Llywodraeth Cymru / Welsh Government

A487 New Dyfi Bridge

Environmental Statement – Volume 1: Chapter 12 Noise and Vibration

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12 Noise and Vibration

12.1 Introduction

12.1.1 This chapter describes the noise and vibration assessment conducted for the Scheme. The following sections describe the baseline noise climate, assessment methodology, results and conclusions for a 'Detailed' assessment of the Scheme according to the Design Manual for Roads and Bridges (DMRB) (Highways Agency et al, 2011) (HD 213/11). Potential noise effects have been considered for both construction and operation of the Scheme. Details of any proposed mitigation measures to minimise noise are presented along with an assessment of residual noise effects in Sections 12.11, 12.12, and 12.13.

12.1.2 For a glossary of terms and abbreviations refer to Volume 3, Appendix 12.1.

12.2 Legislation, Policy Context and Guidance

Legislation

Legislative Framework for Construction

Environmental Protection Act 1990 (HMSO, 1990)

12.2.1 The Environmental Protection Act (HMSO, 1990) describes the duty of the Local Authority to take steps to abate any noise impact, including that from a construction site, deemed to be causing a statutory nuisance. Noise is outlined in Part III of the Act in relation to noise as a nuisance or that is prejudicial to health.

Control of Pollution Act 1974 (HMSO, 1974)

12.2.2 The Control of Pollution Act (HMSO, 1974) gives the Local Authority powers to serve a notice to the developer requiring the control of site noise under Section 60 of the Act. This may include specific controls to restrict certain activities identified as causing particular problems. Conditions regarding hours of operation will generally be specified and noise and vibration limits at certain locations may be applied in some cases. All requirements must adhere to established guidance and be consistent with best practicable means to control noise only as far as is necessary to prevent undue disturbance.

Legislative Framework for Operational Noise

Land Compensation Act 1973 (HMSO, 1973)

12.2.3 The Land Compensation Act (HMSO, 1973) Part 1 entitles property or land owners to compensation if their property has been reduced in value as a result of a public project such as a new or improved highway.

Noise Insulation Regulations & Noise Insulation Amendment Regulations 1988 (1975, Amended 1988) (HMSO, 1975)

12.2.4 The Noise Insulation Regulations (HMSO, 1975) define the conditions under which dwellings are eligible for noise insulation to control internal noise levels. The conditions relate to the level of traffic noise at the façade, the increase in noise levels as a result of the highway and the contribution of the new or altered project to the noise level received at the façade. In summary, noise insulation qualification criteria require that:

- the facade noise threshold of 68dB$L_{A10,18h}$ is met or exceeded;
- there must be a noise increase of at least 1dB(A) compared to the prevailing noise level immediately before the construction of a highway or an additional carriageway were begun;
- the noise caused by traffic on new or altered roads makes an effective contribution of at least 1dB(A); and
- the property is 300 metres or less from the nearest point on the carriageway of a highway to which the Regulations apply.

12.2.5 Potential eligibility for statutory insulation is identified as part of the assessment.

Policy Context

National and Regional Policy

Planning Policy Wales Edition 8 (Welsh Government, 2016)

12.2.6 Planning Policy Wales Edition 8 - January 2016 (Welsh Assembly Government, 2016), describes the planning development policies of the Welsh Assembly Government. Chapter 13 of the policy '*Minimising and Managing Environmental Risks and Pollution*' sets out the policy objectives with regard to noise from new development. Paragraph 13.13.1 states the policy objectives:

'Noise can affect people's health and well-being and have a direct impact on wildlife and local amenity. Noise levels provide

an indicator of local environmental quality. The objective of a policy for noise is to minimise emissions and reduce ambient noise levels to an acceptable standard. Noise Action Plans, drawn up by the Welsh Ministers in relation to Wales under the Environmental Noise Directive, and the Wales Regulations, aim to prevent and reduce environmental noise where necessary and preserve environmental noise quality where it is good. They are a planning consideration in the use and development of land.'

12.2.7 With regard to the assessment of noise associated with development, paragraph 13.15.1 states the following:

'Noise can be a material planning consideration, for example in proposals to use or develop land near an existing source of noise or where a proposed new development is likely to generate noise. Local planning authorities should make a careful assessment of likely noise levels and have regard to any relevant Noise Action Plan before determining such planning applications and in some circumstances it will be necessary for a technical noise assessment to be provided by the developer.'

12.2.8 Paragraph 13.15.2 provides guidance on noise generation near protected areas:

'Special consideration is required where noise-generating development is likely to affect a protected species, or is proposed in or near statutorily designated areas, including urban 'quiet areas' designated in Noise Action Plans. The effect of noise on the enjoyment of other areas of landscape, wildlife and historic value should also be taken into account.'

Technical Advice Note 11 Noise (Welsh Assembly Government, 1997)

12.2.9 TAN 11 (Welsh Assembly Government, 1997) provides technical guidance on noise generating development including transportation projects. In relation to highway projects TAN 11 makes reference to the Noise Insulation Regulations as described above.

Well-being of Future Generations (Wales) Act 2015 (Welsh Assembly Government, 2015)

12.2.10 The act strengthens existing governance arrangements for improving the well-being of Wales to ensure that present needs are met without compromising the ability of future generations to meet their own needs.

Local Planning Policy

Powys County Council Environmental Policy, (Powys County Council, 2007)

12.2.11 Within the Council's high-level environmental policy is the requirement to 'minimise adverse effects on the environment, following the principles embedded in sustainable development'.

Powys Unitary Development Plan 2001 - 2016

12.2.12 The requirements and guidance from the Powys Unitary Development Plan (2001 -2016 – adopted March 2010) will be followed with regard to sustainable development and the control of environmental effects. Amongst its broader objectives, this document also provides guidance and policies on a wide range of noise impacts such as minerals extraction and agricultural operations. Under Section 3 of the plan, Policy GP1 relating to general development control notes that:

12.2.13 *'3. The amenities enjoyed by the occupants of nearby properties shall not be unacceptably affected by levels of noise, light, dust, odour, hours of operation or any other planning matter.'*

Eryri Local Development Plan 2007 - 2022

12.2.14 The Eryri Local Development Plan 2007-2022 sets objectives for the control of development within the Snowdonia National Park and notes the particular sensitivities to noise in this designated area. Specifically, Paragraph 1.45 mentions the need for development planning to consider *'the provision of good public recreational and open space and noise reduction measures'*. More generally, Development Policy 6 (xii) requires that:

'The development is compatible with, and does not cause significant harm, to the environment, neighbouring residential amenity or the amenity of the Park by way of noise, dust, vibration, odour, light pollution, hazardous materials or waste production.'

12.2.15 With regard to the 'special qualities' of the National Park, Paragraph 2.25 notes:

'It is important that provision is made for acceptable mitigation of those potential adverse impacts of new development upon natural beauty, wildlife and cultural heritage. Adverse impacts might include, for example, increased erosion, pressures on habitats and species, changes in landscape character, erosion of cultural heritage and linguistic vitality, noise intrusion and traffic congestion.'

Relevant Guidance

Design Manual for Roads and Bridges – Environmental Assessment, Volume 11, Section 3, Part 7, HD 213/11 Noise and Vibration *(Highways Agency et al, 2011)*

12.2.16 The Design Manual for Roads and Bridges (DMRB) is the regulatory standard for the design of a new road or improvements to an existing road. In particular, Volume 11 Section 3 Part 7: HD 213/11 Revision 1 (Highways Agency et al, 2011) (HD 213/11) sets out the method for assessing noise and vibration associated with road traffic. HD 213/11 provides guidance on the selection of the scheme assessment area and the relevant assessment years. This procedure has been adopted for the purpose of this assessment.

Calculation of Road Traffic Noise *(Welsh Office, 1988)*

12.2.17 HD 213/11 requires that road traffic noise is calculated under the method described in Calculation of Road Traffic Noise (Welsh Office, 1988) (CRTN). This describes a procedure for determining the level of noise from the highway based upon the traffic flow parameters, road surface, propagation distance, screening, intervening ground cover and topographical features between the highway and receptor. This is the accepted methodology to quantify traffic noise levels for use with highway noise assessment procedures.

