



Shoalhaven City Council

West Nowra Recycling and Waste Facility Air Quality Management Plan

April 2021

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Appendix A – Example odour survey form

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Glossary

Acronym/Terms	Definition
AQMP	Air Quality Management Plan
AWS	Automatic weather station
BOM	Bureau of Meteorology
DPIE	Department of Planning, Industry and Environment
EPA	Environment Protection Authority
EPL	Environment Protection Licence
LEMP	Landfill Environmental Management Plan
NSW	New South Wales
OU	Odour Unit
PIRMP	Pollution Incident Response Management Plan
PM ₁₀	Particulate matter less than 10 µm in aerodynamic equivalent diameter
PM _{2.5}	Particulate matter less than 2.5 µm in aerodynamic equivalent diameter
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
SCC	Shoalhaven City Council
SSD	State Significant Development
TSP	Total Suspended Particulates

1. Introduction

1.1 Background

Shoalhaven City Council (SCC) currently operates and manages the West Nowra Recycling and Waste Facility (the Facility) at Flatrock Road, Mundamia. SCC recently received development consent for the extension of the landfill to an area south-east of the existing Facility (known as the Stage 4 landfill extension area or “the site”) on 11 May 2020 (SSD-7187).

The existing landfill at the Facility (Stages 1-3) operates in accordance with a Landfill Environmental Management Plan (LEMP) prepared in 2019 by SCC and Environment Protection Licence (EPL) No. 5877. An LEMP has been prepared for the Stage 4 landfill extension area only, however it considers relevant components of the existing Facility where necessary. The remainder of the Facility (Stages 1-3) will continue to be managed in accordance with the existing LEMP (SCC, 2019).

The LEMP for the Stage 4 landfill extension area includes this Air Quality Management Plan (AQMP).

1.2 Purpose

The purpose of this AQMP is to provide an appropriate management framework and site-specific procedures to manage air quality emissions from the Stage 4 landfill extension area, in line with the required environmental outcomes.

In addition, this Plan specifically addresses Schedule 2, Conditions B30 to B31 and C1 of the development consent. The specific conditions of consent relating to this Plan are set out in Table 1-1.

1.3 Objectives

During the operation of Stage 4 landfill extension area, air quality management measures will need to be implemented in order to comply with environmental and legal obligations set under the Development Consent and EPL No. 5877. The AQMP outlines the basis and strategy to appropriately manage air emissions from the Stage 4 landfill extension area to achieve the relevant requirements. This includes the following:

- Identification of air quality and odour objectives and targets.
- Identification and ranking of all sources of emissions to air.
- An odour risk assessment.
- Identification of air quality control measures.
- Description of an air quality monitoring program capable of evaluating the performance of the operation and determining compliance with key performance indicators.
- Identification of corrective actions to reduce odour impacts.
- Description of a communications strategy.

1.4 Compliance with consent conditions

The development consent contains a number of conditions with regards to the environmental management of the site. Specifically, Schedule 2, Conditions B30 to B31 and C1 in Table 1-1 provide details about the requirements for this plan.

Table 1-1 Compliance with consent conditions

Consent condition	Description	Relevant section
B30	Prior to the commencement of clearing works for the development, the Applicant must prepare an Air Quality Management Plan (AQMP) to the satisfaction of the Planning Secretary. The AQMP must form part of the LEMP required by condition C2. The AQMP must:	Refer to this document and overarching LEMP
	(a) Be prepared by a suitably qualified and experienced person(s) whose appointment has been endorsed by the Planning Secretary	SCC has engaged GHD Pty Ltd to complete this AQMP, written and overseen by air quality specialists
	(b) Consider both particulate emissions and odour impacts	Refer to Section 5
	(c) Describe the objectives and targets, including specific reference to the offensive odour provision under Section 129 of the <i>Protection of the Environment Operations Act, 1997</i> ;	Refer to Section 3
	(d) Include a risk assessment to evaluate the odour;	Refer to Section 6
	(e) Detail and rank all emissions from all sources of the development, including particulate emissions;	Refer to Section 5
	(f) Describe a program that is capable of evaluating the performance of the operation and determining compliance with key performance indicators;	Refer to Section 8
	(g) Identify the control measures that that will be implemented for each emission source	Refer to Section 7
	(h) Nominate the following for each of the proposed controls: (i) key performance indicator; (ii) monitoring method; (iii) location, frequency and duration of monitoring; (iv) record keeping; (v) complaints register must document investigations undertaken to identify the causes(s) of and action(s) taken to rectify any complaints received; (vi) response procedures; and (vii) compliance monitoring.	Refer to Section 7 and Section 8
	(i) Include contingencies strategies to reduce odour impacts;	Refer to Section 7
	(j) Establish a communications strategy so that affected neighbours are kept informed about the operation of the facility and are consulted about aspects of the operation likely to result in particulate emissions and odour;	Refer to Section 7
	(k) System and performance review for continuous improvement.	Refer to Section 1.5
B31	The Applicant must:	
	(a) Not commence construction until the AQMP required by condition B30 is approved by the Planning Secretary;	Refer to Section 1.5

Consent condition	Description	Relevant section
	(b) Implement the most recent version of the AQMP approved by the Planning Secretary for the duration of the development.	Refer to Section 1.5
C1	Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:	
	(a) detailed baseline data;	Refer to Section 2 and Section 4
	(b) details of: (i) the relevant statutory requirements (including any relevant approval, licence or lease conditions); (ii) any relevant limits or performance measures and criteria; and (iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	Refer to Section 3
	(c) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	Refer to Section 7 and Section 8
	(d) a program to monitor and report on the: (i) impacts and environmental performance of the development; (ii) effectiveness of the management measures set out pursuant to paragraph (c) above;	Refer to Section 8
	(e) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	Refer to Section 7
	(f) a program to investigate and implement ways to improve the environmental performance of the development over time;	Refer to Section 7 and Section 8
	(g) a protocol for managing and reporting any: (i) incident and any non-compliance (specifically including any exceedance of the impact assessment criteria and performance criteria); (ii) complaint; (iii) failure to comply with statutory requirements; and	Refer to Section 8 and overarching LEMP
	(h) a protocol for periodic review of the plan	Refer to Section 1.5

1.5 Revisions and updates

This AQMP is not a static document. It is a working document that requires regular review and updating to ensure ongoing suitability and effectiveness for environmental management in the Stage 4 landfill extension area.

This AQMP shall be reviewed and updated regularly:

- To remain consistent with relevant regulations and guidelines.
- Should improvements to the management measures be required.

- To take advantage of new technologies, innovations and methodologies that are superior to the management measures presented in the current version of the AQMP.
- After changes are made with regards to landfill operations that may affect management measures in the current version of the AQMP.
- If there are repeated non-conformances against air quality objectives and targets outlined in Section 3.4
- In the event of repeat complaints (more than once for the same aspect).

Changes made to the AQMP, as well as the reasons for the changes made, will be documented as part of the review process. Copies of the original AQMP, as well as all future versions of the AQMP, shall be retained by SCC and made available at prominent locations such as the weighbridge office, staff amenities etc. The most recent version approved by the Department of Planning, Industry and Environment will be implemented.

At a minimum, this document will be reviewed and updated every 5 years from commencement of operation and prior to the commencement of each landfill cell.

1.6 Limitations

This plan has been prepared by GHD for Shoalhaven City Council and may only be used and relied on by Shoalhaven City Council for the purpose agreed between GHD and the Shoalhaven City Council as set out in Section 1.2 of this plan.

GHD otherwise disclaims responsibility to any person other than Shoalhaven City Council arising in connection with this plan. GHD also excludes implied warranties and conditions, to the extent legally permissible.

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

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

2. Site overview

2.1 General

Site overview information relevant to this AQMP are described below, with further information available in the LEMP.

2.2 Location and surrounding land uses

The Facility is located at the northern end of Flatrock Road, Mundamia. The Facility encompasses approximately 65 hectares of land, with the Stage 4 landfill extension area predominantly set within previously undeveloped bushland.

Semirural properties are located to the south and south-east of the Facility. The main township of Nowra is located approximately 4.5 km to the east of the site.



