



PROPOSED RESOURCE RECOVERY FACILITY

BLOCK 11, SECTION 21 HUME ACT

AIR QUALITY ASSESSMENT



Proposed Resource Recovery Facility

Air Quality Assessment

Flexible Australia

Prepared By:

Capital Environmental Consulting Pty Ltd as Trustee for Vexex Trust
ABN: 96 800 162 676
PO Box 4722
Duffy ACT 2611

This report has been prepared by Capital Environmental Consulting Pty Ltd (CEC) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Flexible Australia (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from CEC. CEC disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

REFERENCE	DATE	PREPARED	REVIEWED
Hume RRF AQ Assessment .docx	16 July 2019	Jason Watson BAppSc, MEnvSc	Jason Watson BAppSc, MEnvSc

TABLE OF CONTENTS

1	INTRODUCTION.....	5
1.1	Purpose and Scope	5
1.2	Project Objective.....	6
1.3	Scope of this report	6
2	Project Background.....	7
2.1	Project Description.....	7
2.2	Waste Stream Characterisation	10
2.2.1	Gross Pollutant trap residues	10
2.2.2	Hydro Excavation Mud Residues	11
2.2.3	Street Sweepings.....	12
2.3	Pollutants of Interest	13
2.3.1	Construction.....	13
2.3.2	Operation	14
3	Legislative Context	15
3.1	Commonwealth Regulation – National Environment Protection Measure.....	15
3.2	Australian Capital Territory.....	15
3.2.1	ACT Separation Distance Guidelines for Air Emissions (2018).....	16
3.2.2	South Australian Environment Protection (Air Quality) Policy 2016.....	16
4	Existing Environment.....	18
4.1	Sensitive Receptors.....	18
4.2	Topography	19
4.3	Local Climate.....	20
4.4	Background Air Quality.....	25
4.4.1	PM ₁₀ Monitoring.....	25
4.4.2	PM _{2.5} Monitoring	26
4.4.3	Odour	27
5	Qualitative Assessment	28
5.1	Construction Impacts	28
5.1.1	Emission Sources.....	28
5.1.2	Impacts during construction	28
5.2	Operational Impacts	29
5.2.1	Assessment Approach.....	29
5.2.2	Operational characteristics.....	29
5.2.3	Separation Distance Assessment	31
5.2.4	Emission Assessment	31
6	Management Measures.....	34
6.1	Construction.....	34

6.2	Operation.....	35
6.2.1	Particulates.....	35
6.2.2	Odour.....	35
7	Conclusion.....	36
8	Bibliography.....	37
	APPENDICES.....	38
	APPENDIX A1 GPT Site Visit Photos and Qualitative Odour Survey.....	
	Figure 1: Regional Locality showing Block 11 Section 21 Hume ACT.....	7
	Figure 2: Block 11, Section 21 Hume ACT.....	8
	Figure 3: Site layout.....	9
	Figure 4: Composition of gross pollutants by mass (Source: CRC Monitoring, Stormwater Gross pollutants Industry Report.1997).	10
	Figure 5: Sensitive Receptors.....	19
	Figure 6: Pseudo three-dimensional visualisation of the topography.....	20
	Figure 7: Annual and Seasonal windroses for Tuggeranong AWS (2012).....	23
	Figure 8: Annual and Seasonal and Windroses from CALMET extract at 10m height.....	24
	Figure 9: Monash ACT 24-hour average PM ₁₀ (2014-2018).....	25
	Figure 10: Monash ACT 24-hour average PM _{2.5} (2014-2018).....	26
	Figure 11: Resource Recovery Plant Process Schematic.....	30
	Table 1: Scoping document requirements – Air Quality.....	5
	Table 2: GPT Waste Characterisation.....	11
	Table 3: Hydro excavation mud characterisation.....	12
	Table 5: Street sweepings characterisation.....	13
	Table 6: NEPM Ambient air quality standards and goals.....	15
	Table 7: ACT Separation distance guideline.....	16
	Table 8: Particulate criterion.....	16
	Table 9: Odour criteria.....	17
	Table 10: Selected sensitive receptors.....	18
	Table 11: Monthly climate statistics summary – Tuggeranong AWS.....	21
	Table 12: Monash 24-hour average PM ₁₀ historical statistics (2014 – 2018).....	26
	Table 13: Monash 24-hour average PM _{2.5} historical statistics (2014 – 2018).....	27
	Table 14: Emissions Inventory.....	33
	Table 15: Proposed construction management measures.....	34
	Table 16: Particulate sources and management measures.....	35
	Table 17: Odour sources and management measures.....	35

1 INTRODUCTION

Flexible Australia engaged Capital Environmental Consulting Pty Ltd (CEC) to prepare a qualitative Air Quality Assessment as part of an Environmental Impact Statement (EIS) in support of a Development Application (DA) for the proposed Hume Resource Recovery Facility at Block 11, Section 21 Hume ACT (36 Couranga Crescent).

1.1 Purpose and Scope

The Environment, Planning and Sustainable Development Directorate (EPSDD) provided a Scoping Document for the EIS that specifically outlines the specialist study requirements for the EIS. The purpose of this report is to address the requirements associated with air quality. Table 1 below outlines the specific requirements and where in the report these aspects are addressed in this report.

Table 1: Scoping document requirements – Air Quality

Scoping document Requirement	Requirement Detail	Section where requirement is addressed
8.1.7 Climate change and air quality	An air quality and odour impact assessment must be completed by a suitably qualified environmental consultant. This must include impacts on the adjacent NSW land zoned as residential (South Tralee) and the future residential land (South Jerrabomberra).	Sections 5 and 7
	The assessment must include recommendations on air quality management and controls (i.e. active controls through filtration, or passive controls through separation).	Section 6
	Provide details on how adverse wind conditions will be managed.	The emission sources are primarily contained within an enclosed building. Refer Sections 5.1, 5.2, 6.1 and 6.2

1.2 Project Objective

The objective of this assessment is to qualitatively determine the potential for air emissions from the facility to impact upon adjacent sensitive residential receptors.

1.3 Scope of this report

To address the scoping document requirements detailed in Table 1 and the project objective, the following scope of work was performed:

- Review of applicable air quality legislation;
- Identify the potential pollutants for construction and operation;
- Characterisation of the meteorology and air quality data for the local area;
- Identification of the nearest sensitive receptors;
- Evaluation of the baseline air quality environment using available ambient air quality monitoring data;
- Qualitative review of emissions to air from construction and operation of the proposed facility with target pollutants limited to odour and particulate matter (Total Suspended Particulates [TSP] and PM₁₀).
- Assessment of potential odour emissions based on observations made during one site visit to three (3) Gross Pollutant Trap (GPT) stockpiled material;
- Literature review of the following waste stream sources:
 - Waste derived from street sweeping activities.
 - Waste derived from stormwater maintenance activities (cleanout of gross pollutant traps).
 - Waste derived from hydro excavation activities.
- Assessment of particulate matter emissions based on emission factors as described within the National Pollution Inventory emissions estimation manuals. Assessment was limited to consideration of emissions from on-site activities only.

2 Project Background

2.1 Project Description

The proposed resource recovery facility (hereafter referred to as the Facility) uses proven “low technology” to separate largely waste residues from a variety of sources (described below) into fit for purpose products for beneficial reuse in commercial markets.

The Facility is to be located on Block 11 Section 21, Hume (36 Couranga Crescent). The regional locality of the Facility is illustrated in Figure 1. The site locality is illustrated in Figure 2.



Figure 1: Regional Locality showing Block 11 Section 21 Hume ACT



Figure 2: Block 11, Section 21 Hume ACT

It is proposed to locate the Facility in a fully bundled, enclosed building located on the southern portion of Block 11 as illustrated in Figure 3 below. The intention is to develop the block in 2 stages. The first stage is this development application for the proposed resource recovery facility building. The second stage will be subject to a future development application in merit track for a vehicle depot and administration building.

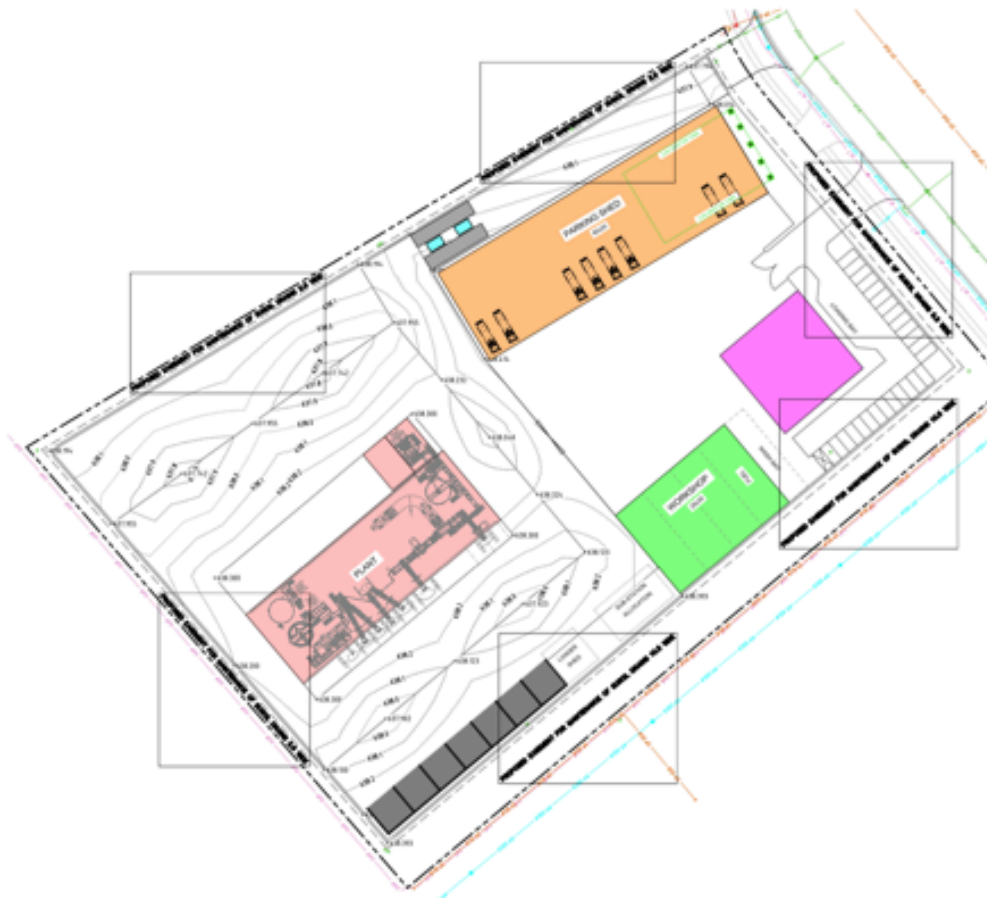


Figure 3: Site layout

The Facility will accept the following waste streams:

- Street sweeping activities;
- Stormwater maintenance activities;
- Golf course bunkers (bunker sand); and
- Hydro excavation activities (hydro excavation and hydro drilling mud).

