E.3.2 Air Quality Assessment

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AIR QUALITY IMPACT ASSESSMENT

SCENIC RIM AGRICULTURAL INDUSTRIAL PRECINCT

6200 CUNNINGHAM HIGHWAY

KALBAR

Prepared for:

Kalfresh Pty Ltd

Prepared by:

MWA Environmental

8 April 2020

Max Winders & Associates Pty Ltd tas MWA Environmental
Level 15, 241 Adelaide St, Brisbane GPO BOX 3137, Brisbane Qld 4001
P 07 3002 5500 **F** 07 3002 5588 E mail@mwaenviro.com.au
W www.mwaenviro.com.au
ABN 94 010 833 084

DOCUMENT CONTROL SHEET

MWA Environmental
Level 15 241 Adelaide Street
GPO Box 3137 Brisbane 4001

Telephone: 07 3002 5500
Facsimile 07 3002 5588
Email: mail@mwaenviro.com.au

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Principal Author: Mr Ben Hyde

Client: Kalfresh Pty Ltd

Client Address: 6206 Cunningham Hwy, Kalbar QLD 4309

Client Contact: Mr David Krause

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1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

MWA Environmental has been engaged by Kalfresh Pty Ltd (“**Kalfresh**”) to prepare an Air Quality Impact Assessment for the proposed Scenic Rim Agricultural Industrial Precinct (“**SRAIP**”) at Kalbar in Queensland.

The SRAIP was declared a ‘coordinated project requiring an impact assessment report’, by the Coordinator-General under Part 4, section 26(1)(b) of the *State Development and Public Works Organisation Act 1971* (SDPWO Act) on 31 May 2019.

The report addresses the potential impact of air pollutant and odour emissions from the SRAIP on sensitive land uses in support of the Impact Assessment Report.

The assessment has given regard to the Coordinator General’s ‘*Scope of work for a draft impact assessment report - Scenic Rim Agricultural Industrial Precinct project*’ (19 August 2019).

The assessment has been based upon detailed meteorological and air pollutant dispersion modelling using preliminary design information for the proposed activities.

1.2 SITE DESCRIPTION

The subject land has a nominal street address of 6200 Cunningham Highway, Kalbar and comprises the following real property descriptions:

- Lot 1 on RP216694
- Lot 2 on SP192221
- Lot 3 on SP192221
- Lot 4 on SP192221
- Lot 2 on RP20974
- Lot 2 on RP44024

The site is located within the Scenic Rim Regional Council area and is located approximately 46 km by road southwest of Ipswich and 13 km by road west of Boonah.

The location of the subject land and surrounding land uses is shown on **Figure 1**.

The subject site is currently utilised for agricultural industry (Kalfresh facility), composting and agricultural activities.

1.3 PROPOSED DEVELOPMENT

The project seeks approval for the following aspects of development:

Planning Act 2016

- Preliminary Approval (including a variation request) for Material Change of Use to override the Planning Scheme to establish the Industry Zone (SRAIP Precinct) and Rural Zone (SRAIP Precinct) to allow for a range of uses including:
  - SRAIP rural industrial activities
  - SRAIP infrastructure activities
  - SRAIP support activities
- Development Permit for Reconfiguring a Lot
- Development Permit for Material Change of Use for Renewable energy facility (Digester), High Impact Industry (Composter) and Utility Installation (Sewerage Treatment Plant)
- Development Permit for Material Change of Use for ERA53a – Organic material processing (by composting the organic material), ERA 53b – Organic material processing (by anaerobic digestion), ERA 63(1b) – Sewerage treatment
- Development Permit for Operational Works for Earthworks
- Preliminary Approval for Operational Work for Constructing or raising waterway barrier works
- Preliminary Approval for Operational Work for Native vegetation clearing

Environmental Protection Act 1994

- Environmental authority for environmentally relevant activities (ERAs):
  - ERA 53a – Organic material processing (by composting the organic material)
  - ERA 53b – Organic material processing (by anaerobic digestion)
  - ERA 63(1b) – Sewerage treatment

Water Act 2000

- ~~Riverine protection permit to excavate or place fill in a watercourse~~
- Water allocation / licence

The SRAIP will provide a formal hub for agricultural industry and associated supporting uses. Key elements of the SRAIP project are:

- Establishment of an industrial precinct for subdivision into allotments supporting a range of agriculture focussed industry uses, infrastructures facilities and supporting uses
- An anaerobic digester and biogas power plant
- A composting facility
- A small scale (approximately 200 equivalent person) on-site sewage treatment plant with an associated 2 hectare effluent irrigation area – no potential for off-site nuisance impacts from this small scale plant

The proposed development seeks development approval for the following Environmentally Relevant Activities:

- ERA 53(a) – Organic material processing more than 200t of organic material in a year – by composting the organic material
- ERA 53(b) – Organic material processing more than 200t of organic material in a year – by anaerobic digestion
- ERA 63(1)(b)(i) – Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of more than 100 but not more than 1,500 equivalent persons – where treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme.

Detailed descriptions of the proposed environmentally relevant activities are provided in the following Precise Environmental reports:

Appendix F

Proposed Environmentally Relevant Activity 53(a) – organic material processing by composting – Proposed Scenic Rim Agricultural Industrial Precinct – 6200-6206 Cunningham Highway, Kalbar, Queensland (Precise Environmental, April 2020)

Appendix G

Proposed Environmentally Relevant Activity 53(b) – organic material processing by anaerobic digestion – Proposed Scenic Rim Agricultural Industrial Precinct – 6200-6206 Cunningham Highway, Kalbar, Queensland (Precise Environmental, April 2020)

Appendix G

Onsite Wastewater Management Report – 6200-6206 Cunningham Highway, Kalbar, Queensland (Precise Environmental, April 2020)

This assessment has been issued on the basis of the following plans:

- Overall Concept Layout Industry Allotment (RPS Group Plan 142489-06J, 5 March 2020) (refer **Attachment 1**)
- Proposed Composter Layout (RPS Group Plan 142489-08 Rev B, 19 February 2020) (refer **Attachment 2**)
- Kalfresh Bioenergy Facility Site Layout (Aquatec Maxcon Pty Ltd Drawing No. 21876A-012 Rev A, 5 March 2020) (refer **Attachment 3**)

1.4 SURROUNDING LAND USES

An aerial photograph of the subject site and surrounding land uses is included as **Figure 2**.

Surrounding land uses comprise:

To the north:	Rural zoning, cattle grazing and two isolated residential dwellings on properties also utilised for industrial purposes.
To the east:	Rural zoning, agricultural uses, Cunningham Highway and residential dwellings along the Cunningham Highway (to northeast) and Muller Road.
To the south:	Rural zoning, Zanow's Quarry, agricultural uses with isolated residential dwellings.
To the west:	Kangaroo Mountain with rural zoning, cattle grazing and isolated residential dwellings beyond that are setback more than 1,500 metres from the subject land.

Selected surrounding residential dwellings are marked on **Figure 3** and labelled as R1 to R14 for the purpose of this assessment. The representative residential dwellings labelled are the nearest residential dwellings that are located within 1,500 metres of the subject land.

It is noted that the receptor identified as R12 is a dwelling on land utilised for industrial purposes (fertiliser supply).

All residential dwellings identified within 1,500 metres of the subject land are setback less than 1,000 metres from the Cunningham Highway aside from R1 and R10 (refer **Figure 3**).

The setback distances from each of the nominated residential dwellings to the subject land and the proposed emission sources are summarised in **Table 1**.

Table 1: Residential Setback Distances from Boundary of Subject Land and Nearest SRAIP Uses

Sensitive Receptor	Setback Distances from Subject Land (metres)	Setback Distances from Nearest SRAIP Use (metres)
R1	1120	1120
R2	620	715
R3	625	640
R4	610	620
R5	607	614
R6	625	625
R7	685	685
R8	690	690
R9	745	745
R10	1430	1430
R11	520	520
R12	95	320
R13	370	455
R14	1260	1500

1.5 SCOPE OF ASSESSMENT

Key air pollutant emissions considered in the assessment are:

- Combustion gas emissions from the biogas cogeneration (“CHP”) units
- Combustion gas emissions from the biogas plant flare (operation for CHP breakdown and scheduled testing purposes)
- Odour emissions from the anaerobic digester plant and associated feedstock storage and handling odour – noting proposed odour control using two ‘BioAir’ systems
- Odour emissions from digestate irrigation over an 18 hectare cropping area on-site at an approximate 1:25 dilution ratio – using low pressure, low height downward spray systems and/or soil injection to minimise off-site odour emission potential
- Odour emissions from the composting facility, including compost windrows at 15,000 tpa and 50,000 tpa production rates and leachate ponds
- Dust emissions from the composting facility including material handling, wind erosion and unsealed roads

2.0 AIR QUALITY ASSESSMENT FRAMEWORK

The air quality impact assessment has considered the assessment of the key air pollutant and odour emissions in detail in the following report sections.

Section 3: Anaerobic Digester Plant Odour Assessment

Odour emissions from the anaerobic digester / biogas plant and associated waste processing building and external silage stockpiles including two proposed 'BioAir' systems for odour control

Section 4: Anaerobic Digester Plant Air Toxics Assessment

Combustion product emissions from the biogas cogeneration ("CHP") units (power generation) and flare operation

Section 5: Digestate Irrigation Odour Assessment

Odour emissions from digestate fertiliser irrigation over an 18 hectare crop area on-site (by low height downward spray system and/or soil injection)

Section 6: Composting Odour Assessment

Odour emissions from the composting facility including windrows and leachate ponds

Section 7: Composting Dust Assessment

Composting facility dust emissions including material handling, wind erosion and unsealed roads

The following emission sources are considered minor and have therefore not been considered in detail.

- Odour emissions from the 200 equivalent person on-site wastewater plant treatment odour – minor, small scale package treatment plant
- Odour emissions from wastewater irrigation odour – minor, small scale effluent volumes

2.1 MODELLING METHODOLOGY

To enable assessment of air pollutant and odour emissions from the proposed SRAIP, detailed dispersion modelling has been conducted using the CALMET / CALPUFF modelling system (CALMET Version: 6.5.0, CALPUFF Version: 7.2.1).

The CALMET / CALPUFF modelling system considers 3-dimensional unsteady state meteorology and is suitable for modelling pollutant transport on a regional scale and for complex terrain and coastal zones. The CALMET / CALPUFF modelling system simulates the effects of spatially and time varying meteorology on pollutant transport within the model domain, including chemical transformation and removal. CALPUFF considers emissions as a series of puffs that, if emitted at a sufficient frequency, simulate a continuous emission. This representation of the plume as a series of puffs allows the pollutant transport to vary spatially across the model domain in accordance with the 3-dimensional meteorological field.

A site-specific 3-dimensional prognostic meteorological dataset generated using TAPM was processed using the CALMET program to provide meteorological inputs in a form suitable for the CALPUFF dispersion model. The terrain and land use resolution were refined to a 100 metre grid for the CALMET / CALPUFF modelling to ensure a reasonable representation of the terrain at the locality. CALMET prepares 3-dimensional meteorological data for each hour of the CALPUFF run based upon the 3-dimensional prognostic dataset generated using TAPM (TAPM Version: 4.0.5).

The CALMET / CALPUFF model was set up to model dispersion within an 8 km x 8 km area surrounding the subject site. The topography of the subject site and surrounding area was sourced from State of Queensland (Department of Natural Resources, Mines and Energy) 2018 QSpatial LiDAR Contours at 1 metre resolution. The CALPUFF sampling domain was represented over a 7 km x 7 km area encompassing the SRAIP and surrounding sensitive receptors.

The CALPUFF model has been used to predict the concentrations of odour and air toxics at discrete receptors locations within the model domain representative of surrounding sensitive uses as shown on **Figure 3**.

Gridded receptor modelling has also been undertaken for a selection of odour and dust scenarios to produce contours of the predicted concentrations over the model domain.

The predicted concentrations at surrounding sensitive uses include relevant ambient air pollutant concentrations (refer **Section 2.3**) where applicable and are assessed against the relevant air quality criteria (refer **Section 2.2**).

2.2 RELEVANT AIR QUALITY CRITERIA

The following environmental objective for air specified in Schedule 8, Part 3, Division 1 of the *Environmental Protection Regulation 2019* is as follows:

Environmental Objective

The activity will be operated in a way that protects the environmental values of air.

The environmental values for the air environment as specified in the Part 6 of the *Environmental Protection (Air) Policy 2019* include the following as relevant to sensitive receptors (dwellings) within 1,500 metres of the subject land:

6 Environmental values

The environmental values to be enhanced or protected under this policy are—

…

(b) the qualities of the air environment that are conducive to human health and wellbeing; and

(c) the qualities of the air environment that are conducive to protecting the aesthetics of the environment, including the appearance of buildings, structures and other property;

The *Environmental Protection (Air) Policy 2019* specifies air quality objectives in Schedule 1 that are stated to be prescribed for enhancing or protecting the environmental values at sensitive receptors.

For the assessment of complex mixtures of odorants, the Queensland Ecoaccess *Guideline: Odour Impact Assessment from Developments* (2013) recommends a 2.5 Odour Units 99.5th percentile 1 hour average odour criterion as being appropriate for the assessment of the odour amenity of a residential land use for ground level and wake-affected sources such as those associated with the SRAIP.

Reference has been made to the air quality (planning) criteria in the Brisbane City Council *CityPlan 2014 Air Quality Planning Scheme Policy* for pollutants with no relevant air quality objective under the *Environmental Protection (Air) Policy 2019.*

Presented in **Table 2** is a summary of the air quality objectives and source adopted for this assessment.

Table 2: Air Quality Criteria

POLLUTANT	AVERAGING PERIOD	GUIDELINE	HEALTH OUTCOME PROTECTED	SOURCE
TSP	Annual Average	90 µg/m^3	Health and Wellbeing	EPP(Air) 2019
PM_{10}	24 Hour Average (Maximum)	50 µg/m^3	Health and Wellbeing	EPP(Air) 2019
	Annual Average	25 µg/m^3	Health and Wellbeing	EPP(Air) 2019
$PM_{2.5}$	24 Hour Average (Maximum)	25 µg/m^3	Health and Wellbeing	EPP(Air) 2019
	Annual Average	8 µg/m^3	Health and Wellbeing	EPP(Air) 2019
Dust Deposition	Maximum Monthly Average	120 mg/m^2/day	-	Common ERA Condition
Nitrogen Dioxide	1-hour average 99.9th percentile	250 µg/m^3	Health and Wellbeing	EPP(Air) 2019
	Annual Average	62 µg/m^3	Health and Wellbeing	EPP(Air) 2019
Sulphur Dioxide	1-hour average	570 µg/m^3	Health and Wellbeing	EPP(Air) 2019
	24 Hour Average (Maximum)	229 µg/m^3	Health and Wellbeing	EPP(Air) 2019
	Annual Average	57 µg/m^3	Health and Wellbeing	EPP(Air) 2019
Carbon Monoxide	Maximum 8-hour average	11,000 µg/m^3	Health and Wellbeing	EPP(Air) 2019
Ethylene oxide	1-hour average	3.3 µg/m^3	IARC Group 1 carcinogen	BCC City Plan 2014
Propylene oxide	1-hour average	90 µg/m^3	USEPA Group B1 carcinogen	BCC City Plan 2014
Odour	1-hour average, 99.5th percentile	2.5 OU	Odour	DEHP Guideline
Acetaldehyde	1-hour	42	Odour	BCC City Plan 2014
Benzene	Annual	5.4	Health and Wellbeing	EPP 2019
1,1-biphenyl	1-hour	24	Health and Wellbeing	BCC City Plan 2014
1.3-butadiene	Annual	2.4	Health and Wellbeing	EPP 2019
Ethyl chloride (chloroethane)	1-hour	48000	Health and Wellbeing	BCC City Plan 2014

POLLUTANT	AVERAGING PERIOD	GUIDELINE	HEALTH OUTCOME PROTECTED	SOURCE
Chloroform	1-hour	900	Health and Wellbeing	BCC City Plan 2014
1.2-dichloroethane	24-hours	764	Health and Wellbeing	EPP 2019
Ethylbenzene	1-hour	8000	Health and Wellbeing	BCC City Plan 2014
Formaldehyde	24-hour	54	Health and Wellbeing	EPP 2019
	30-minutes	109	Protecting Aesthetic Environment	EPP 2019
n-Hexane	1-hour	3200	Health and Wellbeing	BCC City Plan 2014
Methanol	1-hour	3000	Odour	BCC City Plan 2014
Phenol	1-hour	20	Odour	BCC City Plan 2014
Benzo(a)pyrene (as a marker for polycyclic aromatic hydrocarbons)	annual	0.0003	Health and Wellbeing	EPP 2019
Styrene	7-day	284	Health and Wellbeing	EPP 2019
	30-minutes	76	Protecting Aesthetic Environment	EPP 2019
Toluene	24-hour	4100	Health and Wellbeing	EPP 2019
	Annual	400	Health and Wellbeing	EPP 2019
	30-minutes	1100	Protecting Aesthetic Environment	EPP 2019
Vinyl chloride monomer	24-hour	28	Health and Wellbeing	EPP 2019
Xylenes	24-hour	1200	Health and Wellbeing	EPP 2019
	Annual	950	Health and Wellbeing	EPP 2019

2.3 AMBIENT AIR POLLUTANT CONCENTRATIONS

The Queensland Government operates a network of ambient air quality monitoring stations across the state. Annual ambient monitoring datasets are published through the Queensland Government data portal and are available for the years 2010 to 2018.

The Flinders View monitoring station is the closest station to the subject site measuring particulates as PM_{10}, Nitrogen Dioxide and Sulphur Dioxide. The Springwood monitoring station has been referenced for representative $PM_{2.5}$ concentrations and the South Brisbane monitoring station has been referenced for representative Carbon Monoxide concentrations. An analysis of ambient air quality data for the most recent three years of monitoring has been undertaken.

A summary of the relevant ambient air quality statistics for inclusion in the dispersion modelling assessment as ambient concentrations is presented in **Table 3**.

Table 3: Ambient Air Pollutants Concentrations Applied to Assessment

POLLUTANT	AVERAGING TIME	AMBIENT	SOURCE
PM_{10}	24 Hour Average	18.3 µg/m^3	24-hour average 70th percentile over 3 years from 2016 to 2018 at Flinders View
	Annual Average	16.4 µg/m^3	Average over 3 years from 2016 to 2018 at Flinders View
$PM_{2.5}$	24 Hour Average	6.4 µg/m^3	24-hour average 70th percentile over 3 years from 2016 to 2018 at Springwood
	Annual Average	5.7 µg/m^3	Average over 3 years from 2016 to 2018 at Springwood
TSP	Annual Average	36.6 µg/m^3	Double the PM_{10} average over 3 years from 2016 to 2018 at Flinders View
Deposition	Monthly Average	40 mg/m^2/day	Assumption based upon typical background data
Nitrogen Dioxide	1-hour average	16.9 µg/m^3	1-hour average 70th percentile over 3 years from 2016 to 2018 at Flinders View
	Annual Average	14 µg/m^3	Average over 3 years from 2016 to 2018 at Flinders View
Sulphur Dioxide	1-hour average	5.2 µg/m^3	1-hour average 90th percentile over 3 years from 2016 to 2018 at Flinders View
	24 Hour Average (Maximum)	2.6 µg/m^3	24-hour average 70th percentile over 3 years from 2016 to 2018 at Flinders View
	Annual Average	1.9 µg/m^3	Average over 3 years from 2016 to 2018 at Flinders View
Carbon Monoxide	Maximum 8-hour average	180 µg/m^3	8-hour average 70th percentile over 3 years from 2016 to 2018 at South Brisbane

2.4 METEOROLOGICAL DATA

No site-specific meteorological data was available for this assessment. In the absence of site specific data, following accepted methodology for assessment, the TAPM (TAPM Version: 4.0.5) software was utilised to develop a prognostic meteorological model which generated a year of representative hourly meteorological data for the locality.

TAPM has been used to predict meteorological parameters specific to the area surrounding the subject site including temperature, wind speed, wind direction and stability classification. The model accesses databases of surface characteristics (terrain height, soil and vegetation) and synoptic weather analyses provided by CSIRO to carry out these analyses. TAPM is able to process the output data to produce meteorological data files suitable for input to the CALMET / CALPUFF modelling system i.e. a 3-dimensional grid of hourly varying meteorological parameters over a full year.

Technical discussion of the model algorithms, inputs and model validation studies are provided in the Part 1: Technical Paper (Hurley, 2002) and Part 2: Summary of Verification Studies (Hurley et al, 2002)[1,2].

The centre coordinates for the model grid were Latitude -27˚53'30" and Longitude 152°34'. The following nested model grids were applied to the TAPM modelling:

40 x 30 km grid (total area 1200 km x 1200 km)

40 x 10 km grid (total area 400 km x 400 km)

40 x 3 km grid (total area 120 km x 120 km)

40 x 1 km grid (total area 40 km x 40 km)

Twenty-five vertical grid levels were modelled.

The TAPM model was set up to generate a site-specific meteorological data file for the locality, based upon synoptic analysis data for the representative Year 2012, as provided by CSIRO. An analysis of wind speeds and directions measured at the Queensland Government monitoring station at Mutdapilly, approximately 20 km to the northeast of the subject site was undertaken for the years 2010 to 2017. The Year 2012 was statistically the most representative of the long-term average conditions for this period of available data.

