Noise Impact Assessment

Hydro Deeside, Wrexham Industrial Estate

Reference: 50-790-R1-3

Date: October 2024

NOISE IMPACT ASSESSMENT

Hydro Deeside,
Wrexham Industrial Estate

Prepared for:

Portal Construction N.W. Limited

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EXECUTIVE SUMMARY

BACKGROUND

Site Address	Hydro Aluminium Deeside Ltd, Bridge Road, Wrexham LL13 9PS
National Grid Reference	E 337604 N 349272
Proposed Development	Proposed aluminium recycling plant as extension to existing operations.
Report Objectives	To identify, measure and assess the potential impact of the proposed commercial development upon existing noise sensitive receptors in the immediate vicinity of the Site. The report follows current and relevant British Standards in order to provide a robust assessment.

ASSESSMENT

Surveys Completed	A worst-case unattended weekday background sound survey in a position considered representative of the closest existing noise sensitive receptors to the development. The sound level meter was located on the south western boundary of the Site in a position representative of the closest receptors to the south west.
Assessments	E3P has undertaken detailed 3D noise modelling of all the proposed sources, associated with the extension, in order to predict noise levels at ground and 1st floor windows for the daytime and night-time periods respectively, in accordance with BS 4142:2014+A1:2019, at the closest receptors to the site.
Mitigation Requirements	The assessment found that rating levels at existing receptors would not exceed the lowest measured background sound levels during daytime and night-time periods. As such, no mitigation measures are required.

CONCLUSIONS

This assessment has shown that there should be no adverse impact upon existing residential receptors due to the proposed operations. As such, noise should not be a determining factor in the determination of the planning application.

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1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by Portal Construction N.W. Limited to undertake a Noise Impact Assessment for the proposed extension to Hydro Aluminium Deeside within Wrexham Industrial Estate, to be referred to hereafter as *'the site'*.

This assessment looks to determine the key noise sources associated with the development and undertake an assessment of any impacts upon existing noise-sensitive receptors.

1.2. PROPOSED DEVELOPMENT

The Site currently exists as Hydro Deeside with the main facility to the north east of the proposed extension area. The client intends to construct a new aluminium recycling plant for RSI production including for a main building and a raw material storage building.

The key sources of sound associated with the development will be noise break-out from the building and external processes and equipment.

1.3. LIMITATIONS

Where a noise or vibration survey is required to inform an assessment, E3P will endeavour to ensure that all noise and vibration measurements taken are robust, representative and reliable in order to inform an accurate assessment at the time.

E3P will endeavour to capture all existing and proposed sources of sound and vibration at the time of the surveys and/or assessments. However, should new sources of sound be introduced, existing sources modified/changed, or characteristics of the sound be altered following completion of such, E3P cannot be held accountable for this.

Where mitigation measures are specified in this report, it should be noted that these measures are relative to a specific sound or vibration source, both in terms of the measured sound pressure and vibration level and the character of the sound source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, E3P cannot be held responsible for any subsequent variations in the proposed mitigation performance, for either absolute levels or frequency content.

2. ASSESSMENT METHODOLOGY

2.1. PLANNING POLICY WALES (2021)

2.1.1. AIR QUALITY AND SOUNDSCAPE

Clean air and an appropriate soundscape contribute to a positive experience of place as well as being necessary for public health, amenity and well-being. They are indicators of local environmental quality and integral qualities of place which should be protected through preventative or proactive action through the planning system. Conversely, air, noise and light pollution can have negative effects on people, biodiversity and the resilience of ecosystems and should be reduced as far as possible.

Certain sounds, such as those created by trees, birds or water features, can contribute to a sense of tranquillity whilst others can be reassuring as a consequence of their association with the normality of everyday activities. Problematic forms of sound are generally experienced as noise pollution and can affect amenity and be prejudicial to health or a nuisance. Noise action plans drawn up by public bodies aim to prevent and reduce noise levels where necessary and preserve soundscape quality where it is good. Noise levels used to identify priority areas contained in noise action plans are usually set quite high in order to focus resources on the most polluted areas and noise must meet a number of tests before it qualifies as a statutory nuisance. Lower levels of noise, however, can still be annoying or disruptive and impact on amenity and as such should be protected through the planning process wherever necessary. The planning system must protect amenity and it is not acceptable to rely on statutory nuisance under the Environmental Protection Act 1990 to do so.

The health imperative of good air quality and appropriate soundscapes in contributing to the overall character and quality of places and the health and well-being of people and wildlife should be fully recognised. It will not be appropriate to locate sensitive uses, such as hospitals, schools, care homes and housing adjacent to busy roads or other transport routes, where there are no connectivity benefits to be gained and where health and amenity impacts associated with increased exposure of people to pollution will be unacceptable. Whilst some uses may be appropriate with the aid of good design air quality and soundscape considerations can be overriding factors, especially for sensitive uses, if they cannot be adequately mitigated and impacts minimised.

