



John Murphy and Sons Ltd.

OLLERTON DEPOT, NOISE ASSESSMENT

Newark Rd, New Ollerton, Newark





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1 INTRODUCTION

1.1 OVERVIEW

- 1.1.1. WSP has been instructed by John Murphy and Sons Ltd (hereafter referred to as 'the Client') to carry out an assessment to accompany the planning application for the proposed Ollerton Depot development in terms of potential noise impacts. The proposed re-development is located at the existing Ollerton depot, on Newark Road in New Ollerton, hereafter referred to as 'the Application Site'.
- 1.1.2. This report presents the findings of a noise impact assessment in relation to the re-development proposals at the existing depot. This has been considered based on a baseline sound monitoring survey undertaken in March 2021 at the Site boundary closest to residential receptors located on Kelsey Avenue, and an assessment of the existing grit- blasting facility which is to be retained as part of the proposed re-development (report reference 70072988-N04-001 Revision 1 dated April 2021).
- 1.1.3. An assessment of noise impacts has been undertaken considering the process outlined in BS4142: 2014+A1:2019 '*Methods of rating and assessing industrial and commercial sound*'¹ (BS4142). The assessment has drawn upon the results of a detailed baseline sound survey and modelling exercise. The modelling exercise has been used to assist in predicting sound levels from the proposed facility at the closest residential receptors.
- 1.1.4. This report is necessarily technical in nature and to assist the reader a glossary of technical terms is presented in Appendix A.

1.2 APPLICATION SITE

- 1.2.1. The Application Site is located within Newark and Sherwood District Council (NSDC) administrative area at the approximate National Grid Reference (NGR): X 467010 Y 367070.
- 1.2.2. The Application Site is located south of the town of New Ollerton and adjacent to Newark Road on its western border. West of the Application Site are both residential dwellings and industrial facilities. Sherwood Forest Crematorium is located on the southwest boundary of the Application Site. A railway line is situated on the northern boundary.
- 1.2.3. The eastern area of the Application Site is currently greenfield land, the west is occupied by multiple warehouse units and office buildings, alongside existing car parking spaces.
- 1.2.4. The location of the Application Site is presented in Figure 1-1.

¹ British Standards Institution (2014), BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound. London: BSi.

Figure 1-1 - Location of the Application Site



1.3 SITE HISTORY

- 1.3.1. The Ollerton depot has been occupied by the Client for over 20 years and has been used for the maintenance and storage of both small and large plant items since that time.
- 1.3.2. The Site is located adjacent to a recently built residential development on Kelsey Avenue with the Site surrounding the residential development on three sides. 090882
- 1.3.3. Outline planning permission for the residential development was granted in 2003 with the subsequent reserved matters application approved in 2004 (References 03/00020/OUTM and 04/01337/RMAM respectively) by Newark and Sherwood District Council (NSDC).
- 1.3.4. The reserved matters application was approved subject to a number of conditions of which no. 7 is relevant to noise from the depot:

'The development shall not be commenced until a noise assessment and details of the method of noise attenuation to Plots 1, 2, 7, 8, 12 to 38 have been submitted to and agreed in writing by the Local Planning Authority.'
- 1.3.5. However, no noise assessment was completed for the Kelsey Avenue residential development² and it is understood that the developer (Peveril Homes) is now immune from any enforcement action due to the time elapsed since the approval was granted.

² Email from Emma Fawcett of Newark and Sherwood District Council to Michael Wood of WSP on 11th August 2020

- 1.3.6. The Ollerton depot was operational prior to the approval of the neighbouring residential development. As detailed in the letter sent by WSP³, whilst activity may have fluctuated in the Site's operation since being established in circa 1999, the general lawful uses on the land have remained consistent.

1.4 PROPOSED DEVELOPMENT

- 1.4.1. The proposals comprise the demolition of numerous existing buildings followed by the relocation of several existing buildings and internal vehicle movements along the western site boundary, in combination with newly constructed workshops and offices (the "Proposed Development").
- 1.4.2. Key new facilities included within the proposals include:
- Plant and vehicle workshop;
 - Specialist welding services workshop;
 - Office and training academy incorporating 200 associated car parking spaces; and
 - Pylon training facility.
- 1.4.3. The proposed ventilation strategy will utilise Mechanical Ventilation with Heat Recovery (MVHR) units connected to the building façade for the office areas of the Proposed Development. The workshop areas will utilise supply and extract ventilation to suit specialist plant.
- 1.4.4. The Proposed Development also includes a 20m buffer zone along the western site boundary with residential receptors located on Kelsey Avenue.
- 1.4.5. The proposed layout for the development prepared by CTH Architects, drawing number 117-GTH-04-ZZ-DR-A-1100, is included in Appendix B.

1.5 SCOPE OF WORKS

- 1.5.1. The scope of the assessment comprised:
- liaison with the Client to discuss the sound sources within the Proposed Development;
 - review of the survey data obtained by WSP in March 2021 to establish the background sound levels at the residential boundary;
 - the generation of a detailed noise model to determine the propagation of sound across the site and sound levels at nearby residential receptors; and
 - assessment of the outputs from the noise model at the nearest residential receptors in accordance with BS4142.

³ Response to the Planning Contravention Notice (PCN) dated 19 February 2020 issued by Michael Wood of WSP to Richard Marshall, Planning Services, dated 14th January 2020.

2 PLANNING POLICY AND GUIDANCE

2.1 BS4142 2014+A1:2019 ‘METHODS OF RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND’

2.1.1. BS4142:2014+A1:2019 describes methods for rating and assessing the following:

- 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; and
- 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 on or around an industrial and/or commercial site.