Figure 2-1 Stage 4 landfill extension area (source: Google Earth)

2.3 Land ownership, zoning and description

The Facility is located on parcels of land owned by SCC. SCC is the authority for the operation and management of the Facility.

The principal environmental planning instrument applying to properties in the Shoalhaven Local Government Area is the Shoalhaven Local Environmental Plan 2014 (SLEP, 2014).

Details of land parcels, zoning and zoned land use applicable to the Facility are summarised in Table 2-1.

Table 2-1 Property details

Lot No.	DP No.	Area (ha)	Zone and zoned land use	Address
436	808415	8.29	SP2 Infrastructure – Waste / Resource Management Facility	Flatrock Road, Mundania, NSW
1	1018196	13.04	SP2 Infrastructure – Waste / Resource Management Facility	120 Flatrock Road, Mundania, NSW
1	847203	8.96	SP2 Infrastructure – Waste / Resource Management Facility	Flatrock Road, Mundania, NSW
1	870268	20.33	SP2 Infrastructure – Waste / Resource Management Facility	Flatrock Road, Mundania, NSW
1	1104402	14.52	SP2 Infrastructure – Waste / Resource Management Facility	Flatrock Road, Mundania, NSW

The Facility commenced operations in 1979, accepting domestic, industrial, commercial liquid, solid wastes and hazardous wastes including asbestos and oil. Landfilling practices originally involved the excavation and filling of a series of trenches. Operations have since progressed to comply with the NSW EPA Landfill Guidelines. The Facility no longer accepts liquid wastes and only small quantities of asbestos waste (SCC, 2019).

Operationally, the Facility is divided into several stages:

- Stage 1: “Old” unlined landfill, stockpile and irrigation areas, and landfill gas extraction comprising the northern portion of the Facility.
- Stage 2: Completed lined landfill areas, now used for stockpiling and landfill gas extraction. Irrigation area to be relocated to this area when Stage 4 is initiated.
- Stage 3: Active lined landfilling of solid waste and wet weather tipping areas, and future landfill gas extraction area.
- Stage 4: Proposed lined landfilling areas for solid waste, and future landfill gas extraction.

2.4 Physical environment

2.4.1 Topography and hydrology

Stages 1, 2 and 3 of the Facility are located on the western side of a north-south ridge line (approximately 50 m AHD) with Stage 4 on the eastern side of the ridge. Each side slopes downwards to the local creek lines running parallel to the site boundaries on the east and west side (Cabbage Tree Creek and Sandy Creek respectively). Natural surface water flows would generally be expected to follow the local topography.

There are no natural, major surface water features on the site, however there is a leachate dam adjacent to the western site boundary.

The Facility is located within the Shoalhaven Catchment, and is approximately 1.5 km south and 2.5 km east of the Shoalhaven River. The local area is drained by two tributary creeks; Sandy Creek (170 m to the west of the Facility) and Cabbage Tree Creek (250 m to the east of the Facility) which flow in a northerly direction into the Shoalhaven River.

The EIS (Arcadis, 2019) states that there is no available baseline water quality data for Cabbage Tree Creek. The limited monitoring data collected from Sandy Creek, indicates water in Sandy Creek has low dissolved oxygen, is typically acidic (pH < 6.5) and the conductivity ranges from 460 – 1850 uS/cm.

2.4.2 Geology and soils

The Facility is underlain by Nowra Sandstone and Wandrawandian Siltstone of the Permian aged, Shoalhaven Group (SCC, 2008). The Nowra Sandstone consists typically of quartz sandstone and the Wandrawandian Siltstone consists typically of siltstone and sandy siltstone.

SLR (2018) states that typical geology in the area comprises sandstone overlain by up to 7.0 m of sandy clay. Based on an investigation by Coffey (2016), SLR (2018) described the bedrock profile as being variable, ranging from moderately to heavily weathered.

The soil profile at the Facility comprises typically, from top to bottom (Maunsell, 1991):

- Grey loam (approximately 50-100 mm thick).
- Yellow / white silty clay (approximately 200 mm thick).
- Yellow clay (approximately 300 mm thick).
- Red / yellow / white clay (>1,600 mm thick).

Sandstone bedrock across the site is likely to be variably and often deeply weathered (Forbes Rigby, 1996).

The Stage 4 area comprises silty topsoils underlain by sandy or silty clays, with sandstone bedrock occurring at depths from 2.5 m to 4.5 m below ground surface among the locations investigated by Coffey (2016).

Based on the Australian Soil Resource Information System (ASRIS), SLR (2018) stated that the site has no known occurrences of Acid Sulfate Soils (ASS), and based on elevation, ASS is not anticipated to be encountered on site or in the local area.

2.4.3 Groundwater and hydrogeology

According to ENRS (2018), groundwater in the area is expected to be associated with two primary forms of aquifer systems;

1. Shallow unconfined alluvial and unconsolidated systems, generally less than 20 m in depth with low transmissivity and variable water quality strongly controlled by rainfall recharge.
2. Deep fractured rock and dual porosity aquifers hosted by the Shoalhaven Group sedimentary rock sequence. Typically deeper than 20 m, at depths significantly greater than the interface with the landfill activities. Similarly low transmissivity, high iron concentrations and variable salinity.

Stage 1 areas are underlain almost everywhere by a deep soil profile, underlain by weathered sandstone, that is highly permeable and can be water bearing if sufficient flow occurs (Forbes Rigby 1996). The major source of groundwater to Stage 1 areas is from the east; it is believed that groundwater flows south-west and downslope from Stage 1 areas towards Sandy Creek.

A water bearing zone and, in some cases, two zones at different depths, were identified during a groundwater investigation by Forbes Rigby (1996). The depth to both water bearing zones were approximately 2 m to 3 m below ground level (bgl). The upper water bearing zone is a semi-confined aquifer between bedrock and overlying soils.

Coffey (2016) interpolated the groundwater table in Stage 4 areas as being between 5 m to 12 m below ground level (BGL) with ground level being the existing natural surface, but noted that the groundwater table may rise after Stage 3 is completed and capped. SLR (2018) noted that the groundwater table may fluctuate up to 5 m with rainfall and seasonal variations. Further review of groundwater elevation was undertaken by SLR (2019) and concluded that groundwater fluctuations due to rainfall were limited.

Groundwater in Stage 4 is understood to flow predominately east and discharges to Cabbage Tree Creek (Coffey 2016). SLR (2018) states that Coffey (2016) considered the primary source of groundwater recharge to be rainfall.

2.4.4 Local climate

The nearest Bureau of Meteorology (BOM) automatic weather station (AWS) to the site is the Nowra RAN Air Station AWS (Site No. 068072) located approximately 7.5 km from West Nowra.

Details from the BOM on climatic distribution throughout the year are shown in Table 2-2.

Table 2-2 Climate data from AWS 068072 (2000-2020¹)

Month	Mean min temp (°C)	Mean max temp (°C)	Mean rainfall (mm)	Mean 9 am wind speed (km/h)
Jan	16.8	27.8	64.2	11.5
Feb	16.7	26.5	145.9	11.7
Mar	15.1	25.3	109.0	11.7
Apr	12.5	22.9	62.5	13.7
May	9.2	19.8	47.6	14.8
Jun	7.7	17.0	111.9	16.8
Jul	6.7	16.8	66.8	16.8
Aug	6.8	18.1	80.1	18.1
Sep	8.7	21.1	40.7	16.8
Oct	10.7	23.2	63.5	14.7
Nov	13.5	24.9	72.9	12.7
Dec	15	26.3	73.4	12.2
Mean	11.6	22.5	78.2	14.3
Annual	11.6	22.5	871.9	14.3

¹ Data accessed from the BOM website http://www.bom.gov.au/climate/averages/tables/cw_068076_All.shtml on 29th October 2020

