



Noise Assessment

Land at Dig Gate Lane, Rochdale, OL16 4NR

For:

Rochdale Power Ltd

SHF.3050.001.NO.R.001



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Noise Assessment

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For:	Rochdale Power Ltd
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1 Introduction

1.1 Project Introduction

- 1.1.1 Enzygo Limited (Enzygo) has been commissioned by Rochdale Power Ltd to undertake an environmental noise impact assessment to support a planning application for a proposed energy reserve facility on land at Dig Gate Lane, Rochdale.
- 1.1.2 The assessment has been undertaken to assess compliance with the relevant standards at the nearest noise-sensitive receptors during the proposed operational hours of the equipment and to provide outline mitigation advice, where considered necessary.
- 1.1.3 Details of the assessment methodology, the assessment and conclusions are presented within this report.

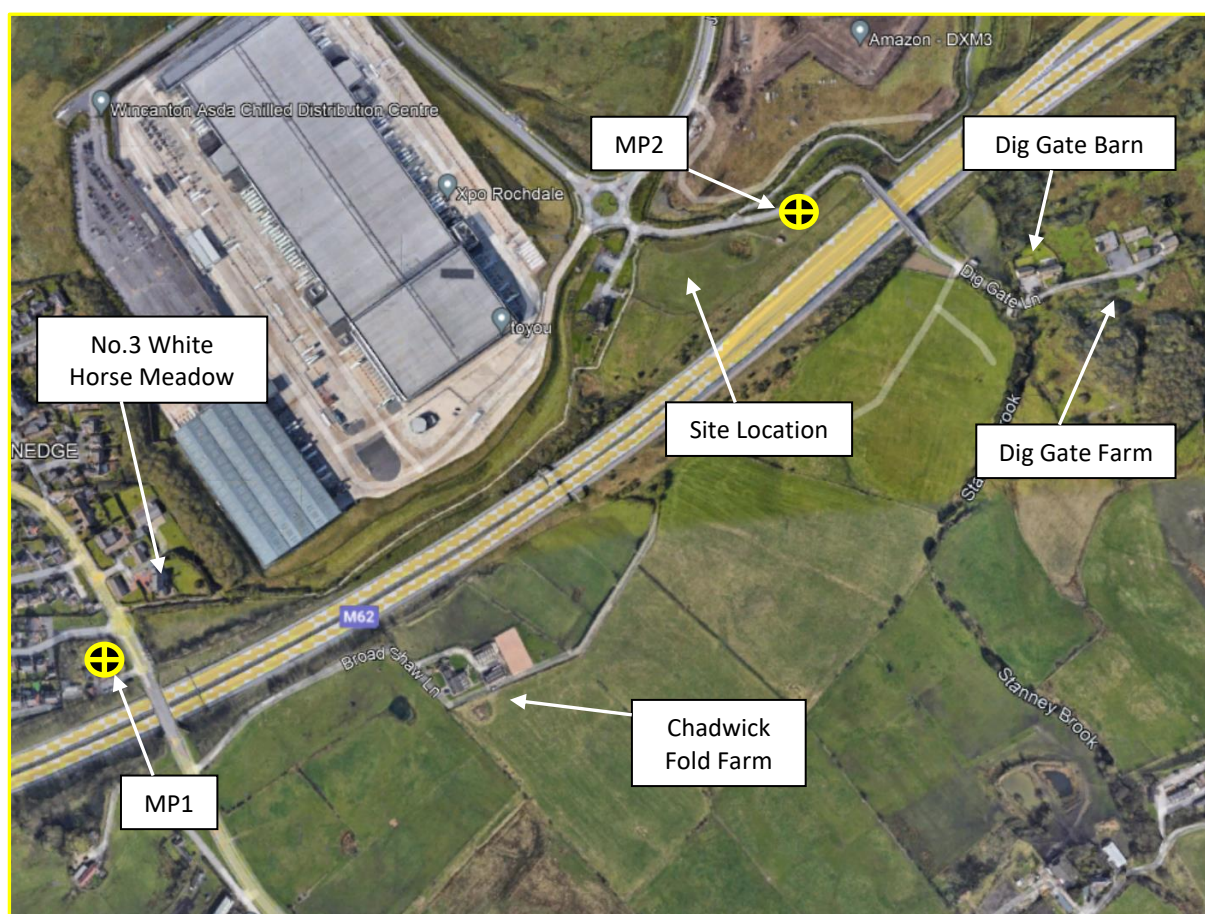
1.2 Site Description

- 1.2.1 The site lies adjacent to the M62 on a parcel of land between the M62 and Dig Gate Lane, Rochdale. The site is centred at grid reference SD 91846 11185, approximately.
- 1.2.2 To the north of the site there are warehouses and related buildings forming Kingsway Business Park, to the east of the site is the M62 beyond which is Dig Gate Barn and Farm with open farmland and other farm buildings as far as Newhey. To the south, beyond the M62 is open farmland as far as Broad Lane, Burnedge. To the west are retail buildings with the ASDA warehouses beyond with residential properties at Balderstone.
- 1.2.3 The nearest noise sensitive residential receptors, identified in the WYG Report, shown in Figure 1-1, are:
 - No.3 White Horse Meadows, Balderstone;
 - Chadwick Fold Farm, Burnedge;
 - Dig Gate Barn, Milnrow; and
 - Dig Gate Farm, Milnrow.

