CSPAcoustics

NOISE IMPACT ASSESSMENT

128-130 Motherwell Road
Bellshill

Prepared for:
The Creanor Consultancy

Ref: 1807 R001 AH V1
Date: 4th April 2023

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Document Revision History

Version	Reason	Date/Edits Made By:
V1 Draft	Draft for client to review	16/02/23 AH
V1 Final	Final version	04/04/23 AH

1.00 Introduction

1.01 CSP Acoustics has been commissioned by The Creanor Consultancy to provide a noise impact assessment to support a planning application (ref. 21/00765/FUL) for the proposed development of 2 dwelling houses at 128-130 Motherwell Road, Bellshill. The application also involves demolition of the existing derelict garage building.

1.02 Layouts have been provided by the client on 9th June 2022. This report assesses the potential noise impacts upon the development from the surrounding noise climate and any noise impacts from the proposed development upon existing noise sensitive receptors (NSRs).

1.03 The site can be seen in Figure 1 below. R1 and R2 indicate the nearest NSRs.

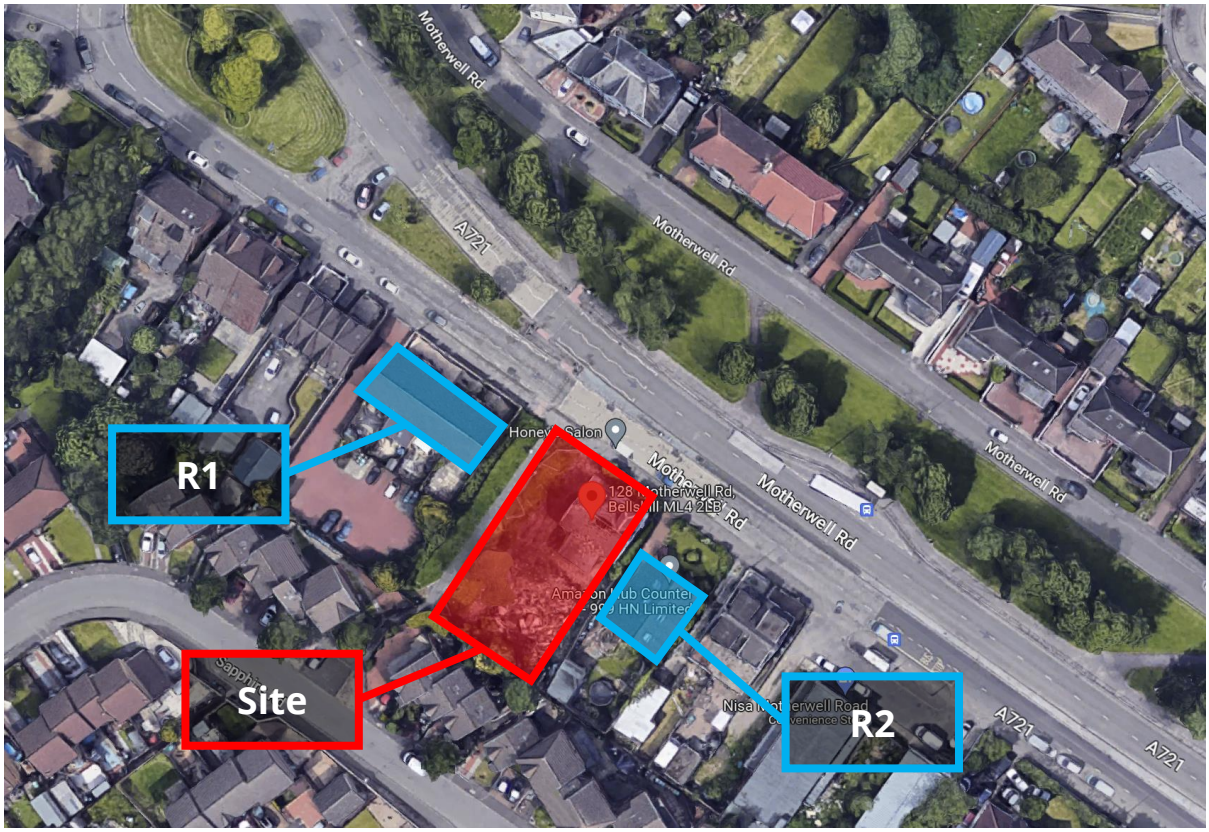

Figure 1: Site Location

2.00 Non-Technical Summary

2.01 This report has been prepared to support a planning application for the proposed development of 2 residential dwelling houses at 128-130 Motherwell Road, Bellshill.

2.02 The report has assessed the effect of ambient noise ingress into proposed residential rooms. The criteria summarised in the table below were used for the above assessments, according to BS8233:2014, and agreed criteria with North Lanarkshire Council (NLC) Environmental Health Officer Ms. Carol Heaton.

Noise Assessment Criteria (Upper Limits of Noise Levels)			
Noise source	**Location**	**07:00 to 23:00 (Daytime)**	**23:00 to 07:00 (Night Time)**
Road Traffic	Living Room (internal)	35dB $L_{Aeq,16hrs}$	-
	Dining Area (internal)	40dB $L_{Aeq,16hrs}$	-
	Bedroom (internal)	35dB $L_{Aeq,16hrs}$	30dB $L_{Aeq,8hrs}$, 45dB L_{Amax}

2.03 For open window assessments, it was assumed a reduction of 15 dB from free field levels near the facades.

2.04 Assessment of Noise Ingress into Proposed Residential Rooms:

Based on the predicted levels of road traffic noise ingress to habitable residential rooms, the following conclusions can be reached:

- Levels of road traffic noise ingress to the proposed habitable residential rooms are likely to exceed the noise limits during daytime and night-time periods with windows open.
- Mitigation measures will need to be taken to reduce noise levels to within acceptable levels.

2.05 Mitigation Measures:

The implementation of uprated façade elements will be required to meet with acceptable internal noise level criteria. The details of the mitigation measures can be found in Section 7 of this report.

3.00 Assessment Framework and Criteria

Planning Policy

3.01 The Scottish Office Development Department issued SODD Circular 10/1999 and the associated Planning Advice Note - PAN 56 - "Planning and Noise" in April 1999. In March 2011, the Scottish government issued PAN1/2011 “Planning and Noise” and an associated Technical Advice Note (TAN) which replaced PAN 56.

