Odour Assessment of Emissions to Atmosphere from Proposed Non Ferrous Metal Recycling Facility,

Land to North of Kirby Lane, Gretton Brook Road, Corby

P2003

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1 INTRODUCTION

DMP Metals Ltd has commissioned Atmospheric Dispersion Modelling Ltd (ADM Ltd) to undertake an odour assessment of emissions to atmosphere from the proposed non-ferrous metal recycling facility. The proposed facility is located on land to the north of Kirby Lane, Gretton Brook Road, Corby.

The application site is currently used as an In-Vessel Composting (IVC) facility (known as Kirby Lodge), processing and recycling green and food waste to produce a compost material for re-use. The IVC facility, however, is in the process of closing following the clean-up of the site. During its operation as an IVC facility, it was the subject of numerous complaints regarding odour.

The proposed recycling facility will target contaminated non-ferrous metals that have previously been removed from Refuse Derived Fuels (RDF) and Solid Recovered Fuel materials (SRF) which have an average contamination rate of approximately 30%. Other potential sources of feedstock could include waste from the incineration or the processing of biomass.

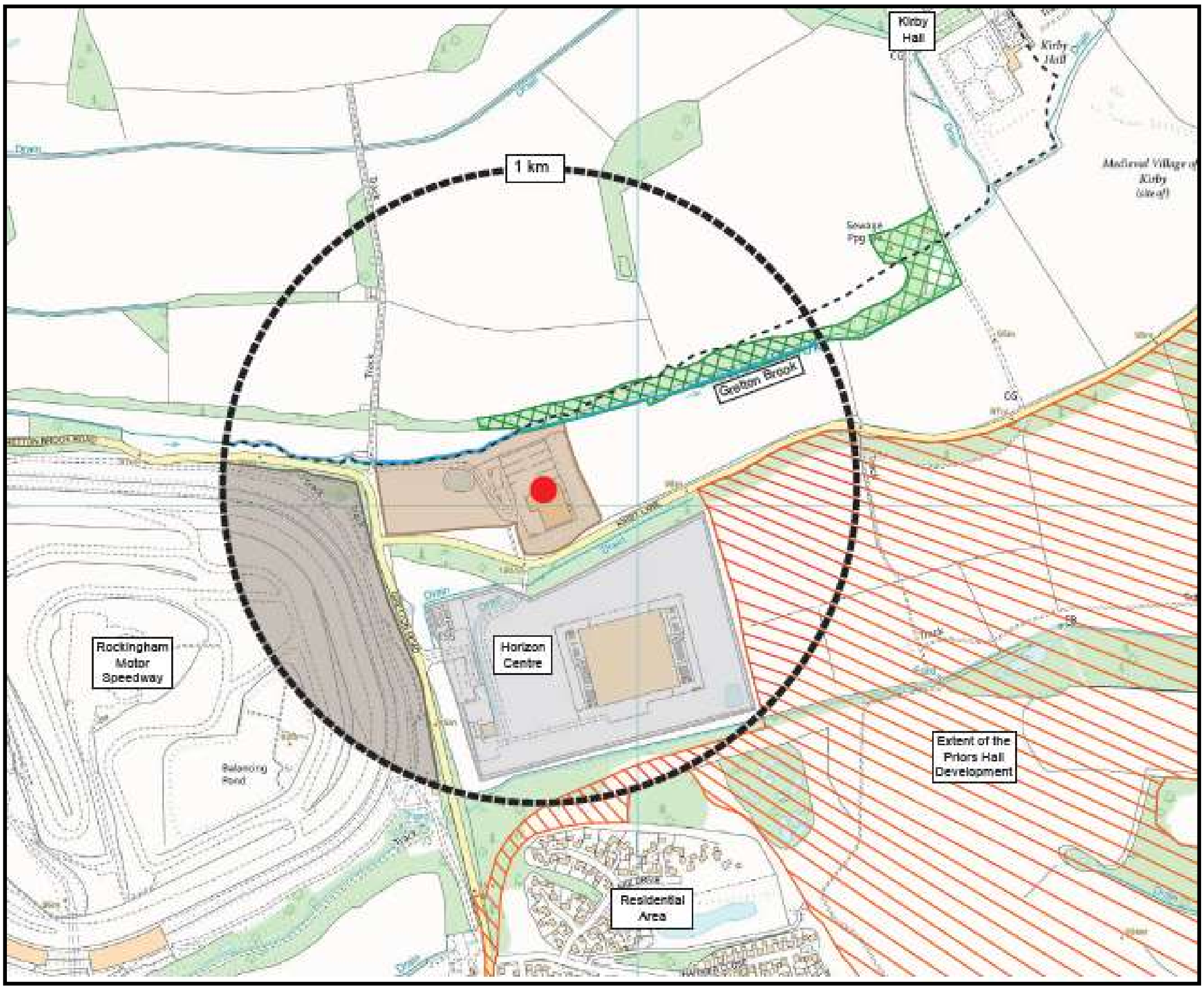
Although the proposed facility will use the existing buildings, the magnitude and nature of odours generated from the facility will be entirely different to those that occurred from the sites' previous use as an In-Vessel Composting (IVC) facility. The odour assessment presented in this report should, therefore, be considered on its own merits.

At present, there are no odour-sensitive residential dwellings near the proposed facility. However, construction of residential properties is currently progressing within the Priors Hall Park development to the south and east of the proposed facility, which would become sensitive to odours, once occupied. This assessment assumes residential properties at the closest location possible to the proposed facility.

The principal source of emissions of odour from the proposed facility will be the storage bays within storage building. In addition, there will be some emission of odours from the process building.

Figure 1.1 shows the location of the proposed facility.

Figure 1.1 Location of Proposed Facility



The ADMS 5.2 dispersion model has been used to make predictions of ground-level concentrations of odours occurring due to emissions from the facility.

The remainder of the report is structured as follows:

- Section 2: Site operational context and baseline
- Section 3: Assessment and significance criteria
- Section 4: Methodology
- Section 5: Predictions and assessment of the impact
- Section 6: Sensitivity analysis
- Section 7: Summary and conclusions

2 SITE OPERATIONAL CONTEXT AND BASELINE

2.1 INTRODUCTION

This section describes the previous operation of the site and outlines the areas where emissions of odour gave rise to complaints. Also detailed are the proposed changes that will be made as part of the proposed change of use of the site.

2.2 NORTHAMPTONSHIRE MINERALS AND WASTE LOCAL PLAN

Policy 18 of the Northamptonshire Minerals and Waste Local Plan states [(1)]:

'avoiding and / or minimising potentially adverse impacts to an acceptable level, specifically addressing air emissions (including dust), odour, bioaerosols, noise and vibration, slope stability, vermin and pests, birdstrike, litter, land use conflict and cumulative impact'

This assessment demonstrates compliance with Policy 18 of the adopted Mineral and Waste Local Plan.

2.3 IN-VESSEL COMPOSTING FACILITY

The In-Vessel Composting (IVC) facility at Kirby Lane was granted planning permission on 9 May 2007 for a 40,000 tonnes per year facility and was the subject of complaints about odour. The IVC facility is in the process of closing clean-up of the site.

