IN THE MATTER OF AN APPLICATION TO
AN BORD PLEANÁLA

FOR APPROVAL OF THE FOYNES TO LIMERICK ROAD (INCLUDING ADARE BYPASS) COMPRISING:

(I) FOYNES TO RATHKEALE PROTECTED ROAD SCHEME, 2019;

(II) RATHKEALE TO ATTYFLIN MOTORWAY SCHEME, 2019;

(III) FOYNES SERVICE AREA SCHEME, 2019.

ABP Ref. ABP-306146-19 and ABP-306199-19

ORAL HEARING

Brief of Evidence

Noise and Vibration

By Jennifer Harmon
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February 2021

1 QUALIFICATIONS AND EXPERIENCE

1.1 My name is Jennifer Harmon, I hold a BSc (Hons) Degree in Environmental Science and a Diploma in Acoustics and Noise Control. I am a full member of the Institute of Acoustics (MIOA).

1.2 I am Principal Acoustic Consultant with AWN Consulting Ltd. and have over 19 years consulting experience working in the field of environmental noise impact assessment. My professional background includes the preparation of Noise Impact Assessments for various projects types including transport, industrial, commercial, leisure and residential developments throughout Ireland.

2 ROLE IN PROPOSED ROAD DEVELOPMENT

2.1 I have prepared the noise and vibration appraisal for the proposed road development within the Environmental Impact Assessment Report (EIAR).

2.2 This involved the selection and review of baseline studies, noise modelling of the proposed road development, impact assessment for the construction and operational phases, noise and vibration mitigation recommendations and residual impact assessments.

2.3 I prepared Chapter 12 Noise and Vibration of the EIAR for the proposed road development and the associated Appendices.

3 INTRODUCTION

3.1 An assessment of the potential noise and vibration impacts associated with the project has been undertaken within Chapter 12 of the EIAR which is taken as read. Potential impacts have been assessed for the both the construction and operational phases of the proposed road development (referred to also as "The Project" within this brief). To assist the Board in its consideration of the applications for approval, for the convenience of all participants at this oral hearing, and to set the context for responding to the objections and submissions, the key issues pertaining to noise and vibration assessment of the project are summarised briefly below.

3.2 The construction phase will involve extensive earthworks including rock breaking, blasting, excavation and fill, construction of structures, road works and landscaping. Construction phase noise and vibration impacts are unavoidable during the construction of a large infrastructure project but impacts during this phase are short-term and transient in nature in the context of the overall construction period.

3.3 In order to control noise and vibration impacts during this phase, strict limit values and best practice control measures are included within Sections 12.2.2.1 and 12.5.1 respectively of Chapter 12 of the EIAR. Limit values and control measures will be adhered to during all phases of the construction of the proposed road development.

3.4 Construction traffic will be limited to the identified permitted haulage routes illustrated in Figure 4.71 in Volume 3 of the EIAR and will make maximum use of the corridor of the project once established to reduce vehicle movements along the local road network.

3.5 The operational phase will involve a new road alignment, junctions, overpasses and bridges as part of the project. Operational noise impacts are long term and will result in changes to the noise environment broadly categorised into the following scenarios:

- the project will divert traffic flows from sections of the existing N69 and N21 roads which currently experience high levels of traffic and congestion and will result in a reduction in traffic noise along these sections once operational
- the project will introduce traffic noise to areas which are not currently exposed to any significant level of road traffic, particularly at properties set back from existing local roads in rural and semi-rural settings. At these locations, increased noise levels will occur and the character of the noise environment will be altered
- the project will introduce a new road to areas where road traffic already dominates the existing noise environment and the contribution of the project will be neutral to slight.

3.6 Operational traffic noise levels have been calculated across the environments noted above at an extensive number of noise sensitive properties (458 No. locations) extending out to 300m from the proposed road alignment. It is acknowledged in the EIAR that increased noise levels will occur as a result of the project with highest potential impacts occurring in areas with existing low noise environments.

3.7 Noise mitigation measures are included along the project in order to control noise levels to within the prescribed traffic noise level discussed in the EIAR, i.e. 60dB L_{den} in line with the TII noise guidelines.

3.8 Noise mitigation includes a low noise road surface (LNRS) to the full extent of the project and the incorporation of noise barriers along the proposed development boundary in noise sensitive areas. Details of the proposed mitigation measures are outlined in Section 12.5.4 and Table 12.14 of Chapter 12 of the EIAR and are illustrated in Figures 12.1 to 12.23 in Volume 3 of the EIAR. The predicted post mitigation noise levels at receptors requiring mitigation are presented in Table 12.15 of Chapter 12 of the EIAR and included in full for all assessment locations in Appendix 12.1 of Volume 4A of the EIAR.

3.9 The TII guidelines for noise are the appropriate relevant guidelines for national roads schemes in Ireland and the related design goal is appropriate for the protection of individual receptors such as residences. The WHO Environmental Noise Guidelines for Europe (2018) provide recommended threshold levels relating to traffic noise across Europe. Whilst they provide useful information on potential health related impacts relating to populations across Europe from exposure to noise, it is not appropriate or indeed possible to meet these levels on an individual basis when considering new national road projects. The WHO 2018 Noise Guidelines are directed to population level effects and should not be viewed as limit values for specific individual properties, unlike the TII guidelines which are used for this purpose. The

project does, however, align with the principles of the WHO Guidance through the redistribution of traffic away from existing higher density population areas and incorporating noise mitigation into the project to control noise levels to within acceptable levels at affected properties. Further discussion on these guidelines is included in the response to submissions in this Brief of Evidence and are also discussed in the Brief of Evidence of Dr Martin Hogan dealing with Human Health.

3.10 Overall, whilst the project will result in increased noise levels at noise sensitive locations along its route, it has been designed to reduce operational noise levels to within national design guidelines through the incorporation of detailed and extensive noise mitigation measures. The TII noise design goal protects the majority of the exposed population being highly annoyed by road traffic noise. The incorporation of a low noise road surface and the use of extensive noise barriers along the proposed roadside boundary will reduce noise levels to within the design goal of 60dB L_{den} or to the pre-existing Do Minimum noise levels, whichever is the higher value. A positive impact will be experienced at properties along the existing N69 and N21 road where traffic will be diverted from, as a result of the project.

4 RESPONSES TO SUBMISSIONS / OBJECTIONS

4.1 Overview

4.1.1 Sixty two (62) the 162 submissions/ objections made to An Bord Pleanála (ABP) in respect of the Foynes to Limerick Road (including Adare Bypass) Environmental Impact Assessment Report (EIAR) and Response for Further Information (RFI) include submissions/ objections relevant to noise and vibration.

4.1.2 Responses have been grouped into categories to address the issues raised in the submissions as follows:

- Route selection process (Addressed in Section 4.2)
- Guidelines used to assess traffic noise impacts (Addressed in Section 4.3)
- Increase in noise levels as a result of the road, and the extent, adequacy and type of noise mitigation measures being provided (Addressed in Section 4.4)
- Noise and vibration impacts during construction and blasting works (Addressed in Section 4.5)

4.2 Route Selection Process

Issues raised in submissions / objections

4.2.1 The following submissions / objections have raised issues relating to the noise assessment undertaken as part of the route selection process:

- Submission ENV-25 suggests the approach used to compare route options is flawed, specifically the comparison between Option 3 (Orange) and Option 2 (Blue).
- Submission FI-7 suggests the EIS report states that the blue route (Option 2) would have a lower noise impact than the selected orange route (Option 3). The submission also raises concerns over the approach used to compare both options, specifically reference to existing traffic noise levels and changes in traffic noise as part of the route selection process.

Response

4.2.2 The following extract from submission ENV-25 is responded to below: *"As expected Table 6.1 gives a PIR of 506 for Route 2 and 578 for Route 3. Inexplicably despite the much higher PIR, Route 3 is deemed to be the "Preferred" in this table that outcome is then fed into the other matrices for route comparisons"*

4.2.3 In response, Table 6.1 referred to above is within Section 6.12.1 of Volume 1 of the Route Selection Report. The report clearly states the following considerations are taken into account when comparing route options:

- The Potential Impact Rating (PIR): This is undertaken using counts of sensitive properties within distance bands between 0 and 300m from the route option;
- The likely requirement for noise mitigation: This is determined using the indicative vertical and horizontal alignment of each route option, the expected

traffic flows and traffic speeds, to calculate the number of properties likely to exceed 60 dB L_{den}, or exceed the existing noise environment by more than 1dB if already above 60dB $L_{den,}$ and;

- An assessment of changes in noise levels along the existing road network, both positive and negative.

4.2.4 The use of the PIR is, therefore, not used in isolation to compare one route against another. The methodology and assessment undertaken for the route selection is set out in Appendix C, Volume 3 of the Route Selection Report. Section 5.1.5 of Volume C notes the following relating to the use of the PIR in the route selection process:

"Whilst the PIR assessment provides information on the number of properties in the vicinity of each route, the Guidelines acknowledge that the PIR process only provides an initial high level screening for route ranking. This approach does not take into account other key factors affecting the potential noise impact from a route, most notably its vertical alignment (cuttings, embankments, at grade, tunnels etc.), road traffic flows and potential for noise mitigation."

4.2.5 With respect to the overall route option assessment the report notes:

"Option 3 has been ranked as a preference over Option 2. This is due to the overall noise footprint of Option 2 compared to Option 3. On assessment of the indicative horizontal and vertical alignment of both, a higher number of properties are calculated to exceed 60dB L_{den} for Option 2 compared to Option 3. Taking account of these factors with the other assessment criteria being similar, Option 3 has been ranked ahead of Option 2 from a noise point of view."

4.2.6 Submission ENV-25 states as follows with respect to the further analysis undertaken to compare the divergent sections between Node E and Node K "..*As I understand dwellings along Option 3 were only considered for additional noise impact above the current levels experienced from the current N21 whereas dwellings on the more remote Option 2 were assessed based on full noise impact"*

4.2.7 In response, the methodology set out in Page 6/63 of the Route Selection Report (Volume 1), confirms that properties along the full extent of Option 3 and Option 2 were reviewed and included in the assessment as part of the initial exercise.

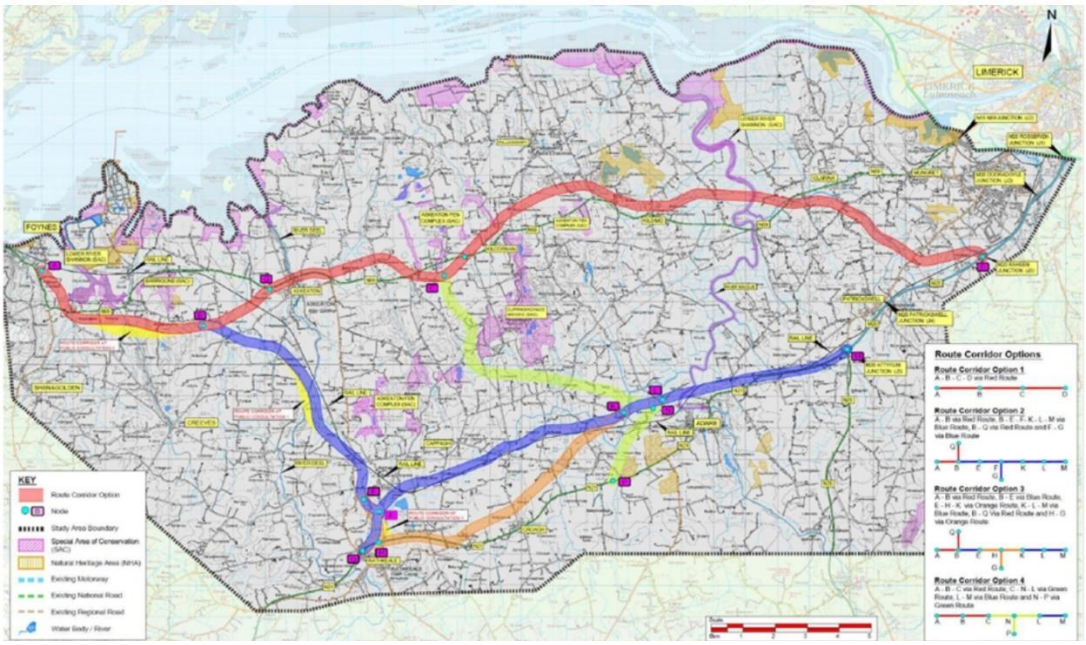


Plate 3.6 of the EIAR - Refined Route Corridor Options 1-4

4.2.8 In order to compare potential noise impacts associated with both route options, a review of traffic flows between the Do Nothing and Do Something scenarios was undertaken. This review indicated that noise level changes of less than 1dB would be experienced along the existing N21 as part of Option 3 and would result in a negligible change in noise levels at properties along this section of road. In addition, a further assessment of the likely requirement for noise mitigation between the two route options over the full extent of the study area was undertaken. The assessment concluded that noise impacts along Option 2 (blue) were greater compared to Option 3 (orange) in terms of changes to the noise environment and the requirement for noise mitigation. On the basis of this further analysis, Option 3 remained a preferred option over Option 2.

4.2.9 Submission FI-7 states as follows, with respect to consideration of the noise impact at design stage: *"No consideration was given to noise impact at design stage. When the proposed road design was complete a noise impact exercise was carried out and minimum mitigation including flimsy barriers were added in as afterthoughts….. the original impact assessment has no evidence that noise pollution was evaluated at the very high elevations of many sections of the proposed route"*

4.2.10 In response, it should be noted that, as part of the route selection process, the vertical and horizontal alignment of each route option forms part of the impact assessment. The assessment takes into consideration the presence of embankments, cuttings and at grade sections of road and the related noise impact associated with each. This methodology forms the basis for determining the overall noise footprint of the route option and the determination of the likely requirement for noise mitigation. This methodology is described in Section 5.2.1 of Volume C of the Route Selection Report. Using this approach, Option 3 was selected as the most preferred option from a noise impact point of view.

4.2.11 The noise impact assessment for the preferred route option (the project) takes full account of the vertical and horizonal alignment of the project through detailed 3D

modelling. This fully accounts for the presence of all embankments and other earthworks affecting the propagation of sound. The methodology for assessing operational noise impacts is described in Section 12.4.2.1 of Chapter 12 the EIAR.

4.2.12 Noise mitigation is incorporated into the final design of the project taking account of the detailed 3D traffic noise modelling. The mitigation measures are described in detail in Section 12.5.4 of Chapter 12 of the EIAR. This includes the performance specification for noise barriers which must achieve a minimum sound insulation value.

4.3 Guidelines Used to Assess Traffic Noise Impacts

Issues raised in submissions / objections

4.3.1 20 no submissions have raised issues regarding the guidelines used to assess noise and vibration as part of the EIAR. These are summarised as follows:

- Submission ENV-17 refers to the 2018 WHO European Noise Guidelines, the WHO 2008 Night Noise Guidelines. The submission also refers to a ruling from An Bord Pleanála relating to a private residential development
- Submission ENV-18 includes commentary on the requirements to comply with the TII's (formerly NRA) Noise guidance documents for roads.
- Submission ENV-25 suggests the EIAR does not comply with the Limerick City and County Noise Action Plan or WHO Guidelines for Community Noise.
- Submissions SCH-12, SCH-26, SCH-51, SCH-54, SCH-61, SCH-66, SCH-72, SCH-80, SCH-85, SCH-92 and SCH-98 suggest that the proposed road development should be designed to comply with WHO standards.
- Submissions SCH-48, SCH-67, SCH-81, SCH-106 and SCH-114 suggest that mitigation is required to ensure that the road design complies with WHO standards.
- Submission SCH-123 raises issues relating to health impacts relating to traffic noise. These issues are addressed within Dr Martin Hogan's brief of evidence on Human Health.

Response

4.3.2 The guidelines used for the appraisal of noise and vibration for the proposed road development are the TII (formally NRA) "Guidelines for the Treatment of Noise and Vibration in National Road Schemes" (2004) and the "Good Practice Guidance for the Treatment of Noise during the Planning of National Road Proposed Road Schemes" (TII, 2014).

4.3.3 The following three conditions must be satisfied under the TII Guidelines in order for noise mitigation to be provided (as discussed in Section 12.2.2.2 of Chapter 12 of the EIAR):

(a) The combined expected maximum traffic noise level, i.e. the relevant noise level, from the proposed road development together with other traffic in the vicinity is greater than the design goal of 60dB L_{den}

(b) The relevant noise level is at least 1dB more than the expected traffic noise level without the proposed road development in place

(c) The contribution to the increase in the relevant noise level from the proposed road development is at least 1dB

4.3.4 Submissions which raise this topic are addressed in turn below.

4.3.5 In response to submission ENV-17, the design goal for road traffic noise is set as an external noise criterion in line with best practice environmental guidelines (e.g. WHO 2018 European Noise Guidelines referred to in the submission). In line with the TII noise guidelines (2004 and 2014), the 60dB L_{den} design goal is an external free field noise level and is the relevant and appropriate criteria for new national roads.

4.3.6 Submission ENV-17 refers to a planning decision relating to a new residential development along the N11 seeking to be constructed within 100m of the road. The Board in this instance refused to grant permission on the basis that the proposed development contravened an objective of the Wicklow County Development Plan and, therefore, did not comply with the requirements with respect to a set-back zone for new residential developments. However, the application under consideration here relates to a new national road development and the relevant criteria for noise have been applied to the proposed development.

4.3.7 Submission ENV-18 quotes the two TII noise guidance documents "Guidelines for the Treatment of Noise and Vibration in National Road Schemes" (2004) and the "Good Practice Guidance for the Treatment of Noise during the Planning of National Road Proposed Road Schemes" (TII, 2014) as the required documents to be followed when preparing an EIAR.

