APPENDIX A3.1

NEED FOR THE SCHEME & ALTERNATIVES

FTG ROUTE SELECTION REPORT

R407 SALLINS BYPASS

ROUTE SELECTION REPORT

Prepared for

Kildare County Council
Áras Chill Dara
Devoy Park
Naas
Co. Kildare

Prepared by

Fehily Timoney Gifford Ltd.
Mill House
Ashtown Gate
Navan Road
Dublin 15

November 2007

R407 SALLINS BYPASS

ROUTE SELECTION REPORT

User is Responsible for Checking The Revision Status of this Document

Rev. Nr	Description of Changes	Prepared by:	Checked by:	Approved by:	Date
0	Working Draft, Issued for Comment	GF/GB	AD	OT	03/10/07
1	Final Draft, KCC comments incorporated	GF/GB	AD	OT	20/11/07

Client: Kildare County Council

Keywords: Kildare, Sallins, Route Selection

Abstract: Fehily Timoney Gifford (FTG) has been retained by Kildare County Council to carry out the constraints study, route selection and environmental impact assessment for the R407 Sallins Bypass. This report describes the route corridor options being considered for the R407 Sallins Bypass, these options were chosen following and assessment of the constraints within the study area. (ref. Constraints Report). This report assesses the environmental, engineering, planning and social impacts of each option under a number of headings; based on this assessment a preferred route corridor for the bypass is recommended.

TABLE OF CONTENTS

PAGE

LIST OF APPENDICES

LIST OF TABLES

PAGE

LIST OF FIGURES

PAGE

1. INTRODUCTION AND BACKGROUND

1.1. Introduction

Fehily Timoney Gifford (FTG) were appointed by Kildare County Council to carry out the constraints study and route selection for the proposed by-pass of Sallins town north of Naas in November 2006.

Although the proposed scheme does not include a national road, the process adopted to carry out the route selection is a phased approach based on the NRA document 'Project Management Guidelines'. These guidelines contain a logical sequence of phases for a roads project that extend from feasibility through to the final account stage, and are considered to represent best practice in the development of road schemes.

1.2. Project Need

Sallins is located on the Grand Canal, 32km from Dublin, 5km north of Naas town centre on the R407 Regional route linking Naas with Clane and Kilcock. The town is separated from Naas by the M7 motorway and is primarily a residential centre with a railway station serving Naas and surrounding areas.

Sallins has seen a considerable amount of development in recent years as it has emerged as a commuter town for Dublin. The population has nearly quadrupled since 1996 and the town currently has about 4,000 inhabitants. The extensive development and increase in population has resulted in a large increase in the traffic generated in the town. Traffic volumes on the R407 also include a large amount of strategic traffic as it provides motorists wishing to travel between the M4 and M7 with an alternative route avoiding the M50. These factors have resulted in significant growth in traffic through Sallins in recent years.

A bypass for Sallins town has been identified as an objective by Kildare County Council (KCC) in the Sallins Local Area Plan adopted in 2001 (objective 03.8.1a) and the Kildare County Development Plan 2005-2011 (objective RP14).

1.3. Scheme Objectives

The scheme objectives include:

- To reduce traffic congestion in the centre of Sallins town. In addition the noise and air pollution will also be reduced in this area.
- To reduce journey times and increase capacity on the R407 by removing bottlenecks.
- To facilitate continued economic growth while ensuring a high level of environmental protection.
- To increase road safety and reduce fatalities and serious injuries.

1.4. Constraints Study

Phase 2 of the National Roads Authority (NRA), National Roads Project Management Guidelines outlines the requirement for a constraints study to be carried out. The purpose of a Constraints study is to determine what constraints exist (physical, procedural, legal, environmental, etc.) which could affect the planning and design or the scheme, delay progress and influence the costs.

A draft constraints study report for the R407 Sallins Bypass was produced by Fehily Timoney Gifford in March 2007; this report was then updated following the public consultation in June 2007. The final constraints report was issued to Kildare County Council (KCC) in September 2007.

A study area was produced for the project and information in relation to the major engineering and environmental constraints within the study area were collected. The full extent of the study area is also shown on the Route Corridor Options drawing in Appendix A. This information was methodically reviewed to assess the potential impact on the route selection process and to identify any areas where additional data or studies where required. The issues that were considered included:

- The existing infrastructure, land use, topography and physical features
- Identification of sites or areas of environmental significance or sensitivity
- Planning and development
- Engineering Constraints

1.5. Public Consultation

A Public Consultation for the Constraints Study and Route Corridor Options was carried out over 2 days on 6/7 June 2007 with a manned public display in Naas GAA Club. This was part of the scheme development process and was intended to inform the public at an early stage about the various steps involved as well as the timeframe involved. The study area for the scheme, all known constraints and the route options were displayed and comments and observations from all interested parties were sought. This consultation also provided a valuable opportunity for Kildare County Council to learn about matters of particular concern and sensitivity which should be taken into account when selecting a preferred route option. The public were invited to provide further constraints information and comment on the route corridor options by the 29th June via a questionnaire.

Following the public consultation, the constraints and route corridor options were displayed in the Road Design Department in Áras Cill Dara, Naas until the 29th June. During this time a significant amount of people visited this display and were able to discuss any concerns relating to the Sallins Bypass project with Kildare County Council's road engineers. After the 29th June Kildare County Council actively when out to meet people who were directly affected by the route corridor options being considered.

2. ROUTE CORRIDOR OPTIONS

2.1. Evaluation of Constraints

The purpose of the Constraints Report was to map all the identified constraints within the study area that might impact on choosing potential routes for the project. This data collection focussed on determining what constraints exist (physical, procedural, legal, environmental etc.) which could affect the design of the scheme, delay the progress of the scheme and influence the cost of the scheme.

The constraints noted in this section have been identified as being of primary importance for the route selection of the Sallins Bypass. This does not infer that other constraints identified elsewhere in the report are unimportant, rather that there some constraints which are identified as being of greater significance in the overall development of the scheme.

The primary constraints identified are discussed sections 2.2 and 2.3 below.

2.2. Environmental Constraints

A full and detailed environmental assessment of the proposed route corridors has been carried out. The environmental assessment assesses the impact of the individual options proposed under the following headings:

- Agriculture
- Air Quality
- Archaeology
- Construction Impacts
- Cultural Heritage
- Ecology
- Human Environment
- Hydrology
- Landscape
- Land use
- Leisure & Recreation
- Noise and Vibration
- Water Quality and Fisheries

Only one site within the study area is proposed for designation, the Grand Canal (pNHA). The Grand Canal dominates the centre of the study area, flowing in easterly and southerly directions and is regarded as a nationally important site (i.e. B rating).

2.3. Physical Constraints

- Existing topography
- Existing developments along the proposed route options
- Existing utilities in particular gas, water, sewage, power and telecommunications
- Existing working farms along or adjacent to the proposed route options
- Existing amenity areas within the Study Area
- Existing infrastructure in particular the Dublin/Cork railway and the Grand Canal which will be crossed by the proposed bypass
- Existing and proposed industry within the area.
- Proposed developments with planning permission
- Environmental constraints

Potential routes will be examined as part of the route selection process having regard to these constraints and bearing in mind the need to mitigate adverse impact as far as reasonably possible.

2.4. Route Options Selection

A number of route corridors have been considered during the route selection phase of the project. To clearly identify and distinguish the selected routes it was necessary to give each option a colour:

- Green
- Cyan
- Red
- Cyan/Red (a combination of the red and cyan routes)
- Blue
- Purple
- Yellow
- Orange

The Red, Cyan/Red and Purple Corridor have alternative options as follows:

- Red Option A
- Cyan/Red Option A
- Purple Option A

The Green, Red and Cyan/Red options all terminate at the proposed M7 Osberstown Junction; this junction does not form part of the Sallins Bypass project. Should the proposed junction not proceed, the Green, Red and Cyan/Red options would connect to the Naas Western Distributor Road via the Grey Route, including a new bridge over the M7 motorway.

All of the route options being considered commence at point A at the end of the Castlesize R407 realignment project; which is currently under construction. The options are shown on the Route Corridor Options drawing in Appendix A and are described in the following text:

2.4.1. Green Route

The Green option travels from point A in a south-western direction and crosses River Liffey at Castlesize and the Grand Canal at Barrettstown. It then travels south through Waterstown crossing the Dublin-Cork rail line and the River Liffey in close proximity before crossing the Osberstown Road and tying into the proposed Osberstown Junction.

2.4.2. Red Route

The Red option runs south from point A travelling between the River Liffey and the Castlesize housing estate, the route then continues through Osberstown travelling parallel to the River Liffey. It then crosses the Grand Canal and Dublin-Cork rail line in quick succession before crossing the Osberstown Road and tying into the proposed Osberstown junction on the M7.

2.4.3. Cyan Route

The Cyan option initially follows the Green option from point A up to the first crossing of the River Liffey at Castlesize but then branches off the Green route in a south-westerly direction and crosses River Liffey again at Waterstown. It then continues through Osberstown crossing the Grand Canal in the vicinity of the Leinster Aqueduct and merging with the Red option as it crosses the Dublin-Cork rail line. It then follows the Red option and connects into the proposed Osberstown Junction.

2.4.4. Cyan/Red Route

The Cyan/Red Option travels along the Cyan route almost as far as the second River Liffey crossing; it then turns south east to join Red route and ultimately tie into the Osberstown Junction.

2.4.5. Blue Route

The Blue option follows the corridor reserved for the Sallins Bypass in the Sallins Local Area Plan of 2001. This option starts at point A and travels south through the Castlesize housing estate before turning east to cross the Grand Canal. It then passes through the Osberstown housing estate and crosses the Dublin-Cork rail line before it ties into the existing R407.

2.4.6. Purple Route

The Purple option travels from point A in a south-eastern direction into Bodenstown. It then passes through the townland of Sallins crossing the Straffan Road, Grand Canal, Dublin-Cork rail line and Kerdiffstown Road in quick succession. It continues through Kerdiffstown crossing a disused sand pit before it merges into the existing Kerdiffstown road and terminates at the existing roundabout on the link road south west of the Johnstown Junction.

2.4.7. Orange Route

The Orange option starts at point A and travels east through the townlands of Bodenstown and Sherlockstown crossing the existing Straffan Road before veering south-east to cross the Dublin-Cork rail line and the Grand Canal. The route then traverses Palmerstown Demesne/PGA National Golf Course before it ties into the existing N7 Johnstown Junction.

2.4.8. Red Option A Route

The Red Option A route is an alternative Red Route that ties into the existing R407 rather than Osberstown junction. This option would involve crossing the Naas & Corbally branch of the Grand Canal and upgrading the existing Osberstown road.

2.4.9. Cyan/Red Option A Route

The Cyan/Red Option A route is an alternative Cyan/Red route that ties into the existing R407 rather than Osberstown junction. This option would involve crossing the Naas & Corbally branch of the Grand Canal and upgrading the existing Osberstown road.

2.4.10.Purple Option A Route

The Purple Option A route is an alternative Purple Route that ties into the N7 Maudlins Junction instead of the existing roundabout on the link road south west of the Johnstown Junction.

3. GENERAL ENGINEERING ISSUES

3.1. Design Standards & Criteria

The proposed road shall be designed to conform to the standards laid down by the National Roads Authority and which are current at the time.

3.1.1. Design Speed

The design speed chosen for a road will determine the geometric standards for curvature, visibility and super elevation adopted for the road alignment. It is therefore necessary to choose a design speed that is consistent with the desired vehicle speeds on the road. NRA TD9/05 of the NRA Design Manual for Roads and Bridges (DMRB) identifies the road alignment, the road layout (i.e. the dimensions of the carriageway, hard shoulder, verge & the frequency of junctions) and the mandatory speed limit as the 3 principle factors that influence vehicle speeds. The mandatory speed limit for a Regional Road such as the R407 is 80kph; this is typically reduced to 50kph through an urban area or village.

A preliminary assessment of each route corridors option (ref. Route Corridor Options drawing in Appendix A) has determined that that all the corridor options except for the Blue option, the Red Option A and the Cyan/Red Option A would be able to accommodate a road layout and alignment that would facilitate vehicle speeds of 80kph. A mandatory speed limit of 50kph is recommended for the Blue option, the Red Option A and the Cyan/Red Option A as they pass through built up areas in Sallins and intersects existing roads with a mandatory speed limit of 50kph. In any event the road alignment and frequency of junctions that would be required on the Blue option would significantly reduce vehicle speeds. The chosen design speeds are outlined in Table 3.1

Table 3.1 Chosen Design Speeds

Route Option	Speed Limit	Design Speed
	kph	kph
Blue, Red Option A, Cyan/Red Option A	50	60B
All other options	80	85A

Ref: Table 2 of TD9/05: Maximum Design Speeds for mandatory speed limits

3.1.2. Mainline Cross Section

From the traffic analysis described in Chapter 4 and Appendix B it has been determined that a Standard Single Carriageway (S2) or a Wide Single Carriageway (WS2) would accommodate the predicted diverted traffic levels. However, the final choice of cross-section will be determined by the additional future traffic demand anticipated to use the bypass. Table 3.2 outlines the cross-section for the different road types which are defined in Figure 6A of NRA TD 27/00 Cross Sections and Headroom.

