N6 Galway City Ring Road

Request for Further Information Response

Volume 1 - Report

30 August 2019

Project Ireland 2040 Building Ireland's Future

Comhairle Cathrach na Gaillimhe Galway City Council

Comhairle Chontae na Gaillimhe Galway County Council

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

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1 Introduction

This report has been in response to the Request for Further Information (RFI) received from An Bord Pleanála (ABP) on 4 April 2019 in respect of the application for permission for the N6 Galway City Ring Road (GCRR) submitted to ABP on 23 October 2018. This report is referred to as the RFI Response hereafter, and any new figures prepared specifically for this RFI Response to add further clarity are referred to as Additional Figures.

2 Drawings

Given the queries raised by ABP in relation to various drawings, Galway County Council (GCC) believe that it would be of assistance to submit, with this RFI Response, the N6 Galway City Ring Road Design Report which will be referred to at various stages as the "Design Report", a copy of which is included in **Appendix A.10.1**.

2.1 River Corrib Bridge

2.1.1 Request

Item 1a of the RFI states:

Please provide detailed and scaled drawings of the main structure including:

Plan and elevation drawings of the bridge over the River Corrib detailing the span lengths, structural supports, the associated piers and barriers as well as the transparent noise barriers. In addition, please provide detailed sections and elevations of the eastern approach to the bridge which crosses over the Lough Corrib cSAC, including details of supporting structures and foundations within the cSAC.

2.1.2 Response

The River Corrib Bridge, which includes both the structure over the River Corrib and NUIG Sporting Campus, is described in Section 5.5.4.6 Chapter 5, Description of the Proposed Road Development of the Environmental Impact Assessment Report (EIAR) and Section 2 of the Natura Impact Statement (NIS) and presented on Figure 5.1.07 of the EIAR and Figure 1.7 of the NIS, with photomontages from 22 different viewpoints of this structure presented in Appendix A.12.2 of the EIAR. Specific additional detail as requested under Item 1a above, including details of structural supports, associated piers, barriers (including the transparent noise barrier) and the proposed material finishes is presented in accordance with the guidelines detailed within TII DN-STR-03001 (formally NRA BD 02) in Appendix A.7.6 of the Design Report.

The list below sets out the drawings included in Appendix A.7.6 of the Design Report and the information presented on each drawing:

- GCOB-1700-D-S08-04-001 – General Arrangement for the structure including details of span lengths and locations of the structural supports
- GCOB-1700-D-S08-04-002 – General Arrangement for the structure including typical cross-sections of the structure, the supports and foundation details
- GCOB-1700-D-S08-04-004 – General Arrangement for the structure including a plan and elevation for the structure
- GCOB-SK-D-746 – Plan and profile (elevation) of the design of the proposed N6 GCRR for this structure

A copy of these figures is included in **Appendix A.1.1** to this RFI Response for ease of reference.

The bridge parapet will be a 1250mm high H2-W2 type with mesh infill. The approach and departure safety barrier and transitions will provide H2 containment. A 2m high noise barrier is to be provided along the full length of the bridge, on both sides of the structure, as indicated in Figure 3.2 of the A.7.6 of the Design Report. The noise barrier will be positioned behind the parapet on the deck edge beam. The panel material will be toughened glass; where appropriate local frosting or patterns will be provided on the glass as can be seen on the photomontages, in particular Figure 1.6.2, included in Appendix A.12.2 of the EIAR. The support posts will be included to the vertical plane, and will consist of painted steelwork or aluminium, typically at 2m centres. The posts and the arrangement of the noise barrier shall be given the appropriate architectural treatment for the dominant location of this element.

The eastern approach to the River Corrib Bridge within the Lough Corrib cSAC (Ch. 9+500 to Ch. 9+600) includes an embankment with culverts C09/01, C09/02, C09/03, C09/04 and C09/05 to create permeability for the passage of mammals and bats. Retaining walls R09/01 and R09/02 are also included in the design at this location. Details of these structures are outlined in Section 2.6 below. Additional Figures, **Figures 1.1.01** to **1.1.02** in **Appendix A.1.1** to this RFI Response have been prepared to include cross-sections of this area between Ch. 9+500 and Ch. 9+600 at 25m intervals.

A report detailing the constructability of this bridge is included in Appendix A.7.1 of the EIAR and the same report is included in Appendix D of the NIS.

2.2 NUIG Viaduct

2.2.1 Request

Item 1b of the RFI states:

Please provide detailed and scaled drawings of the main structure including:

Plan and elevation drawings of the viaduct over NUIG sports pitches including sections detailing the embankments and approaches to the bridge and elevations over the sports campus.

2.2.2 Response

As noted in **Section 2.1.1** above the design for the River Corrib Bridge includes both the structure over the River Corrib and NUIG Sporting Campus. The drawings referenced in **Section 2.1.1** above are also applicable to the structure over the NUIG Sporting Campus. Figure 1.18.2 of Appendix A.12.2 of the EIAR illustrates this section of the bridge.

Additional Figures, **Figures 1.2.01** to **1.2.03** in **Appendix A.1.2** to this RFI Response include cross-sections of the embankment on the western approach to the bridge over NUIG Sporting Campus as requested in Item 1b.

2.3 Menlough Viaduct

2.3.1 Request

Item 1c of the RFI states:

Please provide detailed and scaled drawings of the main structure including:

Plan and elevation drawings of the Menlough Viaduct. Include details of support structures, including foundation, and identify where the Annex I habitat will potentially be affected. Provide elevations of the viaduct with dimensions of its height above the limestone pavement. Provide sections/embankment details where it crosses adjacent to/in the boundary of the cSAC.

2.3.2 Response

Menlough Viaduct (Structure S10/01) is described in Section 5.5.4.6 Chapter 5, Description of the Proposed Road Development of the EIAR and Section 2 of the NIS and presented on Figure 5.1.07 of the EIAR and Figure 1.7 of the NIS. Specific additional detail as requested under Item 1c above is included in Appendix A.7.4 of the Design Report, including details of span lengths, structural supports (including foundation details) and areas of Annex I habitat within the Zone of Influence of the structure.

The list below sets out the drawings included in Appendix A.7.4 of the Design Report and the information presented on each drawing:

- GCOB-1700-D-S10-01-001 – General Arrangement for the structure including details of span lengths and locations of the structural supports
- GCOB-1700-D-S10-01-002 – General Arrangement for the structure including typical cross-sections of the structure, the supports and foundation details
- GCOB-SK-D-672 – Plan and profile (elevation) of the design of the proposed N6 GCRR for this structure

A copy of these figures is included in **Appendix A.1.3** to this RFI Response for ease of reference.

Additional Figure, **Figure 1.3.01** in **Appendix A.1.3** to this RFI Response presents the areas of Annex I habitat within the Zone of Influence of the Menlough Viaduct and the elevation of the viaduct with dimensions of its height above the Limestone pavement. A report detailing the constructability of this viaduct is included in Appendix A.7.2 of the EIAR and the same report is included in Appendix E of the NIS.

2.4 Lackagh and Galway Racecourse Tunnels

2.4.1 Request

Item 1d of the RFI states:

Please provide detailed and scaled drawings of the main structure including:

Provide elevation drawings of entry and exit to both tunnels with clear dimensions. Provide elevation drawings of western approach to Lackagh Tunnel with supporting sectional drawings at the pinch points with the cSAC.

2.4.2 Response

2.4.2.1 Lackagh Tunnel

Lackagh Tunnel (Structure S11/01) is described in Section 5.5.4.6 Chapter 5, Description of the Proposed Road Development of the EIAR and Section 2 of the NIS and presented on Figure 5.1.08 of the EIAR and Figure 1.8 of the NIS. Specific additional detail as requested under Item 1d above is included in Appendix A.7.5 of the Design Report, including detailed and scaled drawings of the tunnel.

The list below sets out the drawings included in Appendix A.7.5 of the Design Report and the information presented on each drawing:

- GCOB-1700-D-S11-01-001 – plan layout and profile of the Lackagh Tunnel and its Western Approach, including details of the location of Annex I habitat in the vicinity of this structure
- GCOB-D-S11-01-011 – Typical cross-section of the eastbound and westbound bores for the Lackagh Tunnel
- GCOB-D-S11-01-013 – Temporary support details for the construction of Lackagh Tunnel and its Western Approach

- GCOB-1700-D-S11-01-020 to 025 – Plan layout of the Lackagh Tunnel and its Western Approach with accompanying elevation detail and cross-sections at locations identified on the plan layout
- GCOB-1700-D-S11-01-025 – Cross section of the tunnel to detail the transition from the western approach (open cut) to the tunnel (Lackagh Tunnel)
- GCOB-1700-D-S11-01-026 – Typical detail for the u-structure required for the western approach
- GCOB-1700-D-S11-01-027 – Proposed sump layout to drain the tunnel
- GCOB-1700-D-S11-01-030 – Plan layout and elevation for the eastern approach to Lackagh Tunnel
- GCOB-1700-D-S11-01-040 – Elevations of the eastern and western tunnel portals

A copy of these figures is included in **Appendix A.1.4** to this RFI Response for ease of reference.

Additional Figure, **Figure 1.4.01** in **Appendix A.1.4** to this RFI Response includes dimensions for the eastern and western portals for Lackagh Tunnel and Additional Figures, **Figures 1.4.02** to **1.4.05** present additional cross-sections to those listed above to detail the cross-section at the pinch points with the Lough Corrib cSAC.

A report detailing the constructability of this tunnel is included in Appendix A.7.3 of the EIAR and the same report is included in Appendix I of the Natura Impact Statement (NIS).

2.4.2.2 Galway Racecourse Tunnel

Galway Racecourse Tunnel (Structure S14/02) is described in Section 5.5.4.6 Chapter 5, Description of the Proposed Road Development of the EIAR and Section 2 of the NIS and presented on Figure 5.1.10 of the EIAR and Figure 1.10 of the NIS. Specific additional detail as requested under Item 1d above is included in Appendix A.7.3 of the Design Report, including detailed and scaled drawings of the tunnel.

The list below sets out the drawings included in Appendix A.7.3 of the Design Report and the information presented on each drawing:

- GCOB-1700-D-S14-02-001 – plan layout and profile and cross section of the Galway Racecourse Tunnel
- GCOB-1700-D-S14-02-002 – Elevation and dimensions of the south eastern and north western portals to the tunnel
- GCOB-1700-D-S14-02-003 – Details of the utilities at the south eastern portal
- GCOB-2700-D-1000 – Plan layout of tunnel maintenance building
- GCOB-SK-D-674 – Plan and profile of the Galway Racecourse Tunnel
- GCOB-SK-D-809 – Proposed sump location and sewer diversion details

A copy of these figures is included in **Appendix A.1.5** to this RFI Response for ease of reference.

A report detailing the constructability of this tunnel is included in Appendix A.7.4 of the EIAR and the same report is included in Appendix I of the Natura Impact Statement (NIS).

2.5 Typical structures

2.5.1 Request

Item 1e of the RFI states:

Please provide detailed and scaled drawings of the main structures including:

Provide a selection of plan and elevation and section drawings of typical underbridge and overbridges, mammal underpasses/culverts and the wildlife overbridge.

2.5.2 Response

2.5.2.1 Underbridges

The locations of the standard underbridges are presented in Section 5.5.4.6 Chapter 5, Description of the Proposed Road Development of the EIAR and shown on Figures 5.1.01 to 5.1.15 of the EIAR. is Specific additional detail as requested under Item 1e above is included in Appendix A.7.2 of the Design Report including the design details of the four types of standard underbridges proposed for the ten underbridges required as part of the proposed N6 GCRR namely, structures S06/01; S07/01; S07/02; S08/02; S09/01; S10/02; S12/01; S13/02; S15/01 and S15/02.

The list below sets out the drawings included in Appendix A.7.2 of the Design Report. and the information presented on each drawing:

- GCOB-1700-D-GEN-001 – Details of Type 1 of the standard underbridges, including plan and cross-sections and a typical cross-section of the abutment
- GCOB-1700-D-GEN-002 – Details of Type 2A of the standard underbridges, including plan and cross-sections and a typical cross-section of the abutment
- GCOB-1700-D-GEN-003 – Details of Type 2B of the standard underbridges, including plan and cross-sections and a typical cross-section of the abutment
- GCOB-1700-D-GEN-004 – Details of Type 3 of the standard underbridges, including plan and cross-sections and a typical cross-section of the abutment

A copy of these figures is included in **Appendix A.1.6** of this RFI Response for ease of reference.

2.5.2.2 Overbridges

The locations of the standard overbridges are presented in Section 5.5.4.6 Chapter 5, Description of the Proposed Road Development of the EIAR and shown on Figures 5.1.01 to 5.1.15 of the EIAR., Specific additional detail as requested under Item 1e above is included in Appendix A.7.1 of the Design Report, including the design details of the seven standard overbridges required as part of the proposed N6 GCRR namely, structures S01/01; S03/01; S12/02; S13/01; S14/01; S16/01 and S16/02.

The list below outlines the drawings included in Appendix A.7.1 of the Design Report and the information presented on each drawing:

- GCOB-1700-D-S01-01-001 – Details of standard overbridge S01/01, including plan and cross-sections and a typical cross section of the abutment
- GCOB-1700-D-S01-01-002 – Layout of the parapet/safety barrier for structure S01/01
- GCOB-1700-D-S03-01-001 – Details of standard overbridge S03/01, including plan and cross-sections and a typical cross-section of the abutment
- GCOB-1700-D-S03-01-002 – Layout of the parapet/safety barrier for structure S03/01
- GCOB-1700-D-S12-02-001 – Details of standard overbridge S12/02, including plan and cross-sections and layout of the parapet/safety barrier
- GCOB-1700-D-S13-01-001 – Details of standard overbridge S13/01, including plan and cross-sections and a typical cross-section of the abutment
- GCOB-D-ST-S13-01-002 – Layout of the parapet/safety barrier for structure S13/01
- GCOB-1700-D-S14-01-001 – Details of standard overbridge S14/01, including plan and cross-sections and a typical cross-section of the abutment
- GCOB-1700-D-S14-01-002 – Layout of the parapet/safety barrier for structure S14/01
- GCOB-1700-D-S16-01-001 – Details of standard overbridge S16/01, including plan and cross-sections and a typical cross-section of the abutment
- GCOB-D-ST-S16-01-002 – Layout of the parapet/safety barrier for structure S16/01
- GCOB-1700-D-S16-02-001 – Details of standard overbridge S16/02, including plan and cross-sections and a typical cross-section of the abutment
- GCOB-D-ST-S16-02-002 – Layout of the parapet/safety barrier for structure S16/02

A copy of these figures is included in **Appendix A.1.7** to this RFI Response for ease of reference.

2.5.2.3 Mammal Underpasses & Culverts

The locations of the Mammal Underpass and Culverts are presented in Section 5.5.4.6 Chapter 5, Description of the Proposed Road Development of the EIAR and shown on Figures 5.1.01 to 5.1.15 of the EIAR. Specific additional detail as requested under Item 1e above is included in Appendix A.7.7 of the Design Report.

The list below outlines the drawings included in Appendix A.7.7 of the Design Report and the information presented on each drawing:

- GCOB-1700-D-GEN-011 – includes plan, elevation and cross-sections for the buried box and arch structures for the culverts and mammal underpasses listed in the table on this drawing
- GCOB-D-ST-C09-1 to 5-001 – includes the plan and elevation for culverts C09-01 to 05 on the eastern approach to the River Corrib Bridge referenced in Section 2.1 above
- GCOB-D-ST-C09-1 to 5-002 – includes cross-sections for culverts C09-01 to 05 on the eastern approach to the River Corrib Bridge referenced in Section 2.1 above
- GCOB-1700-D-C10-01-001 – includes plan, elevation, cross-section and abutment details for culvert C10/01 over Limestone pavement outside the Lough Corrib cSAC at approx. Ch. 10+040

A copy of these figures is included in **Appendix A.1.8** to this RFI Response for ease of reference.

2.5.2.4 Wildlife Overpass

The Wildlife Overbridge is structure S12/02. It is shown on Figure 5.1.9 of the EIAR and Figure 1.9 of the NIS and is detailed in the Standard Overbridges in Section 2.5.2.2 above. For ease of reference, Figure GCOB-1700-D-S12-02-001, in **Appendix A.1.7** to this RFI Response, includes a plan and cross-sections of this structure and the proposed location of the parapet/safety barrier.

2.6 Boundary Treatment

2.6.1 Request

Item 1f of the RFI states:

Provide details of proposed boundary treatments, including typical elevations and sections, specifying materials, dimensions etc. Where stone walls are proposed, details of construction type and typical height of walls are to be provided.

2.6.2 Response

As set out in Section 5.5.4.3 of Chapter 5, Description of the Proposed Road Development, of the EIAR and Section 2.5.5 of the NIS, fence types will vary across the proposed road development depending on the different requirements and may be temporary in nature. Fence types will include timber post and rail fencing, masonry walls, steel palisade fencing, noise barriers, parapets (safety barriers) etc. and will be provided to meet the requirements of the current TII Publications and guidance documents. For clarity, Additional Figures, **Figures 1.6.01** to **1.6.30** in **Appendix A.1.9** to this RFI Response identifies the boundary treatment proposed along the length of the proposed N6 GCRR. The boundary treatment comprises of one of the following elements, with details of material type, elevations and sections contained in **Appendix A.1.9** of this report:

- Stone wall as shown on Figure GCRR-SK-C-001
- Timber post and rail fence as shown on CC-SCD-00301
- Mammal resistant fencing as shown on CC-SCD-00319
- Stud fencing as shown on CC-SCD-00322
- Paladin security fencing as shown on CC-SCD-00317
- Otter proof fencing as shown on GCOB-300-D-101 (also included in the Design Report)
- Maintain existing boundary whereby the existing boundary remains as per the existing elevation and section

The purpose of the boundary treatment is to secure the extents of the proposed road development as well as preventing errant persons or wildlife accessing the network and posing a risk to road users. The selection of the type of boundary treatment varies across the proposed road development depending on different circumstances and is governed by the following criteria:

1. Timber post and rail fence is generally proposed to secure the extents of the site through agricultural lands as it is a recognised and proven restraining measure. The addition of mesh to render this fence mammal proof is included as necessary to prevent wildlife accessing the network. This is replaced by stud fencing in areas of equine activity to prevent horses accessing the network. Finally, this fence is replaced by otter proof fencing in areas of otter activity to prevent otters accessing the network.

2. Paladin security fence is proposed around all attenuation ponds/water ponds to prevent errant persons accessing them. The addition of mesh to render this fence mammal proof is included as necessary to prevent wildlife accessing them.
3. Dry-stone walling is a feature of the Irish landscape and may be of ecological (Fossitt Code BL1) value, cultural heritage value, aesthetic value, natural heritage value and amenity value. As it is an objective of the Galway City Development Plan to retain natural boundaries, including stone walls and hedgerows wherever possible, the proposed road development has maintained or replaced existing stone walls on the local roads where feasible and practicable.
4. Where stone walls are removed and not replaced as part of the proposed road development, the stone will be retained and made available for re-use by the adjacent property owners for the construction of a new stone wall on their side of the proposed development boundary if they wish.

2.7 Retaining Walls

2.7.1 Request

Item 1g of the RFI states:

Provide typical sections through retaining walls at Ch. 9+880 to Ch. 10+050 and Ch. 11+150 to demonstrate how they will be constructed without encroaching on Annex I habitat within Lough Corrib cSAC.

2.7.2 Response

As outlined in Section 7.4.7.8 of Chapter 7, Construction Activities, of the EIAR and Section 2.5.7.3 of the NIS, a combination of a retaining structure and reinforced soil embankment (reference R09/03) is proposed between Ch. 9+850 to Ch. 10+050 to ensure that the proposed road development does not encroach on the Annex I habitat of the Lough Corrib cSAC. The construction of both the retaining structure and reinforced soil embankment will be undertaken in tandem within the proposed development boundary from the proposed road development side and outside the areas of Annex I habitat. Specific additional detail as requested under Item 1g above is included in Appendix A.7.8 Other Structures (Retaining Structures, Sign Gantries and Environmental Noise Barriers) of the Design Report, which includes structure R09/03.

Additional Figures, **Figures 1.7.01** to **1.7.03** in **Appendix A.1.10** to this RFI Response include cross-sections of this retaining structure, R09/03.

As outlined in Section 7.4.7.10 of Chapter 7, Construction Activities, of the EIAR and Section 2.5.7.3 of the NIS, a combination of retaining systems will be implemented along the Western Approach and above the western tunnel portal at Lackagh Tunnel (Ch. 10+850 to Ch. 11+150) in circumstances where unsupported slopes are not proposed as they would encroach on areas of Annex I habitats. The selection of the type of retaining system is governed by the ground conditions

encountered at that particular location, for example whether it is rock only, or overburden only or a combination of overburden and rock. The applicable retaining systems are further detailed in Section 6.5.2 of Appendix A.7.3 of the EIAR and the same report is included in Appendix I of the NIS. Within this area, the rock head level changes significantly, requiring retaining system solutions for shallow and deep rock ground conditions which can be constructed outside the Lough Corrib CSAC Annex I habitat. The construction methodologies for these retaining systems is further explained in Section 7.4.7.10 of Chapter 7, Construction Activities of the EIAR. These methodologies are bespoke to this location and, when implemented, will ensure that they will be constructed without encroaching on Annex I habitat within Lough Corrib cSAC.

As discussed in **Section 2.4** above, the specific details for the Lackagh Tunnel (Structure S11/01) are included in Appendix A.7.5 of the Design Report, including detailed and scaled drawings of the tunnel and approach, copies of which are included as GCRR-1700-D-S11-01-020 to GCRR-1700-D-S11-01-027 in **Appendix A.1.4** to this RFI Response for ease of reference. A report detailing the constructability of the Lackagh Tunnel, including its western approach and this retaining wall is included in Appendix A.7.3 of the EIAR and the same report is included in Appendix I of the Natura Impact Statement (NIS), in particular Section 5.3.4 of Appendix A.7.3 of the EIAR.

2.8 Lackagh Quarry – Post Construction

2.8.1 Request

Item 1h of the RFI states:

Provide details of final plan layout for Lackagh Quarry. Include consideration of the potential to divert flow of the petrifying spring feature within the quarry to create a new spring feature.

2.8.2 Response

2.8.2.1 Final Plan Layout of Lackagh Quarry

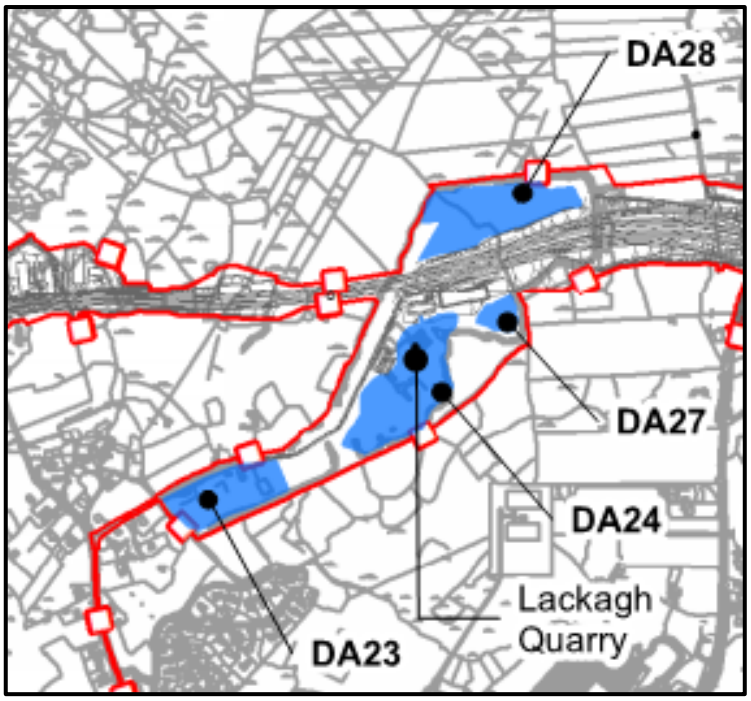
Additional Figures, **Figures 1.8.1** to **1.8.6** in Annex 1 to **Appendix A.1.11** to this RFI Response presents Lackagh Quarry as it is today, i.e. pre-construction and the proposed plan layout of Lackagh Quarry with the proposed N6 GCRR constructed, included the proposed mitigation measures. These mitigation measures include the following:

- provision of artificial bat roosts
- stabilisation of the existing blast damaged rock face to prevent encroachment on the Lough Corrib cSAC, including Annex I habitat

Material Deposition Areas (MDAs) have been designed to provide the required stability to the existing blast damaged rock face and to facilitate the creation of compensatory ecological habitat. The creation of MDAs to the north of the

proposed road development within Lackagh Quarry is limited to the north western area, as the north eastern area is used to mitigate potential impacts on Peregrine Falcon. The EIAR submitted to ABP in October 2018 presents four MDAs within Lackagh Quarry as shown in **Plate 2.1** below (extract from Figure 7.302 of the EIAR).

Plate 2.1: Lackagh Quarry Material Deposition



The MDAs in Lackagh Quarry were identified for the following reasons:

- DA23: To facilitate the creation of ecological habitat compensation
- DA24: To provide stability to the existing blast damaged rock face and to facilitate habitat compensation and making the area safe
- DA27: To provide stability to the existing blast damaged rock face and thereby prevent encroachment on areas of Annex I habitat outside a European site
- DA28: To provide stability to the existing blast damaged rock face and thereby prevent encroachment on the Lough Corrib cSAC including areas of Annex I habitat. The north eastern portion of this area is used to mitigate potential impacts on Peregrine Falcon

A number of factors influence the MDA plan area such as geometry, composition including the requirements for MDA slope stability, blast damaged slope stability, ecological habitat compensation and maintenance. Considering these factors, the MDAs were reviewed following consultation with the reputed property owner and a modified MDA layout was developed whilst ensuring that the original four criteria for their development was satisfied.

These MDA modifications were assessed by the various environmental specialists including ecological, landscape & visual, geotechnical, hydrogeological and hydrological specialists to complete an environmental assessment of the deposition

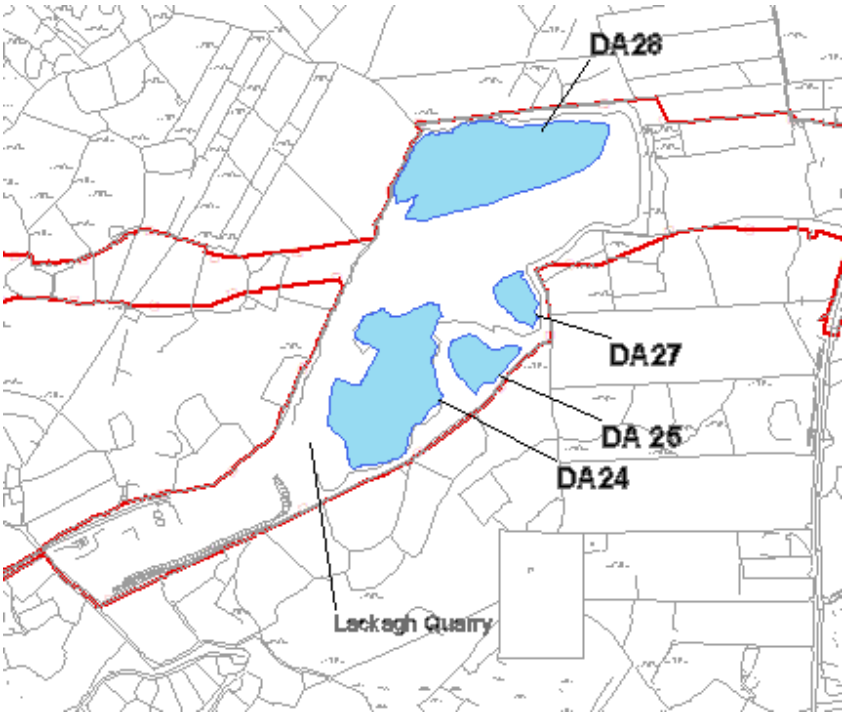
of material. There are no additional amendments in the EIAR following this assessment.

Following this review the proposed layout of the quarry post-construction has been refined as follows:

- Removal of DA23: DA28 has been remodelled and modified to accommodate the ecological habitat compensation from DA23 thus facilitating the removal of DA23 as a MDA and also maintaining the other environmental commitments of the EIAR
- Modified DA24: DA24 has been remodelled and decreased in size whilst maintaining the environmental commitments of the EIAR including:
    - ecological commitments in Section 8.9.1 of Chapter 8, Biodiversity and Appendix A.8.26 of the EIAR
    - hydrological commitments in Section 11.4.1.5 of Chapter 11, Hydrology of the EIAR
- Addition of DA 25: To accommodate habitat compensation from the reduced DA24 whilst maintaining the environmental commitments of the EIAR including:
    - ecological commitments in Section 8.9.1 of Chapter 8, Biodiversity and Appendix A.8.26 of the EIAR
    - hydrological commitments in Section 11.4.1.5 of Chapter 11, Hydrology of the EIAR
- Modified DA27: DA27 has been remodelled and decreased in size whilst maintaining the environmental commitments of the EIAR including:
    - ecological commitments in Section 8.9.1 of Chapter 8, Biodiversity and Appendix A.8.26 of the EIAR
    - hydrogeological commitments in Section 10 of Chapter 10.5.3.5 Hydrogeology of the EIAR
    - hydrological commitments in Section 11.4.1.5 of Chapter 11, Hydrology of the EIAR
- Modified DA28: DA28 has been remodelled and the extents of flat areas increased to accommodate the ecological habitat compensation from DA23 thus facilitating the removal of DA23 as a MDA and also maintaining the other environmental commitments of the EIAR including:
    - ecological commitments in Section 8.9.1 of Chapter 8, Biodiversity and Appendix A.8.26 of the EIAR
    - hydrogeological commitments in Section 10 of Chapter 10.5.3.5 Hydrogeology of the EIAR
    - hydrological commitments in Section 11.4.1.5 of Chapter 11, Hydrology of the EIAR

Plate 2.2 illustrates the proposed modified layout.

Plate 2.2: Lackagh Quarry Material Deposition Proposed Modification 2019



The proposed modifications do not compromise the mitigation measures included in the EIAR that was submitted in October 2018. The same plan area of compensatory ecological habitat can be created, and the exposed rock face can be stabilised with the modified layout. Refer to **Appendix A.1.11** to this RFI Response for a detailed explanation of these proposals. As noted above, these MDA modifications were assessed by the various environmental specialists including ecological, landscape & visual, geotechnical, hydrogeological and hydrological specialists to complete an environmental assessment of the deposition of material. There are no additional amendments in the EIAR following this assessment.

2.8.2.2 New Petrifying Spring Features

There is potential for new petrifying spring features to develop in Lackagh Quarry as they occur where recharge pathways through the limestone have been intersected by the quarry face. The construction works at the quarry face comprise of the MDA placement and the slope stability measures and both facilitate the development of new petrifying springs in the following manner:

- As part of the MDA placement the groundwater regime (both discharge and recharge) will be maintained by the inclusion of a free draining material where the MDA is in contact with the rock face and the quarry base
- As part of the slope stability measures for the exposed rock face the groundwater regime will be maintained through existing cracks and fissures as much as possible or through weep holes where shotcrete is required. These weep holes will permit free drainage of groundwater from the rock face and are likely to form new spring locations

Equally, there are existing water inflows into the quarry, as shown in Figure 8.14.8 of the EIAR, which have the potential to become petrifying springs as the natural hardness of the recharge waters will lead to $CaCO_3$ precipitation and petrification will occur. This process could take up to 10 years.