4.3.8 In response to submission ENV-18, these two documents have formed the basis of the impact assessment for Chapter 12 *Noise and Vibration* of the EIAR

4.3.9 Submission/ objection ENV-18 notes the following:

> *"Firstly extensive baseline noise surveys and a noise model have to be included within the EIS"*
> *"Additionally, the NRA guidance on noise good practice has to be complied with"*

4.3.10 Submission ENV-18 also includes an extract of the TII 2004 noise guidance document which summarises the required information to be included within an EIAR for a new national road. It is confirmed that all of the items listed in the extracted section of the TII 2004 document are included within Chapter 12 of the EIAR.

4.3.11 An extensive baseline noise survey was completed as part of the EIAR. This included noise monitoring surveys at 104 locations along the length of proposed road development. The surveys comprised a mixture of unattended surveys over a 24 hour period at 31 locations and daytime attended surveys at 73 locations. The number and selection of noise surveys were undertaken in line with TII guidance and in accordance with the methodologies for environmental noise surveys in line with best practice guidance (i.e. ISO 1996-2 2017 *Acoustics: Description Measurement and Assessment of Environmental Noise. Part 2: Determination of sound pressure levels).* Full details of the environmental noise surveys undertaken as part of the EIAR are included in Section 12.3.1 of Chapter 12 of the EIAR. The noise survey locations are illustrated in Figure 12.1 to Figure 12.23, Volume 3 of the EIAR

4.3.12 The noise impact assessment was undertaken using a 3D acoustic model of the project. The model takes account of the vertical alignment of the road and by association all sections of elevated road in addition to those in cutting. Specific information relating to the noise modelling approach, input data and the calculated results are included in Section 12.4.2.1 of Chapter 12 of the EIAR.

4.3.13 In summary, the noise impact assessment within Chapter 12 of the EIAR has been undertaken fully in line with the TII 2004 and 2014 noise guidance documents.

4.3.14 In response to submission ENV-25, the TII noise guidelines for national road projects are specifically referred to within the second round of the Limerick City and County Council Noise Action Plan (2013 to 2018) and the third round Limerick City and County Noise Action Plan (2018 to 2023) as the relevant noise design criterion for new national roads which is directly applicable to the project under consideration here. Section 2.1.5 of the 2018 - 2023 NAP refers specifically to these guidance documents as the noise design goal for new national roads. The EIAR therefore complies with the TII Noise Guidelines and second and third Limerick City and County Council Noise Action Plans. The WHO *Guidelines for Community Noise* referred to within this submission are not applicable to a new national road.

4.3.15 When assessing the requirement for noise mitigation in Ireland for new road schemes, the design goal of 60dB L_{den} is applied to all properties to ensure a uniform and national best practice approach across the country. This also ensures a uniform assessment is applied across the extent of the project.

WHO Environmental Noise Guidelines

4.3.16 The response to submission no's SCH-12, SCH-26, SCH-48, SCH-51, SCH-54, SCH-61, SCH-66, SCH-67, SCH-72, SCH-80, SCH-81, SCH-85, SCH-92, SCH-98, SCH-106 and SCH-114 and ENV-17 relating to compliance with WHO standards is addressed below.

4.3.17 The most recent publication from the WHO relating to noise is the *Environmental Noise Guidelines for the European Union ,*2018 (Hereafter referred to as WHO 2018 Noise Guidelines). This document provides recommendations for protecting human health from exposure to environmental noise originating from various sources. For road traffic, the WHO 2018 Noise Guidelines recommend limiting traffic noise to below 53dB L_{den} and below 45dB L_{night}. The recommended road traffic noise levels within the WHO 2018 Noise Guidelines are set on the basis of limiting annoyance and sleep disturbance. Dr Martin Hogan in his Brief of Evidence on Human Health discusses the application of these guidelines from a human health perspective. Their application is also discussed below in the context of the noise impact assessment for the project.

4.3.18 The WHO 2018 Noise Guidelines values are recommended to serve as the basis for a policy-making process, to allow public health orientated recommendations to control noise exposure within populations on a European and national level. The WHO 2018 Noise Guidelines states the following regarding the implementation of the guidelines:

"The WHO guideline values are evidence-based public health-oriented recommendations. As such, they are recommended to serve as the basis for a policy-making process in which policy options are considered. In the policy decisions on reference values, such as noise limits for a possible standard or legislation, additional

considerations – such as feasibility, costs, preferences and so on – feature in and can influence the ultimate value chosen as a noise limit. WHO acknowledges that implementing the guideline recommendations will require coordinated effort from ministries, public and private sectors and nongovernmental organizations, as well as possible input from international development and finance organizations.."

4.3.19 These guidelines are relevant, therefore, in the context of policy-making to adopt and/or propose alternative noise limits for use, should they be deemed feasible, based on a range of factors which must be considered. In making these decisions, economic, physical, and social considerations all need to be factored in. It is important, therefore, to highlight that the TII noise guidelines for national roads and the WHO 2018 Noise Guidelines serve different purposes. The WHO 2018 Noise Guidelines should be considered across populations as a whole and used to review and manage health-related noise exposure across national and European populations, and set a guideline as to what is desirable at a population level . They are therefore not intended to be applied on an individual receptor basis. The TII guidelines are, however set specific to individual receptors.

WHO 2018 Noise Guidelines – *Derivation of Recommendations for Road Traffic Noise - Lden*

4.3.20 The recommended levels for road traffic noise are based on two factors; increased risk of incidence of Ischaemic Heart Disease (IHD) and the percentage of people being Highly Annoyed (HA) by road traffic noise. For risks relating to incidence of IHD, a benchmark of 5% increase of relevant risk (RR) was set. On the basis of this benchmark, the corresponding road traffic noise level is 59dB $L_{den,}$ based on a strong body of evidence to support the relationship.

4.3.21 For risks relating to perceived annoyance, a benchmark of 10% of the population being HA by road traffic noise was set. On the basis of this benchmark (10% HA), the corresponding road traffic noise level is 53dB L_{den}. This was set based on a compilation of varying community response studies relating to road traffic noise from European and International sources. The WHO 2018 Noise Guidelines note the body of evidence supporting this benchmark is of moderate quality due to large variability in the quality of the data sets available.

4.3.22 The recommended traffic noise level of 53dB L_{den} within the WHO 2018 Noise Guidelines is therefore based on a level which 10% of the population are estimated to be HA by road traffic noise. This level is 6dB below the noise level determined for increase of relevant risk (RR) relating to incidence of IHD, i.e. 59dB $L_{den.}$

WHO Guidelines in Context of TII/ EIAR Noise design goal

4.3.23 The TII traffic noise design goal is set as an absolute noise level of 60dB $L_{den.}$ This is 1dB above the value noted in the WHO 2018 Noise Guidelines for increased relevant risks relating to incidence of IHD from road traffic noise. Based on the community response studies presented within the WHO 2018 Noise Guidelines, a road traffic noise level of 60dB L_{den} equates to 15% of people being HA by road traffic noise.

4.3.24 The design goal used in the TII guidelines is therefore comparable to WHO 2018 Noise Guidelines relating to controlling increased relevant risk of cardiovascular health effects associated with road traffic noise. From an annoyance point of view, whilst the design goal used in the TII guidelines is above the benchmark of 10% of the population being HA, the design goal of 60dB L_{den} will still protect the vast majority of the population being highly annoyed by road traffic noise based on the community response studies discussed within its guidance, i.e. 15% of the population are likely to be highly annoyed by road traffic noise at this level.

Application of the WHO 2018 Noise Guidelines

4.3.25 The WHO 2018 Noise Guidelines discuss a number of possible interventions to be considered with respect to controlling and reducing road traffic noise. These include:

- changes in infrastructure
- reduction in road traffic flows
- pathway interventions (barriers)
- quieter road surfaces

4.3.26 In the context of the Limerick City and County Noise Action Plan (2013 – 2018), this discuses mitigation or intervention options to reduce traffic noise at exposed populations. These are noted to include transport strategies, reducing traffic speeds, limiting vehicle numbers, using low noise road surfaces and using noise barriers. These measures broadly align with the recommended interventions for traffic noise reduction discussed in the WHO 2018 Noise Guidelines. The redistribution of traffic from the existing N69 and N21 onto the proposed road development will result in traffic noise reductions at properties close to these roads which experience high noise levels.

4.3.27 Section 12.6.2 of Chapter 12 of the EIAR discusses the associated positive noise impacts associated with the diversion of traffic flows off the local road network. The EIAR notes that along the N69 Road between Foynes and Askeaton, a traffic noise reduction of the order of 7dB(A) will be experienced. Road traffic noise along sections of the N69 Road between Askeaton and the M7 west of Limerick City is calculated to be reduced by the order of 1 and 3dB(A). Along the N21 between Rathkeale and Adare, traffic noise levels are calculated to be reduced by the order of 10 to 13dB(A) as a result of traffic flow reductions along this road. As discussed in the EIAR, properties along these roads are currently exposed to significantly higher noise levels from passing traffic compared to those predicted along the proposed road development, due to their proximity to the road edge and limited opportunities for noise mitigation due to access requirements and engineering constraints. The proposed road development, in comparison, is designed from the outset to control operational traffic noise levels at the most affected locations along its alignment through detailed modelled noise mitigation.

4.3.28 Notwithstanding the above, it is important to put the WHO 2018 Noise Guidelines recommended traffic noise levels into context with respect to the existing roads in Limerick County and its environs. For the existing road network across Limerick City and County, the most recent noise mapping prepared as part of the third round of Noise Action Plans (2018 to 2023), notes that approximately 32,000 people are exposed to road traffic noise levels above 55dB $L_{den.}$ This relates to population counts along sections of roads which were mapped as part of the study (total length of 223km of road). The existing road network therefore already contributes to road traffic noise

above the recommended levels within the WHO 2018 Noise Guidelines. Even with a reduction in traffic flows along the existing road network as a result of the project, a traffic noise level of 53dB L_{den} will not be achieved due to residual traffic volumes, proximity of properties to road edges and minimal opportunities for physical mitigation along existing roads.

4.3.29 With respect to the proposed road development, 85% of modelled locations are calculated to meet or exceed 53dB L_{den} with the extensive suite of noise mitigation already in place. In order to reduce traffic noise levels to below 53dB L_{den} with the current alignment and the current extensive suits of noise mitigation, traffic flows along the proposed road development would need to be reduced by 80%. Reducing operational traffic flow by 80% along the proposed road development would not present a feasible road option.

4.3.30 In summary, the WHO 2018 Noise Guidelines have not been adopted in any form in Ireland to date. Whilst they provide a valuable peer review of potential health based indicators, the recommendations are made primarily in the context of strategic policy-making as opposed to environmental impact assessment. The WHO 2018 Noise Guidelines are directed to population level effects and should not be viewed as limit values for specific individual properties, unlike the TII guidelines which are used for this purpose. The project does, however, align with the principles of the WHO through the redistribution of traffic away from existing higher density population areas and incorporating noise mitigation into the project, in order to control noise levels to within acceptable levels at affected properties.

4.3.31 In conclusion, the TII guidance remains the current best practice standard for road traffic noise in Ireland.

4.4 Increase in noise levels as a result of the road, and extent, adequacy and type of noise mitigation measures being provided

4.4.1 The following submissions have raised issues relating to noise increases and noise mitigation proposals relating to the proposed road development:

- Submission ENV-9 seeks noise attenuation measures to be conditioned as part of any grant of approval from An Bord Pleanála.
- Submission ENV-10 and ENV-27 seeks confirmation on adequate noise mitigation so as not to devalue the residential properties.
- Submission ENV-12 seeks confirmation on noise mitigation measures for property.
- Submission ENV-13 raises issues relating to the absence of noise mitigation at the residential property.
- Submission ENV-17 raises issues relating to the absence of noise mitigation at the residential property
- Submission ENV-19 raises issues relating to future noise levels on retained lands
- Submission ENV-26 seeks clarification on noise control measures at the residential property.
- Submission ENV-29 seeks confirmation on noise mitigation measures for the property.

- Submissions SCH-1 and SCH-13 state that there are: *"Inadequate noise abatement measures or noise reduction proposals."* And "*problems with noise, dust etc. during construction and when of if road is eventually opened"*
- Submissions SCH-14 and SCH-18 raise issues relating to noise from the proposed road development on equine enterprise.
- Submission SCH-27 raises the following issue: *"Impact of proposed land acquisition on dwelling house Vis-Via noise"*
- Submissions SCH-28 and SCH-44 state that there is "*inadequate mitigation measures during and post construction including noise …. Vibration."*
- Submission SCH-43 and SCH-70 seek information on noise control measures for their property.
- Submission SCH-47 raises issues relating to increased noise levels at the property from the operation of the proposed road development and queries why triple glazed windows have not been provided.
- Submission SCH-64 raises issues relating to increased noise levels at the property from the operation of the proposed road development.
- Submission SCH-119 states that: "*Inadequate information has been provided regarding the mitigation measures that are being proposed to control noise pollution."*
- Submission SCH-123 raises concerns relating to traffic noise levels at the residential property once the road becomes operational.
- Submissions SCH-16, SCH-19, SCH-31, SCH-33, SCH-55, SCH-58, SCH-60, SCH-62, SCH-76, SCH-82, SCH-91, SCH-96 and SCH-115 state the following in relation to the control of noise and mitigation: "*The proposed scheme is in close proximity to the dwelling house. The County Council has not specified how it proposes to protect the dwelling house from noise, vibration, illumination and other forms of pollution into the future."*
- Submissions SCH-48, SCH-67, SCH-81, SCH-106 and SCH-114 state: "*Mitigation is required to ensure the road design complies with WHO standards"*.
- Submission SCH-71 states: "*Noise Mitigation Proposals are inadequate"*.
- Submissions SCH-90 and SCH-110 state: *"The data provided in the EIS is too general, in particular.. noise and visual impact"*.
- Submissions SCH-12, SCH-26, SCH-51, SCH-54, SCH-61, SCH-72, SCH-80, SCH-85, SCH-92 and SCH-98 make a general objection in relation to noise that: "*Noise Mitigation is required to ensure that the road design complies with WHO standards which is a higher standard than that proposed*."
- SCH-103 state that there are: *"Inadequate noise abatement measures or noise reduction proposals."*, "*problems with noise, dust etc. during construction and when of if road is eventually opened" and "Unacceptable noise levels due to close proximity of the dwelling house to the proposed roadway".*

Response

4.4.2 Operational traffic noise levels associated with the proposed road development have been fully considered within Chapter 12, Volume 2 of the EIAR.

4.4.3 It is fully acknowledged that once operational, an increase in the noise environment will be experienced at properties located in proximity to the project, particularly at locations set back from existing heavily trafficked roads at present. Whilst an increase

will be experienced, and the noise environment altered at affected properties, the proposed road development has been assessed against the most appropriate noise criteria in order to control traffic noise levels within acceptable limits. Further discussion on the TII noise guidance values is included in Section 4.3 of this Brief of Evidence.

4.4.4 Section 12.2.2.2 of Chapter 12 of the EIAR sets the relevant criteria for determining the requirement for noise mitigation for the operation of the proposed road development. The relevant criteria are also summarised in Section 4.3.3 of this Brief of Evidence. The criteria are those set for road schemes throughout Ireland as specified in the TII noise guidance documents. A response to the use of WHO guidelines for national road schemes is included in Section 4.3 of this Brief of Evidence.

4.4.5 The impact assessment has calculated operational road traffic noise levels at 458 properties along the extent of the project. At each location, the three conditions for noise mitigation were assessed in accordance with the TII guidelines in order to determine if noise mitigation is required.

4.4.6 Traffic noise levels are calculated for both the opening year (2024) and the design year of the project (2039). Noise mitigation is designed against the future design year which relates to the higher predicted future traffic flows and hence higher traffic noise levels. Mitigation will, however, form part of the project from the year of opening.

4.4.7 Where the modelled locations were determined to meet the three conditions for noise mitigation, specific noise mitigation was modelled for each property to reduce traffic noise levels to within the design goal. The requirement for noise mitigation was assessed on this basis for each property referenced in each of the submissions noted above.

4.4.8 Detailed information relating to the type, extent and location of noise mitigation for the operational phase is included in full in Section 12.5.4 and Table 12.14 of Chapter 12 of the EIAR. The noise barrier locations are illustrated in Figures 12.1 to 12.23 in Volume 3 of the EIAR.

4.4.9 Noise mitigation along the proposed road development includes the use of a LNRS, providing a correction of -2.5dB compared to hot rolled asphalt, along the following roads:

- Section A: Full extent of the proposed road between Foynes and Ballyclogh;
- Section C: Full extent of the proposed road between Ballyclogh and Rathkeale;
- Section D: Full extent of the proposed road between Rathkeale and Adare to the end of realigned N21 including junction slip roads;
- Existing N21 at tie in between the eastern end of Section D and the N20 Attyflin Junction, and;
- Adare Link Road.

4.4.10 In addition to the LNRS, a total of 45 noise barrier structures over a total length of approximately 15.5km are included along the length of the project. The barriers range in height between 2m to 3.5m. The location, height and length of each barrier is modelled to achieve the specific noise reduction required at each noise sensitive

location along the project. This information is detailed in Table 12.14 of Chapter 12 alongside the specific properties the noise barriers are incident to.

4.4.11 For assessment locations where noise mitigation is provided for, the residual traffic noise levels are presented in Table 12.15 of Chapter 12 of the EIAR. The full set of calculated residual noise levels for all assessment locations is included in Appendix 12.1, Volume 4A of the EIAR.

4.4.12 The approach used in the EIAR and prescribed by TII ensures that the same level of protection is provided to all noise sensitive areas across the project in relation to operational noise levels.

4.4.13 It is confirmed that the noise mitigation within the EIAR forms part of the Schedule of Environment Commitments for the project.

