

Noise Impact Assessment

- Project:** Proposed Construction, Demolition and Excavation Waste Recycling Facility
- Site:** Heron Farm
Bunwell Road
Besthorpe
Attleborough
NR17 2LN
- Report Ref:** IEC/4470/01/AVH



Noise Impact Assessment



Proposed Construction, Demolition and Excavation Waste Recycling Facility at
Heron Farm, Bunwell Road, Besthorpe, Attleborough, NR17 2LN

Prepared For:	Newall Plant Limited
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Document Review Sheet

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1.0 Introduction

- 1.1 Heron Farm, Besthorpe has planning permission for open air storage of plant, materials and aggregates (Ref. 3PL/2018/1262/F). It also benefits from a standard rules permit for the treatment of waste to produce soil, soil substitutes and aggregate.
- 1.2 Newall Plant Limited has submitted a planning application to Norfolk County Council (NCC) to recycle up to 60,000 tonnes per annum of aggregates and soils from imported construction, demolition and excavation waste (Ref. FUL/2022/0045).
- 1.3 As part of the planning application, NCC has requested an assessment of operational noise from the proposed crushing and screening plant, as well as vehicle movements in and out of the Site. The assessment also considers the cumulative impact of the proposed waste recycling facility and the existing open air storage use.
- 1.4 At the request of Newall Plant Limited, Independent Environmental Consultancy Limited has been commissioned to undertake an assessment of noise and provide technical advice, as required, for noise mitigation measures.
- 1.5 The report assesses the impact of the development with regards noise. It describes the methods used to assess the impacts, the baseline conditions, appropriate noise limits and potentially affected noise sensitive receptors within the vicinity.
- 1.6 The assessment includes consideration of the following issues:
- Information on the existing noise climate;
 - Information on the potential noise impact upon existing residential dwellings in the locality; and
 - Noise mitigation measures necessary to comply with current noise standards and guidance.

Sources of Information

- 1.7 The following drawings and documents have been supplied by the applicants Planning Consultant for use in the assessment.

Issued By	Drawing/ Document Title	Reference	Revision	Issue Date
Egon Environmental	Site Location Plan	Drawing 001	C	12.10.2022
Egon Environmental	Site Layout	Drawing 002	D	12.10.2022

- 1.8 Information used in this assessment has been obtained from the following sources:
- Pre-Application Advice for Waste Development from Norfolk County Council dated 12 March 2020 Ref. ENQ/2020/0007.
 - Planning Permission for Open Air Storage (Plant, Materials and Aggregates in Connection with the Operations of Newall Plant Ltd). Breckland Council Ref. 3PL/2018/1262/F.
 - Heron Farm Proposed Site Plan prepared by CSL Surveying Limited (Ref. CSL-CJ-TP01 Revision 1 dated 06 December 2021).
 - National Planning Policy Framework NPPF (2021) Ministry of Housing, Communities & Local Government.

- Noise Policy Statement for England: NPSE (2010) Department for Environment, Food & Rural Affairs.
- Planning Practice Guidance: PPG (2021) Ministry of Housing, Communities & Local Government.
- British Standard 5228-1: 2009 + A1: 2014 'Code of practice for noise and vibration control on construction and open sites - Part 1: Noise.'
- British Standard 5228: 2009+A1: 2014 'Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration.'
- Guidelines for Community Noise – World Health Organisation: 1999.
- British Standard 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound.
- British Standard 7445: 2003 Description and measurement of environmental noise.
- ISO 9613-2 (1996) Acoustics – Attenuation of sound during propagation outdoors: General method of calculation.

2.0 Site Description

2.1 Introduction

2.1.1 The application area is accessed from a private driveway off Bunwell Road, via the existing premises. The application area encompasses a consented open air storage area at Heron Farm and extends to approximately 1.15 hectares.

2.2 Currently Permitted Site Operations

2.2.1 Permitted operations for the storage area allows loading or tipping processes between 07:00 to 18:00 hours, Monday to Friday and 07:00 to 13:00 hours on Saturday. 24 tips a year but no more than 5 per calendar month outside of the above hours are also allowed.

2.2.2 Workshop operations and vehicle movements in and out of the Site via the access road are understood to be covered by an extant permission relating to an existing civil engineering business at Heron Farm.

2.3 Proposed Site Operations

2.3.1 The Proposed Development seeks to align the planning permission for the Site with the standard rules permit that the Site holds to allow for the recycling of construction, demolition and excavation waste and soils with an annual throughput of up to 60,000 tonnes. The proposed operation of the facility would be 07:30 to 16:30 hours, Monday to Friday.

2.3.2 In terms of vehicle movements, the applicant has stated that no additional HGV movements in and out of the Site will result due to the Proposed Development.

2.3.3 The applicant has detailed the following plant complement for the waste recycling facility:

- 2 no. Excavators;
- 1 no. Anaconda DF512 Mobile Screen;
- 1 no. Terex Powerscreen R400 Mobile Jaw Crusher; and
- 1 no. Volvo L120h loading shovel.

2.4 General Environs

2.4.1 The main significant sources affecting the existing noise climate relates to the following:

- (i) Road traffic using the local road network;
- (ii) Existing operations at Heron Farm;
- (iii) Agricultural activity;
- (iv) Aircraft flyovers; and
- (v) Birds vocalising.

2.5 Nearest Noise-Sensitive Receptors

2.5.1 The nearest uninvolved residential property is Heron Cottage to the north. The dwelling is in excess of 200m from the area where materials will be recycled.

- 2.5.2 Residential dwellings including Shire Barn and Potters Barn are located to the east at a distance of 500m from the site. Flaxton Farm and Flaxton Barn are located to the north-west an approximate distance of 500m.
- 2.5.3 Heron Farm is an 'involved' receptor and is not considered further within the scope of the assessment.
- 2.5.4 Appendix B of the report shows the position of the site in relation to the nearest noise sensitive receptor positions and also details environmental noise monitoring locations.

3.0 Noise Criteria

3.1 Introduction

- 3.1.1 The following section outlines the key planning policy and guidance that relates to the assessment of residential amenity and protection of residents from environmental noise sources.
- 3.1.2 In the context of this assessment, noise is defined as sound that is unwanted by the recipient. The effects of noise on the neighbourhood are varied and complicated, and include 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.
- 3.1.3 A measure that is in general use and is recommended internationally for the description of environmental noise is the equivalent continuous noise level or L_{Aeq} (Equivalent Continuous Sound Pressure Level) parameter.

3.2 National Planning Guidance

National Planning Policy Framework (NPPF): 2021

- 3.2.1 The National Planning Policy Framework (NPPF)¹ was updated in July 2021 and sets out the government's planning policies for England and how these are expected to be applied.
- 3.2.2 In terms of considering noise impact, Chapter 15 of NPPF 'Conserving and enhancing the natural environment' states:
- "174. Planning policies and decisions should contribute to and enhance the natural and local environment by:*
- 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."*
- 3.2.3 The following section within the NPPF also specifically refers to noise.

"Ground conditions and pollution

- 185. 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:*

¹ National Planning Policy Framework NPPF, July (2021) Ministry of Housing, Communities & Local Government.

- 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.*

3.2.4 The NPPF considers the impact of new development on existing businesses and community facilities stating:

“187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”

3.2.5 Chapter 17 of NPPF specifically relates to mineral extraction sites and is entitled ‘Facilitating the sustainable use of minerals’. Paragraphs 209-212 are repeated below:

“209. It is essential that there is a sufficient supply of minerals to provide the infrastructure, buildings, energy and goods that the country needs. Since minerals are a finite natural resource, and can only be worked where they are found, best use needs to be made of them to secure their long-term conservation.

210. Planning policies should:

- a) *provide for the extraction of mineral resources of local and national importance, but not identify new sites or extensions to existing sites for peat extraction;*
- b) *so far as practicable, take account of the contribution that substitute or secondary and recycled materials and minerals waste would make to the supply of materials, before considering extraction of primary materials, whilst aiming to source minerals supplies indigenously;*
- c) *safeguard mineral resources by defining Mineral Safeguarding Areas; and adopt appropriate policies so that known locations of specific minerals resources of local and national importance are not sterilised by non-mineral development where this should be avoided (whilst not creating a presumption that the resources defined will be worked);*
- d) *set out policies to encourage the prior extraction of minerals, where practical and environmentally feasible, if it is necessary for non-mineral development to take place;*

- e) *safeguard existing, planned and potential sites for: the bulk transport, handling and processing of minerals; the manufacture of concrete and concrete products; and the handling, processing and distribution of substitute, recycled and secondary aggregate material;*
 - f) *set out criteria or requirements to ensure that permitted and proposed operations do not have unacceptable adverse impacts on the natural and historic environment or human health, taking into account the cumulative effects of multiple impacts from individual sites and/or a number of sites in a locality;*
 - g) *when developing noise limits, recognise that some noisy short-term activities, which may otherwise be regarded as unacceptable, are unavoidable to facilitate minerals extraction; and*
 - h) *ensure that worked land is reclaimed at the earliest opportunity, taking account of aviation safety, and that high quality restoration and aftercare of mineral sites takes place.*
211. *When determining planning applications, great weight should be given to the benefits of mineral extraction, including to the economy. In considering proposals for mineral extraction, minerals planning authorities should:*
- a) *as far as is practical, provide for the maintenance of landbanks of non-energy minerals from outside National Parks, the Broads, Areas of Outstanding Natural Beauty and World Heritage Sites, scheduled monuments and conservation areas;*
 - b) *ensure that there are no unacceptable adverse impacts on the natural and historic environment, human health or aviation safety, and take into account the cumulative effect of multiple impacts from individual sites and/or from a number of sites in a locality;*
 - c) *ensure that any unavoidable noise, dust and particle emissions and any blasting vibrations are controlled, mitigated or removed at source, and establish appropriate noise limits for extraction in proximity to noise sensitive properties;*
 - d) *not grant planning permission for peat extraction from new or extended sites;*
 - e) *provide for restoration and aftercare at the earliest opportunity, to be carried out to high environmental standards, through the application of appropriate conditions. Bonds or other financial guarantees to underpin planning conditions should only be sought in exceptional circumstances;*
 - f) *consider how to meet any demand for small-scale extraction of building stone at, or close to, relic quarries needed for the repair of heritage assets, taking account of the need to protect designated sites; and*
 - g) *recognise the small-scale nature and impact of building and roofing stone quarries, and the need for a flexible approach to the duration of planning permissions reflecting the intermittent or low rate of working at many sites.*

212. *Local planning authorities should not normally permit other development proposals in Mineral Safeguarding Areas if it might constrain potential future use for mineral working."*

