

IN THE MATTER OF AN APPLICATION  
TO

AN BORD PLEANÁLA

FOR APPROVAL OF (I) THE N6 GALWAY  
CITY RING ROAD PURSUANT TO SECTION  
51 OF THE ROADS ACT 1993 (AS  
AMENDED); (II) THE N6 GALWAY CITY  
RING ROAD MOTORWAY SCHEME 2018; and  
(III) THE N6 GALWAY CITY RING ROAD  
PROTECTED ROAD SCHEME 2018

ABP Ref. ABP-302848-18 and ABP-  
302885-18

Response to Queries raised in Module 2 of  
the N6 Galway City Ring Road

Oral Hearing

In respect of consideration of the  
N6 Galway City Outer Bypass (GCOB) as a  
solution to the transport problem in Galway  
and its environs

**by**

Arup: Eileen McCarthy & Mary Hurley

**15 October 2020**

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# 1 Introduction

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- 1.1 This response sets out the consideration given to the 2006 Galway City Outer Bypass (2006 GCOB) during the assessment of alternatives for a transport solution for Galway City and its environs and the reasons why it does not meet the project objectives and would not be, and is not a viable alternative.
- 1.2 Many objectors during the course of the hearing to date suggested the that the 2006 GCOB Route Option should have been the preferred option even though (i) its western section did not receive approval from An Bord Pleanála in 2008 due to potential environmental impacts in the area of Moycullen Bog Complex NHA and (ii) the eastern section of the 2006 GCOB Route Option was ultimately determined by the European Courts as having an adverse impact on the integrity of the Lough Corrib cSAC.
- 1.3 It was also suggested during the course of the oral hearing that a solution to these issues with the eastern section of the 2006 GCOB Route Option could have been engineered.
- 1.4 Section 2 of this response summarises the context in which the 2006 GCOB was developed in comparison to how the current N6 Galway City Ring Road (GCRR) has been developed, given that there is almost twenty years' time lapse and significant changes in the interim in technology and planning policy. The project objectives against which all potential options are assessed are included in Section 3.3 of the Environmental Impact Assessment Report (EIAR) and are reproduced for convenience in Section 3 of this response.
- 1.5 Section 4 of this response presents a summary of the assessment of the 2006 GCOB Route Option and Section 5 presents a summary of the assessment undertaken of the Cyan Route Option (a modification of the 2006 GCOB Route Option developed to address the issues associated with the refusal of the western section of the 2006 GCOB Route Option by ABP and to improve connectivity on the eastern section of the 2006 GCOB Route Option). Section 6 details why the eastern section of the 2006 GCOB Route Option could not be engineered to mitigate its adverse impacts on the European site. Finally, after discussing the 2006 GCOB Route Option and a modification of it being the Cyan Route Option and a potential engineering solution in relation to the Lough Corrib cSAC, Section 7 sets out why the N6 GCRR was chosen as the route to address the transport problem in Galway and how it will do that.

## 2 The Context for the development of the 2006 GCOB vs the N6 GCRR

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- 2.1 At the commencement of the assessment work in 2014 on the potential solution to the transport problem for which this application to ABP is made, in line with the 2009 Common Appraisal Framework (“CAF”), it was necessary to undertake an appraisal on whether investing public money in solving the transportation problems in Galway represented value. At this point, it was necessary to clearly define the problem to be solved and clearly identify the objectives that need to be achieved. This required the design team to start with a blank canvas – which it did – with the benefit of more informed population data sets, in terms of detail on place of work and place of education in relation to place of residence, and transport modelling tools than those that were available at the time of the development of the 2006 GCOB project.
- 2.2 The traffic analysis which was undertaken to inform the 2006 GCOB utilised manual origin and destination surveys using roadside surveys undertaken by An Gardaí Síochana of every tenth vehicle. By comparison, the project design team had the 2011 Census data available which gave detail on place of work and place of education (POWSCAR) for every single home in the study area.
- 2.3 The traffic modelling suite used to assess the traffic impacts to inform the 2006 GCOB project was not capable of modelling public transport, walking or cycling. In addition, the zones within the model were not sufficiently refined within the city to understand the potential impact of the project on the individual streets within the city.
- 2.4 As one would expect, the modelling techniques have advanced significantly since 2006. The transport model which was available to test scenarios in 2014 is the Western Regional Model, which is a strategic transport multi-modal model for counties Galway, Mayo, Roscommon, Sligo, Leitrim and Donegal, with a focus on the city of Galway, and is capable of modelling walking, cycling and public transport in addition to private vehicle trips.
- 2.5 This level of data together with the more sophisticated modelling techniques identified that the congestion problems experienced in Galway were not primarily attributable to by-passable traffic. This raised the further question as to whether a bypass would solve the problem. Therefore, with a better understanding of the transportation problem and in line with the requirements of CAF, project objectives together with specific performance targets were defined in conjunction with Galway City Council and Galway County Council so that it was very clear going forward what the scope was. It should be noted that these objectives included the preservation of existing well-established communities as well as seeking to minimise impacts on the ecological designated sites. At all stages during the project, potential options were assessed against these agreed project objectives to establish whether they would progress further.

- 2.6 Additionally, planning policy has changed, especially with the introduction of the National Planning Framework (NPF) and Galway County and City have developed in a different way to that set out in the Galway Transport Planning Study (GTPS) of 2001, which was used to inform the 2006 GCOB project. The traffic model for the 2006 GCOB project was updated to reflect some changes in the land use in 2004 but the county and city continued to deviate from the GTPS and the land use assumptions upon which the traffic modelling for the N6 GCRR are based differ from that of the 2006 GCOB.
- 2.7 Items of note since the development of the Galway Transport Planning Study (GTPS) of 2001 upon which the 2006 GCOB was developed are:
- Initial data collection for the 2006 GCOB was undertaken in 1997 which was before POWSCAR data. As such, Origin/Destinations were calculated on a relatively small sample of road-side surveys.
  - The Ardaun area was a significant part of the GTPS and development was to be concentrated to east of the city and with a good public transport spine. This development targeted to have 18,000 people living and working in Ardaun by 2016, with two-thirds in the county portion and one-third in the city portion of Ardaun. However, development continued to the west of the city and radially out of the city since 2004 as opposed to building out Ardaun.
  - Employment in Parkmore grew significantly more than that envisaged in the GTPS, which is why the 2006 GCOB did not provide a junction on the N83 Tuam Road and why such a junction is so critical and included in the N6 GCRR.
- 2.8 Given that the development pattern that the 2006 GCOB was developed to serve did not materialise, the 2006 GCOB would not have been the correct solution for the actual reality of the actual development of the city and county. This was clearly demonstrated in the optioneering phase of the N6 GCRR which is discussed in Section 4 below and evidences the clear reasoning why the 2006 GCOB did not progress to the final route options considered.
- 2.9 While it was recognised that the 2006 GCOB would have less impacts on homeowners, communities and amenities with a lower number of demolitions, it did not and could not meet the project objectives as set out in Section 3 and had a number of significant shortcomings as are clearly set out below in Section 4.

### 3 Project Objectives

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- 3.1 For the purposes of considering the 2006 GCOB, the Cyan Route Option (modified 2006 GCOB) and ultimately the N6 GCRR it is important to consider the overall objectives of the solution to the transport problem.
- 3.2 As set out in Section 1.5 of the Route Selection Report, the overall ambition of the project is to achieve a number of specific objectives under a number of multi-criteria categories. By considering the objectives under these headings, it is the intention to provide a scheme which is attractive to all, delivers the road component solution (of the overall transport solution), provides benefit to the local and the larger regional population of Galway and the West Region and is cognisant of the sensitive environment in which it is interwoven. The multi criteria headings are as follows:
- a) Economy
  - b) Safety
  - c) Environment
  - d) Accessibility & Social Inclusion
  - e) Integration.<sup>1</sup>
- 3.3 The specific objectives under each of the headings included in the Route Selection Report are detailed below.
- 3.4 The '*Economic*' objectives of the scheme include:

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<sup>1</sup> These multi criteria were selected in accordance with the Department of Transport's Guidelines on a *Common Appraisal Framework for Transport Projects and Programme of June 2009*, which was current for the Route Selection Report. This was subsequently updated in March 2016 to include a further criterium of Physical Activity and this criterium is included in the framing of the project objectives in Section 3.3 of the EIAR. The Route Selection objectives of 'Accessibility' and 'Social Inclusion and Integration' both aimed at addressing the measures which would lead to increased physical activity, thereby ensuring that all options assessed thereafter took due cognisance of this requirement.

- Encourage local, regional, national and international development
- Reduce journey times
- Increase journey time certainty
- Support the economic performance of the Gateway of Galway as the only large employer in the region
- Provide benefits to the transport infrastructure
- Improve connectivity to the Gateway of Galway
- Improve linkages between the west and east sides of the county
- Deliver a cost-effective project.

3.5 The '**Safety**' Objectives of the scheme include:

- Segregation of the interface of through traffic from urban traffic
- Reduction in road traffic collisions
- Provision of safer urban streets.

3.6 The '**Environmental**' Objectives of the scheme include:

- The proposed scheme will minimise impacts on the integrity of all designated Natura 2000 sites
- The proposed scheme will seek to avoid impacts to National Monuments
- The proposed scheme will not be unduly detrimental to the architectural, cultural or linguistic heritage of the area
- The proposed scheme will take due cognisance of the importance of the existing landscape
- The proposed scheme will seek to preserve existing well-established communities
- The proposed scheme will seek to reduce noise and air impacts on sensitive receptors.

