Suite 2717
37 Westminster Buildings
Theatre Square
Nottingham
NG1 6LG
Tel No: 01773 603331
e-mail: nvc.acoustics@btopenworld.com

Noise Assessment
For Planning & Environmental Permit
For Proposed
Materials Recycling Facility (MRF)

At

Shelford Landfill Site
Broad Oak Road
Hackington
Canterbury

For

Valencia

Consultant: D.R. Kettlewell MSc MIOA MAE I.Eng
Report No.: R23.1002/DRK

Noise & Vibration Consultants Ltd

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

Report prepared by:
D R Kettlewell MSc MIOA MAE I.Eng – Principal Consultant:

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1.0 INTRODUCTION

1.1 Noise & Vibration Consultants Ltd ("NVC") have been instructed by Valencia (the Applicant) to provide a noise impact assessment for the proposed Materials Recycling Facility ("MRF") at Shelford Landfill Site, Shelford Farm Estate, Shalloak Road Canterbury, CT2 0PU.

1.2 The noise impact assessment would utilise empirical data taken from measurements made at other similar MRF plant operating in the UK over the last 10 years, to determine the resultant noise contribution at identified noise sensitive receptors ("NSR"). The assessment will ensure resultant noise levels at NSRs will meet appropriate guidance and standards for noise.

1.3 Noise levels have been considered and assessed during the operational phase (as the MRF building exists on Site) of the proposed development and where appropriate advice on any measures required 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 and the latest Environment Agency ("EA") Guidance on Noise.

1.6 The plant would be located within a purpose-built portal frame building (as shown on Figure 2 and photographs attached):

1.7 Information used in this review has been obtained from the following sources:

- ordnance Survey maps of the local area;
- MRF layout and elevation drawings of the Proposed Development (Valencia SHF 118 Rev A, Tusker [G]-106 Rev0, [G]-108 Rev0, [G-104 Rev 0;
- National Planning Policy Framework – September 2023;
- Planning Practice Guidance – June 2021;
- Noise Policy Statement for England (NPSE) – March 2010;
- EA Noise and vibration management: environmental permits (January 2022);
- BS4142: 2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'
- BS8233: 2014 'Guidance on sound insulation and noise reduction for buildings'
- World Health Organisation: 'Guidelines for Community Noise' - April 1999;
- Department of Transport 'Calculation of Road Traffic Noise': 1988;

- ISO 9613-2: 1996 Acoustics – Attenuation of Sound During Propagation Outdoors; and
- Planning Consent Conditions (planning ref: CA/96/794 dated 27th October 1997).

Assessment Methodology

1.8 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 or sites;
- determine likely source noise levels;
- provide information on existing background sound levels and specific site noise levels at nearest sensitive receptors ("NSR");
- provide predictions on the construction of the development;
- provide predictions of resultant noise levels from the 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.

1.9 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).

1.10 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.

2.0 SITE DESCRIPTION, RECEPTORS & BASELINE LEVELS

2.1 The MRF would be located on the existing Shelford Landfill Site, which is an active landfill, which includes a gas engine facility and leachate facility. The Site is located off Shalloak Road in Hackington at the northwest edge of the city of Canterbury with its boundary immediately north of the Canterbury and Whitstable Railway line.

2.2 The site is surrounded by a combination of agricultural stock fencing and hedgerows. Fencing is located along the southern, western and northern boundaries of the site. Shelford Landfill is located on the northern slope of the Stour Valley with a surface elevation of approximately 30 metres above ordnance datum (AOD). The surface topography of the surrounding area ranges between 10m AOD and 50m AOD, with a southerly dip towards the River Great Stour.

2.3 To the north and north-east of Shelford landfill, lie Barton, Little Hall and Beecham Woods which form part of the West Blean and Thornden Woods Site of Special Scientific Interest (SSSI) complex. Beyond Beecham Wood to the north and east of the site lies Maydon Cottages, the village of Broad Oak and Shalloak Road. Forty metres to the South of the site lies a business park.

2.4 The Canterbury and Whitstable railway line, Broad Oak & Shalloak Roads and the River Great Stour run in a south-west to east-north-east direction to the south of the site. Beyond the River Great Stour lies a caravan park, the Maybrook Industrial Estate, Sturry Sewage Works and an Electricity Sub-Station

2.5 To the south-west of the site lies agricultural land, beyond which lies the residential suburb of Hales Place. To the west and north-west lies agricultural land with intervening woodland, beyond which lies further residential properties at greater distance.

2.6 The MRF development includes for the construction of a portal frame building to contain the MRF operations. The plant includes the following features:

(i) pre-shredder;
(ii) conveyors;
(iii) overband magnet;
(iv) drum separator;
(v) combi screen;
(vi) eddy current separator;
(vii) picking stations;
(viii) bulking bays
(ix) dust extraction; and
(x) mobile plant.

Processing Activities

Proposed Operations

2.7 The proposal is for the erection of a building which would measure 64.5m by 64.5m with an eaves height of approximately 9m and a ridge

height of circa 11.5m. The building would be steel portal frame structure on breeze block with internal breeze block push walls (to a height of circa 3.6m).

2.8 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.

Site Access

2.9 Access to the Shelford landfill site is from Broad Oak Road to the southeast of the site. This access point currently serves the landfill traffic for the site and would be the main point of access for the MRF.

Site Operation Noise Sources

2.10 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.

Operating Hours

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

Monday to Saturday: 0700 to 1800 hours.

Nearest Receptors

2.12 The nearest residential properties to the landfill site include the properties along Shalloak Road (R1) (grid reference: 616582 160054), which at their closest point are approximately 170m southeast of the MRF building and are located close to the road. Other receptors at greater distance off this road include No. 3 Shelloak Road Mobile Home Park (grid reference: 616702 160610) (R2) and Broad Oak Lodge Farm (grid reference: 616826 160503) (R3).

2.13 The nearest residential receptors in a southwest direction from the MRF building include those off Bicknor Close (grid reference: 615608 159732) (R4), Folly Farm Gardens (grid reference: 615623 159685) (R5) and

Kemsing Gardens (grid reference: 615673 159568) (R6), which are located circa 780m to 800m from the MRF building. The NSR located south of the railway line include those off Broad Oak Road (No. 251) to the southwest at a distance of circa 590m (grid reference: 615910 159695) (R7). Note the landform of the Site provides significant screening relative to these receptors, which for the purpose of the noise predictions has not been included for robustness.

2.14 Figures 1 and 2 attached, shows the layout of the site and the site position relative to the NSR.

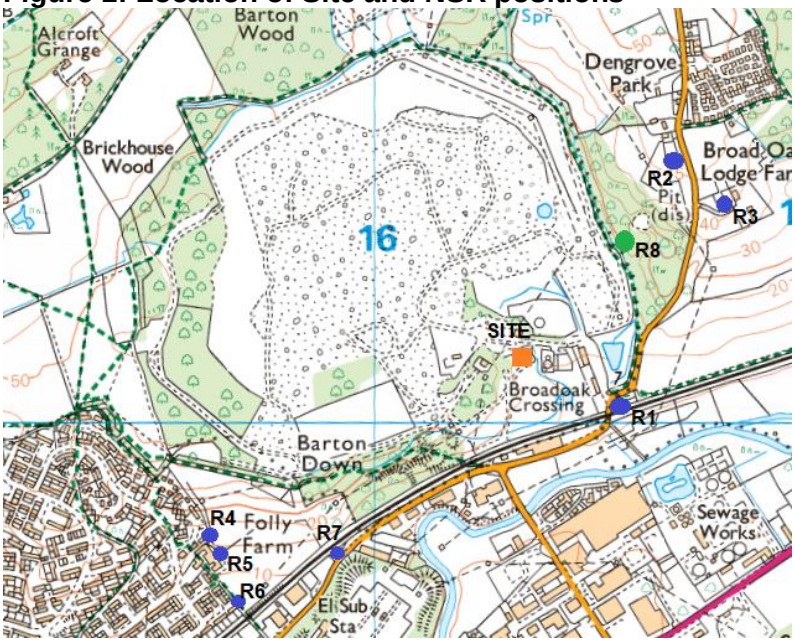
Ecological Sensitive Receptors

2.15 The nearest ecological receptors to the MRF are woodland areas to the northeast direction relative to the MRF building, referred to as West Blean and Thornden Woods (Receptor R8). From an ecological designation perspective these are Sites of Special Scientific Interest (SSSI) and are located circa 260m at the closest approach to the MRF building. There is significant earth mound screening on intervening ground between the woodland and the MRF in this direction, which for the purpose of the noise predictions, has been excluded for robustness.

2.16 There are no known future receptors proposed that would be of greater sensitivity than those considered in this assessment. Furthermore, there are no known additional developments proposed in the area that are considered likely to result in any material cumulative effects in combination with the Proposed Development.

2.17 Based on distance relative to the Proposed Development, the NSR properties that would be subject to the highest likely noise levels would be those located southeast of the Site, at the residential receptors off Shalloak Road (Receptor R1).

