Ravensworth Composting Facility | State Significant Development | Modification 3

MODIFICATION REPORT

Prepared for Bettergrow Pty Ltd (Bettergrow) | 31 October 2025

elementenvironment.com.au

Ravensworth Composting Facility

STATE SIGNIFICANT DEVELOPMENT | MODIFICATION 3 | MODIFICATION REPORT

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PR425

	Prepared by	Reviewed by
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Company	Element Environment	Element Environment
Position	Senior Environmental Consultant	Director
Project Role	Lead Author	Technical Reviewer
Signature		
Date	31 October 2025	31 October 2025

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0	20 October 2025	For Bettergrow review	Element Environment	Bettergrow
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Certification Page

Submission of a modification report prepared under Part 4 of the NSW *Environmental Planning and Assessment Act 1979*.

Aspect	Details	
Name	Amna Robinson	Neville Hattingh
Position	Senior Environmental Consultant	Director
Project role	Lead author	Technical review
Qualifications	Master of Environment (Environmental Science)	BSc (Hons) Environmental Science CENVP Certified Impact Assessment Specialist NSW REAP
Address	Element Environment Pty Ltd PO Box 1563, Warriewood, NSW, 2102	
In respect of	Ravensworth Composting Facility, State significant development consent (SSD-9418) – Modification 3	
Applicant name	Bettergrow Pty Ltd	
Responsible person/applicant	Zac Rowlandson	
Responsible person/applicant address	2 Wella Way, Somersby, NSW, 2250	
Proposed development	Modification 3 to Ravensworth Composting Facility State significant development consent (SSD-9418).	
Land to be developed	The site comprises Lot 10 in DP1204457, otherwise known as 74 Lemington Road, Ravensworth.	
Proposed development description	The proposed modification would increase the processing capacity of the facility from 200,000 tonnes per annum (tpa) to 250,000 tpa, and allow for the receival and processing of raw Food Organics and Garden Organics (FOGO) recovered material and the installation of a weighbridge.	
Environmental assessment	This modification report addresses the requirements of Section 4.55 of the *NSW Environmental Planning & Assessment Act 1979.*	
Preparation	This modification report has been prepared by Element Environment Pty Ltd on behalf of Bettergrow Pty Ltd. In preparing the report, Element Environment has relied upon data, designs and plans and other information provided by Bettergrow Pty Ltd and other individuals and organisations referenced herein.	
Signature	Robinson	
Name	Amna Robinson	Neville Hattingh
Date	31 October 2025	31 October 2025

EXECUTIVE SUMMARY

Introduction

Bettergrow Pty Ltd (Bettergrow) is seeking approval to modify development consent SSD-9418 for the Ravensworth Composting Facility (the 'facility') at 74 Lemington Road, Ravensworth, New South Wales (NSW) (the 'site'). The facility processes biosolids, garden organics and other organic recovered material in outdoor windrows to produce a compost product suitable for mine site rehabilitation and agricultural uses.

Modification 1 to development consent SSD-9418 (SSD-9418-MOD-1) under Section 4.55(1A) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) was approved on 6 December 2023 to allow for:

- removal of the site weighbridge; and
- receival and processing of additional waste streams that would require a general or site-specific resource recovery order to be granted and an exemption issued by the Environment Protection Authority (EPA), including spent bleaching clay, the organic fraction of street sweepings and plasterboard/gypsum.

Bettergrow has recently submitted an application to the NSW Department of Planning, Housing and Infrastructure (DPHI) to modify consent SSD-9418 under Section 4.55(1A) of the EP&A Act (Modification 2). Under Modification 2, Bettergrow is seeking approval to receive and process decontaminated and pasteurised Food Organics and Garden Organics (FOGO) and/or food recovered material, and receive and blend Virgin Excavated Natural Material (VENM) and Excavated Natural Material (ENM) with organic recovered materials, at the facility. As part of this modification application, Bettergrow is also proposing to install a 65,000 litre (L) above ground diesel storage tank to reduce fuel deliveries to the site.

This modification report supports an application by Bettergrow to modify consent SSD-9418 under Section 4.55(2) of the EP&A Act. The proposed modification would be the third modification (Modification 3) to development consent SSD-9418.

Description of site and surrounds

The site is on part of Lot 10 DP1204457 in the Singleton local government area (LGA) in the Upper Hunter Valley region, and covers an area of approximately 57 hectares (ha). Nearby towns and urban centres include Camberwell, approximately 6 km to the south-east, Singleton, approximately 20 kilometres (km) to the south-east, and Muswellbrook, approximately 20 km to the north-west of the site.

The site is owned by AGL Macquarie Pty Ltd (AGL) and is within the Ravensworth Operations open cut mining complex, which comprises surface mining operations, coal processing plants and related infrastructure, and former mine sites that are currently being rehabilitated. The site is located on part of a capped and rehabilitated open cut mining void (Void 3) that has been filled with ash from the Bayswater Power Station.

Land within the site is zoned RU1 (Primary Production) under the Singleton Local Environmental Plan 2013 (Singleton LEP). The land surrounding the site is zoned RU1 (Primary Production) to the north, east, south and west, and SP2 (Infrastructure - Classified Road) and SP2 (Infrastructure - Rail Infrastructure) to the north, east and south-east.

The area surrounding the facility is dominated by coal mining and other heavy industrial activities, including power generation and related activities, and grazing pastures. Key land uses surrounding the site include:

- Bayswater Power Station and Lake Liddell to the north-west;
- Liddell Coal Mine to the north;
- Mt Owen Coal Mine to the north-east;
- Ravensworth Coal Mine to the west;
- Glendell Coal Mine, Ashton Coal Mine and Integra Coal Mine (production ceased in 2024) to the south-east;
- Loop Organics composting facility to the south;
- New England Highway to the east; and
- Main Northern Railway to the east.

Access to the facility is provided via an internal access road off Lemington Road, that connects to the New England Highway (A15) approximately 3.4 km south-east of the site.

The nearest sensitive receivers (private rural residential properties) for the facility are at Camberwell village, approximately 6 km away.

Modification overview

Modification 3 would allow:

- an increase in the processing capacity of the facility from 200,000 tonnes per annum (tpa) to 250,000 tpa;
- the receival and processing of raw FOGO recovered material (classified as general solid waste (putrescible) under the *Waste Classification Guidelines* (EPA, 2014));
- installation of a weighbridge;
- employment of three additional staff; and
- up to 5 additional light vehicles and 14 additional heavy vehicles to access the site per day.

The existing operations at the facility would remain virtually unchanged under the proposed transition to raw FOGO recovered material. The material flows, composting technique, monitoring procedures and protocol and management practices would be consistent with the current operations.

No changes are required to the existing development footprint, site infrastructure, plant, equipment or operating hours under this modification.

The scope of the proposed modification is hereafter referred to as 'the project'.

Impact assessment

The key environmental issues associated with the project relate to potential air quality, noise, surface water and traffic impacts during construction and operation and have been assessed via detailed assessments by technical specialists. Other aspects are expected to be minimal, and have been assessed via a standard assessment.

Air quality

Dust

Construction activities associated with the installation of the weighbridge have the potential to generate dust emissions, primarily from windblown dust from exposed areas during site preparation and levelling of the ground surface, vehicle movements, material handling and exhaust emissions from diesel powered equipment.

Dust emissions during construction would be minor, temporary and short term, and is not likely to result in any dust impacts at nearby sensitive receivers, based on the scale of the activities and the distance to receivers.

The receival and processing of FOGO material at the facility may increase dust emissions during the loading/unloading of material and screening and blending processes, and increase windblown dust from exposed areas including windrows and stockpiles. The use of additional vehicles may increase dust emissions generated by vehicles travelling on unsealed surfaces on-site and off-site, and increase particulate emissions from vehicle exhaust systems.

Dispersion modelling of the potential particulate emissions during operation indicates that the predicted dust levels attributable to the project would be negligible and below the relevant EPA air quality assessment criteria, and would not be discernible at the nearest sensitive receivers in Camberwell.

Odour

The project has the potential to increase ambient odour levels during operation, due to the processing of a new type and larger quantity of organic recovered material. Odour emissions would potentially be generated during the receival and blending of the organic recovered material and storage of the final compost product, and the evaporation of leachate from the leachate control dam. There is also the potential for cumulative odour impacts with the Loop Organics composting facility approximately 2 km south of the site.

Odour emission rates from the open air composting windrows and leachate dam are influenced by a number of factors, including the physical and chemical characteristics of the raw materials, microbiological activity, operational practices, environmental conditions and the use of additives. Specifically, high temperatures, excessive moisture and less frequent turning of the windrows are key contributors to unpleasant odours.

Dispersion modelling of the potential odour emissions during operation of the project indicates that odour levels, including incremental and cumulative odour levels, in combination with the Loop Organics composting facility, would be well below the most stringent EPA impact assessment criteria at the nearest sensitive receivers in Camberwell. The project would increase odour levels close to the site, however, changes in odour levels at the nearest sensitive receivers in Camberwell are predicted to remain negligible due to their distance from the site.

These results are based on the conservative assumptions that the entire processing pads area would act as an odour source, and that the maximum odour emission rates established from an analysis of site-specific and other odour monitoring data would apply to the project. In practice, some of the processing pads area is used for vehicle access and spacing between windrow piles, and odour emission rates measured at the facility are much lower. Odour levels during operation of the project are therefore expected to be lower than the predicted odour levels.

Greenhouse gas

The project has the potential to increase greenhouse gas emissions during construction and operation due to the increase in throughput of the facility and the operation of additional vehicles.

Greenhouse gas emissions would be generated during the production of organic material off-site, on-site composting processes, diesel and petrol consumption during operation of vehicles, plant and equipment on-site and transportation of material to and from the site, as well as construction of the on-site weighbridge.

The project would only make a very minimal contribution to total Scope 1 greenhouse gas emissions in NSW and Australia (0.0108% and 0.0027% respectively). There are no Scope 2 emissions associated with the project as the site does not consume electricity. Scope 3 emissions occur outside the project’s direct control and represent indirect impacts of its activities. Mandatory, comprehensive state-wide and nation-wide reporting on Scope 3 emissions is not yet in place.

Surface water

Potential impacts of the project on surface water quality, hydrology and flooding during construction and operation include:

- increased contamination risks associated with:
  - additional contaminants of potential concern and physical contaminants (e.g. litter) in the feedstock; and
  - increased refuelling of plant and vehicles to facilitate increased production at the facility, resulting in accidental leaks or spills;
- potential erosion and sedimentation impacts during construction of the weighbridge;
- alteration or impedance of existing drainage paths during construction due to the presence of plant and equipment and stockpiling of excavated soil and materials, resulting in localised areas of flooding and scour; and
- obstruction of overland flow paths by the weighbridge, resulting in localised areas of flooding and scour.

These impacts are expected to be minimal with the implementation of the existing surface water mitigation and management measures. The existing stormwater diversion infrastructure is considered to be adequate to manage runoff during construction and operation of the project.

The facility currently operates as a closed-loop water management system, whereby leachate generated on the processing pads and wastewater generated by the truck wash are captured in the onsite leachate control dam and reused for moisture conditioning during the composting process, as the composting process is a net user of water. No leachate is discharged to surrounding drainage lines or watercourses and no water is sourced from outside the AGL mining operations.

The site water balance indicates that, under average climate conditions, the expanded site operation would remain a net user of water. The compost moisture conditioning process would retain an almost net neutral water balance (i.e. total water in = total water out). However, the facility would have a slightly increased reliance on water sourced from Void 4 (approximately 7 megalitres (ML) per year (ML/year)) to support dust suppression and truck wash activities. This would result in a minor reduction in the volume of Void 4 water AGL currently disposes to Lake Liddell (approximately 500 ML/year). This is unlikely to impact water availability for the facility.

Noise

The project has the potential to increase noise levels at sensitive receivers due to the operation of additional vehicles, plant and equipment during construction, and additional vehicle movements during operation.

Construction noise impacts would be temporary and short term, and noise levels at the nearest sensitive receivers in Camberwell are predicted to be significantly below the noise criteria outlined in the *Interim Construction Noise Guideline* (DECC, 2009).

There would be no net increase in operational noise levels at the nearest sensitive receivers in Camberwell due to the additional vehicle movements. Operational noise levels at these receivers would remain well below the daytime noise criterion specified in consent SSD-9418.

The additional operational vehicle movements would result in an increase of road traffic noise levels of less than 2 dB, which is unlikely to be discernible at nearby sensitive receiver locations according to the *NSW Road Noise Policy* (NSW Department of Environment, Climate Change and Water, 2011).

Traffic

The project is expected to result in minimal impacts on the performance of the New England Highway/Lemington Road intersection and the local road network and road safety, considering the relatively low traffic volumes generated during construction and operation (compared to the existing traffic volumes).

Given the lack of public transport services in the vicinity of the site, the additional traffic is unlikely to affect any public transport operations.

No impacts are expected on the active transport network, since there is no active transport infrastructure in the vicinity of the site and the project would not generate any active transport demand.

The project is not expected to result in any impacts on access and parking, as the project would not generate additional parking demand or require changes to property access or parking.

Mitigation and management measures

The existing mitigation and management measures outlined in the SSD EIS are considered to be adequate to minimise potential impacts during construction and operation of the project.

A review of the existing *Operational Environmental Management Plan* (OEMP) (Bettergrow, 2024a) (and its associated sub-plans) and *Composting Management Plan, Including Management for CA-05 Biosecure Treatment of Phylloxera Host Plant Material for Recycling* (Bettergrow, 2025b) will be undertaken to ensure all management and mitigation measures, monitoring and maintenance actions, and action trigger levels remain fit for purpose.

Justification and conclusion

The proposed modification has been assessed in accordance with the requirements of the EP&A Act and has been shown to be consistent with the relevant local, State and Commonwealth government planning instruments and policies, including the National Waste Policy: Less Waste, More Resources (Commonwealth of Australia, 2018), NSW Circular Economy Policy Statement (EPA, 2019) and NSW Waste and Sustainable Materials Strategy 2041 Stage 1:2021–2027 (NSW Department of Planning, Industry and Environment, 2021a).

The environmental impacts of the proposed modification have been assessed and found to be minimal to negligible, subject to the implementation of the existing mitigation and management measures.

The development (as modified) would provide critical waste management infrastructure to service the existing and future waste management needs of the Hunter region. The development would also support AGL's rehabilitation activities across previously mined land and the increasing demand for recycled organics driven by urban and industrial development.

The modification would be confined to already disturbed and operational areas of the site and would not involve extension of the development footprint or disturbance to native vegetation. Overall, the development, as proposed to be modified, would have significant environmental, social and economic benefits that far outweigh any residual environmental impacts.

The proposed modification is, therefore, considered to be justified and in the public interest and appropriate for approval under Section 4.55(2) of the EP&A Act.

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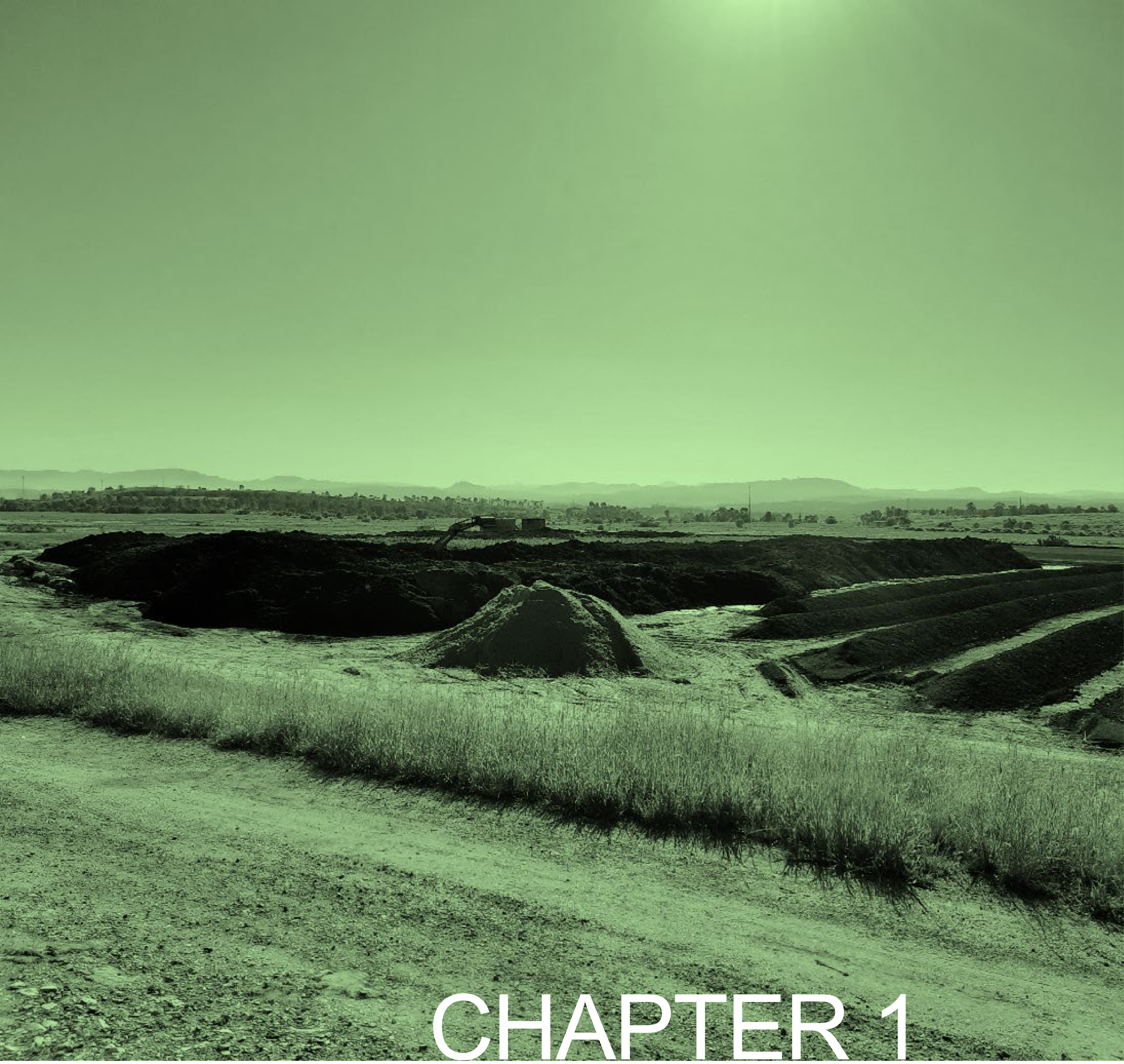
ABBREVIATIONS AND ACRONYMS

Abbreviation/Acronym	Definition
AEP	Annual Exceedance Probability
AGL	AGL Macquarie Pty Ltd
AHIMS	Aboriginal Heritage Information Management System
am	Ante meridiem: before noon
ANZECC	Australian and New Zealand Environment and Conservation Council
ARI	Annual Recurrence Interval
AS	Australian Standard
BC Act	*NSW Biodiversity Conservation Act 2016*
BC SEPP	State Environmental Planning Policy (Biodiversity and Conservation) 2021
Bettergrow	Bettergrow Pty Ltd
BoM	Bureau of Meteorology
CCTV	Closed-circuit television
CLM Act	*NSW Contaminated Land Management Act 1997*
CO_2-e	Carbon dioxide-equivalent emissions
CSSI	Critical State significant infrastructure
DA	Development Application
dB	Decibel
dB(A)	A-weighted decibel
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DCP	Development Control Plan
DECC	NSW Department of Environment and Climate Change
DPE	NSW Department of Planning and Environment
DPHI	NSW Department of Planning, Housing and Infrastructure
DPIE	NSW Department of Planning, Industry and Environment
Element	Element Environment Pty Ltd
EMP	Environmental Management Plan
ENM	Excavated Natural Material
EP&A Act	*NSW Environmental Planning and Assessment Act 1979*
EP&A Regulation	NSW Environmental Planning and Assessment Regulation 2021
EPA	NSW Environment Protection Authority
EPBC Act	*Commonwealth Environment Protection and Biodiversity Conservation Act 1999*
EPI	Environmental planning instrument
EPL	Environment protection licence
ESD	Ecologically sustainable development
etc	Et cetera
FM Act	*NSW Fisheries Management Act 1994*
FOGO	Food Organics and Garden Organics
g/m^2/month	Grams per square meter per month
GDE	Groundwater Dependent Ecosystem
GJ/k	Gigajoule per kilolitre
ha	hectares
Heritage Act	*NSW Heritage Act 1977*
ICNG	Interim Construction Noise Guideline

Abbreviation/Acronym	Definition
ISO	International Organization for Standardization
kg CO_2-e/GJ	Kilograms of carbon dioxide equivalent per gigajoule
kL	Kilolitre
km	Kilometre
km^2	Square kilometre
km/h	Kilometres per hour
L	Litre
$LA_{eq(15\ minute)}$	A-weighted equivalent continuous sound pressure level averaged over a 15-minute period.
LEP	Local environmental plan
LGA	Local government area
m	Metre
m^2	Square metre
m^3	Cubic metre
m AHD	Metres Australian Height Datum
mbgl	Metres below ground level
ML	Megalitre
ML/year	Megalitres per year
mm	Millimetre
mm/day	Millimetres per day
MNES	Matter of national environmental significance
m/s	Metres per second
Mt	Million tonnes
mtpa	Million tonnes per annum
NPI	Noise Policy for Industry
NPW Act	*NSW National Parks & Wildlife Act 1974*
NSW	New South Wales
NSW DECCW	NSW Department of Environment, Climate Change and Water
OEMP	Operational Environmental Management Plan
OU	Odour Unit
OUV/m^2/s	Odour unit volume per square metres per second
PCT	Plant Community Type
PHA	Preliminary hazard analysis
Planning Systems SEPP	State Environmental Planning Policy (Planning Systems) 2021
pm	Post meridiem: after noon
$PM_{2.5}$	Particulate matter less than or equal to 2.5 micrometres in aerodynamic diameter
PM_{10}	Particulate matter less than or equal to 10 micrometres in aerodynamic diameter
POEO Act	*NSW Protection of Environment Operations Act 1997*
Pty Ltd	Proprietary Limited
Resilience and Hazards SEPP	State Environmental Planning Policy (Resilience and Hazards) 2021
RFS	NSW Rural Fire Service
RNP	NSW Road Noise Policy
Roads Act	*NSW Roads Act 1993*
Rural Fires Act	*NSW Rural Fires Act 1997*

Abbreviation/Acronym	Definition
SEARs	Secretary's environmental assessment requirements
SEPP	State environmental planning policy
SOER	Specific odour emission rate
SSD	State significant development
SSI	State significant infrastructure
t	Tonne
t/m^3	Tonnes per cubic metre
TEC	Threatened ecological community
TISEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021
tpa	Tonnes per annum
tpd	Tonnes per day
TSP	Total suspended particulates
µs/cm	Microsiemens per centimeter
$\mu g/m^3$	Micrograms per cubic metre
VENM	Virgin Excavated Natural Material
WARR Act	*NSW Waste Avoidance and Resource Recovery Act 2001*
WM Act	*NSW Water Management Act 2000*
WSP	Water Sharing Plan



CHAPTER 1

INTRODUCTION

1 INTRODUCTION

1.1 Overview

This modification report has been prepared by Element Environment Proprietary (Pty) Limited (Ltd) (Element) on behalf of Bettergrow Pty Ltd (Bettergrow) for submission to the New South Wales (NSW) Department of Planning, Housing and Infrastructure (DPHI) to accompany an application to modify the State significant development (SSD) consent SSD-9418 for the Ravensworth Composting Facility (the 'facility').

The facility processes biosolids, garden organics and other organic recovered material in outdoor windrows to produce a compost product suitable for mine site rehabilitation and agricultural uses. It is located at 74 Lemington Road, Ravensworth (the 'site'), on part of Lot 10 DP1204457, in the Singleton local government area (LGA). The site covers an area of approximately 57 hectares (ha). The regional and local context of the site is shown in Figure 1.1 and Figure 1.2, respectively.

Development consent SSD-9418 provided for the expansion of the existing facility to process up to 200,000 tonnes per annum (tpa) of organic recovered material, including water drainage and leachate works, extension of the compost processing and blending areas pad and associated infrastructure.

Bettergrow has recently submitted an application to the NSW Department of Planning, Housing and Infrastructure (DPHI) to modify consent SSD-9418 under Section 4.55(1A) of the EP&A Act (Modification 2). Under Modification 2, Bettergrow is seeking approval to receive and process decontaminated and pasteurised Food Organics and Garden Organics (FOGO) and/or food recovered material, and receive and blend Virgin Excavated Natural Material (VENM) and Excavated Natural Material (ENM) with organic recovered materials, at the facility. Bettergrow is also proposing to install a 65,000 litre (L) above ground diesel storage tank to reduce fuel deliveries to the site.

Bettergrow is now applying to DPHI to modify consent SSD-9418 under Section 4.55(2) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to allow:

- a 50,000 tpa increase in the processing capacity of the facility, from 200,000 to 250,000 tpa;
- receival and processing of raw FOGO recovered material at the facility;
- employment of three additional staff;
- installation of a site weighbridge; and
- up to 5 additional light vehicles and 14 additional heavy vehicles to access the site per day.

The scope of the proposed modification is hereafter referred to as 'the project'.

The proposed modification will be the third modification (Modification 3) to development consent SSD-9418. The modification does not involve any clearing of native vegetation or bulk earthworks, or changes to the existing development footprint, site infrastructure, composting operation, plant, equipment, or operating hours.

It was confirmed with DPHI that the approval pathway and scope of environmental impact assessment as outlined in the Scoping Report (Element Environment, 2025) is appropriate for the modification and that Secretary's environmental assessment requirements (SEARs) are not required for the modification.

Element has prepared this modification report on behalf of Bettergrow to address the requirements of Section 4.55(3) of the EP&A Act. The report has been prepared in accordance with the Department's *State significant development guidelines – preparing a modification report* (NSW Department of Planning and Environment (DPE), 2022a).

Figure 1.1
Regional context

Ravensworth Composting Facility SSD Modification 3
Modification Report

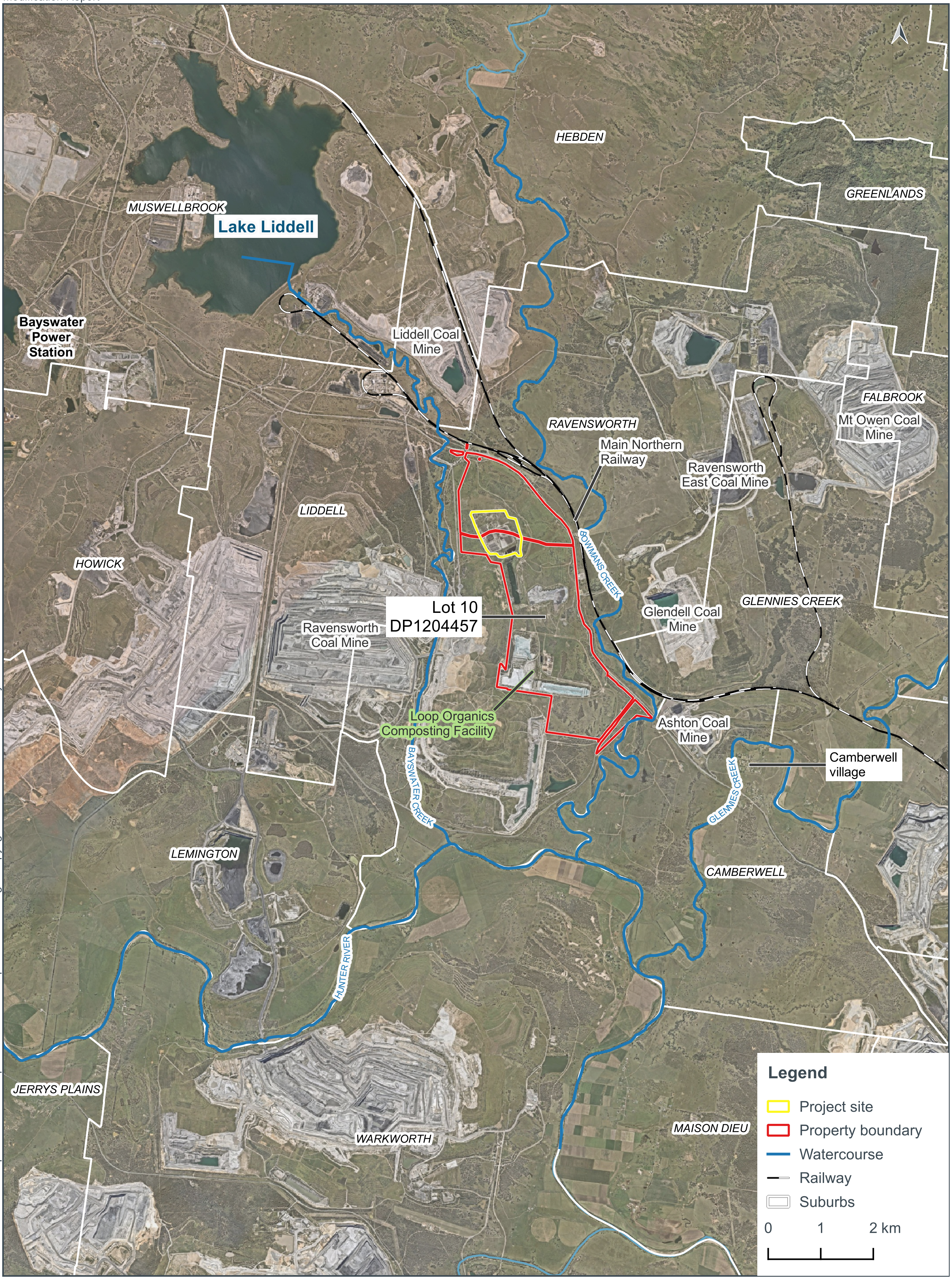
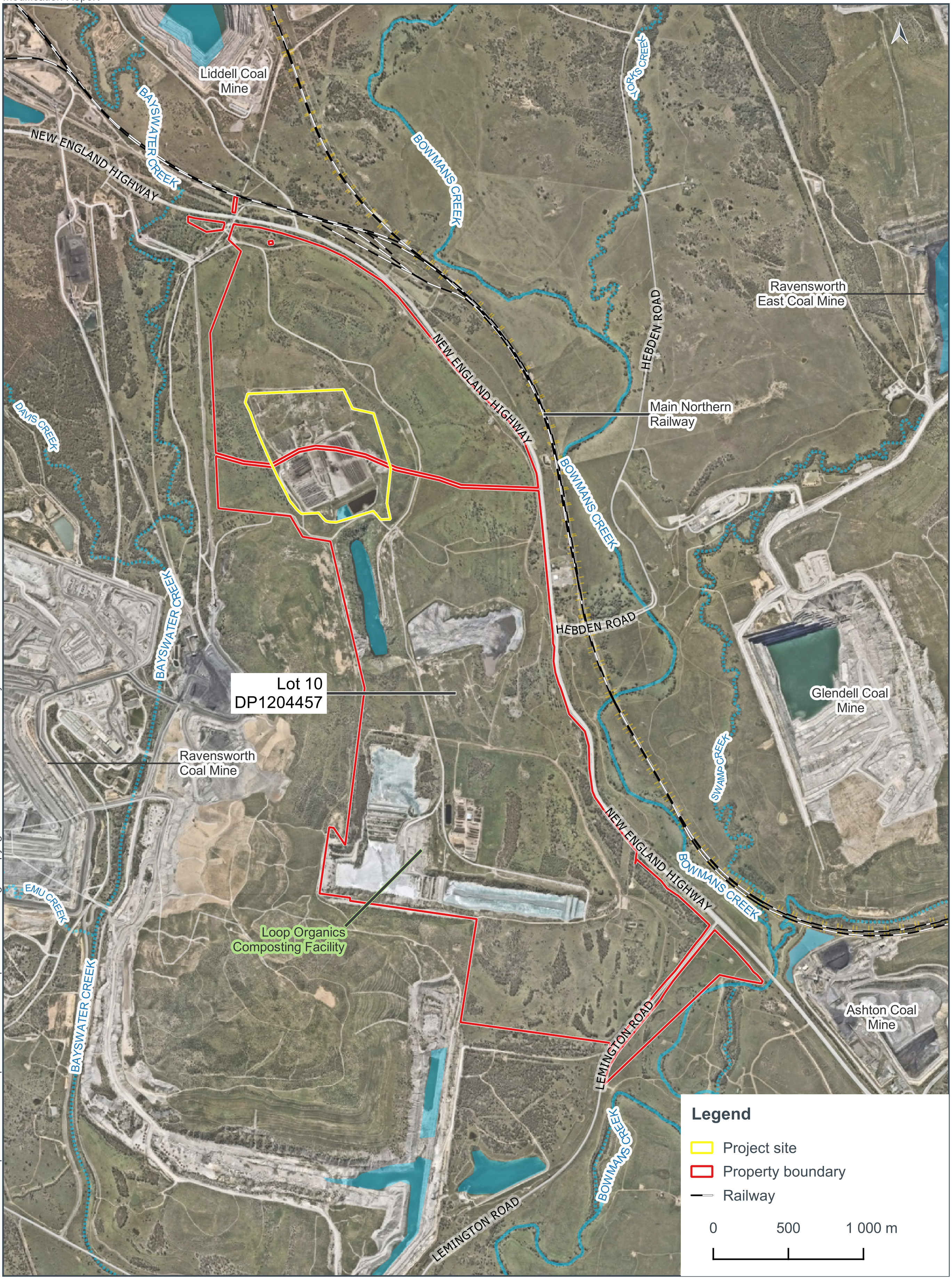


Figure 1.2
Local context

Ravensworth Composting Facility SSD Modification 3
Modification Report



1.2 The applicant

Bettergrow is the applicant for the modification application. The applicant's details are provided in Table 1.1.

Table 1.1 Applicant details

Item	Detail
Full name	Bettergrow Pty Ltd
Contact	Zac Rowlandson, Chief Executive Officer
Postal address	2 Wella Way, Somersby, NSW, 2250
ABN	71 062 888 117

Bettergrow is a wholly owned subsidiary of the Borg Group. The company is a recognised pioneer in the organic recovery sector with operations spanning across various sites throughout NSW. It was first established in 1978, and over the course of the past 40 years has been at the forefront of an array of organic industries, including drilling slurries, biosolids, garden organics, food and grease trap waste.

The company is an Australian leader in the recovery and re-manufacture of organic residuals, waste and by-products to provide quality composts, fertilisers and bespoke soil rehabilitation products for beneficial use across a range of markets. It works with governments, communities and multi-national companies to progress the circular economy and preserve natural resources for a sustainable future.

Bettergrow also operates recycling facilities at:

- Bathurst, NSW – liquid wastes (existing operations), and forestry residues, biosolids, food organics, and garden organics; and
- Gulgong, NSW – farming enterprises.

1.3 The existing approved development

1.3.1 Related development

There is an extensive history of surface and underground coal mining operations in the Ravensworth area, with mining commencing as early as the 1950s at Liddell Colliery. Mining operations at the former Ravensworth South and Ravensworth No. 2 open cut mines, located immediately south of the facility, commenced in the early 1970's. Operations ceased at the Ravensworth No. 2 mine in 1993 and at the Ravensworth South mine in 2000.

The decommissioned Ravensworth No. 2 mine comprises five voids (referred to as Voids 1, 2, 3, 4 and 5) which are currently being rehabilitated by AGL Macquarie Pty Ltd (AGL), as the current owner of the mine. The voids are being filled with spoil and fly ash from the Bayswater Power Station, capped and rehabilitated. Voids 1, 2 and 3 have been rehabilitated. The site is located on top of the former Void 3.

Void 4 is located approximately 100 metres (m) south of the leachate control dam on the site and is used as a water storage dam. It provides additional capacity for surface water runoff from the site during significant rainfall events.

The rehabilitation of Void 5 commenced in 2014 and is expected to be completed by 2032. Fly ash is pumped as a thick slurry from the Bayswater Power Station and deposited into Void 5. As a result of this process, water from the fly ash seeps from Void 5 into Void 4 and is pumped from

Void 4 back to the Bayswater Power Station for further re-use. Void 3 also seeps water into Void 4.

Rehabilitation works at Voids 1 to 5 are undertaken in accordance with the following development consents issued for the site in the 1980s and 1990s:

- Development Application (DA) 86/51 for the Ravensworth South mine, granted by the DPE on 16 December 1986;
- DA144/93, granted by Singleton Council on 8 December 1993 (as modified); and
- DA138/93, granted by Muswellbrook Shire Council on 13 December 1993 (as modified).

These development consents allow the use of composting material as part of the mine rehabilitation process, however, does not explicitly allow for the on-site processing of composting material.

1.3.2 Original development consent

The facility originally commenced operation under a development consent granted by Singleton Council (Council) on 25 November 2016 (DA140/2016). The application was assessed as integrated development (and not designated development) on the basis that the project was entirely ancillary to the existing rehabilitation works approved as part of the Bayswater Power Station and Ravensworth Operations open cut mining complex. The consent permitted the establishment and operation of on-site composting of 50,000 tpa of a mix of organic material, including garden organics, clean timber, biosolids, hydro excavation and drill slurry, paper pulp, fly ash, lime and manures, to facilitate the rehabilitation of the Ravensworth No. 2 mine and Ravensworth South mine.

On 19 April 2018, Council approved a modification to DA140/2016 under Section 4.55(2) of the EP&A Act to facilitate an increase in organic material received on site to 76,000 tpa, and the transfer of compost products to additional AGL sites, including the areas associated with the Liddell Power Station (which is now decommissioned). On 18 December 2018, Council approved a modification to DA140/2016 under Section 4.55(1A) of the EP&A Act to allow for the sale of compost material from the site to third parties in the region.

An SSD application (SSD-9418) to expand the existing composting facility was approved by the (then) Minister for Planning on 31 August 2022 under Section 4.38 of the EP&A Act to allow for:

- an increase in the receival and processing of up to 200,000 tpa of recovered organic material;
- transfer of composted material to other AGL sites (e.g. Liddel Ash Dam and Baywater Power Station) for use in rehabilitation;
- expansion of the compost processing and blending areas pad;
- extension of the surface water drainage works to cover the additional pad area;
- expansion of the leachate control dam;
- installation of the following:
  - a single lane weighbridge (approximately 27.5 m long);
  - a dedicated trailer wash bay;
  - two 50,000 L recycled drill water storage tanks; and
  - a machinery shelter for the storage of tools and machinery for servicing.

1.3.3 Previous modification

The NSW Environment Protection Authority (EPA) advised Bettergrow on 15 May 2023 that a weighbridge is not required for premises that only have ‘composting’ as a scheduled activity listed on their Environment Protection Licence (EPL), as long as alternative methods to record waste received onto their premises are implemented.

A modification to SSD-9418 (SSD-9418-MOD-1) (hereafter referred to as 'Modification 1') under Section 4.55(1A) of the EP&A Act was approved on 6 December 2023 to allow for:

- removal of the site weighbridge; and
- receival and processing of additional waste streams that would require a general or site-specific resource recovery order to be granted and an exemption issued by the EPA, including spent bleaching clay, the organic fraction of street sweepings and plasterboard/gypsum.

Modification 1 allows greater flexibility to receive materials that have a beneficial re-use rather than send these materials direct to landfill.

Raw materials entering the site are weighed at the location of loading, either by loader scales or a weighbridge, prior to being delivered. No loads are accepted at the site without a weighbridge docket. Drivers with incoming material loads are required to supply details of the waste (including quantity, type, waste stream), vehicle, driver and supplier of the waste on their weighbridge docket.

Before the finished compost leaves the facility, it is weighed by scales fitted to front end loaders used on-site or by truck scales. All weighbridge/weigh dockets are maintained and recorded by Bettergrow. Outgoing dockets contain details of the waste (including quantity, type, waste stream), vehicle, driver and destination of the waste.

1.3.4 Environment Protection Licence

The site has been operating under EPL 7654 issued by the EPA since September 2000.

The EPL was last varied on 12 August 2024 (Notice number 1639204) to remove the Street Sweeping Composting Trial under Section E3 of the EPL and add the following wastes in Condition L3.1:

- the Downer organic fraction of street sweepings (as defined in 'The Bettergrow street sweepings compost order 2024' or as in force from time to time);
- the ReDirect organic fraction of street sweepings (as defined in 'The Bettergrow street sweepings compost order 2024' or as in force from time to time); and
- paunch (as defined in 'The Bettergrow Compost Order 2023' or as in force from time to time).

1.3.5 Existing operation

Table 1.2 provides a summary of the existing site infrastructure and composting operation.

Table 1.2 Existing facility infrastructure and operation

Operational aspect	Detail
Existing site infrastructure	The following ancillary infrastructure supports the operation of the facility, as shown in Figure 1.3: ▪ site office and staff amenities; ▪ site access and parking; ▪ mobile plant, including green waste shredder, trommel/stardeck screen, excavator, front end loaders, windrow turners, water carts; ▪ workshop; ▪ load inspection bay; ▪ processing pads; ▪ truck wash; ▪ dirty water pit; ▪ surface water drainage infrastructure, including: - diversion bunds - drainage channels and spillway

Operational aspect	Detail
	- 50.2 megalitre (ML) leachate control dam, consisting of a western and eastern dam - 2 ML sediment ('lower') basin; ▪ water storage tanks, including: - 300,000 L AGL water storage tank - two 1,000 L potable water storage tanks; and ▪ 5,000 L diesel storage tank. The processing pads consist of compacted earth to achieve low permeability (1x10^{-9} metres per second (m/s)) to impede leachate generated from the composting process percolating through the capping layer into the subsoil and potentially groundwater. This ensures leachate is directed via a series of rock drains/channels to the leachate control dam. The processing pads had been designed to capture runoff from the site in excess of the minimum EPL requirement (i.e. the 4 per cent (%) Annual Exceedance Probability (AEP) 24-hour rainfall event).
Compost feedstock	Schedule 2, Condition A6 of development consent SSD-9418-MOD-1 permits the facility to process up to 200,000 tpa of organic material, inclusive of: a) urban wood residues for composting (as defined in 'The compost order 2016'); b) paper crumble for composting (defined as General or Specific Exempted Waste); c) wastewater from Bayswater Power Station; d) drilling mud process water (as defined in 'The Treated Drill Mud Order 2014'); e) natural organic fibrous composting material (as defined in Schedule 1 of the NSW *Protection of the Environment Operations Act 1997* (POEO Act)); f) biosolids (as defined in 'The Biosolids Order 2014'); g) garden waste (as defined in Schedule 1 of the POEO Act); h) animal waste (as defined in Schedule 1 of the POEO Act); and i) materials for the purpose of composting that are subject to a general or site specific resource recovery order and exemption as issued by the EPA from time to time. Schedule 2, Condition A7 of the development consent specifies that the facility is not permitted to receive or process food organic waste. Condition L3.1 of EPL 7654 permits the facility to receive up to 200,000 tpa of the following types of general solid waste (non-putrescible) and liquid waste: ▪ General solid waste (non-putrescible): - paunch (as defined in 'The Bettergrow compost order 2023' or as in force from time to time); - reDirect organic fraction of street sweepings (as defined in 'The Bettergrow street sweepings compost order 2024' or as in force from time to time); - Downer organic fraction of street sweepings (as defined in 'The Bettergrow street sweepings compost order 2024' or as in force from time to time); - recovered plasterboard (as defined in 'The Bettergrow compost order 2023' or as in force from time to time); - spent bleaching clay (as defined in 'The Bettergrow compost order 2023' or as in force from time to time); - paper crumble (as defined in 'The Bettergrow compost order 2023' or as in force from time to time); - urban wood residues (as defined in 'The compost order 2016'); - natural organic fibrous material (as defined in Schedule 1 of the POEO Act); - coal ash which meets the conditions of 'The coal ash order 2014'; - biosolids categorised as unrestricted use, or restricted use 1, 2 or 3 in accordance with criteria in the Biosolids Guidelines (EPA, 2000). Contamination and stabilisation grades A, B and C only. Biosolids classified as 'Not Suitable For Use' (Grade E) are not to be accepted at the premises; and - garden waste (as defined in Schedule 1 of the POEO Act). ▪ Liquid waste:

Operational aspect	Detail
	- Bayswater Mine Water (as defined in 'The Bettergrow compost order 2023' or as in force from time to time). The facility receives and processes organic recovered material from the following sources: ▪ kerbside green waste collection from residential households (garden organics only); ▪ Hunter Water and Sydney Water (biosolids); ▪ sawmills (wood residues); ▪ paper processors (paper crumble); ▪ infrastructure projects (drill muds); ▪ mines (raw water); ▪ food processors (organic fibrous material); and ▪ waste resource recovery facilities.
Operational processes	The current operations involve the blending and composting of organic material, which is then used to create a final compost layer for rehabilitated land or agricultural uses. This involves the following processes: *Receival of organic material* ▪ Vehicles enter the site via the internal access road off Lemington Road. ▪ Drivers provide their weighbridge docket to the site coordinator or delegate who checks that the docket description is the same as what is in the load. In the unlikely event a load arrives at the facility without a weighbridge docket, the driver is instructed to attend a public weighbridge before returning to site and unloading. All delivery dockets are retained for record keeping. ▪ Staff inspect the trucks visually for any obvious contamination prior to tipping. ▪ Where contaminants are identified, the load is rejected and instructed to leave the site without unloading. Any rejected loads are recorded in the Rejected Loads Register, including truck and supply company details. The supplier is contacted and advised of the contaminated load. ▪ Where no contaminants are identified, the truck is instructed to proceed to the correct tipping area on the load receival hardstand area. *Inspection and unloading* ▪ Loads are tipped onto the hardstand pad and visually inspected by a staff member who has been appropriately trained in identifying any hazardous or non-conforming recovered material, including physical contaminants (such as plastic) and asbestos. ▪ If contaminants are found, the truck is reloaded and returned to the supplier. ▪ The supplier is contacted and advised of the contaminated load and the details of the rejected load are entered into the Rejected Loads Register. *Blending and composting* ▪ Each material type is stockpiled in the designated tipping area until a sufficient volume of material has accumulated. It is then blended as instructed by the biosolids manager and placed into the windrows for pasteurisation and turning. ▪ Any contamination identified during the blending process is appropriately removed and isolated in a covered hook-lift bin. The hook-lift bin, when required, is transported to a suitably licensed landfill facility for disposal. ▪ Windrows are frequently turned with either a front-end loader, or a specialised windrow turner to ensure they remain aerobic and that pasteurisation of all products is achieved. Windrows may initially be covered with previously composted material to act as an odour filter, or an odour neutralising agent, such as BioActive, may be used to aid the process. On windy days, water is sprayed over the compost or biosolids to prevent dust generation during the turning of windrows. ▪ During the composting process, temperature and moisture levels for each windrow are monitored and adjusted as needed. The internal temperature of the windrows reaches a minimum of 55 degrees Celsius (°C) for a minimum of three days and is turned at least three times to create a stabilised product in accordance with *AS 4454-2012 Composts, soil conditioners and mulches* (Standards Australia, 2012) and the *Composting Management Plan, Including Management for CA-05 Biosecure Treatment of Phylloxera Host Plant Material for Recycling* (Composting Management Plan) (Bettergrow, 2025a).

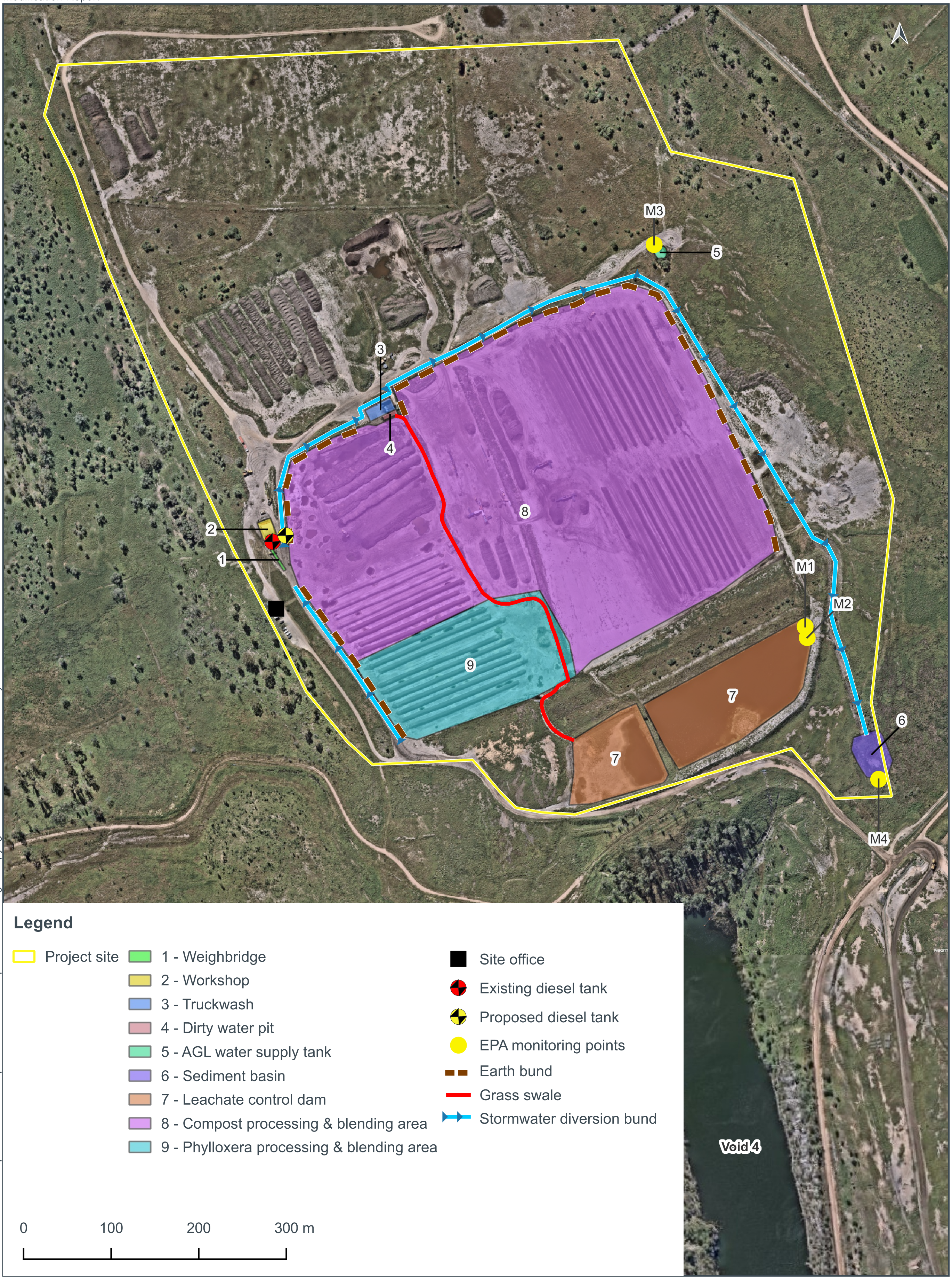
Operational aspect	Detail
	▪ Compost windrows may reach temperatures higher than 55 ºC during the initial phase of composting. When windrows reach internal temperatures greater than 62 ºC, the windrow is turned to dissipate heat and to provide oxygen which is essential for maintaining aerobic conditions. ▪ Compost windrows are constructed so as to run parallel with the stormwater flows, in order to minimise the transport of leachate and gross solids to the leachate dams. ▪ Maturation occurs after approximately eight weeks. Compost must be dried to a moisture content of approximately 35 % weight per weight (w/w) or less. The finished compost material is screened and vacuumed (if necessary) to remove any remaining physical contaminants, and stored (and may be blended with other ingredients) in a designated area to create the required final product. *Storage* ▪ The final compost material is stockpiled in a designated area. The compost material is sampled and analysed at National Association of Testing Authorities (NATA) accredited laboratories to confirm the outputs produced meet the requirements set in the EPA's *Environmental Guidelines – Use and disposal of biosolids products* (EPA, 2000). The material is not released from site until the laboratory results are received to ensure the correct land application method is applied. ▪ The final composted material is then loaded onto trucks using a front-end loader and transported to the relevant area for rehabilitation use or sold to third parties. *Loading and transfer of material off-site* ▪ Vehicles transporting products off-site are loaded with the composted material. ▪ Weights of material being transported off-site are recorded from the loader bucket electronic scales or truck electronic scales, together with other details, including material type, waste stream (where the material is a rejected load), date and time load is transported from the facility, vehicle registration number, drivers signature, contact details for receiver site, and EPL(s) for receiver sites, if applicable. ▪ Vehicles are washed at the wash bay before exiting the site. ▪ Vehicles exit via the internal access road into Lemington Road that connects to the New England Highway. ▪ All loads that leave the site are tracked to the relevant customer or mine. ▪ Composted material is received at the receiver site under the 'The Bettergrow compost exemption 2023' (or as in force from time to time) issued by the EPA. ▪ All delivery dockets are retained for record keeping.
Stormwater management	Diversion bunds are in place around the processing pads to exclude minor upstream catchment flows from entering the processing pads. Diversion bunds along the western side of the site direct stormwater to surrounding land, and a diversion wall and channel direct stormwater from the eastern side of the site into the sediment ('lower') basin in the south-eastern corner of the site (refer to Figure 1.3). Rock structures and rip rap are provided to slow the velocity of stormwater flowing towards the lower basin. In the exceedingly rare event that the lower basin fills, water can overflow into the former Void 4 south-west of the lower basin, which has over 40 m of available airspace above its normal operating level (i.e. over 500 ML). There is no surface water discharge from the site into local drainage lines or watercourses. Any rainfall captured by the processing pads is considered to be leachate and managed as described below.
Leachate management	Leachate generated from organic material within the processing pads enters the leachate control dam via a shotcrete lined channel at the north-western corner of the dam. A concrete sedimentation fore-bay restricts gross solids entering the leachate control dam. The leachate control dam has enough storage capacity (50.2 ML) to capture all runoff up to the 1% (1 in 100-year) AEP 24-hour rainfall event. In the exceedingly rare event that the leachate control dam overflows during rainfall less frequent than the 1% AEP 24-hour rainfall event, leachate water can flow via a spillway into the lower basin.

Operational aspect	Detail
	In the exceedingly rare event that the lower basin fills, water can overflow into the former Void 4 south-west of the lower basin, which has in excess of 40 m depth of available airspace above its normal operating level (i.e. hundreds of megalitres). The facility operates within a closed-loop water cycle, as the composting process is a net user of water. Water from the leachate control dam and Void 4 is used in the composting windrows to ensure optimal moisture conditions are maintained throughout the composting cycle. There is no direct discharge of leachate to surrounding drainage lines or watercourses.
Surface water and leachate monitoring	EPL 7654 identifies four monitoring points for leachate and surface water quality (refer to Figure 1.3). The monitoring program outlined in the *Surface and Groundwater Management Plan* (Surface and Groundwater Management Plan) (Senversa, 2024) comprises regular site inspections and checks of stormwater control systems, and periodic sampling of surface water and leachate quality. Additional monitoring is triggered by changes in site activities, environmental incidents or unexpected finds.
Wastewater management	Wastewater from the truck wash is captured in the dirty water pit and channelled via swale drains to the leachate control dam.
Utilities and services	
Electricity	No site infrastructure is connected to mains power. Electricity for the existing site office and staff amenities is provided by a mobile generator.
Water	The facility does not source any water from natural water bodies, watercourses or groundwater bores. There is no water supply (potable or raw) from a mains system available at the site. Water from the leachate control dam and Void 4 is used in the composting windrows to ensure optimal moisture conditions are maintained throughout the composting cycle. Water from Void 4 is also used for dust suppression and truck washing, and is accessed via an existing storage tank located in the north-eastern corner of the site (refer to Figure 1.3). This tank is filled remotely from the former Void 4 by an operator at the Bayswater Power Station. There are no other demands on water from Void 4. An estimated 16.2 ML of water per year is sourced from Void 4, including 10.8 ML per year for dust suppression, 4.2 ML per year for truck washdown, and 1.2 ML per year for compost moisture conditioning. Potable water for staff amenities is trucked to site and stored in two 1,000 L tanks.
Sewerage	There is no sewerage main available at the site. All liquid waste generated from staff amenities is removed by a licensed waste contractor and transported to a licensed facility when required.
Telecommunications	There are no fixed line telecommunication services available at the site. Staff use Ultra High Frequency (UHF) 2-way radios to communicate with each other on-site. Fourth-generation (4G) mobile phone services are available at the site from all the major service providers, however mobile phones are only allowed to be used in the office and staff amenities building.
Site access, traffic and parking	The site is accessed via an internal access road off Lemington Road, that connects to the New England Highway (A15) approximately 3.4 km south-east of the site (refer to Figure 1.2). There is a single designated entry/exit driveway along the southern boundary of the site and internal access roads through the site. The internal access road off Lemington Road is approximately 2 m wide to accommodate incoming and outgoing heavy vehicle movement. The road surface allows all-weather access, and surface water drainage is installed to divert stormwater away from the roadway onto suitable areas. Up to 54 heavy vehicles and 19 light vehicles access the site per day, generating up to 146 vehicle movements per day (73 movements in-bound and 73 movements outbound). A parking area for staff vehicles is provided adjacent to the site office. Trucks entering the site are unloaded directly on the pad area. Parking for trucks is available adjacent to the processing pads if trucks are required onsite for an extended period.

Operational aspect	Detail
Hazardous substances and dangerous goods	Hazardous substances and dangerous goods are stored and used at the facility, including fuels, oils, lubricants and cleaning solvents. Diesel is stored in a 5,000 L above ground portable fuel tank on a bunded hardstand area next to the workshop. The facility consumes an estimated 139 kilolitres (kL) of diesel and 1.5 kL of fuel per year to operate plant and equipment on site and run a small generator that generates electricity for the site office. A tanker delivers diesel as required to the on-site storage tank. Various other chemical substances are consumed in minor quantities and stored within secure and/or bunded areas within the workshop and office building. Vehicles and machinery are refuelled off-site or at the diesel tank using a drip tray. Other maintenance of machinery on site takes place within designated bunded areas or hardstand areas using drip trays.
Site security	A security gate, fencing, closed-circuit television (CCTV) camera, and manned gate control building are located at the entrance to the internal access road off Lemington Road to control access to the site. All light and heavy vehicles require security clearance to access the site.
Hours of operation	The facility operates from Monday to Saturday from 6:00 am to 6:00 pm. No work is undertaken on Sundays or public holidays. The current consent allows works outside of these hours in the following circumstances: ▪ works that are inaudible at the nearest sensitive receivers; ▪ for the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons; or ▪ where it is required in an emergency to avoid the loss of lives, property or to prevent environmental harm.
Workforce	Ten full time administrative and operational staff are employed at the facility.

Figure 1.3
Site layout

Ravensworth Composting Facility SSD Modification 3
Modification Report



1.4 Related modification application

Bettergrow has recently submitted an application to the DPHI to modify development consent SSD-9418 under Section 4.55(1A) of the EP&A Act (Modification 2) to allow:

- receival and processing of decontaminated and pasteurised FOGO and/or food recovered material;
- receival and blending of VENM and ENM with organic recovered materials; and
- installation of a 65,000 L above ground diesel storage tank to reduce fuel deliveries to the site.

Modification 2 does not require an extension of the existing development footprint, or any changes to the existing throughput of the facility, site infrastructure, plant, equipment, vehicle movements, workforce or operating hours.

Variation of the EPL to allow for the proposed modification will be sought in consultation with the EPA, subject to the approval of the modification application.

1.5 Environmental performance

1.5.1 Environmental audit

An independent environmental audit was undertaken for the facility in August and September 2024 for the period 24 January 2023 to 21 August 2024 (KPMG, 2024). The audit included a qualitative assessment of the predicted impacts associated with the development as described in the following documents, against the actual impacts observed by the auditor during the audit process:

- Greenspot Hunter Valley: EIS for 200,000 tpa Nutrient Recycling Facility – Ravensworth, NSW – SSD 9418 (SSD EIS) (RPS Australia East Pty Ltd (RPS), 2019a);
- Greenspot Hunter Valley Nutrient Recycling Facility Response to Submissions – SSD 9418 20 June 2022 (SSD Submissions Report) (Space Urban, 2022a);
- Greenspot Hunter Valley Nutrient Recycling Facility Amended Report – 28 June 2022 (Space Urban, 2022b); and
- Statement of Environmental Effects – Ravensworth Nutrient Recycling Facility Modification of SSD9418 – MOD 1 (Modification 1 SEE) (Space Urban, 2023).

The audit demonstrated a strong environmental performance during the audit period. Three non-compliances were identified during the audit, however they were considered administrative in nature and have not been associated with any actual environmental impacts, and therefore no actions were assigned to them.

The audit report noted:

> '…the Bettergrow site operations and management teams are considered to have demonstrated a strong awareness of their environmental obligations, including OEMP requirements and relevant SSD-9418 conditions of approval, with the following key strengths noted:

- The site presented well during the inspection with no evidence of dust, sediments or other pollutants observed to be escaping the boundaries. Only minor issues were identified during the site inspection.
- The site induction contained a comprehensive summary of environmental requirements, including the conditions of approval and management plans.
- Chemical storage was well managed, with the storage areas clean and tidy, bunding and spill kits provided and no evidence of spills or leaks occurring.

- Dust suppression was well managed via use of a dedicated water cart and a network of sprinklers to keep the compost windrows moist.
- Bettergrow management utilised an internal compliance tracking register to compile evidence against each condition of approval, making it readily available to the auditor.
- Bettergrow utilised a platform 'Safe by Choice' to store plant and equipment and employee competency information.'

Two minor issues were identified, which do not constitute non-compliances or opportunity for improvements:

- Moderate amounts of shredded plastic litter had collected within the swale drains on site. Routine housekeeping and maintenance activities are required on an ongoing basis to prevent litter from building up in swale drains. This was considered by the auditor to be a minor issue and a low risk.
- A moderate odour was observed when downwind of the compost stockpiles. Given the significant distance to the nearest receiver (approximately 6 km from the site), odour was not considered to present a major issue, nor would it meet the definition of an 'offensive odour' within the POEO Act. The auditor noted that the process of composting, whereby the materials are constantly being mixed and aerated is in itself a practical odour management strategy. This was considered by the auditor to be a minor issue and a low risk.

The auditor considered that all current environmental impacts at the time of the audit were less or equal to those anticipated within the relevant documents.

1.5.2 Compliance reporting

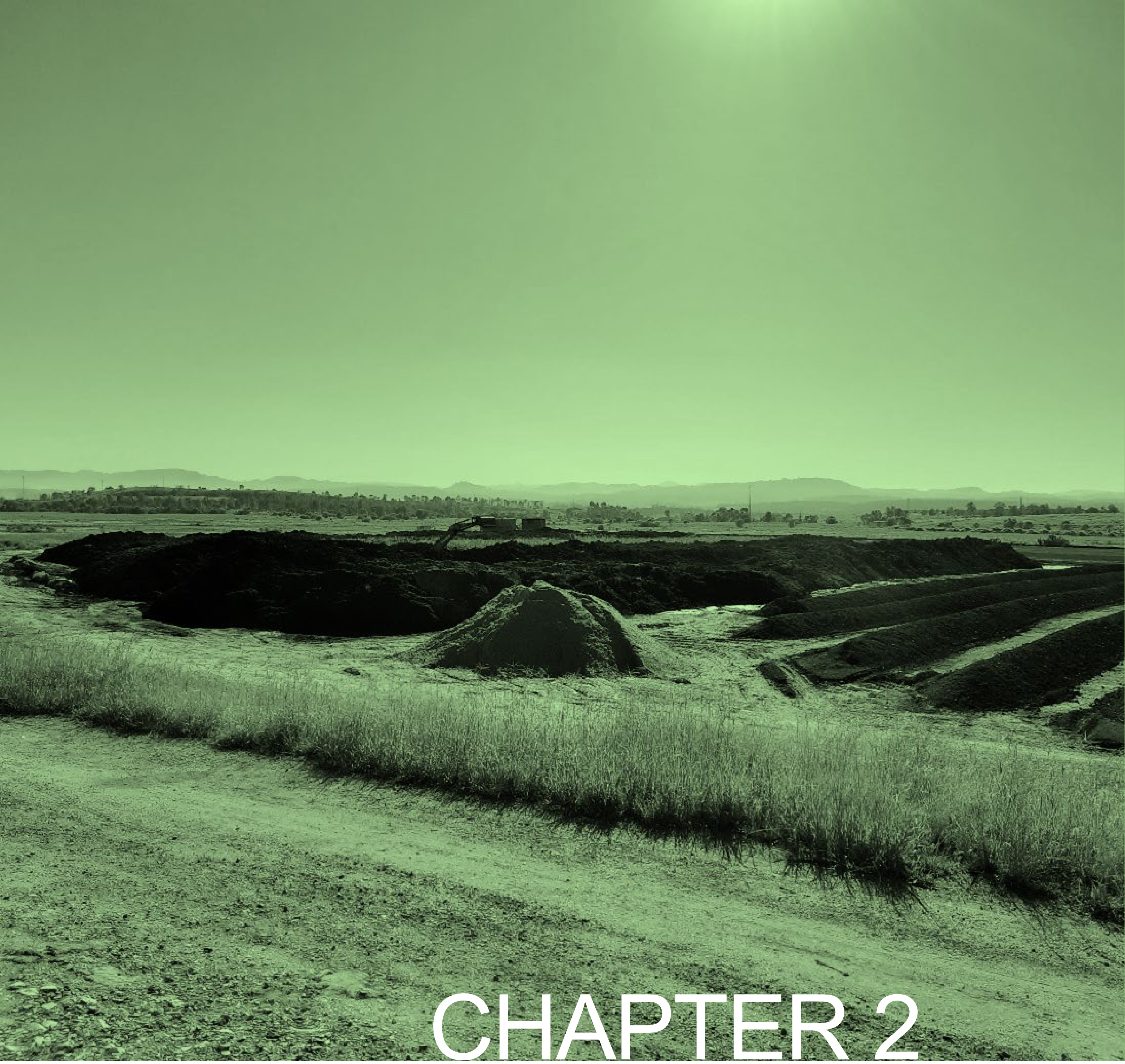
The first compliance report for the facility (the only compliance report to date) was published in October 2024 to review the overall environmental performance of the facility and report water quality monitoring data (as required by EPL 7654).

The auditor considered all current environmental impacts to be less or equal to those that were anticipated within the SSD EIS.

There was nil discharge from the two discharge points (Points 2 and 4) during the reporting period. As data from the other two monitoring (characterisation) points (Points 1 and 3) were restricted to only three monitoring events, a discussion on water quality trends could not be performed yet.

1.5.3 Complaints register

A monthly Complaints Register is maintained for the facility and is available on the Bettergrow website (Bettergrow, 2025b). A review of the register indicates that no complaints have been received or recorded for the facility since January 2023 (when the Complaints Register was launched). This suggests that the existing operations are not causing any adverse impacts at sensitive receivers and that the existing mitigation and management measures implemented are effective.



CHAPTER 2

STRATEGIC CONTEXT

2 STRATEGIC CONTEXT

2.1 Key features of the site and surrounds

2.1.1 Site location

The site is at 74 Lemington Road, Ravensworth, on part of Lot 10 DP1204457 in the Singleton LGA, in the Upper Hunter Valley region. The site covers an area of approximately 57 ha.

The site is within the Ravensworth Operations open cut mining complex, which comprises surface mining operations, coal processing plants and related infrastructure, and former mine sites that are currently being rehabilitated. The site is located on part of a rehabilitated capped open cut mining void (Void 3) that has been filled with ash from the Bayswater Power Station.

Nearby towns and urban centres include Camberwell, approximately 6 km to the south-east, Singleton, approximately 20 km to the south-east, and Muswellbrook, approximately 20 km to the north-west of the site (refer to Figure 1.1).

Access to the facility is provided via an internal access road off Lemington Road, that connects to the New England Highway (A15) approximately 3.4 km south-east of the site.

The local context of the site, including local roads, nearby developments and natural features, are shown in Figure 1.2 and the existing site layout is shown in Figure 1.3.

2.1.2 Land use, ownership and zoning

The site is owned by AGL and the facility is operated by Bettergrow. Land within the site is zoned RU1 (Primary Production) under the Singleton Local Environmental Plan 2013 (Singleton LEP).

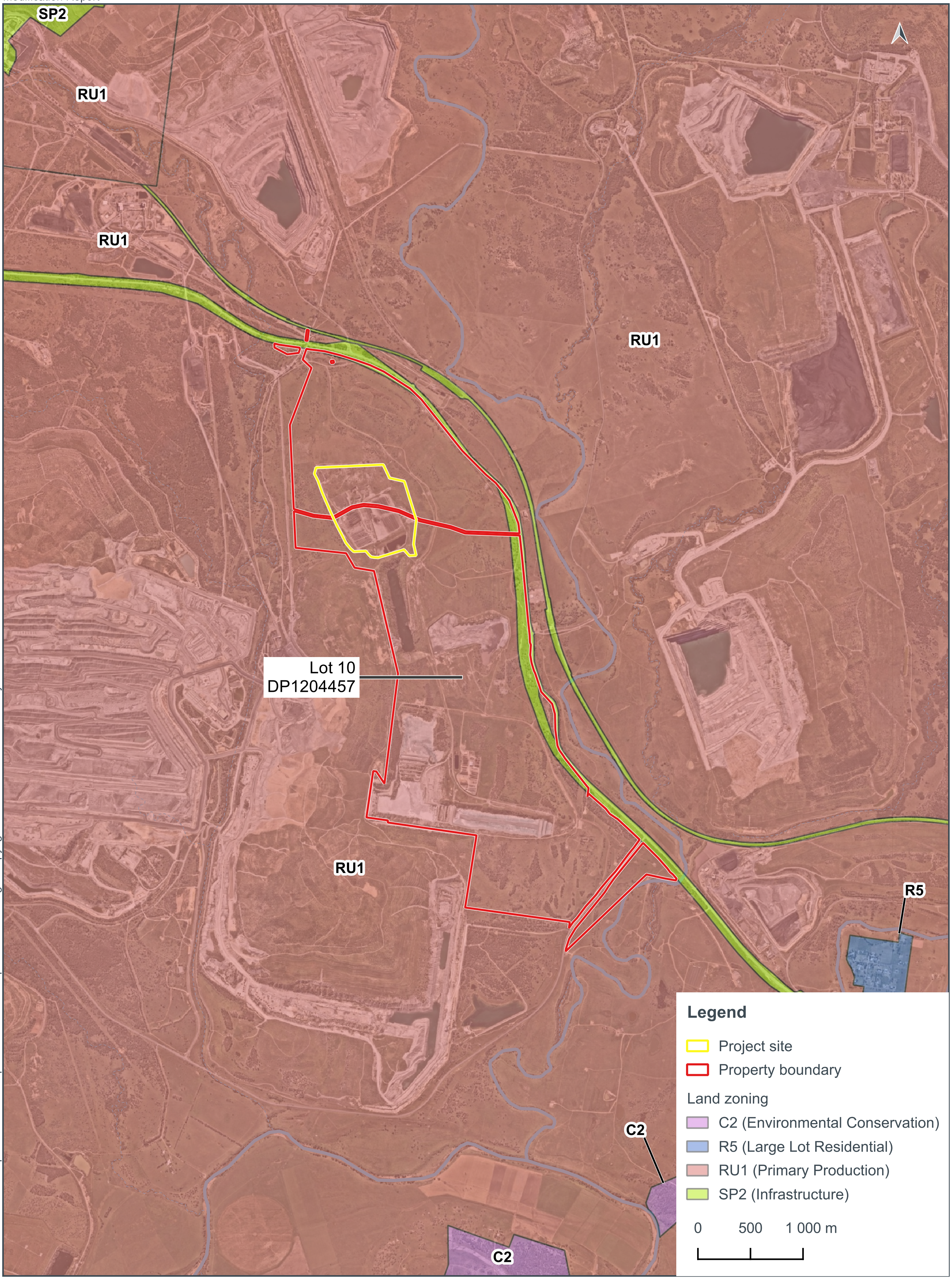
The area surrounding the facility is dominated by coal mining and other heavy industrial activities, including power generation and related activities, and grazing pastures. Key land uses surrounding the site (refer to Figure 1.1) include:

- Bayswater Power Station and Lake Liddell to the north-west;
- Liddell Coal Mine to the north;
- Mt Owen Coal Mine to the north-east;
- Ravensworth Coal Mine to the west;
- Glendell Coal Mine, Ashton Coal Mine and Integra Coal Mine (production ceased in 2024) to the south-east;
- Loop Organics composting facility to the south;
- New England Highway to the east; and
- Main Northern Railway to the east.

The land surrounding the site is zoned RU1 (Primary Production) to the north, east, south and west, and SP2 (Infrastructure - Classified Road) and SP2 (Infrastructure - Rail Infrastructure) to the north, east and south-east (refer to Figure 2.1).

Figure 2.1
Land zoning

Ravensworth Composting Facility SSD Modification 3
Modification Report



2.1.3 Sensitive receivers

The site is located within the Ravensworth Operations open cut mining complex characterised by mining operations, including blasting, drilling, excavation, hauling, crushing and grinding, and rehabilitation activities.

The nearest residences are along Hebden Road, approximately 2 km north-east of the site, and along Lemington Road, approximately 4.4 km south-east of the site. However, these residences are on mining land owned by Glencore Australia Pty Ltd (Glencore) and Yancoal Australia Pty Ltd, and currently experience noise, air quality, visual amenity, traffic and other environmental impacts from mining operations, and therefore are not considered as sensitive receivers for the facility.

The nearest sensitive receivers (private rural residential properties) for the facility are at Camberwell village, approximately 6 km to the south-east of the site (refer to Figure 1.1).

2.2 Environmental setting

2.2.1 Topography, geology and soils

The landscape of the local area generally consists of undulating hills, ranging in elevation from 140 to 220 m Australian Height Datum (m AHD) and with slope gradients typically between 4% and 7%. The site is located on a ridge that runs in a north-south direction between Bayswater Creek in the west and Bowmans Creek in the east. Local relief within the site ranges from approximately 60 m AHD at the central southern end of the site to approximately 125 m AHD along the eastern border of the site (Kovac & Lawrie, 1991).

A review of the Camberwell 1:100 000 Geological Sheet 9133 (Roberts et al., 1991) indicates that the site is underlain by the Denham Formation within the Late Permian Wittingham Coal Measures, consisting of coal seams with interbedded sequences of claystone, tuff, siltstone, sandstone and conglomerate.

The Soil Landscapes of the Singleton 1:250,000 Sheet (Kovac & Lawrie, 1991) indicates that the site and its surroundings are underlain by the Liddell soil landscape. This landscape is characterised by yellow soloths on slopes and yellow solodic soils on concave slopes. Earthy and siliceous sands occur on mid to lower slopes where the parent material is more sandy. Red soloths, red solodic soils and red podzolic soils may also occur. Limitations of this soil landscape include minor to severe sheet erosion with some minor rill erosion, low to high erodibility, high to very high erosion hazards, low to high soil salinity and low to moderate flood hazard (Kovac & Lawrie, 1991). The erosion hazard of land within the vicinity is defined as a ‘slight’ to ‘moderate’ (DPHI, 2025a), indicating that significant erosion damage is unlikely to occur given the site’s profile.

