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**Environmental Noise Impact Assessment
Relating to Proposed
Materials Recycling Facility (MRF)**

At

**Pilsworth South Landfill Site
Pilsworth Road
Bury**

for

Valencia Waste Management Ltd

Consultant: D.R. Kettlewell MSc MIOA MAE I.Eng

Ref No.: R23.0706/DRK

Noise & Vibration Consultants Ltd

**Member of Institute of Acoustics
Member of Association of Noise Consultants
Member of Academy of Experts**

**Report prepared by:
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A handwritten signature in black ink, appearing to read 'DR Kettlewell', is written over a light blue grid background.

Date: 21st July 2023

Summary

1. The assessment is being carried out as a result of a proposed Planning Application for the construction and operation of a Materials Recycling Facility ("MRF"). In order to provide supporting information to the application document submission, Valencia Waste Management Ltd has requested a noise impact assessment for the operation of the Proposed Development facility to ensure noise levels meet appropriate guidance and standards for noise.
2. The site is located on the Pilsworth South Landfill site off Pilsworth Road in Bury.
3. Background noise measurements have been undertaken in the vicinity of the nearest sensitive receptors (NSR) during a typical weekday daytime period.
4. The study benefits from noise measurements recorded at other similar MRF operations in the UK, which has enabled us to inform the site noise model and determine the noise contribution from the proposed site at the NSR for comparison with the representative background sound measurements in accordance with BS4142: 2014+A1:2019.
5. The most relevant noise criteria for this type of facility are BS4142: 2014+A1:2019 with the aim to ensure that the 'rating' site noise level would not exceed the representative background sound level or lower to result in a **low** impact.

Existing Noise Climate:

6. The results of the investigations into the existing noise climate at NSR have established the following:
7. Representative background sound levels based on the methodology and guidance found in BS4142: 2014+A1:2019 have been established. The representative background sound was shown to range between 47dB to 58dB LA90 (in the vicinity of NSRs).

Conclusions

8. The results of these measurements and detailed analysis have shown the following:
 - a) Predicted noise levels from the operation of the MRF, HGV movement and mobile plant operation, show that the site rating noise level would be well below representative background sound levels and would therefore result in a **low impact** according to BS4142: 2014+A1:2019.
 - b) The noise level from site would also be **well below appropriate design levels** within living rooms according to BS8233: 2014 for internal levels within sensitive rooms of dwellings assuming an open or closed window.

- c) The results of noise calculations (in accordance with BS5228-1: 2009+A1:2014) of the highest likely noise levels generated during the construction phase show that, during peak noise generated periods, noise levels are unlikely to exceed typical residual noise levels and would be well below threshold guidance levels at residential NSR and best practice would be applied to control and minimise noise.
9. The assessment concludes that the proposed operation of the Site would generate noise levels well within relevant noise standards and guidelines at nearest sensitive receptors and therefore noise would be **not significant**.

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1.0 INTRODUCTION

- 1.1 The assessment is being carried out as a result of a proposed Planning Application for the construction and operation of a Materials Recycling Facility ("MRF"). In order to provide supporting information to the application document submission, Valencia Waste Management Ltd has commissioned Noise & Vibration Consultants Ltd ("NVC") to provide a noise impact assessment for the operation of the Proposed Development to ensure noise levels meet appropriate guidance and standards for noise.
- 1.2 The development includes for the construction of a portal frame building to contain the MRF operations, which includes a pre-shredder, conveyors, screens, picking station, drum separator, bulking bays, dust extraction and mobile plant.
- 1.3 Noise levels have been considered and assessed during the construction and operational phase of the proposed development. Relevant and appropriate noise guidance and standards have been used to determine the noise impact and where appropriate amelioration measures provided to mitigate noise sources to acceptable and reasonable levels.
- 1.4 Background noise measurements have been undertaken adjacent to the nearest sensitive receptors (NSR) during a typical weekday daytime period
- 1.5 The study benefits from noise measurements recorded at other similar MRF operations in the UK, which has enabled us to inform the site noise model and determine the noise contribution from the proposed site at the NSR for comparison with the representative background sound measurements in accordance with BS4142: 2014+A1:2019.

Sources of Information

- 1.6 Information used in this assessment has been obtained from the following sources:
 - Ordnance Survey maps of the local area;
 - Information relating to the general layout of the proposed site was provided by Egniol Consulting Ltd (drg.no. ECL.9595.D01.001,002 & 004);
 - BS5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites';
 - Noise Policy Statement for England (NPSE) – March 2010;
 - Department for Communities and Local Government: National Planning Policy Framework: July 2021;
 - Planning Practice Guidance: June 2021;
 - British Standards BS4142: 2014+A1:2019, BS7445: 2003 & BS8233: 2014;
 - Department of Transport 'Calculation of Road Traffic Noise': 1988;
 - Design Manual for Roads & Bridges (DMRB) LA 111 'Noise and Vibration' (version 2) May 2020; and
 - Bury Metropolitan Borough Council Planning consent conditions (ref. 53453) dated 9th May 2012.

Assessment Methodology

- 1.7 The aim of the survey and assessment was to provide information and advice on the following:
- identify plant equipment and its location;
 - identify the nearest noise sensitive receptors (NSR) or sites;
 - determine likely source noise levels;
 - provide information on existing background sound levels and specific site noise levels at NSR;
 - provide predictions on the construction of the development;
 - provide predictions of resultant noise levels from the cumulative operation of the MRF at the NSR; and
 - advice on any appropriate amelioration measures to reduce noise for the proposed development by applying Best Available Techniques.
- 1.8 Where new noise sources have been identified as being significant or has the potential of causing a significant increase in existing noise levels, we would provide (where practicable) recommendations for noise amelioration using Best Available Techniques (BAT).
- 1.9 Appendix 1 provides details of technical terms within the chapter, for ease of reference. There is also a chart showing typical everyday noise levels to assist in understanding the subjective level of noise in terms of decibels.
- 1.10 The potential noise generated by the above plant is considered in the context of the existing background sound at the site, which is generally influenced by distant road traffic movements along the M66 Motorway to the west and M62 Motorway to the south.

2.0 SITE DESCRIPTION

2.1 Location

- 2.1.1 The site comprises active landfilling and is located to the southeast of Bury, east of Pilsworth and lies within the administrative boundary of Bury Metropolitan Borough Council.
- 2.1.2 Pilsworth South is an operational landfill site, which was granted planning permission in May 2012 (via planning ref. 53453) for the extension to landfill operations and provision of an enhanced restoration and ecological scheme.
- 2.1.3 The Site is located east of Junction 3 of the M66 Motorway with a large retail park lying west of the landfill site on the western side of the M66 Motorway and a large industrial/distribution park to the east of the Site.
- 2.1.4 The proposed MRF Facility would be located on land just south of the site entrance off Pilsworth Road. The facility would be just north of the existing site weighbridge and office areas.

2.2 Processing Activities

Proposed Operations

- 2.2.1 The proposal is for the erection of a building which would measure 72m by 49m with an eaves height of approximately 9m and a ridge height of circa 12.4m. The building would be steel portal frame structure on breeze block with internal breeze block push walls.
- 2.2.2 The purpose of the facility is to intercept and extract recyclable materials from the commercial and industrial waste that is heading for landfill, which would then be removed from site for recycling/re-use/recovery by third parties elsewhere. Any domestic/putrescible waste would by-pass the facility to landfill as per current arrangements and be directly landfilled. The proposed development could attract third-party construction/demolition/excavation waste and much of this material would be segregated into recyclables and soils/rubble that can be used as engineering materials and daily cover on the landfill.

2.3 Site Access

- 2.3.1 Access to the Pilsworth South landfill site is from Pilsworth Road located at the northwest corner of the Site. Pilsworth Road has direct access to the M66 Motorway via junction 3. This access point currently serves the landfill traffic for the site and would be the main point of access for the MRF. Access to the wider transport network is taken from the M62 Motorway junction 18, which is located further south.

2.4 Site Operation Noise Sources

- 2.4.1 The MRF associated noise sources would include the following:

- Delivery, tipping, bulking and storage within the bulking bays within the MRF building;
- Delivery, offloading and storage within the MRF building;
- Loading of waste into hopper and MRF plant operations for processing of waste;
- Loading of sorted waste streams and baled waste into bulker vehicles; and
- Noise from the movement of HGVs on site and mobile plant movement within the MRF building.

2.5 Operating Hours

- 2.5.1 The site would operate in accordance with the permitted hours for the landfill site i.e.

Monday to Friday: 0700 to 1800 hours
Saturday: 0700 to 1300 hours

2.6 Nearest Sensitive Receptors (NSR)

- 2.6.1 The nearest residential properties to the landfill site include the property to the northeast off Pilsworth Road (Jackson Fold Barn) and Castle Road to the south of the landfill.
- 2.6.2 The NSR are located circa 280m to 600m from the MRF building. Further NSR are located at greater distance to the east and northeast off Moss Hall Road.
- 2.6.3 Figures 1 and 2 attached, shows the layout of the site and the site position relative to the NSR.

