5. Project Description

5.1 Introduction

As set out in Chapter 1 of this updated EIAR, this is an update to Chapter 5 of the EIAR submitted to An Bord Pleanála in October 2018 as part of the application for approval of the proposed N6 GCRR pursuant to Section 51 of the Roads Act 1993 (as amended) (the "Section 51 Application"). It forms part of the response to the request by ABP for further information in December 2023 where ABP (in addition to a number of other requests) requested GCC to "Update the Environmental Impact Assessment Report". This chapter provides a description of the Project which is more particularly described below for EIA purposes which is considered and assessed in the subsequent chapters of this updated EIAR. Where changes have been made since the 2018 EIAR these have been set out in this updated chapter.

The proposed N6 GCRR, the subject of the Section 51 Application, comprises the construction of approximately 5.6km of a single carriageway from the western side of Bearna as far as the Ballymoneen Road and approximately 11.9km of dual carriageway from Ballymoneen Road to the eastern tie in with the existing N6 at Coolagh, Briarhill, and associated link roads, side roads, junctions, structures and localised works to the existing electricity transmission and distribution networks (specifically comprising of the diversion of the 110kV and 38kV services). The section of the proposed N6 GCRR from the tie-in with the R336 Coast Road to the N59 Letteragh Junction is a protected road[1] and the section from this junction to the tie-in with the existing N6 at Coolagh, Briarhill is a motorway. This overview of the proposed N6 GCRR remains as per the application for approval in 2018.

In its decision on the Section 51 Application, made in respect of the proposed N6 GCRR on 6 December 2021 (ref. no. ABP-302848-18), and while noting that this decision was quashed on the consent of the ABP, ABP had in that decision imposed a condition which required the omission of the permanent stables at Galway Racecourse. Arising from that, in order to ensure the functionality of Galway Racecourse during the construction and operation of the proposed N6 GCRR, Galway Race Committee Trust applied for planning permission for temporary and permanent stables and associated development, which application was granted permission by Galway City Council on 2 December 2024 (Reference 24/60279). This therefore represents a change from the Section 51 Application in 2018 whereby both the temporary and permanent stables formed part of that Section 51 Application in 2018.

The demolition of the existing stables at the racecourse will occur as part of the construction of the proposed N6 GCRR. As set out in that application for planning permission by Galway Race Committee Trust to Galway City Council (ref. 24/60279) and as reflected in condition No. 3 included in the grant of planning permission by Galway City Council, this planning permission will only be implemented if the proposed N6 GCRR is granted approval and is proceeding. Equally, the permanent stables cannot be constructed until post completion of construction and handover of the operational N6 GCRR. This has resulted in the requirement for temporary stables for the continued operation of the racecourse during the demolition of the existing stables and the commissioning of the new permanent replacement stables. These temporary stables are therefore required to be fully operational before the demolition of the existing stables commences. While the application for development consent pursuant to Section 51 of the Roads Act (as amended) in relation to the proposed N6 GCRR and the application for planning permission for which a grant of planning permission issued in relation to the proposed development at Galway Racecourse ("the Galway Race Committee Trust Planning Permission") were and are progressed separately, those developments form part of the Project which is examined and assessed in this updated EIAR.

[1] A protected road means a public road or proposed public road specified to be a protected road in a protected road scheme approved by the An Bord Pleanála. A protected road scheme approved by An Bord Pleanála may provide for the prohibition, closure, stopping up, removal, alteration, diversion or restriction of any specified or all means of direct access to the protected road from specified land or from specified land used for a specified purpose or to such land from the protected road.

Therefore, it is necessary for Environmental Impact Assessment (EIA) and Appropriate Assessment (AA) purposes to assess all aspects of both the proposed N6 GCRR and the proposed development at Galway Racecourse, which for EIA and AA purposes is referred to as the "Project" and has been considered and assessed in this updated EIAR and in the updated AA Screening Report and updated NIS.

Therefore, the term Project, when used throughout this updated EIAR, refers to combination of the proposed N6 GCRR and the proposed development at Galway Racecourse.

Refer to Figures 5.1 to 5.15 for the full extents of the Project.

The Project is located in Galway as shown on Figure 1.1 and the total area within the footprint of the Project Assessment Boundary is approximately 334ha. The total area within the footprint of the development boundary was 280ha in the 2018 EIAR. This increase of 54ha is due to the additional lands included at Galway Racecourse for the purposes of the application for the Galway Race Committee Trust Planning Permission relating to the proposed development at Galway Racecourse for which planning permission has been granted. Of this total area, an area of approximately 180ha is required for the proposed N6 GCRR construction works.

5.2 Background to the Proposed N6 GCRR

As discussed in Chapter 4, Alternatives Considered, there are a number of physical and environmental constraints which are considered in the evolution of the proposed N6 GCRR, such as Galway City, Lough Corrib, the River Corrib, Galway Bay and the surrounding natural environment, the presence of designated sites as well as the constraints of the built environment of the city itself. Elements were included in the design, which allowed the proposed N6 GCRR to avoid or reduce direct and indirect impacts on sensitive environmental receptors including persons and businesses potentially affected.

These avoidance measures which are incorporated as part of the design of the proposed N6 GCRR include the following:

- A bridge over the River Corrib with no instream piers and the piers located in areas of non-Annex I habitat
- A viaduct structure extending from the River Corrib Bridge to traverse University of Galway Sporting Campus
- A viaduct over non-designated priority Annex I habitat at Menlough
- A tunnel beneath a narrow section of the Lough Corrib SAC in Menlough at Lackagh Quarry
- A retaining wall on the southern side of the proposed N6 GCRR at approximately Ch. 9+880 to Ch. 10+050 and on both sides of the proposed N6 GCRR at approximately Ch. 10+850 to Ch. 11+150 to avoid the encroachment on Annex I habitat within the Lough Corrib SAC
- A retaining wall on the southern side of the proposed N6 GCRR at approximately Ch. 8+340 to Ch. 8+380 to reduce the potential impact on a private property
- Galway Racecourse Tunnel structure under the racecourse
- Lowering of the proposed N6 GCRR from an overbridge to at-grade junction at Cappagh Road and changing from an overbridge at Hynes' Bóithrín in Castlegar from being in a cutting to at-grade to reduce the potential impacts on private properties
- Movement of the N59 Letteragh Junction further west and revision of the Coolagh Junction to avoid private dwellings

The provision of the above structures as part of the proposed N6 GCRR (which remain the same as in the 2018 EIAR) have facilitated the avoidance of more densely populated areas of Galway City and avoided the acquisition of additional properties.

As set out in Chapter 1 of this updated EIAR, further to the submission of the Section 51 Application in 2018 and the subsequent response to the Request for Further Information in 2019, certain modifications and their associated environmental assessments were presented on the proposed N6 GCRR at the commencement of the oral hearing before An Bord Pleanála in February 2020 namely:

- Changes to the mitigation proposed for University of Galway (formerly NUIG) Sporting Campus
- Alternative alignment for the southern portion of the Parkmore Link Road through Boston Scientific campus

Further modifications to the proposed N6 GCRR were proposed during the oral hearing and were presented on a series of drawings which were included in the Schedule of Commitments on 4 November 2020[2]. This suite of drawings was originally included in Appendix A.9.1 of the 2019 RFI and they were updated during the oral hearing. The final version of these drawings is shown as Figures 5.6.01 to 5.6.30 in Volume 3 of this updated EIAR. The changes proposed during the oral hearing are as follows:

- Additional access to severed lands for property 106 proposed from Access Road AR 0/02 as shown on Figure 5.6.01 in Volume 3 of this updated EIAR
- Access Road AR 1/01 was amended to facilitate access to properties 131 and 7891 as agreed with these property owners and shown on Figure5.6.02 in Volume 3 of this updated EIAR
- Access Road AR 7/04 was extended further west to provide access to lands severed by a stream which is shown on Figure 5.6.10 in Volume 3 of this updated EIAR
- Connection between Access Road 13/06 and the N83 Tuam Road for pedestrians which is shown on Figure 5.6.18 in Volume 3 of this updated EIAR
- Changes to land ownership boundary details and / or property extents which are reflected in proposed modifications to the Motorway Scheme and Protected Road Scheme and Figures 5.6.01 to 5.6.30 in Volume 3 of this updated EIAR
- Some permanent land acquisition was changed to temporary acquisition which is reflected in proposed modifications to the Motorway Scheme and Protected Road Scheme and Figures 5.6.01 to 5.6.30 in Volume 3 of this updated EIAR
- Some land proposed to be acquired was removed which is reflected in proposed modifications to the Motorway Scheme (Part II) and Protected Road Scheme (Part III) of this 2025 RFI Response
- Additional cycle paths and footpaths were added at Gort na Bró as set out in Drawing GCRR-SK-OH-054 in the Schedule of Commitments on 4 November 2020[2]. This is reflected in the updated series of drawings showing the Pedestrian and Cycle Facilities in Figures 5.7.12 to 5.7.13 of Volume 3 of this updated EIAR. These were originally included in Appendix A.1.13 of the 2019 RFI

A further modification was made post oral hearing based on the decision of ABP Board Order ABP-302885-18:

- Access Road AR 13/02 amended to minimise impacts on landowner whilst providing access to adjoining landowner as shown in Figure 5.6.17 in Volume 3 of this updated EIAR. Further details are provided in Section 5.4.1.2.12

Another further modification was made as a result of the grant of approval by ABP for a development, Glenveagh Large-scale residential development (LRD), at Gort na Bró, Knocknacarra, noting that the approval has subsequently been challenged in judicial review proceedings. This modification includes a bus bay on the southern side of the access road AR 06/04 into Galway Retail Park to align with the proposed bus bay in the LRD development, and all is possible within the proposed land acquisition within the N6 Galway City Ring Road Protected Road Scheme 2018:

[2] https://www.n6galwaycityringroad.ie/sites/default/files/media/GCRR-4.04-019_002%20Chapter%2021%20SoC_I2_Final%2004112020.pdf

- Access Road AR 06/04 amended to add a bus bay to reflect the design of the Knocknacarra District Centre Large-scale Residential Development (LRD) which obtained approval from ABP reference ABP-318687-23. This is shown on Figure 5.7.13 in Volume 3 of this updated EIAR. Further details are provided in Section 5.4.1.2.12

Further, as set out above, the decision of An Bord Pleanála on the Section 51 Application for the proposed N6 GCRR on 6 December 2021, reference ABP-302848-18, conditioned the omission of the permanent stables at Galway Racecourse. Arising from that, Galway Race Committee Trust has, in order to mitigate the significant impacts of the proposed N6 GCRR on the operation of the racecourse and to ensure the continued operation of the racecourse, separately sought planning permission for replacement temporary and permanent stables, and associated development, and planning permission (Reference 24/60279) was granted by Galway City Council on 2 December 2024.

Galway Race Committee Trust in its application confirmed that that separate planning application will only be implemented if the development of the proposed N6 GCRR obtains approval and is proceeding and this is reflected in the conditions attached to the grant of planning permission by Galway City Council.

Furthermore, the N6 Galway City Ring Road Motorway Scheme 2018 is modified as directed by the ABP Board Order ABP-302885-18 as follows:

(v) Plot Number 713a.203 shall be subject to temporary acquisition

(vi) Plot Number 713a.204, Plot Number 713a.101 and Plot Number 713b.101 shall be subject to temporary acquisition to a depth of 1.5 metres below ground level and subject to permanent acquisition to a depth beyond 1.5 metres below ground level.

Some lands are swapped from permanent to temporary landtake in the N6 Galway City Ring Road Protected Road Scheme 2018 as directed by the ABP Board Order ABP-302885-18 as follows:

(ii) Plot number 195a.202 shall be subject to permanent acquisition save for the portion accommodating the final regraded entrance to the existing dwelling which shall be subject to temporary acquisition.

(iii) Plot number 246a.203 shall be subject to permanent acquisition save for the portion accommodating the piped outfall which shall be subject to temporary acquisition with an associated wayleave agreement in favour of the Road Authority.

All these modifications are reflected in the updated documents submitted to An Bord Pleanála in the response to the request for further information and have been taken into account in the assessment of the Project in this updated EIAR and in the updated NIS.

Where guidelines and standards have been updated or new ones have been published are of relevance to the Section 51 Application the design has been reviewed to ensure it is compliant with current standards. The design is compliant, subject to a minor change to the single carriageway, and no additional lands or changes to the vertical alignment are required to deliver a compliant design. All current guidelines and standards have been taken into account in the assessment of the Project in this updated EIAR.

5.3 Project Phases

The Project comprises five phases, which are as follows:

- Phase 1: These works do not form part of the development for which approval is sought as part of the Section 51 Application for the proposed N6 GCRR, however Phase 1 does form part of the Project that has been considered and assessed for EIA and AA purposes. Works undertaken as part of Phase 1 will include the construction of the temporary stableyard, machinery shed, maintenance shed, water supply wells, ESB substation and new pre-parade ring and pavilion on Galway Racecourse lands.
- Phase 2: Works undertaken as part of Phase 2 will include the following:
  - The provision of the proposed N6 GCRR in two stages which will take place concurrently:
    - Stage A - N6 Coolagh Junction to N59 Letteragh Junction

  - Stage B - N59 Letteragh Junction to R336 west of Bearna
  - Existing stableyard at the racecourse to be demolished, including existing well, existing water tank, machinery shed and adjacent car parking
  - Existing commercial building on the lands the subject matter of the N6 Galway City Ring Road Motorway Scheme 2018 to the north of the Galway Racecourse to be demolished and the site cleared
  - Existing horse box parking off Racecourse Avenue to be demolished, including removal of existing access arrangement to the Ballybrit graveyard, to accommodate the Galway Racecourse Tunnel as part of the proposed N6 GCRR

- Phase 3: Again, these works do not form part of the development for which approval is sought as part of the Section 51 Application for the proposed N6 GCRR, however Phase 3 does form part of the Project that has been considered and assessed for EIA and AA purposes. Works undertaken as part of Phase 3 will include construction of the new permanent stableyard upon completion and handover of the proposed N6 GCRR.
- Phase 4: These works do not form part of the development for which approval is sought as part of the Section 51 Application for the proposed N6 GCRR, however Phase 4 does form part of the Project that has been considered and assessed for EIA and AA purposes. Works undertaken as part of Phase 4 will include demolition of the temporary stableyard constructed in Phase 1 and reinstate the site of temporary stableyard as car parking. Retain ESB sub-station, pavilion, machinery shed, maintenance shed and pre-parade ring.
- Phase 5: Relates to the operation of the Project.

5.4 Description of Phase 2: Proposed N6 GCRR

The proposed N6 GCRR follows the alignment as submitted as part of the 2018 EIAR for the majority of its length, but also now takes account of the modifications outlined in Section 5.2. These modifications are described sequentially in this chapter as they occur across the length of the proposed N6 GCRR.

The proposed N6 GCRR ties into the existing R336 Coast Road in An Baile Nua with an at-grade roundabout junction approximately 2km to the west of Bearna Village and then proceeds north and east as a single carriageway to the north of Bearna Village and onwards towards Ballymoneen. Local connectivity is maintained via the Troscaigh/Na Foraí Maola Overbridge Link whilst an at-grade roundabout is proposed at the Bearna to Moycullen (Maigh Cuilinn) Road L1321. At-grade signalised junctions are proposed at Cappagh Road and Ballymoneen Road.

To the east of the Ballymoneen Road Junction, the proposed N6 GCRR is a dual carriageway and continues east to the grade separated N59 Letteragh Junction located in Letteragh. The junction connects to the N59 Moycullen Road via the proposed N59 Link Road North, and to the Letteragh Road and Rahoon Road via the proposed N59 Link Road South. The proposed N6 GCRR continues eastwards to cross the existing N59 Moycullen Road at Dangan and travels on a viaduct over the University of Galway Sporting Campus before crossing the River Corrib on a bridge structure. The total length of the structure through the University of Galway Sporting Campus and over the River Corrib Bridge is 620m.

The University of Galway (UoG) Sports Pavilion will be modified and will continue to function as a sports facility during and post construction. The modifications to the Sports Pavilion at UoG Sporting Campus will be undertaken as enabling works during the summer period prior to commencement of the construction of the proposed N6 GCRR. Welfare facilities at the Sports Pavilion at UoG Sporting Campus will be maintained throughout the construction works.

The Section 51 Application in 2018 included the provision of an all-weather full size GAA pitch and a training pitch at the location of the existing GAA pitches at University of Galway (UoG) Sporting Campus due to the loss of the two number grass-based GAA sized playing pitches adjacent to the River Corrib. However, after the Section 51 Application was made to ABP in 2018 UoG completed their University Sports Masterplan and strategy and identified their future requirements and plans for the University Sporting Campus. UoG confirmed at the oral hearing in February 2020 that they did not want the mitigation measures

originally proposed in the 2018 EIAR and subsequently obtained planning permission from Galway City Council Ref 19/372 which was appealed to ABP Ref ABP-308412-20 for replacement pitches. ABP upheld the decision of Galway City Council and granted permission for the replacement pitches on 19 February 2021. These pitches are at an alternative location on UoG lands in line with their strategy and for UoG to mitigate the impacts of the proposed N6 GCRR on their sports campus and to ensure its continued operation to its requirements and in accordance with its masterplan and strategy.

To ensure interconnection for UoG Sporting Campus post completion of the construction of the proposed N6 GCRR, Galway County Council will provide UoG with a right for UoG to use the lands under the proposed viaduct for sporting/athletic purposes by way of a long lease. This commitment has been included in the Schedule of Environmental Commitments.

East of the River Corrib the proposed N6 GCRR continues east on embankment toward the Menlough Viaduct. Additional lands to the north of Menlo Castle are included as part of the proposed development to provide lands for the enhancement of the core foraging habitat for the Lesser horseshoe bat known to roost at Menlo Castle and to mitigate against potential impacts to this species. These lands will be planted with additional hedgerows, maintained as agricultural lands by the local authority and will remain in their ownership.

Continuing east the proposed N6 GCRR crosses over Bóthar Nua in the townland of Menlough and remains on a viaduct section, Menlough Viaduct (length 320m), towards Seanbóthar before entering a section of cut preceding Lackagh Tunnel (length 250m) immediately west of Lackagh Quarry and exits the tunnel in the quarry. There is a tunnel maintenance building located adjacent to Lackagh Tunnel.

The proposed N6 GCRR continues east with a grade separated junction located at the N84 Headford Road Junction at Ballinfoyle and continues east through the townland of Castlegar to the grade separated junction at N83 Tuam Road. This junction provides access to both the N83 Tuam Road and the proposed Parkmore Link Road between the Ballybrit Business Park and the Parkmore Industrial Estate via the proposed City North Business Park Link Road to provide full connectivity at this location.

The southern portion of the Parkmore Link Road was originally routed along an existing IDA road passing between Boston Scientific and Hewlett Packard and the old APC site in the Section 51 Application from 2018. However, Boston Scientific subsequently acquired the site formerly occupied by APC which allowed them to expand their activities at this location to both sides of the IDA road and brought this vacant industrial building back into a high value use. The route of what was originally proposed for the Parkmore Link Road as set out in the 2018 EIAR created a conflict with necessary daily movements of both people and plant between Boston Scientific activities to the east and west of the proposed link road. Galway County Council took cognisance of this change of land ownership and of the masterplan for the expanded Boston Scientific campus and sought a modification to the route for the section of the Parkmore Link Road within the Boston Scientific lands at the commencement of the oral hearing in 2020. This new route served the transport functionality of the original proposal at this location and achieved the objectives of the original alignment as follows:

- Provides the necessary link for the public transport network envisaged in the GTS and as detailed in Chapter 3 of this updated EIAR, our analysis indicates it would also be envisaged in any update to the GTS
- Provides dedicated cycle lanes as required of the primary cycle network in the GTS (and as detailed in Chapter 3 of this updated EIAR, our analysis indicates it would also be envisaged in any update to the GTS), and pedestrian facilities are also provided
- Provides a connection to the proposed N6 GCRR to enable dispersal of traffic directly to its destination

In achieving the objectives set out above, it enables the type of compact employment centre located where it is easily accessed by active travel and public transport modes from the city's residential area. The alignment of the southern portion of the Parkmore Link Road is retained in this updated EIAR in accordance with the modification presented at the oral hearing in 2020 and for which the local authority sought such a modification to the proposed N6 GCRR (and this modification did form part of the Section 51 Approval that was since quashed and remitted back to An Bord Pleanála).

The proposed N6 GCRR then continues eastwards entering the Galway Racecourse Tunnel (length 230m) at Ballybrit to the north of the racetrack which results in the demolition of the existing stables. As noted in Section 5.2 Galway Race Committee Trust has subsequently applied for planning permission for replacement temporary and permanent stables, and associated development, to address/mitigation against the loss of stables and to ensure the continued operation of the racecourse.

As set out earlier, planning permission (Reference 24/60279) was granted to Galway Race Committee Trust by Galway City Council on 2 December 2024. The lands on which the temporary stables are located is in the infield of Galway Racecourse and in the ownership of Galway Race Committee Trust. In relation to the location of the permanent stables, the landowner and the tenant of that landholding, (subject to having the necessary planning permission from Galway City Council (Reference 24/60279), which has been granted), have consented to the construction of the permanent stables in the same location as presented in the 2018 EIAR. As noted in Section 5.1,the Galway Race Committee Trust Planning Permission will only be implemented if the proposed N6 GCRR is granted approval and is proceeding. These lands upon which the permanent stables are to be built are also acquired temporarily for the purposes of the construction of the Galway Racecourse Tunnel and therefore are in included in the Motorway Scheme as a temporary acquisition.

There is a tunnel maintenance building located adjacent to the Galway Racecourse Tunnel. On emerging from the tunnel, the proposed N6 GCRR continues south, crossing over the R339 Monivea Road on embankment and continuing south to enter a cutting as it reaches its junction with the existing N6 at Coolagh Junction. The proposed Coolagh Junction will be a fully grade separated junction with partial free flow on the major movements.