2.1.2. The methodology contained within BS4142 uses 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. A summary of the approach set out within BS4142 is set out below:

- establish the specific sound level of the source(s);
- measure the representative background sound level, typically by measurement close to the receptor location;
- rate the specific sound level to account for any distinguishing characteristics (see below);
- estimate the impact by subtracting the background sound level from the rating level; and
- consider the initial estimate of impact, as determined above, in the context of the noise and its environment.

2.1.4. The specific sound level is rated to account for distinguishing characteristics by using the following penalties:

- Tonality up to 6dB⁴
- Impulsivity up to 9dB⁵
- Other sound characteristics 3dB
- Intermittency 3dB

2.1.5. The corrections provided above could be applied in a linear fashion. However, this could result in some large penalties and it is recommended that where two characteristics are present and one is dominant that the larger of the two is used.

⁴ BS 4142 suggests that a penalty of “2 dB for tone which is just perceptible at the receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible” could be applied.

⁵ BS 4142 suggests that a penalty of “3 dB for impulsivity which is just perceptible at the receptor, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible” could be applied.

- 2.1.6. An initial estimate of the impact of the specific sound is obtained by subtracting the background sound level from the rating level. Using this approach, BS4142 states:
- *“Typically, the greater this difference, the greater the magnitude of impact*
 - *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 on the context*
 - *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.”*
- 2.1.7. The results of the initial assessment should be considered in light of all pertinent contextual factors, including:
- the absolute level of the sound;
 - the character and level of the residual sound compared to the character and level of the specific sound;
 - the sensitivity of the receptor; and
 - the overall context in which the application is being put forward.

3 ASSESSMENT METHODOLOGY

3.1 SOUND MEASUREMENTS

- 3.1.1. Baseline sound levels pertinent to this assessment were obtained by WSP between Monday 15 March 2021 and Friday 19 March 2021 and adopted as a basis for the noise assessment of the existing grit blasting facility (report reference 70072988-N04-001 Revision 1 dated April 2021). These baseline sound levels have also been adopted as a basis for this assessment.
- 3.1.2. The March 2021 baseline sound monitoring was carried out in accordance with the measurement guidance in British Standard BS 7445: 2003 '*Description and Measurement of Environmental Noise*'⁶.
- 3.1.3. The sound level meter was set to measure the L_{Aeq} , L_{A90} and L_{AFmax} parameters, logging in contiguous periods of 15 minutes. Whilst the sound level meter location was within 3.5m from the boundary fence. The fence is not considered a solid barrier due to gaps within the panelling. Therefore, sound levels are considered as free-field and no façade correction has been applied.
- 3.1.4. Further information on the sound monitoring is provided in Section 4 and Appendix C.

3.2 CALCULATIONS AND ASSESSMENT

- 3.2.1. Activities on the application site itself such as HGV movements, grit blasting, etc. will generate sound. Sound levels at the nearest receptors due to the existing and proposed operational activities on the Application Site have been predicted using CadnaA 2023 acoustic modelling software which implements ISO 9613-2:1996: *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*⁷ (ISO 9613-2) prediction methodology.
- 3.2.2. The model consists of a detailed three dimensional representation of the application site and the surroundings and has been employed to calculate noise levels at surrounding sensitive receptors due to existing and proposed activities within the site. The sources terms used within the model are provided in Appendix D, Table D-1.
- 3.2.3. The model has taken the following into consideration:
- Open source LIDAR Composite DTM (Digital Terrain Model) raster elevation data at 1m spatial resolution topographic data was incorporated into the model for the existing application site and surrounding area, extending to encompass the nearest receptors.
 - The model was set to include two no. order of reflections from solid structures.
 - Building heights are set based on existing and proposed elevation drawings provided by the Client.
 - Noise generating activities which take place within Building 6b in the Container Preparation and Storage area of the site, Building 7 of the grit Blasting Facility, Building 11 in the Non-mechanical store, the plant and vehicle workshop and the Specialist welding services workshop. Using the sound pressure level (L_p) values measured from previous site visits and

6 British Standards Institution (2003) BS 7445: 2003 '*Description and Measurement of Environmental Noise*'. British Standards Institution. London: BSI.

7 International Organization for Standardization (1996) ISO 9613: 1996 Part 2 Attenuation of sound during propagation outdoors, ISO.

details of the proposed facility provided by the Client, radiating sound power levels (L_w) of each building façade have been calculated.

- External plant sources are assumed to have a source height of 1m.
- Anticipated Heavy Duty Vehicles (HDVs) movements have been provided by Transport Planning Practice Ltd, the appointed Transport Consultants for the project. The initial flows indicate that there will be a total 24-hour AADT of 54 HDVs on the local road network as a result of the Proposed Development. The daytime assessment is based on a one hour period and on this basis a reasonable worst case assumption of six incoming and six outgoing have been assumed. HDV movements within the application site have been modelled as moving point sources with a speed of 10 kph.
- The assessment is based on a worst-case scenario with all plant operating.
- Ground absorption was set to zero due to the hard standing surfaces found across the Site.
- Garden fences along the perimeter boundary of the properties of Kelsey Avenue are included as a 1.8 m high barrier.
- The receiver height is taken as 1.5 m above local ground (i.e. ground floor).

3.2.4. The hours of operation for the Proposed Development are between 07:00 and 18:00, Monday to Friday. Therefore, no night-time assessment is required.

3.2.5. The model has been used to calculate sound levels at representative sensitive receptors and an assessment carried out in accordance with BS 4142 to determine the calculated rating levels.

