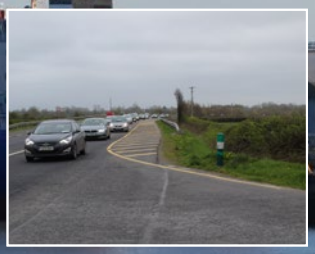


Foynes to Limerick Road (including Adare Bypass)

Request for Further Information

Further Information Response | September 2020

Rialtas na hÉireann Government of Ireland | Tionscadal Éireann Project Ireland 2040 | An Roinn Iompair Turasóireachta agus Spóirt Department of Transport, Tourism and Sport | TII Bonneagar Iompair Éireann Transport Infrastructure Ireland | Comhairle Cathrach & Contae Luimnigh Limerick City & County Council | RODD AECOM

Foynes to Limerick Road (including Adare Bypass)

Further Information Response

30th September 2020

Foynes to Limerick Road (including Adare Bypass)

Further Information Response

TABLE OF CONTENTS

APPENDICES

APPENDIX A1 An Bord Pleanála Request for Further Information Letter to Limerick City and County Council dated 15th July 2020

APPENDIX A2 Figure R4.1

APPENDIX A3 Figures R5.1 and R5.2

APPENDIX A4 Figures R6.1 to R6.5

APPENDIX A5 Figures R11, R11.1, R11.3, R11.4 and R11.7

APPENDIX A6 SLM 20 and SLM 21 Descriptions

0. INTRODUCTION

0.1 An application was submitted by Limerick City & County Council to An Bord Pleanála for development consent for the proposed Foynes to Limerick Road (including Adare Bypass) in December 2019.

0.2 On 15th of July 2020 An Bord Pleanála wrote to the applicant with a Request for Further Information in relation to the likely effects on the environment under 15 items which may be grouped thematically as follows:

Items 1 to 10:	Soils, Geology and Hydrogeology
Items 11 & 12:	Climate
Items 13 & 14:	Biodiversity
Item 15:	River Deel Drinking Water Source

0.3 This document provides responses from the applicant to the Request for Further Information received from An Bord Pleanála.

The Proposed Road Development

0.4 The proposed Foynes to Limerick Road (including Adare Bypass) will provide 35km of new high-quality road to replace 57km of existing roads on parts of both the N21 Limerick to Tralee route, and the N69 Limerick to Foynes Port route, in a combined scheme.

Policy Objectives for Transport & Climate Change

0.5 There will be two major benefits of the proposed development:

a) To relieve existing severe traffic congestion and delay on the N21 route at Adare, and

b) To support the development of the strategic national Shannon-Foynes Port as a major economic facility for the mid-west and south-west regions of Ireland.

0.6 These economic and social objectives are supported by Planning Policies at European, National, Regional and Local levels. With reference to **Item 12 of the RFI,** the objectives of the national *Climate Action Plan* are compatible with the other policies that anticipate and cater for continued demographic growth and economic and social improvements. The key aim of the Climate Action Plan is to accelerate the move away from fossil-fuel based energy in transport as the sector transitions to electric vehicles which is expected to largely eliminate greenhouse gas emissions from transport in the next two decades. Improved roads will assist this process by increasing the efficiency of each trip, which will add to interim reductions in emissions during the transition period to a fully electric fleet. The improved roads will continue to support more efficient transportation in terms of journey times for many decades beyond the point where the internal combustion engine has become an historical relic.

0.7 The proposed road will deliver two elements of the EU Trans-European Network – Transport (TEN-T) in County Limerick for

- the Core Network Route to Shannon-Foynes Port, and
- the Comprehensive Network Route from Attyflin, east of Adare, to Rathkeale.

The TEN-T Network also requires the provision of a railway link to Foynes Port through reinstatement of the disused railway line. The proposed road will complement that railway, with a design that will bridge over it at 3 locations and will not in any way compromise the future reinstatement of the rail service.

0.8 The key relevant National Policy objectives are:

1. To support the Tier 1 status of Shannon-Foynes Port and to provide efficient and effective transport links to the national road network at Limerick, and
2. To improve the route between Limerick and towns in the south-western region through the bypassing of Adare.

0.9 Regional policies have the following key objectives:

1. To help realise the potential of the Limerick-Shannon Metropolitan Area.
2. To support the economic growth of the Shannon Estuary and its resources; and
3. To facilitate a road link between Tralee and Limerick City, including a bypass of Adare.

0.10 Local Policies have highlighted the following needs:

1. To provide key transportation links to achieve balanced regional development.
2. To improve the quality of life of those in towns affected by congestion.
3. To improve local journey times, and
4. To enhance amenities and heritage within attractive places such as Adare, which is currently adversely affected by congestion.

Avoidance and Mitigation of Impacts through the Planning and Design Process

0.11 The planning and design process for the proposed road development commenced in March 2014 and concluded in December 2019, nearly 6 years later, when the application for consent was submitted to An Bord Pleanála. This lengthy time period has ensured a very thorough and exhaustive process that carefully identified and assessed numerous potential route options in the Route Selection stage. This was followed by very detailed design development and further refinements to ensure that the most appropriate and least impactful scheme was developed.

0.12 The outcome is a proposal that is very economically efficient through being nearly 40% shorter than the combined lengths of the national roads that it will replace.

0.13 In the response to **Item 11 for Climate**, the resultant savings in embedded carbon from the shorter route are described. Other reductions and offsets in embedded carbon associated with various design features, together with extensive new landscape planting of woodland areas and boundary hedges and tree lines are also described in the response.

Potential Environmental Effects

Soils, Geology and Hydrogeology

0.14 As elaborated under **Items 1 to 10 for Soils, Geology and Hydrogeology**, the ground conditions along the route consist of limestone and mudstone below a variable depth of soils. In the cuttings in particular, and elsewhere along the route where the soil cover is thin, protective measures will be provided to prevent the infiltration of pollutants from surface water drainage off the road, at both construction and operation stages, that could adversely affect groundwater quality.

0.15 Standard pollution control and attenuation measures will be provided at all road drainage outfalls to protect water quality in watercourses. These protections will address the concerns raised by Irish Water under **Item 15 for the River Deel drinking water source** at Askeaton 2.2km downstream from the proposed new road crossing of the river at Bullaun, and further crossings on tributaries upstream of there.

0.16 Because of the generally flat terrain, which is low-lying in places close to tidal estuaries, the proposed road will be largely constructed on embankments. Cuttings will be limited to a small number of places, and these will yield three-quarters of the fill material required to construct the road embankments. The balance of fill material will require to be sourced from quarries in the region and imported to the site. In the design process the proposed major cuttings have been carefully assessed to limit the potential for adverse impacts on groundwater resources where these provide local water supplies. These concerns constrained the depths of the proposed cuttings and limited the extent to which the proposed road could achieve a full earthworks balance within the footprint of the lands to be acquired.

Climate

0.17 In response to **Item 12 for the national Climate Action Plan**, by providing for more efficient transport in the mid-Limerick area, the proposed road development will assist in greater

operational efficiencies and lower emissions per vehicle journey through relief of traffic congestion and smoother traffic flows. As the regional population increases and improves economically, especially through the growth of Shannon-Foynes Port, the improved road transport will offset to a large extent the emissions that would arise without the proposed new road links. This will support the rebalancing of economic activity across the country with the Mid-West region earmarked for greater proportional growth under the *National Planning Framework*.

Biodiversity

0.18 In response to **Items 13 & 14 for Biodiversity**, the proposed road development has been designed to minimise potential impacts on the local environment in this very environmentally sensitive area of Co Limerick. Biodiversity sites are mainly avoided where possible, or where not, such as at the crossing of the Special Area for Conservation (SAC) at the River Maigue, a very long-span bridge has been proposed to avoid direct impacts on the ecologically sensitive river channel which is in a tidal zone. The response in this document addresses the issues raised in the submission from Inland Fisheries Ireland in relation to sea lamprey and water quality testing in the River Maigue prior to construction.

0.19 On other watercourses there will be clear-span bridges provided that retain the channels and banks undisturbed as wildlife corridors where appropriate.

Population & Human Health

0.20 In respect of population and human health there will be numerous positive impacts of the proposed road development as follows:

1. Improved safety on the road network.
2. Reduced journey times and lower emissions per trip for national and regional traffic will benefit the human population at a local, regional and national level.
3. Improved journey amenity for regional traffic and all modes of local traffic including cycling and walking through reduced traffic volumes on existing roads. More sustainable modes of transport for local and recreational trips will be encouraged by the removal of the large volume of long-distance traffic, especially heavy goods vehicles from the existing roads.
4. Improved general amenity due to transfer of major traffic flows from the local communities of Adare and Croagh on the existing N21 route, and to a lesser extent for the various communities along the existing N69 route.
5. Reduced exposure of population to noise and air pollution within the local communities along the existing roads.

Noise and Visual Impacts

0.21 Noise barriers and screen planting will minimise adverse effects for the residents of houses within the vicinity of the proposed new roads.

Agriculture

0.22 Impacts for agriculture have been largely reduced through the alignment of the route along or close to property boundaries as much as possible. Farm severance will be mitigated through the provision of 20 dedicated farm underpasses along the route with an additional 4 farm underpasses provided under river bridges and 3 as overbridges.

Response to the Request for Further Information (RFI)

0.23 The further information provided in this document addresses comprehensively the 15 items sought by An Bord Pleanála and was compiled over a 2-month period. When read in conjunction with the EIAR, the clarifications in this document should provide An Bord Pleanála with all of the information necessary to consider the granting of consent to the proposed road development.

EXECUTIVE SUMMARY - ITEMS 1 – 10 SOILS, GEOLOGY AND HYDROGEOLOGY

Items 1 to 10 of the RFI are principally responded to by Fintan Buggy of Roughan & O'Donovan and Anthony Cawley of Hydro Environmental who were involved with compiling Chapters 8 Soils and Geology and Chapter 9 Hydrogeology of the EIAR, with inputs from the design team where required.

Item 1 & 2 Geological Conditions

The response to Item 1 of the RFI provides a summary of the site visits undertaken by members of the design team over a number of years from 2014 to 2018. The results of the walkovers together with all other information, subsequently informed the ground investigations which followed between October 2016 and January 2019 and were used to determine the soil, bedrock, and groundwater conditions.

For item 2, the RFI response provides clarification of the depths at which bedrock was encountered across the proposed road development. The response confirms that depths of rock are generally in the range of 0.3m to 6.5m as stated in Chapter 8 of the EIAR. However, there are localised exceptions to this where rock was encountered at a greater depth. The response to Item 3 of the RFI subsequently validates the estimated quantities of rock summarised in Section 8.4.1.1 of the EIAR, following the confirmation that there is no discrepancy in bedrock depths reported.

Items 4 & 5 Karst Features

Items 4 and 5 of the RFI relate to Karst Limestone features and geophysical survey anomalies. The responses provided to these items present evidence of the extensive investigation and assessment undertaken of karst issues in this project, including initial desk study, site walkover by relevant specialists, targeted ground investigations informed by geophysical surveys and detailed follow-up assessment and consideration. The response to item 4 of the RFI clarifies that as per section 8.3 of the EIAR, there are no surface depressions within a 2km buffer zone. Surface depressions could be an indicator of internal erosion or instability of soils into voids within limestone bedrock e.g. sinkholes, depressions, or caves. It is noted that this is in keeping with the identification of other karst features in Chapter 9, including turloughs and springs, within the 2km buffer zones, which are of hydrological significance. The response to item 5 identifies the locations of the two possible karst anomalies which were identified through geophysical surveys as part of site investigations. It is further noted that these possible anomalies were subject to further investigations during the design stage to ensure there were no voids or unstable ground conditions present.

Item 6 Extent of Dewatering

The response to item 6 of the RFI outlines the extent of dewatering required as part of the construction phase. The Sichardt drawdown formula is used and the anticipated extent of dewatering, where applicable, is presented. The response also reiterates that Table 9.19 of the EIAR outlines the potential impacts and subsequent mitigation measures which have been incorporated within the EIAR to ensure that water supplies such as those listed in item 6 of the RFI are not affected.

Item 7 Soft Ground

The response to item 7 of the RFI outlines the location and extent of soft ground along the proposed road development as discussed in Chapters 8 and 9 of the EIAR. Areas of soft ground were assessed by the ecologist as part of the EIAR, and Key Ecological Receptors were identified in Chapter 7 of the EIAR. In all cases, no environmental effects of concern were identified.

Item 8 Contaminated Soil

The response to item 8 of the RFI discusses a very small area of potentially contaminated soil or waste which was omitted from Chapter 8 of the EIAR. The area in question at Craggs near Foynes at the western end of the proposed road is used as a fuel storage / coal depot. Following site investigations, it was found to have a thin 0.3m deep layer of coal dust and grit at the surface. The design of the proposed road was arranged to skirt around the coal yard and there is a very small area of encroachment by the proposed road works at the southern edge of this site. The treatment of this ground will be carried out as outlined in Section 8.4.1.8 of the EIAR, and any excavated waste soils will be tested on site and disposed into licenced landfill as appropriate.

A second area of potential contamination arises at the location of a former quarry which was more recently used for dumping activities. At the construction stage the ground conditions will be closely monitored at this location to check if any waste material is exposed during excavations, with provision for any such material to be tested on site and disposed into licensed landfill facilities

Item 9 Borrow Pits

The response to item 9 of the RFI identifies the areas which may be considered for borrow areas during construction, as referenced in the EIAR. These potential areas are within the land-take and are located in the three largest cuttings along the route and may consist of some modest degree of additional excavation below the level of the permanent works to gain more rock materials. The applicant confirms that the potential temporary hydrogeological impacts of such extraction activities have been considered in the assessment of impacts on groundwater as described in Chapter 9 of the EIAR, including consideration of drawdown effects as described in the EIAR and in the response to item 6 of the RFI above. As indicated in Section 8.4.1.9 of the EIAR, some excavated soft soil materials which are not suitable for re-use for engineering purposes may be deposited into such borrow areas, and this is not expected to result in any detrimental environmental impacts at these locations, as the materials will be chemically inert. As any borrow pits would be temporary with ground levels reinstated following deposition of backfill, the groundwater levels will remain the same as for the permanent works once they are completed. Should this option be pursued, a layer of cohesive fill material and geosynthetic separator will be placed as deemed necessary to ensure that migration of fines into underlying groundwater sources is avoided.

Item 10 Drainage

The response to item 10 of the RFI seeks to clarify that the proposals for the use of cohesive non-permeable material and drainage blankets are as illustrated in Figures 9.5 to 9.16 of Volume 3 of the EIAR which are primarily associated with Chapter 9 Hydrogeology as opposed to Chapter 10 Hydrology. The drainage measures are proposed to mitigate potential impacts on the hydrology of three fens as outlined in table 9.19 of Chapter 9 in the EIAR, following which the residual impact on the three groundwater dependant Key Ecological Receptors (KER) were found to be imperceptible in terms of Hydrological impacts. The overall residual impact on these groundwater dependant KERs for Biodiversity is detailed in Chapter 7 of the EIAR and has determined that the impact will be reduced to permanent slight negative due to loss of habitat and dissection of the sites.

1. ITEM 1: SITE INSPECTIONS FOR SOILS & GEOLOGY

An Bord Pleanála RFI:

*In section 8.2.4 of Chapter 8 (Soils and Geology) of the EIAR, the applicant makes reference to having carried out several site inspections along the length of the proposed road development in order to assist in the identification and assessment of the environmental impact on the geological environment. However, no records of these inspections could be found in the information received by the Board. In this regard, the applicant is requested to provide a **summary account** of the site inspection records undertaken in **key areas** that informed the environmental component of the ground / site investigations.*

Applicant Response for Item 1

1.0 Site reconnaissance visits took place on numerous occasions over a 5 year period for general purposes initially and specifically in relation to soils, geology and hydrogeology as following:

a) Various site visits throughout the study area for the Route Selection Stage in 2014 and 2015, which provided a general appreciation of the topography and ground conditions such as limestone rock exposures on the surface and soft areas in floodplains and numerous fens associated with the underlying hydro-geological features.

b) 20th June 2016: Full site walkover at start of the design stage to plan the ground investigations along the selected route.

c) 29th and 30th August 2018: General site walkover which included review of watercourses and areas of soft ground to verify numerous matters of detail including provisions at watercourse crossings and connectivity for farming across the route where necessary.

d) 5th October 2018: Site walkover to investigate hydrogeology aspects, karst features etc. following desk studies including review of aerial photography and relevant GIS mapping.

1.1 Numerous design team members partook in these inspections to various extents, including the Project Director, the Project Manager, road designers, drainage designers, geotechnical engineers, and various environmental specialists.

1.2 Formal records were not prepared during these inspections, with team members taking numerous photographs of features of particular interest to their role in the project, and making associated hand-written notes, which would not have been saved to the formal project files or retained beyond their short-term use to inform the relevant design and planning tasks in hand at that time. A small sample of 6 photographs from these site inspections in 2014, 2016 and 2018 are included for illustrative purposes at the end of this section of the RFI response.

1.3 The above site walkovers informed the ground investigations which were undertaken in several phases during the development of the Foynes to Limerick Road (including Adare Bypass) between October 2016 and January 2019. The inspections included consideration of geomorphology including karst features, noting the presence of watercourses and possible interaction with hydrogeological features. The inspections carried out also assisted in the planning of the scope of the ground investigations required to determine the soil, bedrock and groundwater conditions on the project. The site walkovers also helped to establish the presence or likely presence of any possible contaminants along the corridor. Key issues which would have been considered included areas of anticipated deep cuttings (Ardaneer, Barrigone and Ballycannon north of Croagh village) together with areas of soft or potential soft ground at Lismakeery, and Rathkeale Commons / Blossomhill.

1.4 The ground investigations undertaken for the design of the proposed road development were carried out during the period 2016-2019. These investigations consisted of boreholes, trial pits and dynamic probes to determine the characteristics of the overburden material, and rotary cores to determine the bedrock conditions and rock strength. In addition, geophysical surveys were carried out at various locations along the route including at areas of known or suspected karst activity which is an area of concern environmentally. Additionally, in this regard, standpipes and piezometers were installed in areas of interest with respect to groundwater and monitoring of groundwater levels (both manually and digitally) was undertaken to ascertain

seasonal groundwater fluctuations. Groundwater quality was monitored at sensitive locations in order to determine baseline conditions and, in areas of concern relating to potential ground contamination, environmental sampling of soil and groundwater was carried out to determine the nature and extent of any contaminants which may be present. Team members supervised the ground investigation works and made numerous inspections as they proceeded.

1.5 The locations of the resulting ground investigations have been included in Figures 8.1 to 8.24 of Volume 3 of the EIAR, along with the conditions identified from the boreholes, rotary drill holes, trial pits and probes outlining the rock/soil type and depth encountered. A general description of the conditions encountered is presented in section 8.3 of the EIAR.

SAMPLE PHOTOGRAPHS FROM SITE INSPECTIONS

General view of terrain between Croagh and Cappagh (May 2014)

Fen at Cappagh (May 2014)

Limestone rock outcrop (June 2016)

Soft ground area at Rathkeale Commons / Blossomhill northeast of Rathkeale (June 2016)

Rock at surface in a small hill (June 2016)

Standpipe for groundwater monitoring at Bullaun near River Deel (August 2018)

2. ITEM 2: DEPTH OF BEDROCK

An Bord Pleanála RFI:

It is stated in section 8.3 of the EIAR that bedrock was generally encountered at depths varying between 0.3m and 6.5m. This is at variance with section 9.3.2 of the EIAR addressing 'Hydrogeology', which states that in Sections A to C, intrusive site investigations encountered moderately weak to strong Limestone and Mudstone at depths ranging between 0 – 17.1m below ground level. The applicant is requested to clarify and confirm the depths of bedrock encountered during the site investigations at representative locations along the proposed road development.

Applicant Response:

2.1 Section 8.3 refers to general conditions relating to bedrock and indicates a typical range of depths of between 0.3 and 6.5m. There are localised exceptions to this where increased depths were encountered.

2.2 The depth of 17.1m recorded at BH/RC 03-06 at Ch.3+870 has been checked for evidence of possible irregularities. Despite the exceptional depth of rock at this location, the materials overlying the rock are firm comprise stiff glacial till overburden and boulders. No evidence was found of other erosion or instability of soils or voiding such as sinkholes, depressions, or caves.

2.3 Depths to bedrock along the route of the proposed development are shown on Ground Investigation Figures 8.1 to 8.24 as contained in Vol. 3 of the EIAR.

3. ITEM 3: MATERIAL TO BE EXCAVATED

An Bord Pleanála RFI:

It is stated in section 8.4.1.1 of the EIAR that the total volume of cut material would amount to approximately 3 million cubic metres, of which 1.9 million cubic metres would be rock. In light of the possible discrepancy regarding depth to rock (set out in item 2 of this request above) the applicant is requested to clarify and confirm the volumes of rock and various soil types that are estimated to be excavated and to address any additional resultant environmental effects, as necessary.

Applicant Response:

3.1 The total rock cut volume estimates reported in Section 8.4.1.1 of the EIAR are based on the ranges of depths to bedrock encountered in boreholes in cuttings and have been calculated using appropriate numerical modelling tools.

3.2 As explained in the response to query 2 above, there is no discrepancy in the bedrock depths used to estimate those volume calculations. On this basis the applicant confirms the estimated quantities summarised in Section 8.4.1.1 of the EIAR. The total volume of cut material within the proposed road development amounts to approximately 3.0 million m^3, of which rock will amount to 1.9 million m^3 (63%). Of the soils to be excavated, 300,000m^3 (27%) is expected to be unsuitable for reuse as an engineering material but will be used as general fill in landscaping areas or deposited in borrow pit areas as referred to in the EIAR and additionally in response to RFI Item 6 below. A net volume of 2.7 million m^3 of cut material will be available for embankment construction within the proposed road development.

3.3 Further detailed information on general earthworks quantities is presented in Section 4.11.2 of the EIAR.

4. ITEM 4: KARST FEATURES

An Bord Pleanála RFI:

It is stated in section 8.3 of the EIAR that no karst surface depressions were observed within 2km of the proposed road development. This is at variance with the information provided in section 9.3.6 of the EIAR which lists a number of karst features encountered (including karst surface depressions associated with turloughs). The applicant is requested to clarify and confirm the extent of existing karst features within 2km of the proposed road development and to address any additional resultant environmental effects, as necessary.

Applicant Response:

4.1 For clarification, the statement in Section 8.3 of the EIAR relates to the absence of **surface depressions** within a 2km buffer zone and which could be an indicator of internal erosion or instability of soils into voids within limestone bedrock e.g. sinkholes, collapses, or caves. The conclusion that no surface depressions were observed was arrived at following the various site walkovers carried out as referred to in response item 1 above, and is consistent with the locations of karst features recorded in the GSI database and as shown on EIAR Figure 9.3: "Groundwater Vulnerability & Karst Features". This information is reproduced in Figure R4.1 in Appendix A2 of this Response document. Groundwater vulnerability mapping, which had been included in EIAR Figure 9.3, has not been shown in Figure R4.1 in the interests of clarity.

4.2 The surface depressions referred to in par. 4.1 above are separate from other karst features which were encountered within the 2km buffer zone. These include turloughs and springs which are of hydrogeological significance and are described in Section 9.3.6 of the EIAR.

4.3 Investigations of possible karst anomalies, including the use of geophysics techniques, is dealt with in response to item 5 of the RFI below, and they indicated no features of concern.

4.4 The potential impacts on these features, together with appropriate mitigation measures, are fully described in Chapters 7 and 9 of the EIAR as appropriate and the potential environmental effects are fully addressed therein.

4.5 The EIAR concludes that no net significant adverse environmental impacts will arise from karst related features.

5. ITEM 5: KARST ANOMALIES

An Bord Pleanála RFI:

It is stated in Section 8.3 of the EIAR that the geophysical surveys carried out revealed possible karst anomalies and that these anomalies were followed up by additional rotary boreholes. The applicant is requested to clearly identify the areas of karst anomalies on a standalone drawing.

Applicant Response:

5.1 Section 9.3.6 of Chapter 9 details the geophysical surveys undertaken under the heading **Site Investigations to Identify Karst Features** (page 9/13 of the EIAR).

5.2 Geophysical surveys consisting of 2D-Resistivity and seismic refraction (p-wave) were carried as part of the site investigations. A total of 22 transects profiles were carried out along the proposed route with 11 profiles located within Sections A to C and a further 11 profiles carried out in Section D.

5.3 Figures R5.1 and R5.2 in Appendix A3, indicate the presence of any possible karst anomalies arising from the geophysical surveys carried out, on a standalone drawing. Further investigation of these geophysics anomalies was made by the following boreholes: BH/RC 01-05; BH/RC 51-05; & BH/RC A19. These boreholes identified firm to stiff glacial till overburden soils with competent limestone bedrock with no evidence of voids or unstable ground conditions which would be prone to collapse.

6. ITEM 6: DEWATERING

An Bord Pleanála RFI:

The extent of dewatering required for the construction phase of the proposed road development is unclear. The applicant is requested to identify the locations where dewatering would occur, to confirm the extent of dewatering required and to address any environmental effects, as necessary. Impacts that could potentially arise as a result of dewatering on the Craggs - Barrigone and Croagh – Farrandonnelly group water schemes as key receptors should be identified and addressed.

Applicant Response:

Dewatering

6.1 Groundwater levels along the proposed road development were recorded during the monitoring period (typically December 2016 to August 2018), as referred to in section 9.2.4 of the EIAR.

6.2 As stated in Section 8.4.1.2 of the EIAR, groundwater levels can be lowered during construction by dewatering operations involving temporary pumping of excavations in which groundwater is encountered, to allow construction operations to proceed. During the operation phase of the road the groundwater level can be lowered permanently by the road drainage where the invert level of the drain is below the water table level. This may result in a drawdown/lowering effect on the groundwater table in the surrounding area. To assess this drawdown effect the radius of influence is calculated from the dewatering point or at the proposed cut locations.

6.3 The drawdown radius of influence can be calculated using the Sichardt drawdown formula which has the following form:

$$Ro = C(H-hw)*\sqrt{K}$$

where Ro is the Radius of influence measured in m, C is an empirical coefficient (3000), H-hw is the maximum drawdown depth at the excavation and K is the hydraulic conductivity (m/sec) of the various media considered (limestone bedrock or overburden soils).

6.4 Permeability in karst limestone is highly variable with hydraulic conductivities ranging from in excess of 0.001m/s (c. 100m per day) down to as low as $1x10^{-9}$ m/s. Falling head permeability testing of a number of boreholes within the Limestone Bedrock gave generally very low conductivity reading and in a lot of cases recorded no falling head. Recorded values gave a range from 6×10^{-4} m/s to 2×10^{-7} m/s.

6.5 The bedrock aquifer is classified as a Regionally Important karst diffuse flow bedrock aquifer. Based on positive falling head permeability results and anticipated permeabilities for such diffuse flow bedrock aquifers, a conservative conductivity value of 5×10^{-5} m/s associated with the average conductivity of the full road cut lengths is used in the Sichardt Equation together with the maximum predicted drawdown. A further 1.5m drawdown is assumed below the proposed road finish level for the formation layers and road drainage.

6.6 The anticipated extent of dewatering, where applicable, is presented in Table 6.A below and is also indicated graphically in Figures R6.1 to R6.5 (contained in Appendix A4). A specific review of the drawdown zones to confirm possible environmental impacts has confirmed that there are no ground-water dependent or otherwise environmentally sensitive habitats within the anticipated drawdown zones.