Composting facilities are by their very nature significant sources of odours. Emissions of odours can be managed, to a certain extent, by enclosing the facility and passing extracted air through a biofilter. The Kirby Lane composting facility included an aeration and air extraction system for the composting tunnels that utilised a biofilter to reduce emissions of odour. It is understood that the tunnels were not well sealed, and it is not clear how well the biofilter performed. There was no air management system for the composting maturing pads which would have acted as a source of odours as would the receiving hall where the material was shredded.

2.4 PROPOSED ALTERATIONS TO THE SITE AND ODOUR ABATEMENT

The nature of the incoming waste streams will not be inherently odorous (for example, it will not include food waste). The plant will be designed to minimise the risk of fugitive odours.

The following odour management measures will be adopted at the facility to minimise odour release:

(1) Northamptonshire Minerals and Waste Local Plan (Adopted July 2017).

- A subjective 'sniff' testing exercise will be conducted daily. This exercise utilises human assessors (site personnel) who use their sense of smell to sniff odours detectable in the vicinity of the site and identify their sources.

- All loads arriving at the facility will be subject to an odour inspection prior to being permitted to proceed to the tipping hall.

- Any particularly odorous material will be placed in a sealed container within the building for removal from site.

- Waste will only be stored for up to 48 hours, ensuring that the material is dealt with on a 'first in and first out basis'.

- The volume of the waste received will be managed to ensure that all material can be accommodated within the tipping hall and that all material can be processed within an appropriate timeframe.

- All residual wastes arising from the treatment will be mechanically or hand-sorted and fall into the one of the dedicated bays which will be removed from site or into a tipping skip once the bay is full.

3 ASSESSMENT AND SIGNIFICANCE CRITERIA

3.1 INTRODUCTION

This section presents the assessment and significance criteria used in this assessment.

3.2 DESCRIBING ODOURS

Human response to odour is very subjective; some people are particularly sensitive to odours and may object at levels which other people are not able to detect.

The detection of an odour may or may not cause annoyance. The concentrations of any particular substance or group of substances that can be detected by an individual depend on a number of factors which vary from individual to individual and can change for each individual depending on, for example, frequency of exposure.

The following sensory characteristics are used to describe odours and are factors that, together with the frequency and duration of odour detection, determine whether an odour may cause annoyance.

- **Hedonic Tone**: this is an individual's judgement of the relative pleasantness or unpleasantness of an odour. The measurement scale for hedonic tones typically ranges from +4 for very pleasant odours (bakeries, say) to -4 for foul ones (rotting flesh, for example).

  The offensiveness of an odour, however, is not entirely related to its hedonic tone. Offensiveness takes account of exposure, and the attributes that determine nuisance sensitivity, whereas hedonic tone is measured in a laboratory situation, simply as 'like' or 'dislike'.

- **Quality/Characteristics**: This is a qualitative attribute which is expressed in terms of 'descriptors' such as 'fruity' or 'fishy'.

- **Concentrations**: The odour concentrations can be expressed as a mass or volume fraction (mg m^{-3} or ppb) if it is a single odorous compound. More frequently, the odour concentration is expressed as OU or OU_e m^{-3}. An OU is a ratio: it is the number of times an odour sample needs to be diluted such that 50% of an odour panel are unable to detect it. An OU_e m^{-3} is the mass of substance that when evaporated into 1 m^3 of odourless gas at standard conditions has the same odour detection of 1 OU of a reference odorant (123 μg of n-butanol).

- **Intensity**: Faint to strong is the magnitude (strength) of perception of an odour. Intensity usually increases with increasing concentrations but often in a non-linear manner.

3.3 ODOUR ANNOYANCE CRITERIA

Odour can be detected over a time period of a few seconds and may cause annoyance if the smell is offensive and/or re-occurring. Predictions of short-time periods present significant problems for dispersion models as they are not able readily or reliably to predict concentrations with an averaging period of less than about one hour. This is in part due to the fact that the meteorological data used are hourly averaged data and in part due to assumptions about dispersion made by the models, which are not appropriate for short averaging periods.

A standard for odour annoyance in terms of the 98^{th} percentile of hourly average odour concentration has been widely used with a threshold in the range of 1 to 10 $OU_e\ m^{-3}$ set as the criterion.

The UK's Environment Agency (EA) H4 guidance suggests a range of benchmarks for unacceptable pollution; these are shown below (1).

- 1.5 $OU_e\ m^{-3}$ 98th Percentile of Hourly Averages for 'most offensive' odours.
- 3.0 $OU_e\ m^{-3}$ 98th Percentile of Hourly Averages for 'moderately offensive' odours.
- 6.0 $OU_e\ m^{-3}$ 98th Percentile of Hourly Averages for 'less offensive' odours.

Table 3.1 shows the Environment Agency (EA) examples for a range of odours

Table 3.1 UK Environment Agency - Odour Characterisation

Category	Examples
Most Offensive	Processes involving decaying animal or fish remains Processes involving septic effluent or sludge Biological landfill odours
Moderately Offensive (a)	Intensive livestock rearing Fat frying (food processing) Sugar beet processing Well aerated green waste composting
Less Offensive	Brewery Confectionery Coffee roasting Bakery
(a) Most odours from processes fall into this category, ie any odours which do not obviously fall within the 'most offensive' or 'less offensive' categories.	

Odours from the proposed facility are best described as being 'moderately offensive' because they do not obviously fall within the 'most offensive' or 'less offensive' categories.

(1) Environment Agency (March 2011) Horizontal Guidance Note H4 Odour Management.

3.4 SIGNIFICANCE CRITERIA

The Institute of Air Quality Management (IAQM) has published guidance on the assessment of odour for planning which was updated in July 2018 (1). As with air quality, the assessment of significance ultimately relies on professional judgement.

The IAQM guidance suggests three categories for receptor sensitivity and odour effect descriptors based on the sensitivity of the receptor and the magnitude of the impact.

Table 3.2 provides details of the receptor sensitivity and **Table 3.3** the IAQM odour effect descriptors.

Table 3.2 IAQM Receptor Sensitivity

Sensitivity	Description
High	Surrounding land where: • Users can reasonably expect enjoyment of a high level of amenity. • People would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.
Medium	Surrounding land where: • Users would expect to enjoy a reasonable level of amenity but wouldn't reasonably expect to enjoy the same level of amenity as in their home. • People wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Examples may include places of work, commercial/retail premises and playing/recreation fields.
Low	Surrounding land where: • The enjoyment of amenity would not reasonably be expected. • There is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples may include industrial use, farms, footpaths and roads.

(1) Institute of Air Quality Management (IAQM, July 2018) Guidance on the assessment of odour for planning.

Table 3.3 IAQM Odour Effect Descriptors (Moderately Offensive Odours)

Odour Exposure (C_{98}, $OU_e\ m^{-3}$) [(a)]	Receptor Sensitivity		
	Low	Medium	High
>10	Moderate	Substantial	Substantial
5-10	Slight	Moderate	Moderate
3-5	Negligible	Slight	Moderate
1.5-3	Negligible	Negligible	Slight
0.5-1.5	Negligible	Negligible	Negligible
<0.5	Negligible	Negligible	Negligible
(a) 98th percentile of hourly averages.			

The IAQM guidance on odours states: *Where the overall effect is greater than 'slight adverse', the effect is likely to be considered significant. This is a binary judgement: either it is 'significant' or 'not significant'*. Therefore, if the overall effect is not worse than *'slight adverse'* then the impact is *'not significant'*.

