

APPENDIX M

NOISE ASSESSMENT (REPORT REFERENCE R21.11266/2/AP)



Noise Assessment

Environmental Permit Application, Landfilling with Inert Materials, Earls Barton Spinney Quarry, Northamptonshire





BREEDON TRADING LIMITED

**R22.11266/2/AP
Date of Report: 25 February 2022**

REPORT DETAILS

Client	Breedon Trading Limited
Report Title	Noise Assessment – Environmental Permit Application, Landfilling with Inert Materials
Site Address	Earls Barton Spinney Quarry, Grendon Road, Earls Barton, Northamptonshire
Report Ref.	R22.11266/2/AP
Vibrocock Contact	vibrocock@vibrocock.com

QUALITY ASSURANCE

Issue No.	Issue Date	Author	Technical Review
1	18/11/21		
		A Pickford BSc MSc MIOA Director	R Kennedy B.Eng MIOA Director
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		A Pickford BSc MSc MIOA Director	R Kennedy B.Eng MIOA Director

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Vibrocock Limited

Shanakiel
Ilkeston Road, Heanor
Derbyshire, DE75 7DR
Tel: +44 (0) 1773 711211
Fax: +44 (0) 1773 711311
Email: vibrocock@vibrocock.com
Web: www.vibrocock.com

COMPETENCY AND EXPERTISE

The Company

Vibroch Ltd is an established independent environmental consultancy who has been providing noise, dust and vibration consultancy services to industry since 1991. Vibrock Ltd is a member of the Association of Noise Consultants (ANC) and its consultants are Associate or Corporate Members of the Institute of Acoustics (IOA).

The Authors

Andrew Pickford *BSc MSc PgDip MIOA* has undertaken responsible work in noise impact assessment and acoustics since 2006. Andrew specialises in the measurement and assessment of environmental noise for a wide range of applications within the industrial, commercial, residential, waste disposal and mineral extraction sectors. In addition to a diploma in Acoustics and Noise Control, Andrew holds the IOA Certificate of Competency in Environmental Noise Measurement, an MSc in Environmental Management and is a Member of the Institute of Acoustics.

Richard Kennedy *B.Eng PgDip MIOA* has been employed as a Consultant at Vibrock Limited since 2006 and has undertaken responsible work in occupational and environmental noise, dust and vibration assessments for major civil engineering projects, large manufacturing and processing industries and mineral extraction developments. In addition to a diploma in Acoustics and Noise Control, Richard is a Member of the Institute of Acoustics.

NON-TECHNICAL SUMMARY

1. Breedon Group are seeking an Environmental Permit for the deposition of waste on land as a recovery activity for the restoration of Earls Barton Spinney Quarry in Northamptonshire. Vibrock Limited has been commissioned to conduct a noise impact assessment of the proposals.
2. The intended operating hours of the site are Monday to Friday 0700 – 1800 and Saturday 0700 – 1300. The site is accessed from Grendon Road which connects to the A45. It is anticipated that approximately 250,000m³ of inert waste materials will be needed to complete the restoration of Phase 1 and 3.
3. As part of the assessment, environmental noise levels have been measured at locations chosen to represent noise-sensitive premises in the vicinity of the proposed site. This information has been used to characterise the existing acoustic environment.
4. Predicted noise levels from the proposed operations have been calculated at nearby noise-sensitive premises. These predictions are based on detailed information regarding the proposed working of the site and have been undertaken following recommended calculation methods. The proposed development has been assessed with reference to BS 4142 *'Methods for rating and assessing industrial and commercial sound'* in line with Environment Agency stipulations.
5. The outcome of the assessment demonstrates that the proposed scheme is likely to have a 'low impact' in accordance with BS 4142. It is therefore considered that there will be no significant or unacceptable adverse impacts at existing noise-sensitive premises in the vicinity of the site.
6. A range of noise mitigation measures have been recommended to minimise potential noise emissions associated with the proposed waste recovery plan.

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APPENDIX

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1.0 INTRODUCTION

1.1 Overview

- 1.1.1 Vibrock Limited are commissioned to undertake a noise impact assessment in relation to an Environmental Permit application for the deposition of waste on land as a recovery activity for the restoration of Earls Barton Spinney Quarry in Northamptonshire.
- 1.1.2 An assessment of the potential impact of the proposals at identified noise-sensitive premises in the vicinity of the site has been made with reference to the guidance presented within BS 4142.
- 1.1.3 Further explanation of the terminology used within this report is provided in Appendix 1.

1.2 Proposals

- 1.2.1 Earls Barton Spinney Quarry is located approximately 0.3km south-south east of Earls Barton, approximately 0.5km south of Ecton and approximately 1km east of Little Billing which comprises the eastern outskirts of Northampton. The site is accessed from Grendon Road which connects to the A45.
- 1.2.2 The area the subject of the Environmental Permit application is shown on Figure 1.
- 1.2.3 It is anticipated that approximately 250,000m³ of inert waste materials will be needed to complete the restoration of Phase 1 and 3. On site overburden and quarry waste materials are being used to restore the remainder of Phases 1 and 3 together with Phase 2. The restoration scheme is to agriculture and nature conservation interest.
- 1.2.4 It is understood that the proposed operating hours would be Monday to Friday 07:00 – 18:00 and Saturday 07:00 – 13:00.