Table 6.A Anticipated Extent of Dewatering

Chainage (Ch.)	Representative Cutting Depth (m)	Representative Cut Length (m)	Representative Maximum Drawdown Depth (m)	Stratum	Drawdown Extent from Cutting (m)
1+350 to 1+750	6 to 8	350	5	Bedrock	106
3+950 to 4+300	6 to 8	300	0 (dry)	Bedrock	nil
5+150 to 6+400	15 to 17	1,100	11	Bedrock	233
52+400 to 56+000	6 to 7	3,400	6	Bedrock	127
60+000 to 60+500	7 to 8	250	0 (dry)	Bedrock	nil

Water Supply

6.7 Assessment of potential impacts on private wells and water supplies is summarised in Table 9.18 of the EIAR. Appropriate mitigation measures are provided in Table 9.19 of the EIAR. These measures will apply in the case of temporary dewatering activities as well as at operational stage. These measures will ensure that there is no effect on water supplies as a result of the proposed road development.

6.8 The Craggs/Barrigone GWS and the Croagh-Farrandonnelly GWS have been assessed in Section 9.4.5 of the EIAR and the assessments carried out have taken into consideration the possible drawdown effects as summarised in Table 6.A above and as presented in Figs R6.1-R6.5 included in Appendix A4 of this Response document. Table 9.19 of the EIAR identities appropriate mitigation measures to offset any effects on supply.

7. ITEM 7: SOFT GROUND

An Bord Pleanála RFI:

It is noted that in section 8.4.1. 7 of the EIAR, reference is made to soft ground which appears to focus on river alluvium and lake sediments in Blossomhill but their specific location (chainage) is not set out. Wet silts, fen peat and lake marl are also referenced throughout Chapter 9 (Hydrogeology) of the EIAR. The applicant is requested to confirm the location and extent of soft ground and to address any additional resultant environmental effects, as necessary.

Applicant Response:

7.1 A summary table of all significant soft ground identified during the ground investigation is provided in Table 7.A below.

Table 7.A Areas of Significant Soft Ground

Section	From Chainage (Ch.)	To Chainage (Ch.)	Range of depths of Soft Ground (m)	Soil Type
A	1+200	1+300	0.5 - 6.0	Alluvial Fines, Glacial Fines
	2+500	2+800	0.8	Alluvium
B	10+070	10+250	1	Organic Fen Peat/Lake Marl
	11+100	11+200	0.5	
C	20+200	21+350	0.7 - 5.0	Glacial Fines, Peat
	22+400	22+450	0.9	-
	23+400	23+500	3	Glacial Fines
	24+900	25+700	0.7 - 3.0	Organic, Alluvial Fines, Peat, Lacustrine Deposits, Glacial Fines
	28+800	29+150	1.5 - 5.8	Glacial Fines, Lake sediments
D	50+500	51+350	0.5 - 5.0	Lake sediments, Glacial Fines, Peat (1m)
	57+200	57+450	1	Glacial Fines, Glacial Coarse
	58+000	58+250	0.6 - 4.1	-
	59+250	59+650	0.7 - 4.0	Alluvial Fines, Glacial Fines. Greanagh River
	60+650	61+300	1.1 - 2.9	Alluvium, River Maigue
	62+200	63+750	1.5 - 4.0	Glacial Fines

7.2 The issue of environmental effects in ecologically sensitive areas of soft ground is addressed in Chapter 7 of the EIAR. Typically, this refers to wetter areas related to the hydrological regime encountered. In particular, impacts on the hydrological regime in designated areas and on ground water dependant Key Ecological Receptors (KERs) have been examined in sections 7.4.3 and 7.4.5.

7.3 The principle concern associated with the proposed road development in areas of soft / wet ground in the vicinity of Key Ecological Receptors relates to the risk of altering the ground water flows towards or away from these sites, and thus affecting the hydrology of the sites and the associated biodiversity features. The use of cohesive non-permeable material to ensure that the road formation does not drain the wetland fen areas and provision of drainage blankets

where appropriate (as elaborated under Item 10 below) will avoid any changes in the ground water hydrology at these sites.

7.4 In all cases, no environmental effects of concern were identified. The applicant further confirms that there are no adverse environmental effects associated with the areas of soft ground identified in Table 7.A above and which were not identified in Chapter 7 of the EIAR as they are not of ecological importance.

7.5 The estimated quantities of soft ground have been fully accounted for in the requirements for disposal and importation of replacement fill materials summarised in EIAR Sections 8.4.1.7 and 8.4.1.9. In light of the enquiry raised, the relevant sections of the EIAR as outlined above have been reviewed, and the applicant confirms that the potential environmental impact of these soft ground areas has been fully assessed in the EIAR and that there are no significant adverse environmental impacts arising therefrom.

8. ITEM 8: CONTAMINATED SOILS

An Bord Pleanála RFI:

It is stated in section 8.4.1.8 of the EIAR that it is unlikely that contaminated soils or waste deposits would be encountered within the footprint of the proposed road development and that the risk of encountering unforeseen contaminated materials is small. This is at variance with information contained in section 9.3.2 of Chapter 9 which refers to an area of potential contamination along the route of the proposed road development identified in the townland of Craggs, located 4km to the east of Foynes and of the possibility of also encountering made ground in urban areas. The applicant is requested to clarify and confirm whether or not contaminated and/or made ground is expected to be encountered including the nature and extent of such ground and to address any resultant environmental effects, as necessary.

Applicant Response:

8.1 The reference to a very small localised area of potential contaminated soil/waste deposit was omitted from section 8.4.1.8 of the EIAR in error. As referred to in section 9.3.2, there is an area used as fuel storage / coal depot near Craggs between Ch.4+450 to Ch.4+550. The location is visible and ringed in yellow on Figure 4.4 (Amended) of Volume 3 of the EIAR as shown below.

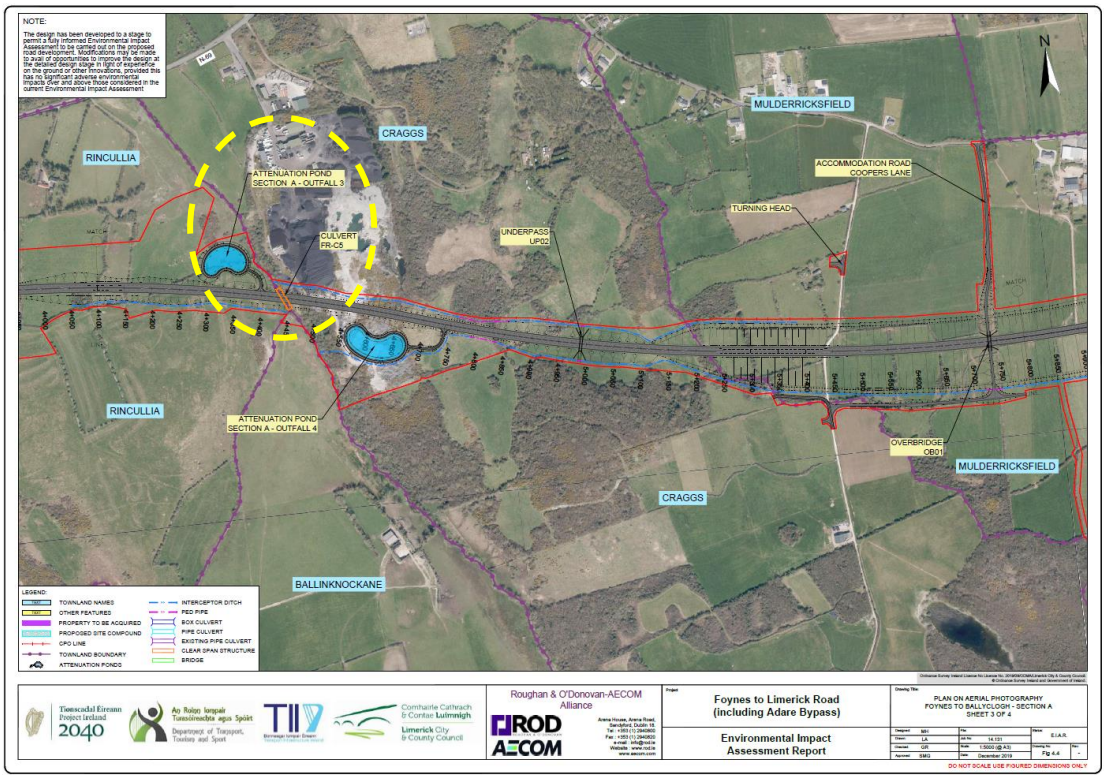
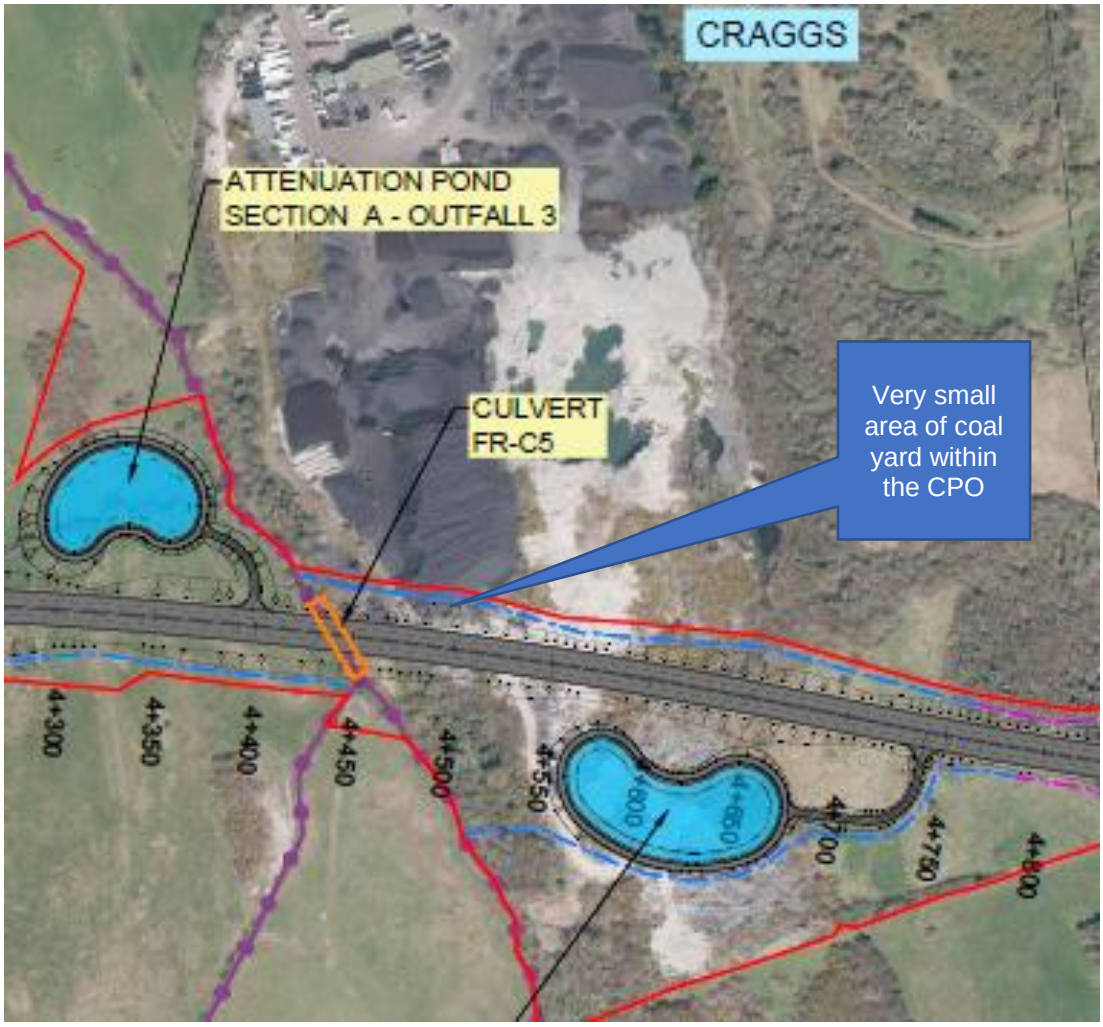


Figure 4.4 (Amended) of Volume 3 of the EIAR

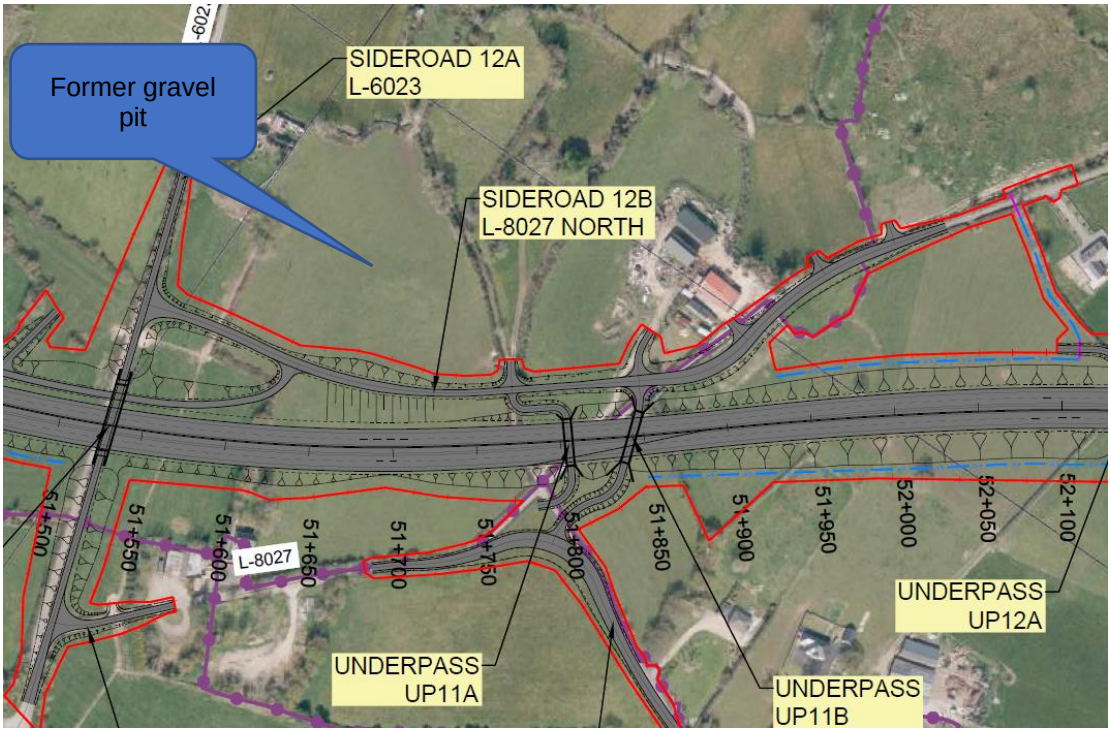
The proposed road development will skirt the southern edge of the coal yard lands with a very small degree of encroachment as now indicated on the following enlarged image extracted from Figure 4.4 of the EIAR.



Enlargement extracted from Figure 4.4 of Volume 3 of the EIAR

8.2 Following site inspection this area was explored by two exploratory holes (TP04-02 and BH/RC04-03). TP04-02 revealed a 0.3m deep layer of coal dust and grit at the surface underlain by clean fill to 1.5m depth. No evidence of waste or contamination was found in BH/RC04-03. Waste materials appear to be locally present to very shallow depths and will be excavated and replaced with acceptable fill beneath the proposed road embankment as required. All excavated waste soils will be tested on site and disposed into licensed landfill facilities as stated in section 8.4.1.8 of the EIAR.

8.3 A second area of potential contamination arises at the location of a former gravel pit / quarry which was reinstated with material of unknown origin. The issue has been raised by a stakeholder. The location is close to the project corridor, at CH.51+650 at Blossomhill (as shown in the following extract from Figure 4.15 of Volume 3 of the EIAR) but its limits are not clearly defined. At the construction stage the ground conditions will be closely monitored to check if any waste material is exposed during excavations, with provision for any such material to be tested on site and disposed into licensed landfill facilities It should be noted that nearby borehole BHA 26 showed no evidence of any infill or contamination in this vicinity.



Enlargement from Figure 4.15 of Volume 3 of the EIAR

8.4 Made Ground is not commonly present elsewhere along the proposed route which predominantly traverses undeveloped agricultural land. When encountered, Made Ground was typically associated with engineering fill materials placed into existing road embankments and foundation layers beneath pavements at the following locations:

- Section A: Ch.3+380; reworked glacial till fill up to 2m deep;
- Section C: Ch.27+750 & Ch.28+770; reworked glacial till up to 0.8m deep;
- Section D: Ch.62+950 to Ch.64+170; reworked glacial till up to 2.5m deep beneath bituminous surfacing (existing N21 road embankment at eastern tie in);
- Reworked glacial till up to 1.2 deep beneath bituminous surfacing (existing N21 road embankment at Rathkeale junction).

8.5 Further information on Made Ground is provided in Summary Table 8.A overleaf. No evidence of contaminated material was present within the lands to be acquired for the proposed road development with the exception of the location at Craggs as described above.

8.6 On the basis of the above, the applicant is satisfied that all appropriate endeavours have been made to investigate the presence of contaminated ground and has identified appropriate measures for dealing with any instances encountered.

Table 8.A: Summary Table of Made Ground

Section	Chainage (Ch.)	Exploratory Hole Ref	Depth of MG	Description
A	3+380	TP03-01	2	clayey gravelly SAND with a high cobble content and a variable boulder content
	4+480	TP04-02	1.5	black coal ash deposits (0-0.15m); sandy GRAVEL (to 0.3m); Slightly clayey slightly sandy GRAVEL (to 1.5m)
	4+520	BH04-03	1.2	sandy silty GRAVEL with low cobble content
B	-	-	-	No Made Ground recorded
C	27+750	TP28-01	0.8	very clayey very sandy GRAVEL with high cobble content and high boulder content
	28+770	TP29-01	0.8	COBBLES and BOULDERS with brick
Side Road at the beginning of Section D	0+030	ST50-02	1.2	Bituminous surfacing (0-0.12m); Compacted, grey, sandy GRAVEL (to 0.6m); Brown, very silty very sandy GRAVEL with high cobble content (to 1.2m)
D	63+810	ST64-01	1.2	Bituminous surfacing (0-0.27m); Grey, sandy GRAVEL (to 0.4m); Grey, slightly silty sandy GRAVEL with medium cobble content (to 1.2m)
	63+880	BH64-03	1.7	Grey brown, Stiff, slightly sandy gravelly SILT with low cobble content
	63+970	ST64-02	0.9	Brown, very sandy very clayey GRAVEL with medium cobble content
	64+150	ST65-01	1.2	Brown, slightly gravelly CLAY (to 0.3m); Brown, very sandy very clayey GRAVEL with high cobble content, high boulder content (to 1.2m)
	64+170	TP65-02	2.5	Brown, slightly sandy slightly gravelly CLAY with high cobble content, concrete (to 0.9m); Firm, dark brown, grey mottled, sandy very clayey GRAVEL with medium cobble content, timber, tar (to 2m); Sandy very silty GRAVEL with medium cobble content (to 2.5m)

9. ITEM 9: BORROW PITS

An Bord Pleanála RFI:

Section 8.4.1.9 of the EIAR refers to the possibility of using borrow pits to partially offset the net import of material required. It is also stated that these borrow pits could be used for the deposition of unsuitable material. While it is acknowledged that the hydrology impacts associated with the borrow pits has been addressed in Chapter 10 (Hydrology) of the EIAR, the applicant is requested to identify the location of the proposed borrow pits and to address geological and hydrogeological impacts associated with use of borrow pits for deposition of unsuitable material.

Applicant Response:

9.1 Section 8.4.1.9 of the EIAR identifies possible borrow areas at the locations of three large cuttings in rock along the route, namely in the Ardaneer area (Ch.1+500, Section A), the Mulderricksfield area (Ch.5+100 to Ch.6+450, Section A) and at Ballycannon (Ch.52+550 to Ch.55+500, Section D). These potential areas are within the land-take and are located in the three largest cuttings along the route and may consist of some modest degree of additional excavation below the level of the permanent works to gain more rock materials.

9.2 The applicant confirms that the hydrogeological impacts of these extraction activities have been considered in the assessment of impacts on groundwater as described in Chapter 9 of the EIAR, including consideration of drawdown effects as described in the EIAR and in the response item 6 above (Ref. paragraph 6.5). As any borrow pits would be temporary with ground levels reinstated following deposition of backfill, the groundwater levels will remain the same as for the permanent works once they are completed.

9.3 The applicant further re-affirms that there will be no geological impacts associated with the additional excavation areas. The excavations will take account of appropriate working arrangements and provision of safe cutting slope angles for the remaining overburden or bedrock as the case may be.

9.4 As indicated in Section 8.4.19 of the EIAR, the disposal of excavated soft soil materials which are not suitable for re-use for engineering purposes at these borrow areas is not expected to result in any detrimental environmental impacts at these locations, as the materials will be chemically inert. Disposal of such soils within the project limits has an environmental benefit by reducing the need for transport of these materials for disposal off site. Should the option be pursued, a layer of cohesive fill material and geosynthetic separator will be placed as deemed necessary to ensure that migration of fines into underlying groundwater sources is avoided. All deposited material would be placed at safe slope angles. Mitigation measures will include mounding of the deposited material followed by early topsoiling and grassing so that runoff water can be collected using cut-off drains where necessary which will also serve to minimise recharge to the borrow pit. The deposition of soft soils in the rock cuttings will benefit the landscaping proposals by provision of a good depth of sub-soil to accommodate the root system of new trees and shrubs.

9.5 At Mulderricksfield Ch.5+100 to Ch.6+450 where there may be risks of karst limestone being encountered. Any exposed local karst features will first require mitigation by treatment as described in Section 8.4.1.5 of the EIAR to restrict potential for future erosion prior to disposal of unsuitable soils.

10. ITEM 10: CHAPTER 10 USE OF MATERIALS FOR DRAINAGE

An Bord Pleanála RFI:

Drawings associated with Chapter 10 of the EIAR show proposals for the use of cohesive non-permeable material to ensure that the road formation does not drain the wetland fen area. This aspect of the proposed road development is not discussed in the chapter. Similarly, drainage blankets are shown on drawings, but not discussed or described in Chapter 10. The applicant is requested to clarify and confirm where these materials are intended to be used on the proposed road development and to address the resultant environmental effects, as necessary.

Applicant Response:

10.1 These matters are dealt with primarily in Chapter 9 Hydrogeology, rather than in Chapter 10 Hydrology, as the issue which is being addressed is the achievement of appropriate mitigation of possible impacts on existing groundwater flows, including mitigation of impacts on the ecological regime. The proposals for the use of cohesive non-permeable material and drainage blankets are illustrated in Figures 9.5 to 9.16 of Volume 3 of the EIAR. Interaction with the road drainage system is dealt with in section 10.5.3.1 of Chapter 10 Hydrology where reference is made to reliance on a sealed drainage system, where appropriate, as part of the measures deployed to protect the groundwater resource.

10.2 Section 9.5.1.2 Site Specific Mitigation Required for Hydrogeology outlines the following in respect of Hydrogeological Features:

> "*Each of the hydrogeological features identified that are potentially at risk due to the proposed road development were assessed based on the potential magnitude of the impact. Where an impact rating was deemed to be slight or imperceptible it is considered that the adherence to good construction practices applies, as fully outlined in the Environmental Operating Plan (Appendix 4.1) and as further detailed in Chapter 10. Adoption of these measures can adequately mitigate the level of risk involved and no additional specific mitigation is required. Each of the features which were found to have an impact rating greater than slight have been considered to require some form of mitigation to reduce the magnitude of the risk posed. Table 9.19 gives details of the specific mitigation measures proposed at each hydrogeological feature.*"

10.3 The proposed road development has been selected to avoid crossing between any parts of the Askeaton Fen Complex SAC. However, three fen wetlands at Ballyellinan (KER 7), Lismakeery (KER 11) and Blossomhill (KER 21) not within the SAC complex, are at possible minor risk from modifications to their hydrology. Coarse material used as a capping layer for the road could lead to new preferential flow paths which could lower the water table of these sites without appropriate design mitigation. The locations for both the drainage blankets and cohesive materials in relation to these three critical fen locations are included in Table 9.19 of Chapter 9 of the EIAR. The drainage measures are proposed to mitigate potential impacts on the hydrology of the fens as outlined in table 9.19 of Chapter 9 in the EIAR which include:

- Changes to groundwater flow regime; and
- Risk of localised pollution of bedrock aquifer or fen wetland.

10.4 Following the implementation of these mitigation measures, the residual impact on the three groundwater dependant KERs were found to be imperceptible in terms of Hydrological impacts. The overall residual impact on these groundwater dependant KERs is detailed in Chapter 7 of the EIAR and found that the impact will be reduced to permanent slight negative due to loss of habitat and dissection of the sites.

10.5 In addition, interaction with the road drainage system is dealt with in section 10.5.3.1 of Chapter 10 Hydrology, where reference is made to reliance on a sealed drainage system, where appropriate, as part of the measures deployed to protect the groundwater resource.

10.6 The applicant confirms that no adverse effects on groundwater arise as a result of the proposed development.

EXECUTIVE SUMMARY - ITEMS 11 AND 12 CLIMATE

Items 11 and 12 of the RFI are responded to by Dr Edward Porter who composed Chapter 13 Air Quality and Climate of the EIAR. In response to Item 11(a) of the RFI, it is noted that it is not possible to identify the specific effect of any one scheme, in isolation, on the climate at the local level. The impact of all global greenhouse gas emissions is intertwined and, in a global context, any emissions from this proposed development will be imperceptible in this context. The response outlines how the embodied carbon of the proposed road development has been continuously reduced throughout the design, construction, and operation of the proposed development.

The various design decisions that have contributed to this reduction of embodied carbon are outlined in the response, and relate to junction design, drainage design and material usage. The response also outlines the mitigation measures and carbon offsetting techniques which have been incorporated into the climate assessment. This includes 190 hectares of land that will be planted for landscape and biodiversity purposes and which will benefit in offsetting approximately 30,000 tonnes CO_{2eq} over the lifetime of the proposed road development. This is equivalent to offsetting 28% of the GHG emissions associated with the construction of the proposed development. In terms of the maintenance phase of the development, the offset equates to 31% of the annual maintenance phase GHG emissions.

The greenhouse gas emission calculations for this proposed road development have been revised based on the latest version of the TII Carbon Assessment Tool, and with refined traffic volumes for comparison between the Do-Minimum and Do-Something scenarios. The material quantities input into the TII Carbon Assessment Tool are outlined in the detailed response and the operational impact of the proposed road development in 2039, having regard to the proposed policy based increase in electrical vehicles, is now 1,778 CO_{2eq} tonnes/annum which is 0.0039% of Ireland's 2030 GHG target. The initial construction of, and ongoing maintenance requirements of the proposed road development, which, will reach at most 0.01% of Ireland's 2030 emissions target on an annual basis have been assessed as long-term, negative but, overall, not significant.

The response to Item 11(b) of the RFI outlines the resilience of the development to climate change. Flood risk assessments have been prepared for sections of the alignment along watercourses to determine the likely long-term changes that may arise from climate change with increased rainfall and rising sea levels. The proposed road levels have been designed for appropriate clearance above the estimated future flood levels to ensure that the infrastructure will be resilient in accordance with current guidelines.

The response to item 12 of the RFI examines the compatibility of the proposed road development with the Climate Action Plan 2019 with emphasis on the targets for transport. The response outlines that the primary focus of the *Climate Action Plan* for the transport sector is to transition away from internal combustion engine vehicles to electric vehicles, so as to eliminate greenhouse gas emissions from traffic. The action plan must be considered alongside other relevant Government policies for the economic and social development of Ireland, including the *National Policy Framework* which anticipates significant population growth and rebalancing of development into regions other than the east coast and the greater Dublin area and the *Programme for Government – Our Shared Future* which commits to investing in new roads infrastructure to ensure that all parts of Ireland are connected to each other. These development focussed policies are not incompatible with the *Climate Action Plan* which provides a basis for the proposed national and regional development to be attained in a sustainable manner through adaptation of human activities, including mobility, to a low-carbon basis.