The proposed N6 GCRR will also include extensive landscape planting for screening and the creation of specific habitat areas to compensate for loss of habitat elsewhere. To mitigate noise impacts across the proposed N6 GCRR, a low noise road surface (LNRS) is incorporated into the design to reduce noise at source. In addition, an extensive scheme of noise barriers has also been incorporated into the design to further reduce noise levels along the proposed N6 GCRR.

The proposed plan layout shown on Figures 5.1.01 to 5.1.15 and the plan and profile of mainline and side roads for the proposed N6 GCRR shown on Figures 5.2.01 to 5.2.15 and Figures 5.3.01 to 5.3.21, respectively represent the design inclusive of all amendments at the conclusion of the oral hearing in 2020. The proposed N6 GCRR has been designed to a sufficient level of detail for a full and complete environmental impact assessment of all potential direct and indirect impacts (including cumulative impacts).

5.4.1 Design Standards for the Proposed N6 GCRR

A review of the design of the mainline, junctions, link and connector roads and non-motorised user facilities for the proposed N6 GCRR was undertaken as part of this EIAR update to ensure that the design is compliant with the TII current design standards available on the TII Publication's website, the TII Manual of Contract Documents for Road Works (MCDRW), the Department of Transport's Design Manual for Urban Roads and Streets (DMURS) and the National Transport Authority's National Cycling Manual. The design is compliant, subject to a minor change to the climbing lane on the single carriageway noted below in Section 5.4.1.1.1, and no additional lands or changes to the vertical alignment are required to deliver a compliant design. All of the link roads and side roads remain unchanged as part of this EIAR update.

As the proposed N6 GCRR is spread between urban and rural environment consideration has been given to allow for safe provision of non-motorised users within the fenceline for the proposed N6 GCRR using the above standards. The following TII Publications are particularly still relevant to the design and the latest version of these guidelines have not resulted in changes to the design that would alter the landtake or potential environmental impacts:

- DN-GEO-03031 – Road Link Design (April 2017)
- DN-GEO-03060 – Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated, and compact grade separated junctions) (May 2023)
- DN-GEO-03036 – Cross-Sections and Headroom (May 2023)

- Design Manual for Urban Roads and Streets (September 2023)
- National Transport Authority, National Cycling Manual (August 2023)

In addition to the above design documents further guidance was drawn as necessary from relevant published data.

5.4.1.1 Proposed Road Type and Cross-Section

5.4.1.1.1 Mainline

From the R336 Coast Road to Ballymoneen, the mainline of the proposed N6 GCRR is a Type 1 Single Carriageway in accordance with TII Publication DN-GEO-03036 (Cross-Sections and Headroom). This section of mainline will be designated as a protected national road. The design speed of the mainline over this area is 85km/h. The cross-section, shown in Plate 5.1, is as follows and is as presented in the 2018 EIAR:

Western Verge Width (minimum): 3.0m

Western Hard Shoulder: 2.5m

Carriageway Width: 7.3m (2 x 3.65m lanes)

Eastern Hard Shoulder: 2.5m

Eastern Verge Width (minimum): 3.0m

Total Width (minimum): 18.3m

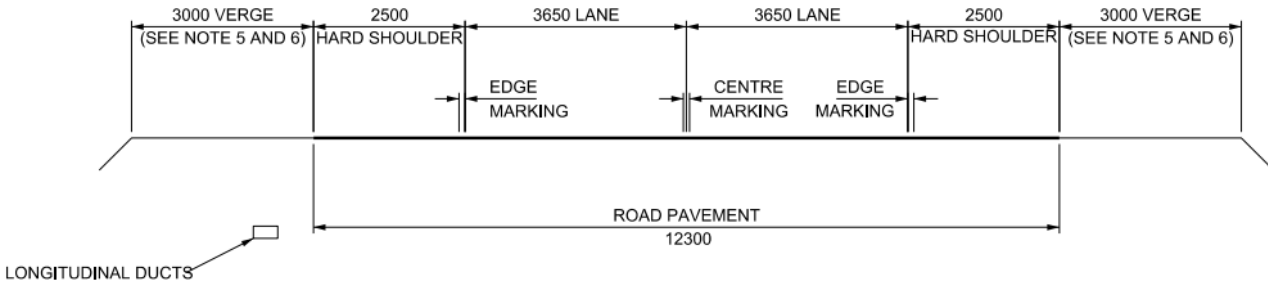

Plate 5.1 Typical cross-section of the Type 1 Single Carriageway Link from the R336 to Ballymoneen

Climbing lanes are incorporated on the single carriageway at two locations, one in the eastbound direction and one in the westbound direction. These are designed in accordance with DN-GEO-03031. As non-motorised users are permitted on the protected road, the TII standard DN-GEO-03036 was updated in May 2023 to ensure that the design follows 'cycle friendly' principles. This results in an increase in the cross-section width of the hard strip on the climbing lanes to a minimum 1.5m hard strip instead of the 0.5m provided previously to maintain space for cyclists over the length of the climbing lanes and has been reflected in this updated EIAR and has been assessed. This can be accommodated within the current proposed landtake for the proposed N6 GCRR.

From Ballymoneen Road to the eastern tie in with the existing N6 at Coolagh, Briarhill the mainline of the proposed N6 GCRR is a Standard Dual Carriageway Urban Motorway (D2UM) in accordance with DN-GEO-03036. The mainline from Ballymoneen Road to the N59 Letteragh Junction will be designated as a Protected National Road and the mainline from the N59 Letteragh Junction to the N6 Coolagh Junction will be designated as a motorway, however, the cross-sections remain the same. The design speed of the mainline over this area is 100km/h. The cross-section, illustrated by Plate 5.2, is as follows and is as presented in the 2018 EIAR:

Western Verge Width (minimum): 3.0m

Western Hard Shoulder Width (minimum): 2.5m

Western Carriageway Width: 7.0m (2 x 3.5m lanes)

Central Reserve Width (minimum):	2.6m (including 2 x 1.0m offside hardstrip)
Eastern Carriageway Width:	7.0m (2 x 3.5m lanes)
Eastern Hard Shoulder Width (minimum):	2.5m
Eastern Verge Width (minimum):	3.0m
Total Width (minimum):	**27.6m**

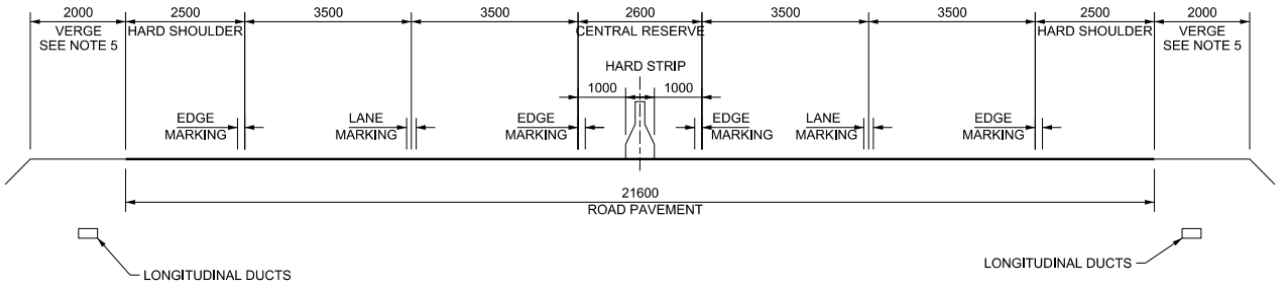

Plate 5.2 Typical cross-section of the Dual Carriageway Urban Motorway Link from Ballymoneen to Coolagh

Between the N84 Headford Road Junction and the N83 Tuam Road Junction the mainline cross-section will widen to 34.6m to accommodate a third lane in each direction (3 x 3.5m lane). This is to cater for the forecasted traffic between these junctions and is as presented in the 2018 EIAR.

The cross-sections at the River Corrib Bridge and Menlough Viaduct consist of the same as described above with the exception of the hard shoulder width which is reduced to 0.5m and a raised verge of 0.6m (excluding widening requirements for visibility) and is as presented in the 2018 EIAR.

The cross-sections of the Lackagh Tunnel and the Galway Racecourse Tunnel differ from that required for a Standard Dual Carriageway Urban Motorway in accordance with DN-GEO-03036. These cross-sections are dictated by national and international best practice with respect to tunnel layouts, geometric parameters such as stopping sight distance, the provision of space for operational equipment and the provision of safe access and egress in cases of emergency. Cross-sections of both tunnels consist of 2 x 3.75m lanes in both directions, minimum nearside and offside 0.5m hard strip (excluding widening requirements for visibility) and 1.2m walkways nearside and offside. A minimum maintained headroom of 5.3m is provided in both tunnels. The tunnel cross-sections remain as presented in the 2018 EIAR.

5.4.1.1.2 Link Roads

There are four main link roads included as part of the proposed N6 GCRR:

- N59 Link Road North and is as presented in the 2018 EIAR
- N59 Link Road South and is as presented in the 2018 EIAR
- Parkmore Link Road and is as presented at the commencement of the 2020 oral hearing outlined above
- City North Business Park Link and is as presented in the 2018 EIAR

A signalised grade separated junction at Letteragh connects the proposed N6 GCRR to the N59 Moycullen Road via the N59 Link Road North and to the Rahoon and Letteragh Roads to the south via the N59 Link Road South and is as presented in the 2018 EIAR.

The Parkmore Link Road forms part of the N83 Tuam Road Junction. The Link Road connects the Parkmore Industrial Estate to Ballybrit and City East Business Parks, providing a new access/egress to these estates as well as to the N83 Tuam Road. The southern portion of the Parkmore Link Road traverses the Boston Scientific campus on the eastern boundary. Access to the N83 Tuam Road is facilitated via City North Business Park Link. All link roads described above consist of a footpath in either direction with a minimum width of 1.8m in accordance with DN-GEO-03036 (May 2023). These link roads are detailed below in Table 5.1 and are as presented in the 2018 EIAR.

Table 5.1 Link Roads

Road Name	Lane Width	Footpath	Cycle Lane	Length	Chainage
N59 Link Road North & South	2 x 3.5m	Min 1.8m	2.0m (Ch. 1+500 – 2+220)	2200m	Ch. 7+575
City North Business Park Link	2 x 3.5m	Min 1.8m	2.0m	420m	Ch. 14+000
Parkmore Link Road	2 x 3.5m	Min 1.8m	2.0m	1650m	Ch. 14+375

5.4.1.1.3 Side Roads

Side roads which require redesign and realignment for the proposed N6 GCRR have been designed in accordance with the standards noted in Section 5.4. Table 5.2 details all side roads, both on-line and off-line, all of which remain as presented in the 2018 EIAR.

Table 5.2 Side Roads

Road Name	Lane Width	Length	Approx. Chainage	Comment
R336 Coast Road West	2 x 3m	245m	Ch. 0+030	Realignment of R336 Coast Road west to proposed roundabout, Bearna West Roundabout, at Baile Nua.
R336 Coast Road East	2 x 3m	90m	Ch. 0+030	Realignment of R336 Coast Road east to proposed roundabout, Bearna West Roundabout, at Baile Nua.
Na Foraí Maola to Troscaigh Link Road North	2 x 3m	500m	Ch. 1+400	Link road to connect existing local roads north and south of the proposed mainline via overbridge.
Na Foraí Maola to Troscaigh Link Road South	2 x 3m	730m	Ch. 1+400	Link road to connect existing local roads north and south of the proposed mainline via overbridge.
Na Foraí Maola to Troscaigh Overbridge Link	2 x 3m	200m	Ch. 0+190	Link road connecting Na Foraí Maola to Troscaigh Link Road North and Na Foraí Maola to Troscaigh Link Road South.
L1321 Bearna to Moycullen Road North	2 x 3m	170m	Ch. 2+800	Realignment and tie into proposed Bearna East Roundabout.
L1321 Bearna to Moycullen Road South	2 x 3m	170m	Ch. 2+800	Realignment and tie into proposed Bearna East Roundabout.
L5384 Aille Road	2 x 3m	270m	Ch. 3+310	Realignment of L5384 Aille Road for proposed mainline underbridge.
Cappagh Road North	2 x 3m	140m	Ch. 4+450	Realignment and tie into proposed signalised junction.
Cappagh Road South	2 x 3m	230m	Ch. 4+450	Realignment and tie into proposed signalised junction.
Ballymoneen Road North	2 x 3m	230m	Ch. 5+650	Realignment and tie into proposed signalised junction.
Ballymoneen Road South	2 x 3m	130m	Ch. 5+650	Realignment and tie into proposed signalised junction.

Road Name	Lane Width	Length	Approx. Chainage	Comment
Rahoon Road	2 x 3m	290m	Ch. 6+350	Redesign of Rahoon Road at Mincloon to accommodate mainline overbridge.
Clybaun Road	2 x 3m	410m	Ch. 6+350 to Ch. 6+650	Redesign of Clybaun Road at Mincloon to accommodate mainline overbridge and staggered junction.
Rahoon Road	2 x 3m	290	N59 Link Road Ch. 2+200	Redesign Rahoon Road at Gort na Bro to tie to proposed signalised junction with Letteragh Link Road South.
Gort na Bró Road	2 x 3m	270m	N59 Link Road Ch. 2+200	Redesign of Gort na Bró Road to tie to proposed signalised junction with Rahoon Road (Rahoon Road Junction) and N59 LRS+.
Letteragh Road	2 x 3m	780m	Ch. 7+250	Redesign of Letteragh Road to tie into proposed signalised junction with Letteragh Link Road South and proposed mainline overbridge.
N59 Moycullen Road	2 x 3.5m	350m	N59 LRN* Ch. 0+000	Redesign of N59 Moycullen Road at Bushypark to tie in to proposed signalised junction with Letteragh Road North.
N59 Moycullen Road	2 x 3.5m	390m	Ch. 8+500	Redesign of N59 Moycullen Road at Dangan to accommodate proposed mainline overbridge.
Bóthar Nua	2 x 3m	260m	Ch. 10+110	Redesign of Bóthar Nua at Coolough to accommodate proposed mainline overbridge.
Sean Bóthar	2 x 3m	250m	Ch. 10+475	Realignment and tie into existing.
N84 Headford Road	2 x 3.5 lanes transitioning to 4 x 3.5m	400m	Ch. 12+125	Redesign of N84 Headford Road to accommodate proposed grade separated junction.
School Road L2134	2 x 3m	240m	Ch. 13+150	Redesign of L-2134 School Road, Castlegar to accommodate proposed mainline underbridge.
N83Tuam Road	2 x 3.5 lanes transitioning to 4 x 3.5m 1x3.25m Bus Lane	1060m	Ch. 14+000	Redesign of N83 Tuam Road to accommodate proposed grade separated junction.
N6 Bóthar na dTreabh at City East Business Park	4 x 3.5m lanes	300m	N/A	Provision of signalised junction access from N6 Bóthar na dTreabh to City East Business Park.
Briarhill Business Park Road	2 x 3.5m lanes	190m	Ch. 15+730	Redesign of Briarhill Business Park road to accommodate proposed mainline overbridge
R339 Monivea Road	2 x 3.5m	275m	Ch. 15+850	Redesign of Monivea Road R339 to accommodate proposed mainline overbridge
Ballybrit Crescent	2 x 3.5m	200m	Ch. 15+850	Redesign of Ballybrit Crescent Road

Note:

*N59 LRN = N59 Link Road North

N59 LRS = N59 Link Road South

5.4.1.2 Other Design Aspects of the proposed N6 GCRR

This section describes the design of other aspects of the proposed N6 GCRR. Reference is made to the relevant guidance on which the design is based. The Design Report for the proposed N6 GCRR contains the technical detail associated with the structures, attenuations ponds etc and can be found at https://www.n6galwaycityringroad.ie/Volume 4, Appendix,A101,Design,Report,DR/.

5.4.1.2.1 Traffic Signs

Signage will be provided along the proposed N6 GCRR to ensure that clear directional and regulatory messages are transmitted to drivers and other road users and has been included in the design. The design of the signs and road marking is based on the Traffic Signs Manual issued by the Department of Transport and complemented by series 1200 of TII MCDRW (published in 2019), the National Cycle Manual by the National Transport Authority, and the Design Manual for Urban and Streets (DMURS) also compiled by the Department of Transport. Whilst the Traffic Signs Manual was updated in 2021, the National Cycle Manual in 2023 and DMURS in 2023, the new publications have not resulted in material changes to the proposed N6 GCRR There are 29 gantries signs, which will support advanced directional signage, proposed as part of the proposed N6 GCRR. The updated series of drawings showing the Pedestrian and Cycle Facilities in Figures 5.7.01 to 5.7.22 of Volume 3 of this updated EIAR also show details of the signals and signage at the junctions. These were originally included in Appendix A.1.13 of the 2019 RFI.

Pedestrian and Cyclist Provision

As outlined in previous chapters of this updated EIAR, the proposed N6 GCRR is a key element of a wider transportation strategy for Galway City and its environs, the Galway Transport Strategy (GTS). The GTS examines and provides for the needs of all modes of transport including but not limited to cyclists, pedestrians, public transport users, private motorists etc. Information on this strategy can be obtained by visiting the Galway City Council website (http://www.galwaycity.ie/galway-transport-strategy/). Refer to Pedestrian and Cycle Facilities in Figures 5.7.01 to 5.7.22 of Volume 3 of this updated EIAR. These were originally included in Appendix A.1.13 of the 2019 RFI.

The proposed N6 GCRR interacts with the existing road network at numerous locations along its extent. The existing networks at these locations act as multi modal corridors and as a result required particular attention and care when designing suitable provisions. An overview of the interactions along the extent of the proposed N6 GCRR along with the provisions at each location is detailed below all of which remain as presented in the 2018 EIAR unless noted otherwise.

Bearna West Roundabout

The Bearna West Roundabout is located on the R336 Coast Road west of Bearna Village. Footpaths are provided on each arm of the junction which facilitates pedestrian crossings away from the flaring of the approaches.

Na Foraí Maola to Troscaigh Overbridge

An overbridge with footpaths on both sides is provided in this area. These footpaths extend from the structure along the upgraded overbridge link road to maintain connectivity north and south of the proposed N6 GCRR to the Na Foraí Maola and Troscaigh area.

Bearna East Roundabout

The Bearna East Roundabout is located on the Bearna to Moycullen Road (L1321) north of Bearna Village. Footpaths are provided on each arm of the junction which facilitates pedestrian crossing away from the flaring of the approaches. The area is remote from amenities and services and there is low pedestrian activity in the area.

An Chloch Scoilte

An overbridge is provided in this area. There is no direct connection provided to the mainline of the proposed N6 GCRR. Footpaths are provided on the overbridge. These footpaths extend from the structure along the upgraded Aille Road (L5384) and connect into the An Chloch Scoilte Road (L5385).

Cappagh Road Junction
A signalised junction is provided in order to enhance operational safety and performance and to facilitate the efficient movement of all road users. Footpaths are provided on each arm of the junction. These footpaths connect into the existing networks in the area.

Ballymoneen Road Junction
A signalised junction is provided in order to enhance operational safety and performance and to facilitate the efficient movement of all road users. Footpaths are provided on each arm of the junction. These footpaths connect into the existing networks in the area.

Rahoon Road
An underbridge is provided in this area. There is no direct connection provided to the mainline of the proposed N6 GCRR. Footpaths are provided on the Rahoon Road. These footpaths extend from the structure along the upgraded Rahoon Road and connect into the existing road network.

Letteragh Road
A signalised junction is provided in order to enhance operational safety and performance and to facilitate the efficient movement of all road users. Footpaths are provided on each arm of the junction.

Dedicated footways are provided through the junction on the N59 Link Road South, a dedicated cycleway is provided on the southern arm of this junction to Rahoon Road as per the GTS. These cycleways and footways connect into the existing networks in the area.

N59 Letteragh Junction
Signalised junctions are provided in order to enhance operational safety and performance and to facilitate the efficient movement of all road users. Dedicated crossing points are provided on each arm of the junction. Dedicated footways are provided through the junction on the N59 Link Road South as per the GTS. These footways connect into the existing networks in the area.

Bushypark Junction
A signalised junction is provided in order to enhance operational safety and performance and to facilitate the efficient movement of all road users. Footpaths are provided on each arm of the junction. Dedicated footways are provided on the N59 Link Road North. The need for this provision arose from the GTS. These footways connect into the existing networks in the area.

Rahoon Road Junction
A signalised junction is provided in order to enhance operational safety and performance and to facilitate the efficient movement of all road users. Footpaths are provided on each arm of the junction. Dedicated cycleways and footways are provided on the N59 Link Road South and footways on the Gort Na Bró Link Road as per the GTS. These cycleways and footways connect into the existing networks in the area.

Gateway Retail Junction
Gateway Retail Junction is a simple junction providing connectivity to the Gort na Bró Road from existing residential areas. The existing network provides dedicated footways and these are maintained in the design. A two-way segregated off-road cycle path is provided in the verge on the Gort na Bró Road from the Gael Scoil Mhic Amhlaigh to the Rahoon Road which was attached to the Schedule of Commitments on 4 November 2020 as per drawing GCRR-SK-OH-054 and is now included in Figure 5.7. of this updated EIAR.

Gort na Bró and Western Distributor Road Junction
As per drawing GCRR-SK-OH-054 which was attached to the Schedule of Commitments on 4 November 2020 and is now included in Figure 5.7.13 of this updated EIAR, full pedestrian and cycle provision is provided at this junction to enable safe access from the existing cycle lanes on the Western Distributor Road north to Gael Scoil Mhic Amhlaigh and south to St John the Apostle School. A 2m cycle track is provided from Gort na Bró Roundabout to Gael Scoil Mhic Amhlaigh on both sides.

N59 Moycullen Road Area

An overbridge is provided in the area where the mainline of the proposed N6 GCRR crosses the N59 Moycullen Road. There is no direct connection provided to the mainline of the proposed N6 GCRR. Footpaths are provided in the area. These footpaths extend from the location of the structure along the upgraded N59 Moycullen Road and connect into the existing networks.