4.4.14 The specific mitigation measures required for each of the submissions noted in this section which have raised this issue are summarised individually. The responses make reference to Table 12.14 from Chapter 12 of the EIAR to identify the mitigation measures. For ease of reference, this table is reproduced in Appendix A of this Brief. The figures referred to within the responses below are those within the EIAR and are also reproduced in Appendix B of this Brief.

- Submission SCH-28: This submission refers to a property located at Corgrig in proximity to the existing N69. Whilst this property is not specifically modelled as part of the noise impact assessment due to its distance from the road, review of adjacent properties (e.g. A00-014 – Figure 12.1) in the vicinity, confirm that noise mitigation is not required in this area of the project due to the neutral noise impact experienced.

- Submission SCH-19: There are no dwelling houses or other noise sensitive buildings within this landholding. The landowner has a residential dwelling which is, however, modelled as property A02-017 located north of the project in the vicinity of Sroolane North. Reference to Table 12.14 of Chapter 12 confirms that NB-003 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.2. The residual traffic noise level in EIAR Appendix 12.1 for this property is 56 dB L_{den} which meets the design goal.

- Submission SCH-91: This property has not been modelled due its distance from the proposed road alignment. Adjacent properties in this area closer to the proposed road alignment (in Sroolane North Illustrated in Figure 12.2) are all below 60dB L_{den}. In addition, this property is located north of the existing N69 which will experience a reduction in traffic flows once the project becomes operational. A reduction in traffic noise level will therefore be experienced at this property and noise mitigation measures are not required at this location.

- Submission SCH-96: This submission refers to the property number A02-014 located south of the proposed road alignment in the vicinity of Roberstown. The modelled location is illustrated in Figure 12.2. The operational noise level associated with this property is 57 dB L_{den} which is below the operational traffic

noise design goal. Additional noise mitigation is therefore not required at this location.

- Submission SCH-82: This submission refers to the property number A02-009 located in the vicinity of Sroolane North along the existing N69 and to the east of the project. The modelled location is illustrated in Figure 12.2. A positive impact will be experienced at this property due to the reduction in traffic along the existing N69 and the incorporation of noise mitigation along the project (NB-003). The residual traffic noise level at the property is 62 dB L_{den} which is reduced to below the Do Minimum traffic noise level associated with the existing N69 road (i.e. 67dB L_{den}).

- Submission SCH-115: This submission refers to the property number A04-001 located north of the proposed road alignment in the vicinity of Oorla. The modelled location is illustrated in Figure 12.3. Reference to EIAR Appendix 12.1 confirms that operational noise level associated with this property is 54 dB L_{den} which is below the operational traffic noise design goal. Additional noise mitigation is therefore not required at this location.

- Submission SCH-119: This submission refers to the property number A05-005 located north of the proposed road alignment in the vicinity of Mulderricksfield. The modelled location is illustrated in Figure 12.3. Reference to EIAR Appendix 12.1 confirms that operational noise level associated with this property is 50 dB L_{den} which is below the operational traffic noise design goal. Additional noise mitigation is therefore not required at this location.

- Submission ENV-26: This submission refers to the property number A06-006 north of the project in the vicinity of Mulderricksfield. The modelled location is illustrated in Figure 12.4. In response to queries raised in the submission, it is confirmed that a LNRS forms part of the project noise mitigation. The operational noise level associated with this property in EIAR Appendix 12.1 is 54dB L_{den} which is below the operational traffic noise design goal.

- Submission SCH-61: This submission refers to the property number A05-008 located to the north of the project at Mulderricksfield. The modelled location is illustrated in Figure 12.4. The operational noise level associated with this property in EIAR Appendix 12.1 is 52 dB L_{den} which is below the operational traffic noise design goal. Additional noise mitigation is therefore not required at this location.

- Submission SCH-64: This submission refers to the property number C20-001 located east of the project within Ballycullen. The modelled location is illustrated in Figure 12.7. The operational noise levels associated with this property is 53 dB L_{den} (Included in EIAR Appendix 12.1) which is below the operational traffic noise design goal.

- Submission SCH-67: This submission refers to the property number C22-015 as outlined in Chapter 12. The modelled location is illustrated in Figure 12.8. The operational noise level associated with this property is 54 dB L_{den} (Included in EIAR

Appendix 12.1) which is below the operational traffic noise design goal. Additional noise mitigation is therefore not required at this location.

- Submission SCH-81: This submission refers to the property number C22-001 and C22-002 located west of the project in the vicinity of Milltown North. The modelled locations are illustrated in Figure 12.8. The operational noise level associated with these properties are 55 and 54 dB L_{den} respectively (Included in EIAR Appendix 12.1) which is below the operational traffic noise design goal. Additional noise mitigation is therefore not required at these locations.

- Submission SCH-66: This submission refers to the property number C24-001 and C24-00A located west of the project within Bullaun. The modelled locations are illustrated in Figure 12.9. The operational noise levels associated with these properties are 54 and 58dB L_{den} respectively (Included in EIAR Appendix 12.1) which are below the operational traffic noise design goal. Additional noise mitigation is therefore not required at this location.

- Submission SCH-16: This submission refers to the property number C25-003 located at Feeagh. The modelled location is illustrated in Figure 12.10. The operational noise level associated with this property in EIAR Appendix 12.1 is 52dB L_{den} which is below the operational traffic noise design goal. Additional noise mitigation is therefore not required at this location.

- Submission SCH-92: This property has not been modelled due its distance from the proposed road alignment. Noise barrier NB-10 is located north of the proposed road alignment to reduce traffic noise levels at properties in this area. Adjacent properties in this area closer to the proposed road alignment (i.e. C27-030 and C27-032 – Figure 12.11) have a calculated operational noise level of 53dB L_{den}.

- Submission SCH-43 and SCH-70: Both submissions refer to the property number C27-031 in the vicinity of Ballingarrane. Reference to Table 12.14 of Chapter 12 confirms that NB-010 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.11. As noted in the previous sections, LNRS also forms part of the road noise mitigation measures. The residual traffic noise level in EIAR Appendix 12.1 for this property is 57 dB L_{den} which meets the design goal.

- Submission SCH-76: This submission refers to the property number D50-013 located north of the existing N21 and north of the proposed realigned N21, to the east of Rathkeale. Reference to Table 12.19 of Chapter 12 confirms that NB-12 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.13. The residual traffic noise level in EIAR Appendix 12.1 for this property is 61 dB L_{den} which is reduced to below the 2039 Do Minimum traffic noise level of 62 dB L_{den} associated with the existing N21 road.

- Submission SCH-47: This submission refers to the property number D52-001 in the vicinity of Clogh West. It is acknowledged that an increase in noise level will be experienced at this property as a result of the project. Reference to Table 12.14

of Chapter 12 confirms that NB-16 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.14. The residual traffic noise level in EIAR Appendix 12.1 for this property is 58 dB L_{den} which is below the design goal. The noise mitigation incorporated across the project is designed in order to reduce noise levels at source through the incorporation of the LNRS and reduction in traffic noise levels along the propagation pathway using noise barriers. The incorporation of measures to private properties such as glazing is not proposed. The use of triple glazing is not required at this property in order to achieve the relevant design goal which is an external criteria. Operational traffic noise levels at this property are in line with those at surrounding properties adjacent to the proposed road development.

- Submission SCH-85: There are no dwelling houses or other noise sensitive buildings within these landholdings. Noise mitigation is included along the length of the project in this area, however. Noise barriers NB-04, NB-05, NB-13, NB-14 and NB-15 are included as mitigation in this area to reduce traffic noise levels at affected properties. The barriers are described in Table 12.19 of the EIAR and illustrated in Figure 12.14.

- Submission SCH-55: This submission refers to the property number D55-015 in the vicinity of Croagh. The modelled location is illustrated in Figure 12.16. The operational noise level associated with this property in EIAR Appendix 12.1 is 57dB L_{den} which is below the operational traffic noise design goal. Additional noise mitigation is therefore not required at this location.

- Submission SCH-106: This submission refers to the property number D54-012 located north of the proposed road alignment in the vicinity of Ballycannon. Reference to Table 12.19 of Chapter 12 confirms that NB-17 and NB-18 are specifically provided to mitigate traffic noise levels at this property. The barriers and modelled location are illustrated in Figure 12.16. The residual traffic noise level in EIAR Appendix 12.1 for this property is 57 dB L_{den} which meets the design goal.
- Submission ENV-17: This submission refers to a property approximately 350m south of the proposed road development in the vicinity of Clonshire More. This property was not modelled in the EIAR due its distance from the project. An extensive suite of noise barriers (NB-19 to NB-21 illustrated in Figure 12.17) are, however, included along the road edge in this area to reduce traffic noise levels at residential properties closer to the project. Traffic noise levels have been calculated at this property to address this submission. The calculated noise levels for the design year of 2039 are 55 dB L_{den} which is below the design goal.

- Submission SCH-1: This submission refers to the property number D57-001 at Clonshire More. Reference to Table 12.14 of Chapter 12 confirms that NB-024 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.17. The residual traffic noise level in EIAR Appendix 12.1 for this property is 58 dB L_{den} which is below the design goal.

- Submission SCH-71: This submission refers to the property number D56-005 in the vicinity of Clonshire More. Reference to Table 12.19 of Chapter 12 confirms

that NB-19 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.17. The residual traffic noise level in EIAR Appendix 12.1 for this property is 59 dB L_{den} which is below the design goal.

- Submission SCH-103: This submission refers to the property number D56-013 located south of the proposed road alignment in the vicinity of Clonshire More. It is acknowledged ambient noise levels will be increased at this location due to the operation of the proposed road. Reference to Table 12.19 of Chapter 12 confirms that NB-20 and NB-21 are specifically provided to mitigate traffic noise levels at this property. The barriers and modelled location are illustrated in Figure 12.17. The residual traffic noise level in EIAR Appendix 12.1 for this property is 56 dB L_{den} which meets the design goal applied across the full extent of the project.

- Submission SCH-114: This submission refers to the property number D57-013 located north of the proposed road alignment in the vicinity of Rower More. Reference to Table 12.19 of Chapter 12 confirms that NB-026 is specifically provided to mitigate traffic noise levels at this property. The barriers and modelled location are illustrated in Figure 12.17. The residual traffic noise level in EIAR Appendix 12.1 for this property is 57 dB L_{den} which is below the design goal.

- Submission ENV-19: This submission refers to retained lands located below and adjacent to the project in the vicinity of Clonshire More (Figure 12.17). Noise mitigation has been provided for all existing noise sensitive locations where the relevant noise criteria have been met as discussed in the paragraphs above. It is noted, also that a low noise road surface is included the full extent of the project as standard. It is not, however, proposed to extend noise barriers over the full extent of zoned or retained lands in the event that future development may occur.

- Submission ENV-9: This submission refers to the property number D59-005 located some 300m south of the project in the vicinity of Kilknockan. Noise barrier NB-028 is located along the project north of this property to reduce traffic noise levels at properties closer to the road alignment. The barrier and modelled location are illustrated in Figure 12.18. It is confirmed that all operational noise mitigation within Chapter 12 of the EIAR forms part of the Schedule of Environmental Commitments. The residual traffic noise level in EIAR Appendix 12.1 for this property is 53 dB L_{den} which is below the design goal. No further noise mitigation measures are proposed for this property.

- Submission ENV-13: This submission refers to the property number D57-015 located approximately 200m north of the project in the vicinity of Clonshire Beg. Reference to Table 12.11 confirms that noise mitigation is provided at this property based on traffic noise levels associated with the design year of 2039. It is confirmed this mitigation forms part of the Schedule of Environmental Commitments and is included from the year of opening. Chapter 12 confirms that NB-029 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.18. The residual traffic

noise level in EIAR Appendix 12.1 for this property is 56 dB L_{den} which is below the design goal.

- Submission SCH-13: This submission refers to the property number D58-003 in the vicinity of Rower More. Reference to Table 12.14 of Chapter 12 confirms that NB-027 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.18. The residual traffic noise level in EIAR Appendix 12.1 for this property is 58 dB L_{den} which is below the design goal.

- Submission SCH-26: This submission refers to the property number D59-002 in the vicinity of Rower More. Reference to Table 12.14 of Chapter 12 confirms that NB-028 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.18. The residual traffic noise level in EIAR Appendix 12.1 for this property is 57 dB L_{den} which is below the design goal.

- Submission SCH-18 refers to the property number D57-008 in the vicinity of Clonshire Beg. Submission SCH-14 refers to the closest equine buildings at Clonshire Beg (modelled reference D57-017). Reference to Table 12.14 of Chapter 12 confirms that NB-025 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled locations are illustrated in Figure 12.18. The residual traffic noise level in EIAR Appendix 12.1 for D57-008 is 59 dB L_{den} and for D57-017 is 58 dB L_{den} which is below the design goal. Specific issues relating to equine impacts relevant to this landholding are dealt with by Michael Sadlier in his Brief of Evidence on equine issues.

- Submission SCH-123: This submission refers to the property number D57-016 located approximately 270m north of the project in the vicinity of Clonshire Beg. Noise barrier NB-26 is incorporated along the road edge in the vicinity of this property to reduce traffic noise levels at properties closer to the project. The barrier and modelled location are illustrated in Figure 12.18. The operational noise level associated with this property inclusive of all noise mitigation in EIAR Appendix 12.1 is 55 dB $L_{den,}$ which is below the operational traffic noise design goal.

- Submission SCH-98: This submission refers to the property number D59-004 south of the proposed road alignment in the vicinity of Rower More. Reference to Table 12.19 of Chapter 12 confirms that NB-28 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.18. The residual traffic noise level in EIAR Appendix 12.1 for this property is 57 dB L_{den} which is below the design goal.

- Submission ENV-12: This submission refers to the property number D59-009 located approximately 200m south of the project in the vicinity of Kilknockan. Reference to Table 12.14 of Chapter 12 confirms that NB-029 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.19. The residual traffic noise level in EIAR Appendix 12.1 for this property is 57 dB L_{den} which is below the design goal.

- Submission ENV-29: This submission refers to the property number D60-013 located approximately 135m south of the project in the vicinity of Curraghbeg. The modelled location is illustrated in Figure 12.19. The operational noise level associated with this property in EIAR Appendix 12.1 is 60dB L_{den} which meets the operational traffic noise design goal.

- Submission SCH-27: This submission refers to the property number D60-001 in the vicinity of Islandea. The modelled location is illustrated in Figure 12.19. It is acknowledged ambient noise levels will be increased at this location due to the operation of the proposed road. The residual traffic noise level in EIAR Appendix 12.1 for this property is 59 dB L_{den} which is below the design goal applied across the project.

- Submission SCH-31: This submission refers to the property number D60-004 in the vicinity of Curraghbeg. Reference to Table 12.14 of Chapter 12 confirms that NB-030 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.19. The residual traffic noise level in EIAR Appendix 12.1 for this property is 60 dB L_{den} which meets the design goal.

- Submission SCH-51: This submission refers to the property number D59-011 in the vicinity of Kilknockan. Reference to Table 12.19 of Chapter 12 confirms that NB-29 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.19. The residual traffic noise level in EIAR Appendix 12.1 for this property is 57 dB L_{den} which is below the design goal.

- Submission SCH-60: This submission refers to the property number D60-003 in the vicinity of Curraghbeg. Reference to Table 12.19 of Chapter 12 confirms that NB-31 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.19. The residual traffic noise level in EIAR Appendix 12.1 for this property is 60 dB L_{den} which meets the design goal.

- Submission SCH-33: This submission refers to the property number D61-015 in the vicinity of Gortaganniff. Reference to Table 12.14 of Chapter 12 confirms that NB-037 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.20. The residual traffic noise level in EIAR Appendix 12.1 for this property is 59 dB L_{den} which meets the design goal.

- Submission SCH-58: This submission refers to the property number D61-003 in the vicinity of Ardshanbally. Reference to Table 12.19 of Chapter 12 confirms that NB-34 is specifically provided to mitigate traffic noise levels at this property. The barrier and modelled location are illustrated in Figure 12.20. The residual traffic noise level in EIAR Appendix 12.1 for this property is 60 dB L_{den} which meets the design goal.

- Submission SCH-44: This submission refers to the property number D62-012 / D62-015 in the vicinity of Gortaganniff. Reference to Table 12.14 of Chapter 12 confirms that NB-39 is specifically provided to mitigate traffic noise levels associated with the project to the rear of these properties. The barrier and modelled locations are illustrated in Figure 12.21. The residual traffic noise level in EIAR Appendix 12.1 for of these properties is 59 dB L_{den} which is below the design goal. Due to traffic flow reductions along the local road, there is a positive traffic noise impact experienced to the front of the property, reducing from 63 dB L_{den} to 59 dB L_{den}.

- Submission ENV-10 & ENV-27: Both submissions relate to a property located some 1.6km north of the project. To address the specific issue within these submissions, it is confirmed that adequate noise mitigation is incorporated along the full extent of the project as discussed in the previous section and forms part of the Schedule of Environmental Commitments.

- Submission SCH-12: There are no dwelling houses or other noise sensitive buildings within this landholding. In accordance with the TII guidelines, noise mitigation is not required in this instance.

- Submission SCH-48: There are no dwelling houses or other noise sensitive buildings within this landholding. In accordance with the TII guidelines, noise mitigation is not required in this instance.

- Submission SCH-72: There are no dwelling houses or other noise sensitive buildings within this landholding. In accordance with the TII guidelines, noise mitigation is not required in this instance.

- Submission SCH-80: There are no dwelling houses or other noise sensitive buildings within this landholding. In accordance with the TII guidelines, noise mitigation is not required in this instance.

