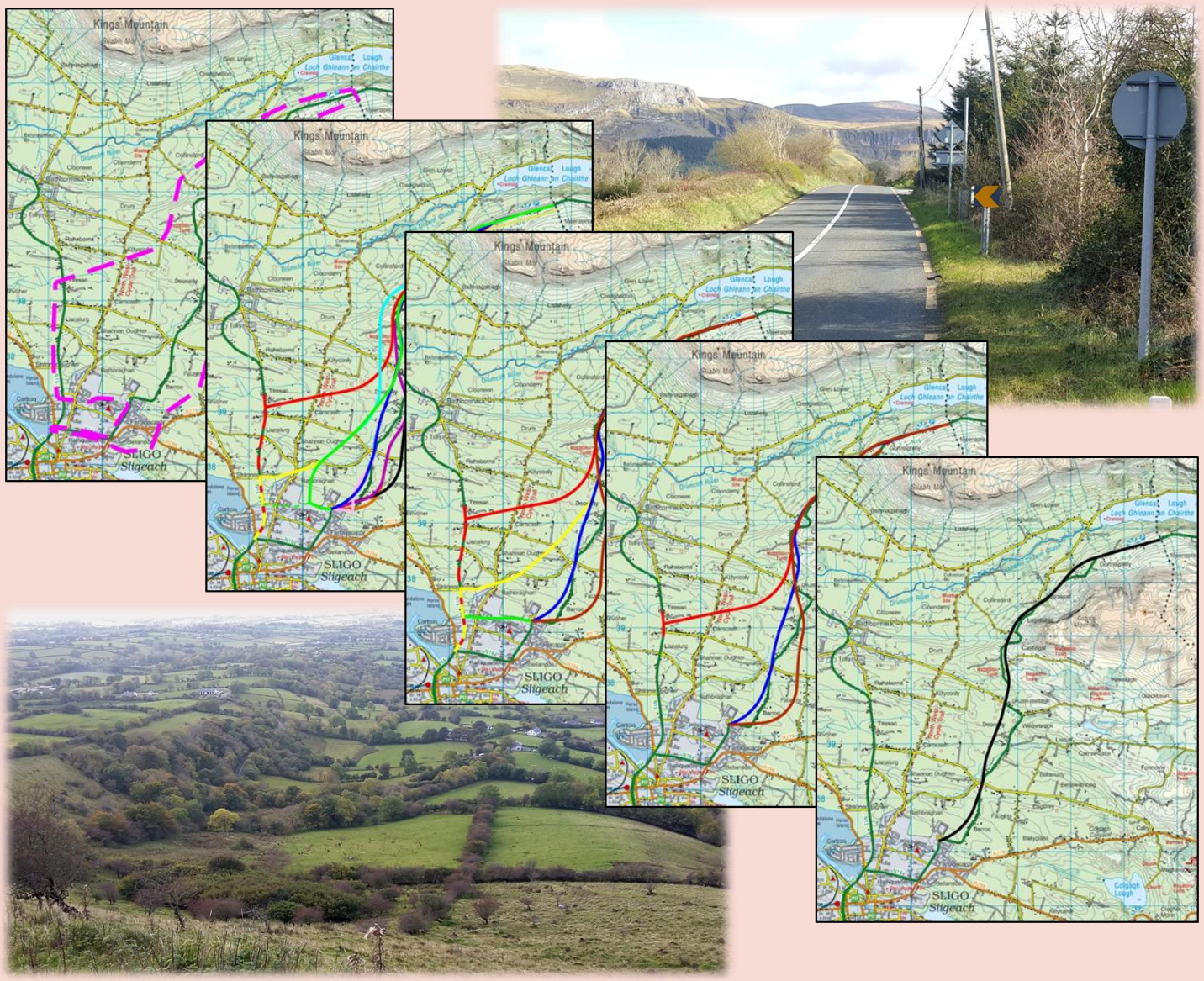
Route Selection Report

Volume 6: Stage 2, Project Appraisal
Multi Criteria Analysis

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

N16 Sligo to County Boundary



Land of Hearts Desire

SLIGO COUNTY COUNCIL

TII
Bonneagar Iompair Éireann
Transport Infrastructure Ireland

i. PREFACE

THIS ROUTE SELECTION REPORT CONSISTS OF THE FOLLOWING DOCUMENTS:

Volume 1

- MAIN REPORT

Volume 2

- Engineering appendices (Traffic & Transport Assessment, Road Engineering, Road Safety Impact Assessment and Options Comparison Estimate)

Volume 3

- Environmental appendices:
  - PART A: Human Environment (including Urban Planning);
  - PART B: The Natural Environment;
  - PART C: Landscape & Visual, and Cultural Heritage;

Volume 4

- Road Safety Audit Stage F;

Volume 5

- Figures

Volume 6

- **Stage 2, Project Appraisal – Multi Criteria Analysis**

Document Control

Status	Issued For	Signed	Date	Approved
DRAFT	*TII Peer Review*	*Fergus Meehan*[1]	*April 2017*	*Emer Concannon*[2]
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This Route Selection Report (RSR) has been prepared and coordinated by Sligo County Councils National Roads Project Office, under the auspices of Transport Infrastructure Ireland and with the assistance of specialist engineering, planning and environmental sub-consultants as outlined below.

Table 1-1: N16 Sligo to County Boundary Route Selection Team

Study/Element	Body Responsible
Design	SCC National Road Design Office
Engineering	
Assessment Coordination, Multi Criteria Analysis and Report Compilation.	
Project Liaison.	
Road Safety Impact Assessment	
Traffic Modelling	Jacobs Engineering
Stage F Road Safety Audit	Kerry and Donegal NRDO's
Economic Appraisal (Stage 2 – Project Appraisal)	Jacobs Engineering
Landscape & Visual	RPS Ireland Ltd.
Flora, Fauna & Fisheries	RPS Ireland Ltd. With input from Denyer Ecology.
Agricultural and Non-Agricultural Property	John Bligh & Associates
Noise & Vibration	Envest Environmental
Air Quality & Climate Change	Envest Environmental
Hydrology & Hydrogeology	Hydro Environmental (Galway)
Soils & Geology	Roughan & O'Donovan
Socio Economic	Optimize Consulting
Archaeology & Cultural Heritage	ASCU
Architectural Heritage	ASCU
Impacts on Sligo & Environs Development Plan	The Planning Partnership

Design

Sligo County Councils National Roads Project Office is responsible for the design of the various route options contained within this Route Selection Report.

TABLE OF CONTENTS

Tables

ii. Stage 2, Project Appraisal, Multi Criteria Analysis

1 Multi Criteria Analysis (MCA)

The MCA performance matrix for Stage 2, Project Appraisal is outlined in Table 1-1. This matrix which is inverted, from that which was used in the initial Stage 1, Preliminary Options Assessment (i.e. positive scores are high indexes as opposed to low ones) is a similar integer system to that recommended in *PE-PAG-0203, Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis.*

Table 1-1: TII PAG – MCA Criteria

Score Index	Impact Level
7	Major, or Highly Positive
6	Moderately Positive
5	Minor, or Slightly Positive
4	Not significant, or neutral
3	Minor, or slightly negative
2	Moderately negative
1	Major or highly negative.

The assessment and its results are outlined in the aforementioned Volume 6 of the Route Selection Report.

By way of a reference to the initial 'Preliminary Options Assessment', the assessment within Volume 6 includes reference to the previous matrix undertaken during the initial stages of the Preliminary Options Assessment. The connection is provided via a reference key in the top right hand corner of each assessment commentary box and is explained in Table 1-2. Prior to the completion of the MCA, additional studies have been undertaken in relation to:

- Traffic and Transport Assessment;
- Economic Analysis; and
- Road Safety Assessments.

The results of these additional studies are outlined in section 9 of the Main Report.

Table 1-2: Reference Key to Stage 1, Preliminary Options Assessment

Reference Key	
Very High Preference	
High Preference	
Medium Preference	
Low Preference	
Very Low Preference	
Internal Key acronyms	
UB	Urban Planning
SE	Socio Economic
N&V	Noise & Vibration
AQ	Air Quality
N.AG	Non Agricultural Property
AG	Agricultural Property
F&F	Flora & Fauna
F	Fisheries
H&H	Hydrology & Hydrogeology
S&G	Soils & Geology
L&V	Landscape & Visual
ACH	Archaeology & Cultural Heritage
AH	Architectural Heritage

2 Route Option 01A – Project Appraisal MCA

Table 2-1: Route Option 01A – MCA, Environment

Criterion	Sub Criteria	Quantitative Assessment	OPTION 1A-v2 - Qualitative Assessment	Score
ENVIRONEMENT	Urban Planning	N/A	**South** UP[3] While this route would have certain physical planning advantages in terms of avoiding urban roads and streets, the traffic model predicts it to be underutilised. It is considered preferable from an urban planning perspective that the chosen route would be the primary corridor of inter urban traffic, rather than splitting same over a new (underutilised) route. The existing (unimproved) route remains in this instance as a competing alternative route. [Minor, or Slightly to Not Significant or Neutral] (3.5)	**3.5**
	Socio Economic		**South** SE[4] This route option adds to severance issues on the N15, while also maintaining c. 50% of traffic on the exiting N16 south of the Drum Road. [Minor or Slightly Negative] (2) **Central (Opt. 8 v2)** SE In this section, the route option minimises the potential for loss of passing trade to a shot blasting business and a B&B. Amenity is also improved in terms of access arrangements to the N16. [Minor or Slightly Positive] (5) **North (Opt. 8 v2)** SE In this section a more continuous length of the existing N16 is maintained. [Minor or Slightly Positive] (5)	**4**
	Noise & Vibration		**South** N&V Overall, it is considered that negative noise impacts associated with the new route are balanced by the benefits provided in terms of removing traffic from the existing N16. 68 (PIR 272) properties within the 50m corridor band. 88 (PIR 264) properties within the 50-100m corridor band. 189 (PIR 378) properties within the 100m-200m corridor band. 227 properties within the 200m – 300m corridor band. [Not Significant or Neutral] (4) **Central (Opt. 8 v2)** N&V No significant change in terms of noise exposure, or balanced against improvements to existing conditions. 4 (PIR 16) properties within the 50m corridor band. 6 (PIR 18) properties within the 50-100m corridor band. 5 (PIR 10) properties within the 100m-200m corridor band. 0 properties within the 200m – 300m corridor band. [Not Significant or Neutral] (4) **North (Opt. 8 v2)**	**4**