The Noise Policy Statement for England (NPSE): 2010

- 3.2.6 The Noise Policy Statement for England (NPSE) was published in March 2010. It specifies the following long-term vision in policy aims: *"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*
- *Avoid significant adverse impacts on health and quality of life;*
 - *Mitigate and minimise adverse impacts on health and quality of life; and*
 - *Where possible, contribute to the improvement of health and quality of life."*
- 3.2.7 The NPSE introduced three concepts to the assessment of noise, which includes:
- NOEL – No Observed Effect Level
This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.
- LOAEL – Lowest Observable Adverse Effect Level
This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level
This is the level above which significant adverse effects on health and quality of life occur.
- 3.2.8 The above categories are however undefined in terms of noise levels and for the SOAEL the NPSE indicates that the noise level will vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research is therefore required to establish what may represent an SOAEL. It is acknowledged in the NPSE that not stating specific SOAEL levels provides policy flexibility until there is further evidence and guidance.
- 3.2.9 The following commentary is given on the representation of NOEL, LOAEL and SOAEL in relation to existing British Standards/ International guidelines:
- NOEL – Inaudibility
LOAEL – The guideline values for community noise in specific environments as set out in Table 1 of the WHO Guidelines for Community Noise 1999 and Table 4 of British Standard 8233: 2014 Guidance on sound insulation and noise reduction in buildings.
- 3.2.10 The NPSE concludes how the LOAEL and SOAEL relate to the three aims listed in paragraph 3.2.4. The initial aim relates to avoiding significant adverse effects on health and quality of life, it then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when:
- "all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development."*
- 3.2.11 The final aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development.
- 3.2.12 The Government is undertaking a review of technical guidance but currently there is no agreed methodology for noise to accompany the NPPF guidance.

3.2.13 The Government has recently removed the existing Planning Policy Guidance on noise, which was known as PPG24: 1994. The National Planning Policy Framework, which has recently been published states “109. The planning system should contribute to and enhance the natural and local environment by:

- Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability;”

The Planning Practice Guidance (PPG): 2021

3.2.14 The Department for Communities and Local Government published the final version of the Planning Practice Guidance (PPG) on 06 March 2014. The PPG provides further information with regard new developments which may be sensitive to the prevailing acoustic environment. The main section of PPG was also updated in July 2019 and consultation and pre-decision matters updated in June 2021².

3.2.15 The PPG includes a table summarising the noise exposure hierarchy, based on the likely average response. Under the heading of ‘perception’ the ‘noticeable and not intrusive’ assessment of noise is defined as ‘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 there is a perceived 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.

3.2.16 Full details of the Planning Practice Guidance on effects are provided in Table 3.1.

Table 3.1: Noise Exposure Hierarchy

Perception	Example of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable 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	No specific measures required
	Lowest Observed Adverse Effect Level		
Noticeable 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; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported 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

² Planning Practice Guidance PPG (2021) Ministry of Housing, Communities & Local Government (Department for Levelling Up, Housing and Communities).

Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. 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 Effect	Avoid
Noticeable 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 Adverse Effect	Present

3.2.17 The subjective nature of noise means there is not a simple relationship between noise levels and its effects. Factors to be considered in determining if noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative impacts.

3.2.18 The section in PPG headed 'Assessing environmental impacts from minerals extraction' (Ref paragraphs 19 to 22) is provided for ease of reference.

Paragraph 19 states:

"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."*

Paragraph 20 states:

“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.”

Paragraph 21 of PPG discusses noise standards and states:

“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 ($L_{A90,1h}$) 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 ($L_{A90,1h}$) 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 beepers, may also require separate limits that are independent of background noise (e.g. L_{max} in specific octave or third-octave frequency bands – and that should not be allowed to occur regularly at night.)

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

PPG also considers temporary operations and states in Paragraph 22:

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

- 3.2.19 Noise levels in proximity to the nearest noise sensitive receptors should be determined over a suitably representative period in order to characterise the existing background noise climate.
- 3.2.20 Reference should be made to NPPF and PPG to establish suitable noise criteria at the nearest noise sensitive receptors, with regard to the prevailing background noise climate or maximum permissible limits.
- 3.2.21 In terms of noise emissions, planning policy considers waste recycling sites of this type to be 'related similar processes' to mineral development proposals. Suitable criterion would then be based on the operational noise level not exceeding 10 dB(A) above the background noise level up to a maximum limit of 55 dB LAeq,1hour.

3.3 Relevant Guidance & Standards

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

- 3.3.1 The World Health Organisation's (WHO) 'Guidelines for Community Noise'³ report for external environmental noise levels states that;

"4.2.7 Annoyance responses

During the daytime, few people are seriously annoyed by activities with LAeq levels below 55 dB; or moderately annoyed with LAeq levels below 50 dB. Sound pressure levels during the evening and night should be 5-10 dB lower than during the day..."

- 3.3.2 For night-time noise sources the WHO guidelines recommend a night-time (23.00-07.00) 8-hour noise level of 30 dB LAeq inside bedrooms (for a reasonably steady noise source) to avoid sleep disturbance.
- 3.3.3 For internal noise levels during the daytime and evening period it is suggested that a noise level of 35 dB LAeq,16h (07.00-23.00 hours) is achieved to avoid speech intelligibility and moderate annoyance.
- 3.3.4 A summary of the guideline internal noise levels, taken from Table 1 of the WHO guidelines, is given in Table 3.2.

³ Guidelines for Community Noise, World Health Organisation (1999).

Table 3.2: Relevant Information from WHO Guidelines

Specific Environment	Critical Health Effect(s)	L_{Aeq} [dB]	Time Base [hours]	$L_{Amax, fast}$ [dB]
Dwelling, indoors	Speech intelligibility & moderate annoyance daytime & evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outdoor living area	To avoid serious annoyance, daytime and evening	55	16	-
Outdoor living area	To avoid minimal moderate annoyance, daytime and evening	50	16	-

3.3.5 The guidelines assume that an open bedroom window will typically provide 15 dB sound attenuation, consequently the guidelines recommend a maximum noise limit of 60 dB $L_{Amax, fast}$ for 'outside bedrooms, sleep disturbance, window open, outdoor values'.

3.3.6 The World Health Organisation (WHO) Europe has published the WHO Environmental Noise Guidelines for the European Region (2018)⁴. This supplements WHO Guidelines (1999).

British Standard 8233: 2014 (BS8233: 2014)

3.3.7 British Standard 8233:2014 'Guidance on sound insulation and noise reduction of buildings'⁵ offers guidance on suitable internal noise levels for spaces when they are unoccupied.

3.3.8 The suggested design criteria for reasonable listening and resting/sleeping conditions are given in Table 4 of BS8233, and reproduced in Table 3.3.

Table 3.3: Relevant Information from BS 8233:2014

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

3.3.9 It can be seen that a design standard should be adopted to ensure internal noise from steady external sources in living rooms should not exceed 35 dB $L_{Aeq,16hour}$.

⁴ The World Health Organisation (WHO) Europe has published the WHO Environmental Noise Guidelines for the European Region (2018).

⁵ British Standard BS 8233 (2014) 'Guidance on sound insulation and noise reduction of buildings' British Standards Institution.

3.3.10 The design criteria for bedrooms suggests that a noise level not exceeding 35 dB $L_{Aeq,16hour}$ during the daytime (07:00 to 23:00) and 30 dB $L_{Aeq,8hour}$ during the night-time (23:00 to 07:00).

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

3.3.11 British Standard BS4142⁶ was revised in 2014 and updated in 2019. The scope of the Standard has been extended to methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

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

3.3.12 The method is based on the difference between the background noise level without the industrial/commercial source and the noise level of the industrial source (specific sound) at the receiver location. The noise is rated for having tonality, impulsivity, intermittency or other distinguishable characteristics that may attract attention. In cases where the noise contains multiple characteristics, the penalties are cumulative.

3.3.13 In the majority of cases, the greater the difference between the rated noise level (specific noise and corrections for character) and background noise level, the greater the magnitude of impact (see Table 3.4).

Table 3.4: Assessment of the Impacts

Difference	Assessment
Around +10 dB or more	Likely to be an indication of a significant adverse impact, depending on the context
Around +5 dB	Likely to be an indication of an adverse impact, depending on the context

3.3.14 In Section 8 of the 1997 version of the Standard "Assessing the noise for complaint purposes" it is stated that an excess above the existing background noise level L_{A90} of up to 5 dB(A) due to noise from fixed plant at a new development is of 'marginal significance'. This has been interpreted, since the introduction of the Standard in 1967, that a 5 dB(A) excess due to new, fixed plant noise source is, in general, acceptable.

3.3.15 In terms of establishing the rating level, corrections for the noise character has to be taken into consideration. These include the following factors:

⁶ British Standard BS4142 (2014)+A1 (2019) 'Methods for rating and assessing industrial and commercial sound' British Standards Institution.

Tonality

For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.

Impulsivity

A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible.

Other sound characteristics

Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

NOTE 2 Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion.

Intermittency

When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

- 3.3.16 BS4142:2014 acknowledges that where background and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background (particularly at night).

British Standard 7385-2: 1993 (BS7385-2: 1993) Evaluation and Measurement for Vibration in Buildings

- 3.3.17 British Standard 7385-2: 1993⁷ provides guidance on the assessment of vibration within buildings and quotes vibration levels above which building structures could be damaged. With respect to the potential for building damage, the Standard sets guide values for transient vibration considered to give minimal risk for vibration induced damage in various types of buildings. These are the values also used in BS 5228-2: 2009+A14: 2014 and shown in Table 3.5 and Figure 3.1.

⁷ British Standard 7385-2: 1993 Evaluation and Measurement for Vibration in Buildings.