4 METHODOLOGY

4.1 INTRODUCTION

This section describes the methodology and assumptions made for this odour assessment. Also described are the emissions data used for both the baseline and proposed development.

The predicted odour impacts from the proposed use of the site are assessed against criteria for a new facility.

4.2 EMISSIONS DATA

An odour management plan will be prepared and submitted to the Environment Agency (EA) detailing the procedures that will be employed to minimise the potential for odours to be released to the atmosphere.

For the proposed facility, the two potential sources of odour are:

- Emissions from the six storage bays and one tipping bay
- Emissions from the process building

The wastes that will be processed at the proposed facility will be of low odour potential. In the absence of actual measured data, from the waste to be processed, reference is made to measured data from an existing waste transfer station that are shown below.

Table 4.1 shows measured odour emission rates from a range of waste types for a waste recycling facility in Lancashire (1).

(1) Odour Sol JV (April 2016) Odour Assessment, Lancashire Waste Recycling Ltd.

Table 4.1 Odour Emission Rates from Range of Waste Types

Table 1. Stockpiles and odour characteristics

Stockpile reference (refer to Figure 3)	Type	Derived Surface Area (m^2)	Measured Odour concentration $ou_E m^{-3}$	Derived Emission rate $ou_E s^{-1} m^{-2}$	Derived Odour emissions $ou_E s^{-1}$
ST1	Recovered over size mixed waste	74	861	8.4	626
ST2	Segregated 40 mm fines	72	1880	18.4	1325
ST3	Recovered over size mixed waste	37	861	8.4	314
ST4	Segregated glass	134	1880	18.4	2473
ST5	Segregated 10 mm fines	134	1020	10	1335
ST6	Segregated 10 mm fines	42	1020	10	417
ST7	Segregated 15 mm fines	42	1020[5]	10[6]	417
ST8	Recovered over size mixed waste	42	861	8.4	352
SRF	Secondary Recovered Fuel	669	645	6.3	4218
F1	Organic Growth Medium (reject)	92	1330	13	1192
F2	Mixed waste feed stock	158	2900	28.4	4476
Metal Skip	Segregated Aluminium	16	861	6.3	104
MS1	Segregated metal	6	645[7]	6.3	38
MS2	Segregated metal	6	645[7]	6.3	38
MS3	Segregated metal	6	645[7]	6.3	38

The waste type that is closest in description to the waste that will be processed at the proposed facility is 'segregated aluminium'. It is also considered that the odour emission rate from the waste to be processed will be less than 'secondary recovered fuel'. Therefore, this assessment uses an odour emission rate of 6.3 $OU_e\ m^{-2}\ s^{-1}$. This rate is applied to all areas where the waste will be stored or processed. It is considered that this provides a robust approach to the determination of the odour emissions from the proposed facility.

Table 4.2 shows details of the sources of odour included in the modelling.

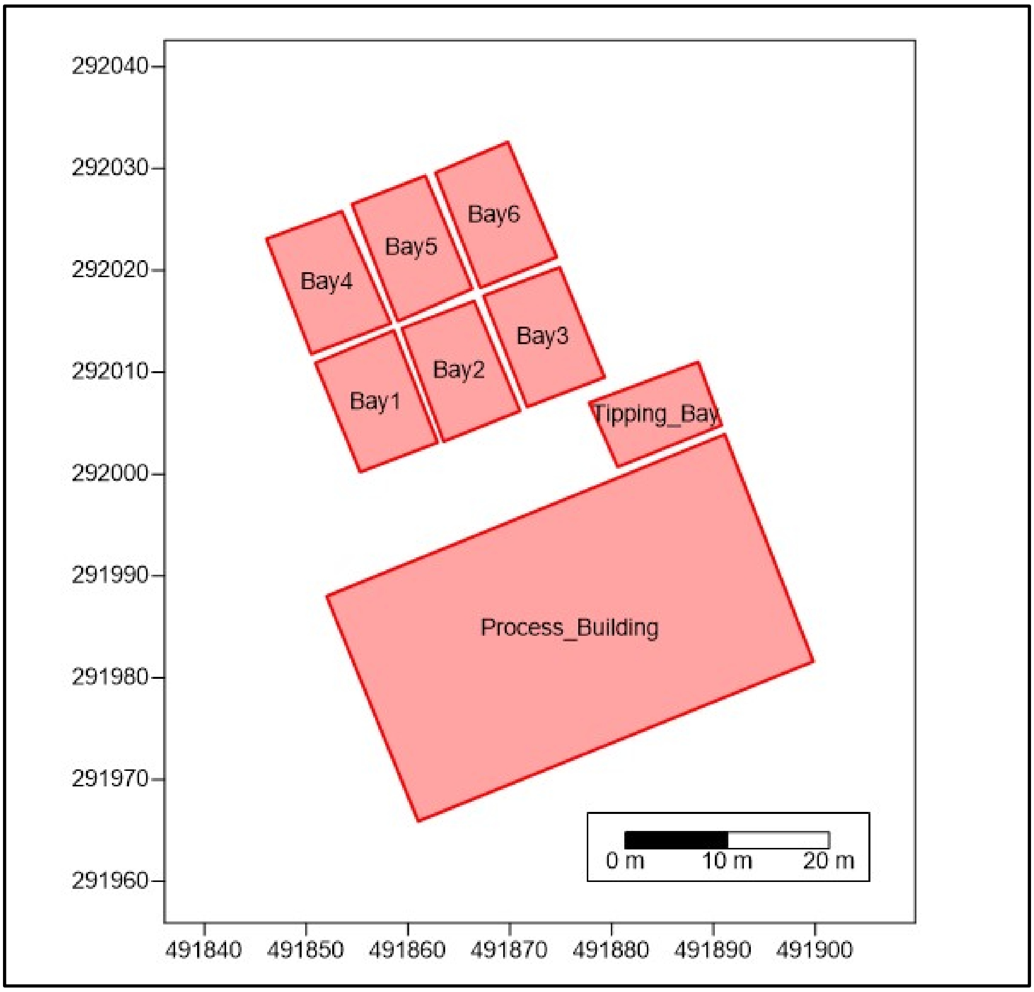
Table 4.2 Emissions and Physical Properties

Source	Odour Emission Rate ($OU_e\ m^{-2}\ s^{-1}$)	OS Grid Reference of each corner (m)
Bay 1: Input Waste Storage	6.3	491855 292000 491863 292003 491859 292014 491851 292011
Bay 2: Input Waste Storage	6.3	491864 292003 491871 292006 491867 292017 491859 292014
Bay 3: Input Waste Storage	6.3	491872 292007 491879 292010 491875 292020 491867 292018
Bay 4: Treated Waste Storage non-Ferrous. Residual	6.3	491851 292012 491858 292015 491854 292026 491846 292023
Bay 5: Treated Waste Storage non-Ferrous. Residual	6.3	491859 292015 491866 292018 491862 292029 491855 292027
Bay 6: Treated Waste Storage non-Ferrous. Residual	6.3	491867 292018 491875 292021 491870 292033 491863 292030
Tipping Bay	6.3	491881 292001 491891 292005 491889 292011 491878 292007
Process Building (Height to eaves 8 m)	0.33 ($OU_e\ m^{-3}\ s^{-1}$) [(a)]	491861 291966 491900 291982 491891 292004 491852 291988

(a) Modelled as a volume source: It is assumed that the surface area of the conveyors, shredder area and bagging areas is 400 m^2 and building volume is 7,680 m^3. It is conservatively assumed that emissions will occur 24 hours per day, 7 days per week, whereas actual emissions will reduce when processing is not being carried out.