4 BASELINE SOUND MONITORING

4.1 OVERVIEW

- 4.1.1. Baseline sound monitoring was carried out within the application site, at the boundary adjacent to the residential receptors of Kelsey Avenue, as presented in Figure 1-1.
- 4.1.2. The location is the same as that used for previous sound surveys at the application site and is deemed representative of the closest residential receptor on Kelsey Avenue.

4.2 INSTRUMENTATION

- 4.2.1. The monitoring equipment used to measure the prevailing sound levels representative of the residential properties is presented in Table 4-1. The Class 1 measurement systems were calibrated within the previous 24 months, and the calibrators are calibrated within the previous 12 months. No significant calibration drift occurred during the survey.

Table 4-1 – Baseline Sound Monitoring Equipment

Equipment Description	Manufacturer & Type No.	Serial No.
Sound Level Meter	01 dB-Metravib DUO	10617
Pre-amplifier	01 dB Metravib PRE 22	10180
Microphone	GRAS 40CD	162036
Calibrator	01 dB-Stell CAL 21	34924010

4.3 METEOROLOGICAL CONDITIONS

- 4.3.1. The nearest weather station⁸ to the Site is located at Retford Gamston Airport, approximately 6.5 miles to the north. The conditions throughout the survey were dry with average windspeeds of 4 to 5m/s. A small period of light rain was present on Friday 19 March 2021 from 09:00 – 10:00, however the data was comparable and didn't appear to affect the measurements.

4.4 RESULTS AND ADOPTED LEVELS

The average residual sound levels ($L_{Aeq,1hr}$) and background sound levels ($L_{A90,1hr}$) values for each day of monitoring are presented in Table 4-2. Whilst the sound level meter location was within 3.5m from the boundary fence. The fence is not considered a solid barrier due to gaps within the panelling. Therefore, sound levels are considered as free-field and no façade correction has been applied.

⁸ <https://www.wunderground.com/history/weekly/EGNE/date/2021-3-15>

Table 4-2 – Baseline Sound Monitoring Results

Period (08:00 – 18:00)	Average Residual Sound Level L_{Aeq, 1hr} (dB) Free-Field	Average Background Sound Level L_{90, 1hr} (dB) Free-Field
Monday 15 March 2021 ^A	49	34
Tuesday 16 March 2021	48	38
Wednesday 17 March 2021	46	35
Thursday 18 March 2021	43	34
Friday 19 March 2021 ^B	39	34
Average Sound Level	45	-

^A 10:00 – 18:00
^B 08:00 – 13:00

Note: The sound level meter was positioned approximately 3m from the corner boundary fence. A façade correction of 2.5dB would have been applied if the meter was positioned 1m in front of the fence. Therefore, the reflection at 3m would be minimal and noise levels are considered as free-field, hence no façade correction has been applied.

- 4.4.2. As the current noise climate includes the Client’s existing operations, the L_{Aeq} values obtained throughout the baseline sound survey are considered to be residual sound levels. Therefore, the average residual sound level used as part of the BS4142 assessment is considered to be 45dB L_{Aeq,1hr}.
- 4.4.3. As part of the BS4142 assessment, a representative background sound level should be chosen to assess the specific sound source against. Statistical analysis has been undertaken on the L_{90,1hr} values obtained during the operational hours of the Client (08:00 – 18:00, during weekdays) and the most commonly occurring value selected is 35dB L_{90,1hr}.
- 4.4.4. A graph of the statistical analysis is presented in Figure C-1, Appendix C.

5 NOISE ASSESSMENT

5.1 INITIAL ESTIMATE OF NOISE IMPACT

- 5.1.1. The predicted sound levels from the Proposed Development at 1.5m height is shown within Appendix D, Figure D-1 (doors closed) and Figure D-2 (doors open), in terms of $L_{Aeq,1hr}$, during daytime. Whilst all receptors on Kelsey Avenue have been considered as part of the assessment; the sound levels presented herein are the maximum specific sound levels derived from the acoustic model.
- 5.1.2. The existing grit blasting facility remains to be one of the main sources of noise associated with the Proposed Development and it was noted in the previous assessment undertaken by WSP not to demonstrate any tonal characteristics. Similarly, the sound was of a relatively steady, non-impulsive nature. It is also considered that the noise breakout from the existing and proposed buildings would not demonstrate acoustic correction features. Accordingly, no feature correction penalties are considered applicable in these regards.
- 5.1.3. A comparison of the $L_{Aeq,1hr}$ values and $L_{90,1hr}$ values, measured during the baseline sound survey, show a difference of circa 10dB between the two metrics, suggesting there is already intermittent noise present at the residential properties. Accordingly, whilst the specific source may be considered to be intermittent, it is unlikely to be readily distinctive against the residual environment and therefore no additional feature penalty is applied in this regard.
- 5.1.4. Table 5-1 outlines the predicted results from the BS4142 assessment for typical operations associated with the proposed development with all plant operating and doors closed, prior to considering the context.

Table 5-1 – Doors Closed Scenario – BS4142 Assessment

Results	Value	Commentary
Background sound level [A]	$L_{A90,1hr} = 35dB$	Statistical average of data from 15 – 19 March 2021.
Assessment duration	1 hour	Assessment made during operating hours (07:00 – 18:00, Monday – Friday)
Specific sound level [B]	$L_{Aeq,1hr} = 42dB$	
Acoustic feature correction [C]	+ 0dB	Detailed above.
Rating level [D = B+C]	$L_{Ar,1hr} = 42dB$	Specific sound + acoustic feature correction
Excess of rating level of background sound level [D-A]	+ 7dB	Rating level – background sound level
Initial impact indication	Adverse Impact	

- 5.1.5. Table 5-2 outlines the predicted results from the BS4142 assessment for the worst-case operations associated with the proposed development with all plant operating and doors open, prior to considering the context. Doors would typically only be opened during the summer months.