Where sensitive developments need to be located close to existing transportation infrastructure for sustainable movement and access they should be designed, as far as practicable, to limit harmful substances and noise levels within and around those developments both now and in the future. This may include employing the principles of good acoustic design and the inclusion of active travel or travel management measures as part of development proposals. Such development, however, should preferably be located away from existing sources of significant noise, which may include aircraft noise or roads, particularly new roads or those with programmed route improvements.

Regard should be paid to current air quality and noise levels and the quality of the existing soundscape and account taken of any relevant local air quality action plan, noise action plan and/ or local or regional air quality strategy as part of development strategies and proposals in development plans and before determining planning applications.

2.2. NOISE AND SOUNDSCAPE ACTION PLAN 2018-2023

The noise action plan for Wales has a broader focus than simply controlling the level of noise. It links to the notion of creating appropriate soundscapes, meaning the right acoustic environment in the right time and place. The towns and cities serve us in a variety of ways, and it is believed should therefore contain a variety of soundscapes appropriate to the land use.

The Action Plan draws from information provided in Professional Practice Guidance (ProPG) and the relevant British Standards to recommend that placemaking, soundscapes and good acoustic design are considered and incorporated into the design and development of any new sites. It provides guidance on numerous sources of sound but does not set any guidelines, beyond those given in the British Standards.

It does relate to the European noise indices of the day-evening-night level, L_{den}, and the night level, L_{night}, which are used in the World Health Organisation's Environmental Noise Guidelines for the European Region (2018) but does not go so far as to stipulate the criterion from the guidelines. As such, the assessment that follows will primarily focus on the British Standards.

2.3. PLANNING GUIDANCE (WALES), TECHNICAL ADVICE NOISE (WALES) 11, NOISE (1997)

This note provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business. It outlines some of the main considerations which local planning authorities should consider in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

Noise Exposure Categories (NECs) have been derived to assist local planning authorities in their consideration of planning applications for residential development near transport related noise sources.

A recommended range of noise levels is given in Table 2.1 for each of the NECs for dwellings exposed to noise from road, rail, air and mixed sources. However, in some cases, it may be appropriate for local planning authorities to determine the range of noise levels they wish to attribute to the various NECs. Where there is a clear need for new residential development in an already noisy area some or all NECs might be increased by up to 3 dB(A) above the recommended levels. In other cases, a reduction of up to 3 dB(A) may be justified.

TABLE 2.1 NOISE EXPOSURE CATEGORIES FOR DWELLINGS

NOISE SOURCE	ASSESSMENT PERIOD	NOISE EXPOSURE CATEGORY, $L_{Aeq,T}$ dB(A)(1)			
		A	B	C	D
Road Traffic	Daytime 07:00-23:00	<55	55-63	63-72	>72
	Night-time 23:00-07:00(2)	<45	45-57	57-66	>66
Rail Traffic	Daytime 07:00-23:00	<55	55-66	66-74	>74
	Night-time 23:00-07:00(2)	<45	45-59	59-66	>66
Air Traffic (3)	Daytime 07:00-23:00	<57	57-66	66-72	>72
	Night-time 23:00-07:00(2)	<48	48-57	57-66	>66
Mixed Sources (4)	Daytime 07:00-23:00	<55	55-63	63-72	>72
	Night-time 23:00-07:00(2)	<45	45-57	57-66	>66

Notes:

*(1) **Noise levels:** the noise level(s) ($L_{Aeq,T}$) used when deciding the NEC of a site should be representatives of typical conditions.*

*(2) **Night-time noise levels (2300-0700):** sites where individual noise events regularly exceed 82dBL_{Amax} (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq,8H}$ (except where the $L_{Aeq,8H}$ already puts the site in NEC D).*

*(3) **Aircraft noise:** daytime values accord with the contour values adopted by the Department of Transport which relate to levels measured 1.2m above open ground. For the same amount of noise energy, contour values can be up to 2 dB(A) higher than those of other sources because of ground reflection effects.*

*(4) **Mixed sources:** this refers to any combination of road, rail, air and industrial noise sources. The "mixed source" values are based on the lowest numerical values of the single source limits in the table. The "mixed source" NECs should only be used where no individual noise source is dominant.*

To check if any individual noise source is dominant (for the purposes of this assessment) the noise level from the individual sources should be determined and then combined by decibel addition (remembering first to subtract 2 dB(A) from any aircraft noise contour values). If the level of any one source then lies within 2 dB(A) of the calculated combined value, that source should be taken as the dominant one and the site assessed against the appropriate NEC for that source, rather than using the "mixed source" NECs. If the dominant source is industrial noise see paragraph B17 of Annex B.

If the contribution of the individual noise sources to the overall noise level cannot be determined by measurement and/or calculation, then the overall measured level should be used and the site assessed against the NECs for "mixed sources".

When assessing a proposal for residential development near a source of noise, local planning authorities should determine into which of the four NECs the proposed site falls, taking account of both day and night-time noise levels. Local planning authorities should then have regard to the advice in the appropriate NEC, as below:

- **A** - Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable.
- **B** - Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.
- **C** - Planning permission should not normally be granted. Where it is considered that permission should be given, for example, because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
- **D** - Planning permission should normally be refused.