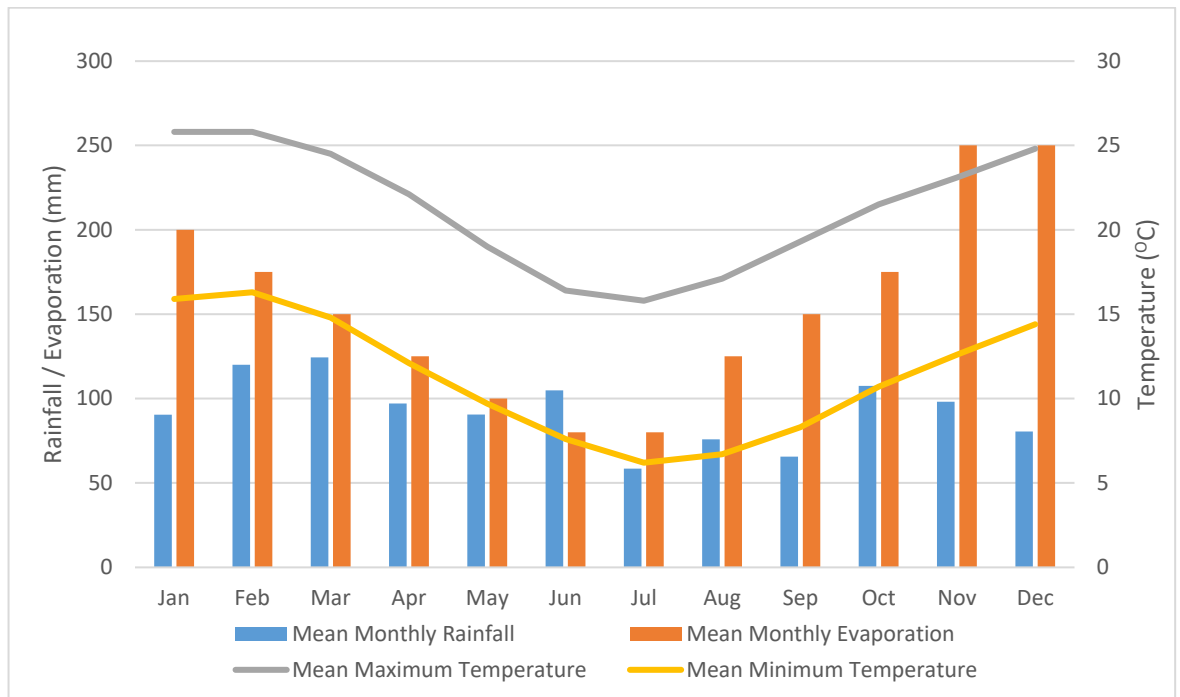


Figure 2-2 Climate statistics

The data shown in Figure 2-2 indicates the following:

- Mean monthly maximum and minimum temperatures are lowest during winter months (June to August) and highest during the summer months (December to February).
- Mean monthly rainfall varies across the year with the lowest during late autumn months and late winter / early spring (July to September) and highest during the end of summer / beginning of autumn (February to March).
- Estimated monthly evaporation is lowest during winter months (May to July) and highest during late spring and summer months (November to February).
- Estimated monthly evaporation exceeds mean monthly rainfall for most months and estimated annual evaporation exceeds the estimated annual rainfall.

Long term wind data (9 am and 3 pm) for the Nowra RAN Air Station AWS are presented as wind roses in Figure 2-3 and Figure 2-4. The wind roses show winds from the northwest dominating during the morning while afternoon winds are more variable. Winds are also stronger in the afternoon than during the morning.

Rose of Wind direction versus Wind speed in km/h (01 Dec 1955 to 26 Nov 2000)

Custom times selected, refer to attached note for details

NOWRA RAN AIR STATION

Site No: 068076 • Opened Jan 1942 • Closed Nov 2000 • Latitude: -34.9449° • Longitude: 150.545° • Elevation 109m

An asterisk (*) indicates that calm is less than 0.5%.

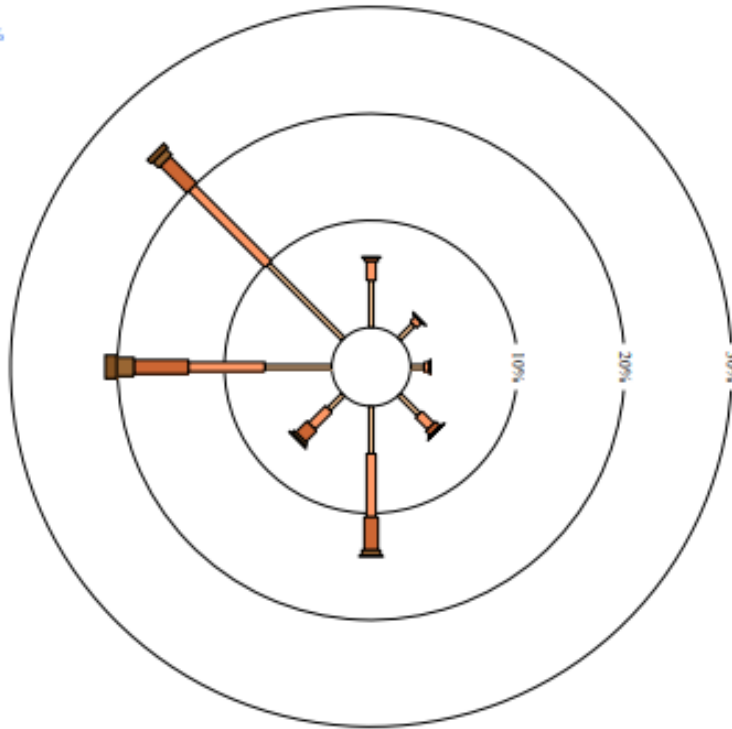
Other important info about this analysis is available in the accompanying notes.



9 am

15996 Total Observations

Calm 18%



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 Prepared by the Bureau of Meteorology.
 Contact us by phone on (03) 9589 4082, by fax on (03) 9669 4515, or by email on climate.data@bom.gov.au
 We have taken all due care but cannot provide any warranty nor accept any liability for this information.

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Figure 2-3 Nowra RAN Air Station AWS 9 am Wind Rose

Rose of Wind direction versus Wind speed in km/h (01 Dec 1955 to 26 Nov 2000)

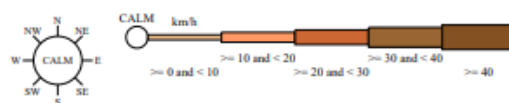
Custom times selected, refer to attached note for details

NOWRA RAN AIR STATION

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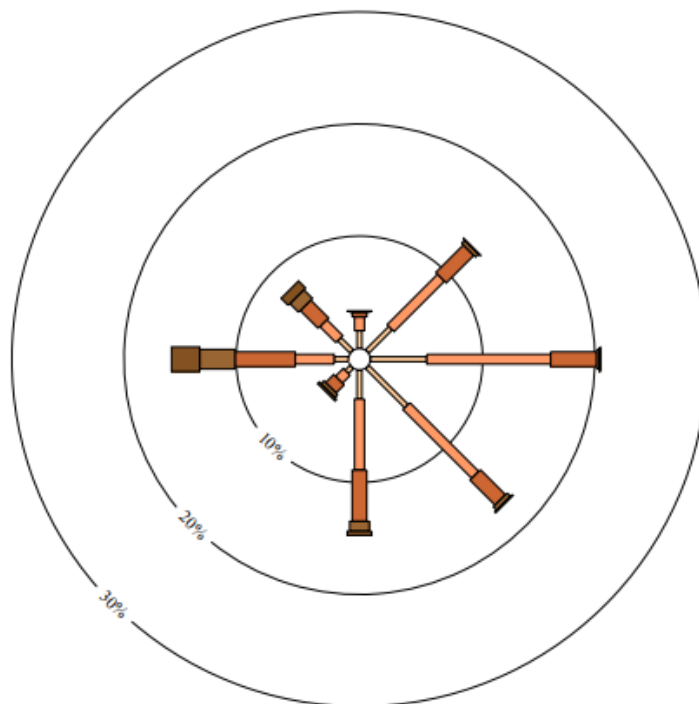
An asterisk (*) indicates that calm is less than 0.5%.

Other important info about this analysis is available in the accompanying notes.