1.3 Planning Conditions

- 1.3.1 The extant planning permission for Earls Barton Spinney Quarry is ref. 15/00091/MINVOC and WP/15/00791/CRA (the 2016 planning permission) which was granted on 24 February 2016 for the *'Variation of conditions 2 (Approved Documents), 16 (Waste Deposition Phases), 17 (Working Scheme) and 43 (Floodplain Compensatory Storage) of permission ref. no. 10/00066/MINEXT – Earls Barton Spinney Quarry, off Grendon Road, Earls Barton'*.
- 1.3.2 The noise conditions associated with the extant permission are detailed below.

Noise and Dust

25. For the duration of the development hereby permitted site operations shall only be undertaken in accordance with the following requirements:
- a) All plant, equipment and machinery used on site, including vehicles, shall be designed and maintained to reduce noise levels to a minimum and shall be operated in accordance with manufacturers instructions;
 - b) All plant, equipment and machinery used on site, including vehicles, capable of being fitted with silencers, baffles, cladding or rubber linings shall be so fitted and maintained; and,
 - c) The site shall be worked in accordance with the measures set out in Part 1, Section 5 of the British Standard 5228: 1997 "Noise Control on Construction and Open Site". The equivalent sound level (L_{Aeq}), measured over any 1 hour time period, attributable to the normal operations on site, as measured free field shall not exceed 55 dBA ($1hrL_{Aeq}$) at Appleton's Place, Fairacres, The Gatehouse, Dunkleys and Eden House.
26. Monitoring of noise from the mineral extraction operations within the quarry at the above locations shall be undertaken following notification of this requirement in writing by the Mineral Planning Authority for a period of 1 hour during operational phases. Monitoring shall include assessment and management of dewatering pumps during all periods of their operation.
27. The results of the noise monitoring shall be submitted to the Mineral Planning Authority when required and shall include the following information:
- a) The measured L_{Aeq} (free field) level in dB(A)
 - b) Date and time of measurement
 - c) Description of site activity
 - d) Details of measuring equipment
 - e) Weather conditions, including wind speed and direction

Reason for conditions 25 – 27: To safeguard the amenity of the area and of the local residents (Policy 22 of the Minerals & Waste Local Plan (October 2014)).

2.0 GUIDANCE

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

2.1.1 This British Standard was amended in June 2019. BS 4142:2014+A1:2019 supersedes BS 4142:2014, which is withdrawn.

2.1.2 This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- 1) sound from industrial and manufacturing processes;
- 2) sound from fixed installations which comprise mechanical and electrical plant and equipment;
- 3) sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- 4) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

2.1.3 The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

2.1.4 This standard is intended to be used for the purposes of:

- a) investigating complaints;
- b) assessing sound from existing, proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and
- c) assessing sound at proposed new dwellings or premises used for residential purposes.

2.1.5 This standard is not intended to be applied for the following purposes:

- The determination of noise amounting to a nuisance;
- The assessment of indoor sound levels;
- The assessment of low-frequency noise;
- The assessment of sound from the passage of vehicles on public roads and railway systems;

- The assessment of sound from recreational activities, including all forms of motorsport;
- music and other entertainment;
- shooting grounds;
- construction and demolition;
- domestic animals;
- people;
- public address systems for speech;
- The assessment of sound from other sources falling within the scopes of other standards or guidance.

2.1.6 The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. When making assessments and arriving at decisions it is essential to place the sound in context.

2.1.7 The sound level from a source when determined as a discrete entity, distinct and free of other influences contributing to the ambient sound, is referred to as the 'specific sound level'. The specific sound level is evaluated, at an identified assessment location, over the appropriate reference time interval which is as follows:

- 1 hour during the daytime (07:00 – 23:00); and
- 15 minutes during the night-time (23:00 – 07:00).

NB. The shorter reference time interval at night means that short duration sounds with an on time of less than 1 hour can lead to a greater specific sound level when determined over the reference time interval during the night than when determined during the day.

2.1.8 The specific noise may be subject to an acoustic character correction if the noise level at the assessment location is subjectively considered to exhibit certain acoustic features that could increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level.

2.1.9 This standard requires the assessor to 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. Such features are taken into account by applying the following corrections to the specific sound level to obtain the rating level as follows:

Subjective Prominence	Tonality	Impulsivity	Intermittency	Other Sound Characteristic (neither tonal, nor impulsive, nor intermittent)
Just Perceptible	+2 dB	+3 dB	-	-
Clearly Perceptible	+4 dB	+6 dB	-	-
Highly Perceptible	+6 dB	+9 dB	-	-
Readily Distinctive Against Residual Environment	-	-	3 dB	3 dB

2.1.10 If characteristics likely to affect perception and response are present in the specific sound, within the same reference period, then the applicable corrections ought normally to be added arithmetically. However, if any single feature is dominant to the exclusion of the others then it might be appropriate to apply a reduced or even zero correction for the minor characteristics. The rating level is equal to the specific sound level if there are no such features present or expected to be present.

2.1.11 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level, and consider the following.

- 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 or more 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.

2.1.12 Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

- 1) The absolute level of sound.
- 2) The character and level of the residual sound compared to the character and level of the specific sound.

3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

- i) façade insulation treatment;
- ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
- iii) acoustic screening.