The proposed road development is included in the *National Development Plan* as enabling infrastructure to support the objectives of the *National Planning Framework*. By providing for more efficient transport in the Limerick area, the proposed road development will assist in greater operational efficiencies as the regional population increases and improves economically, especially through the growth of Shannon-Foynes Port. On this basis, the proposed road development will be fully compatible with the *Climate Action Plan* through

removal of existing delays and congestion, in Adare especially, and by supporting more efficient transport generally in the Limerick and Midwest regions.

11. ITEM 11: CLIMATE

An Bord Pleanála RFI:

Notwithstanding the information provided in Chapter 13 (Air and Climate) of the EIAR, the applicant is required to provide further details on climate, specifically addressing the following:

*a) Provide an assessment of the **effects on the climate of greenhouse gas emissions** arising from the proposed road development during the design, construction and operation of the proposed road development over its lifetime. Key parameters used and outputs from the TII Carbon Assessment Tool referenced in Section 13.3.1.2 of the EIAR should be provided if this tool is being used as part of the assessment.*

*b) Provide an assessment of **the resilience of the development to climate change**, including how the proposed road development can be adapted to take account of the projected impacts of climate change on the design, construction and operation of the proposed road development over its lifetime.*

Applicant Response:

Applicant Response Part a)

Climate Assessment – Operational Phase

11.1 Chapter 13 of the EIAR outlines the climate impact of the proposed road development, in the worst-case scenario, which was deemed to be imperceptible and long-term. The climate assessment showed that the impact of the proposed development in 2024 would be to increase CO_2 emissions by 0.058% of Ireland's EU 2020 Target, while in the design year of 2039, the proposed road development would increase CO_2 emissions by 0.078% of Irelands EU 2020 Target, reflecting the traffic for the for the Do-Minimum and Do-Something scenarios based on the TII High Growth Scenario. As a result of these calculations, the climate impact of the proposed road development, as outlined in Chapter 13 of the EIAR, was deemed to be imperceptible and long-term.

11.2 The impact of the operational phase of the proposed road development on GHG (greenhouse gas) emissions has been determined using the methodology provided in Annex 2 in the UK Design Manual for Roads and Bridges (DMRB) (UK Highway Agency, 2007). This methodology is in line with TII guidance (TII, 2011), "*Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Scheme*" and states, in Appendix 7, that the DMRB spreadsheet is a straightforward means of calculating total CO_2 emissions across the route network. The methodology has historically been used routinely for the climate impact of road schemes in Ireland.

11.3 However, the emission factors in the DMRB are based on the COPERT III database which the DMRB last updated in 2007, 13 years ago. This database does not take account of the recent advances in engine technology and does not accommodate the increasing number of electric vehicles predicted in future years.

11.4 In order to address these shortcomings, the climate assessment model we have used for future year forecasts, has been updated using the Emission Factors Toolkit (Version 10.1, August 2020) which includes Euro 6 emission factors taken from the European Environment Agency (EEA) COPERT 5 emission calculations (September 2016). In addition, the extent of the road network included in the assessment has been expanded to include regional and local road links within the traffic model which were not previously specifically included in the climate assessment. Specifically, the analysis now includes an additional 3000 links within the study area which were not included in the original assessment. This expanded traffic analysis will ensure that the overall network redistribution of traffic due to the proposed road development is adequately captured.

11.5 The above Greenhouse Gas (GHG) emissions calculations has been updated to take account of the impact of increased electric vehicles in future years based on the electric vehicle targets outlined in the Climate Action Plan 2019 (CAP) was published by the Department of Communications, Climate Action & Environment (DCCAE) in August 2019.

11.6 The CAP outlines the current status across key sectors including electricity, transport, built environment, industry and agriculture and outlines the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. Given that it is expected there will be 2.64m cars in Ireland by 2030 (National Transport Model Update, December 2019), this equates to approximately 32% of cars being electric vehicles by 2030. As the NCT will not be available to fossil-fuel cars post 2045, it is assumed that there will be 62.6% of electric cars in 2039 based on a linear interpolation between 2030 and 2050 (2050 has been selected conservatively as the latest date when fossil-fuel cars will no longer be in operation).

11.7 The % additional increase in GHG emissions due to the proposed road development relative to Ireland's 2030 GHG Target is also included in Table 11.A. Based on the revised GHG emission calculations, the impact of the proposed road development in 2024 is now 1,211 CO_{2eq} tonnes /annum which is 0.0027% of Ireland's 2030 GHG target. By 2039, taking into account the increase in EVs, the impact of the proposed road development in 2039 is now 1,778 CO_{2eq} tonnes/annum which is 0.0039% of Ireland's 2030 GHG target. This can be compared to impact for 2024 and 2039 respectively of 22,121 CO_{2eq} tonnes /annum and 29,720 CO_{2eq} tonnes /annum reported previously in the EIAR which equated to 0.048% and 0.065% of Ireland's 2030 GHG target in 2024 and 2039 respectively.

Table 11.A Annual GHG Emissions For Do Minimum & Do Something Scenarios for the Proposed Road Development in 2024 and 2039

Year	Do Minimum (CO_{2eq} tonnes)	Do Something (CO_{2eq} tonnes)	Difference (CO_{2eq} tonnes)	% Difference (relative to 2030 Target) Note 1
2024	396,377	397,588	1,211	0.0027%
2039	305,705	307,483	1,778	0.0039%

Note 1 Ireland's 2030 target is the sum of the Emission Trading Scheme (ETS) and non-ETS targets equating to approximately 45,700,000 CO_{2eq}.

11.8 In order to add context to these figures, the increase in GHG emissions due to the operation of the proposed road development can be compared to the GHG emissions associated with the construction of a typical 3-bedroom house using traditional construction methods. A study in 2011 (Monahan, 2011) found that the typical GHG emissions associated with the embodied carbon was typically around 50 tonnes CO_{2eq}. Thus, the proposed road development in 2039 will lead to an increase in carbon emissions equivalent to the construction of 35 houses (excluding electricity) and an additional 2 or 3 houses when electricity in taken into account.

11.9 Electric vehicles will require electricity to charge batteries, some of which will be generated from fossil-fuel sources. By 2039, the renewable fraction of electricity generation is conservatively predicted to be 70% of all electricity generated (based on the CAP target of 70% for renewable electricity generation by 2030). Thus, 30% of the electricity used to charge battery operated electric vehicles will be derived from fossil fuels and will have GHG emissions associated with this.

11.10 However, electricity generators form part of the EU-wide Emission Trading Scheme (ETS) and thus greenhouse gas emissions from these electricity generators are not included when determining compliance with the targeted 30% reduction in the non-ETS sector i.e. electricity associated greenhouse gas emissions will not count towards the Effort Sharing Regulation (Regulation (EU) 2018/842). Thus, any necessary increase in electricity generation due to the increase in electric vehicles will have no impact on Ireland's obligation to meet the EU Effort Sharing Regulation.

11.11 Shown in Table 11.B is the GHG emissions associated with the electricity used to charge the electric vehicle batteries. The impact of the electricity in 2039 is 123 CO_{2eq} tonnes /annum which is 0.001% of Ireland's ETS 2030 target.

Table 11.B GHG Emissions For Do Minimum & Do Something Scenarios for the Proposed Road Development in 2039 Due To Electricity Used To Charge Vehicles

Year	Do Minimum (CO_{2eq} tonnes)	Do Something (CO_{2eq} tonnes)	Difference (CO_{2eq} tonnes)	% Difference (relative to ETS 2030 Target) Note 1
2039	60,731	60,853	123	0.001%

Note 1 2030 ETS target is set at 43% below Ireland's 2005 ETS allocation. The 2005 allocation was 22.44 million tonnes CO_2. Thus, 2030 target is 12.79 million tonnes CO_2.

Climate Assessment – Construction Phase Emissions

11.12 As shown below in Paragraphs 11.39 – 11.44, the total construction phase carbon emissions, when assessed over the predicted 3-year construction period, reach at most 0.11% of Ireland's 2030 emissions target. The predicted impact to climate during the construction phase is short-term, negative but overall, not significant.

Design - Route Selection

11.13 The environmental impacts of design alternatives considered have been assessed in the decision-making process throughout the development of the proposed road development extending back to concept development and options selection stage. The Route Selection Report for the proposed road development noted that in terms of geographical location, the N69 and N21 road corridors are within 10km of one another in the vicinity of Askeaton and Rathkeale, as illustrated in Figure 2.3 of the Report. It was therefore noted that synergies might exist between the Core and Comprehensive elements of the TEN-T Network in this region. The study area for this project was subsequently defined to include a wide region served by both the N69 and N21 routes so as to fully evaluate the scope for synergy between the Core and Comprehensive Network elements. It was recognised during the design development phase that there was potentially an opportunity to consider a combined road development for the N69 and the N21 of approximately 35km in length, instead of two separate schemes as these routes would have amounted to approximately 57km in length, and that the embodied carbon of the proposed combined road alternative would be significantly reduced.

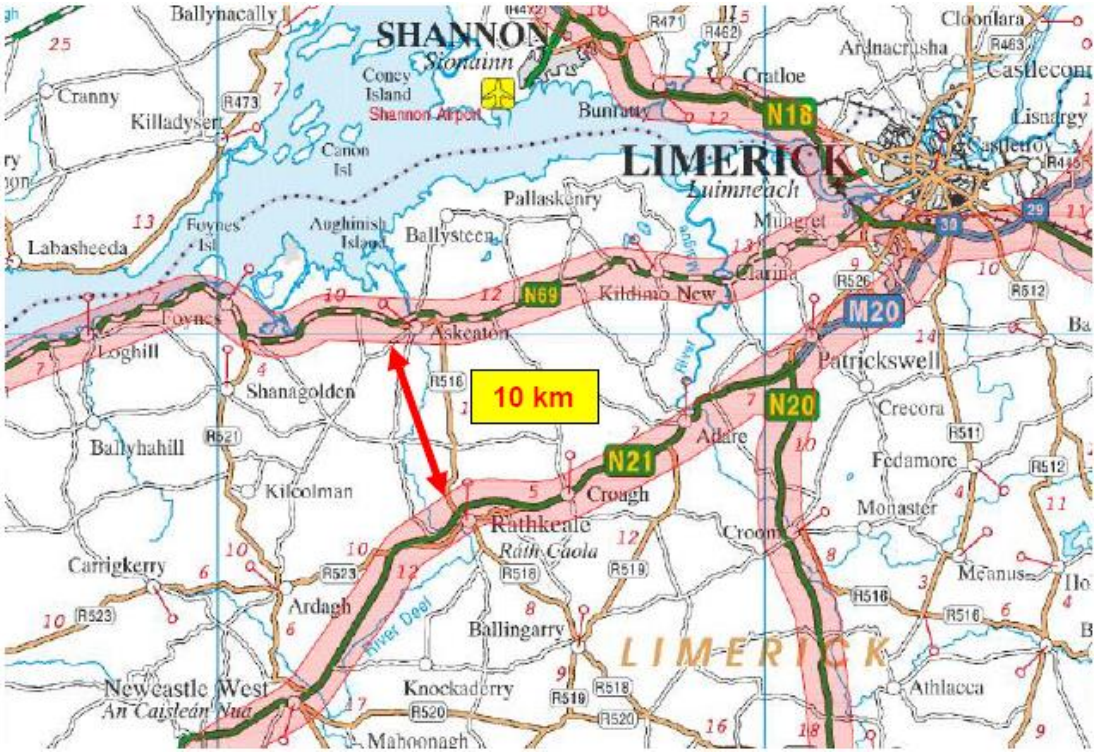


Figure 2.3 from the Route Selection Report – Proximity of National Routes in Western Limerick

11.14 The proposed road development therefore provides both a Core and Comprehensive Network combined in one development, resulting in a reduction in materials required for construction. Based on the embodied carbon calculation provided in Paragraphs 11.39 – 11.44, it is estimated that if both schemes were to be provided, the embodied carbon would have totalled 175,400 tonnes CO_{2eq} over the 3-year construction phase. The proposed development therefore provides a saving of 67,700 tonnes CO_{2eq} of embodied carbon over the 3-year construction period reflecting that the issue of carbon mitigation and sustainable design was integral to the design approach (see Figure 11.A below). Thus, the proposed road development will lead to total emissions of 107,700 tonnes CO_{2eq} over the 3-year construction period which equates to 0.11% of Ireland's non-ETS 2030 emission target.

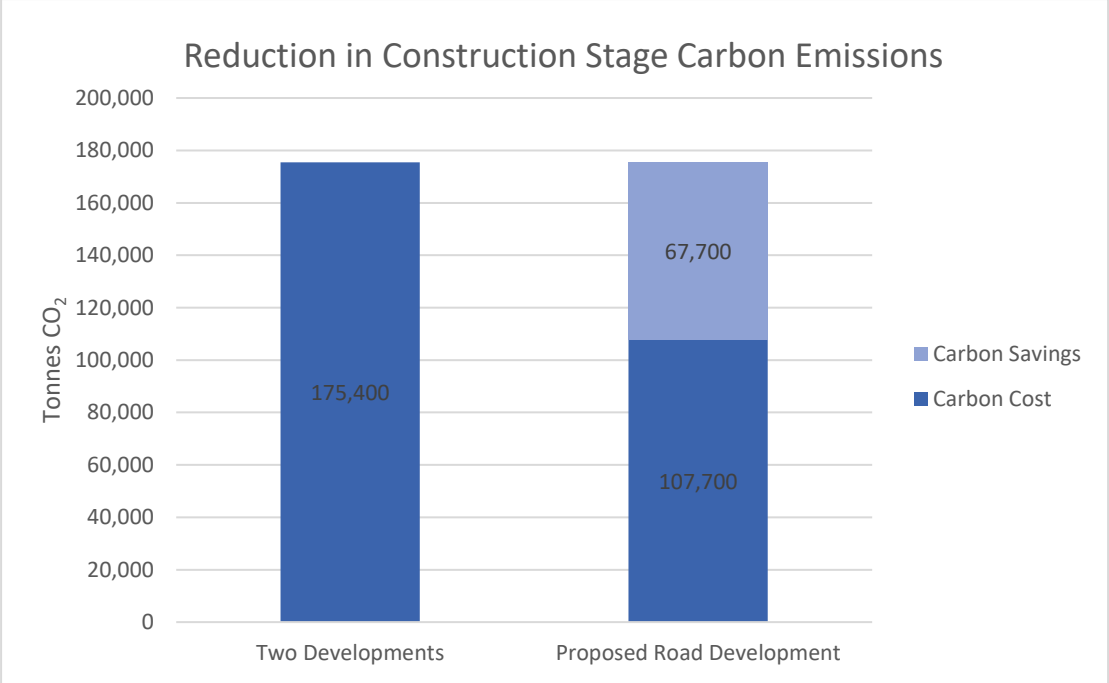


Figure 11.A Reduction in Construction Stage Carbon Emissions Over The 3-Year Construction Phase

Note: Based on the embodied carbon outputs provided in Paragraphs 11.39 – 11.44

11.15 The Route Selection process aimed to achieve the most efficient form of the proposed road development, that would result in a reduction of the carbon impact of the development through a lower quantity of materials being required. This can be seen under the heading of Efficiency and Effectiveness, where Route Option 3 (which emerged to form the preferred route corridor) was found as being preferred compared to Route Option 1. The higher construction costs associated with Route Option 1, were a result of long lengths of poor ground near the River Maigue which would require improvement with a long bridge crossing of the River Maigue and more road bridges related to all of the roads off the existing N69. The higher construction cost and the associated construction works required for Option 1, would have also resulted in a higher carbon output, as they are both correlated.

11.16 Similarly, the Soils and Geology and Waste assessment considered the earthworks balance for each route option including the shortfall of fill material that would need to be sourced. Route Option 3 emerged as one of two preferred routes, with a total material deficit of 1.6 million m^3. This option, compared to options 4 and 1, which had total material deficits of 2.6 million m^3 and 3.6 million m^3 respectively, resulting in another reduction in the carbon emissions that would be associated with the proposed road development. Option 3 was also found to be preferred in terms of Hydrogeology and Ecology, due to the proximity of the other options to the Askeaton Fen Complex. Route Option 3 would therefore have the least impact on the fens within the study area, ensuring that they are preserved into the future and will continue to provide carbon sequestration. In the further assessment of the corridor options between Blossomhill and Ballycannon in March 2017, the green route which was chosen as the preferred, resulted in the avoidance of waterlogged and deep soft ground associated with the pink option. The alternative option would have required complex mitigation during foundation construction which in turn would have had an increased carbon cost.

Design Choices

11.17 A suite of other design choices has also had a positive impact on sequestration of carbon. Carbon saving has been generated by use of open channel drainage systems, as described in Chapter 4 (Section 4.10) of the EIAR, instead of piped drainage systems, reducing the total volume of concrete required.

11.18 Efforts have also been made, insofar as possible, to source infill material from within the proposed cuttings, in order to minimise the volume of material imported from quarries in the region. This has resulted in the reuse of approximately 0.3 million m^3 of soil materials that is appropriate for landscaping purposes.

11.19 Chapter 3 Alternatives Considered also outlines design choices that were made in relation to the grade separated junctions along the route in Section 3.9.7. Grade-separation with a bridge is required at the interfaces with other roads for operational, safety and strategic function reasons. Various constraints including, but not limited to, locations of dwelling houses, proximity to rivers, locations of junctions on the existing road network, materials required and cost are influential and considered in the decision process. The decision to close the local road at Rincullia (L-6068 at Ch.3+600) was made, because if the road were to remain open, it would require vertical realignment over a length of 600m and an over-bridge to span across the new road, which could not be justified. Similarly, the grade-separation at crossings of existing roads was optimised at Ballyclogh (L-1220 at Ch.10+050), Ballynacaheragh (L-1236 at Ch.22+500), Clogh Road (L-8027 at Ch.51+800), Clonshire More (L-8026 at Ch.56+200), Gortnagrour (L-8024 at Ch.57+650), and Blackabbey Road (L-1422 at Ch.59+000) with options selected that require less materials for construction of embankments and road realignments. While the benefits of these development design options will primarily result in reduced cost, they will also result in reduced embodied carbon and significant benefits in reducing the carbon impact of the construction phase of the proposed road development.

Construction and Operation - Mitigation Measures and Carbon Offsetting

11.20 Section 13.6.1.2 of the EIAR has also included mitigation measures for the construction stage of the development to ensure that construction plant will be used in the most efficient manner to reduce carbon emissions. It is stipulated that materials will be ordered carefully to avoid waste and will be re-used where possible. Construction related congestion will be avoided insofar as possible through the implementation of a Traffic Management Plan. Measures have also been included to limit the hours during which bulk materials can be delivered through Adare to site, so as not to add to congestion within Adare village during peak traffic periods.

11.21 In addition, the proposed development will see an estimated area of 181 ha planted as per Drawings 11.1 to 11.24 of the EIAR. This planting will comprise screen planting (37.2 ha) and specific landscape measures (85.4 ha) to mitigate visual impacts, scrub and mature tree planting as mitigation for Barn Owls (37.3 ha) and Wet Woodland and Riparian Planting where suitable around attenuation ponds (21.1 ha). Further to this, 45km of Hedgerow and treelines will be provided along the development boundaries.

11.22 The above mitigation measures will not only mitigate impacts on sensitive receptors and biodiversity, but the volume of planting will also create carbon sequestration as part of the development which will provide carbon offsetting throughout the operational stage. There is one fen within the extent of the CPO at Lismakeery while two other fens are adjacent to the proposed road development at Ballyellinan and Blossomhill. The latter two fens have been avoided through option selection while further mitigation measures have been incorporated to ensure their hydrological regime are not impacted. Although an area of the Lismakeery Fen will be impacted by the proposed road alignment, the section of the fen which is within the CPO will be further protected through the removal of livestock from the area going forward, which will enhance the biodiversity of the area. These fens will continue to provide carbon sequestration for the lifetime of the project, providing further carbon offsetting to those figures outlined above.

11.23 The sequestered carbon saving due to planting of 181 ha as outlined in Paragraph 11.19, and the additional 9 ha of treeline planting which was not calculated as part of the EIAR, has been calculated using data from the UK Forestry Commissions (UK Forestry Commission, 2012). The CO_2 uptake rate for trees vary for different species with for example a thinned oak forest sequestering at a rate of 2.62 tCO_{2eq}/hectare/year, a thinned Sitka spruce forest sequestering at 9.6 tCO_{2eq}/hectare/year and a thinned beech forest sequestering at 3.4 tCO_{2eq}/hectare/year (UK Forestry Commission 2012). Generally, trees have the ability to sequester carbon with the peak CO_{2eq} uptake rate for tree stands of the order of 5 – 20 tCO_{2eq}/hectare/year with CO_{2eq} uptake rates declining with maturity and health (UK Forestry Commission, 2012). Using the

lower level of a thinned oak forest sequestering at a rate of 2.62 tCO_{2eq}/hectare/year, the benefit amounts to approximately 30,000 tonnes CO_{2eq} over the 60-year lifetime of the proposed road development. This is equivalent to offsetting 28% of the GHG emissions associated with the construction of the proposed development. In terms of the maintenance phase of the development, the offset equates to 31% of the annual maintenance phase GHG emissions.

11.24 In addition to the planting proposed as part of the EIAR, additional areas of planting within the CPO are now being included to provide further carbon offsetting throughout the life of the proposed road development within the two areas of cuttings in the Ardaneer area (Ch.1+500, Section A) and the Mulderricksfield area (Ch.5+100 to Ch.6+450, Section A). As detailed in response to item 9 of this RFI, excavated materials will be deposited of within the side slopes of these cuttings, upon which landscaping can be included. In Appendix A5 of this document, Figure R11 illustrates a cross section of these two cuttings, while Figures R11.1, R11.3 and R11.4 show the locations of these areas to be planted, which will be included in the Schedule of Commitments. The areas are shown on the above listed figures as SLM 20 and it is proposed to use these areas to provide additional native planting for carbon sequestration to offset potential environmental effects. The areas will be divided into zones with both woodland planting and scrub planting provided, in order to comply with the TII guidance on maintaining clear zones. Scrub planting will be in place in areas within the clear zone and woodland will be planted in the remaining areas. The total area to be planted will amount to 10ha. Using a sequestration rate of 2.62 tCO_{2eq}/hectare/year, the benefit amounts to approximately 1,570 tonnes CO_{2eq} over the 60-year lifetime of the proposed road development. This is equivalent to offsetting 1.5% of the GHG emissions associated with the construction of the proposed development. In terms of the maintenance phase of the development, the offset equates to 1.6% of the maintenance phase GHG emissions.

11.25 Further to this, an area within the CPO from Ch.20+600 to Ch.20+900 to the north of the alignment, will be planted with native woodland species, to avail of the benefit afforded for carbon offsetting. The landscaping Figures which form part of the EIAR do not currently include any form of planting in this area. Figure R11.7 in Appendix A5 illustrates the 0.94ha area to be planted, as SLM 21. Using a sequestration rate of 2.62 tCO_{2eq}/hectare/year, the benefit amounts to approximately 148 tonnes CO_{2eq} over the 60-year lifetime of the proposed road development.

11.26 Appendix A6 of this response document includes descriptions of these Specific Landscape Measures SLM 20 and SLM 21. These will be added to the Schedule of Commitments in addition to Figures R11, R11.1, R11.3, R11.4 and R11.7.

11.27 The following additional mitigation measure will also be included in the Schedule of Commitments and will be specified in the Contract Documents:

- It is estimated that 45,000 m^3 of concrete required for structures can utilise cements based on Ground Granulated Blast Furnace Slag (GGBFS) rather than traditional Portland Cement. This will lead to a saving of approximately 1,200 tonnes CO_{2eq} (a saving of 10% on this item).

11.28 Several additional benefits which will arise as a result of the proposed road development, are relevant when assessing the carbon emissions in future years. Fuel usage and associated carbon emissions on the proposed road will be lower than those experienced in more built-up areas, where higher emissions result from frequent stop-start motions and queuing. In particular, Adare Village will benefit from an improvement to air quality, safety, noise, quality of life in general and greater opportunities for active travel as a result of the bypass of the village.

11.29 The embodied carbon emissions associated with the construction and maintenance of the road are detailed below in Paragraphs 11.39 – 11.45, which confirm that when assessed over the predicted 3 years construction and 60 years operational lifespan of the project, carbon emissions, on an annual basis, reach at most 0.01% of Ireland's 2030 emissions target. The predicted impact to GHG emissions during the construction and maintenance phase, including the embodied carbon associated with construction materials and follow-up maintenance of the road, is long-term, negative but, overall, not significant.

11.30 In relation to the effect on climate due to emissions from the proposed road development, it is not possible to identify the specific effect of any one scheme, in isolation, on the climate at the local level. The impact of all global greenhouse gas emissions is intertwined and, in a global context, any emissions from this proposed development will be imperceptible in this context. In addition, although there is certainty at global level of the warming of the earth due to anthropogenic GHG emissions, there is significant uncertainty associated with how global climatic trends will be reflected at the regional and local scale (IPCC, 2015).

Regional Climate Change Impacts Irrespective of the Proposed Development

11.31 The EPA (EPA, 2017) has reviewed likely future effects on Ireland due to climate change. Impacts as a result of climate change involve increases in global temperatures and increases in the number of rainfall days per year. Ireland has seen increases in the annual rainfall in the north and west of the country, with small increases or decreases in the south and east (EPA 2017). The EPA have compiled a list of potential adverse impacts as a result of climate change including the following which may be of relevance to the proposed road development:

- more intense storms and rainfall events;
- increased likelihood and magnitude of river and coastal flooding;
- water shortages in summer in the east;
- adverse impacts on water quality; and
- changes in distribution of plant and animal species.

11.32 The EPA (EPA, 2020c) has modelled future climate change over the period 2041-2060. The conclusions from this study include:

- temperatures are predicted to increase by 1.0 – 1.6°C compared with the baseline period (1981-2000), with the largest increases in the east;
- warming will be enhanced at the extremes with summer daytime and winter night-time temperatures projected to increase by 1.0 – 2.4°C;
- substantial decreases of approximately 50% are projected in the number of frost and ice days;
- summer heatwave events are expected to occur more frequently, with the largest increases in the south;
- precipitation is expected to become more variable, with substantial projected increases in the occurrence of both dry periods and heavy precipitation events.

11.33 The region of the proposed road development has a temperate, oceanic climate, resulting in mild winters and cool summers. The Met Éireann weather station at Shannon Airport is the nearest weather and climate monitoring station to the proposed road development that has meteorological data recorded for the 30-year period from 1981-2010. The monitoring station is located approximately 14km northeast of the proposed road development at its nearest point. Meteorological data recorded at Shannon Airport over the 30-year period from 1981-2010 indicates that the wettest months were October and December, and the driest month on average was February. July was the warmest month with a mean temperature of 15.7° Celsius.

11.34 The recent weather patterns and extreme weather events recorded by Met Éireann have been reviewed. A noticeable feature of the recent weather has been an increase in the frequency and severity of storms with notable events including Storm Ophelia in October 2017, Storm Emma in March 2018 and Storm Darwin in February 2014. The maximum wind gust for Shannon Airport for Storm Ophelia peaked at 122 km/hr with a 10-minute speed of 87 km/hr.

11.35 Heavier historical rainfall events have also been recorded in recent years including heavy rainfall in October 2011, severe flooding in November 2009 and heavy rainfall and flooding in the summer of 2008. The rainfall recorded in November 2009 totalled 231mm over a 25-day period at Shannon Airport, an event which has an annual probability of 81 years.

11.36 Future climate predictions undertaken by Met Éireann have been published in '*Ireland's Climate: the road ahead*' *(*Met Éireann 2013*)* based on four representative concentration

pathways (RCP) scenarios (RCP2.6, RCP4.5, RCP6.0 and RCP8.5) which is named with reference to a range of radiative forcing values for the year 2100 i.e. 2.6, 4.5, 6.0 and 8.5 W/m^2 respectively with focus on RCP4.5 (medium-low) and RCP8.5 (high) scenarios. In terms of mean temperatures, it is predicted that increases of between 1-3 degrees will occur under RCP4.5, while these rise to 2-4 degrees under RCP8.5. Warm extremes are expected to rise by 2-3 degrees under RCP4.5 and by up to 5 degrees under RCP8.5.