Table 3.5: Transient Vibration Guide Values for Cosmetic Damage

Line (see Figure 3.2)	Type of Building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
	Industrial and heavy commercial buildings		
2	Unreinforced or light framed structures	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50mm/s at 40 Hz and above
	Residential or light commercial buildings		

NOTE 1 Values referred to are at the base of the building.
NOTE 2 For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

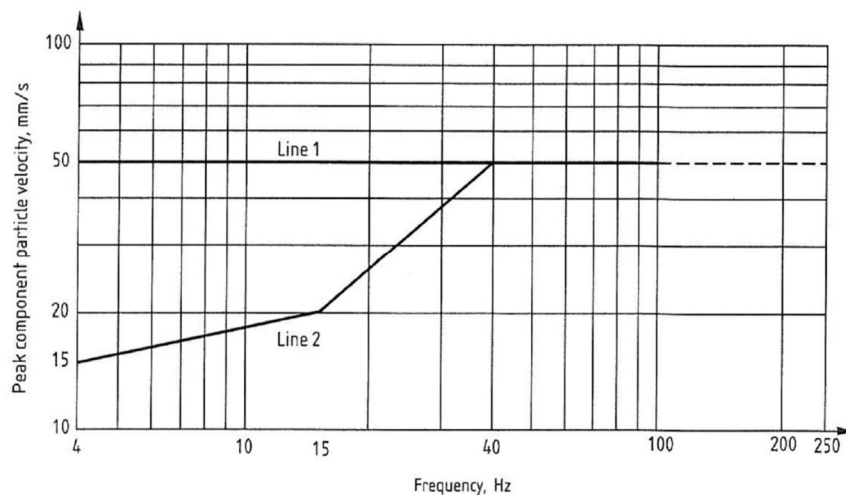


Figure 3.1: Transient Vibration Guide Values for Cosmetic Damage

3.3.18 Lowest guide value for cosmetic damage to buildings given in BS 7385-2: 1999 and BS 5228 2:2009+A14:2014 is 15 mm/s for transient vibration.

British Standard 5228-2:2009+A14: 2014 'Code of practice for noise and vibration control on construction and open sites' Part 2: Vibration

3.3.19 Vibration can be generated from any dynamic source of sufficient energy. The vibration generated will be composed of various wave types of differing characteristics and significance collectively known as seismic waves.

3.3.20 The fact that the human body is very sensitive to vibration can result in subjective concern being expressed at energy levels well below the threshold of damage.

3.3.21 A person will generally become aware of vibration at levels of around 0.15 mms⁻¹ and 0.3mms⁻¹ peak particle velocity (PPV) at frequencies between 8 Hz to 80 Hz. Even though such vibration is routinely generated within any property and is also entirely safe, when it is induced by construction activities it is not unusual for such a level to give rise

to subjective concern. Such concern is also frequently the result of the recent discovery of cracked plaster or brickwork that in fact has either been present for some time or has occurred due to natural processes.

3.3.22 BS 5228-2: 2009+A14:2014⁸ provides guidance on the effects of vibration from construction activities in terms of PPV and Table 3.6 is reproduced from Annex B of the Standard.

Table 3.6: Guidance on Effects of Vibration Levels

Vibration Level (PPV)	Effect
0.14 mms ⁻¹	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mms ⁻¹	Vibration might be just perceptible in residential environments.
1.0 mms ⁻¹	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mms ⁻¹	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

3.4 Consultation with Local Authority

3.4.1 Condition 2 of the extant planning permission for open air storage of plant, materials and aggregates (Ref. 3PL/2018/1262/F) relates to daytime operations and states:

"2. 1) The development hereby permitted shall not generate a noise level measured at the nearest noise sensitive premises greater than 10dB(A) above the existing background level LA90(60mins) or the total noise from the operations should not exceed 55dB(A) LAeq, (60 mins) (free field) whichever is the lowest during normal day time working hours (07.00 18.00) Monday to Friday or 07.00 to 13.00 Saturdays.

All measurements to be taken with a sound level meter of IEC 651 Type 1, or BS EN 61672 Class 1, standard (or the equivalent relevant UK adopted standard in force at the time of the measurements) set to measure using a fast time weighted response. This should be calibrated in accordance with the procedure specified in BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (or the equivalent relevant UK adopted standard in force at the time of the measurements).

Reason for condition:- In the interest of the amenities of nearby residents in accordance with Breckland Local Plan (2019) Policy COM 03."

3.4.2 Suitable criterion would then be based on the operational noise level not exceeding 10 dB(A) above the background noise level up to a maximum limit of 55 dB LAeq,1hour.

⁸ British Standard BS5228 – Part 2: 2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites. Vibration.

4.0 Existing Noise Climate & Environmental Noise Survey Methodology

4.1 Introduction

- 4.1.1 Environmental noise monitoring to establish baseline conditions was carried out between Wednesday 18th January 2023 and Friday 27th January 2023.
- 4.1.2 The monitoring was carried out in accordance with advice provided in BS7445: 2003 'Description and measurement of environmental noise'⁹.
- 4.1.3 Subjective observations during the survey measurements showed that the audible sources contributing to the overall acoustic environment include traffic using the local road network, operations at Heron Farm, agricultural activity and birdsong.
- 4.1.4 Ambient noise levels were measured at three noise-sensitive receptor locations in the vicinity of the Site with the proposed plant on and off as part of noise model verification test. The survey measurements were carried out on the afternoon of Monday 23rd January 2023.

4.2 Environmental Noise Survey Instrumentation

- 4.2.1 The baseline environmental noise survey was carried out to characterise the existing noise climate at the nearest residential receptors to the Site. The typical and representative background noise levels are used to establish appropriate relative noise limits.
- 4.2.2 The instrumentation displayed below was used for the measurements undertaken during the survey work.

Table 4.1: Details of Instrumentation

Manufacturer	Equipment	Serial No.	Calibration Due Date
Norsonic	Sound Level Meter Type 140	1402944	14/10/2023
Rion	Sound Level Meter Type NL-52	00420712	01/08/2024
Rion	Sound Level Meter Type NL-52	00197697	08/04/2023
Pulsar	Sound Level Meter Type Nova 45	PN1142	30/03/2023
Pulsar	105 Acoustic Calibrator	53536	12/10/2023
Norsonic	Acoustic Calibrator 1251	34495	12/10/2023

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

Frequency Weighting: 'A' or Linear (1:1 or 1:3 octave bands)
Measurement Periods: 15 minutes or variable

⁹ BS7445:2003 *Description and measurement of environmental noise*. British Standards Institution, 2003.

4.2.4 The sound level meters were calibrated with the electronic calibrator prior to the commencement and on the completion of the survey. No significant drift in calibration was observed. The meters used during the survey work are a precision grade Class 1.

Calibration Setting: 94 or 114 dB @ 1kHz
Meter Setting: Fast Response

4.3 Environmental Noise Measurement Procedure

4.3.1 Noise monitoring was undertaken at least 3.5m from any vertical reflecting surface and at a height of 1.5m above ground level.

4.3.2 The meteorological conditions during the measurement periods relevant to the assessment are presented in Table 4.2:

Table 4.2: Summary of meteorological conditions

Date	Description	Wind Speed (ms ⁻¹)	Wind Direction	Temp. (°C)
18/01/2023	Fair	3-4	W	3 to 4
19/01/2023	Fair	<1-2	W/SW	-2 to 4
20/01/2023	Fair	<1-2	SW/W/NW	0 to 6
23/01/2023	Fair	<1	S	0 to 5
24/01/2023	Fog followed by sunshine	<1	S/SW	-5 to 5
25/01/2023	Overcast	<1-2	SW	2 to 5
26/01/2023	Overcast	<1-3	N	2 to 7
27/01/2023	Overcast	<1-2	NE	3 to 5

4.3.3 The noise survey measurements were generally conducted in climatic conditions suitable for monitoring environmental noise levels in accordance with advice given in British Standard 7445: 2003 'Description and measurement of environmental noise'.

4.3.4 The data obtained on the morning of Monday 23rd January 2023 have been removed from the baseline dataset due to the test measurements of the crusher conducted in the afternoon.

4.4 Environmental Noise Survey Results

4.4.1 The results of the baseline survey are summarised below (full survey results are presented in Appendix C).

**Table 4.3: Daytime noise levels measured at monitoring locations
(Proposed Operating Hours of 07:30 to 16:30 hours)**

Location Ref.	Location Description	Coordinates		Statistical Parameters (dB)		
		X (Eastings)	Y (Northings)	$L_{Aeq,9hour}$	$L_{A90,9hour}$ (Mean)	$L_{A90,15mins}$ (modal)
MP1	Shire Barn	608946	295384	42.1-49.9	32.4-41.1	37
MP2	Heron Cottage	608292	295426	54.7-64.0	35.4-43.7	42
MP3	Flaxton Barn	607940	295628	42.7-55.9	31.6-40.7	39

4.5 Operational Noise Limits

- 4.5.1 For routine daytime operations, PPG suggests that suitable noise level criteria would be a limit of 10 dB above the background noise level, subject to a maximum of 55 dB $L_{Aeq,1hour}$. On this basis, criterion for routine operations at each of the identified receptor locations is presented in Table 4.4.

Table 4.4: Noise criterion for daytime operations based on PPG

Location Ref.	Location Description	Coordinates		Background Noise Level $L_{A90,modal}$ (dB)	Criterion $L_{A90} + 10$ dB
		X (Eastings)	Y (Northings)		
R1	Shire Barn	608935	295390	37	47
R2	Potters Barn ^A	608933	295424	37	47
R3	Southcroft ^A	609040	295562	37	47
R4	Heron Cottage	608314	295425	42	52
R5	Flaxton Farm ^B	607938	295570	39	49
R6	Flaxton Barn	607940	295628	39	49

A = Based background level measured at MP1.

B = Based background level measured at MP3.

5.0 Assessment of Noise Impact

5.1 Introduction

5.1.1 The actual noise levels generated by the development would vary at the nearest local receptors and will depend upon a number of variables, the most significant which are:

- The amount of noise generated by the plant or equipment being used on site; generally expressed as Sound Power Level (L_{WA});
- The periods of operation of the plant on site, known as the “on-time”;
- The distance between the noise source and the receiving position;
- The attenuation due to ground absorption or barrier effects; and
- The reflection of noise due to the facades of buildings, etc.

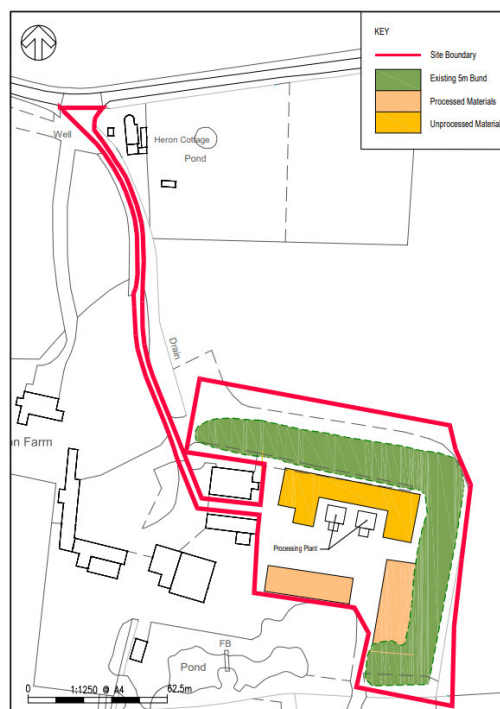
5.2 Proposed Operations

5.2.1 Condition 3 relating to the permitted storage area states:

“3. No loading or tipping processes shall be carried out and no deliveries taken at or dispatched from the site outside the hours of 07:00 18:00 Monday to Friday, 07:00 13:00 on Saturday nor at any time on Sundays, Bank Holidays or Public Holidays. Notwithstanding this, 24 tips a year but no more than 5 per calendar month outside of the above hours are allowed, a register of tipping activities, including times and dates shall be kept to demonstrate this is being adhered to.”