Previous open cut mining operations across the Ravensworth Operations mining complex have significantly impacted soils within the area through soil removal, erosion and degradation. The site is located on the former Ravensworth Void 3 that has been filled with spoil and fly ash from the Bayswater Power Station, capped and rehabilitated.

Acid sulfate soils

Acid sulfate soils generally occur in low lying areas in and around coastal swamps, estuaries, and other coastal water bodies. If these soils are disturbed or exposed to oxygen, they have the potential to oxidise over time, resulting in acidic water leaching from these soils and scalding vegetation or killing aquatic fauna. Acid sulfate soils can also react with concrete and steel infrastructure.

A review of the Singleton LEP and DPHI eSPADE Spatial viewer (DPHI, 2025a) did not identify any potential acid sulfate soils at the site. However, historical mining activities such as excavation and crushing of mineral deposits that accelerate the oxidation process may have resulted in the formation of acid sulfate soils within the vicinity.

Salinity

Saline soils occur naturally in many parts of Australia because of a combination of biophysical conditions, including climate, topography and geology (NSW Department of Environment and Climate Change (DECC), 2008). The erosion and transfer of saline sediments off-site have the potential to alter the water quality of receiving environments which in turn has the potential to impact upon flora and fauna that are sensitive to elevated levels of salinity.

A review of the DPHI eSPADE database (DPHI, 2025a), the Singleton LEP and spatial data from the Dryland Salinity National Assessment (Australian Bureau of Agricultural and Resource Economics and Sciences, 2016) did not identify any areas with risk of dryland salinity within or near the site. However, historical mining operations involving deep excavation and handling of mine wastes may have released salts into soil and groundwater, resulting in increased salinity within the vicinity.

Land and soil capability

The Land and Soil Capability Assessment Scheme (LSC Scheme) (Office of Environment and Heritage (OEH), 2012) classifies agricultural land based on its biophysical characteristics and subsequent limits they place on use of the land. The land and soil capability of land within the site has not been assessed as part of the LSC Scheme.

In addition to the LSC assessment scheme, the NSW government has mapped Biophysical Strategic Agricultural Land (BSAL) (OEH, 2013) and State significant agricultural land (SSAL) (in draft). The mapping of BSAL and SSAL is aimed at managing competing land uses and ensuring high value agricultural lands in NSW are preserved. BSAL is land with high quality soil and water resources capable of sustaining high levels of productivity. The biophysical attributes of SSAL represent the most capable, fertile and productive agricultural lands in the State, and can support a variety of agricultural industries operating successfully.

Draft SSAL mapping was released by the NSW Government in 2021 (NSW Department of Primary Industries (DPI), 2021). There are currently no specific requirements for the assessment of development projects in areas of draft SSAL, however the purpose was to understand the location, value and contribution to agricultural productivity in regional economics, and to assist with planning decisions on agricultural lands.

Neither BSAL nor SSAL has been mapped within the site (DPHI, 2025b; DPI, 2021).

2.2.2 Hydrology, flooding and water quality

Catchments, watercourses and drainage

The site is located within the lower portion of the Hunter River catchment. The Hunter River catchment is the largest coastal catchment in NSW, covering an area of approximately 21,500 square kilometres (km^2), and plays a significant role in regional hydrology. The headwaters of the catchment are formed by runoff from the Barrington Tops and Coolah Tops National Parks in the north and the Goulburn River and Wollemi National Parks in the south. The Hunter River rises on the western slopes of the Mount Royal Range, part of the Great Dividing Range, east of Murrurundi, and flows generally south-west and then south-east for approximately 460 km before flowing into the Pacific Ocean at Newcastle.

There are no watercourses or drainage lines traversing the site. The nearest mapped drainage line (a tributary of Bowmans Creek) traverses the New England Highway approximately 620 m north-east of the site. Bayswater Creek, approximately 600 m to the west, is the nearest watercourse to the site. The creek is classified as a fifth order stream according to the Strahler stream ordering system (Strahler, 1957). Other nearby watercourses and waterbodies include Bowmans Creek, approximately 1.2 km to the east, the Hunter River, approximately 6 km to the south, and Lake Liddell, approximately 5.7 km to the north-west of the site. The site is well elevated at approximately 40 m higher than surrounding watercourses.

Bayswater Creek and Bowmans Creek flow in a southerly direction to discharge into the Hunter River. Both creeks are highly modified due to mining and power generation activities in the area and generally have low flows (median flow of less than 1 ML per day) (Fifteen50, 2019a). The Hunter River flows in a south-easterly direction to drain into the Tasman Sea (a marginal sea of the South Pacific Ocean) at Newcastle.

The Ravensworth Void 4 dam is located immediately south of the facility and receives stormwater from the surrounding land and seepage from Void 5. Fly ash from the Bayswater Power Station is currently pumped as a thick slurry into Void 5 as part of the approved rehabilitation of the Ravensworth No. 2 mine. Water from the fly ash seeps from Void 5 into Void 4 and is pumped from Void 4 back to the Bayswater Power Station for further re-use. Void 3, which has also been subject to filling with fly ash, also seeps water into Void 4.

As a result of the natural topography and modification from mining and power generation activities, only a small portion of the upstream catchment drains toward the site (Fifteen50, 2019a). The on-site surface water management system prevents minor upstream catchment flows from entering the processing pads. Diversion bunds along the western side of the site direct stormwater to surrounding land, and a diversion wall and channel direct stormwater from the eastern side of the site into the sediment ('lower') basin in the south-eastern corner of the site. Rock structures and rip rap are provided to slow the velocity of stormwater flowing towards the lower basin.

In the exceedingly rare event that the lower basin fills, water can overflow into the former Void 4 south-west of the lower basin, which has in excess of 40 m depth of available airspace above its normal operating level (i.e. hundreds of megalitres). There is no surface water discharge from the site into local drainage lines or watercourses.

Any rainfall captured by the processing pads is considered to be leachate and managed by the on-site leachate management system (refer to Section 1.3.5).

Surface water management

The site is located within the Jerrys Water Source regulated under the Water Sharing Plan (WSP) for the Hunter Unregulated and Alluvial Water Sources 2022.

In a letter to Bettergrow dated 26 July 2022, the (then) Department of Planning and Environment – Water confirmed that the Ravensworth composting facility does not require a water access licence to use the water from Void 4, as the source of the water is not groundwater, but tailings and ash dams, which are above the natural groundwater table.

Flooding

The site is well elevated at approximately 40 metres higher than surrounding watercourses (Fifteen50, 2019a). The site is located above the 1% AEP, 5% AEP and Probable Maximum Flood (PMF) flood event levels (BMT, 2023) and is not identified as a flood planning area in the Singleton LEP (DPHI, 2025a).

Water quality

Both Bayswater Creek and Bowmans Creek are highly modified due to mining and power generation activities in the area, including discharges from Lake Liddell and Bayswater Power Station, and have elevated salinity levels (Fifteen50, 2019a).

WaterNSW data (WaterNSW, 2025) indicate that the average electrical conductivity (EC) measurement at Bayswater Creek in 2024 was 6,588 microsiemens per centimetre (µS/cm), with the average of all yearly averages (from the period 1999 to 2024) being 3,654 µS/cm. Bowmans Creek (Foy Brook Downstream Bowmans Creek Bridge Station No. 210130) is also saline with median EC measurements of 1,125 µS/cm (for the period 1993 to 2026). These median EC values are well in excess of the Australian and New Zealand Environment and Conservation Council (ANZECC) water quality trigger values for upland/lowland southeastern Australian streams (upland: 30-350 µS/cm; lowland: 125-220 µS/cm).

Water quality testing carried out by Bettergrow in 2018 indicated that the water within Void 4 is alkaline and brackish to saline, and has a low level of total suspended solids (Fifteen50, 2019a).

Sensitive receiving environments

Sensitive receiving environments for surface water impacts include groundwater dependent ecosystems (as described in Section 2.2.3), riparian land with a vegetation condition index of ‘moderate’ approximately 1 km west and east of the site (refer to Section 2.2.4), and the Hunter River and Lake Liddell (which are used for recreational purposes).

2.2.3 Groundwater

Groundwater occurrence, recharge and use

The facility is located within the Hunter subregion in the Northern Sydney Basin bioregion. Aquifers in the Hunter subregion can be broadly classed into three hydrogeological types: alluvial aquifers along major rivers and creek lines, coastal aquifers in the coastal area, and Triassic-Permian fractured (including porous) rock aquifers. The facility at Ravensworth is located above fractured and porous rock across the subregion, where the deeper, more extensive aquifer systems occur. The two main water bearing systems within and near the site are the Permian coal measures and the unconsolidated alluvial sediments associated with the Hunter River, Bayswater Creek and Bowmans Creek (Jacobs, 2022).

Groundwater recharge at the site primarily occurs as a result of rainfall infiltration at the subcrop/outcrop of the coal measures, across the alluvium, across deposited spoil and ash, and via lateral flow from the alluvium to the coal measures. The Whittingham Coal Measures are known to subcrop below the Hunter River alluvium, Bayswater Creek alluvium and Bowmans Creek alluvium. Coal seams are generally permeable horizontally, but vertical hydraulic connectivity is generally low (in the absence of subsidence induced cracking). The hydraulic connectivity between the Whittingham Coal Measures, the respective alluvium bodies and the surface waters is not precisely understood and/or varies along the river/creek lines (Jacobs, 2022).

Rainfall leakage below the existing site is conservatively estimated at 0.1 millimetres (mm) per day (mm/day), equivalent to a seepage rate of 10^{-9} metres per second (m/s). Across the site, this results in an annual leakage of less than 4 megalitres (ML). Rainfall seepage into Void 3 is contained and eventually seeps into the lower Void 4, where it is captured and stored for reuse (Fifteen50, 2019a).

Groundwater extracted from aquifers in the Hunter subregion is used for a range of purposes, including domestic, stock, irrigation, town water supply and industrial purposes, with a proportion of water protected for the environment in all water sources (Commonwealth of Australia, 2019).

A review of available real time groundwater monitoring data maintained by WaterNSW identified nine groundwater bores within 2 km of the site, registered for monitoring, testing, dewatering, industrial, stock, domestic and irrigation purposes (WaterNSW, 2025). The nearest monitoring borehole (GW078054) is approximately 1.1 km east of the site. No new boreholes have been installed since the SSD EIS was published. Glencore and AGL also regularly monitor several other bores near the site and report on these annually (Fifteen50, 2019b).

The facility does not extract any water from groundwater bores.

Groundwater management

The site is located within the Sydney Basin-North Coast Groundwater Source regulated by the WSP for the North Coast Fractured and Porous Rock Groundwater Sources 2016.

Groundwater levels and water quality

Drilled depths of bores identified within 2 km of the site range between 6.2 and 300 metres below ground level (mbgl). Groundwater was intercepted at 43 mbgl at borehole GW080725, approximately 1.8 km to the east of the site. A water bearing zone between 11.4 and 12 mbgl, with a standing water level of 6.9 mbgl, was recorded for borehole GW078054, approximately 1 km to the south-east (WaterNSW, 2025).

In 2018, groundwater levels at the nearest Glencore and AGL monitoring bores were recorded at greater than 60 mbgl and between 16 and 31 mbgl, respectively (Fifteen50, 2019b).

The groundwater impact assessment (Fifteen50, 2019b) prepared for the SSD EIS confirmed depth to groundwater to be greater than 40 mbgl at the site.

Analysis of groundwater samples taken from the Glencore and AGL monitoring bores in 2018 indicated that the pH tended to range from neutral to alkaline (pH of 7.0 - 8.3) and electrical conductivity typically ranged between 4,550 and 9,670 microsiemens per centimeter (μs/cm) (brackish to saline water) (Fifteen50, 2019b). Water of this quality is generally limited to industrial use, as salinity levels are greater than acceptable limits for stock and domestic consumption, and would be detrimental to crops and soils when used for irrigation.

Groundwater vulnerability

Groundwater vulnerability maps have been prepared by the DPHI for some catchments in NSW to indicate the vulnerability (or level of risk) of aquifers to contamination due to physical characteristics of the location, such as the depth to the water table and soil type. A groundwater vulnerability map has not been prepared for the Hunter River catchment in which the site is located. Given that the site and surrounding areas have historically been used for open cut and underground mining, groundwater in the area is not considered to be vulnerable.

2.2.4 Biodiversity

Native and non-native vegetation

Significant disturbance of the natural environment within and surrounding the site has occurred as a result of the long history of agricultural and mining activities in the area, and the site and its surrounding area were mostly cleared of vegetation prior to the construction of the facility.

Existing vegetation mostly consists of grassland and scattered shrubs or small trees in the north-western and north-eastern corners of the site and just north of the leachate control dam.

Vegetation mapping for the Upper Hunter region (NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW), 2024a) does not identify any native vegetation within the site. Native plant community types (PCTs) identified near the site are described in Table 2.1.

Table 2.1 PCTs surrounding the site

Class	PCT	Description	Location
Western Slopes Grasslands	796	Derived grassland of the NSW South Western Slopes	Approximately 500 m to the west
Coastal Valley Grassy Woodlands	1691	Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter	Approximately 500 m to the west
Coastal Swamp Forests	1731	Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley	Approximately 500 m to the west
Coastal Valley Grassy Woodlands	1603	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	Approximately 600 m to the north-east

Field surveys carried out in October 2018 as part of ecological investigations (Peak Land Management, 2018) for the SSD EIS confirmed vegetation within the site consists mostly of exotic weeds, with only two native species (unnamed) recorded in very low numbers.

Riparian land with a vegetation condition index of 'moderate' is identified approximately 1 km west and east of the site (refer to Appendix D).

Threatened ecological communities

Regional vegetation mapping (NSW DCCEEW, 2024a) does not identify any threatened ecological communities (TECs) within the site. Ecological investigations (Peak Land Management, 2018) undertaken for the SSD EIS confirmed that there are no TECs or TEC habitat present within the site.

PCTs in the surrounding area may correspond with the following five TECs listed as endangered or critically endangered under the *NSW Biodiversity Conservation Act 2016* (BC Act) or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act):

- PCT 796 may correspond with the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, listed as critically endangered under the EPBC Act.
- PCT 1603 and PCT 1691 may correspond with the Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions TEC, listed as endangered under the BC Act.
- PCT 1603 and PCT 1691 may correspond with the Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions TEC, listed as endangered under the BC Act.
- PCT 1691 may also correspond with the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions TEC, listed as critically endangered under the BC Act.

- PCT 1731 may correspond with the Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions TEC, listed as endangered under the BC Act.

Threatened flora and fauna

No threatened flora or fauna species listed under the BC Act and/or EPBC Act have previously been recorded within the site (DPHI, 2025c; Peak Land Management, 2018).

Eight threatened flora species and 288 threatened fauna species, including 24 frog species, 183 bird species, 49 mammal species and 32 reptile species, listed under the BC Act and/or EPBC Act have been recorded within 10 km of the site (DPHI, 2025c).

Ecological investigations (Peak Land Management, 2018) undertaken for the SSD EIS did not identify any suitable habitat for threatened species within the site.

Biodiversity values

No declared areas of outstanding biodiversity value have been identified within 10 km of the site. The site is not mapped as having biodiversity values in the Biodiversity Values Map and Threshold Tool (NSW DCCEEW, 2025b).

Aquatic habitat

Nearby watercourses include Bayswater Creek, approximately 600 m to the west, Bowmans Creek, approximately 1.2 km to the east, and the Hunter River, approximately 6 km to the south of the site.

Ecological investigations (Peak Land Management, 2018) undertaken for the SSD EIS identified ephemeral ponds/shallow standing water over small depressions adjacent to the north-eastern corner of the site, with some local and migratory waterbirds present.

Groundwater dependent ecosystems

Groundwater Dependent Ecosystems (GDEs) are defined as ecosystems that require access to groundwater to meet all or some of their water requirements in order to maintain the communities of plants and animals, ecological processes they support, and ecosystem services they provide (NSW Department of Land and Water Conservation, 2002).

The GDE Atlas (Bureau of Meteorology (BoM), 2025a) does not identify any terrestrial or aquatic GDEs within the site. Low and high potential terrestrial GDEs are identified approximately 500 m to 600 m to the west, north and east of the site. A moderate potential aquatic GDE, Bowmans Creek, is identified approximately 1.2 km to the east of the site.

The WSP for the Hunter Unregulated and Alluvial Water Sources 2022 does not identify any high priority GDEs within or near the site.

Weeds, pests and pathogens

Weeds listed as Priority Weeds for the Hunter region under the *Biosecurity Act 2015* (Biosecurity Act) may occur within the site (Hunter Local Land Services, 2022a). Under the Biosecurity Act, Priority Weeds are weeds that have been determined as being of a high risk of causing significant negative impacts to agriculture, the environment, the community and the economy.

The Hunter region provides habitat for a range of commonly occurring pest species (Hunter Local Land Services, 2024). Exotic pests that may occur within the site include wild dogs, feral cats, European red fox, feral deers, feral horses, feral goats, feral pigs, and wild rabbits. No feral animals were observed during previous field surveys of the site (Peak Land Management, 2018).

Pathogens that have been recorded in the Hunter Interim Biogeographical Regionalisation for Australia (IBRA) subregion and have the potential to occur within the site include Myrtle rust (*Austropuccinia psidii*) and Phytophthora Root Rot Fungus (*Phytophthora cinnamomi*) (Hunter Local Land Services, 2022a).

Matters of National Environmental Significance

A search was undertaken on 14 April 2025 for Matters of National Environmental Significance (MNES) listed under the EPBC Act that may occur within a 10 km radius of the site (refer to Section 4.1.1).

The following MNES may occur within 10 km of the site:

- 8 TECs, including:
  - Central Hunter Valley eucalypt forest and woodland (critically endangered);
  - Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (endangered);
  - Hunter Valley Weeping Myall (Acacia pendula) Woodland (critically endangered);
  - Lowland Rainforest of Subtropical Australia (critically endangered);
  - River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria (critically endangered);
  - Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions (endangered);
  - Warkworth Sands Woodland of the Hunter Valley (critically endangered); and
  - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (critically endangered).
- 49 threatened flora and fauna species, including 19 bird species, 2 frog species, 11 mammal species, 15 plant species and 2 reptile species; and
- 10 migratory species.

These matters are further discussed in Section 4.1.1.

2.2.5 Heritage

Non-Aboriginal heritage

A search of the World Heritage List, National Heritage List, Australian Heritage Database, NSW State Heritage Register, State Heritage Inventory, Section 170 Heritage and Conservation Registers and heritage schedule of the Singleton LEP on 14 April 2025 did not identify any registered heritage items within 1 km of the site.

The nearest registered heritage item is a former public school along Hebden Road, Ravensworth, approximately 1.4 km south-east of the site, listed as a local heritage item under the Singleton LEP (Item ID I42). Recent satellite imagery indicates that the school has been demolished, with only the foundations and some external walls remaining.

Aboriginal heritage

The site is located within the Wanaruah Local Aboriginal Land Council (LALC) area.

Archaeological evidence suggests the Wonnarua (Wanaruah) People have occupied the Hunter Valley region for at least 35,000 years, however the majority of Aboriginal sites in the region are dated to the more recent Holocene period (less than 10,000 years ago). This may reflect Aboriginal occupation patterns but may also be influenced by the inaccessibility of potential coastal Pleistocene sites, which were inundated when sea levels rose and reached present levels approximately 6,000 years ago (RPS, 2019b).

Nearby watercourses and vegetation communities within and surrounding the site would have provided habitat for a variety of animals such as kangaroos, wallabies, possums, echidnas and birds, as well as potential food and raw material sources for Aboriginal people. However, the underlying geological formation would have provided few suitable raw stone materials for the manufacture of stone artefacts. While it is possible that mudstone could have been used in the production of lithic (stone-built) artefacts, it is likely that resources would have been procured from elsewhere (RPS, 2019b).

European settlement of the Hunter Valley commenced in 1820 as the region was pronounced open to free settlement. The site constituted farmland from 1824 until 1972, when coal mining in the Ravensworth area commenced at the Ravensworth No. 2 open cut mine.

Historical farming and mining activities included extensive land clearing, excavation, filling and levelling, resulting in a high level of successive disturbance at the site over the past 200 years (RPS, 2019b). The site formed part of the Ravensworth No. 2 open cut mine and has subsequently been filled in, capped and rehabilitated.

A search of the Aboriginal Heritage Information Management System (AHIMS) carried out in October 2018 as part of the Aboriginal Cultural Heritage Assessment (ACHA) (RPS, 2019b) prepared for the SSD EIS identified a large number of previously recorded Aboriginal sites in the Ravensworth Operations open cut mining complex, most of which have been partially or fully destroyed. No registered AHIMS sites were identified within the site. Aboriginal sites identified within the surrounding area included low-density surface artefact sites, art (pigment or engraved), grinding grooves, a modified tree, a massacre site, and potential archaeological deposits (PADs). The nearest AHIMS sites, a potential archaeological deposit (PAD) (Site ID 37-3-0591) and artefact (Site ID 37-3-0005), were identified over 300 m to the south-west and north-east of the site (respectively).

An updated search of the AHIMS on 15 April 2025 did not identify any additional registered Aboriginal sites near the facility.

The ACHA determined that the site has no archaeological, aesthetic or historic significance. It further concluded that the site has some cultural significance when considered as part of the wider cultural landscape, however, has no specific cultural values when viewed in isolation (RPS, 2019b).

2.2.6 Contamination

A review of the EPA, NSW Department of Primary Industries and Regional Development and Department of Defence public registers of contaminated sites was carried out on 17 April 2025 to assess the potential sources of contamination near the site. A number of potential current and former contaminant sources have been identified near the site and are summarised in Table 2.2.

There were no former gas works, sites listed on the EPA per- and polyfluoroalkyl substances (PFAS) investigation program, areas where unexploded ordinance is known to occur, liquid fuel facilities, or other waste management facilities listed in the National Waste Management Database, identified within 5 km of the site.

Table 2.2 Potential current and former contaminant sources

Item	Details
List of contaminated sites regulated by or notified to the EPA	There are no sites listed in the Contaminated Land Record of Notices within 5 km of the site. Two sites within 5 km of the site have been notified to the EPA under the *Contaminated Land Management Act 1997* (CLM Act): ▪ Ravensworth Operations Narama Mine, approximately 4 km south-west of the site; and ▪ Cumnock Colliery, approximately 4.5 km north-west of the site. Regulation under the CLM Act is not required for these premises.
Current EPA licensed activities	Six activities licensed under the POEO Act occur within 5 km of the site: ▪ coal works and mining for coal at the Ravensworth Operations open cut mining complex, off Lemington Road, Ravensworth (approximately 1 km south-west of the site), operated by Ravensworth Operations Pty Ltd, owned and operated by Glencore Coal (EPL No. 2652); ▪ coal works and mining for coal at Liddell Coal Operations, Old New England Highway (approximately 1.8 km north of the site), operated by Liddell Coal Operations Pty Ltd, a wholly owned subsidiary of Glencore Coal (EPL No. 2094). Open cut coal mining including coal preparation plant and rail loading facilities ceased in November 2023. The mine site is now in the closure phase with closure activities consisting of bulk push, tailings dam capping, and landform rehabilitation. ▪ composting at Loop Organics, 74 Lemington Road, Ravensworth (approximately 2 km south of the site), operated by Loop Organics Pty Ltd (EPL No. 20892); ▪ coal works and mining for coal at Glendell Mine, Hebden Road, Ravensworth (approximately 2.5 km south-east of the site), operated by Glendell Tenements Pty Ltd on behalf of Glencore (EPL No. 12840); ▪ dangerous goods production at Orica Australia Pty Ltd, New England Highway, Liddell (approximately 2.7 km north-west of the site), operated by Orica Australia Pty Ltd (EPL No. 1122). The facility is a dangerous good storage depot for ammonium nitrate, ammonium nitrate emulsion and diesel to support bulk explosives delivery to mines. This plant also manufactures emulsion phase; and ▪ extractive activities, crushing, grinding or separating, coal works and mining for coal at Mount Owen Mine, Hebden Road, Ravensworth (approximately 3.8 km north-east of the site), operated by Mt Owen Pty Ltd on behalf of Glencore (EPL No. 4460).
Former licensed activities, now surrendered	Three former licensed activities, now surrendered under the POEO Act, occurred near the site: ▪ coal works at Ravensworth Coal Terminal, Liddell Station Road, Ravensworth (approximately 2.5 km north of the site), operated by Ravensworth Coal Terminal Pty Ltd (EPL No. 5585); ▪ coal works and mining for coal at Ravensworth East Mine, Hebden Road, Ravensworth (approximately 3.8 km east of the site), operated by Mt Owen Pty Ltd (EPL No. 10860); and ▪ coal works and mining for coal at Cumnock No. 1 Colliery, off Old New England Highway (approximately 4.5 km north-west of the site), operated by Cumnock No. 1 Colliery Pty Ltd (EPL No. 37).

The site is located on top of the former Void 3 that has been filled with spoil and fly ash from the Bayswater Power Station, capped and rehabilitated. Previous contamination investigations carried out for the SSD EIS have not identified any known contamination at the site.

2.2.7 Hazards

Bushfire

Sections of the eastern, southern and western boundaries of the site are mapped as ‘Vegetation Category 3’ bushfire prone land, which presents a medium risk for bushfire, and its vegetation buffer (30 m) (DPHI, 2025a). The vegetation buffer represents areas that may be impacted by ember attack, radiant heat and/or flame contact during fires in adjacent bushfire prone land.

A Bushfire Risk Management Plan was developed in 2023 for the Singleton and Muswellbrook LGAs by the Hunter Valley Bushfire Management Committee (Hunter Valley Bushfire Management Committee, 2023). The plan identifies land areas and associated community assets within the Singleton and Muswellbrook regions at risk of bushfire and recommends measures to reduce these risks. The site is not located within any of the focus areas identified as having unacceptable high fire risk.

The bushfire season in the Singleton region predominantly occurs during the hotter months of the year, from October to March. The prevailing weather conditions typically associated with the bushfire season are windy conditions accompanied by high day time temperatures and relative low humidity.

Hazardous substances and dangerous goods

Hazardous substances and dangerous goods stored and used at the facility are described in Section 1.3.5. The quantities of dangerous goods and hazardous substances that are stored and handled on site are below the threshold quantities listed in the *Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines* (Applying SEPP 33 Guidelines) (NSW Department of Planning (Department of Planning), 2011).

Vehicles and machinery are refuelled off-site or at the diesel tank using a drip tray. Other maintenance of machinery on-site takes place within designated bunded areas or hardstand areas using drip trays. Emergency spill kits are available on-site for the management of any accidental fuel, oil or chemical spills.

Mine subsidence and ground settlement

Mine subsidence is a risk in areas which have been subject to underground coal mining as the land above can sink and fill the voided mine drifts, causing tilts and strains on the ground surface. In areas where coal extraction has taken place, subsidence generally occurs within a relatively short time after extraction.

The site is located within the Patrick Plains Mine Subsidence District in an area that has been subject to open cut and underground longwall mining as part of the Ravensworth Operations mining project.

The facility is located on the former Void 3 of the Ravensworth No. 2 open cut mine, which was filled in the early 2000's with fly ash (refer to Section 1.3.1).

Consultation has been undertaken with Subsidence Advisory NSW to determine any requirements for the project to reduce the risk of potential mine subsidence damage (refer to Section 5.1.5).

2.3 Strategic policy context

The following strategic policies and plans have been considered in the assessment of the project, as they have not been considered previously for the approved development:

- National Waste Policy: Less Waste, More Resources (National Waste Policy) (Commonwealth of Australia, 2018);
- NSW Circular Economy Policy Statement (NSW Circular Economy Policy) (EPA, 2019);
- Net Zero Plan Stage 1: 2020–2030 (NSW Net Zero Plan) (NSW Department of Planning, Industry and Environment (DPIE), 2020);

- NSW Waste and Sustainable Materials Strategy 2041 Stage 1:2021–2027 (NSW Waste and Sustainable Materials Strategy) (DPIE, 2021a);
- Strategic Plan 2024–29 (EPA Strategic Plan) (EPA, 2024a);
- Waste Delivery Plan (EPA Waste Delivery Plan) (EPA, 2021);
- Hunter Regional Plan 2041 (Hunter Regional Plan) (DPE, 2022b);
- Regional Circular Materials Strategy Hunter and Central Coast 2022 – 2027 (Hunter and Central Coast Regional Circular Materials Strategy) (Hunter Joint Organisation, 2022); and
- Create Singleton 2032 – Community Strategic Plan 2022 – 2032 (Singleton Community Strategic Plan) (Singleton Council, 2022).

The project's consistency with the relevant objectives and planning priorities contained within the abovementioned strategic policies and plans is discussed in the following sections.

2.3.1 National Waste Policy

The National Waste Policy provides a national framework for waste management, recycling and resource recovery in Australia to 2030. It focuses on reducing waste disposal and treating waste as a valuable resource, aiming to deliver economic, environmental, and social benefits while transitioning towards a circular economy.

The overarching goal of the policy is to ensure all waste is managed in alignment with Australia's international commitments, safeguarding human health and the environment. The policy also aims to identify and mitigate long-term risks associated with waste to prevent intergenerational environmental impacts.

The policy outlines a nationally coordinated approach to waste management, guided by five key principles:

- waste avoidance – prioritising waste prevention, promoting efficient resource use, and designing products to minimise waste;
- enhanced resource recovery – improving collection systems, recycling processes, and the quality of recovered materials;
- increased use of recycled materials – stimulating demand and markets for recycled products;
- better management of material flows – ensuring waste is managed to benefit human health, the environment, and the economy; and
- improved data and innovation – enhancing information systems to drive innovation, guide investment, and support informed consumer choices.

The National Waste Policy is implemented through the National Waste Policy Action Plan 2024 (National Waste Policy Action Plan) (Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024a), which includes targets and priorities to guide Australia's investment and national efforts for waste management. The seven targets outlined in this plan include:

- Target 1: Ban the export of waste plastic, paper, glass and tyres, commencing in the second half of 2020;
- Target 2: Reduce the total waste generated in Australia by 10% per person by 2030;
- Target 3: 80% average recovery rate from all waste streams following the waste hierarchy by 2030;
- Target 4: Significantly increase the use of recycled content by governments and industry;
- Target 5: Continued phase out problematic and unnecessary plastics;
- Target 6: Halve the amount of organic waste sent to landfill for disposal by 2030; and
- Target 7: Make comprehensive, economy-wide and timely data publicly available to support better consumer, investment and policy decisions.

The project supports the National Waste Policy objectives and Action Plan targets by:

- treating waste as a resource;
- reducing the amount of organic material sent to landfill and increasing the recovery of raw FOGO material;
- expanding industry capacity, and increasing the supply of recycled organic material (compost);
- generating economic, environmental, and social benefits by increasing processing capacity while minimising environmental impacts;
- promoting sustainability, innovation, and job creation; and
- protecting human health and the environment.

2.3.2 NSW Circular Economy Policy

The NSW Circular Economy Policy sets the ambition and approach for a circular economy in NSW, and provides principles to guide resource use and management. It provides a framework for implementing initiatives throughout the product life cycle, from design, manufacturing, and retail to end-of-life-disposal.

Key principles of a circular economy include:

- maximising resource value by extending the lifespan of products and materials; and
- optimising resource use to generate significant economic, social, and environmental benefits.

The NSW Circular Economy Policy outlines seven principles that will underpin NSW Government decision making and planning:

- sustainable management of all resources – replacing raw materials with recycled products;
- value resource productivity – minimising the inefficient use of virgin materials;
- design out waste and pollution – innovating product design for longevity, re-use, remanufacture and resource recovery, and increasing service offerings and remanufacture and repair activities;
- maintain the value of products and materials – increasing the repairability of products and the recyclability of materials to allow the preservation of value;
- innovate new solutions for resource efficiency – implement innovating technologies that increase resource efficiency and prioritise higher value re-use opportunities;
- create new circular economy jobs; and
- foster behaviour change through education and engagement of communities and businesses.

The project aligns with the following five focus areas that are outlined in the policy to guide government action:

- support innovation – by assisting businesses to develop innovative solutions to accelerate the transition to a circular economy;
- sustainable procurement – by supporting sustainable procurement practices by businesses and government which would, in turn, drive demand for recovered materials and reusable products;
- high quality, consistent recycling – by increasing the generation of high quality recovered materials that can be used more easily for a greater range of purposes;
- mainstream product stewardship – by assisting producers to take responsibility for the management of the end of product life to improve environmental, economic and social outcomes; and
- circular design – by increasing the lifetime of organic materials and reducing their environmental impacts over their lifecycle.

2.3.3 NSW Net Zero Plan

The NSW Government is committed to achieving net zero emissions by 2050. In 2020, the NSW Government released the Net Zero Plan, which sets out how we will reduce our emissions by 35% over the next decade, in order to reach net zero emissions by 2050. Plans for the second and third decades of the net zero path will be developed in the lead-up to the 2030s and 2040s respectively.

As part of the Net Zero Plan, the NSW Government has committed to a target of net zero emissions from organic waste in landfill by 2030. Organic waste, such as food scraps and garden trimmings, makes up about 40% of red-lidded kerbside bins. When sent to landfill, the decomposing material releases methane that may not be captured. However, when this waste is managed effectively through composting and recycling processes, methane emissions can be substantially reduced, soils can be regenerated to store carbon, and biogas can be created to generate electricity. A recent study by the EPA (EPA, 2024b) indicates that the collection, transport and processing of food waste into compost can reduce greenhouse gas emissions by up to 96% compared to landfilling it.

In order to deliver on its goal, the NSW Government has established world-leading landfill diversion policies to apply to the waste industry. In particular, it will:

- support local councils to provide communities with best-practice food and garden waste management infrastructure;
- ensure composts or other organic soils are of the highest quality for land application;
- facilitate the development of 'waste to energy' facilities in locations that have strong community support, provided those facilities meet strict environmental standards; and
- update regulatory settings to ensure residual emissions from the organic waste industry are offset.

The project supports these landfill diversion policies by expanding operations at the facility to include the processing of raw FOGO material, thereby reducing the amount of FOGO that is sent to landfill. Further, the facility produces stabilised, pasteurised compost material that is of a high quality. By utilising the compost for agricultural land application and land rehabilitation, this initiative closes the loop on organic waste, while promoting circular economy principles and sustainable environmental practices.

2.3.4 NSW Waste and Sustainable Materials Strategy

The NSW Waste and Sustainable Materials Strategy is informed and driven by the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act). It aims to encourage waste reduction and recycling as NSW transitions to a circular economy (refer to Section 2.3.2). The strategy adopts the targets set in the National Waste Policy Action Plan (refer to Section 2.3.1), and reaffirms the NSW Government's commitment to the goal of net zero emissions from organic waste by 2030, as set out in the NSW Net Zero Plan (refer to Section 2.3.3).

The strategy further outlines the actions needed over the six years leading up to 2027 (the first phase of the strategy) to deliver on the long term objectives of the NSW Circular Economy Policy, based on the following three focus areas:

- meeting future infrastructure and service needs by ensuring critical waste infrastructure is in place, with an emphasis on co-locating businesses in precincts that promote a circular economy;
- reducing carbon emissions by improving waste and materials management, including making materials more productive by improving their durability through design, reusing or

repairing them, recycling and remanufacturing them or extracting their embodied energy, to reduce reliance on emissions-intensive virgin materials; and
- protecting the environment and public health by strengthening measures to manage waste pollution, including efforts to combat illegal dumping.

The project aligns with these focus areas by:

- increasing processing capacity at an existing composting facility, and expanding operations to include the processing of raw FOGO recovered material, to ensure recovery and recycling infrastructure keep pace with demand;
- diverting more organic material from landfill, including raw FOGO material, and processing it into compost that is returned to local soils to sequester carbon, improve soil health, increase water retention and boost crop yields, and reduce carbon emissions; and
- increasing the supply of high quality recycled organic material while minimising environmental impacts.

The project represents a significant step in meeting future waste management needs while advancing NSW's transition to a circular economy.

2.3.5 EPA Strategic Plan

The EPA Strategic Plan describes how the EPA, as NSW's primary environmental regulator, will protect, restore and enhance the NSW environment and human health over the next five years and beyond.

The plan outlines three strategic choices about the environmental and human health outcomes the EPA will deliver:

- care for Country – land, water, air and community;
- drive climate action; and
- enable a safe circular economy.

The project supports the following outcomes of the strategic choices:

- Licensees respond to the challenges of climate change and collectively reduce their greenhouse gas emissions, helping to meet the targets in the Net Zero Plan. By increasing the processing capacity of the facility and expanding operations to include the processing of raw FOGO material, the project would allow more organic material to be diverted from landfill, resulting in reduced greenhouse gas emissions.
- The necessary systems, infrastructure and regulatory settings are incentivising the transition to a circular economy. The project would utilise the existing site infrastructure and systems to support increasing rates of recycling of organic material, including raw FOGO material, and supply of recycled organic material in the region.
- Potential harm associated with managing waste and recovered materials is minimised. The project would minimise potential environmental impacts associated with the processing of recovered materials as it does not involve extension of the existing development footprint, vegetation clearing or bulk earthworks, and is located far from sensitive receivers.
- Communities, industry and government are actively participating in the circular economy. The project would assist communities, industry and government to increase the recycling of organic material and the use of recycled organic products.

2.3.6 EPA Waste Delivery Plan

The EPA Waste Delivery Plan describes how the EPA will reduce the harmful impact of waste and drive behaviours that create a circular economy. It outlines how the EPA will work with communities, industries and government to achieve their strategic waste priorities and implement the NSW Waste and Sustainable Materials Strategy and NSW Plastics Action Plan (DPIE, 2021b).

The project aligns with the following initiatives of the plan:

- diverting organics from landfill – by providing more organics processing capacity to support the recent FOGO recycling mandates in NSW (refer to Section 2.4.1);
- leveraging government purchasing power to stimulate a local circular economy – by assisting the industrial sector to meet the increased demand for organic recycled material; and
- building on our success: business recycling – by supporting businesses to reduce the volume of organic material sent to landfill.

2.3.7 Hunter Regional Plan

The Hunter region is the leading regional economy in Australia, driven by the mining, energy, manufacturing and agricultural sectors. The Hunter Regional Plan is a 20-year land use plan to manage growth and change in the Hunter region. It seeks to streamline planning so that the Hunter can transition over time to an economy focussed on renewable energy and the circular economy.

The plan defines the region's long term vision and goals across areas such as economic diversification, environmental sustainability, and community wellbeing through nine objectives. Each objective is supported by performance outcomes, to guide planning decisions and assess whether local strategic plans and planning proposals are effectively contributing to the broader regional goals.

Objective 1 of the plan focuses on diversifying the Hunter's mining, energy, and industrial capacity and Objective 6 outlines the need to conserve heritage, landscapes, environmentally sensitive areas, waterways and drinking water catchments. The project supports performance outcome 5 (Circular economy industries and facilities area in appropriate sites) of Objective 1 and performance outcome 1 (Areas of high environmental value are protected to contribute to a sustainable region) of Objective 6, as it utilises a former mine site to increase organics recycling capability, thereby avoiding impacts on environmentally sensitive areas and receivers.

Objective 7 of the plan aims to reach net zero and increase resilience and sustainable infrastructure. The project supports Objective 5 of the plan (Places are designed to support the goal of net zero emissions by 2050 and opportunities for mitigation and adaptation to a changing climate and environment) of this objective as it reduces greenhouse gas emissions by diverting more organic material from landfill, and is designed to be resilient to climate change.

2.3.8 Hunter and Central Coast Regional Circular Materials Strategy

The Hunter and Central Coast Regional Circular Materials Strategy represents the regional response of the Hunter and Central Coast region to the Waste and Sustainable Materials Strategy. The strategy outlines a 20-year vision to transform the Hunter and Central Coast region into Australia's leading circular materials region, as well as an Implementation Plan to deliver the Strategic Direction objectives of the strategy over the next five years.

Four regional themes are identified in the strategy to align with the NSW Waste and Sustainable Materials Strategy themes and key priorities:

- collaboration – collaborating to solve regional problems for greatest positive impact;
- circularity – enabling and influencing the circular economy;
- resource recovery – improved infrastructure and operations for circular outcomes; and
- protect the environment – improved problem waste management and disaster resilience.

Each regional theme is associated with outcomes, success measures, strategic directions and key regional challenges.

The project aligns with the following strategic directions of the circularity and resource recovery themes:

- circularity:
  - support the adoption of upstream circular economy solutions to reduce consumer waste generation – by allowing increased volumes and a wider range of organic material to be diverted from landfill;
  - improve circular economy knowledge and embed principles into practice – by transforming organic recovered material into a valuable resource (compost), reducing greenhouse gas emissions and reducing reliance on manufactured chemical fertilizers;
- resource recovery:
  - investigate and implement solutions to increase resource recovery by improving infrastructure, operations and material quality – by increasing processing capacity at an existing composting facility and extending existing operations to include the processing of raw FOGO recovered material; and
  - collaborate, conduct research and support programs to divert organic waste from landfill – by providing increased capacity in the Hunter region to divert a wider range of organic recovered material from landfill.

2.3.9 Singleton Community Strategic Plan

The Singleton Community Strategic Plan presents the community's long term vision, goals and strategic priorities for the Singleton LGA, and provides a guiding framework for Council's actions and policies. It identifies objectives for various aspects of community development, including people, places, the environment, the economy, and leadership, and strategies to achieve these objectives.

The project supports the following objectives of the strategy:

- our places are sustainable, adaptable and inclusive – by providing safe and well-maintained recycling infrastructure and promoting sustainable practices;
- our environments are valued, preserved, respected and enhanced in a sustainable way – by promoting efficient waste management, increasing reuse and recycling, and reducing risks from environmental pollution and disease; and
- our economy will demonstrate diversity, resilience and innovation – by supporting increased recycling of organic material by businesses as waste generation increases.

2.4 Need and alternatives

2.4.1 Need and justification

NSW is transitioning to a circular economy over the next 20 years, as outlined in the NSW Circular Economy Policy (refer to Section 2.3.2). This policy supports the broader Australian Government's commitment to reduce waste disposal and treat waste as a valuable resource, in order to deliver economic, environmental, and social benefits while transitioning towards a circular economy (Commonwealth of Australia, 2018) (refer to Section 2.3.1).

The NSW Waste and Sustainable Materials Strategy outlines the actions needed over the six years leading up to 2027 to deliver on the long term objectives of the NSW Circular Economy

Policy (refer to Section 2.3.4). These actions are backed by $356 million in funding to help deliver priority programs and policy reforms.

Waste targets that have been set for the State in the NSW Waste and Sustainable Materials Strategy include:

- reduce the total waste generated by 10% per person by 2030;
- have an 80% average recovery rate from all waste streams by 2030;
- significantly increase the use of recycled content by governments and industry; and
- halve the amount of organic waste sent to landfill by 2030.

To achieve these targets, the NSW government has passed legislation to mandate FOGO recycling in NSW (EPA, 2025a), including:

- Local councils will be required to provide all NSW households who receive a residual (red lid) waste collection service with a FOGO waste service by 1 July 2030.
- Relevant premises, including supermarkets, some institutions and hospitality businesses, will be required to have a source-separated food organics waste collection service in place, starting with the largest generators from 1 July 2026 and staggered to 2030, depending on how much waste they send to landfill each week.

Implementation of these mandates for all households in NSW is predicted to result in the diversion of almost 950,000 tonnes (t) of FOGO waste each year from landfill and into circular economy products like compost (EPA, 2025a). The NSW government is providing a suite of support programs for councils and businesses, including grant funding for infrastructure, education and guidance, to help communities transition to the FOGO mandates.

The Hunter Regional Plan forecasts an approximate 11% growth in the region's population by 2041. It is also estimated the Hunter region will be the leading regional economy in Australia by that time. A study into the current supply and demand drivers of organics recycling in NSW (EPA, 2020) indicates there is an increasing demand for recycled organics, mainly driven by the urban amenity market, which is influenced by urban and industrial development. The agriculture market is the second largest end-use market (with stronger demand in regional areas), and growth in this market is accelerating. Recycled organics also play a key role in the rehabilitation/remediation of degraded or marginal land. The study further shows that the urban amenity market is becoming increasingly discerning, with a strong demand for higher quality recycled organic products (EPA, 2020).

AGL has over 700 ha of land requiring progressive rehabilitation. The open cut mining operations have removed the topsoil and the remaining sub-soils have limited value as a plant growth medium. The SSD EIS noted that the successful rehabilitation of the mine voids is dependent on creating a biologically active soil to enable the establishment of robust and diverse vegetation communities. The organic material produced at the facility is used to improve the soil across existing rehabilitated areas and new rehabilitation areas.

The project aligns with circular economy government policies, plans and legislation by meeting the increasing demand for recycled organic products while continuing to support AGL's existing rehabilitation activities. In addition, the project would provide additional employment opportunities and have minimal environmental and social impact, as it does not involve an extension to the existing development footprint, clearing of native vegetation, bulk earthworks, or any changes to the existing site infrastructure, plant, equipment or operating hours.

2.4.2 Project alternatives

The alternatives considered by Bettergrow for the ongoing composting of organic material at the Ravensworth facility are outlined in the following sections.

Option 1 - Do nothing

The ‘do nothing’ option consists of the composting facility continuing operations under the existing approval. The facility would continue to receive and process up to 200,000 tpa of organic material as described in Section 1.3.5.

The ‘do nothing’ option is not considered appropriate, as the ability of the composting facility to process an increased supply of organic material associated with the NSW government FOGO mandates (as described in Section 2.4.1), and support increasing population growth and development in the region (DPIE, 2022), would be severely constrained.

With the existing operation capped at current levels and limited to the current feedstock, the site would lack the ability to significantly contribute to the FOGO recycling effort in the Hunter region. As a result, there would be an increased reliance on waste disposal and alternative similar composting facilities located further away. This would increase the overall cost of waste management for relevant waste generators due to longer haulage distances or disposal costs, while also increasing greenhouse gas emissions and heavy vehicle traffic on roads.

The ’do nothing’ option is therefore not considered appropriate due to the potential increased environmental, social and economic costs associated with an increased supply of FOGO waste in the region, and given the opportunity exists to process FOGO recovered material at the existing composting facility.

Option 2 – An alternative site

Moving the facility to an alternative site is not considered a viable option, as the existing site already comprises the infrastructure, space and plant and equipment to receive and process recovered organic material with minimal environmental and social impact.

Alternative sites have not been considered from a technical, capacity and environmental impact perspective, and would be inappropriate from an economic perspective, given:

- sunken costs in the existing site;
- capital expediture required for a new site; and
- challenges of finding an appropriately zoned and located area for a new site near waste sources and transport infrastructure, with minimal environmental impacts and at an appropriate distance from sensitive receivers.

Option 3 – Increase processing capacity and receive and process FOGO recovered material

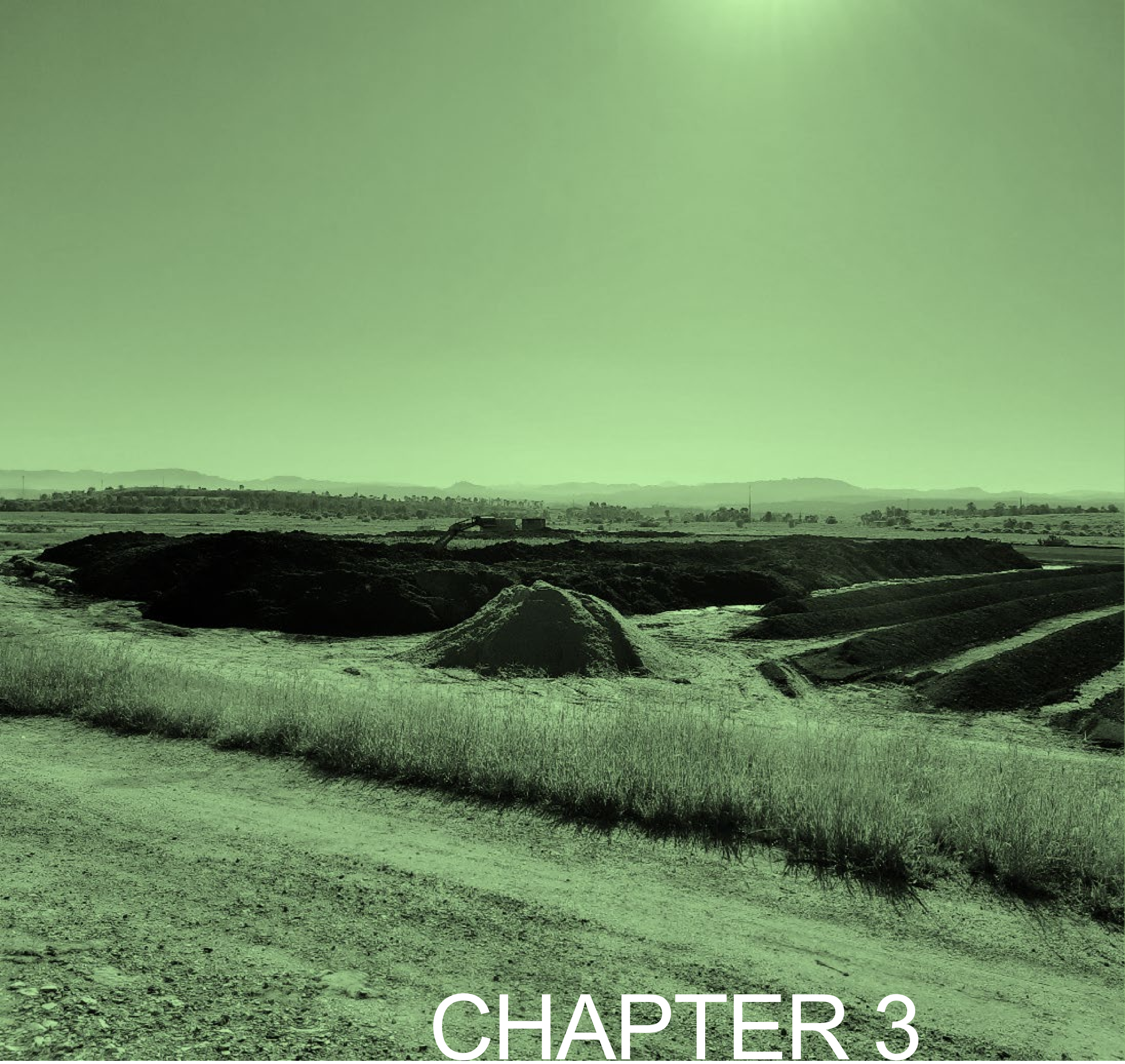
This option was considered most suitable as it involves the utilisation of existing disturbed land and infrastructure to receive and process a wider range and larger quantity of organic material with minimal additional environmental and social impacts. This option would also have positive flow on effects throughout the local and regional economy through the creation of jobs and increased supply of compost to the agricultural, horticultural, mining and other industry sectors in the region.

The processing of raw FOGO recovered material would further contribute to achieving targets for increased organics recycling and landfill diversion outlined in Australian and NSW government strategic policies and plans (refer to Section 2.3).

Option 3 was therefore selected as the preferred option as it would best meet the current and expected future demand for FOGO composting services in the region, and support government initiatives promoting sustainability and resource conservation.

The receival and processing of raw FOGO recovered material within an enclosure was not considered as part of Option 3 for the following reasons:

- The site is located in a remote location within a mining complex, with the nearest sensitive receivers located approximately 6 km away from the site.
- Potential odour emissions, including cumulative odour emissions with the Loop Organics composting facility, from the receival and processing of raw FOGO recovered material are predicted to be well below the EPA criteria at the nearest sensitive receivers (based on conservative assumptions) and would be further minimised with the implementation of the existing odour management and mitigation measures (refer to Section 6.2).
- Organic material is frequently inspected (including upon arrival at the site, during unloading and blending of the material and after the maturation process) to remove any physical contaminants such as plastics, glass and textiles and prevent littering of the surrounding environment and potential contamination impacts (refer to Section 1.3.5).
- There is adequate space available in the processing pads to receive and process a wider range of organic material.
- The installation of a product receival and blending shelter is not a commercially viable option at the site, due to the high cost associated with installing an adequately sized structure for the facility.
- Other outdoor windrow FOGO composting facilities are currently operating in NSW without enclosures which supply high quality compost to the agricultural and mining sectors (Carbon Mate Pty Ltd, 2025; YLAD Living Soils, 2025; Worm Tech, 2025).



CHAPTER 3

DESCRIPTION OF THE MODIFICATION

3 DESCRIPTION OF THE MODIFICATION

3.1 Overview

Bettergrow is seeking approval to modify the SSD-9418 consent to allow:

- an increase in the receival and processing capacity of the facility from 200,000 tpa to 250,00 tpa;
- receival and processing of raw FOGO recovered material (classified as general solid waste (putrescible) under the *Waste Classification Guidelines* (Waste Classification Guidelines) (EPA, 2014)) at the facility;
- installation of a site weighbridge;
- employment of three additional staff; and
- up to five additional light vehicles and 14 additional heavy vehicles to access the site per day.

No changes are required to the existing development footprint, composting processes, site infrastructure, plant, equipment, or operating hours under this modification.

A comparison of the approved project description, its previous modifications and the project is provided in Appendix B.

3.2 Project objectives

The project has the following objectives:

- assist the Australian and NSW governments to meet the waste reduction and resource recovery targets outlined in the National Waste Policy and NSW Waste and Sustainable Materials Strategy;
- support the current and expected future demand for recycled organic compost products driven by urban and industrial development;
- increase employment opportunities within the Singleton LGA;
- support economic development within the Hunter region;
- minimise environmental impacts by utilising the existing facility and site infrastructure; and
- operate the facility in full accordance with local and regional planning requirements and EPL considerations in an environmentally responsible and sustainable manner.

3.3 Maximum processing capacity

The project is seeking to increase the maximum throughput of the facility from 200,000 tpa to 250,000 tpa of organic recovered material.

3.4 Raw FOGO recovered material

The project would enable raw FOGO recovered material to be received and processed at the facility under the ‘The compost order 2016’ issued by the EPA under clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014 (Waste Regulation). The raw FOGO recovered material would consist of a mix of food waste (as defined in Schedule 1 of the POEO Act) and garden waste (as defined in Schedule 1 of the POEO Act). Garden organic recovered material is already approved to be received and processed on-site (refer to Section 1.3.5).

The raw FOGO recovered material is classified as general solid waste (putrescible), as food waste is classified as general solid waste (putrescible) and garden waste is classified as general solid waste (non-putrescible) under the Waste Classification Guidelines.

The ratio/blend of materials used to make up the windrows to be composted will be provided by Bettergrow's Biosolids Manager. Careful consideration is given to each recipe based on the beneficial properties of the material in the compost blend. Section 3 (Process Overview) within the *Operational Environmental Management Plan* (OEMP) (Bettergrow, 2024a) provides further detail on how the waste streams are integrated into the composting operation.

The existing *Composting Management Plan, Including Management for CA-05 Biosecure Treatment of Phylloxera Host Plant Material for Recycling* (Composting Management Plan) (Bettergrow, 2025b) and OEMP (and its associated sub-plans, including the Surface and Groundwater Management Plan, *Waste Management Plan – Bettergrow Ravensworth Composting Facility* (Waste Management Plan) (Bettergrow, 2024b) and other sub-plans) will be reviewed and updated in accordance with the modified consent, subject to approval of the modification application, to ensure they remain fit for purpose.

3.5 Material quantities

The estimated annual throughputs of the different types of recovered organic material that would be received and processed at the facility are outlined in Table 3.1.

Table 3.1 Estimated throughput of recovered organic material streams

Type of organic material	Waste classification[1]	Description	State of material received	Existing tonnage (tpa)	Proposed tonnage (tpa)
FOGO	General solid waste (putrescible)	Food waste and garden waste as defined in Schedule 1 of the POEO Act	Raw – for blending	0	105,000
VENM/ENM	ENM: General solid waste (non-putrescible)	VENM as defined in Schedule 1 of the POEO Act and ENM as defined in the Excavated Natural Material Order 2014	Ready for blending	0	15,000
Garden organics	General solid waste (non-putrescible)	Garden waste (as defined in Schedule 1 of the POEO Act)	Mulched and screened	110,000	57,500
Biosolids	General solid waste (non-putrescible)	Biosolids (as defined in 'The Biosolids Order 2014')	Dewatered – for blending	25,000	42,500
Paper crumble	General solid waste (non-putrescible)	Paper crumble for composting (defined as General or Specific Exempted Waste)	Shredded – for blending	10,000	0
Urban wood residue	General solid waste (non-putrescible)	Urban wood residues for composting (as defined in 'The compost order 2016')	Shredded – for blending	2,500	2,500
Natural organic fibrous material	General solid waste (non-putrescible)	Natural organic fibrous composting material (as defined	Shredded – for blending	2,500	2,500

Type of organic material	Waste classification[1]	Description	State of material received	Existing tonnage (tpa)	Proposed tonnage (tpa)
		in Schedule 1 of the POEO Act)			
Recycled water from Bayswater Power Station	Liquid waste	Wastewater from Bayswater Power Station	Raw – for blending and compost maintenance	25,000	15,000
Animal waste (manure)	General solid waste (non-putrescible)	Animal waste (defined in Schedule 1 of the POEO Act)	Raw – for blending	5,000	10,000
Hydro-excavated drilling mud	General solid waste (non-putrescible)	Drill mud process water (as defined in 'The Treated Drill Mud Order 2014')	Raw – transfer only to another facility for processing	20,000	0
Total				200,000	250,000

1: In accordance with the Waste Classification Guidelines.

3.6 Installation of weighbridge

3.6.1 Weighbridge specifications

A prefabricated weighbridge with associated concrete approaches (ramps) is proposed to be installed in the north-western corner of the site next to the workshop. The weighbridge and its approaches would have a total length of approximately 56 m.

The installation of a weighbridge was initially approved under development consent SSD-9418. The weighbridge was consequently removed from the approved development under Modification 1 as the facility is not considered a 'waste facility' due to the scheduled activity at the site being composting (refer to Section 1.3.3). The weighbridge is proposed under this modification as some organic recovered material that would be received at site may not have been weighed prior to arrival at site.

The proposed location for the weighbridge along the internal access road (refer to Figure 1.3) is approximately 130 m north of the previously approved location. The proposed location for the weighbridge allows sufficient space for light vehicles to pass while heavy vehicles are being weighed, which was not the case for the previously approved location.

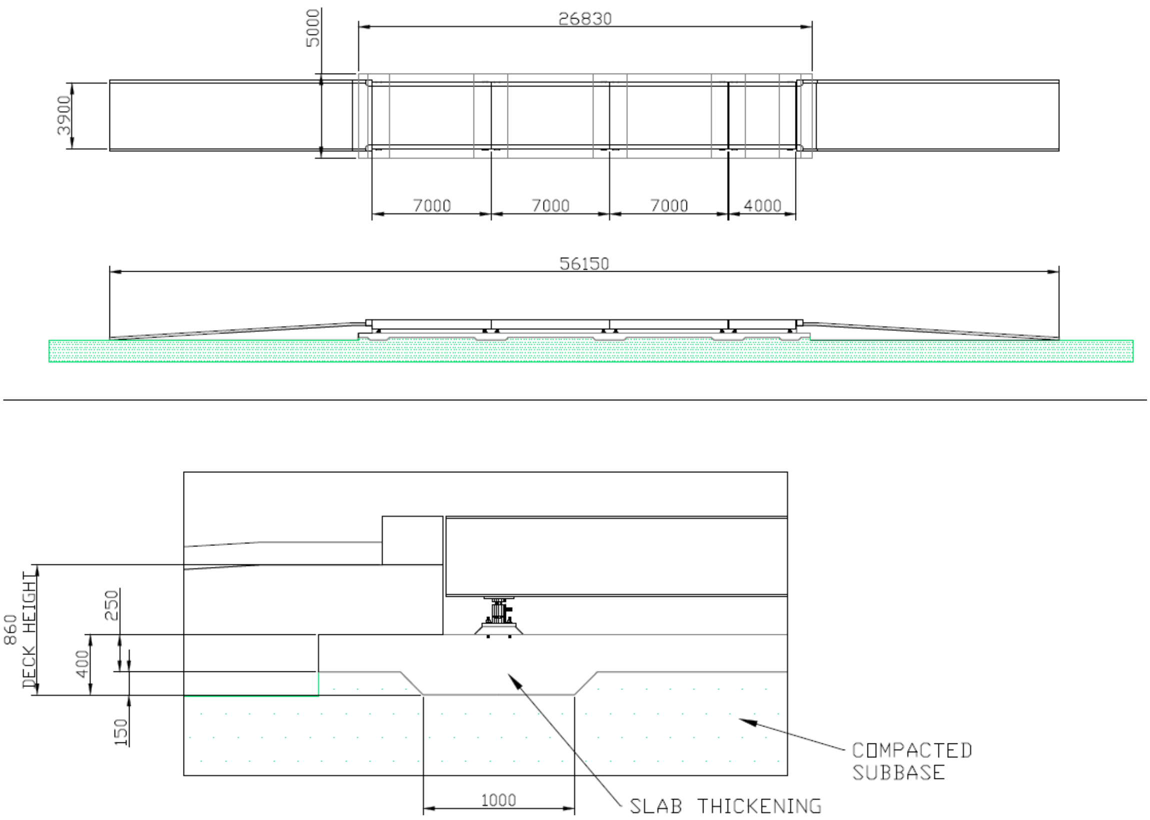
The weighbridge would weigh trucks entering the site with loads of organics, and also weigh outgoing unloaded and loaded trucks.

The weighbridge would be designed to accommodate vehicles up to 27.5 m in length, with the weighbridge structure having a reinforced concrete foundation, steel sub-structure, and concrete deck (approximately 26.8 m in length and 860 mm in height) which would be raised above the surrounding ground surface. The weighbridge would be powered by solar and battery storage.

A typical weighbridge is shown in Figure 3.1 and the indicative design for the weighbridge is shown in Figure 3.2.

Figure 3.1 Typical weighbridge

Figure 3.2 Indicative design of weighbridge



3.6.2 Construction methodology

The installation of the weighbridge involves preparing the site (clearing the construction area and levelling the ground surface), installing the drainage infrastructure, laying the concrete foundation and ramps, assembling the weighbridge modules onto the foundation, installing peripheral equipment (display unit, printers etc.), and electrical cabling and wiring to connect the load cells with the weighbridge's control unit. Once the weighbridge platform and load cells are installed, the system is calibrated to ensure accuracy, and safety and compliance checks are completed to ensure compliance with industry standards and regulations.

3.6.3 Construction timeframe

The construction of the weighbridge would take around five weeks to complete.

3.6.4 Construction hours and workforce

Construction work would be carried out during the recommended standard construction working hours in accordance with the *Interim Construction Noise Guideline* (DECC, 2009) (ICNG), as follows:

- Monday to Friday: 7 am to 6 pm;
- Saturday: 8 am to 1 pm; and
- Sunday and public holidays: no work.

No out of hours work is proposed.

Indicative workforce requirements during construction of the weighbridge are discussed in Section 3.10.

3.6.5 Vehicles, plant and equipment

Indicative vehicles, plant and equipment used during construction of the weighbridge include:

- light vehicles;
- flatbed truck;
- roller;
- mobile crane;
- forklift;
- concrete mixer truck;
- concrete saw;
- concrete vibrator;
- concrete compactor/rammer; and
- hand tools, including power tools and welding equipment.

Indicative vehicle movements during construction of the weighbridge are discussed in Section 3.7.

3.7 Operational processes

Delivery drivers that arrive at the site without a weighbridge docket would be directed to the proposed on-site weighbridge to record details such as the quantity, type and source of waste, as well as the vehicle registration, driver signature and the materials' origin.

No changes are proposed to any other operational processes as described in Section 1.3.5.

3.8 Traffic, access and parking

Up to four additional light vehicles and one additional heavy vehicle would access the site per day during construction of the weighbridge, resulting in up to eight additional light vehicle movements (four in-bound and four out-bound) and two additional heavy vehicle movements (one in-bound and one out-bound) per day.

To facilitate transportation of the additional 50,000 tpa of organic recovered material to and from the site over the next 10 years, up to 14 additional heavy vehicles would be required to access the site per day, resulting in up to 28 additional heavy vehicle movements per day (14 in-bound and 14 out-bound).

The project would continue to import organic recovered material along the internal access road, Lemington Road and beyond via the same transportation routes (refer to Section 1.3.5).

Three additional staff are required to support increased processing capacity at the facility (refer to Section 3.10). Up to five additional light vehicles used by administrative, operational and maintenance personnel (some of which would carpool), would access the site per day, resulting in up to 10 additional light vehicle movements per day.

No changes are proposed to the existing parking or access arrangements.

3.9 Hazardous substances and dangerous goods

The project would result in an estimated 20% (27.8 kL) increase in diesel consumption per year during operation, resulting in up to 172.6 kL of diesel consumed per year.

Under Modification 2, a new 65,000 L above ground self-bunded diesel tank would be installed next to the existing 5,000 L diesel tank (refer to Section 1.4).

The project would not result in any other changes to the existing storage, handling or processing of hazardous substances or dangerous goods at the site during construction or operation.

3.10 Employment

Four additional personnel would be required to construct the weighbridge.

Three additional staff, including administrative and operational staff, are required to support increased processing capacity at the facility. The project would continue to provide employment for the existing 10 full time staff.

3.11 EPL variation

Bettergrow holds EPL 7654 for the facility, issued under Section 55 of the POEO Act. The EPL was first issued in September 2000 and last modified on 12 August 2024 (Notice number 1639204) (refer to Section 1.3.4).

EPL 7654 authorises the carrying out of scheduled and fee-based activities at the premises, as summarised in Table 3.2.

Table 3.2 Scheduled activities authorised by EPL 7654

Scheduled activity	Fee based activity	Scale
Composting	Composting	>50000 T annual capacity to receive organics

Condition L3.1 of EPL 7654 specifies the types of waste that may be received for composting at the site. Condition L3.2 states that the maximum amount of waste that may be received at the facility per year is 200,000 t.

Subject to the approval of this modification application, Bettergrow will request a variation to the EPL in consultation with the EPA, to increase the maximum amount of waste that may be received at the facility per year to 250,000 t, and include the receival and processing of raw FOGO recovered material.

3.12 Qualification as a modification

Section 4.55(2) of the EP&A Act allows for a modification of a development where the consent authority is 'satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all)'.

The term 'substantially' means 'essentially or materially having the same essence'. Therefore, the assessment is not focused on whether the changes are 'minor' or 'minimal', but rather whether the resultant development (the development as modified) is still, in its essence, the same development that was originally approved.

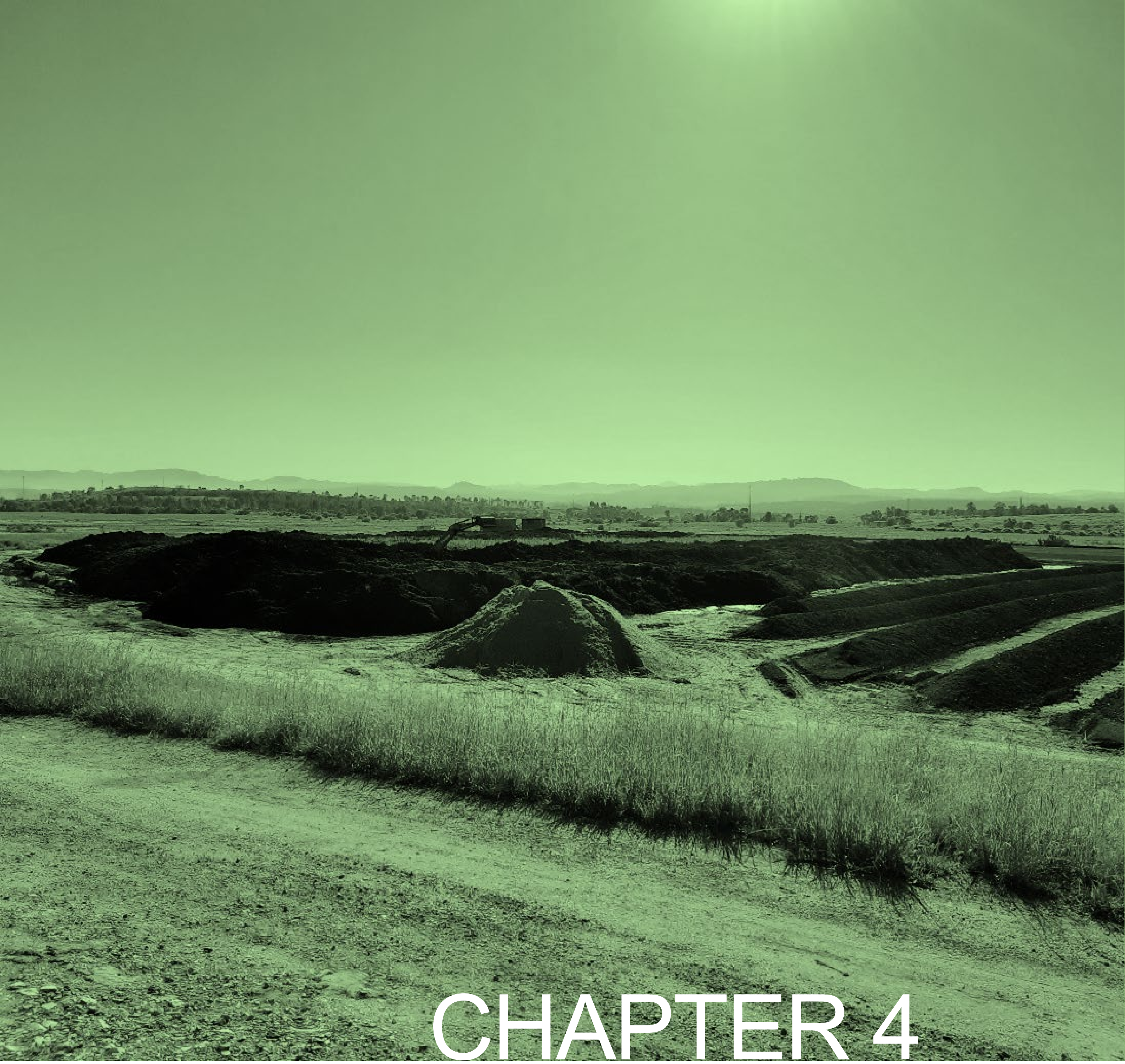
It is considered that the proposed modification would be substantially the same development as originally approved in SSD-9418 for the following reasons:

- There would be no change to the approved use of the facility as a 'waste or resource management facility' (or more specifically a 'resource recovery facility').
- The proposed modification does not seek to introduce new unrelated elements or expand the physical extent of the approved composting operations beyond the established operational area. The existing core components (approved development footprint, site layout, site infrastructure, plant and equipment, site operations and operating hours) and functionality (the composting of organic recovered material) of the composting facility would be maintained.
- The proposed modification would not affect the nature of the processes carried out on-site or the method of operation of the development, as originally approved.
- The essence of the development remains the composting of organic recovered material to provide compost products suitable for mine site rehabilitation and agricultural uses. The modification aims to enhance this existing, approved function by processing a larger range and quantity of organic material to assist the Australian and NSW governments to meet their waste reduction and resource recovery targets and support the current and expected future demand for recycled organic compost products in the Hunter region.
- The proposed modification would result in minimal to negligible air and noise impacts at the nearest sensitive receivers, a minimal impact on intersection and road network performance, and contamination risks during construction and operation (refer to sections 6.2, 6.3, 6.4 and 6.5). With the implementation of the existing mitigation and management measures, these impacts would be minimal or negligible. The existing OEMP (including associated sub-plans) and Composting Management Plan will be updated to reflect the expanded operation and consider any additional contaminants (refer to Section 3.4).
- The proposed modification would not result in any impacts on:

  - biodiversity, including native vegetation, threatened ecological communities, populations or species;
  - Aboriginal or historic heritage;
  - visual amenity;
  - public transport, active transport, access and parking; and
  - waste management;

- The environmental impacts associated with the modification are manageable and do not alter the overall environmental impact profile of the development in a way that would render it a different development.

In summary, the proposed modification would have the 'same essence' and be materially the same as the approved development under SSD-9418, and would not involve a radical transformation of, the originally approved composting facility. The development, as proposed to be modified, is therefore substantially the same as that for which consent was originally granted. As such, the proposed modification can be appropriately assessed and approved under Section 4.55(2) of the EP&A Act.



CHAPTER 4
STATUTORY CONTEXT

4 STATUTORY CONTEXT

4.1 Commonwealth legislation

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the primary environmental legislation at the Federal level. The EPBC Act is administered by the Australian government DCCEEW, and provides a legal framework to protect and manage national and international important flora, fauna, ecological communities and heritage places, defined under the EPBC Act as MNES. The EPBC Act also confers jurisdiction over actions that have a significant impact on the environment where the actions affect, or are taken on, Commonwealth land.

An action that has, will have or is likely to have a significant impact on a MNES or Commonwealth land may not be undertaken without prior approval from the Australian Minister for the Environment and Water, as provided under Part 9 of the EPBC Act.

The protected matters search tool (PMST) is managed by the Australian government DCCEEW and is used to identify MNES within the proximity of a project. A search of the PMST was undertaken on 14 April 2025 for MNES and Commonwealth land within a 10 km radius of the site. The results of the search are presented in Table 4.1.

Table 4.1 EPBC Act Protected Matters

Protected matter	Comments
MNES	
World heritage properties	There are no world heritage properties within 10 km of the site.
National heritage places	There are no national heritage places within 10 km of the site.
Wetlands of international importance (listed under the Ramsar Convention)	The site is between 50 km and 100 km from two wetlands of international importance (Hunter Estuary Wetlands). The project is not expected to result in any potential impacts on these wetlands (refer to Section 6.6).
Listed threatened species and ecological communities	Eight TECs may occur within 10 km of the site, namely: ▪ Central Hunter Valley eucalypt forest and woodland (critically endangered); ▪ Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (endangered); ▪ Hunter Valley Weeping Myall (Acacia pendula) Woodland (critically endangered); ▪ Lowland Rainforest of Subtropical Australia (critically endangered); ▪ River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria (critically endangered); ▪ Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions (endangered); ▪ Warkworth Sands Woodland of the Hunter Valley (critically endangered); and ▪ White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (critically endangered).

Protected matter	Comments
	A total of 49 nationally listed threatened species, including 19 bird species, 2 frog species, 11 mammal species, 15 plant species and 2 reptile species, may occur within a 10 km radius of the site. The project does not involve the removal of native vegetation. The prefabricated weighbridge would be installed on previously disturbed cleared land. The project is not likely to impact any nationally listed threatened species, populations, ecological communities or their habitat (refer to Section 6.6).
Migratory species protected under international agreements	The PMST lists a total of 10 migratory species that may occur within 10 km of the site. The project would not impact on potential habitat for marine bird species (refer to Section 6.6).
Commonwealth marine area	There are no Commonwealth marine areas in the vicinity of the site.
The Great Barrier Reef Marine Park	The Great Barrier Reef Marine Park is not in the vicinity of the site.
Nuclear actions (including uranium)	There are no nuclear actions within the vicinity of the site.
A water resource, in relation to coal seam gas development and large coal mining development	This is not applicable to the project.
Commonwealth land	
Commonwealth land	The site is not located on Commonwealth land. There are two parcels of Commonwealth land (Australian Telecommunications Corporation [12615] and Telstra Corporation Limited [12614]) within 10 km of the site. The project is not expected to result in any potential impacts on this land.