3 pm
15995 Total Observations

Calm 5%



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Figure 2-4 Nowra RAN Air Station AWS 3 pm Wind Rose

3. Regulatory requirements

3.1 General

The following regulatory guidance documents have been considered in preparing this plan:

- Development Consent – West Nowra Landfill Extension (SSD-7187)
- Environment Protection Licence No. 5877, issued under the *Protection of the Environment Operations Act 1997*
- NSW Department of Environment and Conservation (2006). Technical Framework – Assessment and Management of Odour from Stationary Sources in NSW (henceforth referred to as the Technical Framework)
- NSW EPA (2016). Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (henceforth referred to as the Approved Methods)
- *Protection of the Environment Operations Act 1997* (henceforth referred to as the POEO Act)
- *Protection of the Environment Operations (Clean Air) Regulation 2010* (henceforth referred to as the Clean Air Regulation)

3.2 Consent conditions

Consent conditions have been defined in the development consent received on 11 May 2020. These conditions are required to:

- Prevent, minimise, or offset adverse environmental impacts.
- Set standards and performance measures for acceptable environmental performance.
- Require regular monitoring and reporting.
- Provide for the ongoing environmental management of the development.

The consent conditions relevant to this ONMP have been discussed in Section 1.4.

3.3 Environmental protection licence

EPLs are issued under Section 55 of the *Protection of the Environment Operations Act 1997* (POEO Act). Details of EPL No. 5877 for the Facility are contained in Table 3-1 below.

Table 3-1 EPL No. 5877 details

Item	Description
License number	5877
Anniversary date	30-October
Review period	Every 5 years
Licensee	Shoalhaven City Council PO Box 42 Nowra NSW 2541
Premises	West Nowra Recycling and Waste Facility Flat Rock Road Mundamia NSW 2540
Scheduled activity	• Composting • Waste disposal (application to land) • Waste processing (non-thermal treatment) • Waste storage
Fee based activity	• Composting (> 5000-50,000t annual capacity to receive organics)

Item	Description
(and scale)	• Non-thermal treatment of general waste (Any annual processing capacity) • Waste disposal by application to land (Any capacity) • Waste storage – other types of waste (Any other types of waste stored)
Region	Regional Waste Compliance 59-61 Goulburn Street Sydney NSW 2000 Phone: (02) 9995 5000 Fax: (02) 9995 5999 PO Box A290 Sydney South NSW 1232

Specific to this AQMP, EPL No. 5877 contains the following requirements:

- Condition L4.1: The licensee must not cause or permit the emission of offensive odour beyond the boundary of the premises.
- Condition O3.1: All operations and activities occurring at the premises must be carried out in a manner that will minimise the emission of dust from the premises.

3.4 POEO Act and Clean Air Regulation

The POEO Act provides the statutory framework for managing pollution in NSW, including the procedures for issuing licences for environmental protection on aspects such as waste, air, water and noise pollution control.

The POEO Act requires that no occupier of any premises causes air pollution (including odour) through a failure to maintain or operate equipment or deal with materials in a proper and efficient manner. The operator must also take all practicable means to minimise and prevent air pollution (sections 124, 125, 126 and 128 of the POEO Act).

The POEO Act includes the concept of 'offensive odour' (Section 129) and states it is an offence for scheduled activities to emit 'offensive odour'.

The Clean Air Regulation provides regulatory measures to control emissions from motor vehicles, fuels, and industry.

3.5 Technical Framework

The Technical Framework provides a legislative context for the control of odour and presents odour assessment criteria guidelines. It provides a framework for different levels of odour assessment, strategies to mitigate odour, and guidance for performance monitoring, regulation and enforcement.

3.6 Approved Methods

The Approved Methods lists the statutory methods for modelling and assessing emissions of air pollutants from stationary sources in NSW. It considers the above-mentioned legislation and guidance to provide pollutant assessment criteria.

3.7 Air quality objectives and targets

Air quality and odour key performance indicators and targets for the site are outlined in Table 3-2. Key performance objectives are to ensure dust and odour are minimised and are not impacting on nearby receptors.

Table 3-2 Air quality and odour key performance indicators and targets

Emission type	Key performance indicators/targets
Dust	• No visible dust from the site beyond the boundary of the site. • All on site staff adequately trained in dust minimisation procedures and techniques. • No dust complaints. • Complaint based TSP and PM₁₀ monitoring as required.
Odour	• Meet the requirements of Section 129 of the POEO Act. • Achieving no detectable offensive odours (less than 5 OU, cumulative) at the nearest residential receptor. • No odour complaints.

4. Existing air quality (baseline data)

4.1 Background dust

No ongoing air quality sampling is undertaken at the site. The site does not have a history of dust or odour issues or complaints.

Baseline air quality data was sourced from the Bargo Department of Planning, Industry and Environment (DPIE) ambient air quality monitoring station located approximately 62 kilometres north of the Facility. It is acknowledged that the Albion Park South monitoring station is located closer to the Facility (approximately 40 kilometres north of the Facility), however it is situated in a more urbanised environment. Therefore the recorded air quality concentrations are potentially influenced by vehicle emissions which would be uncharacteristic of the environment surrounding the site. Therefore, data from the Bargo monitoring station was adopted as the environment surrounding the Bargo station is considered more similar to that of the site.

Ambient air quality concentrations are shown in Table 4-1 and Figure 4-1. It should be noted that monitoring of ambient PM_{2.5} concentrations commenced in December 2016.

The spike in PM₁₀ and PM_{2.5} concentrations observed in late 2019 and early 2020 is primarily attributed to bushfires that occurred throughout New South Wales at that time.

Table 4-1 Ambient air quality concentrations (µg/m³)

Pollutant	Averaging period	Background concentration at Bargo monitoring station (µg/m ³)				
		2016	2017	2018	2019	2020
PM ₁₀	24 hour maximum	58.4	53.5	60.8	188.9	265.7
	Annual average	14.2	13.9	16.9	21.2	15.9
PM _{2.5}	24 hour maximum	11.5	20.9	38.1	170.7	121.9
	Annual average	7.2	6.3	6.8	10.4	7.8

