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INTRODUCTION

This assessment considers the potential impact of the operational noise resultant from the proposed lateral extension to the slate workings, together with the ancillary deposit of quarried waste and overburden, upon nearby existing noise sensitive receptors. This chapter describes the scope, relevant legislation, assessment methodology, and the baseline conditions existing at the site and its surroundings. It considers any potential significant environmental effects the proposed development would have on this baseline environment; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed.

METHODOLOGY

Legislation and Planning Policy Guidance

The Guidelines for Environmental Noise Impact Assessment

- 10.1 This assessment has been conducted in accordance with The Guidelines for Environmental Noise Impact Assessment, produced by the Institute of Environmental Management and Assessment, and published in October 2014.
- 10.2 The guidelines address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. The guidelines provide specific support on how noise impact assessments fit within the Environmental Impact Assessment (EIA) process. They cover:
 - how to scope a noise assessment;
 - issues to be considered when defining the baseline noise environment;
 - prediction of changes in noise levels as a result of implementing development proposals; and
 - definition and evaluation of the significance of the effect of changes in noise levels.
- 10.3 The guidelines offer advice on how to establish the baseline noise level and suggest that *“it is good practice to measure over short time periods even though the required assessment indicator is to be averaged over a longer period”*.
- 10.4 The guidelines also state that monitoring should be avoided when the wind speed exceeds 5ms^{-1} , unusual temperature conditions, or when there is significant precipitation unless these are normal conditions for the area.

10.5 In terms of cumulative effects, these are defined as:

“those that result from additive impacts caused by other past, present or reasonably foreseeable actions together with the plan, programme or project itself and synergistic effects (in combination) which arise from the reaction between impacts of a development plan, programme or project on different aspects of the environment.”

Minerals Technical Advice Note (Wales) 1: Aggregates

10.6 Minerals Technical Advice Note (Wales) 1: Aggregates (MTAN1) provides the latest advice on planning controls and good practice methods for minerals extraction sites in Wales. It also provides guidance on keeping noise emissions from mineral extraction sites to acceptable levels including advice on noise level limits for various operational stages on mineral developments during specific times of the day.

10.7 The guidance suggests that operators should take all reasonable steps, through the use of BATNEEC (best available techniques not entailing excessive cost), to minimise noise emissions and maintain the highest possible environmental standards.

10.8 In paragraph 88 of the guidance, MTAN1 states:

“noise limits should relate to the background noise levels, subject to a maximum daytime noise limit of 55 dB(A) where background noise levels exceed 45 dB(A). 55 dB(A) is the lower limit of the daytime noise level where serious annoyance is caused. Where background noise is less than 45 dB(A), noise limits should be defined as background noise levels plus 10dB(A). Night-time working limits should not exceed 42 dB(A) at noise sensitive properties. Daytime working is defined as 0700-1900 hours and night-time as 1900-0700 hours. Noise limits should be set in terms of LAeq,T over a 1-hour measuring period. LAeq is the noise index used to describe the “average” level of noise that varies with time (T) and should be measured “free-field” that is, at least 3.5 metres away from a façade to prevent reflection of noise by any façade that faces the source. During temporary and short-term operations higher levels may be reasonable but should not exceed 67dB(A) for periods of up to 8 weeks in a year at specified noise sensitive properties.”

British Standard 5228-1:2009+A1:2014

10.9 Operational noise levels have been calculated in accordance with BS5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*. This standard sets out a methodology for predicting noise levels arising from a wide variety of open site activities and contains tables of sound power levels generated by a wide variety of mobile and fixed plant equipment.

10.10 Noise levels generated by open site operations and experienced at local receptors will depend upon a number of variables, the most significant of which are likely to be:

10.11 The amount of noise generated by plant and equipment being used at the development site, generally expressed as a sound power level;

- the periods of operation of the plant at the development site, known as the “on-time”;

- the distance between the noise source and the receptor, known as the “stand-off”;
- the attenuation due to ground absorption or barrier screening effects; and
- reflections of noise due to the presence of hard vertical faces such as walls.