Bóthar Nua (Coolough Road)

An underbridge is provided in the area where the mainline of the proposed N6 GCRR crosses Bóthar Nua. There is no direct connection provided to the mainline of the proposed N6 GCRR. The existing road serves all modes. There are no footpaths or dedicated cycleways in the area. It is not proposed to provide isolated footpaths/cycleways in the area.

Seanbóthar (Menlo)

An underbridge is provided in the area where the mainline of the proposed N6 GCRR crosses Seanbóthar. There is no direct connection provided to the mainline of the proposed N6 GCRR. However, there is a diverge from the mainline to Seanbóthar to accommodate the egress of over height and emergency vehicles from Lackagh Tunnel. Seanbóthar is an existing access road which primarily serves agricultural traffic. Footpaths are provided along the section of road beneath the structure.

N84 Headford Road

Dedicated crossing points are provided on each arm of the junction. Dedicated footways are provided through the junction. These footways connect into the existing networks in the area.

School Road Castlegar

An overbridge is provided in this area. There is no direct connection provided to the mainline of the proposed N6 GCRR. Footpaths are provided on the overbridge. These footpaths extend from the structure along the upgraded School Road (L2134) and connect into the existing road network.

N83 Tuam Road Junction and Parkmore Link Road

Signalised junctions are proposed where diverge and merge arms interact with the existing N83 Tuam Road. Signalised junctions are provided in order to enhance operational safety and performance and to facilitate the efficient movement of all road users. Dedicated crossing points for pedestrians and cyclists are provided on each arm of the junction. Dedicated cycleways and footways are provided through the junction in line with the GTS. These cycleways and footways will connect into the existing and proposed networks in the area. A dedicated inward bus only lane, as per the GTS, is also accommodated within the design.

The Parkmore Link Road is proposed to connect major industrial areas of Galway City. This is an urban street and dedicated cycleways and footways are provided along its length. The Parkmore Link Road is a key component of the GTS which has been identified as being one of the infrastructure measures to cater for public transport between the Ballybrit and Parkmore industrial estates. It facilitates the interchange of bus routes servicing these industrial estates thus increasing the level of provision of public transport into the whole of the north eastern quarter of the city. It also provides a shorter direct route with full provision of appropriate infrastructure along the desire line for both pedestrians and cyclists to the industrial estates of Parkmore and Ballybrit. City North Business Park Link provides connectivity between the proposed Parkmore Link Road and the existing N83 Tuam Road.

This link has dedicated cycleways and footways as per the GTS thereby linking the networks for all modes in the area. All of this culminates in the encouragement of a modal shift to sustainable transport measures.

Signalised junctions are proposed along Parkmore Link Road for the junctions with the entry/exit loops from the N6 GCRR and for the Business Park Junction 2 which is a four arm junction connecting the City North Business Park Link to the realigned Parkmore Link Road on the eastern Boston Scientific campus and AR 13/10. Signalised junctions are provided in order to enhance operational safety and performance and to facilitate the efficient movement of all road users. Dedicated crossing points for pedestrians and cyclists are provided at each junction location.

Ballybrit Crescent Junction

Ballybrit Crescent Junction is an existing signalised junction. The upgrade of this junction as part of the proposed N6 GCRR caters for the requirements of the GTS which includes a dedicated bus lane and dedicated cycle facilities (recently constructed). Footpaths are maintained in the area at the current level of provision.

Lynch Junction

Lynch Junction is an existing signalised junction. This junction was previously upgraded to signalisation to enhance operational safety and performance and to facilitate the efficient movement of all road users. No works are proposed to be undertaken on the Lynch Junction at Briarhill as part of the proposed N6 GCRR. The proposed N6 GCRR will connect to the junction only.

City East Business Park Junction

There is currently a merge lane from City East Business Park to the existing N6 at this location. As part of the proposed N6 GCRR it is proposed to provide a signalised junction. Footpaths are proposed on the City East Business Park Road. Footpaths are not proposed on the N6 Bóthar na dTreabh.

Coolagh Junction

The eastern terminus of the proposed N6 GCRR connects to the existing N6 at Coolagh, Briarhill. The provision of a full movement, high quality junction at the intersection of the proposed N6 GCRR and the existing N6 terminus is necessary due to the fact that the N6 is the primary access to Galway from the east and has become the primary access to Galway from the south since the opening of the M17/M18.

The existing road serves all modes. There are no footpaths or dedicated cycleways in the area. It is not proposed to provide isolated footpaths/cycleways in the area as safer alternatives are available. From the signalised junction to the east, motorway restrictions will apply.

The proposed pedestrian and cyclist provisions are shown on Figures 5.7.01 to 5.7.22 in Volume 3 of this updated EIAR.

5.4.1.2.2 Fencing and Barriers

At the beginning of the construction phase the land to be acquired as per the proposed fenceline for the proposed N6 GCRR will be fenced and access across it restricted. Temporary construction fencing or hoarding may be required during construction prior to the installation of permanent fencing to secure the site and prevent unauthorised access.

Fencing will be erected from the proposed road side of the fence. In areas where the lands within the proposed fenceline includes Annex I habitat within Lough Corrib SAC the permanent fencing will be located between the proposed road and the Annex I habitat and will not be located within the habitat areas.

Fence types will vary across the proposed N6 GCRR depending on the different requirements and maybe temporary in nature. Fence types will include timber post and rail fencing, masonry walls, steel palisade fencing, noise barriers, parapets etc. Fencing, safety barriers and parapets on the proposed N6 GCRR will be provided to meet the requirements of the current TII Publications and guidance documents.

Standard detailed fencing typically used on schemes of this nature will be used however site specific requirements may differ between rural and urban environments across the proposed N6 GCRR. Existing residential and commercial boundary walls impacted by the proposed N6 GCRR will be replaced.

A vehicle restraint system design has been completed in accordance with DN-REQ-03034 Safety Barriers and DN-STR-03011 (The Design of Vehicle and Pedestrian Parapets). Whilst DN-REQ-03034 was updated in May 2019 the design of the proposed N6 GCRR is compliant with the updated standard. The DN-STR-03011 standard is unchanged since 2017. All hazards located within the clear zone have been addressed as per hazard definitions, classifications, and ranking. Fencing within the defined clear zone of vehicular traffic will need to be installed as timber post and tension mesh fencing in accordance with TII Publication DN-REQ-03034. See also Chapter 8, Biodiversity for the location of mammal proof fencing and Chapter 18, Noise and Vibration for noise mitigation and their associated figures for their locations.

Drawings of the proposed fence types are included in Figures 5.5.01 to 5.5.30 in Volume 3 of this updated EIAR. These figures were originally submitted as A.1.9 of the 2019 RFI. The standard construction details for gates and stone walls are included Appendix A.5.4 of this updated EIAR.

5.4.1.2.3 Lighting

The road lighting design shall meet the requirements of BS5489-1 (updated in May 2020), IS EN 13201 (unchanged since 2018) and the UK DMRB TD 34-07 (unchanged since 2018) and TII addendum (DN-LHT-03038) TII addendum (DN-LHT-03038. This will ensure that light pollution is kept to a minimum. Whilst BS5489-1 was updated in May 2020 the design of the proposed N6 GCRR is compliant with the updated standard.

The proposed road lighting installation has been considered and designed with limiting light trespass as a key priority.

Multiple measures have been taken to ensure that light is applied only where it is required. In addition to traditional good practice design approaches, modern and emerging technologies have been applied to limit the light spill. For the road lighting, these generally include:

- The use of LED lanterns with well-defined and controlled light beam distributions, mounted on columns with a maximum height of 10m. When compared with traditional discharge lamps and lantern technologies, this will provide a significant reduction in light trespass to surrounding areas and properties
- The lanterns are mounted on bracket arms with a 0° tilt to the horizontal, where a 5° tilt would have been typical with older technologies or in less sensitive areas of application
- The LED lanterns emit 0% of their light above the horizontal, meaning no light is directly emitted into the night-sky. The lanterns have been selected to ensure that light directed behind the lantern is minimised

All of the above factors combine to produce a design that is compliant with the relevant standards previously quoted, but also a design that has paid due attention to the sensitive nature of the surrounding areas. It is proposed to provide public lighting at roundabouts on the proposed N6 GCRR for reasons of safety. Lighting is also provided at Cappagh Road, Ballymoneen Road, N59 Letteragh, N84 Headford Road, N83 Tuam Road and the Coolagh Junctions and associated slip roads in accordance with TII Guidelines. There will also be lighting provided at the entrances to both the Lackagh Tunnel and Galway Racecourse Tunnel.

The City North Business Park Link, Parkmore Link and N59 Link Road North and South will also be lit as they are urban roads. Lighting will be provided at the car parks for the tunnel maintenance buildings at Lackagh Quarry.

There is currently lighting on the Ballybrit Crescent Junction, the southern section of the existing N83 Tuam Road (Ch. 14+000), the N59 Moycullen Road and the southern portion of the Rahoon Road at the proposed Rahoon Road Junction. The lighting provision in these areas shall be extended to tie into that of the proposed N6 GCRR.

The road lighting column heights and their proposed locations along with the potential light spill are shown on Figures 5.4.01 to 5.4.15. The proposed lighting of the carparks at the tunnel services buildings is included in Appendix A.5.1. The potential direct and indirect impacts of the proposed lighting on ecology is assessed in Chapter 8, Biodiversity and on human beings in Chapter 12, Landscape and Visual and Chapter 19, Human Beings, Population and Health.

5.4.1.2.4 Earthworks and Road Surfaces

The aspects relating to earthworks such as quantities, proposed site compounds and haul routes are discussed in Chapter 7, Construction Activities and Chapter 9, Soils and Geology.

The pavement design for all roads has been carried out considering the appropriate design life and axle loading in accordance with current TII document PE-SMG-02002 addendum to HD 24/06 Traffic Assessment (unchanged since 2018) and DN–PAV-03021 Pavement and Foundation Design (updated in August 2022). Low noise surfacing will be used for the full length of the mainline of the proposed N6 GCRR and at junctions. Whilst DN–PAV-03021 was updated in August 2022 the design of the proposed N6 GCRR is compliant with the updated standard.

5.4.1.2.5 Structures

The proposed N6 GCRR includes a total of 164 structures as per the 2018 EIAR. Table 5.3 below gives a summary of the 164 structures included in the proposed N6 GCRR.

Table 5.3 Structures Overview

Structure Group		Overview
Major Structures	River Corrib Bridge	The River Corrib Bridge crosses the River Corrib and through the Lough Corrib SAC. It is in close proximity to Menlo Castle and traverses the University of Galway's Sporting Campus. The width of the river at the crossing is approximately 153m.
	Menlough Viaduct	In the vicinity of the Menlough area, the proposed N6 GCRR will be carried on a viaduct to reduce the potential impacts on Limestone pavement which is immediately adjacent to the Lough Corrib SAC boundary and a Turlough.
	Lackagh Tunnel	The proposed N6 GCRR will tunnel under the Lough Corrib SAC immediately west of Lackagh Quarry with is primary function to avoid direct impacts on Annex I habitats at the surface, namely Limestone pavement and Calcareous grasslands. This tunnel will be constructed in such a way to avoid any deformations to the Annex I habitat at the surface. This tunnel is expected to be constructed using mined tunnels methods (drill and blast). See Chapter 7, Construction Activities for further details.
	Galway Racecourse Tunnel	The proposed N6 GCRR will be accommodated in a 240m cut and cover tunnel in the Ballybrit area to reduce the residual impact on the Galway Racecourse. This tunnel is expected to be constructed using the cut and cover method. See Chapter 7, Construction Activities for further details.
Standard Overbridges		This family of structures consists of 7 standard overbridges carrying side roads over the proposed N6 GCRR. These bridges will typically be 2 or 3 span bridges with clear open spans.
Standard Underbridges		This family of structures consists of 10 standard underbridges carrying the proposed N6 GCRR over local and regional roads. At local roads, typically a single span portal frame arrangement will be adopted; at regional road crossings configuration with clear open span(s) will be chosen.
Other Structures	Retaining Structures	15 retaining structures are currently identified. These are expected to be of reinforced earth and/or reinforced concrete retaining wall configuration.
	Culverts & Minor Watercourse crossings	Currently there are approximately 43 culvert type structures, of which 28 are structural, to accommodate drainage and watercourses and wildlife under the proposed N6 GCRR.
	Sign Gantries	29 sign gantries are to be constructed in accordance with DN-STR-03010 and TII Standard Construction Details for sign gantries.
	Environmental Noise Barriers	56 noise barriers are to be constructed. The location, form and type of the environmental noise barriers are shown on Figures 18.1.01 to 18.1.14.

The following is a summary of the main structures to be constructed for the proposed N6 GCRR and all are as presented in the 2018 EIAR, and figures of these structures are provided in Appendix A.5.2 (which were originally presented in A.1.1 to A.1.8 of the 2019 RFI):

River Corrib Bridge

The proposed N6 GCRR crosses the River Corrib on a bridge structure (S08/04) from Ch. 8+850 to Ch. 9+500 (650m in length). The proposed structure comprises of an eight span bridge carrying the proposed N6 GCRR over the River Corrib adjacent to a retained embankment with five culvert openings on the eastern approach. The proposed structure is a variable depth (between 3m and 7m) single concrete box without supports in the river with the main span over the river being 153m. The adjacent spans consist of a variable depth single concrete box increasing in depth from 3m to 7m on approach to the main span. The remaining western approach spans consists of 3m constant depth single concrete box while the remaining eastern approach links into a retaining embankment with five culvert openings to facilitate the passage of wildlife.

The superstructure will be supported on reinforced concrete piers. For aesthetic reasons, inclined webs instead of vertical webs are proposed.

Menlough Viaduct

A viaduct structure, Menlough Viaduct (S10/01) is proposed from Ch. 10+100 to Ch. 10+420 is located outside but adjacent to the Lough Corrib SAC. The total length of the bridge is dictated by the area of priority Annex I habitat over which it crosses, namely Limestone pavement and a Turlough (all of which fall outside of the Lough Corrib SAC boundary) and this will reduce the potential impact on these habitats. The viaduct has a total length of approximately 320m, and the proposed N6 GCRR is on embankment on both approaches to it. The viaduct contains eight spans of a similar 40m span length. The span lengths have been adjusted to reduce the impact of the substructure and foundations on the Limestone pavement and Turlough.

The minimum distance between the soffit of the superstructure and the ground level is approximately 1.5m at one pinch point at the location of the high point in the rock outcropping on the western side. The bridge deck superstructure will consist of prefabricated precast post-tensioned beams supporting a cast in-situ concrete bridge deck. The substructure will consist of conventional reinforced concrete piers at intermediate supports while the reinforced concrete bankseats at the abutments will be supported on a reinforced earthworks system. No substructure supports are proposed within the extents of the Turlough.

Lackagh Tunnel

Lackagh Tunnel (S11/01) is 270m long and is located at Ch. 11+150 to Ch. 11+420. The eastern portal of Lackagh Tunnel is located within the inactive Lackagh Quarry, a limestone quarry.

The central section of the tunnel will pass under the Lough Corrib SAC, while the western portal is proposed to be located in agricultural fields, outside of Lough Corrib SAC.

The primary function of the Lackagh Tunnel and its Western Approach is to transverse the Lough Corrib Special Area of Conservation (SAC) between Lackagh Quarry and Menlough without directly impacting on the Limestone pavement and Calcareous grass within the Lough Corrib SAC. This requires a safe method of excavation and construction of the tunnel such that there will be no impact on the Lough Corrib SAC during the construction or operation of the tunnel, as discussed in Chapter 7, Construction Activities and Appendix A.7.3.

Galway Racecourse Tunnel

The proposed Galway Racecourse Tunnel (S14/02) consists of a 240m twin tube reinforced concrete cut and cover tunnel with central wall. The purpose of the Galway Racecourse Tunnel is to avoid by design adverse impacts, namely disruption to operations and functioning, on the Galway Racecourse. The proposed mainline passes through the north western corner of Galway Racecourse property and necessitates a cut and cover tunnel from Ch. 14+950 to Ch. 15+190, resulting in a tunnel length of approximately 240m.

Underbridges

There are 10 underbridges identified in the current design, which will carry the proposed N6 GCRR over local, regional and national roads. All underbridges are single span. Three main types of underbridges are proposed:

- Type 1: Buried reinforced concrete box structure
- Type 2: Bridge deck with reinforced earth wall abutment
- Type 3: Concrete deck with side slopes

The underbridges over National Roads will incorporate open clear spans as appropriate, in recognition of the fact that higher volumes of traffic on these National Roads will make these bridges highly visible.

The proposed standard underbridges are located at chainages stated in Table 5.4 below, along the proposed N6 GCRR.

Table 5.4 Standard underbridge mainline chainages

Name of Structure	Approx. Chainage
S06/01 - Rahoon Road Underbridge	Ch. 6+335
S07/01 - Letteragh Road Underbridge	Ch. 7+290
S07/02 - N59 Link Road Underbridge	Ch. 7+570
S08/02 - N59 Moycullen Road Underbridge	Ch. 8+540
S09/01 - Menlo Castle Bóithrín Underbridge	Ch. 9+730
S10/02 – Seanbóthar Underbridge	Ch. 10+520
S12/01 - N84 Headford Road Underbridge	Ch. 12+150
S13/02 - N83 Tuam Road Underbridge	Ch. 13+975
S15/01 - Briarhill Business Park Underbridge	Ch. 15+725
S15/02 - Monivea Road R339 Underbridge	Ch. 15+880

Overbridges

There are seven overbridges proposed and the function of these are:

- Structure S01/01, S03/01, S13/01, and S14/01 are overbridges required to carry local roads over the proposed N6 GCRR
- S13/01 will convey the gas main over the proposed N6 GCRR
- Structure S12/02 is required as a mammal crossing (green bridge) over proposed N6 GCRR
- Structures S16/01 and S16/02 are required at Coolagh Junction to provide free flow access between the R446 and the proposed N6 GCRR

The proposed standard overbridges are located at chainages stated in Table 5.5 below, along the proposed N6 GCRR.

Table 5.5 Standard overbridge mainline chainages

Name of Structure	Approx. Chainage
S01/01 - Na Foraí Maola to Troscaigh Overbridge	Ch. 1+375
S03/01 - Barr Aille Overbridge	Ch. 3+300
S12/02 - Castlegar Wildlife Overbridge	Ch. 12+700
S13/01 - School Road Overbridge	Ch. 13+185
S14/01 - Parkmore Link Road Overbridge	Ch. 14+375
S16/01 - Coolagh Junction Overbridge (EB diverge to R446)	Ch. 16+410
S16/02 - Coolagh Junction Overbridge (EB merge from R446)	Ch. 16+830

Culverts and Underpasses

Hydraulic culverts have been designed to minimise impact on both upstream and downstream flood risk. In addition to the hydraulic requirements for the proposed N6 GCRR crossings, consideration has also been given to the passage of mammals at some ecologically sensitive areas. Some of the hydraulic culverts have been increased in size to allow passage for a range of mammal species; for example, otters, badgers and bats.

A full list of the culverts and underpasses is provided in Table 5.6, and all are as presented in the 2018 EIAR.

Table 5.6 Culverts and Underpasses

Name of Structure	Approx. Chainage	Function	Other Requirements
C00/00	Ch. 0+550	Mammal Underpass	-
C00/01	Ch. 0+640	Combined Hydraulic Culvert & Mammal Underpass	-
C00/02	Ch. 0+975	Hydraulic Culvert	-
C01/01	Ch. 1+550	Hydraulic Culvert	-
C02/01a	Ch. 2+740	Hydraulic Culvert	-
C02/01b	Ch. 2+840	Combined Hydraulic Culvert & Mammal Underpass	-
C03/01	Ch. 3+040	Combined Hydraulic Culvert & Mammal Underpass	-
C03/02	Ch. 3+350	Hydraulic Culvert	-
C03/03	Ch. 3+920	Combined Hydraulic Culvert & Mammal Underpass	-
C03/04	Ch. 3+640	Combined Hydraulic Culvert & Mammal Underpass	-
C04/01	Ch. 4+100	Combined Hydraulic Culvert & Mammal Underpass	Otter Ledge
C04/02	Ch. 4+895	Combined Hydraulic Culvert & Mammal Underpass	Otter Ledge
C05/01	Ch. 5+270	Mammal Underpass	-
C06/00	Ch. 6+450	Mammal Underpass	-
C06/01	Ch. 6+850	Combined Hydraulic Culvert & Mammal Underpass	-
C06/01b	Ch. 6+850	Mammal Underpass	-
C07/00	Ch. 7+100	Mammal Underpass	-
C07/01a	Ch. 1+620	Hydraulic Culvert	-
C07/01b	Ch. 1+610	Mammal Underpass	-
C07/02a	Ch. 7+210	Combined Hydraulic Culvert & Mammal Underpass	-
C07/02B	Ch. 7+290	Combined Hydraulic Culvert & Mammal Underpass	-
C07/04	Ch. 0+700	Mammal Underpass	-

Name of Structure	Approx. Chainage	Function	Other Requirements
C08/01	Ch. 8+640	Hydraulic Culvert	-
C08/01a	Ch. 8+450	Mammal Underpass	-
C08/02	Ch. 8+760	Mammal Underpass	-
C08/04	Ch. 8+570	Mammal Underpass	-
C08/05	Ch. 8+643	Mammal Underpass	-
C09/01	Ch. 9+525	Mammal Underpass	-
C09/02	Ch. 9+540	Mammal Underpass	-
C09/03	Ch. 9+560	Mammal Underpass	-
C09/04	Ch. 9+570	Mammal Underpass	-
C09/05	Ch. 9+580	Mammal Underpass	-
C09/06	Ch. 9+710	Mammal Underpass	-
C09/07	Ch. 9+920	Mammal Underpass	-
C10/01	Ch. 10+040	Mammal Underpass and spanning over exposed Limestone pavement	-
C10/02	Ch. 10+740	Combined Hydraulic Culvert & Mammal Underpass	-
C10/02a	Ch. 10+740	Mammal Underpass	-
C12/01	Ch. 12+130	Mammal Underpass	-
C12/02	Ch. 12+350	Mammal Underpass	-
C12/03	Ch. 12+390	Mammal Underpass	-
C12/04	Ch. 12+450	Mammal Underpass	-
C13/01	Ch. 13+980	Mammal Underpass	-
C13/02	Ch. 13+710	Mammal Underpass	-

Other Structures

There are a number of other structures incorporated into the proposed N6 GCRR. These include retaining structures, sign gantries and noise barriers.

