown sand with carbonaceous pieces of coral/shell etc.			
вн5	0–0.3	Dull brown sand with organics and traces of concrete frags.			
	0.3–1.2	Dull brown sand.			
ВНб	0–0.2	Dark brown to dull brown sand with organics.			
	0.2–1.2	Dull brown sand.			
BH7	0–0.3	Dark brown to dull brown sand with large cement fragments and gravel, trace plastics.			
	0.3–0.7	Dull brown sand. Refusal on hard layer.			

Table 9.1 Material observations log

9.2 Analytical results

A total of 12 primary samples obtained from six hand auger locations were submitted to ALS Environmental Pty Ltd (ALS) for NATA accredited laboratory analysis. The laboratory analytical results are presented in Appendix E and laboratory certificates of analysis are included in Appendix C.

All samples submitted for analysis were reported below the SAC for selected analytes (TRH/TPH, BTEXN, PAHs, PFAS and heavy metals). No asbestos was detected in the samples analysed.

Analytes reported to be above the laboratory limit of reporting (LOR) are listed below:

- Heavy metals at all locations, however no elevated concentrations were reported above the adopted SAC.
- Perfluorooctane sulfonic acid (PFOS) at all locations with concentrations above the LOR ranging from 0.0003 mg/kg at BH06 (1.0–1.2 m bgl) to 0.0011 mg/kg at BH02 (0–0.2 m bgl).
- Perfluorooctanoic acid (PFOA) in two samples at concentrations of 0.0003 mg/kg at BH06 (0–0.2 m bgl) and 0.0002 mg/kg at BH07 (0–0.3 m bgl).
- Sum of perfluorohexane sulfonic acid (PFHxS) and PFOS at all locations with concentrations above the LOR ranging from 0.0003 mg/kg at BH06 (1.0–1.2 m bgl) to 0.0011 mg/kg at BH02 (0–0.2 m bgl).
- PFAS Australian Standard Leaching Potential (ASLP) results were below the LOR with the exception of PFHxS at concentrations of 0.04 μg/L at BH01 (0–0.2 m bgl) and 0.02 μg/L at BH03 (1.0–1.2 m bgl), PFOS at a concentration of 0.01 μg/L at BH01 (0–0.2 m bgl) and sum of PFHxS and PFOS at concentrations of 0.05 μg/L at BH01 (0–0.2 m bgl) and 0.02 μg/L at BH03 (1.0–1.2 m bgl).

10 Assessment of sources, pathways and receptors

10.1 Sources and contaminants of potential concern

Table 10.1 shows a summary of the potential sources of contamination and associated contaminants of potential concern (CoPC) identified as an outcome of the information review and Site inspection.

Potential sources of CoPC Likelihood of contamination/release mechanisms contamination Residual building and waste BTEXN², TRH³, Potential - Small quantities of residual buildings and waste materials may be materials following the PAHs4, VOCs5, present following the fire that previously occurred at the Site. Building and historical fire ACM⁶, metals waste materials may be a source of asbestos or other CoPC. Plastic, a fibre cement fragment and concrete fragments were identified in soil from 0-0.3 m bgl. Firefighting residues following PFAS¹ Potential - it is understood that a fire historically damaged the former power the historical fire house at the Site on 13 November 2009. C02, powder dump and water was reportedly used to extinguish the fire, however it is uncertain whether the powder dump could potentially contain PFAS. Former use of ACM on Site Asbestos Potential - based on the assumed age of some buildings and the historical use buildings of asbestos containing building materials during that period, some buildings may contain ACM material. During sampling works, a fragment of potential bonded cement material was observed on the ground surface near the corner of a building in the northern portion of the Site. The fragment was not analysed but may potentially contain asbestos. Former use of lead paint on Potential - flaking and/or lead dust, based on the assumed age of some Lead Site buildings buildings, and the historical application of lead-based paints during that time. Macerator pump and 3,000 L Nutrients Potential - leaking from tanks and ancillary infrastructure can be common. AST potentially related to Leaks could infiltrate the underlying ground surface through small cracks or joins in a concrete slab. The current condition of the tank is not known. sewage system **Regional PFAS contamination** PFAS¹ Potential - it is understood that previous investigations at other parts of Lord of soil and groundwater Howe Island have identified elevated concentrations of PFAS. Site-wide use of fill material BTEXN², TRH³, Potential - the Site likely has areas of potential natural and anthropogenic fill PAHs4, VOCs5, reworked into soils around the Site, likely present around buildings where the ACM⁶, metals ground would have been levelled through cut and fill. Fill may be a source of asbestos or other CoPC. Plastic, a fibre cement fragment and concrete fragments were identified in soil from 0-0.3 m bgl. Potential application of Heavy metals, Potential - pesticides may have been applied to building footings and void pesticides for pest control. OCP7/OPP8 spaces.

Table 10.1 Summary of potential sources of historical contamination and CoPC

1. PFAS - per- and polyfluoroalkyl substances.

2. BTEXN - benzene, toluene, ethylbenzene, xylene and naphthalene.

3. TRH - total recoverable hydrocarbons.

4. PAHs - polycyclic aromatic hydrocarbons.

5. VOCs - volatile organic compounds.

6. ACM - asbestos containing material.

7. OCP – Organochlorine pesticides.

8. OPP – Organophosphorus pesticides.

The following transport mechanisms may apply at the Site:

- vertical migration of CoPC through the soil profile
- migration of CoPC into shallow groundwater
- atmospheric dispersion dust or fibres to on- and off-Site residents
- surface run-off transportation of CoPC
- migration of CoPC via groundwater transport.

Identified potential exposure pathways for the nominated CoPC include:

- i) dermal contact and incidental ingestion
- ii) inhalation of dust (including soil derived) or fibres
- iii) inhalation of soil vapours in outdoor air
- iv) inhalation of vapours in indoor air
- v) ingestion of CoPC from surface water by aquatic biota
- vi) uptake of CoPC from soil (microorganisms).

Based on the physical and chemical features of the CoPC identified, the exposure pathways that may be applicable to each CoPC at the Site are presented in Table 10.2.

Table 10.2 CoPC and applicable exposure pathways

CoPC	Applicable pathways		
TRH/BTEXN	i, ii, iii, iv, v, vi		
PAHs	i, ii, v, vi		
VOCs	i, ii, iii, iv, v, vi		
Asbestos	П		
Nutrients	i, ii, v, vi		
PFAS	i, ii, v, vi		
OCP/OPP	i, ii, v, vi		
Metals	i, ii, v, vi		

10.2 Receptors

A CSM has been developed to identify existing known sources and areas of contamination, associated potential impacts to human health and ecological receptors and to identify exposure source, pathway, receptor (S-P-R) linkages. Typical receptors for the Site would include:

- Current and future Site users general public.
- Construction/intrusive maintenance workers involved in the future development/maintenance of the Site where excavation is required (e.g. trenching for CBD toilets infrastructure).

Ecological receptors, including aquatic, terrestrial and groundwater ecosystems.

10.3 Risk assessment methodology

EMM has quantified potential contamination risks using a risk assessment matrix. Each identified contamination issue was assessed in terms of the potential consequence for future development works, using the matrix of consequences and likelihoods in Table 10.3. This information was subsequently used to inform the CSM and risk assessment in Table 10.4.

Table 10.3 Qualitative risk assessment matrix

	Likelihood of soil contamination to be present						
Consequence	Rare (1) – Very unlikely at concentrations above the relevant assessment criteria and limited in extent.	Unlikely (2) – Potentially present at concentrations above the relevant assessment criteria and limited in extent.	Possible (3) – Potentially present at concentrations above the relevant assessment criteria and widespread.	Likely (4) – Most likely present at concentrations above the relevant assessment criteria and widespread.	Almost certain (5) - Known to be present at concentrations above the relevant assessment criteria and widespread.		
Insignificant (1) – No or highly unlikely exposure pathway for human or ecological receptors under current and future land use.	Low 1	Low 2	Low 3	Low 4	Moderate 5		
Minor (2) – Unlikely exposure pathway for human or ecological receptors under current and future land use.	Low 2	Low 4	Low 6	Moderate 8	Moderate 10		
Moderate (3) – Exposure pathway for human or ecological receptors may be present and complete under current and future land use.	Low 3	Low 6	Moderate 9	Moderate 12	High 15		
High (4) – Exposure pathway for human or ecological receptors likely to be present and complete under current and future land use.	Low 4	Moderate 8	Moderate 12	High 16	High 20		
Significant (5) – Exposure pathway for human or ecological receptors present and are considered complete under current and future land use.	Moderate 5	Moderate 10	High 15	High 20	High 25		

10.4 Conceptual site model

The preliminary CSM and tier-1 risk assessment is presented in Table 10.4.
Table 10.4 Conceptual site model

Source area	CoPC	Potential exposure pathway between contamination and receptor	Receptor	Potentially complete source-pathway-receptor linkage?	Tier 1 risk assessment
Residual building waste materials following the historical fire	BTEXN, TRH, PAHs, VOCs, ACM, metals	 Exposure pathways: Dermal contact or incidental ingestion. Inhalation of dust. Inhalation of outdoor and/or indoor air. Migration pathways: Vapour intrusion. Infiltration of soil CoPC to groundwater. Surface water runoff. 	 Current and future Site users. Intrusive maintenance workers. On-Site ecology. 	Unlikely – no concentrations of CoPC in soil at the Site were elevated or reported above the adopted SAC.	Low 6
Firefighting residues following historical fire	PFAS	 Exposure pathways: Dermal contact or incidental ingestion. Migration pathways: Shallow groundwater flow. Surface water runoff. Plant uptake. 	 Current and future Site users. Intrusive maintenance workers. On-Site ecology. 	Unlikely – there were no elevated concentrations of PFAS above the SAC reported in soil at the Site and anecdotal information suggests firefighting foam potentially containing asbestos was not used to fight the fire.	Low 6
Former use of ACM on Site buildings	ACM	Exposure pathways:Inhalation of outdoor and/or indoor air.Migration pathway:Atmospheric dispersion of dust/fibres.	 Current and future Site users. Intrusive maintenance workers. 	Potential – no asbestos was reported by the laboratory in any of the analysed soil samples. However, during the Site inspection a fragment of potential bonded cement material was observed on the ground surface near the corner of a building. The fragment was not sampled but may potentially contain asbestos.	Low 6
Residual lead- based paint on buildings and potential leaching through underlying/ surrounding soils	Lead	 Exposure pathways: Dermal contact or incidental ingestion. Inhalation of outdoor and/or indoor air. Migration pathways: Seepage into underlying soils. Atmospheric dispersion of dust/fibres. 	 Current and future Site users. Intrusive maintenance workers. On-Site ecology. 	Unlikely – there were no elevated concentrations of lead reported in surface soil at locations adjacent to buildings at the Site.	Low 6

Source area	CoPC	Potential exposure pathway between contamination and receptor	Receptor	Potentially complete source-pathway-receptor linkage?	Tier 1 risk assessment
Macerator pump and 3,000 L AST potentially related to sewage system	Nutrients	 Exposure pathways: Dermal contact or incidental ingestion. Inhalation of dust. Inhalation of outdoor and/or indoor air. Migration pathways: Seepage into underlying soils. Surface water runoff. Plant uptake. 	 Current and future Site users. Intrusive maintenance workers. On-Site ecology. 	Potential – there were no elevated concentrations of CoPC reported in soil at BH07, located approximately 10 m west of the AST. However, no analysis was completed for nutrients.	Low 6
Regional PFAS contamination of soil and groundwater	PFAS	 Exposure pathways: Dermal contact or incidental ingestion. Migration pathways: Shallow groundwater flow. Surface water runoff. Plant uptake. 	 Current and future Site users. Intrusive maintenance workers. On-Site ecology. 	Unlikely – there were no elevated concentrations of PFAS reported in soil at the Site.	Low 6
Site-wide use of fill material	BTEXN, TRH, PAHs, VOCs, metals, ACM	 Exposure pathways: Dermal contact or incidental ingestion. Inhalation of dust. Inhalation of outdoor and/or indoor air. Migration pathways: Vapour intrusion. Infiltration of soil CoPC to groundwater. Surface water runoff. 	 Current and future Site users. Intrusive maintenance workers. On-Site ecology. 	Unlikely – no concentrations of CoPC in soil at the Site were elevated or reported above the adopted SAC.	Low 6
Potential application of pesticides for pest control	Pesticides (OCP/OPP), metals	 Exposure pathway: Dermal contact or incidental ingestion. Migration pathways: Seepage into underlying soils. Migration through surface runoff. 	 Current and future Site users. Intrusive maintenance workers. On-Site ecology. 	Unlikely – there were no elevated concentrations of metals reported in surface soil at the Site.	Low 6

*The contamination risk level is based on a tier-one preliminary qualitative risk assessment matrix as outlined in Table 10.3 above.

11 Conclusion and recommendations

This PSI was undertaken to assess the contamination status of the Site as part of the development application (DA) for the proposed CBD toilet development. Targeted soil sampling was conducted by a contractor on behalf of LHIB, with the data being incorporated into the PSI.

A total of six boreholes were drilled to a maximum depth of 1.2 m bgl with selected samples analysed for TRH/TPH, BTEXN, PAHs, PFAS and metals. Concentrations of CoPC were reported below the SAC for the intended future land use.

The Site's CSM identified several potential contamination sources which have a potential exposure scenario to on-Site receptors. This included the potential former use of ACM on site buildings.

Based on the reported results, the PSI has identified an overall contamination risk rating of **low** for the proposed CBD toilets development. Notwithstanding, given that reported concentrations of CoPC including PFAS were detected at concentrations above the laboratory LOR and with consideration to the sensitive environment at Lord Howe Island, the following recommendations are made with regards to managing potential contamination risks during redevelopment works at the Site:

- Preparation and implementation of a construction environmental management plan (CEMP) incorporating an unexpected contamination finds protocol (including asbestos). The CEMP would outline recommended management actions in the event of potential contamination being encountered during Lot 44 construction work activities.
- Should potential ACM be encountered at the Site during construction, samples should be collected and analysed by a suitably qualified and experienced professional and managed in accordance with the requirements outlined in the CEMP.

References

Heads of Environment Protection Authority (HEPA) (2025). *PFAS National Environment Management Plan 3.0* (NEMP 2025)

National Environment Protection Council (NEPC) 1999, National Environment Protection (Assessment of Site Contamination) Measure 2013 (ASC NEPM 2013)

NSW EPA (2020) Consultants reporting on Contaminated Land Contaminated Land Guidelines.

NSW EPA (2022) Contaminated Land Guidelines: Sampling Design (Parts 1 and 2).

Standards Australia (AS 4482.2 - 1999) Guide to the sampling and investigation of potentially contaminated soil, Part 2: Volatile Substances

Standards Australia (AS4482.1-2005) *Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds*

Standards Australia (AS4482.1-2005) *Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semivolatile compounds*

Appendix A Background information review





Due Diligence Insight Report

Neds Beach Rd Lord Howe Island, NSW

11 Apr 2025

Report nº: LI-4693 DDR

Understanding your report

Thank you for ordering your report from Land Insight. If you have any feedback, questions or queries, please get in touch with us at <u>orders@landinsight.co</u>.

Your Report has been produced by Land Insight and contains information related to current and historical land use information, environmental risks and hazards.

The information presented in this report includes Land Insights' comprehensive research into current and historical land use derived from Land Insight's proprietary National Land Use Atlas (NLUA), environmental risk information and data available from public databases, third party providers, local and state authorities. The report also includes detailed property and soil setting information, hydrogeology, identification of potential pollution and contamination along with ground and natural hazards. The records identified are presented within a 200 to 2000m radius (buffer zone) from the boundaries of the Property searched, depending on the screened constraint. The report is separated and grouped into easy to navigate sections as per Summary below:

0	Section 1	PROPERTY SETTING	Sensitive Receptors, Planning Controls, Zoning, Heritage, Soil and Land Information, Geology and Topography
8	Section 2	HYDROGEOLOGY AND GEOTECHNICAL	Groundwater Bores and Other Borehole investigations, Groundwater Dependent Ecosystems (GDE), Aquifer and Wetland, Other Hydrogeology information.
	Section 3	ENVIRONMENTAL REGISTERS, LICENCES AND INCIDENTS	Contaminated Land Public Register, Licences, Audits and Orders, Sites Regulated by Other Jurisdictional Body (Former Gaswork sites / PFAS sites, UXO Areas), Historical Landfills, Derelict Mines and National Pollutant Inventory (NPI).
	Section 4	POTENTIALLY CONTAMINATED AREAS	Potentially Contaminating activities (Industries, businesses and activities that may cause contamination), Historical Potentially Contaminating activities and Historical Land Use.
0	Section 5	NATURAL HAZARDS	Erosion hazard, Flood hazards, Bushfire prone land and Bushfire history.

This report includes data listed on page 4 (table of contents). All sources of data and definitions are provided in the Product Guide (Attached). For a full list of references, metadata, publications or additional information not provided in this report, please contact <u>orders@landinsight.co</u>.

This report does not include information derived from a physical inspection. It is important to note that a site inspection can present information relevant to other risks and hazards that may not be identified by this Report.

Due to the ongoing nature of database development and frequency of updates provided by various state government regulators and data sources, the data displayed within this report is only current from date of production. While every effort is made to ensure the details in your Report are correct, Land Insight cannot guarantee the accuracy or completeness of the information and/or data provided.

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Report Summary

	Dataset name	Onsite	On Buffer	Buffer Distance
Sectio	on 1 - Property Setting			- CASACITORS
1.1	Sensitive Receptors		1	200m
1.2a	Planning Controls (Zoning)	1	1	500m
1.2b	Planning Overlays (Environmental Planning Instruments)	1	1	500m
	Planning Overlays (Other Planning Information)			500m
1.3	Heritage (State and Local Heritage)	1	1	200m
	Heritage (Australian and World Heritage Database Register)	1	1	200m
1.4a	Soil and Land Use Information (Soil Landscape)	1	1	500m
	Soil and Land Use Information (Soil Salinity)			500m
	Soil and Land Use Information (Radon)	1	1	500m
1.4b	Acid Sulfate Soil (State and Local Acid Sulfate Soil Registers)			500m
-	Acid Sulfate Soil (National Acid Sulfate Soil Registers)			500m
1.5	Geology and Topography (Geology)	1	1	500m
	Geology and Topography (Naturally Occurring Asbestos Potential NOA)	-		500m
Sectio	on 2 – Hydrogeology and Geotechnical			
2.1	GDE & Hydrogeology Constraints (Aquifer Type)			2000m
	GDE & Hydrogeology Constraints (Groundwater Protection Areas)			2000m
	GDE & Hydrogeology Constraints (Wetlands)			2000m
-	GDE & Hydrogeology Constraints (GDE Surface)			2000m
-	GDE & Hydrogeology Constraints (GDE Subsurface)			2000m
	GDE & Hydrogeology Constraints (Groundwater Licences)			2000m
	GDE & Hydrogeology Constraints (Groundwater Bores)			2000m
2.2	Groundwater and Other Bores (Groundwater Restricted Use Zones)			2000m
	Groundwater and Other Bores (Groundwater Salinity)		· · · · · ·	2000m
	Groundwater and Other Bores (Other Known Boreholes Investigations)		1	2000m
Sectio	on 3 - Environmental Registers, Licences and Incidents			
3.1	Contaminated Land Public Register (Contaminated Sites)			1000m
3.2	Licences, Approvals & Assessments (Licences)			1000m
	Licences, Approvals & Assessments (Audits)			1000m
1	Licences, Approvals & Assessments (Clean up Notices, Penalty Notices and Orders)			1000m
3.3a	Sites Regulated by other Jurisdictional Body (Contaminated Legacy Areas)			2000m
	Sites Regulated by other Jurisdictional Body (Defence, Military Sites and UXO Areas)		1	2000m
	Sites Regulated by other Jurisdictional Body (Former Gasworks Sites)			2000m
	Sites Regulated by other Jurisdictional Body (PFAS Sites)		1	2000m
3.3b	Other Potential Hazard Sources (Mines and Quarries)			500m
	Other Potential Hazard Sources (Landfills)			500m
	Other Potential Hazard Sources (National Pollutant Inventory NPI)			500m
Sectio	on 4 - Potentially Contaminated Areas		,	
4.1	Potentially Contaminating Activities (Liquid Fuel Facilities)	-	1	200m
4.2	Historical Business Directories			200m
Sectio	on 5 - Natural Hazards			
5.1	Fire Hazard (Bushfire Prone Areas)			500m
	Fire Hazard (Bushfire History)	1		500m
5.2	Flood Hazard (Flood Planning Area)		1	500m
	Flood Hazard (Other Flood Studies)			500m
	Flood Hazard (Flood History)			500m
5.3	Erosion Hazard			500m
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ATTACHMENTS

Appendix A - Report Maps Appendix B - Historical Imagery







Section 1 Property Setting

1.1 Sensitive Receptors and Features of Interest

Map 1.1 (200m Buffer)

Sensitive receptor	Туре	Distance (m)	Direction
Lord Howe Island Community Hall	Community Centres	31.7	West
Stevens Reserve	Parks	93.4	East
Thompson Memorial Park	Parks	114.4	West
Public park	Parks	141.5	North
Lord Howe Island Protection Zone	Parks	191.1	South-west

Source: Sensitive Receptors

1.2a Planning Controls

Map 1.2a (500m Buffer)

Zoning

Zoning	Туре	Details	Distance (m)	Direction
SET	Settlement	Lord Howe Island Local Environmental Plan 2010	0.0	Onsite
ENP	Environment Protection	Lord Howe Island Local Environmental Plan 2010	19.5	South
SPU	Special Uses	Lord Howe Island Local Environmental Plan 2010	20.5	North-west
REC	Recreation	Lord Howe Island Local Environmental Plan 2010	23.3	East
МАР	Marine Park	Lord Howe Island Local Environmental Plan 2010	53.5	South
RUR	Rural	Lord Howe Island Local Environmental Plan 2010	82.3	North-west

Source: Zoning, Planning Overlays and Other Planning Information



1.2b Planning Overlays

Environmental Planning Instruments

Map 1.2b (500m Buffer)

Name	Туре	Details	Distance (m)	Direction
40%	Minimum Water Use Standard (%)	State Environmental Planning Policy (Sustainable Buildings) 2022	0.0	Onsite
Land Application	SEPP Land Application	State Environmental Planning Policy (Primary Production) 2021	0.0	Onsite
Land Application	SEPP Land Application	State Environmental Planning Policy (Planning Systems) 2021	0.0	Onsite
Land Application	SEPP Land Application	State Environmental Planning Policy (Transport and Infrastructure) 2021	0.0	Onsite
Land Application	SEPP Land Application	State Environmental Planning Policy (Housing) 2021	0.0	Onsite
Significant Native Vegetation	Significant Native Vegetation	Lord Howe Island Local Environmental Plan 2010	18.1	East
Additional Permitted Uses	Additional Permitted Uses	Lord Howe Island Local Environmental Plan 2010	20.8	South

Other Planning Information

Name	Туре	Details	Distance (m)	Direction
Not identified	+	· · · · · · · · · · · · · · · · · · ·		

Including Mining Subsidence Areas.

Source: Zoning, Planning Overlays and Other Planning Information.

1.3 Heritage

Map 1.3 (200m Buffer)

State and Local Heritage Registers

Site ID	Site Name	Туре	Details	Distance (m)	Direction
970	Lord Howe Island Group	State Heritage Register	Landscape	0.0	Onsite

Source: State and Local Heritage Registers

Australian Heritage Database Register

Site ID	Site Name	Туре	Details	Distance (m)	Direction
105694	Lord Howe Island Group	National Heritage List	Natural	0.0	Onsite
105085	Lord Howe Island Group	World Heritage Area	Strict Nature Reserve	0.0	Onsite

Source: Commonwealth Heritage List, National Heritage List and World Heritage Area

1.4a Soil and Land Use Information

Map 1.4a (500m Buffer)

Soil Landscape

Code	Name	Soil Group	Description	Distance (m)	Direction
CL	Calcareous soil	Calcisols	Calcareous soil, rich in calcium carbonate, is typically alkaline with a pH above 7.0. Light-colored and formed from weathered limestone, it can hinder nutrient availability, requiring careful management for optimal crop growth.	0.0	Onsite



Code	Name	Soil Group	Description	Distance (m)	Direction
FI	Alluvial Soil	Fluvisols	Alluvial soil, deposited by rivers, is fertile and found in valleys and deltas. It has a loamy texture, good drainage, and distinct layers, making it ideal for agriculture due to its nutrient richness and versatility.	52.5	North- west
An	Volcanic soil	Andosols	Volcanic soil, also known as Andisol, is formed from volcanic ash and other volcanic materials. It is highly fertile due to its rich mineral content, good drainage, and high organic matter. These soils support diverse agriculture, particularly in volcanic regions, and are known for their dark color and fine texture.	347.2	North

Source: Soil Landscape

Salinity

Salinity Hazard	Туре	Details	Distance (m)	Direction
Not identified				

Source: Soil Salinity

Radon

Radon Level (Bq/m³)	Distance (m)	Direction
4	0.0	Onsite

Typical radon levels in Australia are low and the values shown are the average values for each census district. For specific location, factors such as the local geology and house type could lead to different values. (ARPANSA).

1.4b Acid Sulfate Soil

Map 1.4b (500m Buffer)

State and Local Acid Sulfate Soil Registers

Name	Classification	Description	Distance (m)	Direction
Not identified	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		-

To ensure that development does not disturb, expose, or drain acid sulfate soils and cause environmental damage, development consent may be required for conducting works within areas and land shown on the Acid Sulfate Soils Map.

Source: National, State and Local Acid Sulfate Soils Registers

National Acid Sulfate Soil Register

Name	Classification	Description	Distance (m)	Direction
Not identified			-	9

Acid Sulfate Soils (ASS) are all those soils in which sulfuric acid may be produced, is being produced, or has been produced in amounts that have a lasting effect on main soil characteristics.

Source: National, State and Local Acid Sulfate Soils Registers

1.5 Geology and Topography

Map 1.5 (500m Buffer)

Geology

Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
Brooke, B.P. 1999. Quaternary stratigraphy and evolution of aeolianite on	QH_bf	Coastal deposits - backbarrier flat facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Fine- to medium- grained quartz- lithic sand with carbonate and	0.0	Onsite



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Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
Lord Howe Island						humic components (marine- deposited), indurated sand, silt, clay, gravel, organic mud. peat.		
McDougall, I., Embleton, B.J.J. and Stone, D.B. 1981. Origin and evolution of Lord Howe Island	QH_pt	Coastal deposits - backbarrier flat facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Fine- to medium- grained quartz- lithic sand with carbonate and humic components (marine- deposited), indurated sand, silt, clay, gravel, organic mud, peat.	0.0	Onsite
DICKSON ME 2002. The development of rock coast morphology on Lord Howe Island	QH_bf	Coastal deposits - backbarrier flat facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Fine- to medium- grained quartz- lithic sand with carbonate and humic components (marine- deposited), indurated sand, silt, clay, gravel, organic mud. peat.	0.0	Onsite
DICKSON ME 2002. The development of rock coast morphology on Lord Howe Island	QP_n	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	Brown to yellow, fine- to coarse-grained calcarenite; cross-bedded. Consists of coralline algae fragments, less abundant coral, foraminifera & molluscs. Common clay- rich palaeosols with bird bones, land snail shells & common rhizoliths & solution pipes.	0.0	Onsite
Game, P.M. 1970. Petrology of Lord Howe Island. Part 1	QH_bf	Coastal deposits - backbarrier flat facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Fine- to medium- grained quartz- lithic sand with carbonate and humic components (marine- deposited), indurated sand, silt, clay, gravel, organic mud, peat.	0.0	Onsite
THOMPSON, D., BLISS, P., & PRIEST, J. 1987.	QPn	Neds Beach Formation	Upper Pleistocene (base) to	Null	Carbonate sedimentary rock	Brown to yellow, fine- to coarse-grained	0.0	Onsite



Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
Lord Howe Island Geology			Upper Pleistocene (top)			calcarenite; cross-bedded. Consists of coralline algae fragments, less abundant coral, foraminifera & molluscs. Common clay- rich palaeosols with bird bones, land snail shells & common rhizoliths & solution pipes.		
McDougall, I., Embleton, B.J.J. and Stone, D.B. 1981. Origin and evolution of Lord Howe Island	QP_n	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	Brown to yellow, fine- to coarse-grained calcarenite; cross-bedded. Consists of coralline algae fragments, less abundant coral, foraminifera & molluscs. Common clay- rich palaeosols with bird bones, land snail shells & common rhizoliths & solution pipes.	0.0	Onsite
Bull, K.F. 2019. Field Observations	QP_n	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	Brown to yellow, fine- to coarse-grained calcarenite; cross-bedded. Consists of coralline algae fragments, less abundant coral, foraminifera & molluscs. Common clay- rich palaeosols with bird bones, land snail shells & common rhizoliths & solution pipes.	0.0	Onsite
THOMPSON, D., BLISS, P., & PRIEST, J. 1987. Lord Howe Island Geology	QH_pt	Coastal deposits - backbarrier flat facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Fine- to medium- grained quartz- lithic sand with carbonate and humic components (marine- deposited), indurated sand, silt, clay, gravel, organic mud, peat.	0.0	Onsite



Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
Game, P.M. 1970. Petrology of Lord Howe Island. Part 1	QP_n	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	Brown to yellow, fine- to coarse-grained calcarenite; cross-bedded. Consists of coralline algae fragments, less abundant coral, foraminifera & molluscs. Common clay- rich palaeosols with bird bones, land snail shells & common rhizoliths & solution pipes	0.0	Onsite
Brooke, B.P. 1999. Quaternary stratigraphy and evolution of aeolianite on Lord Howe Island	QP_n	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	Brown to yellow, fine- to coarse-grained calcarenite; cross-bedded. Consists of coralline algae fragments, less abundant coral, foraminifera & molluscs. Common clay- rich palaeosols with bird bones, land snail shells & common rhizoliths & solution pipes	0.0	Onsite
Brooke, B. P., Woodroffe, C. D., Murray- Wallace, C. V., Heijnis, H., and Jones, B. G., 2003, Quaternary aminostratigraph	QH_bf	Coastal deposits - backbarrier flat facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Fine- to medium- grained quartz- lithic sand with carbonate and humic components (marine- deposited), indurated sand, silt, clay, gravel, organic mud, peat.	0.0	Onsite
Brooke, B. P., Woodroffe, C. D., Murray- Wallace, C. V., Heijnis, H., and Jones, B. G., 2003, Quaternary aminostratigraph	QPn	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	Brown to yellow, fine- to coarse-grained calcarenite; cross-bedded. Consists of coralline algae fragments, less abundant coral, foraminifera & molluscs. Common clay- rich palaeosols with bird bones, land snail shells & common	0.0	Onsite



Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
						rhizoliths & solution pipes.		
Standard, J.C. 1963. Geology of Lord Howe Island	QH_pt	Coastal deposits - backbarrier flat facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Fine- to medium- grained quartz- lithic sand with carbonate and humic components (marine- deposited), indurated sand, silt, clay, gravel, organic mud. peat.	0.0	Onsite
Bull, K.F. 2019. Field Observations	QH_bf	Coastal deposits - backbarrier flat facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Fine- to medium- grained quartz- lithic sand with carbonate and humic components (marine- deposited), indurated sand, silt, clay, gravel, organic mud, peat.	0.0	Onsite
Standard, J.C. 1963. Geology of Lord Howe Island	QPn	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	Brown to yellow, fine- to coarse-grained calcarenite; cross-bedded. Consists of coralline algae fragments, less abundant coral, foraminifera & molluscs. Common clay- rich palaeosols with bird bones, land snail shells & common rhizoliths & solution pipes.	0.0	Onsite
Standard, J.C. 1963. Geology of Lord Howe Island	QP_s	Searles Point Formation	lonian (base) to lonian (top)	Null	Carbonate sedimentary rock	Yellow to pale brown calcarenite occurring in well-lithifed exposures displaying medium- to large-scale cross-bedding and exposed relict speleothem and clay-rich palaeosol units.	8.7	South
Brooke, B.P. 1999. Quaternary stratigraphy and evolution of aeolianite on Lord Howe Island	QPs	Searles Point Formation	lonian (base) to Ionian (top)	Null	Carbonate sedimentary rock	Yellow to pale brown calcarenite occurring in well-lithifed exposures displaying	8.7	South



Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
						medium- to large-scale cross-bedding and exposed relict speleothem and clay-rich palaeosol units.		
Brooke, B. P., Woodroffe, C. D., Murray- Wallace, C. V., Heijnis, H., and Jones, B. G., 2003, Quaternary aminostratigraph	QPs	Searles Point Formation	lonian (base) to lonian (top)	Null	Carbonate sedimentary rock	Yellow to pale brown calcarenite occurring in well-lithifed exposures displaying medium- to large-scale cross-bedding and exposed relict speleothem and clay-rich palaeosol units.	8.7	South
THOMPSON, D., BLISS, P., & PRIEST, J. 1987. Lord Howe Island Geology	QPs	Searles Point Formation	lonian (base) to lonian (top)	Null	Carbonate sedimentary rock	Yellow to pale brown calcarenite occurring in well-lithifed exposures displaying medium- to large-scale cross-bedding and exposed relict speleothem and clay-rich	8.7	South
Game, P.M. 1970. Petrology of Lord Howe Island. Part 1	QP_s	Searles Point Formation	lonian (base) to lonian (top)	Null	Carbonate sedimentary rock	Yellow to pale brown calcarenite occurring in well-lithifed exposures displaying medium- to large-scale cross-bedding and exposed relict speleothem and clay-rich palaeosol units.	8.7	South
DICKSON ME 2002. The development of rock coast morphology on Lord Howe Island	QPs	Searles Point Formation	lonian (base) to lonian (top)	Null	Carbonate sedimentary rock	Yellow to pale brown calcarenite occurring in well-lithifed exposures displaying medium- to large-scale cross-bedding and exposed relict speleothem and clay-rich palaeosol units.	8.7	South



Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
McDougall, I., Embleton, B.J.J. and Stone, D.B. 1981. Origin and evolution of Lord Howe Island	QP_s	Searles Point Formation	lonian (base) to Ionian (top)	Null	Carbonate sedimentary rock	Yellow to pale brown calcarenite occurring in well-lithifed exposures displaying medium- to large-scale cross-bedding and exposed relict speleothem and clay-rich palaeosol units.	8.7	South
Bull, K.F. 2019. Field Observations	QPs	Searles Point Formation	lonian (base) to lonian (top)	Null	Carbonate sedimentary rock	Yellow to pale brown calcarenite occurring in well-lithifed exposures displaying medium- to large-scale cross-bedding and exposed relict speleothem and clay-rich palaeosol units.	8.7	South
THOMPSON, D., BLISS, P., & PRIEST, J. 1987. Lord Howe Island Geology	QH_bd	Coastal deposits - dune facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited and aeolian- reworked coastal sand dunes.	30.6	South
Brooke, B.P. 1999. Quaternary stratigraphy and evolution of aeolianite on Lord Howe Island	QH_pq	Coastal deposits - dune facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited and aeolian- reworked coastal sand dunes.	30.6	South
Bull, K.F. 2019. Field Observations	QH_bd	Coastal deposits - dune facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited and aeolian- reworked coastal sand dunes.	30.6	South
Standard, J.C. 1963. Geology of Lord Howe Island	QH_bd	Coastal deposits - dune facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited and aeolian- reworked coastal sand dunes.	30.6	South
McDougall, I., Embleton, B.J.J. and Stone, D.B. 1981. Origin and evolution of Lord Howe Island	QH_bd	Coastal deposits - dune facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited and aeolian- reworked coastal sand dunes.	30.6	South
Game, P.M. 1970. Petrology of Lord Howe Island. Part 1	QH_bd	Coastal deposits - dune facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited and aeolian- reworked coastal sand dunes.	30.6	South



Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
DICKSON ME 2002. The development of rock coast morphology on Lord Howe Island	QH_pq	Coastal deposits - dune facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited and aeolian- reworked coastal sand dunes.	30.6	South
Brooke, B. P., Woodroffe, C. D., Murray- Wallace, C. V., Heijnis, H., and Jones, B. G., 2003, Quaternary aminostratigraph	QH_pq	Coastal deposits - dune facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited and aeolian- reworked coastal sand dunes.	30.6	South
McDougall, I., Embleton, B.J.J. and Stone, D.B. 1981. Origin and evolution of Lord Howe Island	QH_a	Null	Holocene (base) to Now (top)	Alluvium	Clastic sediment	Unconsolidated alluvial clay, silt, sand, and gravel deposits.	40.0	North- west
Brooke, B. P., Woodroffe, C. D., Murray- Wallace, C. V., Heijnis, H., and Jones, B. G., 2003, Quaternary aminostratigraph	QH_a	Null	Holocene (base) to Now (top)	Alluvium	Clastic sediment	Unconsolidated alluvial clay, silt, sand, and gravel deposits.	40.0	North- west
Brooke, B.P. 1999. Quaternary stratigraphy and evolution of aeolianite on Lord Howe Island	QH_a	Null	Holocene (base) to Now (top)	Alluvium	Clastic sediment	Unconsolidated alluvial clay, silt, sand, and gravel deposits.	40.0	North- west
THOMPSON, D., BLISS, P., & PRIEST, J. 1987. Lord Howe Island Geology	QH_a	Null	Holocene (base) to Now (top)	Alluvium	Clastic sediment	Unconsolidated alluvial clay, silt, sand, and gravel deposits.	40.0	North- west
Bull, K.F. 2019. Field Observations	QH_a	Null	Holocene (base) to Now (top)	Alluvium	Clastic sediment	Unconsolidated alluvial clay, silt, sand, and gravel deposits.	40.0	North- west
Game, P.M. 1970. Petrology of Lord Howe Island. Part 1	QH_a	Null	Holocene (base) to Now (top)	Alluvium	Clastic sediment	Unconsolidated alluvial clay, silt, sand, and gravel deposits.	40.0	North- west
Standard, J.C. 1963. Geology of Lord Howe Island	QH_a	Null	Holocene (base) to Now (top)	Alluvium	Clastic sediment	Unconsolidated alluvial clay, silt, sand, and gravel deposits.	40.0	North- west
DICKSON ME 2002. The development of rock coast morphology on Lord Howe Island	QH_a	Null	Holocene (base) to Now (top)	Alluvium	Clastic sediment	Unconsolidated alluvial clay, silt, sand, and gravel deposits.	40.0	North- west
Game, P.M. 1970. Petrology of Lord Howe Island. Part 1	QH_bb	Coastal deposits - beach facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited quartz-lithic fine- to	40.0	South- west



Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
						medium- grained sand, shell and shell material, polymictic gravel,		
Brooke, B.P. 1999. Quaternary stratigraphy and evolution of aeolianite on Lord Howe Island	QH_bb	Coastal deposits - beach facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited quartz-lithic fine- to medium- grained sand, shell and shell material, polymictic gravel.	40.0	South- west
Brooke, B. P., Woodroffe, C. D., Murray- Wallace, C. V., Heijnis, H., and Jones, B. G., 2003, Quaternary aminostratigraph	QH_pp	Coastal deposits - beach facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited quartz-lithic fine- to medium- grained sand, shell and shell material, polymictic gravel.	40.0	South- west
THOMPSON, D., BLISS, P., & PRIEST, J. 1987. Lord Howe Island Geology	QH_pp	Coastal deposits - beach facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited quartz-lithic fine- to medium- grained sand, shell and shell material, polymictic gravel.	40.0	South- west
McDougall, I., Embleton, B.J.J. and Stone, D.B. 1981. Origin and evolution of Lord Howe Island	QH_pp	Coastal deposits - beach facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited quartz-lithic fine- to medium- grained sand, shell and shell material, polymictic gravel.	40.0	South- west
Standard, J.C. 1963. Geology of Lord Howe Island	QH_pp	Coastal deposits - beach facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited quartz-lithic fine- to medium- grained sand, shell and shell material, polymictic gravel.	40.0	South- west
DICKSON ME 2002. The development of rock coast morphology on Lord Howe Island	QH_pp	Coastal deposits - beach facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited quartz-lithic fine- to medium- grained sand, shell and shell material, polymictic gravel.	40.0	South- west
Bull, K.F. 2019. Field Observations	QH_bb	Coastal deposits -	Holocene (base) to Now (top)	Coastal deposits	Sand	Marine- deposited quartz-lithic	40.0	South- west



Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
		beach facies				fine- to medium- grained sand, shell and shell material, polymictic gravel.		
Brooke, B.P. 1999. Quaternary stratigraphy and evolution of aeolianite on Lord Howe Island	QH_bls	Coastal deposits - lagoon facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Fine- to coarse- grained, carbonate-rich sand forming the lagoon floor and displaying symmetrical ripples up to 100 mm high. Isolated clumps of coral, algae and seagrass.	53.4	South- west
Brooke, B. P., Woodroffe, C. D., Murray- Wallace, C. V., Heijnis, H., and Jones, B. G., 2003, Quaternary aminostratigraph	QH_bls	Coastal deposits - lagoon facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Fine- to coarse- grained, carbonate-rich sand forming the lagoon floor and displaying symmetrical ripples up to 100 mm high. Isolated clumps of coral, algae and seagrass.	53.4	South- west
KENNEDY DM 1999. Reef growth and lagoonal sedimentation at high latitudes, Lord Howe Island	QH_bls	Coastal deposits - lagoon facies	Holocene (base) to Now (top)	Coastal deposits	Sand	Fine- to coarse- grained, carbonate-rich sand forming the lagoon floor and displaying symmetrical ripples up to 100 mm high. Isolated clumps of coral, algae and seagrass.	61.1	South- west
KENNEDY DM 1999. Reef growth and lagoonal sedimentation at high latitudes, Lord Howe Island	QPn	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	Brown to yellow, fine- to coarse-grained calcarenite; cross-bedded. Consists of coralline algae fragments, less abundant coral, foraminifera & molluscs. Common clay- rich palaeosols with bird bones, land snail shells & common rhizoliths & solution pipes.	99.3	South- west
Brooke, B.P. 1999. Quaternary stratigraphy and evolution of	QH_blt	Coastal deposits - lagoon facies	Holocene (base) to Now (top)	Coastal deposits	Rock	Subtidal to intertidal rock platform occurring in	99.9	South- west



Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
aeolianite on Lord Howe Island						shallow lagoonal water usually offshore from coastal outcrops.		
Brooke, B. P., Woodroffe, C. D., Murray- Wallace, C. V., Heijnis, H., and Jones, B. G., 2003, Quaternary aminostratigraph	QH_blt	Coastal deposits - lagoon facies	Holocene (base) to Now (top)	Coastal deposits	Rock	Subtidal to intertidal rock platform occurring in shallow lagoonal water usually offshore from coastal outcrops.	99.9	South- west
KENNEDY DM 1999. Reef growth and lagoonal sedimentation at high latitudes, Lord Howe Island	QH_blt	Coastal deposits - lagoon facies	Holocene (base) to Now (top)	Coastal deposits	Rock	Subtidal to intertidal rock platform occurring in shallow lagoonal water usually offshore from coastal outcrops.	99.9	South- west
Bull, K.F. 2019. Field Observations	QH_c	Null	Holocene (base) to Now (top)	Colluvium	Clastic sediment	Poorly sorted, weakly cemented to unconsolidated colluvial lenses of polymictic conglomerate with medium- to very coarse- grained sand matrix; interspersed with unconsolidated clayey and silty (aeolian) sand layers, modified by pedogenesis.	360.0	North
THOMPSON, D., BLISS, P., & PRIEST, J. 1987. Lord Howe Island Geology	QH_c	Null	Holocene (base) to Now (top)	Colluvium	Clastic sediment	Poorly sorted, weakly cemented to unconsolidated colluvial lenses of polymictic conglomerate with medium- to very coarse- grained sand matrix; interspersed with unconsolidated clayey and silty (aeolian) sand layers, modified by pedogenesis.	360.0	North
Brooke, B.P. 1999. Quaternary stratigraphy and evolution of aeolianite on Lord Howe Island	QH_c	Null	Holocene (base) to Now (top)	Colluvium	Clastic sediment	Poorly sorted, weakly cemented to unconsolidated colluvial lenses of polymictic conglomerate with medium-	360.0	North



Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
						to very coarse- grained sand matrix; interspersed with unconsolidated clayey and silty (aeolian) sand layers, modified by pedogenesis.		
Standard, J.C. 1963. Geology of Lord Howe Island	QH_c	Null	Holocene (base) to Now (top)	Colluvium	Clastic sediment	Poorly sorted, weakly cemented to unconsolidated colluvial lenses of polymictic conglomerate with medium- to very coarse- grained sand matrix; interspersed with unconsolidated clayey and silty (aeolian) sand layers, modified by pedogenesis.	360.0	North
McDougall, I., Embleton, B.J.J. and Stone, D.B. 1981. Origin and evolution of Lord Howe Island	QH_c	Null	Holocene (base) to Now (top)	Colluvium	Clastic sediment	Poorly sorted, weakly cemented to unconsolidated colluvial lenses of polymictic conglomerate with medium- to very coarse- grained sand matrix; interspersed with unconsolidated clayey and silty (aeolian) sand layers, modified by pedogenesis.	360.0	North
Game, P.M. 1970. Petrology of Lord Howe Island. Part 1	QH_c	Null	Holocene (base) to Now (top)	Colluvium	Clastic sediment	Poorly sorted, weakly cemented to unconsolidated colluvial lenses of polymictic conglomerate with medium- to very coarse- grained sand matrix; interspersed with unconsolidated clayey and silty (aeolian) sand layers, modified by pedogenesis.	360.0	North



Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
Brooke, B. P., Woodroffe, C. D., Murray- Wallace, C. V., Heijnis, H., and Jones, B. G., 2003, Quaternary aminostratigraph	QH_c	Null	Holocene (base) to Now (top)	Colluvium	Clastic sediment	Poorly sorted, weakly cemented to unconsolidated colluvial lenses of polymictic conglomerate with medium- to very coarse- grained sand matrix; interspersed with unconsolidated clayey and silty (aeolian) sand layers, modified by pedogenesis.	360.0	North
DICKSON ME 2002. The development of rock coast morphology on Lord Howe Island	QH_c	Null	Holocene (base) to Now (top)	Colluvium	Clastic sediment	Poorly sorted, weakly cemented to unconsolidated colluvial lenses of polymictic conglomerate with medium- to very coarse- grained sand matrix; interspersed with unconsolidated clayey and silty (aeolian) sand layers, modified by pedogenesis	360.0	North
DICKSON ME 2002. The development of rock coast morphology on Lord Howe Island	NMlon	North Ridge Basalt	Messinian (base) to Messinian (top)	Lord Howe Volcanic Complex	Basalt	Basalt commonly vesicular & amygdaloidal. Often intruded by thin, subvertical dykes. Formed by coherent, plagioclase- & clinopyroxene- phyric basaltic (tholeiitic) 2- 5m thick lava flows, with fragmental, oxidised tops & bases with more massive interiors.	451.8	North
Brooke, B. P., Woodroffe, C. D., Murray- Wallace, C. V., Heijnis, H., and Jones, B. G., 2003, Quaternary aminostratigraph	NMlon	North Ridge Basalt	Messinian (base) to Messinian (top)	Lord Howe Volcanic Complex	Basalt	Basalt commonly vesicular & amygdaloidal. Often intruded by thin, subvertical dykes. Formed by coherent, plagioclase- & clinopyroxene-	451.8	North



Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
						phyric basaltic (tholeiitic) 2- 5m thick lava flows, with fragmental, oxidised tops & bases with more massive interiors		
Game, P.M. 1970. Petrology of Lord Howe Island. Part 1	NMlon	North Ridge Basalt	Messinian (base) to Messinian (top)	Lord Howe Volcanic Complex	Basalt	Basalt commonly vesicular & amygdaloidal. Often intruded by thin, subvertical dykes. Formed by coherent, plagioclase- & clinopyroxene- phyric basaltic (tholeiitic) 2- 5m thick lava flows, with fragmental, oxidised tops & bases with more massive interiors.	451.8	North
Bull, K.F. 2019. Field Observations	NMlon	North Ridge Basalt	Messinian (base) to Messinian (top)	Lord Howe Volcanic Complex	Basalt	Basalt commonly vesicular & amygdaloidal. Often intruded by thin, subvertical dykes. Formed by coherent, plagioclase- & clinopyroxene- phyric basaltic (tholeiitic) 2- 5m thick lava flows, with fragmental, oxidised tops & bases with more massive interiors	451.8	North
Brooke, B.P. 1999. Quaternary stratigraphy and evolution of aeolianite on Lord Howe Island	NMlon	North Ridge Basalt	Messinian (base) to Messinian (top)	Lord Howe Volcanic Complex	Basalt	Basalt commonly vesicular & amygdaloidal. Often intruded by thin, subvertical dykes. Formed by coherent, plagioclase- & clinopyroxene- phyric basaltic (tholeiitic) 2- 5m thick lava flows, with fragmental, oxidised tops & bases with more massive interiors.	451.8	North



Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
Standard, J.C. 1963. Geology of Lord Howe Island	NMIon	North Ridge Basalt	Messinian (base) to Messinian (top)	Lord Howe Volcanic Complex	Basalt	Basalt commonly vesicular & amygdaloidal. Often intruded by thin, subvertical dykes. Formed by coherent, plagioclase- & clinopyroxene- phyric basaltic (tholeiitic) 2- 5m thick lava flows, with fragmental, oxidised tops & bases with more massive interiors.	451.8	North
McDougall, I., Embleton, B.J.J. and Stone, D.B. 1981. Origin and evolution of Lord Howe Island	NMlon	North Ridge Basalt	Messinian (base) to Messinian (top)	Lord Howe Volcanic Complex	Basalt	Basalt commonly vesicular & amygdaloidal. Often intruded by thin, subvertical dykes. Formed by coherent, plagioclase- & clinopyroxene- phyric basaltic (tholeiitic) 2- 5m thick lava flows, with fragmental, oxidised tops & bases with more massive interiors.	451.8	North
THOMPSON, D., BLISS, P., & PRIEST, J. 1987. Lord Howe Island Geology	NMlon	North Ridge Basalt	Messinian (base) to Messinian (top)	Lord Howe Volcanic Complex	Basalt	Basalt commonly vesicular & amygdaloidal. Often intruded by thin, subvertical dykes. Formed by coherent, plagioclase- & clinopyroxene- phyric basaltic (tholeiitic) 2- 5m thick lava flows, with fragmental, oxidised tops & bases with more massive interiors.	451.8	North
McDougall, I., Embleton, B.J.J. and Stone, D.B. 1981. Origin and evolution of Lord Howe Island	QPnm	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	White, miliolid- rich, fine- grained calcarenite, displaying well developed medium- to large-scale cross-bedding.	471.6	East



Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
Game, P.M. 1970. Petrology of Lord Howe Island. Part 1	QPnm	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	White, miliolid- rich, fine- grained calcarenite, displaying well developed medium- to large-scale cross-bedding.	471.6	East
THOMPSON, D., BLISS, P., & PRIEST, J. 1987. Lord Howe Island Geology	QP_nm	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	White, miliolid- rich, fine- grained calcarenite, displaying well developed medium- to large-scale cross-bedding.	471.6	East
Brooke, B.P. 1999. Quaternary stratigraphy and evolution of aeolianite on Lord Howe Island	QPnm	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	White, miliolid- rich, fine- grained calcarenite, displaying well developed medium- to large-scale cross-bedding.	471.6	East
Brooke, B. P., Woodroffe, C. D., Murray- Wallace, C. V., Heijnis, H., and Jones, B. G., 2003, Quaternary aminostratigraph	QPnm	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	White, miliolid- rich, fine- grained calcarenite, displaying well developed medium- to large-scale cross-bedding.	471.6	East
Standard, J.C. 1963. Geology of Lord Howe Island	QPnm	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	White, miliolid- rich, fine- grained calcarenite, displaying well developed medium- to large-scale cross-bedding.	471.6	East
Bull, K.F. 2019. Field Observations	QPnm	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	White, miliolid- rich, fine- grained calcarenite, displaying well developed medium- to large-scale cross-bedding.	471.6	East
DICKSON ME 2002. The development of rock coast morphology on Lord Howe Island	QPnm	Neds Beach Formation	Upper Pleistocene (base) to Upper Pleistocene (top)	Null	Carbonate sedimentary rock	White, miliolid- rich, fine- grained calcarenite, displaying well developed medium- to large-scale cross-bedding.	471.6	East

Source: Geology



Naturally Occurring Asbestos Potential (NOA)

Category	On the Property?	Within Buffer?
Not identified	· · · · · · · · · · · · · · · · · · ·	
urce: Naturally Occurring Asbestos NC	A	

Topography

Topography (Onsite)	10 mAHD	
Source: National State and Local Acid Sulfate Soils F	legisters	3

Land Insight

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Section 2 Hydrogeology and Geotechnical



2.1 GDE & Hydrogeology Constraints

Map 1.5 (500m Buffer)

Aquifer Type

Туре	Distance (m)	Direction	
Not identified	-		

Source: Groundwater Aquifers

Groundwater Protection Areas

Name	Water Plan Area	Distance (m)	Direction	
Not identified	· · · ·		- 3 -	
Source: Groundwater Protection Areas and Groundwater Re	stricted Use Zones			

Source: Groundwater Protection Areas and Groundwater Restricted Use Zones

Wetlands

Name	Description	Distance (m)	Direction	
Not identified		1		

Source: Wetlands

Groundwater Dependent Ecosystems (GDE) - Aquatic (Surface)

Potential	Distance (m)		
Not identified	4		

Aquatic - Ecosystems that rely on the Surface expression of groundwater. Source: <u>Groundwater Dependent Ecosystems</u>



Groundwater Dependent Ecosystems (GDE) - Terrestrial (Subsurface)

Potential	Distance (m)	Direction
Not identified	-	

Terrestrial - Ecosystems that rely on the Subsurface expression of groundwater. Source: <u>Groundwater Dependent Ecosystems</u>

Groundwater Licences (Western Australia)

Map ID	WRI number	Allocation (KL)	Address	All Parties	Distance (m)	Direction
Not identified		24 C	÷.	£	91	

Source: Groundwater Protection Areas and Groundwater Restricted Use Zones

Groundwater Bores

Map ID	Groundwater Bore ID	Authorised Purpose	Completion Date	Drilled Depth (m)	Final Depth (m)	SWL (m)	Salinity/ TDS (mg/l)	Yield (L/s)	Distance (m)	Directio n
Not identified		4	-1	÷	Ŷ	-	4	- 41	1	e>

Note: The use of the symbol "-" or "Null" indicates that no records were found.

SWL: Standing Water Level (the latest record is displayed). RWL: Rest Water Level (the latest record is displayed). TSS: Total Soluble Salts. Source: Groundwater Bores & Lithology

Groundwater Bores Driller Lithology Details

Groundwater Bore ID	From Depth – To Depth (m) Lithology	Distance (m)	Direction
Not identified			
Mary The second falls		1. Contract (1. Co	

Note: The use of the symbol "-" or "Null" indicates that no records were found. Source: <u>Groundwater Bores & Lithology</u>

2.2 Groundwater and other Bores

Map 2.2 (2000m Buffer)

Groundwater Restricted Use Zones

Name / Number	Address	Site History	Description	Distance (m)	Direction
Not identified		÷			÷

Source: Groundwater Protection Areas and Groundwater Restricted Use Zones

Groundwater Salinity

Class	Salinity Value	Source	Distance (m)	Direction	
Not identified		-		4	

Source: Groundwater Salinity

Other Known Borehole Investigations (Coal Seam Gas (CSG), Petroleum Wells and Other Boreholes)

Borehole ID	Purpose	Project	Client/ License	Date Drilled	Depth (m)	Distance (m)	Direction
GT0001700	Intrusive Investigation	A collection of NSW geotechnical reports as part of the NSW Government Geotechnical Report Database Project (GGRD).	Soil Sample Analysis located at Lord Howe Island roadworks	01/01/1988	0.0	882.8	East



Borehole ID	Purpose	Project	Client/ License	Date Drilled	Depth (m)	Distance (m)	Direction
GT0001697	Intrusive Investigation	A collection of NSW geotechnical reports as part of the NSW Government Geotechnical Report Database Project (GGRD).	Geological assessment for geothermal power potential	01/01/2004	0.0	924.1	East
GT0001698	Intrusive Investigation	A collection of NSW geotechnical reports as part of the NSW Government Geotechnical Report Database Project (GGRD).	Soil Sample Analysis located at Lord Howe Island	01/01/2010	0.0	924.1	East

Note: The use of the symbol "-" or "Null" indicates that no records were found. Source: <u>Other Known Borehole Investigations (Coal Seam Gas (CSG)</u>, Petroleum Wells and Other Boreholes).



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Section 3 Licences and Incidents

3.1 Contaminated Land Public Register

Map 3.1 (1000m Buffer)

Contaminated Sites

Register Type	Site Name	Address	Description	Details	Distance (m)	Direction
Not identified		•	-		÷	

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

Source: Contaminated Land Public Register

Table 3.1	.1 Contaminated Land Public Register	
State	Regulatory Body	Information included in this search (by state)
АСТ	EPA (Environment Protection Authority)	Contaminated Land Search Register of Contaminated Sites* (on request)
NSW	EPA (Environment Protection Authority)	Sites Notified as Contaminated Records of Notices
NT	EPA (Environment Protection Authority)	Contaminated Land Audit Pollution Abatement Notice
QLD	DES (Department of Environment and Science)	Contaminated Land Search (Environmental Management and Contaminated Land Registers)* (per lot)
SA	EPA (Environment Protection Authority)	Site Contamination Index Assessment Areas
TAS	EPA (Environment Protection Authority)	Regulated Sites and Premises Lutana and Parts of Hobarts Eastern Shore
VIC	EPA (Environment Protection Authority)	Priority Sites Register Pollution Abatement Notice
WA	DWER (Department of Water and Environmental Regulation)	Contaminated Sites Database



Page 25 LI-4693 DDR This search contains information retrieved from the relevant state authority, agency/department, or government authority that notifies and identifies contaminated land. The list only contains contaminated sites that the regulatory body is aware of or that have been notified by owners or occupiers as contaminated land. The sites are recorded on the register at various stages of the assessment and/or remediation process. If a site is not on the list, it does not necessarily mean the site is not contaminated.

3.2 Licences, Approvals & Assessments

Map 3.2 (1000m Buffer)

Licences

Licence Nº	Туре	Licence holder	Location Name	Premise Address	Activity	Dist. (m)*	Direct
Not identified						-	

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

*Results that appear as "not mapped" refer to licences that are applied to larger areas and/or without specific definition, such as waterways, forests etc. These are still identified in the search results but will not be shown within the map.

Source: Licences, Approvals & Assessments

Audits, PRSA

N٩	Туре	Licence holder	Location Name	Premise Address	Activity	Dist. (m)*	Direction
Not identified	.*	E el -	-	-		4	-

¹If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

Source: Licences, Approvals & Assessments

Clean Up, Penalty Notices and Orders

N°	Туре	Licence holder	Location Name	Premise Address	Details	Dist. (m)*	Direction
Not identified	1		-			1	-

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

Source: Licences, Approvals & Assessments

Table 3.2	.1 Licences, Approvals & Assessments	
State	Regulatory Body	Information included in this search (by state)
АСТ	EPA (Environment Protection Authority)	Environment Protection Authorisation Search Environment Protection Agreement Search
NSW	EPA (Environment Protection Authority)	POEO Public Register (Environment Protection licences, Applications, Notices, Audits or Pollution studies and Reduction Programs)
NT	EPA (Environment Protection Authority)	Environment Protection Licences and Approvals
QLD	DES (Department of Environment and Science)	Environmental Authorities
SA	EPA (Environment Protection Authority)	Licences or Authorisations (Licences, Exemptions and Works Approvals) Environment Protection Orders (EPO) and Clean Up Orders (CUO)
TAS	EPA (Environment Protection Authority)	Regulated Sites and Premises
VIC	EPA (Environment Protection Authority)	Permissions Register (Operating Licence, Permit and Registration) Audit Reports



Table 3.2.1 Licences, Approvals & Assessments		
WA	DWER (Department of Water and Environmental Regulation)	Licences and Works Approvals

3.3a Sites Regulated by other Jurisdictional Body

Contaminated Legacy Areas

Site Name	Description	Distance (m)	Direction
Not identified			12.1

Includes known contaminated areas such as James Hardies Asbestos waste legacy areas, Pasminco Smelter and Uranium processing site. Source: <u>Contaminated Legacy Areas</u>

Defence, Military Sites and UXO Areas

Site name	Type*	Details	Distance (m)	Direction
Not identified	4	+	4	

*RCIP (Regional Contamination Investigation Program). UXO (Unexploded Ordnance Areas) . Source: <u>Defence, Military Sites, and UXO Areas</u>

Former Gasworks Sites

Site name	Description	Distance (m)	Direction
Not identified	-	-	4

Source: Former Gasworks Sites

PFAS Sites

Site name	Туре	Details	Distance (m)	Direction
Lord Howe Island Airport	PFAS investigation site	Preliminary investigations have found PFAS in soil and groundwater samples close to the airport, lagoon and depot. The detection of PFAS is not unexpected given the past use of PFAS-containing fire-fighting foams at these locations. PFAS has also been used in many domestic and industrial products and background levels may be present from these other sources. Further investigations will now be undertaken to better understand the extent of the PFAS presence, and what measures might need to be put in place to manage this. These further investigations will consist of additional soil, sediment and water sampling, and may require testing of residential groundwater bores to verify the initial results. At this stage, residents and visitors to the Island do not need to take any precautionary steps to reduce their exposure to PEAS. (EPA NSW)	1540.3	South-east

Source: PFAS Sites



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3.3b Other Potential Hazard Sources

Mines and Quarries (current and historical)

Map 3.3b (500m Buffer)

Site name	Description	Status	Distance (m)	Direction
Not identified	64 fr. m. m.			4

Source: Mines and Quarries

Landfills (current and historical)

Site name	Description	Status	Distance (m)	Direction
Not identified	let in the second se			-

National Pollutant Inventory (NPI)

Facility name	Address	Primary ANZSIC Class	Latest report	Distance (m)	Direction
Not identified		· · · · · · · · · · · · · · · · · · ·	-		

Source: Contaminated Legacy Areas



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Section 4 Contaminated Areas



4.1 Potentially Contaminating Activities

Map 4.1 (200m Buffer)

Industries, businesses and activities that may cause contamination

Map ID	Site name	Category	Description	Address	Status*	Dist. (m)	Direction
1	Thompson Family Cemetery	Other Potentially Contaminating Activities	Null	55 Ocean View Drive, Lord Howe Island NSW 2898	Current	183.2	North- west

*Status: Information is current as when this report was created.

The operational status of the business is determined using the available data sources and does not indicate real-time conditions at the site. Current: business is operating on the day this report was issued.

Former: business that have been closed or discontinued within 2 years from the date of this report.

Source: Potentially Contaminated Areas, Activities (PCA)

Categories included in this search. (Notifiable activities)				
Abattoirs	Explosives and Dangerous Goods	Paint Industries		
Abrasive Blasting	Extractive Industries	Petrol Stations		
Agriculture / Horticulture	Fire and Rescue	Pharmaceuticals		
Airports	Food Manufacturing	Port and Marina Operations		
Asbestos	Foundry, Smelting or Refining	Power Plants		
Asphalt or Bitumen	Fuel Terminals & Depots	Printing and Photography		
Batteries	Glass, Ceramics and Plastic	Rail Industry and Associated Activities		
Breweries / Distilleries	Gun, Pistol or Rifle Ranges	Rubber and Tyre		
Cement, Concrete or Lime	Hospitals and Research Facilities	Storage Tanks		
Cemeteries	Landfill Sites	Substations and Switching Stations		
Chemicals	Livestock Dips	Textiles and Tannery		
Coal Yards	Mechanical and Automotive	Timber, Pulp and Paper Works		
Depots and Storage Yards	Metal Fabrication and Treatments	Waste and Recycling Facilities		
Dry Cleaners	Oil and Gas	Wastewater Treatment Facilities		
Electrical or Electrical Components	Other Infrastructure Facilities			

Industries, businesses, and activities identified as having an increased likelihood of causing contamination.



The industries and business activities listed above have been identified as having an increased likelihood of causing contamination and have been identified through published state and national guidelines and regulations. These industries are noted due to their potential to store or use substances that could cause contamination to the surrounding environment if not managed appropriately. The identification of these activities does not imply the presence of contamination at the site.

The records identified are based on the reported business activity and have not been assessed based on any current or previous site inspection. Please note that records not identified within this section (due to error or unforeseen omission) does not necessarily mean that the screened area is not potentially contaminated or free of any risks.



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4.2 Historical Business Directories

(not mapped)

YEAR	Activity	Name	Address	Positional accuracy	Distance (m)	Direction
Not identified			(a)		-	e e

Land Insight uses a number of address geocoding techniques and has characterised them based on completeness (match rates) and positional accuracy. When a historical street address is incomplete or a match is not found, a record identified as being in the surrounding area will be included for reference and the accuracy of the data is approximate only. An explanation of the positional accuracy records is defined in the table below.

Source: <u>Historical Business Directories</u>

Historical da	Historical data positional accuracy and georeferencing results explanation			
Positional accuracy	Georeferenced	Description		
Address	Located to the address level	When street address and names fully match.		
Street	Located to the street centroid	When street names match but no exact address was found. Location is approximate.		
Place	Located to the structure, building or complex	When building, residential complex or structure name match but no exact address was found. Location is approximate.		
Suburb	Located to the suburb area	When suburb name match but no exact address was found. Location is approximate.		

The data used in this section was extracted from range of historical commercial trade directories and business listings. The business addresses were geocoded using historical information and the accuracy of the data may vary due to changes to the physical address at a given locality over time or the quality of the original records. From 2005, the historical business records in this section are considered more accurate as information was extracted from digital directories with geographic coordinate location information available. On this basis, reliance on the historic listing data should be considered when assessing the risk of contamination from an activity at the site. The presence of a business listing does not definitively confirm the actual activity that has occurred at the site. For more information on how these records were geocoded and the methodology used by Land Insight, contact us at info@landinsight.co.

Historical business directory listings have been filtered to match activities and industries identified as PCAs in Section 4.1. Please note that any record not identified within this section (due to error or unforeseen omission) does not necessarily mean that the screened area is not potentially contaminated or free of any risks.



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Section 5 Natural Hazards



Map 5.1 (500m Buffer)

Bushfire Prone Areas

Category	Туре	Details	Distance (m)	Direction
Not identified	-	-	-	4

Source: Fire Hazards

Bushfire History

Туре	Season	Details	Distance (m)	Direction
Not identified	-	-	-	1

Source: Fire Hazards

5.2 Flood Hazard

Map 5.2 (500m Buffer)

Flood Planning Area

Туре	Name	Details	Distance (m)	Direction
Flood Prone Area - 1 in 100 (1%) AEP floodplain	ED21 5584.01 Flood Study - Community Newsletter - June 2021 - Maps.pdf	Councils develop Flood Planning Areas (FPAs) as part of Flood Overlay mapping to guide future building and development in flood prone areas. The FPAs are designed to recognise the flood hazard for different flooding types.	24.5	North- west

Source: Flood Hazard



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Other Flood Studies

Туре	Name	Details	Distance (m)	Direction
Not identified	· · · · · · · · · · · · · · · · · · ·			40

Source: Flood Hazard

Flood History

Туре	Season	Details	Distance (m)	Direction
Not identified	÷			

The list provided is not comprehensive and does not consider all flood history. It only includes the information that is currently available. Source: Flood Hazard

5.3 Erosion Hazard

Map 5.3 (500m Buffer)

Erosion Hazard

Category	Туре	Details	Distance (m)	Direction
Landslip Erosion Risk			÷	

Source: Erosion Hazard



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Product Guide

Due Diligence Insight Report

11 Apr 2025

Data Sources

NLUA - The Land Insight National Land Use Atlas (NLUA)

Land Insights' NLUA is a unique, proprietary database, meticulously curated from over a decade's worth of research and hundreds of thousands of diverse information sources. NLUA provides a comprehensive overview of land usage and potential hazards, drawing from a wide array of reliable sources. These include verified Council Records, Historic Zoning Maps, Topographic and Parish Maps, and technically published reports.

NLUA integrates thoroughly researched information extracted from published reports, publications, and technical studies. It also incorporates Land Insight's proprietary machine learning process, which identifies land anomalies, patterns, and changes through aerial imagery interpretations.

Leveraging advanced technologies, NLUA verifies the provenance, authenticity, and precision of its data. This database undergoes rigorous validation procedures carried out by scientists, quality assurance teams, and technical experts. This ensures its accuracy and reliability before publication. For more information on methodologies and further inquiries, please contact the Land Insight teams at support@landinsight.co.

Section 1 - Property Setting

Sensitive Receptors

National – Google. Nearmap. @ Land Insight National Land Use Atlas (NLUA). Points of Interest - © OpenStreetMap. Australian Business Datalist, Australian Schools Database - @ Australian Business Datalist ABDL (with permission). Cadastre. National - The digital cadastral boundaries and their legal identifiers have been derived from the relevant bodies from each Australian State and Territory jurisdiction combined by Land Insight & Resources.

Topographic data and Contours. National - The digital contours data and elevation information have been derived from the relevant bodies from each Australian State and Territory jurisdiction combined by Land Insight & Resources. National - Catchments, Streams, Aquifers, Storages, Wetlands and Man-made Structures that make up the hydrological system - © Geoscience Australia. Parks and National and State Forest Data © Department of Agriculture, Fisheries and Forestry.

Planning Controls and Overlays

Zoning, Planning Overlays and Other Planning Information

The digital planning information have been derived from the relevant bodies from each Australian State and Territory jurisdiction combined by Land Insight & Resources.

Mine subsidence districts - © DFSI Subsidence Advisory NSW. ACT - ACT Territory Plan and Land Use Zones and ovleryas © ACT Government Environment, Planning and Sustainable Development Directorate - Environment. NSW - NSW Environmental Planning Instruments, Land Use Zoning, Local Environmental Plan - © State Government of NSW and NSW Department of Planning, Housing, and Infrastructure. NT - NT Planning Scheme, Land Use Zones © NT Government Department of Infrastructure, Planning and Logistics. QLD - Land use mapping series, Land Use in QLD @ QLD Environment, Science, and Innovation. QLD zoning information, various LGA Councils. SA - Land Development Zones, Planning and Design Code Zones and Overlays - © SA Government Department for Trade and Investment. TAS - Tasmania Planning Scheme, Zoning and Overlays, theLIST ©State of Tasmania. @ Department of Natural Resources and Environment Tasmania. VIC - Tasmania Planning Scheme, Zoning and Overlays, theLIST ©State of Tasmania. @ Department of Natural Resources and Environment Tasmania. WA - Local Planning Scheme and Region Scheme, Zones, and Reserves, © WA Government Department of Planning, Lands and Heritage.

Heritage

Commonwealth Heritage List, National Heritage List and World Heritage Area

AUS - World, Commonwealth, and National Heritage Areas - World Heritage List, UNESCO. Australia's World Heritage List, © Australian Government Department of Sustainability, Environment, Water, Population and Communities. @ Department of Climate Change, Energy, the Environment and Water.

State and Local Heritage Registers

ACT - ACT Heritage Sites © ACT Government Environment, Planning and Sustainable Development Directorate - Environment. NSW - NSW EPI Heritage, NSW Heritage State Curtilage @ NSW Department of Premier and Cabinet, Heritage Council of NSW. NT - Heritage Register in NT, NT Town Planning Zones Heritage - © NT Government of Australia through Department of Tourism, Sport, and Culture. QLD - Queensland Heritage register boundaries, Queensland Local Heritage. © QLD Government Department of Environment and Science. Data from various local councils compiled by Land Insight Research Team (LIRT). SA - SA Heritage Places, SA Conservation State Heritage Areas, SA Conservation State Heritage Areas, Aboriginal Heritage in SA @Governemtn of South Australia © SA Government Department for Trade and Investment, Department for Environment and Water. TAS -Heritage Tasmania Features theLIST @State of Tasmania. VIC - VIC Heritage Inventory, VIC Sensitivity Public, VIC Heritage Register © VIC Government Department of Energy, Environment and Climate Action; Department of Premier and Cabinet. WA -WA Heritage Areas, WA Heritage Council Local Heritage Survey, WA Heritage Council State Heritage Survey, WA Aboriginal Heritage Places © WA Government Department of Planning, Lands and Heritage.



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Soil and Land Use Information

Soil landscape

Soil Mapping, Information & Landscape - Digital Atlas of Australian Soils, Bureau of Rural Sciences (BRS); Commonwealth Scientific and Industrial Research Organisation (CSIRO) Australian Soil Resource Information System (ASRIS). CSIRO (2024): Australian Soil Resource Information System Website. v1. CSIRO. Data Collection. <u>https://doi.org/10.25919/pdct-9a97</u>

Australian Soil Resource Information System - Australian Soil Classification @ Geoscience Australia, ASRIS Australian Soil Classification @ CSIRO Soil and Landscape Information of Australia @ CSIRO. Australian national map layers, Atlas of Australian Soils - @ ABARES Australian Bureau of Agricultural and Resource Economics and Sciences.

ACT Soil Landscapes, Soil Landscapes of the Canberra 1:100,000 © Australian Capital Territory Government, @ State Government of NSW and NSW Department of Climate Change, Energy, the Environment and Water. NSW Great Soil Group (GSG) Soil Type, Australian Soil Classification (ASC) soil type, Strategic Regional Land Use and Soil Profiles, 1:100 000 Soil Landscape Series, 1:250 000 Soil Landscape Series © State Government of NSW and NSW Department of Climate Change, Energy, the Environment and Water. NT Northern Territory Land Systems compilation 1:1 000 000, 1:250 000 @ Environment, Parks, and Water Security. QLD Land systems series, Soil Series and Soil and land resource information © The State of Queensland. SA Land Systems & Soil Types, Soils of South Australia @ Department for Environment and Water. TAS Soil Maps of Tasmania 1:100 000 various regions. Dominant Soil Order TAS @ Department of Natural Resources and Environment Tasmania. VIC Victorian Soil type mapping, VIC Land units (various regions), Victorian Land Use Information System, Land Systems of Victoria at 1:100 000 and 1:250 000 @ Department of Energy, Environment and Climate Action. WA Soil Landscape Mapping - Best Available, Soil Landscape Mapping - Systems, WA Soil Group @ Department of Primary Industries and Regional Development.

Soil salinity

ACT - Hydrogeological Landscapes, Soil Landscapes of the Australian Capital Territory @ actmapi ACT gov. NSW -Hydrogeological landscapes mapping, Sydney Metropolitan Western Study Area Hydrogeological Landscapes; New South Wales - Dryland Salinity Assessment 2000 - Assessment of Dryland salinity extent 2020 - © State Government of NSW and NSW Department of Climate Change, Energy, the Environment and Water; Australian Bureau of Agricultural and Resource Economics and Sciences. NT - Land Suitability Guidelines @ Department of Infrastructure, Planning and Logistics NT. QLD - Salinity in Queensland @ Environment, land, and water QLD. SA - Land salinity, Dryland salinity, Watertable and non-watertable @ Department for Environment and water SA. TAS - Vulnerable Soils: Salinity Hazard @ thelist Land Tasmania. VIC - Victorian Dryland Salinity Assessment 2000 - Australian Bureau of Agricultural and Resource Economics and Sciences. WA - Dryland salinity in Western Australia - © Department of Primary Industries and Regional Development's Agriculture and Food.

Acid Sulfate Soils

National, State and Local Acid Sulfate Soils Registers

AUS - Acid sulfate Soils - Atlas of Australian Acid Sulphate Soils @ CSIRO (2024): Australian Soil Resource Information System Website. v1. CSIRO. ACT - Environmental Planning Instrument (Acid Sulfate Soils) - © State Government of NSW and NSW Department of Planning, Housing, and Infrastructure. NSW - Environmental Planning Instrument (Acid Sulfate Soils); Land and Soil Capability Mapping for NSW - © State Government of NSW and NSW Department of Planning, Housing, and Infrastructure; © State Government of NSW and NSW Department of Climate Change, Energy, the Environment and Water. NT - Acid Sulfate Soils of the Darwin Region; Northern Territory Land Systems (compilation of north_250 and south_1M) - © Northern Territory Government of Australia Environment, Parks, and Water Security. QLD - Acid sulfate soils series - © The State of Queensland Environment and Science. SA - Acid Sulfate Soil Potential - @ Government of South Australia Department for Environment and Water. TAS - Marine Acid Sulfate Soils; Inland Acid Sulfate Soils; Coastal Acid Sulfate Soils; Acid Sulfate Soils - Resource Management and Conservation. VIC - Coastal Acid Sulphate Soils - Department of Jobs, Skills, Industry and Regions. WA - Acid Sulfate Soil Risk Map 100K; Soil landscape land quality - Subsurface Acidification Risk - @ Department of Water and Environmental Regulation; Department of Primary Industries and Regional Development.

Geology and Topography

Naturally Occurring Asbestos NOA

Naturally Occurring Asbestos in NSW © State of New South Wales and Department of Planning and Environment; WA Management of Asbestos In Mining Operations Department of Industry and Resources; SA Carbonate-hosted asbestos occurrences in South Australia: review of geology and implications for mesothelioma [Hendrickx, M.]; Mapping of naturally occurring asbestos in NSW [NSW Trade & Investment, Division of Resources & Energy]

Geology

ACT - New South Wales Seamless Geology dataset (latest version 2.3), various geology data sources 1:25K to 1:100K - © Department of Regional NSW. NSW - New South Wales Seamless Geology dataset (latest version 2.3) - © Department of Regional NSW. NT - Geological digital data 1:100 000 sheet - © Commonwealth of Australia (Geoscience Australia). QLD - Queensland geology detailed surface geology 1:100K and Queensland geology state surface geology 1:2M - © State of Queensland (Department of Resources). SA - 1:100K Geology (surface geology) - © SA Government Department of Energy and Mining, Customer Services. TAS - 1:25K and 1:250K Geology Data and Maps - © TAS Government Department of Infrastructure, Energy, and Resources (Mineral Resources Tasmania). VIC - Geological units represented as two dimensional polygons (1:50,000), and Geological units represented as two dimensional polygons (1:250,000) - © VIC Government Department of Jobs, Skills, Industry and Regions. WA - 1:50K Geological series map, 1:100K Geological series map, and 1:500K State interpreted bedrock geology -© WA Government Department of Mines, Industry Regulation and Safety.