Scoping Assessment

- 10.12 As detailed in Chapter 4 above, SLR submitted a request for a scoping opinion to Gwynedd Council (as MPA) in November 2018 in relation to the proposals for a small lateral extension to the slate workings, together with the ancillary deposit of quarried waste and overburden, at Penrhyn Quarry.
- 10.13 In Section 7.1 of the Scoping Opinion (dated 29th January 2019) a number of points were raised in relation to the possible noise impact from the proposed development; these have been detailed in Table 4-2 in Chapter 4 above. From that it should be noted that the main environmental effects in relation to noise from the proposed development were considered to be from the waste tipping operations, particular in connection with Tip E2 located on the boundary of the quarry. It is no longer proposed as part of this application to amend the profile of the quarry tips from those shown on the approved drawings.
- 10.14 In view of this, and given that the potential noise effects were set out in Chapter 9 of the 2016 ROMP ES (ref. C16/1164/16/MW) it is considered that the assessment should confirm that development within the proposed extension would not breach existing noise limits set out in the extant planning permission.

Current Planning Conditions

- 10.15 The current conditions regulating noise emissions from the quarry are contained in permission C16/1164/16/MW issued under the provisions of the Environment Act 1995 on 3 February 2017 (the ROMP Permission, refer to Chapter 2 for planning history of the quarry). In this respect conditions 17 to 19 refer. These conditions are derived from those issued in January 2000 (Condition 18 of planning permission reference C96A/0020/16/MW; carried forward into planning permission C08A/0039/16/MW dated 9 June 2008) and in 2012 (permission reference C12/0874/16/MW, Condition 16).
- 10.16 Condition 17 of the ROMP permission indicates that *“Between the hours of 07.00 and 19.00 noise levels arising from the development shall not exceed the LAeq,1 hr free field levels shown in Table 2 [reproduced as Table 9-1] below. Between the hours of 19.00 and 07.00, the noise levels arising from the development shall not exceed 42dB LAeq,1 hr free field at any noise sensitive property.”*

**Table 10-1
Noise Limits**

Lleoliad/Location	Cyfyngiad Swm/Noise Limit
Tal y Waen Grid Ref. 259411 363302	45L _{Aeq,1hr} - free field
Bwthyn Gwelain Grid Ref. 259304 365199	45L _{Aeq,1hr} - free field
33 Tan y Bwlch Grid Ref. 260300 365199	45L _{Aeq,1hr} - free field
14 Gefnan Grid Ref. 260946 365184	45L _{Aeq,1hr} - free field
Hirdir Ganol Grid Ref. 251133 365801	45L _{Aeq,1hr} - free field
Bryn Llys Grid Ref. 262024 366115	50L _{Aeq,1hr} - free field
Tan y Twr Grid Ref. 262473 365976	55L _{Aeq,1hr} - free field

- 10.17 Condition 18 relates to temporary operations, imposing a limit of 67dBA for such operations at the nearest noise sensitive receptors for periods of less than eight weeks in duration. The condition also indicates the time of day that the operations may be undertaken.
- 10.18 Finally, planning permission was granted on 21 June 2016 for “an application under section 73 to vary condition 2 on planning permission C04A/0519/16/MW to continue operations involving the removal of material from a mineral working deposit” (planning permission C15/1344/16/MW). Condition 14 of that planning permission imposes the following limits as detailed in Table 10-2:

Table 10-2
Noise Limits, Condition 14 of C15/1344/16/MW

Lleoliad/Location	Cyfnod/Time Period	Cyfyngiad Swm/Noise Limit
Hirdir Ganol Cfy.Grid Ref. 251133 365801	Dydd/daytime 0700 - 1900	45L _{Aeq,1hr} - free field
	Nos/nighttime 1900 - 0700	42L _{Aeq,1hr} - free field
Bryn Lllys Cfy.Grid Ref. 262024 366115	Dydd/daytime 0700 - 1900	50 L _{Aeq,1hr} - free field
	Nos/nighttime 1900 - 0700	42L _{Aeq,1hr} - free field
33 Tan y Bwlch Cfy.Grid Ref. 262473 365976	Dydd/daytime 0700 - 1900	55L _{Aeq,1hr} - free field
	Nos/nighttime 1900 - 0700	42L _{Aeq,1hr} - free field
14 Gefnan Cfy. Grid Ref. 260946 365184	Dydd/daytime 0700 - 1900	45L _{Aeq,1hr} - free field
	Nos/nighttime 1900 - 0700	42L _{Aeq,1hr} - free field