Figure 1: Location of Site and NSR positions



3.0 REVIEW OF NOISE GUIDANCE AND STANDARDS

3.1 Introduction

3.1.1 The ambient environmental noise at any location will vary according to the activities occurring around the location. In the vicinity of a busy motorway, for example, the noise level will remain fairly constant due to the relatively steady noise input from road traffic, whereas the noise level close to a source of high noise over short periods, such as an airport, will vary over a much wider range. It is therefore necessary to consider how to quantify the existing noise levels in an area in order to accurately assess the acceptability of the introduction of a new noise source.

3.1.2 The background sound level, defined as the L_{A90} parameter, represents the sound level exceeded for 90% of a measurement period, or the ninety- percentile level. It generally reflects the quieter sound level between peak events and generally ignores the effects of short-term higher sound level events. Another way of describing the L_{A90} level is that it represents the `troughs' of the sound climate and the lower 10% of the fluctuating ambient sound.

3.1.3 The ten-percentile level L_{A10}, represent the level that is exceeded for 10% of the measurement period and is therefore an indication of the higher levels of sound. This is commonly used to describe and quantify noise from road traffic as it reflects the higher levels of noise and the upper 10% of the fluctuating ambient noise.

3.1.4 The equivalent continuous sound pressure level or L_{Aeq} parameter, is a measure of the average sound energy over a given time period. It will include noise from all contributing sources. This is commonly used to describe and quantify noise from specific industrial noise sources.

Noise Guidance and Standards

3.1.5 The relevant guidance and standards for noise for industrial development. This provides detail of the most relevant noise criteria upon which the site should be assessed, this includes:

1. BS4142: 2014+A1:2019 `Methods for rating and assessing industrial and commercial sound' (updated in June 2019);
2. BS8233: 2014 `Guidance on sound insulation and noise reduction for buildings';
3. Noise Policy Statement for England: March 2010;
4. National Planning Policy Framework (NPPF): September 2023;
5. Planning Practice Guidance: June 2021; and
6. Environment Agency (EA) Guidance (Noise and vibration management: environmental permits January 2022)

General Planning Guidance

3.1.6 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 – September 2023 (NPPF)

3.1.7 Chapter 15 of the National Planning Policy Framework (NPPF) relates to 'Conserving and enhancing the natural environment'.

3.1.8 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;"*

3.1.9 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."

3.1.10 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."*

3.1.11 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.

3.1.12 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.

3.1.13 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."*

3.1.14 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.

3.1.15 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

3.1.16 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.

3.1.17 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."*

3.1.18 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'.*

3.1.19 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."

3.1.20 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

3.1.21 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 (LA90,1h) 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) LAeq, 1h (free field). For operations during the evening (1900-2200) the noise limits should not exceed the background noise level (LA90,1h) by more than 10dB(A) and should not exceed 55dB(A) LAeq, 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) LAeq,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 bleepers, may also require separate limits that are independent of background noise (eg Lmax 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."

BS4142:2014+A1:2019 `Methods for rating and assessing industrial and commercial sound'

3.1.22 In terms of defining a suitable noise limit, achieving a low impact in accordance with BS4142:2014+A1:2019 would provide suitable protection for amenity of NSR. The Standard is based on the measurement of background sound using L_{A90} noise measurements, compared to source noise levels measured in L_{Aeq} units. Once any corrections have been applied for source noise tonality, distinct

impulses and intermittency etc., the difference between these two measurements (i.e. known as the `rating' level) determines the impact magnitude.

- Typically, the greater the difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact (although this can be dependent on the context).
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- 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 (although this can be dependent on the context).

3.1.23 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."

3.1.24 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.

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

3.1.26 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.

3.1.27 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, local topography and measured residual noise levels.

3.1.28 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. 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.

3.1.29 In defining noise limits and the significance of the impact from the site BS4142 indicates that a low impact occurs where the `rating' level from site (which includes a noise character) does not exceed the representative baseline sound level and an adverse impact where the `rating' level is around +5dB above baseline sound levels (depending on the context i.e. if residual sound levels significantly increase).

Latest Advice Set Out in Latest Environment Agency (EA) Guidance (Noise and vibration management: environmental permits January 2022)

3.1.30 The latest guidance from the EA (Noise and vibration management: environmental permits – January 2022) states:

"For industrial noise impacts where the sound is neither impulsive nor tonal, but you can readily distinguish it against the usual residual acoustic environment, the environment agencies will expect you to apply a minimum character correction of +3 decibels (dB) 'other'. This is unless you can robustly justify that you do not need such a correction."

3.1.31 Whilst the MRF is designed to eliminate noise character at NSRs to comply with the EA guidance on design, the limits are reduced by a further 3dB to allow for noise character. Based on the measured background levels detailed in section 4.0, the resultant design limit levels are presented below in Table 3.3.

Table 3.3: EA Noise Limits

NSR	Location	Daytime Noise Limits $L_{Aeq,1hr}$ dB
R1	R1. Shalloak Rd	<=49
R2	R2. No. 3 Shelloak Road Mobile Home Park	<=43
R3	R3. Broad Oak Lodge Farm	<=43
R4	R4. Bicknor Close (SW)	<=43
R5	R5. Folly Farm Gardens (SW)	<=43
R6	R6. Kemsing Gardens (SW)	<=43
R7	R7. Broad Oak Road (SW)	<=50

Other Relevant Guidance and Standards

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

3.1.32 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.

3.1.33 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	35 dB $L_{Aeq,16hours}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hours}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hours}$	30 dB $L_{Aeq,8hours}$
Study & work requiring concentration	Office	35-45dB $L_{Aeq,16hours}$	-

3.1.34 For a partially open window the standard refers to a reduction of approximately 15dB. This would therefore indicate a noise level outside the window of approximately 50-55dB $L_{Aeq,16hours}$ for living rooms during daytime and 45dB $L_{Aeq,8\ hours}$ during night-time outside bedrooms. For office environments the external noise level would be in the region of 50-60dB $L_{Aeq,16hours}$ on the assumption that the office window is open.

World Health Organisation (WHO) Night Noise Guidelines for Europe: 2009

3.1.35 In 2009, the World Health Organisation published `*Night Noise Guidelines for Europe'*, which it describes as an extension to the WHO `*Guidelines for community noise'* (1999). It concludes that *"Considering the scientific evidence on the thresholds of night noise exposure indicated by Lnight,outside as defined in the Environmental Noise Directive (2002/48/EC), an Lnight,outside of 40dB should be the target of the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. Lnight,outside value of 55dB is recommended as an interim target for those countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach."* The target of 40dB(A) outside would relate to an internal noise level within bedrooms of 25-30dB(A) Leq8hours.

Ecological Receptors

3.1.36 The nearest SSSI designation is located at edge of West Blean and Thornden Woods (grid reference 616610 160364). In terms a minimum disturbance threshold a level of 55 dB $LAeq_{,1hr}$ for general noise was used to represent a minimum disturbance threshold.

Existing Planning Permission Consent

3.1.37 The MRF has existing planning permission from Kent County Council (ref: CA/96/794) dated 27th October 1997. Planning condition (7) includes the following noise limits:
"*The level of noise emitted as a result of any activity or operation hereby permitted shall not exceed 52dB LAeq when measured at any residential property or other occupied building;*

Reason: To ensure minimum disturbance from operations and avoidance of nuisance to the local community and so as to accord with the objectives of Kent and Medway Structure Plan Policy QL1 and Policy W18 of the Kent Local Plan."

3.1.38 Condition (6) refers to permitted operating hours:

"No operation other than leachate or water pumping, servicing, environmental monitoring, maintenance or testing of plant shall be carried out at the site except between 0700 hours and 1800 hours Monday to Saturday, no operations other than environmental monitoring and water, leachate or landfill gas pumping at the site shall take place on Sundays or public holidays, except in emergencies to maintain the safe working of the site (which shall be notified to the Mineral Planning Authority as soon as possible);

Reason: To ensure minimum disturbance from operations and avoidance if nuisance to the local community and so as to accord with the objectives of Kent and Medway Structure Plan Policy QL1 and Policy W18 of the Kent Waste Local Plan."

4.0 SURVEY METHOLDOGY & 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 November 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 Shalloak Road (fixed position)
- Position B: Southwest – Adjacent to site boundary opposite to Broad Oak Road (fixed position)
- Position C: West of Bicknor Close (fixed position)
- Position D: Northeast of Site off Shalloak Road (spot roaming monitoring)
- Position E: Northeast adjacent to woodland area (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 weekday 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.

4.1.5 The sound monitoring exercise was carried out over a typical weekday period during appropriate weather conditions as defined by BS7445-1: 2003. Any associated periods of rain were removed from the analysed data set.

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

Manufacturer	*Description*	*Type*	*Calibration Due date*	*Serial No.*
Norsonic	Real Time Analyser	140	February 2024	1405418
Norsonic	Real Time Analyser	118	May 2024	31337
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 9th November 2023
Time Period: 0700 hours to 1530 hours

Meteorological Conditions

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

Generally dry, light south westerly winds (1-2m/s), temperature 8 to 10degC, variable cloud cover with sunny periods. Rain between 0930-1030 hours which was removed from the data set.

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 3.

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 3.