Finally, if required by ABP, GCC can create new spring features by installing drill holes (<5cm diameter and c.1-2m in length) from the quarry face into the rock mass. These drill holes will be installed in accordance with the rock bolt measures as set out in the Construction Environmental Management Plan in Appendix A.7.5 of the EIAR. Where these drill holes intersect natural recharge pathways then the flow will be diverted, and new springs will occur. The natural hardness of the recharge waters will lead to $CaCO_3$ precipitation and petrification will occur. Precipitation is expected to commence from new springs with the build-up of the $CaCO_3$ to a comparable thickness to the existing petrification expected to take c.10 years.

2.9 N6 GCRR versus 2006 GCOB

2.9.1 Request

Item 1i of the RFI states:

In the interests of clarity, please provide a layout plan overlaying the proposed development and the previous 2006 N6 GCOB proposal.

2.9.2 Response

Additional Figures, **Figures 1.9.1** and **1.9.2** in **Appendix A.1.12** to this RFI Response present the proposed N6 Galway City Ring Road overlaid with the 2006 Galway City Outer Bypass with aerial and discovery background mapping.

2.10 Pedestrian and Cycling Facilities

2.10.1 Request

Item 1j of the RFI states:

Provide locations and details of all proposed pedestrian and cyclist crossing facilities within the proposed project at an appropriate scale.

2.10.2 Response

Section 5.5.4.2 of Chapter 5, Description of the Proposed Road Development, of the EIAR and Figures 5.1.01 to 5.1.15 of the EIAR sets out the pedestrian and cyclist facilities proposed as part of the proposed N6 GCRR. For clarity, Additional Figures, **Figures 1.10.01** to **1.10.22** in **Appendix A.1.13** to this RFI Response present the locations and details of all proposed pedestrian and cyclist crossing facilities within the proposed N6 Galway City Ring Road at a clearer scale and include road signage locations.

3 Route Selection Report

3.1 Request

Item 2 of the RFI states:

Please submit a copy of the Route Selection Report referred to throughout the EIAR.

3.1.1 Response

A copy of the Route Selection Report is included in **Appendix A.2.1** to this RFI Response. The Route Selection Report sets out the consideration of alternatives and process followed in identifying the transport solution for the traffic problems experienced in Galway.

While the proposed road development fulfils specific strategic objectives in terms of the functionality of the national road network in the region, at an early stage in the N6 GCRR project development, GCC and Galway City Council, in partnership with the NTA and supported by TII, commenced the development of the Galway Transport Strategy (GTS). The GTS builds on previous transport studies and sets out integrated transport proposals which will provide Galway City and its environs with a clear implementation framework over the next 20 years. As part of this work, it was necessary to identify where a new road could potentially be located and its proximity to the city in order to complete the analysis of the performance of the incremental transport measures in addressing the transport issues experienced in Galway. Therefore, N6 GCRR and GTS were progressed in parallel. Equally, the assessment completed through the development of the GTS tested and affirmed the need for a new road. Throughout the development of the N6 GCRR and the GTS, alternatives were considered.

In summary, the consideration of alternatives started with the assessment of doing nothing, followed by the examination of how the incremental addition of transport measures could address the transport issues currently experienced in Galway before considering the addition of road infrastructure. The incremental transport measures started with walking measures, followed by cycling measures, followed by a review of possible modes of public transport, followed by development of a public transport network configuration for the most applicable mode to suit Galway.

The identification of the most appropriate route for any proposed road development starts with the development of an understanding of constraints. In this regard, a comprehensive baseline study of the wider Galway environs was undertaken. The significant constraints for developing new transport infrastructure in Galway can be principally categorised as being:

(i) The physical form of the city

(ii) The limited space available

(iii) The built environment and residential areas on both sides of the River Corrib

(iv) The presence of ecological areas protected by national and European law (designated sites)

The physical form of the city in terms of the built and natural environment and residential areas on both sides of the River Corrib, together with the limited available space between the lake and the bay, plus the presence of the designated sites presents significant constraints for developing new infrastructure for the city. The presence of these constraints focused attention on the importance of considering all alternatives in order to minimise the impact on the human environment and the designated sites.

In addition to the consideration of alternatives as part of the GTS, at a project level the N6 GCRR also considered a 'Do-Nothing' option in terms of the existing transportation network and infrastructure and its ability to meet future transportation demands, in the absence of any upgrade works other than routine maintenance. This alternative did not provide for any investment in the transportation network and infrastructure of Galway City and its environs. It compounded existing significant congestion issues experienced across the city, particularly during peak hours, which impacts on the economic capability of the city and did not facilitate the implementation of the measures identified in the Galway Transport Strategy measures. As this was unsatisfactory, this alternative was discounted.

Similarly, an effective 'Do-Minimum' was considered, whereby the existing transportation networks and infrastructure combined with likely and committed transportation schemes were examined to determine their ability to meet future transportation demands. The assessment of the 'Do-Minimum' alternative concluded that whilst it would achieve more economic benefit than the 'Do-Nothing' alternative it would not serve to reduce the existing congestion sufficiently such that the overall transportation issues would be solved, and it could not facilitate the complete implementation of the measures identified in the Galway Transport Strategy. As this was unsatisfactory, this alternative was discounted.

A 'Do-Something Traffic Management Measures' alternative was considered which represented alternatives that seek to respond to transportation problems by maximising the value of existing infrastructure without construction of major new infrastructure. The 'Do-Something Traffic Management Measures' alternative included local road safety improvements, monetary measures or traffic control measures to manage demand on the transport infrastructure, public transport priority schemes, improvements to pedestrian and cycling provision and technology improvements to traffic signals to improve reliability, safety and operation capacity. This alternative was assessed in an incremental manner starting from improvements to public transport only and moving on to the full implementation of the GTS. Whilst these measures worked towards resolving the transport issues experienced in Galway, they did not resolve the strong negative impact of congestion and limited the ability to achieve the objectives of the transport strategy. Additional capacity is required for traffic to meet the strategic regional requirements in terms of the functionality of the national road network and to connect the east and west of Galway City and County plus to enable the full implementation of the GTS which delivers on the local need.

As additional road infrastructure is required, numerous alternatives for connecting the east and west of Galway City and County with a 'Do-Something Road Based Alternative' were considered as detailed in the Route Selection Report. Alternatives across Lough Corrib and Galway Bay or a tunnel from the far west of the study area to the east were all considered and discounted as they did not meet the project objectives for various reasons.

The development of a road-based alternative included an assessment of the previous 2006 GCOB scheme as well as new route options which included an upgrade of the existing road network known as the on-line upgrade, a partial on-line upgrade coupled with new road infrastructure and a totally new road. The on-line upgrade to the existing N6 utilised the existing Quincentenary Bridge for the strategic traffic and included a new bridge immediately south of it to cater for local traffic. Detailed environmental studies were undertaken on the entire study area so that a comprehensive multi-criteria assessment of the various options could be completed. Included in this environmental assessment and criteria is an assessment of the impact on people, homes and communities.

Although the route of the N6 GCRR has been designed to skirt the city and lands zoned for development, and every effort was made to avoid homes, the avoidance of all properties is unfortunately not possible given the linear development of the city with housing along every road radiating out of the city. However, the option selected has the least number of residential demolitions, whilst also being the least impacting on the receiving environment. It was also acknowledged that significant engineering infrastructure, such as a tunnel beneath Lough Corrib cSAC, a tunnel beneath Galway Racecourse, a viaduct over Limestone pavement outside the Lough Corrib cSAC and a viaduct over NUIG Sports Facilities would form part of the design measures to enable advancement of this preferred route.

In accordance with the Department of Transport's "Guidelines on a Common Appraisal Framework for Transport Projects and Programmes" (updated March 2016), the alternatives were assessed against the six criteria of Economy, Safety, Physical Activity, Environment, Accessibility and Social Inclusion and Integration.

Upon completion of this assessment, the Emerging Preferred Route Corridor of the preferred road-based alternative, was developed as an amalgamation of different route options over the length of the study area, which in combination, were considered to be the least impacting on the receiving environment in terms of impacts on people, ecology and all other environmental factors.

The proximity of the proposed road development to the urban environment, which is necessary to provide the optimal solution for a new ring road, results in the unfortunate but unavoidable demolition of 44 dwellings to facilitate construction, and the acquisition of a further 10 dwellings due to the impacts on those properties. This is a significant impact on the people living in these homes. However, this must be viewed and considered and balanced with the overall benefits (as set out in more detail in EIAR) that the proposed road development presents for the future of Galway and its environs and connectivity to the West Region.

Further refinement continued during the design to eliminate and reduce impacts on the human environment.

4 Appropriate Assessment

4.1 Relevé Data within Lough Corrib cSAC

4.1.1 Request

Item 3a of the RFI states:

Provide details of vegetation samples (Relevé data) in each location where the development boundary overlaps with the Lough Corrib cSAC (as shown on Plates 2.3 to 2.6 of the NIS) with up to five samples for each habitat type at each location where space permits. Grid reference and photographs are to be provided for each.

4.1.2 Response

To ensure sufficient ecological data was available to inform the ecological assessment of potential options for a transport solution for Galway City and its environs, habitat surveys within the Lough Corrib cSAC commenced in 2013 and continued throughout the period from 2013 to 2018.

Given the nature of the ecological constraints within the study area identified from the desktop study and through consultation, it was determined that detailed ecological surveying to a level required for an EIA assessment was required in order to develop feasible alternatives and to identify an option that has the least adverse impact on a European site. The guiding principles to determining the level of detail required for these surveys were:

- Will there be enough data available to identify the least damaging route (not only in terms of impacts on SACs/SPAs but also on non-designated Annex I habitats and Annex II species)?
- Are there currently any undesignated areas of Annex I habitats or populations of Annex I (birds)/ II (all other species) species which could qualify for inclusion within a cSAC?
- Will there be any significant adverse effects on the favourable conservation status of any areas of Annex I habitats or populations/habitats of Annex I (birds)/ II and IV (non-bird species) species?

The areas identified during the desktop study for habitat surveys were the Lough Corrib cSAC firstly, ecological sites (i.e. areas identified of ecological interest) secondly and thirdly other areas of interest with the level of surveys undertaken for each area specifically designed as follows:

i. All Annex I habitat within the Lough Corrib cSAC was mapped to the vegetation community type and included a condition/quality assessment (monitoring stops).

ii. All other habitats within the Lough Corrib cSAC were mapped to Fossitt level 3 with valuations as per the NRA/CIEEM guidelines.

iii. All identified ecological sites were mapped to Fossitt level 3 with valuations as per the NRA/CIEEM guidelines.

iv. Habitat checks were completed for all other areas within the study area. These checks included a rapid assessment for affinity to Annex I habitat types and to other habitat types of local high value as per NRA/CIEEM. Further detailed botanic assessment was undertaken where required to either vegetative community level for Annex I habitat types or Fossitt level 3 with valuations as per the NRA/CIEEM guidelines for all other habitat types.

These surveys are described in full in the EIAR (Section 8.2.4.2 and Appendix A.8.1) and in the NIS (Section 4.4.1.1). The 2014 surveys were followed up by additional surveys along the Emerging Preferred Route Corridor between 2015 and 2018 to inform the biodiversity assessment of the proposed road development for the EIAR and NIS.

As outlined in the EIAR and NIS, a significant number of relevés[1] were recorded as part of those habitat surveys in support of the classification of Annex I habitats. The collection of relevé data as part of the habitat surveys undertaken between 2013 and 2018 was to inform and support the classification of Annex I habitats across the study area. As Annex I habitat areas were key biodiversity constraints in the context of informing the route selection process, they were avoided, where possible, by the various route options. Hence, the majority of the relevés recorded at that time lie outside of the proposed development boundary.

As requested in the RFI, additional relevés, up to five where space permitted, including grid references and photographs, were taken between June and August 2019 in each location where the proposed development boundary overlaps with the boundary of the Lough Corrib cSAC. The results of the habitat survey are discussed in detail in the Habitat Survey Report, included at **Appendix A.3.1** to this RFI Response, and are summarised below. The location of these relevés and their extents are shown on **Figures 2.3.01** to **2.3.05** and the full results of the 2019 habitat survey are shown on **Figures 2.5.01** to **2.5.15** and **2.6.01** to **2.6.15** in **Annex 2** to **Appendix A.3.1** to this RFI Response.

The full relevé dataset, including GIS files, grid references and photographs, are provided in the digital datasets included in **Annex 3** to **Appendix A.3.1** to this RFI Response.

Subject to the exceptions discussed in more detail below, the habitat mapping carried out in 2019 in response to this RFI generally reflects and confirms the habitat mapping included in the EIAR and NIS submitted to ABP in October 2018 in the area of overlap between the proposed development boundary and Lough Corrib cSAC.

[1] Relevés are small vegetation sampling plots used to record the plant species present and their relative abundance within the sampling plot, as a representative sample of a larger habitat area. Relevés are generally a standard size for a given habitat type, but this is also dependant on the subsequent use or analysis required of the data being collected. For example, a sampling plot of 2m x 2m is standard for most habitat types for habitat classification or long-term vegetation monitoring, with larger 10m x 10m (or sometimes 20m x 20m) plots used for woodland classification or monitoring.

The only change to the habitat mapping of relevance to the NIS arising from the 2019 surveys relates to a habitat area located in Menlough between Ch. 10+050 and Ch. 10+100 where an additional area of Limestone pavement [*8240] habitat was identified within the overlap between the proposed development boundary and Lough Corrib cSAC (approximately 205m^2), as shown in **Plate 4.1** and **4.2** below. In surveying this habitat area in 2019, the woodland contained sufficient cover of limestone pavement to correspond with Annex I Limestone pavement [*8240] habitat. Therefore, the classification of this habitat area was corrected and is now classified as Limestone pavement [*8240] habitat.

Plate 4.1: EIAR Habitat Mapping and access road AR 10/01 – Ch. 10+050 to Ch. 10+100

Plate 4.2: 2019 Habitat Mapping and EIAR access road AR 10/01 – Ch. 10+050 to 10+100

Note: the plate above only shows the Limestone pavement within the proposed development boundary

The design of the proposed access road AR 10/01 has been amended to avoid direct and indirect impacts on this area of Limestone pavement, as shown in **Plate 4.3** below. The existing access road at this location will be reutilised and there will be no construction works in this area of Limestone pavement. As a result, this change in habitat classification does not affect the assessment or conclusions presented in the NIS submitted to ABP in October 2018 – i.e. the proposed road development will not result in the loss of any areas of qualifying interest Annex I habitat within Lough Corrib cSAC.

Plate 4.3: 2019 Habitat Mapping and amended access road AR 10/01 – Ch. 10+050 to 10+100

Note: the plate above only shows the Limestone pavement within the proposed development boundary

There were also a number of other amendments to the habitat mapping and classifications which were of a minor nature, as follows:

- Small patches of amenity grassland and dry calcareous and neutral grassland were added into the habitat mosaic on the south-west bank of the River Corrib (Relevés 5880_R1, 5880_R2, 5880_R3 and 5880_R4)
- At the termination of the proposed drainage outfall from the N59 Link Road North the habitat classification has changed to riparian woodland from the original treeline and scrub classification due to increased canopy height and shrub cover that had established in the intervening years (Relevé 3815_R1)
- As grassland habitat had established since the previous survey, an area of bare ground adjacent to Bothár Nua was reclassified as dry calcareous and neutral grassland (**Figure 2.10.3** in **Annex 2** to **Appendix A.3.1** to this RFI Response)
- The relevé data also highlighted that some of the areas classified as oak-ash-hazel woodland also contained a significant cover of scrub habitat in the overlap area (**Figure 2.10.5** in **Annex 2** to **Appendix A.3.1** to this RFI Response)

None of these minor amendments, which would be expected for most habitat types due to the influences of land management and vegetation succession/establishment over time, affect the assessment or conclusions presented in the NIS submitted to ABP in October 2018 – i.e. none of these habitat areas correspond with any Annex I habitat types and their loss, either directly or indirectly, will not affect the conservation objectives, or adversely affect the integrity of, Lough Corrib cSAC.

Therefore, the conclusion of the NIS submitted to ABP in October 2018 still stands, namely that the proposed road development will not result in the loss of any qualifying interest habitat from Lough Corrib cSAC and, accordingly, the competent authority is in a position to conclude beyond reasonable scientific doubt that the proposed road development will not adversely affect the integrity of Lough Corrib cSAC.

The findings of the 2019 habitat survey detailed above have no implications for any other European sites or the assessment presented in the NIS in relation to Lough Corrib SPA, Galway Bay Complex cSAC or Inner Galway Bay SPA. Therefore, the overall conclusion of the NIS also still stands, and the proposed road development will not adversely affect the integrity of any European sites.

The revisions to the habitat mapping and the design of the proposed access road AR 10/01, and the implications of same on the assessment and conclusion presented in the published NIS, are detailed in **Appendix A.3.1** to this RFI Response.

4.2 Relevé Data outside Lough Corrib cSAC

4.2.1 Request

Item 3b of the RFI states:

Provide additional vegetation samples (Relevé data) to support the habitat mapping in other areas within the development boundary, with sufficient samples per habitat type, for empirical verification of the habitat mapping. Grid reference and photographs are to be provided for each.

4.2.2 Response

As requested in the RFI, in excess of 700 relevés were recorded between June and August 2019 within the proposed development boundary. The results and analysis of this survey work is contained in **Appendix A.3.1** to this RFI Response, with the locations of all relevés shown on **Figures 2.2.01** to **2.2.09** and **Figures 2.4.001** to **2.4.120** included in **Annex 2** to **Appendix A.3.1** to this RFI Response and the relevé data that supports the habitat classifications in each habitat area included in the digital datasets in **Annex 3** to **Appendix A.3.1** to this RFI Response.

The methodology for the surveys undertaken in response to item 3b of the RFI is detailed in **Section 3.2** of **Appendix A.3.1** to this RFI Response and is summarised below.

A walkover of the area within the proposed development boundary and outside of Lough Corrib cSAC, was undertaken to verify and photograph habitats. Visual checks were undertaken of habitats to verify any changes to habitat classifications and a photo record was taken as a reference dataset to support the habitat classifications. In addition to the visual checks, relevé samples were taken from a representative number of habitat areas for each habitat type. The quantity of relevés taken for each habitat type varied depending on the following factors:

- The ecological value of the habitat type

- The number of habitat areas which exist whereby sufficient and representative relevé sampling was undertaken for habitats with a proportionally larger number of habitat areas (e.g. dry calcareous and neutral grassland GS1 habitat areas)
- It was considered adequate for habitats of a very low ecological value to carry out a lower sampling percentage (e.g. approx. 18% of amenity grassland GA2 habitat areas were sampled)
- The potential for variation within a habitat type whereby habitats with a potentially higher degree of variation within a given habitat area were sampled at a higher percentage to ensure the variation is captured (e.g. there can be large variation in vegetation composition within grassland habitats and therefore a higher percentage of sampling may be warranted)
- The ecological value and potential for habitat areas to correspond to Annex I habitat types whereby certain habitats with a higher ecological value and a potentially high affinity to Annex I habitat types were sampled at a relatively higher sampling percentage (e.g. dry calcareous and neutral grassland GS1)

Where the habitat classification has changed since the information published in the EIAR in 2018, a species list or a relevé (as appropriate) was recorded in support of the revised classification.

Relevé sampling was not appropriate for the following habitat types and was not undertaken as part of the habitat survey: residential properties, aquatic habitats (e.g. lakes and rivers), exposed siliceous (granite) rock, calcareous springs, scattered trees and parkland, hedgerows and treelines.

In addition to providing the relevé and survey results, **Section 4.2** of **Appendix A.3.1** to this RFI Response provides a review of the EIAR assessment in light of the changes to the habitat classifications and amendments to the habitat areas boundaries recorded in 2019.

The changes in Fossitt habitat classifications are mainly attributed to changes in grassland habitat types and to scrub encroachment. The largest change in grassland habitat is an increase in the area of Dry calcareous and neutral grassland (GS1) from 13.7ha to 43.5ha. The change in grassland habitat types are generally attributed to change in land use management since the EIAR surveys.

The changes in Annex I habitat classifications include:

- change in areas from Annex I habitats to non-Annex I habitat (changes from *8240, 4030, 4030/4010 mosaic, *91E0 and 6410 to non-Annex habitats)
- change in habitat areas from one Annex I habitat type to another Annex I habitat type (changes from 4030 or 4030/4010 mosaic to 4010 and in one case from 4010 to *7130)
- change in areas from non-Annex to Annex I habitat types (changes from GS4 and HD1 to 4010, from ED3 and HD1 to 4030/4010, from ED3, GS3, GS4 and HD1 to 4030, from WD1, WN2 and WS1 to *8240, and in one case from GS1 to 6210)

The main items to note in terms of Annex I habitats arising from the 2019 habitat survey results are:

- the range of Annex I habitat types present within the proposed road development are similar to that published in the EIAR; all of the Annex I habitat types published in the EIAR were also recorded during the 2019 surveys, with the addition of one new habitat type which involved a single small area of *7310 (93m^2 in size)
- in the EIAR there was a total of 111 Annex I habitat areas while in the 2019 habitat survey results there are a total of 116 Annex I habitat areas
- the changes in the extent of Annex I habitat areas include:
    - an increase in the single area of *91E0 habitat from 0.1h to 0.14ha
    - an increase in the number and areas of *8240 increasing from 2.3ha to 2.71ha
    - the addition of a single area of *7130 of 93m^2 in size
    - the addition of small areas of *6210 within mosaics of *8240 above the Lackagh tunnel
    - an increase in 4010 from 1.22ha to 1.78ha
    - a reduction in 6210 from 1.14ha to 0.15ha
    - a reduction in 4030 from 1.96ha to 1.5ha
    - a reduction in 6410 from 1.02ha to 0.73ha

The changes in the Annex I habitats in the 2019 habitat survey results arise from a number of different factors including:

- the passage of time since the previous surveys were undertaken
- vegetation succession has occurred in the intervening time e.g. there has been an increase in the encroachment of scrub on grassland and heath habitats
- changes in land use management since the previous surveys were undertaken, in particular changes in grasslands
- the significant increase in relevé intensity of the 2019 surveys which resulted in finer scale mapping
- the application of intensive relevé sampling in 2019 as opposed to application of a combined approach of either relevés or a DAFOR[2] scale assessment across the proposed road development, which applies a finer scale approach to habitat surveying and classification

The results of the 2019 habitat surveys confirm that the impacts of the proposed road development in terms of habitat loss or degradation remain the same as presented in the EIAR with the exception of (i) one very small area of a new Annex I habitat type affected (a single area of *7130 of 93m^2 in size) and (ii) changes in the areas and precise locations of Annex I habitats to be lost. In summary arising from the 2019 surveys there is:

[2] DAFOR scale: D = Dominant; A = Abundant, F = Frequent, O = Occasional, R = Rare

- No change in the area of two Annex I habitat types to be lost (*3180 and *7220); noting that the single area of *3180 will not be lost, as per the EIAR 2018 findings
- A reduction in the area of three Annex I habitat types to be lost (6210, 6410 and 4030)
- An increase in the area of three Annex I habitat types to be lost (*91E0, *8240 and 4010)
- The addition of a single area (c.0.01ha, 93m^2 in size) of *7130 which will be lost
- The addition of small areas of *6210 within *8240 mosaics above the Lackagh Tunnel which will be retained and will not be lost

The same mitigation and compensatory measures as proposed in the EIAR will be implemented to avoid, minimise and compensate habitat losses within the proposed development boundary, as well as to protect surface water quality and groundwater in the receiving environment, control dust emissions from the construction site, control and prevent the spread of non-native invasive plant species, and ensure that tunnelling and deep excavations do not affect the structural integrity of the surrounding rock mass. There is no need arising from the 2019 habitat survey results to change any of the mitigation or compensatory habitat strategies.

The permanent losses of the following habitats will result in significant residual effects on the habitats listed below in Table 4.1 at geographic scales ranging from local to international. As per the EIAR, the following Annex I habitats will have residual habitat losses:

- Residual alluvial forest habitat *91E0
- Limestone pavement habitat *8240
- Wet heath habitat 4010
- Dry heath habitat 4030
- Calcareous grassland habitat (non-priority) 6120
- *Molinia* meadow habitat 6410

There is one new Annex I habitat that will have a residual habitat loss, namely Blanket bog (active) *7130.

The areas of residual habitat losses differ in some cases compared to these presented in Chapter 8, Biodiversity of the EIAR and these are presented in **Table 4.1** below which is based on Table 8.40 of the EIAR. Compensatory habitat[3] will be provided as noted in **Table 4.1** below to replace the areas of Residual alluvial forest, Dry

[3] "Compensation describes measures taken to make up for residual effects resulting in the loss of, or permanent damage to ecological features despite mitigation" (CIEEM, 2016). It is important to note that the reference to "compensatory habitat" areas are not compensatory measures in the context of the requirements of Article 6(4) of the Habitats Directive, as they are not compensating for an impact that would adversely affect the integrity of any European site. Rather, for the reasons set out in detail in the NIS, it is concluded that the proposed road development will not result in such an adverse effect on any European site.

heath, Calcareous grassland and *Molinia* meadow by providing a greater area to that being permanently lost to the proposed road development.

Table 4.1: Summary of Residual Priority Annex I/Annex I habitat loss after compensation (update of Table 8.40 in Chapter 8, Biodiversity of the EIAR)

Annex I habitat type	Permanent Area of Habitat Loss (EIAR)	Area of Compensatory Habitat Created (EIAR)	Residual Habitat Loss (EIAR)	Residual Impact Significance Post-compensation	Permanent Area of Habitat Loss (2019) (Pre-Compensation)	Permanent Area of Habitat Loss (2019) (Post Compensation)
Petrifying springs [*7220]	One Petrifying spring feature	n/a	One Petrifying spring feature	Likely significant residual effect at the county geographic scale	One Petrifying spring feature	One Petrifying spring feature
Residual alluvial forest [*91E0]	c.0.1ha	c.0.18ha	None	No likely significant residual effect	c.0.14ha	None
Limestone pavement [*8240]	c.0.54ha	n/a	c.0.54ha	Likely significant residual effect at the international geographic scale	c.1.18ha	c.1.18ha
Wet heath [4010]	c.2.06ha	n/a	c.2.06ha	Likely significant residual effect at the national geographic scale	c.2.36ha	c.2.36ha
Dry heath [4030]	c.1.85ha	c.7.06ha	None	No likely significant residual effect	c.1.39ha	None
Wet heath/Dry heath/*Molinia* mosaic [4010/4030/6410]	c.0.87ha	n/a	c.0.87ha[4]	Likely significant residual effect at the national geographic scale	None	None
Calcareous grassland [6210]	c.0.7ha	c.7.14ha	None	No likely significant residual effect	c.0.15ha	None
Molinia meadow [6410]	c.0.28ha	c.0.49ha	None	No likely significant residual effect	c.0.07ha	None

[4] Considered as Wet heath habitat for the purposes of the impact assessment, the loss of which cannot be directly compensated for.

Annex I habitat type	Permanent Area of Habitat Loss (EIAR)	Area of Compensatory Habitat Created (EIAR)	Residual Habitat Loss (EIAR)	Residual Impact Significance Post-compensation	Permanent Area of Habitat Loss (2019) (Pre-Compensation)	Permanent Area of Habitat Loss (2019) (Post Compensation)
Blanket bog (active) [*7130]	n/a	n/a	n/a	n/a	c.0.01ha (93m^2)	c.0.01ha (93m^2) Likely significant residual effect at the international geographic scale

However, as was the case in the EIAR it remains the case that some of the Annex I habitat types that are being lost, **outside of European sites**, cannot be directly compensated. Therefore, there will be a significant residual effect at the international geographic scale for the permanent loss of c.1.18ha of Limestone pavement and c 0.01ha (93m^2) of Blanket bog (active) [*7130], at the national geographic scale for the permanent loss of c.2.49ha of Wet heath, at the county geographic scale for the loss of a Petrifying spring feature at Lackagh Quarry.

There are also a number of habitat types of a local biodiversity importance that will be permanently lost as a result of the proposed road development, and where significant residual negative effects are likely:

- Calcareous springs (FP1)
- Dry-humid acid grassland (GS3)
- Poor fen and flush (PF2)
- (Mixed) broadleaved woodland (WD1)
- Hedgerows (WL1)
- Treelines (WL2)

Of these, the planting proposed in the landscape design will compensate for the loss of the areas of (mixed) broadleaved woodland (WD1), hedgerows (WL1) and treelines (WL2) by providing a greater area to that being permanently lost to the proposed road development, as follows:

- (Mixed) broadleaved woodland (WD1) - greater than 2.62ha being lost
- Hedgerows (WL1) - greater than 10.2km being lost
- Treelines (WL2) - greater than 5.4km being lost

In compensating for the losses of these habitat types, the proposed road development is not likely to result in a significant residual effect, at any geographic scale, on (mixed) broadleaved woodland (WD1), hedgerows (WL1) and treelines (WL2).

However, the proposed road development is likely to have a significant residual negative effect, at the local geographic scale, as a result of the permanent loss of fifteen Calcareous spring features (FP1), c.4.51ha of Dry-humid acid grassland (GS3) (reduced from c.7.81ha presented in the EIAR) and c.0.25ha of Poor fen and flush habitat (PF2) (increased from c.0.13ha presented in the EIAR).

While **Section 4.1** above deals with how the 2019 surveys relate to the NIS, it can also be confirmed that any habitat changes outside of the Lough Corrib cSAC will not result in any changes to the conclusions of the NIS. Any change in habitat areas or classification outside of the Lough Corrib cSAC do not introduce any supporting role to habitats within the Lough Corrib cSAC or any other European site.

4.3 Clarification

4.3.1 Request

Item 3c of the RFI states:

Clarify extent of Area 1f on Figure 15.1 of NIS.

4.3.2 Response

As described in Section 9.1.2.1.1 of the NIS (pages 128 and 129), Area 1f is beech woodland covering an area of approximately 1.58ha. The full extent of the woodland is shown on **Plate 4.4** below for clarity, the majority of which (c.1.45ha) lies inside the cSAC boundary.

Plate 4.4: Area 1f

4.4 Limestone pavement mapping

4.4.1 Request

Item 3d of the RFI states:

Provide a detailed map of exposed and thinly covered limestone rock within each location where the development boundary overlaps with the Lough Corrib cSAC.

4.4.2 Response

All of the Annex I Limestone pavement habitat recorded within the area where the proposed development boundary overlaps with Lough Corrib cSAC had either exposed limestone rock and/or thinly covered limestone rock present.

As requested, a detailed map showing all areas of Limestone pavement [*8240][5] habitat recorded within each location where the development boundary overlaps with Lough Corrib cSAC is provided in the Additional Figures, **Figure 2.7.01** to **2.7.02** in **Annex 2** to **Appendix A.3.1** to the RFI Response. These figures show where each of the following types of Limestone pavement habitat were recorded within the overlap between the proposed development boundary and Lough Corrib cSAC:

- Exposed limestone pavement [*8240]
- Scrub covered limestone pavement [*8240]
- Wooded limestone pavement [*8240]
- A mosaic of exposed Limestone pavement [*8240] and Calcareous grassland [6210]
- A mosaic of scrub covered Limestone pavement [*8240] and Calcareous grassland [6210]

4.5 Definition of Limestone pavement

4.5.1 Request

Item 3e of the RFI states:

Provide an explanation of how the 50% exposed limestone criteria has been applied to the definition of limestone pavement, including over what scale (whole parcel, square meter, etc.)