Table 3.2 Cross-section for Standard Single/Wide Single Carriageway

	Dimensions		
	Wide Single	**Standard Single**	**Standard Dual**
Carriageway	10.0m	7.3m	2 x 7.0m
Central Reserve	n/a	n/a	2.6m
Hard Shoulder	2.5m	2.5m	2.5m
Verge	3.0m	3.0m	3.0m

Ref: Table 6A of TD27/00: Lane widths and carriageway markings

The cross-sections described in Table 3.3 are based solely on traffic analysis. Depending on the proximity of the chosen route option to Sallins town it may be desirable to adopt a more urban cross-section which includes a cycleway and footpath. A typical urban cross-section is given in Table 4.3.

Table 3.3 Typical Urban Cross-section

	Dimensions
Carriageway	7.0m to 10.0m
Verge	1.0m
Footpath	2.0m
Cycleway	2.0m

The exact details of cross-section will be depend on the route option chosen and will be determined following the Route Selection process.

3.2. Road Alignment

The proposed road shall be designed in accordance with the NRA Design Manual for Roads and Bridges (DMRB) TD 9/05 Road Link Design. The desirable minimum alignment parameters for the chosen design speeds are outlined in Table 3.4 below.

Table 3.4 Desirable Minimum Alignment Parameters

	Parameter	85kph	60kph
Horizontal Alignment	Desirable Minimum Stopping Sight Distance	160m	90m
	Desirable Minimum Horizontal Radius	510m	255m
	Overtaking Sight Distance	490m	345m
Vertical Alignment	Desirable Maximum Gradient	5.0%	5.0%
	Minimum Gradient for effective drainage	0.5%	0.5%
	Desirable Minimum Vertical Crest k Value	55	17
	Desirable Minimum Vertical Sag k Value	26	13

3.3. Topography

The topography to the west of Sallins is generally flat to undulating with the majority of land intensively used for farming. To the east of Sallins the landscape is dominated by Naas and the PGA National golf courses, the topography is generally undulating with some steep hills to the east of the town centre.

3.4. Earthworks

The construction of embankments and the excavation of cuttings is one of the most significant elements in the construction of road schemes.

Due to the relatively flat topography of the study area the routes will mostly be at grade with embankments at the approaches to bridges, however the Yellow, Purple and Purple Option A will have a 300 m long cutting which will be approximately 6m depth. It is preferable to have slightly more cut material than fill with regard to earthworks. The excess fill can be used as general fill material on site and the material may also be used to create landscaping bunds where the routes are in close proximity to dwellings. However this is dependant on the quality of material being excavated. Earthworks which have a deficit of material will require the import of material to site. This is costly and has the negative impacts associated with the importation of material.

Other imported materials include road pavement, concrete, pre-cast concrete pipes, culverts and the import of materials from local quarries.

3.5. Geology

A geological assessment of the study area was carried out during the constraints study phase of project. The assessment of the geology and associated hydrogeology consisted of a combined site visit and desk study using available published information from the Geological Survey of Ireland Sheet 16, information contained on their website and examination of aerial photography. A general summary based on this assessment is outlined below; the impact of geology on the various route corridor options is discussed in Chapter 5.

3.5.1. Bedrock

The bedrock within the study area comprises of limestone of the Rickardstown, Waulstortian and Ballysteen formations. Typically the limestone formation will comprise of an upper weathered zone on top of well bedded lower regions which may prove difficult to excavate.

3.5.2. Glacial Soils

The study area mainly comprises glacial clay tills; these are typically a well graded material with a varying degree of clay minerals. The clay portion of the till deposit usually consists of rock flour rather than true clay particles and is typically limited to upper limits of 15%. The overall fines content (clay and silt) is generally in the region of 30 to 40% and thus borders on the BS 5930 description between coarse and fine grained soils.

Glacial tills in this area are typically encountered in an over-consolidated state with descriptions usually recorded as being firm to stiff in consistency and are generally low in compressibility. The clay till is, however, low in plasticity and is very sensitive to changes in moisture content, resulting in softening and deterioration in wet weather or extensive trafficking. Clay tills can be regarded as presenting relatively straightforward construction conditions when maintained in a dry state and properly managed.

3.5.3. Made ground

Made ground has been noted and is to be expected within built-up areas of Sallins and the surrounding towns. Construction through areas of made ground will typically require removal and replacement with materials suitable for road construction. An disused landfill site has also been identified close to the Grand Canal along the Green route option, this landfill will require further investigation should the Green route option be chosen.

3.5.4. Alluvium

Alluvium or soft soils have been noted to be present along the outer edges of the Grand Canal along the eastern section of the study area and along the River Liffey. Soft ground has also been identified possibly immediately north of Palmerstown in the vicinity of the PGA National Golf Course.

These alluvial materials are deposited by overflows of rivers, construction of the Grand Canal or the action of melting glaciers. These soils are generally normally consolidated and therefore susceptible to compression. Special measures are required for road construction over or through alluvial materials.

3.5.5. Peat

A localised fen area is located at the outer edge of the north-eastern quadrant of Sallins town.

Peat soils are characterised as being highly compressible, low shear strength organic materials. Large immediate and primary settlements are typical in peat soils followed by long-term creep settlements. Special measures are required for road construction over or through areas of peat.

3.5.6. Hydro-Geology

Bedrock Aquifers

The main bedrock aquifers identified within the study area during the constraints study are:

- Karstified limestone: Rickardstown formation. This formation contains an aquifer of regional importance.
- Dolomitised limestones: Ballysteen and Waulsortian formations. This is a locally important aquifer and is regarded as being moderately productive in localised zones.
- The aquifer contained within the bedrock is regarded as posing a minimal impact on route selection.

Sand and Gravel Aquifers

Within the study area, there area number of major water bearing sand and gravel deposits regarding as having potential impacts on the route selection:

- Sand and gravel aquifer between Barretstown and Waterstown in the west of the study area. This is a locally important aquifer.

- Sand and gravel aquifer between Bodenstown north of Sallins and Johnstown at the south-eastern quadrant of the study area. This aquifer is regarded as being locally important.

Aquifer Vulnerability and Protection

The aquifers associated with the sand and gravel deposit identified above are reported to be areas of high vulnerability. The surrounding areas mainly contained within the glacial till deposits are considered low to moderately vulnerable.

Assessment of the potential impacts on local well yields should be carried out where excavation in the vicinity of vulnerable aquifers is contemplated. Construction runoff and traffic oil spillages must also be considered as both could impact the quality of the local groundwater sources.

3.6. Utilities

The following public utilities have been identified in the study area during the constraints study and are described in the Constraints Report.

- Electricity Supply
- Gas Distribution
- Telecom
- Water Supply
- Wastewater Disposal

The following sub-sections describe information regarding these services as received from the statutory undertakers concerned. To date there has been no detailed investigation to determine the precise locations of these services or any unknown underground services as that is beyond the scope of this report.

3.6.1. Electricity Supply

The following two 110kv lines cross the study area:

- Blake to Griffinrath line
- Griffinrath to Newbridge line

The following two 38kv lines cross the study area:

- Griffinrath to Sallins line
- Johnstown to Sallins line

There is also a 38kv station located just north of Sallins along the existing R407. The Orange, Purple and Purple Option A route corridors interfaces with these ESB lines.

3.6.2. Gas Distribution

The Naas to Prosperous branch of the Dublin to Kinsale transmission pipeline cross the study area. This 180 PE 4 bar pipeline is located in the existing R407 carriageway with smaller pipes branching off to serve the housing estates in the vicinity of Sallins. All route options will interface with this gas main when connecting to the existing R407.

3.6.3. Telecom

Both Eircom and NTL have an extensive network in the Sallins area, the Blue route corridor will have most interfaces with these networks.

3.6.4. Water and Wastewater

There are watermains and sewers located in the existing R407, these branch off to serve the housing estates surrounding of Sallins. It is expected that the Blue route corridor will have most interfaces with these services.

Water and wastewater infrastructure is also located in the Osberstown, Straffan and Kerdiffstown roads.

4. TRAFFIC ANALYSIS

FTG prepared a traffic assessment report for the route selection process; the report is contained in Appendix B. The report seeks to establish a preferred route alignment for the proposed Sallins bypass in terms of forecast diversion of traffic from the existing R407 through Sallins.

A straightforward technique was used to analyse data from a 12 hour road side interview and traffic counts taken in May 2007 to estimate whether alignments lying to the west or to the east of Sallins produce the greatest diversion of trips from the R407.

The result of this analysis was that a western bypass option would remove the most traffic from Sallins due to the greater trip opportunity afforded by its connectivity to the M7 and the Naas Western Distributor Road, achieving a 37% reduction in traffic volumes through Sallins, as opposed to 29% for an eastern bypass. This assessment is based on current infrastructure and traffic levels.

Of the western route alignments, the Red, Cyan and Cyan/Red routes emerged as the preferred options due to connections with the M7 and the Naas Western Distributor Road, coupled with likely reduced journey times when compared to the remaining green route option. This is outlined in Table 4.1.

Table 4.1 Traffic Analysis Route Matrix

Best / Average / Worst	Green	Cyan	Red	Cyan/ Red	Blue	Purple	Yellow	Orange	Red Option A	Cyan/ Red Option A	Purple Option A
Route Ranking from Traffic Analysis											

Whilst providing a forecast matrix and modelling the impact of future infrastructure developments was outside the scope of this brief, it is expected that as the Osberstown Junction proposals and associated proposed infrastructure, principally the new M7 interchange and connection to the Naas Western Distributor Road, the case for a western bypass will be strengthened in the future. The extent of the increase in traffic on a western bypass of Sallins resulting from these developments has not been quantified.

The diverted traffic levels currently being considered could either be accommodated by a single or wide-single carriageway. However, the potential additional future demand may have an impact on the carriageway standard for the bypass and will need to be reviewed in due course.

5. ENGINEERING ASSESSMENT

5.1. Green Route

The Green route at 4.6km is one of the longest route options being considered. The route would require construction of 4 bridges, 2 over the River Liffey, and 1 each over the Grand Canal and Dublin-Cork railway line. Although further work would be required at the preliminary design stage to establish exact span requirements, the bridges over the River Liffey are envisaged to be 3 span structures, with an overall length of circa 90m. The railway crossing and the most southern Liffey crossing are very close together, which would require an embankment of approximately 600 m long, however as the railway is in a cutting at this location, the maximum embankment height is expected to be in the order of 4m to 5m.

The remainder of the Green route would pass mostly through open farmland and it is expected that alignment be largely at grade however a number of farm accommodation underpasses and culverts may be required, resulting in some sections of embankment. The alignment also crosses a tributary of the River Liffey in Osberstown which would also require a culvert.

In the vicinity of the River Liffey, it is recommended that the road level be chosen so as to be above the 100 year flood level, to control the risk of the road being flooded.

At grade junctions would need to be provided to allow access onto the Osberstown Road and the existing R407. Noise mitigation is also likely to be required at individual dwelling locations along the route.

It is also worth noting that the green route will pass alongside a disused Kildare County Council landfill site at Waterstown in Sallins. Adjacent to the site is a well which provides water services to nearby residents. Although the Green route does not directly impose on this landfill site, any construction work nearby could result in the possibility of leachate contaminating this local water supply.

5.2. Red Route

The Red route is approximately 3.3km long and will be largely at grade except for the crossings of the Grand Canal and Dublin-Cork railway line, where bridges with approach embankments will be required. It is envisaged that single span structures will be required at both these locations, subject to agreement with Waterways Ireland and Iarnród Éireann. The location of the crossing of the railway has been selected at the point where the railway is in a slight cutting, thereby reducing the requirements for approach embankments.

In the vicinity of the River Liffey, it is recommended that the road level be chosen so as to be above the 100 year flood level, to control the risk of the road being flooded.

If the road is constructed close to the boundary of the Castlesize Estate, the likely minimum distance between west road fenceline and east river bank is of the order of 30m. It is not envisaged that this would necessitate the provision of extraordinary flood protection measures, although the inclusion of gabion mattresses at the toe of the likely small embankment would be considered prudent to reduce scour damage were the river to flood.

Noise mitigation would be required along the eastern side of the Red Route. This is likely to consist of a high noise barrier. Noise barriers would also be required at individual dwelling locations e.g. Osberstown Road, Grand Canal towpath.

At grade junctions would need to be provided to allow access onto the Osberstown Road and the existing R407, north of Sallins.

5.3. Cyan Route

The Cyan route is 3.5km long and would require construction of 4 bridges, 2 over the River Liffey, and 1 each over the Grand Canal and Dublin-Cork railway line. Although further work would be required at the preliminary design stage to establish exact span requirements, the bridges over the River Liffey are envisaged to be 3 span structures, with an overall length of circa 90m. The crossings of the canal and railway are similar to those required for the Red Route, however as the crossing is in close proximity to the Leinster Aqueduct at a location were the canal is on a high embankment in order to cross the River Liffey, a relatively high structure and high approach embankments would be required.