Observed wind speeds and wind directions for the Queensland Government monitoring station at Mutdapilly were incorporated into the TAPM model as assimilation data. Considering broader topographical influences and separation from the subject site, the Mutdapilly station was given a radius of influence of 20 km over 2 vertical levels with a quality factor of 0.9.

[1] Hurley, P.J. (2002) The Air Pollution Model (TAPM) Version 2: User Manual. Aspendale: CSIRO Atmospheric Research Internal Paper.

[2] Hurley, P.J. (2002) The Air Pollution Model (TAPM) Version 2: Part 1: Technical Description. Aspendale: CSIRO Atmospheric Research Technical Paper.

The TAPM output was processed using the CALTAPM software to produce a 3-dimensional data file suitable for input to the diagnostic CALMET model as an 'initial guess field'. The CALMET model further resolved the prognostic meteorology to a finer terrain, land use and soil type resolution of 100 metres over an 8 x 8 km area covering the subject site and surrounding region for the purpose of dispersion modelling.

Analysis of the CALMET derived meteorology for the subject land including a wind rose, wind frequency graph, monthly average temperatures graph and tabulated stability class analysis is contained in **Attachment 4**.

3.0 ANAEROBIC DIGESTER ODOUR ASSESSMENT

A preliminary assessment has been undertaken of odour emissions from the anaerobic digester / biogas plant located on proposed Lot 11.

The waste receival and processing building including the liquid pre-storage area will be operated under negative pressure, with ventilated air treated through a suitably designed 'BioAir' odour control system. Odour emissions from all activities within the waste receival and processing building will be treated using the 'BioAir' odour control unit, including solid feedstock handling / storage, liquid feedstock handling / storage and feedstock processing prior to input to the digesters. Preliminary specifications for the 'BioAir' system and outlet concentrations as supplied by Aquatec Maxcon (refer **Attachment 5**) have been considered in this assessment and will be reviewed subject to detailed design process.

The odour assessment has also considered the potential for release of fugitive odour from the waste receival and processing building. It is recommended that vehicle access to the waste receival and processing building be via fast-acting automatic closing door systems that are to remain closed aside from allowing vehicle access. Pedestrian access doors to the waste receival and processing building should also be self-closing. With these measures in place fugitive odour from the building should be minimal. For the purposes of this assessment fugitive losses have been considered based upon an indicative loss of 1 percent of building volume per hour.

The anaerobic digester tanks will be sealed with all gases produced directed through the gas treatment system and CHP units for combustion. Only minor fugitive losses from overpressure release valves, for example, are anticipated prior to the combustion process. Odour emissions from the CHP units are expected to be minor due to the high temperature combustion conditions but have been considered in the assessment.

An additional 'BioAir' system is proposed to treat odour emissions associated with the digestate treatment (separation and pasteurisation) building and the buffer tank. Preliminary specifications for the 'BioAir' system and outlet concentrations as supplied by Aquatec Maxcon (refer **Attachment 5**) have been considered in this assessment and will be reviewed subject to detailed design process.

Odour emissions from the proposed external silage stockpiles have been included in the model. The corn silage stockpiles are to be covered when not being actively stocked or reclaimed.

3.1 ODOUR EMISSION RATES

MWA Environmental has prepared an odour emissions inventory for key sources associated with the proposed anaerobic digester and biogas plant on proposed Lot 11.

Presented in **Table 4** are a description of the sources, model parameterisation and adopted odour emission rates.

Table 4: Odour sources from anaerobic digester / biogas plant on Lot 11

Description	Source Type	Dimensions (m)	Area (m^2)	Emission Rate Calculations	Odour Emission Rate (ou/s)
Waste Processing Building 'BioAir' Stack	Point (stack)	12m High 600mm diameter	n/a	See calculation below	2,800
Waste Processing Building Fugitive Losses	Volume	2m height, Sigma-y 7.91, Sigma-z 3.72	n/a	See calculation below	11,900
Digestate Storage & Seperation & Pasteurisation Building 'BioAir' Stack	Point (stack)	12m High 600mm diameter	n/a	See calculation below	5,667
External Corn Silage Bunks (x4)	Area	4x60m x 25m	4x 1500	See calculation below	3,150

Waste Processing Building 'BioAir' Calculation:

Design 'BioAir' Outlet Concentration:	1000 ou[3]
Extraction volume per hour:	10,000 m^3/hr[3]
'BioAir' stack OER:	2,800 ou/s

Waste Processing Building Fugitive Losses Calculation:

Internal Shed Concentration:	90,000 ou[4]
Internal Shed Dimensions:	28 x 40 x 8.5 metres
Internal Shed Volume:	9520 m^3
Leakage assumed:	1 %[5]
Fugitive OER:	2,380 ou/s

3 Preliminary design specification for 'BioAir' system supplied by Aquatec Maxcon indicates expected outlet concentration of 1,000 OU.m^3 and extraction flow rate of 10,000m^3/hr (refer **Attachment 5**)

4 Estimate from Aquatec Maxcon based upon prior projects (refer **Attachment 5**)

5 Estimated hourly losses from opening of access doors for vehicle and pedestrian access only with the negative pressure system

Digestate Storage & Separation & Pasteurisation Building 'BioAir' Calculation:

Design 'BioAir' Outlet Concentration:	1000 ou[3]
Extraction volume per hour:	10,000 m^3/hr[3]
'BioAir' stack OER:	2,800 ou/s

Corn Silage Stockpile Calculation:

Corn Silage OER:	1.5 ou/m^2/s[6]
Control Efficiency for use of Covers:	50%
Area of Single Silage Bay:	1500 m^2
Number of Silage Bays:	4
Total Area of Silage Bays:	6000 m^2
Stockpile Surface area within bays:	70%
Silage OER (per bay):	788 ou/s
Silage OER (total):	3,150 ou/s

Two CHP engines are proposed to be located at the Anaerobic Digester Plant on Lot 11. Technical specifications for a 637kW Jenbacher engine have been supplied by Aquatec Maxcon, noting that the specifications are for an engine approximately 15 percent larger than those proposed at SRAIP. Presented in **Table 5** are emission characteristics for the CHP units applied to the model. The CHP emission specifications applied in this assessment are noted to be based upon the preliminary design process and will be reviewed subject to the detailed design process.

[6] Based upon odour emission rate supplied by Aquatec Maxcon using data previously applied to plants in Germany

Table 5: CHP Emission Characteristics (per CHP)

Parameter	Value	Units	Reference
Stack Height	10	m	Aquatec Maxcon preliminary specification
Diameter	0.25	m	Jenbacher JMC 312 GS technical specification
Area	0.05	m^2	MWA Calc
Exhaust Gas Volume (wet)	2650	Nm^3/hour	Jenbacher JMC 312 GS technical specification
Volumetric Flowrate	0.74	Nm^3/s	MWA Calc
Temperature	200	°C	Aquatec Maxcon preliminary specification (with heat recovery operating)
Actual Flow	1.3	m^3/s	MWA Calc
Velocity	26	m/s	MWA Calc
Odour Emission Rate (per CHP)	1230	ou/s	Measured odour emission rates for 1.2MW CHP at Richgro (WA)[7]

3.2 ODOUR MODELLING RESULTS

Presented in **Table 6** are the model-predicted odour concentrations at surrounding sensitive receptors (refer **Figure 3**) as a result of the anaerobic digester and biogas plant on proposed Lot 11.

[7] Per '*Biogas Facility, Stage 3 Minor Change Application, Wood Mulching Industries Centenary Highway, Swanbank - Odour Impact Assessment*' (ASK Consulting Engineers, 12 April, 2018)

Table 6: Predicted Odour Concentrations from Anaerobic Digester Plant

Sensitive Receptor	Odour 1-hour average 99.5th percentile
R1	0.33
R2	0.49
R3	0.16
R4	0.15
R5	0.16
R6	0.16
R7	0.15
R8	0.15
R9	0.26
R10	0.09
R11	0.36
R12	0.20
R13	0.14
R14	0.26
Odour Criterion	2.5 odour units
Compliance?	**Yes**

Included in **Attachment 6** are contours of predicted 99.5th percentile 1-hour average odour concentrations from the anaerobic digester and biogas plant on proposed Lot 11.

The dispersion modelling conducted demonstrates that, subject to implementation of appropriate odour control systems, odour emissions from the anaerobic digester and biogas plant on proposed Lot 11 can comply with the relevant odour amenity guideline at all surrounding sensitive receptors.

Review of the anaerobic digester and biogas plant odour assessment is required at the detailed design stage of the project.

4.0 BIOGAS PLANT AIR TOXICS ASSESSMENT

A preliminary assessment has been undertaken of key combustion emissions from the biogas power generation (CHP) plant and flare located on proposed Lot 11.

Preliminary specifications for the CHP units and flare as supplied by Aquatec Maxcon have been considered in this assessment and will be reviewed subject to the detailed design process.

4.1 AIR TOXICS EMISSION RATES

MWA Environmental has prepared an air toxics emissions inventory for key combustion gas emissions associated with the proposed biogas power generation plant on Lot 11. Manufacturer emission limits and National Pollutant Inventory (NPI) emission factors have been referenced to derive emission rates.

Emission rates from the CHP engines for Oxides of Nitrogen and Carbon Monoxide have been based upon the Jenbacher JMC 312 GS technical specification provided by Aquatec Maxcon. The manufacturer has specified the CHP engines as achieving the following emission limits:

NOx: <0.5 g/Nm^3

CO: <1.0 g/Nm^3

Combustion emissions for Sulphur Dioxide from the CHP units have been estimated based upon 'biogas' and 'natural gas' emission factors specified in the *National Pollutant Inventory (NPI) Emission Estimation Technique Manual for Combustion Engines - Version 3.0 - June 2008*. No emission factors are supplied for VOC emissions from biogas combustion. As such, emission factors specified for natural gas combustion have been supplemented as indicative values for the range of VOC compounds.

Aquatec Maxcon has advised that typical H_2S emission concentrations from the CHP engine exhausts are expected to be below 0.3 mg/Nm^3. However, for the purposes of this assessment a conservative 5 mg/Nm^3 H_2S concentration has been modelled from the CHP engine exhausts.

The proposed flare is to be operated in the event of CHP breakdown and for scheduled testing purposes (weekly).

Combustion emissions associated with the flare operation have been estimated based upon the *USEPA AP-42, CH 13.5: Industrial Flares - September 1991.*

The modelling has conservatively represented the flare as operating continuously, concurrent with the two CHP engines.

Presented in **Table 7** are descriptions of the sources, model parameterisation and key air pollutant emission rates for the CHP engines and flare.

Table 7: Source Emission Parameters for the Biogas Plant

Parameter	CHP (x2)	Flare	Units
Stack Height	10	7.0	m
Diameter	0.25	1.0	m
Area	0.05	0.79	m^2
Exhaust Gas Volume	2650	4,370[8]	Nm^3/hour
Flow	0.74	1.21	Nm^3/s
Temperature	200	800	°C
Actual Flow	1.3	4.8	m^3/s
Velocity	26	6.1	m/s
Methane energy content	n/a	35.9	MJ/Nm^3
Methane energy density		55.5	MJ/kg
Methane emission rate		103	g/s

Presented in **Table 8** are the air pollutant emission rates for the CHP units and flare of the Biogas plant.

A summary of the CHP air pollutant emission rate calculations is included as **Attachment 7**.

[8] Based upon the flare upper limit biogas burning rate of 575 Nm^3/hour and an indicative overall air and fuel combustion gas ratio of 7.6

Table 8: Emission Rates for the Biogas Plant

Air Pollutant	CHP Emission Rate (per CHP) (g/s)	Flare Emission Rate (g/s)
Acetaldehyde	1.04E-02	n/a
Benzene	5.46E-04	n/a
1,1-biphenyl	2.63E-04	n/a
1.3-butadiene	3.31E-04	n/a
Ethyl chloride (chloroethane)	2.32E-06	n/a
Chloroform	3.53E-05	n/a
Carbon monoxide	0.74	0.90
1.2-dichloroethane	3.33E-06	n/a
Ethylbenzene	4.93E-05	n/a
Formaldehyde	6.55E-02	n/a
Hydrogen Sulphide	3.7E-03	n/a
n-Hexane	1.38E-03	n/a
Methanol	3.10E-03	n/a
Oxides of Nitrogen	0.37	0.17
Phenol	2.98E-05	n/a
$PM_{2.5}$	9.56E-05	0.04
PM_{10}	9.56E-05	0.04
Benzo(a)pyrene (as a marker for polycyclic aromatic hydrocarbons)	2.15E-07	n/a
Sulfur Dioxide	0.23	n/a
Styrene	2.93E-05	n/a
Toluene	5.06E-04	n/a
Vinyl chloride monomer	1.84E-05	n/a
Xylenes	2.28E-04	n/a
Ethylene oxide	n/a	0.027
Propylene oxide	n/a	0.085

4.2 AIR TOXIC MODELLING RESULTS

Presented in **Table 9** are the model-predicted air pollutant concentrations from combustion emissions associated with the biogas plant at surrounding sensitive receptors (refer **Figure 3**).

The tabulated concentrations / deposition rates include the ambient concentrations specified in **Table 3** above.

Table 9: Predicted Air Toxics Concentrations from Biogas Plant

Air Pollutant	Averaging Period	Highest Concentration at Surrounding Sensitive Receptor (Refer Figure 3) (µg/m^3)	Air Quality Objective (µg/m^3)	Highest % of Guideline at Any Receptor
Acetaldehyde	1-hour	1.26E+00	42	2.99
Benzene	Annual	6.78E-04	5.4	0.01
1,1-biphenyl	1-hour	3.19E-02	24	0.13
1.3-butadiene	Annual	4.11E-04	2.4	0.02
Ethyl chloride (chloroethane)	1-hour	2.81E-04	48000	<0.01
Chloroform	1-hour	4.28E-03	900	<0.01
Carbon monoxide (including ambient as per Table 3)	8-hours	254.4	11000	2.23
1.2-dichloroethane	24-hours	9.86E-05	764	<0.01
Ethylbenzene	1-hour	5.97E-03	8000	<0.01
Formaldehyde	24-hour	1.94E+00	54	3.59
	30-minutes	1.01E+01	109	9.28
Hydrogen Sulphide	30-minutes	0.57	7.5	7.62
	24-hour	0.45	164	5.98
n-Hexane	1-hour	1.67E-01	3200	0.01
Methanol	1-hour	3.76E-01	3000	0.01
Nitrogen Dioxide (30%)	1-hour	13.45	250	5.38
	Annual	0.15	62	0.25
Nitrogen Dioxide (30%) (including ambient as per Table 3)	1-hour	30.35	250	12.14
	Annual	14.15	62	22.83
Phenol	1-hour	3.61E-03	20	0.02
$PM_{2.5}$	24-hour	2.83E-03	25	0.01
	Annual	1.19E-04	8	<0.01
$PM_{2.5}$ (including ambient as per Table 3)	24-hour	6.40E+00	25	25.61
	Annual	5.70E+00	8	71.25

Table continued…

Air Pollutant	Averaging Period	Highest Concentration at Surrounding Sensitive Receptor (Refer Figure 3) (µg/m^3)	Air Quality Objective (µg/m^3)	Highest % of Guideline at Any Receptor
PM_{10}	24-hour	2.83E-03	50	0.01
	Annual	1.19E-04	25	<0.01
PM_{10} (including ambient as per Table 3)	24-hour	1.83E+01	50	36.61
	Annual	1.64E+01	25	65.60
Benzo(a)pyrene (as a marker for polycyclic aromatic hydrocarbons)	Annual	2.67E-07	0.0003	0.09
Sulfur Dioxide	1-hour	27.9	570	4.89
	24-hour	6.8	230	2.96
	Annual	0.3	57	0.50
Sulfur Dioxide (including ambient as per Table 3)	1-hour	33.1	570	5.80
	24-hour	9.4	230	4.09
	Annual	2.2	57	3.83
Styrene	7-day	2.21E-04	284	<0.01
	30-minutes	4.52E-03	76	0.01
Toluene	24-hour	1.50E-02	4100	<0.01
	Annual	6.28E-04	400	<0.01
	30-minutes	7.81E-02	1100	0.01
Vinyl chloride monomer	24-hour	5.46E-04	28	<0.01
Xylenes	24-hour	6.75E-03	1200	<0.01
	Annual	2.83E-04	950	<0.01
Ethylene oxide	1-hour	4.55E-01	3.3	13.8
Propylene oxide	1-hour	1.43E+00	90	1.59

5.0 DIGESTATE IRRIGATION ODOUR ASSESSMENT

An assessment of odour emissions from irrigation of digestate on the subject site has been undertaken.

Digestate will be stored within the Digestate Storage Tank on proposed Lot 11 for an average period of 5 weeks after discharge from the Digesters and a Pasteurisation process. The Digestate Storage Tank is sealed to minimise odour emissions whilst the digestate remains biologically active.

The digestate liquid fraction (digestate liquid) will be separated from the solid fraction (digestate solids). The digestate liquid fraction produced is estimated to be 65 to 80 tonnes per day, to be utilised for on-site irrigation, on-site composting and off-site irrigation as fertiliser.

The digestate liquid fraction will be transferred to a proposed 0.4 hectare digestate storage pond (refer **Attachment 1**), for pre-irrigation storage.

Approximately 10 percent of the total digestate liquid fraction will be irrigated over an 18 hectare cropping area on-site (refer **Attachment 1**) at a 1:25 dilution ratio with water.

On-site irrigation is proposed to utilise low-pressure, low elevation spray or drip line technologies to minimise volatilisation of odorous compounds.

The key odour emission sources associated with the digestate irrigation are:

- An 18 hectare cropping area is proposed for irrigation of diluted digestate on the southwest portion of the subject site (refer **Attachment 1**).
- A 0.4 hectare pond is proposed for digestate storage prior to irrigation (refer **Attachment 1**).

5.1 ODOUR EMISSION RATES

MWA Environmental has prepared an odour emissions inventory for key sources associated with the proposed on-site digestate irrigation.

The majority of digestate irrigation odour emission and impact information relates to whole digestate (liquid and solid fraction) application from on-farm anaerobic digester plants associated with intensive livestock facilities in Europe and the United Kingdom. The odour emissions from anaerobic digestion of intensive livestock slurries is considered to have a substantially higher odour emission potential than digestion utilising the feedstocks proposed to the SRAIP plant.

Odour emission rates from the land application of digestate from the Beckerich plant (Luxemburg) have been referenced[9] as the plant is stated to include maize (corn) silage and manure, both of which are feedstocks to the proposed SRAIP plant. The Beckerich plant case is likely to be a conservative basis for odour emission rates as the manure input for the Beckerich livestock facility plant is expected to be significantly higher than for the proposed SRAIP plant, where only minor amounts of poultry manure are to be utilised.

The Beckerich plant data for the measured odour emission rates from digestate land application by low pressure surface application as a function of time from application are presented in the figure below[9].

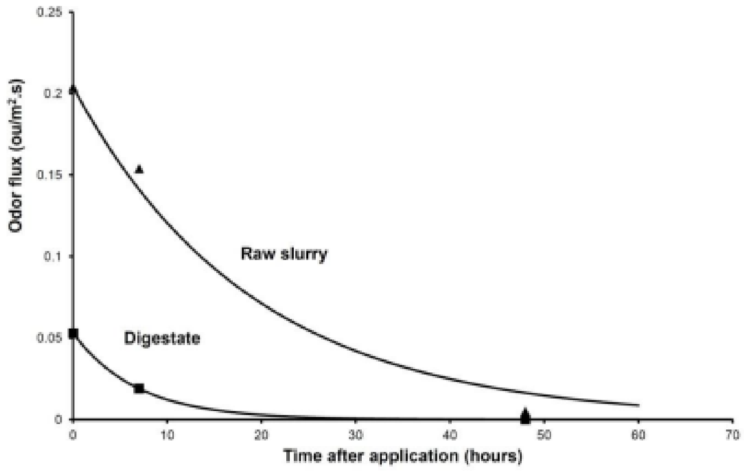

Figure 3 : Temporal decreasing of odor fluxes after application of raw slurry or digestate on grasslands.

For the purposes of this assessment it has been assumed that at any point in time 25 percent of the 18ha on-site irrigation area is emitting at the 0.05 $OU/m^2/s$ rate as 'at time of application'. The balance of the 18ha on-site irrigation area has been modelled at the lower 0.02 $OU/m^2/s$ rate representative of odour emission rates 7 hours after initial application.

It is noted that the SRAIP digestate irrigation will be at a 1:25 dilution ratio, which will reduce odour emission potential as compared to undiluted liquid digestate application. Conservatively, no account for dilution has been made in the modelled odour emission rates.

The same reference[9] states that liquid digestate in tank emits at a specific odour emission rate of approximately 1 $OU/m^2/s$. This has been conservatively applied for representation of odour emissions from the proposed pre-irrigation Digestate Storage Pond, although emission potential is expected to be lower due to the preceding 5 week period of storage in the Digestate Storage Tank at the anaerobic digester plant prior to transfer to the pond.

Presented in **Table 10** are a description of the sources, model parameterisation and adopted odour emission rates.