4.5.2 Response

A 50% criteria has been applied in two contexts in relation to defining limestone pavement habitats.

[5] The habitat codes provided in […] are those for Annex I habitat types after the *Interpretation manual of European Union Habitats EUR28* (CEC, 2013)

1. A threshold of 50%[6] exposed limestone was used to differentiate *8240 exposed limestone pavement habitat type from grassland, heath and scrub habitat types (*sensu* Wilson & Fernandez 2013).[7] Initially, during preliminary polygon digitisation, this was applied at a broad scale such that larger and more discrete areas of habitat were chiefly mapped as separate polygons. Later, in the field, the 50% threshold was applied at a finer patch scale when considering the presence and abundance of habitat elements within the survey polygons.
2. A threshold of 50%[8] surface bedrock (including rock covered by mosses) was used as one criterion to differentiate between *8240 wooded limestone pavement habitat type and non-Annex I woodland habitat type.

It is worth elaborating on the issue raised in this second context. There are no guidelines or definitions for how the *8240 wooded limestone pavement Annex I habitat type should be distinguished from non-Annex woodland with some limestone boulders or rocks in it. For the purposes of this project best expert judgement was used, applying a very broad and precautionary definition of what may be classified as *8240 wooded limestone pavement Annex I habitat type. Criteria were developed by BEC Consultants based on available definitions and published literature[9], and that were judged to be appropriate and applicable in the field, based on the unique Irish context of woodland limestone pavement.

Section 2.6 of Appendix A.8.5 of EIAR explains how *8240 wooded limestone pavement was defined for the purposes of this project. Page 7 of Appendix A.8.5 states '*…it was decided for this project to define wooded *8240 Limestone pavement as having a closed canopy of trees at least 3m tall with at least 50% of the surface comprising bedrock at the surface (the bedrock was normally covered by mosses) and retaining some evidence of limestone pavement structure'*. It is further stated '*In the wooded limestone pavement habitats encountered during this survey, soil was generally present but was thin (< 2 cm), though could be deeper in places – for example, in old grikes – due to a build-up of humus*.' As detailed in Section 3.2 (page 11) of Appendix A.8.5 '*Soil depth and areas of exposed limestone pavement and boulders differentiate these rocky Annex I variants from non-Annex versions of WN2 Oak-ash-hazel woodland*.'

In summary, the list of criteria applied by experienced botanists in the field when undertaking habitat surveys on Limestone pavement included:

- Presence of closed canopy of trees at least 3m tall
- At least 50% surface bedrock (including rock covered by mosses) at a polygon scale

[6] The area of limestone pavement was greater than 50% of a given habitat area.
[7] Wilson, S. & Fernández, F. (2013) *National survey of limestone pavement and associated habitats in Ireland*. Irish Wildlife Manuals, No. 73. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.
[8] The area of limestone at the surface was greater than 50% of a given habitat area.
[9] DG Environment (April 2013) *Interpretation Manual of the European Union Habitats*.

- Evidence of limestone pavement structure e.g. evidence of clints, grikes or other features confirming rock was more likely to be pavement structure than random boulders or collections of rock
- Thin soils (<2 cm), although with places where it may have been deeper e.g. in old grikes
- Application of expert surveyor judgement considering all of the above factors to determine on balance whether the polygon would be mapped as either *8240, or in the case where small elements of the polygon included *8240, as a mosaic of *8240 along with the other relevant habitat types

Therefore, the percentage rock cover was not the only criterion used. In some cases, it was difficult to differentiate between wooded limestone pavement *8240 and non-Annex woodland which included some boulders or rocks. In many areas surveyed there was a high proportion of scattered boulder and rock and collapsed stone walls, which added to rock cover but with deeper soils or lack of any evidence of pavement structure. In these cases, application of expert surveyor judgement, considering all of the agreed criteria (including the 50% threshold at a polygon scale), was applied to determine whether the polygon would be mapped as either *8240, or in the case where small elements of the polygon included *8240 then it would have been mapped as a mosaic of *8240 along with the other relevant habitat types present within the mosaic for example a mosaic of *8240 and 6210 (Calcareous grasslands).

It should be noted that a conservative approach was followed and many of the polygons classified as *8240 wooded limestone pavement were very marginal and were on the cusp of what may or may not be considered *8240. It should also be noted that the majority of the polygons mapped as wooded limestone pavement *8240 received the lowest Annex quality rating[10] as they are considered to be poor examples of limestone pavement.

4.6 Habitat description for drainage outfall to River Corrib

4.6.1 Request

Item 3f of the RFI states:

Provide additional information on habitats/vegetation within the cSAC from the point of the outfall to the River Corrib, including for the drainage ditch and the vegetation located on either side (minimum 25m) along its full length.

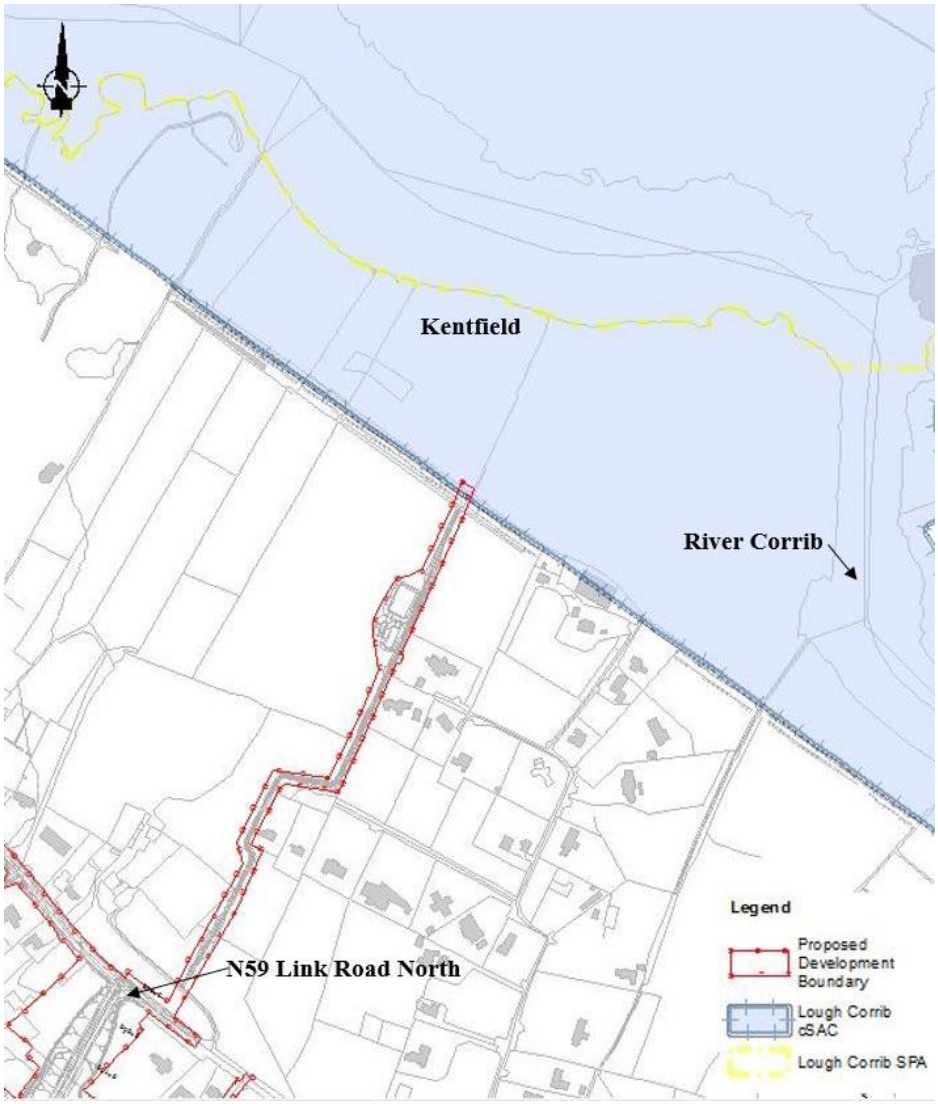
4.6.2 Response

The proposed drainage outfall from the N59 Link Road North will discharge to an existing drainage ditch which will ultimately outfall to the River Corrib within the Lough Corrib cSAC and Lough Corrib SPA. **Plate 4.5** below shows the location of

[10] The quality ratings are explained in Section 4.4.1.1 and Appendix G of the NIS and appendices A.8.1 and A.8.5 of the EIAR.

this drainage outfall. The drainage ditch itself is contiguous with the surrounding habitats and in the vicinity of the proposed drainage outfall has steep unvegetated banks with no aquatic vegetation present.

Plate 4.5: N59 Link Road North Drainage Outfall



The locations of each of the habitat areas along the drainage ditch and adjacent to the proposed road development are shown on **Figures 2.8.01** and **2.8.02** in **Annex 2** to **Appendix A.3.1** to this **RFI**. The habitat types recorded in the wider area, with regard to the Fossitt and Annex I classifications, and the vegetation communities, are also shown on the following Figures in Appendix G of the NIS: Figures 2a and 2c for Fossitt classifications, Figures 3a and 3c for Annex I classifications and Figures 6a and 6c for the vegetation communities recorded.

The disused railway embankment, which runs along the south-western edge of the drainage ditch, forms the south-western boundary of the Lough Corrib cSAC, separating it from the wet grassland agricultural fields beyond. The disused railway embankment consisted of a mosaic of rank/neutral grassland (GS2/GS1)[11], treeline

[11] The habitat codes given in parenthesis are after *A Guide to Habitats in Ireland* (Fossitt, 2000)

(WL2) and scrub (GS4). The eastern most section of disused railway embankment area was described in detail as Area 4.a in Section 9.1.2.1.2 of the NIS and corresponded with the *Cynosurus cristatus – Trifolium pratense* 3d grassland community. The westernmost end of the embankment and drainage ditch comprised a treeline and wet grassland mosaic including *Alnus glutinosa*, *Salix cinerea*, *Picea sitchensis*, *Holcus lanatus*, *Agrostis stolonifera* and *Calystegia sepium*.

That part of the disused railway embankment which overlaps with the proposed development boundary was resurveyed in 2019 and classified as a riparian woodland (WN5) dominated by *Salix cinerea*. The following plant species in **Table 4.1** were recorded in a relevé taken in this area (**relevé 3810_R1**).[12].

Table 4.1: Relevé 3810_R1

Species	% Cover	Species	% Cover
Salix cinerea s. oleifolia	90	*Plagiomnium undulatum*	0.1
Hedera helix	75	*Frullania dilatata*	0.1
Athyrium filix-femina	7	*Cryphaea heteromalla*	0.1
Phalaris arundinacea	5	*Orthotrichum affine*	0.1
Crataegus monogyna	3	*Metzgeria fruticulosa*	0.1
Fraxinus excelsior	3	*Rumex crispus*	0.1
Filipendula ulmaria	1	*Hypnum cupressiforme s.s.*	0.1
Metzgeria furcata	0.1	*Urtica dioica*	0.1
Neckera complanata	0.1	*Ulota crispa*	0.1

The other habitat areas immediately surrounding the proposed drainage outfall are comprised of a mosaic of wet grassland (GS4), reed swamp (FS1), rich fen and flush (PF1) and tall-herb swamp (FS2) are described as areas 4.b, 4.c and 4.d in Section 9.1.2.1.2 of the NIS. The area of rich fen and flush (Area 4.c) lies c.2.5m to the east of the proposed development boundary (and is not directly or indirectly impacted by the proposed road development) and corresponded with the Annex I habitat Alkaline fens [7230]. Immediately to the north and west of the drainage ditch were areas of wet grassland (GS4), neutral grassland (GS1), scrub (WS1), wet heath (HH3) and transition mire (PF3). The wet grassland area immediately adjacent to the proposed N59 drainage outfall is described in detail as Area 4.d in Section 9.1.2.1.2 of the NIS. Almost surrounded by that area is a patch of neutral/wet grassland (GS1) characterised by *Holcus lanatus*, *Centaurea nigra* and *Anthoxanthum odoratum* which corresponded with the *Cynosurus cristatus – Trifolium pratense* 3d grassland community.

The remaining three wet grassland areas adjacent to the drainage ditch (closest is c.25m to the north and outside of the proposed development boundary), from east to west, were described as follows: the easternmost was characterised by *Molinia caerulea*, *Lythrum salicaria* and *Festuca arundinacea* and corresponded with the *Molinia caerulea – Succisa pratensis* 1c grassland community; the centremost, was

[12] The full relevé dataset is included as an excel spreadsheet that accompanies this document as part of **Appendix A.8.1** to this RFI Response.

characterised by *Lythrum salicaria*, *Potentilla anserina* and *Filipendula ulmaria* and corresponded with the *Agrostis stolonifera – Filipendula ulmaria* 1b grassland community; the westernmost, was characterised by *Alnus glutinosa*, *Lythrum salicaria*, *Plantago lanceolata* and *Succisa pratensis* and also corresponded with the *Agrostis stolonifera – Filipendula ulmaria* 1b grassland community.

Beyond these wet grassland fields, to the north and east, are areas of wet grassland (GS4) corresponding to the Annex I *Molinia* meadow [6410] grassland habitat type, an area of Annex I Wet heath [4010] habitat, and an area of the Annex I habitat Transition mires and quaking bog [7140]. *Molinia* meadow habitat is a qualifying interest habitat of Lough Corrib cSAC.

The three areas of *Molinia* meadow Annex I habitat all corresponded with the *Molinia caerulea – Succisa pratensis* 1c grassland community and are not directly or indirectly impacted by the proposed road development.

The following plant species in **Table 4.2** were recorded in a relevé taken in the easternmost area of *Molinia* meadow habitat (**relevé 215**).

Table 4.2: Relevé 215

Species	% Cover	Species	% Cover
Agrostis capillaris	1	*Galium palustre*	0.1
Agrostis stolonifera	5	*Juncus acutiflorus*	1
Anthoxanthum odoratum	7	*Juncus conglomeratus*	0.5
Brachythecium rutabulum	0.1	*Juncus effusus*	1
Calliergonella cuspidata	3	*Lotus pedunculatus*	3
Carex disticha	0.5	*Luzula multiflora*	0.1
Carex echinata	1	*Lythrum salicaria*	0.7
Carex flacca	10	*Molinia caerulea*	50
Carex hostiana	5	*Plagiomnium elatum*	0.1
Carex panicea	7	*Plantago lanceolata*	0.3
Cirsium dissectum	7	*Potentilla palustris*	0.5
Eurhynchium hians	0.1	*Ranunculus acris*	0.3
Festuca rubra	3	*Rhytidiadelphus squarrosus*	1
Filipendula ulmaria	0.5	*Succisa pratensis*	35

The following plant species in **Table 4.3** were recorded in a relevé taken in the central area of *Molinia* meadow habitat (**relevé 216**).

Table 4.3: Relevé 216

Species	**% Cover**	**Species**	**% Cover**
Agrostis canina	0.5	*Juncus acutiflorus*	3
Agrostis stolonifera	30	*Leontodon autumnalis*	0.1
Calliergonella cuspidata	5	*Lotus pedunculatus*	1
Cardamine pratensis	0.3	*Lythrum salicaria*	1
Carex flacca	10	*Molinia caerulea*	40
Carex hostiana	1	*Plantago lanceolata*	0.3
Carex nigra	5	*Potentilla erecta*	0.7
Carex panicea	7	*Potentilla palustris*	1
Carex viridula	3	*Pulicaria dysenterica*	1
Cirsium dissectum	50	*Ranunculus acris*	0.3
Climacium dendroides	0.3	*Ranunculus flammula*	0.3
Filipendula ulmaria	3	*Ranunculus repens*	0.3
Fissidens dubius	0.1	*Rhytidiadelphus squarrosus*	0.3
Galium palustre	5	*Taraxacum officinale agg.*	0.1
Holcus lanatus	1	*Triglochin palustre*	0.1

The following plant species in **Table 4.4** were recorded in a relevé taken in the central area of *Molinia* meadow habitat (**relevé 47**).

Table 4.4: Relevé 47

Species	% Cover	Species	% Cover
Agrostis stolonifera	15	*Juncus acutiflorus*	35
Alnus glutinosa	1	*Juncus conglomeratus*	1
Anthoxanthum odoratum	7	*Lophocolea bidentata*	0.1
Calliergonella cuspidata	35	*Lythrum salicaria*	1
Carex echinata	1	*Molinia caerulea*	30
Carex flacca	1	*Plantago lanceolata*	20
Carex nigra	3	*Potentilla erecta*	20
Carex panicea	10	*Rhytidiadelphus squarrosus*	0.3
Cirsium dissectum	0.5	*Rumex acetosa*	0.3
Festuca arundinacea	7	*Senecio aquaticus*	0.3
Festuca rubra	3	*Succisa pratensis*	15
Filipendula ulmaria	3	*Trifolium repens*	0.3
Galium palustre	0.5	*Valeriana officinalis*	0.3
Holcus lanatus	5		

The area of Wet heath was characterised by *Myrica gale*, *Festuca arundinacea*, *Molinia caerulea* and *Filipendula ulmaria* and corresponded with the *Schoenus nigricans – Molinia caerulea – Myrica gale* WH6 wet heath vegetation community.[13]

The area of Transition mire was characterised by *Carex rostrata*, *Carex disticha*, *Iris pseudacorus*, *Ranunculus flammula* and *Potentilla palustris*, and an absence of brown moss species, and, therefore, corresponded with the species-poor sub-community of the *Carex rostrata* RFEN1b fen community. The following plant species in **Table 4.5** were recorded in a relevé taken in this habitat area (**relevé 48**).

Table 4.5: Relevé 48

Species	% Cover	Species	% Cover
Agrostis stolonifera	3	*Galium palustre*	5
Calliergon cordifolium	60	*Glyceria fluitans*	0.1
Calliergonella cuspidata	0.3	*Iris pseudacorus*	10
Cardamine pratensis	0.1	*Juncus acutiflorus*	25
Carex disticha	40	*Persicaria amphibia*	0.3
Carex elata	7	*Potentilla palustris*	3
Carex rostrata	30	*Ranunculus flammula*	1
Eleocharis palustris	0.1	*Veronica scutellata*	0.1

Between the disused railway embankment and the River Corrib the drainage ditch passes through an area of wet willow-alder woodland (WN6) comprising *Alnus glutinosa*, *Salix cinerea*, *Calystegia sepium*, *Urtica dioica*, *Circaea lutetiana*, *Rubus fruticosus*, *Ranunculus repens* and *Lythrum salicaria*. This woodland corresponded with the *Alnus glutinosa – Rubus fruticosus* 3b vegetation community and the priority Annex I habitat Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [*91E0]. The following plant species in **Table 4.6** were recorded in a relevé taken in this habitat area (**relevé 207**). [14]

Table 4.6: Relevé 207

Species	% Cover	Species	% Cover
Agrostis stolonifera	35	*Homalothecium sericeum*	0.1
Ajuga reptans	0.1	*Hypericum tetrapterum*	0.1
Alnus glutinosa	55	*Hypnum cupressiforme s.s.*	0.3
Angelica sylvestris	0.5	*Hypnum resupinatum*	0.1

[13] Heath and fen communities referenced are as per Perrin, P.M., Barron, S.J., Roche, J.R. & O'Hanrahan, B. (2014). *Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland. Version 2.0. Irish Wildlife Manuals, No. 79*.

[14] Woodland communities referenced are as per Perrin, P., Martin, J., Barron, S., O'Neill, F., McNutt, K. & Delaney, A. (2008) *National Survey of Native Woodlands 2003-2008. Volume II: Woodland classification*.

Species	% Cover	Species	% Cover
Brachythecium rutabulum	0.1	*Iris pseudacorus*	1
Bryum rubens	0.1	*Isothecium myosuroides v. myosuroides*	0.7
Calystegia sepium	3	*Lythrum salicaria*	0.1
Circaea lutetiana	3	*Metzgeria furcata*	0.1
Crataegus monogyna	0.3	*Pellia species*	0.1
Dactylis glomerata	0.1	*Ranunculus acris*	0.1
Entosthodon obtusus	0.1	*Ranunculus repens*	0.3
Equisetum arvense	0.1	*Rosa canina*	0.3
Eurhynchium hians	0.1	*Rubus fruticosus agg.*	20
Filipendula ulmaria	20	*Rumex sanguineus*	0.1
Fissidens taxifolius	0.1	*Salix cinerea*	30
Fraxinus excelsior	1	*Sonchus asper*	0.1
Frullania dilatata	0.1	*Taraxacum officinale agg.*	0.3
Galium aparine	0.1	*Ulota bruchii*	0.1
Hedera helix	0.3	*Urtica dioica*	0.5

To the north-west of the woodland were two patches of wet grassland (GS4) and some *Salix cinerea*, *Rubus fruticosus* agg. and *Calystegia sepium* scrub (WS1), beyond which was the amenity grassland (GA2) of the golf course. The southern wet grassland area was characterised by *Elymus repens*, *Epilobium hirsutum* and *Calystegia sepium* and corresponded with the *Agrostis stolonifera – Filipendula ulmaria* 1b grassland community.[15] The northern wet grassland area was characterised by *Agrostis stolonifera*, *Calystegia sepium*, *Molinia caerulea* and *Festuca arundinacea* and corresponded with the *Molinia caerulea – Succisa pratensis* 1c grassland community. The following plant species in **Table 4.7** were recorded in a relevé taken in this habitat area (**relevé 228**).

Table 4.7: Relevé 228

Species	% Cover	Species	% Cover
Agrostis stolonifera	30	*Filipendula ulmaria*	7
Angelica sylvestris	1	*Juncus acutiflorus*	5
Calystegia sepium	60	*Juncus conglomeratus*	0.3
Carex flacca	5	*Molinia caerulea*	35
Festuca arundinacea	1	*Potentilla erecta*	10
Festuca rubra	7	*Valeriana officinalis*	1

[15] Grassland communities referenced are as per O'Neill, F.H., Martin, J.R., Devaney, F.M. & Perrin, P.M. (2013) *The Irish semi-natural grasslands survey 2007-2012. Irish Wildlife Manuals, No. 78*.

In summary, the habitats along the drainage ditch include a diverse range of habitat types, including the Annex I habitats Alkaline fens [7230], *Molinia* meadow [6410], Wet heath [4010], Transition mires and quaking bog [7140] and Residual alluvial forests [*91E0]. Although Alkaline fens and *Molinia* meadow habitat are qualifying interests of Lough Corrib cSAC and are present along the drainage ditch, as assessed in the NIS, they will not be directly or indirectly affected by the proposed road development.

4.7 River Corrib Classification

4.7.1 Request

Item 3g of the RFI states:

The site synopsis describes the River Corrib as meeting the requirements of "Watercourses of plain to montane levels with the Ranunculion fluitantis and Calitricho-Batrachion vegetation [3260]". However, the NIS concludes that the River Corrib is not such a watercourse. Please provide further explanation and consideration of whether the River Corrib is or was this Annex I type.

4.7.2 Response

The site synopsis for Lough Corrib cSAC states the following in relation to this Annex I habitat type:

'*A number of the rivers in the site support submerged and floating vegetation of the Ranunculion fluitantis and Callitricho-Batrachion, including mosses. For example, in the River Corrib species such as Shining Pondweed (Potamogeton lucens), Perfoliate Pondweed (Potamogeton perfoliatus), Small Pondweed (P. berchtoldii), Yellow Waterlily (Nuphar lutea), White Water-lily (Nymphaea alba) and stoneworts (Chara spp.) occur*.'

This description of the aquatic plant species presented in the site synopsis for Lough Corrib cSAC corresponds with the overarching description of the aquatic vegetation of the River Corrib presented in Appendix K of the NIS, although considerably more detail of the specific area of interest in the River Corrib which is within the zone of influence of the proposed road development is provided in the NIS.

According to the conservation objectives document for Lough Corrib cSAC[16], little is known about the distribution of this Annex I habitat in this cSAC and no location maps are available. There is also no direct reference to any specific part of the River Corrib in the conservation objectives document or the site synopsis. For example, it is noted in the conservation objectives document that the Cornamonna, Owennaraha, Owenakilla and other rivers flowing into the north-western part of Lough Corrib are worthy of further investigation to establish the distribution of this Annex I habitat type in Lough Corrib cSAC (none of these river systems are within the zone of influence of the proposed road development).

[16] NPWS (2017) *Conservation Objectives: Lough Corrib SAC 000297. Version 1*. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

The inclusion of *Chara* sp. as typical of floating river vegetation is unexpected as the species are characteristic of lakes and ponds and are not adapted to grow in strong currents like the River Corrib. The EU habitats interpretation manual[17] gives only a very brief description of the habitat and it can be interpreted very broadly to include any river vegetation with floating components especially *Potamogeton* species. If this interpretation was applied nearly all rivers in Ireland could be included in this habitat type but doing so reduces the practical conservation value of the designation, as good or conservation worthy sites are not distinguished from severely degraded or atypical examples. This broad definition is noted by the National Parks & Wildlife Service (NPWS) in their Article 17 monitoring reporting[18] but that report also notes '*there is to date no satisfactory definition of the habitat and its sub-types or their distribution in Ireland'*. The probable reason for accepting such a broad definition is we lack precise descriptions of natural, as opposed to human affected (i.e. the aquatic environment is influenced by water quality pressures or physical pressures such as dredging), typical floating river vegetation in Ireland.

Other authorities have taken a more restrictive interpretation. In the UK, Hatton Ellis and Grieve (2003)[19] attempt to separate conservation worthy river vegetation types from those of little conservation value. By applying this interpretation not all floating river vegetation would necessarily be included in the 3260 Annex I habitat type. A Guide to Habitats in Ireland[20] notes that only clear unpolluted stretches of river channel should be included in 3260 Annex I habitat type.

In the case of the River Corrib, while species such as *Potamogeton*, *Myriophyllum* and *Zannichella* do occur they are a minor part of the river vegetation with the charophyte *Chara rudis*, along with *Elodea canadensis*, being considerably more abundant. These species are more typical of lacustrine (i.e. lake) vegetation and are not mentioned in either Fossitt (2000) or Hatton Ellis and Grieve (2003). Stewart and Church (1992)[21] note that *Chara* species only rarely occur in rivers and then only when current is very slight. It should also be noted that, in part at least, the River Corrib is a channel modified in the 19th century. Furthermore, there is some evidence that the channel shows signs of eutrophication. In the opinion of the surveyor (Dr Cilian Roden) the vegetation present in the River Corrib in the vicinity of the proposed road development does not correspond with the 3260 Annex I habitat type and is closer to the charophyte vegetation of marl lakes, largely due to the presence of abundant charophyte algae and the small extent of floating flowering plants.

To clarify, Section 8.3.3.1.1 of Chapter 8, Biodiversity of the of the EIAR and Section 9.1.2.1 of the NIS states that the extents of the River Corrib '*within the area*

[17] European Commission (2013). *Interpretation Manual of European Union Habitats, EUR 28*.
[18] NPWS (2013) *The Status of EU Protected Habitats and Species in Ireland. Habitat Assessments Volume 2*. Version 1.1. Unpublished Report, National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
[19] Hatton-Ellis, T.W. & Grieve, N. (2003). *Ecology of Watercourses Characterised by Ranunculion fluitantis and Callitricho-Batrachion Vegetation. Conserving Natura 2000 Rivers Ecology Series No. 11*. English Nature, Peterborough.
[20] Fossitt (2000). *A Guide to Habitats in Ireland*. The Heritage Council.
[21] Stewart, N.F. & Church, J.M (1992). *Red Data Books of Britain & Ireland: Stoneworts.* The Joint Nature Conservation Committee.

covered by the aquatic surveys' does not correspond with the Annex I habitat Watercourses type of plain to montane levels with the *Ranunculion fluitantis* and *Calitricho-Batrachion* vegetation [3260]. The EIAR and NIS does not state the River Corrib in its entirety does not feature the 3260 Annex I habitat type. As was and is appropriate, the aquatic surveys covered the part of the River Corrib in the vicinity, and downstream, of the proposed road development only which is appropriate for these surveys and meets best practice. The more natural channel of the River Corrib, upstream of the proposed road development, may support this Annex I habitat type but as it is beyond the potential zone of influence of the proposed road development, accordingly, there was no necessity or benefit from investigating that area as part of the ecological surveys.

Regardless of whether or not the River Corrib conforms to the 3260 Annex I habitat type, considering the design and the mitigation strategy to protect water quality in the receiving environment the proposed road development will not have any direct or indirect impacts on the aquatic habitats of the River Corrib.

Figures 8.1.1 and 8.1.2 of the EIAR present the extent and location of the aquatic habitat surveys completed for the ecological assessment of the proposed road development.

4.8 Semi-Natural Grassland assessment

4.8.1 Request

Item 3h of the RFI states:

Provide an explanation of how Appendix 1 of the Irish Semi-Natural Grassland Survey 2007-2012 has been applied (or otherwise) in the NIS to the assessment and definition of Annex I types.

4.8.2 Response

Item 3h of the RFI states:

Provide an explanation of how Appendix 1 of the Irish Semi-Natural Grassland Survey 2007-2012 has been applied (or otherwise) in the NIS to the assessment and definition of Annex I types.

4.8.3 Response

Annex I grassland habitats were defined with reference to both the Interpretation Manual of European Union Habitats EUR28 and the Irish Semi-Natural Grassland Survey 2007-2012.

Appendix 1 of the Irish Semi-Natural Grassland Survey 2007-2012 contains the assessment criteria for the five Annex I grasslands surveyed during the Irish Semi-Natural Grassland Survey (ISGS).

The assessment criteria listed in Appendix 1 was used to assess the structure and functions of the 6210 Calcareous grassland habitats and 6410 Molina meadows. In

addition to this, they were also used as a guide, where it was immediately clear when considering if a grassland community represented the Annex I habitats.

In the scenario that a grassland community broadly corresponded to these criteria but did not match them exactly, as grassland habitats generally exist on a gradient between clearly not Annex I and definitely Annex I, the expert judgement of a suitably qualified and experienced botanist[22] was applied, with reference to the Interpretation Manual of European Union Habitats EUR28 and the Irish Semi-Natural Grassland Survey 2007-2012, to make the decision as to whether the grassland community corresponded to the Annex I habitat as defined by the assessment criteria, but with unfavourable structure and functions or if the grassland community was non-Annex or corresponded to another Annex I habitat.

4.9 Supporting role of habitats to Lough Corrib cSAC

4.9.1 Request

Item 3i of the RFI states:

Provide an explanation of why the Annex I habitats, and other habitats of conservation interest, that lie outside the cSAC do not provide a supporting role for the habitats that lie within the cSAC and similarly, why non-Annex I habitats within the cSAC do not provide a supporting role for the Annex I habitats within the cSAC (refer to section 2.5.7.5 of the NIS for example).

4.9.2 Response

In response to the query, it is important to clarify at the outset that there are habitat areas (both Annex I and non-Annex I), that lie both within and outside of Lough Corrib cSAC, that do provide a supporting role to habitats within Lough Corrib cSAC – including the qualifying interest habitats of Lough Corrib cSAC.