3.7 The '**Accessibility and Social Inclusion**' Objectives of the scheme include:

- Improve accessibility to Galway City
- Interconnection of the Galway City and environs road network to the national motorway network
- Improve accessibility of Galway urban area to its main markets
- Improve accessibility of the Gaeltacht areas to the remainder of the county and country
- Reduce disadvantage of the Gaeltacht areas
- Implement sustainable transport policies for shorter commutes
- Improve urban environment of Galway City centre
- Support the improvement of the public transport hub linking Galway to other Gateways
- Support the current development strategy and settlement strategy.

3.8 The '*Integration*' Objectives of the scheme include:

- Support the development of critical mass of regional population centres
- Integration of Galway City and environs (including western parts of Galway County) into the national economic development agenda
- Support balanced social and economic development at a national level
- Support balanced social and economic development at a city-region level
- Understanding of the development, land-use and transportation pressures in the Galway urban area and their impact on the delivery of a successful city region at Galway;
- To deliver on Galway's potential as Ireland's fourth largest city and an important residential, educational, employment and service centre for a wide regional hinterland, contributing to the national urban hierarchy
- Recognition of the role of Galway City as a gateway to the west and Connemara, and the consequent socio-economic benefits of enhanced connectivity of Galway City to national markets, enhanced tourism accessibility, and the national transport system
- Improvement of the TEN-T network to ensure connectivity of the west of Ireland to the single European market.



## 4 Assessment of the 2006 GCOB as a potential solution?

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### 4.1 Introduction

- 4.1.1 This section of the response sets out the assessment of the original 2006 Galway City Outer Bypass (2006 GCOB) using the same criteria and assessment matrix as all other route options that were considered as part of the route selection process. As will be evidenced from what is set out below this demonstrates that the 2006 GCOB Route Option fails to meet the project objectives based on the current land use and constraints.

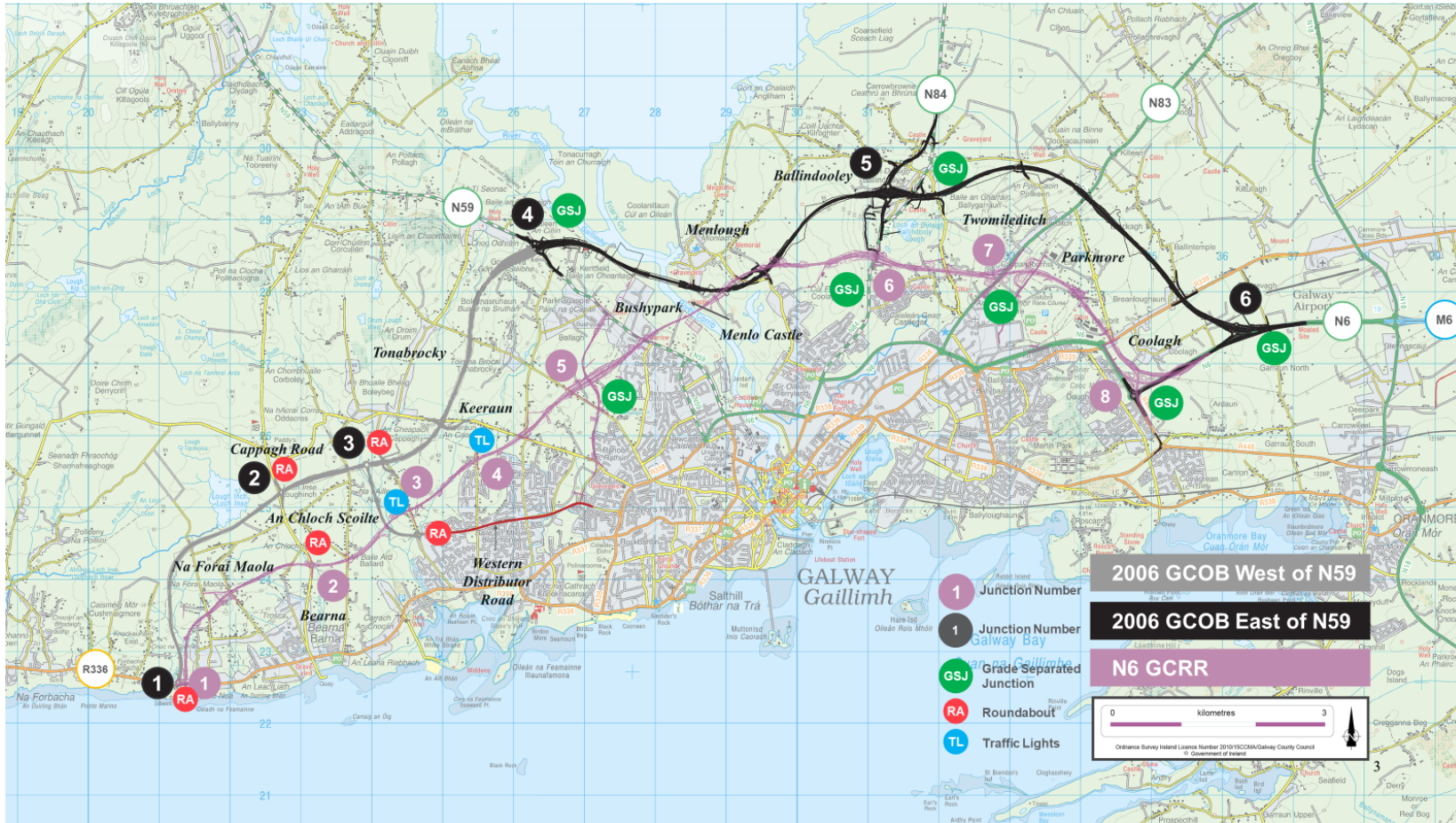
### 4.2 Description of Route

- 4.2.1 The 2006 GCOB Route Option commences at the R336, with an at-grade roundabout junction approximately 2km to the west of Bearna and travels north, passing around Na Foraí Maola and to the south of Lough Inch, with an at-grade roundabout junction on the Bearna to Moycullen Road. It then travels east as far as Cappagh, with a link road connecting the mainline to the existing roundabout at the junction of the Cappagh Road and the Western Distributor Road. The mainline continues north-east from here, travelling through Tonabrocky, Gortacleva and Killeen, where there is a grade separated junction with the N59. It travels around the northern side of Glenlo Abbey, turning south-east, and crosses the River Corrib on a bridge structure between Menlough Village and Menlo Castle.
- 4.2.2 The 2006 GCOB Route Option crosses over the Menlough Road and travels north towards Ballindooley. There is a grade separated junction located to the west of Ballindooley, and the N84 is realigned to connect to the mainline here. The 2006 GCOB Route Option continues east, curving north around Pollkeen and Twomileditch, and crossing under the N83 without a connection. It then travels south-east, crosses under the R339 in Ballintemple, and connects to the existing N6 to the east of Coolagh. An assessment of this route option was included in Appendix A.5.4 of the Route Selection Report and follows the same methodology used for all the route options assessed in Stage 1<sup>2</sup> of the Route Options Selection Process.
- 4.2.3 Figure 4.1 shows the 2006 GCOB Route Option with reference to the N6 GCRR.
- 4.2.4 Appendix A.5.4 of the Route Selection Report presents an engineering and environmental assessment of the 2006 GCOB.

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<sup>2</sup> TII guidelines for undertaking Phase 2 Option Selection requires a two-stage process of sifting of options to be undertaken. The first sift is called Stage 1 Preliminary Options Assessment and requires a comparative assessment under the headings of engineering, environment and economy.

Figure 4.1: 2006 GCOB and N6 GCRR



### 4.3 Engineering & Traffic Assessment

- 4.3.1 Section 2 of Appendix A.5.4 of the Route Selection Report determined that, from an engineering perspective, the 2006 GCOB Route Option is a feasible route option.
- 4.3.2 However, it did not provide a connection with the N17 (subsequently renamed the N83), a national road, thereby providing a lesser level of connectivity than alternatives considered as part of the Stage 1 assessment of options.
- 4.3.3. While traffic modelling of the 2006 GCOB Route Option (using the same traffic model used on all six options that were considered in the Route Selection Report) demonstrated that this option provides some relief to the existing road network in Galway (see to Table 4.1 of Appendix A.5.4 of the Route Selection Report), but it does not provide relief to the same extent that the other options offer. For instance, it provides only minimal relief to the existing (i) Quincentenary Bridge, (ii) Seamus Quirke Road, (iii) Western Distributor Road, (iv) Salthill, (v) Kingston Road, etc.
- 4.3.4 Also, it performed worse than the emerging preferred route corridor (EPRC), which was subsequently developed into the N6 GCRR, on the existing N6 in the vicinity between the N84 and N83 which may be attributed to the lack of a junction on the N83.
- 4.3.5 An extract from Table 4.1 of Appendix A.5.4 of the Route Selection Report is replicated below for ease of reference. An additional column is added to this table on the right with the details of the traffic projections for the emerging preferred route corridor (EPRC) at the same locations. These EPRC AADT figures are extracted from Table 7.5.1 of Appendix A.3.1 of the Route Selection Report.
- 4.3.6 When the AADTs forecast for the 2006 GCOB Route Option in 2034 are compared to the AADTs forecast for the EPRC in 2034, the EPRC provides greater relief to the links on the existing road network. The most significant improvements in removal of traffic from the city, and thus facilitating more sustainable modes of transport, are on the Quincentenary Bridge with a 16% improvement, Seamus Quirke Road with a 34% improvement, Bearna Village with a 24% improvement and N6 Bóhtar na dTreabh with a 21% improvement on the EPRC when compared to the 2006 GCOB Route Option.
- 4.3.7 The removal of traffic from the city centre, the provision of safer urban streets and the segregation of by-passable traffic from city bound traffic are all project objectives. The EPRC, which subsequently was developed as the N6 GCRR, performs better than the 2006 GCOB Route Option from a traffic perspective.