Table 4.2: Baseline & Residual Sound Level Range during Weekday

Location	Time	Average LAeq dB	Average LA10 dB	Average LA90 dB	Representative LA90 dB	LAmax dB range
A: Southeast off Shalloak Rd	0730-1500	66	70	53	**52**	73-85
B: Southwest boundary of Site	0830-1530	56	57	53	**53**	59-80
C: West of Site at Bicknor Close	0845-1530	49	49	46	**46**	56-69

Location	Time	Average LAeq dB	Average LA10 dB	Average LA90 dB	Representative LA90 dB	LAmax dB range
D: Northeast off Shalloak Rd	1030-1445	49	50	46	**46**	54-68
E: Northeast adj. to woodland	1510-1541	49	50	46	**46**	61-66

[1] Note: Takes into account the median, mean and most commonplace LA90 based on statistical analysis, whichever is lowest.

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.

4.3.5 Based on the requirements set out in BS4142: 2014+A1:2019 to achieve a **low impact**, the following noise limits would apply:

Table 4.3: Noise Limits Daytime (relative to BS4142 low impact)

NSR	Location	Grid Reference X Y	Day (0700-1800 hours)		
			Representative Background Sound Level LA90 dB	Residual Sound Level LAeq dB	Rating[1] Level Limit $LAeq_{1hr}$ dB
R1	R1. Shalloak Rd (SE)	616582 160054	52	66	<=52
R2	R2. No. 3 Shelloak Road Mobile Home Park (NE)	616702 160610	46	49	<=46
R3	R3. Broad Oak Lodge Farm (NE)	616826 160503	46	49	<=46
R4	R4. Bicknor Close (SW)	615608 159732	46	49	<=46
R5	R5. Folly Farm Gardens (SW)	615623 159685	46	49	<=46
R6	R6. Kemsing Gardens (SW)	615673 159568	46	49	<=46
R7	R7. Broad Oak Road (SW)	615910 159695	53	56	<=52[2]

[1] Rating level includes any relevant noise character penalties in accordance with BS4142:2014+A1:2019
[2] Limit here would be <+52dB LAeq1hr due to existing planning permission.

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 PREDICTIONS

5.1 Mitigation Strategy

5.1.1 The predicted noise levels from the Proposed Development have been calculated using the noise levels provided within Appendix 4. The noise levels are based on plant noise data provided by Technology Providers on other similar projects in the UK. The noise mitigation strategy includes the following mitigation measures:

Design Layout

(i) The design layout has taken into account the most significant noise sources and door openings where access will be required and the building orientated to minimise noise impacts on the closest NSR.

Noise Control Measures

(ii) Reverberant sound pressure levels of typical MRF plant in operation is provided in Appendix 4.

(iii) Plant and bulking areas to be located within a clad portal frame building.

(iv) Lower walls (circa 3.6m high) on inside of cladding constructed from concrete blockwork.

(v) Upper walls formed from single skinned cladding (Rw typically 22dB).

(vi) Roof formed from single skin cladding (Rw typically 22dB) with roof lights.

(vii) Doors that are not regularly used for vehicle access to be closed, unless for maintenance or emergency.

(viii) Large doors into MRF building to be either fast acting (typical Rw 10dB) or electric roller shutter doors (typical Rw 18dB)

(ix) Single doors to be fire type.

(x) Design to ensure no noise character is perceptible at NSRs in accordance with BS4142: 2014+A1:2019.

(xi) Mobile plant and site-controlled vehicles fitted with non-tonal reversing alarms (i.e. broadband noise, `white noise' or SMART type reversing alarms).

(xii) Any future proposed external plant should be designed to a level not exceeding 65dB(A) @ 3m.

(xiii) Any future proposed ventilation openings to be fitted with acoustic louvres (advice to be sought on acoustic performance required).

5.1.2 For the purpose of the noise model we have referred to the layout plans and elevations of the MRF provided by Valencia.

5.1.3 In terms of assumed sound reduction index for associated cladding and doors relative to the MRF buildings we have assumed the following acoustic performance, which is detailed below in Table 5.1.

Table 5.1: Assumed SRI values for the cladding and doors into the building

	Frequency (Hz)									
Material	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**Rw**
Kalzip 0.91mm	0	0	1.7	7.7	13.7	19.7	25.7	31.8	37.8	18
Single Skin Clad	4	4	6	12	18	24	30	36	37	22
Insulated Roller Door		3	7	9	15	19	21	25	20	18
Roller Shutter Door		2	3	5	8	10	11	13	12	10
Roof Reinforced Gravel Conrete 150 mm			39	41	50	57	63	71		54

5.1.4 The information assumed for noise emission levels for the plant provides us with noise data for input into the noise model and is provided in Appendix 4 and below for ease of reference.

Estimated grid references for the MRF building include the following:

	Easting	**Northing**
Northwest corner of MRF building:	616331	160161
Northeast corner of MRF building:	616397	160161
Southwest corner of MRF building:	616331	160095
Southeast corner of MRF building:	616397	160095

Table 5.2: Noise Source Input Data

	Type	Octave Band Centre Frequencies (Hz)									
Source		**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**A**
Wall of New MRF	Lw	88	91	92	88	91	86	85	80	71	92
Roof of New MRF	Lw	91	91	92	88	91	86	85	80	71	92
Door opening of New MRF	Lw	98	101	100	97	101	95	94	89	80	102
Door closed	Lw	93	96	95	92	96	90	89	84	75	97
HGV	Lw	106	109	94	92	93	96	95	91	83	101

5.1.5 For daytime periods the site is assumed to have HGVs moving around the site and doors into the buildings facing west to be open. For calculation purposes HGV movement has been included for a worst case scenario.

5.2 Noise Prediction Modelling

5.2.1 Noise prediction modelling of the site is based on the information detailed in Table 4.1 and 4.2 using CadnaA noise prediction modelling software. The results of the noise mapping are shown below and Appendix 5 (noise maps 1 to 2).

5.2.2 The model utilises ISO9613-2 as the method of calculation for propagation from the building to the receptor. Settings for the noise

model include the following, which is based on industry accepted standards:

Ground effect (Agr) = 0.5 (mixed ground absorption assumed which is a pessimistic assumption due to surrounding topography)
Temperature = 10degC
Humidity = 70%
Height above ground for receiver = 1.5m (daytime)
Maximum order of reflection = 1

5.2.3 Drawings of the site layout and building elevations have been provided and the MRF building assumed height within the noise model would indicate the following:

(i) MRF Building: 10m to 11.5m

5.2.4 The results of the noise predictions are provided below in Table 5.3, which include the assumed building cladding and insulation specification for doors and louvres provided in Table 5.1.

Table 5.3: Noise Prediction Results at Residential Receptors with noise mitigation

Noise Receptor	Predicted Rating Noise Level LAeq dB with mitigation	Representative[2] Background Sound Level LA90 dB	Level Difference [predicted with LA90] dB
Daytime (0700-1800 hours) LAeq dB$_{1\ hour}$			
R1. Shalloak Road (SE)	49[1]	52	-3
R2. No. 3 Shelloak Road (NE)	42[1]	46	-4
R3. Broad Oak Lodge Farm (NE)	42[1]	46	-4
R4. Bicknor Close (SW)	43[1]	46	-3
R5. Folly Farm Gardens (SW)	43[1]	46	-3
R6. Kemsing Gardens (SW)	43[1]	46	-3
R7. Broad Oak Road (SW)	46[1]	53	-7

Note 1: Whilst noise characteristics at receptor locations is not expected, to comply with EA guidelines a +3dB penalty is included in the assessment for robustness. This period also includes HGV movement on Site between 0700-1800 hours Monday-Saturday.
Note 2: Based on a typical weekday period for baseline sound monitoring at NSRs.
Note 3: The above predictions do not allow for any attenuation from the screening effect of the landfill topography, which would be significant in the southwest and northeast directions.

5.2.5 The above table shows the impact relative to BS4142 methodology and shows that the noise contribution is between 6dB to 10dB **lower** than the representative background sound level. The `rating' level is also between 3dB and 7dB **lower** than the representative background sound level.

5.2.6 With the proposed mitigation strategy, the site is not expected to produce any noise character at NSRs. The above `rating' level predictions do however allow for a +3dB noise penalty for noise character as advised by the EA guidelines for robustness.

5.2.7 The results show that the daytime predicted noise levels (according to BS4142: 2014+A1:2019) shows a **low** impact magnitude.

Ecological Receptors

5.2.8 The potential for disturbance to the nearest SSSI designation at edge of West Blean and Thornden Woods has been considered. In terms a minimum disturbance threshold a level of 55 dB $LAeq_{,1hr}$ for general noise was used to represent a minimum disturbance threshold. The results of the noise predictions during MRF operations are provided in Table 5.4.

5.2.9 The predicted noise levels associated with the MRF during the daytime at the ecological receptors with the inherent noise mitigation measures is provided below in Table 5.4.

Table 5.4: Predicted Noise Contribution from Proposed Development (with Inherent Noise Mitigation Measures) at Ecological Receptors

Receptor Position (Refer to Figure 1)	Time Period (0700-2300 hours)	Predicted Noise Level from Site $LAeq_{1hr}$ dB	Residual Sound Levels LAeq	Assessment Criteria [$LAeq_{1hr}$]
R8. Ecological NSRs at nearest SSSI	Daytime	40-44	49	55

5.2.10 The above results show that the Site operational noise would be below the noise level deemed to be considered for any impacts on ecological receptors and would therefore be acceptable.