1.3 Project Description

- 1.3.1 The proposed energy reserve facility would generate electricity to support the National Grid when required to cope with short-term peak energy demand. The facility, which will be enclosed within a paladin perimeter fence, will comprise the following equipment:
 - A containerised generator (including roof mounted remote radiator and exhaust system).
 - A gas kiosk, DNO room, welfare cabin and an electrical switchgear container.
- 1.3.2 It is understood that the containerised generator packages have been designed to achieve a noise level of 70dB(A)@10m under full load operating conditions.

Figure 1-1: Site Location Plan



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1.4 Consultation

- 1.4.1 Enzygo previously consulted with Rochdale Borough Council regarding an earlier assessment for the proposed development site. It is assumed that that assessment methodology would be suitable for any subsequent assessments at the site.

1.5 Noise Assessment Methodology

- 1.5.1 The noise assessment has been made in accordance with the guidance contained within British Standard 4142:2014 '*Method for rating and assessing industrial and commercial sound*' (BS4142).
- 1.5.2 Noise levels generated by the proposed development during operations to support the National Grid power supply during peak demands/power outages, have been predicted to the nearby sensitive receptors using the calculation methodology outlined in ISO 9613:1996 '*Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*' (ISO 9613) using the proprietary noise modelling software CadnaA.
- 1.5.3 The assessment is based upon the results of the baseline noise survey at the nearby receptors over representative operational periods.

2 Standards and Guidance

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

2.1.1 BS4142 provides a methodology for rating and assessing sound associated with both industrial and commercial premises. The purpose of the Standard is clearly outlined in the opening section where it states that the method is appropriate for the consideration of:

- Sound from industrial and manufacturing processes.
- Sound from fixed installations which comprise mechanical and electrical plant and equipment.
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises.
- 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.

2.1.2 The methods described in the 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.

2.1.3 The standard states that sound of an industrial/commercial nature does **not** include sound from the passage of vehicles on public roads and railway systems.

2.1.4 The Standard is based around the premise that the significance of the noise impact of an industrial/commercial facility can be derived from the numerical subtraction of the background noise level (not necessarily the lowest background level measured, but the typical background at the receptor) from the measured/calculated rating level of the specific sound under consideration. This comparison will enable the impact of the specific sound to be concluded based upon the premise that typically *“the greater this difference, the greater the magnitude of the impact”*. This difference is considered as follows:

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5dB is likely to be an indication of an adverse impact, depending upon context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact.

2.1.5 BS4142 further 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”* again depending upon the specific context of the site. The standard further qualifies the assessment protocol by outlining conditions to the comparative assessment and stating that *“not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact”*, thus implying that all sites should be assessed on their own merits and specifics.

2.1.6 The standard goes on to states that “where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night”.

2.1.7 The standard quantifies the typical reference periods to be used in the assessment of noise, namely:

Typical Daytime	07:00 – 23:00	1-hr assessment period
Typical Night-time	23:00 – 07:00	15-min assessment period

2.1.8 The Standard outlines methods for defining appropriate “character corrections” within the rating levels to account for tonal qualities, impulsive qualities, other sound characteristics and/or intermittency. These are a) the Subjective Method, b) the Objective Methods for tonality and c) the Reference Method. It is noted by the Standard that where multiple features are present the corrections should be added in a linear fashion to the specific level.

2.1.9 The Subjective Method is based on the following corrections:

Table 2-1: BS4142 Subjective Method Rating Corrections

Level of Perceptibility	Tonal Correction	Impulsivity Correction	Correction for “Other sound characteristics”	Intermittency Correction
No Perceptibility	+0 dB	+0 dB	Where neither tonal nor Impulsive but clearly identifiable +3 dB	If intermittency is readily identifiable +3 dB
Just Perceptible	+2 dB	+3 dB		
Clearly Perceptible	+4 dB	+6 dB		
Highly Perceptible	+6 dB	+9 dB		

2.2 British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings*

2.2.1 BS8233 provides guidance and recommendations for the control of noise from outside sources to maintain an internal acoustic environment appropriate for the intended use. The Standard suggests appropriate criteria and limits for differing situations which are, primarily, intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes to the external noise climate. However, it is considered that the guidance provides suitable criteria for the assessment of internal noise levels in this instance.

2.2.2 The Standard suggests suitable guidance values for residential dwellings shown in Table 2-2.

Table 2-2: BS8233 Indoor Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00 Hours	23:00 to 07:00 Hours
Resting	Living room	35dB L _{Aeq,16hr}	-
Dining	Dining room/area	40dB L _{Aeq,16hr}	-
Sleeping (daytime resting)	Bedroom	35dB L _{Aeq,16hr}	30dB L _{Aeq,8hr}

- 2.2.3 Whilst it is considered desirable to achieve these internal noise levels with the windows open, it is not stipulated within the Standard which states:

"If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level."

- 2.2.4 The Standard suggests that the level of noise reduction provided by a partially open window would be approximately 15dB.

- 2.2.5 BS8233 also sets out a design-criteria for external noise in external amenity spaces such as gardens and patios stating:

"it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments."

- 2.2.6 These guideline design-criteria values are meant for new residential development rather than for assessing new noisy development being introduced into a residential area. However, the guideline values provide good noise limits to attain in this instance.

2.3 ISO9613 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation

- 2.3.1 The noise levels generated by the operation of the proposed development have been predicted using the calculation methodology set out in ISO9613-2. The methodology considers the distance between the sources and the receptors and applies the amount of attenuation due to atmospheric absorption and other site-specific characteristics.