**Table 4.1: 2006 GCOB Route Option AADT Figures (Extract of Table 4.1 of Appendix A.5.4 of the Route Selection Report for 2034) and EPRC AADT Figures (Extracted from Table 7.5.1 of Appendix A.3.1 of the Route Selection Report)**

Location	Do-Minimum 2034	2006 GCOB 2034	EPRC 2034
Quincentenary Bridge	34,800	34,100	28,600
Salmon Weir Bridge	16,700	15,400	14,500
O'Brien's Bridge	9,100	8,300	7,600
Wolfe Tone Bridge	20,800	18,200	17,000
Bearna Village	13,400	7,300	5,500
Seamus Quirke Road	11,500	8,700	5,700
Headford Road (between Bodkin Junction and Kirwan Roundabout)	29,900	31,300	32,000
Bóthar na dTreabh (between N84 and N17 i.e. N83)	33,800	25,700	20,200
Dublin Road (between Moneenageisha Junction and Skerritt Roundabout)	18,600	18,400	18,300

## 4.4 Environmental Assessment

4.4.1 Section 3 of Appendix A.5.4 of the Route Selection Report details the environmental assessment of the 2006 GCOB Route Option and the results of these assessments are set out under individual headings below.

### *Ecology*

4.4.2 The ecological assessment determined that “Overall, the 2006 GCOB Route Option has the potential to result in significant negative impacts to Lough Corrib cSAC and Moycullen Bogs NHA.

4.4.3 *The loss of QI habitats in Lough Corrib cSAC associated with this route option would constitute an adverse effect on the integrity of this European site based on the previous EU judgment as the alignment through here is as per the 2006 GCOB. Therefore, for the 2006 GCOB Route Option to be advanced through the planning process in accordance with the requirements of Article 6(4) of the EU Habitats Directive, there must be no feasible alternative solutions and, despite the predicted impact, there must also be imperative reasons of overriding public interest for progressing the option. Aside from the impacts to designated sites, the 2006 GCOB Route Option would also likely result in significant impacts to areas of Annex I habitat, the legally protected plant species Slender cotton-grass, the Marsh fritillary butterfly, Barn owl and a range of other sensitive ecological receptors, many of which are listed on Annex II and/or Annex IV of the EU Habitats Directive.”*

## ***Soils and geology***

4.4.4 The location of the River Corrib bridge crossing presents a major negative in terms of impact of soils and geology due to the presence of soft and peat soils in the area.

4.4.5 The soils and geology assessment also determined the following impacts.

**Table 4.2: Assessment of the soil and geology impacts for the 2006 GCOB Route Option (Extract from 3.3.3 of Appendix A.5.4 of the Route Selection Report)**

<b><i>Attribute</i></b>	<b><i>Attribute importance</i></b>	<b><i>Impact</i></b>	<b><i>Level of impact</i></b>
<i>Agricultural soils – western side of scheme</i>	<i>Low</i>	<i>Loss of low fertility soil over limited section of route</i>	<i>Minor negative</i>
<i>Agricultural soils – east side of scheme</i>	<i>Medium</i>	<i>Loss of medium fertility soil over limited section of route</i>	<i>Minor negative</i>
<i>Exposure of granite bedrock</i>	<i>Medium</i>	<i>Deep cuttings exposing the bedrock will increase the geological heritage</i>	<i>Minor positive</i>
<i>Peat/soft soils – Western part of scheme</i>	<i>Medium</i>	<i>Excavation and replacement likely to be required for shallow deposits. Disposal of peat and soft soils requires identification of suitable disposal site.</i>	<i>Moderately negative</i>
<i>Peat soft soils – river crossing</i>	<i>High</i>	<i>Extensive ground improvement and / or excavation and replacement of soft soils. Construction of bridge likely to require extensive temporary works.</i>	<i>Major negative</i>
<i>Karst limestone – scheme wide</i>	<i>Medium</i>	<i>Karst features may require additional engineered solutions to ensure an acceptable risk level for the route during its design life.</i>	<i>Moderately negative</i>
<i>Roadstone Quarry</i>	<i>High</i>	<i>Potential sterilisation of limited portions of quarry. Modification to extraction techniques likely.</i>	<i>Major negative</i>

## ***Hydrogeology***

4.4.6 The hydrogeological assessment determined that “*the geology of the region divides the hydrogeological characterisation between west and east of the scheme study area. In the west the underlying granite is classified as a poor aquifer, but these low permeability crystalline rocks are important as they perch shallow groundwater, locally trapping them and maintaining a high water level that supports water dependant habitats such as at Tonabrocky Bog. The 2006 GCOB Route Option cuts through a number of wetland habitats, including Tonabrocky, and would likely have profound impacts on*

*the perched groundwater by the removal of rock topography that maintains the water level and supports the ecology.*

- 4.4.7 *The regionally important karst aquifer of the eastern section has high vulnerability groundwater and includes localised surface water features that are in seasonal continuity with groundwater. There would be a potential profound to significant risk to Coolagh Lakes and Ballindooley Lough from up gradient road cuttings and these would need to be assessed for drawdown impacts.”*

### **Hydrology**

- 4.4.8 *The hydrological assessment determined that “The 2006 GCOB Route Option is considered unacceptable as it has the potential to cause significant hydrological impact on Annex 1 Active Blanket bog [\*7130] and Northern Atlantic wet heaths with Erica tetralix [4010] habitat associated with the Moycullen Bog NHA.*

- 4.4.9 *This route is considered unacceptable from a hydrological perspective, as it has the potential to cause significant hydrological impact on the Annex 1 habitats associated with the Moycullen Bog NHA at Tonabrocky cutting through the middle of this bog over a distance of approximately 700 to 750m. It further crosses through Annex 1 aquatic sensitive habitats associated with Wet heath and Blanket bog at Coolagh (EC19, EC20) and EC24 and the riparian zone of the Lough Corrib cSAC. The route option has a long encroachment length of the River Corrib floodplain and high flood risk zone. The footprint of the design within the 100year flood zone would be approximately 1.9km.”*

### **Landscape and visual**

- 4.4.10 *The landscape and visual assessment determined that “the 2006 GCOB Route Option has less incidence of significant and profound visual impacts on properties than other route options considered as part of the Stage 1 assessment of options – taking as it does a more rural alignment through Tonabrocky, Glenlo, Menlo and around the eastern side of Parkmore. By contrast, this route option has a higher degree of landscape impact than other routes, particularly as a result of impact on Lough Inch, Tonabrocky, Glenlo Abbey and the setting of the River Corrib corridor and severs on embankment, the demesne and avenue to Menlo Castle. However, the route has less impact on the visual riverside setting of the castle itself when compared to the other route options examined during the Stage 1 assessment of options.”*

### **Archaeology, architectural and cultural heritage**

- 4.4.11 *The archaeology, architectural and cultural heritage assessment determined that “the 2006 GCOB Route Option would impact considerably upon the cultural heritage resource. Whilst it is acknowledged that many of the sites identified in or within the immediate vicinity of scheme were identified during the 2006 GCOB EIS and receive no specific statutory protection, this route option would impact considerably on the recorded archaeological,*

*architectural and cultural heritage resource. The area that would suffer the greatest impact runs from Killeen to Menlough. This area is characterised by demesne landscapes and large houses, which were established by the landed gentry who were keen to utilise the picturesque River Corrib landscape within the settings of their houses. As such this route option directly impacts on four large demesnes, with the impact at Menlo Castle demesne considered to be profound. Here the route option runs in close proximity to the castle itself and severely truncates the principal structure from attendant features. The impact on the demesne would be profoundly negative due to the level of truncation and the nature and extent of the direct impact.*

4.4.12 *In addition to this particular impact, this route option would profoundly impact on one protected structure (BH 99) and one recorded archaeological site (AH 4). A total of 28 significant impacts are predicted upon sites identified as part of the 2006 GCOB EIS and during geophysical survey of the route.”*

### **Material Assets Agriculture**

4.4.13 *The material assets agriculture assessment determined that “the GCOB 2006 Route Option would take approximately 207 hectares of agricultural land with approximately 62 hectares of this classified as medium – good quality agricultural land. The quality of land at the western end is very poor from an agricultural perspective – the majority of it being blanket bog – and the sensitivity of the agricultural environment is low. The sensitivity of the agricultural environment further east is low – medium.*

### **Air Quality**

4.4.14 *The air quality assessment determined that “the 2006 GCOB Route Option follows an alignment predominately towards the outskirts of the city, traversing a large number of local and regional roads all of which have clusters of residential properties in close proximity.*

4.4.15 *Pollutant concentrations recorded by the EPA are well within air quality standards and the assimilative capacity of the air within the scheme study area is considered good.*