The assessment of the project's impact on MNES and the environment of Commonwealth land, found that there is unlikely to be a significant impact on MNES or on Commonwealth land. Accordingly, the project has not been referred to the Australian government DCCEEW under the EPBC Act.

4.1.2 Native Title Act 1993

The *Native Title Act 1993* recognises that Aboriginal people have rights and interests to land and waters which derive from their traditional laws and customs. Native title may be recognised in places where Indigenous people continue to follow their traditional laws and customs and have maintained a link with their traditional country. It can be negotiated through a Native Title Claim, an Indigenous Land Use Agreement or future act agreements.

A search of the National Native Title Tribunal registers, including the National Native Title Register, Register of Native Title Claims, Register of Indigenous Land Use Agreements and Native Title Application, Registration Decision and Determination records, was carried out on 14 April 2025.

No Native Title has been prescribed for the land on which the project is proposed and therefore no further approval is required under the NT Act.

4.1.3 National Greenhouse and Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting Act 2007* provides a single national framework for the reporting and dissemination of information about the greenhouse gas emissions, greenhouse gas projects, and energy use and production of corporations. It makes registration and reporting mandatory for corporations whose energy production, energy use or greenhouse gas emissions meet specified thresholds.

The facility does not trigger any of the thresholds for reporting under the NGER Act (refer to Section 6.2.6).

4.2 NSW legislation

4.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act is the principal piece of legislation governing the assessment and determination of development applications in NSW. Implementation of the EP&A Act is the responsibility of the Minister for Planning and Public Spaces, statutory authorities and local councils.

Section 4.55 of the EP&A Act sets out the requirements for modifications to existing development consents. Bettergrow is seeking to modify the existing development consent under Section 4.55(2) of the EP&A Act, which provides for modification of a development where the consent authority 'is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which the consent was originally granted and before that consent as originally granted was modified (if at all)'. A summary of how the modification meets the criteria for a modification under Section 4.55(2) is provided in Table 4.2.

Table 4.2 Section 4.55(2) modification requirements

Clause and requirements	Comments
4.55 Modifications of consents – generally (cf previous s 96) (2) Other modifications. A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if--	This application seeks to modify development consent SSD-9418 under Section 4.55(2).
(a) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all), and	As outlined in Section 3.12, the proposed modification will be substantially the same as the existing development.
(b) it has consulted with the relevant Minister, public authority or approval body (within the meaning of Division 4.8) in respect of a condition imposed as a requirement of a concurrence to the consent or in accordance with the general terms of an approval proposed to be granted by the approval body and that Minister, authority or body has not, within 21 days after being consulted, objected to the modification of that consent, and	Consultation was carried out with the EPA to introduce the modification application and discuss the scope of the environmental assessment (refer to Section 5.1.2). The EPA has not objected to the modification of the consent, providing the issues raised during the consultation meeting be addressed in the modification report.
(c) it has notified the application in accordance with – (i) the regulations, if the regulations so require, or (ii) a development control plan, if the consent authority is a council that has made a development control plan that requires the notification or advertising of applications for modification of a development consent, and	The modification application will be submitted to DPHI, who will notify the application in accordance with Section 106 of the NSW Environmental Planning and Assessment Regulation 2021 (EP&A Regulation), and make it publicly available on the Major Projects portal.
(d) it has considered any submissions made concerning the proposed modifications within the period prescribed by the regulations or provided	DPHI will need to consider any submissions received in relation to the proposed modification.

Clause and requirements	Comments
by the development control plan, as the case may be.	
Subsections (1) and (1A) do not apply to such a modification.	Subsections (1) and (1A) do not apply to this modification.
(3) In determining an application for modification of a consent under this section, the consent authority must take into consideration such of the matters referred to in section 4.15(1) as are of relevance to the development the subject of the application. The consent authority must also take into consideration the reasons given by the consent authority for the grant of consent that is sought to be modified.	The relevant matters for consideration are addressed in Table 4.3. The proposed modification would not alter or impact the reasons given by the consent authority for the granting of development consent SSD-9418.
(4) The modification of a development consent in accordance with this section is taken not to be the granting of development consent under this Part, but a reference in this or any other Act to a development consent includes a reference to a development consent as so modified.	Noted.

Prior to the preparation of this modification report, DPHI was consulted regarding the most appropriate planning approval pathway for the proposed modification (refer to Section 5.1.1). DPHI confirmed that the modification application should be submitted and assessed under Section 4.55(2) of the EP&A Act, as the development (as modified) will be substantially the same development as the development for which consent was originally granted. It was confirmed with DPHI that SEARs are not required for the modification.

Section 4.55(3) of the EP&A Act requires the consent authority to take into account those matters under Section 4.15(1) of the EP&A Act that are of relevance to the proposed modification. The relevant matters for consideration under Section 4.15(1) of the EP&A Act are addressed in Table 4.3.

Table 4.3 Section 4.15(1) evaluation

Section and requirement	Comment
4.15(1) Matters for consideration – general In determining a development application, a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the development application: (a) the provisions of -	-
(i) any environmental planning instrument, and	All relevant environmental planning instruments are considered in Section 4.2.3.
(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and	There are no applicable draft instruments for consideration.
(iii) any development control plan, and	Section 2.10 of the SEPP (Planning Systems) 2021 (Planning Systems SEPP) states that development control plans (DCPs) do not apply to SSD. As such, it is not a mandatory requirement for the proposal to be assessed against the Singleton DCP 2014.

Section and requirement	Comment
(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and	There is no Voluntary Planning Agreement (VPA) or draft VPA that applies to the modification proposal or the site.
(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph),	Refer to Section 4.2.2.
(v) (Repealed)	-
(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,	Refer to Chapter 6
(c) the suitability of the site for the development,	The suitability of the site as an organics composting facility was determined through approval of SSD-9418. As shown by the recent environmental audit and compliance report results (refer to Section 1.5), the existing approved operations have been performing in accordance with the requirements of SSD-9418 and EPL 7654. The results indicate that the site is highly suitable for the existing composting operation and that the operation is being managed appropriately. The site remains suitable for the proposed modification as: ▪ no changes are required to the development footprint, composting processes, site infrastructure, plant, equipment, or operating hours; ▪ the modification is unlikely to result in any adverse environmental impacts as the site is located in a highly disturbed environment in a mining complex, a significant distance (approximately 6 km) away from sensitive receivers (refer to Chapter 6); ▪ any potential impacts can be adequately minimised and managed through the existing site-specific mitigation and management measures; and ▪ the modified development is expected to maintain its high level of compliance.
(d) any submissions made in accordance with this Act or the regulations,	Bettergrow will respond to any government agency or public submissions received that DPHI requests a response to.
(e) the public interest.	The proposed modification is considered to be in the public interest, as discussed in Section 2.4.1.

4.2.2 Environmental Planning and Assessment Regulation 2021

Section 100(1) of the EP&A Regulation outlines the requirements for modification applications. Table 4.4 lists the relevant requirements and where they have been addressed in this report.

Table 4.4 Requirements of Section 100(1) of the EP&A Regulation

Clause requirement	Comments
(1) A modification application must contain the following information—	
(a) the name and address of the applicant,	Section 1.2
(b) a description of the development that will be carried out under the consent,	Section 1.3 and Chapter 3
(c) the address and folio identifier of the land on which the development will be carried out,	Section 2.1.1
(d) a description of the modification to the development consent, including the name, number and date of plans that have changed, to enable the consent authority to compare the development with the development originally approved,	Chapter 3
(e) whether the modification is intended to— (i) merely correct a minor error, misdescription or miscalculation, or (ii) have another effect specified in the modification application,	Section 4.2.1
(f) a description of the expected impacts of the modification,	Chapter 6
(g) an undertaking that the modified development will remain substantially the same as the development originally approved,	Sections 3.12 and 4.2.1
(h) for a modification application that is accompanied by a biodiversity development assessment report—the biodiversity credits information,	N/A
(i) if the applicant is not the owner of the land—a statement that the owner consents to the making of the modification application,	Landowner's consent is required from AGL for the modification application.
(j) whether the modification application is being made to— (i) the Court under the Act, section 4.55, or (ii) the consent authority under the Act, section 4.56.	The application is being made to the consent authority under Section 4.55(2) of the EP&A Act.

4.2.3 Environmental Planning Instruments

The relevant environmental planning instruments (EPIs) considered in relation to the project are summarised in Table 4.5.

Table 4.5 Relevant EPIs

SEPP	Overview
State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP)	Section 2.6 and Schedule 1 of the Planning Systems SEPP declare certain development to be SSD. The existing facility currently receives and processes up to 200,000 tpa of organic recovered material. The current development is classified as SSD under Part 4, Division 4.7 of the EP&A Act, in accordance with the categories and thresholds listed under clause 23(3) of Schedule 1 of the Planning Systems SEPP, being: '23 Waste and resource management facilities (3) Development for the purpose of resource recovery or recycling facilities that handle more than 100,000 tonnes per year of waste' The project would increase the throughput of the facility to 250,000 tpa of organic recovered material and remains appropriately characterised as SSD.
State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP)	Chapter 2 of the Biodiversity and Conservation SEPP aims to protect and preserve trees and other vegetation in non-rural areas of the State. Section 2.3 of the Biodiversity and Conservation SEPP identifies the land to which Chapter 2 of the SEPP applies. The Singleton LGA is not listed in Clause 2.3(a) and therefore the provisions of Chapter 2 of the SEPP do not apply to the project. Nevertheless, it is not proposed to clear any vegetation as part of the project.

SEPP	Overview
State Environmental Planning Policy (Transport & Infrastructure) 2021 (TISEPP)	The TISEPP provides a consistent planning regime for infrastructure and the provision of services across NSW, along with providing for consultation with relevant public authorities during the assessment process. It further specifies when consent is (and is not required) for infrastructure development when carried out in certain zones. The current development was deemed permissible with consent under Clause 2.153(2)(a) of the TISEPP, as the development is considered a waste or resource management facility for the purposes of the TISEPP, and is located on land zoned as RU1 (Primary Production), defined as a 'prescribed zone' under Section 2.152 of the TISEPP. The project would not change the classification of the development as a waste or resource management facility or the permissibility of the development under the TISEPP. Under Section 2.122 of the TISEPP, DPHI is required to provide written notice of development applications for certain traffic-generating developments listed in columns 2 and 3 of Schedule 3 of the TISEPP to Transport for NSW, and consider any response to the notice that is received from Transport for NSW within 21 days after the notice is given. The project is classified as traffic-generating development under Schedule 3 of the TISEPP, as it involves an increase in processing capacity at a resource management facility that has direct access to a road. The project would result in an increase in light and heavy vehicle movements, however is expected to have a minimal impact on the transport network (refer to Section 6.5). However, the modification application will still need to be referred to Transport for NSW.
State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP)	Chapter 3 of the Resilience and Hazards SEPP requires the consent authority to consider whether an industrial proposal is a potentially hazardous industry or a potentially offensive industry. Potentially hazardous or offensive development is defined by the Resilience and Hazards SEPP as development which poses a significant risk to, or which would have a significant adverse impact on, human health, life, existing or likely future development or the biophysical environment, when all measures proposed to reduce or minimise its impacts have been implemented. The preliminary risk screenings conducted for the SSD EIS and Modification 1 SEE concluded that the proposed development would not be classified as a potentially 'offensive' or 'hazardous' development in accordance with the SEPP 33 Guidelines. A Preliminary Hazard Assessment (PHA) was not required for the EIS or Modification 1 SEE under the Resilience and Hazards SEPP. The project would result in an estimated 20% (27.8 kL) increase in diesel consumption per year during operation (refer to Section 3.9). No other changes to the existing storage, handling or management of hazardous substances or dangerous goods at the site are proposed. The project would not change the risk screening analysis of the existing development, as diesel on-site would be stored within a self-bunded tank and an above ground portable fuel tank on a bunded hardstand area, and would not be stored with other flammable/combustible liquids/materials, and is therefore not considered a potential hazardous substance under the SEPP 33 Guidelines (refer to Section 6.6). A PHA is not required to support the modification application under the Resilience and Hazards SEPP. Chapter 4 of the Resilience and Hazards SEPP aims to provide a State-wide planning approach to the remediation of contaminated land and to reduce the risk of harm to human health and the environment by considering contaminated land as part of the planning process. Under Section 4.6 of the Resilience and Hazards SEPP, a consent authority must not consent to the carrying out of development on land unless it has considered potential contamination issues. Waste storage and treatment is listed in Table 1 of *Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land*

SEPP	Overview
	(Department of Urban Affairs and Planning, 1998) as an activity that may cause contamination. Despite this, there is no known contamination on the site and no duty to report contamination to the EPA under Section 60(3) of the CLM Act (refer to Section 2.2.6). The project has the potential to increase contamination risks at the site due to: ▪ additional contaminants of potential concern and physical contaminants (e.g. litter) in the feedstock; and ▪ increased refuelling of plant and vehicles to facilitate increased production at the facility that may result in accidental leaks or spills. The existing OEMP (and associated sub-plans) and Composting Management Plan will be updated to reflect the expanded operation and consider any additional contaminants of potential concern (refer to Section 3.4). With the implementation of the mitigation and management measures provided in the SSD EIS, contamination risks are expected to be minimal (refer to sections 6.3.4 and 6.6). On the basis that the site has previously been found to be suitable for its current use, it is considered that the project is consistent with the requirements of the Resilience and Hazards SEPP and that it can be determined without further contamination assessment.
Singleton LEP	The site is zoned RU1 (Primary Production) under the Singleton LEP. Resource recovery facilities are not defined as 'permitted without consent' or 'permitted with consent' in land use zone RU1 (Primary Production), and is thereby considered prohibited development in this land use zone. However, the TISEPP prevails over the Singleton LEP where there is inconsistency between the two EPIs (refer to Section 2.7 of the TISEPP). The project would not change the permissibility of the development under the TISEPP, as discussed above.

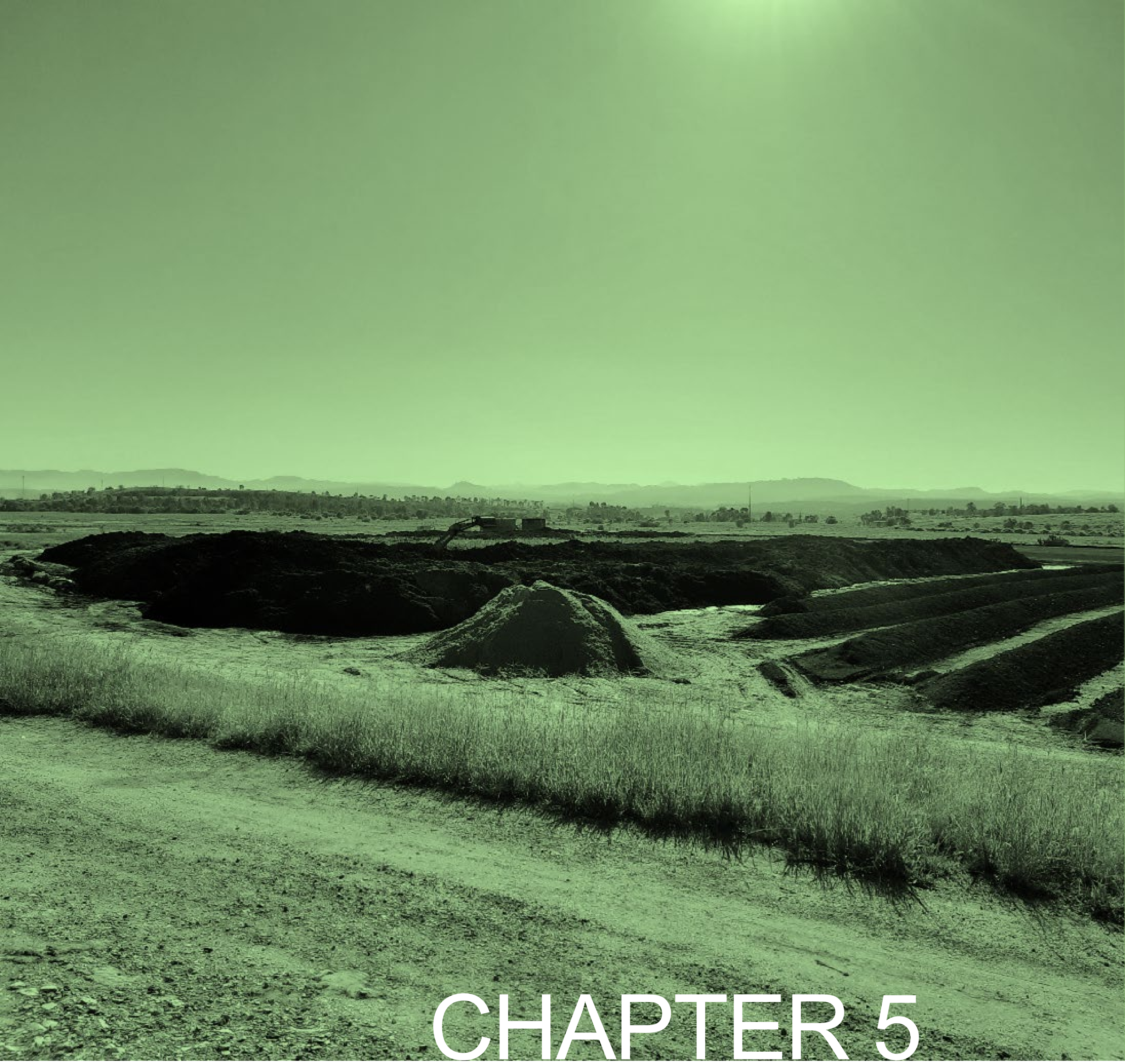
4.2.4 Other NSW legislation

Approvals that were required for the approved development under other NSW legislation, in addition to the approval required under Part 4 of the EP&A Act, are summarised in Chapter 5 of the SSD EIS. These approvals are replicated in Table 4.6 below and any changes to the requirements resulting from the project are noted.

Variation of EPL 7654 will be sought in consultation with the EPA to include the receival and processing of raw FOGO recovered material as acceptable feedstock and increase the throughput of the facility from 200,000 tpa to 250,000 tpa, subject to the approval of the development application.

Table 4.6 Summary of other approvals

Legislation	Authorisation	Approving authority	Change required for project
POEO Act	EPL for the scheduled activity 'composting'	EPA	The project will require a variation to EPL 7654 to include the receival and processing of raw FOGO recovered material and increase the throughput of the facility to 250,000 tpa, subject to approval of the modification application.



CHAPTER 5

COMMUNITY AND STAKEHOLDER ENGAGEMENT

5 COMMUNITY AND STAKEHOLDER ENGAGEMENT

5.1 Government agencies

Bettergrow and Element have consulted with DPHI, the EPA, Council, Transport for NSW and Subsidence Advisory NSW in relation to the project, as discussed in the following sections.

5.1.1 DPHI

Bettergrow and Element held an online scoping meeting with DPHI's Industry Assessments team on 10 April 2025, to inform the team about the project and confirm the approval pathway, scope of the impact assessments and consultation requirements.

At this meeting, it was agreed that:

- Element would progress Modification 3 as a Section 4.55(2) modification application.
- The proposed scope of the environmental assessment, as outlined in the Scoping Report (Element Environment, 2025), is acceptable to DPHI.
- The modification report will need to demonstrate that the modification will have a minimal impact on the environment, specifically in relation to potential air quality, leachate management and contamination impacts (refer to sections 6.2 and 6.3).

Following the scoping meeting, DPHI officers confirmed in an email dated 29 April 2025 that the proposed modification would fall within the scope of a Section 4.55(2) modification.

5.1.2 EPA

Bettergrow and Element held an online meeting with the EPA on 2 June 2025 to introduce the modification application and discuss the scope of the environmental assessment.

Issues raised by the EPA and sections where these have been addressed are summarised in Table 5.1.

Table 5.1 Issues raised by EPA

Issue	Section(s) where addressed
Relevant advice previously provided by the EPA on the SSD EIS and Submissions Report should be considered, including:	
▪ Describe odour mitigation and management measures.	Section 6.2 and Appendix C
▪ Benchmark odour mitigation and management measures against best practice (including the enclosure or covering of food waste composting).	Sections 2.4.2 and 6.2 and Appendix C
▪ Provide sample testing reports to verify emission rates from site sampling.	Section 6.2
▪ Consider cumulative odour impacts resulting from the neighbouring compost facility.	Section 6.2
▪ Assess the model generated meteorological data used in the dispersion assessment against longer term (minimum five years)	Section 6.2

Issue	Section(s) where addressed
meteorological data as required in the Approved Methods.	
▪ The dust assessment should assess $PM_{2.5}$ and correctly reference the guideline.	Section 6.2
▪ Detail the expected quantity of each waste type proposed to be accepted at the premises, including the state of the waste received (i.e. raw, screened, processed, pre-blended, partially composted etc.).	Section 3.5
▪ The EPA generally requires any processing or composting of food wastes to be conducted within an enclosed space. If the applicant wishes to deviate from this standard, it will be required to provide justified alternatives that can demonstrate the same level of control gained by enclosing the operation.	Sections 2.4.2 provides justification why an enclosure has not been considered for the project. Section 6.2 demonstrates that potential odour impacts of the project would be minimal and remain well below the most stringent EPA impact assessment criteria at the nearest sensitive receivers in Camberwell.
▪ Include the categorisation of the various organic wastes proposed to be accepted.	Sections 1.3.5 and 3.5
The key issues for the project are potential odour impacts, including cumulative odour impacts, and stormwater and leachate management.	Sections 1.3.5, 6.2 and 6.3
Modelling and assessment of impacts should be undertaken in accordance with EPA approved methods.	Chapter 6

5.1.3 Council

Bettergrow and Element held an online meeting with a representative of Council's planning team on 28 August 2025, to inform the team about the project and obtain any feedback from Council on potential environmental risks.

Council requested that relevant advice previously provided by the Council on the SSD EIS and Submissions Report and concerns discussed during the meeting be considered. These issues and the sections where they have been addressed are summarised in Table 5.2.

Table 5.2 Issues raised by Council

Issue	Section(s) where addressed
Clarification on the interaction between the existing and future approval requirements, including the management plans and controls that will be required.	Chapter 6
Potential impacts of the existing and proposed development on surrounding land uses, including future land use.	Section 6.1 and Section 4.4 of the Submissions Report
The surface and groundwater management plan should be updated to support the proposed development.	Section 3.4
Adequacy of existing stormwater and leachate management systems to manage leachate generated by the proposed development.	Sections 1.5 and 6.3
Prevention measures that will be implemented to prevent material/matter being tracked by vehicles from the site.	Appendix B
Prevention measures that will be implemented to prevent material entering the waterways and groundwater system.	Appendix B

Issue	Section(s) where addressed
Information is required regarding the use and management of the vehicle wash-down bay, including how the bay will be monitored to ensure all vehicles utilising it are minimising the risk of material being transported off site.	Appendix B and Section 4.4 of the Submissions Report
Measures that will be implemented to prevent soil contamination, particularly from fuel and chemical storage areas, and materials brought into the facility.	Appendix B and Section 3.4
Structural integrity of the leachate and surface water containments, seepages and leakage.	Section 1.5 and the OEMP
Adequacy of controls in water management plans to mitigate impacts of the proposed development.	Sections 1.5 and 3.4, and the Surface water and Groundwater Management Plan
Potential cumulative odour impacts from a different array of material sources should be assessed and where required additional controls implemented.	Section 6.2
The existing management plans and controls should be updated with the new waste types.	Section 3.4
Further information is required on the management of residual wastes generated at the site, including expected contamination rates and management.	Section 6.6 and the OEMP
More information on the decommissioning and rehabilitation of the site once operations cease. Council and the community should be consulted during these phases of the facility.	Chapter 7 of the SSD EIS
The existing facility is located within a Phylloxera Exclusion Zone, and Council notes that material imported into the facility can come from areas that are Phylloxera infested, including the Sydney Basin. Council requires clarification on the current and future proposed controls for ensuring that the facility and its products will be Phylloxera free and will not pose any risk to the internationally recognised viticultural region of the Hunter Valley, including pathogen management and any adaptive management responses should Phylloxera be detected at the site.	The OEMP, Composting Management Plan and *Transport Management Plan for Part A & Part B of CA-05 Biosecure Transport of Host Plant Material Bettergrow Ravensworth Compost Facility* (Bettergrow, 2023) outline mitigation and management measures to ensure any biosecurity risks (including potential infestation and spread of Phylloxera) at the site are minimised.
Adequacy and effectiveness of existing controls to manage and mitigate potential cumulative dust impacts due to vehicle movements.	Sections 1.5 and 6.2.6
Adequacy or effectiveness of the existing controls, or the ability of these controls to manage and mitigate the potential impacts of the proposed development.	Section 1.5 and Chapter 6
Potential impacts on the road network.	Section 6.5

5.1.4 Transport for NSW

5.1.5 Subsidence Advisory NSW

The site is located within the Patrick Plains Mine Subsidence District (refer to Section 2.2.7).

A project notification letter was sent to Subsidence Advisory NSW on 28 July 2025 to provide information and invite feedback on the project.

Subsidence Advisory NSW advised that the site is located on land subject to a mining lease (ML 1349) held by Glencore Newpac Pty Ltd (Glencore). Subsidence Advisory NSW recommended that Glencore be contacted to confirm potential future subsidence impacts to the site and that proposed structures be designed to remain serviceable for predicted subsidence impacts if applicable.

Glencore has been contacted regarding potential future mine subsidence or ground settlement at the site. At the time of writing, no response has been received from Glencore.

The proposed new prefabricated weighbridge will be constructed in accordance with Australian Standards to minimise any potential impacts in the event of potential ground settlement or mine subsidence (refer to Section 3.6). Subsidence Advisory NSW have not provided any design specifications for the weighbridge.

5.2 Local community and stakeholders

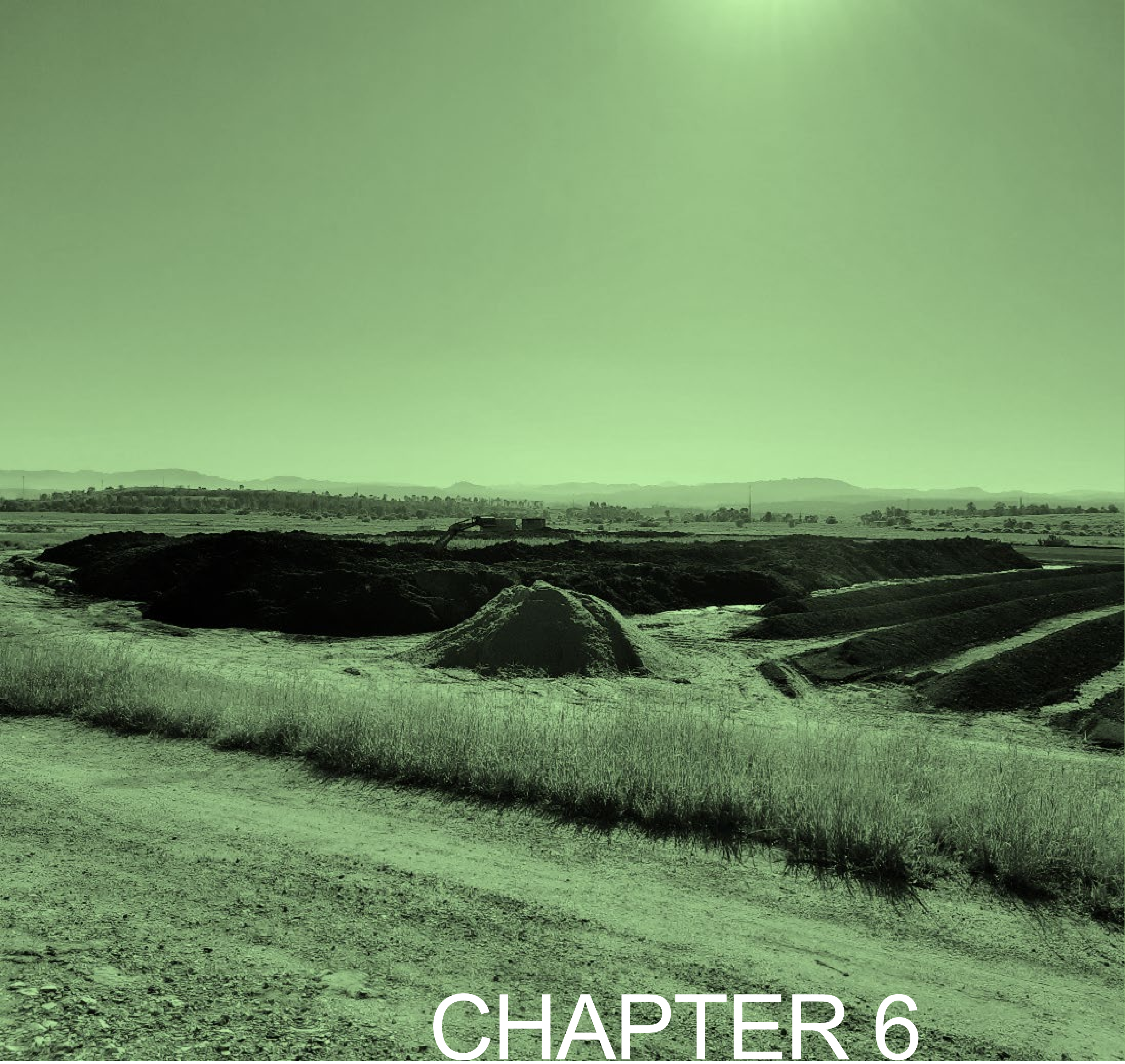
Bettergrow undertook consultation with key stakeholders and the local community during preparation of the modification report. A project factsheet was mailed to surrounding mine operators and businesses, and residents in Camberwell. A total of 66 copies were distributed. The factsheet:

- identified the proponent;
- outlined the planning approval history for the facility and justification for the proposed modifications;
- summarised the proposed modifications for the facility (including Modification 2 described in Section 1.4);
- outlined the statutory planning process; and
- invited feedback and provided contact details for feedback.

At the time of writing, no feedback on the letter has been received.

5.3 Landowner's consent

Landowner's consent is required from AGL for the modification application.



CHAPTER 6
ASSESSMENT OF IMPACTS

6 ASSESSMENT OF IMPACTS

6.1 Introduction

The key environmental issues associated with the approved development were assessed in detail in the SSD EIS.

As required by Section 4.55(3) of EP&A Act, DPHI is to take into account those matters listed under Section 4.15(1) of the EP&A Act (as relevant) when determining an application to modify an existing development consent.

Section 4.15(1)(b) of the EP&A Act requires the consent authority to consider the following:

> ‘The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality.’

This chapter summarises the likely impacts of the project, including environmental impacts on both the natural and built environments, and social and economic impacts on the locality.

Environmental risks were analysed prior to the preparation of this modification report to identify the key potential environmental impacts associated with the project. Potential air quality, noise, surface water and traffic impacts are considered to be the key issues associated with the project and are considered further via a detailed assessment provided in sections 6.2 to 6.5.

Low-risk environmental aspects were considered via a standard assessment and are summarised in Section 6.6.

Environmental matters that were not assessed in the EIS have not been considered in this report as they will not be impacted by the project.

6.2 Air quality

An assessment of potential dust, greenhouse gas and odour impacts of the approved development was provided in Appendix G and Section 9.1 of the SSD EIS.

6.2.1 Methodology

The potential impacts on air quality associated with the operation of the project are assessed in the *Air Quality Impact and Greenhouse Gas Assessment* (Todoroski Air Sciences, 2025b) provided in Appendix C. The findings of the report are summarised in this section.

The air quality impact assessment has been undertaken in accordance with the following guidelines:

- *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA Approved Methods) (EPA, 2022b);
- *Technical framework – Assessment and management of odour from stationary sources in NSW* (NSW Department of Environment and Conservation (DEC), 2006a);
- *Guidance on the assessment of dust from demolition and construction* (Institute of Air Quality Management (IAQM), 2024); and
- *NSW Guide for Large Emitters* (NSW Guide for Large Emitters) (EPA, 2025b).

The assessment involved:

- reviewing publicly available air quality monitoring data, local topography and climate and meteorological data, to characterise the background air quality environment and identify the topographic features and climate and meteorological conditions that may influence air quality;
- reviewing previous environmental investigations undertaken for the facility and current environmental management processes and license requirements relating to air quality;
- identifying sensitive receivers for air quality in the surrounding area;
- identifying the main types and sources of air emissions during construction and operation;
- estimating emission rates from each air emission source. Odour monitoring was undertaken at the Valoriza composting facility in Dandenong South, Victoria, to establish odour emission rates of the raw FOGO recovered material (refer to the 'Odour assessment' section below);
- developing an air dispersion model using a combination of the CALPUFF modelling system and the Weather Research and Forecasting model (WRF) for a potential worst-case operating scenario to determine the extent and severity of potential odour and dust impacts. The CALPUFF modelling system combines estimated emission rates, neighbouring emission sources, emission controls and local meteorology to predict incremental and cumulative air quality impacts;
- quantitatively analysing and assessing operational air quality with reference to measured background levels, including cumulative impacts with the existing facility, Modification 2 and other odour sources in the area;
- quantitively estimating operational greenhouse gas emissions; and
- identifying management and mitigation measures required to avoid, minimise, and manage any potential air quality impacts during the project's construction and operation.

Odour emissions

The main sources of odour emissions at the site include:

- the processing pads, due to the receival and blending of the input material streams in the compost windrows, and storage of the final compost product; and
- leachate control dam, due to the evaporation of leachate.

The odour impact assessment is based on the conservative assumption that the entire processing pads area acts as an odour source. In practice, some of this area is used for vehicle access and spacing between windrows.

Odour emission rates for the modelled odour sources have been estimated based on site-specific odour monitoring at the facility and at another facility that receives and processes raw FOGO recovered material. This data was supplemented with odour monitoring data from other studies on similar types of composting operations.

Site-specific odour monitoring was undertaken at the facility in 2015 and 2018, at windrows containing garden organic material and biosolids at various maturation stages, as detailed in the *Greenhouse gas, odour and dust assessment* (Advanced Environmental Dynamics, 2019) of the SSD EIS. The recorded odour emission rates are considered representative of the current operations.

Additional odour monitoring was undertaken by Ektimo Pty Ltd (Ektimo) on 13 June and 6 August 2025 at the Valoriza composting facility in Dandenong South, Victoria, to obtain odour emission rates of raw FOGO recovered material. The Valoriza facility receives and processes raw FOGO material from kerbside collections and commercial sources. The odour monitoring report (Ektimo, 2025) is provided in Appendix B of Appendix C.

Odour monitoring was conducted using an Isolation Flux Chamber (IFC) in accordance with Australian/New Zealand Standard (AS/NZS) *4323.4:2009 Stationary source emissions - Area source sampling - Flux chamber technique* (Standards Australia, 2009) and the EPA Approved Methods. The IFC method is widely used for emission monitoring across a variety of applications and is commonly employed on surfaces such as soil, water bodies, landfills, compost piles, biosolids, wastewater treatment beds and industrial materials.

Odour emission rates of the following samples were measured:

- two samples of raw FOGO recovered material;
- two samples of decontaminated FOGO recovered material (3 weeks old at the time of sampling);
- two samples of 1-day old (within 24 hours after removal from tunnel) pasteurised FOGO recovered material; and
- single samples of 2, 5 and 19-day old (2, 5 and 19 days after removal from tunnel) pasteurised FOGO recovered material (to identify any changes in the odour profile over time).

Decontaminated and pasteurised material was sampled for the purposes of Modification 2, but odour monitoring results from these samples are included in this assessment for comparison purposes.

A detailed description of the monitoring methodology is provided in Section 2 of the odour monitoring report (refer to Appendix B of Appendix C). The results of the odour monitoring are summarised in Section 6.2.3.

Dust emissions

The *Guidance on the assessment of dust from demolition and construction* (IAQM Guidelines) (IAQM, 2024) evaluates dust risks based on the scale and nature of activities, proximity to receivers and the level of mitigation required to manage impacts effectively.

The IAQM Guidelines recommend that a detailed (quantitative) assessment be carried out if:

- a human receiver is within:
  - 250 m of the site boundary; and/or,

- 50 m of the public highway routes used by construction vehicles, up to 250 m from the site entrance.

- an ecological receiver is within:
  - 50 m of the site boundary; and/or,
  - 50 m of the public highway routes used by construction vehicles, up to 250 m from the site entrance.

Since construction of the project would occur within the site boundary and there are no nearby human or ecological receivers, a detailed assessment is not required and a qualitative risk-based approach has been adopted to assess potential dust impacts during construction. This method identifies activities that pose the greatest air quality risks during construction, allowing targeted control measures to mitigate potential impacts proactively.

The assessment of operational dust impacts considers a worst case scenario that assumes the maximum processing capacity of 250,000 tpa of organic recovered material, transported to and from the site via Lemington Road.

Greenhouse gas emissions

Greenhouse gas is a collective term that describes a range of gasses that absorb or reradiate outgoing infrared radiation reflected from the Earth's surface that, in turn, influence the global temperatures. This is known as the greenhouse effect. A change in the mix of greenhouse gas can result in a cooling or heating of the current global temperatures. Human activities, including the combustion of carbon-based fuels, have and continue to increase the concentration of greenhouse gas in the atmosphere. This leads to greater absorption of infra-red radiation and an increase in atmospheric temperature.

Greenhouse gasses reported under the National Greenhouse and Energy Reporting Scheme include:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Sulphur hexafluoride (SF_6)
- Perfluorocarbons (PFCs)
- Hydrofluorocarbons (HCFs).

Each greenhouse gas behaves differently in the atmosphere with respect to its ability to trap outgoing radiation and its residence time in the atmosphere. To achieve a common unit of measurement each greenhouse gas has been compared to the warming potential of carbon dioxide over a 100 year period. This provides a global warming potential for each greenhouse gas that can be applied to the estimated emissions of the project. The resulting aggregated emissions are referred to in terms of carbon dioxide-equivalent emissions (or CO_2-e).

To help differentiate between greenhouse gas emission sources, emissions are typically classified into the following scopes to help define ownership and the ability to control and influence different emissions sources:

- Scope 1 'direct' emissions include all direct greenhouse gas emissions from sources that are within the project's control boundary (e.g. combustion of fuels on-site, refrigerants);
- Scope 2 'indirect' emissions relate to energy produced outside the project's control boundary but are used in the project. This includes purchased electricity (from the grid), heat, cooling and steam; and
- Scope 3 'indirect' emissions are all emissions that occur as a result of the activities of the project, but occur from sources outside the project's control boundary. This includes

upstream or downstream activities (e.g. emissions associated with the extraction and production of materials and the transportation of materials to site).

Although the project is not likely to result in significant additional greenhouse gas emissions from the new types of organic material that would be received and processed on-site, an updated greenhouse gas assessment has been completed to consider the most recent emission factors and greenhouse gas emission data for Australia.

The assessment focused on the 'modified business' scenario defined in the NSW Guide for Large Emitters that addresses overall sources and emissions associated with the existing operations and the project.

6.2.2 Assessment criteria

Odour

Impacts from odorous air emissions are often nuisance-related rather than health-related. Odour performance goals guide decisions on odour management, but are generally not intended to achieve "no odour". The detectability of an odour is a sensory property that refers to the theoretical minimum concentration that produces an olfactory response or sensation. This point is called the odour threshold and defines one odour unit (OU). An odour goal of less than 1 OU would theoretically result in no odour impact being experienced.

The level at which an odour is perceived to be a nuisance depends on a combination of factors, including odour quality (individual compounds or mixtures of compounds), odour intensity (concentration of chemical or mix of chemicals), odour frequency, timing and duration (higher levels of short term emissions are likely to be more tolerable than long term emissions at the same level), population sensitivity, background level (that are likely to contribute to cumulative odour impacts), public expectation (e.g. background agricultural odours may not be considered offensive), source characteristics (point or diffuse sources) and health effects.

Odour assessment criteria are designed to take into account the range in sensitivities to odour within the community, and provide additional protection for individuals with a heightened response to odours. This can be done using a statistical approach which depends upon the size of the affected population. As the affected population size increases, the number of sensitive individuals is also likely to increase, which suggests that more stringent criteria are necessary in these situations. Therefore, the odour assessment criteria allow for population size, cumulative impacts, anticipated odour levels during adverse meteorological conditions and community expectations of amenity.

The NSW criteria for acceptable levels of odour outlined in the EPA Approved Methods range from 2 to 7 Odour Unit (OU), with the more stringent 2 OU criteria applicable to densely populated urban areas and the 7 OU criteria applicable to sparsely populated residential rural areas.

The EPA Approved Methods odour criteria are summarised in Table 6.1.

Table 6.1 Impact assessment criteria for complex mixtures of odorous air pollutants

Population of affected community	Impact assessment criteria for complex mixtures of odorous air pollutants (OU)
Urban (≥~2000) and/or schools and hospitals	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence (≤~2)	7.0

Dust

The EPA Approved Methods air quality criteria for particulate matter are summarised in Table 6.2. The air quality criteria for total impact relate to the total pollutants in the air (i.e. cumulative) and not just the contribution from the project.

Table 6.2 EPA air quality impact assessment criteria

Pollutant	Averaging period	Impact	Criterion
TSP[1]	Annual	Total	90 µg/m³
PM_{10}[1]	Annual	Total	25 µg/m³
	24-hour	Total	50 µg/m³
$PM_{2.5}$[1]	Annual	Total	8 µg/m³
	24-hour	Total	25 µg/m³
Deposited dust[1]	Annual	Incremental	2 g/m²/month
		Total	4 g/m²/month

1: TSP = total suspended particulates; PM_{10} = particulate matter with a diameter of 10 micrometres or less; $PM_{2.5}$ = particulate matter with a diameter of 2.5 micrometres or less; Deposited dust = the portion of particulate matter that has settled out of the air onto surfaces.

6.2.3 Odour emission rates

Odour emission rates for the modelled odour sources have been estimated based on site-specific odour monitoring previously carried out at the facility, odour monitoring conducted for the project and the Modification 2 air quality impact assessment at the Valoriza composting facility (described in Section 6.2.1), and monitoring data from other studies on similar types of composting operations.

Odour emission rates that have previously been recorded at the site and are considered representative of the existing operations are summarised in Table 6.3.

Table 6.3 Site-specific odour emission rates (Advanced Environmental Dynamics, 2019)

Odour source	Specific Odour Emission Rate (SOER) (odour unit volume per square metres per second (OUV/m²/s))
Fresh green waste	0.027
One week old (3-part green organics and 1-part biosolids)	0.045
Five week old (3-part green organics and 1-part biosolids)	0.03
Freshly opened compost windrow	0.041
Finished product (3-part green organics and 1-part biosolids)	0.032

The results of the odour monitoring conducted at the Valoriza composting facility are presented in Table 6.4. This material is representative of the type of material proposed to be received and processed at the site under Modification 2 and Modification 3.

Table 6.4 Valoriza composting facility odour monitoring results (Ektimo, 2025)

Material type	Material age*	Sample no.	SOER (OUV/m²/s)
Raw FOGO recovered material	1-day old	1	2.0
		2	1.7
Decontaminated FOGO recovered material	3 weeks	1	0.6
	3 weeks	2	0.4
Pasteurised FOGO recovered material	1-day old	1	3.2
	1-day old	2	5.0
	2-day old	1	0.4
	2-day old	2	0.3
	5-day old	1	0.15
	19-day old	1	0.23

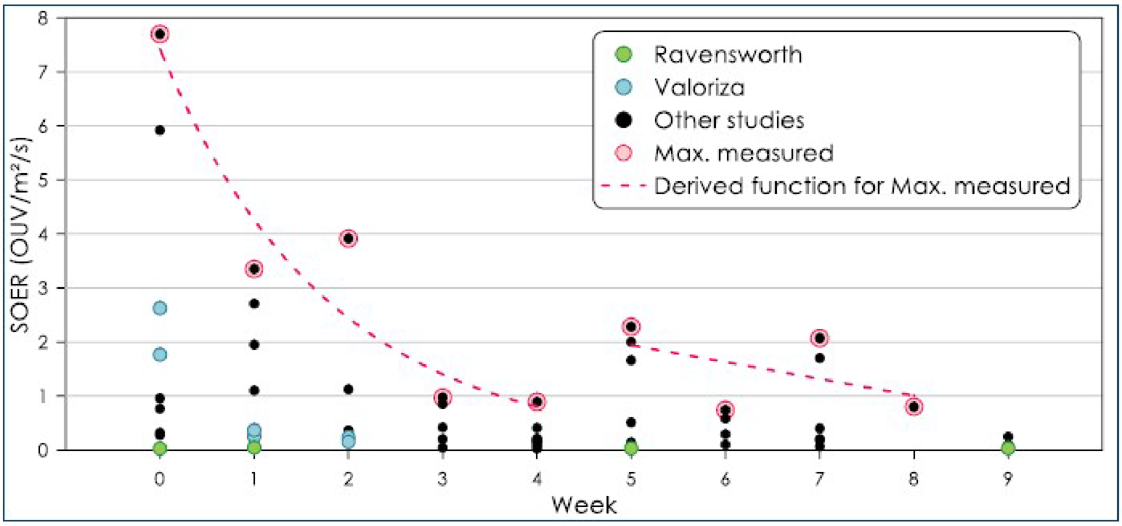
Note: The material age for the pasteurised FOGO recovered material indicates the number of days after removal from the tunnels.

The results indicate that the pasteurised FOGO recovered material removed from the tunnels within 24 hours has the highest odour concentration, followed by the raw FOGO recovered material, the decontaminated FOGO recovered material and the 2-day old (and older) pasteurised FOGO recovered material.

Odour monitoring data for composting material at different stages were also collated from a review of studies which focused on windrow composting of green waste and food organics (Environmental Resource Management, 2015; GHD, 2015; Todoroski & Cowan, 2015; The Odour Unit, 2010).

This data is presented graphically in Figure 6.1, together with data collected at the facility and the Valoriza composting facility. The results show variability in odour emissions across the composting stages for each dataset reviewed. This variability can be attributed to factors such as the composition of the compost material, climatic conditions, and the sampling methodology. Overall, the data demonstrate a consistent trend of decreasing odour as composting material matures.

Figure 6.1 Change in odour emission rates over time



Note: The SOER shown for the Valoriza monitoring samples represent the respective averages where two samples were taken.

To conservatively estimate the potential odour emissions for the project, the maximum measured odour levels (pink circles in Figure 6.1) were used to determine the odour emission rates for the project, assuming an eight week composting process at the site.

For other odour sources in the area (Loop Organics composting facility), a similar approach to that used in previous air quality assessments for the facility (Advanced Environmental Dynamics, 2019; Advanced Environmental Dynamics, 2022) has been adopted, with odour emission rates based on the average of the monitoring results applied to the modelled area source.

The odour emission rates for the project and the Loop Organics composting facility adopted for the assessment are presented in Table 6.5.

Table 6.5 Odour emission rates for the project and Loop Organics composting facility

Facility	Odour source	SOER (OUV/m²/s)
Ravensworth composting facility	Raw FOGO recovered material	1.8
	Processing pads – Week 1	4.3
	Processing pads – Week 2	2.4
	Processing pads – Week 3	1.4
	Processing pads – Week 4	0.8
	Processing pads – Week 5	1.9
	Processing pads – Week 6	1.6
	Processing pads – Week 7	1.3
	Processing pads – Week 8	1.0
	Leachate dams	1[1]
Loop Organics composting facility	Composting processing and blending area	0.034
	Leachate dams	1[1]

1: Obtained from *Greenhouse gas, odour and dust assessment* (Advanced Environmental Dynamics, 2019).

6.2.4 Greenhouse gas emission factors

The project would generate greenhouse gas emissions during composting activities and the operation of vehicles, plant and equipment on-site and off-site.

Estimated annual quantities of fossil fuels used to assess greenhouse gas emissions are summarised in Table 6.6. Diesel and petrol requirements for the approved project are adopted from the greenhouse gas assessment undertaken for the SSD EIS (Advanced Environmental Dynamics, 2019). Diesel requirements for the transport of organic recovered material to the site have been scaled linearly from the approved project. No changes are expected in petrol requirements. Diesel requirements to transport the finished compost product off-site assumes an average distance of approximately 200 km per return trip and an average truck fuel consumption rate of 53.1 litres (L) per 100 km.

Table 6.6 Estimated fossil fuel requirements

Activity	Fossil fuel	Quantity (kL)	
		Approved development	Project
Construction	Diesel	N/A	18.48
Transport of organic recovered material to site and use of vehicles and plant on-site	Diesel	139	172.6
	Petrol	1.5	1.5
Transport of finished compost product off-site	Diesel	664	830

Greenhouse gas emission factors outlined in the *Australian National Greenhouse Accounts Factors – For individuals and organisations estimating greenhouse gas emissions* (DCCEEW, 2024b) were applied in the assessment, as outlined in Table 6.7. As the site does not consume electricity, there are no Scope 2 emissions associated with the project.

Table 6.7 Greenhouse gas emission factors

Type	Energy content factor (Gigajoule per kilolitre (GJ/kL))	Emission factor			Units	Scope of emissions
		CO_2	CH_4	N_2O		
Composting	-	0.046	-	-	Tonnes of carbon dioxide equivalent per tonne of activity (t CO_2-e/t)	1
Diesel - stationary	38.6	69.9	0.1	0.2	Kilograms of carbon dioxide equivalent per gigajoule (kg CO_2-e/GJ)	1
		17.3	-	-	kg CO_2-e/GJ	3
Automative gasoline/petrol		67.4	0.2	0.2	kg CO_2-e/GJ	1
		17.2	-	-	kg CO_2-e/GJ	3
Diesel - transport	34.2	69.9	0.07	0.4	kg CO_2-e/GJ	3

6.2.5 Existing environment

Sensitive receivers

Sensitive receivers in the surrounding area are described in Section 2.1.3.

Climate and meteorology

Meteorological conditions, particularly temperature, rainfall, relative humidity, wind speed and wind direction, determine the direction and rate at which air emissions disperse from a source.

Local climatic and meteorological conditions were identified using data from the nearest BoM weather monitoring station with suitable available long term data at Cessnock Airport (Site No. 061260), approximately 48 km south-west of the site (BoM, 2025b). The weather station has been operating since 1968.

The area is characterised by a temperate climate, with cool winters and warm and wet summers (BoM, 2025c).

Most of the annual rainfall occurs in the summer months, with the average rainfall ranging from 34.2 mm over 4.4 days in August to 98.7 mm over 8.1 days in February. The annual average rainfall is 738.4mm over 74.8 days.

January is the hottest month, with a mean maximum and minimum temperature of 30.4ºC and 17.1ºC respectively, while July is the coldest month, with a mean maximum and minimum temperature of 17.6ºC and 4.2ºC respectively (BoM, 2025b).

Relative humidity levels exhibit variability over the day and seasonal fluctuations. Mean 9 am relative humidity ranges from 60% in October to 80% in March and June. Mean 3 pm relative humidity levels range from 42% in August and September to 55% in June.

Wind speeds exhibit seasonal variations with lower wind speed records for 9 am and higher observations for 3 pm conditions. Mean 9 am wind speeds range from 8.7 kilometres per hour (km/h) in March to 14 km/h in September. Mean 3 pm wind speeds range from 14.2 km/h in May to 19.1 km/h in September.

Wind directions are generally evenly distributed ranging from the east-southeast to south-west on an annual basis with winds greatest from the north-west and north-northwest. During summer, winds are predominantly from the east-southeast to south. During autumn, winds are mainly from the south-southwest, and in winter, winds from the north-west and north-northwest are most frequent. In spring, winds are predominantly from the north-west and east-southeast.

Ambient air quality

The main sources of air pollutants in the area are emissions from industrial and commercial operations and other anthropogenic sources such as wood heaters and motor vehicle exhausts.

A review of the National Pollutant Inventory (NPI) (DCCEEW, 2025a) identified the following facilities within 5 km that reported to the NPI during the 2023/2024 reporting year:

- Ravensworth Operations open cut mining complex, operated by Glencore Coal, at Lemington Road, Ravensworth, approximately 1 km west of the site.
- Orica Liddell Mining Services Plant, operated by Orica Australia Pty Ltd, at Pikes Gully Road, Liddell, approximately 1.2 km north-east of the site.
- Liddell Coal Operations, operated by Liddell Coal Operations Pty Ltd, at Old New England Highway, Ravensworth, approximately 1.8 km north of the site.
- Glendell Open Cut Mine, operated by Mt Owen Pty Ltd, at 246 Hebden Road, Ravensworth, approximately 3.8 km north-east of the site.

Emissions to air at the Ravensworth Operations open cut mining complex, Liddell Coal Operations and Glendell Open Cut Mine include carbon monoxide (CO), oxides of nitrogen (NOx), sulfur dioxide (SO_2), particulate matter (PM_{10} (particulate matter with a diameter of 10 micrometers (µm) or less) and $PM_{2.5}$ (particulate matter with a diameter of 2.5 µm or less)), and Volatile Organic Compounds (VOCs), among other substances. Emissions to air at the Orica Liddell Mining Services Plant include acetic acid (ethanoic acid), Cumen (1-methylethylbenzene) and VOCs.

Additional industrial and commercial activities may be present in the local area beyond those listed on the NPI database that could impact on air quality within the vicinity of the site. However, these activities would operate below the air quality thresholds specified for the relevant industry type and are not required to report under the NPI program.

Other sources of odour in the vicinity of the site include the Loop Organics composting facility at 74 Lemington Road, Ravensworth (approximately 2 km south of the site), operated by Loop Organics Pty Ltd (Loop Organics, 2025). This facility processes up to 55,000 tpa of food organics, garden organics, FOGO, biosolids, grease trap, organic fibrous material and paper crumble, and includes a composting and blending area and leachate dam.

The nearest air quality monitoring station to the site is in Camberwell, approximately 6 km south-east of the site. Monitoring data suggest that air quality at this location is significantly impacted by surrounding mining operations (Advanced Environmental Dynamics, 2019). Exceedances of the ambient air criterion of 50 µg/m^3 for the 24-hour average concentration of PM_{10} is a frequent occurrence at the Camberwell monitoring station with between 4 and 87 exceedance days per year recorded during the 10-year period from 2014 to 2024. No exceedances were recorded in 2022. However, it is noted that the Camberwell monitoring station is a small community monitoring station which is not suitable for assessing performance against the National Environment Protection Measure (NEPM) standards (Advanced Environmental Dynamics, 2019).

Analysis of air quality data from 14 monitoring stations in the Upper Hunter region between 2011 and 2023 (NSW DCCEEW, 2024c) indicated the following:

- Hourly and annual nitrogen dioxide (NO_2) levels were below the NEPM benchmarks (8 parts per hundred million (pphm) and 1.5 pphm respectively) at the larger population centres of Merriwa, Muswellbrook and Singleton in all years.
- Hourly and daily SO_2 levels were generally below the NEPM benchmarks (10 pphm and 2 pphm respectively) at the larger population centres of Merriwa, Muswellbrook and Singleton in all years.
- Annual average PM_{10} and $PM_{2.5}$ levels increased at all monitoring stations throughout the region, compared to recent record low years, due to low rainfall levels, higher temperatures, drought and bushfire smoke.
- Annual average PM_{10} levels were below the NEPM benchmark (25 µg/m^3) at all stations, except one, in 2023, ranging between 14.2 µg/m^3 and 32.5 µg/m^3.

Annual average $PM_{2.5}$ levels were below the NEPM benchmark (8 µg/m^3) at all stations in 2023, ranging between 4.7 µg/m^3 and 7.5 µg/m^3. Smoke from domestic wood heaters contributed significantly to particle levels at larger population centres.

6.2.6 Potential impacts

Incremental impacts relate to the air pollutant concentrations predicted due to the operation of the project in isolation, whereas cumulative impacts relate to the air pollutant concentrations predicted due to the operation of the project in combination with the Loop Organics composting facility.

Odour

The project has the potential to increase ambient odour levels, due to the processing of a new type and larger quantity of organic recovered material. Odour emissions would potentially be generated during the receival and blending of the organic recovered material and storage of the final compost product, and the evaporation of leachate from the leachate control dam. In addition, there is the potential for cumulative odour impacts with the Loop Organics composting facility approximately 2 km south of the site.

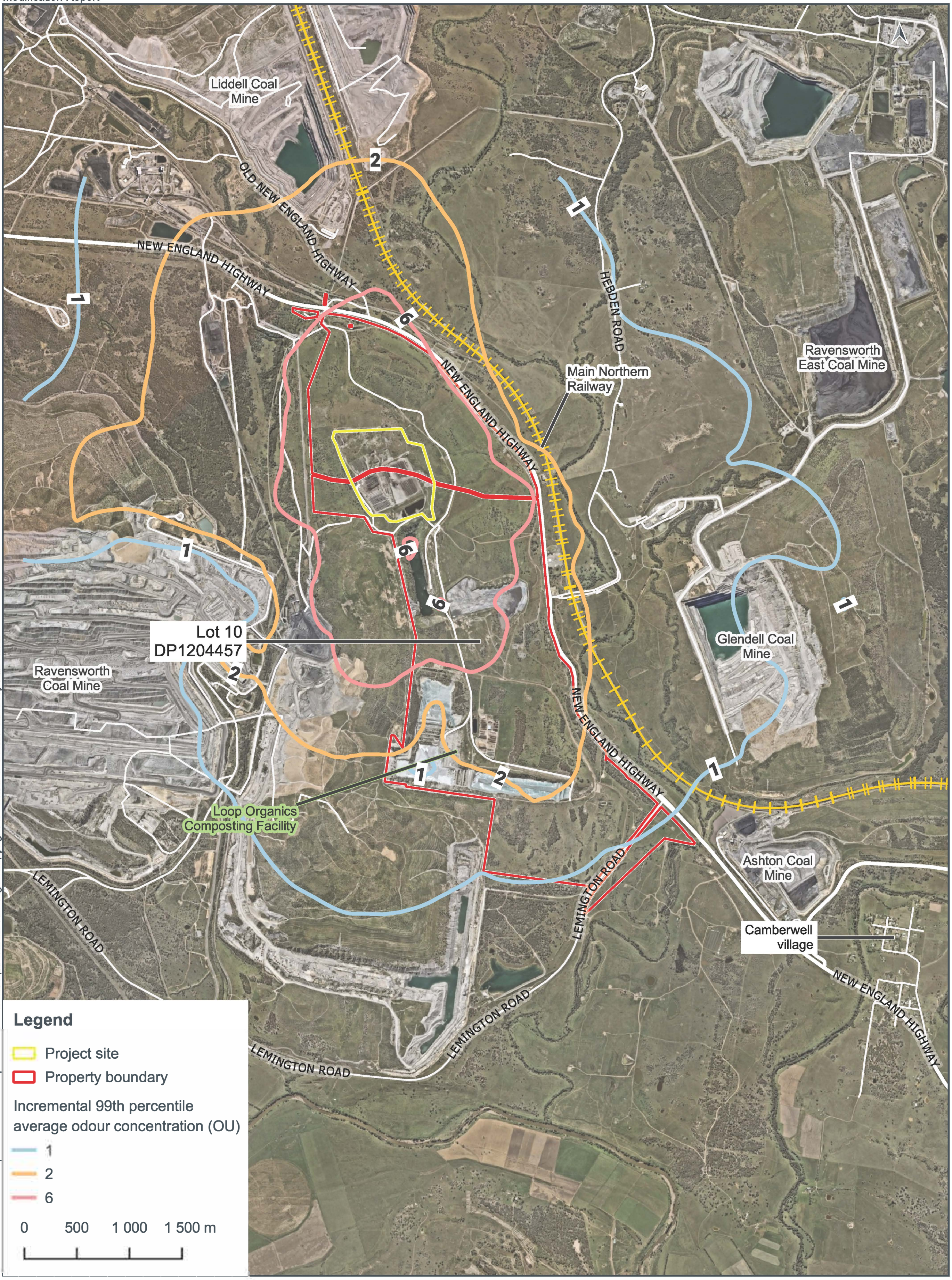
Factors influencing odour emission rates from the open air composting windrows and leachate dam include the physical and chemical characteristics of the raw materials (like carbon, nitrogen, moisture and volatile solids content and particle size), microbiological activity, operational practices (especially windrow turning frequency), environmental conditions (temperature, wind speed, atmospheric stability and humidity), and the use of additives. Specifically, high temperatures, excessive moisture and less frequent turning of the windrows are key contributors to unpleasant odours (Arcadis, 2019; O'Neill et al., 2022).

The predicted incremental maximum 99th percentile average odour concentrations for the project are presented in Figure 6.2.

The results indicate that odour levels during operation of the project would be well below the most stringent EPA impact assessment criterion of 2 OU at the nearest sensitive receivers in Camberwell. These results are based on the conservative assumptions that the entire processing pads area would act as an odour source, and that the maximum odour emission rates established from an analysis of site-specific and other odour monitoring data would apply to the project. In practice, some of the processing pads area is used for vehicle access and spacing between windrow piles, and odour emission rates measured at the facility are much lower. Odour levels during operation of the project are therefore expected to be lower than the predicted incremental odour levels.

Figure 6.2
Predicted incremental 99th percentile average odour concentration contours

Ravensworth Composting Facility SSD Modification 3
Modification Report



The predicted cumulative maximum 99th percentile average odour concentrations for the project, operating in combination with the Loop Organics composting facility, are presented in Figure 6.3. The results indicate that cumulative odour levels during operation of the project would remain well below the EPA criterion of 2 OU at the nearest sensitive receivers in Camberwell. The project would slightly increase cumulative odour levels close to the site, however, changes in odour levels at sensitive receivers in Camberwell are predicted to remain negligible due to their distance from the site. These results are based on conservative assumptions as noted above, including that the entire composting and blending area of the Loop Organics facility would act as an odour source. Odour levels during operation of the project are therefore expected to be lower than the predicted odour levels.

The incremental odour concentrations associated with Modification 2 (Todoroski Air Sciences, 2025a) and the project are presented for comparison purposes in Figure 6.4. The comparison indicates that the project would result in a notable increase in odour levels due to the processing of raw FOGO recovered material, however, impacts at the nearest sensitive receivers in Camberwell would remain negligible due to their distance from the site.

Considering the results above, there is no requirement for additional odour mitigation or management measures. Nevertheless, the existing air quality mitigation and management measures in relation to odour emissions will continue to be implemented to minimise odour emissions during operation as far as possible (refer to Appendix B).

Figure 6.3
Predicted cumulative 99th percentile average odour concentration contours

Ravensworth Composting Facility SSD Modification 3
Modification Report

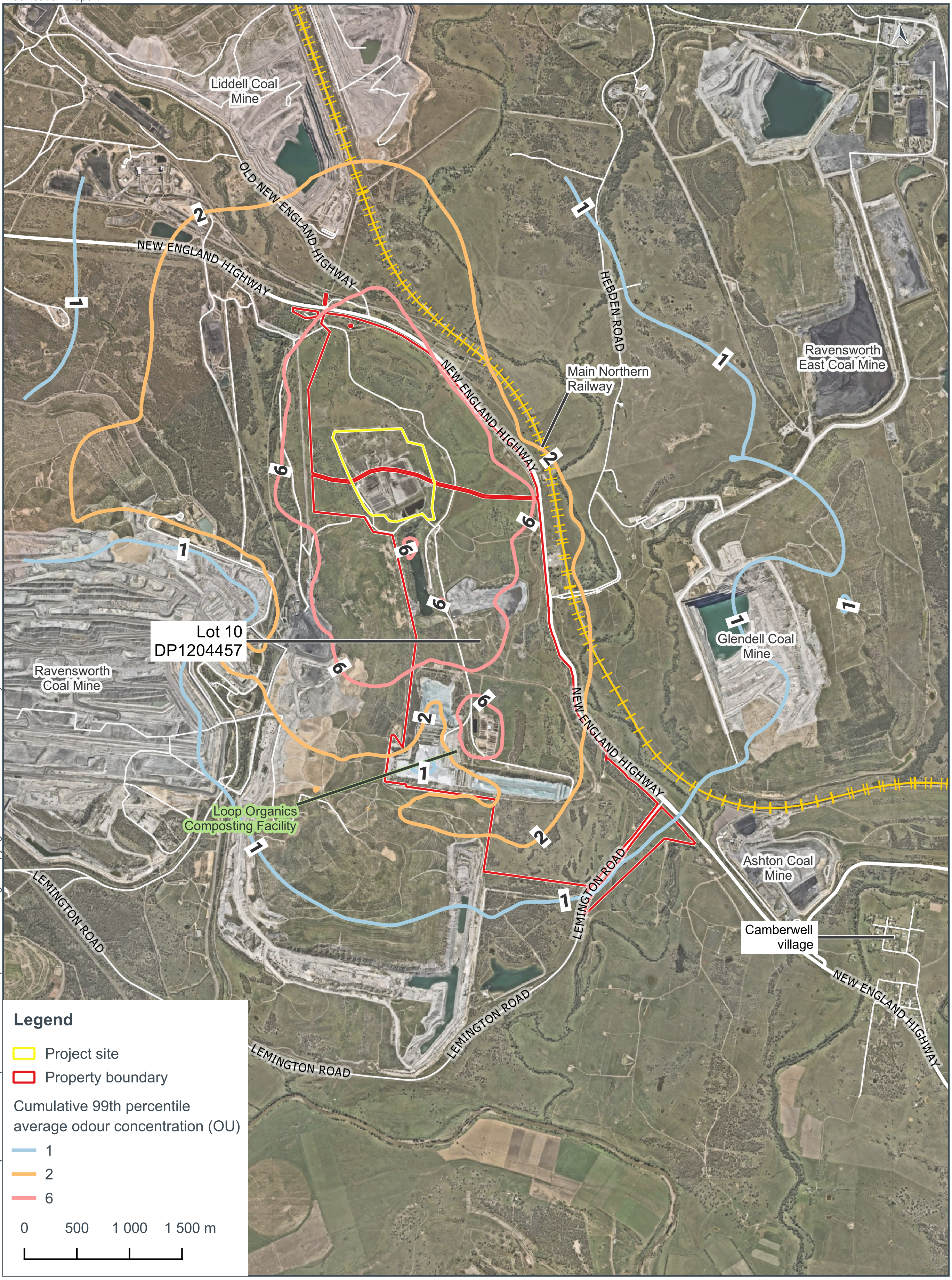
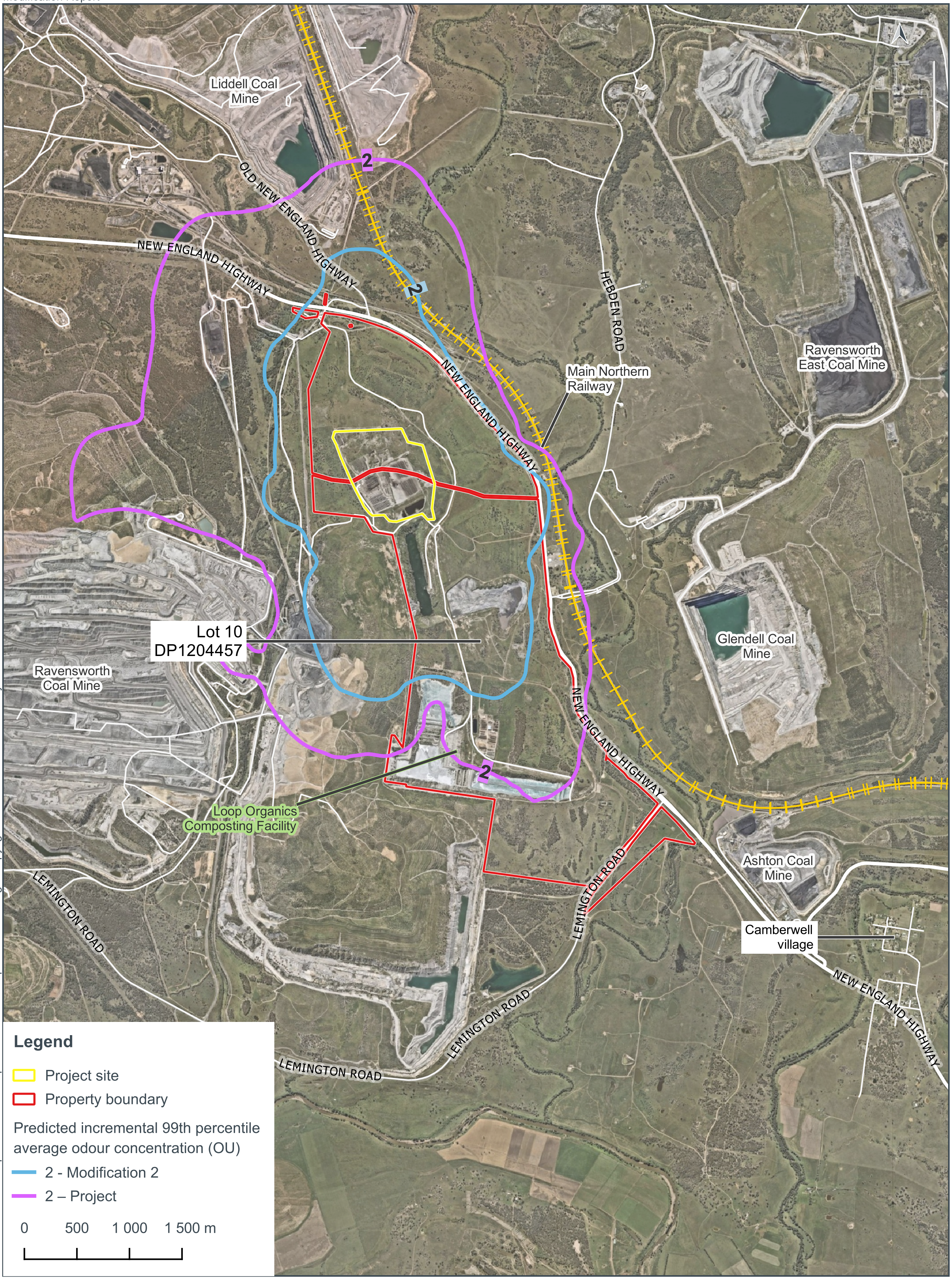


Figure 6.4
Comparison of the predicted incremental 99th percentile average odour concentration contours for Modification 2 and the project
Ravensworth Composting Facility SSD Modification 3
Modification Report



Dust emissions

Construction

Construction activities associated with the installation of the weighbridge have the potential to generate dust emissions, primarily from windblown dust from exposed areas during site preparation and levelling of the ground surface, vehicle movements, material handling and exhaust emissions from diesel powered equipment.

Dust emissions during construction would be minor, temporary and short term, and is not likely to result in any dust impacts at nearby sensitive receivers, based on the scale of the activities and the distance to receivers. These emissions will be managed effectively through the implementation of the existing air quality mitigation and management measures in relation to dust emissions (refer to Appendix B).

Operation

The receival and processing of FOGO material at the facility may increase dust emissions during the loading/unloading of material and screening and blending processes, and increase windblown dust from exposed areas including windrows and stockpiles. The use of additional vehicles may increase dust emissions generated by vehicles travelling on unsealed surfaces on-site and off-site, and increase particulate emissions from vehicle exhaust systems.

Dust emissions have been estimated by analysing the various types of dust generating activities and using suitable emissions sourced from both locally developed and United States Environmental Protection Agency emission factors approved by the EPA.

A summary of the estimated annual dust emissions during operation of the project are provided in Table 6.8. Detailed calculations of the dust emission estimates are provided in Appendix C.

Table 6.8 Estimated annual dust emissions during operation

Activity	TSP emission (kilograms per year (kg/year))	PM_{10} emission (kg/year)	$PM_{2.5}$ emission (kg/year)
Hauling raw material on-site	46,760	11,816	1,182
Unloading raw material	412	195	30
Rehandle raw material and shaping windrows	412	195	30
Screening material	3,125	1,075	73
Blending material	412	195	30
Loading product material to truck	412	195	30
Hauling product material off-site	46,760	11,816	1,182
Wind erosion from exposed areas	9,138	4,569	685
Exhaust emissions	494	494	479
Total emissions	**107,925**	**30,550**	**3,718**

The predicted incremental particulate emissions during operation of the project are presented in Figure 6.5 to Figure 6.10.

At Camberwell, the predicted incremental dust levels attributable to the project would be less than 0.5 $\mu g/m^3$ for 24-hour average PM_{10}, less than 0.1 g/m^2/month for dust deposition levels and less than 0.1 $\mu g/m^3$ for the other dust metrics. These levels are negligible and would not be discernible relative to the existing background dust levels experienced at Camberwell (refer to Section 6.2.5), and would not exceed the relevant EPA air quality assessment criteria.

The existing air quality mitigation and management measures in relation to dust emissions will continue to be implemented to minimise dust emissions during operation as far as possible (refer to Appendix B).