- 2.3.2 The methodology assumes downwind propagation, i.e., a wind direction that assists the propagation of noise from the source to all receptors.

3 Baseline Noise Monitoring Survey

3.1 Introduction

3.1.1 Environmental baseline noise surveys were undertaken at the nearest accessible locations to the nearest noise-sensitive residential receptors. The monitoring locations are detailed in Table 3.1 and shown on Figure 1.1.

3.1.2 The monitoring was undertaken on Tuesday 5th and Wednesday 6th July 2022 for 2-hours during the day, avoiding rush hour and for 1-hour during the night-time period.

Table 3-1: Noise Monitoring Locations

Monitoring Location	Approx. Distance from Site	Reflecting Surfaces between Source & Receptor	Topography of Intervening Ground	Justification for Choice of Measurement Location
MP1	600m	Warehouses north of the M62	Undulating landforms, buildings/warehouses and roads	Location representative the White Horse Meadow and Chadwick Farm receptors.
MP2	50M	None	Undulating landform between the site and measurement position	Location representative the Dig Gate Barn and Dig Gate Farm receptors.

3.2 Weather Conditions

3.2.1 Weather conditions during the survey periods were noted and are detailed in Table 3-2.

Table 3-2: Weather Conditions

Period	Wind Speed & Direction	Rain	Fog or Mist	Ground Conditions	Cloud Cover	Temp
Day	<5m/s	None	Clear	Dry	100%	15°C
Night	<5m/s	None	Clear	Dry	90%	11°C

3.3 Measuring Equipment

3.3.1 The noise monitoring equipment used during the surveys is shown in Table 3-3 and was set to record the $L_{Aeq,T}$, L_{A90} , L_{A10} and L_{Amax} parameters.

3.3.2 The following set-up parameters were used on the sound level meter during all the noise measurements undertaken:

Time Weighting: Fast
Frequency Weighting: "A"

- 3.3.3 The sound level meters were field calibrated, using the acoustic calibrator, prior to commencement and upon completion of the overall survey. No drifts in calibration were noted.

Table 3-3: Noise Monitoring Equipment

Location	Equip. Make & Model	Class	Calibration Level, dB	Serial No.	Calibration Date Prior to Survey
MP1	01dB Solo Sound Level Meter	1	93.7	065445	March 2022
MP2	01dB Solo Sound Level Meter	1	93.9	065396	February 2022
All	Cirrus CR:515 Acoustic Calibrator	-	-	59522	February 2022

- 3.3.4 The external calibration documentation for the equipment used is available upon request.

3.4 Survey Details and Results

- 3.4.1 The results of the baseline surveys are summarised in Table 3-4 below and can be found in full in Appendix A. Background levels have been rounded to the nearest whole decibel with both average background and lowest (in brackets) shown.

Table 3-4: Summary of Baseline Survey Results, dB

Location	Period	L _{Aeq,T}	L _{Afmax}	L _{A90}	L _{A10}
MP1	Day	63.3	83.1	61 (59)	64.9
	Night	55.9	67.4	52 (51)	58.2
MP2	Day	59.9	75.8	58 (57)	61.1
	Night	53.2	61.3	50 (50)	55.2

3.5 Existing Context

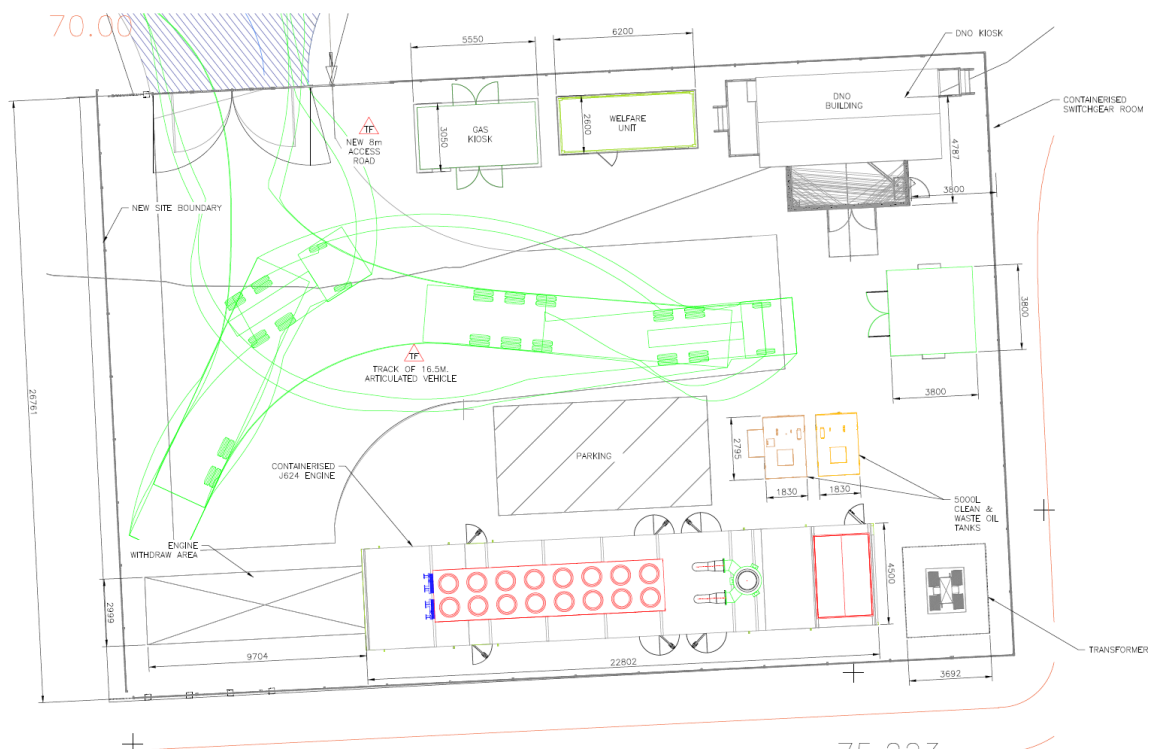
- 3.5.1 The daytime noise climate at MP1 was dominated by road traffic noise from the M62, occasional road traffic passing the monitoring position and some wind in the nearby trees.
- 3.5.2 The night-time noise climate at MP1 was dominated by road traffic noise from the M62, frequent road traffic passing the monitoring position and some wind in the nearby trees.
- 3.5.3 The daytime noise climate at MP2 was dominated by road traffic noise from the M62, some distant banging sounds from the commercial units with the Kingsway Business Park, reversing warning system audible at times and some wind in the nearby trees.
- 3.5.4 The night-time noise climate at MP2 was dominated by road traffic noise from the M62 with some wind noise in nearby trees. There was not activity audible from within the business park.