3.02 **PAN 1/2011**: The Planning Advice Note (PAN) recommends the use of Quantitative and Qualitative assessments of noise together with assessments of the level of its significance to help planning authorities determine applications for development types including residential, commercial and workshop development. The PAN and its accompanying Technical Advice Note do not however offer specific guidance with respect to the standards to be applied in assessments of noise impact.

3.03 In the TAN that accompanies the PAN in Chapter 3, para 3.8 states that: “The choice of appropriate criteria noise levels and relevant time periods are the responsibility of the local authority. Although this may lead to inconsistencies between different Local Authorities and, indeed, across areas within a given Local Authority, it does provide flexibility, allowing particular circumstances to be taken into account and the use of the latest guideline values to be included where appropriate.”

3.04 Table 1 shows the criteria used to define the magnitude of noise impact.

Table 1: Magnitude of noise impact	
Magnitude	**x = Noise Level Change**
Major Adverse	≥ 10
Moderate Adverse	5 – 9.9
Minor Adverse	3 – 4.9
Negligible Adverse	0 – 2.9
No Change	<0

3.05 Table 2 provides a framework in determining the level of significance relating the magnitude of impact with the sensitivity of the receptor.

Table 2: Level of Significance			
Magnitude of Impact	**Level of Significance Relative to Sensitivity of Receptor**		
	Low	**Medium**	**High**
Major	Slight/Moderate	Moderate/Large	Large/Very Large
Moderate	Slight	Moderate	Moderate/Large
Minor	Neutral/Slight	Slight	Slight/Moderate
Negligible	Neutral/Slight	Neutral/Slight	Slight
No Change	Neutral	Neutral	Neutral

3.06 The PAN also notes, in Appendix 1, a range of Technical Standards and Codes of Practice that may be relevant to assessments including BS 8233:2014 which provides general guidance on acceptable levels within buildings and WHO Guidelines for Community Noise, 1999 et alia. These are discussed below.

Standards and Guidance

3.07 **BS 8233: 2014:** Guidance on sound insulation and noise reduction for buildings establishes basic criteria for dwellings as follow:

Table 3: BS8233:2014 – "Table 4: Indoor ambient noise levels for dwellings"			
Activity	**Location**	**07:00 to 23:00 (Daytime)**	**23:00 to 07:00 (Night Time)**
Resting	Living Room	35dB, $L_{Aeq,16hrs}$	-
Dining	Dining room/ area	40dB, $L_{Aeq,16hrs}$	-
Sleeping (daytime resting)	Bedroom	35dB, $L_{Aeq,16hrs}$	30dB, $L_{Aeq,8hrs}$

3.08 For regular individual noise events with the potential to cause sleep disturbance such as vehicle pass-bys, it is stated that a guideline value may be set in terms of Single Event Level (SEL) or L_{AFmax}, depending on the character and number of events per night. No further guidance is provided with respect to an appropriate criterion which may be adopted for the assessment of such events. This assessment has therefore drawn upon the guidance detailed within the WHO: Guidelines for community noise document as summarised in the corresponding section below.

3.09 **World Health Organisation (WHO):** From research commissioned to examine community noise the WHO offers advice regarding setting noise criteria applicable to sleep disturbance. Section 4.2.3 specifies: *"If the noise is not continuous, L_{Amax} or SEL are used to indicate the probability of noise induced awakenings. Effects have been observed at individual L_{Amax} exposures of 45 dB or less. Consequently, it is important to limit the number of noise events with a L_{Amax} exceeding 45 dB."*

3.10 The guidelines reference a study by Vallet & Vernet, 1991, which concluded that: *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10-15 times per night."*

North Lanarkshire Council (NLC)

3.11 Discussions with North Lanarkshire Council Environmental Health Officer Ms Carol Heaton has established the following criteria and methodology;

Road Traffic Noise

3.12 It is understood that road traffic noise from the A721 Motherwell Road to the north of the site is the dominant part of the noise environment during daytime and night time periods. A survey was carried out following the shortened measurement procedure within CRTN 1988 to calculate the $L_{10\,(18\,hour)}$. This can be used in conjunction with *'TRL: Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping'* to estimate daytime, evening and night-time indices.

Criteria

3.13 The criteria used for the assessments in this report are summarised in Table 4.

Table 4: Noise Assessment Criteria (Upper Limits of Noise Levels)

Noise source	Location	07:00 to 23:00 (Daytime)	23:00 to 07:00 (Night Time)
Road traffic	Living Room (internal)	35dB $L_{Aeq,16hrs}$	-
	Dining area (internal)	40dB $L_{Aeq,16hrs}$	-
	Bedroom (internal)	35dB $L_{Aeq,16hrs}$	30dB $L_{Aeq,8hrs}$, 45dB L_{Amax}
	Garden (external)	50-55 dB $L_{Aeq,16hrs}$	-

4.00 Survey

4.01 The proposed building is to be constructed on land along Motherwell Road and to the north of Sapphire Road. The development site is shown below in Figure 2. It is understood that noise from Motherwell Road is the dominant source of noise, hence a noise survey following guidance set out in the Calculation of Road Traffic Noise (1988) has been carried out.

