



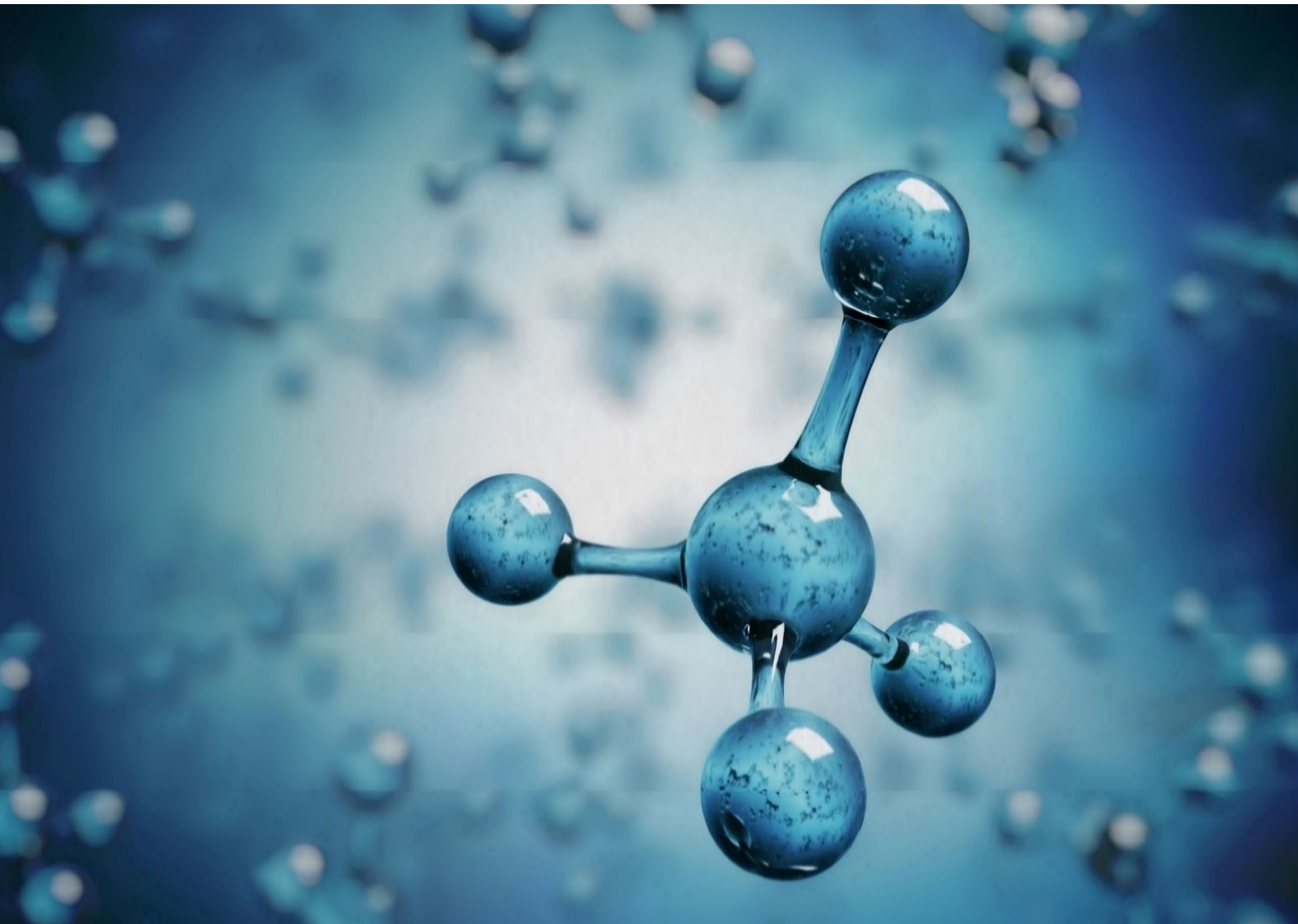
# Lucas Heights Bioenergy Facility

**Preliminary Site Investigation (PSI) for  
Contamination**

LMS Energy Pty Ltd

October 2025

→ **The Power of Commitment**



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# Executive Summary

## The project

LMS Energy Pty Ltd (LMS) ('the proponent') proposes to upgrade the landfill biogas management infrastructure at the Lucas Heights Resource Recovery Park (LHRRP), by upgrading the existing power station to produce renewable energy from landfill biogas generated at the LHRRP ('the project'). The project is a State Significant Development and is subject to approval by the NSW Minister for Planning and Public Spaces under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

The project would involve a like-for-like replacement of the existing power station to comply with current standards and regulations. It will provide renewable energy generation via landfill biogas for the duration of remaining landfilling and the post-closure period for the site, which would last several decades. The proposed bioenergy facility would be capable of generating up to 190,000 MWh annually, which is equivalent to powering approximately 30,000 homes. The project would further support the transition to renewable energy while increasing electricity supply to the National Energy Market.

## This report

LMS commissioned GHD Pty Ltd (GHD) to undertake a Preliminary Site Investigation (PSI) for contamination to assess the existing power station (project site). The objective of this PSI is to assess if contamination has the potential to exist on the project site and whether further investigation and/or management is required. This information will be used to assist LMS with an understanding of the potential impact that contamination may have on the project site and the proposed construction (including potential risk to human health and the environment).

The scope of work developed to meet these objectives included a desktop study of site history, review of available and relevant contamination and geotechnical reports, development of a conceptual site model (CSM) and conclusions and recommendations in relation to the above objectives.

## Existing environment

The project site consists of an existing power station situated to the immediate south east of the LHRRP which is an active waste management facility. There is a variety of infrastructure on the project site including generator modules, aboveground oil storage tanks, oil distribution lines, waste oily water and coolant storage, and a flare compound.

The outcomes of a site history information review indicated that prior to 1956, the project site appeared to be undeveloped bushland. From 1956, the vegetation was progressively cleared and formed part of the LHRRP. Landfilling activities occurred to the west, north west and south west of the project site in the 1980's. The power station was originally built in 1997 (anecdotally) and situated east of a nearby landfill waste cell which is in the process of being capped.

A soil investigation undertaken by Douglas Partners Pty Ltd (Douglas Partners) in May 2025 for Energy Development Limited (EDL) encountered fill and evidence of hydrocarbon impacts at the site. The description of the fill materials did not indicate the presence of anthropogenic or waste materials. Soil analysis indicated that hydrocarbon concentrations were below the nominated human health assessment criteria for industrial land use, however, there was an exceedance of the adopted petroleum management limits at one investigation location (TBH5).

A geotechnical investigation undertaken by GHD in 2025 on the project site encountered fill material to depths up to 1.4 metre (m) below ground level but did not identify waste or anthropogenic materials. A previous investigation by GHD in 2015 carried out for the LHRRP site, excluding the power station site, indicated a low likelihood of exposure to landfill biogas across the LHRRP site on the basis of continued operation of the landfill biogas extraction system as well as the ongoing monitoring of landfill biogas emissions.

## Conclusions

Based on the outcomes of the investigation, three Areas of Environmental Concern (AECs) were identified where source-pathway-receptor (SPR) linkages were assessed as potentially complete for:

- AEC 02: Presence of landfill biogas underlying the project site originating from the biogas extraction and distribution system.
- AEC 03: Presence of hydrocarbon impacts to soil/fill material (likely to be engine or lubricant oils) identified adjacent some of the existing generator modules and associated with their operation.
- AEC 10: Subsurface biogas migration towards the project site from the landfill to the west.

The risk of potential exposure to contamination was assessed to exist for construction workers undertaking excavations and earthworks and for future maintenance workers at the project site if SPR linkages are complete.

## Recommendations

Based on the results of the PSI for contamination, the following is recommended:

- Preparation of a Construction Environmental Management Plan (CEMP) to manage potential contaminant exposure risks during construction works and to manage unexpected contamination. A surface and subsurface monitoring program should be implemented which includes a higher frequency of monitoring events that aligns with construction activities, particularly those that will disturb the ground surface.
- The CEMP should include an Unexpected Finds Protocol.
- If ground disturbance and/or excavations occur and there is a requirement to remove soils from the site, these should be sampled and analysed in accordance with the NSW Environmental Protection Authority (EPA) Waste Classification Guidelines (NSW EPA, 2014). Appropriate documentation should be prepared to support the classification of the waste in accordance with the NSW EPA guidelines.
- If hydrocarbon impacted soils remain post decommissioning of the generator modules, a site management plan should be developed to provide a framework to manage potential exposure to future workers, particularly future intrusive maintenance workers.
- To minimise risks to future workers to be exposed to contamination (if present), implement an environmental monitoring programme to assess for the presence of landfill biogas at the project site (surface and subsurface) targeting underground services and buildings/structures where enclosed spaces are likely.
- It is recommended to keep accurate and regularly updated records of maintenance of equipment, on-site infrastructure, fuels, chemicals and/or oil storage checks and a register of environmental incidents to assist with decommissioning of the bioenergy facility in the future during the LHRRP post closure period.

*This report is subject to, and must be read in conjunction with, the limitations set out in section 1.6, and the assumptions and qualifications contained throughout the Report.*

# Key terms, acronyms and abbreviations

Term	Definition
ACM	Asbestos Containing Material
AEC	Area of Concern
AEMR	Annual Environmental Monitoring Report
AFFF	Aqueous film-forming foam
ANSTO	Australian Nuclear Science and Technology Organisation
ARRT	Advanced Resource Recovery Technology
ASS	Acid Sulfate Soils
AST	Above Ground Storage Tank
Bgl	Below ground level
BOM	Bureau of Meteorology
BTEX	Benzene, toluene, ethylbenzene, xylene
btoc	Below top of casing
CEMP	Construction Environmental Management Plan
CH <sub>4</sub>	Methane
CO <sub>2</sub>	Carbon dioxide
COPC	Contaminants of potential concern
CSM	Conceptual site model
CVS	Condensate Storage Vessel
DOD	Department of Defence
DSI	Detailed Site Investigation
EDL	Energy Developments Limited
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
EPL	Environmental protection licence
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
GHD	GHD Pty Ltd
GO	Garden Organics
H <sub>2</sub> S	Hydrogen Sulphide
HDPE	High Density Polyurethane
HV	High Voltage
IBC	Intermediate bulk containers
kV	Kilovolt
IWC	Industrial Waste Collection
L	Litres
LEP	Local Environmental Plan
LFG	Landfill gas
LGA	Local Government Area

<b>Term</b>	<b>Definition</b>
LHRRP	Lucas Heights Resource Recovery Park
m	metres
m AHD	Metres Australian Height Datum
m bgl	Metres below ground level
m btoc	Metres below top of casing
MWh	Megawatt-hour
NSW	New South Wales
OCPs	Organochlorine pesticides
OEMP	Operational Environmental Management Plan
OPPs	Organophosphorus pesticides
PFAS	Per-and-Polyfluoroalkyl Substances
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated Biphenyls
PIRMP	Pollution Incident Response Management Plan
POEO Act	Protection of the Environment Operations Act 1997 (NSW)
ppm	Parts per million
PSI	Preliminary Site Investigation
SEARs	Secretary's Environmental Assessment Requirements
SITA	SITA Australia Pty Ltd
SSD	State significant development
SPR	Source-pathway-receptors
SVOCs	Semi-Volatile Organic Compounds
SWL	Standing water level
TRH	Total recoverable hydrocarbons
UCL	Upper confidence limit
UFP	Unexpected Finds Protocol
UST	Underground Storage Tank
VMP	Voluntary Management Proposal
VOCs	Volatile Organic Compounds

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# 1. Introduction

## 1.1 Project overview

LMS Energy Pty Ltd (LMS) proposes to upgrade the landfill biogas utilisation infrastructure at the Lucas Heights Resource Recovery Park (LHRRP), by replacing the existing power station (the project) to produce renewable energy from landfill biogas generated at the LHRRP.

The new bioenergy facility would be a like for like replacement of the existing power station landfill biogas generators within the existing power station site, with improvements that comply with modern standards and regulations and forecasted biogas generation capacity requirements. The project provides increased capacity to manage forecast peak recoverable biogas and renewable energy generation would effectively continue through the remaining landfilling and post closure periods for the landfill.

The location of the project is shown on Figure 1.1.

## 1.2 Objectives

The objectives of this report were to:

- assess the likelihood for contamination to exist on the site from past or present activities at the project site
- provide recommendations for further investigation and/or contamination management in relation to the proposed development (if applicable).

## 1.3 Purpose and scope

The purpose of this report is to document the findings of the PSI for Contamination which will support the planning project as described above. Information documented in this report will also be used to assist LMS with an understanding of the potential impact that contamination may have on the project site and the proposed construction (including risk to human health and the environment).

In order to meet the objectives stated in section 1.2, GHD completed the following scope of work:

- A site inspection undertaken on 19 August 2025 by an experienced GHD environmental scientist.
- A review of background information on the project site encompassing the following:
  - Review of historical aerial photography of the project site and the surrounding area to assess historical land uses that may have the potential to cause contamination.
  - Review of topographical, soil, geological and hydrogeological maps of the project site and the surrounding area for assessment of baseline environmental conditions (including acid sulfate soil and salinity) and potential contaminant migration pathways (including soil and/or groundwater).
- A search and review of information available from the following sources:
  - Registered groundwater bore search – WaterNSW Real Time data online database<sup>1</sup>.
  - Search of the NSW EPA databases including the Contaminated Land Registers (notified sites and record of notices).
  - Search of the *Protection of the Environment Operations Act 1997* (POEO Act) public registers for the site and the surrounding area.
  - Search of other NSW EPA databases (former gasworks sites, Defence and Airservices Australia PFAS investigation sites, National Waste Management Site database and National Liquid Fuel Facilities database).
- Interview with a Cleanaway staff member familiar with the history of the wider LHRRP.
- A review of existing contamination and geotechnical reports for the site and adjacent areas.

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<sup>1</sup> [Real-time water data](#)

- Preparation of a preliminary conceptual site model (CSM).
- Preparation of this PSI report documenting the findings of the investigation and providing conclusions and recommendations in relation to the above objectives. The report was prepared with reference to NSW EPA 2020, *Consultants reporting on contaminated land Contaminated Land Guidelines*.

## 1.4 Secretary’s Environmental Assessment Requirements

The specific SEARs addressed in this report are summarised in Table 1.1.

**Table 1.1** SEARs and agency response(s) relevant to this assessment

Requirement	Where addressed in this report
<p>Contamination<sup>2</sup>:            A site contamination assessment in accordance with the Managing Land Contamination Planning Guidelines: SEPP 55 – Remediation of Land (DUAP, 1998), including:</p> <ul style="list-style-type: none"> <li>– Characterisation of the nature and extent of any contamination on the site and surrounding area.</li> <li>– A Detailed Site Investigation (DSI) and a Remedial Action Plan, if the Preliminary Site Investigation indicates contamination is present and a DSI is required.</li> </ul>	<p>An assessment of contamination risk at the project site is presented in section 6 with discussion and recommendations provided in sections 6.5 and 7, respectively.</p>
<p>Agency response, Sutherland Shire Council (26 February 2025):  <i>“Section 2.4.6 of the scoping report notes that the land may have been impacted or substantially altered by past landfilling activities. It is noted this is not followed up in section 6 ‘proposed assessment of impacts’ and should be included for assessment.</i>  <i>Despite the site area not historically being used for landfilling, it is unlikely that the risk from contaminated land is ‘low’. The site is adjacent to an area that has been landfilled and gas and vapour migration must be considered, particularly the potential impacts to occupiers of the ancillary buildings proposed for the site.”</i></p>	<p>An assessment of risk associated with the potential presence of landfill gas at the project site is presented in section 6 with discussion and recommendations provided in sections 6.5 and 7, respectively.</p>

## 1.5 Regulatory guidelines

This report has been completed with consideration of guidelines made or endorsed by the NSW EPA under Section 105 of the *Contaminated Land Management Act 1997*. These guidelines include the following key documents:

- National Environment Protection Council (NEPM, 2013), National Environment Protection (Assessment of Site Contamination) Amendment Measure (No. 1).
- NSW Environment Protection Authority (EPA) (NSW EPA, 2020), *Guidelines for Consultants Reporting on Contaminated Land*.