2.4. BS 4142: 2014+A1:2019 'METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND'

This standard describes methods for rating and assessing sound of an industrial or commercial nature which includes:

- 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 processes or premises, such as that from forklift trucks, or that from train or ship movements on or around an industrial or commercial Site.

The procedure detailed in the standard compares the measured or predicted specific noise level from any of the above with the background sound level at a residential dwelling. The measured background sound level at a receptor should be reliable and should not necessarily ascertain a lowest measured background sound level, but rather to quantify what is typical.

The specific noise level also acknowledges the reference time intervals depending upon whether the noise source operates during daytime (1-hour) or night-time (15-minute) periods.
There are several 'penalties' which can be attributed to the specific sound level depending upon the 'acoustic features' of the sound level under investigation as follows:

Tonality

- +2 dB: where the tonality is just perceptible.
- +4 dB: where the tonality is clearly perceptible; and
- +6 dB: where the tonality is highly perceptible.

Impulsivity

- +3 dB: where the impulsivity is just perceptible.
- +6 dB: where the impulsivity is clearly perceptible; and
- +9 dB: where the impulsivity is highly perceptible.

Intermittency

- +3dB: where the intermittency is readily distinctive against the acoustic environment.

In addition to the above, there is a penalty for 'other sound characteristics' of +3 dB where a sound exhibits characteristics that are neither tonal nor impulsive, though are readily distinctive against the acoustic environment. BS 4142 goes on to state that the rating level is equal to the specific sound level if there are no such features present or expected to be present.

Assessment of the rating level relative to the background sound level can yield the following commentary:

- Typically, the greater this difference (between the rating level and the background sound level), the greater the magnitude of impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and
- 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. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

It is common that a Local Planning Authority (LPA) will specify their own criterion and, where this is the case, this criterion will usually take precedence over a simple comparison of the rating level against the background sound level.

3. SURVEY RESULTS

3.1. UNATTENDED BACKGROUND AND AMBIENT SOUND SURVEY

E3P have undertaken an unattended background and ambient sound survey in a position considered representative of the closest noise sensitive receptors located south west of the site on The Oval and Bridgeway East.

The survey was carried out over the following time periods:

- 14:00 Friday 17th February to 15:00 May to 10:00 Monday 20th February 2023.

The following noise measurement position was chosen for the Background Sound Survey:

- Noise Measurement Position 1 (NMP1): Located on the south western boundary of the site, immediately adjacent to Clywedog Road East approximately 82 m to the closest garden edge to the west. The microphone of the sound level meter was set at a height of 1.5 m above ground level and in free-field conditions. Sound sources consisted of existing commercial sound from Hydro Deeside and occasional road traffic.

Table 3.1 details the measured background sound levels. The daytime levels correspond to the $L_{A90,1hr}$ and the night-time levels to the $L_{A90,15mins}$. The full data set is available upon request.

TABLE 3.1 MEASURED BACKGROUND SOUND PRESSURE LEVELS

DATE	TIME PERIOD	RANGE OF MEASURED BACKGROUND SOUND LEVELS, $L_{A90,T}$ (dB)	MODAL MEASURED BACKGROUND SOUND LEVEL, $L_{A90,T}$ (dB)
Friday 17th February 2023	Daytime	46.2-52.6	50
	Night-time	44.6-52.1	51
Saturday 18th February 2023	Daytime	**45.2**-51.5	51
	Night-time	44.7-52.4	51
Sunday 19th February 2023	Daytime	46.1-51.9	50
	Night-time	**44.0**-51.8	50
Monday 20th February 2023	Daytime	49.9-52.8	N/A

The levels highlighted bold above are the lowest measured levels to be used in the assessment to inform a worst-case assessment. It is important to note that BS 4142 states the following:

> *In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.*

However, given that the position is closer to the Hydro Deeside than the receptors, the use of the lowest level is considered robust.

Weather forecasts were monitored throughout the surveys to ensure no adverse conditions as the location of the Site was not suitable for the installation of an unattended weather station. During the survey, conditions remained dry and wind speeds rarely exceeded 10 mph.

The equipment outlined in Table 3.2 was used for the noise survey.

TABLE 3.2 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE AT TIME OF SURVEY
NMP1	Sound Level Meter	01dB Fusion	14226	1st October 2023
	Pre-amplifier	01dB Pre22	2135072	
	Microphone	GRAS 40CD	470570	
	Calibrator	01dB Cal31	99204	25th July 2023

The sound level meter was field calibrated on site using the above-mentioned calibrator prior to and after noise measurements were taken. No significant drift was witnessed as noted above. Calibration certificates are available upon request.

4. NOISE IMPACT ASSESSMENT

This assessment has made assumptions on the sources of sound relating to the development, to predict the noise level impact on the existing closest residential dwellings during the daytime and night-time periods. As the development could operate 24/7 with no known difference between output in the day or night, to is assumed the noise output from the site will be the same, day and night.

