RB Groundworks Ltd, Blyth

Noise impact assessment

11688.1

28th March 2024

Revision A

RB Groundworks Ltd, Blyth

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1 Summary

1.1 Apex Acoustics has been appointed by RB Groundworks Ltd to carry out a noise impact assessment in support of a permit application for their site at Ennerdale Road, Blyth NE24 4RT.

1.2 The nearby noise sensitive receptors are identified as the residential properties on Kitty Brewster Lane/Avondale Close circa 215m to the south-west of the site and Residential properties on Maple Crescent circa 150m to the south of the site.

1.3 Background sound levels have been measured at positions considered representative of the identified noise-sensitive receptors.

1.4 Existing noise from plant associated with the site have been measured on site. Noise due to HGV movements have been determined from previous measurements.

1.5 The proposed plant is not yet operational on site and manufacturer noise data for each plant unit was not made available. Therefore, to estimate the sound power level of each piece of plant, to input to the CadnaA model, noise data provided in BS 5228-1 was used. Plant of the same type, similar weight and engine size was selected where possible. In cases where this was not feasible, noise levels were deliberately overestimated to represent a worst-case scenario.

1.6 The sound propagation is modelled and calculated according to ISO 9613-2 implemented by Cadna/A software.

1.7 The site is located within an existing industrial site, with other industrial/ commercial sites located closer to the identified noise sensitive receptors which are likely to have a higher noise impact on the receptors.

1.8 The noise impacts on these noise sensitive receptors are assessed in accordance with BS 4142.

1.9 The rating levels at residential receptors are predicted to be 6 dB above the background sound levels and based on current proposals the BS 4142 assessment results at the identified noise sensitive receptors indicate the likelihood of an adverse impact.

1.10 In order to result in a low impact, with rating noise levels not exceeding the background sound levels at the nearest noise sensitive receptors, the following mitigation is proposed:

- Installing a ≥ 3.5 m high, solid barrier at the location shown in Figure 9.

1.11 To be effective in practice, the barrier should have no cracks or gaps, be continuous to the ground, and have a surface density of at least 10 kg/m^2, such as a timber fence with overlapping boards, solid concrete, or a brick wall.

1.12 Considering the predicted noise impact with the proposed mitigation measures and the context as discussed in Table 11, the assessment result indicates the likelihood of a low impact when assessed in accordance with BS 4142 guidance. This may be considered a barely audible or detectable noise as defined in the EA guidance.

1.13 Measurement or calculation uncertainties are considered unlikely to change the assessment outputs.

3 Introduction

3.1 A proposal has been submitted for the integration of additional waste treatment processes at RB Groundworks, situated at Ennerdale Road, Blyth NE24 4RT. This enhanced waste management strategy encompasses the processing of waste materials, utilising methods such as crushing and screening to repurpose soils and aggregates. The site location is shown in Figure 1.

3.2 The operational hours of the site are as follows:

- 07:00 – 17:00, Monday to Friday;
- 07:00 -13:00, Saturday; and
- Closed on Sunday/Bank/public holidays.

3.3 Apex Acoustics has been commissioned to undertake a noise survey and assessment of the noise from plant and operations associated with the development in support of an Environmental Permit application.

3.4 The scope of our instruction includes:

- Measurement of the existing noise environment over the operational hours of the site at a location representative of the nearest noise-sensitive receptors;
- Measurement of existing plant and operational noise levels on site;
- Analysis of source noise levels, based on measured noise levels;
- Use previous measurements to determine noise levels due to HGV movements on site;
- Use historical measurements from available guidance for proposed plant/ machines;
- Calculate noise propagation using proprietary noise modelling software to the noise-sensitive receptors and assess the impact in accordance with BS 4142: 2014; and
- Advise on a scheme for noise mitigation to avoid a significant adverse impact and mitigate and reduce to a minimum any adverse impacts.

Figure 1: Site location outlined in red

4 Assessment location

4.1 **Site boundary**

4.2 The site location and boundary are indicated by the red outline in Figure 1.

4.3 **Noise sources on site**

4.4 Images of the existing heavy plant machinery operating on site are shown in Figure 2, and summarised in Table 1.

Figure 2: Heavy Plant machinery (Manitou Telehandler, Bell Loading Shovel, and Volvo EC220 Excavator) on site.

Onsite	Plant	Model
Existing	Telehandler x1	Manitou Telescopic
	Loading Shovel x1	Bell
	360 Excavator x1	Volvo EC220 360
Proposed	Crusher x1	Atlas Copco PC 1055J
	Screen x1	Fintec 640

Table 1: Existing and proposed vehicles

4.5 It is also understood that up to two HGV movements occur on site in any one hour of operation as a worst-case approximation.

4.6 **Noise sensitive receptors**

4.7 The nearest noise sensitive receptors (NSRs) are identified as the following:

- Residential properties on Kitty Brewster Lane/Avondale Close circa 215m to the south-west of the site (NSR 1 and NSR 2) and;
- Residential properties on Maple Crescent circa 150m to the south of the site (NSR 3).

4.8 The NSR locations are shown in Figure 3.

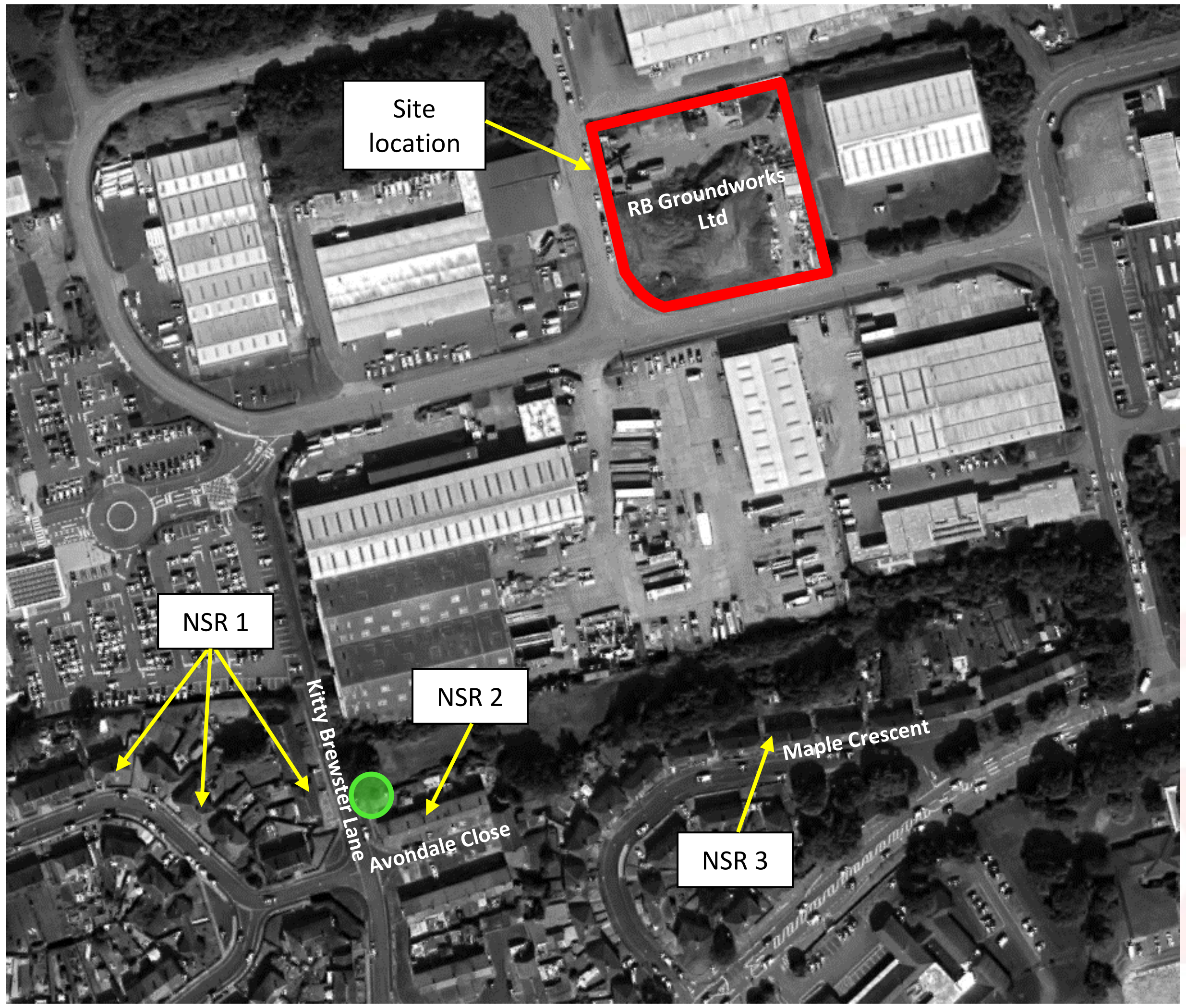

Figure 3: Noise sensitive receptors and Position 1 background survey as indicated by green marker.

4.9 All other receptors in the vicinity are located further away from the site and therefore the impact will be lower than that predicted at the identified nearest NSRs.

4.10 **Background monitoring locations**

4.11 The measurement position (Position 1) is shown in Figure 3 as indicated by the green marker.

4.12 The existing acoustic environment was measured between 14:26 hours on 14th March 2024 and 12:38 hours on 18th March 2024 to account for both weekday and weekend noise levels.

4.13 The measurement at this position is considered representative of the noise environment at NSRs 1 and 2. The background levels to the rear of NSR 3 are likely to be higher considering their proximity to other existing businesses to the north of the NSR. As such the use of the measured background levels at Position 1 is considered prudent for NSR 3.

4.14 Although the site was in operation during the background measurements, noise from operations at the site were not identifiable at the measurement location and is therefore considered representative of the noise environment in the absence of the site in operation.

4.15 Significant noise sources at the measurement locations included road traffic noise, operations at other nearby commercial/ industrial premises, and bird song.

4.16 Pictures of the measurement in progress at Position 1 are shown in Figure 4.

Figure 4: Picture of the measuring equipment at Position 1

4.17 **Source measurement locations.**

4.18 As the site is currently operational, measurements of the existing sources were made on site on 18th March 2024.

4.19 Measurements were taken of individual plant items, which are depicted in Figure 5.

Figure 5: Pictures showing plant source measurements in progress

4.20 All items were conceptually enclosed within an imaginary box (illustrated in grey in Figure 6) comprising of the same dimensions for each measurement. This standardised approach was adopted for all plant items owing to their comparable dimensions. Measurements were conducted at 1 m from all sides of the imaginary box, as well as from the top.

4.21 The duration of the measurement periods for each plant item was determined based on the typical operational process of each item. These measurement periods varied, ranging from 8 seconds to 4 minutes and 30 seconds and covered all operational processes associated with each vehicle.