2.1.13 Response to sound can be subjective and is affected by many factors both acoustic and non-acoustic. The significance of its impact, for example, can depend on such factors as the margin by which a sound exceeds the background sound level, its absolute level, time of day and change in the acoustic environment, as well as local attitudes to the source of the sound and the character of the neighbourhood. This edition of the standard recognises the importance of the context in which a sound occurs.

2.2 BS 8233:2014 Guidance on sound insulation and noise reduction for buildings

2.2.1 This Standard provides guidance for the control of noise in and around buildings and is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.

2.2.2 For dwellings, the main considerations are:

- a) for bedrooms, the acoustic effect on sleep; and
- b) for other rooms, the acoustic effect on resting, listening and communicating.

2.2.3 It is desirable that the internal ambient noise level does not exceed the following guideline values.

Table 8: Indoor ambient noise levels for dwellings (From Table 4 of BS 8233)

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

2.2.4 For traditional external areas that are used for amenity space, such as gardens, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$.

2.3 World Health Organisation (WHO)

- 2.3.1 The World Health Organisation ‘*Guidelines for Community Noise*’ 1999 aims to provide environmental health authorities and professionals with guidance on the adverse health effects of community noise on people.
- 2.3.2 This document presents a summary of research and opinions on the impacts of noise and recommends guideline values for avoidance of particular effects e.g. annoyance and sleep disturbance. It is the primary reference point for other guidance value based documents, such as BS 8233.
- 2.3.3 The following guideline values have been derived according to specific environments. The values relevant to residential development are shown in the table below.

Specific Environment	Critical Health Effect(s)	L _{Aeq} (dB)	Time base (hrs)	L _{Amax,f} (dB)
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	
Inside bedrooms	Sleep disturbance, night-time	30	8	45

2.4 Environment Agency Guidance: Noise and Vibration Management (2021)

- 2.4.1 Operators (or permit applicants) must consider the potential noise impact of their site. They may need to carry out noise impact assessments:
- at the permit application stage
 - when applying to vary a permit
 - to comply with specific permit conditions
- 2.4.2 Where noise is possibly causing an impact, the operator must carry out an assessment to determine:
- the level of impact
 - how much work needs to be done to prevent or minimise noise pollution
- 2.4.3 Operators must prevent significant pollution and also comply with the requirements to use ‘appropriate measures’ (Waste Framework Directive 2018/851) or ‘best available techniques’ (BAT) to prevent or minimise noise pollution.

- 2.4.4 For assessment purposes, 'BS 4142: Methods for rating and assessing industrial and commercial sound' must be used to quantify the level of environmental noise impact from industrial processes.
- 2.4.5 For any particular case, the environment agencies have to decide whether or not the operator is causing (or are likely to cause) unacceptable noise pollution, even if appropriate measures are used.
- 2.4.6 It is the responsibility of the operator to avoid significant pollution and to demonstrate the use of BAT or appropriate measures to prevent, or where that is not practicable, to minimise noise impact.

3.0 BACKGROUND NOISE SURVEY

3.1 Survey Methodology

3.1.1 Background noise levels were measured on Tuesday 7 September 2021 at locations selected to represent noise-sensitive premises in the vicinity of the site.

3.1.2 During the survey, no noise generating operations were occurring at Earls Barton Spinney Quarry.

3.1.3 The assessment locations used for the purpose of this study are shown in Figure 2.

3.2 Instrumentation

3.2.1 Monitoring was undertaken using the following equipment.

Manufacturer	Type	Serial No.	Date of last calibration
Norsonic	Class 1 Precision Sound Analyser Nor140	1403165	06/11/2020
Norsonic	Class 1 Sound Calibrator Type 1251	34488	06/11/2020

3.2.2 During all measurements the microphone was protected with an outdoor windshield and mounted on a tripod.

3.2.3 The monitoring positions were 'free field' (no vertical reflective surfaces within 3.5 metres of the microphone) and at a height of between 1.2 – 1.5 metres above ground level.

3.2.4 The following set-up parameters were used:

- Time Weighting: Fast
- Frequency Weighting: A
- Averaging-Integrating Period: 20 minutes

3.2.5 With the equipment set up in the configuration used during measurement, field calibration checks were performed on site immediately before and after the survey period using a sound calibrator. No significant drift (i.e. no greater than ± 0.5 dB) in the calibration value was observed between the initial and final checks.

3.3 Observations

- 3.3.1 The acoustic environment in the vicinity of the site predominantly comprises noise from distant and local road traffic, along with occasional aircraft movements and birdsong.
- 3.3.2 Weather conditions during the survey were dry and settled with average wind speeds of $1 - 2 \text{ ms}^{-1}$ and predominantly from a south-south-easterly direction. Cloud cover varied between 0 and 2 oktas, relative humidity was in the region of 50 - 75% and temperatures ranged from $18 - 27^{\circ}\text{C}$.
- 3.3.3 Winds speeds were quantified at each monitoring location using a Munro IM161 Anemometer, temperature and relative humidity were measured at the start and end of the survey period using a Precision Gold N18FR meter and cloud cover was visually estimated by eye.

3.4 Results

- 3.4.1 The measurement data collected during the survey is presented in Table 1 and summarised below.