The Cyan route will require the construction of a road embankment between the 2 bridges over the River Liffey. As per the Green and Red routes, road levels should be designed to be above the 100 year flood level of the River Liffey.

It is not envisaged that noise barriers would be required other than where the route passes individual dwellings.

5.4. Cyan/Red Route

The Cyan/Red route is approximately 3.5km long and is a route option that combines the northern portion of the Cyan route and the southern portion of the Red route. The route will require construction of 4 bridges, 2 over the River Liffey, and 1 each over the Grand Canal and Dublin-Cork railway line. As discussed in earlier sections, the bridges over the River Liffey are envisaged to be 3 span structures, with an overall length of circa 90 m (subject to confirmation at the preliminary design stage). The crossings of the canal and

railway are expected to be single span structures, subject to agreement with Waterways Ireland and Iarnród Éireann.

The Cyan/Red route will require the construction of a road embankment between the 2 bridges over the River Liffey.

It is not envisaged that noise barriers would be required other than where the route passes individual dwellings. At grade junctions would need to be provided to allow access onto the Osberstown Road and the existing R407, north of Sallins.

5.5. Blue Route

The Blue route at 2.2km is the shortest route being considered, the northern end of the route is at grade as the route passes through the Castlesize residential estate. Bridges over the Grand Canal and Dublin/Cork railway line are required. The approach embankments for these bridges would have a significant impact on the adjacent residential area as the road level would be approximately the same as the first floor level of the houses.

Should the Blue route be chosen, below standard horizontal and vertical geometry may be required to accommodate the road within the land available. Substantial noise mitigation would also be required along both sides of the road.

At grade junctions will need to be provided in both the Castlesize and Osberstown estates and on the R407 north and south of Sallins. The junctions in the Castlesize and Osberstown estates will result in significant mixing of middle distance/strategic traffic and local residential traffic at these junctions. Due to the close proximity of the railway bridges adequate junction visibility may not be achievable at the southern junction on the R407.

Drainage of the section of the Blue route of the road will be difficult due to the present of a low point in between the canal and railway crossings which has no local ditch/stream as a suitable outfall.

5.6. Purple Route

The Purple route would be approximately 4.1km long; the northern section of the route will largely be at grade. A viaduct structure of approximately 300m long will be required to carry the proposed road over the Grand Canal and Dublin/Cork railway line. A cutting of approximately 6m in depth would be required on the north side of this viaduct. An overbridge would need to be provided to carry the L-6011 Straffan Road over the proposed bypass. An at grade junction would need to be provided between the proposed bypass and the L-2005 Kerdiffstown Road. There would be a minimum of at least 3 houses required to be demolished at this location.

The Purple route also travels through a disused sand pit at Kerdiffstown; the alignment would be in a cutting of approximately 6m to 7m depth and some backfilling of the sand pit may also be required depending on the results of site investigations. Substantial widening of the existing L-2005 Kerdiffstown Road would be required in the vicinity of the existing roundabout on the link road south west of the Johnstown Junction; this would potentially involve a number of property demolitions. Noise barriers would be required where the route passes the residential estates around Sallins, other noise barriers may be required where the route passes individual dwelling. An at grade junction will need to be provided at the existing R407, north of Sallins.

5.7. Yellow Route

The Yellow route will be approximately 3.2km long; the northern section of the route is common with the Purple route and would largely be at grade. A viaduct structure of approximately 300 m long will be required to carry the proposed road over the Grand Canal and Dublin/Cork railway. A cutting of approximately 6m in depth will be required on the north side of this viaduct.

An overbridge will need to be provided to carry the L-6011 Straffan Road over the proposed bypass and an at grade junction would need to be provided between the proposed bypass and the L-2005 Kerdiffstown Road. There would be a minimum of at least 3 houses required to be demolished at this location.

Below standard horizontal geometry will be required to facilitate an alignment from the viaduct to the existing R407, south of Sallins. Noise barriers will be required along large stretches of the route and at grade junctions will also need to be provided to allow access the existing R407 at both ends of this route option.

Drainage of the an approximately 1km long section of the Yellow route will be difficult as this section has to be drained towards the south where no suitable stream/ditch is available to outfall.

5.8. Orange Route

The Orange route option is the longest route at just over 4.7km, the north western section of this route will consist of a small cutting and then a fill, both approximately 3m high, bridges with approach embankments of approximately 8m to 9m will be required to carry the proposed bypass over the Grand Canal and Dublin/Cork railway line.

The route bisects the PGA National golf course and significant accommodation works such as underpasses, pedestrian overbridges will need to be provided. The route connects to the Johnstown Junction on the M7; some realignment of the access road to Goffs will be required. At grade junctions will need to be provided to allow access onto the L-2005 Kerdiffstown Road and the existing R407, north of Sallins. Noise barriers may be required where the route passes individual dwellings.

5.9. Red Option A

The Red Option A route is approximately 3.62km long and is an alternative to the Red route which connects to the existing R407 rather than the proposed Osberstown Junction. In addition to the engineering factors identified for the Red route, the Red Option A route will require a bridge and approach embankment over the Naas and Corbally branch of the Grand Canal, demolition of a disused railway bridge and it's approach embankments and realignment of the L-2006 Osberstown Road at Oldbridge.

5.10. Cyan/Red Option A

The Cyan/Red Option A route is approximately 3.5km long and is an alternative to the Cyan/Red route which connects to the existing R407 rather than the proposed Osberstown Junction. In addition to the engineering factors identified for the Cyan/Red route the Cyan/Red Option A route will require a bridge and approach embankment over the Naas and Corbally branch of the Grand Canal, demolition of a disused railway bridge and its approach embankments and realignment of the L-2006 Osberstown Road at Oldbridge.

5.11. Purple Option A Route

The Purple Option A route is approximately 3.65km long and is an alternative to the Purple route which connects to the Maudlins Junction rather than the Johnstown Junction on the M7. In addition to the engineering factors identified for the Purple route, the Purple Option A route will require extensive realignment of the existing Maudlins Junction layout.

5.12. Summary

Table 5.1 Engineering Assessment Route Matrix

Best / Average / Worst	Green	Cyan	Red	Cyan/ Red	Blue	Purple	Yellow	Orange	Red Option A	Cyan/Red Option A	Purple Option A
Length	Worst	Average	Best	Average	Best	Worst	Best	Worst	Average	Average	Average
Canal Crossings	Best	Average	Best	Best	Average	Worst	Worst	Average	Average	Average	Worst
Railway Crossings	Best	Best	Best	Best	Average	Worst	Worst	Average	Average	Average	Worst
River Crossings	Worst	Worst	Average	Worst	Best	Best	Best	Average	Average	Worst	Best
Earthworks	Worst	Worst	Average	Worst	Best	Average	Average	Average	Average	Worst	Average
Gradients	Average	Average	Average	Average	Worst	Average	Average	Best	Average	Average	Average
Horizontal Geometry	Average	Average	Average	Average	Worst	Best	Worst	Best	Average	Average	Best
Junctions	Average	Average	Average	Average	Worst	Best	Worst	Best	Worst	Worst	Worst
Noise Mitigation	Average	Best	Average	Best	Worst	Average	Worst	Best	Average	Worst	Average
Public Utilities	Best	Best	Best	Best	Worst	Average	Average	Average	Worst	Worst	Average
Overall Route Ranking from Engineering Factors	Average	Average	Best	Best	Worst	Average	Worst	Best	Average	Worst	Average

6. ENVIRONMENTAL ASSESSMENT

6.1. Hydrology and Drainage

A hydrology report which assesses the impacts of the route options on the various hydrological features in the study area is contained in Appendix C. The main conclusions of this assessment are as follows:

Attenuation will most likely be required if road drainage is discharged to the Morell River or any of its tributaries, this will affect the Purple, Purple Option A and Orange routes.

Drainage of the an approximately 1km long section of the Yellow route will be difficult as this section has to be drained towards the south where no suitable stream/ditch are available to outfall.

A section of the Red route approximately 200 metres long will pass through the 100-year flood plain of the River Liffey. This has been determined from a Flood assessment of the River Liffey at Sallins which is contained in Appendix D.

Drainage of the section of the Blue route of the road will be difficult due to the present of a low point in between the canal and railway crossings which has no local ditch/stream as a suitable outfall.

The finished road level of any route option which runs parallel to the River Liffey at Sallins will need to be 72.8m OD or above, this will affect the Red, Cyan, Cyan/Red, Red Option A and Cyan/Red Option A routes.

The OPW will require a 15m clear width on each river bank for maintenance access, crossings of watercourses will require a License under Section 50 of the Arterial Drainage Act 1945 prior to construction. The statutory authority responsible for control of watercourses is the OPW, and the OPW also administer the granting of Section 50 licenses.

It is estimated that between 2 to 4 culverts are required for all routes, with the Cyan route requiring the minimum number of culverts and the Orange route requiring the maximum number of culverts.

Whilst a detailed evaluation of the span requirements of potential bridges on the routes crossing the River Liffey will be required at the preliminary design stage, considering the approximate channel width of 30m at each location (taken from OS mapping), and the likely ecological and flooding requirements, it is envisaged that bridges would most likely be 3 span structures, with a central span over the channel, and intermediate piers set back 5m from either bank of the river. This would give an indicative span arrangement of 25m-40m-25m (total 90m) for each bridge.

6.2. Landscape and Visual

6.2.1. Receiving Environment

Landscape within the Study Area

The landscape to the west of Sallins is smooth terrain and generally flat to undulating topography. To the east of sallins the topography is undulating and generally slopes to the southeast, two notable features are a medium sized hill to the notheast of Sallins town and a significant canal valley to the east of the town. A substantial area of the eastern landscape is occupied by the PGA National and Naas golf courses, there is also a large landfill in the south-eastern section of the study area.

Three linear features dominate the study area; the Dublin/Cork railway line and Grand Canal traverse the study area in a northeast to west direction. The River Liffey flows north through the western portion of the study area.

Landscape Character Areas

Northern Lowlands

The study area is located within the Northern Lowlands – Naas and Environs landscape unit which lies to the northeast of County Kildare. The main features of this landscape are the River Liffey valley and the Grand Canal water corridor. This landscape area type is characterised be generally flat terrain and open lands with regular field patterns. Field boundaries are maintained by low well managed hedgerows and scattered trees. Vegetative screening only limits visibility of low lying areas. The low hedgerows allow for long distance visibility of the environs.

In general the sensitivity of the landscape character is considered low. The likely perception of a road development on this character type is considered low as this form of development would not impinge on the characteristic flat terrain.

River Liffey Valley

The western section of the study area is comprised of the River Liffey valley. This landscape is considered to be significant for County Kildare due to the scenic open mountain views. The landscape characteristics of this area are similar to the Northern Lowlands landscape type. It is predominantly flat land with low lying vegetation and smooth terrain. These characteristics allow for extensive open visibility of the surrounding environs. The river valley is characterised by floodplains progressing to shrub and tree planted slopes to low lying grassland.

The soils are Regosols and are of alluvial origin hence suitable for tillage, pasture and forestry. There are pasture and forestry on some of the floodplains.

The landscape sensitivity of River Liffey Valley is considered high. It is perceived as having high amenity value and having significant landscape value. Within the study area there are no scenic routes along the valley reducing the potential impact from developments. Road developments are considered to have a low perceived impact on water corridor landscapes as vistas are not disrupted by a low lying development.

Grand Canal Water Corridor

The study area is bisected by the Grand Canal water corridor in an east to west direction. The characteristics of the landscape are smooth terrain and even topography. The canal corridor and immediate environs were artificially landscaped during canal construction. There are some plantations of coniferous and mixed trees along the canal border and these provide some visual screening. Areas of the corridor where the vegetation is low do provide long distance visibility.

Similarly to the River Liffey valley, water corridors are considered to have high landscape values and the landscape sensitivity is high. Road developments are considered however to be a low impact on this landscape type.

Scenic Viewpoints

There is one scenic viewpoint, Millicent Bridge, within the study area. This viewpoint is located within the River Liffey water corridor. Visibility is focused primarily along the river corridor and the rural environs to the north of the viewpoint. Visibility to the south of this viewpoint is restricted by the riverbank vegetation.

6.2.2. Route Options Assessment

Green Route

The Green route is one of the longest and the most westerly route being considered, it traverses through the undulating agricultural landscape in this rural section of the study area. The biggest visual impact of this route will be the 2 crossings of the River Liffey, and the crossing of the Grand Canal and Dublin/Cork railway line which will involve the construction of bridges and approach embankments. The most significant of these is the most southern Liffey crossing and the Dublin/Cork railway crossing, which due to their close proximity will require a 600m long embankment, this would have a large impact on the otherwise flat landscape in the immediate area. The Green route would also impact most on the one scenic viewpoint at Millicent Bridge.