- Submission SCH-90: There are no dwelling houses within these landholdings. In accordance with the TII guidelines, noise mitigation has not been provided for the dwelling house. Impacts relating to equine areas are addressed by Mr Michael Sadlier in his brief of evidence.

- Submission SCH-110: There are no dwelling houses or other noise sensitive buildings within this landholding. In accordance with the TII guidelines, noise mitigation is not required in this instance.

4.5 Noise and vibration impacts during construction and blasting works

Issues raised in submissions / objections

4.5.1 The following submissions have raised issues relating to noise mitigation proposals relating to the project during construction:

- Submission ENV-29 raises the following issue *"The excess noise during the construction phase and from the traffic once completed will result in increased noise and air pollution"*.
- Submissions SCH-1 and SCH-13 state that there are: "*problems with noise, dust etc. during construction and when or if road is eventually opened"*
- Submissions SCH-14, SCH-18 and SCH-102 raise issues relating to construction noise affecting equine enterprise.
- Submission SCH-60 raises the following issue: *"No detail regarding mitigation measure for noise, dust and vibrations during the works have been discussed. Details regarding same and any detail regarding the proposal for blasting of rock in the area is required"*
- Submission SCH-62 raises the followings issue: "*The proposed road is in a significant cut in the vicinity of the landowner's property. Detail on blasting and mitigation measures have not been discussed."*
- Submission SCH-64 seeks clarification on the control measures proposed to control noise and vibration during construction.
- Submission SCH-74 raises the following issue: "*It appears the proposed road is in significant cut in the vicinity of the landowner's property. He has concerns regarding blasting of rock and no detail regarding mitigation measures for such blasting have been discussed with the landowner."*
- Submissions SCH-28 and SCH-44 raises the following issue: "*The Environmental Impact is flawed and does not adequately contain sufficient design information in relation to the following:*
  Potential damage to structures including dwelling houses
  Construction compounds
  Construction traffic movements, particularly outside CPO lands
  Inadequate mitigation measures during construction including noise and vibration."
- Submission SCH-103 raises the following issue: "*Problem with noise, dust, etc, during construction and when road is eventually opened"*
- Submission FI-2 raises issues relating to property conditions surveys only extending to 150m from a blast and the potential impact on Ballyclogh House.
- Submission FI-8 notes that all structures, houses, farm buildings, bridges and most especially listed structures must be surveyed by an engineer and baseline reports given to owners prior to the start of the road construction phase.

Response

4.5.2 It is acknowledged that during the construction phase of the project, noise will be increased in proximity to noise sensitive areas for the duration of works occurring at that location. High levels of construction noise are unavoidable during the construction of a large infrastructure project due to the nature of activities involved.

4.5.3 Given the linear nature of the works, noise emissions related to the construction phase will, however, be of short-term impact at any one area as the works progress along the length of the project. In other words, there will be extended periods during the overall construction programme when there will be no construction noise impacts at a particular location.

4.5.4 Table 12.1 of Chapter 12 of the EIAR includes the construction limit values which are set as 70 dB $L_{Aeq,1hr}$ for daytime periods during week days, 65 dB $L_{Aeq,1hr}$ for daytime periods on Saturdays and 60dB L_{Aeq} for Sundays and bank holidays.

4.5.5 Vibration limits for general construction works are included Table 12.3 of Chapter 12 of the EIAR.

4.5.6 In response to Submissions SCH-1, SCH-13, SCH-28, SCH-44, SCH-64, and SCH-103, the potential for noise impacts associated with major earthworks, structures, site compounds and construction traffic across the project are discussed in Section 12.4.1.1 of Chapter 12 of the EIAR. Construction noise calculations associated with the key elements of works are included Table 12.7. The areas identified for construction compounds are set out in Section 12.4.1.1 of Chapter 12 of the EIAR. The EIAR notes that "*A general restriction will apply for all construction compounds not to be located within 100m of any inhabited dwelling so as to limit risk of noise nuisance impacts. The main construction compound will be accommodated within the lands immediately west of the proposed Rathkeale Junction. This site is likely to remain in place for the duration of the construction stage".* The locations and distances from construction works are identified where noise mitigation is required in Section 12.4.1.1 of Chapter 12 of the EIAR. Figure 4.71 includes the permitted haulage routes and construction traffic noise calculations are included in Section 12.4.1.2 of the EIAR.

4.5.7 In response to submissions SCH-29, SCH-28, SCH-44 and SCH-64 which have sought assurances relating to the control and management of noise and vibration impacts during the construction phase, the construction noise and vibration limit values are contained in the Schedule of Environmental Commitments to be implemented during construction by the contractor and are therefore binding. Limerick City and County Council have an obligation to ensure that the mitigation measures within the Schedule of Commitments are adhered to during construction.

4.5.8 In response to Submissions SCH-1, SCH-13, SCH-14 and SCH-18, SCH-28, SCH-44, SCH-64, SCH-102, and SCH-103, the construction of the works will be undertaken implementing the specific noise abatement measures identified in the application documentation and in compliance with the recommendations of *BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Noise* and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001. It is noted that specific responses to construction noise impacts at equine enterprises raised in SCH-14, SCH-18 and SCH-102 are addressed by Michael Sadlier in his Brief of Evidence dealing with equine issues.

4.5.9 The noise and vibration mitigation measures for each work area will be determined taking account of the various control measures included and assessed within Section 12.5.1 of Chapter 12 of the EIAR.

4.5.10 BS 5228 *-1:2009+A1 2014* includes guidance on several aspects of construction site practices, which include, but are not limited to selection of quiet plant, control of noise sources, screening of noisy plant and works areas, controlling hours of work, ongoing liaison with the public through a dedicated public liaison officer in addition to compliance monitoring.

Blasting

4.5.11 For the proposed road development where a significant portion of hard rock is required to be excavated, the use of drill and blast will enable extraction works to be undertaken at a significantly faster rate compared to traditional rock breaking techniques.

4.5.12 As addressed in Section 8.4.1.4 of Chapter 8 of the EIAR, the extent of rock excavation by blasting is only expected at two locations: the cutting at Mulderricksfield chainage 5+250 to 6+400, and typically in the lower cutting depth at Ballycannon, chainage 52+400 to 56+000. Table 12.10, Section 12.4.4.1 of the EIAR addresses the relevant locations where blasting is likely to be required in addition to other locations where it is possible, yet unlikely. For areas where drill and blast methods will occur, it is acknowledged these generate clearly perceptible noise and ground vibration levels during an event. The duration of the event, however, is momentary and effects and impacts can be well controlled through the use of the limit values discussed in Section 12.2.2.1 of Chapter 12 of the EIAR.

4.5.13 The limit values are set in terms of Air Over Pressure (AOP) and Peak Particle Velocity (PPV). These are the two key parameters used for assessing noise and vibration from blast events. The vibration limits for blast events within the EIAR are set in accordance with best practice national and international guidance documents for this activity. These limit values are set in order to prevent any cosmetic or structural damage to properties adjacent to the works.

4.5.14 Any potential impacts to structures in proximity to blasting, specific blast control techniques will be undertaken in line with those prescribed within *BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Vibration* in addition to experienced blast control techniques used by the contractor.

4.5.15 Best practice control measures are outlined in Section 12.5.2 of Chapter 12 of the EIAR in order to ensure the relevant limits values are not exceeded. These will include the following:

- All blasting will be undertaken by professionally trained blast contractors
- Restriction of hours within which blasting can be conducted (09:00 – 18:00hrs)
- Trial blasts will be tested in less sensitive areas to assist in blast designs and identify potential zones of influence
- Explosive charges will be properly confined by a sufficient amount of stemming
- Blasting contractors will ensure that the minimum amount of primer cord is used, and that no primer cord is located above ground
- Profiling will be carried out after each blast in order to ensure the geometry of the rock face can be established, enabling the optimum burden and spacing to be applied for subsequent blasts
- The design, execution and completion of any blasting within 150m of any existing structure shall require special considerations. This will include the use of pre and post condition structural surveys by a competent structural engineer

- Ground vibration and air over pressure (AOP) will be recorded simultaneously for each blast at the most sensitive locations, depending on the works area being blasted
- When blasting moves into a new area, an initial low level blast will be carried out (i.e. a low Maximum Instantaneous Charge (MIC)) and monitoring will be carried out simultaneously at a number of sensitive properties in different directions in order to generate specific scaled distance graphs
- The scaled distance graphs will be used to determine the optimum MIC for subsequent blasts area in order control vibration and AOP limits below the relevant limit values at the nearest sensitive buildings.

4.5.16 A Public Communications Strategy will be implemented prior to the commencement of any blast works. This will include the following:

- Relevant nearby residents will be notified before any work and blasting starts (e.g. a minimum of 24-hour written notification)
- The firing of blasts will be undertaken, where possible, at similar times to reduce the 'startle' effect
- Ongoing circulars will be issued informing people of the progress of the blasting works
- The implementation of an onsite documented complaints procedure will be maintained by the contractor
- The use of independent monitoring will be undertaken by external bodies for verification of results

4.5.17 As set out in Section 12.5.3 of Chapter 12 of the EIAR, property condition surveys will be offered for all buildings within 50m of the proposed development boundary and those within 150m of proposed blasting works along the project. Property condition surveys will also be carried out at buildings and structures considered appropriate relative to their proximity to the works. Such property condition surveys will be carried out by a Chartered Surveyor or Chartered Structural Engineer. Such property condition surveys, subject to the written agreement of relevant property owners, will be carried out in two stages as follows:

- the first stage will consist of pre-construction condition surveys including photographic records which will be carried out prior to the commencement of construction
- the second stage will consist of post-construction condition surveys which shall include photographic records

4.5.18 In response to submission SCH-60, blasting is identified as a possible rock extraction method for a section of road cutting between 60+300 and 63+500. As this property (D60-003) is located within 100m of potential blast, a property condition survey will be offered prior to and post any blast works as discussed in Section 4.5.17 above. The limit values included in Section 12.2.2.1 of Chapter 12 of the EIAR and the blast control measures included in Section 12.5.2 of Chapter 12 of the EIAR will be fully implemented during any blast event to control noise and vibration impacts.

4.5.19 In response to submission SCH-62, the EIAR has not identified any blasting requirements in the area where this landholding is located (Chainage 20+700 to 21+000) due to the vertical alignment of the proposed road on an embankment. The closest area of proposed or likely blasting is at the cutting at Mulderricksfield located in excess of 1km from the landholding. Notwithstanding the above, where blasting is required along the project at any location, the control and monitoring measures set out in the in the EIAR and summarised above will be fully adhered to.

4.5.20 In response to submission SCH-74, the EIAR has not identified any blasting requirements in the area where this landholding is located (Chainage 10+050) and is unlikely at this location due to the vertical alignment of the proposed road. In addition, there are no sensitive buildings noted within this landholding. Notwithstanding the above, where blasting is required along the project at any location, the control and monitoring measures set out in the in the EIAR and summarised above will be fully adhered to.

4.5.21 In response to submissions FI-2 and FI-8, property condition surveys extending to 150m from a blast area is set to protect the closest properties to a potential blast area. As noted in Section 12.5.2 of Chapter 12 of the EIAR and reproduced in Section 4.5.15 above, the design, execution and completion of any blasting within 150m of any existing structure shall require special considerations. Specifically, when blasting moves into a new area, an initial low level blast will be carried out (i.e. a low Maximum Instantaneous Charge (MIC)) and monitoring will be carried out simultaneously at a number of sensitive properties in different directions in order to generate specific scaled distance graphs. This approach ensures that the blast design is tailored to the area in which it will take place. The blast will be designed to ensure the vibration and AOP values are not exceeded at the closest sensitive buildings to the works. Buildings and structures at further distances from the works will therefore experience lower impacts and will be well controlled.

4.5.22 The distance of Ballyclogh House is approximately 500m south of the cutting at Mulderricksfield (CH 5+150 to 6+400). The closest sensitive structures identified to this cutting are at distances of approximately 120m. The blast design in this area, will therefore be controlled to not exceed the limit values at these buildings. Notwithstanding, giving the protected status and vulnerability of this structure, a pre and post condition structural survey will be included as part of the Schedule of Environmental Commitments.

5.0 CONCLUSION

5.1 An assessment of the potential noise and vibration impacts of the proposed road development has been carried out for both the construction phase and the operational phase within Chapter 12 of the EIAR.

5.2 All of the issues raised in the submissions and objections to the proposed road development, as discussed in Section 4, are addressed in detail in Chapter 12 of the EIAR.

5.3 During the operational phase, noise levels will be increased at noise sensitive locations along the length of the project and a long-term change in the noise environment will occur.

5.4 Whilst the proposed road development will result in increased noise levels at noise sensitive locations along its route, it has been designed to reduce operational noise levels to within national design guidelines. The guidelines used in the assessment for noise and vibration are best practice and in line with those used for all national road projects across Ireland. The TII noise design goal protects the majority of the exposed population being highly annoyed by road traffic noise.

5.5 The incorporation of a low noise road surface and the use of extensive noise barriers along the proposed roadside boundary will reduce noise levels to within the design goal of 60dB L_{den} or within the pre-existing Do Minimum noise levels.

5.6 A positive impact will be experienced at properties along the existing N69 and N21 road where traffic will be diverted from as a result of the project.

5.7 During the construction phase, the use of best practice noise control measures, hours of operation, scheduling of works within appropriate time periods, strict construction noise limits and noise monitoring during this phase will ensure impacts are controlled to within the adopted criteria.

5.8 Vibration impacts during the construction phase will be well controlled through the use of low impact equipment and adherence to strict limit values which will be subject to monitoring at the nearest sensitive buildings.

5.9 Blasting will undertaken at a limited number of locations. The design of any blast event will be controlled to ensure the appropriate limit values are not exceeded at adjacent buildings and structures in order to ensure no structural damage can occur. Pre and post property condition surveys will be undertaken at all properties within 150m of blast works. Vibration and noise monitoring will be undertaken during all blast events.

5.10 In conclusion, each of the issues relating to noise and vibration have been reviewed and responded to within this Brief of Evidence. In responding to the issues raised, the relevant sections of Chapter 12 of the EIAR, its associated Figures and Appendices have been directly referred to and summarised in this Brief of Evidence.

Appendix A

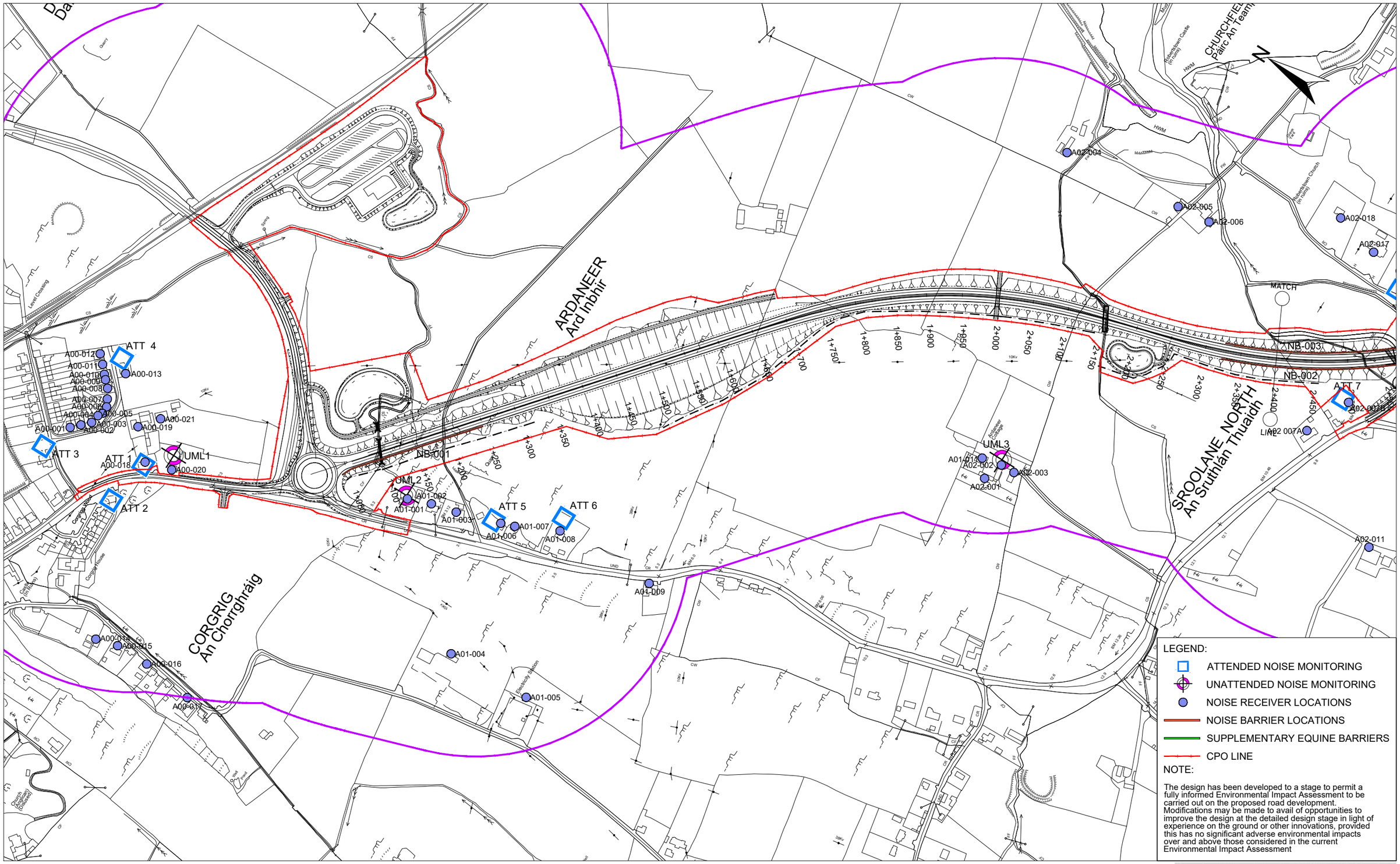
EIAR Table 12.14 - Noise Barrier Requirements (Note : This table is presented as per the EIAR)