With regard to assumptions for the assessment, the following has been considered for the full planning application aspects:

- Ground elevations have been taken as existing by way of a 2 m grid Digital Terrain Model (DTM) which contains public sector information licensed under the Open Government License v3.0.
- It is assumed, in order to inform a worst-case assessment, that there will be 5 FLT movements per hour which includes for a full circuit in the finishing area.
- HGV deliveries/collections are included with up to 4 movements/deliveries/collections per hour.
- One scrap delivery is assumed with a front loader also moving scrap in the adjacent bay in any given 1-hour period.
- Noise breakout from the façades of the proposed units has been input into the model as vertical area sources with the roof added as an area source.
- Soft ground attenuation has been applied, where necessary.

E3P have been provided with noise data (Yard and Operation noise levels indications dated 24th October 2024) which outlines expected sound power levels for all operations and plant items that are proposed for the extension.

Within this data, it is clear that, inside, noise levels are typically 88 dB or below and it is a level of noise that is favoured. However, E3P also note that certain plant items inside have a sound power level of up to 115 dB, resulting in a much higher noise level. In order to inform the assessment, an internal noise level of 90 dB is assumed, which on average incident upon the building envelope is likely to be worst-case. A simple equation of Sound pressure level outside = Sound pressure level inside – Sound Reduction Index (SRI) of building envelope – 6 dB for diffuse field to free-field correction.

E3P note that the building envelope has a minimum sound reduction of 30 dB, accordingly, it is expected that noise break-out from the facades would be no more than 54 dB. Roller shutter entrances are assumed to be open up to 3 times in an hour for access only and, as such, an on-time correction is applied to these vertical area sources to allow for intermittent break-out.

For the BS 4142:2014+A1:2019 assessments, penalties are applied to the specific sound level in order to provide the rating level. These penalties relate to the acoustic features of the sound source. Given that this forms an extension to an existing premise and that sound sources are likely to be of a similar character, no feature corrections have been applied.

4.1. DAYTIME ASSESSMENT

Table 4.2 details the resultant rating level at the worst affected receptors. The grid noise map can be seen in Figure 2 of Appendix II.

The lowest measured background sound level during the daytime periods have been used for each corresponding receptor. This informs a worst-case assessment.

For the nursery, a criterion of 48 dB is used which aims to achieve 35 dB inside with an open window.

TABLE 4.2 BS 4142:2014+A1:2019 ASSESSMENT - DAYTIME

RECEPTOR	CALCULATED RATING LEVEL, $L_{A,r}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)	CRITERION, $L_{A90} = L_{A,r}$ (dB)	DIFFERENCE +/- (dB)
The Oval	39	45	45	-6
Bridgeway East	37	45	45	-8
Nursery	38	-	48	-10

Table 4.2 indicates that the predicted rating level falls below the existing background sound level or relevant criterion for all receptors by at least 5 dB. As such, no consideration towards mitigation measures is required.

Indeed, when considering typical background sound levels, i.e. with existing noise from Hydro Deeside included, the expected rating levels from the extension fall more than 10 dB below the background. This is a positive indication that the additional noise from the extension will not increase existing baseline levels of noise at the receptors.

4.2. NIGHT-TIME ASSESSMENT

The noise model has been used to predict the rating level at the receptors during the night-time period. Table 4.3 details the calculated rating level at the receptors and compares the rating level with the background sound level. Specifically, the levels relate to first floor windows.

TABLE 4.3 BS 4142:2014+A1:2019 ASSESSMENT – NIGHT-TIME

RECEPTOR	CALCULATED RATING LEVEL, $L_{A,r}$ (dB)	LOWEST MEASURED BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)	CRITERION, $L_{A90} = L_{A,r}$ (dB)	DIFFERENCE +/- (dB)
The Oval	39	44	44	-5
Bridgeway East	37	44	44	-7
Nursery	-	-	-	-

Table 4.3 indicates that the predicted rating level falls below the typical measured background sound level during the night-time period.

Indeed, when considering typical background sound levels, i.e. with existing noise from Hydro Deeside included, the expected rating levels from the extension fall more than 10 dB below the background. This is a positive indication that the additional noise from the extension will not increase existing baseline levels of noise at the receptors.

5. COMMERCIAL SOUND IMPACT CONTEXT AND UNCERTAINTY

In order to determine the final outcome of the assessment, the context must be considered, in accordance with BS 4142:2014+A1:2019, Section 11. The factors to be considered are discussed below:

THE ABSOLUTE LEVEL OF THE SOUND

Since the assessment relates to a future noise source, it is not possible at present to compare the Specific Noise Level with the residual sound, as discussed within the standard. However, the absolute noise level at the façade of the most affected residential receptor is 39 dB $L_{Aeq,15min}$ respectively. Assuming 13 dB for attenuation provided by an open window, this would result in the internal noise levels falling below the internal bedroom criterion given in BS 8233:2014 by 4 dB. As such, this would not cause adverse impact.