BS 5228-1:2009+A1:2014 and BS 5228-2 Code of Practice for noise and vibration on construction and open sites *(British Standards Institution, updated 2014)*

12.2.18 The British Standard BS 5228 Code of Practice for noise and vibration on construction and open sites – Part 1:2009+A1:2014 (British Standards Institution, 2014a) and BS 5228 Part 2: 2009+A1:2014 (British Standards Institution, 2014b) provide guidance on the assessment and control of noise and vibration from construction activities. Part 1 of the Standard contains detailed information on noise reduction measures and promotes the 'best practicable means' approach to control noise and vibration to minimise the impact on local residents and construction workers. Part 2 of the Standard provides criteria for vibration with regard to perception and disturbance to residents and the onset of potential cosmetic or structural damage to buildings.

BS 6472-1:2008 and BS 6472-2:2008 Guide to evaluation of human exposure to vibration in buildings

12.2.19 Part 1 of BS 6472 (British Standards Institution, 2008a) provides guidance on the assessment of vibration from a variety of sources (including general construction) and its potential to cause disturbance to people. It does not cover vibration from blasting.

BS ISO 4866: 2010 Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the

measurement of vibrations and evaluation of their effects on structures

12.2.20 BS ISO 4866 (British Standards Institution, 2010b) provides guidance and methodologies for the measurement and effects of vibration upon buildings.

BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings

12.2.21 BS 8233 (British Standards Institution, 2014) provides guidance for the control of noise in and around buildings. It is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.

12.3 Study Area

12.3.1 The determination of study area is based on the DMRB HD 213/11 guidance and it includes the proposed new section of road bypassing the existing Dyfi Bridge. This was defined in the Scoping Report which showed the study area graphically and described the study methodology. For the Detailed level of assessment used for this study, HD 213/11 requires that a quantitative noise impact study is made for all noise sensitive properties within 600m of all Scheme roads and sections of existing roads within 1 km of the Scheme that are predicted to be subject to a change in noise level of more than 1dB$L_{A10,18hr}$ in the short term as a result of the Scheme on opening year. Existing roads subject to a change of 1dB(A) or more were identified by forecast traffic changes arising from the Scheme. HD 213/11 notes that a change in noise level of 1dB is associated with an increase in flow by at least 25% or decrease by 20% in the Scheme opening year.

12.3.2 The study area also includes affected routes beyond 1km from the Scheme. However, for these routes an assessment of noise change is carried out using 'Basic Noise Levels' (BNLs) where dwellings lie within 50m of affected routes. The Basic Noise Level is the noise level at a reference distance of 10m from the carriageway edge, derived using the CRTN methodology.

12.4 Methodology

Approach to Identification of Baseline Conditions

12.4.1 Noise or vibration sensitive buildings and amenity areas have been identified for inclusion in the assessment. Baseline noise

surveys have been carried out at sufficient locations to represent all identified noise sensitive areas. These locations (and the assessment methodology) have been agreed with Powys County Council, Gwynedd Council and the Snowdonia National Park Authority. The noise survey was performed in accordance with the 'Shortened measurement procedure', described in paragraph 43 of CRTN. Full details of the survey procedures and locations are provided in Volume 3, Appendix 12.2.

12.4.2 The measured baseline noise survey data has been used for the construction noise assessment to represent baseline ambient noise levels at representative receptor locations. It is assumed that local noise conditions would not change substantively between the survey period and the commencement of proposed works.

12.4.3 The future baseline noise conditions for the operational traffic assessment have been determined by the CRTN noise prediction model for a forecast traffic scenario prior to construction of the Scheme. This has provided detailed coverage across the entire study area. HD 213/11 makes clear that this is the preferred approach for establishing baseline noise conditions, which are then directly comparable with the noise levels predicted in the same way with the Scheme in operation for future assessment years. The future baseline noise level predictions will be supplemented by the data obtained during the baseline noise measurement survey.

Methodology for Construction Impacts

12.4.4 Construction noise and vibration is temporary and cannot be assessed in the same way as more permanent operational impacts such as traffic noise.

12.4.5 Noise and vibration from the construction of the Scheme has been determined using BS 5228 (Parts 1 and 2). This standard provides information on the prevention and control of construction noise and vibration, and includes a procedure for predicting construction noise. Calculations of noise levels at selected receivers have been based on typical source noise levels (mainly taken from BS 5228), propagation distance, and details of the intervening ground cover, topography and screening.

12.4.6 Construction noise predictions are based on the anticipated programme and construction methods. Nevertheless, it has been necessary to make assumptions with the advice of the Scheme engineers regarding some aspects of the construction process. These construction method assumptions, as described in Chapter 2 of the ES, are considered to provide a sufficient level of accuracy for this assessment.

Construction noise impact evaluation

12.4.7 Assessment of the significance of construction noise has been carried out based upon noise change as outlined in BS 5228 Part 1. The Standard provides a number of methods for the assessment of significant effects. The 'ABC' assessment method described in BS 5228–1:2009+A1:2014 has been used to establish the threshold of potential significant effect for construction noise at residential receptors.

12.4.8 Under this approach, the adverse impact threshold is determined at a dwelling using the existing ambient noise level, rounded to the nearest 5dB. This is then used to determine the assessment category: A, B or C, which then defines the adverse noise impact threshold, as described in

12.4.9 Table 12.1. The predicted construction noise level is then compared to the appropriate noise impact threshold level. If the L_{Aeq} construction noise level exceeds the appropriate noise impact threshold level shown in

12.4.10 Table 12.1, then an adverse impact with the potential to cause a significant effect is identified.

Table 12.1: Threshold of potential significant effect at dwellings according to ABC method in BS 5228–1:2009 + A1:2014

Assessment category and threshold value period	**Threshold value, dBL_{Aeq}**		
	Category A	Category B	Category C
Night-time (23:00 – 07:00)	45	50	55
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Other: Weekday evenings (19:00 – 23:00) Saturdays (13:00 – 23:00) Sundays (07:00 – 23:00)	55	60	65
Category A: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are less than these values Category B: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are the same as Category A values Category C: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are higher than Category A values.			

12.4.11 For example, for a site exposed to an existing ambient noise level of 68dB(A), this would be rounded to 70dB(A). An ambient level of 70dB(A) is higher than the Category A value of 65dB(A), therefore the Category C value of 75dB(A) would apply in this case as a threshold for potentially significant effects.

12.4.12 Having established if there is a potentially significant effect using the ABC method, the final assessment of significance is made using professional judgement. This is evaluated by considering various other factors described in Section 12.5 such as the expected duration of the activity.

12.4.13 For non-residential receptors, significant effects would be evaluated on a receptor-by-receptor basis, using established noise impact criteria for the type of receptor and professional judgement based on the factors described in Section 12.5.

Construction vibration impact evaluation

12.4.14 BS 5228–2:2009+A1:2014 indicates that the threshold of perception in residential environments corresponds with a Peak Particle Velocity (PPV) of 0.3mm/s. The standard also states that a complaint is likely where levels occur above 1.0mm/s PPV at residential properties but this exposure can be tolerated if prior warning and explanation has been given to residents. Levels of vibration of 10mm/s PPV and above are likely to be intolerable for any more than a very brief exposure to this level.

12.4.15 BS 5228–2:2009+A1:2014 also provides criteria for the potential onset of cosmetic and structural damage in light-framed and industrial buildings.

12.4.16 The overall significance of the effect is assessed using professional judgement by considering not only the criteria above but also other factors, as discussed in Section 12.5.

12.4.17 Ground-borne vibration during the construction of the proposed carriageway may arise due to breaking out surfaces and foundations, excavation, and the use of compactors or rollers. Impacts at sensitive receptors will be dependent on their proximity to the works and the intervening ground conditions.

12.4.18 The effects in terms of community response are expected to be governed mainly by the time of day that the works are undertaken and whether prior notice has been given. Effects in terms of cosmetic or structural damage to buildings may also be of concern where they are exposed to levels of vibration much higher than the lowest perceptible levels.

12.4.19 BS 5228–2:2009+A1:2014 provides a methodology for predicting typical levels of vibration from certain types of construction activities based on case study data and empirical models. This has been used to assess the likelihood that vibration from the works may exceed the thresholds for perception and disturbance.

Methodology for Operational Impacts

12.4.20 Geographical Information Systems (GIS) have been used to construct a topographically accurate 3-dimensional noise model of the calculation area for A487 New Dyfi Bridge. The model includes terrain data, buildings and other structures that might screen or reflect noise, ground cover types and road links. Drawings of the Scheme design and groundworks were incorporated to ensure an accurate representation of the Scheme and existing roads.