Barrier Ref.	Incident to	Road Link	Chainage Start (m)	Chainage End (m)	Height (m)	Length (m)	Alignment/ Notes
NB-001	A01-001/A01-002	N69	1+050	1+250	2	200	South
NB-002	A02-007A/A02-007B	N69	2+325	2+600	2.5	275	South
NB-003	A02-008/ A02-017	N69	2+325	2+600	2.5	275	North
NB-004	D51-001A	M21	51+150	51+325	3	175	South
NB-005	D51-001A	M21	51+325	51+450	3.5	125	South
NB-006	C26-005 - C26- 009 / C26-011 / C27-001	Ballyclogh to Rathkeale	26+555	27+175	2	620	East
NB-008	C27-002 - C27-007	Ballyclogh to Rathkeale	26+900	27+350	2	450	West
NB-009	C27-008/C27-009 - C27-014 /C27-019	Ballyclogh to Rathkeale	27+350	27+750	2.5	400	West
NB-010	C27-021, C27-027, C27-031	Ballyclogh to Rathkeale	27500	27+900	2.5	400	East
NB-012	D50-013	M21	50+750	51+025	3	275	North
NB-013	D51-003	M21	51+550	51+775	3.5	225	South
NB-014	D51-006/ D51-007/D51-011	M21	51+775	51+925	3	150	South
NB-015		M21	51+925	52+150	2.5	225	South
NB-016	D51-012/ D52-001	M21	51+775	52+225	2	450	North
NB-017A/B	D54-012	M21	54+350	54+450	2.5	125	North
NB-018		M21	54+475	54+560	2	100	North
NB-019	D56-003, D56-004, D56-005, D56-008	M21	55+975	56+300	3.5	325	South
NB-020	D56-012 / D56-013	M21	56+300	56+500	2	200	South

Barrier Ref.	Incident to	Road Link	Chainage Start (m)	Chainage End (m)	Height (m)	Length (m)	Alignment/ Notes
NB-021			56+500	56+730	2.5	230	South
NB-022	D56-009/ D56-010/ D56-014/ D56-015	M21	56+000	56+400	3.5	400	North
NB-023	D56-011	M21	56+400	56+875	2.5	325	North
NB-024	D57-001	M21	56+875	57+225	3	350	North
NB-025	D57-006 / D57-008/ D57-017	M21	57+475	58+025	3.5	550	South
NB-026	D57-007/ D57-009/ D57-009A/ D57-012/ D57-013 - D57-015	M21	57+475	58+075	3.5	50	North
NB-027	D58-002 - D58-005 / D59-001	M21	58+675	59+250	3	575	North
NB-028	D59-002/D59-004/ D59-006/ D59-007	M21	58+725	59+325	3	600	South
NB-029	D59-009/ D59-011	M21	59+675	60+100	3.5	425	South
NB-030	D60-004/ D60-005	M21	60+100	60+300	3.5	200	South (Absorptive)
NB-031	D60-003	M21	60+025	60+300	3.5	275	North
NB-032	D60-003 / D60-011	M21	60+325	60+510	2.5	185	North
NB-033	D60-011	M21	60+510	60+860	3	350	North
NB-034	D61-003	M21	60+975	61+325	3.5	350	South
NB-035	D61-004 / D61-005 / D61-006 / D61-008 - D61-010	M21	61+325	61+475	3	150	South
NB-036		M21	61+475	61+725	2.5	250	South
NB-037	D61-015	M21	61+650	62+125	2.5	475	South
NB-038	D62-004 - D62-011 / D62-016 / D62-017	M21	62+375	62+875	3.5	500	North
NB-039			62+875	63+025	3	150	North
NB-040	D62-011 /D63-004	M21	63+025	63+560	3.25	535	North

Barrier Ref.	Incident to	Road Link	Chainage Start (m)	Chainage End (m)	Height (m)	Length (m)	Alignment/ Notes
NB-041	D62-012 /D63-003 /D63-005	M21	62+625	63+630	3	1005	South
NB-042	D63-006	M21	63+775	64+025	3	250	North
NB-043	D63-002 / D64-004 /D63-006 - D64-009 - D64-012	M21	64+025	65+050	3.5	1025	North
NB-044	D64-001 /D64-003 / D64-005	M21	63+750	64+300	3.5	550	South
NB-045	D66-001	Existing N21	65+775	66+175	2	400	South

Appendix B – Chapter 12 EIAR Figures Referred to in Section 4.4



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- ATTENDED NOISE MONITORING
- UNATTENDED NOISE MONITORING
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Environmental Impact Assessment Report

Drawing Title:

NOISE MONITORING LOCATIONS & MITIGATION
SECTION A
SHEET 1 OF 4

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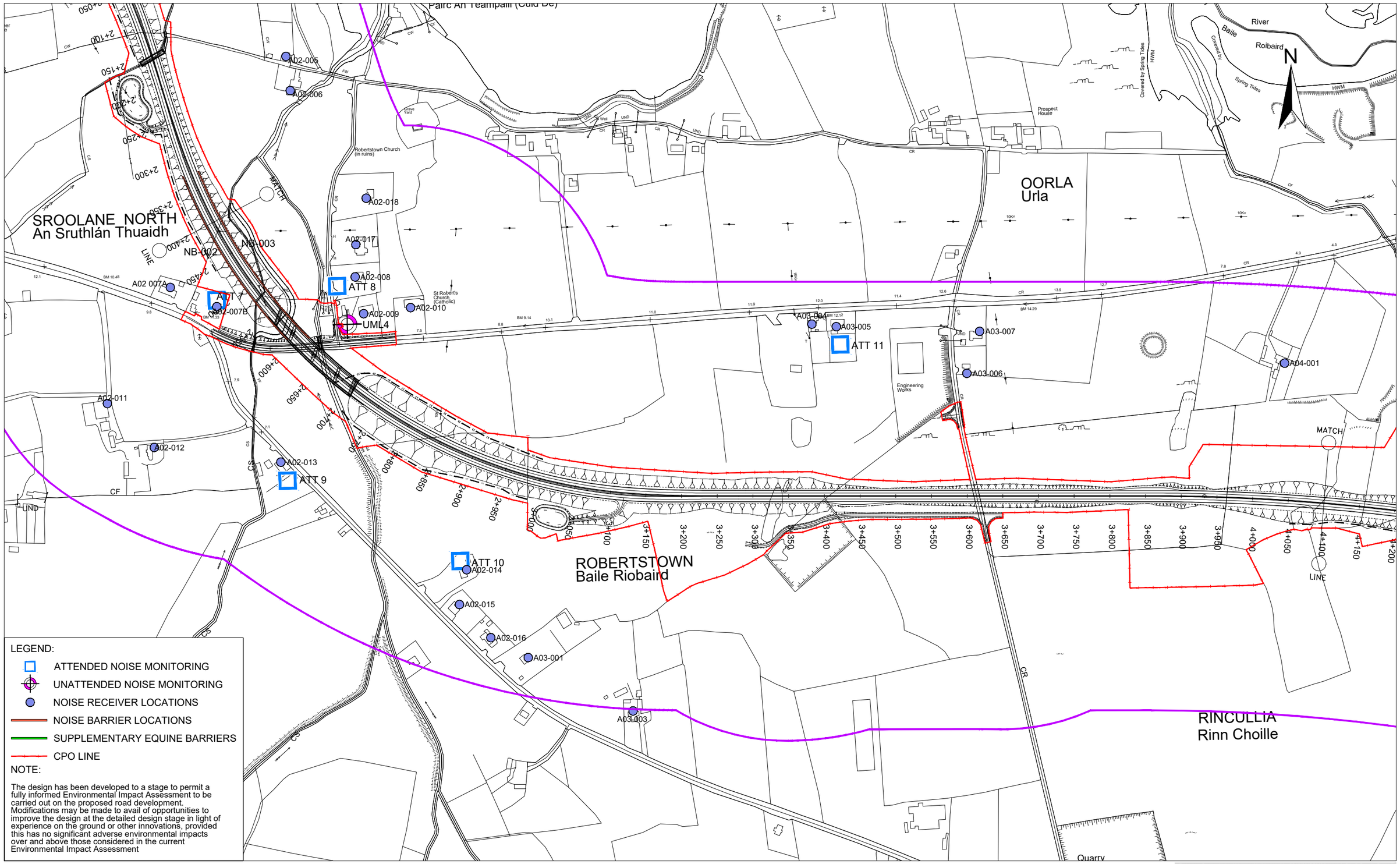

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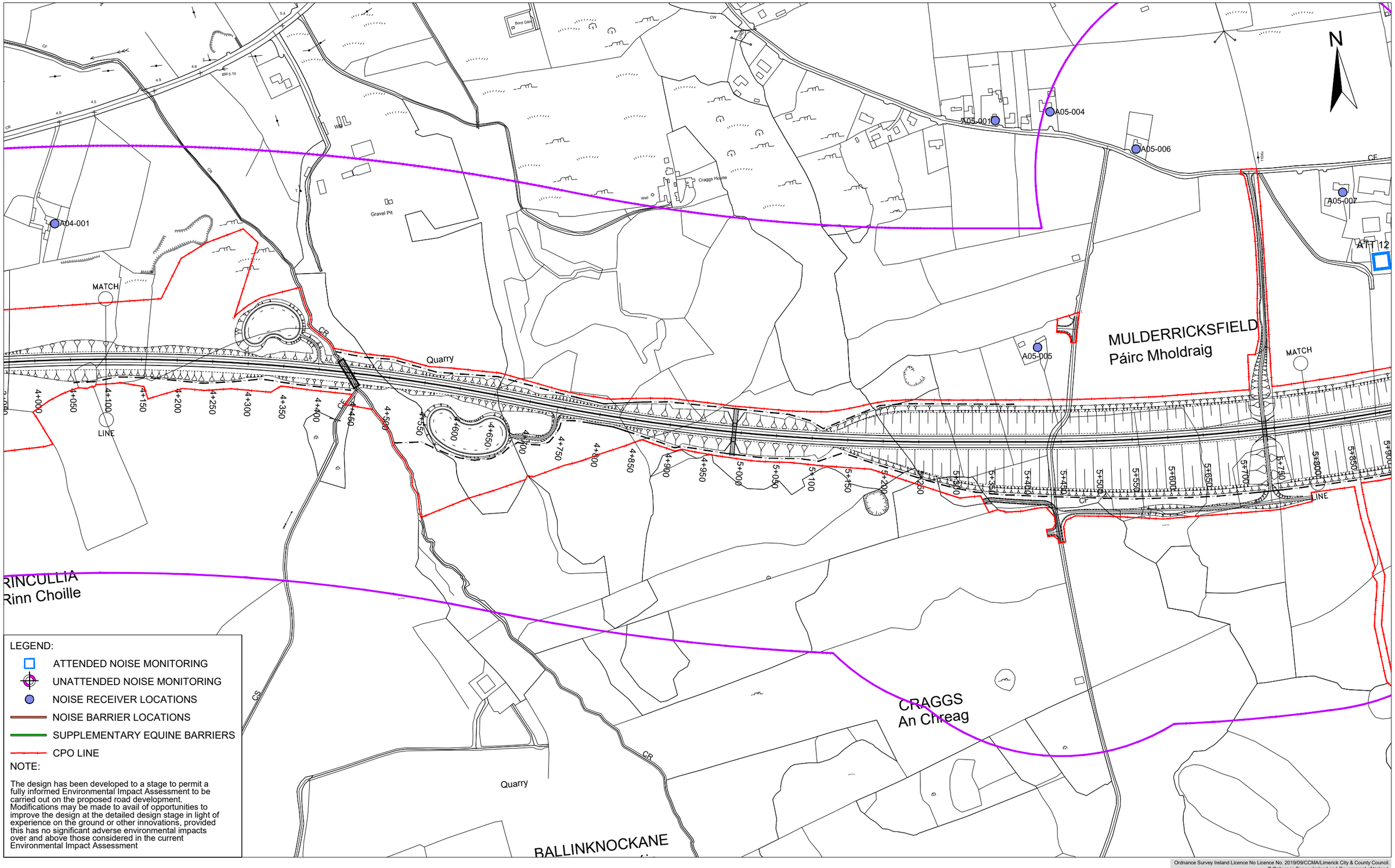

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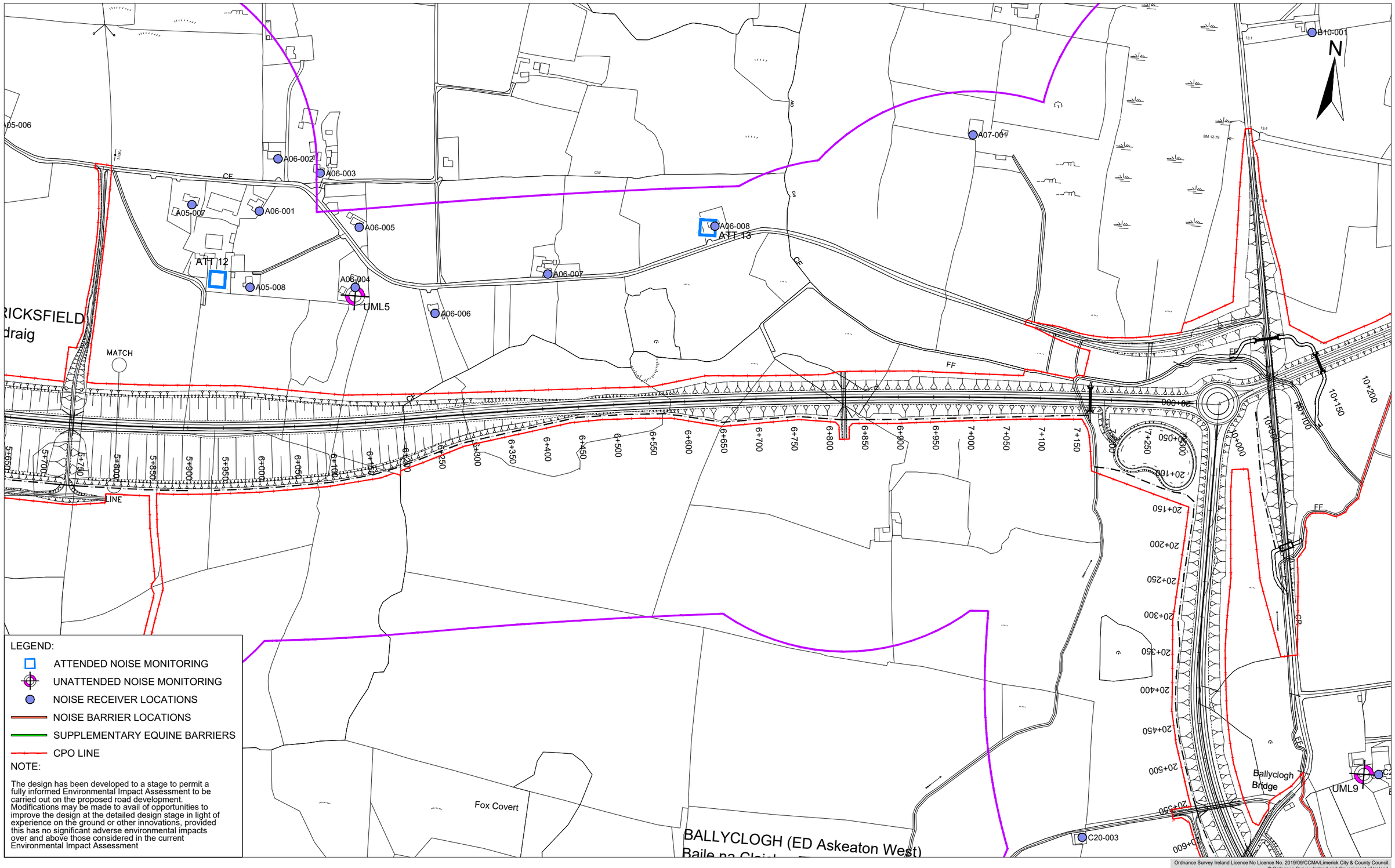