11.37 The EPA sponsored research project '*Ensemble of regional climate model projections for Ireland (Report No. 159)*' (EPA 2015) has projected significant decreases in mean annual, spring and summer precipitation amounts with extended dry periods. The decreases are largest for summer, with reductions ranging from 0% to 13% and from 3% to 20% for the medium-to-low and high emission scenarios, respectively. Conversely increases of heavy precipitation of up to 20% are projected to occur during the winter and autumn months. The number of extended dry periods is projected to increase substantially by mid-century during autumn and summer with summer likely to increase by between 12% - 40%.

11.38 In relation to storms, the report indicates that the overall number of North Atlantic cyclones is projected to decrease by 10% coinciding with a decrease in average mean sea-level pressure of 1.5 hectopascals (hPa) for all seasons by mid-century. Wind energy is also predicted to decrease for spring, summer and autumn with a projected increase in winter. A projected increase in extreme storm activity is expected to adversely affect the future wind energy supply.

Key parameters used and outputs from the TII Carbon Assessment Tool

11.39 In the EIAR, the TII Carbon Assessment Tool (Version 1) (TII 2018) was used to determine carbon emissions from the construction and maintenance activities associated with the proposed road development. Since publication of the EIAR, TII has released the TII Carbon Assessment Tool (Version 2) (TII 2020) and thus the embodied carbon calculations have been updated to reflect any changes associated with the updated software.

11.40 The maintenance activity quantifies emissions which occur once the road is open and include activities which are necessary to maintain the road to the appropriate standard. The calculation does not include an estimate of the GHG emissions from the vehicles using the road when operational. This is instead calculated using the Emission Factor Toolkit (EFT) EFT V.10 which is a more accurate and suitable tool for this purpose. Details on operational emissions is outlined in Paragraphs 11.1 – 11.11.

11.41 The stages of the assessment in the TII Carbon Tool (TII 2020) are shown in Figure 11.B below. The assessment commences with the high-level design, through the pre-construction (site clearance) stage, followed by the assessment of the embodied carbon associated with all materials used in the construction of the road, the emissions during the construction phase and additionally emissions related to waste generated during the construction phase. The tool also assesses on-going maintenance associated with the default 60-year lifetime of the road development. For roads, it is generally assumed that end-of-life demolition is not relevant and thus there are no emissions associated with this stage.

11.42 The TII Carbon Tool (TII 2020) uses emission factors from recognized sources including the Civil Engineering Standard Method of Measurement (CESSM) Carbon and Price Book database (CESSM, 2013). The emission factors are generally expressed in units of $kgCO_{2eq}$ per unit of mass (tonnes), area (m^2) or volume (m^3). The carbon emissions are calculated by multiplying the emission factor by the quantity of the material that will be used over the entire construction / maintenance phase.

Figure 11.B TII Carbon Assessment Tool Layout (TII 2020)

11.43 Based on the updated TII Carbon Tool (TII 2020), the breakdown of the activities between the different phases of the proposed road development has been assessed. As shown in Table 11.C, the updated assessment indicates that the key phases of the carbon generation are the embodied carbon of the construction materials and the maintenance of these construction materials, which when combined account for over 89% of all carbon emissions. Pre-construction and construction operations, together with construction waste account for 11% of all emissions.

Table 11.C Carbon Emissions During Construction & Maintenance of the Proposed Road Development

Activity	Tonnes CO_{2eq} / Total
Pre-Construction	1,830
Embodied Carbon	84,549
Construction Activities	19,459
Construction Waste	1,859
Maintenance	97,582
All	205,281

11.44 The key parameters and GHG outputs associated with embodied carbon emissions during the construction phase are shown in Table 11.D. The most significant contributor to the embodied carbon emissions is asphalt which accounts for 48% of total embedded carbon emissions followed by concrete - design mix at 14%.

Table 11.D Embodied Carbon Emissions During Construction of the Proposed Road Development

Embodied Carbon Materials	Tonnes CO_{2eq} / Total	% Contribution
Timber fencing	1,597	2%
Galvanised steel safety barriers and guardrails	1,509	2%
Plastic ducting	1,666	2%
Filling - embankments (average)	3,416	4%
Granular material Type 1 depth 150mm	1,894	2%
*Close graded asphalt 40mm nominal size aggregate; depth 80mm	40,656	48%
Dense asphalt concrete 14mm nominal size aggregate; depth: 40mm	6,884	8%
Concrete - standard mix (average)	1,430	2%
Concrete - design mix (average)	11,615	14%
Steel bar reinforcement	4,190	5%
Other Materials	3,380	4%
Transport of Materials	6,311	7%
All	**84,549**	**100%**

* Due to the available options of asphalt depths available for input in to the TII Carbon Tool, the overall pavement area has been increased to ensure that the total volume of Asphalt is accounted for.

11.45 The key parameters and associated GHG outputs associated with embodied carbon emissions during the maintenance phase are shown in Table 11.E. The most significant contributor to the embodied carbon emissions is asphalt which accounts for 85% of total embedded carbon emissions followed by concrete at 14%.

Table 11.E Embodied Carbon Emissions During Maintenance of the Proposed Road Development

Embodied Carbon Materials	Tonnes CO_{2eq} / Total	% Contribution
Timber - softwood	180	0.2%
Close graded asphalt	82,938	85%
Dense asphalt concrete	14,044	14%
Other	421	0.4%
All	**97,582**	**100%**

Applicant Response Part b)

11.46 The proposed road development has been designed to be resilient to the effects of climate change for both the construction and operation stages of its lifetime.

11.47 The proposed road levels for the mainline are sufficiently elevated above the predicted 1% Annual Exceedance Probability (AEP) fluvial and/or 0.5% AEP coastal levels (where applicable). A freeboard allowance of at least 600mm has also been provided for finished road levels in accordance with Transport Infrastructure Ireland (TII) and Office of Public Works (OPW) guidelines. In all cases climate change allowances are in line with the current guidance and sensitivity checks have been undertaken on the design to ensure the proposed road development is not vulnerable to the predicted climate change effects going forward; particularly in respect to the finished road level of the proposed road development.

11.48 In carrying out the assessment to ensure the proposed road development is not vulnerable to climate change effects, detailed flood models were developed for several sections of the alignment including the following areas:

- Foynes HGV Rest Area;
- Robertstown Crossing and surrounds;
- Ahacronane Crossing;
- Lismakeery Crossing and surrounds;
- Deel Crossing and surrounds;
- Blossomhill;
- Greanagh and Maigue Crossings and surrounds.

11.49 In addition, all culvert (pipe/box) crossings have been designed to current TII and OPW requirements using flow estimates which include a 20% uplift for climate change, known as the 1%+CC AEP. This is also known as the Mid-Range Future Scenario (MRFS) and is seen as the more likely estimate of climate change to the future scenario drivers by 2100. In addition to this, a freeboard allowance of at least 300mm has been incorporated into the design of all culvert (pipe/box) crossings as per TII and OPW guidelines. A freeboard of at least 300mm is also provided to the soffit level of all other watercourse crossings.

11.50 All attenuation basins have been sized based on a climate change increase in rainfall intensity of 20% to allow for higher future inflows from the road network but maintaining the same outflow discharge rate. Again, this is in line with the MRFS.

11.51 The Environmental Operating Plan also accounts for the effects of climate change during construction stage. Construction compounds, machinery re-fuelling and lubrication stations are to avoid flood risk areas to ensure any incidents of extreme flooding do not pose any risk. In addition, the EOP requires the Contractor to prepare an Incident Response Plan, detailing procedures to be undertaken in the event of flood risk.

11.52 The above suite of measures have ensured that the impacts of climate change are already provided for in the design of the proposed road development and will ensure that the proposed road development is sufficiently resilient to the future impacts of climate change in accordance with current guidelines.

12. ITEM 12: CLIMATE ACTION PLAN 2019

An Bord Pleanála RFI:

The applicant is requested to demonstrate how the proposed road development would be compatible with the Climate Action Plan 2019, specifically the element of transport targets set out in 10.2 of the plan which seeks to 'reduce CO2 eq. emissions from the transport sector by 45 - 50% relative to 2030 pre-NDP projections'.

Applicant Response:

12.1 Several important changes to legislation have been recently enacted in Ireland and the EU in the area of greenhouse gas (GHG) emissions and climate change including the Climate Action Plan 2019, the Draft General Scheme of the Climate Action (Amendment) Bill 2019 (in January 2020), Ireland's declaration of a climate and biodiversity emergency in May 2019 and the European Parliament's approval of a resolution declaring a climate and environment emergency in Europe in November 2019.

The Climate Action Plan 2019 Targets and Actions

12.2 The 'Climate Action Plan' (CAP), published in June 2019, outlines the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlines the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The CAP also details the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas.

12.3 In relation to the transport sector, the CAP identifies the electrification of transport as the most cost-effective abatement opportunity. The CAP outlines a range of targets for electrification of vehicles including:

- Increasing the number of passenger electric vehicles (EVs) on the road to 840,000 by 2030;
- Achieving a target of 95,000 electric vans and trucks by 2030;
- Procuring 1,200 low-emission buses for public transport in cities; and
- Increasing the biofuel blend rate from the current E5 and B5 blends to E10 and B12 in petrol and diesel, respectively.

12.4 The CAP has set a transport sector reduction target of 45-50% in GHG emissions relative to 2030, pre-NDP (National Development Plan) projects. In order to achieve this, the Climate Action Plan 2019 proposes the introduction of new legislation to ban the sale of fossil fuel cars from 2030 and to stop granting NCT certificates from 2045 to fossil fuel cars. The Plan foresees that by 2030, 32% of vehicles will be electric vehicles (EV). In addition, at the EU level, carbon emissions from vehicles are continuing to reduce with a target of 130g of CO_2/km applied to new passenger cars since 2015, reducing to 95g of CO_2/km by 2021.

12.5 Additional measures targeted at public fleets include the transition to LEVs (low emission vehicles) for the urban public bus fleet, with a policy of no diesel-only purchases already in place since July 2019 and a roadmap for all PSO (Public Service Obligation) urban bus fleets to become LEVs by 2035.

12.6 As part of the Draft General Scheme of the Climate Action (Amendment) Bill 2019 (in January 2020), there will be an annually revised Plan which will require sectoral mitigation measures, within the ceilings of the 5 year carbon budget and sectoral decarbonisation ranges for the relevant period including an annual trajectory decarbonisation target range for each sector.

12.7 The Government approved the publication of the General Scheme for the Climate Action (Amendment) Bill 2019 in December 2019. The General Scheme was prepared for the purposes of giving statutory effect to the core objectives stated within the CAP. It is expected that the new Climate Action (Amendment) Bill (the Bill) will be published before the end of 2020.

12.8 The General Scheme of the Bill outlines a series of specific actions including:

- Placing the 2050 emissions reduction target from the CAP in law;
- To make a strategy to be known as the '*National Long Term Climate Strategy*', not less than once in every five year period, with the first to be published for the period 2021 to 2035 and with each subsequent Strategy covering the next three five-year carbon budgets, having a 15-year outlook and also include a longer term perspective of at least 30 years;
- To adopt a system of carbon budgets which will be determined as part of a grouping of three five-year periods calculated on an economy-wide basis, starting with the periods 2021 to 2025, 2026 to 2030, and 2031 to 2035;
- To request all local authorities to prepare climate action plans for the purpose of contributing to the national transition objective. These plans should contain mitigation and adaptation measures that each local authority intends to adopt;
- To address the commitment in the National Development Plan and Climate Action Plan to introduce legislation to ban the sale of new fossil fuel cars from 2030 and to stop the granting of NCTs from 2045;
- Increasing the power of the Climate Action Council (formerly the Climate Change Advisory Council) to recommend appropriate climate budget and policies;
- Requiring the Government to set a decarbonisation target range for each sector with responsibility given to the Minister for each sector to deliver actions and report on the achievement of targets; and
- Updating the CAP annually with actions in every sector.

Additional Government Policy

12.9 Recently published also, the National Development Plan (Government of Ireland 2018a) has highlighted the priority areas for future public capital investment in Ireland. In relation to transport, the NDP states (NDP, page 14):

> *"Maintenance and upgrading of the road network and public transport to protect asset quality and value, meet demand forecast, ease congestion and to meet climate action objectives".*

12.10 The NDP set a target of 500,000 EVs by 2030 (subsequently revised upwards in the CAP to 840,000) and also proposed the ban on the sale of fossil-fuel cars post 2030, the elimination of NCT Certs post 2045 and a range of sustainable transport measures including comprehensive cycling and walking networks for metropolitan areas of Ireland's cities and expanded greenways. In addition, the NDP plans a comprehensive integrated public transport network for Ireland's cities connecting more people to more places.

12.11 The NDP has detailed both a continuation of the upgrading of the road network and a range of detailed measures to improve road transport GHG emissions. Thus, the NDP perceives no contradiction in promoting the upgrading of the road network in tandem with GHG reduction measures and thus improvements in road infrastructure are not seen as a barrier to the adoption of GHG emission reductions out to 2050.

12.12 In June 2020 the Government published the '*Programme for Government – Our Shared Future*' (Government of Ireland 2020). In relation to climate, there is a commitment to an average 7% per annum reduction in overall greenhouse gas emissions from 2021 to 2030 (51% reduction over the decade) with an ultimate aim to achieve net zero emissions by 2050. Policies consistent with the NDP and CAP include the acceleration of the electrification of the transport system, including electric bicycles, electric vehicles and electric public transport, alongside a ban on new registrations of petrol and diesel cars from 2030. In addition, there will be a policy to ensure an unprecedented modal shift in all areas by a reorientation of investment to walking, cycling and public transport.

12.13 In relation to roads infrastructure, the *'Programme for Government – Our Shared Future*' (Government of Ireland 2020) states:

'We are committed to maintaining the existing road network to a high standard and funding safety improvements.

We will continue to invest in new roads infrastructure to ensure that all parts of Ireland are connected to each other' (Programme for Government, page 14).

Climate Action Plan 2019 - Transport

12.14 Reviewing the Transport Chapter of the CAP in detail highlights that there are significant opportunities and policy options in the sector. The CAP states:

"*The analysis of the most effective policy options available to Ireland shows a very substantial number in the transport sector and, while they have significant upfront costs, their adoption will bring net savings to the economy overall. Consumer costs have fallen significantly. EV battery prices have fallen by 79% in the last 7 years, with 2030 forecasts predicting a further 67% fall by 2030. This will mean cheaper consumer prices. When the upfront cost and ongoing running cost are looked at together, it will be as cheap to have an EV as to have a petrol/diesel vehicle.*

On this basis, the most efficiency roadmap for Ireland would include a 45-50% reduction in transport by 2030, with substantial acceleration in the second half of the decade." (CAP, Page 86)

12.15 Thus, the reduction in the transport sector of 45-50% in the CAP is framed in the context of a very significant increase in the uptake of EVs over the period 2020 – 2030. There is no indication of a policy to reduce road construction nor to reduce road transport in general. Rather, by ensuring that all cars will be electric by 2045 at the latest and that the electricity grid will have at least 70% renewables by 2030 and net zero emissions by 2050, the sought after reduction in the transport sector will be obtained from technology shifts rather than a policy to reduce mobility and car ownership.

12.16 Specific measures focused on rural transport include the following steps necessary to deliver the strategy (CAP 2019 – Annex of Actions, page 52, Action 100):

- A comprehensive assessment of rural travel demand, and methodologies for determining same,
- Set a target for modal shift and emission reductions for 2021-2025,
- Development proposals for an integrated public transport network,
- Develop a pilot scheme for a city and its regional hinterland to develop a best practice model,
- Pilot a car sharing initiative such as a vehicle bank in rural towns.

Modal Shift

12.17 Section 10.3 of the Climate Action Plan also sets out *Measures to Deliver Targets* in relation to the targets set out in section 10.2 for Transport. One of the measures outlined as being critical to the success of achieving the transport targets is Modal Shift. The plan outlines the aim to provide good public transport, cycling and walking infrastructure, so people are less reliant on their cars, and congestion can be reduced.

12.18 The proposed development will help facilitate this modal shift by removing congestion and a proportion of the through traffic from towns and villages along the N21 and along the N69. In particular this development will benefit the communities of Adare, Kildimo, Clarina and Mungret. The above listed towns are currently subject to high numbers of HGV traffic, with Adare experiencing an AADT of 15,750 in 2017 with a HGV rate of 3.7% (582 AADT). Kildimo was subject to 9,550 AADT in 2017 with a 5.8% HGV rate, while Mungret was subject to 10,200 with a HGV percentage of 5.3%.

12.19 The removal of future congestion within these towns will also allow public transport to function reliably, with improved journey times and improved journey amenity. Public transport will operate more efficiently and will be more attractive to commuters, contributing to placemaking where communities can prosper. In This way, the proposed development supports the

Compact Growth National Strategic Outcome (NSO) as identified in the Project Ireland 2040 National Planning Framework (Government of Ireland 2018b). The NSO aims to invest in enabling infrastructure and supporting amenities to enhance the attractiveness, viability and vibrancy of smaller towns and villages and rural areas as a means of achieving more sustainable patterns and forms of development, releasing the potential of urban settlements.

12.20 The environment for pedestrians and cyclists within these towns will also benefit from the reduction in traffic and HGVs in terms of a safer environment. Improved amenity within towns will help encourage the uptake of walking and cycling for accessing amenities within the town which is also in line with NSO 2 of the National Planning Framework. Several local roads are currently subject to HGVs and cars trying to avoid the congestion in Adare. This can often lead to increased speeds and a reduction in safety on these rural local roads. The removal of this traffic onto the proposed road will result in local roads being quieter and safer for use by cyclists and pedestrians.

12.21 In addition, reduced traffic levels as a result of the proposed road development, will improve the safety of pedestrians and cyclists throughout the wider rural area and will provide enhanced opportunity for a change of mode when travelling between the towns and villages in the area. The removal of HGVs from non-national roads will lead to an improvement both to the amenity and safety of other vehicles, cyclists and pedestrians. Enhancing the attractiveness, viability and vibrancy of smaller towns, villages and rural areas in between will act as a means of achieving more sustainable patterns and forms of development. Improved accessibility to and between centres and villages, and better integration with their surrounding areas will benefit the communities, enhancing job creation and improved quality of life using existing assets. Chapter 4 of the EIAR (Section 4.8) outlines the benefits to cyclists and pedestrians which will be afforded along the combined length of 53km of existing roads due to reduced traffic flows. The cycle links outlined have the potential to account for modal shifts from private cars to cycling for local trips. It is also proposed to include additional mitigation measures to further encourage a modal shift to cycling for local journeys and to enhance the local road network for cyclists as a result of the proposed Foynes to Limerick Road (including Adare Bypass). The mitigation measure to be included in the Schedule of Commitments is as follows:

12.22 Local Cycling Network: The following will be provided along the local roads identified as cyclist and pedestrian routes in Plates 4.50 and 4.51 of Chapter 4 of the EIAR:

- Clear directional signs will be provided to ensure that cyclists and pedestrians are aware of available routes to follow;
- Directional signs will be provided at crossroads and within towns and villages, providing information on towns and local amenities within the vicinity.

Electric Vehicles

12.23 The UK policy document "*Net Zero Technical Report*" (Committee on Climate Change (COCC), 2019) has published a detailed pathway for the significant reductions required in the transport sector to meet the overall UK target of net zero emissions by 2050. The UK surface transport sector accounts for 23% of total UK emissions in 2017, which is slightly greater than Ireland (projected to be 20.1% in 2018) (EPA, 2020). However, the policy document is projecting that by switching to sales of EVs solely by 2040, using electricity and hydrogen fuel for buses, encouraging public transport, walking and cycling and making improvements to logistics, the GHG emissions associated with transport can be reduced by 79% by 2050 compared to a 1990 baseline.

12.24 The policy document also outlines a "*further ambition scenario*" set of measures including the end of non-zero emission vehicles sales by 2035 with no usage of non-zero emission vehicles after 2049, an increase in rail electrification and more ambitious targets for demand reduction, including reducing car mileage by 10% and reducing HGV mileage by 10%. Combining these, leads to a reduction in GHG emissions from surface transport by 98% by 2050 compared to 1990 (COCC, 2019).

Achieving the Climate Action Plan Targets

12.25 In summary, evidence from the NDP and the CAP in Ireland and the UK COCC report supports the assertion that very significant reductions in GHG emissions are possible through the early adoption of improvements in technology including electric vehicles and low-emission buses and HGVs. By ensuring that all cars will be electric by 2045 at the latest and that the electricity grid will have at least 70% renewables by 2030 and net zero emissions by 2050, the sought after reduction in the transport sector in Ireland of between 45-50% of the 2030 pre-NDP GHG emissions will be obtained from technology shifts rather than a policy to reduce mobility and car ownership. Therefore, it is clear that the construction and operation of new infrastructure developments such as the proposed Foynes to Limerick Road (including Adare Bypass), supports the objectives of the Climate Action Plan 2019, in particular, the element of transport targets set out in section 10.2 of the plan. In addition, the proposed road development will enhance the lives of the local community and the amenity of the local villages, encouraging modal shift and facilitating greater commercial activity and employment opportunities in sectors such as tourism.

EXECUTIVE SUMMARY - ITEMS 13 AND 14 BIODIVERSITY

Items 13 and 14 of the RFI are responded to by Paul Murphy of EirEco Consultants, who composed the Natura Impact Statement (NIS) and Chapter 7 Biodiversity of the EIAR for the proposed road development.

As noted in the NIS, there were no published records or evidence of Sea Lamprey from the River Maigue or tributaries prior to publishing.

The response to item 13 of the RFI now accounts for the presence of Sea Lamprey in the River Maigue as referred to in the Inland Fisheries Ireland submission to An Bord Pleanála and incorporates this into the relevant sections of the NIS. The response identifies the changes required to sections 3 and 4 of the NIS to incorporate the presence of Sea Lamprey into the assessment.

It is noted that Section 5 of the NIS prescribes measures to mitigate any adverse effects and details a protocol to ensure their full and proper implementation to ensure the protection of the integrity of the European Sites during both the construction and operation of the proposed road development. In light of the similarities in the ecology and movements between the Sea Lamprey and River Lamprey, neither the assessment of impacts, nor the proposed measures to off-set any potential impacts, will differ from those that are currently outlined within the NIS.

Accordingly, the response reaffirms the conclusions presented within the NIS regarding the impact on Annex II species (Section 6.2) following the implementation of mitigation measures. The conclusion will not change and remains as stated in the NIS.

The response to item 14 of the RFI addresses the request from Inland Fisheries Ireland in their submission to An Bord Pleanála to extend the pre-construction water sampling period to cover 12 months. The applicant accepts this recommendation and notes that the six month proposal in the Environmental Operating Plan will be extended to incorporate the request.

13. ITEM 13: SEA LAMPREY

An Bord Pleanála RFI:

In their submission, Inland Fisheries Ireland have confirmed records of Sea Lamprey in the River Maigue in the vicinity of Adare Manor. In order for the Board to have access to the best scientific information for the purpose of carrying out and completing an Appropriate Assessment the applicant is requested to provide a detailed assessment of the effects of the proposed road development and any mitigation measures designed to prevent adverse effects on Sea Lamprey in view of the species conservation objectives within the Lower River Shannon Special Area of Conservation (Site Code 002165) in view of the site's conservation objectives, including those relating to Sea Lamprey.

Applicant Response:

13.1 Inland Fisheries Ireland have noted in their submission to An Bord Pleanála (dated 14th February 2020) that Sea Lamprey have been confirmed as present in the River Maigue in the vicinity of Adare. Sea Lamprey, like the closely related River Lamprey, are anadromous, spending their adult life in the marine environment and returning to freshwater in the early summer to spawn. The Natura Impact Statement (NIS) has presented an assessment and mitigation proposals in relation to the related River Lamprey, and the applicant confirms that the results of that assessment equally will also apply to Sea Lamprey. The main difference between the two species relates to the marginally earlier movement of River Lamprey upstream (March and April) while the Sea Lamprey typically move upstream in May to June.

13.2 It is noted at the outset of this response, that Section 5 of the NIS prescribes measures to mitigate any adverse effects and details a protocol to ensure their full and proper implementation to ensure the protection of the integrity of the European Sites during both the construction and operation of the proposed road development. In light of the similarities in the ecology and movements between the Sea Lamprey and River Lamprey, neither the assessment of impacts, nor the proposed measures to off-set any potential impacts, will differ from those that are currently outlined within the NIS. The conclusion will not change and remains as stated in the NIS. The following paragraphs outline the changes required to the NIS to incorporate the presence of Sea Lamprey within the assessment sections.

13.3 As noted in the NIS, there were no published records or evidence of Sea Lamprey from the River Maigue or tributaries prior to publishing. In view of the submission from IFI which confirms the presence of Sea Lamprey within the River Maigue, the following should be noted.

13.4 Section 3.4 of the NIS 'Effects on Conservation Objectives' examines the potential for adverse effects on the Qualifying Interests of the European Sites in view of the relevant Conservation Objectives, prior to mitigation. Table 3.3 Assessment of Conservation Objectives for the Lower River Shannon SAC, from Section 3.4 of the NIS is amended below, to account for the presence of Sea Lamprey.

13.5 In the following revised sections of the NIS deleted text is marked as ~~text~~ (strikethrough and in red ink), while additional text is marked as text (underlined and in green ink) for ease of reference.

Updated row from Table 3.3 Assessment of Conservation Objectives for the Lower River Shannon SAC of the NIS

Qualifying Interest	Closest proximity	Extent and character	Risk to this Qualifying Interest	Conservation Objective	Attribute	Target	Potential Adverse Effect
Sea Lamprey (*Petromyzon marinus*) [1095]	~~Indeterminate but not recorded from the watercourses crossed by the proposed road development~~ Recently recorded from the lower reaches of the Maigue by IFI.	Sea Lamprey is an anadromous fish species. Adults live at sea as external parasites on host fish. Migration to freshwater occurs in spring, with spawning in June / July. Hatching of ammocoetes takes place within days and the immature lamprey swims or drifts downstream until it encounters an area of fine sediment into which it can burrow. Transformation to the adult stage occurs in late summer and young adults migrate downriver in late autumn / winter. Barriers to migration are seen as major negative impacts on this species. Twelve SACs have been designated for the presence of this species in the Country. Population size within the Lower River Shannon SAC is not determined, but it is considered to be <2% of the national population. Nevertheless, this SAC is considered to be of 'good' conservation value for this species. The overall conservation status of the species is considered 'Bad' but 'stable', with major pressures / threats including canalisation and barriers to migration.	Drainage maintenance works, barriers to migration, and pollution. ~~None – Given the distance from the preferred habitat of this Qualifying Interest and the nature of the proposed road development, potential pathways of risk are not considered to exist.~~ Yes – Given the nature of the proposed road development, potential pathways of risk are considered to exist.	To restore the favourable conservation condition of Sea Lamprey in the Lower River Shannon SAC	Distribution : extent of anadromy	Greater than 75% of main stem length of rivers accessible from estuary	~~No Adverse Effect:~~ ~~There are no published records or evidence of Sea Lamprey from the River Maigue or tributaries (Harrington, 2017). In the event that sea lamprey would occur, there would be no interference with their movement within the River Maigue. Spawning by Sea lamprey occurs in freshwater habitats only.~~ Yes – Owing to the use of this habitat by this species in the vicinity of the proposed road development and the crossing point on the River Maigue, adverse effects on this Qualifying Interest cannot be ruled out at this stage. While there are no records of this species near the proposed crossing point of the River Maigue, migration of the species is likely to occur in the area.