## 1.6 Limitations

*This report has been prepared by GHD for LMS Energy Pty Ltd and may only be used and relied on by LMS Energy Pty Ltd for the purpose agreed between GHD and LMS Energy Pty Ltd as set out in section 1.3 of this report. GHD otherwise disclaims responsibility to any person other than LMS Energy Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.*

*The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.*

*The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.*

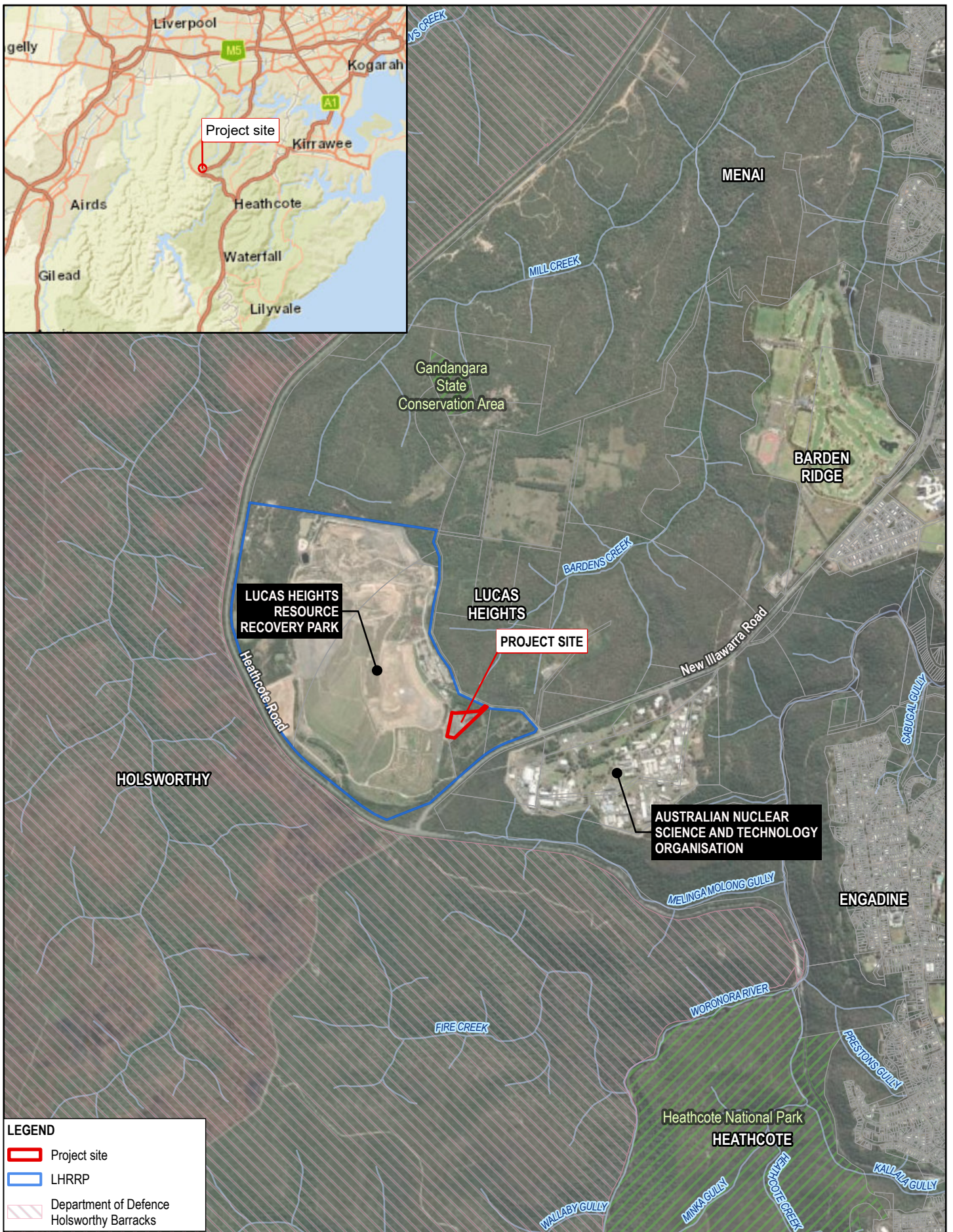
<sup>2</sup> We note that the SEPP55 now forms part of State Environmental Planning Policy (Resilience and Hazards) 2021

*The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.*

*GHD has prepared this report on the basis of information provided by LMS Energy Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.*

*Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.*

*Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.*



**LEGEND**

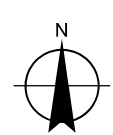
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- LHRP
- Department of Defence Holsworthy Barracks

Paper Size ISO A4

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Metres

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Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 56



**LMS Energy**  
Lucas Heights Bioenergy facility

Project No. 12649882  
Revision No. 0  
Date 17/09/2025

**Regional context**

**FIGURE 1.1**

## 2. Key project features

The key features of the project are summarised in Table 2.1. The existing layout and key features of the site are shown on Figure 2.1.

The proposed layout of the infrastructure for the project is shown on Figure 2.2.

Table 2.1 Key features of the project

Project element	Summary
Project site	Approximately 1.8 ha located within the existing power station footprint.
Output capacity	20 x 1.1 MW modular lean burn generator sets to provide a total output of approximately 22 MW.
Proposed built infrastructure	<p><b>New proposed infrastructure</b></p> <ul style="list-style-type: none"> <li>– Gas delivery and metering, system</li> <li>– Transformers to step up the electrical output voltage from low voltage (LV) to high voltage (HV) to match the local grid voltage</li> <li>– Electricity metering, protection and communication equipment</li> <li>– Covered storage bund for chemical and coolant storage</li> <li>– HV Switchroom / Control room</li> <li>– Lightning poles</li> <li>– External lighting</li> <li>– Safety showers</li> </ul> <p><b>Retained/ upgraded infrastructure</b></p> <ul style="list-style-type: none"> <li>– Gas delivery, metering, and condensate removal system</li> <li>– Lunchroom / Toilet</li> <li>– Offices / Workshop</li> <li>– Car parking for on site operators</li> <li>– Security fencing</li> <li>– External lighting</li> <li>– Waste oil and clean oil tanks</li> </ul> <p><b>Buildings to be decommissioned</b></p> <ul style="list-style-type: none"> <li>– Workshop x 2</li> <li>– Existing generators</li> <li>– Existing flare facility</li> <li>– Cooling towers.</li> </ul>
Utilities connections	<p><b>Proposed new connections</b></p> <ul style="list-style-type: none"> <li>– New underground HV electricity line to the Ausgrid 33 kilovolt (kV) distribution network as an extension of the connection from the existing on site electrical infrastructure to the Lucas Heights Zone Substation.</li> </ul> <p><b>Existing utilities</b></p> <ul style="list-style-type: none"> <li>– Fibre connection to the Lucas Heights Zone Substation</li> <li>– Potable water connection from LHRRP.</li> </ul>
Key construction activities	<p><b>Early works (site establishment)</b></p> <ul style="list-style-type: none"> <li>– Site compound set-up including fencing to isolate the construction area from existing power station operations and set-up of environmental controls</li> <li>– Demolition of existing site sheds and flare compound</li> </ul> <p><b>Minor civil works for site levelling and compaction</b></p> <ul style="list-style-type: none"> <li>– Mobilisation and structure installations (project construction)</li> <li>– Generator assembly and placement onto concrete pads using cranes</li> <li>– Installation of gas delivery skids and placement onto concrete foundations</li> </ul>

Project element	Summary
	<ul style="list-style-type: none"> <li data-bbox="571 210 1437 264">– Ancillary connections (electricity through trenching) (gas, electrical, water, oil, compressed air)</li> </ul> <p data-bbox="571 271 895 297"><b>Testing and commissioning</b></p> <ul style="list-style-type: none"> <li data-bbox="571 304 1251 331">– Test and commission of generators and ancillary equipment</li> <li data-bbox="571 338 775 365">– Demobilisation.</li> </ul>

## 2.1.1 Key construction elements

Key construction activities that have been considered with respect to this assessment are as follows:

- Site preparation.
- Earthworks during construction of new power station including excavations and disturbance of soils
- Trenching for new underground earth grid, piping, conduits and cable connections (i.e., for potable water, high voltage ((HV)) power). Trenches are likely to be 1 metre (m) deep and 0.6 m wide (actual trench subject to detailed design).
- Generator assembly through installation of pre-fabricated components.
- Decommissioning of existing landfill biogas generator modules, transformers and ancillary infrastructure nearing end of design life.

### Site preparation

The preparation of the bioenergy facility site would include any services relocations, earthworks or stabilisation required to provide a suitable work area for construction to proceed. Site preparation would also include the establishment of areas for laydown of materials and equipment.

### Trenching

Trenching would be required for the installation of earth grid, piping, conduit and HV cable connections within the project application area. Trenching would be undertaken progressively using an open cut method, involving excavation, pipeline or conduit installation and backfilling.

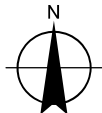
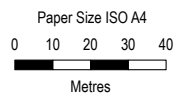
Typical trench dimensions would be approximately 1 m deep and 0.6 m wide (actual trench subject to detailed design). Once a section of the trench is excavated, a suitable bedding material such as sand would be placed at the base, followed by the installation and joining of pipeline or conduit sections. The trench would then be backfilled, primarily using the originally excavated material.

### Generator assembly

The construction of the generators and related components would include the establishment of foundations and installation of pre-fabricated components including the generator modules and related components.

The construction of the HV switchroom would similarly mainly involve installation of one pre-fabricated room, associated access platforms and stairs.

The construction of ancillary components would include the establishment of the various other buildings, systems and infrastructure at the site.



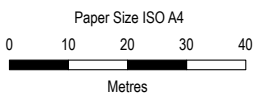
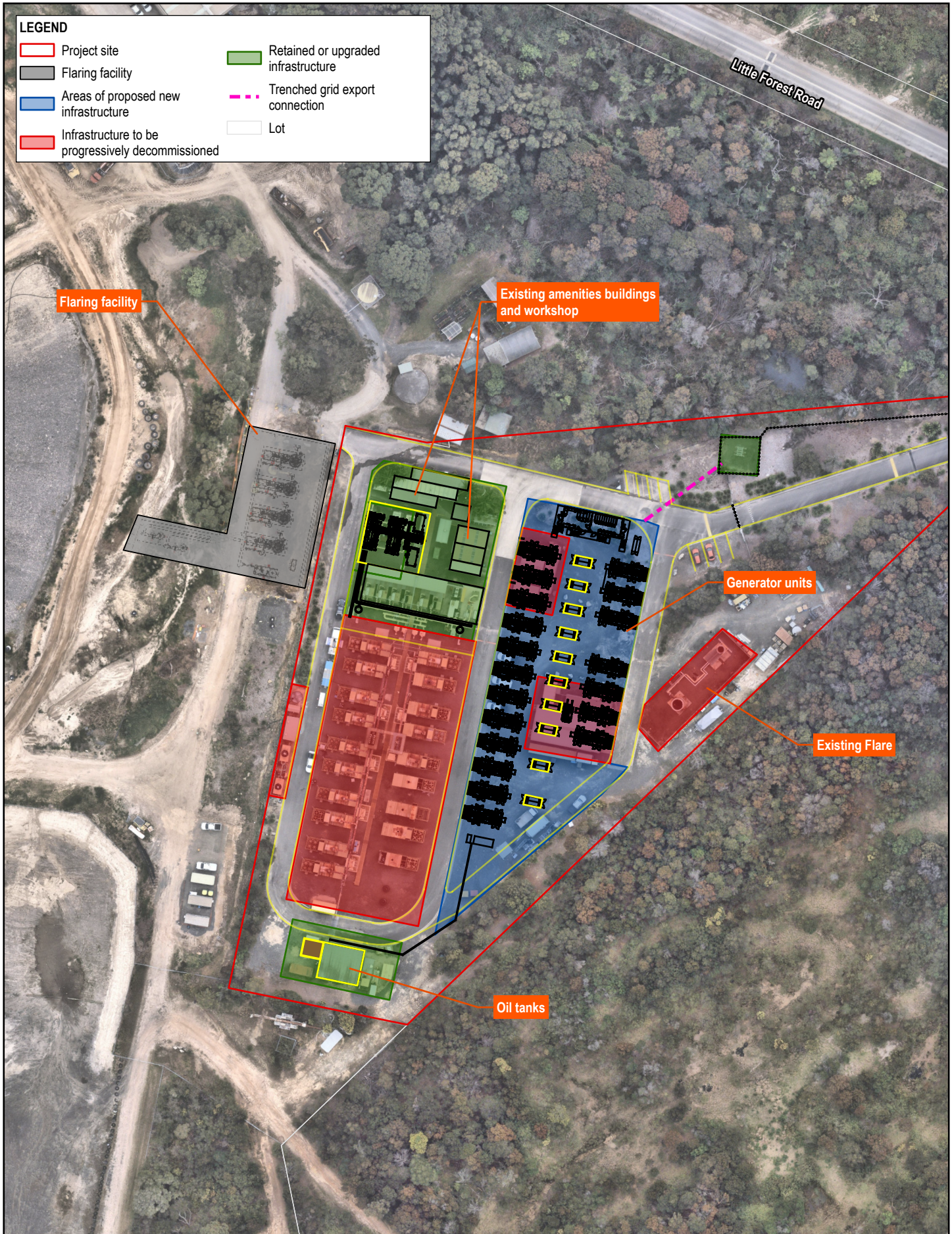
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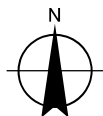
Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 56

**Existing site layout**

**FIGURE 2.1**



Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 56



LMS Energy  
Bioenergy facility BDAR waiver

**Proposed site layout  
and key features**

Project No. 12649882  
Revision No. 0  
Date 9/10/2025

**FIGURE 2.2**

## 3. Site and environmental setting

### 3.1 Site identification

The location of the project site is shown on Figure 1.1. A summary of available information pertaining to the project site is presented in Table 3.1.

Table 3.1 Site identification summary

Information	Details
Local government area (LGA)	Sutherland Shire Council
Site address	19 Little Forest Road, Lucas Heights, NSW 2234. Lot 102 DP 1009354
Current land zoning of the areas on the alignment as per Sutherland Shire Local Environmental Plan (LEP) 2015	SP1 Special activities – Waste recycling. The objectives of the SP1 – Special Activities zone are: <ul style="list-style-type: none"> <li>– to provide for special land uses that are not provided for in other zones.</li> <li>– to provide for sites with special natural characteristics that are not provided for in other zones.</li> <li>– to facilitate development that is in keeping with the special characteristics of the site or its existing or intended special use, and that minimises any adverse impacts on surrounding land.</li> </ul>
Current land use	Currently existing power station site within the footprint of the LHRRP waste management facility.
Proposed land use	Electricity production facility using landfill biogas (continued).
Surrounding land use	The project site is situated within the footprint of the LHRRP which is an active waste management facility. Land uses surrounding the project site are summarised as follows: <ul style="list-style-type: none"> <li>– North: LHRRP internal access roads, workshop, unused land (vegetated), Little Forest Road.</li> <li>– South: rehabilitated landfill area (PCYC Minibike track), New Illawarra Road, bushland.</li> <li>– East: unused land (vegetated), New Illawarra Road, ANSTO facility.</li> <li>– West: unused land, capped landfill waste cell, rehabilitated landfill area, Heathcote Road, Holsworthy Barracks.</li> </ul> Special land use activities are key features of the local area which include Department of Defence (Defence) activities, ANSTO and its associated facilities and the LHRRP. These activities correspond to land zoning of RE1 Public Recreation, SP1 – Research and Technology and SP2 Defence.

### 3.2 Environmental setting

Table 3.2 provides a summary of information related to the environmental setting of the site. The information was obtained from investigations at the site and publicly available datasets as listed in Chapter 8.

Table 3.2 Environmental setting

Aspect	Description
Topography and elevation	The project site has an elevation between 156 and 160 m Australian Height Datum (AHD) based on a topographical survey undertaken in January 2025 (refer to Appendix C). The existing terrain is likely to have been substantially altered by earthworks associated with the construction of the existing power station site.
Hydrology and drainage	The project site is within the catchment area of Bardens Creek, which is inferred to flow northward from its source at the western edge of the LHRRP toward the Georges River. The terrain steepens as it approaches Mill Creek, located 1.5 kilometres to the north west, reflecting the region's dissected plateau landform. Bardens Creek begins flowing approximately 250 metres north of the project site. Both Bardens Creek and Mill Creek ultimately flow into the Georges River near Alford's Point before reaching Botany Bay.

Aspect	Description
	<p>The project site is not located in an area identified as flood prone land (Sutherland Shire LEP, 2015) and flooding is not expected to occur over the project site.</p> <p>Drainage management features at the project site include roadside gutters around the gravelled area which directs surface water generated during precipitation events to the local stormwater management network associated with the LHRRP that includes a sedimentation pond located approximately 30 m to the north east of the northern boundary.</p>
Soil landscapes	<p>A review of information presented in eSPADE<sup>3</sup> web portal (accessed on 14 April 2025) indicates that the project site is situated within the Lucas Heights soil landscape (residual) with relevant characteristics summarised below:</p> <ul style="list-style-type: none"> <li>– Consists of gently undulating crests, ridges and plateaus surfaces of the Mittagong Formation (inter-bedded shale, laminate and fine to medium grained quartz sandstone).</li> <li>– The landscape is extensively to completely cleared dry sclerophyll low open-forest and woodland.</li> <li>– Moderately deep soils comprise Yellow Podzolic Soils, Yellow Soloths and Lateritic Podzolic soils on ridges and plateau surfaces. Lateritic Podzolic Soils are found on crests, Yellow Earths on ridge and plateaux surfaces, and Earthy Sands in valley flats.</li> <li>– Limitations include stoniness, hard setting surfaces, low soil fertility.</li> </ul>
Geology	<p>According to the Wollongong 1:250,000 Geological Map (Geoscience Australia, 2017) the project site is underlain by the Hawkesbury Sandstone unit from the Triassic period. The Hawkesbury Sandstone is described as a medium to coarse-grained quartz sandstone, with very minor shale and laminate lenses and can be inter-bedded with claystone or siltstone from the same unit. The bedrock is reported as relatively shallow.</p> <p>A geotechnical investigation was undertaken by GHD (GHD, 2025) at the project site in August 2025. Four boreholes were drilled (BH11, BH12, BH13 and BH14) to depths ranging from 4.9 m to 8 m bgl. The subsurface conditions encountered during the investigation are summarised as follows:</p> <ul style="list-style-type: none"> <li>– Fill material was encountered to depths of 1.4 m bgl and consisted of dark grey gravel (100 mm thick) underlain by dark orange sandy clay.</li> <li>– Residual soil was consistent across the site comprising medium grained, brown-orange-grey sand, and brown-orange-grey sandy clays overlying sandstone bedrock.</li> <li>– The sandstone bedrock underlying the residual soil was described as moving from extremely weathered to slightly weathered with depth.</li> </ul> <p>The location of the boreholes is shown on Figure 4.4 (in red) and further information on the investigation is provided in Section 4.3.4.</p>
Hydrogeology	<p>Based on a review of information presented on the WaterNSW Real-time data website<sup>4</sup>, the site is underlain by porous, extensive aquifers of low to moderate productivity.</p> <p>GHD conducted a review of existing groundwater boreholes from the Bureau of Meteorology (BOM) and WaterNSW information databases. Four groundwater bores were identified within 500 m of the site, primarily used for water supply and monitoring. Available and relevant information is summarised below:</p> <ul style="list-style-type: none"> <li>– GW110042 is located on the LHRRP to the east of the project site and was drilled in 1992 to a depth of 52 m below ground level (bgl) for Waste Services NSW, reported to have a standing water level (SWL) of 4.770 m bgl.</li> <li>– GW111096, GW111097 and GW111098 are located offsite to the south east and were drilled in 2010 as a monitoring bores to depths ranging from 12.1 m to 27.5 m bgl for ANSTO. The geology was described as 'sandstone' in the logs provided.</li> </ul> <p>Information detailed in the LHRRP Operational Environmental Management Plan (OEMP) (Cleanaway, 2025) indicates that there are three wells which are located approximately 250 m to the south east of the project site. These wells are identified as background wells (hydraulically upgradient) and standing water level (SWL) was reported to be range from 14.87 m below top of casing (btoc) to 18.92 m btoc. Figure 3.1 shows the location of these wells in the southeastern portion of the LHRRP. The approximate location of the project site has been added for reference purposes.</p> <p>It is noted that groundwater was estimated at a depth of 4 to 5 m bgl at the project site (see section 4.2) in a discussion with the landfill manager, however, it was reported to be approximately 8 m bgl based on groundwater information related to a former well on the project site (DP, 2025).</p>

<sup>3</sup> eSPADE v2.2

<sup>4</sup> [Real-time water data \(watersw.com.au\)](https://www.watersw.com.au)

Aspect	Description
Acid sulfate soils (ASS)	According to the Atlas of Australian Acid Sulfate Soils, the project site is located within an area of extremely low probability of occurrence of acid sulfate soils (1-5% chance in small, localised areas).