Table 5-2 – Doors Open Scenario – BS4142 Assessment

Results	Value	Commentary
Background sound level [A]	$L_{A90, 1hr} = 35dB$	Statistical average of data from 15 – 19 March 2021.
Assessment duration	1 hour	Assessment made during operating hours (07:00 – 18:00, Monday – Friday)
Specific sound level [B]	$L_{Aeq, 1hr} = 53dB$	
Acoustic feature correction [C]	+ 0dB	Detailed above.
Rating level [D = B+C]	$L_{Ar, 1hr} = 53dB$	Specific sound + acoustic feature correction
Excess of rating level of background sound level [D-A]	+ 18dB	Rating level – background sound level
Initial impact indication	Significant Adverse Impact	

5.2 CONTEXT

5.2.1. In addition to the initial estimate of noise impact, which is simply based on the excess of the rating level over the background sound level, the following contextual factors are to be considered as part of the assessment:

- *Development of residential dwellings* - as discussed in section 1.3, the reserved matters application for the residential land parcel, which adjoins the Site, was approved subject to a number of conditions, of which number seven was, and still is, relevant to noise from the Client and the Site. However, no noise assessment was completed at the time. Had a BS4142 assessment been undertaken as requested, the outcome would likely have demonstrated that the parcel of land is not suitable for residential development.
- *Existing operations associated with Ollerton depot* – the Proposed Development also includes a 20m buffer zone along the western site boundary, i.e. relocating internal vehicle movements from the western site boundary with No 18 to 30 Kelsey Avenue (even numbers only) and No 40 Kelsey Avenue.
- *Existing noise environment* – the Client’s current operations form part of the overall noise environment and the majority of the proposed buildings are situated away from the residential receptors on Kelsey Avenue. The results of the noise assessment indicate that the typical operations associated with the Proposed Development would be 42dB $L_{Aeq, 1hr}$ which would be 3dB below the prevailing residual sound level and a potentially perceptible decrease in sound at the residential receptors on Kelsey Avenue when compared to the sound generated by the existing operations of the Ollerton depot.

- *Noise levels in external amenity areas* – the sound levels predicted from the proposed facility are lower than that of the external amenity guidelines outlined within BS 8233: 2014 ‘*Guidance on sound insulation and noise reduction for buildings*⁹’.

5.3 UNCERTAINTY

- 5.3.1. As described in section 3.2, an acoustic noise model has been created to simulate and assess the specific sound levels at the nearby receptors.
- 5.3.2. The model has been created based on a worst-case scenario, whereby large shipping containers are situated within the application site are excluded from the noise model. These obstacles are likely to further screen the sound from the Proposed Development resulting in reduced sound levels at the nearest receptors.

5.4 SUMMARY

- 5.4.1. The initial noise estimate suggests that the typical operations associated with the Proposed Development with doors closed would be +7dB over the background sound level (adverse impact) and would be +18dB over the background for worst-case operations with doors open (significant adverse impact), before considering context.
- 5.4.2. When considering the context of the site and proposals, as detailed in sections 5.2 and 5.3, it can be reasoned that the assessment can be modified to be less adverse than the initial numerical impacts suggests. In addition, the results of the noise assessment indicate that the typical operations associated with the Proposed Development would be 3dB below the prevailing residual sound level and a potentially perceptible decrease in sound at the residential receptors on Kelsey Avenue when compared to the sound generated by the existing operations of the Ollerton depot. Accordingly, it is considered that under typical operating conditions, the Proposed Development would be less likely to have an adverse impact at the nearby residential properties.
- 5.4.3. When activities need to be undertaken with the facility doors kept open, there is a likelihood of adverse impact, however, this would be an exception to normal and should be avoided whenever possible.

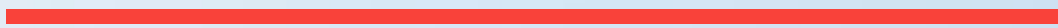
⁹ British Standards Institution (2014) BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings. London: BSi

6 CONCLUSIONS

- 6.1.1. John Murphy and Sons Ltd are proposing to re-develop the existing Ollerton depot with the demolition of numerous existing buildings and relocation of several existing buildings in combination with newly constructed workshops and offices.
- 6.1.2. This noise assessment is to accompany a planning application for the proposed re-development to determine the potential for noise impacts. The assessment has been carried out in accordance with BS4142 and utilising baseline sound levels obtained by WSP in March 2021, which were also adopted for the assessment of the existing grit blasting facility which is to be retained as part of the Proposed Development (report reference 70072988-N04-001 Revision 1 dated April 2021).
- 6.1.3. The March 2021 baseline sound survey established residual and background sound levels considered representative of the closest residential receptors located on Kelsey Avenue. Sound measurements were also been carried out of existing operations, to define sound power levels within the grit blasting facility. Noise levels for proposed buildings and activities are based on data from similar schemes determined from information provided by the Client.
- 6.1.4. Drawing upon the results of the source sound survey and details of the proposed facility provided by the Client, a detailed 3D computer-based noise model has been prepared and used to determine the resulting sound levels across the Site and at the nearest residential receptors. Given that the operations of the Proposed Development will be between 07:00 and 18:00 during weekdays, the BS4142 assessment includes the daytime period only.
- 6.1.5. An initial estimation of impact has been derived, indicating that the typical operations associated with the Proposed Development with doors closed would be +7dB over the background sound level (adverse impact) and would be +18dB over the background for worst-case operations with doors open (significant adverse impact), before considering context. When activities need to be undertaken with the facility doors kept open, there is a likelihood of adverse impact, however, this would be an exception to normal and should be avoided whenever possible.
- 6.1.6. When considering the context of the site and proposals, it can be reasoned that the assessment can be modified to be less adverse than the initial numerical impacts suggests. In addition, the results of the sound assessment indicate that the typical operations associated with the Proposed Development would be a potentially perceptible decrease in sound at the residential receptors on Kelsey Avenue when compared to the noise generated by the existing operations of the Ollerton depot. Accordingly, it is considered that under typical operating conditions, the Proposed Development would be less likely to have an adverse impact at the nearby residential properties.
- 6.1.7. The limitations of this report are presented in Appendix E.