9 *Multi-method Monitoring of Odor Emissions in Agricultural Biogas Facilities* (2013) Jacques Nicolas, Gilles Adam, Yolanda Ubeda, Anne-Claude Romain, University of Liège and Universidad Politécnica de Valencia

Table 10: Digestate Irrigation Odour Emission Rates

Description	Source Type	Area (ha)	Odour Emission Rate ($ou/m^2/s$)	Odour Emission Rate Reference	Odour Emission Rate (ou/s)
Digestate Irrigation Area	Area	18	0.0275	*Multi-method Monitoring of Odor Emissions in Agricultural Biogas Facilities* (2013) Jacques Nicolas, Gilles Adam, Yolanda Ubeda, Anne-Claude Romain, University of Liège and Universidad Politécnica de Valencia	4950
Digestate Pre-Irrigation Storage Pond	Area	0.4	1		4000

5.2 ODOUR MODELLING RESULTS

Presented in **Table 11** are the model-predicted odour concentrations at surrounding sensitive receptors (refer **Figure 3**) as a result of digestate irrigation on the subject site.

Table 11: Predicted Odour Concentrations from Digestate Irrigation on the Subject Site

Sensitive Receptor	Odour 1-hour average 99.5^{th} percentile
R1	0.45
R2	0.95
R3	0.18
R4	0.17
R5	0.17
R6	0.18
R7	0.16
R8	0.17
R9	0.31
R10	0.12
R11	0.79
R12	0.56
R13	0.34
R14	0.32
Odour Criterion	**2.5 odour units**
Compliance?	**Yes**

The discrete receptor modelling conducted demonstrates that odour emissions from digestate irrigation can comply with the relevant odour amenity guideline at all surrounding residences.

Included in **Attachment 8** are contours of predicted 99.5^{th} percentile 1-hour average odour concentrations from the digestate irrigation activities.

6.0 COMPOSTING ODOUR ASSESSMENT

The key odour emission sources associated with the proposed composting activities located on the western portion of the site are:

- Raw material stockpiles (green waste, digestate solid fraction, chicken litter, mushroom substrate, vegetable food waste);
- Composting windrows (continuous source, gradual reduction in odour emission as windrow ages and short-term peaks in emissions when windrows are turned); and
- Leachate management pond(s).

The anticipated compost production rates are 15,000 tpa initially and ultimately up to 50,000 tpa. Feedstocks are expected to include:

Green Waste:	up to 46,000 tpa
Digestate solid fraction:	up to 13,500 tpa
Vegetable food waste:	up to 9,000 tpa
Chicken litter:	up to 5,500 tpa
Mushroom substrate:	up to 5,500 tpa

The conceptual layout plan for the composting facility is shown on the plan included as **Attachment 2**.

6.1 ODOUR EMISSION RATES

A literature review from the odour emission rates generated from green waste and composting activities has been undertaken. The Odour Emission Rate (OER) from a source is ultimately determined by the odour concentration of air being emitted and the surface area of material generating the odours:

$$OER\ (OU.m^3/sec) = SOER\ (OU.m^3/m^2/sec) \times \text{Area of Emitting Surface}\ (m^2)$$

The following key factors influence the variation in odour concentrations measured from varying composting operations:

- Composition of feedstocks
- Extent of microbial activity
- Extent of turning
- Internal temperature of the stockpile
- Age of stockpile
- Ambient temperature and humidity

Presented in **Table 12** is a review of odour emission rates that have been considered for the representation of odour emissions from the proposed composting operations.

Table 12: Literature review of composting odour emission rates

Source	Details	Emission Rate ($ou/m^2/s$)	Notes
GHD (2010)	Windrows	22.4	Recently Turned
	Windrows	1.3	Undisturbed
	Leachate Pond	0.3	Well maintained pond
Air Quality Impact Assessment for the Narangba Industrial Estate (Katestone, 2010)[10] Deception Bay Transfer Station Green waste	Fresh to 1 week	4.0	Composted green waste stockpile
	2 week	0.1	Composted green waste stockpile
	4 weeks	0.1	Composted green waste stockpile
	6 weeks	0.1	Composted green waste stockpile
	8 weeks	0.1	Composted green waste stockpile
	Freshly Turned	3.5	Composted green waste stockpile
	Freshly Turned + 1hour	0.8	Composted green waste stockpile
	Freshly Turned + 2hour	0.8	Composted green waste stockpile

MWA Environmental has reviewed the composting odour emission rates in **Table 12** for application to this study.

The odour emission rates from GHD (2010) are considered a reasonable basis for representing odour emissions from the proposed composting operations. This relates to odour emission rates of 1.3 $OU/m^2/s$ for undisturbed windrows and 22.4 $OU/m^2/s$ for 'just turned' windrows.

10 *Air Quality Impact Assessment for the Narangba Industrial Estate* (Katestone, May 2010)

The report *Air Quality Impact Assessment for the Narangba Industrial Estate* (Katestone, May 2010) describes sampling of odour emission rates undertaken by AWN/Golder Associates on composted green waste stockpiles. Sampling was undertaken on composted stockpiles of varying age. Highest odour emissions were in the first week before odour emissions rapidly decreased and remained constant from Week 2 to Week 8.

The sampling undertaken on freshly disturbed composted material and 1 and 2 hours post disturbance is also relevant. In the hours following disturbance (turning) of the composting material, odour emission rates were 8 times higher than the undisturbed windrow emission rates (0.8 versus 0.1). Turning of windrows generates a short-term peak in odour emissions, followed by a period of several hours following disturbance where odour emission rates remain elevated compared to an unturned stockpile.

In order to reflect the varying odour emission rates over the life of a windrow and due to disturbance (turning) activities, MWA Environmental has represented odour emissions from the compost windrows as varying with time of day. Windrow turning operations have been represented as occurring progressively between the hours of 6am and 6pm. All windrows have been represented as turned once per week. The sampling undertaken reported in Katestone (2010) has indicated a period of recent disturbance which MWA Environmental have represented in the dispersion model. The odour emission rate applied to windrows during the 2 hours following turning has been estimated as 10.4 $OU/m^2/s$ based upon the '8 times higher' post turning emission rate referenced in Katestone (2010) applied to the adopted baseline emission rate of 1.3 $OU/m^2/s$ for undisturbed windrows.

Liquid wastes received at the site with the potential to generate significant odour emissions should be blended with green waste within one hour of receival. Odour emissions from the liquid waste feedstock mixing bay have been considered on the basis of an indicative $500m^2$ surface area at a specific odour emission rate of 2.62 $OU/m^2/s$ based upon the SOER applied in ERM (2013)[11] with reference to grease trap waste feedstock. The mixing bay odour emissions have been modelled from the Feedstock Holding Bay on a continuous 24 hour / 7 day basis.

Cardno has undertaken a preliminary engineering sizing assessment for the composting facility. The preliminary design relates to three separate ponds (refer **Attachment 2**) for management of leachate and stormwater runoff detention for a 10% AEP event. The leachate and stormwater detention pond sizes, conservatively based upon the full capacity top surface area, are as follows:

DAM ID 1: $7,500m^2$

DAM ID 2: $3,380m^2$

DAM ID 4: $2,652m^2$

[11] *Resource Recovery Facility – Gerogery – Odour Impact Assessment* (ERM, 2013)

Odour emissions from leachate management ponds have been estimated based upon a rate of 0.3 OU/m²/s based upon the SOER applied in ERM (2013)[11]. This odour emission rate is noted to be applicable for a well maintained leachate pond, including implementation of measures to avoid anaerobic conditions. The adopted SOER is reasonable given the conservative assumption of leachate pond surface areas at the maximum top surface area for the ponds at capacity (i.e. during a 10%AEP event).

No specific emissions have been represented for the application of leachate to compost windrows given that odour emissions from this activity are short-term and based upon the leachate pond SOER would be negligible in comparison to the short-term elevated odour emission rates represented for the windrow turning activities and recently turned windrows.

The specific odour emission rates summarised in **Table 13** have been used in this assessment.

<u>Table 13:</u> Composting odour emission rates adopted for assessment

Odour Source	Odour Emission Rate	Units
Actively Turned Windrow	22.4	$ou/m^2/s$
Recently Turned Windrow	10.4	$ou/m^2/s$
Unturned Windrow	1.3	$ou/m^2/s$
Liquid Waste Mixing Bay	2.62	$ou/m^2/s$
Leachate Pond	0.3	$ou/m^2/s$

Two scenarios have been considered for the composting odour assessment based upon 15,000 tpa and 50,000 tpa operating scenarios but conservatively assuming full development emissions from leachate ponds and mixing bay sources.

Scenario 1: **Long-term composting of 50,000 tpa**

29 windrows x 75 metre length

Windrows formed and turned by windrow turning machine[12]

Approximate 3.0 metre windrow height and 7.2m width

Approximate 10m^2 surface area per lineal metre[13]

Estimated total windrow surface area 21,750m^2

Scenario 2: **Initial composting of 15,000 tpa**

29 windrows x 75 metre length

Windrows turned by tractor PTO driven windrow turner

Approximate 1.8 metre windrow height and 3.6m width

Approximate 5.4m^2 surface area per lineal metre[14]

Estimated total windrow surface area 11,745m^2

12 For example Scarab 24FT 10' TUN

13 Based upon trapezoidal shape windrow with 2m flat top section

14 Based upon trapezoidal shape windrow with 1m flat top section

For each scenario, compost windrow emissions have been distributed evenly across the two windrow pads shown on the Proposed Composter Layout (refer **Attachment 2**). The exposed surface areas of compost windrows for each scenario have been calculated based upon preliminary operational information provided by Kalfresh (refer above).

A summary of the odour emission rate calculations for the various compost facility sources is included as **Attachment 9**.

The overall odour emission rates from the composting facility summarised in **Table 14** have been used in this assessment.

Table 14: Overall compost facility odour emission rates

Odour Source Group	Overall Odour Emission Rate (ou/s)
Unturned Compost Windrows (at 15,000 tpa)	15,269
Unturned Compost Windrows (at 50,000 tpa)	28,275
Liquid Waste Mixing Bay	1,310
Leachate Ponds	4,050

In accordance with the DEHP *Guideline – Odour Impact Assessment from Developments* (2013) provisions, the modelled specific odour emission rates for the composting activities have been scaled for ambient wind speed and stability class as discussed in Watts (2000)[15].

[15] Watts, P.J., 2000, Development of a pig effluent emissions database and analysis of promising control strategies final report, Part A – database on odour research and emission rates, report prepared for Pig Research and Development Corporation, FSA Environmental, Toowoomba

6.2 ODOUR MODELLING RESULTS

Presented in **Table 15** are the model-predicted odour concentrations at surrounding sensitive receptors (refer **Figure 3**) as a result of composting operations.

Table 15: Predicted Odour Concentrations from Composting Operations

Sensitive Receptor	**Predicted 1-hour average 99.5th percentile Odour Concentrations**	
	Scenario 1 Composting 50,000 tpa	**Scenario 2 Composting 15,000 tpa**
R1	0.84	0.65
R2	0.84	0.67
R3	0.38	0.24
R4	0.38	0.23
R5	0.38	0.24
R6	0.38	0.25
R7	0.36	0.23
R8	0.34	0.23
R9	0.41	0.29
R10	0.27	0.18
R11	0.72	0.57
R12	1.14	0.72
R13	1.02	0.90
R14	0.90	0.64
Odour Criterion	2.5 odour units	2.5 odour units
Compliance?	**Yes**	**Yes**

The discrete receptor modelling conducted demonstrates that odour emissions from the composting operations can comply with the relevant odour amenity guideline at all surrounding residences.

Included in **Attachment 10** are contours of predicted 99.5th percentile 1-hour average odour concentrations from the composting facility.

7.0 COMPOSTING DUST ASSESSMENT

The key dust emission sources associated with the proposed composting activities are:

- Vehicle and mobile equipment movements on unsealed roads;
- Raw material handling and blending/mixing;
- Product handling for stockpiling and dispatch;
- Wind erosion from unsealed areas; and
- Windrow turning.

Emission estimations and CALPUFF dispersion modelling have been undertaken considering the potential dust impacts associated with the ultimate 50,000 tpa production rate.

The model-predicted dust concentrations and deposition rates due to emissions from the proposed composting operations were added to the ambient concentrations presented in **Table 3** to assess the cumulative dust exposure at surrounding receptors.

7.1 DUST EMISSION SOURCES

The following sources were represented in the CALPUFF Model:

- Internal Access Roads (unpaved) as a series of area sources;
- Wind Erosion from stockpiles and unsealed areas as area sources;
- Material Handling operations as area sources including:
  - Raw material delivery
  - Raw material mixing and screening
  - Blended material transfer (loading + unloading) to wind rows
  - Windrow Turning
  - Compost material transfer (loading + unloading) to finished product stockpiles
  - Finished Product material transfer (loading to trucks)

Detailed emission rate calculations are included as **Attachment 11**.

7.2 PARTICLE SIZE DISTRIBUTION

To assess the potential dust deposition, it was necessary to model a particle size distribution. Whilst the actual particle size distribution of various sources and materials does vary, it is considered reasonable to apply a generalised particle size distribution for the purposes of this modelling. The modelled particle size distribution was derived from the following data included in the USEPA AP42 Chapter 13.2.4 *Aggregate handling and Storage Piles*[16].

Aerodynamic Particle Size Multiplier (k) For Equation 1				
< 30 μm	< 15 μm	< 10 μm	< 5 μm	< 2.5 μm
0.74	0.48	0.35	0.20	0.053[a]

[a] Multiplier for < 2.5 μm taken from Reference 14.

7.3 DUST CONTROL STRATEGY

The following measures are proposed to be implemented to minimise dust emissions from the composting activities.

- Access to the composting area will be via the 'Future Road Connection to Composter Lot' (refer **Attachment 1**), which will be unsealed west of the SRAIP industrial precinct. Regular watering of the unsealed compost access road at a rate of 2 litres/m^2/hour (Level 1) will be undertaken as required to minimise dust emissions.
- Regular watering of the trafficable areas within the compost facility at a rate of 2 litres/m^2/hour (Level 1) will be undertaken as required to minimise dust emissions.
- A wheel wash or alternative measure will be operated at the site as required to minimise silt track out on to the external road network.

7.4 DUST MODELLING RESULTS

Presented in **Table 16** are the model-predicted dust concentrations and deposition rates at surrounding sensitive receptors (refer **Figure 3**) from the composting operations.

The tabulated concentrations / deposition rates include the ambient concentrations specified in **Table 3** above.

16 USEPA (2006) Compilation of Air Pollutant Emission Factors – Volume 1: Stationary Point and Area Sources, AP-42 Chapter 13.2.4 Aggregate Handling and Storage Piles, United States Environmental Protection Agency.

Table 16: Predicted Dust Concentrations from Composting Operations including Ambient

Sensitive Receptor	PM_{10} (µg/m³)		$PM_{2.5}$ (µg/m³)		TSP (µg/m³)	Dust Deposition (mg/m²/day)
	Maximum 24-hour average	Annual Average	Maximum 24-hour average	Annual Average	Annual Average	Maximum Monthly Average
R1	19.0	16.4	6.5	5.7	36.7	40.1
R2	19.3	16.5	6.5	5.7	36.7	40.3
R3	18.8	16.4	6.5	5.7	36.7	40.2
R4	18.9	16.4	6.5	5.7	36.7	40.2
R5	18.9	16.4	6.5	5.7	36.7	40.2
R6	18.9	16.4	6.5	5.7	36.7	40.2
R7	18.8	16.4	6.5	5.7	36.7	40.2
R8	18.8	16.4	6.5	5.7	36.7	40.2
R9	19.2	16.4	6.5	5.7	36.7	40.2
R10	19.0	16.4	6.5	5.7	36.6	40.1
R11	19.9	16.5	6.6	5.7	36.7	40.4
R12	20.8	16.7	6.7	5.7	37.4	41.6
R13	19.9	16.5	6.6	5.7	36.9	40.7
R14	18.9	16.4	6.5	5.7	36.7	40.1
Air Quality Objective	50 µg/m³	25 µg/m³	25 µg/m³	8 µg/m³	90 µg/m³	120 mg/m²/day
Compliance?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

The discrete receptor modelling conducted demonstrates that, with the proposed dust control measures (refer **Section 7.3**), particulate emissions from the proposed composting activities will readily comply with the air quality objectives of the Queensland *Environmental Protection (Air) Policy 2019* at surrounding sensitive receptors.

In addition to the discrete receptor modelling, gridded receptor modelling is presented in **Attachment 12** as contours of predicted PM_{10} concentrations and dust deposition rates over an aerial photograph base. The plotted concentrations / deposition rates include the ambient concentrations specified in **Table 3** above.

8.0 CUMULATIVE ODOUR ASSESSMENT

The Queensland Eco access *Guideline: Odour Impact Assessment from Developments* (2013) acknowledges that odour emissions from sources with different odorant compositions are not necessarily 'additive' in terms of assessment of potential cumulative impacts, as follows:

> *"Source information compiled for modelling should include all sources of odour from the proposed development and other nearby facilities. However, odour impact assessment differs from that of other air pollutants in that odour concentrations at receptors are rarely additive. As a general guideline, emissions from like sources may be combined but for odours with different characteristics, the one with the steepest intensity curve versus concentration curve is likely to make the dominant contribution to odour impact. In some cases, odours can be masked by other odours."*

In terms of the SRAIP project, the odorant mix associated with the anaerobic digester plant 'BioAir' systems is expected to be significantly different to the odorant mix associated with the compost windows, such that the atmospheric concentrations are not simply additive. In the case of the SRAIP, these sources are relatively well separated.

Notwithstanding, modelling outputs for all odour sources associated with the anaerobic digester plant, the digestate irrigation and the composting facility have been combined for the purposes of conservative a review of the potential overall impact of the proposed development. The cumulative assessment has been based upon the Scenario 1, 50,000 tpa compost facility operation.

8.1 ODOUR MODELLING RESULTS

Presented in **Table 17** are the model-predicted 99.5th percentile 1 hour average odour concentrations at surrounding sensitive receptors (refer **Figure 3**) for a conservative assessment assuming additive cumulative impacts from the anaerobic digester plant, the digestate irrigation and the composting facility[17].

[17] Scenario 1 - 50,000tpa

Table 17: Predicted Cumulative Odour Concentrations from Anaerobic Digester and Composting Operations

Sensitive Receptor	Odour 1-hour average 99.5th percentile
R1	1.10
R2	1.75
R3	0.65
R4	0.65
R5	0.66
R6	0.66
R7	0.60
R8	0.62
R9	0.94
R10	0.46
R11	1.66
R12	1.38
R13	1.20
R14	1.24
Odour Criterion	2.5 odour units
Compliance?	**Yes**

The discrete receptor modelling conducted demonstrates that a conservative assessment of cumulative odour emissions from the proposed SRAIP activities can comply with the relevant odour amenity guideline at all surrounding residences.

In addition to the discrete receptor modelling, overall cumulative gridded receptor modelling is presented in **Attachment 13** as contours of predicted 99.5th percentile 1-hour average odour concentrations over an aerial photograph base.

9.0 CONCLUSION

MWA Environmental has been engaged by Kalfresh Pty Ltd to prepare an Air Quality Impact Assessment for the proposed Scenic Rim Agricultural Industrial Precinct at Kalbar in Queensland.

The SRAIP was declared a ‘coordinated project requiring an impact assessment report’, by the Coordinator-General under Part 4, section 26(1)(b) of the *State Development and Public Works Organisation Act 1971* (SDPWO Act) on 31 May 2019.

The report addresses the potential impact of air pollutant and odour emissions from the SRAIP on sensitive land uses in support of the Impact Assessment Report. The assessment has been based upon detailed meteorological and air pollutant dispersion modelling using preliminary design information for the proposed activities.

Detailed air pollutant dispersion modelling of the proposed activities based upon currently available design information demonstrates that compliance with the relevant air quality guidelines can be achieved at sensitive receptors with the implementation of appropriate controls and management measures.

This assessment has been undertaken based upon the current design for the composting facility and anaerobic digester / biogas plant. If any modifications to these facilities are required through the detailed design phase of the project, then this assessment should be reviewed to ensure that the relevant air quality and odour amenity criteria are achieved at surrounding sensitive land uses.