The proposed retaining structures are located at chainages stated in Table 5.7 below, along the proposed N6 GCRR and are as presented in the 2018 EIAR.

Table 5.7 Retaining structures location

Name of Structure	Approx. Chainage
R04/01	Ch. 4+450
R08/01	Ch. 8+325
R08/02	Ch. 8+390
R08/03a	Ch. 8+475
R08/07	Ch. 8+550
R08/08 (N59 Link Road North)	N59 LRN* Ch. 0+100
R08/09	Ch. 8+400
R09/01	Ch. 9+510
R09/02	Ch. 9+510
R09/03	Ch. 9+825
R12/01	Ch. 12+300
R14/03	Ch. 14+550
R14/05	Ch. 14+890
R15/01	Ch. 15+630
R15/02	Ch. 15+750

Note: *N59 LRN = N59 Link Road North

It should be noted that there are other retaining structures proposed elsewhere on the proposed N6 GCRR, for example at the western approach to Lackagh Tunnel, at Structure S11/01, as abutments to overbridges and underbridges, etc. These retaining structures are included with the associated structure.

The proposed sign gantries are located at chainages stated in Table 5.8 below, along the mainline of the proposed N6 GCRR.

Table 5.8 Sign Gantries location

Name of Structure	Approx. Chainage	Gantry type	Lateral siting / span	Comments
G06/01	Ch. 6+260	Cantilever	Eastbound verge	Variable Message Sign
G06/02	Ch. 6+950	Cantilever	Eastbound verge	Advance Directional Sign
G08/01	Ch. 8+340	Cantilever	Westbound verge	Advance Directional Sign
G10/01	Ch. 10+075	Cantilever	Eastbound verge	Variable Message Sign
G10/02	Ch. 10+470	Portal	Across Eastbound lanes	Advance Directional Sign Intelligent Transport Sign
G10/03	Ch. 10+600	Portal	Across Eastbound lanes	Intelligent Transport Sign

Name of Structure	Approx. Chainage	Gantry type	Lateral siting / span	Comments
G10/04	Ch. 10+840	Portal	Across Eastbound lanes	Advance Directional Sign Intelligent Transport Sign
G11/01	Ch. 11+030	Portal	Across entire carriageway	Intelligent Transport Sign
G11/02	Ch. 11+525	Portal	Across Westbound lanes	Intelligent Transport Sign
G11/03	Ch. 11+600	Portal	Across Eastbound lanes & diverge	Directional Sign Intelligent Transport Sign
G11/04	Ch. 11+775	Portal	Across Westbound lanes & merge	Intelligent Transport Sign
G12/01	Ch. 12+060	Portal	Across Westbound lanes	Intelligent Transport Sign
G12/02	Ch. 12+450	Portal	Across Westbound merge only	Advance Directional Sign
G12/03	Ch. 12+725	Portal	Across all Westbound lanes	Directional Sign
G12/04	Ch. 12+950	Portal	Across all Eastbound lanes	Advance Directional Sign Variable Message Sign
G13/01	Ch. 13+190	Portal	Across all Westbound lanes	Advance Directional Sign Variable Message Sign
G13/02	Ch. 13+450	Portal	Across Eastbound lanes &diverge	Directional Sign
G13/03	Ch. 13+610	Portal	Across Westbound merge only	Advance Directional Sign
G14/01	Ch. 14+250	Portal	Across Westbound lanes	Intelligent Transport Sign
G14/02	Ch. 14+650	Portal	Across entire carriageway	Directional Sign Intelligent Transport Sign
G14/03	Ch. 14+810	Portal	Across entire carriageway	Advance Directional Sign Intelligent Transport Sign
G15/01	Ch. 15+290	Portal	Across entire carriageway	Advance Directional Sign Intelligent Transport Sign
G15/02	Ch. 15+510	Portal	Across Westbound lanes	Intelligent Transport Sign

Name of Structure	Approx. Chainage	Gantry type	Lateral siting / span	Comments
G15/03	Ch. 15+690	Portal	Across Westbound lanes	Advance Directional Sign Intelligent Transport Sign Variable Message Sign
G15/04	Ch. 15+820	Cantilever	Eastbound verge	Directional Sign
G15/05	Ch. 15+925	Cantilever	Westbound verge	Variable Message Sign
G16/01	Ch. 16+900	Portal	Across Westbound diverge only	Directional Sign
G17/01	Ch. 17+320	Cantilever	Westbound verge	Directional Sign
G18/01	Ch. 18+090	Cantilever	Westbound verge	Variable Message Sign

5.4.1.2.6 Landscaping

The aspects relating to landscaping are discussed in Chapter 12, Landscape and Visual.

5.4.1.2.7 Drainage

The proposed N6 GCRR involves the construction of a new drainage system which includes the provision of a surface water collection system, earthworks drainage, sub-surface drainage, attenuation and pollution control, and the culverting of existing streams. The proposed N6 GCRR has been designed such that surface water drainage and sub-surface drainage will be provided for the proposed mainline carriageway, junctions, link roads, all new sections of local roads and all is as presented in the 2018 EIAR. The addition of the temporary stables in the infield of Galway Racecourse has necessitated the provision of an additional drainage pond. The removal of the grass-based GAA pitches at UoG has resulted in the removal of drainage features. These changes are noted where relevant in this section of this updated EIAR.

Due to the contrasting geological features across the extents of the proposed N6 GCRR, the type of natural drainage can be split into two different broad categories west and east of the N59 Moycullen Road.

The natural discharge of rainfall and surface water drainage west of the N59 Moycullen Road is overland to low points in the topography where shallow ditches and streams are present. The underlying bedrock is granite. This is a low importance, poor aquifer where the bedrock is generally unproductive except for local zones (ref Chapter 10, Hydrogeology). In general, the water table is quite close to the surface.

The natural discharge of rainfall and surface water drainage east of the N59 Moycullen Road is directly to ground, with extreme events accumulating at low points and seasonal lakes within the topography. The underlying bedrock is limestone. The aquifer is a regionally important karstified aquifer which is dominated by conduit flow (ref Chapter 10, Hydrogeology). Except for the River Corrib, Terryland River, Ballindooley Lough and Coolagh Lakes, there are no other significant watercourses in the area east of the N59 Moycullen Road.

The two different categories of natural drainage inform the approach to drainage design for the proposed N6 GCRR. As well as the efficient removal of water from the road surface and pavement, the drainage design aims to minimise the impact of runoff from the proposed N6 GCRR on the receiving environment by replicating, as much as possible, the natural water flows across the proposed N6 GCRR. This is achieved using a variety of sustainable drainage measures.

All surface water collected by the proposed carriageway drainage system will be discharged to watercourses or existing storm sewers crossed by or adjacent to the proposed N6 GCRR if present or will be discharged to ground via infiltration. Flow control measures will be provided at all outfalls and discharge points along the length of the proposed N6 GCRR to ensure discharge does not cause any adverse effects upstream or downstream of the receiving watercourse or sewer. Infiltration basins have been sized to allow sufficient time for infiltration to discharge to the ground. Pollution control measures will be provided on all mainline

road drainage networks prior to outfalling/discharging to ensure that receiving water bodies are not contaminated by runoff from the proposed N6 GCRR.

In summary, the design basis for the drainage strategy is as follows:

- West of the N59 Moycullen Road the surface water collected by the carriageway drainage system will be discharged into watercourses crossed by, or adjacent to, the proposed N6 GCRR that eventually outfall to Galway Bay
- East of the N59 Moycullen Road the surface water collected by the carriageway drainage system will be discharged to ground via infiltration, with the exception of two drainage networks (S18A and S18B refer Figure 11.6.107) which will discharge directly to the River Corrib and three networks (S14A, S14B and S15 refer to Figure 11.6.106) which discharge to tributaries which eventually outfall to the River Corrib

The procedures below have been adopted for the drainage design of the proposed N6 GCRR in accordance with current TII Publications, guidance documents and best practice methods.

Watercourses

The proposed N6 GCRR crosses a number of existing watercourses which includes the Bearna Stream and its tributaries, the River Corrib and a number of smaller streams. Streams and rivers will be crossed using culverts or bridge structures.

There is one major river bridge required to cross the River Corrib as outlined in Section 5.4.1.2.6.

As noted in Section 5.4.1.2.8, culverts have been designed to minimise impact on both upstream and downstream flood risk. In addition to the hydraulic requirements for the proposed N6 GCRR crossings, consideration has also been given for the passage of mammals at some ecologically sensitive areas. Some of the hydraulic culverts have been increased in size to cater for a range of mammal passages for example otters, badgers and bats. Section 5.4.1.2.8 summarises the proposed hydraulic culverts and bridge structures.

All of the proposed structures over existing watercourses were submitted to the OPW for approval under Section 50 of the Arterial Drainage Act and were approved in 2016. Such consent remains valid as the proposed structures and culverts have not changed and the design flows and flood levels have not significantly changed, and ample freeboard allowance was included in the original S50 sizing.

Details of required stream realignments in the vicinity of the structures were submitted and approved as part of the 2018 EIAR and also remain valid.

There are a small number of Salmonid rivers interacting with the proposed N6 GCRR. Inland Fisheries Ireland have been consulted regarding the requirements, for fish passage at these locations. The design of all culverts conveying watercourses provides a minimum embedment depth of 150mm on circular culverts or 300mm on rectangular box culverts below stream bed or to the minimum level as requested by Inland Fisheries Ireland. This is to encourage the re-establishment of stream bed ecology. The bed of the channel both upstream and downstream of the culvert should be reinstated with material similar to that removed during construction. This is similar to a “natural” bed contiguous with the existing stream bed, upstream and downstream of the proposed culvert. Proposed culverts encroaching on fish habitats shall be designed to ensure that the velocity of flow will be less than the swimming speed to allow passage of migrating fish. Culverts will be designed such that the velocity in the barrel will not be significantly increased from the velocity of the existing watercourse.

Gradients of proposed culverts will aim to recreate the gradient of the existing watercourse where possible. Where relevant, the culvert design shall accommodate invert baffles to facilitate fish passage upstream and downstream. Suitable measures are to be employed to ensure that livestock are prevented from entering culverts.

Interceptor Ditches

Interceptor ditches are required to intercept the overland flow from the natural catchment adjacent to the proposed N6 GCRR (both during construction and the operational phases) and to prevent ponding of water adjacent to embankments. The use of interceptor ditches is to prevent drainage from the road curtilage running onto adjacent lands and vice-versa.

The interceptor ditches are provided at the top of the cutting or the base of the embankment where land falls towards the proposed N6 GCRR to collect overland flow. The ditches have been sized to cater for a 1 in 75 year return period as per DN-DNG-03064 – Drainage of Runoff from Natural Catchments (HD 106) (June 2015). All land drains that are intercepted by the proposed works will be discharged into an interceptor ditch. Scour protection shall be provided where velocities exceed 2.5m/s in the interceptor ditches.

To the west of the N59 Moycullen Road, interceptor ditches will discharge to existing streams, rivers and storm sewers. Due to the undulating nature of the natural topography of the land along the route of the proposed N6 GCRR, there are some considerable areas of cutting required for earthworks drainage. To the east of the River Corrib, interceptor ditches will discharge to stone filled infiltration trenches located adjacent to the proposed N6 GCRR. Cross-drains will be provided to convey flow from the interceptor ditches beneath the proposed N6 GCRR to the outfall/discharge locations where required.

Carriageway Drainage

A surface water collection system will be provided so as to comply with the design requirements of DN-DNG-03022 – Drainage Systems for National Roads (HD33/15) (February 2024). Whilst this standard was updated from the earlier March 2015 edition, this does not change the drainage design. This includes providing suitably sized longitudinal carrier drains to accommodate a 1 year return period storm in-bore without surcharging, with no flooding of the proposed carriageway for a 1 in 5 year return period for filter drains. Where combined surface and ground water drains are proposed, a 1 in 5 year return period storm will not rise above the formation level, or sub-formation level where a capping layer is present. The drainage networks are designed to include an increase of 20% in rainfall depth to cater for the impact of climate change.

In the western section of the proposed N6 GCRR from the R336 Coast Road to the N59 Moycullen Road, the drainage network is in accordance with Figure 3.1 of DN-DNG-03022 (HD33/15). However, in the eastern section of the proposed N6 GCRR from the N59 Moycullen Road to the connection point with the existing N6 at Coolagh, Briarhill, due to the karstic nature of the underlying bedrock and the vulnerability of the underlying aquifers, there is a requirement for a fully sealed system to accept the proposed carriageway runoff. Therefore, the network collecting the drainage from the proposed carriageway will be kept separate to the groundwater and sub-surface drainage network. This will be achieved by using either a kerb, gully and carrier pipe system or a surface water channel and carrier pipe system. This allows for controlled treatment of surface waters prior to discharge to the ground thereby reducing the risk to the underlying aquifer. For cuttings and low embankments, a separate filter drain will be provided for sub surface flows Table 5.9 summarises the proposed mainline drainage networks.

Table 5.9 Summary of Mainline and Junction Drainage Networks

Drainage Network Ref. No.	Mainline / Junction	Chainage	Approx. Total Drainage Area (ha)	Outfalling to	Drainage System Type (Sealed / Non-Sealed)
S1	Mainline	Ch. 0+000 to Ch. 0+700	2.05	Watercourse	Non-Sealed
S2	Mainline	Ch. 0+700 to Ch. 1+000	0.55	Watercourse	Non-Sealed
S3	Mainline	Ch. 1+000 to Ch. 1+475	2.31	Watercourse	Non-Sealed
S4A	Mainline	Ch. 1+475 to Ch. 1+900	0.96	Watercourse	Non-Sealed
S5A	Mainline	Ch. 1+900 to Ch. 2+850	2.45	Watercourse	Non-Sealed
S7A	Mainline	Ch. 2+850 to Ch. 3+050	0.30	Watercourse	Non-Sealed
S7B	Mainline	Ch. 3+050 to Ch. 3+910	2.94	Watercourse	Non-Sealed

Drainage Network Ref. No.	Mainline / Junction	Chainage	Approx. Total Drainage Area (ha)	Outfalling to	Drainage System Type (Sealed / Non-Sealed)
S8	Mainline	Ch. 3+910 to Ch. 4+125	0.42	Watercourse	Non-Sealed
S9	Mainline	Ch. 4+125 to Ch. 4+900	1.75	Watercourse	Non-Sealed
S10	Mainline	Ch. 4+900 to Ch. 5+640	2.19	Watercourse	Non-Sealed
S11	Mainline	Ch. 5+640 to Ch. 6+325	2.02	Existing Sewer	Non-Sealed
S12	Mainline	Ch. 6+325 to Ch. 7+300	3.15	Watercourse	Non-Sealed
S13	Mainline	Ch. 7+300 to Ch. 7+525	0.91	Watercourse	Non-Sealed
S14A	Mainline	Ch. 7+525 to Ch. 8+250	5.66	Existing Culvert & onto watercourse	Non-Sealed
S14B	Mainline	Ch. 8+250 to Ch. 8+525	0.85	Watercourse	Non-Sealed
S18A	Mainline	Ch. 8+525 to Ch. 9+250	1.75	Watercourse	Sealed
S18B	Mainline	Ch. 9+250 to Ch. 10+150	2.27	Watercourse	Sealed
S19A	Mainline	Ch. 10+150 to Ch. 10+730	1.95	Infiltration Basin	Sealed
S19B	Mainline	Ch. 10+730 to Ch. 11+150	2.22	Infiltration Basin	Sealed
F19	Mainline	Ch. 11+150 to Ch. 11+420	N/A	Foul Sewer	Sealed
S20	Mainline	Ch. 11+420 to Ch. 12+020	4.95	Infiltration Basin	Sealed
S21B	Mainline	Ch. 12+020 to Ch. 13+630	8.28	Infiltration Basin	Sealed
S22A	Mainline	Ch. 13+360 to Ch. 14+350	5.68	Infiltration Basin	Sealed
S22B	Mainline	Ch. 14+350 to Ch. 14+950	3.06	Infiltration Basin	Sealed
F24	Mainline	Ch. 14+950 to Ch. 15+200	N/A	Foul Sewer	Sealed
S30	Mainline & Junction& Side Road	Ch. 15+200 to Ch. 15+700 Galway Racecourse Tunnel to Briarhill Coolagh Junction to Briarhill Tie-in Realigned Briarhill Business Park Road	6.33	Existing Sewer	Sealed
S26	Mainline	Ch. 15+750 to Ch. 16+750	5.12	Existing Sewer	Sealed

Drainage Network Ref. No.	Mainline / Junction	Chainage	Approx. Total Drainage Area (ha)	Outfalling to	Drainage System Type (Sealed / Non-Sealed)
S27	Mainline	Ch. 16+750 to Ch. 17+535	5.47	Existing M6 Infiltration Basin	Sealed
S21A	Junction	Ch. 12+125 N84 Headford Road Junction	3.31	Attenuation Basin	Sealed
S22E	Junction	Ch. 14+400 N83 Tuam Road Junction (northern loop of junction and northern section of Parkmore Link Road)	0.79	Infiltration Basin	Sealed
S29	Junction	Ch. 16+500 Coolagh Junction south to tie-in with R446	2.73	Existing Sewer	Sealed

Suitably sized and located outfalls have been designed in accordance with DN-DNG-03071 – Design of Outfall and Culvert Details (HD 107) (June 2015) which is as per the 2018 EIAR.

Sub-Surface Drainage

A sub-surface drainage system of the road pavement will be provided in order to control groundwater levels in the vicinity of the proposed N6 GCRR and to drain the road foundation. This is required in areas of cuttings and low embankments (<1.5m). In general, this is achieved using a network of filter drains or narrow filter drains.

Due to the karstic nature of the catchments to the east of the N59 Moycullen Road a hydrogeological risk assessment for each surface water drainage network catchment has been carried out at the location of each infiltration basin. This assessment is included in Chapter 10, Hydrogeology of this updated EIAR. Details of the discussion at the oral hearing in 2020 in respect of the hydrogeological modelling for the proposed N6 GCRR is also included in Chapter 10, Hydrogeology of this updated EIAR.

Structure Drainage

A separate isolated sealed drainage system will be utilised for the Lackagh Tunnel and the Galway Racecourse Tunnel structures. The drainage system will be designed in accordance DN-STR-03015 – Design of Road Tunnel (BD78) (December 2000). The sealed system of slot drains and carrier pipes will be used in both tunnels to pick up groundwater ingress, surface water from wheels, fire flows and tunnel wash down, all of which will be drained to sumps and pumped to the closest foul sewer. This system mitigates against the potential for pollution of groundwater and also minimises the risk to the Lough Corrib SAC surface water bodies.

A watertight seal will be installed on the underside of the road base and cuttings on the western approach to the Lackagh Tunnel and on the eastern approach to the Galway Racecourse Tunnel up to the known high winter groundwater level. This is to protect against groundwater inflow and prevent contamination of groundwater and no dewatering is permitted in the operational phase of the proposed N6 GCRR at these locations (see Chapter 10, Hydrogeology of this updated EIAR).

Drainage of the proposed bridge structures will be managed so as to achieve the requirements set out in DN-DNG-03022 – Drainage Systems for National Roads (HD33/15). For the long lengths of the Menlough Viaduct and the River Corrib Bridge a specialised sealed drainage system will capture the runoff on the bridge deck, transport it beneath the structure in a network of slung sealed carrier drains, before descending into the ground at suitable pier locations and discharging to a wetland and attenuation treatment area.

This is required due to the sensitivity of the areas which the bridges are crossing above i.e. Limestone pavement and Turlough (Priority Annex 1 habitats) and the River Corrib (Lough Corrib SAC).

Link Road and Side Road Drainage

The side roads and proposed link roads where drainage is proposed include the R336 Coast Road, L5386 Na Foraí Maola Road, L5387 Troscaigh Road, Na Foraí Maola to Troscaigh Link Road North, South and Overbridge Link, L1321 Bearna to Moycullen Road, L5384 Aille Road, Cappagh Road, Ballymoneen Road, Rahoon Road, Clybaun Road, L1323 Letteragh Road, N59 Link Road North and South, Seanbóthar, N84 Headford Road, L2134 School Road, N83 Tuam Road, Parkmore Link Road, Briarhill Business Park Road, Ballybrit Crescent and R339 Monivea Road. These roads require kerbs at locations including at bridge or junction locations or where footways are required and will therefore be drained using gullies with carrier drains or combined filter/carrier drains. Piped drains will discharge to an outfall, a sealed drain or to the mainline drainage system. Table 5.10 summarises the proposed link road drainage networks and is as presented in the 2018 EIAR.