Figure 6.5
Predicted incremental maximum 24-hour average $PM_{2.5}$ concentration contours

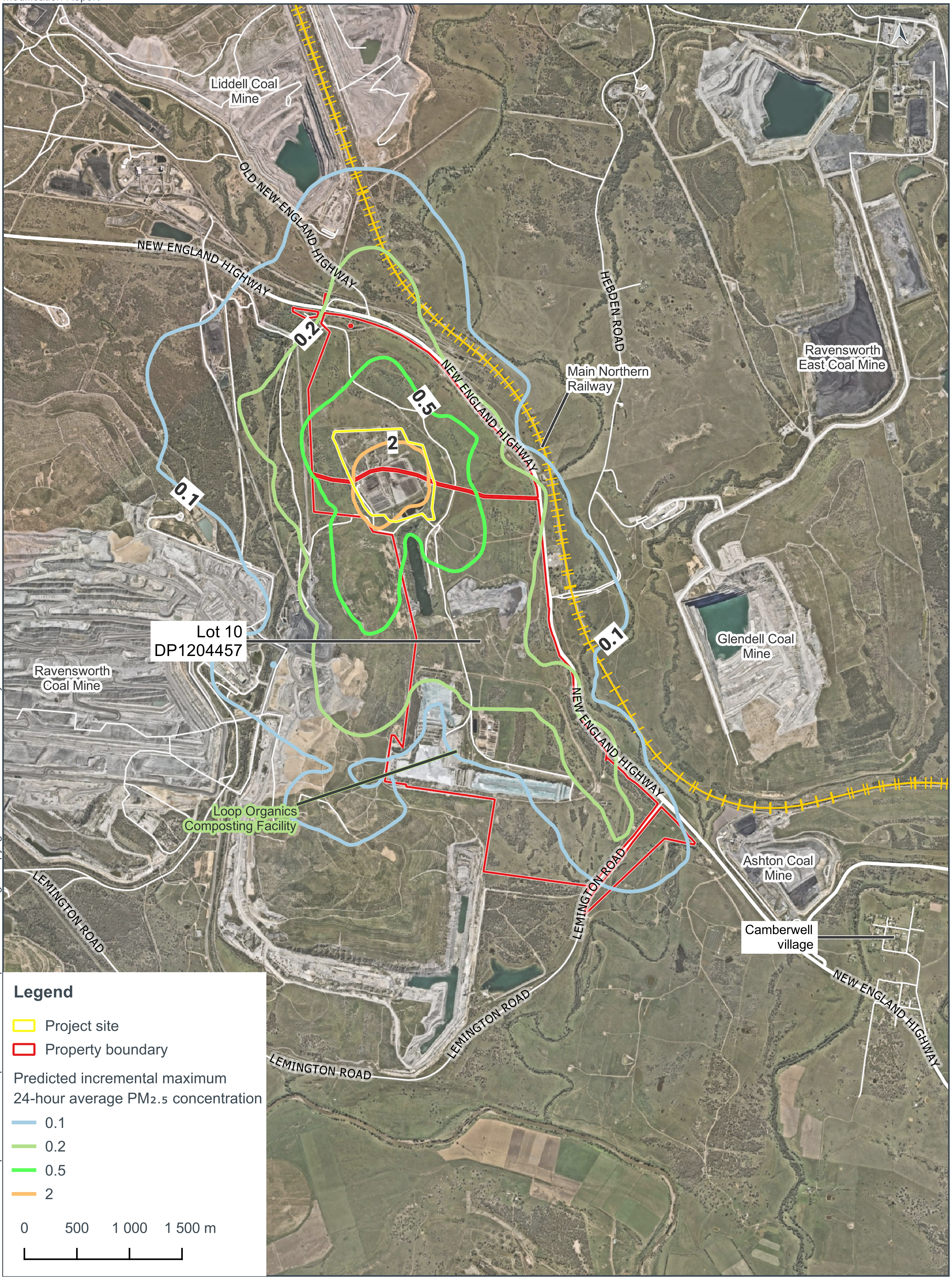


Figure 6.6
Predicted incremental annual average $PM_{2.5}$ concentration contours

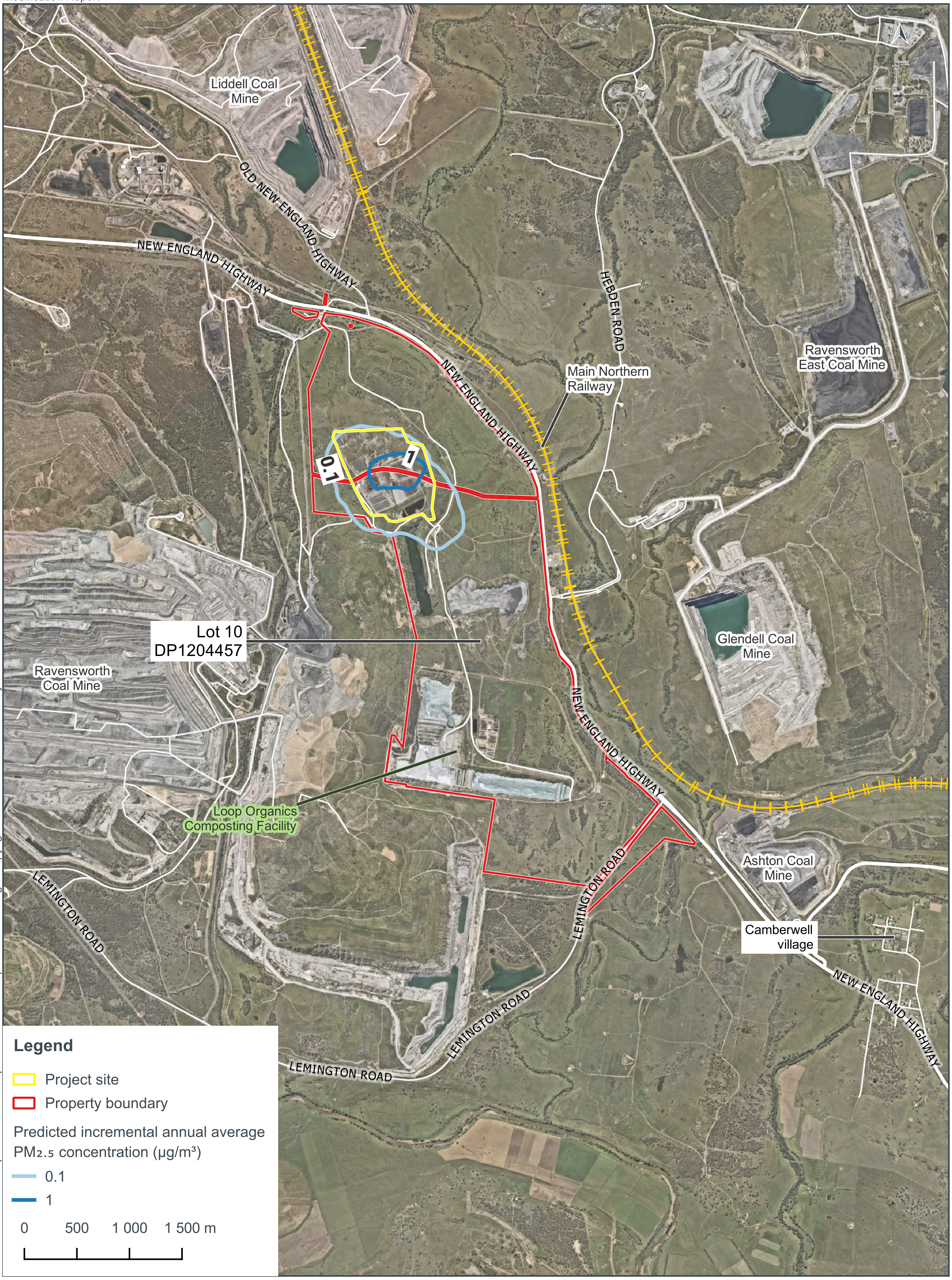


Figure 6.7

Predicted incremental maximum 24-hour average PM_{10} concentration contours

Ravensworth Composting Facility SSD Modification 3
Modification Report

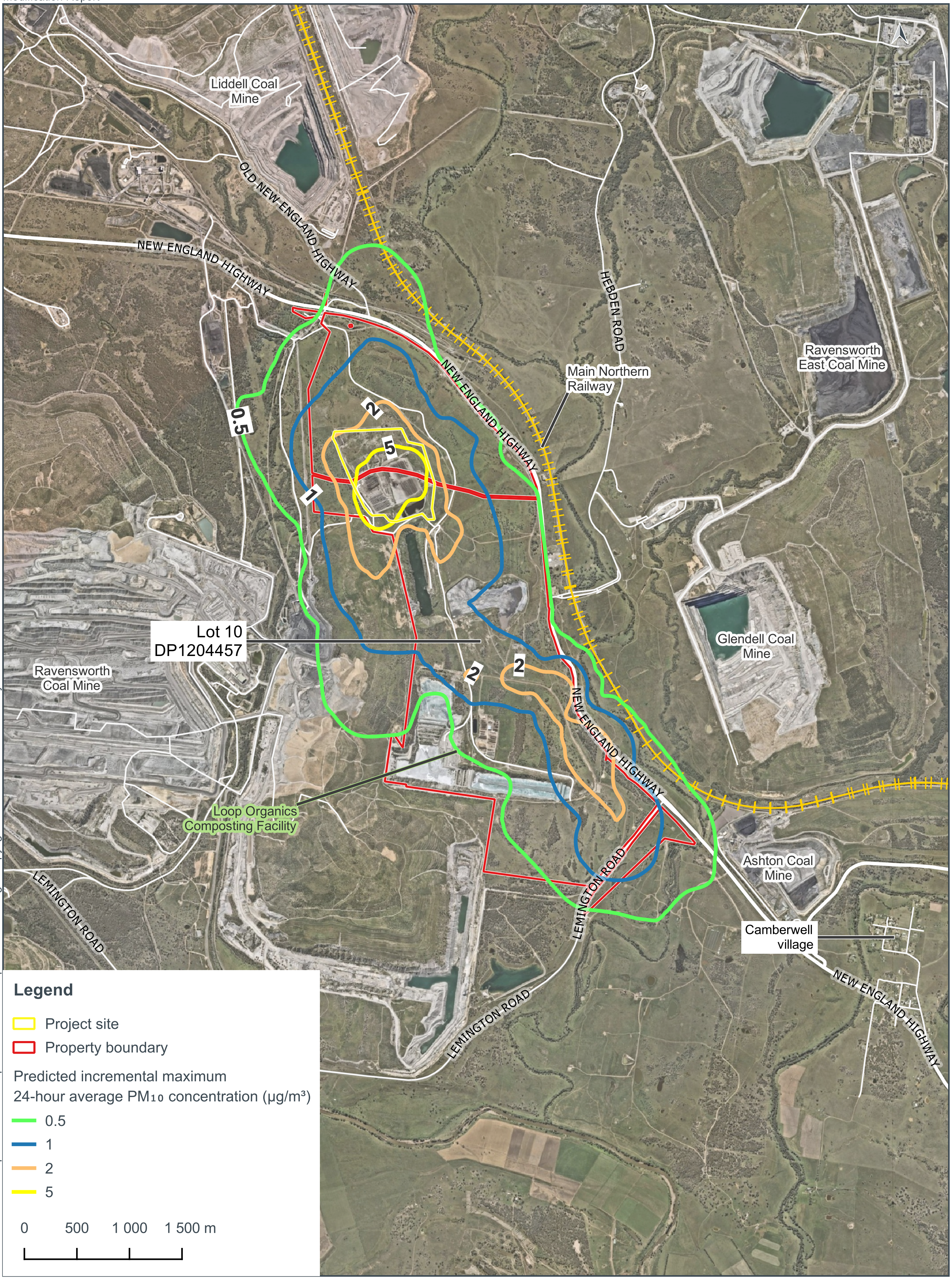


Figure 6.8

Predicted incremental annual average PM_{10} concentration contours

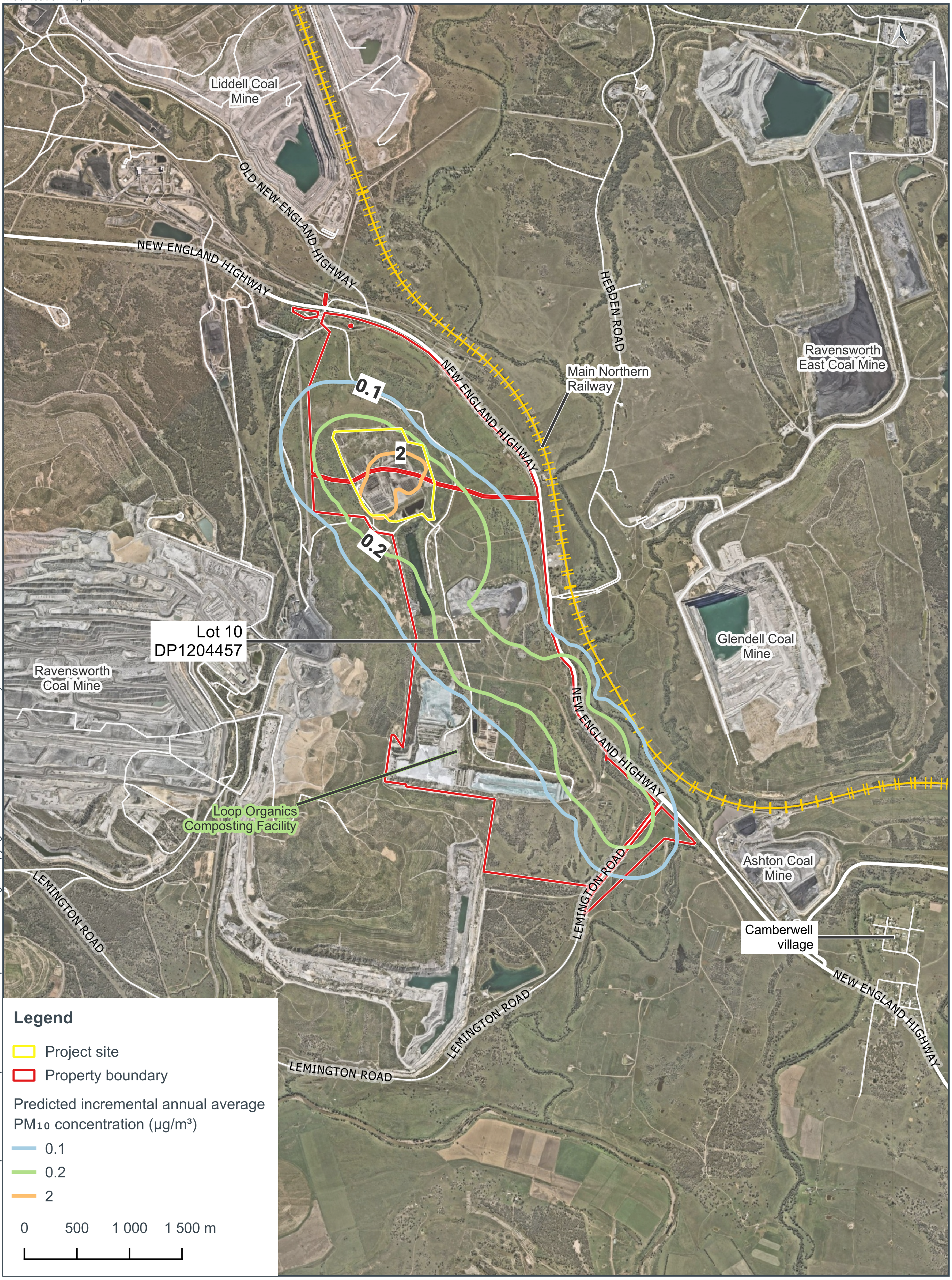


Figure 6.9
Predicted incremental annual average TSP concentration contours

Ravensworth Composting Facility SSD Modification 3
Modification Report

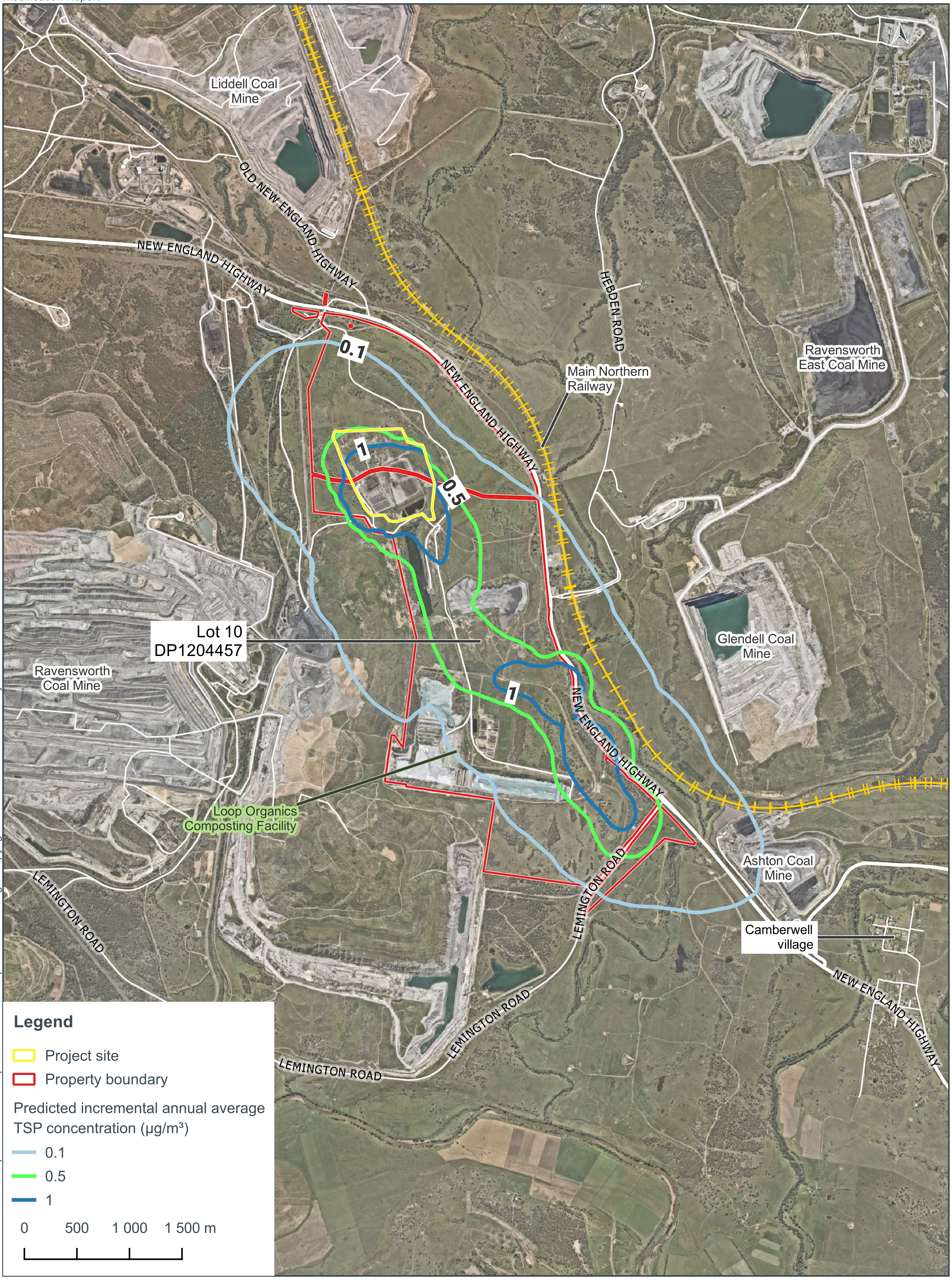
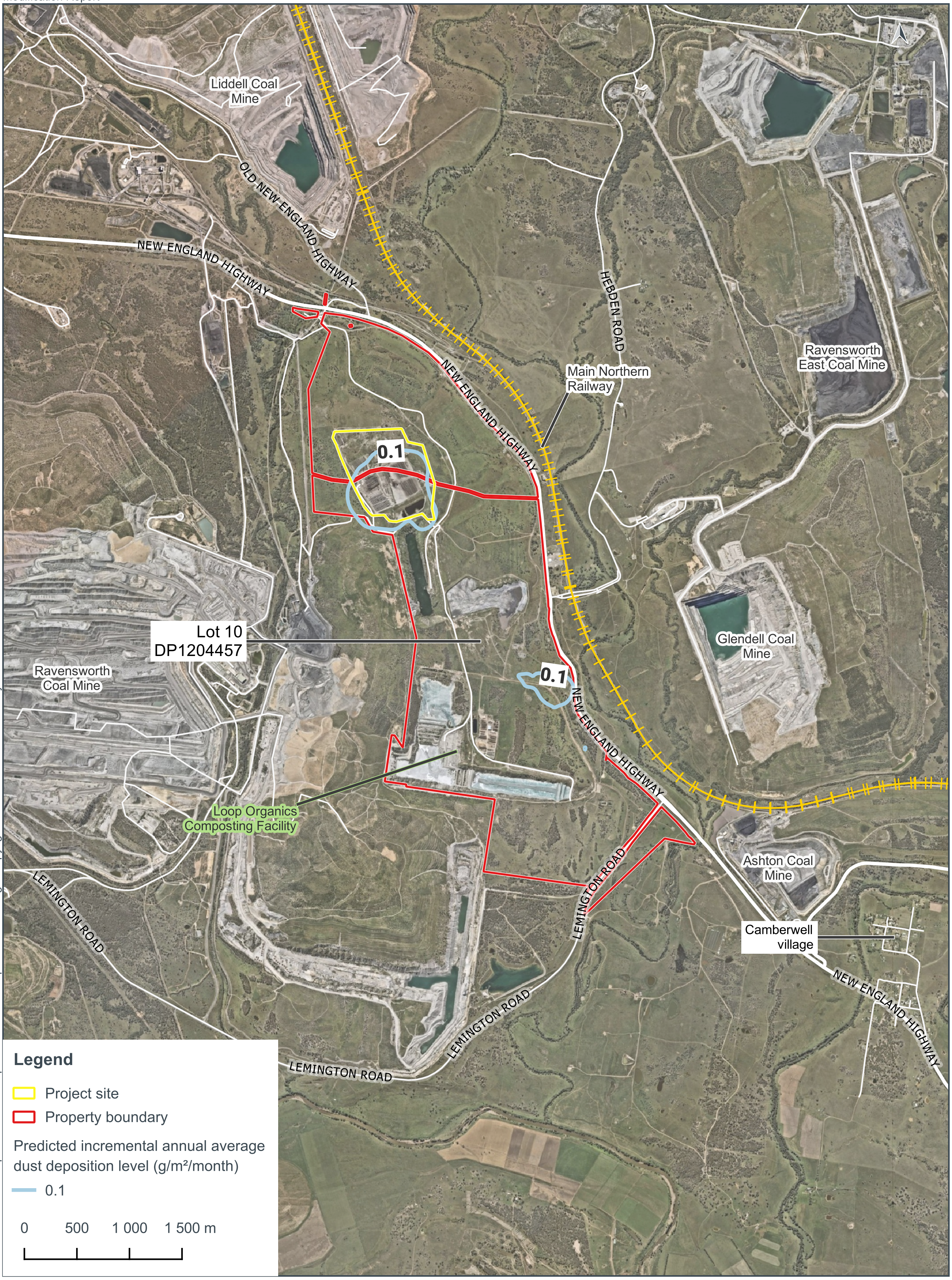


Figure 6.10
Predicted incremental annual average dust deposition levels



Greenhouse gas emissions

The project has the potential to increase greenhouse gas emissions during construction and operation due to the increase in throughput of the facility and the operation of additional vehicles.

Greenhouse gas emissions would be generated during the production of organic material off-site, on-site composting processes, diesel and petrol consumption during operation of vehicles, plant and equipment on-site and transportation of material to and from the site, as well as construction of the on-site weighbridge.

The estimated annual average Scope 1 and Scope 3 greenhouse gas emissions for the project are outlined in Table 6.9. There are no Scope 2 emissions associated with the project as the site does not consume electricity. The total estimated Scope 1 and Scope 3 annual average greenhouse gas emissions during construction and operation of the project are 12,021 t CO_2-e and 2,370 t CO_2-e, respectively.

Table 6.9 Estimated annual average greenhouse gas emissions for the project

Scope of emissions	Description	Greenhouse gas source	Estimated annual average greenhouse gas emissions (t CO_2-e)	
			Approved development	**Project**
1	Direct greenhouse gas emissions associated with emissions generated on-site.	Emissions from organic recovered material during composting. Fossil fuel combustion during operation of diesel-powered vehicles, plant and equipment on-site during operation.	9,580	11,971
		Fossil fuel combustion during operation of diesel-powered vehicles, plant and equipment on-site during construction of the weighbridge.	0	50
Total Scope 1 emissions			**9,580**	**12,021**
3	Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities and waste disposal.	Emissions from organic material during production of food and garden organic material.	94	116
		Fossil fuel combustion during the transport of organic recovered material from suppliers to the site and the transport of the finished compost product from the site to customers.	1,803	2,254
Total Scope 3 emissions			**1,897**	**2,370**

The estimated annual average Scope 1 greenhouse gas emissions for the project is 0.012 million tonnes (Mt) CO_2e, which is approximately 0.0027% of the estimated annual Scope 1 greenhouse gas emissions for Australia from July 2023 to June 2024 (440.6 Mt CO_2-e) (DCCEEW, 2024c), and approximately 0.0108% of the estimated annual Scope 1 greenhouse gas emissions for NSW from July 2021 to June 2022 (111.0 Mt CO_2e) (DCCEEW, 2025c). The project would therefore only make a very minimal contribution to total Scope 1 greenhouse gas emissions in NSW and Australia. Therefore, there are no changes required to the existing mitigation and management measures related to greenhouse gas emissions.

As the estimated Scope 1 emissions for the project are below 25,000 t CO_2-e, the preparation of a detailed greenhouse gas assessment and Climate Change Mitigation and Adaptation Plan is not required for the project, in accordance with the NSW Guide for Large Emitters.

Scope 3 emissions occur outside the project's direct control and represent indirect impacts of its activities. Mandatory, comprehensive state-wide and nation-wide reporting on Scope 3 emissions is not yet in place.

The existing air quality mitigation and management in relation to greenhouse gas emissions will continue to be implemented to minimise greenhouse emissions during construction and operation as far as possible (refer to Appendix B).

6.3 Surface water

An assessment of potential surface water impacts of the approved development was provided in Appendix H and Section 9.2 of the SSD EIS.

6.3.1 Methodology

The potential impacts on surface water associated with the construction and operation of the project are assessed in the *Surface Water Impact Assessment* (Senversa, 2025) provided in Appendix D. The findings of the report are summarised in this section.

The assessment involved:

- reviewing publicly available information to describe the topography, climate, local catchment and drainage network, hydrologic processes, hydrogeology, flood hazard, key water sensitive environments as well as existing water quality conditions of key watercourses;
- reviewing previous environmental investigations undertaken for the facility and current environmental management processes and license requirements relating to surface water;
- preparing a site water balance for the existing operation and the project;
- assessing the potential impacts on water quality, flood risk, stormwater and leachate management and water availability during construction and operation of the project;
- identifying management and mitigation measures required to avoid, minimise and manage any potential surface water impacts during the project's construction and operation.

Site water balance

The approach taken for the site water balance assessment relies on average climate data (temperature, rainfall and pan evaporation) over the defined facility footprint to estimate the average monthly volume of water entering the facility (water inflows) and the total amount of water leaving the facility (water outflows).

The water balance model assumes a simple 'bucket' method of:

Total water inflows – Total water outflows = Balance of water in the 'bucket'.

Identified water inflows include:

- rainfall, which is captured as:

  - direct infiltration into stockpiles;
  - runoff from the processing pads area collected in the leachate control dam (then used for moisture conditioning); and
  - direct rainfall into the leachate control dam (then used for moisture conditioning);
- process water:
  - water collected from the truck wash pit drains into the leachate control dam (then used for moisture conditioning); and
  - direct import of Void 4 water; and
- water (moisture) in incoming waste materials.

Identified water outflows include:

- evaporation:
  - evaporation from the leachate control dam;
  - evaporation from stockpiles; and
  - evaporation from exposed areas of the processing pads;
- seepage losses into the subgrade; and
- water (moisture) in exported compost.

The volume of process water used for dust suppression is tracked separately in the water balance, as all dust suppression water is sourced entirely from Void 4, and it is assumed that dust suppression activities do not result in water runoff that is collected in the leachate control dam as the majority of dust suppression occurs on general site access roads and not directly within the composting pad.

Climate data used in the water balance included data from the following sources:

- Rainfall data has been sourced from BoM Station 061191 located at Bulga (South Wambo), approximately 20 km south of the site. The station was selected as it is in the same valley as the site. There is significant variability in observed rainfall data from the valley (drier) to the ranges located to the north and south (~20% wetter than the valley).
- Pan evaporation data has been applied as an average value based on observations from three BoM weather stations located within 50 km of the site, including:
  - BoM Station 061288 Lostock Dam, approximately 40 km north-west of the site;
  - BoM Station 061242 Cessnock (Nulkaba), approximately 50 km south-west of the site; and
  - BoM Station 061089 Scone SCS, approximately 50 km north-east of the site.

  An average value was selected to account for variability in the local topography and how this affects climate data; however, all sites observed similar evaporation data.
- Average maximum temperature has been applied as an average value based on observations from the same three BoM weather stations.

6.3.2 Existing environment

The local climate is described in Section 6.2.5 and the local topography, geology, soils, hydrology, hydrogeology, flood risk, sensitive receiving environments and water quality are described in Section 2.2.

6.3.3 Site water balance

An updated site water balance comparing the existing and proposed site operations is presented in Table 6.10.

Table 6.10 Site water balance for the existing operation and project

Month	Average daily maximum temperature	Average monthly rainfall (mm)	Average monthly pan evaporative (mm)	Total water in (ML)		Total water out (ML)		Balance (ML)		Dust suppression (ML)	
				Existing operation	Project	Existing operation	Project	Existing operation	Project	Existing operation	Project
Jan	30.7	85.7	187.5	28.71	30.99	31.61	34.78	-2.91	-3.79	1.59	1.99
Feb	29.6	85.4	151.6	28.65	30.92	26.75	29.59	1.90	1.34	1.34	1.67
Mar	27.4	75.8	126.5	26.51	28.79	23.45	26.06	3.06	2.73	1.26	1.57
Apr	24.2	47.3	88.8	20.15	22.43	18.38	20.65	1.77	1.78	0.89	1.12
May	20.4	40.6	67.2	18.67	20.95	15.52	17.59	3.16	3.37	0.53	0.66
Jun	17.3	43.2	51.5	19.24	21.52	13.40	15.33	5.84	6.19	0.20	0.25
Jul	17.1	33.1	61.3	16.98	19.26	14.73	16.75	2.25	2.51	0.18	0.23
Aug	19.1	36.3	85.9	17.71	19.99	18.02	20.26	-0.31	-0.27	0.39	0.49
Sep	22.3	38.8	116.2	18.27	20.55	22.06	24.57	-3.79	-4.03	0.70	0.88
Oct	25.2	55.1	144.0	21.90	24.18	25.80	28.57	-3.90	-4.39	1.03	1.29
Nov	27.3	64.1	159.1	23.90	26.17	27.79	30.70	-3.90	-4.52	1.21	1.51
Dec	29.6	72.0	176.5	25.65	27.93	30.15	33.21	-4.50	-5.28	1.48	1.85
Total		**677.2**	**1,416.2**	**266.33**	**293.68**	**267.66**	**298.04**	**-1.33**	**-4.36**	**10.80**	**13.49**

The facility currently operates as a closed-loop water management system, whereby leachate generated on the processing pads and wastewater generated by the truck wash are captured in the onsite leachate control dam and reused for moisture conditioning during the composting process, as the composting process is a net user of water.

No leachate is discharged to surrounding drainage lines or watercourses and no water is sourced from outside the AGL mining operations. Additional water requirements (e.g. process water or any shortfall in leachate for compost conditioning) is sourced from Void 4 (located south of the leachate dams) via the AGL storage tank (refer to Section 1.3.5).

The site water balance indicates that, under average climate conditions, the facility would remain a net user of water. The compost moisture conditioning process would retain an almost net neutral water balance (i.e. total water in = total water out). However, the facility would have a slightly increased reliance on water sourced from Void 4 (approximately 7 ML/year) to support dust suppression and truck wash activities.

6.3.4 Potential impacts

Water quality

The construction and operation of the project have the potential to impact surface water quality due to:

- increased contamination risks associated with:
  - additional contaminants of potential concern and physical contaminants (e.g. litter) in the feedstock;
  - increased refuelling of plant and vehicles to facilitate increased production at the facility, resulting in accidental leaks or spills; and
  - a potential increase in the volume of leachate generated due to the increase in throughput, which may result in the leachate storage capacity on-site being exceeded and overflows of leachate storage dams; and
- potential erosion and sedimentation impacts during construction of the weighbridge.

The site water balance presented in Section 6.3.3 indicates that the project would not result in a net increase of leachate generated. In addition, the risk of exceeding the leachate storage capacity on-site is considered highly unlikely, as the combined storage capacity of the leachate control dam and overflow facilities (lower sediment basin and Void 4) is hundreds of megalitres (refer to Section 1.3.5). Therefore, the project would not increase contamination risks due to the generation of leachate.

The OEMP and its associated sub-plans, including the Surface and Groundwater Management Plan, will be updated to reflect the expanded operation and consider any additional contaminants (refer to Section 3.4). This will include review of the existing surface water monitoring program with regard to the analytical suite for sampling and actions, and action trigger levels for additional contaminants of potential concern, if any are identified.

Potential impacts on surface water quality during construction and operation of the project are expected to be minimal with the implementation of the existing controls in relation to erosion and sedimentation and contamination risks (refer to Appendix B), and existing monitoring and maintenance actions outlined in the Surface and Groundwater Management Plan to ensure the integrity of the existing stormwater and leachate management infrastructure and prevent cross-contamination. As such, there is no requirement for additional surface water mitigation or management measures.

Hydrology and flooding

Potential impacts to surface water hydrology and flooding during construction and operation include:

- alteration or impedance of existing drainage paths during construction, due to the presence of plant and equipment and stockpiling of excavated soil and materials, resulting in localised areas of flooding and scour; and
- obstruction of overland flow paths by the weighbridge, resulting in localised areas of flooding and scour.

These impacts are expected to be minimal with the implementation of the existing surface water mitigation and management measures (refer to Appendix B). The existing stormwater diversion infrastructure is considered to be adequate to manage runoff during construction and operation of the project (refer to Section 1.3.5).

Water availability

The site water balance presented in Section 6.3.3 indicates that an additional 7 ML/year of Void 4 water would be required to support dust suppression and truck wash activities.

Void 4 water levels are currently managed by two mechanisms:

- Usage for compost moisture conditioning at the facility.
- Pumping to Bayswater Power Station (by AGL) for further re-use. In years of average rainfall, AGL disposes of approximately 500 ML/year to Lake Liddell.

There are no other demands on water from Void 4.

As such, the estimated additional water usage of 7 ML/year for the project for dust suppression and the truck wash facility would result in a minor reduction in the volume of water AGL disposes to Lake Liddell. This is unlikely to impact water availability for the facility.

6.4 Noise and vibration

An assessment of potential noise and vibration impacts of the approved development was provided in Appendix K and Section 9.5 of the SSD EIS.

6.4.1 Methodology

The potential noise impacts associated with the construction and operation of the project are assessed in the *Noise Impact Assessment* (Muller Acoustic Consulting, 2025) provided in Appendix E. The findings of the report are summarised in this section.

The project is not expected to result in any additional vibration impacts at surrounding receivers during construction or operation, as it is a significant distance from the nearest sensitive receivers in Camberwell (approximately 6 km away). Potential vibration impacts were therefore not considered further in the assessment.

The noise impact assessment was undertaken in accordance with the following government and industry policies, guidelines and standards:

- *Noise Policy for Industry* (NPI) (EPA, 2017);
- *NSW Road Noise Policy* (RNP) (NSW Department of Environment, Climate Change and Water (DECCW), 2011); and
- *Interim Construction Noise Guideline* (ICNG) (DECC, 2009).

The assessment involved:

- characterising the existing noise environment through a review of any previous acoustic assessments for the site and/or publicly available monitoring data;
- identifying noise sensitive receivers surrounding the site using satellite imagery;
- establishing noise criteria for the project;
- assessing the prevailing weather conditions using historical weather data from the nearest BoM weather station to derive metrological parameters for prediction of noise during calm and noise enhancing weather;
- identifying the 'realistic worst-case' construction scenario and representative plant and equipment for the scenario, including plant and equipment sound power levels. The worst-case scenario considered for the project assumes that all plant and equipment are operating simultaneously during standard construction hours (refer to Section 3.6.4). A list of vehicles, plant and equipment that would be used during construction is provided in Section 3.6.5. Sound power levels for the plant and equipment were sourced from the Transport for NSW Construction and Maintenance Noise Estimator Tool;
- quantitatively assessing potential construction noise impacts of the project using the distance attenuation calculation method (outlined in the ICNG), a highly conservative method that takes into account sound intensity losses due to hemispherical spreading;
- quantitatively assessing potential operational noise impacts of the project using logarithmic addition of noise sources, including cumulative noise impacts with the existing facility operations;
- qualitatively assessing potential increases to road traffic noise on haulage routes; and
- identifying management and mitigation measures required to avoid, minimise and manage any potential noise impacts during the project's construction and operation.

6.4.2 Existing environment

Sensitive receivers

Sensitive receivers in the surrounding area are described in Section 2.1.3.

6.4.3 Assessment criteria

Construction noise

Condition B27 of consent SSD-9418 states that the development must be constructed to achieve the construction noise management levels detailed in the ICNG.

In accordance with the ICNG, the noise management level (NML) for standard construction hours (refer to Section 3.6.4) is equal to the rating background level (RBL) + 10 decibels (dB). Therefore, the applicable standard construction hours NML is 45 dB $LA_{eq(15min)}$ (the A-weighted equivalent continuous sound pressure level measured over a 15-minute period), conservatively assuming a minimum daytime RBL of 35 dB(A) (A-weighted decibels) as per the ICNG.

It is noted that EPL 7654 does not prescribe noise limits for construction of the facility.

Operational noise

Condition B28 of consent SSD-9418 states that operational noise from the facility must not exceed the noise limits presented in Table 6.11. EPL 7654 does not prescribe any noise limits for the operation of the facility.

Table 6.11 Operational noise limits

Location	Operational noise limit		
	Day (dB $LA_{eq(15\ minute)}$)	Evening (dB $LA_{eq(15\ minute)}$)	Night (dB $LA_{eq(15\ minute)}$)
Camberwell	40	35	35

6.4.4 Potential impacts

Construction noise

During construction of the weighbridge, there is the potential for noise impacts at nearby sensitive receivers due to the operation of additional vehicles, plant and equipment, as described in sections 3.6.5 and 3.7.

Noise levels at the nearest sensitive receivers in Camberwell during the simultaneous use of construction vehicles, plant and equipment are predicted to be less than 30 dB $LA_{eq(15min)}$, which is significantly below the construction NML of 45 dB(A).

Therefore, there is no requirement for any additional construction noise mitigation or management measures. Nevertheless, the existing mitigation and management measures in relation to noise emissions will continue to be implemented to minimise these emissions as far as possible (refer to Appendix B).

Operational noise

The project has the potential to increase operational noise levels, as up to an additional 28 heavy vehicle movements and 10 light vehicle movements would be required to and from the site per day to facilitate transportation of the additional organic recovered material and staff (refer to Section 3.7). No changes are required to the existing operational plant and equipment currently used at the facility.

The logarithmic addition of potential operational noise sources indicates there would be no net increase in operational noise levels at the nearest sensitive receivers in Camberwell due to the additional vehicle movements.

The noise impact assessment for the SSD EIS (Global Acoustics, 2019) predicted operational noise levels of up to 27 dB $LA_{eq(15min)}$ at the nearest sensitive receivers in Camberwell under noise enhancing meteorological conditions. It is therefore predicted that operational noise levels at these receivers would remain consistent with the previously predicted operational noise levels, and would remain significantly below the daytime noise criterium of 40 dB $LA_{eq(15min)}$.

As such, there is no requirement for any additional operational noise mitigation or management measures. Nevertheless, the existing mitigation and management measures in relation to noise emissions will continue to be implemented to minimise these emissions as far as possible (refer to Appendix B).

Road traffic noise

An additional 38 vehicle movements would be required to and from the site per day during operation of the project, consisting of 28 heavy vehicle movements and 10 light vehicle movements (refer to Section 3.7). The facility is currently approved for 146 vehicle movements per day, comprising 114 heavy vehicle movements and 32 light vehicle movements.

A review of traffic volumes from the nearest traffic data collection station (Station ID 6153, north of Singleton) identified that the New England Highway carries approximately 13,915 vehicles per day (Transport for NSW, 2025). The increase in traffic volumes associated with the project equates to an increase in traffic volumes of less than 0.3%, and an increase in road traffic noise levels of less than 0.02 dB $LA_{eq(period)}$. Consequently, the potential increases in road noise levels are unlikely to be discernible at nearby sensitive receiver locations according to the RNP (as it would be significantly less than 2 dB), and will not require additional mitigation or management measures. Nevertheless, the existing mitigation and management measures in relation to noise emissions will continue to be implemented to minimise these emissions as far as possible (refer to Appendix B).

6.5 Traffic, transport and access

An assessment of potential traffic, transport and access impacts of the approved development was provided in Appendix J and Section 9.4 of the SSD EIS.

6.5.1 Methodology

The potential traffic impacts associated with the construction and operation of the project are assessed in the *Traffic Impact Assessment* (SCT Consulting, 2025) provided in Appendix F. The findings of the report are summarised in this section.

The assessment involved:

- describing the existing traffic and transport environment of the local area, including the existing road network, and active and public transport provisions;
- identifying key transportation routes during construction and operation;
- identifying daily and peak traffic movements likely to be generated during construction and operation;
- assessing the potential impacts of the project's construction and operational traffic on the performance of key roads and intersections within the surrounding road network, including potential cumulative impacts with the existing facility operation, as well as public and active transport, access, parking and road safety; and
- identifying management and mitigation measures required to avoid, minimise, and manage any potential traffic, transport and access impacts during the project's construction and operation.

6.5.2 Existing environment

Road network and site access

Access to the site is via an unsealed internal access road off Lemington Road. Lemington Road is a sealed road that connects to the New England Highway (A15) approximately 3.5 km south of the site. The New England Highway connects Hexham, NSW in the south with Yarraman, Queensland in the north.

Public and active transport

The Main Northern Railway is approximately 730 m north-east of the site and runs in a north-south direction. The nearest train station that operates passenger services is located at Singleton, approximately 20 km from the site.

There are no public transport services or pedestrian/cycling facilities in the vicinity of the site, due to its rural setting.

Traffic volumes, internal access and parking

A review of existing traffic volumes from the Transport for NSW Traffic Volume Viewer (Transport for NSW, 2025) identified that the New England Highway carries approximately 13,915 vehicles per day.

Existing traffic volumes generated by the facility, and internal access and parking provisions at the site are discussed in Section 1.3.5.

6.5.3 Potential impacts

The project would generate up to an additional 8 light vehicle movements and 2 heavy vehicle movements per day during construction (including inbound and outbound movements) and up to an additional 10 light vehicle movements and 28 heavy vehicle movements per day during operation (including inbound and outbound movements). Therefore, the operational stage is forecast to generate more traffic, and would have a larger impact than the construction stage. No additional vehicle movements were proposed as part of Modification 1 or are proposed as part of Modification 2.

During operation, the project is expected to generate five additional light vehicle movements inbound during the morning peak period as well as outbound during the afternoon peak period, representing staff travelling to and from the facility. Up to three additional heavy vehicle movements would occur in an hour to transport feedstock/compost product to/from the site, as heavy vehicle movements would be spread out over the 12-hour work day (from 6:00 am to 6:00 pm). As such, the project could generate up to eight additional vehicle movements during the morning and afternoon peak periods. These additional vehicle movements would comprise less than 1% of the existing 1,000 to 1,200 vehicles travelling through the New England Highway/Lemington Road intersection during the peak periods (Transport for NSW, 2025).

Traffic modelling of the New England Highway/Lemington Road intersection was conducted as part of the revised traffic impact assessment (Pavey Consulting Services, 2019) prepared for the SSD Submissions Report. The modelling indicated that, in 2028, the intersection would perform at a good level of service with acceptable delays and about 60-70% spare capacity during both the morning and afternoon peak periods, based on the proposed development traffic (an additional 32 light vehicle movements and 114 heavy vehicle movements per day). The modelling further indicated that the proposed development would have a minimal impact on the intersection with no deterioration in average delay, level of service or queue length.

The project is expected to result in minimal impacts on the performance of the New England Highway/Lemington Road intersection and the local road network and road safety, considering the relatively low traffic volumes generated during construction and operation (compared to the existing traffic volumes).

Given the lack of public transport services in the vicinity of the site, the additional traffic is unlikely to affect any public transport operations.

No impacts are expected on the active transport network, since there is no active transport infrastructure in the vicinity of the site and the project would not generate any active transport demand.

The project is not expected to result in any impacts on access and parking, as the project would not generate additional parking demand or require changes to property access or parking.

6.6 Other environmental impacts

Other environmental matters that were assessed in the SSD EIS were subject to a desktop assessment to confirm that the project will not result in any significant changes to the impacts assessed in the original SSD application. The findings of the desktop assessment are summarised in Table 6.12.

Table 6.12 Assessment of other environmental impacts

Matter and EIS summary	Impacts associated with Modification 2	Impacts associated with Modification 3
Hazards and risk – hazardous goods and substances		
▪ The preliminary risk screening conducted for the SSD EIS concluded that the development is not classified as a potentially 'offensive' or 'hazardous' development in accordance with the SEPP 33 Guidelines. A PHA was not required for the EIS under the Resilience and Hazards SEPP.	▪ The project would install a 65,000 L above ground self-bunded portable diesel tank adjacent to the existing 5,000 L diesel tank. No other changes to the existing storage, handling or management of hazardous substances or dangerous goods at the site are proposed. Diesel is classified as a combustible liquid (Class C1) by Australian Standard *AS 1940:2017 The storage and handling of flammable and combustible liquids* (AS 1940:2017) (Standards Australia, 2017) for the purpose of storage and handling, but is not classified as a dangerous good by the Australian Dangerous Goods Code (National Transport Commission, 2014) for transport purposes, when transported on its own (i.e. not with flammable liquids). Diesel will continue to be transported, stored, handled and managed in accordance with the relevant regulations and industry standards, including AS 1940:2017. ▪ The project would not change the risk screening analysis of the existing development, as diesel on-site would be stored within a self-bunded tank and would not be stored with other flammable/combustible liquids/materials, and is therefore not considered a potential hazardous substance under the SEPP 33 Guidelines. A PHA is not required to support the modification application. ▪ There are no changes required to the existing mitigation and management measures related to hazardous goods and substances.	▪ The project would result in an estimated 20% (27.8 kL) increase in diesel consumption per year during operation, resulting in up to 172.6 kL of diesel consumed per year. No other changes to the existing storage, handling or management of hazardous substances or dangerous goods at the site are proposed. Diesel will continue to be transported, stored, handled and managed in accordance with the relevant regulations and industry standards, including AS 1940:2017. ▪ The project would not change the risk screening analysis of the existing development, as diesel on-site would be stored within a self-bunded tank and an above ground portable fuel tank on a bunded hardstand, and would not be stored with other flammable/combustible liquids/materials (refer to sections 1.3.5 and 3.9), and is therefore not considered a potential hazardous substance under the SEPP 33 Guidelines. A PHA is not required to support the modification application. ▪ There are no changes required to the existing mitigation and management measures related to hazardous goods and substances.
Hazards and risk – bushfire risk		

Matter and EIS summary	Impacts associated with Modification 2	Impacts associated with Modification 3
▪ The construction and operation of the expanded development have the potential to result in increased bushfire risks. ▪ The development area is not mapped as bushfire prone land. Nevertheless, mitigation measures are proposed with respect to ensuring access, emergency evacuation and the supply of water.	▪ There are no changes expected to potential bushfire risks of the approved development. ▪ There are no changes required to the existing mitigation and management measures related to bushfire risk.	▪ The project has the potential to increase bushfire risks on-site, as the project may increase fire risks due to the increased quantity of combustible material that would be stored on-site (refer to 'Fire and incident management' section below). ▪ With the implementation of the existing mitigation and management measures provided in the SSD EIS and Site Emergency Plan (Bettergrow, 2025c) and emergency response procedures outlined in the OEMP, there would be negligible changes to potential bushfire risks from the approved development. ▪ There are no changes required to the existing mitigation and management measures related to fire and incident management.
Groundwater		
▪ The proposed expansion increases the potential for groundwater pollution impacts associated with leachate infiltration to the groundwater aquifers beneath the site. ▪ The potential risk and impact are considered minor given the negligible volumes of rainfall seepage below the site, depth of groundwater and the groundwater is saline. In addition, groundwater beneath the site flows into Void 4 immediately to the south, providing opportunity to capture and recycle water infiltrated throughout the site. ▪ Potential impacts to groundwater can be mitigated through a range of measures, including effective management of surface water. ▪ The facility will continue to be managed in accordance with the requirements of EPL 7654, including surface water monitoring requirements. ▪ The Surface and Groundwater Management Plan and other existing environmental management plans are to be updated to include expanded operations.	▪ The project is not expected to result in any additional groundwater impacts as: - the proposed new double-walled self-bunded above ground diesel tank is constructed to comply with Australian Standards to minimise any risk of environmental contamination; and - no changes are proposed to the existing leachate management infrastructure. ▪ There are no changes required to the existing mitigation and management measures related to groundwater.	▪ The project increases the potential for groundwater pollution impacts due to increased contamination risks associated with: - additional contaminants of potential concern and physical contaminants (e.g. litter) in the feedstock; and - increased refuelling of plant and vehicles to facilitate increased production at the facility that may result in accidental leaks or spills. ▪ The existing OEMP (and associated sub-plans) and Composting Management Plan will be updated to reflect the expanded operation and consider any additional contaminants of potential concern (refer to Section 3.4). ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be negligible changes to potential groundwater impacts from the approved development (refer to Section 6.3.4).

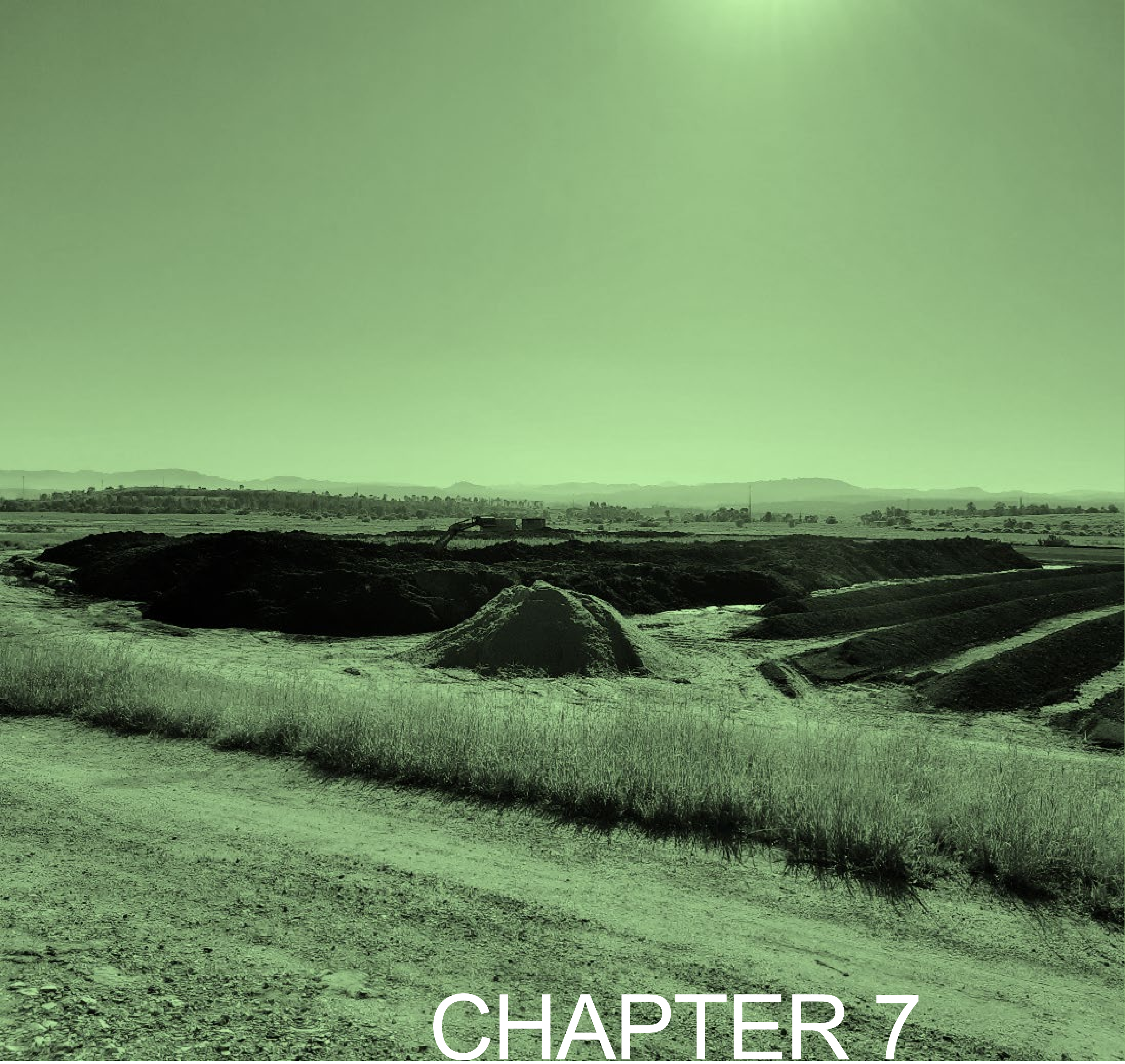
Matter and EIS summary	Impacts associated with Modification 2	Impacts associated with Modification 3
		▪ There are no changes required to the existing mitigation and management measures related to groundwater.
Biodiversity and biosecurity		
▪ The construction and operation of the expanded development have the potential to result in biodiversity impacts and increased biosecurity and bushfire risks. ▪ Ecological investigations carried out in support of the proposed expansion have found there is no suitable habitat present at the site or immediate surrounds to support any threatened species, endangered ecological communities, critical habitat or endangered populations. ▪ The site is in a Phylloxera Exclusion Zone and there is the potential for material imported to the site to come from areas that are Phylloxera infested. ▪ The incoming material would not come from areas considered high risk for Phylloxera. ▪ Any presence of Phylloxera would be destroyed due to the temperatures achieved during the composting process. AS 4554-2012 requires compost material to be subjected to pasteurisation temperatures above 55 °C for at least three consecutive days. These requirements meet the heat treatment disinfection procedures outlined in the Australian National Phylloxera Management Protocol. ▪ The biosecurity risk posed by the development would be adequately managed through the composting processes required by AS 4554-2012.	▪ There are no changes expected to potential biodiversity impacts or biosecurity risks from the approved development as the project does not involve any construction works, bulk earthworks or removal of native vegetation, or changes to vehicle movements or operational practices. ▪ There are no changes required to the existing mitigation and management measures related to biodiversity and biosecurity	▪ There are no changes expected to potential biodiversity impacts from the approved development as the project does not involve the removal of native vegetation or bulk earthworks. ▪ The project would result in a minor increase in biosecurity risks due to the generation of additional vehicle movements during construction and operation that may spread weeds or pathogens. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be negligible changes to potential biosecurity impacts from the approved development. ▪ There are no changes required to the existing mitigation and management measures related to biodiversity and biosecurity.
Visual		
▪ The development design has considered potential visual impacts on surrounding areas, including the distance of sensitive receivers from potentially affected areas and shielding provided by natural topographic features and the landforms associated with rehabilitated mining areas in the project area.	▪ There are no changes expected to potential visual impacts from the approved development as the project would not involve an extension to the development footprint, construction works or changes to operational activities.	▪ The project is not likely to result in any additional visual impacts during construction or operation considering: - its distance from nearest sensitive receivers (approximately 6 km away) and public viewpoints; - surrounding topographic features;

Matter and EIS summary	Impacts associated with Modification 2	Impacts associated with Modification 3
▪ The development does not require any site infrastructure that is elevated in nature, or visually intrusive during the day or night, or dominates the landscape. ▪ The existing and proposed operations would remain visually shielded by the surrounding vegetation and topography.	▪ There are no changes required to the existing mitigation and management measures related to visual amenity.	- landforms associated with rehabilitated mining areas; - the small scale and temporary nature of construction activities; and - no changes are required to the development footprint or operational activities. ▪ There are no changes required to the existing mitigation and management measures related to visual amenity.
Aboriginal heritage		
▪ The expanded operations may impact Aboriginal heritage values during construction and operation. ▪ No Aboriginal objects were identified in the project area and it is highly unlikely that Aboriginal objects would be uncovered as part of the proposed development. ▪ The proposed development would impact the cultural values of the project area by changing the land surface from disturbed land to a composting facility. However, given the project area is situated in a highly modified landscape and within an existing development, the impact is considered minor.	▪ There are no changes expected to potential Aboriginal heritage impacts from the approved development as the project would not involve any excavation of undisturbed land, extension of the development footprint or changes to operational activities. ▪ There are no changes required to the existing mitigation and management measures related to Aboriginal heritage.	▪ There are no changes expected to potential Aboriginal heritage impacts from the approved development as the project would not involve any excavation of undisturbed land, extension of the development footprint or changes to operational activities. ▪ There are no changes required to the existing mitigation and management measures related to Aboriginal heritage.
Historic heritage		
▪ The expanded operations may impact historic heritage values during construction and operation. ▪ There are no heritage items identified in the project area and it is not anticipated that the expansion would have any impact on any items of historic heritage due to the highly disturbed nature of the site and the lack of any listed sites in the vicinity.	▪ There are no changes expected to potential historic heritage impacts from the approved development as the project would not involve any excavation of undisturbed land, extension of the development footprint or changes to operational activities. ▪ There are no changes required to the existing mitigation and management measures related to historic heritage.	▪ There are no changes expected to potential historic heritage impacts from the approved development as the project would not involve any excavation of undisturbed land, extension of the development footprint or changes to operational activities. ▪ There are no changes required to the existing mitigation and management measures related to historic heritage.
Socio-economic		
▪ Construction and operation of the proposed development may result in potential impacts to local amenity, including air quality (dust and odour),	▪ The modification would result in minimal additional socio-economic impacts as it would result in minimal amenity impacts (including air	▪ The project would result in minimal additional socio-economic impacts as it would result in minimal amenity impacts (including air quality,

Matter and EIS summary	Impacts associated with Modification 2	Impacts associated with Modification 3
noise, traffic and visual impacts, unless appropriate design and mitigation measures are adopted. ▪ The potential for negative amenity impacts would be significantly reduced with the implementation of appropriate design features and environmental management controls guided by the Operational Environmental Management Plan. ▪ The expansion of the existing operation would benefit the existing rehabilitation activities across AGL lands. ▪ The development would assist the NSW Government in achieving an increased diversion of waste from landfill and increasing availability of recycled products through the provision of strategic infrastructure and processing capacity, thus having a positive impact on waste minimisation and resource recovery in the region. ▪ The proposed expansion would generate employment opportunities during construction and operation. ▪ The capital expenditure and associated economic spin-offs would contribute to and strengthen the local and regional economy.	quality, noise or visual impacts) to neighbouring landowners, and is unlikely to impact on the value of any properties in the area or negatively impact the operation of any business in the area. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be negligible changes to potential socio-economic impacts from the approved development. ▪ The project would generate socio-economic benefits by supporting NSW's transitioning to a circular economy and meeting the increasing demand for recycled organic products, while having minimal environmental and social impact. ▪ There are no changes required to the existing mitigation and management measures related to socio-economic impacts.	noise or visual impacts) to neighbouring landowners and minimal traffic impacts, and is unlikely to impact on the value of any properties in the area or negatively impact the operation of any business in the area. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be negligible changes to potential socio-economic impacts from the approved development. ▪ The project would generate socio-economic benefits by supporting NSW's transitioning to a circular economy and meeting the increasing demand for recycled organic products, while having minimal environmental and social impact. ▪ There are no changes required to the existing mitigation and management measures related to socio-economic impacts.
Fire and incident management		
▪ The main risk for waste combustion exists from spontaneous combustion due to the overheating of the composted materials. No stockpiles of timber or dry product will be stored on-site. ▪ Established fire management control measures, pollution incident response management plans and emergency procedures and protocols from Bettergrow's existing operations will be updated for the expanded development. This would ensure that the site has the appropriate checks and balances in place to safeguard the protection of life and the prevention of environmental harm, including air, water or land pollution.	▪ There are no changes expected to potential fire risks or incident management of the approved development, as the project would not increase the quantity of organic material stored on-site or introduce organic material that is more combustible than the material already approved to be received, stored and processed on-site. The new double-walled self-bunded diesel tank would be installed, maintained and operated in accordance with the relevant Australian standards that minimise fire risk and incidents. ▪ There are no changes required to the existing mitigation and management measures related to fire and incident management.	▪ The project has the potential to increase fire risks on-site, as the project would increase the quantity of combustible organic material stored on-site. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be negligible changes to potential fire risks from the approved development. ▪ There are no changes required to the existing mitigation and management measures related to fire and incident management.

<table>
<tr><th>Matter and EIS summary</th><th>Impacts associated with Modification 2</th><th>Impacts associated with Modification 3</th></tr>
<tr><td colspan="3">Waste management</td></tr>
<tr><td>The development would accept up to 200,000 tpa of organic waste for processing. It would also generate operational waste including office waste, packaging waste and maintenance wastes. The inappropriate management of these wastes has the potential to result in impacts both on and off the site.
The waste streams presently received at the facility will continue to be managed in accordance with the facility's existing management plans.
Waste generated from construction and operation of the expanded facility will continue to be managed in accordance with the established waste hierarchy which underpins the objectives of the Waste Avoidance and Resource Recovery Act 2001 to ensure that the diversion of waste from landfill is maximised.
A Waste Monitoring Program and Waste Management Plan will be prepared and implemented, and updated as required, to ensure waste inputs and outputs are monitored and adequate waste management measures are in place for the development.
The facility, once operational, would provide critical waste management infrastructure that would be able to service existing and future waste management needs and assist the NSW Government in achieving an increased diversion of waste from landfill through the provision of strategic infrastructure and processing capacity.</td><td>The introduction of new waste streams has the potential to result in impacts on-site and off-site if the waste is not appropriately managed.
The project is not expected to result in any additional waste management impacts as:
Additional waste streams brought on site would only be for the purpose of composting. Decontaminated and pasteurised FOGO and/or food recovered material received on-site would require a specific resource recovery order and exemption issued by the EPA. Only VENM and ENM that comply with the requirements of the POEO Act and Excavated Natural Material Order 2014 will be accepted for processing at the site.
Only deliveries with weighbridge dockets will continue to be allowed at the facility, and information on the quantity, type and source of waste, as well as the vehicle registration, driver signatures and the materials' origin will be collected.
With the implementation of the mitigation and management measures provided in the SSD EIS, there would be negligible changes to potential waste management impacts from the approved development.
There are no changes required to the existing mitigation and management measures related to waste management.</td><td>The introduction of new waste streams has the potential to result in impacts on-site and off-site if the waste is not appropriately managed.
The project is not expected to result in any additional waste management impacts as:
Additional waste streams brought on site would only be for the purpose of composting.
FOGO recovered material would comprise food waste and garden waste as defined in Schedule 1 of the POEO Act (refer to Section 3.4).
Information on the quantity, type and source of waste, as well as the vehicle registration, driver signature and the materials' origin would be collected from the weighbridge dockets (refer to Section 3.7).
Organic material is frequently inspected (including upon arrival at the site, during unloading and blending of the material and after the maturation process) to remove any physical contaminants such as plastics, glass and textiles and prevent littering of the surrounding environment and potential contamination impacts (refer to Section 1.3.5).
With the implementation of the mitigation and management measures provided in the SSD EIS, there would be negligible changes to potential waste management impacts from the approved development.
There are no changes required to the existing mitigation and management measures related to waste management.</td></tr>
<tr><td colspan="3">Cumulative impacts</td></tr>
<tr><td>The construction and operation of the expanded operations would make a minimal contribution to potential cumulative dust, noise, traffic, visual,</td><td>The project would make only a minimal contribution to cumulative odour impacts and greenhouse gas emissions.</td><td>The project would make only a minimal contribution to cumulative air quality and traffic impacts (refer to sections 6.2 and 6.5).</td></tr>
</table>

Matter and EIS summary	Impacts associated with Modification 2	Impacts associated with Modification 3
surface water, leachate management and groundwater impacts. ▪ Potential cumulative impacts would be further reduced or avoided with the implementation of the mitigation and management measures provided in the SSD EIS.	▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be negligible changes to potential cumulative impacts from the approved development. ▪ There are no changes required to the existing mitigation and management measures related to cumulative impacts.	▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be negligible changes to potential cumulative impacts from the approved development. ▪ There are no changes required to the existing mitigation and management measures related to cumulative impacts.



CHAPTER 7

JUSTIFICATION OF MODIFIED PROJECT

7 JUSTIFICATION OF MODIFIED PROJECT

The facility originally commenced operation under development consent DA140/2016 granted by Council under Part 4 of the EP&A Act on 25 November 2016. This development consent was subsequently modified on two separate occasions (refer to Section 1.3.2).

On 31 August 2022, development consent SSD-9418 was granted by a delegate of the (then) Minister for Planning under Section 4.38 of the EP&A Act, to expand the existing facility to process up to 200,000 tpa of organic recovered material, including water drainage and leachate works, extension of the compost processing and blending areas pad and associated infrastructure.

Development consent SSD-9418 has previously been modified under Section 4.55(1A) of the EP&A Act on one occasion (refer to Section 1.3.3). Bettergrow has recently submitted an application to the DPHI to modify consent SSD-9418 under Section 4.55(1A) of the EP&A Act (Modification 2) to enable the following at the facility:

- receival and processing of decontaminated and pasteurised FOGO and/or food recovered material;
- receival and blending of VENM and ENM with organic recovered materials; and
- installation of a 65,000 L above ground diesel storage tank to reduce fuel deliveries to the site.

Bettergrow is now seeking approval to modify consent SSD-9418 under Section 4.55(2) of the EP&A Act (Modification 3) to allow:

- an increase in the receival and processing capacity of the facility from 200,000 tpa to 250,000 tpa;
- receival and processing of raw FOGO recovered material at the facility;
- installation of a site weighbridge;
- employment of three additional staff; and
- up to five additional light vehicles and 14 additional heavy vehicles to access the site per day.

Prior to the preparation of this modification report, DPHI was consulted regarding the most appropriate planning approval pathway for the modification. DPHI confirmed that the modification application should be submitted and assessed under Section 4.55(2) of the EP&A Act, as the development (as modified) would be substantially the same development as the development for which consent was originally granted.

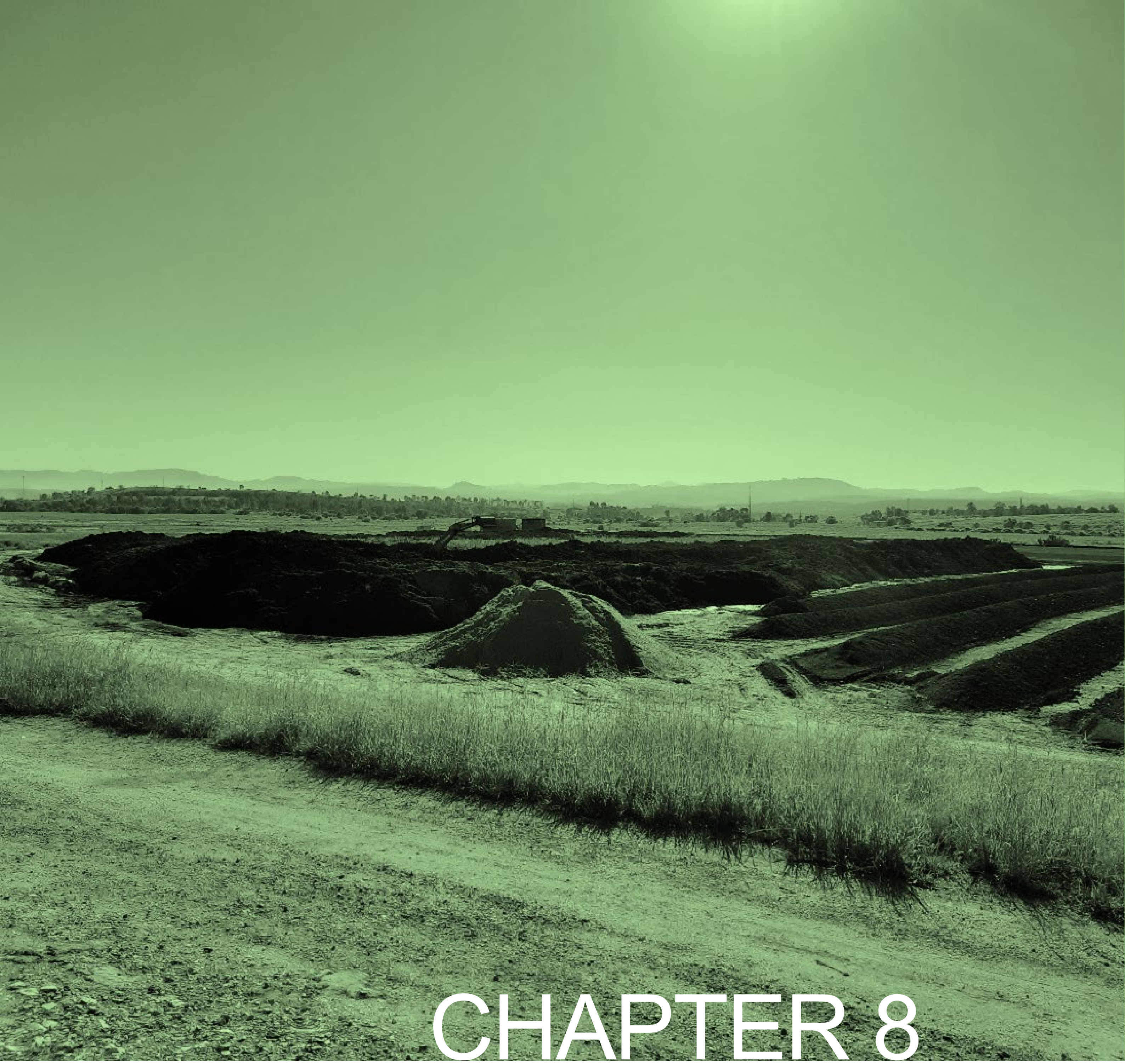
Consultation was also undertaken with the EPA, Council, Transport for NSW, Subsidence Advisory NSW and adjoining landowners. Feedback provided by these stakeholders has been addressed in Chapter 5 of this report.

The modification has been assessed in accordance with the requirements of Section 4.55 the EP&A Act and has been shown to be consistent with the relevant local, State and Commonwealth government statutory planning instruments and strategic plans and policies.

The proposed modified operations will provide enhanced social and economic benefits by increasing the region's processing capacity to recycle FOGO recovered material, thereby reducing the amount of organic waste going to landfill and contributing to the conservation of natural resources, which is consistent with the principles of a circular economy and environmentally sustainable development.

It has been demonstrated throughout this report that minor impacts associated with the proposed modification can be addressed through the implementation of the existing management and mitigation measures, as summarised in Appendix B. Overall, the development, as proposed to be modified, would have significant environmental, social and economic benefits that far outweigh any residual environmental impacts.

Given the need for the modification, the suitability of the site and lack of environmental impacts, the modification is considered to be justified and in the public interest and therefore appropriate for approval under Section 4.55(2) of the EP&A Act.



CHAPTER 8

REFERENCES

8 REFERENCES

Advanced Environmental Dynamics (2019), Appendix G – Greenspot Ravensworth Greenhouse gas, odour, and dust Assessments.

Advanced Environmental Dynamics (2022), Memorandum Greenspot Ravensworth Greenhouse Gas, Odour and Dust Assessments AED Report# 957002.1 – Update 2022, prepared for Space Urban by Advanced Environmental Dynamics, 6 May 2022.

Arcadis (2019), Critical Evaluation of Composting Operations and Feedstock Suitability – Phase 1 – Odour Issues. Prepared for the Department of Environment and Science, Queensland Government.

Australian Bureau of Agricultural and Resource Economics and Sciences (2016), Australian Dryland Salinity Assessment Spatial Data (1:2,500,000) – NLWRA 2001. Available at: https://data.gov.au/data/dataset/australian-dryland-salinity-assessment-spatial-data-12500000-nlwra-2001 [Accessed 15 April 2025].

Bettergrow (2023), Transport Management Plan for Part A & Part B of CA-05 Biosecure Transport of Host Plant Material Bettergrow Ravensworth Compost Facility (Version 1, dated 23 June 2023).

Bettergrow (2024a), Operational Environmental Management Plan – Bettergrow Ravensworth Composting Facility (Version 4, dated 1 October 2024).

Bettergrow (2024b), Waste Management Plan – Bettergrow Ravensworth Composting Facility (Version 2, dated 26 July 2024).

Bettergrow (2025a), Bettergrow website - Environmental. Available at: https://www.bettergrow.com.au/environmental/. [Accessed 15 August 2025].

Bettergrow (2025b), Composting Management Plan, Including Management for CA-05 Biosecure Treatment of Phylloxera Host Plant Material for Recycling (Version 12, dated 7 August 2025).

Bettergrow (2025c), Site Emergency Plan (Version 1.0, dated 4 August 2025).

BMT (2023), Singleton Floodplain Risk Management Study and Plan. Prepared for Singleton Council.

Bureau of Meteorology (2025a), Groundwater Dependent Ecosystems Atlas. Available at: http://www.bom.gov.au/water/groundwater/gde/ [Accessed 16 April 2025].

Bureau of Meteorology (2025b), Climate Data Online. Available at: http://www.bom.gov.au/climate/averages [Accessed May 2025].

Bureau of Meteorology (2025c), Climate classification maps. Available at: http://www.bom.gov.au/climate/maps/averages/climate-classification/ [Accessed 17 April 2025].

Carbon Mate Pty Ltd (2025), Carbon Mate website. Available at: https://carbonmate.com.au/ [Accessed 17 April 2025].

Clean Energy Regulator (2023), National Greenhouse and Energy Reporting (NGER) Calculator, Australian Government Clean Energy Regulator, Canberra, Available at: https://cer.gov.au/schemes/national-greenhouse-and-energy-reporting-scheme/report-emissionsand-energy/nger-calculators [Accessed 6 May 2025].

Clean Energy Regulator (2024), Emissions and Energy Threshold Calculator User Guide.

Commonwealth of Australia (2018), National Waste Policy: Less Waste, More Resources.

Commonwealth of Australia (2019), Bioregional Assessment Program – Hunter subregion – Groundwater systems. Available at: https://www.bioregionalassessments.gov.au/assessments/11-context-statement-hunter-subregion/1141-groundwater-systems [Accessed 16 April 2025].

Department of Climate Change, Energy, the Environment and Water (2024a), National Waste Policy Action Plan 2024.

Department of Climate Change, Energy, the Environment and Water (2024b), Australian National Greenhouse Accounts Factors – For individuals and organisations estimating greenhouse gas emissions, Department of Climate Change, Energy, the Environment and Water, August 2024.

Department of Climate Change, Energy, the Environment and Water (2024c), Quarterly Update of Australia's National Greenhouse Gas Inventory: June 2024, Department of Climate Change, Energy, the Environment and Water, November 2024.

Department of Climate Change, Energy, the Environment and Water (2025a), National Pollutant Inventory. Available at: https://www.npi.gov.au/npidata/action/load/map-search [Accessed 15 April 2025]. Commonwealth Department of Climate Change, Energy, the Environment and Water (2025)

Department of Climate Change, Energy, the Environment and Water (2025b), State and Territory greenhouse gas inventories: 2022 emissions – Department of Climate Change, Energy, the Environment and Water website, Available at: https://www.dcceew.gov.au/climate-change/publications/national-greenhouse-accounts-2022/state-and-territory-greenhouse-gas-inventories-2022-emissions [Accessed January 2025].

Ektimo (2025), Modification 2 & Modification 3 of State Significant Development 9418 for Bettergrow Pty Ltd – Odour Emission Monitoring at Valoriza Dandenong Report R019297a.

Element Environment (2025). Scoping of environmental assessment for Modification 2 to the Bettergrow Ravensworth Composting Facility. Letter to NSW Department of Planning, Housing and Infrastructure, dated 11 April 2025.

Environmental Resources Management (2013), Resource Recovery Facility – Gerogery, Odour Impact Assessment, prepared for Baker & McKenzie, August 2013.

Fifteen50 (2019a), Appendix H – GreenSPOT Recycling Facility EIS: Surface Water Report.

Fifteen50 (2019b), Appendix I – GreenSPOT Recycling Facility EIS: Groundwater Report.

GHD (2015), Lucas Heights Resource Recovery Park Project Air Quality Assessment, prepared for SITA Australia, August 2015.

Hunter Joint Organisation (2021), Regional Circular Materials Strategy Hunter and Central Coast 2022 – 2027.

Hunter Local Land Services (2022a), Hunter Regional Strategic Weed Management Plan 2023-2027.

Hunter Local Land Services (2022b), Hunter Region Natural Resource Management Plan 2023-2028.

Hunter Local Land Services (2024), Hunter Regional Strategic Pest Animal Management Plan June 2024 – June 2028.

Hunter Valley Bushfire Management Committee (2023), Bush Fire Risk Management Plan.

Institute of Air Quality Management (2024) Guidance on the assessment of dust from demolition and construction January 2024 (Version 2.2).

Jacobs (2022), Ravensworth South Mine - Rehabilitation Amendment Modification Report Appendix D – Groundwater technical reports.