It is also important to clarify that it is not just Annex I habitats, or other habitats of conservation interest, outside Lough Corrib cSAC that provide a supporting role. In some instances, habitats of a relatively low or negligible conservation interest in their own right can support important habitats in biodiversity conservation sites. For example, improved agricultural fields (in most instances, a habitat generally considered as being of low conservation value) have a role in groundwater recharge which in turn may support groundwater dependant habitats in a designated site for nature conservation.

[22] The botanists who carried out the habitat surveys are listed in Table 8.2 of the EIAR and Table 4.1of the NIS with the terrestrial habitat surveys carried out by Botanical, Environmental & Conservation (BEC) Consultants Ltd., Scott Cawley Ltd. and various independent botanists including Dr Joanne Denyer, Dr John Conaghan, Dr Janice Fuller, Katharine Duff. Eamon O'Sullivan, Roger Goodwillie, Michelle O'Neill and Mary O'Connor.

Therefore, this response considers the following two questions in relation to habitats that will be directly affected by the proposed road development:

a) the supporting role that all habitat areas (both Annex I and non-Annex) outside of Lough Corrib cSAC provide to habitats within Lough Corrib cSAC, and

b) the supporting role that non-Annex I habitats within Lough Corrib cSAC provide to Annex I habitats and in particular qualifying interest habitats within Lough Corrib cSAC.

4.9.2.1 Identification of habitat types within Lough Corrib cSAC to which supporting habitats may provide supporting role

Firstly, it is important to identify the habitat types that are present within Lough Corrib cSAC to which surrounding habitats may provide some supporting role.

The following Annex I habitats are present within Lough Corrib cSAC in the vicinity, or downstream, of the proposed road development; all except 6430, 7140 and *91E0 are qualifying interest habitats of Lough Corrib cSAC (for locations refer to the Additional Figures, **Figure 2.9.01** in **Annex 2** to **Appendix A.3.1** to this RFI Response):

- [3140] Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.
- [6410] *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
- [7210] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* *
- [7230] Alkaline fens
- [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (*important orchid sites)
- [8240] Limestone pavements *
- [6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
- [7140] Transition mires and quaking bogs
- [91E0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) *

The non-Annex I habitat types present within Lough Corrib cSAC in the vicinity of the proposed road development, or downstream with a potential hydrological pathway to the proposed road development, that form part of the conservation objectives of the cSAC are the fringing wetland habitats surrounding the Coolagh Lakes. These fringing wetland habitats are also considered as part of the

conservation objectives of the Hard water lakes [3140] habitat in the conservation objectives document for Lough Corrib cSAC[23]:

- Reed and large sedge swamps (FS1)
- Tall-herb swamps (FS2)
- Wet grassland (GS4)
- Rich fen and flush (PF1)
- Wet willow-alder-ash woodland (WN6)

4.9.2.2 The supporting role that all habitat areas outside of Lough Corrib cSAC provide to habitats within Lough Corrib cSAC

There are many habitat areas outside of Lough Corrib cSAC that provide support to habitats within this cSAC. However, only those which are affected by the proposed road development are discussed here. The habitats affected by the proposed road development in the area around Lough Corrib cSAC include:

- Buildings and artificial surfaces (local roads and tracks/pathways)
- Amenity grassland and improved agricultural grassland
- Calcareous/neutral grasslands
- Wet grassland
- Beech woodland
- Wet woodland (some of which corresponds with the Annex I habitat Residual alluvial forest [*91E0])
- Hedgerows
- Treelines
- Ash and hazel woodland (some of which corresponds with the Annex I habitat Limestone pavement [*8240])
- Exposed calcareous rock (some of which corresponds with the Annex I habitat Limestone pavement [*8240])
- Scrub (some of which corresponds with the Annex I habitat Limestone pavement [*8240])

Most importantly, the only Annex I and non-Annex I habitats within Lough Corrib cSAC which can be supported by habitat outside the cSAC comprise of (1) terrestrial 'dry' habitats and (2) aquatic/wetland habitats. Each of these is discussed further to demonstrate how the habitat areas outside of Lough Corrib cSAC listed above play a supporting role to these particular habitats within the cSAC and how the proposed road development will not affect the functioning of that role, where it exists.

[23] *Conservation Objectives: Lough Corrib SAC 000297. Version 1.* (NPWS, 2017)

Terrestrial 'dry' habitats

The terrestrial 'dry' habitats are those that are not reliant upon the existing hydrological or hydrogeological regimes to support species diversity or their structure or function – i.e. the water inputs come from precipitation. In Lough Corrib cSAC, these are calcareous grassland [6210] and Limestone pavement [*8240]. The biological and environmental process and conditions that support the extent, distribution and quality/condition of these habitats include precipitation levels, nutrient levels, pollination, seed dispersal and, importantly for calcareous grassland and limestone pavement habitats, appropriate land management.

The habitat areas outside of Lough Corrib cSAC listed above do not influence precipitation levels in any way. They may provide a supporting role to local populations of pollinators (e.g. bees) and fauna species relied upon for seed dispersal (e.g. mammals and birds) but considering the habitats that will be affected by the proposed road development, and the relatively low proportion of those that will be lost, those processes will not be affected to a degree that will have any effect on local habitat area, distribution or quality/condition.

The extent, distribution and condition of calcareous grassland and limestone pavement habitats is primarily maintained by an appropriate level of low intensity grazing by livestock or horses and also by low nutrient inputs, as noted in the condition assessment carried out for these habitats (see Section 3.4.3 of Appendix G to the NIS). The level of land management strongly determines the level of impact pressures on these habitats: abandonment or lack of management can lead to scrub and bracken encroachment, loss or degradation of habitat and the introduction/spread of non-native invasive plant species; intensification of land management and use can lead to nutrient enrichment and the loss/degradation of habitat. In the case of nutrient enrichment, habitat surrounding Lough Corrib cSAC are likely in some cases to contribute to nutrient inputs from agricultural runoff and, in other cases, play a role in protecting the site from nutrient enrichment (where they act as a barrier or buffer from sources of nutrient enrichment). As access will be maintained to all landholdings post-construction, the proposed road development will not influence how these areas are managed into the future and will not affect the land management processes that support habitats in Lough Corrib cSAC. The proposed road development will also not contribute to, or influence, nutrient levels in Lough Corrib cSAC.

Aquatic/wetland habitats

The aquatic/wetland Annex I habitats in Lough Corrib cSAC are hard water lakes [3140], *Molinia* meadows [6410], *Cladium* fen [*7210], alkaline fen [7230], hydrophilous tall herb fringe [6430], transition mires and quaking bogs [7140] and alluvial forests [*91E0]. The other non-Annex I aquatic/wetland habitats in Lough Corrib cSAC are reed and large sedge swamps (FS1), tall-herb swamps (FS2), wet grassland (GS4), rich fen and flush (PF1) and wet willow-alder-ash woodland (WN6). The wetland habitats locally in Lough Corrib cSAC are associated with either the floodplain of the River Corrib or the Coolagh Lakes.

Similar to terrestrial dry habitats, the biological and environmental process and conditions that support the extent, distribution and quality/condition of the aquatic and wetland habitats include precipitation levels, nutrient levels, pollination, seed

dispersal and, although potentially to a lesser degree, appropriate land management. However, and crucially, these aquatic and wetland habitats are also dependant on the underlying hydrological and hydrogeological regimes to which the surrounding habitats contribute and influence.

As with the calcareous grassland and limestone pavement habitats discussed above, the proposed road development will not affect how aquatic and wetland habitats in Lough Corrib cSAC are supported in terms of precipitation levels, nutrient levels, pollination, seed dispersal and land management.

How the extent, distribution and condition of the aquatic and wetland habitats in Lough Corrib cSAC is supported by the existing hydrogeological and hydrological regimes, is discussed below.

The Coolagh Lakes correspond with the Hard water lakes [3140] Annex I habitat type. The natural structure and functioning of the lakes, and by association the extent, distribution and quality/condition of the associated wetland habitats (e.g. typical species and vegetation composition and structure), is supported indirectly by the surrounding habitats in two ways: the role they play in maintaining the existing hydrogeological regime; and the role they play in maintaining the existing hydrological regime[24]. As noted above, the fringing aquatic/wetland habitats integrate with and also form part of the conservation objectives for the Hard water lake [3140] habitat in supporting the natural structure and function of the lakes. These include reed and large sedge swamp, tall-herb swamp, marsh, wet grassland, fen and wet woodland – some areas of which correspond with *Molinia* meadows [6410], *Cladium* fens [*7210] and alkaline fen [7230] habitat.

Firstly, in terms of supporting the existing hydrogeological regime and the lake/wetland habitats, the surrounding terrestrial habitats play a role in recharging the groundwater aquifer. This process involves the infiltration of rainwater through the soils to the underlying limestone bedrock which then flows to the springs which supply groundwater to the Coolagh Lakes. The potential effects of the proposed road development on the existing groundwater regime are described in detail in Section 9.1.4.3 of the NIS, and the mitigation measures proposed to ensure that the groundwater regime supporting the wetland complex at the Coolagh Lakes is not affected, in terms of both groundwater quantity and quality, are described in Section 10.2 and 10.3 of the NIS. Considering the design and mitigation measures associated with the proposed road development, none of the impacted habitats, regardless of whether they occur inside or outside of Lough Corrib cSAC, will influence how the existing hydrogeological regime functions in supporting the Coolagh Lakes or any of the associated wetland habitats.

Secondly, the existing hydrological regime supports the lake/wetland habitats through surface water runoff draining to the Coolagh Lakes and through the influence that the River Corrib has on water levels and water quality at Coolagh Lakes. The existing hydrological baseline environment, as it relates to the River Corrib and the Coolagh Lakes, is described in detail in Sections 3.7.1 and 3.7.2 (respectively) of Appendix B of the NIS. In summary, the Coolagh Lakes receive

[24] Refer to 4.13 below for discussion on how the existing groundwater regime supports Ground Water Dependent Terrestrial Ecosystems in Lough Corrib cSAC

surface water drainage from a relatively small catchment of c.2.5km^2. The Lower Coolagh Lake is in continuity with the River Corrib and the lake level is influenced by the River Corrib water levels which are controlled by the OPW at the Galway City Salmon Weirs Barrage. As discussed in Section 6.4 of the NIS, and in more detail in Section 5.2 of Appendix B of the NIS, the proposed road development will not have any perceptible effect on the hydrological regime, in terms of surface water contributions or flooding regime/water levels, that supports the Coolagh Lakes or any of the associated wetland habitats.

Similarly, the proposed road development will not affect the level of surface water contribution entering the River Corrib as all rainwater intercepted within the River Corrib catchment will be treated and discharged back into the same surface water system. As a result, the proposed road development will not have any perceptible effect on the hydrological regime, in terms of surface water contributions or flooding regime/water levels, that supports the associated wetland habitats along the floodplain of the River Corrib.

The terrestrial habitats surrounding wetland complexes can also play a role on buffering the effects of overland run-off on water quality in receiving lakes and rivers through either acting as a barrier, nutrient sink and/or filtering sediments and pollutants before they reach the freshwater environment. As the proposed River Corrib Bridge is elevated on piers across the valley, the proposed road development will not have any effect in that regard in relation to the River Corrib. East of the River Corrib, the proposed road development will not reduce any available habitat buffer surrounding the Coolagh Lakes; being separated from it by either the local road network or significant blocks of woodland or agricultural fields.

Those areas of *Molinia* meadows [6410], *Cladium* fens [*7210] and alkaline fen [7230] habitat that occur in the floodplain along the margins of the River Corrib are similarly supported by the level of the underlying groundwater table and influenced by water levels in the River Corrib. Similar to the Coolagh Lakes, the proposed road development will not affect the existing hydrogeological regime along the River Corrib corridor (i.e. there will not be any residual effects on groundwater beyond the proposed development boundary) and will not affect the hydrological functioning of the River Corrib.

Conclusion

In conclusion, habitat areas outside of Lough Corrib cSAC do provide a supporting role to habitats within Lough Corrib cSAC. However, the role these habitat areas play in supporting the biological and environmental processes that, in turn, support the extent, distribution and quality/condition of habitat in Lough Corrib cSAC, will not be affected by the proposed road development due to its design and the effective implementation of the mitigation measures proposed.

4.9.2.3 The supporting role non-Annex I habitats within Lough Corrib cSAC provide to Annex I habitats within Lough Corrib cSAC

As discussed above in **Section 4.9.2.2** the non-Annex I habitats directly affected by the proposed road development within Lough Corrib cSAC are:

- Buildings and artificial surfaces (local roads and tracks/pathways)
- Amenity grassland and improved agricultural grassland
- Calcareous/neutral grasslands
- Wet grassland
- Beech woodland
- Wet woodland (some of which corresponds with the Annex I habitat Residual alluvial forest [*91E0])
- Hedgerows
- Treelines
- Ash and hazel woodland (some of which corresponds with the Annex I habitat Limestone pavement [*8240])
- Exposed calcareous rock (some of which corresponds with the Annex I habitat Limestone pavement [*8240])
- Scrub (some of which corresponds with the Annex I habitat Limestone pavement [*8240])

The Annex I habitats present within Lough Corrib cSAC in the vicinity, or downstream, of the proposed road development are:

- Calcareous grassland [6210]
- Limestone pavement [*8240]
- Hard water lakes [3140]
- *Molinia* meadows [6410]
- *Cladium* fen [*7210]
- Alkaline fen [7230]
- Hydrophilous tall herb fringe [6430]
- Transition mires and quaking bogs [7140]
- Residual alluvial forests [*91E0]

All except 6430, 7140 and *91E0 are qualifying interest habitats of Lough Corrib cSAC

As per **Section 4.9.2.2** above, the non-Annex I habitats in Lough Corrib cSAC, to varying degrees, will support the same biological and environmental processes that in turn support the extent, distribution and quality/condition of the Annex I habitats

in Lough Corrib cSAC. For the same reasons explained above, the potential impacts of the proposed road development on areas of non-Annex I habitat in Lough Corrib cSAC will not affect precipitation levels, have a negative effect on local fauna populations that are involved in pollination or seed dispersal, influence nutrient levels, land management in the cSAC, or affect the functioning of the existing hydrogeological or hydrological regimes.

In conclusion, non-Annex I habitat areas within Lough Corrib cSAC do provide a supporting role to habitats within Lough Corrib cSAC. However, the role these non-Annex I habitat areas play in supporting the biological and environmental processes that, in turn, support the extent, distribution and quality/condition of Annex I habitat in Lough Corrib cSAC, will not be affected by the proposed road development due to its design and the effective implementation of the mitigation measures proposed.

4.10 Clarification of vegetation removal

4.10.1 Request

Item 3j of the RFI states:

With reference to Section 2.5.4 of the NIS, and the proposed retention of all Annex I habitats within the cSAC, please provide clarification on the extent of vegetation clearance required within the development boundary.

4.10.2 Response

To clarify, as stated in Section 9.1.4.1 of the NIS, and for the avoidance of all doubt, it is confirmed that *no* areas of qualifying interest (QI) Annex I habitat will be removed within Lough Corrib cSAC during site clearance or to facilitate construction of the proposed road development (indeed, this is demonstrated on Figures 14.1 – 14.5 and 15.1 – 15.5 of the NIS). The commitment to protect and retain all areas of qualifying interest habitats within Lough Corrib cSAC, that also lie within the proposed development boundary, is included within the mitigation strategy (refer to Section 10.1.1 of the NIS). Figures 14.1 to 14.5 in Volume 3 of the NIS illustrate the areas of habitat, namely QI Annex I habitat within Lough Corrib cSAC (all of which is to be retained) outlined in yellow, other Annex I habitat (which are to be retained) outlined in pink and other areas of habitat to be retained (which is outlined in brown).

Aside from those areas highlighted to be retained, all other areas of vegetation within the proposed development boundary will be removed to facilitate the construction and operation of the proposed road development. These are described in Section 9.1.2.1 of the NIS and include: roads and pathways, wet, rank and neutral/calcareous grasslands, scrub, treelines and woodlands (beech woodland and ash/hazel woodlands.) However, notwithstanding the proposed removal of this vegetation none of these habitats corresponds with any Annex I habitat types, none are QIs of Lough Corrib cSAC, and any supporting role they do provide to any QI habitats within Lough Corrib cSAC, or to QI species of Lough Corrib cSAC, will not be negatively affected. Therefore, their loss from Lough Corrib cSAC will not

affect the conservation objective attributes and targets supporting the conservation condition of any of the QI habitats or species of Lough Corrib cSAC.

4.11 Time to establish compensatory measures

4.11.1 Request

Item 3k of the RFI states:

Provide an indication, for each habitat type, of the time taken for the identified compensatory habitat which the applicant is proposing to address residual impacts to Annex I habitats outside of any European sites to reach an equivalent value to the areas of the equivalent habitat that will be lost to development, and whether this affects the conclusions on residual impact.

4.11.2 Response

The full details of the Habitat Compensation Management Plan for each of the Annex I habitat types being compensated for, including monitoring details, are presented in Appendix A.8.26 of the EIAR. These are not compensatory measures in the context of the requirements of Article 6(4) of the Habitats Directive as they are not compensating for an impact that would adversely affect the integrity of any European site. The areas where compensatory habitats will be created are shown on EIAR Figures 8.23.1 to 8.23.14. The Annex I habitat types to be compensated are:

- European dry heaths [4030]
- Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210]
- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae*) [*91E0]

The predicted timeframes to establish and provide habitat of an equivalent cover and quality to that which would be lost due to the proposed road development, for each of the Annex I habitats located outside a European site, are set out below and have been included within the compensatory habitat strategy detailed in Appendix A.8.26 of the EIAR.

It should be noted that the indicative number of years required for the creation of habitat of an equivalent ecological value to that being lost at the donor sites will be dependent upon the condition of the receptor sites and the management interventions to be carried out by Galway County Council and/or Transport Infrastructure Ireland (TII).

However, in order to ensure that a robust appraisal has been undertaken, a precautionary "*worst-case scenario*" approach has been used to estimate the habitat compensation maturation timeframes.[25]

4.11.2.1 Annex I habitat European dry heaths [4030]

In a 'worst-case' scenario, it would take between 15 to 25 years for positive indicator species of the European dry heath [4030] compensatory habitat to establish and mature at receptor sites and reach an equivalent ecological value to the donor sites. This does not affect the conclusions set out in the EIAR on the residual impact on this habitat, *i.e.* that post-compensation the loss of 4030 will not likely to result in a significant residual effect, at any geographic scale, over the long-term (*i.e.* >15-25 years).

In order to achieve the equivalent value of the areas of the Annex I habitat European dry heaths [4030] (hereafter referred to as "4030") being lost, the habitat that will be created at the compensatory receptor sites must correspond to 4030 and, therefore, contain sufficient established and mature positive indicator species of this Annex I habitat type (as per Perrin *et al.*, 2014[26]).

The most significant time constraint, with respect to achieving the equivalent value of the areas of 4030 being lost, is the total number of years it will take for the positive indicator species of 4030 habitat, in particular *Calluna vulgaris*, to establish and mature at the receptor sites. As detailed in the Habitat Compensation Management Plan in Appendix A.8.26 of the EIAR, the various compensatory measures can be implemented in isolation or in combination to create 4030 habitat. Whilst it is likely that a combination of compensatory measures will be undertaken at the receptor sites (*i.e.* the translocation of intact turves, soils and/or plant species and the spreading of mature clippings of *Calluna vulgaris* and *Erica cinerea*), a precautionary approach has been adopted and, as such, the number of years considered is establishment from seed rather than from the translocation of intact turves. In the case of the translocation of turves, the number of years required to achieve an equivalent value to that of the habitat being lost will be less when compared to the other compensatory measures, as the turves already contain established and mature positive 4030 indicator species.

[25] "Compensation describes measures taken to make up for residual effects resulting in the loss of, or permanent damage to ecological features despite mitigation" (CIEEM, 2016). It is important to note that the reference to "compensatory habitat" areas are not compensatory measures in the context of the requirements of Article 6(4) of the Habitats Directive, as they are not compensating for an impact that would adversely affect the integrity of any European site. Rather, for the reasons set out in detail in the NIS, it is concluded that the proposed road development will not result in such an adverse effect on any European site.

[26] *Calluna vulgaris* is typically the main species of 4030. Other species that are important components of this Annex I habitat include: *Erica cinerea*, *Ulex gallii* and *Vaccinium myrtillus* Perrin, P.M., Barron, S.J., Roche, J.R. & O'Hanrahan, B. (2014). *Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland.* Version 2.0. *Irish Wildlife Manuals*, No. 79. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

There are three key stages in the developmental life cycle of the main species of 4030, Calluna vulgaris, i.e. pioneer, building and maturation. The pioneer stage (i.e. from the development and establishment of a seedling to when the plant has developed into a fully formed bush) typically lasts between five to six years. Following on from the pioneer stage is the building stage. This typically occurs when the plant is approximately 15 years old. The final stage is the mature phase, which typically occurs when the plant is approximately 25 years old (Webb, N.R., 198627). In the context of restoring 4030 habitat to a favourable condition full recovery of a structurally diverse heathland may occur within 15 years after the management method of turf-stripping is complete (Plantlife, 2016) and will occur within 25 years. This method involves the removal of undesirable vegetation and topsoil from the site and would result in conditions that are comparable to the translocation of soils as the plant species will be establishing from seed. In a study conducted in Denmark, it was noted that heathland habitat had successfully established, using the method of natural succession, 22 years after the cessation of farming at an acid grassland site and that the abundance of Calluna vulgaris notably increased the vegetation after ten years of cessation. This species however was not dominant after 22 years (Degn, 2001[28]).

To conclude, applying the methodologies set out in the compensatory habitat plan, in Appendix A.8.26 of the EIAR, will ensure the establishment of European dry heaths [4030] habitat, of an equivalent ecological value to that being lost, within 15 to 25 years.

4.11.2.2 Annex I habitat Semi-natural dry grasslands and scrubland facies on calcareous substrates [6210] and Annex I habitat *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]

In a ‘worst case’ scenario, it will take between approximately 10 to 20 years for the 6210 and 6410 compensatory habitats to establish and mature at their respective receptor sites and reach an equivalent ecological value to the respective donor sites. This does not affect the conclusions set out in the EIAR on the residual impact on these habitats, *i.e.* that post-compensation the loss of 6210 or 6410 will not result in a significant residual effect, at any geographic scale, over the long-term (*i.e.* >10-20 years).

In order to achieve the equivalent value of the areas of the Annex I Semi-natural dry grasslands and scrubland facies on calcareous substrates [6210] (hereafter referred to as “*6210*”) and *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] (hereafter referred to as “*6410*”) being lost, the habitat that will be created at the compensatory receptor sites must correspond to 6210 and 6410 respectively and, therefore, contain sufficient established and

[27] Webb, N.R. (1986) Heathlands. London. William Collins & Sons.

[28] Degn, H.J. (2001) Succession from farmland to heathland: a case for conservation of nature and historic farming methods. Biological Conservation 97 319-330.

mature positive indicator species of those Annex I habitat types (as per Martin *et al.*, 2018[29]).

The most significant time constraint, with respect to achieving this requirement, is the total number of years it will take for the positive indicator species of these Annex I habitats to establish and mature at the receptor sites. As detailed in the Habitat Compensation Management Plan in Appendix A.8.26 of the EIAR, the various compensatory measures can be implemented in isolation or in combination to create 6210 habitat. Whilst it is likely that a combination of compensatory measures will be undertaken at the receptor sites (*i.e.* translocation of intact turves/suitable soils, seeding, hay-strewing (in the case of 6210 only), application of freshly cut plant material (in the case of 6410 only) and/or natural colonisation[30]), a precautionary approach has been adopted and, as such, the number of years provided is from seed rather than the translocation of intact turves. In the case of the translocation of turves, the number of years required to achieve an equivalent value to that of the habitat being lost will be less when compared to other compensatory measures, as the turves already contain established and mature positive indicator species of these Annex I habitats.

The number of years required for a species-rich grassland to establish and mature, (e.g. a calcareous grassland or wet grassland), varies in published literature. The establishment of calcareous grassland typically takes between three to five years and, following the implementation of site preparation and appropriate management, a relatively species-rich grassland community will develop in between five to ten years (Ashwood, 2014[31]). In a study on the restoration of species-rich calcareous grassland in The Netherlands, it was found that after 20 years the number of indicative grassland species stabilised at the site (Willems & van Nieuwstadt, 1996[32]). In another study based in the United Kingdom, it was found that under the appropriate management practices of nutrient-stripping, the re-creation of a species-rich grassland occurred in less than 10 years (Walker *et al.*, 2004[33]).

To conclude, applying the methodologies set out in the compensatory habitat plan will ensure the establishment of Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210] and

[29] Martin, J.R., O'Neill, F.H. and Daly, O.H. (2018) The monitoring and assessment of three EU Habitats Directive Annex I grassland habitats. *Irish Wildlife Manuals, No. 102*. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

[30] It is noted that the compensatory measure of natural colonisation may take a number of years before desired species established (Croft, A. & Jefferson R. G. (eds)(1999) *The Lowland Grassland Management Handbook*, 2nd Edition.) and as such it was recommended that it is only implemented in-combination with a selection of or all other compensatory measures.

[31] Ashwood, F. (2014). *Lowland Calcareous Grassland Creation and Management in Land Regeneration. BPG Note 18 Best Practice Guidance for Land Regeneration.* Forest Research, Alice Holt Lodge, Farnham, Surrey, GU10 4LH, United Kingdom.

[32] Willems, J.H. and M.L.G. van Nieuwstadt (1996) Long-term after-effects of fertilization on above-ground phytomass and species diversity in calcareous grassland. *Journal of Vegetation Science* 7:177–184.

[33] Walker, K.J., Stevens, P.A., Stevens, D.P., Mountford, J.O., Manchester, S.J. & Pywell, R.F. (2004) The restoration and re-creation of species-rich lowland grassland on land formerly managed for intensive agriculture in the UK. *Biological Conservation* 119 1-18.

Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410] habitats, of an equivalent ecological value to that being lost, within 10 to 20 years.

4.11.2.3 Priority Annex I habitat Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae*) [*91E0]

In a worst-case scenario it may take between 20 to 50 years for the *91E0 compensatory habitat at receptor site to establish and mature and reach an equivalent ecological value to the donor sites. This does not affect the conclusions set out in the EIAR on the residual impact on this habitat, *i.e.* that post-compensation the loss of *91E0 will not likely to result in a significant residual effect, at any geographic scale, over the long-term (*i.e.* >50 years).

In order to achieve the equivalent value of the areas of the priority Annex I habitat Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae*) [*91E0] (hereafter referred to as "*91E0") being lost, the habitat at the compensatory receptor site must correspond to *91E0 and, therefore, contain sufficient established and mature positive indicator species of this priority Annex I habitat type (as per Perrin *et al.*, 2008[34]).

The most significant time constraint, with respect to achieving this requirement, is the number of years it will take for the target tree species and other woody species to establish and mature at the receptor site. The time required for the non-woody vascular species and non-vascular bryophyte species to establish and mature will be significantly less when compared to woody species, in particular the tree species. The number of years for each of the woody species to establish and mature is provided in **Table 4.7** below. Whilst a combination of both tree seed sowing and tree sapling planting will be undertaken at the receptor site, a precautionary approach has been adopted and, as such, the number of years considered is taken from seed sowing rather than a planted tree sapling. In the case of the latter, a planted tree sapling is likely to reach maturation in less years.

To conclude, applying the methodologies set out in the compensatory habitat plan will ensure the establishment of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae*) [*91E0] habitat, of an equivalent ecological value to that being lost, within 20 to 50 years.

[34] Perrin, P., Martin, J., Barron, S., O'Neill, F., McNutt, K. & Delaney, A. (2008) *National Survey of Native Woodlands 2003-2008 Volume I: Main Report.* Unpublished Report, National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Table 4.7: Indicative number of years for each of the target tree species and other woody species to establish and reach maturation

Plant Species	Indicative Number of Years until Establishment and Maturation
Target Species	
Alnus glutinosa	Initial growth of this species is typically rapid. It usually reaches its ultimate height, and therefore maturation, in 20-50 years, usually attaining its full development by 30-40 years (Royal Horticultural Society, 2019[35] and Council for Forest Research and Development, 2004[36]).
Fraxinus excelsior	Initial growth of this species is typically rapid. This species typically reaches its ultimate height, and therefore maturation, in 20-50 years. It's level of annual growth peaks around 20 years (Royal Horticultural Society, 2019 and Council for Forest Research and Development, 2002[37]).
Salix cinerea	The sub-species of this species, *Salix cinerea subsp. oleifolia*[38], typically reaches its ultimate height, and therefore maturation, in 5-10 years (Royal Horticultural Society, 2019).
Salix spp.	As above for *Salix cinerea*.
Other Woody species	
Betula pubescens	This species typically reaches its ultimate height, and therefore maturation, in 20-50 years (Royal Horticultural Society, 2019).
Crataegus monogyna	This species typically reaches its ultimate height, and therefore maturation, in 20-50 years (Royal Horticultural Society, 2019).
Solanum dulcamara	This species is likely to reach maturity in 10-20 years.
Viburnum opulus	This species typically reaches its ultimate height, and therefore maturation, in 10-20 years (Royal Horticultural Society, 2019).

[35] Royal Horticultural Society (2019) Royal Horticultural Society website. Accessed at https://www.rhs.org.uk/Plants/897/Alnus-glutinosa/Details on the 9th May 2019.

[36] Council for Forest Research and Development (2004) *Common Alder (Alnus glutinosa) as a forest tree in Ireland.* Reproductive Material No. 8 Council for Forest Research and Development (COFORD) Connects, Sandyford, Dublin 18.

[37] Council for Forest Research and Development (2002) *Silviculture of Broadleaves.* Silviculture and Forest Management No. 6. Council for Forest Research and Development (COFORD) Connects, Sandyford, Dublin 18.

[38] This subspecies is comparable to *Salix cinerea* and other *Salix* species in terms of its life cycle and indictive number of years to maturation.