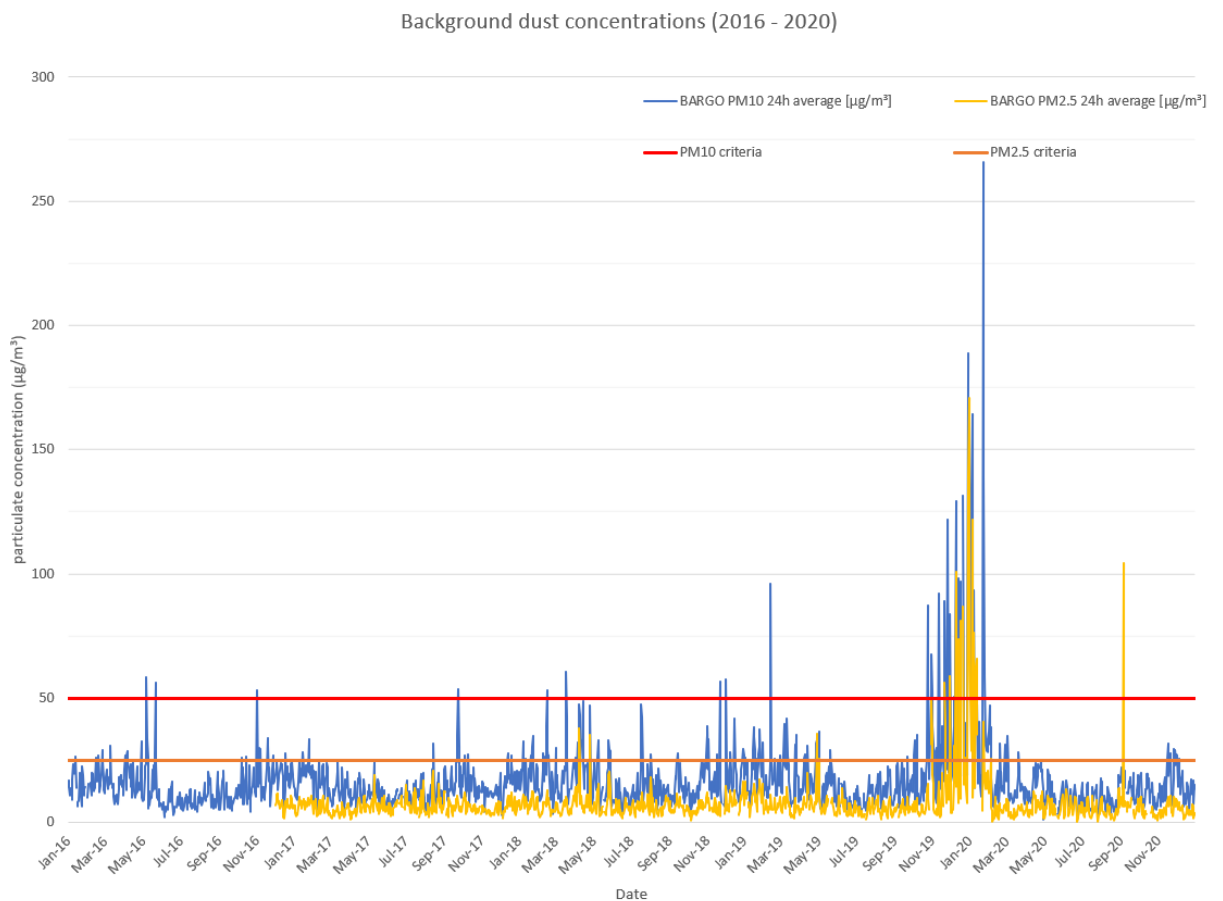


Figure 4-1 Ambient dust concentrations recorded at Bargo DPIE monitoring station, 2016 – 2020 ($\mu\text{g}/\text{m}^3$)

4.2 Background odour

The Facility is the main source of odour in the local area. There are no other identified sources of odour which may contribute to cumulative odour levels at nearby sensitive receptors.

The Facility contains various odour sources external to the Stage 4 landfill extension area including the leachate dam, composting activities and capped areas of completed landfill. These sources are likely to contribute to off-site odour concentrations.

A summary of odour complaint data from 2006 to 2019 is provided in Table 4-2. It was identified that the three complaints occurred when waste is stored at the licenced wet weather tipping area and is subsequently resolved when the waste is relocated from the wet weather tipping area to the active tipping face.

Based on the relatively low number of odour complaints received and none since 2014, the Facility has demonstrated competency with regards to odour management.

Table 4-2 Summary of odour complaints (2006 to 2019)

Date of complaint	Complaint details	Actions
1 April 2014	Alleged odour complaint on 1 April 2014. Neighbouring resident confirmed that strong odours had been strong for three days.	Relocation of waste from licenced wet weather tipping area to active landfilling area - waste covered daily to reduce the likelihood of odours.
7 June 2013	Alleged odour complaint on 6 June 2013. Neighbouring resident confirmed that this was the first time in 7 years of living there that the odour had occurred.	Relocation of waste from licenced wet weather tipping area to active landfilling area - waste covered daily to reduce the likelihood of odours. Recent wet weather and low cloud cover over the last few days not assisting.
6 July 2010	Alleged odour complaint	Complaint investigated, and site inspection carried out. Due to wet weather, waste temporarily disposed at wet weather tip. Waste transferred from wet weather tipping area to the new landfill cell may have caused the alleged odour.

5. Potential emission sources

5.1 Overview

This section lists the potential dust and odour emissions sources across the Stage 4 landfill extension area. Air quality objectives and targets for each emission type are provided in Section 3.4.

5.2 Sensitive receivers

The location of the sensitive receivers around the Stage 4 landfill extension area is shown in Figure 5-1.

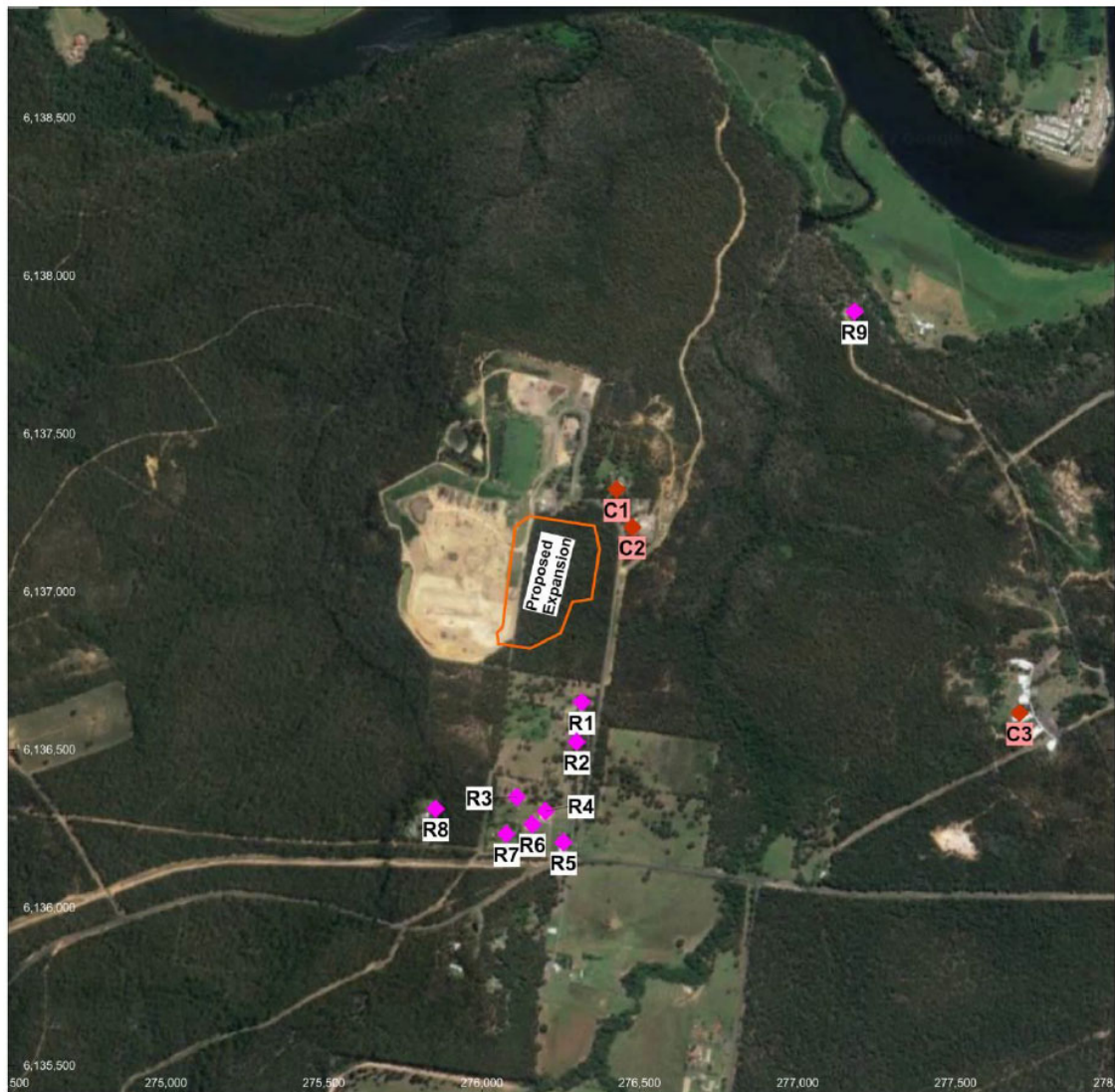


Figure 5-1 Sensitive receiver locations

5.3 Dust

Potential sources of dust at the Stage 4 landfill extension area include (ordered from most dust generating to least dust generating based on the PM₁₀ emission rates presented in SLR (2019a)):

- Scrappers
- Hauling excavated materials to stockpiles

- Hauling waste to waste disposal area
- Wind erosion – landfill sub-cell 1
- Wind erosion – stockpile
- Unloading excavated materials
- Excavator – landfill sub-cell 1
- Bulldozer – landfill sub-cell 1
- Compactor on active face
- Hauling waste to tipping face – unpaved road
- Excavator – leachate drainage
- Unloading waste at tipping face
- Wind erosion – tipping face

5.4 Odour

Potential sources of odour at the Stage 4 landfill extension area include (ordered from most odorous to least odorous based on the Odour Emission Rate (OU.m³/s) presented in SLR (2019a)):

- Intermediate cover.
- Leachate irrigation area.
- Leachate dam.
- Daily cover.
- Active waste disposal area.

