Noise and Odour Assessment Summary

for the

Hay Shire Material Recycling Facility

Hay Shire COUNCIL

INTRODUCTION

This assessment is a summary and some additions of the 2021 JustWaste Consulting SEE report to accompany the development application for Hay Shire Council Material Recycling Facility at 109 Thelangerin Road, Hay NSW 2711. Please note that the majority of the report is a verbatim duplication if the JustWaste report.

The Hay Shire Council would like to establish a Material Recycling Facility to process a Range of materials from the waste stream, and also reducing waste currently in the landfill. The aim is a facility that recovers and reprocesses waste from municipal, as well as domestic waste collection, targeting waste streams such as glass, plastics, tyres, paper, cardboard as well as Food Organics/Garden Organics (FOGO). The facility would also process Construction and Demolition Waste and take waste from the surrounding neighbouring Councils which also do not undertake any recycling.

The Hay Material Recycling Facility (MRF) will accept and process self-haul green waste and food and garden organics (FOGO) from a kerbside collection service that is currently in the planning stages. Processing (composting) of the material will be undertaken on a compacted clay liner hardstand. The hardstand will be bunded to exclude uncontaminated storm water and be constructed so that leachate generated on-site discharges into a leachate dam for recirculation.

The project has the backing from surrounding Councils, who will also deliver waste to the MRF, creating a regional solution to waste issue. The amount of waste that is envisaged to be received is the following:

Waste (tonnes per annum) to be received by Hay MRF				
Council	**Kerbside Waste**	**Recyclables**	**FOGO**	**Total**
Edward River		1056	3523	**4579**
Balranald		253	843	**1096**
Carrathool		180	599	**779**
Murrumbidgee		320	1068	**1388**
Hay	184	488	1629	**2301**
Total	**184**	**2297**	**7662**	**10143**

It is envisaged that the recycling facility can produce the following:

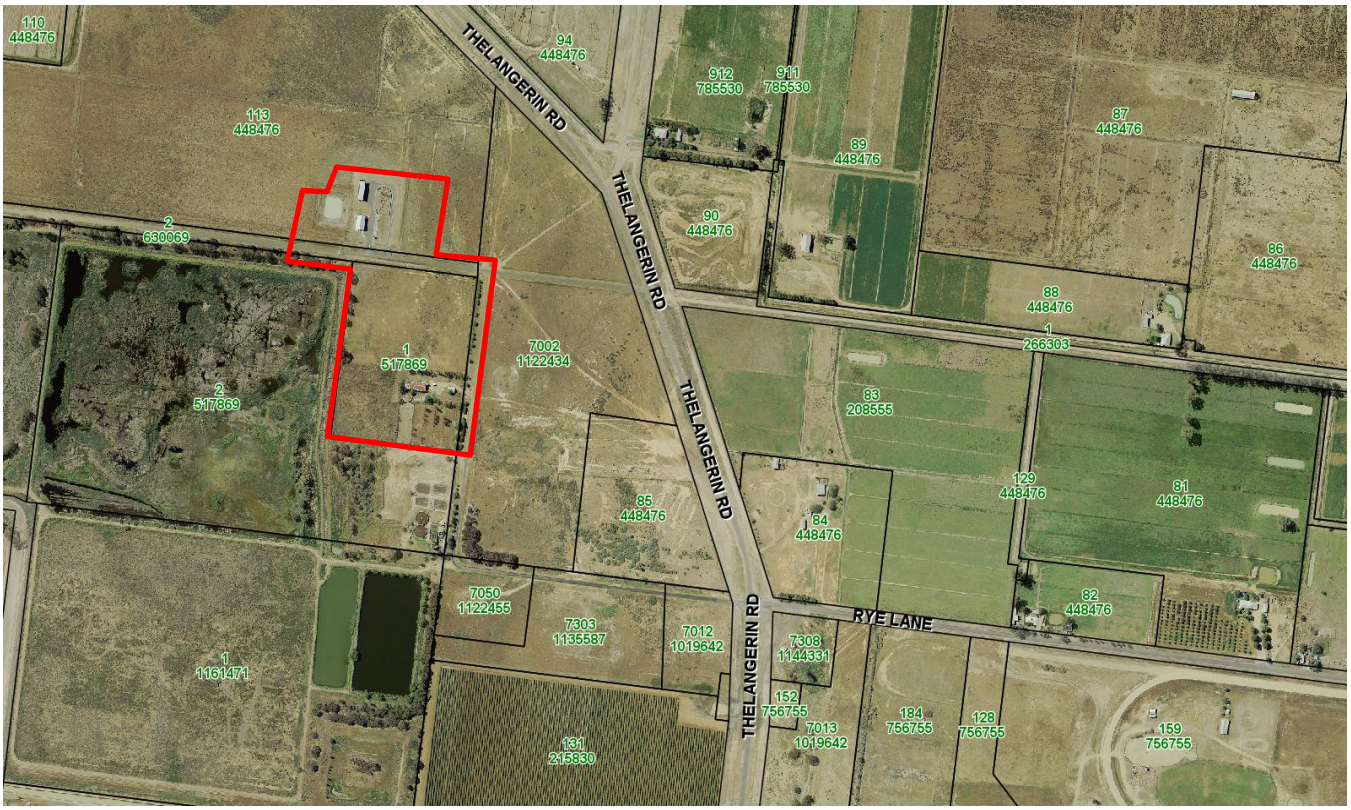
	Current	**6 Month Forecast**	**3 Year Forecast**	**10 Year Forecast**
	2021	**2022**	**2024**	**2031**
Polypropylene (PP) plastic pellets		100	350	500
Mixed crushed glass		200	600	800
Glass fines		50	150	300
Rubber crumb		100	300	600
Beneficiated paper		100	300	500
E Waste	68	100	300	300
Mulch/Shredded Products/Compost		200	200	500
Textiles/Cloth		100	300	500
Plastics - soft		100	300	500