Figure 4.1 shows the seven bays modelled as area sources and the process building which is modelled as a volume source.

Figure 4.1 Layout of Odour Sources included in Modelling



4.3 RECEPTORS

Predictions are made for a grid of receptors and at 23 specific receptors. The receptor grid is 2,000 m by 2,000 m with a spacing of 25 m and allows the predicted odour ground level concentrations to be presented as contour plots. Predictions at specific receptors allow for the significance of the odour impacts to be determined.

The specific receptors used in this assessment are split into the categories outlined below:

High

- Users can reasonably expect enjoyment of a high level of amenity.
- People would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.
  Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.

Medium

- Users would expect to enjoy a reasonable level of amenity but wouldn't reasonably expect to enjoy the same level of amenity as in their home.
- People wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.
  Examples may include places of work, commercial/retail premises and playing/recreation fields.

Low

- The enjoyment of amenity would not reasonably be expected.
- There is transient exposure, where people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.
  Examples may include industrial use, farms, footpaths and roads

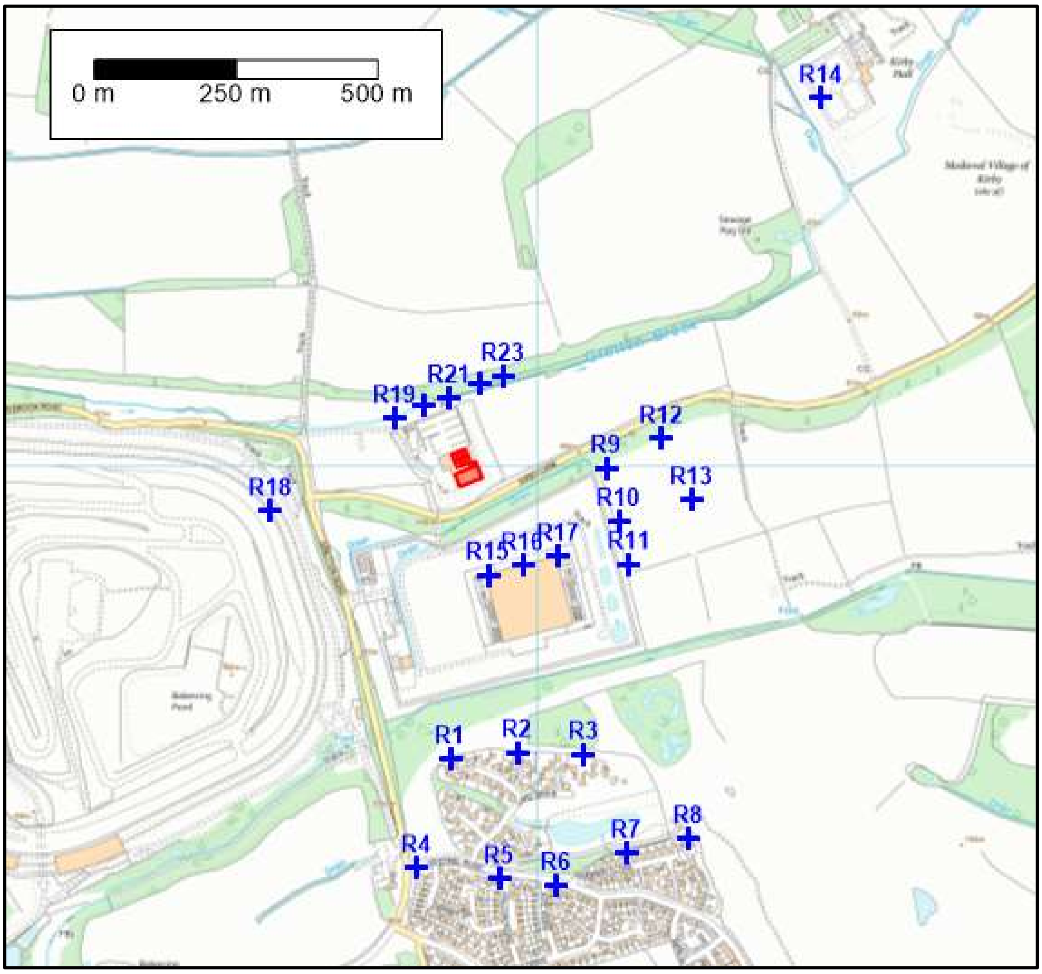
Table 4.3 presents details of the specific receptors included in the modelling which have been selected because of their potential for relevant exposure.

Table 4.3 Receptor Locations

No.	Description	Sensitivity	Distance from Processing Building (km)	OS Grid Reference (m)
R1	Existing Residential	High	0.5	491844 291486
R2	Existing Residential	High	0.5	491962 291497
R3	Existing Residential	High	0.5	492080 291494
R4	Existing Residential	High	0.7	491785 291293
R5	Existing Residential	High	0.7	491930 291274
R6	Existing Residential	High	0.7	492031 291263
R7	Existing Residential	High	0.7	492155 291319
R8	Existing Residential	High	0.7	492264 291345
R9	Future Residential	High	0.2	492119 291999
R10	Future Residential	High	0.3	492141 291905
R11	Future Residential	High	0.3	492160 291829
R12	Future Residential	High	0.3	492217 292051
R13	Future Residential	High	0.4	492270 291943
R14	Kirby Hall	High	0.9	492498 292652
R15	Data Centre	Medium	0.2	491911 291810
R16	Data Centre	Medium	0.2	491972 291827
R17	Data Centre	Medium	0.2	492035 291843
R18	Racetrack	Low	0.4	491527 291923
R19	Footpath	Low	0.2	491746 292087
R20	Footpath	Low	0.1	491798 292108
R21	Footpath	Low	0.1	491843 292123
R22	Footpath	Low	0.2	491897 292148
R23	Footpath	Low	0.2	491937 292161

Figure 4.2 shows the locations of the receptors, also shown is the location of the proposed facility.

Figure 4.2 Location of Receptors and the Proposed Facility (Red)



4.4 FACTORS AFFECTING DISPERSION

There are several factors that will affect how emissions disperse once released to atmosphere. The four factors having the greatest effect on dispersion are:

- Physical characteristics of the emissions
- Climate
- Building downwash
- Nature of the surface

4.4.1 PHYSICAL CHARACTERISTICS OF THE EMISSIONS

The degree of plume rise usually depends on the greater of the thermal buoyancy or momentum effects. In the case of emissions from the proposed facility, there will be very little thermal or momentum-driven plume rise, and therefore, these effects are discounted in the model.

4.4.2 CLIMATE

The most important meteorological parameters governing the atmospheric dispersion of pollutants are wind speed, wind direction and atmospheric stability.

- **Wind direction** determines the broad transport of the plume and the sector of the compass into which the plume is dispersed.

- **Wind speed** can affect plume dispersion by increasing the initial dilution of pollutants and inhibiting plume rise.

- **Atmospheric stability** is a measure of the turbulence of the air, in particular the vertical motions present. For dispersion modelling purposes, one method of classifying stability is by the use of Pasquill Stability categories, A to F. Another is by reference to the surface heat flux present at the ground.