Appendix A

GLOSSARY





SOUND

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20Hz (deep bass) to 20,000Hz (high treble) and over the audible range of 0dB (the threshold of perception) to 140dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify sound in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of sound may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of sound depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a sound source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc, according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

ACOUSTIC TERMINOLOGY

dB (decibel): The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2×10^{-5} Pa).

dB(A): A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

$L_{Aeq,T}$: Defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.

L_{Amax} : The maximum A-weighted sound pressure level recorded over a particular period. L_{Amax} is sometimes used in assessing environmental noise where occasional loud sounds occur, which may have little effect on the overall $L_{Aeq,T}$ sound level, but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response, denoted L_{AFmax} or $L_{Amax,F}$.

L_{10} and L_{90} : If a non-steady sound is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time, and the L_{90} is the



level exceeded for 90% of the time. Unless described otherwise, they are measured using the 'fast' sound level meter response, denoted L_{AF10} and L_{AF90} .

Free-field level: A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and at least 3.5m away from buildings.

Façade level: A sound field determined at a distance of 1 m in front of a large sound reflecting object such as a building façade.

Ambient sound level: The all-encompassing sound level measured in $L_{Aeq,T}$. The Ambient sound level incorporates background sounds as well as that of the industrial source under consideration (BS 4142).

Background sound level: The sound level exceeded for 90% of the time, the L_{A90} sound index, in the absence of sound of an industrial and/or commercial nature (BS 4142).

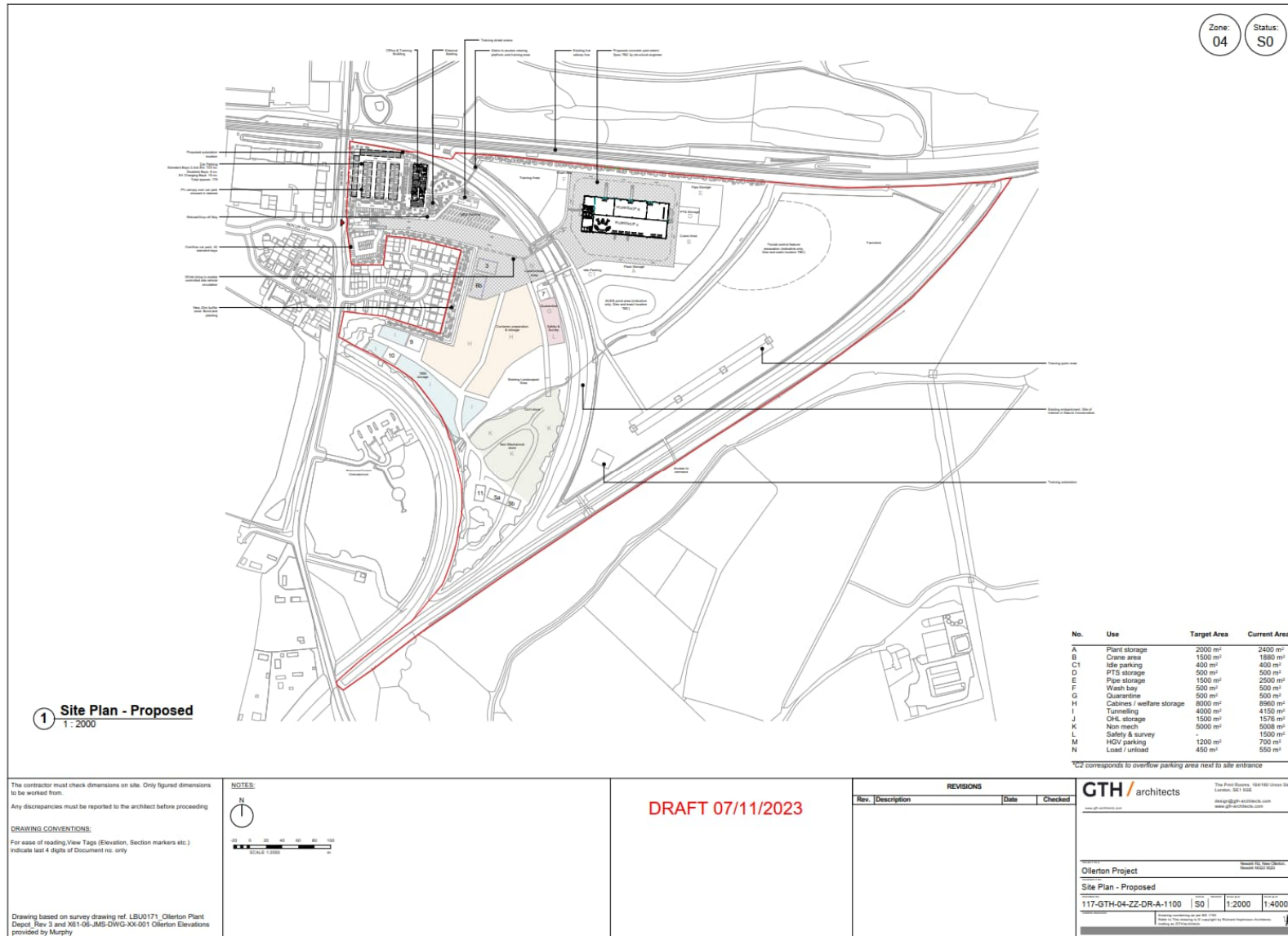
Specific sound level, $L_s = L_{Aeq,T}$: The term used in BS 4142 to describe the equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given time period.