MWA Environmental
8 April 2020

FIGURES

LEGEND

SITE BOUNDARY

DRAWING REFERENCES

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CLIENT

KALFRESH PTY LTD

PROJECT

AIR QUALITY ASSESSMENT

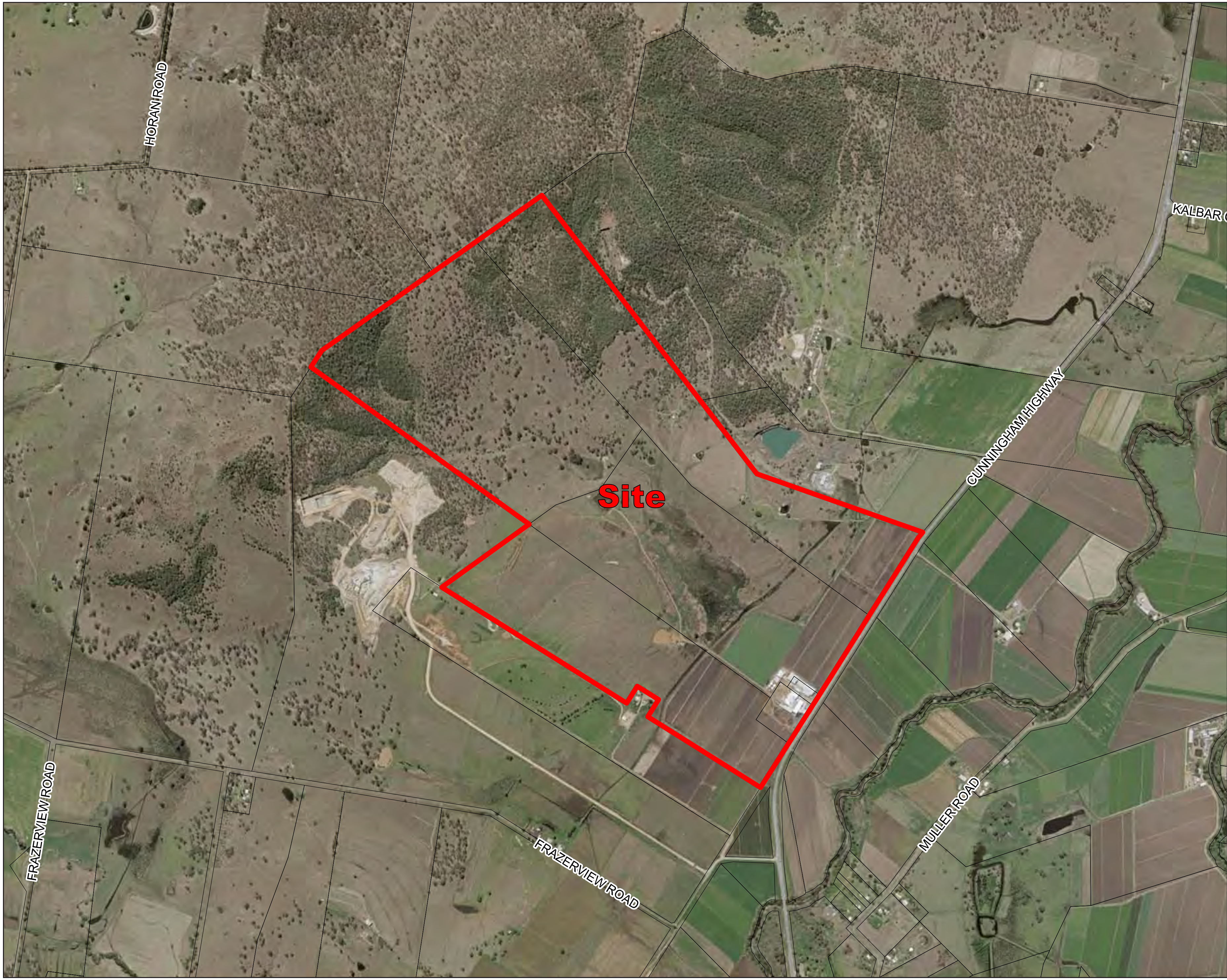
SCENIC RIM AGRICULTURAL INDUSTRIAL PRECINCT KALBAR QUEENSLAND

TITLE

SITE LOCATION AND SURROUNDING LAND USES

JOB	KALBAR	**FIGURE 1**
JOB NO.	19-143	
DATE	18/12/19	DWG NUMBER
SCALE	1:35000 (A4)	**19-143-1**
REV.		

Max Winders & Associates Pty Ltd tas MWA Environmental
Level 15, 241 Adelaide St, Brisbane. GPO BOX 3137, Brisbane Qld 4001
P 07 3002 5500 F 07 3002 5588 E mail@mwaenviro.com.au
W www.mwaenviro.com.au
ABN 94 010 833 084



LEGEND

SITE BOUNDARY

DRAWING REFERENCE

© THE STATE OF QUEENSLAND 2019 QLDGLOBE

N

0 200 400 600m

CLIENT

KALFRESH PTY LTD

PROJECT

AIR QUALITY ASSESSMENT

SCENIC RIM AGRICULTURAL INDUSTRIAL PRECINCT KALBAR QUEENSLAND

TITLE

AERIAL PHOTOGRAPH

JOB	KALBAR	**FIGURE 2**
JOB NO.	19-143	
DATE	18/12/19	DWG NUMBER
SCALE	1:20000 (A4)	**19-143-2**
REV.		

mwa ENVIRONMENTAL

Max Winders & Associates Pty Ltd t/as MWA Environmental
Level 15, 241 Adelaide St, Brisbane. GPO BOX 3137, Brisbane Qld 4001
P 07 3002 5500 F 07 3002 5588 E mail@mwaenviro.com.au
W www.mwaenviro.com.au
ABN 94 010 833 084

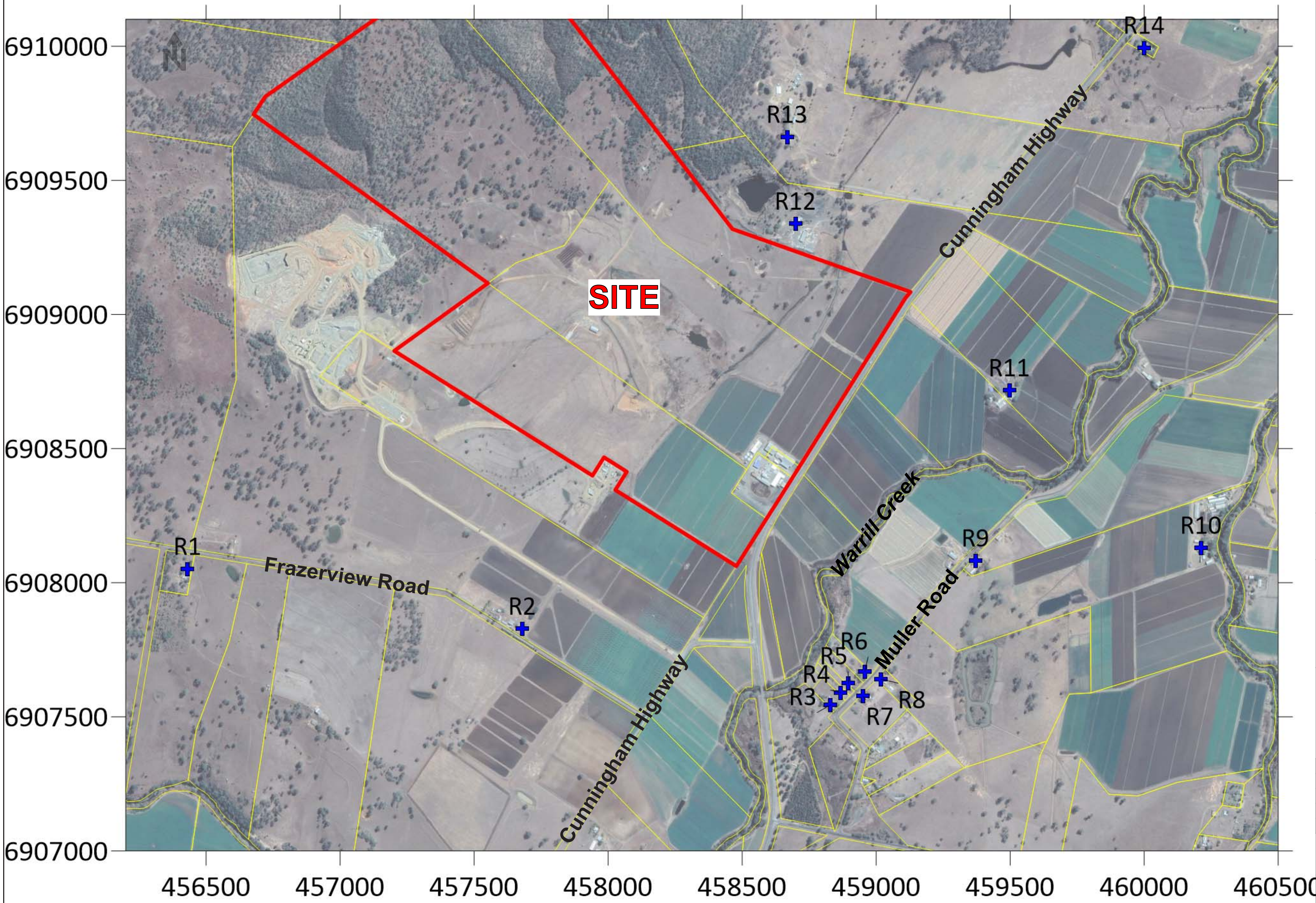
LEGEND

SITE BOUNDARY

R14 SENSITIVE RECEPTOR LOCATIONS (R1-R14)

DRAWING REFERENCES

© THE STATE OF QUEENSLAND 2019 QLDGLOBE



CLIENT

KALFRESH PTY LTD

PROJECT

AIR QUALITY ASSESSMENT

SCENIC RIM AGRICULTURAL INDUSTRIAL PRECINCT KALBAR QUEENSLAND

TITLE

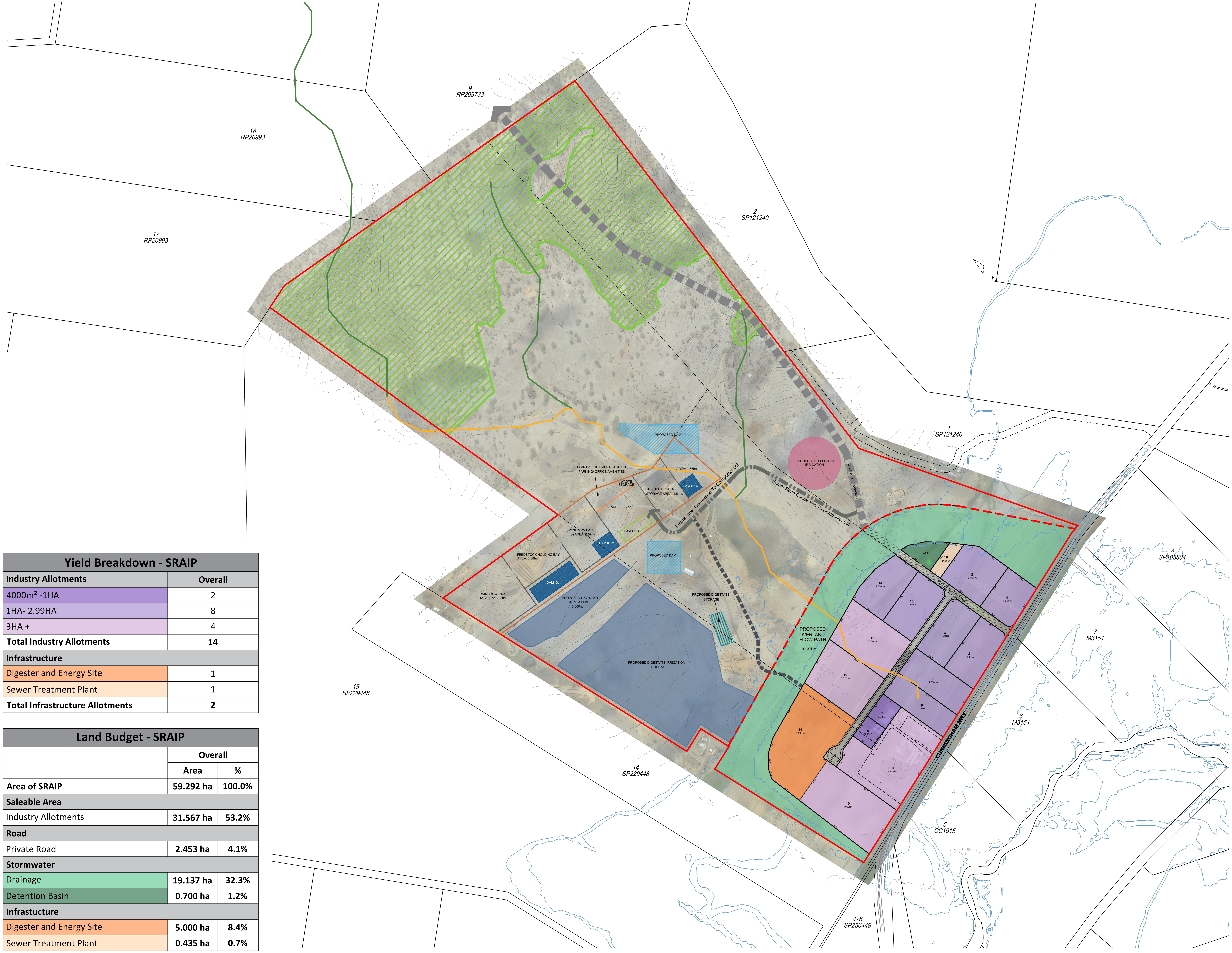
REPRESENTATIVE RECEPTOR LOCATIONS

JOB	KALBAR	FIGURE 3
JOB NO.	19-143	
DATE	18/12/19	DWG NUMBER
SCALE	1:20000 (A4)	19-143-3
REV.		

Max Winders & Associates Pty Ltd tas MWA Environmental
Level 15, 241 Adelaide St, Brisbane. GPO BOX 3137, Brisbane Qld 4001
P 07 3002 5500 F 07 3002 5588 E mail@mwaenviro.com.au
W www.mwaenviro.com.au
ABN 94 010 833 084

ATTACHMENT 1

Overall Concept Layout Industry Allotment
(RPS Group Plan 142489-06J, 5 March 2020)



0 25 50 75 100 150 1 : 5,000 @ A1

SCENIC RIM AGRICULTURAL INDUSTRIAL PRECINCT

6200 CUNNINGHAM HWY KALBAR CONCEPT OVERALL

PLAN REF: **142489-06L**
DATE: 16 MARCH 2020
CLIENT: KALFRESH
DRAWN BY: LZ
CHECKED BY: PHE

Legend

- Site Boundary
- SRAIP Industrial Precinct
- 0.25m Contours
- Existing Boundaries
- Existing Easement
- Drainage
- Detention Basin
- Proposed Overland Flow Path
- Proposed Flow Path Q100
- Proposed Bio Basin
- Proposed Effluent Irrigation
- Proposed Digestate Irrigation
- Proposed Dam
- Proposed Digestate Storage
- Proposed Composting Area
- Lechate Pond
- Proposed Composter Lot Road Access
- Proposed Plant & Equipment
- Proposed Windrow & Finished Product
- Proposed Stormwater Basin
- Proposed Wagner Quarry Access - (not part of the SRAIP proposal and subject to separate development approval)
- Environmental Protection Area (clearing within the Environmental Protection Area is subject to future development approval)
- Low Order Queensland Waterway
- Medium Order Queensland Waterway
- Road Connection to Composter Area
- Access Easement for Wagners Road Alignment

Note:
All Lot Numbers, Dimensions and Areas are approximate only, and are subject to survey and Council approval.

Dimensions have been rounded to the nearest 0.1 metres.

Areas have been rounded down to the nearest 5m².

The boundaries shown on this plan should not be used for final detailed engineers design.

Source Information:
Site boundaries: DCDB
Adjoining information: DCDB.
Contours: RPS Survey
Aerial photography: RPS Survey
Overland Flow Path: Aurecon

URBAN DESIGN
Level 4 HQ South
520 Wickham Street
PO Box 1559
Fortitude Valley QLD 4006
T +61 7 3539 9500
W rpsgroup.com

Yield Breakdown - SRAIP

Industry Allotments	Overall
4000m² -1HA	2
1HA- 2.99HA	8
3HA +	4
Total Industry Allotments	**14**
Infrastructure	
Digester and Energy Site	1
Sewer Treatment Plant	1
Total Infrastructure Allotments	**2**

Land Budget - SRAIP

	Overall	
	Area	%
Area of SRAIP	**59.292 ha**	**100.0%**
Saleable Area		
Industry Allotments	**31.567 ha**	**53.2%**
Road		
Private Road	**2.453 ha**	**4.1%**
Stormwater		
Drainage	**19.137 ha**	**32.3%**
Detention Basin	**0.700 ha**	**1.2%**
Infrastructure		
Digester and Energy Site	**5.000 ha**	**8.4%**
Sewer Treatment Plant	**0.435 ha**	**0.7%**

ATTACHMENT 2

Proposed Composter Layout
(RPS Group Plan 142489-08 Rev B, 19 February 2020)

0 10 20 30 40 60 1 : 2,000 @ A2

6200 CUNNINGHAM HWY KALBAR

PROPOSED COMPOSTER LAYOUT

PLAN REF: 142489-08
Rev No: C
DATE: 12 MARCH 2020
CLIENT: KALFRESH
DRAWN BY: LZ
CHECKED BY: PHE/CH

Legend

- Site Boundary
- 0.25m Contours
- Existing Boundaries
- Proposed Flow Path
- Proposed Effluent Irrigation
- Proposed Digestate Irrigation
- Proposed Dam
- Proposed Digestate Storage
- Proposed Composting Lot
- Lechate Pond
- Propsoed Composter Lot Road Access
- Proposed Plant & Equipment
- Proposed Windrow & Finished Product
- Proposed Stormwater Basin

Note:
All Lot Numbers, Dimensions and Areas are approximate only, and are subject to survey and Council approval.

Dimensions have been rounded to the nearest 0.1 metres.

Areas have been rounded down to the nearest $5m^2$.

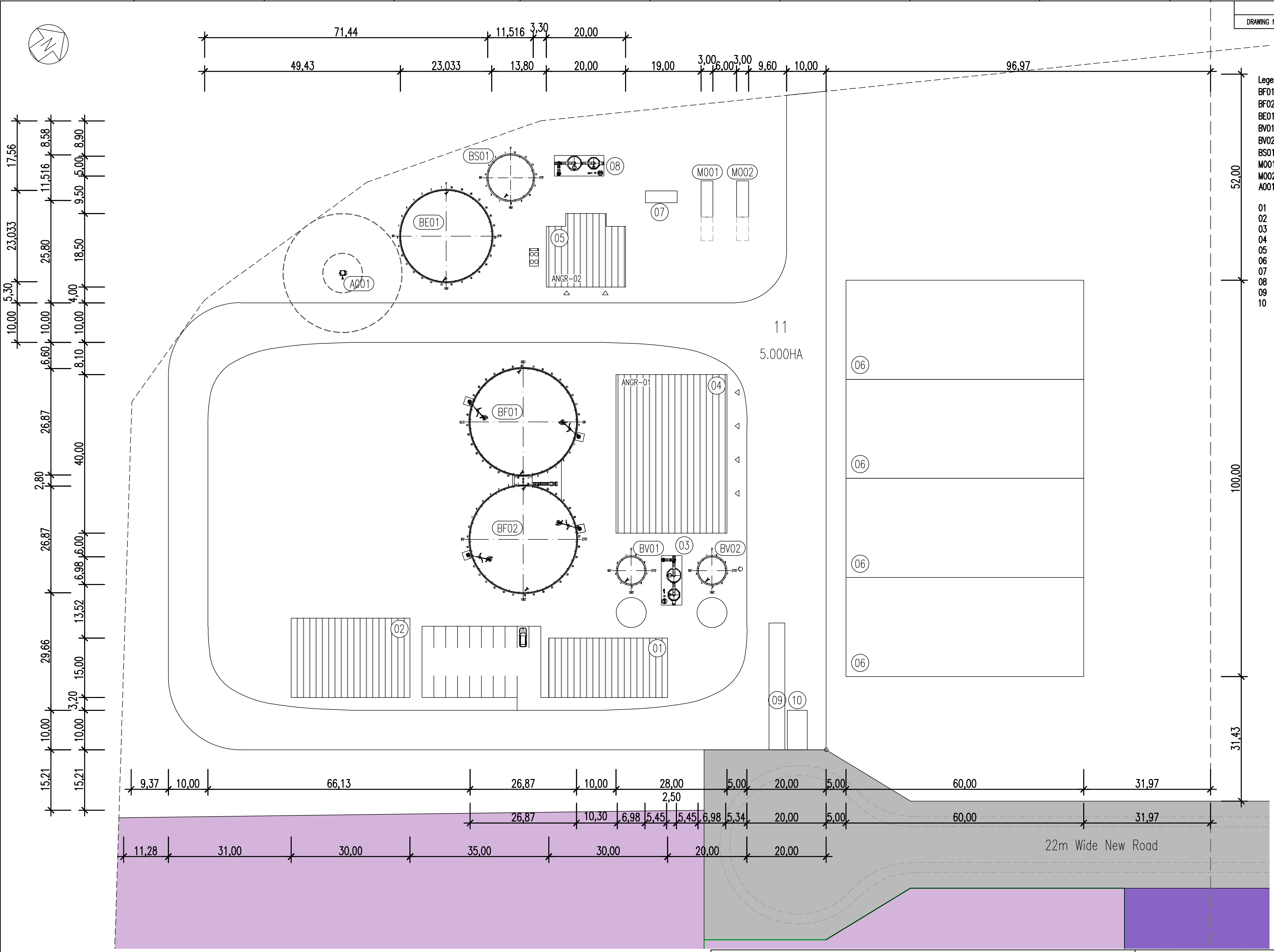
The boundaries shown on this plan should not be used for final detailed engineers design.