Figure 3.1 Groundwater well locations close to the project site (extracted from OEMP (Cleanaway, 2025))

### 3.3 Site inspection

An inspection of the site was undertaken on 19 August 2025 by an experienced GHD environmental scientist. The conditions at the time of the inspection were cloudy with mild to moderate strength wind, intermittent rainfall, wet underfoot and cold temperatures. GHD was accompanied by an LMS employee during the inspection. Access to the generator module area was restricted to employees of Energy Developments Limited (EDL) only at the time of the site inspection. A photographic record of the site inspection is presented in Appendix A.

The observations made during the inspection were followed up by liaison between GHD and LMS and information gathered has been incorporated in the observations and details below. Existing site features are presented on Figure 2.1.

The site had a gentle fall from the south to north with some areas relatively level. The majority of the site consisted of a compacted gravel surface with asphalt roadways, with some concrete roadways, and embankments with vegetation around the boundaries. There were some stormwater pits observed and it was reported by site staff that stormwater is directed to a retention basin located on the adjacent LHRRP site.

The existing power station site was constructed in 1997, where the surface coverage comprised predominantly low, small scrub and bushes. This surface cover was removed and used as landfill cover. In addition, sandstone bedrock was excavated to a depth of 1.5 m below ground level (bgl) across the site with this material disposed to the landfill. LMS report that there was no requirement to import fill material to the site.

The following infrastructure and facilities were observed on site at the time of the inspection:

- Two biogas flares were situated in a compound located in the north eastern section of the site, adjacent to the site boundary. The compound was fenced off at the time of the site inspection.
- To the immediate east of the gas flare compound, an area was used for storage. Various items were observed including an empty intermediate bulk container (IBC) labelled 'waste oily water coolant' set on a wooden pallet, a wooden pallet, plastic flexible piping, pressure piping and a boat. Staining was not observed on the ground surface in the vicinity of the IBC or other items here.
- Material storage area: the area to the immediate north of the flare compound was used to store unused or redundant items. These consisted of batteries (no leaks were observed at the time of the inspection), metal wiring, wooden panels, large metal tubes, large black plastic trays (High Density Polyurethane ((HDPE)), two portable toilets, wooden pallets, gas generation or blower equipment, a portable bund, two empty IBCs, large water metal water tank, a demountable and a metal skip with smaller waste metal items in it.
- Approximately 30 m to the south west of the flare compound there was a shipping container with miscellaneous items stored in its immediate vicinity. The contents of the shipping container were not known, however, there was no evidence of staining or leaks around the base and on the adjacent ground surface.
- The items in the vicinity of the shipping container included multiple metal poles, multiple electrical sensors/panels, empty water cooler bottle, various types of pipes/piping, an unused solar panel, electrical controller (solar and mains supplied) used for pumping systems (branded Airwell Group), unused electrical cabling, milk crates, unused portable bund and a large plastic crate. It was noted that these items are generally not associated with contamination. The metal poles and electrical sensors/panels appeared to be in good condition at the time of the inspection i.e., rust, deterioration free. Two waste disposal bins were observed to the south west of these (general waste and cardboard recycling).
- The main offices and amenities were situated in a series of demountable buildings located in the north western section of the site. These were observed to be raised off the ground surface.
- A sewage collection system was observed adjacent to the main office buildings in the north of the site. The sewage is collected in an effluent tank and this is transferred to the local network.
- A maintenance shed/workshop was located to the south of the main office buildings, and another workshop was located in the central section of the site. There were no oils, fuels or chemicals observed in this building at the time of the site inspection. Evidence of staining, leaks and/or spills was not observed. Access to the second workshop was not possible at the time of the site inspection.
- Nineteen gas generator modules were observed in the western section of the site, 15 of which are in operation as part of the existing power station, the remaining four are temporarily stored on site. The operating generators receive biogas from the adjacent landfill via underground pipework. Each of these units were set on concrete hardstand and between each module the surface cover consisted of gravel. Both above ground and below ground pipework leading into/from each of the modules. Several IBCs labelled as 'waste oily water only' were positioned around these modules and staining, leaks and/or spills was not observed on the ground surface adjacent to these.
  - Oil draining from the generators is captured in oil sumps as the internal concrete floor is sloped which directs oil to the sump.
- Two x 20,000 L metal, above ground storage tanks (ASTs) were situated within a concrete bund in the southern area of the site. The tanks were labelled with 'Mobil Pegasus 605 Ultra 40, C2 Combustible'. This product is a gas engine oil used for lubrication purposes. It was confirmed by site staff that one tank contains new oil and the other tank contains used oil from the generators.
  - The fill points for the tanks were observed to sit in the bund and there was no staining or product observed on rainwater that was pooling in the bund. There were also two IBCs set within the bund.
  - A shipping container was observed adjacent to the concrete bund, close to the southern boundary of the project site. The contents of the shipping container were not known, however, there was no evidence of staining or leaks around the base and on the adjacent ground surface.
- A white, self-bunded, 6,000 L rectangular AST was observed adjacent to the two 20,000 L ASTs. This tank had been labelled with 'waste oily water coolant'. It was noted that the labels had been placed over signage that stated 'Combustible C1'. The tank was used for draining engine oil filters from the generators. Staining was not observed on the ground surface surrounding this AST.
- Above ground pipework was observed along the length of the generator modules reported to be associated with oil distribution to the generators.

- Two self-contained hazardous chemical storage units (containing a series of 5 to 20L drums of hydraulic oils, paint remover, lubricants, diesel fuel treatment oil and degreasers) were observed. Minor staining was observed on the floors of each of the shelves and base of the storage unit. Staining was not observed on the ground surface surrounding these units.
- Eight coolers and associated above-ground pipework were observed along the western boundary of the site.
- Several IBCs set on portable bunds located around the operational area of the site. These IBCs were labelled as ‘waste oily water coolant’ or ‘waste oily water only’. Staining was not observed on the ground surface surrounding these IBCs.
- Two condensate separation vessels (CSVs) were observed on site at the time of the site inspection. These are used to separate condensate produced as a result of condensation from the landfill gas. The CSVs were reported to pump collected condensate (leachate) back to the landfill leachate treatment system via an underground pipe. The CSVs were partially buried and leaks were not observed from the portion that was visible at ground surface.
- In the south eastern portion of the site, adjacent to the site boundary, there was a small plastic tank mounted on a trailer which was labelled “leachate” at the time of the inspection. It was reported that this is used to support the management of the landfill biogas extraction system and stored on site when not in use for that purpose.
- At the time of the site inspection one of the IBCs in the waste storage area contained a dark brown coloured liquid (likely to be oily water/waste oil as is stored elsewhere on the site). There was a hole in the top of the IBC, and the liquid was visible through it. The IBC had a tap on the bottom, which was in a closed position, however, water was observed to leak from the tap which contained a slight brown tinge when rubbed between the fingers. There was no staining observed on the ground surface at the time of the site inspection, nor were there odours noted in the vicinity of the IBC. It was considered possible that rainwater had been dripping onto the tap and mobilising residual oily water at the tap.
- In the northern area of the project site, adjacent to the main offices and toilets, surface water was observed to flow towards a roadside kerb along the northern boundary of the project site. The storm drainage here appeared to redirect flow to the LHRRP site.
- No potential asbestos containing material (ACM) was observed during the site walkover.
- Groundwater wells were not observed on the site at the time of the inspection, however, BH14 was observed from markings on the surface (refer to Figure 4.4).

# 4. Site history

## 4.1 Historical aerial photographs

A selection of historical aerial photographs was reviewed to assess potential historical activities, and land uses at the project site and surrounding areas. The years examined were 1949, 1956, 1965, 1972, 1980, 1988, 2005, 2011, 2021 and 2025 sourced from:

- NSW Government Spatial Services, Historical Imagery – web portal<sup>5</sup>
- Geoscience Australia, Historical Aerial Photography – web portal<sup>6</sup>
- Nearmap online aerial imagery provider<sup>7</sup>.

The years selected are not exhaustive and are used to provide an indication of development and land use changes at the project site. A summary of observations from the review of the historical aerial photography is provided in Table 4.1. The observations were made with a general reference to direction from the project site. A copy of the aerial photography is provided in Appendix B.

**Table 4.1** Summary of historical aerial photograph review

Year	Observations
1949	The project site and surrounding areas are situated within undeveloped bushland with two roads visible. There is a relatively large gully orientated in a general north-south direction is located to the west of the project site.  There is a small area of exposed soils or cleared vegetation adjacent to the Old Illawarra Road approximately 280 m from the site. The land use at this location is not clear from the aerial photograph. The junction between Old Illawarra Road and Heathcote Road is visible and some residential housing to the east towards Engadine.
1956	There has been some vegetation clearance and activity in the area of the project site and to the east, north west and south east (current day ANSTO facility) of the project site.  The area immediately surrounding the junction with Old Illawarra Road and Heathcote Road has been subject to development possibly associated with road widening.
1965	This aerial photograph shows significant changes with large areas cleared of vegetation on the project site and areas to the north, east and west. The large natural formed gully remains close to the site and passes through the current location of the LHRRP.  To the south of the project site, the ANSTO facility appears to be under construction where roads and tracks visible throughout.  Significant vegetation clearance is evident to the north east and east at Menai.
1972	No significant changes observed at the project site and surrounding area when compared to the 1965 aerial imagery.
1980	No significant changes observed on the project site, similar to the aerial photograph in 1972.  A series of buildings and access tracks are present on the present day ANSTO facility.
1988	The project site and to the south and east of the project site appears to be exposed soils and vegetated areas.  There have been significant changes to immediate surrounding areas with the construction of the current LHRRP including landfilled waste. The project site is situated immediately to the east of the main landfill area.  The ANSTO facility is constructed with formal access roads and multiple buildings constructed.
2005	The quality of the image is poor however there is possibly some development where the existing power station is located (the project site).  The landfill to the immediate west of the project site has extended significantly to the north with rehabilitated areas observed adjacent to the project site.

<sup>5</sup> [Historical Imagery](#)

<sup>6</sup> [Historical Aerial Photography | Geoscience Australia](#)

<sup>7</sup> [MapBrowser | Nearmap](#)

Year	Observations
2011	<p>The power station at the project site has been constructed consisting of infrastructure, asphalt surfaces, access roadways and a strip of vegetated land adjoining the project site boundary.</p> <p>The area to the west of the project site appears relatively similar to the current site layout where it is occupied by vegetated areas and access roads. There is an area of disturbance which includes several small structures or in-ground infrastructure situated in the southern area of the project site. The purpose of the structures/infrastructure cannot be discerned from the aerial photograph.</p> <p>The area to the immediate south west appeared to be occupied by a bicycle track within a rehabilitated portion of the landfill.</p> <p>The landfill operations to the north and north west continue to change and expand with various types of surface cover observed including rehabilitated areas (vegetated), stockpiles, access tracks and roads and water management features. In particular, a stockpile area is located very close to the north west which appears to be a staging area for the management of various materials e.g., daily cover.</p>
2020	<p>There appears to be an additional small building (green roof) located midway along the south east boundary.</p> <p>The landfill and bicycle track to the south west of the project site appears to be relatively unchanged since the 2011 aerial photograph.</p> <p>The area to the south east has remained similar some variations observed on the surface cover noted, particularly a reduction in exposed soil.</p>
2023	<p>By 2023, four additional generators appear to have been installed on the project site.</p> <p>The aerial photograph also shows that waste has been placed on the landfill cell to the west of the project site. There is evidence of waste placement and soil stockpiles present along with associated machinery.</p> <p>In addition, the south west portion of the project site has exposed soil at surface with the vegetation previously there removed. Tyres appear to have been placed immediately to the west of the site in a manner that suggests either a parking area, informal roadway or boundary demarcation.</p>
2025	<p>The project site does not appear to differ to the 2023 aerial photography.</p> <p>The area to the immediate west of the project site has been altered with evidence of soil placement, exposed surfaces and rutting from rainfall or surface water discharges observed. The vegetation has not grown back since 2020, and an informal access road splits the western boundary and continues to the north.</p> <p>The landfilling to the west of the project site appears to have stopped and has been covered in soil with black pipework present on its surface. The nature of the pipework is not clear but could be associated with gas management infrastructure or water spraying to promote vegetation growth.</p>

## 4.2 Interview

GHD spoke with a Cleanaway employee (Mr. LC Chiang, Landfill Manager) regarding the history and activities at the wider LHRRP and land in vicinity of the project site. Information of relevance to the LHRRP and the area close to the project site that was obtained during the discussion is summarised as follows:

- SITA Australia (SITA) had acquired the LHRRP from WSN Environmental Solutions in 2011 and at that time there was ambiguity regarding the footprint of the waste at the landfill cell located approximately 70 m to the west of the project site.
- The employee reported that waste materials had been encountered on the eastern side of an access road outside the footprint of the established waste cell during works previously undertaken in that area (refer to AEC 09 shown on Figure 6.1. The gas extraction pipework from the landfill feeds into the existing power station (project site) via an underground main feeder pipe. There are manholes on the eastern boundary indicating its location.
- There was significant disturbance observed on the land immediately to the west of the project site and the employee reported that this was associated with the works on the expansion of the adjacent landfill waste cell (vertical expansion).
- The depth to groundwater underlying the project site was estimated to be 4 or 5 m below ground level (bgl) and lower than the leachate cut off trench that runs along the base of the landfill waste cell.

In a follow-up email (dated 19 May 2025) LC Chiang confirmed the following:

- There are no underground storage tanks (UST) at the workshop to the north west of the project site and that spills and leaks, if they occur, are contained within bunded areas in the workshop area.

- There is a 60,000 Litre (L) above ground storage tank (AST) containing diesel located at the workshop and a second 60,000 L AST is located in the former collection car park to the east of the landfill office.
- The waste cell located 70 m to the west of the project site is unlined.

## 4.3 Previous site investigation reports

### 4.3.1 Report on Soil Contamination Assessment Douglas Partners 2025

Douglas Partners prepared a soil contamination assessment for EDL for the proposed divestiture of the site in May 2025. The objective was to assess the subsurface conditions at the site regarding potential contamination imparted by EDL's land use. Based on anecdotal evidence from EDL to Douglas Partners, the power station was built by EDL in 1997 and there was no evidence to suggest the use of Aqueous Film Forming Foam (AFFF) at the site.

Douglas Partners noted a range of power station infrastructure on-site, including:

- two 20,000 Litre (L) above ground storage tanks (ASTs) containing hydrocarbons with concrete bunding
- 19 LFG diesel-powered<sup>8</sup> generator modules (15 operational modules) with sumps to collect engine oil overflows
- above ground fuel distribution lines to the modules
- eight transformers
- a chemical storage shed containing 200 L drums of lubricant oil
- eight blowers and associated above-ground pipework
- two cooling towers and an underground cooling water system
- a flare compound with two LFG flares.

Douglas Partners drilled 27 boreholes using a hand auger to a maximum depth of 0.65 m bgl. The location of the boreholes is shown below on Figure 4.1. Of the 27 boreholes, 10 boreholes were positioned in a grid pattern across the site, and 17 boreholes were positioned to target the generator modules, transformers, the ASTs and chemical storage sheds.

Douglas Partners reported that a well had been installed on the site in 1992, MB009, and the depth to groundwater was approximately 150 m AHD (approximately 8 m bgl). The location of this well is shown as adjacent to the flare compound as shown on Figure 4.1.

Douglas Partners observed the presence of fill material to a depth of 0.65 m bgl (TBH6), however, the base of the fill was generally not confirmed as fill was deeper than borehole depth. The fill was generally described as sandy gravel or gravelly sand, and pale to dark brown or grey. In addition, anthropogenic and/or waste materials were not observed during the investigation. Douglas Partners reported that hydrocarbon staining was observed on the concrete pad beneath one of the generator modules near TBH5. Douglas Partners reported hydrocarbon odours at sampling locations TBH3, TBH5, TBH6 and TBH7 from surface level to 0.5 m bgl (refer to Figure 4.1). The Douglas Partners soil investigation did not confirm the depth to natural soils, however, boreholes were generally terminated on siltstone cobbles/ boulders.

The laboratory analysis of the soils sampled across the site included heavy metals, total recoverable hydrocarbons (TRHs), benzene, toluene, ethylene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs). Selected soil samples were also analysed for cyanide, phenols, organochloride pesticides (OCP), polychlorinated biphenyls (PCB), atrazine, chlorpyrifos, bifenthrin, bioavailability of nickel and zinc (at neutral pH). Concentrations of the contaminants of concern (COPC) were compared against Tier 1 investigation levels for human health and environmental receptors for commercial / industrial land use scenario as detailed in the NEPM (NEPC 2013).

TRH concentrations were detected at nine soil locations; however, reported below the adopted human health criteria for commercial / industrial land use scenario. There was an exceedance of the petroleum hydrocarbon management limit criterion at TBH5 for TRH F3 fraction (C<sub>16</sub>-C<sub>34</sub>) (0.4 m depth).

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<sup>8</sup> LMs have confirmed that the generator modules are LFG powered only and no diesel is used.