Noise-Sensitive Premises	Background Noise Level $L_{A90,1h}$ (dB)
High Street, Ecton	45
Dwelling Adjacent to Whites Nurseries	49
Holdenby Lane, Earls Barton	49
Appletons Place, Grendon Road	47
Fairacre, Station Road	42
Eden House / The Gatehouse	40
Cogenhoe Mill Holiday Park	35

4.0 POTENTIAL NOISE EMISSIONS

4.1 Introduction

4.1.1 The level of noise in the local environs that arises from a site will depend on a number of factors. The more significant of which are:

- (a) the sound level output 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 of screening due to barriers;
- (e) the reflection of sound;
- (f) soft ground attenuation.

4.1.2 Noise levels from operations associated with the Waste Recovery Plan have been calculated at the identified assessment locations based on the following methodologies and assumptions.

4.2 Calculation Methodology

4.2.1 In order to assist in the calculation of predicted noise levels from the proposed inert landfill activities, CadnaA noise modelling software has been used. The noise prediction software has been configured to undertake the noise calculations in accordance with ISO 9613 '*Acoustics - Attenuation of sound during propagation outdoors*'. Noise model configuration details are outlined in Table 2.

4.2.2 Within the model, HGV movements have been modelled as line sources. Point sources have been used to represent stationary noise sources such as pumps and quasi-stationary activities such as the tipping of inert materials and the inspection and spreading of materials by a dozer.

4.2.3 For all noise prediction calculations, the ground absorption coefficient has been estimated according to the combination of soft and hard ground conditions present between the source and receiver position. 'Soft' ground is taken to refer to surfaces which are absorbent to sound, e.g. grassland, cultivated land or plantations as opposed to 'hard' ground surfaces which reflect sound such as paving, asphalt and surface water.

4.2.4 The modelling software predictions assume conditions favouring sound propagation from source to receiver. The ISO 9613 calculation methodology assumes wind direction with $\pm 45^{\circ}$ of the direction connecting the centre of the dominant sound sources and the centre of the specified receptor region, together with wind speeds of between $1 - 5 \text{ ms}^{-1}$. It should therefore be noted that in practice the eventual longer-term measured levels are invariably lower than predicted levels due to the temporal variation in meteorological conditions.

4.2.5 Sound levels have been predicted within private external amenity areas at a height of 1.5 metres above ground level and at least 3.5 metres from any reflecting surface other than the ground. The predictions made by the modelling software are for ‘free-field’ sound levels to allow for an appropriate comparison with the free-field background sound levels measured during the survey.

4.2.6 The convention applied within BS 4142, and throughout this report, is that all measured or calculated numbers are rounded to the nearest whole number with 0.5 being rounded up.

4.3 Noise Source Details

4.3.1 Information regarding the proposed working of the site has been based on discussions with the applicant along with proposed development plans.

4.3.2 A list of noise generating plant and activities, from which the noise predictions have been made, is presented in Table 3 along with a number of assumptions regarding typical operating times and vehicle movements. The sound level data used to represent each proposed noise source has been taken from Vibrock’s extensive sound level database which contains measurements of noise generating plant and activities operating at similar waste/quarry sites across the UK.

4.3.3 The location of each modelled noise source is presented in Table 4. The locations represent a worst-case situation relative to each identified noise-sensitive receptor.

4.4 Calculation Results

4.4.1 The following table summarises the results of the noise level predictions at the identified assessment locations.

Assessment Location	Calculated Specific Sound Level $L_{Aeq,1h}$ (free-field) dB
High Street, Ecton	35
Dwelling Adjacent to Whites Nurseries	36
Holdenby Lane, Earls Barton	34
Appletons Place, Grendon Road	45
Fairacre, Station Road	35
Eden House / The Gatehouse	29
Cogenhoe Mill Holiday Park	28

5.0 ASSESSMENT

5.1 This assessment has been undertaken with reference to the guidance provided within BS 4142.

5.2 This standard requires the following levels to be established:

- The Background Sound Level
- The Specific Sound Level
- The Rating Level

Background Sound Level

5.3 BS 4142 requires the quantification of typical background sound levels at locations representing the noise-sensitive receptors. The results of the survey are presented in Section 3 of this report.

Specific Sound Level

5.4 The specific sound level has been determined by calculation following the guidance within Section 7 of BS 4142. The method of calculation is explained in Section 4 of this report.

Rating Level

5.5 In determining the Rating Level it is recognised that certain acoustic features can increase the significance of noise impact.

5.6 Noise from the proposed landfill operations are not considered to be significantly tonal, impulsive or intermittent at noise sensitive premises in the vicinity of the site, however, the sound is considered to contain occasionally discernible characteristics at Appletons Place due to its relatively close proximity to the proposed site access. In accordance with BS 4142, it is therefore considered appropriate to apply a correction of + 3 dB to the calculated specific sound levels to account for the presence of these other characteristics which could at times be perceptible at Appletons Place.

5.7 At all other noise-sensitive premises it is considered that any acoustic features associated with the proposed operations are unlikely to be discernible and therefore, in accordance with BS 4142, no acoustic feature correction is considered necessary.

Initial Estimate of Impact

5.8 The tables below present an ‘initial estimate’ of the potential impact of the proposals in accordance with BS 4142.

Assessment Location	Background Sound Level ($L_{A90,15min}$ dB)	Specific Sound Level ($L_{Aeq,1h}$ dB)	Acoustic Feature Correction (dB)	Rating Level ($L_{Ar,Tr}$ dB)	Initial Estimate Excess of rating over background sound level (dB)
High Street, Ecton	45	35	0	35	-10
Dwelling Adjacent to Whites Nurseries	49	36	0	36	-13
Holdenby Lane, Earls Barton	49	34	0	34	-15
Appletons Place, Grendon Road	47	45	+3	48	+1
Fairacre, Station Road	42	35	0	35	-7
Eden House / The Gatehouse	40	29	0	29	-11
Cogenhoe Mill Holiday Park	35	28	0	28	-7

5.9 Typically, the greater the difference between the rating level and the background sound level, the greater the magnitude of the impact.