10.19 As part of this assessment the extant conditioned noise limits will continue to apply.

Assessment Methodology

Significance Criteria

10.20 The Guidelines for Environmental Noise Impact Assessment address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. In accordance with the guidelines the following must be determined:

- the noise impact;
- the noise effect; and
- the significance of the effect.

Noise Impact

10.21 In accordance with the Guidelines the noise impact may be determined in the first instance by calculating the change in the noise level¹ and secondly by comparing the subsequent noise level with an absolute noise limit value².

Operational Impact - Quarry

10.22 The impact of operational noise upon residential receptors is determined with reference to MTAN1.

10.23 In accordance with MTAN1:

¹ Paragraphs 7.7 to 7.11 of the Guidance

² Paragraphs 7.54 to 7.66 of the Guidance

“noise limits should relate to the background noise levels, subject to a maximum daytime noise limit of 55 dB(A) where background noise levels exceed 45 dB(A). 55 dB(A) is the lower limit of the daytime noise level where serious annoyance is caused. Where background noise is less than 45 dB(A), noise limits should be defined as background noise levels plus 10dB(A). Night-time working limits should not exceed 42 dB(A) at noise sensitive properties. Daytime working is defined as 0700-1900 hours and night-time as 1900-0700 hours. Noise limits should be set in terms of LAeq,T over a 1-hour measuring period. LAeq is the noise index used to describe the “average” level of noise that varies with time (T) and should be measured “free-field” that is, at least 3.5 metres away from a façade to prevent reflection of noise by any façade that faces the source. During temporary and short-term operations higher levels may be reasonable but should not exceed 67dB(A) for periods of up to 8 weeks in a year at specified noise sensitive properties.”

10.24 Based on the above the impact of operational noise upon residential receptors is as detailed in Table 10-3.

Table 10-3
Operational Noise Residential Receptors – Impact Magnitude

Magnitude	Description
Major	Limit value exceeded by more than 5dB
Moderate	Limit value exceeded between 3.0 and 4.9dB
Minor	Limit value exceeded between 1.0 and 2.9dB
Negligible	Limit value exceeded between 0.1 and 0.9dB
None	Limit value not exceeded

Effect

10.25 Generic noise effects are detailed in Table 7-7 of the Guidelines for Environmental Noise Impact Assessment produced by the Institute of Environmental Management and Assessment, October 2014. Where an adverse impact is identified the guidelines present the following generic relationship between noise impact and noise effect:

- Negligible Impact Noise Effect: “Noise impacts can be heard, but do not cause any change in behaviour or attitude, e.g. turning up volume on television; speaking more loudly; closing windows. Can slightly affect the character of the area but not such that there is perceived change in the quality of life”;
- Minor Impact Noise Effect: “Noise impact can be heard and causes small changes in behaviour and/ or attitude, e.g. turning up volume of television; speaking more loudly; closing windows. Potential for non-awakening sleep disturbance. Affects the character of the area such that there is a perceived change in the quality of life”;
- Moderate Impact Noise Effect: “Causes a material change in behaviour and/or attitude, e.g. voiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in character of the area”; and

- Major Impact Noise Effect: “Significant changes in behaviour and/or inability to mitigate effect of noise leading to psychological stress or physiological effects e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory”.

The Significance of the Effect

10.26 The significance of the noise effect will depend on the receptor type and its sensitivity to the noise impact. The sensitivity of the receiving environment is shown in Table 10-4.