THE CHARACTER AND LEVEL OF THE RESIDUAL SOUND COMPARED TO THE CHARACTER AND LEVEL OF THE SPECIFIC SOUND

As discussed above, this is not directly possible since the assessment relates to a proposed noise source rather than an existing noise source. However, there is existing commercial/industrial uses at the site and, as such, commercial sound already forms part of the existing acoustic environment, and this would therefore form part of the Residual Sound. This is significant because the proposed noise source would therefore be contributing to an existing impact, rather than presenting a brand-new impact within the area. However, the new noise sources will bring this source closer to the receptors and so mitigation in order to reduce the potential impact is therefore justified.

THE SENSITIVITY OF THE RECEPTOR AND WHETHER DWELLINGS OR OTHER PREMISES USED FOR RESIDENTIAL PURPOSES WILL ALREADY INCORPORATE DESIGN MEASURES THAT SECURE GOOD INTERNAL AND/OR OUTDOOR ACOUSTIC CONDITIONS.

The closest receptors are residential and are therefore considered to be sensitive. Given that details of the existing receptors are not known, it is assumed that no design measures are incorporated, i.e. open windows rather than trickle vents are relied upon for ventilation. Based on the absolute noise levels at the façade, the internal noise levels would be below BS 8233:2014 criteria and would be acceptable when the windows are open. This is significant during the night-time, when indoor conditions are of paramount importance, and outdoor conditions are of less importance.

Given the contextual factors discussed above in accordance with BS 4142:2014+A1:2019, it is concluded that the sound sources proposed are likely to have a low to adverse impact during the daytime and night-time periods. Indeed, this is further compounded by the potential uncertainty of the assessment in relation to the measured background sound levels, accuracy of the noise model and subjective penalties applied that could result in a +/-3 dB uncertainty overall.

6. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by Portal Construction N.W. Ltd to undertake a Noise Impact Assessment for the proposed extension to Hydro Deeside at Wrexham Industrial Estate.

This assessment looked to determine the key noise sources associated with the development and undertake an assessment of any impacts upon existing noise sensitive receptors.

An unattended background sound surveys has been undertaken in order to capture worst case baseline noise levels.

E3P has undertaken detailed 3D noise modelling of all the proposed sources in order to predict noise levels at ground and 1st floor windows for the daytime and night-time periods respectively, in accordance with BS 4142:2014+A1:2019, at the closest receptors to the site.

The assessment has shown that the predicted rating level falls below the typical measured background sound level during daytime and night-time periods.

Indeed, when considering typical background sound levels, i.e. With existing noise from Hydro Deeside included, the expected rating levels from the extension fall more than 10 dB below the background. This is a positive indication that the additional noise from the extension will not increase existing baseline levels of noise at the receptors.

This assessment has shown that there should be no adverse impact upon existing residential receptors due to the proposed operations. As such, noise should not be a determining factor in the determination of the planning application.

END OF REPORT

APPENDIX I
GLOSSARY OF ACOUSTIC TERMINOLOGY

NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (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 noise 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 noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise 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 noise 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 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective but, as a general guide, a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE A1 TYPICAL SOUND PRESSURE LEVELS

SOUND PRESSURE LEVEL	LOCATION/EXAMPLE
0	Threshold of hearing
20–30	Quiet bedroom at night
30–40	Living room during the day
40–50	Typical office
50–60	Inside a car
60–70	Typical high street
70–90	Inside a factory
100–110	Burglar alarm at 1 m away
110–130	Jet aircraft on take off
140	Threshold of pain

ACOUSTIC TERMINOLOGY

TABLE A2 TERMINOLOGY

DESCRIPTOR	EXPLANATION
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 (2E-05 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.
$L_{Aeq, T}$	L_{Aeq} is 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}	L_{Amax} is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the "fast" sound level meter response.
L_{10} and L_{90}	If a non-steady noise 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 as such can be regarded as the "average maximum level". Similarly, L_{90} is the "average minimum level" and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
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 away from buildings.
Fast	A time weighting used in the root-mean-square section of a sound level meter with a 125-millisecond time constant.
Slow	A time weighting used in the root-mean-square section of a sound level meter with a 1000-millisecond time constant.