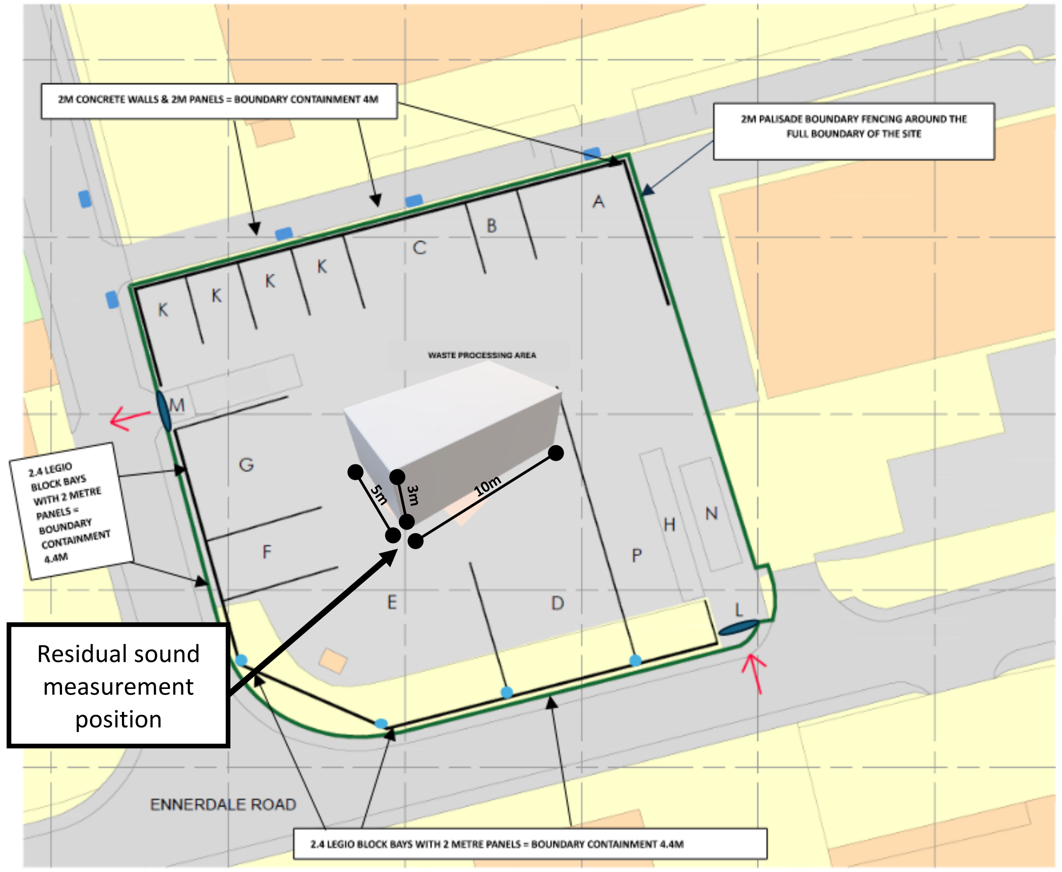

Figure 6: Plant source measurement positions including the imaginary box dimensions.

4.22 Residual measurements were also made with all plant switched off, at the position shown in Figure 6.

4.23 **Surrounding buildings, geography, and ground type**

4.24 The buildings surrounding the site have been included in the noise model, based on Google satellite and street view.

4.25 The site is set within an existing industrial estate, surrounded by other commercial/ industrial premises.

4.26 There are other industrial/ commercial premises in closer proximity to the NSRs in comparison to the site, which also provide shielding against the sources on site.

4.27 The ground type between the site and the NSRs include mostly hard ground in the built areas, with some soft ground in the unoccupied land areas.

4.28 There is a large earth bund located to the south of the site that serves as a natural noise barrier. This strategically positioned barrier helps to reduce sound transmission that is generated on-site from impacting on the nearest source sensitive receptors, most notably at NSR3.

5 Methodology

5.1 The guidance on Noise and vibration management: environmental permits, Reference 1, published by the Environmental Agency (EA) requires assessment of plant and operations following BS 4142, Reference 2, methodology.

5.2 BS 4142 defines an assessment method to quantify the potential level for adverse impact from commercial and / or industrial noise sources impacting upon sound sensitive receptors i.e. residential properties.

5.3 The specific sound source of an industrial/ commercial nature is rated according to BS 4142 and compared against the measured existing background sound environment, considering the context.

5.4 The rating level is calculated based on the specific sound level plus penalties due to perceptible sound features, including:

- Tonality penalty

  It is stated in BS 4142 that tonality 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 penalty

  It is stated that impulsivity 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.

- Intermittency penalty

  If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

- Other features penalty

  Penalties can be applied due to other readily distinguishable features.

5.5 The method estimates the impact significance by comparing the Rated noise against the background sound levels, as summarised below:

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around + 5dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound sources having a low impact, depending on the context.

5.6 The terminology used in BS 4142 to describe the various levels of potential adverse impact is respect to the PPG-N noise hierarchy, are summarised in Appendix A.

5.7 The EA guidance identifies three levels of noise impact relating to the BS 4142 descriptors:

- Unacceptable level of audible or detectable noise, which corresponds to a BS 4142 significant adverse impact, and requires taking further action or reducing/ stopping operations;
- Audible or detectable noise, which corresponds to a BS 4142 adverse impact, and requires using appropriate measures to prevent or, where this is not practicable minimise noise;
- No noise, or barely audible or detectable noise, which corresponds to BS 4142 low impact or no impact.

5.8 The guidance also requires consideration of context when determining the impact.

5.9 **Prediction of sound levels**

5.10 Noise transmission and propagation is modelled to the noise sensitive receptors using proprietary software, CadnaA, Reference 3, which models noise propagation outdoors according to ISO 9613-2, Reference 4.

5.11 ISO 9613-2 is a widely used and accepted standard to calculate sound propagation outdoors. This standard includes sound reflection, sound diffraction over buildings, meteorological conditions, ground effects, and sound propagating over built-up areas. This is considered the most appropriate calculation method available for this assessment.

6 Equipment and meteorology

6.1 **Equipment used**

6.2 The equipment used in the background and source sound measurements are shown in Table 2.

Equipment	Model	Serial no.
Sound Level Meter	NTi XL2	A2A-19046-E0
Calibrator	Larson Davis CAL 200	12572
Sound Level Meter	NTi XL2	A2A-19046-E0
Calibrator	Larson Davis CAL 200	12572
Weather station	Aercus Instruments WS2083	180619

Table 2: Equipment used

6.3 Meters and calibrators have current calibration certificates traceable to national standards. The sound level meters have been calibrated within the last two years and calibrators have been calibrated within the last year in accordance with the guidance of BS 4142; calibration certificates are available on request.

6.4 The equipment was field-calibrated before and after the measurements with no significant drift in sensitivity noted.

6.5 **Weather conditions**

6.6 The weather conditions were measured during the background sound measurements.

6.7 The weather station was positioned on-site in a secure and safe location, which, due to logistical constraints, could not be directly adjacent to the background measurement setup.

6.8 For periods when the weather station was unable to monitor conditions effectively, historical weather data from online sources was used as an alternative. The specific cause of the monitoring failure remains unidentified, but the substitute data ensures continuity and completeness of environmental condition records.

6.9 The weather conditions at the site are considered representative for the background measurement location as well.

6.10 The measured weather data for the operational period of the site is shown in Appendix B.

6.11 Wind speeds were generally below 5 m/s and there was little to no precipitation affecting the measurements. Although gusts during the noise measurement periods were occasionally higher than 5 m/s, particularly on 15th March, this is not observed to have a significant impact on the measured background sound levels

6.12 As weather conditions are identified to not have any impact on the measurement, all measured data can be used in the assessment.

7 Noise monitoring data

7.1 The microphone was located 3 metres above ground level for the background sound measurements and 1.8 m above the ground level for source noise measurements.

7.2 The measurements were also made away from other reflecting surfaces such that they are considered free-field.

7.3 Data was recorded in single octave band frequencies for the background sound measurements and one-third octave band frequencies for the plant noise measurements. Both types of measurements were conducted at one-second intervals throughout their respective measurement periods.

7.4 **Background sound level**

7.5 A time history of the measured $L_{A90,1hr}$ and $L_{Aeq,T}$ levels are shown in Appendix C.

7.6 The background sound levels at positions 1, $L_{A90,\ 1hr}$ is calculated from the L_r, $L_{Aeq\ 1hr}$ with results shown in Table 14 of Appendix C.

7.7 Statistical analysis is undertaken of the results of all the $L_{A90,\ 1hr}$ data following the guidance of BS 4142, to determine a background sound level considered to be representative of the daytime operational period of the site. Results of the analysis are shown in Appendix C.

7.8 Based on the statistical analysis results, the background sound level considered representative of the daytime assessment period is shown in Table 3.

Assessment period	Position	L_{A90} (dB)	Range of measured $L_{Aeq,T}$ (dB)
Daytime (07:00 – 17:00 Mon-Fri, and 07:00 – 13:00 Sat)	1	55	51 - 61

Table 3: Background and range of existing residual sound levels representative of the assessment periods

7.9 The range of measured $L_{Aeq,T}$ levels at the measurement position are also shown in Table 3.

7.10 **Existing source noise measurements**

7.11 Measurements made at 1 m from the imaginary box enclosing each plant at the site is shown in Table 15 of Appendix D.

7.12 The residual sound level, measured for just under a 3 minute period, with all plant at the site turned off is also shown in Table 16 of Appendix D, which is significantly lower than the ambient sound levels measured with the plant turned on. As such corrections for residual levels are not required.

7.13 The residual noise levels are shown in Table 4.

Parameter	L_p, dB(A)	Octave band centre frequency, Hz Measured A-weighted sound power level, dB								
		31.5	63	125	250	500	1000	2000	4000	8000
Residual	**60**	29	38	43	50	54	55	54	50	43

Table 4: Measured residual noise level with all plant turned off

7.14 Measurements were conducted on each side of the plant (east, west, front, rear, above), positioned 1 m from the imaginary box that encloses the entire plant. The measured average sound pressure levels across all five sides for each item of plant is presented in Table 5

Plant	Average L_p dB(A)	Octave band centre frequency, Hz Measured A-weighted sound power level, dB								
		31.5	63	125	250	500	1000	2000	4000	8000
Manitou Telehandler	**77**	56	65	64	66	70	71	70	69	62
Bell Loading Shovel	**80**	32	66	66	66	69	76	74	68	63
Volvo EC220 360 Excavator	**78**	29	49	59	68	71	74	73	69	61

Table 5: Measured surface average sound pressure levels

7.15 The dimensions of the imaginary box were determined on site as 10 m (L) x 5 m (W) x 3 m (H).

7.16 To calculate the sound power from the surface average sound pressure levels, the following equation is used:

$$L_w = L_p + 10\log_{10}(S)$$

Where S is the measurement surface area (m^2), at a specified distance from the unit, i.e., 1 m.

7.17 The predicted sound power levels of the existing plant/machinery are shown in Table 6.

Parameter	L_w dB(A)	Octave band centre frequency, Hz Predicted A-weighted sound power level, dB								
		31.5	63	125	250	500	1000	2000	4000	8000
Manitou Telehandler	**101**	80	89	87	90	94	94	94	92	86
Bell Loading Shovel	**103**	55	89	89	89	93	99	98	92	87
Volvo EC220 360 Excavator	**102**	53	73	83	91	95	97	97	92	85

Table 6: Predicted sound power level of the existing plant/machinery

7.18 Noise levels in single octave band centre frequencies have been determined from measured data in one-third octave band centre frequencies.

7.19 **Other sources**

7.20 It is understood that up to two HGV movements occur within the site within any 1 hour period. The noise from HGV movements is assessed based on previously measured representative data.