[3] Denotes: Urban Planning

[4] Denotes: Socio Economic

Criterion	Sub Criteria	Quantitative Assessment	OPTION 1A-v2 - Qualitative Assessment	Score
			No significant change in terms of noise exposure, or balanced against improvements to existing conditions. N&V 3 (PIR 12) properties within the 50m corridor band. 4 (PIR 12) properties within the 50-100m corridor band. 6 (PIR 12) properties within the 100m-200m corridor band. 10 properties within the 200m – 300m corridor band. [Not Significant or Neutral] (4) **Overall** Possible requirement for mitigation in 9 locations.	
	Air Quality		**South** AQ Slight positive improvement [Not Significant, or Neutral to Minor or Slightly Positive] (4.5) **Central (Opt. 8 v2)** AQ Negligible Change [No Significant Effect] (4) **North (Opt. 8 v2)** AQ Negligible Change [No Significant Effect] (4)	**4.2**
	Agriculture		**South** AG On this section there is a High impact on one farm holding due to landtake and severance. The alignment will be in close proximity to one farmhouse and a farmyard in Teesan. There is a Low impact on a Key dairy enterprise at Doonally. There is one farm house and one farm yard in close proximity to the route option. The impact on the remaining farm holdings will be Low to Medium. [Moderate Negative] (2) **Central (Opt. 8 v2)** AG There is a High impact on one farm holding in Lugatober arising from a direct impact on the farmyard and landtake and severance. The route option will have a High impact on one farm holding in Collinsford arising from direct impacts on a workshop and landtake and severance. There is a High impact on one farm holding due to landtake and severance. There are three farm houses and one farm yard in close proximity to the route option. The impact on remaining farm holdings is Low to Medium. [Major Negative] (1) **North (Opt. 8 v2)** AG There is a High impact on one farm holding in Collinsford due to the direct impact on the dwelling house. The remaining farm holdings will have a mostly Low impact. [Moderate Negative] (2)	**1.7**
	Non - Agri		**South** N.AG The route option will have a High impact, involving property acquisition, on one property on the Drum road (L-3406-0) due to a direct impact from the route option alignment. There will be a High impact on one site on the Drum Road (L-3406-0) due to landtake. There will be a Medium impact on one house at Teesan due to significant effects on the property curtilage and garden shed. There will be a Medium impact on two houses on the Drum road (L-3406-0) due to significant effects on the property curtilage. The impact on the remaining properties will be Low involving slight effects to property boundaries, entrances and / or gardens.	**1.7**

Criterion	Sub Criteria	Quantitative Assessment	OPTION 1A-v2 - Qualitative Assessment	Score
			[Major Negative] (1) **Central (Option 8-v2)** N.AG There will be a Medium impact on a house and a separate site on the Drum Road (L-3406-0) due to significant effects from the route option alignment on the property curtilage. There will be a Low impact on the remaining properties. [Moderate Negative] (2) **North (Option 8-v2)** N.AG There will be a Medium impact on one house in Lugnagall due to the significant effects on the property curtilage and garden. There will be a Low impact on the remaining properties. There is a High impact involving a direct impact on one house considered as a farm house, however this impact is considered as part of the assessment in the Agricultural Chapter. [Moderate Negative] (2)	
	Flora, Fauna & Fisheries		**South** F&F F Flora and Fauna - Nothing about the routeing of this option is likely to result in significant ecological effects in the southern section. The route does not impact upon any identified badger setts. Effects upon flora and fauna are expected to be minor to moderate in magnitude. [No Significant Effect] (4) Fisheries - There are no proposed crossings of significant channels. There are no pathways to Lough Gill SAC. [No Significant Effect] (4) **Central (Option 8-v2)** F&F F Flora and Fauna – This option is not routed over any badger sett through this section. Streams and hedgerows are used as a proxy measure of possible implications upon bats. This FRO crosses 12 vegetated field boundaries (principally hedgerows and a treeline), and an area of mixed broadleaf woodland. Effects upon flora and fauna are expected to be of moderate magnitude. [Moderately Negative] (2) Fisheries - 2 small streams draining to Lower Drumcliff crossed; Tully River also crossed. Effects upon fisheries are expected to be of moderate magnitude. [Moderately Negative] (2) **North (Option 8-v2)** F&F F Flora and Fauna – The route crosses a number of discrete habitats of natural value for which County Development Plan policies apply but direct impacts on Annex I habitats are no longer as great a risk. This route does not impact upon any identified badger setts. Effects upon flora and fauna are expected to be of moderate magnitude. [Moderately Negative] (2) Fisheries - In the Northern Section, this route option includes proposed crossings of three tributaries of the Upper Drumcliff River and three tributaries of Glencar Lough. Some of these streams are likely to be inhabited by brown trout in the area of the proposed crossings and therefore fish passage should be considered in the design of culvert or bridge structures. These streams are also a potential pathway for sediment run-off to reach more productive downstream reaches including the Drumcliff River, a noted salmon river discharging from Glencar Lough which forms part of Ben Bulben, Gleniff and Glenade Complex SAC. Effects upon fisheries are expected to be of a moderate magnitude. [Moderately Negative] (2)	**2.7**
	Hydro and Hydro Geology		**South** H&H Hydrology	**2.25**

Criterion	Sub Criteria	Quantitative Assessment	OPTION 1A-v2 - Qualitative Assessment	Score
			The southern section of this route option avoids intercepting any significant streams with only small drainage channels as part of the Cregg stream system intercepted and therefore potential impact on surface hydrology will be slight. The absence of surface drainage features in the karst area to the north of Carncash may lead to difficulty in regard to disposing of road run-off with a potential requirement of discharging to groundwater. There are no significant flood risk zones encountered by this route option from Teesan east to Castlegal. Hydrogeology The southern section of this route passes through a regionally important karst aquifer of conduit flow which has vulnerabilities of moderate, high and extreme. A cutting is required which is likely to intercept bedrock and therefore this proposed route represents a risk to the water quality of a regionally important groundwater body. [Moderately Negative, to, Minor, or Slightly Negative] (2.5) **Central & North (Option 8-v2)** H&H H&H Hydrology A number of streams (three small streams) at the northeast end of the scheme feed directly into Glencar Lough which is part of the Ben Bulben, Gleniff and Glenade Complex SAC and pNHA (000623). The others discharge to the Drumcliff River and the Drumcliff-Glebe Stream both of which outfall in to Drumcliff Bay and the SAC/SPA waters. In terms of hydrology the impacts in the northern and central sections of the routes are similar between all the route options and represent a potential moderate impact on flooding and the flow regime and potential significant impact without appropriate mitigation on the water quality to Glencar Lough and a moderate impact to the water quality in the Drumcliff River and Drumcliff-Glebe Stream and a potential slight impact on water quality in Drumcliff Bay SAC. Hydrogeology In the central section this route similar to the other routes results in a potential bedrock cutting into the hill slopes near Castlegal. The road cut section intercepts 2 mapped fault lines at Castlegal which may have a weathered zone that potentially encourages preferential groundwater flow along the faultline. The downstream groundwater fed Drum East ecological receptor could potentially be impacted by this cutting which could divert groundwater flow away from the feature. The route passes close to, but down gradient of the petrifying spring habitat at Castlegal which is located just east of the existing N16 road and the potential impact to this groundwater fed system by the road construction is expected to be imperceptible particularly as the road will be in embankment adjacent to this feature. From Lugatober to north of Gortnagrelly, Option 08-v2 is similar to options 01A/01B, 02A/02B and 05 taking an offline alignment slightly to the west /northwest of the N16 Road. At Lugnagall the route option also passes down gradient of the ecological receptor and is buffered by the existing N16 road and therefore unlikely to impact on this ecological feature which is fed from recharge to bedrock and direct surface runoff from up gradient off the hill slopes of Cope's Mountain. At Gortnagrelly the route crosses over the seepage zone that includes petrifying springs and tufa mounds of Annex I Habitat. Without mitigation direct impact by the road alignment on this feature represents a significant impact. To avoid such impacts mitigation in the form of bridge spanning the road over this feature will be required. The required spanning could be of the order of 40 to 50m in order to avoid the seepage zone. Similar, to the other route options it passes up gradient of a number of domestic wells whose water quality could be impacted at Castlegal. At Lugatober the route passes down gradient of identified domestic supply sources and therefore is unlikely to impact these sources. At Gortnagrelly the route passes both down gradient and up gradient of a number of small local well supplies, with no impact anticipated to those located up gradient and potential water quality impacts only to those down-gradient as the road will be in embankment and should not impact well yield. A private supply from the Gortnagrelly springs has been identified which could be impacted by the road similar to the potential impact described above in regard to the Gortnagrelly Annex I habitat. [Moderately Negative] (2)	
	Soils & Geology		**South** S&G Approximate material deficit (cut/fill) of circa 97,000m^3. No soft ground encountered. The route passes in close proximity to an area of karstified bedrock, therefore there is some potential for impact during construction.	**3.3**

Criterion	Sub Criteria	Quantitative Assessment	OPTION 1A-v2 - Qualitative Assessment	Score
			Minor, or Slightly negative (3) **Central (Option 8-v2)** S&G Approximate material deficit (cut/fill) of circa 96,000m^3. 70 – 80m of alluvium (potentially soft) encountered. No perceived risk of encountering karstified bedrock. Minor, or Slightly Negative (3) **North (Option 8-v2)** S&G Approximate material deficit (cut/fill) of circa 8,000m^3. No areas of soft ground encountered. No perceived risk of encountering karstified bedrock. Not significant, or neutral (4)	
	Waste		Desktop studies indicate soft ground deposits to be overall marginal in the area. A certified waste disposal site has been identified from desktop studies to occur at Lugnagall, however the route does not intercept. U1 unsuitable material is expected to be generated in cut sections. Minor/Slightly Negative (3)	**3**
	Landscape & Visual		**South** L V LANDSCAPE Crosses Sligo Lowland Agricultural LCA for most of its length with a location that is closer to the N15 corridor and a more robust part of this landscape. Avoids any visually significant vegetation. Refined route has increased embankments to create underbridge for L74151 road but overall has a reasonably good fit in landscape. Minor Slightly Negative/Moderately Negative (2.5) VISUAL Visual Impact Index = 81.5 [Moderately Negative] (2)	**1.8**
			Central (Option 8-v2) L V LANDSCAPE Crosses Sligo Lowland Agricultural LCA and small part of Glencar Valley LCA. Medium embankments required at crossing of N16 as far as L7413-0 and small embankment required within Glencar Valley LCA. Negatively impacts on visually significant vegetation at L3404-0 as with all options. Moderate Negative/Major Negative (1.5) VISUAL Visual Impact Index = 29 [Moderately Negative] (2)	