4.12 Clarification of Groundwater Impacts

4.12.1 Request

Item 3l of the RFI states:

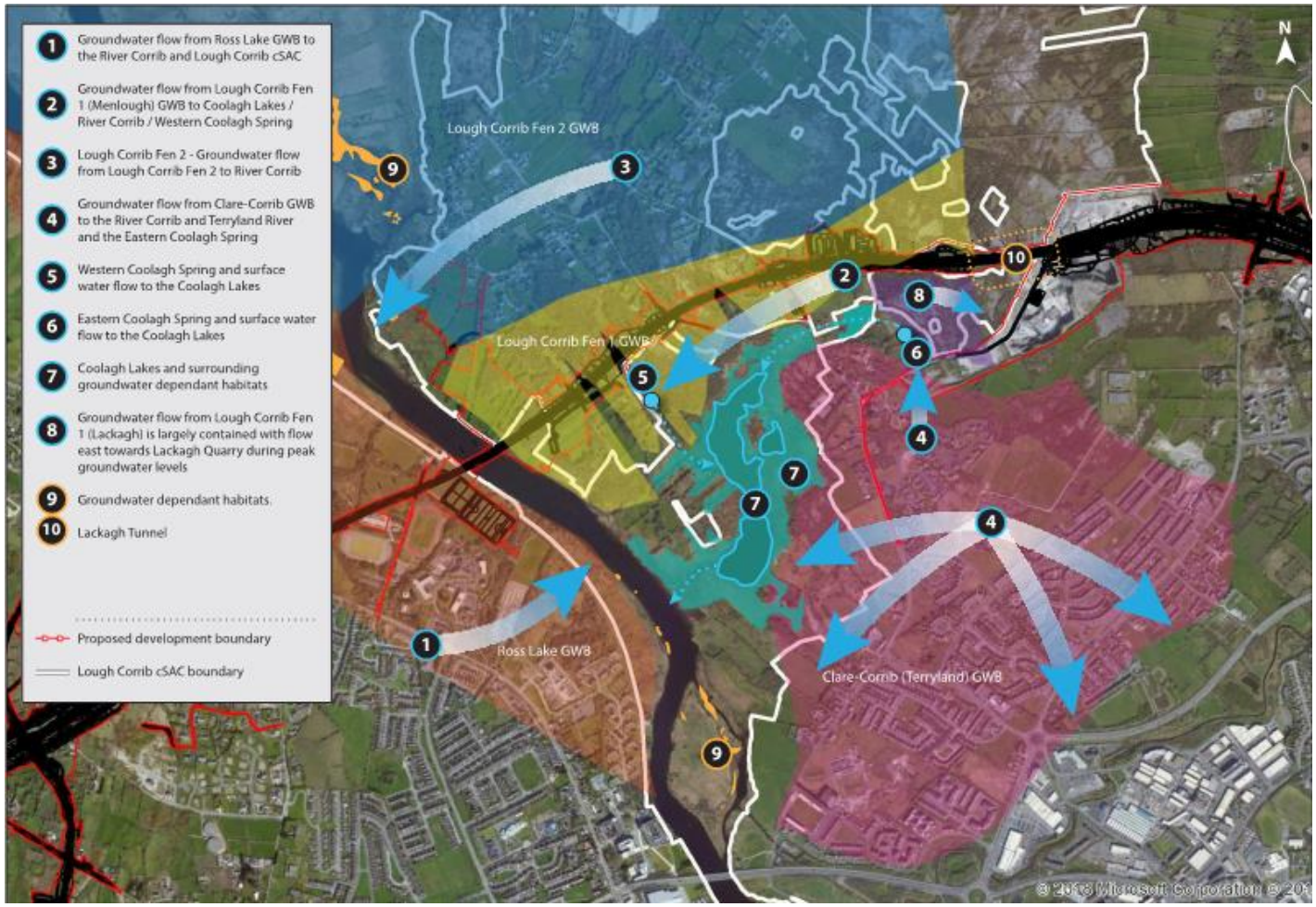
Substantiate or explain the statement that "there will be no groundwater lowering within the groundwater bodies that support groundwater dependant habitats within a European site" given in section 2.6.7 of the NIS.

4.12.2 Response

It must be recalled that only one European site (i.e., Lough Corrib cSAC) lies within the hydrogeological zone of influence of the proposed road development and, accordingly, only that single European site is at any risk of groundwater impacts.

The hydrogeological study undertaken to inform the EIAR and NIS for the proposed road development identified those groundwater bodies that contribute groundwater to Groundwater Dependant Terrestrial Ecosystems (GWDTE). The proposed road development traverses four groundwater bodies that contribute groundwater to wetland habitats within Lough Corrib cSAC: Ross Lake GWB, Lough Corrib Fen 1 (Menlough) GWB, Lough Corrib Fen 2 GWB and the Clare-Corrib GWB. This is explained and illustrated in Section 5.2 of the NIS. Plate 5.2 in the NIS (included below in **Plate 4.6** for ease of reference) illustrates those groundwater bodies that contribute groundwater to the Lough Corrib cSAC.

Plate 4.6: Generalised hydrogeology interactions with European sites



The hydrogeological assessments identified that groundwater dependant habitats within the Lough Corrib cSAC rely on seasonal groundwater levels in the contributing groundwater bodies to provide groundwater flow. Based on this assessment, the design and mitigation measures included as part of the proposed road development were specifically designed to ensure that groundwater levels are not lowered in these contributing groundwater bodies. These measures are set out in Chapter 21, Schedule of Environmental Commitments of the EIAR, in the Construction Environmental Management Plan (CEMP) in Appendix A.7.5 of the EIAR and in Lackagh Tunnel Geotechnical and Hydrogeological Appraisal Report included in Appendix A.7.3 of the EIAR and Appendix F of the NIS. These measures include: excavations associated with the Lackagh Tunnel will not permit dewatering of the bedrock aquifer or works below the groundwater table, and the karst inspection protocol. The effective implementation of these measures will prevent groundwater levels being lowered during construction in the groundwater bodies that contribute groundwater to Lough Corrib SAC and hence, as stated in Section 2.6.7 of the NIS, “there will be no groundwater lowering within the groundwater bodies that support groundwater dependant habitats with a European site”.

4.13 Clarification on the hydrogeology of GWDTE within Lough Corrib cSAC

4.13.1 Request

Item 3m of the RFI states:

Clarify how the Ground Water Dependent Terrestrial Ecosystems in the Lough Corrib cSAC are working "hydrogeologically" and if flow paths may change post-construction.

4.13.2 Response

As noted in **Section 4.12** above, the proposed road development traverses four groundwater bodies that contribute groundwater to wetland habitats within Lough Corrib cSAC: Ross Lake GWB, Lough Corrib Fen 1 (Menlough) GWB, Lough Corrib Fen 2 GWB and the Clare-Corrib GWB. Plate 5.2 in the NIS (included above in **Plate 4.6** for ease of reference), illustrates the direction of groundwater flow within each of those groundwater bodies, which is generally towards the wetland habitats that fringe the banks of the River Corrib and the Coolagh Lakes, i.e. the GWDTE in Lough Corrib cSAC. To note, Coolagh Lakes is hydraulically connected to the River Corrib.

The Coolagh Lakes are underlain by low permeability thick silt and clay subsoil deposits. For that reason, groundwater inflow through the base of the lakes is unlikely. The only significant groundwater input to the Coolagh Lakes is via the karst spring named as the Western Coolagh Spring. This spring is fed by groundwater from the Lough Corrib Fen 1 (Menlough) GWB.

Groundwater in the groundwater bodies adjacent to Coolagh Lakes and the River Corrib contribute baseflow. At Coolagh Lakes, groundwater contributes via springs and seepages so that the water level in the lakes is slightly higher than the water level in the River Corrib. During the summer, the groundwater level in the aquifer adjacent to Coolagh Lakes is lower and as a result the natural groundwater baseflow contribution to Coolagh Lakes is seasonally reduced. Due to the seasonal reduction in groundwater baseflow, the summer water level in Coolagh Lakes lowers seasonally. During extended dry weather the groundwater level in the adjacent groundwater bodies provides little baseflow contribution to Coolagh Lakes and during these times the water level in the lakes will match the water level of the River Corrib. On this basis the variability of the water level in Coolagh Lakes throughout any year is dependent on the seasonal groundwater contributions from groundwater bodies.

Plate 3 and 4 in Appendix A of the NIS (also included as Plate 10.3 and 10.4 in Chapter 10, Hydrogeology of the EIAR), included below in **Plate 4.7** and **4.8** of this report for ease of reference, illustrate the 'workings' between groundwater and surface water at Coolagh Lakes.

Plate 4.7: Schematic north south cross-section through Coolagh Lakes (groundwater high)

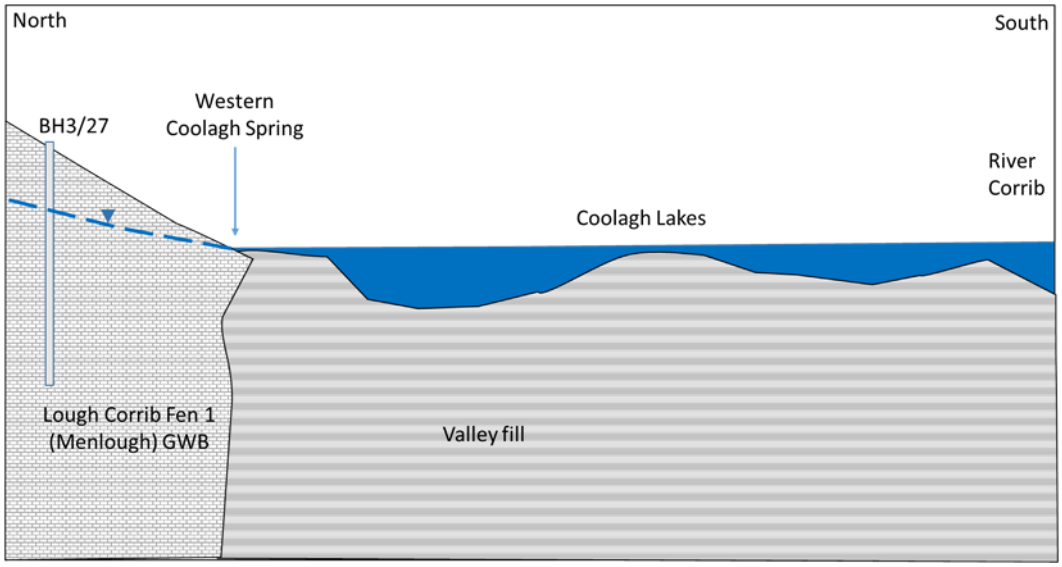
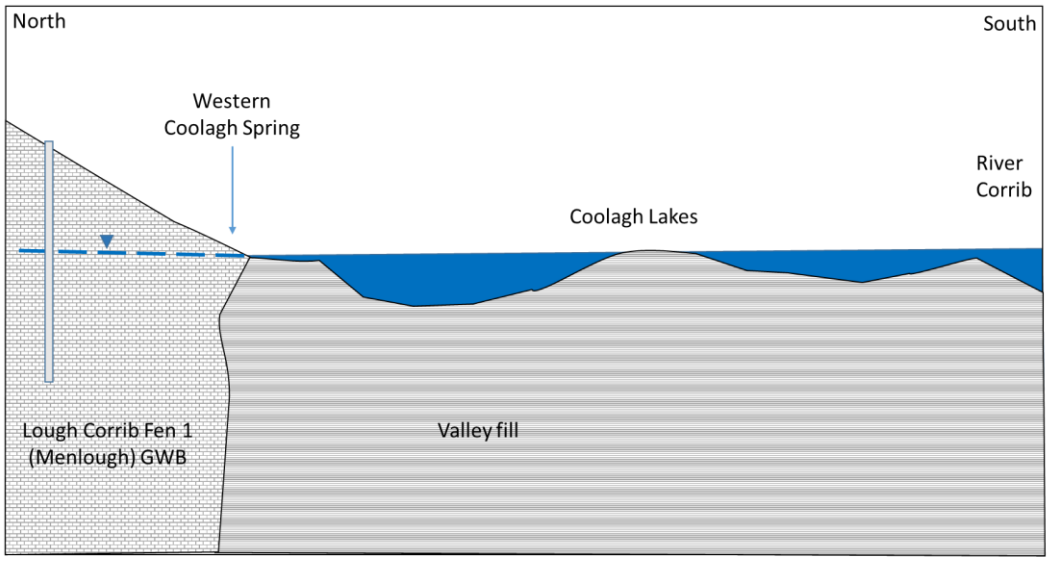


Plate 4.8: Schematic north south cross-section through Coolagh Lakes (groundwater low)



The overall hydrogeological baseline environment supporting groundwater dependant habitats in Lough Corrib cSAC is summarised and illustrated in Section 5.2 of Volume 1 of the NIS - Executive Summary. A more detailed description is provided in Section 5.2 of the NIS, which is supported by the full hydrogeological study, included as Appendix A of the NIS (refer to Section 4.2 for the baseline hydrogeological description of each of the groundwater bodies that contribute groundwater to wetland habitats within Lough Corrib cSAC). It is also presented in Section 10.3.3.2 of Chapter 10, Hydrogeology of the EIAR.

To confirm, groundwater flow paths will remain the same as they currently are following construction of the proposed road development and will not change as a result of any permanent groundwater lowering. Therefore, the proposed road development will not pose any temporary or permanent barrier to the movement of groundwater in these groundwater bodies.

4.14 In-combination assessment

4.14.1 Request

Item 3n of the RFI states:

With respect to the Habitats Directive, please provide a brief "in-combination" assessment which considers all the plans and projects together, rather than pairwise with the proposed development.

4.14.2 Response

Whilst the assessment presented in Table 12.2 of Section 12 of the NIS presents a pairwise in-combination assessment of each of the other plans and projects with the proposed road development, the cumulative implications of all of those other plans and projects together in-combination with the proposed road development were also

considered in Section 12.2 by assessing the pathways by which each of the plans/projects either individually or cumulatively could affect a European site.

The potential impact pathways by which each of the plans/projects considered in Table 12.2 of Section 12 of the NIS could affect Lough Corrib cSAC, Lough Corrib SPA, Galway Bay Complex cSAC or Inner Galway Bay SPA were identified. The primary potential impacts on those European sites that could arise from those plans and projects, either individually or cumulatively with one another, are:

- Effects on water quality in the River Corrib and Galway Bay which could affect the aquatic and wetland qualifying interest habitats and species of Lough Corrib cSAC, the special conservation interest bird species of Lough Corrib SPA that use the River Corrib, and the coastal/marine habitats and species of Galway Bay Complex cSAC and Inner Galway Bay SPA
- Effects on air quality in the vicinity of the proposed road development from any future industrial development or land use activities (e.g. intensive agriculture) which could cumulatively affect habitats along the River Corrib and the Menlough area in Lough Corrib cSAC as a result of air emissions (e.g. nitrogen deposition and nutrient enrichment)
- Disturbance to wintering birds in Lough Corrib SPA and Inner Galway Bay SPA, and disturbance to otter in Lough Corrib cSAC and in Galway Bay Complex cSAC
- The introduction of non-native invasive species which could negatively affect qualifying interest habitats within Lough Corrib cSAC and Galway Bay Complex cSAC, and negatively affect habitats supporting the special conservation interest species of Inner Galway Bay SPA
- The proposed Galway Harbour Port Extension project, the Sailín to Silverstrand Coastal Protection Scheme project and the Salthill Coastal Protection Works (Blackrock to Galway Golf Club) project will have, may already have had, or have the potential to, result in habitat loss in Galway Bay Complex cSAC and/or Inner Galway Bay SPA, including loss of qualifying interest habitat

There is also the potential for any future development or activities within Galway City and Counties Galway, Clare and Mayo to also cumulatively affect the receiving environment in the River Corrib and Galway Bay to result in habitat loss, habitat degradation and impose barriers to species movements across any of Lough Corrib cSAC, Lough Corrib SPA, Galway Bay Complex cSAC or Inner Galway Bay SPA.

The proposed Galway Harbour Port Extension project, the Sailín to Silverstrand Coastal Protection Scheme project and the Salthill Coastal Protection Works (Blackrock to Galway Golf Club) project have the potential to cumulatively affect the conservation objectives of Galway Bay Complex cSAC and Inner Galway Bay SPA.

Whilst there is the potential for the plans or projects (apart from the Galway Harbour Port Extension project and the coastal protection projects which are likely to have an impact on a European site) to affect a European site cumulatively with one another, and therefore in-combination with the proposed road development they

must adhere to the overarching policies and objectives of the relevant land use plans. The relevant environmental protective policies and objectives contained within the Galway County Development Plan 2015-2021, the Galway City Council Development Plan 2017-2023, the Clare County Development Plan 2017-2022 and the Mayo County Development Plan 2014-2020 are included as Appendix O to the NIS.

These policies and objectives will ensure the protection of European sites across all identified potential impact pathways and will include the requirement for any future project to undergo Screening for Appropriate Assessment and/or Appropriate Assessment.

Regardless of the likelihood or potential for other plans and projects to adversely affect the integrity of Lough Corrib cSAC, Lough Corrib SPA, Galway Bay Complex cSAC or Inner Galway Bay SPA, either individually or cumulatively with one another, the proposed road development will not have any perceptible effects on the conservation objectives of any European sites. Therefore, there is no possibility of the cumulative effects of any other plans or projects acting in combination with the proposed road development to undermine the conservation objectives or adversely affect the integrity of any European sites.

4.15 Department of CHG Comments

4.15.1 Request

Item 3o of the RFI states:

Please address the comments made by the Department of Culture, Heritage and the Gaeltacht with respect to the analysis in the NIS appearing to be undertaken without reference to the Designated Sites' conservation objectives.

4.15.2 Response

The comment made by the Department of Culture, Heritage and the Gaeltacht in that regard relates to the conservation objectives of Lough Corrib cSAC.

The conservation objectives of *all* the qualifying interests of *all* European sites within the potential zone of influence of the proposed development, including Lough Corrib cSAC, have been considered in detail as part of the assessment undertaken and presented in the NIS. The overall conservation objectives are listed in Table 9.1 of the NIS. The ecological baseline is then described in Section 9.1.2, which established those of the qualifying interests of Lough Corrib cSAC that are present within the zone of influence of the proposed road development.

Thus, for the avoidance of doubt, *all* habitat areas within Lough Corrib cSAC that lie within the potential zone of influence of the proposed development were surveyed, classified and mapped. Therefore, it is certain that the following qualifying interest habitats of Lough Corrib cSAC are <u>not</u> present within the section of the cSAC that is within the zone of influence of the proposed road development:

- [3110] Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)
- [3130] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
- [3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho - Batrachion* vegetation
- [7110*] Active raised bogs
- [7120] Degraded raised bogs still capable of natural regeneration
- [7150] Depressions on peat substrates of the *Rhynchosporion*
- [7220*] Petrifying springs with tufa formation (*Cratoneurion*)

Similarly, due to the level of field survey work undertaken, it is certain that the following qualifying interest species are also not present within the zone of influence of the proposed road development: White-clawed crayfish, Slender green feather-moss and the Slender naiad (refer to Section 9.1.2.3 and Section 9.1.2.7 of the NIS). Although there is a local Lesser horseshoe bat population, this does not form part of the qualifying interest population for Lough Corrib cSAC at Eborhall House (this is explained in detail in Section 9.1.2.5 of the NIS) and does not support the conservation objectives or conservation condition of this roost at Eborhall House.

Any qualifying interests which are not present within the zone of influence of the proposed road development cannot be impacted by it, either directly, indirectly or in-combination with other plans or projects. Therefore, it may be concluded with certainty that the conservation objectives of those particular qualifying interests cannot be undermined in any way by the proposed road development. On that basis, it is not necessary to consider these qualifying interests in any more detail in the NIS in order to definitively conclude that the proposed road development will not adversely affect the integrity of Lough Corrib cSAC by affecting those particular habitats and species.

The remaining qualifying interests of Lough Corrib cSAC which are present within the zone of influence of the proposed road development and are potentially at risk of effects are set out in detail in Table 9.1 and Table 9.15 of the NIS. The potential for the proposed road development to affect the conservation objectives of each of these qualifying interest habitats and species are examined, analysed and evaluated in Section 9.1.4 and Table 9.16 of the NIS.

In summary, the proposed road development could affect the conservation objectives of the qualifying interests of Lough Corrib cSAC as a result of habitat loss, construction of the Lackagh Tunnel, potential hydrological impacts, potential hydrogeological impacts, dust emissions during construction, and the accidental spread or introduction of non-native invasive species. However, the design of the proposed road development in conjunction with the mitigation measures detailed in Section 10 of the NIS will ensure that the proposed road development will not undermine the conservation objectives of, and will not adversely affect the integrity of, Lough Corrib cSAC.

5 Birds

5.1 Bird Surveys

5.1.1 Request

Item 4a of the RFI states:

Please clarify whether observation of birds moving along the River Corrib corridor were made at night (sound recordings, etc) and in poor conditions, and whether flight heights were recorded. Please provide a copy of the RPS 2006 survey report (not included with the NIS/EAIR). It is noted that the information in the RPS report is 13 years old, and in a different location. Therefore, please justify why it can be relied upon now.

5.1.2 Response

A copy of the RPS 2006 survey report is included as **Appendix A.4.1** to this RFI Response.

The observations made during the 2005/2006 survey period were all recorded during daylight hours. The vantage point watches were generally undertaken during dry, calm and clear weather condition but did include periods of variable wind speeds and rain. The information recorded in addition to the species, included: the number of individual birds, flight direction and approximate flight height.

The surveys carried out in 2005/2006 recorded the following SCI species of Lough Corrib SPA and/or Inner Galway Bay SPA at Kentfield (c.600m upstream of where the proposed road development crosses the River Corrib): Black-headed gull, Common gull, Common tern, Cormorant, Coot, Curlew, Grey heron, Hen harrier, Lapwing and Merlin. The most frequently recorded of these were Black-headed gull, Common gull and Cormorant. Many of these species, Black-headed gull, Common gull, Cormorant, Coot, Curlew, Grey heron, along with Redshank, were also recorded along the River Corrib over the course of the 2014/2015 surveys carried out in the preparation of the NIS. The full survey results are included as Appendix 2 of the RPS 2006 survey report in **Appendix A.4.1** to this RFI Response.

A combination of desktop data (the information in the 2005/2006 RSP report) and the scheme specific surveys (2014,2015 and 2016 breeding and winter bird survey results) were used to establish which SCI species used the River Corrib for foraging and commuting. The fact that the 2005/2006 survey was at a different location is not of great importance given the relatively short length of the river corridor between Lough Corrib and Galway City (c.5.5km) and that the 2005/2006 surveys were only 600m from the proposed River Corrib Bridge – i.e. birds present would be expected to commute and/or forage along the entire river between the Salmon Weir and Coolanillaun/Tonacurragh.

It is important to note that the 2005/2006 survey data was used as available background information in relation to the use of the River Corrib corridor by bird species listed as SCIs of the nearby SPA sites, supported and confirmed by the

results of the 2014,2015 and 2016 wintering and breeding bird surveys carried out for the proposed N6 Galway City Ring Road[39].

Similarly, the age of the 2005/2006 surveys is not a limitation on the assessment given wintering bird surveys were undertaken again in 2014 and 2015 which confirmed the species that use the River Corrib corridor most frequently (i.e. Black-headed gull, Common gull and Cormorant).

However most important, as is detailed in the assessment presented in Section 6.11 of the NIS, the main factor influencing the conclusion of the assessment of the risk of bird collision presented in Section 6.11 of the NIS, based on existing published scientific literature, is that bridges, regardless of their design, do not pose a collision risk to birds that would have any long-term effects on the SCI bird populations of any SPA site, including Lough Corrib SPA or Inner Galway Bay SPA.

Therefore, the conclusion of the assessment relies upon the findings of the scientific literature review and is not dependent upon the 2005/2006 or the 2014/2015 survey data which was sufficient to provide a baseline of the suite and abundance of bird species that would be expected to forage/commute along the River Corrib in the vicinity of the proposed road development.

5.2 Wintering Birds and potential impact due to the proposed River Corrib Bridge

5.2.1 Request

Item 4b of the RFI states:

Based on existing wintering bird surveys and data, provide details on wintering bird species and numbers occurring (foraging, roosting) within 300m of the proposed River Corrib Bridge and an assessment of the potential for the bridge structure to result in displacement of wintering birds.

5.2.2 Response

There are three distinct habitat complexes of relevance to wintering birds which lie within 300m of the proposed River Corrib Bridge: the playing fields at the NUIG Sporting Campus (wintering bird survey site WB45), the River Corrib (wintering bird survey site WB12), and the agricultural fields and woodland on the east bank of the River Corrib. The full results of the wintering bird surveys for sites WB12 and WB45 are included in Appendix A.8.23 of the EIAR and the findings are summarised below in relation to records within 300m of the proposed River Corrib Bridge.

The lands on the east bank of the River Corrib were not included as a dedicated survey site for the wintering bird surveys as the surrounding landscape, particularly within 300m of the proposed River Corrib Bridge, is not suitable as either foraging or roosting habitat for those species of birds listed as SCIs of Lough Corrib SPA or

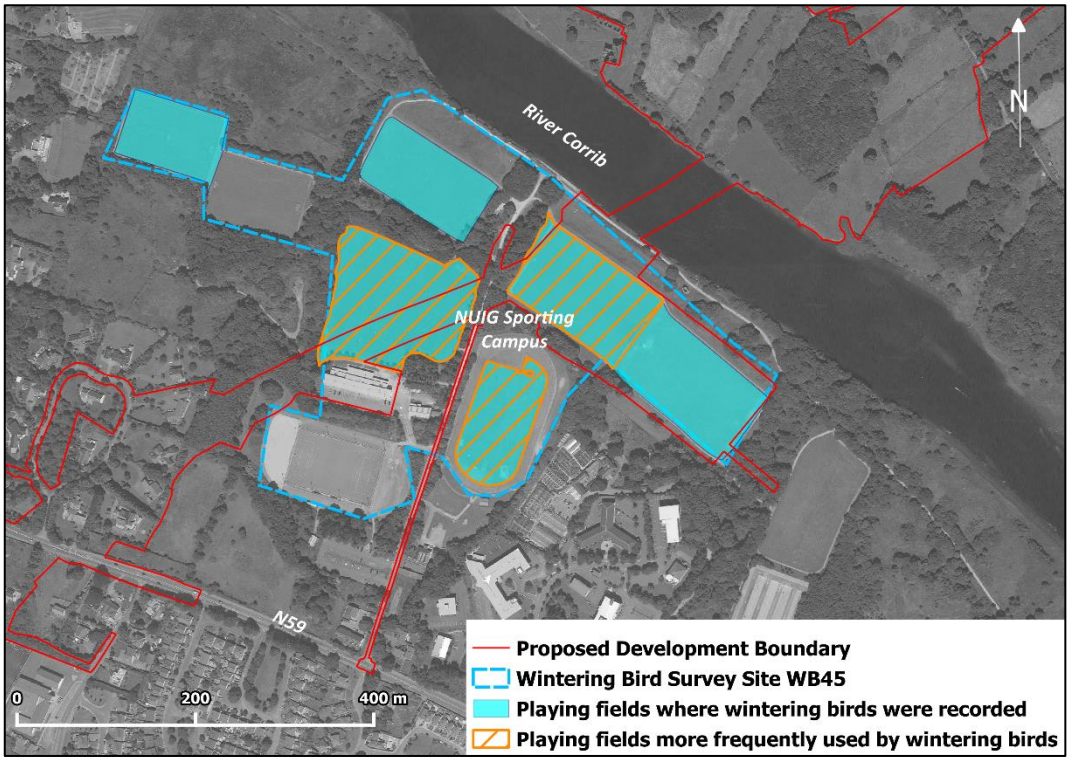
[39] The wintering bird surveys were carried out over the winter of 2014/15 and the breeding bird surveys in May/June 2015 and in June 2016.

Inner Galway Bay SPA for their wintering populations (see Table 9.29 and Table 9.31 of the NIS for a list of the wintering SCI species). This is principally due to the physical structure of the habitats present which consist of a network of small, enclosed narrow fields surrounded by woodland. Enclosed, cluttered and wooded habitats of that nature are avoided by these species of wintering birds (which forage and roost on the ground) as their line-of-sight is greatly restricted and the ability of wintering birds to detect approaching dangers (e.g. predators) when foraging or roosting is also greatly restricted.

At the NUIG Sporting Campus playing fields (WB25), the most frequently recorded species were Black-headed gull and Oystercatcher. Black-headed gull were recorded on seven occasions across the winter in flocks ranging in size from 16 to 47 individuals (mean 27). Oystercatcher were recorded on nine occasions in flocks ranging in size from three to 34 individuals (mean 14). Common gull was recorded on three occasions; a flock of 21 birds in November 2014, with only single birds recorded on the other two occasions. Hooded crow was also recorded on three occasions but only single or a pair of birds were present. Other species recorded using the playing fields less frequently were Blackbird, Jackdaw, Magpie, Pied wagtail and Woodpigeon.

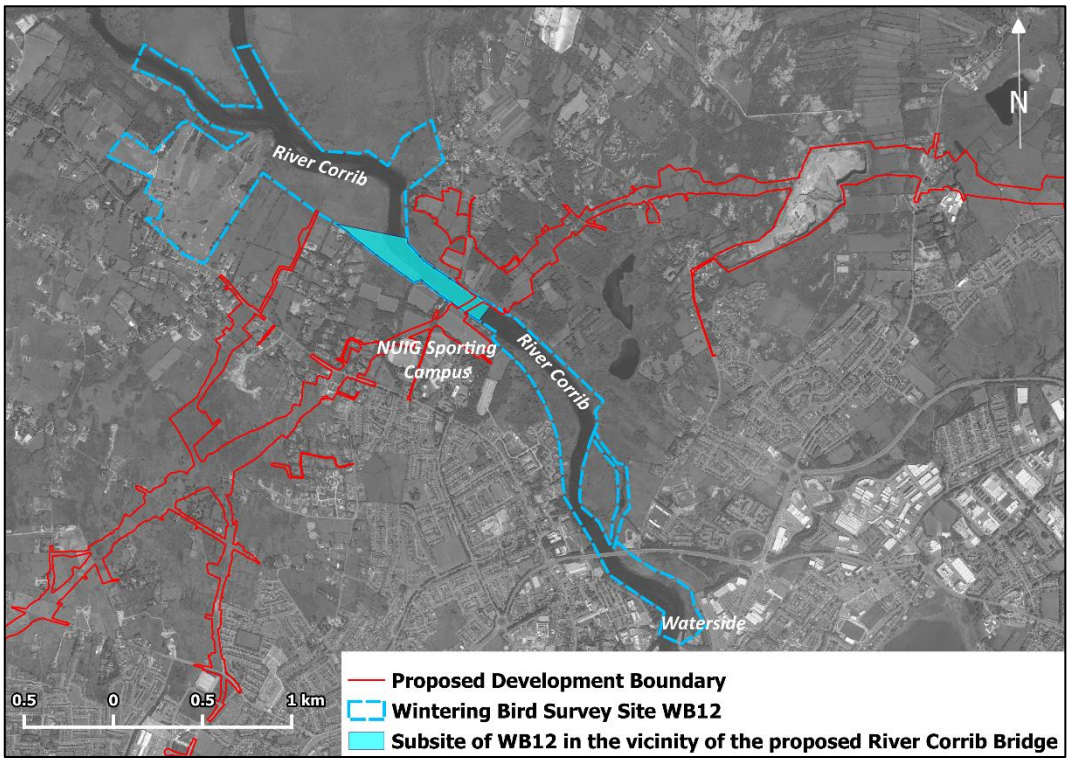
From observations made over the course of the field surveys, wintering birds make use of all the playing fields at the NUIG Sporting Campus to some degree, regularly relocating in response to what are frequent disturbance events from recreational users. These disturbance events are predominantly triggered by walkers, runners and dogs but also include periods when the pitches are being used for sports competitions/matches/training and are unavailable for several successive hours. **Plate 5.1** below illustrates the playing fields where wintering birds were recorded, highlighting those pitches that most regularly supported the larger numbers of wintering birds.

Plate 5.1: Playing fields at the NUIG Sporting Campus where wintering birds were recorded



The River Corrib wintering bird survey site (WB12) extended from Tonacurragh/Coolanillaun in the north to the Salmon Weir in Galway City to the south. The portion of WB12 in the vicinity of the proposed River Corrib Bridge (as shown on **Plate 5.2** below) supported relatively few wintering birds during the 2014 surveys. Small numbers of Mute swan, Mallard and Little grebe (generally only one or two individuals) were the most frequently recorded birds on the river in this area. Coot and Moorhen were also regularly recorded but also in low numbers (between one and three individuals). Water rail were recorded on a single occasion and small numbers of Black-headed gull, Common gull and Cormorant (individual or a single pair of birds) were also recorded flying along the river corridor on one occasion.