Source Information:
Site boundaries: DCDB
Adjoining information: DCDB.
Contours: RPS Survey
Aerial photography: RPS Survey
Overland Flow Path: Aurecon

URBAN DESIGN
Level 4 HQ South
520 Wickham Street
PO Box 1559
Fortitude Valley QLD 4006
T +61 7 3539 9500
W rpsgroup.com

ATTACHMENT 3

Kalfresh Bioenergy Facility Site Layout
(Aquatec Maxcon Pty Ltd Drawing No. 21876A-012 Rev A, 5 March 2020)



Legend

BF01	Fermenter ø26,872m, h=6,30m, gross volume 3573m³
BF02	Fermenter ø26,872m, h=6,30m, gross volume 3573m³
BE01	Digestate Storage Tank ø23,033m, h=6,30m, gross volume 2625m³
BV01	Pre-Storage Tank ø6,98m, h=5,03m, gross volume 192m³
BV02	Pre-Storage Tank ø6,98m, h=5,03m, gross volume 192m³
BS01	Buffer Tank ø11,516m, h=5,03m, gross volume 524m³
M001	Container 30' with CHP
M002	Container 30' with CHP
A001	Emergency Flare
01	Office, 30,00m x 15,00m on site
02	Workshop Building, 30,00m x 20,00m
03	Biofilter 14,00m x 2,50m
04	Waste Processing Building with MultiMix and BigMix 28,00m x 40,00m
05	Building with Hygienization and Separation 20,00m x 20,00m
06	Silage Bays 25,00m x 60,00m
07	Gas Pre-Treatment 8,00m x 3,00m
08	Biofilter 5,00m x 20,00m
09	Weighbridge 32,00m x 4,00m
10	Wheel wash 10,00m x 5,00m

REFERENCE DRAWING LIST

DRAWING No.	DRAWING TITLE

SITE LAYOUT – PLAN
SCALE 1:500

STATUS
FOR TENDER

AQUATEC MAXCON PTY. LTD.
WATER TREATMENT TECHNOLOGY AND EQUIPMENT
A.B.N. 45 002 250 482 P.O. BOX 455 IPSWICH QLD.4305
PH. (61) 7 3813 7100
FAX. (61) 7 3813 7199
EMAIL. enquiries@aquatecmaxcon.com.au

DIMENSIONS ARE IN MILLIMETRES U.N.O.
DO NOT SCALE THIS DRAWING
IF IN DOUBT ASK

DRAWINGS SHALL BE PREPARED IN ACCORDANCE WITH THE FOLLOWING STANDARDS – CURRENT EDITION

AS 1074 STEEL TUBES & TUBULAR FOR ORDINARY SERVICE
AS 1100 TECHNICAL DRAWING
AS 1101 GRAPHIC SYMBOLS FOR GENERAL ENGINEERING
AS 1111 ISO METRIC COMMERCIAL NUTS & SCREWS
AS 1112 ISO METRIC HEXAGON NUTS
AS 1163 STRUCTURAL STEEL HOLLOW SECTIONS
AS 1275 METRIC SCREW THREADS FOR FASTENERS
ASTM A240 STAINLESS STEEL PLATE, SHEET & STRIP
AS 1460 FITTINGS FOR USE WITH POLYETHYLENE PIPES
AS 1477 PVC PIPES & FITTINGS FOR PRESSURE APPLICATIONS
AS 1554 STRUCTURAL STEEL WELDING
AS 1665 WELDING OF ALUMINIUM STRUCTURES
AS 1657 FIXED PLATFORMS, WALKWAYS, STAIRWAYS & LADDERS
AS 1734 ALUMINIUM FLAT SHEET, COILED SHEET & PLATE
AS 1866 ALUMINIUM EXTRUDED ROD, BAR, SOLID & HOLLOW SHAPES
AS 2129 FLANGES FOR PIPES, VALVES & FITTINGS
AS 2280 DUCTILE IRON PRESSURE PIPES & FITTINGS
AS 2837 STAINLESS STEEL BARS & SEMI-FINISHED PRODUCTS
AS 3518 ABS PIPES & FITTINGS FOR PRESSURE APPLICATIONS
AS 1594 HOT-ROLLED PLATES, FLOORPLATES & SLABS
AS 3679 STRUCTURAL STEEL AS 4041 FABRICATION OF PRESS. PIPE.
AS 4087 METALLIC FLANGES FOR WATERWORKS PURPOSES
AS 4100 STEEL STRUCTURES AS 4041 CLASS 3 PRESSURE PIPE UNO.
AS 4130 POLYETHYLENE PIPE FOR PRESSURE PURPOSES
AS/NZS 4792 HOT-DIP GALVANISED COATINGS ON FERROUS ARTICLES
ASTM A53 SEAMLESS STEEL TUBES FOR PRESSURE PURPOSES
API 5L E.R.W. LINEPIPE FOR HIGH PRESSURE APPLICATIONS
ALL LEVELS ARE EXPRESSED IN METRES
ALL SCREW THREADS TO BE COATED WITH NICKEL ANTI-SEIZE
ALL ITEMS TO BE TAGGED IN ACCORDANCE WITH Q.A. PROCEDURES
ALL WELDS TO BE 6mm CFW TO AS 1554 CAT G.P. UNO
OR TO MATCH THINNEST PLATE SIZE
ALL FLANGES TO BE WELDED OFF CENTRE U.N.O.
TRACEABILITY REQUIRED? NO

DIMENSIONAL TOLERANCES (U.N.O)	
MACHINING	
UP TO 500mm	±0.25mm
ABOVE 500mm	±0.50mm
STRUCTURAL	
UP TO 150mm	±1.0mm
150mm TO 1000mm	±1.5mm
ABOVE 1000mm	±3.0mm
ANGULAR	±0.5°

REV.	REVISION DESCRIPTION	DATE	BY	APPROVED
A	FOR TENDER	05-03-20	A.P.D.	

SCALE	AS SHOWN
DRAWN	A.P.D.
DATE	05-03-20
CHECKED	
DATE	
APPROVED	
DATE	

CLIENT KALFRESH
PROJECT KALFRESH BIOENERGY FACILITY
TITLE SITE LAYOUT

CLIENT REFERENCE	SUPPLIED DRAWING NUMBER		DRAWING NUMBER	REV.
		A1	21876A – 012	A

LAST PLOTTED BY ARCHIE DOLLIENTE ON 05/03/20 AT 3:55 PM

ATTACHMENT 4

Analysis of CALMET-Generated Site Meteorological Data

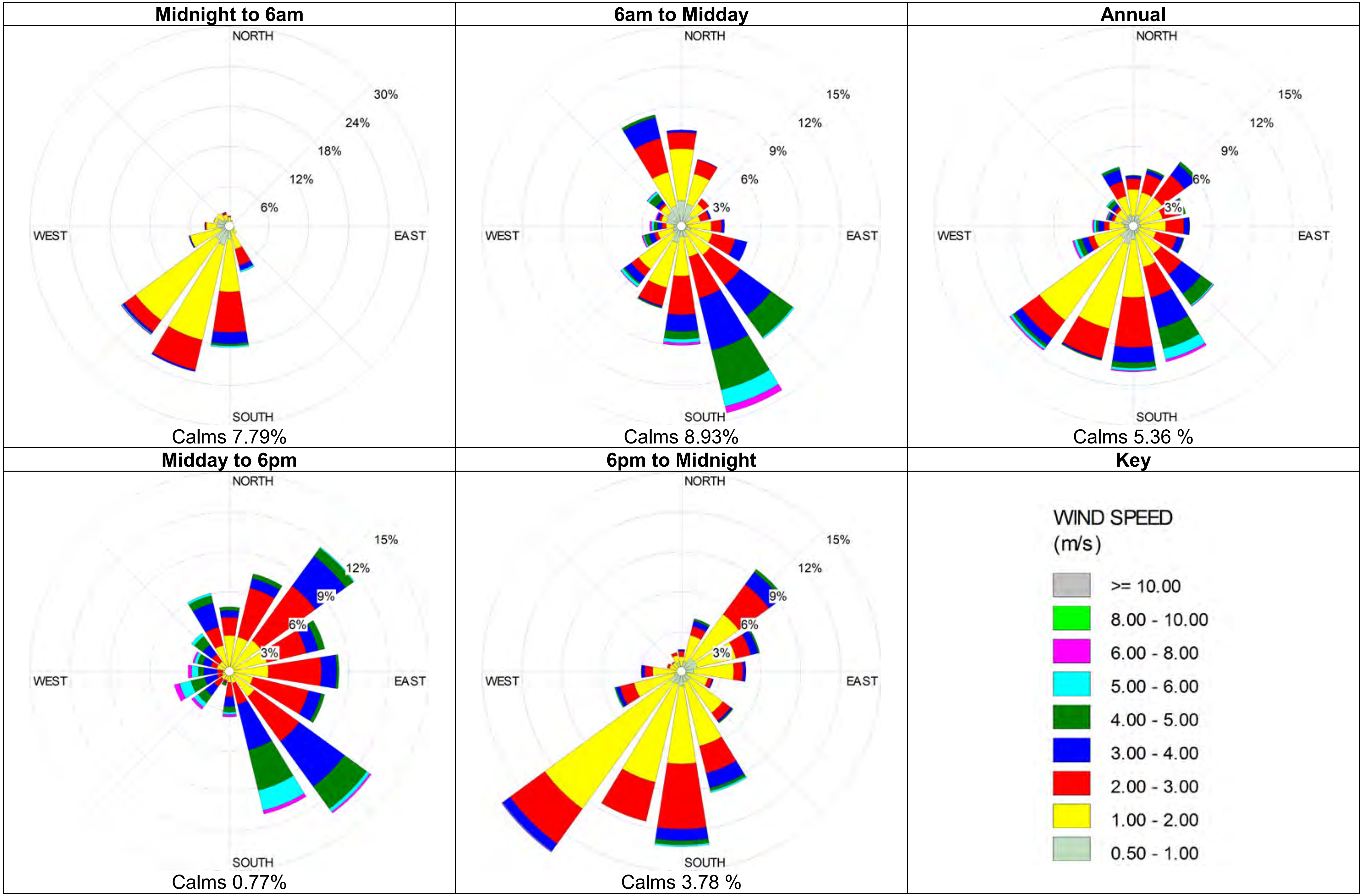


Figure A4.1 Diurnal wind roses for the Site as generated by CALMET

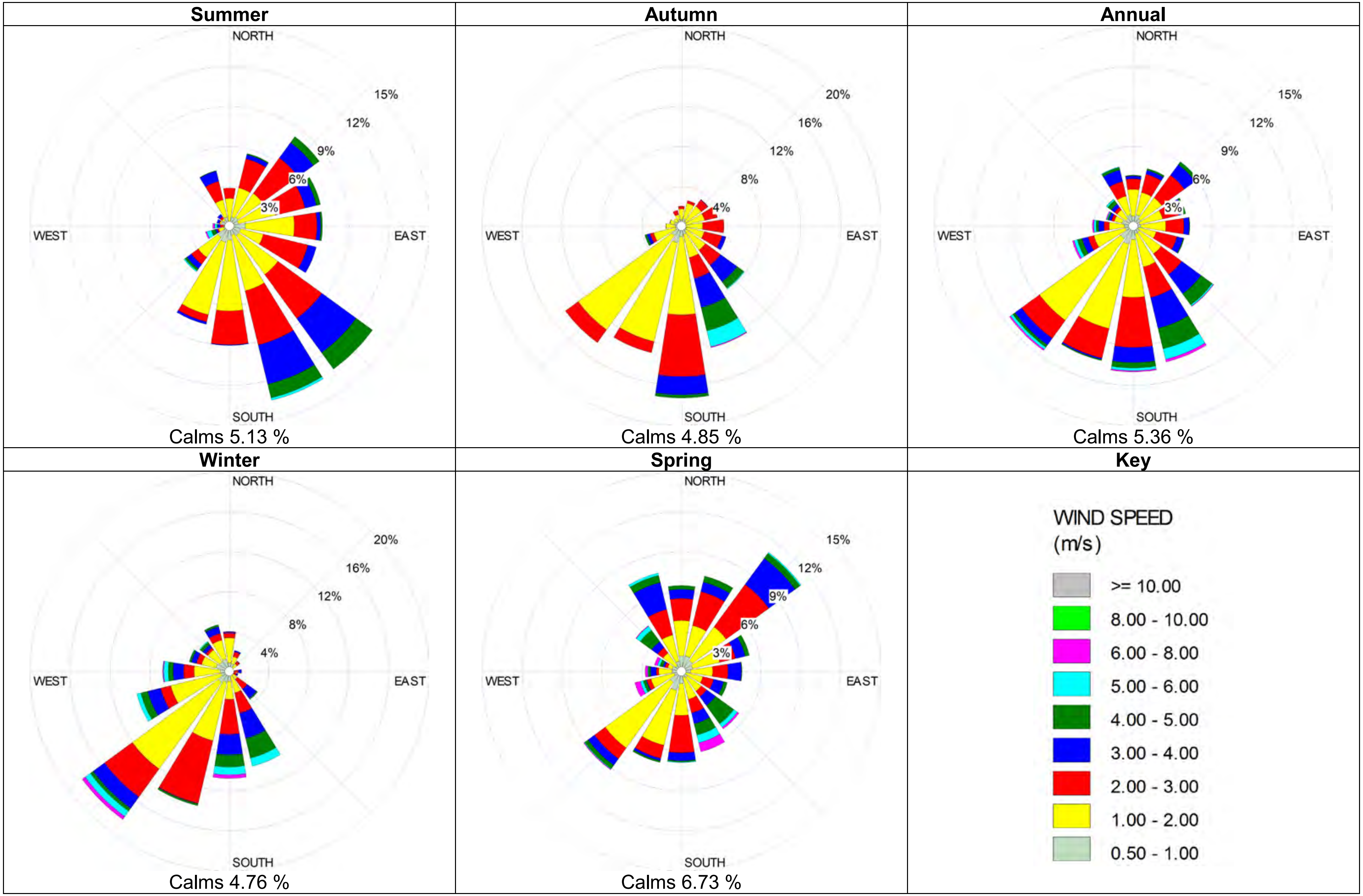


Figure A4.2 Seasonal wind roses for the Site as generated by CALMET

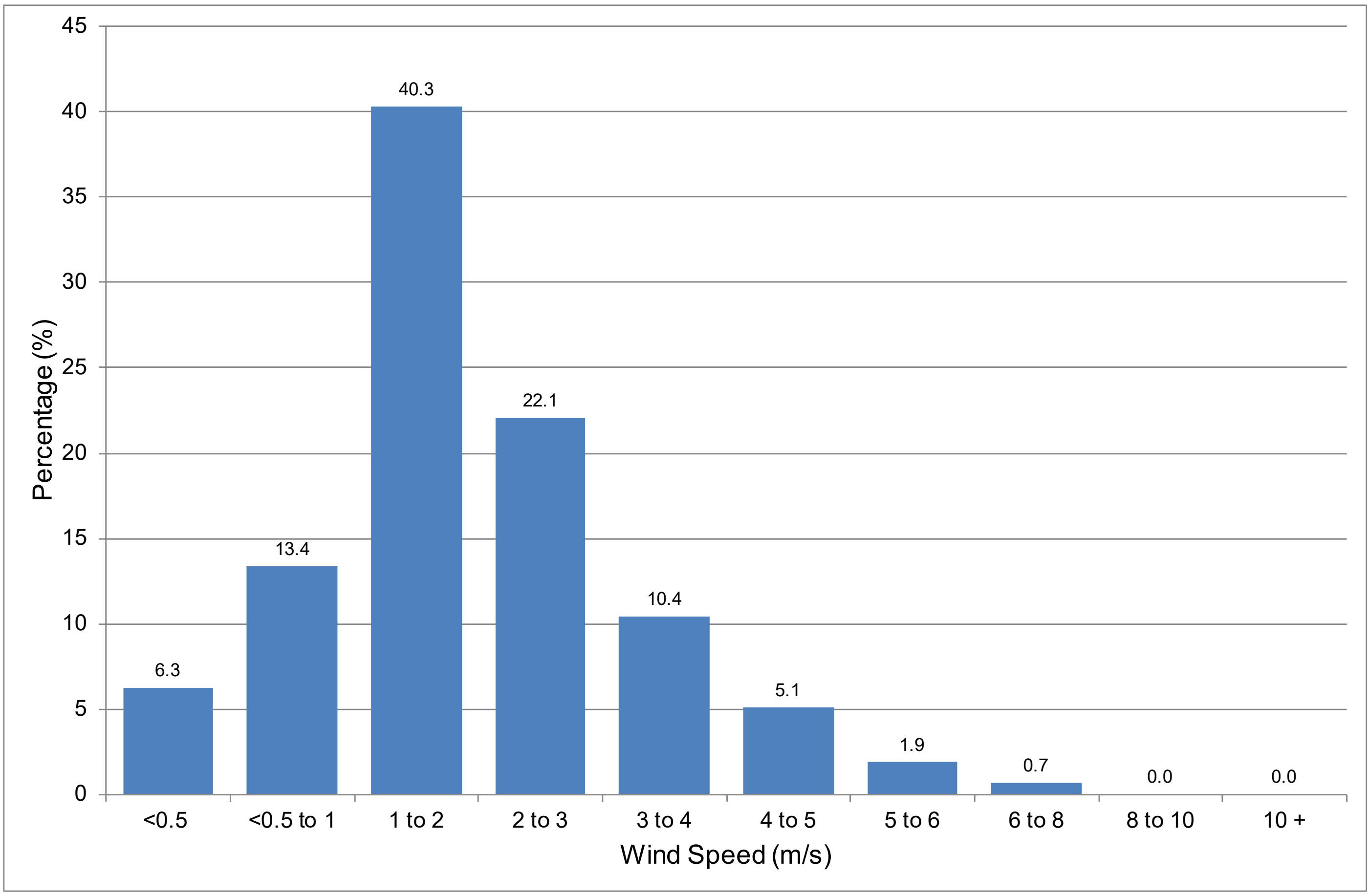


Figure A4.3 Wind frequency graph for the Site as generated by CALMET

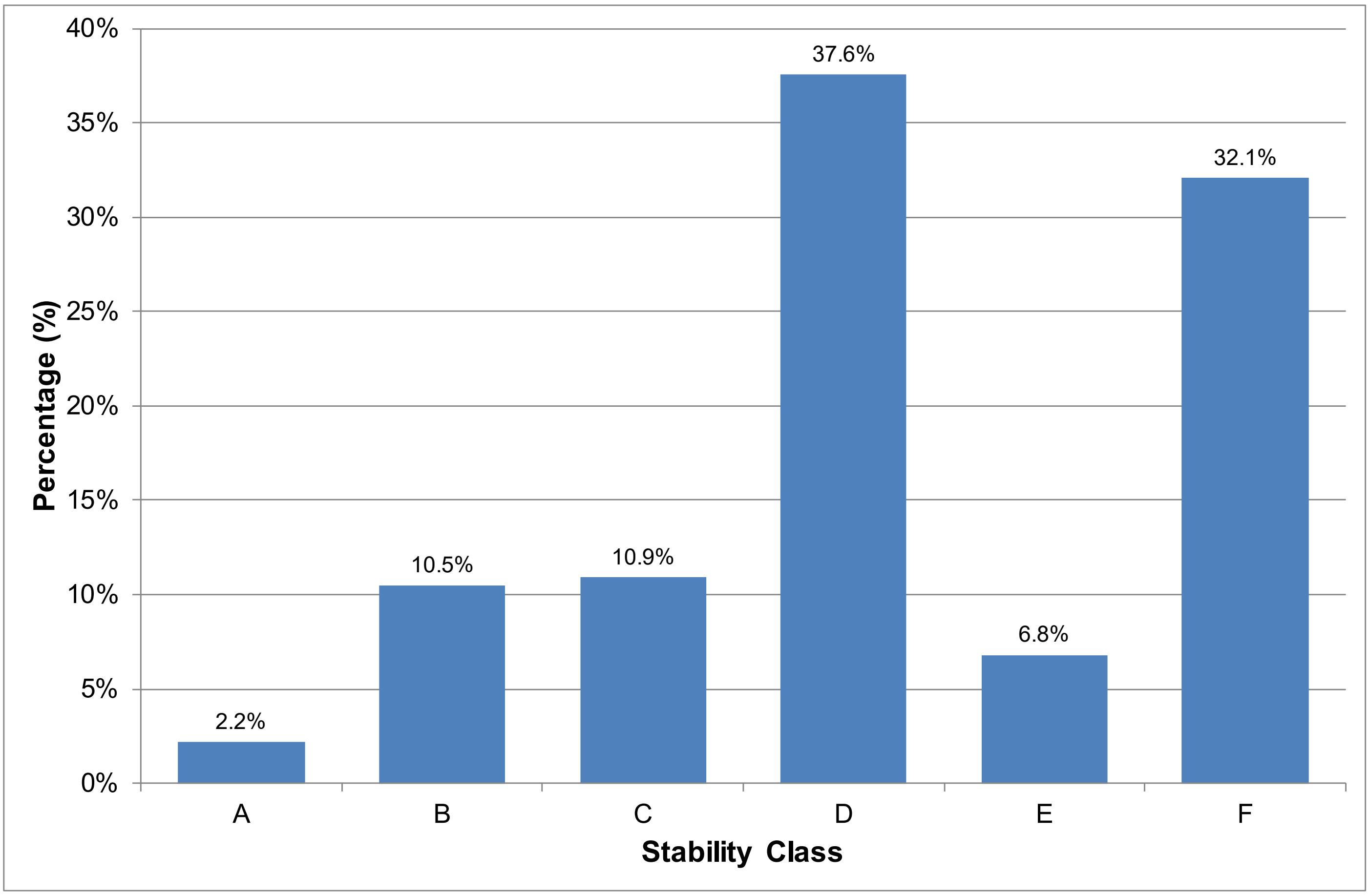


Figure A4.4 Stability Class Histograms for the Site as generated by CALMET

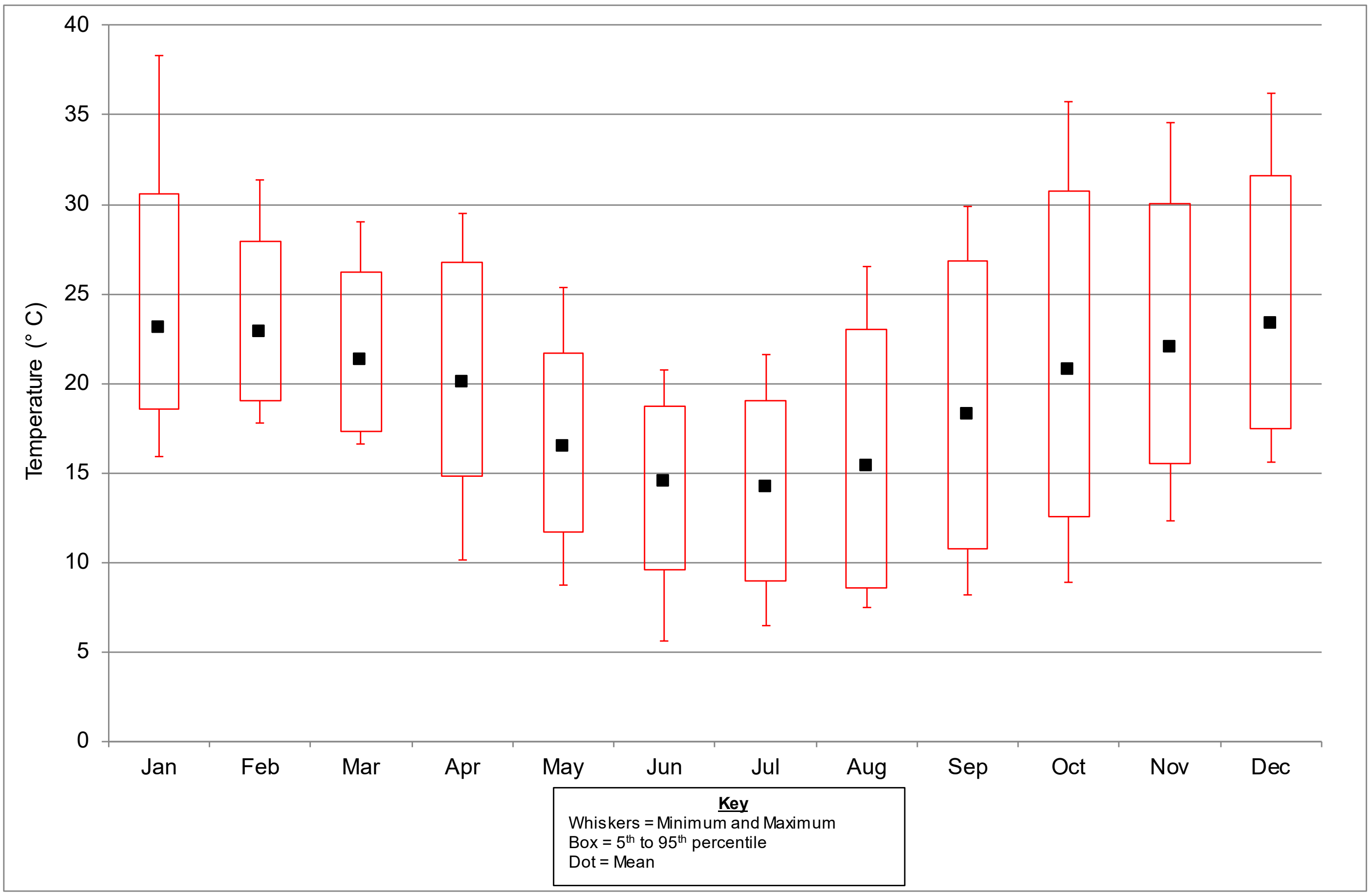


Figure A4.5 Box and Whisker plot of monthly temperature for the Site as generated by CALMET