Kovac M. & Lawrie J.M. (1991), Soil Landscapes of the Singleton 1:250,000 Sheet map and report, Soil Conservation Service of NSW, Sydney.

KPMG (2024), Independent Audit No.1 – Ravensworth Composting Facility SSD-9418 (September 2024).

KPMG (2025), Statistical Review of World Energy 74th Edition.

Loop Organics (2025), Loop Organics. Available at: https://looporganics.com.au [Accessed 4 April 2025].

Muller Acoustic Consulting (2025), Noise Impact Assessment – Ravensworth Composting Facility, 94 Lemington Road, Ravensworth, NSW (dated 7 August 2025).

NSW Department of Climate Change, Energy, the Environment and Water (2024a), NSW State Vegetation Type Map.

NSW Department of Climate Change, Energy, the Environment and Water (2024b), Biodiversity Values Map and Threshold Tool. Available at: https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap [Accessed 15 April 2025].

NSW Department of Climate Change, Energy, the Environment and Water (2024c), Air Quality Monitoring Network – Upper Hunter 2023 overview.

NSW Department of Environment and Climate Change (2008), Book 1 Dryland Salinity: The Basics.

NSW Department of Environment and Climate Change (2009), Interim Construction Noise Guideline.

NSW Department of Environment and Conservation (2004), Environmental Guidelines – Composting and Related Organics Processing Facilities.

NSW Department of Environment and Conservation (2006a), Technical framework – Assessment and management of odour from stationary sources in NSW.

NSW Department of Environment and Conservation (2006b), Assessing Vibration: A Technical Guideline.

NSW Department of Land and Water Conservation (2002), The NSW State Groundwater Dependent Ecosystem Policy. Sydney: Department of Land and Water Conservation.

NSW Department of Planning (2011), Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines.

NSW Department of Planning and Environment (2022a), State significant development guidelines – preparing a modification report.

NSW Department of Planning and Environment (2022b), Hunter Regional Plan 2041.

NSW Department of Planning, Housing and Infrastructure (2025a), Planning Portal Spatial Viewer. Available at: https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/address [Accessed 15 April 2025].

NSW Department of Planning, Housing and Infrastructure (2025b), The Sharing and Enabling Environmental Data (SEED) Portal. Available at: https://datasets.seed.nsw.gov.au/dataset/srlup-salbiophysical [Accessed 15 April 2025].

NSW Department of Planning, Housing and Infrastructure (2025c), Bionet Atlas. Available at: https://atlas.bionet.nsw.gov.au/UI_Modules/ATLAS_/AtlasSearch.aspx [Accessed 15 April 2025].

NSW Department of Planning, Industry and Environment (2020), Net Zero Plan Stage 1:2020-2030.

NSW Department of Planning, Industry and Environment (2021a), NSW Waste and Sustainable Materials Strategy 2041 Stage 1:2021-2027.

NSW Department of Planning, Industry and Environment (2021b), New South Wales Plastics Action Plan.

NSW Department of Primary Industries (2021), Draft SSAL Map. Available at: https://nswdpi.mysocialpinpoint.com/ssal/map#/ [Accessed 15 April 2025].

NSW Environment Protection Authority (2000), Environmental Guidelines – Use and disposal of biosolids products.

NSW Environment Protection Authority (2011), Environmental Guidelines: Use and Disposal of Biosolids Products.

NSW Environment Protection Authority (2011), NSW Road Noise Policy.

NSW Environment Protection Authority (2014), Waste Classification Guidelines.

NSW Environment Protection Authority (2015), Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997.

NSW Environment Protection Authority (2017), NSW Noise Policy for Industry.

NSW Environment Protection Authority (2019), Circular Economy Policy Statement – Too good To Waste.

NSW Environment Protection Authority (2020), Positive outlook for organics markets in NSW. Available at: https://www.epa.nsw.gov.au/sites/default/files/21p3340-nsw-organics-market-analysis.pdf [Accessed 2 April 2025].

NSW Environment Protection Authority (2021), Waste Delivery Plan.

NSW Environment Protection Authority (2022a), Approved methods for the sampling and analysis of air pollutants in NSW.

NSW Environment Protection Authority (2022b), Approved methods for the measurement and analysis of environmental noise in NSW.

NSW Environment Protection Authority (2024a), Strategic Plan 2024 –29.

NSW Environment Protection Authority (2024b), Emission impacts of composting food waste.

NSW Environment Protection Authority (2025a), FOGO mandates and rollout. Available at: https://www.epa.nsw.gov.au/Your-environment/Recycling-and-reuse/business-government-recycling/Food-organics-and-garden-organics/fogo-mandates-and-rollout#:~:text=NSW%20has%20a%20statewide%20mandate,in%20stages%20from%20July%202026 [Accessed 2 April 2025].

NSW Environment Protection Authority (2025b), NSW Guide for Large Emitters.

NSW Rural Fire Service (2019), Planning for Bushfire Protection – A guide for councils, planners, fire authorities and developers.

Office of Environment and Heritage (2012), Land and Soil Capability Assessment Scheme.

Office of Environment and Heritage (2013), Interim protocol for site verification and mapping of biophysical strategic agricultural land.

O'Neill, T., Rynk, R., Black, G., & Bokowa, A.F. (2022), The Composting Handbook, Chapter 12 - Odor management and community relations, Editor: Robert Rynk, Academic Press.

Pavey Consulting Services (2020), Traffic Impact Assessment – Greenspot Hunter Valley Nutrient Reycling Facility Lot 10 DP1204457, 74 Lemington Road, Ravensworth, NSW (12 October 2020 Rev 1), prepared for the Submissions Report.

Peak Land Management (2018), Appendix L – Biodiversity Constraints Assessment Report – Bettergrow Pty Ltd Organics Facility Expansion Ravensworth.

RCA Australia (2023), Ravensworth Leachate Barrier Certification.

Roberts J., Engel B. & Chapman J. (editor) (1991), Camberwell 1:100 000 Geological Sheet 9133, 1st edition. Geological Survey of New South Wales, Sydney.

RPS Australia East Pty Ltd (2019a), Greenspot Hunter Valley: EIS for 200,000 tpa Nutrient Recycling Facility – Ravensworth, NSW (SSD 9418).

RPS Australia East Pty Ltd (2019b), Appendix N – Ravensworth Aboriginal Cultural Heritage Assessment Report.

SCT Consulting (2025), Ravensworth Composting Facility | SSD-9418 Modification 3 – Traffic Impact Assessment (dated 2 October 2025).

Senversa (2024), Surface and Groundwater Management Plan – Ravensworth Composting Facility, 74 Lemington Road, Ravensworth, NSW (Version 3, dated 1 October 2024).

Senversa (2025), Surface Water Impact Assessment – Ravensworth Composting Facility – 74 Lemington Road, Ravensworth NSW (Version 4, dated 29 October 2025).

Singleton Council (2022), Create Singleton 2032 – Community Strategic Plan 2022 – 2032.

Space Urban (2022a), Greenspot Hunter Valley Nutrient Recycling Facility Response to Submissions – SSD 9418 20 June 2022.

Space Urban (2022b), Greenspot Hunter Valley Nutrient Recycling Facility Amended Report – 28 June 2022.

Space Urban (2023), Statement of Environmental Effects – Ravensworth Nutrient Recycling Facility Modification of SSD9418 – MOD 1, V2 13 October 2023.

Standards Australia (2003), AS 4454–2003 Compost soil conditioners and mulches.

Standards Australia (2006), AS 1692-2006 Steel tanks for flammable and combustible liquids (Reconfirmed 2016).

Standards Australia (2009), AS/NZS 4323.4:2009 Stationary source emissions - Area source sampling - Flux chamber technique.

Standards Australia (2012), AS 4454-2012 Composts, soil conditioners and mulches.

Standards Australia (2013), AS 1657-2013 Fixed platforms, walkways, stairways and ladders - Design, construction and installation.

Standards Australia (2017), AS 1940:2017 The storage and handling of flammable and combustible liquids.

Standards Australia (2018), AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures.

Strahler, A.N. (1957), Quantitative Analysis of Watershed Geomorphology – Transactions of American Geophysical Union.

The Odour Unit (2010), Odour Impact Assessment of Proposed Composting Facility, Wooroloo Brook Farm, WA, prepared for Purearth, April 2010.

Todoroski, A. and Cowan, I. (2015), Odour Measurement Data for Composting of Green Waste with the Addition of Food Organics or Grease Trap Waste Using Gore Covers, CASANZ 2015 conference, Melbourne.

Todoroski Air Sciences (2024), Air Quality Management Plan – Bettergrow Nutrient Recycling Facility Ravensworth (Rev 2, dated 25 July 2024).

Todoroski Air Sciences (2025a), Air Quality Impact and Greenhouse Gas Assessment – Bettergrow Ravensworth Composting Facility Modification 2, prepared for Element Environment, 23 September 2025.

Todoroski Air Sciences (2025b), Air Quality Impact and Greenhouse Gas Assessment – Bettergrow Ravensworth Composting Facility Modification 3, prepared for Element Environment, 30 October 2025.

Transport for NSW (2024a), Construction Noise and Vibration Guideline.

Transport for NSW (2024b), Guide to Transport Impact Assessment.

Transport for NSW (2025), Traffic Volume Viewer. Available at: https://maps.transport.nsw.gov.au/egeomaps/traffic-volumes/index.html#/?z=6 [Accessed 7 August 2025]

WaterNSW (2025), Real time data - Groundwater sites. Available at: https://realtimedata.waternsw.com.au/water.stm [Accessed 15 April 2025].

Worm Tech (2025), Organics Recycling. Available at: https://wormtech.com.au/resource-recovery/#composting [Accessed 4 April 2025].

YLAD Living Soils (2025), YLAD Living Soils. Available at: https://www.yladlivingsoils.com.au/ [Accessed 4 April 2025].

APPENDIX A

UPDATED PROJECT DESCRIPTION

Updated project description

The modified development remains essentially the same as the existing approved development, with minor changes for each modification shown in red in the table below.

Element	Existing Development	Modification 1	Modification 2	Modification 3
Use	Resource recovery facility for composting and nutrient recycling	Resource recovery facility for composting and nutrient recycling	Resource recovery facility for composting and nutrient recycling	Resource recovery facility for composting and nutrient recycling
Processing capacity	Total up to 200,000tpa	Total up to 200,000 tpa	Total up to 200,000 tpa	Total up to 250,000 tpa
Site area	Site and development footprint approximately 57ha in area.	Site and development footprint approximately 57 ha in area.	Site and development footprint approximately 57 ha in area.	Site and development footprint approximately 57 ha in area.
Hours of operation	6:00 am to 6:00 pm Monday to Saturday. No work on Sundays or Public Holidays.	6:00 am to 6:00 pm Monday to Saturday. No work on Sundays or Public Holidays.	6:00 am to 6:00 pm Monday to Saturday. No work on Sundays or Public Holidays.	6:00 am to 6:00 pm Monday to Saturday. No work on Sundays or Public Holidays.
Receival of waste	1 x weighbridge and 1 x load inspection bay	~~1 x weighbridge and~~ 1 x load inspection bay	1 x load inspection bay	1 x load inspection bay and 1 x weighbridge
Site infrastructure	▪ Site access and parking; ▪ Site office and staff amenities; ▪ Processing pads; ▪ Load inspection bay; ▪ Surface water drainage, including: - diversion bunds - drainage channels and spillway - 50.2 ML leachate control dam, consisting of a western and eastern dam - 2 ML sediment ('lower') basin; ▪ water storage tanks, including: - 1 x 300,000 L AGL water storage tank	▪ Site access and parking; ▪ Site office and staff amenities; ▪ Processing pads; ▪ Load inspection bay; ▪ Surface water drainage, including: - diversion bunds - drainage channels and spillway - 50.2 ML leachate control dam, consisting of a western and eastern dam - 2 ML sediment ('lower') basin; ▪ water storage tanks, including: - 1 x 300,000 L AGL water storage tank - 2 x 1,000 L potable water storage tanks;	▪ Site access and parking; ▪ Site office and staff amenities; ▪ Processing pads; ▪ Load inspection bay; ▪ Surface water drainage, including: - diversion bunds - drainage channels and spillway - 50.2 ML leachate control dam, consisting of a western and eastern dam - 2 ML sediment ('lower') basin; ▪ water storage tanks, including: - 1 x 300,000 L AGL water storage tank - 2 x 1,000 L potable water storage tanks; ▪ 1 x machinery shelter;	▪ Site access and parking; ▪ Site office and staff amenities; ▪ Processing pads; ▪ Load inspection bay; ▪ Surface water drainage, including: - diversion bunds - drainage channels and spillway - 50.2 ML leachate control dam, consisting of a western and eastern dam - 2 ML sediment ('lower') basin; ▪ water storage tanks, including: - 1 x 300,000 L AGL water storage tank

Element	Existing Development	Modification 1	Modification 2	Modification 3
	- 2 x 1,000 L potable water storage tanks; ▪ 1 x machinery shelter; ▪ 1 x truck wash; ▪ 1 x 27 m weighbridge; ▪ 1 x dirty water pit; and ▪ 1 x ,5000 L above ground diesel storage tank.	▪ 1 x machinery shelter; ▪ 1 x truck wash; ~~▪ 1 x Weighbridge;~~ ▪ 1 x dirty water pit; and ▪ 1 x 5,000 L above ground diesel storage tank.	▪ 1 x truck wash; ▪ 1 x dirty water pit; ▪ 1 x 5,000 L above ground diesel storage tank; and ▪ 1 x 65,000 L above ground diesel tank.	- 2 x 1,000 L potable water storage tanks; ▪ 1 x machinery shelter; ▪ 1 x truck wash; ▪ 1 x dirty water pit; ▪ 1 x 5,000 L above ground diesel storage tank; ▪ 1 x 65,000 L above ground diesel tank; and ▪ 1 x weighbridge.
Permitted waste	▪ Urban wood residues for Composting (as defined in 'The compost order 2016'); ▪ Paper Crumble for Composting (defined as General or Specific Exempted Waste); ▪ Wastewater from Bayswater mine Void 4; ▪ Drill mud process water (as defined in 'The Treated Drill Mud Order 2014'); ▪ Natural organic fibrous Composting material (as defined in Schedule 1 of the POEO Act); ▪ Biosolids; ▪ Garden Waste (as defined in Schedule 1 of the POEO Act); and ▪ Animal Waste (as defined in Schedule 1 of the POEO Act).	▪ Urban wood residues for Composting (as defined in 'The compost order 2016'); ▪ Paper Crumble (as defined in the 'Bettergrow Compost Order 2023', or as in force from time to time); ▪ Wastewater from Bayswater mine Void 4 (as defined in the 'Bettergrow Compost Order 2023, or as in force from time to time); ▪ Drill mud process water (as defined in 'The Treated Drill Mud Order 2014'); ▪ Natural organic fibrous ~~Composting~~ material (as defined in Schedule 1 of the POEO Act); ▪ Biosolids (categorised as unrestricted use, or restricted use 1,2 or 3 in accordance with criteria in the EPA Biosolids Guidelines, 2000); ▪ Garden Waste (as defined in Schedule 1 of the POEO Act); ▪ Animal Waste (as defined in Schedule 1 of the POEO Act); and	▪ Urban wood residues for Composting (as defined in 'The compost order 2016'); ▪ Paper Crumble (as defined in the 'Bettergrow Compost Order 2023', or as in force from time to time); ▪ Wastewater from Bayswater mine Void 4 (as defined in the 'Bettergrow Compost Order 2023, or as in force from time to time); ▪ Drill mud process water (as defined in 'The Treated Drill Mud Order 2014'); ▪ Natural organic fibrous ~~Composting~~ material (as defined in Schedule 1 of the POEO Act); ▪ Biosolids (categorised as unrestricted use, or restricted use 1,2 or 3 in accordance with criteria in the EPA Biosolids Guidelines, 2000); ▪ Garden Waste (as defined in Schedule 1 of the POEO Act); ▪ Animal Waste (as defined in Schedule 1 of the POEO Act);	▪ Urban wood residues for Composting (as defined in 'The compost order 2016'); ▪ Paper Crumble (as defined in the 'Bettergrow Compost Order 2023', or as in force from time to time); ▪ Wastewater from Bayswater mine Void 4 (as defined in the 'Bettergrow Compost Order 2023, or as in force from time to time); ▪ Drill mud process water (as defined in 'The Treated Drill Mud Order 2014'); ▪ Natural organic fibrous ~~Composting~~ material (as defined in Schedule 1 of the POEO Act); ▪ Biosolids (categorised as unrestricted use, or restricted use 1,2 or 3 in accordance with criteria in the EPA Biosolids Guidelines, 2000); ▪ Garden Waste (as defined in Schedule 1 of the POEO Act);

Element	Existing Development	Modification 1	Modification 2	Modification 3
		▪ Materials which are beneficial for compost production that are subject to a general or site-specific resource recovery order and exemption as issued by the EPA from time to time.	▪ Materials which are beneficial for compost production that are subject to a general or site-specific resource recovery order and exemption as issued by the EPA from time to time; ▪ VENM (as defined in Schedule 1 of the POEO Act); ▪ ENM (as defined in the Excavated Natural Material Order 2014); and ▪ Decontaminated and pasteurised FOGO and/or food recovered material, as defined in the relevant EPA resource recovery order and exemption.	▪ Animal Waste (as defined in Schedule 1 of the POEO Act); ▪ Materials which are beneficial for compost production that are subject to a general or site-specific resource recovery order and exemption as issued by the EPA from time to time; ▪ VENM (as defined in Schedule 1 of the POEO Act); ▪ ENM (as defined in the Excavated Natural Material Order 2014); ▪ Decontaminated and pasteurised FOGO and/or food recovered material, as defined in the relevant EPA resource recovery order and exemption; and ▪ Raw FOGO recovered material (comprising food waste and garden waste as defined in Schedule 1 of the POEO Act).
Waste sources	▪ Kerbside green waste collection from residential ▪ households (garden organics only), ▪ Hunter Water and Sydney Water (biosolids), ▪ Sawmills (wood residues), ▪ Paper processors (paper crumble), ▪ Infrastructure projects (drill muds), ▪ Mines (raw water), and	▪ Kerbside green waste collection from residential households (garden organics only), ▪ Hunter Water and Sydney Water (biosolids), ▪ Sawmills (wood residues), ▪ Paper processors (paper crumble), ▪ Infrastructure projects (drill muds), ▪ Mines (raw water),	▪ Kerbside green waste collection from residential households (garden organics only), ▪ Hunter Water and Sydney Water (biosolids), ▪ Sawmills (wood residues), ▪ Paper processors (paper crumble), ▪ Infrastructure projects (drill muds), ▪ Mines (raw water),	▪ Kerbside green waste collection from residential households (garden organics only), ▪ Hunter Water and Sydney Water (biosolids), ▪ Sawmills (wood residues), ▪ Paper processors (paper crumble), ▪ Infrastructure projects (drill muds), ▪ Mines (raw water),

Element	Existing Development	Modification 1	Modification 2	Modification 3
	▪ Food processors (organic fibrous material).	▪ Food processors (organic fibrous material), and ▪ Waste resource recovery facilities.	▪ Food processors (organic fibrous material), and ▪ Waste resource recovery facilities.	▪ Food processors (organic fibrous material), and ▪ Waste resource recovery facilities.
Operational vehicles and plant	▪ 1 x green waste shredder (if required); ▪ 1 x trommel or stardeck screen; ▪ 1 x 24 tonne excavator; ▪ 3 x 33 tonne front end loaders; ▪ 1 x top turn windrow turner; ▪ 2 x 15,000 litre water trucks; and ▪ 4 x light vehicles.	▪ 1 x green waste shredder (if required); ▪ 1 x trommel or stardeck screen; ▪ 1 x 24 tonne excavator; ▪ 3 x 33 tonne front end loaders; ▪ 1 x top turn windrow turner; ▪ 2 x 15,000 litre water trucks; and ▪ 4 x light vehicles.	▪ 1 x green waste shredder (if required); ▪ 1 x trommel or stardeck screen; ▪ 1 x 24 tonne excavator; ▪ 3 x 33 tonne front end loaders; ▪ 1 x top turn windrow turner; ▪ 2 x 15,000 litre water trucks; and ▪ 4 x light vehicles.	▪ 1 x green waste shredder (if required); ▪ 1 x trommel or stardeck screen; ▪ 1 x 24 tonne excavator; ▪ 3 x 33 tonne front end loaders; ▪ 1 x top turn windrow turner; ▪ 2 x 15,000 litre water trucks; and ▪ 4 x light vehicles.
Traffic generation	Up to 146 movements per day	Up to 146 movements per day	Up to 146 movements per day	Up to 184 movements per day
Workforce	Up to 15 operational jobs	Up to 15 operational jobs	Up to 15 operational jobs	Up to 18 operational jobs and up to 4 construction jobs.

APPENDIX B

UPDATED MITIGATION AND MANAGEMENT MEASURES

Updated mitigation and management measures

The mitigation and management measures for the project remain the same as the existing modified development (Modification 1), and are outlined in the table below.

The existing Composting Management Plan and the OEMP (and its associated sub-plans) will be reviewed and updated in accordance with the modified consent, subject to approval of the modification application, to ensure they remain fit for purpose.

Issue	Mitigation or management measure
Air quality – odour emissions	▪ A revised Compost Management Plan is to be prepared prior to the development increasing operations at the site. ▪ Staff will receive training on methods to reduce odour generation. ▪ On-site dams, stormwater, and leachate to be suitably managed through separation of clean and leachate runoff, reuse, and sampling. ▪ Only approved wastes will be accepted onsite. ▪ Windrows will be managed in accordance with site operational procedure for windrow construction and maintenance. ▪ All odorous wastes are to be mixed immediately with less odorous wastes to reduce odour generation. Where this is not possible odorous wastes will be covered temporarily with green waste or saw dust. ▪ Homogeneous mixing will be undertaken. ▪ Compost materials will be watered to a moisture content such as not to create an anaerobic environment. ▪ Odour monitoring will be undertaken as required should an issue be identified at a sensitive receiver.
Air quality – dust emissions	▪ Hardstand pads and the internal roadways will be regularly watered to suppress dust using site water carts. ▪ Staff will undertake visual inspections of dust generation to ensure dust is not spreading beyond the site boundary. ▪ Loads leaving the site will be required to be watered and tarped to prevent dust generation. ▪ Windrows and stockpiles will be maintained by water cart and will have a minimum moisture content of 45 %, with increased watering to occur prior to adverse weather conditions. ▪ During excessive wind conditions, loading activities will be reduced until more favourable conditions prevail. ▪ Staff will receive training on methods to reduce dust generation.
Air quality – greenhouse gas emissions	▪ Whenever practicable, vehicles to leave site with full loads to reduce the number of traffic movements and diesel consumption. ▪ All vehicles/plant and machinery will be turned off when not in use and regularly serviced in accordance with manufacturers specifications to ensure efficient operation. ▪ The use of alternative fuels and power sources for construction plant and equipment will be investigated and implemented, where appropriate. ▪ Recycled materials will be incorporated into the project where possible. ▪ The energy efficiency and related carbon emissions will be considered in the selection of vehicle and plant equipment. ▪ All vehicles and machinery will be fitted with OEM exhaust systems to ensure exhaust emissions are within accepted standards.
Surface water and groundwater	▪ Surface and Groundwater Management Plan to be updated to include the expanded facility. ▪ Limit fuels and chemicals stored onsite to a minimum. ▪ All required chemicals and fuels must be located within a bunded enclosure located away from drainage lines and stormwater drains. ▪ Plant and equipment must be regularly inspected and serviced to limit risk of oil loss. ▪ Refuelling of vehicles or machinery is to occur within a containment or hardstand area designed to prevent the escape of spilled substances to the surrounding environment. ▪ Wash down areas must be appropriately constructed to capture and treat all wastewater, with collected solid material disposed off-site to a licensed facility. ▪ All staff to be appropriately trained in the spill response plan for the minimisation and management of unintended spills.

Issue	Mitigation or management measure
	▪ A high standard of site housekeeping is to be maintained to limit risk of gross pollutants entering surface waters (i.e. construction waste, litter). ▪ All reasonable and practicable measures must be taken to prevent pollution of any existing waterways from silt or untreated leachate run-off, and oil or grease spills from any machinery. ▪ Wastewater for cleaning equipment must not be discharged or indirectly to any watercourses or stormwater systems. ▪ Exposed bare earth areas within the composting facility site must be minimised. Unused areas are to be revegetated. ▪ The facility must be designed to prevent surface water from mixing with the organics received and processed at the premises and the final products, process residuals and contaminated materials stored at the premises. This includes: - Drains and spillways. - Bunding. - Sediment controls during construction. ▪ Clean stormwater must be diverted around waste and leachate catchments through the installation of clean water catch drains and diversion bunds. ▪ Maintain surface gradient of the hardstand pad and orientation/geometry of windrows to minimise leachate generation and to ensure that leachate flows directly to the primary detention basin without mixing with compost organics ▪ Maintain all water related infrastructure, during construction and operation of expanded infrastructure, and operation, designed to maximise runoff and reduce infiltration including: - Low permeability base in the composting processing areas. - Bunding and arrangement of windrows. - Perimeter bunding and diversion drains. ▪ Procedures for testing, treatment, and discharge of leachate to be established and implemented, including monitoring anaerobic conditions. ▪ Undertake aeration of the leachate dam (increase oxygen) if required (i.e. if hydrogen sulphide, dissolved oxygen or pH levels are outside limits). ▪ Monitor water levels of the detention basin to ensure that the water levels do not drop below the anticipated use of water for composting and evaporation. ▪ Maintain integrity of hardstand pad by repairs to areas damaged by plant and machinery movements. ▪ Ensure drains and surface water gradients are free of excess vegetation and debris so that the flow of stormwater or leachate is not impeded, and the moisture / compaction levels achieved in embankment construction are maintained. ▪ Regular inspections of onsite infrastructure and structural integrity of drains, hardstand, and leachate dam. ▪ Repair and maintain any cracks observed in the base and side walls of the dam using clay, preferably bentonite or bentonite clay mixture. ▪ Waste to be accepted at the facility is to be in accordance with the EPA licence. Waste must be effectively vetted so prohibited wastes are not accepted at the facility. ▪ Waste is only to be received, stored, or processed in areas where the leachate barrier has been installed. ▪ Monitoring of pollutants must be undertaken as per EPL 7654. ▪ Leachate collection and storage facilities must be maintained to collect and impound all leachate in accordance with the design storm event. ▪ Leachate is not to be used for dust suppression on haul roads. ▪ Leachate is to be recycled through moisture conditioning of compost, to drawdown on basin volumes and ensure the design capacity of the basin is maintained for future storm events. ▪ Management of windrows and gradients to ensure no ponding or pooling occurs. ▪ Depressions must be filled promptly by using screened or sieved overburden. ▪ All water that has entered processing and storage areas and water that has been contaminated by leachate must be handled and treated in the same manner as leachate.

Issue	Mitigation or management measure
	▪ Leachate must be collected and stored in a lined basin capable of capturing the 1% AEP, 24-hour runoff event. The hardstand pad and basin liner shall be constructed recompacted overburden/clay with an in-situ permeability (K) of less than $1x10^{-9}$ m/s in accordance with Aurecon (2017). ▪ The leachate dam must be designed in accordance with AS 3798-2007 – Guidelines on Earthworks for Commercial and Residential Developments. ▪ Leachate basin is to be regularly desilted in order to maintain design storage capacity, without compromising basin liner integrity.
Traffic and access	▪ The bulk of heavy vehicle movements will be scheduled to avoid the busy morning and afternoon peak hours.
Noise and Vibration	▪ All employees and contractors are to receive an environmental induction that will include: - Relevant licence and approval conditions. - Permissible hours of work. - Location of nearest sensitive receivers. - Construction employee parking areas. - Designated loading/unloading areas and procedures. - Site opening/closing times (including deliveries). - Environmental incident procedures.
Biodiversity	▪ The establishment of artificial wetlands in the north-western area of the lease area, where small depressions exist, is recommended. Use of a variety of water depths, and planting of native wetland species endemic to the Singleton region is encouraged. ▪ Weeds present over the disturbed areas of the site should be controlled/eradicated where feasible.
Bushfire	▪ A minimum 4 m wide access road with 1 m shoulders, passing areas every 200 m to allow two-way passing of vehicles, and all-weather trafficable is to be provided. ▪ A minimum 4 m wide unsealed all-weather trafficable road around the external perimeter of the compost mounds should be provided to prevent potential grass fires encroaching into the compost facility, or a fire from the compost facility spreading into surrounding grassed areas and properties. ▪ A diesel or petrol-powered fire-fighting pump, with at least a 40 m long hose with steel nozzle, mounted on a mobile fire tanker unit should be provided. It should be able to pump out water and cart water from the water supply tank/dam, and fight any spot fires caused by ember attack, or self-combustion. ▪ An Emergency and Evacuation Plan should be prepared, including details of the site Fire Warden, local NSW Rural Fire Service contact numbers, emergency muster point, fire-fighting appliance location, first aid kits, and emergency response procedures in the advent of a bush fire. ▪ The NSW Rural Fire Service should also be notified of the development once approved so it can be added to their facility register, and details also provided of access and fire-fighting capacity onsite.
Visual	▪ Existing trees within the site is to be retained to maintain the existing level of screening.
Aboriginal Heritage	▪ All relevant staff should be made aware of their statutory obligations for heritage under the *National Parks and Wildlife Act 1974* and the *Heritage Act 1977*. This is to be in the form of a heritage induction on site prior to works. ▪ In the unlikely event that disturbed Aboriginal objects are identified during the development then they are to be collected and recorded in accordance with Heritage NSW guidelines and in consultation with the Registered Aboriginal Parties. ▪ In the unlikely event that human skeletal remains are identified, work must cease immediately in the vicinity of the remains and the area cordoned off. ▪ The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of a crime scene or are possible Aboriginal remains. ▪ If the remains are thought to be Aboriginal, Heritage NSW must be contacted via the Environment Line 131 555.

Issue	Mitigation or management measure
	▪ A Heritage NSW officer will determine if the remains are Aboriginal or not. ▪ If the remains are identified as Aboriginal, a management plan must be developed in consultation with the relevant Aboriginal stakeholders before works recommence.
Historic Heritage	▪ All relevant staff should be made aware of their statutory obligations for heritage under the *National Parks and Wildlife Act 1974* and the *Heritage Act 1977*. This is to be in the form of a heritage induction on site prior to works. ▪ In the unlikely event that disturbed objects are identified during the development then they are to be collected and recorded in accordance with Heritage NSW guidelines. ▪ In the unlikely event that human skeletal remains are identified, work must cease immediately in the vicinity of the remains and the area cordoned off. ▪ The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of a crime scene. ▪ If the remains are thought to be of heritage significance, Heritage NSW must be contacted via the Environment Line 131 555. ▪ A Heritage NSW officer will determine if the remains are of heritage significance.
Socio-economic	▪ Ongoing engagement will occur with key stakeholders during construction and operations.
Fire and Incident Management	▪ New storage structures on the site should be constructed to comply with Part E1 (deemed to satisfy provisions) and Part E2.3 (Special Hazards) of the BCA. ▪ A strict no smoking policy should be enforced on site when in proximity of any combustible materials. Smoking will only be permitted in clearly signposted areas. ▪ All water collection points should be checked regularly to ensure their ability to be accessed in an emergency. ▪ Fire extinguishers should be positioned at readily accessible points, including on mobile plant, so that their use in an emergency is not restricted. ▪ All firefighting plant and equipment should be regularly serviced in line with the manufacturer's recommendation. ▪ The temperature of all stockpiles and windrows should be monitored in accordance with established workplace procedures. If temperatures throughout the compost exceed 67 °C, then watering is to be initiated to dissipate heat. ▪ All stockpiles and windrows should be sufficiently moist. The moisture content of compost windrows must be kept above 40 % weight for weight to retard burning. ▪ In the event of a fire within a windrow, the affected stockpile/windrow must first be suppressed with either the use of water and/or dirt. The stockpile/windrow must then be pulled apart. However, if weather conditions are such that pulling apart the stockpile/windrow is likely to ignite other stockpile/windrows or spread the fire internally or externally, (eg dry with moderate/strong winds), the stockpile must not be broken up until conditions are suitable. ▪ In the event a fire cannot be extinguished using water or soil, the use of fire retardants should be considered (expert advice should be sought from Fire and Rescue NSW before taking action with retardants). ▪ Once the fire has been extinguished, affected areas should be monitored on a continual basis until materials have cooled. ▪ All fire water should be contained on site. ▪ All staff should be trained in the use of onsite firefighting appliances. ▪ Combustible materials should not be accumulated in areas close to exhausts or engines. ▪ Display emergency procedures and information in the site office or other visible location. ▪ Conduct or participate in site emergency scenarios as required. ▪ Regularly identify and check all site fire extinguishers and firefighting equipment.
Hazard and Risk	▪ All mobile plant and equipment should be fitted with fire extinguishers.

Issue	Mitigation or management measure
	▪ An Emergency Response Plan should be prepared and implemented for the facility. ▪ All staff on site should be appropriately trained in the handling of dangerous goods. ▪ Flammable and combustible liquids with be stored in accordance with AS 1940-2004: The Storage and Handling of Flammable and Combustible Liquids.
Waste Management	▪ Plant and equipment should be regularly maintained in accordance with OEMP requirements. ▪ Ordering should be limited to only the required amount of materials. ▪ Materials should be segregated to maximise reuse and recycling. ▪ Routine checks should be undertaken of waste sorting and storage areas for cleanliness, hygiene and OH&S issues, and contaminated waste materials. ▪ Separate skips and recycling bins should be provided for effective waste segregation and recycling purposes. ▪ Training and awareness of the requirements of the WMP and specific waste management strategies should be undertaken. ▪ Contaminated waste should be managed, transported, and disposed of in accordance with licensing requirements. ▪ Off-site waste disposal should be transported and disposed of in accordance with licensing requirements. ▪ Assessment of suspicious potentially contaminated materials, hazardous materials and liquid wastes should be undertaken. ▪ Regular monitoring, inspection and reporting requirements should be undertaken, and findings implemented. ▪ All waste materials (not including compost) removed from the site should only be directed to a waste management facility or premises lawfully permitted to accept the materials. ▪ All waste will be: (a) stored wholly within the designated waste storage areas; and (b) loaded and unloaded within the designated loading and unloading areas. ▪ Subcontractors will be informed of site waste management procedures. ▪ All contractors and staff will receive a site specific environmental induction at the commencement of their employment at the development.

APPENDIX C

AIR QUALITY IMPACT ASSESSMENT

TODOROSKI AIR SCIENCES

AIR QUALITY IMPACT AND GREENHOUSE GAS ASSESSMENT

BETTERGROW RAVENSWORTH COMPOSTING FACILITY MODIFICATION 3

Element Environment

30 October 2025

Job Number 25031860

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Air Quality Impact and Greenhouse Gas Assessment Bettergrow Ravensworth Composting Facility Modification 3

DOCUMENT CONTROL

Report Version	Prepared by	Reviewed by
FINAL - 002	PH	EA

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1 INTRODUCTION

Todoroski Air Sciences has prepared this report for Element Environment on behalf of Bettergrow Pty Ltd (the Proponent). It presents an assessment of the potential air quality impacts and greenhouse gas emissions associated with the proposed Modification 3 to the Ravensworth Composting Facility at Ravensworth, New South Wales (NSW) (hereafter referred to as the Project).

The Project seeks to allow the receival and processing of raw Food Organics and Garden Organics (FOGO) recovered material along with an increase of 50,000 tonnes per annum (tpa) in the processing capacity of the facility and installation of a weighbridge.

This assessment has been prepared in general accordance with the NSW Environment Protection Authority (EPA) document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (Approved Methods) (**NSW EPA, 2022**) using a methodology based on a Level 2 / 3 Odour Impact Assessment as described in the *Technical Framework – Assessment and Management of Odour from Stationary Sources in NSW* (Technical Framework) (**NSW DEC, 2006**). The greenhouse gas (GHG) assessment has been prepared in general accordance with the *NSW Guide for Large Emitters* (**NSW EPA, 2025**).

This report comprises:

- A background to the Project and description of the proposed operations;
- A review of the existing meteorological and air quality environment surrounding the site;
- A description of the dispersion modelling approach and emission estimation used to assess potential air quality impacts;
- Presentation of the predicted results and discussion of the potential air quality impacts;
- A discussion on the proposed odour mitigation and management measures; and,
- An assessment of the potential GHG emissions associated with the Project.

2 PROJECT BACKGROUND

2.1 Local setting

The Project site is located at 74 Lemington Road, Ravensworth (Lot 10 DP1204457), approximately 6 kilometres (km) northwest of Camberwell.

The land use surrounding the Project site comprises of open cut and underground coal mining operations including Ravensworth, Glendell and Ashton and Mt Owen Complex. Loop Organics is a composting operation located within the same property boundary, approximately 2.5km to the south. The nearest privately-owned residential receptors to the Project are located in the vicinity of Camberwell.

There are also other receptors located closer to the Project site along Hebden Road and Lemington Road, between approximately 2 and 5 km from the site. However, these residences are on mining land owned by Glencore Australia Pty Ltd (Glencore) and Yancoal Australia Pty Ltd, and subject to noise, air quality, visual amenity, traffic and other environmental impacts from mining operations, and therefore not considered as sensitive receptors for this assessment.

Other industrial receptors, such as the neighbouring coal-mining operations and the composting facility, are not considered sensitive receptors for this assessment. These land uses do not warrant the same level of amenity as residential dwellings and, as industrial operations, are themselves potential sources of air emissions. This is discussed further in **Section 3.1.2**.

Figure 2-1 presents the location of the Project.

Figure 2-2 presents a pseudo three-dimensional visualisation of the topography in the general vicinity of the Project location. The area is characterised by undulating terrain, including depressions and elevations resulting from the open cut mining operations. Broader terrain features of the Hunter Valley Region are expected to influence the dispersion of air emissions at the Project.

Figure 2-1: Project setting

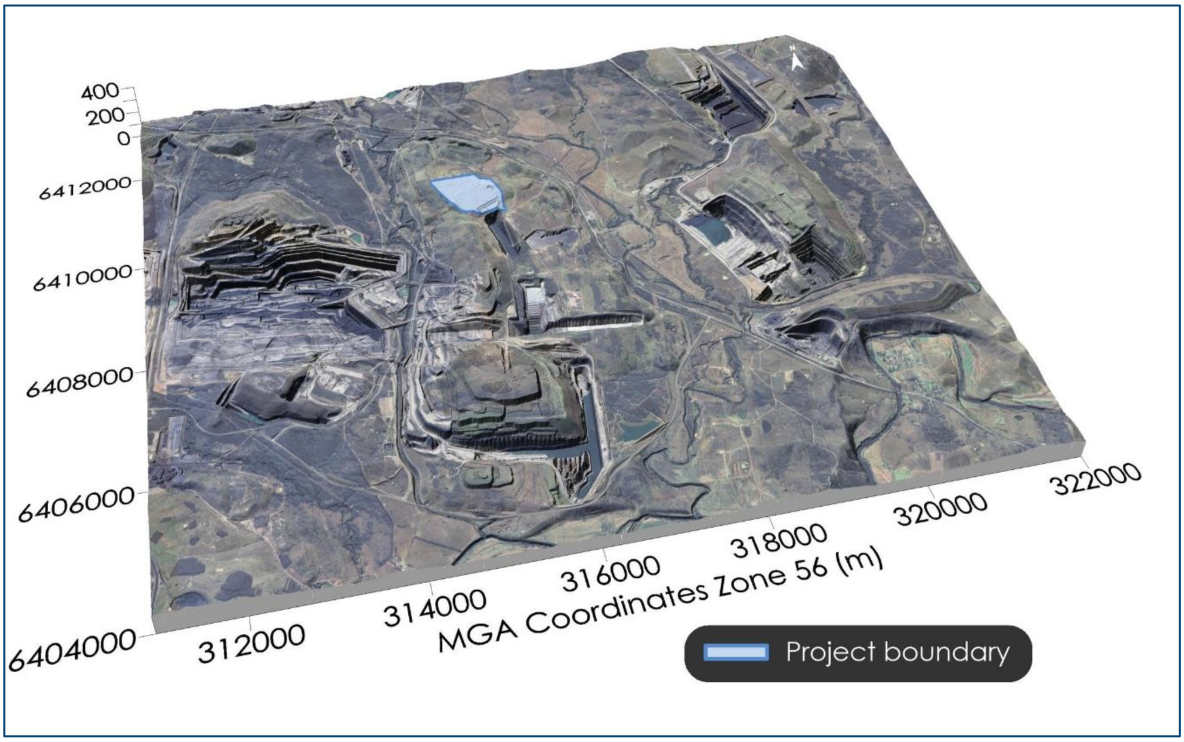


Figure 2-2: Topography in the vicinity of the Project location

2.2 Project description

2.2.1 Existing operations

The existing approved operations comprise of an outdoor organic recycling facility which composts approximately 200,000 tonnes per annum (tpa) of organic material. The facility processes biosolids, garden organics and other organic recovered materials in outdoor windrows to produce a compost product suitable for mine site rehabilitation and agricultural uses.

Odour impacts for the approved operation were assessed in the *Greenspot Ravensworth Greenhouse Gas, Odour and Dust Assessments* (**Advanced Environmental Dynamics, 2019**) as part of the approved development's original State Significant Development application, and subsequently revised as part of the response to submissions in *Memorandum Greenspot Ravensworth Greenhouse Gas, Odour and Dust Assessments Update 2022* (**Advanced Environmental Dynamics, 2022**).

Operational activities generally include the receival and processing of a range of organic recovered material, including shredded green waste from curb side green bins and biosolid waste from sewage treatment plants. The mixed waste is incorporated directly into windrows for a period of time to allow for pasteurisation to occur, where temperatures reach 55-65 degrees Celsius (°C) and destroy organic contaminants, seeds and parasites.

Hours of operation are from 6:00am to 6:00pm, Monday to Saturday, with no work undertaken on Sundays or public holidays.

The Proponent has recently submitted a modification application (Modification 2) to allow the receival and processing of decontaminated and pasteurised FOGO and/or food recovered material, as well as the receival and blending of Virgin Excavated Natural Material (VENM) and Excavated natural Material

(ENM) with organic recovered materials at the site. These additional materials would be processed using the existing methods at the site.

Potential odour impacts of Modification 2 are assessed in the *Air Quality Impact and Greenhouse Gas Assessment Bettergrow Ravensworth Modification 2* (**Todoroski Air Sciences, 2025**).

2.2.2 Proposed operations

The Project seeks to allow the receival and processing of raw FOGO recovered material and increase the processing volume of the facility from 200,000tpa to 250,000tpa.

No changes are proposed to the existing development footprint, site infrastructure, equipment/plant, or operating hours. No road upgrades are required for the Project.

The Project includes the installation of a prefabricated weighbridge and concrete approaches, with construction expected to take around five weeks. Works involve site preparation, drainage installation, concrete foundations and ramps, assembly of weighbridge modules, installation of peripheral equipment, and electrical connections to the control unit.

The Project has the potential to generate additional particulate matter emissions associated with the construction and operational activities (i.e. handling the increased material throughput at the site, an additional 50,000tpa). A corresponding increase in odour emissions is also expected from the composting of FOGO recovered material. In addition, the Project would result in increased GHG emissions from the handling of additional material and from construction activities, which have been assessed as part of this report.

3 AIR QUALITY CRITERIA

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The sections below identify the potential air emissions from the Project and the applicable air quality criteria.

3.1 Odour

3.1.1 Introduction

In New South Wales, odour regulation sits within the framework of the Protection of the Environment Operations Act 1997 (POEO Act). Key provisions relevant to odour from premises include:

- Section 126 – prohibits the emission of an odour from premises that constitutes an offence under the Act.
- Section 128 – establishes offences for causing air pollution, which includes the emission of odour.
- Section 129 – enables regulatory authorities to take action where emissions (including odour) result in harm or unreasonable interference with amenity.

Importantly, there are currently no regulations in NSW prescribing generic point-source odour emission limits. Instead, odour is managed through the statutory prohibition on offensive odour under the POEO Act, supported by NSW EPA guidance such as the Technical Framework and Approved Methods.

As a result, odour assessment in the planning and approval process relies on the use of odour concentration criteria (expressed in odour units, OU) as a proxy measure, providing a consistent framework for predicting and managing the risk of odour impacts at sensitive receptors.

In this context, odour needs to be considered in two distinct ways. For operational facilities, offensive odour is evaluated in the field by authorised officers, who are obliged to consider the odour in the context of its receiving environment, frequency, duration, character etc. and to determine whether the odour would interfere with the comfort and repose of the normal person unreasonably. The POEO Act defines the term *offensive odour* to mean an odour—

> *"(a) that, by reason of its strength, nature, duration, character or quality, or the time at which it is emitted, or any other circumstances—*
>
> > *(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
> >
> > *(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*
>
> *(b) that is of a strength, nature, duration, character or quality prescribed by the regulations or that is emitted at a time, or in other circumstances, prescribed by the regulations."*

In this context, the concept of offensive odour is applied to operational facilities and relates to actual emissions in the air.

However, in the approval and planning process for proposed new operations or modifications to existing projects, no actual odour exists for assessment under the POEO Act. Accordingly, it is necessary to consider hypothetical odour and predictive odour concentration criteria (in odour units) to evaluate potential future impacts, ensuring statutory obligations are addressed in the absence of existing emissions.

The number of odour units represents the number of times that the odour would need to be diluted to reach a level that is just detectable to the human nose. Thus, by definition, odour less than an odour unit (1OU), would not be detectable to most people.

The range of a person's ability to detect odour varies greatly in the population, as does their sensitivity to the type of odour. The wide-ranging response in how any particular odour is perceived by any individual poses specific challenges in the assessment of odour impacts and the application of specific air quality goals related to odour. The Technical Framework sets out a framework specifically to deal with such issues.

It needs to be noted that the term “odour” refers to complex mixtures of odours, and not “pure” odour arising from a single chemical. Odour from a single, known chemical rarely occurs (when it does, it is best to consider that specific chemical in terms of its concentration in the air). In most situations odour will be comprised of a cocktail of many substances that is referred to as a complex mixture of odour, or more simply odour.

For activities with potential to release significant odour it may be necessary to predict the likely odour impact that may arise. This is done by using air dispersion modelling which can calculate the level of dilution of odours emitted from the source at the point that such odour reaches surrounding receptors. This approach allows the air dispersion model to produce results in terms of odour units.

The NSW criteria for acceptable levels of odour range from 2 to 7OU, with the more stringent 2OU criteria applicable to densely populated urban areas and the 7OU criteria applicable to sparsely populated rural areas, as outlined below.

3.1.2 Complex Mixtures of Odorous Air Pollutants

Table 3-1 presents the assessment criteria as outlined in the Approved Methods. This criterion has been refined to take into account the population densities of specific areas and is based on a 99th percentile of dispersion model predictions calculated as 1-second averages (nose-response time).

Table 3-1: Impact assessment criteria for complex mixtures of odorous air pollutants (nose-response-time average, 99th percentile)

Population of affected community	Impact assessment criteria for complex mixtures of odorous air pollutants (OU)
Urban (≥~2000) and/or schools and hospitals	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence (≤~2)	7.0

Source: **NSW EPA, 2022**

The NSW odour goals are based on the risk of odour impact within the general population of a given area. In sparsely populated areas, the criteria assume there is a lower risk that some individuals within the community would find the odour unacceptable, hence higher criteria apply.

Peak-to-mean factors are applied to account for any odour fluctuation above and below the mean odour level of the 1-hour averaging time. The criteria in **Table 3-1** are compared with modelled results which include peaking factors to account for the time-averaging limitations of air dispersion models. The peak-to-mean factors developed by **Katestone Scientific Pty Ltd** (**1995, 1998**) for the NSW EPA are applied to convert the modelled (1-hour) averaging time to 1-second peak concentrations.

A summary of the peak-to-mean values is provided in **Table 3-2**.

Table 3-2: Peak-to-mean values

Source Type	Pasquill-Gifford stability class	Near field P/M 60*	Far field P/M 60*
Area	A, B, C, D	2.5	2.5
	E, F	2.3	1.9
Line	A-F	6	6
Surface point	A, B, C	12	4
	D, E, F	25	7
Tall wake-free point	A, B, C	17	3
	D, E, F	35	6
Wake-affected point	A-F	2.3	2.3
Volume	A-F	2.3	2.3

*Ratio of peak 1-second average concentrations

Places where people work, such as the surrounding industrial receptors (e.g. coal-mining and composting operations), are not considered to have equivalent amenity expectation relative to residential locations for reasons including the following:

- Industrial receptors only have healthy adults present, fit and capable to partake in the work, whereas residential locations may have sensitive individuals present;
- The industrial receptors include a range of industrial activities where people are exposed to a range of various odours (or chemicals), and as such cannot be expected to have the same sensitivity;
- An existing industrial precinct can expect a lower level of amenity and this a higher level of odour and would be acceptable considering the nature of the activities occurring within this

area. For example, people visiting the industrial precinct, would be aware that industrial activities occur there. Consequently, they may encounter varying degrees of environmental effects, distinct from what one would expect in a residential area.

- Any reasonable expectation of comfort and repose whilst visiting or working in an industrial area is greatly less than what one would reasonably expect in one's own home.
- Workers are generally working and would be less focussed on things other than their work, unlike the case of residents in their home where a greater focus on their amenity and surroundings would be likely.

For reasons including the above, the NSW EPA impact assessment criteria applied at the residential receptors are not considered directly applicable at the industrial receptors and a less stringent odour criterion should be applied.

3.2 Particulate matter

Particulate matter consists of dust particles of varying size and composition. Air quality goals refer to measures of the total mass of all particles suspended in air defined as the Total Suspended Particulate matter (TSP).

The upper size range for TSP is nominally taken to be 30 micrometres (µm) as in practice particles larger than 30 to 50µm will settle out of the atmosphere too quickly to be regarded as air pollutants. Two sub-classes of TSP are also included in the air quality goals, namely PM_{10}, particulate matter with equivalent aerodynamic diameters of 10µm or less, and $PM_{2.5}$, particulate matter with equivalent aerodynamic diameters of 2.5µm or less.

Particulate matter, typically in the upper size range, that settles from the atmosphere and deposits on surfaces is characterised as deposited dust. The deposition of dust on surfaces may be considered a nuisance and can adversely affect the amenity of an area by soiling property in the vicinity.

Table 3-3 summarises the air quality goals that are relevant to this assessment as outlined in the Approved Methods.

The air quality goals for total impact relate to the total pollutant burden in the air and not just the contribution from the Project. Consideration of background pollutant levels needs to be made when using these goals to assess potential impacts.

Table 3-3: NSW EPA air quality impact assessment criteria for particulate matter

Pollutant	Averaging Period	Impact	Criterion
TSP	Annual	Total	90 µg/m^3
PM_{10}	Annual	Total	25 µg/m^3
	24 hour	Total	50 µg/m^3
$PM_{2.5}$	Annual	Total	8µg/m^3
	24 hour	Total	25 µg/m^3
Deposited dust	Annual	Incremental	2 g/m^2/month
		Total	4 g/m^2/month

Source: **NSW EPA, 2022**
µg/m^3 = micrograms per cubic metre
g/m^2/month = grams per square metre per month

4 EXISTING ENVIRONMENT

This section describes the existing environment including the climate and meteorology in the area surrounding the Project.

4.1 Local climate

Long-term climatic data from the Bureau of Meteorology (BoM) weather station at Cessnock Airport Automatic Weather Station (AWS) (Site No. 061260) were analysed to characterise the local climate in the proximity of the Project. The Cessnock Airport AWS weather station is located approximately 48 km southwest of the Project. The Cessnock Airport AWS weather station is the nearest BoM weather station with suitable available long-term data used to select the meteorological year for the dispersion modelling as outlined in **Appendix A**.

Table 4-1 and **Figure 4-1** present a summary of data from the Cessnock Airport AWS collected over an approximate 13 to 35-year period for various meteorological parameters. The data assists in characterising the local climatic conditions based on long-term meteorological parameters.

The data indicates that on average, January is the hottest month with a mean maximum temperature of 30.4°C and July is the coldest month with a mean minimum temperature of 4.2°C.

Rainfall levels are elevated in the summer months compared to the other seasons. The data show February is the wettest month with an average rainfall of 98.7 millimetres (mm) over 8.1 days, and August is the driest month with an average rainfall of 34.2mm over 4.4 days. The annual average rainfall is 738.4mm over 74.8 days.

Mean 9am relative humidity ranges from 60% in October to 80% in March and June. Mean 3pm relative humidity levels range from 42% in August and September to 55% in June.

Wind speeds exhibit seasonal variations with lower wind speed records for 9am and higher observations for 3pm conditions. Mean 9am wind speeds range from 8.7 kilometres per hour (km/h) in March to 14.0km/h in September. Mean 3pm wind speeds range from 14.2km/h in May to 19.1km/h in September.

Table 4-1: Monthly climate statistics summary – Cessnock Airport AWS

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Temperature													
Mean max. temp. (°C)	30.4	29.3	27.4	24.3	20.8	17.9	17.6	19.6	22.7	25.4	27.0	29.2	24.3
Mean min. temp. (°C)	17.1	16.9	15.0	10.8	7.5	5.7	4.2	4.6	7.1	9.9	13.1	15.2	10.6
Rainfall													
Rainfall (mm)	76.2	98.7	87.8	59.3	39.7	54.5	36.0	34.2	43.3	54.7	75.1	78.7	738.4
No. of rain days (≥1mm)	6.7	8.1	8.2	5.8	5.3	5.5	4.4	4.4	5.7	6.4	7.1	7.2	74.8
9am conditions													
Mean temp. (°C)	23.2	22.2	20.2	17.8	14.1	11.0	10.1	12.2	16.2	19.1	20.2	22.2	17.4
Mean R.H. (%)	68	76	80	76	79	80	76	69	63	60	65	65	71
Mean W.S. (km/h)	11.5	10.2	8.7	10.1	10.4	11.5	11.5	13.0	14.0	13.7	12.7	11.8	11.6
3pm conditions													
Mean temp. (°C)	28.7	27.3	25.7	23.0	19.6	16.8	16.4	18.6	21.2	23.4	25.0	27.3	22.8
Mean R.H. (%)	46	53	53	52	54	55	49	42	42	44	47	46	49
Mean W.S. (km/h)	18.5	17.3	15.7	14.6	14.2	15.1	15.3	17.3	19.1	18.7	18.6	18.3	16.9

Source: **BoM, 2025**

R.H. – Relative Humidity, W.S. – wind speed

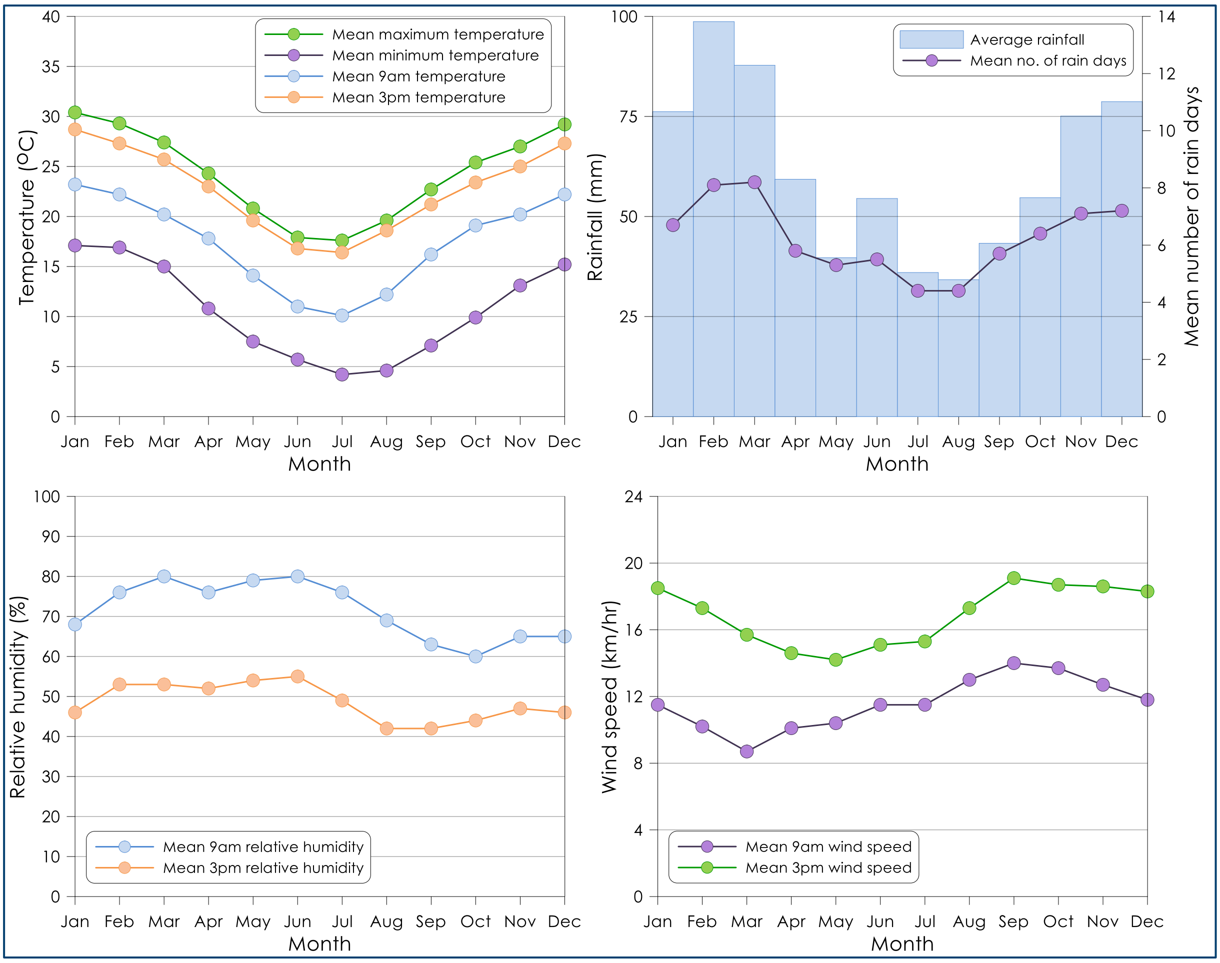


Figure 4-1: Monthly climate statistics summary – Cessnock Airport AWS

4.2 Local meteorological conditions

Annual and seasonal windroses for the Cessnock Airport AWS during the 2017 calendar period are presented in **Figure 4-2**.

The 2017 calendar year was selected as the meteorological year for the dispersion modelling based on an analysis of long-term data trends in meteorological data recorded for the area and wind patterns which reflect the patterns experienced in other years. Further detail is presented **Appendix A**.

Analysis of the windroses shows that the wind directions are generally evenly distributed ranging from the east-southeast to southwest on an annual basis with winds greatest from the northwest and north-northwest. During summer, winds from the east-southeast to south are most frequent. During autumn, winds are predominately from the south-southwest. In winter, winds from the northwest and north-northwest are most frequent. Spring windrose shows a similar distribution pattern as the annual windrose with winds from the northwest and east-southeast most frequent.

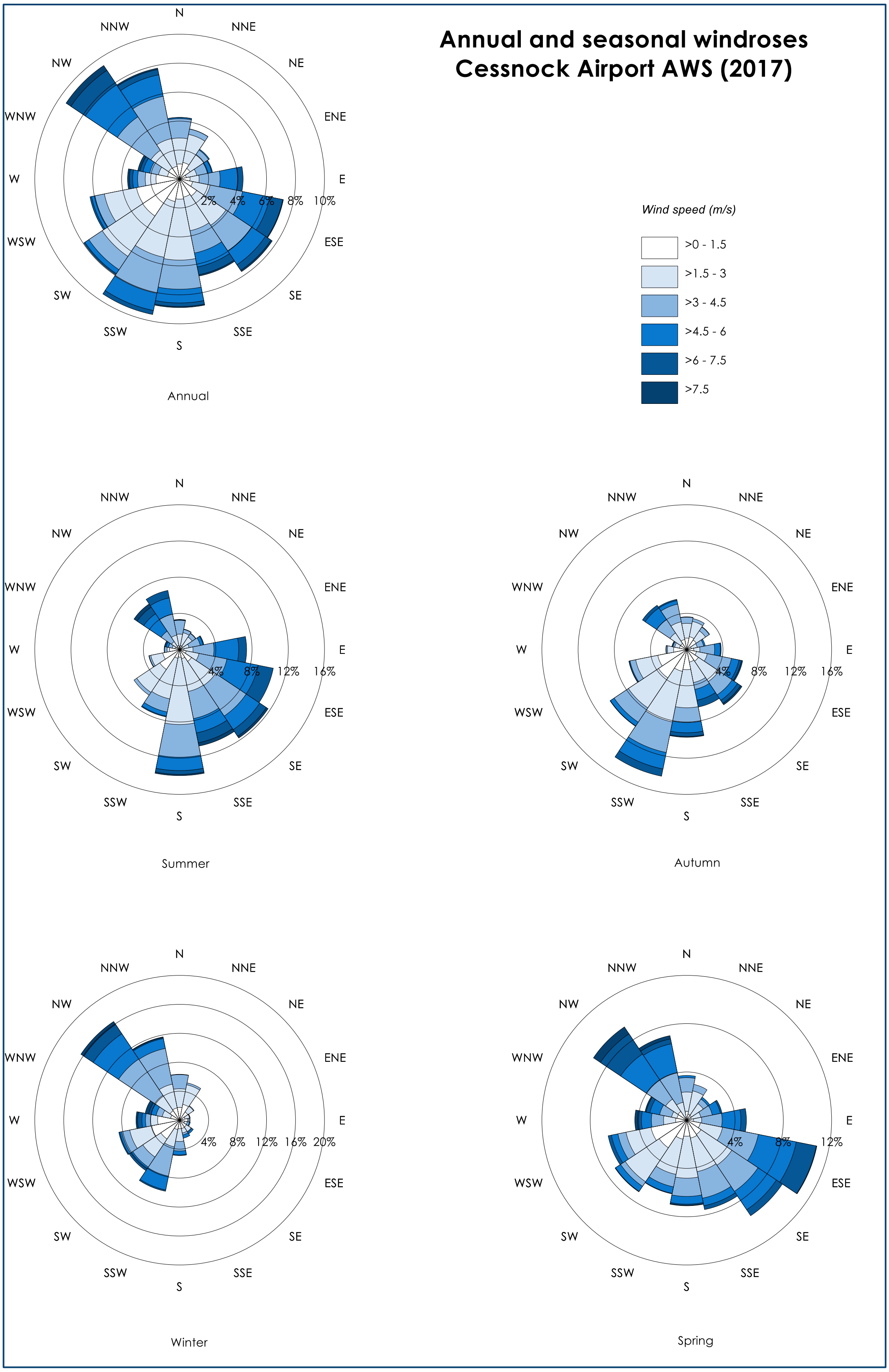


Figure 4-2: Annual and seasonal windroses – Cessnock Airport AWS (2017)

4.3 Local air quality monitoring

The main sources of particulate matter in the area surrounding the Project include extractive industries, agricultural activities and emissions from local anthropogenic activities such as motor vehicle exhaust, vehicles on unsealed roads and domestic wood heaters. Natural events such as bushfires and dust storms also contribute to air pollution in the region.

Ambient air quality from the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) Camberwell air quality monitoring station have been reviewed to characterise the existing air quality near the Project site. A summary of the available 24-hour average PM_{10} and $PM_{2.5}$ concentrations from 2015 to 2024 is presented **Figure 4-3** and **Figure 4-4**, respectively.

The maximum 24-hour average concentrations of PM_{10} and $PM_{2.5}$ were found to occasionally exceed the relevant criterion of 50µg/m^3 and 25µg/m^3, respectively. These exceedances are likely attributable to regional dust events, local dust sources, smoke from hazard reduction burns and bushfires.

An increase in the frequency of 24-hour average exceedances was observed in the lead-up to the 2019/2020 summer, predominantly due to drought conditions across NSW and smoke from widespread bushfires during this period.

Overall, the trend in measured PM_{10} and $PM_{2.5}$ concentrations (in **Figure 4-3** and **Figure 4-4**) show a gradual improvement, with lower 24-hour average levels from 2015 to 2024 and an increasing number of days below the criterion, indicating generally good air quality for the location.

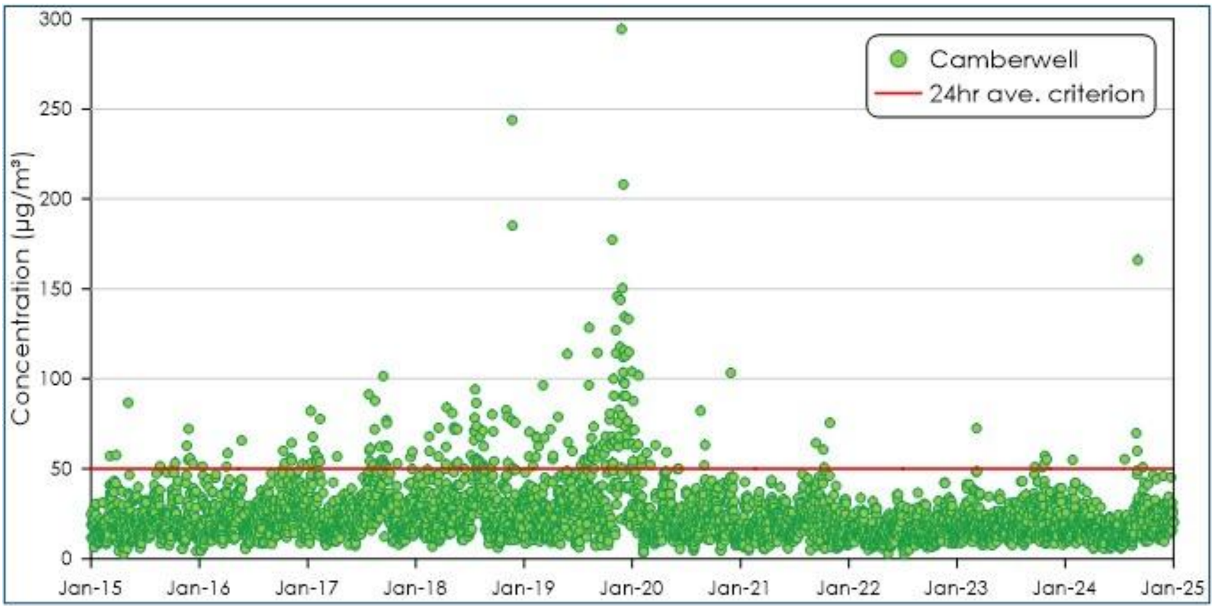


Figure 4-3: 24-hour average PM_{10} concentrations

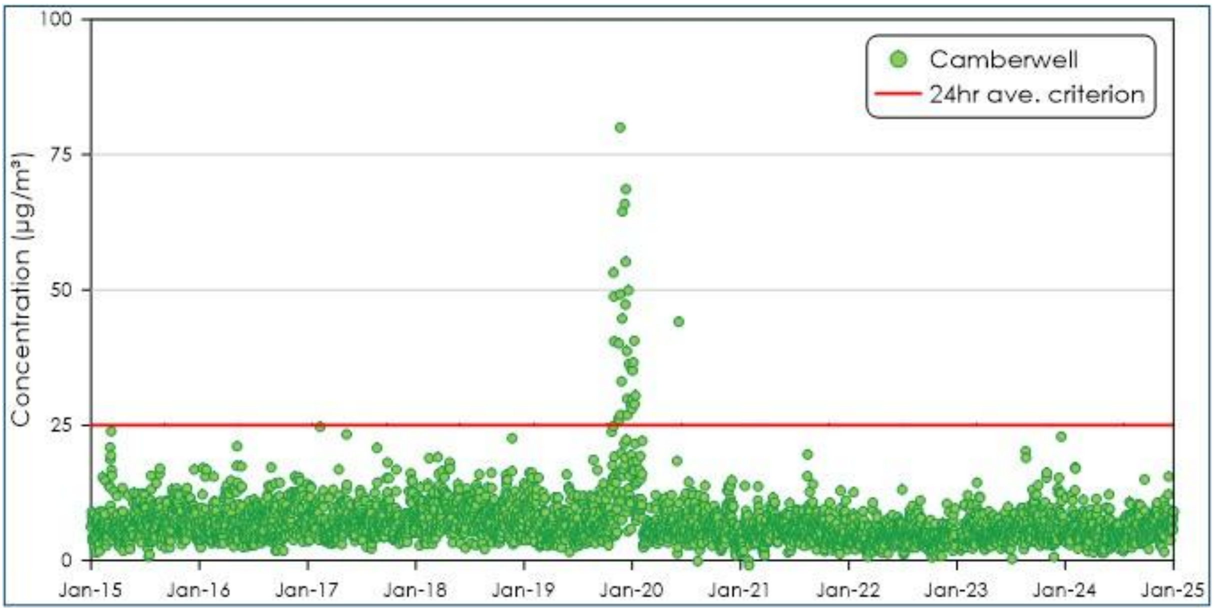


Figure 4-4: 24-hour average $PM_{2.5}$ concentrations

4.4 Odour complaints

A Complaints Register is maintained monthly and is available on the Bettergrow website[1]. A review of the register indicates that no complaints have been received, or recorded, since January 2023. This suggests that air quality and odour from the operations are not causing adverse impacts and that existing mitigation and management measures are effective.

[1] https://www.bettergrow.com.au/environmental/

5 DISPERSION MODELLING APPROACH

The following sections are included to provide the reader with an understanding of the model and modelling approach applied for the assessment.

Modelling was undertaken using a combination of the CALPUFF Modelling System and the Weather Research and Forecasting model (WRF). The CALPUFF Modelling System includes three main components: CALMET, CALPUFF and CALPOST, and a large set of pre-processing programs designed to interface the model to standard, routinely available meteorological and geophysical datasets. WRF is a prognostic air model used to simulate meteorological data for input into CALMET.

The model was set up in general accordance with the NSW EPA *Generic Guidance and Optimum Model Settings for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia'* (**TRC Environmental Corporation**, **2011**).

5.1 Meteorological modelling

The meteorological modelling methodology applied a 'hybrid' approach which includes a combination of prognostic model data from WRF with surface observations.

The WRF model was applied to the available data to generate a three-dimensional upper air data file for use in CALMET. The centre of analysis for the WRF modelling used is 325000mE and 6406000mN. The simulation involved an outer grid of 750km with 15km grid spacing, with two nested grids with 3km and 1km grid spacing.

The CALMET domain was run on a 10 x 10km grid with a 0.1km grid resolution. The available meteorological data for January 2017 to December 2017 from the DCCEEW monitoring stations at Camberwell and Singleton Northwest were included in the simulation.

The 2017 calendar year was selected as the modelling period based on an analysis of long-term meteorological data as outlined in **Appendix A**.

The seven critical parameters used in the CALMET modelling are presented in **Table 5-1**.

Table 5-1: Seven critical parameters used in CALMET

Parameter	Value
TERRAD	10
IEXTRP	-4
BIAS (NZ)	-1, -0.5, -0.25, 0, 0, 0, 0, 0, 0, 0, 0, 0
R1 and R2	5, 5
RMAX1 and RMAX2	12, 12

5.2 Meteorological modelling evaluation

The outputs of the CALMET modelling are evaluated using visual analysis of the wind fields and extract data. **Figure 5-1** presents a visualisation of the wind field generated by CALMET for a single hour of the modelling period (i.e. example only). The wind fields follow the terrain well and indicate that the simulation produces realistic fine scale flow fields (such as terrain forced flows) in surrounding areas.

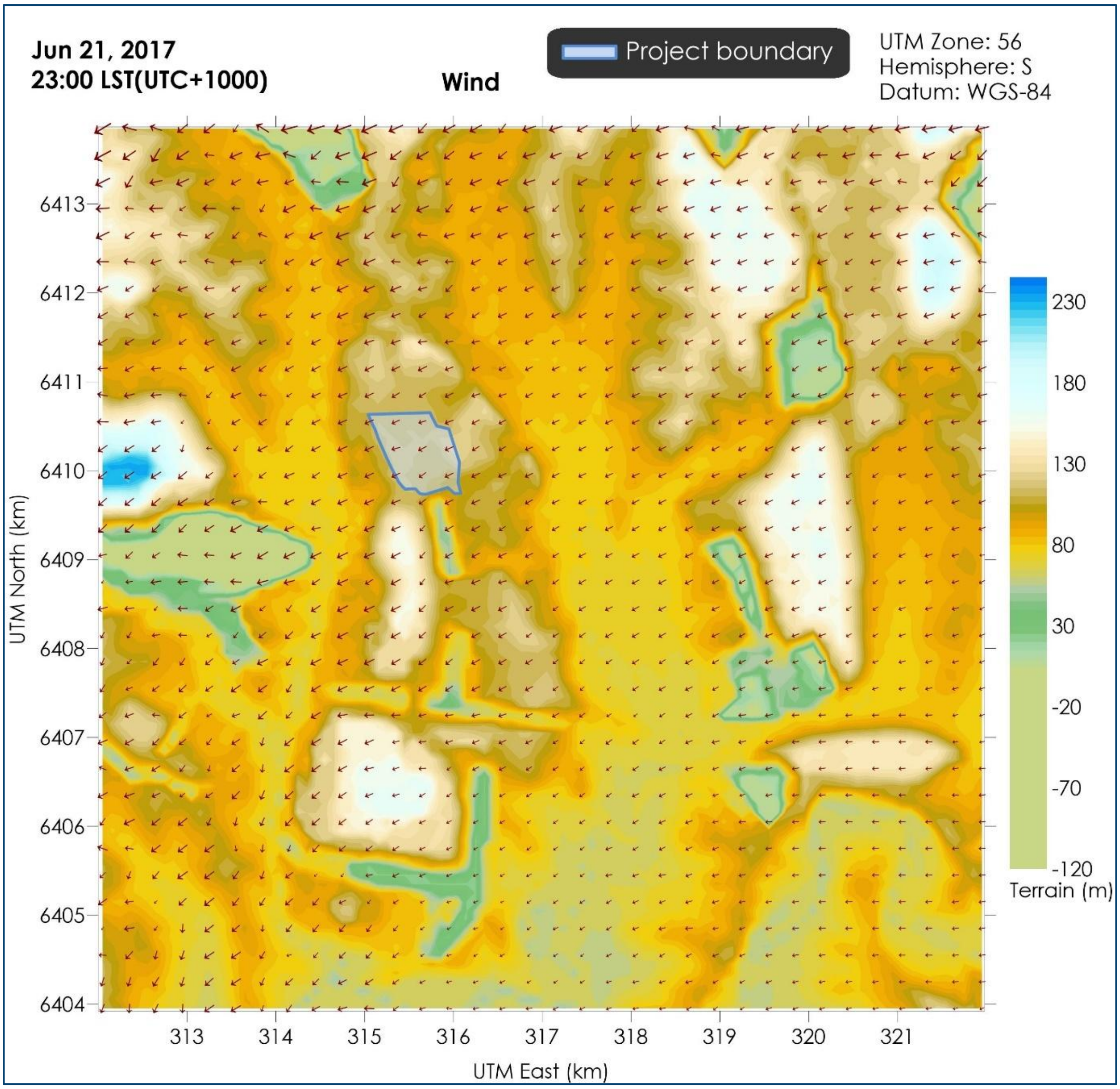


Figure 5-1: Representative 1-hour average snapshot of wind field for the Project

CALMET generated meteorological data were extracted from a point within the CALMET domain and are graphically represented in **Figure 5-2** and **Figure 5-3**.