7.21 Noise measurements used are shown in Appendix E, and the predicted sound power is shown in Table 7 below.

HGV movement	Single-octave band centre frequency (Hz) A-weighted sound power levels (dB)							dB(A)
	63	125	250	500	1k	2k	4k	
Sound power level	75	77	83	86	91	87	80	**93**

Table 7: HGV sound power

7.22 **Proposed noise sources**

7.23 The new plant/ machinery, Atlas Copco PC 1055J Crusher and Fintec 640 Screen, were present on the site at the time of making measurements of the existing sources. However, it was not feasible to measure them under typical operational conditions, as the necessary permits for their use have not yet been issued.

7.24 The client was unable to provide the manufacturer noise data for each item. Therefore, to estimate the likely sound power level of each piece of plant, to input to the CadnaA model, noise data available in BS 5228-1, Reference 6, was used. Plant of the same type, similar weight and engine size was selected where possible.

7.25 However, the engine size and weight for a Screen unit specified in the BS 5228 example was approximately half the size of the unit proposed to be used on site. To account for this discrepancy and ensure a conservative estimate, the number of Screen units in the CadnaA model was doubled, to ensure that the accumulated engine size and unit weights were comparable, thereby presenting a worst-case scenario.

7.26 The equipment sound pressure levels sourced from BS 5228 is shown in Table 12.

Proposed Unit	Model	Engine (kW)		Weight (tonne)		BS 5228-1 reference	Single-octave band centre frequency (Hz) Linear noise levels (dB)							dB(A)
		Proposed Unit	BS 5228 example	Proposed Unit	BS 5228 example		63	125	250	500	1k	2k	4k	$L_{p@10m}$
Crusher x1	Atlas Copco PC 1055J	187	172	34	47	Table C.1 Ref no. 14	93	86	79	81	75	71	66	82
Screen x1	Fintec 640	75	56	29	15	Table C.10 Ref no. 14	93	86	79	78	75	71	69	81

Table 8 Noise levels sourced from BS 5228-1

7.27 To calculate the sound power from the sound pressure levels, the following equation is used:

$$L_w = L_p + 20\log(r) + 8$$

Where S is the measurement distance from the unit (m), i.e., 10 m.

7.28 The predicted sound power levels and A-weighted spectral levels of the proposed plant/machinery used in the CadaA model are shown in Table 9.

Unit	Single-octave band centre frequency (Hz) A-weighted noise levels (dB)							dB(A)
	63	125	250	500	1k	2k	4k	L_w
Crusher x1	95	98	98	106	103	100	95	**110**
Screen x1	95	98	98	103	103	100	98	**109**

Table 9 Predicted L_w and spectral noise level data for each plant

8 Noise impact assessment

8.1 **Operation times**

8.2 All plant is assumed to operate continuously during the daytime 1-hour assessment period; this is a prudent assumption.

8.3 **Noise transmission and propagation**

8.4 Noise transmission and propagation is modelled to the NSRs based on the noise source data detailed, using proprietary software, CadnaA.

8.5 This models noise propagation outdoors according to ISO 9613.

8.6 The model parameters and assumptions are summarised in Appendix F.

8.7 The plant associated with the development is modelled as point sources and attributed the sound power levels shown in Table 6 and Table 9.

8.8 The resulting sound power of two HGV movements for the 1-hour assessment period is predicted in the noise model as a moving point source along the yard based on observations made on site and on the basis on the sound power level as shown in Table 7, and considering the HGVs travel at a speed of 10 km/h.

8.9 Assessment results – based on current operation

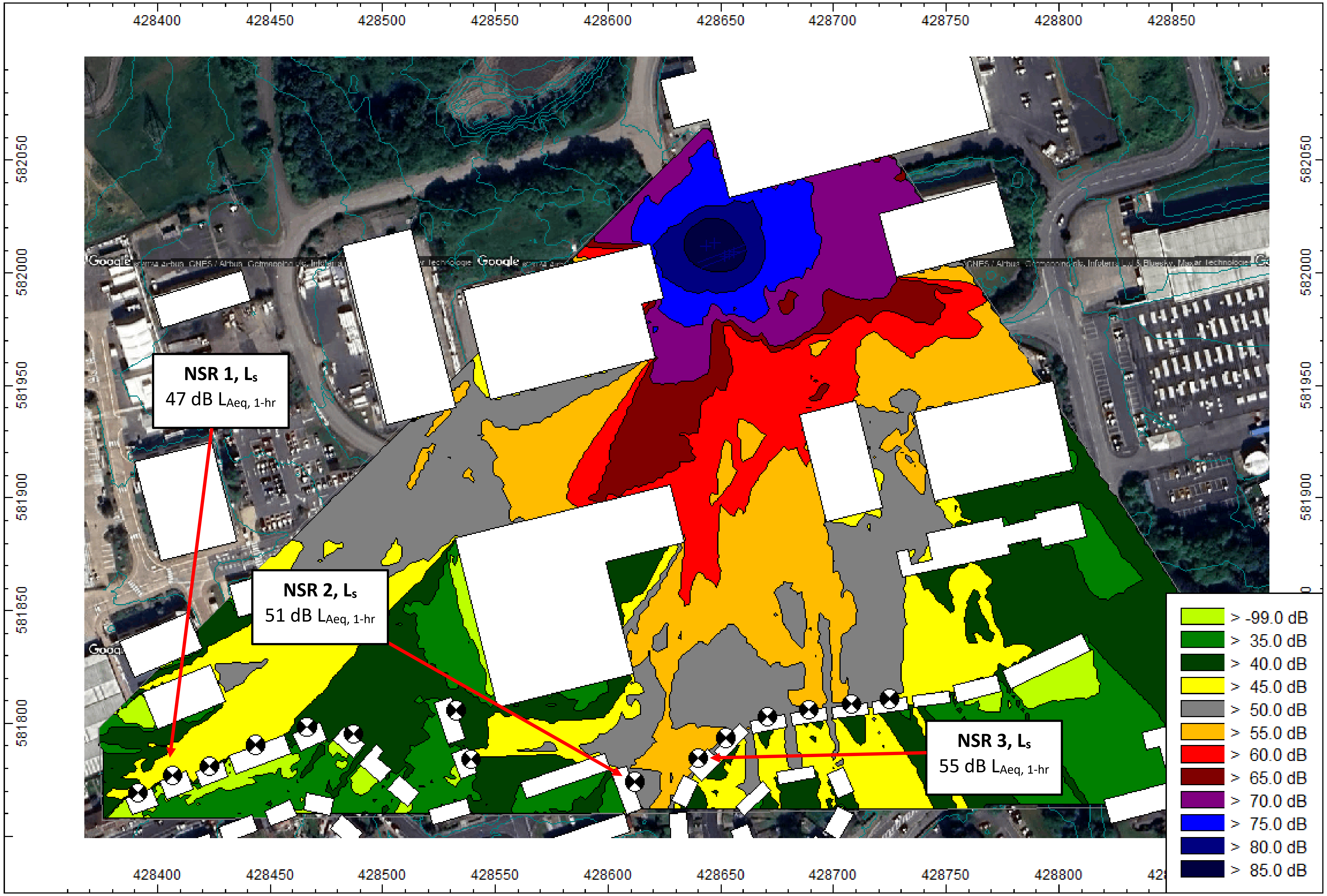

Figure 7: Sound contours at 1.5 m (ground floor window height), showing the predicted specific sound level, $L_{Aeq\ 1\ hr}$ based on current operation

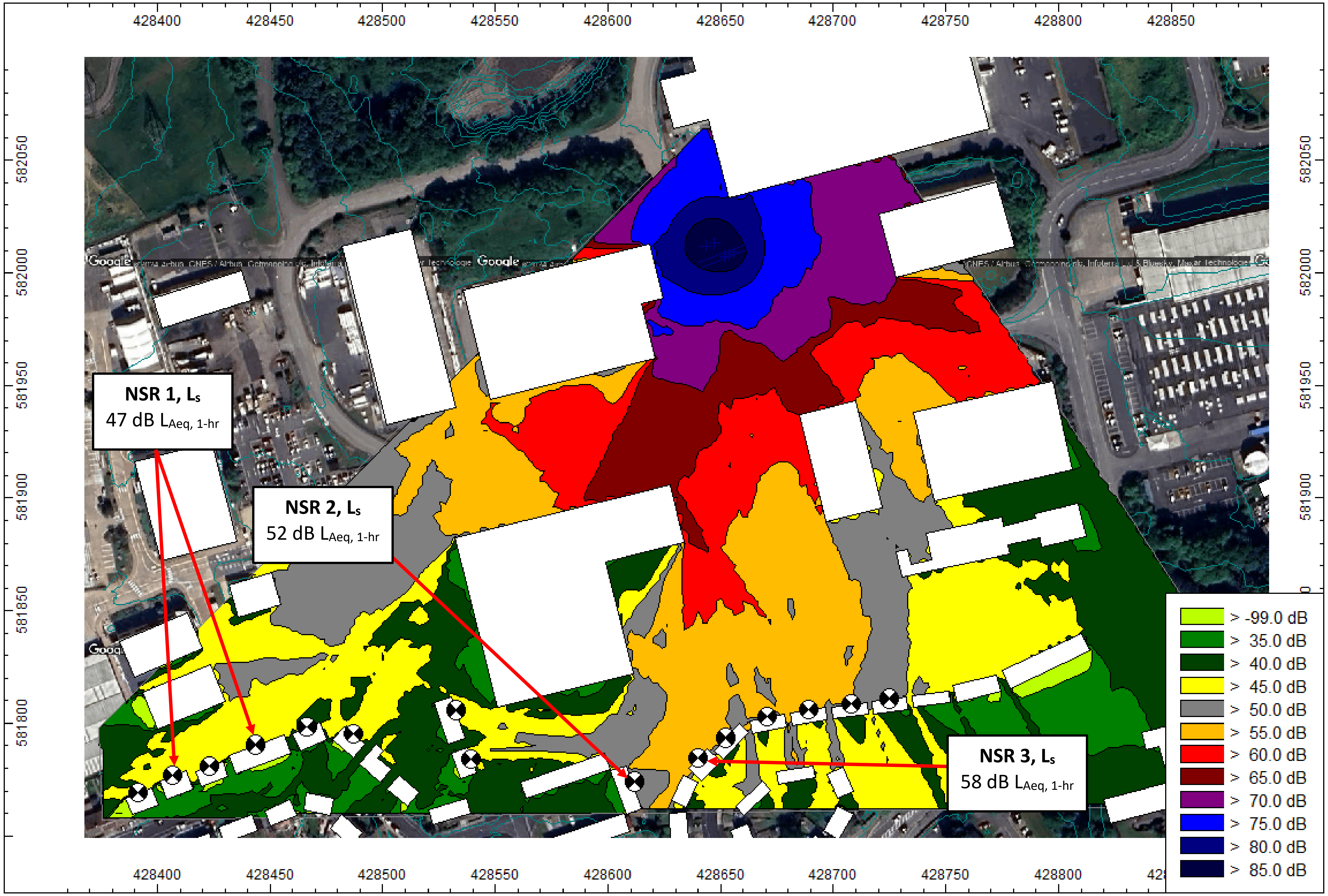

Figure 8: Sound contours at 4 m (first floor window height), showing the predicted specific sound level, $L_{Aeq\ 1\ hr\ based}$ on current operation