4.4.16 *In general, the 2006 GCOB Route Option avoids large residential areas and communities but runs adjacent to clusters of houses where it crosses the local and regional roads.*

4.4.17 *Due to the expected traffic volumes and the existing assimilative capacity of the scheme study area, no air quality standards would likely be exceeded as a result of the 2006 GCOB Route Option.”*

### **Noise & Vibration**

4.4.18 *The noise and vibration assessment determined that “overall, the potential noise impact of the 2006 GCOB Route Option would affect a large number of properties due to its length and its general proximity to Galway City and outer suburban areas. Whilst this route option has the potential to affect a*

*large number of properties, the overall PIR rating for this route option is the lowest compared to other route options assessed as part of the Stage 1 assessment of options. In addition, whilst the number of properties in the wider reaches of the route alignment is high, the number of properties counted within the indicative 60dB  $L_{den}$  contour line is also the lowest compared to the other route options assessed.”*

### **Material Assets Non-Agriculture**

- 4.4.19 The EIS for the 2006 GCOB identified that 8 properties would be demolished, and 1 additional property would be acquired for the construction and operation of the 2006 GCOB. An assessment of the properties which would have to be acquired or demolished on the 2006 GCOB Route Option using the same methodology that was used in this route selection process identified an additional 7 properties over and above those identified in the 2006 GCOB EIS. Therefore, a total 16 properties would be acquired/ demolished to facilitate the construction and operation of the 2006 GCOB Route Option.
- 4.4.20 While the 2006 GCOB Route Option has the least number of property demolitions/acquisitions at 16 number over the entire extent of the route, it has to be borne in mind that the western section of the 2006 GCOB did not receive planning approval from ABP under the earlier application due to potential environmental impacts in the area of Tonabrocky Bog pNHA. Therefore, the property acquisition/demolitions are not an accurate reflection of what in fact might be the likely property impacts of a modified/revised 2006 GCOB scheme.
- 4.4.21 The consideration of a modified/revised 2006 GCOB Route Option being the Cyan Route Options is discussed in Section 5 below and that route option required the demolition/acquisition of 38 properties.
- 4.4.22 In addition, the 2006 GCOB would not deliver the optimum intermodal transport solution. As explained in Section 4.3 above as the 2006 GCOB Route Option would not deliver relief to congestion to the same level as the EPRC and hence the N6 GCRR due to the lower transfer of traffic from the existing urban centre to the 2006 GCOB. As a result, this would mean less road space would be freed for reallocation to more sustainable modes such as walking, cycling and public transport.

### **Human Beings**

- 4.4.23 The human beings assessment determined that *“The principal impacts on Human Beings at a community level include the loss of the pitch-and-putt amenity at Lough Inch, amenity and economic impacts on Glenlo Abbey Golf Course, and a mixture of net new severance at Ballindooley.*
- 4.4.24 *The outer alignment of the 2006 GCOB Route Option avoids some of the socio-economic impacts associated with other options, but at the expense of longer journey times and lesser relevance to journeys between the east and west of the city.”*



## 4.5 Summary of the consideration of the 2006 GCOB as a solution to the transport problems in Galway City and its environs

4.5.1 As detailed in Appendix A.5.4 of the Route Selection Report, the 2006 GCOB was not advanced further for the following reasons:

- It does not provide connectivity with the city to the degree required to alleviate congestion sufficiently.
- It does not provide connection with the N83 (previously called the N17), a national road, thereby providing a lesser level of connectivity to the national road network. Note that the lack of this connection also resulted in the lack of the direct connection to the key employment centres of Parkmore and Ballybrit.
- It has longer journey times and less relevant journey possibilities between east and west.
- It would not facilitate the delivery of the optimum intermodal transport solution.
- It has an adverse impact on the site integrity of the Lough Corrib cSAC per the European Court decision in Sweetman v An Bord Pleanála.
- It has potential to impact on Lough Inch River which is known to contain Freshwater pearl mussels downstream.
- It has a significant impact on the Moycullen Bog Complex NHA from a hydrogeological and hydrological perspective both at Tonabrocky and in the vicinity of Lough Inch
- It has potentially a large impact on flood risk in the vicinity of the River Corrib and its floodplains.
- It has a profound impact on the curtilage of Menlo Castle from a cultural heritage perspective and on the amenity value from a Landscape and Visual and Human Beings perspective.
- It has less impacts on communities and amenities with, but at the expense of longer journey times and less relevant journey possibilities between east and west.
- The section of the route between the N59 and R336 was refused planning approval from ABP and so an alternative alignment for this section would be required and is considered in detail in Section 5 below being the Cyan Route Option.

## CONCLUSION

While the 2006 GCOB Route Option would require less acquisitions and demolitions of homes compared to the N6 GCRR, the western section of the route did not receive planning approval and, therefore, the property acquisition/demolitions are not an accurate reflection of what in fact might be the likely property impacts of a modified/revised 2006 GCOB Route Option as discussed in Section 5 below on the Cyan Route Option.

Further, following the decision of the European Court on the 2006 GCOB, the eastern section would have an adverse impact on the integrity on the Lough Corrib cSAC and so could only be progressed pursuant to Article 6(4) of the Habitats Directive and such an application can only be progressed in the absence of alternative solutions and in this case there is an alternative solution, namely the N6 GCRR, which, in our opinion, will not have an adverse impact on the integrity of the Lough Corrib cSAC or indeed any other European Site.

The N6 GCRR also provides a better transport solution to the transport issues experienced in Galway City and its environs and allows for the more sustainable growth of Galway in line with the National Planning Framework and Ireland 2040.

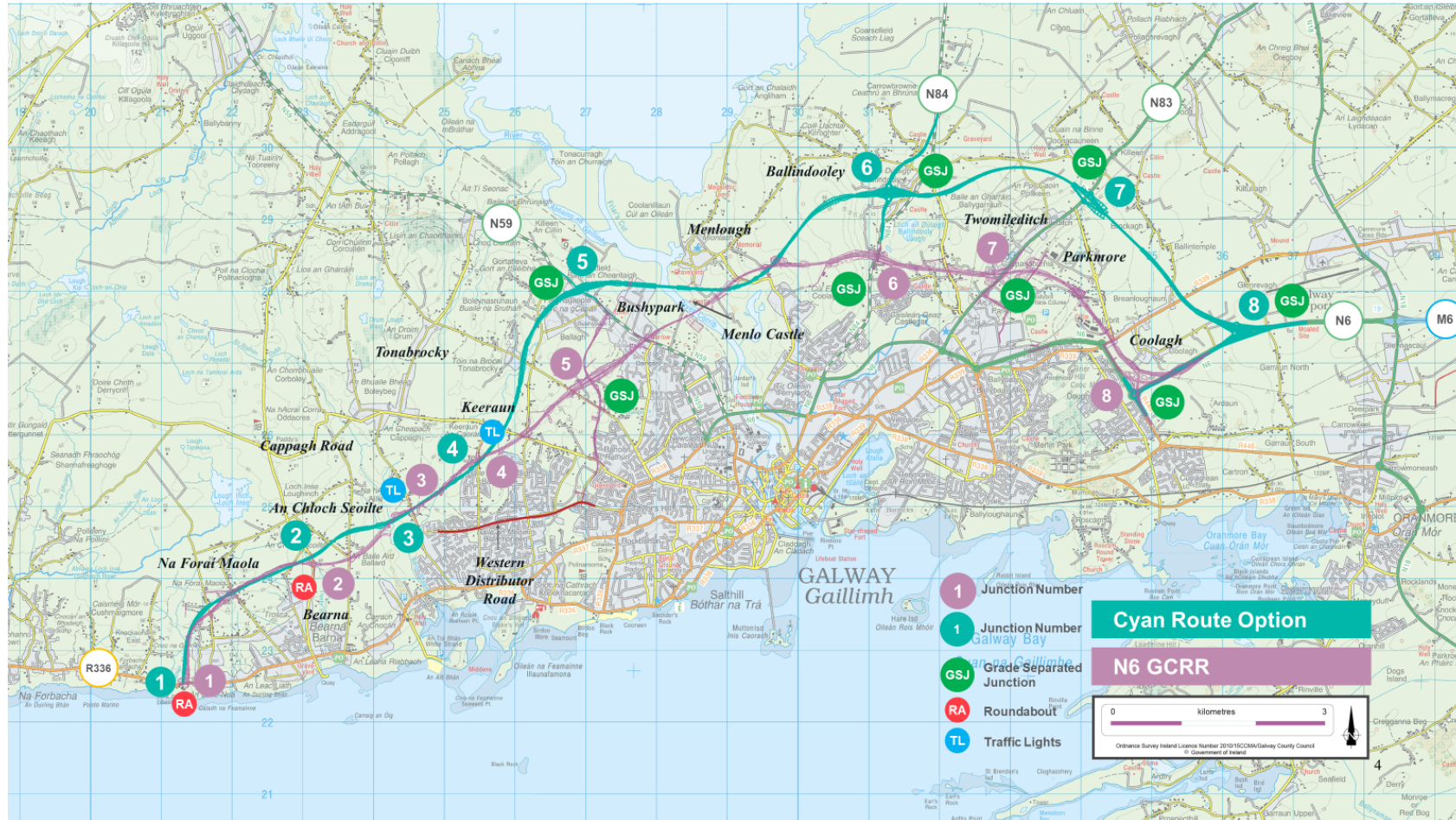
## 5 Modifications to address the issues of the 2006 GCOB Route Option-the Cyan Route Option