Figure 5-2 presents the annual and seasonal windroses from the CALMET data. Overall, the windroses generated in the CALMET modelling reflect the expected wind distribution patterns in the area as determined based on the available measured data and the expected terrain effects on the prevailing winds.

Figure 5-3 includes graphs of the temperature, wind speed, mixing height and stability classification over the modelling period for each modelled year and shows sensible trends considered to be representative of the area.

The annual temperature pattern exhibits a clear seasonal trend, with the highest temperatures occurring during the summer months and lowest temperatures observed in winter. The wind speed statistics shows a fairly even distribution of wind speeds. The mixing height trends follow expected patterns, varying throughout the day due to changes in solar radiation and atmospheric stability. The stability classification indicates a high percentage of E and F-class periods combined, characterised by stable, calm conditions typically occurring at night.

In conclusion, the CALMET generated meteorological data are considered suitable for use in the air dispersion modelling for the Project.

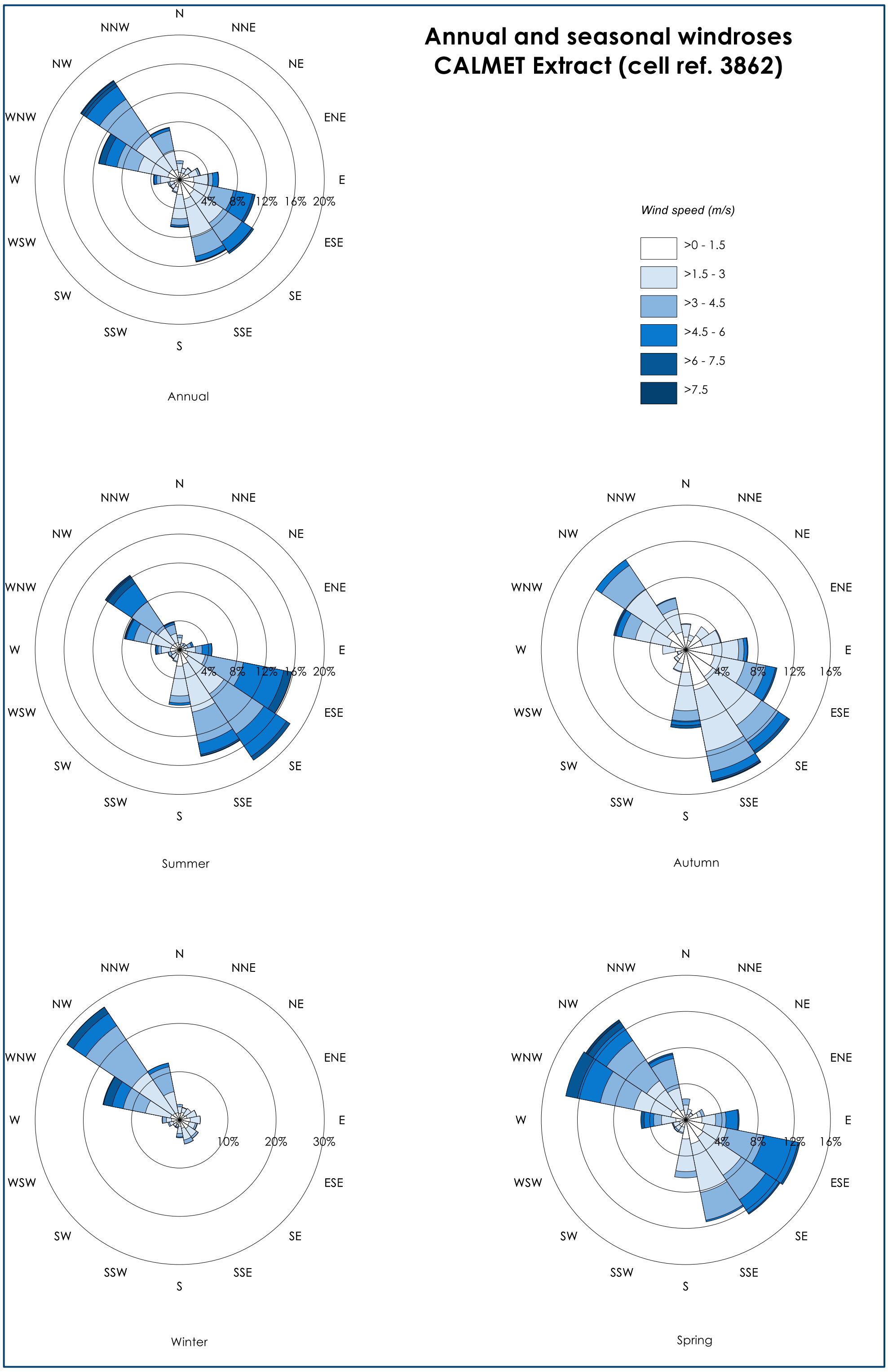


Figure 5-2: Annual and seasonal windroses from CALMET (Cell ref 3862)

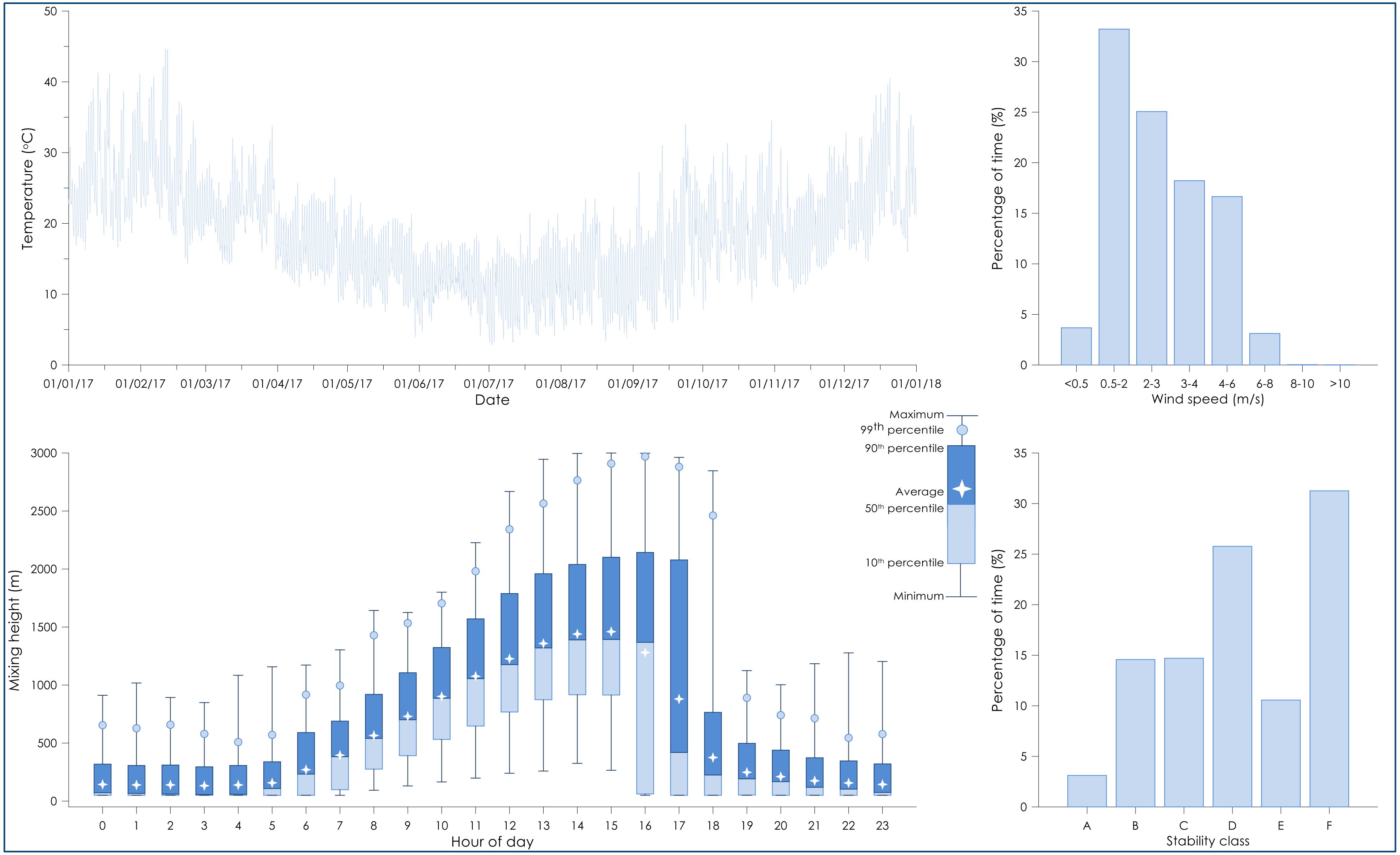


Figure 5-3: Meteorological analysis of CALMET (Cell REF 3862)

5.3 Dispersion modelling

The CALPUFF air dispersion model has been used to predict the potential odour and dust levels in the ambient air in the wider area around the site.

Modelling of the key odour and dust emission sources was conducted using the emissions rates and parameters outlined in the following section and utilising the meteorological data described in the previous section.

5.4 Modelled odour sources

Odour emissions from the Project would potentially arise from a range of sources with varying rates of odour emissions due to the nature and age of the composted material. The main sources of odour emissions for the Project modelled in this assessment are identified as:

- Composting processing and blending area - which includes the compost windrows, receival and blending of the input material streams and storage of mature compost; and,
- Leachate dams.

For the purpose of this assessment, the entire composting processing and blending area is assumed to act as an odour source. In practice, some of this area is used for vehicle access and spacing between windrow piles. This assumption provides a conservate estimate of potential odour from the source.

There is limited publicly available information on the operation of the nearby Loop Organics composting facility, aside from an annual composting rate of 55,000tpa and water quality monitoring data (published on the Loop Organics website). For the purpose of this assessment, the assumed odour sources have been identified using satellite imagery of the site with the entire areas assumed to act as odour sources, similar to the Project.

Figure 5-4 and **Figure 5-5** presents the location of the modelled odour emission sources for the Project and Loop Organics, respectively.

A summary of the approximate areas for the modelled odour sources is outlined in **Table 5-2**.

Table 5-2: Summary of the areas for modelled odour sources

Facility	Source	Approximate area (m²)*
Project	Composting Processing & Blending Area	187,000
	Leachate Dams	28,000
Loop Organics	Composting Processing & Blending Area	71,500
	Leachate Dam	5,400

*values have been rounded

Figure 5-4: Modelled odour sources for the Project

Figure 5-5: Modelled odour sources for Loop Organics

5.5 Odour emission estimation

Odour emission rates for the modelled odour sources have been estimated based on site-specific odour sampling at the Ravensworth Composting Facility and at another facility that receives raw FOGO material. This data is supplemented with odour measurements of the significant odour sources at the Project were obtained from a review of studies on similar types of composting operations.

Site-specific odour sampling was conducted as part of the original SSD application (**Advanced Environmental Dynamics, 2019**) and considered representative of the current operations. A summary of Specific Odour Emission Rates (SOER) taken at the Ravensworth Composting Facility and considered in the assessment is presented in **Table 5-3**.

Table 5-3: Summary of site-specific odour sampling

Source description	SOER (OUV/m²/s)
Fresh green waste	0.027
One week old (3-part green organic (GO) and 1-part biosolids)	0.045
Five week old (3-part GO and 1-part biosolids)	0.03
Freshly opened compost windrow	0.041
Finished Product (3-part GO and 1-part biosolids)	0.032

Source: **Advanced Environmental Dynamics (2019)**
OUV/m²/s = odour unit volume per metre squared per second

Odour sampling of FOGO recovered material was conducted at the Valoriza Environment Australia (Valoriza) facility in Dandenong South, Victoria. This material is representative of the type proposed to be received at the Project site.

The Valoriza facility receives and processes raw FOGO material from kerbside collections and commercial sources. The material undergoes a decontamination and shredding process before being loaded into sealed pasteurisation tunnels for a period of approximately four weeks. Following pasteurisation, the material is unloaded from the tunnels and stockpiled for despatch.

Odour sampling was conducted by **Ektimo (2025)** using an isolation flux chamber in accordance with Australian Standard AS 4323.4 (2009) – Stationary Source Emissions, Method 4: Area source sampling – Flux chamber technique. Sampling was performed on a range of materials at Valoriza including raw FOGO material, decontaminated material, and decontaminated and pasteurised material at different maturation stages ranging from 1 day old to 19 days old to identify any variability. The results are summarised in **Table 5-4** the odour sampling report (**Ektimo, 2025**) is provided in **Appendix B**.

Table 5-4: Summary of odour sampling at Valoriza

Source description	Test 1 (OUV/m²/s)	Test 2 (OUV/m²/s)
Raw FOGO material	2.0	1.7
Decontaminated material	0.6	0.4
1 day old decontaminated and pasteurised material	3.2	5.0
2 day old decontaminated and pasteurised material	0.4	0.3
5 day old decontaminated and pasteurised material	0.15	-
19 day old decontaminated and pasteurised material	0.23	-

Source: **Ektimo (2025)**

Odour emission measurement data for composting material at different stages were collated from a review of studies, including **ERM (2013)** and **Todoroski & Cowan (2015)**, which focused on windrow composting of green waste and food organics, and **TOU (2010)** and **GHD (2015)** studies, which primarily examined green waste composting.

These data are presented graphically in **Figure 5-6**, together with data collected at Ravensworth and Valoriza. The results show variability in odour emissions across composting stages for each dataset reviewed. This variability can be attributed to factors such as the composition of the compost material, climatic conditions, and the sampling methodology. Overall, the data demonstrate a consistent trend of decreasing odour as composting material matures.

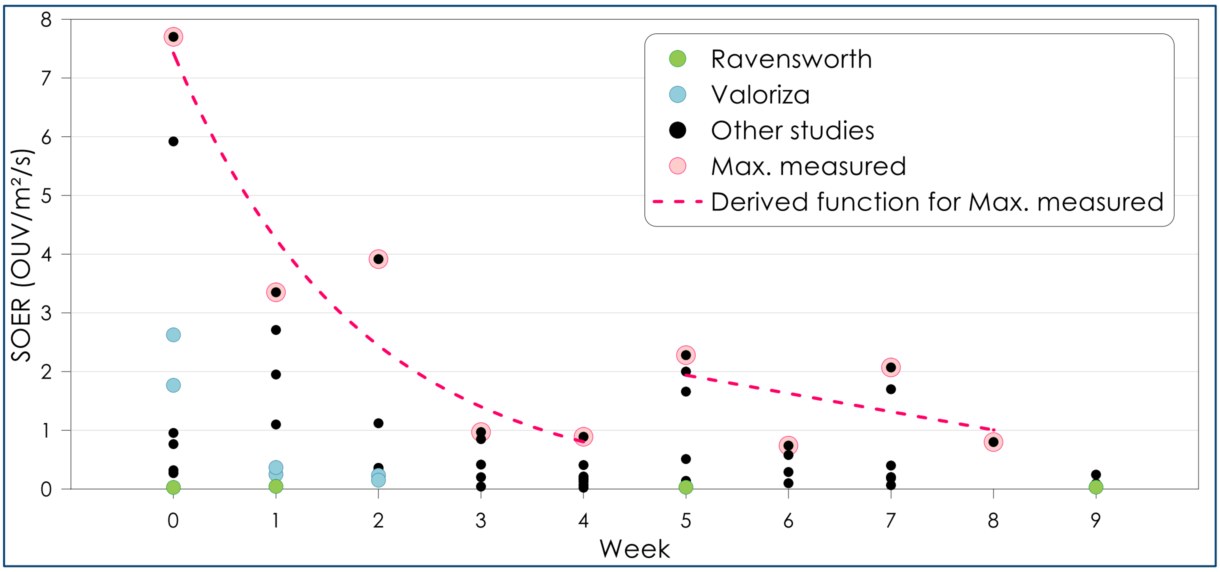


Figure 5-6: Summary of odour measurement data for composting operations

To conservatively estimate the potential odour emissions for the Project, the maximum measured odour levels for each week (pink circles in **Figure 5-6**) were used to derive a function (pink line in **Figure 5-6**) to describe the Specific Odour Emissions Rate (SOER) of the Project assuming an eight week composting process at the site.

The maximum measured odour levels representing weeks 0 to 4 and 5 to 8 in the collated dataset were used to derive Equation 1 and Equation 2, respectively, (see below) and estimate the SOER for each week of the composting process.

Equation 1: $y = 7.4234e^{-0.555x}$

Where: x = Stage or week of composting, between weeks 0-5
y = SOER ($OUV/m^2/s$)

Equation 2: $y = -0.311x + 3.494$

Where: x = Stage or week of composting, for week 6
y = SOER ($OUV/m^2/s$)

For other odour sources, a similar approach to that used in the previous assessments for the Ravensworth Composting Facility has been adopted, with odour emission rates based on the average of the sampling results (from **Table 5-3** and **Table 5-4**) applied to the modelled area source.

A summary of the odour emission rates for the Project and Loop Organics is outlined in **Table 5-5**. Odour emissions from these sources are assumed to remain at a constant rate for the modelling period.

Table 5-5: Odour emission rates for the Project

Facility	Source description	SOER (OUV/m²/s)
Project	FOGO recovered material	1.8
	Composting Processing & Blending Area – Week 1	4.3
	Composting Processing & Blending Area – Week 2	2.4
	Composting Processing & Blending Area – Week 3	1.4
	Composting Processing & Blending Area – Week 4	0.8
	Composting Processing & Blending Area – Week 5	1.9
	Composting Processing & Blending Area – Week 6	1.6
	Composting Processing & Blending Area – Week 7	1.3
	Composting Processing & Blending Area – Week 8	1.0
	Leachate Dams	1^
Loop Organics	Composting Processing & Blending Area	0.034
	Leachate Dam	1^

Source: **^Advanced Environmental Dynamics (2019)**

5.6 Modelled dust sources

The assessment considers a single worst-case scenario to represent the potential dust impacts of the Project. This scenario assumes the proposed processing capacity of 250,000tpa of material, transported to and from the site via Lemington Road.

The main dust generating activities associated with operation of the Project are identified as the loading/unloading of material, vehicles travelling on-site and off-site, screening and blending processes, and windblown dust from exposed areas including windrows and stockpiles. The on-site plant equipment also have the potential to generate particulate emissions from the diesel exhaust.

Dust emissions from each operational activity of the Project and associated approved activities were represented by a series of volume sources and were included in the CALPUFF model using an hourly varying emission file. Meteorological conditions relevant to dust generation (such as wind speed) and the level of dust generating activities were factored into the calculation of hourly emission rates for each source.

Modelled source locations are presented in **Figure 5-7**.

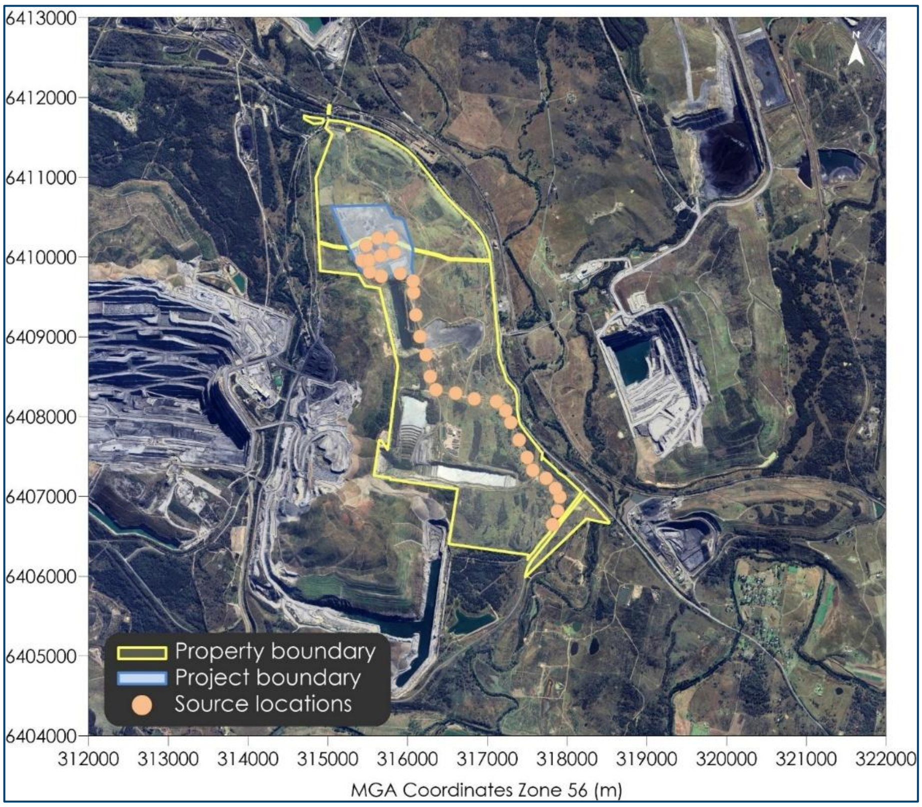


Figure 5-7: Modelled dust source locations

5.7 Dust emission estimation

Dust emissions have been estimated by analysing the dust generating activities and utilising suitable emission factors. The emission factors were sourced from both locally developed and United States Environmental Protection Agency developed documentation as approved by the NSW EPA. A summary of the estimated annual dust emissions is presented in **Table 5-6**. Detailed calculations of the dust emission estimates are provided in **Appendix C**.

Table 5-6: Summary of estimated dust emissions for the Project (kilograms per year [kg/year])

Activity	TSP emission	PM_{10} emission	$PM_{2.5}$ emission
Hauling raw material on-site	46,760	11,816	1,182
Unloading raw material	412	195	30
Rehandle raw material and shaping windrows	412	195	30
Screening material	3,125	1,075	73
Blending material	412	195	30
Loading product material to truck	412	195	30
Hauling product material off-site	46,760	11,816	1,182
Wind erosion from exposed areas	9,138	4,569	685
Exhaust emissions	494	494	479
Total emissions	**107,925**	**30,550**	**3,718**

5.8 Construction activity

Infrastructure upgrades include the installation of a prefabricated weighbridge, which is expected to take approximately five weeks to complete. The works involve site preparation, installation of drainage infrastructure, placement of concrete foundations and ramps, and assembly of the weighbridge modules. The completed weighbridge will be approximately 56 metres (m) in length.

Construction activities associated with the Project have the potential to generate dust emissions, primarily from the material handling, vehicle movements, exhaust emissions from diesel powered equipment and windblown dust from exposed areas during site preparation and levelling of ground surface. The potential impact of these activities is difficult to quantify on any given day due to their temporary and sporadic nature, as well as the short term and variable location of individual activities during the construction phase.

To assess construction impacts, a qualitative risk-based approach has been adopted. This method identifies activities that pose the greatest air quality risks during construction, allowing targeted control measures to mitigate potential impacts proactively.

The assessment follows the methodology outlined in the Institute of Air Quality Management (IAQM) *Guidance on the assessment of dust from demolition and construction* (**IAQM, 2024**). This guidance evaluates dust risks based on the scale and nature of activities, proximity to receptors, and the level of mitigation required to manage impacts effectively.

The first step of the IAQM methodology determines whether an assessment is necessary based on the following criteria:

- A 'human receptor' within:
  - 250m of the site boundary; and/or,
  - 50m of the public highway routes used by construction vehicles, up to 250m from the site entrance.
- An 'ecological receptor' within:
  - 50m of the site boundary; and/or,
  - 50m of the public highway routes used by construction vehicles, up to 250m from the site entrance.

Since all the construction activity would occur within Project boundary and there are no nearby human or ecological receptors, a detailed assessment is not required. The associated dust emissions are unlikely to be significant and can be managed effectively through standard mitigation measures.

6 DISPERSION MODELLING RESULTS

6.1 Predicted odour levels

The spatial distribution of the dispersion modelling predictions for the Project is shown in **Figure 6-1** as an isopleth diagram showing the 99th percentile nose-response ground level odour concentrations. The results indicate that odour levels due to the Project will be below the most stringent NSW EPA impact assessment criterion of 2OU at the receptor locations in Camberwell.

Predicted cumulative impacts with Loop Organics are presented in **Figure 6-2**. These results also indicate that cumulative odour levels remain below the criterion of 2OU at receptor locations in Camberwell.

For comparison, the incremental odour impacts associated with Modification 2 (**Todoroski Air Sciences, 2025**) and the Project are presented in **Figure 6-3**. The comparison indicates that the Project would result in a notable increase in odour impacts due to the processing of raw FOGO recovered material, however, impacts near the receptor locations in Camberwell would remain negligible due to their distance from the site.

The predicted odour impacts at the industrial receptors can be inferred from isopleth diagrams presented in **Figure 6-1** and in **Figure 6-2**. The level experienced at these locations are not greater than 2OU and is considered acceptable.

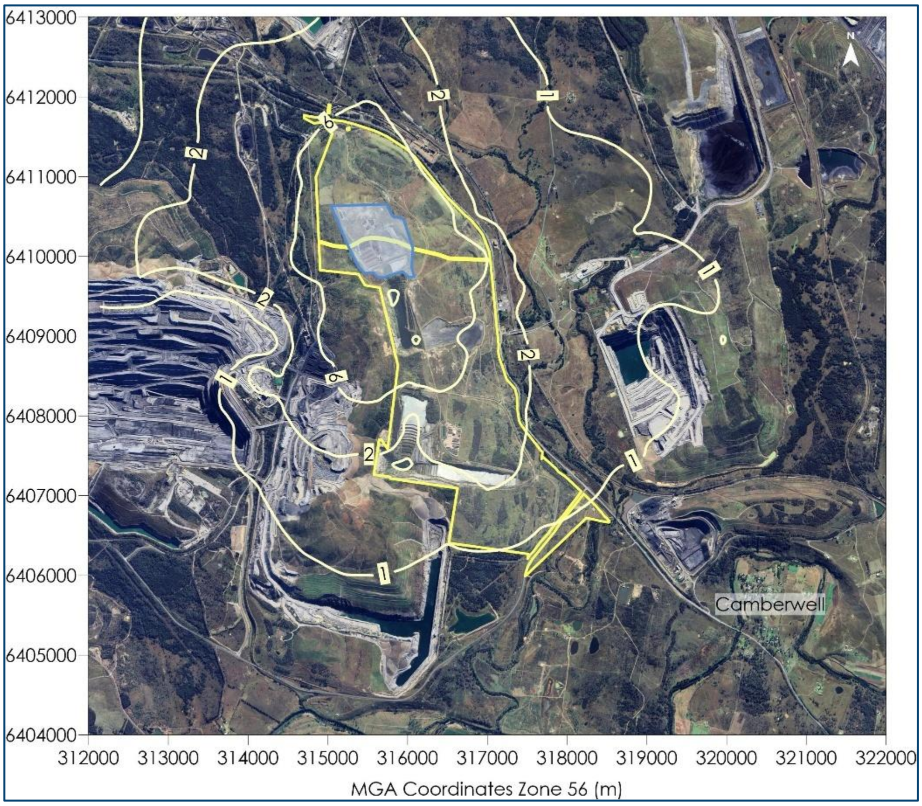


Figure 6-1: Predicted 99th percentile nose-response average odour concentration – Incremental impact

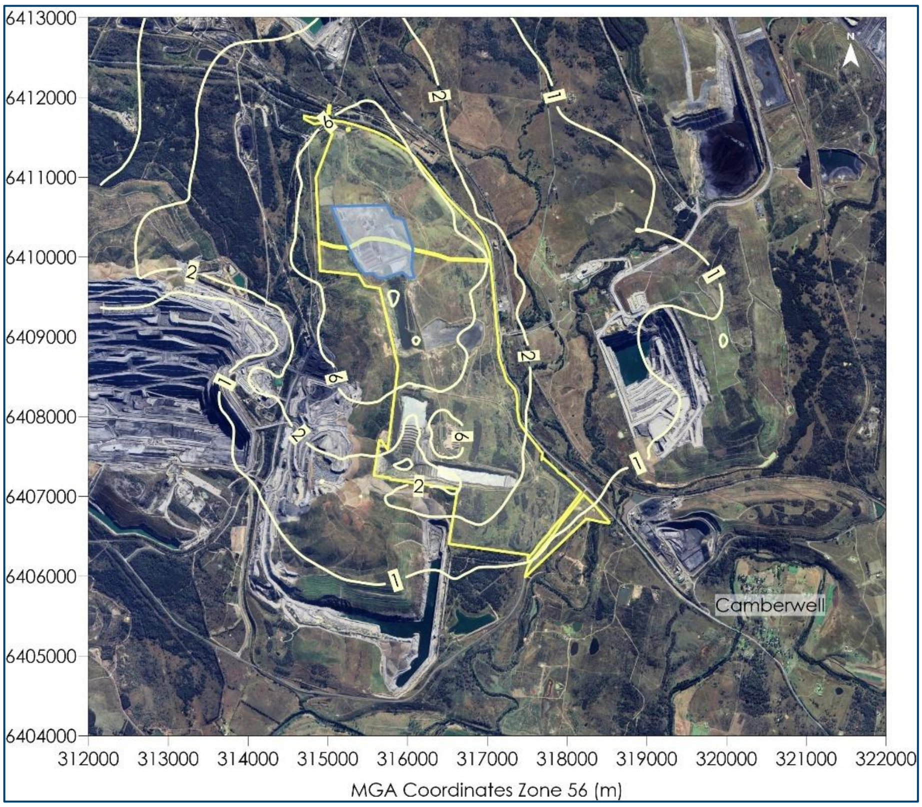
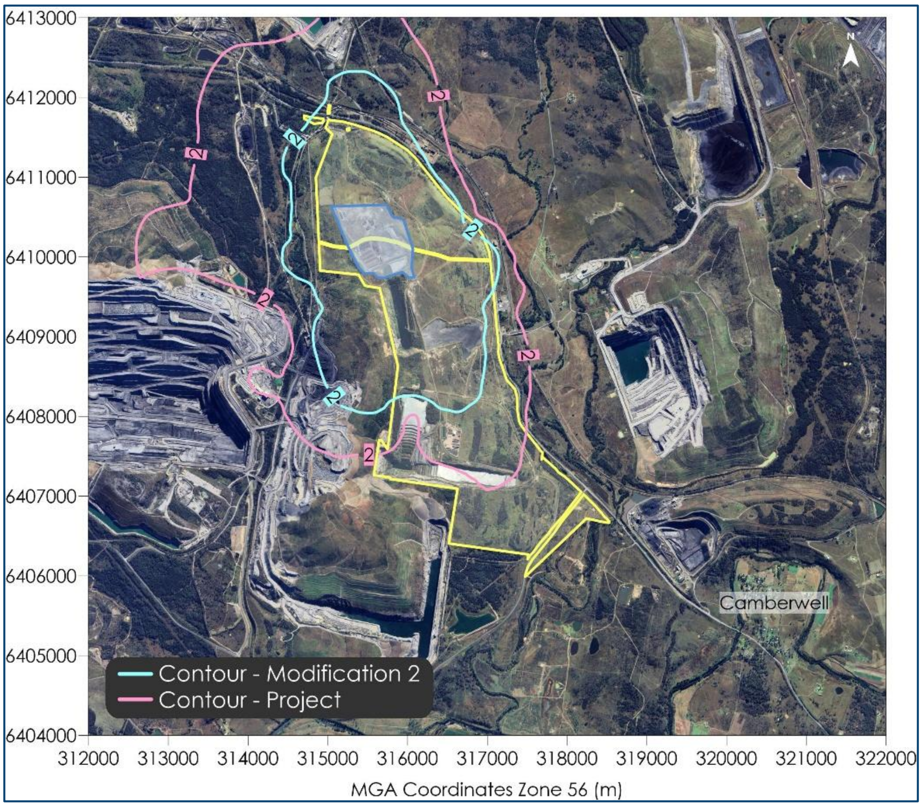


Figure 6-2: Predicted 99th percentile nose-response average odour concentration – Cumulative impact



Source: **Todoroski Air Sciences (2025)**

Figure 6-3: Comparison of predicted 99th percentile nose-response average odour concentrations for Modification 2 and the Project

6.2 Predicted dust levels

The dust dispersion modelling predictions for the operation of the Project in isolation (incremental impacts) are presented in **Figure 6-4** to **Figure 6-9**. The results show the predicted:

- Maximum 24-hour average $PM_{2.5}$ and PM_{10} concentrations;
- Annual average $PM_{2.5}$, PM_{10} and TSP concentrations; and,
- Annual average dust (insoluble solids) deposition rates.

At Camberwell, the predicted incremental dust levels attributable to the Project are less than 0.5µg/m³ for 24-hour average PM_{10}, less than 0.1g/m²/month for dust deposition levels and less than 0.1µg/m³ for the other dust metrics. These levels are negligible and would not be discernible relative to the existing background dust levels experienced at Camberwell (refer to **Section 4.3**) and would not cause exceedance of or impact against, the relevant impact assessment criteria.

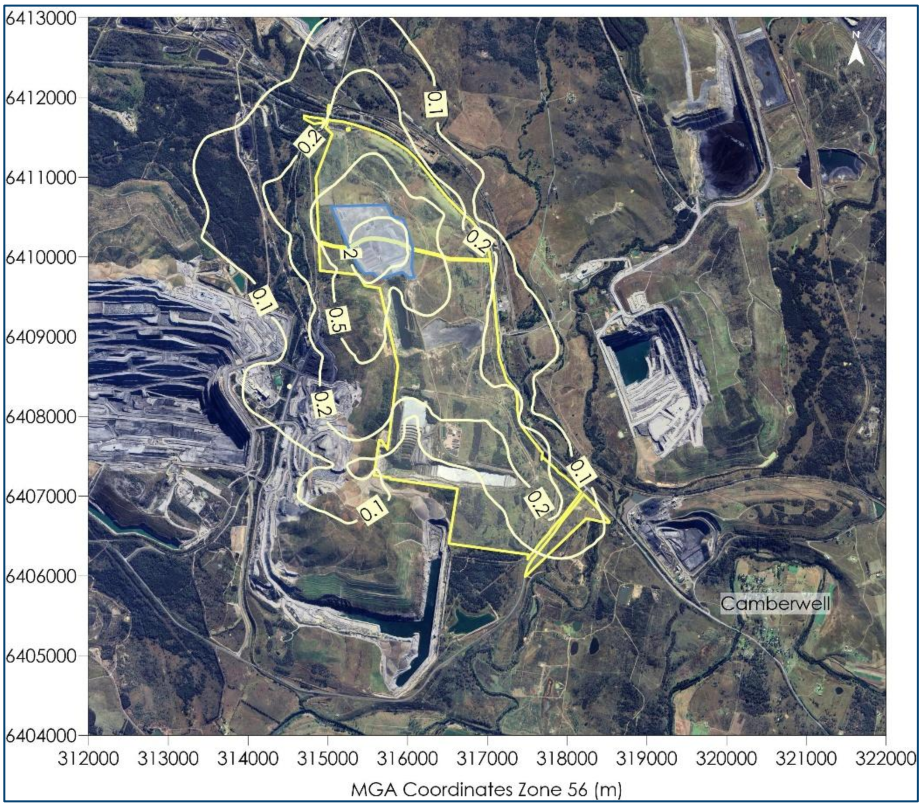


Figure 6-4: Predicted incremental maximum 24-hour average $PM_{2.5}$ concentrations (µg/m³)

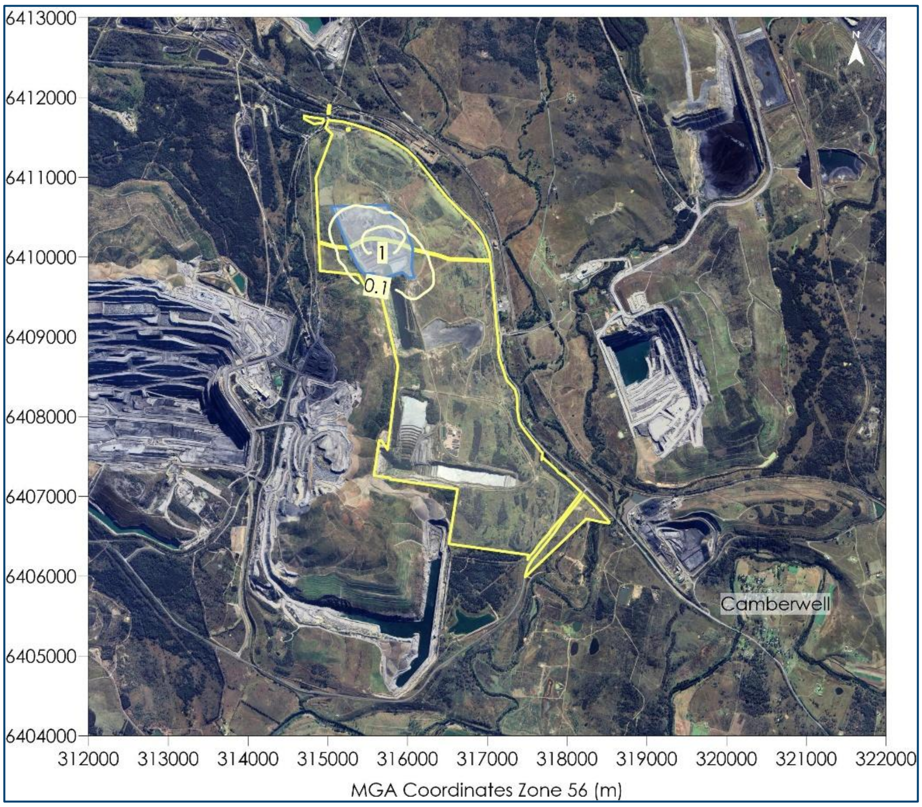


Figure 6-5: Predicted incremental annual average $PM_{2.5}$ concentrations (µg/m³)

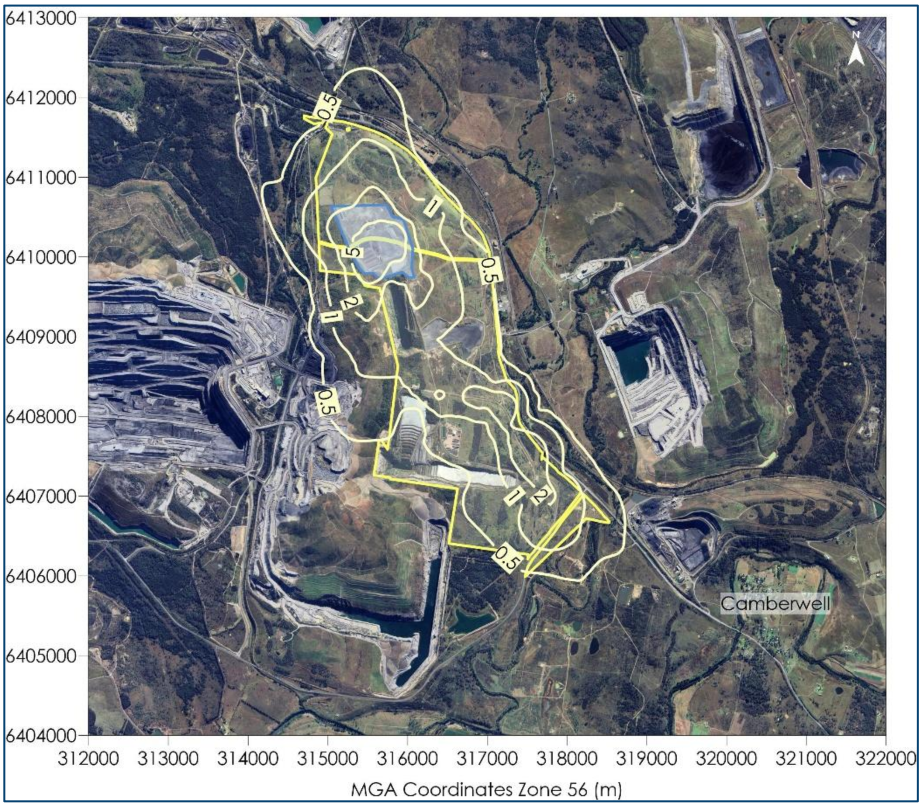


Figure 6-6: Predicted incremental maximum 24-hour average PM_{10} concentrations (µg/m³)

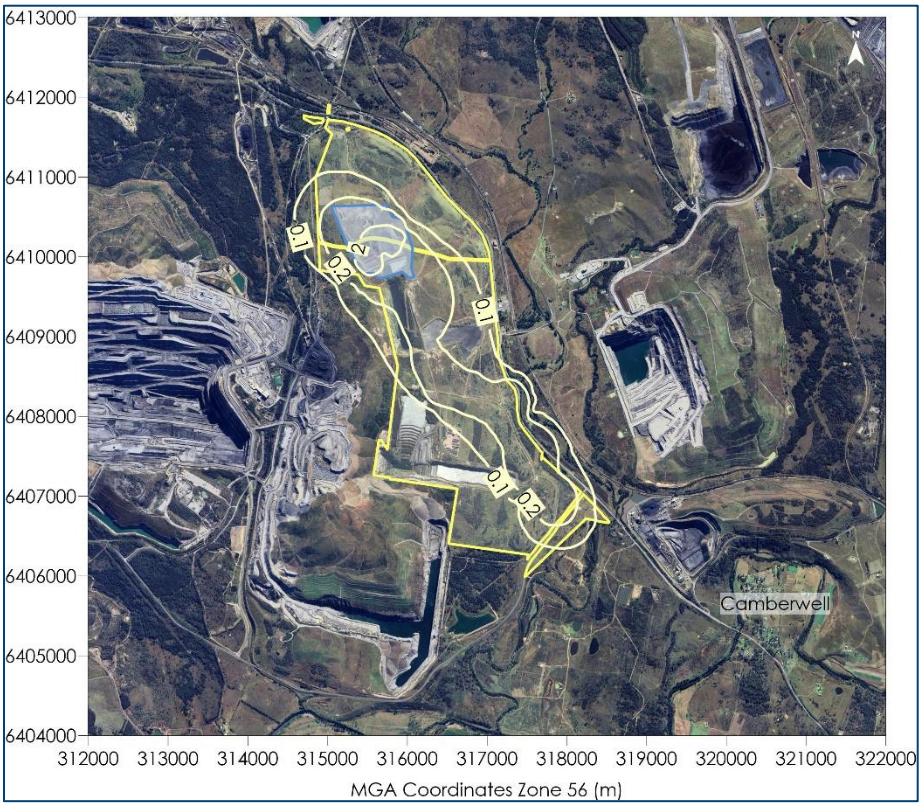


Figure 6-7: Predicted incremental annual average PM_{10} concentrations (µg/m³)

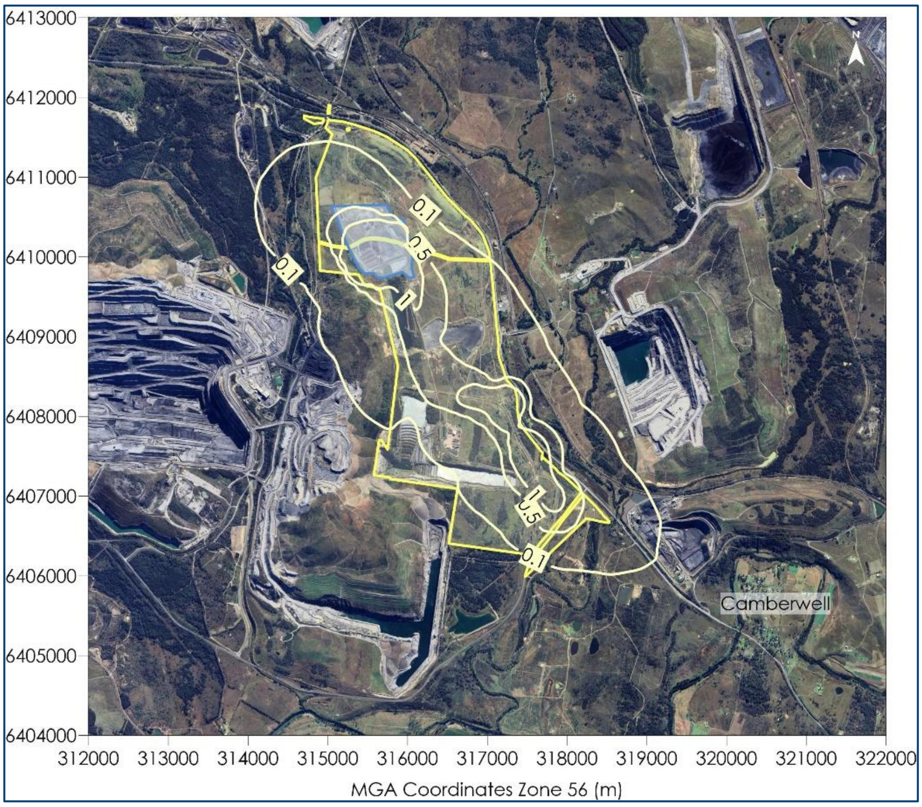


Figure 6-8: Predicted incremental annual average TSP concentrations (µg/m³)

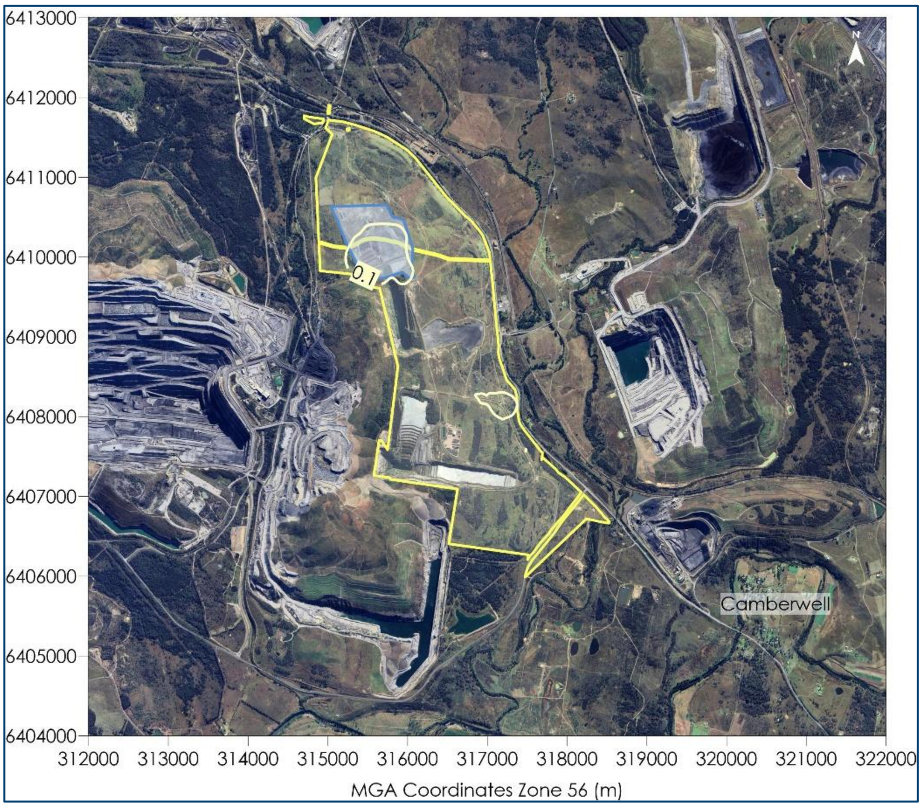


Figure 6-9: Predicted incremental annual average dust deposition levels (g/m²/month)

7 MITIGATION AND MANAGEMENT

The operations of the Project have the potential to result in a negligible change to odour and dust levels at surrounding sensitive receptors. As such, there is no requirement for any additional operational odour or dust mitigation or management measures.

Bettergrow currently implement a number of air quality control measures at the Ravensworth Composting Facility that are included within the site's Air Quality Management Plan (**Todoroski Air Sciences, 2023**). It is recommended that the existing air quality control measures continue to be applied to ensure any potential odour impacts are minimised.

7.1 Protection of the Environment Operations Act, 1997

The general obligations of the NSW *Protection of the Environment Operations Act, 1997* and the Regulations made under the Act (namely the NSW *Protection of the Environment Operations (Clean Air) Regulation, 2022*) would be followed for the Project.

The Project would operate in accordance with the relevant regulatory framework for air quality to ensure compliance with this legislation.

8 GREENHOUSE GAS ASSESSMENT

The activities associated with the Project would result in GHG emissions from composting processes, as well as from diesel and petrol consumption required to operate vehicles, plant and equipment on-site and to transport of material off-site. Construction of the proposed weighbridge would also contribute minor additional GHG emissions.

The GHG assessment presented in the *Air Quality Impact and Greenhouse Gas Assessment Bettergrow Ravensworth Modification 2* (**Todoroski Air Sciences, 2025**) has been used as the baseline comparison point for this assessment.

This assessment addresses overall sources and emissions from the existing approved operations together with those associated with Modification 2 and the Project, and has been prepared in general accordance with the *NSW Guide for Large Emitters* (**NSW EPA, 2025**).

8.1 GHG emission scenario

Table 8-1 presents the estimated annual quantities of materials used to assess GHG emissions for the Project. The composting tonnage reflects the proposed limit, with diesel requirements scaled linearly from the previous GHG assessment for Modification 2 (**Todoroski Air Sciences, 2025**). No changes are anticipated in petrol requirements.

Table 8-1: Estimated quantities of materials used to assess GHG emissions for the Project

Material	Quantity		Units
	Approved	Project	
Composting	200,000	250,000	t
Diesel	139	172.6	kL
Petrol	1.5	1.5	kL

t = tonnes, kL = kilolitres

In terms of delivery of product material to customers, the Project would dispatch 250,000tpa using 32t road trucks, resulting in 7,813 trips. Assuming an average transport distance of 200km per return trip, this results in approximately 1,562,500km per year. Using an average truck fuel consumption rate of 53.1L/100km (**ABS, 2025**), this equates to 830kL/year of diesel required due to the vehicle movements from the Project which is an increase of approximately 166kL/year of diesel compared to the approved operations. **Table 8-2** presents the estimated annual diesel requirements for the transport of product material.

Table 8-2: Estimated annual diesel requirements for transport of product material

Source	Approved	Project	Units
Transport product offsite	664	830	kL

For the construction activities associated with the Project, works would involve site preparation, installation of drainage infrastructure, laying of concrete foundations and ramps, and assembly of modules. The construction period is estimated to take approximately five weeks (around 300 hours). Diesel requirements have been estimated based on the plant and equipment expected to be used, their fuel consumptions rates and the total construction hours (taken as 70% of the available hours). **Table 8-3** presents the estimated annual diesel requirements for the construction activities.

Table 8-3: Estimated annual diesel requirements for construction activities

Equipment	Quantity	Hours	Fuel consumption (L/hr)	Diesel consumption (kL)
Light vehicles	2	210	5	2.1
Flatbed truck	1	210	16	3.36
Roller	1	210	17	3.57
Mobile crane	1	210	20	4.2
Forklift	1	210	5	1.05
Concrete mixer truck	1	210	20	4.2
			Total	**18.48**

The GHG emissions associated with the operation and construction activities for the Project are estimated in the following sections.

8.2 GHG emission factor

To quantify the amount of carbon dioxide equivalent (CO_2-e) material generated, emission factors for diesel use from the Australian *National Greenhouse Accounts Factors* (NGA Factors) document (**Cth DCCEEW, 2024a**) were applied.

Table 8-4 summarises the emission factors applied.

Table 8-4: Summary of emission factor for diesel use

Type	Energy content factor (GJ/kL)	Emission factor			Units	Scope
		CO_2	CH_4	N_2O		
Composting	-	0.046	-	-	t CO_2-e/t	1
Diesel - Stationary	38.6	69.9	0.1	0.2	kg CO_2-e/GJ	1
		17.3	-	-		3
Automotive gasoline/petrol	34.2	67.4	0.2	0.2	kg CO_2-e/GJ	1
		17.2	-	-		3
Diesel – Transport	38.6	69.9	0.07	0.4	kg CO_2-e/GJ	3

Note: GJ/kL = gigajoule per kilolitre, CO_2 = carbon dioxide, CH_4 = methane, N_2O = nitrous oxide, t CO_2-e = tonnes of carbon dioxide equivalent, kg CO_2-e = kilograms of carbon dioxide equivalent

8.3 Estimated GHG emissions

The estimated annual average GHG emissions for the Project have been estimated based on quantity of materials and emission factors described in the previous sections.

A summary of the estimated annual average GHG emissions for the approve operations and the Project is presented in **Table 8-5**.

Table 8-5: Summary of estimated annual average GHG emissions

Activity	Scope	Estimated annual average GHG emissions (t CO_2-e)	
		Approved	Project
Construction	1	-	50
Project	1	9,580	11,971
	3	94	116
Transport product offsite	3	1,803	2,254

The estimated annual average Scope 1 emissions for the Project (including construction) is 12,021t CO_2-e (Scope 1). The change relative to the approved operations is 2,441t CO_2-e which is below the threshold of 25,000 t CO_2-e in accordance with the *NSW Guide for Large Emitters* (**NSW EPA, 2025**). The 25,000 t CO_2-e threshold is designed to identify projects with significant greenhouse gas emissions that require a more detailed climate change response, such as the preparation of a Climate Change Mitigation and Adaptation Plan (CCMAP). The CCMAP sets out how a project will avoid, reduce, substitute and offset emissions, and how it will adapt operations to align with NSW's legislated net zero targets

As the site does not consume electricity, there are no Scope 2 emissions associated with the Project.

The estimated annual GHG emissions for Australia in the 12-month period up to June 2024 was 440.6Mt CO_2-e (**Cth DCCEEW, 2024b**). In comparison, the estimated annual average GHG emissions for the Project is 0.012 Mt CO_2-e (Scope 1). Therefore, the annual contribution of GHG emissions from the Project in comparison to the Australian GHG emissions for the 2024 period is estimated to be approximately 0.0027%.

At a state level, the estimated GHG emissions for NSW in the July 2021 to June 2022 period were 111.0Mt CO_2-e (**Cth DCCEEW, 2025**). The annual contribution of GHG emissions from the Project in comparison to the NSW GHG emissions for the 2022 period is estimated to be approximately 0.0108%.

Scope 3 emissions occur outside the Project's direct control and represent indirect impacts of its activities, as such have not been compared against state or national GHG inventories.

9 SUMMARY AND CONCLUSIONS

This report has examined the air quality impacts associated with the proposed modification to the Ravensworth Composting Facility located at Ravensworth, NSW.

Air dispersion modelling was used to predict the potential for off-site odour impacts in the surrounding area due to the operation of the Project with generally conservative assumptions.

The odour impact assessment indicates odour impacts due to the Project are below the applicable criterion at the receptor locations in Camberwell and would not lead to any unacceptable level of odour in the surrounding environment. Predicted odour impacts at industrial receptors are not greater than 2OU and is considered acceptable.

The predicted dust levels in the surrounding environment associated with the Project are low, and with the addition of background levels are unlikely to lead to exceedances of the criteria.

Overall, the assessment demonstrates that, even under conservative assumptions, the Project can operate without causing any significant air quality impacts at current or future receptors in the surrounding environment. Accordingly, no additional air quality management measures are proposed. The existing mitigation and management measures outlined in the facility's Air Quality Management Plan (**Todoroski Air Sciences, 2023**) will continue to be implemented to minimise any potential odour or dust emissions from the Project.

The estimated annual average GHG emission for the Project are negligible when compared to the overall GHG emissions of Australia and NSW.

10 REFERENCES

ABS (2025)

Survey of Motor Vehicle Use, Australia, Australian Bureau of Statistics (ABS) website, accessed May 2025. https://www.abs.gov.au/statistics/industry/tourism-and-transport/survey-motor-vehicle-use-australia/latest-release

Advanced Environmental Dynamics (2019)

"Greenspot Ravensworth Greenhouse Gas, Odour and Dust Assessments", prepared for Bettergrow Pty Ltd by Advanced Environmental Dynamics, August 2019.

Advanced Environmental Dynamics (2022).

"Memorandum Greenspot Ravensworth Greenhouse Gas, Odour and Dust Assessments Update 2022", prepared for Space Urban by Advanced Environmental Dynamics, May 2022.

Bureau of Meteorology (2025)

Climate statistics for Australian locations, Bureau of Meteorology website, accessed May 2025. http://www.bom.gov.au/climate/averages

Commonwealth Department of Climate Change, Energy, the Environment and Water (2024a)

"Australian National Greenhouse Accounts Factors – For individuals and organisations estimating greenhouse gas emissions", Department of Climate Change, Energy, the Environment and Water [DCCEEW], August 2024.

Commonwealth Department of Climate Change, Energy, the Environment and Water (2024b)

"Quarterly Update of Australia's National Greenhouse Gas Inventory: June 2024", Department of Climate Change, Energy, the Environment and Water [DCCEEW], November 2024.

Commonwealth Department of Climate Change, Energy, the Environment and Water (2025)

State and Territory greenhouse gas inventories: 2022 emissions - Department of Climate Change, Energy, the Environment and Water [DCCEEW] website, Accessed January 2025. https://www.dcceew.gov.au/climate-change/publications/national-greenhouse-accounts-2022/state-and-territory-greenhouse-gas-inventories-2022-emissions

Ektimo (2025)

"Odour Emission Monitoring at Valoriza Dandenong – R019297", prepared for Element Environment by Ektimo, August 2025.

ERM (2013)

"Resource Recovery Facility – Gerogery, Odour Impact Assessment", prepared for Baker & McKenzie by ERM, August 2013.

GHD (2015)

"Lucas Heights Resource Recovery Park Project Air Quality Assessment", prepared for SITA Australia by GHD, August 2015.

IAQM (2024)

“Guidance on the assessment of dust from demolition and construction”, Institute of Air Quality Management, January 2024

Katestone Scientific Pty Ltd (1995)

"The evaluation of peak-to-mean ratios for odour assessments". Volume 1 - Main Report, May 1995.

Katestone Scientific Pty Ltd (1998)

“Peak-to-Mean Concentration Ratios for Odour Assessments”, 1998.

Katestone Environmental (2011)

"NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining", Katestone Environmental Pty Ltd prepared for DECCW, 2011.

National Pollutant Inventory (2012)

“Emission Estimation Technique Manual for Mining Version 3.1”, National Pollutant Inventory, January 2012.

NSW DEC (2006)

“Technical framework – Assessment and management of odour from stationary sources in NSW”, November 2006.

NSW EPA (2014)

“NSW Coal Mining Benchmarking Study Best-practice measures for reducing non-road diesel exhaust emissions”, December 2014.

NSW EPA (2022)

“Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales”, NSW Environment Protection Authority, August 2022.

NSW EPA (2025)

“NSW Guide for Large Emitters”, NSW Environmental Protection Authority, January 2025.

Todoroski, A. and Cowan, I. (2015)

“Odour Measurement Data for Composting of Green Waste with the Addition of Food Organics or Grease Trap Waste Using Gore Covers”, CASANZ 2015 conference, Melbourne.

Todoroski Air Sciences (2023)

“Air Quality Management Plan Bettergrow Nutrient Recycling Facility, Ravensworth”, prepared for Bettergrow Pty Ltd by Todoroski Air Sciences. 2023.

Todoroski Air Sciences (2025)

“Air Quality Impact and Greenhouse Gas Assessment Bettergrow Ravensworth Modification 2”, prepared for Element Environment by Todoroski Air Sciences. 2025.

TOU (2010)

“Odour Impact Assessment of Proposed Composting Facility, Wooroloo Brook Farm, WA”, prepared for Purearth by The Odour Unit, April 2010.

TRC Environmental Corporation (2011)

"Generic Guidance and Optimum Model Settings for the CALPUFF Modeling System for Inclusion into the Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia", Prepared for the NSW Office of Environment and Heritage by TRC Environmental Corporation.

US EPA (1985 and update)

"Compilation of Air Pollutant Emission Factors", AP-42, Fourth Edition United States Environmental Protection Agency, Office of Air and Radiation Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711.

Appendix A

Selection of Meteorological Year

Selection of meteorological year

A statistical analysis of the latest ten contiguous years of meteorological data from the Cessnock Airport AWS weather station is presented in **Table A-1**. The standard deviation of the nine years of meteorological data spanning 2015 to 2024 was analysed against the mean measured wind speed, wind direction, temperature and relative humidity.

The analysis indicates that the 2017 and 2019 datasets are closest to the mean for wind speed, the 2015 and 2017 datasets for wind direction, the 2015 dataset for temperature and the 2016 and 2017 datasets for relative humidity. On the basis of a score weighting analysis, 2017 was found to be most representative as it was calculated to have the lowest score.

Table A-1: Statistical analysis results for Cessnock Airport AWS

Year	Wind speed	Wind direction	Temperature	Relative humidity	Score
2015	1.0	0.2	0.1	0.4	3.3
2016	0.8	0.3	0.2	0.3	3.3
2017	0.7	0.2	0.2	0.3	3.0
2018	0.8	0.3	0.3	0.6	3.5
2019	0.7	0.2	0.2	0.8	3.2
2020	0.9	0.3	0.3	0.7	3.8
2021	1.0	0.3	0.2	0.5	3.7
2022	0.9	0.4	0.3	1.2	4.9
2023	1.5	0.3	0.4	0.4	4.8
2024	1.2	0.5	0.2	0.4	4.8

Figure B-1 shows the frequency distributions for wind speed, temperature, wind direction and relative humidity for the 2017 year compared with the mean of the 2015 to 2024 data set. The 2017 year data appear to be well aligned with the mean data for wind speed, wind direction and relative humidity.

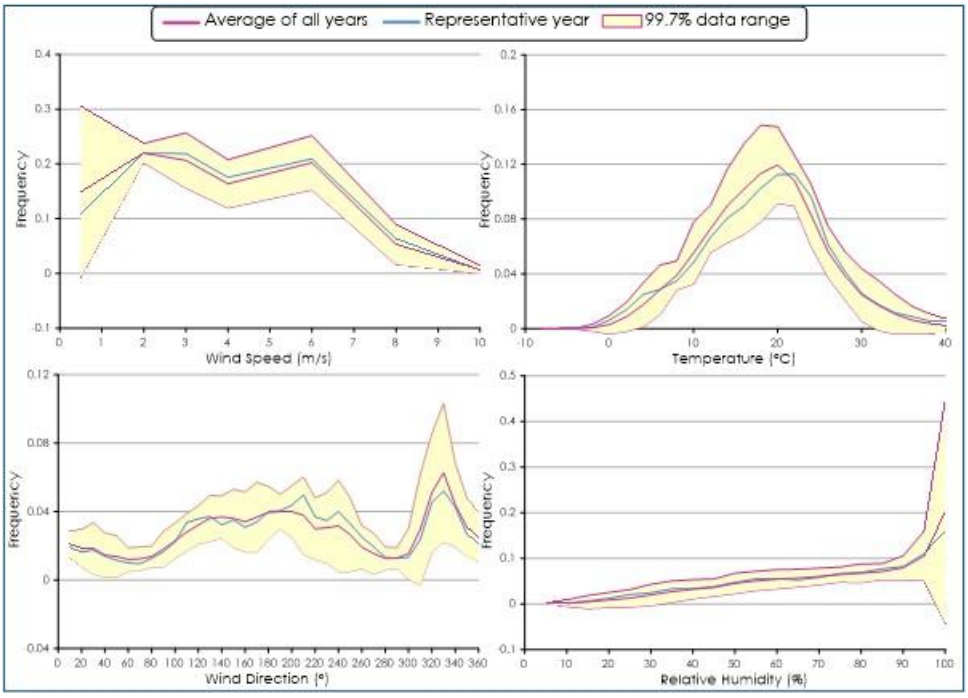


Figure A-1: Frequency distributions for wind speed, wind direction, temperature and relative humidity

Appendix B

Odour Sampling Report

Ektimo

Experts in air quality, odour and emission monitoring.

Modification 2 & Modification 3 of State Significant Development 9418 for Bettergrow Pty Ltd

Odour Emission Monitoring at Valoriza Dandenong

Report: R019297a

Element Environment Pty Ltd, Warriewood

Ektimo

Document Information

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Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

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Table of Contents

1 Introduction

1.1 Background

Bettergrow Pty Ltd (Bettergrow) operate an organics recovery and composting facility at 74 Lemington Road, Ravensworth, NSW. The facility processes biosolids, garden organics and other recovered organic material in outdoor windrows to produce a compost product suitable for mine site rehabilitation and agricultural uses. Bettergrow hold a license to process 200,000 tonnes per annum, granted in 2022.

Bettergrow are currently seeking to expand their processing capacity to 250,000 tonnes per annum, alongside operational changes including the processing of decontaminated and pasteurised Food Organics and Garden Organics (FOGO) and/or food recovered materials. This expansion requires two modifications (Modification 2 and Modification 3) to State Significant Development (SSD) SSD-9418. To support this, Bettergrow engaged Element Environment Pty Ltd (Element Environment) to prepare the environmental assessment documentation for the modification applications. Relevant details of the modification applications are documented in the "Modification 2 – Scoping Letter" and "Modification 3 – Scoping Report" prepared by Element Environment.

To inform the modification reports for Modification 2 & Modification 3, an air quality assessment will be undertaken by Todoroski Air Sciences (Todoroski), including atmospheric dispersion modelling, to evaluate potential air quality impacts of the modifications. To inform this modelling, odour emission rates from the relevant waste types must be quantified. Since Bettergrow's current facility does not process decontaminated and pasteurised FOGO and/or food recovered material or raw FOGO recovered material, it was deemed appropriate to conduct odour monitoring at a composting facility that processes the material described above, which is located in the suburb of Dandenong South. The facility is owned and operated by Valoriza Environment Australia (Valoriza) located at 45/46 Villas Road, Dandenong South, Melbourne, VIC (Figure 1). Valoriza are licensed to process decontaminated and pasteurised FOGO and raw FOGO recovered material.

Element Environment engaged Ektimo to perform odour monitoring at Valoriza. The monitoring programme was conducted to obtain emission rates from sources comparable to those proposed for Bettergrow's expanded operations. Monitoring was undertaken on the 13th of June & the 6th of August 2025. The results of the monitoring programme will then be used as dispersion modelling inputs for the air quality assessments for the proposed modification applications. Please refer to 1.2 Monitoring Objective & Overview for a detailed breakdown of the monitoring sources and conditions.

Please note that the monitoring sources were selected based on a consultation with Element Environment and Todoroski, with an aim of monitoring the worst-case scenario for odour emissions generated by each waste type.

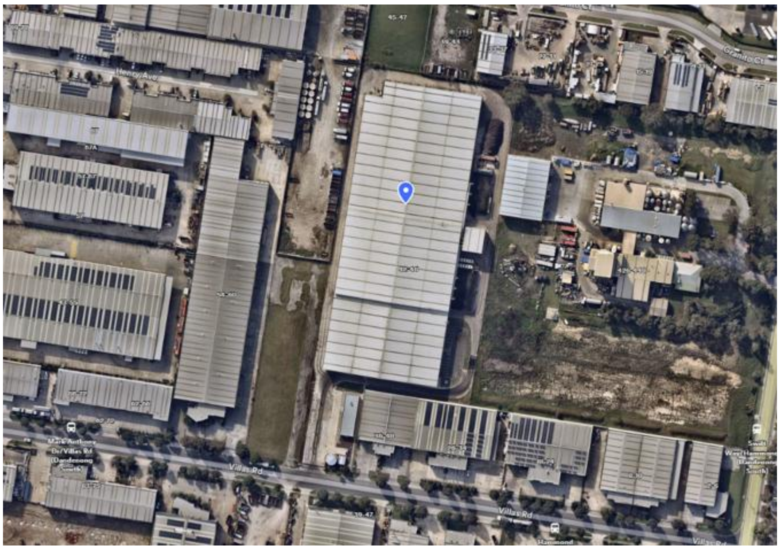

Figure 1: Valoriza Environment Australia – Dandenong composting facility

1.2 Monitoring Objective & Overview

The objective of the monitoring scope was to quantify emissions from three sources/waste material types that form part of Valoriza's operations.

Monitoring was performed as follows:

Section / Material	Age of Material	Monitoring Date	Monitoring Parameters*
Section 1 – Raw FOGO Material	Less than 1 day old	13 June 2025	-Odour (ou) -Flux Emission Rate (ou.m^3/m^2/min)
Section 2 – Decontaminated Material	Approx. 3 weeks old		
Section 3 – Pasteurised Material Window #2	Approx. 1 day old		
Section 3 – Pasteurised Material Window #3 (West)	Approx. 2 days old	06 August 2025	
Section 3 – Pasteurised Material Window #3 (East)	Approx. 2 days old		
Section 3 – Pasteurised Material Window #4	Approx. 5 days old		
Section 3 – Pasteurised Material Window #2	Approx. 19 days old		

*All concentrations are reported on a wet basis at STP.

Please note monitoring was conducted using an Isolation Flux Chamber (IFC) following AS4323.4 at the direction of Element Environment and Todoroski. Refer to Appendix A & Section 2 for further information and the application of the IFC methodology at each location during the monitoring event.

Monitoring images can be seen in Appendix A.

2 Monitoring Methodology – Isolation Flux Chamber (AS 4323.4)

Ektimo conducted emission monitoring using an isolation flux chamber based on NSW EPA (Environmental Protection Authority) regulatory requirements following Australian Standard AS 4323.4 (2009) – Stationary Source Emissions, Method 4: Area source sampling – Flux chamber technique.

The preface of AS4323.4 outlines that the flux chamber sampling technique may be "*used for the determination of atmospheric contaminant emission rates from area sources, in particular, the determination of odour and hazardous air pollutants*".

Area sources include:

a) *Landfill surfaces (e.g. working face, soil/compost/synthetic cover, clay capped and revegetated) of various ages.*
b) *Sewage treatment plant surfaces (e.g. inlet channels, primary sedimentation tanks,*
c) *aeration tanks, activated sludge tanks, clarifiers, sludge lagoons, sludge drying beds,*
d) *facultative lagoons, anaerobic lagoons and dissolved air flotation tanks).*
e) *Composting surfaces (e.g. raw material stockpiles, compost windrows and final product stockpiles).*
f) *Sub-surface contaminated groundwater sources (e.g. floating petroleum layer*
g) *affecting surface emissions).*
h) *Industrial sources (e.g. waste storage/disposal, sumps, surface spills, wastewater*
i) *treatment plant surfaces and effluent disposal areas).*
j) *Agricultural sources (e.g. feed lots, animal waste containments, crop preparation and*
k) *residual crop treatment).*
l) *Contaminated/remediation sites.*

NSW EPA (Environmental Protection Authority) requires that emission to air monitoring for regulatory purposes be conducted following NSW EPA approved methods. These methods are outlined in the NSW EPA document "*Approved methods for the sampling and analysis of air pollutants in NSW*".

The NSW EPA approved method (OM-8/Other Method 8) sites that AS4323.4 should be used to conduct odour sampling from diffuse sources. An excerpt from the *Approved methods for the sampling and analysis of air pollutants in NSW* document and associated link can be seen below in Figure 2.

Table 3 Other methods (OMs)

Method no.	Parameter measured	Method
OM-4	Total and hexavalent chromium emissions	California Air Resources Board Method 425 or USEPA SW-846 Test Method 0061
OM-5	'Fine' particulates (PM_{10}[2] and/or $PM_{2.5}$[3])	USEPA Method 201 or 201A or ISO 23210
OM-6	Polycyclic aromatic hydrocarbons (PAHs)	California Air Resources Board Method 429
OM-7	Odour sampling from point sources or odour analysis using dynamic olfactometry	AS 4323.3
OM-8	Odour sampling from diffuse sources	AS 4323.4
OM-9	'Coarse' particulates	Appendix 6: Other approved method 9
OM-10	Ammonia	ISO 21877
OM-11	Formaldehyde	USEPA Method 323 or USEPA Method 318 or USEPA SW-846 Test Method 0011 USEPA Compendium Method TO-5 or TO11A or NIOSH Method 2016 may be used when the source is comparable to ambient air conditions (<50^{O}C, low moisture and low particulate concentrations).
OM-12	Isocyanates	USEPA Method 326 or USEPA Conditional Test Method 36
OM-13	Asbestos	ISO 10397

Figure 2: NSW EPA Approved Methods - Other Methods

Source: NSW EPA - Approved methods for the sampling and analysis of air pollutants in NSW

The Isolation Flux Chamber (IFC) methodology is widely used for emission monitoring across a variety of applications. It is commonly employed on surfaces such as soil, water bodies, landfills, compost piles, biosolids, wastewater treatment beds, and industrial materials.

The chamber functions by enclosing a defined surface area with a sealed structure, allowing emitted gases to accumulate in the chamber's headspace over a set period. Once an odourless air supply is connected, the equilibration phase begins—for a duration of 24 minutes, in accordance with AS4323.4. Following this phase, a sample is drawn into the designated sample media. Refer to Figure 3 for a schematic representation of the applied methodology.

AS4323.4 also highlights the assumption that for flux chamber measurements, the determined emission rate from within the chamber is representative of the total area source, both spatially and temporally.

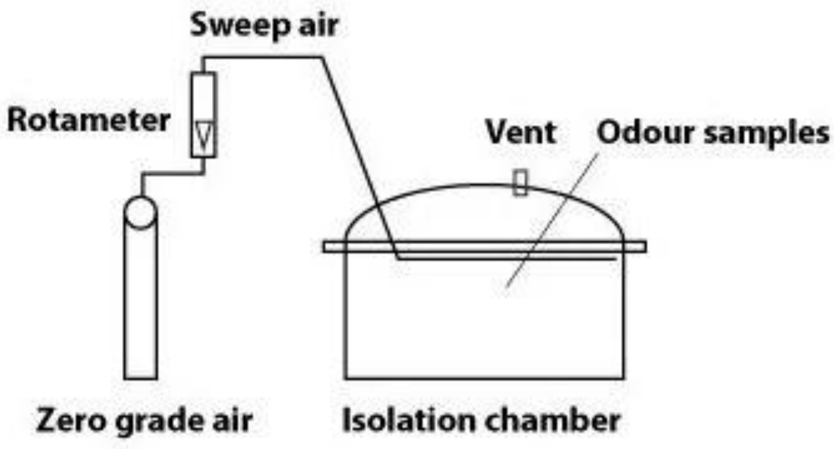

Figure 3: Isolation Flux Chamber diagram

3 Process Conditions

According to a Valoriza representative, the plant was operating as per normal operating conditions during both monitoring occasions. Commentary on the condition of each material monitored (as advised by Valoriza) is outlined below.

3.1.1 Section 1 – Raw FOGO Material

It was advised that the condition of the raw FOGO material monitored was representative of normal operations, and the material was approximately 1 day old. It was observed that the material surface was non-homogenous in nature and contained a combination of green waste, garden waste and food waste (Figure 4).

Figure 4: Raw FOGO material

3.1.2 Section 2 – Decontaminated Material

Once the Raw FOGO material is received, it undergoes decontamination which consists of picking, sorting and shredding the material. The decontamination process blends the waste material, resulting in a more homogeneous mixture. After decontamination the material is stockpiled before undergoing pasteurisation. According to the Valoriza representative, the decontaminated material sampled was approximately three weeks old and was the most recently processed batch. The condition of the material monitored can be seen in Figure 5 below.

Figure 5: Decontaminated material

3.1.3 Section 3 – Pasteurised Material - 1 Day Old

Pasteurisation involves loading decontaminated material into tunnels or sealed vessels, where the material is held for several weeks and aerated to support biological breakdown. Once the pasteurisation process has finished the material is removed from the tunnels/vessel and formed into windrows.