13.6 Table 3.7 of the NIS subsequently outlines the European Sites and their respective Qualifying Interests, which have the potential to be significantly affected by the proposed road development in the absence of mitigation measures (as summarised from Tables 3.3 to 3.6 of the NIS). Table 3.7 has been amended as follows to include the presence of Sea Lamprey:

Table 3.7 from the Foynes to Limerick Road (including Adare Bypass) Natura Impact Statement as amended

European site	Qualifying Interest(s)
Lower River Shannon SAC [002165]	Mudflats and sandflats not covered by seawater at low tide [1140] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] Sea Lamprey (*Petromyzon marinus*) [1095] River Lamprey (*Lampetra fluviatilis*) [1099] Atlantic Salmon (*Salmo salar*) [1106] European Otter (*Lutra lutra*) [1355]
River Shannon and River Fergus Estuaries SPA [004077]	Whooper Swan (*Cygnus cygnus*) [A038] Wetlands and Waterbirds [A999]
Curraghchase Woods SAC [000174]	Lesser Horseshoe Bat (*Rhinolophus hipposideros*) [1303]
Askeaton Fen Complex SAC [002279]	*Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210] Alkaline fens [7230]

13.7 Section 4 of the NIS evaluates the potential significant effects brought forward from Section 3, with reference to the Attributes and Targets which define the Conservation Objectives for the Qualifying Interest or Special Conservation Interest of those sites, in the absence of mitigation measures. In response to the query, Section 4.1.3 of the NIS titled "River Lamprey (*Lampetra fluviatilis*) [1099] and Atlantic Salmon (*Salmo s*alar) [1106]" is amended below to include for Sea Lamprey (*Petromyzon marinus*):

13.8 Section 4.1.3 of the Foynes to Limerick Road (including Adare Bypass) NIS as amended:

"Sea Lamprey (Petromyzon marinus) [1095], River Lamprey (Lampetra fluviatilis) [1099] and Atlantic Salmon (Salmo salar) [1106]

The migratory fish species listed as Qualifying Interests of the Lower River Shannon SAC and potentially adversely affected by the proposed road development are Sea Lamprey, River Lamprey and Atlantic Salmon. ~~There are no published reports of Sea lamprey from the River Maigue (Harrington, 2017).~~ The Conservation Objective for Atlantic Salmon is to restore the favourable conservation condition of Salmon in the Lower River Shannon SAC, while for Sea Lamprey and River Lamprey it is to maintain their favourable conservation condition within the SAC. Salmon are not recorded from any of the other watercourses crossed by the proposed road development and are apparently unable to move upstream of the weir at Askeaton on the River Deel. ~~While~~ Apart from the presence of Sea Lamprey at Adare[1] there are no records of lamprey from any other watercourses along the length of the route. While it is possible that Brook Lamprey are present in some rivers and streams along the length of the proposed road development, they are confined to freshwater environments and therefore do not occur in the estuarine environment of the SAC at the River Maigue crossing.

The Atlantic Salmon is an anadromous species, i.e. the adult life stage is marine, with mature fish returning to their natal freshwater streams to spawn. Adults can begin their spawning migration at any time of year, but there are two main migration periods: fish who have spent

[1] Inland Fisheries Ireland Submission on the Foynes to Limerick Road (including Adare Bypass), February 2020

one winter at sea, known as "grilse", ascend rivers in late winter, while fish who have spent more than one winter at sea, known as "multi-sea-winter (MSW)" (or "spring" salmon, if the enter fresh water before 1st June), generally enter rivers earlier in the year. Movement of spawning salmon upstream through the estuary is predominantly nocturnal and usually occurs on the ebb tide (Smith & Smith, 1997). Once spawning has occurred, most adults die, though as many as 36% may survive and return to sea as kelts (Hendry & Cragg-Hine, 2003). Only 3-6% survive to spawn in subsequent years (Mills, 1989; Hubley et al., 2008).

The eggs hatch in spring and the young, known as "alevins", remain within the gravel interstitia until the yolk-sac is depleted, which takes a number of weeks, at which point they rise to the surface and begin their free-swimming phase. At this point the juvenile fish are known as "fry". At the end of their first summer these fish develop parr marks on their sides and are thereafter known as "parr". Juveniles spend 2-4 years in fresh waters (Hendry & Cragg-Hine, 2003), normally undergoing smoltification (a series of physiological changes or metamorphosis which prepares the young salmon for life in the marine environment) and migrating to sea in the spring (April-June) of their third year (King et al., 2011). Out-migrating smolts are predominantly nocturnal (Moore et al., 1995). However, they become increasingly active during daylight hours with increasing water temperatures (Thorpe et al., 1994; Ibbotson et al., 2006, 2011; Haraldstad et al., 2017). Smolts do not require a period of acclimation to saline conditions and so tend not to delay in the estuary, preferring to move directly to sea (Moore et al., 1995).

River Lamprey have been recorded by Inland Fisheries Ireland (IFI) in the 2013 Fish Population Index survey mainly in the upper parts of the Maigue catchment, though the species does not appear to have been differentiated. Brook lamprey and River lamprey are difficult to distinguish from each other and their classification as separate species has been questioned (Schreiber & Englehorn, 1998). On account of the lack of lamprey recorded in the lower catchment, it is possible that the species present is the Brook Lamprey. Igoe et al. (2004) highlight the possibility "that the river lamprey is an anadromous form of the brook lamprey". All lamprey species are semelparous (Maitland, 2003), i.e. adults undergo a single spawning event and then die.

Mature river lamprey, having spent one to two years mainly in estuaries, stop feeding in the autumn and move upstream into medium to large rivers, usually migrating into fresh water from October to December (Maitland, 2003), though this may extend into the spawning season in spring (King et al., 2008). Upstream migration is almost exclusively nocturnal (Maitland, 2003; Andrade et al., 2007; Quintella et al., 2009; Vrieze et al., 2011). Spawning starts when the water temperature reaches 10-11ºC, usually in March and April (Morris & Maitland 1987). The spawning grounds are areas of small stones and gravel in flowing water. Following hatching of the ova, Lamprey larvae, known as "ammocoetes", burrow into fine sediments at the bottom of fresh waters and live as filter-feeders. Metamorphosis occurs after c. 3-5 years in River Lamprey (Maitland, 2003). The downstream migration of recently metamorphosed lampreys, known as "macrophthalmia", is not well-studied, but Moser et al (2014) suggested that newly metamorphosed River Lamprey "begin their downstream migration over an extended period from late winter to early summer". Downstream migration by River Lamprey is predominantly nocturnal (Maitland, 2003; Potter, 1980; Lucas & Bracken, 2010; Silva et al., 2013; Moser et al., 2014; Dawson et al., 2015).

The sea lamprey usually spawns in late May or June when the water temperature reaches at least 15ºC. The upstream migration from the estuary appears to be triggered by temperature. There must be no significant obstacles (chemical or physical) in the river channel on their migration routes if sea lampreys are to reach their spawning grounds.

The potential impacts of the proposed road development on these three species is now assessed in view of the following key parameters reflected in the attributes and targets of the Conservation Objectives:

- *Anadromy and barriers to migration;*
- *Noise and vibration during construction at river crossings;*
- *Artificial lighting and shade;*
- *Water quality.*

Anadromy and Barriers to Migration

The presence of the Ardnacrusha and Parteen Dams on the Lower River Shannon are the principle reason that salmon are failing to achieve favourable conservation status within the SAC. While the River Maigue has numerous weirs along its length, many of which were established to fish for salmon, they represent a passable barrier in periods of high flow when adult fish are likely to move upstream from the estuarine reaches to spawning grounds. The numbers of spawning salmon have declined markedly in the Maigue in recent years. Consequently, the Maigue system has been closed to salmon angling since 2006 under the Wild Salmon and Sea Trout Tagging Scheme regulations administered by IFI (Harrington, 2017).

Weirs are likely to prove a more significant barrier to the upstream movement of Sea and river lamprey which do not have the capacity to leap vertical barriers as do salmon and rely on their sucker mouth to aid in ascending weirs or other man-made barriers (Maitland, 2003). They have been recorded moving upstream against flow velocities of 1.75m/s (Russon & Kemp, 2011) while the larger Sea Lamprey have been reported achieving speeds in excess of 4m/s for short periods (Hoover & Murphy, 2018).

The proposed bridge over the River Maigue and all other watercourse crossings will not, however, alter existing flow regimes in any way nor otherwise result in any barrier or impediment to upstream or downstream migration of salmon or lamprey species during either construction or operation.

Noise and Vibration during Construction at River Crossings

The main element of the proposed road development to present a risk of significant noise and vibration impacts on migratory fish species are piling operations during construction, including the driving of the temporary sheet piling wall for the temporary deck supports. These piles are being driven along the top of the riverbank at the high-water mark which will limit the propagation of sound and there will be no in-stream activity of any kind. Piles will also be driven as part of the pier foundation which will be located in the middle of the existing flood embankments. Pile driving activity for river bridges will be confined to limited periods during the construction phase and conducted entirely during the daylight working hours.

The effects of noise on fish species include, in order of increasing severity: behavioural change, auditory tissue damage, which can be temporary, i.e. temporary threshold shift (TTS), or permanent, i.e. permanent threshold shift (PTS), non-auditory tissue damage and death. Effects vary greatly between individuals of different sizes or life stages, with smaller/younger individuals being more vulnerable to injury and death, and between different species, i.e. between species classed as "hearing generalists", e.g. salmonids, and those classed as "hearing specialists", e.g. clupeids, including the shads. The effects of noise on a wide range of fish species have not been studied extensively and so any predictive assessment of such noise impacts on fish must rely on extrapolations from what studies have been carried out and thereafter apply the Precautionary Principle when making any necessary assumptions.

As the up-estuary section of the migration of adult Atlantic Salmon is predominantly nocturnal, the vast majority of individuals will migrate past the bridge location during the hours of darkness, i.e. while works are suspended each night. During the winter, works may impede the salmon spawning migration during the first and last 1-2 hours of darkness, but not during the middle 12 hours. Therefore, piling noise is not likely to create a significant barrier to the spawning migration. Any adult salmon which may be present within the affected area during pile driving are considered likely to move out of range to avoid discomfort prior to any risk of injury. Owing to the large body mass of adult salmon and the fact that they are hearing generalists, individuals are considered to be significantly less vulnerable to injury from sound than other fish species.

Similarly, any out-migrating kelts are likely to migrate at night and are not considered to be particularly vulnerable to injury/death from noise impacts. In addition, these fish are likely to spend only a very short time in the estuary, instead migrating directly from the river to the sea. Furthermore, as such a small portion of kelts contribute to future spawning, any such effects

will be imperceptible at the population scale. Therefore, any effects of piling activities on these individuals are both unlikely and insignificant.

Smolts are likely to pass through the construction area in significant numbers on their migration from the river to the sea in the period from March to May, inclusive. As with adult salmon, smolts migrate mostly at night, outside of the period when pile driving would be carried out. Any individuals which may be present within the affected area are likely to escape to avoid injury/death and continue their migration when works cease at night. As with kelts, smolts do not tend to delay in the estuary, preferring to migrate directly to sea. Therefore, owing to the predominantly nocturnal migration of smolts and the timing of the construction works, piling noise during construction is not likely to give rise to any significant barrier to out-migrating Atlantic Salmon smolts.

Upstream and downstream migration of Sea and River Lamprey is almost entirely nocturnal so that in the event they do occur, movement through the works area would primarily take place outside of the hours in which construction works would occur.

In summary, owing to the confinement of working hours primarily to daylight hours and the nocturnal migration patterns observed in both salmon and lamprey, noise and vibration impacts arising from the construction of the proposed River Maigue Bridge are not likely to interfere with the migration of either Sea and River Lamprey or Atlantic Salmon through the construction area. There are no other watercourses crossed by the proposed road development that support migrations of salmon or lamprey.

Artificial Lighting and Shade

Construction

Inappropriate lighting during construction can cause disturbance to or form a barrier to connectivity for nocturnal species. Specifically, light spill onto the water during hours of darkness may cause migrating Sea and River Lamprey and Atlantic Salmon to avoid the area in the vicinity of the bridge, effectively preventing these species from moving past the construction area. Temporary lighting associated with the construction of the proposed road development will not be permitted at the river crossings so as not to affect the movements, particularly the spawning migrations, of these Sea and River Lamprey and Atlantic Salmon in the Maigue Estuary. There are no other watercourses crossed by the proposed road development that support migrations of salmon or lamprey.

Operation

Inappropriate lighting designs or regimes can cause disturbance to connectivity or form a barrier for nocturnal species. In the case of the proposed River Maigue and River Deel Bridges, lighting will not be provided.

Water Quality

There are no suitable spawning habitats for lamprey or salmon within the vicinity of the proposed River Maigue Bridge and no pathways for impacts from the proposed road development to such habitats. Juvenile habitat for both lamprey ammocoetes and salmon alevin, fry and parr is confined to freshwater habitat also. The proposed road development will not have any effect on the distribution, quantity or quality of spawning habitats for either species at any watercourse crossing locations.

Water quality impacts likely to arise from the construction of the proposed River Maigue Bridge are detailed in 5.1.1 above. While impacts would be of short duration and restricted extent, they could result in a reduction in water quality in the estuarine reaches of the river and will require mitigation. As River Lamprey reside within the estuary during their adult lives, they may be susceptible to reduced water quality indirectly as a result of reduced prey availability. Sea Lamprey and Atlantic Salmon, however, spend only a short time in the estuary (during migrations) and generally do not feed there, so would not be as vulnerable to water quality impacts. On other watercourses, effects on spawning habitat for salmonids or lamprey species could result from pollution or siltation arising during construction without mitigation.

Conclusion

In the absence of appropriate mitigation, the construction of the proposed River Maigue Bridge is considered to have the potential to adversely affect the Conservation Objective for Sea Lamprey and River Lamprey in the Lower River Shannon SAC through reduced water quality indirectly as a result of reduced prey availability. On other watercourses, effects on spawning habitat for salmonids or lamprey species could also result from pollution or siltation arising during construction without mitigation.

Noise and vibration impacts arising from construction activities, particularly pile driving are considered unlikely to give rise to any effect, significant or otherwise, on the movement of either Sea Lamprey, River Lamprey or Atlantic Salmon upstream or downstream as the movement of these anadromous species occurs at night."

13.9 The above section assesses the potential impacts of the proposed road development on these species in view of the following key parameters reflected in the attributes and targets of the Conservation Objectives:

- Anadromy and barriers to migration;
- Noise and vibration during construction at river crossings;
- Artificial lighting and shade;
- Water quality.

13.10 Section 5 of the NIS prescribes measures to mitigate any adverse effects and details a protocol to ensure their full and proper implementation to ensure the protection of the integrity of these European Sites during both the construction and operation of the proposed road development. In light of the similarities in the ecology and movements between the Sea Lamprey and River Lamprey, neither the assessment of impacts or the proposed measures to off-set any potential impacts will differ from those that are currently outlined within the NIS. The title of section 5.2.2 of the NIS should now be updated to read "***Sea Lamprey (Petromyzon marinus) [1095], River Lamprey (Lampetra fluviatilis) [1099] and Atlantic Salmon (Salmo salar) [1106]"*** however, there are no other updates required to the text thereunder.

Conclusion

13.11 Accordingly, we reaffirm the conclusions presented within the NIS regarding the Annex II species (Section 6.2) following the implementation of mitigation measures. The conclusion will not change and remains as follows in the NIS:

> *"The mitigation prescribed in respect of water quality impacts and invasive species will provide for the protection of any protected aquatic species including otter, salmon and lamprey present within the likely zone of impact of the proposed road development. The facilitation of otter passages on all watercourse crossings in tandem with fencing to prevent access to the road will avoid any impact on movement or habitat continuity. (. . .)*
>
> *Therefore, with the full and proper implementation of the mitigation prescribed in this NIS, it can be concluded beyond all reasonable scientific doubt that construction and operation of the proposed road development will not adversely affect the integrity of the Lower River Shannon SAC, in view of its Conservation Objectives for Salmon, Sea Lamprey, River Lamprey and Otter."*

14. ITEM 14: IFI RECOMMENDATION

An Bord Pleanála RFI:

The applicant is requested to address the Inland Fisheries Ireland recommendation that the pre-construction works water sampling period should be extended to cover 12 months to capture seasonal variations in parameters.

Applicant Response:

14.1 The recommendation by Inland Fisheries Ireland that the pre-construction works water sampling period should be extended to cover 12 months to capture seasonal variations in parameters, has been considered.

14.2 Section 6.8.2 of the Environmental Operating Plan (Appendix 4.1 of the EIAR) currently includes pre-construction water quality monitoring for a minimum of six months, on a monthly basis prior to construction to establish baseline conditions for the following receiving watercourses:

i. Robertstown River;
ii. Ahacronane River;
iii. Lismakeery Stream;
iv. River Deel;
v. Clonshire River;
vi. Greanagh River; and
vii. River Maigue.

14.3 On request from Inland Fisheries Ireland, it is agreed that 12 months of monthly samples will be undertaken prior to construction to account for seasonal variations. For clarity, the following text will be added to the Schedule of Commitments:

> *Water quality monitoring in the receiving watercourses listed in section 6.8.2 of the Environmental Operating Plan (Appendix 4.1 of the EIAR) shall entail 12 no. monthly samples to be taken prior to construction to establish baseline conditions. This testing shall include (but not be limited to) those parameters listed in Section 6.8.2 of the above-mentioned plan.*

EXECUTIVE SUMMARY - ITEM 15 IRISH DRINKING WATER SOURCE

Item 15 of the RFI is responded to by Seamus MacGearailt. The response confirms that the measures proposed in Chapters 9 and 10 of the EIAR for surface waters and groundwater along with the adherence to good construction practices as fully outlined in the Environmental Operating Plan will ensure that the quality of drinking water sourced at the Foynes/Shannon Estuary Public supply abstraction point will not be compromised.

15. ITEM 15: IRISH WATER DRINKING WATER SOURCE

An Bord Pleanála RFI:

In their submission, Irish Water notes that elements of the proposed road development, including the proposed crossing of the River Deel together with works in minor water courses discharging to the River Deel, have the potential to impact on Irish Water's drinking water source at the Foynes/ Shannon estuary public water supply abstraction point, which is located approximately 2.3km downstream of this proposed river crossing. Noting the requirement of the Water Framework Directive that waters used for the abstraction of drinking waters need to be protected so as to avoid deterioration in quality, the applicant is requested to provide details of measures which are proposed to protect Irish waters drinking water source during the construction and operation phases of the proposed road development.

Applicant Response:

15.1 Sections 9.3.11 of Chapter 9 and 10.3.1 of Chapter 10 of the EIAR address the importance of the Water Framework Directive and outline the current status of the groundwater and surface water of the area. Pre-construction water quality monitoring will also be undertaken, for both ground water (quarterly monitoring for 12 months - see Page 9/48 of the EIAR) and surface water (see Item 14 above) for 12 months prior to construction. Potential impacts on water quality are outlined in both chapters and mitigation measures are proposed. The measures proposed in Chapter 9 (Section 9.5) and Chapter 10 (Section 10.5.) of the EIAR for the protection of surface waters and groundwater during both construction and operation stages, will ensure that the quality of drinking water sourced at the Foynes/Shannon Estuary Public supply at Askeaton will not be compromised by the proposed development.

15.2 All road drainage will pass through pollution control and/or ponds, so no issue will arise during the operation stage.

15.3 Adherence to good construction practices, as fully outlined in the Environmental Operating Plan (EOP) (Appendix 4.1 of the EIAR), will ensure protection of water quality in all drainage catchments and watercourses traversed by the proposed road development. Sections 6.6 and 6.7 of the EOP outline Erosion and Sediment Controls and Mitigation Measures that will be put in place during the construction stage to protect the water quality of the receiving watercourses as listed in Table 6.2 of the plan (including W11: River Deel at Milltown North). Attention is also drawn to the location of silt fences proposed for the River Deel on Pages 4.1/39 and 4.1/40, under Section 6.7.7 Specific Mitigation Measures.

16. REFERENCES

Climate Change Advisory Committee (CCAC) (2019). Climate Change Advisory Committee Annual Review 2019

DCCAE (2017). National Mitigation Plan

DCCAE (2017). National Adaptation Plan

DCCAE (2018). National Adaptation Framework - Planning for a Climate Resilient Ireland

DCCAE (2019). Climate Action Plan 2019

Department of Transport, Tourism and Sport (2019). Transport Climate Change Sectoral Adaptation Plan

EPA (2015) Ensemble of regional climate model projections for Ireland (Report No. 159)

EPA (2017). 'What impact will climate change have for Ireland' [Online] Available from http://www.epa.ie/climate/communicatingclimatescience/whatisclimatechange/whatimpactwillclimatechangehaveforireland/

EPA (2019a). Ireland's Greenhouse Gas Emissions Projections.

EPA (2020a). Ireland's Greenhouse Gas 1990-2018 Final Inventory

EPA (2020b). Ireland's National Inventory Report 2020 - Greenhouse Gas Emissions 1990-2018

EPA (2020c) Research 339: High-resolution Climate Projections for Ireland – A Multi-model Ensemble Approach

European Commission (EC) (2014) 2030 Climate and Energy Policy Framework

Government Of Ireland (2018a) National Development Plan

Government Of Ireland (2018b) Project Ireland National Planning Framework

Government Of Ireland (2020) Programme for Government – Our Shared Future IPCC (2015). AR5 Synthesis Report: Climate Change 2014

Met Eireann (2013). Ireland's Climate: the road ahead

Monahan, J (2011) *'An embodied carbon and energy analysis of modern methods of construction in housing: A case study using a lifecycle assessment framework'* January 2011, Energy & Buildings 43(1) 179-188

SEAI (2019). Energy in Ireland 2019

Transport Infrastructure Ireland (2011). Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes

UK Committee on Climate Change (2019) Net Zero Technical Report

UK Forestry Commission (2012) Understanding the Carbon and Greenhouse Gas Balance of Forests in Britain

UK Highways Agency (2019). Design Manual for Roads and Bridges Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 14 LA 114 - Climate

UNFCCC (1997). Kyoto Protocol to the United Nations Framework Convention on Climate Change adopted at COP3 in Kyoto, Japan, on 11 December 1997

APPENDIX A1

An Bord Pleanála Request For Further Information Letter to Limerick City and County Council dated 15th July 2020

Our Case Number: ABP-306146-19

An Bord Pleanála

Tim Fitzgerald
Limerick City and County Council
Corporate Headquarters
Merchants Quay
Limerick

Date: 15th July 2020

Re: Foynes to Limerick Road (including the Adare Bypass) including all ancillary and consequential works.
Shanagolden, Craggs, Askeaton West, Lismakeery, Nantian, Riddlestown, Rathkeale Rural, Rathkeale Urban, Dromard, Croagh, Adare North, Adare South, Clarina and Patrickswell, Co. Limerick.

Dear Sir,

I refer further to the above mentioned proposed road development.

Please be advised that the Board, in accordance with section 51(4) of the Roads Act 1993, as amended, hereby requires you to furnish the following additional information in relation to the likely effects on the environment of the proposed road development:

1. In section 8.2.4 of Chapter 8 (Soils and Geology) of the EIAR, the applicant makes reference to having carried out several site inspections along the length of the proposed road development in order to assist in the identification and assessment of the environmental impact on the geological environment. However, no records of these inspections could be found in the information received by the Board. In this regard, the applicant is requested to provide a **summary account** of the site inspection records undertaken in **key areas** that informed the environmental component of the ground/site investigations.

2. It is stated in section 8.3 of the EIAR that bedrock was generally encountered at depths varying between 0.3m and 6.5m. This is at variance with section 9.3.2 of the EIAR addressing 'Hydrogeology', which states that in Sections A to C, intrusive site investigations encountered moderately weak to strong Limestone and Mudstone at depths ranging between 0 – 17.1m below ground level. The applicant is requested to clarify and confirm the depths of bedrock encountered during the site investigations at representative locations along the proposed road development.

Teil	**Tel**	(01) 858 8100
Glao Áitiúil	**LoCall**	1890 275 175
Facs	**Fax**	(01) 872 2684
Láithreán Gréasáin	**Website**	www.pleanala.ie
Ríomhphost	**Email**	bord@pleanala.ie

64 Sráid Maoilbhríde
Baile Átha Cliath 1
D01 V902

64 Marlborough Street
Dublin 1
D01 V902

3. It is stated in section 8.4.1.1 of the EIAR that the total volume of cut material would amount to approximately 3 million cubic metres, of which 1.9 million cubic metres would be rock. In light of the possible discrepancy regarding depth to rock (set out in item 2 of this request above) the applicant is requested to clarify and confirm the volumes of rock and various soil types that are estimated to be excavated and to address any additional resultant environmental effects, as necessary.

4. It is stated in section 8.3 of the EIAR that no karst surface depressions were observed within 2km of the proposed road development. This is at variance with the information provided in section 9.3.6 of the EIAR which lists a number of karst features encountered (including karst surface depressions associated with turloughs). The applicant is requested to clarify and confirm the extent of existing karst features within 2km of the proposed road development and to address any additional resultant environmental effects, as necessary.

5. It is stated in Section 8.3 of the EIAR that the geophysical surveys carried out revealed possible karst anomalies and that these anomalies were followed up by additional rotary boreholes. The applicant is requested to clearly identify the areas of karst anomalies on a standalone drawing.

6. The extent of dewatering required for the construction phase of the proposed road development is unclear. The applicant is requested to identify the locations where dewatering would occur, to confirm the extent of dewatering required and to address any environmental effects, as necessary. Impacts that could potentially arise as a result of dewatering on the Craggs- Barrigone and Croagh-Farrandonnelly group water schemes as key receptors should be identified and addressed.

7. It is noted that in section 8.4.1.7 of the EIAR, reference is made to soft ground which appears to focus on river alluvium and lake sediments in Blossomhill but their specific location (chainage) is not set out. Wet silts, fen peat and lake marl are also referenced throughout Chapter 9 (Hydrogeology) of the EIAR. The applicant is requested to confirm the location and extent of soft ground and to address any additional resultant environmental effects, as necessary.

8. It is stated in section 8.4.1.8 of the EIAR that it is unlikely that contaminated soils or waste deposits would be encountered within the footprint of the proposed road development and that the risk of encountering unforeseen contaminated materials is small. This is at variance with information contained in section 9.3.2 of Chapter 9 which refers to an area of potential contamination along the route of the proposed road development identified in the townland of Craggs, located 4km to the east of Foynes and of the possibility of also encountering made ground in urban areas. The applicant is requested to clarify and confirm whether or not contaminated and/or made ground is expected to be encountered including the nature and extent of such ground and to address any resultant environmental effects, as necessary.

9. Section 8.4.1.9 of the EIAR refers to the possibility of using borrow pits to partially offset the net import of material required. It is also stated that these borrow pits could be used for the deposition of unsuitable material. While it is acknowledged that the hydrology impacts associated with the borrow pits has been addressed in Chapter 10 (Hydrology) of the EIAR, the applicant is requested to identify the location of the proposed borrow pits and to address geological and hydrogeological impacts associated with use of borrow pits for deposition of unsuitable material.

10. Drawings associated with Chapter 10 of the EIAR show proposals for the use of cohesive non-permeable material to ensure that the road formation does not drain the wetland fen area. This aspect of the proposed road development is not discussed in the chapter. Similarly, drainage blankets are shown on drawings, but not discussed or described in Chapter 10. The applicant is requested to clarify and confirm where these materials are intended to be used on the proposed road development and to address the resultant environmental effects, as necessary.