Dispersion models, such as ADMS and AERMOD, do not allocate the degree of atmospheric turbulence into six discrete categories. These models use a parameter known as the Monin-Obukhov length which, together with the wind speed, describes the stability of the atmosphere.

4.4.3 BUILDING DOWNWASH

The presence of buildings can significantly affect the dispersion of atmospheric emissions. Wind blowing around a building distorts the flow and creates zones of turbulence that are greater than if the building were absent. Increased turbulence causes greater plume mixing; the rise and trajectory of the plume may be depressed generally by the flow distortion.

When modelling emissions from area and volume sources such as for the proposed facility, it is not possible to include the effects of building downwash in the modelling. The effects that building downwash will have is to increase turbulence which will increase dispersion and reduce the resulting odour concentrations. The presence of buildings could be accounted for by an increase of the roughness length (Ro), but for this assessment, a conservative approach was adopted, and the roughness length has not increased to account for building downwash effects. The sensitivity of the predicted odour impacts to the selected roughness length is presented in **Section 6**.

4.4.4 NATURE OF THE SURFACE

Terrain

The effects of elevated terrain can affect dispersion, especially for elevated sources. An investigation into the effects of terrain for emissions from the proposed facility has shown that including its effects in the model reduces the predicted impacts. Given that it is difficult to explain this outcome, a conservative approach has been adopted, and the effects of terrain have not been included in the modelling. The sensitivity of the predicted odour concentrations to the effects of the terrain is presented in **Section 6** of this report.

Roughness

The nature of the surface of the terrain can have a significant influence on dispersion by affecting the velocity profile with height and the amount of atmospheric turbulence. To account for the surrounding nature of the surface a roughness length of 0.3 m has been assumed for the dispersion modelling. It is assumed that this roughness length at the observing station (Wittering) is 0.2 m.

The sensitivity of the predicted odour impacts to the selected roughness length is presented in **Section 6.**

4.5 SELECTION OF SUITABLE DISPERSION MODEL

The dispersion models which are widely used to predict ground level pollutant concentrations are based on the concept of the time averaged lateral and vertical concentration of pollutants in a plume being characterised by a Gaussian (1) distribution and the atmosphere is characterised by a number of discrete stability classes. So-called 'new generation' dispersion models have been developed which replace the description of the atmospheric boundary layer as being composed of discrete stability classes with an infinitely variable measure of the surface heat flux, which in turn influences the turbulent structure of the atmosphere and hence the dispersion of a plume.

There are two commercially available dispersion models that are able to predict ground level concentrations arising from emissions to atmosphere from elevated point sources (ie stacks) and are described by the Environment Agency (EA) as being 'new generation'.

- AERMOD: The US **A**merican Meteorological Society and **E**nvironmental Protection Agency **R**egulatory Model Improvement Committee developed the dispersion **MOD**del called AERMOD, which incorporates the latest understanding of the atmospheric boundary layer.

- Atmospheric Dispersion Modelling System (ADMS): This dispersion model was developed by the UK consultancy CERC. The model allows for the skewed nature of turbulence within the atmospheric boundary layer.

ADMS 5.2 was selected as the model for use in this assessment because it has been extensively used for assessment work of this nature.

(1) A Gaussian distribution has the appearance of a bell-shaped curve. The maximum concentration occurs on the centre line.

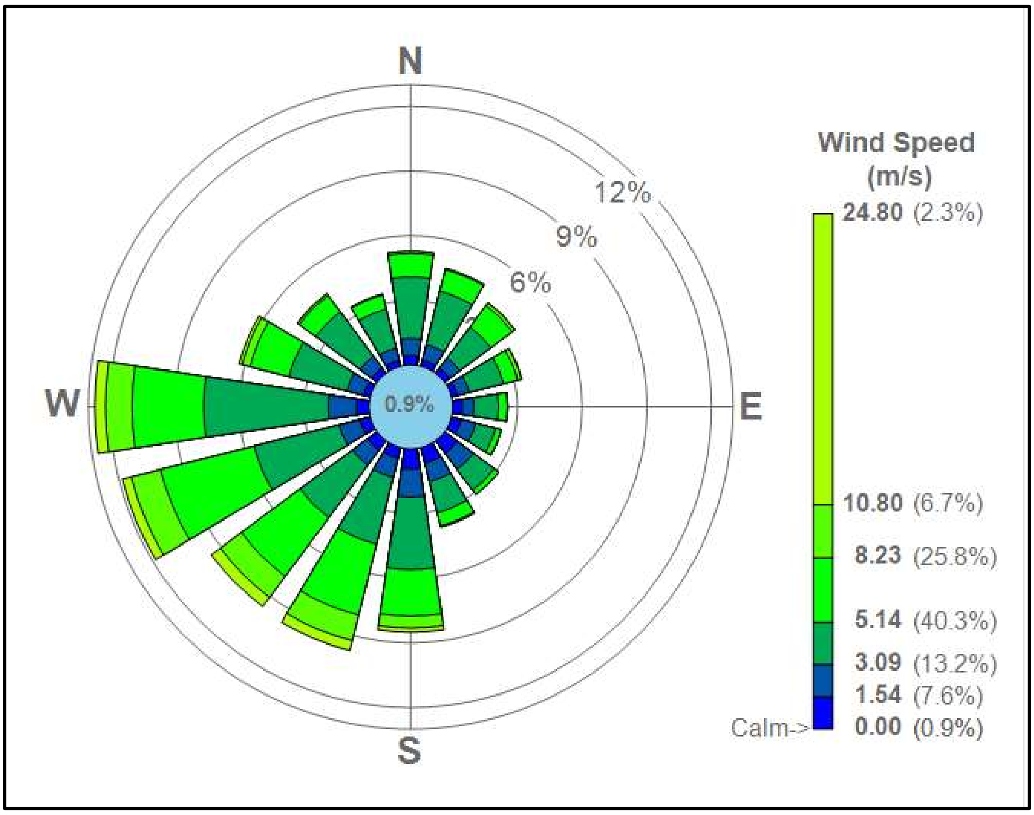
4.6 METEOROLOGICAL DATA

An important input to the dispersion model is the meteorological data. These data are important in determining the location of the maximum concentrations and their magnitude.

The closest observing station to the proposed facility where data is available is Wittering which is at a distance of 16 km from the proposed facility and has complete data. Five years of hourly meteorological data for 2015-2019 have been used in this assessment.

Figure 4.3 shows the windrose from Wittering for 2015-2019, this shows that the prevailing wind is from the south, south-west, and west which will transport emissions to the north-east.

Figure 4.3 Windrose from Wittering (2015-2019)



The sensitivity of the predicted odour impacts to the selected meteorological data is presented in **Section 6.**

5 PREDICTIONS AND ASSESSMENT OF ODOUR IMPACTS

5.1 INTRODUCTION

This section presents the predicted odour concentrations and assesses the potential for occurrences of odour to cause annoyance.

5.2 PREDICTED ODOUR IMPACT AND ASSESSMENT OF IMPACT

Table 5.1 shows the ADMS 5.2 predicted 98th percentile of hourly average odour concentrations for the proposed use for each of five years of meteorological data. Also shown are the IAQM impact descriptors for a '*moderately offensive'* odour for the year of meteorological data that gives rise to the highest impacts.