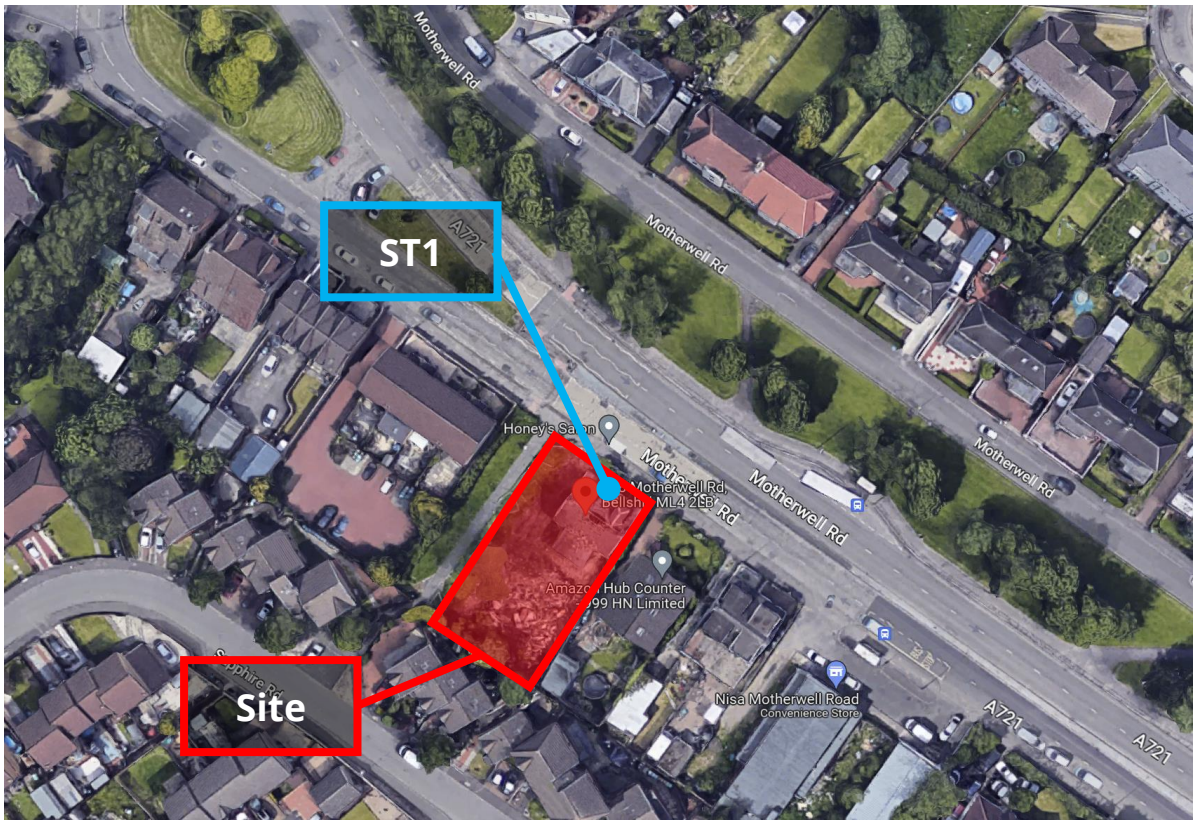

Figure 2: Existing Site & Measurement Positions

4.02 One attended noise monitor, marked as ST1 in Figure 2, was installed on the development site for a period of three consecutive hours between 14:00-17:00 following the shortened measurement procedure methodology set out within the Calculation of Road Traffic Noise (1988). ST1 was installed approximately 7m from the carriageway and 1.2m above local ground level to measure typical noise levels emanating from Motherwell Road. The measurements were carried out on 25th January 2023.

4.03 All equipment was operated in accordance with British Standard and ISO procedures. The sound level meter was calibrated prior and post to site measurements using the appropriate calibrator to a reference tone of 114 dB at 1 kHz. Pre and post calibrations indicated a shift of no more than 0.1 dB.

4.04 Details of sound level meters & equipment used are set out below:

- Norsonic Nor140 Serial Number 1404033

- Norsonic Microphone Type 1209 Serial Number 13570
- Norsonic Calibrator Type 1251 Serial Number 34637

4.05 Weather conditions for the duration of the survey were noted as having mean wind speeds below 1m/s with a temperature of around 8°C. The surface of the roads were noted as being damp, however the majority of the driving surface was dry. It is understood, therefore, that the effect on noise measurements was insignificant.

4.06 The measurement protocol consisted of continuous monitoring with noise level indices $L_{Aeq,T}$, $L_{A90,T}$, $L_{A10,T}$, $L_{AFmax,T}$ logged every 15 minutes. A summary of the measured noise level indices are shown below in Table 5.

Table 5: Summary of Measured Noise Level Indices at ST1 on 25th January 2023

Measurement Time	L_{Aeq}(dB)	L_{A10} (dB)	L_{A90} (dB)	L_{AFmax} (dB)
14:00	70.1	74.1	58.2	81.1
14:15	71.3	74.7	62.4	81.6
14:30	71.4	74.7	62.7	80.1
14:45	70.3	74.2	59.0	79.9
15:00	71.6	75.0	62.7	82.9
15:15	71.5	74.8	64.0	83.9
15:30	70.6	74.4	59.8	79.9
15:45	71.1	74.7	62.7	80.4
16:00	71.8	75.3	62.0	82.3
16:15	70.5	74.4	60.2	85.1
16:30	72.1	74.5	62.0	91.9
16:45	71.4	75.1	59.5	83.8
Average	**71.2**	**74.7**	**61.3**	**N/A**

4.07 The calculation method set out within CRTN 1988 was used to predict the $L_{A10,18h}$, and further calculations set out within 'TRL: Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping', were used to predict noise levels during daytime, evening and night-time periods respectively. Table 6 shows the values that were used in the assessment. Relevant equations can be seen below.

$$L_{10}(18\,hour) = L_{10}(3\,hour) - 1\,dBA$$
$$L_{day} = 0.95 \times L_{A10,18h} + 1.44\,dB$$
$$L_{night} = 0.90 \times L_{A10,18h} - 3.77\,dB$$

Table 6: Summary of Road Traffic Noise Levels Used in the Assessment			
$L_{A10,3hr}$	CRTN (dB $L_{A10,18h}$)	L_{day} (dB $L_{A10,16h}$)	L_{night} (dB $L_{A10,8h}$)
74.7	73.7	71.4	62.5

5.00 Assessment of Noise Ingress into Proposed Residential Development

5.01 To provide the most comprehensive assessment method for this site, an acoustic noise model of the site has been produced that considers the noise incident on the building facades based on information gathered during noise surveys carried out on site.

5.02 The noise predictions are made by means of the proprietary noise prediction software CadnaA® (Computer Aided Noise Abatement) developed by Datakustik, and the general methods of calculation set out in ISO 9613.