12.4.21 For each road link in the model, data on traffic flow, speed, proportion of heavy goods vehicles (HGVs) and road surface type were obtained from the project traffic and highways engineers for inclusion into the model. Noise level calculations according to CRTN were carried out using proprietary noise modelling software. Traffic noise levels were calculated across a grid of receptor positions over the study area, and contours of noise level exposure were established. Additional calculations were also conducted at each property facade to establish noise and nuisance change at each dwelling.

12.4.22 The traffic data used in the model were those forecasted under the Do-Something and Do-Minimum scenarios both in the Scheme opening year (2019) and those in the future assessment year i.e. the year of maximum projected traffic flow within 15 years of opening – in this case, the design year (2034). These traffic data were included in the noise model to produce the following scenarios:

- Do-Minimum (without the Scheme) in the opening year (2019);
- Do-Minimum (without the Scheme) in the design year (2034);
- Do-Something (with the Scheme) in the opening year (2019); and
- Do-Something (with the Scheme) in the design year (2034).

12.4.23 The study area and HD 213/11 calculation area are defined in Section 12.3 above.

12.4.24 The noise prediction model was used to calculate noise levels within the noise study area, at a height of 4m above local ground, in terms of the free-field $L_{A10,18h}$ index in accordance with CRTN methodology, as required by HD 213/11, for each of the four scheme scenarios as listed above.

12.4.25 The $L_{A10,18h}$ index represents the arithmetic mean of all the hourly values of L_{A10} during the period between the hours of 06:00 and 24:00. The CRTN procedure is based upon empirical data with a slightly positive wind vector component blowing downwind from

source to receptor. The CRTN prediction therefore assumes an adverse wind component to represent a typical worst case scenario. The additional advice given in HD 213/11 has been adopted regarding CRTN procedures. These include revisions to vehicle classification, traffic data and corrections due to road surface.

12.4.26 Baseline noise survey results (as outlined in Section 12.4 and detailed in Volume 3, Appendix 12.2) were used as a general means of providing indicative information to assist in the validation of the range of predicted noise climates across the study area.

12.4.27 As part of the procedure for a Detailed Assessment, HD 213/11 requires that the magnitude of the noise impact is reported using a suggested scale of magnitude to describe the increase or decrease in noise level associated with the Scheme. The magnitude scale is described in more detail later in this Section.

12.4.28 Following the HD 213/11 procedures, noise difference contour maps were produced using the results from the calculations to graphically represent the noise changes within the noise study area. The required assessment of impact magnitude is presented in Volume 2, Figures 12.1 to 12.3, for the following scenarios:

- Do-Minimum scenario in the 2019 baseline year against the Do-Minimum scenario in the 2034 design year (long term);
- Do-Minimum scenario in the 2019 baseline year against the Do-Something scenario in the 2019 baseline year (short term); and
- Do-Minimum scenario in the 2019 design year against Do-Something scenario in the 2034 design year (long term).

12.4.29 HD 213/11 Detailed Assessment also requires that a night-time noise assessment is carried out. The L_{night} descriptor is used to represent the noise level at dwellings between the hours of 23:00 and 07:00. Method 3 from the Transport Research Laboratory (TRL) report *'Converting the UK traffic noise index $L_{A10,18hr}$ to EU noise indices for noise mapping'* was used for predicting L_{night} noise levels. Method 3 uses daily traffic flow data converting predicted daytime noise levels ($L_{A10,18h}$) to night-time noise levels. This method was appropriate as there was nothing considered to be unusual in the proportionate traffic flow volumes for this route between daytime and night-time.

12.4.30 For the night-time noise assessment, only dwellings with a noise level over 55dB$L_{night,outside}$ are considered (as specified in HD 213/11). The assessment of impact magnitude for night-time noise follows the same method as the daytime and is required for the following scenarios:

- Do-Minimum scenario in the 2019 baseline year against the Do-Minimum scenario in the 2034 design year (long term); and
- Do-Minimum scenario in the 2019 design year against Do-Something scenario in the 2034 design year (long term).

12.4.31 HD 213/11 requires tabulated results of noise level changes, which summarise the number of dwellings and other noise sensitive receptors subject to noise changes corresponding to each magnitude of impact in both the short term (opening year) and long term (design year), for the daytime period. To evaluate the night-time effects, only the long term impacts need to be considered. In accordance with the method, these tables are completed with noise levels calculated for the façade with the least beneficial change in noise.

12.4.32 In addition, traffic noise nuisance reporting tables are also required. The noise nuisance level is calculated at the least beneficial facade of each dwelling in accordance with HD 213/11 methodology, and is presented in percentage bands relating to the change in percentage of people bothered by the noise change.

12.4.33 For the Do-Minimum scenario the change in 'steady state' nuisance between the baseline and future years is reported. For the Do-Something scenario, it is the highest increase in nuisance that occurs between the opening and future assessment years that is reported.

12.4.34 The results of all the assessments have been used to consider the requirement for noise mitigation. This is discussed in Section 12.11 which considers mitigation if appropriate to reduce or remove significant effects evaluated for the base Scheme. The resulting noise levels and residual significant effects following additional mitigation are assessed in Sections 12.12 and 12.13.

12.4.35 The determination of study area is based on the HD 213/11 guidance and detailed in Section 12.3.

12.4.36 This assessment has also taken into consideration the Environmental Noise Directive's (END) Noise Action Planning Priority Areas (NAPPA) study. These Priority Areas (PA) identify existing noise sensitive areas, i.e. residential, where noise exposure is shown to be particularly high, and where ameliorative measures should be considered a high priority. There are no identified NAPPA locations within the immediate study area of the Scheme.

Traffic noise impact evaluation

12.4.37 There is no established UK guidance which clearly defines criteria for the assessment of significant effects arising from road traffic noise. The response of people to noise is subjective and sensitivity to changes in traffic noise is therefore variable across the population. Given the variability of response and the potential for non-acoustic factors to influence perceptions of noise, any assessment of significance can only represent the general community response to traffic noise.

12.4.38 It is common practice to use the change in noise level climate brought about by a scheme as the basis for evaluating noise impacts (i.e. the impact of the Scheme on the pre-existing noise environment and the effects this may have on the receptors in that environment).

12.4.39 The scale or severity of any noise change, positive or negative, requires description to indicate the degree of impact. This leads to the common practice of defining noise change impact categories with an associated semantic scale.

12.4.40 HD 213/11 assigns magnitude of impact descriptors associated to different levels of noise change in the short and long term. These magnitude of impact descriptors are shown in Table 12.2 (short term) and Table 12.3 (long term). The different scales describe the more sensitive response described in HD 213/11 for short term changes in traffic noise, as opposed to the long term response to differences in steady state traffic noise.

Table 12.2: Classification of magnitude of impact in the short term under HD 213/11

Noise Change [dB(A)]	Magnitude of Impact in the short term
0	No change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5.0 +	Major

Table 12.3: Classification of magnitude of noise impact in the long term under HD 213/11

Noise Change [dB(A)]	Magnitude of Impact in the long term
0	No change
0.1 – 2.9	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
10.0 +	Major

12.4.41 The research cited by HD 213/11 states that even for those most sensitive to short term change in noise, a change of less than 1dB(A) is imperceptible and hence is a negligible impact on the environment. Equally, in the long term, a change of less than 3dB(A) is imperceptible and hence is a negligible impact on the environment.

Traffic noise significance – general

12.4.42 As discussed above, the effect of an impact on the noise environment would depend on the type of receptor subject to the impact.

12.4.43 Historically, the assessment of significant noise effects was often based on exceeding the Noise Insulation Regulations (NIR) qualification level (i.e. 68dB$L_{A10,18h}$). This is accepted as a very high level of external noise where the noise insulation provided by a closed, single-glazed window is insufficient to maintain internal noise levels that are consistent with quiet enjoyment of a property and restorative sleep.

12.4.44 HD 213/11 states that, following a change in traffic flow, perceptible changes have been reported in the short term for traffic noise changes as small as 1dB(A). This is based on research of community response to noise indicating that people can be more sensitive to the abrupt noise change soon after opening of a new or altered road. The guidance notes that this heightened sensitivity to noise change is a temporary effect and the longer term noise nuisance level after a number of years reverts to the 'steady state' level.

12.4.45 Other research suggests that the reported sensitivity to small changes in noise levels (less than 3dB) may be coloured by factors other than noise (Baughan & Huddart, 1993).

12.4.46 As required by HD 213/11, an assessment of the short term and long term change in noise levels comparing the Do-Minimum condition in the baseline year against the Do-Something condition, will be undertaken.