Teil	**Tel**	(01) 858 8100
Glao Áitiúil	**LoCall**	1890 275 175
Facs	**Fax**	(01) 872 2684
Láithreán Gréasáin	**Website**	www.pleanala.ie
Ríomhphost	**Email**	bord@pleanala.ie

64 Sráid Maoilbhríde
Baile Átha Cliath 1
D01 V902

64 Marlborough Street
Dublin 1
D01 V902

11. Notwithstanding the information provided in Chapter 13 (Air and Climate) of the EIAR, the applicant is required to provide further details on climate, specifically addressing the following:

    a) Provide an assessment of the **effects on the climate of greenhouse gas emissions** arising from the proposed road development during the design, construction and operation of the proposed road development over its lifetime. Key parameters used and outputs from the TII Carbon Assessment Tool referenced in Section 13.3.1.2 of the EIAR should be provided if this tool is being used as part of the assessment.

    b) Provide an assessment of **the resilience of the development to climate change**, including how the proposed road development can be adapted to take account of the projected impacts of climate change on the design, construction and operation of the proposed road development over its lifetime.

12. The applicant is requested to demonstrate how the proposed road development would be compatible with the Climate Action Plan 2019, specifically the element of transport targets set out in 10.2 of the plan which seeks to 'reduce CO_2 eq. emissions from the transport sector by 45 – 50% relative to 2030 pre-NDP projections'.

13. In their submission, Inland Fisheries Ireland have confirmed records of Sea Lamprey in the River Maigue in the vicinity of Adare Manor. In order for the Board to have access to the best scientific information for the purpose of carrying out and completing an Appropriate Assessment the applicant is requested to provide a detailed assessment of the effects of the proposed road development and any mitigation measures designed to prevent adverse effects on Sea Lamprey in view of the species conservation objectives within the Lower River Shannon Special Area of Conservation (Site Code 002165) in view of the site's conservation objectives, including those relating to Sea Lamprey.

14. The applicant is requested to address the Inland Fisheries Ireland recommendation that the pre-construction works water sampling period should be extended to cover 12 months to capture seasonal variations in parameters.

15. In their submission, Irish Water notes that elements of the proposed road development, including the proposed crossing of the River Deel together with works in minor water courses discharging to the River Deel, have the potential to impact on Irish Water's drinking water source at the Foynes/ Shannon estuary public water supply abstraction point, which is located approximately 2.3km downstream of this proposed river crossing. Noting the requirement of the Water Framework Directive that waters used for the abstraction of drinking waters need to be protected so as to avoid deterioration in quality, the applicant is requested to provide details of measures which are proposed to protect Irish waters drinking water source during the construction and operation phases of the proposed road development.

Should the Board consider that additional information furnished in accordance with this request contains significant additional data in relation to the effects on the environment of the proposed road development it will, in accordance with section 51(4A) of the Roads Act 1993, as amended, require you to:

(a) publish in one or more newspapers circulating in the area in which the proposed road development would take place a notice stating that significant additional information in relation to the said effects has been furnished to the Board, that the additional information will be available, for inspection or for purchase (on payment of a specified fee not exceeding the reasonable cost of making a copy), at a specified place and at specified times during a specified period, and that submissions or observations in relation to theadditional information may be made in writing to the Board before a specified date, and

Teil	**Tel**	(01) 858 8100
Glao Áitiúil	**LoCall**	1890 275 175
Facs	**Fax**	(01) 872 2684
Láithreán Gréasáin	**Website**	www.pleanala.ie
Ríomhphost	**Email**	bord@pleanala.ie

64 Sráid Maoilbhríde
Baile Átha Cliath 1
D01 V902

64 Marlborough Street
Dublin 1
D01 V902

(b) send notice of the furnishing to the Board of significant additional information, and a copy of the additional information, to the bodies and persons and the authority (where appropriate) referred to in section 51(3)(b) and (c) of the Roads Act 1993, as amended, and to indicate to such bodies and persons and the authority (where appropriate) that submissions or observations in relation to the additional information may be made in writing to the Board before a specified date.

Your response to this letter should be received **not later than 5.30 p.m. on the Wednesday 26th August 2020.**

In this regard, please submit 3 hard copies and one electronic copy of the above information.

If you have any queries in relation to this matter, please contact the undersigned officer of the Board.

Please quote the above mentioned An Bord Pleanála reference number in any correspondence or telephone contact with the Board.

Yours faithfully

pp. EW

Kieran Somers
Executive Officer
Direct Line: 01-873 7250

HA11

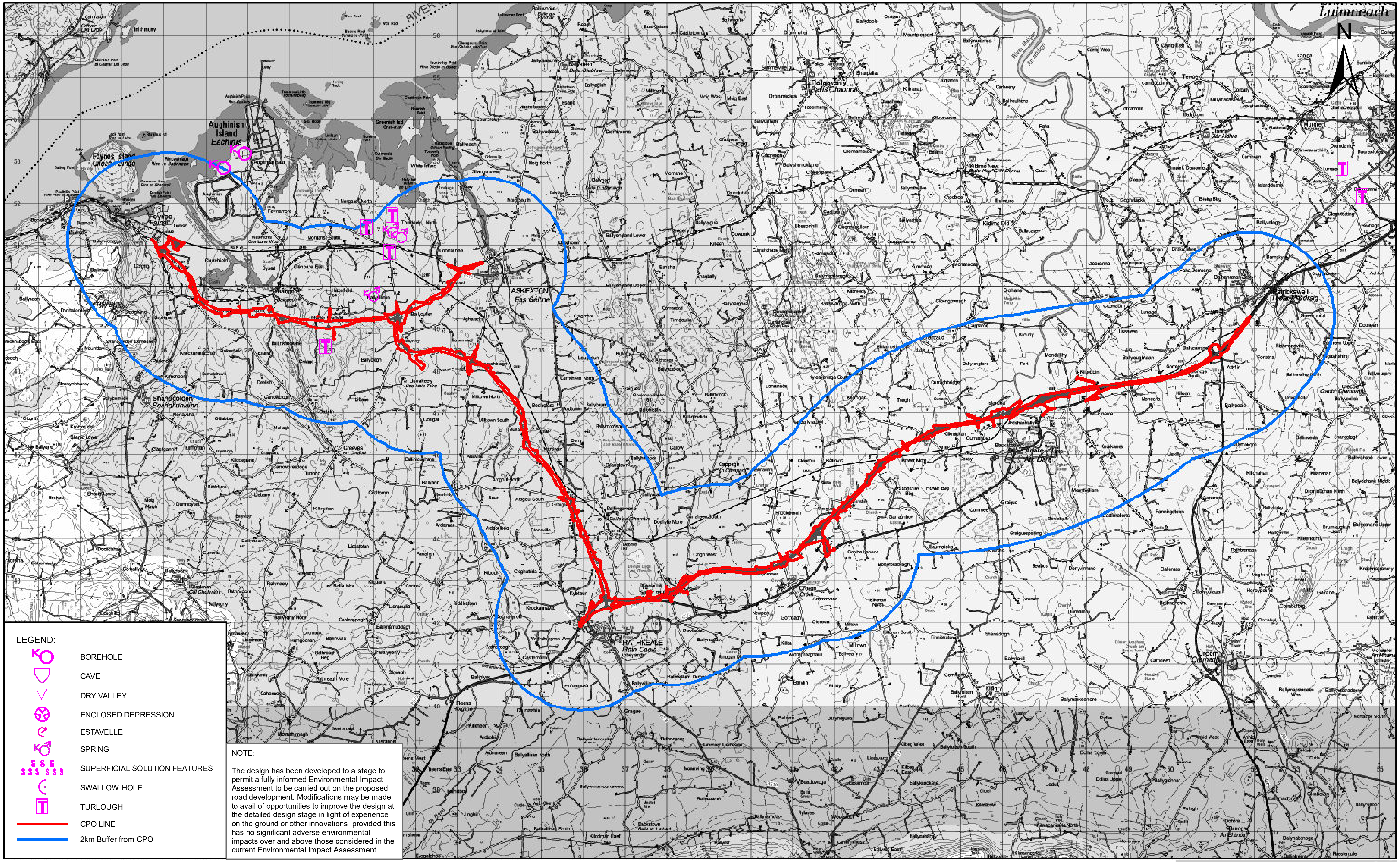
Teil	**Tel**	(01) 858 8100
Glao Áitiúil	**LoCall**	1890 275 175
Facs	**Fax**	(01) 872 2684
Láithreán Gréasáin	**Website**	www.pleanala.ie
Ríomhphost	**Email**	bord@pleanala.ie

64 Sráid Maoilbhríde
Baile Átha Cliath 1
D01 V902

64 Marlborough Street
Dublin 1
D01 V902

APPENDIX A2

Figure R4.1



NOTE:

The design has been developed to a stage to permit a fully informed Environmental Impact Assessment to be carried out on the proposed road development. Modifications may be made to avail of opportunities to improve the design at the detailed design stage in light of experience on the ground or other innovations, provided this has no significant adverse environmental impacts over and above those considered in the current Environmental Impact Assessment

Tionscadal Éireann Project Ireland 2040

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Comhairle Cathrach & Contae Luimnigh
Limerick City & County Council

Roughan & O'Donovan-AECOM Alliance

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 (1) 2940800
Fax : +353 (1) 2940820
e-mail : info@rod.ie
Website : www.rod.ie
www.aecom.com

Project

Foynes to Limerick Road (including Adare Bypass)

Request of Further Information

Drawing Title:

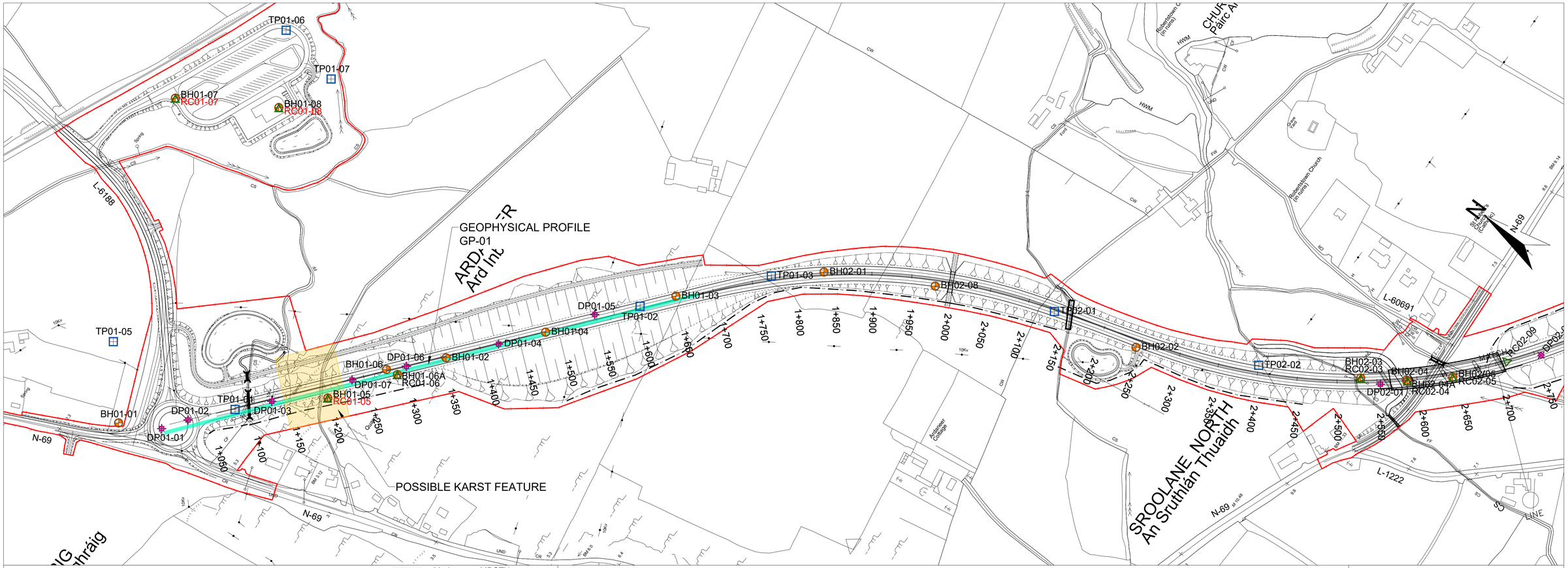
GSI DATABASE KARST FEATURES PLAN LOCATIONS

Designed:	JC	File:		Status:	R.F.I.
Drawn:	LA	Job No:	14.131		
Checked:	FB	Scale:	N.T.S. (@ A3)	Drawing No: FIG R4.1	Rev:
Approved:	SMG	Date:	August 2020		

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

APPENDIX A3

Figures R5.1 and R5.2



LEGEND:

BH BOREHOLE	Topsoil - TS	Cobbled & Boulders - CB	Mudstone - MDSTN
TP TRIAL PIT	Glacial fine - GF	Alluvial coarse - AC	Void or Undefined
DP DYNAMIC PROBE	Glacial coarse - GC	Organic - ORG	Stiff CLAY
RC ROTATE CORE	Limestone - LMST	Lacustrine Deposits - LAC	GRAVEL
	Made ground - MG	Siltstone - SILT	CPO LINE
	Alluvial fine - AF	Peat - PEAT	GEOPHYSICAL PROFILE
			POSSIBLE KARST FEATURES

NOTE:

The design has been developed to a stage to permit a fully informed Environmental Impact Assessment to be carried out on the proposed road development. Modifications may be made to avail of opportunities to improve the design at the detailed design stage in light of experience on the ground or other innovations, provided this has no significant adverse environmental impacts over and above those considered in the current Environmental Impact Assessment

CHAINAGE	EXISTING	PROPOSED
1+000		4.591
1+050		4.841
1+100	0.589	5.091
1+150	0.904	5.341
1+200	14.100	5.591
1+250	2.671	5.841
1+300	1.600	6.091
1+350	13.385	6.341
1+400	13.988	6.591
1+450	14.988	6.841
1+500	15.243	7.091
1+550	15.707	7.341
1+600	10.319	7.662
1+650	13.947	8.223
1+700	13.333	8.873
1+750	10.960	9.523
1+800	9.599	10.162
1+850	8.675	10.614
1+900	7.479	10.815
1+950	6.010	10.767
2+000	5.483	10.469
2+050	5.360	9.920
2+100	4.989	9.152
2+150	4.715	8.352
2+200	5.371	7.724
2+250	5.341	7.745
2+300	5.596	8.441
2+350	5.533	9.656
2+400	5.899	10.906
2+450	6.154	12.156
2+500	5.980	13.406
2+550	6.179	14.656
2+600	6.473	15.906
2+650	5.154	17.156
2+700	6.483	18.285

Tionscadal Éireann Project Ireland 2040

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Comhairle Cathrach & Contae Luimnigh
Limerick City & County Council

Roughan & O'Donovan-AECOM Alliance

ROD ROUGHAN & O'DONOVAN
AECOM

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 (1) 2940800
Fax : +353 (1) 2940820
e-mail : info@rod.ie
Website : www.rod.ie
www.aecom.com

Project

Foynes to Limerick Road (including Adare Bypass)

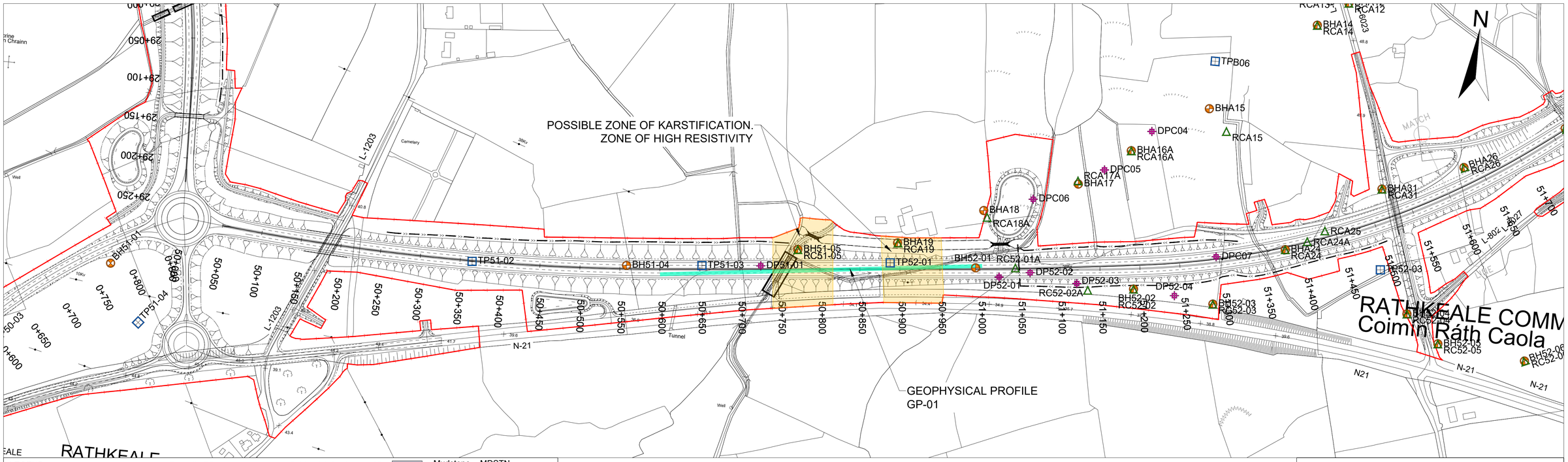
Request of Further Information

Drawing Title:

GEOPHYSICS SURVEY
POSSIBLE KARST ANOMALY PLAN
FOYNES TO BALLYCLOGH - SECTION A

Designed:	JC	File:		Status:	R.F.I.
Drawn:	LA	Job No:	14.131		
Checked:	FB	Scale:	1:5000 (@ A3)	Drawing No:	Fig R5.1
Approved:	MC	Date:	August 2020	Rev:	-

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

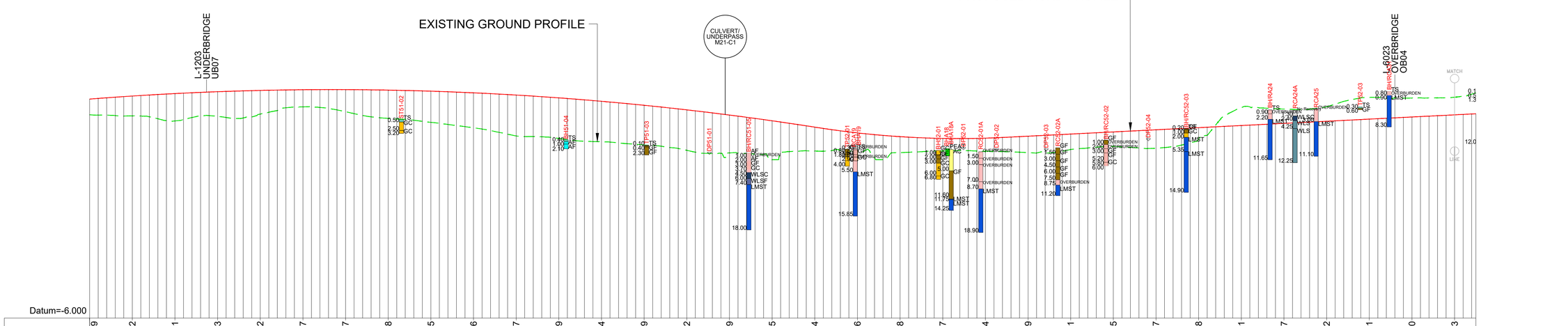


LEGEND:

BH BOREHOLE	Topsoil - TS	Cobbled & Boulders - CB	Mudstone - MDSTN
TP TRIAL PIT	Glacial fine - GF	Alluvial coarse - AC	Void or Undefined
DP DYNAMIC PROBE	Glacial coarse - GC	Organic - ORG	Stiff CLAY
RC ROTATE CORE	Limestone - LMST	Lacustrine Deposits - LAC	GRAVEL
	Made ground - MG	Siltstone - SILT	CPO LINE
	Alluvial fine - AF	Peat - PEAT	GEOPHYSICAL PROFILE
			POSSIBLE KARST FEATURES

NOTE:

The design has been developed to a stage to permit a fully informed Environmental Impact Assessment to be carried out on the proposed road development. Modifications may be made to avail of opportunities to improve the design at the detailed design stage in light of experience on the ground or other innovations, provided this has no significant adverse environmental impacts over and above those considered in the current Environmental Impact Assessment.



CHAINAGE	EXISTING	PROPOSED
50+000	41.629	45.314
50+050	41.382	46.027
50+100	40.191	46.601
50+150	41.273	47.039
50+200	41.802	47.339
50+250	43.497	47.502
50+300	42.367	47.527
50+350	40.788	47.415
50+400	39.865	47.166
50+450	38.586	46.780
50+500	36.687	46.256
50+550	36.089	45.594
50+600	35.324	44.795
50+650	34.559	43.859
50+700	33.312	42.786
50+750	32.699	41.575
50+800	31.115	40.227
50+850	33.154	38.741
50+900	33.076	37.390
50+950	32.778	36.508
51+000	33.177	36.099
51+050	33.094	36.161
51+100	32.769	36.618
51+150	33.501	37.118
51+200	34.215	37.618
51+250	33.777	38.118
51+300	36.048	38.618
51+350	43.331	39.118
51+400	42.977	39.618
51+450	43.512	40.118
51+500	45.701	40.618
51+550	45.560	41.118
51+600	45.753	41.618

Tionscadal Éireann Project Ireland 2040

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Bonneagar Iompair Éireann Transport Infrastructure Ireland

Comhairle Cathrach & Contae Luimnigh
Limerick City & County Council

Roughan & O'Donovan-AECOM Alliance

ROD ROUGHAN & O'DONOVAN
AECOM

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 (1) 2940800
Fax : +353 (1) 2940820
e-mail : info@rod.ie
Website : www.rod.ie
www.aecom.com

Project

Foynes to Limerick Road (including Adare Bypass)

Request of Further Information

Drawing Title:

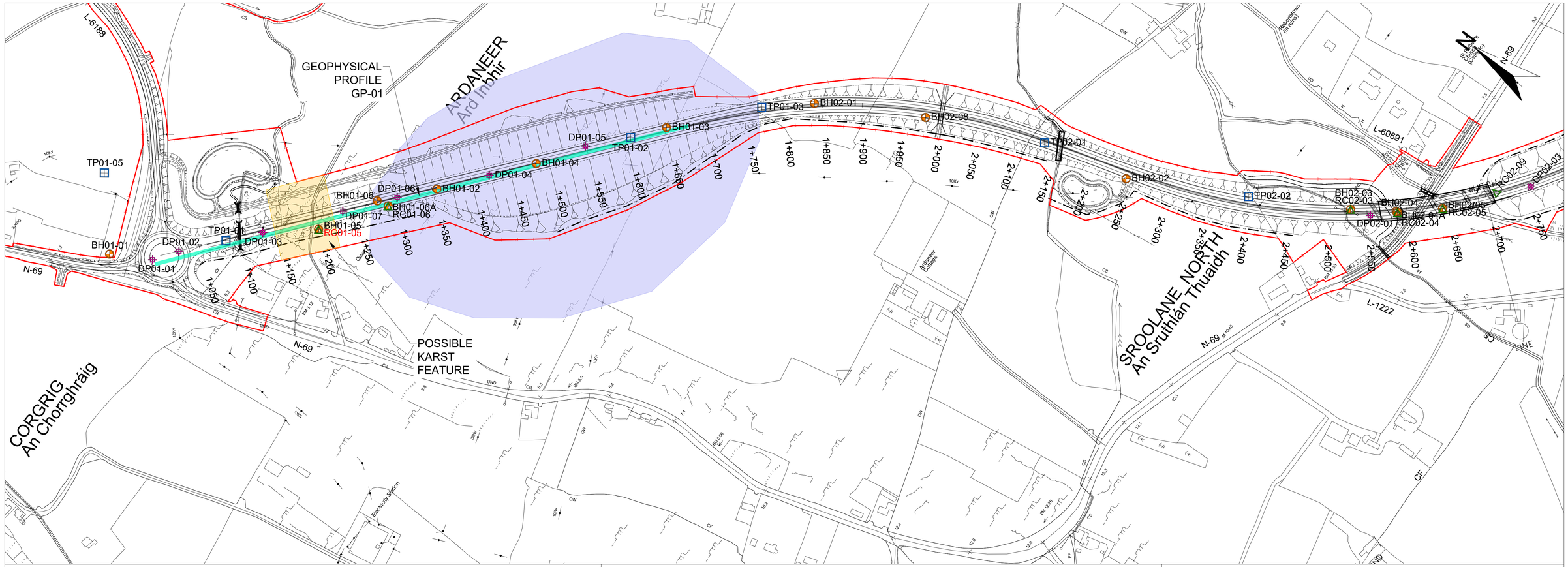
GEOPHYSICS SURVEY
POSSIBLE KARST ANOMALY PLAN
RATHKEALE TO ATTYFLIN - SECTION D

Designed:	JC	File:		Status:	R.F.I.
Drawn:	LA	Job No:	14.131		
Checked:	FB	Scale:	1:5000 (@ A3)	Drawing No:	Fig R5.2
Approved:	MC	Date:	August 2020	Rev:	-

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

APPENDIX A4

Figures R6.1 to R6.5



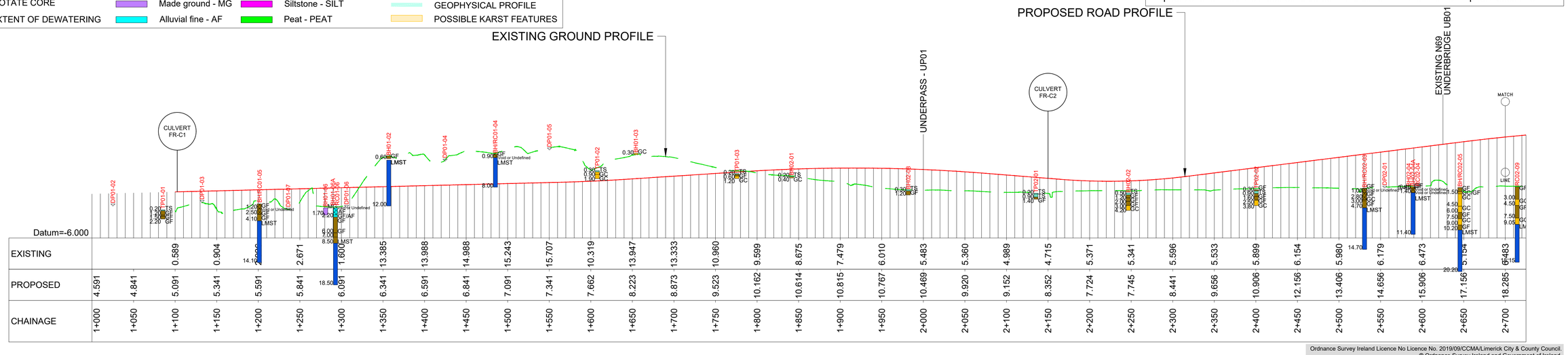
LEGEND:

- BH BOREHOLE
- TP TRIAL PIT
- DP DYNAMIC PROBE
- RC ROTATE CORE
- EXTENT OF DEWATERING

- Topsoil - TS
- Glacial fine - GF
- Glacial coarse - GC
- Limestone - LMST
- Made ground - MG
- Alluvial fine - AF
- Cobbled & Boulders - CB
- Alluvial coarse - AC
- Organic - ORG
- Lacustrine Deposits - LAC
- Siltstone - SILT
- Peat - PEAT
- Mudstone - MDSTN
- Void or Undefined
- Stiff CLAY
- GRAVEL
- CPO LINE
- GEOPHYSICAL PROFILE
- POSSIBLE KARST FEATURES

NOTE:

The design has been developed to a stage to permit a fully informed Environmental Impact Assessment to be carried out on the proposed road development. Modifications may be made to avail of opportunities to improve the design at the detailed design stage in light of experience on the ground or other innovations, provided this has no significant adverse environmental impacts over and above those considered in the current Environmental Impact Assessment.