5.10 BS 4142 states that where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact. A difference of around +5 dB is likely to be an indication of an adverse impact. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

5.11 It should be noted that the initial estimate is not to be considered in isolation and due regard to the following sections on context and uncertainty should also be made.

Context

5.12 In addition to the initial estimate of noise impact which has determined the excess of rating level over background sound level, the following should also be considered as part of the impact assessment process:

- *Operational Period* – The noise sources under assessment will operate during the daytime only when there is a lower likelihood of adverse impact compared to operations during more sensitive periods such as the evening, night-time or early morning.
- *Character of the Sound* – As part of the assessment the potential character of the sound has been assessed and an acoustic feature correction applied accordingly in accordance with BS 4142. The existing acoustic environment around the site is influenced predominantly by road traffic but also comprises a range of other industrial and commercial sound sources including HGV movements and the operation of fixed and mobile plant. Overall, the character of the sound from the proposed scheme is not considered incongruous with the existing acoustic environment which whilst relatively steady, includes regular events of a significantly higher level than that predicted from the proposed scheme.
- *Absolute Level of Sound* – In some circumstances, absolute noise levels can be as, or more, relevant than the margin by which the rating level exceeds the background. Worst-case rating levels are not expected to exceed 48 dB and noise emissions from the site are therefore considered likely to have a low impact on residents using private external amenity areas during the daytime. The predicted external noise levels are all within the guide values recommended by BS 8233 and World Health Organisation Guidelines.
- *Assessment Approach* – The noise level predictions represent a worst-case operating scenario with all significant items of noise generating plant and activities occurring simultaneously and at the closest point to each assessment location. This situation may occur on an occasional basis over the lifetime of the site, but longer term noise levels perceived outside of the site boundary would normally be significantly less.
- *Planning Permission* – The extant planning permission associated with the site specifies a noise limit of 55 dB at noise-sensitive premises. This assessment has demonstrated that potential noise emissions from the proposed waste operations are likely to be significantly below this limit to the extent that any contribution from the proposed landfill works would not result in an exceedance of the planning condition limits. The permission also contains conditions which require the routine monitoring of noise from the site.

Uncertainty

5.13 Whilst it is accepted that uncertainty can occur throughout all aspects of the noise measurement and assessment process, the approach undertaken at all stages has been adopted with the aim of reducing uncertainty via the implementation of good practice. During this process reference has been made to BS 4142 Annex B '*Consideration of uncertainty and good practice for reducing uncertainty*'.

5.14 The following list details the key steps taken to reduce uncertainty:

- Background sound level measurements were made in close proximity to the assessment locations and were fully attended to ensure that the acoustic environment was accurately characterised. No operations were occurring on the site during the survey;
- Measurement procedures were in accordance with Section 6 of BS 4142 including precautions against interference such as unsuitable weather conditions;
- Site noise levels were determined by calculation with reference to Section 7 of BS 4142 and utilising the methodology outlined within ISO 9613 which is a widely accepted standard for the calculation of outdoor sound propagation;
- Operations during the on-site sample measurements at similar sites were considered to be representative of typical operating conditions and the measurement durations were considered to be representative of any longer term fluctuations in the specific sound. The influence of sound from other sources was minimised by measuring at times when the residual sound had subsided to a relatively low level;
- The instrumentation used was in accordance with Section 5 of BS 4142. Use of digital transfer methods and equipment whose conformity and calibration have been checked periodically.

6.0 NOISE CONTROL RECOMMENDATIONS

6.1 The following noise control measures should be considered during the implementation of the proposed scheme to demonstrate best practice and minimise the potential impact at noise-sensitive receptor locations within the vicinity of the site:

- (a) Adhere strictly to the stated operating hours of the site and ensure that site working hour restrictions are effectively communicated to all site staff and subcontractors;
- (b) All plant and equipment should comply with the relevant statutory requirements regarding noise emissions;
- (c) Audible reversing warning systems on mobile plant and vehicles should be of a type which, whilst ensuring that they give proper warning, has a minimum noise impact on persons outside sites;
- (d) Ensure machinery is regularly well maintained and where appropriate fitted with exhaust silencers. Any defective items should not be used. Regular inspections of plant should be undertaken to identify any faults or wear and tear that may be resulting in excessive noise;
- (e) Minimise drop heights of materials;
- (f) Plant and vehicles should be started up sequentially rather than all together. Any period of idling required to warm up mobile plant at the start of the working day should be undertaken in locations away from residential premises;
- (g) Unnecessary horn usage, revving of engines and aggressive accelerating/braking should be avoided.
- (h) Equipment should be switched off or throttled down to a minimum when not required. Any covers, panels or enclosure doors to engines should be kept closed when the equipment is in use;
- (i) Where reasonably practicable, noisy equipment should be located as far from sensitive premises as possible. Plant from which the noise generated is known to be particularly directional should, wherever practicable, be orientated so that the noise is directed away from noise-sensitive areas;
- (j) Keep internal vehicle routes clear and well maintained. Avoid steep gradients and the use of speed bumps where possible. Regularly inspect routes for potholes and repair as necessary;
- (k) Operatives should be trained to employ appropriate techniques to keep site noise to a minimum, and should be effectively supervised to ensure that best working practice in respect of noise minimisation is followed. All operational staff and contractors should be responsible for reporting any noise problems immediately to the site supervisor.