There were also exceedances of the site-specific ecological assessment criteria for arsenic, copper, zinc, TRH F3 (C<sub>16</sub>-C<sub>34</sub>) and TRH F4 (>C<sub>34</sub>-C<sub>40</sub>). Douglas Partners noted that the 95% upper confidence level (UCL) for arsenic, copper and zinc were below the adopted ecological assessment criteria, however, there were concentrations of zinc that were 250% greater than the criterion as well as the standard deviation being greater than 50% of the adopted criterion.

GHD notes that these zinc concentrations may be indicative of hotspot contamination. It is also noted that the heavy metal and TRH ecological criteria exceedances were located amongst the generator modules.

Douglas Partners concluded that:

- The source of TRH F3 concentrations at TBH5 was considered to be associated with historical overflows of diesel fuel<sup>9</sup> or oily water from the nearby generator modules.
- The areas where the TRH and heavy metal exceedances were located is capped with gravel, the site was fenced and it is a highly modified environment and were considered to represent a negligible risk to sensitive ecological organisms within an ongoing industrial land use setting.
- Douglas Partners recommended either remediation or preparation of a soil management plan be undertaken to manage potential risks to future intrusive maintenance workers from the elevated concentrations of TRH F3 at TBH5, given the presence of underground services near the borehole location.

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<sup>9</sup> At source TRH F3 concentrations are not likely to be attributed to diesel as the generators are powered by LFG. Likely to be from other hydrocarbons such as lubricant oils associated with the generator usage.

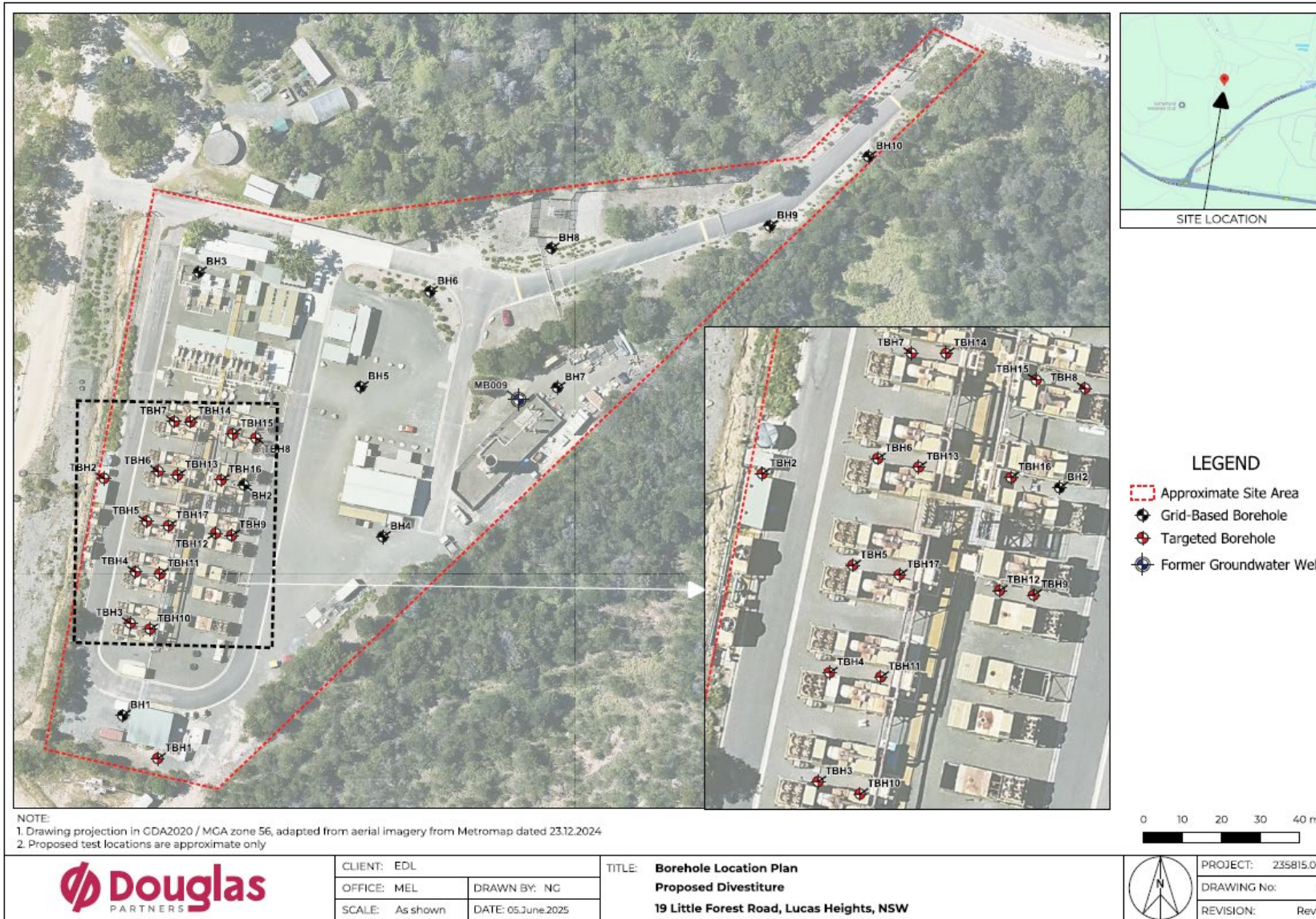


Figure 4.1 Soil investigation borehole locations at existing power station site (Douglas Partners, 2025)

## 4.3.2 Contamination Assessment GHD 2015

GHD prepared a contamination assessment in 2015 on behalf of SITA as part of an Environmental impact statement (EIS) to support a planning application (SSD-6835-Mod-2) for a number of activities associated with the LHRRP which included:

- landfilling operations (reprofiling of the landfill cell (70 m to the west of the project site)
- relocation and expansion of a garden organics facility (1 km to the west of the project site)
- construction of a resource recovery facility (on the 300 m northwest of the project site)
- rehabilitation of the LHRRP into a community parkland (LHRRP wide, excluding the power station site).

The objective was to identify the potential for contamination to pose a constraint to the proposed redevelopment of the above areas and to demonstrate that land that may be contaminated was suitable for the proposed development. The contamination assessment report focused on the potential for contamination to be present based on current and historical activities at the LHRRP. It is noted that the assessment boundary did not include the power station (project site) and the location of the proposed garden organics facility and resource recovery facility were located on the western side of the LHRRP, which is approximately 1 km from the project site. However, the proposed landform reprofiling, which covered the entire LHRRP waste disposal footprint, was immediately west of the project site.

GHD identified that the existing power station (the project site) uses a network of gas extraction pipework throughout the landfilled waste. GHD indicated that subsurface migration of biogas from this facility may have posed a potential risk to the landfilling reprofiling works at that time.

A search of dangerous goods records was undertaken as part of the assessment, the results of which reported that there were three above ground storage tanks on the LHRRP, one contained sodium hypochlorite (1,200 L) and two contained sodium hydroxide (1,200 and 10,000 L). SITA staff reported that these were located on the wider LHRRP, they were bunded to 110% and contain an epoxy coating for added protection against corrosion.

Site history information from the GHD 2015 report indicates that in addition to Harringtons Quarry landfill and the Industrial Waste Collection (IWC) landfill, there was a night soil and sludge landfill (1965 to 1980) and the Little Forest Burial Ground which received wastes from ANSTO (1958 to 1968). The location of these was not provided in the report. A review of online information undertaken by GHD (September 2025) indicates that the night soil and sludge landfill and Little Forest Burial Ground are located over 1 km to the north of the site (based on the scale presented in the excerpt from a study completed by Hughes et al, 2009, refer to Figure 4.2).

GHD conducted a detailed groundwater study of the LHRRP as part of the EIS (GHD, 2015). Observed groundwater elevations suggest that the general groundwater flow in a northerly direction. The report also suggests that the direction of shallow groundwater flow is significantly influenced by topography.

It was expected that the landfill (being lined) would reduce groundwater recharge to the hydrogeological system, however, there does not appear to be a significant reduction in groundwater elevations in the catchment in response to the expansion of landfill cells over time.

GHD reported that some of the landfill stages are unlined, and others have a compact clay liner and an impermeable lining in addition to an extensive drainage network that directs infiltrating leachate to a sump and pump system (the project site is hydraulically upgradient from the closest landfill waste cell).

Overall, the data made available to GHD, which covered 1987 to 2014, suggested that there was no breakthrough or increasing trends of leachate influence on downgradient groundwater and surface water locations. The data suggests that the landfill and leachate management practices implemented (including the leachate collection system) are preventing down-gradient impacts to groundwater and surface water systems. As such, the continuing operation of the system was not anticipated to result on the development of impacts to down gradient receptors currently monitored.

A Conceptual Site Model (CSM) was presented in the report which identified potential sources of contamination as the historical landfill waste, historical and current leaks/spills from vehicles coming onto the site and lead bullets on the ground surface (specifically at the western side of the LHRRP, close to Heathcote Road). It was assessed that Source-Pathway-Receptor (SPR) linkages could be complete for the following scenarios:

- Construction workers associated with dermal contact with potential contamination in soils particularly if the landfill cap is disturbed or when excavations are undertaken.

- Future construction and intrusive maintenance workers if they encounter groundwater in excavations at the proposed GO/ARRT facility and landfill.
- Exposure pathways were assessed as incomplete for ecological receptors.

The potential exposure to landfill biogas was assessed as low on the basis of the continued operation of the landfill gas extraction system as well as the ongoing monitoring of the landfill biogas emissions (both surface and subsurface). In addition, the existence of the leachate collection system reduces the possibility of contaminants entering groundwater from the landfill area.

The report concluded that the LHRRP for the development activities was suitable for its intended future use on the assumption that the capping layer remains in place and it is maintained in accordance with a closure plan in tandem with post closure monitoring.

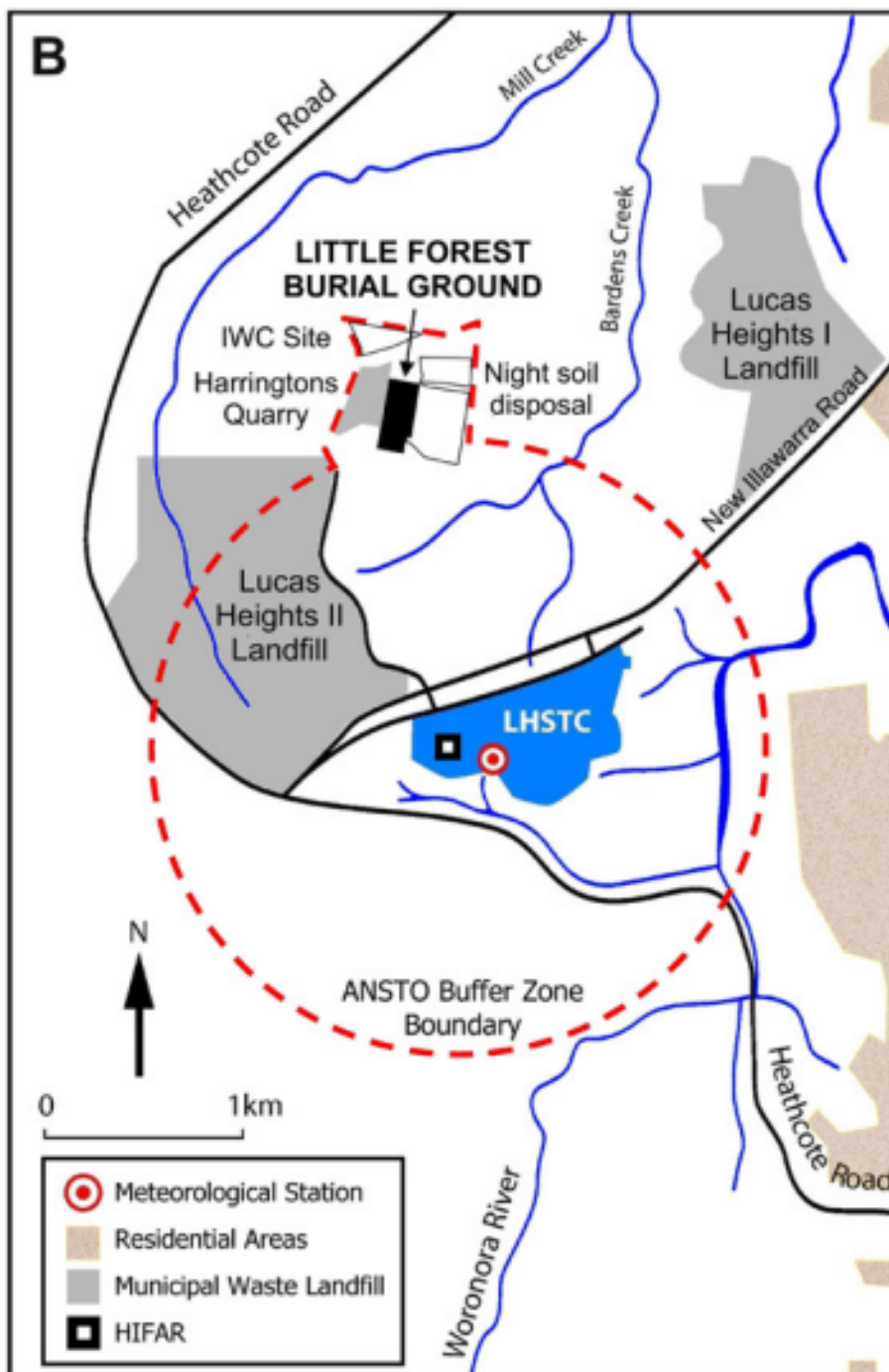


Figure 4.2 Location of Little Forest Burial Ground and night soil disposal landfills (excerpt from Hughes et al, 2009)

### 4.3.3 Cleanaway AEMR

GHD reviewed the *Cleanaway Lucas Heights Landfill Annual Environmental Management Report (AEMR) 2024* for LHRRP which was prepared as part of Cleanaway's ongoing Environmental Protection Licence (EPL) (number 5056) obligations on environmental performance of the site. This report is available directly from the Cleanaway website. The AEMR covers the environmental performance of various aspects of the LHRRP operations including surface water and groundwater discharge limits. A review of the report with a focus on environmental monitoring outcomes indicates the following key information:

- There have been various waste filling activities throughout the landfill, reported to be in Area F, Area H/I, excavation of Stage 2C of North Wall, gas well drilling at Area C and completion of capping works at Area G. Refer to Figure 4.3 which was obtained from a Statement of Environmental Effects report (GHD, 2022) for an organics facility at the LHRRP, that shows the approved staging areas for the LHRRP. The approximate location of the project site has been added for reference purposes (yellow boundary).
- A landfill gas collection system is in place which is maintained by EDL and quarterly surface gas monitoring is undertaken as per the EPL requirements.
- A water treatment plant and leachate treatment plant are in operation and maintained by JPG Engineering.
- Sampling of surface water and groundwater was undertaken in compliance with the EPL requirements with results returned to the EPA in an annual return.
- There are monitoring locations situated across the wider LHRRP area for both landfill gas (subsurface) and groundwater, of these MB008, MB044 and MB045 appear to be closest to the project site.
  - Of the subsurface data presented in the AEMR, none reported concentrations of methane which exceeded the trigger levels.
  - Surface gas monitoring undertaken across the LHRRP indicates that a maximum concentration of methane was reported at approximately 160,000 parts per million (ppm) in 2020 and 2023 across the landfill surface. In 2024 there were exceedances of the 500 ppm threshold<sup>10</sup> with concentrations ranging from 700 to 4300 ppm. Cleanaway report that these have been remediated with a clay plug and increased gas extraction.
  - Groundwater monitoring results indicate that concentrations of ammonia are low and below the EPL license limit of 1 mg/L.
  - Total organic carbon (TOC) levels have remained generally similar to previous monitoring periods with some fluctuations noted at two wells.
  - SWLs were reported to be generally consistent with decreases and fluctuations noted at some wells.
  - Two 60,000 L diesel tanks which are used for refuelling of collection vehicles and civil plant are on the LHRRP, the exact location is not clear from the AEMR.
  - An outcome of an Independent Environmental Audit (IEA) undertaken in 2024 identified that the integrity of a bund at a waste oil tank required review and assessment. Cleanaway reported that the bund is functioning as expected and a roof was installed above the tank to reduce rainwater ingress.
  - The IEA recommended that a more detailed interpretation and analysis of groundwater monitoring results, including Mann-Kendall trend analysis, is undertaken. Cleanaway reported that as there were no exceedances in 2024, trend analysis was not required.
  - No environmental incidents occurred during the reporting period of 2024.
  - The AEMR concluded that the overall environmental performance for the reporting period can be demonstrated to be well managed. Cleanaway indicated that there will be an increase in the number of gas extraction wells on the site

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<sup>10</sup> Threshold limit specified in the EPL 5065 for the LHRRP (Cleanaway license holder).