5.2.11 The above resultant noise levels at the ecological receptors shows no significant impact.

Office Receptors

5.2.12 The predicted daytime levels at the nearest industrial facilities with offices to the southeast (circa 120m) off Broad Oak Road is shown to be circa 50dB LAeq. This is within BS8233:2014 guidance for office environments (external level of circa 55-60dB LAeq with open window).

Noise Limits at Residential Receptors

5.2.13 For noise limits, we would expect that given the residual and background sound levels in the area that the design should aim to achieve a noise contribution that is no higher than the background sound level during daytime operational periods. Additionally, in consideration of the latest EA Guidance `Noise and vibration management: environmental permits': January 2022 the design levels have been lowered by 3dB to allow for noise character.

6.0 CONCLUSIONS

Noise Limits

6.1 In terms of noise limits at NSRs the indicative background noise levels enable us to establish reasonable noise limits based on satisfying appropriate and relevant standards and guidance. The majority of the residential receptors are located at circa 500m or greater distance from the site and therefore the noise contribution from site is relatively low.

6.2 By applying BS4142 methodology, we have assumed that reasonable noise limits at each NSR for daytime operational periods would achieve a `rating' level that does not exceed background sound levels during Site operations. A further reduction of 3dB has been included in the design for noise character to comply with the latest EA guidance on environmental permits which supersedes the previous H3 Horizontal Guidance on noise.

Noise Predictions

6.3 A noise prediction model has been developed based on information from MRF plant library data from similar facilities and information concerning the proposed development. The prediction model used includes the use of ISO9613-2 which is a nationally recognised calculation method to provide good accuracy.

6.4 Within BS4142: 2014 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."

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

(i) A recognised standard for calculation has been used with appropriate settings to give an accurate prediction (i.e. ISO9613-2).
(ii) Input data for the MRF is based on highest likely measured plant noise levels within a reverberant environment.
(iii) Input data for the MRF plant and associated equipment has been based on library data from NVC empirical library based on measurements at other similar sites over the last 10-15 years.
(iv) Detailed layout of the site and elevations for the proposed MRF building have been used to inform the noise model.
(v) Typical manufacturers' data relative to building cladding and doors has been provided for input into the noise model.
(vi) Baseline levels have been recorded by NVC over a weekday period in the vicinity of the most sensitive receptor positions.
(vii) No allowance of additional attenuation has been included from existing landfill topography which is likely to be provide some significant reduction in noise levels towards a southwest and northeast direction.
(viii) An allowance of +3dB has been included for noise character which is not expected to be relevant.

6.6 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. It should be noted that the predominant national wind direction is south to west during the year, which would mean that the wind direction under these conditions would blow away from the most sensitive receptor and therefore provide benefit of wind directivity and assist in reducing noise levels further.

Assessment Results

6.7 The results show no exceedance above relevant noise limits determined from standards, guidance and planning consent noise limits for daytime periods at NSRs.

6.8 Predicted noise levels using typical plant operating noise levels with appropriate noise mitigation would produce levels which would be well within residential amenity and internal guidance levels for habitable rooms and office environments as advised by BS8233: 2014 and produce a low impact magnitude in accordance with BS4142: 2014+A1:2019.

6.9 Noise levels are expected to be below LOAEL levels according to national policy guidelines.

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 – September 2023

7. Planning Practice Guidance – June 2021

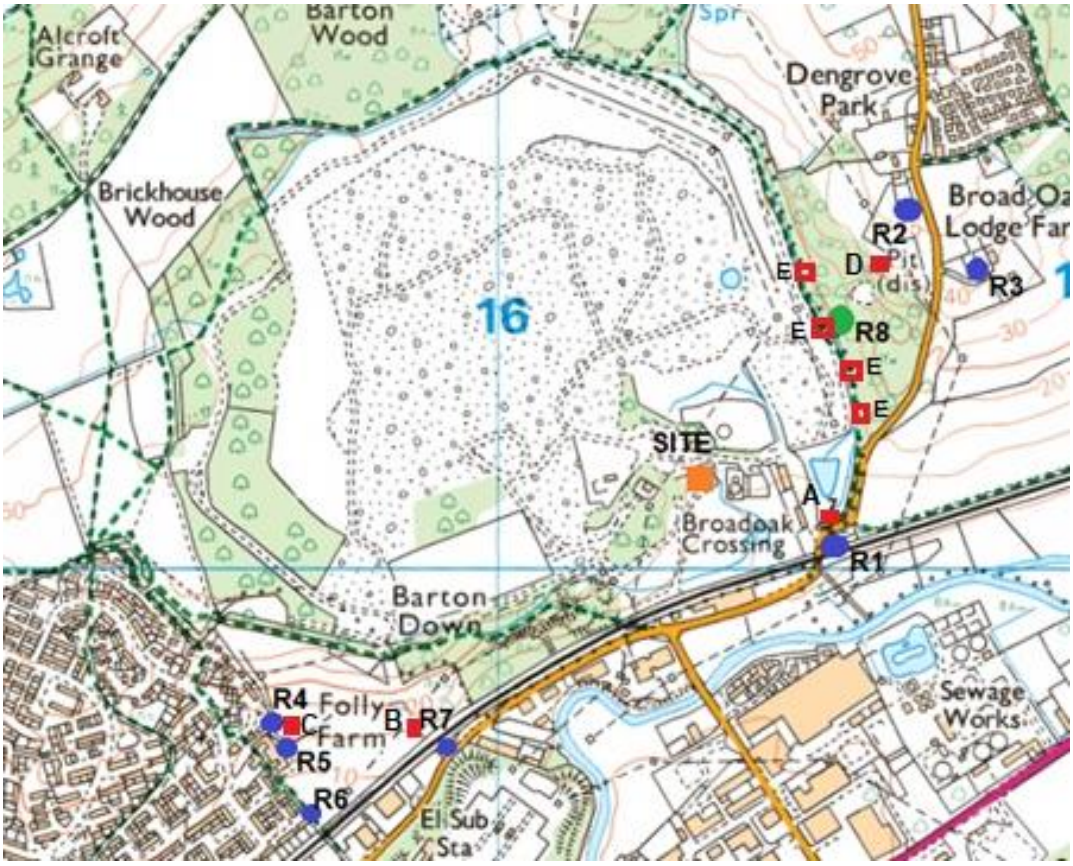
8. Noise Policy Statement for England (NPSE) – March 2010