Parameter	Daytime assessment			Relevant clause of BS 4142	Commentary
	NSR 1	NSR 2	NSR 3		
Background sound level	55 dB $L_{A90,\ 1hr}$			8.1.2 8.1.4	Considered representative of the assessment period based on statistical analysis detailed in Appendix C.
Specific sound level L_s, due to all sources for the required assessment interval	47 dB $L_{Aeq,\ 1hr}$	52 dB $L_{Aeq,\ 1hr}$	58 dB $L_{Aeq,\ 1hr}$	7.2 7.3.6	The predicted L_s contours across the site due to all sources during the assessment period are shown in Figure 7 and Figure 8; the L_s assessed is the highest predicted level at the NSRs.
Acoustic feature correction	+ 3 dB			9.2	A subjective assessment to determine acoustic features is undertaken, and the following penalties are considered applicable: • + 3dB for impulsivity which is just perceptible at the NSRs This accounts for banging when screened material is transferred to the crusher etc
Rating level, $L_{Ar,Tr}$	50 dB	55 dB	61 dB		
Uncertainty of assessment				10	Background data was obtained over a 5-day period, accounting for the changing acoustic environment. The location is considered representative for NSRs 1 and 2, and worst-case for NSR 3. Measurements of the exact plant during operation were undertaken, which allows for the exact noise impact to be determined.
Excess of $L_{Ar,Tr}$ over background sound level	- 5 dB	0 dB	+ 6 dB	11	The rated noise impact is 6 dB higher than the representative background sound levels at NSR 3 during the daytime operating hours. The assessment result indicates the likelihood of an **adverse impact.**

Table 10: BS 4142 assessment results, based on current operation

9 Noise mitigation measures

9.1 Based on the current plant proposals, the results in Table 10 indicates the likelihood for an adverse impact.

9.2 This section details the proposed noise control measures required to achieve the necessary sound reduction.

A 3.5 m high solid barrier

9.3 A ≥ 3.5 m high solid barrier is proposed to the location shown in Figure 9.

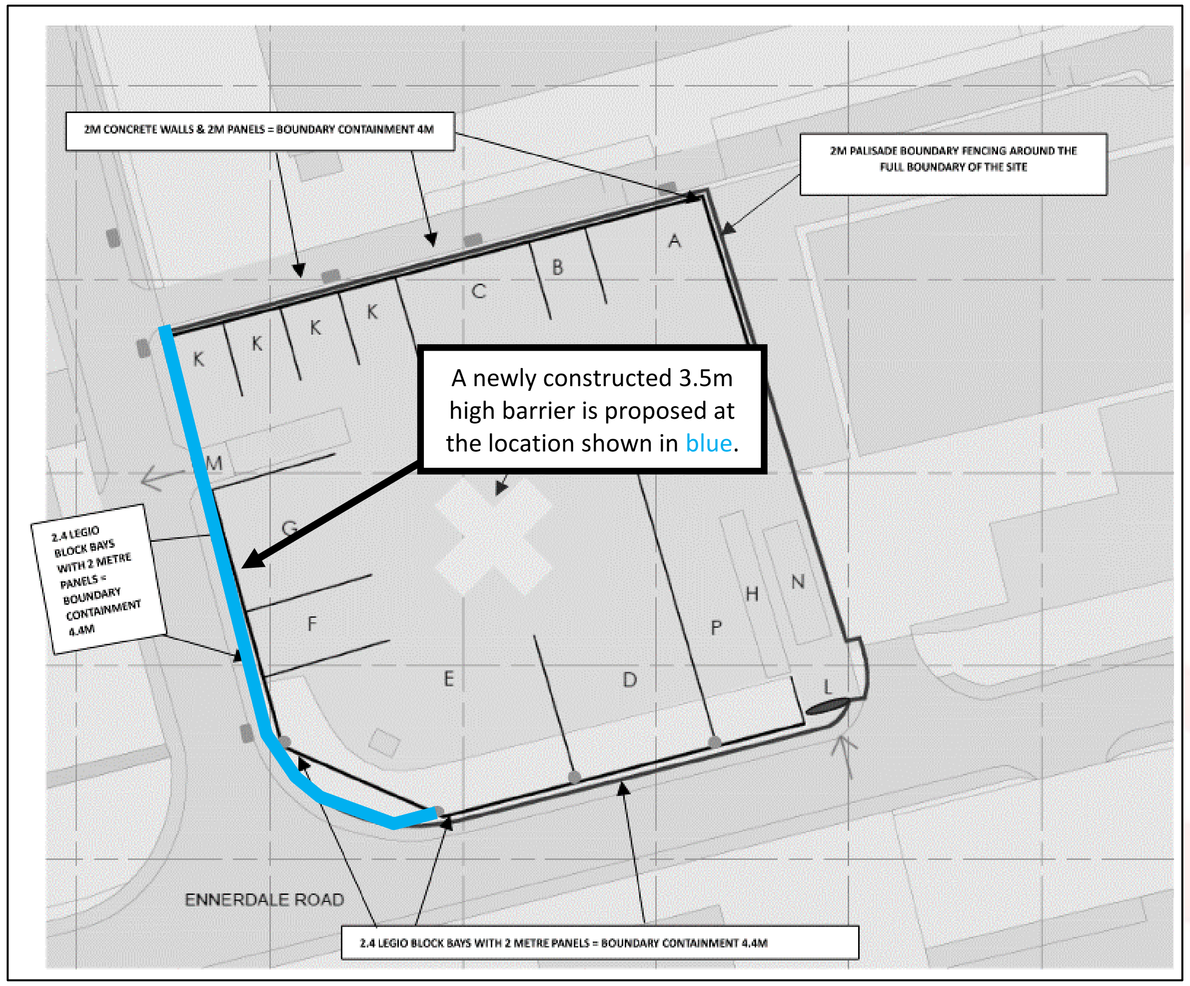

Figure 9: Mitigation required to minimise the adverse impact

9.4 To be effective in practice, a barrier should have no cracks or gaps, be continuous to the ground, and have a surface density of at least 10 kg/m^2, such as a timber fence with overlapping boards, solid concrete wall or a brick wall.

9.5 The earth bund located to the south of the site effectively reduces noise levels in that direction, hence the need for a barrier is limited to the area depicted in Figure 9.

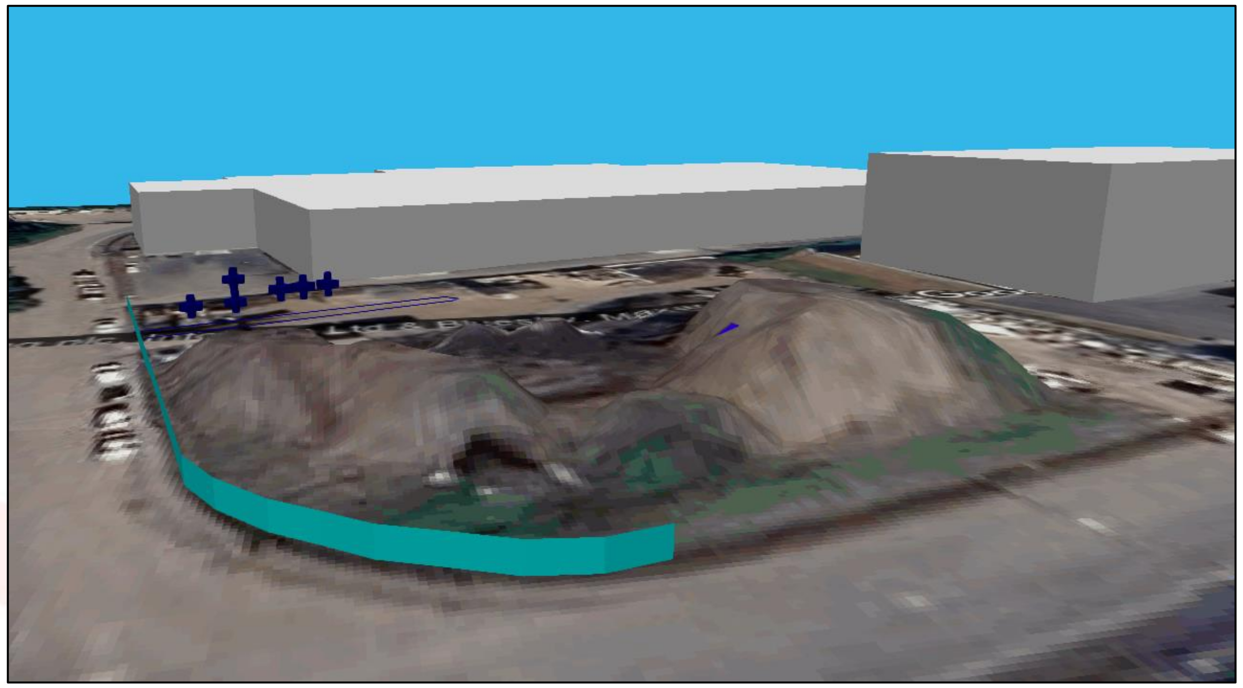

Figure 10: 3D view of the 3.5 m high solid barrier

10 Assessment results – with proposed noise control measures

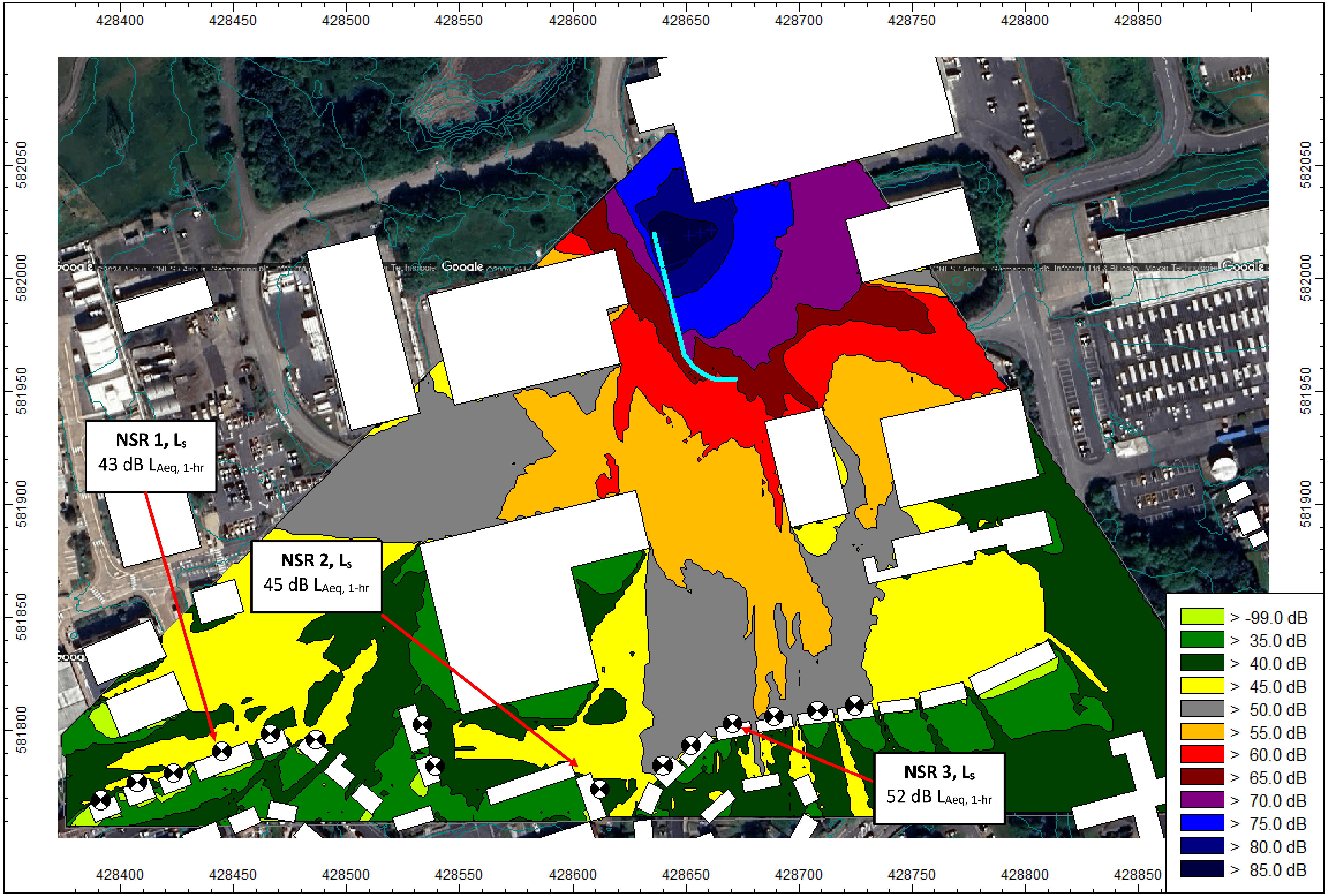

Figure 11: Sound contours at a height of 4 m, showing the predicted specific sound level, $L_{Aeq\ 1\ hr}$ with proposed mitigation measures