Rating level, $L_{Ar,Tr}$: The term used in BS 4142 to describe the specific sound level plus any adjustment for the characteristic features of the sound.

Appendix B

PROPOSED DEVELOPMENT LAYOUT



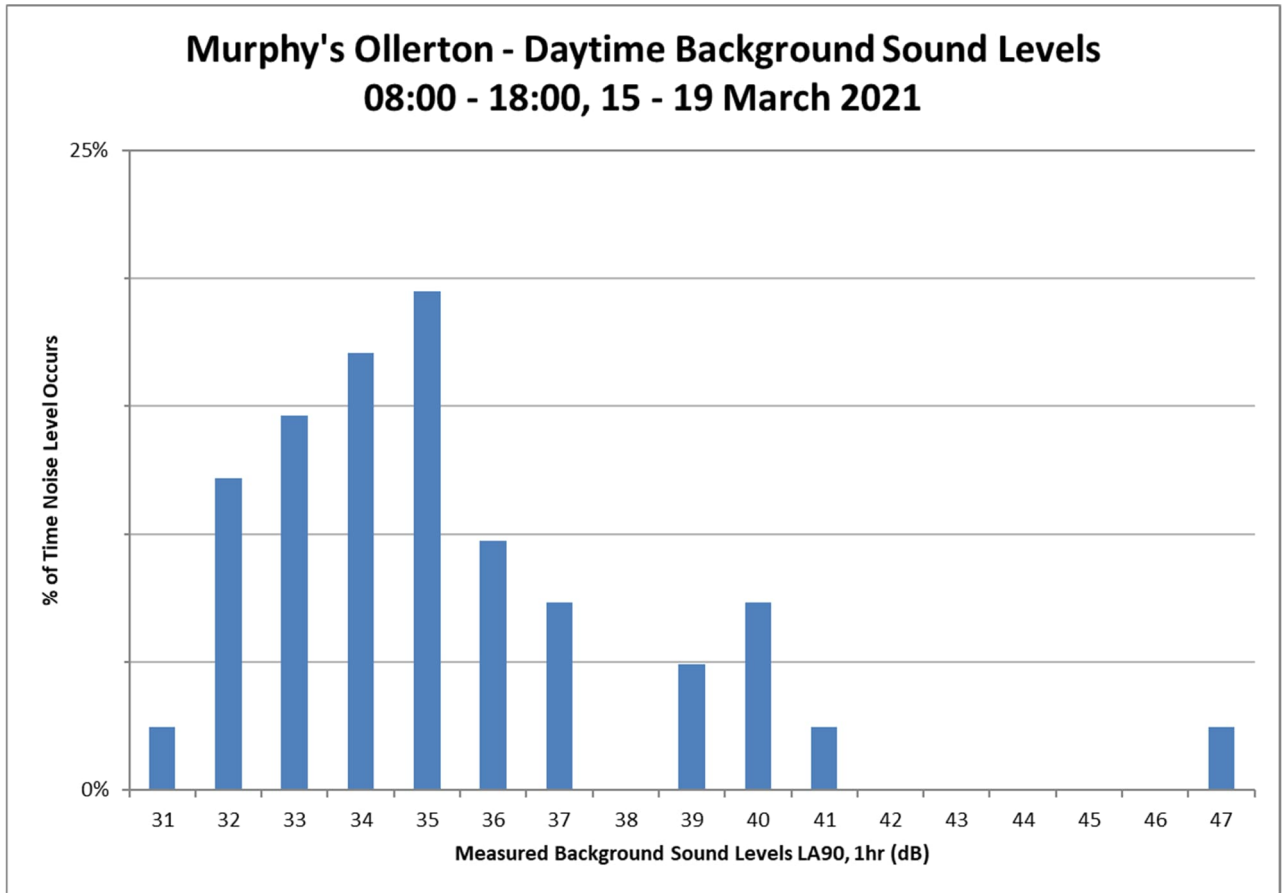


Appendix C

BACKGROUND SOUND LEVEL DATA



Figure C-1 - Statistical Analysis of $L_{90, 1hr}$ Sound Levels (08:00 - 18:00)



Appendix D

SOUND MODELLING





Table D-1: Sound Power Data of Plant Employed in Operational Noise Model

Noise Source	Octave Band Centre Frequency / Hz									LwA	Source Type	Number	Comments
	31.5	63	125	250	500	1k	2k	4k	8k				
HDV Movements	114.6	108.1	99.1	93.4	90.2	90.1	87.4	80.9	72.8	94.9	Line	6 in, 6 out per 1-hour (worst case)	Based on WSP measurements database. Existing source but the Proposed Development will result in a change to the internal route of HDVs.
Container Preparation & Storage – Building 6b	-	58.1	47.9	50.9	55.8	62.9	74.3	82.1	79.9	85.0	Internal reverberant sound level	-	Based on WSP measurements in 2021. Existing source retained. A 50% on-time correction (-3dB) has been applied to the specific sound source to account for a maximum duration of circa 30 mins in any 1 hour period.
Container Preparation & Storage - Telescopic handler - outside		113.0	107.0	97.0	95.0	92.0	90.0	84.0	75.0	98.5	Line	12/h	BS5228 Table C2 no.35. Existing source retained but will not operate within the 20m buffer zone along the western site boundary.
Container Preparation & Storage - Forklift – outside	-	92.6	91.1	85.0	83.7	82.0	78.8	82.5	82.0	89.0	Line	4/h	Based on WSP measurement database. Existing source retained but will not operate within the 20m buffer zone along the western site boundary.