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### 5.1 Description of the Cyan Route

- 5.1.1 The Cyan Route Option was developed to address the issues associated with the western section of the 2006 GCOB Route Option which resulted in the refusal of that section by ABP. This route option reflects the 2006 GCOB Route Option to the east of the River Corrib (i.e. approved by ABP in 2008) but with the addition of a grade separated junction on N83 at the crossing point. It follows an alternative route to 2006 GCOB to the west of the River Corrib (i.e. refused by ABP in 2008) in order to address the issues raised by ABP for that section.
- 5.1.2 It commences at the R336 to the west of Bearna and proceeds in a north-easterly direction, keeping to the north of Bearna and passing through the townlands of An Chloch Scoilte, Na hAille, Keeraun, Tonabrocky and Bushypark before crossing the River Corrib to the north of Menlo Castle. The Cyan Route Option then follows the path of the 2006 GCOB Route Option, travelling northeast through Menlough to Ballindooley and then southeast to Coolagh before it terminates at the existing N6.
- 5.1.3 The Cyan Route Option connects to the R336 with an at-grade roundabout junction approximately 2km to the west of Bearna Village. There are then three at-grade roundabout junctions, at approximately 2km spacing, on the Bearna to Moycullen road, on Cappagh Road and on Ragoon Road. A grade separated junction is proposed on the N59.
- 5.1.4 To the east of the River Corrib, there is a grade separated junction to serve the N84 immediately west of the N84 in the townland of Ballindooley, and an additional grade separated junction on the existing N83 in the vicinity of Two-Mile Ditch. A further grade separated junction south-east of Coolagh connects the Cyan Route Option to the existing N6.
- 5.1.5 Figure 5.1 shows the Cyan Route Option with reference to the N6 GCRR.
- 5.1.6 Appendix A.5.5 of the Route Selection Report presents an engineering and environmental assessment of the Cyan Route Option.

Figure 5.1: Cyan Route Option and N6 GCRR



## 5.2 Engineering & Traffic Assessment

- 5.2.1 Section 2 of Appendix A.5.5 of the Route Selection Report determined that, from an engineering perspective, the Cyan Route Option is a feasible route option. It provides a connection with the N83, N84, N59 and the existing N6, thereby providing the same level of connectivity to national roads as the other alternatives considered.
- 5.2.2 The traffic assessment for the Cyan Route Option utilised the results of the Green Route Option (as discussed at Section 7.2.2.8 of the Route Selection Report) and the 2006 GCOB Route Option which were both modelled using the same traffic model used on all six options considered as part of the route selection process. The Cyan Route is identical to the Green Route Option in the west and is very similar to the Green Route Option in the east with respect to junction connectivity, i.e. the Green Route Option contains a junction at the N84, the N83 and a junction at the tie in to the existing N6.
- 5.2.3 Further, the Cyan Route Option is similar in length to the 2006 GCOB Route Option in the east but the 2006 GCOB Route Option lacks the connectivity at the N83. Therefore the traffic figures for the Cyan Route Option would lie between the two sets of results but closer to the Green Route Option due to the provision of the additional junction at the N83 and it is the exact same alignment to the west of the river.
- 5.2.4 Table 4.2.1 of Appendix A.5.5 of the Route Selection Report presents the results of this assessment and are included below in Table 5.1 for ease of reference.
- 5.2.5 An additional column is added to this table on the right with the details of the traffic projections for the EPRC at the same locations. These EPRC AADT figures are extracted from Table 7.5.1 of Appendix A.3.1 of the Route Selection Report.
- 5.2.6 When the AADTs forecast for 2034 for the Green Route Option, which was used for the Cyan Route Option traffic assessment, are compared to the AADTs forecast for the EPRC, the EPRC provides greater relief to the links on the existing road network. It can be seen from this table that as the connectivity with the existing network improves with the development from the 2006 GCOB to the Green Route Option to the EPRC, that the level of transfer of traffic to the option improves, thus providing greater relief on the existing network.
- 5.2.7 The removal of traffic from the city centre, the provision of safer urban streets and the segregation of by-passable traffic from city bound traffic are all project objectives. The EPRC, which subsequently was developed as the N6 GCRR, performs better than the Cyan Route Option from a traffic perspective.

**Table 5.1: Cyan Route Option Comparative AADT Figures (Extract of Table 4.2.1 of Appendix A.5.5 of the Route Selection Report for 2034) and EPRC AADT Figures (Extracted from Table 7.5.1 of Appendix A.3.1 of the Route Selection Report)**

Location	Do-Minimum 2034	Green Route Option 2034	2006 GCOB Route Option 2034	EPRC 2034
Quincentenary Bridge	34,800	31,000	34,100	28,600
Salmon Weir Bridge	16,700	15,100	15,400	14,500
O'Brien's Bridge	9,100	7,800	8,300	7,600
Wolfe Tone Bridge	20,800	17,600	18,200	17,000
Bearna Village	13,400	5,200	7,300	5,500
Seamus Quirke Road	11,500	7,600	8,700	5,700
Headford Road (between Bodkin Junction and Kirwan Roundabout)	29,900	30,600	31,300	32,000
Bóthar na dTreabh (between N84 and N17 i.e. N83)	33,800	20,900	25,700	20,200
Dublin Road (between Moneenageisha Junction and Skerritt Roundabout)	18,600	18,400	18,400	18,300

## 5.3 Environmental Assessment

5.3.1 Section 3 of Appendix A.5.5 of the Route Selection Report details the environmental assessment of the Cyan Route Option and the results of these assessments are set out under individual headings below.

### *Ecology*

5.3.2 The ecological assessment determined that *“Overall, the Cyan Route Option has the potential to result in significant negative impacts to Lough Corrib cSAC. The loss of QI habitats in Lough Corrib cSAC associated with this route option would constitute an adverse effect on the integrity of this European site based on the previous EU judgement as the alignment through here is as per the 2006 GCOB. Therefore, for the Cyan Route Option to be advanced through the planning process in accordance with the requirements of Article 6(4) of the EU Habitats Directive, there must be no feasible alternative solutions and, despite the predicted impact, there must also be imperative reasons of overriding public interest for progressing the option. The close proximity of this route option to the Moycullen Bogs NHA also poses a risk of significant impacts to peatland habitats in that site. Aside from the impacts to designated sites, the Cyan Route Option would also likely result in significant impacts to areas of Annex I habitat, Barn owl*

*and a range of other sensitive ecological receptors, many of which are listed on Annex II and/or Annex IV of the EU Habitats Directive.”*

### **Soils and Geology**

5.3.3 The location of the River Corrib bridge crossing presents a major negative in terms of impact of soils and geology due to the presence of soft and peat soils in the area.

5.3.4 The soils and geology assessment also determined the following impacts.

**Table 5.2: Assessment of the soil and geology impacts for the Cyan Route Option**

<i>Attribute</i>	<i>Attribute importance</i>	<i>Impact</i>	<i>Level of impact</i>
<i>Agricultural soils – western side of scheme</i>	<i>Low</i>	<i>Loss of low fertility soil over limited section of route</i>	<i>Minor negative</i>
<i>Agricultural soils – east side of scheme</i>	<i>Medium</i>	<i>Loss of medium fertility soil over limited section of route</i>	<i>Minor negative</i>
<i>Exposure of granite bedrock</i>	<i>Medium</i>	<i>Deep cuttings exposing the bedrock will increase the geological heritage</i>	<i>Minor positive</i>
<i>Peat/soft soils – Western part of scheme</i>	<i>Medium</i>	<i>Excavation and replacement likely to be required for shallow deposits. Disposal of peat and soft soils requires identification of suitable disposal site.</i>	<i>Moderately negative</i>
<i>Peat/soft soils – river crossing</i>	<i>High</i>	<i>Extensive ground improvement and / or excavation and replacement of soft soils. Construction of bridge likely to require extensive temporary works.</i>	<i>Major negative</i>
<i>Karst limestone – scheme wide</i>	<i>Medium</i>	<i>Karst features may require additional engineered solutions to ensure an acceptable risk level for the route during its design life.</i>	<i>Moderately negative</i>
<i>Twomileditch Quarry</i>	<i>High</i>	<i>Potential sterilisation of limited portions of quarry. Modification to extraction techniques likely.</i>	<i>Major negative</i>

## **Hydrogeology**

5.3.5 The hydrogeological assessment determined that *“the geology of the region divides the hydrogeological characterisation between west and east of the scheme study area. In the west the underlying granite is a poor aquifer and of low risk, however, the perching of groundwater in the subsoil and soil has generated water dependant habitats that are sensitive. By avoiding these habitats, the Cyan Route Option is unlikely to impact on the integrity of the supporting groundwater and the risk is considered relatively low. The regionally important karst aquifer of the eastern section has high vulnerability groundwater and includes localised surface water features that are in seasonal continuity with groundwater. There is potential risk to Coolagh Lakes and Ballindooley Lough from up gradient road cuttings and these will need to be assessed for drawdown impacts. There is also a potential to impact on the water supply well at a commercial property to the east of the River Corrib. Assessment will be required of reduced recharge along the line of the Cyan Route Option and assessment will also have to be made on discharge points from the sealed drainage systems.”*