Parameter	Daytime assessment			Relevant clause of BS 4142	Commentary
	NSR 1	NSR 2	NSR 3		
Background sound level	55 dB $L_{A90,\ 1hr}$			8.1.2 8.1.4	Considered representative of the assessment period based on statistical analysis detailed in Appendix C.
Specific sound level L_s, due to all sources for the required assessment interval	46 dB $L_{Aeq,\ 1hr}$	45 dB $L_{Aeq,\ 1hr}$	52dB $L_{Aeq,\ 1hr}$	7.2 7.3.6	The predicted L_s contours across the site due to all sources during the assessment period are shown in Figure 11; the L_s assessed is the highest predicted level at the NSRs.
Acoustic feature correction	+ 3 dB			9.2	A subjective assessment to determine acoustic features is undertaken, and the following penalties are considered applicable: • + 3dB for impulsivity which is just perceptible at the NSRs This accounts for banging when screened material is transferred to the crusher etc
Rating level, $L_{Ar,Tr}$	49 dB	48 dB	55 dB		
Uncertainty of assessment				10	Background data was obtained over a 5-day period, accounting for the changing acoustic environment. The location is considered representative for NSRs 1 and 2, and worst-case for NSR 3. Measurements of the exact plant during operation were undertaken, which allows for the exact noise impact to be determined.
Excess of $L_{Ar,Tr}$ over background sound level	- 6 dB	- 7 dB	0 dB	11	The rated noise impact due to plant and operations at the site do not exceed the background sound level at the NSRs once the proposed mitigation measures have been implemented. The modelling is also considered prudent, whereby noise levels due to the site impacting on the NSRs in practice are anticipated to be lower than that predicted. The site is located within an existing industrial site, with other industrial/ commercial sites located closer to the NSRs which are likely to have a higher noise impact on the NSRs. Considering the predicted rated noise impact and the context as discussed above, the **assessment result indicates the likelihood of a low impact when assessed in accordance with BS 4142 guidance. This may be considered a barely audible or detectable noise as defined in the EA guidance.**

Table 11: BS 4142 assessment results, based on proposed noise control measures

11 Uncertainty of assessment

11.1 The background sound levels were measured over five consecutive days to minimise the uncertainty due to noise level fluctuations.

11.2 Wind speeds were below 5 m/s. Although gusts during the noise measurement periods were occasionally higher than 5 m/s, this is not observed to have a significant impact on the measured background sound levels. Also, as the measurement period is long enough to make most of the noise data be recorded at suitable meteorological conditions, the uncertainty due to weather conditions were minimised.

11.3 The weather measurements were not made immediately adjacent to the background measurement position due to unavailability of suitable locations to leave the equipment unattended. The measurement was made within the site and is considered representative of the weather conditions at Positions 1.

11.4 For periods when the weather station was unable to monitor conditions effectively, historical weather data from online sources was used as an alternative. The specific cause of the monitoring failure remains unidentified, but the substitute data ensures continuity and completeness of environmental condition records.

11.5 Position 1 is close to the NSRs on Kitty Brewster Lane and Avondale Close. This is also considered worst-case for the existing sound environment at the NSRs on Maple Crescent, considering their proximity to other existing businesses.

11.6 Background sound levels were measured when the site is operational. Noise from the site were however not identifiable at positions 1, and the measurements were dominated by road traffic noise and operations of other nearby industrial premises. These premises also shielded the NSRs to some extent from the site. The background sound levels are therefore considered representative

11.7 The noise level data from BS 5228 for the Screen was lower than that of the proposed Screen intended for onsite use. To address this difference and to avoid under estimating the noise impact, two 15-tonne Screen Units were included in the CadnaA model to represent the 29-tonne unit that is actually proposed for site, thereby representing a worst-case scenario.

11.8 Uncertainty in the predicted impact has been reduced by the use of a calculation method in accordance with ISO 9613-2.

11.9 The above uncertainties are unlikely to change the output of the assessment.

12 Conclusion

12.1 Noise from existing plant were measured at the site, of HGV movements determined from previous measurements, and of new plant from historical data in available guidance.

12.2 Representative background sound levels at the nearby noise sensitive receptors were also measured.

12.3 Noise impact from the proposed permit application site has been assessed according to BS 4142. The noise impacts on all identified noise sensitive receptors are likely to be low once mitigation measured have been implemented.

13 References

1. Guidance – Noise and vibration management: Environmental permits, Environmental Agency, Updated 31 January 2022.

   https://www.gov.uk/government/publications/noise-and-vibration-management-environmental-permits/noise-and-vibration-management-environmental-permits#step-3-source-assessment

2. BS 4142 2014: A1+2019, Method for rating and assessing industrial and commercial sound.

3. CadnaA environmental noise modelling software, version 2023, Datakustik GmbH.

4. ISO 9613: Acoustics - Attenuation of sound during propagation outdoors.

5. Olive Compliance architect drawings. RB Groundworks. EA Permit Application. Darwing title: Permitted Boundary Plan. Drawing No. 002, Rev, R2., 9th Feb 2024.

6. BS 5228-1: 2009+A1: 2014, Code of practice for noise and vibration control on construction and open sites - Part 1: Noise

7. DEFRA LIDAR height data, 2022

   https://environment.data.gov.uk/DefraDataDownload/?Mode=survey

8. ISO 12913-1:2014 Acoustics, Soundscape, Part 1: Definition and conceptual framework

Appendix A Noise exposure hierarchy

Planning Practice Guidance - Noise			
Noise	***Example of outcomes***	***Increasing effect level***	***Action***
Present and very distributive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	**Prevent**
Present and distributive	The noise causes a material change in behaviour, attitude or other physiological response, 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 Adverse Effect	**Avoid**
Significant Observed Adverse Effect Level (SOAEL)			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	**Mitigate and reduce to a minimum**
Lowest Observed Adverse Effect Level (LOAEL)			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	**No specific measures required**
No Observed Adverse Effect Level (NOAEL)			
Not present	No effect	No Observed Effect	**No specific measures required**
No Observed Effect Level (NOEL)			

BS 4142: Initial estimate of external noise risk significance

An initial estimate of the impact of the specific sound may be obtained by subtracting the measured background sound level form the rating level. Typically, the greater this difference, the greater the magnitude of impact

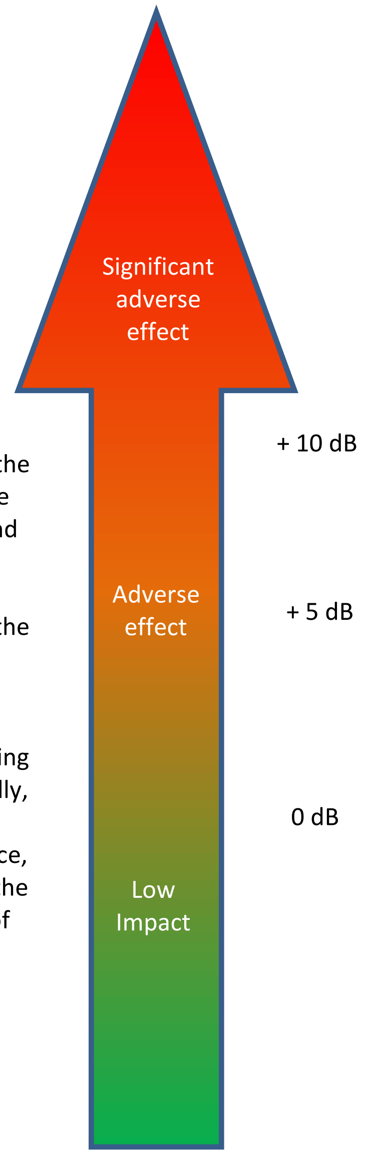

Table 12: PPG-N Noise Exposure Hierarchy and BS 4142 initial estimate of impact

Appendix B Weather data

B.1 The measured weather data during the operational hours of the site are shown in Table 13. Full set of measurements are reported in the supplementary data excel sheet.