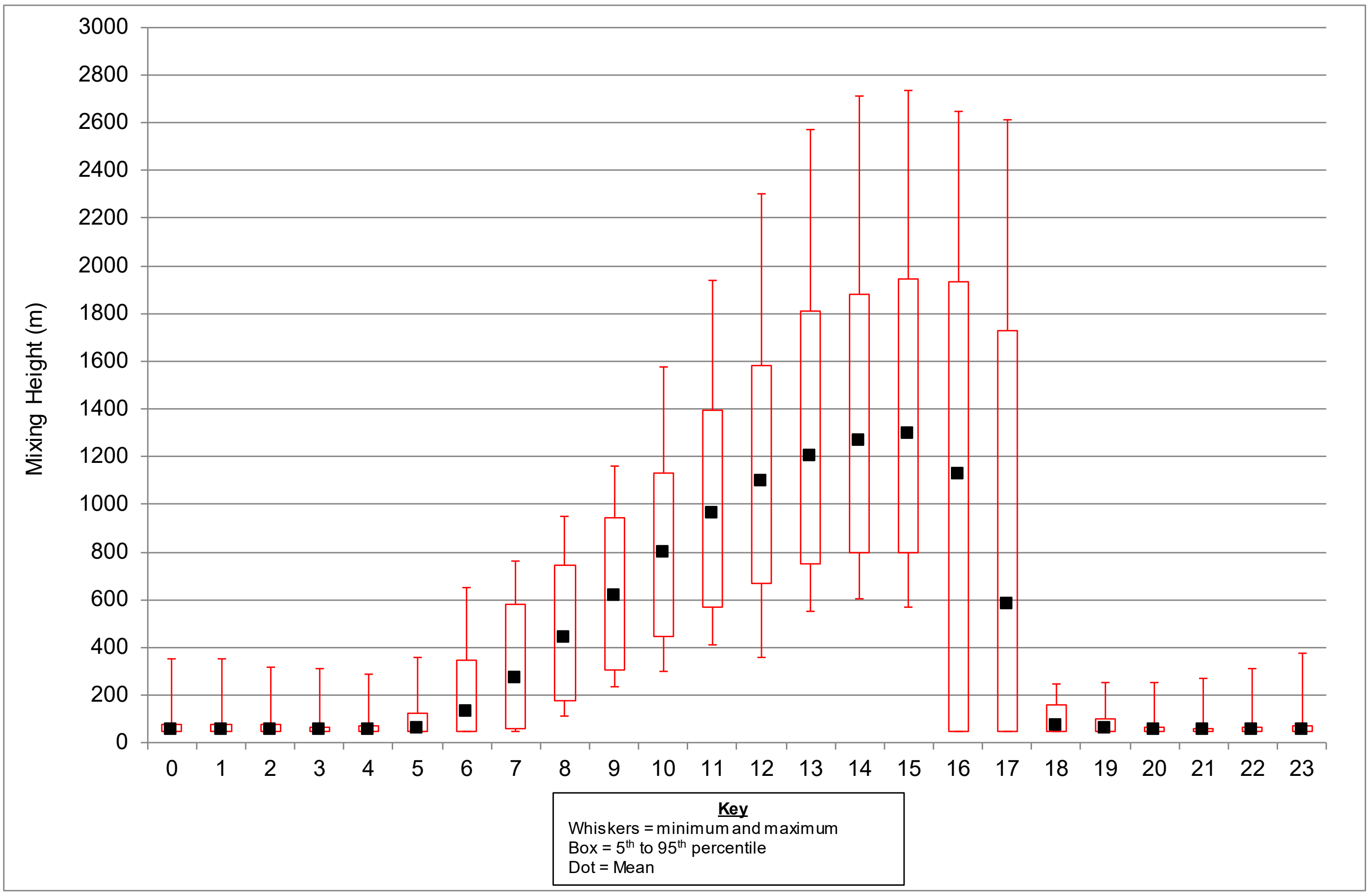


Figure A4.6 Box and Whisker plot of diurnal mixing height for the Site as generated by CALMET

ATTACHMENT 5

Preliminary Specifications for ‘BioAir’ System (Aquatec Maxcon)

Bioenergy Facility

Document Control					
Revision	Author	Reviewed	Approved for Issue		
			Name	Signature	Date
0	A. Vogelsang	A. Davey	A. Vogelsang		06/03/2020

Contents

1 *Preliminary Odour Treatment Concept*

This high-level report and design are based on the existing experience from AQM. AQM is not accountable for any provided data. AQM recommendation is to do a concept design work for the two odour control units and sections of the Bioenergy Facility. Part of this concept design is to determine suitable airflow extraction rates, number and sizing of filter units and fans, preferred locations and treatment technology. As part of this concept design works, AQM will be able to deliver a more detailed design of the odour control strategy.

1.1. Introduction

The odour treatment at the bioenergy facility will be split into two individual odour control units (OCU).

<u>OCU No 1:</u>
One OCU is designed, to capture and treat odorous gases from the waste handling building as well as from the liquid pre-storage area. This includes areas with high odour concentration such as feed hoppers, Multimix & liquid storage tanks.
Therefore, solids and liquid unloading activities and related equipment have been housed within a building to prevent odour escaping the facility.
The solid waste streams will be unloaded in concrete bunkers which are located in the waste receival building. The solids storage area will be ventilated and off-gas treated using an odour gas treatment system. The building will be equipped with roller doors, which will be closed during unloading to keep the odorous gasses inside.

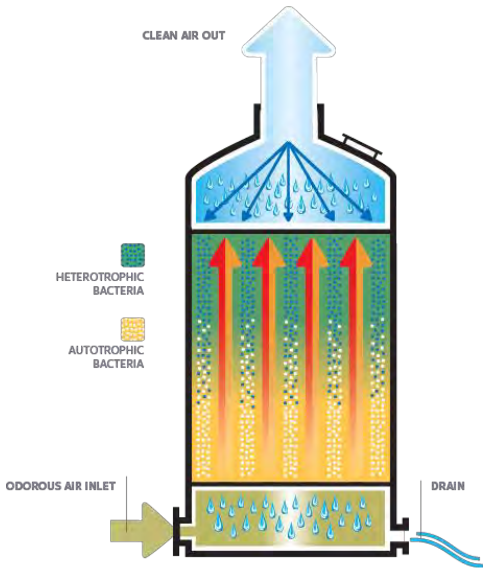


Figure 1 Schematic EcoFilter

<u>OCU No 2:</u>
The second OCU is designed to treat odour emissions from the digestate treatment building and the buffer tank. The digestate treatment building will be equipped with roller doors as well, to keep the odorous gasses inside.

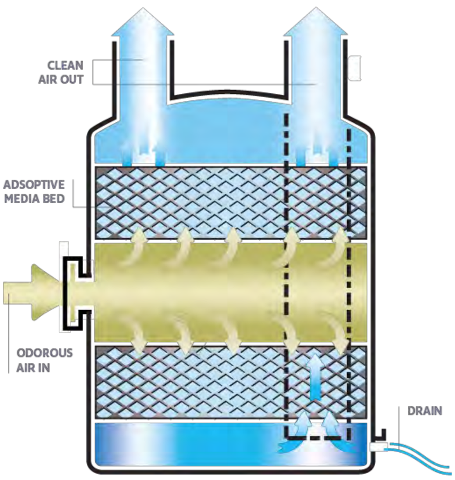


Figure 2 Schematic EcoCarb Filter

Each odour control system will consist of 1x EcoFilter and 1 x EcoCarb as a secondary activated carbon filtration for final polishing of the odorous air. This odour treatment provided is a higher level of treatment compared to the compost beds used in some of the anaerobic digestion plants in Europe.

The EcoFilter units are capable of treating very high or very low concentrations of pollutants. After polluted air is gathered and centralized, it is pulled through the EcoFilter vessel.

As with all other aspects of the systems, one size does not fit all. The way foul air is collected and transported for treatment is highly dependent on the unique schematics of your site and will be designed accordingly.

The outlet of the EcoFilter is connected to the EcoCarb filter system, which will be the secondary filter. Odorous compounds, which could not be captured from the first step, will be adsorbed by the carbon filter media. If the media is fully loaded, the carbon filter needs to be changed to guarantee the same performance.

The bio-filters require process water containing nutrients for the growth of the bio-organisms. The units are equipped to dose additional nutrients if necessary. These nutrients will be supplied as a powder and liquified in the dosing unit of the odour treatment.

Each bio-filter unit produce around 4.5 m^3 of wastewater per day with a pH of around 2 if the hydrogen sulphide concentrations are within design expectations. This wastewater needs to be transferred via a dedicated pump station to a neutralisation tank where it will be neutralised. The odour filters housings are made from Fiberglass Reinforced Plastic (FRP) and constructed to comply with ASTM D3299 and C582.

1.2. Preliminary Design Criteria

The odour treatment design criteria of each biofilter system is outlined in the table below.

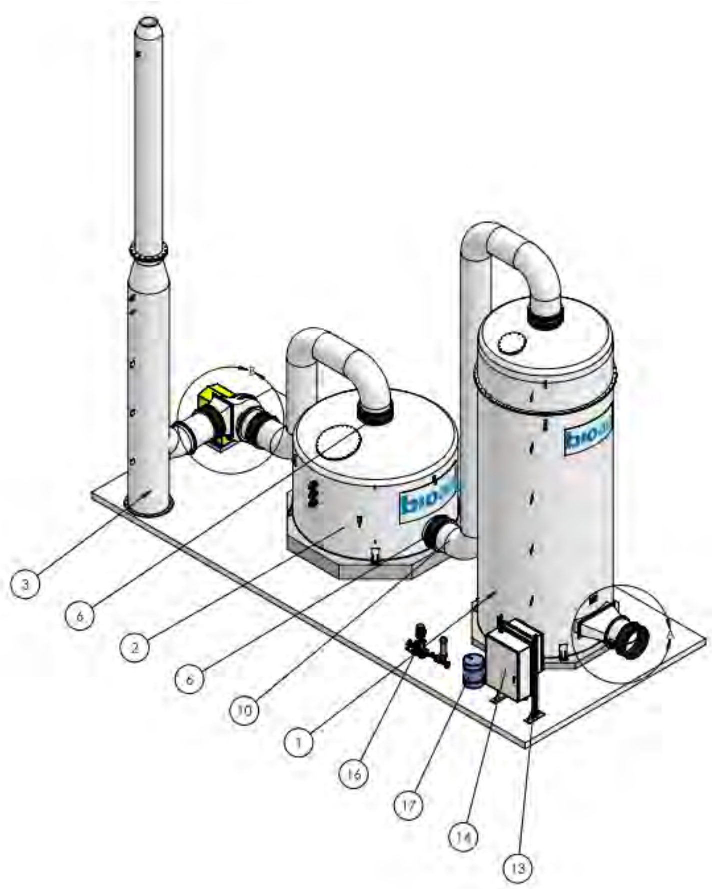
Parameter	Units	Average	
Odour units	OU	90,000	Onsite
Airflow	Nm3/h	8,000-10,000	
H2S	ppmv	Very low 0.01 up to 5	Dependant on substrates
Mercaptans (R-SH)	ppmv	Very low .01 up to 15	Dependant on substrates
SVOC	ppmv	Up to 20	Dependant on substrates
Volatile Organic Compounds (VOCs)	ppmv	< 10	Dependant on substrates
Reduced Sulphur Compounds (RSCs)	ppmv	< 0.5	Dependant on substrates
Volatile Fatty Acids (VFAs)	ppmv	< 0.5	Dependant on substrates
Odorous Air temperature	°C	15-38	
Ambient Air temperature	°C	1-45	

1.3. Preliminary Design Assumptions

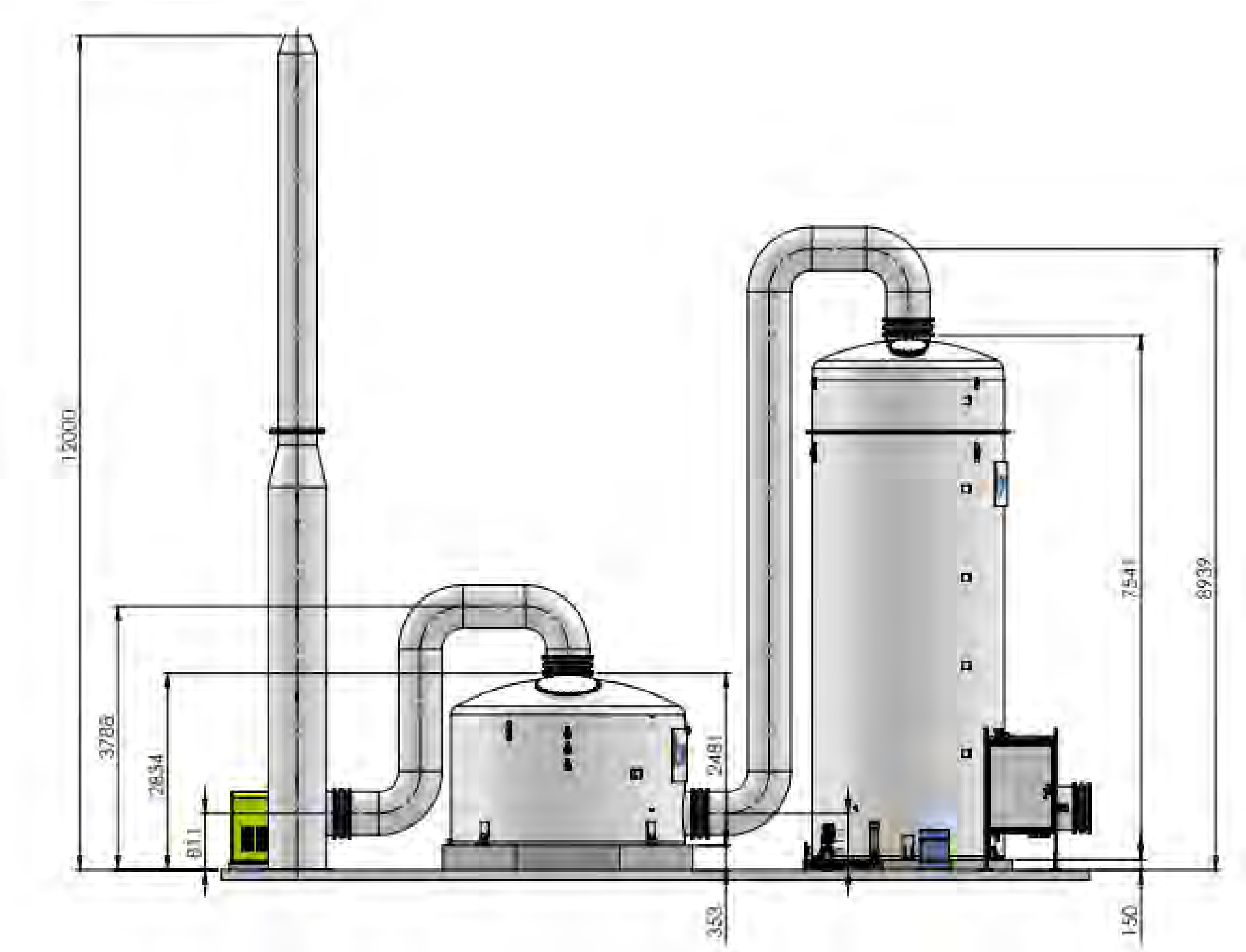
- No odour emissions from the digester tanks, as they are fully sealed through to the combustion engine
- No odour emissions are going from the combustion engine into the odour control unit
- Minor fugitive odour from the digestate storage tank
- An indicative odour concentration of 90,000 Odour Units (OU) in the feedstock storage building with an indicative extraction rate of 10,000m3/hour to maintain negative pressure in the building ducted through an odour control unit
  (e.g. BioAir as previously used by Aquatec Maxcon plus carbon filter ‘polishing’ treatment), relating to emissions of:
  - 1,000 OU concentration (at odour control unit outlet) x 10,000m3/hour => 2,800 OU per second released via a 12-metre-high stack from the BioAir
  - Minor fugitive odours from the feedstock storage building based upon, say, 5% of room volume losses per hour

The BioAir performance guarantee, based on the design criteria, will be less than 1,000 OU at average air flow and average H2S concentration.