## **Hydrology**

5.3.6 The hydrological assessment determined that *“this route option is considered to be acceptable from a hydrological perspective, as it can be constructed and operated without creating the potential for significant hydrological impacts on water quality, flood risk and hydro-ecology receptors. It represents the shorter river channel crossing point of the route options considered but one of the longer floodplain widths of c. 530m (at the 100year flood inundation footprint).”*

## **Landscape and Visual**

5.3.7 The landscape and visual assessment determined that *“the Cyan Route Option has less incidence of significant and profound visual impacts on properties than other route options – especially to the east of the River Corrib – taking as it does a more outer rural alignment east of Galway Technology Park. The route option has a similar high level of landscape impact to that of other routes. The route has a significant impact on the setting of the River Corrib corridor and severs, on embankment, the demesne and avenue to Menlo Castle, however, it has less impact on the visual riverside setting of the castle itself when compared to other route options.”*

## **Archaeological, Architectural and Cultural Heritage**

5.3.8 The archaeology, architectural and cultural heritage assessment determined that *“the Cyan Route Option would impact considerably upon the cultural heritage resource. Whilst it is acknowledged that many of the sites identified in or within the immediate vicinity of scheme to the east of the River Corrib, were identified during the 2006 GCOB EIS and receive no specific statutory protection, this route option would impact considerably on the recorded archaeological, architectural and cultural heritage resource. The area that would suffer the greatest impact runs from Killeen to Menlough. This area*



*is characterised by demesne landscapes and large houses, which were established by the landed gentry who were keen to utilize the picturesque River Corrib landscape within the settings of their houses. As such this route option directly impacts on three large demesnes, with the impact at Menlo Castle demesne considered to be profound. Here the route option runs in close proximity to the castle itself and severely truncates the principal structure from attendant features. The impact on the demesne can be considered to be profoundly negative due to the level of truncation and the nature and extent of the direct impact”.*

- 5.3.9 There are a total of 19 significant impacts upon sites which were identified as part of the N6 Galway City Outer Bypass EIS (2006) and during geophysical survey of for that scheme” which will also be impacted by the Cyan Route Option.

### ***Material Assets – Agriculture***

- 5.3.10 The Cyan Route Option would take approximately 115.5 hectares of agricultural land with 50 hectares classed as being good agricultural land. The quality of land at the western end is very poor from an agricultural point of view – the majority of it being blanket bog – and the sensitivity of the agricultural environment is low. The sensitivity of the agricultural environment further east is low – medium.

### ***Air Quality and Climate***

- 5.3.11 The air quality assessment determined that *“the Cyan Route Option follows an alignment predominately towards the outskirts of the city, traversing a large number of local and regional roads, greenfield land and villages all of which have clusters of residential properties in close proximity.*
- 5.3.12 *Pollutant concentrations recorded by the EPA are well within air quality standards and the assimilative capacity of the air within the scheme study area is considered good.*
- 5.3.13 *In general, the Cyan Route Option avoids large residential areas and communities but runs adjacent to clusters of houses where it crosses the local and regional roads.*
- 5.3.14 *Due to the expected traffic volumes and the existing assimilative capacity of the scheme study area, no air quality standards are likely to be exceeded as a result of the Cyan Route Option.”*

### ***Noise and Vibration***

- 5.3.15 The noise and vibration assessment determined that “there are of the order of 500 properties which have the potential to fall within the 60dB Lden noise contour along the alignment the Cyan Route Option. A large proportion of these properties are positioned along the western section of the route option. Due to the distribution of properties in linear development along local roads in addition to clusters of properties at crossing points and villages along the route option, the requirement for noise mitigation along this route will be substantial. In order to suitably reduce traffic noise emissions from the

proposed alignment to within the specified design goal of 60dB Lden set out by the NRA for new national roads, the mitigation measures available for the route will be limited to selection of the road surface and the use of barrier screening.

- 5.3.16 Once operational, there are no significant vibration impacts associated with road traffic along well maintained roads. This is not considered to be an issue for the operational phase of this road.
- 5.3.17 Overall, the Cyan Route Option alignment will have a significant noise impact on the local environment through which it passes, particularly those areas currently set back from existing road traffic noise. The number of properties likely to require noise mitigation is likely to be significant along the length of the route.”

### ***Human Beings***

- 5.3.18 The human beings assessment determined that *“the Cyan Route Option avoids some established communities and areas of built development, although there would be construction and operation phase impacts at Bushypark and Ballindooley. The relative weakness of the option is that by taking a route to the edge of the scheme study area it would be less successful at capturing both through and intra-city traffic than options closer to Galway City. This factor...can be expected to affect local journey times, journey amenity and severance in the city during the operational phase. More traffic would continue to utilise the existing N6 and R338 in the city with the effect that reductions in journey time for local traffic, improvements in journey amenity for pedestrian and cyclists, and potential relief from severance for communities and community facilities would be inferior to that achieved by other options.”*

### ***Material Assets – Non-Agriculture***

- 5.3.19 The assessment of potential impacts on properties during the route selection process identified that the Cyan Route Option would require 41 property acquisitions. This is as a result of the alternative route on the west to minimise the environmental impacts identified in the earlier decision of ABP, plus the addition of the N83 Tuam Road Junction compared to the 2006 GCOB Route Option.
- 5.3.20 On review of the Cyan Route Option and a comparison with the emerging preferred route corridor (EPRC) it is noted that the western section of the two routes are very similar as far as the Ballymoneen Road and the design alterations made to the western section of the EPRC, which culminated in the N6 GCRR, as far as the Ballymoneen Road since the publication of the EPRC in 2015 would also have been made to the Cyan Route Option if it had been the preferred route. Therefore, reviewing the assessment of property impacts along the Cyan Route Option taking account of the modifications on the western section, and applying the same methodology that was used for the N6 GCRR identified 38 properties, 23 which would require demolition and 15 that would require acquisition for the construction and operation of the modified Cyan Route Option.

5.3.21 There will be no full acquisition/demolition of commercial properties, however three commercial sites lie within the footprint of the design and will require some land acquisition. The Cyan Route Option has a low number of utility impacts largely due its rural location.

## **5.4 Summary of the consideration of the Cyan Route Option (a modified 2006 GCOB option) as a solution to the transport problems in Galway City and its environs**

5.4.1 While the Cyan Route Option meets the project objectives the following conclusions as detailed in Appendix A.5.5 of the Route Selection Report, were made on its assessment as a viable alternative:

- It has a significant impact on Annex I habitat, Limestone pavement [\* 8240] within the Lough Corrib cSAC and as such an adverse impact on the site integrity of the Lough Corrib cSAC per the European Court decision.
- It has a profound impact on the curtilage of Menlo Castle from a cultural heritage perspective and on the amenity value from Human Beings perspective.
- It has potentially a large impact on flood risk in the vicinity of the River Corrib and its floodplains.
- The location of the River Corrib bridge crossing presents a major negative in terms of impact of soils & geology due to the presence of soft & peat soils in the area.
- From a socio-economic and human beings perspective, there are a number of major severance effects on communities associated with the Cyan Route Option at Bushypark and at Ballindooley.
- Whilst the traffic assessment shows a slight improvement to congestion with the implementation of the Cyan Route Option when compared to the 2006 GCOB Route Option due to the addition of the N83 junction, the other route options assessed have the potential to provide a greater level of relief due to the inclusion of a more direct connection to the key employment centres of Parkmore and Ballybrit.

## CONCLUSION

Whilst the Cyan Route Option has less demolitions/ acquisitions compared to the N6 GCRR, namely 38 versus 54 respectively, the Cyan Route Option would not deliver the optimum intermodal transport solution as traffic modelling showed that it would not deliver relief to congestion to the same level as the N6 GCRR as set out in Section 5.2 above due to the lower transfer of traffic from the existing urban centre to the Cyan Route Option. As a result, this would mean less road space would be freed for reallocation to more sustainable modes such as walking, cycling and public transport. This allows for the more sustainable growth of Galway in line with the National Planning Framework and Ireland 2040.

Further, following the decision of the European Court on the 2006 GCOB, the Cyan Route Option (in terms of its eastern section) would result in adverse impacts on the integrity of the Lough Corrib cSAC (Limestone Pavement) and, and so could only be progressed pursuant to Article 6(4) of the Habitats Directive and such an application can only be progressed in the absence of alternative solutions and in this case there is an alternative solution, namely the N6 GCRR, which, in our opinion, will not have an adverse impact on the integrity of the Lough Corrib cSAC or indeed any other European Site.

## 6 Why the eastern section of the N6 Galway City Outer Bypass (2006) could not be engineered to resolve its issues relating to the Lough Corrib SAC?