Criterion	Sub Criteria	Quantitative Assessment	OPTION 1A-v2 - Qualitative Assessment	Score
			North (Option 8-v2) L V LANDSCAPE Close to N16 but inside Glencar Valley LCA. Runs along existing N16 alignment to County Boundary. Major Negative (1) VISUAL Visual Impact Index = 28 [Moderately Negative] (2)	
	Archaeology & CH		**South** ACH Profound Impacts on CHC6 & CHC33; Moderate Impacts on CHC63 & CHC65; Slight Impacts on CHC3, CHC5 and CHC26 Moderate/Major Negative (1.5) **Central (Option 8-v2)** ACH Profound Impact on CHC1 and CHC11; Slight Impact on CHC72 Moderate/Major Negative (1.5) **North (Option 8-v2)** ACH Profound impacts on CHC8 & CHC27; Slight Impacts on CHC52 Moderate/Major Negative (1.5)	**1.5**
	Architectural H		**South** AH Moderately negative impacts on AHC 15 and AHC 17 Moderately Negative (2) **Central (Option 8-v2)** AH Significant impact on AHC 33 bridge Moderately Negative (2) **North (Option 8-v2)** AH Slight negative impact on AHC 24 (vernacular structure) Minor or Slightly Negative (3)	**2.3**
Environmental total Index				**35.95**
Environmental average Index				**2.77**

Table 2-2: Route Option 01A – MCA, Safety

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
SAFETY	Collision Reduction		Collision reduction arising from the proposed scheme have been calculated with reference to the Department of Environment publication '*A Guide to Road Safety Engineering in Ireland, 1996 DoE*' and the '*Certificate in Road Safety Audits, 2016 TMS/UCD*'. These publications outline the collision savings predicted with new scheme improvements to be in the region of 30% - 40%. In order to produce a conservative economic assessment of the likely collision reductions arising from the proposed scheme a **30%** reduction factor in collisions over the appraisal period has been applied. This is considered to be generally similar for each of the route options being assessed. The total collision cost savings over the 30 year appraisal period amount to circa €6.8m. This item has not been included in the 'Quantitative Assessment' as a generic approach to each option has been undertaken at Route Selection Stage. Moderately Positive (6)	**6**
	Security		The proposed new route will either include a dedicated cycle/pedestrian track, or will facilitate the use of the existing N16 as a suitable track. Direct domestic and agricultural tracks, will as far as practicable be removed from the national primary route and accommodated via the provision of new improved junction arrangements. Traffic model analysis indicate that the provision of the scheme will not impact on future plans to pedestrianise certain sections of Sligo City. Major, or Highly Positive (7)	**7**
			Safety Sub-Total Score	**6.5**

Table 2-3: Route Option 01A – MCA, Economy

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
ECONOMY	Efficiency and Effectiveness	Forecast Year (2047) **Excl. Safety** Present Value of Costs: €22.887m; Present Value of Benefits: €7.08m; Benefit to Cost Ratio: 0.309; Residual Period (2077) **Excl. Safety** Present Value of Costs: €22.887m; Present Value of Benefits: €12.031m; Benefit to Cost Ratio: 0.526; Moderately Negative (2)		**2**
	Wider Economic Impacts		Competition in the market (Neutral) Agglomeration (Neutral)	**4**

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
			Inward Investment (Neutral) Labour Supply (Neutral) Urban Regeneration (Neutral) Not Significant, or Neutral (4)	
	Transport Quality and Reliability	N16 journey times from the Leitrim boundary to Sligo City Centre Do – Min (2047) AM Peak: 10:12 min (612 sec); Do – Min (2047) Inter Peak: 10:04 min (604 sec); Do – Min (2047) PM Peak: 10:34 min (634 sec); Average: 10:17 min (617 sec) Do – Some (2047) AM Peak: 09:55min (595sec); Do – Some (2047) Inter Peak: 09:36 min (576 sec) Do – Some (2047) PM Peak: 10:06 min (606 sec); Average: 9:52 min (592 sec); Journey Time Saving: 0:25 min (25 sec); Minor, or Slightly Positive (5)		**5**
	Funding Impacts	It is not apparent at the current time as to whether there will be any non-exchequer funding for the project. Therefore a 'Neutral' score is applied.		**4**
			Economy Sub-Total Score	**3.75**

Table 2-4: Route Option 01A – MCA, Accessibility and Social Inclusion

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
ACCESSIBILITY & SOCIAL INCLUSION	Deprived Geographical Areas		The Pobal HP deprivation Index, generally shows the electoral divisions between Sligo and Enniskillen, to be in the 'marginally above average' and 'marginally below average' brackets; that is with the exception of areas in the Drumcliff East and Glencar electoral divisions, which are considered to be affluent based on the results of 2011 CSO data. Minor, or Slightly Positive (5)	**5**
	Vulnerable Groups		The new road scheme will improve journey time and journey reliability to Sligo, however this is appropriately covered under 'Economy'. In this regard, for the purposes of Route Selection comparison, a neutral score is considered appropriate. Not Significant, or Neutral (4)	**4**
			Accessibility & Social Inclusion Sub-Total Score	**4.5**

Table 2-5: Route Option 01A – MCA, Integration

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
INTEGRATION	Transport Integration		The Route Option links into the existing N15 in the townland of Teesan. Although this represents a direct strategic connection at the current time, the future design of the 'N15 Sligo to County Boundary' project will require a c. 1km diversion south wards (on the existing N15) in order to reconnect with the new N15. The project via the provision of adjacent cycling/walking facilities will improve the connectivity of existing sustainable transport networks, particularly between Sligo and Glencar. Moderately Positive (6)	6
	Land use Integration		It is an objective of the County Sligo Development Plan to realign and upgrade the existing N16. The N16 is defined as a Strategic Radial Corridor within the Border Regional Planning Guidelines (2010-2022). It is an important infrastructural element in developing the Region and is defined as a 'key priority' in terms of improvement requirements. Major, or Highly Positive (7)	7
	Geographical Integration		The N16 is part of the comprehensive network of routes which support the Trans-European Transport Network. Major, or Highly Positive (7)	7
	Other Government Policy Integration		Within the context of the National Spatial Strategy the N16 is as a 'strategic linking corridor', providing North Western International access and access from Sligo through the Central Spine of the Country to the East. Major, or Highly Positive (7)	7
			Integration Sub-Total Score	6.75

3 Route Option 05 – Project Appraisal MCA

Table 3-1: Route Option 05 – MCA, Environment

Criterion	Sub Criteria	Quantitative Assessment	OPTION 05 - Qualitative Assessment	Score
ENVIRONEMENT	Urban Planning	N/A	**South** UP[5] This option traverses/subdivides a small portion of planned urban areas. The option also maintains routing of national primary traffic through urban streets; however, it would retain the majority of traffic on the planned route avoiding unregulated 'short cuts', etc. [Minor, or Slightly Negative to Not Significant, or Neutral] (3.5)	**3.5**
	Socio Economic		**South** SE This option allows traffic from the north to directly access community facilities on the edge of North Sligo such as Sligo IT and transfers more traffic from the existing N16. In doing so it does, however, maintain community severance in this built-up area. This severance is likely to increase over time as traffic volumes increases, but is mitigated by the presence of pedestrian crossings and cycle facilities. It also introduces new severance for Barroe properties and maintains some existing severance at Doonally Bridge, although the introduction of a staggered junction between the L3407-0 and L3407-22 reduces this relative to the existing or do-nothing situation. [Minor, or Slightly positive to Moderately positive] (4.5) **Central** SE Access is provided to the L3406-0 behind a cluster of properties at the existing location. A shot-blasting business and B&B are impacted due to respective effects on passing trade combined with access 1km to the south. [Minor or Slightly positive] (5) **North (Opt. 8 v2)** SE In this section a more continuous length of the existing N16 is maintained. [Minor or Slightly positive] (5)	**4.8**
	Noise & Vibration		**South** N&V The new route is located in a less populated area than the current location of the N16 (i.e.: Ribbon Development in Barroe). Therefore, it is expected that there will overall be slight positive benefits. 122 (PIR 488) properties within the 50m corridor band. 142 (PIR 426) properties within the 50-100m corridor band. 264 (PIR 528) properties within the 100m-200m corridor band. 244 properties within the 200m – 300m corridor band. [Not Significant or Neutral to Minor or Slightly positive] (4.5) **Central** N&V No significant change in terms of noise exposure, or balanced against improvements to existing conditions. 3 (PIR 12) properties within the 50m corridor band. 1 (PIR 3) properties within the 50-100m corridor band. 9 (PIR 18) properties within the 100m-200m corridor band. 0 properties within the 200m – 300m corridor band.	**4.2**