3.0 NOISE CRITERIA

3.1 Introduction

- 3.1.1 Noise has been defined as sound that is unwanted by the recipient. The effects of noise on the neighbourhood are varied and complicated, including such things as interference with speech communication, disturbance of work, leisure or sleep. A further complicating factor is that in any one neighbourhood some individuals will be more sensitive to noise than others.

General Planning Guidance

- 3.1.2 Noise has been defined as sound that is unwanted by the recipient. The effects of noise on the neighbourhood are varied and complicated, including such things as interference with speech communication, disturbance of work, leisure or sleep. A further complicating factor is that in any one neighbourhood some individuals will be more sensitive to noise than others.

National Planning Policy Framework – July 2021 (NPPF)

- 3.1.3 Chapter 15 of the National Planning Policy Framework (NPPF) relates to 'Conserving and enhancing the natural environment'.
- 3.1.4 Paragraph 174 e) refers directly to noise and states that: *"e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;"*
- 3.1.5 Paragraph 185 also states: *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
 - b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
 - c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."*
- 3.1.6 The Noise Policy Statement for England (NPSE) was published in March 2010. It specifies the following long-term vision in policy aims: *"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life.”*

3.1.7 The NPSE introduced three concepts to the assessment of noise, which includes:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observable Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

3.1.8 The above categories are however, undefined in terms of noise levels and for the SOAEL the NPSE indicates that the noise level will vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research is therefore required to establish what may represent an SOAEL. It is acknowledged in the NPSE that not stating specific SOAEL levels provides policy flexibility until there is further evidence and guidance.

3.1.9 The NPSE indicates how the LOAEL and SOAEL relate to the three aims listed above. The first aim of NPSE requires that:

“significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development.”

3.1.10 The second aim of the NPSE (mitigating and minimising adverse impacts on health and quality of life) refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate adverse effects on health and quality of life whilst also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.

3.1.11 The third aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development.

Planning Practice Guidance – June 2021

3.1.12 In October 2014, the Ministry of Housing, Communities & Local Government updated the Planning Practice Guidance (“PPG”) on noise associated with Minerals, which provides guidance on the planning process. The main section of PPG was also updated in July 2019 and consultation and pre-decision matters updated in June 2021.

3.1.13 The PPG refers to the NPSE documents and under the heading ‘How can noise impacts be determined?’ it states:

“Plan-making and decision taking need to take account of the acoustic environment and in doing so consider:

- whether or not a significant adverse effect is occurring or likely to occur;*
- whether or not an adverse effect is occurring or likely to occur; and*
- whether or not a good standard of amenity can be achieved.”*

3.1.14 At paragraph 004 the PPG includes a table summarising the noise exposure hierarchy, based on the likely response. Under the heading of ‘example of outcome’ the ‘*present and not intrusive*’ assessment of noise is defined as ‘*noise can be heard, but does not cause any change in behaviour, attitude or physiological response. Can slight affect the acoustic character of the area but not such that there is a change in the quality of life*’. The increasing effect level under these conditions is deemed to be ‘*no observed adverse effect*’ and ‘*no specific measures are required*’.

3.1.15 The PPG explains this by stating:

“At the lowest extreme, when noise is not perceived to be present, there is by definition no effect. As the noise exposure increases, it will cross the ‘no observed effect’ level. However, the noise has no adverse effect so long as the exposure does not cause any change in behaviour, attitude or other physiological responses of those affected by it. The noise may slightly affect the acoustic character of an area but not to the extent there is a change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.

As the exposure increases further, it crosses the ‘lowest observed adverse effect’ level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).

Increasing noise exposure will at some point cause the ‘significant observed adverse effect’ level boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is predicted to be above this level the planning process should be used to avoid this effect occurring, for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained adverse changes in behaviour and / or health without an ability to mitigate the effect of the noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be avoided.”

3.1.16 The PPG includes a table summarising the noise exposure hierarchy, based on the likely average response. Table 3.1 below provides the perception, example of outcome, effect and action required relative to noise.

Table 3.1: Noise Exposure Hierarchy

Response	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect (NOEL)	No Specific Measures Required
Present and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect (NOAEL)	No Specific Measures Required
Lowest Observed Adverse Effect Level (LOAEL)			
Present and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Present and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Observed Adverse Effect	Prevent

Guidance Relevant to Quarries and Landfilling of a Quarry

3.1.17 Within PPG there is a section on 'Guidance on the planning for mineral extraction in plan making and the application process' and under Paragraphs 019 to 021 (Reference ID: 27-019-20140306, 27-020-20140306 and 27-021-20140306) the guidance under 'Noise emissions' states:

"Noise emissions

How should minerals operators seek to control noise emissions?

Those making mineral development proposals, including those for related similar processes such as aggregates recycling and disposal of construction waste, should carry out a noise impact assessment, which should identify all sources of noise and, for each source, take account of the noise emission, its characteristics, the proposed operating locations, procedures, schedules and duration of work for the life of the operation, and its likely impact on the surrounding neighbourhood.

Proposals for the control or mitigation of noise emissions should:

- *consider the main characteristics of the production process and its environs, including the location of noise-sensitive properties and sensitive environmental sites;*
- *assess the existing acoustic environment around the site of the proposed operations, including background noise levels at nearby noise-sensitive properties;*
- *estimate the likely future noise from the development and its impact on the neighbourhood of the proposed operations;*
- *identify proposals to minimise, mitigate or remove noise emissions at source;*
- *monitor the resulting noise to check compliance with any proposed or imposed conditions.*

How should mineral planning authorities determine the impact of noise?

Mineral planning authorities should take account of the prevailing acoustic environment and in doing so consider whether or not noise from the proposed operations would:

- *give rise to a significant adverse effect;*
- *give rise to an adverse effect; and*
- *enable a good standard of amenity to be achieved.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure would be above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy.

What are the appropriate noise standards for mineral operators for normal operations?

Mineral planning authorities should aim to establish a noise limit, through a planning condition, at the noise-sensitive property that does not exceed the background noise level (LA_{90,1h}) by more than 10dB(A) during normal working hours (0700-1900). Where it will be difficult not to exceed the background level by more than 10dB(A) without imposing unreasonable burdens on the mineral operator, the limit set should be as near that level as practicable. In any event, the total noise from the operations should not exceed 55dB(A) LA_{eq, 1h} (free field). For operations during the evening (1900-2200) the noise limits should not exceed the background noise level (LA_{90,1h}) by more than 10dB(A) and should not exceed 55dB(A) LA_{eq, 1h} (free field). For any operations during the period 22.00 – 07.00 noise limits should be set to reduce to a minimum any adverse impacts, without imposing unreasonable burdens on the mineral operator. In any event the noise limit should not exceed 42dB(A) LA_{eq,1h} (free field) at a noise sensitive property.

Where the site noise has a significant tonal element, it may be appropriate to set specific limits to control this aspect. Peak or impulsive noise, which may include some reversing beepers, may also require separate limits that are independent of background noise (eg L_{max} in specific octave or third-octave frequency bands – and that should not be allowed to occur regularly at night.)

Care should be taken, however, to avoid any of these suggested values being implemented as fixed thresholds as specific circumstances may justify some small variation being allowed.

What type of operations may give rise to particularly noisy short-term activities and what noise limits may be appropriate?

Activities such as soil-stripping, the construction and removal of baffle mounds, soil storage mounds and spoil heaps, construction of new permanent landforms and aspects of site road construction and maintenance.

Increased temporary daytime noise limits of up to 70dB(A) LAeq 1h (free field) for periods of up to 8 weeks in a year at specified noise-sensitive properties should be considered to facilitate essential site preparation and restoration work and construction of baffle mounds where it is clear that this will bring longer-term environmental benefits to the site or its environs.

Where work is likely to take longer than 8 weeks, a lower limit over a longer period should be considered. In some wholly exceptional cases, where there is no viable alternative, a higher limit for a very limited period may be appropriate in order to attain the environmental benefits. Within this framework, the 70 dB(A) LAeq 1h (free field) limit referred to above should be regarded as the normal maximum."

3.2 Relevant Guidance & Standards – Industrial Noise

BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

3.2.1 BS 4142: 2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' is based on the measurement of background sound using L_{A90} noise measurements, compared to source noise levels measured in L_{Aeq} units. The differential between the two measurements; once any corrections have been applied for source noise tonality, distinct impulses etc. (i.e. the 'rating' level); determines the likelihood of complaints.

- a) Typically, the greater this difference, the greater the magnitude of the impact.
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

3.2.2 In order to establish the rating level, corrections for the noise character need to be taken into consideration. The Standard states that when considering the perceptibility:

“Consider the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention.”

3.2.3 The subjective method adopted includes the following character corrections:

Table 3.2: BS4142: 2014 Character Corrections

Level of Perceptibility	Correction for Tonal Character dB	Correction for Impulsivity dB	Correction for Intermittency dB	Correction for 'Other Character' dB
Not perceptible	0	0	0	0
Just perceptible	+2	+3	0	0
Clearly perceptible	+4	+6	+3*	+3*
Highly perceptible	+6	+9	+3*	+3*

*Standard defines this should be readily distinctive against the residual acoustic environment, it is interpreted therefore to be either clearly or highly perceptible as a character.