APPENDIX II
MEASURED SOUND PRESSURE LEVELS

TABLE A1: HOURLY AMBIENT AND BACKGROUND SOUND LEVEL DATA – NMP1

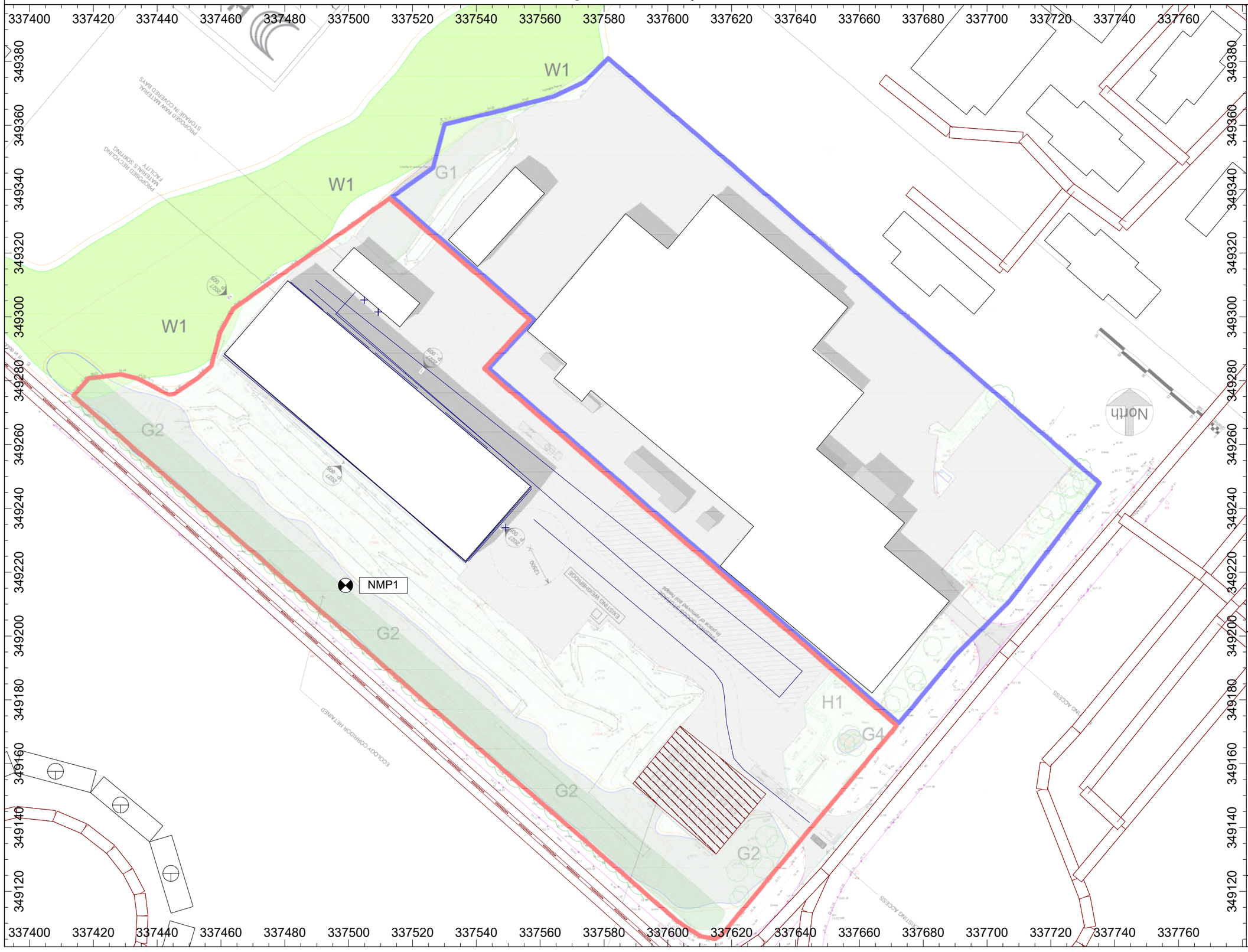
PERIOD START	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
17/02/2023 14:00	56.2	52.0
17/02/2023 15:00	56.6	53.0
17/02/2023 16:00	55.9	52.0
17/02/2023 17:00	58.2	50.0
17/02/2023 18:00	53.5	51.0
17/02/2023 19:00	53.9	51.0
17/02/2023 20:00	51.4	46.0
17/02/2023 21:00	53.3	51.0
17/02/2023 22:00	53.1	51.0
17/02/2023 23:00	52.0	47.0
18/02/2023 00:00	53.5	50.0
18/02/2023 01:00	52.4	50.0
18/02/2023 02:00	54.2	50.0
18/02/2023 03:00	51.3	46.0
18/02/2023 04:00	56.4	50.0
18/02/2023 05:00	56.7	52.0
18/02/2023 06:00	55.0	48.0
18/02/2023 07:00	56.0	50.6
18/02/2023 08:00	55.7	51.5
18/02/2023 09:00	54.2	50.4
18/02/2023 10:00	54.6	48.6
18/02/2023 11:00	54.6	50.9
18/02/2023 12:00	54.4	50.5
18/02/2023 13:00	53.2	47.3
18/02/2023 14:00	55.9	50.2
18/02/2023 15:00	53.3	48.1
18/02/2023 16:00	52.2	46.3
18/02/2023 17:00	53.2	50.6
18/02/2023 18:00	52.0	47.6
18/02/2023 19:00	59.3	46.3
18/02/2023 20:00	52.9	50.5
18/02/2023 21:00	51.6	45.2