Council have investigated various composting methods and given the site parameters, and to maintain a low input-cost project, have decided to pursue an open windrow composting methodology. This option makes use of the existing resources of space, infrastructure, machinery, and staff, ensuring low capital expenditure and maintenance costs.

Under the proposed organics composting method, FOGO material will be deposited on a bunded, concrete input pad, spread and manually decontaminated, with contaminants taken directly to the adjacent landfill. The remaining feedstock will be windrowed on the bunded clay pad with the first windrow established over approximately 2 weeks, ensuring the composition and amount of material is right for proper composting conditions (i.e. C/N ratio, moisture). Upon full operation, the site will have at least five windrows, each at various stages of composition, and all monitored for temperature and moisture, ensuring optimum composting conditions. The windrows will be turned as required to ensure adequate material breakdown, and at the end of stage five, the material will be screened and tested for contaminates, and if satisfactory, moved to a maturation pad awaiting distribution and use. Any oversized screened material will be reintegrated into stage 1 for further breakdown and the introduction of established inoculants.

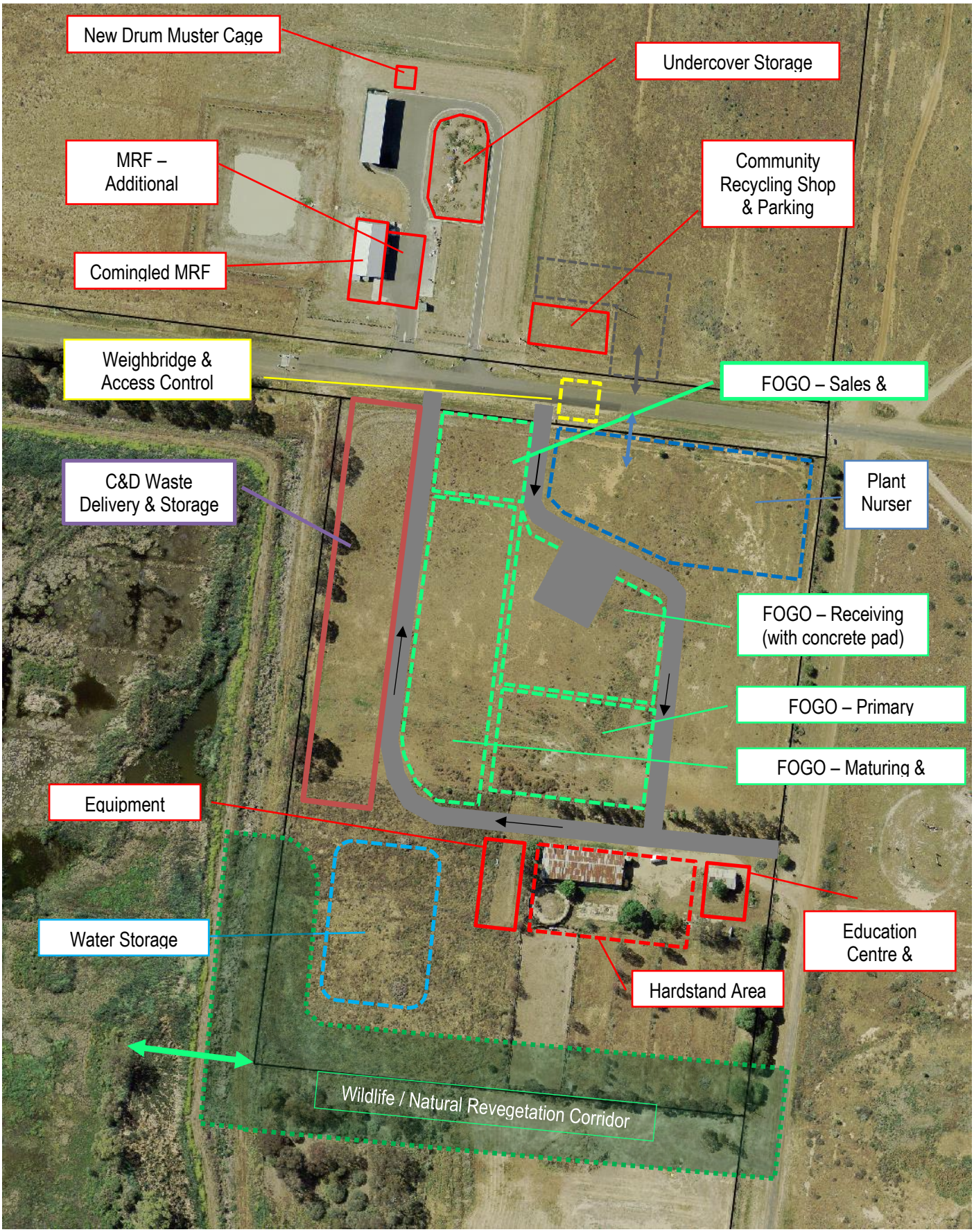
Site description and suitability

The site is located between the Sewer Treatment Plant and Waste Sites to the west of the town. The development will take up the entirety of Lot 1 DP 517869, and a small corner of Lot 113, DP 448476.



Location of the proposed MRF

The proposed development can be seen below, it will encompass the entrance of the current waste site, the existing Waste Transfer Station, and a recently acquired piece of land to the south.


New Drum Muster Cage
Undercover Storage
MRF – Additional
Community Recycling Shop & Parking
Comingled MRF
Weighbridge & Access Control
FOGO – Sales &
C&D Waste Delivery & Storage
Plant Nurser
FOGO – Receiving (with concrete pad)
FOGO – Primary
FOGO – Maturing &
Equipment
Water Storage
Education Centre &
Hardstand Area
Wildlife / Natural Revegetation Corridor

The site is generally flat and sparsely vegetated weeds and grasses, with limited established trees around the perimeter and an elevation of approximately 89 m above sea level (Google Earth Pro, 2018). There is no identified flooding (NSW SES, 2014) or subsidence risk (NSW Government, 2021c).

The site has a few derelict buildings on site on the southern section, and the current Waste Transfer Station is located on the northern section.

Hay Shire has hot summers with monthly mean temperatures ranging between 32.3 to 35.2 ^{o}C and cooler winters with monthly mean temperatures ranging between 15.8 to 17.5 ^{o}C. The area receives approximately 40% of its rainfall in the four months between November and February with lower, more consistent rainfall from March to October . Although mean annual temperature and total annual rainfall has been quite variable from 2008, climate change trends indicate that the region is experiencing increases in mean annual temperatures combined with a concurrent decrease in total annual rainfall . This suggests that fire risk, both from the composting process and from bushfire, from high temperature and dry conditions will be monitored and managed.

The annual average wind directions and speeds are illustrated with wind roses below. The length of each arm is proportional to the frequency of the direction and the length of each segment within each arm corresponds to the range of speeds from that direction. The different times (9 am and 3 pm) are used to show the normal variation over a day. Summer (Jan-Mar) winds are predominantly southernly at 9 am and south-westerly at 3 pm. Winter (Jul-Sep) winds are predominantly south-westerly at 3 pm however at 9 am, winds are equally divided between northernly and south-westerly. On an annual basis, 9 am winds can be evenly divided between northernly, southernly, and south-westerly while 3 pm wind direction is predominantly south-westerly . Wind speeds (indicated in the coloured sections of the arms) can be interpreted as dominantly calm to gentle and very rarely strong (above 40 km/h) according to the Beaufort scale.