5.03 A detailed 3D acoustic model of the site has been created to calculate the levels of noise incident upon the proposed development due to existing noise sources in the localised area. The model has been generated taking the following settings into consideration:

- The model was set up to apply the prediction methodology set out in the International Standard ISO 9613-2: 1996: Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation (ISO 9613-2) for the calculation of industrial/commercial sound sources.
- Google aerial photography and Ordnance Survey Mastermap Data was used to identify building locations and areas of hard ground.
- The heights of existing buildings in the vicinity of the site were obtained from observations made during site surveys and using Google Street View.
- Ground absorption was set to G = 1 (100% soft ground) with identified areas of hard ground to best reflect local ground cover as present and proposed.
- The model was set to include second order acoustic reflections.
- Measurement locations were incorporated into the noise model based upon the calibrated aerial photography.

5.04 Noise levels measured during the CRTN survey on 25th January 2023 have been used within the model in order to best reflect the resultant noise levels from road traffic at the proposed development. It is understood that road traffic is the predominant source of noise onsite, and there are no other notable sources of noise. The noise levels utilised in the model are shown in their respective segment within Section 4 of this report.

5.05 It was noted that the highest L_{Amax} event recorded during the CRTN survey on 25th January 2023 was nearly 7 dB higher than the next highest level and was noted as being uncharacteristically high in comparison to normal L_{Amax} events (the event was due to an extremely loud motorcycle). To avoid the assessment of

extraneous noise levels, the second highest L_{Amax} noise level captured during the survey was used. Table 7 shows the L_{Amax} levels used in the assessment.

Table 7: Summary of L_{Amax} Level used in the Assessment								
Frequency (Hz)								**L_{AFmax} (dB)**
63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	
84.5	87.7	88.0	84.5	80.3	73.4	70.0	69.5	85.1

5.06 Sources of road traffic noise within the model were calibrated to meet with noise level measurements mentioned above at the relevant measurement position within the noise model. Receiver positions were then located along the façade of the proposed development plots in respect to the worst case rooms for each plot.

5.07 Tables 8 and 9 show the highest noise level results taken from the model at the northern and southern façades respectively, assessed against relevant criteria within BS 8233:2014 as agreed with NLC. For the prediction of noise, the receiver height is taken from the worst-affected window of the proposed development.

Table 8: Predicted Noise Levels at Proposed Development (North Façade)			
Period	**Daytime (07:00-23:00)**	**Night-Time (23:00-07:00)**	
Noise Type	**Ambient ($L_{Aeq,T}$)**	**Ambient ($L_{Aeq,T}$)**	**Max (L_{Amax})**
Noise Level, 1m from façade	70.3	61.4	79.3
Resultant Internal Noise Level*	55.3	46.4	64.3
Required Criteria	35	30	45
Level above or below ACC criteria (dBA)	**+20.3**	**+16.4**	**+19.3**
Notes: The acoustic environment is controlled by local road traffic noise. *Assuming a 15 dB attenuation through open window.			

Table 9: Predicted Noise Levels at Proposed Development (South Façade)			
Period	**Daytime (07:00-23:00)**	**Night-Time (23:00-07:00)**	
Noise Type	**Ambient ($L_{Aeq,T}$)**	**Ambient ($L_{Aeq,T}$)**	**Max (L_{Amax})**
Noise Level, 1m from façade	48.7	39.8	61.6
Resultant Internal Noise Level*	33.7	24.8	46.6
Required Criteria	35	30	45
Level above or below ACC criteria (dBA)	**-1.3**	**-5.2**	**+1.6**
Notes: The acoustic environment is controlled by local road traffic noise. *Assuming a 15 dB attenuation through open window.			

5.08 The levels provided in Tables 8 and 9 illustrate that the predicted noise levels incident upon the proposed development will be up to 20 dB above the recommended internal criteria at the northern façade. Therefore, the proposal,

without any noise mitigation, would indicate an exceedance and would be non-compliant.

5.09 It is clear that open windows as a form of ventilation will not be viable for either plot. Detailed results and assessment will be explored in the mitigation section of this report at Section 7.

6.00 Assessment of Noise within External Amenity Areas

6.01 Noise levels within the garden spaces of the proposed development sit above 55 dB $L_{Aeq,T}$ at all plots, which is the upper limit set out within BS 8233:2014. However, BS 8233:2014 and does also recognise that *"these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited"*.

6.02 The location of this site is very urban, with a busy road fronting the site. Travel links into the city and surrounding towns/cities is a prominent draw for prospective residents, and the proximity to these transport links will evidently lead to higher noise levels.

6.03 The highest noise levels within garden spaces to the rear of the proposed development do not exceed 57 dB $L_{Aeq,T}$ with the implementation of standard height fencing (1.8m). This is 2 dB above the upper guideline limit.

6.04 However, most areas within the proposed gardens fall within the upper guideline limit. A noise map showing these results can be seen in Figure 3 below. More detailed noise maps can be seen in Appendix B.

Figure 3: Noise Map of External Amenity Areas

6.05 It can be seen from the above results that a high percentage of the external amenity areas fall within acceptable limits and meets the necessary criteria. There are areas within the garden space of the western-most plot that have exceedances over the upper guideline limit set out within BS 8233:2014. However, it is accepted that residents could move away from these areas of higher noise in order to benefit from areas of lower noise within the garden space.

7.00 Mitigation Measures

7.01 Noise levels incident on the façades of the proposed development will need mitigation in order to meet with agreed criteria set out in Table 4. NLC's Supplementary Guidance Note SPG 15A states that *"Pan 1/2011 and BS 8233:2014 both recognise, in some areas where development is desirable, while it is preferable to have open windows in habitable rooms of a new noise sensitive development, this might not always be possible where external noise levels are high, and still achieve satisfactory internal noise levels"*

7.02 It is understood that the redesign of the development would still provide an outcome where further mitigation is necessary due to noise incident on the rear facing windows (specifically maximum noise events) also exceeding required criteria. It is recognized that necessary levels of mitigation on rear facing windows would be lower than those facing the road, but it is at the clients discretion to decide whether to redesign the layout of the development for this reason.

7.03 It is understood a noise barrier is not practicable for this development, and NLC are prepared to accept alternative means of ventilation if the following measures have been exhausted:

- reducing the noise at source.
- orientating the proposed buildings to reduce noise impact.
- the use of barriers and bunds to reduce the noise level at the noise sensitive receptor.
- designing the internal layout to place habitable rooms away from the line of site of any noise sources; and
- use of insulation of the building envelope to mitigate noise.