Table 5.10 Summary of Link Road and Side Road Drainage Networks and Drainage for Proposed Development at Galway Racecourse

Drainage Network Ref. No.	Link Road/Side Road	Road Name and Chainage	Approx. Total Drainage Area (ha)	Outfalling to	Drainage System Type (Sealed/Non-Sealed)
S4B	Link Road	Troscaigh Road	0.12	Watercourse	Non-Sealed
S15	Link Road	N59 Link Road North	1.89	Watercourse	Non-Sealed
S16A	Link Road	N59 Link Road North and South	4.16	Existing Sewer	Non-Sealed
S17A	Link Road	Letteragh Road - Ch. 1+625 to Ch. 2+210	1.08	Existing Sewer	Non-Sealed
S22C1	Link Road	City North Business Park Road - Ch. 14+400	1.46	Existing Sewer	Sealed
S22C2	Link Road	Parkmore Link Road - Ch. 14+400	1.41	Infiltration Basin	Sealed
S5B	Side Road	Upgrading of Bearna to Moycullen Road South - Ch. 2+800	0.24	Watercourse	Non-Sealed
S16B	Side Road	Letteragh Rd - Ch. 0+000	0.12	Existing Sewer	Non-Sealed
S17B	Side Road	Gort Na Bró Realignment - Ch. 0+100	0.34	Existing Sewer	Non-Sealed
S31A	Side Road	Upgrading of Letteragh Road - Ch. 7+250	0.09	Watercourse	Non-Sealed
S31B	Side Road	Upgrading of Letteragh Road - Ch. 7+250	0.15	Watercourse	Non-Sealed
S31C	Side Road	Upgrading of Letteragh Road - Ch. 7+275	0.25	Existing Sewer	Non-Sealed
S32	Side Road	Realigned Clybaun Road and Rahoon Road - Ch. 6+325	0.80	Existing Sewer	Non-Sealed
S33	Side Road	Realigned Racecourse Avenue - Ch. 15+000	0.83	Existing Sewer	Sealed
S36A	Side Road	Realigned Aille Road North - Ch. 3+350	0.24	Watercourse	Non-Sealed
S36B	Side Road	Upgrading of Aille Road South - Ch. 3+350	0.10	Existing Ditch	Non-Sealed

Drainage Network Ref. No.	Link Road/Side Road	Road Name and Chainage	Approx. Total Drainage Area (ha)	Outfalling to	Drainage System Type (Sealed/Non-Sealed)
S37	Side Road	Upgrading of Cappagh Road South - Ch. 4+450	0.21	Existing Sewer	Non-Sealed
S38	Side Road	Upgrading of Ballymoneen Road North - Ch. 5+650	0.14	Existing Sewer	Non-Sealed
S39	Side Road	Realigned entrance of Gateway Retail Park in Knocknacarra	0.22	Existing Sewer	Non-Sealed
S40	Side Road	Upgrading of Seanbóthar and access road - Ch. 10+475	0.16	Infiltration Basin	Sealed
S41	Side Road	School Road - Ch. 13+150	0.24	Existing Sewer	Sealed
S45	Galway Racecourse Stables	Galway Racecourse	1.54	Existing Sewer	Sealed
S48	Galway Racecourse Stables	Galway Racecourse	0.13	Existing Outfall	Sealed
S50	Galway Racecourse Stables	Galway Racecourse	2.32	Existing Outfall	Sealed
F50	Galway Racecourse Stables	Galway Racecourse	N/A	Existing Sewer	Sealed

Side roads that do not require kerbs will be drained using either over-the edge drainage or combined filter drains where appropriate in accordance with the principles described above. The drains will discharge to an outfall, a sealed drain or to the mainline drainage system.

Outfalls, Attenuation Ponds and Infiltration Basins

West of the N59 Moycullen Road the surface water collected by the carriageway drainage system will be discharged to watercourses crossed by, or adjacent to, the proposed N6 GCRR. In order to prevent discharge from the road increasing the peak flow rate of water within many of the watercourses, which may compound any flooding downstream of the proposed N6 GCRR, flow restriction and attenuation storage is proposed. Attenuation ponds have been selected as the main attenuation facility provided along the proposed N6 GCRR. Attenuation ponds will not be lined to the west of the N59 Moycullen Road and can become a feature of the landscape in time and is in line with current best practice guidelines. The proposed outfalls, with proposed attenuation ponds, have been chosen at appropriate locations along the route of the proposed N6 GCRR typically as close as possible to an existing watercourse. Table 5.11 details the drainage networks that discharge to watercourses and the associated volumes of storage required to attenuate peak flows up to the 1 in 100 year return period storm event.

Table 5.11 Proposed Mainline and Link Road Drainage Networks Discharging to Surface Waterbodies

Drainage Network Ref. No.	Approx. Total Drainage Area (ha)	Approx. Pavement Area (ha)	Approx. Attenuation Pond - Volume of Storage (m3)	Network Discharge Q100 (l/s)
S1	2.05	1.29	894	8.4
S2	0.55	0.38	184	5.0
S3	2.31	1.28	1028	8.7
S4A	0.96	0.62	324	5.2
S5A	2.45	1.53	977	9.7
S7A	0.30	0.24	81	4.8
S7B	2.94	1.07	1081	11.5
S8	0.42	0.26	114	4.7
S9	1.75	1.19	796	8.2
S10	2.19	1.22	873	8.3
S12	3.15	2.45	1697	11.5
S13	0.91	0.63	378	5.0
S14A	5.66	2.20	1975	21.0
S14B	0.85	0.65	613	5.2
S18A	1.75	1.58	N/A	427.7
S18B	2.27	1.95	N/A	494.8
S21A	3.31	1.36	1568	5.2
S4B	0.12	0.07	21	4.2
S15	1.89	0.73	692	7.5
S50	2.32	1.28	1425	5

Where the drainage system outfalls to a watercourse the final outfall level (after the attenuation and treatment measures) shall be set above the 1 in 5 year flood level of the watercourse where possible. Furthermore, an assessment of the impact of the outfall from the pond on the hydraulic regime of the watercourse has been undertaken (Chapter 11, Hydrology of this updated EIAR).

A flow control device (Hydro-Break or similar) will be installed at the outfall location of all attenuation ponds to restrict the flow rate from the pond to the receiving watercourse. The discharge rate for each drainage catchment is set to the Q_{bar} greenfield runoff rate to replicate the existing environment or to a minimum of 5 l/s to minimise the risk of blockage from debris within the network.

There are a number of outfalls to existing sewers along the proposed N6 GCRR. The surface water sewers are generally located in the more urbanised areas adjacent to the proposed N6 GCRR, where existing streams and ditches have already been previously culverted to facilitate development. Table 5.12 details the drainage networks that discharge to existing storm sewers.

Table 5.12 Proposed Mainline & Link Road Drainage Networks Discharging to Storm Sewers

Drainage Network Ref. No.	Approx. Total Drainage Area (ha)	Approx. Pavement Area (ha)	Network Discharge Q100 (l/s)	Receiving Storm Sewer Diameter (mm)
S11	2.02	1.57	7.8	300
S26	5.12	3.47	4.5	900
S29	2.73	2.07	5.0	900
S30	6.33	4.58	5.7	900
S16A	4.16	2.15	16.1	450
S17A	1.08	0.98	5.7	1500
S22C1	1.46	1.27	5.0	900
S45	1.54	0.61	153.1	525

To the east of the N59 Moycullen Road the surface water collected by the carriageway drainage system will be discharged to ground via an infiltration basin where a positive outfall to a watercourse is not available. Ground investigations have been undertaken at the proposed locations of the infiltration basins to determine the permeability of the existing soil and bedrock and inform the design of the infiltration basins. Where the infiltration rate is outside the range of the permissible flow rates (e.g. discharge directly to karst limestone bedrock) then the base layer of the infiltration basin will be created synthetically to reduce the infiltration rate artificially. The design infiltration rate for the proposed N6 GCRR is 0.036m/hr. The infiltration basins have been sized so as to drain down to half volume in a 24-hour period. The infiltration basins will not be lined so as to allow for infiltration to ground. Table 5.13 details the proposed drainage networks that discharge to ground via infiltration basin.

Table 5.13 Proposed Mainline and Link Road Drainage Networks Discharging to Ground via Infiltration Basins

Drainage Network Ref. No.	Approx. Total Drainage Area (ha)	Approx. Pavement Area (ha)	Infiltration Basin - Volume of Storage (m3)	Approx. Invert Level (mAOD)
S19A	1.95	1.66	1226	11.15
S19B	2.22	1.68	1112	10.24
S20	4.95	2.23	1928	14.74
S21B	8.28	4.82	4227	18.53
S22A	5.68	3.94	2953	14.07
S22B	3.06	2.76	2543	37.93

Drainage Network Ref. No.	Approx. Total Drainage Area (ha)	Approx. Pavement Area (ha)	Infiltration Basin - Volume of Storage (m3)	Approx. Invert Level (mAOD)
S27	5.47	N/A	N/A	N/A
S22E	0.79	0.69	300	45.71
S22C2	1.41	1.26	738	38.96

To the east of the N59 Moycullen Road, where attenuation ponds and discharge to watercourses or public sewers are proposed in the karst limestone area, the base of the attenuation ponds will be lined to prevent infiltration to groundwater using a synthetic or suitable clay liner.

All attenuation ponds and infiltration basins will cater for return period up to a 1 in 100 year storm event minimising any increase in flood risk to adjacent properties as set out in Clause 7.5 of DN-DNG-03022 (HD33/15). A minimum freeboard of 300mm is provided between the maximum water level in the attenuation pond or infiltration basin and the top level of the pond/basin or the pond/basin protection bund. Peak discharge rates from the proposed N6 GCRR will not exceed the peak discharge rates in the greenfield scenario for the critical storm return period. The pond/basin will be bunded to a level 500mm above any adjacent 1 in 100 year flood levels in rivers or streams. To reduce the risk of receiving water and groundwater being contaminated by runoff from the proposed N6 GCRR, pollution control measures will be provided as detailed in the following section.

Pollution Control

Pollution control measures are proposed prior to each outfall/discharge point from the carriageway which will reduce the risk of watercourses or groundwater being contaminated by runoff from the proposed N6 GCRR. A range of pollution control measures have been adopted along the length of the proposed N6 GCRR which includes combined filter drains, attenuation ponds, grassed surface water channels, petrol and oil interceptors, emergency spill containment areas, surface flow wetlands and infiltration basins.

Sustainable drainage systems (SuDS) have been considered in the first instance. Only where there is insufficient space, or the road geometry precludes their inclusion (e.g. on embankments higher than 1.5m or in cuttings with groundwater drainage problems) were other conventional methods used. In general, where the risk to groundwater is low combined filter drains form the first treatment against pollutants making their way into surrounding water bodies as combined filter drains can reduce the release of pollutants. The filter material will trap suspended solids and other contaminants thus reducing the downstream pollution risk. Where the proposed N6 GCRR carriageway runoff will drain into grassed surface water channels, the slow moving flow through the wide shallow grassed channels will allow for the processes of sedimentation and adsorption to take place while carrying the runoff to the outfall.

Where the groundwater is highly vulnerable, typically in the karstic area to the east of the River Corrib, a sealed drainage system will collect and distribute surface water runoff to a suitable outfall location/discharge point (e.g. carrier pipe with gullies, concrete surface water channels, slot drains etc.) Sub surface flow will be collected in a series of narrow filter drains.

At each mainline and link road drainage network across the proposed N6 GCRR, a SuDS surface flow (SF) treatment wetland will also be provided upstream of each attenuation pond or infiltration basin to further treat runoff. The surface flow wetlands have been sized to store the ‘First Flush’ runoff from their associated road pavement catchments in the permanent pool. This comprises a volume equal to a 15mm depth of rainfall on the road catchment. This ‘First Flush’ runoff carries the highest load of pollutants, compared to runoff discharged later in the rainfall event. The minimum depth of the permanent pool is 600mm which will further encourage settlement of suspended solids and will be lined to reduce the risk of watercourses or groundwater being contaminated by runoff from the proposed N6 GCRR.

Suitable planting and additional measures will be employed to encourage the settlement of silt and absorption of any remaining pollutants i.e. silt traps, reed beds. The increased retention time provided by the wetland will provide additional time for further adsorption and sedimentation to take place and will also allow for a range of natural biological processes (including biodegradation, microbial action and plant uptake) to further remove waterborne pollutants.

Oil and petrol interceptors will be provided upstream of the wetland and attenuation pond/infiltration basin to prevent any contamination from hydrocarbons, such as oil or petrol spillages, from entering the receiving water or groundwater. The interceptors will be sized for each drainage catchment according to the inflow. Along the mainline of the proposed N6 GCRR a minimum emergency spill containment volume area equal to 25m^3 will be provided at all outfall locations as set out in the TII Drainage Standards, which is as per the 2018 EIAR.

The outfalls of each drainage network have been assessed individually for potential impacts to the water environment as part of the HD45 assessments and appropriate methods of treatment applied in accordance with TII requirements, the assessments are detailed in the Chapter 10, Hydrogeology and Chapter 11, Hydrology of this updated EIAR. The adopted pollution control measures are listed in Table 5.14.

Table 5.14 Proposed Pollution Control Measures for Mainline, Link Road and Side Road Drainage Networks

Drainage Network Ref. No.	Discharging to	Pollution Control Measure
S1	Watercourse	Spillage Containment Pipe, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S2	Watercourse	Spillage Containment Pipe, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S3	Watercourse	Spillage Containment Pipe, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S4A	Watercourse	Spillage Containment Area, Oil and Petrol interceptor, Wetland, Attenuation Pond
S5A	Watercourse	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S7A	Watercourse	Spillage Containment Pipe, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S7B	Watercourse	Spillage containment Area, Oil and Petrol interceptor, Wetland, Attenuation Pond
S8	Watercourse	Spillage containment Area, Oil and Petrol interceptor, Wetland, Attenuation Pond
S9	Watercourse	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S10	Watercourse	Spillage Containment Pipe, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S11	Existing Sewer	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S12	Watercourse	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S13	Watercourse	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S14A	Existing Culvert	Spillage Containment Pipe, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S14B	Watercourse	Spillage Containment Pipe, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S18A	Watercourse	Spillage Containment Pipes, Oil and Petrol Interceptor, Wetland

Drainage Network Ref. No.	Discharging to	Pollution Control Measure
S18B	Watercourse	Spillage Containment Area, Oil and Petrol Interceptor, Wetland
S19A	Infiltration Basin	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Infiltration Basin
S19B	Infiltration Basin	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Infiltration Basin
F19	Foul Sewer	Spillage Containment Area, Oil and Petrol Interceptor discharging to Foul Sewer. Discharge to be treated at Mutton Island Waste Water Treatment Works
S20	Infiltration Basin	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Infiltration Basin
S21B	Infiltration Basin	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Infiltration Basin
S22A	Infiltration Basin	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Infiltration Basin
S22B	Infiltration Basin	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Infiltration Basin
F24	Foul Sewer	Spillage Containment Area, Oil and Petrol Interceptor discharging to Foul Sewer. Discharge to be treated at Mutton Island Waste Water Treatment Works.
S26	Existing Sewer	Spillage Containment Pipe, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S27	Existing M6 Infiltration Basin	Existing M6 Infiltration Pond
S21A	Attenuation Basin	Spillage Containment Pipe, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S22E	Infiltration Basin	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Infiltration Basin
S29	Existing Sewer	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S30	Existing Sewer	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S4B	Watercourse	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S15	Watercourse	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S16A	Existing Sewer	Spillage Containment Area, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S17A	Existing Sewer	Spillage Containment Pipe, Oil and Petrol Interceptor, Wetland, Attenuation Pond
S22C1	Existing Sewer	Spillage Containment Pipe, Oil and Petrol Interceptor, Attenuation Pond
S22C2	Infiltration Basin	Spillage Containment Pipe, Oil and Petrol Interceptor, Infiltration Basin

Drainage Network Ref. No.	Discharging to	Pollution Control Measure
S5B	Watercourse	None Required, overlay of existing local road
S16B	Existing Sewer	Online Attenuation - Flow Control and Oversized Pipes
S17B	Existing Sewer	Online Attenuation - Flow Control and Oversized Pipes
S31A	Watercourse	None Required, overlay of existing local road
S31B	Watercourse	None Required, overlay of existing local road
S31C	Existing Sewer	Online Attenuation - Flow Control and Oversized Pipes
S32	Existing Sewer	Attenuation Pond
S33	Existing Sewer	Attenuation Tank
S36A	Watercourse	None Required, upgrade of existing local road
S36B	Existing Ditch	None Required, overlay of existing local road
S37	Existing Sewer	Online Attenuation - Oversized Pipes
S38	Existing Sewer	None Required, overlay of existing local road
S39	Existing Sewer	None Required, overlay of existing local road
S40	Infiltration Basin	Spillage Containment Area, Oil and Petrol Interceptor, Infiltration Basin
S41	Existing Sewer	None Required, overlay of existing local road
S45	Existing Sewer	Grasscrete GC1 to parking areas
S48	Existing Outfall	None Required, existing track drainage system
S50	Existing Outfall	Oil and Petrol Interceptor, Attenuation Basin
F50	Existing Sewer	Spillage Containment Area, Oil and Petrol Interceptor discharging to Foul Sewer. Discharge to be treated at Mutton Island Waste Water Treatment Works

The regular inspection and maintenance of drainage systems is essential for continued protection of the natural water regime into which the road runoff discharges and must take priority. Maintenance procedures are to be undertaken as set out in TII Publications, guidance documents and best practice methods.

5.4.1.2.8 Utilities

The infrastructure of a number of service providers is impacted by the proposed N6 GCRR. The provision of the proposed N6 GCRR shall ensure there are no permanent disruptions to services provided by these bodies and that all temporary disruptions must be kept to a minimum. Where services diversions are required all design works and construction works must be carried out in coordination with the relevant statutory bodies and services providers.

Furthermore, these services are being developed and expanded on an on-going basis. In order to avoid trenching in the new road for services after completion, provision must be made at construction stage for future crossing by services were agreed with the local authority.

The following statutory bodies and service providers were consulted to identify conflict areas between their services and the proposed N6 GCRR prior to submission of the Section 51 Application for the proposed N6 GCRR in 2018. Follow up consultation took place in 2024 which confirmed that the diversions as proposed in 2018 remain valid in 2024:

- Galway County Council – Watermain, Surface Water Drainage, Foul Sewer
- Galway City Council – Watermain Surface Water Drainage, Foul Sewer
- Irish Water – Watermain, Foul Sewer
- Eir
- ESB Networks – Low to Medium Voltage
- ESB Networks as the Transmission system Owner and EirGrid as the Transmission System Operator ESB International (ESBI), – High Voltage
- Gas Network Ireland – Transmission and Distribution
- E-Net
- Virgin Media
- BT Ireland
- SSE Airtricity
- Three Networks Ireland

All works required for the diversion or protection of any of the above services in conflict with the proposed N6 GCRR have been confirmed with each of the service providers as part of this updated EIAR. Further details on the locations, potential utility impacts and proposed measures are included in Chapter 15, Material Assets Non-Agriculture.

5.4.1.2.9 Noise Barriers

The aspects relating to noise barriers are discussed in Chapter 18, Noise and Vibration.

5.4.1.2.10 Biodiversity measures

Four new artificial bat roosts and the modification of one existing building to become a bat roost are proposed as part of the proposed N6 GCRR. Full details of these roosts are discussed in Chapter 8, Biodiversity.

5.4.1.2.11 Permanent Maintenance Facilities

There are two permanent maintenance facilities proposed as part of the proposed N6 GCRR. These tunnel services, monitoring and maintenance buildings (TSB) will house operations personal and tunnel plant and equipment and will include an office area, control room, technical equipment room(s) (TER(s)), staff welfare facilities, stores and plant rooms to assist with the monitoring and control of traffic and systems both leading up to and within the tunnel.

Both are located in close proximity to the proposed tunnel structures. These permanent maintenance facilities will serve as tunnel services, monitoring and maintenance buildings. One facility is located in Lackagh Quarry on the south side of the eastern portal of Lackagh Tunnel and the other is located at Galway Racecourse adjacent to the western portal of the Galway Racecourse Tunnel as shown on Figure 5.1.8 and 5.1.10 respectively.

These buildings will be serviced with electrical services, surface water drainage, potable water supply and foul water drainage. Heating, ventilation and air conditioning will be required to the TSB.

The surface water drainage design for the Lackagh TSB and Galway Racecourse Tunnel TSB site compounds are designed in accordance with best practice and BS EN-752 – Drain and Sewer Systems outside buildings. Roof runoff is collected from the rainwater down pipes and discharged to a system of carrier pipes located within the site compound. Runoff from the service yard and car parking areas will be collected using road gullies. Discharge from the service yard area will be routed through a Class 1 full retention forecourt oil and petrol interceptor located within the TSB site compound. The outfall discharge from the Lackagh TSB site is to ground via an infiltration basin which is provided as part of the mainline road drainage system. The outfall discharge from the Galway Racecourse Tunnel TSB site is to the existing

trunk storm sewer located to the north of the eastern Racecourse Tunnel portal. The flow will be attenuated in an underground attenuation tank and released at a design discharge flow of 5l/s.

The water demand for the potable water supply is based on 10 staff per building with an assumed usage of 60 litres per person per day. The water connections will also be utilised as needed to fill the tunnel fire water storage tanks. A pre connection enquiry form has been approved in principle by Irish Water for the connection to the existing public watermains. The watermain connection for the Lackagh Tunnel TSB is to the existing 150mm diameter public watermain located in Coolough Road. The proposed new watermain connection for the Racecourse Tunnel TSB is to the proposed new 100mm watermain diversion, located in the realigned racecourse avenue.

Pre-Connection Enquiries have been approved in principle by Irish Water for the proposed foul connections required for the TSBs. The foul wastewater discharge for the Lackagh Quarry TSB will be pumped to the public foul sewer at the Barr na Coille (Crestwood) housing estate adjacent to the Coolough Road. The foul wastewater discharge for the Galway Racecourse Tunnel TSB will be by gravity to the realigned IDA foul sewer west of the eastern Galway Racecourse Tunnel portal.

The main access for Lackagh Quarry TSB will be from the existing main entrance of Lackagh Quarry on Coolough Road. The main access to the Racecourse Tunnel TSB will be from the realigned Racecourse Avenue. Emergency access is also provided from the proposed N6 GCRR to both buildings. Car parking will also be provided at both sites.

Drawings of the details on these tunnel services, monitoring and maintenance buildings are included in Appendix A.5.1.

5.4.1.2.12 Land and Property Requirements

Galway County Council, together with Arup, undertook a series of meetings with affected landowners over the past 10 years.