Cyan Route

The Cyan Route also involves 2 crossings of the River Liffey and a crossing of the Grand Canal and Dublin/Cork railway line. The Cyan route crosses the canal in close proximity to the Leinster Aqueduct at a location were the canal is on a high embankment in order to cross the River Liffey. The construction of a bridge at this location would result in a relatively high structure that would involve the construction of high approach embankments which would have a significant visual impact on the local landscape and the residential property nearby. The Cyan route would also impact the scenic viewpoint at Millicent Bridge but to a lesser extent than the Green route.

Red and Red Option A Routes

The northern section of the Red route runs parallel to the River Liffey, it is generally at grade and would not have a significant impact on the landscape in the study area due to the close proximity the route to Sallins town. The southern section of the route travels mostly through farmland and will involve bridges with approach embankments over the Grand Canal and Dublin/Cork railway; this would have a visual impact on the local properties.

The Red Option A route involves a bridge and approach embankment over the Naas and Corbally branch of the Grand Canal, but this would not have a significant visual impact.

Cyan/Red and Cyan/Red Option A Routes

The Cyan/Red Route is approximately is a route option that combines the northern portion of the Cyan route and the southern portion of the Red route. The route will require construction of 4 bridges, 2 over the River Liffey, and 1 each over the Grand Canal and Dublin-Cork railway. The crossing of the Grand Canal is at a location which would have less of a visual impact than the Cyan route crossing.

The route would also impact the scenic viewpoint at Milicent Bridge but to a lesser extent than the Green route.

Blue Route

The Blue route is almost entirely within the urban fabric of Sallins; it bisects two residential estates and would have a major visual impact on the local residents. This is most significant in the southern end of the route at the canal and railway crossings where the road level may be at the first floor level of the nearby houses.

Purple and Purple Option A Routes

The northern section of the route will largely be at grade and as it is located very close to Sallins town would not have a significant impact on the landscape. A viaduct structure of approximately 300m long would be required to carry the proposed road over the Grand

Canal and Dublin/Cork railway. This will also involve a cutting of approximately 6m in depth on the north side of this viaduct. This viaduct and associated earthworks would have a significant visual impact on the local residents and on some views across Naas Golf course, but would not be visible from distance. The southern section of the route is at grade and runs parallel to the M7 motorway; it would not have a significant visual impact on the landscape.

Yellow Route

The northern section of the route will largely be at grade and as it is located very close to Sallins town would not have a significant impact on the landscape. A viaduct structure of approximately 300m long would be required to carry the proposed road over the Grand Canal and Dublin/Cork railway. This viaduct and associated earthworks would have a significant visual impact on the local residents and on some views across Naas Golf course, but would not be visible from distance. The southern section of the route is at grade and runs parallel to the M7 motorway; it would not have a significant visual impact on the landscape.

Orange Route

The Orange route option is the longest route at just over 4.7km and like the Green route traverses through a rural section of the study area. The western section of this route will consist of a small cutting and then a fill, both approximately 3m high which would have a minor impact on the surrounding landscape.

In the eastern half of the route bridges with approach embankments over the Grand Canal and Dublin/Cork railway would impact on the otherwise flat landscape. The route also bisects the PGA National Golf Course and would have a major impact on views across the golf course.

6.3. Ecology, Water Quality & Fisheries

An ecology report which assesses the impacts of the route options on ecology, water quality & fisheries is contained in Appendix E. The main features of ecological interest identified in this report and the conclusions of the route assessment are summarised in the following sections. It should be noted that methodologies used in the desktop & field studies and the processes used in the site evaluation & impact assessment as well as any limitations of the study are described in detail in the ecology report in Appendix E.

6.3.1. Conservation Sites

Only one site within the study area is proposed for designation, the Grand Canal (pNHA). The Grand Canal dominates the centre of the study area, flowing in easterly and southerly directions and is regarded as a nationally important site (i.e. B rating).

The Liffey at Osberstown (pNHA) is just outside the south-western boundary of the study area. Kilteel Wood (pNHA) is approximately 5km east of the study area. The remaining

conservation sites are located within 5 - 10 km of the study area, with two of these sites, the Slade of Saggart & Crooksling Glen and Poulaphouca Reservoir, approximately 10km from the study area.

6.3.2. Fisheries

In terms of fisheries within the study area, the River Liffey is the most significant watercourse and is of international importance (i.e. A rating). It has populations of Atlantic Salmon (Salmo salar), which is listed under Annex II and V of the EU Habitats Directive, Sea Trout (Salmo trutta) and Brown Trout (Salmo trutta). In addition, the River Liffey is known to have Brook Lamprey (Lampetra planeri), another species listed under Annex II of the EU Habitats Directive, although it is not clear at this stage if the species is present in the section of the River Liffey that runs through the study area.

Furthermore the River Liffey and many of its tributaries of are known to support White-clawed Crayfish (Austropotamobius pallipes), which is listed under Annex II and V of the EU Habitats Directive. The latest Environmental Protection Agency (EPA) data for water quality of the River Liffey indicates that it is unpolluted upstream and slightly polluted downstream of study area.

The Rivers Hartwell and Morrell are tributaries of the River Liffey and are known to support significant populations of Brown Trout as well as providing good spawning habitat for salmonids. These two rivers lie to the eastern section of the study area, and would not be impacted by the Red route.

Even though the Grand Canal is not regarded as an important fisheries watercourse, it is still an important ecological watercourse of national importance as already outlined above. Otter (Lutra lutra), which is listed in Annex II of the EU Habitats Directive, is known to occur along the Grand Canal and it is very likely that this mammal also occurs along many other watercourses in the area, especially the River Liffey.

6.3.3. Birds

In total, 26 bird species were recorded in the general study area during the selected site walkovers. The avian species recorded in this survey are typical of the mixture of agricultural and riparian habitats. The majority such as Robin, *Erithacus rubecula*, Wren, *Troglodytes troglodytes* and Blackbird, *Turdus merula*, are common and widespread resident species

Three species of medium conservation concern, *Amber-listed*, were recorded. These were, Cormorant, *Phalocrocorax carbo*, Sand Martin, *Riparia riparia* and Swallow, *Hirundo rustica*. One Cormorant was recorded flying over the River Liffey near the Cyan/Red route crossing and Sand Martin burrows were recorded exclusively in exposed sands in the

Quarry along the Purple route. Swallows were common and widespread throughout the study area (all route corridors).

Due to the presence of riparian habitat, as well as woodland and wet grassland, it is likely that a number of other bird species not recorded in field surveys are present in the study area, at least for part of the year. These would include the Kingfisher, *Alcedo atthis* and Barn Owl, *Tytp alba* both of which are *Red-listed* species and are listed in Annex I of the EU Birds Directive. The *Red-listed* Yellowhammer, *Emberiza citrinella* is also likely to occur in areas of arable agriculture. Several other *Amber-listed* species such as Snipe, *Gallinago gallinago* and Stonechat, *Saxicola torquata* are also likely to be present in the area. The similarity of habitats traversed by the route corridors would indicate that these species could potentially occur on all route corridors.

6.3.4. Mammals

Several mammal species were widespread and common throughout the survey area. Rabbit's, *Oryctolagus cuniculus*, were sighted on many of the route corridors and are undoubtedly present throughout the study site. Similarly signs of Brown Rat, *Rattus norvegicus*, were noted, particularly along waterways. Otter, *Lutra lutra*, tracks were observed on the banks of the River Liffey at the Cyan and Cyan/Red route corridor crossing points. It is considered likely that Otters are present on most of the major watercourses within the general study area.

Fox, *Vulpes vulpes* droppings were found in the quarry on the Purple route and this species is likely to be common and widespread across all the route options.

Although there was no evidence of Badger, *Meles meles*, activity during site visits, this species is likely to be widespread in the general area, particularly in areas of woodland and improved grassland.

Small mammal trapping was not carried out as during field visits and this no doubt led to under recording of species such as Pygmy Shrew, *Sorex minutus* and possibly Bank Vole, *Clethrionmys glareolus*. Other species known to be relatively common but difficult to observe in this type of broad-scale survey include Hedgehog, *Erinaceus europaeus*, Stoat, *Mustela erminea hibernica* and Mink, *Mustela vison*.

Although not recorded during field surveys the Red Deer, *Cervus elaphus* and Sika Deer, *Cervus Nippon* are known to occur in the general area, both species are protected under the Wildlife Act (1976).

Given the similarities in the habitats traversed by the route corridors it is probable that very similar mammal taxa are to be found along all of the potential route corridors. The areas of highest mammal diversity are likely to be the riparian and woodland habitats which occur to some degree on all route corridors

6.3.5. Bat Surveys

In general, bat activity was highest at sampling locations on the Green route, where five Bat species were recorded, and lowest on the Purple and Yellow routes, where no Bats were recorded. It should be noted however that only a small portion of each route was sampled and it is highly likely that these mobile Bat species utilise areas within all of the route corridors. Furthermore, the presence of several waterways, treelines and wooded copses makes this area very attractive for bats and it would be expected that many more Irish Bat species occur locally

Many of the bat species recorded in this survey roost at both natural and man-made sites, some showing a preference for disused buildings or farm buildings. Others such as Daubenton's Bat commonly roost under bridges or close to flowing water. It is possible that many of the Bat species recorded in this survey roost in the general area, due to the presence of suitable roosting sites, *i.e.* mature woody vegetation, bridges and old buildings.

6.3.6. Other taxa

The Common Frog, Rana temporaria was widespread along the banks of the eastern section of the Grand Canal, particularly along the Orange route corridor. This species is also likely to be present in areas of wet grassland in the study area.

A number of macro-invertebrate (including Lepidoptera and Odonata) species were observed during field surveys, with the majority of sightings occurring along the Grand Canal and Liffey waterways. Three species of Butterfly were sighted and these records are detailed in the ecology report. A Common Blue Damselfly, Enallagma cythigerum and Brown Hawker, Aeshna grandis, were also recorded along the banks of the Grand Canal.

Desktop studies revealed no further records of protected Amphibians or macro-invertebrates in the general study area. In general waterways, woodland and areas of wet grassland are considered to be the most important habitats for Amphibians and macro-invertebrates in this study area. All of the route options cross at least one important waterway and it is likely that the species assemblage is similar across these route corridors.

6.3.7. Consultation with NPWS

FTG have had a preliminary conversation with the National Parks and Wildlife Service (NPWS) on how they would view construction of the Red route. Not unexpectedly, NPWS were guarded and non-committal in their response, pending provision of more detailed information.

6.3.8. Site evaluation & impact Assessment

In total 10 sites were identified as areas of particular ecological importance and were rated using the NRA site evaluation scheme. No internationally important (A - rated) sites were

identified. However, two sites were classified as 'Nationally Important' (B - rating). These were the River Liffey and the Grand Canal.

The Grand Canal has been designated as a proposed National Heritage Area (pNHA) and as such is protected under Irish law as an area of national importance. The River Liffey is an important Salmonid (particularly Trout) river, which also contains other protected fauna such as Lamprey species.

A further five sites were identified as being of 'High Value or Locally Important' (C-Rating). These sites include rivers, patches of woodland and riparian vegetation. These are sites with high biodiversity in a local context. The remaining three sites were classified as being of 'Moderate Value, Locally Important' (D-Rating) and include Kerdiffstown Quarry (where the protected Sand Martin species is thought to nest) as well as some small areas of scrub/wood and wet grassland.

6.3.9. Corridor Impact Assessment

The evaluation of the potential impact significance of each of the route corridors on the sites of ecological importance and details the criteria used for assessing the impact significance of the routes on these selected sites is outlined in the ecology report in Appendix E.

It is predicted that all route corridors will have a Major Negative impact on the Grand Canal, and all apart from the Blue route will have a Major Negative impact on Riparian vegetation. The Red route and the Red Option A route are the only two routes predicted to have a Severe Negative impact on any of the selected sites. The number of sites impacted (to any extent) by each route varied from three to six per route, with the Blue route impacting on the least number of sites (i.e. the Grand Canal only).

The Green, Cyan, Cyan/Red and Cyan/Red Option A route corridors are predicted to have no Severe Negative impact on any of the sites identified. However, it is predicted that these routes would have a Major Negative impact on three sites, the River Liffey, the Grand Canal and Riparian vegetation. A further 7 sites would not be directly impacted by these routes.

The Yellow and Orange Route Corridor's are predicted to have a Major Negative impact on two of the selected sites and a Moderate Negative impact on three sites. The Orange route corridor is the only corridor predicted to impact upon the River Morell, the PGA National Golf Course and the areas of woodland south of Greenhills townland (all C-Rated Sites). The Yellow route corridor (together with the Purple route corridor) is predicted to have a Moderate Negative impact on Naas Golf Course, the wet area adjacent to Sallins Park housing estate and an area of wood/scrub northwest of the Canal/Railway intersection. A further five sites will not be directly impacted by the Yellow and Orange route corridors.

The Blue route corridor is predicted to have a Major Negative impact on the Grand Canal but will not directly impact any of the other sites selected.

The Purple and the Purple Option A route corridors are predicted to have similar impacts on the selected sites. These corridors are predicted to have Major Negative impacts on the Grand Canal and Riparian Vegetation and Moderate Negative impacts on three other sites. These routes are predicted to have a Minor Negative impact on the quarry south of Kerdiffstown. Four of the selected sites will not be directly impacted by these route corridors.