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Section 2 - Hydrogeology

GDE & Hydrogeology Constraints

Groundwater Aquifers

Groundwater Aquifers - The National Hydrogeological Inventory, Commonwealth of Australia (Geoscience Australia). Australian Hydrological Geospatial Fabric @ Department of Climate Change, Energy, the Environment and Water, National Aquifer Network © Commonwealth of Australia (Bureau of Meteorology)

Groundwater Protection Areas and Groundwater Restricted Use Zones

Groundwater Protection Areas – © State of New South Wales and Department of Planning and Environment, NT Environment, Parks and Water Security, QLD Department of Resources, SA Environment Protection Authority (EPA), TAS TasWater, VIC Department of Environment, Land, Water & Planning; WA Department of Water and Environmental Regulation. Groundwater Licences - The Perth Groundwater Atlas and Department of Water (DoW) database © State of Western Australia. NSW -Groundwater Restricted Use Zones: EPI Groundwater Vulnerability, Botany Groundwater Management Zone, Williamtown Management Area, UPSS Environmentally Sensitive Zone, EPI Drinking Water Catchments – EPA NSW; NSW Department of Planning, Industry and Environment. NSW Temporary Water Restrictions Order Botany Sands groundwater - @ The NSW Department of Industry—Lands & Water. NT - Groundwater Restricted Use Zones: NT Water Protection Areas - Department of Environment, Parks, and Water Security. QLD - Groundwater Restricted Use Zones: Water Licences, Groundwater Management Areas, Surface Water Management Areas, Water Plan Catchments - Department of Resources. SA - Groundwater Restricted Use Zones: EPA Groundwater Prohibition Area - EPA SA. TAS - Groundwater Restricted Use Zones: Drinking Catchments, Water Management Plan Areas, Water Districts. VIC - Groundwater Restricted Use Zones: GMA, Groundwater Resources, Water Supply Protection Areas, Water Asset Database, Groundwater Catchments - © EPA Victoria. WA -Groundwater Restricted Use Zones: Gnangara Groundwater Protection, Jandakot Groundwater Protection, Groundwater Areas, PDWSA, Water Licences -Department of Water and Environmental Regulation.

Wetlands

Ramsar Wetlands of Australia - Directory of Important Wetlands in Australia (DIWA) – DCCEEW Department of Climate Change, Energy, the Environment and Water. ACT - Wetland Mapping - © State of New South Wales and Department of Planning and Environment. Important Wetlands - © Australian Capital Territory. NSW - Wetlands, Ramsar Sites, and various sources - © State of New South Wales and Department of Planning and Environment. NSW Environmental Planning Instruments (Wetlands, Coastal Wetlands), © State Government of NSW and NSW Department of Planning, Housing, and Infrastructure NT - Wetlands and Ramsar Sites - @ Department of Environment, Parks, and Water Security. QLD - Local Significant Wetlands and Ramsar Sites - @ Department of Environment and Science. SA - Ramsar Wetlands - @ Department for Environment and Water. TAS - Ramsar Wetlands - @ Land Tasmania. VIC - Victoria Wetlands and Ramsar Sites, @ Department of Energy, Environment and Climate Action. WA - Geomorphic Wetlands (various), Consanguineous Wetlands Suites, Ramsar Sites, @ Department of Biodiversity, Conservation and Attractions.

Groundwater Dependent Ecosystems

Groundwater Dependent Ecosystems (GDE) - Terrestrial (subsurface) and Aquatic (surface) - © Commonwealth of Australia (Bureau of Meteorology).

Groundwater Bores & Lithology details

Groundwater bores and lithology - National Groundwater Information System (NGIS) Dataset. - © Australian Government Bureau of Meteorology. © Water NSW. Groundwater Bores - © Australian Capital Territory. VIC Groundwater Sites, Domestic and stock groundwater bores @ DELWP. WA GW Bores, @ Department of Agriculture Resource Management. SA WaterConnect @ State of South Australia.

Groundwater Salinity

AUS - Groundwater Salinity © Commonwealth of Australia, Bureau of Meteorology. Groundwater Salinity - ACT - Canberra Hydrogeological Landscape, Hydrogeological Landscape Reports, Salinity, ACTmapi @ ACT gov. NSW - Salinity locations and mapping, Hydrogeological landscapes, @ NSW Environment and Heritage. NT - Dryland Salinity Hazard of the Northern Territory, @ Environment, Parks, and Water Security NT. QLD - Salinity in Queensland, @ QLD gov. SA - Annual ground water salinity sampling, @ Landscape South Australia. TAS - Groundwater Salinity - © Department of Natural Resources and Environment Tasmania. VIC -Groundwater Salinity - © State Government of Victoria. Groundwater Salinity - Department of Water and Environmental Regulation. WA - Salinity & Dryland salinity in Western Australia, @ Department of Agriculture and Food WA.

Other Known Borehole Investigations (Coal Seam Gas (CSG), Petroleum Wells and Other Boreholes)

Other Known Borehole Investigations (Coal Seam Gas (CSG), Petroleum Wells and Other Boreholes) - NSW Planning & Environment (Resources & Energy); Department of Energy, Environment and Climate Action. Other Known Borehole Investigations (Coal Seam Gas (CSG), Petroleum Wells and Other Boreholes) - © The State of Queensland, © Commonwealth of Australia (Geoscience Australia), Other Known Borehole Investigations (Coal Seam Gas (CSG), Petroleum Wells and Other Boreholes) - © SA Government Department for Environment and Water; Department for Energy and Mining. Other Known Borehole Investigations (Coal Seam Gas (CSG), Petroleum Wells and Other Boreholes) - Department of Water and Environmental Regulation, © Government of Western Australia Department of Mines, Industry Regulation and Safety. Other Known Borehole Investigations (Coal Seam Gas (CSG), Petroleum Wells and Other Boreholes), various sources @ Land Insight National Land Use Atlas (NLUA).



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Section 3 - Environmental Registers, Licences and Incidents

Contaminated Land Public Register

ACT - Register of Contaminated Sites, Contaminated Land Search (per request) - © Australian Capital Territory, Environment Protection Authority. NSW - Sites Notified as Contaminated, Records of Notices - © State of NSW and the NSW Environment Protection Authority. NT - Contaminated Land Audit, Pollution Abatement Notice - Northern Territory Environment Protection Authority. QLD - Contaminated Land Search (Environmental Management and Contaminated Land Registers - per lot) - © The State of Queensland (Department of Environment, Science, and Innovation). SA - Site Contamination Index, Assessment Areas -© Government of South Australia Environment Protection Authority. TAS - Regulated Sites and Premises, Lutana, and Parts of Hobarts Eastern Shore - © The Crown of Tasmania, Environment Protection Authority. VIC - Priority Sites Register, Pollution Abatement Notice - © EPA Victoria. WA - Contaminated Sites Database - © Government of Western Australia, Department of Water and Environmental Regulation.

Licences, Approvals, & Assessments

ACT - Environment Protection Authorisation Search, Environment Protection Agreement Search - © Australian Capital Territory, Environment Protection Authority. NSW - POEO Public Register - © 2023 State of NSW and the NSW Environment Protection Authority. NT - Environment Protection Licences - © Northern Territory Environment Protection Authority. QLD - Environmental Authorities - © The State of Queensland (Department of Environment, Science, and Innovation). SA - Licences or Authorisations, Environment Protection Orders (EPO), Clean-Up Orders (CUO), Assessment Areas - © Government of South Australia Environment Protection Authority. TAS - Regulated Premises - © The Crown of Tasmania, Environment Protection Authority. VIC - Permissions Register, Audit Reports - © EPA Victoria. WA - Licences and Works Approvals - © Government of Western Australia, Department of Water and Environmental Regulation.

Sites Regulated by Other Jurisdictional Body

Contaminated Legacy Areas

Contaminated Legacy Areas mapped by Land Insight Research team @ Land Insight National Land Use Atlas (NLUA). James Hardie Asbestos Waste Contamination Legacy @ The Australian Asbestos Network, Loose-fill Asbestos register @NSW Department of Climate Change & Water. Loose Fill Asbestos @ ACT Government. Asbestos Register @NT Government. Asbestos Register @ QLD Government. Asbestos Safework @ Government of South Australia. Asbestos Safety WorkSafe @Tasmania Government. Asbestos in Victoria @State Government of Victoria. Asbestos - contaminated sites @ Government of Western Australia Department of Health. National Pollutant Inventory - @ Commonwealth of Australia, Department of Agriculture, Water, and the Environment. Parramatta River Catchment Land Use Areas - Compiled by Land Insight derived from Parramatta River Estuary Processes Study (2010); and @ Land Insight National Land Use Atlas (NLUA).

Mines and Quarries (current locations, derelict and abandoned mines and quarries, mine shaft)

Current and Historical location of mines and quarries, derelict mine locations mapped by Land Insight Research team @ Land Insight National Land Use Atlas (NLUA). Australia's abandoned mines: rehabilitated @Australian Geographic. List of mines, List of open-pit mines @ Wikipedia. Goldfields places & Maps- National Library of Australia and State Libraries. A Geospatial Database for Effective Mine Rehabilitation in Australia - Monash University, various authors. Inventory of abandoned mines in Australia @ Australian Government AusIndustry. National Heritage Places - Coal Mines Historic Site @Department of Climate Change, Energy, the Environment and Water. Legacy Mines Program © State of New South Wales through Regional NSW. Map of NSW Mines @NSW Minerals Council. Legacy Mines @ Northern Territory Government. Abandoned mine remediation projects - @ The State of Queensland Government. Map of abandoned mines in Queensland. Queensland's quarry operations @ QLD Government Department of Resources. South Australian Mining History @ Mining Heritage, Former Mines, SARIG @ Government of South Australia @ EPA SA. Mineral Resources Tasmania @ Department of State Growth Mineral Resources Tasmania, Abandoned Mines Rehabilitation in Tasmania @ Department of Infrastructure, Energy and Resources. Tasmania Goldfields dataset. Mineral Occurrences Data @ Tasmania Government. Rehabilitating Mines @ Copyright Victorian Auditor-General's Office, @ Mining Legacies. Historical Mining Activities @ VIC Department of Jobs, Skills, Industry and Regions. Heritage Victoria. Mineral Assessment @ VIC Department of Natural Resources and Environment. Abandoned Mines, Inactive And Abandoned Mine Land Reports - @ WA Department of Mines, Industry Regulation and Safety. Abandoned Mines Program @ WA Department of Energy, Mines, Industry Regulation and Safety. Mines and Mineral Deposits (MINEDEX) - @ WA Department of Energy, Mines, Industry **Regulation and Safety**

Defence, Military Sites, and UXO Areas

Current and Historical Defence and Military sites mapped by Land Insight Research team @ Land Insight National Land Use Atlas (NLUA). Department of Defence 3 Year Regional Contamination Investigation Program (RCIP) © Commonwealth of Australia, Department of Defence. Defence Sites © Australian Government - Various sources and Department of Defence © Commonwealth of Australia. @ Land Insight National Land Use Atlas (NLUA). National Unexploded Ordnance Program (UXO) @ Australian Government Defence.

Former Gasworks Sites

AUS - Gasworks sites (Various), @ National Trust of Australia, @ National Library of Australia, @ Pocket Oz Sydney Guide, @ wikipedia. Former gasworks site locations mapped by Land Insight Research team @ Land Insight National Land Use Atlas (NLUA). Archaeological database and records © New England Archaeology. Images, Wikipedia, @Flickr images. The historical marker database. ACT - Gaswork sites @ ACT gov. NSW - Former gasworks sites @ EPA NSW, @ NSW Department of Environment and Conservation, Heritage NSW. NT - Gaswork sites @ EPA NT. QLD - Gaswork sites @ DES QLD. SA - Gaswork sites @ EPA SA, @ SA Heritage Places Database Search (maps SA). TAS - Gaswork sites @ EPA TAS, @ Ligthscape Tasmania. VIC - Gasworks sites, sites, and the site of the site of



Page 39 LI-4693 DDR @EPA VIC, @ Development Victoria. WA - Gasworks sites, @EPA WA, @ Department of Water and Environmental Regulation WA.

PFAS sites

AUS – National PFAS Investigation Program – State-wide PFAS Investigation Program @Australian Government, Department of Infrastructure, Transport, Regional Development, Communications and The Arts. PFAS research @ Land Insight National Land Use Atlas (NLUA).

PFAS Investigation and Management Program - PFAS contamination at Department of Defence sites, @ Defence Government. @ Australian Government Defence. Metropolitan Fire Brigade stations. Potential historical use of PFAS @ Australian Government.

PFAS Taskforce. Airservices Australia National & PFAS Management Program, Airservices Australia.

ACT - Potential PFAS contaminated sites in the ACT - © ACT Environment Protection Authority. NSW - The NSW Government PFAS Investigation Program, © State of NSW and the NSW Environment Protection Authority. NT - PFAS National Environmental Management Plan (NEMP) @ NT EPA. QLD - PFAS site investigations, PFAS in QLD, @ QLD government. SA - Per- and polyfluoroalkyl substances (PFAS), @SA EPA. TAS - PFAS Contamination, @ TAS EPA. VIC - PFAS management sites, PFAS contamination at Department of Defence sites @ VIC EPA. WA - PFAS Investigations in Western Australia, @ WA government, @ WA DWER.

Section 4 - Potentially Contaminated Areas

Potentially Contaminated Areas, Activities (PCA) - Notifiable Activities Locations and Description

The research database includes Potentially Contaminating Activities or businesses, industries, and activities that have been identified as having an increased likelihood of causing contamination. Many of these are considered notifiable activities, or activities that require regulation to operate. This database is meticulously curated from a variety of information sources and undergoes rigorous validation procedures carried out by our team of scientists, quality assurance professionals, and technical experts, ensuring its accuracy and reliability. The PCA database systematically identifies and classifies site locations into fifty differing categories, including:

Abattoirs, Abrasive Blasting, Agriculture/Horticulture, Airports, Asbestos, Asphalt or Bitumen, Batteries, Breweries/Distilleries, Cement, Concrete or Lime, Cemeteries, Chemicals, Coal Yards, Depots and Storage Yards, Dry Cleaners, Electrical or Electrical Components, Explosives and Dangerous Goods, Extractive Industries, Fire and Rescue, Food Manufacturing, Foundry, Smelting or Refining, Fuel Terminals & Depots, Glass, Ceramics and Plastic, Gun, Pistol or Rifle Ranges, Hospitals and Research Facilities, Landfill Sites, Livestock Dips, Mechanical and Automotive, Metal Fabrication and Treatments, Oil and Gas, Other Infrastructure Facilities, Paint Industries, Petrol Stations, Pharmaceuticals, Port and Marina Operations, Power Plants, Printing and Photography, Rail Industry and Associated Activities, Rubber and Tyre, Storage Tanks, Substations and Switching Stations, Textiles and Tannery, Timber, Pulp and Paper Works, Waste and Recycling Facilities, Wastewater Treatment Facilities.

Potentially Contaminating Activities and Locations (PCA) - © Google; Nearmap data; @ Datajet Australia Pty Ltd - with permission and @ Land Insight National Land Use Atlas (NLUA).

The Potentially Contaminating Activities (PCA) is a unique database proprietary to Land Insights. Please note that <u>not all</u> sources are included; only the most significant or larger databases are referenced for brevity. Individual research on each of these sources has not been included due to the comprehensive nature of the list.

Airports – Designated international airports in Australia @ Department of Infrastructure, Transport, Regional Development, Communities, and the Arts Australian Gov. List of airports Australia @ Wikipedia. Australia Airports Map @ Sydney-australia biz

Catte Dips: Cattle Dip Site Locator Northern Rivers Region - © State of New South Wales through NSW Department of Industry; and @ Land Insight National Land Use Atlas (NLUA).

Dry cleaners: Dry cleaners @ Drycleaning Institute of Australia; Lawrence Dry Cleaners Locations @ Lawrence Dry Cleaners, and @ Land Insight National Land Use Atlas (NLUA).

Landfill Sites: NSW - Landfill sites @ EPA NSW. QLD - Location of waste sites | Environment, land and water, Closed landfill sites @ QLD gov. SA - Landfill map, EPA SA. TAS - Landfills @ EPA TAS. VIC - Victorian Landfill Register - © EPA Victoria. Waste and Recycling Facilities: National Waste Management Facilities - © Commonwealth of Australia (Geoscience Australia), Australia's waste and resource recovery infrastructure @ DCCEEW @ Land Insight National Land Use Atlas (NLUA).

Petrol Stations: National Liquid Fuel Refineries and Facilities, Liquid Fuel & Aviation Fuel Depots/Terminals, National Liquid Fuel Refineries - © Commonwealth of Australia (Geoscience Australia), Petrol Stations @ Digital Atlas of Australia. Fuelcheck @ Fair Trading NSW gov. @ Land Insight National Land Use Atlas (NLUA).

Power Plants: AUS @ Powerplants Australia. QLD Power Plants map of Queensland @Department of Energy and Climate. Various sources. @ Land Insight National Land Use Atlas (NLUA).

Waste and Recycling Facilities: National Waste Management Facilities - © Commonwealth of Australia (Geoscience Australia), Australia's waste and resource recovery infrastructure @ DCCEEW. @ Land Insight National Land Use Atlas (NLUA). NSW - Waste facilities @ NSW EPA. NT - Waste & Recycling NT, City of Darwin. QLD - Public waste and recycling facilities in Queensland @ Queensland Government Open Data Portal. SA - Waste disposal, Waste depots @ EPA SA. TAS - Waste Centres, Waste Disposal Facilities @ EPA TAS. VIC - Victoria's waste and resource recovery infrastructure, Waste Facility Locations Victoria's Waste and Recycling Infrastructure Map © Recycling Victoria. WA @ VIC Gov. WA - Waste locations and recycling centres @ DEW WA. @ Land Insight National Land Use Atlas (NLUA).



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Historical Business Directories

AUS - AUS Historical Commercial & Trade Directory Data - various sources, see below. UBD business & street directory, Sands & McDougall directories, @ Australian Business Datalist ABDL (with permission)

ACT - 1971, 1981 & 1991 Telecom Australia Yellow Pages Country NSW Directories - Permission for use Sensis 2017.

2005 - 2022 - @ Australian Business Datalist ABDL - with permission

NSW - Sydney Metropolitan Area: 1932-1933 John Sands Sydney Trades Directory

1940 & 1950 Commonwealth of Australia Telephone Directory Sydney

1960-1961 Telecom Australia Pink Pages Sydney - Permission for use Sensis

1970-1971 United Business Directories Sydney - Licenced under Hardie Grant

1974-1975 NSW Post Office Yellow Pages Sydney Buying Guide and Commercial/Industrial Directories - Permission for use Sensis 1980-1981 & 1990-1991 Telecom Australia Yellow Pages Sydney - Permission for use Sensis. 2005 - 2022 @ Australian Business Datalist ABDL

NT - 2005 - 2022 @ Australian Business Datalist ABDL - with permission

QLD - 1865, 1890, 1900, 1906, 1916, 1919, 1924, 1925, 1970 - Pugh's Almanac (copyright expired)

1970-1971 - Brisbane Telephone Directory (copyright expired)

2005 - 2022 - @ Australian Business Datalist ABDL - with permission

SA - 1930, 1935, 1944-45, 1950, 1955, 1960, 1965, 1970, 1973 - Sands & McDougall Melbourne Trade Directory (copyright expired) 2005 - 2022 @ Australian Business Datalist ABDL - with permission

TAS - 1896-1897, 1900, 1905, 1910, 1915, 1920, 1925, 1930, 1935, 1940-41, 1945-46, 1948 - Wises Post Office Directory (copyright expired)

2005 - 2022 @ Australian Business Datalist ABDL - with permission

VIC - 1900, 1905, 1915, 1925, 1935, 1945, 1955, 1965, 1975 - Sands & McDougall Melbourne Trade Directory (copyright expired) 1960-1961, 1970-1971 - Post Office Pink Pages Melbourne - Permission for use Sensis 2017

1981-1982, 1990-1991 - Telstra Yellow Pages Melbourne - Permission for use Sensis 2017

Telstra Yellow Pages Melbourne - Permission for use Sensis 2017

2005 - 2022 @ Australian Business Datalist ABDL - with permission

WA -2005 - 2022 @ Australian Business Datalist ABDL - with permission

Section 5 - Natural Hazards

Fire Hazards

AUS - Bushfire Prone Areas - @ Australian Government Department of Climate Change, Energy, the Environment and Water. Bushfire History - Commonwealth of Australia (Geoscience Australia). ACT - Bushfire Prone Areas - ACT Government Environment, Planning and Sustainable Development Directorate. Bushfire History - NPWS Fire History - Wildfires and Prescribed Burns © State Government of NSW and Department of Planning, Industry and Environment. NSW - Bushfire Prone Areas - © State of New South Wales (NSW Rural Fire Service). Bushfire History - © State Government of NSW and NSW Department of Climate Change, Energy, the Environment and Water, Wildfires and Prescribed Burns - © State of New South Wales, National Parks, and Wildlife Management Unit. NT - Bushfire Prone Areas - © NT Government of Australia through Department of Environment and Natural Resources. Bushfire History - @The Commonwealth of Australia through the Department of the Environment and Energy. QLD - Bushfire Prone Areas - © Commonwealth Scientific and Industrial Research Organisation (CSIRO) in conjunction with the State of Queensland (Queensland Fire and Emergency Services). Bushfire History - © State of Queensland (Department of Environment and Science). SA - Bushfire Prone Areas - © SA Government Country Fire Service (CFS), Department of Planning, Transport, and Infrastructure. Bushfire History - © SA Government Department for Environment and Water. TAS - Bushfire Prone Areas - @ Tasmania Fire Service. Bushfire History - @ Department of Environment, Parks, and Water Security. VIC - Bushfire Prone Areas - © VIC Government Department of Environment, Land, Water and Planning; Department of Transport, Planning and Local Infrastructure. Bushfire History - © VIC Government Department of Transport, Planning and Local Infrastructure. WA - Bushfire Prone Areas - © WA Government Department of Fire and Emergency Services. Bushfire History - © WA Government Department of Fire and Emergency Services.

Flood Hazard

AUS - Flood Planning Area, Other Flood Studies, and Flood History - @ Commonwealth of Australia, @ Bureau of Meteorology. This dataset is digitised and/or aggregated from various verified Council Records, Aerial Photography Interpretation, Flood Imagery Maps, Topographic Maps, Historic Parish Maps, publicly available technical reports, and information digitised by the Land Insight Research team. @Land Insight Research. ACT - Flood Risk and Flood map information © ACT Government Environment, Planning and Sustainable Development Directorate - Environment, NSW - NSW Flood Data Portal @NSW State Emergency Service, © State Government of NSW, NSW Department of Climate Change, Energy, the Environment and Water; and NSW Department of Planning, Housing, and Infrastructure; @ NSW Government Spatial Services. NT - Floodplain maps, Flood monitoring © NT Government of Australia through Department of Environment and Natural Resources, Department of Lands, Planning, and the Environment. QLD - QLD Flood mapping, Historical flood mapping @ The State of Queensland, Department of Resources, Queensland Reconstruction Authority. Flood data series and Flood data overlays (various) Queensland Open Data portal. SA - Flood Awareness map, Flood Risk © Crown in right of the State of South Australia, @ Government of South Australia, Department for Environment and Water. Flood mapping (various) SA Data Directory portal. TAS - Tasmania Flood Mapping Projects Reports @ Tasmania State Emergency Services. Floodplain Mapping in Tasmania, Flood Inundation Extent models. © Department of Natural Resources and Environment Tasmania. TAS TheList dataset portal. VIC - Victoria Flood mapping and overlays. © Copyright State Government of Victoria various datasets, Victoria State Emergency Service; Department of Energy, Environment and Climate Action, Department of Environment, Land, Water & Planning. Flood data (various) VIC data portal (data.vic). WA - Floodplain mapping tool, Landgate Flood Map. @ Government of Western Australia, @ Department of Water and Environmental Regulation. Flood data (various) WA data portal.



Erosion Hazard

AUS - Soil Erosion Hazards, © Commonwealth of Australia (Geoscience Australia), @ Agriculture DAFF @Australian Government. ACT - Soil and Land Resources of the Australian Capital Territory, © State of New South Wales and Department of Planning and Environment. NSW - Land Soil Capability, Vulnerable lands, © State of New South Wales and Department of Planning and Environment NT - Land System, Soil Conservation, © Department of Environment, Parks, and Water Security. QLD - QLD Erosion prone areas, Coastal and Inland erosion areas, © The State of Queensland. SA - Landscape salad, Mass movement and soil Attributes, Water and Wind Erosion, © Department for Environment and Water. TAS - Coastal Erosion Hazard, Landslide Planning Map, Water and Wind Erosion Statewide map, © Department of Natural Resources and Environment Tasmania. VIC -Geomorphology of Victoria, © VIC Government Department of Jobs, Skills, Industry and Regions. WA - Soil Landscape Land Quality, Land capability assessment, Land instability Risk, Water Erosion Riks, Wind Erosion Risk, © WA Government Department of Primary Industries and Regional Development.

For more information visit www.landinsight.co or contact orders@landinsight.co.



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Terms and Conditions

Terms and Conditions

1. Land Insight & Resources (Land Insight) will perform the Services in accordance with these terms and conditions

2. By submitting the Application Form, the User acknowledges that it has read and understood these terms and conditions and agrees to be bound by them.

3.Land Insight reserves the right to change these terms and conditions. Any change shall be effective upon notice, which may be given by Land Insight posting such change on the Website, or by direct communication with the User.

<u>Services</u>

4.Land Insight agrees to undertake the Services using due skill, care, and diligence.

5. The User assumes the sole risk of making use of, and/or relying on, the report and the Services. Land Insight makes no representations about the suitability, completeness, timeliness, reliability, legality, or accuracy of the Services.

6.Unless Land Insight agrees expressly otherwise:

(A) The Services are solely for the use and benefit of the User; and

(B) Land Insight does not accept any liability, whether directly or indirectly, for any liability or loss suffered or incurred by any third par ty placing any reliance on the performance of the Services or any Documents or material arising from or in connection with the Services. 7. The User warrants to Land Insight that it will not use the Services for any purpose that is unlawful or is otherwise inconsistent with these terms and conditions.

8. The User will not alter in any way or provide a copy of the report, or any Document prepared by Land Insight to any other person without Land Insight's prior written consent.

Payment Terms

9. The Fee will be payable at the time of submitting the Application Form unless invoicing payment terms have been negotiated prior to purchase with Land Insight.

10. The User and Land Insight may agree in writing to vary the Services. The fee for each variation shall be agreed between Land Insight and the User.

11. The User agrees to pay Land Insight the Fee, including the fee for any variation requested in accordance with clause 12.

12. If the User's rights are terminated and the User has made an advance payment, Land Insight will refund the User a reasonable

proportion of the balance as determined by Land Insight in relation to the value of Services already provided.

13. GST at the prevailing rate is payable in addition to the Fee. The User agrees to pay any other applicable taxes, duties or governmentimposed fees related to the User's use of the Services.

Intellectual Property

14. Land Insight owns all intellectual proper ty in the Report and arising from or in connection with the Services.15.Land Insight grants the User a royalty free licence to use Land Insight's intellectual proper ty for that User's personal assessment of its Proper ty(s) only.

Privacy Policy

16. Upon submitting the Application Form the User consents to Land Insight's use of the personal data provided by the User for the purposes of providing the Services.

17. The Reliance on the report, the use of the Services and the use of Land Insight's Website is at the User's own risk. The User accepts that Land Insight does not guarantee the confidentiality of any communication or information transmitted through the use of the Website.

18. Land Insight will not provide to any third par ty any personal data provided by a User without the User's permission.

19. The User acknowledges that any feedback provided to Land Insight over the Website is not confidential and that Land Insight has the right to publish, reproduce, disseminate, transmit, distribute and copy (in whole or in part) any such feedback without the approval of the User.

20. Land Insight assumes no responsibility or liability for any content, communications or feedback submitted by a User over the Website. If a User has submitted objectionable content, communications or Feedback, Land Insight may, in its sole discretion, terminate that User's account, take legal action, or notify the appropriate authorities or parties, without prior notice.

Third Party Services

21. The User accepts that, although the Website may contain or provide information regarding applications, products and/or services provided or offered by third par ties, Land Insight does not recommend or endorse any such third par ty applications, products, and/or services.

22. The report contains content provided to Land Insight by other par ties (Third Par ty Content). Land Insight is not responsible for, does not endorse and makes no representations either expressly or impliedly concerning the accuracy or completeness of any Third Par ty Content. You rely on the Third Par ty Content completely at your own risk.

Limit and Extent of Liability

23. Land Insight's liability is limited to the amount of the Fee. Liability arising in the provision of the Services is reduced to the extent that it arises out of or in connection with any negligent act or omission by the User.

24. Neither par ty is liable to the other for loss of actual or anticipated revenue or profits, increased capital, or financing costs, increased operational or borrowing costs, pure economic loss, exemplary or punitive damages or indirect or consequential damages or loss. 25. In no event shall Land Insight or any directors, officers, employees or agents be liable for any indirect, punitive, incidental, special, or consequential damages arising out of or in any way connected with the use of the Website, any delay or inability to use the Website, any information available on the Website, or otherwise arising out of the utilisation of the Website, whether based in contract, tor t, strict liability, or otherwise, even if Land Insight has been advised of the possibility of such damages. The negation of damages set forth herein is a fundamental element of the basis of the bargain between Land Insight and the User. The Services would not be provided without such limitations.



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Property Verification

26. The User accepts that the Services provided do not take into account any information relating to the actual state or condition of the Property.

27. The User acknowledges that the Services are not to be interpreted as commenting on the physical characteristics or condition of the Proper ty, any particular purpose or use of that Proper ty or the saleability or value of the Property.

Termination and Modification

28. Land Insight reserves the right in its sole discretion to terminate, block or restrict the User's use of the Services or any portion thereof, for any reason, and without notice. In addition, Land Insight reserves the right in its sole discretion to terminate or modify any part of the Website without notice, for any reason.

<u>Anti-Hacking</u>

29. The User agrees not to directly or indirectly, attempt to or disrupt, impair, interfere with, alter, or modify the Website or any of its content.

30. The User agrees not to allow, aid or abet third par ties to directly or indirectly, attempt to or disrupt, impair, interfere with, alter or modify the Website or any of its content, or obtain access to any information regarding any User or any other report issued to a User.

Complaints

31. Any complaints in relation to the Services should, in the first instance, be in writing and addressed to Land Insight Customer Service at: info@landinsight.co. Land Insight will respond to any such complaints in writing as soon as practicably possible.

General Matters

32. These terms and conditions are governed by and will be construed and enforced in accordance with the laws of the State of New South Wales, Australia. If any dispute, controversy, or claim arises out of or relating to these terms and conditions, whether sounding in contract, tor t or otherwise, it shall be resolved by use of an alternative dispute resolution procedure acceptable to both par ties with the assistance of a mediator. If the dispute has not been resolved to the satisfaction of either par ty within 60 days of initiation of the procedure or if either par ty fails or refuses to participate in or withdraws from participating in the procedure, then either par ty may refer the dispute to the court.

33. These terms and conditions apply to all Services provided by Land Insight.

34. If there is any inconsistency between these terms and conditions and any other document or agreement between the parties, these terms and conditions will prevail.

35. These terms and conditions represent the entire agreement between the par ties.

36. The User authorises Land Insight to destroy Documents which Land Insight has prepared or holds in connection with the Services 7 years after the last date on which the Services were provided.

37. If any of the terms of the Application Form or the terms and conditions are invalid, unenforceable, or void, the relevant term must be read down to the maximum extent possible or severed from the rest of the Application Form or these terms and conditions. 38. These terms and conditions can only be amended or varied by a written document signed by both par ties.

39. Neither par ty may assign or transfer any rights or obligations arising in the provision of the Services or these terms and conditions without the other party's written consent.

<u>Defined Terms</u>	
Application Form	Means the form and accompanying information provided on the Website, completed, and submitted by the User to request the Services.
Document	Includes a report, and any other written or electronic document.
Fee	Means the amount set out in the Application Form or confirmed via an invoice.
Property	Means the proper ty to which the Services and the report relate.
Report	Means the Document prepared by Land Insight and provided to the User which contains the environmental and development data which is relevant to the Proper ty.
Services	Means the review of data and information on which the report is based, and the preparation and provision to the User of the report.
Website	Means Land Insight's online site, which is: www.landinsight.co
User	Means the person(s) set out in the Application Form including that person's permitted successors.





Appendix A

11

-

REPORT MAPS

Neds Beach Rd Lord Howe Island, NSW



PROPERTY SETTING

MAP 1.1





Subject area Park Community Centre Parks







Land Insight do no warrant the accuracy or completeness of information in this publication and any person using or relying upon such information does so on the basis that this company shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information.

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Land Insight





4

Data Digita

Data

VXXX

Planning Overlays



Overlays

SEPP Land Application Additional Permitted Uses Significant Native Vegetation









Land Insight

World Heritage Area

100m

PROPERTY SETTING



Soil Landscape and Salinity









Acid Sulfate Soils



Subject area



PROPERTY SETTING



in the

Data

to 'Digita

and nsight

Geology and Topography



Topographic Contour (m) QH bb QH bb QH bt Geology Code QH bd QH c NMlon QH bf QP n



HYDROGEOLOGY





Subject area

E

Land Insight

HYDROGEOLOGY



Groundwater and Other Bores



MAP 2.2

Subject area Other borehole/monitoring well location









Subject area







Subject area



Sites Regulated by Other Jurisdictional Body



Subject area





Other Potential Hazard Sources



Subject area





POTENTIALLY CONTAMINATED AREAS

MAP 4.1





Subject area Potentially Contaminating Activities Other Potentially Contaminating Activities

Data is current as when this report was created. However due to the turnover of business locations, some addresses may be former.









Subject area







Data

0

Flood Hazard



Flood Prone Area







Erosion Hazard



Subject area




Appendix B

HISTORIC IMAGERY

Neds Beach Rd Lord Howe Island, NSW









MAP B5

Historic Aerial Photograph - 2014









MAP B9

Historic Aerial Photograph - 2023





IMAGERY INSIGHT

MAP B10

1966 1:15,000 Topographic Map (Lord Howe Island)







Appendix B Photographic log





Photographic log

Project	Lord Howe Island Preliminary Site Investigation					
Site	Lot 44					
Client	Lord Howe Island Board	Job number	E241081			



Plate 1 Sample location: BH03



Plate 2
Sample location: BH03 sample 3_2 and Dup_1





Plate 3 Sample location: BH05



Plate 4 Sample location: BH05





Plate 5
Sample location: BH05 sample 5_2 and Dup_2



Plate 6 Sample location: BH06





Plate 7

Small fragment of potential fibro cement located adjacent to BH06 – near corner of building. Sample FC_01



Plate 8

Sample FC_01





Plate 9 Carbonaceous pieces of coral/shell



Plate 10

Carbonaceous pieces of coral/shell





Plate 11 Sample location: BH07



Plate 12

Sample location: BH07 and 3,000 L above ground storage tank (AST) in background





Plate 13 Sample location: BH01 – sample 1_1 (0 to 0.2 m below ground level [bgl])



Plate 14 Sample location: BH02 – sample 2_1 (0 to 0.2 m bgl)





Plate 15 Sample location: BH02 – sample 2_2 (0.6 to 0.8 m bgl)



Plate 16 Sample location: BH02 – sample 2_3 (1.0 to 1.2 m bgl)





Plate 17 Sample location: BH03 – sample 3_1 (0 to 0.2 m bgl)



Plate 18 Sample location: BH03 – sample 3_2 (0.5 to 0.7 m bgl)





Plate 19 Sample location: BH03 – sample 3_3 (1.0 to 1.2 m bgl)



Plate 20 Sample location: BH05 – sample 5_1 (0 to 0.2 m bgl)





Plate 21 Sample location: BH05 – sample 5_2 (0.5 to 0.7 m bgl)



Plate 22 Sample location: BH05 – sample 5_3 (1.0 to 1.2 m bgl)





Plate 23 Sample location: BH06 – sample 6_1 (0 to 0.3 m bgl)



Sample location: BH06 – sample 6_2 (0.5 to 0.7 m bgl)





Plate 25 Sample location: BH06 – sample 6_3 (1.0 to 1.2 m bgl)



Plate 26 Sample location: BH07 – sample 7_1 (0 to 0.3 m bgl)





Plate 27

Sample location: BH07 – sample 7_2 (0.3 to 0.7 m bgl)

Appendix C Laboratory reports





Work Order

Client

Contact

Address

Telephone

Order number

Project

CERTIFICATE OF ANALYSIS Page : ES2508808 : 1 of 20 : LORD HOWE ISLAND BOARD Laboratory : Environmental Division Sydney : ANTHONY DAVIS Contact : Customer Services ES Address : 277-289 Woodpark Road Smithfield NSW Australia 2164 : Bowker Avenue/PO Box 5 LORD HOWE ISLAND NSW 2898 : -----Telephone : +61-2-8784 8555 E241081 Lot 44 Lord Howe Island **Date Samples Received** 24-Mar-2025 14:30 Date Analysis Commenced : -----: 28-Mar-2025



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits

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

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Brendan Schrader	Laboratory Technician	Newcastle - Asbestos, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

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

ø = ALS is not NATA accredited for these tests

~ = Indicates an estimated value.

- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP231X Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20mL or 125mL bottles have been tested in accordance with the QSM5.4 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- · EG005: LORs have been raised for some samples due to matrix interference (High sample salinity)
- EG035: Positive Mercury results ES2508808 #9, 10, 18 have been confirmed by reanalysis
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

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Project	E241081 Lot 44 Lord Howe Island



- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration or as per tables in USEPA 1633 where listed. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS and also conform to QSM 5.4 (US DoD) requirements.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration or as per USEPA 1633 limits where listed. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS and also conform to QSM 5.4 (US DoD) requirements.
- EN60-DI: Where leachable PFAS analysis is requested, centrifugation rather than pressure filtration is used as the default approach for removal of particulates, in line with AS 4439.3.



Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)			Sample ID	1_1	3_1	3_3	5_2	6_3
		Samplin	ng date / time	time 19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00
Compound	CAS Number	LOR	Unit	ES2508808-001	ES2508808-005	ES2508808-007	ES2508808-009	ES2508808-013
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Ac	ids							
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	0.04	<0.01	0.02	<0.01	<0.01
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
EP231B: Perfluoroalkyl Carboxylic	Acids							
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L_	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231D: (n:2) Fluorotelomer Sulfor	nic Acids							
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23- 1	0.01	µg/L	0.05	<0.01	0.02	<0.01	<0.01
Sum of PFAS (WA DER List)		0.01	µg/L	0.05	<0.01	0.02	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS		0.02	%	98.0	101	101	97.7	96.7
13C8-PFOA		0.02	%	101	96.7	97.5	96.0	102

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Project	E241081 Lot 44 Lord Howe Island



Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	1_1	2_1	2_3	3_1	3_3
		Sampli	ng date / time	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00
Compound	CAS Number	LOR	Unit	ES2508808-001	ES2508808-002	ES2508808-004	ES2508808-005	ES2508808-007
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried (@ 105-110°C)							
Moisture Content		1.0	%	7.1	12.9	8.7	1.5	4.5
EA200: AS 4964 - 2004 Identificat	tion of Asbestos in Soils							
Asbestos Detected	1332-21-4	0.1	g/kg	No	21 - 2 99 - 2	No	No	1
Asbestos (Trace)	1332-21-4		1.0	No		No	No	
Asbestos Type	1332-21-4	-	100			20		
Synthetic Mineral Fibre		6	-	No		No	No	
Organic Fibre		- G		No		No	No	
Sample weight (dry)		0.01	g	422		611	546	
APPROVED IDENTIFIER:			-	B.SCHRADER	· · · · · · · · · · · · · · · · · · ·	B.SCHRADER	B.SCHRADER	
EG005(ED093)T: Total Metals by	ICP-AES							6
Arsenic	7440-38-2	5	mg/kg	6	8	6	5	<5
Cadmium	7440-43-9	1	mg/kg	<2	<2	<2	<2	<2
Chromium	7440-47-3	2	mg/kg	33	54	37	14	12
Copper	7440-50-8	5	mg/kg	13	19	22	<5	<5
Lead	7439-92-1	5	mg/kg	9	14	20	<5	<5
Nickel	7440-02-0	2	mg/kg	44	93	33	15	6
Zinc	7440-66-6	5	mg/kg	54	68	60	62	19
EG035T: Total Recoverable Mer	curv by FIMS							
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EN60-DI: Bottle Leaching Proced	lure - Inorganics/PFAS (F	lastic Ve	ssel)					
Final pH	-	0.1	pH Unit	8.8			9.4	9.6
EP075(SIM)B: Polynuclear Aroma	atic Hydrocarbons							
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

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Sub-Matrix: SOIL			Sample ID	1_1	2_1	2_3	3_1	3_3
(Malix. SOL)		Sampli	ng date / time	19-Mar-2025 00:00				
Compound	CAS Number	LOR	Unit	ES2508808-001	ES2508808-002	ES2508808-004	ES2508808-005	ES2508808-007
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydro	carbons - Conti	nued						
Anthracene	120-12-7	05	mg/kg	05	05	05	05	05
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene 205	-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Sum of polycyclic aromatic hydrocarbons		0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ (zero)		0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ (half LOR)		0.5	mg/kg	0.6	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (LOR)		0.5	mg/kg	1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction		10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction		50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	1.1	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction		100	mg/kg	<100	<100	<100	<100	<100
C10 - C36 Fraction (sum)		50	mg/kg	<50	<50	<50	<50	<50
P080/071: Total Recoverable Hydrocarbo	ns - NEPM 2013	3 Fractio	ns					
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction		50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction		100	mg/kg	<100	<100	<100	<100	<100

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Sub-Matrix: SOIL			Sample ID	1_1	2_1	2_3	3_1	3_3
		Sampli	ng date / time	19-Mar-2025 00:00				
Compound	CAS Number	LOR	Unit	ES2508808-001	ES2508808-002	ES2508808-004	ES2508808-005	ES2508808-007
and Manual A				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydroca	arbons - NEPM 201	3 Fraction	ns - Continued					
>C34 - C40 Fraction		100	mg/kg	<100	<100	<100	<100	<100
>C10 - C40 Fraction (sum)		50	mg/kg	<50	<50	<50	<50	<50
>C10 - C16 Fraction minus Naphthalene (F2)		50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Sum of BTEX	لببة	02	mg/kg	02	02	02	02	02
Total Xylenes		0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids	1							
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0005	0.0011	0.0007	<0.0002	<0.0002
P231B: Perfluoroalkyl Carboxylic Ac	ids							
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic	Acids							
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

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Client	LORD HOWE ISLAND BOARD
Project	E241081 Lot 44 Lord Howe Island



Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	1_1	2_1	2_3	3_1	3_3
		Samplii	ng date / time	19-Mar-2025 00:00				
Compound	CAS Number	LOR	Unit	ES2508808-001	ES2508808-002	ES2508808-004	ES2508808-005	ES2508808-007
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfo	nic Acids - Continued							
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23-	0.0002	mg/kg	0.0005	0.0011	0.0007	<0.0002	<0.0002
Sum of PFAS (WA DER List)		0.0002	mg/kg	0.0005	0.0011	0.0007	<0.0002	<0.0002
EP075(SIM)S: Phenolic Compound	Surrogates		-					
Phenol-d6	13127-88-3	0.5	%	85.0	92.1	93.2	84.3	102
2-Chlorophenol-D4	93951-73 <mark>-</mark> 6	0.5	%	85.8	88.0	89.4	83.1	96.4
2.4.6-Tribromophenol	118-79-6	0.5	%	71.1	71.6	72.1	64.5	75.9
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	98.1	100	102	96.7	112
Anthracene-d10	1719-06-8	0.5	%	115	116	121	113	116
4-Terphenyl-d14	1718-51-0	0.5	%	98.3	101	104	97.7	113
EP080S: TPH(V)/BTEX Surrogates	1							
1.2-Dichloroethane-D4	17060-07-0	0.2	%	94.4	87.7	90.2	93.3	96.4
Toluene-D8	2037-26-5	0.2	%	91.0	82.8	88.0	88.9	94.5
4-Bromofluorobenzene	460-00-4	0.2	%	93.1	83.6	86.9	87.8	93.5
EP231S: PFAS Surrogate				المسجوع والتسبي				
13C4-PFOS		0.0002	%	93.6	96.8	99.4	94.3	102
13C8-PFOA		0.0002	%	98.7	101	101	102	106
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Sub-Matrix: SOIL			Sample ID	5_2	5_3	6_1	6_2	6_3
(Matrix: SOIL)		Sampli	ng date / time	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00
Compound	CAS Number	LOR	Unit	ES2508808-009	ES2508808-010	ES2508808-011	ES2508808-012	ES2508808-013
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @	@ 105-110°C)							
Moisture Content		1.0	%	6.8	6.6	9.3		6.3
EA200: AS 4964 - 2004 Identificat	ion of Asbestos in Soils	e				-		
Asbestos Detected	1332-21-4	0.1	g/kg		No	· · · · · · · · · · · · · · · · · · ·	No	1
Asbestos (Trace)	1332-21-4	- F. 11			No		No	
Asbestos Type	1332-21-4	-	100			· · · · · · · · · · · · · · · · · · ·	· · · · ·	
Synthetic Mineral Fibre		6	-	1111	No	1000	No	
Organic Fibre		- <u>e</u>	100 H		No		No	
Sample weight (dry)		0.01	g	-	531	- 1	499	
APPROVED IDENTIFIER:		5	-	1	B.SCHRADER		B.SCHRADER	
EG005(ED093)T: Total Metals by I	ICP-AES							
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5		<5
Cadmium	7440-43-9	1	mg/kg	<2	<2	<2		<2
Chromium	7440-47-3	2	mg/kg	19	15	24	12 20 80 (2002)	15
Copper	7440-50-8	5	mg/kg	44	36	12		5
Lead	7439-92-1	5	mg/kg	19	23	21		5
Nickel	7440-02-0	2	mg/kg	10	10	17	1	8
Zinc	7440-66-6	5	mg/kg	586	514	163		51
EG035T: Total Recoverable Merc	ury by FIMS							
Mercury	7439-97-6	0.1	mg/kg	0.4	0.4	<0.1		<0.1
EN60-DI: Bottle Leaching Proced	ure - Inorganics/PFAS (F	lastic Ve	essel)					
Final pH		0.1	pH Unit	9.0		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	8.9
EP075(SIM)B: Polynuclear Aroma	tic Hydrocarbons		-					
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5

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Sub-Matrix: SOIL			Sample ID	5_2	5_3	6_1	6_2	6_3
		Sampli	ng date / time	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00
Compound	CAS Number	LOR	Unit	ES2508808-009	ES2508808-010	ES2508808-011	ES2508808-012	ES2508808-013
and the second sec		-		Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydr	ocarbons - Conti	nued						
Anthracene	120-12-7	05	mg/kg	05	0 5	05		05
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Benzo(b+j)fluoranthene 20	15-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	1	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Sum of polycyclic aromatic hydrocarbons		0.5	mg/kg	<0.5	<0.5	<0.5	1. S. I. (1999)	<0.5
Benzo(a)pyrene TEQ (zero)		0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Benzo(a)pyrene TEQ (half LOR)		0.5	mg/kg	0.6	0.6	0.6		0.6
Benzo(a)pyrene TEQ (LOR)		0.5	mg/kg	1.2	1.2	1.2		1.2
EP080/071: Total Petroleum Hydrocarbon	S							
C6 - C9 Fraction		10	mg/kg	<10	<10	<10		<10
C10 - C14 Fraction		50	mg/kg	<50	<50	<50	1	<50
C15 - C28 Fraction		100	mg/kg	<100	<100	<100	1	<100
C29 - C36 Fraction		100	mg/kg	<100	<100	<100		<100
C10 - C36 Fraction (sum)		50	mg/kg	<50	<50	<50		<50
EP080/071: Total Recoverable Hydrocarbo	ons - NEPM 2013	3 Fractio	ns					
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10		<10
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	-	<10
>C10 - C16 Fraction		50	mg/kg	<50	<50	<50		<50
>C16 - C34 Fraction		100	mg/kg	<100	<100	<100	and the second	<100

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Sub-Matrix: SOIL			Sample ID	5_2	5_3	6_1	6_2	6_3
		Sampli	ng date / time	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00
Compound	CAS Number	LOR	Unit	ES2508808-009	ES2508808-010	ES2508808-011	ES2508808-012	ES2508808-013
and States 1				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydroca	arbons - NEPM 201	3 Fraction	ns - Continued					
>C34 - C40 Fraction	1	100	mg/kg	<100	<100	<100	1	<100
>C10 - C40 Fraction (sum)		50	mg/kg	<50	<50	<50		<50
>C10 - C16 Fraction minus Naphthalene (F2)		50	mg/kg	<50	<50	<50		<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2		<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	10. 1 	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5		<0.5
Sum of BTEX	ليبة	02	mg/kg	02	02	02		02
Total Xylenes		0.5	mg/kg	<0.5	<0.5	<0.5	· · · · · · · · · · · · · · · · · · ·	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1		<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002		<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002		<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0004	0.0004	0.0009		0.0003
P231B: Perfluoroalkyl Carboxylic Ac	ids							
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001		<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002		<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002		<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002		<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0003		<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic	Acids					ante.		
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005		<0.0005

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Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	5_2	5_3	6_1	6_2	6_3
		Samplii	ng date / time	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00
Compound	CAS Number	LOR	Unit	ES2508808-009	ES2508808-010	ES2508808-011	ES2508808-012	ES2508808-013
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfo	nic Acids - Continued							
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005		<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005		<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	1	<0.0005
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23-	0.0002	mg/kg	0.0004	0.0004	0.0009		0.0003
Sum of PFAS (WA DER List)		0.0002	mg/kg	0.0004	0.0004	0.0012		0.0003
EP075(SIM)S: Phenolic Compound	Surrogates							
Phenol-d6	13127-88-3	0.5	%	94.1	85.3	87.7		87.0
2-Chlorophenol-D4	93951-73 <mark>-</mark> 6	0.5	%	90.3	81.4	83.4		82.8
2.4.6-Tribromophenol	118-79-6	0.5	%	73.3	67.3	74.9		65.7
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	103	95.0	97.2		96.5
Anthracene-d10	1719-06-8	0.5	%	118	112	119		114
4-Terphenyl-d14	1718-51-0	0.5	%	105	97.3	122	· · · · · · · · · · · · · · · · · · ·	99.6
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	94.3	102	98.0		77.2
Toluene-D8	2037-26-5	0.2	%	88.9	97.0	87.5		84.0
4-Bromofluorobenzene	460-00-4	0.2	%	87.3	97.0	90.2		85.2
EP231S: PFAS Surrogate			-					
13C4-PFOS		0.0002	%	105	91.0	105		98.2
13C8-PFOA		0.0002	%	101	85.6	104		104

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Work Order	ES2508808
Client	: LORD HOWE ISLAND BOARD
Project	E241081 Lot 44 Lord Howe Island



Sub-Matrix: SOIL			Sample ID	7_1	7_2	Dup_1	Dup_2	
(Matrix: Sole)		Sampli	ng date / time	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	
Compound	CAS Number	LOR	Unit	ES2508808-014	ES2508808-015	ES2508808-017	ES2508808-018	
				Result	Result	Result	Result	-
EA055: Moisture Content (Dried @	2 105-110°C)							
Moisture Content		1.0	%	14.4		4.3	6.5	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
EA200: AS 4964 - 2004 Identificati	ion of Asbestos in Soils							
Asbestos Detected	1332-21-4	0.1	g/kg		No		Contraction and Contraction of Contr	2 00
Asbestos (Trace)	1332-21-4	-			No			
Asbestos Type	1332-21-4	-			1	(-)		
Synthetic Mineral Fibre		6.1	-		No			
Organic Fibre		동네	10 (H) (1		No	100		
Sample weight (dry)		0.01	g	- James	570			
APPROVED IDENTIFIER:		4	-		B.SCHRADER			
EG005(ED093)T: Total Metals by I	CP-AES							
Arsenic	7440-38-2	5	mg/kg	8		<5	<5	
Cadmium	7440-43-9	1	mg/kg	3		<2	<2	
Chromium	7440-47-3	2	mg/kg	32		16	21	
Copper	7440-50-8	5	mg/kg	33		<5	56	
Lead	7439-92-1	5	mg/kg	48		<5	27	
Nickel	7440-02-0	2	mg/kg	50		8	13	
Zinc	7440-66-6	5	mg/kg	143		49	774	
EG035T: Total Recoverable Merc	ury by FIMS							
Mercury	7439-97-6	0.1	mg/kg	<0.1		<0.1	0.4	
EP075(SIM)B: Polynuclear Aroma	tic Hydrocarbons							
Naphthalene	91-20-3	0.5	mg/kg	<0.5		<0.5	<0.5	
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5		<0.5	<0.5	
Acenaphthene	83-32-9	0.5	mg/kg	<0.5		<0.5	<0.5	
Fluorene	86-73-7	0.5	mg/kg	<0.5	(<0.5	<0.5	
Phenanthrene	85-01-8	0.5	mg/kg	<0.5		<0.5	<0.5	
Anthracene	120-12-7	0.5	mg/kg	<0.5		<0.5	<0.5	
Fluoranthene	206-44-0	0.5	mg/kg	<0.5		<0.5	<0.5	

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Sub-Matrix: SOIL			Sample ID	7_1	7_2	Dup_1	Dup_2	
		Sampli	ng date / time	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	
Compound	CAS Number	LOR	Unit	ES2508808-014	ES2508808-015	ES2508808-017	ES2508808-018	
				Result	Result	Result	Result	
EP075(SIM)B: Polynuclear Aromatic Hy	drocarbons - Cont	inued						
Pyrene	129-00-0	05	mg/kg	05		05	05	
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5		<0.5	<0.5	
Chrysene	218-01-9	0.5	mg/kg	<0.5		<0.5	<0.5	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5		<0.5	<0.5	
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5		<0.5	<0.5	
Benzo(a)pyrene	50-32-8	05	mg/kg	05		05	05	
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5		<0.5	<0.5	
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5		<0.5	<0.5	
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5		<0.5	<0.5	
Sum of polycyclic aromatic hydrocarbons		0.5	mg/kg	<0.5		<0.5	<0.5	
Benzo(a)pyrene TEQ (zero)	تنذ	05	mg/kg	05	(0.5	05	
Benzo(a)pyrene TEQ (half LOR)		0.5	mg/kg	0.6		0.6	0.6	
Benzo(a)pyrene TEQ (LOR)		0.5	mg/kg	1.2		1.2	1.2	
EP080/071: Total Petroleum Hydrocarbo	ons							
C6 - C9 Fraction		10	mg/kg	<10	/ 	<10	<10	
C10 - C14 Fraction	-	50	mg/kg	<50		<50	<50	
C15 - C28 Fraction		100	mg/kg	<100		<100	<100	
C29 - C36 Fraction		100	mg/kg	<100		<100	<100	
C10 - C36 Fraction (sum)		50	mg/kg	50		50	50	
EP080/071: Total Recoverable Hydrocar	bons - NEPM 201	3 Fractio	ns					
C6 - C10 Fraction	C6_C10	10	mg/kg	<10		<10	<10	
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	10		10	10	
>C10 - C16 Fraction		50	mg/kg	50		50	50	
>C16 - C34 Fraction		100	mg/kg	<100		<100	<100	
>C34 - C40 Fraction		100	mg/kg	<100		<100	<100	3
>C10 - C40 Fraction (sum)		50	mg/kg	<50		<50	<50	- <u></u>

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Work Order	ES2508808
Client	: LORD HOWE ISLAND BOARD
Project	E241081 Lot 44 Lord Howe Island



Sub-Matrix: SOIL			Sample ID	7_1	7_2	Dup_1	Dup_2	
(MBRIX. SOIL)		Samplii	ng date / time	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	
Compound	CAS Number	LOR	Unit	ES2508808-014	ES2508808-015	ES2508808-017	ES2508808-018	
			-	Result	Result	Result	Result	
EP080/071: Total Recoverable Hydroca	arbons - NEPM 201	3 Fraction	ns - Continued					
>C10 - C16 Fraction minus Naphthalene	-	50	mg/kg	<50	*	<50	<50	
(F2)								
P080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2		<0.2	<0.2	
Toluene	108-88-3	0.5	mg/kg	<0.5		<0.5	<0.5	
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2	<0.5	<0.5	-
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	i i i i i i i i i i i i i i i i i i i	<0.5	<0.5	
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5		<0.5	<0.5	÷
Sum of BTEX		0.2	mg/kg	<0.2	· · · · · · · · · · · · · · · · · · ·	<0.2	<0.2	
Total Xylenes		0.5	mg/kg	<0.5		<0.5	<0.5	
Naphthalene	91-20-3	1	mg/kg	<1		<1	<1	
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	-	<0.0002		() (
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002		<0.0002		() (
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0007		0.0004		
P231B: Perfluoroalkyl Carboxylic Ac	ids							
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001		<0.001	-	
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002		<0.0002		
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002		<0.0002		
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	· · · · · · · · · · · · · · · · · · ·	<0.0002		
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0002		<0.0002	· · · · · · · · · · · · · · · · · · ·	·
P231D: (n:2) Fluorotelomer Sulfonic	Acids							
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005		<0.0005	-	
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	-	<0.0005		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	-	<0.0005	-	

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Sub-Matrix: SOIL Sample ID (Matrix: SOIL) Sampling date / time				7_1	7_2	Dup_1	Dup_2	
				19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	19-Mar-2025 00:00	
Compound	CAS Number	LOR	Unit	ES2508808-014	ES2508808-015	ES2508808-017	ES2508808-018	
				Result	Result	Result	Result	
EP231D: (n:2) Fluorotelomer Sulfo	nic Acids - Continued							
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0 0005	mg/kg	0 0005		0 0005		
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23- 1	0.0002	mg/kg	0.0007	1.000	0.0004	-	
Sum of PFAS (WA DER List)		0.0002	mg/kg	0.0009		0.0004		
EP075(SIM)S: Phenolic Compound	Surrogates							
Phenol-d6	13127-88-3	0.5	%	97.1		85.6	83.0	
2-Chlorophenol-D4	93951-73-6	0.5	%	89.5		81.8	76.5	
2.4.6-Tribromophenol	118-79-6	0.5	%	79.9		64.2	60.8	
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	104		95.6	95.1	
Anthracene-d10	1719-06-8	0.5	%	118		112	115	
4-Terphenyl-d14	1718-51-0	05	%	104		96.5	97.9	<u>~</u>
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	75.1		65.3	68.7	
Toluene-D8	2037-26-5	02	%	82.0	· · · · · · · · · · · · · · · · · · ·	81.0	80.2	(111)
4-Bromofluorobenzene	460-00-4	0.2	%	85.7		84.1	83.7	
EP231S: PFAS Surrogate			_					
13C4-PFOS		0 0002	%	97.4		106		
13C8-PFOA		0.0002	%	95.6	1	108		

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Sub-Matrix: WATER (Matrix: WATER)			Sample ID	R1				
		Samplir	ng date / time	19-Mar-2025 00:00				
Compound	CAS Number	LOR	Unit	ES2508808-019				
				Result	-		-	-
EG020T: Total Metals by ICP-MS	S				-			
Arsenic	7440-38-2	0.001	mg/L	<0.001				· · · · · · · · · · · · · · · · · · ·
Cadmium	7440-43-9	0.0001	mg/L	<0.0001				
Chromium	7440-47-3	0.001	mg/L	<0.001			-	
Copper	7440-50-8	0.001	mg/L	<0.001				
Lead	7439-92-1	0.001	mg/L	<0.001				-
Nickel	7440-02-0	0.001	mg/L	<0.001				
Zinc	7440-66-6	0.005	mg/L	<0.005			· · · · · · · · · · · · · · · · · · ·	(
EG035T: Total Recoverable Me	rcury by FIMS							
Mercury	7439-97-6	0.0001	mg/L	<0.0001		()		
EP075(SIM)B: Polynuclear Aron	natic Hydrocarbons							(
Naphthalene	91-20-3	1.0	µg/L	<1.0	()			
Acenaphthylene	208-96-8	1_0	µg/L	<1.0			·	
Acenaphthene	83-32-9	1.0	µg/L	<1.0	÷		1	
Fluorene	86-73-7	1.0	µg/L	<1.0				
Phenanthrene	85-01-8	1.0	µg/L	<1.0				
Anthracene	120-12-7	1.0	µg/L	<1.0				1 m / 100
Fluoranthene	206-44-0	1.0	µg/L	<1.0				
Pyrene	129-00-0	1.0	µg/L	<1.0	(111)			
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0				
Chrysene	218-01-9	1.0	µg/L	<1.0				
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0			·····	
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0				
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5		1		
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0				
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0		· · · · · · · · · · · · · · · · · · ·		
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0				
* Sum of polycyclic aromatic hydro	ocarbons	0.5	µg/L	<0.5				



Sub-Matrix: WATER (Matrix: WATER)			Sample ID	R1				- 14
		Samplii	ng date / time	19-Mar-2025 00:00				
Compound	CAS Number	LOR	Unit	ES2508808-019				
				Result		-		
EP075(SIM)B: Polynuclear Aromatic H	ydrocarbons - Cont	nued						
^ Benzo(a)pyrene TEQ (zero)		05	µg/L	05				· · · · · · · · · · · · · · · · · · ·
EP080/071: Total Petroleum Hydrocarb	oons							
C6 - C9 Fraction		20	µg/L	<20				,
C10 - C14 Fraction		50	µg/L	50				
C15 - C28 Fraction		100	µg/L	<100	(111)			
C29 - C36 Fraction		50	µg/L	<50	(111) -			
 C10 - C36 Fraction (sum) 		50	µg/L	<50	- Con celland			
EP080/071: Total Recoverable Hydroca	arbons - NEPM 201	3 Fraction	าร					
C6 - C10 Fraction	C6_C10	20	µg/L	<20				
^ C6 - C10 Fraction minus BTEX	C6 C10-BTEX	20	µg/L	<20		(2222)		
(F1)	100 A							
>C10 - C16 Fraction		100	µg/L	<100			-	
>C16 - C34 Fraction		100	µg/L	<100			- 10 00	
>C34 - C40 Fraction		100	µg/L	<100			1 7 1 1	· · · · · ·
^ >C10 - C40 Fraction (sum)		100	µg/L	<100				
 >C10 - C16 Fraction minus Naphthalene (F2) 	- T	100	µg/L	<100		77		
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	1			1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	
Toluene	108-88-3	2	µg/L	<2				
Ethylbenzene	100-41-4	2	µg/L	<2	(****			
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2				· · · · · · · · · · · · · · · · · · ·
ortho-Xylene	95-47-6	2	µg/L	<2				
* Total Xylenes		2	µg/L	2	(<u>1111</u>)			
* Sum of BTEX		1	µg/L	<1				
Naphthalene	91-20-3	5	µg/L	<5	- And - Contraction of the Contr			
EP075(SIM)S: Phenolic Compound Su	rrogates					Č.		
Phenol-d6	13127-88-3	1.0	%	25.7			0	



Sub-Matrix: WATER (Matrix: WATER)			Sample ID	R1			
		Sampli	ng date / time	19-Mar-2025 00:00	inter a		
Compound	CAS Number	LOR	Unit	ES2508808-019			
				Result			
EP075(SIM)S: Phenolic Compour	nd Surrogates - Continued						
2-Chlorophenol-D4	93951-73-6	1.0	%	46.7			 · · · · · · · · · · · · · · · · · · ·
2.4.6-Tribromophenol	118-79-6	1_0	%	45.4	1 		
EP075(SIM)T: PAH Surrogates							
2-Fluorobiphenyl	321-60-8	1.0	%	57.9			 1 m
Anthracene-d10	1719-06-8	1.0	%	73.5	(2002)		
4-Terphenyl-d14	1718-51-0	1.0	%	83.1	(****	1	
EP080S: TPH(V)/BTEX Surrogate	s						
1.2-Dichloroethane-D4	17060-07-0	2	%	97.2	e e e e e e e e e e e e e e e e e e e		
Toluene-D8	2037-26-5	2	%	106		1	
4-Bromofluorobenzene	460-00-4	2	%	103			

Analytical Results

Descriptive Results

Sub-Matrix: SOIL

Method: Compound	Sample ID - Sampling date / time	Analytical Results	
EA200: AS 4964 - 2004 Identificati	on of Asbestos in Soils		
EA200: Description	1_1 - 19-Mar-2025 00:00	A soil sample.	
EA200: Description	2_3 - 19-Mar-2025 00:00	A soil sample.	
EA200: Description	3_1 - 19-Mar-2025 00:00	A soil sample.	
EA200: Description	5_3 - 19-Mar-2025 00:00	A soil sample.	
EA200: Description	6_2 - 19-Mar-2025 00:00	A soil sample.	
EA200: Description	7_2 - 19-Mar-2025 00:00	A soil sample.	



Surrogate Control Limits

Sub-Matrix: DI WATER LEACHATE		Recovery Limits (%)			
Compound	CAS Number	Low	High		
EP231S: PFAS Surrogate	one number				
13C4-PFOS		60	120		
13C8-PFOA		60	120		
Sub-Matrix: SOIL		Recovery	Limits (%)		
Compound	CAS Number	Low	High		
EP075(SIM)S: Phenolic Compound Su	irrogates				
Phenol-d6	13127-88-3	63	123		
2-Chlorophenol-D4	93951-73-6	66	122		
2.4.6-Tribromophenol	118-79-6	40	138		
EP075(SIM)T: PAH Surrogates					
2-Fluorobiphenyl	321-60-8	70	122		
Anthracene-d10	1719-06-8	66	128		
4-Terphenyl-d14	1718-51-0	65	129		
EP080S: TPH(V)/BTEX Surrogates					
1.2-Dichloroethane-D4	17060-07-0	63	125		
Toluene-D8	2037-26-5	67	124		
4-Bromofluorobenzene	460-00-4	66	131		
EP231S: PFAS Surrogate					
13C4-PFOS		60	120		
13C8-PFOA		60	120		
Sub-Matrix: WATER		Recovery	Limits (%)		
Compound	CAS Number	Low	High		
EP075(SIM)S: Phenolic Compound Su	irrogates				
Phenol-d6	13127-88-3	10	44		
2-Chlorophenol-D4	93951-73-6	14	94		
2.4.6-Tribromophenol	118-79-6	17	125		
EP075(SIM)T: PAH Surrogates					
2-Fluorobiphenyl	321-60-8	20	104		
Anthracene-d10	1719-06-8	27	113		
4-Terphenyl-d14	1718-51-0	32	112		
EP080S: TPH(V)/BTEX Surrogates					
1.2-Dichloroethane-D4	17060-07-0	72	143		
Toluene-D8	2037-26-5	75	131		
4-Bromofluorobenzene	460-00-4	73	137		

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry / Biology).

(SOIL) EA200: AS 4964 - 2004 Identification of Asbestos in Soils



QUALITY CONTROL REPORT

Work Order	: ES2508808	Page	: 1 of 16
Client	: LORD HOWE ISLAND BOARD	Laboratory	: Environmental Division Sydney
Contact	: ANTHONY DAVIS	Contact	: Customer Services ES
Address	: Bowker Avenue/PO Box 5 LORD HOWE ISLAND NSW 2898	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	·	Telephone	: +61-2-8784 8555
Project	: E241081 Lot 44 Lord Howe Island	Date Samples Received	: 24-Mar-2025
Order number	:	Date Analysis Commenced	: 28-Mar-2025
C-O-C number	:	Issue Date	: 03-Apr-2025
Sampler	: Cheyne Hudson		Hac-MRA NATA
Site	: Lot 44		
Quote number	: EN/222		Accreditation No. 825
No. of samples received	: 25		Accredited for compliance with
No. of samples analysed	: 15		ISO/IEC 17025 - Testing

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Brendan Schrader	Laboratory Technician	Newcastle - Asbestos, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

Key: Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot

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

LOR = Limit of reporting

RPD = Relative Percentage Difference

= Indicates failed QC

* = The final LOR has been raised due to dilution or other sample specific cause; adjusted LOR is shown in brackets. The duplicate ranges for Acceptable RPD% are applied to the final LOR where applicable.

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: SOIL						Laboratory L	Duplicate (DUP) Report		
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: To	tal Metals by ICP-AES	G(QC Lot: 6471442)							
ES2508808-007	3_3	EG005T: Cadmium	7440-43-9	1 (2)*	mg/kg	<2	<2	0.0	No Limit
		EG005T: Chromium	7440-47-3	2 (5)*	mg/kg	12	13	0.0	No Limit
		EG005T: Nickel	7440-02-0	2 (5)*	mg/kg	6	<5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	19	20	0.0	No Limit
EG005(ED093)T: Total ES2508808-007 ES2508808-011 ES2508808-011 ES2508659-002 ES2508808-009 EG035T: Total Recov ES2508327-001 ES2508327-001	6_1	EG005T: Cadmium	7440-43-9	1 (2)*	mg/kg	<2	<2	0.0	No Limit
		EG005T: Chromium	7440 47 3	2 (5)*	mg/kg	24	20	17 2	No Limit
		EG005T: Nickel	7440-02-0	2 (5)*	mg/kg	17	14	22.5	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	12	12	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	21	21	0.0	No Limit
		EG005T: Zinc	7440 66 6	5	mg/kg	163	170	40	0% 20%
EA055: Moisture Co	ntent (Dried @ 105-1	10°C) (QC Lot: 6471453)							
ES2508659-002	Anonymous	EA055: Moisture Content		0.1 (1.0)*	%	17.9	21.6	18.9	0% - 20%
ES2508808-009	5_2	EA055: Moisture Content		0.1 (1.0)*	%	6.8	6.8	0.0	No Limit
EG035T: Total Rec	overable Mercury by I	FIMS (QC Lot: 6471441)							
ES2508327-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2508327-016	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit

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Project	E241081 Lot 44 Lord Howe Island



Sub-Matrix: SOIL						Laboratory	Duplicate (DUP) Report		
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG035T: Total Rec	overable Mercury by F	IMS (QC Lot: 6471443)							
ES2508808-007	3 3	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP075(SIM)B: Polyr	uclear Aromatic Hydr	rocarbons (QC Lot: 6470858)			0.0				
ES2508808 001	1 1	ED075/SIM): Naphthalana	91 20 3	0.5	ma/ka	0.5	0.5	0.0	No Limit
20200000000	11	EP075(SIM): Acenanthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Aconophthono	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphulene	86.73.7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Procenting	85.01.9	0.5	ma/ka	<0.5	<0.5	0.0	No Limit
		EP075(SIM). Prenanuliene	120 12 7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorantnene	206-44-0	0.0	mg/kg	<0.5	<0.5	0.0	NO LIMIL No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	0 5	05	0 0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
:S2508808-007 P075(SIM)B: Polynu :S2508808 001 :S2508808-017		EP075(SIM): Sum of polycyclic aromatic hydrocarbons		0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)		0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES2508808-017	Dup_1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Eluorene	86 73 7	05	mg/kg	05	05	00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
Laboratory sample ID G035T: Total Recov ES2508808-007 EP075(SIM)B: Polynu ES2508808 001 ES2508808-017		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Eluoranthene	206-44-0	0.5	ma/ka	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	ma/ka	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56 55 3	05	mg/kg	0.5	0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207 08 9	05	mg/kg	05	05	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES2508808-017		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	ma/ka	<0.5	<0.5	0.0	No Limit
		ED075(SIM): Dibenz(a b)anthracene	53-70-3	0.5	ma/ka	<0.5	<0.5	0.0	No Limit

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Client	LORD HOWE ISLAND BOARD
Project	E241081 Lot 44 Lord Howe Island



Sub-Matrix: SOIL						Laboratory	Duplicate (DUP) Report		
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP075(SIM)B: Poly	uclear Aromatic Hyd	Irocarbons (QC Lot: 6470858) - continued							
ES2508808-017	Dup_1	EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic		0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		hydrocarbons							
		EP075(SIM) Benzo(a)pyrene TEQ (zero)		0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Pe	etroleum Hydrocarbo	ns (QC Lot: 6470859)							
ES2508808-001	1_1	EP071: C15 - C28 Fraction		100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction		100	mg/kg	100	100	00	No Limit
		EP071: C10 - C14 Fraction		50	mg/kg	<50	<50	0.0	No Limit
ES2508808-017	Dup_1	EP071: C15 - C28 Fraction		100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction		100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction		50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Pe	etroleum Hydrocarbo	ns (QC Lot: 6471305)							
ES2508327-001	Anonymous	EP080: C6 - C9 Fraction		10	mg/kg	<10	<10	0.0	No Limit
ES2508327-016	Anonymous	EP080: C6 - C9 Fraction		10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Pe	etroleum Hydrocarbo	ns (QC Lot: 6471310)							-
EN2505101-001	Anonymous	EP080: C6 - C9 Fraction		10	mg/kg	<10	<10	0.0	No Limit
ES2508808-014	7 1	EP080: C6 - C9 Fraction		10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total R	ecoverable Hydrocarl	bons - NEPM 2013 Fractions (QC Lot: 6470859)							
ES2508808-001	11	EP071: >C16 - C34 Fraction	·	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction		100	mg/kg	<100	<100	0.0	No Limit
	-	EP071: >C10 - C16 Fraction		50	mg/kg	<50	<50	0.0	No Limit
ES2508808-017	Dup 1	EP071: >C16 - C34 Fraction		100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction		100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction		50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Re	ecoverable Hvdrocarl	bons - NEPM 2013 Fractions (QC Lot: 6471305)							
ES2508327-001	Anonymous	EP080: C6 - C10 Fraction	C6 C10	10	mg/kg	<10	<10	0.0	No Limit
ES2508327-016	Anonymous	EP080: C6 - C10 Fraction	C6 C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total R	ecoverable Hydrocar	bons - NEPM 2013 Fractions (QC Lot: 6471310)	_						
EN2505101-001	Anonymous	EP080: C6 - C10 Fraction	C6 C10	10	ma/ka	<10	<10	0.0	No Limit
ES2508808-014	7 1	EP080: C6 - C10 Fraction	C6 C10	10	ma/ka	<10	<10	0.0	No Limit
EPORO BTEXN (OC	Lot: 64713051			14					inte Linit
ES2508327 001	Anonymous	ED090: Bonzono	71 49 9	0.2	malka	<0.2	(0.2	0.0	No Limit
10200027-001	Anonymous	EPU80. Belizene	11-40-2	0.2	mg/kg	<0.5	<0.2	0.0	No Limit
		EP080: Toluene	100-00-3	0.5	ma/ka	<0.5	<0.5	0.0	No Limit
		EPU80: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EPU80: meta- & para-Xylene	108-38-3	0.0	ng/kg	×0.5	NU.0	0.0	NOLIMIT
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

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Work Order	ES2508808
Client	LORD HOWE ISLAND BOARD
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Sub-Matrix: SOIL						Laboratory	Duplicate (DUP) Report		_
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP080: BTEXN (QC	C Lot: 6471305) - cont	tinued				1			
ES2508327-001	Anonymous	EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES2508327-016	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
C. C. MINELSON DE LA COLO	ALL AND DESCRIPTION	EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080; meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
			106-42-3				Marine H		
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP080: BTEXN (QC	C Lot: 6471310)								
EN2505101-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
			106-42-3		-				
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91 20 3	1	mg/kg	1		00	No Limit
ES2508808-014	7_1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
·		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES2508808-014 7		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP231A: Perfluoroa	alkyl Sulfonic Acids (QC Lot: 6471046)							
ES2508808-001	1_1	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
A	and the second second	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
	-	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0005	0.0005	0.0	No Limit
ES2508808-017	Dup_1	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0004	<0.0002	75.2	No Limit
EP231B: Perfluoro	alkyl Carboxylic Acid	s (QC Lot: 6471046)							
ES2508808 001	1.1	EP231X: Perfluoropentanoic acid (PFPeA)	2706 90 3	0 0002	mg/kg	0 0002	0 0002	0 0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	< 0.001	<0.001	0.0	No Limit
ES2508808 017	Dup 1	EP231X: Perfluoropentanoic acid (PFPeA)	2706 90 3	0 0002	mg/kg	0 0002	0 0002	00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit



Cub Matrix: COIL						Laboratory I	Duplicate (DUP) Report		
	Sample ID	1 million and a monthly	CAS Number	LOR	Unit	Original Result	Duplicate Result	PPD /%/1	Accontable PPD (%)
ED221D: Dorfluoroal	and Carbovalia Asid	(OC Let: 6471046)	CAS Humber	Lon	Unit	Unginal Nesan	Dupicate Result	11 0 (76)	Acceptable II D (76)
EF251B. Periluoroali ES2508808-017	Dup 1	ED221X: Derfluersbentensis asid (DEUnA)	375.85.9	0.0002	ma/ka	<0.0002	<0.0002	0.0	No Limit
Stub-Matrix: SOLL Laborationy: CAS Number Laboration: CAS Number	Dup_1	EP231X: Perhudroneptanoic acid (PEPA)	335 67 1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
	0.0	No Limit							
		EP231X. Perilluorobulanoic acid (PFBA)	515-22-4	0.001	ing/kg	<0.001	<0.001	0.0	NO LIMIL
EP231D: (n:2) Fluoro	telomer Sulfonic A	cids (QC Lot: 64/1046)							
Sub-Matrix: SOIL Samp Laboratory sample ID Samp EP231B: Perfluoroally/I Ca ES2508808-017 Dup	1_1	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	Laboratory Duplicate (DUP) Report CAS Number LOR Unit Original Result Duplicate Result RPD (%) Acceptable RF 375-85-9 0.0002 mg/kg <0.0002	No Limit				
ES2508808-017	Dup_1	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
Sub-Matrix: WATER					8	Laboratory L	Duplicate (DUP) Report		
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020T: Total Metals	by ICP-MS (OC Lo	nt: 6477699)						10 - 1.0	
ES2508685-005	Anonymous	EC020A T: Cadmium	7440-43-9	0.0001	ma/l	<0.0001	<0.0001	0.0	No Limit
20200000 000	Anonymous	EG020A T: Argenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
	for the second second	EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	1.92	1.96	1.9	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Nickel	7440 02 0	0.001	mg/L	0.001	0.001	0.0	No Limit
Sub-Matrix: SOIL Laboratory sample ID EP231B: Perfluoroalk ES2508808-017 EP231D: (n:2) Fluoroal ES2508808-001 ES2508808-001 ES2508808-001 ES2508808-017 EG020T: Total Metals ES2508685-005 ES2508685-004 ES2508965-004		EG020A-T: Zinc	7440-66-6	0.005	ma/L	0.085	0.086	0.0	0% - 50%
ES2508965-004	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	ma/L	<0.0001	< 0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/l	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440 50 8	0 001	mg/L	0 450	0 445	11	0% 20%
		FG020A-T: Lead	7439-92-1	0.001	ma/L	0.008	0.008	0.0	No Limit
		FG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.031	0.031	0.0	No Limit

EG035T: Total Recoverable Mercury by FIMS (QC Lot: 6477717)

