

## **Appendix A**

### **A.5.1 Lough Corrib Route Options Report**

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Galway County Council  
**N6 Galway City Transport Project**  
Lough Corrib Viaduct Option

GCOB-4.04-REP001

Issue 1 | 4 July 2014

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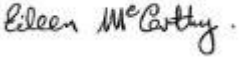
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# Document Verification

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# 1 Introduction

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## 1.1 Overview

Arup was appointed to provide multi-disciplinary engineering consultancy services for delivery of Phases 1, 2, 3 and 4 of the NRA Project Management Guidelines (NRA PMG) for the N6 Galway City Transport Project. This appointment includes the examination of studies, documents and court rulings relating to the earlier unsuccessful scheme, followed by feasibility studies, route selection, design and planning for a revised scheme.

The commission commenced at *Phase 1: Scheme Concept & Feasibility Studies*. As public funding will be required for any future potential scheme, a Preliminary Appraisal was undertaken during Phase 1. The purpose of this appraisal is to ensure that public funds are allocated in an efficient manner by establishing the merits of a proposal using a consistent and comprehensive framework. Phase 1 has now been completed and *Phase 2: Route Selection* has commenced.

## 1.2 Scheme Background

Consultants were appointed in 1999 to undertake feasibility studies, route selection, design and planning for a Galway City Outer Bypass scheme. The resultant scheme including the Compulsory Purchase Order (CPO) and Environmental Impact Statement (EIS) was submitted to An Bord Pleanála (ABP) in December 2006. This scheme consisted of 21.4km of mainline, 9km of link roads, associated intersections and a major bridge crossing of the River Corrib.

ABP granted approval for only part of the scheme, the section from the N59 east to the existing N6 and refused permission for the section of the scheme from the R336 west of Bearna to the N59. The ABP decision granting approval of the eastern section was appealed to the High Court. The High Court undertook a judicial review of the ABP decision. The High Court confirmed ABP approval but allowed an appeal to the Supreme Court. The Supreme Court sought the opinion of the Court of Justice of the European Union (CJEU) on an interpretation of the Habitats Directive. Following receipt of the CJEU opinion, the Supreme Court quashed the earlier ABP decision.

Therefore, the process of developing a transportation solution for Galway City and environs is commencing again.

## 1.3 Purpose of this Report

The scheme is currently at Phase 2 - Route Selection stage. The objective of this phase is to identify a suitable study area for the examination of alternative routes and transportation solutions, to identify key constraints within this study area, to develop feasible route options and transportation solutions and to carry out a systematic assessment of these options leading to the selection of a preferred route corridor or transportation solution which will form the basis for the detailed design to follow. This phase also outlines the requirements for public consultation associated with the development of routes and alternatives. Both “on-line” and “off-

line” options are to be considered during the planning and design of the preferred option for the scheme.

As part of this process the feasibility and applicability of a number of options and alternatives need to be considered for inclusion or otherwise in the route option selection process. This technical note examines the feasibility and applicability of linking the eastern and western areas of County Galway by crossing Lough Corrib.

## 1.4 Viaduct versus Causeway versus Bridge

The principle of a viaduct, a causeway and a bridge are similar and are defined as follows:

- A viaduct is a long bridge-like structure, typically a series of arches, carrying a road or railway across a valley or other low ground;
- A causeway is a raised road or track across low or wet ground; and
- A bridge is a structure carrying a road, railway etc. across a road, railway or other obstacle.

As the terms are broadly equal, the term viaduct will be used for the remainder of this report. This has been chosen as the likelihood of a single span crossing is negligible and any crossing would involve a combination of crossing water, marsh and floodplains.

## 2 Technical Feasibility of a Viaduct Structure

### 2.1 Viaduct Options

Two broad options can be examined when considering the feasibility of crossing Lough Corrib using a viaduct as follows:

1. **Partial Crossing:** This option crosses part of Lough Corrib, transverses the floodplain of the River Corrib and crosses the confluence of the River Corrib before landing on the western bank of the river. Intermediate piers for this option could be located within the floodplain of the River Corrib but may also be required in the bed of Lough Corrib; and
2. **Full Crossing:** This option fully transverses Lough Corrib. Intermediate piers into the bed of Lough Corrib would be required for this option.