The Red route and the Red Option A route are the only corridors predicted to have a Severe Negative impact on any of the sites selected (i.e. the River Liffey). Unlike other routes which cross the river at discrete points, this route runs parallel to the river at a close proximity to it for a significant stretch and is therefore expected to impact on a relatively large portion of the site. These routes are also predicted to have a Major Negative impact on the Grand Canal and Riparian Vegetation. Seven of the selected sites will not be directly impacted by these routes.

Taking into account the impact of each route corridor on the sites of ecological importance, and what was learned from desktop and field reviews, routes were ranked in order of preference from 1 (Most Preferred) to 11 (Least Preferred). These rankings are presented in the ecology report in Appendix E and identify the Blue Route as the preferred route corridor in terms of likely ecological impacts. The next most preferred routes are the Cyan and Cyan/Red routes, which are ranked joint 2nd in order of preference; this is illustrated in Table 6.5 at the end of the chapter. The least preferred route ecologically is the Red route.

6.4. Air Quality

6.4.1. Introduction

This section has been prepared with regard to Chapter 3.0 “Route Corridor Selection” of the National Roads Authority (NRA) document “Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes”. The primary aspects of the assessment relate to traffic flow, proximity of sensitive locations and a review of the overall significance of potential changes. The principle pollutants of concern on a local scale are benzene, particulate matter (PM_{10}) and nitrogen dioxide. Nitrogen dioxide (NO2), benzene and PM_{10}, (particulates size less than 10 microns) were monitored and modeled for the purpose of this assessment. The Air Quality Standards Regulations (S.I. 271 of 2002) specify limits for these parameters and these limits will be employed for the assessment.

Table 6.1 Air Quality Standards Regulations

Pollutant	Averaging Period	Limit Value
Nitrogen Dioxide (NO_2)	1 hour	200 µg/m^3 not to be exceeded more than 18 times per year by 2010
Particulate Matter (PM_{10})	24 hour	50 µg/m^3 not to be exceeded more than 7 times per year by 2010
Benzene	Annual average	5 µg/m^3 by 2010

6.4.2. Changes to Baseline Air Quality Conditions

Index of Overall Change in Exposure

The Index of Overall Change in Exposure is based on the number of sensitive locations within 50m of the carriageway and determines the overall impact on receptors within 50m of each route corridor. Since the predicted traffic flows on each of the individual new routes are not available, indexes were prepared based on the east / west route predictions available. The breakdown of traffic between light vehicles (LVs) such as cars and vans and heavy vehicles (HVs) such as buses and HGVs was not available. It is assumed in the index that the ratio of LVs to HVs is 92 to 8, which would be typical of Irish roads in this region.

Table 6.2 Table Index of Overall Change in Exposure (NOx)

Route	Receptors within 50 m of route	Change in Emission Rate (Kg/year)	Better or Worse
Cyan Route	1	+ 4,629	Worse
Cyan/Red Route	1	+ 4,629	Worse
Orange Route	0	+ 4,878	Worse
Green Route	2	+ 4,365	Worse
Red Route	1	+ 4,365	Worse
Purple Option A Route	3	+ 4,827	Worse
Cyan/Red Option A Route	20	+ 4,629	Worse
Purple Route	4	+ 4,255	Worse
Red Route Option A Route	20	+ 4,788	Worse
Yellow Route	5	+ 4,685	Worse
Blue Route	79	+ 2,910	Worse
Existing R407	201	- 2,489	Better

Table 6.3 Table Index of Overall Change in Exposure (PM10)

Route	Receptors within 50 m of route	Change in Emission Rate (Kg/year)	Better or Worse
Cyan Route	1	+ 124	Worse
Cyan/Red Route	1	+ 124	Worse
Orange Route	0	+ 131	Worse
Green Route	2	+ 163	Worse
Red Route	1	+ 117	Worse
Purple Option A Route	3	+ 129	Worse
Cyan/Red Option A Route	20	+ 124	Worse
Purple Route	4	+ 114	Worse
Red Option A Route	20	+ 128	Worse
Yellow Route	5	+ 126	Worse
Blue Route	79	+ 78	Worse
Existing R407	201	- 66	Better

All the proposed routes show worst for overall change in total exposure. This is due to the significant difference between the do nothing scenario of no road existing and the do something scenario of the new route. The route which impacts least, and is most preferable is the Orange route and this is due to the lower number of sensitive properties within 50m of the road. The Red route and the Cyan route also score well. The least preferable route is the Blue route, due to the large number of adjacent properties within the 50m corridor.

6.4.3. Impacts on Local Sensitive Ecosystems

According to Chapter 3.0 “Route Corridor Selection” of the National Roads Authority (NRA) document “Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes”, impacts on ecosystems need only be addressed if there is a 5% change or greater in traffic flows. There is one protected ecosystem within the defined 200m of the route centerlines:

- Grand Canal (pNHA)

All of the routes cross the Grand Canal (pNHA), each proposed route when passing the sensitive ecosystems outlined above is new road section therefore the potential air quality impact on each eco-system must be addressed. The modeling completed shows that the predicted NO_x concentrations from 20 m to 175 m from the roadway centrelines (based on a conservative background concentration of 15 µg/ m^3) are within the standard air quality limit for the protection of vegetation of 30 µg/ m^3. Therefore based on the air quality modelling completed to date there should be no impact on vegetation from NO_2 emissions.

The PM_{10} modelled values also show a minor increase in PM_{10} concentrations for the proposed routes. Based on the modelled values, there should be a negligible air quality impact from the proposed routes and is considered minor with respect to other environmental impacts from the proposed routes.

6.4.4. Recommendations

There are negligible impacts from traffic emissions on the conservative baseline figure of 15 µg/ m^3 applied in the model from all the routes. Impacts on neighbouring ecosystems are also considered minor. The decision at this stage for preferable to least preferable route would arise from the Index of Overall Change in Exposure. In all cases the indexes show the proposed routes to be worse as they are predominantly new roads however a scale of preference can be applied from the NO_2 and PM_{10} score.

Route	
Orange Route	Most preferable
Red Route	⇩
Cyan Route	
Cyan/Red Route	⇩
Green Route	
Purple Option A Route	⇩
Purple Route	
Yellow Route	⇩
Cyan/Red Option A Route	
Red Option A Route	
Blue Route	Least preferable

6.5. Noise & Vibration

6.5.1. Introduction

This section has been laid out in accordance with Chapter 5 “Route Corridor Selection” of the National Roads Authority (NRA) document “Guidelines for the Treatment of Noise and Vibration in National Road Schemes”. The primary aspects of the assessment relate to traffic flow, proximity of sensitive locations and a review of the overall significance of potential changes.

6.5.2. Methodology

The methodology for noise assessment was completed as per flowchart no. 2 of Chapter 5 “Route Corridor Selection” of the National Roads Authority (NRA) document “Guidelines for the Treatment of Noise and Vibration in National Road Schemes”.

Each route option was reviewed for number of sensitive receptors within 300m of the proposed routes. These are properties most likely to experience impacts from traffic noise. A sensitive receptor is defined as being a dwelling house, hotel, hostel, educational facility, place of worship or a property which "benefits from, or requires the absence of, high noise levels".[1] The numbers of sensitive locations were confirmed during site visits.

The sensitive receptors were grouped into bands of 0-50m, 50-100m, 100-200m and 200-300m from the proposed routes and counted as sums for each band. The numbers of sensitive receptors are weighted using an arbitrary weighting of 4 for Band 1, 3 for Band 2, 2 for Band 1 and 1 for Band 4. A potential impact rating (PIR score) is determined from the sum of the weighted bands.

As outlined in Chapter 5 "Route Corridor Selection" of the National Roads Authority (NRA) document "Guidelines for the Treatment of Noise and Vibration in National Road Schemes" this stage of the route selection process "*only permits ranking of routes options in order of potential noise impacts. In order to accurately assess the likely impact of each route option other factors such as "cut and fill", traffic flow and mitigation measures should be considered*".

6.5.3. Assessment of Potential Impact

Potential impacts were determined using sensitive receptor counts and an arbitrary weighting of 4 for all sensitive receptors within Band 1, 3 for all sensitive receptors within Band 2, 2 for all sensitive receptors within Band 3 and 1 all sensitive receptors within for Band 4. as outlined in Section 6.5.2. Table 6.4 details the Potential Impact Rating (PIR) calculated for each route option.

[1] "Guidelines for the Treatment of Noise and Vibration in National Road Schemes" National Roads Authority, 2004.

Table 6.4 PIR Values

Route Option	Property Count				Total	PIR
	<50	50-100	100-200	200-300		
Cyan Route	1	3	4	3	11	**24**
Cyan/Red Route	1	2	7	1	11	**25**
Orange Route	0	4	8	6	18	**34**
Green Route	2	6	5	9	22	**45**
Red Route	1	18	101	105	225	**365**
Purple Option A Route	3	9	125	202	339	**491**
Cyan/Red Option A Route	20	39	154	88	301	**593**
Purple Route	4	18	139	254	415	**602**
Red Option A Route	20	55	248	192	515	**933**
Yellow Route	5	50	205	365	625	**945**
Blue Route	79	152	364	239	834	**1739**

From initial assessment of the additional routes, it would appear that the Cyan route and the Cyan/Red routes are the most preferred option based on potential noise impacts. The Blue route has the most significant potential noise and vibration impact on identified sensitive receptors. The closeness of magnitude of impacts due to the Red Option A, Yellow and Blue routes would make these least preferable options.

6.5.4. Mitigation Measures

For new roads in Ireland, it is standard practice to adopt the traffic noise design goal contained within the NRA document Guidelines for the Treatment of Noise and Vibration in National Road Schemes.

This document specifies that the Authority (i.e. NRA) considers it appropriate to set the design goal for Ireland as follows:

- day-evening-night 60dB L_{den} (free field)

This design goal represents a more onerous limit values than those that have typically been employed in Ireland to date.

As per Section 2.3.1 Operational Noise of the National Roads Authority (NRA) document "Guidelines for the Treatment of Noise and Vibration in National Road Schemes".

Mitigation measures are only deemed necessary when the following three conditions are satisfied at designated sensitive receptors:

(a) the combined expected maximum traffic noise level, i.e. the relevant noise level, from the proposed road scheme together with other traffic in the vicinity is greater than the design goal;

(b) the relevant noise level is at least 1dB more than the expected traffic noise level without the proposed road scheme in place;

(c) the contribution to the increase in the relevant noise level from the proposed road scheme is at least 1dB.

These conditions will ensure that mitigation measures arising out of this process are based upon the impact of the scheme under consideration.

Determination of mitigation requirements will be completed during detailed noise modelling as part of the environmental impact assessment.

6.5.5. Recommendations

The preferable route choice is primarily based on the Potential Impact Ratings at this stage. However, noise modeling will be needed to establish whether the preferred route will generate excessive noise within 50m, 100m and 200m of the road.

Route	
Cyan Route	Most preferable
Cyan/Red Route	⇩
Orange Route	
Green Route	⇩
Red Route	
Purple Option A Route	⇩
Cyan/Red Option A Route	
Purple Route	⇩
Red Option A Route	
Yellow Route	
Blue Route	Least preferable

6.6. Summary

A summary of the environmental impacts for each route is presented in Table 6.5. The Red route, due to its close proximity to the River Liffey is least preferred under Hydrology and Ecology, Water Quality & Fisheries. The most preferred routes from a hydrological point of view are the Green, Cyan and Cyan/Red as these don't have constraints on drainage design and all outfall to the River Liffey, which has a far greater capacity than the Morel river. The most preferred route for Ecology, Water Quality & Fisheries impact is the blue route; this is to be expected due to the urban nature of the route. The next most preferred routes are the Cyan and Cyan/Red routes.

From a landscape perspective the Green and Orange routes are least preferred due to their impact on the rural landscape. The Green route also impacts most on the protected scenic viewpoint from Millicent Bridge and the Orange route impacts significantly on the views across the PGA National golf course. The Blue route has the most significant visual impact due to its close proximately to the residential area to the west of Sallins.

The preferred options based on air quality are the Cyan, Red and Orange routes, the Blue, Red Option A and Cyan/Red Option A are the least preferred. Considering Noise & Vibration the Cyan, Cyan/Red and Orange routes are most preferred and the Blue, Yellow and Red Option Aare least preferred.

The environmental ranking of the routes is shown in Table 6.5 below.

Table 6.5 Environmental Impact Route Matrix

Best / Average / Worst	Green	Cyan	Red	Cyan/ Red	Blue	Purple	Yellow	Orange	Red Option A	Cyan/ Red Option A	Purple Option A
Hydrology											
Landscape and Visual											
Ecology, Water Quality & Fisheries											
Air Quality											
Noise & Vibration											
Overall Route Ranking from Environmental Assessment											

7. ARCHAEOLOGY AND ARCHITECTURAL HERITAGE

7.1. Introduction

A report which assesses the impacts of the route options on Archaeology and Architectural Heritage is contained in Appendix F. The main features of interest identified in this report and the conclusions of the route assessment are summarised in the following sections. It should be noted that methodologies used in the data gathering, desktop & field studies and the processes used in the evaluation & impact assessment as well as any limitations of the study are described in detail in the report in Appendix F.