[5] Denotes: Urban Planning

Criterion	Sub Criteria	Quantitative Assessment	OPTION 05 - Qualitative Assessment	Score
			[Not Significant or Neutral] (4) **North (Opt. 8 v2)** N&V No significant change in terms of noise exposure, or balanced against improvements to existing conditions. 3 (PIR 12) properties within the 50m corridor band. 4 (PIR 12) properties within the 50-100m corridor band. 6 (PIR 12) properties within the 100m-200m corridor band. 10 properties within the 200m – 300m corridor band. [Not Significant or Neutral] (4) **Overall** Possible requirement for mitigation in 6 locations.	
	Air Quality		**South** AQ Negligible Change [No Significant Effect] (4) **Central (Opt. 8 v2)** AQ Negligible Change [No Significant Effect] (4) **North (Opt. 8 v2)** AQ Negligible Change [No Significant Effect] (4)	**4**
	Agriculture		**South** AG There will be a High impact on a farm holding on the Drum road (L-3406-0) resulting from a direct impact on a farmyard comprising of animal housing and other facilities. There is a High impact on a Key dairy enterprise due to landtake and severance and the proximity of the alignment to the farmyard. There is a High impact on one farm holding arising from landtake and severance. The remaining impacts on other farm holdings are Low to Medium. [Major Negative] (1) **Central** AG At the Drum local road (L-3406-0) the offline link to the N16 will sever lands. There will be a High impact on two farm holdings in Castlegal and Collinsford arising from direct impacts on the farm house, farmyard and landtake and severance. There is a Medium impact on one farm holding due to a direct impact on a farmyard in Drumkilsellagh. There are three farm houses and one farmyard in close proximity to the route option. There is a High impact on one farm holding due to the severance involved. The impact on remaining farm holdings is mostly Medium. [Major Negative] (1) **North (Opt. 8 v2)** AG There is a High impact on one farm holding in Collinsford due to the direct impact on the dwelling house. The remaining farm holdings will have a mostly Low impact. [Moderate Negative] (2)	**1.3**
	Non - Agri		**South** N.AG There will be a Medium impact on one property in Barroe due to the impact on the property curtilage, existing property access and a building replicating a gate lodge. There will be a Medium impact on a second property in Barroe due to the impact on the property curtilage and existing access. There will be a Low impact on the remaining properties.	**2.3**

Criterion	Sub Criteria	Quantitative Assessment	OPTION 05 - Qualitative Assessment	Score
			[Moderate Negative] 2 **Central** N.AG There will be a Low impact on each of the properties affected in this section. There are also High impacts involving direct impacts on two houses considered as farm houses, however these impacts are considered as part of the assessment in the Agricultural Chapter. [Minor Negative] 3 **North (Options 8 – v2)** N.AG There will be a Medium impact on one house in Lugnagall due to the significant effects on the property curtilage and garden. There will be a Low impact on the remaining properties. There is a High impact involving a direct impact on one house considered as a farm house, however this impact is considered as part of the assessment in the Agricultural Chapter. [Moderate Negative] 2	
	Flora, Fauna & Fisheries		**South** F&F F Flora and Fauna – This option is routed principally over improved agricultural grassland until it passes through mixed broadleaf and mixed coniferous woodland at a crossroads east of Shannon Oughter. Here, side road realignment cuts into wet willow-alder-ash woodland to the west and mixed broadleaf coniferous woodland to the east. Streams and hedgerows are used as a proxy measure of possible implications upon bats. This FRO crosses 3 watercourses and the least (13) vegetated field boundaries (principally hedgerows). Effects upon flora and fauna are expected to be minor to moderate in magnitude. [Minor/Slight Negative] (3) Fisheries – Significant section of route in Doonally catchment and close interaction with main channel over 300-400m section in Doonally area (behind vet lab); 1 crossing of main channel and a crossing of the key tributary (Lisgorey); also another tributary near source in Barrroe area. Potential for run-off of sediment. [Moderate Negative] (2) **Central** F&F F Flora and Fauna – This route crosses 13 vegetated field boundaries (principally hedgerows). It crosses a treeline on a watercourse at Castlegal and cuts through broadleaf woodland at Lugatober. It is not routed over any badger sett through this section. Streams and hedgerows are used as a proxy measure of possible implications upon bats. All FRO's cross the same amount of streams through this section. This FRO crosses 13 vegetated field boundaries (principally hedgerows and a treeline), and an area of mixed broadleaf woodland. Effects upon flora and fauna are expected to be minor to moderate in magnitude. [Moderately Negative] (2) Fisheries – 2 small streams draining to Lower Drumcliff crossed; Tully River also crossed. [Moderately Negative] (2) **North (Option 8 –v2)** F&F F Flora and Fauna – The route crosses a number of discrete habitats of natural value for which County Development Plan policies apply but direct impacts on Annex I habitats are no longer as great a risk. This route does not impact upon any identified badger setts. Effects upon flora and fauna are expected to be of moderate magnitude. [Moderately Negative] (2) Fisheries - In the Northern Section, this route option includes proposed crossings of three tributaries of the Upper Drumcliff River and three tributaries of Glencar Lough. Some of these streams are likely to be inhabited by brown trout in the area of the proposed crossings and therefore fish passage should be considered in the design of culvert or bridge structures. These streams are also a potential pathway for sediment run-off to reach more productive downstream reaches including the Drumcliff River, a noted salmon river discharging from Glencar Lough which forms part of Ben Bulben, Gleniff and Glenade Complex SAC. Effects upon fisheries are expected to be of a moderate magnitude.	**2.2**

Criterion	Sub Criteria	Quantitative Assessment	OPTION 05 - Qualitative Assessment	Score
			[Moderately Negative] (2)	
	Hydro and Hydro Geology		**South** H&H Hydrology The southern section of this route intercepts Willsborough stream to the east of Shannon Oughter. The alignment potentially will result in the road running almost parallel and in close proximity to the stream channel and within the Floodplain for c. 200m. This will result in pushing the effective flood plain area west of the road alignment and represents a potential moderate impact on local flooding and flood risk. A link road associated with this option will also require a new bridge crossing of the Willsborough channel and floodplain to the South of Doonally. Some channel diversion and regrading may be required to mitigate the impact on the Willsborough stream and floodplain area. Route Option 05 crosses the Rathbraghan Stream just downstream of its spring source and a number of small stream / drainage channels in its northerly route to the west of the Existing N16 road to north of Drumkilsellagh. Hydrogeology The southern section of this route option avoids the regionally important karst aquifer and passes predominantly through a locally important bedrock aquifer which is generally productive only in local zones. The groundwater vulnerability to contamination ranges in the southern section of this route to be predominantly moderate and increasing to high near Doonally. North of Doonally similar to all of the route options the regionally important karst aquifer is intercepted from Doonally to Castlegal where vulnerabilities range from high to extreme. North of Castlegal a locally important bedrock aquifer of extreme vulnerability is intercepted by all of the route options. In the southern section a number of small cuttings may be required which are unlikely to reach bedrock and therefore are unlikely to result in any significant dewatering of the local groundwater table. In this south section, to the south of Doonally a number of shallow wells are in proximity to the road but are unlikely to be significantly impacted as the road is at grade or in embankment and the overburden permeability is low. [Moderately Negative, to Minor, or Slightly Negative] (2.5) **Central & North (Option 8 –v2)** H&H H&H Hydrology A number of streams (three small streams) at the northeast end of the scheme feed directly into Glencar Lough which is part of the Ben Bulben, Gleniff and Glenade Complex SAC and pNHA (000623). The others discharge to the Drumcliff River and the Drumcliff-Glebe Stream both of which outfall in to Drumcliff Bay and the SAC/SPA waters. In terms of hydrology the impacts in the northern and central sections of the routes are similar between all the route options and represent a potential moderate impact on flooding and the flow regime and potential significant impact without appropriate mitigation on the water quality to Glencar Lough and a moderate impact to the water quality in the Drumcliff River and Drumcliff-Glebe Stream and a potential slight impact on water quality in Drumcliff Bay SAC. Hydrogeology In the central section a cutting into the hill slopes near Castlegal will be required which is likely to intercept the limestone and sandstone bedrock. The alignment is slightly more west of option 01 and 08-v2 and therefore does not require as extensive a cutting. Nevertheless, it intercepts a mapped faultline that runs southeast to northwest. A second east-west fault line is encountered just to the north of the cutting where the alignment is transitioning to embankment. These faultlines have potential to represent weathered zones in the bedrock that can give rise to preferential groundwater flow paths along the fault line and potentially may contribute to the downstream groundwater fed Drum East ecological feature. The impact of this route on a potential groundwater flow that supplies the Drum-East ecological feature cannot be ruled out, but relative to route options 1 and 8 is likely to have a lesser potential for intercepting groundwater flow. The route passes close to, but down gradient of the petrifying spring habitat at Castlegal which is located just east of the existing N16 road and the potential impact to this groundwater fed system by the road construction is expected to be imperceptible. At Lugnagall the route option also passes down gradient of the ecological receptor and is buffered by the existing N16 road and therefore unlikely to impact on this ecological feature which is fed from recharge to bedrock and direct surface runoff from up gradient off the hill slopes of Cope's Mountain. At Gortnagrelly the route crosses over the seepage zone that includes springs of a Annex I petrifying spring and tufa mound ecological habitat. Without mitigation direct impact by the road alignment on this feature represents a significant impact. To avoid such impact, mitigation in the form of bridge spanning the road over this feature will be required. The required spanning is likely to be of the order of 40 to 60m in order to completely avoid the seepage zone. Similar, to the other route options it passes up gradient of a number of domestic wells whose water quality could be impacted at Castlegal. At Lugatober the route passes down gradient of identified domestic supply sources and therefore is unlikely to impact these sources. At Gortnagrelly the route passes both down gradient and up gradient of a	**2.25**

Criterion	Sub Criteria	Quantitative Assessment	OPTION 05 - Qualitative Assessment	Score
			number of well supplies with no impact to those located up gradient and potential water quality impacts only to those down gradient as the road will be in embankment and therefore unlikely to impact on yield. A supply from the Gortnagrelly springs has been identified which would be impacted similar to the potential impact described above in regard to the Gortnagrelly petrifying spring habitat. [Moderately Negative] (2)	
	Soils & Geology		**South** S&G Approximate material deficit (cut/fill) of circa 177,000m^3. 180m of alluvium (potentially soft) encountered. No perceived risk of encountering karstified bedrock. Moderately Negative (2) **Central** S&G Approximate material deficit (cut/fill) of circa 178,000m^3. 70 – 80m of alluvium (potentially soft) encountered. No perceived risk of encountering karstified bedrock. Moderately Negative (2) **North (Option 8-v2)** S&G Approximate material deficit (cut/fill) of circa 8,000m^3. No areas of soft ground encountered. No perceived risk of encountering karstified bedrock. Not significant, or Neutral (4)	**2.7**
	Waste		Desktop studies indicate soft ground deposits to be overall marginal in the area. A certified waste disposal site has been identified from desktop studies to occur at Lugnagall, however the route does not intercept. U1 unsuitable material is expected to be generated in cut sections. Minor, or Slightly Negative (3)	**3**
	Landscape & Visual		**South** L V LANDSCAPE Crosses Sligo Lowland Agricultural LCA. Crosses along stream north of Doonally Bridge with visually significant vegetation. Only small cuttings and embankments required and has a reasonably good fit in landscape. Minor, or Slightly Negative to Moderately Negative (2.5) VISUAL Visual Impact Index = 77.5 [Moderately Negative] (2) **Central** L V LANDSCAPE Crosses Sligo Lowland Agricultural LCA and small part of Glencar Valley LCA. Very small embankments required at crossing of L7413-0 as far as L34041-0 and no embankments/cuttings required within Glencar Valley LCA. Negatively impacts on visually significant vegetation at L3404-0 as with all options. Moderately Negative to Major Negative (1.5) VISUAL Visual Impact Index = 20	**1.8**