The findings of these meetings have been combined with land registry records to produce a comprehensive landownership mosaic for the proposed N6 GCRR (ref Figures 14.01 to 14.15). This has been reviewed and updated as part of this updated EIAR to reflect any changes to land ownership boundary details and / or property extents or change of land use. In some cases, agricultural land has been developed and housing has been built on the land, thereby changing the impact from a material assets agricultural impact to a material assets non-agricultural impact.

This landownership mosaic together with information gained during individual meetings was used to establish access requirements and to evaluate side road and mainline realignments. Requests made by the impacted landowners and the general public were evaluated and included to the extent that this was reasonably possible having regard to the objectives of the proposed N6 GCRR.

The accommodation works proposed will be introduced to serve the landowners in the following ways:

- To ensure landowners are given access to the local road network in the area, and that access can be gained between the local road and primary road networks
- To provide access between severed and separated land parcels

The accommodation works include access roads to allow access to land severed by the proposed N6 GCRR. These access roads are 4.0m wide with 1.0m grass verges on either side and shall be designed in accordance with TII Standard Construction Details (SCDs) CC-SCD-02754 and CC-SCD-00706 (both of which are unchanged since 2018).

As noted in Section 5.2, two access roads have been modified as part of this updated EIAR, namely AR 13/02 and AR 06/04. The rationale for these modifications is described herein.

The modification to AR 13/02 arises from Point (iv) of the Schedule in ABP's Board Direction on ABP-302885-18 which directed the N6 Galway City Ring Motorway Scheme 2018 shall be modified as follows:

(iv) Plot Number 651a.202 shall be reduced in area, so as to include only those lands required for the construction of the northern portion of Access Road 13/02 along the alignment of the existing bóithrín.

Access Road AR 13/02, as shown on Plate 5.3 below, provides access to three different land holdings, namely plot references 705, 651 and 627, from School Road as their existing accesses are impacted by the proposed N6 GCRR.

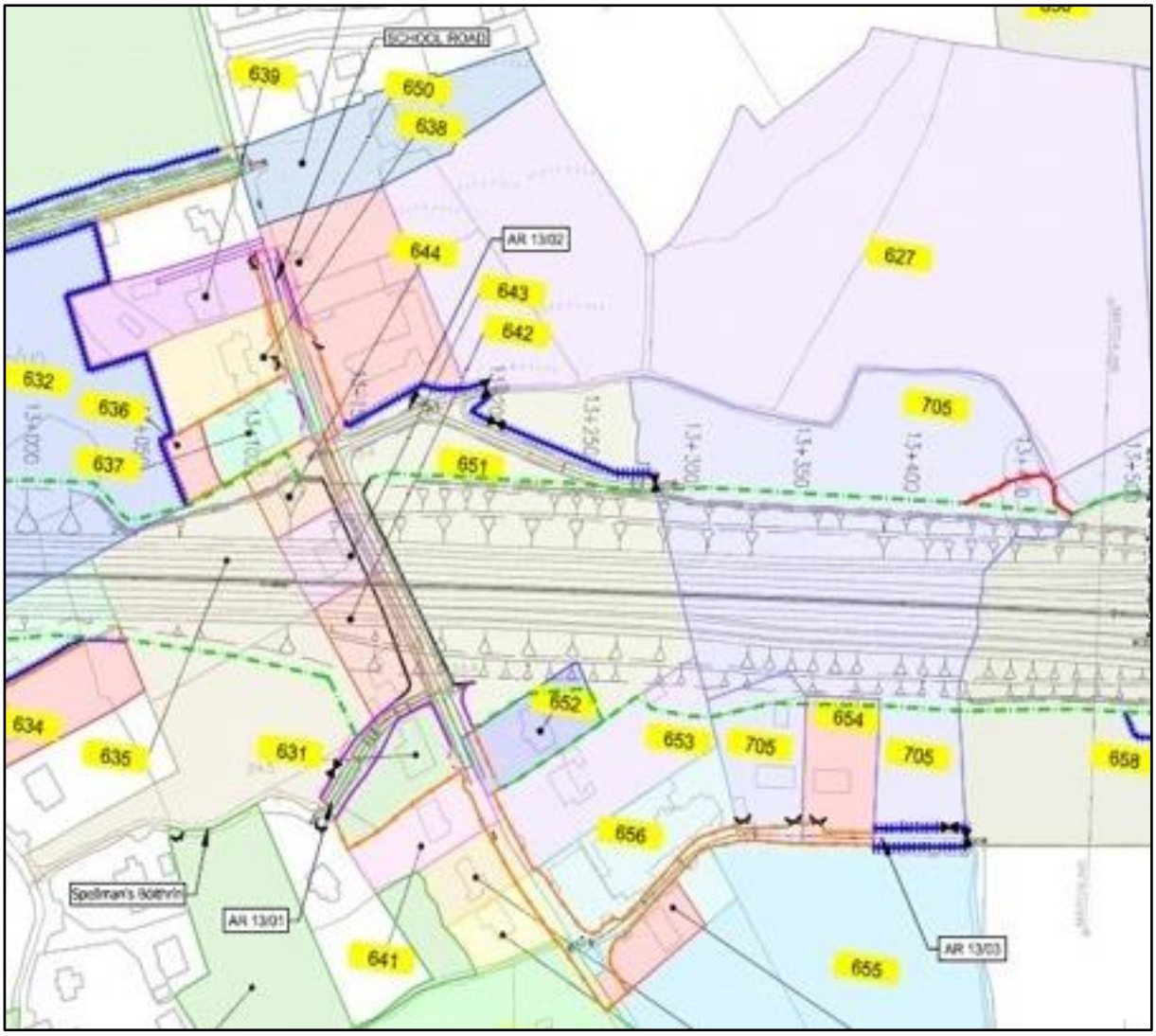

Plate 5.3 Landownership plots and AR 13/02 as per the 2018 EIAR

As per the 2018 EIAR, AR 13/02 is widened along the line of the existing alignment of the bóithrín from School Road until it encounters Limestone pavement, i.e. Annex 1 habitat (refer to Plate 5.4 for extents of Limestone pavement), and then diverges southeast until it reaches plot reference 705 to give access to all severed lands in the ownership of plot reference 705 to the north of the proposed N6 GCRR.

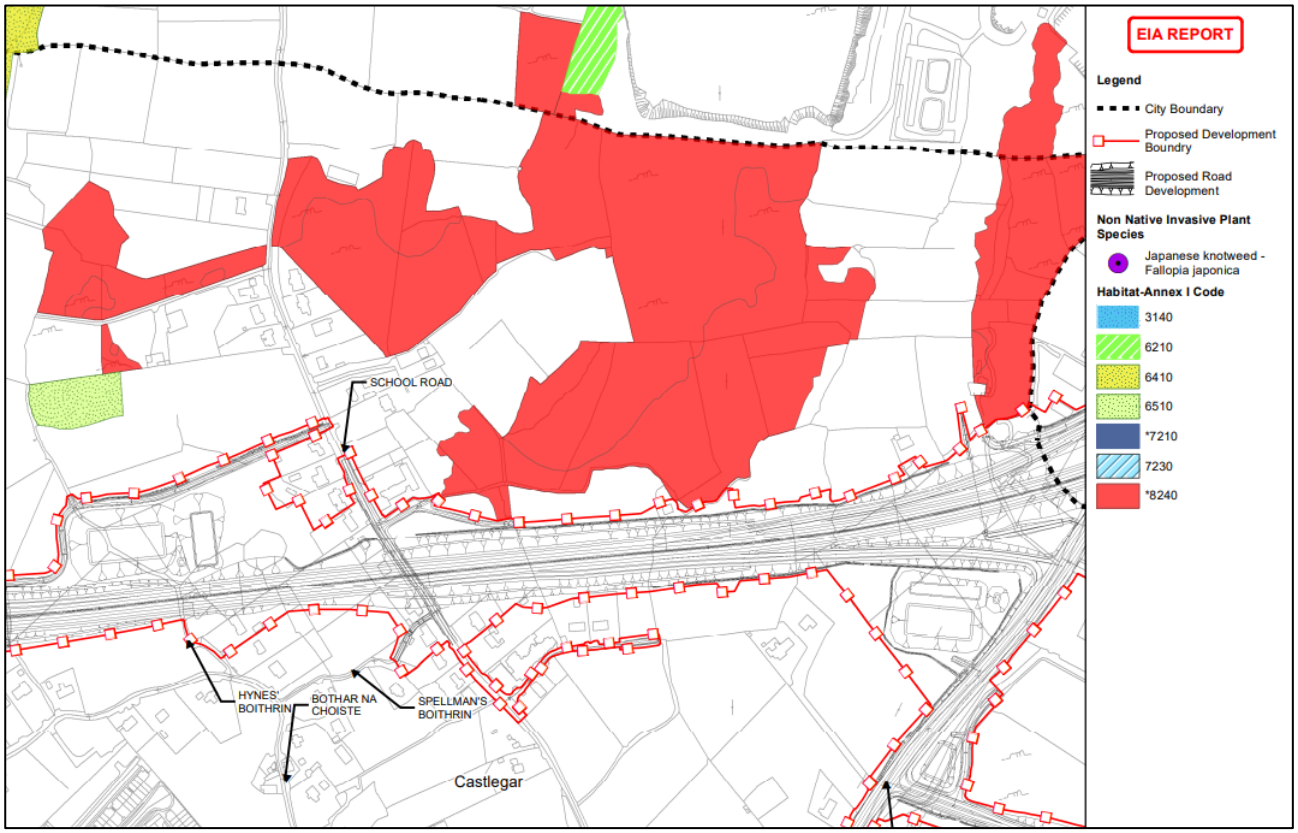

Plate 5.4 Extent of Limestone Pavement (refer Figure 8.15.3 of 2018 EIAR)

Point (iv) of the Direction from ABP in their decision in 2021 would remove the southeast section of AR 13/02. In this scenario, the existing bóithrín would be the only access for plot reference 705 to their severed lands to the north of the proposed N6 GCRR from the point at which the AR 13/02 would terminate at the commencement of the Limestone pavement.

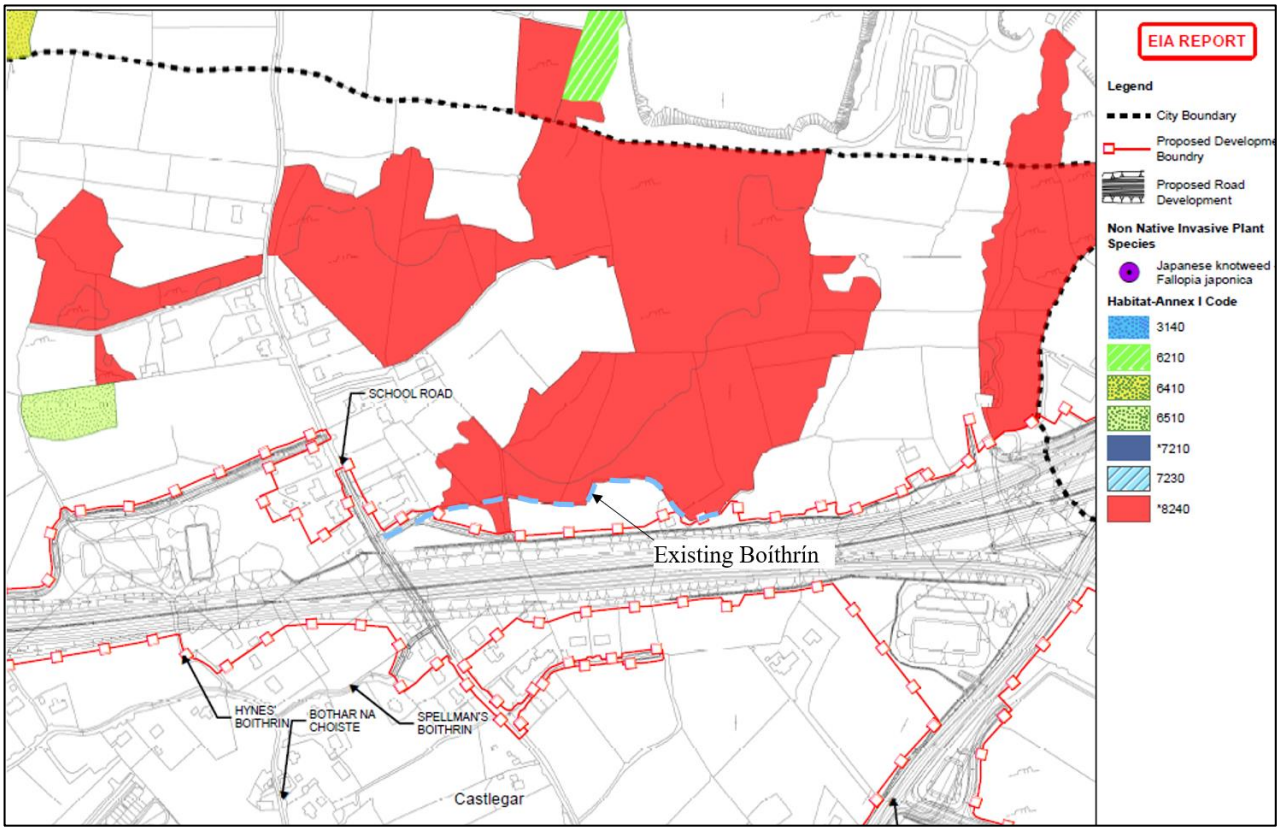

Plate 5.5 Existing Bóithrín (blue dashed line) and extent of Limestone Pavement (refer Figure 8.15.3 of 2018 EIAR)

Limestone pavement extends over the existing bóithrín as seen on Plate 5.5 from the point at which the northern portion of Access Road 13/02 turns southeast. As can be seen from Plate 5.6 the existing bóithrín is overgrown and in its current form is not suitable for agricultural vehicles over its full extents. To provide the same standard of access to the severed lands and mitigate the loss of the current access to plot reference 705 from the south would require an upgrade of this bóithrín, i.e. it needs to be suitable for access for agricultural vehicles. For this reason, it was not used in the 2018 EIAR to provide access to the severed lands in the ownership of plot reference 705, as to upgrade this bóithrín would result in the loss of approximately 480m^2 of Limestone pavement, an Annex I habitat. It is noted that the necessary widening would also require acquisition of land from plot reference 651.

Plate 5.6 Existing Bóithrín – View to the east along the Bóithrín from School Road

Taking cognisance of the Direction in ABP's decision in 2021, to limit the landtake from N6 Galway City Ring Motorway 2018 Scheme plot reference 651a.202, the southeast portion of AR 13/02 has been modified along the alignment shown on Plate 5.7 below. This reduces the permanent landtake from plot reference 651a.202 by 770m^2, shown in green, as well as avoiding impact on the Limestone pavement. The N6 Galway City Ring Motorway Scheme 2018 has been amended accordingly.

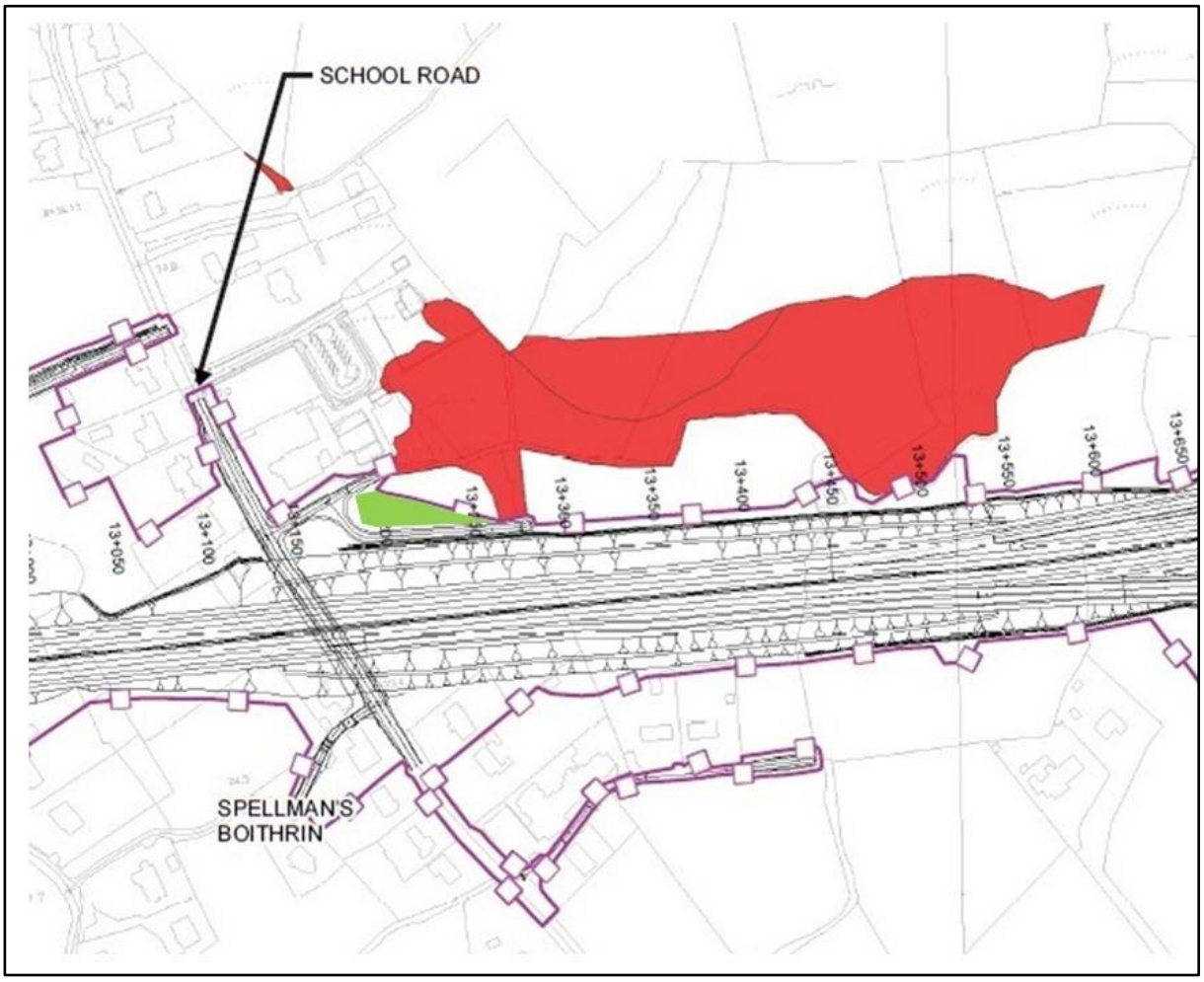

Plate 5.7 Modification to AR 13/02 included in this Updated EIAR

The second access road referenced in Section 5.2 to be modified is AR 06/04 due to the overlapping of the Project with the Glenveagh Large-scale residential development (LRD), at Gort na Bró, Knocknacarra. There is no conflict between this LRD and the proposed N6 GCRR, and the Project, in that both can be implemented without comprising each other. Each possible scenario of sequencing of construction possible without compromising the other development is explained below.

Plate 5.8 shows the scenario whereby the proposed N6 GCRR is constructed first within the lands acquired under the N6 Galway City Ring Motorway Scheme 2018. The Gort na Bró Roundabout is upgraded to a signalised junction with full pedestrian and cycle facilities as part of the construction of the proposed N6 GCRR.

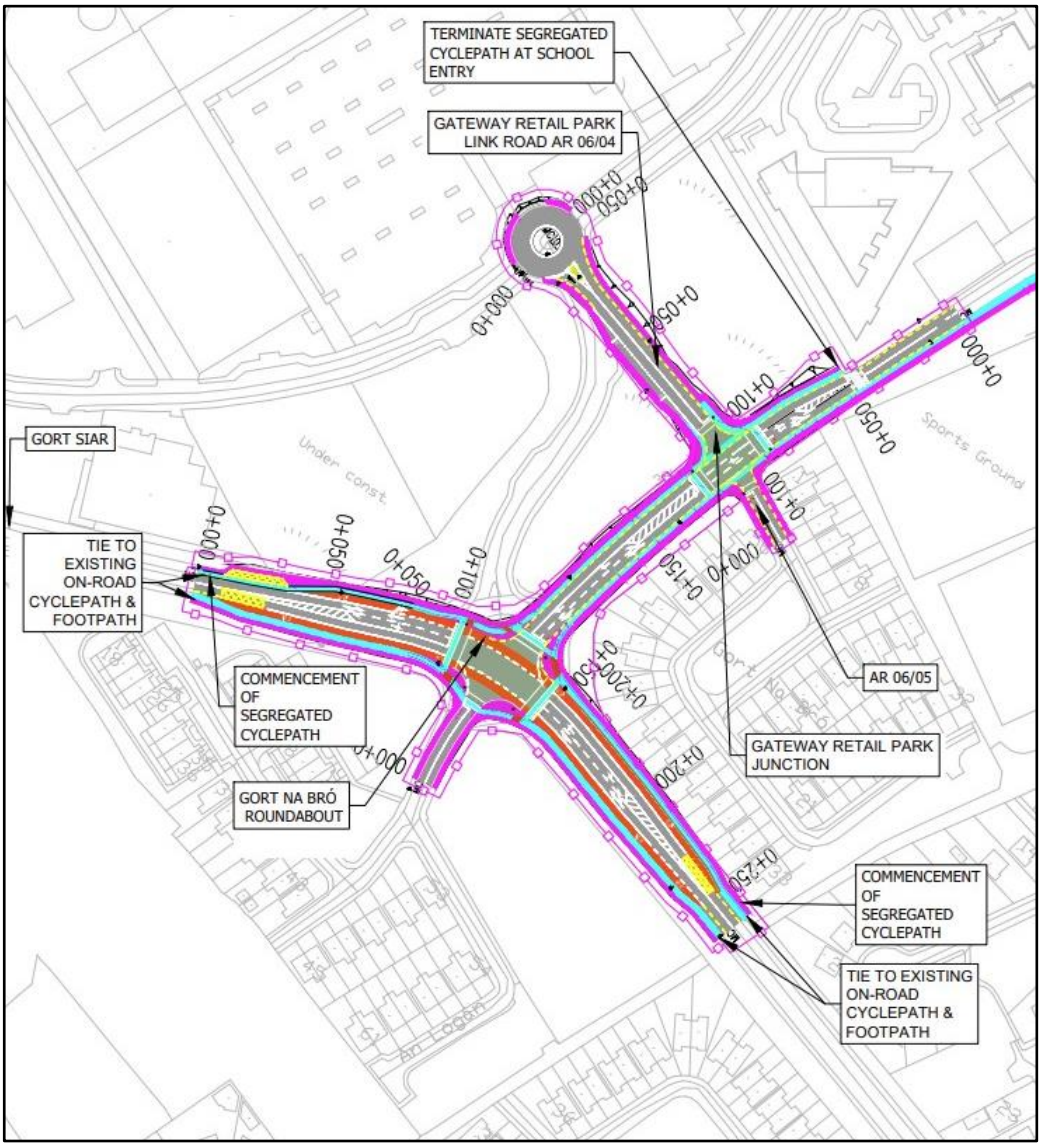

Plate 5.8 Proposed N6 GCRR modification built first with Bus Bay

Plate 5.9 shows the scenario whereby the LRD is constructed following the completion of the proposed N6 GCRR. Access Road AR 06/04 will be modified as part of the construction of the LRD to match ABP-318687-23 (Glenveagh permission) to enable access to both sides of the access road for the LRD. Works will be confined primarily to lands within the LRD, with works on Gort na Bró retained as already constructed under the proposed N6 GCRR.