4 Noise Assessment

4.1 Noise Emissions

- 4.1.1 The J624 generator package has been designed to achieve a noise specification of 70dB(A) measured at 10m from the side of the container.
- 4.1.2 The proposed facility would also include ancillary items such as a switchgear container, welfare room, DNO room and gas kiosk. No significant noise emissions are expected from these plant items and therefore are not included within the following assessment.
- 4.1.3 The proposed layout of the site is shown in Figure 4-1.

Figure 4-1: Proposed Site Layout



4.2 Noise Modelling Protocols

- 4.2.1 The noise model was constructed using the proprietary noise modelling software package CadnaA. The potential noise impacts at the nearby residential properties have been predicted using the calculation methodology outlined in ISO9613.
- 4.2.1 The noise model was constructed utilising Google Earth geo-referenced 1:1 scaled aerial photography and noise source data supplied by the client.
- 4.2.2 Table 4-1 shows the sound levels used for the noise model.

Table 4-1: Modelled Sources

Plant Noise Source	Mid Band Frequency, dB(A) @ 10m (except when stated otherwise)								
	31.5	63	125	250	500	1k	2k	4k	8k
Container	-	49	63	57	51	43	38	37	36
Inlet Atten Louvre	-	61	63	58	46	44	44	47	55
Outlet Atten Louvre	-	61	66	43	39	39	39	40	46
Roof Radiator	-	-	37	45	54	56	54	51	-
Exhaust Silencer @1m	68	76	80	75	78	78	74	79	-
500kVA Transformer	70dB(A) @ 1m in accordance with NEMA TR1								

4.3 Noise Modelling Assumptions

4.3.1 Modelled noise levels form the basis of the calculated specific sound level. Noise emissions from the site have also been plotted graphically and are shown in Appendix A. The following assumptions have been made during the modelling process:

- All sources have a 100% on-time throughout the 1-hour daytime and 15-minute night-time assessment periods.
- Wind and temperature gradient assisted sound propagation at all receptors; and
- 75% soft ground between the sources and receptors.

4.4 Predicted Sound Levels/Sound Rating Levels

4.4.1 For the purposes of this assessment the predicted sound levels assume that all generators would be operating simultaneously and at 100% capacity.

4.4.2 Predicted specific sound levels have been made to heights of 1.5m for outdoor amenity space and 4.0m for an upstairs bedroom window, respectively. The results are shown in Table 4-3.

Table 4-2: Predicted Specific Sound Levels at the Assessment Locations

Location	Assessment Location	Assessment Height, m	Predicted Specific Sound Level dB L _{Aeq,1hr}
No.3 White Horse Meadows	Ground Floor – day	1.5	36.0
	1 st Floor - night	4.0	36.3
Chadwick Fold Farm	Ground Floor – day	1.5	38.6
	1 st Floor - night	4.0	38.8
Dig Gate Barn	Ground Floor – day	1.5	40.1
	1 st Floor - night	4.0	41.1
Dig Gate Farm	Ground Floor – day	1.5	35.7
	1 st Floor - night	4.0	37.9

4.5 Subjective Impressions at the Receptors

- 4.5.1 As the development proposals are in the planning stage there are currently no specific noise sources at site, the ambient sound level and residual sound level are considered to be equal and are taken as the measured $L_{Aeq,T}$. There have been no corrections applied to the measured sound levels. The specific sound level will be predicted using the proprietary noise modelling software CadnaA.

4.6 Sound Rating Levels

Existing Context

- 4.6.1 The identified nearest receptors are located close to the M62, local roads network and significant industrial/commercial development. The receptors are therefore subject to high background noise levels and acoustic characteristics of such environments.

Derived Sound Rating Levels

- 4.6.2 Based on the distance from the site, the existing local context, and the nature of the installation, it is unlikely that any tonal, intermittent, or impulsive content of the sound sources associated with the development proposals would be perceptible above the prevailing acoustic environment. Therefore, no corrections have been made for these acoustic features.

4.7 Assessment of Impacts

- 4.7.1 BS4142 states:

“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.”

- 4.7.2 A comparative assessment has been undertaken to determine the potential impact of the predicted sound rating levels at the nearest residential receptors upon the lowest prevailing background noise level measured at each monitoring location. Table 4-3 details the results of the assessment.