Vehicles transporting waste into the facility will be inspected and weighed, then unloaded directly into the plant at the Facility to commence the recovery process.

The recovery process is contained within a fully enclosed metal clad building which is bunded to prevent the escape of process water.

Recovered materials are deposited into covered bunded bays for inspection and reuse if accepted as fit for purpose. Should any recovered material prove to be unfit for purpose or out of specification, it will be reprocessed or disposed of at landfill.

There will be no discharge of liquid from the site other than sewer from staff amenities. The stormwater onsite will be captured, treated and reused within the operation of the facility and for irrigation of landscaping. Rooftop rainwater will also be used.

The site perimeter will be surrounded with colourbond and steel tube fencing and landscaped.

2.2 Waste Stream Characterisation

2.2.1 Gross Pollutant trap residues

“Gross pollutant” is a debris item larger than 5 mm that includes litter, debris and coarse sediments. The composition of gross pollutants within a standard GPT by mass is shown below in Figure 4.

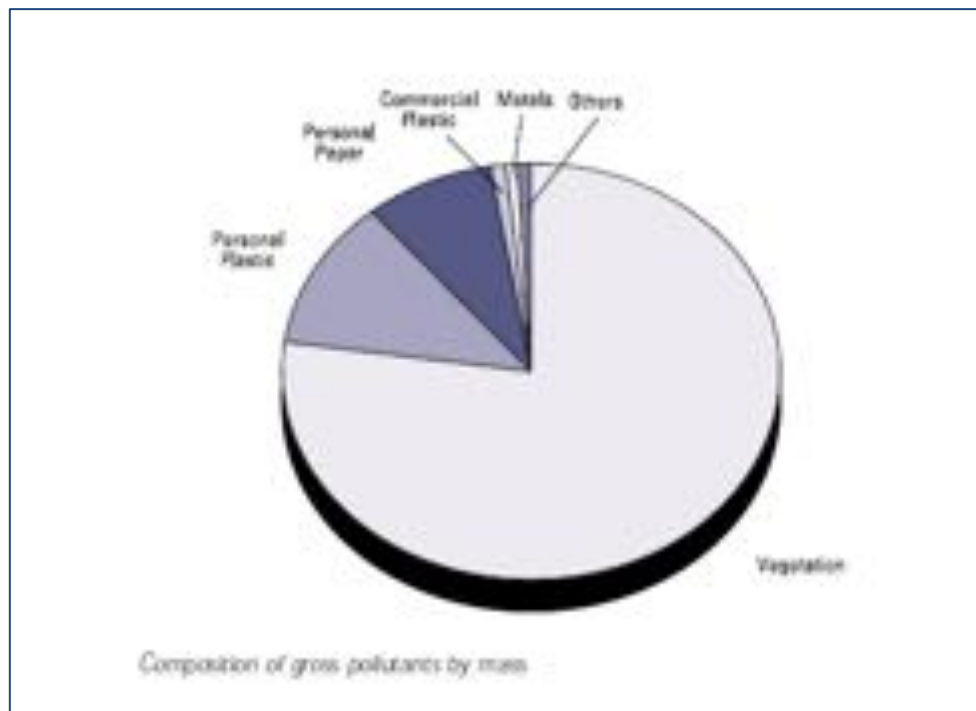


Figure 4: Composition of gross pollutants by mass (Source: CRC Monitoring, Stormwater Gross pollutants Industry Report.1997).

Leaves, twigs and grass clippings constitute the largest proportion of gross pollutant load (larger mesh size) carried by stormwater. In addition to the larger mesh fraction, GPT residues also consist of a sump fraction. This fraction contains sand/clay, silt aggregate and organic matter that has passed through trash racks etc. This fraction is considered to be representative of roadside sedimentation basin sediment in regard to particle size and contamination. These factors are dependent upon location and the maintenance interval as well as road drainage characteristics soil type/erosion, traffic volume, ratio of drainage area to device size, and precipitation. Given that most GPT maintenance intervals in the ACT are regular, Flexible Australia has indicated that the concentration of adverse inorganic/organic compounds are not expected to exceed total Toxicity Characteristic Leaching Procedure (TCLP) concentrations to warrant special processing/disposal or adversely impact on downstream products. This regularity is also anticipated to reduce potential odorous emissions from any accumulated organic material that become anaerobic. Flexible Australia

has indicated the aqueous phase associated with GPT waste is expected to contain contaminant levels below that of stormwater.

The GPT material is proposed to be characterised and processed as detailed in Table 2.

Table 2: GPT Waste Characterisation

Component/derived from processing GPT waste.	Product	Waste/landfill	Recycling	Limitations	How monitored/mitigation
Light Organic fraction /oversize	√			Plastic contamination/cigarette butts	Finished product quality control check against client specification.
Organic /undersize Fraction – centrifuge sludge		√		Hydrocarbon/excessive inorganic/organic compounds	Qualitative check on received waste. If suspected, then EPA Information Sheet 4 followed.
Glass bottles			√		Removed in process
Aluminium cans			√		Removed in process
Metal/ferrous /nonferrous			√		Removed in process
Sand	√			Plastic contamination	Finished product quality control check against client specification.
Aggregates	√			Plastic contamination	Finished product quality control check against client specification.
Plastics			√		
Waste water	√		√	Excessive NPK / Salts	Periodic testing waste water / qualitative and quantitative / see
Misc over 100mm Rocks/bricks/tyres/timber		√	√		Removed by receival screen.

2.2.2 Hydro Excavation Mud Residues

Hydro-excavation mud is derived from the hydro excavation of soil, which typically comprises a mixture of:

- naturally occurring rock and soil including but not limited to sandstone, shale and clay;
- naturally occurring organic matter including tree roots, grass and shrub; and
- fluid, which consists of water.

Hydro-excavation results in the destruction of soil into organic humic and clay fractions. In general, unless hydroexcavation work is undertaken at a contaminated site, it is not expected to contain inorganic/organic compounds that will impact on downstream products or at levels to warrant special management. Water used in hydroexcavation is derived from town water

or treated stormwater from rooftop/hard stand areas around the plant and therefore does not pose a contamination threat.

Hydro excavation mud residues would be characterised and processed as detailed in Table 3.

Table 3: Hydro excavation mud characterisation

Component/derived from processing GPT waste.	Product	Waste/landfill	Recycling	Limitations	How monitored/mitigation
Dense Organic fraction	√			Hydrocarbon contamination	Qualitative check on received waste. If suspected, then EPA Information Sheet 4 followed or reprocess material.
Organic Fraction – centrifuge sludge/clay	√			Hydrocarbon/excessive inorganic/organic compounds	As above.
Sand	√			High clay contamination	Finished product quality control check against client specification.
Aggregates	√			Plastic contamination	Finished product quality control check against client specification.
Waste water	√		√		Periodic testing waste water / qualitative and quantitative / see OEMP method

2.2.3 Street Sweepings

Street sweepings may contain glass, metal, soil/sand, aggregate, biological matter such as leaves/twigs/branches, litter or anything which ends up on the road. A vehicular accident or spill can result in high levels of hazardous compounds.

As noted by Flexible Australia, characterisation studies of deposited road sediments and street sweepings have found that street sweeping do not qualify for beneficial reuse without treatment due to the potential risk to human health and the environment from heavy metals, oil and grease and polycyclic aromatic hydrocarbon (PAHs).

Street sweepings would be characterised and processed as detailed in Table 4.

Table 4: Street sweepings characterisation

Component/derived from processing GPT waste.	Product	Waste/landfill	Recycling	Limitations	How monitored/mitigation
Light Organic fraction /oversize	√			Plastic contamination/cigarette butts	Contractor agreements – Qualitative check on received waste / see OEMP method. If suspected waste not accepted in the plant.
Organic /undersize Fraction – centrifuge sludge		√		Hydrocarbon/excessive inorganic/organic compounds, heavy metals, PAHs Oil and Grease.	
Sand	√			Plastic contamination	Finished product quality control check against client specification.
Aggregates	√			Plastic contamination	Finished product quality control check against client specification.
Plastics			√		
Waste water	√		√	Excessive NPK / Salts/heavy metals / PAHs, O&G.	Periodic testing waste water / qualitative and quantitative.

2.3 Pollutants of Interest

2.3.1 Construction

The main air pollutants likely to be generated during construction works include the following:

- Total Suspended Particulate (TSP) matter.
- Particle matter with an aerodynamic diameter of less than 10 microns (PM₁₀).
- Particle matter with an aerodynamic diameter of less than 2.5 microns (PM_{2.5}).