7.04 Reducing the noise at source is not possible as the main source of noise is a road and it can be shown that noise levels to the rear of the property will still need mitigation in order to fall within acceptable criteria. Therefore, a ventilation strategy of uprated glazing with trickle vents is understood to be the most viable method of mitigation.

7.05 Table 10 shows the results of the internal noise assessment with the installation of the additional noise mitigation measures. The construction of additional mitigation measures are also noted within Table 10, and more detail on these constructions including the minimum sound insulation performance can be found in Table 11.

Table 10: Details of Mitigation and Summary of Results after Mitigation				
Room	**Construction Type**		**Internal Noise Levels**	
			Daytime (07:00-23:00)	**Night-Time (23:00-07:00)**
	Vents	**Glazing**	**$L_{Aeq,16hrs}$**	**L_{Amax}**
Bedroom 1	V1	G1	N/A*	40
Bedroom 2	V2	G2	33	45
Bedroom 3	V3	G2	32	45
Living Room	V4	G3	35	N/A
*L_{max} events exceed criteria by the highest level within these rooms, hence any mitigation employed will also attenuate ambient noise levels to acceptable limits.				

Table 11: Summary of Construction Types										
Construction Type	**Description**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**R_w**
V1	Standard Trickle Vent	30	30	30	30	30	30	30	30	30
V2	Wall Trickle Vent, 46 dB	31	35	42	41	47	52	60	60	46
V3	Wall Trickle Vent, 55 dB	40	47	46	49	56	66	68	70	55
V4	Trickle Vent, 40 dB	29	29	28	36	44	44	44	58	40
G1	4/12/4	20	24	20	25	35	38	35	35	31
G2	10/12/16.8 laminate	24	28	32	43	46	48	55	61	45
G3	6/12/10	22	26	27	34	40	38	46	52	38

7.06 It can be seen from the results in the tables above that internal noise level criteria can be met with the implementation of the mitigation measures detailed in the same tables.

8.00 Conclusion

8.01 CSP Acoustics have been appointed by The Creanor Consultancy to undertake a noise impact assessment for the proposed development of 2 dwelling house plots on land at 128-130 Motherwell Road, Bellshill.

8.02 The scope and approach of the assessment has been completed considering both local planning policy and agreed methodology with NLC. The assessment has also drawn upon applicable environmental noise guidance documents and British Standards.

8.03 An assessment of the effect of noise from road traffic upon the proposed development has been completed. The site is located along the A721, Motherwell Road, Bellshill and the noise environment is controlled by road traffic. Ambient and maximum noise levels have been assessed to meet with guidance set out in BS 8233:2014 within external and internal spaces.

8.04 The outcome of the BS8233 assessment concludes that using open windows as a ventilation strategy will not achieve acceptable internal noise levels along all façades of the plots in the current site layout without mitigation.

8.05 Mitigation in the form of uprated façade elements has been specified in Section 7. With the implementation of these uprated elements, the required internal criteria can be met.

8.06 Noise within external amenity areas falls within guideline limits for the majority of the garden spaces of both dwellings with the installation of standard 1.8m high fencing. There are areas within the western-most plot where noise levels exceed guideline limits, but it is acknowledged that residents could move away from these areas of higher noise if they wished to afford a quieter area within the garden space.