Criterion	Sub Criteria	Quantitative Assessment	OPTION 05 - Qualitative Assessment	Score
			[Moderately Negative] (2) **North (Opt. 8 v2)** L V LANDSCAPE Close to N16 but inside Glencar Valley LCA. Runs along existing N16 alignment to County Boundary. Major Negative (1) VISUAL Visual Impact Index = 28 [Moderately Negative] (2)	
	Archaeology & CH		**South** ACH Significant negative Impacts on CHC47 Mill Race; Moderate Impacts on CHC62 & CHC63; Slight Impacts on CHC76 & CHC77 Moderate/ Major Negative (1.5) **Central** ACH Slight Impacts on CHC11 Ringfort & CHC72 Old Road Minor/Slightly Negative (3) **North (Opt. 8 v2)** ACH Profound impacts on CHC8 & CHC27; Slight Impacts on CHC52 Moderate/ Major Negative (1.5)	**2**
	Architectural H		**South** AH Significant impact on AHC 14, 15 & 35. Moderate impact on AHC 19. Moderate/ Major Negative (1.5) **Central** AH Significant Impact on AHC 33. Moderate/ Major Negative (1.5) **North (Opt. 8 v2)** AH Slight negative impact on AHC 24 (vernacular structure). Minor/Slightly Negative (3)	**2**
Environmental total Index				**36.05**
Environmental average Index				**2.77**

Table 3-2: Route Option 05 – MCA, Safety

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
SAFETY	Collision Reduction		Collision reduction arising from the proposed scheme have been calculated with reference to the Department of Environment publication '*A Guide to Road Safety Engineering in Ireland, 1996 DoE*' and the '*Certificate in Road Safety Audits, 2016 TMS/UCD*'. These publications outline the collision savings predicted with new scheme improvements to be in the region of 30% - 40%. In order to produce a conservative economic assessment of the likely collision reductions arising from the proposed scheme a **30%** reduction factor in collisions over the appraisal period has been applied. This is considered to be generally similar for each of the route options being assessed. The total collision cost savings over the 30 year appraisal period amount to circa €6.8m. This item has not been included in the 'Quantitative Assessment' as a generic approach to each option has been undertaken at Route Selection Stage. Moderately Positive, to Major or Highly Positive (6.5) This option received a higher index ranking of 0.5 greater than options 01A-v2, or 12, for the following reasons: ➢ The RSIA and the Road Safety Audit Stage F, both rank Option 05 as being a high preference option;	**6.5**
	Security		The proposed new route will either include a dedicated cycle/pedestrian track, or will facilitate the use of the existing N16 as a suitable track. Direct domestic and agricultural tracks, will as far as practicable be removed from the national primary route and accommodated via the provision of new improved junction arrangements. Traffic model analysis indicate that the provision of the scheme will not impact on future plans to pedestrianise certain sections of Sligo City. Major, or Highly Positive (7)	**7**
			Safety Sub-Total Score	**6.75**

Table 3-3: Route Option 05 – MCA, Economy

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
ECONOMY	Efficiency and Effectiveness	Forecast Year (2047) **Excl. Safety** Present Value of Costs: €25.827m; Present Value of Benefits: €25.618m; Benefit to Cost Ratio: 0.992; Not Significant, or Neutral (4) *Residual Period (2077)* ***Excl. Safety*** *Present Value of Costs: €25.827m;* *Present Value of Benefits: €34.432m;* *Benefit to Cost Ratio: 1.333;*		**4**
	Wider Economic Impacts		Competition in the market (Neutral) Agglomeration (Neutral) Inward Investment (Neutral) Labour Supply (Neutral) Urban Regeneration (Neutral) Not Significant, or Neutral (4)	**4**
	Transport Quality and Reliability	N16 journey times from the Leitrim boundary to Sligo City Centre Do – Min (2047) AM Peak: 10:12 min (612 sec); Do – Min (2047) Inter Peak: 10:04 min (604 sec); Do – Min (2047) PM Peak: 10:34 min (634 sec); Average: 10:17 min (617 sec) Do – Some (2047) AM Peak: 08:47 min (527 sec); Do – Some (2047 Inter Peak: 08:45 min (525 sec) Do – Some (2047) PM Peak: 09:42 min (582 sec); Average: 09:05 min (545 sec); **Journey Time Saving: 01:12 min (72 sec);** Moderately Positive (6)		**6**
	Funding Impacts	It is not apparent at the current time as to whether there will be any non-exchequer funding for the project. Therefore a 'Neutral' score is applied.		**4**
			Economy Sub-Total Score	**4.5**

Table 3-4: Route Option 05 – MCA, Accessibility and Social Inclusion

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
ACCESSIBILITY & SOCIAL INCLUSION	Deprived Geographical Areas		The Pobal HP deprivation Index, generally shows the electoral divisions between Sligo and Enniskillen, to be in the 'marginally above average' and 'marginally below average' brackets; that is with the exception of areas in the Drumcliff East and Glencar electoral divisions, which are considered to be affluent based on the results of 2011 CSO data. Minor, or Slightly Positive (5)	**5**
	Vulnerable Groups		The new road scheme will improve journey time and journey reliability to Sligo, however this is appropriately covered under 'Economy'. In this regard, for the purposes of Route Selection comparison, a neutral score is considered appropriate. Not Significant, or Neutral (4)	**4**
			Accessibility & Social Inclusion Sub-Total Score	**4.5**

Table 3-5: Route Option 05 – MCA, Integration

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
INTEGRATION	Transport Integration		The route option as assessed in the 'Traffic and Transport' Assessment provides for a good strategic connection. The project via the provision of adjacent cycling/walking facilities will improve the connectivity of existing sustainable transport networks, particularly between Sligo and Glencar. Moderately Positive (6)	**6**
	Land use Integration		It is an objective of the County Sligo Development Plan to realign and upgrade the existing N16. The N16 is defined as a Strategic Radial Corridor within the Border Regional Planning Guidelines (2010-2022). It is an important infrastructural element in developing the Region and is defined as a 'key priority' in terms of improvement requirements. Major, or Highly Positive (7)	**7**
	Geographical Integration		The N16 is part of the comprehensive network of routes which support the Trans-European Transport Network. Major, or Highly Positive (7)	**7**
	Other Government Policy Integration		Within the context of the National Spatial Strategy the N16 is as a 'strategic linking corridor', providing North Western International access and access from Sligo through the Central Spine of the Country to the East. Major, or Highly Positive (7)	**7**
			Integration Sub-Total Score	**6.75**

4 Route Option 12 – Project Appraisal MCA

Table 4-1: Route Option 12 – MCA, Environment

Criterion	Sub Criteria	Quantitative Assessment	OPTION 12 - Qualitative Assessment	Score
ENVIRONMENT	Urban Planning	N/A	**South** UP[6] This route would involve very limited encroachment on the planned development areas in the SEDP and LAP. This route is considered to have a relatively neutral effect in urban planning terms of any potential 'barrier' effect of routing national road traffic through the urban area. [Not Significant, or Neutral] (4)	**4**
	Socio Economic		**South** SE The existing N16 would be severed to the north, requiring the occupants of 18 properties to detour up to one kilometre north to a connection with the L-3407-22. However, new community integrity is provided for the numerous properties centred on Doonally Bridge due to the relief in severance at this location. This positive impact does not quite cancel out the impact of the aforementioned new severance at Barroe in the absence of any design modification. The existing N16 would be severed to the south at Fawcett's Bridge and to the north (Willowbrook Bridge). Northbound journeys would require a detour of over one kilometre to the junction between RRO 12 and the L-3407-22. [Not Significant, or Neutral] (4) **Central** SE In this section, impacts on a shot blasting business and a B&B due to any reduction in passing trade is minimised due to its visibility from the road and the availability of nearby access. Access is maintained to the L-7413-0. [Minor, or Slightly Positive] (5) **North** SE In this section, route option 12 severs two sections of the existing N16 compared with only one in the case of options 05 and 08-v2, with relatively adverse but minor implications for farm and leisure cycling and inter-house traffic. The existing N16 is severed south of Gortnagrelly Bridge, being connected instead to the north with imperceptible/slight journey time impacts for two or more properties, but with safer indirect access to the N16 than for the existing alignment. [Minor, or Slightly Positive] (5)	**4.7**
	Noise & Vibration		**South** N&V The new route is located in a less populated area than the current location of the N16 (i.e.: Ribbon Development in Barroe). Therefore, it is expected that there will overall be slight positive benefits. 126 (PIR 504) properties within the 50m corridor band. 8 (PIR 24) properties within the 50-100m corridor band. 26 (PIR 52) properties within the 100m-200m corridor band. 30 properties within the 200m – 300m corridor band. [Not Significant, or Neutral to Minor ,or Slightly Positive] (4.5) **Central** N&V No significant change in terms of noise exposure, or balanced against improvements to existing conditions.	**4.2**