Plate 5.2: Subsite of WB12 in the vicinity of the proposed River Corrib Bridge



The areas along the River Corrib most frequently used by wintering birds were within the Waterside area of the city (WB12), immediately to the north of the Salmon Weir (WB12) and to the north and south on the playing fields at NUIG Sporting Campus (WB45), with these three areas consistently supporting the largest flocks of birds over the winter period.

The wintering birds recorded during 2014/15 using the River Corrib and the playing fields at NUIG Sporting Campus were consistent with the findings of the 2005/06 surveys undertaken by RPS for the N6 Galway City Outer Bypass scheme, in that the following bird species were the most frequently recorded species along the River Corrib across the year and, in general, the number of birds recorded were comparatively low:

- Black-headed gull
- Cormorant
- Mallard,
- Woodpigeon
- Common gull

During operation, whilst there is likely to be some level of displacement of wintering birds using the NUIG playing fields in the immediate vicinity of the supporting piers themselves (e.g. Black-headed gull and Common gull), the structure of the proposed River Corrib Bridge is extremely unlikely to displace wintering birds from using the River Corrib or the adjacent playing fields at the NUIG Sporting Campus.

The wintering birds that use the playing pitches have already habituated and adapted to the regular and ongoing disturbance and displacement associated with the use of the fields for sports training, matches and recreational use (e.g. dog walking). The low use of the river itself by wintering birds is most likely as a result of the high level of recreational use along the west bank of the river and on the river itself; the birds, such as Oystercatcher and gulls, that persist are those most tolerant to that type of intermittent disturbance. This is a pattern that was evident across the city in the recreational green spaces that are used by wintering birds and was also evidenced in the Waterside area of the city where the larger numbers of gulls were recorded despite relatively high levels of disturbance there.

The design of the bridge is also an important consideration, as many wintering bird species tend to avoid cluttered habitats or portions of fields that lie adjacent to edge habitats that restrict their view of approaching dangers (e.g. predators). The fact that it is a clear span design with a relatively low number of supporting piers maintains an open view across the playing pitches, minimising any perceived reduction in visibility and the potential for wintering birds to be displaced in that regard.

Accordingly, the proposed River Corrib Bridge is extremely unlikely to displace wintering birds from using the River Corrib or the adjacent playing fields at the NUIG Sporting Campus.

Assessment of the inclusion of Black-throated diver Gavia arctica as a Special Conservation Interest (SCI) of Inner Galway bay SPA.

It should also be noted that in June 2019 the Department of Culture, Heritage and the Gaeltacht made an adjustment in the bird species listed as Special Conservation Interest (SCI) of Inner Galway Bay SPA. The Black-throated diver (Gavia arctica) was included as a SCI of Inner Galway Bay and the Shoveler (Anas clypeata) was removed from the SCI list. Therefore, it was not assessed in the NIS published in October 2018.

Black-throated divers are a wintering bird in Ireland of inshore waters that feed primarily on fish.

At the time of writing, the conservation objectives document for Inner Galway Bay SPA had not been revised to include the Black-throated diver and site-specific conservation objectives have not yet been set for this species. Therefore, the assessment presented below as to whether the proposed road development has the potential to affect the conservation objectives for Black-throated diver in Inner Galway Bay SPA is based upon the following attributes and targets in **Table 5.1** below, as per Table 9.37 of the NIS.

Table 5.1: Attributes and targets of the Inner Galway Bay SPA

To maintain/restore the favourable conservation condition of Black-throated diver in Inner Galway Bay SPA, which is defined by the following list of attributes and targets:	
Attribute and Measure	**Target**
Population trend: Percentage change	Long term population trend stable or increasing
Distribution: Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation

As the proposed road development does not cross Inner Galway Bay SPA, Black-throated diver, nor their supporting habitats within the SPA, are directly impacted by the proposed road development. At its nearest point, the proposed road development is more than 1km from the Inner Galway Bay SPA boundary and therefore, there is no risk of disturbance/displacement of Black-throated diver from habitats within the SPA.

Black-throated diver were not recorded at any of the winter bird sites surveyed in 2014/15 surveys undertaken for the N6 GCRR and were not recorded along the River Corrib corridor during the RPS 2005/2006 surveys undertaken for the 2006 N6 Galway City Outer Bypass. As Black-throated diver were not recorded within the zone of influence of the proposed road development, construction or operation of the proposed road development will not result in any disturbance or displacement of the species from any potential ex-situ sites they might utilise outside of Inner Galway Bay SPA.

The only potential impact pathway by which the proposed road development could affect the conservation objectives supporting the Black-throated diver population of Inner Galway Bay SPA is the potential for construction works to affect water quality in receiving watercourses and consequently downstream in Galway Bay, which could then affect the quality of marine habitat and prey abundance relied upon by this species. These impacts could potentially negatively affect the long-term population trends of the Inner Galway Bay SPA Black-throated diver population; potentially affecting the conservation objective attributes and targets supporting the conservation condition of this species in Inner Galway Bay SPA.

As per Section 11.4.2 of the NIS, the risk of the proposed road development affecting surface water quality during construction requires mitigation to ensure that receiving watercourses are protected. These mitigation measures are detailed in Section 10.4 of the NIS. These mitigation measures will be implemented through the implementation of the Construction Environmental Management Plan (CEMP), included in Appendix A.7.5 of the EIAR and Appendix C of the NIS, by the contractor during construction (pollution control) and by Galway City and County Councils/TII over the operational lifespan of the proposed road development (maintenance) and will ensure that hydrological impacts do not occur.

Therefore, habitat degradation as a result of impacts on the existing surface water regime will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the Black-throated diver population of Inner Galway Bay SPA.

The proposed road development will also not inhibit any efforts to restore favourable conservation status, where this might form part of the conservation objectives in the future.

Therefore, the conclusion of the NIS assessment of Inner Galway Bay SPA, presented in Section 11.4.5 of the NIS, still applies as there are no residual direct or indirect impacts associated with the proposed road development that could adversely affect the integrity of Inner Galway Bay SPA through affecting the SCI Black-throated diver population.

The removal of Shoveler Anas clypeata from the list of Special Conservation Interest (SCI) of Inner Galway bay SPA has no implications for the assessment presented in the NIS. As Shoveler are no longer an SCI of Inner Galway Bay, any references or impact assessment related to Shoveler in the NIS can be disregarded as it is no longer relevant in the context of the NIS assessment.

5.3 Clarification on time restrictions for blasting at Lackagh Quarry

5.3.1 Request

Item 4c of the RFI states:

With respect to proposed mitigation measures, it is noted that blasting in Lackagh Quarry will be timed to avoid disturbance to the wintering birds in Ballindooley Lough but also to avoid disturbance to the Peregrine Falcons during the nesting season. Please address the potential conflict with the timings of blastings.

5.3.2 Response

To clarify, there is no requirement to restrict the timing of blasting to avoid disturbance to nesting Peregrine falcon. The mitigation measures relating to Peregrine falcon at Lackagh Quarry (in Section 8.6.9.1.1 of the EIAR) require that construction works between the proposed Lackagh Tunnel to the N84 Headford Road Junction commence prior to mid-February to ensure that disturbance influences the nest site selection as opposed to displacing an incubating female from the nest.

The timing of blasting is included only in relation to wintering birds at Ballindooley Lough (as set out in Section 8.6.9.2.1 of the EIAR). The blasting works associated with the construction of the proposed road development between the eastern approach to Lackagh Quarry (Ch. 11+800 to Ch. 12+100) will be carried out between the months of April to September (inclusive) to minimise disturbance effects on wintering birds at Ballindooley Lough. Blasting relating to the Lackagh Tunnel construction is outside the zone of influence for the wintering birds at Ballindooley Lough. Therefore, the construction works at Lackagh Tunnel can commence prior to mid-February.

6 Bats

6.1 Clarification on link between Lesser Horseshoe bat populations

6.1.1 Request

Item 5a of the RFI states:

The EIAR/NIS provides contradictory indications as to the presence of a link between the Lesser Horseshoe bat population at Menlo, Ross House and Ebor Hall. Please clarify.

6.1.2 Response

To clarify, the Menlo Castle Lesser horseshoe bat population is not linked to the qualifying interest populations of Ross Lake and Woods cSAC (i.e. the roost at Ross Lake Gate House) or Lough Corrib cSAC (i.e. the roost at Eborhall House). Therefore, any potential impacts on the Menlo Castle Lesser horseshoe bat population will not affect the conservation objectives of Ross Lake and Woods cSAC or Lough Corrib cSAC. As is apparent from the results of extensive radio-tracking surveys, ringing of bats and roost checks carried out to inform the assessment, including the checks at Eborhall House for Lesser horseshoe bats ringed at Menlo Castle, there is no linkage between the study area and any Lesser horseshoe bat roosts which support the qualifying interests for any European sites. Furthermore, the distances between Menlo Castle and the roosts at Ross Lake and Woods SAC (more than 13km) and at Eborhall House (more than 30km) are beyond the normal core foraging and commuting range of the species except on exceptional occasions or over long periods of time – for example, bats dispersing and moving between areas in the wider landscape over a period of many years/generations. Therefore, the proposed road development poses no risk of affecting the conservation objectives[40] supporting the qualifying interest Lesser horseshoe populations of any European sites by impacting upon: the number, availability or condition of the roost sites that support the qualifying interest populations (e.g. maternity, hibernation, transitional, night or day roosts); the extent, quality or availability of habitat supporting those roost sites (e.g. the area, connectivity or condition of foraging or commuting habitat); or, the number of individual bats within the population.

The potential stepping-stone landscape link that the Menlo Castle Lesser horseshoe bat population may provide relates to a potential role that population may play in supporting the genetic diversity of the national Lesser horseshoe population. This is not a factor that would influence local populations in any perceptible way, even over the long-term, and poses no risk of affecting, directly or indirectly, the

[40] *Conservation objectives supporting document – lesser horseshoe bat (*Rhinolophus hipposideros*) Version 1*. (NPWS, 2018).

conservation objectives of any European site that is designated to protect the Lesser horseshoe bat.

6.2 Additional information on Core Sustenance Zone

6.2.1 Request

Item 5b of the RFI states:

With reference to Table 8.31 of the EIAR provide additional information on the quantity of high-quality bat habitat affected by the proposed development in each bat Core Sustenance Zone (CSZ) and comparison with that remaining within the CSZ when the road is operational.

6.2.2 Response

High suitability commuting and foraging habitat for bats (i.e. high-quality bat habitat) is defined in ***Bat Surveys for Professional Ecologists: Good Practice Guidelines*** **(Collins, 2016)**[41] as follows:

> 'Commuting habitat – continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge.
>
> Foraging habitat – high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, treelined watercourses and grazed parkland.
>
> Site is close to and connected to known roosts.'

The roost sites and CSZs referred to in Table 8.31 of Chapter 8, Biodiversity of the EIAR relate to four bat species: common pipistrelle bats, soprano pipistrelle bats, brown long-eared bats and the Lesser horseshoe bats. The general habitat preferences of each are outlined below.[42]

- Common and soprano pipistrelle bats are generalist foragers with broad foraging habitat niches. Habitats likely to be regularly used by these species are associated with a range of habitat types, such as: woodlands, riparian habitats, scrub, pasture, parkland, hedgerows and treelines, and low-density urbanisation (e.g. suburban gardens)

- The brown long-eared bat is known to forage in broad-leaved and mixed woodlands, tree lines, scrub, conifer plantations, gardens with mature trees

[41] Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd end)*. The Bat Conservation Trust, London

[42] Lundy MG, Aughney T, Montgomery WI, Roche N (2011) *Landscape conservation for Irish bats & species specific roosting characteristics.* Bat Conservation Ireland.

Roche, N., Aughney, T., Marnell, F. & Lundy, M. (2014) *Irish Bats in the 21st Century*. Bat Conservation Ireland.

(including low-density urbanisation, e.g. suburban gardens), parkland and orchards

- The Lesser horseshoe bat forages in deciduous woodland and habitats associated with riparian vegetation

All of these bat species rely on linear landscape features, such as hedgerows, treelines and stone walls, to commute between roosting sites and foraging areas.

Section 8.5.6.2.1 of Chapter 8, Biodiversity of the EIAR, under Habitat Loss on page 530, notes the following in relation to bat habitat use across the study area:

'The studies of several different species as part of the collection of baseline data has demonstrated that more open habitats including pastures, open heathland and suburban gardens are also used by bats. Therefore, there are actually very few areas within the corridor of the proposed road development that are considered unsuitable for bats. These would be restricted to locations where the proposed road development crosses main roads and connects to the existing dual carriageway near Oranmore. All other locations are potentially used by bats'.

This is important in the context of defining high-suitability habitat for the bat species noted in Table 8.31 of Chapter 8, Biodiversity of the EIAR as, based on the survey results, the urban environment of Galway City is generally the only foraging or commuting habitat not likely to be regularly used by bats.

The high-density urban habitats and the marine areas have been removed from the CSZ calculations as they do not correspond with high-suitability bat habitat in consideration of: the habitat preferences of these bat species, the habitat types present within the CSZ and connectivity between them at a landscape scale, and the results of the bat surveys.

Table 8.31 of Chapter 8, Biodiversity of the EIAR has been adapted below to present the total area of high-suitability habitat present within each CSZ, the area of high-suitability bat habitat that will be lost within each CSZ during construction, and the total area of high-suitability bat habitat remaining within each CSZ post-construction. These calculations take into account all areas of high-suitability bat habitat that are being retained within the proposed development boundary.

Considering high-suitability bat habitat within each of the CSZs results in only minor increases in the percentage of habitat loss affecting each of the CSZ and does not affect the conclusions of the impact assessment of habitat loss on these roost sites, as presented under the heading of 'Likely significance of impact of habitat loss' in Table 8.31 of Chapter 8, Biodiversity of the EIAR (as summarised in **Table 6.1** presented below).

Table 6.1: Extent of direct high-suitability bat habitat loss within the theoretical core sustenance zone relating to the roosts within the proposed development boundary (the calculated areas of high-suitability bat habitat loss takes into account areas of habitat that are being retained intact within the boundary of the proposed road development)

Approx. Chainage	Roost reference	Species	EIAR Table 8.31 Area of habitat loss within the CSZ	EIAR Table 8.31 % of total CSZ being lost	Total area of high-suitability bat habitat within the CSZ	Area of high-suitability bat habitat loss within the CSZ	% of high-quality bat habitat loss within the CSZ	Area of high-suitability bat habitat remaining within the CSZ	Likely significance of impact of habitat loss
Ch. 3+320	PBR241 (Building to be retained)	Soprano pipistrelle bats	37ha	2.95%	1,039ha	37ha	3.6%	1,002ha	Significant negative effect at a local geographic scale only
Ch. 5+550	PBR267	Soprano pipistrelle bats	46ha	3.66%	886ha	43ha	4.9%	843ha	Significant negative effect at a local geographic scale only
		Brown Long-eared bats	79ha	2.79%	2,035ha	76ha	3.7%	1,959ha	
Ch. 8+600	PBR256	Brown Long-eared bats (maternity)	100ha	3.54%	2,020ha	96ha	4.8%	1,924ha	Significant negative effect at a local geographic scale only
Ch. 8+620	PBR178	Lesser horseshoe bat	64ha	5.1%	952ha	62ha	6.5%	890ha	Significant negative effect at a local geographic scale only
		Brown long-eared bats	101ha	3.57%	2,012ha	97ha	4.8%	1,915ha	
Ch. 8+650	PBR255	Soprano pipistrelle bats	64ha	5.1%	1,006ha	63ha	6.3%	943ha	Significant negative effect at a local geographic scale only
Ch. 8+700	PBR177	Soprano pipistrelle bats	65ha	5.18%	1,018ha	63ha	6.2%	955ha	Significant negative effect at a local

Approx. Chainage	Roost reference	Species	EIAR Table 8.31 Area of habitat loss within the CSZ	EIAR Table 8.31 % of total CSZ being lost	Total area of high-suitability bat habitat within the CSZ	Area of high-suitability bat habitat loss within the CSZ	% of high-quality bat habitat loss within the CSZ	Area of high-suitability bat habitat remaining within the CSZ	Likely significance of impact of habitat loss
									geographic scale only
Ch. 10+050	PBR179	Soprano pipistrelle bats	75ha	5.97%	1,064ha	63ha	5.9%	1,001ha	Significant negative effect at a local geographic scale only
		Brown long-eared bats	116ha	4.1%	2,177ha	104ha	4.8%	2,073ha	
Ch. 11+400	PBR253	Unidentified bats	122ha (3km radius CSZ)	4.32%	2,017ha	109ha	5.4%	1,908ha	Significant negative effect at a local geographic scale only
Ch. 12+150	PBR204	Lesser horseshoe bats	76ha (2km radius CSZ)	6.05%	999ha	74ha	7.4%	925ha	Significant negative effect potentially at a national geographic scale
		Brown long-eared bats	126ha	4.46%	2,061ha	104ha	5.0%	1,956ha	Significant negative effect at a local geographic scale only
Ch. 12+150	PBR182	Unidentified pipistrelle bats	126ha	4.46%	2,064ha	104ha	5.0%	1,960ha	Significant negative effect at a local geographic scale only
Ch. 12+150	PBR196	Soprano pipistrelle	78ha	6.21%	1,007ha	76ha	7.5%	931ha	Significant negative effect not predicted
		Brown long-eared bats	126ha	4.46%	2,075ha	105ha	5.1%	1,971ha	
Ch. 12+960	PBR183	Brown long-eared bats	118ha	4.17%	1,952ha	102ha	5.2%	1,850ha	Significant negative effect at a local

Approx. Chainage	Roost reference	Species	EIAR Table 8.31 Area of habitat loss within the CSZ	EIAR Table 8.31 % of total CSZ being lost	Total area of high-suitability bat habitat within the CSZ	Area of high-suitability bat habitat loss within the CSZ	% of high-quality bat habitat loss within the CSZ	Area of high-suitability bat habitat remaining within the CSZ	Likely significance of impact of habitat loss
									geographic scale only
Ch. 15+100	PBR205	Common and Soprano pipistrelle bats	92ha	7.32%	896ha	65ha	7.3%	831ha	Significant negative effect not predicted
Ch. 8+750	PBR210	Lesser horseshoe bat	NA	NA	1,028ha	NA	NA	NA	Night roost for Lesser horseshoe bats. Since this is within the range of a day roost (likely to be PBR178 or PBR06) the impact on the CSZ is covered by the commentary for those roosts in Tables 8.3.1 and 8.3.2 of the EIAR and does not change.
Ch. 15+250	PBR270	Unidentified bat species	106	3.76%	2,130ha	76ha	3.6%	2,054ha	Significant negative effect not predicted

7 Other Ecological Issues

7.1 Effectiveness of mitigation measures

7.1.1 Request

Item 6a of the RFI states:

Provide further information to demonstrate that the proposed culverts etc. are an effective mitigation measure to reduce or prevent isolation of populations of red squirrel, pine marten and common lizard. Provide evidence of the availability of alternative habitat for common lizard.

7.1.2 Response

The guidance document *Wildlife and Traffic: A European Handbook for Identifying Conflicts and Designing Solutions* [43] examines the barrier and fragmentation effects to wildlife associated with infrastructure projects (including roads) and presents design solutions to minimise those effects, based on the existing knowledge base and current published literature. This guidance document was used to inform the mitigation strategy for the proposed N6 GCRR.

In relation to pine marten, all structures, from wildlife overpasses through to modified culverts, are considered to be optimal solutions for providing safe passage beneath or over a road. For red squirrel, only the smaller underpasses are considered to be unsuitable solutions.[44]

The woodland/scrub habitats of local importance for both these species are located in the Menlough area, between the River Corrib and the N84 Headford Road. Within this zone there are extensive large structures (bridge, viaduct and tunnel) proposed which will facilitate passage of these species across the proposed road development, namely the River Corrib Bridge, the Menlough Viaduct and the land being retained above Lackagh Tunnel. These are supported by a network of other large and medium size underpass structures such as S09/01 (local access road), C10/01 (structure spanning Limestone pavement habitat) and S10/02 (local road access).

Little is known about the use of mammal underpasses by Common lizard. However, the *Wildlife and Traffic: A European Handbook for Identifying Conflicts and Designing Solutions* publication notes that overpasses and viaduct structures are the optimal solutions for lizards with larger underpasses also an option where adapted to local conditions. The series of culverts across the western part of the proposed road development (where Common lizard were recorded) are of a size that are likely

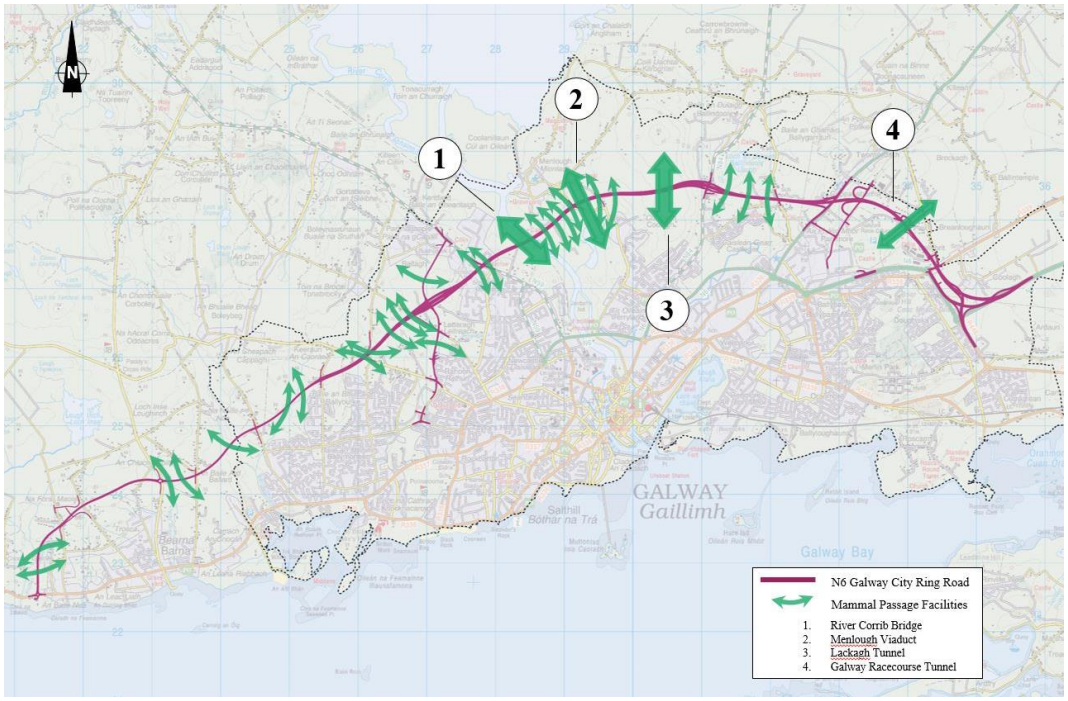
[43] Iuell, B., Bekker, G.J., Cuperus, R., Dufek, J., Fry, G., Hicks, C., Hlavác, V., Keller, V., B., Rosell, C., Sangwine, T., Tørsløv, ˇ N., Wandall, B. le Maire, (Eds.) 2003. Wildlife and Traffic: A European Handbook for Identifying Conflicts and Designing Solutions.

[44] See also, Macdonald-Smart. S. (2017) Developing a mitigation monitoring approach for the A9 and A96 dualling projects. *Scottish Natural Heritage Commissioned Report No. 1003*.

to be used by Common lizard and will, therefore, maintain connectivity across the proposed road development.

The extent of those structures is illustrated on **Plate 4.11** below.

Plate 4.11: Mammal Passage Facilities



Common lizard in Ireland occupy a wide range of habitats from heaths, bogs and marshes to woodlands and grasslands, and also utilise areas of scrub, exposed rock, bare ground and stone walls. Lizard were recorded in lands to the west of the River Corrib during the field surveys and in the following habitat types, or mosaics of those habitat types: wet heath, dry heath, exposed siliceous rock, fen, scrub, acid grassland, wet grassland, bare ground, recolonising bare ground and bracken. Aside from the urban environment and large open expanses of bare ground or improved agricultural grassland (due to the lack of refuges), all other areas of semi-natural habitat, or habitat areas that offer a mix of cover and exposed locations for basking, are potentially suitable to support Common lizard. These habitat types make up the majority of the landscape west of the River Corrib, and to the north and west of the proposed road development; habitat areas which will be available to support the local Common lizard population during construction and operation. Figures 8.14.1-6 of the EIAR evidence the range and extent of these suitable, alternative habitat areas that will be available for Common lizard in the vicinity of the proposed road development.

Accordingly, in the light of the information presented in the EIAR and the supplemental details provided in this RFI Response, it has been comprehensively demonstrated that the proposed culverts etc. are an effective mitigation measure to reduce or prevent isolation of populations of red squirrel, pine marten and common lizard. Moreover, additional evidence has been provided as to the availability of alternative habitat for common lizard.

7.2 Potential impacts on Biodiversity in General

7.2.1 Request

Item 6b of the RFI states:

Having regard to the amending 2014 EIAR Directive (Directive 2014/52/EU), based on existing data, please provide a brief assessment of the likely significant effects on biodiversity in general, rather than specific species and habitats, including consideration of the potential isolation of biodiversity to the south of the proposed development.

7.2.2 Response

The consideration of impacts on biodiversity, in the EIAR and in this RFI Response, has had regard to the following guidance documents in terms of the scope of the biodiversity assessment:

- Guidelines on the information to be contained in Environmental Impact Assessment Reports (Environmental Protection Agency, Draft August 2017)
- Environmental Impact Assessment of Projects, Guidance on the preparation of the Environmental Impact Assessment Report (European Union, 2017)
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Union, 2013)

As presented in Chapter 8, Biodiversity of the EIAR, the local area surrounding Galway City is a highly diverse landscape in terms of its biodiversity resource. This is not only limited to the key ecological receptors assessed in detail in the EIAR but also includes many other habitats and species (refer to Appendix A.8.18 of the EIAR for the full biodiversity record collated as part of the desk study).

Biodiversity is generally defined in terms of habitat and species abundance and habitat and species diversity, including both flora and fauna species. Habitat diversity is supported by contributing environmental processes including the existing hydrogeological and hydrological regimes and key interactions with species that in turn support diversity within habitat units. For example, the role insects play in pollination and fauna species can play in seed dispersal.

Although the interaction between flora and fauna species and their physical environment occurs at an ecosystem level, it is the diversity of habitat types, and their condition, that ultimately constrains the level of species diversity within a given area. Habitats provide many of the environmental conditions necessary to support fauna diversity, from the spectrum of broad habitat requirements for certain bird species (e.g. woodland species) through to micro-habitat niches for specialists such as the marsh fritillary butterfly; relying upon habitat features as breeding and resting places and to supply or support their food resources. Therefore, the impacts on habitat is the key consideration in assessing the likely significant effects of the proposed road development on biodiversity more generally.

The biodiversity resource across the local area surrounding Galway City, through which the proposed road development passes, is supported by a wide range of habitat types from freshwater lakes and rivers to marine, coastal and estuarine habitats, peatland habitats, semi-natural woodlands, acidic and calcareous grasslands, limestone pavement and wetlands.

In terms of habitat loss, the vast majority of the habitats that will be directly affected by the proposed road development are of a low biodiversity value in their own right and are likely to only support a limited diversity of plant and animal species. To quantify, c.48% of the habitats that lie within the proposed development boundary are built ground, disturbed or highly managed/modified/degraded habitats (e.g. improved agricultural grassland, buildings and artificial surfaces, spoil and bare ground and amenity grassland).

That is not to say that they are of no biodiversity value, but these habitat types are abundant in the local area and the relative area of habitat loss is comparatively minor. Therefore, their loss is not likely to result in a significant residual effect on biodiversity, either directly or indirectly.

The remaining habitats (c.52%) that will be affected by the proposed road development are those assessed as being of a higher ecological value. These habitats are generally semi-natural habitats of a higher biodiversity value (e.g. Annex I habitat types) and would be expected to support a much greater diversity of flora and fauna species.

Table 8.27 of the EIAR sets out the areas of each of these habitat types that will be lost as a result of the proposed road development. These areas are put in context, in terms of the local habitat resource of each, in Section 6.5.4.3 of the EIAR. The areas of each of these habitat types are relatively minor when compared against the residual habitat resource locally, which will be unaffected by the proposed road development. The relative proportion of each habitat type becomes comparatively even less significant when compared against the diversity of habitats present in the wider area,[45] and the likely residual effect on biodiversity becomes negligible.

Furthermore, none of the habitat areas directly affected by the proposed road development were noted as being unique in a local or regional scale – i.e. they do not support unique assemblages of plant species or communities.

In terms of biodiversity isolation, the same principles as those used in assessing the impact of habitat severance and barrier effects on species completed for all the key ecological receptors in the EIAR apply when considering the potential effects a new road development may have on biodiversity more generally. These include ensuring that the proposed road development is as permeable to wildlife as possible to maintain both local and landscape scale links to prevent species or populations becoming isolated and trapped between the road and the expanding urban environment of Galway City. Given the high level of permeability provided for

[45] For example, c.5.15ha of peatland habitats will be lost to the proposed road development. This represents c.1.8% of the area of peatland habitat mapped locally and when compared against what is likely to be present to the north and west of the proposed road development, where there is a vast expanse of peatland habitat present (c.40km^2). Therefore, the habitat losses are negligible in terms of habitat area (<c.0.001%).

wildlife across the length of the proposed road development, significant effects on biodiversity as a result of species isolation are not predicted to occur.

The residual biodiversity effects of the proposed road development are minimised as far as possible through the mitigation strategy and the inclusion of compensatory measures, including the creation of peatland and calcareous grassland habitat to offer some level of overall biodiversity gain locally. Nevertheless, as stated in Section 8.10 of the EIAR, there are significant residual effects on biodiversity (including to local biodiversity areas) predicted as a result of the presence of the proposed road development and the associated habitat loss.

However, as set out in this RFI Response, considering the relatively small proportion of the local habitat resource that will be permanently lost as a result of the proposed road development, the relative abundance of these habitat types locally of comparable (or in many cases of better) quality, the mitigation and compensation measures proposed, and the high level of landscape permeability that will be maintained, additional significant residual effects on biodiversity in general are not predicted to occur as a result of the proposed road development.

As regards the potential isolation of biodiversity to the south of the proposed development, it is concluded that, given the high level of permeability provided for wildlife across the length of the proposed road development, significant effects on biodiversity as a result of species isolation are not predicted to occur.

8 Traffic and Transport

8.1 Justification in use of 2012 as a base year traffic

8.1.1 Request

Item 7a of the RFI states:

Provide a justification for the use of 2012 as the base year for the traffic assessment, given the population and economic changes in the intervening years and clarify if more recent traffic survey data is available.