Table 10-4
Sensitivity Criteria for Acoustic Receptors

Sensitivity	Definition
Very High	Residential properties (night-time), Schools and healthcare building (daytime)
High	Residential properties (daytime), Special Areas of Conservation, Special Protection Areas, Sites of Special Scientific Interest (or similar areas of special interest)
Medium	Offices and other non-noise producing employment areas
Low	Industrial areas

10.27 The sensitivity of the receiving environment together with the magnitude of impact defines the level of effect as shown in Table 10-5.

Table 10-5
Level of Effect Matrix

Magnitude	Sensitivity			
	Very High	High	Medium	Low
Major	Major	Major	Major	Moderate
Moderate	Major	Moderate	Moderate	Minor
Minor	Moderate	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible
None	None	None	None	None

BASELINE CONDITIONS

Baseline Noise Environment

10.28 Noise levels have not been measured by SLR as part of this assessment as existing noise limits are in place and follow current guidance. Notwithstanding this, as required by extant planning conditions, noise monitoring is carried out on behalf of the applicant.

10.29 This monitoring shows that noise levels from current operations at the quarry do not exceed the limits set out in the extant planning conditions.

ASSESSMENTS OF EFFECTS

Operational Quarry Noise Effects

- 10.30 The sound predictions for the operational assessment have been undertaken using a proprietary software-based noise model, CadnaA®, which implements the full range of UK calculation methods. The calculation algorithms set out in BS5228-1:2009+A1:2014 have been used and the model assumes:
- a ground absorption factor of 0.5;
 - a reflection factor of 2;
 - a daytime receiver height of 1.5m; and
 - topographic data covering the entire quarry workings, tip area and the surrounding area to include all the considered residential receptors.
- 10.31 This assessment considers the noise impact due to extraction within the proposed extension area.
- 10.32 A cumulative assessment of the noise impact from continued operations associated with the main quarry including haulage and processing/production of materials, with reference to the existing planning conditions relating to noise, has also been undertaken. Operational noise levels generated by the plant/equipment have been predicted to the façade of the nearby noise-sensitive receptors facing the site. The results have been assessed against criteria outlined in the current planning permission (see above).
- 10.33 The noise sensitive receptors identified within this assessment are consistent with the properties assessed in the previous assessment; Chapter 9 Noise, of the ROMP ES (ref: C16/1164/16/MW).
- 10.34 The operational layout, route of internal haul roads and location of screening bunds/tips have been designed to offer maximum protection from potential impacts, and to protect the amenity at nearby residential receptors.
- 10.35 Operational plant and equipment details have been provided by the applicant and are set out in Table 9-7 together with the adopted sound power levels for the plant. The sound power levels are taken from manufacturers' datasheets where available or the tables contained in BS5228-1:2009+A1:2014.

**Table 10-6
Plant & Equipment**

Operation	Plant/Equipment Item (or similar)	Sound Power Level, LWA, dB each
Quarry Operations	Caterpillar CAT336F Hydraulic Excavator	105
	Caterpillar CAT349 Hydraulic Excavator	107
	Volvo A40G Articulated Dump Trucks (8 loads per hour)	110
	Volvo A40D Articulated Dump Truck/Bowser	110
	Bedford Trucks (1 Fuel Bowser & 2 Quarry Bench)	98
	Sandvik DQ500 Drill Rig	108
Production Sheds	Caterpillar CAT308 Excavator	104
	Caterpillar CAT962H Wheeled Loader	106
	Liebherr 521 Wheeled Loader	101
	JCB 411 Wheeled Loader	102
	Forklifts (x5)	99
Aggregates/tip working	Caterpillar CAT962H Wheeled Loader	111
	Powerscreen Washplant	106
	Komatsu WA480 Wheeled Loader	108
	Caterpillar CAT725 Articulated Dump Truck	110
	Komatsu WA470 Wheeled Loader	107
	Lokotrak LT1213 Crusher	115
	Powerscreen 2100	106
	Komatsu PC210 Excavator	102
	Caterpillar CAT360 Excavator (x2)	107
	Caterpillar CAT725 Articulated Dump Truck	110
	Caterpillar TH414C	106

*maximum ($L_{A_{fmax}}$) measured drive by noise level from BS5228-1:2009+A1:2014.