Date/ Time (hh:mm)	Outdoor Temperature (°C)	Wind speed (m/s)	Wind direction (degrees)	Hour Rainfall (inch)
14-03-24 14:30	12	2.5	190	0.000
14-03-24 14:35	12	2.5	190	0.000
14-03-24 14:40	12	2.5	190	0.000
14-03-24 14:45	12	2.5	190	0.000
14-03-24 14:50	12	2.5	190	0.000
14-03-24 14:55	12	2.5	190	0.000
14-03-24 15:00	12	3.2	200	0.000
14-03-24 15:05	12	3.2	200	0.000
14-03-24 15:10	12	3.2	200	0.000
14-03-24 15:15	12	3.2	200	0.000
14-03-24 15:20	12	3.2	200	0.000
14-03-24 15:25	12	3.2	200	0.000
14-03-24 15:30	12	3.2	200	0.000
14-03-24 15:35	12	3.2	200	0.000
14-03-24 15:40	12	3.2	200	0.000
14-03-24 15:45	12	3.2	200	0.000
14-03-24 15:50	12	3.2	200	0.000
14-03-24 15:55	12	3.2	200	0.000
14-03-24 16:00	11.8	4.4	196	0.000
14-03-24 16:05	11.8	4.4	196	0.000
14-03-24 16:10	11.8	4.4	196	0.000
14-03-24 16:15	11.8	4.4	196	0.000
14-03-24 16:20	11.8	4.4	196	0.000
14-03-24 16:25	11.8	4.4	196	0.000
14-03-24 16:30	11.8	4.4	196	0.000
14-03-24 16:35	11.8	4.4	196	0.000
14-03-24 16:40	11.8	4.4	196	0.000
14-03-24 16:45	11.8	4.4	196	0.000
14-03-24 16:50	11.8	4.4	196	0.000
14-03-24 16:55	11.8	4.4	196	0.000
14-03-24 17:00	11.4	4.4	193	0.003
15-03-24 07:00	9.5	2.4	214	0.004
15-03-24 07:05	9.5	2.4	214	0.004
15-03-24 07:10	9.5	2.4	214	0.004
15-03-24 07:15	9.5	2.4	214	0.004
15-03-24 07:20	9.5	2.4	214	0.004
15-03-24 07:25	9.5	2.4	214	0.004
15-03-24 07:30	9.5	2.4	214	0.004
15-03-24 07:35	9.5	2.4	214	0.004
15-03-24 07:40	9.5	2.4	214	0.004
15-03-24 07:45	9.5	2.4	214	0.004
15-03-24 07:50	9.5	2.4	214	0.004
15-03-24 07:55	9.5	2.4	214	0.004
15-03-24 08:00	10.7	3.6	245	0.001
15-03-24 08:05	10.7	3.6	245	0.001
15-03-24 08:10	10.7	3.6	245	0.001
15-03-24 08:15	10.7	3.6	245	0.001
15-03-24 08:20	10.7	3.6	245	0.001
15-03-24 08:25	10.7	3.6	245	0.001
15-03-24 08:30	10.7	3.6	245	0.001
15-03-24 08:35	10.7	3.6	245	0.001
15-03-24 08:40	10.7	3.6	245	0.001
15-03-24 08:45	10.7	3.6	245	0.001
15-03-24 08:50	10.7	3.6	245	0.001
15-03-24 08:55	10.7	3.6	245	0.001
15-03-24 09:00	10.3	6.1	262	0.000
15-03-24 09:05	10.3	6.1	262	0.000
15-03-24 09:10	10.3	6.1	262	0.000
15-03-24 09:15	10.3	6.1	262	0.000
15-03-24 09:20	10.3	6.1	262	0.000
15-03-24 09:25	10.3	6.1	262	0.000
15-03-24 09:30	10.3	6.1	262	0.000
15-03-24 09:35	10.3	6.1	262	0.000
15-03-24 09:40	10.3	6.1	262	0.000
15-03-24 09:45	10.3	6.1	262	0.000
15-03-24 09:50	10.3	6.1	262	0.000
15-03-24 09:55	10.3	6.1	262	0.000
15-03-24 10:00	11.4	6.8	264	0.000
15-03-24 10:05	11.4	6.8	264	0.000
15-03-24 10:10	11.4	6.8	264	0.000
15-03-24 10:15	11.4	6.8	264	0.000
15-03-24 10:20	11.4	6.8	264	0.000
15-03-24 10:25	11.4	6.8	264	0.000
15-03-24 10:30	11.4	6.8	264	0.000
15-03-24 10:35	11.4	6.8	264	0.000

Date/ Time (hh:mm)	Outdoor Temperature (°C)	Wind speed (m/s)	Wind direction (degrees)	Hour Rainfall (inch)
15-03-24 10:40	11.4	6.8	264	0.000
15-03-24 10:45	11.4	6.8	264	0.000
15-03-24 10:50	11.4	6.8	264	0.000
15-03-24 10:55	11.4	6.8	264	0.000
15-03-24 11:00	11.8	6.4	259	0.000
15-03-24 11:05	11.8	6.4	259	0.000
15-03-24 11:10	11.8	6.4	259	0.000
15-03-24 11:15	11.8	6.4	259	0.000
15-03-24 11:20	11.8	6.4	259	0.000
15-03-24 11:25	11.8	6.4	259	0.000
15-03-24 11:30	11.8	6.4	259	0.000
15-03-24 11:35	11.8	6.4	259	0.000
15-03-24 11:40	11.8	6.4	259	0.000
15-03-24 11:45	11.8	6.4	259	0.000
15-03-24 11:50	11.8	6.4	259	0.000
15-03-24 11:55	11.8	6.4	259	0.000
15-03-24 12:00	11.8	7.9	270	0.000
15-03-24 12:05	11.8	7.9	270	0.000
15-03-24 12:10	11.8	7.9	270	0.000
15-03-24 12:15	11.8	7.9	270	0.000
15-03-24 12:20	11.8	7.9	270	0.000
15-03-24 12:25	11.8	7.9	270	0.000
15-03-24 12:30	11.8	7.9	270	0.000
15-03-24 12:35	11.8	7.9	270	0.000
15-03-24 12:40	11.8	7.9	270	0.000
15-03-24 12:45	11.8	7.9	270	0.000
15-03-24 12:50	11.8	7.9	270	0.000
15-03-24 12:55	11.8	7.9	270	0.000
15-03-24 13:00	9.8	8.8	279	0.001
15-03-24 13:05	9.8	8.8	279	0.001
15-03-24 13:10	9.8	8.8	279	0.001
15-03-24 13:15	9.8	8.8	279	0.001
15-03-24 13:20	9.8	8.8	279	0.001
15-03-24 13:25	9.8	8.8	279	0.001
15-03-24 13:30	9.8	8.8	279	0.001
15-03-24 13:35	9.8	8.8	279	0.001
15-03-24 13:40	9.8	8.8	279	0.001
15-03-24 13:45	9.8	8.8	279	0.001
15-03-24 13:50	9.8	8.8	279	0.001
15-03-24 13:55	9.8	8.8	279	0.001

Date/ Time (hh:mm)	Outdoor Temperature (°C)	Wind speed (m/s)	Wind direction (degrees)	Hour Rainfall (inch)
15-03-24 14:00	8.9	8.3	292	0.000
15-03-24 14:05	8.9	8.3	292	0.000
15-03-24 14:10	8.9	8.3	292	0.000
15-03-24 14:15	8.9	8.3	292	0.000
15-03-24 14:20	8.9	8.3	292	0.000
15-03-24 14:25	8.9	8.3	292	0.000
15-03-24 14:30	8.9	8.3	292	0.000
15-03-24 14:35	8.9	8.3	292	0.000
15-03-24 14:40	8.9	8.3	292	0.000
15-03-24 14:45	8.9	8.3	292	0.000
15-03-24 14:50	8.9	8.3	292	0.000
15-03-24 14:55	8.9	8.3	292	0.000
15-03-24 15:00	7	6.4	6	0.008
15-03-24 15:05	7	6.4	6	0.008
15-03-24 15:10	7	6.4	6	0.008
15-03-24 15:15	7	6.4	6	0.008
15-03-24 15:20	7	6.4	6	0.008
15-03-24 15:25	7	6.4	6	0.008
15-03-24 15:30	7	6.4	6	0.008
15-03-24 15:35	7	6.4	6	0.008
15-03-24 15:40	7	6.4	6	0.008
15-03-24 15:45	7	6.4	6	0.008
15-03-24 15:50	7	6.4	6	0.008
15-03-24 15:55	7	6.4	6	0.008
15-03-24 16:00	6.1	6.4	4	0.004
15-03-24 16:05	6.1	6.4	4	0.004
15-03-24 16:10	6.1	6.4	4	0.004
15-03-24 16:15	6.1	6.4	4	0.004
15-03-24 16:20	6.1	6.4	4	0.004
15-03-24 16:25	6.1	6.4	4	0.004
15-03-24 16:30	6.1	6.4	4	0.004
15-03-24 16:35	6.1	6.4	4	0.004
15-03-24 16:40	6.1	6.4	4	0.004
15-03-24 16:45	6.1	6.4	4	0.004
15-03-24 16:50	6.1	6.4	4	0.004
15-03-24 16:55	6.1	6.4	4	0.004
15-03-24 17:00	6	5.6	5	0.002
16-03-24 07:00	0.4	1.1	259	0.000
16-03-24 07:05	0.4	1.1	259	0.000
16-03-24 07:10	0.4	1.1	259	0.000

Date/ Time (hh:mm)	Outdoor Temperature (°C)	Wind speed (m/s)	Wind direction (degrees)	Hour Rainfall (inch)
16-03-24 07:15	0.4	1.1	259	0.000
16-03-24 07:20	0.4	1.1	259	0.000
16-03-24 07:25	0.4	1.1	259	0.000
16-03-24 07:30	0.4	1.1	259	0.000
16-03-24 07:35	0.4	1.1	259	0.000
16-03-24 07:40	0.4	1.1	259	0.000
16-03-24 07:45	0.4	1.1	259	0.000
16-03-24 07:50	0.4	1.1	259	0.000
16-03-24 07:55	0.4	1.1	259	0.000
16-03-24 08:00	2.9	0.7	329	0.000
16-03-24 08:05	2.9	0.7	329	0.000
16-03-24 08:10	2.9	0.7	329	0.000
16-03-24 08:15	2.9	0.7	329	0.000
16-03-24 08:20	2.9	0.7	329	0.000
16-03-24 08:25	2.9	0.7	329	0.000
16-03-24 08:30	2.9	0.7	329	0.000
16-03-24 08:35	2.9	0.7	329	0.000
16-03-24 08:40	2.9	0.7	329	0.000
16-03-24 08:45	2.9	0.7	329	0.000
16-03-24 08:50	2.9	0.7	329	0.000
16-03-24 08:55	2.9	0.7	329	0.000
16-03-24 09:00	6.7	0.8	169	0.001
16-03-24 09:05	6.7	0.8	169	0.001
16-03-24 09:10	6.7	0.8	169	0.001
16-03-24 09:15	6.7	0.8	169	0.001
16-03-24 09:20	6.7	0.8	169	0.001
16-03-24 09:25	6.7	0.8	169	0.001
16-03-24 09:30	6.7	0.8	169	0.001
16-03-24 09:35	6.7	0.8	169	0.001
16-03-24 09:40	6.7	0.8	169	0.001
16-03-24 09:45	6.7	0.8	169	0.001
16-03-24 09:50	6.7	0.8	169	0.001
16-03-24 09:55	6.7	0.8	169	0.001
16-03-24 10:00	8.1	2.1	145	0.000
16-03-24 10:05	8.1	2.1	145	0.000
16-03-24 10:10	8.1	2.1	145	0.000
16-03-24 10:15	8.1	2.1	145	0.000
16-03-24 10:20	8.1	2.1	145	0.000
16-03-24 10:25	8.1	2.1	145	0.000
16-03-24 10:30	8.1	2.1	145	0.000