1.4. Preliminary Design Layout

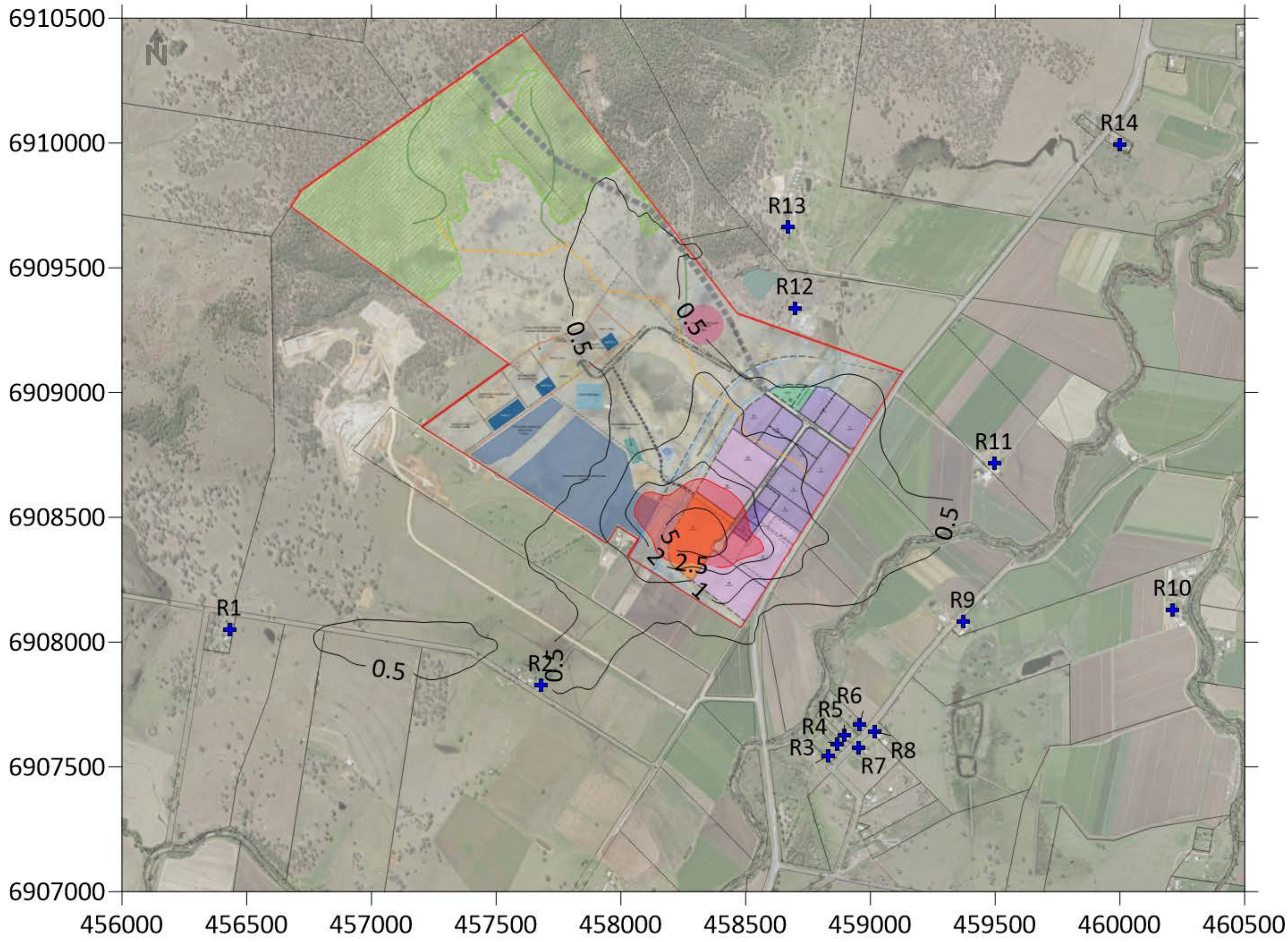


ITEM	DESCRIBTION
1	ECOFILTER VESSEL
2	ECOCARB VESSEL
3	STACK, 12m
8	BLOWER
14	WATER PANEL
15	ELECTRICAL CONTROL CABINET
17	NUTRIENT BARREL



ATTACHMENT 6

Predicted Odour Impact
Anaerobic Digester and Biogas Plant Only



Kalbar 19-143

1-hour average 99.5th percentile ground level concentrations of Odour from; Anaerobic Digester and Biogas Plant Only

Figure A6	Pollutant	Averaging Period	Guideline	Units	Date
mwa ENVIRONMENTAL	Odour	1-hour average 99.5th percentile	2.5	Odour Units	2020-03-17

ATTACHMENT 7

Emission Estimation Summary
Anaerobic Digester and Biogas Plant Air Toxics

CHP

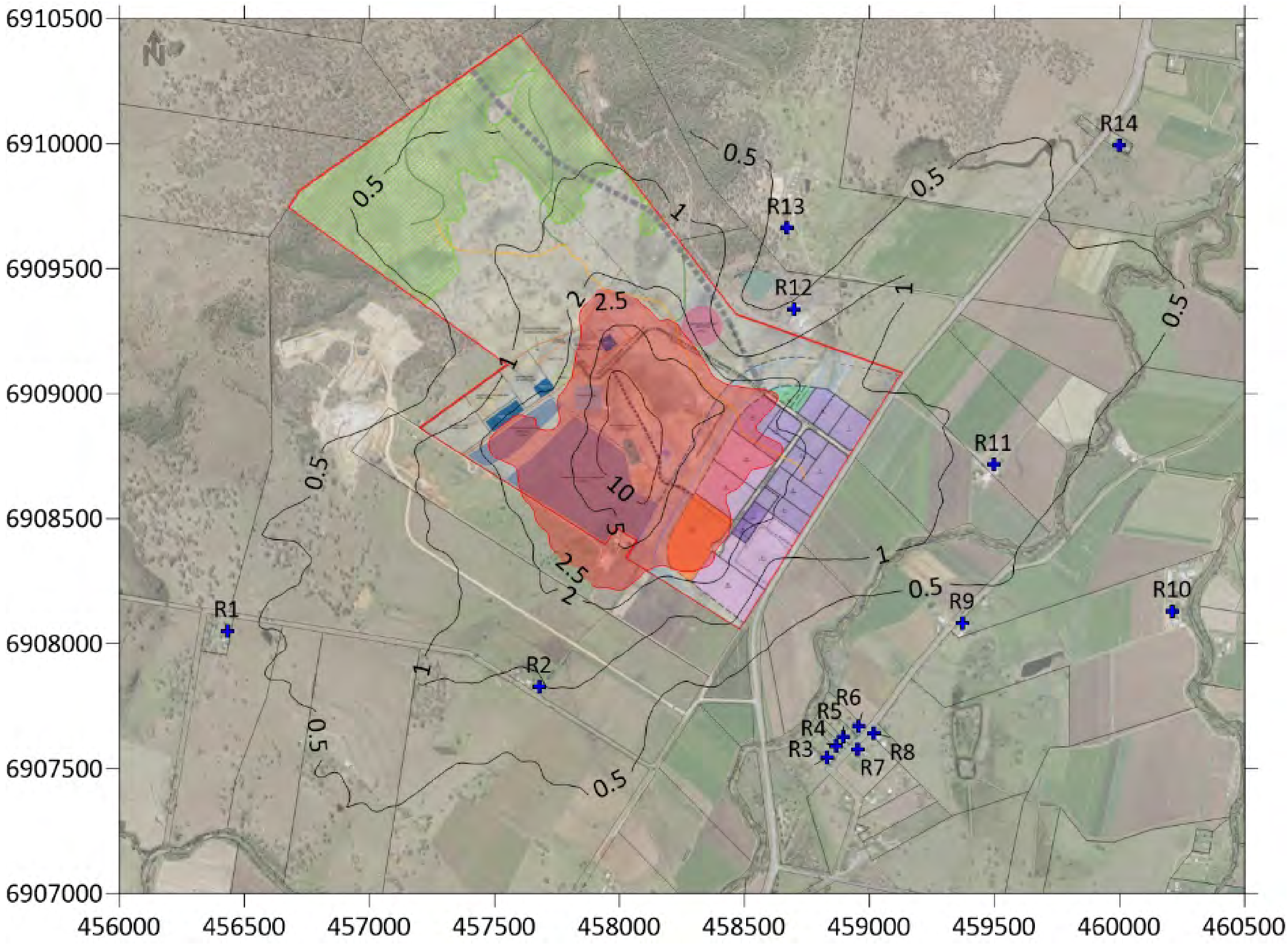
Parameter	Value	Units	Reference
Stack Height	10	m	Email, Aquatec Maxcon 11/12/2019
Diameter	0.25	m	191211 T VA technical information_CHP.pdf
Area	0.05	m^2	MWA Calc
Exhaust Gas Volume (wet)	2650	Nm^3/hour	191211 T VA technical information_CHP.pdf
Flow	0.74	Nm^3/s	MWA Calc
Temperature	200	°C	Aquatec Maxcon advice with heat recovery
Actual Flow	1.3	m^3/s	MWA Calc
Velocity	26	m/s	MWA Calc
Proposed Engine Size:	637	KW	Jenbacher
Emission Limits			
NOX	0.5	g/Nm^3	Aquatec Maxcon advice
	0.37	g/s	MWA Calc
CO	1	g/Nm^3	Aquatec Maxcon advice
	0.74	g/s	MWA Calc
H_2S	0.005	g/Nm^3	Aquatec Maxcon advice
	3.7E-03	g/s	MWA Calc
Emission Factors			
SO_2	1.29E-03	kg/kWhr	NPI Table 56 Emission Factors Biogas
SO_2	0.82	kg/hr	MWA Calc
SO_2	0.23	g/s	MWA Calc
Adopted Emissions			
NOX	0.37	g/s	Emission Limit
CO	0.74	g/s	Emission Limit
SO_2	0.23	g/s	Emission Factor
H_2S	3.7E-03	g/s	Emission Limit

Additional VOCs estimated by adopting Table 54: Emission factors (kg/m³) for uncontrolled 4-stroke natural gas engines

Pollutant	NPI Emission Factor	MWA Calc	MWA Calc	MWA Calc
	(kg/m³)	(kg/kw-hr)	kg/hr	g/s
Acetaldehyde	0.00014	5.9E-05	3.7E-02	1.04E-02
Benzene	0.00000737	3.1E-06	2.0E-03	5.46E-04
Biphenyl (1,1-biphenyl)	0.00000355	1.5E-06	9.5E-04	2.63E-04
1,3 Butadiene (vinyl ethylene)	0.00000447	1.9E-06	1.2E-03	3.31E-04
Chloroethane (ethyl chloride)	3.13E-08	1.3E-08	8.3E-06	2.32E-06
Chloroform (trichloromethane)	0.000000477	2.0E-07	1.3E-04	3.53E-05
Dichloroethane	0.000000045	1.9E-08	1.2E-05	3.33E-06
Ethylbenzene	0.000000665	2.8E-07	1.8E-04	4.93E-05
Formaldehyde (methyl aldehyde)	0.000884	3.7E-04	2.4E-01	6.55E-02
n-Hexane	0.0000186	7.8E-06	5.0E-03	1.38E-03
Methanol	0.0000419	1.8E-05	1.1E-02	3.10E-03
Phenol	0.000000402	1.7E-07	1.1E-04	2.98E-05
Particulate matter 2.5 µm	0.00000129	5.4E-07	3.4E-04	9.56E-05
Particulate matter 10.0 µm	0.00000129	5.4E-07	3.4E-04	9.56E-05
Polycyclic aromatic hydrocarbons	0.0000000029	1.2E-09	7.7E-07	2.15E-07
Styrene (ethenylbenzene)	0.000000395	1.7E-07	1.1E-04	2.93E-05
Toluene (methylbenzene)	0.00000683	2.9E-06	1.8E-03	5.06E-04
Vinyl chloride monomer	0.000000249	1.0E-07	6.6E-05	1.84E-05
Xylenes (individual or mixed isomers)	0.00000308	1.3E-06	8.2E-04	2.28E-04

ATTACHMENT 8

Predicted Odour Impact
Digestate Irrigation Only



Kalbar 19-143

1-hour average 99.5th percentile ground level concentrations of Odour from; Digestate Irrigation Only

Figure A8	Pollutant	Averaging Period	Guideline	Units	Date
mwa ENVIRONMENTAL	Odour	1-hour average 99.5th percentile	2.5	Odour Units	2020-03-17

ATTACHMENT 9

Odour Emission Rate Summary
Composting Facility Only

Compost Odour Emission Rate Summary

The surface areas of windrows have been estimated assuming trapezoidal shape for estimation of surface areas for the 15 ktpa and 50 ktpa composting scenarios.

For the 15 ktpa scenario, windrows will be turned by a Tractor PTO Turner e.g. Scarab 24FT 10' TUN.

For the 50 ktpa scenario, a specific windrow turning machine will be used to turn the greater volume of compost more efficiently. A larger face area has been calculated for the windrow turning machine compared to the tractor pulled turner.

Surface area calculation for 15,000 tonnes per annum composting

Windrow Width:	3.6 m
Windrow Height:	1.8 m
Top Width:	1 m
Left Hand Face Side A:	2.2 m^2
Right Hand Face Side B:	2.2 m^2
Face area per lineal metre of windrow:	5.4 m^2
Windrow Length:	75 m

Total Surface Area = 75m length x 29 windrows x 5.4 m^2 per linear metre = 11,745m^2

Surface area calculation for 50,000 tonnes per annum composting

Windrow Width	7.2 m
Windrow Height	3 m
Top Width	2 m
Left Hand Face Side A:	4.0 m^2
Right Hand Face Side B:	4.0 m^2
Face area per lineal metre of windrow	10 m^2
Windrow Length:	75 m

Total Surface Area = 75m length x 29 windrows x 10 m^2 per linear metre = 21,750m^2

Odour Emission Rate Summary

Unturned Wind Rows

15 ktpa composting = 11,745 m^2 x 1.3 ou/m^2/s = 15,269 ou/s

50 ktpa composting = 21,750 m^2 x 1.3 ou/m^2/s = 28,275 ou/s

Actively Turned Emission Rate 22.4 ou/m2/s
Recently turned Emission Rate 10.4 ou/m2/s
Unturned Emission Rate 1.3 ou/m2/s
Length of disturbed time 2 hours

Composting Windrows 21,750 m2 for 50ktpa scenario

Frequency of turning 1 times per week based on advice from a large commercial composting operator.

Area per day turned 3107 m2/day
Operating hours per day 12 hours
Area turned per hour 259 m2/hour

Unturned (all day) 18,643 m2
Balance of area 2848 m2/waiting to be turned or recently turned at start of day

	OER (ou/m2/s)	Areas (m2)																							
		6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM	1:00 AM	2:00 AM	3:00 AM	4:00 AM	5:00 AM
Turned Areas	22.4	259	259	259	259	259	259	259	259	259	259	259	259	0	0	0	0	0	0	0	0	0	0	0	0
Windrow Area Unturned Anytime during the day	1.3	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643	18643
Recently Turned Areas - 2 hours Disturbed	10.4		259	259																					
				259	259																				
					259	259																			
						259	259																		
							259	259																	
								259	259																
									259	259															
										259	259														
											259	259													
												259	259												
													259	259											
														259	259										
Portion of daily stockpile turnover in unturned state	1.3	2848	2589	2330	2330	2330	2330	2330	2330	2330	2330	2330	2330	2589	2848	3107	3107	3107	3107	3107	3107	3107	3107	3107	3107

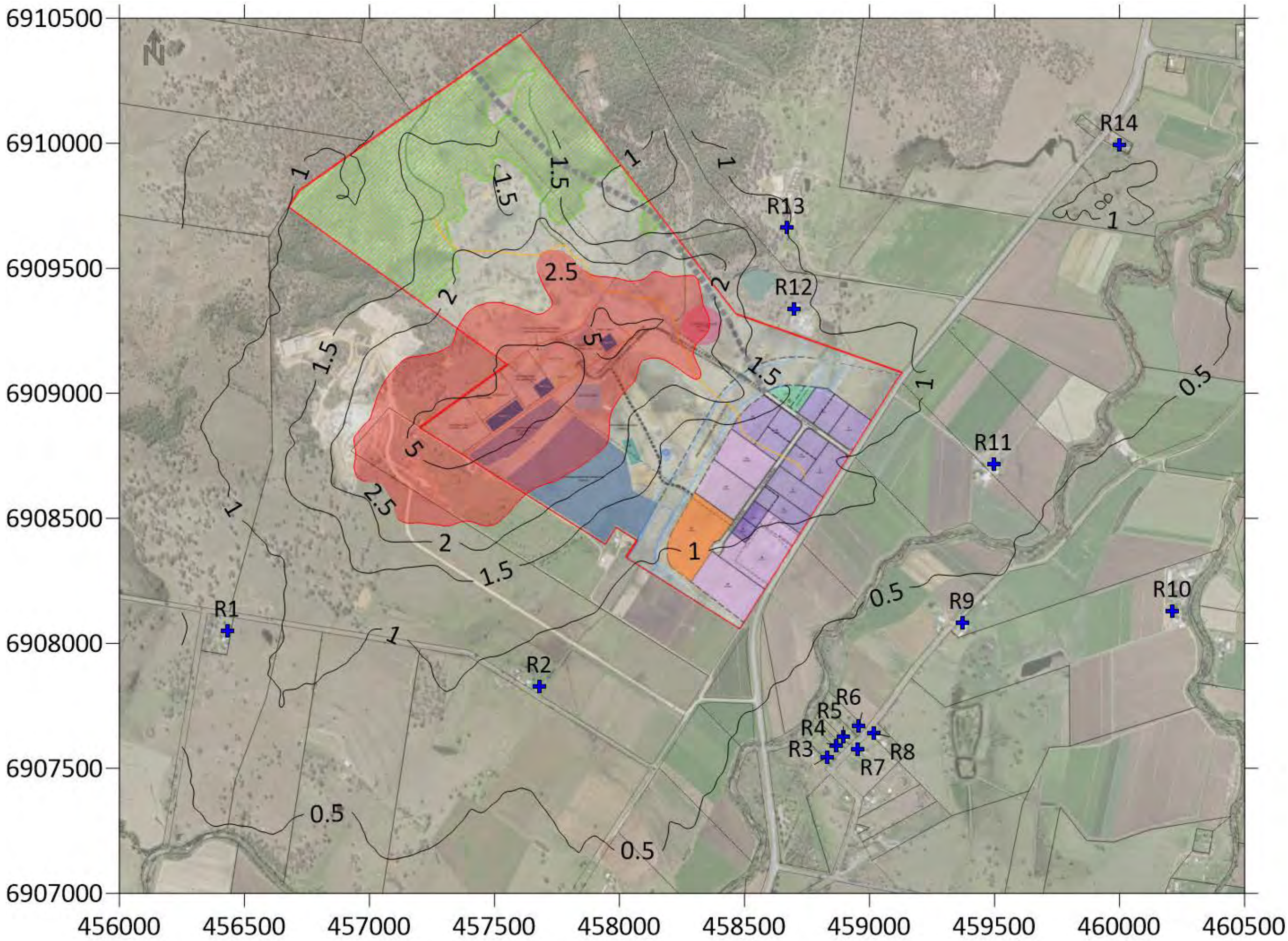
Turned	ou/s	5800	5800	5800	5800	5800	5800	5800	5800	5800	5800	5800	5800	0	0	0	0	0	0	0	0	0	0	0	0
Recently Turned	ou/s	0	2693	5386	5386	5386	5386	5386	5386	5386	5386	5386	5386	5386	2693	0	0	0	0	0	0	0	0	0	0
Unturned	ou/s	27938	27602	27265	27265	27265	27265	27265	27265	27265	27265	27265	27265	27602	27938	28275	28275	28275	28275	28275	28275	28275	28275	28275	28275
Total Odour Units Per Second	ou/s	33738	36095	38451	38451	38451	38451	38451	38451	38451	38451	38451	38451	32988	30631	28275	28275	28275	28275	28275	28275	28275	28275	28275	28275

Turned	(ou/m2/s)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recently Turned	(ou/m2/s)	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unturned	(ou/m2/s)	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3

		Ramp up in Odour Emissions		Daytime Odour Emissions during Turning										Ramp Down in Odour Emissions		Unturned Odour Emissions at Night									
Average odour emission rate	(ou/m2/s)	1.6	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.5	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3

ATTACHMENT 10

Predicted Odour Impact
Composting Facility Only



Kalbar 19-143

**1-hour average 99.5th percentile ground level concentrations of Odour from;
Composting Facility plus Ambient**

Figure A10	Pollutant	Averaging Period	Guideline	Units	Date
mwa ENVIRONMENTAL	Odour	1-hour average 99.5th percentile	2.5	Odour Units	2020-03-17

ATTACHMENT 11

Particulate Emission Rate Calculations

Kalbar - Composting Activities - Dust Emission Rate Assumptions

Compost Component	50,000	tonnes per annum

Parameter	Value	Units	Notes
1 truck and Dog load of material			
Volume	30	m³	Representative from other projects
Density	0.8	tonnes/m³	Representative from other projects
	24	tonnes per truck	Representative from other projects
Annual Production	50,000	tonnes per annum	Representative
Production Days	300	Days per annum	Representative
Production Rate	167	Tonnes per day	MWA Calc
Truckloads of Raw Material (into site)	7	Trucks per day	MWA Calc
Truckloads of Compost Product (leaving site)	7	Trucks per day	MWA Calc
Total Trucks into site:	14	Trucks per day	MWA Calc
Hours of Operation			
Monday to Friday:	12	hours per day	Assumption, typical hours
Fill truck mass	23.0	tonnes	Representative from other projects
Fill truck payload	28.0	tonnes	Representative from other projects
Greenwaste Screening			
Total	50,000	tonnes per annum	
Screening Frequency	1	day per week	Representative
Screening Frequency	52	days per annum	MWA Calc
Screening Frequency	962	tonnes per day	MWA Calc
Screening Frequency	80	tonnes per hour	MWA Calc
Vehicle Movements for Whole of Site			
Light vehicles	6,981	vehicles per day	Cardno
Heavy Vehicles	2,851	vehicles per day	Cardno
Total	9,832	vehicles per day	Cardno

JOB: **Kalbar 19-143**

STAGE:

UNPAVED ROADS

Emission Source: **Internal Haul Road**

Data Source: ***USEPA AP42 Chapter 13.2.2 Unpaved Roads (2006)***

Emission Factor Formula:

$$EF = k \times \left(\frac{s}{12}\right)^{a} \left(\frac{W}{3}\right)^{b}$$

lb/VMT

Haul Road Silt Content (s):	4.8 %	(USEPA AP42 Chapter 13.2.2 Table 13.2.2-1 mean for sand and gravel processing)	
Mean Vehicle Mass (W):	40.8 tons		
Constants (PM2.5):	k = 0.15	a= 0.9	b= 0.45
Constants (PM10):	k = 1.5	a= 0.9	b= 0.45
Constants (TSP):	k = 4.9	a= 0.7	b= 0.45

(USEPA AP42 Chapter 13.2.2 Table 13.2.2-2)

Uncontrolled Emission Factor (PM2.5):	EF=	60.0	g/VKT
Uncontrolled Emission Factor (PM10):	EF=	599.9	g/VKT
Uncontrolled Emission Factor (TSP):	EF=	2353.8	g/VKT

Control Measures: None

Control Efficiency: 0 % (Table 4 NPI Emission Estimation Technique Manual for Mining, Environment Australia 2011)