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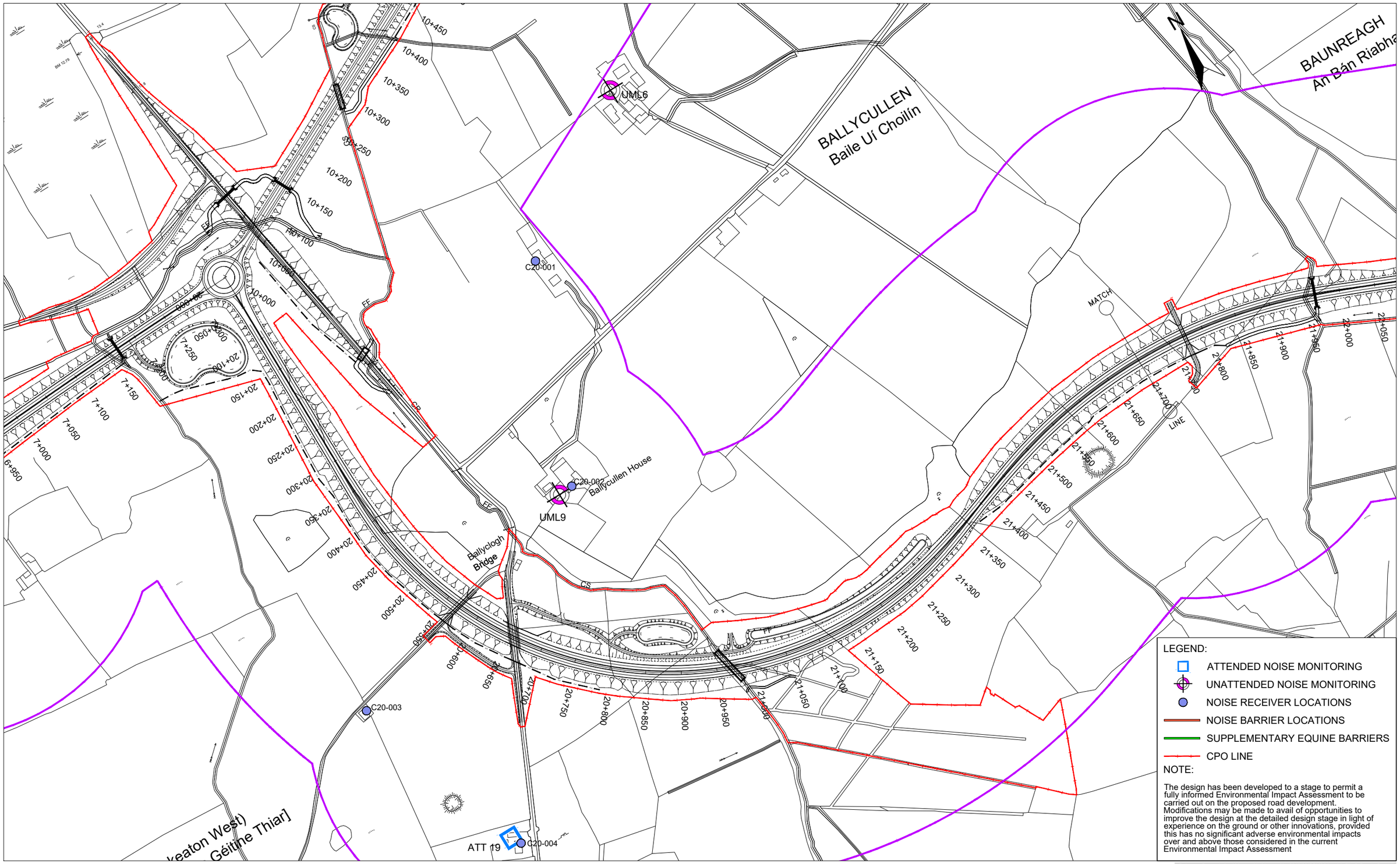

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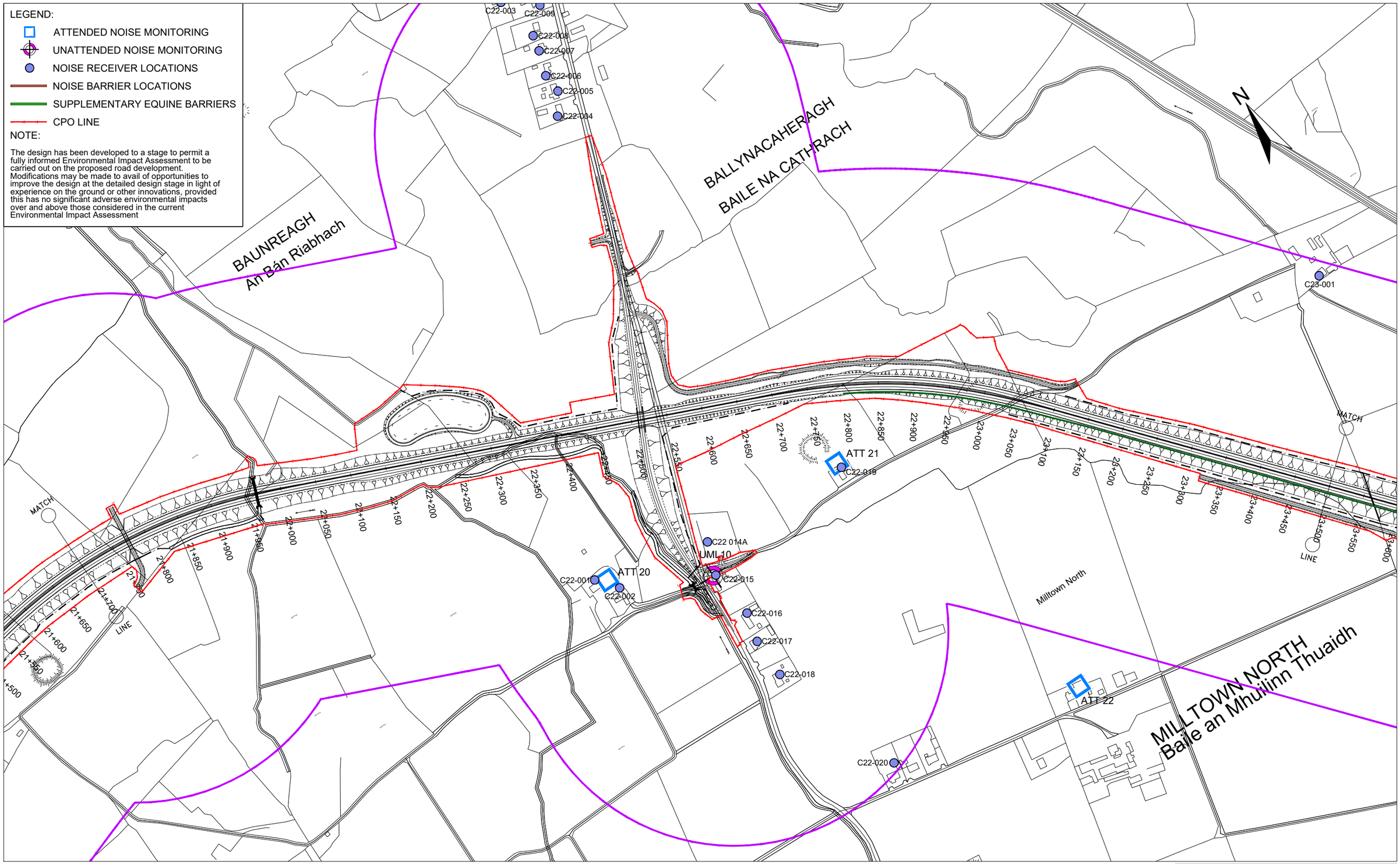

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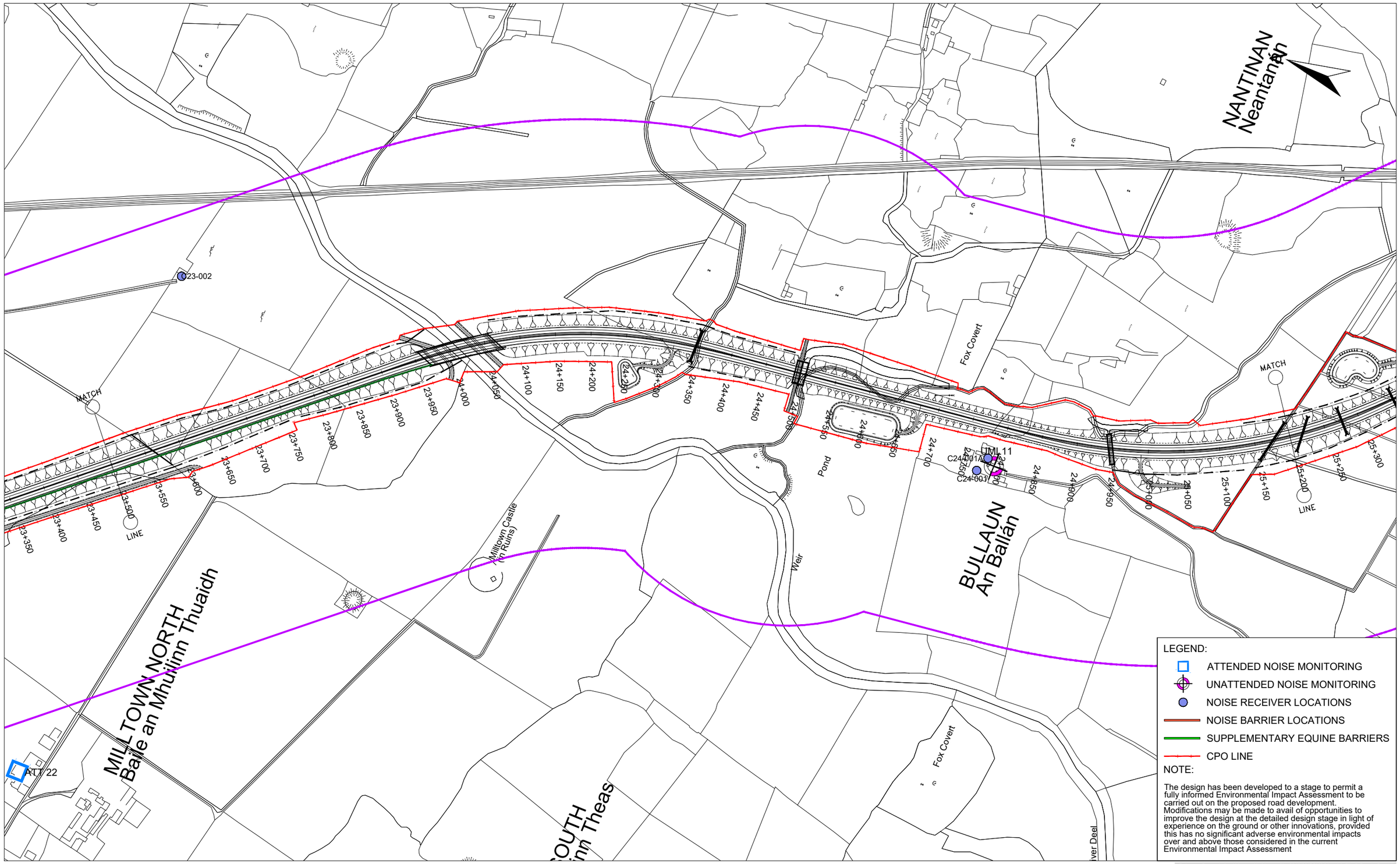

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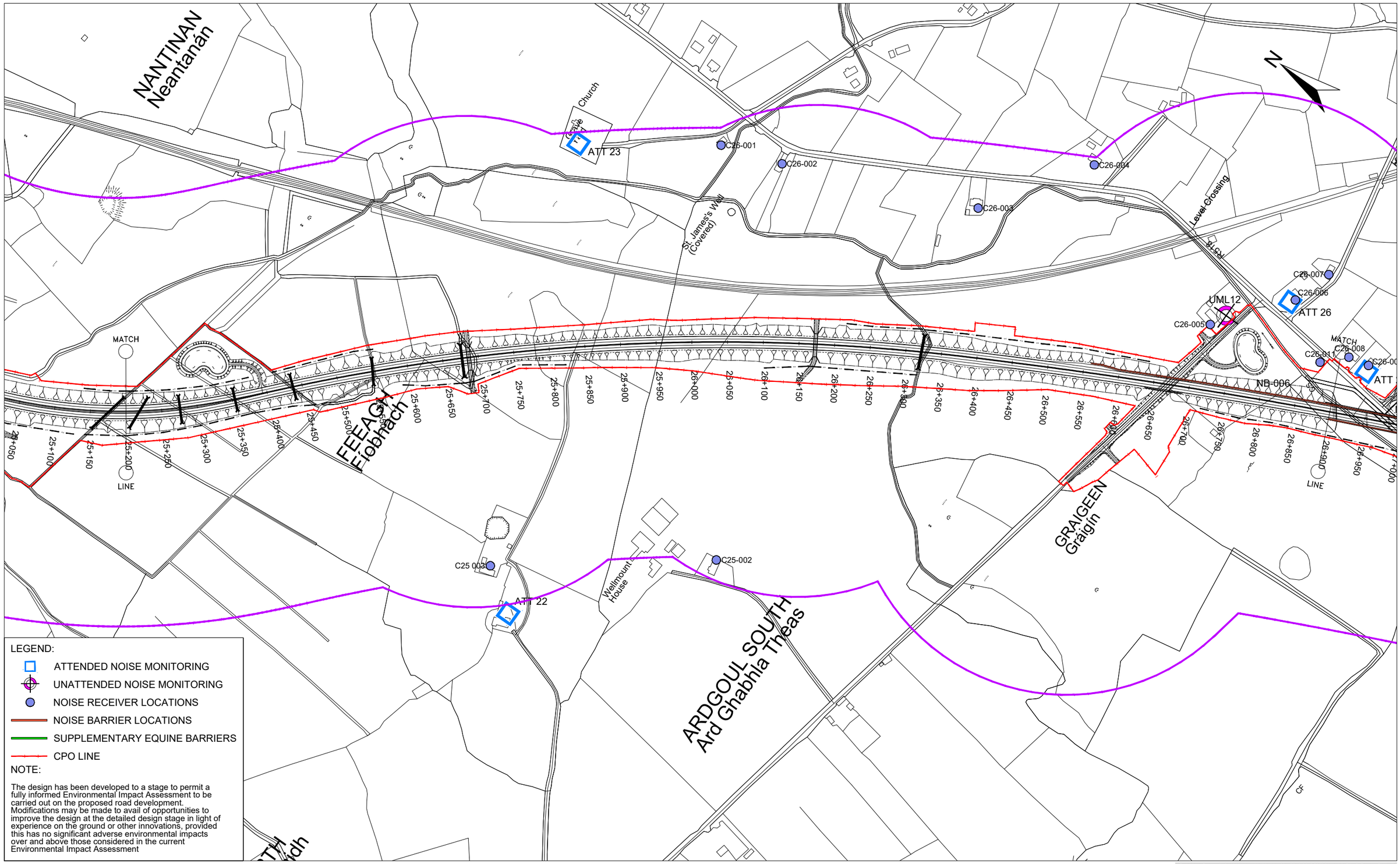

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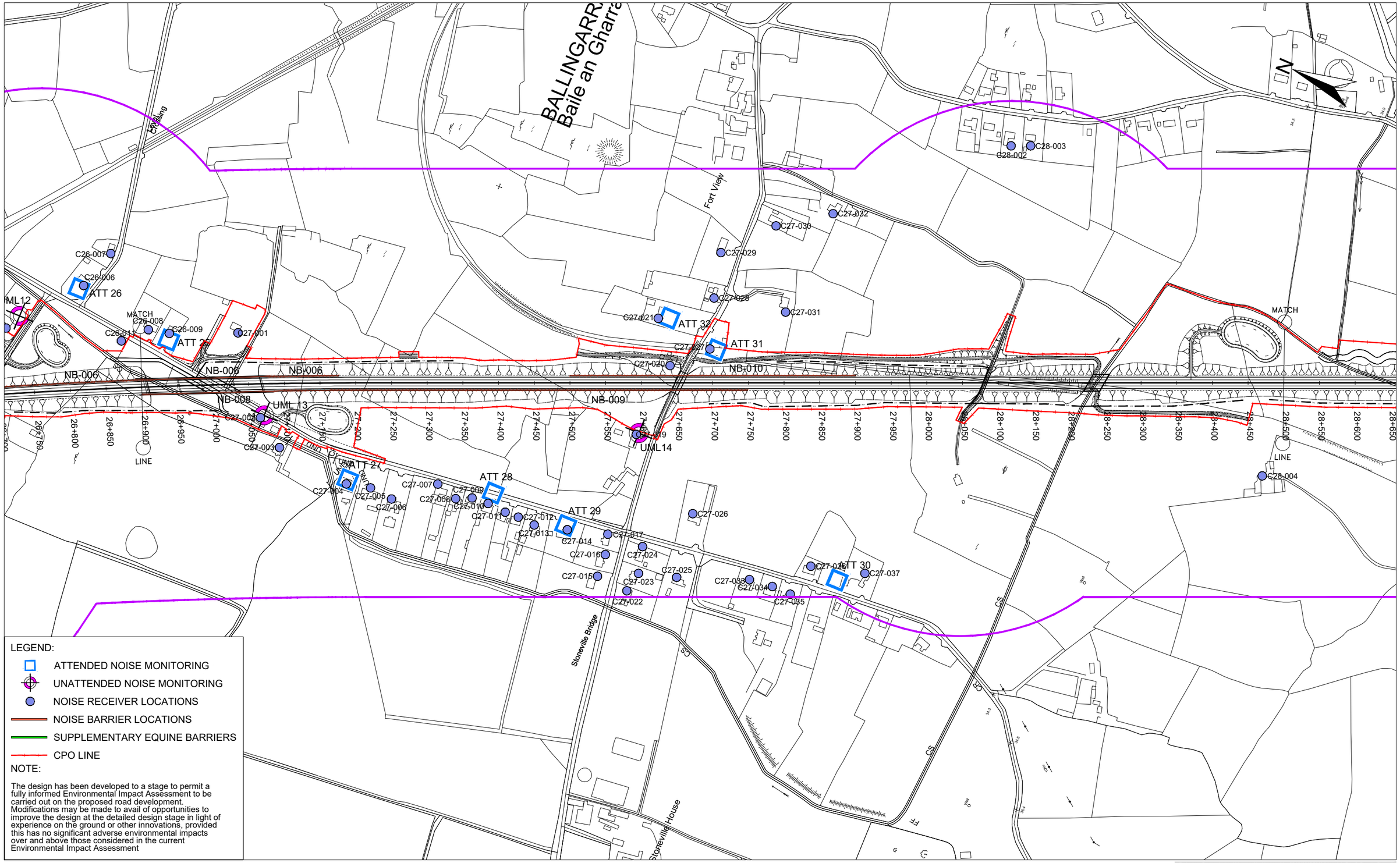

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Project

Foynes to Limerick Road (including Adare Bypass)

Environmental Impact Assessment Report

Drawing Title:

NOISE MONITORING LOCATIONS & MITIGATION
SECTION C
SHEET 5 OF 6

Designed:	JH	File:		Status:	E.I.A.R.
Drawn:	LA	Job No:	14.131		
Checked:	GR	Scale:	1:5000 (@ A3)	Drawing No:	Fig 12.11
Approved:	SMG	Date:	December 2019	Rev:	-

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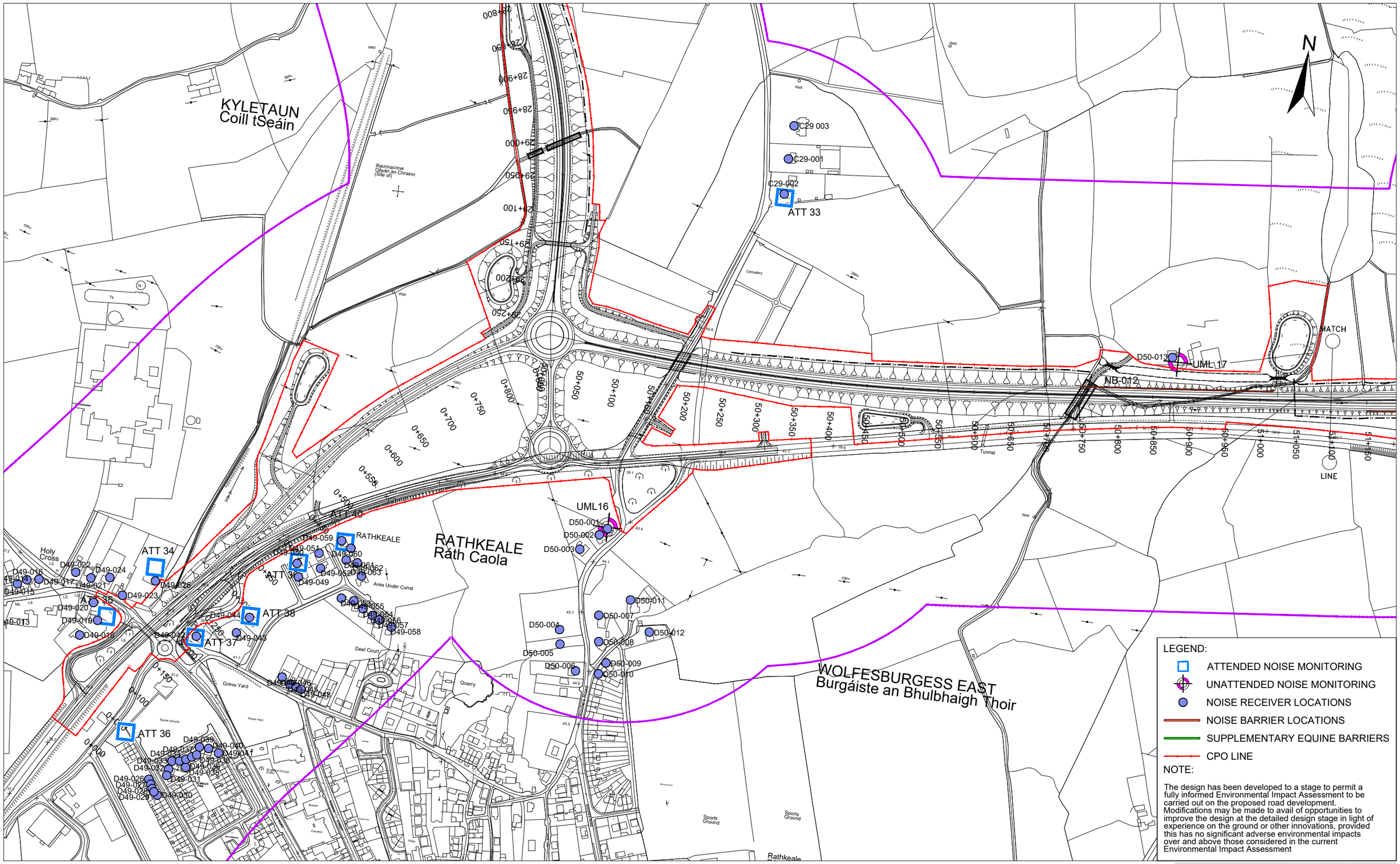

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Environmental Impact Assessment Report

Drawing Title:
NOISE MONITORING LOCATIONS & MITIGATION
SECTION D
SHEET 1 OF 11

Designed: JH	File:	Status: E.I.A.R.	
Drawn: LA	Job No: 14.131		
Checked: GR	Scale: 1:5000 (@ A3)	Drawing No: Fig 12.13	Rev: -
Approved: SMG	Date: December 2019		

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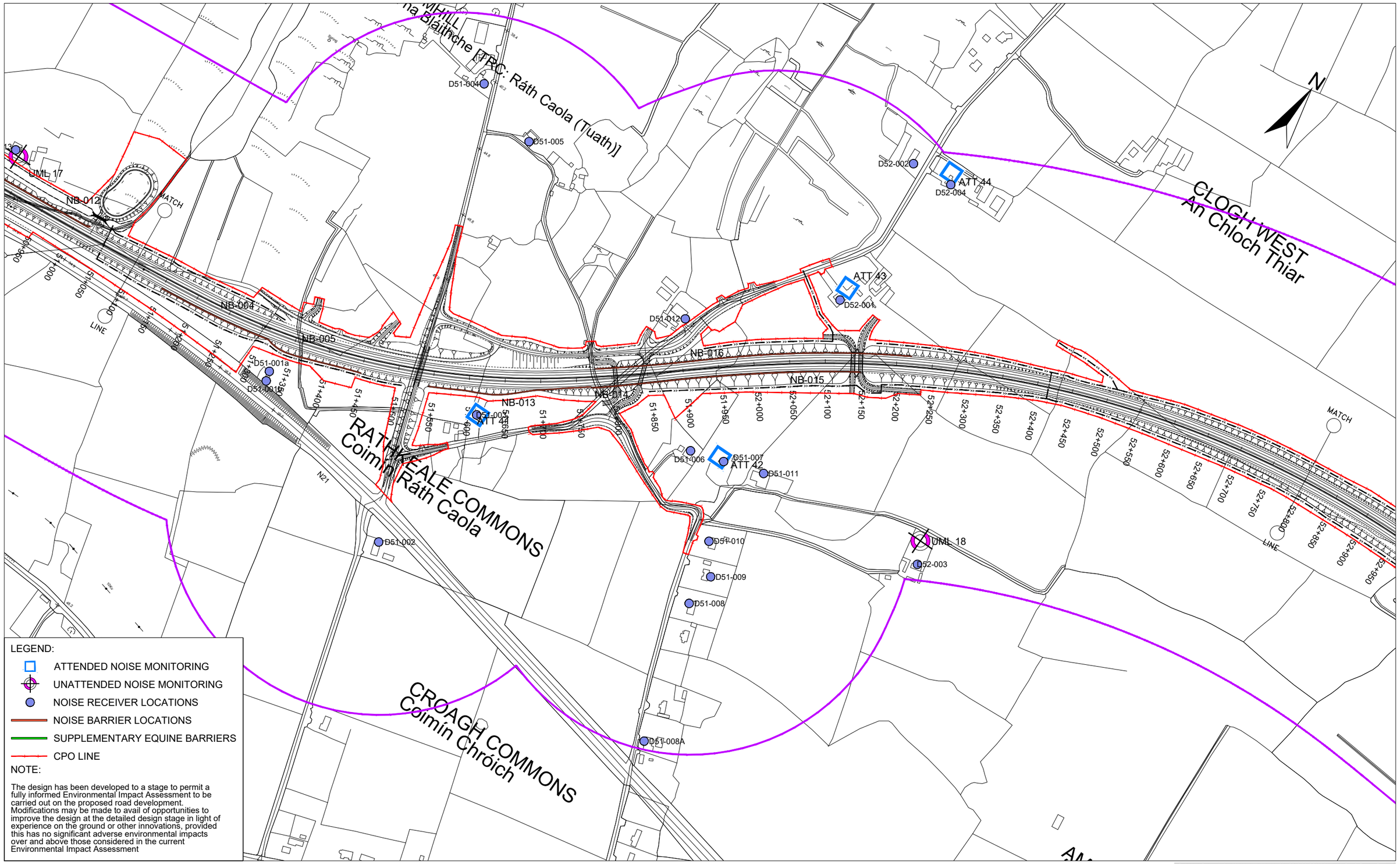

LEGEND:

- ATTENDED NOISE MONITORING
- UNATTENDED NOISE MONITORING
- NOISE RECEIVER LOCATIONS
- NOISE BARRIER LOCATIONS
- SUPPLEMENTARY EQUINE BARRIERS
- CPO LINE

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Environmental Impact Assessment Report

Drawing Title:

NOISE MONITORING LOCATIONS & MITIGATION
SECTION D
SHEET 2 OF 11

Designed:	JH	File:		Status:	E.I.A.R.
Drawn:	LA	Job No:	14.131		
Checked:	GR	Scale:	1:5000 (@ A3)	Drawing No:	Fig 12.14
Approved:	SMG	Date:	December 2019	Rev:	-

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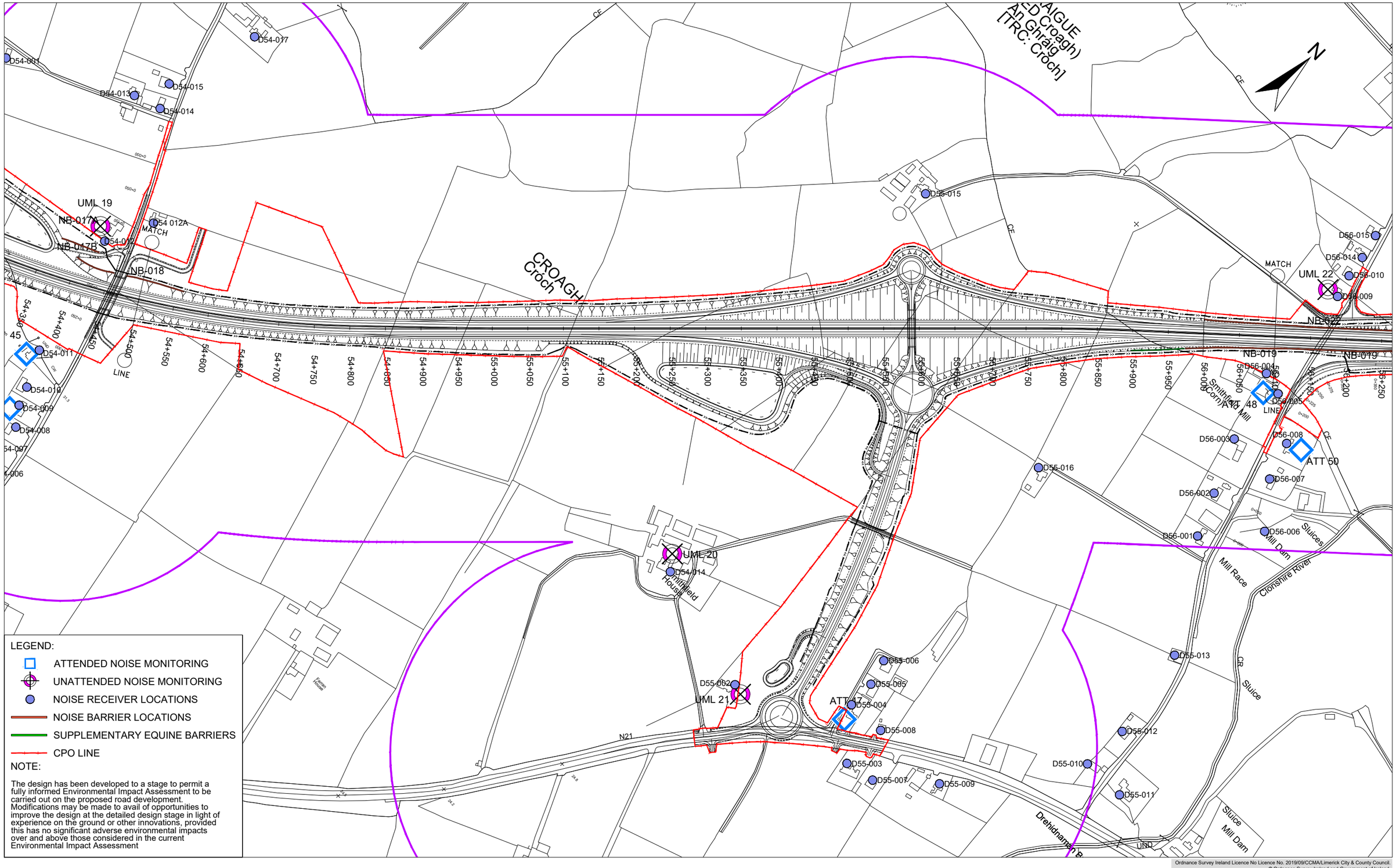

LEGEND:

- ATTENDED NOISE MONITORING
- UNATTENDED NOISE MONITORING
- NOISE RECEIVER LOCATIONS
- NOISE BARRIER LOCATIONS
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Environmental Impact Assessment Report

Drawing Title:

NOISE MONITORING LOCATIONS & MITIGATION
SECTION D
SHEET 4 OF 11

Designed: JH	File:	Status: E.I.A.R.	
Drawn: LA	Job No: 14.131		
Checked: GR	Scale: 1:5000 (@ A3)	Drawing No: Fig 12.16	Rev: -
Approved: SMG	Date: December 2019		

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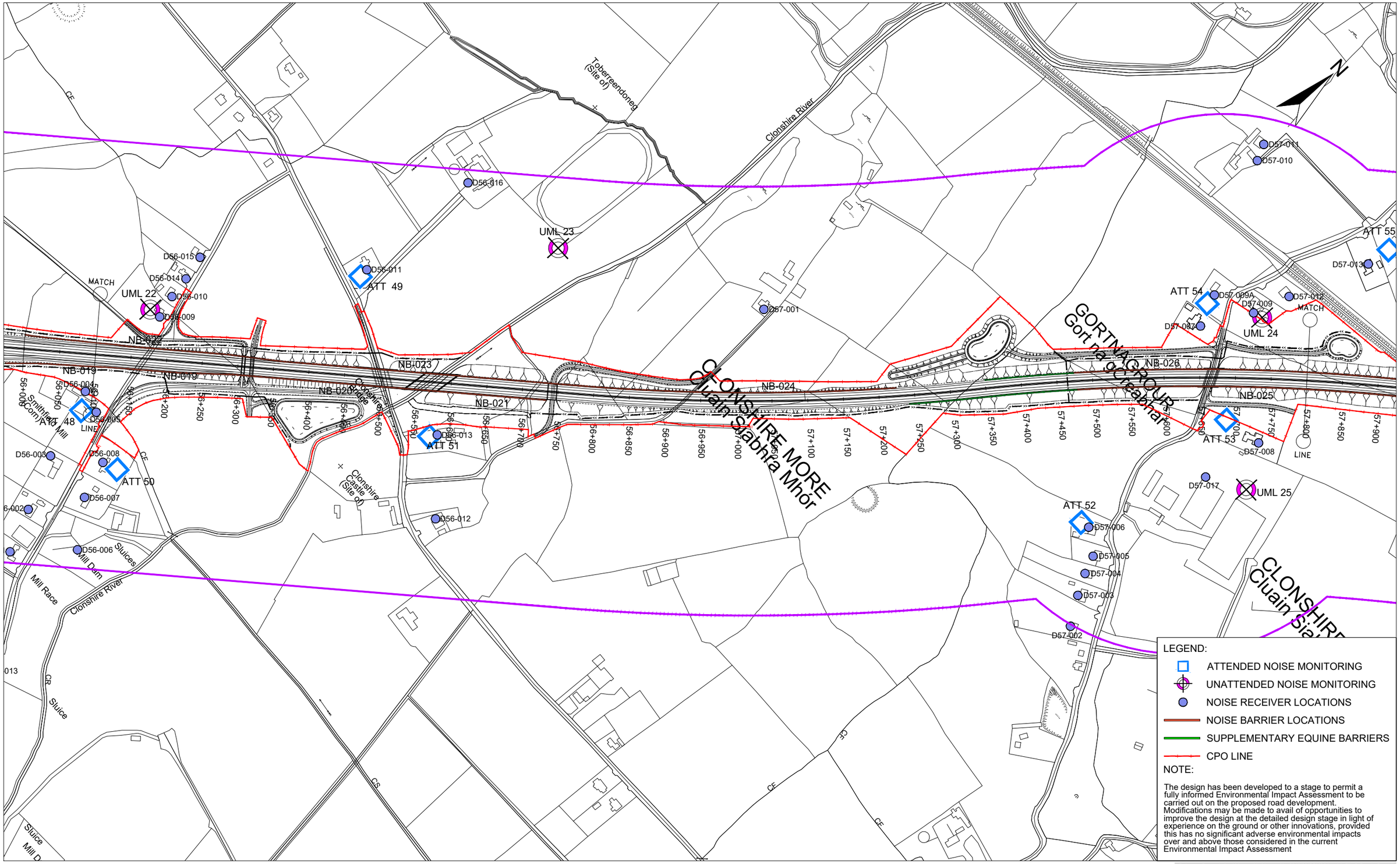

LEGEND:

- ATTENDED NOISE MONITORING
- UNATTENDED NOISE MONITORING
- NOISE RECEIVER LOCATIONS
- NOISE BARRIER LOCATIONS
- SUPPLEMENTARY EQUINE BARRIERS
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Drawing Title:

NOISE MONITORING LOCATIONS & MITIGATION
SECTION D
SHEET 5 OF 11

Designed:	JH	File:		Status:	E.I.A.R.
Drawn:	LA	Job No:	14.131		
Checked:	GR	Scale:	1:5000 (@ A3)	Drawing No:	Fig 12.17
Approved:	SMG	Date:	December 2019	Rev:	-