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Sub-Matrix: WATER						Laboratory	Duplicate (DUP) Report		
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG035T: Total Rec	coverable Mercury by I	FIMS (QC Lot: 6477717) - continued							
ES2508713-004	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2508775-006	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP080/071: Total P	etroleum Hydrocarbor	ns (QC Lot: 6473080)							
EB2510260-001	Anonymous	EP080: C6 - C9 Fraction		20	µg/L	200	210	0.0	0% - 50%
ES2508713-003	Anonymous	EP080: C6 - C9 Fraction		20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total R	ecoverable Hydrocarb	ons - NEPM 2013 Fractions (QC Lot: 6473080)							
EB2510260-001	Anonymous	EP080 C6 C10 Fraction	C6_C10	20	µg/L	160	170	0.0	No Limit
ES2508713-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC	C Lot: 6473080)						1		
EB2510260 001	Anonymous	EP080: Benzene	71 43 2	1	µg/L	43	49	12.8	0% 20%
		EP080: Toluene	108-88-3	2	µg/L	4	4	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	2	2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	14	15	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	4	4	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES2508713-003 Ar	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100 41 4	2	µg/L	2	2	0 0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP231A: Perfluoroa	alkyl Sulfonic Acids (QC Lot: 6475705)							
ES2508631-004	Anonymous	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
	-	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoro	alkyl Carboxylic Acids	s (QC Lot: 6475705)							
ES2508631-004	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
-		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231D: (n:2) Fluc	protelomer Sulfonic Ad	cids (QC Lot: 6475705)							
ES2508631-004	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit

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Sub-Matrix: WATER						Laboratory I	Duplicate (DUP) Report		
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231D: (n:2) Fluore	otelomer Sulfonic Acid	ds (QC Lot: 6475705) - continued		Imber LOR Unit Original Result Duplicate Result RPD (%) Acceptable RPD (%) 97-2 0.05 μg/L <0.05 <0.05 0.0 No Limit 34-4 0.05 μg/L <0.05 <0.05 0.0 No Limit					
ES2508631-004 Anor	Anonymous	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit



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

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

Sub-Matrix: SOIL				Method Blank (MB)		Laboratory Control Spike (LCS) Report		
and modeline and				Report	Spike	Spike Recovery (%)	Acceptable	e Limits (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCL	_ot: 6471442)							
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	94.9	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	84.3	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	110	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	96.8	89.0	111
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	90.9	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	94.6	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	84.7	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 6471441)							
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	105	70.0	125
EG035T: Total Recoverable Mercury by FIMS (QCLot: 6471443)						1	
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	84.1	70.0	125
EP075(SIM)B: Polynuclear Aromatic Hydrocarb	ons (QCLot: 6470858)							
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	96.9	77.0	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	93.4	72.0	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	94.9	73.0	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	96.4	72.0	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	97.1	75.0	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	98.5	77.0	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	96.7	73.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	97.4	74.0	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	87.7	69.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	95.0	75.0	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	90.2	68.0	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	99.9	74.0	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	.91.4	70.0	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	89.3	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	91.9	62.0	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	85.9	63.0	121
EP080/071: Total Petroleum Hydrocarbons (QC	Lot: 6470859)							
EP071: C10 - C14 Fraction		50	mg/kg	<50	300 mg/kg	100	75.0	129

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Sub-Matrix: SOIL				Method Blank (MB)	Laboratory Control Spike (LCS) Report				
	the second se			Report	Spike	Spike Recovery (%)	Acceptable	e Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High	
EP080/071: Total Petroleum Hydrocarbons (QCLot	: 6470859) - continued								
EP071: C15 - C28 Fraction		100	mg/kg	<100	450 mg/kg	99.2	77.0	131	
EP071: C29 - C36 Fraction	، تبينو	100	mg/kg	<100	300 mg/kg	102	71.0	129	
EP080/071: Total Petroleum Hydrocarbons (QCLot:	6471305)								
EP080: C6 - C9 Fraction		10	mg/kg	<10	26 mg/kg	77.3	72.2	131	
EP080/071: Total Petroleum Hydrocarbons (QCLot:	6471310)								
EP080: C6 - C9 Fraction		10	mg/kg	<10	26 mg/kg	92.9	72.2	131	
EP080/071: Total Recoverable Hydrocarbons - NEPI	M 2013 Fractions (QCLo	t: 6470859)							
EP071: >C10 - C16 Fraction		50	mg/kg	<50	375 mg/kg	100	77.0	125	
EP071: >C16 - C34 Fraction		100	mg/kg	<100	525 mg/kg	99.4	74.0	138	
EP071: >C34 - C40 Fraction		100	mg/kg	<100	225 mg/kg	104	63.0	131	
EP080/071: Total Recoverable Hydrocarbons - NEPI	W 2013 Fractions (QCLo	ot: 6471305)							
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	77.8	72.4	133	
EP080/071: Total Recoverable Hydrocarbons - NEPI	W 2013 Fractions (QCLo	t: 6471310)							
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	86.0	72.4	133	
EP080: BTEXN (OCLot: 6471305)									
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	80.3	76.0	124	
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	81.2	78.5	121	
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	78.6	77.4	121	
EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	2 mg/kg	81.6	78.2	121	
	106-42-3								
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	85.6	81.3	121	
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	85.8	78.8	122	
EP080: BTEXN (QCLot: 6471310)									
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	86.5	76.0	124	
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	81.5	78.5	121	
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	81.8	77.4	121	
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	84.7	78.2	121	
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	81.6	81.3	121	
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	80.4	78.8	122	
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 647	1046)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	72.0	128	
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.6	67.0	130	
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.4	68.0	136	
EP231B: Perfluoroalkyl Carboxylic Acids (OCL of:)	5471046)		1						

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Sub-Matrix: SOIL				Method Blank (MB)	Laboratory Control Spike (LCS) Report				
			Method Blank (MB) Report Laboratory Cl Spike Laboratory Cl Spike LOR Unit Result Concentration L 0.001 mg/kg <0.001 0.00625 mg/kg 9 0.002 mg/kg <0.0002 0.00125 mg/kg 9 0.0002 mg/kg <0.0002 0.00125 mg/kg 8 0.0002 mg/kg <0.0002 0.00125 mg/kg 9 0.0002 mg/kg <0.0002 0.00125 mg/kg 9 0.0005 mg/kg <0.0005 0.00125 mg/kg 9 0.0001 mg/kg <0.0005 0.00125 mg/kg 9 0.001 mg/kg <0.0001	Spike Recovery (%)	Acceptable	e Limits (%)			
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High	
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 64	471046) - continued								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	91.9	71.0	135	
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	69.0	132	
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.4	70.0	132	
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	108	71.0	131	
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.5	69.0	133	
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot:	6471046)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	98.3	62.0	145	
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	103	64.0	140	
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	91.8	65.0	137	
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	79.8	69.2	143	
Sub Matrix: WATER				Method Blank (MB)	Laboratory Control Snike (LCS) Report				
Sub-Maula, WATER				Report	Spike	Spike Recovery (%)	Acceptable	e Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High	
EG020T: Total Metals by ICP-MS (QCLot: 6477699)									
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	97.0	82.0	114	
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	94.8	84.0	112	
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	98.0	86.0	116	
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	95.1	83.0	118	
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.2	85.0	115	
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	94.4	84.0	116	
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	117	79.0	117	
EG035T: Total Recoverable Mercury by FIMS (QCLo	t: 6477717)					A			
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	95.5	77.0	111	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (OCLot: 6471314)					1			
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	68.4	50.0	94.0	
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	75.0	63.6	114	
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	73.5	62.2	113	
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	74.4	63.9	115	
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	80.4	62.6	116	
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	80.2	64.3	116	
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	82.0	63.6	118	
EP075(SIM): Pyrene	129-00-0	1	μg/L	<1.0	5 µg/L	83.2	63.1	118	
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	84.3	64.1	117	
EP075(SIM): Chrysene	218-01-9	.1	µg/L	<1.0	5 µg/L	80.6	62.5	116	

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Sub-Matrix: WATER				Method Blank (MB)	IB) Laboratory Control Spike (LCS) Report				
				Report	Spike	Spike Recovery (%)	Acceptable	e Limits (%)	
Method: Combound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	(QCLot: 6471314) - cor	tinued							
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	76.6	61.7	119	
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	87.4	63.0	115	
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	91.0	63.3	117	
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1.	µg/L	<1.0	5 µg/L	87.3	59.9	118	
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	85.0	61.2	117	
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	91.7	59.1	118	
EP080/071: Total Petroleum Hydrocarbons (QCLot:	6471315)								
EP071: C10 - C14 Fraction	-	50	µg/L	<50	400 µg/L	79.1	53.7	97.0	
EP071: C15 - C28 Fraction		100	µg/L	<100	600 µg/L	94.4	63.3	107	
EP071: C29 - C36 Fraction	· · · · · ·	50	µg/L	<50	400 µg/L	99.1	58.3	120	
EP080/071: Total Petroleum Hydrocarbons (QCLot:	6473080)								
EP080: C6 - C9 Fraction		20	µg/L	<20	260 µg/L	87.4	75.0	127	
EP080/071: Total Recoverable Hydrocarbons - NEPM	M 2013 Fractions (QCLo	t: 6471315)							
EP071: >C10 - C16 Fraction		100	µg/L	<100	500 µg/L	79.2	53.9	95.5	
EP071: >C16 - C34 Fraction		100	µg/L	<100	700 µg/L	96.5	57.8	110	
EP071: >C34 - C40 Fraction	÷	100	µg/L	<100	300 µg/L	88.6	50.5	115	
EP080/071: Total Recoverable Hydrocarbons - NEPM	M 2013 Fractions (QCLo	t: 6473080)							
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	80.9	75.0	127	
EP080: BTEXN (QCLot: 6473080)									
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	86.7	68.3	119	
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	91.3	73.5	120	
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	91.9	73.8	122	
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	94.8	73.0	122	
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	91.8	76.4	123	
EP080: Naphthalene	91-20-3	5	hð/r	<5	10 µg/L	94.3	75.5	124	
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 647	5705)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	μg/L	<0.02	0.25 µg/L	89.8	72.0	130	
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	0.25 µg/L	83.8	68.0	131	
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	80.9	65.0	140	
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 6	6475705)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	96.3	73.0	129	
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	96.6	72.0	129	
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	98.2	72.0	129	



Sub-Matrix: WATER				Method Blank (MB)	Laboratory Control Spike (LCS) Report				
			Report	Spike	Spike Recovery (%)	Acceptable Limits (%)			
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High	
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 6	475705) - continued								
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	102	72.0	130	
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	96.0	71.0	133	
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot	:: 6475705)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	99.4	63.0	143	
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	103	64.0	140	
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	95.8	67.0	138	
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	127	71.4	144	

Matrix Spike (MS) Report

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

Sub-Matrix: SOIL		Matrix Spike (MS) Report					
				Spike	SpikeRecovery(%)	Acceptable	Limits (%)
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005(ED093)T: T	otal Metals by ICP-AES (QCLot: 6471442)						
ES2508808-007	3_3	EG005T: Arsenic	7440-38-2	50 mg/kg	112	70.0	130
	17 March 19	EG005T: Cadmium	7440-43-9	50 mg/kg	107	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	109	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	114	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	105	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	108	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	108	66.0	133
EG035T: Total Re	coverable Mercury by FIMS (QCLot: 6471	441)					
ES2508327-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	96.2	70.0	130
EG035T: Total Re	coverable Mercury by FIMS (QCLot: 6471	443)					
ES2508808-007	3_3	EG035T: Mercury	7439-97-6	5 mg/kg	93.4	70.0	130
EP075(SIM)B: Pol	ynuclear Aromatic Hydrocarbons (QCLot	6470858)					
ES2508808-001	1_1	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	99.5	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	105	70.0	130
EP080/071: Total I	Petroleum Hydrocarbons (QCLot: 647085	9)					
ES2508808-001	1_1	EP071: C10 - C14 Fraction		480 mg/kg	117	73.0	137
		EP071: C15 - C28 Fraction		3100 mg/kg	102	53.0	131
		EP071: C29 - C36 Fraction		2060 mg/kg	104	52.0	132
EP080/071: Total I	Petroleum Hydrocarbons (QCLot: 647130	5)					
ES2508327-001	Anonymous	EP080: C6 - C9 Fraction		32.5 mg/kg	83.6	60.4	142

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Sub-Matrix: SOIL			Matrix Spike (MS) Report				
			Spike	SpikeRecovery(%)	Acceptable	Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total	Petroleum Hydrocarbons (QCLot: (6471310)					
EN2505101-001	Anonymous	EP080: C6 - C9 Fraction		32.5 mg/kg	72.8	60.4	142
EP080/071: Total	Recoverable Hydrocarbons - NEPM	2013 Fractions (QCLot: 6470859)					
ES2508808-001	1_1	EP071: >C10 - C16 Fraction	<u>مست.</u>	860 mg/kg	100	73.0	137
		EP071: >C16 - C34 Fraction		4320 mg/kg	102	53.0	131
		EP071: >C34 - C40 Fraction		890 mg/kg	109	52.0	132
EP080/071: Total	Recoverable Hydrocarbons - NEPM	2013 Fractions (QCLot: 6471305)					
ES2508327-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	84.6	61.1	142
EP080/071: Total	Recoverable Hydrocarbons - NEPM	2013 Fractions (QCLot: 6471310)					
EN2505101-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	70.0	61.1	142
EP080: BTEXN (C	CLot: 6471305)						
ES2508327-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	79.8	62.1	122
in the second seco		EP080: Toluene	108-88-3	2.5 mg/kg	83.2	66.6	119
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	79.6	67.4	123
		EP080: meta- & para-Xylene	108-38-3	2.5 mg/kg	80.4	66.4	121
			106-42-3				
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	84.3	70.7	121
	and the second	EP080: Naphthalene	91-20-3	2.5 mg/kg	92.3	61.1	115
EP080: BTEXN (C	CLot: 6471310)						
EN2505101-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	73.2	62.1	122
		EP080: Toluene	108-88-3	2.5 mg/kg	72.1	66.6	119
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	74.8	67.4	123
		EP080: meta- & para-Xylene	108-38-3	2.5 mg/kg	75.7	66.4	121
			106-42-3	100000			
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	75.2	70.7	121
		EP080: Naphthalene	91-20-3	2.5 mg/kg	70.7	61.1	115
EP231A: Perfluor	oalkyl Sulfonic Acids (QCLot: 6471	046)					
ES2508808-001	1_1	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	77.6	72.0	128
1		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	87.0	67.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	80.0	68.0	136
EP231B: Perfluor	oalkyl Carboxylic Acids (QCLot: 6	471046)					
ES2508808-001	1_1	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	89.9	71.0	135
A REPORT OF A		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	104	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	94.3	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	100	71.0	131
L.		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	93.8	69.0	133



Sub-Matrix: SOIL				M	atrix Spike (MS) Repor	t	
				Spike	SpikeRecovery(%)	Acceptable	Limits (%)
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231D: (n:2) Flue	protelomer Sulfonic Acids (QCLot: 647	71046) - continued					
ES2508808-001	1_1	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	100	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	113	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	106	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	75.6	69.2	143
Sub-Matrix: WATER				M	atrix Spike (MS) Repor	t	
				Spike	SpikeRecovery(%)	Acceptable	Limits (%)
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020T: Total Met	als by ICP-MS (QCLot: 6477699)						
ES2508685-006	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	95.5	70.0	130
And the second second		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	96.0	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	101	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	94.7	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	114	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	96.0	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	95.1	70.0	130
EG035T: Total Re	coverable Mercury by FIMS (QCLot: 64	\$77717)					
ES2508713-005	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	88.6	70.0	130
EP080/071: Total P	etroleum Hydrocarbons (QCLot: 6473	080)					*
EB2510260-001	Anonymous	EP080: C6 - C9 Fraction		325 µg/L	82.8	70.0	130
EP080/071: Total R	Recoverable Hydrocarbons - NEPM 201	3 Fractions (QCLot: 6473080)					
EB2510260-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	80.7	70.0	130
EP080: BTEXN (Q	CLot: 6473080)						
EB2510260-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	92.3	70.0	130
1 million (1997)	and the second se	EP080: Toluene	108-88-3	25 µg/L	90.8	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	94.5	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	92.6	70.0	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	94.5	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	96.9	70.0	130
EP231A: Perfluoro	alkyl Sulfonic Acids (QCLot: 6475705)						
ES2508631-004	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	93.8	72.0	130
A 800.00		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	88.2	68.0	131
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	83.0	65.0	140
EP231B: Perfluoro	oalkyl Carboxylic Acids (QCLot: 64757	05)					
ES2508631-004	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	97.8	73.0	129
A PARTY OF CO.		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	106	72.0	129

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Work Order	ES2508808
Client	LORD HOWE ISLAND BOARD
Project	E241081 Lot 44 Lord Howe Island



Sub-Matrix: WATER			Matrix Spike (MS) Report				
				Spike	SpikeRecovery(%)	Acceptable	Limits (%)
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluor	roalkyl Carboxylic Acids (QCLot: 6475	705) - continued					
ES2508631-004	Anonymous	EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	108	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	108	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	100.0	71.0	133
EP231D: (n:2) Flu	uorotelomer Sulfonic Acids (QCLot: 64	75705)					
ES2508631-004	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	112	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	97.2	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	89.9	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	118	71.4	144



	QA/QC Compliance Assessment to assist with Quality Review								
Work Order	: ES2508808	Page	: 1 of 10						
Client	: LORD HOWE ISLAND BOARD	Laboratory	: Environmental Division Sydney						
Contact	: ANTHONY DAVIS	Telephone	: +61-2-8784 8555						
Project	: E241081 Lot 44 Lord Howe Island	Date Samples Received	: 24-Mar-2025						
Site	: Lot 44	Issue Date	: 03-Apr-2025						
Sampler	: Cheyne Hudson	No. of samples received	: 25						
Order number	:	No. of samples analysed	: 15						

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- <u>NO</u> Method Blank value outliers occur.
- <u>NO</u> Duplicate outliers occur.
- <u>NO</u> Laboratory Control outliers occur.
- <u>NO</u> Matrix Spike outliers occur.
- For all regular sample matrices, where applicable to the methodology, <u>NO</u> surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

• Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

• Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Analysis Holding Time Compliance

Aatrix:	WATER	
incatti i As	TIPAT LETA	

Method	Б	draction / Preparation		Analysis		
Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons						
Amber Glass Bottle - Unpreserved R1	28-Mar-2025	26-Mar-2025	2	-		t.
EP080/071: Total Petroleum Hydrocarbons						
Amber Glass Bottle - Unpreserved R1	28-Mar-2025	26-Mar-2025	2	-		-
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions						1. A.
Amber Glass Bottle - Unpreserved R1	28-Mar-2025	26-Mar-2025	2			

Outliers : Frequency of Quality Control Samples

Matrix: WATER	R	TE	WA	trix:	Ma
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Quality Control Sample Type		Count		Rate (%)		Quality Control Specification
Analytical Methods	Method	QC Regular		Actual Expected		
Laboratory Duplicates (DUP)						
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	7	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	11	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)						
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	7	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	11	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: SOIL				Evaluation	: × = Holding time	breach ; 🖌 = Within	n holding time.
Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Matrix: SOIL					Evaluation	: × = Holding time	breach ; 🗸 = With	in holding time	
Method		Sample Date	E	draction / Preparation		Analysis			
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA055: Moisture Content (Dried	@ 105-110°C)								
Soil Glass Jar - Unpreserved (EA	A055)						Constraints T		
1_1,	2_1,	19-Mar-2025				28-Mar-2025	02-Apr-2025	1	
2 3.	3 1,					the second second	10-10 D	1.1	
3 3.	5 2								
5 3	6.1								
6.3	7.1								
Dup 1.	Dup 2						/		
EA200: AS 4964 - 2004 Identifica	tion of Asbestos in Soils			h	-		1		
Snap Lock Bag - Friable Asbesto	os/PSD Bag (EA200)								
1_1,	2_3,	19-Mar-2025				31-Mar-2025	15-Sep-2025	1	
3 1.	5 3,	1.000							
6_2,	7_2					_			
EG005(ED093)T: Total Metals by	ICP-AES								
Soil Glass Jar - Unpreserved (EG	3005T)	1 35 000	Color Consta	Sec. Sec.	11 28	1.1.1.1.1.1.1.1.1	CHE STREET	1000	
1_1,	2_1,	19-Mar-2025	28-Mar-2025	15-Sep-2025	~	31-Mar-2025	15-Sep-2025	1	
2_3,	3_1,								
3_3,	5_2,								
5 3,	6 1,								
6 3.	7 1.								
Dup_1,	Dup_2					1. Sec. 1. 1	A company of the		
EG035T: Total Recoverable Mer	cury by FIMS								
Soil Glass Jar - Unpreserved (EC	G035T)	10000				1-	0.0000000	1000	
1_1,	2_1,	19-Mar-2025	28-Mar-2025	16-Apr-2025	~	01-Apr-2025	16-Apr-2025	1	
2_3,	3_1,					1.			
3 3,	5 2,								
5 3.	6 1.								
6 3.	7 1.								
Dup_1,	Dup_2			· · · · · · · · · ·					
EN60-DI: Bottle Leaching Proces	dure - Inorganics/PFAS (Plastic Vessel)								
Non-Volatile Leach: 180 day HT	(e.g. PFAS, metals ex.Hg) (EN60-DIa-P)			land statement of			1		
1_1,	3_1,	19-Mar-2025	28-Mar-2025	15-Sep-2025	1				
3_3,	5_2,								
6_3						/	5		
EP075(SIM)B: Polynuclear Arom	atic Hydrocarbons								
Soil Glass Jar - Unpreserved (EF	2075(SIM))								
1_1,	2_1,	19-Mar-2025	28-Mar-2025	02-Apr-2025	~	29-Mar-2025	07-May-2025	1	
2_3,	3_1,								
3_3,	5_2,								
5_3,	6_1,								
6_3,	7_1,								
Dup 1,	Dup 2				S				



Matrix: SOIL					Evaluation	n: × = Holding time	breach ; 🗸 = Withi	n holding time.
Method		Sample Date	Ð	traction / Preparation			Analysis	
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080)	1400 C	and the	and the second s	102.000.000		and a state of the state of the	10.0771000	100
6_3,	7_1,	19-Mar-2025	28-Mar-2025	02-Apr-2025	~	28-Mar-2025	02-Apr-2025	1
Dup_1,	Dup_2	and the second se		1				
Soil Glass Jar - Unpreserved (EP071)				00 4 0005			07 14-1 0005	
1_1,	2_1,	19-Mar-2025	28-Mar-2025	02-Apr-2025	~	29-Mar-2025	07-May-2025	~
2_3,	3_1,							
3_3,	5_2,							
5_3,	6_1,							
6_3,	7_1,							
Dup_1,	Dup_2							
EP080/071: Total Recoverable Hydrocarbons -	NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080)			Contractor of	Sarah Care	1	a marting	0224002222	
6_3,	7_1,	19-Mar-2025	28-Mar-2025	02-Apr-2025	~	28-Mar-2025	02-Apr-2025	~
Dup_1,	Dup_2							
Soil Glass Jar - Unpreserved (EP071)		TT Grate and	Des established	10000000	1	A dest lands	1000000	
1_1,	2_1,	19-Mar-2025	28-Mar-2025	02-Apr-2025	~	29-Mar-2025	07-May-2025	×
2_3,	3_1,				_			
3_3,	5_2,							
5_3,	6_1,							
6_3,	7_1,							
Dup_1,	Dup_2							
EP080: BTEXN			1					
Soil Glass Jar - Unpreserved (EP080)		Canada and C	and the second	a share	1	A CONTRACTOR	1.2.0.02.0	
6_3,	7_1,	19-Mar-2025	28-Mar-2025	02-Apr-2025	1	28-Mar-2025	02-Apr-2025	~
Dup_1,	Dup_2			1				
Soil Glass Jar - Unpreserved (EP080)		in the second	1000000000	100000000000000000000000000000000000000		41.07.00010	11.0.0000000	
1_1,	2_1,	19-Mar-2025	28-Mar-2025	02-Apr-2025	1	29-Mar-2025	02-Apr-2025	~
2_3,	3_1,					1.		
3_3,	5_2,					A		
5_3,	6_1					1 · · · · · · · · · · · · · · · · · · ·		
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)			1		·	1		
1_1,	2_1,	19-Mar-2025	28-Mar-2025	15-Sep-2025	1	31-Mar-2025	07-May-2025	1
2_3,	3_1,		1.					0
3_3,	5_2,							
5_3,	6_1,							
6_3,	7_1,							
Dup 1								



Matrix: SOIL					Evaluation	: × = Holding time	breach ; ✓ = Withi	in holding time	
Method		Sample Date	Б	traction / Preparation		Analysis			
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231B: Perfluoroalkyl Carboxylic Acids									
HDPE Soil Jar (EP231X)									
1_1,	2_1,	19-Mar-2025	28-Mar-2025	15-Sep-2025	1	31-Mar-2025	07-May-2025	1	
2 3.	3 1,		ALC: NO DESCRIPTION					1.1	
3 3.	5 2.								
5 3.	6 1.								
6.3	7.1								
Dup 1	1-9								
EP231D: (n:2) Eluorotelomer Sulfonic Acid	Is								
HDPE Soil Jar (EP231X)									
1 1.	2 1,	19-Mar-2025	28-Mar-2025	15-Sep-2025	1	31-Mar-2025	07-May-2025	1	
2 3.	3 1.								
3 3.	5.2.								
5.3	6.1								
6.3	7 1								
Dup 1	1-11								
EP231P: PEAS Sums									
HDPE Soil Jar (EP231X)									
1.1.	2 1.	19-Mar-2025	28-Mar-2025	15-Sep-2025	1	31-Mar-2025	07-May-2025	1	
2 3.	3 1.		1.000					2	
3 3	5.2								
5.3	6.1								
6.3	7 1								
Dup 1	120						, L.		
					Evaluation	· · - Holding time	breach : V - Withi	in holding time	
Method		Sample Date	Evaluation			Analysis			
Container / Client Sample ID(s)		Sample Date	Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
			Date CARacted	Duc for Calidouon	Evaluation	Date analysed	Duc for analysis	Evaluation	
Clear Plastic Bottle - Nitric Acid: Unfiltered	(EG020A-T)			1			-		
R1		19-Mar-2025	01-Apr-2025	15-Sep-2025	1	01-Apr-2025	15-Sep-2025	1	
EG035T: Total Recoverable Mercury by Fil	MS								
Clear Plastic Bottle - Nitric Acid; Unfiltered	(EG035T)				1		1 are set of		
R1	CLOREN	19-Mar-2025				02-Apr-2025	16-Apr-2025	1	
EP075(SIM)B: Polynuclear Aromatic Hydro	carbons								
Amber Glass Bottle - Unpreserved (EP075)	SIM))	1 Sec. 6.7	See. Sugar	Contraction of the		ALC: NO.	DIG STOR	1.50	
R1		19-Mar-2025	28-Mar-2025	26-Mar-2025	*	01-Apr-2025	07-May-2025	1	
EP080/071: Total Petroleum Hydrocarbons									
Amber Glass Bottle - Unpreserved (EP071)			Children and			Terror and	123.13.1.11.11.1	100	
R1		19-Mar-2025	28-Mar-2025	26-Mar-2025	×	01-Apr-2025	07-May-2025	1	
Amber VOC Vial - Sulfuric Acid (EP080)				00 4 0005	1.0				
R1		19-Mar-2025	28-Mar-2025	02-Apr-2025	-	29-Mar-2025	02-Apr-2025	1	



Matrix: WATER					Evaluation	: × = Holding time	breach ; 🗸 = With	in holding time	
Method Container / Client Sample ID(s)		Sample Date	E	draction / Preparation		Analysis			
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP080/071: Total Recoverable Hydroca	rbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EPC R1)71)	19-Mar-2025	28-Mar-2025	26-Mar-2025	*	01-Apr-2025	07-May-2025	1	
Amber VOC Vial - Sulfuric Acid (EP080) R1		19-Mar-2025	28-Mar-2025	02-Apr-2025	1	29-Mar-2025	02-Apr-2025	1	
EP080: BTEXN									
Amber VOC Vial - Sulfuric Acid (EP080) R1		19-Mar-2025	28-Mar-2025	02-Apr-2025	1	29-Mar-2025	02-Apr-2025	1	
EP231A: Perfluoroalkyl Sulfonic Acids		and the second							
HDPE (no PTFE) (EP231X) 1_1, 3_3, 6_3	3_1, 5_2,	28-Mar-2025	31-Mar-2025	24-Sep-2025	1	02-Apr-2025	24-Sep-2025	~	
EP231B: Perfluoroalkvi Carboxviic Aci	ds								
HDPE (no PTFE) (EP231X) 1_1, 3_3, 6_3	3_1, 5_2,	28-Mar-2025	31-Mar-2025	24-Sep-2025	1	02-Apr-2025	24-Sep-2025	1	
EP231D: (n:2) Fluorotelomer Sulfonic	Acids							1	
HDPE (no PTFE) (EP231X) 1_1, 3_3, 6_3	3_1, 5_2,	28-Mar-2025	31-Mar-2025	24-Sep-2025	1	02-Apr-2025	24-Sep-2025	~	
EP231P: PFAS Sums									
HDPE (no PTFE) (EP231X) 1_1, 3_3, 6_3	3_1, 5_2,	28-Mar-2025	31-Mar-2025	24-Sep-2025	1	02-Apr-2025	24-Sep-2025	×	

Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS

Total Mercury by FIMS



Quality Control Parameter Frequency Compliance

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

Matrix: SOIL			Evaluatio	on: \star = Quality Co	/ not within specification ; 🗹 = Quality Control frequency within specificatio		
Quality Control Sample Type		0	ount	Rate (%)			Quality Control Specification
Analytical Methods	Method	OC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	10.00	10.00	1	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	13	15.38	10.00	1	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	11	18.18	10.00	1	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	29	10.34	10.00	1	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	16	12.50	10.00	1	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	13	15.38	10.00	1	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	34	11.76	10.00	1	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)						A REAL PROPERTY OF	
PAH/Phenols (SIM)	EP075(SIM)	1	13	7.69	5.00	1	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	11	9.09	5.00	1	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	29	6.90	5.00	1	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	16	6.25	5.00	1	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	13	7.69	5.00	1	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	34	5.88	5.00	1	NEPM 2013 B3 & ALS QC Standard
, Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	13	7.69	5.00	1	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	11	9.09	5.00	1	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	29	6.90	5.00	1	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	16	6.25	5.00	1	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	13	7.69	5.00	1	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	34	5.88	5.00	1	NEPM 2013 B3 & ALS QC Standard
Matrix Snikes (MS)							
PAH/Phenois (SIM)	EP075(SIM)	1	13	7.69	5.00	1	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	11	9.09	5.00	1	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	29	6.90	5.00	1	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	16	6.25	5.00	1	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	13	7.69	5.00	1	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	34	5.88	5.00	1	NEPM 2013 B3 & ALS QC Standard
	2. 505					ana ann an h-	
Matrix: WATER				Evaluatio	on: * = Quality Co	ontrol frequency	not within specification ; < = Quality Control frequency within specification.
Quality Control Sample Type	Mothod	00	Count		Rate (%)	Evaluation	Quality Control Specification
Analytical Methods	метоо	QC	Regular	Actual	Expected	LvaluauOn	
Laboratory Duplicates (DUP)			7 7				
PAH/Phenois (GC/MS - SIM)	EP075(SIM)	0	1	0.00	10.00	×	NEPM 2013 B3 & ALS QC Standard

20

19

5.00

10.53

10.00

10.00

×

1

1

2

EP231X

EG035T

NEPM 2013 B3 & ALS QC Standard

NEPM 2013 B3 & ALS QC Standard



Matrix: WATER				Evaluatio	n: × = Quality Co	ntrol frequency	not within specification ; \checkmark = Quality Control frequency within specification
Quality Control Sample Type		C	ount		Rate (%)		Quality Control Specification
Analytical Methods	Method	oc	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP) - Continued							
Total Metals by ICP-MS - Suite A	EG020A-T	2	17	11.76	10.00	1	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	11	0.00	10.00	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	1	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	7	14.29	5.00	1	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	1	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	5.26	5.00	1	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	5.88	5.00	1	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	11	9.09	5.00	1	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	1	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	.1	7	14.29	5.00	1	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	1	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	5.26	5.00	1	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	5.88	5.00	~	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	11	9.09	5.00	~	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	1	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)				-			
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	7	0.00	5.00	×	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	1	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	5.26	5.00	1	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	5.88	5.00	1	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	11	0.00	5.00	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	1	NEPM 2013 B3 & ALS QC Standard


Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3).
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of fresh and saline waters by solid phase extraction (SPE) followed by negative mode LC-ESI-MS/MS using MRM and isotope dilution or internal standard quantitation. Isotope dilution standards (where commercially available) and surrogates are added to the sample container. The entire contents are transferred to a weak anion exchange (WAX) solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Data quality objectives for internal standard recoveries are based on US EPA method 1633.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).



Analytical Methods	Method	Matrix	Method Descriptions
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270 Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Preparation Methods	Method	Matrix	Method Descriptions
Deionised Water Leach - Plastic Leaching Vessel	EN60-DIa-P	SOIL	In house QWI-EN/60 referenced to AS4439.3 Preparation of Leachates
Hot Block Digest for metals in soils sediments and sludges	EN69.	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
QuECheRS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.
Solid Phase Extraction (SPE) for PFAS in water	ORG72	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.

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Appendix D Data validation report



Project number:	E241081	Project name:	Lord Howe Island Preliminary Site Investigation								
Client:	LHIB/KPMG	Site(s):	Lot 44								
Matrix type:	Soil, Water	Laboratory:	ALS								
Sampling event:	Soil sampling event	Lab reference:	ES2508808								
Validation by:	Jude Lewis	Date:	15/04/2025								
Verification by:	Lachlan Lewis	Date:	16/04/2025								
Field QA/QC											
Sampling personnel	Soil sampl	ing was conducted on 19	/03/2025 by C. Hudson (Broadcrest).								
Sampling Methodolo	gy Soil sampl	Soil sampling was completed by hand auguring at six locations to a maximum depth of 1.2 m.									
Chain of Custody (CC	C) Chain of c	Chain of custody documents were completed by C. Hudson (Broadcrest).									
Analysis Request	Laborator	y analysis request review	ed and approved by J. Lewis (EMM).								
Rinsate Blanks	Rinsate bl equipmen auger. All	anks were collected at a r t was used. One rinsate b analytes were below the	minimum frequency of one per day when non-dedicated plank samples (sample ID R1) was collected from the hand limit of reporting (LOR).								
Intra-laboratory dup	licates Intra-labo samples fr primary sa	Intra-laboratory duplicate samples were collected at a minimum frequency of 1 in 20 primary samples for TRH, BTEXN, PAHs and heavy metals, and at a minimum frequency of 1 in 10 primary samples for PFAS. One intra-laboratory duplicate (sample ID Dup_1) was collected.									
Inter-laboratory dup	licates No inter-la	No inter-laboratory duplicate samples were collected during this sampling event.									
Handling and preserv	vation All sample	All samples were received at the laboratories in appropriate sample containers.									
	Due to the to keep sa laboratory chilled on	Due to the logistical constraint of distance to the nearest laboratory, it was not always possible to keep samples chilled during transportation. The sample batch was received at the primary laboratory at 23.4°C, above the recommended range (<6°C). It is understood that samples were chilled on the plane between Lord Howe Island and Sydney.									
-	The samp	es were received approp	riately preserved.								
Laboratory QA/QC											
Tests requested/rep	orted Samples w FC_01 wh	vere analysed and reporte ich was not received by t	ed as requested on the COC, with the exception of sample he lab.								
Holding time complia	ance Samples w of:	vere extracted and analys	ed within recommended holding times, with the exception								
	EP075(: sample	 EP075(SIM)B Polynuclear Aromatic Hydrocarbons extracted two days overdue for rinsate sample R1. 									
	• EP080/ R1.	071 Total Petroleum Hyd	rocarbons extracted two days overdue for rinsate sample								
	 EP080/ overdu 	071 Total Recoverable Hy e for rinsate sample R1.	drocarbons – NEPM 2013 Fractions extracted two days								
	This is not laboratory	expected to impact on the contract on the contract of the cont	he quality of the data as the above analytes were below the amples.								
Laboratory Accredita	tion The labora (NATA) ac	The laboratory analysis was conducted by ALS, a National Association of Testing Authorities (NATA) accredited laboratory.									
Frequency of laborat	ory QC The labora results ha of three a analytes d samples fo the one w	The laboratory reported a sufficient frequency of quality control samples to assess whether results have been reported to an acceptable accuracy and precision for most analytes. A tot of three analytes did not meet the sufficient frequency for laboratory duplicates and two analytes did not meet the sufficient frequency for matrix spikes. These were quality control samples for the water matrix and are not expected to impact on the quality of the data due the one water sample (rinsate R1) having no concentrations of analytes above the LOR.									

DATA QUALITY ASSURANCE AND QUALITY CONTROL REPORT

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DATA QUALITY ASSURANCE AND QUALITY CONTROL REPORT

Project number:	E241081		Project name:	Lord Howe Island Preliminary Site Investigation							
Client:	LHIB/KPMC	G	Site(s):	Lot 44							
Matrix type:	Soil, Water		Laboratory:	ALS							
Sampling event:	Soil sampli	ng event	Lab reference:	ES2508808							
Validation by:	Jude Lewis		Date:	15/04/2025							
Verification by:	Lachlan Lev	wis	Date:	16/04/2025							
Method Blank		Method bla	Nethod blank concentrations were not detected above the LOR for all analytes								
Laboratory duplicate	RPDs	Laboratory control limi	Laboratory duplicate (LD) Relative Percentage Differences (RPDs) were within laboratory control limits for all analytes.								
Laboratory control s	pike recovery	LCS recover	LCS recoveries were within laboratory control limits.								
Matrix spike recover	Y	Matrix spike (MS) recoveries were within laboratory control limits.									
Surrogate spike reco	very	Surrogate spike recoveries were within laboratory control limits.									
Data Validation											
Comparison of Field and Laboratory Resu	Observations Its	No anomalous results between field observations and analysis results were noted.									
Data transcription		A random check of the laboratory results identified no anomalies between the electronic da the laboratory reports, and tables generated by EMM.									
Limits of Reporting (LOR)	LORs were sufficiently low to enable assessment against adopted criteria.									
Intra-laboratory dup	licate RPDs	RPDs for intra-laboratory duplicates were within control limits.									
Inter-laboratory duplicate RPDs		No inter-laboratory duplicate RPDs were collected during this sampling event.									
Comments											

Based on EMM's review, it is considered that an acceptable degree of QA/QC information has been collected and reported in accordance with EMM and the laboratory internal standard operating procedures. The assessment of field and laboratory QA/QC data indicated that the reported analytical results are generally representative of the conditions at the sample locations analysed and that the overall quality of the data produced is considered to be acceptably reliable for the purpose of this investigation. Despite the minor variations/outliers summarised above, the laboratory data are considered to provide an appropriate level of confidence in the precision, accuracy, representativeness, comparability and completeness of the analytical results, and are considered suitable for interpretive use.