Low levels of pollutants from fuel combustion during construction of the Facility are also likely to be emitted such as oxides of nitrogen (NO_x), carbon monoxide (CO), sulphur dioxide (SO₂), volatile organic compounds (VOCs) and PAHs. However, it is understood that plant and equipment associated with construction would be operated in accordance with the manufacturers maintenance specifications and therefore, these pollutants have not been considered any further within this assessment.

This technical report addresses emissions of TSP, PM₁₀ and PM_{2.5} only.

2.3.2 Operation

Following a review of the project, the main pollutants likely to be emitted during operation of the Facility are considered to be:

- Odour.
- TSP.
- PM₁₀.

3 Legislative Context

This section overviews the legislative context for the Project and the setting of criteria for assessing air quality impacts of pollutants during construction and operation.

3.1 Commonwealth Regulation – National Environment Protection Measure

The National Environment Protection (Ambient Air Quality) Measure (Air NEPM) contains standards and goals for key pollutants that are required to be achieved nationwide, with due regard to population exposure. Table 5 identifies NEPM standards that are relevant for pollutants (PM) during construction of the Project. Air NEPM standards are intended to be applied at performance monitoring locations that represent air quality within a region or sub-region of 25,000 people or more. Noting that these standards are not relevant to air emissions from individual sources, specific industries or roadside locations.

Table 5: NEPM Ambient air quality standards and goals

Pollutant	Averaging Period	Air Quality Standard	Maximum Allowable Exceedances
PM ₁₀	24-hours	50 µg/m ³	None
	Annual	20 µg/m ³	
PM _{2.5}	24-hours	25 µg/m ³	None
		20 µg/m ³ (2025*)	
	Annual	8 µg/m ³	
		7 µg/m ³ (2025*)	

* Commonwealth, State and Territory Environment Ministers have flagged an objective to move to PM2.5 standards of 20 µg/m³ (1 day average) and 7 µg/m³ (1 year average) by 2025.

3.2 Australian Capital Territory

There is no current Australian Capital Territory (ACT) legislation or policies that specifically govern air quality standards during construction. The Environment Protection Guidelines for Construction and Land Development in the ACT, Environment Protection Authority, March 2011 would be applicable for construction of the Project.

The Australian Capital Territory (ACT) is currently in the process of formalising its policy position regarding air emissions in the ACT. This includes the scheduled review of the 'Air - Environment Protection Policy' pursuant to the *Environment Protection Act 1997*. In the interim, the ACT Environment Protection Authority (EPA) has adopted the South Australia EPA (SA EPA) Environment Protection (Air Quality) Policy 2016 (Air EPP) and the SA

EPA Ambient Air Quality Assessment, 2016 guidance for assessing air emissions in the ACT.

3.2.1 ACT Separation Distance Guidelines for Air Emissions (2018)

These guidelines provide recommended separation distances between various emitters and sensitive land uses. They ensure incompatible land uses are located in a way that minimises the impacts of odour and polluting air emissions when applied to the assessment of new development applications. While the guidelines assist in the siting of new developments, they may also be used to ensure industrial activities in appropriate zones are protected from encroachment by residential and other sensitive land uses that would have a negative effect on the viability of industry.

Table 6 provides the relevant separation distance within this guideline associated with the activity applicable for this Project.

Table 6: ACT Separation distance guideline

Activity	Description	Separation distance (metres)
Materials recovery facility	Collecting, dismantling, processing, storing or recycling used or surplus materials	300

3.2.2 South Australian Environment Protection (Air Quality) Policy 2016

The Air EPP was developed to reduce the harmful impacts of smoke and other air pollutants on communities and the environment. Schedule 3 of the Air EPP prescribes the maximum PM₁₀ criterion (Table 7) that must not be exceeded at the nearest sensitive receiver.

Table 7: Particulate criterion

Pollutant	Averaging time	Criterion (µg/m ³)
PM ₁₀	24-hours	50

Schedule 3 of the Air EPP also prescribes the maximum odour concentration that must not be exceeded for a specific number of people, over a 3-minute averaging period, 99.9 per cent of the time. Odour concentration is expressed in odour units (OU), where one odour unit is the point at which 50 per cent of test panelists cannot detect the odour. An OU of two means that the original sample was diluted with clean air by two times the original sample concentration and 50 per cent of test panelists would still detect the odour. The relevant odour concentration criteria for this assessment are presented in Table 8.

Table 8: Odour criteria

Number of people	Odour Units (3-minute average, 99.9%)
2000 or more	2
350 – 1999 (inclusive)	4
60 – 349 (inclusive)	6
12 – 59 (inclusive)	8
Single residence	10

The Facility is proposed to be located in an industrial area with residential dwellings in areas surrounding the industrial estate. Within the urban residential area the number of people exposed to emissions is likely to exceed 2000 persons and an odour criterion of 2 OU is therefore considered appropriate for this assessment.

4 Existing Environment

4.1 Sensitive Receptors

The SA EPA ‘*Ambient Air Quality Assessment*’, guideline document describes a sensitive receptor as a:

‘Fixed location such as a house, building, other premises or open area where health, property or amenity is affected’.

As described within the Scoping document, this assessment must also include potential impacts on the adjacent NSW land zoned as residential (South Tralee) and the future residential land (South Jerrabomberra). Following a site visit and familiarisation by a CEC consultant, Table 9 presents the nearest existing and future sensitive receptors to the proposed facility. The sensitive receivers are illustrated in Figure 5.

Table 9: Selected sensitive receptors

Sensitive Receiver ID	Direction from facility	Estimated distance from activity boundary (metres)	Type
SR1	West	370	Rose Cottage
SR2	North west	1880	Residential
SR3	West north-west	1440	Residential
SR4	West	1240	Residential
SR5	West-south west	1245	Residential
SR6	South west	1237	Residential
SR7	South west	1300	Residential
SR8	South south-west	1270	Residential
SR9	South	1100	Residential (South Jerrabomberra)
SR10	South south-east	1070	Residential (South Jerrabomberra)
SR11	South east	905	Residential (South Jerrabomberra)
SR12	East	1150	Residential (South Tralee)
SR13	East	1410	Residential (South Tralee)
SR14	South east	1150	Residential (South Tralee)
SR15	South east	1780	Residential (South Tralee)
SR16	South east	3050	Residential (South Tralee)

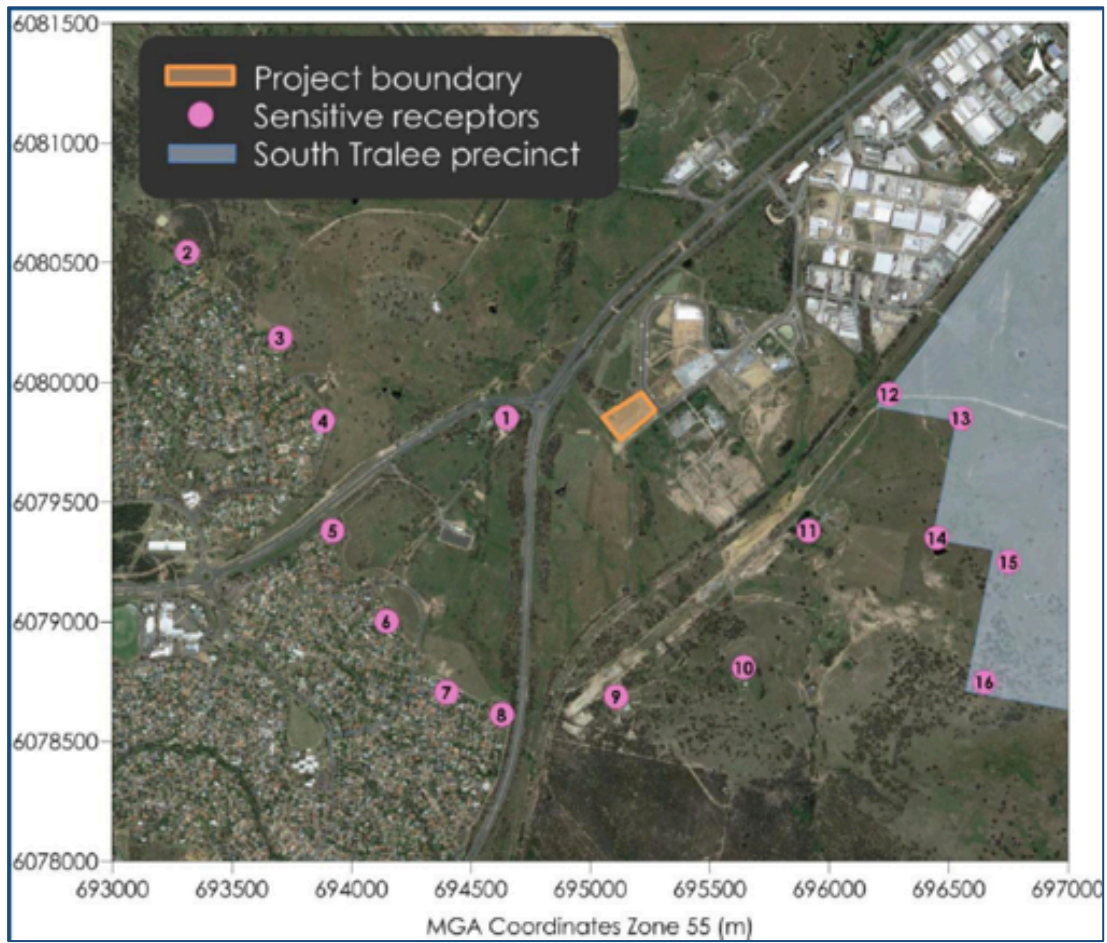


Figure 5: Sensitive Receptors

4.2 Topography

Figure 6 presents a pseudo three-dimensional visualisation of the topography in the general vicinity of the Project area. The Project area is relatively flat with elevated terrain to the northwest and southeast.