7.0 SUMMARY

- 7.1 An assessment of potential noise impact associated with the proposed permit application has been made following the guidance presented within BS 4142.
- 7.2 Following an initial estimate of noise impact, along with consideration of the context and any potential effects of uncertainty, the implementation of the Waste Recovery Plan is considered likely to have a ‘low impact’ in accordance with BS 4142.
- 7.3 It is therefore considered that there will be no significant or unacceptable adverse impacts at existing noise-sensitive premises in the vicinity of the site. A range of recommendations have been made to minimise potential noise emissions associated with the proposed waste operations.

8.0 REFERENCES

1. ANC Guidelines: *Environmental Sound Measurement Guide*. ANC. May 2021.
2. BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*, British Standards Institution 2019.
3. BS 7445-1:2003 *Description and measurement of environmental noise – Part 1 Guide to quantities and procedures*. British Standards Institution 2003.
4. *Guidelines for Environmental Noise Impact Assessment*, v1.2. Institute of Environmental Management & Assessment. November 2014.
5. *Guidance: Noise impact assessments involving calculations or modelling*. Environment Agency. November 2019.
6. *Guidance: Noise and vibration management: environmental permits*. Environment Agency. July 2021.
7. *Guidance: Risk assessments for your environmental permit*. Environment Agency and Department for Environment, Food and Rural Affairs. March 2021.
8. ISO 9613-2:1996 *Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation*.

FIGURE 1

Application Site Plan

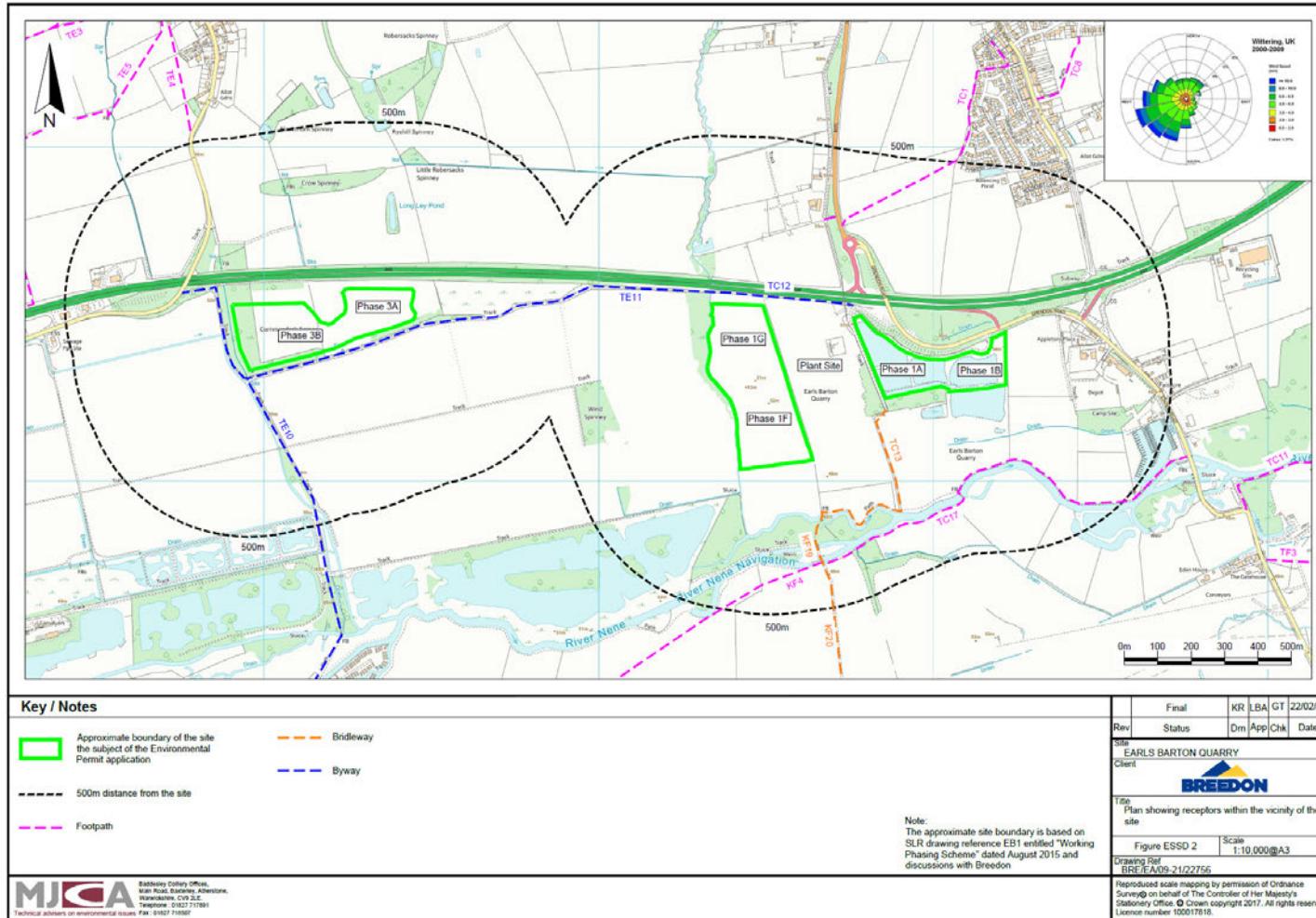
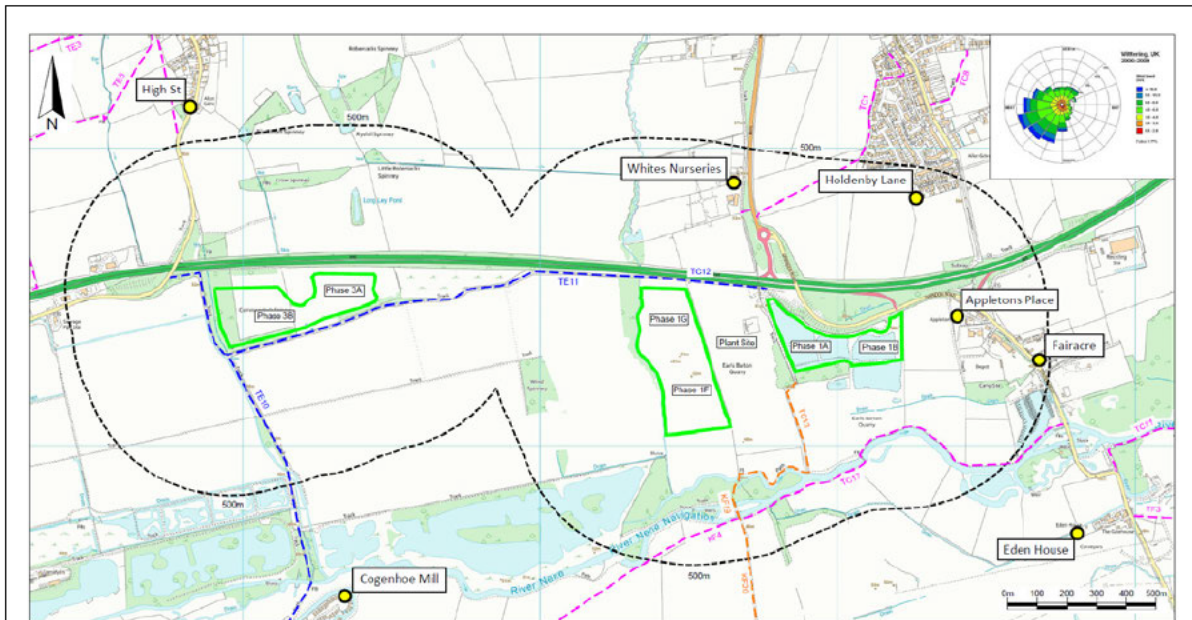