Table 5.1 ADMS 5.2 Predicted 98th Percentile of Hourly Average Odour Concentrations at Specific Receptors, 2015 to 2019 Meteorological Data ($OU_e\ m^{-3}$)

No.	Description	Sensitivity	2015	2016	2017	2018	2019	Maximum	Descriptor
R1	Existing Residential	High	0.17	0.19	0.08	0.18	0.15	**0.19**	Negligible
R2	Existing Residential	High	0.14	0.19	0.10	0.18	0.12	**0.19**	Negligible
R3	Existing Residential	High	0.13	0.17	0.12	0.14	0.13	**0.17**	Negligible
R4	Existing Residential	High	0.10	0.11	0.04	0.11	0.09	**0.11**	Negligible
R5	Existing Residential	High	0.08	0.10	0.04	0.10	0.07	**0.10**	Negligible
R6	Existing Residential	High	0.07	0.09	0.05	0.09	0.06	**0.09**	Negligible
R7	Existing Residential	High	0.08	0.10	0.07	0.09	0.07	**0.10**	Negligible
R8	Existing Residential	High	0.08	0.09	0.08	0.08	0.08	**0.09**	Negligible
R9	Future Residential	High	0.64	1.15	0.80	0.73	0.74	**1.15**	Negligible
R10	Future Residential	High	0.51	0.69	0.58	0.54	0.58	**0.69**	Negligible
R11	Future Residential	High	0.35	0.46	0.41	0.36	0.39	**0.46**	Negligible
R12	Future Residential	High	0.36	0.59	0.48	0.42	0.43	**0.59**	Negligible
R13	Future Residential	High	0.28	0.46	0.34	0.34	0.35	**0.46**	Negligible
R14	Kirby Hall	High	0.08	0.10	0.11	0.09	0.11	**0.11**	Negligible
R15	Data Centre	Medium	0.82	0.98	0.59	0.92	0.74	**0.98**	Negligible
R16	Data Centre	Medium	0.78	0.91	0.82	0.85	0.82	**0.91**	Negligible
R17	Data Centre	Medium	0.64	0.79	0.73	0.76	0.71	**0.79**	Negligible
R18	Racetrack	Low	0.16	0.26	0.14	0.24	0.24	**0.26**	Negligible
R19	Footpath	Low	1.70	2.24	2.38	2.33	2.43	**2.43**	Negligible
R20	Footpath	Low	2.64	4.25	**5.35**	4.53	4.25	**5.35**	Slight
R21	Footpath	Low	3.26	4.38	4.42	3.76	4.20	**4.42**	Negligible
R22	Footpath	Low	2.26	3.05	2.50	2.28	3.26	**3.26**	Negligible
R23	Footpath	Low	1.63	2.03	1.88	1.75	2.67	**2.67**	Negligible

Table 5.1 shows that the Environment Agency's (EA) benchmark level of 3 $OU_e\ m^{-3}$ for *'moderately offensive'* odours is only exceeded at the footpath adjacent to the site where it is unlikely to cause annoyance due to the short time duration (less than an hour) that people might be using the path at the location where impacts are at their greatest. It is more appropriate to compare the EA's

benchmark to residential locations where the highest predicted 98th percentile of hourly averages is 1.15 OU_e m^{-3} at receptor R9 which is less than half the benchmark of 3 OU_e m^{-3} and therefore unlikely to cause annoyance.

The IAQM impacts descriptors for '*moderately offensive*' odours suggests a '*slight*' impact at one location on the footpath, albeit only for one out of the five years of meteorological data used. The IAQM impacts descriptions at all the remaining receptors are negligible.

Figure 5.1 to Figure 5.5 shows the predicted odour contours for the proposed facility for each of the five years.

The figures show that the area of exceedence of the EA's benchmark is limited to the site of the proposed facility and its immediate surroundings.

Figure 5.1 ADMS 5.2 Predicted 98th Percentile of Hourly Average Odour Concentration, 2015 Meteorological Data (OU_e m^{-3})

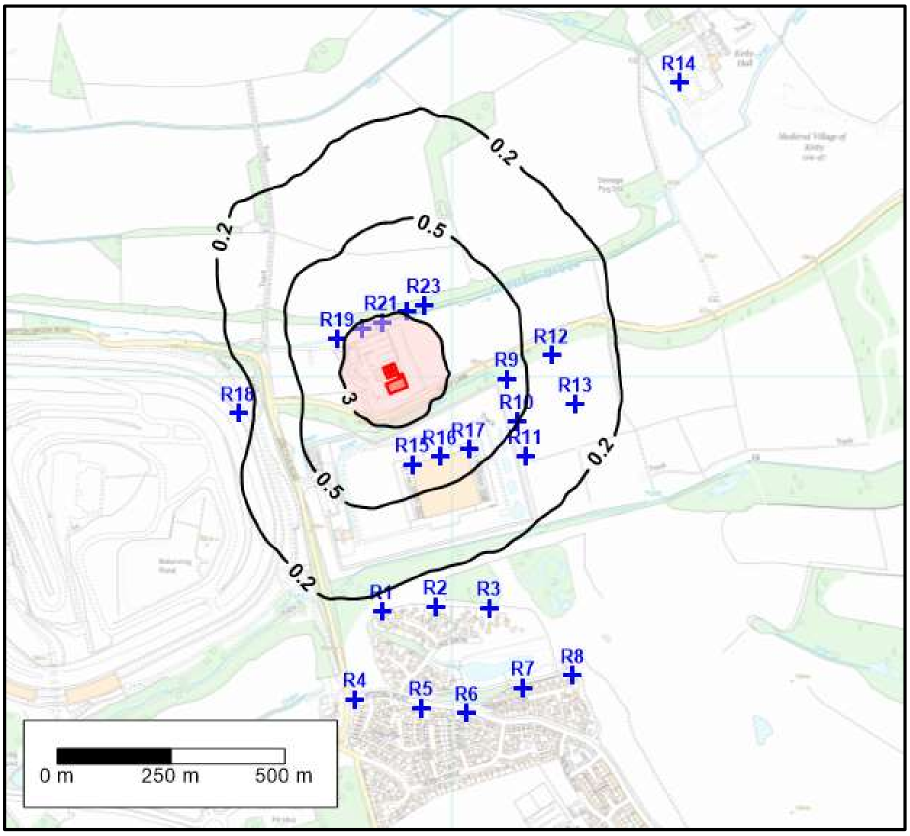


Figure 5.2 ADMS 5.2 Predicted 98th Percentile of Hourly Average Odour Concentration, 2016 Meteorological Data (OU$_e$ m^{-3})