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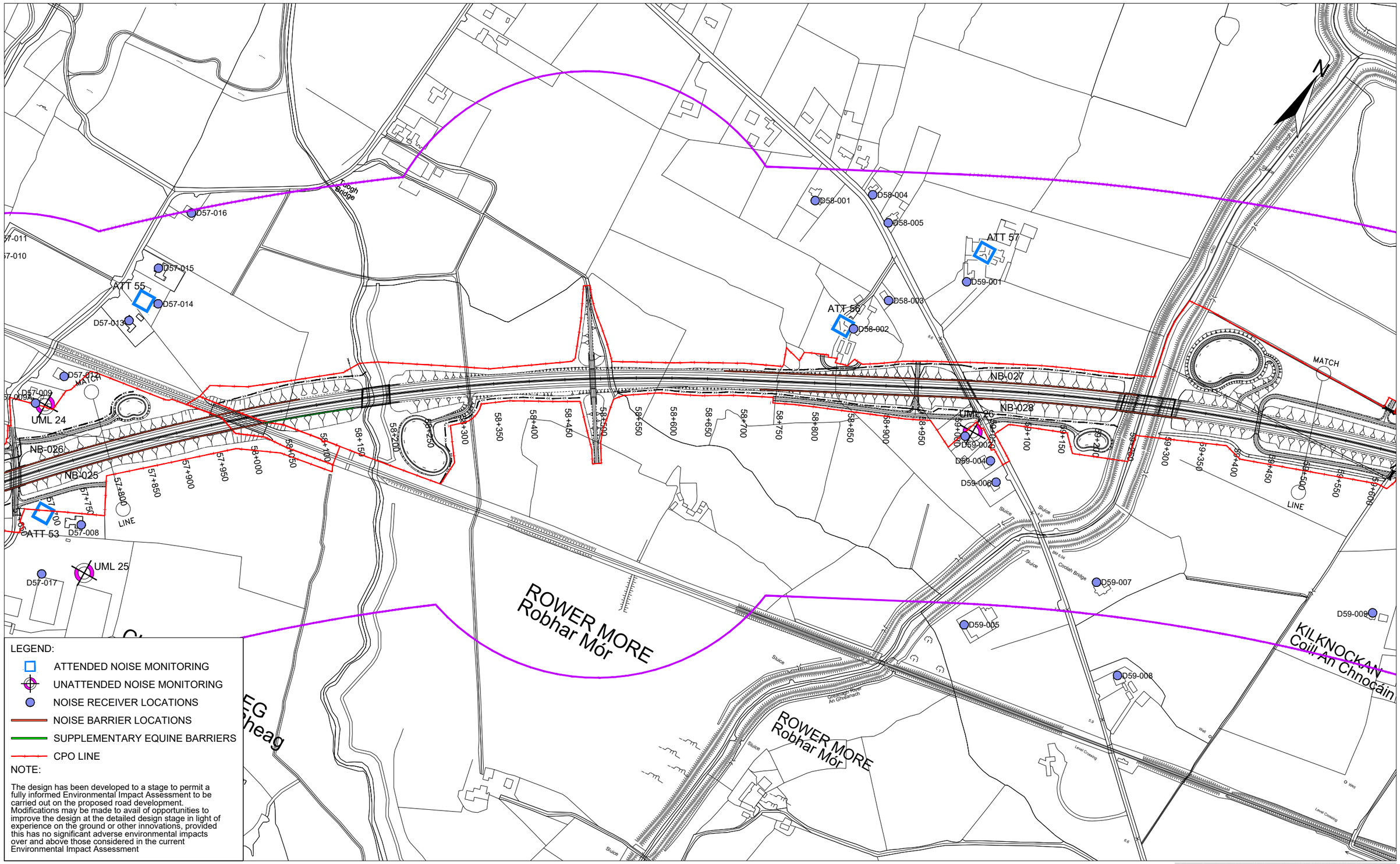

LEGEND:

- ATTENDED NOISE MONITORING
- UNATTENDED NOISE MONITORING
- NOISE RECEIVER LOCATIONS
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Drawing Title:

NOISE MONITORING LOCATIONS & MITIGATION
SECTION D
SHEET 6 OF 11

Designed:	JH	File:	Status: E.I.A.R.
Drawn:	LA	Job No: 14.131	
Checked:	GR	Scale: 1:5000 (@ A3)	Drawing No: Fig 12.18
Approved:	SMG	Date: December 2019	Rev: -

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LEGEND:

- ATTENDED NOISE MONITORING
- UNATTENDED NOISE MONITORING
- NOISE RECEIVER LOCATIONS
- NOISE BARRIER LOCATIONS
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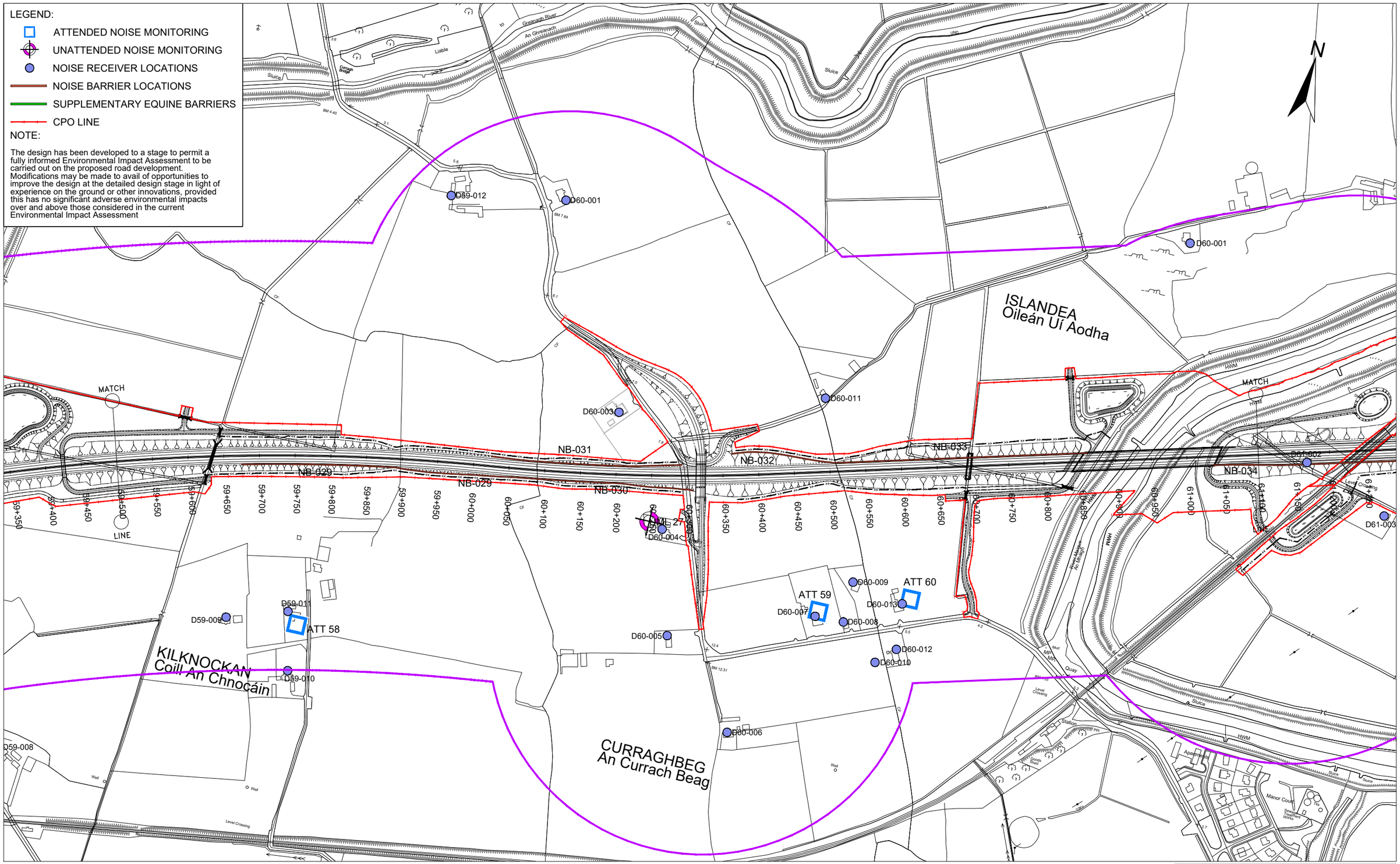

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Drawing Title:

NOISE MONITORING LOCATIONS & MITIGATION
SECTION D
SHEET 7 OF 11

Designed:	JH	File:		Status:	E.I.A.R.
Drawn:	LA	Job No:	14.131		
Checked:	GR	Scale:	1:5000 (@ A3)	Drawing No:	Fig 12.19
Approved:	SMG	Date:	December 2019	Rev:	-

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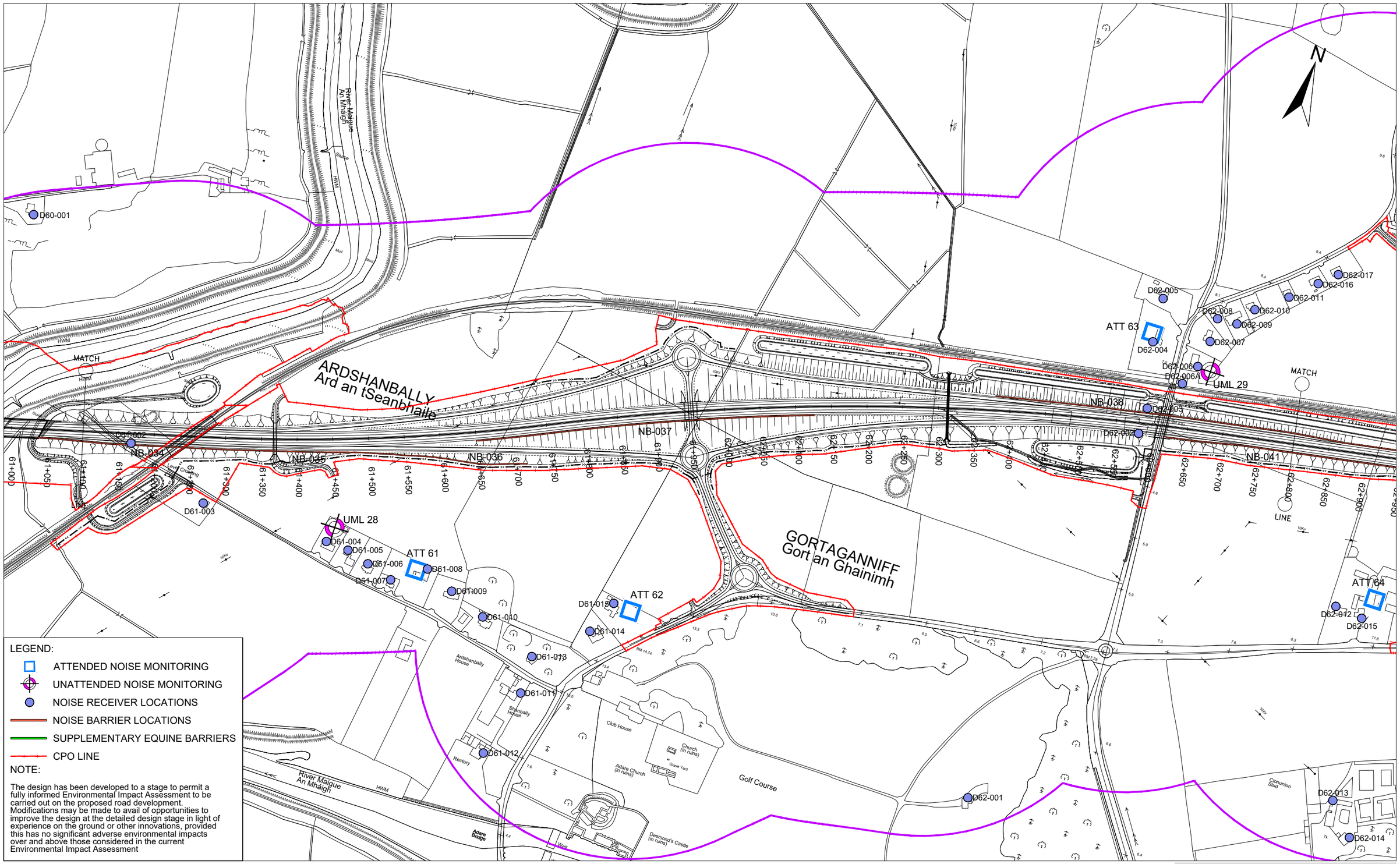

LEGEND:

- ATTENDED NOISE MONITORING
- UNATTENDED NOISE MONITORING
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Drawing Title:

NOISE MONITORING LOCATIONS & MITIGATION
SECTION D
SHEET 8 OF 11

Designed:	JH	File:		Status:	E.I.A.R.
Drawn:	LA	Job No:	14.131		
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Approved:	SMG	Date:	December 2019	Rev:	-

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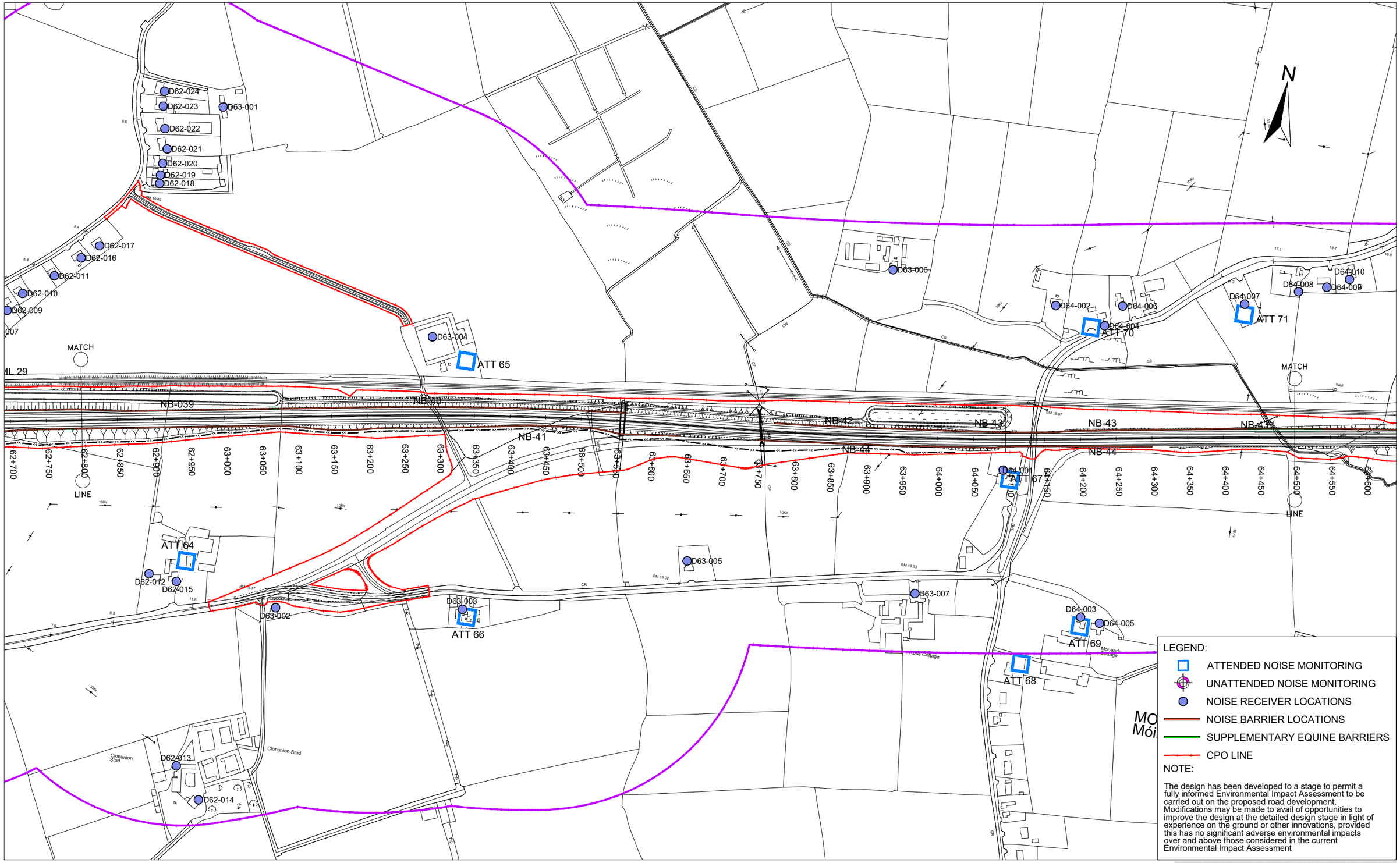

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Drawing Title:

NOISE MONITORING LOCATIONS & MITIGATION
SECTION D
SHEET 9 OF 11

Designed:	JH	File:		Status:	E.I.A.R.
Drawn:	LA	Job No:	14.131		
Checked:	GR	Scale:	1:5000 (@ A3)	Drawing No:	Fig 12.21
Approved:	SMG	Date:	December 2019	Rev:	-

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Appendix C

The following submissions have been responded to in this Brief of Evidence:

Submissions Responded to in this Brief of Evidence	
ENV-	9,10,12,13,17,18,19,25,26,27,29
SCH-	1, 12, 13, 14, 16, 18, 19, 26, 27, 28, 31, 33, 43, 44, 47, 48, 51, 54, 55, 58, 60, 61, 62, 64, 66, 67, 70, 71, 72, 74, 76, 80, 81, 82, 85, 90, 91, 92, 96, 98, 102, 103, 106, 110, 114, 115, 119, 123
FI-	2, 7, 8