7.2. Assessment of Features to the west of Sallins

The constraints study, archaeological walkover of the routes, and the route corridor selection study has shown that the lands west of Sallins contain the following significant archaeology and architectural heritage features:

- Osberstown House (listed on the RPS/NIAH gardens & landscapes)
- Osberstown Hill (listed on the NIAH gardens & landscapes)
- Watch tower
- Enclosure at Osberstown (listed as a RMP)
- Leinster Viaduct (listed on the RPS)
- Railway Bridge

7.2.1. Osberstown House

The date at which the present house and its gardens were founded has not been established. However, 'Osberstowne Manor' is marked on a map of 1683, and was the home of Dr John Esmond (c. 1760-1798) who was executed in Dublin for his part in the 1798 rebellion. Its original design is presumed to include a broad semi-circle of land to the east of the house shown on early ordnance survey maps. Osberstown House is a protected structure listed on the RPS, with retained formal grounds immediately adjacent to the house. These grounds are listed on the National Inventory of Architectural Heritage.

Construction of either the Red, Cyan or Cyan/Red routes would not impact directly on the house or the formal gardens immediately adjacent, but would impact on lands to the east and south of the house that should be considered as part of the original attendant grounds or vistas, and which would certainly have been conceived as being part of the intended sight lines afforded by the south-eastern prospects of the building. It is noted that while construction of the Red route as presently shown should be considered as a significant impact, the integrity of the greater setting of the house has already to a certain extent been

compromised by the construction of the M7 Naas Bypass which passes some 300m to the south-east of the main house.

In summary, the principal issue from a heritage perspective will be minimising the impact of the Red, Cyan or Cyan/Red routes (if selected) on Osberstown House; one of only two Protected Structures to appear within the 500m corridors. In this regard it is envisaged that is will be desirable to keep the road as far as practicable from Osberstown House and provide visual and possibly noise screening to minimise the impact.

7.2.2. Osberstown Hill

Osberstown Hill is an attractive, possibly Georgian farmhouse (marked as 'Hill House' on 1939 6 - inch map), with detached farm buildings, and an attractive driveway and gates. Landscaped grounds to the east of the buildings which were once part of the original grounds attendant to the house are shown on the 1837 6 -inch map, these are now pasture, although several parkland trees survive. It is no longer, as such, a formal part of the design although the field and buildings are still recognisably part of an earlier design. This design has, it should be noted, previously been compromised by the construction of the railway.

The Red, Cyan or Cyan/Red routes would pass approximately 140m to the east of the buildings, through the large adjoining field which was once part of the original grounds attendant to the house. Construction of either the Red, Cyan or Cyan/Red routes would impact on the vistas from the house, and its general setting. They would not impact directly on the house.

7.2.3. Watch Tower

This is a square masonry building, now in ruins which stands at the junction of field boundaries. The building is of several storeys, it was originally heated on first-floor and the ground floor was vaulted. It is not shown on the 1837 6inch map and it probably dates from the mid 19th-century, it possibly was intended as a folly. To the south, a field entrance is flanked by two ornate gateposts, possibly part of the same design. The tower is shown on 1910 1:2,500 map and later editions as 'In Ruins'.

The Green, Red, Cyan and Cyan/Red routes pass close to the Watch Tower. Although no route corridor impacts directly on the structure Green, Cyan and Cyan/Red routes pass close by. However, there is scope with the alignment of either route to maintain a satisfactory distance from the Watch Tower.

7.2.4. Enclosure at Osberstown

This is an oval-shaped mound, rising to *c*. 2m in height, with a wide and shallow (*c*. 1m deep) ditch to the north and concave depression to the south, it is now partially overgrown. The Green route passes within 150m of the feature.

7.2.5. Leinster Aqueduct

The Cyan route would pass cross the Grand Canal approximately 200m east of the Leinster Viaduct and whilst it would not impact directly on the viaduct, it would impact on the setting of the viaduct. The adoption of the Red/Cyan route or the Red route would increase the distance from the route to the viaduct to approximately 400m.

7.2.6. Railway Bridge

The bridge originally carried the Osberstown Road over a rail line between Sallins and Naas. The bridge was built by Courtney Stephens & Bailey of Dublin and survives in good condition. The Red Option A, Cyan Red Option A and Cyan/Red Red Option A routes would all involve the demolition of this bridge.

7.3. Assessment of Features to the east of Sallins

The Constraints Study, archaeological walkover of the routes, and the Route Corridor Selection Study has shown that the lands east of Sallins contain the following significant archaeology and architectural heritage features:

- Detached Cottage
- Industrial building
- Railway bridge
- Enclosure
- Palmerstown Demesne

7.3.1. Detached Cottage

This detached five-bay single-storey cottage, c.1770, probably originally thatched retains early fenestration. It was re-roofed, c.1950. with gable-ended roof and replacement corrugated-iron, c.1950.

The Yellow, Purple and Purple Option A routes pass will potentially require the demolition of this cottage.

7.3.2. Industrial building

This derelict building is sited on the north bank of the Grand Canal. It is possibly the remains of a failed venture in the early 20th century to produce sugar.

The Yellow, Purple and Purple Option A routes pass will require the demolition of this building.

7.3.3. Railway bridge

This is a three-span cut-stone railway bridge over canal, c.1870, on a skewed plan. It was renovated c.1970 and the parapet walls rebuilt with coursed rock-faced rubble stone walls and rubble stone piers. It is sited spanning the Grand Canal; with grass banks to the canal and was originally part of Great Southern and Western Railway line.

The Yellow, Purple and Purple Option A routes pass with approximately 110m of this bridge and require the construction of a viaduct over the canal and railway which would have an indirect impact on this bridge.

7.3.4. Enclosure (close to existing R407)

This enclosure is marked on a map from 1783 as a circular doughnut, which is not shown on the 1837 6-inch map. It re-appears on the 1938-1939 6-inch map, but is no longer visible on the ground. It is possible that this earthwork has been obliterated since 1939, although it may survive below the ground surface.

The Blue route would directly impact on this feature.

7.3.5. Palmerstown Demesne

Up to 1.5km of the Orange route corridor would directly impact on the grounds to Palmerstown House. However, this impact, significant though it is, would lie a substantial distance from Palmerstown House itself, and would be hidden for large stretches of the route by belts of trees.

7.4. Conclusions

The route options that impact least on Archaeology and Architectural Heritage are the Blue and the Orange. Only two identified constraints fall within the Blue route corridor. Although construction within the corridor would have a profound impact on the circular enclosure, which is a recorded monument, this monument is no longer visible. The second constraint, a former brick quarry, lies up to 246m from the centre of the route corridor and may, in any case, have been backfilled in antiquity. The only constraint with the Orange route is Palmerstown House, however the Orange route would lie a substantial distance from Palmerstown House itself.

The least preferred routes are the Green, Red and Cyan/Red routes, these routes would have a direct and significant impact on former parkland to Osberstown Hill, to the setting of Osberstown Hill (which comprises an early 19th-century farmhouse and detached farm). There would also be a significant and direct impact to the setting of Osberstown House, a protected structure.

The ranking of the routes is outlined in Table 7.1.

Table 7.1 Archaeology and Architectural Heritage Matrix

Best Average Worst	Green	Cyan	Red	Cyan/ Red	Blue	Purple	Yellow	Orange	Red Option A	Cyan/ Red Option A	Purple Option A
Route Ranking from Archaeology and Architectural Heritage											

8. SOCIO – ECONOMIC IMPACTS

8.1. Introduction

This section of the route selection report focuses on the impacts of the various route options in respect of agriculture, land severance, demolition of properties, loss of land for amenity and recreation and the impact on the local economy and businesses. The methodology employed to undertake this assessment involved:

- A desktop assessment
- Windscreen survey of the proposed routes

For the purposes of this study a route corridor of 300m in width was used to determine the impact of the routes on agricultural sites and dwellings.

8.2. Agriculture

A report prepared by agriculture consultants Martin & Rea is attached in Appendix G. The report assesses the following impacts on agriculture for each of the route options being considered:

- Loss of usable farmland
- Severance of land holding
- Loss of trees, hedgerows and shelter
- Access problems
- Injurious Affection
- Temporary and Permanent Disturbance

The Blue, Red and Red Option A routes are the preferred routes with regards to Agriculture.

8.3. Land Severance

The impact of the route corridors on land severance will be a numeric value representing the number of farms that will be severed by the proposed route. It should be noted that an embankment would sever land but an underpass could be provided to reduce the severance.

The impact of the proposed route corridors on farming is discussed in depth in Appendix G of this report. The degree of severance is illustrated in Table 8.1 below:

Table 8.1 Number of farms severed by the different route corridors

Route Corridor	No. of farms badly severed
Green	8
Cyan	3
Red	1
Cyan/ Red	2
Blue	0
Purple	6
Yellow	2
Orange	5
Red Option A	1
Cyan/Red Option A	2
Purple Option A	6

8.4. Demolition of Property

The impact of the route corridors on the demolition of property will be a numeric value representing the number of houses that will be demolished. A review of the route option corridors has shown that the number of properties that will be demolished or directly affected and within 150m of the route options is shown in Table 8.2 below.

Table 8.2 Dwellings affected by the Route Options

Route Option	Demolished	Directly Affected	Within 150 m of Route
Green		5	10
Cyan		7	2
Red		4	56
Cyan/ Red		5	4
Blue	1	64	177
Purple	3	13	66
Yellow	3	8	8
Orange		3	8
Red Option A		22	92
Cyan/Red Option A		22	94
Purple Option A	3	8	58

8.5. Loss of land for Amenity/Recreation

The impacts of the proposed route corridors will be assessed based on the number of recreation sites/amenity sites that the route bisects and the impact on these sites.

The main amenities in the east of the study area are Naas Golf Course and the PGA National Golf Course. The PGA National Golf Course would be bisected by the orange route and the substantial redesign of a number of holes would be required to accommodate the route. The purple and yellow route pass through the corner of Naas Golf Course further reducing the area of this already confined site.

All of the proposed route options will cross over the Grand Canal, but the loss of amenity/recreational land will be minimal. The actual footprint of the bridge will be the only loss of land and even then, the design of the proposed bridges will ensure navigation clearances are maintained and users will still be able to access all walks.

In Sallins village itself the main recreation site is the sports field; there is also a substantial amount of open space in the residential developments to the east of the village. None of the proposed routes impact on these recreational sites. The blue route runs through the 2 most substantial areas of open space currently provided in the residential developments to the west of the village. The blue route would therefore have a severe impact on the amenity/recreational lands available in these residential areas.

The close proximity of the River Liffey to Sallins provides potential for the development of linear features such as walking routes and parks along the river banks. A strategy for developing a Liffey Valley Park is outlined in the strategy document “Towards a Liffey Valley Park”. The study area for the Liffey Valley Park includes Sallins as it extends from Ballymore Eustace in south Kildare to Islandbridge in Dublin city centre. The priority area for the implementation of this Liffey Valley Park is from Celbridge to Islandbridge, however it is envisaged that this will be extended to cover the entire study area at some stage in the future. The strategy document highlights the importance of keeping a corridor along the river bank free from development, a 50m minimum set back is recommended. Should the Red route be selected it will have a major impact on the potential to develop a linear feature such as the Liffey Valley Park in the Sallins area.

The degree of impact on recreation amenity sites is illustrated in Table 8.3.

Table 8.3 Recreation/amenity sites affected by the Route Options

Route Corridor	No. of sites affected	Effect
Green	0	-
Cyan	0	-
Red	1	moderate
Cyan/ Red	0	-
Blue	2	severe
Purple	1	moderate
Yellow	1	moderate
Orange	1	moderate
Red Option A	1	moderate
Cyan/Red Option A	0	-
Purple Option A	1	moderate

8.6. Local Economy and Business

The development of the Sallins bypass is an important strategic infrastructural requirement to improve the existing road network around the village. The Sallins Local Area Plan 2001 highlights the importance of the completion of the bypass.

Most of the developments currently in Sallins are residential. Lands currently zoned for office/industrial development in the Sallins LAP are to the west of the village, the Red or Cyan/Red route would provide access to these lands.

The majority of the commercial and industrial activities in the region are located in nearby Naas. The most significant future developments will be the Osberstown Park development and the completion of the Naas outer ring roads.

8.7. Conclusions

As mentioned agriculture is the primary land use within the study area. An agricultural assessment has shown that the green and purple route options would have the largest impact on farm severance while the Blue and Red route options would have the least impact.

Regarding dwellings affected by the route options the Blue, Purple and Yellow routes will require the demolition of houses. The Blue option will also have the largest number of houses within 150m of the route. The Orange and Green routes will also affect a significant number of rural houses. The Cyan/Red route affects the least number of houses.

The blue route will have the largest impact on amenity/recreational land because the road will eliminate the majority of open space in the western residential areas of Sallins. The green, cyan and cyan/red route options would have no impact.