### 2.2 Engineering Assessment of Viaduct Options

Both options have technical difficulties and cost implications associated with them. The following is a brief outline of the challenges associated with each option:

- **Option 1** would require a span across Lough Corrib ranging from 480m to 1950m without intermediate supports. This can be achieved but would result in a significant structure and associated costs. Therefore, the provision of intermediate piers on the Lough would be likely; and
- **Option 2** would be required to bridge a distance of 4400m or greater. It is possible to bridge this distance using a number of intermediate piers on the Lough.

Crossing Lough Corrib is technically feasible, the cost implications associated with this option are large. No suitable data was available to provide detailed costs for these options. Figures were available for “standard” viaducts on land (€14M/km) and sea viaducts (€52M/km), these are however significantly different structures. In addition, costs can vary significantly from location to location due to unforeseen ground conditions, available construction methodologies etc. Therefore, it is not possible at this point to provide indicative costs per-kilometre or indicative total costs for these options.

**Figure 2.1** below shows graphically the location of the potential options detailed above.



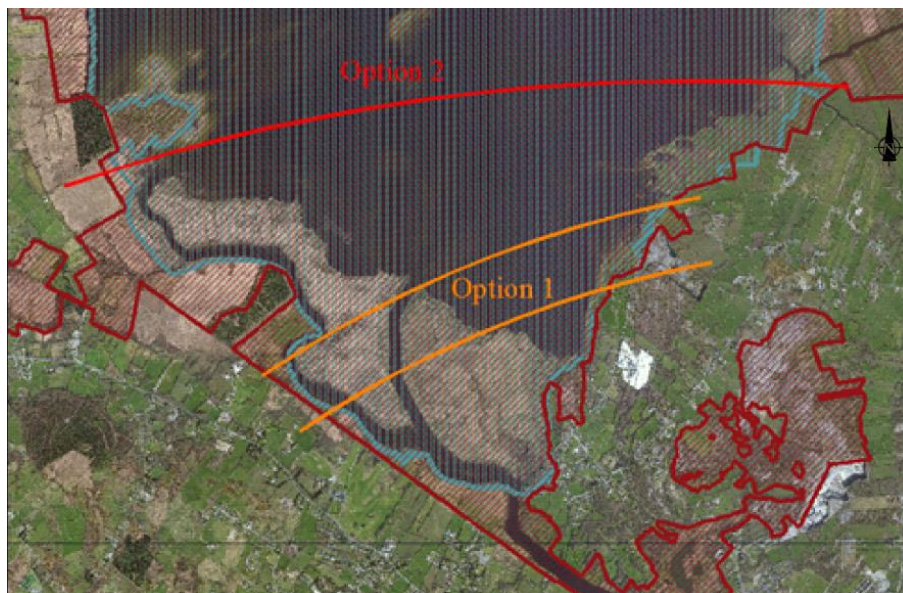
**Figure 2.1:** Potential Viaduct Crossing Points



## 3 Ecology Assessment

### 3.1 Ecology

Lough Corrib is a site of significant ecological importance. It is part of the EU wide network of nature protection areas established under the EU Habitats Directive 92/43/EEC. The aim of the network is to assure the long-term survival of Europe's most valuable and threatened species and habitats. It is comprised of candidate Special Areas of Conservation (cSAC's) designated by Member States under the Habitats Directive, and also incorporates Special Protection Areas (SPAs) which are designated under the Birds Directive. **Figure 3.1** below shows an outline of the Lough Corrib cSAC (hatched area in red) and Lough Corrib SPA (hatched area in blue), overlain on this graphic are the options detailed in **Section 2** above.