12.4.47 Whilst HD 213/11 does not advocate use of absolute noise levels as a means of assessing noise impact or effects on receptors, the IEMA, Guidelines for Environmental Noise Impact Assessment (Institute of Environmental Management and Assessment, 2014) notes that relying solely on noise change may not be always appropriate. There are two sets of circumstance that in particular warrant some further consideration:

- Already very noisy locations: Receptors may already be exposed to very high levels of noise from other sources and hence any increase in noise may be considered

unsatisfactory and hence additional effort may need to be made to reduce the projected noise increase; and

- Tranquil areas: In areas formally recognised for their tranquillity because of low noise levels, small increases in noise may again be considered significant.

Proposed traffic noise potential significance criteria for scheme

12.4.48 Arup has developed potential significance criteria for changes in road traffic noise at sensitive receptors. These are given below in Table12.4.

Table12.4: Assessment of magnitude and potential significance of impact

Change in Noise Level in the long Term (dB(A))	Initial Indicator of Significance
+5 or greater	Potentially significant increase
+3 to +4.9	
+1 to +2.9	Unlikely to be significant
+0.9 to -0.9	Not significant
-1 to -2.9	Unlikely to be significant
-3 to -4.9	Potentially significant decrease
-5 or less	

12.4.49 For residential receptors, the overall significance of the effect is assessed using professional judgement by considering not only the HD 213/11 noise impact criteria to determine potential significance, but also other factors, as discussed in Section 12.5.

Road traffic vibration

12.4.50 HD 213/11 recommends that the effects of vibration should also be considered where appropriate. In the case of ground-borne vibration, the likelihood of perceptible vibration being caused is particularly dependent upon the smoothness of the road surface. Research has shown that vibration levels caused by heavy vehicles travelling at 110kph over a 25mm hump (i.e. a large discontinuity consistent with poorly backfilled trench) could cause perceptible vibration at up to 40m from the road (Watts, 1990). This would infer that it is unlikely that significant levels of vibration would be generated at distances greater than this.

12.4.51 Also, with a newly laid road surface it is a requirement of new highway construction specification that the surface would be smooth and free from any discontinuities of this magnitude. Paragraph A5.26 of HD 213/11 states: '*Such vibrations are unlikely to be important when considering disturbance from new roads and an assessment would only be necessary in*

exceptional circumstances'. No such exceptional circumstances are envisaged for the Scheme and hence no impacts or effects from ground-borne vibration are predicted.

12.4.52 The HD 213/11 covers the potential for airborne noise, from heavy goods vehicles, to cause vibration nuisance close to main roads. As an indication of the scale of impact relative to noise effects, the guidance in HD 213/11 paragraph A6.21 states that for a given level of traffic noise exposure the percentage of people bothered very much or quite a lot by airborne vibration is 10% lower than the corresponding amount for noise nuisance. It is also noted in paragraph A6.21 that airborne vibration is expected to affect a very small percentage of people at exposure levels below 58dB$L_{A10,18h}$. Also, the significance of any change in airborne traffic vibration can be considered proportional to the significance of changes in traffic noise. As such the assessment of airborne vibration can be included within the assessment of airborne noise.

12.4.53 The impact of vibration effects is discussed further in Section 12.10.

12.5 Significance of Effect

12.5.1 All of the identified sources of noise and vibration will be evaluated to determine if there would be adverse impacts and the potential to cause significant effects according to the criteria described above.

12.5.2 If potentially significant effects are identified, the overall assessment of significance is evaluated using professional judgement based on the following factors:

Residential:

- the magnitude of the impact and effect identified (based on overall noise level and noise change);
- the number and grouping of adversely affected dwellings and shared open areas;
- the level and character of the existing noise environment;
- any unique features of the source or receiving environment in the local area;
- combined exposure to noise and vibration;
- duration of impact and effect (for construction); and,
- the effectiveness of mitigation measures that could avoid or reduce the adverse effects.

Non-residential:

- the generic use (e.g. outdoor amenity, educational, healthcare, religious buildings or community uses) and hence relevant guidance on noise;
- the times of use;
- the design of the receptor (especially windows, doors and ventilation systems) and hence ability of receptor to experience changes in external noise environment without significant change in internal noise conditions);
- the layout - whether the most sensitive parts of the building are closest to and face the Scheme, or are located further from the scheme and are on the opposite side of a building;
- duration of impact and effect (for construction); and,
- the effectiveness of mitigation measures that could avoid or reduce the adverse effects.

12.5.3 The sensitive receptors considered for this assessment are shown in ES Volume 2, Figure 12.1.

12.6 Receptor Sensitivity

12.6.1 To the north of the scheme most of the dwellings within the study area are close to the east side of the bridge (Pont-ar-Ddyfi), although there are some residences approximately 130m east of the bridge (Ffridd Farm). Further east, there are also residences beyond the Millennium Cycle Bridge over the river as the A487 turns to the north. Residential receptors are categorised as high sensitivity with regard to noise. The river is used by anglers, and the riverside paths used by walkers and cyclists. National Parks (as is the area north of the river) are designated as sensitive in HD 213/11. These non-residential receptors are categorised as medium sensitivity.

12.6.2 At the southern end of the Scheme is the Dyfi Eco Park which accommodates a range of commercial and amenity buildings. This is categorised as low sensitivity. Further south, but north of the railway, there are two dwellings close to Dyfi Eco Park and the railway. South of the railway, the closest dwellings in Machynlleth are approximately 200m from the Scheme at its closest point. These residential receptors are categorised as high sensitivity.

12.7 Limitations of the Assessment

Construction

12.7.1 The assessment considers construction noise and vibration on a month-by-month basis; this is based on representative

construction methods suitable for this assessment (processes described in Volume 3, Appendix 12.3). Noise levels would vary day-to-day; the highest daily levels may sometimes be around 5dB higher than the monthly average levels but would then be substantially lower on other days in that month. Noise and vibration from all construction activities, including short duration activities, is subject to control under the Construction Environmental Management Plan (CEMP) (see Volume 3 Appendix 17.1). Hence minimisation of noise as far as practicable is agreed with the relevant local authority by consent under the *Control of Pollution Act 1974* before the works can commence on site.

Operation

12.7.2 The effects of noise and vibration from the operation of the Scheme have been assessed based on traffic modelling (detailed results are presented in Volume 2, Figures 12.1 to 12.3 and in Sections 12.10 and 12.13). Other developments may affect the predicted traffic using the scheme and these have, as far as possible, been included within the scheme traffic data on the basis of assumed dates for committed developments to be operational. It is likely that the changes in impact associated with any variability in programme for committed developments would be negligible in terms of predicted traffic noise levels.

12.7.3 There would be regular planned maintenance work along the route. Given the infrequent, irregular and short duration of works likely to cause appreciable noise or vibration, maintenance work is considered unlikely to give rise to significant noise or vibration effects.

12.8 Baseline Conditions

12.8.1 Appendix 12.2 in Volume 3 shows a plan of the survey locations around the study area which highlights the noise sensitive areas as described in the following. Traffic travelling over the river (Afon Dyfi) from the north of Machynlleth currently passes over the Pont-ar-Ddyfi near residential properties on the north bank of the river. Most of these properties are close to the east side of the Pont-ar-Ddyfi, although there are some residences approximately 130m further east (Ffridd Farm). Approximately 500m east of the Pont-ar-Ddyfi, where the Scheme would connect to the existing A487, the Millennium Cycle Bridge crosses the river just south of the existing road as part of National Cycle Route 8. From the Millennium Cycle Bridge, this route continues west along the south river bank to join with the Pont-ar-Ddyfi. Other than the residential uses, the river is used by anglers, and the riverside paths used by walkers and cyclists.

Open space used for recreational purposes is considered as a sensitive receptor in accordance with HD 213/11.

12.8.2 Road traffic noise, combined with the noise of the river, affect dwellings and the public paths near to the river.

12.8.3 At the southern end of the Scheme is the Dyfi Eco Park which accommodates a range of mainly commercial and amenity buildings. Further south, over the railway, the closest dwellings in Machynlleth are mostly 200m from the Scheme at its closest point (there is a dwelling alongside the station). Noise levels here are affected by local traffic noise and noise from the railway.

12.8.4 As noted in Section 12.4.36, there are no identified NAPPA locations within the immediate study area of the Scheme.

12.8.5 A noise survey was undertaken to establish baseline noise levels in the vicinity of A487 New Dyfi Bridge, and performed in accordance with the 'Shortened measurement procedure', described in paragraph 43 of CRTN. Full details of the survey are provided in Volume 3, Appendix 12.2.