8.1.2 Response

8.1.2.1 Overview

The request for further information addresses three specific points:

- Justification of 2012 as the base year for the traffic assessment
- Population and economic changes in the intervening years
- Recent traffic survey data

The sections below contain a detailed response to compressively address each of these points. These responses can be summarised as follows:

- ***Justification of 2012 base year model:***

  Traffic modelling for the N6 GCRR project commenced in 2013. At that time, the Western Regional Model was under development with a base year of 2012. As a strategic, multi-modal model of the entire region, the 2012 Western Regional Model (WRM) was (and is) the most appropriate model for the appraisal of the proposed N6 GCRR. The fact that the base year is 2012 is irrelevant to the forecast traffic flows as the forecast flows are determined based on land use, population forecasts and economic assumptions as opposed to applying a growth factor to the base year flows as used to be done before.

- ***Population and Economic Changes:***

  All population and economic changes which have occurred between 2012 and present (May 2019) have been accounted for in the forecasting undertaken as part of the appraisal of this project.

- ***Recent Traffic Survey Data:***

  Recent (2018) traffic survey data has been collated for Galway City, however its incorporation into the WRM would not alter the future year demand forecasts which are determined using planning data/ land use assumptions combined with the various calibrated travel behaviour parameters.

To test the forecasting ability of the WRM, 2016 land use and demographic data (the most up to date year for which accurate data is available) was used to "forecast"

2016 peak hour traffic flows in the study area. These forecasts were then compared to observed 2016 traffic counts. This comparison was used to demonstrate how accurately the regional model can process input planning data to produce peak hour traffic flows and showed that the model can closely replicate observed traffic survey data for a forecast year (2016 in this case) and produce accurate travel demand forecasts.

8.1.2.2 Justification of 2012 as the Base Year

At the commencement of the project in 2013, the WRM was identified as the most appropriate model for use for the following reasons:

- It is a regional model covering the entire western region (Galway, Mayo, Roscommon, Sligo, Leitrim and Donegal) and is therefore capable of assessing the regional impacts (as well as local impacts) likely to arise from a scheme of this scale
- It provides a detailed representation of the urban environment within Galway City and includes accurate simulation of all major and minor junctions within the study area
- It provides a detailed representation of the public transport network and services, and can predict demand on the different public transport services within the regions
- It provides a representation of all major transport modes including active modes (walking and cycling) and includes accurate mode-choice modelling of residents
- It is comprised of a variable demand model which provides a detailed representation of travel demand on the network broken down by journey purpose, mode of travel, person types, user classes and socio-economic classes. This demand is modelled at a granular (Census Small Area) level within the WRM which is critical for modelling transport demand within an urban context such as Galway City. The WRM also provides a prediction of changes in trip destination in response to changing traffic conditions, transport provision and/or policy.

No other model has the capabilities outlined above and therefore the WRM was determined to be the most appropriate for use in the appraisal of the N6 GCRR.

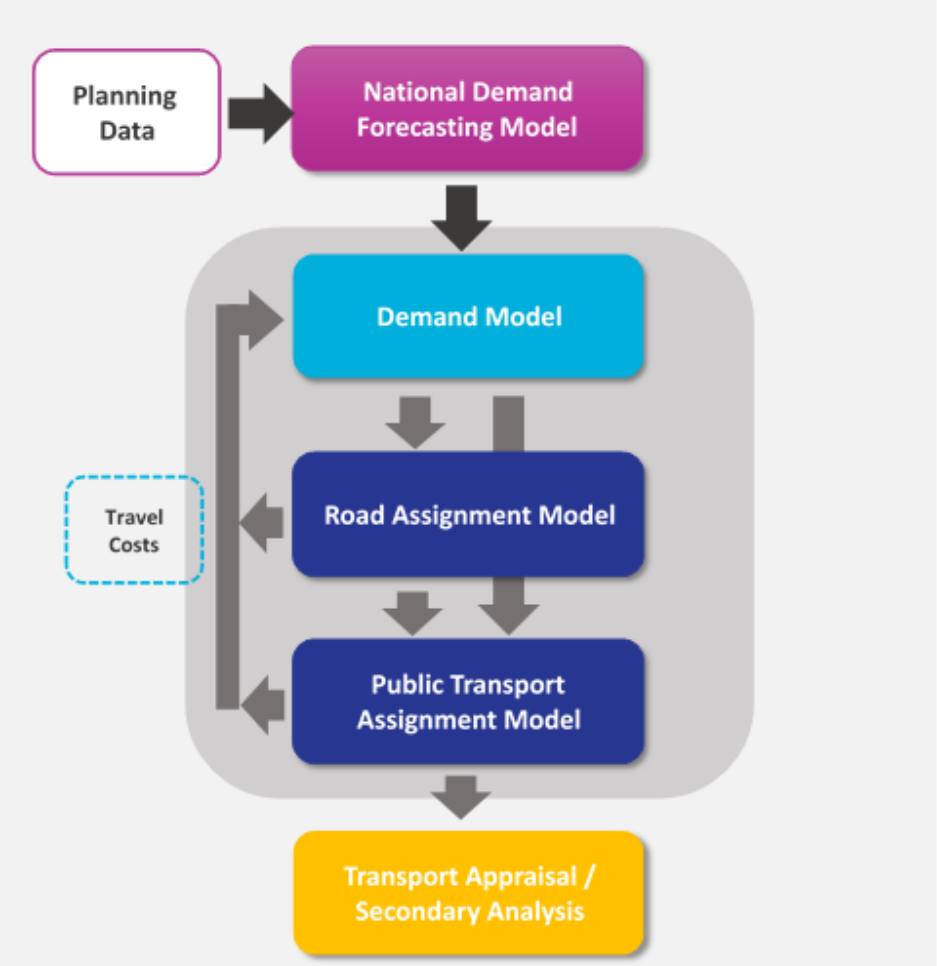
As the travel behaviour characteristics (trip production rates and likely trip making choice responses) within the Regional Models are largely based on data obtained from the National Census (2011) and National Household Travel Survey (2012) the WRM was calibrated to a base year of 2012.

8.1.2.3 Population and Economic Changes Since 2012

All of the Regional Models include three core modelling processes: (i) Demand Model; (ii) Road Assignment Model; and (iii) Public Transport Assignment Model. These models receive inputs from the National Demand Forecast Model (NDFM) and provide outputs for transport appraisal and secondary analysis. This process is

shown in **Figure 8.1** below. The **NDFM** is a separate modelling system that estimates the total quantity of travel demand (referred to as trip ends) generated by and attracted to every Census Small Area zone on a daily basis. This level of demand is related to characteristics such as population, number of employees and land-use data. The NDFM provides forecast trip ends, at a national level, for input into the Demand Model within the Regional Model.

Figure 8.1: Traffic Modelling Processes



The key input data in determining the forecast travel demand is the planning data/ land use (population) assumptions adopted for each forecast year, these are totally independent of the base year. This data is combined with the various calibrated travel behaviour parameters contained within the Regional Models to produce a set of forecast peak hour car trips.

When forecasting, traditional *Incremental* Highway Models generally apply growth factors to a calibrated base year traffic demand matrix (trip levels and distribution of trips) thus linking the forecast travel demand to the base year traffic flows. This is not the case with the Regional Models which are *Absolute* Models, and have no direct link between forecast travel demand and the base year traffic flows. Instead, the travel demand for each forecast year is based on the forecast land use assumptions (population, employment, etc.) combined with the calibrated travel behaviour parameters and trip rates contained in the NDFM and Regional Model.

The behavioural responses which underpin the Regional Model forecasts were derived from the 2012 NTA National Household Survey (the base year). Travel behavioural responses (for example, the key factors which influence certain segments of the population to use car over public transport, or vice versa) take many years to change and therefore will not have altered in any material respect since 2012.

Therefore, as the WRM is an absolute model generating and distributing demand based on future land use information, and because travel behaviour responses are relatively constant over the short to medium term, the base year of the WRM (namely 2012) does not in fact play an important part in forecasting future year traffic flows. Instead the key drivers of demand for the forecast years under consideration are the population, employment and other socio-economic factors assumed to be in place for the opening year (2024) and Design Year (2039).

Very importantly, the values used for these key drivers are up to date as the population, land use and economic forecasts used in the project appraisal to date include for all the actual growth which has occurred from 2012 to present, in addition to the anticipated growth up to the assessment years of 2024 (Year of Opening) and 2039 (Design Year).In addition, each model scenario tested included the most up to date highway, public transport and active travel networks incorporating all network changes which have occurred between 2012 and present (May 2019).

8.1.2.4 Recent traffic survey data

Galway City Council carry out city-wide traffic surveys each year and therefore recent traffic data is available for the model area. Given the architecture of the WRM (*absolute* model as opposed to *incremental* model), it is not necessary to update the base year highway model as the traffic forecasts used in the project appraisal do not pivot off the calibrated base year flows.

To demonstrate the forecasting capability of the WRM, a test has been undertaken whereby 2016 planning data (the most up to date year for which a full set of accurate demographic data is available) has been used to "forecast" 2016 traffic levels in Galway. By comparing the 2016 model outputs from this model run to observed 2016 traffic counts we can determine how accurately the NDFM can process input planning data to produce peak hour traffic flows. This is a very useful test to address the specific issue raised in the query as it is checking the accuracy of the model's forecasted flows for 2016 against actual measured flows obtained from actual 2016 traffic counts.

The results of this test, and location of the comparison counts, for the AM peak period is shown in **Figure 8.2** and **Table 8.1** below. This table details the absolute differences between the observed and modelled flows and also provides a GEH value. The GEH statistic is a measure that considers both absolute and proportional differences in flows. The reason for introducing such a statistic is the inability of either the absolute difference or the relative difference to cope over a wide range of flows. For example, an absolute difference of 100 pcu/h may be considered a big difference if the flows are of the order of 100 pcu/h, but would be unimportant for

flows in the order of several thousand pcu/h. Equally a 10% error in 100 pcu/h would not be important, whereas a 10% error in, say, 3000 pcu/h might mean the difference between adding capacity to a road or not.

As a rule of thumb, in comparing assigned volumes with observed flows, a GEH parameter of 5 or less would be an excellent match, those between 5 and 10 are considered a good fit and anything greater than 20 would require examination.

Figure 8.2: Galway City Council Count Locations 2016

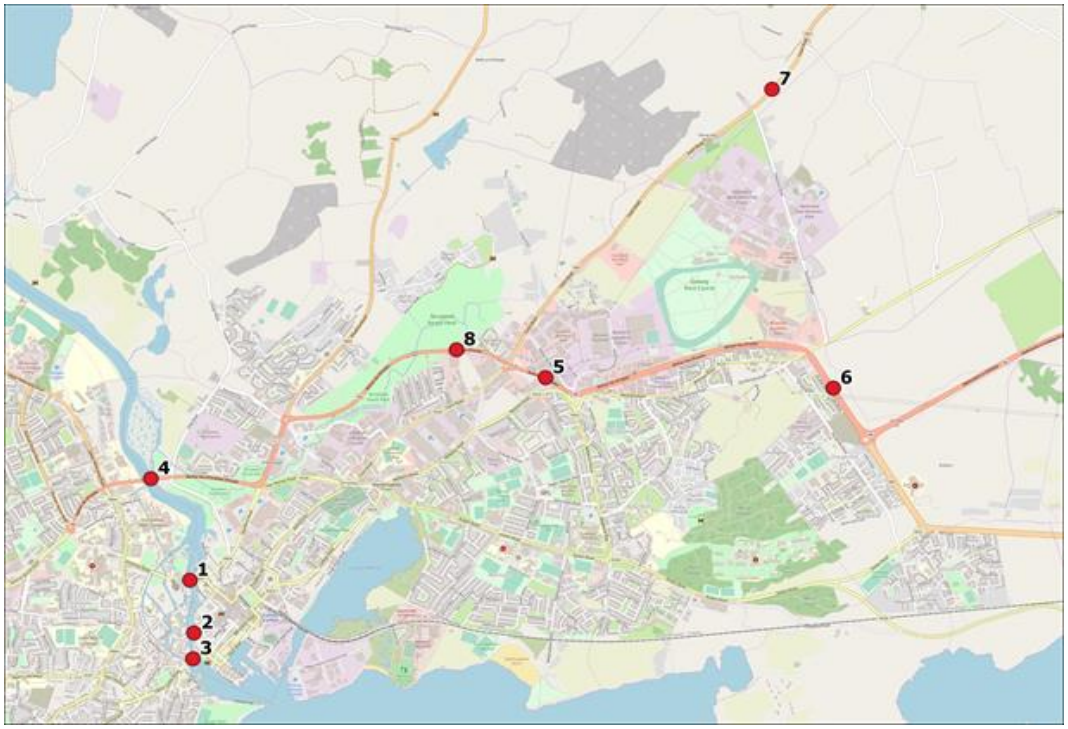


Table 8.1: AM Peak Results from model run

Site #	Location	Direction	Model Output (pcu/h)	2016 Count (pcu/h)	Difference	Difference %	GEH
1	Salmon Weir Bridge	WB	766	747	-19	-3%	0.7
1	Salmon Weir Bridge	EB	784	483	-301	-62%	12.0
2	O' Brien's Bridge	WB	295	136	-159	-117%	10.8
2	O' Brien's Bridge	EB	528	640	112	18%	4.7
3	Wolfe Tone Bridge	WB	556	698	142	20%	5.7
3	Wolfe Tone Bridge	EB	1068	1045	-23	-2%	0.7
4	Quincentenary Bridge	WB	1488	1614	126	8%	3.2

Site #	Location	Direction	Model Output (pcu/h)	2016 Count (pcu/h)	Difference	Difference %	GEH
4	Quincentenary Bridge	EB	1412	1464	52	4%	1.4
5	Existing N6	WB	1052	1164	112	10%	3.4
5	Existing N6	EB	1219	1212	-7	-1%	0.2
6	Existing N6	NB	1659	1787	128	7%	3.1
6	Existing N6	SB	890	684	-206	-30%	7.3
7	N83 Tuam Road	SWB	1207	1336	129	10%	3.6
7	N83 Tuam Road	NEB	349	379	30	8%	1.6
8	Existing N6	EB	1102	1149	47	4%	1.4
8	Existing N6	WB	997	892	-105	-12%	3.4

The table above shows a close match between 2016 modelled traffic forecasts and 2016 observed traffic counts within the study area. In particular, the forecasts for the existing N6 and other national roads show an excellent match between observed and modelled flows. While a small number of locations showed a GEH value of greater than 10, the difference in absolute traffic volumes at these locations is relatively low. This test therefore demonstrates that, irrespective of the base year of the WRM, the model has the ability to closely replicate observed traffic survey data, for a forecast year (2016 in this case) and produce accurate travel demand forecasts.

8.2 Comparison of traffic forecasts with the National Planning Framework

8.2.1 Request

Item 7b of the RFI states:

It is noted that the traffic forecasts are based on growth scenarios from the TII National Traffic Model. Please provide clarification on how these growth scenarios compare to the population growth targets for Galway City and suburbs set out in Project Ireland 2040: National Planning Framework and outline any consequent implications for traffic forecasts.

8.2.2 Response

The National Planning Framework (NPF) 2040 was launched by the government in February 2018. The document sets out the long-term context for our country's physical development and associated progress in economic, social and environmental terms. In terms of spatial planning, the Plan targets future growth in Dublin and the four regional cities in a compact form with growth centred on brownfield sites and along public transport corridors.

In light of the publication of the NPF, population and employment growth forecasts have been developed for Galway City and County aligned with the NPF forecasts

for the city and region. In addition, a modelling exercise has been undertaken using the N6 GCRR for the NPF Growth Forecast and comparing them to the 2039 "TII Central Case" Do-Something Scenario which is presented in the EIAR. The outputs of this exercise are summarised below and detailed in NPF Sensitivity Test Analysis Report included in **Appendix A.8.1** to this RFI Response.

8.2.2.1 Comparison of NTA/GCC NPF Growth Forecasts to TII's Central Scenario growth forecasts

The NPF recognised the role that Galway and the other regional cities of Limerick, Cork and Waterford have to play in providing a counter-weight to Dublin and assigned a population growth forecast of 50% - 60% for each city. The National Transport Authority (NTA) in conjunction with Galway City and County Councils have prepared population and employment growth scenarios aligned to the NPF growth forecasts and distributed within the city and county based on:

- Existing planning applications
- Existing land use zoning and plot ratios
- Existing & emerging policy

These forecasts are detailed in the table below at the city and county level. While the NPF targets are for the year 2040, in order to produce a conservative estimate, and because of the uncertainty which surrounds such forecasts, it has been assumed that all of the population and jobs growth assumed in the NPF has occurred by the design year of the Scheme (2039). This allows us to directly compare the NPF forecasts with the forecasts used in the EIAR (TII Central).

Table 8.2: Galway NTA/GCC NPF Population Forecasts

Scenario	2016 Census	NTA/GCC NPF Forecasts	
		Total	% Increase from 2016
2039 Galway City Population	78,668	121,741	55%
2039 Galway County Population	179,390	218,459	22%
Galway Total	**258,058**	**340,200**	**32%**

Table 8.3: Galway NTA/GCC NPF Job Forecasts

Scenario	2016 Census	NTA/GCC NPF Forecasts	
		Total	% Increase from 2016
2039 Galway City Jobs	41,775	63,647	52%
2039 Galway County Jobs	32,420	48,487	50%
Galway Total	**74,195**	**112,134**	**51%**

The table below compares the 2039 TII Central Case Growth Forecasts with 2039 NTA/GCC NPF forecasts for Galway City and County population. This table

clearly illustrates that the total growth assumed for Galway City + County is higher in the NTA/GCC NPF Scenario. The Galway City population forecasts, in particular, are significantly higher in the NTA/GCC NPF Scenario (+55%) than the TII Central Growth Scenario (+14%).

Table 8.4: Population Forecast Comparisons

Scenario	2016 Census	TII Central Case Forecasts (2039)		NTA/GCC NPF Forecasts (2039)	
		Total	% Increase from 2016	Total	% Increase from 2016
2039 Galway City Population	78,668	90,000	14%	121,741	55%
2039 Galway County Population	179,390	205,362	14%	218,459	22%
Galway Total	**258,058**	**295,362**	**14%**	**340,200**	**32%**

Table 8.5 below compares the 2039 TII Central Case Growth Forecasts with 2039 NTA/GCC NPF forecasts for Galway City and County Employment. As with the population forecasts, the NTA/GCC NPF forecasts contain significantly more jobs in the city (+52%) than the TII forecasts (+15%). Similarly, the total jobs growth for Galway City and County assumed in the NTA/GCC NPF forecasts (+51%) is more than double that assumed in the TII Central Case forecasts (+24%).

Table 8.5: Employment Forecast Comparisons

Scenario	2016 Census	TII Central Case Forecasts (2039)		NTA/GCC NPF Forecasts (2039)	
		Total	% Increase from 2016	Total	% Increase from 2016
2039 Galway City Jobs	41,775	48,000	15%	63,647	52%
2039 Galway County Jobs	32,420	44,100	36%	48,487	50%
Galway Total	**74,195**	**92,100**	**24%**	**112,134**	**51%**

The above tables show that, in line with policy, the NTA/GCC NPF forecasts assume that the majority of future population and employment growth in the region will occur within Galway City and its Environs.

These demographic forecasts have been input to the National Demand Forecasting Model and West Regional Model to determine the resultant traffic flows in the Design Year of 2039 with the N6 GCRR in place (the 2039 Do-Something NPF Scenario).

8.2.2.2 Comparison of modelled traffic flows for the NTA/GCC NPF Growth Forecasts with TII's Central Case Growth Forecasts

Chapter 6 of **Appendix A.8.1** to this RFI Response provides a comparison of the modelled flows for the 2039 Do-Something NTA/GCC NPF Scenario against the 2039 "TII Central Case" Do-Something Scenario which is presented in the EIAR. Both scenarios have the same infrastructure assumed (N6 GCRR only) but differ in their planning and land use assumptions. A summary of the results is presented below.

Total Network Statistics

Table 8.6 below compares the Total Vehicle Distance Travelled, Total Network Travel Time and Average Vehicle Speeds on the network for the EIAR and NTA/GCC NPF scenario.

The results show that the new NTA/GCC NPF assumptions lead to some moderate increases in Total Vehicle Distance Travelled (15%) and total travel time on the network (22%). Similarly, average speeds on the network decrease by 6%.

These impacts are considered relatively small in the context of the large differences in assumed population and employment between the two scenarios. For example, the NPF assumptions include 41% more population in Galway City (90,000 in the EIAR Scenario versus 121,741 in the NTA/GCC NPF Scenario) and 37% more employment growth in Galway City (48,000 in the EIAR (TII Central Case) Scenario versus 63,647 in the NTA NPF Scenario). It also reinforces the need for the N6 GCRR to support the projected growth in population and employment in Galway (in line with the NPF policy) as without the N6 GCRR in place there would be a significant reduction in capacity on the network which would result in considerably more congestion.

Table 8.6: Network Performance Indicators AM Peak

Scenario	Total Vehicle Distance (pcu. Kms)	Total Network Travel Time (pcu. Hrs)	Average Vehicle Speed (kph)
EIAR (TII Central Case)	294,178	7,611	38.7
NTA/GCC NPF	339,630	9,300	36.5
Difference (%)	15%	22%	-6%

Journey Times

Chapter 6 of **Appendix A.8.1** to this RFI Response presents Journey Times for the EIAR (TII Central) scenario and NTA/GCC NPF Scenario for a number of corridors across the city. Across all routes, the results indicate that the new NTA/GCC NPF assumptions lead to an average increase in Journey Times of 5.8% in the AM Peak and 4.5% in the PM Peak. This is considered a minor impact in the context of the considerable amount of additional population assumed to be living in Galway City in the NPF scenario (an increase of 41% on the EIAR assumptions).

Ratio of Flow to Capacity (RFC)

The key junctions used for this capacity assessment are the same as those outlined in Plate 6.8 in Chapter 6, Traffic Assessment and Route Cross-Section of the EIAR. **Table 8.7** below details the results of the RFC comparison for the AM Peak period and compares the NTA/GCC Do Something (with GCRR) to the EIAR Do Something (With GCRR) Scenario. Also included in the table are the results for the NTA/GCC Do-Minimum (No GCRR Scenario).

Table 8.7: Ratio of Flow to Capacity AM Peak

	Criteria	EIAR (TII Central Case) - Do Something	NTA/GCC NPF - Do Something	NTA/GCC NPF - Do Minimum
Key Junctions (N6 / R338)	RFC > 90%	12	14	22
Entire Network	RFC > 90%	115	185	81

The above table shows that the new NTA/GCC NPF assumptions lead to an increase in the number of links in the network which have a RFC of over 90%.

This is because the NTA/GCC NPF Scenario land use assumptions have resulted in a much higher level of trip generation during the peak periods, arising from the increased population assumptions. This in turn leads to increased traffic flow through the key junctions in the study area. Analysis of the NTA/GCC Do-Minimum results show that, without the N6 GCRR in place, the forecast population and employment growth in this scenario will lead to a significant deterioration in the performance of the traffic network in Galway with 50% more links experiencing an RFC of greater than 90% than when the N6 GCRR is in place.

Mode Share

Table 8.8 below presents the mode share comparison, for the city centre, over a full 24-hour period.

Table 8.8: City Centre Mode Share Percentages

Scenario	% Car	% PT	% Walk	% Cycle
EIAR (TII Central Case)	69%	4%	25%	3%
NTA/GCC NPF	61%	6%	30%	3%
Difference (%)	-8%	2%	5%	0%

The mode share analysis shows the significant benefits of locating the forecast population and jobs within the city centre and settlements easily served by public transport. This demonstrates that the NTA NPF Scenario will result in a greater integration of land uses which in turn increases the mode share of sustainable modes and reduces the mode share of private vehicles. This aligns with Smarter Travel policy and offers the most opportunity for further improvement on mode share with the full implementation of all measures within the Galway Transport Strategy.

Summary

The above sections compare the new NTA NPF Scenario with the TII Central Case as presented in the EIAR. While these results show some increases in delay and congestion as a result of the differing demographic assumptions, these increases are considered to be relatively minor in the context of the considerable increases in population (+41% in Galway City vs EIAR) and Employment (+37% in Galway City vs EIAR) assumed to take place under the NPF assumptions.

Furthermore, the Do-Minimum NTA/GCC NPF modelling results indicate that if the NPF policy is implemented in the absence of the N6 GCRR, it will lead to significant operational issues at key junctions throughout the city.

8.2.2.3 Galway Transport Strategy Forecasts

Section 6.8.3.3 of Chapter 6, Traffic Assessment and Route Cross-Section of the EIAR outlines the Galway Transport Strategy (GTS) that Galway City and County Councils have developed in partnership with the National Transport Authority (NTA) to help resolve existing transportation issues in Galway City and its environs. A sensitivity test using the NTA NPF forecasts with the GTS recommendations in place i.e. NTA NPF+GTS has also been carried out. The sections below compare the results of this sensitivity test against the 'TII Central Case' Do Something and GTS recommendations i.e. TII Central Case +GTS which were presented in the EIAR.

Total Network Statistics

Table 8.9 below compares the Total Vehicle Distance Travelled, Total Network Travel Time and Average Vehicle Speed in the model network for the EIAR (developed using TII Central Case forecasts) and NPF scenarios.

The results below show that the GTS measures have a greater impact when combined with the NTA NPF growth assumptions compared to the TII Central Case forecasts. Both Vehicle Distance and Total Network Travel Time show a reduction (around 4% and 6% respectively), and Average Vehicle Speed improve as a result of the introduction of the GTS measures in the NPF growth scenarios.

Table 8.9: Comparison of Network Performance Indicators AM Peak + GTS

Scenario	Total Vehicle Distance (pcu. Kms)	Total Network Travel Time (pcu. Hrs)	Average Vehicle Speed (kph)
EIAR - TII Central Case Do Something	294,178	7,611	38.7
EIAR –TII Central Case+GTS	294,497	7,756	38.0
Difference (%)	**+0%**	**+2%**	**-2%**
NTA/GCC NPF – Do Something	339,630	9,300	36.5
NTA/GCC NPF+GTS	325,157	8,707	37.3

Scenario	Total Vehicle Distance (pcu. Kms)	Total Network Travel Time (pcu. Hrs)	Average Vehicle Speed (kph)
Difference (%)	**-4%**	**-6%**	**+2%**

Journey Times

Comparison of the journey times for the EIAR Do Something+GTS (developed using TII Central case forecasts) and the NTA NPF Do Something+GTS indicates that the introduction of the GTS measures has a minimal impact on journey times under the NTA NPF scenario growth assumptions whereas they result in further delays using the TII Central case development assumptions. During the AM peak period, the average journey time increases by 5% with the GTS in place for the EIAR forecasts whereas there is no increase under the NPF forecasts. The GTS includes several measures which reduce vehicular capacity in the city in favour of increased service provision for sustainable modes (e.g. closing Salmon Weir Bridge to vehicular traffic). This reduction in capacity leads to a decrease in journey times under the EIAR land use assumptions but has minimal impact under the NPF assumptions. This is a reflection of the mode shift to sustainable modes facilitated by the NPF policy and indicates that the GTS measures will be more beneficial when the forecast population and jobs growth is concentrated within the city centre and settlements which are easily served by public transport as is the case with the NPF land use assumptions.

Ratio of Flow to Capacity (RFC)

The key junctions used for this capacity assessment are the same as those outlined in Plate 6.8 in Chapter 6, Traffic Assessment and Route Cross-Section of the EIAR. **Table 8.10** below details the results of the RFC comparison for the AM peak period.

Table 8.10: Ratio of Flow to Capacity AM Peak on Network

	Criteria	EIAR (TII Central Case)	EIAR TII Central Case +GTS	NTA/GCC NPF	NTA/GCC NPF+GTS
Key Junctions (N6 / R338)	RFC > 90%	12	8	14	6
Entire Network	RFC > 90%	115	131	185	150

The above table shows that, as would be expected, the NTA NPF assumptions lead to an increase in the number of links in the network which have a RFC of over 90% compared to the TII Central Case assumptions in the EIAR. This is because the NPF Scenario assumes a much greater level of population and employment which results in a higher level of trip generation during the peak periods. This in turn leads to increased traffic flow through the key junctions in the study area.

Examination of the impact of introducing the GTS measures shows that, in the EIAR scenario, there are minor benefits along key junctions. However, on a

network wide basis the GTS measures lead to an increase in links experiencing a RFC of over 90%.

Under NPF assumptions, network performance improves at both key junctions and on a network-wide basis because of the introduction of the GTS measures. Notably, the number of key junctions experiencing an RFC of greater 90% (6) is less than under the comparable EIAR scenario (8). Considering the NPF scenario will cater for significantly more person trips on the network than the EIAR scenario, the fact that there are less key links experiencing operational issues in the NPF shows the considerable benefits to be gained from good integration of land use and transport.

Mode Share

Table 8.11 below presents a mode share comparison for the city centre over a full 24-hour period.

Table 8.11: City Centre Mode Share Percentages

Scenario	% Car	% PT	% Walk	% Cycle
EIAR TII Central Case Do Something	69%	4%	25%	3%
EIAR –TII Central Case+GTS	67%	5%	25%	3%
Difference (%)	**-2%**	**+1%**	**0%**	**0%**
NTA NPF – Do Something	61%	6%	30%	3%
NTA NPF+GTS	54%	8%	32%	6%
Difference (%)	**-7%**	**+2%**	**+2%**	**+3%**

The mode share analysis shows the significant benefits of locating the forecast population and jobs within the city centre and settlements easily served by public transport, as per NPF policy.

The introduction of the GTS measures under NTA NPF growth assumptions leads to a 7% decrease in car mode share in Galway City versus only a 2% reduction under the TII Central Case assumptions used in the analysis undertaken for the EIAR. This demonstrates that greater integration of land uses, and concentration of population growth, contained with the NTA NPF Scenario will result in greater increases in the mode share of sustainable modes when combined with the GTS proposals.

Summary

The above section compares the implementation of measures outlined in the Galway Transport Strategy (GTS) under NTA/GCC NPF growth assumptions with the TII Central Case as presented in the EIAR.

The results show that, in general, the introduction of the GTS measures under NPF assumptions will result in some improvements to the network performance (increases in average speed, reductions in average travel time, reduction in overcapacity junctions).

Conversely, the introduction of the GTS measures under TII central growth assumptions, as outline in the EIAR, will result in some deterioration in network

performance (decreased average speed, increased average journey times, and increases in network wide links with a RFC greater than 90%).

Notably, the GTS measures will result in a much greater mode shift under the NPF growth assumptions than under the TII Central growth assumptions (54% car mode share in the NPF scenario vs 67% in the TII scenario.

These results therefore illustrate that there are considerable benefits to be gained from good integration of land use and transport and that the GTS measures will have a much greater impact (in terms of encouraging sustainable) travel when implemented alongside a complimentary land use policy i.e. the NPF.

8.2.2.4 TII NPF Growth Forecasts

The analysis undertaken in Sections 8.2.2.2 and 8.2.2.3 above utilises the forecasts developed by the NTA and Galway City and County Council Planners to assign population and employment as set out in the NPF. In May 2019, TII also undertook a similar exercise and released updated travel demand projections for the country aligned with the national forecasts contained in the NPF.

TII's Project Appraisal Guidelines for National Roads Unit 5.3 – Travel demand Projections - May 2019 (PE-PAG-0217) provides an overview of how the demographic and economic projections are developed in TII's National Transport Model (NTpM). The population and jobs models generate projections of future growth in population and jobs at Electoral Division (ED) level, which is subsequently aggregated to NTpM zone level. The central projection is based on the ESRI "50:50 City" Scenario from their "*Prospects for Irish Regions and Counties: Scenarios and Implications (2018)*". This scenario is one where the population increase is roughly equally split between the East and Midland Region and the rest of the country, and the growth is focused on the major cities within each region.