Table 4-3: BS 4142 Assessment

Location	Period	Background Noise Level dB L_{A90}	Sound Rating Level dB $L_{Ar,T}$	Level Exceeding Background dB
No.3 White Horse Meadows	Day	59	36	-23
	Night	51	36	-15
Chadwick Fold Farm	Day	59	39	-20
	Night	51	39	-12
Dig Gate Barn	Day	58	40	-18
	Night	50	41	-9
Dig Gate Farm	Day	58	36	-22
	Night	50	38	-12

- 4.7.3 Table 4-3 shows that the predicted sound rating levels are below the prevailing background noise levels indicating that the specific sound would have a **low impact** depending on the context.

4.8 Context

- 4.8.1 BS4142 states that where the initial estimate of impact needs to be modified due to the context, all pertinent factors should be taken into consideration.

The Absolute Level of Sound

- 4.8.2 The specific sound levels generated by the development proposals are predicted to be below the prevailing average ambient L_{Aeq} noise levels at the receptors assessed during both the day and night.

The Character and Level of the Residual Sound

- 4.8.3 The specific sound levels from the proposed facility are predicted to be below the measured background noise levels during both the day and night. Therefore, the character and level of the specific sound are unlikely to be distinguishable against the residual noise climate.

Sensitivity of the Receptors

- 4.8.4 The nearest receptors identified are residential in nature and as such are sensitive to noise impact during both the day and overnight. However, as they are located close to major infrastructure, namely the M62 motorway and large warehouse developments, it is considered that the sensitivity to noise would be greatly reduced.

Summary of Context

- 4.8.5 The context should not affect the initial estimate of impact as predicted noise levels would remain below the prevailing background noise levels.
- 4.8.6 During the night, it is unlikely that residents would be using outdoor amenity spaces therefore an assessment of internal noise levels using the guidance contained in BS8233, as suggested by BS4142, has been made, specifically those relating to sleeping conditions in bedrooms.
- 4.8.7 Based on the findings and context of the assessment, mitigation measures are considered unnecessary.

4.9 BS8233 Indoor Noise Level Assessment, Emergency Night-time Operations

- 4.9.1 An assessment of the predicted internal noise levels, generated during rare emergency night-time operations at the proposed facility, has been made against the guideline values for internal ambient noise levels for sleeping in bedrooms outlined in BS8233.
- 4.9.2 Table 4-4 details the results of the assessment when considering a 15dB reduction for a partially open window.

Table 4-4: BS8233 Assessment

Location	Floor	Predicted External Noise Level dB LAeq	Predicted Internal Noise Level dB LAeq	Guidance Level for Sleeping dB LAeq,8hr	Difference
No.3 White Horse Meadows	1 st	36	21	30	-9
Chadwick Fold Farm	1 st	39	24		-6
Dig Gate Barn	1 st	41	26		-4
Dig Gate Farm	1 st	38	23		-7

4.9.3 Table 4-4 shows that predicted internal noise levels generated by the proposed facility during night-time operations would meet the guideline values for sleeping condition in bedrooms at all receptors assessed.

4.9.4 Based on the findings of the assessment, mitigation measures to reduce potential impacts are considered unnecessary.

5 Conclusion

5.1 Background

- 5.1.1 Enzygo Limited (Enzygo) has been commissioned by Rochdale Power Ltd to undertake an environmental noise impact assessment to support a planning permission for a proposed energy reserve facility on land at Dig Gate Lane, Rochdale.
- 5.1.2 The assessment has been undertaken to assess compliance with the relevant standards at the nearest noise-sensitive receptors during the proposed operational hours of the equipment and to provide outline mitigation advice, where considered necessary.

5.2 Noise Assessment

- 5.2.1 Sound levels generated by the proposed development have been predicted using CadnaA and an assessment has been made in accordance with the guidance contained in BS4142.
- 5.2.2 The BS4142 assessment has shown that daytime predicted sound rating levels would be significantly below the prevailing background noise levels at the nearest residential receptors assessed. This would indicate that the specific sound level would have a **low impact**, depending on the context.
- 5.2.3 At night the BS8233 assessment, made in accordance with the guidance outlined in BS4142, has shown that the guideline internal noise level of 30dB $L_{Aeq,8hr}$ for sleeping in bedrooms would be easily met at all receptors assessed.

5.3 General Conclusion

- 5.3.1 Based on the findings of the assessment against the guidance contained in the relevant standards it is considered that the proposed energy reserve facility would be able to operate without adversely affecting the nearby sensitive receptors assessed in terms of acoustic impact.

Glossary of Terminology

Noise is defined as unwanted sound. The range of audible sound is known to be from 0dB (threshold of hearing) to 140dB (threshold of pain). Examples of typical noise levels relating to ‘everyday’ occurrences are given in Table G-1 below.

Table G-1: Typical Noise Levels

Source	Sound Pressure Level in dB(A)	Subjective Level
Gun shot	160	Perforation of eardrum
Military Jet take-off	140	Threshold of pain
Jet Aircraft at 100m	120	Very Loud
Rock Concert, front seats	110	Threshold of Sensation
Pneumatic Drill at 5m	100	Very Loud
Heavy goods vehicle from pavement	90	
Traffic at kerb edge	70 – 85	Loud
Vacuum Cleaner, Hair Dryer	70	
Normal conversation at 1m	60	Moderate
Typical Office	50 – 60	
Residential area at night	40	Quiet
Rural area at night, still air	30	
Leaves Rustling	20	
Rubbing together of fingertips	10	
	0	Threshold of hearing

The frequency response of the human ear to noise is usually taken to be around 18Hz (number of oscillations per second) to 18,000Hz. However, the human ear does not respond equally to different frequencies at the same level; it is more sensitive in the mid-frequency range than lower and higher frequencies and, because of this, when undertaking the measurement of noise the low and high frequency components of any given sound are reduced in importance by applying a filtering (weighting) circuit to the noise measuring instrument. The weighting which is widely accepted to correlate best with the subjective nature of human response to noise and is most widely used to quantify this is the A-weighted filter set. This is an internationally accepted standard for noise measurement.