3.2.4 The assessment of noise from the fixed plant at the nearest receptors is considered and our expert opinion is provided below:

3.2.5 In terms of tonality, based on typical frequency spectra measurements at MRF sites in the UK indicate no significant tonal noise at near field or far field positions. We would therefore not expect any tonal characteristics to be perceptible at the nearest receptor and no tonal character correction would be required.

3.2.6 In terms of impulsivity, this would relate to the movement of waste material in bulking bays, however as this occurs inside the MRF building we would not expect this to be a perceptible noise character, due to the distance to the NSR and measured residual noise levels.

3.2.7 In terms of intermittency whilst some of the activities would operate intermittently it is unlikely to be distinctive at NSR due to residual sound levels and distance separation.

3.2.8 In conclusion, in view of the noise contribution from the Proposed Development and mitigation measures proposed, we would advise that a noise character penalty is unlikely to be appropriate.

BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'

3.2.9 The British Standard BS8233 provides additional guidance on noise levels within buildings. These are based on the WHO recommendations and the criteria given in BS8233 for unoccupied spaces within residential properties.

3.2.10 The guidance provided in section 7.7 of BS8233 provides recommended internal ambient noise levels for resting, dining and sleeping within residential dwellings. Table 3.3 provides detail of the levels given in the standard.

Table 3.3: BS8233: 2014 Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35dB LAeq	30dB LAeq
Dining	Dining Room/area	40dB LAeq	
Sleeping (daytime resting)	Bedroom	35dB LAeq	
Study and work requiring concentration	Staff/Meeting Room	35-45dB LAeq	
	Training Room/	35-45dB LAeq	
	Executive Office		

3.2.11 This standard would be appropriate to apply to existing residential developments. The Site noise contribution should be within the proposed internal noise levels, which would include the following noise limits:

- Living room areas: $\leq 35\text{dB } L_{Aeq,16\text{hours}}$ (0700-2300 hours) [equivalent to an external level of approximately $65\text{dB } L_{Aeq,16\text{hours}}$ based on typical standard double-glazed units in the closed position and approximately $50\text{dB } L_{Aeq,16\text{hours}}$ in the open position].
- Bedrooms: $\leq 30\text{dB } L_{Aeq,8\text{ hours}}$ (2300-0700 hours) [equivalent to an external level of approximately $60\text{dB } L_{Aeq,8\text{hours}}$ based on typical standard double-glazed units in the closed position and approximately $45\text{dB } L_{Aeq,8\text{hours}}$ in the open position].
- Offices: 35dB to $45\text{dB } L_{Aeq, 8\text{hours}}$ [equivalent to an external level of approximately 65dB to $75\text{dB } L_{Aeq, 8\text{hours}}$ based on typical standard double-glazed units in the closed position].

World Health Organisation (WHO) Guidelines for Community Noise: April 1999

3.2.12 This document provides further updated information on noise and its effects on the community. The document for noise '*In Dwellings*' states "*The effects of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30dB LAeq for continuous noise and 45dB LAmax for single sound events. Lower noise levels may be disturbing depending upon the nature of the noise source.*"

3.2.13 The WHO document also states "To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35dB LAeq . To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dB LAeq on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50dB LAeq . Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development."

3.3 Survey Techniques

3.3.1 The background sound survey has been carried out in accordance with BS4142: 2014+A1:2019.

3.4 Guidance on Construction Noise

BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites'

- 3.4.1 BS 5228 refers to *"the need for the protection against noise and vibration of persons living and working in the vicinity of, and those working on, construction and open sites. It recommends procedures for noise and vibration control in respect of construction operations and aims to assist architects, contractors and site operatives, designers, developers, engineers, local authority environmental health officers and planners."*
- 3.4.2 Part 1 deals with noise in terms of background legislation and gives recommendations for basic methods of noise control relating to construction and open sites where significant noise levels may be generated. The guidance is aimed at giving advice on achieving 'best practice' in controlling noise and vibration from construction and open sites. There is an example of noise limits given in Annex E, which sets out cut-off limits between 65dB(A) and 75dB(A) or 5dB(A) above the ambient noise, whichever is the greater. Part 2 of BS 5228 deals specifically with vibration control and provides the legislative background to the control of vibration and recommendations for controlling vibration at source and management controls (e.g. liaison with communities, supervision, preparation and choice of plant etc.)

3.5 Relevant Noise Criteria

- 3.5.1 For fixed plant operations such as the proposed MRF, the relevant guidance would be BS4142:2014+A1:2019. To achieve a low impact the site rating level would not exceed the established representative background sound level. Where rating levels exceed background sound levels by around +5dB(A) would indicate an 'adverse impact' and an exceeding by around +10dB(A) would indicate a significant adverse impact.

4.0 SURVEY METHODOLOGY & RESULTS

4.1 Baseline Sound Survey

4.1.1 An environmental sound survey was carried out at the NSR areas relative to the Landfill site during July 2023 by NVC Ltd to determine typical baseline levels to enable determination of likely impacts.

4.1.2 The main source of existing noise affecting nearest receptor properties relates to the movement of traffic along local and distant roads.

4.1.3 Monitoring locations previously identified in consultation with the Local Authority are referenced to establish the NSR, which are detailed below:

- Position A: Southeast off Moss Hall Road (fixed position)
- Position B: South - Rear of Castle Road (fixed position)
- Position C: Northeast off Pilsworth Road (fixed position)
- Position D: Southeast off Moss Hall Road (fixed position)
- Position E: Southeast off Moss Hall Road (spot roaming monitoring)
- Position F: North off Moss Hall Road (spot roaming monitoring)

4.1.4 The fixed and spot monitoring positions provide broadband noise data of the existing sound climate around the site, at the NSR. The noise monitoring exercise was carried out over a daytime period to establish typical ambient sound climate. Details of the instrumentation used for the survey are detailed in Appendix 2. The noise monitoring positions are presented in Figure 1.

4.1.2 The sound monitoring exercise was carried out over a typical weekday period during appropriate weather conditions as defined by BS7445-1: 2003.

4.2 Instrumentation

4.2.1 For sound in the vicinity of nearest sensitive property boundary positions to the site, the following instrumentation was used:

Table 4.1: Instrumentation

<i>Manufacturer</i>	<i>Description</i>	<i>Type</i>	<i>Calibration Due date</i>	<i>Serial No.</i>
Norsonic	Real Time Analyser	140	September 2023	1402924
Norsonic	Real Time Analyser	140	February 2024	1405418
Norsonic	Real Time Analyser	118	November 2023	31992
Cirrus	Real Time Analyser	CR:171B	April 2024	G056142
Cirrus	Real Time Analyser	CR:1710	April 2024	G066350
Cirrus	Acoustic Calibrator	CR: 531A	April 2024	031523

4.2.2 The noise meters used during the survey are precision grade type 1 meters to IEC 651 standard and accuracy.
Calibration Setting: 94dB
Meter Setting: Fast Response

Fieldwork Details:

Date of tests: Thursday 13th July 2023

Time Period: 0700 hours to 1400 hours

Meteorological Conditions

- 4.2.3 Weather conditions were recorded during the baseline survey are detailed below:

Dry, light south westerly to westerly winds (1-2m/s), temperature 13 to 17degC, variable cloud cover.

- 4.2.4 The above climatic conditions were suitable for monitoring environmental noise levels in accordance with advice given in BS 7445:2003 'Description and measurement of environmental noise'.

Calibration

- 4.2.5 The noise meters were calibrated with the electronic calibrator prior to commencement and on completion of the survey. No significant drift in calibration was observed.

4.3 Noise Survey Results

- 4.3.1 The results of background sound analysis taken at the monitoring position is presented below in Table 4.2 and detailed measurements in Appendix 2.

Baseline Levels

- 4.3.2 The baseline sound levels have been analysed for the monitoring period to establish the 'representative' background sound level.

Background Sound Levels

- 4.3.3 The results of average measurements taken at the fixed monitoring positions are presented below in Table 4.2 and detailed measurements in Appendix 2.

Table 4.2: Baseline & Residual Sound Level Range during Weekday

Location	Average LAeq dB	Average LA10 dB	Average LA90 dB	Representative LA90 dB	LAmx dB range
A. Moss Hall Road (SE)	54	56	47	47	62-77
B. Rear of Castle Road (S)	60	61	58	58	63-79
C. North of Pilsworth Rd (NE)	58	59	56	56	62-76
D. West of Moss Hall Road (SE)	49	51	45	45	55-78
E. 150m Moss Hall Rd (SE)	48	50	45	45	59-61
F. 10m Moss Hall Rd (SE)	58	61	48	48	71-73
G. 10m Moss Hall Rd (N) ¹	59	63	51	47	71-77

¹Planning submission for the Pilsworth North Gas Peaking Plant includes noise impact assessment by Wardell Armstrong (May 2020) and provides baseline levels for daytime at this location.

- 4.3.4 For the operation of the MRF, based on the results of the background noise survey and the guidance provided within BS4142:2014+A1:2019, the 'rating' level design criteria should aim to be at or lower than the representative background sound level. Table 4.3 provides the assessment of noise criteria relative to the MRF activities.