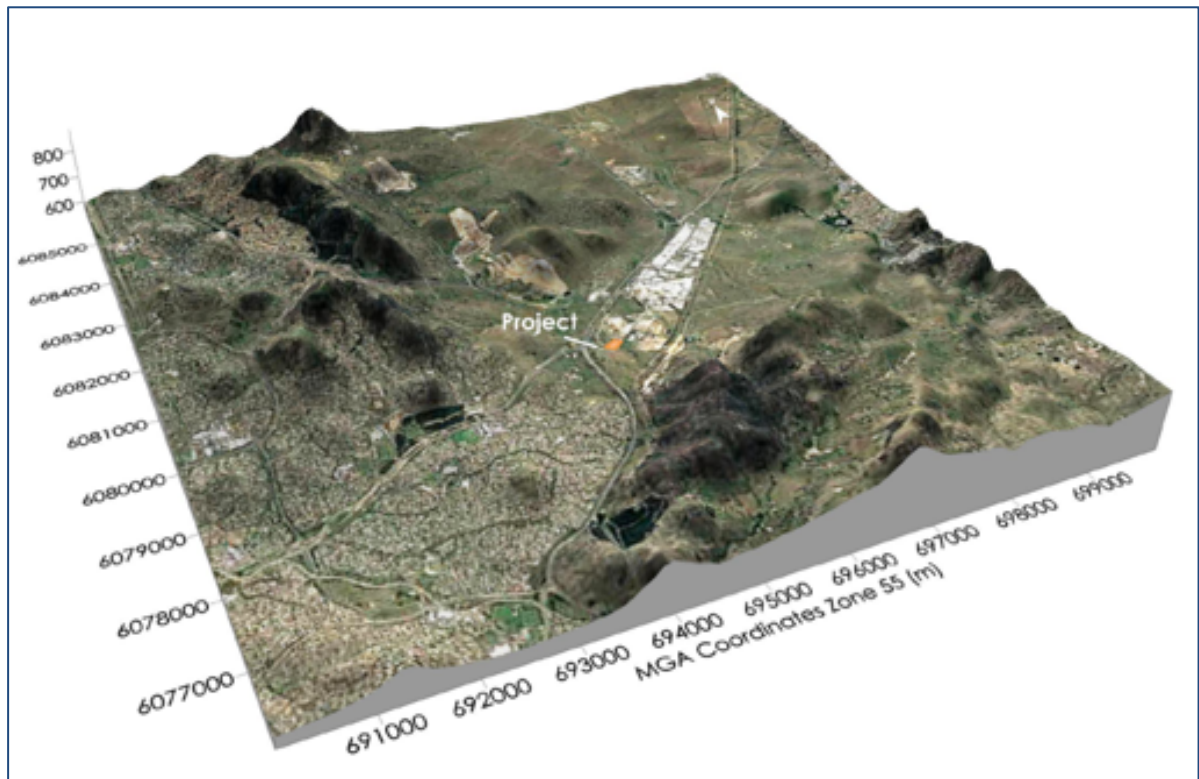


Figure 6: Pseudo three-dimensional visualisation of the topography

4.3 Local Climate

Meteorological conditions are important for determining the direction and rate at which emissions from a source would disperse. The key meteorological requirements for air assessments are typically hourly records of wind speed, wind direction, temperature, rainfall and relative humidity. This section discusses meteorological conditions in the vicinity the Project study area.

The Bureau of Meteorology (BoM) collects meteorological data at automatic weather stations (AWS) across Australia and these can be used for determining climate statistics over standard periods, such as 30 years, known as climate normals. These can be used to compare with shorter time periods such as one year.

The nearest AWS to the Project study area that characterises the climate of the local area is Tuggeranong AWS (Site Number: 070339). The station is located at an elevation of 587 m, approximately 5 km west southwest of the Facility study area. The following sections provide information based on historical meteorological data for Tuggeranong AWS, including wind speed and direction, temperature, rainfall and relative humidity.

Table 10 provides a data summary from the Tuggeranong station collected over an approximate 14 to 21-year period for the various meteorological parameters.

The data indicates that January is the hottest month with a mean maximum temperature of 29.3 degrees Celsius (°C) and July as the coldest month with a mean minimum temperature of 0.1°C. Rainfall exhibits variability across the year. The data indicates that February is the wettest month with an average rainfall of 74.5 millimetres (mm) over 6.0 days and May is the driest month with an average rainfall of 22.3mm over 3.5 days.

Humidity levels peak during winter and decline thereafter. Mean 9am humidity levels range from 59 per cent (%) in December to 83% in June. Mean 3pm humidity levels range from 34% in January and December to 57% in June. Mean 9am wind speeds range from 6.5 kilometres per hour (km/h) in May to 11.3km/h in October. Mean 3pm wind speeds range from 13.2km/h in May to 18.7km/h in October.

Table 10: Monthly climate statistics summary – Tuggeranong AWS

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Temperature													
Mean max. temperature (°C)	29.7	28.1	25.3	21.1	16.6	13.1	12.3	14.1	17.6	21.0	24.3	27.2	20.9
Mean min. temperature (°C)	14.5	14.2	11.4	6.9	2.5	1.3	-0.1	0.9	3.7	6.4	9.9	12.4	7.0
Rainfall													
Rainfall (mm)	53.9	69.6	52.5	32.4	24.8	52.8	39.4	47.1	59.4	50.4	76.5	70.2	620.0
Mean No. of rainfall days (≥ 1mm)	5.3	5.6	4.8	3.7	3.6	5.7	5.6	5.8	6.0	6.2	7.5	6.0	65.8
9am conditions													
Mean temperature (°C)	19.6	18.6	15.7	13.1	8.3	5.9	4.8	6.9	10.9	13.9	15.8	18.2	12.6
Mean relative humidity (%)	61	68	70	69	78	83	82	73	65	60	62	59	69
Mean wind speed (km/h)	8.4	7.7	6.5	8.0	6.5	7.1	7.1	8.9	10.8	11.3	10.1	9.6	8.5
3pm conditions													
Mean temperature (°C)	27.8	26.6	24.3	20.1	15.6	12.1	11.3	12.8	16.2	19.2	22.5	25.5	19.5
Mean relative humidity (%)	34	39	38	42	50	57	56	50	46	41	39	34	44
Mean wind speed (km/h)	16.2	15.4	14.7	13.8	13.2	13.5	14.3	16.5	18.5	18.7	17.3	17.7	15.8

Source: Bureau of Meteorology, 2019 (accessed July 2019)

Annual and seasonal windroses prepared from data collected from the 2012 calendar year are presented in Figure 7. This calendar year was assessed to allow for comparison with the prognostic data discussed below.

Analysis of the windroses show that on an annual basis, winds are typically from the northwest quadrant and winds from the north and east dominate the distribution. Seasonal distributions are similar to the annual distribution at varying degrees. During summer, winds are typically from the east with few winds from all other directions. In autumn, winds from the north and north-northwest dominate the distribution followed by winds from the northwest, south, and lighter winds from the east. In winter, winds from the north and

northwest dominate followed by winds from the northwest quadrant and from the south. In spring winds are typically from the northwest quadrant.

The windroses show a wind distribution pattern that is typical of the expected patterns for this area considering the location of the station in relation to local terrain features.

Todoroski (2018) undertook an air quality assessment for a historic (and unrelated) development application on the Project site. Prognostic meteorology was presented for the project site, based on CALMET modelling. CALMET is a meteorological model that uses the geophysical information and observed/simulated surface and upper air data as inputs and develops wind and temperature fields on a three-dimensional gridded modelling domain.

The wind distribution based on the CALMET data (see Figure 8) shows a somewhat similar trend to that from the Tuggeranong AWS monitoring station. The main difference in the wind distributions is the less frequent, almost non-existent winds from the north in the CALMET extract which were dominant at the Tuggeranong AWS, and the more frequent southerly winds in the CALMET extract dominating the annual, autumn and winter distribution.

For this qualitative assessment, the wind distribution for both (actual and prognostic) will be considered.