		Field ID	5_2	Dup_2	-
		Date	19 Mar 2025	19 Mar 2025	
		Matrix Type	Soil	Soil	Carl I
F	16	Lab Report Number	ES2508808	ES2508808	RPD
	Unit	501			
Inorganica	Unic	EQL			-
Moisture Content	92		6.9	65	5
Motols	70		0.8	0.5	
Amonic	me/ka	5	-5	25	0
Cadmium	mg/kg	1	1	2	0
Chromium (III.)/I)	mg/kg	2	19	21	10
Conner	mg/kg	5	15	56	24
tead	mg/kg	5	19	27	35
Mercury	mg/kg	01	15	0.4	0
Nickel	mg/kg	2	10	12	26
Zine	mg/kg	5	596	774	20
	mg/ kg		380	//4	20
Nanhthalene (VOC)	ma/ka	1		21	0
Renzene	mg/kg	0.2	<0.2	<0.2	0
Toluene	mg/kg	0.5	20.5	-0.2	0
Ethylhonzone	mg/kg	0,5	<0.5	0.5	0
Yulono (m. R. n)	mg/kg	0,5	<0.5	(0,5	0
Xylene (iii & p)	mg/kg	0.5	<0.5	<0.5	0
Xylene (0)	mg/kg	0.5	<0.5	<0.5	0
Total BTEV	mg/kg	0.5	<0.3	<0.3	0
	mg/kg	0.2	<0.2	<0.2	0
CE C10 Eraction (E1)	malka	10	<10	<10	0
C6-C10 Flattion (F1)	mg/kg	10	<10	<10	0
SCID CIE Fraction (F2)	mg/kg	50	<10	<10	0
SCIO-CIB Fraction (F2)	mg/kg		<50	<50	0
Nanhthalana)	malka	50	450	~50	0
SCIE C24 Eraction (E2)	mg/kg	100	<100	<100	0
SC24 C40 Fraction (F4)	mg/kg	100	<100	<100	0
>C10 C40 Fraction (Fum)	mg/kg	100 E0	<100	<100	0
Thu	mg/ Kg		00	< 30	0
C6-C9 Fraction	mg/kg	10	~10	<10	n
C10-C14 Fraction	mg/kg	50	<50	<50	0
C15-C28 Fraction	mg/kg	100	<100	<100	0
C20 C26 Fraction	mg/kg	100	<100	<100	0
C10.C26 Fraction (Sum)	mg/kg	50	<50	<50	0
DAU	mg/ kg	50	100	4,50	0
Acepanbthene	ma/ka	0.5	20.5	(0.5	0
Acenaphthylene	mg/kg	0.5	<0.5	<0.5	0
Anthracene	mg/kg	0.5	<0.5	<0.5	0
Benz(a)anthracene	mg/kg	0.5	<0.5	<0.5	0
Benzo(a) nyrene	mg/kg	0.5	<0.5	(0.5	0
Benzo(b±i)fluoranthene	mg/kg	0,5	<0.5	<0.5	0
Benzo(g h i)perviene	mg/kg	0.5	<0.5	<0.5	0
Benzo(k)fluoranthene	mg/kg	0.5	<0.5	<0.5	0
Chrysene	mg/kg	0.5	<0.5	<0.5	0
Dihenz(a blanthracene	mg/kg	0.5	<0.5	(0.5	0
Fluoranthene	mg/kg	0,5	<0.5	<0.5	0
Fluorene	mg/kg	0.5	20.5	<0.5	0
Indeno(1,2,3-c d)nyrana	mg/kg	0.5	<0.5	<0.5	0
Naphthalene	mg/kg	0.5	<0.5	<0.5	0
Phenanthrene	mg/kg	0.5	(0.5	(0.5	0
Dyrono	mg/kg	0,5	<0.5	(0.5	0
Benzo(a)nyrene TEO calc (Half)	mg/kg	0.5	0.5	0.5	0
Benzo(a)pyrene TEO (LOD)	mg/kg	0.5	1.2	1.2	0
Benzo(a)pyrene TEO calc (Zero)	mg/kg	0.5	205	40.5	0
PAHs (Sum of total)	mg/kg	0.5	<0.5	<0.5	0
i vina founi or rouni	1 116/ AB	0.5	-0.5	-015	

*RPDs have only been considered where a concentration is greater than 1 times the EQL. **Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 200 (1 - 10 x EQL); 30 (10 - 30 x EQL); 30 (> 30 x EQL)) ***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

1 of 1



		Field ID	R1
		Lab Report Number	E\$2508808
		Las Report Marine	132300000
	Unit	EQL	
Metals	1		
Arsenic	mg/L	0.001	<0.001
Cadmium	mg/L	0.0001	<0.0001
Chromium (III+VI)	mg/L	0.001	<0.001
Copper	mg/L	0.001	<0.001
Lead	mg/L	0.001	<0.001
Mercury	mg/L	0.0001	<0.0001
Nickel	mg/L	0.001	<0.001
Zinc	mg/L	0.005	<0.005
3TEX	1		
Naphthalene (VOC)	mg/L	0.005	<0.005
Benzene	μg/L	1	<1
Toluene	µg/L	2	<2
Ethylbenzene	µg/L	2	<2
Xylene (m & p)	µg/L	2	<2
Xylene (o)	µg/L	2	<2
Xylene Total	µg/L	2	<2
Total BTEX	µg/L	1	<1
[RH]			
C6-C10 Fraction (F1)	μg/L	20	<20
C6-C10 (F1 minus BTEX)	µg/L	20	<20
>C10-C16 Fraction (F2)	µg/L	100	<100
>C10-C16 Fraction (F2 minus	101		
Naphthalene)	μg/L	100	<100
>C16-C34 Fraction (F3)	ug/L	100	<100
>C34-C40 Fraction (F4)	µg/L	100	<100
>C10-C40 Fraction (Sum)	ug/L	100	<100
ГРН			
C6-C9 Fraction	ug/L	20	<20
C10-C14 Fraction	ug/L	50	<50
C15-C28 Fraction	ug/L	100	<100
C29-C36 Fraction	ug/L	50	<50
C10-C36 Fraction (Sum)	ug/L	50	<50
РАН			
Acenaphthene	ug/L	1	<1.0
Acenaphthylene	ug/L	1	<1.0
Anthracene	ug/L	1	<1.0
Benz(a)anthracene	ug/1	1	<1.0
Benzo(a) pyrene	ug/L	0.5	<0.5
Benzo(b+i)fluoranthene	mg/l	0.001	<0.0010
Benzo(g.h.i)pervlene	ug/t	1	<1.0
Benzo(k)fluoranthene	ug/1	1	<1.0
Chrysene	ug/1	1	<1.0
Dihenz(a h)anthracene	ug/1	1	<1.0
Fluoranthene	ug/1	1	<1.0
Fluorene	μσ/L	1	<1.0
Indeno(1 2 3-c d)nyrana	<u>µв/с</u> µв/1	1	21.0
Nanhthalene	μα/ι	1	<1.0
Dhananthrana	μg/L	1	<1.0
Durano	με/ι	1	<1.0
Renzo(a)purono TEO colo (Zero)	μg/L mg/l	0.0005	<1.0
benzo(a)pyrene iEQ calc (zero)	mg/L	0.0005	<0.0005

μg/L	0.5	<0.5
	μg/L	μg/L 0.5

Appendix E Analytical results





				Me	tals	1			1		(BT	EX				1
	Arsenic	Cadmium	Chromium (III+VI)	Copper	ead	Mercury	Vickel	Cinc	Vaphthalene (VOC)	Benzene	oluene	thylben zene	(ylene (m & p)	(ylene (o)	tylene Total	lotal BTEX	C6-C10 Fraction (F1)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	5	1	2	5	5	0.1	2	5	1	0.2	0.5	0.5	0.5	0.5	0.5	0.2	10
CRC Care 2011 HSL Direct Contact - Intrusive Maintenance Worker				1					-	1,100	120,000	85,000		1	130,000		82,000
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil										1	U						700
PFAS NEMP 2025 Ecological direct exposure – all land uses				1				5									
PFAS NEMP 2025 HIL C Public open space				1	1		12 - 24			1 mar 21		30 OK				_	1
PFAS NEMP 2025 Interim ecological indirect exposure – all land uses		[]			1		1.1	1	1		10.000						
NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand	1											1				1	1
NEPM 2013 Table 18(5) Generic EIL - Urban Res & Public Open Space	100			4					170		-			1			
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil	the second s	1		1					1	50	85	70	-	1	105		1
NEPM 2013 Table 1A(1) HILS Rec C Soil	300	90		17,000	600	80	1,200	30,000		1000	10.00	1		1		1	-

Field ID	Location Code	Date	Depth	Sample Type	Lab Report Number																_	
1_1	BH01	19 Mar 2025	0 - 0.2	Normal	ES2508808	6	<2#1	33	13	9	<0.1	44	54	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10
2_1	BH02	19 Mar 2025	0-0.2	Normal	ES2508808	8	<2#1	54	19	14	<0.1	93	68	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10
2_3	BH02	19 Mar 2025	1-1.2	Normal	ES2508808	6	<2#1	37	22	20	<0.1	33	60	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10
3_1	BH03	19 Mar 2025	0 - 0.2	Normal	ES2508808	5	<2#1	14	<5	<5	<0.1	15	62	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10
3_3	BH03	19 Mar 2025	1-1.2	Normal	ES2508808	<5	<2#1	12	<5	<5	<0.1	6	19	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0,5	<0.2	<10
5_2	BH05	19 Mar 2025	0.5 - 0.7	Normal	ES2508808	<5	<2#1	19	44	19	0.4	10	586	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10
5_3	BH05	19 Mar 2025	1-1.2	Normal	ES2508808	<5	<2#1	15	36	23	0.4	10	514	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10
6_1	BH06	19 Mar 2025	0-0.2	Normal	ES2508808	<5	<2#1	24	12	21	<0.1	17	163	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10
6_2	BH06	19 Mar 2025	0.5 - 0.7	Normal	ES2508808	-	17			-									1	-	-	
6_3	BH06	19 Mar 2025	1-1.2	Normal	ES2508808	<5	<2#1	15	5	5	<0.1	8	51	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10
7_1	BH07	19 Mar 2025	0-0.3	Normal	ES2508808	8	3	32	33	48	<0.1	50	143	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10
7_2	BH07	19 Mar 2025	0.3 - 0.7	Normal	ES2508808	200		-	1.000			11 Tyr 11	1		I	1	5.00	-145	1	-		
Dup_1	BH03	19 Mar 2025	0.5 - 0.7	Field_D	ES2508808	<5	<2#1	16	<5	<5	<0.1	8	49	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0,5	<0.2	<10
Dup_2	BH05	19 Mar 2025	0.5 - 0.7	Field_D	ES2508808	<5	<2#1	21	56	27	0.4	13	774	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10

#1 Reported Analyte LOR is higher than Requested Analyte LOR

Environmental Standards

CRC Care, 2011, CRC Care 2011 HSL Direct Contact - Intrusive Maintenance Worker NEPM, NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil HEPA, March 2025, PFAS NEMP 2025 Ecological direct exposure – all land uses HEPA, March 2025, PFAS NEMP 2025 HL C Public open space HEPA, March 2025, PFAS NEMP 2025 Interim ecological indirect exposure – all land uses 2013, NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand 2013, NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil

2013, NEPM 2013 Table 1A(1) HILs Rec C Soil

Lord Howe Island Lot 44 Preliminary Site Investigation E241081



			TRH						ТРН								
	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthen e
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	10	50	50	100	100	50	10	50	100	100	50	0.5	0.5	0.5	0.5	0.5	0.5
CRC Care 2011 HSL Direct Contact - Intrusive Maintenance Worker	1	62,000		85,000	120,000		1.		1		1						
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil		1,000		2,500	10,000						1				1		
PFAS NEMP 2025 Ecological direct exposure – all land uses																	
PFAS NEMP 2025 HIL C Public open space	_						, i				-						
PFAS NEMP 2025 Interim ecological indirect exposure — all land uses						1 T.	1 - 1			-		· · · · · · · · · · · · · · · · · · ·					S
NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand						()	1	(1	1	1	1					1
NEPM 2013 Table 18(5) Generic ElL - Urban Res & Public Open Space											1						1
NEPM 2013 Table 18(6) ESLs for Urban Res, Coarse Soil	180	120	120	300	2,800	-	1		[1			0.7	
NEPM 2013 Table 1A(1) HILs Rec C Soil						-	12			-	1.1	-		2		1	1

Field ID	Location Code	Date	Depth	Sample Type	Lab Report Number								_									
1_1	BH01	19 Mar 2025	0 - 0.2	Normal	ES2508808	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2_1	BH02	19 Mar 2025	0-0.2	Normal	ES2508808	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2_3	BH02	19 Mar 2025	1-1.2	Normal	ES2508808	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3_1	BH03	19 Mar 2025	0 - 0.2	Normal	ES2508808	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3_3	BH03	19 Mar 2025	1-1.2	Normal	ES2508808	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0,5	<0.5	<0.5
5_2	BH05	19 Mar 2025	0.5 - 0.7	Normal	ES2508808	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
5_3	BH05	19 Mar 2025	1-1.2	Normal	ES2508808	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
6_1	BH06	19 Mar 2025	0-0.2	Normal	ES2508808	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0,5	<0.5	<0.5
6_2	BH06	19 Mar 2025	0.5 - 0.7	Normal	ES2508808			19		×		8	170	(-		-	171			
6_3	BH06	19 Mar 2025	1-1.2	Normal	ES2508808	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0,5	<0.5	<0.5
7_1	BH07	19 Mar 2025	0-0.3	Normal	ES2508808	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
7_2	BH07	19 Mar 2025	0.3 - 0.7	Normal	ES2508808		54.c		-	~	1.00		1	(÷	n - percent	1.0		÷	÷	· · ·
Dup_1	BH03	19 Mar 2025	0.5 - 0.7	Field_D	ES2508808	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dup_2	BH05	19 Mar 2025	0.5 - 0.7	Field_D	ES2508808	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

#1 Reported Analyte LOR is higher than Requested Analyte LOR

Environmental Standards

CRC Care, 2011, CRC Care 2011 HSL Direct Contact - Intrusive Maintenance Worker NEPM, NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil HEPA, March 2025, PFAS NEMP 2025 Ecological direct exposure – all land uses HEPA, March 2025, PFAS NEMP 2025 HLC Public open space HEPA, March 2025, PFAS NEMP 2025 Interim ecological indirect exposure – all land uses 2013, NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand 2013, NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil

2013, NEPM 2013 Table 1A(1) HILs Rec C Soil



				P/	AH										Leaching Preparation	
	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracen e	Fluoranthene	Fluorene	Indeno(1,2,3- c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ calc (Half)	Benzo(a)pyrene TEQ (LOR)	Benzo(a)pyrene TEQ calc (Zero)	PAHs (Sum of total)	pH (Final)	Perfluorobutane
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		mg/kg
EQL	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.1	0.0002
CRC Care 2011 HSL Direct Contact - Intrusive Maintenance Worker			1	0				29,000						je i		
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil		-					-							1		
PFAS NEMP 2025 Ecological direct exposure – all land uses								5								
PFAS NEMP 2025 HIL C Public open space						12	1									
PFAS NEMP 2025 Interim ecological indirect exposure — all land uses	(18) (17) (18) (18)						J.C.	1			-	1			I make a second of	
NEPM 2013 Table 1A(3) Rec E Soil HSL for Vapour Intrusion, Sand	1.1					-			1		1			1	1	
NEPM 2013 Table 18(5) Generic EIL - Urban Res & Public Open Space				1				170		-		1		1		
NEPM 2013 Table 18(6) ESLs for Urban Res, Coarse Soil		1			-	2	1		1			1		1	1	1
NEPM 2013 Table 1A(1) HILs Rec C Soil			1		1		1-1-1-2		1-	-	3	3	3	300		

Field ID	Location Code	Date	Depth	Sample Type	Lab Report Number	(
1_1	BH01	19 Mar 2025	0 - 0.2	Normal	ES2508808	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	8.8	<0.0002
2_1	BH02	19 Mar 2025	0-0.2	Normal	ES2508808	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1,2	<0.5	<0.5		<0.0002
2_3	BH02	19 Mar 2025	1-1.2	Normal	ES2508808	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5		<0.0002
3_1	BH03	19 Mar 2025	0 - 0.2	Normal	ES2508808	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	9.4	<0.0002
3_3	BH03	19 Mar 2025	1-1.2	Normal	ES2508808	<0.5	<0.5	<0.5	<0,5	<0.5	<0.5	<0,5	<0.5	<0.5	<0.5	0.6	1,2	<0.5	<0.5	9.6	<0.0002
5_2	BH05	19 Mar 2025	0.5 - 0.7	Normal	ES2508808	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	9.0	<0.0002
5_3	BH05	19 Mar 2025	1-1.2	Normal	ES2508808	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5		<0.0002
6_1	BH06	19 Mar 2025	0-0.2	Normal	ES2508808	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0,5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	+	<0.0002
6_2	BH06	19 Mar 2025	0.5 - 0.7	Normal	ES2508808						-		174	1		1	· · · ·	÷	-	- 75	
6_3	BH06	19 Mar 2025	1-1.2	Normal	ES2508808	<0,5	<0.5	<0.5	<0.5	<0.5	<0.5	<0,5	<0.5	<0,5	<0.5	0.6	1,2	<0.5	<0.5	8.9	<0.0002
7_1	BH07	19 Mar 2025	0-0.3	Normal	ES2508808	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5		<0.0002
7_2	BH07	19 Mar 2025	0.3 - 0.7	Normal	ES2508808	1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-			1	35			- AC-1	1		1			-	-	· · · · ·
Dup_1	BH03	19 Mar 2025	0.5 - 0.7	Field_D	ES2508808	<0,5	<0.5	<0.5	<0,5	<0.5	<0.5	<0,5	<0.5	<0.5	<0.5	0.6	1,2	<0.5	<0.5		<0.0002
Dup_2	BH05	19 Mar 2025	0.5 - 0.7	Field_D	ES2508808	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	-	

#1 Reported Analyte LOR is higher than Requested Analyte LOR

Environmental Standards

CRC Care, 2011, CRC Care 2011 HSL Direct Contact - Intrusive Maintenance Worker NEPM, NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil HEPA, March 2025, PFAS NEMP 2025 Ecological direct exposure – all land uses HEPA, March 2025, PFAS NEMP 2025 HLC Public open space HEPA, March 2025, PFAS NEMP 2025 Interim ecological indirect exposure – all land uses 2013, NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand 2013, NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil

2013, NEPM 2013 Table 1A(1) HILs Rec C Soil

Lord Howe Island Lot 44 Preliminary Site Investigation E241081



			_	_	_	_		_					P	FAS		-	-
	sulfonic acid (PFBS)	Perfluorohexane	sulfonic acid (PFHxS)	Perfluorooctane	sulfonic acid (PFOS)	Perfluorobutanoic	acid (PFBA)	Perfluorohexanoic	acid (PFHxA)	Perfluoro pentanoic	acid (PFPeA)	Perfluoroheptanoic	acid (PFHpA)	Perfluorooctanoic	acid (PFOA)	4:2 Fluorotelomer	sulfonic acid (4:2 FTS)
	μg/L	mg/kg	µg/L	mg/kg	μg/L	mg/kg	µg/L	mg/kg	µg/L	mg/kg	μg/L	mg/kg	µg/L	mg/kg	µg/L	mg/kg	µg/L
EQL	0.02	0.0002	0.01	0.0002	0.01	0.001	0.1	0.0002	0.02	0.0002	0.02	0.0002	0.02	0.0002	0.01	0.0005	0.05
CRC Care 2011 HSL Direct Contact - Intrusive Maintenance Worker									1		1			1			
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil							Personal Property lies										
PFAS NEMP 2025 Ecological direct exposure – all land uses				1										10			
PFAS NEMP 2025 HIL C Public open space		1		1		1						2		10			
PFAS NEMP 2025 Interim ecological indirect exposure – all land uses	De la Casa da	1 million (1997)		0.003		1.0		1		10 million (10 million)		S		0.003			Sec. 1.
VEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand										1 3						1	
NEPM 2013 Table 18(5) Generic EIL - Urban Res & Public Open Space				1			-		1					1			
NEPM 2013 Table 18(6) ESLs for Urban Res, Coarse Soil			1		1	-			[1			1			1
NEPM 2013 Table 1A(1) HILs Rec C Soil						-			, I			S		1	- L.	1	

Field ID	Location Code	Date	Depth	Sample Type	Lab Report Number	-	_		-			_										
1_1	BH01	19 Mar 2025	0 - 0.2	Normal	ES2508808	<0.02	<0.0002	0.04	0.0005	0.01	<0.001	<0.1	<0.0002	<0.02	<0.0002	<0.02	<0.0002	<0.02	<0.0002	<0.01	<0.0005	<0.05
2_1	BH02	19 Mar 2025	0-0.2	Normal	ES2508808	-	<0.0002		0.0011	- R.	<0.001	9	<0.0002	-	<0,0002	1.1.4	<0.0002		<0.0002	~	<0.0005	
2_3	BH02	19 Mar 2025	1-1.2	Normal	ES2508808	1 - 2 - 1	<0.0002	-	0.0007		<0.001		<0.0002	1 a	<0.0002		<0.0002	E.	<0.0002	-	<0.0005	1.4
3_1	BH03	19 Mar 2025	0 - 0.2	Normal	ES2508808	<0.02	<0.0002	<0.01	<0.0002	<0.01	<0.001	<0.1	<0.0002	<0.02	<0.0002	<0.02	<0.0002	<0.02	<0.0002	<0.01	<0.0005	<0.05
3_3	BH03	19 Mar 2025	1-1.2	Normal	ES2508808	<0.02	<0.0002	0.02	<0.0002	<0.01	<0.001	<0.1	<0.0002	<0.02	<0.0002	<0.02	<0.0002	<0.02	<0.0002	<0.01	<0.0005	<0.05
5_2	BH05	19 Mar 2025	0.5 - 0.7	Normal	ES2508808	<0.02	<0.0002	<0.01	0.0004	<0.01	<0.001	<0.1	<0.0002	<0.02	<0.0002	<0.02	<0.0002	<0.02	<0.0002	<0.01	<0.0005	<0.05
5_3	BH05	19 Mar 2025	1-1.2	Normal	ES2508808		<0.0002		0.0004		<0.001		<0.0002	1	<0.0002		<0.0002		<0.0002		<0.0005	1
6_1	BH06	19 Mar 2025	0-0.2	Normal	ES2508808	1000	<0.0002		0.0009	1.1	<0.001	1.1	<0.0002	1	<0.0002	1.04	<0.0002	-	0.0003	100 million (100 million)	<0.0005	10.1410
6_2	BH06	19 Mar 2025	0.5 - 0.7	Normal	ES2508808					~		8		1 = 90. =					1.0.0		-	-
6_3	BH06	19 Mar 2025	1-1.2	Normal	ES2508808	<0.02	<0.0002	<0.01	0.0003	<0.01	<0.001	<0,1	<0.0002	<0.02	<0.0002	<0.02	<0.0002	<0.02	<0.0002	<0.01	<0.0005	<0.05
7_1	BH07	19 Mar 2025	0-0.3	Normal	ES2508808	e	<0.0002	÷ .	0.0007	-	<0.001		<0.0002	-2	<0.0002		<0.0002		0.0002	-	<0.0005	
7_2	BH07	19 Mar 2025	0.3 - 0.7	Normal	ES2508808			- X	1						1)÷		45 E		
Dup_1	BH03	19 Mar 2025	0.5 - 0.7	Field_D	ES2508808	100.200	<0.0002	-	0.0004	1. Q. 11	<0.001	1.1	<0.0002		<0.0002	11.112	<0.0002	- ž	<0.0002	1.46.1.1	<0.0005	1.14
Dup_2	BH05	19 Mar 2025	0.5 - 0.7	Field_D	ES2508808		150.00	÷	10.00		1114-011	8	1.00	it nam	1000	1.42	-	4		1.14	-	- × 1

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Environmental Standards

CRC Care, 2011, CRC Care 2011 HSL Direct Contact - Intrusive Maintenance Worker NEPM, NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil HEPA, March 2025, PFAS NEMP 2025 Ecological direct exposure – all land uses HEPA, March 2025, PFAS NEMP 2025 HL C Public open space HEPA, March 2025, PFAS NEMP 2025 Interim ecological indirect exposure – all land uses 2013, NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand 2013, NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil

2013, NEPM 2013 Table 1A(1) HILs Rec C Soil



											Inorganics	Biota	Asbestos	Mass	Particulates
	6:2 Fluorotelomer	sulfonic acid (6:2 FTS)	8:2 Fluorotelomer	sulfonic acid (8:2 FTS)	10:2 Fluorotelomer	surronic acta (10:2 FTS)	Sum of PFHxS and	PFOS	Sum of PFAS (WA DER List)	Sum of PFAS (WA DER List)	Moisture Content	Biota Description	Asbestos detected	weight of sample	Organic Fibre
	mg/kg	µg/L	mg/kg	µg/L	mg/kg	µg/L	mg/kg	µg/L	mg/kg	µg/L	%	-	Yes/No	g	i internet
EQL	0.0005	0.05	0.0005	0.05	0.0005	0.05	0.0002	0.01	0.0002	0.01	1			0.01	
CRC Care 2011 HSL Direct Contact - Intrusive Maintenance Worker				1				1	1						
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil		-	a second s												
PFAS NEMP 2025 Ecological direct exposure – all land uses														8	
PFAS NEMP 2025 HIL C Public open space							1					_			
PFAS NEMP 2025 Interim ecological indirect exposure – all land uses							1.1.1			a				1.0	
VEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand	1.1.1		1											1	3
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space				1											
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil	and the second s				1	-			1						
NEPM 2013 Table 1A(1) HILs Rec C Soil			()	1.										1	

Field ID	Location Code	Date	Depth	Sample Type	Lab Report Number		_		_							· · · ·				
1_1	BH01	19 Mar 2025	0 - 0.2	Normal	ES2508808	<0.0005	<0.05	<0.0005	<0.05	<0.0005	<0.05	0.0005	0.05	0.0005	0.05	7.1	Soil sample	No	422	No
2_1	BH02	19 Mar 2025	0-0.2	Normal	ES2508808	<0.0005	1.00	<0.0005		<0.0005	11.1.	0.0011		0.0011		12.9	-			
2_3	BH02	19 Mar 2025	1-1.2	Normal	ES2508808	<0.0005	1 200	<0.0005	1.72.7	<0.0005	11.51.55	0.0007	-	0.0007		8.7	Soil sample	No	611	No
3_1	BH03	19 Mar 2025	0 - 0.2	Normal	ES2508808	<0.0005	<0.05	<0.0005	<0.05	<0.0005	<0.05	<0.0002	<0.01	<0.0002	<0.01	1.5	Soil sample	No	546	No
3_3	BH03	19 Mar 2025	1-1.2	Normal	ES2508808	<0.0005	<0.05	<0.0005	<0.05	<0.0005	<0.05	<0.0002	0.02	<0.0002	0.02	4.5		1 £		
5_2	BH05	19 Mar 2025	0.5 - 0.7	Normal	ES2508808	<0.0005	<0.05	<0.0005	<0.05	<0.0005	<0.05	0.0004	<0.01	0.0004	<0.01	6.8				
5_3	BH05	19 Mar 2025	1-1.2	Normal	E\$2508808	<0.0005		<0.0005		<0.0005		0.0004		0.0004		6.6	Soil sample	No	531	No
6_1	BH06	19 Mar 2025	0-0.2	Normal	ES2508808	<0.0005	1.1.6	<0.0005	1.1.1	<0.0005	HI CONTRACTOR	0.0009		0.0012	-	9.3	1000			-
6_2	BH06	19 Mar 2025	0.5 - 0.7	Normal	ES2508808	1	. = 9 - 1		-		-			1 · · · · · · · · · · · · · · · · · · ·		-	Soil sample	No	499	No
6_3	BH06	19 Mar 2025	1-1.2	Normal	ES2508808	<0.0005	<0.05	<0.0005	<0.05	<0.0005	<0.05	0.0003	<0.01	0.0003	<0.01	6.3	-			
7_1	BH07	19 Mar 2025	0-0.3	Normal	ES2508808	<0.0005	-	<0.0005	-	<0.0005	· · · · · · · · · · · · · · · · · · ·	0.0007	9	0.0009		14.4				
7_2	BH07	19 Mar 2025	0.3 - 0.7	Normal	E\$2508808	1-0-0	1 = 142	1	1.0.0					1		-	Soil sample	No	570	No
Dup_1	BH03	19 Mar 2025	0.5 - 0.7	Field_D	ES2508808	<0.0005	11.9	<0.0005	11.54	<0.0005	11.02.000	0.0004	-	0.0004		4.3		-	-	
Dup_2	BH05	19 Mar 2025	0.5 - 0.7	Field_D	ES2508808	-	1.1	÷ 1	1.1	1.5-0.1	1.1	1 × 1	4	1 - 2	-	6.5		-		- 1

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2013, NEPM 2013 Table 1A(1) HILs Rec C Soil

Lord Howe Island Lot 44 Preliminary Site Investigation E241081

Australia

SYDNEY Level 10 201 Pacific Highway St Leonards NSW 2065 T 02 9493 9500

NEWCASTLE Level 3 175 Scott Street Newcastle NSW 2300 T 02 4907 4800

BRISBANE Level 1 87 Wickham Terrace Spring Hill QLD 4000 T 07 3648 1200

CANBERRA Suite 2.04 Level 2 15 London Circuit Canberra City ACT 2601 ADELAIDE Level 4 74 Pirie Street Adelaide SA 5000 T 08 8232 2253

MELBOURNE Suite 9.01 Level 9 454 Collins Street Melbourne VIC 3000 T 03 9993 1900

PERTH Suite 3.03 111 St Georges Terrace Perth WA 6000 T 08 6430 4800

Canada

TORONTO 2345 Yonge Street Suite 300 Toronto ON M4P 2E5 T 647 467 1605

VANCOUVER 2015 Main Street Vancouver BC V5T 3C2 T 604 999 8297

CALGARY 700 2nd Street SW Floor 19 Calgary AB T2P 2W2



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Development Application **ACCESS REPORT**

Reference Number: 24362

Client: Site Address: Barbara Tarnawski Architects Pty Ltd

Lot 44, Neds Beach Road, Lord Howe Island, NSW

Vista Access Architects Pty. Ltd.

Executive Summary and Design Compliance Statement

This Access Compliance Report is to accompany a Development Application (DA) for the development proposed at Lot 44, Neds Beach Road, Lord Howe Island, NSW. The development is within Lord Howe Island Board LGA and proposes Additions and Alterations to Existing Building for a community building. 1 accessible carparking space for visitor use has been provided in the development.

The development has building classification as detailed below:

- Class 5 (office building for professional or commercial use)
- Class 6 (shops, sale of goods and services by retail)
- Class 9b (assembly building, school)

This report is based on the relevant components of:

- Building Code of Australia (BCA) 2022, Volume 1- Performance requirements of D1P1, D1P2, D1P8, D1P9, E3P4, F4P1 and Parts D4, E3 and F4 (where applicable)
- Disability (Access to Premises Buildings) Amendment Standards 2010
- AS1428.1-2021 Part 1: General requirements for access, including any amendments
- AS1428.4.1-2009 Part 4.1: TGSIs (Tactile ground surface indicators), including any amendments
- AS2890.6-2009 Part 6: Off-street parking for people with disabilities.

The assessment of the proposed development has been undertaken to the extent necessary to issue DA consent under the Environmental Planning and Assessment Act. The proposal achieves the spatial requirements to provide access for people with a disability and it is assumed that assessment of the detailed requirements such as assessment of internal fit-out, details of stairs, ramps and other features will occur at CC (Construction Certificate) stage.

By compliance with the recommendation in this report, the development complies with the requirements of:

 Access Code of Disability (Access to Premises - Buildings) Amendment Standards 2010, and the Disability Access relevant sections of applicable BCA (Building Code of Australia)/ NCC (National Construction Code)

Note: At the time of issuing this report the **Disability (Access to Premises - Buildings) Amendment (2024 Measures No. 1) Standards 2024** has been released which references AS1428.1-2021 which conflicts with the BCA/NCC2022 referencing AS1428.1-2009. It is our opinion that AS1428.1-2021 is to be used for purposes of compliance with APS which is a Federal Act and therefore higher in the hierarchy of legislation than the BCA/NCC. However, this would mean that any feature of AS1428.1-2021 that is used in this project that differs from the requirements of AS1428.1-2009 will need a Performance Solution to comply with the BCA/NCC

The ABCB (Australian Building Codes Board) has issued a directive noting that Disability (Access to Premises - Buildings) Amendment Standards 2010 is still appliable along with AS1428.1-2009. Therefore this report notes the requirements as per Disability (Access to Premises - Buildings) Amendment Standards 2010 and AS1428.1-2009.



The information contained in this statement is true and accurate to the best of our knowledge. Our gualifications and accreditations are listed below

Assessed by

Jenny Desai

Accredited Access Consultant and LHA Assessor ACAA Accredited Membership number 572 Qualified- Certificate IV in Access Consulting LHA Assessor Licence number 20242



Vista Access Architects Pty. Ltd.

Peer reviewed by



Farah Madon

Accredited Access Consultant and LHA Assessor ACAA Accredited Membership number 281 Qualified- Diploma in Access Consulting LHA Assessor Licence number 10032





Relevant Dates:

Fee proposal, number FP-240742 dated 26-08-2024. Fee proposal was accepted by Client on 29-11-2024

Assessed Drawings:

The following drawings by Barbara Tarnawski Architects have been assessed for compliance.

Drawing no	Issue	Date	Details
241124-05	D	02-04-2025	Floor plan



Docum	ent Issue:	
Issue	Date	Details
Draft 1	27-02-2025	Issued for Architect's review
A	02-04-2025	Issue A

Limitations and Copyright information:

This report is based on discussions with the project architect and a review of drawings and other relevant documentation provided to us. No site visit was undertaken for the purposes of this report.

This assessment is based on the provided drawings and not based on constructed works; hence the assessment will provide assurance of compliance only if all the recommendations as listed in this report are complied with and constructed in accordance with the requirements of the current BCA, AS1428.1, AS2890.6 and other latest, relevant standards and regulations applicable at the time of construction.

Assessment is based on classification/use of the building. If the class of the building changes to any other building class, this access report will have to be updated accordingly.

Unless stated otherwise, all dimensions mentioned in the report are net (CLEAR) dimensions and are not to be reduced by projecting skirting, kerbs, handrails, lights, fire safety equipment, door handles less than 900mm above FFL (finished floor level) or any other fixtures/fit out elements. When we check drawings, we assume that the dimensions noted are CLEAR dimensions and therefore the Architect / Builder shall allow for construction tolerances.

Only some numerical requirements from relevant AS (Australian Standards) have been noted in the report and for further details and for construction purposes refer to the latest relevant AS.

This report and all its contents including diagrams are a copyright of Vista Access Architects Pty Ltd (VAA) and can only be used for the purposes of this specific project. Copy-pasting diagrams from this report to Architectural plans will constitute copyright infringement.

This report is does not assess compliance matters related to WHS, Structural design, Services design, Parts of DDA other than those related to APS or Parts of BCA or Parts of AS other than those directly referenced in this report.

Where LHS assessments are provided there, we will use our best judgement regarding LHA assessments. However, we are not to be held responsible if another licenced LHA assessor comes to a different conclusion about compliance, certification, or allocation of a particular Quality mark to us as several items in LHA are subject to interpretation.

We have no ability to check for slip resistance of surfaces. All wet areas, parking areas, pavement markings shall have the appropriate slip resistance for the location.

Note: The Access report prepared for Development Application (DA) or Section 4.55 is not suitable for use for purposes of Construction Certificate (CC) Application.



Hierarchy of Access-related Legislation and Standards





Hierarchy of Access-related Legislation and Standards (continued)

Disability Discrimination Act 1992

The federal Disability Discrimination Act 1992 provides protection for everyone in Australia against discrimination based on disability. Sections 23 and 24 of the DDA focuses on the provision of equitable and dignified access to premises, goods, services and facilities for people with mobility, sensory and cognitive disabilities.

Disability discrimination happens when people with a disability and their relatives, friends or carers, co-workers or associates are treated less fairly than people without a disability.

Compliance with Access to Premises Standards gives certainty to building certifiers, building developers and building managers that if access to new parts of the building is provided in accordance with these standards, the provision of that access to the extent covered by these standards, will not be unlawful under the DDA. This however applies only to the new buildings or new parts of an existing building and the "affected part".

All areas outside the scope of these areas are still subject to the DDA. We cannot guarantee or certify for DDA compliance because DDA compliance can only be assessed by the courts where a complaint is made. Scope of DDA extends beyond the building fabric and also includes furniture, fittings, building management, employment, education, accommodation, clubs, sport and the administration of Commonwealth laws and programs.

Compliance assessment with Disability (Access to Premises - Buildings) Amendment Standards 2010 (APS) for Existing Buildings

Affected part upgrades

Requirement:

- In general, APS covers new building work to existing buildings, such as an extension or an upgrade.
- APS only applies to the part of the building that is the subject of the building approval application (i.e., new, and modified works) and the 'affected part' of works.
- Application of the APS to the new work in an existing building does not trigger the need to upgrade the whole building or parts of the building outside the new work that is subject to the building approval application.
- The definition of 'affected part' of a building is limited to the area between (and including) the principal pedestrian entrance and the new work but does not extend from the entrance to the allotment boundary or any required carparking spaces. It also does not extend to any toilet facilities or other rooms adjacent to the pathway between the principal pedestrian entrance and the area of the new work.
- When the 'affected part' is triggered it does not require access upgrades to any step or stairway adjacent to a continuous accessible path of travel.
- Where an access barrier, such as a step, is located at the threshold of a principal pedestrian entrance the 'affected part' upgrade would require the removal of the step.

Compliance Complies (limited to new works, modified works and works within the affected path as identified earlier in the report)

Comments

As stated in the above requirements, APS only applies to,

- New works,
- Modified works and
- Works within the 'affected part'

In this development, the new works, modified works and works within the 'affected part' have been shown in the plan below, highlighted in red.





Compliance assessment with Access related requirements of BCA and Disability (Access to Premises - Buildings) Amendment Standards 2010

The development consists of Additions and Alterations to an existing building and therefore the requirements in this report only apply to the New works, Modified works and Works within the 'affected part' as identified earlier in the report

BCA 2022 Part D4 Access for People with a Disability D4D2 General building Access requirements

Requirement

Class 5 / 6 - Commercial/ Retail.

To and within all areas that are normally used by the occupants.

Compliance

Complies (limited to new works, modified works and works within the affected path as identified earlier in the report)

Comments

- Access has been provided to and within all areas required to be accessible.
- Access has been provided to all common use areas.
- Access has not been provided to common use garbage storage rooms as it is assumed that a
 caretaker will be provided due to the commercial use of the premises and where required individual
 bins can be provided within the businesses for use by visitors.
- All common use accessway widths are to be a minimum of 1M clear measured from skirting to skirting (increases to comply with door circulation spaces where doorways provided) with vertical clearance of at least 2M or 1.98M at doorways.

Details to be verified at CC stage of works.

BCA 2022 Part D4D3 Access to buildings

Requirement

Accessway is required from:

- Main pedestrian entry door for existing buildings (as per APS)
- Any other accessible building connected by a pedestrian link.
- Accessible car parking spaces.

Complies (limited to new works, modified works and works within the affected path as identified earlier in the report)

Comments

Compliance

Community Building: Entry via Neds Beach Road

- Access by means of a kerb ramp and 1:14 grade ramps have been provided from the accessible car parking space to main entry door of the boundary.
- No new parking spaces have been identified in the development.

Details to be verified at CC stage of works.



Requirement

Common use External Walkway / Pedestrian access requirements as per AS1428:

- Accessible path of travel to have a gradient no steeper than 1 in 20 and a maximum cross fall or landings to be maximum of 1:40 (or maximum 1:33 for bitumen).
- Landings are required as below
 - for 1:20 grade walkways, 1200mm flat landings are required every 15M intervals
 - for 1:33 grade walkways, 1200mm flat landings are required every 25M intervals
 - for walkways with gradients between 1:33 and 1:20, 1200mm flat landings are required at intervals obtained by liner interpolation.
 - Above intervals can be increased by 30% where at least one side of walkway has a kerb or kerbrail with handrail or a wall with a handrail.
 - For walkways shallower than 1:33 no landings are required.
 - The floor surface abutting the sides of the walkway to be provided with
 - a firm and level surface (of a different material) at the same level and grade of the walkway and extend horizontally for a minimum of 600mm, or
 - 150mm high kerb (can be reduced to 65 if required), or
 - kerb-rail with handrail, or
 - wall / fence / balustrade or similar barrier
- At 60° to 90° bends in pathways provide a 1500mmx1500mm space with maximum 500mm splay at internal corner.
- At 30° to < 60° bends in pathways that are less than 1200mm provide a splay of 500mm at internal corner.