Controlled Emission Factor (PM2.5):	EF=	59.99	g/VKT
Controlled Emission Factor (PM10):	EF=	599.90	g/VKT
Controlled Emission Factor (TSP):	EF=	2353.79	g/VKT
Trips per Day:		14	trips
Average Trip Length (each way):		1	km

Controlled Emission Rate:	**PM2.5:**	**0.02**	**grams/second**	**6am to 6pm**
	PM10:	**0.19**	**grams/second**	**6am to 6pm**
	TSP:	**0.76**	**grams/second**	**6am to 6pm**

JOB: **Kalbar 19-143**

STAGE:

PAVED ACCESS ROADS

Emission Source: **External Paved Access Road with Low Silt Content**

Data Source: ***USEPA AP42 Chapter 13.2.1 Paved Roads (2011)***

Emission Factor Formula:

$$E_{ext} = [k(sL)^{0.91} \times (W)^{1.02}](1 - P/4N)$$

Silt Loading (sL):		2.4	g/m^2	(USEPA AP42 Chapter 13.2.1 low range for quarryi
Mean Vehicle Mass (W):		40.8	tonnes	
Days of rainfall > 0.25mm (p):		83	days	Tarome - Average for 1990 to 2016
Constants (PM2.5):	k =	0.15		(USEPA AP42 Chapter 13.2.2 Tables 13.2.1-1)
Constants (PM10):	k =	0.62		
Constants (TSP):	k =	3.23		
Uncontrolled Emission Factor (PM2.5):	EF=	13.8	g/VKT	
Uncontrolled Emission Factor (PM10):	EF=	57.0	g/VKT	
Uncontrolled Emission Factor (TSP):	EF=	296.8	g/VKT	
Control Measures:	None			
Control Efficiency:	0 %		(Table 3 NPI Emission Estimation Technique Manual for Mining, Environment Australia 2012)	
Resultant Emission Factor (PM2.5):	EF=	13.8	g/VKT	
Resultant Emission Factor (PM10):	EF=	57.0	g/VKT	
Resultant Emission Factor (TSP):	EF=	296.8	g/VKT	
Trips per day:		14		
Average Trip Length (each way):		0.40	km	

Controlled Emission Rate:	**PM2.5:**	**0.00**	**grams/second**	**6am to 6pm**
	PM10:	**0.01**	**grams/second**	**6am to 6pm**
	TSP:	**0.04**	**grams/second**	**6am to 6pm**

JOB: **Kalbar 19-143**

STAGE:

UNLOADING TRUCKS - WITH FILL MATERIAL

Emission Source: **Unloading trucks with fragmented stone (at pit)**

Data Source: ***USEPA AP42 Chapter 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing (2004)***

Derived Emission Factor (PM2.5):	EF=	1.25E-05	kg/tonne	Assume 1/4 of PM10 emissions
Default Emission Factor (PM10):	EF=	5.00E-05	kg/tonne	(Table 11.19.2-1 USEPA AP42)
Derived Emission Factor (TSP):	EF=	1.19E-04	kg/tonne	Based upon 0.42 PM10/TSP ratio for unloading from stockpiles specified in NPI Emission Estimation Technique Manual for Mining (Environment Australia, 2011)
Average Production Rate:		167	tonnes per day	
Operating Hours:		12.0	per day	
Emission Rate (PM2.5):	EF=	0.002	kg/day	
Emission Rate (PM10):	EF=	0.008	kg/day	
Emission Rate (TSP):	EF=	0.020	kg/day	

Emission Rate:	**PM2.5:**	**0.0000**	**grams/second**	**6am to 6pm**
	PM10:	**0.0002**	**grams/second**	**6am to 6pm**
	TSP:	**0.0005**	**grams/second**	**6am to 6pm**

JOB: **Kalbar 19-143**

STAGE:

FINES SCREENING

Emission Source: **Greenwaste screening**

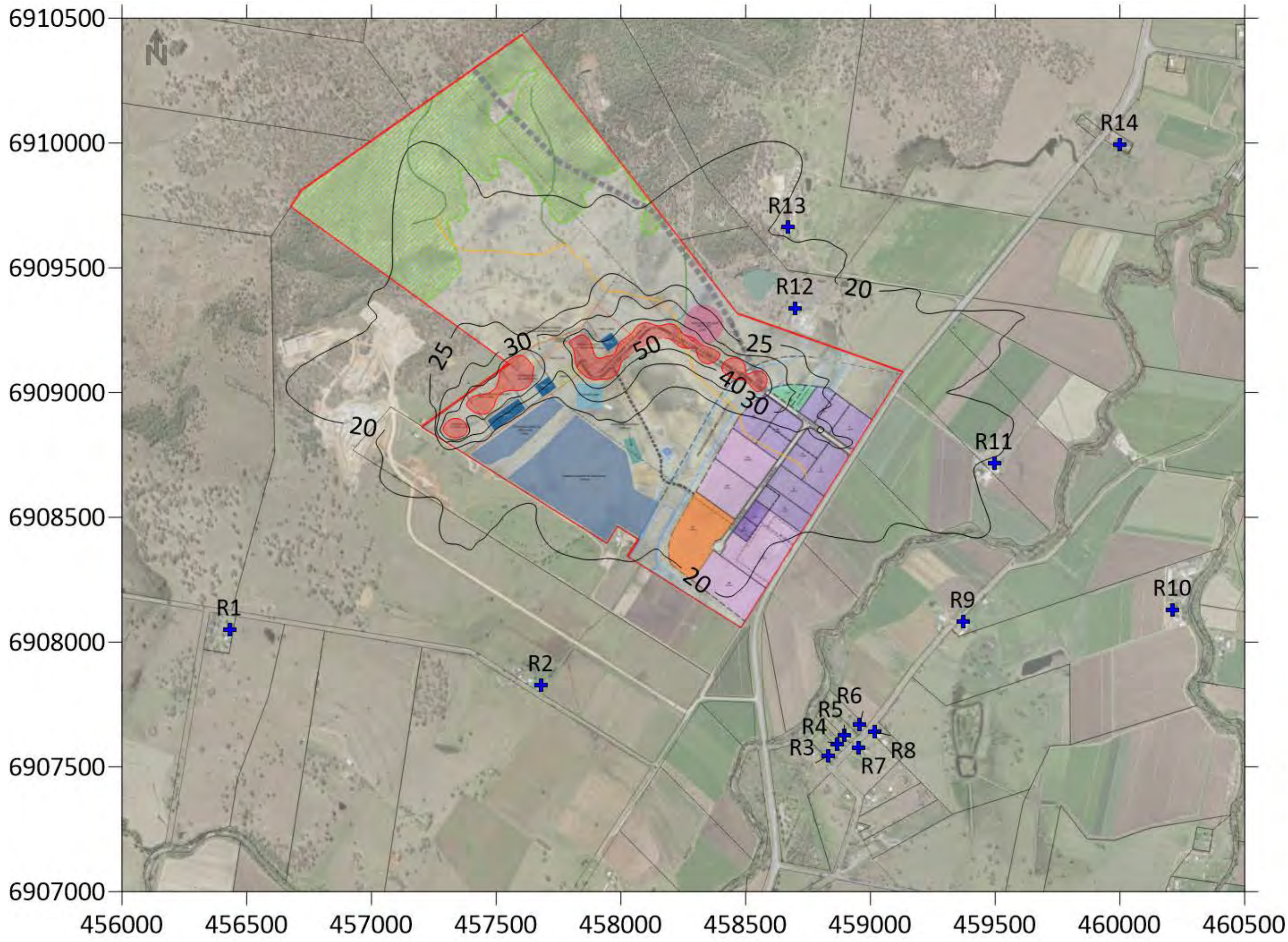
Data Source: ***USEPA AP42 Chapter 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing (2004)***

Control Measures:	Water Sprays to Processing Plant			
Derived Controlled Emission Factor (PM2.5):	EF=	2.75E-04	kg/tonne	Assume 1/4 of PM10 emissior
Controlled Emission Factor (PM10):	EF=	1.10E-03	kg/tonne	
Controlled Emission Factor (TSP):	EF=	1.80E-03	kg/tonne	
Production Rate:		80	tonnes per hour	
Emission Rate (PM2.5):	EF=	0.022	kg/hr	
Emission Rate (PM10):	EF=	0.088	kg/hr	
Emission Rate (TSP):	EF=	0.144	kg/hr	

Emission Rate:	**PM2.5:**	**0.006**	**grams/second**	**6am to 6pm**
	PM10:	**0.024**	**grams/second**	**6am to 6pm**
	TSP:	**0.040**	**grams/second**	**6am to 6pm**

ATTACHMENT 12

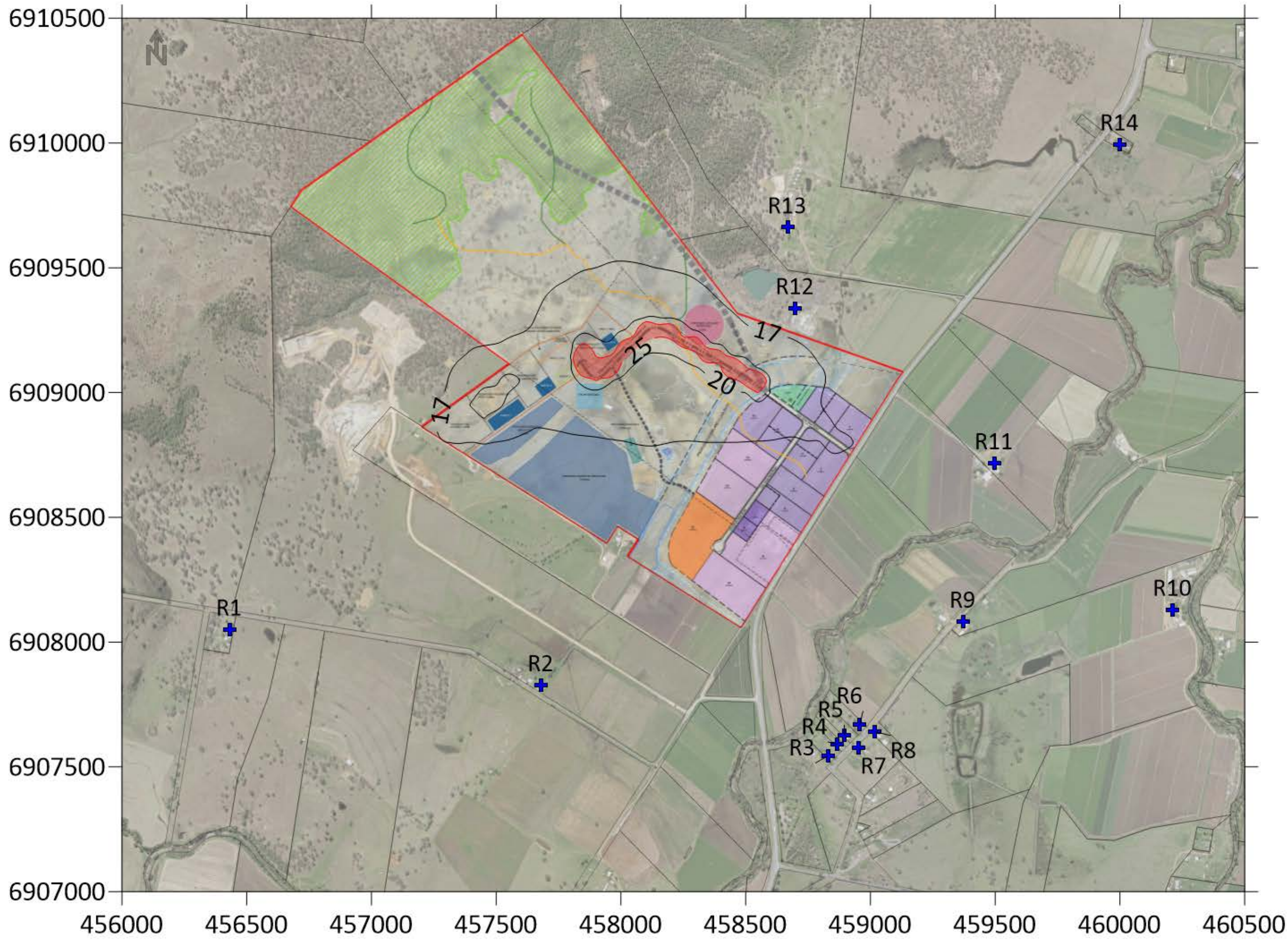
Predicted Particulate Impacts
Composting Facility



Kalbar 19-143

Predicted Maximum PM_{10} 24-hour average concentrations from;
Composting Facility plus Ambient

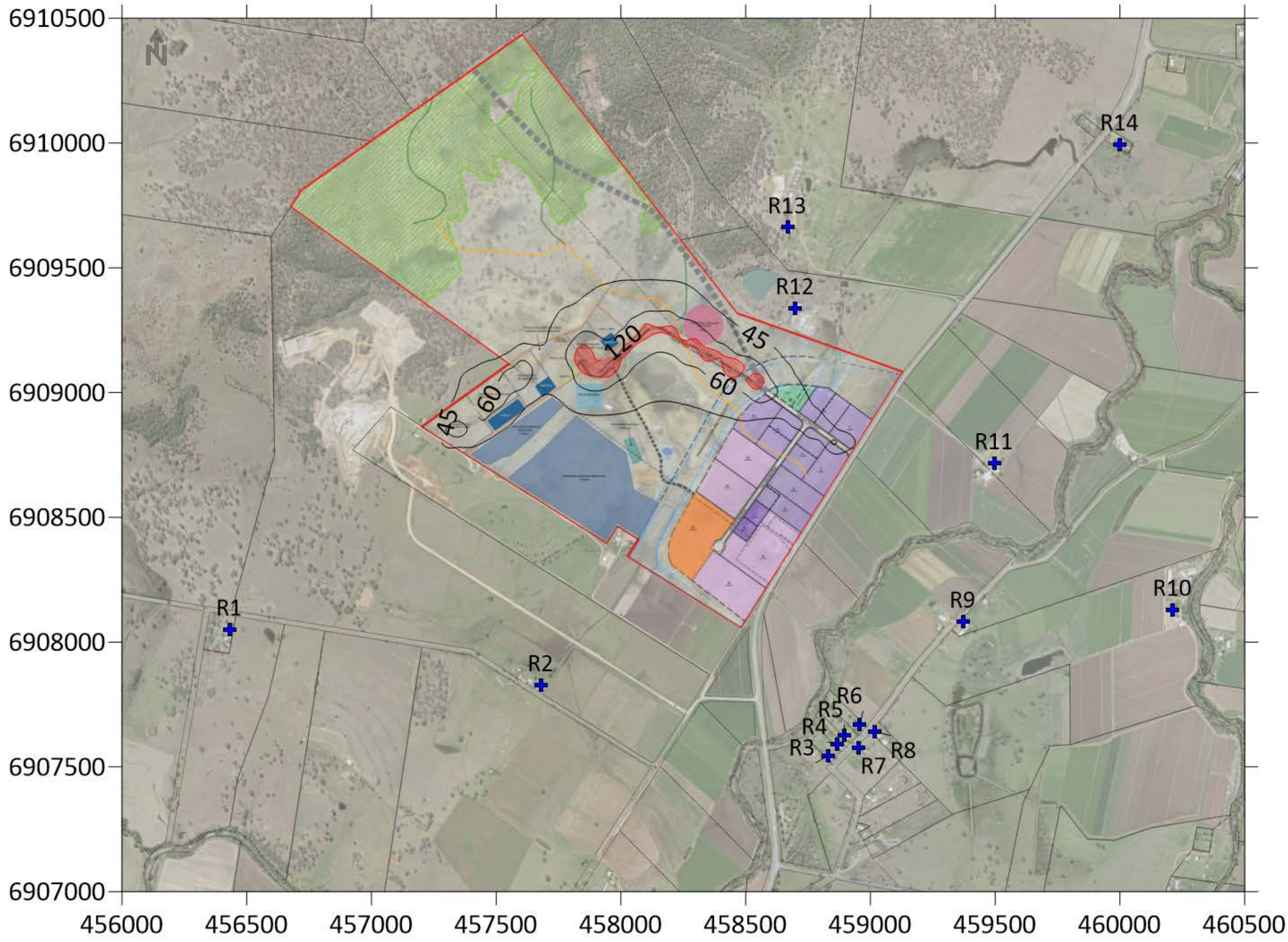
Figure A12.1	Pollutant	Averaging Period	Ambient Concentration	EPP Objective	Date
mwa ENVIRONMENTAL	PM_{10}	Maximum 24-hour average	18.3 µg/m³	50 µg/m³	2020-03-17



Kalbar 19-143

Predicted PM_{10} annual average concentrations from;
Composting Facility plus Ambient

Figure A12.2	Pollutant	Averaging Period	Ambient Concentration	EPP Objective	Date
mwa ENVIRONMENTAL	PM_{10}	Annual Average	16.4 µg/m³	25 µg/m³	2020-03-17



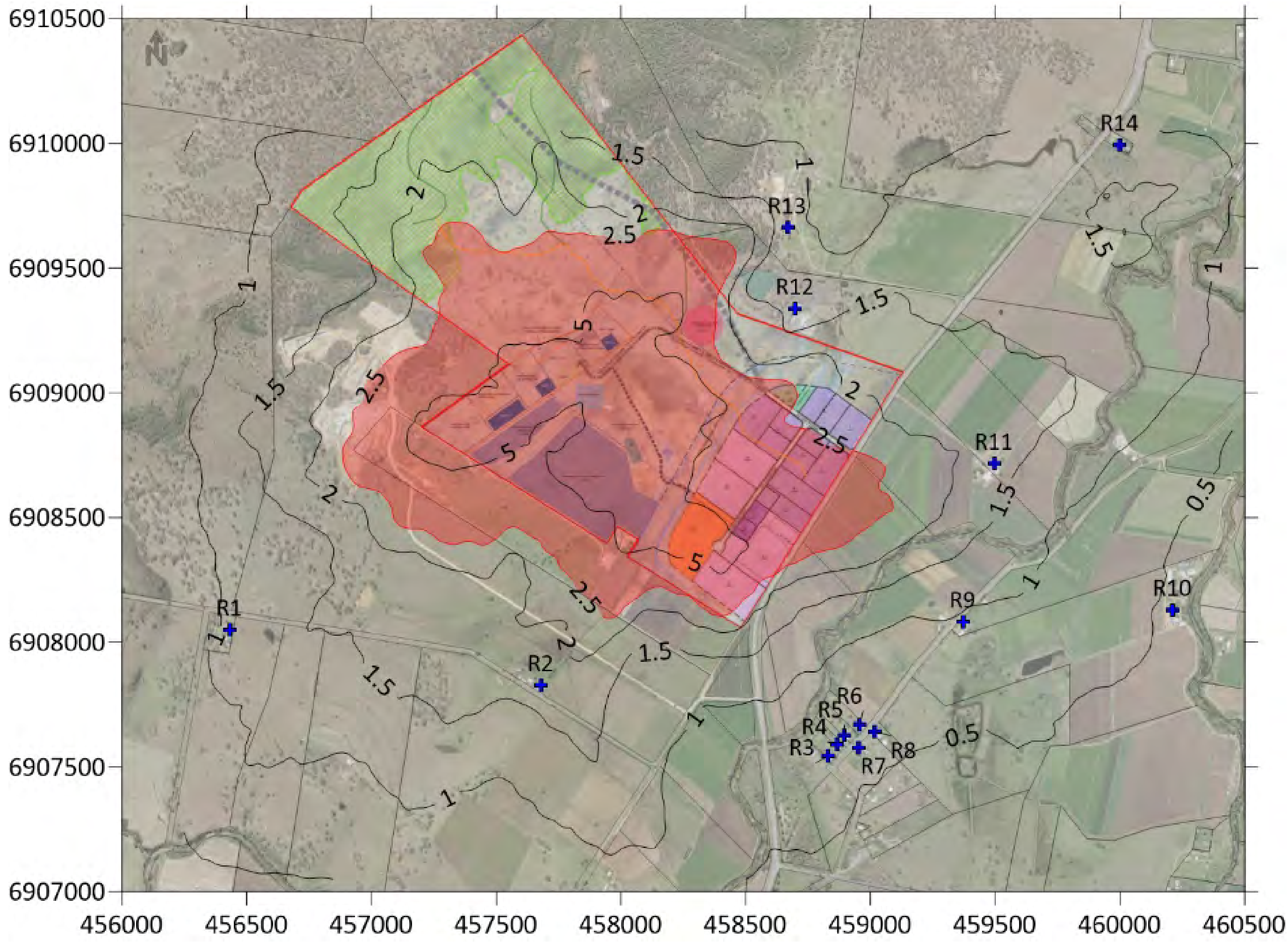
Kalbar 19-143

Maximum Monthly Dust Deposition Rates from Composting Facility plus Ambient

Figure A12.3	Pollutant	Averaging Period	Background Deposition Rate	Common ERA Guideline	Date
mwa ENVIRONMENTAL	Dust Deposition	Maximum Monthly Average	40 mg/m^2/day	120 mg/m^2/day	2020-03-17

ATTACHMENT 13

Predicted Odour Impact
Overall Cumulative Odour Emission Scenario



Kalbar 19-143

1-hour average 99.5th percentile ground level concentrations of Odour from;
Overall Cumulative Site Emissions
Note: Conservative Assessment Assuming Directly Additive Odour Concentrations from All Sources

Figure A13	Pollutant	Averaging Period	Guideline	Units	Date
mwa ENVIRONMENTAL	Odour	1-hour average 99.5th percentile	2.5	Odour Units	2020-03-17