6. Odour risk assessment

6.1 Overview

This odour risk assessment was informed by the dispersion modelling undertaken by SLR (2020) in support of the proposed Stage 4 landfill extension of the Facility. A risk based approach that considered the results of the odour dispersion modelling was adopted.

6.2 Risk assessment

6.2.1 Odour sources

Potential sources of odour from the landfill at the Stage 4 landfill extension area are outlined in Section 5, the greatest of which was identified to be intermediate cover.

Cumulative odour emissions from the Facility estimated by SLR (2020) are provided in Table 6-1. It should be noted that proposed Stage 4 landfill extension area operations are estimated to account for 36.4% of Facility wide odour emissions.

Therefore the majority of Facility odour emissions were estimated to occur from composting activities which are not considered in this AQMP. As mentioned in Section 4.2, off site odour impacts may occur despite effective management of Stage 4 landfill extension area odour sources due to odour emissions from other areas of the Facility.

Table 6-1 Cumulative odour emissions from the Facility (SLR, 2020)

Source	Odour Emission Rate (OU.m ³ /s) ²
Proposed Stage 4 landfill extension area landfill operations ³	9,548
Composting (current and proposed)	16,743

6.2.1 Odour assessment predictions

Predicted odour concentrations from cumulative operations of the Facility at each sensitive receptor by SLR (2020) are provided in Table 6-2. No exceedances of the 5 OU criterion were predicted.

² Odour Emission Rates were sourced from SLR (2020)

³ Leachate dam removed from proposed operations

Table 6-2 Predicted odour concentrations (SLR, 2020)

Receptor	Predicted Odour Concentration (ou, 99.9th percentile, nose-response time)			
	Average SOERs for Landfill Sources		Maximum SOERs for Landfill Sources	
	Current Operations	Proposed Operations	Current Operations	Proposed Operations
R1	0.4	1.1	0.5	1.1
R2	0.3	0.7	0.4	0.7
R3	0.4	0.6	0.4	0.6
R4	0.3	0.5	0.3	0.5
R5	0.2	0.4	0.2	0.4
R6	0.3	0.4	0.3	0.5
R7	0.3	0.4	0.3	0.5
R8	0.3	0.5	0.3	0.6
R9	0.5	0.7	0.5	0.7
C1	1.1	3.9	1.2	3.9
C2	0.8	3.9	0.9	3.9
C3	0.1	0.2	0.1	0.2

6.2.2 Risk of odour impacts

Based on odour dispersion predictions undertaken by SLR (2020) the risk of future odour impacts resultant from the Stage 4 landfill extension area is considered low if the outcomes of this AQMP are implemented.

The Facility has experience with effective odour management and has demonstrated competency as reflected by the low number of odour complaints received and that they only occur during adverse wet weather conditions when the licenced wet weather tipping area is used.

7. Management measures and controls

7.1 Overview

The main features of the air quality and odour management strategy is based on prevention, mitigation and rectification. The mitigation and rectification measures will be implemented as required and their exact details will be based on a case by case situation depending on the issue and technical solutions available at the time. The proposed management strategies are described in the following sections.

7.2 Dust management measures and control

Prevention measures

- Prepare dust management education material for inclusion in site inductions, training and daily toolbox meetings.
- Plan earthworks, landfill operations, rehabilitation and construction activities to keep exposed areas to a minimum and schedule major dust generating activities to occur one at a time.
- Implement on site traffic and operational controls to prevent unnecessary dust generation from vehicle movements including regularly watering access roads, inspect incoming trucks to ensure trucks transporting material are covered and that tailgates are firmly fixed, enforcing speed limits and operating wheel washing facilities at exits from unsealed roads for use during wet conditions.
- Do not undertake dust generating activities during adverse weather conditions when visible plumes of dust are observed to leave the Facility boundary.

Mitigation measures

- Perform daily inspections for visible dust emissions along the site boundary of the Facility (refer Section 8 for details).
- Use dust suppression techniques (such as watering via watering trucks or sprinkler systems) to maintain moist conditions on exposed areas, unsealed roadways and high dust generating equipment.
- Undertake continuous visual monitoring of dust emissions.
- Retain as much vegetative screening between the Facility and the nearest sensitive receptors as possible.

Rectification measures

- Record environmental complaints and maintain regular reviews and reporting of performance.
- Consider spraying dust suppressants on the soil/cover material stockpiles.
- Increase the amount of sprinklers on stockpiles and water cart equipment for operational areas if required.
- Develop alternative operational methods to reduce dust generation.

7.3 Odour management measures and control

Prevention measures

- Prepare odour management education material for inclusion in site inductions, training and daily toolbox meetings.
- Regularly audit waste receipt procedures to confirm that appropriate actions are taken by on-site staff in the event that unacceptable and highly odorous wastes are delivered to site.
- Operate a wheel washing facility for trucks leaving the site to minimise the transport of potentially odorous soil particles and debris onto adjacent roads.
- Cover odorous wastes as soon as possible after delivery.
- Cover waste during daily operations as required and at the end of day.
- Minimise the size of the active landfill face, taking into account the practicalities, safety, access, traffic management, etc. This should be no greater than 100 m² (or as otherwise agreed to in writing by the EPA).
- Install leachate capture infrastructure on areas of the site being re-profiled and minimise the duration of any leachate pooling on exposed waste during heavy rain.
- Minimise the area of cap removed prior to placement of additional waste.
- Use intermediate cover on inactive areas and progressive capping of sub-cells.
- Undertake regular inspection and monitoring of the capping layer.
- Monitor landfill gas extraction flow rates and gas quality.
- Develop standard operating procedures that incorporate odour prevention and minimisation techniques.
- Train staff (internal and contractors) on odour management strategy and all relevant procedures.

Mitigation measures

- Perform daily odour surveys along the site boundary of the Facility (refer Section 8 for details).
- Retain as much vegetation as possible to act as a buffer against odours and assist dispersion of any fugitive emissions (as based on the NSW EPA's Environmental Guidelines: Solid Waste Landfills (2016) guidance on odour control).
- Provide a sealing layer in the capping profile (in accordance with the NSW EPA's Environmental Guidelines: Solid Waste Landfills (2016)).
- Progressively install and operate a landfill gas collection system to minimise odour as a result of landfill gas emissions.
- Install additional landfill gas extraction infrastructure to support the landfill gas collection system.
- Undertake daily site inspections of the areas being filled.
- Record all incidents of identification and/or rejection of unacceptable waste.
- Investigate complaints from neighbours and record in register.
- Include environmental KPIs in staff reviews.

Rectification measures

- Reduce the size of the active landfill face.
- Increase equipment and personnel for daily cover operations.
- Consider additional gas infrastructure when installing the capping layer after re-profiling areas of the site.

7.4 Training

All personnel must receive induction training prior to entering site. Training must include:

- Location of sensitive receptors.
- Implementation of the mitigation measures outlined above.
- Roles and responsibilities in regards to air quality mitigation and management.
- Incident response, management and reporting.
- Environmental safe work methods relating to air quality.

Supervisors and workforce representatives that are nominated to undertake monitoring and inspections will be trained specifically for this task. Mitigation measures outlined above will be repeatedly covered in tool box talks to serve as a reminder to the workforce.

Other specific topics covered by the tool box talks will be planning and preparation for high wind or regional dust events. Lessons learnt during the construction and operation of the site and updates to this AQMP will be communicated to the workforce in toolbox talks.

7.5 Corrective actions

Corrective actions will be driven by the results of ongoing monitoring (refer Section 8) and any complaints received. Should these require corrective actions, the following mitigation measures will be implemented:

- Halt/reduce activity causing impact and initiate an investigation to determine the source(s) responsible for the exceedance.
- Once the responsible plant/activities have been identified, conduct a review of the management measures and controls described above to ensure they are being implemented appropriately.
- Conduct additional monitoring and evaluation upon restart of operation to confirm the exceedance has been mitigated.

In the event that the above actions are not effective in addressing the identified issue, the response measures outlined in Table 8-1 will be implemented.