For variable noise sources within an area an increase of 3dB(A) would be the minimum perceptible to the human ear under normal conditions. It is generally accepted that an increase/decrease of 10dB(A) corresponds to a doubling or halving in perceived loudness. The ‘loudness’ of a noise is a purely subjective parameter, dependant not only upon the sound pressure of the event but also on the dynamics of the listener’s ear, the time of the day and the general mood of the person.

With regard to environmental noise levels (in the open air), these are rarely steady but rise and fall according to the activities being undertaken within the surrounding area at any given time. In an attempt to produce a figure that relates this variable nature of noise to human subjective response, a number of statistical noise metrics have been developed. These and other useful terminology and descriptors are presented in Table G-2 below.

Table G-2: Terminology

Term	Definition
Sound	Pressure fluctuations in a fluid medium within the audible range of amplitudes and frequencies which stimulate the organs of hearing.
Noise	Unwanted sound emitted from a source and received by the sensitive receptor.
Decibel (dB)	Unit most often used to describe the sound pressure level. A logarithmic number, it correlates closely to the way in which humans perceive sound. Its wide range of values helps quantify sound pressures from a large variety of magnitudes.
A-Weighting (dB(A))	Human perception of sound is frequency dependant. A-weighting applies a range of corrections at each frequency to provide a 'human-averaged'. Can be frequency band or broadband values.
Frequency (Hz)	The number of cycles per second, for sound this is closely related (and often mistaken for) pitch.
Frequency Spectrum	A more detailed analysis of the frequency components that comprise a sound source.
L_{A10,T}	The 10 th statistical percentile of a measurement period, i.e. the level that is exceeded for 10% of the measurement duration. Closely correlates with traffic sources, A-weighted.
L_{A90,T}	The 90 th statistical percentile of a measurement period, i.e. the level that is exceeded for 90% of the measurement duration. Used to describe background sound levels, as this value is affected less by short, transient sound sources, A-weighted.
L_{Amax}	The root mean square (RMS) maximum sound pressure level within a measurement period, A-weighted.
Ambient Sound	The total sound climate of all sources incident at one location, both in the near- and far-field (<i>The ambient sound comprises the residual sound and the specific sound when present</i>).
Ambient Sound Level L_a = L_{Aeq,T}	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
Background Sound Level L_{A90,T}	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

Term	Definition
Equivalent Continuous A-weighted Sound Pressure Level $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation: $L_{Aeq,T} = 10 \lg_{10} \left\{ \left(\frac{1}{T} \right) \int_{t_1}^{t_2} \left[p_A \frac{(t)^2}{p_0^2} \right] dt \right\}$ Where p_0 is the reference sound pressure (20μPA); and $p_A(t)$ is the instantaneous A-weighted sound pressure level at time t.
Measurement Time Interval T_m	Total time over which measurements are taken (<i>This may consist of the sum of a number of non-contiguous, short-term measurement time intervals</i>)
Rating level $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound, over a period of time, T .
Reference Time Interval, T_r	Specified interval over which the specific sound level is determined (This is 1hr during the day from 07:00 to 23:00 hours and a shorter period of 15-min at night from 23:00 to 07:00 hours).
Residual Sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level $L_r = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the residual sound in a given situation at the assessment location over a given time interval, T .
Sound Pressure Level	The level of fluctuation in air pressure, caused by airborne sound sources. Measured in Pascals (Pa).
Sound Power Level	The rate at which sound is radiated by a source. This parameter is useful as it describes sound energy before environmental or decay factors. Quantified in dB and notated usually as L_w or SWL.
Specific sound level $L_s = L_{Aeq,Tr}$	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, T .
Specific Sound Source	Sound source being assessed.

Statement of Uncertainty

This report is based upon a range of measurements, a system of calculations and noise predictions. As such, this report attempts to quantify fluctuations in air pressure and is subject to the effects of meteorology, physical and perceived anomalies, tolerances within the measuring and monitoring equipment and accuracy margins within the noise modelling software. In the interests of repeatability, this report must be considered as being affected by common factors involved in the measurement and calculation of noise propagation.

All measurement values, outcomes and assumptions are subject to a margin of uncertainty. This has been quantified and assessed as follows:

- Rounding errors – systemic tolerance of $\pm 1\text{dB}$;
- Type 1 sound level meter – operational tolerance of $\pm 1.1\text{dB}$;
- Meteorology – allowance of $\pm 1.9\text{dB}$; and
- CadnaA noise propagation modelling software – operational accuracy of $\pm 2.1\text{dB}$

The most influential uncertainty factors for the assessment of noise are deemed to be equipment tolerances, meteorology and software accuracy. A root-sum-square statistical average has been used to provide an overall margin of uncertainty of $\pm 3\text{dB}$.