[6] Denotes: Urban Planning

Criterion	Sub Criteria	Quantitative Assessment	OPTION 12 - Qualitative Assessment	Score
			3 (PIR 12) properties within the 50m corridor band. 7 (PIR 21) properties within the 50-100m corridor band. 5 (PIR 10) properties within the 100m-200m corridor band. 0 properties within the 200m – 300m corridor band. [Not Significant, or Neutral] (4) **North** N&V No significant change in terms of noise exposure, or balanced against improvements to existing conditions. 3 (PIR 12) properties within the 50m corridor band. 4 (PIR 12) properties within the 50-100m corridor band. 3 (PIR 6) properties within the 100m-200m corridor band. 11 properties within the 200m – 300m corridor band. [Not Significant, or Neutral] (4) **Overall** Possible requirement for mitigation in 6 locations	
	Air Quality		**South** AQ Negligible Change [Not Significant, or Neutral] (4) **Central** AQ Negligible Change [Not Significant, or Neutral] (4) **North** AQ Negligible Change [Not Significant, or Neutral] (4)	**4**
	Agriculture		**South** AG There will be a High impact on five farm holdings in Barroe, Faughts and Doonally (Calry ED) due to landtake and severance. There will be a Medium impact on a key dairy enterprise in Doonally (Drumcliff East ED) due to landtake and severance. There is a farm house in Doonally (Calry ED) and two farmyards in Doonally (Drumcliff East ED) and Drumkilsellagh that are in close proximity to the route option. The remaining impacts on other farm holdings are Low to Medium. [Moderately Negative, to Major Negative] (1.5) **Central** AG The Refined Route Option will have a High impact on one farm holding in Lugatober arising from direct impacts on the farm house, farmyard and landtake and severance. There is a High impact on three farm holdings in Drumkilsellagh and Lugatober due to landtake and severance. There is a Medium impact on one farm holding in Collinsford due to impact on a workshop, farmyard area and landtake and severance. There is one farm house in Drumcliff East in close proximity to the route option. The impact on remaining farm holdings is Low to Medium. [Moderately Negative] (2) **North** AG There is a Medium impact on one farm holding in Lugnagall and one farm holding in Gortnagrelly due to the landtake and severance impact. The remaining farm holdings will have a Low impact. [Minor, or Slightly Negative] (3)	**2.2**

Criterion	Sub Criteria	Quantitative Assessment	OPTION 12 - Qualitative Assessment	Score
	Non - Agri		**South** N.AG There will be a Medium impact on a property (currently a Day Care Centre) in Faughts due to the impact on the property curtilage, existing property access and garden. There will be a Medium impact on a second property in Doonally due to the impact on existing access. There will be a Low impact on the remaining properties. [Minor, or Slightly Negative] (3) **Central** N.AG There will be a Medium impact on four houses and a separate site on the Drum Road (L-3406-0) due to effects from the route option alignment on the property curtilage. There will be a Low impact on the remaining properties. [Moderately Negative] (2) **North** N.AG There is a Low impact on each of the affected properties. [Minor, or Slightly Negative] (3)	**2.7**
	Flora, Fauna & Fisheries		**South** F&F | F Flora and Fauna – This FRO crosses 23 vegetated field boundaries (principally hedgerows). It is routed principally over improved agricultural grassland save for a wet grassland parcel north of Faughts, scrub on the local road and mixed broadleaf coniferous woodland where it crosses the existing N16 between Doonally and Willowbrook. Effects upon flora and fauna are expected to be of minor or slight negative. [Minor, or Slightly Negative] (3) Fisheries – Significant section of route in Doonally catchment with 1 crossing of main channel and crossings of 2 key tributaries (Lisduff & Lisgorey). It also crosses a 3rd tributary near the source in the Barroe area. Effects upon fisheries are expected to be of a moderate magnitude. [Moderately Negative] (2) **Central** F&F | F Flora and Fauna – This option is not routed over any badger sett through this section. Streams and hedgerows are used as a proxy measure of possible implications upon bats. This FRO crosses 12 vegetated field boundaries (principally hedgerows and a treeline), and an area of mixed broadleaf woodland. Effects upon flora and fauna are expected to be of moderate magnitude. [Moderately Negative] (2) Fisheries - 2 small streams draining to Lower Drumcliff crossed; Tully River also crossed. Effects upon fisheries are expected to be of moderate magnitude. [Moderately Negative] (2) **North** F&F | F Flora and Fauna – From the Lugnagall wetland site the route runs flush with Crockauns/Keelogyboy Bogs NHA along the existing N16 alignment. From the Gortnagrelly wetland-woodland feature, it continues along the existing N16 route as an amalgamated design option of POA Options 2A, 2A/B, 3 and 10. This option does not have a footprint inside Ben Bulben, Gleniff and Glenade Complex SAC. The route crosses a number of discrete habitats of natural value for which County Development Plan policies apply. Effects upon flora and fauna are expected to be minor to moderate in magnitude. [Moderately Negative] (2) Fisheries – In the Northern Section, this route option includes proposed crossings of three tributaries of the Upper Drumcliff River and three tributaries of Glencar Lough. Some of these streams are likely to be inhabited by brown trout in the area of the proposed crossings and therefore fish passage should be considered in the design of culvert or bridge structures. These streams are also a potential pathway for sediment run-off to reach more productive downstream reaches including the Drumcliff River, a noted salmon river discharging from Glencar Lough which forms part of Ben Bulben, Gleniff and Glenade Complex SAC.	**2.3**

Criterion	Sub Criteria	Quantitative Assessment	OPTION 12 - Qualitative Assessment	Score
			[Minor, or Slightly Negative] (3)	
	Hydro and Hydro Geology		**South** H&H Hydrology The southern section of this route intercepts Willsborough stream to the east of N16 road at Willowbrook where the floodplain is not extensive and the river is essentially confined to its river channel. To the north of Faughts in the vicinity of the existing country road an extensive area of pluvial flood risk has been identified which the proposed route traverses. This area is drained westward to the Willsborough stream via a series of small open drains with limited capacity and therefore potential for impact both by encroachment and storm drainage discharges. Hydrogeology In the Southern Section Route Option 12 is the same alignment as Route Options 8-v2 and Option 12(v2). It is relatively similar to Route Option's 02 and 05 in that it avoids the regionally important karst aquifer and passes predominantly through a locally important bedrock aquifer which is generally productive only in local zones. Its alignment to the east of the existing N16 road results in a longer section of the alignment located on higher ground where shallower soils exist, resulting in increased exposure to a bedrock aquifer with high and extreme vulnerability to contamination. The alignment also results in a local deep cuttings near Faughts which is unlikely to reach bedrock but may potentially intercept a perched water table within the overburden layer. North of Doonally similar to all of the route options the regionally important karst aquifer is intercepted from Doonally to Castlegal where vulnerabilities range from high to extreme. North of Castlegal a locally important bedrock aquifer of extreme vulnerability is intercepted by all of the route options. [Minor, or Slightly Negative] (3) **Central & North** H&H H&H Hydrology A number of streams (three small streams) at the northeast end of the scheme feed directly into Glencar Lough which is part of the Ben Bulben, Gleniff and Glenade Complex SAC and pNHA (000623). The others discharge to the Drumcliff River and the Drumcliff-Glebe Stream both of which outfall in to Drumcliff Bay and the SAC/SPA waters. In terms of hydrology the impacts in the northern and central sections of the routes are similar between all the route options and represent a potential moderate impact on flooding and the flow regime and potential significant impact without appropriate mitigation on the water quality to Glencar Lough and a moderate impact to the water quality in the Drumcliff River and Drumcliff-Glebe Stream and a potential slight impact on water quality in Drumcliff Bay SAC. Hydrogeology In the central section this route similar to the other routes results in a potential bedrock cutting into the hill slopes near Castlegal. This option represents the furthest west of the options and results in a smaller length and depth and of bedrock cutting. This cutting still intercepts one of the faultlines at Castlegal which may have a weathered zone that potentially encourages preferential groundwater flow along the faultline. The downstream, groundwater fed Drum East ecological receptor could potentially be impacted by this cutting as the cutting could divert groundwater flow away from the feature. However in comparison to the other options (01A/01B, 02, 05 and 08-v2) this option represents the lowest risk to the feature. The route passes close to, but down-gradient of the petrifying spring annex I habitat that is located just upstream to the east of the existing N16 road at Castlegal and consequently the potential impact to this groundwater fed system by the road construction is expected to be imperceptible. From Lugatober to north of Lugnagall this Option 12 follows the N16 alignment which brings it very close to the Lugnagall ecological receptor with a potential for impact through dewatering during construction when the existing buffering N16 road is excavated to accommodate the proposed route. This potential impact is rated as potentially significant and will require careful construction mitigation and vertical alignment design. At Gortnagrelly the route crosses over the seepage zone that includes petrifying springs and tufa mounds of Annex I Habitat. Without mitigation direct impact by the road alignment on this feature represents a significant impact. To avoid such impacts mitigation in the form of bridge spanning the road over this feature will be required. The required spanning could be of the order of 40 to 50m in order to avoid the seepage zone. Similar, to the other route options it passes up gradient of a number of domestic wells whose water quality could be impacted at Castlegal. At Lugatober the route passes down gradient of identified domestic supply sources and therefore is unlikely to impact these sources. At Gortnagrelly the route passes both down gradient and up gradient of a number of small local well supplies, with no impact anticipated to those located up gradient and potential water quality impacts only to those down-gradient as the road will be in	**2.5**

Criterion	Sub Criteria	Quantitative Assessment	OPTION 12 - Qualitative Assessment	Score
			embankment and should not impact well yield. A private supply from the Gortnagrelly springs has been identified which could be impacted by the road similar to the potential impact described above in regard to the Gortnagrelly Annex I habitat. [Moderately Negative] (2)	
	Soils & Geology		**South** S&G Approximate material deficit (cut/fill) of circa 42,000m^3. 295m of alluvium (potentially soft) encountered. No perceived risk of encountering karstified bedrock. Minor, or Slightly Negative (3) **Central** S&G Approximate material deficit (cut/fill) of circa 96,000m^3. No soft ground encountered. No perceived risk of encountering karstified bedrock. Minor, or Slightly Negative (3) **North** S&G Approximate material deficit (cut/fill) of circa 8,000m^3. No areas of soft ground encountered. No perceived risk of encountering karstified bedrock. Not significant, or Neutral (4)	**3.3**
	Waste		Desktop studies indicate soft ground deposits to be overall marginal in the area. A certified waste disposal site has been identified from desktop studies to occur at Lugnagall, however the route does not intercept. U1 unsuitable material is expected to be generated in cut sections. Minor, or Slightly Negative (3)	**3**
	Landscape & Visual		**South** L V LANDSCAPE Crosses Sligo Lowland Agricultural LCA. Crosses along stream north of Doonally Bridge with visually significant vegetation. Only small embankments required with one larger cut in the southern section. Route has a reasonably good fit in landscape. Moderately Negative (2) VISUAL Visual Impact Index = 75 [Moderately Negative] (2) **Central** L V LANDSCAPE Crosses Sligo Lowland Agricultural LCA and small part of Glencar Valley LCA. Medium embankments required at crossing of N16 as far as L7413-0 and small embankment required within Glencar Valley LCA. Negatively impacts on visually significant vegetation at L3404-0 as with all options. Moderately Negative to Major Negative (1.5) VISUAL Visual Impact Index = 28 [Moderately Negative] (2)	**1.8**