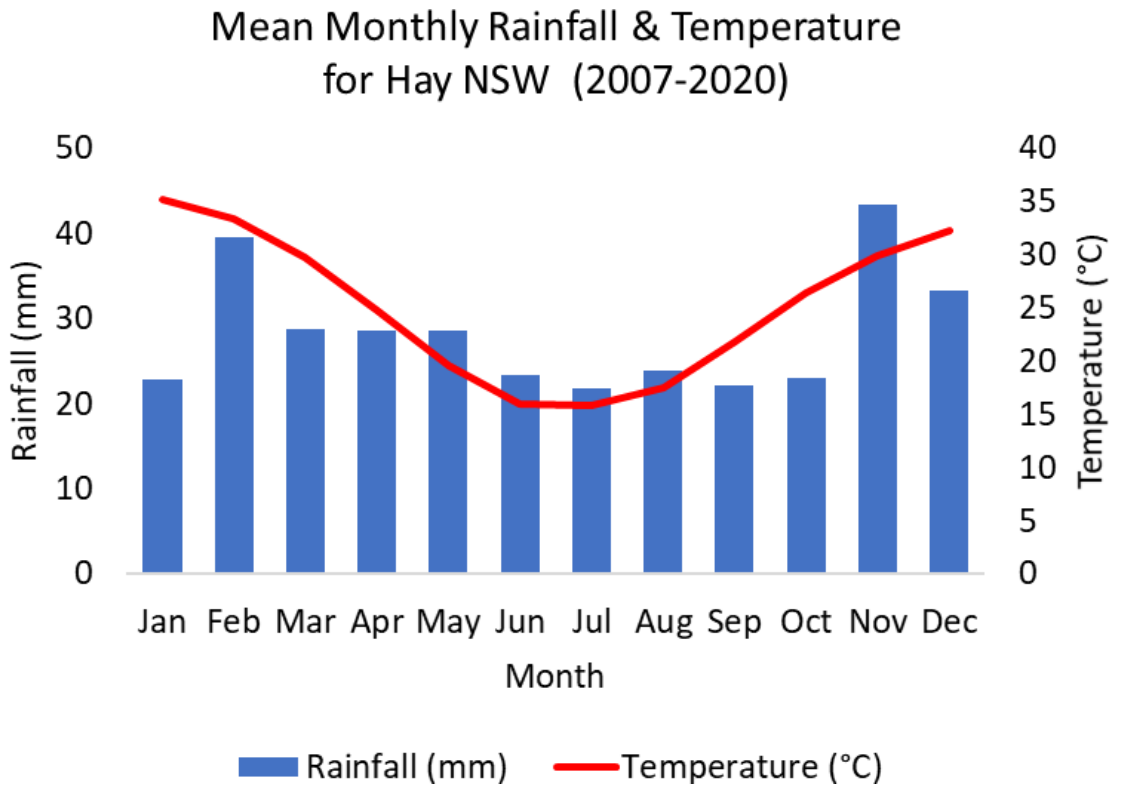
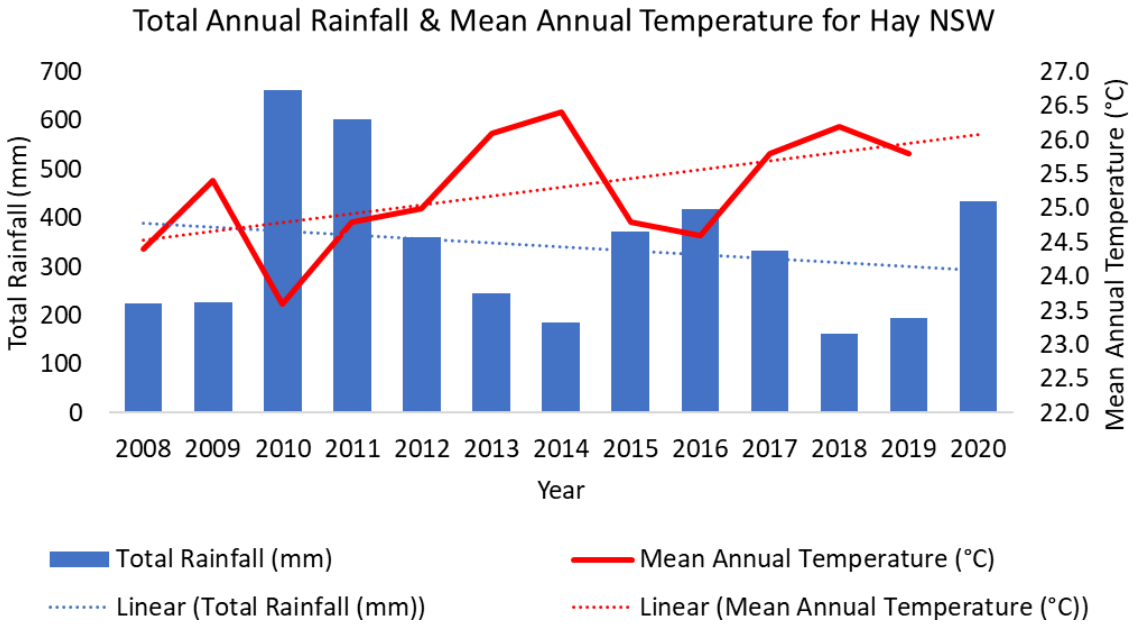