12.8.6 A baseline noise survey is recommended as part of the HD 213/11 Detailed assessment procedure. The guidance also notes that:

'During the assessment process, measurements should not routinely be compared with calculations for the purpose of predicting changes in noise level. There is currently no methodology available to take account of the potential errors associated with comparing measurements with calculations, especially when the receptor is some distance from the noise source.'

12.8.7 The purpose of the baseline noise survey was to provide data on noise climates at a sample of locations to supplement the traffic noise predictions and to provide baseline data for the construction noise assessment. The survey was also considered important to determine if any parts of the study area are dominated by noise from sources other than traffic noise, in which case the prediction results would not accurately reflect noise levels in that area.

12.8.8 It should be noted that, even where the noise climate is dominated by roads, some variance between existing measured noise levels and predicted noise levels for the future baseline year prior to opening of the Scheme would be expected. This might be due to differences in traffic flow levels between the present and the baseline year or meteorological conditions at the time of the survey.

12.8.9 The range of measured daytime values during the survey are presented in Table 12.5. Detailed results and the survey method

are reported in Volume 3, Appendix 12.2 along with a plan of the survey locations.

12.8.10 Measurements were made at nine locations within the scheme assessment area. These were selected to represent the nearest residential receptors on the north bank of the river and the riverside path and cycle route. Other noise sensitive receptor locations surveyed include the closest residential properties to the south of the proposed scheme. A noise logger was also used to capture baseline noise over a 24 hour period near to the railway. The exact locations were as follows:

- **Location 1** (attended) – on the north side of the proposed road scheme, in line with the front façade of "Corris House" on the A487;
- **Location 2** (attended) – on the north boundary of the proposed road scheme, on a driveway leading to a row of houses set in to the hillside (Ffridd Farm) next to the A487;
- **Location 3** (attended) – on the north side of the proposed road scheme, located just to the edge of a farm access driveway approx. 5m from the edge of the A487;
- **Location 4** (attended) – on the north side of the proposed road scheme, on the pavement running parallel to the river (Afon Dyfi) leading to the Millennium Cycle Bridge;
- **Location 5** (attended) – on the south side of the proposed road scheme, located in the car park of the dis-used Powys UK garden centre, approximately 35m east from the edge of the existing A487;
- **Location 6** (unattended logger) – on the top of the hill overlooking Machynlleth and the river (Afon Dyfi) and its floodplains to the east /west;
- **Location 7** (attended) – on the hillside overlooking Machynlleth and the river (Afon Dyfi) and its floodplains to the east;
- **Location 8** (attended) – on the pavement next to No.5 Ffordd Mynydd, Griffiths Road, Machynlleth; and
- **Location 9** (attended) – on the grass bank next to the car park of the Mid Wales Storage Centre Limited facility approximately 3m east from the edge of the A487.

Table 12.5: Measured daytime baseline noise levels

Location (see survey location plan - Volume 3, Appendix 12.2)	Measured noise levels (dB)		
	$L_{A90, 10\ min}$	$L_{A10, 10\ min}$	$L_{Aeq, 10\ min}$
1	57	70-72	64 – 69
2	55	75-78	68 – 70
3	51-52	73-75	67
4	49	58 – 62	54 – 68
5	48	59 – 62	56 - 60
6 (unattended)	42	51 - 66	48 – 62
7	46	55 – 61	53 – 58
8	43	52-54	50-51
9	49	69 – 71	65 - 68

12.9 Assessment of Potential Construction Effects – Before Mitigation

Construction Noise

12.9.1 For the purposes of assessment, the site preparation and construction works have been divided into the following generic stages for A487 New Dyfi Bridge Scheme works, which each represent distinct activities in terms of noise impact (Appendix 12.3 in Volume 3 describes the plant machinery assumed for the assessment):

- Site establishment (less than one month);
- Section 1: Machynlleth Tie-in;
- Section 2: Machynlleth Embankment;
- Section 3: Viaduct;
- Section 4: Afon Dyfi River Bridge; and
- Section 5: Afon Dyfi Tie-in.

12.9.2 The timetable and phasing of works is assumed to be as given in Appendix C of the A487 Dyfi Bridge - Key Stage 6 Tender Programme document.

12.9.3 In relation to noise and vibration, it has been assumed that standard construction management measures (Best Practicable Means – BPM) would be implemented as part of the construction

works. This requires that all reasonable measures are taken to minimise construction noise and vibration (as specified in Annex B of BS 5228). In particular, the contractor would be required to operate in accordance with the provisions of a Construction Environmental management Plan (CEMP) for the works for agreement with the local authority. This is a 'good practice guide' which includes measures which would be adopted to minimise the likelihood of significant disturbance to neighbouring properties. The construction noise assessment has been based on such Best Practicable Means assumptions. A pre-CEMP is provided as part of the Environmental Management Plan in Chapter 17 of this Environmental Statement.

12.9.4 Night-time construction would be avoided for the majority of the proposed works, however, night-time working may be required for specific activities. An example of a specific activity would be tie-in works, i.e. joining existing to new road, where night-time working is likely to be required for road traffic management reasons to avoid daytime road closures. Such works are considered exceptional and would likely only occur for one or two contiguous nights at intervals throughout the works. Any such night-time works would not be considered a significant effect due to their short term impacts. Any noise effects arising from these short term construction activities would be controlled by the management processes set out in the CEMP (Volume 3 Appendix 17.1) and as described above.

12.9.5 Daytime construction noise levels at the nearest sensitive receptors have been predicted based on the relevant construction plant, propagation distances, screening, on times and programme. The receptor locations are represented by the baseline survey locations shown in the survey location plan - Volume 3, Appendix 12.2. The locations are also described above in Paragraph 12.8.10.

12.9.6 The results of the assessment of construction noise at the Scheme are presented in Table 12.6 and Table12.7. The tables show the predicted typical monthly construction noise levels for each of the construction stages described above.

Table 12.6: Phases of construction and predicted noise levels at residential locations.

Location (see survey location plan - Volume 3, Appendix 12.2)	**Baseline**			**Construction noise assessment**		
	Ambient noise level *, $dBL_{Aeq, daytime}$	**ABC method category (BS 5228)**	**ABC threshold, $dBL_{Aeq,daytime}$**	**Typical/highest monthly predicted construction façade noise level,**	**Number of months typical monthly construction noise levels exceed ABC threshold**	**Construction activities resulting in construction noise levels exceeding ABC threshold**
1 Corris House	70	C	75	54 / 62	-	-
2 Ffridd Farm	71	C	75	55 / 63	-	-
3 Farm access north of Millennium Cycle Bridge	70	C	75	55 / 67	-	-
6 Hillside south of station	62	A	65	41 / 57	-	-
7 Hillside, east edge of Ffordd Mynydd Griffiths	58	A	65	39 / 47	-	-
8 No.5 Ffordd Mynydd Griffiths	58	A	65	40 / 52	-	-
9 Mid Wales Storage	69	C	75	49 / 63	-	-

Location (see survey location plan - Volume 3, Appendix 12.2)	Baseline			Construction noise assessment		
	Ambient noise level *, $dBL_{Aeq, daytime}$	ABC method category (BS 5228)	ABC threshold, $dBL_{Aeq,daytime}$	Typical/highest monthly predicted construction façade noise level,	Number of months typical monthly construction noise levels exceed ABC threshold	Construction activities resulting in construction noise levels exceeding ABC threshold
Centre, A487						

* Noise level includes correction for façade acoustic reflection (i.e. noise level at 1m from façade)

12.9.7 For the residential receptors shown in Table 12.6, the BS 5228 ABC threshold for potential significant effects is not exceeded at any of the closest residential properties around the A487 New Dyfi Bridge. As such, likely effects are assessed as not significant at residential properties.