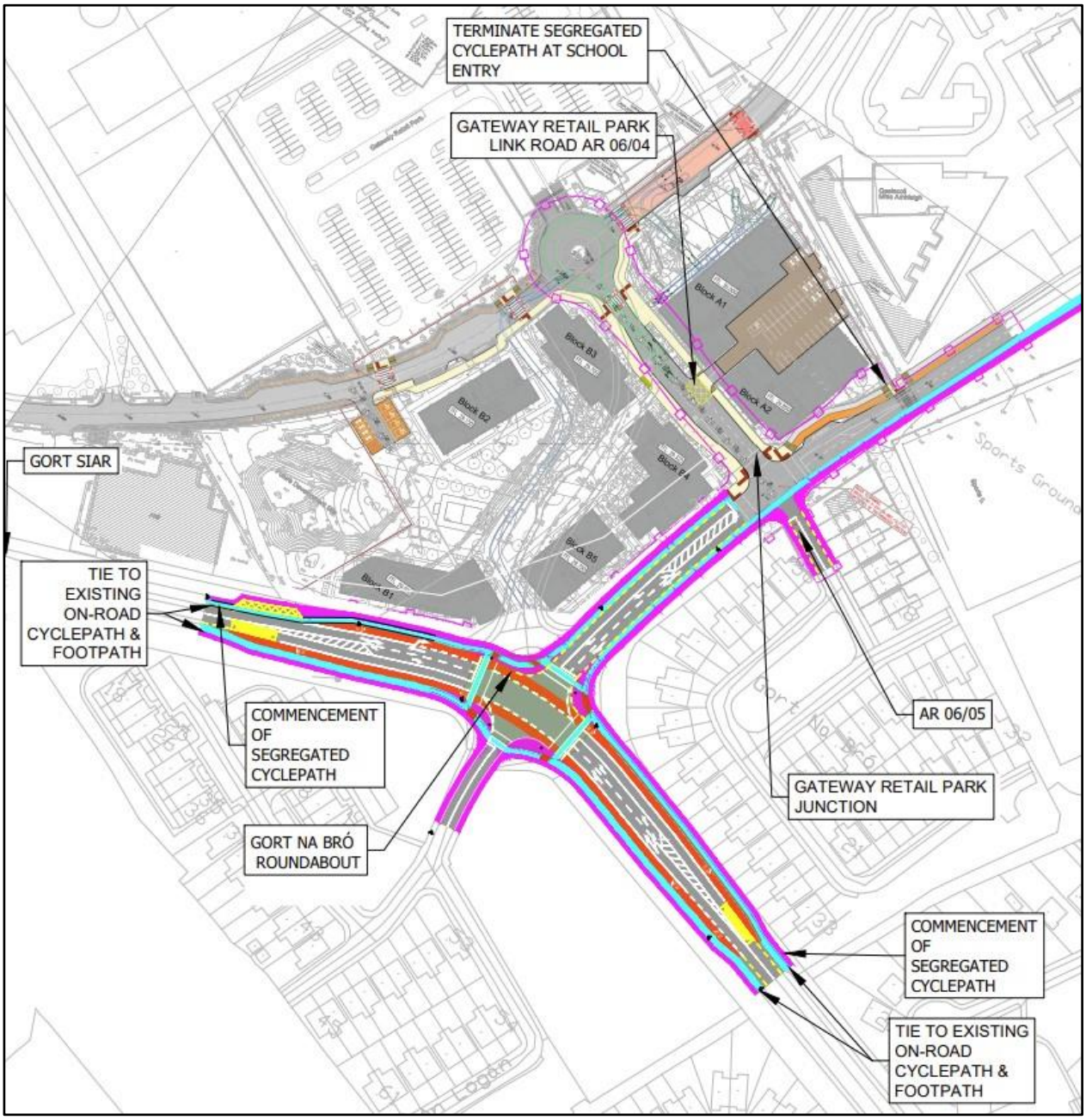

Plate 5.9 LRD built post completion of proposed N6 GCRR

Plate 5.10 shows the scenario whereby the LRD is constructed prior to the construction of the proposed N6 GCRR. The full extents of the LRD as per ABP-318687-23 (Glenveagh permission) will be constructed. This does not include the signalisation of the Gort na Bró Roundabout.

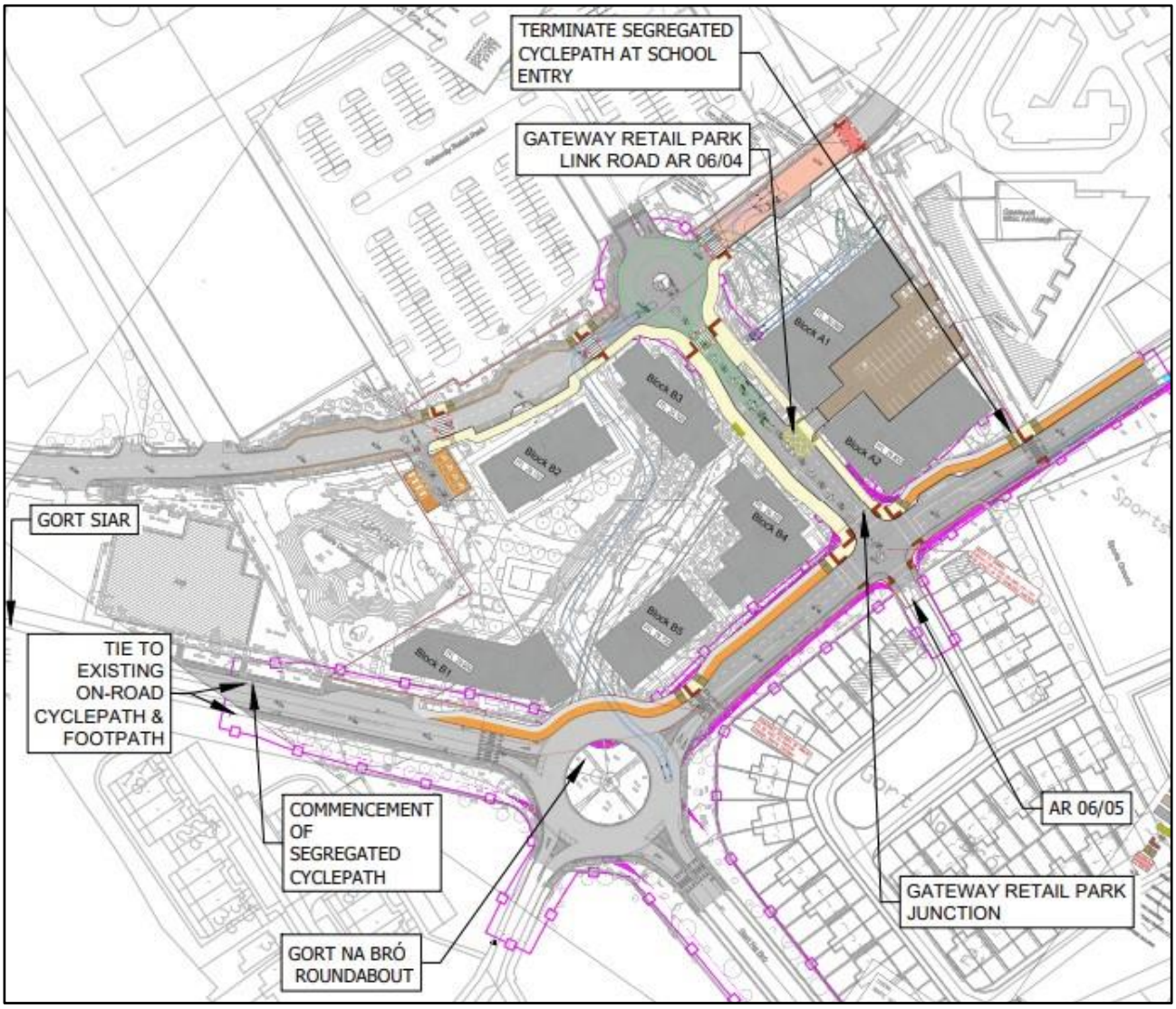

Plate 5.10 LRD Built prior to proposed N6 GCRR

Plate 5.11 shows the shows the scenario whereby the proposed N6 GCRR is constructed following completion of the LRD. No alteration will be made to Link Road AR 06/04 as part of the construction of the proposed N6 GCRR because all required changes to this link road will already have been implemented pursuant to the LRD. The layout along Gort na Bró will be modified to match the proposed N6 GCRR including the signalisation of the Gort na Bró Roundabout.

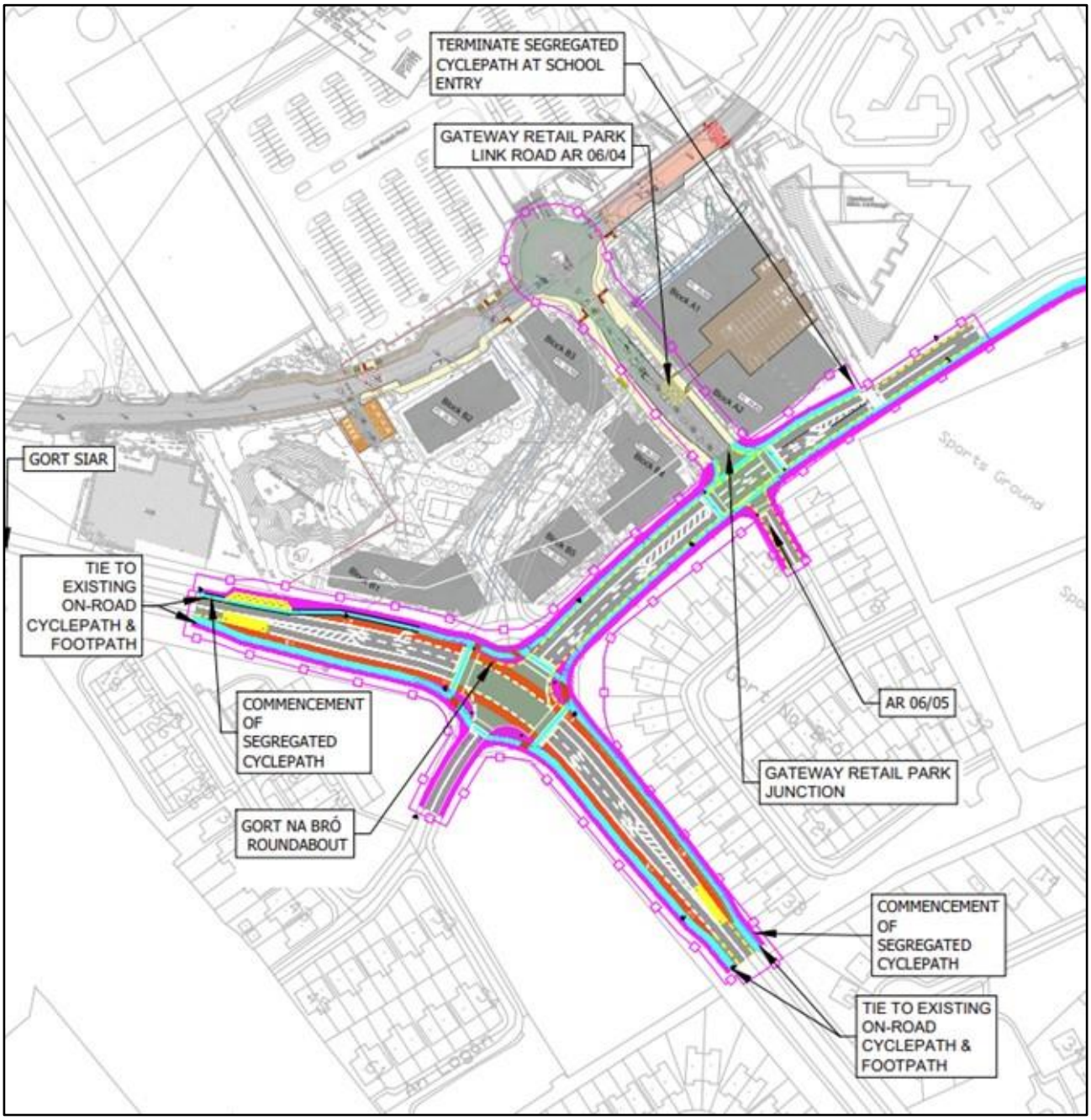

Plate 5.11 Proposed N6 GCRR Built Post Completion of LRD

There is no conflict between the proposed N6 GCRR and the LRD. Regardless of the sequencing, both scenarios have been assessed and there is no difference in the assessments.

The following is a list of access roads identified in the Project. These access roads will be private roads with a private right of way provided to those parties listed in the Table 5.15 below under the reference number. These access roads remain as presented in the 2018 EIAR submitted with the exception of the AR 06/04 and AR 13/02 as noted in Section 5.2 and detailed above. Drawings showing the landowner boundary details and these accommodation works are included in Figures 5.6.01 to 5.6.30 in Volume 3 of this updated EIAR.

Table 5.15 Access Roads

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	Description		
Ch. 0+000	80m access road AR0/01 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 AR0/02 Width 4m	106, 107, 108, 109, 112	Provides access to attenuation ponds and land parcels via single field gates as current access is severed by the proposed N6 GCRR
Ch. 0+650 to Ch. 0+700	65m access road AR0/03 Width 4m	-	Provides access to attenuation ponds.
Ch. 0+850 to Ch. 0+950	160m access road AR0/04 Width 4m	114, 117 236	Provides access to land parcels
Ch. 0+990	30m access road AR0/05 Width 4m	-	Provides access to attenuation ponds only
Ch. 1+100 (Troscaigh Road L5387)	35m access road AR1/01 Width 4m	130, 131, 7891	Re-graded entrance to a house and land parcels as current access via Foraí Maola Road is severed by the proposed N6 GCRR
Ch. 1+300 (Troscaigh Road L5387)	30m access road AR1/03 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 N6 GCRR
Ch. 1+500	15m access road AR1/04 Width 4m	156, Folio GY71569F, Folio GY99412F	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 N6 GCRR
Ch. 1+550	25m access road AR1/05 Width 4m	154	Provides access to land parcel as current access arrangement via Troscaigh Road L5387 is severed by the proposed N6 GCRR
Ch. 1+550 to Ch. 1+675 (Troscaigh Road L5387)	215m access road AR1/06 Width 4m	149, 150, 151, 152, 153	Access to houses and land parcels but also provides access to attenuation ponds

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	Description		
Ch. 2+475 to Ch. 2+550	65m access road AR2/01	176	Provides access to land parcel via Ann Gibbons Road L13215 as land parcel is being severed by proposed N6 GCRR
Ch. 1+750 to Ch. 2+550	830m access road AR2/02 Width 4m	171, 147, 174, 173, 172, 170, 169, 167, 166, 146, 165, 168 164 154	Provides access to houses and land parcels as current access via Ann Gibbons Road L13215 is severed by the proposed N6 GCRR
Ch. 3+275	10m access road AR3/01 Width 4m	199	Provides access to land as current access via Aille road is altered by the proposed N6 GCRR (located north of proposed Aille Overbridge S03/01)
Ch. 3+325 to Ch. 3+900	620m access road AR3/02 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 N6 GCRR. Also provides access to attenuation ponds
Ch. 4+025 to Ch. 4+050	75m access road AR4/01 Width 4m	-	Provides access to attenuation ponds
Ch. 4+240 to Ch. 4+360	140m access road AR4/02 Width 4m	-	Provides access to attenuation ponds
Ch. 4+450 (South of Cappagh Road Junction)	20m access road AR4/03 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 AR4/04 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	185m access road AR4/05 Width 4m	216, 217	Provides access onto land parcels as current access via Boleybeg Bóthrín is severed by the proposed N6 GCRR

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	Description		
Cappagh Road Junction)		223, 226, Folio GY27430F, Folio GY49098, Folio GY104075F, Folio GY40009, Folio GY33928F, Folio GY34114F, Folio GY40058, Folio GY40052, Folio GY45883, Folio GY113505F, Folio GY76735F, Folio GY40054	
Ch. 4+525 to Ch. 4+650	145m access road AR4/06 Width 4m	223, 224, 226, 227	Re-alignment of Boleybeg Bóthrín as currently being severed by the proposed N6 GCRR. Provides access onto land parcels
Ch. 4+950 to Ch. 4+990	60m access road AR4/07 Width 4m	-	Provide access from mainline to attenuation ponds. Pond access gate to be provided adjacent to carriageway
Ch. 5+360 to Ch. 5+660 North of Ballymoneen Road Junction	345m access road AR5/01 Width 6m	223, 261, 230	Provide access to farmyard and land parcels as current access is directly onto the existing Ballymoneen Road
Ch. 5+600 to Ch. 5+625 South of Ballymoneen Road Junction	30m access road AR5/02 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 AR6/01 Width 4m	243	Provide access to land parcel as existing access via Clybaun Road is severed by the proposed N6 GCRR
Ch. 6+525 to Ch. 6+560	45m access road AR6/02 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 AR6/03 Width 4m	241, 239, 245, 247	Provide access to land parcels as being severed by the proposed N6 GCRR
Gort na Bró road	100m Gateway Retail Park Link Road AR6/04	-	Realignment of access to Gateway Retail Park Link Road including roundabout. Bus bay provided on Galway Retail Park Link Road.
Gort na Bró road	30m access road AR6/05	-	Access provided to tie the proposed N6 GCRR into the existing access road to Gort na Bró housing estate

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	Description		
Gort na Bró road - North	15m access road AR6/06	-	Provides access to Gateway Retail Park
N59 Link Road South Ch. 1+900	50m access road AR7/01 Width 6m	480, 481	Provides access to land parcels as part of the proposed N6 GCRR
N59 Link Road South Ch. 1+900	60m access road AR7/02	-	Provides access to Bun a' Chnoc and Culgharraí housing developments as part of the proposed N6 GCRR
N59 Link Road South Ch. 1+900	55m access road AR7/03	-	Provides access to Bun a' Chnoc and Culgharraí housing developments as part of the proposed N6 GCRR. Ties-in to AR7/02
Ch. 7+225 to Ch. 7+300	60m access road AR7/04 Width 4m	250/466	Located just off Letteragh Road L1323. Provides access to land parcel as current access is severed by the proposed N6 GCRR
Ch. 7+260 to Ch. 7+450	200m access road AR7/05 Width 4m	272/462, 259_463	Located just off Letteragh Road L1323. Provides access to land parcel as current access is severed by the proposed N6 GCRR. Also access to attenuation ponds
N59 Link Road South Ch. 1+500	60m access road AR7/06 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 AR7/07 Width 4m	486, 272/462	Provide access to land parcels as current access is severed by the proposed N6 GCRR
N59 Link Road South Ch. 1+140 to Ch. 1+190	70m access road AR7/08 Width 4m	457	Provides access to agricultural lands as current access is severed by the proposed N6 GCRR and acquired severed lands
N59 Link Road Ch. 0+700 to Ch. 0+860	210m access road AR7/09 Width 4m	457, 468, 502, 505, 501	Provides access to land parcels as current access is severed by the proposed N6 GCRR
Ch. 7+800 to Ch. 7+850. Access from local road network	Existing access road within the Heath and the 160m access road AR7/10 Width 4m	506, 504	Located off Circular Road, includes the existing access road to the Heath, and provides access to land parcel as current access is severed by the proposed N6 GCRR. Access is an agricultural right of way to pass and repass with or without vehicles but without livestock on foot.
Ch. 7+800 to Ch. 7+850. Access from local road network	Existing access road within the Heath	Folio GY86696F, Folio GY35103F, Folio GY118263F, Folio GY41823F, Folio GY42106F, Folio GY36701F, Folio	Located off Circular Road and consists of the existing access road within the Heath.