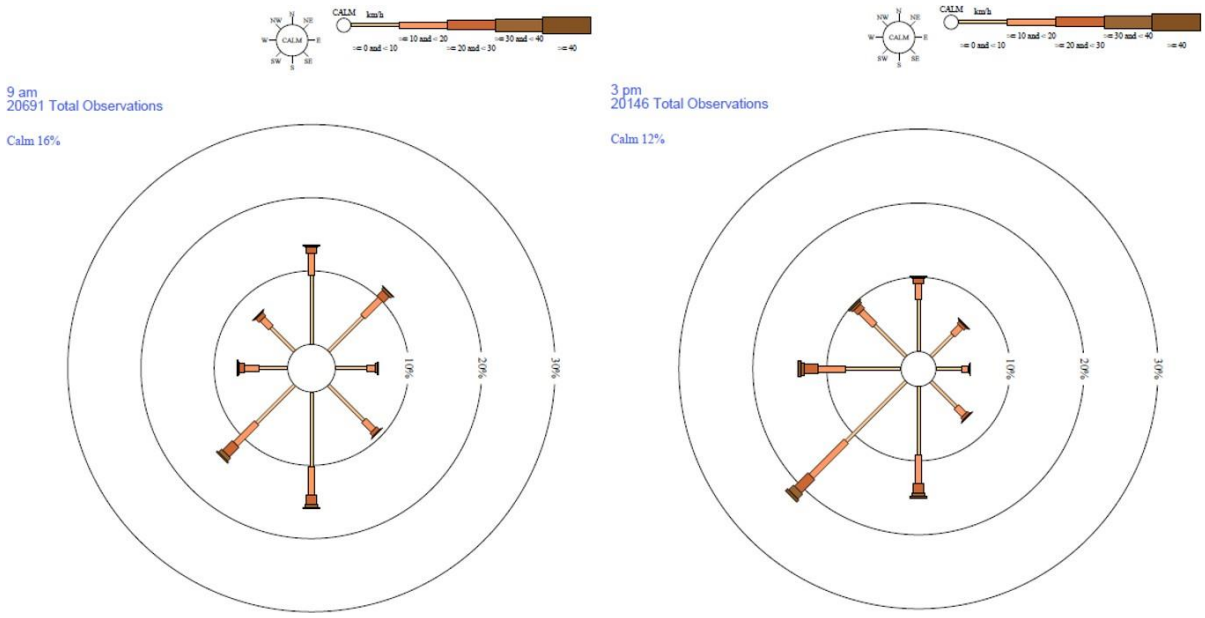