12.9.8 The results for the nearest non-residential receptors are shown in Table12.7.

Table12.7: Phases of construction and predicted noise levels at non-residential locations

Location (see survey location plan - Volume 3, Appendix 12.2)	Type of receptor	Ambient noise level, $dBL_{Aeq, daytime}$	Construction noise assessment	
			Typical/highest monthly predicted construction free-field noise level, $dBL_{Aeq,daytime}$	Construction activity resulting in highest construction noise levels
4	Riverside Footpath	55	55 / 63	Viaduct - Earthworks Viaduct - Surfacing Afon Dyfi River Bridge - Earthworks
5	Dyfi Eco Park Commercial /Industrial/ Office	58	53 / 69	

12.9.9 Location 4 represents noise levels midway along the foot and cycle path on the south side of the river (Afon Dyfi) between the Pont-ar-Ddyfi and the Millennium Cycle Bridge. Typical predicted construction noise levels at this location on the footpath do not exceed the ambient noise level. However, the highest construction noise levels are predicted to be more than 5dB above the ambient noise for three months. BS 5228-1, Annex E.3.3 notes that:

For public open space, the impact might be deemed to cause significant effects if the total noise exceeds the ambient noise ($L_{Aeq, T}$) by 5 dB or more for a period of one month or more. However, the extent of the area impacted relative to the total available area also needs to be taken into account in determining whether the impact causes a significant effect.

12.9.10 This temporary adverse impact is only expected to occur on the eastern half of this particular section of riverside path (i.e. between the Pont-ar-Ddyfi and the Millennium Cycle Bridge). Construction noise levels at the west end of this section of path are not expected to exceed 5dB above ambient levels at any point.

12.9.11 As such, the riverside path, which, as an overall amenity extends well beyond the Pont-ar-Ddyfi and the Millennium Cycle Bridge to the west and east respectively, is only affected by construction noise levels more than 5dB above the ambient noise for a small proportion of its length immediately around the works. Hence, overall, most of the footpath is not expected to have adverse impacts 5dB above the ambient noise due to construction noise, and therefore likely effects are assessed as **not significant** for the riverside path during this three month period.

12.9.12 The non-residential properties represented by location 5 are commercial and industrial. Typical predicted construction noise levels are below the ambient noise level at these properties, however the ambient noise level is predicted to be exceeded for four months. The most noise sensitive operations in these properties are considered to be offices. BS 8233 recommends noise levels of 45 – 50dBL_{Aeq} in open plan offices. Considering a conservative level difference of 25dB through the building envelope with windows closed, the threshold for noise break in to exceed these recommended levels is 70 – 75dBL_{Aeq}. The highest predicted construction noise level does not exceed this threshold therefore impacts are assessed as **not significant**.

Construction Vibration

12.9.13 Based on the types of process assumed for this assessment, there are no activities likely to create high levels of vibration (e.g. piling or heavy vibratory plant) in close proximity to sensitive

receptors. As noted in Section 12.4 a complaint is likely where levels occur above 1.0mm/s PPV at residential properties but this exposure can be tolerated if prior warning and explanation has been given to residents (BS 5228: Part 2). It is not expected that vibration above this level will be generated for any sustained period from the construction works. Construction vibration effects are assessed as **not significant**.

12.10 Assessment of Potential Operational Effects – Before Mitigation

12.10.1 As previously described, the EIA Scoping conducted for the Scheme identified that the Scheme should be taken forward for a HD 213/11 Detailed Assessment.

12.10.2 The noise effects associated with changes in lane alignment geometries (or new traffic lanes) are considered below. This Section is concerned with the assessment of changes to the existing noise climate as a direct result of the Scheme without mitigation. This assessment has been carried out in accordance with the HD 213/11 assessment procedure and includes:

- an assessment of the daytime and night-time noise impacts and effects of the Scheme with respect to changes to the existing noise climate;
- results of the Noise Insulation Regulations (NIR) assessment; and
- an assessment of operational ground-borne vibration impacts associated with the Scheme.

Noise Assessment

12.10.3 Daytime and night-time traffic noise levels within the Scheme study area have been predicted in accordance with the methodology set out in Section 12.4. Noise level predictions have been made for Do-Something and Do-Minimum scenarios in both the opening year (2019) and future year (2034).

12.10.4 Volume 3, Appendix 12.4, lists the noise levels predicted at all dwellings and sensitive receptors within the study area for all scenarios. The magnitude of noise change that would occur for each receptor can be determined simply by comparing the results between the various scenarios predicted. The magnitude of noise change is also shown graphically in the noise level difference contours described below. The noise change magnitude bands correspond to the classification of magnitude of impact shown in Tables 3.1 and 3.2 of HD 213/11. The magnitude of noise change classifications are also described for

each area of the Scheme for the baseline and future years as part of the assessment text later in this section.

12.10.5 The following Volume 2 Figures 12.2 to 12.4 show predicted daytime traffic noise levels represented in noise level contour maps:

- Figure 12.2: Do-Minimum scenario in the 2019 baseline year against the Do-Minimum scenario in the 2034 future assessment year (long term);
- Figure 12.3: Do-Minimum scenario in the 2019 baseline year against the Do-Something scenario in the 2019 baseline year (short term); and
- Figure 12.4: Do-Minimum scenario in the 2019 baseline year against Do-Something scenario in the 2034 future assessment year (long term).

12.10.6 The following Volume 2 Figures 12.5 and 12.6 show predicted night-time traffic noise levels represented in noise level contour maps:

- Figure 12.5: Do-Minimum scenario in the 2019 baseline year against the Do-Minimum scenario in the 2034 future assessment year (long term); and
- Figure 12.6: Do-Minimum scenario in the 2019 baseline year against the Do-Something scenario in the 2034 future assessment year (long term).

12.10.7 The following assessment considers noise impacts and effects for both daytime and night-time periods in accordance with HD 213/11 procedure.

12.10.8 The assessment of the magnitude of daytime noise change impact has been made based on changes in the noise climate between opening year (2019) without the Scheme and the opening year with Scheme, and opening year without the Scheme and the future year (2034) with the Scheme.

12.10.9 The assessment of the magnitude of night-time noise change impact has been made based on changes in the noise climate between opening year without the Scheme (2019) and the future year (2034) with the Scheme.

12.10.10 Subsequently an assessment of the effects for both daytime and night-time has been made. This describes whether the noise effects in an area affected by the Scheme are rated as significant or not, based on the criteria described in Section 12.5.

Daytime

12.10.11 Based on the noise modelling results, Table 12.8 and Table 12.9 give a summary of noise level changes as a result of the Scheme

at dwellings and other sensitive receptors in the short and long term across the entire study area. The noise change bands shown in each table correspond to the DMRB HD 213/11 classification of magnitude of impact at each receptor shown in Table 12.2 and Table 12.3.

12.10.12 In general, the tables show that most dwellings are in the 'negligible' noise increase or 'no change' bands. There are more dwellings in the negligible noise increase band in the future assessment year due to traffic growth between opening and future years with the Scheme. It should be noted that a similar traffic growth would have occurred in the absence of the Scheme. In the short term, there would be more beneficial impacts, including 12 minor beneficial impacts, than in the long term. Again, this is due to the increase in traffic flows in the future year diminishing the initial noise reductions.

12.10.13 All 'other' sensitive receptors (i.e. terminology in DMRB to refer to non-residential sensitive receptors) have negligible impacts in the short and long term.

Table 12.8: Short term noise reporting table (HD 213/11 Table A1.1)

Project/Option: A487 New Dyfi Bridge **Scenario/Comparison: Do-Something unmitigated 2019 compared to Do-Minimum 2019**				
Change in noise Level		DMRB Impact category (short term)	Daytime	
			Number of Dwellings	Number of 'other' sensitive receptors
Increase in noise level, $L_{A10,18h}$ dB	0.1 – 0.9	Negligible	200	4
	1 – 2.9	Minor adverse	5	0
	3 – 4.9	Moderate adverse	0	0
	5 +	Major adverse	1	0
No Change	0	Negligible	204	3
Decrease in noise level, $L_{A10,18h}$ dB	0.1 – 0.9	Negligible	23	0
	1 – 2.9	Minor beneficial	13	0
	3 – 4.9	Moderate beneficial	0	0
	5 +	Major beneficial	0	0

Table 12.9: Long term traffic noise reporting table (HD213/11 Table A1.2)

Project/Option: A487 New Dyfi Bridge **Scenario/Comparison: Do-Something unmitigated 2034 compared to Do-Minimum 2019**					
Change in noise Level		DMRB Impact category (long term)	Daytime		Night-time
			Number of Dwellings	Number of 'other' sensitive receptors	Number of Dwellings
Increase in noise level, $L_{A10,18h}$ dB	0.1 – 2.9	Negligible	430	7	41
	3 – 4.9	Minor adverse	2	0	0
	5 – 9.9	Moderate adverse	1	0	0
	10 +	Major adverse	0	0	0
No Change	0	Negligible	0	0	0
Decrease in noise level, $L_{A10,18h}$ dB	0.1 - 2.9	Negligible	13	0	2
	3 - 4.9	Minor beneficial	0	0	0
	5 - 9.9	Moderate beneficial	0	0	0
	10 +	Major beneficial	0	0	0

12.10.14 The daytime noise level difference maps, Volume 2, Figures 12.2 to 12.4, show the changes in the noise climates between the Do-Something scenarios for years 2019 and 2034 and Do-Minimum scenario 2019 and 2034. Using the information from these figures, the following is a detailed assessment identifying specific noise impacts and effects around the Scheme.