Date/ Time (hh:mm)	Outdoor Temperature (°C)	Wind speed (m/s)	Wind direction (degrees)	Hour Rainfall (inch)
16-03-24 10:35	8.1	2.1	145	0.000
16-03-24 10:40	8.1	2.1	145	0.000
16-03-24 10:45	8.1	2.1	145	0.000
16-03-24 10:50	8.1	2.1	145	0.000
16-03-24 10:55	8.1	2.1	145	0.000
16-03-24 11:00	8.8	2.6	165	0.000
16-03-24 11:05	8.8	2.6	165	0.000
16-03-24 11:10	8.8	2.6	165	0.000
16-03-24 11:15	8.8	2.6	165	0.000
16-03-24 11:20	8.8	2.6	165	0.000
16-03-24 11:25	8.8	2.6	165	0.000
16-03-24 11:30	8.8	2.6	165	0.000
16-03-24 11:35	8.8	2.6	165	0.000
16-03-24 11:40	8.8	2.6	165	0.000
16-03-24 11:45	8.8	2.6	165	0.000
16-03-24 11:50	8.8	2.6	165	0.000
16-03-24 11:55	8.8	2.6	165	0.000
16-03-24 12:00	9.6	3.2	166	0.000
16-03-24 12:05	9.6	3.2	166	0.000
16-03-24 12:10	9.6	3.2	166	0.000
16-03-24 12:15	9.6	3.2	166	0.000
16-03-24 12:20	9.6	3.2	166	0.000
16-03-24 12:25	9.6	3.2	166	0.000
16-03-24 12:30	9.6	3.2	166	0.000
16-03-24 12:35	9.6	3.2	166	0.000
16-03-24 12:40	9.6	3.2	166	0.000
16-03-24 12:45	9.6	3.2	166	0.000
16-03-24 12:50	9.6	3.2	166	0.000
16-03-24 12:55	9.6	3.2	166	0.000
16-03-24 13:00	9.4	3.5	166	0.000
18-03-24 07:00	7.8	0.7	120	0.000
18-03-24 07:05	7.9	1	125	0.000
18-03-24 07:10	8	1.4	125	0.000
18-03-24 07:15	8.3	1	125	0.000
18-03-24 07:20	8.6	0.3	125	0.000
18-03-24 07:25	9	0.7	125	0.000
18-03-24 07:30	9.4	0.7	120	0.000
18-03-24 07:35	9.7	0.7	120	0.000
18-03-24 07:40	9.8	1	120	0.000
18-03-24 07:45	9.8	1.7	120	0.000

Date/ Time (hh:mm)	Outdoor Temperature (°C)	Wind speed (m/s)	Wind direction (degrees)	Hour Rainfall (inch)
18-03-24 07:50	9.8	1.7	120	0.000
18-03-24 07:55	9.9	1.4	120	0.000
18-03-24 08:00	10.2	1.4	125	0.000
18-03-24 08:05	10.4	1.4	180	0.000
18-03-24 08:10	10.5	1	180	0.000
18-03-24 08:15	10.9	1	180	0.000
18-03-24 08:20	11.1	1.4	180	0.000
18-03-24 08:25	11.1	2	180	0.000
18-03-24 08:30	11.3	1.7	180	0.000
18-03-24 08:35	11.5	1.7	220	0.000
18-03-24 08:40	11.8	1	220	0.000
18-03-24 08:45	12.4	1.4	140	0.000
18-03-24 08:50	12.6	2	140	0.000
18-03-24 08:55	12.7	2	220	0.000
18-03-24 09:00	12.9	2	200	0.000
18-03-24 09:05	13.1	1.7	270	0.000
18-03-24 09:10	12.7	2	270	0.000
18-03-24 09:15	12.5	1	200	0.000
18-03-24 09:20	12.8	1.4	270	0.000
18-03-24 09:25	13.1	2.7	170	0.000
18-03-24 09:30	13	1.4	185	0.000
18-03-24 09:35	13.1	2	165	0.000
18-03-24 09:40	13.2	2	165	0.000
18-03-24 09:45	13.2	2.7	170	0.000
18-03-24 09:50	13.1	3.1	174	0.000
18-03-24 09:55	13.3	2.4	190	0.000
18-03-24 10:00	13.5	3.4	190	0.000
18-03-24 10:05	13.6	2.7	195	0.000
18-03-24 10:10	13.5	3.7	200	0.000
18-03-24 10:15	13	3.4	200	0.000
18-03-24 10:20	12.8	4.1	200	0.000
18-03-24 10:25	12.8	4.4	200	0.000
18-03-24 10:30	12.8	2.7	220	0.000
18-03-24 10:35	12.9	3.1	225	0.000
18-03-24 10:40	13.2	2.4	225	0.000
18-03-24 10:45	13.3	4.1	225	0.000
18-03-24 10:50	13.4	2.7	190	0.000
18-03-24 10:55	13.3	2	185	0.000
18-03-24 11:00	13.3	2	180	0.000
18-03-24 11:05	13.2	1.7	210	0.000
18-03-24 11:10	13.1	3.1	220	0.000
18-03-24 11:15	13.1	2	22	0.000
18-03-24 11:20	13.2	2.4	270	0.000
18-03-24 11:25	13.2	2.4	270	0.000
18-03-24 11:30	13.3	2	270	0.000
18-03-24 11:35	13.3	2	270	0.000
18-03-24 11:40	13.5	2	270	0.000
18-03-24 11:45	13.9	3.4	220	0.000
18-03-24 11:50	13.8	3.1	225	0.000
18-03-24 11:55	13.8	3.4	240	0.000
18-03-24 12:00	13.7	3.7	245	0.000
18-03-24 12:05	13.6	3.1	250	0.000
18-03-24 12:10	13.7	2.4	250	0.000
18-03-24 12:15	13.9	2.7	255	0.000
18-03-24 12:20	14.1	4.4	230	0.000
18-03-24 12:25	14.3	0	235	0.120
18-03-24 12:30	14.7	0	200	0.120

Table 13: Measured weather data

Appendix C Residual and background sound levels

C.1 Measurement time history

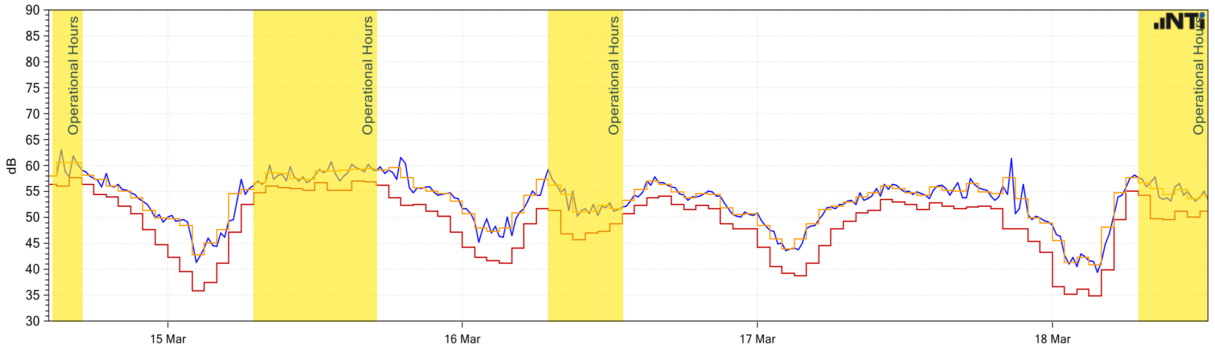

Figure 12: Residual sound level time history, $L_{A90,1hr}$ (red), $L_{Aeq, 5min}$ (blue), and $L_{Aeq, 1hr}$ (orange) levels – Position 1

C.2 Background and residual sound level data

C.3 The measured daytime $L_{A90,1hr}$ and $L_{Aeq,1hr}$ levels during the operational period of the site are shown in Table 14. Complete measurement data is included in the supplementary data excel sheet.

Date/Time (hh:mm)	Position 1	
	$L_{Aeq,1hr}$ (dB)	$L_{A90, 1hr}$ (dB)
2024-03-14 14:00:00	58	56
2024-03-14 15:00:00	61	56
2024-03-14 16:00:00	61	58
2024-03-15 07:00:00	57	55
2024-03-15 08:00:00	59	56
2024-03-15 09:00:00	59	56
2024-03-15 10:00:00	58	56
2024-03-15 11:00:00	57	55
2024-03-15 12:00:00	59	57
2024-03-15 13:00:00	59	55
2024-03-15 14:00:00	59	55
2024-03-15 15:00:00	59	57
2024-03-15 16:00:00	60	57
2024-03-16 07:00:00	56	51
2024-03-16 08:00:00	54	47
2024-03-16 09:00:00	51	46
2024-03-16 10:00:00	51	47
2024-03-16 11:00:00	52	47
2024-03-16 12:00:00	52	49
2024-03-18 07:00:00	57	54
2024-03-18 08:00:00	56	50
2024-03-18 09:00:00	54	50
2024-03-18 10:00:00	55	51
2024-03-18 11:00:00	54	50
2024-03-18 12:00:00	54	51

Table 14: Measured background sound $L_{A90, 1hr}$ levels and $L_{Aeq,1hr}$ levels

C.4 Analysis to determine the typical background sound level representative of the daytime assessment period is undertaken following the guidance of BS 4142, with results shown in Figure 13.

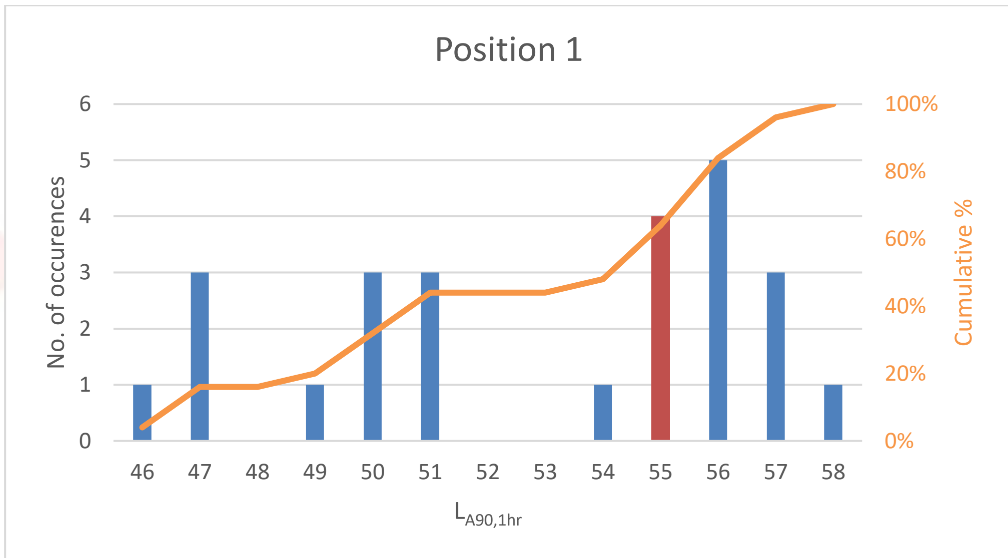

Figure 13: Analysis of daytime background levels, $L_{A90, 1hr}$ – Position 1

Appendix D Source measurements

D.1 Measurements around the imaginary box enclosing all the existing plant on site are shown in Table 15.