Mineral Extraction Operational Assessment

- 10.36 Noise predictions represent a worst-case scenario in terms of plant and equipment locations where mobile equipment is operating at its closest approach to the nearby receptors or in locations where attenuation provided by the screening bunds is at a minimum.
- 10.37 All predictions are based on plant operating at full power and 100% on-time. No allowance has been made for breaks and/or temporary shutdowns of the plant and equipment. The results of the predictions for worst-case operational noise levels are shown in Table 10-7 along with a comparison of the conditioned noise limits. The predicted noise levels have been rounded to the nearest whole number. As mineral extraction operations would only occur during daytime hours, the assessment has only reported the predicted noise levels during the day.

Table 10-7
Predicted Noise Levels Generated Operations, free-field, dB

Location	Predicted Noise Level, $L_{Aeq,1hr}$	Derived Noise Limit, $L_{Aeq,1hr}$	Difference
Gerlan Road	34	49	-15
Hirdir Ganol	36	50	-14
14 Gefnan	39	45	-6
33 Tan y Bwlch	39	45	-6
Bwthyn Gwelain	36	45	-9
Tal y Waen	32	45	-13
Tai-Newyddion	30	47	-17
Dolawen	31	50	-19
Caravan Park	35	55	-20

- 10.38 Table 10-7 shows that the worst-case predicted noise levels generated by daytime operations would be below the conditioned noise limits at all receptor locations.
- 10.39 It should also be noted that these are worst-case operational noise levels when all operations are taking place simultaneously and at their most exposed elevation or closest approach. For the majority of the life of the development operations would be undertaken at greater distances and/or lower elevations within the void and therefore noise levels are likely to be lower than those shown.
- 10.40 Based on the results of the operational noise assessment, mitigation measures to reduce potential impacts at the nearby receptors, other than those included within the design of the site, are considered unnecessary. However, good site management practices would be followed at all times.

- 10.41 Sound levels are predicted at public footpath No.43 and No.50 which circumnavigate the western boundary of the quarry and are respectively, approximately 125m and 100m from the outer edge of the quarry boundary. At footpath No.43 the predicted noise level is 32dB(A) and at footpath No. 50 it is 33dB(A).
- 10.42 As these footpaths are not representative of permanent residences and that any persons using the path will do so in a transitory manner and will only be in the vicinity for a short period of time it would seem appropriate to apply a limit of 67dB(A) as stated in MTAN1 *“During temporary and short-term operations higher levels may reasonable but should not exceed 67dB(A) for periods of up to 8 weeks in a year at specified noise sensitive properties”*.

Cumulative Operational Quarry Noise Effects

- 10.43 An assessment of the cumulative acoustic impact of the operations associated with the proposed extension area in conjunction with the existing operations within the quarry has also been undertaken.
- 10.44 The existing quarry workings would continue to operate in the same manner, i.e. materials would be extracted from the working face and transported to the production site for processing. The noise predictions represent a worst-case scenario in terms of plant and equipment locations where mobile equipment is operating at its closest approach to the nearby receptors or in locations where attenuation provided by the screening bunds is at a minimum.
- 10.45 For the existing quarry workings, all predictions are based on plant operating at full power and 100% on-time. No allowance has been made for breaks and/or temporary shutdowns of the plant and equipment. The results of the predictions for worst-case operational noise levels for the existing operations are shown in Table 10-8 along with the predicted noise levels for the proposed tip area. The cumulative predictions are then compared to the conditioned noise limits. The predicted noise levels have been rounded to the nearest whole number.

Table 10-8
Predicted Cumulative Daytime Noise Levels Generated Operations, free-field, dB

Location	Predicted Noise Level, $L_{Aeq,1hr}$ Existing Operations	Predicted Noise Level, $L_{Aeq,1hr}$ Proposed Extension Area	Cumulative Predicted Noise Level, $L_{Aeq,1hr}$	Derived Noise Limit, $L_{Aeq,1hr}$	Difference
Gerlan Road	44	34	44	49	-5
Hirdir Ganol	43	36	44	50	-6
14 Gefnan	41	39	42	45	-3
33 Tan y Bwlch	38	39	41	45	-4
Bwthyn Gwelain	34	36	37	45	-8
Tal y Waen	31	32	34	45	-11
Tai-Newyddion	33	30	34	47	-13
Dolawen	37	31	38	50	-12
Caravan Park	48	35	48	55	-7