Table 4.3: Proposed Noise Criteria at NSR

NSR	Grid Reference X Y	Existing LAeq (dB)	Existing Representative LA90 (dB)	Noise Rating Limit for Low Impact According to BS4142:2014+ A1:2019 LAeq (dB)
R1. Moss Hall Road (SE)	383644 408911	54	47	47
R2. Castle Road (S)	382419 408340	60	58	58
R3. Jackson Fold Pilsworth Rd (NE)	382518 409233	58	56	56
R4. Higher Barn Moss Hall Road (SE)	383575 408497	49	45	45
R5. Brook Cottage Moss Hall Rd (N)	382962 409897	59	47	47
R6. Junction with Moss Hall Rd & Pilsworth Rd (SE)	383575 409117 Property has been demolished	58	48	48

4.4 MRF Site Noise Measurements

- 4.4.1 Noise surveys have been undertaken at a similar MRF site during peak operating activities.

Results:

- 4.4.2 Noise measurements taken at close range has shown that impact noise from the loading, movement and processing of material produces a noise level varying from around 80dB(A) to 88dB(A) L_{eq} inside the MRF building. The corresponding maximum levels within the facility building (L_{Amax}) are typically between 3dB and 15dB higher than the L_{eq} levels. Refer to Appendix 3 for further detail.

5.0 NOISE LEVEL PREDICTIONS

5.1 Introduction

- 5.1.1 Noise has been defined as sound, which is undesired by the recipient. The effects of noise on the neighbourhood are varied and complicated, including such things as interference with speech communication, disturbance of work, leisure or sleep. A further complicating factor is that in any one neighbourhood some individuals will be more sensitive to noise than others.
- 5.1.2 A measure that is in general use and is recommended internationally for the description of environmental noise is the equivalent continuous noise level or L_{Aeq} parameter.
- 5.1.3 In general, the level of noise in the local environs that arises from a development site will depend on a number of factors. The more significant of which are:-
- (a) The sound power or sound pressure levels of the plant or equipment used on site.
 - (b) The periods of operation of the plant on site.
 - (c) The distance between the source noise and the receiving position.
 - (d) The presence or absence of screening effects due to barriers, or ground absorption.
 - (e) Any reflection effects due to the facades of buildings etc.
 - (f) Noise character

5.2 Prediction Methodology

Construction Noise

- 5.2.1 The prediction method used for the construction phase of the development is based on that outlined in British Standard (BS) 5228:2009+A1:2014 "Noise and vibration control on construction and open sites".
- 5.2.2 Initial site preparation work is likely to involve the movement of soils and the construction of new buildings and infrastructure. It is considered that excavators, haulage lorries, cranes, dumpers, concrete mixers, diggers and paving machines would all, at some time during the construction programme, be operating on the site. In addition, ancillary equipment such as small generators and compressors may also be operating on occasions during the construction of the new building.
- 5.2.3 The above noise sources and their associated activities would vary from day to day and may be in use at different stages of the proposed development for relatively short durations.

Construction Noise Prediction

- 5.2.4 The actual noise level produced by construction work would vary at the nearest property boundary at any time depending upon a number of factors including the plant location, duration of operation, hours of operation, intervening topography and type of plant being used.

- 5.2.5 Detailed below is an indication of the highest likely noise levels at the nearest receptors based on soil movement, infrastructure work and building construction activities at the closest approach to existing residential areas.
- 5.2.6 The calculations use the methodology provided within BS 5228-1:2009+A1:2014. For this method the sound power level of the noise source is defined and the attenuation is calculated between its location and the selected receiver, taking account of distance, screening due to barriers, ground attenuation and the time that a noise source would be operating.
- 5.2.7 It is difficult to estimate how long the different types of activity would last, but typically in areas close to the site boundary (i.e. noisiest construction period assessed) this is normally completed in weeks rather than months.
- 5.2.8 The results of calculations at the NSR are shown below in Table 5.1.

Table 5.1: Noise Predictions for Highest Likely Construction Noise

Position	Distance to receptor (m)	Activity	Residual Noise Level, dB L _{Aeq}	Noise Level Range at receptor, L _{Aeq} 1hr dB	Guidance Noise Threshold dB L _{Aeq}
R1. Moss Hall Road (SE)	1240-1370	Piling (if required)	54	39-40	65
	1200-1390	Soil Movement	54	37-38	65
	1200-1390	General site activities	54	34-35	65
	1200-1390	Infrastructure	54	35-40	65
	1240-1370	Building Construction	54	38-39	65
R2. Castle Road (S)	640-720	Piling (if required)	60	45-46	65
	620-740	Soil Movement	60	42-43	65
	620-740	General site activities	60	40-41	65
	620-740	Infrastructure	60	40-46	65
	640-720	Building Construction	60	44-45	65
R3. Jackson Fold, Pilsworth Rd (NE)	280-360	Piling (if required)	58	52-53	65
	260-400	Soil Movement	58	48-51	65
	260-400	General site activities	58	45-49	65
	260-400	Infrastructure	58	46-54	65
	280-360	Building Construction	58	50-52	65
R4. Higher Barn Farm, Moss Hall Road (SE)	1340-1410	Piling (if required)	50	39-40	65
	1320-1430	Soil Movement	50	36-37	65
	1320-1430	General site activities	50	34-35	65
	1320-1430	Infrastructure	50	34-40	65
	1340-1410	Building Construction	50	38-39	65
R5. Brook Cottage Moss Hall Rd (N)	1050-1120	Piling (if required)	59	41-42	65
	1030-1150	Soil Movement	59	38-39	65
	1030-1150	General site activities	59	36-37	65
	1030-1150	Infrastructure	59	36-42	65
	1050-1120	Building Construction	59	40-41	65

- 5.2.9 For the development, the highest community noise levels are likely to be created during construction of infrastructure, piling and new buildings. Best practice would be applied in accordance with BS5228: 2009+A1:2014 to minimise noise levels. Refer to section 6.4 for details of mitigation measures.

Operational Noise Prediction

5.2.10 For site operational noise we have used ISO9613-2 prediction modelling and CadnaA software for producing noise maps of the highest likely generated noise.

5.2.11 The methodology takes into account source position, distance, duration of activity in relation to site activities and the nearest sensitive receptors. The noise modelling assumes that all plant is operating. The prediction calculations therefore provide an indication of the highest likely noise level.

5.2.12 We have used CadnaA software prediction modelling for the calculations (refer to Appendix 4 for noise maps). The noise model uses empirical data and appropriate settings to give an accurate prediction of noise from site.

5.3 Noise Sources

5.3.1 Measured sound pressure levels at a similar MRF; from which the noise predictions were made; are presented in Appendix 3.

5.4 Results of Noise Predictions

Site Plant Noise Assessment

5.4.1 Noise levels from fixed and mobile plant operating at the development site would be assessed against BS4142: 2014+A1:2019. The cumulative effect of all MRF plant operating during the daytime including HGV movement has been considered.

Table 5.2: Predicted Cumulative Noise Contribution from the Proposed MRF Site (including HGV movement) with noise mitigation measures

Receptor Position (Refer to Figure 1)	Period	Background sound level LA90 (dB) [Residual LAeq dB]	Site Noise Contribution [Rating noise level] LAeq (dB)	Level Difference* Between Rating Level & Background LA90 dB
R1. Moss Hall Road (SE)	0700-1800	47 [54]	27	-20
R2. Castle Road (S)	0700-1800	58 [60]	36	-22
R3. Jackson Fold Pilsworth Rd (NE)	0700-1800	56 [58]	41	-15
R4. Higher Barn Moss Hall Road (SE)	0700-1800	49 [45]	27	-22
R5. Brook Cottage Moss Hall Rd (N)	0700-1800	47 [59]	29	-18

*Level difference relates to predicted rating noise in column 4 in brackets [] compared with background sound in column 3. Note: The prediction assumes doors open at MRF.

5.4.2 The above table show the range of predicted highest likely noise levels from the proposed site operations, which would occur during the daytime periods.

5.4.3 The access doors of the building are assumed to be open during the operational period for the purpose of the calculations.

- 5.4.4 The results show rating noise levels are well below the representative background sound level and therefore a **low impact** according to BS4142: 2014+A1:2019. The assessment is based on the highest likely site noise contribution.
- 5.4.5 Noise levels based on BS8233:2014 guidance for internal levels within sensitive rooms of dwellings with the window open, indicate a level range of between 12dB to 26dB $L_{Aeq,8hrs}$ which is well below a guidance level of 35dB $L_{Aeq,8hrs}$ for a living room.

Road Traffic Noise – Off Site

- 5.4.6 There would be no additional vehicles relating to the import of material (i.e. HGVs will be coming from existing waste vehicles that would normally be travelling to the landfill). There would be only limited additional vehicles for recycled material for export, as a result of the MRF installation. The increase in noise levels due to HGV movements would therefore be negligible and not significant.