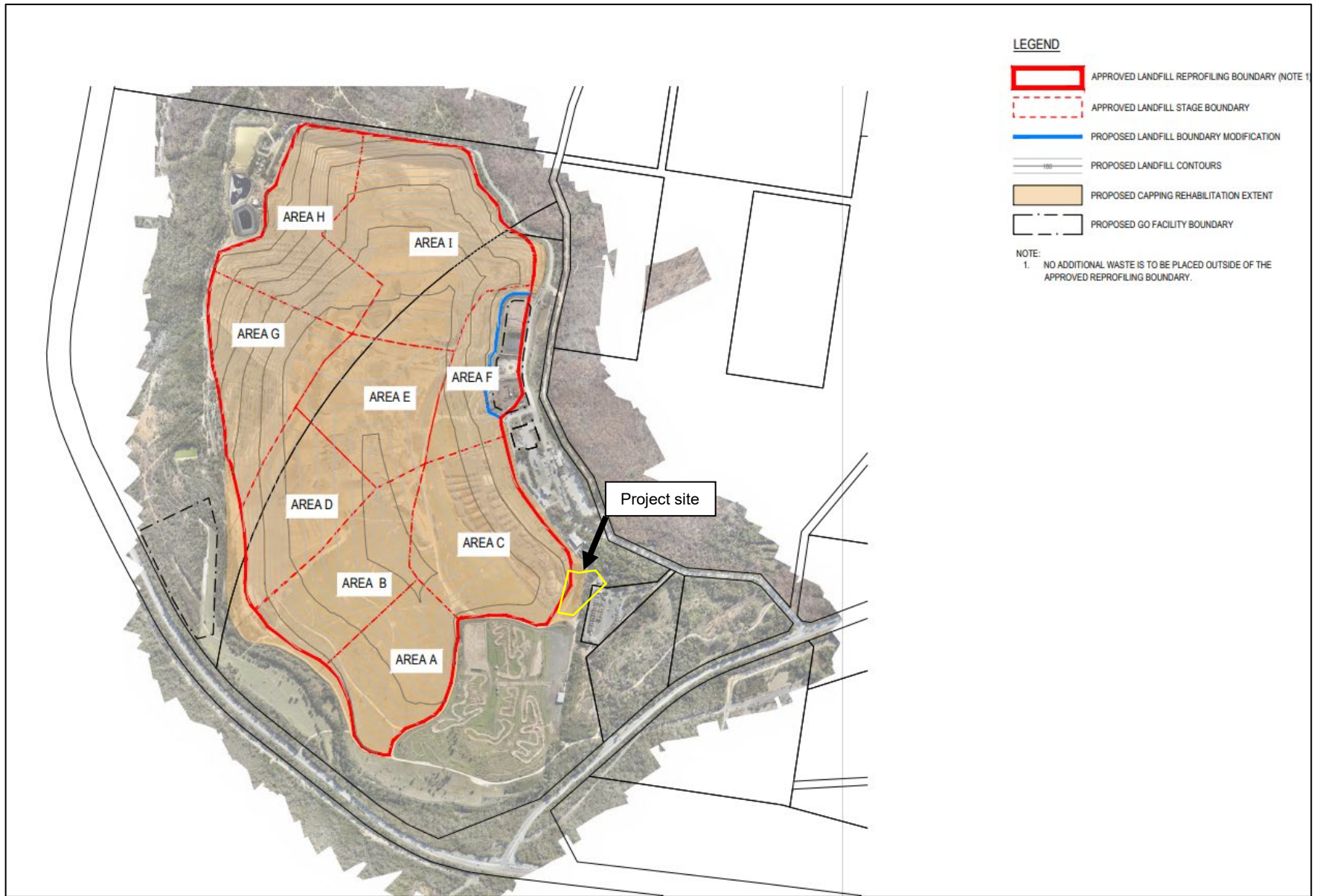


Figure 4.3 Approved staging areas for the LHRRP (GHD, 2022)

## 4.3.4 Geotechnical investigation

GHD were engaged by LMS to undertake a geotechnical investigation at the project site between 5 and 6 August 2025. GHD had undertaken geotechnical investigations during previous design phases located to the west of the project site. The objectives of the investigation were to obtain data required to inform planning and preliminary design to support the construction of the project.

The investigation focused on the gravel pad around the site offices, workshop and to the east of the generator modules. GHD drilled four boreholes (BH11, BH12, BH13 and BH14) to depths ranging from 4.9 m to 8 m bgl. The location of the boreholes is shown on Figure 4.4 (in red). The outcomes of the investigation are summarised as follows:

- Fill material was encountered up to a depth of 1.4 m bgl and consisted of dark grey gravel (100 mm thick) underlain by dark orange sandy clay. In addition:
  - fill extended to 0.4 m bgl at BH12 (northern portion of the site)
  - at BH11, BH13 and BH14 the fill material was observed to extend to depths ranging from 1.2 to 1.4 m bgl
  - anthropogenic and/or waste materials were not observed in the fill material during the investigation.
- Residual soil was consistent across the site and comprised medium grained, brown-orange-grey sand, and brown-orange-grey sandy clays overlying sandstone bedrock.
- The sandstone bedrock underlying the residual soil was described as transitioning from extremely weathered to slightly weathered with depth.
- Groundwater was reported to be present in all boreholes indicating a possible perched groundwater table. The groundwater observations summary is provided in Table 4.2. The observations were reported to be consistent with previous investigations on the adjacent land (50 m to the west of the project site).
- GHD report that a constant seepage was observed during site visits and site activities at the north western corner of the gravel pad (BH12) which flowed into the road gutter in this area. It was considered that this is likely a low flowing groundwater seepage.

The weather conditions in the three days preceding the investigation were reported to be wet with significant rainfall occurring. BOM weather and climate data for Holsworthy Aerodrome (approximately 6 km to the west) reported a range of 1.0 to 24.6 mm of rain from 2 to 4 August 2025. During previous phases of design for the project, a geotechnical investigation was undertaken in the adjacent site in 2024 (GHD, 2025b) and groundwater was not observed in the four boreholes drilled. Weather conditions leading up to and during the 2024 investigation were dry. As such, the water observations made during the August 2025 site investigation are considered to be a result of perched groundwater that is temporary and present only after precipitation events.

*Table 4.2 Groundwater observations summary*

BH ID	Groundwater depth (m bgl)	Elevation (m AHD)
BH11	1.2	157.3
BH12	0.1	156.1
BH13	1.0	155.5
BH14	1.0	157.1



Figure 4.4 Location of geotechnical investigation boreholes (GHD, 2025)

### 4.3.5 Geotechnical investigations on adjoining site

GHD were initially engaged to undertake a geotechnical investigation to the west of the project site in August 2024 as part of the originally planned bioenergy facility site footprint along the western boundary of the existing bioenergy facility.

Four boreholes were drilled in disturbed areas of the project site to depths ranging from 6 m to 7.5 m bgl. The boreholes were positioned to target the inferred boundary between the landfilled waste to the west and the project site. The outcomes of the investigation are summarised as follows:

- Fill material was encountered to some extent in each of the boreholes and its presence varied with location:
  - At BH01, fill material was encountered to a depth of 1.3 m bgl.
  - At BH04, fill material was encountered to a depth of 0.4 m bgl.
  - Limited topsoil (up to 0.5 m thick) was observed at both BH02 and BH03. These locations form part of an existing internal access track.
- The fill material typically consisted of dark brown, fine to medium grained sands, with fine, sub-rounded to sub-angular gravel and varying degrees of clay content. When clay was present as a fill material constituent, it was typically low plasticity. No landfill waste was reported to be encountered.
- Residual soils were encountered during the investigation which were described as fine to medium grained, brown-orange-yellow sand, and red-brown-orange sandy clays of typically a low to medium plasticity. The sand-dominant residual units typically exhibited traces of medium, sub-rounded to sub-angular gravel.
- The depth to sandstone bedrock was inferred to range from 2.5 to 2.6 m bgl at these boreholes.
- Groundwater was not observed in the boreholes during the drilling prior to rock coring. It is noted that groundwater inflows could not be assessed during rock coring as drilling fluids are introduced into the borehole to facilitate the rock coring process.

The investigation confirmed that the project site was likely subject to land surface reprofiling works and excavation associated with previous landfilling activities. It is noted that based on site history information that the project site was not excavated to store waste material and landfill waste was not encountered during intrusive investigations at the project site.

LMS subsequent undertook potholing works in April 2025, where two trenches were excavated approximately 50 m to the west of the project site. LMS reported that they encountered “green waste mixed with plastic and soil” at a depth of approximately 1.8 m bgl in one trench (TT1), and “buried rock / boulders” at a depth of 0.5 m bgl at the other trench (TT2). An additional geotechnical drilling campaign was therefore undertaken to further delineate the potential waste material and a further five boreholes (BH06, BH07, BH08, BH09 and BH10) as shown on Figure 4.5. The additional boreholes were drilled to depths of 5.5 to 6 m bgl and waste mixed with soil material were encountered at three locations (BH07, BH08, BH09) along the boundary of the existing cell.



Figure 4.5 Locations of geotechnical investigation boreholes (GHD, 2024)

## 5. Regulatory searches

As part of the desk-based review, information was obtained from publicly available sources to assist with a greater understanding of the historical land use at the project site. This information aids in detailing potentially contaminating activities that may have occurred at the project site historically. The desk based review included the following sources of information:

- NSW Environmental Protection Authority (EPA) contaminated land record and contaminated sites register (notifications or records of notices)
- NSW EPA Protection of the Environment Operations (POEO) licence register
- other relevant sources.

The findings have been summarised in the subsections below.

### 5.1.1 Contaminated Land Management Act 1997

#### 5.1.1.1 List of sites notified to the NSW EPA

The NSW EPA maintains a “List of NSW contaminated sites notified to the EPA” under Section 60 of the *Contaminated Land Management Act 1997* (the CLM Act). Inclusion on this list indicates that the notifiers consider the sites are contaminated and warrant reporting to the NSW EPA. The contamination at a site may or may not be significant enough to warrant regulation by the NSW EPA, and following review of relevant site information, the NSW EPA will determine whether or not the site warrants regulation. A search of contaminated sites database found no sites within 500 m of the project which have been notified to NSW EPA.

#### 5.1.1.2 Contaminated land record of notices

The NSW EPA maintains a list of sites that appear on the *Contaminated Land: Record of Notices* which are issued under the CLM Act. A search of the NSW EPA register indicates that there are no premises within 500 m of the project subject to current or prior regulatory notices.

A further review of information contained in this NSW EPA register indicates that there are two premises within the boundary and one on the boundary of the LHRRP which have been notified under the CLM Act:

- Harringtons Quarry (access from Little Forest Road), located approximately 1 km to the north of the project site and is classified as “Contamination currently regulated under the CLM Act”. This premises has three current and two former notices in relation to contamination.
- IWC Landfill (Little Forest Road), located approximately 1 km to the north west of the project site and is classified as “Contamination formerly regulated under the CLM Act”. This premises has one current and two former notices in relation to contamination.
- Sydney Clay Target Club (Heathcote Road), located approximately 1.3 km to the north west of the project site, classified as “Under assessment”.

Harringtons Quarry is currently managed under a Voluntary Management Proposal (VMP) (March 2005) for ammonia, petroleum hydrocarbons and volatile chlorinated hydrocarbons in groundwater. The VMP focuses on the prevention of off-site migration of groundwater through improvement to the existing landfill cap and leachate extraction.

IWC Landfill is subject to management where a notice under Section 35 of the Environmentally Hazardous Chemicals Act 1985 (EHC) (January 1993) has been issued where the NSW EPA have directed that remedial action is taken that involves leachate characterisation, leachate treatment and transfer and leachate treatment and disposal. The chemicals listed in the notice are industrial in nature such as dioxins, polychlorinated biphenyls, chlorophenol, heavy metals and coal tar wastes.

These premises are a sufficient distance from the project site so as not present a risk to constructability and construction workers of the project. In addition, both of these premises are associated with the management of waste where leachate management has been or is currently undertaken and the risk of offsite migration is reduced, particularly if regulation by the NSW EPA has been required.

There is no information provided in relation to the Sydney Clay Target Club and the contamination that may be present. Under assessment indicates that this premises is being assessed by the NSW EPA to determine if regulation is required, however, given the distance from the project site the risks of exposure from this source are considered low and it is not considered further. The lease for the Sydney Clay Target Club has expired and the area is no longer occupied.

## 5.1.2 Former gasworks

The NSW EPA maintains a public register of former gasworks within NSW and the register indicates that there are no former gasworks located within 500 m of the project site.

## 5.1.3 PFAS investigation and management sites

The NSW EPA maintains a register regarding Per-and-Polyfluoroalkyl Substances (PFAS) investigation and management programs within Australia. These programs are undertaken by the NSW EPA, Department of Defence (DOD) and Airservices Australia, respectively. A review of this information concluded that there are no sites subject to PFAS investigation and management within 500 m of the project site.

It is noted that Holsworthy Barracks has been identified as a PFAS management site by the DOD and the boundary is located adjacent to the western side of the LHRRP and situated approximately 1.2 km from the project site at its closest point. A review of a 'factsheet' provided by DOD<sup>11</sup> suggests that the known PFAS sources are located in the northern portion of Holsworthy, the closest being approximately 6 km from the project site. Based on a review of information on the DOD website<sup>12</sup> it is considered likely that areas impacted by PFAS contamination at Holsworthy Barrack site are situated hydraulically down gradient of the project site. The pathways from the Holsworthy Barracks are reported to be towards the Georges River to the north.

## 5.1.4 Waste management and liquid fuel sites

A database of waste management sites and liquid fuel sites is maintained by Geoscience Australia via a web-based service platform. A review of this information indicated that there is one premises within 500 m of the project site, as summarised in Table 5.1.

Table 5.1 Waste Management and Liquid Fuel Facilities Summary

Site	Address	Class	Operational Status	Location in relation to site boundary
LHRRP, Sita Australia Pty Ltd (now Cleanaway Pty Ltd)	New Illawarra Road	Multi-purpose, waste management	Operational	Onsite (mainly to the west)

## 5.1.5 POEO Act registers

### 5.1.5.1 Currently licenced activities

The NSW EPA maintains a public register of premises subject to an Environment Protection Licence (EPL) under the *Protection of the Environment Operations Act 1997* (the POEO Act). A search of the register found three premises currently licensed activities within 500 m of the project site. These are summarised in Table 5.2.

<sup>11</sup> [20200624HolsworthyPMAFactsheet.pdf](#)

<sup>12</sup> [HolsworthyBarracksDocumentsArchive\\_0.pdf](#)

**Table 5.2** Current Licenced Activities under the POEO Act 1997

Licence Holder	Number / ID	Type of Licence	Distance from site boundary (m)	Comment
EDL LFG (NSW) Pty Ltd	6345	– Generation of electrical power from gas	On-site	Existing power station operations occupying land directly to the east of the project site
Cleanaway Pty Ltd	5065	– Non-thermal treatment of liquid waste – Waste disposal by application to land – Waste storage: other types of waste – Waste storage: waste tyres	Adjacent to western project site boundary	Waste management operations occupying land directly to the west of the project site
Cleanaway Pty Ltd	12520	Composting	Adjacent to western project site boundary	Waste management operations occupying land within close proximity to the project site

### 5.1.5.2 Delicensed licenced activities

The NSW EPA also maintains a public register of premises which have been delicensed under the POEO Act. A search found one premises within 500 m of the project site that has delicensed activities still regulated by the NSW EPA, summarised in Table 5.3.

**Table 5.3** Current Delicensed Activities under the POEO Act 1997

Licence Holder	Number / ID	Type of Licence	Distance from site boundary (m)	Comment
Waste Assets Management Corporation	13384	– Non-thermal treatment of liquid waste – Waste disposal by application to land – Waste storage: other types of waste – Waste storage: waste tyres.	Adjacent to western project site boundary	This is the current LHRRP

### 5.1.5.3 Former licenced activities

The NSW EPA also maintains a public register of premises which have been formerly subject to an EPL under the POEO Act. A search of the register found six surrendered licences within 500 m of the project, summarised in Table 5.4.

Table 5.4 Former Licenced Activities under the POEO Act 1997

Licence Holder	Number / ID	Type of Licence	Distance from site boundary (m)	Comment
Heidelberg Materials Australia Pty Ltd <sup>1</sup>	626	Concrete works	225 m to the south	Appears to be road construction associated with the New Illawarra Road based on the location of the activity
Luhrmann Environment Management Pty Ltd <sup>2</sup>	4653	Other activities- application of herbicides	Various – associated with watercourses surrounding the site	These activities are associated with the application of herbicides along waterways throughout NSW. This activity is likely to involve the application of low risk herbicides along various waterways. Impact from this activity is likely to be low.
Robert Orchard <sup>2</sup>	4838	Other activities- application of herbicides		
Sutherland Shire Council <sup>2</sup>	6375	Other activities- application of herbicides		
Sydney Weed & Pest Management Pty Ltd <sup>2</sup>	6630	Other activities- application of herbicides		
Veolia Recycling & Recovery Pty Ltd (PCYC Minibike Club area)	13114	Waste storage – other types of waste	234 m to the south west	This activity is located within the wider LHRRP and is likely associated with waste management activities

Notes:

1. Formerly Hanson Construction Materials Pty Ltd
2. It is noted that the application of herbicide activities is usually undertaken on a local government area-wide basis and is unlikely to have been a direct impact on the investigation area.

## 5.2 Site history summary

Site history information indicated that prior to 1956, the project site appeared to be undeveloped bushland. From 1956, the vegetation was progressively cleared and formed part of the LHRRP. The existing landfill gas power station on the project site was constructed in 1997 with the EPL for the operation initially submitted in October 2000. The existing EPL (#6345) for the site is in relation to the generation of electrical power from biogas by EDL. The landfill operations to the west and north west are subject to regulation under the POEO Act (EPL #5065 and #12520) which includes composting and waste storage.

Landfilling activities occurred adjacent to the west, north west and south west of the project site in the 1980's. The area immediately to the west of the project site has experienced some ground disturbance and storage of several stockpiles, however, it has remained undeveloped. Additionally, the area immediately east of the site has not been developed with evidence of previous ground disturbance and vegetation clearance observed from historical aerial photographs.

There are no Contaminated Land Record of Notices nor Notified Sites under the CLM Act associated with the project site. The project site and nearby areas do not form part of the NSW EPA PFAS Investigation Program.

A geotechnical investigation undertaken on the project site in August 2025 reported the presence of fill material to a depth of 1.4 m bgl. The fill consisted of a layer of gravel overlying dark orange sandy clay. Anthropogenic and/or waste materials were not observed in the fill material during the investigation. A similar outcome was reported by Douglas Partners in 2025 during a site wide investigation undertaken for EDL.

Previous investigations carried out in the adjoining areas indicated a low likelihood for contamination to exist from historical activities and low likelihood of contamination (e.g., landfill biogas, leachate) arising from current landfill activities. The 2025 geotechnical investigation undertaken in the area immediately west of the project site encountered fill material to depths of up to 1.3 m bgl in the western area of the investigation (furthest distance from the project site) but did not identify landfill waste. The geotechnical investigation did not identify evidence of contamination such as odours, staining or ACM (GHD 2025) in this area.

## 6. Preliminary conceptual site model

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The preliminary CSM is developed using information obtained from the site environmental setting, a site history review, observations made during an inspection, current and former land use and expected ground conditions.

The development of a preliminary CSM is an essential part of site contamination assessments and provides the framework for identifying contamination sources and how potential receptors may be exposed to contamination. The preliminary CSM has been assessed on the basis of the potential risk to the constructability of the project as well as the risk to site users (i.e., construction workers and future maintenance workers) and the site visitors, where applicable.