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- 6.1 A further query which has been raised during the hearing is whether a tunnel was considered to avoid the Limestone pavement habitat at the surface level within Lough Corrib cSAC along the line of the 2006 GCOB Route Option between the N84 Headford Road and the River Corrib. Consideration was given to this option, but it was immediately apparent that it was not viable for the reasons outlined below.
- 6.2 As explained in the engineering section of the response to queries in Module 1, the tunnel length (comprising twin bore tunnels) to deal with the issues relating to the eastern section of the 2006 GCOB Route Option would be in excess of 2km in length, with significant cuttings of the order of 50m diameter to construct the launch pit at either side.
- 6.3 The eastern section of the 2006 GCOB Route Option is underlain by karst limestone with a variable rockhead and complex hydrogeological regime in the area so any tunnelling in this location would require extensive ground investigation along the proposed twin bore tunnel alignment to determine the feasibility and constructability of the tunnel. A ground investigation of this scale and extent would, of itself, have the potential to adversely affect the integrity of the Lough Corrib cSAC through the excavation of numerous boreholes and groundwater monitoring wells.
- 6.4 During the initial stages of the optioneering phase, from April 2014 to November 2014, along with the preliminary desk studies, a karst study (including aerial and satellite photograph analysis) was undertaken to further understand the geomorphology and karst risk of the area. This karst study was undertaken to identify the location of karst landforms with a particular focus on the water dependant Annex I habitats. This study is contained at Appendix A.4.4 of the Route Selection Report.
- 6.5 This study identified five key karst features linked to water dependent habitats namely Ballindooley Lough, Coolagh Lakes, Terryland River, Kentfield/NUIG and Coolanillaun Wetlands and four individual turloughs. This study also determined that the groundwater flow was from north to south.
- 6.6 A tunnel peer review was undertaken in December 2014 with the Arup London tunnelling team to understand the scale of engineering involved in any tunnelling in the rock formations found in Galway, both east of River Corrib in the limestone and west of the River Corrib in the granite. Both Marie Fleming, Arup and Eileen McCarthy, Arup attended this workshop. The peer review team visited two disused limestone quarries to the east of the River Corrib, namely Lackagh Quarry and Angliham Quarry (approx. 1 km north of Menlough Village) and a disused granite quarry on Letteragh

Road at Tonabrocky on the west of the River Corrib. These quarries presented a wealth of relevant information as the type of soil, rock and the presence of water which all have a fundamental impact on the tunnel boring machine selection and also inform a decision on whether tunnelling at a particular location is in fact feasible at all. Depending on the ground conditions, different techniques are used, and these were reviewed in the context of the geology of the area and the constraints associated with each technique.

- 6.7 Based on (i) the length of tunnel required at this location, (ii) the presence of karst bedrock (with a variable rockhead), and (iii) the complex hydrogeology and sensitive receptors, it was determined that the type of tunnelling required along the alignment of the 2006 GCOB Route Option would require a Tunnel Boring Machine (TBM).<sup>3</sup>
- 6.8 The invert level of a tunnel along the alignment of the 2006 GCOB Route Option would be at a level of approximately (minus) -10.00m AOD at its lowest point and approximately 6m below the water level of the River Corrib at the western portal. Due to the nature of the ground conditions along alignment of the 2006 GCOB Route Option, active face support by the TBM would be required to maintain control of the excavation face in order to prevent settlement and avoid ingress of water. This is provided by earth pressure balance or slurry pressure balance where a polymer or foam is added to the excavated material at the tunnel face to balance rock and water pressure on the working face.
- 6.9 The selection of the support system is based on the type of rock being bored. Karstic limestone as exists at this location poses significant challenges to tunnelling, dissolution of the rock creates pockets and cavities characterised by water flow through the rock mass. These cavities may be open or fill with weaker material / debris over time. Tunnelling through this material carries the significant risk of dislodging debris material (creating a sinkhole to surface) or opening a drainage path (flooding the tunnel). In order to address these significant issues, a slurry pressure balance system would have to be used.
- 6.10 In the case of the alignment of the 2006 GCOB Route Option, the deployment of this system would result in the production of approximately 380,000m<sup>3</sup> of slurry/tunnel arisings.

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<sup>3</sup> TBMs represent mechanised forms of tunnelling; the face is excavated by a rotating cutting disc and a lining consisting of precast concrete segments is put in place to stabilise the rock mass and provide the permanent lining solutions. Temporary support of the surrounding rock during tunnelling is necessary in poor rock conditions.

- 6.11 Further, as the tunnel progresses along the 2km length, the tunnel would have to be lined with a permanent pre-cast concrete segmental lining which means that, when the TBM exits, it would have to be dismantled at the exit pit of the first tunnel bore and transported back to launch again for the second bore or else dismantled, turned around and tunnel back along the second bore. Each scenario requires a significant excavation at the launch and exit portal. It is estimated that this pit is a minimum of 50m in diameter for extraction, disassembly and reassembly. A further area would be required to provide access ramps up and down to the pit, plus a working area. The total area required at each pit would be approximately 15m wide by 100m in length and will generate significant earthwork volumes. This would pose a significant challenge in the marginal ground conditions around the River Corrib and have the very real potential to have adverse impacts on the integrity of the Lough Corrib cSAC.
- 6.12 Lackagh Quarry was also reviewed as a potential option for a tunnel alignment as part of this peer review. The option at that time, December 2014, comprised a short tunnel (500m) long, travelling down slope from the quarry towards the River Corrib beneath a short section of the Limestone pavement in the Lough Corrib cSAC. Topographically the tunnel is elevated in comparison to the River Corrib, with the invert of the tunnel at +12.7m AOD. This is in stark contrast with the conditions for tunnelling along the alignment of the 2006 GCOB Route Option. The clear conclusion of the peer review (which I was part of) was that a Roadheader would be suitable for the construction of this type of tunnel, given that it was short and well above the water table and so it did not have the significant issues identified above with any tunnelling along the alignment of the 2006 GCOB Route Option. This 500m tunnel would generate only a quarter of the volume of material of the tunnel option for the 2006 GCOB Route Option. Furthermore, this excavated material could be processed in the adjacent quarry for reuse in road construction.
- 6.13 In considering the outputs of the environmental studies which were ongoing during the optioneering phase, and in consideration of the tunnel peer review, the engineering design team sought to minimise the tunnel length on options as much as possible due to the scale of the unknown in the karst area on the east of the River Corrib and the potential impacts to the ground water levels and groundwater quality with the associated risks to water dependent habitats and karst features in the Lough Corrib cSAC. It was clear at that stage, for the reasons set out above, that a tunnel length of in excess of 2km in length was unworkable and would have the very real potential to itself adversely impact on the integrity of the Lough Corrib cSAC rather than avoiding any such impact.
- 6.14 There are also significant issues to consider with a tunnel of this length under the headings of sustainability and economy both in the construction and operational phase which became apparent during the Phase 3 when design of the proposed tunnels on the EPRC was undertaken. In particular, in connection with longer tunnels, fire safety and ventilation requirements increase operational cost and resource consumption significantly.

- 6.15 In summary, therefore, a tunnel on the alignment of the 2006 GCOB Route Option under the extent of the Limestone pavement within the Lough Corrib cSAC was not advanced because of the following reasons:
- (a) The initial ground investigations to inform the hydrogeological and geological ground model had the potential to adversely impact the integrity of the Lough Corrib cSAC.
  - (b) The construction of a significant tunnel length in a karst area with hydrogeological conditions had the potential to adversely the integrity of Lough Corrib cSAC.
  - (c) Tunnel length exceeding 2km in length and large construction footprint at both portals would significantly increase the construction period.
  - (d) The tunnel length would have generated more than 380,000m<sup>3</sup> of spoil potentially not suitable for reuse within the proposed road development.
  - (e) A tunnel of this length is not a sustainable solution and would result in very significant additional carbon emissions both during construction and during operation.
  - (f) Very significant operational costs due to fire safety and ventilation requirements of a tunnel of this length.
  - (g) Resilience would require duplication of tunnel maintenance building.
- 6.16 In contrast, Lackagh Quarry offered the opportunity of using the existing quarry face to launch the tunnel construction resulting in a much shorter tunnel length. During Phase 3, a detailed ground investigation was undertaken outside the Lough Corrib cSAC, in line with that outlined above, i.e. vertical boreholes from surface level down to the proposed tunnel level along the line of the N6 GCRR, in tandem with driving a horizontal borehole from Lackagh Quarry along the line of the tunnel. This is contained in Appendix A.7.3 of the EIAR. The results of this ground investigation enabled the further shortening of the tunnel to 230m. Indeed, this tunnel is so short that it is not classified as a tunnel under EU Standards and therefore, has much lower fire safety and ventilation requirements. A tunnel of this length is a much more sustainable option.



## CONCLUSION

The N6 GCRR route, in contrast to the 2006 GCOB route, afforded the opportunity for a short tunnel. The N6 GCRR route was then capable of being developed into a solution which most effectively meets the project objectives and would, in our expert opinion, not adversely impact the integrity of the Lough Corrib cSAC whereas it was clear for the reasons set out above that a tunnelling option on the alignment of the 2006 GCOB route would do the very thing it was seeking to avoid, namely have the very real potential to adversely impact the integrity of the cSAC.

## 7 Why the N6 GCRR?

7.1 Table 5 below provides a comparison of the Cyan Route Option and N6 GCRR against the project objectives. Given that the western section of the 2006 GCOB Route Option did not receive planning approval from An Bord Pleanála, the Cyan Route Option is representative of a modified/revised 2006 GCOB Scheme to address the western section only.

**Table 7.1: Comparison of N6 GCRR and Cyan Route Option with the Project Objectives (as set out in Section 3 above)**

Project Objective	N6 GCRR	Cyan Route Option
<b>Economic</b>		
Encourage local, regional, national and international development	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre and the lack of a direct connection to the key employment centres on the eastern side of the city in terms of their connection to the city centre, residential areas of the city and the national road network.
Reduce journey times	This objective is achieved	This objective is not achieved to the same extent due to the longer journey length on this route to get from point A to B.
Increase journey time certainty	This objective is achieved	This objective is not achieved to the same extent due to the lesser diversion of traffic out of the city centre, which in turn leads to the increased risk of congestion impacting on journey time.
Support the economic performance of the Gateway of Galway as the only large employer in the region	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre and the lack of a direct connection to the key employment centres on the eastern side of the city – both of which impact on the attractiveness of Galway for employment.