5.5 Noise Prediction Uncertainties

- 5.5.1 A noise prediction model of the site has been developed based on the information detailed in the report and Appendix 3 based on measured data of typical MRF operations and information concerning the proposed development and layout. The prediction model used includes the use of ISO9613-2 which is a nationally recognised calculation method to provide good accuracy.
- 5.5.2 Within BS4142: 2014+A1:2019 section 10.3 deals with 'uncertainty in calculation' and states:

"Uncertainty in calculating sound levels can arise from:

- a) uncertainty in any measured sound levels used in the calculations;*
- b) uncertainty in the operation or sound emission characteristics of the specific sound source and any assumed sound power levels;*
- c) uncertainty in the calculation method;*
- d) simplifying the real situation to "fit" the model (user influence on modelling); and*
- e) error in the calculation process.*

Where the sound power level is used for calculating sound pressure levels, it ought to be representative of the source and the conditions under which the source is expected to operate.

Where possible, use recognized standards to establish the sound power level and the uncertainty (e.g. BS EN ISO 3740 and BS EN ISO 3747). Where it is not possible to use appropriate standards, describe the method of establishing the sound power level, report the uncertainty and state the reasons for using this method.

Use a validated method of calculating sound levels, e.g. ISO 9613-2 or similar. If an alternative calculation method is used, fully describe the method and state the reasons for using this method.

Check the implementation of the calculation method for errors.

For simple cases, e.g. where the level of variability in sound propagation resulting from changes in meteorological conditions is likely to be small, simple calculation methods might be sufficient.”

5.5.3 In terms of the prediction calculations undertaken, the following points are noted:

- (i) Baseline survey work has been carried out in vicinity of NSR over a typical daytime period to determine representative background sound levels for the assessment.
- (ii) A recognised standard for calculation has been used with appropriate settings to give an accurate prediction.
- (iii) Input data for the MRF is based on measured plant noise levels recorded at internal and external positions to a typical MRF building in the UK.
- (iv) Detailed layout of the site and the surrounding building heights has been used to inform the noise model.

5.5.4 The only potential variation in predicted noise levels is likely to be as a result of sound propagation resulting from changes in meteorological conditions. This is difficult to predict, and in the situation where there is a positive wind vector in the direction of nearest sensitive receptors the actual background noise level could, in any case, be higher than when measured under ideal conditions. We therefore would not consider this to be a significant factor due to the fact that, when assessing the site for compliance this would be carried out in suitable meteorological conditions. The noise model assumes the wind direction is a positive vector. We therefore conclude that the assessment of site noise is accurate, and uncertainty is minimised.

6.0 CONCLUSIONS & MITIGATION MEASURES

6.1 General

- 6.1.1 Background sound measurements have been recorded in the vicinity of the NSR during a weekday period to establish representative background and residual ambient sound levels.
- 6.1.2 Calculations have been carried out to determine the highest likely noise contribution at the NSR property boundary positions for comparison with ambient and background sound levels.
- 6.1.3 The noise assessment has considered the effect of noise 'break-out' from the MRF building as shown on the site layout plan (see Figure 2). The assessment has also considered the effect of vehicle movements around the MRF and typical processing activities within the building to assess any significant impacts.
- 6.1.4 In order to calculate the likely noise 'break-out' from the proposed building and external activities we have used empirical data recorded at a typical facility to assess the noise 'break-out'. The calculations assume that the mobile or fixed noise source is operating for 100% of the time and takes into account spectral corrections for building attenuation, directivity, distance and area factors.

6.2 Existing Sound Climate

- 6.2.1 Representative background sound levels based on the methodology and guidance found in BS4142: 2014+A1:2019 have been established. The representative background sound was shown to range between 47dB to 58dB LA90 (in the vicinity of NSRs).

6.3 Conclusions

- 6.3.1 The results of analysis of measured baseline data, detailed calculations and consideration of appropriate and relevant noise guidance and standards, we have concluded the following:
 - a) Predicted noise levels from the operation of the MRF, HGV movement and mobile plant operation, show that the site rating noise level would be well below representative background sound levels and would therefore result in a **low impact** according to BS4142: 2014+A1:2019.
 - b) The noise level from site would also be **well below appropriate design levels** within living rooms according to BS8233: 2014 for internal levels within sensitive rooms of dwellings assuming an open or closed window.
 - c) The results of noise calculations (in accordance with BS5228-1: 2009+A1:2014) of the highest likely noise levels generated during the construction phase show that, during peak noise generated periods, noise levels are unlikely to exceed typical residual noise levels and would be well below threshold guidance levels at residential NSR and best practice would be applied to control and minimise noise.

- 6.3.2 This assessment concludes that the proposed operation of the Site would generate noise levels well within relevant noise standards and guidelines at nearest sensitive receptors and therefore noise would not be significant.

6.4 Mitigation Measures

Construction Noise

- 6.4.1 In consideration of the likely highest levels of construction noise and vibration, the following approach could be adopted (where applicable):
- Restriction of construction hours to non-sensitive times of day would normally form part of the planning consent conditions.
 - Use of broadband type reverse alarms for mobile plant (i.e. avoiding tonal 'beeper' type alarms)
 - Consider using a one-way system or turning circles and/or use of a banksman to avoid/reduce the need for reverse alarms.
 - Careful choice of plant to minimise noise generation (e.g. hire of fixed plant with acoustic enclosures).
 - Ensure all plant is regular maintained and correctly fitted with effective silencers / any relevant acoustic hoods etc.
 - Plant switched off when not in use.

Operational Noise

- 6.4.2 The control of noise from site has been based on the following control measures which will ensure that site operations achieve reasonable and relevant noise criteria. Further advice on applying management controls based on good practice is provided to minimise noise levels although these are not required to meet reasonable and appropriate noise level criteria:

Noise mitigation measures

- (i) MRF plant located in a purpose-built building having cladding to walls and roof area to a minimum Rw value of 22dB. Some of the lower wall areas would be formed by blockwork or similar to form 'push' walls in offloading areas within the building.
- (ii) Any roof areas fitted with roof lights to be formed by suitable material having a minimum Rw value of 18dB.
- (iii) Doors to be either roller shutter or 'quick acting' automatic roller access doors would be installed. These typically provide around Rw 10dB sound insulation based on empirical data taken at other sites.
- (iv) Any ventilation louvres to be fitted with louvres to reduce noise 'break-out' to a level not exceeding 80dB(A) @ 1m.

Management Control Applying Best Practice

- (v) Drivers of mobile plant instructed to avoid un-necessary banging of loading 'buckets' onto the MRF floor areas (i.e. bucket placed on floor), avoid un-necessary scraping of floor areas and excessive revving of engines.

- (vi) Mobile plant fitted with broadband type noise reverse alarms (i.e. non-beeper type).

REFERENCES

1. ISO 9613-2: 1996 Acoustics – ‘Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation’
2. British Standards BS4142: 2014+A1:2019 ‘Methods for rating and assessing industrial and commercial sound’
3. BS8233: 2014 ‘Guidance on sound insulation and noise reduction for buildings’
4. Guidelines for Community Noise – World Health Organisation: April 1999
5. BS7445: 2003 - Description and measurement of environmental noise
6. National Planning Policy Framework – July 2021
7. Planning Practice Guidance – June 2021
8. Noise Policy Statement for England (NPSE) – March 2010
9. BS5228: 2009+A1:2014 ‘Code of practice for noise control on construction and open sites’
10. Bury Metropolitan Borough Council Planning consent conditions (ref. 53453) dated 9th May 2012.