12.10.15 Volume 2, Figure 12.2 shows that noise increases would occur in the future year in the absence of the Scheme due to traffic growth. From the noise change contour map it can be seen that these increases would occur in the 0.1 to 2.9dB increase band[1] in the future year. Within this change band the noise increases are typically just below 1dB. This sets the context against which the future year noise increases with the Scheme are considered below; i.e. part of the noise increase would have occurred in the absence of the Scheme.

North of Scheme

12.10.16 To the north of the Scheme it can be seen that the re-alignment reduces the road traffic noise at those properties close to the existing A487 near the Pont-ar-Ddyfi. In the opening year with the scheme (Figure 12.3 in Volume 2), there are dwellings subject to 1.0dB to 2.9dB reductions (minor beneficial impact). In the future assessment year (Figure 12.4 in Volume 2) reductions in the 0.1 to 2.9dB reduction contour band would occur (negligible impact) when compared to the without scheme situation. In addition to the realignment, the introduction of a proposed traffic calming narrowing in front of these dwellings would potentially reduce the mean speed of passing traffic and hence reduce noise further (relative to the conservative mean speed assumption used in the noise model for this location).

12.10.17 Despite the predicted noise reductions, these beneficial impacts are assessed as a **not significant** effect based on the potential significance criteria shown in Table12.4. It is not considered that there would be any worsening of stop / start 'character' noise associated with the traffic calming narrowing relative to the existing situation, in fact the number of these events is likely to be fewer. This is because, currently, the larger proportion of vehicles travelling on the A493 and A487 on the north side of the river would either make the turn onto, or from the bridge - hence necessitating a stop / start manoeuvre adjacent to the properties directly opposite the junction.

[1] Note that HD 213/11 specifies different ranges of noise change band for opening and future years, as shown above in
Table 12.8 and

Table 12.9.

12.10.18 Further east, where the Scheme re-joins the existing A487 alignment, there are two dwellings, one immediately to the west of the road (Fferm Y FFridd), and one to the east of the A487 (Glan-fechan). These closest dwellings to the proposed re-alignment would be subject to noise increases as a result of their exposure to the Scheme. In the opening year, the dwelling on the west side would be subject to an increase in the 5.0dB+ contour band (major adverse impact) and in the future year increases in the 5.0dB to 9.9dB contour band (moderate adverse impact). On the east side of the road, the dwelling would be subject to an increase in the 1.0dB to 2.9dB contour band (negligible adverse impact) in the opening year, and an increase within the 3.0dB to 4.9dB band in the future year (minor adverse impact).

12.10.19 For these noise increases, it is considered that it is not sustainable in cost-benefit terms to provide mitigation for these two separated dwellings. For example, to provide even a perceptible benefit of 3dB on just the west side (Fferm Y FFridd) relative to the unmitigated situation, a 4m high noise screen of approximately 150m in length along the northern part of the scheme would be required. Also, the resulting noise level with the unmitigated scheme in the future year would only just exceed 50dB$L_{Aeq,\ daytime}$. Even with partially open windows, this would be expected to result in an internal noise level of approximately 35dB$L_{Aeq,\ daytime}$. The desirable guideline noise level given in BS 8233 for living rooms is 35dB$L_{Aeq,\ daytime}$. The resulting noise levels on the east side (Glan-fechan), would be less. Given that these are two isolated properties and not a larger community of dwellings, and the resulting noise exposure is relatively low, the noise impact is assessed as a **not significant** effect.

12.10.20 Approximately 800m west of the Pont-ar-Ddyfi along the A493 there is one property on the hillside (Cwm gila) subject to noise increases as a result of its exposure to the realigned scheme. In the opening year, this would be subject to noise increases in the 0.1dB to 0.9dB contour band (negligible adverse impact) and in the future year increases in the 0.1dB to 2.9dB band (negligible adverse impact). This is assessed as a **not significant** effect.

12.10.21 The Snowdonia National Park lies to the north of the existing A487 and noise levels are predicted to increase as a result of the Scheme. Despite moving the source of road traffic noise further away, the southern slopes of the hill would be more exposed to the new alignment, relative to the existing road which is close to the base of the hill and hence largely screened from the upper hillside. The noise increases would be greater than 5dB in the most exposed areas in the opening year, and between 5.0 and 9.9dB in the future year. However, the resulting noise levels on the hillside would be below 55dBL_{Aeq} (i.e. the WHO guideline

noise level for outdoor living areas) for most of the hillside with the exception of areas closest to the road. This guideline noise level is often applied for outdoor amenity areas (WHO 1999). The areas affected by these largest noise increases are not located close to footpaths and are not likely to be used as leisure amenity areas given the nature of the terrain. Hence this is assessed as a **not significant** effect.

12.10.22 On the north side of the proposed road scheme, on the footpath/cycle path along the river (Afon Dyfi) leading to the Millennium Cycle Bridge, the predicted noise levels show reductions in noise level at the western end near the Pont-ar-Ddyfi, and increases in noise closer to the Scheme at the eastern end near the Millennium Cycle Bridge. In the opening year the increases around the realignment are in the 5.0+dB contour band; in the future year the increases along the footpath are predominantly in the 5.0 to 9.9dB contour band. The resulting noise levels are below the WHO 55dBL_{Aeq} guideline noise, except areas immediately next to the Scheme. Given the proportions of the path length affected for this amenity area and the levels of noise predicted, this is assessed as a **not significant** effect.

South of Scheme

12.10.23 To the south of the Scheme, there are three dwellings closest to the southern end of the realignment that would be subject to the largest noise changes relative to more distant properties. These are described below.

12.10.24 The northernmost of the properties (designated as residential) is at the western boundary of the Dyfi Eco Park. Just south of the railway there is a dwelling on the west side of the station building which overlooks the railway and the Dyfi Eco Park towards the Scheme. Further south there is a property just off Ffordd Mynydd Griffiths which is elevated above the station on the hillside, again with an angle of view across the Scheme.

12.10.25 In the opening year, the dwelling at the Dyfi Eco Park would be subject to noise level reductions in the -2.9dB to -1dB contour band due to the realignment of the highway and increased distance from the Scheme (moderate beneficial impact). In the future year the reductions would be in the -2.9dB to -0.1dB band (negligible beneficial impact). In the opening year, the dwelling on the west side of the station building would be subject to noise level increases in the 1.0dB to 2.9dB band (minor adverse impact). In the future year the increase would be in 0.1dB to 2.9dB contour band (negligible adverse impact). The property on the northwest edge of Ffordd Mynydd Griffiths overlooking the station and the Scheme would be subject to noise level increases in the 1.0dB to 2.9dB band (minor adverse impact). In the future

year, the increase would be in the 3.0dB to 4.9dB contour band (minor adverse impact). Based upon the levels of impact and the number of properties affected, this is assessed as a **not significant** effect.

12.10.26 Further southeast in the Ffordd Mynydd Griffiths residential estate, the dwellings here are substantially screened from the Scheme by the rising hillside along the south side of the railway. Consequently these dwellings would be subject to smaller noise increases from the Scheme. These increases in the opening year would be in the 0.1dB to 0.9dB contour band[2] (negligible adverse impact) and 0.1dB to 2.9dB band (negligible adverse impact) in the future year. This is assessed as a **not significant** effect. Dwellings elsewhere in the town would have no noise change in the opening year and increases in the 0.1dB to 2.9dB band in the future year. This is assessed as a **not significant** effect.

12.10.27 The non-residential noise sensitive receptors shown in Figure 12.1, Volume 2 fall within the 0.1dB to 2.9dB increase band in the future year. Within this change band the noise increases are typically just below 1dB. This is assessed as a **not significant** effect.

12.10.28 Based on the predicted noise levels there are no dwellings that are eligible for noise insulation under the Noise Insulation Regulations.

Night-time

12.10.29 DMRB HD 213/11 requires an assessment of the long term noise impacts at night. The long term change, Do-Something 2034 compared to Do Minimum 2019, is presented in Volume 2, Figures 12.5 and 12.6.