Based on information provided by Valoriza, Ektimo conducted monitoring on material windrow #2, which contained the entirety of Batch 20250528T04 from Tunnel 4. The material was monitored within 24 hours of its removal from the tunnel. This is likely to represent the worst-case emissions scenario for pasteurised material. Refer to Figure 6 for the condition of the pasteurised material.

Figure 6: Pasteurised material – 1 day old

3.1.1 Section 3 – Pasteurised Material – 2, 5 & 19 Days Old

Ektimo conducted monitoring on windrows of various ages to determine the impact of windrow age on odour emissions. Ektimo conducted monitoring on windrowed material that had aged/matured for 1 (discussed above), 2, 5 & 19 days. It was noted that sampling was not conducted on the same windrow for each age, however, based on consultation with Valoriza, the material composition in each windrow is expected to be homogenous and feed stocks do not vary. Monitoring on the windrows was conducted on the 13/06/2025 and the 06/08/2025.

For further information refer to Section 1.2.

Photos of monitored material at various ages can be seen in Figures 7-10 below.

Figure 7: Pasteurised material – 19 days old

Figure 8: Pasteurised material – 5 days old

Figure 9: Pasteurised material – 2 days old (Western bank)

Figure 10: Pasteurised material – 2 days old (Eastern bank)

4 Results Summary

Table 1 below summarises the results of the monitoring programme.

Duplicate samples were collected for all waste types to increase the robustness and repeatability of the measurement (sampling conducted on the 13/06/2025). Analysis of the monitoring programme conducted on 13/06/2025 indicates that pasteurised material exhibited the highest odour concentration of all waste types/process stages, followed by raw FOGO and decontaminated material.

Monitoring was carried out in an enclosed building, where notable temperature differentials between the sampling media and the ambient air created a high-moisture environment. These conditions resulted in condensation during monitoring, most prominently observed in Section 3.

Following a review of the monitoring conducted on the 13/06/2025, Element Environment and Todoroski initiated further investigation into the variation of odour emissions from older windrows, with the aim of characterising the material proposed for acceptance at the Bettergrow site.

Ektimo conducted further monitoring on three additional sampling locations, focusing on Section 3 and various aged windrows. Detailed findings, including site-specific observations and odour concentration measurements are presented in Section 5 of this report.

Single samples were collected on various aged windrows (06/08/2025). It should be noted that two samples were collected on the 2 day old windrow material, however, these samples are not considered duplicates as they were collected at different locations on the windrow. Two separate locations on the windrow were selected to capture potential spatial variation in windrow emissions.

Table 2 and Figure 11 summarise the change in odour concentration, flux emission rate, and temperature over various ages of the pasteurised material. A significant decrease in odour concentration and emissions is noted in the first 48 hours of aging.

Table 1: Results summary of the monitoring programme

Monitoring Parameters	13/06/2025 1018-1034 Section 1 - Raw/FOGO Material		13/06/2025 0914-0930 Section 2 - Decontaminated Material		13/06/2025 0813-0830 Section 3 - Pasteurised Material - 1 Day Old	
Surface description	Pre-processed food and green waste		Shredded green waste/compost		Earth-like grainy compost	
Odour concentration, ou	**Test 1**	**Test 2**	**Test 1**	**Test 2**	**Test 1**	**Test 2**
	3,300	2,700	940	710	5,100	7,800
Average odour concentration, ou	**3,000**		**820**		**6,400**	
Hedonic tone	very unpleasant		very unpleasant		very unpleasant	
Odour character	grass, rotten, green waste		grass, compost		grass,compost, rotten	
Flux Emission Rate, ou.m^3/m^2/min	**Test 1**	**Test 2**	**Test 1**	**Test 2**	**Test 1**	**Test 2**
	120	100	35	26	190	300
Average Flux Emission Rate, ou.m^3/m^2/min	**110**		**31**		**240**	

Monitoring Parameters	6/08/2025 1636-1644 Section 3 - Pasteurised Material - 2 Days Old (West)	6/08/2025 1645-1653 Section 3 - Pasteurised Material - 2 Days Old (East)	6/08/2025 1536-1544 Section 3 - Pasteurised Material - 5 Days Old	6/08/2025 1515-1523 Section 3 - Pasteurised Material - 19 Days Old
Surface description	Shredded soil-like pile of green waste	Shredded soil-like pile of green waste	Shredded soil-like pile of green waste	Shredded soil-like pile of green waste
Odour concentration, ou	**410**	**590**	**240**	**360**
Hedonic tone Odour character	very unpleasant compost, green waste, fruity	very unpleasant compost, green waste, fruity	mildly unpleasant earthy, green waste	mildly unpleasant earthy, green waste
Flux Emission Rate, ou.m^3/m^2/min	**15**	**22**	**9**	**14**

Table 2: Change in temperature, odour concentration and flux rate

Pasteurised Material Age	Temperature (^{o}C)	Odour Concentration (ou)	Flux Emission Rate (ou.m^3/m^2/min)
Approximately 1 Day Old	55	6400	240
Approximately 2 Days Old	72	500	19
Approximately 5 Days Old	57	240	9
Approximately 19 Days Old	25	360	14

Note – The values shown for concentration & emission rate of the Approximately 1 Day Old material represent the average of duplicate samples. The values shown for concentration, temperature & emission rate of the Approximately 2 Day Old material represent the average of two samples collected on the same windrow at the same age at different locations (West & East).

Ektimo

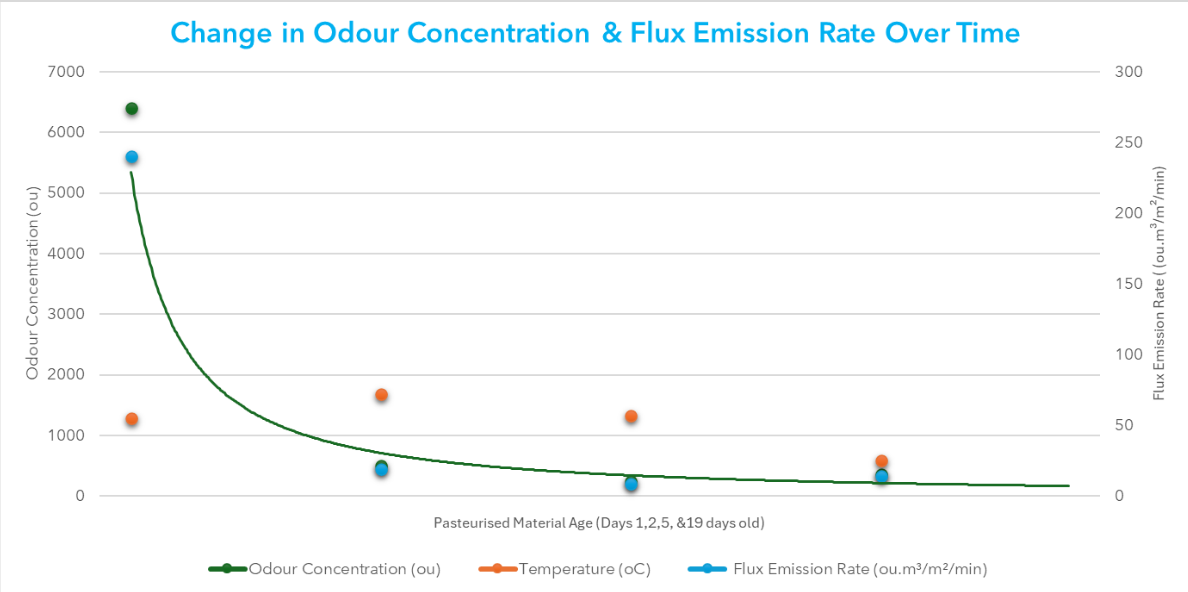

Figure 11: Change in temperature odour concentration and flux emission rate

Note – The values shown for concentration & emission rate of the Approximately 1 Day Old material represent the average of duplicate samples. The values shown for concentration, temperature & emission rate of the Approximately 2 Day Old material represent the average of two samples collected on the same windrow at the same age at different locations (West & East).

5 Results

5.1 Section 1 – Raw FOGO Material

Date	13/06/2025	**Test Location**	Section 1 - Raw FOGO Material
Report	R019031	**Plant/Site**	Valoriza Dandenong
Client	Element Environment		Dandenong South, VIC
Ektimo Staff	Han Ozupek & Mahdi Majd		240425

Test Location Details		
GPS co-ordinates	38°2'4.08"S, 145°11'54.02"E	
Location Description	Stockpile of green waste and food waste	
Surface Description	Pre-processed food and green waste	
Area Classification	Industrial	
Sampling Method	AS4323.4 (Flux)	
Odour	Test 1	Test 2
Sampling time, hrs	1018 - 1026	1026 - 1034
Sample dilution	1	1
Concentration, ou	3300	2700
Hedonic tone	very unpleasant	very unpleasant
Odour character	grass, rotten, green waste	grass, rotten, green waste
Flux Emission Rate, ou.m³/m²/min	120	100
Average concentration, ou	**3000**	
95% Confidence Interval	2600 - 3500	
Average Flux Emission Rate, ou.m³/m²/min	**110**	
Flux Testing Parameters		
Equilibration time, hrs	0954 - 1018	
Sweep Rate @ STP, L/min	4.89	
Penetration Depth, mm	20	
Static Pressure, Pa	<2	
Surface temperature, °C	46	
Chamber temperature, °C	26	
Ambient temperature, °C	12	

5.2 Section 2 - Decontaminated Material

Date	13/06/2025	**Test Location**	Section 2 - Decontaminated Material
Report	R019031	**Plant/Site**	Valoriza Dandenong
Client	Element Environment		Dandenong South, VIC
Ektimo Staff	Han Ozupek & Mahdi Majd		240425

Test Location Details		
GPS co-ordinates	38°2'0.13"S, 145°11'54.25"E	
Location Description	Stockpile of compost	
Surface Description	Shredded green waste/compost	
Area Classification	Industrial	
Sampling Method	AS4323.4 (Flux)	
Odour	**Test 1**	**Test 2**
Sampling time, hrs	0914 - 0922	0922 - 0930
Sample dilution	1	1
Concentration, ou	940	710
Hedonic tone	very unpleasant	very unpleasant
Odour character	grass, compost	grass, compost
Flux Emission Rate, ou.m³/m²/min	35	26
Average concentration, ou	**820**	
95% Confidence Interval	700 - 960	
Average Flux Emission Rate, ou.m³/m²/min	**31**	
Flux Testing Parameters		
Equilibration time, hrs	0850 - 0914	
Sweep Rate @ STP, L/min	4.86	
Penetration Depth, mm	20	
Static Pressure, Pa	<2	
Surface temperature, °C	43	
Chamber temperature, °C	18	
Ambient temperature, °C	13	

5.3 Section 3 - Pasteurised Material

5.3.1 Windrow #2 – 1 Day Old

Date	13/06/2025	**Test Location**	Section 3 - Pasteurised Material
Report	R019031	**Plant/Site**	Valoriza Dandenong
Client	Element Environment		Dandenong South, VIC
Ektimo Staff	Han Ozupek & Mahdi Majd		240425

Test Location Details		
GPS co-ordinates	38°1'58.49"S, 145°11'54.3"E	
Location Description	Stockpile of compost	
Surface Description	Earth-like grainy compost	
Area Classification	Industrial	
Sampling Method	AS4323.4 (Flux)	
Odour	**Test 1**	**Test 2**
Sampling time, hrs	0813 - 0821	0822 - 0830
Sample dilution	1	1
Concentration, ou	5100	7800
Hedonic tone	very unpleasant	very unpleasant
Odour character	grass, compost, rotten	grass, compost, rotten
Flux Emission Rate, ou.m³/m²/min	190	300
Average concentration, ou	**6400**	
95% Confidence Interval	5500 - 7500	
Average Flux Emission Rate, ou.m³/m²/min	**240**	
Flux Testing Parameters		
Equilibration time, hrs	0748 - 0812	
Sweep Rate @ STP, L/min	4.93	
Penetration Depth, mm	20	
Static Pressure, Pa	<2	
Surface temperature, °C	55	
Chamber temperature, °C	21	
Ambient temperature, °C	8	

5.3.2 Windrow #3 - 2 Days Old (West)

Date	6/08/2025	**Test Location**	Windrow #3 - 2 Days Old (West)
Report	R019297	**Plant/Site**	Valoriza Dandenong
Client	Element Environment		Dandenong South, VIC
Ektimo Staff	Han Ozupek & Mahdi Majd		240425

Test Location Details	
GPS co-ordinates	38°2'1"S, 14°11'55"E
Location Description	Middle-left section of the windrow
Surface Description	Shredded soil-like pile of green waste
Area Classification	Industrial
Sampling Method	AS4323.4 (Flux)
Odour	
Sampling time, hrs	1636 - 1644
Sample dilution	1
Concentration, ou	**410**
Hedonic tone	very unpleasant
Odour character	compost, green waste, fruity
Flux Emission Rate, ou.m³/m²/min	**15**
Flux Testing Parameters	
Equilibration time, hrs	1612 - 1636
Sweep Rate @ STP, L/min	4.62
Penetration Depth, mm	20
Static Pressure, Pa	<2
Surface temperature, °C	69
Chamber temperature, °C	23
Ambient temperature, °C	21

5.3.3 Windrow #3 - 2 Days Old (East)

Date	6/08/2025	**Test Location**	Windrow #3 - 2 Days Old (East)
Report	R019297	**Plant/Site**	Valoriza Dandenong
Client	Element Environment		Dandenong South, VIC
Ektimo Staff	Han Ozupek & Mahdi Majd		240425

Test Location Details	
GPS co-ordinates	38°2'1"S, 145°11'55"E
Location Description	Middle-right section of the windrow
Surface Description	Shredded soil-like pile of green waste
Area Classification	Industrial
Sampling Method	AS4323.4 (Flux)
Odour	
Sampling time, hrs	1645 - 1653
Sample dilution	1
Concentration, ou	**590**
Hedonic tone	very unpleasant
Odour character	compost, green waste, fruity
Flux Emission Rate, ou.m³/m²/min	**22**
Flux Testing Parameters	
Equilibration time, hrs	1621 - 1645
Sweep Rate @ STP, L/min	4.72
Penetration Depth, mm	20
Static Pressure, Pa	<2
Surface temperature, °C	75
Chamber temperature, °C	27
Ambient temperature, °C	21

5.3.4 Windrow #4 - 5 Days Old

Date	6/08/2025	**Test Location**	Windrow #4 - 5 Days Old
Report	R019297	**Plant/Site**	Valoriza Dandenong
Client	Element Environment		Dandenong South, VIC
Ektimo Staff	Han Ozupek & Mahdi Majd		240425

Test Location Details	
GPS co-ordinates	38°2'1"S, 145°11'54"E
Location Description	Middle-left section of the windrow
Surface Description	Shredded soil-like pile of green waste
Area Classification	Industrial
Sampling Method	AS4323.4 (Flux)
Odour	
Sampling time, hrs	1536 - 1544
Sample dilution	1
Concentration, ou	**240**
Hedonic tone	mildly unpleasant
Odour character	earthy, green waste
Flux Emission Rate, ou.m³/m²/min	**9**
Flux Testing Parameters	
Equilibration time, hrs	1508 - 1532
Sweep Rate @ STP, L/min	4.74
Penetration Depth, mm	20
Static Pressure, Pa	<2
Surface temperature, °C	57
Chamber temperature, °C	24
Ambient temperature, °C	19

5.3.5 Windrow #2 - 19 Days Old

Date	6/08/2025	**Test Location**	Windrow #2 - 19 Days Old
Report	R019297	**Plant/Site**	Valoriza Dandenong
Client	Element Environment		Dandenong South, VIC
Ektimo Staff	Han Ozupek & Mahdi Majd		240425

Test Location Details	
GPS co-ordinates	38°2'1"S, 145°11'54"E
Location Description	Middle-left section of the windrow
Surface Description	Shredded soil-like pile of green waste
Area Classification	Industrial
Sampling Method	AS4323.4 (Flux)
Odour	
Sampling time, hrs	1515 - 1523
Sample dilution	1
Concentration, ou	**360**
Hedonic tone	mildly unpleasant
Odour character	earthy, green waste
Flux Emission Rate, ou.m³/m²/min	14
Flux Testing Parameters	
Equilibration time, hrs	1451 - 1515
Sweep Rate @ STP, L/min	4.81
Penetration Depth, mm	20
Static Pressure, Pa	<2
Surface temperature, °C	25
Chamber temperature, °C	23
Ambient temperature, °C	19

6 Test Methods

All sampling and analysis were performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling method	Analysis method	Uncertainty*	NATA accredited Sampling	NATA accredited Analysis
Area sources (equilibrium flux chamber)	AS 4323.4	NA	not specified	✓	NA
Odour	AS 4323.3	AS 4323.3	refer to results	✓	✓¥
Odour characterisation	NA	direct observation	NA	NA	×

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* Uncertainties cited in this table are estimated using typical values and are calculated at the 95% confidence level (coverage factor = 2).

¥ Odour analysis conducted at the Ektimo VIC laboratory by forced choice olfactometry. Results were reported to Ektimo on:
13 June 2025 in report OV-01109
07 |August 2025 in report OV-01124

7 Quality Assurance/Quality Control Information

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo is accredited by NATA to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through mutual recognition arrangements with these organisations, NATA accreditation is recognised worldwide.

Unless specifically noted, all samples were collected and handled in accordance with Ektimo's QA/QC standards.

8 Definitions

The following symbols and abbreviations may be used in this test report:

% v/v	Volume to volume ratio, dry basis (except moisture)
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
AS	Australian Standard
NA	Not applicable
NATA	National Association of Testing Authorities
OU	Odour unit. One OU is that concentration of odorant(s) at standard conditions that elicits a physiological response from a panel equivalent to that elicited by one Reference Odour Mass (ROM), evaporated in one cubic metre of neutral gas at standard conditions.
STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0 °C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa.
Vic EPA	Victorian Environment Protection Authority
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range

9 Appendix A – Monitoring Images

Image 1: Raw FOGO material monitoring

Image 2: Decontaminated material monitoring

Image 3: Pasteurised material – 1-day old monitoring

Image 4: Pasteurised material - 2 Days Old (West) monitoring

Image 5: Pasteurised material - 2 Days Old (East) monitoring

Image 6: Pasteurised material – 5-day old monitoring

Image 7: Pasteurised material – 19-day old monitoring

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Appendix C
Dust Emission Calculations

Emission Calculations

The dust emissions from the Project have been estimated from the operational description of the proposed activities provided by the Proponent and have been combined with emissions factor equations that relate to the quantity of dust emitted from particular activities based on intensity, the prevailing meteorological conditions and composition of the material being handled.

Emission factors and associated controls have been sourced from:

- United States (US) EPA AP42 Emission Factors (**US EPA, 1995 and Updates**);
- National Pollutant Inventory document, Emission Estimation Technique Manual for Mining, Version 3.1 (**NPI, 2012**); and,
- NSW EPA document, NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining, prepared by Katestone Environmental (**Katestone Environmental, 2011**).

The emission factor equations used for each dust generating activity are outlined in **Table C-1** below. A detailed emission inventory is presented in **Table C-2**.

Control factors include the following:

- Hauling on unpaved surfaces – 75% control for watering of trafficked areas and road maintenance.
- Exposed areas and stockpiles – 50% control for use of water sprays

Air emissions associated with the operation of the diesel-powered equipment have been estimated based on the number of equipment, power rating, hours of operation and emission factors sourced from the NSW EPA document *NSW Coal Mining Benchmarking Study Best-practice measures for reducing non-road diesel exhaust emissions* (**NSW EPA, 2014**). Emission factors are based on Tier 2 equipment.

Table C-1: Emission factor equations

Activity	Emission factor equation		
	TSP	PM_{10}	$PM_{2.5}$
Loading / emplacing material	$EF = 0.74 \times 0.0016 \times \left(\frac{U}{2.2}^{1.3} / \frac{M^{1.4}}{2}\right) kg/tonne$	$EF = 0.35 \times 0.0016 \times \left(\frac{U}{2.2}^{1.3} / \frac{M^{1.4}}{2}\right) kg/tonne$	$EF = 0.053 \times 0.0016 \times \left(\frac{U}{2.2}^{1.3} / \frac{M^{1.4}}{2}\right) kg/tonne$
Hauling on unsealed surfaces	$EF = \left(\frac{0.4536}{1.6093}\right) \times 4.9 \times (s/12)^{0.7} \times (1.1023 \times M/3)^{0.45} kg/VKT$	$EF = \left(\frac{0.4536}{1.6093}\right) \times 1.5 \times (s/12)^{0.9} \times (1.1023 \times M/3)^{0.45} kg/VKT$	$EF = \left(\frac{0.4536}{1.6093}\right) \times 0.15 \times (s/12)^{0.9} \times (1.1023 \times M/3)^{0.45} kg/VKT$
Screening	$EF = 0.0125\ kg/tonne$	$EF = 0.00043\ kg/tonne$	$EF = 0.000291\ kg/tonne$
Wind erosion on exposed areas & stockpiles	$EF = 850\ kg/ha/year$	$0.5 \times TSP$	$0.075 \times TSP$

EF = emission factor, U = wind speed (m/s), M = moisture content (%), s = silt content (%), VKT = vehicle kilometres travelled (km), W = average vehicle weight (t)

Table C-2: Emissions inventory

Activity	TSP emission	PM10 emission	PM25 emission	Intensity	Units	EF - TSP	EF - PM10	EF - PM25	Units	Var 1	Units	Var 2	Units	Var 3 - TSP / PM10 / PM25	Units	Var 4	Units	Var 5	Units	Var 6	Units
Hauling raw material on-site	46,760	11,816	1,182	250,000	t/yr	0.748	0.189	0.019	kg/t	30	t/l	10.9	km/rt	2.1 / 0.5 / 0.1	kg/VKT	4.6	S.C. %	30	Ave weig	75	C. %
Unloading raw material	412	195	30	250,000	t/yr	0.00165	0.00078	0.00012	kg/t	1.39	ave. ws (r	2	M.C. %								
Rehandle raw material and shaping windr	412	195	30	250,000	t/yr	0.00165	0.00078	0.00012	kg/t	1.39	ave. ws (r	2	M.C. %								
Screening material	3,125	1,075	73	250,000	t/yr	0.0125	0.00430	#####	kg/t												
Blending material	412	195	30	250,000	t/yr	0.00165	0.00078	0.00012	kg/t	1.39	ave. ws (r	2	M.C. %								
Loading product material to truck	412	195	30	250,000	t/yr	0.00165	0.00078	0.00012	kg/t	1.39	ave. ws (r	2	M.C. %								
Hauling product material off-site	46,760	11,816	1,182	250,000	t/yr	0.748	0.189	0.019	kg/t	30	t/l	10.9	km/rt	2.1 / 0.5 / 0.1	kg/VKT	4.6	S.C. %	30	Ave weig	75	C. %
Wind erosion from exposed areas	9,138	4,569	685	21.5	ha	850	425	64	kg/ha/year											50	C. %
Exhaust emissions	494	494	479																		
Total emissions (kg/yr.)	**107,925**	**30,550**	**3,718**																		

APPENDIX D

SURFACE WATER IMPACT ASSESSMENT

Ravensworth Composting Facility – 74 Lemington Road,
Ravensworth NSW

29 October 2025

Surface Water Impact Assessment

Document Information

Surface Water Impact Assessment,

Ravensworth Composting Facility – 74 Lemington Road, Ravensworth NSW

Prepared by:

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Revision	Date	Author	Reviewed	Approved	Detail
0	08/08/2025	S. Barnsley, S. Waurich, E. Cooke	C. Stapleton	C. Stapleton	Draft for review
1	17/09/2025	S. Waurich, E. Cooke	C. Stapleton	C. Stapleton	Draft for review
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3	7/10/2025	S. Waurich, E. Cooke	C. Stapleton	C. Stapleton	Draft for review
4	29/10/2025	S. Waurich, E. Cooke	C. Stapleton	C. Stapleton	Final

Project Manager: Emmylou Cooke

Project Director: Colin Stapleton

Disclaimer and Limitations:

This document is confidential and has been prepared by Senversa for use only by its client and for the specific purpose described in our proposal which is subject to limitations. No party other than Senversa's client may rely on this document without the prior written consent of Senversa, and no responsibility is accepted for any damages suffered by any third party arising from decisions or actions based on this document. Matters of possible interest to third parties may not have been specifically addressed for the purposes of preparing this document and the use of professional judgement for the purposes of Senversa's work means that matters may have existed that would have been assessed differently on behalf of third parties.

Senversa prepared this document in a manner consistent with the level of care and skill ordinarily exercised by members of Senversa's profession practising in the same locality under similar circumstances at the time the services were performed.

Permission should be sought before any reference (written or otherwise) is made public that identifies any people, person, address or location named within or involved in the preparation of this report. Senversa requires that this document be considered only in its entirety and reserves the right to amend this report if further information becomes available. This document is issued subject to the technical principles, limitations and assumptions provided herein in **Section 7.0**.

Senversa acknowledges the traditional custodians of the land on which this work was created and pay our respect to Elders past and present.

Executive Summary

Senversa Pty Ltd (Senversa) was engaged by Element Environment Pty Ltd to prepare a Surface Water Impact Assessment on behalf of Bettergrow Pty Ltd (Bettergrow) for the Ravensworth Composting Facility located at 74 Lemington Road, Ravensworth, NSW 2330 (the site) to support Bettergrow's application to modify a State Significant development approval.

Bettergrow operates an outdoor windrow composting facility, licensed to receive biosolids, garden organics and other organic waste materials as approved in Environment Protection Licence 7654, to produce a compost product for mine site rehabilitation and agricultural uses.

Bettergrow is currently applying to the NSW Department of Planning, Housing and Infrastructure to modify the SSD-9418 through Modification 2 and Modification 3. Modification 2 seeks approval to receive, and process decontaminated and pasteurised Food Organics and Garden Organics and/or food recovered material, and to blend Virgin Excavated Natural Material and Excavated Natural Material with organic recovered materials. Modification 3 seeks approval to receive and process raw Food Organics and Garden Organics recovered material at the Facility, increase the site's processing capacity by 50,000 tonnes per annum (tpa) over the next 10 years, install a weighbridge, and allow for additional vehicle movements.

The site water balance assessment identified that the composting operation (current and proposed) is a net user of water.

Senversa identified the following potential risks arising from the proposed Modification 3:

- Chemical spills and/or leaks entering stormwater.
- Leachate from treatment pads entering stormwater drain or stormwater discharge and infiltration area.
- Additional contaminants of potential concern associated with changes to feedstock, and the potential for these to enter stormwater discharge and infiltration area, if not properly segregated or managed.
- Increased likelihood of physical contamination (e.g. litter) in organic wastes from household Food Organics and Garden Organics sources, though this is likely manageable using existing controls.

Recommendations to mitigate these risks are detailed in **Section 5.0** and are summarised here:

- Continual assessment of the effectiveness of spill controls such that they can continually meet the conditions of consent, and meet the National Occupational Health & Safety Commission (2001) *Storage and Handling of Workplace Dangerous Goods* requirements for spill control.
- A review of the adequacy of the existing Bettergrow (2024) *Operational Environmental Management Plan* relating to spills associated with the above ground storage tank (existing and/or proposed) and refuelling activities is proposed, as well as the inclusion of fuel products on the pollution inventory. Where existing controls are in place (e.g. drip trays), the Bettergrow (2024) *Operational Environmental Management Plan* should be revised to incorporate these controls.
- Inspection of the washdown area to assess whether bunding is adequate, intact, and operates as intended and in accordance with the Bettergrow (2024) *Operational Environmental Management Plan*.
- Complete an inspection of the integrity and operational effectiveness of the clean water diversion drainage channel and if deficiencies are identified then the appropriate rectification should be made.
- Review the adequacy of the surface water monitoring regime with regards to analytical suite, and update actions and action levels where required, including updating the Bettergrow (2024) *Operational Environmental Management Plan* for consistency with Environmental Protection Licence monitoring requirements.

Contents

Tables in Text

Appendices

List of Acronyms

Acronym	Definition
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ASS	Acid Sulfate Soil
AST	Above Ground Storage Tank
BOD	Biological Oxygen Demand
BOM	Bureau of Meteorology
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CoPC	Contaminant of Potential Concern
DO	Dissolved Oxygen
EC	Electrical Conductivity
EMP	Environmental Management Plan
ENM	Excavated Natural Material
EPA	Environment Protection Authority (Nsw)
EPL	Environment Protection License
FOGO	Food Organics and Garden Organics
GDA	Geographic Datum of Australia
GDE	Groundwater Dependent Ecosystems
GSW	General Solid Waste
IEA	Independent Environmental Audit
LGA	Local Government Area
m	Metre
m^3	Cubic Metres
mAHD	Metres Australian Height Datum
m bgl	Metres Below Ground Level
MGA	Map Grid of Australia

Acronym	Definition
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
ML	Megalitres
NEPC	National Environment Protection Council
OCP	Organochlorine Pesticides
OEMP	Operational Environmental Management Plan
OPP	Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PASS	Potential Acid Sulfate Soils
PFAS	Per And Polyfluoroalkyl Substances
PMF	Probable Maximum Flood
SGWMP	Surface Water and Groundwater Management Plan
SLEP	Singleton Local Environmental Plan
SoEE	Statement of Environmental Effects
SSD	State Significant Development
SWIA	Surface Water Impact Assessment
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
TSS	Total Suspended Solids
VENM	Virgin Excavated Natural Material
VOC	Volatile Organic Compounds

1.0 Introduction

1.1 Background

Senversa Pty Ltd (Senversa) was engaged by Element Environment Pty Ltd (Element) to prepare a Surface Water Impact Assessment (SWIA) on behalf of Bettergrow Pty Ltd (Bettergrow) for the Ravensworth Composting Facility located at 74 Lemington Road, Ravensworth, NSW 2330 (the site) to support Bettergrow's application to modify a State Significant development (SSD) approval. The site is legally identified as Part Lot 10 in Deposited Plan (DP) 1204457 and occupies a total area of approximately 57 hectares (ha).

The site location is presented on RPS Australia East Pty Ltd (RPS) Project Site and Surrounding Development Figure (September, 2019) (refer **Appendix A**) and site layout is shown in Element's Figure 1.3: Site Layout provided in **Appendix A**.

Bettergrow operates an outdoor windrow composting facility, licensed to receive biosolids, garden organics and other organic waste materials as approved in Environment Protection Licence (EPL) 7654, to produce a compost product for mine site rehabilitation and agricultural uses.

Bettergrow are contracted by AGL Macquarie (the landowner) to supply manufactured soil ameliorant and rehabilitation products for use, in part, for approved rehabilitation works at the AGL Macquarie sites such as the Ravensworth Mine sites, Liddell Ash Dam, Liddell Power Station and Bayswater Power Station. Bettergrow also sell a portion of the composted material to third parties.

Bettergrow is currently applying to the NSW Department of Planning, Housing and Infrastructure (DPHI) to modify the SSD-9418 through Modification 2 and Modification 3. Modification 2 seeks approval to receive and process decontaminated and pasteurised Food Organics and Garden Organics (FOGO) and/or food recovered material, and to blend Virgin Excavated Natural Material (VENM) and Excavated Natural Material (ENM) with organic recovered materials. Modification 3 seeks approval to receive and process raw FOGO recovered material at the Facility, increase the site's processing capacity by 50,000 tonnes per annum (tpa) over the next 10 years, install a weighbridge, and allow for additional vehicle movements. These modifications are described further in **Sections 3.3** and **3.4.** The Modification 3 Scoping Report (Element, 2025) states that the inclusion of this feedstock source was proposed in response to recent support programs and grant funding provided by the NSW Government due to legislation passed mandating FOGO recycling across NSW. This initiative is anticipated to divert approximately 950,000 tonnes of FOGO waste annually from landfill, repurposing it into circular economy products such as compost.

This SWIA is required as part of the environmental assessment documentation to support the environmental planning approval process for the proposed modification (Modification 3) to the existing Ravensworth Composting Facility (the Facility). Any information provided in relation to Modification 2 in this report is for context only and this SWIA is intended to address the proposal under Modification 3 only.

1.2 Objectives

The overall objective of this SWIA is to support the environmental planning approval process for Modification 3 by providing an evaluation of surface water-related impacts associated with the proposed changes to the site operations. The specific objectives of this SWIA are to:

- Assess the potential for changes in leachate chemistry resulting from changes to waste type.
- Assess the risks to surface water quality from the changes in waste type, including limited assessment of cumulative impacts.
- Update the site water balance to reflect the proposed increase in throughput and changes in waste stream composition.
- Review the existing stormwater and leachate management infrastructure and practices and identify necessary improvements of mitigation measures relevant to the mitigating impacts that may arise from proposed changes to the waste types received.

1.3 Scope

The scope of work conducted for this SWIA included:

- Desktop review of:
  - Relevant existing documentation including the Development Consent for SSD-9418, EPL 7654, previous surface water impact assessment and management plans.
  - Operational information including anticipated volumes of waste stream, water usage and proposed storage and handling methods for new composting of new waste streams.
- Site water balance assessment.
- Assessment of surface water impacts arising from the proposed changes to the waste types.
- Preparation of this report.

Excluded from the SWIA are as follows:

- An assessment of stormwater run-off volumes and catchment analysis due to the proposed modification not changing the footprint of the approved operational footprint, for which the existing stormwater management infrastructure was designed.
- An assessment of impacts from flooding or the capacity of the site infrastructure to mitigate the impacts of flooding due to the proposed modification not changing the footprint of the approved operations or otherwise increasing the flood risk at the site.
- An assessment of future potential impacts of incremental increases on waste volumes on available organics processing infrastructure and, resulting effects on surface water management. Our assumption is that the current site infrastructure is appropriately sized to accommodate the total waste volumes proposed.

1.4 Development Approvals

This SWIA has been prepared to support Bettergrow's application to the DPHI to modify the development consent for SSD-9418. The modification relevant to this report, known as Modification 3, is being sought under Section 4.55(2) of the NSW *Environmental Planning and Assessment Act 1979*.

1.5 Statutory Framework and Guidelines

Relevant legislation, regulation and guidelines considered applicable to the SWIA at the site include, but are not necessarily limited to, the following:

- DEC (2004). *Environmental Guidelines: Composting and Related Organics Processing Facilities*. July 2004.
- ROU (2007). *Establishing a Licensed Composting Facility*. 2007.
- *Environmental Planning and Assessment Act 1979* (EP&A Act).
- *Protection of the Environment Operations Act 1997* (POEO Act) and subordinate regulations:
  - *Protection of the Environment Operations (General) Regulation 2022*.
  - *Protection of the Environment Operations (Waste) Regulation 2014*.
- *Contaminated Land Management Act 1997* (CLM Act).
- *Water Management Act 2000*.
- NEPC (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (as amended May 2013).
- *Singleton Local Environmental Plan 2013* (SLEP 2013).

2.0 Site Overview

2.1 Site Identification

Relevant site identification information is presented in **Table 2-1** below. The site area and property boundary are illustrated on RPS Project Site and Surrounding Development Figure (September 2019) (refer **Appendix A**).

Table 2-1: Site Identification

Item	Relevant Site Information
Site Address	74 Lemington Road, Ravensworth NSW 2330.
Title Plan Identifier	Part Lot 10 in DP 1204457.
Geographic Coordinates (Site Centre)	Geographic Datum of Australia (GDA) 2020 / Map Grid of Australia (MGA) 56. Easting: 315538.804. Northing: 6410243.161.
Site Area	Approximately 57 ha.
Development Applicant	Bettergrow Pty Ltd.
Site Operator	Bettergrow Pty Ltd.
Landowner	AGL Macquarie Pty Ltd.
Local Government Area (LGA)	Singleton Council.
Current Zoning	In accordance with the *Singleton Local Environmental Plan 2013 (SLEP 2013)*, the site is zoned RU1 Primary Production. The land uses surrounding the site comprise zoning categories including: • RU1 – Primary Production. • SP2 – Infrastructure.
Current Surrounding and Uses	The site is located approximately 20 km north of the township of Singleton, within the Singleton LGA, 25 km south of the township of Muswellbrook within the Muswellbrook LGA and approximately 87 km to the northwest of the Newcastle central business district. It is located within an area dominated by coal mining and heavy industrial activities, including power generation and related activities. As such the site is within a highly altered environment, and operation of a composting activity is considered generally compatible with surrounding land uses for the site, with land uses in the immediate vicinity including: • North: Former Liddell Power Station (currently undergoing demolition) and Bayswater Power Station, Liddell Coal Operations, Hunter River and Lake Liddell. • South: Integra Coal Mine, Loop Organics Compost Facility, with Ashton Coal Mine beyond. • East: New England Highway, rail lines, and Glendell Coal Mine beyond. • West: Ravensworth Coal Mine.

2.2 Document Review

A review of relevant existing documentation including previous investigations conducted at the site has been provided in **Table 2-2** below.

Table 2-2: Summary of Previous Investigations

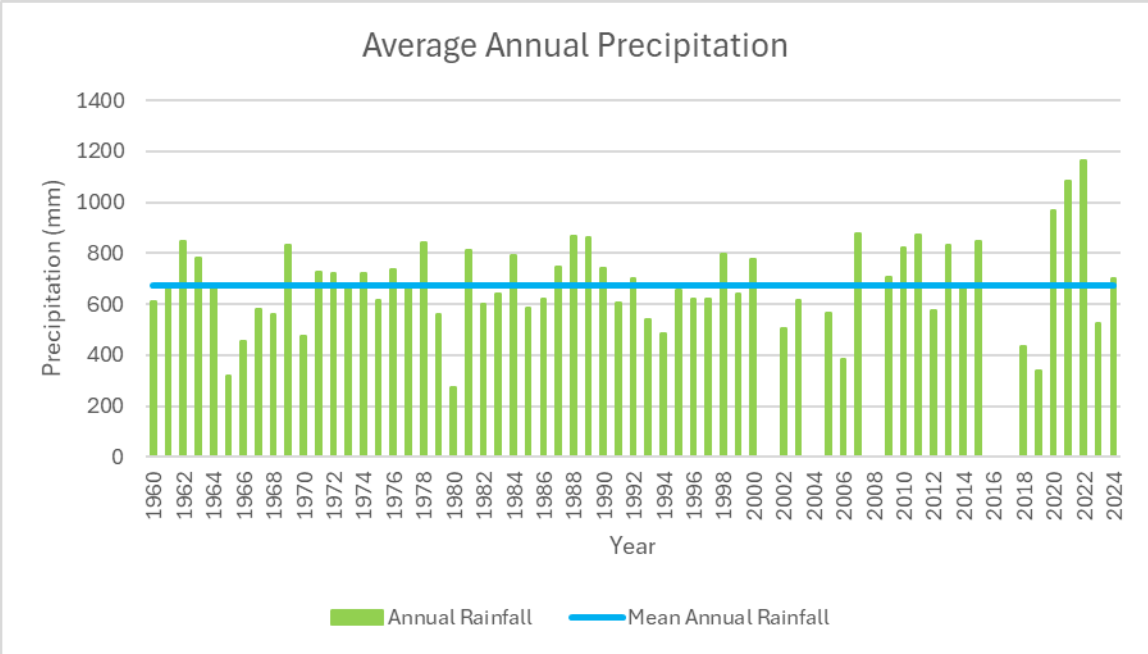
Item	Summary
EPL 7654	Bettergrow are the license holder of EPL 7654 issued under the POEO Act for the scheduled activity of 'composting' at the premise 74 Lemington Road, Ravensworth NSW. The licence specifics the types of wastes that can be received and processed (refer to **Section 3.0**) and the maximum total amount of waste received from off-site (200,000 tpa). Monitoring requirements for pollutants in the leachate dams and process water tank are specified in the EPL (with specific analytes for each monitoring point provided in **Section 3.2.3**) and include: • Point 1 – leachate dam characterisation. • Point 2 – leachate dam emergency spillway. • Point 3 – process water tank. • Point 4 – sediment (lower) basin. The licence has been subject to a number of variations relating to street sweeping composting trials including a *Trial Street Sweepings Compost Resource Recovery Order* and the *Trial Street Sweepings Compost Resource Recovery Exemption 2022* which permitted a 12 month trial and resulted in the *Bettergrow Street Sweepings Compost Order* and *Bettergrow Street Sweepings Compost Exemption*, valid until August 2026. The licence was further varied to include the ability to compost paunch manure at the premise and the addition of three waste streams (organic fraction of street sweepings from two separate sources, and paunch manure) to the waste table under condition L3.1.
Development Consent for SSD-9418	The development consent under Section 4.38 of the EP&A Act was granted by the NSW Government Department of Planning and Environment (DPE) on 31 August 2022 to Bettergrow. The approval for SSD-9418 permitted redevelopment of the site, with the key works approved comprising expansion of an existing resource recovery facility to process up to 200,000 tonnes per annum of organic material, including water drainage and leachate works, hardstand areas and associated infrastructure. Part B of the development consent identified specific environmental conditions to be met including the implementation of a Waste Monitoring Program, Waste Management Plan and a Surface water and Groundwater Management Plan (SGWMP) prior to the development. Condition C14 in the development consent states that a review of the monitoring data collected (compliance report) must be undertaken within the first year of commencement of development and operations under SSD-9418, and in the same month each subsequent year. Additionally, Condition C16 states that an Independent Environmental Audit (IEA) must be undertaken at the site one year after commencement of development and every three years thereafter. As described in Section 1.1, Bettergrow is seeking to modify the SSD-9418 through Modification 2 and Modification 3. Modification 2 seeks approval to receive, and process decontaminated and pasteurised FOGO, and to blend VENM and ENM with organic recovered materials. Modification 3 seeks approval to receive and process raw FOGO recovered material at the Facility, increase the site's processing capacity by 50,000 tpa over the next 10 years, install a weighbridge, and allow for additional vehicle movements.

Item	Summary
GreenSPOT Recycling Facility EIS: Surface Water Report (Fifteen50, 2019a)	Fifteen50 Consulting Pty Ltd (Fifteen50) were engaged by RPS Australia East Pty Ltd (RPS) to prepare a Surface Water Report (SWR) to support the preparation of the EIS (RPS, 2019) at 74 Lemington Road, Ravensworth. The objectives of the SWR were to assess the potential impacts of the proposed expansion of the GreenSPOT Hunter Valley Recycling Facility to involve the composting of up to 200,000 tpa of organics on surface water. The expansion was proposed in order to facilitate remediation of the AGL Macquarie owned lands in addition to the increasing demand of commercial customers in the Upper Hunter Valley. Monitoring results in accordance with EPL 7654 identified the majority of pollutant concentrations were within the limits of Condition L2, with the exception of total suspended solids (TSS). These TSS concentrations were assumed to be associated with dry weather and limited leachate in storage. Potential impacts to surface water identified included: • Pollution from sedimentation, oil/chemical spills and gross pollutants. • Contamination of clean storm water with organics processing increasing leachate volume. • Increased soil infiltration of contaminated surface water and leachate. • High contaminant load in leachate and increased risk of water quality degradation through additional volumes of leachate. • Ineffective collection and storage of leachate. • Contamination due to poor waste management and poorly maintained hardstand pads, bunding and stormwater drains. Fifteen50 provided a number of surface water mitigation measures that included updating the SGWMP, maintaining and enhancing leachate collection and storage facilities, implementing erosion and sediment controls, and diverting clean stormwater around waste and leachate catchments. Regular surface water monitoring and implementing an emergency response plan were recommended to manage potential contamination events. Fifteen50 noted that the risk of discharge of leachate water from the site to the surface water environment is negligible on the basis that the combined storage capacity of the leachate dams, sediment (lower) basin and Void 4 is thousands of megalitres. It was concluded that with the implementation of the proposed mitigation measures that the risk of harm to surface water environments was low and would not result in significant adverse environmental impacts.
Surface and Groundwater Management Plan (Senversa, 2023)	Senversa was commissioned to prepare an SGWMP as a subordinate plan within the Bettergrow (2024) *Operational Environmental Management Plan* (the OEMP) for the operation of the Ravensworth Composting Facility at 74 Lemington Road, Ravensworth NSW. The purpose of the SGWMP was to outline the management controls, procedures and monitoring requirements for surface water, groundwater and leachate at the site. The overall objective of the SGWMP was to ensure environmental protection through effective management of water resources, by: • Preventing pollution to surface water and groundwater from operational activities and development. • Providing contingency and monitoring plans. • Meeting regulatory requirements under the SSD-9418 and EPL 7654. The surface water management plan produced by Senversa outlined measures to prevent the contamination of stormwater at the site through the segregation of clean water from leachate and process water. The plan included the implementation of infrastructure such as sediment basins, diversion bunds and drainage systems, alongside regular monitoring requirements including: • Monitoring of EPA monitoring points identified in the EPL (Point 3 (process water tank) and Point 4 [sediment (lower) basin] and drainage lines by visual inspection, periodic sampling and triggered events. • Reporting of monitoring to be presented in an annual interpretative report (in accordance with SSD 9418 condition C14). Senversa outlined leachate at the site is managed through purpose-built infrastructure designed to contain runoff and minimise infiltration and seepage through the processing pads and leachate dam, with leachate volumes managed via frequent application of leachate to compost windrows. Regular monitoring requirements of leachate included: • Monitoring of EPA monitoring points identified in the EPL (Point 1: leachate dam characterisation, and Point 2: leachate dam emergency spillway) by visual inspection, periodic sampling, event based sampling and triggered events. • Reporting of monitoring to be presented in an annual interpretative report (in accordance with SSD 9418 condition C14). Senversa stated that the groundwater was not considered vulnerable due to the site geology and depth, and that routine monitoring of basic parameters at bores nearby the site is conducted by Glencore and AGL, therefore no routine groundwater monitoring was required by the SGWMP, unless triggered by an incident.

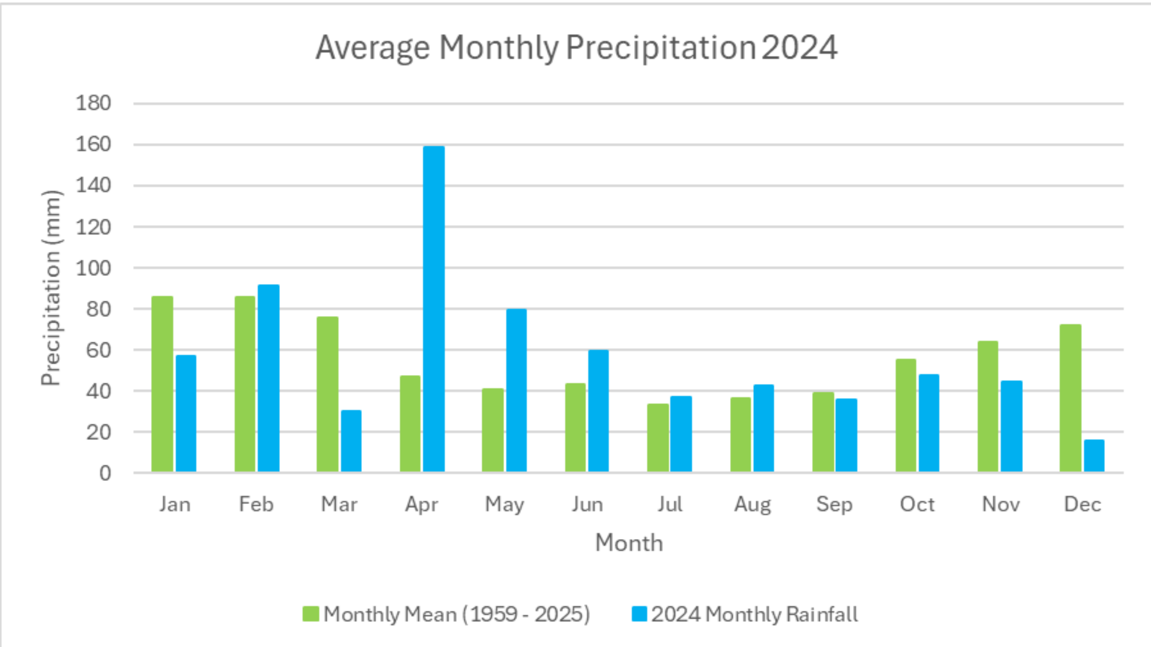
2.3 Environmental Setting

2.3.1 Climate

Rainfall at this site has been recorded by a nearby Bureau of Meteorology (BoM) station (No. 061191) located approximately 20 km south of the site at Bulga (South Wambo) since 1959. The mean annual rainfall recorded for the area is 677 millimetres (mm).



Graph 2-1: Annual Precipitation over the last two decades from the BoM Station Bulga (South Wambo) 061191.



Graph 2-2: Monthly Average Precipitation in 2024 compared with the Monthly Mean Precipitation from years 1959 – 2025, from the BoM Station Bulga (South Wambo) 061191.

The site is situated within an area classed as a climatic zone 3B, generally identified by warm temperatures and dry conditions.

2.3.2 Topography

The site is located on the capped Void 3 of the former Ravensworth No. 2 mine owned by AGL Macquarie Pty Ltd (AGL). The Ravensworth No. 2 mine was decommissioned in 1993 following the completion of coal mining. Void 3 has been filled with fly ash from the AGL Bayswater Power Station and rehabilitated as part of the decommissioning works. The site sits atop a 40-metre-high ridge that runs approximately north south in between Bayswater Creek, 600 metres (m) west and Bowmans Creek, 1,200 m east of the site.

The topography of the site and surroundings is influenced by the underlying geology which is comprised of sedimentary coal measures overlain by alluvial sediments in low-lying flood plains. Topographic elevations range from reduced level (RL) 130 m within the north to RL 90 m within the south of the broader area with slopes of approximately 4 to 7 %. The erosion hazard of the site is defined as a ‘slight’ (DPIE, 2022), indicating that significant erosion damage is unlikely to occur given the site’s profile.

2.3.3 Geology and Soil

The site is located on a capped open cut mining void (Void 3) which has been filled with fly ash from the AGL Bayswater Power Station and rehabilitated. The site is underlain by the Permian sedimentary coal measures and consists of sandy loam underlain with a layer of clay and interbedded with coal seams.

The surrounding area is situated within the Liddell Soil Landscape characterised by Yellow Soloths on slopes and Yellow Solodic Soils on concave slopes. Earthy and Siliceous Sands occur on mid to lower slopes where the parent material is sand. Red Soloths, Red Solodic Soils and Red Podzolic Soils may also occur. Soloth soils are acidic soils usually typical of humid regions. Solodic soils have a strong contrast between A and B horizon textures, with A horizons being often acidic and B horizons often alkaline. Podosol soils are characterised by B horizons dominated by the accumulation of organic compounds, aluminium and/or iron. Minor to severe sheet erosion and low to moderate flood hazard are common within the Liddell Soil Landscape.

A review of eSPADE (DPIE, 2022) did not identify any areas with risk of dryland salinity at the site or surrounds, indicated by no salting events having occurred on the site or within a 1 km radius of the site, which was determined by no visible signs of salting effects on vegetation or the soil surface.

2.3.4 Acid Sulfate Soils

No acid sulfate soil (ASS) risk mapping is available for the area encompassing the site, typically indicating that such conditions have not been identified based on regional mapping of geology and soil. Further, a review of the NSW DPIE eSPADE Spatial Viewer (DPIE, 2022) risk mapping indicates the area occupied by the site has not been required to be assessed for the presence of ASS based on the outcomes of a preliminary evaluation. Such sites are by default characterised as “no known occurrence”, being defined as areas where land management activities are not likely to be affected by ASS material. However, historic mining activities near the site may have led to the formation of ASS due to the excavation and exposure of sulfide minerals to oxygen.

2.3.5 Hydrology

The hydrology setting of the site and surrounds is provided in **Table 2-3** below.

Table 2-3: Hydrology Setting at the Site

Item	Description
Regional	The site and its surrounds are located within the Hunter River catchment, with the Hunter River located 6 km to the south and Lake Liddell approximately 5 km to the north. The Hunter River drains the largest coastal catchment in NSW, covering some 22,000 kilometres squared (km^2). The site is located atop a 40-m-high ridge that runs approximately north-south in between Bayswater Creek, 600 m west and Bowmans Creek, 1,200 m east of the site. Bayswater Creek and Bowmans Creek are highly modified due to mining and power generation activities and exhibit elevated salinity levels and generally low flows. Both creeks flow from north to south to discharge into the Hunter River. The Hunter River alluvium to the south of the site is at RL 62m and falls to approximately RL 60m further to the east. Similarly, the bed of the Hunter River falls from RL 54m to approximately RL 50m. Bayswater Creek is ephemeral and flows in a southerly directly to the west of the development footprint, while Bowmans Creek flows in a southerly directly to the east of the site.
Site Drainage	As a result of the natural topography, and due to modification from mining and power generation activities, there is little upstream catchment draining toward the site and no natural waterways running through the site. Diversion bunds are in place to exclude minor upstream catchment flows from entering the site. Any runoff generated upstream of the site is diverted to the stormwater discharge and infiltration area on-site or surrounding land. Any rainfall captured by the compost processing pads is considered to be leachate and managed as such. There is no surface water discharge from the site into local waterways due to the highly modified nature of the site from historical mining operations. All site runoff is managed and captured in the site's surface water and leachate management system (Surface and Groundwater Management Plan, 2023) and ultimately Void 4 for extreme events.
Void 4	Void 4 is located approximately 100 m south of the leachate dams. In a letter dated 26 July 2022, the Department of Planning and Environment – Water confirmed that the Ravensworth composting facility under SSD-9418 does not require a water access licence to use the water from Void 4, because the source of the water is not groundwater but is sourced from a tailings and ash dams which are above the natural groundwater table. Fly ash from AGL's power stations is placed into remaining voids across the Ravensworth No. 2 and Ravensworth South mine sites as part of the approved rehabilitation of the site. This fly ash is pumped as a thick slurry from the Bayswater Power Station and is currently deposited into Void 5. As a result of this process, water from the fly ash seeps from Void 5 into Void 4 and is pumped from Void 4 back to the Bayswater Power Station for further re-use. Void 3, which has also been subject of filling from fly ash, also seeps water into Void 4.
Flooding	The site is not identified as flood prone land on the SLEP 2013 flood mapping, and is located above the 1% annual exceedance probability (AEP) flood, 5% AEP flood and probable maximum flood (PMF) extents on the Singleton Floodplain Risk Management Study & Plan (BMT, 2023).

2.3.6 Hydrogeology

The site is located within the Hunter subregion, part of the Northern Sydney Basin bioregion. Aquifers in the Hunter subregion can be broadly classed into three hydrogeological types: alluvial, coastal sands and fractured (including porous) rock aquifers. The site is located above the fractured and porous rock across the subregion, where the deeper, more extensive aquifer systems occur. Alluvial aquifers are concentrated around the Hunter River valley, around Maitland, Singleton, between Muswellbrook and Scone and between Muswellbrook and the junction with the Goulburn River.

Shallow regolith aquifers overlying the coal measures are generally unreliable, exhibit slow recharge rates from rainfall and are usually depleted during dry periods. Coal seam aquifers are generally confined, above and below, by massive and relatively impermeable conglomerates which also limits rainfall recharge. Alluvial aquifers at the site are the Hunter River Alluvium, Bowmans Creek Alluvium and Bayswater Creek Alluvium and recharge rates vary from very good to poor, depending on the aquifer material.

Alluvial aquifers are highly connected to surface water, supporting most of the consumptive use for urban and agricultural water supply in the local area. As such, these water sources are controlled by the NSW Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009. The regolith aquifers and coal seam aquifers are less reliable for water supply and consumptive use is limited; these aquifers are obviously intercepted by coal mining activities in and around the site. The groundwater depth at the site has been recorded at more than 40 metres below the site surface level.

Groundwater vulnerability maps have been prepared by the NSW Department of Industry for some catchments in NSW. A groundwater vulnerability map has not been prepared for the Hunter River catchment, which includes the site. Given that the site and surrounding areas have historically been used for open cut and underground mining, the groundwater in the area is not considered to be vulnerable.

The outcomes of the groundwater impact assessment (Fifteen50, 2019b) indicated that the operation of the Facility poses a low risk of significantly impacting groundwater quality, considering the site setting and implementation of the management measures outlined in the OEMP and SGWMP (Senversa, 2023).

2.3.7 Sensitive Receptors

A search of the BoM Groundwater Dependent Ecosystem Atlas (BoM, 2025) indicated that there are no aquatic or terrestrial Groundwater Dependent Ecosystems (GDEs) within or immediately adjacent the site. The site and its surrounds are highly modified and disturbed by mining and power generation activities.

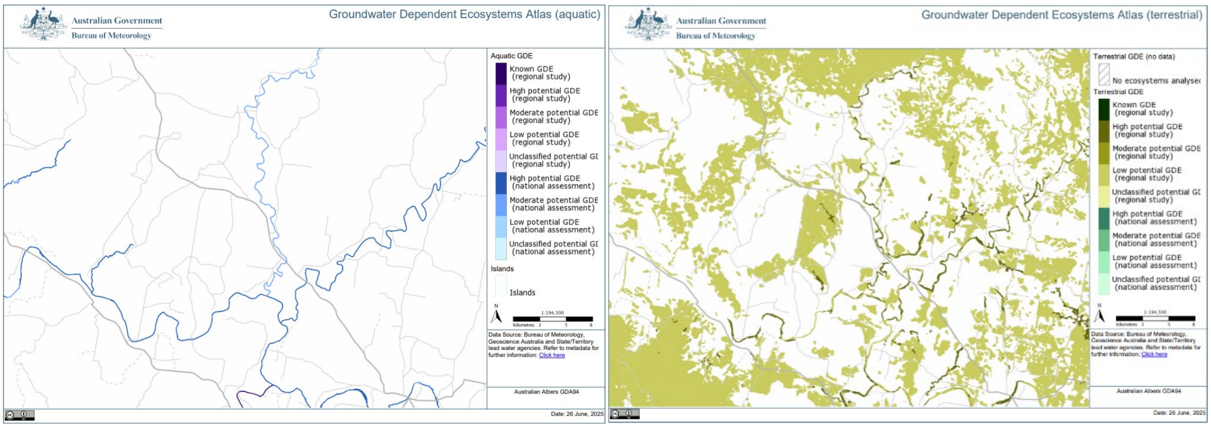


Figure 2-1: Groundwater Dependent Ecosystems within vicinity of the Site (BoM, 2025)

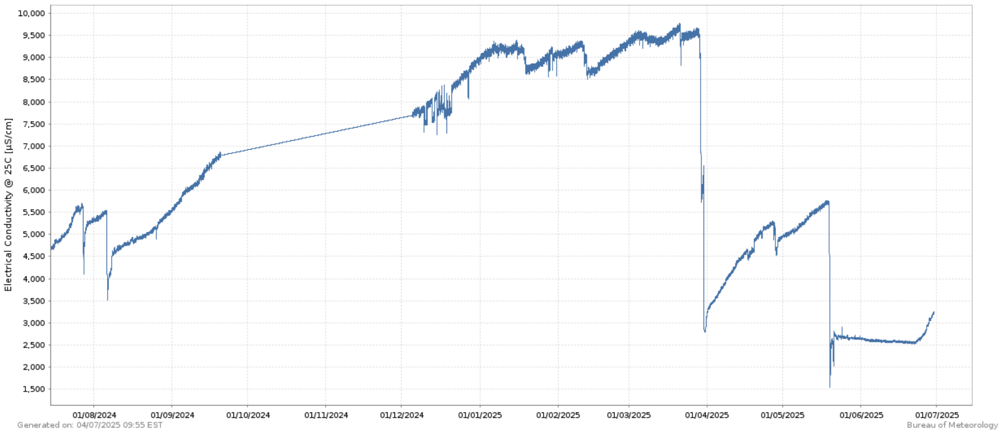
The NSW Government's SEED database indicated no wetlands (including Ramsar wetlands) are located on the site or within a 1 km radius of the site. Riparian land with a vegetation condition index of moderate is located approximately 1 km to the west and east of the site.

Based on the location of the site and surrounding land uses, the possible receptors of potentially impacted water derived from the site includes off-site recreational users of Hunter River and Liddell Creek. Considering the site surface water management system (**Section 3.2**), the risk of site activities impacting the Hunter River or Liddell Creek is low. On-site workers also have the potential to come into direct contact with stormwater, as site workers are subject to occupational health and safety controls and procedures to manage these, and were not considered receptors for the purpose of the SGWMP (Senversa, 2023).

2.3.8 Surrounding Water Quality

As reported in the Surface Water Assessment (Fifteen50, 2019a) the surrounding surface water bodies including Bayswater Creek generally exhibit elevated salinity levels due to mining and power generation activities in the surrounds, including discharges from Lake Liddell and Bayswater Power Station.

Data provided by Water NSW on the BoM (WaterNSW, 2025) indicates the mean electrical conductivity (EC) measurement at Bayswater Creek in 2024 was 6,588 micro Siemens per centimetre (µS/cm), with the mean of all yearly means (from the period 1999 to 2024) being 3,654 µS/cm. The EC at Bayswater Creek over the past year is illustrated on **Graph 2-3**, provided by Water NSW.



Graph 2-3: EC Measurements at Bayswater Creek (provided by BoM (WaterNSW, 2025))

3.0 Site Operations

3.1 Current Site Operations

Bettergrow operates an outdoor windrow composting facility licensed to receive biosolids, garden organics and other organic waste materials as approved in Environment Protection Licence 7654 to produce compost product for mine site rehabilitation and agricultural uses. The premises is located on Lot 10 DP1204457 in the Singleton LGA.

Bettergrow supply manufactured soil ameliorant and rehabilitation products for use, in part, for approved rehabilitation works at the AGL Macquarie sites such as the Ravensworth Mine sites, Liddell Ash Dam, the former Liddell Power Station (currently undergoing demolition), and Bayswater Power Station. Bettergrow also sell a portion of the composted material to third parties.

3.1.1 Operational Overview

Key features of the site are illustrated on the Element Figure 1.3: Site Layout, provided in **Appendix A**, which include:

- Site office and amenities.
- Compost processing pads.
- Leachate dams.
- Sediment (lower) basin.
- Truck wash.
- Machinery storage and refuelling area.

The figure also indicates other site uses to the north of the processing area (north/hydraulically upgradient of the stormwater diversion channel).

The process of site composting operations is summarised in **Figure 3-1**, modified from the OEMP.

Entry

- Vehicles enter site via the internal mine site access road off Lemington Road.
- Once vehicle reaches the Bettergrow site they provide their weighbridge docket to the Site Coordinator or delegate who checkes that the docket description is the same as what is in the load.
- Staff inspect trucks prior to tipping.
- Rejected loads are recorded and instructed to leave the site without unloading.
- Staff will direct trucks with accepted loads to the correct tipping area.

Inspection and unloading

- All loads will be tipped onto the hardstand pad and visually inspected before processing.
- Any non-compliant wastes will be removed (emu pick where appropriate, i.e., minimal physical contaminants) or trucks will be reloaded for off-site disposal at a lawful facility.
- Details will be entered into the Rejected Load Register.

Processing

- Each waste type is stockpiled in the designated area until such a time that sufficient material is on site to combine into the agitation stockpile in readiness for windrow construction.

Storage

- Composted material is stored in designated area until it is required by AGL for site rehabilitation or sold to third parties.

Vehicles provide weight and exit the site

- Vehicles transporting product off-site are loaded with composted material.
- Weights and other details listed in Section 3.1 of the OEMP are recorded either from the loader bucket scales or truck scales.
- All vehicles to wash out at wash bay before exiting site.
- Vehicles exit via the internal mine site access road onto Lemington Road then onto the New England Highway.

Figure 3-1: Process Flowchart for the Operation of the Ravensworth Compost Facility

Inspections of truck loads for signs of contamination is completed by an employee who has been appropriately trained in identifying hazardous and/or non-conforming recovered material (including physical contaminants and asbestos) prior to tipping onto a pad located within the designated load receival tipping area. The EIS (RPS, 2019) indicated that the existing pad area covers approximately 16.58 ha of the site and consists of a compacted 300-400 mm sub-base overlying the original capping area built over Void 3, overburden with 100-150 mm of compacted gravel. This is referred to as 'hardstand' throughout the EIS.

Windrows are constructed to run parallel with the stormwater flows, and are typically 2.5 m high, 4 m wide, and 150 m long. Material within the windrow is blended by the front-end loader or the windrow turner, and is frequently turned to ensure it remains aerobic, and that pasteurisation is achieved. Irrigation of windrows occurs on windy days to prevent dust generation, with temperatures and moisture levels of windrows monitored and adjusted as needed to maintain 45 to 50% moisture content during composting. The final windrow product is required to have a moisture content of approximately 35%, with maturation of the windrow occurring after approximately eight weeks.

3.1.2 Current Feedstock

In accordance with Schedule 2 Condition A6 of the development consent for SSD-9418 and EPL 7654, the total amount of EPA approved waste currently licensed to be received at the site must not exceed 200,000 tpa. The wastes streams licensed to be received at the Facility under SSD-9418 and the EPL are provided in **Table 3-1** below, alongside the sources from which the organic recovered material is currently received and processed by the Facility (Element, 2025).

Table 3-1: Wastes Currently Permitted to be Received at the Facility in Accordance with EPL 7654.

Waste	Description	Facility Sources	Activity
General Solid Waste (GSW) (non-putrescible)	Paunch.	-	Composting.
	reDirect organic fraction of street sweepings.	Waste resource recovery facilities.	
	Downer organic fraction of street sweepings.	Waste resource recovery facilities.	
	Recovered plasterboard.	Waste resource recovery facilities.	
	Spent Bleaching Clay.	Infrastructure projects (drill muds).	
	Paper Crumble.	Paper processors.	
	Urban wood residues.	Sawmills.	
	Natural organic fibrous material.	Food processors.	
	Coal ash which meets the conditions of '*The coal ash order 2014'*.	Mines.	
	Garden Waste.	Residential housing kerbside green waste (only garden organics).	
	Biosolids categorised as unrestricted use, or restricted use 1, 2 or 3 in accordance with criteria in the *Biosolids Guidelines* (NSW EPA, 2000).	Hunter Water and Sydney Water.	Composting Waste Storages.
Liquid Waste	Baywater Mine Water.	Mines.	Composting.

3.2 Surface Water

An overview of the current environmental management processes and license requirements relating to surface water are described below.

3.2.1 Water Supply and Usage

Bettergrow operates a closed water management system, whereby leachate from the composting pad is captured and reused from the onsite leachate dams, therefore direct discharges of leachate to surrounding watercourses or drainage lines do not occur, and no water is sourced from outside the AGL mining operations. Process water is sourced from the Void 4 mine water storage (located south of the leachate dams) and Bettergrow access water from Void 4 via the AGL storage tank. The water inputs, storage and use further outlined in **Table 3-2** below. The most recent estimate (Fifteen50, 2019a) by Bettergrow of annual water consumption for the existing composting operation is 58 ML annually, and has been confirmed via correspondence with Bettergrow to remain applicable for this study. Usage is estimated to peak at:

- 57.1 kilolitres (KL) per day (80 KL per weekday) for dust suppression.
- 164.3 KL per day (230 KL per weekday) for compost moisture conditioning.

Table 3-2: Water Supply, Storage and Usage

Water System	Water Source	Water Storage	Water Usage and Losses
Potable Water	• Off-site source, trucked into site.	• Potable water for staff amenities is stored in 2 x 1,000 litre tanks.	• General use by staff. • Not used for toilets. Site toilets are 'portaloos' that are pumped out by a licensed contractor and the waste disposed of offsite.
Process Water	• Water from Void 4, which receives recycled water from Bayswater PowerStation.	• AGL water storage tank (1 x 300,000 L).	• Truck wash. • Dust suppression on haul roads. • Composting activities.
Leachate	• Any Liquids captured by processing pads and associated drainage lines. This includes: ▪ Liquids leaching from compost piles. ▪ Rainwater captured by processing pads. ▪ Process water captured by processing pads and associated drainage.	• Leachate Storage (50.2 megalitres (ML)).	• Leachate (collected within leachate dam) reused for composting activities only. • Leachate is not used as dust suppression on haul roads. • Leachate water that does overflow via the spillway (e.g. resulting from a rainfall event less frequent than the 1% AEP, 24-hour event) is able to be captured in the sediment (lower) basin.
Runoff / stormwater	• Rainwater diverted away from processing pads by site bunding.	• Sediment (lower) basin (2 ML).	• Water is not utilised. • In the exceedingly rare event that the sediment (lower) basin fills, water can overflow into Void 4, which has in excess of 40 metres depth of available airspace above its normal operating level (i.e. in excess of 500 ML).

3.2.2 Water Capture and Management

The surface water assessment conducted in 2019 (Fifteen50, 2019a) indicated that the risk of leachate discharging from site due to limited storage was negligible, as the combined storage capacity of the leachate control dam, sediment (lower) basin and Void 4 was over 500 ML.

Primary surface water management measures provided in the SGWMP (Senversa, 2023) are detailed in the following sections and include:

- Maximise segregation of stormwater from process water, leachate or wastewater.
- Mitigate off-site migration of sediments and suspended solids in stormwater runoff.
- Manage and monitor discharges from the site.
- Appropriate storage of materials and liquids.
- Ongoing inspection and maintenance of surface water and leachate management system and controls.
- Employee and contractor awareness of, and implementation of procedures relating to waste and chemicals management, spill response and incident reporting.

3.2.2.1 Surface Water and Leachate Management System

All site runoff is managed and captured in the site's surface water and leachate management system. Key components of the surface water management system are indicated on Element's Figure 1.3, provided in **Appendix A**, and includes:

- Processing pads comprising compacted earth to achieve low permeability (1×10^{-9} m/s) to control leachate generated from the composting process. Processing pads have been designed to capture runoff from the site in excess of the minimum EPL requirement (i.e. 4% Annual Exceedance Probability – AEP – 24-hour storm event).
- Leachate dams collect leachate from the processing pads. The leachate dams were designed in accordance with Standards Australia (2007) *AS 3798-2007 – Guidance on Earthworks for Commercial and Residential Development* and engineered to achieve low permeability. The leachate dam has sufficient storage volume to capture runoff up to the 1% AEP, 24-hour storm event without any uncontrolled discharges off-site.
- In an exceedingly rare rainfall event, overflow from the leachate dam is captured in the sediment (lower) basin (Fifteen50, 2019a).
- Drains and channels connect the processing pads to the leachate dam, and the leachate dam to the sediment (lower) basin (to provide a spillway in an overflow event). The channels have sufficient design capacity to discharge the peak flow during a 1% AEP, 24-hour storm event (Fifteen50, 2019a).
- Stormwater (clean water) diversion and sediment bunds located around the processing pads.
- Stormwater (clean water) diversion located along the western side of the site.
- Diversion wall and channel directing stormwater from the eastern side of the site into the sediment (lower) basin.

The key components of the surface water management system, including bunding, drains, spillways, and leachate dam have been designed to prevent surface water from mixing with the organic waste received and processed, and the final products, process residuals and contaminated materials stored at the site.

3.2.2.2 Surface Water Storage, Use and Discharge Management

Management measures for surface water storage, use and discharge that were implemented following the SGWMP on-site include:

- Diverting clean surface water around processing pads and leachate dam through clean water drains and diversion bunds. Diversion system includes:
  - Sediment (lower) basin collecting surface water diverted from the processing pads.
  - Stormwater (clean water) diversion and sediment bunds located around the processing pads.
  - Stormwater (clean water) diversion located along the western side of the site.
  - Diversion wall and channel directing surface water runoff from the eastern side of the site into the sediment (lower) basin.
- Managing leachate such that it is not mixed with clean water and does not enter stormwater infrastructure.
- Only Void 4 water is reused for dust suppression and truck wash (i.e. no leachate is to be used for dust suppression or truck wash).
- No off-site discharges occur, except where a significant rainfall event has occurred and triggered a flood event that exceeds the site basin design capacity to contain water.
- Ensuring drains and surface water gradients are free of excess vegetation and debris so that the flow of stormwater or leachate is not impeded, and the moisture/compaction levels achieved in embankment construction are maintained.
- Ensuring that waste is received, stored, and/or processed within the processing pads, in areas where the leachate barrier has been installed.
- Ensuring integrity of on-site infrastructure and structural integrity of drains, hardstand areas, leachate dam and sediment (lower) basin.
- Repairing and maintaining any cracks observed in the base and side walls of the leachate dam using clay, preferably bentonite or bentonite clay mixture.
- Implementing surface water/stormwater monitoring program (refer **Section 3.2.3**).

3.2.3 Monitoring

The current EPL licence for the site identifies four monitoring points that are indicated on Element's Figure 1.3, provided in Appendix A. The monitoring program provided in the SGWMP (Senversa, 2023) comprises regular site inspections and checks of stormwater control systems, and periodic sampling of surface water quality. Additional monitoring is triggered by changes in site activities, environmental incidents or unexpected finds. The current surface water monitoring program is outlined in **Table 3-3** in accordance with Condition L2 of the EPL, with triggers and actions presented in **Table 3-4.**

Table 3-3: Surface Water and Leachate Monitoring Requirements

Monitoring Type	Frequency	Locations	Inspection Sample Analytical Schedule	Reporting Schedule
Visual Inspection	Weekly.	General site areas (e.g. driveway, car park, truck wash area, machinery storage shelter) and controlled processing pads.	No gross pollutants observed, or waste materials stored or accumulated at ground surface or in surface runoff.	Annual report (in accordance with SSD 9418 condition C14) and also reported in EPL 7654 Annual Return. Trend analysis to be undertaken after each sampling event (e.g. update a trend graph with latest results to visualise data and identify results outside historical range).
	Following a rainfall event).	Sediment (lower) basin and drains.	Stormwater control devices maintained and operating as designed. No significant sediment accumulated in drains.	

Monitoring Type	Frequency	Locations	Inspection Sample Analytical Schedule	Reporting Schedule
Periodic Sampling	Daily during any discharge.	Monitoring Point 2: Leachate dam emergency spillway.	Alkalinity, anions and cations, EC, pH, select metals, total organic carbon (TOC), total petroleum hydrocarbons (TPH), and total suspended solids (TSS), polycyclic aromatic hydrocarbons (PAH) phenols.	Trend analysis to be undertaken after each sampling event (e.g. update a trend graph with latest results to visualise data and identify results outside historical range).
		Monitoring Point 4: Sediment (lower) basin.	Ammonia, EC, nitrogen (total), pH, TOC, TPH, and TSS. Record level in sediment (lower) basin as appropriate.	
	Quarterly.	Monitoring Point 1: Leachate dam characterisation.	Alkalinity, anions and cations, EC, pH, select metals, TOC, TPH, TSS, PAH, phenols.	
		Monitoring Point 3: Process water tank.	Select metals, EC, pH, and TSS.	
Triggered Event (e.g. Environmental Incident or Unexpected Find)*	Event based.	Inspection and sampling of downstream areas as required by event.	As required – default is ammonia, electrical conductivity, nitrogen (total), pH, TOC, TPH, metals and TSS.	Per event.

* The required inspection, sampling and analytical schedule should be assessed by a suitable qualified and experienced person at the time of the trigger response.

Trigger levels and action responses that have been applied to the surface water monitoring program are presented in **Table 3-4** below.