Grit Blasting Facility – Building 7	70.5	68.9	71.3	77.7	84.7	91.9	97.5	104.4	70.5	105	Internal reverberant sound level	-	Based on WSP measurements in 2021 (report reference 70072988-N04-001 Revision 1 dated April 2021). Existing source retained. Due to the nature of grit blasting, a 50% on-time correction (-3dB) has been applied to the specific sound source to account for a maximum blasting duration of circa 30 mins in any 1 hour period.
Grit Blasting Facility – Plant Test	-	-	-	-	-	-	-	-	-	93.0	Point	1	Based on WSP measurements in 2021 (report reference 70072988-N04-001 Revision 1 dated April 2021). Existing source retained.
Non Mechanical Store – Building 11	62	76	70	66	65	61	57	49	62	70.0	Internal reverberant sound level	-	Based on WSP measurements in 2021. Existing source retained. A 50% on-time correction (-3dB) has been applied to the specific sound source to account for a maximum duration of circa 30 mins in any 1 hour period.
Training Pylon Area - Generator	85.0	85.0	99.0	93.0	89.0	88.0	84.0	80.0	72.0	92.9	Point	1	Based on BS5228 Table C4 no.83. New source associated with the Proposed Development.



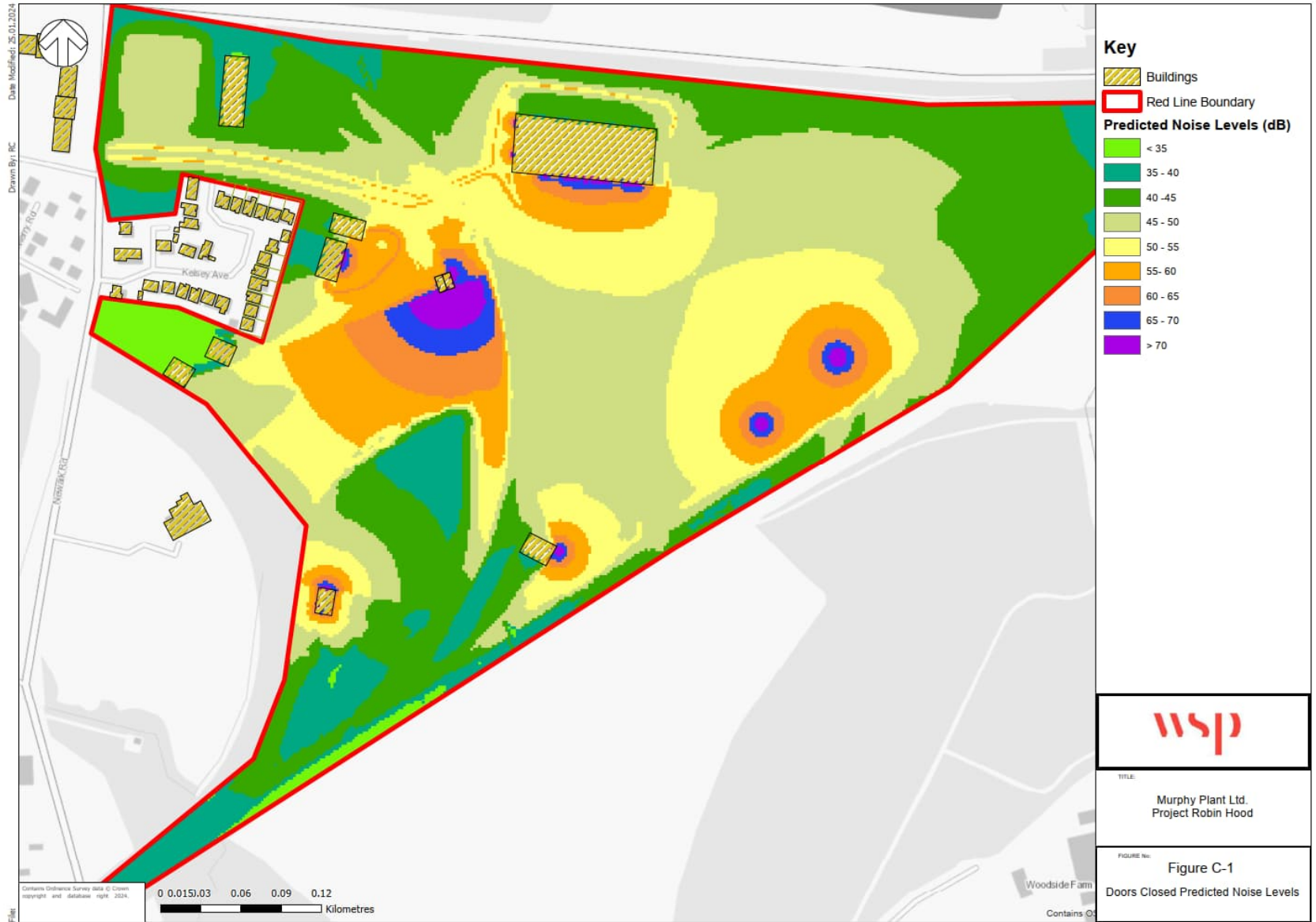
Training Pylon Area - Lifting platform	106.0	104.0	90.0	91.0	88.0	88.0	87.0	86.0	77.0	95.2	Point	1	Based on BS5228 Table C4 no.57. New source associated with the Proposed Development.
Training Pylon Area - Mobile crane	-	108.0	104.0	99.0	91.0	92.0	91.0	84.0	78.0	97.8	Point	1	Based on BS5228 Table C4 no.43. New source associated with the Proposed Development.
Plant and vehicle workshop	-	58.1	47.9	50.9	55.8	62.9	74.3	82.1	79.9	85.0	Internal reverberant sound level		New source associated with the Proposed Development.
Specialist welding services workshop	-	58.1	47.9	50.9	55.8	62.9	74.3	82.1	79.9	85.0	Internal reverberant sound level		New source associated with the Proposed Development.
Car park	-	-	-	-	-	-	-	-	-	81.0	Area	150 movements per hour (worst case)	Based on WSP measurement database. Replacement and increase to existing parking provisions on the application site.