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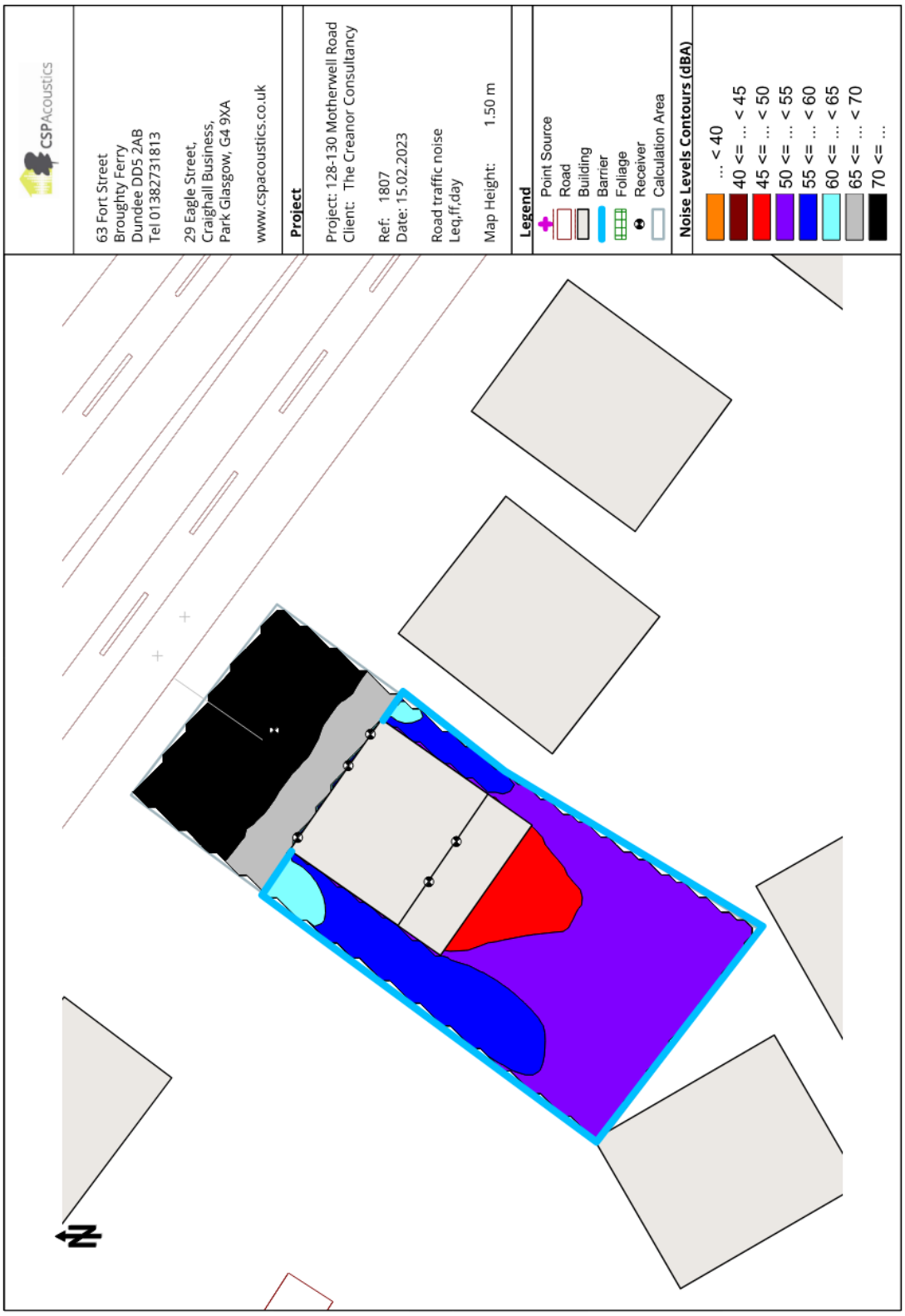
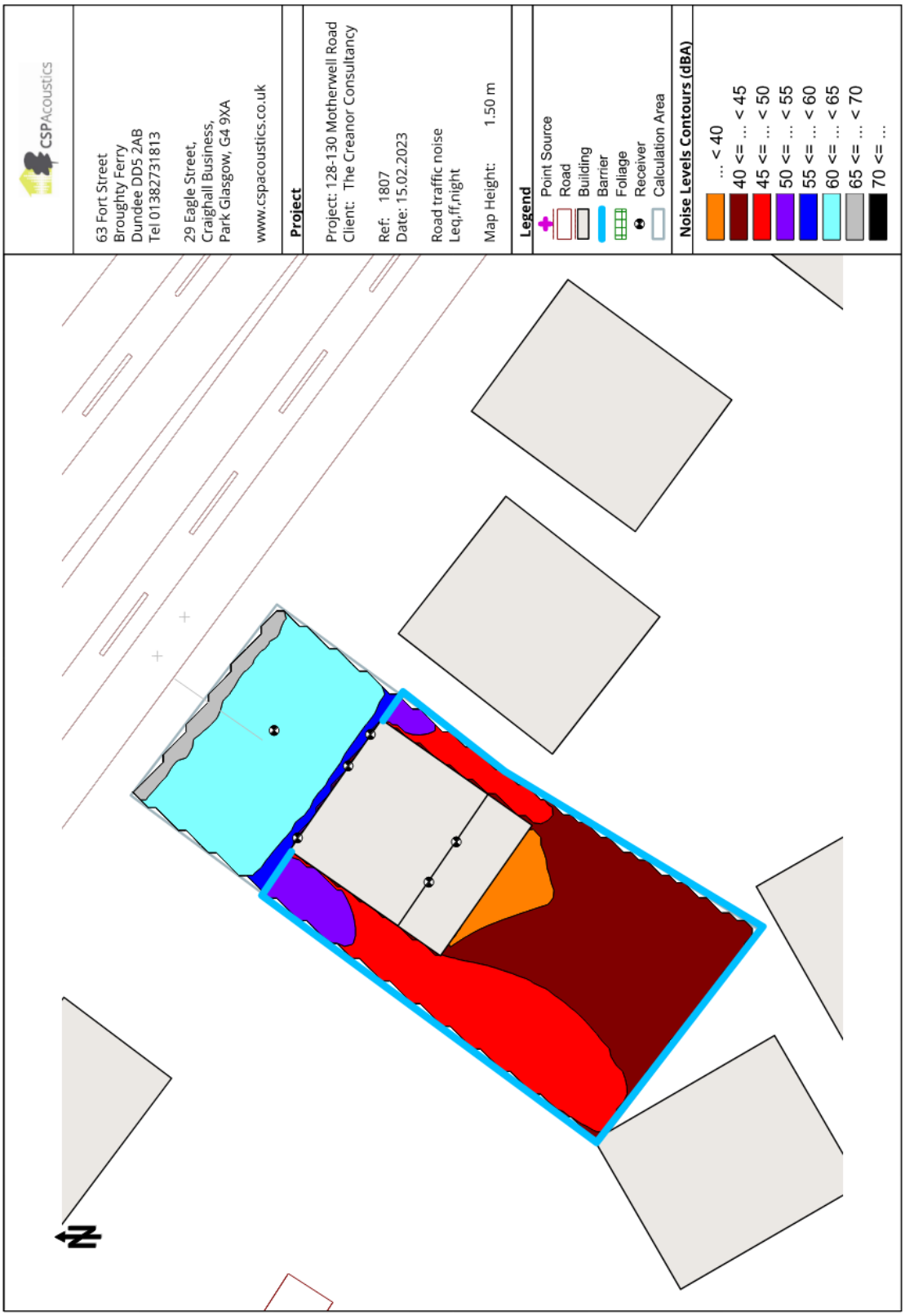
Appendix A: Acoustic Glossary