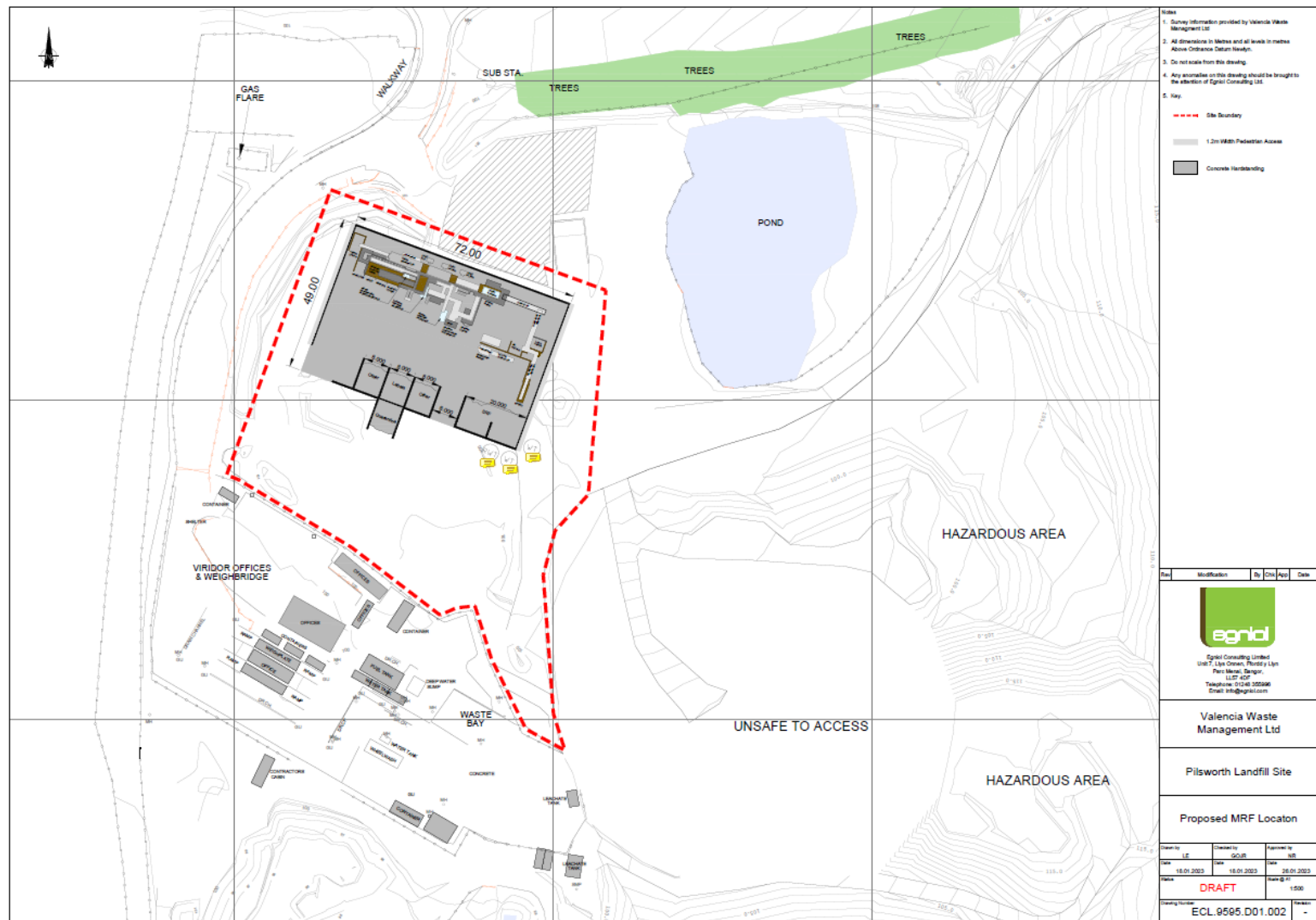
FIGURES

Figure 1: Site Location, Receptor & Baseline Noise Measurement Locations



- Fixed noise monitoring baseline positions
- Spot roaming noise monitoring baseline positions
- Historic baseline monitoring by Wardell Armstrong for Gas Peaking Plant (May 2020)
- NSR Locations
- Previous receptor (building demolished)

Figure 2: Draft Site Layout



Appendix 1

BASIC ACOUSTIC TERMINOLOGY

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air.

Sound Pressure Level is a measurement of the size of these pressure fluctuations. It is expressed in decibels (dB) on a logarithmic scale. Each 3 dB increase in sound pressure level represents a doubling of the sound energy. The threshold of hearing is approximately 0 dB.

The rate at which the pressure fluctuations occur determines the pitch or frequency of the sound. The frequency is expressed in Hertz (Hz), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hz to 20,000 Hz. Although sound can be of one discrete frequency - a 'pure tone' - most noises are made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same 'subjective' way. This is the basis of the A-weighted sound level dB(A), normally used to assess the effect of noise on people. The dB(A) weighting emphasises or reduces the importance of certain frequencies within the audible range.

Noise Measurement

The measurement of sound pressure level is only really meaningful where the level of noise is constant. In the typical industrial environment noise levels can vary widely and sometimes short duration high levels of noise are interspersed with periods of relative quiet. The most widely used means of 'averaging' the noise over a period of time is the Equivalent Continuous Sound Level. Normally written as L_{Aeq} this value takes into account both the level of noise and the length of time over which it occurs. There are many meters available which are capable of measuring L_{Aeq} by electronic integration over the measurement period.

The L_{Aeq} or A-weighted equivalent continuous noise level is a measure of the total noise energy over a stated time period and includes all the varying noise levels and re-expresses as an 'average', allowing for the length of time for which each noise level was presented.

The L_{An} parameters are defined as the noise levels which are exceeded for n% of the monitoring period, thus, for example, the L_{A90} parameter is the noise level exceeded for 90% of the 15-minute period, i.e. 13.5 minutes. The L_{A50} parameter is the noise level exceeded for 50% of the hourly period, i.e. 30 minutes, etc. The L_{max} parameter is the maximum RMS A-weighted noise level occurring during the measurement period.

The definition in layman's terms is given below for terminology used in the measurement and results obtained during the survey work.

A-weighting: Normal hearing covers the frequency (pitch) range from about 20Hz to 20,000 Hz but sensitivity of the ear is greatest between about 500Hz and 5000Hz. The "A-weighting" is an electrical circuit built into noise meters to mimic this characteristic of the human ear.

Ambient noise: The totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

Attenuation: Noise reduction

Background noise: The general quiet periods of ambient noise when the noise source under investigation is not there.

Decibel (dB): The unit of measurement for sound based on a logarithmic scale. 0dB is the threshold of normal hearing; 140dB is the threshold of pain. A change of 1dB is only detectable under controlled laboratory conditions.

dB(A) [decibel A weighted]: Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) serves to distinguish sounds of different frequency (or pitch) in a similar way to how the human ear responds. Measurements in dB(A) broadly agrees with an individual's assessment of loudness. A change of 3dB(A) is the minimum perceptible under normal everyday conditions, and a change of 10dB(A) corresponds roughly to doubling or halving the loudness of sound.

dB(C): [decibel C weighted]: Frequency weighting which does not alter low frequency octave band levels by very much compared to 'A' weighting. Similar to linear reading (i.e. linear does not alter frequency spectra at all)

Frequency (Hz): The number of sound waves to pass a point in one second.

L_{Aeq}: This is a noise index used to describe the "average" level of a noise that varies with time (T). It allows for the different sensitivities of the human ear to different frequencies (pitch), and averages fluctuating noise levels in a manner which correlates well with human perceptions of loudness.

L_{A10,T}: This noise index gives an indication of the upper limit or peak levels of the fluctuating noise. It is the "A weighted" noise level exceeded for 10 per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the L_{A10} reading was say 60dB, then this means that for 1 hour out of 10 the level went above 60dB.

L_{A90,T}: This noise index gives an indication of the lower limit or levels of the fluctuating noise. It is the "A weighted" noise level exceeded for 90 per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the L_{A90} reading was say 50dB, then this means that for 9 hours out of 10 the level went above 50dB.

L_{Amax}: This is the highest 'A' weighted noise level recorded during a noise measurement period.

Residual noise: The ambient noise remaining at a given position in a given situation when the noise source under investigation is not there.

Specific noise: The noise source under investigation for assessing the likelihood of complaints

Examples of typical noise levels

Source/Activity	Indicative noise level [dB(A)]
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Wind farm at 350m	35-45
Busy road at 5km	35-45
Car at 65km/h at 100m	55
Busy general office	60
Conversation	60
Truck at 50km/h at 100m	65
City Traffic at 5m	75-85
Pneumatic drill at 7m	95
Jet aircraft at 250m	105
Threshold of pain	140

Appendix 2

Background Sound Level Results

BASELINE SOUND SURVEY RESULTS

Noise Survey Results

Date: Thursday 13th July 2023

Location: Pilsworth South Landfill, Pilsworth, Bury

Client: Valencia Waste Management Ltd

Project: MRF Project

Data: **Baseline Sound Levels at Position A - Moss Hall Road**

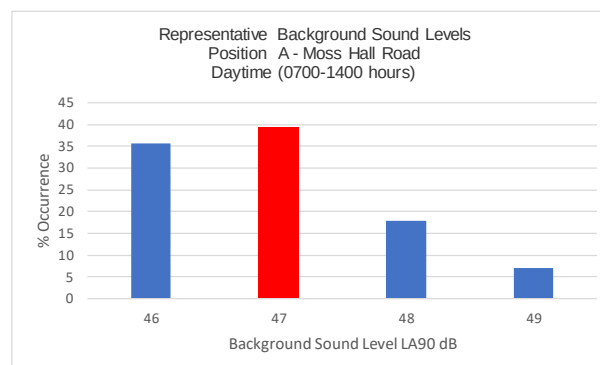
Instrumentation: Cirrus 171A Real Time Analyser (G061253)

Calibration: 94dB

TABLE 1

Start Time	Run Time (hrs:mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmix (dB)	Observations
07:00	15:00	54.4	57.5	47.3	67.1	Intermittent local road traffic No landfill site noise audible
07:15	15:00	54.5	57.8	47.1	68	
07:30	15:00	54.7	57.8	48.1	68.8	
07:45	15:00	55.2	58.8	48.2	63.5	
08:00	15:00	54.2	57.4	46.5	70.6	
08:15	15:00	55.4	59	48	65.7	
08:30	15:00	54.3	57.5	48.6	66.2	
08:45	15:00	54.3	57.5	48.3	66.1	
09:00	15:00	53.5	56.8	47.3	66.9	
09:15	15:00	52.9	56.5	47.3	68.4	
09:30	15:00	52	55.3	47.3	65.9	
09:45	15:00	51.9	54.7	47.2	66	
10:00	15:00	51.3	54.3	46.7	62.4	
10:15	15:00	51.8	54.3	45.7	71	
10:30	15:00	51.8	54.7	45.7	70.4	
10:45	15:00	53	55.8	45.7	68.4	
11:00	15:00	52.3	55.5	46.1	64.6	
11:15	15:00	53.2	55.8	45.8	75.5	
11:30	15:00	51.5	54.1	46.1	66.1	
11:45	15:00	52.9	55.8	46.1	66.5	
12:00	15:00	53.4	56.5	47.5	65.8	
12:15	15:00	51.1	54.4	46	62.3	
12:30	15:00	51.8	54.5	46.7	64	
12:45	15:00	52	54.7	46.1	67	
13:00	15:00	52.1	55.2	46.2	63.8	
13:15	15:00	52.6	55.8	46.7	63.1	
13:30	15:00	53.3	56.3	47.2	67.9	
13:45	15:00	58.4	57.7	48.7	76.7	
Average 0700-1400		53.5	56.3	47.0	62-77	
Representative				47.0		