Criterion	Sub Criteria	Quantitative Assessment	OPTION 12 - Qualitative Assessment	Score
			North L V LANDSCAPE Close to N16 but inside Glencar Valley LCA. Runs along existing N16 alignment to County Boundary. Moderate to Major Negative (1.5) VISUAL Visual Impact Index = 25.5 [Moderately Negative] (2)	
	Archaeology & CH		**South (Option 12)** ACH Moderate Negative Impacts on CHC16, CHC28, CHC34, CHC62, CHC63 and CHC64 Moderately Negative (2) **Central** ACH Profound impacts on CHC 11, Ringfort, Significant (Potential indirect) impact on CHC 1, Megalithic tomb, Slight impact on CHC 72. Moderately, to Major Negative (1.5) **North** ACH Profound negative impacts on CHC8 ringfort (partial removal) and CHC27 enclosure (partial removal); Slight negative impact on CHC52 Moderate, to Major Negative (1.5)	**1.7**
	Architectural H		**South** AH Moderately negative impacts on AHC 6, 14, 15 & 16 Moderately Negative (2) **Central** AH Significant impact on AHC 33 bridge Moderately Negative (2) **North** AH Moderately negative impact on AHC 24 (vernacular structure) Minor, or Slightly Negative (3)	**2.3**
Environmental total Index				**38.7**
Environmental average Index				**2.98**

Table 4-2: Route Option 05 – MCA, Safety

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
SAFETY	Collision Reduction		Collision reduction arising from the proposed scheme have been calculated with reference to the Department of Environment publication '*A Guide to Road Safety Engineering in Ireland, 1996 DoE*' and the '*Certificate in Road Safety Audits, 2016 TMS/UCD*'. These publications outline the collision savings predicted with new scheme improvements to be in the region of 30% - 40%. In order to produce a conservative economic assessment of the likely collision reductions arising from the proposed scheme a **30%** reduction factor in collisions over the appraisal period has been applied. This is considered to be generally similar for each of the route options being assessed. The total collision cost savings over the 30 year appraisal period amount to circa €6.8m. This item has not been included in the 'Quantitative Assessment' as a generic approach to each option has been undertaken at Route Selection Stage. Moderately Positive (6)	**6**
	Security		The proposed new route will either include a dedicated cycle/pedestrian track, or will facilitate the use of the existing N16 as a suitable track. Direct domestic and agricultural tracks, will as far as practicable be removed from the national primary route and accommodated via the provision of new improved junction arrangements. Traffic model analysis indicate that the provision of the scheme will not impact on future plans to pedestrianise certain sections of Sligo City. Major, or Highly Positive (7)	**7**
			Safety Sub-Total Score	**6.5**

Table 4-3: Route Option 12 – MCA, Economy

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
ECONOMY	Efficiency and Effectiveness	Forecast Year (2047) **Excl. Safety** Present Value of Costs: €24.140m; Present Value of Benefits: €20.471m; Benefit to Cost Ratio: 0.848; Residual Period (2077) **Excl. Safety** Present Value of Costs: €24.140m; Present Value of Benefits: €29.107m; Benefit to Cost Ratio: 1.206; Minor, or Slightly Negative to Not Significant, or Neutral (3.5)		**3.5**

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
	Wider Economic Impacts		Competition in the market (Neutral) Agglomeration (Neutral) Inward Investment (Neutral) Labour Supply (Neutral) Urban Regeneration (Neutral) Not Significant, or Neutral (4)	**4**
	Transport Quality and Reliability	N16 journey times from the Leitrim boundary to Sligo City Centre Do – Min (2047) AM Peak: 10:12 min (612 sec); Do – Min (2047) Inter Peak: 10:04 min (604 sec); Do – Min (2047) PM Peak: 10:34 min (634 sec); Average: 10:17 min (617 sec) Do – Some (2047) AM Peak: 09:13 min (553 sec); Do – Some (2047) Inter Peak: 09:11 min (551 sec); Do – Some (2047) PM Peak: 09:47 min (587) sec); Average: 09:24 min (564 sec) Journey Time Saving: 0:53 min (53 sec) Moderately Positive, to Minor, or Slightly Positive (5.5)		**5.5**
	Funding Impacts	It is not apparent at the current time as to whether there will be any non-exchequer funding for the project. Therefore a 'Neutral' score is applied.		**4**
			Economy Sub-Total Score	**4.25**

Table 4-4: Route Option 12 – MCA, Accessibility and Social Inclusion

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
ACCESSIBILITY & SOCIAL INCLUSION	Deprived Geographical Areas		The Pobal HP deprivation Index, generally shows the electoral divisions between Sligo and Enniskillen, to be in the 'marginally above average' and 'marginally below average' brackets; that is with the exception of areas in the Drumcliff East and Glencar electoral divisions, which are considered to be affluent based on the results of 2011 CSO data. Minor, or Slightly Positive (5)	**5**
	Vulnerable Groups		The new road scheme will improve journey time and journey reliability to Sligo, however this is appropriately covered under 'Economy'. In this regard, for the purposes of Route Selection comparison, a neutral score is considered appropriate. Not Significant, or Neutral (4)	**4**
			Accessibility & Social Inclusion Sub-Total Score	**4.5**

Table 4-5: Route Option 12 – MCA, Integration

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
INTEGRATION	Transport Integration		The route option as assessed in the 'Traffic and Transport' Assessment provides for a good strategic connection. The project via the provision of adjacent cycling/walking facilities will improve the connectivity of existing sustainable transport networks, particularly between Sligo and Glencar. Moderately Positive (6)	**6**
	Land use Integration		It is an objective of the County Sligo Development Plan to realign and upgrade the existing N16. The N16 is defined as a Strategic Radial Corridor within the Border Regional Planning Guidelines (2010-2022). It is an important infrastructural element in developing the Region and is defined as a 'key priority' in terms of improvement requirements. Major, or Highly Positive (7)	**7**
	Geographical Integration		The N16 is part of the comprehensive network of routes which support the Trans-European Transport Network. Major, or Highly Positive (7)	**7**
	Other Government Policy Integration		Within the context of the National Spatial Strategy the N16 is as a 'strategic linking corridor', providing North Western International access and access from Sligo through the Central Spine of the Country to the East. Major, or Highly Positive (7)	**7**
			Integration Sub-Total Score	**6.75**

5 Emerging Preferred Route – MCA Route Option 05(S)/12(N)

Table 5-1: Option 05(S)/12(N) – MCA, Environment

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
ENVIRONEMENT	Urban Planning	N/A	**South** UP Option 05(S)/12(N) traverses/subdivides a small portion of planned urban areas. The option also maintains routing of national primary traffic through urban streets; however, it would retain the majority of traffic on the planned route avoiding unregulated short cuts, etc. [Minor, or Slightly Negative to Not Significant, or Neutral] (3.5)	**3.5**
	Socio Economic		**South** SE Option 05(S)/12(N) allows traffic from the north to directly access community facilities on the edge of North Sligo such as Sligo IT and transfers more traffic from the existing N16. In doing so it does, however, maintain community severance in this built-up area. This severance is likely to increase over time as traffic volumes increases, but is mitigated by the presence of pedestrian crossings and cycle facilities. It also introduces new severance for Barroe properties and maintains some existing severance at Doonally Bridge, although the introduction of a staggered junction between the L3407-0 and L3407-22 reduces this relative to the existing or do-nothing situation. [Minor, or Slightly positive to Moderately positive] (4.5) **Central** SE Access is provided to the L3406-0 behind a cluster of properties at the existing location. A shot-blasting business and B&B are impacted due to respective effects on passing trade combined with access 1km to the south. [Minor, or Slightly Positive] (5) **North** SE Option 05(S)/12(N) severs two sections of the existing N16, with relatively adverse but minor implications for farm and leisure cycling and inter-house traffic. The existing N16 is severed south of Gortnagrelly Bridge, being connected instead to the north with imperceptible/slight journey time impacts for two or more properties, but with safer indirect access to the N16 than for the existing alignment. [Minor, or Slightly Positive] (5)	**4.8**
	Noise & Vibration		**South** N&V The new route is located in a less populated area than the current location of the N16 (i.e.: Ribbon Development in Barroe). Therefore, it is expected that there will overall be slight positive benefits. 122 (PIR 488) properties within the 50m corridor band. 142 (PIR 426) properties within the 50-100m corridor band. 264 (PIR 528) properties within the 100m-200m corridor band. 244 properties within the 200m – 300m corridor band. [Not Significant, or Neutral to Minor, or Slightly positive] (4.5) **Central** N&V No significant change in terms of noise exposure, or balanced against improvements to existing conditions. 3 (PIR 12) properties within the 50m corridor band. 1 (PIR 3) properties within the 50-100m corridor band. 9 (PIR 18) properties within the 100m-200m corridor band. 0 properties within the 200m – 300m corridor band. [Not Significant, or Neutral] (4) **North** N&V No significant change in terms of noise exposure, or balanced against improvements to existing conditions. 3 (PIR 12) properties within the 50m corridor band. 4 (PIR 12) properties within the 50-100m corridor band. 3 (PIR 6) properties within the 100m-200m corridor band. 11	**4.2**