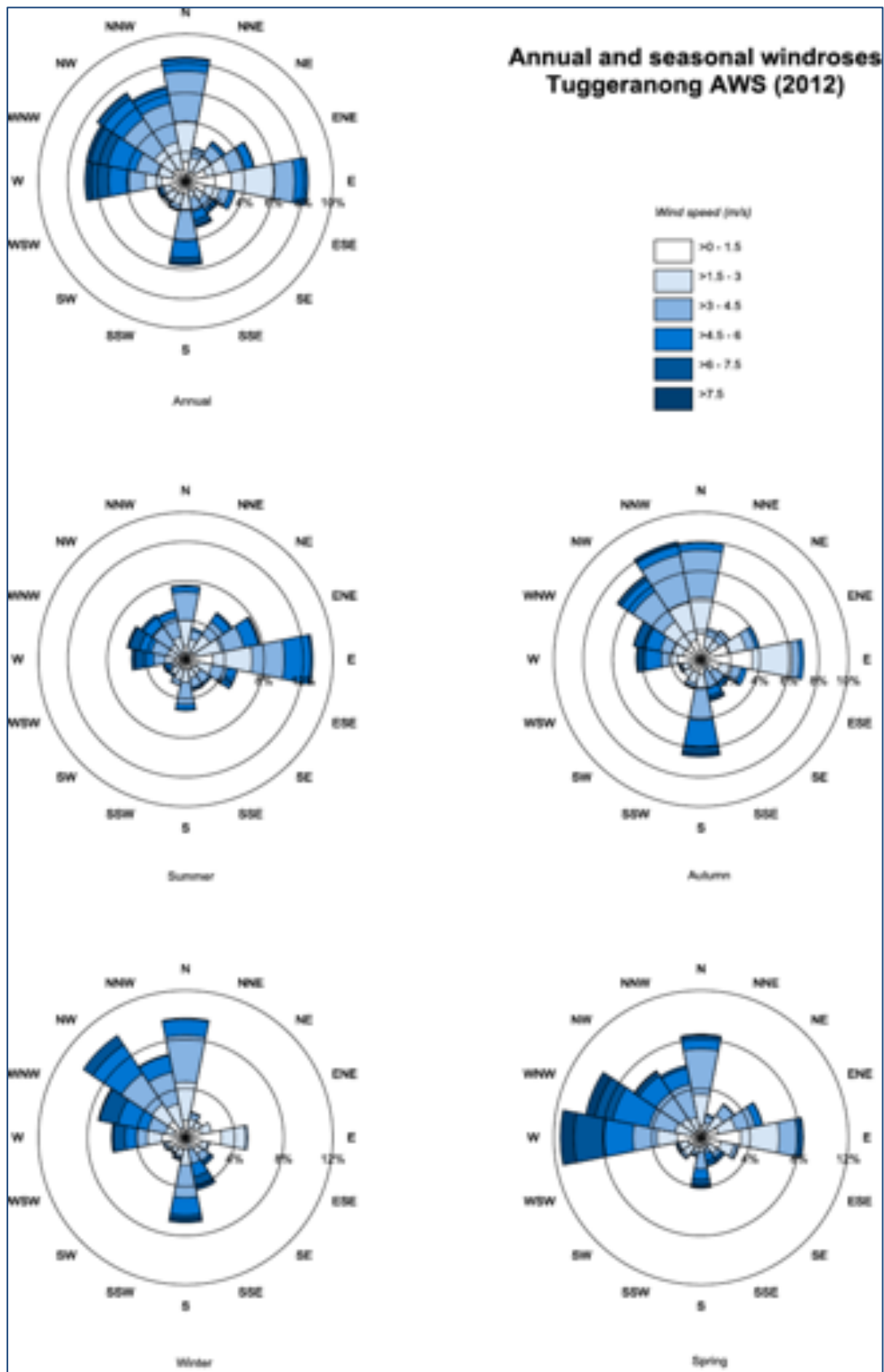


Figure 7: Annual and Seasonal windroses for Tuggeranong AWS (2012)

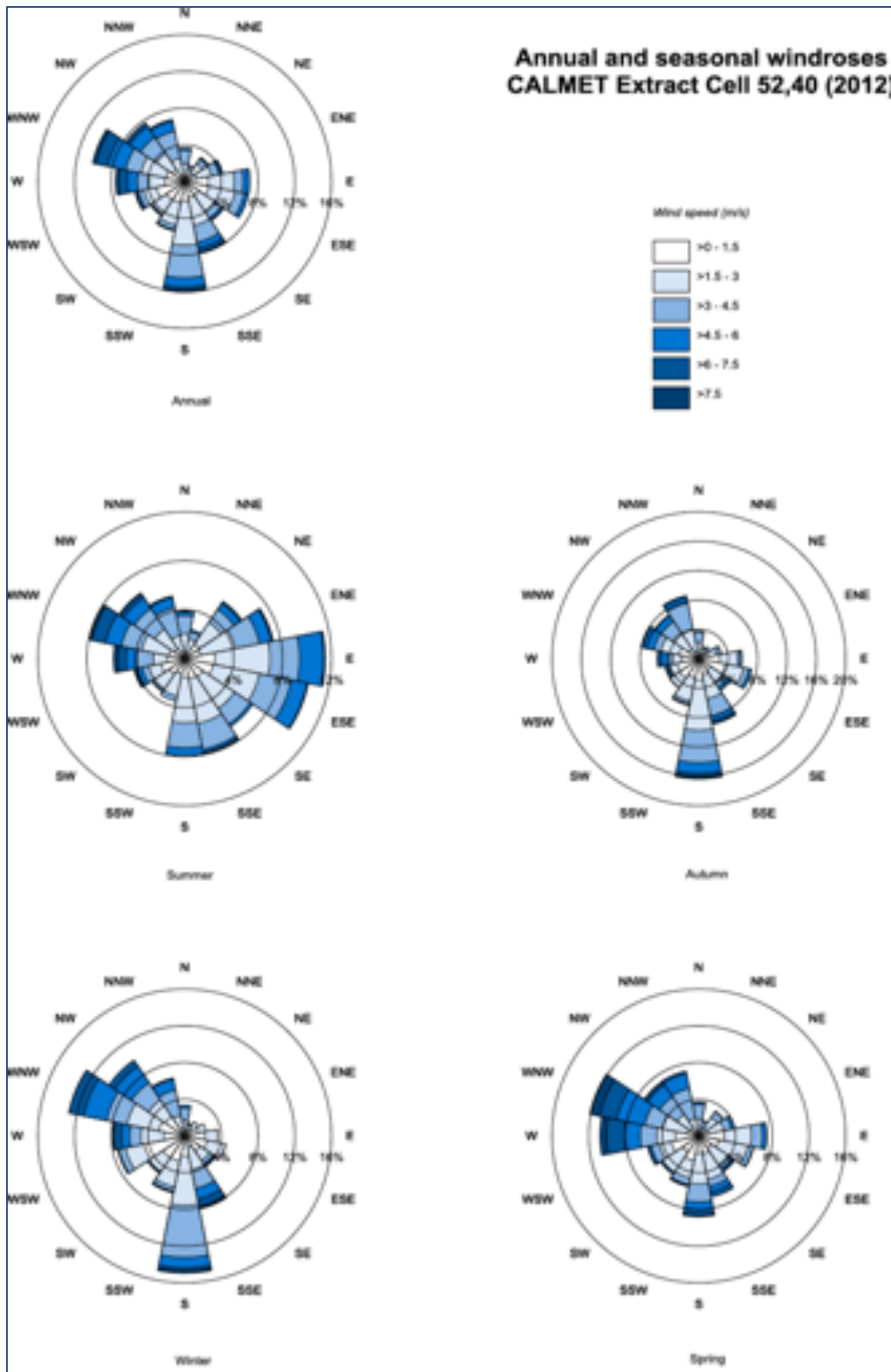


Figure 8: Annual and Seasonal and Windroses from CALMET extract at 10m height

4.4 Background Air Quality

The main sources of air pollutants in the area surrounding the Facility include emissions from local human activities (such as motor vehicle exhaust and domestic wood heaters), agricultural activities and various other commercial or industrial activities within Hume and the surrounding area.

Ambient air quality monitoring for the relevant target pollutants at the Project site are not available (the site is currently undeveloped). Therefore particulate (PM₁₀ and PM_{2.5}) data from the nearest available air quality monitor operated by the ACT government was used to quantify the existing background level for assessed pollutants. The ACT air quality monitor at Monash is approximately 5km from the site and collects data that is considered representative of the potential background air quality levels at the Project site. The data from the Monash monitor has been used to quantify the existing ambient levels of air pollutants in this study.

4.4.1 PM₁₀ Monitoring

Historic data (2014 – 2018) for Monash 24-hr average PM₁₀ is illustrated in Figure 9.

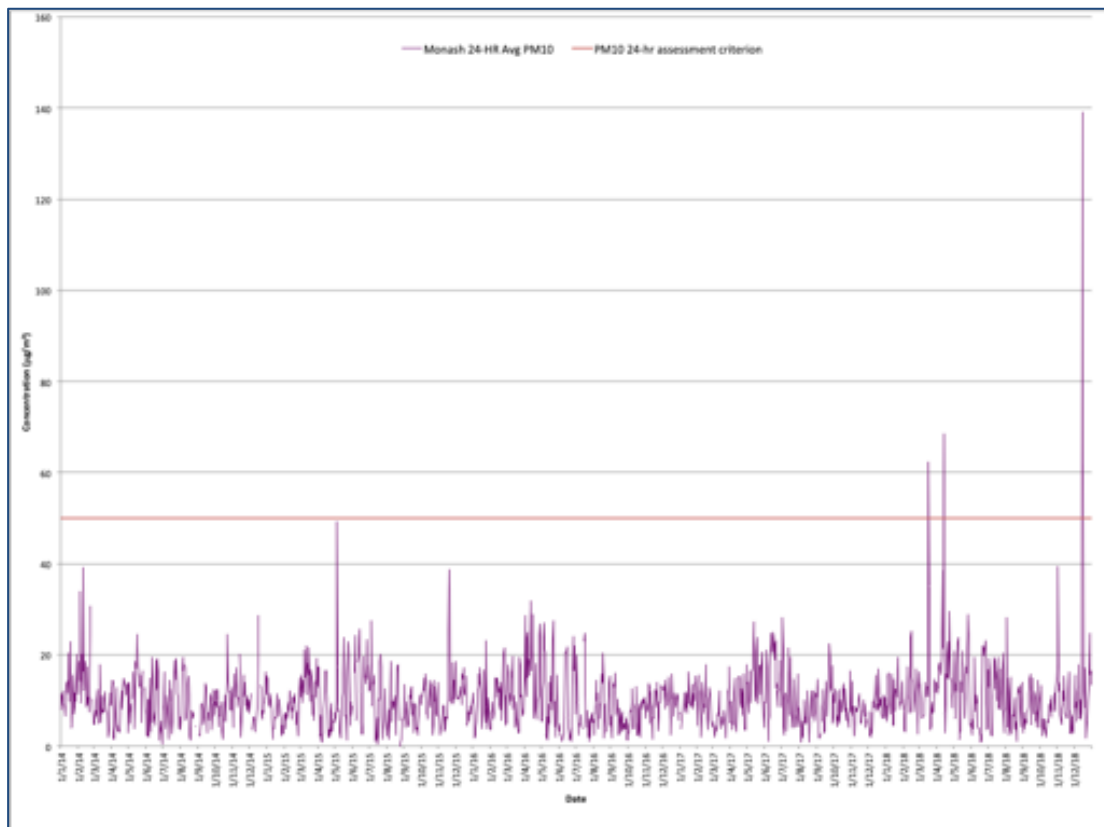


Figure 9: Monash ACT 24-hour average PM₁₀ (2014-2018)

Figure 9 illustrates that between 2014 and 2018, the assessment criterion for PM₁₀ was exceeded on three (3) occasions. Based on a review of other monitoring sites within the ACT these exceedances were likely caused by a regional event, and were not isolated to Monash. **Table 11** summarises the Monash PM₁₀ data, excluding the three regional events.