5.2.2 The proposed site layout is presented in Figure 5.1.

Figure 5.1: View of Proposed Site Layout



- 5.2.3 It is understood that Newall Plant Limited currently has authorisation to operate 14 vehicles and 3 trailers from the Site.
- 5.2.4 We also understand that under planning permission ref. 3PL/2007/0147/CU for the "change of use of existing farm buildings into offices, assoc. HGV parking and storage of plant", HGV movements in and out of the Site do not need to be considered within the scope of this assessment and there are no additional movements associated with the Proposed Development.
- 5.2.5 This assessment considers the proposed crushing and screening plant detailed within this application, as well as the cumulative impacts from the proposal and the recently permitted open air storage and the resulting loading and unloading of waste material.
- 5.2.6 Operation of the crushing and screening plant will be restricted to 07:30 to 16:30 hours, Monday to Friday. The typical working method of the waste recycling facility is presented below:
- Excavator(s) used to load waste material to crushing or screening plant;
 - Crushing or screening plant processing material; and
 - Loading shovel transporting processed material to stockpiles.
- 5.2.7 Newall Plant Limited has indicated that crushing and screening plant would not normally be operated simultaneously. However, we have considered three potential operational scenarios, also taking into account the cumulative impact of the existing consented storage use and proposed recycling facility:
- Scenario 1 – Crushing plant fed by excavator with loading shovel moving unprocessed/processed material;
 - Scenario 2 – Crushing and screening plant fed by excavators with loading shovel moving unprocessed/processed material; and
 - Scenario 3 – Crushing and screening plant fed by excavators and loading/unloading of waste material. Loading shovel moving unprocessed/processed material.

5.3 Prediction Methodology

- 5.3.1 In order to model the proposed operational scenarios, CadnaA modelling software has been utilised for the generation of noise maps of the highest likely site generated noise.
- 5.3.2 The noise maps have been produced using the ISO 9613-2: 1996. The methodology takes into account source position, distance, duration of activity, screening from buildings/barriers or the intervening ground in relation to the nearest sensitive receptors. Point sources have been used to represent the processing and mobile plant.
- 5.3.3 For all noise prediction calculations, the ground absorption coefficient has been set to '0.5' representing mixed-ground. The temperature was set to 10 °C, with relative humidity to 70%. Receptor heights have been modelled at 1.5m above ground level for daytime activities.

5.3.4 The model incorporates site specific data or manufacturer's data.

5.4 Plant Complement

5.4.1 General details of the plant complement (i.e. manufacturer/model) have been provided by Newall Plant Limited and observed during our site visits in 2019, 2020 and 2023 to carry out close range measurements. Details of the plant complement are outlined in Table 5.1.

Table 5.1: List of plant sound power levels (L_{WA})

Description	Manufacturers Sound Power Level L_{WA} (dB)	Measurement L_{Aeq} (dB) @ 10m	Estimated Sound Power Level L_{WA} (dB)
Volvo EC 160DL Excavator loading Terex Powerscreen R400 Jaw Crusher	-	83	111
Volvo EC300EL Excavator loading Anaconda DF512 Screen	-	78	106
Volvo L120h Loading Shovel	106	-	-
HGV	-	-	104
Volvo ECR145DL Loading HGV	-	72	100
Lorry Tipping	-	79	107

5.4.2 We have been made aware that an Anaconda J960 ECO Jaw Crusher has been considered in previous noise assessments for the proposed facility at Heron Farm. On the day of the test measurements this item of plant was awaiting parts and could only be operated without material being processed. Therefore, we have referred back to previous measurements by others to consider noise emissions from this item of plant.

5.4.3 A noise report prepared by Holford Clark Associates in October 2015¹⁰ showed noise levels lower for the Anaconda J960 ECO Jaw Crusher than measured by IEC for Powerscreen R400 Jaw Crusher. Therefore, use of the Powerscreen R400 Jaw Crusher for the measurements and noise modelling suggests this will provide a likely 'worst-case' for crusher noise emissions.

¹⁰ Noise Assessment (2015) Materials Recycling Facility, Bunwell Road, Besthorpe, Attleborough, Norfolk. Prepared by Holford Clark Associates.

5.5 Impact Assumptions

- 5.5.1 A source height of 3.5m has been used for the processing plant and 2m for the mobile plant. Plant "on-times" have been assumed to be 100% for the processing plant and 80% for the loading shovel.
- 5.5.2 In terms of the consented storage area, plant "on-times" have been assumed to be 100% for the excavator moving material or loading tipper lorries and 5% for lorry tipping (3 minutes in any 1-hour period).
- 5.5.3 Attenuation provided by the 5m bund has been included in the predictions. Any screening afforded by temporary structures such as processed/unprocessed material stockpiles has been discounted from the modelling exercise.

5.6 Impact Assessment

- 5.6.1 The predicted noise impact for operations has been undertaken and an assessment of noise impact during processing and loading/unloading operations has been included. The calculated noise levels include mitigation measures which are discussed in the Noise Mitigation Strategy and the existing 5m bunding arrangement.
- 5.6.2 Planning Practice Guidance (PPG) states that minerals-related operations should not exceed the typical background noise level (L_{A90}) by more than 10 dB(A), subject to a maximum daytime limit of 55 dB $L_{Aeq,1hour}$.
- 5.6.3 Where limits of +10 dB(A) above the background noise level place an unreasonable burden on the site operator, the limit should be as close as practicable to the $L_{A90} + 10$ dB(A) criterion, without exceeding 55 dB $L_{Aeq,1hour}$.
- 5.6.4 A comparison of the calculated site noise levels at the nearest noise-sensitive receptor locations and the suggested site noise limits is shown in the following table.

Table 5.2: Predicted L_{Aeq} Noise Levels for Daytime Operations

Ref.	Noise-Sensitive Receptor	Predicted Noise Level $L_{Aeq,1hour}$ dB			Noise Criteria $L_{Aeq,1hour}$ dB
		Scenario 1	Scenario 2	Scenario 3	
R1	Shire Barn	39	41	41	47
R2	Potters Barn	39	40	41	47
R3	Southcroft	37	38	38	47
R4	Heron Cottage	44	45	45	52
R5	Flaxton Farm	42	43	43	49
R6	Flaxton Barn	40	41	41	49

- 5.6.5 The calculated site noise levels for the waste recycling facility comply with the site noise limits according to PPG for a minerals-related development at all six of the assessment locations.

5.7 Test Measurements at Noise-Sensitive Receptor Locations

- 5.7.1 Direct measurement of processing plant noise at the nearest dwellings has practical limitations due to noise from extraneous sources which form the ambient noise climate. Where it is not possible to determine the specific sound level directly by measurement, the specific sound level can be determined by a combination of measurement and calculation. Direct measurement of site noise sources at the nearest receptor positions was validated through carrying out close range measurements of sources and modelling the resulting site-generated noise.
- 5.7.2 Datalogging sound level meters were installed at three locations around the site and measured specific and residual noise levels during the on-site test measurements. In cases where kit was fitted with audio recording capability, listening tests were supplemented with post-processing of the audio recordings.
- 5.7.3 Test measurements were carried out with the Terex Powerscreen R400 Jaw Crusher being fed by a Volvo EC 160DL Excavator working individually in order to measure specific noise levels.

Residual Noise Level Measurements

- 5.7.4 Residual noise measurements were carried out at positions considered representative of the closest proposed dwellings to the site. The measurements results relate to periods prior to the plant operating and following plant being switched-off.

Table 5.3: Residual noise levels measured at fixed monitoring locations

Monitoring Position	Time Period (hh:mm)	Statistical Parameters (dB)			Commentary
		$L_{Aeq,15mins}$	$L_{Amax,15mins}$	$L_{A90,15mins}$	
MP1	13:00-13:15	39.8-44.3	53.9-66.4	31.2-36.2	Plant off
	14:30-16:00				
MP2	13:00-13:15	48.0-58.6	65.4-82.5	33.2-38.0	Plant off
	14:30-16:00				
MP3	13:00-13:15	38.8-44.9	50.0-67.6	33.9-38.3	Plant off
	14:30-16:00				

Measured Ambient Noise Level (Including Residual Noise)

- 5.7.5 Ambient noise level measurements were carried out at the same positions with the results from periods when the plant was running summarised in Table 5.4. Detailed notes of plant on and off times are presented in Appendix C, along with subjective notes during the listening tests.

Table 5.4: Ambient noise levels measured at fixed monitoring locations

Monitoring Position	Time Period (hh:mm)	Statistical Parameters (dB)			Commentary
		L _{Aeq,15mins}	L _{Amax,15mins}	L _{A90,15mins}	
MP1	13:15-14:15	40.4-49.3	58.2-69.2	30.0-32.3	Plant on
MP2	13:15-14:15	48.3-51.0	66.3-70.4	34.8-36.5	Plant on
MP3	13:15-14:15	40.3-46.5	56.6-66.3	32.4-35.7	Plant on

5.7.6 Results from the monitoring exercise and listening tests confirmed that the processing plant was just audible at times but generally masked by residual noise. The measurement results indicate that noise from the processing plant will not result in an adverse impact. However, in order to consider the cumulative impact of all the plant running at the same time the results of the noise modelling forms the basis of the impact assessment.

5.8 Ground-Borne Vibration

5.8.1 Waste recycling plant do not typically generate levels of vibration which are perceptible by occupants of residential property and are not generally considered as likely to cause damage to residential type structures.

5.8.2 Field measurements of the Terex Powerscreen R400 Jaw Crusher and Anaconda Screen registered a Peak Particle Velocity of 1.475 mm/s at 10m during previous survey measurements.

5.8.3 Given the significant separation distances and ground conditions, the likely levels of ground vibration would be well below perceptible levels of vibration (i.e. 0.14mm/s) at all receptors.