9. Noise and vibration management: environmental permits (January 2022)

10. Planning Consent Conditions (planning ref: CA/96/794 dated 27th October 1997)

FIGURES

Figure 1: Site location, Baseline Monitoring and Receptor Positions



Baseline Noise Monitoring Positions

Residential Receptor Positions

Ecological Receptor Positions

Figure 2: Site Location

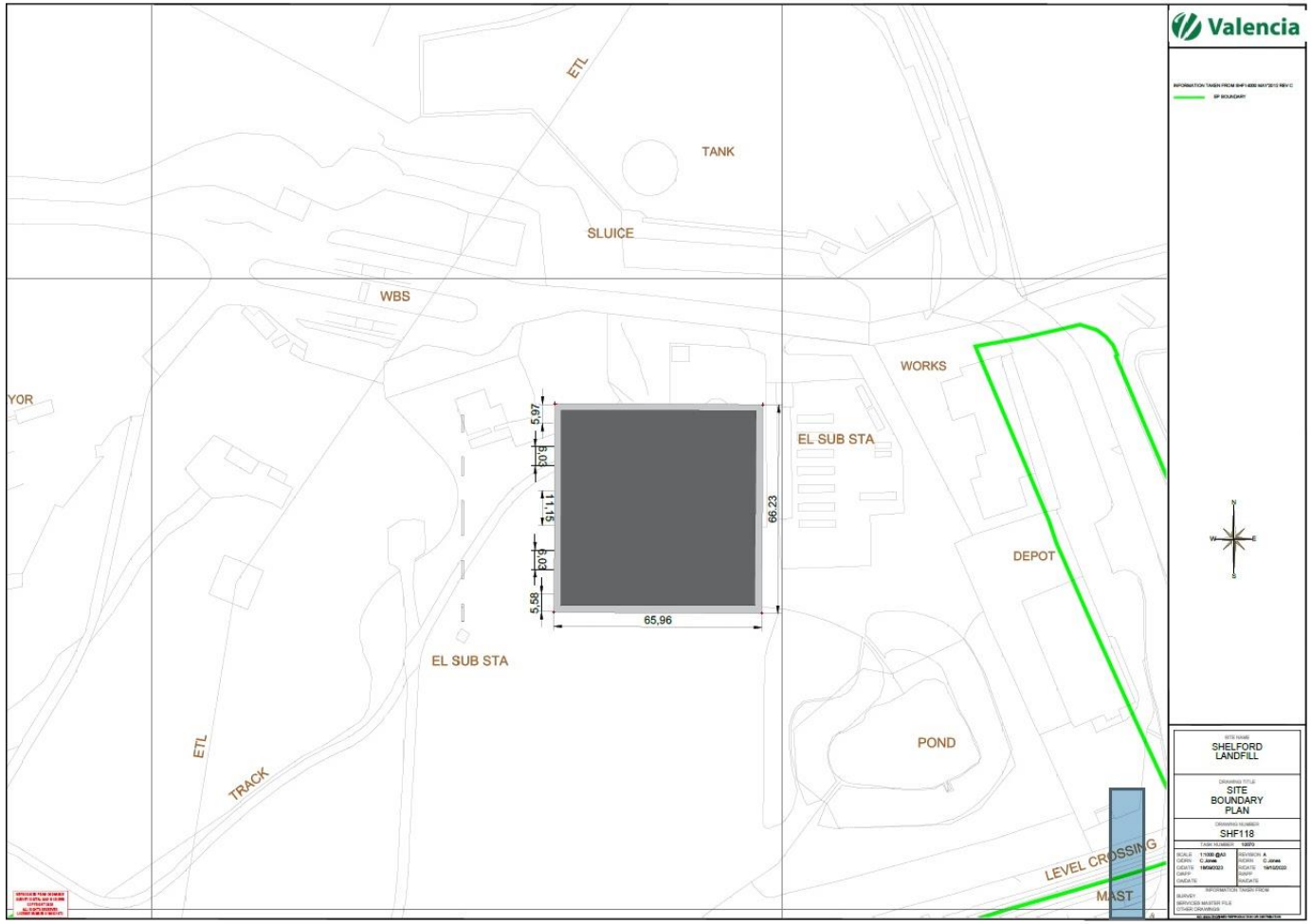


Figure 3: 3D Plan of Site Showing Layout

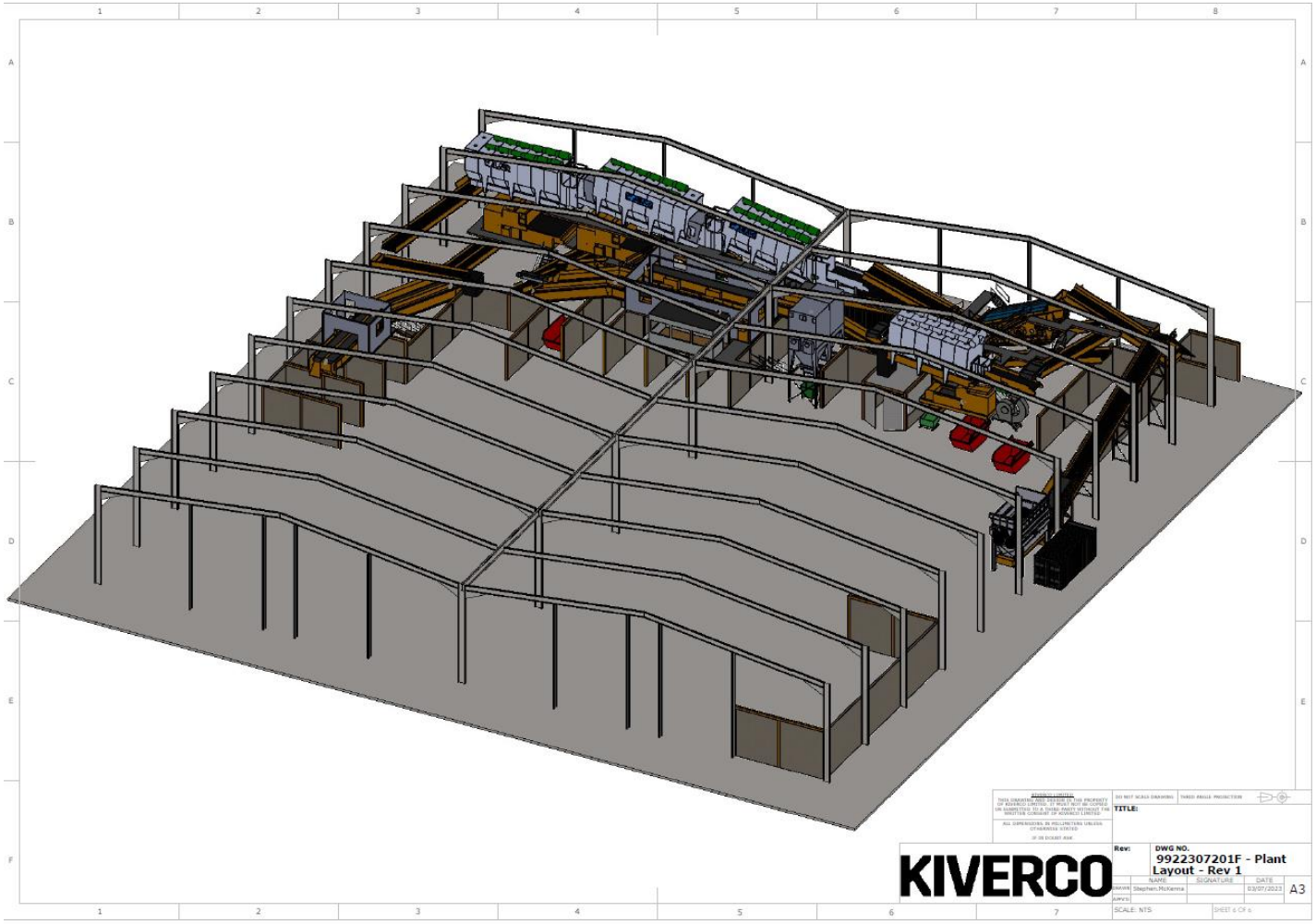
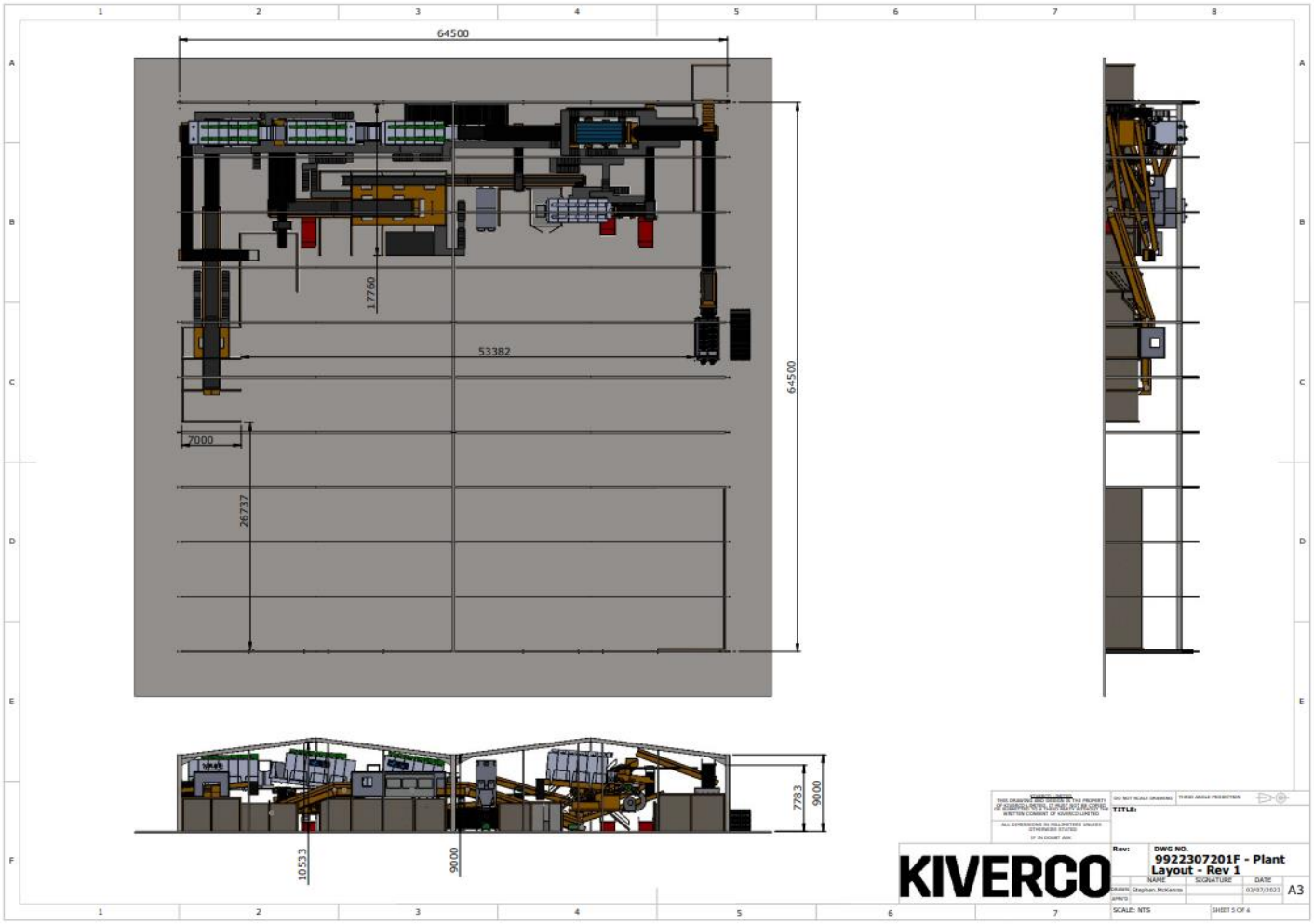


Figure 4: Plan and Elevations of MRF Building



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. An increase of around 10dB is said to subjectively double the sound level. 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

BASELINE SOUND SURVEY METHODOLOGY

BASELINE SURVEY

NOISE INSTRUMENTATION, METHODOLOGY & SURVEY DETAILS

Survey Methodology

Instrumentation and Fieldwork Details

The background sound measurements were undertaken at accessible receptor positions or the closest accessible position or similar distance from local roads relative to the nearest sensitive receptors to identify typical baseline sound levels. The monitoring of residual and background sound was carried out during a weekday period such that the representative background sound levels could be established for the assessment.