### 6.1 Potential sources of contamination

Potential contamination sources identified as Areas of Environmental Concern (AEC) based on the outcomes of the desktop review of information, including review of historical aerial photographs and the site inspection are detailed in Table 6.1 along with a broad suite of Contaminants of Potential Concern (COPC) identified for each AEC. Figure 6.1 presents the locations of the AECs in relation to the project site.

Table 6.1 AECs and associated COPCs

AEC No.	Name/Source	Description	COPCs
<b>On site</b>			
AEC 01	Contamination associated with potential imported fill material of unknown origin, quality and extent	There is the potential that fill materials may have been imported to the site prior to or during the construction of the existing power station in 1997, however, site history information indicates that soil had been removed prior to construction to meet the proposed elevations for the site. It is considered unlikely that materials have been imported to the site and that the underlying fill is possibly reworked natural soils associated with the preparatory works for the construction of the existing power station in 1997.	Heavy metals, total recoverable hydrocarbons (TRHs), benzene, ethylbenzene, toluene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine and organophosphate pesticides (OCPs/OPPs), polychlorinated biphenyls (PCBs), Per- and polyfluoroalkyl substances (PFAS), phenols, asbestos
AEC 02	Underground gas extraction system and existing power station	There is the potential for landfill gas to be present under the project site associated with leaks or failure of the current underground gas extraction and power station infrastructure.	Methane (CH <sub>4</sub> ), carbon dioxide (CO <sub>2</sub> ) and hydrogen sulphide (H <sub>2</sub> S)
AEC 03	Leaks and spills from the generator modules, associated oil pipework and oil sumps	There is the potential for leaks, overflows or spills to have occurred from the generator modules, associated transfer lines and/or maintenance activities that may have seeped into the ground.	TRHs, PAHs
AEC 04	Chemical storage on site	There is the potential for leaks and spills associated with the storage of the chemicals and oils in the hazardous chemicals storage units.	TRHs, BTEX, Volatile Organic Compounds (VOCs)
AEC 05	Use of condensate separation vessels (CSVs) on the site	There is the potential for leaks from the CSVs and associated pipework into the soils and groundwater underlying the site.	TRHs, BTEX, PAHs, heavy metals, nutrients, VOCs, Semi-VOCs (SVOCs)
AEC 06	Material laydown areas	Contamination of soils and groundwater underlying the storage areas associated with deterioration, leaks, run-off from the waste/redundant/unused items and materials.	Heavy metals, TRHs, BTEX, PAHs, OCPs/OPPs, PCBs, PFAS, phenols, asbestos

AEC No.	Name/Source	Description	COPCs
AEC 07	Storage of oils in the 2 x 20,000 L ASTs and 6,000 L AST	There is the potential for leaks and spills associated with the storage of oils in the ASTs.	TRHs
AEC 08	IBCs stored on site (waste oily water and coolant / oil water only)	There is the potential for leaks and spills associated with the storage of oils in the IBCs.	TRHs, VOCs
<b>Off-site</b>			
AEC 09	Presence of mixed waste in fill materials on the adjacent site	Mixed waste and soil in fill materials were encountered during geotechnical works adjacent to the landfill cell.	Heavy metals, TRHs, BTEX, PAHs, OCPs/OPPs, PCBs, PFAS, phenols, asbestos.
AEC 10	Landfill cell to the west of the project site (landfill biogas and leachate migration)	The landfill cell is unlined and there is a potential risk of landfill gas and/or leachate migration towards the project site. The landfill cell is capped; it has an active gas extraction system and there is a leachate collection system that redirects leachate to a treatment plant on-site.	CH <sub>4</sub> , CO <sub>2</sub> and H <sub>2</sub> S. Heavy metals, ammonia, nutrients
AEC 11	Workshop located to the north-west of the project site	There is the potential for contaminants associated with fuel and oil storage and use to be present in the soils and groundwater in this area.	Heavy metals, TRHs, BTEX, PAHs, VOCs.

## 6.2 Potential exposure and migration pathways

The primary potential pathways by which the identified receptors could be exposed to the COPCs are considered to be:

- exposure pathways:
  - ingestion / dermal contact with contaminated soil, leachate and/or water
  - inhalation of contaminated dust, fibres from contaminated soil/fill
  - inhalation of vapours / gases from landfilled waste.
- migration pathways:
  - transport of contaminants by mechanical disturbance (e.g. earthworks, erosion and sediment transport)
  - transport of contaminants via leachate migration
  - lateral and/or upward migration of landfill gas through the soil profile and via underground services.

## 6.3 Potential receptors

When evaluating potential adverse health and environmental effects from exposure to a contaminated site, potentially exposed populations should be considered. For this project, the key populations and receptors of interest are considered to include:

- Human receptors:
  - Individuals involved in earthworks and construction activities at the project site and site visitors.
  - Future workers involved in the operational phase at the project site.
  - Future intrusive maintenance workers carrying out repairs or installation on subsurface utilities following construction phase. It is expected that minor excavation activity could occur in the future (e.g. road repairs or installation of underground services).

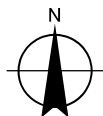
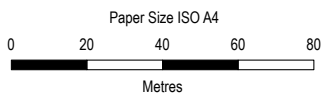
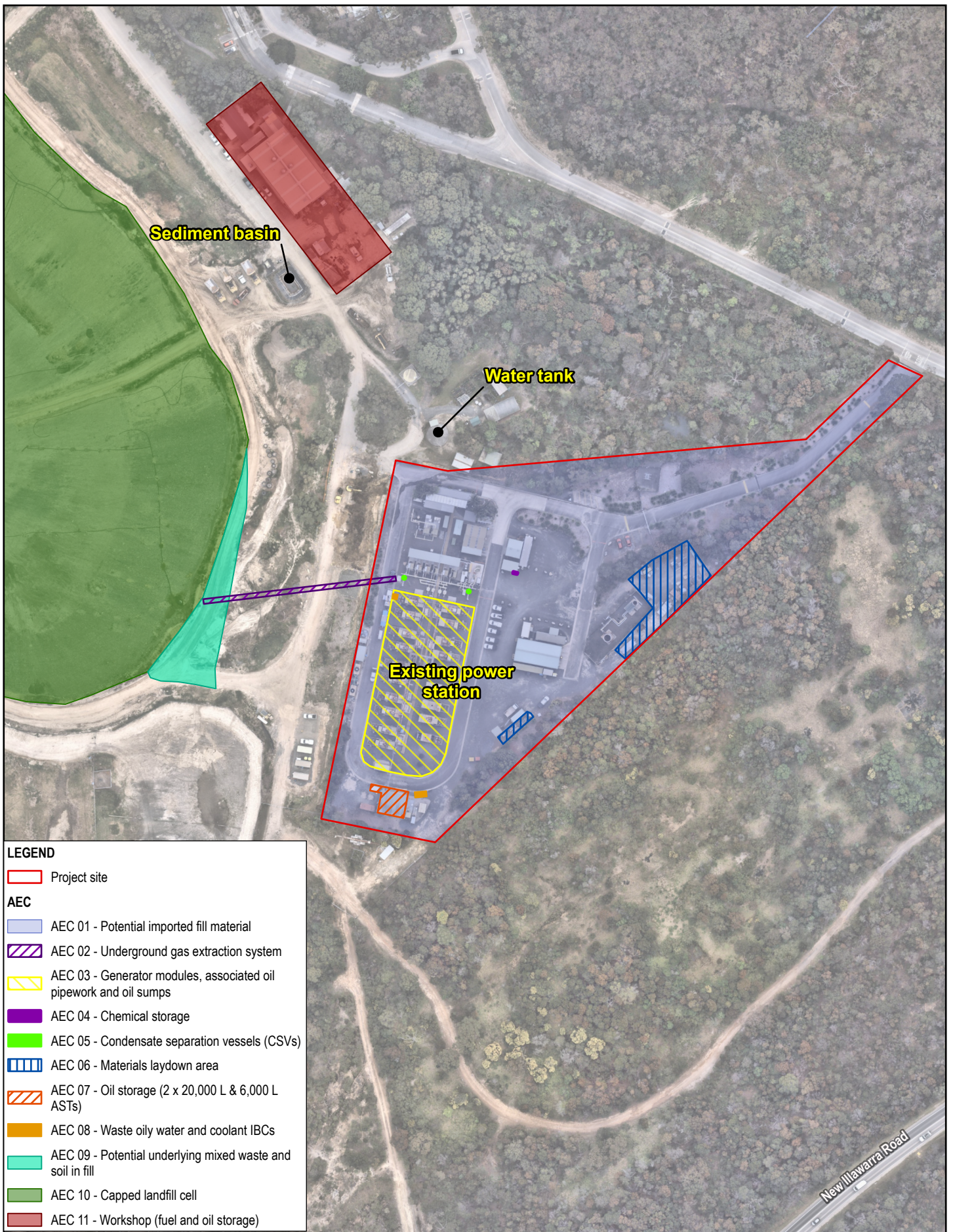
- Groundwater users: The likelihood of contaminants migrating to groundwater is assessed as low based on the following and not considered further:
  - Identified on-site AECs are less likely to directly impact groundwater due to subsurface conditions and depth to groundwater of approximately 4 to 8 m bgl.
  - Groundwater flow direction is to the north, and the project site is upgradient from the landfilled waste.
- Ecological receptors:
  - Ecological receptors were considered in the BDAR waiver report, prepared to support the Environmental Impact Statement (EIS), provided as Appendix G to the main EIS document. The assessment considered that there is a low risk to terrestrial ecological receptors on the basis that the project site is located in a highly disturbed environment which is dominated by power generation activities. As such, these are not considered further.

## 6.4 Potential Source-Pathway-Receptor linkages

Potential Source-Pathway-Receptor (SPR) linkages for on-site and off-site receptors are summarised in Table 6.2 below.

Based on this review, potential SPR linkages could be complete for:

- Human receptors:
  - Construction workers/visitors may encounter contamination in the form of fill, hydrocarbon impacted soil, landfill gases and leachate during excavations and earthworks.
  - Future workers associated with the operational phase may encounter landfill gases, hydrocarbon impacted soil, leachate impacted by landfilling activities.



LMS Energy  
Lucas Heights Bioenergy facility

Project No. 12649882  
Revision No. 0  
Date 20/10/2025

Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 56

Areas of environmental concern

**FIGURE 6.1**

Table 6.2 Preliminary SPR linkages

AEC #	Source of potential contamination	Pathway	Receptor	Potentially complete SPR linkage?	Consider further?
<b>On-site</b>					
AEC 01	Potential imported fill material of unknown origin, quality and extent	Ingestion / dermal contact with potentially contaminated soil and/or water	Construction workers Future workers	<p>The SPR linkage is unlikely to be complete. The outcomes of the Douglas Partners and GHD investigations undertaken in 2025 did not encounter anthropogenic and/or waste materials in the fill material on the site. It is considered that there is a low likelihood that materials have been imported to the site and that the underlying fill is possibly reworked natural soils associated with the preparatory works for the construction of the power plant in 1997.</p> <p>Construction works, including trenching, will likely disturb underlying soils which will be undertaken in accordance with a CEMP. An Unexpected Finds Protocol (UFP) should be developed for the works, which would reduce the potential exposure to suspected or actual contamination encountered during construction works (if present).</p>	No
		Inhalation of contaminated dust, fibres from contaminated soil/fill			No
AEC 02	Presence of landfill biogas underlying the project site originating from the biogas extraction and distribution system. Existing power station	Inhalation of vapours / gases originating from landfilled waste	Construction workers	There is potentially a complete SPR linkage. Landfill biogas that originates from the landfill cell to the west feeds into the generator modules on the project site via above and below ground pipework. There is the potential for leaks and preferential pathway from this underground pipework. However, it is noted that the biogas extraction system is subject to management, and it is expected that leaks would be detected and rectified promptly.	Yes
			Future workers	<p>There is potentially a complete SPR linkage to future workers as conditions may change where the likelihood of exposure from landfill gas leaks may increase.</p> <p>Existing buildings, where personnel have occupancy throughout the day, are raised above the ground surface which allows ventilation and minimises the potential for migration into these buildings and these will remain on the site for use as part of LMS occupation. There may be a complete pathway for other buildings with lesser occupancy and are built directly on the ground surface where there may be a risk of accumulation in buildings and structures if gas migrates into these via underground conduits/pipework and trenches.</p> <p>It is expected that future works, if required e.g., maintenance, intrusive works, will be managed under procedures and protocols designed to minimise the risk of exposure. It is also anticipated that the project site will be subject to surface and subsurface gas monitoring as part of ongoing management of the project site.</p>	Yes

AEC #	Source of potential contamination	Pathway	Receptor	Potentially complete SPR linkage?	Consider further?
AEC 03	Leaks and spills from the generator modules, associated oil pipework and oil sumps	Incidental ingestion / dermal contact with contaminated soil Inhalation of vapours from impacted material	Construction workers	<p>There is potentially a complete SPR linkage as hydrocarbon impacted soil was encountered during the investigation by Douglas Partners in 2025. Concentrations of hydrocarbons were reported to be below adopted human health criteria for a commercial/industrial land use (NEPC, 2013). The extent of impact appears to be restricted to the generator module area as hydrocarbons were not detected in soils sampled at BH3, located 50 m to the north.</p> <p>There was an exceedance of the petroleum management limit criterion at TBH5, however, this is based on site specific considerations related to the formation of phase separated hydrocarbons, fire and explosive risks, infrastructure damage and aesthetic concerns.</p> <p>There is potentially a complete SPR linkage to construction workers if earthworks are undertaken in areas where hydrocarbons have been encountered, mainly in proximity of the existing generator modules.</p> <p>Construction works will be undertaken in accordance with a CEMP, which would reduce the potential exposure to contamination in the soils.</p> <p>Limited information about groundwater at the project site is available, however, groundwater is expected to be at depths approximately 4 to 8 m bgl, based on the LHRRP AMER, information detailed in the Douglas Partners report (2025) and discussion with site representatives. It is noted that a perched groundwater table is likely to exist at the site however this is considered likely to be localised and discontinuous across the site. Based on the observations made during the GHD geotechnical investigation (2025) and the weather preceding the site works, it is likely that groundwater forms after rain events.</p> <p>Construction workers are unlikely to come into contact with hydrocarbon impacted groundwater (if present) and this groundwater pathway has not been considered further.</p>	Yes
			Future workers	<p>There is potentially a complete SPR linkage for intrusive maintenance workers if earthworks or maintenance are undertaken in areas where hydrocarbons have been encountered (in proximity of the existing generator modules). It is understood that some of these generator modules will be removed during decommissioning of the existing facility, significant further disturbance of subsurface soils is not expected given most of the at surface level infrastructure will be left in place.</p>	Yes

AEC #	Source of potential contamination	Pathway	Receptor	Potentially complete SPR linkage?	Consider further?
				<p>Limited information about groundwater at the project site is available, however, groundwater is expected to be at approximately 4 to 8 m bgl, based on the LHRRP AMER, information detailed in the Douglas Partners report (2025) and discussion with site representatives. Construction workers are unlikely to come into contact with hydrocarbon impacted groundwater (if present) and this groundwater pathway has not been considered further. It is noted that a perched groundwater table is likely to exist at the site. Based on the observations made during the GHD geotechnical investigation (2025) and the weather preceding the site works, it is likely that groundwater forms after rain events. This is considered to be localised and discontinuous across the site.</p>	
AEC 04	Chemical storage on site – leaks and spills associated with the storage of the chemicals and oils	Ingestion / dermal contact with potentially contaminated soil	Construction workers Future workers	<p>The SPR linkage is unlikely to be complete as there was no evidence of spills or leaks on the ground surface around these units and the volumes stored in individual containers are low i.e., &lt;20 L.</p> <p>If there have been historic leaks and spills there may be residual contamination in the subsoils, however, this can be managed via the implementation of the CEMP and UFP to reduce the potential exposure to contamination (if present).</p>	No
AEC 05	Use of condensate separation vessels on the site	Ingestion / dermal contact with potentially contaminated soil and/or water	Construction workers Future workers	<p>The SPR linkage is unlikely to be complete as the CSVs pump the condensate to a leachate management treatment system on the LHRRP. As such there is a low likelihood of exposure to both construction and future workers via the identified pathways.</p> <p>Leaks may be occurring into the underlying groundwater, however, there is no evidence of impact to the groundwater based on the results of the groundwater reported in the LHRRP AMER (2024) and with a reported depth of 4 to 8 m, the likelihood of exposure is low. It is noted that a perched groundwater table is likely to exist at the site. Based on the observations made during the GHD geotechnical investigation (2025) and the weather preceding the site works, it is likely that groundwater forms after rain events. This is considered to be localised and discontinuous across the site. The presence of the ephemeral groundwater table is unlikely to affect the SPR linkage as exposure to receptors is unlikely to be significant and temporally localised.</p>	No

AEC #	Source of potential contamination	Pathway	Receptor	Potentially complete SPR linkage?	Consider further?
AEC 06	Material laydown areas – contamination of soils and groundwater due to deterioration, leaks, run-off from the waste/ redundant/ unused items and materials.	Ingestion / dermal contact with potentially contaminated soil and/or water	Construction workers Future workers	<p>The SPR linkage is unlikely to be complete as contamination, if present, is expected to be localised and associated with rusted scrap metal which may have leached some heavy metals and/or hydrocarbon residues in the nearby surface soils. Contamination, if any, is expected to be within the upper 0.1 m of the soil profile.</p> <p>The IBC that contained oily water may be leaking into the subsoils, however, observations from the site inspection did not indicate staining on the adjacent ground surface. LMS report that this IBC will be removed from the site ahead of construction works.</p> <p>Construction works will be undertaken in accordance with a CEMP, which would reduce the potential exposure to contamination in the soils.</p> <p>It is expected that future works, if required, e.g. maintenance, intrusive works, will be managed under procedures and protocols designed to minimise the risk of exposure.</p>	No
		Inhalation of contaminated dust, fibres from contaminated soil/fill	Construction workers Future workers	<p>The SPR linkage is unlikely to be complete as contamination, if present, is expected to be localised and associated with rusted scrap metal, which may have leached some heavy metals and/or hydrocarbon residues in the nearby surface soils. Contamination, if any, is expected to be within the upper 0.1 m of the soil profile underlying the layer of gravel across the waste storage areas.</p>	No
AEC 07	Storage of oils in the 2 x 20,000 L ASTs) and AST storing engine oil drained from filters on generators	Ingestion / dermal contact with potentially contaminated soil and/or water	Construction workers Future workers	<p>The SPR linkage is unlikely to be complete as there was no evidence of staining or leaks on the ground surface adjacent to the ASTs, the covered bund was in a good condition and there was no product/sheen on the rainwater in the bund. In addition, the fill points were set within the bund.</p> <p>There was no evidence of staining in the vicinity of the 6,000 L AST which was noted to be a self-bunded steel tank.</p> <p>Construction works will be undertaken in accordance with a CEMP, which would reduce the potential exposure to contamination in the soils.</p> <p>It is expected that future works, if required, e.g. maintenance, intrusive works, will be managed under procedures and protocols designed to minimise the risk of exposure.</p>	No