5.9 Noise Mitigation Strategy

5.9.1 In order to meet best practice without placing unreasonable burden on the site operator, a detailed Noise Mitigation Strategy has been considered with Newall Plant Limited and appointed consultants. The strategy will include the following:

- Restriction of mobile crushing and screening plant operations to 07:30-16:30 hours, Monday to Friday;
- Mobile processing plant to be located within designated area benefiting from 5m bund arrangement;
- All processing plant to be operated at ground level;
- Minimise drop heights of materials; and
- The mobile plant will be fitted with broadband type reverse alarms to minimise any tonal noise characteristics.

5.9.2 Further mitigation measures to reduce the noise impact of the development have been outlined below and would be adopted by Newall Plant Limited as a further demonstration of best practice.

5.9.3 The site operator will select the use of inherently quiet plant where appropriate. Such machines may be fitted with properly lined and sealed acoustic covers which would

be kept closed whenever the machines are in use. The site operator will continue to implement their policy of replacing older machinery with new, quieter machinery as it becomes available and as the business development allows

- 5.9.4 All plant will be subject to regular maintenance checks. All plant and machinery would be fitted with effective exhaust silencers and would be regularly inspected in order to ensure they are meeting the manufacturers' noise rating levels. Any silencers which become defective would be replaced immediately.
- 5.9.5 All plant will be operated in a proper manner with respect to minimising noise emissions, for example, no unnecessary revving of engines, switching off plant not in use, etc.
- 5.9.6 Wherever practically possible, plant fitted with reversing alarms will reverse in a direction away from the nearest noise sensitive properties. In addition, plant would wherever possible manoeuvre in a circular manner to avoid the use of reversing alarms.
- 5.9.7 Good site management is also an effective method of reducing the potential impact of the storage area. Newall Plant Limited management will aim to be proactive, to anticipate when potential noise problems may occur and to take the necessary preventative action. Site noise mitigation measures would be regularly reviewed and where appropriate, new equipment and/or practices implemented.

6.0 Conclusions

- 6.1 Environmental noise from operations associated with the proposed waste recycling facility has been considered in this assessment. The result of the noise prediction calculations and site test measurements has shown the following:
- i. Noise from the use of mobile processing plant within the designated area would not exceed noise criterion according to PPG during the daytime for a minerals-related site.
 - ii. Cumulative noise from the use of mobile processing plant and the recently consented open air storage area would not exceed noise criterion according to PPG during the daytime for a minerals-related site.
- 6.2 It is considered that with the implementation of the noise mitigation strategy to ensure that the noise levels and acoustic character of the plant do not change over time, the resulting noise levels are acceptable at neighbouring noise-sensitive receptor locations.

Appendices

Appendix A

A.0 NOISE PERCEPTION AND TERMINOLOGY

A.1 Terminology

A.1.1 Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in pascals, Pa). Because of this wide range a noise level scale based on logarithms is used in noise measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB.

A.1.2 The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB(A).

A.1.3 The following lists the sound pressure level in dB(A) for common situations.

Table A.1: Noise Levels for Common Situations

Typical Noise Level dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library Refrigerator humming at 2m
50	Quiet office, no machinery Boiling kettle at 0.5m
60	Normal conversation
70	Telephone ringing at 2m Vacuum cleaner at 3m
80	General factory noise level
90	Heavy goods vehicle from pavement Powered lawnmower, operator's ear
100	Pneumatic drill at 5m
120	Discotheque - 1m in front of loudspeaker
140	Threshold of pain

A.1.4 The noise level at a measurement point is rarely steady, even in rural areas, and varies over a range dependent upon the effects of local noise sources. Close to a busy motorway, the noise level may vary over a range of 5 dB(A), whereas in a suburban area this may increase up to 40 dB(A) and more due to the multitude of noise sources in such areas (cars, dogs, aircraft etc.) and their variable operation. Furthermore, the range of night-time noise levels will often be smaller and the levels significantly reduced

compared to daytime levels. When considering environmental noise, it is necessary to consider how to quantify the existing noise (the ambient noise) to account for these second to second variations.

- A.1.5 A parameter that is widely accepted as reflecting human perception of the ambient noise is the background noise level, L_{A90} . This is the noise level exceeded for 90% of the measurement period and generally reflects the noise level in the lulls between individual noise events. Over a 1-hour period the L_{A90} will be the noise level exceeded for 54 minutes.
- A.1.6 The equivalent continuous A-weighted sound pressure level, L_{Aeq} , is the single number that represents the total sound energy measured over that period. The L_{Aeq} is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period. It is commonly used to express the energy level from individual sources that vary in level over their operational cycle.
- A.1.7 The R_w is a single number rating used to describe the sound insulation of building elements. Traditional masonry walls will achieve no less than 48 dB R_w , single glazed windows approximately 25 dB R_w . The figure is mostly used when calculating noise transmission through building elements.
- A.1.8 Human subjects, under laboratory conditions, are generally capable of noticing changes in steady levels of 1 dB(A). However, in the general environment changes of around 3 dB(A) can be detected. It is generally accepted that a change of 10 dB(A) in an overall, steady noise level is perceived to the human ear as a doubling (or halving) of loudness. (These findings do not necessarily apply to transient or non-steady noise sources such as changes in noise due to changes in road traffic flow, or intermittent noise sources).

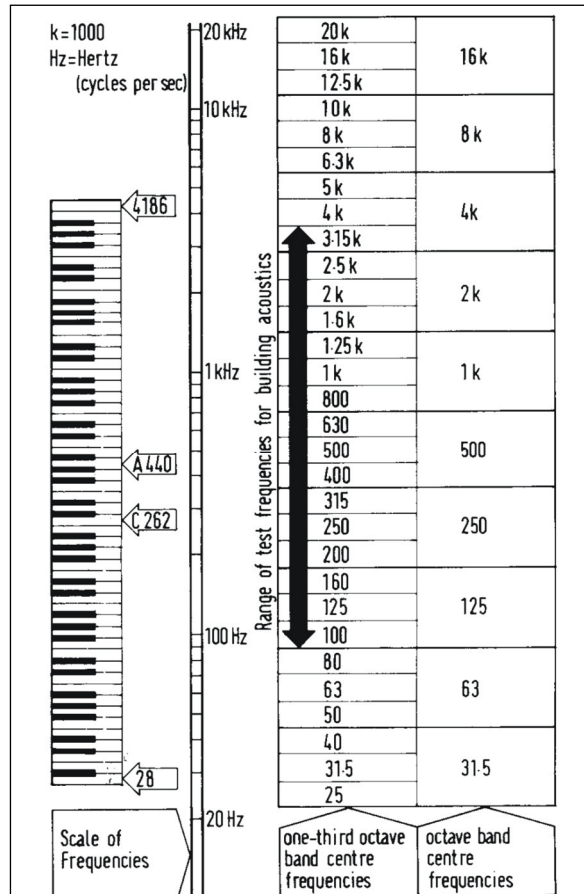
A.2 Perception - Frequency

- A.2.1 Frequency is the rate at which the air particles vibrate. The more rapid the vibrations, the higher the frequency and perceived pitch. Frequency is measured in Hertz (Hz).
- A.2.2 A young person with average hearing can generally detect sounds in the range 20 Hz to 20,000 Hz (20 kHz). Figure A.1¹¹ below illustrates the range of frequencies, for example, the lowest note on a full scale piano, 'A', has a fundamental at 28 Hz, and the highest, 'G', a fundamental at 4186 Hz (there will be higher order harmonics). Human speech is predominantly in the range 250 Hz - 3000 Hz.
- A.2.3 The musical term 'octave' is the interval between the first and eighth note in a scale and represents a doubling of frequency. A series of octave and one-third octave bands have been derived, as shown in the Figure overleaf, and these are commonly used in noise measurements where it is necessary to describe not only the level of the source noise but also the frequency content. The frequency content of a noise source can be useful for identifying acoustic features such as a whine, hiss or screech.
- A.2.4 In most instances it is necessary only to specify and use the overall A-weighted noise values, for example when assessing noise from fixed plant (pumps, motors, refrigeration plant etc.), road traffic and general industrial sources. However, in certain circumstances it is necessary to consider the contribution to the overall A-weighted

¹¹ BRE and CIRIA (1993) Sound Control for Homes. BRE Report 238, CIRIA Report 127.

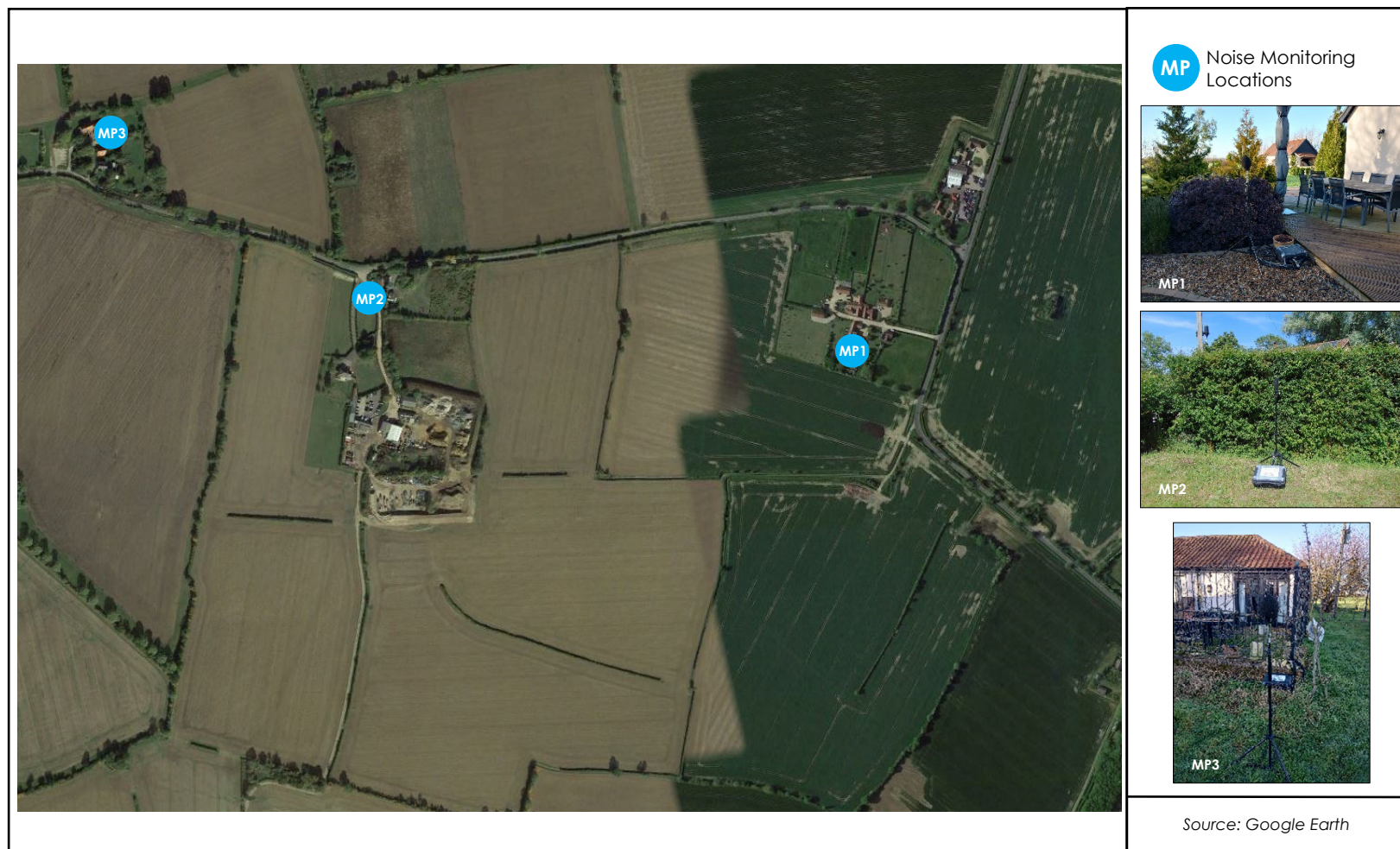
noise level in individual octave frequency bands, such as when assessing architectural acoustics or noise from amplified music events.