Requirement

Common use floor or ground surfaces requirements:

- Use slip-resistant surfaces
- The texture of the surface is to be traversable by people who use a wheelchair and those with an ambulant or sensory disability.
- Abutment of surfaces is to have a smooth transition.
- Construction tolerances to be 0+/- 3mm vertical or 0+/-5mm, provided the edges are bevelled or rounded. This also applies to abutting pavers
- Where joints are provided in pavers, the mortar joints to be between 1-12mm with maximum depth of 2mm. Paver profile and mortar joint variation to not exceed 2mm.



Grates if used in the accessible path of travel are required to comply with the following:

- Circular openings maximum of 13 mm in diameter
- Slotted openings to be not greater than 13mm wide and not greater than 150mm long and be oriented so that the long dimension is transverse to the dominant direction of travel. Where slotted openings are less than 8mm, the length of the slots may continue across the width of paths of travel
- Linear openings to be oriented so that the longer dimension is transverse to the dominant direction
 of travel, except where linear openings are less than 8 mm wide, there the orientation is optional.

Timber decking and boardwalks

The gap between boards depends on the type of board used and the location of installation

- For decking boards maximum 150mm wide the installation to be have maximum 6mm gap.
- Adjacent boards shall be level within a maximum vertical 3mm tolerance
- For decking boards over 150mm wide the gap may be increased to maximum of 10mm. Where the gap exceeds 8mm the boards shall run transverse to the direction of travel.

Compliance	Capable of compliance
Comments	

Details to be verified at the CC stage of works.

Requirement

Accessway is required through:

- Principal pedestrian entry; and
- Not less than 50% of all pedestrian entrances; and
- In building with floor area over 500m², a non-accessible entry must not be located more than 50M from an accessible entry.

Compliance

Complies (limited to new works, modified works and works within the affected path as identified earlier in the report)

Comments

The building has only 1 pedestrian entry, which has been designed to be accessible

Requirement

All common use doorways to comply with AS1428.1 and the below requirements

Where accessible pedestrian entry has Multiple doorways:

- At least 1 to be accessible if 3 provided
- At least 50% to be accessible, if more than 3 provided
- Where doorway has multiple leaves, at least 1 leaf is to have clear opening of 850mm (excluding automatic doors)

Doorway requirements

- All common use doorways in the development within accessible path of travel (other than doorways non-accessible sanitary facilities) to have a clear opening of at least 850mm with appropriate door circulation spaces in accordance with AS1428.1. In case of multiple leaf doorways, at least 1 operable leaf is required to provide a clear opening of 850mm with the door circulations spaces as per AS1428.1.
- Ambulant toilet cubicle door to have a clear door opening of 700mm.
- Space required for door circulation spaces to have a maximum floor grade of 1:40 (doorway threshold ramps are permitted within the circulation space).



- Door thresholds are to be level, or they can incorporate a doorway threshold ramp with a maximum grade of 1:8, for maximum rise of 35mm and a maximum length of 280mm and located within 20mm of the door leaf, with edges to be tapered or splayed at a minimum of 45° where it does not abut a wall.
- Sliding doorways to be provided with recessed floor tracks to enable flush transition from the inside of the building.
- Distance between successive doorways in airlocks to be 1450mm which is measured when the door is in open position in case of swinging doors.
- Door hardware including door handles, door closers and the in-use indicators / snibs in accessible and ambulant toilets are required to comply with requirements of AS1428.1
- Luminance contrast requirements to doorways and other glazed areas to comply with AS1428.1
- Door reveals depth to be maximum of 300mm to the door face.
- Apart from main entry door and doors to any accessible toilets, the door handle height requirements can be varied if required for Childcare centres, swimming pool barriers or similar situations where the location of the opening and locking controls is prescribed by the relevant statutory authority.

Glazed viewing panels in doorway requirements (where compliance is required with AS1428.1-2021)

- Glazed viewing panels in doors to be as per AS1288
- The lower edge of the glazing should be no more than 1000 mm above FFL
- The upper edge of the glazing should be not less than 1600 mm above FFL
- In width, the glazing should extend to within not more than 200 mm from the latch edge of the door and be not less than 150 mm wide.







BCA 2022 Part D4D4 Parts of buildings required to be accessible

Requirement

Every common use **Ramp** with grades steeper than 1:20 and less than or equal to 1:14 (excluding fireisolated ramp) is to be compliant with AS1428.1, including (but not limited to):

- Maximum gradient of 1:14 with 1.2M flat landings at top, bottom and at maximum 9M of ramp and appropriate turning spaces as required by AS1428.1.
- 1M clear width to be provided between handrails / kerb / kerbrails. (curved ramps to be min 1.5M width between handrails / kerb / kerbrails with crossfall towards the centre of curvature) and located at height between 865mm-1000mm above FFL (finished floor level).
- AS1428 compliant handrails and kerbs to be provided on both sides with appropriate extensions

Compliance Complies with spatial requirements (limited to new works, modified works and works within the affected path as identified earlier in the report)

Comments

Detailed features will be assessed with the requirements of AS1428.1 at the CC stage of works.

Requirement

Step ramp if provided in common use areas is to be compliant with AS1428.1 and NCC/BCA

Compliance

N/A

Comments



This type of ramp has not been identified within the new works, modified works or works within the affected part.

Requirement

Kerb ramp if provided in common use areas is to be compliant with AS1428.1 including;

- Maximum grade of 1:8, maximum height of 190mm, maximum length of 1520mm
- Landings as per AS1428.1

Compliance

Complies with spatial requirements (limited to new works, modified works and works within the affected path as identified earlier in the report)

Comments

Where this type of ramp is provided, the details of the ramp will be assessed with the relevant requirements of AS1428.1 at the CC stage of works.

Requirement

Every Stairway in common use areas (excluding fire-isolated stairway) is to be compliant with AS1428.1 including;

- Handrails to be provided on both sides with 1M clearance between them and located at consistent . height, between 865mm-1000mm above FFL, with no vertical sections.
- Either provide handrail extensions or offset first riser going up at mid landings
- . Opaque risers required with nosing to have a sharp intersection or rounded or chamfered to 5mm.
- . Handrails to extend a minimum of 300mm horizontally past the nosing on the top riser. At the bottom of the stairs the handrail is to extend at least one tread depth parallel to the line of the nosing, plus a minimum of 300mm horizontally from the last riser.

Compliance

Complies with spatial requirements (limited to new works, modified works and works within the affected path as identified earlier in the report)

Comments

Where this type of stairway is provided, the details of the stairway will be assessed with the relevant requirements of AS1428.1 at the CC stage of works.



600-800 TGSIs are required where the distance of the landing is 3000mm or more. For landings less than 3000mm, reduce the width of TGSIs to 300-400



handrail 865 - 1000

to do

Requirement

Every Fire-isolated Stairway is to be compliant with AS1428.1 as required

Compliance

N/A

Comments

This type of stairway has not been identified within the new works, modified works or works within the affected part.

Requirement

Nosing for common use fire-isolated and non-fire-isolated stairways to comply with AS1428.1

Compliance

Capable of compliance

Comments

Detailed features of the nosing strips will be assessed with the requirements of AS1428.1 at the CC stage of works.

Requirement

Slip resistance to comply with BCA 2022, Table D3D15 and AS2890.6 when tested in accordance with AS4586 and AS4663

BCA 2022 Table D3D15 Slip -resistance requirements when tested in accordance with AS4586:

Application (common use areas)	Surface conditions	S
	Dry	Wet
Ramp (and accessways to accessible parking spaces) steeper than 1:14	P4 or R11	P5 or R12
Ramp steeper than 1:20 but not steeper than 1:14	P3 or R10	P4 or R11
Accessways to accessible parking spaces not steeper than 1:14	P3 or R10	P4 or R11
Tread or landing surface for ramps and stairways	P3 or R10	P4 or R11
Nosing or landing edge strip	P3	P4
Accessible parking spaces and shared areas	P3 or R10	P4 or R11

HB 197/ HB198 An introductory guide to the slip resistance of pedestrian surface materials provides guidelines for the selection of slip-resistant pedestrian surfaces

Compliance

Capable of compliance

Comments

For Slip resistance of surfaces the builder is required to provide a Certificate stating that the Slip resistance of the surfaces comply with the above listed requirements when tested as per AS4586 at CC stage of works.

Requirement

Every Passenger lift is to comply with the requirements of BCA 2022, E3D7.

Compliance

N/A



No lifts have been identified in the development within the new works, modified works or works within the affected part.

Requirement

Passing spaces requirement

N/A

It is a requirement to provide passing spaces in common use accessways complying with AS1428.1 at maximum 20 M intervals, where a direct line of sight is not available. Space required is 1800x2800mm (in the direction of travel). Chamfer of 400x400mm is permitted at corners.

Compliance

Comments

There are no accessways over 20M lengths in the development where a direct line of sight is not available

Requirement

Turning spaces requirement

It is a requirement to provide turning spaces in common use accessways complying with AS1428.1 within 2M of the end of accessways where it is not possible to continue travelling and at every 20M intervals. CLEAR Space required is 1540mmx2070mm in the direction of travel (measured from skirting to skirting).

Compliance

Complies with spatial requirements

Comments

 Adequate turning spaces have been provided with minimum common use passageway widths being 1540mm clear or alternatively a space of 1540mmx2070mm provided at or within 2M of the end of the passageway.

Details to be verified at CC stage of works.

N/A

Advisory note

Where furniture layouts have been decided in developments, ensure that 1M clear space is available around all furniture and that a turning space of 1540mmx2070mm (in the direction of travel) is provided in areas where travel is no longer possible and a person in a wheelchair would be required to make a 180° turn

Requirement

Carpets, when provided in common use areas or areas with accessible SOUs to comply with AS1428.1

Compliance

Comments

Use of carpets have not been identified in the common use areas within the new works, modified works or works within the affected part.



BCA 2022 Part D4D5 Exemption

Requirement

Access is not required to be provided in the following areas:

- Where access would be inappropriate because of the use of the area
- Where area would pose a health and safety risk
- Any path which exclusively provides access to an exempted area

Compliance

For information only

Comments

Areas such as lift machine rooms, fire services room, commercial kitchens, areas in childcare centres such as nappy change room or cot rooms etc or exclusive staff use areas in storage facilities. in the development are exempted from providing access under this clause due to WHS concerns.

Where a caretaker is provided in the development, the toilet provided exclusively for use by the caretaker can be excluded from providing access based on the provisions in this clause. This also applies for access to commercial use bin areas

BCA 2022 Part D4D7 Signage

Requirement

Braille and Tactile signage are required to identify Accessible Sanitary facilities





[Image description: Diagram to help choose the correct signage based on LH/RH transfer]







International sign of access is required to signage to all accessible sanitary facilities (excluding SOUs within Class 1b or Class 3) and signage is required to identify if facility is for LH (left hand transfer) or RH (right hand transfer)

Compliance

Unisex Toilet RH

Capable of compliance

Comments

Signage selections generally take place at CC stage of works. Selection and location of signage as specified above will lead to compliance. Details of selected signage to be verified at CC stage of works.



Requirement

Braille and Tactile signage are required to identify Ambulant Sanitary facilities





Requirement

Signage is required where a bank of sanitary facilities is not provided with an accessible unisex sanitary facility.

Compliance

Capable of compliance

Comments

Signage selections generally take place at CC stage of works. Selection and location of signage as specified above will lead to compliance. Details of selected signage to be verified at CC stage of works.

Requirement

Signage is required to a single hand pushing action device (example manual control button to an automated doorway) where the latch operation device is not located on the door leaf itself

Compliance

Comments

No automated doors have been identified on the plans.

N/A

Requirement

Directional signage complying with BCA 2022 Specification 15 must be provided at the location of each—

- i. bank of sanitary facilities; and
- ii. accessible unisex sanitary facility, other than one that incorporates an accessible adult change facility, to direct a person to the location of the nearest accessible adult change facility within that building.



Arrow is indicative only and needs to point in the direction of the accessible toilet on side

Compliance

Capable of compliance

Comments

Signage selections generally take place at CC stage of works. Selection and location of signage as specified above will lead to compliance. Details of selected signage to be verified at CC stage of works.

Requirement

All signage is required to be as per BCA 2022 Specification 15 Braille and Tactile Signs This includes location of signage, specifications in regard to braille and tactile characters, luminance contrast and lighting.

Compliance

Capable of compliance

Comments

Signage selections generally take place at CC stage of works. Selection and location of signage as specified above will lead to compliance. Details of selected signage to be verified at CC stage of works.


BCA 2022 Part D4D8 Hearing Augmentation

Requirement

Hearing Augmentation is only required where an inbuilt amplification system (other than emergency) is installed in a Class 9b building, or in an auditorium, conference / meeting room or a reception area where a screen is used.

Compliance

Comments

No areas with provision of inbuilt amplification have been identified on plans within new works, modified works and works within the affected part and hence no hearing augmentation requirements apply to this development.

BCA 2022 Part D4D9 Tactile ground surface indicators (TGSIs)

Requirement

TGSIs are required when approaching:

Stairways other than fire-isolated stairways.

N/A

- Escalators / passenger conveyor / moving walk.
- Ramp (other than fire-isolated ramps / kerb or step or swimming pool ramps).
- Under an overhead obstruction of <2M if no barrier is provided.
- When accessway meets a vehicular way adjacent to a pedestrian entry (if no kerb / kerb ramp provided at the location).

Compliance is required with AS1428.4.1 including Luminance contrast and slip resistance requirements for all TGSIs.

Compliance

Complies with spatial requirements (limited to new works, modified works and works within the affected path as identified earlier in the report)

Comments

TGSI selections generally take place at CC stage of works. Selection of TGSIs as specified will lead to compliance and these selection details are to be verified at CC stage of works.

BCA 2022 Part D4D12 Limitations on Ramps

Requirement

On an accessway:

- A series of connected ramps must not have a combined vertical rise of more than 3.6M;
- And a landing for a step ramp must not overlap a landing for another step ramp or ramp.

Compliance	Complies (limited to new works, modified works and works within the affected path as identified earlier in the report)
Comments	
Compliance is me	t



BCA 2022 Part D4D13 Glazing on Accessways

Requirement

Glazing requirements:

- Where there is no chair rail, handrail or transom, all frameless or fully glazed doors, sidelights and any glazing capable of being mistaken for a doorway or opening are required to have a glazing strip
- The marking should be for the full width with a solid and non-transparent 75mm wide, contrasting line located 900-1000mm above FFL and provide a minimum luminance contrast of 30% when viewed against the floor surface within 2M of the glazing on the opposite end. Graphical representation or cut-outs are not permitted.

Compliance	Capable of compliance
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Comments

Glazing strips are required to be provided to full height glazed areas (doors and windows)

Glazing strip selections generally take place at CC stage of works. Selection of glazing strips as specified above will lead to compliance and details are to be verified at CC stage of works.

BCA Part F Accessible Sanitary Facilities BCA 2022 Part F4D5 Accessible Sanitary facilities

Requirement

Accessible unisex toilet is to be provided in accessible part of building such that;

- It can be entered without crossing an area reserved for 1 sex only
- Where male and female sanitary facilities are provided at different locations, Accessible unisex toilet is only required at one of the locations
- Even distribution of LH and RH facilities
- An accessible facility is not required on a level with no lift / ramp access.

Compliance Complies (limited to new works, modified works and works within the affected path as identified earlier in the report)

Comments

1 unisex accessible toilet has been identified in the development. We note that the location of the toilet is at a different level as that of the ambulant toilets however we find this to be fully functional.

BCA 2022 Part F4D6 Accessible unisex sanitary compartments

Requirement

Class 5, 6, 9b

 1 unisex Accessible toilet on every storey containing sanitary compartments. Where more than 1 bank of sanitary compartments on a level, at 50% of banks

Compliance

Complies with spatial requirements (limited to new works, modified works and works within the affected path as identified earlier in the report)

Comments



1 unisex accessible toilet has been identified in the within new works, modified works and works with	he developm hin the affecte	ent. within Class 5 ed path as identifie	, 6, 9b d ed earlie	component er in the report
The following common use sanitary facilities hav	ve been iden	tified in the develo	pment sible fa	cilities
	LH	LH + Shower	RH	RH + Shower
Unisex accessible toilet on Ground Level			\boxtimes	

BCA 2022 Part F4D7 Requirements for Accessible unisex showers





Requirement

Showers for Accessible use are to be designed in accordance with AS1428.1

Comments			
No accessible show	vers have been identified on the plans		
Requirement			
Ambulant use male toilet is provided	e / female toilets are to be provided if	an additional toilet to the	e Accessible unisex
	Complies with spatial requirements	(limited to new works m	odified works and
Compliance	works within the affected path as ide	entified earlier in the repo	ort)
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Compliance Comments The following amb Location On Ground Level	works within the affected path as ide sulant toilets have been provided Ambulant toile Male ambulant X1	ts Temale ambulant	Unisex Ambulan

Requirement

Ambulant use toilets are to be designed in accordance with AS1428.1









Statement of Experience

Vista Access Architects specialises in disability access consultancy services including. Disability Access and inclusion requirements, Access Performance Solutions under the NCC, NDIS SDA Certifications, Livable Housing Certifications and Changing Places Certifications.



Farah Madon - Director

- ACA Accredited Access Consultant
- NDIS Accredited SDA Assessor
- Livable Housing Assessor
- Changing Places Assessor
- Accredited and Fellow member of the Access Consultants Association (ACA) 281
- NDIS Accredited SDA (Specialist Disability Accommodation) Assessor SDA00001
- Architect registered with the NSW Architect's Registration Board Registration 6940
- Member of Australian Institute of Architects (RAIA), A+ Practice Member 49397
- Registered Assessor of Livable Housing Australia Registration 10032
- Global Alliance on Accessible Technologies and Environments (GAATES) BE-02-021-20
- Registered Assessor of Changing Places Australia Registration CP006

Farah's Educational Profile and Qualifications include:

- Bachelor of Architecture Degree with Honours (B.Arch.)
- International Certification of Accessibility Consultants Built Environment (ICAC-BE) Program, Level 2 Advanced Accessibility Consultant
- Diploma of Access Consulting

Farah has 20 years of experience of working in the field of Architecture and Access.

Farah is the lead author of the NDIS SDA Design Standard. She has been invited on multiple occasions as an expert witness for Access related matters in the NSW Land and Environment Court.

Farah currently participates on the following key committees concerning access for people with disabilities, on an honorary basis:

- President of Access Consultants Association (previously known as ACAA)
- Member of Standards Australia's ME-064 Committee responsible for the AS4299 and AS1428 suite of standards.
- Community Representative Member of the Penrith City Council's Access Committee
- Member of Australian Institute of Architect's National Enabling Architecture Committee (NEAC)
- Member of Changing Places Australia Technical Advisory Team

Some Recent Awards presented to Farah include:

- 2023 Mulgoa Local Woman of the Year
- 2022 ACAA Fellow Award
- · 2021 Australian Access Awards Winner for the Educational App of the Year SDA Tools
- 2021 Excellence in Inclusion Altitude Awards
- 2019 Penrith Citizen of the Year
- 2019 ACAA Access Inclusion Award









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vista access architects

Access | Specialist Disability Accommodation | Livable Housing Certification

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- Livable Housing Assessor
- Changing Places Assessor
- Accredited member of ACA (previously ACAA) 500
- NDIS Accredited SDA Assessor SDA00009
- Registered LHA Assessor 20035
- Registed Assessor of Changing Places Australia CP010





Jenny Desai

ACA Accredited Access Consultant
 NDIS Accredited SDA Assessor
 Livable Housing Assessor

- · Accredited member of ACA (previously ACAA) 572
- NDIS Accredited SDA Assessor SDA00043
- Registered LHA Assessor 20242
- Master's degree in Design M.Des





Art Phonsawat

Accredited member of ACA (previously ACAA) - 695

- ACA Accredited Access Consultant
- NDIS Accredited SDA Assessor
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GEOTECHNICAL SITE INVESTIGATION

Prepared by ASCT – Northern Rivers office, for Lord Howe Island Board.

SUBJECT SITE Corner Lagoon Road & Neds Beach Road, Lord Howe Island, NSW 2898.

ASCT REFERENCE H23-3834.



12th June 2023

Ref No: H23-3834.

Lord Howe Island Board

Dear Lord Howe Island Board,

Re: Proposed CBD Toilets at Corner Lagoon Road & Neds Beach Road, Lord Howe Island, NSW 2898.

Australian Soil and Concrete Testing Pty Ltd (ASCT) is pleased to present the completed *Geotechnical Site Investigation* report, in response to your request.

As per your commission, ASCT was tasked with investigation works appropriate to classification of the site in accordance with *Australian Standard AS 2870 – Residential Slabs & Footings*, and associated parameters requisite to the proper design & construction of a structural footings system.

Details of our investigation process, the findings and results are contained within the body of this report. However, please find below a summation of the investigation results;

tive	assification (AS 2870)
	teristic Surface Movement (Y _s)
	ble Bearing Capacity
	dwater
	ble Bearing Capacity dwater



1.0 Introduction & Understanding

The subject of this site investigation report is;

Corner Lagoon Road & Neds Beach Road, Lord Howe Island, NSW 2898.

It is our understanding that a new toilet building is proposed for the site. Accurate information regarding the 'footprint' of the proposed structure was available at the time of investigation. Three possible locations were investigated and tested (borehole locations 1 to 3).

Information, including anecdotal evidence, provided by our client has been accepted as accurate & complete, and incorporated into the investigation process as appropriate.

2.0 Desktop Study

ASCT maintains an extensive library of previous AS 2870 site classifications. This important resource is consulted with every ASCT site investigation, and appropriate information has been employed during this investigation.

A limited inspection of the available aerial photography, provided no significant information regarding the site history.

Inspection of soil mapping for the area, LORD-HOWE-ISALND - Geological Series (1:20,000), predicts soils of the QP_n – Neds Beach Formation origin.

The site was determined to lie within *Climatic Zone 1*, and therein have a *Depth of design suction change* (H_s) in the order of 1.5m.

Having regard to the guidance provided within AS 2870, a value of *Soil suction change* (ΔpF) of 1.2 Pico farads (pF) was deemed appropriate for the site.

3.0 Field Work

Field work at the investigation site was conducted by ASCT representative on the 24th May 2023.

These works included;

- Recording of all significant site features having, or potentially having, an effect on the site classification.
- Recording the location, and/or physical measurements, of certain significant features (e.g.: ASCT test holes, Tree heights, Slopes, Structures).
- Digital photography.
- A determination of the ultimate bearing pressure exhibited by the site soils.
- Excavation, and logging of one or more test holes.
- An assessment of groundwater conditions.
- The retrieval of one or more soil samples, for subsequent laboratory testing.

3.1 Site Description

The site as found by ASCT on the day of the field work is described below. Photo and a simple plan of the site are included in Appendix A.



The site is located in an established area amidst moderately sloping terrain.

The sites surface slopes at approximately 3 to 6 degrees.

Some trees and vegetation surrounding the site may affect the sites normal moisture conditions.

No significant water sources were observed.

Underground services were observed surrounding the site.

No outcropping of boulders is evident within the site.

3.2 Sub-Surface Profile

Detailed borehole logs, in accordance with AS 1726 section 6.2, are included in Appendix A.

In essence; the sub-surface profile consists of Sand (SP) and Silty Sand (SM) through to the target investigation depth of 1.1m at borehole 1 and 2. ASCT experienced auger refusal at a depth of 0.8m at borehole 3, likely due to calcarenite.

The site exhibits soil stratum which ASCT have determined to be of natural origin.

The investigation results indicate that an essentially uniform sub-surface profile exists across the site.

The sub-surface conditions encountered are unlikely to hinder normal footing construction.

3.3 Groundwater

No groundwater was encountered during the investigation field-work.

The presence of groundwater table/seepage depends on rainfall, ground conditions, permeability and will differ over time.

While it is impossible to accurately predict future levels in a complex groundwater system, especially in a limited investigation such as this, ASCT does not believe that groundwater will be an issue at this site.

3.4 Bearing Capacity

Where possible ASCT employs the results of AS 1289.6.3.2 – Dynamic Cone Penetrometer (DCP) testing, in the assessment of bearing capacity. In such instances the results of the DCP testing are included on the borehole logs, provided in Appendix A. Other inputs, such as visual/tactile assessments and the use of portable engineering equipment (e.g.: pocket penetrometer), also contribute to the overall assessment.

Having allowance for the weakest state of foundation materials, during normal (natural) site conditions, we have determined the allowable (or design) bearing capacity to be;

 In the order of 100 to 200kPa. This is reasonable and likely to be adequate for the support of a normal footings system.

As with all sites, the value of bearing capacity varies with depth. The design bearing capacity given above is available within a zone 0.4 to 1.5m below the existing surface.



4.0 Laboratory Work

During the field-work phase a disturbed soil sample was retrieved from Borehole 1, at a depth of 0.5m.

The sample was submitted to our NATA accredited Ballina facility for testing, in accordance with;

AS 1289.3.1.2 – Liquid Limit of a Soil (One point Casagrande).

Due to the non-plastic nature of the material lab results were unobtainable.

5.0 Characteristic Surface Movement

Incorporating appropriate values for the Climatic Zone, depth of design suction change (H_s), soil suction change (ΔpF), lateral restraint factor (α), the thickness of each layer (h), and the properties of each layer (Instability Index I_{pt}); We have calculated the expected volume change associated with natural changes in soil moisture, and its' effect at the surface of the soil profile.

The resultant value is known as the *Characteristic Surface Movement* (Y_s) , and we have determined it to be in the order of 0 to 20mm in line with AS 2870 Site Class S – "Slightly Reactive".

6.0 Site Problems

AS 2870 contains a list of potential problems that exclude a site from being classified under one of the 'Normal' classifications. Such sites are classified as Class P, so that the issues can be addressed using a tailored solution, by a professional Engineer.

ASCT is pleased to report that none of these potential problems were encountered at your site.

7.0 Earthworks, Site Preparation and Trafficability.

Any earthworks undertaken should be carried out in a responsible manner in accordance with the relevant parts of AS3798 – 2007.

Prior to the placement of any structural fill across the site, any topsoil, unsuitable, deleterious and organically contaminated surface soils should be stripped to depths exposing competent ground. In addition, any tree roots remaining from any clearing operations should be completely removed.

The stripped surface prior to filling should be tyned, moisture conditioned and re-compacted to the minimum density ratios detailed in AS 3798-2007 of 95% Standard compaction for residential and 98% standard compaction for commercial developments.

All bulk fill materials should be placed in layers of approximately 0.2m loose and be moisture conditioned within the range of $\pm 2\%$ of Optimum Moisture Content (OMC). Then compacted to the minimum density ratios detailed in AS 3798-2007 of 95% Standard compaction for residential developments.

Excluding any organic and deleterious materials, it is considered that the majority of materials won from excavation on site will generally be suitable for reuse as bulk filling provided that moisture content of the soils on placement approximates to the Optimum Moisture Content (OMC).

It is appropriate to maintain surface drainage conditions during earthworks and ensure that runoff water is discharged away from the construction area to prevent any water ponding.



8.0 Responsibilities

The Australian Standard AS 2870 includes the following statements "Footing design and construction involves a number of steps: site classification, selection of the footings system, structural design, construction in accordance with the required design details and construction methods, and proper maintenance. In particular, the owner has a responsibility to ensure the site is properly maintained and the Standard attempts to guide owners in this area.".

We draw your attention to this responsibility and have provided a copy of the CSIRO BTF-18 "Foundation maintenance and Footing performance: A Homeowner's Guide" to assist you. The measures suggested in the CSIRO guide are simple & cost effective, and we recommend that you observe them in consultation with your designer.

We have taken every care to be to accurate, complete & objective in the execution of your commission. Should you have any queries, or require further assistance, please do not hesitate to contact our office. This report is your intellectual property and we will not provide it to any 3rd party without your permission. May we also respectfully request that if you provide this report to others (e.g.: your builder): you provide it in its' entirety, to avoid any miscommunication.

Yours faithfully, Australian Soil & Concrete Testing Pty Ltd



Zar Harper <u>Engineering Geologist</u> BSc (*Geology*)



LIMITATIONS OF GEOTECHNICAL SITE INVESTIGATION

COMMISSION OF SERVICES

This geotechnical site assessment report ("The Geotechnical Report") has been prepared in accordance with the commission set out in the contract or quote, or as otherwise agreed between the Customer and Australian Soil & Concrete Testing P/L (ASCT). The commission may be limited by a range of factors such as time, cost, accessibility or site constraints and conditions.

RELIANCE ON INFORMATION PROVIDED

In preparing the report, ASCT has relied upon information provided, surveys, analyses, designs, plans and other documentation provided by the customer or other individuals and organisations, most of which are referred to in preparing the report. Except as otherwise stated in the report, ASCT has not verified the accuracy or completeness of the information provided to the extent that the statements, opinions, facts, information, conclusions and recommendations in the report are based in whole or in part on the information provided. The recommendations and conclusions are contingent upon the accuracy and completeness of the information provided. ASCT will not be liable in relation to incorrect conclusions should any provided information or site condition be incorrect or have been concealed, withheld, mis-represented or otherwise not fully disclosed to ASCT.

GEOTECHNICAL INVESTIGATION

Geotechnical site classification is based extensively on judgment and opinion. It is far less exact than other engineering disciplines. Geotechnical lot classification reports are prepared to meet the specific needs of individuals. This report was prepared expressly for the Customer and expressly for the purposes indicated. Use by any other persons for any purpose or by the customer for a different purpose, may result in problems which ASCT cannot be responsible for. The Customer should not use this report for other than its intended purpose without seeking additional geotechnical advice.

THIS GEOTECHNICAL REPORT IS BASED ON SITE SPECIFIC FACTORS

This geotechnical report is based on a subsurface investigation which only identifies the conditions at the locations and time when the investigation was undertaken. Unless further geotechnical advice is obtained this geotechnical report cannot be used when the nature of the site is changed or when the proposed development is modified for the site.

This geotechnical report cannot be applied to an adjacent site. The *Limitations of Geotechnical Site Investigation* in making an assessment of a site from a limited number of boreholes or test pits is the possibility that actual conditions may vary from those identified at the investigation locations. The Site investigation identifies specific subsurface conditions only at those points from which samples have been taken. The investigation programme undertaken is used to provide a general profile of the subsurface condition. The information obtained from the site investigation and subsequent laboratory testing is used to form a presumed opinion regarding the overall subsurface conditions and their likely behaviour with regard to the proposed development. The borehole logs are the subjective interpretation of the limited site investigation and cannot always be definitive.

SUBSURFACE CONDITIONS ARE TIME DEPENDENT

A geotechnical report is based on conditions which existed at the time of site investigation. The subsurface conditions may change due to natural forces or man-made influences. Civil works at or adjacent to the site and natural events such as floods or groundwater fluctuations may also affect subsurface conditions and the relevance of the geotechnical report. The geotechnical report should therefore be regarded as preliminary and ASCT should be consulted if unexpected conditions are encountered to determine the impact on the recommendations of the report.





SLOPE STABILITY

This report does not cover slope stability. If this is required, an independent assessment and investigation should be undertaken by a qualified Geotechnical Engineer.

AVOID MISINTERPRETATION

The geotechnical report may be misinterpreted by other design professionals. ASCT should be retained to explain relevant geotechnical findings and to review the adequacy of plans and specifications and the implications to the report. The geotechnical report should be maintained as a whole and should not be copied, divided or altered.

GEOTECHNICAL INVOLVEMENT DURING CONSTRUCTION

It is recommended that ASCT should be retained through the construction stage to confirm the actual subsurface conditions are consistent with the geotechnical report. If variations are encountered additional tests may be required to confirm conditions comply with the design specifications and advise on changes to the construction if required.

REPORT FOR BENEFIT OF CUSTOMER

The geotechnical report has been prepared for the benefit of the customer and no other party. ASCT assumes no responsibility and will not be liable to any other person or organisation for, or in relation to, any matter dealt with or conclusion expressed in the report. ASCT will not be responsible for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusion expressed in the report (including, without limitation, matters arising from any negligent act or omission of ASCT or any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy and completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

OTHER LIMITATIONS

ASCT will not be liable to update or revise the report to take into account any events of emergent circumstances or facts occurring or becoming apparent after the date of the report.





APPENDIX A – Site Photos, Site Plan & Borehole Logs.



View of the site (location of borehole 1) facing a north westerly direction.





View of the site (location of borehole 2) facing a southerly direction.





View of the site (location of borehole 3) facing a northerly direction.





Aerial view of the site, with ASCT test positions.



BOREHOLE LOG SHEET 1 -

Client:	Lord Howe Island Board	ASCT Ref No:	H23-3834
Project:	Proposed CBD Public Toliets, Lord Howe Island	Client Ref No:	NA
Borehole Position:	See Site Sketch	Drilling Method:	Hand Auger
Surface Elevation:	Existing Surface Level	Drill Bit:	100mm Ø TC

Depth (m)	Graphic	Group	Soil Description (AS 1726)	Consistency / Relative	DCP Blows /	Test
	Symbol	Symbol		benaky / nock strength	Cono Tin	Sample
0.0	CONTRACTOR OF T	SD	SAND NATURAL: grey pop plastic no dou strength fine	10050	Cone Tip	
0.0		Jr	to medium grained sand trace silt moist	LOOSE		
0.2			to mediam gramed sand, trace sit, moist.		2	
0.3				Madium Dansa	1	
0.4				Wedruin Dense	6	
0.5					6	
0.5	See 10				7	
0.0					ć	
0.9					7	
0.0					, ,	
1.0	Section 5				°	
1.0	観辺国際		DRILLING TERMINATED, hand auger death reached		0	
1.1	NO.S. P. DAS		DRILLING TERMINATED: Hand auger depth reached.		ð	
1.2					ð	
1.3					8	
1.4					8	
1.5					Stores	
1.0					stopped	
1.7						
1.0						
1.9						
2.0						
2.1						
2.2						
2.3						
2.4						
2.5						
2.6						
2.7						
2.8						
2.9						
3.0						
3.1						
3.2						
3.3						
3.4						
3.5						
3.6						
3.7						
3.8						
3.9						
4.0						
4.1						
4.2						
4.3						
4.4						
4.5						
4.6						
4.7						
4.8						
4.9			30			
5.0						



BOREHOLE LOG SHEET - 2

	Client: Project:	Lord Ho Propose	we Island Board d CBD Public Toliets, Lord Howe Island	ASCT Ref No: Client Ref No:	H23-3834 NA		
Borehol	Borehole Position: See Site Sketch		Sketch	Drilling Method:	Hand Auge	er	
Surface	Elevation:	Existing	face Level Drill Bit: 100mm Ø		100mm Ø	ØTC	
Depth (m)	Graphic Symbol	Group Symbol	Soil Description (AS 1726)	Consistency / Relative Density / Rock Strength	DCP Blows / 100mm	Test Sample	
					Cone Tip		
0.0	and the second	SM	Silty SAND, NATURAL: brown, non plastic, no dry	Loose	1		
0.1	Constant 4		strength, fine to medium grained, moist.		2		
0.2	是多い分析。				2		
0.3	ALL SALE				2		

0.2					2	
0.4	1.1.2.3.4			Medium Dense	3	
0.5					3	
0.6					3	
0.7					4	
0.8					4	
0.9					4	
1.0					6	
1.1	State Party		DRILLING TERMINATED: hand auger depth reached.		8	
1.2	Contraction of the second		0		8	
1.3				Dense	13	
1.4					15	
1.5					Stopped	
1.6					1.00	
1.7						
1.8						
1.9						
2.0						
2.1						
2.2						
2.3						
2.4						
2.5						
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BOREHOLE LOG SHEET - 3

Client:	Lord Howe Islan	d Board	ASCT Ref No:	H23-3834	
Project:	Proposed CBD P	Public Toliets, Lord Howe Island	Client Ref No:	NA	
Borehole Position:	See Site Sketch		Drilling Method:	Hand Auger	
Surface Elevation:	Existing Surface	Level	Drill Bit:	100mm Ø TC	
Depth (m) Graphic	Group	Soil Description (AS 1726)	Consistency / Relative	DCP Blows /	Test

Depth (m)	Symbol	Symbol	Sui Description (AS 1726)	Density / Rock Strength	100mm	Sample
					Cone Tip	
0.0		SP	SAND, NATURAL: brown, non plastic, no dry strength,	Loose	1	
0.1			fine to medium grained, trace silt, moist.		2	
0.2					2	
0.3	Section.			Medium Dense	3	
0.4					4	
0.5					4	
0.6			AS ABOVE: with calcarenite (gravel sized pieces)		4	
0.7	Sola Int				4	
0.8	12. 学校学校		HAND AUGER REFUSAL: likely due to calcarenite		4	
0.9					4	
1.0					4	
1.1					4	
1.2					5	
1.3					5	
1.4					5	
1.5					5	
1.6					Stopped	
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Foundation Maintenance and Footing Performance: A Homeowner's Guide



BTF 18-2011 replaces Informatio Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870-2011, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction

There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion

All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation

This is particularly a problem in clay soils. Saturation creates a boglike suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume, particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil

All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes a support needed by the footing to retain equilibrium.

Shear failure

This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.

In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites, which may experience only slight ground movement from moisture changes
М	Moderately reactive day or silt sites, which may experience moderate ground movement from moisture changes
H1	Highly reactive clay sites, which may experience high ground movement from moisture changes
H2	Highly reactive clay sites, which may experience very high ground movement from moisture changes
Е	Extremely reactive sites, which may experience extreme ground movement from moisture changes

Notes

Where controlled fill has been used, the site may be classified A to E according to the type of fill used.
 Filled sites. Class P is used for sites which include soft fills, such as clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soil subject to erosion;

The deep-seated moisture changes exist on sites at depths of 3 m or greater, further classified otherwise. 3



Tree root growth

Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe

reduction in the strength of the soil which may create local shear failure. Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation

Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mottar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/ below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

Seasonal swelling/shrinkage in clay

Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by beaters and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring. As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the

Trees can cause shrinkage and damage



external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots

In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself

Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures

Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become

wider until the sections of brickwork become virtually independent. With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.



The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures

Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation causes a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures

Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious crosion, interstrata scepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem. Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

· Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.

- · Corroded guttering or downpipes can spill water to ground.
- · Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870-2011.

AS 2870-2011 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing

Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

Protection of the building perimeter

It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving should

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS				
Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category		
Hairline cracks	<0.1 mm	0		
Fine cracks which do not need repair	<1 mm	1		
Cracks noticeable but easily filled. Doors and windows stick slightly.	<5 mm	2		
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired.	5–15 mm (or a number of cracks 3 mm or more in one group)	3		
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted.	15–25 mm but also depends on number of cracks	4		





extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, carthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order. Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

The information in this and other issues in the series was derived from various sources and was believed to be correct when published. The information is advisory. It is provided in good faith and not claimed to be an exhaustive treatment of the relevant subject.

Further professional advice needs to be obtained before taking any action based on the information provided.

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Statement of Environmental Effects

LORD HOWE ISLAND CBD AMENITIES

LORD HOWE ISLAND BOARD

April 2025

Executive Summary

This Statement of Environmental Effects ('SEE') accompanies a local development application ('the Application') made under s 4.12 of the Environmental Planning & Assessment Act 1979 ('EPA Act'), which seeks consent from the Lord Howe Island Board ('LHIB'), as the relevant consent authority, for the works as outlined below in Table 1 Description of Works

Applicable Lot	Description of Works
Lot 44 Zone 2 - Settlement	 Extension to the existing LHIB asset, currently leased to a bar and massage and nail parlor. The extension comprises of one (1) accessible toilet, (1) male WC, one (1) urinal and two (2) female WCs. The development will also extend the deck of the existing building and create an enclosed space for services and rubbish bins. A new wastewater treatment system to service all new and existing building on Lot 44
Lot 49 Zone 6 - Recreation	Irrigation of the treated wastewater from Lot 44
Road Reserve	Irrigation of the treated wastewater from Lot 44



The works are proposed to be undertaken in 2 stages as outlined in Table 2 Staged Works and illustrated in Figure 1 Staging Plan.