The following instrumentation was used for all noise measurements:

November 9th 2023

Manufacturer	*Description*	*Type*	*Calibration Due date*	*Serial No.*
Norsonic	Real Time Analyser	140	February 2024	1405418
Norsonic	Real Time Analyser	118	May 2024	31337
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

The following set-up parameters were used on the sound level meters during noise measurement:

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 9th November 2023
Time Period: 0700 hours to 1530 hours

Meteorological Conditions

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

Generally dry, light south westerly winds (1-2m/s), temperature 8 to 10degC, variable cloud cover with sunny periods. Rain between 0930-1030 hours which was removed from the data set.

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

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.

Static Noise Monitoring:
Time Weighting: Fast
Frequency Weighting: 'A'
Measurement Period: 15-minute intervals

Calibration
Calibration setting: 94dB

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.

Survey Dates and Personnel

Baseline Survey – Thursday 9th November 2023

Mr. D.R. Kettlewell of Noise & Vibration Consultants Limited set up the noise monitoring equipment and removed the equipment after completion of the survey.

Measurements were recorded at four fixed monitoring positions during weekday daytime periods. Data logging of L_{Aeq}, L_{A10}, L_{A90} and L_{Amax} were recorded at 15-minute intervals for information on the variation of sound levels at NSRs.

The noise meters were mounted on a tripod at a height of circa 1.5 metres above ground level and fitted with a wind and rain shield.

Baseline Survey Results

Appendix 3 attached, details all measurements taken showing the resultant levels at the selected measurement positions.

APPENDIX 3

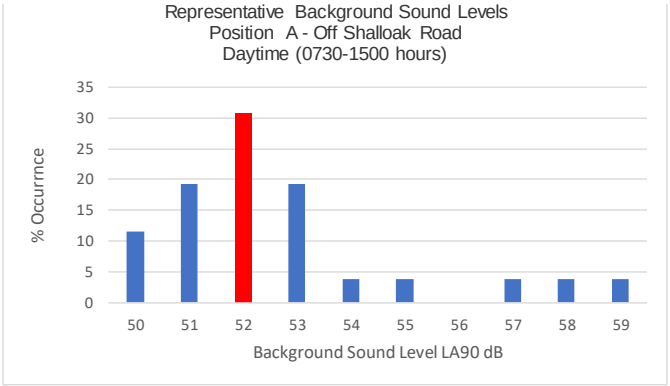
Baseline Survey Results

Noise Survey Results

Date: Thursday 9th November 2023
Location: Shelford Landfill, Broad Oak Road, Canterbury **TABLE 1**
Client: Valencia Waste Management Ltd
Project: MRF Project
Data: **Baseline Sound Levels at Position A - Off Shalloak Road**
Instrumentation: Cirrus Real Time Analyser 171B (G056142)
Calibration: 94dB

Start Time	Run Time (hrs:min	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
07:30	15:00	68.6	71.5	58.3	81.9	
07:45	15:00	68.6	71.7	58.8	79.1	
08:00	15:00	67.2	70.9	52.6	74.5	
08:15	15:00	66.1	70.1	56.7	75.7	
08:30	15:00	66.5	70.3	55.2	74.3	
08:45	15:00	66.8	70.6	52.9	75.7	
09:00	15:00	66.3	70.3	50.9	75.5	
09:15	15:00	65.3	69.8	50.9	78	
09:30	15:00	67	70.8	56.5	83.2	Rain
09:45	15:00	66.8	71.2	54.2	76.7	Rain
10:00	15:00	66.1	70.3	51.4	81.2	Rain
10:15	15:00	65.9	69.8	49.9	86.4	Rain
10:30	15:00	65.6	69.9	49.8	75.3	
10:45	15:00	65.2	69.4	49.5	78.2	
11:00	15:00	65.2	69.3	51.7	76.1	
11:15	15:00	65.6	69.7	52.4	74.2	
11:30	15:00	65.5	69.9	51.7	74	
11:45	15:00	65	69.1	51.9	73.9	
12:00	15:00	65	69.2	51.1	74.4	
12:15	15:00	64	68.7	50.3	73.5	
12:30	15:00	64.7	68.7	51.7	78.7	
12:45	15:00	65.6	69.4	53.4	74	
13:00	15:00	65.2	69.2	52	77.7	
13:15	15:00	65.6	69.5	52.9	80.2	
13:30	15:00	64.9	68.9	51.1	73.3	
13:45	15:00	65.5	69.4	53.4	80.6	
14:00	15:00	64.9	69	50.5	82.2	
14:15	15:00	65.7	69.6	52.2	85.3	
14:30	15:00	65.5	69.4	52.4	75.8	
14:45	15:00	65.7	69.4	53.6	79.9	
Average 0730-1500		**65.9**	**69.7**	**53.3**	**73-85**	Excluding Rain
		Representative		**52.0**		

LA90	% Occurrence
50	11.5
51	19.2
52	**30.8**
53	19.2
54	3.8
55	3.8
56	0.0
57	3.8
58	3.8
59	3.8

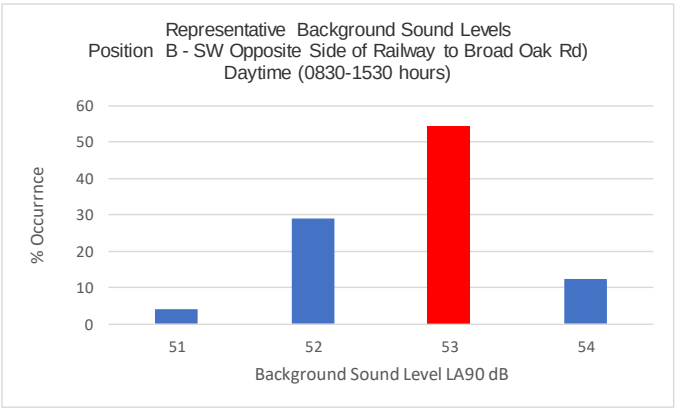


Noise Survey Results

Date: Thursday 9th November 2023
Location: Shelford Landfill, Broad Oak Road, Canterbury **TABLE 2**
Client: Valencia Waste Management Ltd
Project: MRF Project
Data: **Baseline Sound Levels at Position B - SW Opposite side of Railway Line to Broad Oak Rd**
Instrumentation: Cirrus Real Time Analyser CR:1710 (G066350)
Calibration: 94dB

Start Time	Run Time (hrs:mins	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
08:30	15:00	58.3	58.9	54.1	72.3	Distant road traffic & intermittent train
08:45	15:00	55.8	57.1	53.6	71	noise
09:00	15:00	56	57.3	53.2	67.6	
09:15	15:00	54.4	56.2	50.5	64.6	
09:30	15:00	57.4	58.9	54	72.8	Rain
09:45	15:00	58.3	59.4	53.5	80.9	Rain
10:00	15:00	55.5	57.1	53.1	61.4	Rain
10:15	15:00	55.7	57.2	52.2	65.9	Rain
10:30	15:00	55.8	56.7	53.2	70.4	
10:45	15:00	55.4	57	52.6	63.9	
11:00	15:00	55.4	56.8	52.3	68.6	
11:15	15:00	55.5	57.2	52.6	64	
11:30	15:00	55.1	56.6	52.2	65.2	
11:45	15:00	55.2	56.9	52.9	63.8	
12:00	15:00	55.7	57.4	52.9	70.2	
12:15	15:00	56.2	57.7	52.4	71.1	
12:30	15:00	55.3	56.6	52.4	67	
12:45	15:00	55.1	57	51.6	61.6	
13:00	15:00	55	56.6	52.5	59.4	
13:15	15:00	57.6	58.6	53.6	80.2	
13:30	15:00	55.9	56.9	52.7	67.8	
13:45	15:00	58.1	57.3	53.2	71.2	
14:00	15:00	55.4	56.6	52.4	68.5	
14:15	15:00	55.9	57.4	52.5	67.6	
14:30	15:00	55.9	57.3	53	76.3	
14:45	15:00	55.2	56.4	52.2	65.8	
15:00	15:00	55.6	56.9	52.6	67.5	
15:15	15:00	56.1	57.8	53	69.8	
Average 0830-1530		**55.9**	**57.1**	**52.7**	**59-80**	Excluding Rain
		Representative		**53.0**		