The Green, Red and Cyan/Red options all connect to the proposed Osberstown Junction/ Naas Western Distributor Road and will provide the best link from Sallins to the existing and future office/industrial developments in the region.

The orange route would have a significant impact on the PGA National Golf Course and the Purple route would have a significant impact on Naas Golf Course.

The above is summarised in Table 8.4.

Table 8.4 Socio-Economic Route Matrix

Best / Average / Worst	Green	Cyan	Red	Cyan/ Red	Blue	Purple	Yellow	Orange	Red Option A	Cyan/Red Option A	Purple Option A
Agriculture											
Land Severance											
Demolition of property											
Amenity and recreation											
Local economy and businesses											
Overall Route Ranking from Socio-Economics Impacts											

9. CONSTRUCTION IMPACTS

9.1. Introduction

This section assesses the potential effects during the construction phase of the preferred route. Construction impacts will be addressed further during the design and statutory approvals process for the preferred route. The possible benefits or effects of the construction of the proposed scheme on the environment and community and proposed mitigation are outlined in this section of the report.

The existing environment is detailed within other sections of this report under the relevant headings. During the construction of the works there are a number of activities which will lead to disruption. These activities include site clearance, construction of the works, diversion of services and the re-alignment of existing roads.

The overall construction period of this project is estimated to be in the order of 18 months, however this will vary depending on the preferred route corridor chosen.

Activities which are taken into account when assessing construction impacts are:

- Site Clearance
- Earthworks
- Pollution to watercourses
- Demolition.
- Diversion of utilities
- Realignment of existing roads including junctions
- Bridge Construction

9.2. Site Clearance

The chosen route will be cleared of vegetation; this will involve the use of heavy machinery and the stock piling of material on site and removal of excess material.

The impact of the site clearance works include, severance to landowners, disturbance to wild life, disturbance to road users, changes to existing hydrological systems, increase in noise, vibration and dust and visual impacts.

Site clearance will have similar impacts on all the route corridors being considered, however given that the Green, Purple, Purple Option A and Orange are the longest routes it is considered that the site clearance phase would have the greatest potential impact along these routes.

Although the Blue route corridor is the shortest it has the largest number of properties within 300m either side of the proposed centre line of the route corridor. The Cyan, Cyan/Red and Cyan/Red Option A routes affect the least number of residential properties within 300m of the proposed centre line of the route corridor.

9.3. Earthworks

The most significant impact during the construction of the works is during the earthworks phase of the construction activities. It is anticipated that the mass haulage of earthworks would be carried out along haul routes within the fenced off lands available for the construction of the works. The main creation of dust during the construction of a proposed route will be generated from heavy earthmoving plant. Dust control and monitoring will take place along haul routes.

Noise will also be generated from the movement of heavy earthmoving plant and piling operations. While all plant and machinery will be fitted with noise reducing equipment an increase in noise will be evident.

Material which can not be reused on site will be disposed off site. The location, type and quantity of excavated materials will determine the disposal route. Impacts associated with the disposal of material include, noise, vibration, dust, air pollution, increase in volumes of traffic and inconvenience to other road users and an increase in rate of filling of the landfill site.

If there is a deficit of suitable earthworks material excavated within the site material will need to be imported, similarly the import of materials to the site will have impacts such as noise, vibration, dust, air pollution, increase in volumes of traffic and inconvenience to other road users.

All routes options will involve the construction of approach embankments up to the proposed bridges over the canal and railway. It is considered that this activity will have the greatest impact along the Blue, Yellow, Purple and Purple Option A routes as these are located close to residential properties. The western route options will also require approach embankments up to the proposed bridges over the River Liffey.

9.4. Pollution to Watercourses

All construction works near or over water could result in the pollution to the watercourses from accidental spills. Options which are located away from rivers and streams or have fewer crossings are less likely to cause pollution. All routes cross the Grand Canal once, the Red Option A and the Cyan/Red Option A routes also crossing the Naas and Corbally branch of the canal. All routes to the west will involve construction work in close proximity to the River Liffey, the most significant of these is the Red route which runs along the bank of the Liffey for approximately 800m. The Green, Cyan and Cyan/Red will cross the River Liffey twice and the Blue and Cyan routes run within 200m of the Liffey banks.

The Orange route will cross the Morell river which runs to the east of Sallins.

9.5. Demolitions

Subject to further design work, the Purple, Purple Option A and Yellow routes will involve the potential demolition of up to 3 residential dwellings. The Blue route may potentially require the demolition of one residential dwelling. The Orange route will involve the demolition of a number of stone walls on the Palmerstown Demesne estate. The Red Option A route and the Cyan/Red Option A routes will require the demolition of an existing steel bridge over a disused branch off the Dublin/Cork railway.

9.6. Diversion of utilities

All of the route options involve the realignment, protection or diversion of services; this is outlined in more detail in section 3.6. It is considered that more utility diversions will be required along the Blue, Cyan/Red Option A and Red Option A routes as these are located in urban/semi urban areas.

The Orange route may require the diversion of a 110kV ESB line and the Purple and Purple Option A may requires the diversion of a 38kV ESB line.

9.7. Realignment of existing roads including junctions

The realignment of existing roads would result in an increase to dust, vibration, imported materials and inconvenience to other road users. The realignment of existing roads will depend on the selected route corridor.

All options have a proposed junction with the existing R407 to the north of Sallins. The Blue, Yellow, Red Option A and Cyan/Red Option A routes will also have a junction on the R407 at the southern end of Sallins. There will be severe disruption to traffic during the construction of these junctions.

Options to the west will have a junction on the existing L-2006 Osberstown road, it may however be possible to construct this off-line minimising the impact on existing traffic.

Significant re-design of Maudlins grade separated junction would be required to accommodate the Purple Option A route. By contrast minor re-design of the Johnstown grade separated junction would be required to accommodate the Orange and Purple route.

9.8. Bridge Construction

All routes require bridges over the Grand Canal and Dublin/Cork railway. It is estimated that the construction time for these bridges is in the order of 12 to 15 months depending on local site conditions and the requirements of Waterways Ireland and Iarnród Éireann. Construction impacts during the construction of a bridge include potential temporary interruption of services on the railway and temporary closure of the canal towpaths

The Purple, Purple Option A and Yellow routes will require construction of a long viaduct over the valley containing the Grand Canal and Dublin/Cork railway which will have a significant impact on the existing dwellings along the Kerdiffstown road. The Blue option will require the construction of two bridges in a sub-urban/urban area which will have a significant impact on local residents.

The Green, Cyan and Cyan/Red routes would require the construction of 2 bridge crossings over the River Liffey. Subject to further work at the preliminary design stage, it is envisaged that these bridges are likely to be three span structures with intermediate supports set back slightly from the river banks and total length of approximately 90m each. The potential impacts from construction include pollution of watercourses, noise and vibration during construction as well as severance of amenity for users of the river such as anglers.

9.9. Mitigation of Construction Impacts

Mitigation would include working in accordance with relevant legislation and adopting good work practices. Specific working methods would be developed to protect areas of environmental importance. Site supervision, traffic management, signing, local liaison and regulatory bodies would help in minimising construction impacts.

Works could be programmed to minimise as far as possible environmental disturbance including working hours and avoiding ecological sensitive periods such as fish spawning and bird nesting. Management of site drainage and run-off, pollution control measures, protection of sensitive sites, storage of materials and disposal management.

To reduce the noise associated with blasting (if required), the contractor would be required to use blasting techniques such as timed multiple charges, blast mats and similar methods which tend to lessen the severity of blasting noise and vibration levels.

A requirement would be inserted into construction contracts with regard to blasting operations requiring the contractor to implement a program to protect nearby structures from damage.

9.10. Conclusion

Detailed mitigation measures on the preferred route will be investigated at detailed design stage. Where appropriate, specific measures and methods would be developed and implemented to protect areas of environmental importance and in areas of sensitive receptors.

During construction there will be moderate beneficial impact as a result of employment and the use of local materials.

Disruption to local traffic during construction is inevitable; the proper utilisation of temporary roads, traffic management, construction phasing and liaison with the local community would also help to alleviate problems.

Taking into account the considerations discussed above the most preferred option is the Cyan and Cyan/ Red option. This is outlined in the matrix in Table 9.1.

Table 9.1 Construction Impacts Route Matrix

Best / Average / Worst	Green	Cyan	Red	Cyan/ Red	Blue	Purple	Yellow	Orange	Red Option A	Cyan/Red Option A	Purple Option A
Site Clearance											
Earthworks											
Pollution to Watercourses											
Demolitions											
Diversion of utilities											
Realignment of existing roads including junctions											
Bridge Construction											
Overall Route Ranking for Construction Impacts											

10. PLANNING & DEVELOPMENT

10.1. National and Regional Planning Policies

10.1.1.Greater Dublin Area

The Regional Authorities were established by the 1991 Local Government Act and came into existence in 1994. Under this Act, the Regional Authorities have two main functions: to promote the co-ordination of public service provision and to monitor the delivery of EU Structural Fund assistance in the regions. The Greater Dublin Area (GDA) consists of the total area of the two Regional Authorities, Dublin and Mid-East.

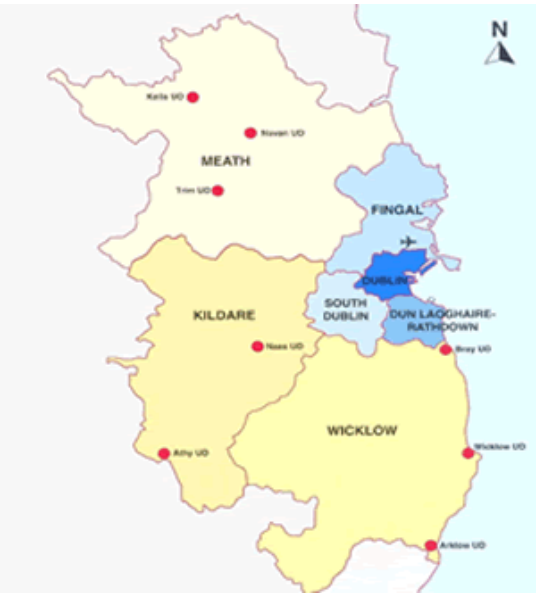

Figure 10.1 Local Authorities in the Greater Dublin Area

The Strategic Planning Guidelines for the Greater Dublin Area, published in February 1999 define the Metropolitan Area, which broadly corresponds with the built up area of Dublin and the Hinterland Area, which is the rest of the Greater Dublin Area.

Regional Planning Guidelines 2004 – 2016 were published for the Greater Dublin Area in 2004. The planning guidelines address the issue of accessibility and connectivity of towns across the GDA region and identify the R407 Kilcock to Sallins as a key strategic non national route in the Hinterland Area.

10.1.2.Dublin Transportation Office (DTO)

The Dublin Transportation Office (DTO) was established in 1995 to coordinate the implementation by the relevant agencies of an agreed integrated transport strategy for the Greater Dublin Area, namely The Dublin Transportation Initiative (DTI) which was adopted as government policy in 1994. The DTI vision was to produce a practicable set of recommendations for new transport infrastructure and complimentary measures to manage projected growth in the demand for travel from all sections of the community over twenty years. A "Platform for Change" an integrated transportation strategy for the Greater Dublin Area was published by the DTO in 2001.

The two key objectives identified in the report relating to Sallins are the upgrading of the Dublin/Cork rail line from Sallins to Cherry Orchard railway and the upgrading of the R407 Kilcock to Sallins.

10.1.3.Transport 21

Transport 21 is the government's capital investment framework through which the transport system in Ireland will be developed, over the period 2006 to 2021. The two major roads projects identified in the plan for the Kildare region are the N4 Dublin to Sligo route and the N7 Dublin to Limerick route.

Although the development of the national roads program provided under Transport 21 is primarily for national inter-urban traffic, in order to safeguard the capacity of this primary network, the government strategy states that it is vital that the regional road network is sufficiently developed to cater for regional commuter traffic. This policy would include projects such as the Sallins Bypass.

10.2. Local Development Plans

The two development plans relevant to the study are:

- Kildare County Development Plan 2005-2011
- Sallins Local Area Plan 2001

The Sallins Local Area Plan 2001 covers an area of approximately 220 hectares; this is an increase of about 100ha from the 1996 plan. The majority of this additional land is zoned for light industry and located to the west, between the town centre and the River Liffey. Overall the majority of land is zoned for residential use with some open space and amenity area's along the River Liffey and to the east of the town.

The Kildare County Development Plan and the Sallins Local Area plan both list the Sallins Bypass as an objective, the latter contains an indicative line showing the location of the bypass, this line is the blue route option. The only route option entirely within the area covered by Sallins Local Area Plan 2001 is the blue option.

10.2.1.Development of Sallins Town

In the context of the future development of Sallins town, the current Sallins Local Area Plan lands zoned for residential and office/industrial use to the west of the town. There are no lands zoned for such development o the east. With this zoning arrangement, the Red, Cyan and Cyan/Red routes would best facilitate such development and could potentially form an outer limit on development of new urban fabric for the town. The remaining western routes being the Blue and Green routes are too close to and too far out respectively to facilitate proper development of the western environs of Sallins.