The sequence of works will ensure the wastewater treatment system & irrigation (stage 1) is fully operational prior to the completion of the new facilities (stage 2).

Stage	Description of Works
Stage 1 (Highlighted in purple)	 Install new wastewater treatment system & irrigation Works extending over Lot 44, Lot 49 & the Road Reserve
Stage 2 (Highlighted in yellow)	 Extension to the existing LHIB asset, currently leased to a bar and massage and nail parlor, comprising of one (1) accessible toilet, (1) male WC, one (1) urinal and two (2) female WCs. The development will also extend the deck of the existing building and create an enclosed space for services and rubbish bins. Works on Lot 44 only

Table 2 Staged Works



Figure 1 Staging Plan

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1. Location and Features

1.1. Description and Location

The project is made up of two components, both which are the subject of this DA.

The proposed new amenities for the Lord Howe Island (LHI) CBD and the associated wastewater treatment system and irrigation area.

The new amenities will be located on the corner of Lagoon Road and Neds Beach Road legally described as Lot 44 in DP757515.

The wastewater treatment system will be located on Lot 44, with irrigation proposed to be within the road reserve to the North East of Lot 44 (highlighted in colour on Figure 1) as well as on Lot 49 on DP757515 as noted on Figure 1 below.



Figure 2 Subject Sites

1.2. Existing Improvements and characteristics

1.2.1. Existing Improvements

- Lot 44: the lot has a number of buildings leased to private and government agencies to serve the community of LHI and an amphitheatre.
- Road reserve: no existing development present on the site
- Lot 49: no existing development present on the site

1.2.2. Existing Vegetation

- Lot 44: the lot has a number of buildings leased to private and government agencies to serve the community of LHI.
- **Road reserve:** contains a moderate amount of vegetation predominantly made up of Norfolk pine trees with ground cover.
- Lot 49: The is covered by a significant amount of vegetation with dense ground cover. The land remains in its natural state.

1.2.3. Topography

• Lot 44 & road reserve: As shown on Figure 2, Lot 44 & the road reserve has a gentle slope south, towards Lagoon Road.



Figure 3 Lot 44 & Road Reserve Slope

• Lot 49: the site is predominantly flat

1.2.4. Services

- Lot 44: The lot is serviced with reticulated water, electricity and phone service. Wastewater is linked to an existing system which will be disconnected in favour of the proposed wastewater system.
- Road reserve: no services to the site
- Lot 49: no services to the site

1.2.5.Access

- Lot 44: Pedestrians can access the site from Neds Beach Road and Lagoon Road. Locals and tourists often use the picnic benches scattered on the lot and amphitheatre. A driveway on the southern end (off Lagoon Road) allows vehicle access to the amphitheatre stage and Post Office. Holding tanks are on the southeast corner, serviced from an off-street parking bay along Lagoon Road.
- Road reserve: no defined access
- Lot 49: no defined access

1.3. Local Context

Lot 44 is one of the busiest lots that makeup the LHI CBD and is located at a key intersection between Lagoon Road and Neds Beach Road. Due to its location, businesses on Lot 44, neighbouring commercial lots, and its proximity to Lagoon Beach, the site experiences significant pedestrian traffic. This is particularly evident during the peak tourist season.

Lot 44 is surrounded by land designated as road corridor as shown on Figure 3. The road corridor northeast of Lot 44 is currently unused and is proposed for wastewater irrigation. Northeast of the road reserve (intended for irrigation), Lot 45 on DP757515 is situated, where Thompsons General Store operates, accessed from Neds Beach Road.

At the southern end of Lot 49 lies Lagoon Road within a road corridor, while the northern end adjoins residential properties and vacant crown land. Driveways through Lot 49 provide access to the residential properties from Lagoon Road.



Figure 4 LHI CBD Defined Road Corridors

1.4. Applicable LHI LEP Mapping

The sites (Lot 44, Road Corridor and Lot 49) are highlighted within the following LHI LEP 2010 mapping accessed via LHIB's ArcGIS platform. Relevant to the subject sites:

Land Zoning

Lot 44 and the adjacent road corridor sits within Zone 2 - Settlement zone. Lot 49 is within Zone 6 - Recreation zone.



Figure 5 Land Zoning Map

• Significant Native Vegetation (SNV) Map

Lot 44 is free from any SNV. There is a minor overlap of SNV on the eastern side of the road reserve which will be address further in the report. Lot 49 is predominantly covered by SNV apart from the northwest end of the lot and driveways to allow access to the residential properties.



Significant Native Vegetation

Figure 6 Significant Native Vegetation Map

2.3

Foreshore Building Line & Water Feature Corridor

All subjects sites are not within a defined Water Feature Corridor and lie behind the Foreshore Building Line.



• Heritage Items

There are no heritage items defined on the LHI LEP 2010 on the subject lots



Flood Maps

Although not a test against the LHI LEP, the subject sites are outside of the Flood Maps available on LHIB's ArcGIS mapping.



• 50m Well Buffer

The subject sites are outside of the 50m well buffer zone required by the LHIB On-Site Wastewater Management Strategy


2. The Proposal

2.1. Lord Howe Island CBD Amenities

The subject of this Application seeks approval as part of stage 1, to construct a new amenities block as an extension of an existing commercial asset owned by the Lord Howe Island Board (LHIB). The new amenities will provide one (1) male WC, one (1) urinal, two (2) female WCs and one accessible WC with a foldable baby change table. The gross floor area of the extension is 21.7m² with a new deck measuring 17.8m². In total the extension will be 39.5m², as shown in Figure 6.

The accessible WC will be available for use by the public and tourists, providing the LHI CBD with a compliant accessible facility that is currently lacking. This facility will greatly benefit individuals with mobility issues, parents with babies, and contribute to the increase in the number of facilities across the LHI CBD.

The male and female toiles will be positioned serve the commercial tenants and their patrons of the LHIB's commercial asset. The provision of the toilets will secure the long-term viability of the asset for the LHIB, by providing flexibility as to the use and nature of tenant that can occupy the premises.

As part of the project, the existing tourist information board will be reconfigured within the general area in which it is currently located. The proposed location is shown dashed in Figure 6.



Figure 7 New Amenities Floor Plan



Figure 8 Site Plan







Figure 10 North Elevation



Figure 11 South Elevation



Figure 12 Section

2.2. Wastewater Treatment System & Irrigation Area

As part of stage 2, this proposal seeks consent for the installation of a new wastewater system and irrigation areas to serve all the buildings on Lot 44. The proposal will greatly benefit the LHI CBD by removing reliance on an existing system on another lot currently treating wastewater generated on Lot 44.

The new system will provide capacity for the additional toilets as well as the other building on Lot 44. Consequently, the existing system, (which is not the subject of this application) will benefit from the additional capacity by diverting the wastewater generated by the building on Lot 44 to the new wastewater system.

The wastewater report prepared by Broadcrest Environmental Pty Ltd provides a comprehensive analysis of the available irrigation area, applicable soil profile, and details of the wastewater system.

As identified shown in Figure 11 Wastewater Plan, the irrigation area proposed is within the road reserve and Lot 49. Where connecting services are required between the road reserve to Lot 49, services will be trenched in accordance with LHIB requirements. Note that a S138 Certificate will be obtained prior to commencing work in a road reserve.



Figure 13 Wastewater Plan

As discussed in section 2.17 of Broadcrest Environmental's on-site Wastewater Report minimum buffer distances. Section 2.19 outlines the proposed mitigation measures put in place for the proposed reduction in Effluent Management Area (EMA) setbacks.

The location of the treatment system is proposed to be next to the existing holding tank on Lot 44. The location is currently utilised for services, and is able to be serviced off Lagoon Road without causing disruption to business, locals or tourist.

2.3. Maximum capacity

Informed by the proposed wastewater system, the maximum capacity of the site is provided in the Table 1, taken from Section 4.2 of the Wastewater Report. The maximum capacity of each individual building, which is not the subject of this document should also be subject to a capacity assessment in accordance with the National Construction Code (NCC), which maybe lower than the capacity provided by the wastewater system.

I.D.	Persons	L/person/day ^[1]	Total (L/day)	Cumulative (L/day)
Bar Breakfast	80	20	1600	1600
Bar lunch	80	20	1600	3200
Bar Dinner	80	20	1600	4800
Bar Staff	3	20	60	4860
Grocer staff	2	20	40	4900
Massage	2	20	40	4940
Marine Park Office staff	2	20	40	4980
Post Office staff	2	20	40	5,020

[1] LHI On-site Wastewater Management Strategy – Design Guidelines, Appendix 2: Commercial Wastewater Design Page 22 - Bar Trade (per customer) = 20L/person

Table 3 Maximum capacity informed by the proposed wastewater system

3. Statutory Assessment

3.1. Acts and Regulation

3.1.1. Environmental Planning and Assessment Act 1979

Reference	Requirement	Response	
Environmenta	al Planning and Assessme	ent Act 1979	
S 4.12 (1) Application	A person may, subject to the regulations, apply to a consent authority for consent to carry out development	In accordance with Clause 4.12(1), this document and the referenced documents within accompanies a development application submitted to the Lord Howe Island Board as the relevant consent authority.	
S 4.14 (1)	Development on bushfire prone land must comply with Planning for Bushfire Protection 2019	The Subject Site is not mapped as bushfire prone land.	
S 4.15 (1) Matters for consideratio	(a) (i) Environmental planning instruments	Consistent, except for side setback control at cl 32(2)(a) LHI LEP 2010 – see clause 32 on page 21 under Table 5 LHI Local Environmental Plan 2010	
n - general	(ii) draft instruments	N/A	
	(iii) development control plans	Generally compliant, refer to Section 4.4.1 Lord Howe Island Development Control Plan (2005). Some matters required a merit assessment as identified in the table.	
	(iiia) planning agreements	N/A	
	(iv) the regulations	Consistent – see below	
	(b) Likely impacts	Acceptable – as assessed against the Environmental Planning and Assessment Regulation 2021 (refer to Table 4), LHI Local Environmental Plan 2010 (refer to Table 6) and Lord Howe Island Development Control Plan (2005) (refer to Table 7)	
	(c) Suitability of the site	Based on compliance with the relevant controls and standards contained in the applicable EPIs and DCP, as well as the consideration of likely impacts noted within this SEE, the Subject Site is suitable for the Proposal.	
	(d) Submissions	The LHIB as the applicant, will address any issues raised by public via a formal submissions issued to the LHIB.	
	(e) Public interest	A public interest benefit is derived from undertaking a development which will ultimately benefit the public by providing additional facilities on the LHI CBD and increasing the commercial viability for a business to occupy the board asset.	
		The proposed development generally complies with the relevant provisions of the applicable SEPPs, LEP and DCP.	
		The Proposal is generally consistent with the various controls and guidelines contained in the relevant SEPPs, LHI LEP 2010 and LHI DCP 2005 with the minor exceptions noted above. The impact to the natural or built environment outweigh the positive economic and social impacts the development will provide in improving the facilities at the LHI CBD.	
S 4.46(1)	Integrated development triggers	The Application is lodged as Local Development and includes work within a defined road corridor.	
		Subject to the approval of the Development Application, a S138 application will be submitted in accordance with the Roads Act 1993 to seek approval for works proposed within the road corridor.	

Table 4 Environmental Planning and Assessment Act 1979

3.1.2. Environmental Planning and Assessment Regulation 2021

Reference	Requirement	Response		
Environmen	Environmental Planning and Assessment Regulation 2021			
	Part 3		Owner's Consent is submitted with development application	
	Development applications, cl 23 – cl 36	CI 24	Information required by the approved form, EPA Act and Regulation has been provided to be best of the applicants knowledge. The Application will be lodged via the Planning Portal	
			Approval of a S138 under the Roads Act 1993 will be required to complete the irrigation component of the development.	
		CI 26	N/A to this Proposal	
		CI 27	N/A to this Proposal	
		CI 28	The Proposal does not trigger the Biodiversity Conservation Act 2016	
		CI 29	N/A to this Proposal	
		CI 30	N/A to this Proposal	
		CI 30A	N/A to this Proposal	
		CI 30B	As the LHIB is the applicant and the consent authority, the LHIB will contract an external party to undertake the assessment as the management strategy to satisfy clause 30B	
		CI 31	N/A to this Proposal	
		CI 32	The required information is provided	
		CI 33	N/A to this Proposal	
			N/A to this Proposal	
		CI 35	N/A to this Proposal	
		CI 35A	N/A to this Proposal	
		CI 35B	The Application proposes development that contravenes a development standard imposed by an EPI. The 'relevant EPI provision' under the LHILEP 2010 is found at cl 32(3).	
		CI 35BA	N/A to this Proposal, - as clause 3.1 (1)(b) of the State Environmental Planning Policy (Sustainable Buildings) 2022 notes the policy does not apply for non-residential developments classifying as an alteration, enlargement or extension of an existing building with a development cost of under \$10 million.	
		CI 35C	N/A to this Proposal - as clause 3.4 of the State Environmental Planning Policy (Sustainable Buildings) 2022 does not apply.	
		CI 35D	N/A to this Proposal - as the proposal does not constitute a large commercial development	
		CI 36	Noted	
	Part 4 Determination of development applications	CI 69(1)	For the purposes of this prescribed condition, it is intended that the Proposal be capable of compliance with the relevant provisions of the Building Code of Australia	

Table 5 Environmental Planning and Assessment Regulation 2021

3.1.3.Lord Howe Island Act 1953

Section 15A authorises the LHIB to act as consent authority for the purposes of the EPA Act.

3.1.4. Lord Howe Island Regulation 2014

Not applicable to development on Lord Howe Island.

3.1.5. Biodiversity Conservation Act 2016

Section 7.3 sets out the test for determining whether proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats.

In response, a 'test of significance' assessment has been undertaken and a report prepared by Bower Bush. The conclusion confirms that the project will not result in a significant impact, as defined by the seven-part test of significance, on the threatened species or listed ecological communities of LHI.

In addition, the report notes, as the project does not put any species at risk of extinction...a Species Impact Statement is not warranted.

3.2. Environmental Planning Instruments

3.2.1. State environmental planning policies

Reference	Requirement	Response		
State Environr	State Environmental Planning Policy (Sustainable Buildings) 2022			
Chapter 3 Stan	dards for non-residential developme	nt		
CI 3.1 Application of Chapter	 (1) This Chapter applies to development, other than development for the purposes of residential accommodation, that involves— (a) the erection of a new building, if the development has an estimated development cost of \$5 million or more, or (b) alterations, enlargement or extension of an existing building, if the development cost of \$10 million or more. 	The chapter does not apply as the development cost as an alteration, enlargement or extension of an existing building is under \$10 million and does not meet the requirement of clause 3.1 (1) (b)		

Table 6 State Environmental Planning Policies

3.2.2.LHI Local Environmental Plan 2010

LHI Local Environmental Plan 2010			
CI 2(2) Aims	 (a) conserve the world heritage values of Lord Howe Island and to restore or enhance lost or disturbed natural resources of the Island; (b) to conserve and facilitate the management of the marine environment of the Island and the resources of that environment, (c) to protect threatened species, populations and ecological communities, and their habitats, (d) to encourage the ecologically sustainable use of resources, (e) to encourage community appreciation of the World Heritage values of the Island, (f) to enhance the wellbeing and welfare of individuals and the Island's community by pursuing economic development that safeguards the welfare of future generations, (g) to facilitate the proper management, development and conservation of the Island's cultural heritage natural environment, the Island's world Heritage and the Island lifestyle, (h) to identify suitable land for the provision of housing and community services for the Island's population while acknowledging suitable land for these purposes is limited, (i) to enable, on the limited land available for agriculture, sustainable agriculture (that is, agriculture that contributes to the Island's economy and also protects the biological and physical resource base on which it depends), (j) to ensure that public utility undertakings are carried out on the Island in a manner that minimises any environmental impact on the Island of those undertakings, (k) to acknowledge the importance of tourism to the Island economy and permit future development of tourism within limits, (l) to ensure that tourism on the Island does not adversely affect the lifestyle of residents, or the World Heritage environmental qualities, of the Island, but enables visitors and residents to enjoy the Island, (m) to ensure the conservation of relics, specified heritage items and the heritage significance of those relics and heritage items), (n) to protect and promote t	The Proposal is either consistent with, or else does not hinder the attainment of, the aims of the LHILEP 2010.	
CI 2(3) Strategies	 (a) to apply general land use controls to land within each zone and special provisions for particular kinds of development or for development on particular land, (b) to identify suitable land for future housing opportunities and limit the total number of future dwellings, (c) to identify significant native vegetation by a map and to ensure that development does not result in its removal, (d) to require the advertising of any development authority's opinion, is likely to have a significantly adverse impact on the environment, (e) to require consideration of possible adverse environmental, economic or social impacts in advance of development. 	The Proposal is permissible with consent in the relevant zone with the exception of the road corridor for which a S138 will be submitted. The Proposal identifies a location for development which utilises existing serviced land, avoids the removal of significant native vegetation and results in a positive economic and social impact. The under utilised road reserve provides the LHIB with the opportunity to irrigate to this land to improve the facilities available on the LHI CBD for locals and tourist.	

LHI Local E	LHI Local Environmental Plan 2010			
CI 11 Matters that must be satisfied before development consent granted	(a) the proposed development is consistent with the aims of this Plan and the objectives of any zone, as set out in this Plan, within which the development is proposed to be carried out,	The proposal is consistent with the aims of this Plan (refer above) and is consistent with the objectives of the Zone 2 & Zone 6 (refer to below)		
	(b) there is an adequate area available for the disposal or treatment of any effluent arising from the proposed development by an appropriate effluent treatment or disposal system and any such system will not have any adverse effect on groundwater quality,	Refer to the details contained in the wastewater report, submitted with the Application documentation		
	 (c) no part of the proposed development— (i) will result in any damage to, or the removal of, significant native vegetation, or (ii) will have a significantly adverse impact on the habitat of any plants, or animals, that are native to the Island, 	Refer to details within the Application of the 'Test of Significance' to determine potential impact to threatened species or ecological communities, or their habitats – prepared by Bower Bush.		
	 (d) access is, or will be, available to the site of the proposed development and the provision of any such access will not— (i) result in any damage to, or the removal of, significant native vegetation, or (ii) have a significantly adverse impact on the habitat of any plants, or animals, that are native to the Island, 	Access to the development on the subject sites will not change from the existing arrangements.		
	(e) any proposed landscaping will provide various species of plants that are native to the Island and common in the locality to enhance any significant native vegetation,	Refer to details within the Application of the 'Test of Significance' to determine potential impact to threatened species or ecological communities, or their habitats – prepared by Bower Bush.		
	(f) the proposed development will not be adversely affected by any landform limitations, including flooding, landslip, unstable soils and steep slopes,	Flooding – as illustrated in section 2.4 Applicable LHI LEP Mapping, the subject sites are not within a defined flood area.		
		Landslip, unstable soils and steep slopes - the Subject Site is relatively flat and considered suitable for the proposal.		
	(g) adequate services in respect of the proposed development can be provided without significant additional cost to the Board or the community of the Island,	Electrical and water supply required by the development is already available and adequate. As part of this proposal a new wastewater treatment system is proposed to serve the		
		proposed development and all existing buildings on Lot 44.		
	(h) the appearance of the proposed development (when considered by itself or in conjunction with existing buildings and works) will not have any significantly adverse impact on the locality,	The proposed development is an extension of an existing LHIB asset. The extension will emulate the design qualities and materiality of the existing building as demonstrated under Section 3.1 Lord Howe Island CBD Amenities		
	 (i) the proposed development will not cause any significant overshadowing of adjoining land, 	The proposal will not overshadow adjoining properties. The height of the proposed additions are below the existing ridge line and main roof of the existing building. The proposed additions are located on the northern end of the building meaning any shadows cast will not impact adjoining properties.		
	 (j) the proposed development will not cause any significant reduction in the privacy of occupiers of adjoining land. 	The proposal will have no impact on visual privacy or acoustic privacy. There are no dwellings immediately adjoining the development that are visible form the site. The proposed screen located at the rear of the deck will contribute in attenuating any noise traveling from the deck of the building to adjoining properties. This screening will also improving the visual appearance by screening the service area from public view.		

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CI 14 Zone 2 Settlement	 (1) The objectives of Zone 2 Settlement are as follows— (a) to provide opportunities for limited residential and commercial development that maintains the dispersed housing pattern of the settlement area and is in sympathy with existing development in relation to the following— (i) setbacks, (ii) building mass and style, (iii) visual amenity, (iv) landscaped character, 	 In the sprit of the LEP, the development's design intent is to integrate with the existing buildings on the Lot in which it lies from a scale and materiality perspective. (i) Setbacks - The Application seeks a variation to the minimum setback boundary to the adjoining road (Neds Beach Road) stipulated in clause 32(2)(a) of the LHI LEP 2010 (see below). The proposed development does not comply with Clause 32 (2) stipulating minimum setbacks for buildings. Approval is sort Under Clause (32) (3) for the following reasons: The propose development follows the precedence set by the existing building in aligning with the existing building's façade and set back to the boundary along Neds Beach Road as shown in Figure 7 Site Plan. The proposed development is positioning an assess toilet which will be open to the general public for use. The entrance to the accessible toilet is close to the boundary along Neds Beach Road providing convenient access to the public. In addition, to ensures a compliant accessible toilet is reason to the general compliant accessible toilet is position.
	 (b) to ensure that any development is only permitted in locations where, in the consent authority's opinion— (i) the development will not involve unacceptable infrastructure costs for the Board or the community of the Island, and (ii) there is an adequate area available for the treatment or disposal of any effluent arising from the proposed development by an appropriate effluent treatment or disposal system and 	 required to be within the minimum setback requirement. (ii) Building mass and style – The proposal is modest in scale. The roof form follows the existing veranda roof line and has been designed to appear as part of the original building. The colours and materials proposed also match the existing building. (iii) Visual amenity –The service area has been screened from the public view improving the outlook from the deck of the building as well as from adjoining retail outlets. The tourist information area is improved visually and provides a shaded courtyard area for visitors. The adjoining retail shops will also benefit from the relocation of the Tourist information area and these works as this will open up the courtyard area providing more exposure from Neds beach Rd. (iv) Surrounding landscape will be in accordance with the recommendations in the Application of the 'Test of Significance' to determine potential impact to threatened species or ecological communities, or their habitats – prepared by Bower Bush. (i) All services required by the development is available on site (ii) Refer to the On-site Wastewater Report by Broadcrest Environmental Pty Ltd (iii) The land is relatively flat and considered suitable for the development (iv) Refer to the On-site Wastewater Report by Broadcrest Environmental Pty Ltd

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	(iii) the land is capable of supporting the proposed development and is suitable in terms of the land's physical constraints (such as vulnerability to erosion, slip or flooding), and (iv) the development (including any effluent treatment or disposal system referred to in subparagraph (ii)) will not adversely affect groundwater quality,	
	 (c) to avoid or minimise environmental damage and protect areas that— (i) comprise significant habitat for species of animals that are native to the Island, or (ii) have significant native vegetation. 	 (i) the Application of the 'Test of Significance' to determine potential impact to threatened species or ecological communities, or their habitats – prepared by Bower Bush. (ii) As highlighted in Section 2.4 Applicable LHI LEP Mapping the development including any irrigation area associated with the proposed wastewater treatment system will not disrupt any mapped SNV.
CI 16 Zone 6 Recreation	 The objectives of Zone 6 Recreation are as follows— (a) to set aside land for open space, (b) to provide opportunities for the passive and active enjoyment of open space areas, (c) to provide utility services that are essential to the community's needs in a manner that is in sympathy with the World Heritage values of the natural environment of the Island. (3) Except as otherwise provided by this Plan, demolition and development for the purposes of any of the following may be carried out on land within Zone 6 Recreation only with the consent of the consent authority—	The area for irrigation falling under Zone 6 is identified in Section 3.2 Wastewater Treatment System & Irrigation Area. The space is densely vegetated and currently services the purpose of providing passive enjoyment of the island to locals and tourist. The installation of wastewater irrigation within the earmarked area is in accordance with clause 16 (1) (c) in providing a utility service that is essential to the community's needs without affecting the natural environment. The development is seeking concent of the consent authority under Clause 16 (3) (h) for the installation of wastewater irrigation system as specified in the On-site Wastewater Report by Broadcrest Environmental Pty Ltd
CI 22 Tourist accommodation, staff accommodation and commercial premises	 (1)The consent authority must not consent to the erection, enlargement or extension of any building comprising, or ancillary to, tourist accommodation, staff accommodation or commercial premises on an allotment unless— (a) the total area of the allotment occupied by any existing or proposed buildings comprising, or ancillary to, the accommodation or premises is no more than 15 percent of the balance of the area of the allotment remaining after the minimum dwelling area is deducted from the total area of the allotment, and 	 The development comprising of the proposed extension and wastewater systems spans across 2 Lots and land defined as a road reserve: Lot 44 – 2240 sqm* Lot 49 – 4330 sqm* Road reserve – n/a Total – 6570 sqm Buildings on the Lots: Building occupied by a Bar and Massage & nail salon - 182.50 sqm Building occupied by retail and convenience store – 100 sqm* Building occupied by government agencies - 220 sqm* Shed – 15 sqm* Total – 517.5 sqm 15% of the area exceeding 3,000 sqm 6570 – 3000 = 3,570 sqm 517.5 / 3570 = 14.5% - which is under 15% required under clause 22 (1) (a). *information taken from LHIB's ArcGIS maps

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	 (b) it is proposed that at least 50 percent of the total area of the allotment be comprised of landscaped areas and that various species of plants that are native to the Island and common to the locality be retained or planted on at least 35 percent of the total area of the allotment, and (c) the proposed development is carried out on a part of the allotment that does not have any significant native vegetation, and (d) the consent authority is satisfied that there is a demonstrated business need for the development. 	Lot 44 – 517.5 / 6570 = 7.9 % of the lots is built, leaving the balance for landscaping. It is noted that due Lot 44 being a prominent civic space, the majority of the lot is developed and comprises of hard and soft landscaping. Landscaping will be in accordance with the recommendations in the Application of the 'Test of Significance' to determine potential impact to threatened species or ecological communities, or their habitats – prepared by Bower Bush. Lot 49 – is utilised for wastewater irrigation. The existing vegetation will remain. The extension and the wastewater system and irrigation is clear of any mapped SNV Due to the lack of facilities on Lot 44, all patrons of business, the public and tourist currently use the existing toilets across the road from Lot 44. The existing toilets are operating beyond
CI 29	(1) Despite anything to the contrary in Part 2 or any	capacity. The proposed toilets and wastewater system for Lot 44 will provide additional facilities to support businesses and the broader tourism industry on LHI. The height of the tallest part of the extension is
Maximum height of buildings	other provisions of this Part, the erection of a building that has a height of more than 7.5 metres above natural ground level is prohibited.	under 7.5m as illustrated in Figure 11 Section.
CI 32 Setbacks of buildings in Zone 1, 2 or 5	 (2) Any building proposed to be erected on an allotment of land to which this clause applies must comply with the following requirements— (a) if the allotment has one boundary adjoining a road—the building must be erected at least 10 metres from that boundary and at least 5 metres from any other boundary of the allotment, (b) if the allotment has more than one boundary adjoining a road—the building must be erected at least 10 metres from one of those boundaries and at least 5 metres from any other scheme from any other boundary of the allotment, (b) if the allotment has more than one boundary adjoining a road—the building must be erected at least 10 metres from one of those boundaries and at least 5 metres from any other boundary of the allotment, (c) in any other case—the building must be erected at least 5 metres from any boundary of the allotment. 	See below, the proposed development seeks approval from the consent authority under Clause 32 (3).
	(3) Despite subclause (2), a proposed building (including any alteration to, or any enlargement or extension of, an existing building) that does not comply with the requirements set out in subclause (2) may be erected with the consent of the consent authority on land to which this clause applies if, in the consent authority's opinion, compliance with the requirements would be unreasonable (for example, because of the physical constraints of the land) or unnecessary.	 The proposed development seeks approval from the consent authority under Clause 32 (3) for the following: the proposal maintains the current set back from the front boundary along Neds Beach Road established by the existing building to which the extension will be built off The proposed development is positioning an assess toilet which will be open to the general public for use. The entrance to the accessible toilet is close to the boundary along Neds Beach Road to ensure a compliant accessible path is provided by minimising the distance from the footpath to the entrance of the accessible toilet. There is no adverse impact as a result of reducing the set back defined in Clause 32 (2) (b)

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CI 33 Landscaping to be carried out in Zone 2	The consent authority must not consent to the carrying out of any development on land within Zone 2 Settlement unless it is satisfied that there will be no significantly adverse impact on the existing landscaped character and dispersed pattern of housing in that zone.	The propose does not disturb SNV in any way. The landscaped disturbed is considered established gardens as outlined in Application of the 'Test of Significance' to determine potential impact to threatened species or ecological communities, or their habitats – prepared by Bower Bush.	
CI 36 Unzoned land	(3) The consent authority must not consent to development on unzoned land unless it is satisfied that the proposed development will not have a significantly adverse impact on the amenity of the locality and the future pattern of development of land in any adjoining zone.	The works proposed in the road corridor falling outside of any defined zone is limited to irrigation of treated wastewater as specified the On-site Wastewater Report by Broadcrest Environmental Pty Ltd. The application of treated wastewater does have a significant adverse impact on the amenity of adjoining zones as the adjoining properties are developed.	

Table 7 LHI Local Environmental Plan 2010

3.3. Applicable Draft Environmental Planning Instruments

There are no provisions within any draft EPI's which are relevant to the assessment of this Application.

3.4. Applicable Development Control Plan(s)

3.4.1.Lord Howe Island Development Control Plan (2005)

Reference	Component	Compliance	Comment
CHAPTER 1	- Introduction, aims and objectiv	ves	
CHAPTER 1 1.2 Objectives of the Plan	 Introduction, aims and objectiv (a) to encourage quality design of residential and non-residential development; (b) to assist in achieving the aims and strategies of the REP; (c) to provide guidelines on appropriate, sustainable building designs and locations; (d) to promote design solutions which respect the Island character and minimise loss of amenity for neighbours; (e) to ensure that the scale and appearance of new development is compatible with the Island character; (f) to protect and/or re-establish environmental integrity; 	ves	 (a) The amenities represent quality design. The designs were developed and drawn by Barbara Tarnawski, a registered architect who was selected for their experience in complecting similar projects. (b) The Lord Howe Island REP 2005 is now repealed. (c) The Proposal is consistent with the guidelines, as demonstrated below. (d) The service area has been screened from the public view improving the outlook from the deck of the building as well as from adjoining retail outlets. The tourist information area is improved visually and provides a shaded courtyard area for visitors. The adjoining retail shops will also benefit from the relocation of the Tourist information area and these works as this will open up the courtyard area providing more exposure from Neds beach Rd. (e) The roof form follows the existing veranda roof line and has been designed to appear as part of the original building. The colours and materials proposed also match the existing building maintaining the island character (f) The Proposal has been arranged so that it avoids SNV, thus protecting the environmental integrity of the locality.

Reference	Component	Compliance	Comment
2.2 Objectives	 (a) to encourage good design of subdivision layout and buildings which respect the special landscape character of the Island; (b) to encourage subdivision that considers future development opportunities appropriately; (c) to encourage the maintenance 		 (a) n/a – subdivision is not proposed. As a central civic space, the character of the landscape and function of Lot 44 will be maintained. The natural vegetation on Lot 49 will be maintained. (b) n/a subdivision is not proposed
	 of the existing scale of Island buildings; (d) to encourage design of buildings in such a way that physical impacts on the site are minimised; (e) to provide information on appropriate construction methods and materials and efficient use of resources recognising the special characteristics of the Island; and (f) To encourage the energy efficient design of buildings 	\checkmark	 (c) The proposal is modest in scale. The roof form follows the existing veranda roof line and has been designed to appear as part of the original building. The colours and materials proposed also match the existing building. (d) The extension is proposed to be positioned in an underutilise area of the site currently used as an informal storage area. The irrigation on Lot 49 will have a minimal impact on the natural vegetation.
			 (e) The development will use similar materials utilised on the island to ensure maintenance can be carried out by local trades and the characters of the island is maintained. Refer to response under item (c) above. (f) The State Environmental Planning Policy (Sustainable Buildings) 2022 does not apply to the development, however the proposal will utilise energy & water efficient fixtures where and seek to minimise consumption where possible.
2.3 Design context	A building should be designed to sit comfortably within the existing natural and built environment. The design should: (a) reflect the existing dispersed development character of the settlement area; (b) be responsive to the site's constraints and opportunities; and (c) be environmentally sensitive and sustainable.	\checkmark	 (a) generally compliant, as an extension of an existing building, the development is maintaining the scale and character of the built environment within the LHI CBD. (b) The extension is proposed to be positioned in an underutilise area of the site currently used as an informal storage area. The layout addressed existing pedestrian footpaths to ensure ease of access to the public. The wastewater treatment system is located where existing holding tanks are positioned, maintain the area for services. (a) The Proposal is considered to be environmentally sensitive and sustainable, as set out in this SEE.
2.3.1 Slope and soil stability	Avoid difficult or unsuitable terrain, unstable soil conditions, erosion hazards and difficult access	\checkmark	The area earmarked for the extension on Lot 44 is considered relatively flat with a gentle slope towards the south. The conditions are suitable for standard construction techniques. There is a slope on the road reserve where treated wastewater will be irrigated, this has been addressed in the On-site Wastewater Report by Broadcrest Environmental Pty Ltd Lot 49 is considered flat and suitable for the irrigation of treated wastewater.

Reference	Component	Compliance	Comment
2.3.2 Orientation	Living areas, verandahs and terraces should be orientated generally toward the NE – NW quadrant.	n/a	n/a as the development is providing facilities for an existing commercial asset.
2.3.3 Climate	Analyse areas exposed to strong winds, use ridgelines and landscaping for protection.	\checkmark	The development is positioned between two existing building which will provide protection from strong winds.
2.3.4 Visual amenity	Provide building sites which are not visually prominent from other locations on the Island; Blend with the settlement area character, avoid the highest point of the allotment, install screen planting as required, consider bulk and scale. View the site from key vantage points. Choose colours and materials to complement the backdrop. Generally, darker colours blend better with a backdrop of trees.	Merrit assessment	Due to the civic nature of Lot 44, the existing building on the Lot are positioned to be visually prominent to aid the public and tourist to find businesses and provide passive security. The proposed development maintains this function of Lot 44. The wastewater treatment system is located in the south east corner in a part of the lot currently occupied by services. Finishes are selected to match the existing building.
2.4 Bulk and scale	Maintain the predominantly low scale, single storey character of the existing buildings on the Island. Avoid excessive elevation of floor levels on visually prominent, steeper slopes – buildings are better planned to step down slopes where possible.	\checkmark	The development is single storey. The roof form follows the existing veranda roof line and has been designed to appear as part of the original building. Slope is not applicable to the development as the site is predominantly flat.
2.5 Building forms 2.5.1 Roofs	Simple gable and hipped roofs using traditional roof pitches in the range of 22.5 degrees to 45 degrees are preferable. Long uninterrupted roof planes should be avoided	Merrit assessment	The roof form follows the existing veranda roof line and has been designed to appear as part of the original building. The roof pitch will be approximately 5 degrees.
2.5.2 Verandas and overhangs	Include verandahs at design stage, particularly north-facing elevations.	Merrit assessment	An extension of the existing deck is proposed to tie in with the existing building. This is on the eastern end of the extension to connect with the existing wrap around veranda. Connection to the existing deck is necessary to facilitate access to the male and female toilets.
2.6 Building materials and colours	Materials and colours should complement the natural surroundings. Avoid reflective surfaces such as high gloss finishes, solar tinted reflective glass and uncoated zincalume sheets unless they can be effectively screened	\checkmark	The colours and materials are proposed to match the existing building and does not include highly reflective surfaces.
2.7 Energy and water efficiency	Various guidelines	\checkmark	The State Environmental Planning Policy (Sustainable Buildings) 2022 does not apply to the development, however the proposal will utilise energy & water efficient fixtures where and seek to minimise consumption where possible.

Reference	Component	Compliance	Comment
2.8 Landscaping design 2.8.1 Site vegetation	Work with existing vegetation. Avoid conflict between buildings and existing vegetation, including during construction phase	\checkmark	Refer to attached preliminary construction management plan for extent of site establishment. Works outside of the site will be managed in consultation with the LHIB and relevant regulations. All SNV areas are avoided.
2.8.2 Visibility and screening	Consider tree planting along sight lines to minimise potential visual exposure, particularly from important vantage points	Merrit assessment	Due to the civic nature of Lot 44, the existing building on the Lot are positioned to be visually prominent to aid the public and tourist to find businesses and provide passive security. The development does not impact any important vantage points on the island.
2.8.3 Planting and establishment	Guidelines for acceptable and recommended species and necessary maintenance to ensure survival of planting	\checkmark	Refer to the Application of the 'Test of Significance' to determine potential impact to threatened species or ecological communities, or their habitats – prepared by Bower Bush.
2.9 Site access and parking	Plan for access roads which curve through existing landscape screening. Consider environmental impacts and avoid long access roads or which require significant cut and fill	n/a	n/a – the development does not include driveways or parking

Table 8 Lord Howe Island Development Control Plan (2005)

3.5. Suitability of the Site for the Proposed Development

Based on the assessment conducted within this SEE, the document demonstrates, Lot 44, Lot 49 & the road reserve is suitable for accommodating the proposed development. The proposal meets all relevant controls, except for the side setback control specified in clause 32(2)(a) of the LHI LEP 2010. However, pursuant to clause 32(3), strict adherence to this control in the current context of Lot 44 being a central civic site would detrimental to the design outcome. Overall, it is concluded that the subject sites are appropriate for the Proposal.

3.6. Community Consultation and Public Submissions

Public exhibition is yet to occur and will be managed by the LHIB. The project team will respond to any submission on the request of the LHIB.

3.7. Public Interest

A public interest benefit arises from carrying out a development that generally conforms with the relevant provisions of the applicable LEP and DCP. The development directly supports and enhances a number of the LHI LEP 2010 aimes listed under Part 1 Clause (2).

From a broader perspective, the proposal will support the local economy by improving the functionality and enjoyment of the LHI CBD, and protecting the long term viability of the LHIB's commercial asset. Importantly, the proposal also addresses issues with the existing wastewater treatment system by de-coupling all building on Lot 44 and providing a standalone system designed for Lot 44 in accordance with the LHIB's wastewater guidelines.

4. Conclusion

This Statement of Environmental Effects ('SEE') accompanies a local development application ('the Application') made under s4.12 of the Environmental Planning & Assessment Act 1979 ('EPA Act'), which seeks consent from the Lord Howe Island Board ('LHIB'), as the relevant consent authority, for the extension on Lot 44, wastewater treatment system on Lot 44 and the irrigation of treated wastewater on Lot 49 and the nominated road reserve.

The Proposal generally adheres to the relevant planning requirements of the SEPP, LHI LEP 2010, and LHI DCP 2005, except where noted in this SEE. The Proposal is not expected to result in unreasonable or unmanageable adverse impacts on either the natural or built environment, and its economic and social effects are anticipated to be positive. Consequently, the Proposal is deemed to align with the public interest and advances the aims of the LHI LEP 2010.

Based on the above assessment within this SEE, it is recommended that the Application be approved subject to conditions.