**Figure 3.1: Potential Viaduct Crossing Points and Lough Corrib cSAC and SPA Boundary**

Lough Corrib is the second largest lake in Ireland with an area of approximately 18,240 ha (the entire cSAC site is 20,556 ha). The lake can be divided into two parts: a relatively shallow basin, underlain by Carboniferous limestone, in the south and a larger, deeper basin, underlain by more acidic granite, schists, shales and sandstones, to the north. Rivers, mainly to the east of the site are included within the cSAC as they are important for Atlantic Salmon. These rivers include the Clare, Grange, Abbert, Sinking, Dalgan and Black to the east, as well as the Cong, Bealanabrack, Failmore, Cornamona, Drimneen and Owenriff to the west. In addition to the rivers and lake basin, adjoining areas of conservation interest, including raised bog, woodland, grassland and Limestone pavement, have been incorporated into the site.

Lough Corrib cSAC is of major conservation importance and includes 14 habitats listed on Annex I of the E.U. Habitats Directive 92/43/EEC. Six of these are priority habitats - petrifying springs, *Cladium* fen, Active raised bog, Limestone pavement, Bog woodland and Orchid-rich calcareous grassland.

The other annexed habitats present include Hard water lakes, Lowland Oligotrophic lakes, Floating river vegetation, Alkaline fens, Degraded raised bogs, *Rhynchosporion* vegetation, *Molinia* meadows and old Oak woodlands. Species present on the site that are listed on Annex II of this directive are Sea lamprey, Brook lamprey, Atlantic Salmon, White-clawed crayfish, Freshwater pearl mussel, Otter, Lesser horseshoe bat, Slender naiad and the moss *Hamatocaulis vernicosus* (formerly *Drepanocladus vernicosus*).

Lough Corrib SPA is one of the top ornithological sites in the country, and easily qualifies for international importance on the basis of numbers of wintering birds using it. It is also of international importance for its population of Pochard. There are a further seven species of wintering waterfowl that have populations of national importance. Its populations of breeding gulls and terns are also notable, with nationally important numbers of Common Tern, Arctic Tern, Common Gull and Black-headed Gull. The site is now the most important in the country for nesting Common Scoter. It is of note that several of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Greenland White-fronted Goose, Golden Plover, Common Tern and Arctic Tern.

In crossing the lake and the fringing wetland habitats, both viaduct options would result in habitat loss within Lough Corrib SPA and have the potential to result in significant adverse effects to bird species listed as the site's special conservation interests. As the southern extent of the SPA ends in the vicinity of the pier at Menlough Village and there is a 4km zone between here and the coastline with no SPA designation, a viaduct through Lough Corrib SPA would likely fail the "alternative solutions" test under Article 6(4) of the EU Habitats Directive 92/43/EEC, given that there is clear scope for an alternative solution that avoids the SPA entirely.

Similarly, a viaduct option in this area would likely result in significant impacts on Lough Corrib cSAC. In addition to impacting on the lake itself (which is classified as the Annex I habitat type Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. [3140]), Option 1 crosses a mosaic of peatland and wetland Annex I habitats<sup>1</sup> at Coolanillaun and Tonacurragh. Both of these areas support the following Annex I habitat types which are listed as qualifying interests of Lough Corrib cSAC: \*Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210]; Alkaline fens [7230]; and, *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]. Given the underlying hydrological conditions that support these habitat types, it is likely that significant habitat loss and degradation would occur, and that the habitats would be significantly affected by the construction of a viaduct. Coolanillaun is also an important site for the local Otter population (a qualifying interest of the cSAC) and significant adverse effects on this species would be likely. A Hen harrier winter roost site on the southern shores of Lough Corrib would also be at risk of adverse effects from a viaduct in this area.

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<sup>1</sup> habitat data based on the findings of N6 GCTP habitat survey work undertaken to date and information on habitats within Lough Corrib cSAC held by the National Parks and Wildlife Service *The Phytosociology and Ecology of the Aquatic and Wetland Plant Communities of the Lower Corrib Basin, County Galway* (Mooney & O'Connell, 1990).

Based on existing knowledge of the locations of the qualifying interests habitats and species within Lough Corrib cSAC and the fact that a viaduct option would cross the cSAC over a length of 3-6km, a viaduct crossing Lough Corrib and/or the Coolanillaun/Tonacurragh area would likely fail the “alternative solutions” test under Article 6(4) of the EU Habitats Directive, given that there is scope for an alternative solution to the south which would be likely to result in a reduced risk of adverse effects on the integrity of the cSAC. In terms of linear distance alone, there are potential crossing options south of Menlough where the cSAC boundary is c.150m in width, and areas where the coverage of Annex I qualifying interest habitats is greatly reduced.