Figure A.1: 1/1 Octave and 1/3 Octave Frequency Bands



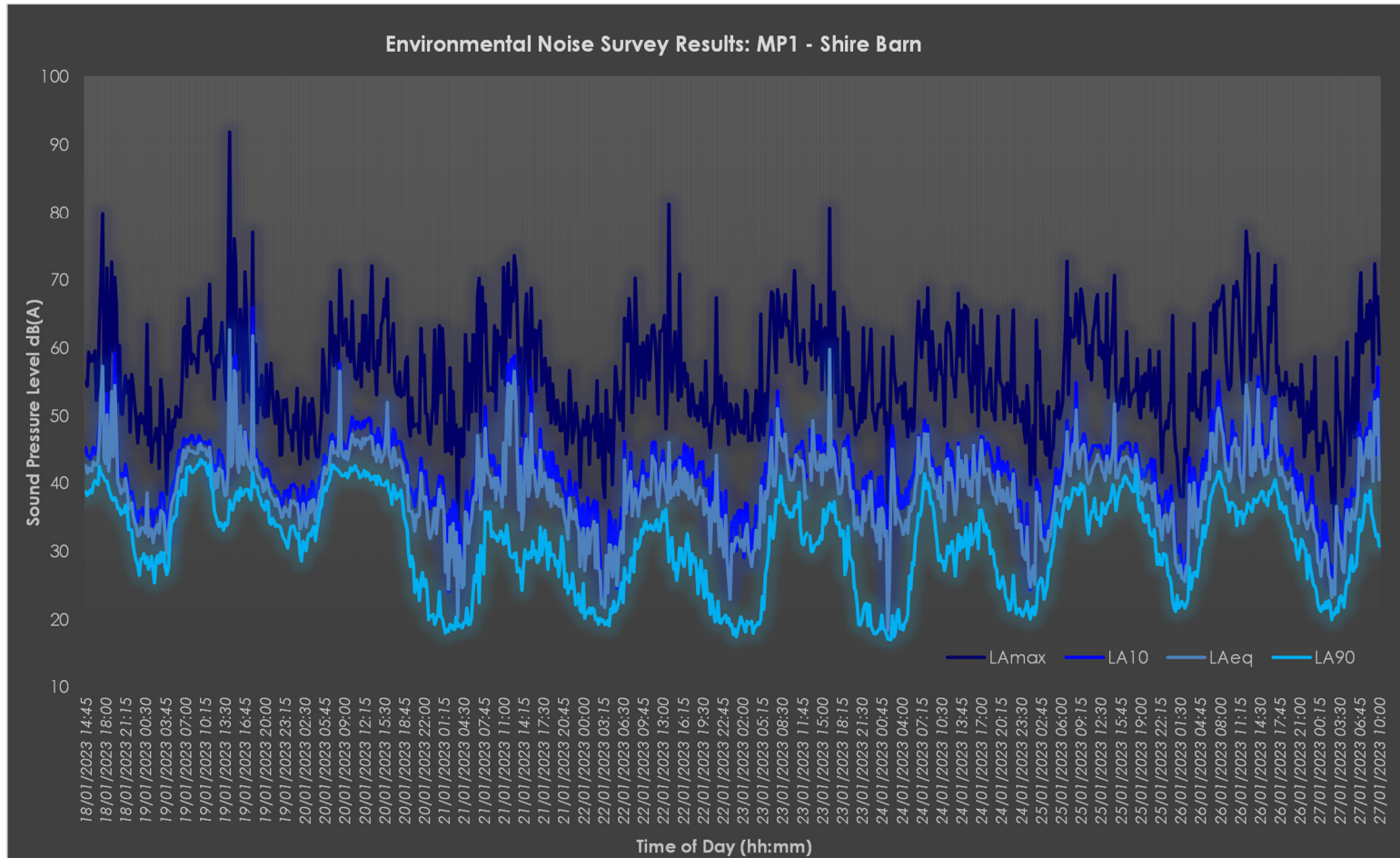
Appendix B

Site Plan Indicating Noise Monitoring Locations



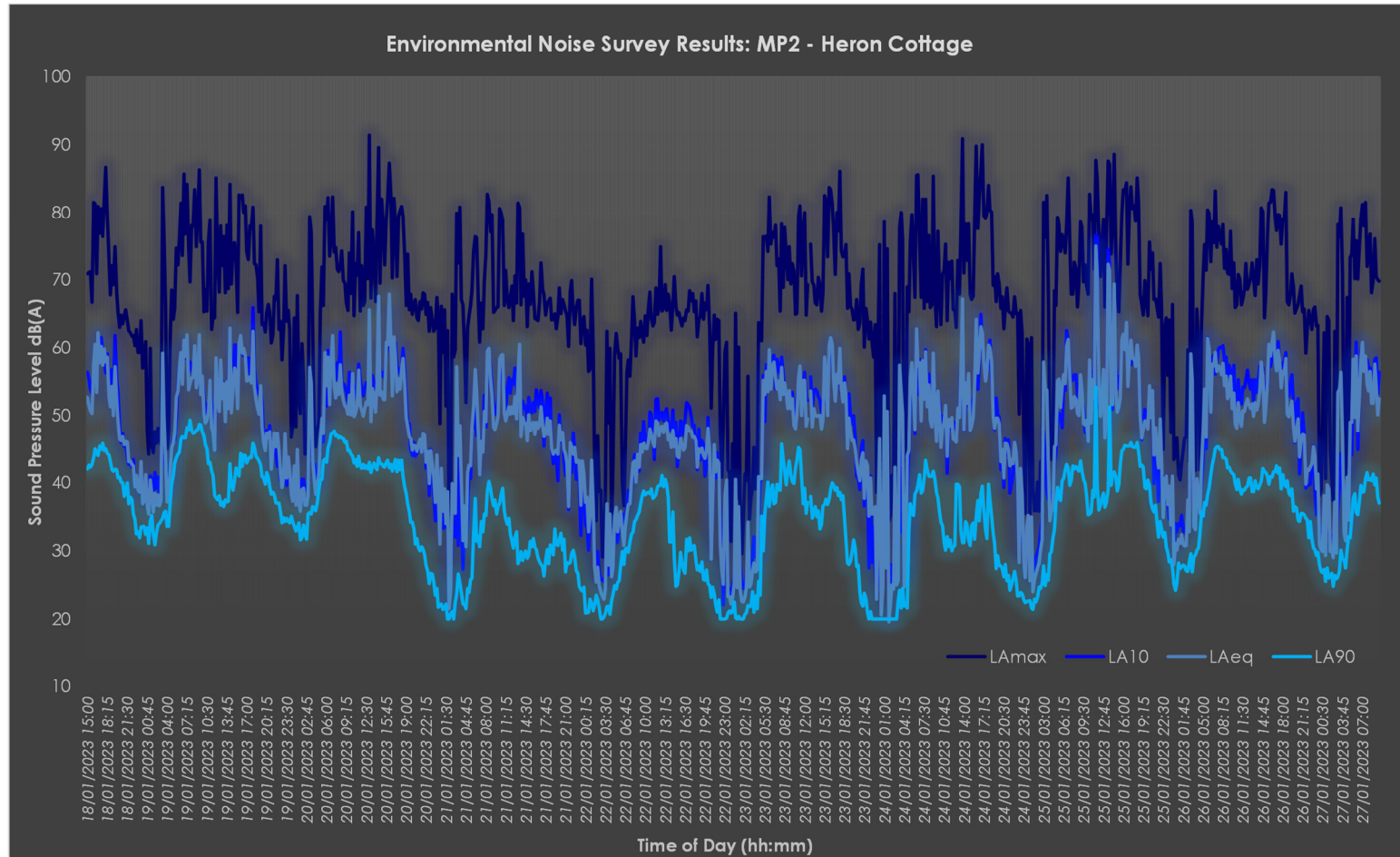
Appendix C.1

Environmental Noise Survey Results: Monitoring Position 1 (MP1) – Shire Barn



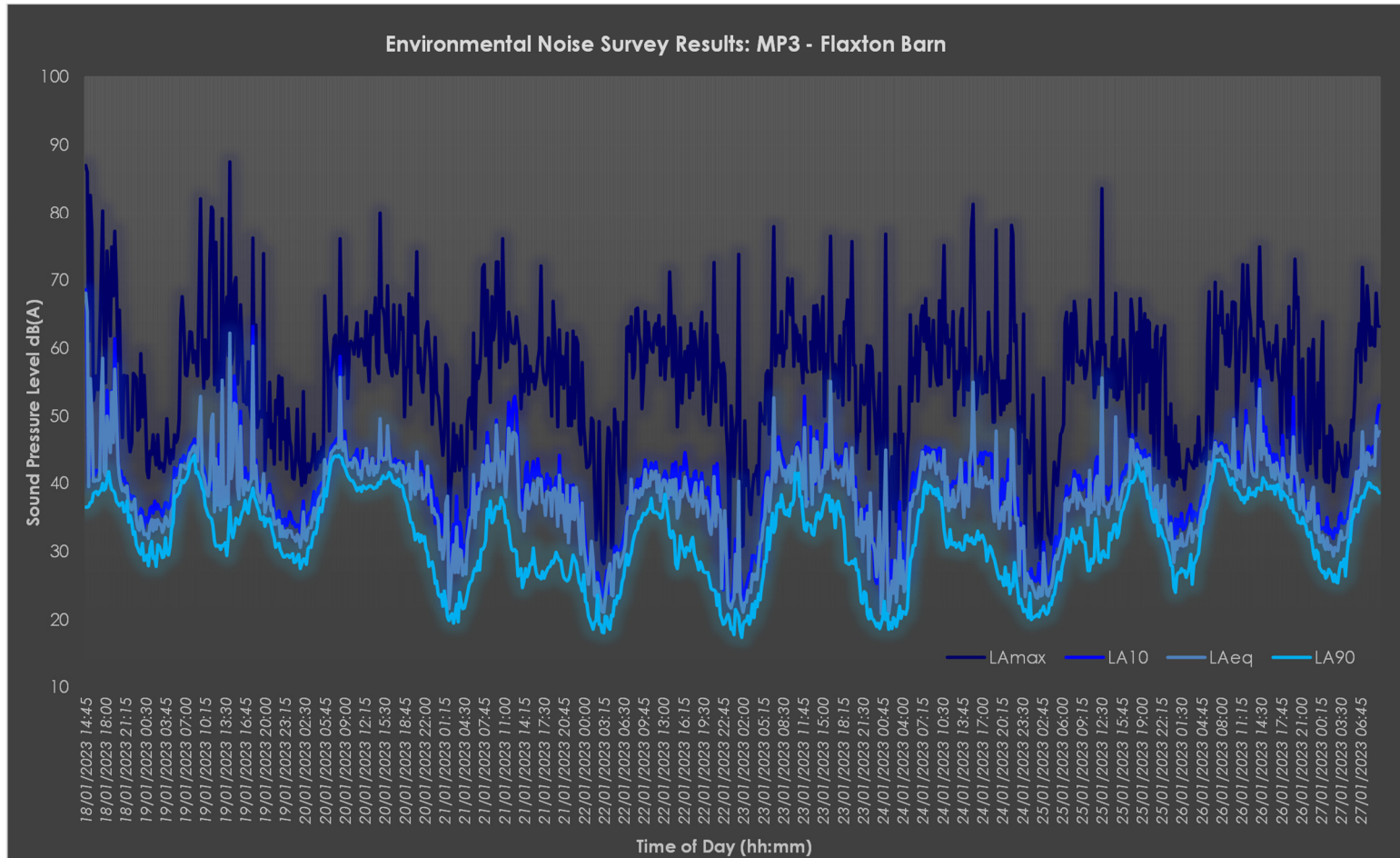
Appendix C.2

Environmental Noise Survey Results: Monitoring Position 2 (MP2) – Heron Cottage



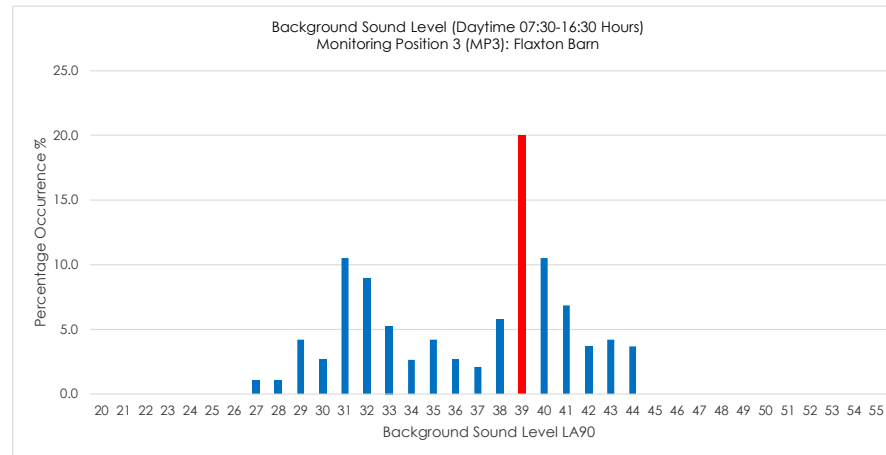