PERIOD START	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
18/02/2023 22:00	51.6	50.2
18/02/2023 23:00	52.2	50.5
19/02/2023 00:00	52.6	49.9
19/02/2023 01:00	51.2	45.9
19/02/2023 02:00	53.0	51.1
19/02/2023 03:00	53.1	51.7
19/02/2023 04:00	51.6	47.3
19/02/2023 05:00	53.0	46.3
19/02/2023 06:00	55.6	51.4
19/02/2023 07:00	55.6	51.9
19/02/2023 08:00	54.5	48.0
19/02/2023 09:00	52.6	46.1
19/02/2023 10:00	54.0	48.8
19/02/2023 11:00	53.7	50.4
19/02/2023 12:00	53.9	50.0
19/02/2023 13:00	51.9	46.2
19/02/2023 14:00	53.2	50.7
19/02/2023 15:00	56.8	50.6
19/02/2023 16:00	53.6	48.4
19/02/2023 17:00	54.2	50.3
19/02/2023 18:00	56.4	51.6
19/02/2023 19:00	53.6	50.6
19/02/2023 20:00	52.6	46.6
19/02/2023 21:00	52.6	50.3
19/02/2023 22:00	52.1	50.3
19/02/2023 23:00	51.7	49.9
20/02/2023 00:00	50.6	45.7
20/02/2023 01:00	52.7	50.5
20/02/2023 02:00	50.9	49.2
20/02/2023 03:00	51.0	46.3
20/02/2023 04:00	51.5	49.7
20/02/2023 05:00	53.4	50.7
20/02/2023 06:00	55.2	50.8

PERIOD START	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
20/02/2023 07:00	56.4	51.6
20/02/2023 08:00	57.9	51.5
20/02/2023 09:00	56.6	52.3
20/02/2023 10:00	57.4	51.8
20/02/2023 11:00	56.9	51.4
20/02/2023 12:00	57.3	49.9

APPENDIX III
FIGURES

Figure 1 - Noise Survey Measurement Positions



Project:
Hydro Deeside

Project-No:
50-790

Client:
Portal Construction N.W. Ltd

N

e3p

Project Engineer: L Faulkner
Date: 08/05/2024

Figure 2 - Daytime Commercial Grid Noise Map - Calculation at 1.5m above ground level