If required, the AQMP will be revised to reflect results of the investigation and implementation of additional mitigation measures.

7.6 Communications strategy

Air quality impacts, including from dust and odour are not anticipated at nearby sensitive receptors.

Any aspects of the operation such as construction of new processes at the Facility, environmental incidents and correspondence from the public are to be outlined in annual reporting as outlined in the overarching LEMP.

A Pollution Incident Response Management Plan (PIRMP) has been prepared by SCC in accordance with the requirements in the POEO Act for holders of an EPL and is included in the overarching LEMP. Page 10 of the PIRMP includes notification of / communication with neighbours and the local community and this would need to be implemented in regards to any dust or odour events.

8. Monitoring and evaluation

8.1 Monitoring overview

Air quality and odour monitoring shall be undertaken as following:

- Continuously monitoring of excessive odour or dust generation by staff during day to day activities. To be implemented by raising staff awareness of potential air quality and odour impacts and educating staff on appropriate responses. This should be regarded as standard operating practice for all staff.
- Ad hoc monitoring investigation to be undertaken as required in response to a reason (e.g. complaint received, change of typical operating procedures or at the request of the site manager etc).
 - Dust: This will involve instrument dust monitoring at the investigation location to assess dust concentrations against regulatory requirements and inform appropriate mitigation (refer Section 8.2.1).
 - Odour: This will involve an odour boundary survey to investigate and mitigate the responsible odour source(s) (refer Section 8.2.2).

The prescribed air quality and odour monitoring program is outlined in Table 8-1.

Table 8-1 Air quality and odour monitoring program

Parameter	Monitoring requirement	Frequency	Key performance indicator	Response
Dust	Visual monitoring of dust generating activities	Continuously	Excessive/atypical dust generation by any activity at the source	Halt/reduce activity rate and mitigate
	Ad hoc monitoring investigation	As required (e.g. complaint received, change of typical operating procedures etc)	Visual plumes of dust leaving Facility boundary observed or dust complaint or excessive/atypical dust generation by any activity at the source PM ₁₀ – 50 µg/m ³ (24 hour average) TSP - 90 µg/m ³ (annual average)	Conduct an investigation to identify responsible sources/activities and mitigate (increase mitigation measure or reduce activity rate)
Odour	Monitoring odour from key odour sources	Continuously	Excessive/atypical odour from any activity or source	Halt/reduce activity rate and mitigate
	Ad hoc monitoring investigation	As required (e.g. complaint received, change of typical operating procedures etc)	Detection of odour at site boundary or excessive/atypical odour from any activity or source	Conduct an investigation to identify responsible sources/activities and mitigate (increase mitigation measure or reduce activity rate)

8.2 Complaint-based monitoring

8.2.1 Instrument dust monitoring

If any valid dust complaints are received, or excessive dust is observed leaving the site during visual dust monitoring (refer Section 8.1), then temporary (until the cause of the dust has been identified and appropriately mitigated) instrument dust sampling shall be undertaken to provide real-time information on dust levels that can be used to better manage site activities.

The following triggers would be used to instigate instrument dust monitoring:

- Valid dust complaints received on consecutive days from the same receptor area.
- Visual inspection identifies deposited dust build up on surfaces of nearby receptors.
- Should the site manager be concerned about dust leaving the site.

If undertaken, dust sampling should include:

- Real time continuous sampling of TSP and PM₁₀.
- Calculation of 1 hour and 24 hour average concentrations.
- Provision of alarms or alerts when trigger levels are being exceeded.
- Where practicable the monitors should be located in accordance with AS/NZ 3570.1.1:2007 method for Sampling and Analysis of Ambient Air – Guide to Siting of Air Monitoring Equipment.
- Be undertaken by suitably qualified and experienced personnel (such as an air quality consultant).

8.2.2 Odour boundary surveys

If any valid odour complaints are received, or excessive odour is noticed at the site boundary, then an odour boundary survey shall be undertaken to investigate and mitigate the responsible odour source(s) in accordance with the methodology outlined in Appendix B.

8.3 Reporting

The impact of operational activities can be influenced by numerous factors such as weather conditions, activities undertaken on that day and equipment used onsite, which can contribute to an increase in dust and/or odour emissions. Recording monitoring and inspection results as well as conditions which influence dust and odour can help to assess if management measures are effective and help define corrective actions, if required.

Environmental reporting for all ad hoc investigations must include the following (at a minimum):

- Date, time and reason for the investigation. If initiated by a complaint, details of the date and time the complaint was received and the date and time that the dust/odours were observed.
- A detailed description of the dust/odour including duration of disturbance and likely location of the responsible source. If odour related include the FIDOL factors (refer Appendix B for explanation) and the character of the odour.
- Any information the complainant can provide on the meteorological conditions at the time of the complaint.
- Contact details for the complainant.

- Outcomes of the investigation (e.g. source(s) identified as responsible for causing the disturbance and mitigation measure implemented).
- The feedback provided to the complainant once the event has been investigated.

9. References

- Arcadis (2019). West Nowra Landfill Extension – Environmental Impact Statement
- Coffey Geotechnics Pty Ltd (2016). Geotechnical and Hydrogeological Investigation West Nowra Recycling and Waste Facility
- ENRS (2018). Hydrogeological Assessment – Leachate Dam
- Forbes Rigby (1996). Report on Groundwater Hydrology and Water Quality West Nowra Waste Disposal Depot
- Ministry for the Environment (2001). Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions
- NSW Department of Environment and Conservation (2006). Technical Framework – Assessment and Management of Odour from Stationary Sources in NSW
- NSW EPA (2016). Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales
- NSW EPA (2016) Environmental Guidelines: Solid Waste Landfills
- Shoalhaven City Council (2020). Pollution Incident Response Management Plan West Nowra Recycling and Waste Facility
- SLR (2018). West Nowra Recycling and Waste Facility. Proposed Stage 4 Landfill Extension – Soil, Water and Leachate Assessment
- SLR (2019). Shoalhaven Response to Submission – Groundwater Elevation Review
- SLR Consulting (2019a). West Nowra Recycling and Waste Facility – Proposed Stage 4 Landfill Extension Air Quality Impact Assessment
- SLR Consulting (2020). Additional Air Quality Modelling and Assessment

Appendices

Appendix A – Example odour survey form

Odour Survey Form

File: _____ Date: ____/____/____ Staff: _____ Signed: _____

L Location	Time 24 Hour	F Frequency How often?	I Level 0-6 Table 4.2	D Total Sum of "F"	O Offensiveness Table 4.4	Character: Description of Odour (001-040)	Wind Direction & Speed m/s:	Comments and Alleged Source:
	From:							
	To:							
	From:							
	To:							
	From:							
	To:							
	From:							
	To:							

FIDOL Factors

FIDOL Factor	Description
F - Frequency	How often the odour is noticed i.e. once for 20 seconds then went away for 30 seconds, or it was a constant odour for two minutes.
I - Intensity	The strength of the odour (refer to the German VDI odour intensity scale – Table 4.2).
D - Duration	The length or total sum of an odour event at a particular site i.e. there were two 20 second wafts in the three minutes at one location, therefore the duration was 40 seconds.
O - Offensiveness	This determines how adverse the odour is. The odour may be pleasant, neutral or unpleasant but still be offensive (refer to Table 4.4 as an example of rating adverse effects – if the odour is not offensive, then the value is 0).
L – Location	The location is the place where the observations are recorded. Location needs to include the type of land use/activities in the vicinity i.e. residential/industrial etc.
Odour Character Descriptors	001 Fragrant, 002 Perfumy, 003 Sweet, 004 Fruity, 005 Bakery (fresh bread), 006 Coffee-like, 007 Spicy, 008 Meaty (cooked, good), 009 Sea/marine 010 Herbal, green, cut grass, 011 Bark-like, birch bark, 012 Woody, resinous, 013 Medicinal, 014 Burnt, smoky, 015 Soapy, 016 Garlic, onion, 017 Cooked vegetables, 018 Chemical, 019 Etherish, anaesthetic, 020 Sour, acrid, vinegar, 021 Like blood, raw meat, 022 Rubbish, 023 Compost 024 Silage, 025 Sickening, 026 Musty, earthy, mouldy, 027 Sharp, pungent, acid, 028 Metallic, 029 Tar-like, 030 Oily, fatty, 031 like gasoline, solvent 032 Fishy, 033 Putrid, foul, decayed, 034 Paint-like, 035 rancid, 036 Sulphidic, 037 Dead animal, 038 Faecal (like-manure), 039 Sewer odour, 040 Describe the odour yourself