12.10.30 Whilst the A487 forms part of the Wales Trunk Road Network, it is not a major freight route, and traffic analysis shows that at present for the Do Minimum scenario, it is not heavily trafficked by heavy goods vehicles (HGVs), nor is it forecasted to increase significantly with the Do Something scenario scheme in place. That being the case, the ratio of HGV movements during the night-time period would also be unlikely to change significantly between the current Do Minimum and Do Something scenarios.

12.10.31 Consequently, it is considered that night time noise effects will be **not significant**.

Nuisance Assessment

12.10.32 As part of the HD 213/11 Detailed Assessment, noise nuisance and airborne vibration nuisance reporting tables are required. Nuisance level is presented as the percentage of people

[2] With one exception at 1.0dB increase.

bothered by traffic noise. The method of calculating nuisance level is described in the HD 213/11. The tables show the change in the percentage of people bothered by traffic noise at dwellings for the Do-Minimum and Do-Something scenarios. This has been reproduced in this assessment as Table 12.10 for noise and Table 12.11 for airborne vibration.

12.10.33 Again, it should be noted that no significant effects have been assessed**.**

12.10.34 Table 12.10Within Table 12.10, in the Do-Minimum column the nuisance level presented represents the change in percentage of people bothered by 'steady state' traffic noise calculated for Do-Minimum opening and future years. In the Do-Something column the nuisance level presented is the greatest change in percentage of people bothered by traffic noise relating to either; the change in 'steady state' noise levels between the Do-Minimum opening and Do-Something future years; or the short term change in noise levels between Do-Minimum and Do-Something opening scenarios.

Noise Nuisance

12.10.35 Again, it should be noted that no significant effects have been assessed**.**

12.10.36 Table 12.10 gives the change in percentage of people bothered by traffic noise at all dwellings within the calculation area for Do-Minimum and Do-Something scenarios.

12.10.37 For the Do-Minimum scenario, all the dwellings are shown to have an increase in nuisance level of less than 10%. This is to be expected as traffic flows generally increase by a relatively small amount between opening and future years.

12.10.38 In the Do-Something scenario the majority of dwellings have a change in the percentage of people bothered of less than 10%, however there are 91 dwellings with increases in nuisance of between 10% and 20%. Just six dwellings are in higher nuisance bands but all are <40%. A total of 13 dwellings have a decrease in nuisance level associated with areas where traffic noise would be reduced due to the realigned Scheme. These noise reductions would correspond to a reduction in the percentage of people bothered by traffic noise of less than 10%.

12.10.39 In summary, the Do-Something scenario shows a proportion of dwellings with higher increases in nuisance level relative to the Do-Minimum scenario. However, the Do-Something scenario also shows a small proportion of dwellings with a decrease in nuisance level. These dwellings are located close to the existing alignment (near Pont-ar-Ddyfi) where traffic flows would reduce

and hence noise levels would diminish. Again, it should be noted that no significant effects have been assessed.

Table 12.10: Traffic noise nuisance reporting table (DMRB Table A1.3)

Change in Nuisance Level		Do-Minimum	Do-Something
		Number of Dwellings	Number of Dwellings
Increase in nuisance level	< 10%	444	336
	10 < 20%	0	91
	20 < 30%	0	5
	30 < 40%	0	1
	> 40%	0	0
No Change	0%	2	0
Decrease in nuisance level	< 10%	0	13
	10 < 20%	0	0
	20 < 30%	0	0
	30 < 40%	0	0
	> 40%	0	0

Airborne Vibration Nuisance

12.10.40 HD 213/11 notes that the relationship between the percentage of people bothered very much or quite a lot by airborne vibration is similar to that for noise nuisance, except that the percentage of people bothered by vibration is lower at all exposure levels by 10%. It is also noted that on average, traffic induced vibration affects a very small percentage of people at exposure levels below 58dBL_{A10} and therefore 0% should be assumed in these cases.

12.10.41 Table 12.11 gives the change in percentage of people bothered by airborne vibration at all dwellings within the study area for Do-Minimum and Do-Something scenarios. In accordance with the HD 213/11 guidance, airborne vibration nuisance is only considered for dwellings in the calculation area within 40m of a road, hence the sample of dwellings is smaller than that for the airborne noise nuisance analysis.

12.10.42 For the Do-Minimum scenario all the dwellings included in this analysis are shown to either have an increase in airborne vibration nuisance level of less than 10% or no change in nuisance level. There are no dwellings with a decrease in airborne vibration nuisance level.

12.10.43 In the Do-Something scenario, the majority of dwellings have a change in nuisance levels of less than 10% or no change in nuisance level. There are seven dwellings with increases in nuisance level across the 10% to 30% bands, and 13 dwellings with a reduction in nuisance level of less than 10%.

12.10.44 The Do-Something scenario shows seven dwellings in higher airborne vibration nuisance bands than the Do-Minimum scenario, but also shows some dwellings with a decrease in nuisance level.

Table 12.11: Traffic airborne vibration nuisance reporting table (DMRB Table A1.4)

Change in Nuisance Level		Do-Minimum	Do-Something
		Number of Dwellings	Number of Dwellings
Increase in nuisance level	< 10%	125	124
	10 < 20%	0	5
	20 < 30%	0	2
	30 < 40%	0	0
	> 40%	0	0
No Change	0%	74	55
Decrease in nuisance level	< 10%	0	13
	10 < 20%	0	0
	20 < 30%	0	0
	30 < 40%	0	0
	> 40%	0	0

Assessment of Affected Routes beyond the Calculation Area

12.10.45 There are no affected links within the 1km to 2km area from the Scheme. Consequently noise impacts within this area are considered to be negligible and changes in noise level are assessed as **not significant**.

Cumulative effects

Predicted changes in traffic flows have included any effects of other committed developments on the local road network and these total traffic flows have been included in noise models. Therefore, the assessment includes cumulative traffic noise effects.

Ground-borne Vibration Assessment

12.10.46 No ground-borne vibration impacts are forecast. This is because, in accordance with highway construction standards, the surface of the proposed upgraded roads would be smooth with no surface irregularities of sufficient size to generate significant levels of ground-borne vibration. It is a standard requirement under the specification for new highways that the new road surfaces would be free of significant discontinuities. The size of irregularities necessary to cause perceptible ground-borne vibration is only expected in 'exceptional circumstances' as discussed in Section 12.4.50. It is not considered that any such exceptional circumstances would arise during operation of the Scheme.

12.11 Mitigation and Monitoring

Construction Mitigation

12.11.1 Best Practicable Means mitigation is assumed to control construction noise in the form of low noise emission plant and processes (as specified in BS 5228-1 Annex B - Noise sources, remedies and their effectiveness). Based upon the construction noise assumptions, the assessment has shown that there is unlikely to be the potential for temporary significant noise effects around the Scheme. These are conservative assumptions (i.e. worst-case) for the purpose of this assessment.

12.11.2 Further information on construction noise control and monitoring is provided in the Pre-CEMP in Volume 3 Appendix 17.1.

Operational Mitigation

12.11.3 No significant operational effects were indicated from the assessment based upon the noise change impacts, therefore no additional mitigation is proposed.

12.12 Assessment of Construction Effects – With Mitigation

12.12.1 Based upon the construction noise and vibration assumptions, the assessment has shown that it is unlikely that there would be temporary significant noise effects around the Scheme. Therefore, no residual significant effects are identified.

12.13 Assessment of Operational Effects – With Mitigation

12.13.1 No significant operational effects were indicated from the assessment based upon the noise change impacts, therefore, no residual significant effects are identified.

12.14 Assessment of Cumulative Effects

12.14.1 No other developments have been identified which could generate cumulative effects with the Scheme during the construction or operation phase.

12.15 Inter-relationships

12.15.1 The effects of noise and vibration associated with the construction and operation of the Scheme may also give rise to other impacts, including detrimental impacts on nature conservation. The impacts upon these receptors, as a result of the Scheme's construction and operation, are considered within the relevant sections of the ES: Nature Conservation (Chapter 9).

12.16 Summary of Effects

12.16.1 This chapter has described the standard methodologies applied to assess the noise and vibration effects associated with the Scheme according to the guidance given in DMRB noise assessment method HD 213/11. Significance criteria have been established for construction and operational noise and the noise effects quantified across the study area.

12.16.2 Construction noise levels during the proposed works have been assessed as not significant.

12.16.3 No significant operational effects were indicated from the assessment, and no potential Noise Insulation Regulations (NIR) qualifiers have been identified.