LA90	% Occurrence
51	4.2
52	29.2
53	**54.2**
54	12.5

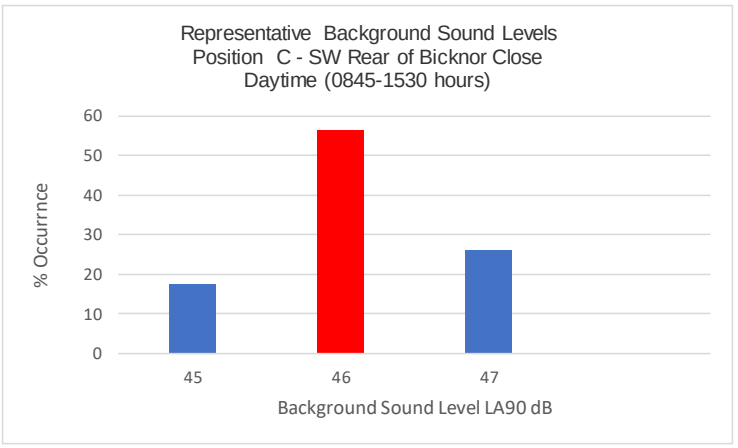


Noise Survey Results

Date: Thursday 9th November 2023
Location: Shelford Landfill, Broad Oak Road, Canterbury **TABLE 3**
Client: Valencia Waste Management Ltd
Project: MRF Project
Data: **Baseline Sound Levels at Position C - SW Rear of Bicknor Close**
Instrumentation: Cirrus Real Time Analyser 171A (G061253)
Calibration: 94dB

Start Time	Run Time (hrs:mins	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
08:45	15:00	50.2	51.6	46.9	68.6	Distant road traffic noise & intermittent
09:00	15:00	49.8	49.9	46.4	67.2	train noise
09:15	15:00	48.4	49.8	45.8	59.9	
09:30	15:00	51.6	52.6	48.4	63.2	Rain
09:45	15:00	51.5	53.4	46.9	71.3	Rain
10:00	15:00	48.4	49.6	46.4	61.5	Rain
10:15	15:00	50.3	50.8	46.6	65.3	Rain
10:30	15:00	48.5	49.5	45.6	62.1	
10:45	15:00	48.7	49.8	45.6	65.3	
11:00	15:00	49.3	49.6	46.7	66.1	
11:15	15:00	48.8	50.4	46.5	61.3	
11:30	15:00	49.5	51.1	45.9	63.4	
11:45	15:00	48.3	49.7	46.5	59.1	
12:00	15:00	49.6	50.6	47.2	64.3	
12:15	15:00	50.2	51	46.8	65	
12:30	15:00	47.9	48.4	45.2	61.8	
12:45	15:00	47.6	49.6	45.4	54.1	
13:00	15:00	50.4	50.9	46	67.9	
13:15	15:00	49.5	49.4	45.4	64.9	
13:30	15:00	48.8	50.1	45.8	63.2	
13:45	15:00	48.2	49.3	46.3	60.7	
14:00	15:00	47.6	48.9	45.8	56.3	
14:15	15:00	48.8	48.9	45.4	65.2	
14:30	15:00	48.9	49.9	45.5	63.4	
14:45	15:00	48.8	50.3	46.1	62.8	
15:00	15:00	49.2	49	45.9	66.2	
15:15	15:00	48.9	50.2	46.4	65.4	
Average 0845-1530		**49.0**	**49.4**	**45.5**	**56-69**	Excluding Rain
		Representative		**46.0**		

LA90	% Occurrence
45	17.4
46	**56.5**
47	26.1

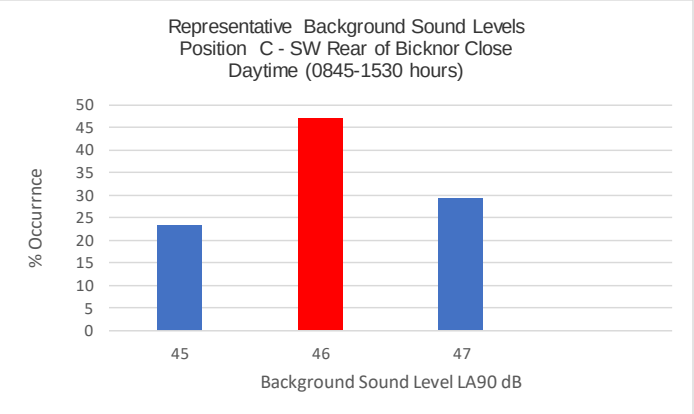


Noise Survey Results

Date: Thursday 9th November 2023
Location: Shelford Landfill, Broad Oak Road, Canterbury **TABLE 4**
Client: Valencia Waste Management Ltd
Project: MRF Project
Data: **Baseline Sound Levels at Position D - NE off Shalloak Road (nr Caravan Park)**
Instrumentation: Norsonic Real Time Analyser 118 (31337)
Calibration: 94dB

Start Time	Run Time (hrs:mins	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
10:30	15:00	48.5	49.5	45.6	62.1	Local road traffic noise generally affects
10:45	15:00	48.7	49.8	45.6	65.3	noise climate
11:00	15:00	49.3	49.6	46.7	66.1	
11:15	15:00	48.8	50.4	46.5	61.3	
11:30	15:00	49.5	51.1	45.9	63.4	
11:45	15:00	48.3	49.7	46.5	59.1	
12:00	15:00	49.6	50.6	47.2	64.3	
12:15	15:00	50.2	51	46.8	65	
12:30	15:00	47.9	48.4	45.2	61.8	
12:45	15:00	47.6	49.6	45.4	54.1	
13:00	15:00	50.4	50.9	46	67.9	
13:15	15:00	49.5	49.4	45.4	64.9	
13:30	15:00	48.8	50.1	45.8	63.2	
13:45	15:00	48.2	49.3	46.3	60.7	
14:00	15:00	47.6	48.9	45.8	56.3	
14:15	15:00	48.8	48.9	45.4	65.2	
14:30	15:00	48.9	49.9	45.5	63.4	
Average 1030-1445		**48.9**	**49.8**	**46.0**	**54-68**	
		Representative		**46.0**		

LA90	% Occurrence
45	23.5
46	**47.1**
47	29.4



Noise Survey Results

Date: Thursday 9th November 2023
Location: Shelford Landfill, Broad Oak Road, Canterbury **TABLE 5**
Client: Valencia Waste Management Ltd
Project: MRF Project
Data: **Baseline Sound Levels at Position E - Spot Roaming - Woodland to NE**
Instrumentation: Norsonic Real Time Analyser 140 (540418)
Calibration: 94dB

Start Time	Run Time (hrs:mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
15:10	05:00	48.5	49.5	45.6	62.1	Distant road traffic noise & landfill mobile plant
15:17	05:00	48.7	49.8	45.6	65.3	Distant road traffic noise & landfill mobile plant
15:19	05:00	49.3	49.6	46.7	66.1	Distant road traffic noise & landfill mobile plant
15:26	05:00	48.8	50.4	46.5	61.3	Distant road traffic noise & landfill mobile plant
Average 0730-1500		**48.8**	**49.8**	**46.1**	**61-66**	

Spot Roaming Noise Measurements At Site

Noise Survey Results

Date: Thursday 9th November 2023
Location: Shelford Landfill, Broad Oak Road, Canterbury **TABLE 6**
Client: Valencia Waste Management Ltd
Project: MRF Project
Data: **Baseline Sound Levels - Spot Roaming - Plant Noise**
Instrumentation: Norsonic Real Time Analyser 140 (540418)
Calibration: 94dB

Start Time	Run Time (mins:secs	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Location
14:39	01:00	57.1	57.5	56.6	58.2	Side boundary of Leachate Facility
14:40	01:00	58.3	57.9	56.5	73.6	Side boundary of Leachate Facility
14:42	01:00	64.2	64.5	63.7	69.7	10m Gas Engine Compound at SW corner
14:45	01:00	52.8	54.1	51.7	55.1	Western boundary of Leachate Facility
14:47	01:00	60	60.5	59.3	60.9	Front of Leachate Facility near plant enclosure
14:48	01:00	74	76.5	68.8	76.9	Pass-by of HGV at 5-10m
14:49	01:00	63.9	64.2	63.6	64.7	At gate of Gas Engine Compound
14:51	01:00	61	61.5	60.5	62.2	Northern boundary of Gas Engine Compound
14:52	01:00	75.1	77.3	70.5	77.8	Pass-by of HGV at 5-10m
14:53	01:00	60.4	60.8	53.8	79.6	Car Park near weighbridge - Landfill at 300m (dozer in view)

APPENDIX 4

TYPICAL MRF OPERATIONAL NOISE LEVELS

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 5

NOISE MODEL SETTINGS & MAPPING RESULTS

INPUT DATA FOR ISO 9613 CALCS

Noise Prediction Model

There are a number of empirical or semi-empirical sound propagation models in common use. One of these is ISO9613-2 which is the International Standard used to predict noise propagation.

The noise levels produced by the MRF plant at each of the nearest sensitive receptors has been calculated using a computer model, which is based on ISO 9613, Acoustics – Attenuation of Sound During Propagation Outdoors [1996]. The propagation model described in Part 2 of the standard provides a method for predicting sound pressure levels.

The computer model utilises octave band frequency data of the noise source to assess and predict the noise contribution with the site in full operation.