LA90	% Occurrence
46	35.7
47	39.3
48	17.9
49	7.1



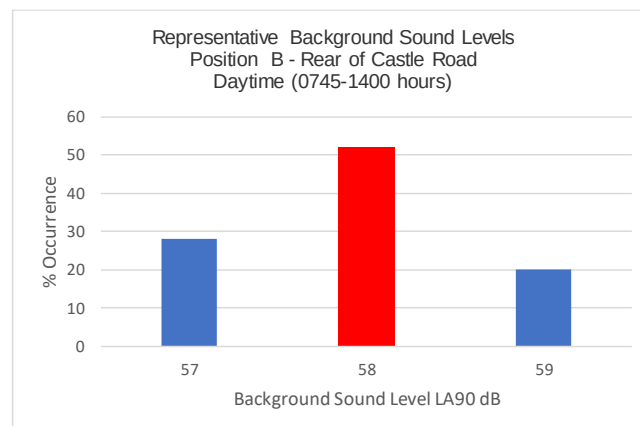
Noise Survey Results

Date: Thursday 13th July 2023
Location: Pilsworth South Landfill, Pilsworth, Bury
Client: Valencia Waste Management Ltd
Project: MRF Project
Data: **Baseline Sound Levels at Position B - Castle Road**
Instrumentation: Cirrus 1710 Real Time Analyser (G066350)
Calibration: 94dB

TABLE 2

Start Time	Run Time (hrs:min)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmx (dB)	Observations
07:45	15:00	59.6	60.2	58.1	77.3	Road traffic noise from M66 Motorway No landfill site noise audible
08:00	15:00	58.6	59.5	57.3	63.6	
08:15	15:00	58.8	59.7	57.6	63.2	
08:30	15:00	59.4	60.4	58	64.9	
08:45	15:00	60	61.3	58.3	66.7	
09:00	15:00	60.5	61.8	58.8	69.3	
09:15	15:00	60.4	61.8	58.8	65.8	
09:30	15:00	61	62.9	58.5	70.1	
09:45	15:00	61.3	63.3	58.5	70.3	
10:00	15:00	61	62.4	59.1	67.1	
10:15	15:00	60.5	61.8	58.4	75.4	
10:30	15:00	59.7	60.9	58.2	65.3	
10:45	15:00	59.3	60.5	57.5	65.2	
11:00	15:00	59.8	61.1	58.2	65.7	
11:15	15:00	59.7	60.9	57.5	79.1	
11:30	15:00	59.8	61.1	57.9	65.6	
11:45	15:00	59.7	61.5	57.5	65.1	
12:00	15:00	60.1	61.7	58	69.8	
12:15	15:00	59.3	60.7	57.7	65	
12:30	15:00	59.3	61	57	67.3	
12:45	15:00	59	60.5	56.9	64.5	
13:00	15:00	59.3	60.8	57.1	67	
13:15	15:00	60.5	61.9	57.4	74.2	
13:30	15:00	60.4	61.7	57.3	76.7	
13:45	15:00	59.9	61.2	57.2	72.1	
Average 0745-1400		59.9	61.3	57.9	63-79	
Representative				58.0		

LA90	% Occurrence
57	28.0
58	52.0
59	20.0



Noise Survey Results

Date: Thursday 13th July 2023

Location: Pilsworth South Landfill, Pilsworth, Bury

Client: Valencia Waste Management Ltd

Project: MRF Project

Data: **Baseline Sound Levels at Position C - North of Pilsworth Road**

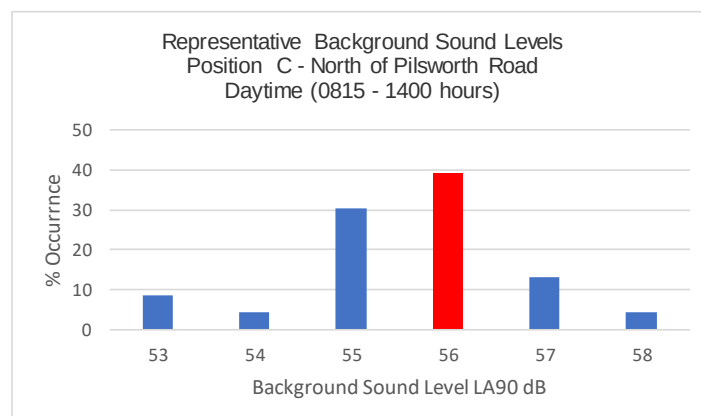
Instrument Cirrus 171B Real Time Analyser (G056142)

Calibration 94dB

TABLE 3

Start Time	Run Time (hrs:mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmix (dB)	Observations
08:15	15:00	57.8	59.3	55.4	76.2	Noise from M66 Motorway dominates noise climate Landfill site noise not audible
08:30	15:00	58.1	60.1	55	75.1	
08:45	15:00	59.2	60.5	56.7	70.2	
09:00	15:00	58.1	59.3	56.3	67.6	
09:15	15:00	57.9	59.5	55.8	68.2	
09:30	15:00	59.8	60.4	56.5	74.1	
09:45	15:00	59.7	61.1	57.3	64.8	
10:00	15:00	57.6	59.4	55.2	65.8	
10:15	15:00	56.8	58.2	54.7	70.2	
10:30	15:00	57.5	59.1	55.6	65.4	
10:45	15:00	57.7	59.2	55.5	67.2	
11:00	15:00	57.4	58.9	55.4	63.6	
11:15	15:00	58.5	60.3	55.9	65.2	
11:30	15:00	57.1	58.9	54.6	69	
11:45	15:00	58.5	60.1	56.2	69.1	
12:00	15:00	57	58.9	54.6	63	
12:15	15:00	57.2	58.5	55.5	62	
12:30	15:00	56.2	58	53.7	63.1	
12:45	15:00	55.8	57.3	53.2	62.8	
13:00	15:00	56.5	58.5	53	65.2	
13:15	15:00	57.8	58.9	55.7	74.8	
13:30	15:00	58.3	59.7	56.4	66.2	
13:45	15:00	59.3	60.5	57.6	68.1	
Average 0815-1400		57.9	59.4	55.6	62-76	
Representative				56.0		

LA90	% Occurrence
53	8.7
54	4.3
55	30.4
56	39.1
57	13.0
58	4.3



Noise Survey Results

Date: Thursday 13th July 2023

Location: Pilsworth South Landfill, Pilsworth, Bury

TABLE 4

Client: Valencia Waste Management Ltd

Project: MRF Project

Data: **Baseline Sound Levels at Position D - West of Moss Hall Road**

Instrumentation: Norsonic 140 Real Time Analyser (1405418)

Calibration: 94dB

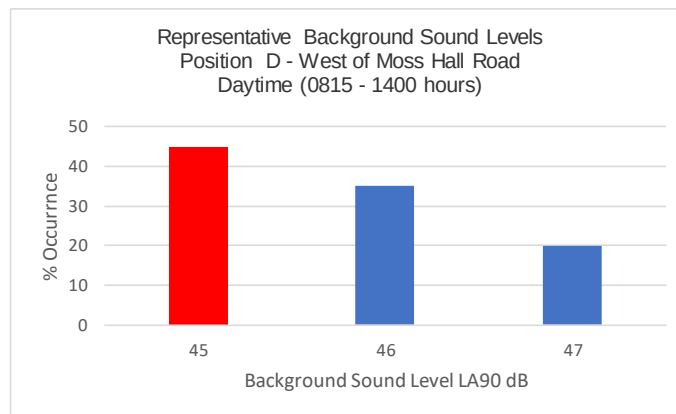
Start Time	Run Time (hrs:mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmx (dB)	Observations
09:00	15:00	51.2	51.1	45.9	78.2	Distant road traffic noise from Motorways dominates noise climate
09:15	15:00	48.6	50.8	45.2	60.8	
09:30	15:00	49.3	51.7	46.1	60.3	
09:45	15:00	49.5	51.7	46.5	57.7	
10:00	15:00	48.1	50.4	45	61.4	
10:15	15:00	48.1	50.4	44.6	57.5	
10:30	15:00	50.1	52.2	44.9	66.4	
10:45	15:00	50.3	53.2	45.3	64	
11:00	15:00	48.6	50.7	45.4	59.6	
11:15	15:00	48.5	50.2	44.9	62.5	
11:30	15:00	48.8	51.1	45.6	59.5	
11:45	15:00	48.3	50.7	44.9	60.5	
12:00	15:00	51.1	53.9	46.3	68.8	
12:15	15:00	47.9	50.1	44.9	55.4	
12:30	15:00	49.3	51.6	46.1	58.9	
12:45	15:00	50.2	53	45.7	60.3	
13:00	15:00	50.8	53.5	46.8	59.1	
13:15	15:00	51.4	54.1	46.6	66.3	
13:30	15:00	51.5	53.9	47.3	61.7	
13:45	15:00	48.7	50.6	45.5	66.9	
Average 0815-1415		49.0	51.3	45.1	55-78	
Representative			45.0			