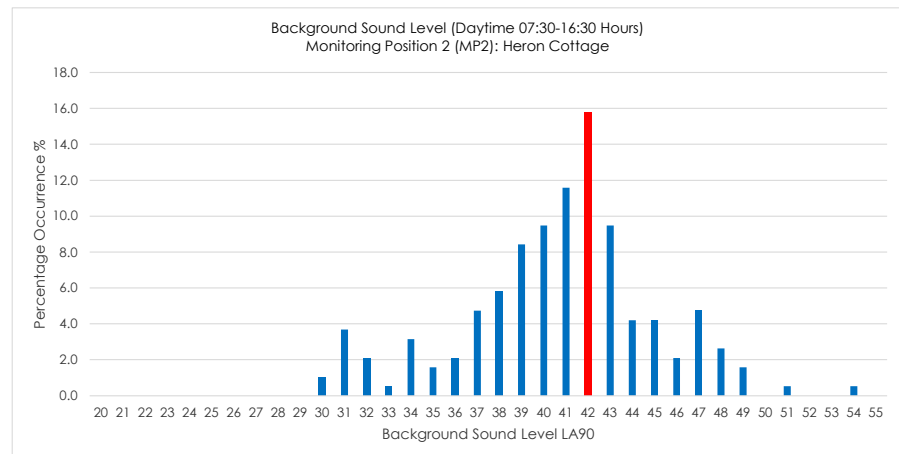
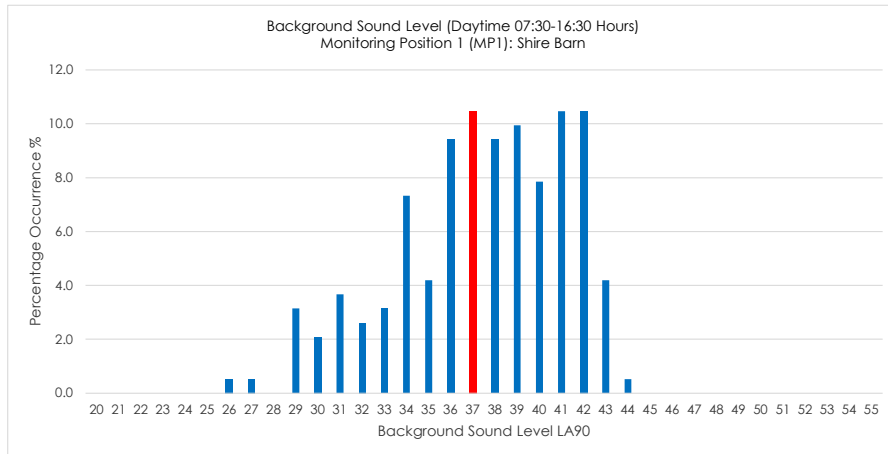
Appendix C.3

Environmental Noise Survey Results: Monitoring Position 3 (MP3) – Flaxton Barn



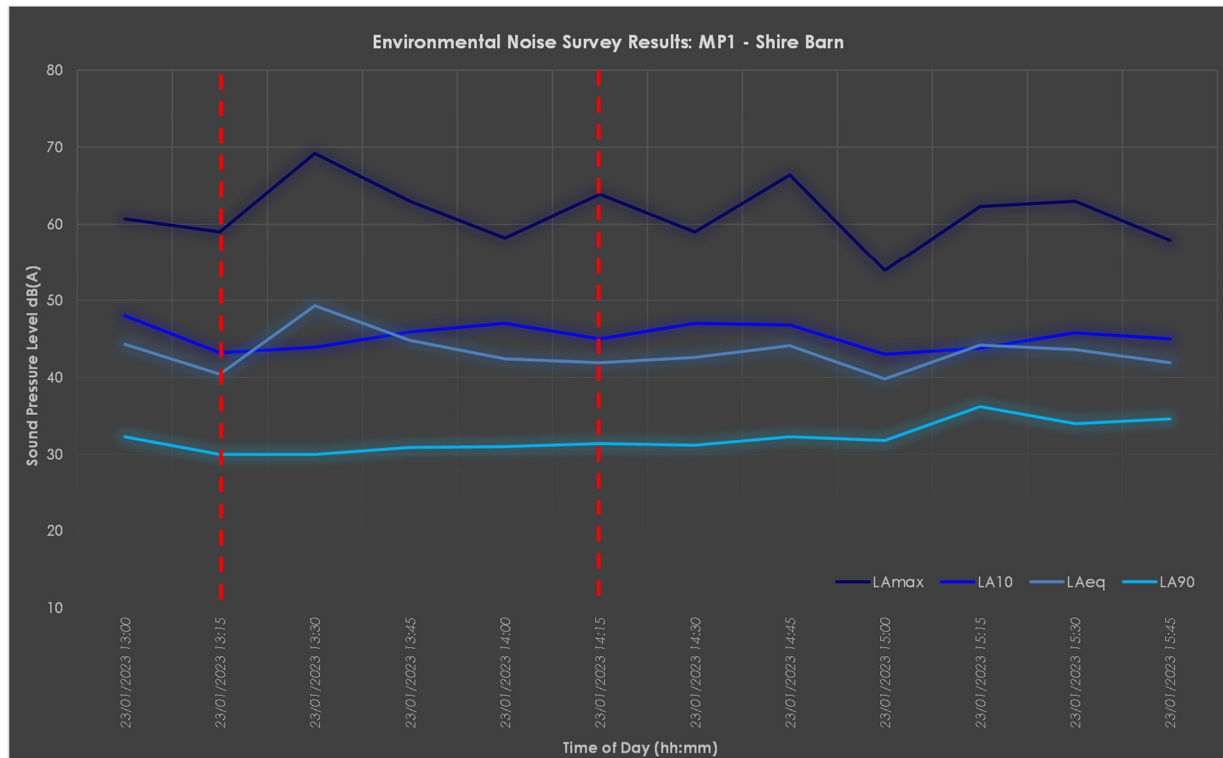
Appendix C.4

Environmental Noise Survey Results: Modal Analysis (L_{A90})



Appendix C.4

Environmental Noise Survey Results: Specific and Residual Noise Measurements at Noise-Sensitive Receptor Locations Monitoring Position 1 (MP1): Shire Barn



Field Notes:

13:20 Excavator tracking.