The ISO propagation model provides a method for calculating the sound pressure level at a specific position by taking the sound power level radiating from the building facades in frequency bands and subtracting a number of attenuation factors according to the following:

Predicted sound pressure level =

$Lw + D – A_{geo} – A_{gr} – A_{bar} - A_{misc}$

The prediction modelling uses octave band frequency sound power level data calculated in different wall and roof areas of the MRF plant and corrects the level for the following additional propagation factors and attenuation:

Octave band frequency spectra:
Based on empirical noise measurements recorded at a similar site in the UK when under load conditions. The noise levels at specific face positions are provided below that have been used for the noise model.

D – Directivity Factor
The Directivity Index will depend on the radiating surface and whether it is located in free space, at junction of two surfaces or more and the correction factor changes accordingly. Directivity factor is generally = 2.

A_{geo} - Geometrical Divergence
The geometrical divergence of sound waves accounts for the spherical spreading in the free field from a point source resulting in attenuation depending on distance, which relates to the following correction:

$A_{geo} = 20 \times \log (d) + 11$ [where d = distance from the noise source]

Receiver height assumed = Daytime = 1.5m above ground level

A_{atm} - Atmospheric Absorption
When sound energy propagates through the atmosphere it is attenuated as a result of the conversion of the sound energy into heat. The attenuation is dependent upon the relative humidity and the temperature of the air through which the sound energy is travelling. The attenuation is also dependent upon the frequency content of the sound energy with higher levels of attenuation towards higher frequencies.

The attenuation therefore depends upon the distance from the sound source and according to ISO9613 is calculated according to the following formula:

A_{atm} = d x α [Where d = distance from the source
a = atmospheric absorption coefficient in dB/m]

From ISO9613 Part 1 [1996] I have used values of `a' corresponding to a temperature of 10°C and a relative humidity of 70%. This will give an indication of the lowest likely atmospheric attenuation as examples worked at 20deg C and -5deg C indicate a reduction of around -0.5dB(A) on those values calculated. The values for each one-third octave band are given below in table 1.

Table 1: Atmospheric absorption attenuation based on temperature of 10°C and a relative humidity of 70%

Third Octave Band Centre Frequency (Hz)	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**
Atmospheric Absorption Coefficient (dB/km)	0.0785	0.122	0.186	0.28	0.411	0.584	0.797	1.04
Third Octave Band Centre Frequency (Hz)	**315**	**400**	**500**	**630**	**800**	**1k**	**1.25k**	**1.6k**
Atmospheric Absorption Coefficient (dB/km)	1.31	1.6	1.93	2.33	2.87	3.66	4.86	6.73
Third Octave Band Centre Frequency (Hz)	**2k**	**2.5k**	**3.15k**	**4k**	**5k**	**6.3k**	**8k**	**10k**
Atmospheric Absorption Coefficient (dB/km)	9.66	14.3	21.5	32.8	50.2	76.9	117	175

A_{gr} – Ground Effect

Ground Effect for Calcs

G = 0.5 (mixed ground absorption)

The ground effect is a result of the interference of sound reflected by the ground which interferes with the direct sound propagating from the noise source to the receiver. The prediction of the ground effects is relatively complex and is dependent upon a number of factors including ground conditions, source height, receiver height and the propagation height between the source and receiver. The ground conditions are described according to a variable `G' which varies between 0 for `hard' ground and 1 for `soft' ground. Hard ground refers to paving, concrete and any sites with low porosity. Soft ground refers to grassland, trees or other vegetation. I have assumed a ground factor of G = 0.5 to represent a mixed ground absorption to NSR for robustness as the intervening ground is generally formed by grassland and woodland or the landfill site. The actual ground absorption value is likely to be closer to soft (G=1) which would provide a slightly lower noise prediction. I have taken the source height as being the height of the relevant section of building and a receiver height of 1.5 metres for daytime operations.

A_{bar} – Barrier Attenuation

When there is a solid barrier between any noise source and the receiver position the noise level will be reduced. The level of attenuation resulting will depend upon the barrier position, barrier size, receiver position and frequency content relative to the noise source. For the purpose of these calculations, we have included local screening from one building just southeast of the Site which represents the closest industrial unit with an office.

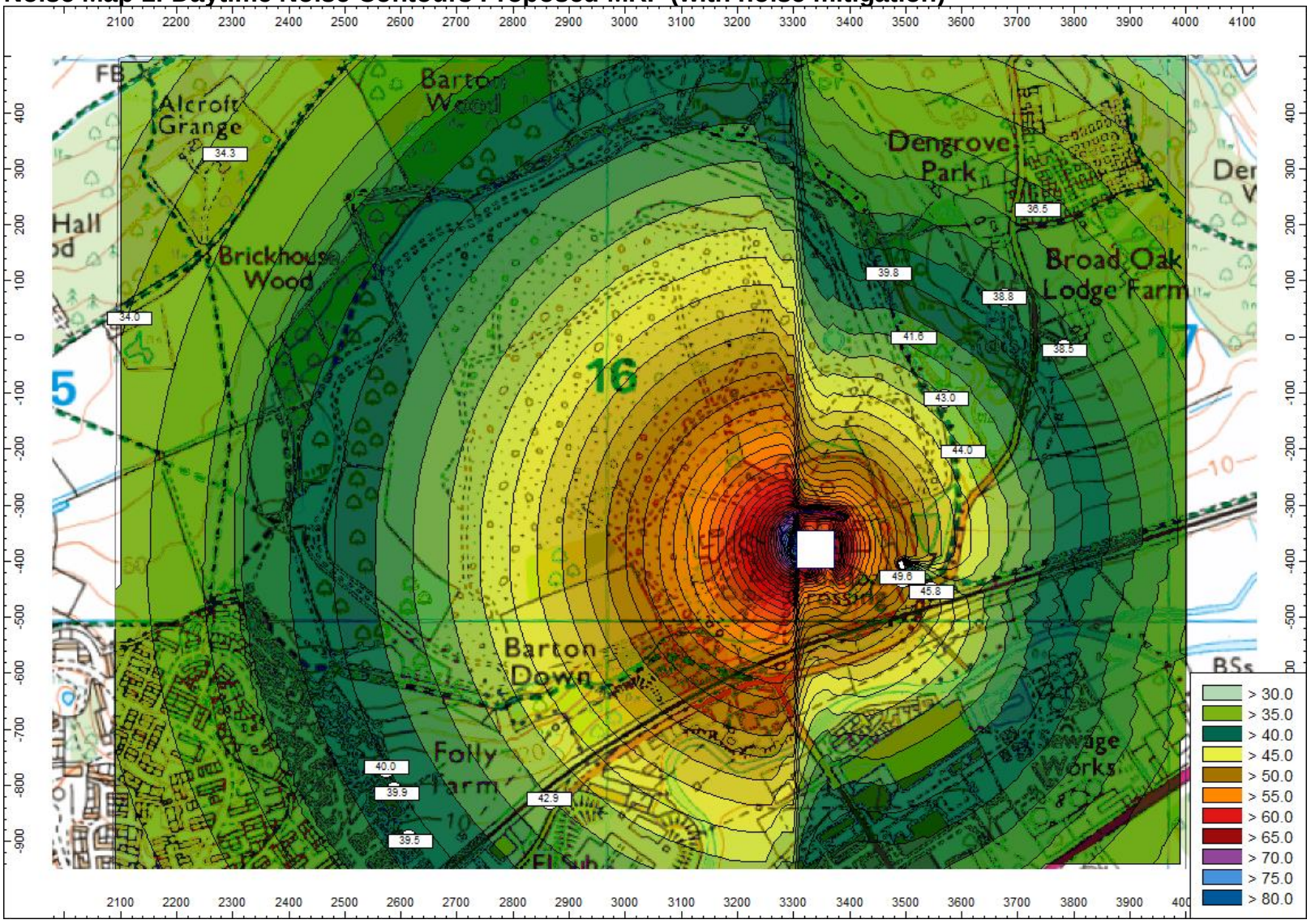
A_{misc} – Miscellaneous Other Effects

This additional attenuation effect described in ISO9613 allows for the effects of propagation through foliage. I have not taken account of any such effects and in my expert opinion they are unlikely to significantly reduce noise levels below those predicted.

Mobile Plant Noise Sources

The noise model allows for HGV movement to and from the MRF building (based on a line source). These are accounted for during the daytime peak operating period based on 17 HGV movements in and out per hour for the MRF facility.

Noise Map 1: Daytime Noise Contours Proposed MRF (with noise mitigation)



APPENDIX 6

CONSULTANT'S EXPERIENCE & QUALIFICATIONS

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

Précis

As Director and Principle 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:

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

Relevant Work Experience

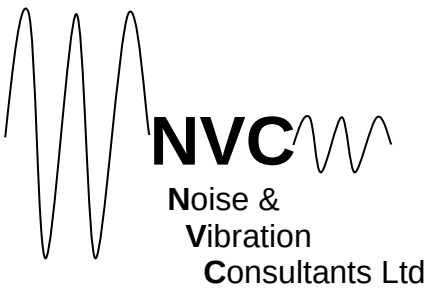
Director & Principal Consultant - Noise & Vibration Consultants Ltd	2001- to date
Senior Acoustic Consultant - Vibrock Limited	1998 - 2001
Associate & Principal Acoustic Consultant - John Savidge & Associates	1994 - 1998
Technical Manager – LBJ Limited (Noise Control Division)	1990 - 1994
Technical Engineer/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