Tionscadal Éireann Project Ireland 2040

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Comhairle Cathrach & Contae Luimnigh
Limerick City & County Council

Roughan & O'Donovan-AECOM Alliance

ROD ROUGHAN & O'DONOVAN
AECOM

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 (1) 2940800
Fax : +353 (1) 2940820
e-mail : info@rod.ie
Website : www.rod.ie
www.aecom.com

Project

Foynes to Limerick Road (including Adare Bypass)

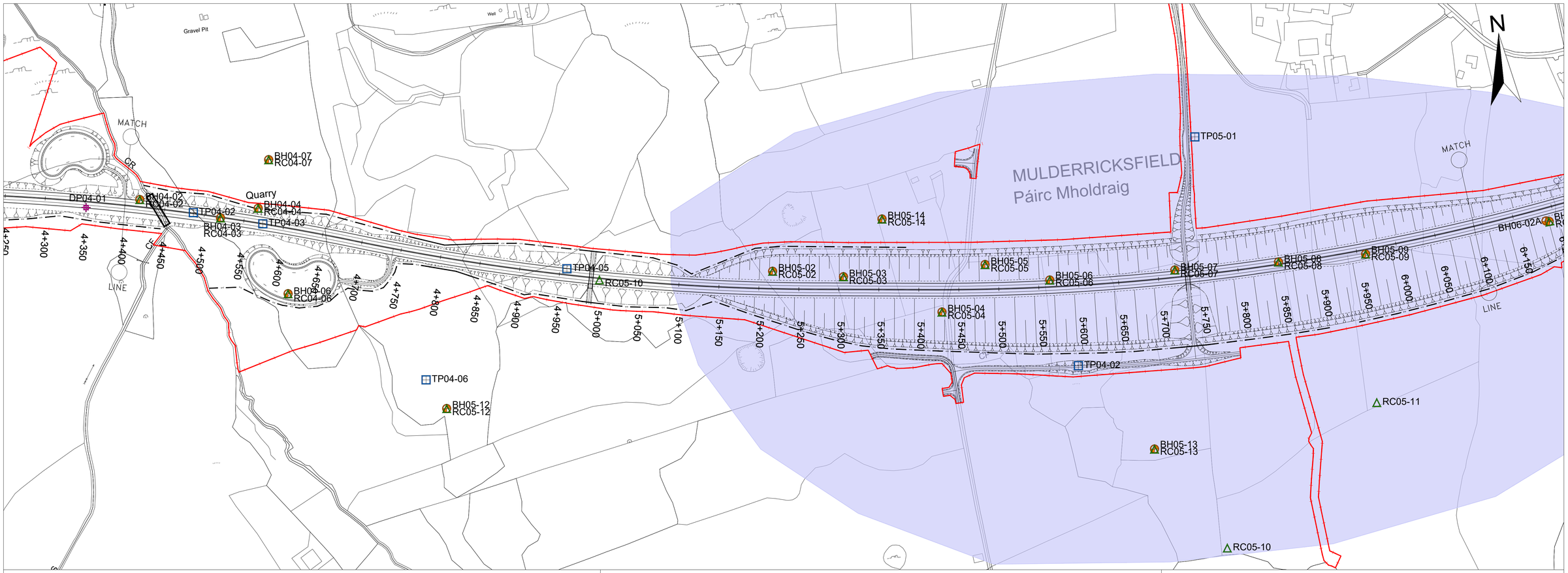
Request of Further Information

Drawing Title:

EXTENT OF DEWATERING
FOYNES TO BALLYCLOGH - SECTION A

Designed: JC	File:	Status: R.F.I.	
Drawn: LA	Job No: 14.131		
Checked: FB	Scale: 1:5000 (@ A3)	Drawing No: Fig R6.1	Rev: -
Approved: MC	Date: August 2020		

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

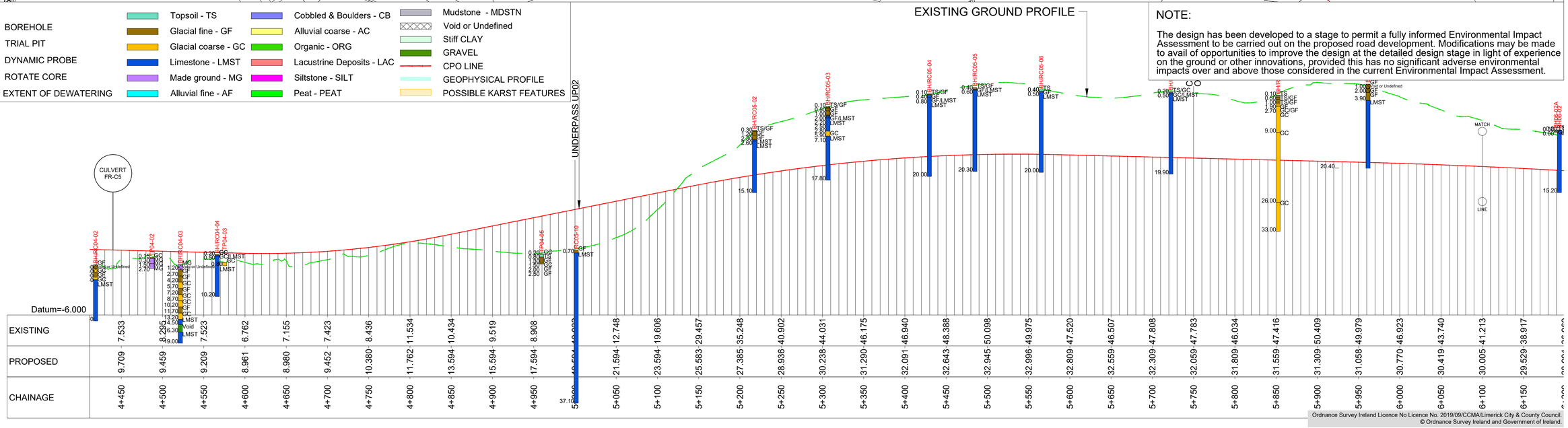


LEGEND:

- BH BOREHOLE
- TP TRIAL PIT
- DP DYNAMIC PROBE
- RC ROTATE CORE
- EXTENT OF DEWATERING

- Topsoil - TS
- Glacial fine - GF
- Glacial coarse - GC
- Limestone - LMST
- Made ground - MG
- Alluvial fine - AF
- Cobbled & Boulders - CB
- Alluvial coarse - AC
- Organic - ORG
- Lacustrine Deposits - LAC
- Siltstone - SILT
- Peat - PEAT
- Mudstone - MDSTN
- Void or Undefined
- Stiff CLAY
- GRAVEL
- CPO LINE
- GEOPHYSICAL PROFILE
- POSSIBLE KARST FEATURES

EXISTING GROUND PROFILE



NOTE:

The design has been developed to a stage to permit a fully informed Environmental Impact Assessment to be carried out on the proposed road development. Modifications may be made to avail of opportunities to improve the design at the detailed design stage in light of experience on the ground or other innovations, provided this has no significant adverse environmental impacts over and above those considered in the current Environmental Impact Assessment.

Tionscadal Éireann Project Ireland 2040

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Comhairle Cathrach & Contae Luimnigh
Limerick City & County Council

Roughan & O'Donovan-AECOM Alliance

ROD ROUGHAN & O'DONOVAN
AECOM

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 (1) 2940800
Fax : +353 (1) 2940820
e-mail : info@rod.ie
Website : www.rod.ie
www.aecom.com

Project

Foynes to Limerick Road (including Adare Bypass)

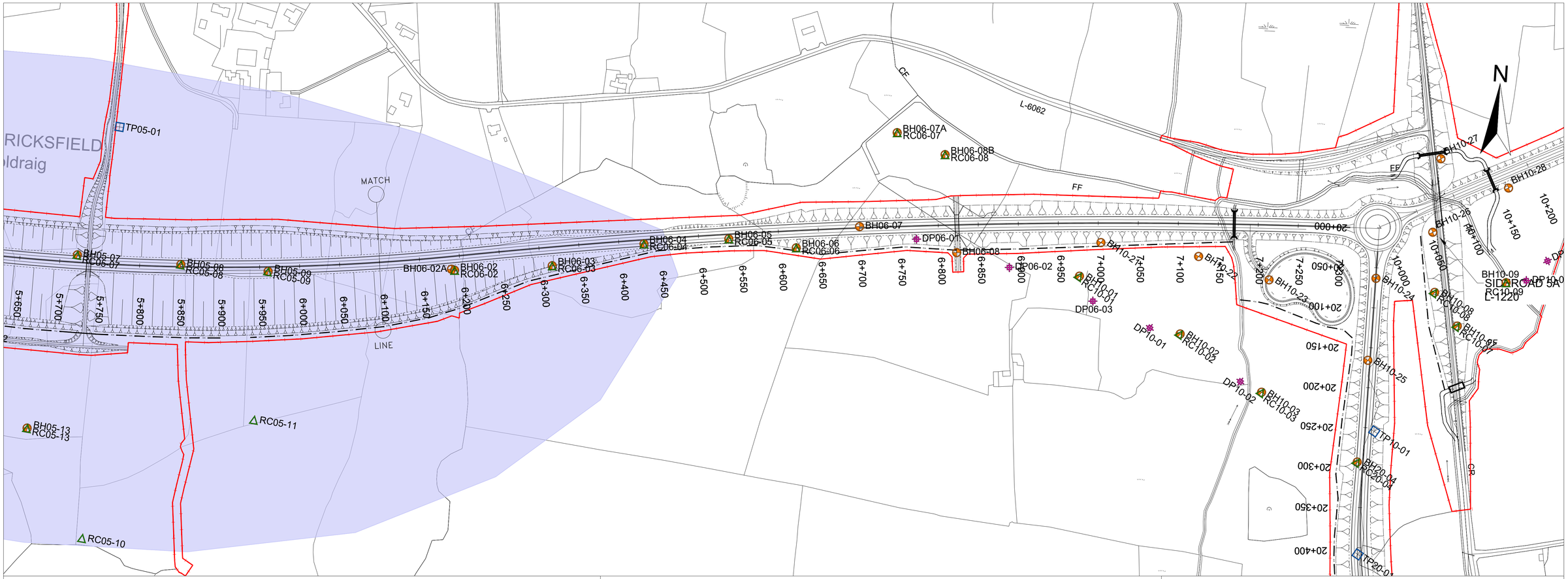
Request of Further Information

Drawing Title:

EXTENT OF DEWATERING
FOYNES TO BALLYCLOGH - SECTION A

Designed:	JC	File:		Status:	R.F.I.
Drawn:	LA	Job No:	14.131		
Checked:	FB	Scale:	1:5000 (@ A3)	Drawing No:	Fig R6.2
Approved:	MC	Date:	August 2020	Rev:	-

DO NOT SCALE USE FIGURED DIMENSIONS ONLY



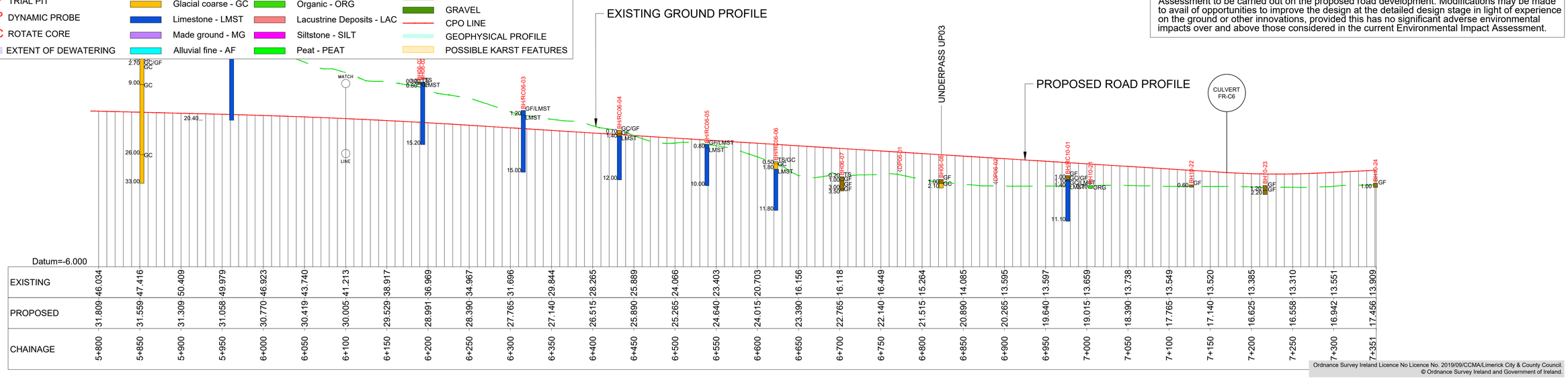
LEGEND:

- BH BOREHOLE
- TP TRIAL PIT
- DP DYNAMIC PROBE
- RC ROTATE CORE
- EXTENT OF DEWATERING

- Topsoil - TS
- Glacial fine - GF
- Glacial coarse - GC
- Limestone - LMST
- Made ground - MG
- Alluvial fine - AF
- Cobbled & Boulders - CB
- Alluvial coarse - AC
- Organic - ORG
- Lacustrine Deposits - LAC
- Siltstone - SILT
- Peat - PEAT
- Mudstone - MDSTN
- Void or Undefined
- Stiff CLAY
- GRAVEL
- CPO LINE
- GEOPHYSICAL PROFILE
- POSSIBLE KARST FEATURES

NOTE:

The design has been developed to a stage to permit a fully informed Environmental Impact Assessment to be carried out on the proposed road development. Modifications may be made to avail of opportunities to improve the design at the detailed design stage in light of experience on the ground or other innovations, provided this has no significant adverse environmental impacts over and above those considered in the current Environmental Impact Assessment.



Tionscadal Éireann Project Ireland 2040

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Comhairle Cathrach & Contae Luimnigh
Limerick City & County Council

Roughan & O'Donovan-AECOM Alliance

ROD ROUGHAN & O'DONOVAN
AECOM

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 (1) 2940800
Fax : +353 (1) 2940820
e-mail : info@rod.ie
Website : www.rod.ie
www.aecom.com

Project

Foynes to Limerick Road (including Adare Bypass)

Request of Further Information

Drawing Title:

EXTENT OF DEWATERING
FOYNES TO BALLYCLOGH - SECTION A

Designed: JC	File:	Status: R.F.I.	
Drawn: LA	Job No: 14.131		
Checked: FB	Scale: 1:5000 (@ A3)	Drawing No: Fig R6.3	Rev: -
Approved: MC	Date: August 2020		

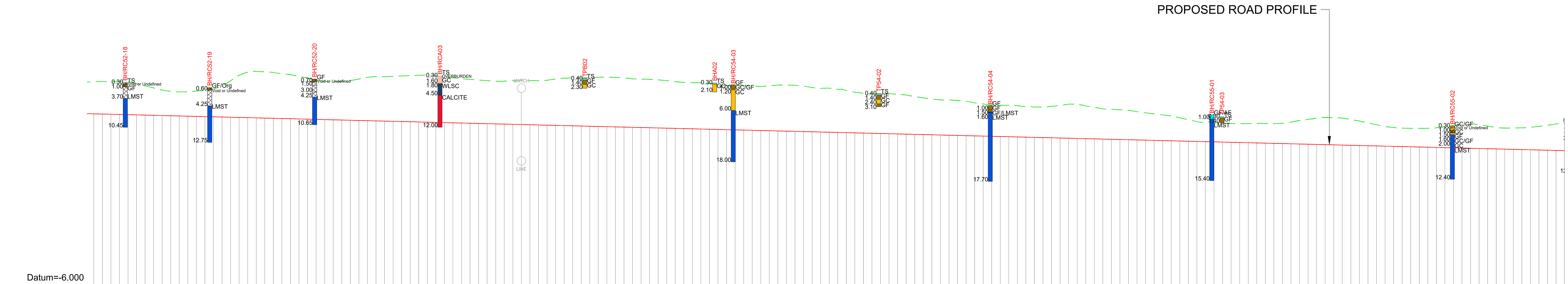
DO NOT SCALE USE FIGURED DIMENSIONS ONLY

LEGEND:

- BH BOREHOLE
- TP TRIAL PIT
- DP DYNAMIC PROBE
- RC ROTATE CORE
- EXTENT OF DEWATERING
- Topsoil - TS
- Glacial fine - GF
- Glacial coarse - GC
- Limestone - LMST
- Made ground - MG
- Alluvial fine - AF
- Cobbled & Boulders - CB
- Alluvial coarse - AC
- Organic - ORG
- Lacustrine Deposits - LAC
- Siltstone - SILT
- Peat - PEAT
- Mudstone - MDSTN
- Void or Undefined
- Stiff CLAY
- GRAVEL
- CPO LINE
- GEOPHYSICAL PROFILE
- POSSIBLE KARST FEATURES

NOTE:

The design has been developed to a stage to permit a fully informed Environmental Impact Assessment to be carried out on the proposed road development. Modifications may be made to avail of opportunities to improve the design at the detailed design stage in light of experience on the ground or other innovations, provided this has no significant adverse environmental impacts over and above those considered in the current Environmental Impact Assessment



CHAINAGE	EXISTING	PROPOSED
52+700	41.465	33.999
52+750	41.014	33.749
52+800	39.123	33.499
52+850	40.516	33.249
52+900	43.808	32.999
52+950	42.384	32.749
53+000	41.778	32.499
53+050	42.738	32.249
53+100	42.904	31.999
53+150	41.909	31.749
53+200	41.835	31.499
53+250	42.332	31.249
53+300	42.594	30.999
53+350	42.054	30.749
53+400	41.275	30.499
53+450	40.540	30.249
53+500	40.710	29.999
53+550	39.947	29.749
53+600	38.808	29.499
53+650	38.402	29.249
53+700	37.258	28.999
53+750	36.132	28.749
53+800	35.579	28.499
53+850	36.239	28.249
53+900	34.942	27.999
53+950	33.746	27.749
54+000	32.025	27.499
54+050	31.714	27.249
54+100	32.066	26.999
54+150	33.106	26.749
54+200	31.439	26.499
54+250	30.599	26.249
54+300	31.553	25.999
54+350	30.677	25.749
54+400	31.341	25.499

Tionscadal Éireann Project Ireland 2040

An Roinn Iompair Turasóireachta agus Spóirt / Department of Transport, Tourism and Sport

Bonneagar Iompair Éireann / Transport Infrastructure Ireland

Comhairle Cathrach & Contae Luimnigh / Limerick City & County Council

Roughan & O'Donovan-AECOM Alliance

ROD ROUGHAN & O'DONOVAN
AECOM

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 (1) 2940800
Fax : +353 (1) 2940820
e-mail : info@rod.ie
Website : www.rod.ie
www.aecom.com

Project

Foynes to Limerick Road (including Adare Bypass)

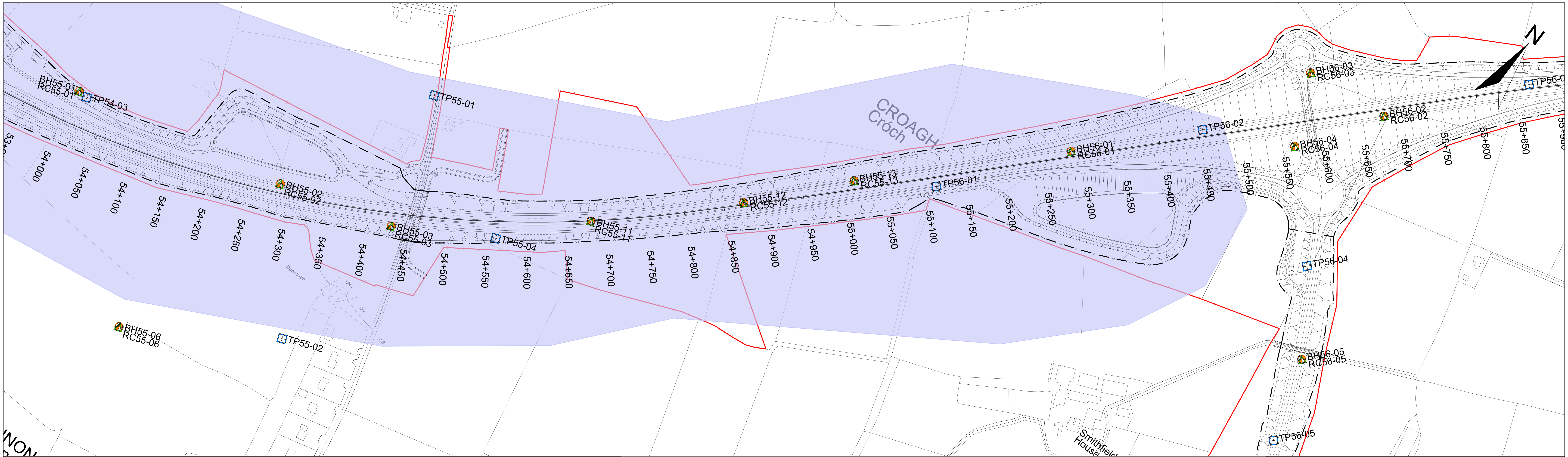
Request of Further Information

Drawing Title:

EXTENT OF DEWATERING
RATHKEALE TO ATTYFLIN - SECTION D

Designed: JC	File:	Status: R.F.I.	
Drawn: LA	Job No: 14.131		
Checked: FB	Scale: 1:5000 (@ A3)	Drawing No: Fig R6.4	Rev: -
Approved: MC	Date: August 2020		

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

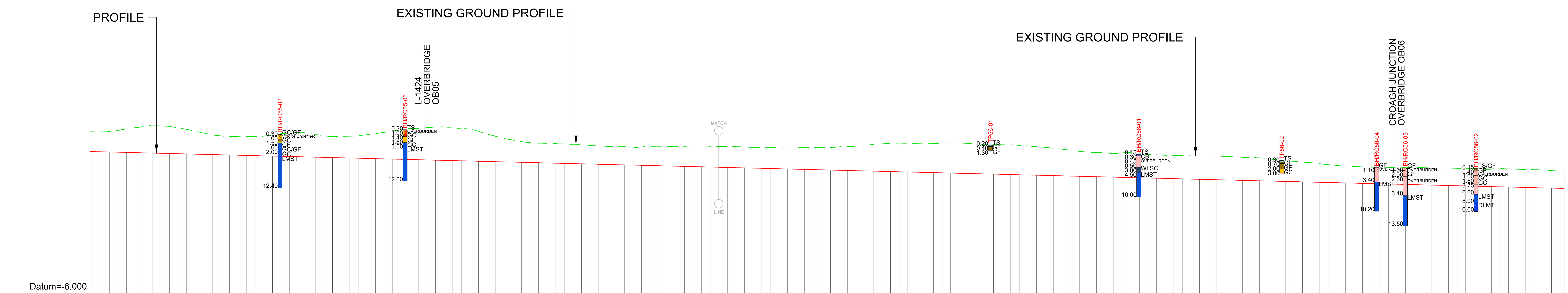


LEGEND:

- BH BOREHOLE
- TP TRIAL PIT
- DP DYNAMIC PROBE
- RC ROTATE CORE
- EXTENT OF DEWATERING
- Topsoil - TS
- Glacial fine - GF
- Glacial coarse - GC
- Limestone - LMST
- Made ground - MG
- Alluvial fine - AF
- Cobbled & Boulders - CB
- Alluvial coarse - AC
- Organic - ORG
- Lacustrine Deposits - LAC
- Siltstone - SILT
- Peat - PEAT
- Mudstone - MDSTN
- Void or Undefined
- Stiff CLAY
- GRAVEL
- CPO LINE
- GEOPHYSICAL PROFILE
- POSSIBLE KARST FEATURES

NOTE:

The design has been developed to a stage to permit a fully informed Environmental Impact Assessment to be carried out on the proposed road development. Modifications may be made to avail of opportunities to improve the design at the detailed design stage in light of experience on the ground or other innovations, provided this has no significant adverse environmental impacts over and above those considered in the current Environmental Impact Assessment



EXISTING	32.066	33.106	31.439	30.599	31.553	30.677	31.341	32.559	32.590	30.212	29.066	28.566	28.112	28.288	28.317	28.135
PROPOSED	26.999	26.749	26.499	26.249	25.999	25.749	25.499	25.249	24.999	24.749	24.499	24.249	23.999	23.749	23.499	23.249
CHAINAGE	54+100	54+150	54+200	54+250	54+300	54+350	54+400	54+450	54+500	54+550	54+600	54+650	54+700	54+750	54+800	54+850

EXISTING	28.104	28.308	28.987	29.005	28.955	28.594	27.708	26.896	26.509	26.145	25.946	25.238	24.331	23.590	23.405	23.312	23.075	22.927
PROPOSED	22.999	22.749	22.499	22.249	21.999	21.749	21.499	21.249	20.999	20.749	20.499	20.249	19.999	19.749	19.499	19.249	18.999	18.749
CHAINAGE	54+900	54+950	55+000	55+050	55+100	55+150	55+200	55+250	55+300	55+350	55+400	55+450	55+500	55+550	55+600	55+650	55+700	55+750

Tionscadal Éireann Project Ireland 2040

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

TII Bonneagar Iompair Éireann Transport Infrastructure Ireland

Comhairle Cathrach & Contae Luimnigh
Limerick City & County Council

Roughan & O'Donovan-AECOM Alliance

ROD ROUGHAN & O'DONOVAN
AECOM

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 (1) 2940800
Fax : +353 (1) 2940820
e-mail : info@rod.ie
Website : www.rod.ie
www.aecom.com

Project

Foynes to Limerick Road (including Adare Bypass)

Request of Further Information

Drawing Title:

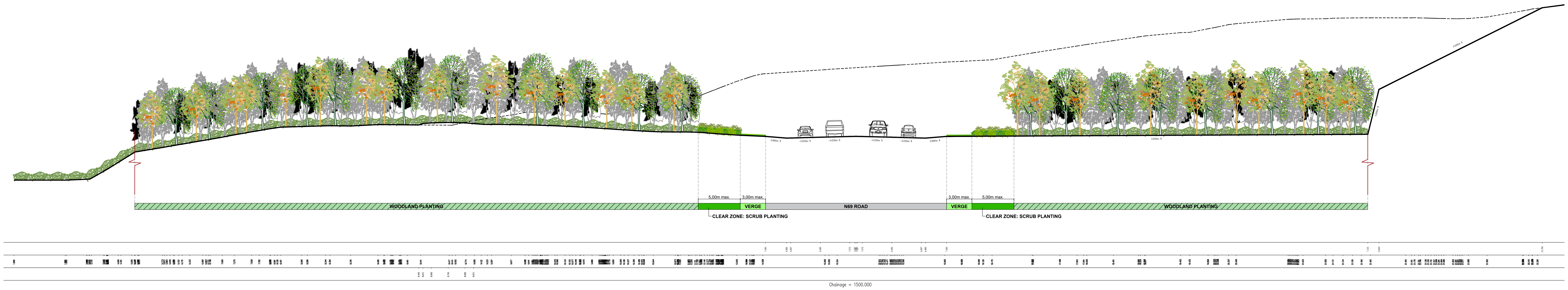
EXTENT OF DEWATERING
RATHKEALE TO ATTYFLIN - SECTION D

Designed: JC	File:		Status: R.F.I.
Drawn: LA	Job No: 14.131		
Checked: FB	Scale: 1:5000 (@ A3)	Drawing No: Fig R6.5	Rev: -
Approved: MC	Date: August 2020		

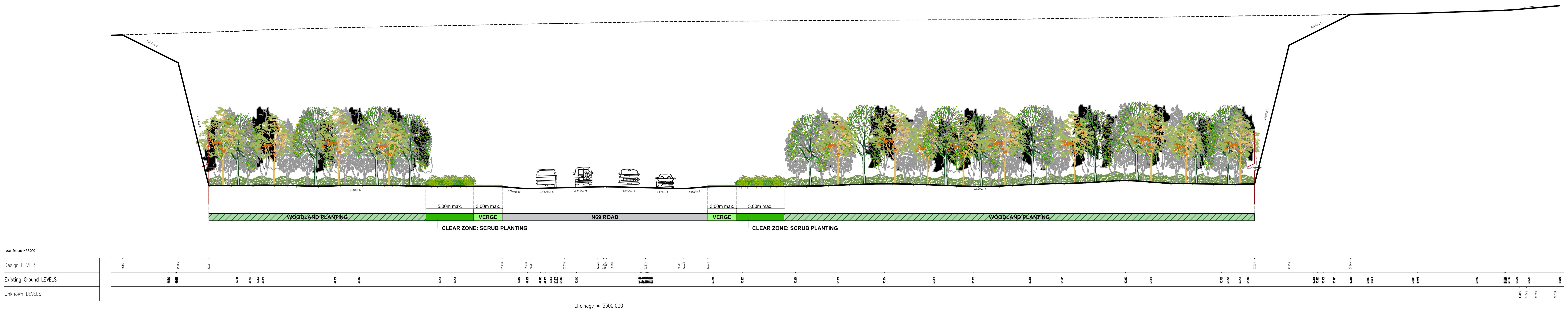
DO NOT SCALE USE FIGURED DIMENSIONS ONLY

APPENDIX A5

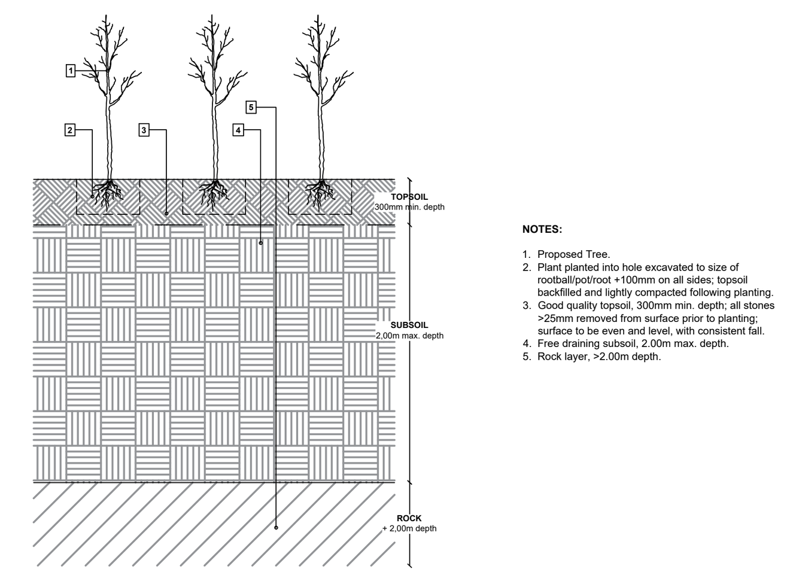
Figures R11, R11.1, R11.3, R11.4 and R11.7



SECTION 1 | SCALE 1/25



SECTION 2 | SCALE 1/25



TREE PLANTING DETAIL SECTION | SCALE 1/50

NOTE:

The design has been developed to a stage to permit a fully informed Environmental Impact Assessment to be carried out on the proposed road development. Modifications may be made to avail of opportunities to improve the design at the detailed design stage in light of experience on the ground or other innovations, provided this has no significant adverse environmental impacts over and above those considered in the current Environmental Impact Assessment.