Table 11: Monash 24-hour average PM₁₀ historical statistics (2014 – 2018)

Statistical Parameter	PM ₁₀ Concentration (µg/m ³)
Maximum 24-hour average	49.40
99 th percentile 24-hour average	28.27
90 th percentile 24-hour average	17.51
70 th percentile 24-hour average	12.24

Table 11 indicates that 24-hour average PM₁₀ concentrations at Monash are generally well below the assessment criterion.

4.4.2 PM_{2.5} Monitoring

Historic data (2014 – 2018) for Monash 24-hr average PM_{2.5} is illustrated in Figure 10.

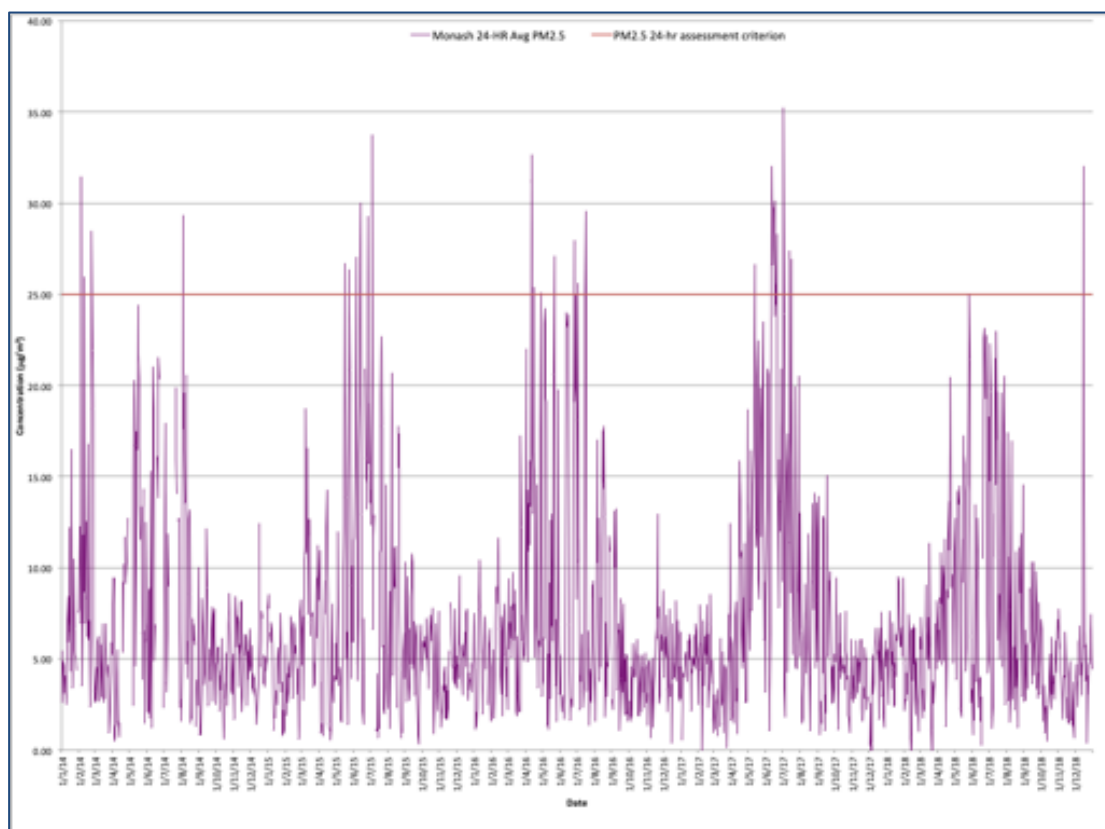


Figure 10: Monash ACT 24-hour average PM_{2.5} (2014-2018)

It is evident from the data presented in Figure 10 that there is a clear seasonal pattern for PM_{2.5}. There are numerous exceedances of the NEPM criterion each winter, which is likely caused by wood burning smoke from household heating. The historical PM_{2.5} data for Monash is summarised in **Table 12**.

Table 12: Monash 24-hour average PM_{2.5} historical statistics (2014 – 2018)

Statistical Parameter	PM _{2.5} Concentration (µg/m ³)
Maximum 24-hour average	35.22
99 th percentile 24-hour average	27.91
95 th percentile 24-hour average	19.97
90 th percentile 24-hour average	15.07
70 th percentile 24-hour average	7.57

Table 12 indicates that 24-hour average PM_{2.5} concentrations at Monash are generally well below the assessment criterion

4.4.3 Odour

There is no odour monitoring data available for consideration at the proposed Facility site.

It is recognised that the Project site boundary is approximately 1,250 metres to the south of the Mugga Landfill (a source of potential odour emissions). It is considered that odour from this source would likely be detectable at the Project site during certain meteorological conditions.

5 Qualitative Assessment

5.1 Construction Impacts

5.1.1 Emission Sources

Air emissions from particulate matter of varying size fractions (TSP, PM₁₀ and PM_{2.5}) are likely to be generated during the following construction activities:

- site establishment and mobilisation.
- earthworks and civil construction works including:
 - excavation and benching.
 - disposal of surplus material.
 - installation of facility.
- pre-commissioning and commissioning works.

5.1.2 Impacts during construction

Direct potential impacts to the local air quality would typically be limited to particulate matter and emissions from vehicles, plant and equipment generated during site establishment works. Given the nature of the construction works, it is unlikely that there would be an odour impact during this period.

Exhaust emissions from the use of vehicles, and other machinery on site are likely to include nitrogen oxides, carbon monoxide, sulphur oxides, hydrocarbons and particulate matter of varying size fractions in small quantities which would be typical for construction sites.

Activities that may generate particulate matter (i.e. dust) include wind erosion of exposed surfaces, movement of topsoil during excavations, disturbance of stockpiles, movement of vehicles and general site preparation works. Dust generation would primarily result from site clearing and benching activities. Impacts from these construction activities can be readily managed with a high level of control via water spray and dust suppression (refer to Section 6).

The dispersion of particulate matter would also depend on the meteorological conditions experienced during the works, but it is expected that these particulate levels would drop significantly with distance. During dry and windy meteorological conditions particulate emissions may be higher requiring additional specific corrective measures. The CEMP would identify triggers and procedures for dealing with these conditions (refer to Section 6.1).

5.2 Operational Impacts

5.2.1 Assessment Approach

Due to the limited scale of the proposal, a qualitative approach was considered appropriate to assess the potential for emissions to air from the operation of the facility.

The following was undertaken:

- Review of the operational characteristics of the facility.
- Consider the facility together with the *ACT separation distance guidelines for air emissions* (2018).
- Review the potential emission sources and estimated emission quantities during operation of the facility.
- Review the mitigation proposed.
- Provide a qualitative conclusion on the potential for emissions to significantly impact upon the surrounding sensitive receivers.

5.2.2 Operational characteristics

Figure 11 provides the process schematic of the facility. The key processes that have the potential for emissions to air are considered to include:

- Waste receivals and stockpiling of each waste stream – particulate matter and odour;
- Preliminary treatment - particulate matter and odour;
- Screening and separation - particulate matter and odour;
- Waste water processing – odour;
- Transfer of reclaimed product to stockpiles - particulate matter;
- Storage of reclaimed product – particulate matter;
- Material load out - particulate matter; and
- Material offsite transportation - particulate matter.

With the exception of reclaimed product, material load out and material transportation all of the nominated emissions to air occur within an enclosed building.