- 10.46 Table 10-8 shows that the worst-case predicted noise levels generated by the existing daytime operations in conjunction with the proposed quarry extension operations would be below the conditioned noise limits at each of the ten receptor locations.
- 10.47 It is also noted that these are worst-case operational noise levels when all operations are taking place simultaneously and at their most exposed elevation or closest approach. For the majority of the life of the development operations would be undertaken at greater distances and/or lower elevations within the void and therefore noise levels are likely to be lower than those shown.
- 10.48 Based on the results of the operational noise assessment, mitigation measures to reduce potential impacts at the nearby receptors, other than those included within the design of the site, are considered unnecessary. However, good site management practices would be followed at all times.

ASSESSMENT OF IMPACT

- 10.49 In all instances the predicted noise levels are below the conditioned noise limits, which were set to minimise the impact at the local receptor locations, therefore it is considered that continued operations at the quarry would not lead to any adverse impacts.
- 10.50 In terms of the significance of the effect, the noise sensitive receptors are considered to have a High sensitivity to noise. The magnitude of impact is None (as the noise limits are not exceeded) and so the significance is None for each receptor.

MITIGATION MEASURES

Good Site Practice

- 10.51 Surface minerals extraction sites, by their nature, generate noise due to the use of heavy machinery. During the continued operations the potential risk of noise impacting on the nearby noise-sensitive receptors would vary depending on the type of activities being undertaken at the time and the effectiveness of any noise control measures that are in place.
- 10.52 Good site management practices and other specific measures could provide additional noise mitigation. These measures could include:
- activities within the site would be undertaken in locations where noise attenuation from existing landforms would maximise the benefit to the noise-sensitive properties;
 - internal haul routes would, wherever possible, be routed such that separation distances to the noise sensitive properties is maximised;
 - all haul roads would be kept clean and maintained in a good state of repair to avoid unwanted rattle and “body slap” from vehicles;
 - all mobile plant used at the proposed extension would have noise emission levels that comply with the limiting levels defined in EC Directive 86/662/EEC and any subsequent amendments;

- all mobile plant and heavy goods vehicles entering the site will move in a circular pattern to minimise, as far as is practical and safe, noise from reverse warning systems;
- plant would be operated in a proper manner with respect to minimising noise emissions, for example, minimisation of drop heights and no un-necessary engine revving;
- plant would be subject to regular maintenance. All plant at the site would be fitted with effective exhaust silencers and would be maintained in good working order to meet manufacturers' noise rating levels. Defective silencers would be replaced immediately;
- plant that is used intermittently, would be shut down when not in use; and,
- pumps, generators and compressors would be located behind existing screening mounds or landform, would be electrically powered and fitted with an acoustic covers where necessary. Diesel powered pumps, generators and compressors, if used, will be installed within acoustic enclosures.

10.53 To ensure that the quarry continues to operate within the conditioned noise limits the existing noise compliance monitoring scheme would be retained.

CONCLUSIONS

10.54 This noise assessment has considered the potential for noise generated by the slight lateral extension to the working area at Penrhyn Quarry to give rise to noise impacts at the nearest noise-sensitive receptors to the workings. The assessment has been made against noise limits contained in the existing planning permission. The assessment has found that worst-case noise levels generated by operational activities would be at or below the conditions noise limits at all locations during daytime periods.

10.55 The predicted noise levels due to operations in the extension area and associated haulage at footpaths No.43 and No. 50 which approach the western boundary of the proposed tip area would not exceed the limit values and there would be no impact magnitude and the level of effect would be none.

10.56 An assessment of the cumulative acoustic impact of the operations associated with the proposed extension area in conjunction with the existing operations within the quarry has also been undertaken. Again, this has shown that noise levels would be below the limits set out in the existing planning permission.

10.57 It is concluded that noise should not pose a material constraint for the continued operation of the site.