Table 4.2 German VDI 3882 Odour Intensity Scale

Odour Intensity	Intensity Level
Extremely strong	6
Very strong	5
Strong	4
Distinct	3
Weak	2
Very Weak	1
Not perceptible	0

Table 4.4 An Example of Scale for Rating Adverse Effects

Perceived odour strength	Intensity level rating	Description
Extremely strong	6	In normal circumstances, this should be very rare in a field situation. For an offensive type of odour, the reaction would be to mitigate against further exposure. This remains the dominant thought and motivation until the exposure level is reduced. The odour cannot be tolerated.
Very strong	5	The odour character is clearly recognisable. For an offensive type of odour, exposure to this level is considered unpleasant/undesirable to the point that action to mitigate against further exposure is considered or taken.
Strong	4	The odour character is clearly recognisable. For an offensive type of odour, exposure to this level would be considered unpleasant/undesirable.
Distinct	3	The odour character is clearly recognisable. Note that this must still apply even if in a different context or situation – for example, not knowing or expecting what type of odour may be present. The odour is tolerable – even for an offensive odour.
Weak	2	The assessor is reasonably sure that odour is present but not 100% sure of that the odour character represents odour from the source, assuming no prior knowledge of the source.
Very Weak	1	The odour character is not recognisable. There is probably some doubt whether the odour is actually present (i.e. it simply doesn't smell like 'fresh air'). A useful strategy where the odour is borderline between 'not perceptible' and 'very weak' is to alternate such observations between 0 and 1.
No odour	0	No odour

Appendix B – Complaint based odour boundary survey methodology

B.1 Odour boundary survey methodology

B.1.1 Odour survey purpose

Daily odour surveys should be undertaken and when an odour is detected, investigated to determine its source and if operating procedures require adjustment to reduce odour generation should be undertaken. Daily odour boundary surveys will allow early detection of any elevated odour emissions so that appropriate mitigation can be implemented to minimise any potential odour impacts.

The odour boundary survey shall be undertaken as soon as practicable after the initiation of the investigation (and receipt of complaint) so that the responsible source(s) can be correctly identified.

B.1.2 Monitoring personnel

The personnel performing the surveys should be tested in a dynamic dilution odour laboratory to confirm they meet the sensitivity requirement for odour panellists as set out in AS 4323.3:2001 Determination of odour concentration by dynamic olfactometry prior to performing any surveys. The survey personnel should be appropriately trained in performing odour observations and documenting their observations as required.

B.1.3 Monitoring locations

Daily odour surveys are to be performed along the southern and eastern boundaries of the Facility.

B.1.4 Odour survey method

Odour surveys should be undertaken as quickly and efficiently as possible so that wind speed and direction remains relatively constant throughout the sampling period. Key information pertaining to the odour survey should be recorded including:

- Date and time of odour survey
- Location where any odours were observed
- Meteorological conditions during the odour survey (wind speed and wind direction)
- A description of the odours including the FIDOL factors (refer Table B-2) and the odour character

An example odour survey form is provided in Appendix A.

Hand held wind meters are useful for odour surveys and can provide weather data on a range of parameters at each survey location such as wind speed, wind direction, temperature, barometric pressure, altitude, humidity, wind chill, wet bulb temperature, dew point, delta T (temperature) and density altitude, refer to Figure B-1.



Figure B-1 Typical hand-held wind meter

The odour survey should start with the locations upwind and furthest away from odorous material, finishing with the locations closer and downwind from the site to prevent staff from becoming desensitised to the odours.

Odour surveyors should be familiar with the German VDI scale for describing odour intensity during field observations (refer Table B-1). This scale is used in Europe, New Zealand and Australia for grading odour intensity. Experience using this scale has shown that observations have a good degree of consistency between observers (Ministry for the Environment, 2003).

Table B-1 Odour intensity scale (derived from the German VDI scale)

Odour Intensity	Intensity Level
Extremely strong	6
Very strong	5
Strong	4
Distinct	3
Weak	2
Very Weak	1
Not perceptible	0

Odour surveyors should also be familiar with odour character descriptors and the FIDOL factors. FIDOL factors are those descriptors used during the survey to best describe the odour and include:

- F - Frequency
- I - Intensity
- D - Duration
- O - Offensiveness
- L – Location

A description of the FIDOL factors and odour characterisation are provided in Table B-2.

Table B-2 FIDOL factors and odour character descriptors

FIDOL Factor	Description
F - Frequency	How often the odour is noticed i.e. once for 20 seconds then went away for 30 seconds, or it was a constant odour for two minutes.
I - Intensity	The strength of the odour (refer to the German VDI odour intensity scale – Table 4.2).
D - Duration	The length or total sum of an odour event at a particular site i.e. there were two 20 second wafts in the three minutes at one location, therefore the duration was 40 seconds.
O - Offensiveness	This determines how adverse the odour is. The odour may be pleasant, neutral or unpleasant but still be offensive (refer to Table 4.4 as an example of rating adverse effects – if the odour is not offensive, then the value is 0).
L – Location	The location is the place where the observations are recorded. Location needs to include the type of land use/activities in the vicinity i.e. residential/industrial etc.
Odour Character Descriptors	001 Fragrant, 002 Perfumy, 003 Sweet, 004 Fruity, 005 Bakery (fresh bread), 006 Coffee-like, 007 Spicy, 008 Meaty (cooked, good), 009 Sea/marine 010 Herbal, green, cut grass, 011 Bark-like, birch bark, 012 Woody, resinous, 013 Medicinal, 014 Burnt, smoky, 015 Soapy, 016 Garlic, onion, 017 Cooked vegetables, 018 Chemical, 019 Etherish, anaesthetic, 020 Sour, acrid, vinegar, 021 Like blood, raw meat, 022 Rubbish, 023 Compost 024 Silage, 025 Sickening, 026 Musty, earthy, mouldy, 027 Sharp, pungent, acid, 028 Metallic, 029 Tar-like, 030 Oily, fatty, 031 like gasoline, solvent 032 Fishy, 033 Putrid, foul, decayed, 034 Paint-like, 035 rancid, 036 Sulphidic, 037 Dead animal, 038 Faecal (like-manure), 039 Sewer odour, 040 Describe the odour yourself.

Finally odour surveyors should summarise the overall impact of the odour at the survey location. An example of the odour impact scale is shown in Table B-3. This covers a range of impacts that refer to chronic through to acute effects and should be used during the survey and not at the end.

Table B-3 Odour impact summary table

Perceived odour strength	Intensity level rating	Description
Extremely strong	6	In normal circumstances, this should be very rare in a field situation. For an offensive type of odour, the reaction would be to mitigate against further exposure. This remains the dominant thought and motivation until the exposure level is reduced. The odour cannot be tolerated.
Very strong	5	The odour character is clearly recognisable. For an offensive type of odour, exposure to this level is considered unpleasant/undesirable to the point that action to mitigate against further exposure is considered or taken.
Strong	4	The odour character is clearly recognisable. For an offensive type of odour, exposure to this level would be considered unpleasant/undesirable.
Distinct	3	The odour character is clearly recognisable. Note that this must still apply even if in a different context or situation – for example, not knowing or expecting what type of odour may be present. The odour is tolerable – even for an offensive odour.
Weak	2	The assessor is reasonably sure that odour is present but not 100% sure of that the odour character represents odour from the source, assuming no prior knowledge of the source.
Very Weak	1	The odour character is not recognisable. There is probably some doubt whether the odour is actually present (i.e. it simply doesn't smell like 'fresh air'). A useful strategy where the odour is

		borderline between 'not perceptible' and 'very weak' is to alternate such observations between 0 and 1.
No odour	0	No odour.

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Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	N Spurrett	E Smith		D Gamble		08/04/2021

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