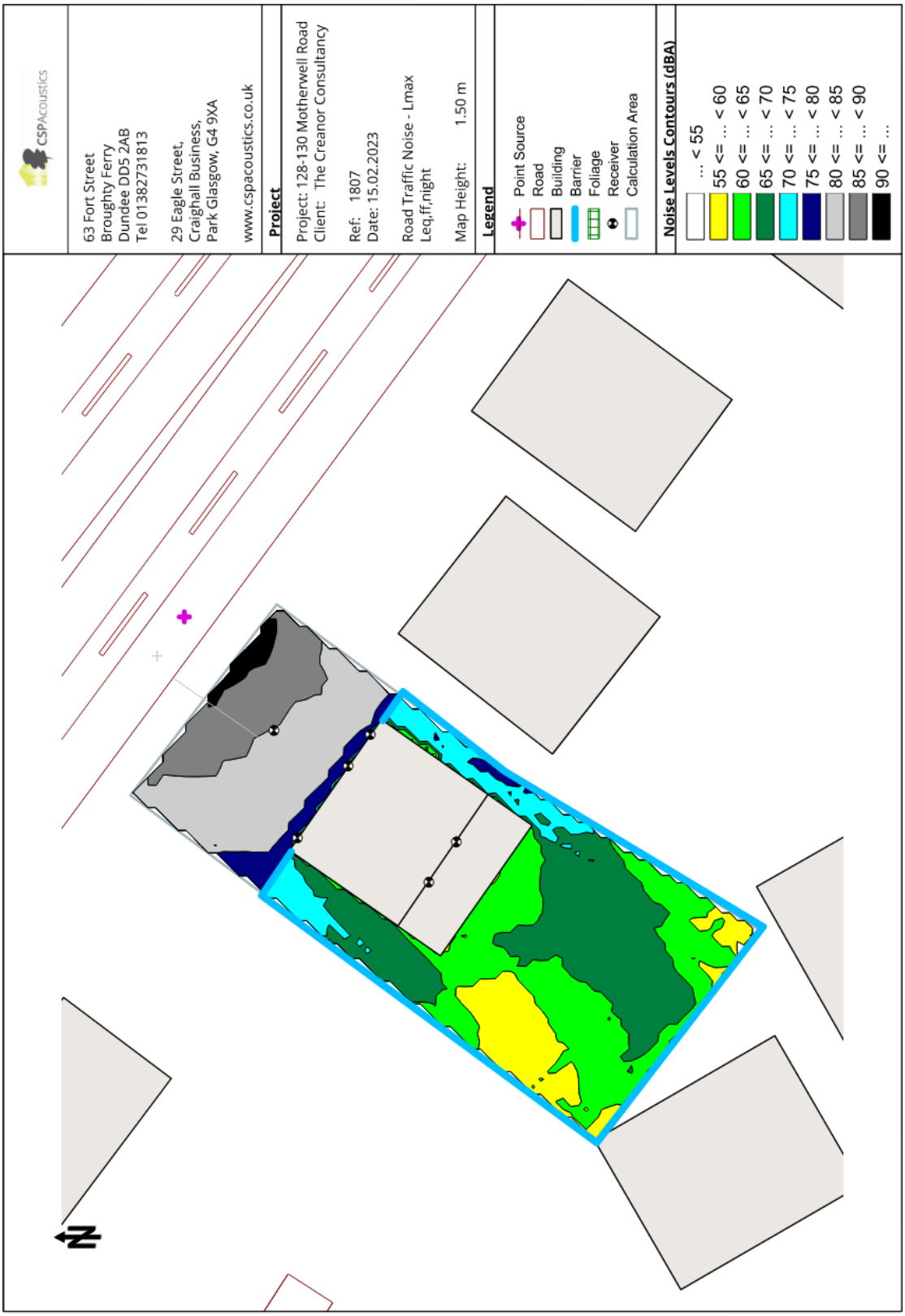
Word	Description
Acoustic environment	Sound from all sound sources as modified by the environment
Ambient Noise	Totally encompassing sound at a given location, usually composed of sound from many sources near and far
Background Noise	The lowest noise level present in the absence of any identifiable noise sources. This is usually represented by the L_{A90} measurement index.
Break-in	Noise transmission into a structure from outside
Break-out	Noise transmission from inside a structure to the outside
Cross-talk	Noise transmission between one room and another room or space
Ctr	Correction term applied against the sound insulation single-number values (R_w, D_w, and $D_{nT,w}$) to provide a weighting against low frequency performance
dB (decibel)	Defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10-5Pa).
dB(A)	Level of sound across the audible spectrum with a frequency filter to compensate for the varying sensitivity of the human ear to sound at different frequencies at a lower SPL
Façade Level	A sound field determined at a distance of 1m in front of a building façade.
Free-field Level	A sound field measured at a point away from reflective surfaces other than the ground
Frequency (Hz)	Number of cycles of a wave in one second measured in Hertz.
Impact sound pressure level	Average sound pressure level in a specific frequency band in a room below a floor when it is excited by a standard tapping machine or equivalent
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants
$L_{Aeq,T}$	$L_{aeq,T}$ is defined as the equivalent continuous "A"-weighted Sound Pressure Level in dB over a given period of time.
L_{Amax}	Maximum A - weighted sound pressure level recorded over the measurement period. Usually has a time constraint (L_{afmax}, L_{asmax})
Measurement time interval, Tm	Total time over which measurements are taken
Noise	Unwanted sound.
Noise criteria	Numerical indices used to define design goals in a given space
Noise rating NR	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves. This is usually used to control noise that has tonal characteristics that $L_{Aeq,t}$ wouldn't detect.
Noise-sensitive premises (NSPs)	Any occupied premises outside the assessment location used as a dwelling (including gardens), place of worship, educational establishment, hospital or similar institution, or any other property likely to be adversely affected by an increase in noise level
Normalized impact sound pressure level	Impact sound pressure level normalized for a standard absorption area in the receiving room
Octave band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit

Word	Description
Percentile level $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting "F", which is exceeded for N% of a specified time period
Plane Source	A flat surface radiating noise, e.g. the side of building. Attenuation of noise from a plane source is related to the dimensions of the plane source. Where a = the shorter dimension of the source and c = the longer dimension, then typically no attenuation will occur between the source and a distance equal to a/π. 3 dB reduction in noise levels per doubling of distance will then occur between the distances a/π and c/π; 6 dB attenuation then occurs between c/π and an assessment location
Rating level, $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound
Reference time interval, T_r	Specified interval over which the specific sound level can be determined.
Residual sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound
Residual sound level, Lr = $L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T
Reverberation time T	Time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped within a reverberant space
Sound level difference D	Difference between the sound pressure level in the source room and the sound pressure level in the receiving room
Sound power level, LWA	Ten times the logarithm to the base 10 of the ratio of the sound power radiated by a sound source to the reference sound power, determined by use of frequency-weighting network "A"
Sound pressure level	Is the Root Mean Squared value of the instantaneous sound level over a period of time expressed in decibels, usually measured with an appropriate frequency weighting
Specific sound level, Ls = $L_{Aeq,Tr}$	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r
Specific sound source	The sound source which is being assessed
Third octave band	Octave bands sub-divided into three parts, equal to 23% of the centre frequency
Weighted level difference Dw	Single-number quantity that characterizes airborne sound insulation between rooms, but which is not adjusted to reference conditions
Weighted standardized level difference $D_{nT,w}$	Single-number quantity that characterizes the airborne sound insulation between rooms