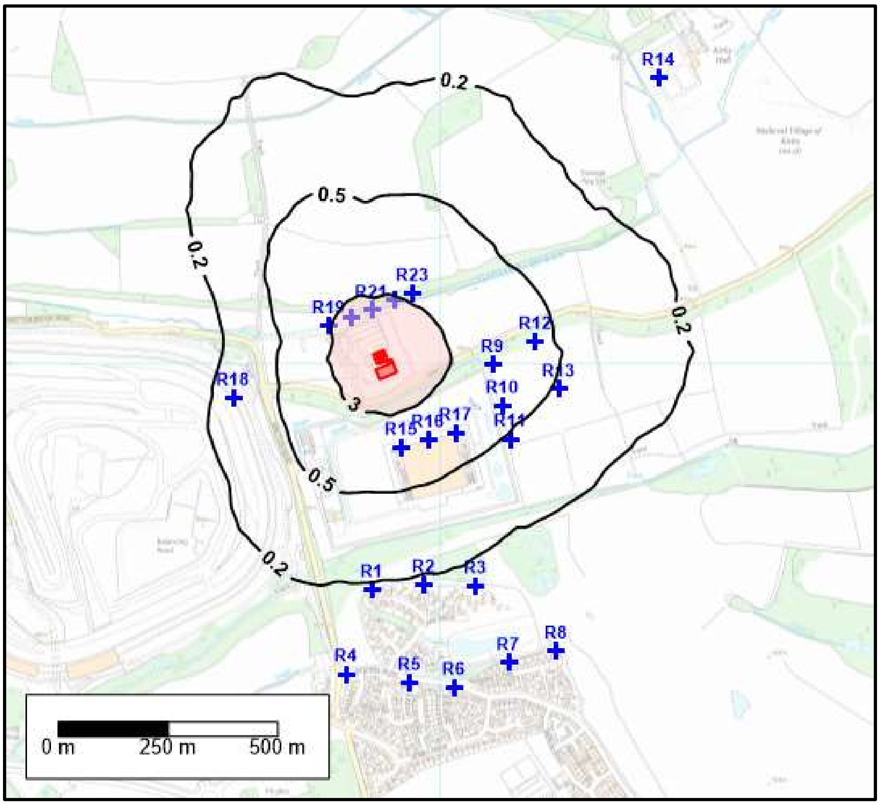


Figure 5.3 ADMS 5.2 Predicted 98th Percentile of Hourly Average Odour Concentration, 2017 Meteorological Data (OU$_e$ m^{-3})

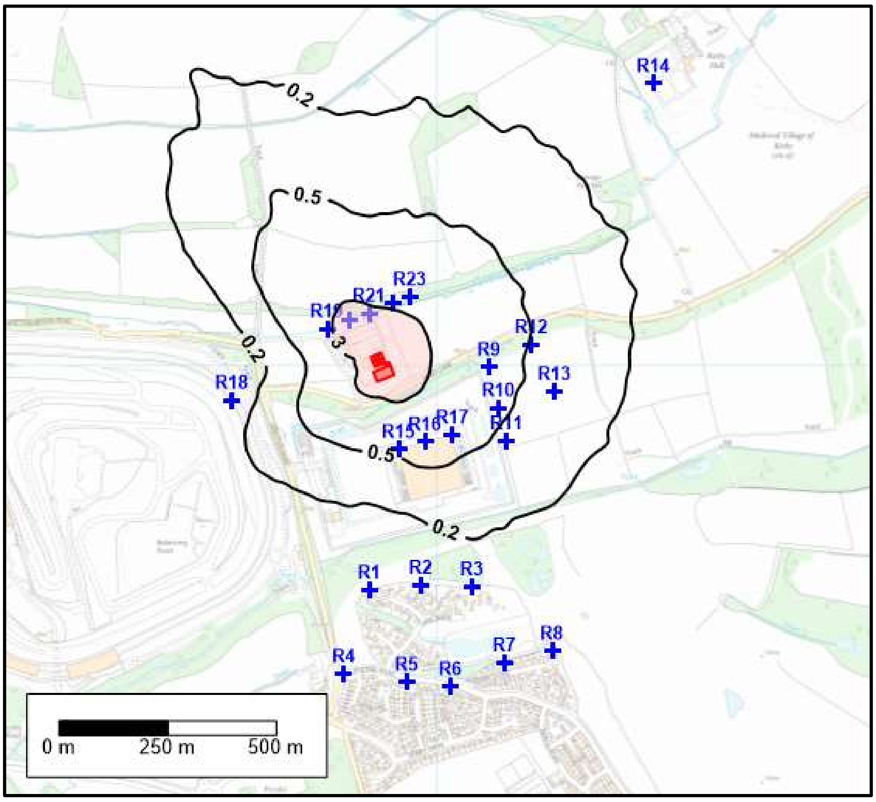


Figure 5.4 ADMS 5.2 Predicted 98th Percentile of Hourly Average Odour Concentration, 2018 Meteorological Data ($OU_e\ m^{-3}$)

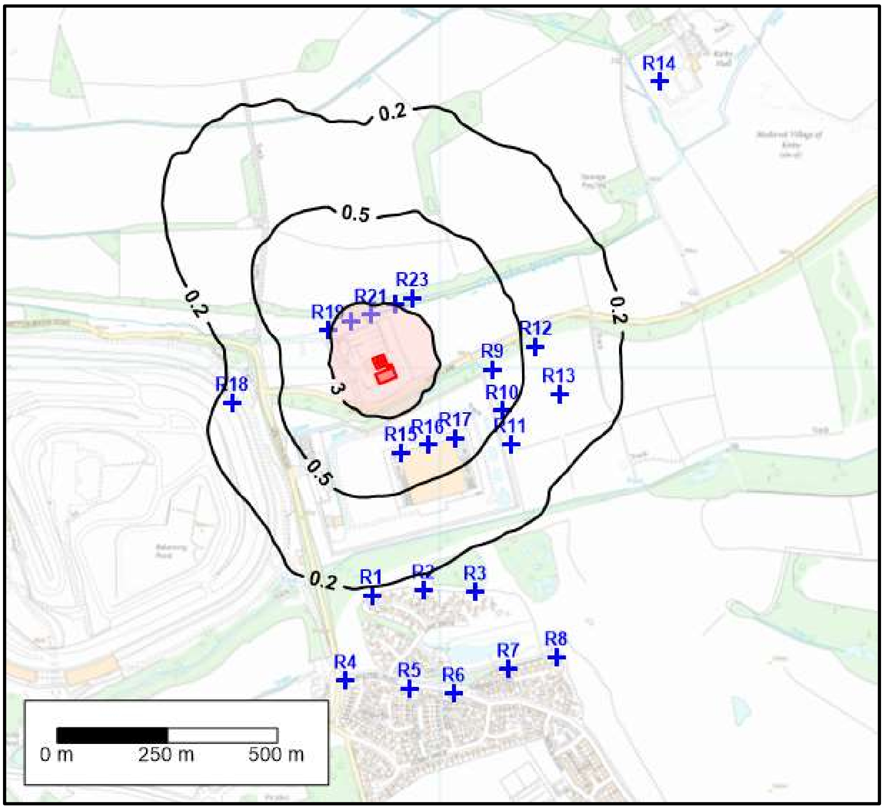
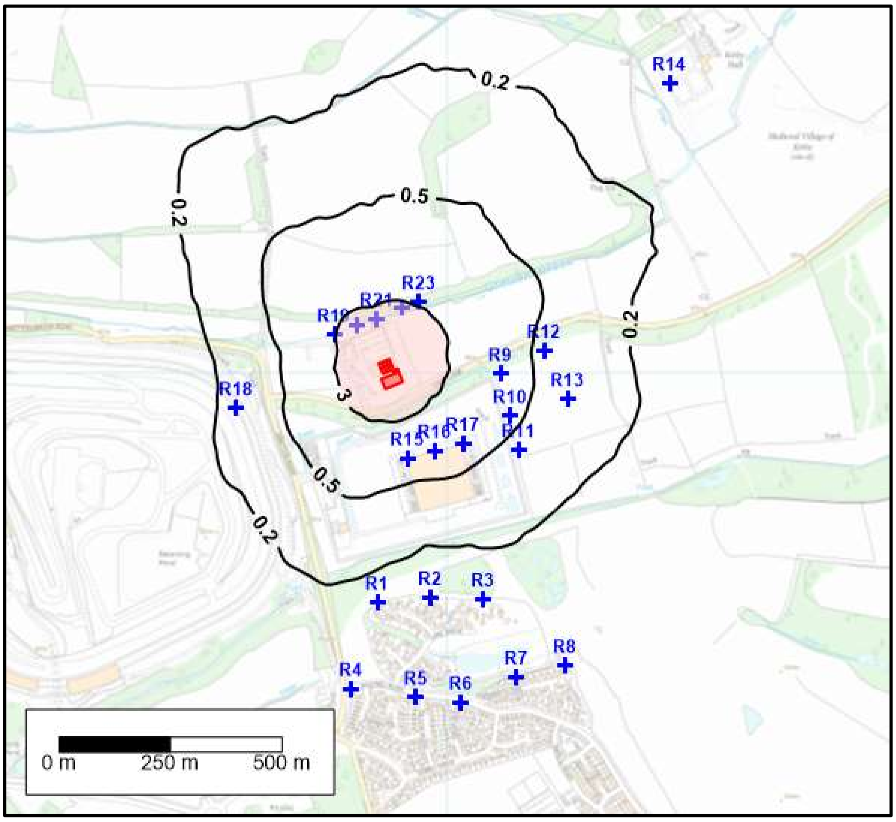