Considering the eastern route options, the Orange and Purple routes pass through lands largely zoned agricultural and amenity; neither route would therefore benefit development of the town under the current zoning arrangement. The Yellow route provides some scope for facilitating development to the north east and south east quadrants of the town. (Currently zoned New Residential)

10.2.2.Development of the River Liffey and Grand Canal

The following extracts are taken from the Sallins Local Area Plan 2001, and the Kildare County Development Plan 2005:

Sallins Local Area Plan 2001

O3.9.3 "Protect the amenity and tourist value of the Liffey and Grand Canal, protect their banks, footpaths and develop walking routes along the Liffey and canal in conjunction with the relevant statutory bodies and voluntary groups."

Kildare County Development Plan

RP 3 "To seek an extension of the proposed Special Amenity Area Order for the Liffey Valley from Lucan to Lexlip (which is envisaged by the Dublin Local Authorities) to other parts of the Valley within County Kildare."

RP 4 "To pursue the creation of a Liffey Valley Regional Park together with Fingal and South Dublin County Councils."

Inland Waterways and other Watercourses

IW 1 "To maximise opportunities for the use of canals and other waterways as tourism and recreational amenities. In this regard the Council will co-operate with Waterways Ireland, National Parks and Wildlife Service of the DoEHLG and community groups to develop the infrastructure, quality and amenity of these waterways."

IW 2 "To encourage the development of facilities for boating, canoeing, angling, cruising and other sustainable water-based interests. The Council will endeavour to provide appropriate access including access for rescue services to existing water based activities. It will consider all

interests and conflicts that might arise between the various interests in conjunction with the Eastern Regional Fisheries Board, the Irish Canoe Union, Inland Waterways and local communities and clubs."

IW 3 "To encourage local awareness and education of the value of inland waterways as a natural resource for conservation and sustainable development."

IW 4 "To prevent inappropriate new development along canal systems."

IW 5 "To encourage the development of amenity and recreational use of canal systems."

IW 6 "To seek to protect items of architectural or industrial archaeological interest associated with canals."

IW 7 "To develop, in conjunction with the relevant authorities, berthing and other ancillary infrastructure at key locations along the canal systems, particularly in areas where tourism is underdeveloped at present."

It is clear from the above extracts from the current planning policy documents that the route selection for the Sallins bypass must include making allowance within the scheme for the future development of the both the River Liffey and Grand Canal for amenity and leisure uses.

The practical implications of these policies are that:

- Access to the river and canal must be maintained
- Space must be retained along river and canal banks to allow development of linear features such as walking routes and parks.

The crossing of the Grand Canal will require that the canal towpaths are maintained (being one of the standard requirements of Waterways Ireland), hence all route options not anticipated to have any detrimental impact on the future development or maintenance of the waterway.

The Red route corridor runs parallel and close to the River Liffey at Castlesize. The minimum space available between the east river bank and the boundary of the Castlesize Housing Estate is 75m. Allowing a 3m cross section width for a single carriageway including footpaths cycletracks, verges etc., this would leave a theoretical maximum of 45m between the west road fenceline and the river bank, but ideally a buffer should be maintained between road and houses (say 15m), reducing the distance between east river bank and road to 30m. Construction of the red route would therefore reduce the options for effective development of the desired amenity and leisure uses of the river. If the red route is selected, significant consideration would need to be given to landscaping design in this area.

The Green, Cyan and Cyan/Red route would cross the River Liffey twice, and hence the aesthetic and functional design of the bridges would need to be carried out in the context

of development of the amenity and leisure uses of the river. It is noted that the likely hydrological and ecological requirements as noted in Section 3 for three span structures will facilitate the design of aesthetically pleasing bridges allowing access along the banks of the river.

The Cyan Route also runs parallel to the Liffey, but will be a minimum of 100m from the west bank of the river and is not anticipated that it would hinder the development of river banks. The Purple, Purple Option A, Yellow and Orange routes impact on existing golf course amenities identified in the vicinity of Sallins.

Table 10.1 Planning & Development Route Matrix

Best / Average / Worst	Green	Cyan	Red	Cyan/ Red	Blue	Purple	Yellow	Orange	Red Option A	Cyan/ Red Option A	Purple Option A
National and Regional Planning Policies											
Local Development Plans -Development of Sallins											
Local Development Plans -Development of Amenity											
Overall Route Ranking for Planning & Development											

10.3. Future relocation of Sallins Railway Station

In parallel with the route selection process for the R407 Sallins Bypass, preliminary discussions are ongoing between Kildare County Council and other stakeholders on the possibility of the existing Sallins railway station being relocated to the west of Sallins, on the north side of the L-2006 Osberstown Road to facilitate expansion of the station. At the time of writing this report, these discussions are still preliminary and the relocation of the Railway Station is not contained in either the Kildare County Development Plan or the Sallins Local Area Plan. The possible re-location of the station has therefore not been included as a criterion for consideration in the route selection process. It is noted however that if the Red, Cyan or Cyan/Red route options are chosen as the preferred route for the Sallins Bypass, such a proposal may necessitate adjustments to the line of the preferred route corridor and associated railway crossing location to accommodate the relocated station.

11. PUBLIC CONSULTATIONS

11.1. Background

Kildare County Council and Fehily Timoney Gifford carried out public consultation for the constraints study and route selection on Sallins Bypass over 2 days on 6/7 June 2007 with a manned public display in Naas GAA Club. The display consisted of an exhibition of known constraints and the route corridor options being considered for the scheme. The public were invited to provide further constraints information and comment on the route corridor options by the 29th June via a questionnaire.

Following the public consultation, the constraints and route corridor options were displayed in the Road Design Department in Áras Cill Dara, Naas until the 29th June. During this time a significant amount of people visited this display and were able to discuss any concerns relating to the Sallins Bypass project with Kildare County Council's road engineers. After the 29th June Kildare County Council actively when out to meet people who were directly affected by the route corridor options being considered.

In total 314 responses were received from the public, including a signed petition with 175 names from Sallins Park in favour of the Red/Cyan route and opposing the Purple route (counted as one submission for the purposes of this report).Analysis of Responses

11.1.1.Route Preferences

The following table lists the preferences expressed by those who made submissions:

Table 11.1 Breakdown of submissions received

Rank	Route	No. of Preferences
1	Cyan/Red	86
2	Red	62
3	Green	33
4	Cyan	26
5	Purple	20
6	Purple Option A	14
6	Orange	14
8	Cyan/Red Option A	13
9	Blue	12
9	Red Option A	12
11	Yellow	2
12	Yellow or Purple	4
	No Preference	16

Note: the previous table counts the petition from Sallins Park as one submission only. As stated above, this petition favoured the Red/Cyan route, adding a potential 175 further supporters to this route.

11.1.2. Analysis

The above results show that 244 responses out of 314 favoured a western bypass of Sallins (78%), with the Cyan, Red or variant of same gaining 63% of the total preferences. If the Sallins Park petition is added to these numbers, there is an even stronger preference

54 responses favoured an eastern bypass (17%), with 11% of the total preferences favouring the Purple Route or Purple plus Option A.

12 responses favoured the blue route (4%).

The results show a very strong public preference for a western bypass, with the Cyan, Red or variant of same being the strongest sub-group; this is outlined in Table 11.2.

Table 11.2 Public Consultation Route Matrix

Best / Average / Worst	Green	Cyan	Red	Cyan/ Red	Blue	Purple	Yellow	Orange	Red Option A	Cyan/ Red Option A	Purple Option A
Route Ranking from Public Consultation											

12. COST ESTIMATE

12.1. Cost Estimate Methodology

In order to compare the cost of the various routes estimation of the construction costs and of the land acquisition costs was made for each route option. These costs where then added together to give a total cost for each route option.

The estimated cost of the road works for each route was calculated by multiplying a typical cost for a kilometre of road by the length of the route corridor. The estimated cost of the bridge works for each route was calculated by multiplying a typical cost for a square metre of bridge deck by the estimated area of each bridge in the route corridor. These two estimated costs were then added together to give a total construction cost for each route option. The Blue route option had the lowest construction cost and the Cyan/Red Option A had the largest construction cost.

The estimated cost of the land acquisition for each route was calculated by multiplying a typical cost for an acre of land by the estimated width of the road corridor. Land costs vary considerable depending on the location and zoning of the land and to allow for this the following land categories were considered.

- Unzoned Agricultural
- Zoned Agricultural
- Zoned Residential
- Zoned Industrial
- Zoned Leisure/Amenity
- Golf Courses

The Cyan route option had the lowest land acquisition cost and the Blue route option had the largest land acquisition cost.

The construction costs and land acquisition costs for each route option were added together to obtain the overall cost for each route option. The Yellow route option had the lowest overall cost and the Cyan/Red Option A had the largest overall cost. The percentage additional overall cost of each route option when compared with the cheapest route option is outlined in Table 12.1 below.

Table 12.1 Overall Cost Ranking

Route	Percentage additional cost when compared with the cheapest route
Yellow	0%
Purple Option A	13%
Cyan	16%
Red	24%
Cyan/Red	25%
Blue	29%
Purple	30%
Green	34%
Orange	44%
Red Option A	48%
Cyan/Red Option A	55%

The Cost estimate assessment is summarised in Table 12.2 below.

Table 12.2 Cost Estimate Route Matrix

Best / Average / Worst	Green	Cyan	Red	Cyan/ Red	Blue	Purple	Yellow	Orange	Red Option A	Cyan/ Red Option A	Purple Option A
Construction Cost											
Land Acquisition Cost											
Route Ranking from Overall Cost Estimate											

13. RECOMMENDED ROUTE CORRIDOR

13.1. Route Comparison

The eleven route corridor options have been compared in the previous chapters under nine criteria. This assessment is summarised in Table 13.1 below.

The main objective of the proposed Sallins bypass is to reduce the traffic volume passing through Sallins town. In traffic terms, the western pass of Sallins is preferred to an eastern bypass, as it will deliver a 29% reduction in traffic in Sallins village compared to a 36% reduction for an eastern bypass. A western route also allows connections with the proposed Osberstown Junction and Naas Western Distributor Road and access to the Office/Industrial areas of Naas. From Table 13.1 it is apparent that the western routes (with the exception of the Blue option) rank better when compared to the eastern routes options.

Table 13.1 Overall Route Matrix

Best / Average / Worst	Green	Cyan	Red	Cyan/ Red	Blue	Purple	Yellow	Orange	Red Option A	Cyan/Red Option A	Purple Option A
Traffic											
Engineering Factors											
Environmental Factors											
Archaeology and Architectural Heritage											
Socio – Economic Impacts											
Construction Impacts											
Planning & Development											
Public Consultations											
Cost Estimate											
Overall Route Preference											

The two options that achieve best option under most criteria are the Red, Cyan and the Cyan/Red options. The most significant difference between the Cyan and the Cyan/Red options is the crossing of the Grand Canal. The Cyan route crosses the canal in close proximity to the Leinster Aqueduct at a location were the canal is on a high embankment in order to cross the River Liffey. The construction of a bridge at this location would result in a very high structure that would involve the construction of high approach embankments which would have a significant visual impact on the local landscape and the residential property nearby. By comparison the location at which the Cyan/Red route option crosses the canal is generally at the same level as the surrounding lands. This is considered a superior crossing point as it will have less of a visual impact on the local landscape and a reduced impact on the nearby residential property.

The Red route also performs well when compared to the Cyan/Red option. The following are the main findings when the Red route is compared to the Cyan/Red route:

- Environmentally:
  - The Red route will be within the flood plain of the River Liffey based on our initial assessment of 100 year flood levels.
  - Ecologically the Red route is less preferred to the Cyan/Red route due to the requirement of the former for construction adjacent to the River Liffey.
  - The Red route will have greater local noise and vibration impact than the Cyan/Red route, which will be difficult to mitigate effectively.
  - The principle archaeological/heritage feature impacted by both the Red and Cyan/Red routes is Osberstown House.
- There is very strong public support for a western bypass of Sallins, with the variants of the Red, Cyan and Cyan/Red attracting 63% or more of the preferences expressed.
- In terms of Public Policy, the Cyan/Red routes will allow the future development of the River Liffey and Grand Canal as amenity and leisure features. The Red route will limit the opportunities for such development.
- With regard to engineering feasibility both routes are constructible in the engineering sense.
- The Cyan/Red route would have a higher construction cost than the Red route mainly due to the requirement for 2 River Liffey crossings, however the land acquisition costs will be significantly higher for the Red route. A preliminary cost estimate (ref. chapter 12) has shown that there is very little difference in the costs of the two routes.

13.2. Recommendation

This assessment has found that the Cyan/Red route and Red route are similar in respect of traffic performance, constructability, public support and archaeological/heritage impacts. The Cyan/Red route is preferred in terms of construction impacts, ecology, noise impact and public policy and is therefore the preferred route option.

It should be noted the relocation of Salllins railway station (as discussed in section 10.3) may necessitate adjustments to the line of the Cyan/Red route corridor and associated railway crossing location to accommodate the relocated station.