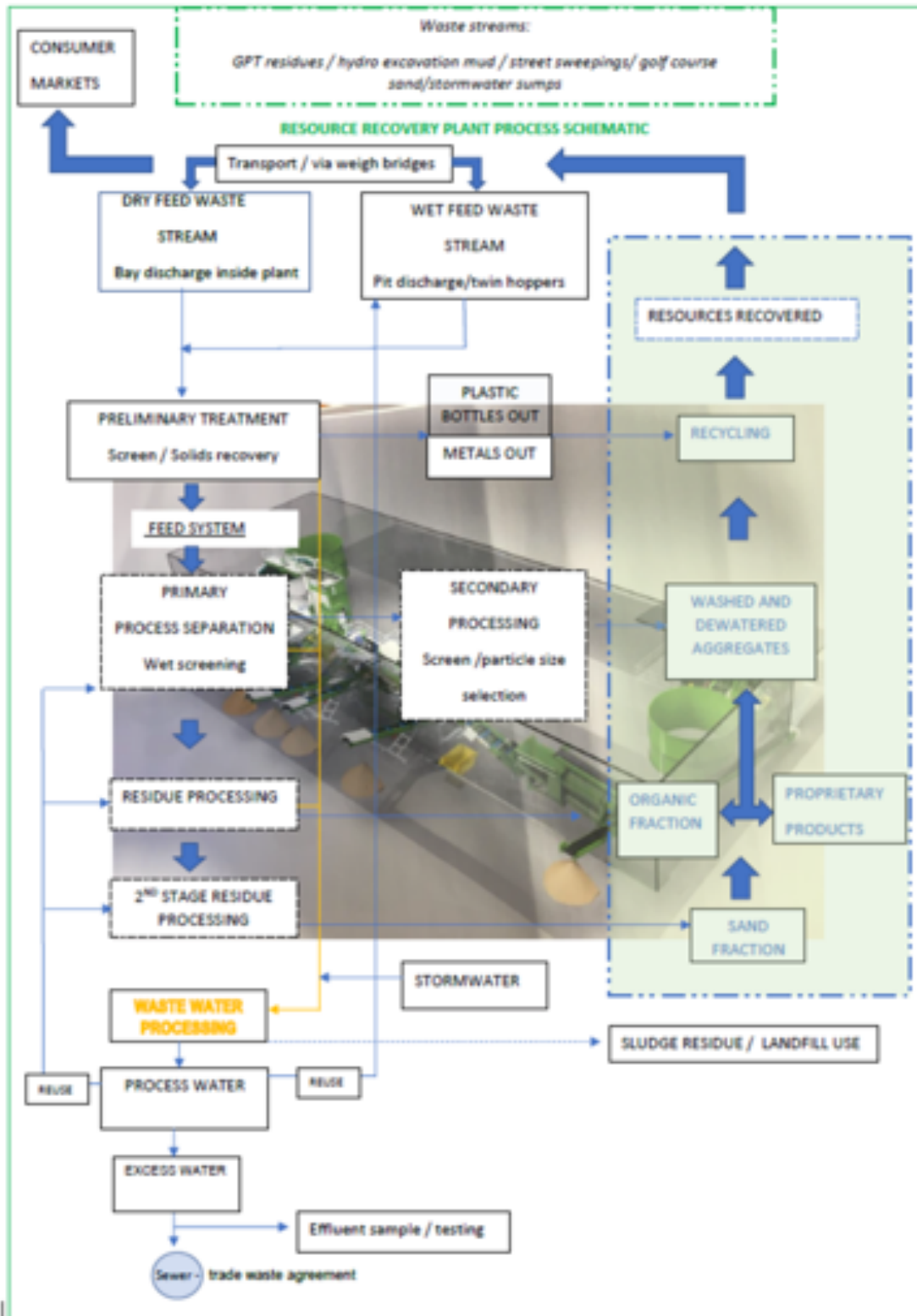


Figure 11: Resource Recovery Plant Process Schematic

5.2.3 Separation Distance Assessment

The *ACT Separation Distance Guidelines for Air Emissions* (2018) details that the appropriate separation distance for an activity applicable to this Facility (being a waste materials facility) to the nearest sensitive receiver is 300 metres. Adjustment for the vegetation/surface roughness between the source and the receptor and the terrain effects around the site was not applicable.

As described in [Table 9](#) above, the nearest sensitive receiver is 370m (Rose Cottage). Based on this guideline, the proposed facility is compliant.

Additional information is provided to further support this position in the following sections.

5.2.4 Emission Assessment

Emissions to air from the operation of the facility are estimated below.

It is noted that emissions to air from the facility following incorporation of emission controls (primarily that most activities occur within an enclosed building) are anticipated to be low. Based on these emission assumptions, a quantitative air quality investigation is not considered necessary, as it would not provide any further useful information.

5.2.4.1 Odour

An assessment of the potential odour emissions from GTP waste is provided in **Appendix A**. The results indicated that with the exception of one sample, the perceived odour emissions from the stockpiles were considered consistent with a background sample of natural excavated material.

One sample with a high leaf litter content had increased odour intensity and a different character that was not consistent with the background sample. It is considered that bacteria within this sample due to breakdown of leaf litter content and a long residence time within the GPT (2-3 months) contributed to this result.

During the operation of the facility, it is understood that these materials would be transferred directly to the treatment plant within the facility, and not stockpiled for any period of time minimising potential for odour impacts.

Based on the results of this indicative survey and proposed mitigation measures discussed in Section 6, odour impacts upon the identified sensitive receptors is considered a low risk of exceeding the adopted assessment criteria.

5.2.4.2 Particulate Matter

Worst-case emission estimation for the facility has been calculated based on the *National Pollution Inventory Emission Estimation Techniques for Mining Version 3.1 (2012)*. The

emission inventory is presented in **Table 13**. Emission estimation was based on the following assumptions and notes:

- The resource recovery site is paved. In accordance with the site environmental management plan, the site will be appropriately maintained. Emissions from haul on the site are therefore considered to be negligible.
- The moisture content of the waste delivered to site will typically be greater than 10%. The emission factors have not considered this higher moisture content, and are therefore considered highly conservative.
- Preliminary treatment and residue processing are understood to be wet processes. Emissions from these activities are therefore considered to be negligible.
- It is understood that all activities are contained within the facility's plant building, as illustrated in Figure 3. Therefore, a 100% reduction has been applied to all emission sources based on *Table 4*, NPI (2012).

Based on the information presented within **Table 13**, particulate emissions from the Facility would present a low risk of exceeding the adopted assessment criteria at the identified sensitive receptors.

Table 13: Emissions Inventory

Activity	Maximum throughput (t/hr)	TSP Emission factor (kg/t)	PM ₁₀ Emission factor (kg/t)	Hours	Uncontrolled Emissions		Mitigation	Controlled Emissions	
					TSP emissions per day (kg)	PM ₁₀ emissions per day (kg)		TSP emissions per day (kg)	PM ₁₀ emissions per day (kg)
Unloading to stockpile	25	0.012	0.0043	8	2.4	0.2752	Enclosed within building (100% reduction)	0	0
Transfer to preliminary treatment (front end loader)	25	0.025	0.012	8	5	0.768		0	0
Preliminary treatment (wet process)	25	0	0	8	0	0		0	0
Transfer to secondary treatment	25	0.00032	0.00015	8	0.064	0.0096		0	0
Residue processing (wet process)	25	0	0	8	0	0		0	0
Transfer to stockpiles	25	0.004	0.0017	8	0.8	0.1088		0	0
Stockpile load out by front end loader	25	0.025	0.012	8	5	0.768	Nil	5	0.768
TOTAL					13.3	2.0		5	0.768

6 Management Measures

6.1 Construction

Best practice management measures would be implemented as described in the Construction Environmental Management Plan (CEMP) for the Project. Management measures would incorporate the following types of controls:

- Engineering controls such as suppressing dust by using water sprays on stockpiles and roads.
- planning controls e.g. scheduling known dust generating activities during favourable meteorological conditions;
- operational controls such as wetting of unsealed roads.

Potential air quality impacts would be localised and occur over a defined period. The implementation of appropriate management practices would ensure that impacts on nearby sensitive receptors and the receiving environment are minimised. The management measures are presented in **Table 14**.

Table 14: Proposed construction management measures

Source	Management Measure
Heavy Commercial Vehicles	<ul style="list-style-type: none">- Diesel fuelled vehicles would be fitted with diesel particulate filters and serviced in accordance with manufacturer's instructions to ensure compliance with the requirements prescribed in the Diesel Vehicle Emissions NEPM.- All trucks containing entrained material entering or leaving the site would be covered.- Speed limits e.g. 20 km/hr would be imposed on vehicles travelling within the construction site.
Vehicle movements	All vehicle movements would be strictly limited to designated entry and exit areas, and parking locations.
Adverse meteorological conditions	PM activities would be reduced under adverse meteorological conditions e.g. high winds and extended periods of low rainfall.
Earthmoving and excavation	All excavated spoil would be wetted to minimise PM emissions.

6.2 Operation

The treatment facility and process has been designed to minimise the potential for impacts to the air environment during operation. The facility has been designed so that incoming material for treatment would be directly loaded into the resource recovery plant.

6.2.1 Particulates

Table 15 details proposed particulate management measures to be implemented during operation to minimise potential impacts on the surrounding environment.

Table 15: Particulate sources and management measures

Source of Particulate	Management Measure
Processing	<ul style="list-style-type: none"> - Materials processing to be contained within an enclosed building. - Maintain adequate moisture content of any stockpile.
Stockpiling of saleable product	<ul style="list-style-type: none"> - Use of water sprays as required. - Contained within the enclosed building
Transportation	<ul style="list-style-type: none"> - Loads will be covered

6.2.2 Odour

Table 16 details proposed odour management measures that would be implemented during operation to minimise potential odour impacts on the surrounding environment.

Table 16: Odour sources and management measures

Source of Odour	Management Measure
Receival of malodorous feedstock	<ul style="list-style-type: none"> - waste inspection and transfer to enclosed waste bins for disposal (localised malodour such as dead animals etc). - waste inspection/processing rejection procedure - waste inspection/removal identification and disposal as per hazmat procedures
Stockpile of unprocessed feedstock becoming odorous	<ul style="list-style-type: none"> - Minimise periods for which stockpiles are held. - Contingency measures if equipment breakdown causes stockpiling
Processing	Materials processing to be contained within an enclosed building
Anaerobic/high biological oxygen demand of process water	<ul style="list-style-type: none"> - Monitoring of dissolved oxygen during the process via a meter. - Air sparging would be incorporated as part of the process water treatment.

7 Conclusion

CEC was engaged by Flexible Australia to prepare this qualitative air quality assessment as part of an EIS in support of a DA for the proposed Waste Recovery Facility, Hume ACT.

It is noted that emission rates from the facility following incorporation of emission controls (primarily that most activities occur within an enclosed building) are anticipated to be low. Based on these emission assumptions, a quantitative air quality investigation is not considered necessary, as it would not provide any further useful information.

Construction works are likely to generate particulate matter of varying size fractions (TSP, PM₁₀ and PM_{2.5}). Best management practices (refer section 6.1) would be implemented to ensure potential impacts on the receiving environment and nearest sensitive receptors are minimised.

During operation of the facility, particulate matter (TSP and PM₁₀) and odour may be generated. The resource recovery plant has been designed to minimise the likelihood for impacts to air by fully enclosing the recovery process and ensuring the time materials are stored is minimised. Best management practices and measures outlined in Section 6.2 would be implemented to ensure potential impacts on the receiving environment and nearest sensitive receptors are minimised.