Figure 5.5 ADMS 5.2 Predicted 98th Percentile of Hourly Average Odour Concentration, 2019 Meteorological Data ($OU_e\ m^{-3}$)



6 SENSITIVITY ANALYSIS

6.1 INTRODUCTION

This section considers the sensitivity of model-predicted concentrations of odour to the following:

- Meteorological data
- Roughness length
- Terrain
- Odour emission rate

Predictions are presented for the proposed use of the site for the current or future residential receptors (R1 to R13) that has the highest predicted impact.

6.2 METEOROLOGICAL DATA

The assessment presented in this report is based on predictions made using five years (2015-2019) of meteorological data from Wittering.

To illustrate the year to year variation in meteorological data, **Table 6.1** shows the maximum predicted odour concentration at any of the 13 current or future residential receptors for each of the five years of meteorological data from Wittering as well as 2019 data from Bedford which is the next closest after Wittering.

Table 6.1 Meteorological Data: ADMS 5.2 Predicted 98th Percentile of Hour Average Odour Concentrations, Maximum at Residential Receptors ($OU_e\ m^{-3}$)

Source	Year	98^{th} Percentile of Hourly Averages
Wittering	2015	0.64
Wittering	2016	1.15
Wittering	2017	0.71
Wittering	2018	0.73
Wittering	2019	0.74
Bedford	2019	1.00
Benchmark Assessment Level		**3**

Table 6.1 shows that there is some year to year variation in predicted concentrations, although the variation is not considered to be significant. The predicted concentration from Bedford is in the range of predicted concentration for Wittering.

6.3 ROUGHNESS LENGTH

The roughness length of 0.3 m used in this assessment was selected using professional judgement. Roughness length cannot be directly measured. In practice, there is no one unique roughness that fits a given wind speed profile.

Roughness length will also vary depending on wind direction and other factors such as the season of the year.

It is therefore of interest to see how sensitive the model predictions are to roughness length.

Table 6.2 shows the maximum predicted 98th percentile odour concentrations ground level concentration at any of the 13 current and future residential receptors for roughness lengths in the range of 0.1 m to 0.5 m using 2019 meteorological data from Wittering.

Table 6.2 Roughness Length: ADMS 5.2 Predicted 98th Percentile of Hour Average Odour Concentrations, Maximum at Residential Receptors (OU_e m^{-3})

Roughness Length (m)	98th Percentile of Hourly Averages
0.1	0.91
0.3	0.74
0.5	0.70
Benchmark Assessment Level	**3**

Table 6.2 shows that in this modelling situation, increasing the roughness length reduces the maximum 98th percentile. It is considered that a roughness length of 0.3 m is appropriate for the location of the facility.

6.4 TERRAIN

The modelling presented in this assessment conservatively assumed flat terrain. **Table 6.3** shows the predicted maximum ground level concentration of odours at the current and future residential receptors both with and without the effects of terrain using 2019 meteorological data.

Table 6.3 Terrain: ADMS 5.2 Predicted 98th Percentile of Hour Average Odour Concentrations, Maximum at Residential Receptors (OU_e m^{-3})

Terrain Effects	98th Percentile of Hourly Averages
No	0.74
Yes	0.65
Benchmark Assessment Level	**3**

It is not clear why the model predicts lower concentrations when the effects of terrain are included. A precautionary approach has been adopted, and terrain effects have not been included in the modelling.

6.5 ODOUR EMISSION CONCENTRATION

The assessment conservatively assumed an odour emission rate of 6.3 OU_e m^{-2} s^{-1}. Given that this is not a measured concentration, there is some uncertainty in the actual emission rate.

Table 6.4 shows the ADMS 5.2 maximum predicted 98th percentile of hourly average odour concentration at the existing and future residential receptors for a range of odour emission concentrations. Predictions are made for 2019 meteorological data for emission rates in the range of 3 $OU_e\ m^{-2}\ s^{-1}$ to 20 $OU_e\ m^{-2}\ s^{-1}$.

Table 6.4 Odour Emission Concentration: ADMS 5.2 Predicted 98th Percentile of Hour Average Odour Concentrations, Maximum at Residential Receptors ($OU_e\ m^{-3}$)

Odour Emission Rate ($OU_e\ m^{-2}\ s^{-1}$)	98^{th} Percentile of Hourly Averages
20	2.36
6.3	0.74
3	0.35
Benchmark Assessment Level	**3**

Table 6.4 shows that if the odour emission concentration were 20 $OU_e\ m^{-2}\ s^{-1}$ the assessment level of 3.0 $OU_e\ m^{-3}$ is not exceeded at the current and future residential properties.

7 SUMMARY AND CONCLUSIONS

DMP Metals Ltd has commissioned Atmospheric Dispersion Modelling Ltd (ADM Ltd) to undertake an odour assessment of emissions to atmosphere from the proposed non-ferrous metal recycling facility. The proposed facility is located on land to the north of Kirby Lane, Gretton Brook Road, Corby.

The application site is currently used as an In-Vessel Composting (IVC) facility (known as Kirby Lodge), processing and recycling green and food waste to produce a compost material for re-use. The IVC facility, however, is in the process of closing following the clean-up of the site. During its operation as an IVC facility, it was the subject of numerous complaints regarding odour.

Although the proposed facility will use the existing buildings, the magnitude and nature of odours generated from the facility will be entirely different to those that occurred from the sites' previous use as an In-Vessel Composting (IVC) facility. The odour assessment presented in this report should, therefore, be considered on its own merits.

The ADMS 5.2 dispersion model has been used to make predictions of odour concentrations occurring due to emissions from the proposed operation.

The following are the principal conclusions that can be drawn from this assessment, which has been undertaken using estimated emissions data and the assumptions specified:

- The model predicted odour concentrations for the proposed facility show that the impact is '*slight*' at worst and not likely to give rise to annoyance due to the emissions of odours.

- The odour impact from the proposed facility is predicted to be insignificant.