AEC #	Source of potential contamination	Pathway	Receptor	Potentially complete SPR linkage?	Consider further?
AEC 08	IBCs stored on site (waste oily water and coolant / oil water only)	Ingestion / dermal contact with potentially contaminated soil and/or water	Construction workers Future workers	<p>The SPR linkage is unlikely to be complete as there was no evidence of spills or leaks on the ground surface around these units and these IBCs were situated with portable bunds underneath which prevents migration onto the ground surface.</p> <p>The IBCs are cleaned out routinely and the waste liquid is removed from site. This practice is expected to continue in the future and there would be a low likelihood of exposure to future workers under the current scenario. If that scenario were to change and a different process for managing oily wastewater and coolant were to be introduced, a reassessment of the SPR linkage may be required.</p>	No
<b>Off-site</b>					
AEC 09	Presence of mixed waste and soil in fill materials underlying the adjacent site to the west	Ingestion / dermal contact with contaminated soil, leachate and/or water	Construction workers Future workers	The quantity, origin and contamination status of the mixed fill material is not known, however, the SPR linkage is unlikely to be complete as construction workers will not be required to undertake work on the adjacent site.	No
		Inhalation of contaminated dust, fibres from contaminated soil/fill		The quantity, origin, extent and contamination status of the fill material is not known, however, the SPR linkage is unlikely to be complete due to the distance from the project site i.e., 50 m and it is considered unlikely that construction workers and future workers will be exposed to airborne dust/fibres originating from this source.	No
		Inhalation of vapours / gases originating from underlying waste materials (if present)		<p>The SPR linkage is unlikely to be complete, as the volume of fill materials underlying the adjacent site is likely to be low and it appears to be present only in the western portion and not contiguous with the landfill cell.</p> <p>It is noted that results of quarterly subsurface monitoring undertaken at the landfilled waste in the wider LHRRP indicates that there were no reported exceedances of the adopted trigger levels. This indicates that the likelihood of biogas migration from this offsite source is low.</p>	No
AEC 10	Landfill cell located approximately 50 m to the west (landfill biogas and leachate)	Ingestion / dermal contact with contaminated soil, leachate and/or water	Construction workers Future workers	<p>The SPR linkages are assessed as incomplete, as the waste cell is currently covered with Virgin Excavated Natural Material (VENM) and is in the process of being capped with no exposure of the underlying waste materials. There is a leachate collection system which manages and directs leachate generated from the decomposition of the waste materials for treatment. This system also reduces the impact to groundwater underlying the LHRRP and wider area, including the project site, as evidenced by the groundwater monitoring results detailed in the AEMR (refer to section 4.3.3).</p> <p>It is considered unlikely that identified receptors will be impacted by contaminants originating from this source.</p>	No

AEC #	Source of potential contamination	Pathway	Receptor	Potentially complete SPR linkage?	Consider further?
		Inhalation of contaminated dust, fibres from contaminated soil/fill		SPR linkages are assessed incomplete as the landfilled waste is currently in the process of being capped with no exposure to the underlying waste materials and final rehabilitation is in process. In addition, construction works will not intercept the landfill cell.	No
		Inhalation of vapours / gases originating from landfilled waste		<p>Whilst the landfilled waste cell is capped and has an active biogas management system in place which reduces the potential for biogas migration from the waste body, there could be a potential for subsurface gas migration towards the project site. Therefore, the SPR linkages are potentially complete. It is noted that the results of subsurface biogas monitoring at the LHRRP report that concentrations of landfill biogas are low and do not exceed trigger levels.</p> <p>There have been instances of methane concentrations encountered during surface emissions monitoring that exceeded the 500 ppm criterion detailed in the EPL (#5065). These instances were located in other areas of the LHRRP as well as being rectified promptly by Cleanaway as per conditions of their management procedures. The landfill cell is currently in the process of being capped which would further minimise potential subsurface migration of methane emissions.</p> <p>If there are changes to the operation of the biogas extraction system and monitoring program currently being implemented, a reassessment of the SPR linkage may be required.</p>	Yes
AEC 11	Workshop to the north	Ingestion / dermal contact with contaminated soil, leachate and/or water	Construction workers Future workers	The SPR linkages are assessed as incomplete as this AEC is located at a sufficient distance (approximately 90 m at the closest point) and hydraulically downgradient of the project site. Therefore, the likelihood of contaminant migration onto the project site is assess as low.	No

## 6.5 Discussion

Based on the outcomes of the preliminary CSM, as assessed in Table 6.2 it is considered that there are potentially complete SPR linkages for the following:

- AEC 02 – there could be potential for biogas inhalation due to leaks from the underground pipework at the project site affecting construction and future workers.
- AEC 03 – hydrocarbon impacted soils have been identified on the site and there is the potential for exposure to contamination via direct contact/ingestion of contaminated soil during construction phase and future works.
- AEC 10 – there could be potential for gas inhalation due to migration of landfill biogas from the waste cell to the west affecting future workers.

SPR linkages are assessed potentially complete for constructions workers and / or future workers associated with this project and will require further consideration. The construction works will be subject to the implementation of a Construction Environmental Management Plan (CEMP) which will minimise potential impacts to construction workers by developing appropriate site management practices and emergency response procedures.

If the proposed construction methodology is to change, e.g. piling for foundations or similar, a reassessment of SPR linkages may be required, particularly if deeper disturbance of soil and rock is required. With respect to the potential for landfill biogas inhalation by construction workers, it is anticipated that soil disturbance and trenching is likely, however, construction works will be undertaken in accordance with a CEMP which will include the implementation of management measures that will minimise exposure to landfill biogas such as monitoring of the proposed works area prior to commencement, ongoing monitoring for landfill biogas during construction and the use of personal gas monitors to warn users of elevated concentrations of target biogases.

Regarding landfill biogas inhalation by future workers at the project site. There is an existing monitoring programme in place for the LHRRP and ongoing environmental monitoring programme will be implemented as part of the management of the project site that will include surface, subsurface and in-building monitoring. This will assist with the identification of fugitive emissions that may affect workers and reduce the likelihood of exposure to landfill biogases.

With respect to the potential for exposure to hydrocarbon impacted soil, a potentially complete SPR linkage for construction workers future workers, i.e. intrusive maintenance workers, who may come into contact with residual contamination in the soils where this contamination has been identified. The implementation of a CEMP will minimise the likelihood of exposure if soil disturbance through the areas adjacent to the existing generator modules occurs. If there is a requirement to remove soils from the site, these should be sampled and analysed in accordance with the NSW EPA Waste Classification Guidelines (NSW EPA, 2014). Appropriate documentation should be prepared to support the classification of the waste in accordance with the NSW EPA guidelines.

The likelihood of contamination present within other identified AECs is assessed as low and unlikely to require further assessment. It is noted that the project site forms part of the wider LHRRP, and is subject to management by various management plans, in particular, an Operational Environmental Management Plan (OEMP), and a Pollution Incident Response Management Plan (PIRMP). The ongoing implementation of these plans, which includes regular environmental monitoring and action responses, provides the necessary framework to reduce exposure of contamination to receptors. The active gas extraction system and leachate collection system reduces the possibility of gases and contaminants entering the environment and impacting identified receptors.

The likelihood of intercepting groundwater underlying the project site is low as any excavations are expected to be relatively shallow (approximately 1 m bgl). There may be some interaction with shallow water in some locations, but this is likely to be intermittent and not extensive.

# 7. Conclusions and recommendations

## 7.1 Conclusions

Site history information indicated that the project site was undeveloped bushland prior to 1956 after which vegetation was progressively cleared as part of the development of the wider LHRRP. There had been no development on the project site until 1997 when construction commenced on the existing power station. In the 1980's, landfilling activities occurred to the west, north-west and south-west of the project site and there is a capped waste cell approximately 70 m to the west of the project site.

Infrastructure on the project site includes two 20,000 L ASTs, nineteen generator modules (each with an oil sump to collect engine oil overflows), oil distribution lines, cooling towers, electrical transformers, chemical storage, waste oily water storage and a flare compound. In addition, landfill biogas extraction infrastructure extends from the capped waste cell to the west, through the adjacent vacant area and to the power station (project site) via underground pipework.

There are no Contaminated Land Record of Notices nor Notified Sites under the CLM Act associated with the project site. The project site and nearby areas do not form part of the NSW EPA PFAS Investigation Program. There is an existing EPL (#6345) for the project site related to the generation of electrical power by EDL and the wider LHRRP site is regulated under two EPLs, #5065 and #12520, for waste storage and composting activities.

A soil contamination assessment was conducted at the project site by Douglas Partners in May 2025 which encountered fill material to depths of 0.65 m bgl. The vertical extent of fill was not assessed. Hydrocarbon staining was noted on a concrete pad and hydrocarbon odours were noted at four locations up to depths of 0.5 m below ground level in the vicinity of the generator modules. There were no exceedances of the adopted human health criteria (NEPC, 2013) for commercial/industrial land use scenario at the locations investigated. There was an exceedance of the petroleum management limit criterion (NEPC, 2013), however, this is related to the formation or and/or presence of phase separated hydrocarbons, fire and explosive risks, infrastructure damage and aesthetic concerns which is considered not to be relevant for the site. There were also exceedances of criteria protective of ecological organisms, however, these were considered to be negligible in an ongoing industrial land use setting. Douglas Partners reported that the extent of the hydrocarbon impact had not been delineated.

A geotechnical investigation undertaken at the project site in August 2025 reported the presence of fill material to a depth of 1.4 m below ground level. The fill consisted of a layer of gravel overlying dark orange sandy clay (possibly reworked natural soils). Anthropogenic and/or waste materials were not observed in the fill material during the investigation. A similar outcome was reported by Douglas Partners during the site investigation in 2025.

A preliminary CSM has been developed to assist with the assessment of the SPR linkages associated with the identified AECs. The outcomes of this assessment found that there were potentially complete SPR linkages for the following:

- AEC 02: Presence of landfill biogas underlying the project site originating from the biogas extraction and distribution system.
- AEC 03: Presence of hydrocarbon impacts from the generator modules, associated oil pipework and oil sumps.
- AEC 10: Subsurface biogas migration towards the project site.

The SPR linkages could be complete for AEC 02 and AEC 10 where construction workers and future workers (i.e., intrusive maintenance workers) could be exposed to landfill biogas present in the subsurface during excavations or ground disturbance works. The exposure to potential contamination can be managed through the following:

- Implementation of a CEMP during construction works that will include monitoring of the proposed works area prior to commencement, ongoing monitoring for landfill biogas during construction and the use of personal biogas monitors to warn users of elevated concentrations of target biogases.
- The implementation of an environmental monitoring programme designed to assess the project site, including buildings and structures, for the presence of landfill biogas will reduce the potential of future workers being exposed to contamination (if present).

Regarding AEC 03 a potentially complete SPR linkage for construction workers or future workers i.e., intrusive maintenance workers, who may come into contact with residual contamination in the soils where this contamination has been identified. The implementation of a CEMP will minimise the likelihood of exposure if soil disturbance through the areas adjacent to the existing generator modules occurs. If there is a requirement to remove soils from the site, these should be sampled and analysed in accordance with the NSW EPA Waste Classification Guidelines (NSW EPA, 2014). Appropriate documentation should be prepared to support the classification of the waste in accordance with the NSW EPA guidelines.

The likelihood of contamination present associated with other identified AECs is assessed as low and unlikely to require further assessment and/or management.

If surplus soils/materials are generated as part of the project, management of these may be required, particularly if they are contaminated. Waste classification assessment undertaken at this stage will assist LMS with an understanding of potential constraints and provide an opportunity for advanced planning to manage such constraints. Supplementary waste classification may be required once materials have been excavated during construction works.

## 7.2 Recommendations

Based on the outcomes of the PSI for contamination, the following is recommended:

- Preparation of a CEMP to manage potential contaminant exposure risks during construction works and to manage unexpected contamination. A surface and subsurface monitoring program should be implemented which includes a higher frequency of monitoring events that aligns with construction activities, particularly those that will disturb the ground surface.
- The CEMP should include an Unexpected Finds Protocol.
- If ground disturbance and/or excavations occur and there is a requirement to remove soils from the site, these should be sampled and analysed in accordance with the NSW EPA Waste Classification Guidelines (NSW EPA, 2014). Appropriate documentation should be prepared to support the classification of the waste in accordance with the NSW EPA guidelines.
- If hydrocarbon impacted soils remain post decommissioning of the generator modules, a site management plan should be developed to provide a framework to manage potential exposure to future workers, particularly future intrusive maintenance workers.
- To minimise risks to future workers to be exposed to contamination (if present), implement an environmental monitoring programme to assess for the presence of landfill gas at the project site (surface and subsurface) targeting underground services and buildings/structures where enclosed spaces are likely.
- It is recommended to keep accurate and regularly updated records of maintenance of equipment, on-site infrastructure, fuels, chemicals and/or oil storage checks and a register of environmental incidents to assist with decommissioning of the bioenergy facility in the future during the LHRRP post closure period.

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# Appendices

# **Appendix A**



**Photographic record**

<p><b>Plate no. 1</b></p>	
<p><b>Description:</b> View east towards flare compound on eastern boundary.</p>	



<p><b>Plate no. 3</b></p>	 <p>A wide-angle photograph of an outdoor waste storage area. In the foreground, a large, dark brown metal container sits on a wooden pallet. To the left, a green metal structure is partially visible. In the background, there are several blue and white IBCs, a yellow container, and a pile of debris. The area is surrounded by trees and a cloudy sky.</p>
<p><b>Description:</b> General view of the waste storage area taken from area 4 m to north west of the flare compound.</p>	
<p><b>Plate no. 4</b></p>	 <p>A close-up photograph of a white IBC with a metal cage. The IBC is positioned next to a blue metal structure. A sign on the blue structure reads "SPILL CONTROL STATION". The IBC has a label that says "BULK CHEVRON". The IBC is sitting on a gravel surface.</p>
<p><b>Description:</b> IBC in waste storage area fill, contains waste oil/oily water. The label on the side does not reflect the contents.</p> <p>Note tap at base – water was observed to leak from the tap which contained a slight brown tinge when rubbed between the fingers.</p>	



<p><b>Plate no. 5</b></p>	 <p>A photograph showing a waste storage area. In the foreground, there are several large, dark-colored pipes and a wooden pallet. In the background, there are more pipes, a blue pipe, and a yellow container. The area is surrounded by trees with autumn foliage.</p>
<p><b>Description:</b> View to north west in the waste storage area.</p>	
<p><b>Plate no. 6</b></p>	 <p>A photograph showing a waste storage area. In the foreground, there is a large, white, rectangular IBC container with a metal frame. The container has a label that reads "WASTE OILY WATER/ COOLANT". To the left of the container, there is a boat covered with a grey tarp. In the background, there is a green metal building and a gravel area.</p>
<p><b>Description:</b> View south west from the flare compound close to site boundary, empty IBC, plastic flexi tubing and boat visible (left hand side of image).</p>	

**Plate no. 7**

**Description:**  
Shipping container and waste items along eastern boundary of the site, 30 m to the north of flare compound.



**Plate no. 8**

**Description:**  
General view north along access road in central portion of the site (generator modules on left hand side of image).



Plate no. 9

**Description:**

Two waste oily water / coolant IBCs set on portable bunds in southern area of the site adjacent to the ASTs. Rainwater observed in bund, no obvious signs of sheen or oil residues.



Plate no. 10

**Description:**

Location of 2 x 20 KL oil ASTs with concrete bund. 6,000 L AST in background. No evidence of leaks from pipework outside the bund. No evidence of leaks inside bund i.e., no sheen on rainwater, no product visible.