Figure 2 Mean monthly rainfall (mm) and temperature (°C) at Hay Airport, Station No. 75019 for the years 2007 to 2020 (BOM, 2021c).



Total annual rainfall (mm) and mean annual temperature (°C) at Hay Airport, Station No.75019 (BOM, 2021c).



Annual average Rose of Wind direction versus Wind speed in km/h as observed at Hay, MillerStreet, between 1 January 1957 to 9 January 2015 (BOM, 2019).

Description	Mean Wind Speed	Appearance of Wind Effects		
		On a Tree	*On Land*	
Calm	< 1 knot < 1 km/h	Still	Smoke rises vertically	
Light Air	1 – 3 knots 1 – 5 km/h		Smoke drifts, wind vanes are still	
Light	4 – 6 knots 6 – 11 km/h	Leaves rustle	Wind felt on face, vanes begin to move	
Gentle	7 – 10 knots 12 – 19 km/h	Leaves and small twigs move	Flags flap	
Moderate	11 – 16 knots 20 – 28 km/h	Small branches move	Dust and loose paper lifted	
Fresh	17 – 21 knots 29 – 38 km/h	Small trees in leaf begin to sway	Flags fully extended	
Strong	22 – 27 knots 38 – 49 km/h	Larger branches shake	Whistling in wires, umbrellas become difficult to use	

Beaufort Scale windspeed interpretations (Claire Flynn, 2016).

Proposed site and nearest sensitive receptors (Residential Dwellings)

Odour issues

Air quality: odour, particular pollution, and methane gas management

The risks of impact on air quality relate mainly to the composting process, although un- composted feedstocks and the leachate dam can also be potential sources of odour emissions. If conditions within the windrows become anaerobic, the emission of gaseous compounds includingsulphur, nitrogen, methane and volatile fatty acids can cause the generation of unpleasant odours (NRCS, 2007). The volatilisation of ammonia is the most common source of odorous emission during normal composting conditions (NRCS, 2007). The production of methane under anaerobic conditions is undesirable both because of the unpleasant odour and also because it is considered a potent greenhouse gas which is more than 20 times more potent than carbon dioxide (NRCS, 2007).