The facility propose to use of low technology to reclaim fit for purpose materials in a fully bunded and enclosed building, using wet processing techniques and as a consequence the emission of particulate matter and odour are considered unlikely.

Based on outcomes of the qualitative assessment, it is concluded that the Facility would present a low risk of exceeding the adopted assessment criteria at the identified sensitive receptors during construction works and operation of the Facility.

8 Bibliography

- ACT Government. *Separation distance guideline for air emissions* (2018).
- Act Government. *The Environment Protection Guidelines for Construction and Land Development in the ACT*, March 2011.
- Australian Government. *National Pollution Inventory Emission Estimation Techniques for Mining Version 3.1* (2012).
- CRC Monitoring, *Stormwater Gross pollutants Industry Report*. (1997).
- National Environment Protection (Ambient Air Quality) Measure (2016).
- South Australia Government, Environment Protection Authority. (2016). *Environment Protection (Air Quality) Policy*.
- South Australia Government, Environment Protection Authority. (2016). *Ambient Air Quality Assessment*.
- Todoroski Air Sciences (2017) *Air Quality Impact Assessment, Waste Plastic to Fuel Facility, Hume ACT*

APPENDICES

APPENDIX A1 GPT Site Visit Photos and Qualitative Odour Survey

Introduction


Jason Watson conducted a site visit with Flexible Australia staff to inspect three Gross Pollutant Trap (GPT) and stockpile sites on Monday 15 July 2019. The sites were:

- Ngunnawal GPT
- Monash GPT; and
- Weston GPT.

At each site, the objective was to inspect the material collected from the GPTs to understand the likely potential for odour emissions from the stockpiled GPT material at the proposed facility. Each stockpile site contains material removed from each GPT which is stockpiled prior to collection and removal by Flexible.

It is noted that at each of the stockpile sites, the majority of the material had been stockpiled for more than 2-3 months. The inspection of materials and odour survey was undertaken on only one occasion and did not consider time of day or meteorological conditions. These limitations should be considered when interpreting any of the survey results.

Photographs of the three stockpile sites are presented below.

Description	Photograph
Monash hydrovac stockpile (which incorporates Monash GPT stockpile)	 A photograph showing a large, muddy stockpile site. The foreground is dominated by dark, wet mud and water. In the background, there are trees and a white truck with a blue and white patterned canopy. The sky is clear and blue.

Monash GPT



Monash GPT stockpile, which contained a high proportion of leaf litter (TP4).



Ngunnawal GPT



Ngunnawal GPT and stockpile



Ngunnawal GPT -
TP1



Weston GPT
stockpile



Weston GPT



Methodology

CEC recorded odour intensity was guided by:

- German VDI 3882:1992 Part 1 *Olfactometry – Determination of Odour Intensity*.

This method was utilised during the odour survey as there is currently no Australian Standard for rating odour intensity. The German VDI 3882 standard is however the most commonly referred to standard by regulatory authorities.

To assess the odour intensity at each location for any discernible odours detected, the odour assessor undertaking the survey would classify their perception of the odour intensity in general accordance with the scale outlined in **Table 1**.

Table 1 Summary of Odour Intensity

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

To assist the CEC odour assessor with recording representative observations of odour characters perceived during the odour survey, an odour wheel was utilised as illustrated in **Figure A1** as an example for referencing perceived odours.

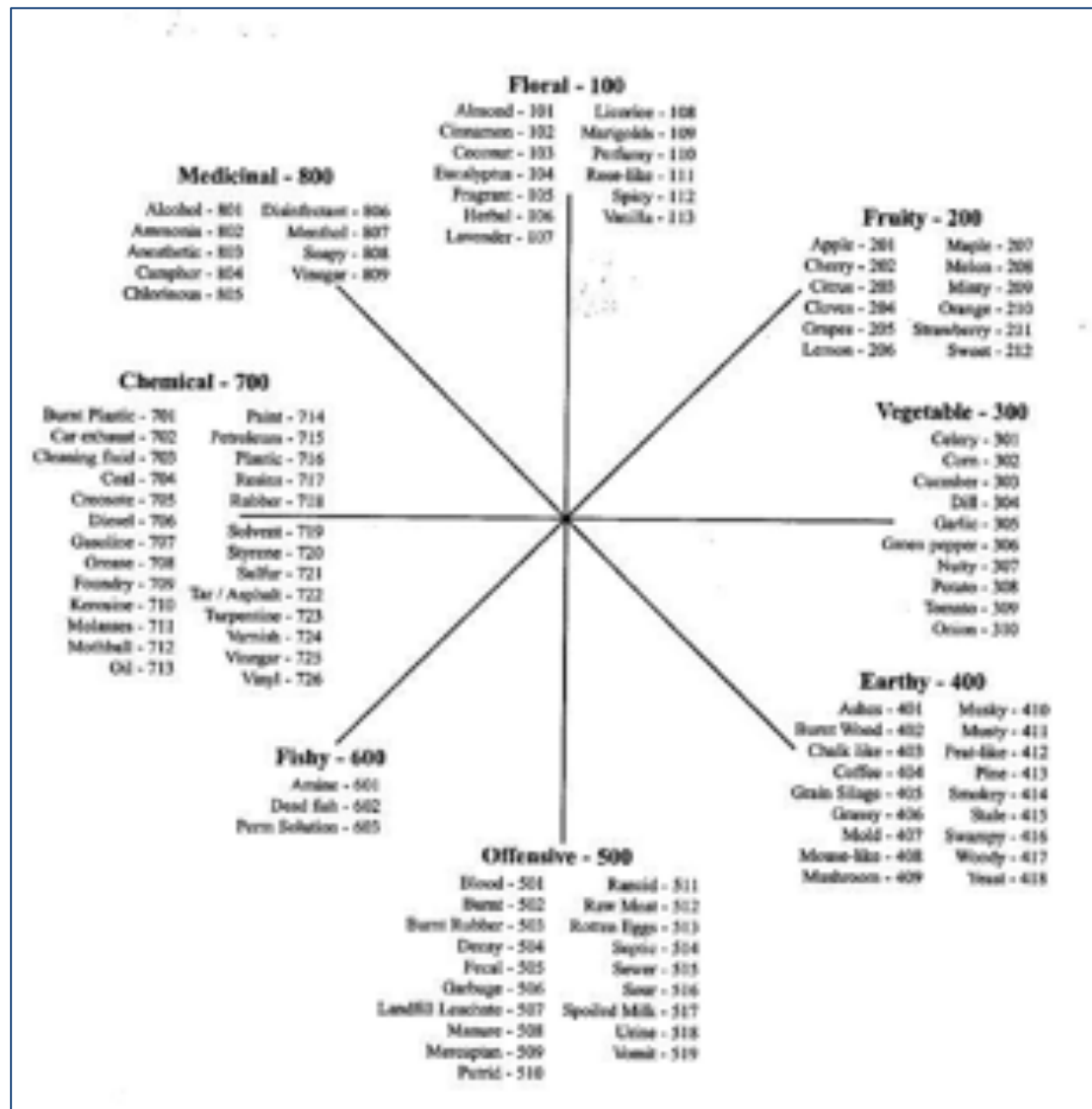


Figure A1 Odour wheel used during odour survey

Test pits were excavated into a number of stockpiles at each location. Test pits were excavated with a hand held shovel to a depth of approximately 40cm. Soil was removed on the head of the shovel and an olfactory estimation of odour intensity recorded. Additionally, an odour intensity result was collected 2 metres downwind of the test pit. It is noted that the collection of odour samples is considered indicative only, and did not follow any recognised olfactory quality assurance sampling methodology.

A blank sample was also conducted for soil excavated from the soil profile (approximately 20cm deep) outside the Weston GPT site, and titled “background sample”.

Results

The results of the odour survey are presented in Table 2.

Table 2 GPT Soil Stockpile Odour Survey Results

Sample ID	Location	Description	Odour Intensity Perceived at source	Odour Character(s) Perceived at source	Odour Intensity Perceived at 2m	Odour Character(s) Perceived at 2m
TP1	Ngunnawal GTP	Sandy soil	2	Peat-like	0.2	Grass
TP2	Ngunnawal GTP	Sandy soil	2	Peat-like	0.2	Grass
TP3	Ngunnawal GTP	Sandy soil	2	Peat-like	0.2	Grass
TP4	Monash GPT	Sandy soil with a high leaf litter content	3	Sewer	0.4	Peat-like
TP5	Monash GPT	Sandy soil	2	Peat-like	0.4	Peat-like
TP6	Monash GPT	Sandy soil	2	Peat-like	0.4	Peat-like
TP7	Weston GPT	Sandy soil	2	Peat-like	0.2	Grass
TP8	Weston GPT	Sandy soil	2	Peat-like	0.2	Grass
TP9	Weston GPT	Sandy soil	2	Peat-like	0.2	Grass
Background	Weston	Sandy clay	2	Peat-like	-	-

The results indicated that with the exception of one sample, the stockpiles were not considered to emit odours greater than those consistent with the background sample.

TP4 had a high leaf litter content. It is considered that bacteria in the presence of the high leaf litter content and the long residence stockpile time onsite (2-3 months) contributed to a higher odour intensity and a different character that was not consistent with the background sample.

Conclusion

The intention is that the proposed facility would provide an opportunity for the increased frequency of collection and treatment of GPT 'waste' material, as there is currently not sufficient means for treatment of this material within the ACT. Therefore once the proposed facility is operational GPT waste will be directly removed from the GPT and not required stockpiling on site for months at a time. This would likely reduce the potential for odours from organic matter and material with high leaf litter content, given they would not have had the opportunity for anaerobic process and breakdowns to occur over time.

Despite this the survey undertaken indicated that the majority of odour samples were considered to be consistent with the background soil sample with minimal odour intensity perceived.