FIGURE 2

Noise Sensitive Receptor Location Plan



Receptor	X (m)	Y (m)	Z (m)
High Street, Ecton	482855.0	263129.9	79.3
Dwelling Adjacent to Whites Nurseries	484655.6	262901.5	56.0
Holdenby Lane, Earls Barton	485253.3	262827.4	59.5
Appletons Place, Grendon Road	485385.3	262439.7	53.5
Fairacre, Station Road	485666.8	262299.6	49.5
Eden House / The Gatehouse	485807.9	261714.0	48.3
Cogenhoe Mill Holiday Park	483364.1	261507.2	50.5

TABLE 1

Background Sound Level Data

Location	Date and Start Time	Duration (T)	L _{Aeq, T} dB	L _{A90, T} dB
High Street, Ecton	07/09/2021 08:21	20 min	50.5	44.6
	07/09/2021 11:24	20 min	54.6	44.7
	07/09/2021 14:14	20 min	52.1	44.4
	Average	1 hour	53	45
Holdenby Lane, Earls Barton (also representing Dwelling Adjacent to Whites Nurseries)	07/09/2021 08:58	20 min	51.5	48.5
	07/09/2021 11:58	20 min	53.0	50.3
	07/09/2021 14:49	20 min	51.5	49.5
	Average	1 hour	52	49
Appletons Place, Grendon Road	07/09/2021 09:26	20 min	56.7	47.4
	07/09/2021 12:25	20 min	58.9	46.5
	07/09/2021 15:14	20 min	54.0	46.5
	Average	1 hour	57	47
Fairacre, Station Road	07/09/2021 09:52	20 min	63.6	39.5
	07/09/2021 12:49	20 min	62.5	41.8
	07/09/2021 15:37	20 min	62.7	43.2
	Average	1 hour	63	42
Eden House / The Gatehouse	07/09/2021 10:18	20 min	57.4	40.1
	07/09/2021 13:14	20 min	57.7	38.9
	07/09/2021 16:02	20 min	59.7	40.5
	Average	1 hour	58	40
Cogenhoe Mill Holiday Park	07/09/2021 10:50	20 min	44.6	35.1
	07/09/2021 13:42	20 min	42.2	34.2
	07/09/2021 16:30	20 min	41.1	34.6
	Average	1 hour	43	35

Note

The background sound level (L_{A90}) at each monitoring location, for the purposes of this assessment, was determined by arithmetically averaging the disaggregated L_{A90,20min} measurement data collected during the survey.