Under aerobic conditions, composting odours are characterised by an earthy woody scent. Gases released in these conditions can be toxic but when managed appropriately the concentrations are not high enough to be considered a health risk (Clark et al., 1983). Under aerobic conditions, the production of methane is minimal with carbon dioxide produced in its place. The amount of methane emitted during composting can be minimised by regular aeration of the pile, reducing the presence of clumps, avoiding compaction, and not allowing the pile to become too wet (NRCS, 2007). Methane emission is not considered a significant risk in a well-maintained open- windrow operation (NRCS, 2007).

The risk of emitting and dispersing odorous gases is greatest upon the delivery of feedstocks, during compost turning, and the screening of mature compost. Emissions can be minimised through good management of the composting process. The key parameters for pasteurisation and odour control include:

- Maintain a nutrient balance between carbon and nitrogen of between 25:1 and 35:1. High nitrogen feedstocks should be mixed with carbon-rich feedstocks to achieve the ideal carbon to nitrogen ratio (EPA Victoria, 2017).

- Moisture levels should be maintained between 45%-60%. Moisture levels above 60% will lead to anaerobic conditions and the production of odorous emissions (EPA Victoria, 2017).

- Available oxygen should be maintained at greater than or equal to 10%. Oxygen levels are influenced by porosity, moisture content, bulk density, windrow size or bed depth and frequency of turning. Lack of oxygen will result in the release of odorous methane gas (EPA Victoria, 2017).

- Maintain a pH between 6.5 and 8.0. Lower pH, coupled with anaerobic conditions, can lead to the production of odorous compounds such as sulphides, amines, ammonia, and volatile fatty acids while a higher pH can lead to gaseous losses of ammonia (EPA Victoria, 2017).

- The porosity and bulk density of the pile should be maintained at 45%-65% and 400-700 kg/m^3, respectively. Porosity and bulk density have a great influence on oxygen availability. Anaerobic conditions are most likely with low porosity and high-density feedstocks. Piles should be constructed to between 1.5-3.0 m in height to minimise the effects of compression yet enable material to heat up sufficiently and allow oxygen to move throughout the pile (EPA Victoria, 2017).

- The temperature should be maintained between 55°C and 75°C. Temperature influences the rate of decomposition and thus oxygen demand, microbial population, and overall propensity to generate odorous compounds. This temperature range is optimal for pasteurizing the compost (EPA Victoria, 2017).

Using non-putrescible category 1 organics including leaves, plants, branches, tree trunks to blend with rapidly biodegradable organics is a good way to manage odour risks. Kerbside FOGO bins are generally 70-80% garden material and Hay Shire Council will have access to 1629 tpa of mulched green waste to blend with the FOGO feedstock. This will be combined with a further 3523 tpa from Edward River Council, 843 tpa from Balranald Council, 599tpa from Carathool Shire, and 1068 tpa from Murrumbidgee Council. This will be a total of 7662 tpa. Given the proposed area does not have heavy rainfall to create excessive moisture levels within the windrows, and the feedstock will be dominated by high carbon, category 1 organics, it is not expected that the site will generate excessive odour emissions.

Odour dispersion meteorology

High peak odour emissions at composting facilities generally occur during the preparation of feedstocks and the turning of the windrows (Department of Environment and Conservation (NSW), 2003a). The resulting odour impacts are most likely to occur during periods of low wind where stable wind conditions cause minimal odour dispersion. Calm conditions commonly occur in the mornings and evenings during late autumn and winter (Department of Environment and Conservation (NSW), 2003a).

Summary climate statistics, including wind speed and direction, were collected at Miller Street, Hay, located approximately 5 km from the proposed site, between 1st January 1957 and the 9th of January 2015 (Figure 4).

The lowest mean windspeed of 6.0 km/hr (considered light wind Figure 5) was recorded in June and July with calm conditions occurring up to 28% of the time in June and 25% of the time in July (Table 2 & Table 3). These light winds were predominantly northly and south-westerly Table 2. . Table 4 however, indicates that the dispersion effects of winds between 2 and 11.5 km/h, are good to excellent during periods of strong solar radiation, dropping to marginally good with weak to slight solar radiation and marginally poor to very poor on heavily overcast days and night-time. Given the sensitive receptors are over 500m away from the site (see above figure) over flat terrain, the site is at a low risk of atmospheric odour emissions causing a nuisance. Should circumstances present an issue, the offending pile of organic matter will be removed and landfilled at the adjacent site.

Wind speed and direction frequency (9 am) measured at the Bureau of Meteorology weatherstation at Miller Street, Hay (Site number: 075031) between 1957 and 2015 (BOM, 2019).