In summary, a viaduct crossing of Lough Corrib is considered to be a very poor option from an ecological perspective given the ecological constraints associated with crossing Lough Corrib, the likelihood of a viaduct resulting in significant adverse effects on the integrity of both Lough Corrib cSAC/SPA (even with stringent environmental management and mitigation in place during construction and operation), the alternative option of avoiding the SPA, and the likely presence of less damaging solutions to crossing the cSAC.

## 4 Traffic Assessment

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### 4.1 Existing traffic

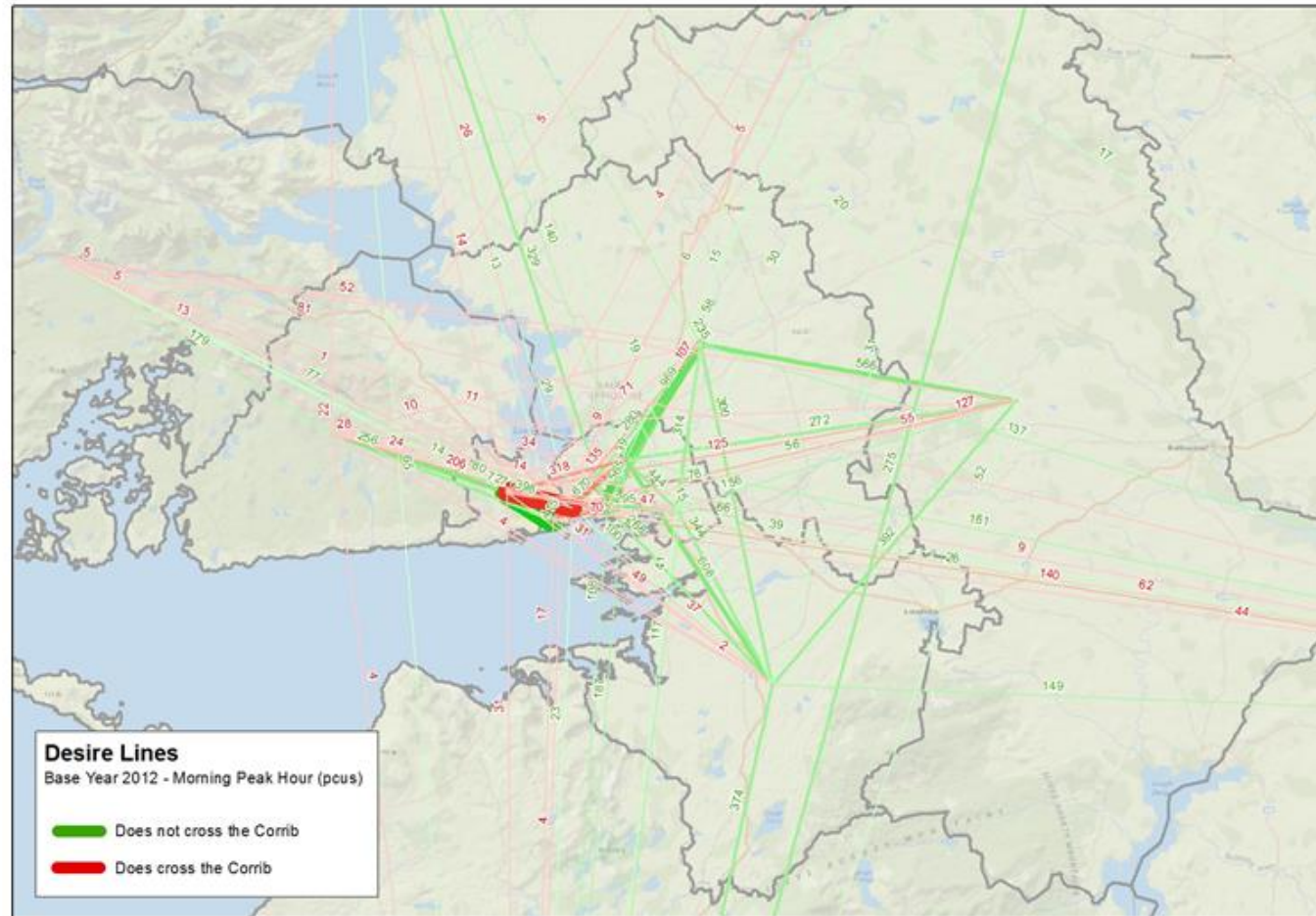
The Census 2011 data showed that Galway City currently has a population of approximately 75,500, an increase of 4.3% since the 2006 census. Galway County (including Galway City) has a population of approximately 250,000, an increase of 8.2% since the 2006 census. The population of Galway west of the River Corrib is approximately 77,000. Of this, 39,625 people live within the city boundary. Therefore, the areas west of the city have a population of approximately 37,375, this population is dispersed from Moycullen and Spiddal in the south to Leenaun on the Mayo boundary in the north.