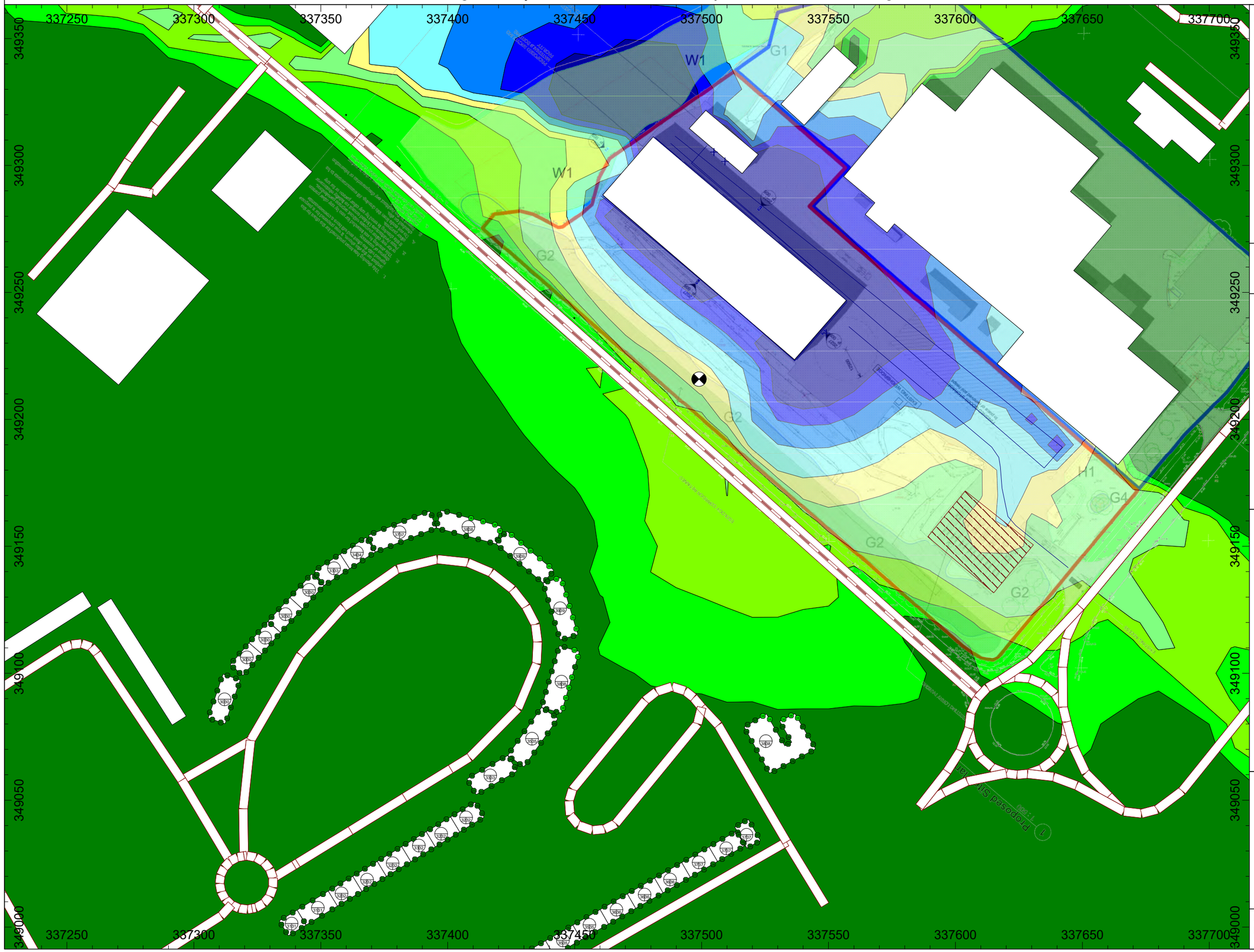
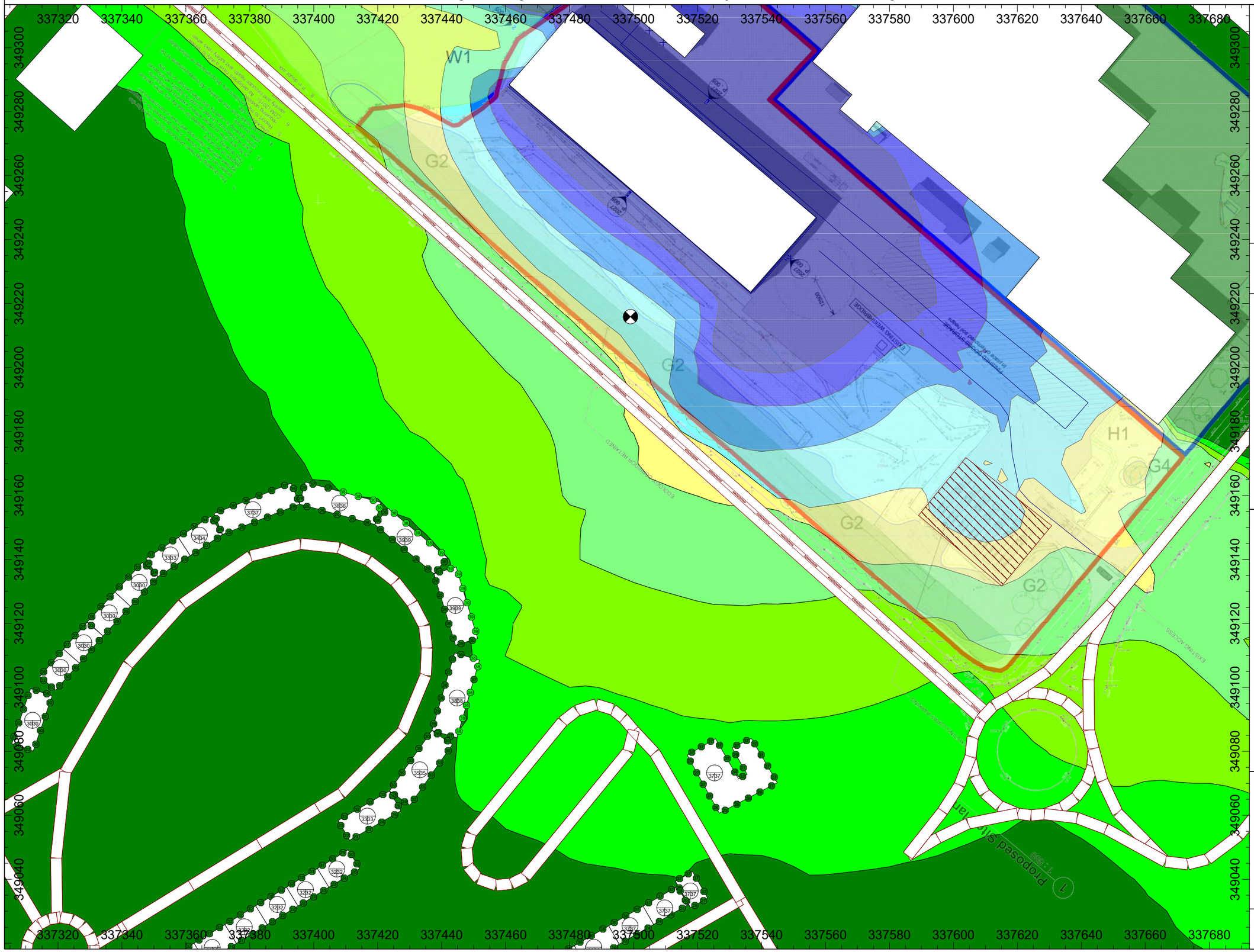


Figure 3 - Night-time Commercial Grid Noise Map - Calculation at 4 m above ground level



Project:
Hydro Deeside

Project-No:
50-790

Client:
Portal Construction N.W. Ltd

Rating Level, LA,r (dB)

- ... <= 38
- 38 < ... <= 40
- 40 < ... <= 42
- 42 < ... <= 45
- 45 < ... <= 48
- 48 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 55
- 55 < ...

Noise Map Objects

- Point Source
- Line Source
- Area Source
- vert. Area Source
- Road
- Parking Lot
- Building
- Receiver
- Building Evaluation
- Calculation Area

e3p

Project Engineer: L Faulkner
Date: 08/10/2024