TABLE 2

Noise Model Configuration Details

Parameter	Input
Software	DataKustik GmbH CadnaA 2021 MR2 (build: 187.5163)
Calculation Standards/Guidelines	ISO 9613
Model of Terrain	Triangulation
Max. Order of Reflection	2
Ground Absorption	0.9
Ground Attenuation	Spectral
Receiver Heights	1.5m above ground level
Topographic data	DTM 1m LiDAR (3D contours)
Frequency Band Calculation	Octave Bands (63Hz – 8kHz)
Temperature	10°C
Relative Humidity	70%

TABLE 3

Noise Source Model Inputs

Plant/Activity	Type	Octave band sound levels (dB)								A-weighted Sound Level dB(A)	Data Source	Source Height (relative to ground)	On-time Assumptions (relative to reference time interval)
		63	125	250	500	1k	2k	4k	8k				
Dozer	L _w	108	107	106	103	101	98	97	94	106	Measured at similar site	2.0m	75%
Tipping	L _w	102	106	106	99	100	96	91	85	104	Measured at similar site	1.5m	25%
Excavator	L _w	111	106	104	100	96	95	95	86	103	Measured at similar site	2.0m	50%
Pump	L _w	102	104	94	91	86	85	82	89	95	Measured at similar site	1.0m	100%
Weighbridge	L _w	98	92	86	84	87	85	81	72	91	Measured at similar site	1.5m	25%
HGV movements *	L _w	101	100	98	94	95	92	86	78	99	Measured at similar site	1.5m	20 movements per hour Speed = 10mph

* Drive-by maximum sound level in L_{max} (octave bands) and L_{Amax} (overall level)

TABLE 4

Noise Source Location Details

Receptors	Phase	Noise Source	X (m)	Y (m)	Z (m)
High Street, Ecton	3B	Dozer	484728.6	262393.6	50.5
		Tipping	483010.4	262532.4	53.3
		Excavator	482985.9	262528.3	53.6
		Pump	483001.5	262523.4	53.7
		Weighbridge	483023.5	262530.2	52.8
Dwelling Adjacent to Whites Nurseries	PLANT AREA	Dozer	484728.6	262393.6	50.5
		Tipping	484631.3	262513.8	51.5
		Excavator	484617.0	262499.5	51.9
		Pump	484639.3	262499.6	51.8
		Weighbridge	484651.2	262509.1	50.9
Holdenby Lane, Earls Barton	1B	Dozer	484728.6	262393.6	50.5
		Tipping	485099.8	262377.2	50.3
		Excavator	485095.0	262370.4	50.8
		Pump	485107.8	262372.7	50.8
		Weighbridge	485113.6	262375.3	49.8
Appletons Place / Fairacres	1B	Dozer	484728.6	262393.6	50.5
		Tipping	485192.6	262333.8	50.0
		Excavator	485193.9	262309.4	50.3
		Pump	485185.9	262321.5	50.4
		Weighbridge	485197.5	262323.2	49.5
Eden House / The Gatehouse	1B	Dozer	484728.6	262393.6	50.5
		Tipping	485204.3	262188.3	48.9
		Excavator	485203.4	262199.5	49.5
		Pump	485214.8	262199.6	49.5
		Weighbridge	485189.9	262193.6	48.5
Cogenhoe Mill Holiday Park	3B	Dozer	484728.6	262393.6	50.5
		Tipping	483043.4	262357.1	52.5
		Excavator	483056.4	262358.6	53.0
		Pump	483050.4	262357.3	53.0
		Weighbridge	483064.3	262363.1	52.0

APPENDIX 1

Terminology and Definitions

Acoustic Environment

Sound from all sound sources as modified by the environment.

Sound Power Level, L_{WA}

The total amount of sound energy per unit of time generated by a particular sound source independent of the acoustic environment that it is in. It is a logarithmic measure of the sound power in comparison to a specified reference level.

Equivalent continuous A-weighted sound pressure level $L_{Aeq,T}$

Value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval T , has the same mean square sound pressure as a sound under consideration whose level varies with time.

A-weighting

The human ear is most sensitive to frequencies in the range 1 kHz to 5 kHz. On each side of this range the sensitivity falls off. A-weighting is used in sound level meters to replicate this sensitivity and respond in the same way as the human ear.

Ambient Sound Level $L_{Aeq,T}$

Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

Specific Sound Level (also referred to as 'site noise') $L_{Aeq,Tr}$

Sound in the neighbourhood of a site that originates from the site i.e. the sound being assessed. The equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment position over a given reference time interval.

Rating Level $L_{Ar,Tr}$

The specific sound level plus any adjustment for the characteristic features of the sound.

Residual Sound Level $L_{Aeq,T}$

Ambient sound remaining at a given position in a given situation when the specific sound source is suppressed to a degree such that it does not contribute to the ambient sound.

Background Sound Level $L_{A90,T}$

The A-weighted sound pressure level of the residual sound at the assessment position that is exceeded for 90% of a given time interval, T , measured using time weighting F.

Reference Time Interval, T_r

The specified interval over which the specific sound level is determined.

NOTE This is 1hr during the day (07:00-23:00) and a shorter period of 15 min at night (23:00-07:00).

Free-field Level

The sound pressure level away from reflecting surfaces.

NOTE Measurements made 1.2 - 1.5 metres above the ground and at least 3.5 metres away from other reflecting surfaces are usually regarded as free-field.