Table 3-4: Surface Water Management Plan Trigger Level and Action Responses

Aspect	Trigger	Actions
Surface Water Monitoring	Assessment criteria exceeded.	• Consider re-sampling or increased sampling frequency to confirm results. • Assess possible sources of contamination such as change in site operations, change in neighbouring site operations or spills. • Refer to the Groundwater Management Plan (Senversa, 2023) regarding changes in Void 4 water quality. • Assess the significance of associated environmental risk – where a potentially unacceptable risk is identified, a suitably qualified and experienced professional should assess whether the monitoring program is adequate to assess potential contamination risks, and risks and recommend program changes (if necessary) (e.g., additional sampling locations, more frequent monitoring or different contaminants of concern). • Implement the amended monitoring program. • Develop and implement management/remedial actions if necessary.
Site Activities	Incident (e.g. spill or release of a material or liquid) that could result in impact to surface or groundwater. Surface water discharge point and associate flow path contaminated with litter, debris or other visual indicators of contamination.	Assess whether monitoring program is adequate to assess potential impact associated with the incident. This assessment should be undertaken by a suitable qualified and experienced professional and documented in a report with clear conclusions and recommendations for amendments (if necessary). Implement program changes – these may include increased monitoring frequency, inclusion of additional monitoring locations, installation and monitoring of additional monitoring locations, broader analytical suite to assess the chemicals of concern.

3.3 Proposed Changes to Site Operations

Modification 2 which, although not the subject of this SWIA, proposes to allow for the receival and processing of decontaminated and pasteurised FOGO recovered material at the Facility, as well as receipt and blending of VENM and ENM at the facility.

Modification 3 (the subject of this SWIA) proposes to:

- Increase the site's processing capacity from 200,000 tpa to 250,000 tpa.
- Install a weighbridge.
- Allow for additional vehicle movements (up to five light vehicles and 14 heavy vehicles per day).
- Allow for receival and processing of raw FOGO.

The installation of a prefabricated weighbridge along the internal access road in the northwest corner of the site (adjacent the workshop) is proposed to weigh trucks transporting organics to/from site and will include the following features:

- Reinforced concrete foundation, deck and approaches (ramps).
- Steel sub-structure.
- Powered by solar and battery storage.
- Ability to accommodate vehicles up to 27.5 m in length.

3.4 Proposed Changes to Feedstock

Bettergrow are proposing to modify SSD-9418 by increasing the processing capacity of the Facility by 50,000 tpa, and to commence import and use of raw FOGO in the feedstock; this is in addition to the receival of decontaminated and pasteurised FOGO currently proposed for use under Modification 2. Mod 3 would allow for the receival and processing of additional feedstock at the Facility, with proposed sources provided below, with **Table 3-5** indicating the proposed feedstock import tonnage, with the 'FOGO' feedstock referring to both pasteurised and decontaminated, as well as raw FOGO.

Table 3-5: Proposed Feedstock

Feedstock	Tonnes Per Annum Received – Proposed under Modification 2	Tonnes Per Annum Received – Proposed under Modification 3
FOGO	70,000	105,000
VENM/ENM	15,000	15,000
Garden Organics	50,000	57,500
Biosolids	35,000	42,500
Urban Wood Residue	2,500	2,500
Natural Organic Fibrous Material	2,500	2,500
Recycled Water from Bayswater Power Station	15,000	15,000
Animal Wastes (Manure)	10,000	10,000
Total	**200,000**	**250,000**

Under Modification 3, Bettergrow are proposing to receive and process raw FOGO at the Facility. This is in addition to the receival and processing of pasteurised and decontaminated FOGO proposed under Modification 2.

The risk of introducing contaminants associated with non-compostable plastics and chemicals increases with the potential introduction of raw FOGO sources, which will not have undergone decontamination and/or pasteurisation prior to receipt at the site. In addition, contaminants of potential concern (CoPC) associated with raw FOGO, as identified in studies completed for and by the NSW EPA (WCA, 2019; NSW EPA, 2023) can include:

- Biological pathogens (*E. Coli*, salmonella).
- Nutrients (such as nitrogen, phosphorus, potassium, ammonia).
- Volatile organic compounds (VOC).
- Organochlorine pesticides (OCP) and organophosphate pesticides (OPP).
- Per and polyfluoroalkyl substances (PFAS).
- Heavy metals.
- Physical contamination (e.g. litter).

Under Modification 2, the FOGO and/or food recovered material is subject to pre-treatment (prior to further blending) prior to receipt at the Facility, including:

- Decontamination: an automated and manual process to remove plastic, packaging and metals.
- Pasteurisation: reduction of plant and animal pathogens and plant propagules via material subject to high temperatures for a period of time as described in Standards Australia (2012) *AS 4454-2012: Compost soil conditions and mulches*.

The pre-treatment process for the material received as decontaminated and pasteurised FOGO is anticipated to remove pathogens, reduce the risk of anaerobic breakdown and reduce the moisture content of the material, a process which raw FOGO will not be subject to. The potential for heavy metals and PFAS substances to remain in all FOGO streams remains post pasteurisation, and the presence of residual contaminants poses a risk of leaching into the Facility's closed water management system, potentially leading to bioaccumulation and cross-contamination of compost products. There is also still the potential for physical contamination such as small, light fragments of litter to remain in FOGO that may become entrained in run-off.

4.0 Site Water Balance Assessment

4.1 General

As noted in **Section 3.2.1**, the Facility operates as a closed water management system, whereby leachate generated on the composting pad or truck wash is captured in the onsite leachate dams and reused for moisture conditioning of compost. The composting process is a net user of water, with water and leachate generated from the operation being managed onsite.

No water is sourced from outside the AGL mining operations. Additional water requirements (e.g. process water or any shortfall in leachate for compost conditioning) is sourced from the Void 4 mine water storage (located south of the leachate dams) and Bettergrow access water from Void 4 via the AGL storage tank.

4.2 Purpose and Approach

The purpose of the water balance assessment is to estimate the total volume of water required to be utilised operationally and to inform how much water is required to be sourced from Void 4.

The approach taken for the site water balance assessment relies on average climate data (temperature, rainfall and pan evaporation) over the defined facility footprint to estimate the average monthly volume of water entering the facility (water inflows) and the total amount of water leaving the facility (water outflows).

The water balance model assumes a simple 'bucket' method of:

Total water inflows – Total water outflows = Balance of Water in the 'bucket'.

Identified water inflows include:

- Rainfall, which is captured in the model as:
  - Direct infiltration into stockpiles.
  - Runoff from the hardstand/pad area collected in the leachate dam (then used for moisture conditioning).
  - Direct rainfall into the leachate dam (then used for moisture conditioning).
- Process water:
  - Water collected in the truck wash pit drains to the leachate dam (then used for moisture conditioning).
  - Direct import of Void 4 water (variable to be estimated in leachate water balance assessment).
- Water (moisture) in incoming waste materials.

Identified water outflows include:

- Evaporation:
  - Evaporation from the leachate dam.
  - Evaporation from stockpiles.
  - Evaporation from exposed areas of the hardstand.
- Seepage losses into the subgrade.
- Water (moisture) in exported compost.

To estimate the water balance of the proposed expanded operation, the water balance model is first calibrated against current (200,000 tpa) site operations based on water consumption estimates provided by Bettergrow to calibrate select variables in the model. The calibrated variables are then applied to the water balance model of the expanded (250,000 tpa) operation.

The volume of process water used for dust suppression is tracked separately in the water balance, as all dust suppression water is sourced entirely from Void 4, and it is assumed that dust suppression activities do not result in water runoff that is collected in the leachate dam as the majority of dust suppression occurs on general site access roads and not directly within the composting pad.

4.3 Variables and Assumptions

Bettergrow has estimated water consumption of the current (200,000 tpa) operation based on 2024 usage data to include:

- Water Usage from Void 4:
  - 1.2 ML/annum of water sourced from Void 4 for compost conditioning. 100% of this water usage occurred in summer months when 2024 experienced drier than average rainfall conditions.
  - 10.7 ML/annum of water sourced from Void 4 for dust suppression. Approximately 75% of this water usage occurred in summer months when 2024 experienced drier than average rainfall conditions.
  - 4.2 ML/annum of water pumped from Void 4 to the AGL storage tank for use in the Truck Wash. Water usage for the truck wash remained fairly consistent for all months of the year.
- Water (Leachate) recirculation from Leachate Dam:
  - Water is recirculated from the Leachate Dam into the compost stockpiles using a fixed sprinkler system. Quantities are not well understood as the sprinkler system is not consistently operated.

Variables and assumptions used in the water balance assessment are presented in **Table 4-1**.

Climate Data used in the water balance has been sourced from:

- Rainfall data has been sourced from BOM Station 061191 located at Bulga (South Wambo). The station is located approximately 20 km south of the site. The station was selected as it is located in the same valley as the project site. There is significant variability in observed rainfall data from the valley (drier) to the ranges located to the north and south (~20% wetter than the valley).
- Pan Evaporation data has been applied as an average value based on observations from three BOM weather stations located within 50 km of the site, including:
  - BoM Station 061288 Lostock Dam (approx. 40 km north-west of the site).
  - BoM Station 061242 Cessnock (Nulkaba) (approx. 50 km south-west of the site).
  - BoM Station 061089 Scone SCS (approx. 50 km north-east of the site).
  - An average value was selected to account for variability in the local topography and how this affects climate data; however, all sites observed similar evaporation data.
- Average maximum temperature has been applied as an average value based on observations from the same three BOM weather stations as considered for Pan Evaporation data.

Water for dust suppression is not directly included in water balance; however, is documented in a separate column to estimate Void 4 water usage requirements. The volume of water consumed for dust suppression activities is factored proportional to the average daily temperature for each month modelled, with the peak water usage estimate provided by Bettergrow applied to January.

Table 4-1: Water Balance Input Parameters and Assumptions

Parameter	Current Operation (200,000 tpa)	Proposed/Future Operation (250,000 tpa)	Comment
Hardstand Area – Pad	202,150 m^2	202,150 m^2	Estimated value from Mod 2 EIS.
Hardstand Area – Leachate Dam	20,720 m^2	20,720 m^2	Estimated value from Mod 2 EIS.
Compost Production Rate	16,667 tonnes/month.	20,833 tonnes/month.	Equivalent to 200,000 tonnes/annum (current operation) and 250,000 tonnes/annum (proposed operation).
Seepage Rate from Hardstand and Leachate Dam Area	0.1 mm/m^2/day	0.1 mm/m^2/day	Assumption.
Percentage of Hardstand Covered by Compost	60%	75%	Estimate provided by Bettergrow for current operation. Estimate of future operation factored proportional to proposed increase in compost production rate.
Infiltration of Rainfall	80%	80%	Assumption (based on model calibration).
Rainfall Runoff	20%	20%	Assumption (based on model calibration).
Truck Wash	4.2 ML/year	5.25 ML/year	4.2 ML/year provided for current condition. Estimate of future operation factored proportional to proposed increase in compost production rate.
Moisture Content of Incoming Waste	55%	55%	Assumption based on advice from Bettergrow. No change in average moisture content expected for proposed increase in compost production rates.
Moisture Content of Finished Compost	35%	35%	Assumption based on advice from Bettergrow on current operations. No change in average moisture content expected for proposed increase in compost production rates.
Leachate Dam - Pan Evaporation Factor	0.8	0.8	Assumption consistent with typical industry standard value for dams/ponds.
Pad – Pan Evaporation Factor	0.4	0.4	Assumption (based on model calibration).
Compost – Pan Evaporation Factor	0.7	0.7	Assumption (based on model calibration).

4.4 Water Balance – Current (200,000 tpa) Operations

The site water balance assessment for current (200,000 tpa) site operations is presented in **Table 4-2**.Key findings of the site water balance for include:

- The model predicts a total of 266.3 ML/annum if inflows into the system and 267.6 ML/annum of outflows exiting the system. The balance of inflows and outflows are within 0.5%, suggesting good model calibration based on available water usage data and climate data.
- The volume of water inflows is predominantly from direct rainfall into stockpiled material (41%) and the moisture content of incoming waste (41%), which is consistent with Bettergrow's site observations. The remaining 17% of water inflows comprises rainfall runoff or operational water reporting to the Leachate Dam for storage and operational reuse.
- The volume of water outflows (losses) is predominantly from evaporation (71%) moisture in exported compost (26%). The remaining 3% of losses are assumed to be seepage losses through the base of the pad and Leachate Dam.
- Moisture conditioning of compost relies on direct rainfall and recirculation of leachate from the leachate dam (sourced from pad runoff and the truck wash) with minimal reliance on imported water from Void 4.
- A total of 45.6 ML/annum of water is estimated to report to the Leachate Dam, where 23.5 ML/annum is lost to evaporation. The remaining 22 ML/annum is inferred to be recirculated into compost stockpiles through a sprinkler system.
- The total volume of water sourced from Void 4 is estimated to be 16.2 ML/annum and includes an estimated:
  - 4.2 ML/annum for the Truck Wash (consistent with Bettergrow data).
  - 10.8 ML/annum for dust suppression (consistent with Bettergrow data).
  - 1.2 ML/annum for additional moisture conditioning of compost (consistent with Bettergrow data).

The site water balance assessment estimates that under average climate conditions, the current (200,000 tpa) site operation is a net user of water, with compost moisture condition having a net neutral water balance (i.e. total water in = total water out) and Void 4 water required to support dust suppression and the Truck Wash activities.

4.5 Water Balance – Proposed (250,000 tpa) Operations

The site water balance assessment for proposed (250,000 tpa) site operations is presented in **Table 4-3**. Key findings of the site water balance for include:

- The model predicts a total of 293.7 ML/annum if inflows into the system and 298.0 ML/annum of outflows exiting the system, suggesting the proposed expanded site operations remains approximately in balance (i.e. total water in = total water out), or requiring minimal reliance of imported water from Void 4 (approximately 4 ML/annum).
- The volume of water inflows is predominantly from direct rainfall into stockpiled material (37%) and the moisture content of incoming waste (47%). The remaining 16% of water inflows comprises rainfall runoff or operational water reporting to the Leachate Dam for storage and operational reuse.
- The volume of water outflows (losses) is predominantly from evaporation (68%) moisture in exported compost (29%). The remaining 3% of losses are assumed to be seepage losses through the base of the pad and Leachate Dam.
- Moisture conditioning of compost relies on direct rainfall and recirculation of leachate from the leachate dam (sourced from pad runoff and the truck wash) with minimal reliance on imported water from Void 4.
- A total of 46.7 ML/annum of water is estimated to report to the Leachate Dam, where 23.5 ML/annum is lost to evaporation. The remaining 23.2 ML/annum is inferred to be recirculated into compost stockpiles through a sprinkler system.

- The total volume of water sourced from Void 4 is estimated to be 23.0 ML/annum and includes an estimated:
  - 5.25 ML/annum for the Truck Wash (proportional to the increased compost production rate).
  - 13.5 ML/annum for dust suppression (proportional to the increased compost production rate).
  - 4.3 ML/annum for additional moisture conditioning of compost.

The site water balance assessment estimates that under average climate conditions, the proposed expanded (250,000 tpa) site operation remains a net user of water, with compost moisture condition having an almost net neutral water balance (i.e. total water in ≈ total water out) and the operation having a slightly increased reliance on water sourced form Void 4 of approximately 7ML/annum.

4.6 Water Security

It is understood that Void 4 is effective at holding water (i.e. limited seepage losses) if water levels are maintained below 46.5 mAHD due to a depression in the Bayswater Syncline Axis (Fifteen50, 2019a).

Void 4 water levels are managed by two mechanisms:

- Usage by Bettergrow in processing compost.
- Pumping to Lake Liddell (by AGL). It is understood that in years of average rainfall, AGL disposes of 500 ML/annum to Lake Liddell.

There are no other demands on water from Void 4; as such, the estimated water usage of 23.0 ML/annum for the proposed (250,000 tpa) operation for dust suppression, the truck wash facility and imported water for compost moisture conditioning is very unlikely to negatively affect water security for the Facility, and will only act to reduce the volume of water AGL disposes of to Lake Liddell.

Table 4-2: Site Water Balance – Current (200,000 tpa) Operations

Month	Average Daily Max Temp	Average Monthly Rainfall	Average Monthly Pan Evaporation	Water Inflows							Water Outflows						*Balance*	Dust Suppression
				Rainfall Infiltration into Compost	Rainfall Runoff from Hardstand to Leachate Dam	Direct Rainfall into Leachate Dam	Truck Wash Pit (overflows to Leachate Dam)	Water in incoming Waste	Imported Water from Void 4	Total Water In	Seepage below Hardstand/ Leachate Dam	Evaporation from Leachate Dam	Evaporation from Hardstand	Evaporation from Compost Stockpiles	Water in Exported Compost	Total Water Out		
	(ºC)	(mm)	(mm)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)
Jan	30.7	85.7	187.5	13.85	3.46	1.77	0.35	9.17	0.10	28.71	0.69	3.11	6.06	15.92	5.83	31.61	-2.91	1.59
Feb	29.6	85.4	151.6	13.81	3.45	1.77	0.35	9.17	0.10	28.65	0.62	2.51	4.90	12.87	5.83	26.75	1.90	1.34
Mar	27.4	75.8	126.5	12.26	3.06	1.57	0.35	9.17	0.10	26.51	0.69	2.10	4.09	10.74	5.83	23.45	3.06	1.26
Apr	24.2	47.3	88.8	7.64	1.91	0.98	0.35	9.17	0.10	20.15	0.67	1.47	2.87	7.54	5.83	18.38	1.77	0.89
May	20.4	40.6	67.2	6.57	1.64	0.84	0.35	9.17	0.10	18.67	0.69	1.11	2.17	5.71	5.83	15.52	3.16	0.53
Jun	17.3	43.2	51.5	6.98	1.75	0.89	0.35	9.17	0.10	19.24	0.67	0.85	1.67	4.38	5.83	13.40	5.84	0.20
Jul	17.1	33.1	61.3	5.35	1.34	0.68	0.35	9.17	0.10	16.98	0.69	1.02	1.98	5.21	5.83	14.73	2.25	0.18
Aug	19.1	36.3	85.9	5.87	1.47	0.75	0.35	9.17	0.10	17.71	0.69	1.42	2.78	7.29	5.83	18.02	-0.31	0.39
Sep	22.3	38.8	116.2	6.28	1.57	0.80	0.35	9.17	0.10	18.27	0.67	1.93	3.76	9.87	5.83	22.06	-3.79	0.70
Oct	25.2	55.1	144.0	8.91	2.23	1.14	0.35	9.17	0.10	21.90	0.69	2.39	4.66	12.23	5.83	25.80	-3.90	1.03
Nov	27.3	64.1	159.1	10.36	2.59	1.33	0.35	9.17	0.10	23.90	0.67	2.64	5.15	13.51	5.83	27.79	-3.90	1.21
Dec	29.6	72.0	176.5	11.64	2.91	1.49	0.35	9.17	0.10	25.65	0.69	2.93	5.71	14.99	5.83	30.15	-4.50	1.48
Total		**677.2**	**1,416.2**	**109.52**	**27.38**	**14.03**	**4.20**	**110.00**	**1.20**	**266.33**	**8.13**	**23.48**	**45.81**	**120.24**	**70.00**	**267.66**	**-1.33**	**10.80**

Table 4-3: Site Water Balance – Proposed Expanded (250,000 tpa) Operations

Month	Average Daily Max Temp	Average Monthly Rainfall	Average Monthly Pan Evaporation	Water Inflows							Water Outflows						*Balance*	Dust Suppression
				Rainfall Infiltration into Compost	Rainfall Runoff from Hardstand to Leachate Dam	Direct Rainfall into Leachate Dam	Truck Wash Pit (overflows to Leachate Dam)	Water in incoming Waste	Imported Water from Void 4	Total Water In	Seepage below Hardstand/ Leachate Dam	Evaporation from Leachate Dam	Evaporation from Hardstand	Evaporation from Compost Stockpiles	Water in Exported Compost	Total Water Out		
	(ºC)	(mm)	(mm)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)	(ML)
Jan	30.7	85.7	187.5	13.85	3.46	1.77	0.44	11.46	0.00	30.99	0.69	3.11	3.79	19.90	7.29	34.78	-3.79	1.99
Feb	29.6	85.4	151.6	13.81	3.45	1.77	0.44	11.46	0.00	30.92	0.62	2.51	3.07	16.09	7.29	29.59	1.34	1.67
Mar	27.4	75.8	126.5	12.26	3.06	1.57	0.44	11.46	0.00	28.79	0.69	2.10	2.56	13.42	7.29	26.06	2.73	1.57
Apr	24.2	47.3	88.8	7.64	1.91	0.98	0.44	11.46	0.00	22.43	0.67	1.47	1.79	9.42	7.29	20.65	1.78	1.12
May	20.4	40.6	67.2	6.57	1.64	0.84	0.44	11.46	0.00	20.95	0.69	1.11	1.36	7.13	7.29	17.59	3.37	0.66
Jun	17.3	43.2	51.5	6.98	1.75	0.89	0.44	11.46	0.00	21.52	0.67	0.85	1.04	5.47	7.29	15.33	6.19	0.25
Jul	17.1	33.1	61.3	5.35	1.34	0.68	0.44	11.46	0.00	19.26	0.69	1.02	1.24	6.51	7.29	16.75	2.51	0.23
Aug	19.1	36.3	85.9	5.87	1.47	0.75	0.44	11.46	0.00	19.99	0.69	1.42	1.74	9.12	7.29	20.26	-0.27	0.49
Sep	22.3	38.8	116.2	6.28	1.57	0.80	0.44	11.46	0.00	20.55	0.67	1.93	2.35	12.34	7.29	24.57	-4.03	0.88
Oct	25.2	55.1	144.0	8.91	2.23	1.14	0.44	11.46	0.00	24.18	0.69	2.39	2.91	15.29	7.29	28.57	-4.39	1.29
Nov	27.3	64.1	159.1	10.36	2.59	1.33	0.44	11.46	0.00	26.17	0.67	2.64	3.22	16.88	7.29	30.70	-4.52	1.51
Dec	29.6	72.0	176.5	11.64	2.91	1.49	0.44	11.46	0.00	27.93	0.69	2.93	3.57	18.74	7.29	33.21	-5.28	1.85
Total		**677.2**	**1,416.2**	**109.52**	**27.38**	**14.03**	**5.25**	**137.50**	**0.00**	**293.68**	**8.13**	**23.48**	**28.63**	**150.30**	**87.50**	**298.04**	**-4.36**	**13.49**

5.0 Surface Water Impact Assessment

The surface water management plan previously identified several potential risks to surface water quality from operations, and proposed management controls and monitoring requirements to mitigate these. In addition, mitigation measures previously provided in the Statement of Environmental Effects (SoEE) (Jacobs, 2018) for the conditions of the development approval DA140/2016 and EPL 7654, that were approved by Council, would continue to apply and be maintained. Potential risks arising from the proposed modifications and a review of the adequacy of the existing controls, based on a desktop assessment, are described in **Table 5-1**, below. Also provided are suggested management and/or mitigation measures to address these risks. Discussions reference **Figure 5-1**, below.

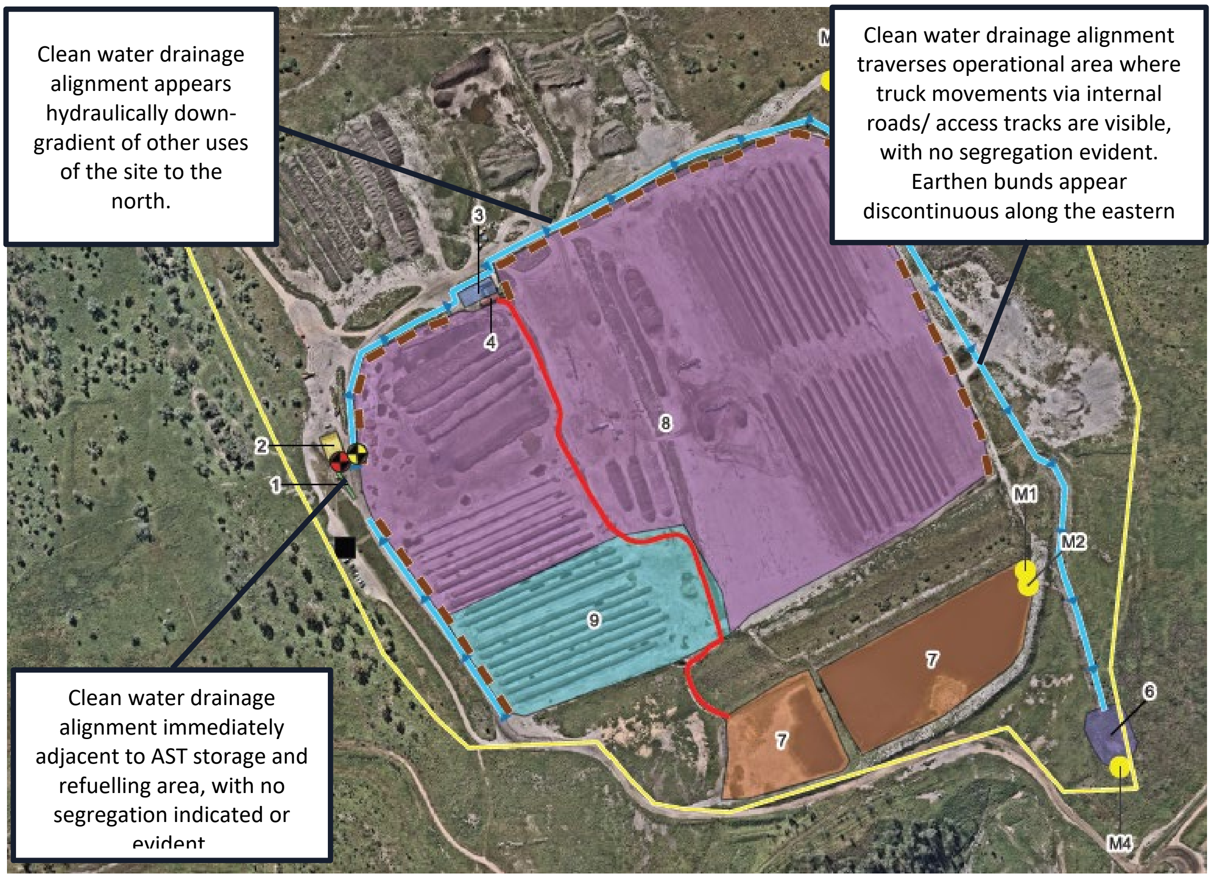


Figure 5-1: Site Plan and Drainage Features

Table 5-1: Surface Water Risks Associated with Proposed Modifications

Hazards	Potential Impacts	Receptor	Existing Controls	Adequacy of Controls	Commentary and Additional Controls
Chemical Spill	Risks associated with chemical spills and/or leaks entering stormwater discharge and infiltration area.	Leachate dam and/or sediment (lower) basin.	• Limit fuels and chemicals stored onsite to a minimum. • All required chemicals and fuels must be located within a bunded enclosure located away from drainage lines and stormwater drains. • Plant and equipment must be regularly inspected to check for oil leaks. • Refuelling of vehicles or machinery is to occur within a containment or hardstand area designed to prevent the escape of spilled substances to the surrounding environment. • Wash down areas must be appropriately constructed, and the collected material disposed of off-site to a licensed facility.	Although the existing above ground storage tank (AST) is self-bunded, there is no containment area for either refuelling of the AST, or for vehicles to be refuelled within. This is a condition of consent for the SSD and is listed as an existing requirement (Bettergrow, 2024). It is understood that spill kits are available in the refuelling area. Nevertheless, with the increase in waste processing, increased refuelling of operational vehicles or machinery will be required. Bettergrow have identified the intention to install an additional 65,000 L AST to accommodate the additional vehicle and plant movements associated with increase capacity. The increased AST capacity is anticipated to reduce the frequency of refuelling required by a fuel tanker, thereby reducing the associated risk of contamination associated with this activity, and it is understood that a review of the potential contamination risks associated with this has been presented as part of the Modification 2 assessment reports. However, the risk of spills associated with increased frequency of vehicles and plant requiring refuelling (i.e. associated with increased production associated with Modification 3) remains. Discussions with Bettergrow representatives indicated that drip trays are currently used as a control, and the continued effectiveness of this as a management tool should continually be reviewed to ensure the environmental controls and contingencies are fit for purpose.	Bettergrow should continually assess the effectiveness of spill controls such that they can continually meet the conditions of consent, and meet the NOHSC (2001) *Storage and Handling of Workplace Dangerous Goods* requirements for spill control. A review of the adequacy of the OEMP relating to spills associated with the AST (existing and/or proposed) and refuelling activities is also proposed, as well as the inclusion of these products on the pollution inventory. Where existing controls are in place (e.g. drip trays), the OEMP should be revised to incorporate these controls. Inspection of the washdown area to assess whether bunding is adequate, intact, and operates as intended and in accordance with the OEMP.

Hazards	Potential Impacts	Receptor	Existing Controls	Adequacy of Controls	Commentary and Additional Controls
Drain Integrity	Leachate from treatment pads entering stormwater drain or stormwater discharge and infiltration area.	Stormwater and sediment (lower) basin.	• Maintain all water related infrastructure designed to maximise runoff and reduce infiltration including: ▪ Low permeability base in the composting processing areas. ▪ Lining or appropriate compaction of the leachate dams during construction. ▪ Bunding and arrangement of windrows. ▪ Perimeter bunding and diversion drains. • Undertake the aeration of leachate in the leachate dams if required following other control measures being implemented. • Reuse runoff and leachate collected in the leachate dams during composting activities. • Upgrade to the clean water diversion to ensure separation from process areas.	It is considered that any potential residual contaminants that are in the feedstock will also likely be in the finished product (e.g. those that would not be removed from FOGO during the pasteurisation process such as PFAS substances) and that runoff from the finished product should also be considered leachate. Separation of the clean water diversion from both the processing areas, finished compost product, and other operational uses of the site (e.g. north of the operational areas), is critical for preventing cross-contamination. A review of the adequacy of the physical separation between the clean water alignment and the stockpiled area and haul road in the east of the site is also recommended.	An upgrade to the clean water diversion to ensure separation from process areas was presented as a control in the Bettergrow (2024) OEMP. The clean water diversion infrastructure should be inspected to assess the integrity of the infrastructure and its operational effectiveness and if deficiencies are identified then the appropriate rectification should be made. The objective being to prevent cross-contamination by composting batches, operational areas, and other potential contaminant sources at the site.

Hazards	Potential Impacts	Receptor	Existing Controls	Adequacy of Controls	Commentary and Additional Controls
Increase in Leachate Volume Generated	Potential change in leachate generation due to an increase in the processing capacity by 50,000 tpa.	Surface water and/or leachate dams.	• Maintain all water related infrastructure designed to maximise runoff and reduce infiltration including: ▪ Low permeability base in the composting processing areas. ▪ Lining or appropriate compaction of the leachate dams. ▪ Perimeter bunding and diversion drains. • Reuse runoff and leachate collected in the leachate dams during composting activities.	As stated above, the separation of leachate and clean water drainage is critical for preventing cross-contamination. The risk of exceeding the storage capacity of the leachate dams is considered unlikely, on the basis that the combined storage capacity of the leachate dams and overflow capture is thousands of megalitres, and the water balance presented in **Section 4.0** indicates no net increase in leachate generated.	As stated above, the clean water diversion infrastructure should be inspected to assess the integrity of the infrastructure and its operational effectiveness and if deficiencies are identified then the appropriate rectification should be made.
Contaminants of Potential Concern	Change in feedstock resulting in changed contaminants of potential concern within leachate.	Surface water, leachate dam, potential cycling through compost.	Inspection of feedstock for anthropogenic material and asbestos. Periodic monitoring for select metals, TPH and water quality parameters (TSS, pH etc).	Visual inspection of imported feedstock is unlikely to identify chemical contamination potentially associated with raw FOGO. The existing analytical suite for periodic sampling may not be adequate to identify CoPC in the changed feedstock and finished product, as described in **Section 3.4**.	• Review of the adequacy of the surface water monitoring regime with respect to CoPC. • Review of the adequacy of the surface water monitoring plan with regards to actions and action levels for CoPC. • Review and revision of the OEMP such that surface water monitoring requirements are consistent with the current EPL.
Rainfall	Rainfall resulting in an extreme flooding event and/or accumulating in bunded areas.	Soil and/or surface water.	Dam capacity and overflow capacity.	The potential risk of rainfall is not considered to be affected by the change in received products or tonnage. As such, previous controls and management strategies are considered to remain appropriate.	None required.

Hazards	Potential Impacts	Receptor	Existing Controls	Adequacy of Controls	Commentary and Additional Controls
Drain Obstruction	Obstructed stormwater drains preventing system free-flow.	Soil and/or surface water.	Visual inspection for gross pollutants or waste materials stored or accumulated at ground surface or in surface runoff.	The potential risk of drain obstruction is not considered to be affected by the change in received products or tonnage. As such, previous controls and management strategies are considered to remain appropriate.	None required.
Increased Potential for Sediment Build-Up from Raw FOGO	Obstructed surface water drainage channels or reduced flow, and/or reduced capacity in leachate drain.	Leachate dams.	Maintenance activities such as removal of deposited sediment, vegetation, blockages etc. where observed (as identified on the Workplace and Environment Inspection Checklist during regular inspections.	Not applicable. This is not considered to be an issue specifically relating to raw FOGO and it is anticipated that controls used to control sediments from VENM and ENM would also be adequate for raw FOGO.	None required.
Poor Waste Management Leading to Contamination of Surface Water Bodies	With an increase in the processing capacity of the facility from 200,000 tpa to 250,000 tpa, there is the risk of generation of increased waste streams, with potential for poor waste management or storage leading to contamination of waterways. There is potential to increase physical contamination (e.g. litter fragments) from household FOGO sources.	Surface water and/or leachate dams.	Visual inspection for gross pollutants or waste materials stored or accumulated at ground surface or in surface runoff.	The existing controls are considered adequate to identify waste and/or gross pollutants in surface water.	None required.
Installation of Site Weighbridge	Senversa did not identify additional potential risks associated with either the installation or operation of the site weighbridge.	None identified.	No existing controls.	Not applicable.	None required.

6.0 Conclusions and Recommendations

The site water balance assessment identified that the composting operation (current and proposed) is a net user of water.

Senversa identified several potential risks arising from the proposed changes to operations under Modification 3, with key risks as follows:

- Chemical spills and/or leaks entering stormwater.
- Leachate from treatment pads entering stormwater drain or stormwater discharge and infiltration area.
- Additional CoPC associated with changes to feedstock, and the potential for these to enter stormwater discharge and infiltration area, if not properly segregated or managed.
- Increased likelihood of physical contamination (e.g. litter) in organic wastes from household FOGO sources, though this is likely manageable using existing controls.

Recommendations to mitigate these risks are detailed in **Section 5.0** and are summarised here:

- Continual assessment of the effectiveness of spill controls such that they can continually meet the conditions of consent, and meet the NOHSC (2001) Storage and Handling of Workplace Dangerous Goods requirements for spill control.
- A review of the adequacy of the OEMP relating to spills associated with the AST (existing and/or proposed) and refuelling activities is proposed, as well as the inclusion of fuel products on the pollution inventory. Where existing controls are in place (e.g. drip trays), the OEMP should be revised to incorporate these controls.
- Inspection of the washdown area to assess whether bunding is adequate, intact, and operates as intended and in accordance with the OEMP.
- Complete an inspection of the integrity and operational effectiveness of the clean water diversion drainage channel and if deficiencies are identified then the appropriate rectification should be made.
- Review the adequacy of the surface water monitoring regime with regards to analytical suite, and update actions and action levels where required, including updating the OEMP for consistency with EPL monitoring requirements.

7.0 Principles and Limitations

7.1 General Principles and Limitations

The following principles (summarised in the table below) are intended to be referred to in resolving any ambiguity or exercising such discretion.

Table 7-1: General Principles and Limitations

Area	Principle and Limitation
Limitations of Information	This SWIA has been prepared by Senversa for the use of Bettergrow. It is prepared in accordance with the scope of work and for the purpose outlined in the proposal dated 16 May 2025. The report is based on the information provided to Senversa. The sources of information used by Senversa are outlined in this Report. In preparing the Report, Senversa has relied upon information prepared by companies including but not limited to Bettergrow, Element Environment, Fifteen50, Jacobs and no independent verification of this information has been made beyond the agreed scope of works, and we assume no liability for any inaccuracies in or omissions to that information. No indications were found during our development of the Report that information contained in this Report as provided to Senversa was intentionally false. The effectiveness of any assessment may be compromised by limitations or defects in the information used to define the objectives and scope of the investigation, including inability to obtain information concerning historic site uses or prior site assessment activities despite the efforts of the user and assessor to obtain such information.
Level of Assessment	The assessment herein should not be considered to be an exhaustive assessment of environmental conditions on a property. There is a point at which the effort required to obtain information is outweighed by the time required to obtain that information, and, in the context of private transactions and contractual responsibilities, may become a material detriment to the orderly conduct of business. If the presence of target analytes is confirmed on a property, the extent of further assessment is a function of the degree of confidence required and the degree of uncertainty acceptable in relation to the objectives of the assessment.
Comparison with Subsequent Inquiry	The justification and adequacy of the findings of this investigation in light of the findings of a subsequent inquiry should be evaluated based on the reasonableness of judgments made at the time and under the circumstances in which they were made.
Data Useability	Investigation data generally only represent the site conditions at the time the data were generated. Therefore, the usability of data included in this assessment may have a finite lifetime depending on the application and use being made of the data. In all respects, a future reader of this report should evaluate whether previously generated data are appropriate for any subsequent use beyond the original purpose for which they were collected, or are otherwise subject to lifetime limits imposed by other laws, regulations or regulatory policies.
Nature of Advice	The investigation works herein are intended to develop and present sound, scientifically valid data concerning actual site conditions. Senversa does not seek or purport to provide legal or business advice.
Elimination of Uncertainty	Some uncertainty is inherent in all assessments. Furthermore, any sample, either surface or subsurface, taken for chemical testing may or may not be representative of a larger population or area. Professional judgment and interpretation are inherent in the process, and even when exercised in accordance with objective scientific principles, uncertainty is inevitable. Additional assessment beyond that which was reasonably undertaken may reduce the uncertainty.

7.2 Project Specific Uncertainties

Senversa did not complete a site inspection as part of this scope of work, and conditions on site may be different to those described herein.

In consultation with Bettergrow, the scope of the investigation was limited to a targeted assessment of potential impacts to surface water associated with the proposed modifications. Assessment of potential impacts to soil and/or groundwater associated with these modifications was excluded.

No environmental sampling was completed as part of this assessment.

8.0 References

Bettergrow. (2024). *Operational Environmental Management Plan, Bettergrow Ravensworth Composting Facility.*

BMT. (2023). Singleton Floodplain Risk Management Study & Plan, Volume 2: Floodplain Risk Management Study & Plan.

BoM. (2025). *Groundwater Dependent Ecosystems Atlas*. Retrieved from Bureau of Meteorology: http://www.bom.gov.au/water/groundwater/gde/map.shtml.

DEC. (2004). *Environmental Guidelines: Composting and Related Organics Processing Facilities.*

DPIE. (2022, April). *eSPADE version 2.2 Spatial Viewer - Environment and Heritage Division*.

Element. (2025). Ravensworth Composting Facility | State Significant Development | Modification 3 | Scoping Report.

Fifteen50. (2019a). *RPS Australia East Pty Ltd - GreenSPOT Recycling Facility EIS: Surface Water Report.*

Fifteen50. (2019b). RPS Australia East Pty Ltd - GreenSPOT Recycling Facility EIS: Groundwater Report.

Jacobs. (2018). Statement of Environmental Effects , Section 96(2) to DA140/2016 - Ravensworth Composting Facility.

NEPC. (2013). *National Environmental Protection (Assessment of Site Contamination) Measure, 1999 (as amended May 2013).*

NOHSC. (2001). *Storage and Handling of Workplace Dangerous Goods.* Hational Occupational Health & Safety Commission.

NSW EPA. (2000). Environmental Guidelines - Use and Disposal of Biosolids Products.

NSW EPA. (2023). *What's the GO with FOGO: Study of food and garden composts and other recovered organics in NSW.* NSW Environment Protection Authority.

ROU. (2007). *Establishing a Licensed Composting Facility.*

RPS. (2019). *Greensport Hunter Valley, EIS for 200,000tpa Nutrient Recycling Facility - Ravensworth NSW, SSD 9418.*

Senversa. (2023). *Surface and Groundwater Management Plan.*

Standards Australia. (2007). *AS 3798-2007 – Guidance on Earthworks for Commercial and Residential Development.*

Standards Australia. (2012). *AS 4454-2012: Compost soil conditions and mulches.*

WaterNSW. (2025). *Water Data Online*. Retrieved from Bureau of Meteorology: http://www.bom.gov.au/waterdata/.

WCA. (2019). *Review of Scientific Literature on Compost Produced from Food and Garden Organic Waste.* WCA Environment Ltd.

Appendix A: Figures

IMPORTANT NOTE

1. This plan was prepared for the sole purposes of the client for the specific purpose of producing a photographic overlay plan. This plan is strictly limited to the Purpose and does not apply directly or indirectly and will not be used for any other application, purpose, use or matter. The plan is presented without the assumption of a duty of care to any other person (other than the Client) ("Third Party") and may not be relied on by Third Party.

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4. The aerial photography used in this plan has not been rectified. This image has been overlaid as a best fit on the boundaries shown and position is approximate only.

FIGURE 3: PROJECT SITE AND SURROUNDING DEVELOPMENT

LOCATION: RAVENSWORTH
JOB NO.: PR 141357
PURPOSE: PLANNING
Technician: andrea.stevkova Date: 9/09/2019

DATUM: GDA94
PROJECTION: MGA Zone 56

Data Sources:
RPS, Client
Land and Property 2017

CLIENT: BETTERGROW

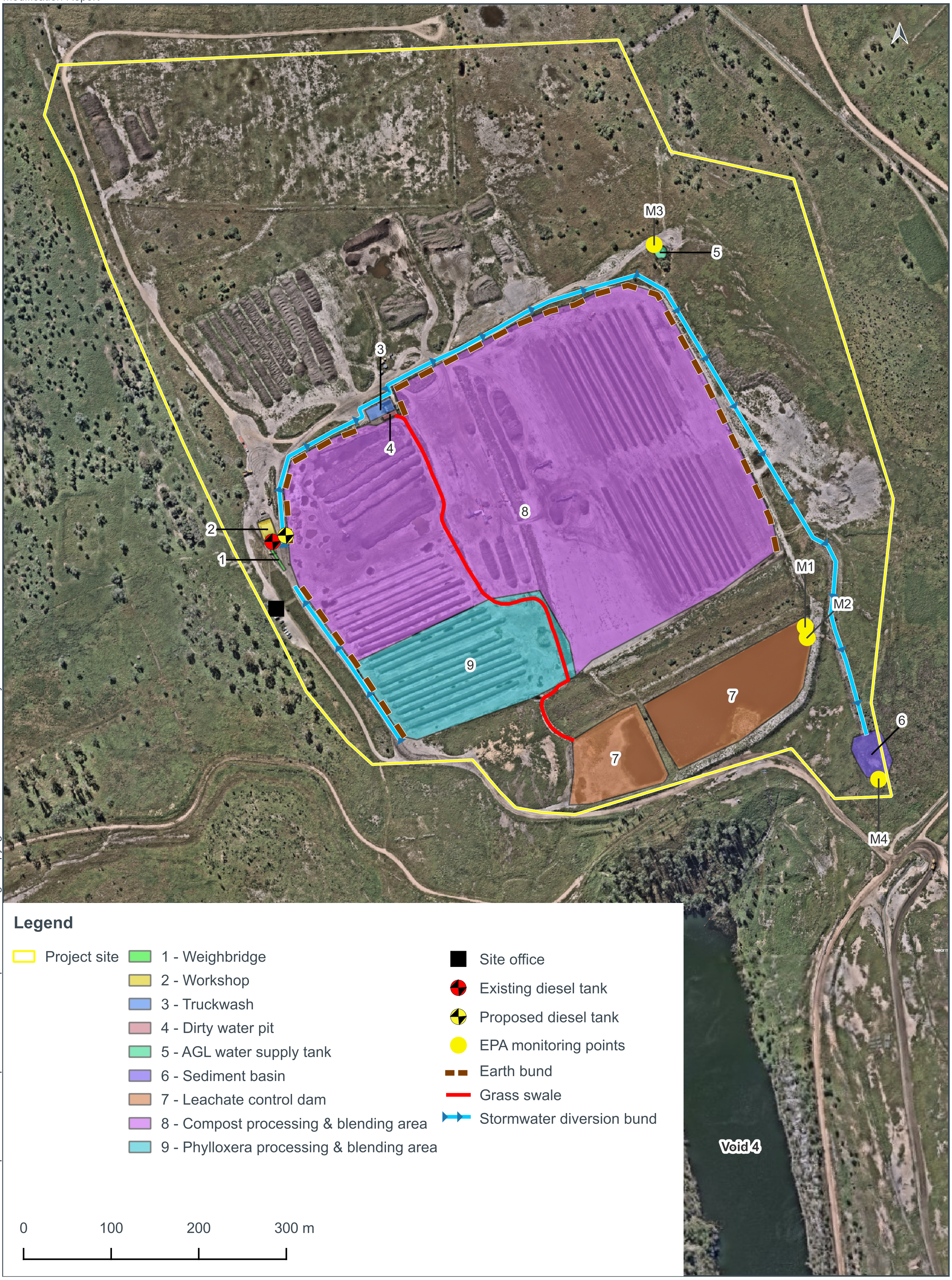
RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
Unit 2A, 45 Fitzroy Street, Carrington, NSW, Australia, 2294 PO Box 120, Carrington, NSW, 2294
T: 02 4940 4200 F: 02 4940 4299 www.rpsgroup.com.au

Path: J:\JOBS\141K\141357 Ravensworth\10 - Drafting\Arcgis Map Documents\Planning\141357 Figure 3 PSite Surround A A4P 20190909.mxd

NEW_A4_Portrait 2018 Rev: B Produced:NW Reviewed: NW Date: 10/05/2018

Figure 1.3
Site layout

Ravensworth Composting Facility SSD Modification 3
Modification Report



Senversa Pty Ltd

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APPENDIX E

NOISE IMPACT ASSESSMENT

PO Box 678
Kotara NSW 2289
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

7 August 2025

MAC252408-01LR1V1

Attention: Amna Robinson
Element Environment Pty Ltd
PO Box 1563
Warriewood NSW 2102

Dear Amna,

Noise Impact Assessment

Ravensworth Composting Facility, 74 Lemington Road, Ravensworth, NSW

1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) understands that Element Environment Pty Ltd (Element), on behalf of Bettergrow Pty Ltd (Bettergrow), require a Noise Impact Assessment (NIA) to quantify emissions from the proposed modification (Modification 3) to the operation of the Ravensworth Composting Facility at 74 Lemington Road, Ravensworth, NSW (the 'project').

The NIA has been prepared to assess the potential change in noise levels associated with the proposed modification to increase the processing capacity of the facility from 200,000 tonnes per annum (tpa) to 250,000tpa of organic material. The NIA is provided to support the Modification Application for the project.

The assessment has been undertaken in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- NSW Department of Environment and Climate Change (DECCW) – NSW Interim Construction Noise Guideline (ICNG), July 2009; and
- NSW Department of Environment, Climate Change and Water (DECCW) – NSW Road Noise Policy (RNP), March 2011.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

2 Project Description

2.1 Existing Development

The facility commenced operations under development consent (DA140/2016), granted by Singleton Council (Council) in November 2016, with approval for on-site composting of 50,000tpa of a mix of organic material. In April and December 2018, Council approved two modifications to DA140/2016 to facilitate an increase in organic material received on site to 76,000tpa, and to allow the sale of compost material from the site to surrounding markets.

A state significant development (SSD) application (SSD-9418) was approved in August 2022 to increase processing capacity at the facility to 200,00tpa of organic material, with a modification (Modification 1) approved in December 2023 for the removal of the site weighbridge and, receival and processing of new source recovery materials on site.

Bettergrow is in the process of applying to the Department of Planning, Housing and Infrastructure (DPHI) to modify SSD-9418 (Modification 2) to allow the receival and processing of decontaminated and pasteurised food organics and garden organics (FOGO) and/or food recovered material, as well as the blending of Virgin Excavated Natural Material (VENM) and Excavated Natural Material (ENM) with organic received materials at the facility. Modification 2 would not result in any changes to the existing development footprint, site infrastructure, plant/equipment, traffic generation, material volumes or operating hours.

The site currently operates under Environment Projection Licence (EPL) No.7654.

2.2 Proposed Modification

Bettergrow is now applying to the DPHI to modify SSD-9418 (Modification 3) to allow:

- The receival and processing of FOGO recovered material at the facility;
- A 50,000tpa increase in the processing capacity of the facility, from 200,000tpa to 250,000tpa;
- Installation of a site weighbridge; and
- Up to five additional light vehicles and 14 additional heavy vehicles to access the site per day.

Under the proposed modification there would be no changes to the existing development footprint, plant/equipment or operating hours.

3 Existing Noise Limits

3.1 Nearby Sensitive Receivers

The project site is located within the Ravensworth Operations open cut mining complex, with the ambient noise environment characterised by mining operations, including drilling/blasting, excavation, haulage, processing (crushing and screening), and rehabilitation activities. The nearest residences are located on Hebden Road approximately 2km northeast of the project site, and Lemington Road approximately 4.4km southeast of the project site, however, MAC understands that these are mine-owned residences and are not considered to be sensitive receivers.

The closest sensitive receivers to the site have been identified in the Statement of Environmental Effects (SEE) for Modification 1 (2023, Ref: SEE-MOD 1 v2.0) as residential properties in Camberwell Village approximately 5.7km to the southeast of the site.

3.2 Construction Noise Limits

Condition B 27 of SSD-9418 states:

The development must be constructed to achieve the construction noise management levels detailed in the 'Interim Construction Noise Guideline' (DECC, 2009) (as may be updated or replaced from time to time). All feasible and reasonable noise mitigation measure must be implemented and any activities that could exceed the construction noise management levels must be identified and managed in accordance with the management mitigation measures in Appendix 2.

In accordance with the Interim Construction Noise Guideline (ICNG), the noise management level (NML) for standard construction hours (ie 7am to 6pm Monday to Friday and 8am to 1pm Saturday) is equal to the rating background level (RBL) + 10dB. Hence, the applicable standard construction hours NML is 45dB $LA_{eq(15min)}$, assuming a default RBL of 35dBA, as per the NSW Noise Policy for Industry (NPI) (EPA, 2017).

3.3 Operational Noise Limits

Condition B 28 of SSD-9418 states:

The Applicant must ensure that noise generated by operation of the development does not exceed the noise limits in Table 2.

Table 2 Noise Limits (dB(A))

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)
Camberwell	40	35	35

It is noted that EPL 7654 does not prescribe noise limits for the construction or operation of the facility.

4 Noise Modelling and Assessment

4.1 Construction Noise Assessment

4.1.1 Assessment Methodology

Assessment of the potential noise impacts during the proposed construction works was completed in accordance with the ICNG. It is noted that the NSW Environment Protection Authority (EPA) have released Draft Construction Noise Guideline (2020) which will replace the ICNG when the draft guideline is finalised. The public consultation for the Draft Construction Noise Guideline closed in April 2021 with feedback currently under review. At the time of writing the ICNG is still applicable.

Construction of the project would generally comprise installation of a prefabricated weighbridge on a concrete slab with ramps. Some minor levelling of the ground surface will be required for the installation.

Equipment that may be used during the proposed construction works includes:

- light vehicles;
- flatbed truck;
- roller;
- mobile crane;
- forklift;
- concrete mixer truck;
- concrete saw;
- concrete vibrator;
- concrete compactor/rammer; and
- hand tools, including power tools and welding equipment.

The noise emissions from the worst-case construction scenario, assuming all equipment operating simultaneously throughout the duration of the assessment period, have been propagated to the nearest residential receivers in Camberwell Village using the simple manual distance attenuation calculation method, with a fleet sound power of 118dBA. It is noted that the sound power levels for the construction equipment were sourced from the Transport for NSW (TfNSW) Construction and Maintenance Noise Estimator Tool (CMNET).

The simple manual distance attenuation calculation method takes into account sound intensity losses due to hemispherical spreading. The calculation has assumed direct line of sight between the proposal area and the nearest sensitive receivers, with an allowance for moderate levels (up to 8dB) of attenuation due to ground attenuation and air absorption. It is noted that the simple manual distance attenuation calculation is a highly conservative method and is typically used as a screening test for low risk assessments. Where compliance is demonstrated using the simple manual distance attenuation calculation, no further detailed modelling is required.

4.1.2 Construction Noise Assessment Results

A review of aerial imagery identified that the closest residential property in Camberwell Village is approximately 5.7km to the southeast of the proposal site.

Based on the simple manual distance attenuation calculation, assuming a fleet sound power level of 118dBA for the combined construction scenario, construction noise levels are predicted to be less than 30dB $LA_{eq(15min)}$ at the nearest residential receivers. Hence, construction noise levels are anticipated to be significantly below the construction NML of 45dBA at all receiver locations, and no specific noise management measures are required.

4.2 Operational Noise Assessment

Operation of the facility would generally remain consistent with the existing approved operations, with additional noise sources comprising up to 14 additional heavy vehicles (28 movements) and up to five additional light vehicles (10 movements) per day. These movements will typically be evenly distributed throughout the day, that is, up to three additional heavy vehicle movements and up to one additional light vehicle movement per hour.

The historic Noise Impact Assessment (Global Acoustics, 2019; Ref: 18323_R01) predicted operational noise levels at the nearest residential receivers in Camberwell Village using a fleet sound power level of 116dBA from plant and equipment onsite. The plant and equipment comprised a windrow turner, loader, water carts (x2), trommel and water tank pump, with sound power levels derived from onsite measurements. Additionally, the facility is currently approved for 146 vehicle movements per day, comprising 114 heavy vehicles and 32 light vehicles.

The proposed modification would introduce up to three additional trucks per hour and one additional light vehicle per hour only, with a combined sound power of 98dBA (sound power level of trucks at low speed is 93dBA each, and light vehicles is 73dBA). Using simple decibel addition, where two noise sources with a difference of 10dBA or more are added together (logarithmic sum), there would be no net increase in the total noise generated.

The historic assessment by Global Acoustics (2019) predicted operational noise levels of up to 27dB $L_{Aeq(15min)}$ at receivers within Camberwell Village under noise enhancing meteorological conditions. It is therefore considered that under the proposed modification, operational noise levels would remain consistent with the predicted levels, of up to 27dB $L_{Aeq(15min)}$, with no net increase in site noise emissions expected.

4.3 Road Traffic Noise Assessment

As noted in **Section 4.2**, the facility is currently approved for 146 movements per day, comprising 114 heavy vehicles (waste and fuel deliveries) and 32 light vehicle movements. Under the proposed modification, there would be approximately 14 additional heavy vehicles (28 movements) and up to five additional light vehicles (10 movements) per day.

A review of existing traffic volumes from the TfNSW Traffic Volume Viewer (Station Id. 6156, north of Singleton) identified that the New England Highway carries approximately 13,915 vehicles per day. The increase in traffic volumes associated with the proposed modification, of up to 38 movements per day, equates to an increase in traffic volumes of less than 0.3%, or an increase in road traffic noise levels of less than 0.02dB $L_{Aeq(period)}$. Hence, as the increase in traffic volumes would be imperceptible to the human ear (ie less than 2dB increase), it is considered that the additional traffic movements from the proposed modification would have a negligible acoustic impact.

5 Discussion and Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Impact Assessment for the proposed modification to the operation of the Ravensworth Composting Facility at 74 Lemington Road, Ravensworth, NSW.

The NIA has considered the potential noise impacts of the proposed modification, including construction activities associated with the installation of a new weighbridge, and operational noise associated with additional vehicle movements generated by the facility.

The results of the assessment demonstrated the construction noise levels during levelling of the site, concreting works and installation of the weighbridge are predicted to be significantly below the relevant noise management levels at the nearest residential receivers in Camberwell Village.

The operational noise assessment demonstrated that the additional vehicle movements associated with the proposed modification would not result in a material change to the site noise emissions. Hence, the proposed modification would not result in an increase to noise levels at the nearest receivers in Camberwell Village.

Similarly, the road traffic noise assessment demonstrated that due to the high existing traffic volumes on the New England Highway, the additional vehicle movements associated with the proposed modification would not have a discernible effect on nearby sensitive receivers.

Accordingly, the Noise Impact Assessment supports the Modification Application for the project without the requirement for the implementation of ameliorative measures.

We trust the above information is satisfactory and if you have any further question regarding the assessment, please contact the undersigned.

Yours sincerely

Dale Redwood
Lead Acoustic Consultant
BSc (Hons) | MAAS
dredwood@mulleracoustic.com
Reviewed: Oliver Muller, Principal Acoustic Scientist, BSc (REM & HGeog) | MAAS

Appendix A – Glossary of Terms

A number of technical terms have been used in this report and are explained in **Table A1**.

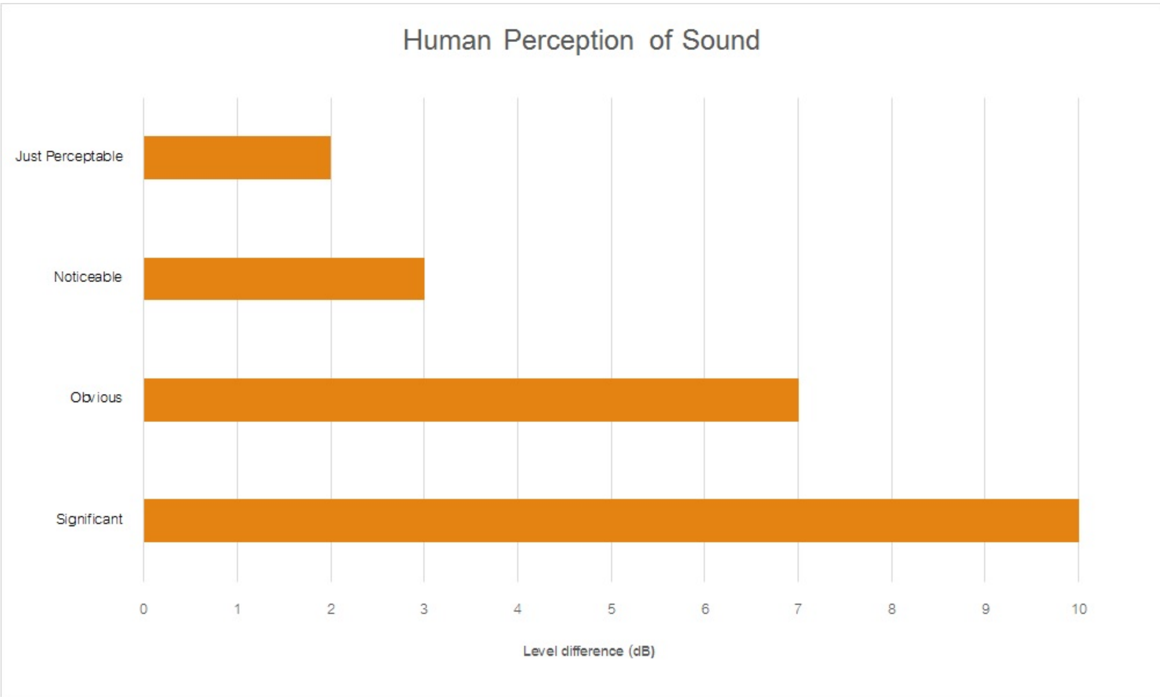
Table A1 Glossary of Acoustical Terms

Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
Ambient Noise	The total noise associated with a given environment. Typically, a composite of sounds from all sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to sound.
Background Noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is usually represented by the LA90 descriptor
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Z-weighted or decibels Linear (unweighted).
Extraneous Noise	Sound resulting from activities that are not typical of the area.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A sound level which is exceeded 10% of the time.
LA90	Commonly referred to as the background noise, this is the level exceeded 90% of the time.
LAeq	Represents the average noise energy or equivalent sound pressure level over a given period.
LAmax	The maximum sound pressure level received at the microphone during a measuring interval.
Masking	The phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.
RBL	The Rating Background Level (RBL) as defined in the NPI, is an overall single figure representing the background level for each assessment period over the whole monitoring period. The RBL, as defined is the median of ABL values over the whole monitoring period.
Sound power level (Lw or SWL)	This is a measure of the total power radiated by a source in the form of sound and is given by 10.log10 (W/Wo). Where W is the sound power in watts to the reference level of 10^{-12} watts.
Sound pressure level (Lp or SPL)	the level of sound pressure; as measured at a distance by a standard sound level meter. This differs from Lw in that it is the sound level at a receiver position as opposed to the sound 'intensity' of the source.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA	
Source	Typical Sound Pressure Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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APPENDIX F

TRAFFIC IMPACT ASSESSMENT

02 October 2025

Amna Robinson
Senior Environment Consultant | Element Environment
GPO Box 1563
Warriewood NSW 2102

Dear Amna

Ravensworth Composting Facility | SSD-9418 Modification 3 – Traffic Impact Assessment

Background

Bettergrow Pty Ltd (Bettergrow) operates the Ravensworth Composting Facility (the 'facility') at 74 Lemington Road, Ravensworth, NSW (the 'site') on part of Lot 10 DP 1204457. The facility processes biosolids, garden organics, and other organic recovered material in outdoor windrows to produce a compost product suitable for mine site rehabilitation and agricultural uses.

The site is located within the Ravensworth Operations open cut mining complex, which comprises surface mining operations, coal processing plants and related infrastructure, and former mine sites that are currently being rehabilitated, about 15km north of Singleton in the Singleton local government area (LGA), as shown in **Figure 1**.

The facility originally commenced operation under a development consent granted by the Singleton Council (Council) on 25 November 2016 (DA 140/2016). A state significant development application (SSD-9418) to increase processing capacity at the facility to 200,000 tonnes per annum (tpa) of organic recovered material was approved by the Minister for Planning and Public Spaces in 2022. Modification 1 to SSD-9418 was approved in 2023 to remove the site weighbridge and allow the receival and processing of new resource recovered material on-site.

Bettergrow is in the process of applying to the NSW Department of Planning, Housing and Infrastructure (DPHI) to modify SSD-9418 (Modification 2) to allow the facility to receive and process decontaminated and pasteurised food organics and garden organics (FOGO) and/or food recovered material, as well as the receival and blending of Virgin Excavated Natural Material (VENM) and Excavated Natural Material (ENM) with organic recovered material at the facility.

Bettergrow is now applying to the DPHI to modify the development consent for SSD-9418 (Modification 3), which would allow the receival and processing of FOGO recovered material at the facility, a 50,000 tpa increase in the processing capacity, the employment of three additional staff, and the installation of site weighbridge.

Element Environment Pty Ltd, on behalf of Bettergrow, has engaged SCT Consulting to prepare this Traffic Impact Assessment (TIA) to inform the SSD Modification 3. The assessment aims to identify potential impacts on traffic and transport associated with the project, and propose mitigation measures, if required.

Existing conditions

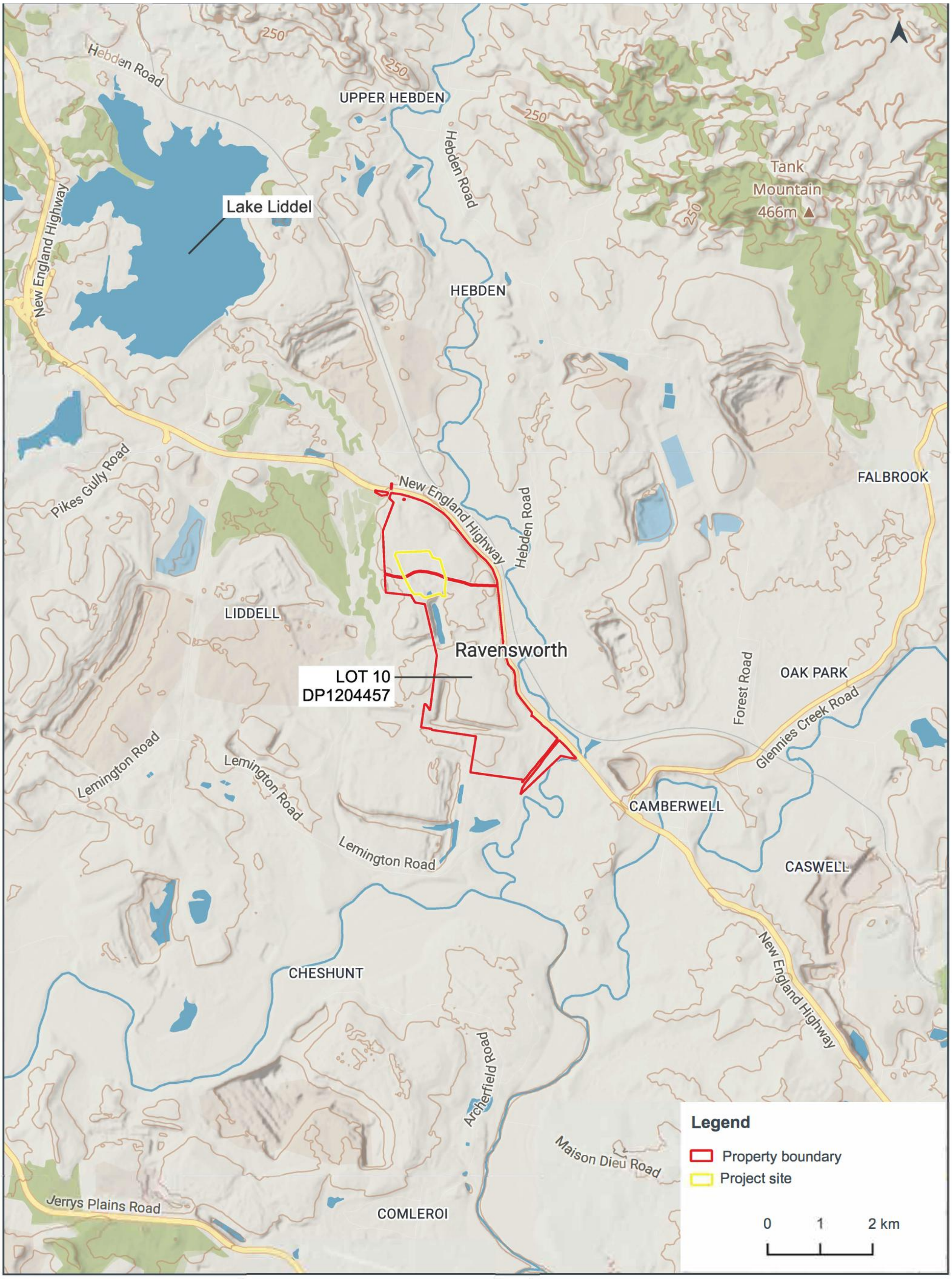
Site traffic and transport context

This site is located close to Singleton (15km to the southeast) and Muswellbrook (20km to the northwest).

Access to the facility is provided via an internal access road off Lemington Road, which connects to the New England Highway about 2 km south of Ravensworth village.

Given the rural nature of the site and the scale of the Ravensworth Operations complex, there are no public transport services and walking and cycling facilities in the vicinity of the facility. All travel demand is catered for by car.

Figure 1 Site location and context



Source: Element Environment, 2025

Existing facility traffic operations

The facility operates from Monday to Saturday from 6:00 am to 6:00 pm. No work is undertaken on Sundays or public holidays. The facility is currently permitted to process up to 200,000 tpa of organic material. However, the current development consent specifies that it is not permitted to receive or process food organic recovered material.

Ten full-time administrative and operational staff are employed at the facility.

Up to 19 light vehicles (cars) and 54 heavy vehicles (trucks) access the facility every day, totalling up to 146 vehicle movements per day (73 inbound and 73 outbound movements).

A staff parking area is provided adjacent to the site office. Trucks entering the site are unloaded directly on the processing pad. Parking for trucks is available adjacent to the processing pad if trucks are required on-site for an extended period.

Project description

Modification 3 seeks to allow the receival and processing of FOGO recovered material at the facility and increase the processing volume of the facility to 250,000 tpa over the next ten years.

This would require the installation of a weighbridge and the employment of three additional staff. Up to five more cars and 14 more trucks would access the facility per day to process the additional recovered material during operation.

No changes are proposed to the existing development footprint, site infrastructure (other than the weighbridge), equipment and plant, or approved operating hours. Modification 3 does not involve any vegetation removal or bulk earthworks. From a transport perspective, no changes are proposed to existing transportation routes, public or active transport infrastructure, parking or property access, and no road upgrades are required for the project. The construction of the weighbridge would temporarily generate up to eight car and two truck movements daily (two-way combined), with four additional staff required during construction.

The proposed site layout is shown in **Figure 2**.

Traffic and transport impacts

Road network

Traffic modelling of the New England Highway | Lemington Road intersection was undertaken as part of the TIA to inform the original SSD-9418 application[1]. The modelling considered two modelling years: 2018 and 2028 (ten years after development completion), each with a base traffic scenario and a scenario with development traffic. The additional development vehicle movements added were 32 car movements and 114 truck movements per day.

The results showed that, in 2028 with development traffic, the intersection would perform at a good level with service with acceptable delays and about 60-70 percent spare capacity during both AM and PM peak hours. The modelling also indicated that the traffic impact of the development traffic was minimal with no deterioration in average delay, level or service or queue length when development traffic was added.

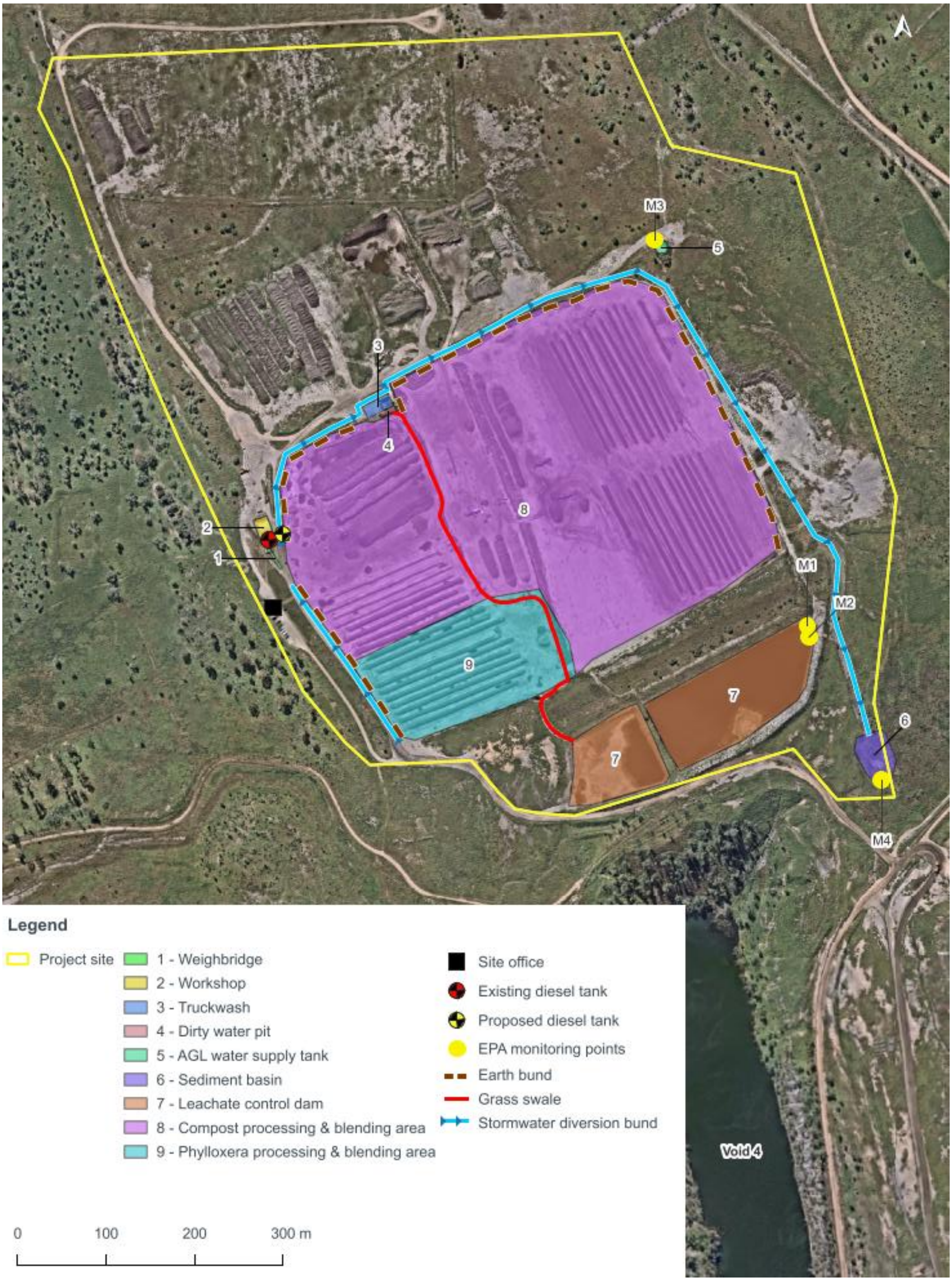
With regard to proposed Modification 3, it is estimated that the project would generate up to 8 car and 2 truck movements per day during construction (inbound and outbound combined) and 10 car and 28 truck movements per day once operational (inbound and outbound combined). Hence, the operational stage would have the larger impact, as it is forecast to generate more traffic.

Once operational, the project is expected to generate 5 car movements inbound in the AM peak and outbound in the PM peak representing staff travel to/from the facility, while up to 3 truck movements would occur in an hour, as truck travel tends to be spread out throughout the 10 hours of operations from 6.00am to 6.00 pm. Therefore, Modification 3 could generate up to 8 vehicle movements during a peak hour. These vehicle trips can be viewed as very low (less than one per cent) compared to the existing 1,000–1,200 vehicles travelling through the intersection during peak hours, as reported in the previous TIA.[1]

Based on the low forecast traffic volumes generated, and the fact that a much larger volume of additional traffic was tested in the original TIA, with minimal impact on intersection performance, the impact of Modification 3 on the operation of the New England Highway | Lemington Road intersection is also likely to be minimal. The intersection would still operate at a satisfactory level of service with spare capacity.

[1] Pavey Consulting Services, 2020, *Traffic Impact Assessment Rev 1*.

Figure 2 Proposed site layout



Source: Element Environment, 2025

Public transport impacts

The project would generate a small number of vehicle movements during peak hours and throughout the day. Given the lack of public transport services in the vicinity of the site, the additional traffic is unlikely to affect any public transport operations.

Active transport (pedestrians and cyclists) impacts

Given the site would not generate additional active transport demand and the absence of active transport infrastructure in the vicinity of the site, there would be no impact on the active transport network.

Conclusions

Bettergrow is applying for Modification 3 to SSD-9418, which would allow the facility to receive and process FOGO recovered material and increase its processing volume to 250,000 tpa over ten years.

This TIA has been prepared to identify potential impacts on traffic and transport associated with the project. The project would generate up to 10 car movements and 28 truck movements per day once operational (inbound and outbound combined).

Based on the findings of this assessment, the project is expected to have a minimal impact on the operation or performance of the local or regional transport network compared to what has already been approved. As the project would also have minimal impact on public transport, active transport, road safety and emergency vehicle movements, no mitigation measures are deemed necessary.

Yours sincerely

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