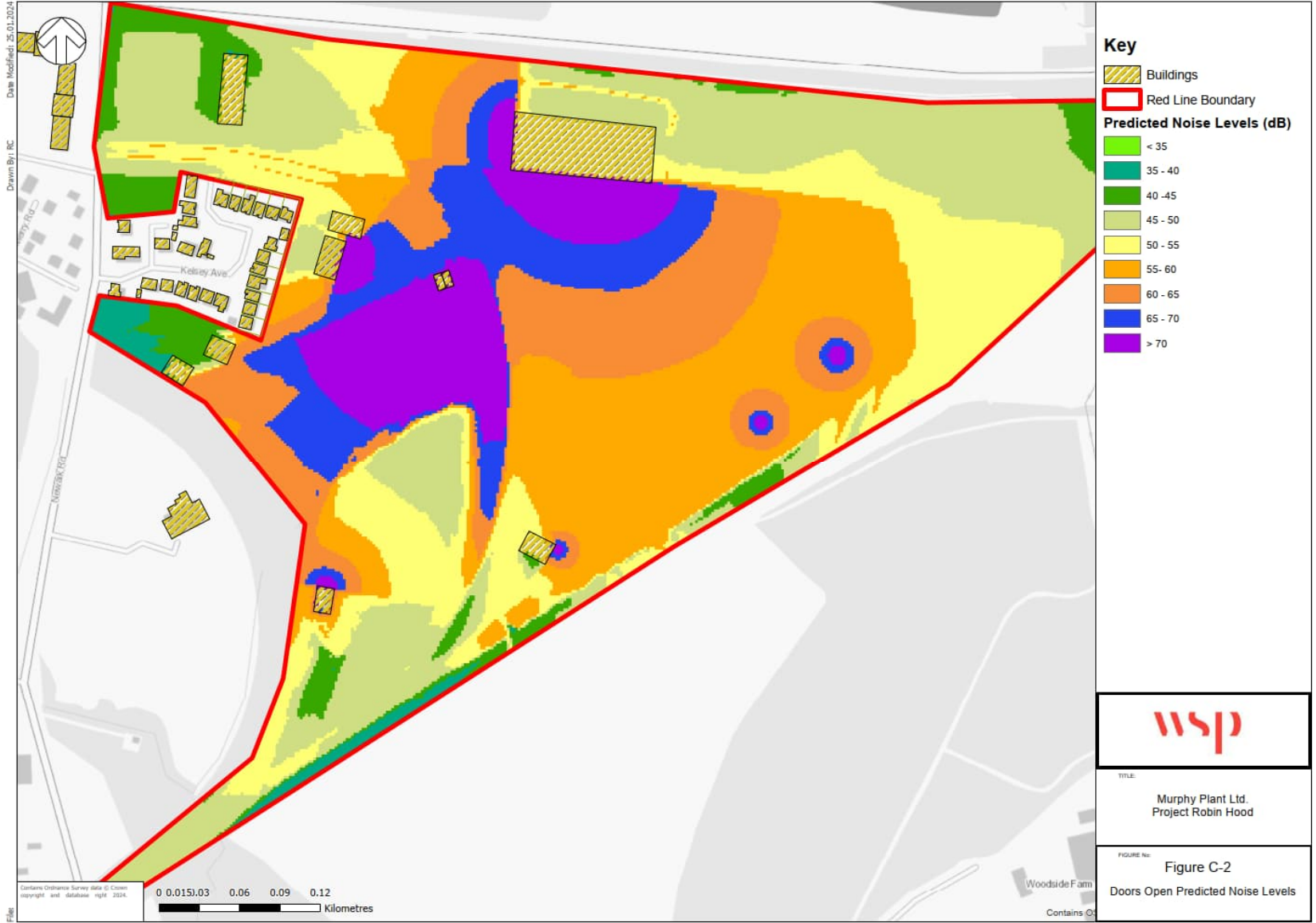


Break out noise prediction from internal plant rooms are also predicted and take account of the Sound Reduction of assumed building elements, as summarised in Table D-2.

Table D-2: Sound Reduction of Building Elements

Building	Building Element	Rw (dB)
Plant and vehicle workshop Specialist welding services workshop	Walls	45
	Roof	43
	Doors Closed	19
Container Preparation & Storage – Building 6b	Walls	42
	Roof	42
	Doors Closed	19
Grit Blasting Facility - Building 7	Walls	42
	Roof	43
	Doors Closed	10
Non Mechanical Store - Building 11	Walls	24
	Roof	24
	Doors Closed	19





Appendix E

LIMITATIONS





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The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. Opinions included therein are based on information gathered during the study and from our experience. If additional information becomes available which may affect our comments, conclusions or recommendations WSP the right to review the information, reassess any new potential concerns and modify our opinions accordingly.



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