Month	Mean 9 am Wind Speed (km/h)	Wind Direction Frequency (%)								
		N	NE	E	SE	S	SW	W	NW	Calm
January	10.9	15	12	8	13	24	11	3	5	9
February	10.1	14	19	9	16	12	10	3	4	13
March	9.2	12	14	8	13	20	11	4	4	14
April	7.5	12	13	7	11	18	12	5	4	18
May	6.3	12	10	7	7	11	12	8	9	24
June	6.0	12	9	5	7	10	12	8	9	28
July	6.0	15	9	3	5	9	13	10	11	25
August	7.7	14	10	5	5	10	15	11	11	19
Septembe	9.4	14	11	4	7	12	18	11	9	14
October	11.0	12	11	6	9	17	18	9	7	11
Novembe	11.3	14	11	8	11	18	18	5	5	10
Decembe	10.8	13	11	8	11	20	18	5	4	10
Annual	**8.8**	**13**	**11**	**7**	**9**	**15**	**13**	**8**	**8**	**16**

red = highest value blue = lowest value

Wind speed and direction frequency (3 pm) measured at the Bureau of Meteorology weatherstation at Miller Street, Hay (Site number: 075031) between 1957 and 2015 (BOM, 2019).

Month	Mean 3 pm Wind Speed (km/h)	Wind Direction Frequency (%)								
		N	NE	E	SE	S	SW	W	NW	Calm
January	10.8	10	8	5	9	19	21	12	8	8
February	9.8	9	8	8	8	18	19	11	8	11
March	9.7	8	7	6	11	16	21	12	7	12
April	8.5	8	7	6	8	17	20	12	8	14
May	8.0	10	5	5	5	15	21	10	10	19
June	8.2	10	7	5	7	14	19	10	11	17
July	9.0	13	6	3	5	11	20	14	15	13
August	10.2	13	6	3	4	11	21	17	14	11
Septembe	10.9	11	6	4	3	12	25	18	11	10
October	11.2	11	6	3	6	15	22	18	10	9
Novembe	11.5	9	5	4	6	15	27	17	9	8
Decembe	11.2	8	6	3	7	16	25	18	8	9
Annual	**9.9**	**10**	**6**	**5**	**7**	**15**	**21**	**14**	**10**	**12**

red = highest value blue = lowest value

The effect of weather conditions on odour dispersion. Colours correspond to dispersion categoriesin the Oklahoma Dispersion Model (EX – excellent, G – good, MG – moderately good, MP – moderately poor, P – poor, VP – very poor). Note that the first four categories for solar radiation are functions of sun angle and cloudiness amount (adapted from Carlson & Hamilton (2019).

Wind Speed (Km/h)	Daytime					Night time		
	Solar Radiation					Cloudiness		
	Strong	Moderate	Weak	Slight	Heavy Overcast	Heavy Overcast	Cloudy/ Mostly Cloudy	Partly Cloudy/ Clear
2	G	G	MG	MG	P	P	VP	VP
5	EX	G	MG	MG	P	P	VP	VP
8	EX	G	MG	MG	MP	MP	P	VP
11	EX	EX	G	MG	MP	MP	P	VP
15	EX	G	G	MG	MP	MP	MP	P
18	G	G	MG	MG	MG	MG	MG	MP
21	G	G	MG	MG	MG	MG	MG	MG
24	G	G	MG	MG	MG	MG	MG	MG
32	EX	G	G	G	G	G	G	G
40	EX	G	G	G	G	G	G	G
48	EX	G	G	G	G	G	G	G

Particulate pollution may present a problem if feedstocks or windrows are allowed to become dry, particularly during the blending and/or turning stages of the process or during periods of high wind. The moisture level of the windrows and feedstocks will be monitored, and where appropriate, a water cart will be used for wetting the compost windrows and feedstock stockpiles.The maximum mean windspeed, as measured at Miller St, Hay, has been recorded as 11.5 km/hour which is considered a light to gentle wind. For this reason, despite the absence of significant wind breaks in the area, particulate pollution is not expected to be a significant concern. Should high winds become a problem, compost turning will be restricted and deliveries of feedstocks will be postponed.

Noise issues

The access road to the site is Thelangerin Road which has very few residential dwellings located on it and is one of the major roads leaving the main township of Hay to the north. The proposed development will have increased deliveries, increased removals, and machinery on site.