Statement of Competency

The assessment has been undertaken by, or under the supervision of, Mr. Darren Lafon-Anthony who is the Director of Acoustics at Enzygo Limited. Mr. Lafon-Anthony holds a Master of Science Degree in Applied Acoustics and has been a Corporate Member of the Institute of Acoustics since July 2004 having previously been an Associate Member of the institute since October 2001. Mr. Lafon-Anthony is also a Fellow of the Institute of Quarrying based on his contribution to minerals and mining noise assessment and mitigation, a qualification he has held since September 2014.

Mr. Lafon-Anthony has worked in acoustics since January 1981. Initially as an engineer designing and overseeing manufacture of noise control equipment for the water industry, standby power diesel generator and power generation markets for several noise control equipment manufacturers and, since February 2004, as an environmental noise consultant in various sectors, including mineral and mining sites, waste disposal and recycling sites, large industrial developments, energy supply projects (EfW, STOR and Battery Energy sites) and residential developments in the UK, Europe and sub-Saharan Africa.

Appendix A – Baseline Noise Data

Table A-1: Location MP1

Start Time	L _{Aeq,T}	L _{AFmax}	L _{A10}	L _{A90}
04/07/2022 11:06	64.7	73.9	62.4	66.3
04/07/2022 11:21	64.2	83.1	60.8	65.1
04/07/2022 11:36	62.8	76.0	60.3	64.5
04/07/2022 11:51	61.9	73.3	59.2	63.7
04/07/2022 12:06	63.1	72.5	60.5	64.9
04/07/2022 12:21	62.9	69.2	60.5	64.5
04/07/2022 12:36	62.9	69.3	60.6	64.5
04/07/2022 12:51	63.6	71.8	61.2	65.4
Overall (Daytime)	63.3	83.1	60.7	64.9
05/07/2022 00:55	56.5	66.2	51.6	58.8
05/07/2022 01:10	55.2	66.6	51.2	57.5
05/07/2022 01:25	56.8	67.4	52.9	59.0
05/07/2022 01:40	54.9	62.3	50.5	57.3
Overall (Night-time)	55.9	67.4	51.6	58.2

Table A-2: Location MP2

Start Time	L _{Aeq,T}	L _{AFmax}	L _{A10}	L _{A90}
04/07/2022 11:19	61.2	73.3	58.7	62.5
04/07/2022 11:34	59.4	69.9	57.6	60.7
04/07/2022 11:49	59.1	63.5	57.2	60.7
04/07/2022 12:04	59.1	65.8	57.1	60.5
04/07/2022 12:19	60.2	75.8	57.9	61.3
04/07/2022 12:34	59.1	63.4	57.4	60.3
04/07/2022 12:49	60.1	72.6	58.2	61.4
04/07/2022 13:04	60.3	68.0	58.5	61.5
Overall (Daytime)	59.9	75.8	57.8	61.1
05/07/2022 00:50	53.0	58.0	50.4	54.7
05/07/2022 01:05	53.4	61.3	50.1	55.8
05/07/2022 01:20	53.2	60.5	50.0	55.3
05/07/2022 01:35	53.1	59.6	50.4	55.0
Overall (Night-time)	53.2	61.3	50.2	55.2