Appendix B: Noise Maps




CSPAcoustics
63 Fort Street
Broughty Ferry
Dundee DD5 2AB
Tel 01382731813
29 Eagle Street,
Craighall Business,
Park Glasgow, G4 9XA
www.cspacoustics.co.uk
Project
Project: 128-130 Motherwell Road
Client: The Creanor Consultancy
Ref: 1807
Date: 15.02.2023
Road traffic noise
Leq,ff,night
Map Height: 1.50 m
Legend
Point Source
Road
Building
Barrier
Foliage
Receiver
Calculation Area
Noise Levels Contours (dBA)
... < 40
40 <= ... < 45
45 <= ... < 50
50 <= ... < 55
55 <= ... < 60
60 <= ... < 65
65 <= ... < 70
70 <= ...
N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Park Glasgow, G4 9XA
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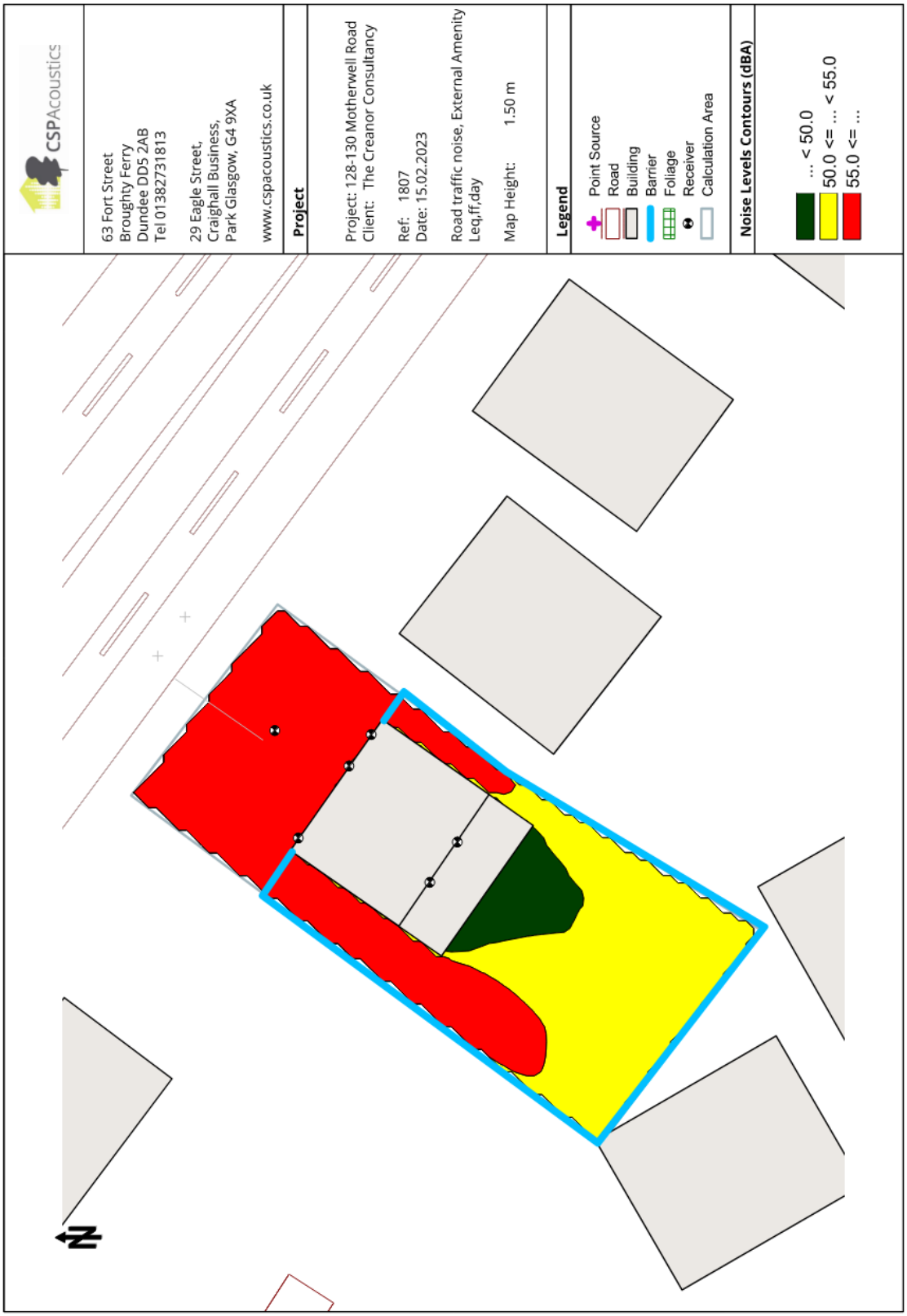
Project
Project: 128-130 Motherwell Road
Client: The Creanor Consultancy
Ref: 1807
Date: 15.02.2023
Road Traffic Noise - Lmax
Leq,ff,night
Map Height: 1.50 m
Legend
Point Source
Road
Building
Barrier
Foliage
Receiver
Calculation Area
Noise Levels Contours (dBA)
... < 55
55 <= ... < 60
60 <= ... < 65
65 <= ... < 70
70 <= ... < 75
75 <= ... < 80
80 <= ... < 85
85 <= ... < 90
90 <= ...
N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Broughty Ferry
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Tel 01382731813
29 Eagle Street,
Craighall Business,
Park Glasgow, G4 9XA
www.cspacoustics.co.uk
Project
Project: 128-130 Motherwell Road
Client: The Creanor Consultancy
Ref: 1807
Date: 15.02.2023
Road traffic noise, External Amenity
Leq,ff,day
Map Height: 1.50 m
Legend
Point Source
Road
Building
Barrier
Foliage
Receiver
Calculation Area
Noise Levels Contours (dBA)
... < 50.0
50.0 <= ... < 55.0
55.0 <= ...
N

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FORT ST, BROUGHTY FERRY
DUNDEE, DD5 2AB
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