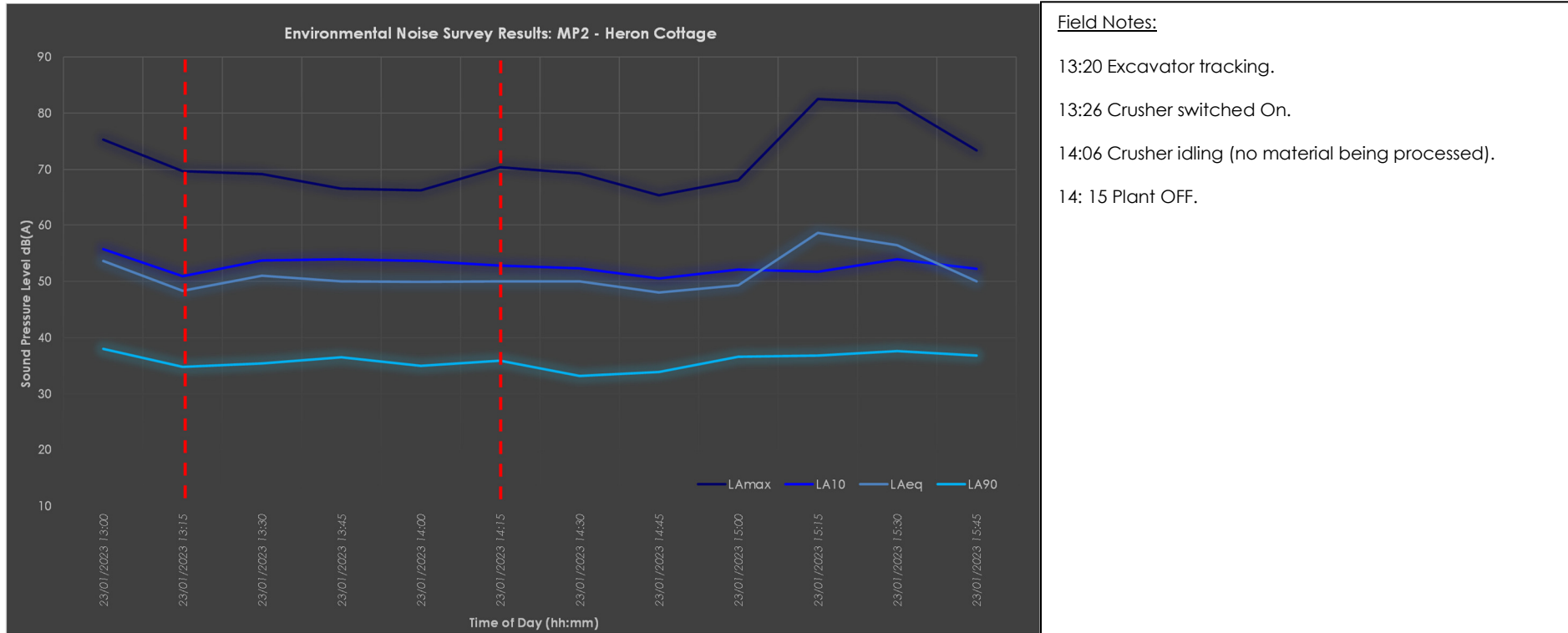
13:26 Crusher switched On.

14:06 Crusher idling (no material being processed).

14:15 Plant OFF.

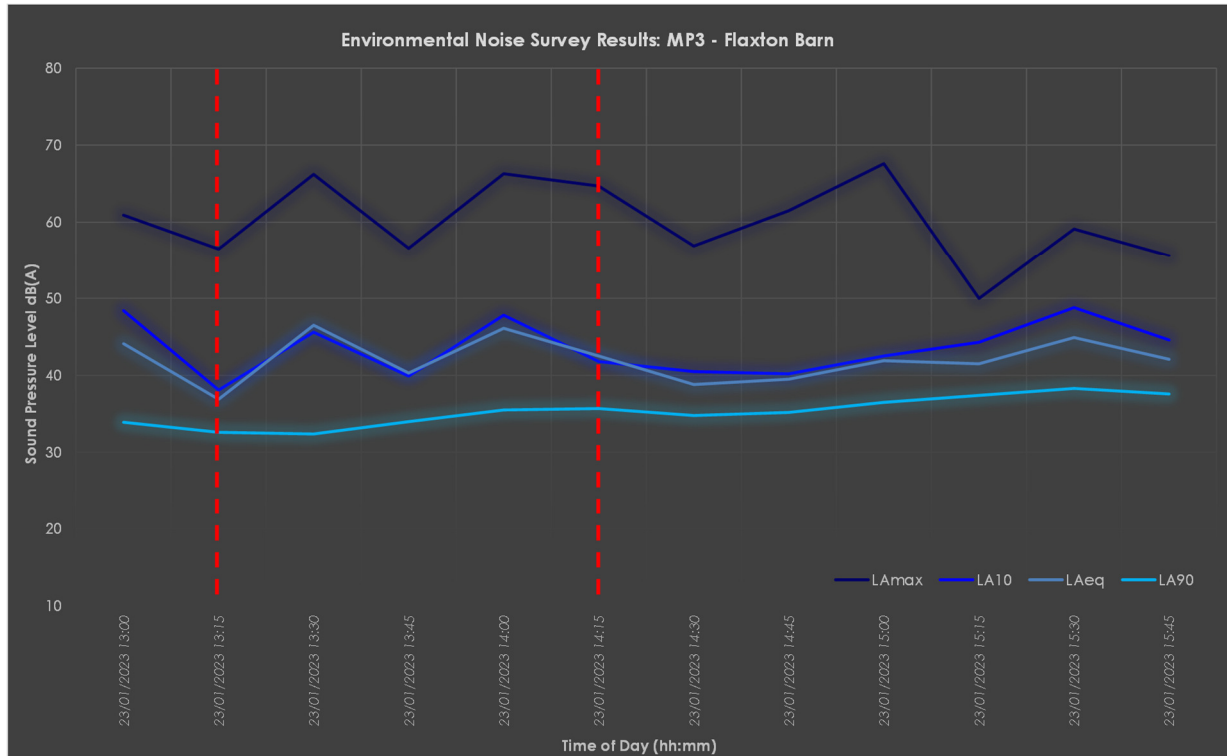
Appendix C.5

Environmental Noise Survey Results: Specific and Residual Noise Measurements at Noise-Sensitive Receptor Locations Monitoring Position 2 (MP2): Heron Cottage



Appendix C.6

Environmental Noise Survey Results: Specific and Residual Noise Measurements at Noise-Sensitive Receptor Locations Monitoring Position 3 (MP3): Flaxton Barn



Field Notes:

13:20 Excavator tracking.

13:26 Crusher switched On.

14:06 Crusher idling (no material being processed).

14:15 Plant OFF.

Appendix D

Photos of Processing Plant



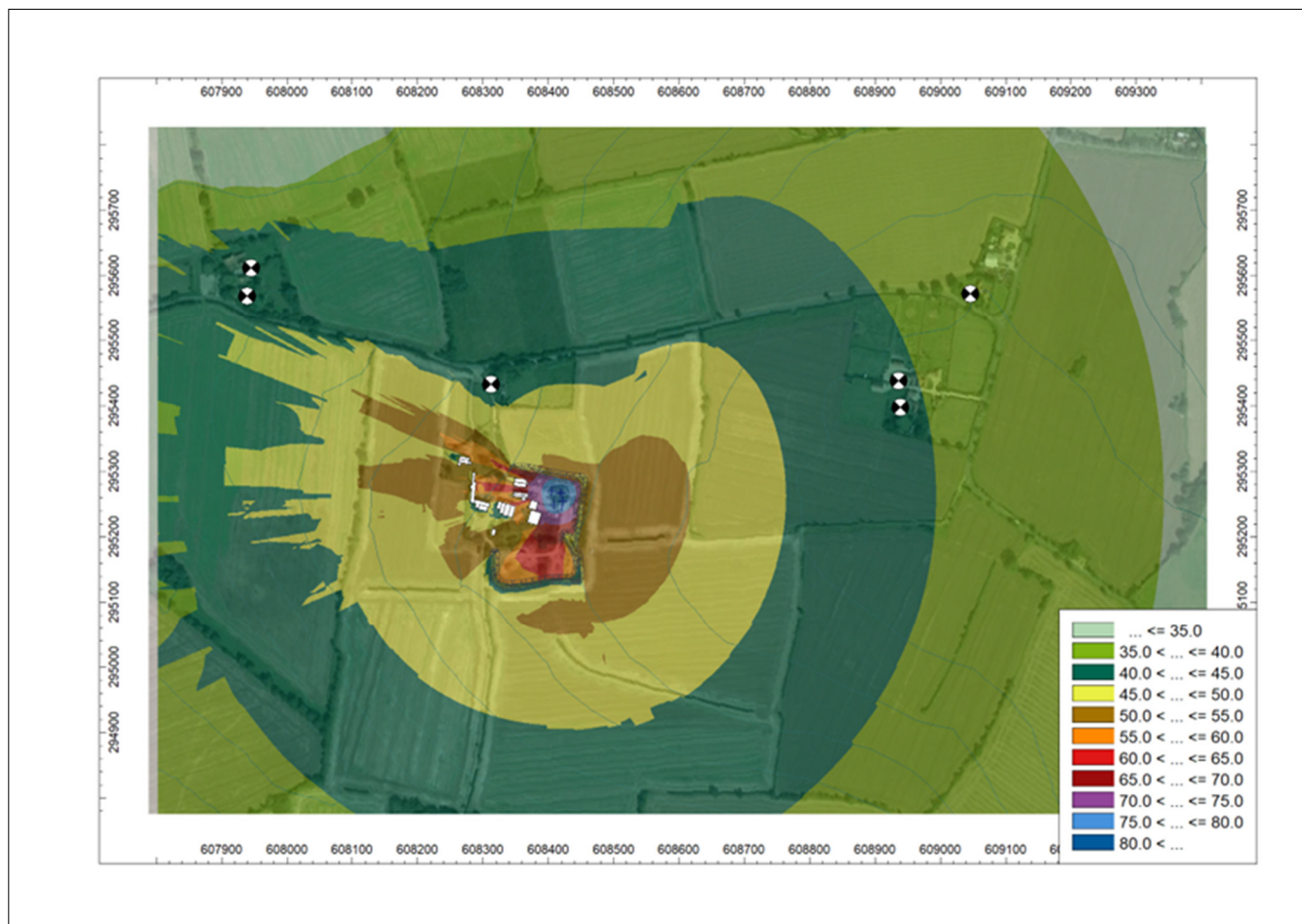
Terex Powerscreen R400 Jaw Crusher



Anaconda DF512 Screen

Appendix E

CadnaA Noise Model: Daytime Operations $L_{Aeq,1hour}$ (1.5m above ground level)
All plant operational





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