**Plate no. 11**

**Description:**  
Two fill points for the 20 KL ASTs set inside the bund.



**Plate no. 12**

**Description:**  
6,000 L AST for oil storage – self banded steel tank



**Plate no. 13**

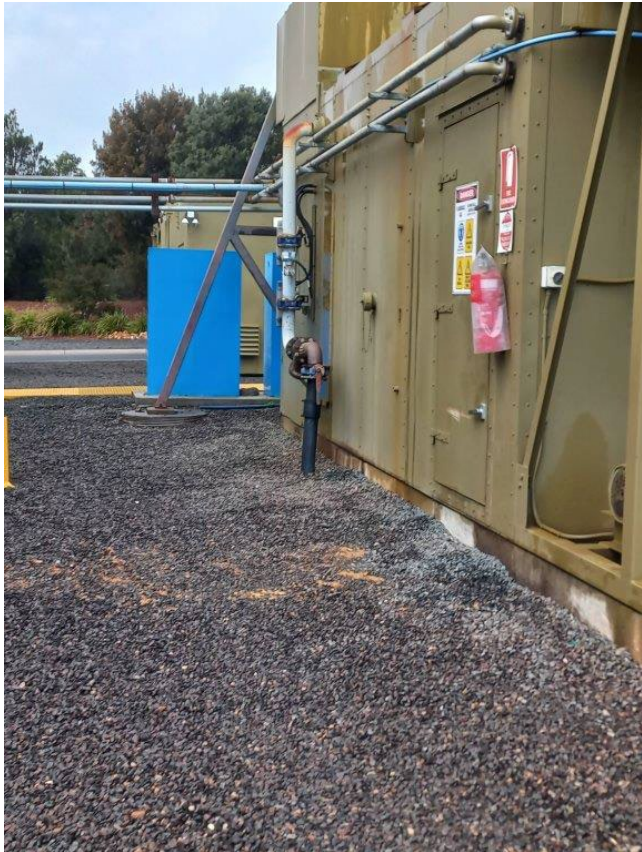

**Description:**  
View west of western boundary with soil embankment and vegetation along boundary



**Plate no. 14**

**Description:**  
Typical generator module set up with concrete base



<p><b>Plate no. 15</b></p> <p><b>Description:</b> Typical view between generator modules with concrete base and gravel surround, also note above and below ground pipework</p>	 A photograph showing a typical view between generator modules. The modules are large, tan-colored metal cabinets with doors. They are situated on a concrete base surrounded by a thick layer of dark gravel. Various pipes and conduits are visible running along the side of the modules and across the gravel area. A blue structure is visible in the background.
<p><b>Plate no. 16</b></p> <p><b>Description:</b> Waste oily water IBC set on portable bund adjacent to the generator modules. Rainwater observed in bund, no obvious signs of sheen or oil residues.</p>	 A photograph showing a waste oily water Intermediate Bulk Container (IBC) set on a portable bund. The IBC is a large, blue, rectangular container with a metal frame. It is placed on a yellow, plastic, portable bund. The bund is situated on a gravel surface adjacent to the generator modules. The background shows the tan-colored metal cabinets and various pipes and conduits.

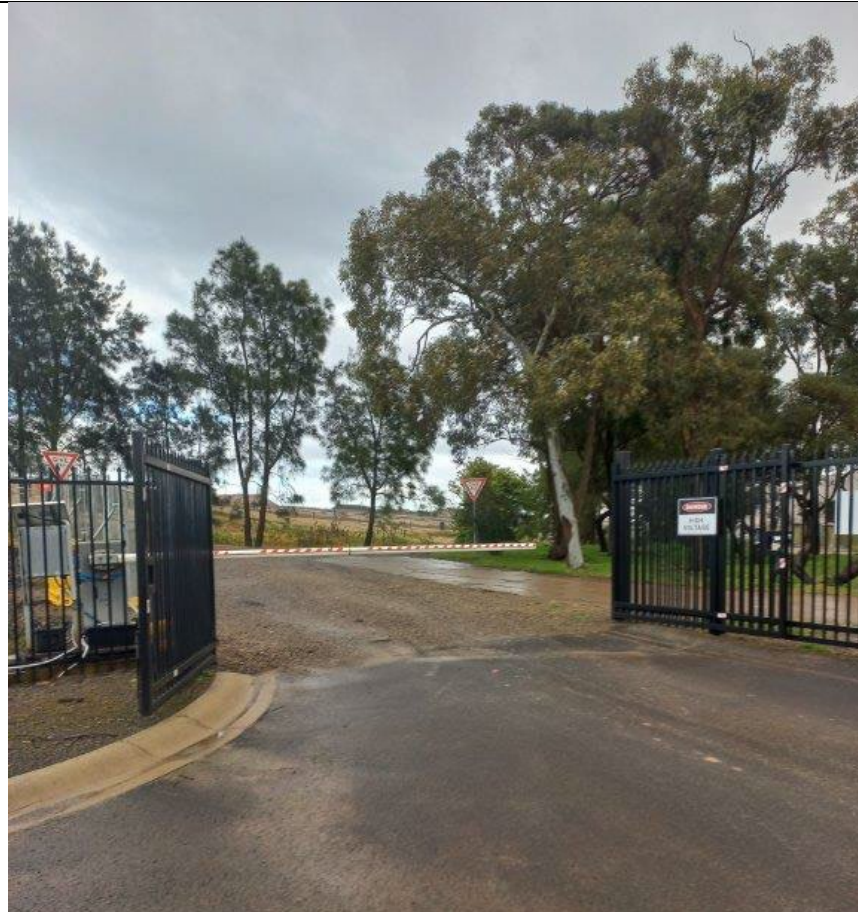
**Plate no. 17**

**Description:**  
Condensate storage vessel adjacent to generator modules in north western area of the site.





**Plate no. 18**

**Description:**  
View north west towards landfill from north western corner of the site.



<p><b>Plate no. 19</b></p>	
<p><b>Description:</b> Sewage collection and pumping system adjacent to the main office and amenities in the north western area of the site.</p>	 A photograph showing a sewage collection and pumping system. A green plastic cover is visible in the foreground. A white pipe runs from the cover to a grey electrical control box mounted on a post. A black pipe runs horizontally across the ground. The area is surrounded by trees and plants, including a palm tree. A white lattice fence is visible in the background.
<p><b>Plate no. 20</b></p>	
<p><b>Description:</b> Workshop adjacent to the main offices in north western area of the site.</p>	 A photograph of a workshop interior. The space is filled with various tools, equipment, and materials. A large stack of cardboard boxes is wrapped in clear plastic and sits on a wooden pallet in the foreground. A red pallet jack is visible near the entrance. The workshop has a corrugated metal roof and walls. A yellow storage bin and a red fire extinguisher are also visible.

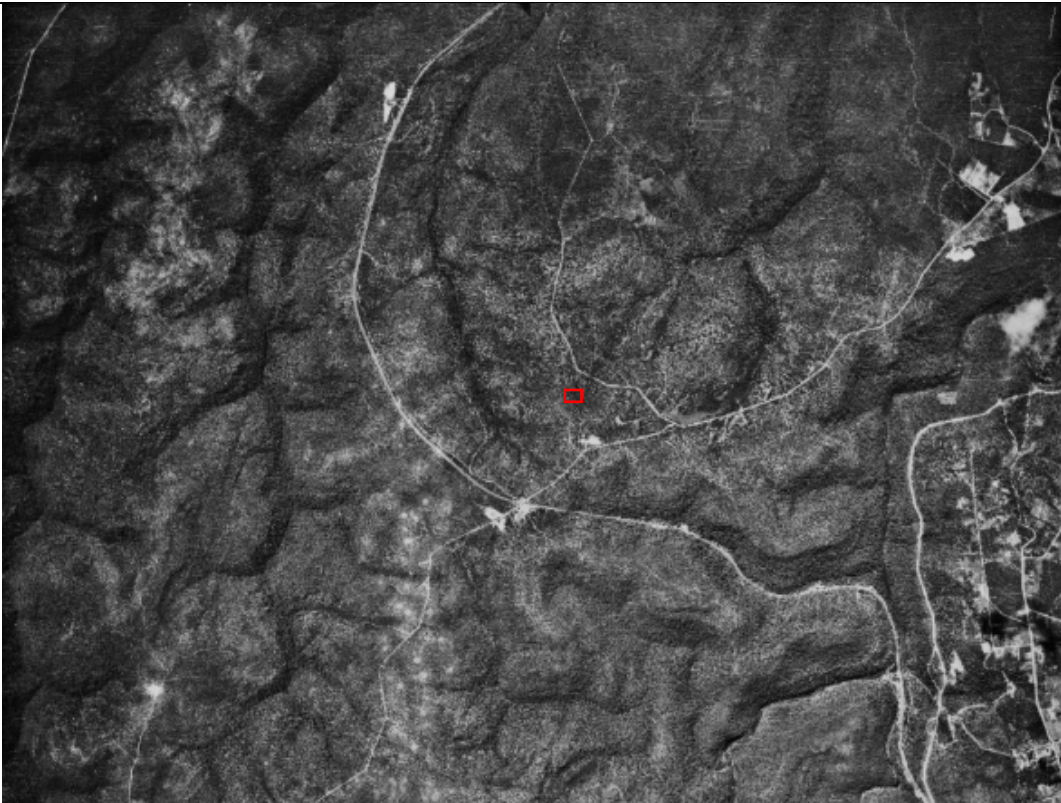
<p><b>Plate no. 21</b></p>	 <p>The photograph shows two blue metal chemical storage units positioned side-by-side under a sheltered area. Each unit has a red 'DANGER' label at the top that reads 'FLAMMABLE MATERIALS'. Below this, a diamond-shaped hazard label indicates 'CORROSIVE'. The units are situated on a gravel surface, and a red fire extinguisher is visible to the left of the units.</p>
<p><b>Description:</b> 2 x chemical storage units located close to main offices in north western area of the site.</p>	<p><b>Plate no. 22</b></p>  <p>The photograph shows the interior of a chemical storage unit. On a metal shelf, there are three containers: a 15-litre can of AirLube oil, a white plastic jug of Diesel Fuel Treatment, and a 40-litre can of Castrol 4000 ISO 46 oil. Below the shelf, two more Castrol oil cans are visible.</p> <p><b>Description:</b> Typical contents of the chemical storage units.</p>

# **Appendix B**

**Historical aerial photographs**

The red outline is the approximate location of the project site.

1949



1956



1965



1972



1980



1988



2005



2011



2020



2023

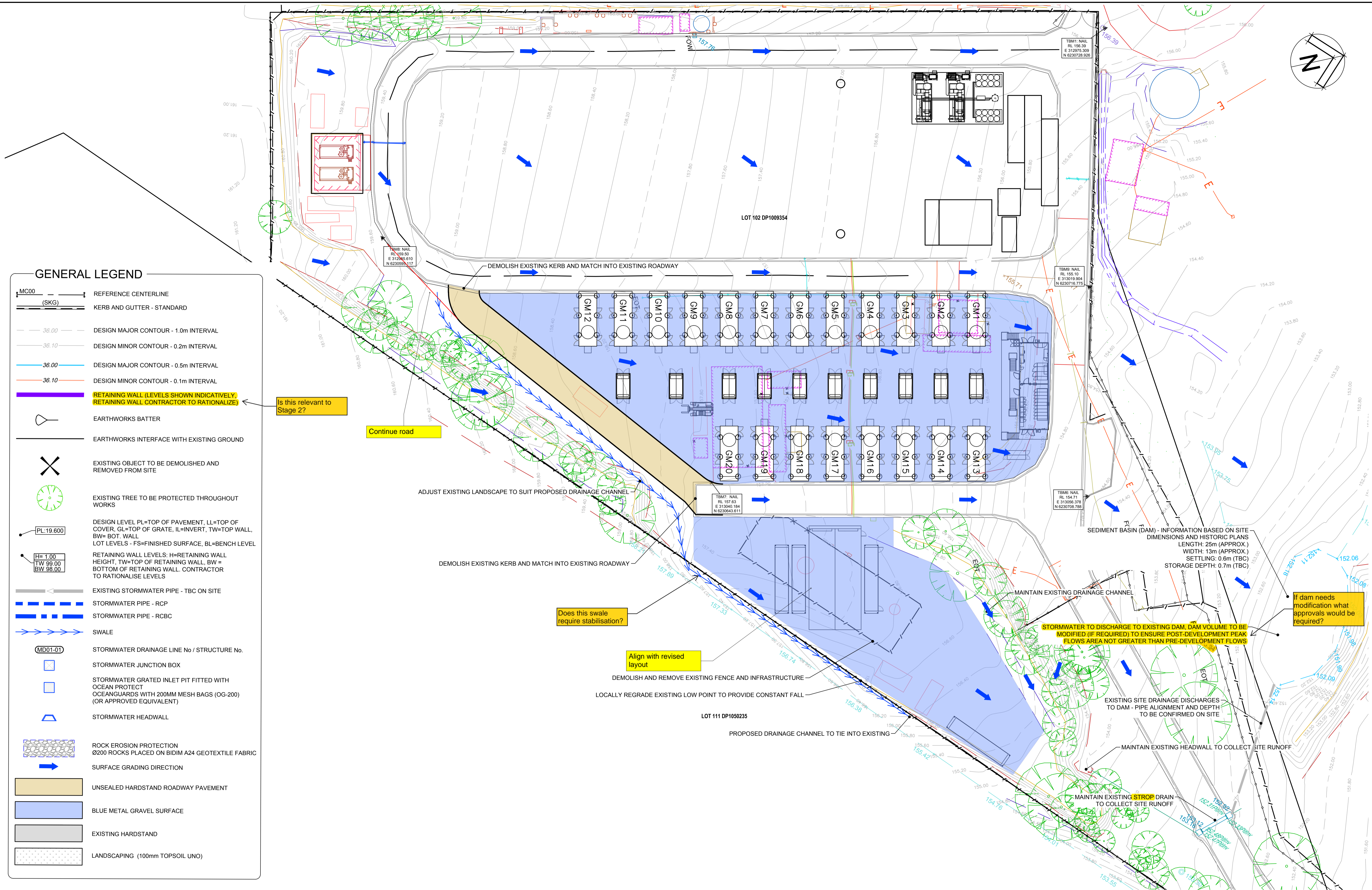


2025



# **Appendix C**

**Proposed design plan and topographic  
survey**



**GENERAL LEGEND**

- REFERENCE CENTERLINE
- KERB AND GUTTER - STANDARD
- DESIGN MAJOR CONTOUR - 1.0m INTERVAL
- DESIGN MINOR CONTOUR - 0.2m INTERVAL
- DESIGN MAJOR CONTOUR - 0.5m INTERVAL
- DESIGN MINOR CONTOUR - 0.1m INTERVAL
- RETAINING WALL (LEVELS SHOWN INDICATIVELY, RETAINING WALL CONTRACTOR TO RATIONALIZE)
- EARTHWORKS BATTER
- EARTHWORKS INTERFACE WITH EXISTING GROUND
- EXISTING OBJECT TO BE DEMOLISHED AND REMOVED FROM SITE
- EXISTING TREE TO BE PROTECTED THROUGHOUT WORKS
- DESIGN LEVEL PL=TOP OF PAVEMENT, LL=TOP OF COVER, GL=TOP OF GRATE, IL=INVERT, TW=TOP WALL, BW= BOT. WALL  
LOT LEVELS - FS=FINISHED SURFACE, BL=BENCH LEVEL
- RETAINING WALL LEVELS: H=RETAINING WALL HEIGHT, TW=TOP OF RETAINING WALL, BW = BOTTOM OF RETAINING WALL. CONTRACTOR TO RATIONALISE LEVELS
- EXISTING STORMWATER PIPE - TBC ON SITE
- STORMWATER PIPE - RCP
- STORMWATER PIPE - RCBC
- SWALE
- STORMWATER DRAINAGE LINE No / STRUCTURE No.
- STORMWATER JUNCTION BOX
- STORMWATER GRATED INLET PIT FITTED WITH OCEANGUARDS WITH 200MM MESH BAGS (OG-200) (OR APPROVED EQUIVALENT)
- STORMWATER HEADWALL
- ROCK EROSION PROTECTION Ø200 ROCKS PLACED ON BIDIM A24 GEOTEXTILE FABRIC
- SURFACE GRADING DIRECTION
- UNSEALED HARDSTAND ROADWAY PAVEMENT
- BLUE METAL GRAVEL SURFACE
- EXISTING HARDSTAND
- LANDSCAPING (100mm TOPSOIL UNO)

Is this relevant to Stage 2?

Continue road

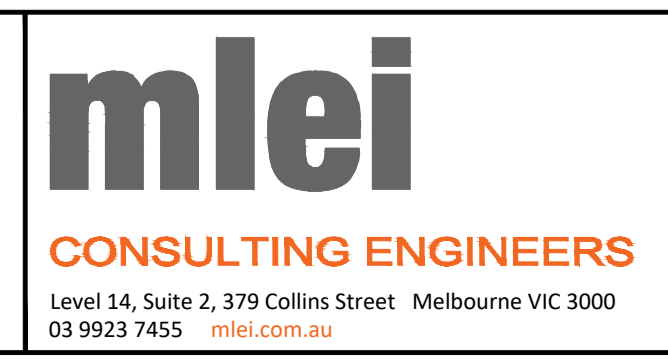
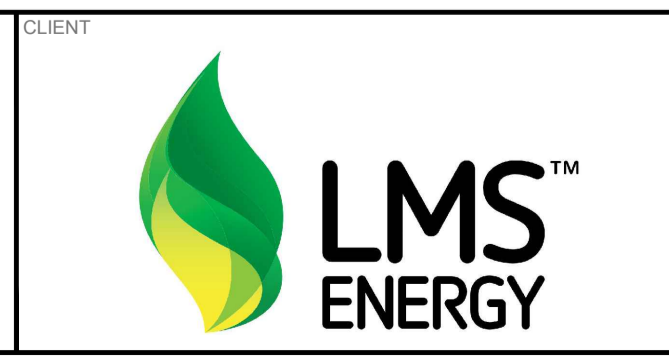
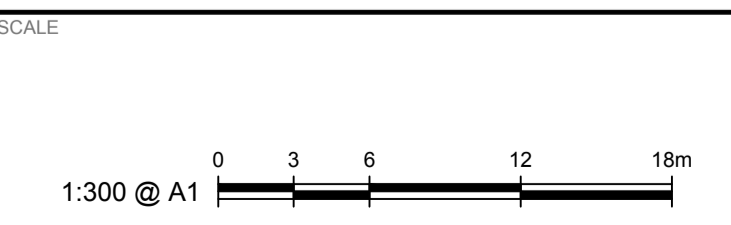
Does this swale require stabilisation?

Align with revised layout

STORMWATER TO DISCHARGE TO EXISTING DAM. DAM VOLUME TO BE MODIFIED (IF REQUIRED) TO ENSURE POST-DEVELOPMENT PEAK FLOWS AREA NOT GREATER THAN PRE-DEVELOPMENT FLOWS

If dam needs modification what approvals would be required?

ISSUE	DESCRIPTION	DRAWN	DESIGNED	CHECKED	APPROVED	DATE
A	CONCEPT ISSUE	MR	MR	BS	RM	08.09.2025



**LMS ENERGY STATION**  
**LUCAS HEIGHTS**  
**PROPOSED SITE CIVIL WORKS - STAGE 2**  
**STORMWATER MANAGEMENT PLAN**

**CONCEPT ISSUE**  
NOT FOR CONSTRUCTION

DRAWN	M.READE	DESIGNED	M.READE
DWG No.	<b>M025-2695</b>	SHEET	<b>SK01</b>
		REV	<b>A</b>



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