Tionscadal Éireann Project Ireland 2040

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

TII Bonneagar Iompair Éireann Transport Infrastructure Ireland

Comhairle Cathrach & Contae Luimnigh
Limerick City & County Council

Roughan & O'Donovan-AECOM Alliance

ROD Roughan & O'Donovan
AECOM

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 (1) 2940800
Fax : +353 (1) 2940820
e-mail : info@rod.ie
Website : www.rod.ie
www.aecom.com

Project

Foynes to Limerick Road (including Adare Bypass)

Environmental Impact Assessment Report

Drawing Title:

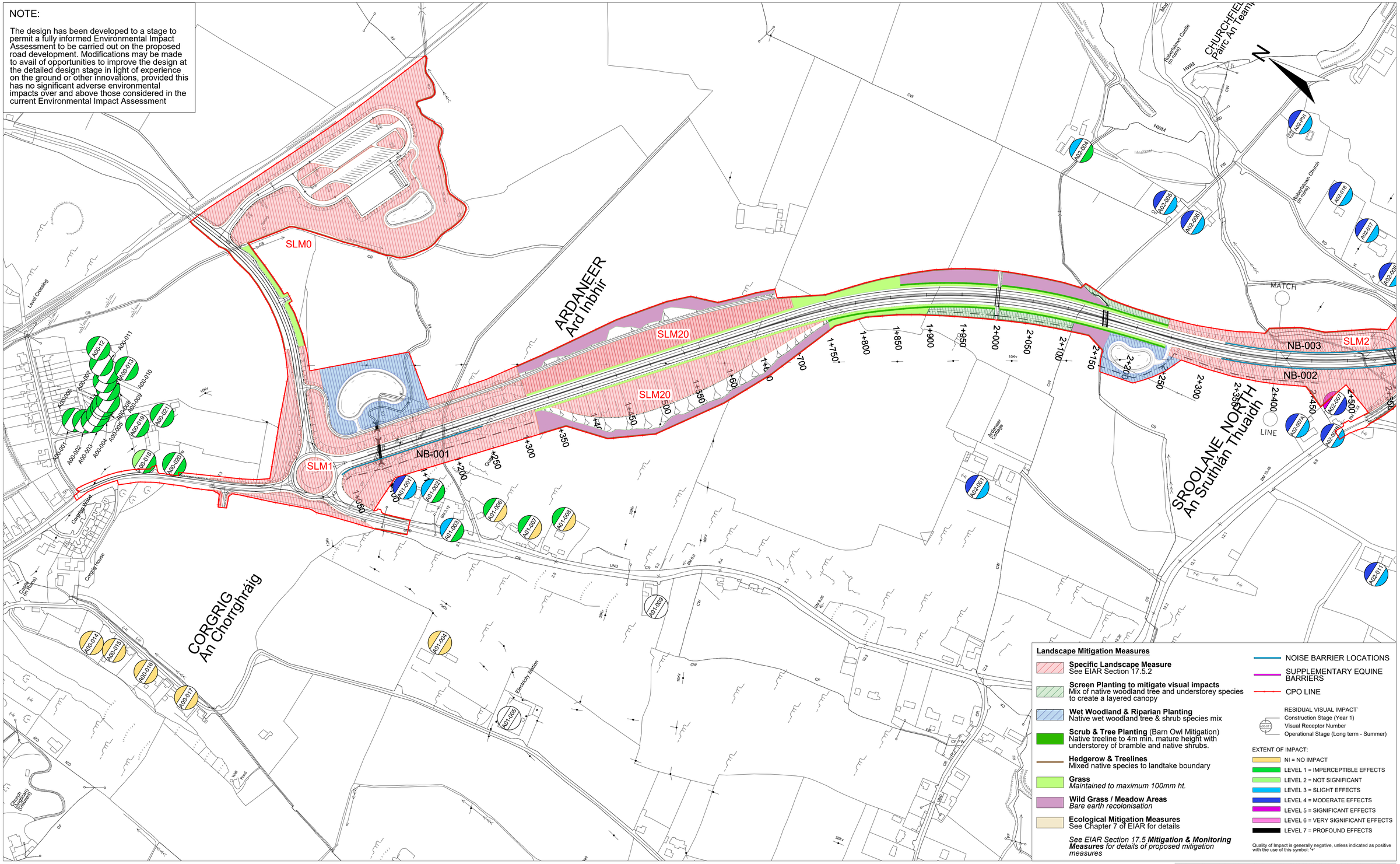
TYPICAL SECTIONS AND TREE PLANTING DETAIL SECTION

Designed:	PM/GR	File:		Status:	R.F.I.
Drawn:	LA	Job No:	14.131		
Checked:	GR	Scale:	As Shown (@ A1)	Drawing No:	Rev:
Approved:	SMG	Date:	September 2020	Fig R11	-

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

NOTE:

The design has been developed to a stage to permit a fully informed Environmental Impact Assessment to be carried out on the proposed road development. Modifications may be made to avail of opportunities to improve the design at the detailed design stage in light of experience on the ground or other innovations, provided this has no significant adverse environmental impacts over and above those considered in the current Environmental Impact Assessment



Landscape Mitigation Measures

- **Specific Landscape Measure** See EIAR Section 17.5.2
- **Screen Planting to mitigate visual impacts** Mix of native woodland tree and understorey species to create a layered canopy
- **Wet Woodland & Riparian Planting** Native wet woodland tree & shrub species mix
- **Scrub & Tree Planting** (Barn Owl Mitigation) Native treeline to 4m min. mature height with understorey of bramble and native shrubs.
- **Hedgerow & Treelines** Mixed native species to landtake boundary
- **Grass** *Maintained to maximum 100mm ht.*
- **Wild Grass / Meadow Areas** *Bare earth recolonisation*
- **Ecological Mitigation Measures** See Chapter 7 of EIAR for details

See EIAR Section 17.5 ***Mitigation & Monitoring Measures*** *for details of proposed mitigation measures*

NOISE BARRIER LOCATIONS

SUPPLEMENTARY EQUINE BARRIERS

CPO LINE

RESIDUAL VISUAL IMPACT*
Construction Stage (Year 1)
Visual Receptor Number
Operational Stage (Long term - Summer)

EXTENT OF IMPACT:

- NI = NO IMPACT
- LEVEL 1 = IMPERCEPTIBLE EFFECTS
- LEVEL 2 = NOT SIGNIFICANT
- LEVEL 3 = SLIGHT EFFECTS
- LEVEL 4 = MODERATE EFFECTS
- LEVEL 5 = SIGNIFICANT EFFECTS
- LEVEL 6 = VERY SIGNIFICANT EFFECTS
- LEVEL 7 = PROFOUND EFFECTS

Quality of Impact is generally negative, unless indicated as positive with the use of this symbol: '+'

Tionscadal Éireann Project Ireland 2040

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Bonneagar Iompair Éireann Transport Infrastructure Ireland

Comhairle Cathrach & Contae Luimnigh
Limerick City & County Council

Roughan & O'Donovan-AECOM Alliance

ROD ROUGHAN & O'DONOVAN
AECOM

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 (1) 2940800
Fax : +353 (1) 2940820
e-mail : info@rod.ie
Website : www.rod.ie
www.aecom.com

Project

Foynes to Limerick Road (including Adare Bypass)

Environmental Impact Assessment Report

Drawing Title:

THE LANDSCAPE - IMPACT RATINGS AND MITIGATION
SECTION A
SHEET 1 OF 4

Designed:	PM/GR	File:		Status:	R.F.I.
Drawn:	LA	Job No:	14.131		
Checked:	GR	Scale:	1:5000 (@ A3)	Drawing No:	Fig R11.1
Approved:	SMG	Date:	September 2020	Rev:	-

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

NOTE:

The design has been developed to a stage to permit a fully informed Environmental Impact Assessment to be carried out on the proposed road development. Modifications may be made to avail of opportunities to improve the design at the detailed design stage in light of experience on the ground or other innovations, provided this has no significant adverse environmental impacts over and above those considered in the current Environmental Impact Assessment

N

MULDERRICKSFIELD
Páirc Mholdraig

CRAGGS
An Chreag

RINCULLIA
Rinn Choille

BALLINKNOCKANE

Cragg's House

Gravel Pit

Quarry

Quarry

MATCH

MATCH

LINE

LINE

SLM20

SLM20

SLM20

A04-001

A04-002

A05-000A

A05-001

A05-001

A05-001

A05-001

A05-002

A05-003

A05-004

A05-005

A05-006

A05-007

4+000 4+050 4+100 4+150 4+200 4+250 4+300 4+350 4+400 4+450 4+500 4+550 4+600 4+650 4+700 4+750 4+800 4+850 4+900 4+950 5+000 5+050 5+100 5+150 5+200 5+250 5+300 5+350 5+400 5+450 5+500 5+550 5+600 5+650 5+700 5+750 5+800 5+850 5+900

Landscape Mitigation Measures

- **Specific Landscape Measure** See EIAR Section 17.5.2
- **Screen Planting to mitigate visual impacts** Mix of native woodland tree and understorey species to create a layered canopy
- **Wet Woodland & Riparian Planting** Native wet woodland tree & shrub species mix
- **Scrub & Tree Planting** (Barn Owl Mitigation) Native treeline to 4m min. mature height with understorey of bramble and native shrubs.
- **Hedgerow & Treelines** Mixed native species to landtake boundary
- **Grass** *Maintained to maximum 100mm ht.*
- **Wild Grass / Meadow Areas** *Bare earth recolonisation*
- **Ecological Mitigation Measures** See Chapter 7 of EIAR for details

See EIAR Section 17.5 ***Mitigation & Monitoring Measures*** *for details of proposed mitigation measures*

- NOISE BARRIER LOCATIONS
- SUPPLEMENTARY EQUINE BARRIERS
- CPO LINE

RESIDUAL VISUAL IMPACT*
Construction Stage (Year 1)
Visual Receptor Number
Operational Stage (Long term - Summer)

EXTENT OF IMPACT:

- NI = NO IMPACT
- LEVEL 1 = IMPERCEPTIBLE EFFECTS
- LEVEL 2 = NOT SIGNIFICANT
- LEVEL 3 = SLIGHT EFFECTS
- LEVEL 4 = MODERATE EFFECTS
- LEVEL 5 = SIGNIFICANT EFFECTS
- LEVEL 6 = VERY SIGNIFICANT EFFECTS
- LEVEL 7 = PROFOUND EFFECTS

Quality of Impact is generally negative, unless indicated as positive with the use of this symbol: '+'

Tionscadal Éireann Project Ireland 2040

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Bonneagar Iompair Éireann Transport Infrastructure Ireland

Comhairle Cathrach & Contae Luimnigh
Limerick City & County Council

Roughan & O'Donovan-AECOM Alliance

ROD ROUGHAN & O'DONOVAN
AECOM

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 (1) 2940800
Fax : +353 (1) 2940820
e-mail : info@rod.ie
Website : www.rod.ie
www.aecom.com

Project

Foynes to Limerick Road (including Adare Bypass)

Environmental Impact Assessment Report

Drawing Title:

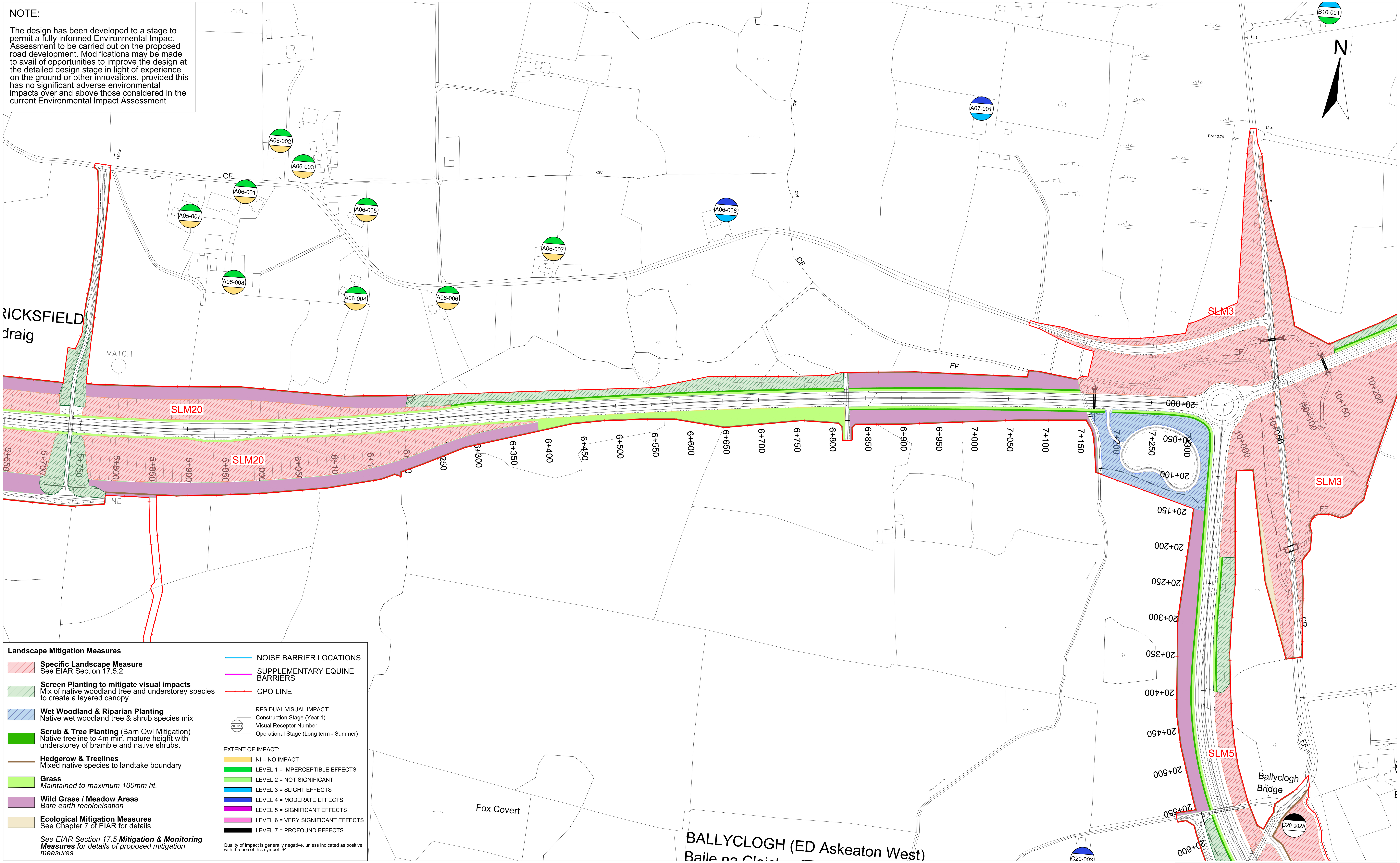
THE LANDSCAPE - IMPACT RATINGS AND MITIGATION
SECTION A
SHEET 3 OF 4

Designed: PM/GR	File:	Status: R.F.I.	
Drawn: LA	Job No: 14.131		
Checked: GR	Scale: 1:5000 (@ A3)	Drawing No: Fig R11.3	Rev: -
Approved: SMG	Date: September 2020		

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

NOTE:

The design has been developed to a stage to permit a fully informed Environmental Impact Assessment to be carried out on the proposed road development. Modifications may be made to avail of opportunities to improve the design at the detailed design stage in light of experience on the ground or other innovations, provided this has no significant adverse environmental impacts over and above those considered in the current Environmental Impact Assessment



Landscape Mitigation Measures

- **Specific Landscape Measure** See EIAR Section 17.5.2
- **Screen Planting to mitigate visual impacts** Mix of native woodland tree and understorey species to create a layered canopy
- **Wet Woodland & Riparian Planting** Native wet woodland tree & shrub species mix
- **Scrub & Tree Planting** (Barn Owl Mitigation) Native treeline to 4m min. mature height with understorey of bramble and native shrubs.
- **Hedgerow & Treelines** Mixed native species to landtake boundary
- **Grass** *Maintained to maximum 100mm ht.*
- **Wild Grass / Meadow Areas** *Bare earth recolonisation*
- **Ecological Mitigation Measures** See Chapter 7 of EIAR for details

See EIAR Section 17.5 ***Mitigation & Monitoring Measures*** *for details of proposed mitigation measures*

- NOISE BARRIER LOCATIONS
- SUPPLEMENTARY EQUINE BARRIERS
- CPO LINE

RESIDUAL VISUAL IMPACT'
Construction Stage (Year 1)
Visual Receptor Number
Operational Stage (Long term - Summer)

EXTENT OF IMPACT:

- NI = NO IMPACT
- LEVEL 1 = IMPERCEPTIBLE EFFECTS
- LEVEL 2 = NOT SIGNIFICANT
- LEVEL 3 = SLIGHT EFFECTS
- LEVEL 4 = MODERATE EFFECTS
- LEVEL 5 = SIGNIFICANT EFFECTS
- LEVEL 6 = VERY SIGNIFICANT EFFECTS
- LEVEL 7 = PROFOUND EFFECTS

Quality of Impact is generally negative, unless indicated as positive with the use of this symbol: '+'

Tionscadal Éireann Project Ireland 2040

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

TII Bonneagar Iompair Éireann Transport Infrastructure Ireland

Comhairle Cathrach & Contae Luimnigh
Limerick City & County Council

Roughan & O'Donovan-AECOM Alliance

ROD Roughan & O'Donovan
AECOM

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 (1) 2940800
Fax : +353 (1) 2940820
e-mail : info@rod.ie
Website : www.rod.ie
www.aecom.com

Project

Foynes to Limerick Road (including Adare Bypass)

Environmental Impact Assessment Report

Drawing Title:

THE LANDSCAPE - IMPACT RATINGS AND MITIGATION
SECTION A
SHEET 4 OF 4

Designed:	PM/GR	File:		Status:	R.F.I.
Drawn:	LA	Job No:	14.131		
Checked:	GR	Scale:	1:5000 (@ A3)	Drawing No:	Rev:
Approved:	SMG	Date:	September 2020	Fig R11.4	-

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

NOTE:

The design has been developed to a stage to permit a fully informed Environmental Impact Assessment to be carried out on the proposed road development. Modifications may be made to avail of opportunities to improve the design at the detailed design stage in light of experience on the ground or other innovations, provided this has no significant adverse environmental impacts over and above those considered in the current Environmental Impact Assessment

BALLYCULLEN
Baile Uí Choilín

An Ba

N

SLM3
SLM3
SLM5
SLM5
SLM21
SLM6

Ballycullen House
Ballyclogh Bridge
LISMAKEERY
Lios Mhic Thíre

MATCH LINE

C20-001
C20-002
C20-002A
C20-003
C20-004
C20-005
C21-001

6+950 7+000 7+050 7+100 7+150 7+200 7+250 7+300 7+350 7+400 7+450 7+500 7+550 7+600 7+650 7+700 7+750 7+800 7+850 7+900 7+950 8+000 8+050 8+100 8+150 8+200 8+250 8+300 8+350

10+000 10+050 10+100 10+150 10+200 10+250 10+300 10+350

20+000 20+050 20+100 20+150 20+200 20+250 20+300 20+350 20+400 20+450 20+500 20+550 20+600 20+650 20+700 20+750 20+800 20+850 20+900 20+950 21+000 21+050 21+100 21+150 21+200 21+250 21+300 21+350 21+400 21+450 21+500 21+550 21+600 21+650 21+700 21+750 21+800 21+850 21+900 21+950 22+000 22+050

CS FF

Landscape Mitigation Measures

Specific Landscape Measure
See EIAR Section 17.5.2

Screen Planting to mitigate visual impacts
Mix of native woodland tree and understorey species to create a layered canopy

Wet Woodland & Riparian Planting
Native wet woodland tree & shrub species mix

Scrub & Tree Planting (Barn Owl Mitigation)
Native treeline to 4m min. mature height with understorey of bramble and native shrubs.

Hedgerow & Treelines
Mixed native species to landtake boundary

Grass
Maintained to maximum 100mm ht.

Wild Grass / Meadow Areas
Bare earth recolonisation

Ecological Mitigation Measures
See Chapter 7 of EIAR for details

See EIAR Section 17.5 ***Mitigation & Monitoring Measures*** *for details of proposed mitigation measures*

NOISE BARRIER LOCATIONS

SUPPLEMENTARY EQUINE BARRIERS

CPO LINE

RESIDUAL VISUAL IMPACT*
Construction Stage (Year 1)
Visual Receptor Number
Operational Stage (Long term - Summer)

EXTENT OF IMPACT:

- NI = NO IMPACT
- LEVEL 1 = IMPERCEPTIBLE EFFECTS
- LEVEL 2 = NOT SIGNIFICANT
- LEVEL 3 = SLIGHT EFFECTS
- LEVEL 4 = MODERATE EFFECTS
- LEVEL 5 = SIGNIFICANT EFFECTS
- LEVEL 6 = VERY SIGNIFICANT EFFECTS
- LEVEL 7 = PROFOUND EFFECTS

Quality of Impact is generally negative, unless indicated as positive with the use of this symbol: '+'

Tionscadal Éireann Project Ireland 2040

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Comhairle Cathrach & Contae Luimnigh
Limerick City & County Council

Roughan & O'Donovan-AECOM Alliance

ROD ROUGHAN & O'DONOVAN
AECOM

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 (1) 2940800
Fax : +353 (1) 2940820
e-mail : info@rod.ie
Website : www.rod.ie
www.aecom.com

Project

Foynes to Limerick Road (including Adare Bypass)

Environmental Impact Assessment Report

Drawing Title:

THE LANDSCAPE - IMPACT RATINGS AND MITIGATION
SECTION C
SHEET 1 OF 6

Designed: PM/GR	File:	Status: R.F.I.	
Drawn: LA	Job No: 14.131		
Checked: GR	Scale: 1:5000 (@ A3)	Drawing No: Fig R11.7	Rev: -
Approved: SMG	Date: September 2020		

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

APPENDIX A6

SLM 20 and SLM 21 Descriptions

SLM 20 Ardaneer and Mulderricksfield Cuttings

In available areas where there is excavation of rock along the proposed road development, at the Ardaneer area (Ch 1+320 to 1+710, Section A) and the Mulderricksfield area (Ch. 5+150 to 6+400, Section A), it is proposed to use these areas to provide additional native planting for carbon sequestration to offset potential environmental effects. The areas will be divided into zones with both woodland planting and scrub planting, in order to comply with the TII guidance on maintaining clear zones. Scrub planting will be in place in areas within the clear zone and woodland will be planted in the remaining areas.

Areas will be cleared of rock and excavated to a depth sufficient to allow for a substantial depth of topsoil, assumed to be 0.6-2m deep and for a minimum of 300mm of topsoil. Drainage measures will be included if necessary, to prevent waterlogging of the soils for planting.

Species to be included in the woodland planting mix are as follows:

- Oak (*Quercus robur*)
- Ash (*Fraxinus excelsior*) [only if restrictions are no longer in place at time of planting]
- Scots Pine (*Pinus sylvestris*)
- Birch (*Betula pendula*)
- Alder (*Alnus glutinosa*)
- Hazel (*Corylus avellana*)
- Hawthorn (*Crataegus monogyna*)
- Holly (*Ilex aquifolium*)
- Willow (*Salix* spp.)
- Elder (*Sambucus nigra*)

The Scrub planting mix is to be largely as per Section 11.5.1 of EIAR (see pages 11/27 and 11/28) omitting the bramble, as follows:

- Hazel (*Corylus avellana*)
- Hawthorn (*Crataegus monogyna*)
- Blackthorn (*Prunus spinosa*)
- Holly (*Ilex aquifolium*)
- Spindle (*Euonymus europaeus*)
- Willow (*Salix caprea*)
- Buckthorn (*Rhamnus frangula*)
- Dogwood (*Cornus sanguinea*).

SLM 21 Ballyclogh

Area to the north of the alignment at Ballyclogh (Ch.20+600 to Ch.20+900), south of Ballycullen Demesne, to be planted with mixed broad-leaved woodland to which it will adjoin to the north. The species composition will be predominantly native but will include a number of non-native species typically associated with demesne woodland planting. Planting will be undertaken with minimal disturbance to the existing ground and maintaining intact all existing woody vegetation, hedgerow and treeline features.

Species to be included in the woodland planting mix are as follows:

- Oak (*Quercus robur*)
- Ash (*Fraxinus excelsior*) [only if restrictions are no longer in place at time of planting]
- Scots Pine (*Pinus sylvestris*)
- Beech (*Fagus sylvatica*)
- Lime (*Tilia X europaea*)
- Hornbeam (*Carpinus betulus*)
- Birch (*Betula pendula*)
- Alder (*Alnus glutinosa*)
- Hazel (*Corylus avellana*)
- Hawthorn (*Crataegus monogyna*)
- Holly (*Ilex aquifolium*)
- Willow (*Salix* spp.)
- Elder (*Sambucus nigra*)