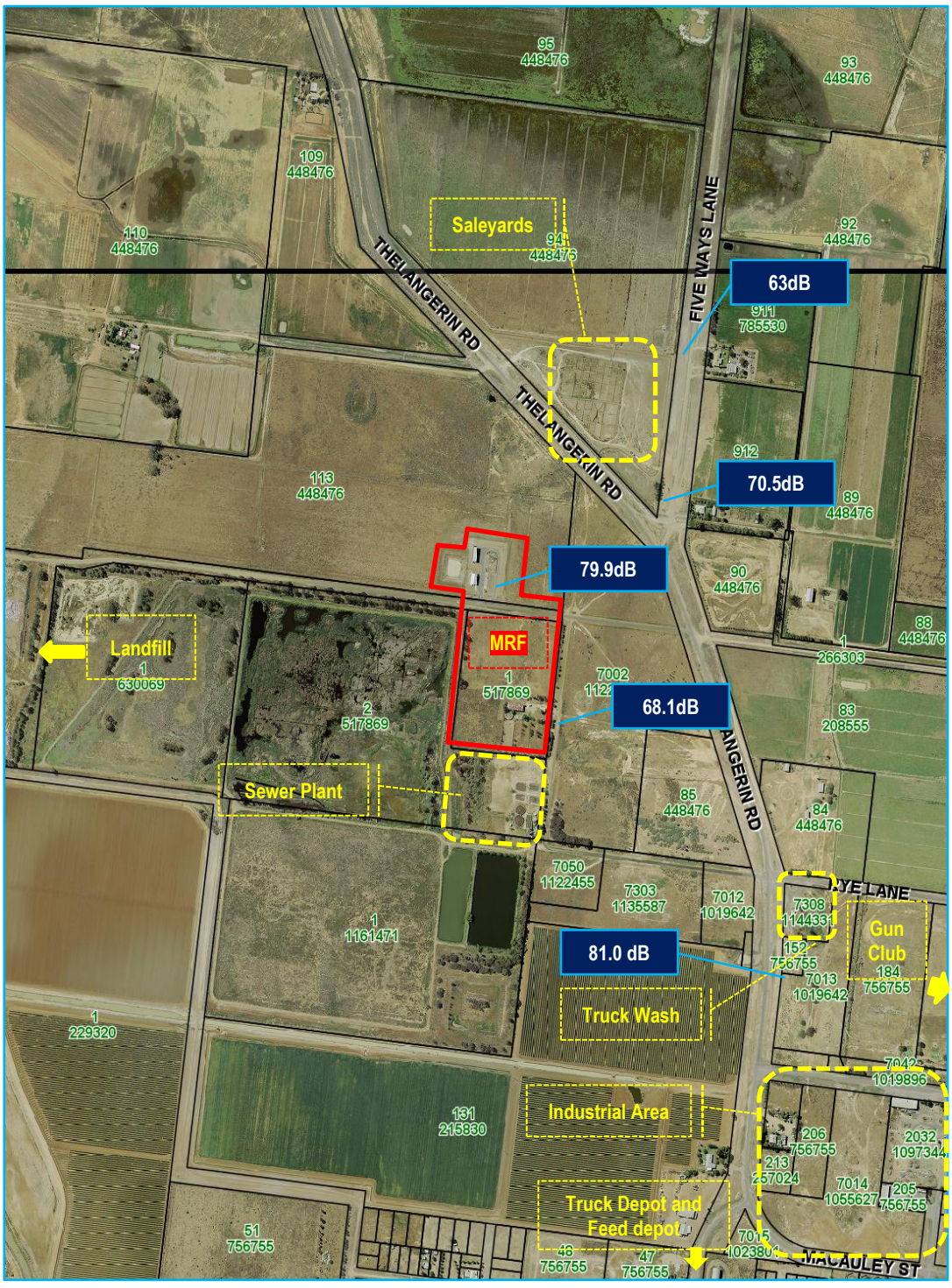
Increased deliveries and removals – These will be 2-4 truck movements per day. As this will be within business hours, the impact will be negligible.

Increased use of machinery on site – There will be more heavy vehicle use on site. Readings were taken on site at the current Waste Transfer Station) during the gathering and removal of waste, in which a single utility vehicle, a backhoe, and a truck was used, with also the cardboard baler being in operation. The reading was 79dB. The supplier for the proposed shredder and baler indicated that the noise levels will not exceed 75dB, so it is envisaged that noise will be roughly equal to the status quo.

Decibel readings were taken at the closest sensitive receptors, and it is found that it is unlikely for the poposed MRF to have a noise impact on the receptors, as other sources of noise dominated the surroundings. These sources include:

- A Saleyard to the north
- A Truck Wash with constant use to the east
- A Gun Club to the east
- An industrial area, truck depot and feed depot to the south.

No surrounding land uses are likely to be impacted by the proposed site operation. Council will keep a noise complaint register to monitor any issues that arise.



Surrounding land uses (impacting noise)(marked yellow), with Decibel readings taken (marked blue) when machinery operated on northern part of site.