<b>Project Objective</b>	<b>N6 GCRR</b>	<b>Cyan Route Option</b>
Provide benefits to the transport infrastructure	This objective is achieved	This objective is not achieved to the same extent due to the less developed integration with the city road network due to the lack of the N59 connection to Rahoon and Salthill, the lack of the direct connection to the employment centres in the east and the lower diversion of traffic out of the city centre which in turn frees up less space to reallocate for development of the wider transport infrastructure.
Improve connectivity to the Gateway of Galway	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre and the lack of a direct connection to the key employment centres on the eastern side of the city in terms of their connection to the city centre, residential areas of the city and the national road network.
Improve linkages between the west and east sides of the county	This objective is achieved	This objective is not achieved to the same extent due to the lack of the link between the N6 and the N59 to the western suburbs, and the lack of the direct connection to the key employment centres on the eastern side of the city in terms of their connection to the city centre, residential areas of the city and the national road network.
Deliver a cost-effective project	This objective is achieved	This objective is achieved
<b>Safety</b>		
Segregation of the interface of through traffic from urban traffic	This objective is achieved	This objective is achieved
Reduction in road traffic collisions	This objective is achieved	This objective is achieved

<b>Project Objective</b>	<b>N6 GCRR</b>	<b>Cyan Route Option</b>
Provision of safer urban streets	This objective is achieved	This objective is achieved
<b>Environmental</b>		
The proposed road development will minimise impacts on the integrity of all designated Natura 2000 sites	The conclusion in the NIS is that, in view of best scientific knowledge and on the basis of objective information and having regard to the conservation objectives of the European sites, that the N6 GCRR either individually or in combination with other plans or projects will n not have any adverse effects on the integrity of any European site.	This objective is <b>not</b> achieved. The decision of the European Court was that the 2006 GCOB as approved (being the eastern portion) would have an adverse impact on integrity of a European site and this would also be the case for the Cyan Route Option as it follows the exact same route through the Lough Corrib cSAC on the east of the river.
The proposed road development will seek to avoid impacts to National Monuments	This objective is achieved	This objective is achieved
The proposed road development will not be unduly detrimental to the architectural, cultural or linguistic heritage of the area	This objective is achieved	This objective is achieved to a lesser extent due to the greater impact on Menlo Castle and its curtilage.
The proposed road development will take due cognisance of the importance of the existing landscape	This objective is achieved	This objective is achieved
The proposed road development will seek to preserve existing well-established communities	This objective is achieved	This objective is achieved to a lesser extent due to the profound impact on a well-established community in Ballindooley.
The proposed road development will seek to reduce noise and air impacts on sensitive receptors	This objective is achieved	This objective is achieved
<b>Physical Activity</b>		
Improve accessibility to Galway City	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out

Project Objective	N6 GCRR	Cyan Route Option
		of the city centre and the lack of a direct connection to the key employment centres on the eastern side of the city in terms of their connection to the city centre, residential areas of the city and the national road network.
Improve opportunities for walking in the core city centre area by creating more walkable environments; and	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre which in turn frees up less space to reallocate for development of active modes such as walking.
Reallocation of road space for the provision of additional cycling facilities on less congested urban streets.	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre which in turn frees up less space to reallocate for development of active modes such as cycling.
<b>Accessibility and Social Inclusion</b>		
Improve accessibility to Galway City	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre and the lack of a direct connection to the key employment centres on the eastern side of the city in terms of their connection to the city centre, residential areas of the city and the national road network.
Interconnection of the Galway City and environs road network to the national motorway network	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre and the lack of a direct connection to the key employment centres on the eastern side of the city in terms of their connection to the city centre, residential areas of the city and the national road network.

<b>Project Objective</b>	<b>N6 GCRR</b>	<b>Cyan Route Option</b>
Improve accessibility of Galway urban area to its main markets	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre and the lack of a direct connection to the key employment centres on the eastern side of the city in terms of their connection to the city centre, residential areas of the city and the national road network.
Improve accessibility of the Gaeltacht areas to the remainder of the county and country	This objective is achieved	This objective is achieved
Reduce disadvantage of the Gaeltacht areas	This objective is achieved	This objective is achieved
Implement sustainable transport policies for shorter commutes	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre which in turn frees up less space to reallocate for development of active modes and public transport to undertake these shorter commutes.
Improve urban environment of Galway City centre	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre which in turn does not relieve the city of traffic to the same extent, noting that the through traffic in Galway City centre, i.e. Eyre Square at the heart of the city, impacts on the city as a place.
Support the improvement of the public transport hub linking Galway to other Gateways	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre which means that Galway City centre, i.e. Eyre Square at the heart of the city, becomes a bottleneck of traffic instead of the public transport hub and

Project Objective	N6 GCRR	Cyan Route Option
		urban space that it has the potential to become.
Support the current development strategy and settlement strategy	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre and the lack of a direct connection to the key employment centres on the eastern side of the city in terms of their connection to the city centre and residential areas of the city. Both of these factors limit the ability to grow the employment and residential in the city on brownfield and infill locations.
<b>Integration</b>		
Support the development of critical-mass of regional population centres	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre and the lack of a direct connection to the key employment centres on the eastern side of the city in terms of their connection to the city centre and residential areas of the city. Both of these factors limit the ability to grow the employment and residential in the city on brownfield and infill locations which are necessary to achieve a compact urban centre of critical-mass in the region. .
Integration of Galway City and environs (including western parts of Galway County) into the national economic development agenda	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre and lesser ability to develop active modes and public transport, all of which leads to less growth in residential and employment in Galway City, thus making it less attractive

Project Objective	N6 GCRR	Cyan Route Option
		to fulfil its role in the National Development Plan.
Support balanced social and economic development at a national level	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre and lesser ability to develop active modes and public transport, all of which leads to less growth in residential and employment in Galway City, thus making it less attractive to fulfil its role in the National Development Plan as a counter balance to the eastern region.
Support balanced social and economic development at a city-region level	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre and lesser ability to develop active modes and public transport, thus making it a less attractive city in which to work and live with the associated disadvantages of same.
Understanding of the development, land-use and transportation pressures in the Galway urban area and their impact on the delivery of a successful city region at Galway	This objective is achieved	This objective is not achieved to the same extent due to the fact that it integrates less as an overall transport solution, therefore does not achieve the maximum potential of the Galway Transport Strategy.
To deliver on Galway's potential as Ireland's fourth largest city and an important residential, educational, employment and service centre for a wide regional hinterland, contributing to the national urban hierarchy	This objective is achieved	This objective is not achieved to the same extent due to the lower diversion of traffic out of the city centre and lesser ability to develop active modes and public transport, all of which leads to less growth in residential and employment in Galway City, thus making it less attractive to fulfil its role as a city of scale contributing to the national urban hierarchy.



Project Objective	N6 GCRR	Cyan Route Option
Recognition of the role of Galway City as a gateway to the west and Connemara, and the consequent socio-economic benefits of enhanced connectivity of Galway City to national markets, enhanced tourism accessibility, and the national transport system	This objective is achieved	This objective is achieved in terms of providing a connection to Connemara, but it is not achieved to the same extent in terms of the level of connectivity which it provides to Galway City.
Improvement of the TEN-T network to ensure connectivity of the west of Ireland to the single European market.	This objective is achieved	This objective is achieved

## 8 The Solution and Its Benefits

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8.1 As set out at Section 3 of the Introduction at the start of this Oral Hearing the N6 GCRR represents the best solution to the transport difficulties in Galway City and supports more sustainable travel for the following reasons:

- It will provide a strategic route across the River Corrib without the need to go through the city
- It will be of a high standard cross-section and will provide the capacity required for the strategic traffic serving the city and connecting the county to the national network
- It will improve connectivity to the West Region i.e. the county areas and hinterland beyond the city zone
- Access to this strategic route will be limited to the junctions provided which will protect the road asset in the future and means that its capacity is secure
- It is of European importance given that the TEN-T comprehensive network designation extends west of the city to the terminus of N6 GCRR and will provide a link to the West Region of the standard of a comprehensive route in accordance with the TEN-T Regulation
- It will provide connections to essential city links to better distribute traffic
- By tackling the city's congestion issues, this route will provide a better quality of life for the city's inhabitants and provide a much safer environment in which to live
- By reducing the number of cars on the roads within the city centre and improving streetscapes, workers and students are facilitated to commute using multi-modal transport means. This includes travelling on foot, by bicycle and on the public transport system
- It will provide connectivity to the national roads via junctions to maximise the transfer of cross-city movements to the new road infrastructure, thus releasing and freeing the existing city centre zone from congestion caused by traffic trying to access a city centre bridge to cross the River Corrib
- It will attract traffic from the city centre zone thus facilitating reallocation of road space to public transport leading to improved journey time reliability for public transport

- It will cater for the strong demand between zones on either side of the city
- It will provide an additional river crossing with connectivity back to the city either side of the bridge crossing
- It will facilitate an improved city centre environment for all due to reduced congestion, thus encouraging walking and cycling as safe transport modes

8.2 The proposed N6 GCRR will also facilitate the implementation of the GTS and an integrated transport solution incorporating a modal shift within Galway City.

8.3 The considerable benefits of the proposed road development far outweigh the potential negative impacts on the receiving environment.