LA90 % Occurrence

45 45.0

46 35.0

47 20.0



Noise Survey Results

Date: Thursday 13th July 2023
 Location: Pilsworth South Landfill, Pilsworth, Bury
 Client: Valencia Waste Management Ltd
 Project: MRF Project
 Data: **Baseline Sound Levels- Off Moss Hall Road**
 Instrumentation: Norsonic 118 Real Time Analyser (31992)
 Calibration: 94dB

TABLE 5

Start Time	Run Time (hrs:min)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmx (dB)	Location
12:00	15:00	48.1	49.5	45.8	60.6	E) 150m Moss Hall Road
12:15	15:00	47.7	49.8	45	60.2	E) 150m Moss Hall Road
12:30	15:00	48	50	45.9	59.4	E) 150m Moss Hall Road
12:45	15:00	47.6	49.5	45.1	61.1	E) 150m Moss Hall Road
Average		47.8	49.7	45.4	59-61	
13:00	15:00	58.6	60.4	48.9	72.5	F) 10m Moss Hall Road
13:15	15:00	57.7	61.2	47.6	71.9	F) 10m Moss Hall Road
13:30	15:00	57.7	61.6	48.2	71.4	F) 10m Moss Hall Road
Average		58	61	48.2	71-73	

Appendix 3

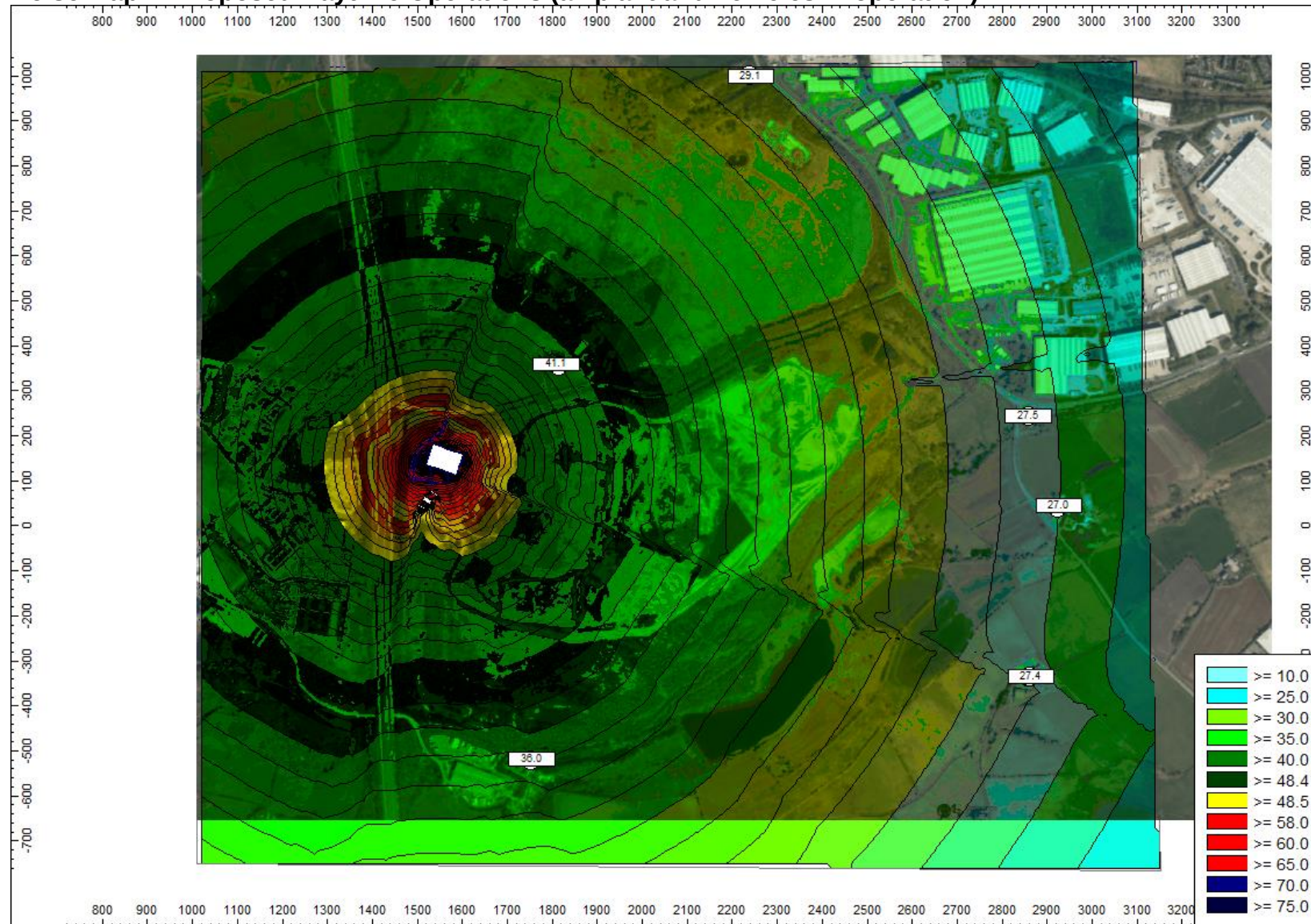
Typical MRF Operational Noise Levels

Position	LAeq	LA10	LA90	LAFmax
MRF Facility				
10m from front of MRF Building (front loader on)	77.8	78.5	71.8	93.8
10m from front of MRF Building (front loader on)	74.6	75.1	67.6	89.7
10m from front of MRF Building (front loader on)	72.7	75.7	68.7	81.5
At open fronted MRF Building	81.2	84	76.6	88.1
At open fronted MRF Building	80.5	81.5	79.4	83.7
Inside MRF (front loader working inside)	87.8	90.6	85.8	92.6
Inside MRF at Mezzanine plant level	88.2	89.6	86.2	92.4
Inside MRF at Mezzanine plant level	86.7	87.9	85.4	89.6
Inspection area at Mezzanine level	84.2	87.1	77.6	89.1
Tipping Hall end at opening	78.4	79.3	77.2	81.6
50m at 45deg to MRF Building	70.8	72.3	69.1	73.7
50m from MRF Building at front	71.9	72.8	71.1	73.9
50m from MRF Building at front	72.6	73.3	71.1	84.4
30m in front of MRF Building	76.5	77.6	74.9	86.2

Appendix 4

Noise Mapping Results

Noise Map 1: Proposed Daytime Operations (all plant and vehicles in operation)



Appendix 5

Consultant's Experience & Qualifications

**Consultant: Dean Robert Kettlewell - MSc MIOA MAE I.Eng
(Director - Principal Acoustic Consultant)**

Précis

As Director and Principal Acoustic Consultant with Noise & Vibration Consultants Ltd, Dean has over 35 years background experience in a wide range of issues relating to environmental, industrial and commercial noise and vibration assessment. He currently manages corporate and unit specific contracts for:

- Assessment of Environmental & Industrial Noise
- Environmental Noise Impact Assessments
- Expert Witness representation for Planning Appeals
- Integrated Pollution Prevention and Control (IPPC) Applications
- Industrial Noise Assessment and Control
- Planning Issues for Residential and Commercial Development
- Noise at Work Regulations Assessments
- Building Acoustics and Sound Insulation Tests
- Specialist knowledge in Renewable Energy & Waste Industry Noise Assessment
- Entertainment Noise Assessment and Control
- Architectural Acoustics
- Specialist knowledge in the Design of Noise Control Systems
- Ground borne vibration measurement and assessment
- Project Management of Noise Control Systems

Relevant Work Experience

Director & Principal Consultant - Noise & Vibration Consultants Ltd	2001- to date
Senior Acoustic Consultant - Vibrock Limited	1998 - 2001
Associate & Principal Acoustic Consultant - John Savidge & Associates	1994 - 1998
Technical Manager – LBJ Limited (Noise Control Division)	1990 - 1994
Technical Engineer/Technical Manager (1988) - Vibac (Noise Control) Ltd	1982 - 1990

Qualifications and Education

M.Sc. Applied Acoustics (Derby University – Distinction)
HNC Electrical & Electronic Engineering
IOA Diploma in Acoustics & Noise Control
IOA Certificate in Law and Administration
Certificate of Competence in Workplace Noise Assessment
Certificate of Competence in Ground Vibration Monitoring

Affiliations: Member of Institute of Acoustics (MIOA)
 Member of Academy of Experts (MAE)
 Member of Association of Noise Consultants (ANC)
 Incorporated Engineer (I.Eng)