As part of the scheme concept and feasibility studies an examination of the existing travel patterns and demand was undertaken. Part of this resulted in the production of desire line diagrams. **Figure 3.1** below shows the desire line diagram produced for Galway City. This diagram shows traffic from east and west of the city travelling cross city and into the city and also details inner city movements. The following should be noted when interpreting **Figure 3.1**:

- Sectors are delineated by solid grey lines;
- Journeys from one sector to another sector are aggregated together and shown as a single line. The thickness of the line highlights the level of demand and includes both directions of travel;
- The aggregated journeys are shown from the centre of one sector to the centre of the destination sector(s);
- Journeys undertaken and completed internally within sectors are not shown;
- Desire lines shown are not road based;
- Green lines denote journeys which commence and end without crossing the River Corrib; and
- Red lines denote journeys which include crossing the River Corrib.

**Figure 4.1** shows the demand towards the city, with a strong demand coming from all over the county to the city. It also shows many red desire lines which commence from sectors outside the city and terminate in sectors outside the city on the opposite side of the river, demonstrating the trips that are forced through the city to cross the river as part of their longer journey beyond the city.

**Figure 4.1** highlights the significant amount of traffic which is drawn towards Galway City. It also highlights the fact that the further the proposed route is from the city the less attractive it would be to motorists accessing the city. Any proposal to introduce a viaduct across Lough Corrib would at a minimum be located 4.5km from the existing cross city route – the N6 and R338. This therefore, limits the benefit from a traffic perspective to locating the potential crossing point across Lough Corrib.



*Figure 4.1: Desire Lines*

## 5 Conclusion

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Crossing Lough Corrib by viaduct is technically feasible. The cost of doing so combined with its distance from the city and the existing de facto bypass of Galway City make the option unattractive.

The ecological constraints associated with this option also make crossing Lough Corrib by viaduct unattractive. The Lough has significant ecological importance and is an area of immense scenic amenity. Any crossing of the Lough would involve a significant structure making its incorporation into the landscape extremely difficult to impossible.

One of the key aims of the scheme is to improve the transportation issues of Galway City. The likely landing of any crossing of the Lough is outside the boundary of the city. This would mean that persons living in Galway City west (approximately 50% of all residents west of the Corrib) would first have to travel north west to travel east if they were to use this route option. This could potentially increase journey times and journey distances for these users rather than reducing travel times and distances.

Alternatives are available which potentially have a lesser impact on the environmental constraints; these options would all rank higher than a crossing of Lough Corrib as they would have a higher patronage and provide a greater benefit to the local economy.

Crossing Lough Corrib by viaduct would not meet the project objectives which are set out in the Chapter 1 of the Route Selection Report for the following reasons:

- The crossing of Lough Corrib may not reduce journey times;
- The crossing of Lough Corrib may not provide a cost effective project;
- The crossing of Lough Corrib would have a significant impact on designated Natura 2000 sites;
- The proposed crossing of Lough Corrib would not take due cognisance of the importance of the existing landscape; and
- The proposed crossing of Lough Corrib may not support the development of critical mass regional population centres.

For the reasons detailed above, the further examination of a viaduct crossing on Lough Corrib has been ruled out.