Appendix B – Noise Contour Plots

Figure B-1: Daytime Noise Contour Plot

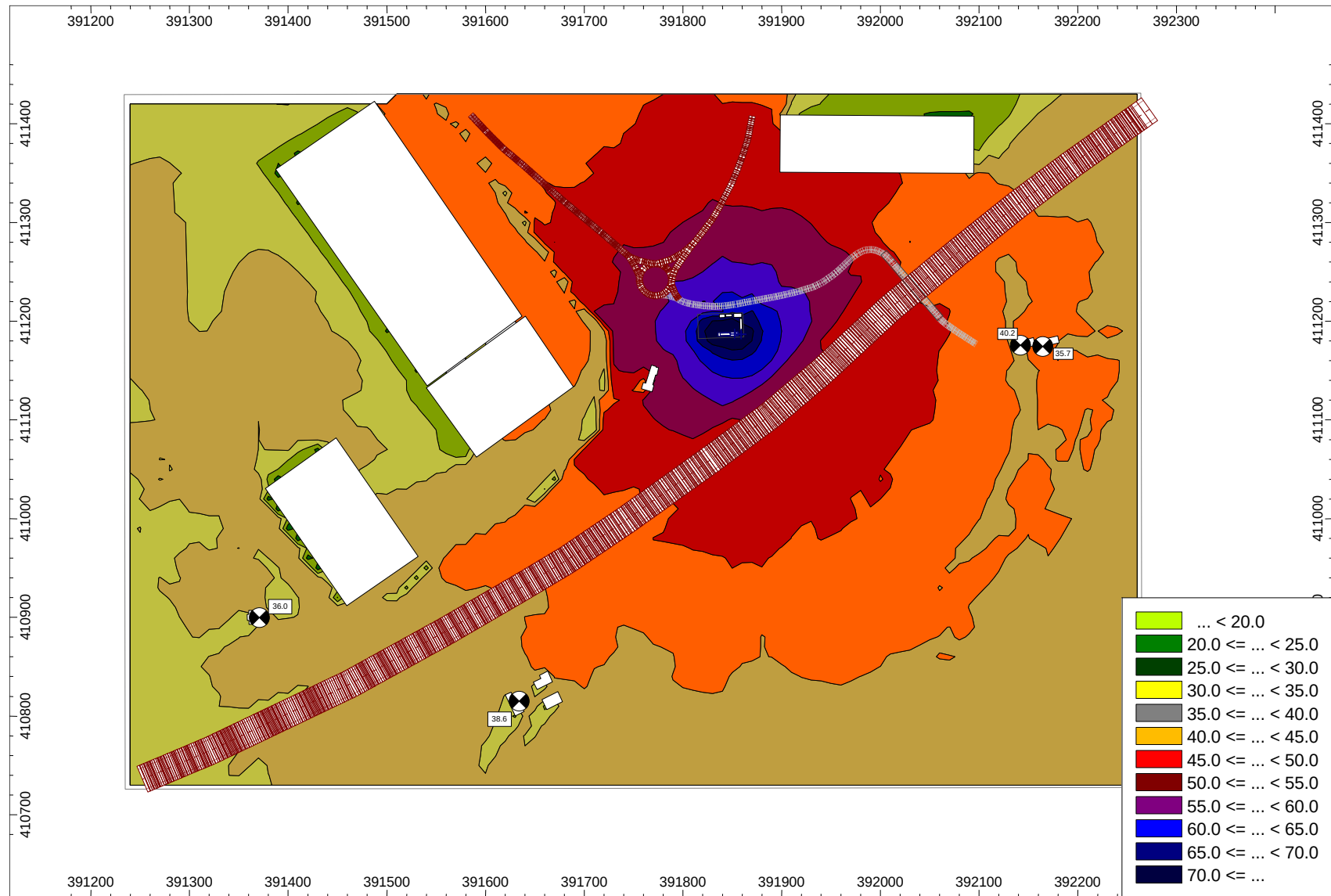
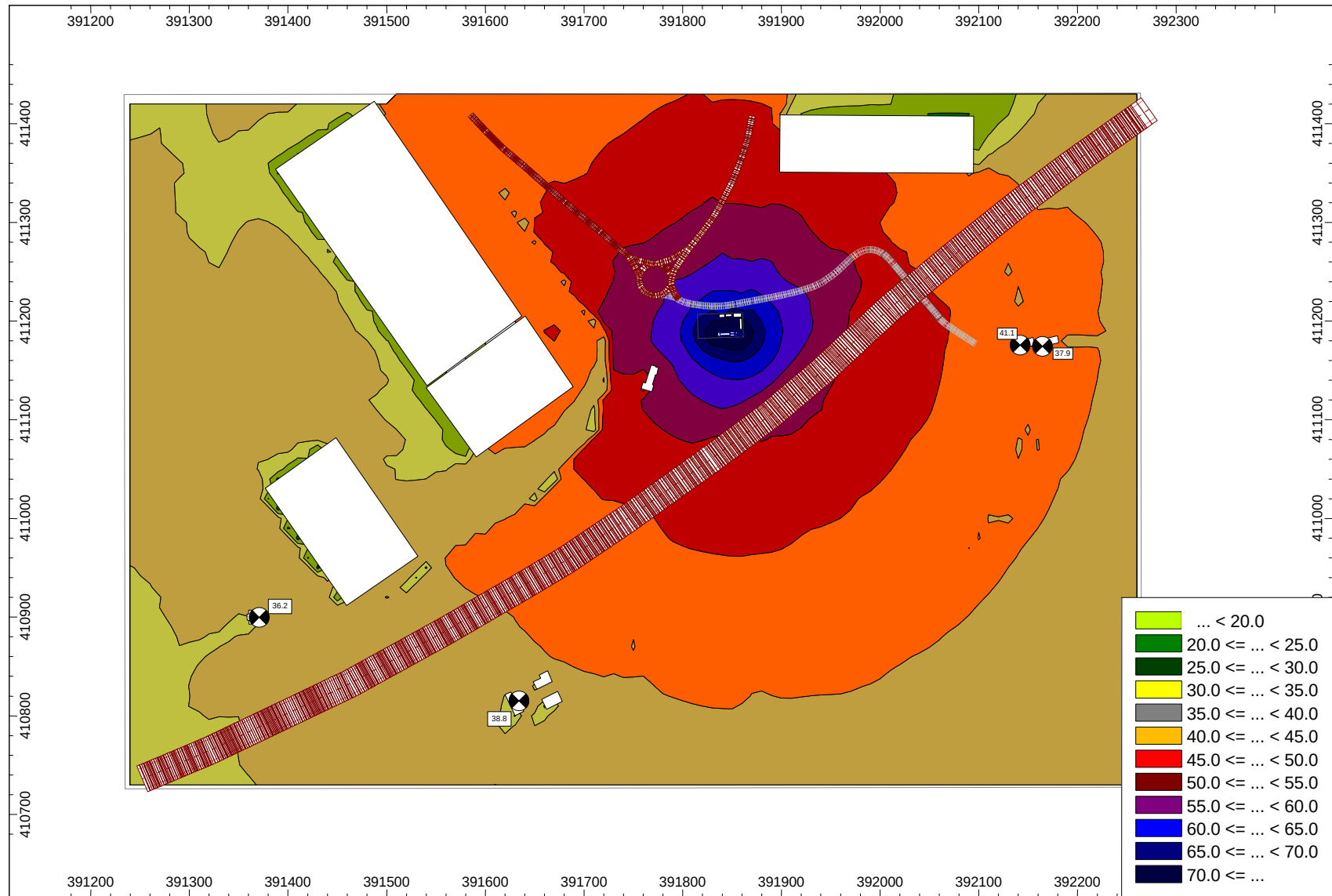


Figure B-2: Night-time Noise Contour Plot





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