As noted previously, the NTA NPF Scenario (NPF forecasts with input from the Galway City and County Planners) population and employment forecasts for Galway City and County have been derived using a 'bottom up' approach based on an understanding of existing planning applications in the city and county, land use zoning and plot ratios, as well as local, regional and national policy.

Whilst both forecast methods are aligned to the NPF, given the urban setting of the N6 GCRR and the granular level of detail within the NTA NPF Scenario forecasts, it is considered that the NTA NPF Scenario forecasts represent the most appropriate forecasts for re-appraising the scheme.

8.2.2.5 Consequent implications of NPF traffic forecasts on environmental receptors

The forecasted average annual daily traffic (AADT) data is used in assessing potential environmental impacts in terms of noise, air quality and water quality. The consequent implications on these environmental receptors if the NTA/GCC NPF Scenario traffic forecasts are taken into account are discussed below.

Noise

Traffic flows associated with the NTA/GCC NPF Scenarios have been modelled for the noise assessment at the same locations assessed within the EIAR.

The results of the noise assessment indicate a negligible change in noise levels between those associated with the TII Central Case growth figures used within the EIAR and the NTA NPF Scenarios. The vast majority (94%) of the changes in noise levels as a result of the higher forecasts in the NTA NPF Scenarios are less or equal to 1dB(A). A small number of remaining locations have a calculated increase between 1.1 and 2.6dB compared to those calculated within the EIAR. These locations are along the local road network outside of the proposed road development boundary and for the majority, experience an overall noise level reduction compared to the Do Minimum scenario.

There are 13 locations along the N6 GCRR in the NTA/GCC NPF Scenarios where the operational noise level is increased above the design goal by 1dB L_{den} or increased by 1dB above the EIAR residual noise level. This calculated change in noise level is negligible (0.5 to 0.7dB) when compared to those assessed in the EIAR. Furthermore, significant noise mitigation measures are already in place at these locations (i.e. noise barriers ranging from 2.5 to 4m in height), and it is not considered practicable to further increase noise barrier heights at these locations to achieve an imperceptible change in noise level due to other engineering and environmental considerations.

Further detail on this assessment is included in **Appendix A.8.2** to the RFI Response.

Air Quality

These higher traffic forecasts for the NTA/GCC NPF Scenarios are used to reassess the local and regional, ecological and climate assessments. Predicted concentrations for relevant pollutants are compared to the air quality standards (AQS) which are the statutory limits that apply in Ireland. There are no adverse impacts on air quality as a result of the NTA NPF Scenarios. All air quality predictions are within the standards.

The potential for nitrogen compound pollution due to the proposed road development under the NTA/GCC NPF Scenarios is also reassessed, and all predicted concentrations are in compliance with the AQS for the protection of vegetation.

Further detail on this assessment is included in **Appendix A.8.3** to the RFI Response.

Water Quality

The potential impacts in terms of water quality (both groundwater and surface water) were also assessed using the NTA/GCC NPF Scenarios. The results of the HAWRAT water quality analysis for surface drainage outfalls showed that there is no change to that presented in the EIAR. In terms of the spillage risk from HGV accidents, the risk has very marginally increased. However, given the very low magnitude of risk at the individual outfalls to surface and groundwater and the proposed drainage design protection that incorporates wetlands, petrol interceptors, shut-off penstocks, etc. there will be no increased magnitude of impact on water quality as a result of the NTA/GCC NPF Scenarios.

In conclusion, there are no adverse impacts on water quality (both groundwater or surface water) as a result of the NTA/GCC NPF Scenario.

Human Health

The potential health impacts due to the proposed road development are presented in Chapter 18, Human Beings, Population and Human Health of the EIAR. It focussed on three main areas namely health protection, health improvement and improving services. Technical assessments for noise, air, soil and water quality impacts were presented in the EIAR, and they were checked for compliance with relevant standards and limit values. Once compliance with these standards is achieved, the proposed road development is not expected to have an adverse impact on human health. As the noise, air and water quality assessments are dependent on traffic forecasts, these were reassessed for the NTA/GCC NPF Scenarios. As the reassessments show no adverse impacts on these pathways which could affect human health, there will be no adverse impacts on human health as a result of the NTA/GCC NPF Scenario.

Opportunities for health improvements are further enhanced in the NTA/GCC NPF Scenarios as the population and jobs are both centred around the urban area with increased employment opportunities for a larger number of the population. This improved socio-economic status will have a positive impact on health outcomes. Finally, the reduction in car usage together with the increase in physical activity due to the improved mode share of cycling and walking as shown in **Table 8.11** above will have a positive impact on health outcomes.

9 Clarifications

9.1 Clarification of figure references in Chapter 11

9.1.1 Request

Item 8a of the RFI states:

Please clarify ALL figures referred to in Chapter 11 of the EIAR - the numbering is unclear and inconsistent with drawings provided in Appendix to Chapter 11.

9.1.2 Response

For the sake of completeness and ease of reference, please see below the correct references for figures to Chapter 11, Hydrology of the EIAR.

Table 9.1: Corrected Figure References in Chapter 11, Hydrology

Section	Section Title	Submitted Reference	Corrected Reference
11.2.4	Study Area and Baseline Data Collection	Figures 11.1.101 to 11.1.114	Figures 11.1.001 to 11.1.002
11.3.1	Regional Overview of Hydrology	Chapter 11, Hydrogeology	Chapter 10, Hydrogeology
11.3.3	Hydrological Drainage Features	Figures 11.1.101 to 11.1.114	Figures 11.1.001 to 11.1.002
11.3.5	Surface Water Ecological Status	Figures 11.1.101 to 11.1.114	Figures 11.1.001 to 11.1.002
11.4.1.3	Proposed Road Drainage Features	Figures 11.6.101 to 11.6.115	Figures 11.5.01 to 11.5.02 and 11.5.101 to 11.5.115.
11.4.2	Construction Phase	Figures 7.101 to 7.123	Figures 7.101 to 7.124
11.5.4.2	Routine Road Runoff	Figures 11.6.101 to 11.6.115	Figures 11.5.01 to 11.5.02 and 11.5.101 to 11.5.115
11.5.4.2	Routine Road Runoff	Figures 11.6.101 to 11.6.115	Figures 11.5.01 to 11.5.02 and 11.5.101 to 11.5.115
11.5.4.2	Routine Road Runoff - Table 11.33	Figures 11.6.101 to 11.6.115	Figures 11.5.101 to 11.5.115
11.6.3.1	Flood Risk Mitigation	Drawing GCOB-500-D-600	Figure 11.6.001

9.2 Drawing GCOB-500-D-600

9.2.1 Request

Item 8b of the RFI states:

Please confirm Drawing GCOB-500-D-600 as referred to in Chapter 11 of the EIAR is the same as Figure 11.6.001.

9.2.2 Response

Drawing GCOB-500-D-600 as referred to in Chapter 11, Hydrology of the EIAR is the same as Figure 11.6.001 included in Volume 3 of the EIAR. A copy of drawing GCOB-500-D-600 is included in Volume 2 of the Design Report - Figures.

9.3 Clarification of figure references in Chapter 12

9.3.1 Request

Item 8c of the RFI states:

Clarify figures referred to in Chapter 12 of the EIAR - Figures 12.4.01 to 12.4.14 are not included in the appendix to Chapter 12.

9.3.2 Response

The reference to Figures 12.4.01 to 12.4.14 is a typographical error as these figures do not exist and are not included in the figures that accompany Chapter 12, Landscape and Visual of the EIAR. This reference should read Figures 12.1.01 to 12.1.15. The table below lists the correct references for figures to Chapter 12, Landscape and visual of the EIAR.

Table 9.2: Corrected Figure References in Chapter 12, Landscape and Visual

Section	Section Title	Submitted Reference	Corrected Reference
12.2.5	Impact Assessment Methodology	Figures 12.1.01 to 12.1.14	Figures 12.1.01 to 12.1.15
12.5.3	Potential Construction Impacts	Figures 12.1.01 to 12.1.14	Figures 12.1.01 to 12.1.15
12.5.3.1	Potential Construction Impacts	12.4.01 to 12.4.05	12.1.01 to 12.1.05
12.5.3.2	Potential Construction Impacts	Figures 12.4.05 to 12.4.06	Figures 12.4.12 to 12.4.13
12.5.3.3	Potential Construction Impacts	Figures 12.4.06 to 12.4.08	Figures 12.1.06 to 12.1.08
12.5.3.4	Potential Construction Impacts	Figures 12.4.08 to 12.4.10	Figures 12.1.08 to 12.1.10
12.5.3.5	Potential Construction Impacts	Figures 12.4.10, 12.4.11 and 12.4.14	Figures 12.1.10, 12.1.11 and 12.1.14

Section	Section Title	Submitted Reference	Corrected Reference
12.6.3	Operational Phase	Figures 12.4.01 to 12.4.14	Figures 12.1.01 to 12.1.15
12.6.3.2	Specific Landscape Measures	Figures 12.4.01 to 12.4.14	Figures 12.1.01 to 12.1.15
12.6.3.2	Specific Landscape Measures – Table 12.8	Figures 12.4.01 to 12.4.14	Figures 12.1.01 to 12.1.15
12.7.3	Operational Phase	Figures 12.4.01 to 12.4.14	Figures 12.1.01 to 12.1.15

9.4 Location of Access Roads

9.4.1 Request

Item 8d of the RFI states:

Clarify locations of Access Roads 13/07, 13/08, 13/09 - indicate locations on drawings

9.4.2 Response

Additional figures, **Figures 4.1.01** to **4.1.30** in **Appendix A.9.1** to this RFI Response indicate the location of all the access roads including the location of Access Roads AR 13/07, 13/08 and 13/09. These figures also include the boundary treatment details along with the landownership mosaic. Table 5.15 of Chapter 5, Description of the Proposed Road Development of the EIAR details the access roads included in the proposed road development. These access roads were all identified in the EIAR as being private roads with a private right of way provided to those parties listed however some of those roads should have been listed as public roads. In addition, the proposed width of these access road has been included in the tables below. **Tables 9.3** and **9.4** below, which is a copy of Table 5.15 of the EIAR, split into two tables to clarify which roads are proposed to be private roads with a private right of way for those parties listed under the reference number (Table 5.15) and which roads will be public roads (Table 5.15A).

Table 9.3: Private Access Roads (Updated Table 15.5 of the EIAR)

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	Description		
Ch. 0+000	80m access road AR 0/01 Width 6m	102, 103	Provides access to houses and land parcels both via single field gates as current access is onto the existing R336
Ch. 0+000 to Ch. 0+250	320m access road AR 0/02 Width 4m	106, 107, 108, 109,	Provides access to attenuation ponds and land parcels via single field gates as current access is severed by the proposed road development

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	**Description**		
		112	
Ch. 0+650 to Ch. 0+700	65m access road AR 0/03 Width 4m	-	Provides access to attenuation ponds
Ch. 0+850 to Ch. 0+950	160m access road AR 0/04 Width 4m	114, 117	Provides access to land parcels
Ch. 0+990	30m access road AR 0/05 Width 4m	-	Provides access to attenuation ponds
Ch. 1+100 (Troscaigh Road L5387)	35m access road AR 01/01 Width 4m	130, 131, 7891	Re-graded entrance to houses and land parcels as current access via Foraí Maola Road is severed by the proposed road development
Ch. 1+300 (Troscaigh Road L5387)	30m access road AR 01/03 Width 4m	144, 145	Provides access (via the proposed Na Foraí Maola to Troscaigh link road) to land parcels as current access arrangement is impacted by the proposed road development
Ch. 1+500	15m access road AR 01/04 Width 4m	156, 157	Proposed access to tie-in to existing access to houses, and existing property currently accessing off existing access track. Current access arrangement via Troscaigh Road L5387 is impacted by the proposed road development
Ch. 1+550	25m access road AR 01/05 Width 4m	154	Provides access to land parcel as current access arrangement via Troscaigh Road L5387 is severed by the proposed road development
Ch. 1+550 to Ch. 1+675 (Troscaigh Road L5387)	215m access road AR 01/06 Width 6m	149, 150, 151, 152, 153	Access to houses and land parcels but also provides access to attenuation ponds
Ch. 2+475 to Ch. 2+550	65m access road AR 02/01 Width 4m	176	Provides access to land parcel via Ann Gibbons Road L13215 as land parcel is being severed by proposed development
Ch. 1+750 to Ch. 2+550	830m access road AR 02/02 Width 4m	171, 147, 174, 173, 172, 170, 169, 167, 166,	Provides multiple accesses to houses and land parcels as current access via Ann Gibbons Road L13215 is severed by the proposed road development

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	**Description**		
		146, 165, 168	
Ch. 3+275	10m access road AR 03/01 Width 4m	199	Provides access to land as current access via Aille road is altered by the proposed road development (located north of proposed Aille Overbridge S03/01)
Ch. 3+325 to Ch. 3+900	620m access road AR 03/02 Width 4m	207, 197, 205, 208, 209, 210	Provides access to land parcels via Aille Road L5384 as current access is severed by the proposed road development. Also provides access to attenuation ponds
Ch. 4+025 to Ch. 4+050	75m access road AR 04/01 Width 4m	-	Provides access to attenuation ponds
Ch. 4+240 to Ch. 4+360	140m access road AR 04/02 Width 4m	-	Provides access to attenuation ponds
Ch. 4+450 (South of Cappagh Road Junction)	20m access road AR 04/03 Width 4m	213	Access re-alignment required due to the proximity with the proposed Cappagh Road signalised Junction
Ch. 4+450 (North of Cappagh Road Junction)	10m access road AR 04/04 Width 4m	215	Access re-alignment required due to the proximity with the proposed Cappagh Road signalised Junction
Ch. 4+450 to Ch. 4+675 (North of Cappagh Road Junction)	185m access road AR 04/05 Width 4m	216, 217, 223, 226	Provides access onto land parcels as current access via Boleybeg Bóthrín is severed by the proposed road development
Ch. 4+525 to Ch. 4+650	145m access road AR 04/06 Width 4m	223, 224, 226, 227	Re-alignment of Boleybeg Bóthrín as currently being severed by the proposed road development. Provides access onto land parcels
Ch. 4+950 to Ch. 4+990	60m access road AR 04/07 Width 4m	-	Provide access from mainline to attenuation ponds. Pond access gate to be provided adjacent to the carriageway
Ch. 5+360 to Ch. 5+660 North of Ballymoneen Road Junction	345m access road AR 05/01 Width 6m	223, 230, 261	Provide access to farmyard and land parcels as current access is directly onto the existing Ballymoneen Road

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	**Description**		
Ch. 5+600 to Ch. 5+625 South of Ballymoneen Road Junction	30m access road AR 05/02 Width 4m	232	Access already provided to houses located directly onto Ballymoneen Road, but re-alignment needed due to the proximity with the proposed signalised Junction
Ch. 6+375 to Ch. 6+475	110m access road AR 06/01 Width 4m	243	Provide access to land parcel as existing access via Clybaun Road is severed by the proposed road development
Ch. 6+525 to Ch. 6+560	45m access road AR 06/02 Width 6m	312, 260	Provides access to farmyard. Access provided as part of Clybaun Road re-alignment
Ch. 6+600 to Ch. 6+960	370m access road AR 06/03 Width 4m	241, 239, 247, 245	Provide access to land parcels as being severed by the proposed road development
N59 Link Road South Ch. 1+900	50m access road AR 07/01 Width 6m	481	Provides access to land parcels as part of the proposed road development
Ch. 7+225 to Ch. 7+300	60m access road AR 07/04 Width 4m	250/466	Located just off Letteragh Road L1323. Provides access to land parcel as current access is severed by the proposed road development
Ch. 7+260 to Ch. 7+450	200m access road AR 07/05 Width 4m	272/462	Located just off Letteragh Road L1323. Provides access to land parcel as current access is severed by the proposed road development. Also access to attenuation ponds
N59 Link Road South Ch. 1+500	60m access road AR 07/06 Width 4m	486	Located just off Letteragh Road L1323, near the at-grade Letteragh Road junction. Provides access to house as current access is impacted by the provision of the junction
N59 Link Road South Ch. 1+350 to Ch. 1+400	80m access road AR 07/07 Width 4m	486, 272/462	Provide access to land parcels as current access is severed by the proposed road development
N59 Link Road South Ch. 1+140 to Ch. 1+190	70m access road AR 07/08 Width 4m	457	Provides access to agricultural lands as current access is severed by proposed road development and acquired severed lands
N59 Link Road Ch. 0+700 to Ch. 0+860	210m access road AR 07/09 Width 4m	457, 502, 505, 501, 468	Provides access to land parcels as current access is severed by the proposed road development

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	**Description**		
Ch. 7+800 to Ch. 7+850. Access from local road network	160m access road AR 07/10 Width 4m	506 504, Folio GY86696F, Folio GY35103F, Folio GY118263F, Folio GY41823F, Folio GY42106F, Folio GY36701F, Folio GY36702F, Folio GY35496F, Folio GY43487F, Folio GY45453F, Folio GY40760F, Folio GY41001F, Folio GY35497F, Folio GY47703F, Folio GY35104F, Folio GY45455F, Folio GY45454F, Folio GY41735F, Folio GY45416F, Folio GY36705F, Folio GY39148F, Folio GY36703F, Folio GY5454F,	Located off Circular Road and consists of the existing access road to the Heath. Provides access to land parcel as current access is severed by the proposed road development. Access is to tie-in with the remainder of the existing access to existing homes

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	**Description**		
		Folio GY36704F	
N59 Link Road South Ch. 1+760	10m access road AR 07/11 Width 6m	484	Provides access to land parcel as current access is severed by the proposed road development
Ch. 8+360 to Ch. 8+500	115m access road AR 08/01 Width 6m	517, 518 (Folio GY72504F), Folio GY61252F Folio GY79016F Folio GY106159F Folio GY61254F Folio GY95973F Folio GY61253F	Located just off the N59. Provides access to house and ties-in to existing housing development access (517). Current access is severed by the proposed road development. Also provides access to attenuation ponds
Ch. 8+375 to Ch. 8+450	165m access road AR 08/02 Width 4m	515, 522	Provides access to house as current access is severed by the proposed road development. Access connected to Circular Road L1020
Ch. 8+525 to Ch. 8+625	100m access road AR 08/03 Width 6m	531, 532, 533, 534, & Folio GY26414F, Folio GY28597F, Folio GY23431F, Folio GY23250F, Folio GY20148F, Folio GY26176F	Located just off the N59. Provides access to Aughnacurra Estate (houses and land parcels) as current access is severed by the proposed road development. Access is to tie-in with the remainder of the existing access to existing homes
Ch. 8+500	640m access road AR 08/05 Width 4m	489	Provides access to attenuation ponds and unhindered access along it to 489

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	**Description**		
Ch. 9+090 to Ch. 9+160	110m access road AR 09/01 Width 4m	528, 543, 557	Provides access to NUIG Sporting Campus as current access is severed by the proposed road development. Also provides access to an attenuation pond located near-by
Ch. 9+710	120m access road AR 09/02 Width 6m	553, 551, 562, 564, 500, Folio GY21502F, Folio GY100171F, Folio GY105725F	This access road will form part of the existing Menlo Castle Bóithrín and as such it must be noted that all landowner's rights of way on this bóithrín will remain unaffected. Also provides access to AR 09/03 & AR 09/04
Ch. 9+560 to Ch. 9+710	145m access road AR 09/03 Width 4m	-	Provides access to attenuation ponds. Accessed from AR 09/02
Ch. 9+710 to Ch. 9+850	160m access road AR 09/04 Width 4m	500	Provides access to land parcel as current access is severed by the proposed road development. Accessed from AR 09/02
Ch. 9+550	120m access road AR 09/05 Width 4m	648	Provides access to land parcel as current access is severed by the proposed road development
Ch. 9+500	120m access road AR 09/06 Width 4m	649	Provides access to land parcel as current access is severed by the proposed road development
Ch. 10+050 to Ch. 10+140	85m access road AR 10/01 Width 4m	563, 568, 564	Located off Bóthar Nua, provides access to land parcels as current access is severed by the proposed road development
Ch. 10+475 to Ch. 10+890	420m access road AR 10/02 Width 4m	553, 563, 572, 580, 581, 591	Provides access to land parcels as current access is severed by the proposed road development; but also provides access to attenuation ponds - via AR 10/03, AR 10/04, AR 10/05, AR 10/06, or AR 10/07
Ch. 10+625	100m access road AR 10/03 Width 4m	563	Provides access to land parcel as current access is severed by the proposed road development. Also provides access to attenuation pond. Ties-in to AR 10/02, AR 10/04 & AR 10/07

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	**Description**		
Ch. 10+625 to Ch. 10+670	65m access road AR 10/04 Width 4m	553	Provides access to land. Ties-in to AR 10/03 & AR 10/05
Ch. 10+625 to Ch. 10+725	125m access road AR 10/05 Width 4m	553	Ties-in to AR 10/02 and AR 10/03. Loop around attenuation pond and land access
Ch. 12+110 to Ch. 12+240	130m access road AR 12/01 Width 6m	602/698/699 /704	Provides access to commercial premises. Slight Re-alignment of the existing access as located in close proximity with the proposed N84 grade separated junction
Ch. 12+290 to Ch. 13+090	100m access road AR 12/03 Width 4m	602/698/699 /704	Provides access to land parcel of the commercial premises. Work required to realign existing access as it is located in close proximity with a proposed retaining wall
Ch. 12+540 to Ch. 13+100	630m access road AR 12/04 Width 4m	626, 627, Folio GY96107F, Folio GY51237	Provides access to land parcels via School Road, as current access is severed by the proposed road development. Also provides access to attenuation ponds. Maintains access to the northern portion of Hynes' Bóithrín
Ch. 13+140 to Ch. 13+290	180m access road AR 13/02 Width 4m	705, 651, 627	Provides access via School Road to land parcels as current access is severed by the proposed road development
Ch. 13+390 to Ch. 13+425	45m access road AR 13/03 Width 4m	705, 658	Provides access to land parcels as current access is severed by the proposed road development. Located on an existing access road that connects with School Road. This access road will stem from the existing Castlegar Nursing Home Access Road and as such it must be noted that all landowner's rights of way on this access road will remain unaffected. The landowners affected include but are not limited to the following: 625, 654, 656, 658
Ch. 13+725 (Off the N83 Tuam Road)	25m access road AR 13/05 Width 4m	-	Provides access to attenuation ponds
Ch. 13+825 to Ch. 14+175 (Off the N83 Tuam Road)	470m access road AR 13/06 Width 6m	682, 681, 680, 679, 678, 677,	Provides a new access to individual houses and land parcels which are currently accessed directly from the N83 Tuam Road. Access road will be segregated from N83 Tuam Road

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	**Description**		
		676, 675, 674, 673, 658	
Parkmore Link Road	50m access road AR 13/07 Width 6m	695, 696	Re-alignment of the existing access to commercial premises (Ballybrit Business Park) so as to accommodate the proposed Parkmore Link Road
Parkmore Link Road	35m access road AR 13/08 Varies to tie to existing	695	Re-alignment of the existing access to commercial premises (Ballybrit Business Park) so as to accommodate the proposed Parkmore Link Road
Parkmore Link Road	50m access road AR 13/09 Width 6m	695	Re-alignment of the existing access to commercial premises (Ballybrit Business Park) so as to accommodate the proposed Parkmore Link Road
Parkmore Link Road	20m access road AR 14/04 Width 4m	701	Provides access to land parcel as current access is severed by the proposed road development
Parkmore Link Road	75m access road AR 14/07 Varies to tie to existing	691	Provides access to Galway Racecourse
Parkmore Link Road	20m access road AR 14/08 Width 6m	691	Provides access to Galway Racecourse (Taxi Entrance)
Ch. 15+690 to Ch. 15+720	30 m access road AR 15/04 Width 6m	720, 719	Slight re-alignment of the current access to a commercial premise (from proposed AR 15/03) as it is in close proximity with the proposed S15/02 Underbridge
City East Business Park Junction	55m access road AR 15/05 Width 7m	729, 691	Re-alignment of the existing access road to the Galway Racecourse as part of the near-by junction's upgrade
Briarhill Link	55m access road AR 16/01 Width 6m	724	Provides access to land parcel as current access is severed by the proposed road development and to attenuation ponds
Ch. 16+800 to Ch. 16+830	30m access road AR 16/02 Width 4m	756,	Upgrade/slight re-alignment of an existing access road to serve land parcel severed by proposed development boundary
Ch. 16+950 to Ch. 17+475	560m access road AR 17/01	754,	Provides access to land parcels as current access is severed by the

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	Description		
	Width 4m	751, 752	proposed road development. Connects to existing access road

As noted above, **Table 9.4** below details the access roads which will be public roads.

Table 9.4: Public Access Roads (Table 5.15A of the EIAR)

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	Description		
Gort na Bró road - North	25m access road AR 06/06 Width 6m	-	Provides access to Gateway Retail Park
Gort na Bró road	100m Gateway Retail Park Link Road AR 06/04 Width 7m	-	Realignment of access to Gateway Retail Park Link Road including roundabout
Gort na Bró road	30m access road AR 06/05 Width 6m	-	Access provided to tie the proposed road development in to the existing access road to Gort na Bró housing estate
N59 Link Road South Ch. 1+900	60m access road AR 07/02 Width 6m	-	Provides access to Bun a' Chnoc and Culgharraí housing developments as part of the proposed road development
N59 Link Road South Ch. 1+900	55m access road AR 07/03 Width 6m	-	Provides access to Bun a' Chnoc and Culgharraí housing developments as part of the proposed road development. Ties-in to AR 07/02
Ch. 8+450	30m access road AR 08/04 Width 6m	-	Located just off the N59 (northern part of the proposed road development). Ties-in to existing access road
Ch. 10+825	20m access road AR 10/06 Width 4m	-	Allow for turning movement of the Over Height Vehicles coming from the emergency slip road (prior the Lackagh tunnel) exit the AR network. Access road is a U-turn accessed from AR 10/02
Ch. 10+620 to Ch. 10+700	70m access road AR 10/07 Width 4m		Provides the last exit point for Over Height Vehicles travelling east-bound on the N6 GCRR before to enter the Lackagh tunnel. Connects to AR 10/02
Ch. 11+075 to Ch. 11+575	615m access road AR 11/01 Width 4m	-	Provides re-routing for Over Height Vehicles engaged on the N6 GCRR prior entering the Lackagh Tunnel when travelling west-bound. Also

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	**Description**		
			provides access to attenuation ponds, and Tunnel services building
Ch. 11+990 to Ch. 12+125	245m access road AR 11/02 Width 4m	-	Provides access to the existing Ballindooley Bóithrín as current access is severed by the proposed road development.
Ch. 13+140 to Ch. 13+180	70m access road AR 13/01 Width 4m	-	Re-alignment of the existing Spellman's Bóithrín access road due to the close proximity with the Overbridge S13/01. Provides access to houses and land parcels via School Road
City North Business Park Link	145m access road AR 13/04 Width 6m	-	Provides access to City North Business Park commercial premises as existing access (from the N83 Tuam Road) is severed by the proposed road development. Access to be re-located onto the proposed City North Park Link. Also provides access to attenuation ponds
Parkmore Link Road	45m access road AR 14/05 Width 7m	-	Connects the proposed Parkmore Link Road with the existing Parkmore Industrial Estate internal road
Ch. 14+790 to Ch. 15+000	235m access road AR 14/09 Width 4m	-	Provides the last exit point for Over Height Vehicles travelling east-bound on the proposed road development before to enter the Galway Racecourse Tunnel. Connects to AR 15/01
Ch. 15+125	470m access road AR 15/01 Width 6m	-	Re-alignment of the Racecourse Avenue which provides access to commercial premises, as current access is severed by the proposed road development. Also provides access to proposed Galway Racecourse Tunnel services building, new relocated ESB substation and new relocated telecommunication mast. Ties-in to AR 14/09 but also AR 15/06
Ch. 15+200 to Ch. 15+725	545m access road AR 15/02 Width 6m	691, 716, 701, 718, 719, 710	Provides access to land parcels as current access is severed by the proposed road development. Also provides access to attenuation ponds. Ties-in to AR 15/03 to the south, and to AR 15/06 to the north; also provides access to AR 15/07

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	**Description**		
			users (Over Height Vehicle re-routing option)
Ch. 15+700 to Ch. 15+725	185m access road AR 15/03 Width 6m	-	Provides access to Briarhill Business Park commercial premises (from Parkmore Road) as current access is severed by the proposed road development. The access road is proposed to pass under S15/02 bridge. Provides access to AR 15/04 and to AR 15/02
Ch. 15+150 to Ch. 15+200	120m access road AR 15/06 Width 6m	-	Provides connection (over the Galway Racecourse Tunnel) to AR 15/01 and AR 15/02 to facilitate the re-routing of Over Height Vehicles
Ch. 15+425 to Ch. 15+475	50m access road AR 15/07 Width 4m	-	Provides re-routing for Over Height Vehicles engaged on the proposed road development prior entering the Galway Racecourse Tunnel when travelling west bound. Connects to AR 15/02

9.5 Node Numbering in Appendix D of Appendix A.6.1

9.5.1 Request

Item 8e of the RFI states:

Provide clarification regarding the node numbering convention/node locations utilised in Appendix D 'Highway Link and Turn County Calibration' of Appendix A.6.1 of the EIAR.

9.5.2 Response

Figures 5.1.01 to **5.1.16** in **Appendix A.9.2** to this RFI Response presents the network for the traffic model, including node numbers.

9.6 Details of Watertight seal on Western Approach to Lackagh Tunnel

9.6.1 Request

Item 8f of the RFI states:

Provide information on the design and durability of the proposed watertight seal which will be installed on the underside of the road base and the cutting sides on the western approach to Lackagh Tunnel and within retaining walls.

9.6.2 Response

The western approach structure at Lackagh Tunnel is designed as a continuous reinforced concrete U-shape structure. This provides a continuous structural separation between the roadway and the existing ground / groundwater. The U-shape structure consists of a reinforced concrete base slab below the proposed road pavement and road base including a sealed drainage system. The walls of the U-shape structure consist of either reinforced concrete retaining walls or reinforced concrete secant piled walls. The base slab is integrally connected to the walls. The upper surface of the base slab is provided with a spray applied waterproofing system; and the proposed road is provided with a sealed drainage system; which prevents any surface water from the proposed roadway entering the groundwater through the concrete structure. The reinforced concrete elements have a design life of 120 years and are designed to prevent the ingress of water by means of the concrete structure, similarly if needed the concrete can be repaired or replaced after this period.

At locations of construction joints and movement joints in the reinforced concrete elements waterstops are provided. The waterstops consist of PVC membranes cast into the concrete. When enclosed in a concrete structure, they remain effective as a waterstop for the life of the structure into which it is incorporated.

As noted in Section 2.4 above, the design report for the Lackagh Tunnel is included in Appendix A.7.5 of the Design Report. This report outlines the design of the Lackagh Tunnel (Structure S11/01) including detailed and scaled drawings of the tunnel and approach. Typical details of the waterstops are provided on the drawing GCOB-1700-D-S11-01-027 in Appendix A of the design report, a copy of which is included in **Appendix A.1.4** to this RFI Response.