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	Description		
		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, Folio GY36704F	
N59 Link Road South Ch. 1+760	10m access road AR7/11 Width 6m	484	Provides access to land parcel as current access is severed by the proposed N6 GCRR
Ch. 8+360 to Ch. 8+500	115m access road AR8/01 Width 6m	518, 517 (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 N6 GCRR. Also provides access to attenuation ponds
Ch. 8+375 to Ch. 8+450	165m access road AR8/02 Width 4m	515, 522	Provides access to house as current access is severed by the proposed N6 GCRR. Access connected to Circular Road L1020
Ch. 8+525 to Ch. 8+625	Remaining portion of the existing access road within Aughnacurra that ties in with Access Road AR 08/03	531, 532, 533, 534, & Folio GY26414F, Folio GY28597F, Folio GY23431F, Folio GY23250F, Folio GY20148F, Folio GY26176F	Located just off the N59 and includes the remaining portion of the existing Aughnacurra that ties in with Access Road AR 08/03
Ch. 8+525 to Ch. 8+625	100m access road AR8/03 Width 6m	531, 532, 533, 534, & Folio GY26414F, Folio GY28597F, Folio GY23431F, Folio GY23250F, Folio	Located just off the N59. Provides access to Aughnacurra Estate (houses and land parcels) as current access is severed by the proposed N6 GCRR. Access is to tie-in with the remainder of the existing access to existing homes

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	Description		
		GY20148F, Folio GY26176F	
Ch. 8+500	640m access road AR8/05 Width 4m	451. 489	Provides access to attenuation ponds and unhindered access along it to 489
Ch. 9+090 to Ch. 9+160	110m access road AR9/01 Width 4m	528, 543, 557	Provides access to University of Galway's Sporting Campus as current access is severed by the proposed N6 GCRR. Also provides access to an attenuation pond located near-by
Ch. 9+710	120m access road AR9/02 Width 6m	559, 553, 551, 562, 564, 500, 552, 663, 461, 559, 471, 733, 580, Folio GY21502F, Folio GY100171F, Folio GY105725F, Folio GY50959F, Folio GY7047F, Folio GY105725F, Folio GY21502F Folio GY109981F GY123020F Lands bounded by Folios GY21502F; GY109981F; and GY123020F	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 AR9/03 Width 4m	-	Provides access to attenuation ponds. Accessed from AR9/02
Ch. 9+710 to Ch. 9+850	160m access road AR9/04 Width 4m	500	Provides access to land parcel as current access is severed by the proposed N6 GCRR. Accessed from AR9/02
Ch. 9+550	120m access road AR9/05 Width 4m	648	Provides access to land parcel as current access is severed by the proposed N6 GCRR
Ch. 9+500	120m access road AR9/06 Width 4m	649	Provides access to land parcel as current access is severed by the proposed N6 GCRR

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	Description		
Ch. 10+050 to Ch. 10+140	85m access road AR10/01 Width 4m	563, 568, 564	Located off Bóthar Nua, provides access to land parcels as current access is severed by the proposed N6 GCRR
Ch. 10+475 to Ch. 10+890	420m access road AR10/02 Width 4m	553, 563, 572, 580, 581, 591	Provides access to land parcels as current access is severed by the proposed N6 GCRR; but also provides access to attenuation ponds - via AR10/03, AR10/04, AR10/05, AR10/06, or AR10/07
Ch. 10+625	100m access road AR10/03 Width 4m	563	Provides access to land parcel as current access is severed by the proposed N6 GCRR. Also provides access to attenuation pond. Ties-in to AR10/02 AR10/04 & AR 10/07
Ch. 10+625 to Ch. 10+670	65m access road AR10/04 Width 4m	553	Provides access to land. Ties-in to AR 10/03 & AR10/05
Ch. 10+625 to Ch. 10+725	125m access road AR10/05 Width 4m	553	Ties-in to AR 10/02 and AR 10/03. Loop around attenuation pond and land access
Ch. 10+825	20m access road AR10/06	-	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 accessed from AR10/02
Ch. 10+620 to Ch. 10+700	70m access road AR10/07	-	Provides the last exit point for Over Height Vehicles travelling east-bound on the N6 GCRR before to enter the Lackagh tunnel. Connects to AR10/02
Ch. 11+075 to Ch. 11+575	615m access road AR11/01	-	Provides re-routing for Over Height Vehicles engaged on the proposed N6 GCRR prior entering the Lackagh Tunnel when travelling west-bound. Also provides access to attenuation ponds, and Tunnel services building
Ch. 11+990 to Ch. 12+125	245m access road AR11/02	-	Provides access to farmyards and land parcels along the existing Ballindooley Bóithrín as current access is severed by the proposed N6 GCRR
Ch. 12+110 to Ch. 12+240	130m access road AR12/01 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 AR12/03 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

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	Description		
			close proximity with a proposed retaining wall
Ch. 12+540 to Ch. 13+100	630m access road AR12/04 Width 4m	626, 627 631, Folio GY96107F, Folio GY51237	Provides access to land parcels via School Road, as current access is severed by the proposed N6 GCRR. Also provides access to attenuation ponds. Maintains access to the northern portion of Hynes' Bóithrín
Ch. 13+140 to Ch. 13+180	70m access road AR13/01	-	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
Ch. 13+140 to Ch. 13+290	161m access road AR13/02 Width 4m	705, 651, 627	Provides access via School Road to land parcels as current access is severed by the proposed N6 GCRR.
Ch. 13+390 to Ch. 13+425	45m access road AR13/03 Width 4m	705, 658	Provides access to land parcels as current access is severed by the proposed N6 GCRR. 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' 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
City North Business Park Link	145m access road AR13/04	-	Provides access to City North Business Park commercial premises as existing access (from the N83 Tuam Road) is severed by the proposed N6 GCRR. Access to be re-located onto the proposed City North Park Link. Also provides access to attenuation ponds
Ch. 13+725 (Off the N83 Tuam Road)	25m access road AR13/05 Width 4m	-	Provides access to attenuation ponds
Ch. 13+825 to Ch. 14+175 (Off the N83 Tuam Road)	470m access road AR13/06 Width 6m	682, 681, 680, 679, 678, 677, 676, 675, 674, 673, 658,	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		
Parkmore Link Road	50m access road AR13/07 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 AR13/08 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 AR13/09 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 AR14/04 Width 4m	701	Provides access to land parcel as current access is severed by the proposed N6 GCRR
Parkmore Link Road	45m access road AR14/05	-	Connects the proposed Parkmore Link Road with the existing Parkmore Industrial Estate internal road
Parkmore Link Road	75m access road AR14/07 Varies to tie to existing	691	Provides access to Galway Racecourse
Parkmore Link Road	20m access road AR14/08 Width 6m	691	Provides access to Galway Racecourse (Taxi Entrance)
Ch. 14+790 to Ch. 15+000	235m access road AR14/09	-	Provides the last exit point for Over Height Vehicles travelling east-bound on the proposed N6 GCRR before to enter the Galway Racecourse Tunnel. Connects to AR15/01
Ch. 15+125	470m access road AR15/01	691, 707, 713	Re-alignment of the Racecourse Avenue which provides access to commercial premises, as current access is severed by the proposed N6 GCRR. Also provides access to proposed Galway Racecourse Tunnel services building. Ties-in to AR14/09 but also AR 15/06
Ch. 15+200 to Ch. 15+725	545m access road AR15/02	691, 716, 701, 718, 719	Provides access to land parcels as current access is severed by the proposed N6 GCRR. Also provides access to attenuation ponds. Ties-in to AR15/03 to the south, and to AR15/06 to the north; also provides access to AR15/07 users (Over Height Vehicle re-routing option)
Ch. 15+700 to Ch. 15+725	185m access road AR15/03	719, 721, 733	Provides access to Briarhill Business Park commercial premises (from Parkmore Road) as current access is severed by the proposed N6 GCRR. The access road is proposed to pass under S15/02 bridge. Provides access to AR15/04 and to AR15/02

Location		Plot ID / Landowner Reference	Comments
Approx. Chainage	Description		
Ch. 15+690 to Ch. 15+720	30 m access road AR15/04 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 AR15/05 Width 7m	729, 691	Re-alignment of the existing access road to the Galway Racecourse as part of the near-by junction's upgrade
Ch. 15+150 to Ch. 15+200	120m access road AR15/06	-	Provides connection (over the Galway Racecourse Tunnel) to AR15/01 and AR15/02 to facilitate the re-routing of Over Height Vehicles
Ch. 15+425 to Ch. 15+475	50m access road AR15/07	-	Provides re-routing for Over Height Vehicles engaged on the proposed N6 GCRR prior entering the Galway Racecourse Tunnel when travelling west bound. Connects to AR15/02
Briarhill Link	55m access road AR16/01 Width 6m	724	Provides access to land parcel as current access is severed by the proposed N6 GCRR and to attenuation ponds
Ch. 16+800 to Ch. 16+830	30m access road AR16/02 Width 4m	756	Upgrade/slight re-alignment of an existing access road to serve land parcel severed by proposed development boundary of the proposed N6 GCRR
Ch. 16+950 to Ch. 17+475	560m access road AR17/01 Width 4m	754, 753, 752	Provides access to land parcels as current access is severed by the proposed N6 GCRR. Connects to existing access road

The proposed N6 GCRR intercepts the existing sports pavilion at UoG resulting in direct impacts to its western end and the building will be modified as follows:

- the existing western plant room, 1 no. changing room, 1 no. storage area, 1 no. weights area and associated access hallways on both ground floor and upper levels will be demolished
- the western plant room and its associated plant will be relocated
- Construction and reconfiguration of the internal and external walls, roof, windows and door locations

Refer also to Chapter 15, Material Assets Non-Agriculture and Appendix A.15.1.

5.4.1.2.13 Demolitions and Acquisitions

One of the project objectives for the proposed N6 GCRR was "to seek to preserve existing well established communities". Therefore, from the outset of the design of the proposed N6 GCRR every effort was made to avoid property demolitions where possible. However, there are still unfortunately and unavoidably a number of property demolitions that are necessary for the construction of the proposed N6 GCRR and to secure the many benefits the proposed N6 GCRR offers as follows:

- 44 residential properties
- 2 industrial properties (one property includes four buildings)
- 2 commercial properties

In addition to the demolition of 44 residential properties, an additional 10 residential properties require full acquisition.

In addition to the demolition of 44 residential properties, an additional 10 residential properties, one commercial property and one landholding that has a full residential planning permission require full acquisition.

It is proposed that 17 farm buildings will be acquired to accommodate the proposed N6 GCRR.

These properties and structures are also discussed in more detail in the following chapters of this updated EIAR:

- Chapter 12, Landscape and Visual
- Chapter 13, Architectural Heritage
- Chapter 14, Material Assets Agriculture
- Chapter 15, Material Assets Non-Agriculture
- Chapter 19, Human Beings, Population and Health

5.4.1.2.14 Planning Permission Modifications

The 2018 EIAR identified the need to acquire land from five properties with full planning permission for residential development or commercial development in 2018 for the proposed N6 GCRR. Since 2018 the situation has changed in respect of these five properties and there is no further requirement to revoke or modify these planning permissions for the reasons set out in Table 5.16. The details are also updated to reflect these changes in the Seventh Schedule of the N6 Galway City Ring Road Protected Road Scheme and N6 Galway City Ring Road Motorway Scheme.

Table 5.16 Non-Agricultural Planning Permissions affected by the proposed N6 GCRR

PRS / MS Ref. Number	Townland	Description	Area of Property (Ha)	Description of Landtake/ Modification	Land to be Acquired (ha)	Updated status of planning in 2025
124	Na Foraí Maola	House and garden	0.47	Acquisition of whole site	0.47	Lapsed planning
149	Troscaigh Thiar	Planning permission for roadside boundary wall and existing access point as constructed with all associated works and ancillary services.	0.20	Boundary Wall relocation, Road Bed acquisition	0.01	Construction complete
229	Ballyburke	Planning permission granted for the demolition of two existing houses shed and outbuildings, construction of crèche, 3 no retail units, 3 no office units, bar/restaurant and 299 residential units in varying design and form, in two and three storey blocks, bin storage, ESB substation, surface and basement car parking and all associated external and site development works including 3 vehicular access points and road widening along Ballymoneen Rd. (1454) (Extension of time to 18/07/2019)	9.2	Severance of site	1.45	Lapsed planning. Superseded by planning application ABP 304762 which took cognisance of the proposed N6 GCRR. Construction is substantially complete and therefore not impacted by proposed N6 GCRR.
528_543	Dangan Lower	Permission for new all-weather sports pitch on the site of existing training pitch (including floodlighting)(14104)	95.896	Partial acquisition of property	6.293	Lapsed planning

PRS / MS Ref. Number	Townland	Description	Area of Property (Ha)	Description of Landtake/ Modification	Land to be Acquired (ha)	Updated status of planning in 2025
528_543	Dangan Lower	Permission for flood lighting of existing GAA pitches adjacent to the river. (17159)	95.896	Partial acquisition of property	6.293	Construction complete

5.5 Description of Phases 1, 3, 4 and 5: Proposed Development at Galway Racecourse

Whilst Phase 1, Phase 3 and Phase 4 of this Project were the subject to a separate development consent process for which planning permission has been granted as mentioned above, those phases form part of the Project that has been considered and assessed for EIA purposes in this updated EIAR (and for AA purposes in the updated AA Screening Report and NIS). These phases relate to the provision of temporary and permanent stables for Galway Racecourse arising from the proposed demolition of the racecourse stables to facilitate the construction and operation of the proposed N6 GCRR so that the racecourse can mitigate against the impacts of the proposed N6 GCRR on the operation of the racecourse and ensure its continued operation.

All works required for the diversion or protection of any of the services in conflict with all phases of the Project have been confirmed with each of the service providers. Further details on the locations, potential utility impacts and proposed measures are included in Chapter 15, Material Assets Non-Agriculture.

5.5.1 Phase 1

Phase 1 includes the construction of a temporary stableyard including horsebox parking, machinery shed, maintenance shed, ESB substation, two wells, new pre-parade ring and pavilion on Galway Racecourse lands.

The proposed temporary stables are to be located on an existing grassed area in the centre of the racetrack i.e. the infield. The temporary stableyard will consist of 159 No. stables; vet, security, storage facilities and groom's pavilion and 61 number horsebox parking spaces.

The machinery storage shed is located to the east of the temporary stables on an area currently used to store sand and grit for use around the Racecourse. A pre-parade ring will be provided to the east of the existing pre-parade ring. A maintenance shed will be provided to the east of the proposed pre-parade ring to replace the existing maintenance shed that will be demolished as part of Phase 2.

Two proposed wells for water supply for track watering will be provided in the existing horsebox parking area to replace the existing water tank within the existing stableyard that will be demolished as part of Phase 2.

An ESB substation will be provided to the rear of the proposed maintenance shed, as well as associated internal roads, drainage, site, utilities connection and landscape works will be undertaken. The external corridors of the temporary stable courtyards will be lit by dimmable LED surface mounted luminaires.

The layout of the proposed temporary stableyard and associated works is shown in Appendix A.5.3 contains the full details of the proposed development at Galway Racecourse.

Similar to the carriageway drainage, a surface water collection system will be provided in both locations. The temporary stables discharges to a natural 'swallow hole' feature in the infield area of racecourse and caters for storm events up to the 1 in 100 year return period storm event, with a limited discharge of 5l/s The proposed system incorporates critical elements of a sustainable drainage (SuDS) treatment train comprising source control (green roof system), water quality improvements (green roof system), runoff volume reduction (green roof system), runoff rate control (hydrobrake flow control) and attenuation storage (attenuation pond).

5.5.2 Phase 3

Phase 3 comprises the construction of the new permanent stableyard including horsebox parking post-handover of the proposed N6 GCRR.

The permanent stableyard will consist of 152 No. stables; vet, security, storage facilities and Groom's Pavilion, and horsebox parking.

The permanent stables will be constructed on a brownfield site in the same location as presented in the 2018 EIAR, subject to the condition that no structural elements will be allowed over the zone of influence of the Galway Racecourse Tunnel. This area has two outfall locations.

The parking area will incorporate a Grasscrete GC1 system to facilitate a reduction in the hardstanding area and make a provision for attenuation, prior to discharging into the existing track drainage network, which discharges to the 'swallow hole' noted above. The main stable yard and buildings will discharge to the proposed diverted combined sewer via a flow control to reduce the existing flow rates to the existing network.

The drainage networks are designed to include an increase of 20% in rainfall depth to cater for the impact of climate change.

5.5.3 Phase 4

Phase 4 comprises the demolition of the temporary stables constructed in Phase 1.

The above ground structures of the stables will be demolished and removed. However, the bases beneath the temporary stables will be retained and reinstated as car parking. The rubberised surface in the temporary stableyard will be removed and this area will be repurposed as the circulatory area for carparking.

The drainage features installed as part of Phase 1 will be retained for attenuation of this repurposed parking area plus attenuation of a portion of the permanent stables installed during Phase 3.

The horsebox parking spaces will be redesignated for car parking post demolition of the temporary stables.

The ESB sub-station, pavilion, machinery shed, maintenance shed, well and pre-parade ring constructed as part of Phase 1 are retained.

5.5.4 Phase 5

Phase 5 is the fully operational proposed N6 GCRR and the fully operational permeant stables.

5.6 Functionality of N6 GCRR

The function of the proposed N6 GCRR is to facilitate the reduction of existing traffic congestion and future proof the effectiveness of this part of the national road network. To achieve this dual functionality, the proposed N6 GCRR design sought to:

1. provide for the strategic need of the TEN-T comprehensive road network and connectivity of Galway City and the West Region to the national road network
2. provide an additional crossing of the River Corrib, thus facilitating the reduction of congestion on city centre roads, and allow the reallocation of road space in the city network to non-motorised modes of transport, thereby facilitating the effective implementation of all the elements contained in the GTS, namely the improvement of public transport, cycling and walking measures

The grade separated junctions on the N59 Moycullen Road, N84 Headford Road, N83 Tuam Road and Coolagh Junction provide the necessary connections to distribute traffic in accordance with demand, whilst also being of a standard to comply with TEN-T regulations (ref Chapter 2, Planning and Policy Context) which require that all roads that form part of the TEN-T Comprehensive network, as a minimum, be a high quality road. Regulation (EU) No 1315/2013 sets out the requirements for high quality roads that shall form part of the network, both Core and Comprehensive.

The N59 Letteragh Junction is a standard grade separated junction, but is offset from the N59 Moycullen Road. The purpose of this offset from the N59 Moycullen Road is two-fold, firstly to minimise the direct impact on residential property at the N59 Moycullen Road bridge crossing and secondly to provide better connectivity and traffic distribution from the proposed N6 GCRR to Knocknacarra and the crossing of the N59 Moycullen Road area. The N59 Link Road South connects to the Letteragh Road and Rahoon Road which effectively distributes traffic accessing University of Galway) South (south of the Quincentary Bridge), Knocknacarra and University Hospital Galway (UHG), whilst the N59 Link Road North facilitates traffic accessing University of Galway North (Sporting Campus), N59 Moycullen Road and Connemara.

The N84 Headford Road Junction is a standard grade separated junction located on the N84 Headford Road to connect with the N84 Headford Road national road traffic. The layout as shown on Figures 5.1.08 and 5.1.09 is the minimum footprint achievable. However, this junction does directly impact on residential property in this area due to the presence of ribbon development along the N84 Headford Road (ref Chapter 15, Material Assets Non-Agriculture).

The N83 Tuam Road Junction is a combined junction to serve the demand arising from the N83Tuam Road and the demand arising from the business parks in the Parkmore and Ballybrit area. As the forecast volume of movements in the N83 Tuam Road area could not be accommodated via single junction slips, alternative layouts had to be considered. The solution determined as most suitable and capable of delivering suitable capacity was a merge / diverge arrangement split between the N83 Tuam Road and Parkmore Link Road. The key features of this layout are as follows:

- Eastbound diverge from the proposed N6 GCRR to the existing N83Tuam Road and westbound merge from the existing N83Tuam Road to the proposed N6 GCRR
- No direct connection from the existing N83Tuam Road to the proposed N6 GCRR travelling eastbound or no direct connection from the proposed Parkmore Link Road to the proposed N6 GCRR travelling westbound. However, the forecast volume of such movements was minimal and they were therefore accommodated via the provision of a connection from the proposed Parkmore Link Road to the existing N83 Tuam Road, the City North Business Park Link Road

The proposed N83 Tuam Road Junction arrangement facilitates the efficient movement of all road users (motor vehicles, buses, trucks, bicycles, and pedestrians). The layout has the benefit of minimising the number of traffic conflicts by segregating the major movements and by providing connections between the proposed and existing road networks as appropriate.

The grade separated junction at the eastern terminus of the N6 at Coolagh provides an efficient partial free-flow transfer of traffic from the existing N6 to the proposed N6 GCRR. Traffic destined for the eastern part of the city diverges from the existing N6 to an at-grade junction in the vicinity of the existing N6 Coolagh Roundabout. Clear signage at this signalised junction, together with appropriate gantry signage in advance of the split for the proposed N6 GCRR will enable drivers to make the appropriate choice to arrive at their destination.

5.7 References

All references were reviewed for relevance in 2025, and updates are listed where available. Standards or guidance which is out of date is not included in this updated EIAR.

DoEHLG and National Construction & Demolition Waste Council (NCDWC). Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects.

BS5489-1, ISEN13201 Code of Practice for the Design of Road Lighting, Part 1: lighting of Roads and Public Amenity Areas

- Department for Transport:
  - Traffic Signs Manual, 2021
  - Design Manual for Urban Roads and Streets (DMURS), 2023
- Transport Infrastructure Ireland (TII) Publications:
  - DN-GEO-03031– Road Link Design
  - DN-GEO-03057– Geometric Design to Improve Surface Drainage
  - DN-GEO-03043– Geometric Design of Major/Minor Priority Junctions and Vehicular Access to National Roads
  - DN-GEO-03033– Geometric Design of Roundabouts

  - DN-GEO-03035– Layout of Grade Separated Junctions
  - DN-GEO-03036– Cross-Sections and Headroom.
- TII Environmental Guidelines:
  - Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan
- National Transport Authority (NTA), *National Cycle Manual*, 2011
- UK DMRB:
  - HD 33/06 and 2009 NRA addendum – Surface and Sub-Surface Drainage Systems for Highways
  - TD 16/06 and 2009 NRA addendum – Geometric Design of Roundabouts
  - TD 22/06 and 2009 NRA addendum – Layout of Grade Separated Junctions
  - TD 34/07 - Design of Road Lighting for the Strategic Motorway and Trunk Road Network.