Plant	Side	dB(A)	1/3rd octave band centre frequency, Hz Measured A-weighted sound level, dB																							
			25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
Manitou Telehandler	West	77	19	47	56	37	57	63	52	63	59	58	61	62	65	64	66	65	65	66	67	66	63	62	60	60	59	56	52
	East	77	18	47	56	40	55	64	54	57	55	59	60	62	66	69	64	65	65	65	66	66	63	61	59	59	57	55	51
	Front	75	22	48	58	36	54	64	48	54	56	62	64	58	64	61	65	66	64	64	64	63	62	63	60	57	55	52	49
	Rear	80	16	43	53	37	51	66	58	64	61	57	56	66	67	64	66	67	69	69	67	69	69	72	68	65	64	62	59
	Above	76	16	40	54	57	45	67	63	54	54	61	62	59	64	66	65	66	64	64	64	63	60	58	55	54	53	51	46
Bell Loading Shovel	West	80	21	23	31	43	59	62	47	56	62	60	57	57	61	64	66	70	73	73	71	70	71	66	63	62	57	57	53
	East	74	17	28	31	48	58	50	47	55	61	62	49	57	59	57	58	59	70	62	62	61	62	59	53	52	50	47	46
	Front	81	21	25	31	47	57	61	51	59	63	61	60	58	62	63	67	69	72	73	72	70	72	67	64	62	57	57	54
	Rear	81	19	24	29	35	70	65	45	68	66	63	67	60	66	66	68	69	71	73	72	68	70	66	66	66	60	66	56
	Above	79	15	25	27	41	58	54	44	62	58	63	57	56	67	64	65	70	72	69	69	66	67	63	62	63	60	56	56
Volvo EC220 360 Excavator	West	71	19	24	28	35	36	44	43	48	53	57	57	58	59	59	60	61	62	62	61	60	59	58	56	53	51	48	45
	East	75	16	25	25	31	35	51	45	51	57	61	61	61	63	63	64	64	65	65	65	63	62	61	58	56	56	50	48
	Front	76	17	25	28	35	39	47	48	52	56	62	60	62	65	67	65	66	65	66	65	64	63	61	58	56	57	53	50
	Rear	76	17	23	28	37	41	52	44	52	57	61	60	63	62	62	65	65	67	67	65	65	65	66	63	61	58	54	51
	Above	84	15	23	26	31	36	45	48	56	61	65	67	69	70	70	72	73	74	75	74	74	73	71	68	66	63	60	56

Table 15: Measurements around the imaginary box enclosing all plant on site

D.2 Residual sound measurements made with all plant turned off are shown in Table 16.

dB(A)	1/3rd octave band centre frequency, Hz Measured A-weighted sound level, dB																							
	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
60	19	24	27	35	32	33	34	39	40	42	43	48	49	48	50	51	51	50	49	49	49	47	44	44	41	37	36

Table 16: Residual sound measurements

Appendix E Representative noise measurements

E.1 The below measurements have been undertaken previously by Apex Acoustics, and sources are considered representative of those proposed.

E.2 HGV movements

Source	Data type	Single-octave band centre frequency (Hz) A-weighted sound pressure levels at 8 m, free field (dB)							dB(A)
		63	125	250	500	1k	2k	4k	
HGV movements	L_p @ 8 m	49	51	57	60	64	61	54	67

Table 17: Measured HGV movements at 8 m

Figure 14: Measurement of HGV movements at 8 m

Appendix F Noise transmission and propagation

F.1 Noise transmission and propagation is modelled using proprietary software, CadnaA. This models noise propagation outdoors according to ISO 9613. The parameters used, source of data and details are described in Table 18.

Parameter	Source	Details
Model dimensions	Google Earth	British Transverse Mercator coordinates
Site location and layout	Drawings	Reference 5
Topography	Environment Agency Height Data, Reference 7	Lidar Digital Terrain Model, DTM
Building heights – outside of site	Site observations and Google Street view	3 m per storey + 3 m roof (residential properties)
Receptor positions	Site observations and Google Street view	On the NSR façade closest to the source at a height of 1.5 m, and 4 m to represent ground and first floor window heights respectively
Building and barrier absorption coefficient	ISO 9613-2	0.21 to represent a reflection loss of 1 dB
G, Ground factor	ISO 9613-2	Hard ground, G = 1 (locally on model)
Max. order of reflections	Apex Acoustics	Three

Table 18: Modelling parameters and assumptions

13.1 A 3D view of the CadnaA model is shown in Figure 15.

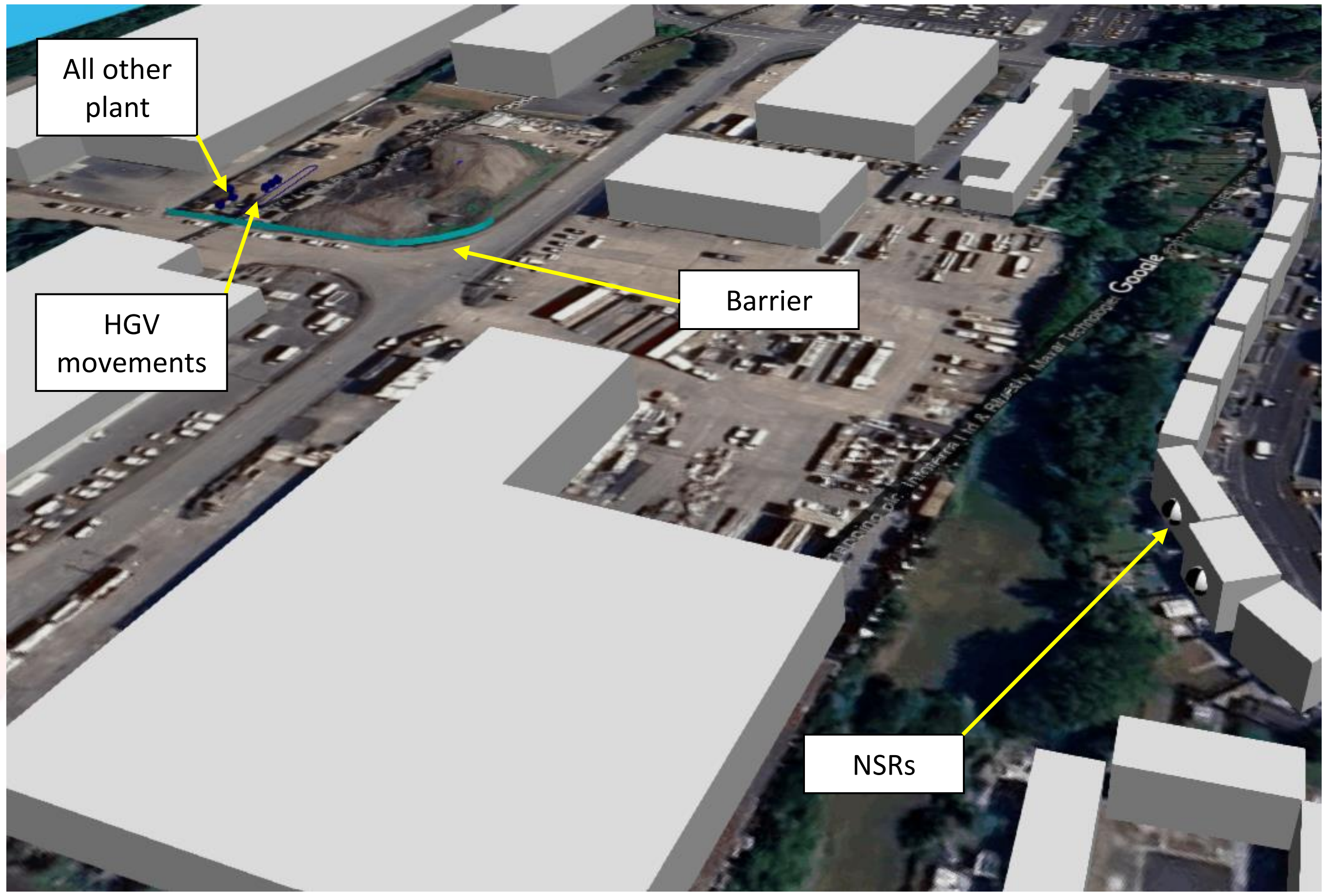

Figure 15: 3D view of the Cadna model

Appendix G Context of acoustic environment

G.1 The context can be expressed in relation with the soundscape, as defined in BS ISO 12913-1, Reference 8.

G.2 ISO 12913-1 states that:

"The context may influence soundscape through the auditory sensation, the interpretation of auditory sensation and the responses to the acoustic environment."

G.3 The process of experiences that describe soundscape and illustrated in Figure 16.

G.4 The acoustic environment is defined as being:

"… the sound from all sound sources modified by the environment. Modification by the environment includes effects on sound propagation, resulting for example from meteorological conditions, absorption, diffraction, reverberation and reflection."

G.5 The auditory sensation is described as:

"… a function of neurological processes that begin when auditory stimuli reach the receptors of the ear. This is the first stage in detecting and representing the acoustic environment. Auditory sensation is influenced by masking, spectral contents, temporal patterns and spatial distribution of the sound sources."

G.6 The interpretation of auditory sensation refers to

"… unconscious and conscious processing of the auditory signal to create useful information, which may lead to awareness or understanding of the acoustic environment. Awareness of the acoustic environment, in context, represents an experience of the acoustic environment."

G.7 Responses describe the short-term reactions and emotions while the outcomes refer to the overall, long-term consequences facilitated or enabled by the acoustic environment.

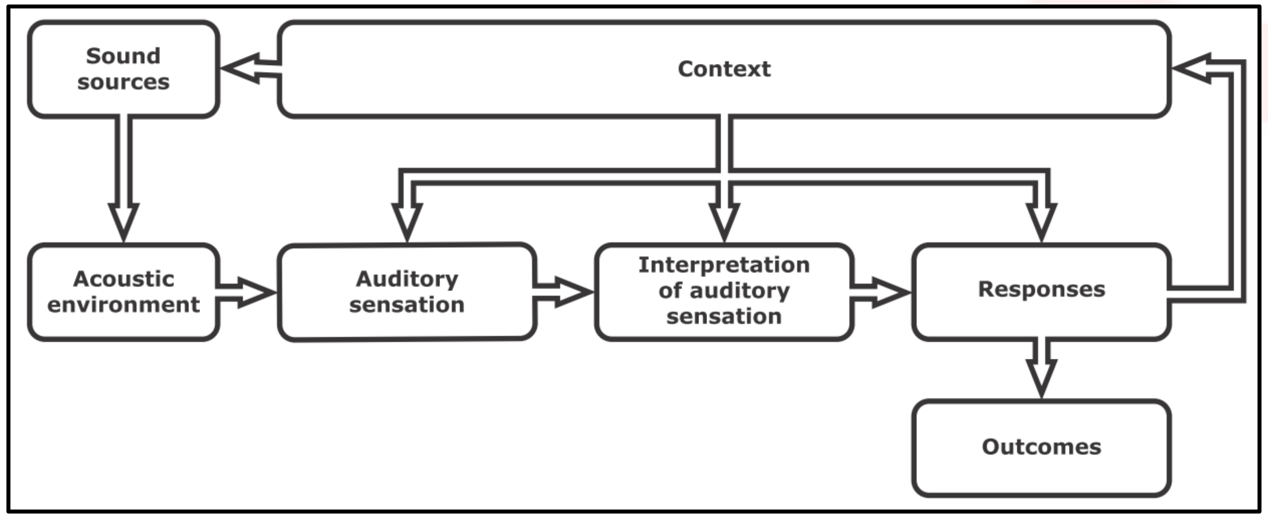

Figure 16: Elements in the perceptual construct of soundscape

G.8 The Planning Practice Guidance notes on noise state that the impact is categorised as SOAEL when "noticeable and disruptive". It details:

"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."

G.9 Such effect is typically defined as a difference between the BS 4142 rating level and the background level of +10 dB, depending on the context, and should be avoided on a regular basis.

Appendix H Professional qualifications and competence

H.1 All Apex Acoustics consultants work under the close supervision of a member who holds qualification in acoustics and is a member of the IOA.

H.2 This can be verified by searching the Institute of Acoustics' list of Members, available here, with the surname of the consultant.

http://www.ioa.org.uk/membership-check

H.3 Apex Acoustics is a member of the Association of Noise Consultants (ANC). The ANC is a trade organisation which seeks to raise the standards of acoustic consultancy and as such there are barriers to entry to ensure member's competency.

H.4 This report has been completed and checked by an appropriately qualified and experienced acoustic consultant.