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
			properties within the 200m – 300m corridor band. [Not Significant, or Neutral] (4) **Overall** Possible requirement for mitigation in 6 locations	
	Air Quality		**South** AQ Negligible Change [Not Significant, or Neutral] (4) **Central** AQ Negligible Change [Not Significant, or Neutral] (4) **North** AQ Negligible Change [Not Significant, or Neutral] (4)	**4**
	Agriculture		AG **South** There will be a High impact on a farm holding on the Drum road (L-3406-0) resulting from a direct impact on a farmyard comprising of animal housing and other facilities. There is a High impact on a Key dairy enterprise due to landtake and severance and the proximity of the alignment to the farmyard. There is a High impact on one farm holding arising from landtake and severance. The remaining impacts on other farm holdings are Low to Medium. [Major, or Highly Negative] (1) AG **Central** At the Drum local road (L-3406-0) the offline link to the N16 will sever lands. There will be a High impact on one farm holding in Castlegal arising from direct[7] impacts on the farm house, landtake and severance. There are three farm houses and one farmyard in close proximity to the route option. There is a High impact on one farm holding due to the severance involved. The impact on remaining farm holdings is mostly Medium. [Major, or Highly Negative, to Moderately Negative] (1.5) **North** AG There is a Medium impact on one farm holding in Lugnagall and one farm holding in Gortnagrelly due to the landtake and severance impact. The remaining farm holdings will have a Low impact. [Minor, or Slightly Negative] (3)	**1.8**
	Non - Agri		**South** N.AG There will be a Medium impact on one property in Barroe due to the impact on the property curtilage and existing access. There will be a Medium impact on a second property in Barroe due to the impact on the property curtilage and existing access. There will be a Low impact on the remaining properties. [Minor, or Slightly Negative] (3) **Central** N.AG There will be a Medium impact on four houses and a separate site on the Drum Road (L-3406-0) on the Drum Road (L-3406-0) due to effects from the route option alignment on the property curtilage. There will be a Low impact on the remaining properties.	**2.7**

[7] A direct impact is the worst case scenario in this instance. The route is immediately proximate to the property rather than directly impacting it; therefore there remains potential to reduce this impact to an indirect one.

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
			[Moderately Negative] (2) **North** N.AG There is a Low impact on each of the affected properties. [Minor, or Slightly Negative] (3)	
	Flora, Fauna & Fisheries		**South** F&F F Flora and Fauna – The route is routed principally over improved agricultural grassland until it passes through mixed broadleaf and mixed coniferous woodland at a crossroads east of Shannon Oughter. Here, side road realignment cuts into wet willow-alder-ash woodland to the west and mixed broadleaf coniferous woodland to the east. Streams and hedgerows are used as a proxy measure of possible implications upon bats. The route crosses 3 watercourses and 13 vegetated field boundaries (principally hedgerows). Effects upon flora and fauna are expected to be minor to moderate in magnitude. [Minor, or Slightly Negative] (3) Fisheries – A significant section of the route occurs in the Doonally River catchment and closely interacts with the main channel over 300-400m section in the Doonally area (behind vet lab). There is one crossing of the main channel and a crossing of a key tributary. There is also a crossing of another tributary near its source in the Barroe area. These crossings raise potential for run-off of sediment. [Moderately Negative] (2) **Central** F&F F Flora and Fauna – Option $05^{(S)}/12^{(N)}$ crosses 13 vegetated field boundaries (principally hedgerows). It crosses a treeline on a watercourse at Castlegal and cuts through broadleaf woodland at Lugatober. It is not routed over any badger sett through this section. Streams and hedgerows are used as a proxy measure of possible implications upon bats. Effects upon flora and fauna are expected to be minor to moderate in magnitude. [Moderately Negative] (2) Fisheries – Option $05^{(S)}/12^{(N)}$ crosses 2 small streams draining to the Drumcliff River. The Tully Stream is also crossed. [Moderately Negative] (2) **North** F&F F Flora and Fauna – From the Lugnagall wetland site the route runs flush with Crockauns/Keelogyboy Bogs NHA along the existing N16 alignment. From the Gortnagrelly wetland-woodland feature, it continues along the existing N16 route. The route will not have a footprint[8] inside Ben Bulben, Gleniff and Glenade Complex SAC. The route crosses a number of discrete habitats of natural value for which County Development Plan policies apply. Effects upon flora and fauna are expected to be minor to moderate in magnitude. [Moderately Negative] (2) Fisheries – In the Northern Section, this route option includes proposed crossings of three tributaries of the Upper Drumcliff River and three tributaries of Glencar Lough. Some of these streams are likely to be inhabited by brown trout in the area of the proposed crossings and therefore fish passage should be considered in the design of culvert or bridge structures. These streams are also a potential pathway for sediment run-off to reach more productive downstream reaches including the Drumcliff River, a noted salmon river discharging from Glencar Lough which forms part of Ben Bulben, Gleniff and Glenade Complex SAC. [Minor, or Slightly Negative] (3)	**2.3**
	Hydro and Hydro Geology		**South** H&H Hydrology The southern section of Option $05^{(S)}/12^{(N)}$ intercepts Willsborough stream to the east of Shannon Oughter. The alignment potentially will result in the road running almost parallel and in close proximity to the stream channel and within the Floodplain for c. 200m. This will result in pushing the effective flood plain area west of the road alignment and	**2.25**

[8] Mitigated by a clear span river bridge.

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
			represents a potential moderate impact on local flooding and flood risk. A link road associated with this option will also require a new bridge crossing of the Willsborough channel and floodplain to the South of Doonally. Some channel diversion and regrading may be required to mitigate the impact on the Willsborough stream and floodplain area. The route crosses the Rathbraghan Stream just downstream of its spring source and a number of small stream / drainage channels in its northerly route to the west of the Existing N16 road to north of Drumkilsellagh. Hydrogeology The southern section of Option $05^{(S)}/12^{(N)}$ avoids the regionally important karst aquifer and passes predominantly through a locally important bedrock aquifer which is generally productive only in local zones. The groundwater vulnerability to contamination ranges in the southern section of this route to be predominantly moderate and increasing to high near Doonally. North of Doonally similar to all of the route options, the regionally important karst aquifer is intercepted from Doonally to Castlegal where vulnerabilities range from high to extreme. North of Castlegal a locally important bedrock aquifer of extreme vulnerability is intercepted by all of the route options. In the southern section a number of small cuttings may be required which are unlikely to reach bedrock and therefore are unlikely to result in any significant dewatering of the local groundwater table. In this south section, to the south of Doonally a number of shallow wells are in proximity to the road but are unlikely to be significantly impacted as the road is at grade or in embankment and the overburden permeability is low. [Moderately Negative, to Minor, or Slightly Negative] (2.5) **Central & North** H&H H&H Hydrology A number of streams (three small streams) at the northeast end of the scheme feed directly into Glencar Lough which is part of the Ben Bulben, Gleniff and Glenade Complex SAC and pNHA (000623). The others discharge to the Drumcliff River and the Drumcliff-Glebe Stream both of which outfall in to Drumcliff Bay and the SAC/SPA waters. In terms of hydrology the impacts in the northern and central sections of the routes are similar between all the route options and represent a potential moderate impact on flooding and the flow regime and potential significant impact without appropriate mitigation on the water quality to Glencar Lough and a moderate impact to the water quality in the Drumcliff River and Drumcliff-Glebe Stream and a potential slight impact on water quality in Drumcliff Bay SAC. Hydrogeology In the central section, Option $05^{(S)}/12^{(N)}$ similar to the other routes results in a potential bedrock cutting into the hill slopes near Castlegal. This option represents the furthest west of the options and results in a smaller length and depth and of bedrock cutting. This cutting still intercepts one of the faultlines at Castlegal which may have a weathered zone that potentially encourages preferential groundwater flow along the faultline. The downstream, groundwater fed Drum East ecological receptor could potentially be impacted by this cutting as the cutting could divert groundwater flow away from the feature. However in comparison to the other options this option represents the lowest risk to the feature. The route passes close to, but down-gradient of the petrifying spring annex I habitat that is located just upstream to the east of the existing N16 road at Castlegal and consequently the potential impact to this groundwater fed system by the road construction is expected to be imperceptible. From Lugatober to north of Lugnagall the route follows the N16 alignment which brings it very close to the Lugnagall ecological receptor with a potential for impact through dewatering during construction when the existing buffering N16 road is excavated to accommodate the proposed route. This potential impact is rated as potentially significant and will require careful construction mitigation and vertical alignment design. At Gortnagrelly the route crosses over the seepage zone that includes petrifying springs and tufa mounds of Annex I Habitat. Without mitigation direct impact by the road alignment on this feature represents a significant impact. To avoid such impacts mitigation in the form of bridge spanning the road over this feature will be required. Similar, to the other route options it passes up gradient of a number of domestic wells whose water quality could be impacted at Castlegal. At Lugatober the route passes down gradient of identified domestic supply sources and therefore is unlikely to impact these sources. At Gortnagrelly the route passes both down gradient and up gradient of a number of small local well supplies, with no impact anticipated to those located up gradient and potential water quality impacts only to those down-gradient as the road will be in embankment and should not impact well yield. A private supply from the Gortnagrelly springs has been identified which could be impacted by the road similar to the potential impact described above in regard to the Gortnagrelly Annex I habitat. [Moderately Negative] (2)	
	Soils & Geology		**South** S&G Approximate material deficit (cut/fill) of circa 177,000m^3. 180m of alluvium (potentially soft) encountered. No perceived risk of encountering karstified bedrock. Moderately Negative (2)	**2.7**

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
			Central S&G Approximate material deficit (cut/fill) of circa 178,000m^3. 70 – 80m of alluvium (potentially soft) encountered. No perceived risk of encountering karstified bedrock. Moderately Negative (2) **North** S&G Approximate material deficit (cut/fill) of circa 8,000m^3. No areas of soft ground encountered. No perceived risk of encountering karstified bedrock. Not significant, or Neutral (4)	
	Waste		Desktop studies indicate soft ground deposits to be overall marginal in the area. A certified waste disposal site has been identified from desktop studies to occur at Lugnagall, however the route does not intercept. U1 unsuitable material is expected to be generated in cut sections. Minor, or Slightly Negative (3)	**3**
	Landscape & Visual		**South** L V Crosses Sligo Lowland Agricultural LCA. Crosses along stream north of Doonally Bridge with visually significant vegetation. Only small cuttings and embankments required and has a reasonably good fit in landscape. Minor, or Slightly Negative to Moderately Negative (2.5) VISUAL Visual Impact Index = 77.5 [Moderately Negative] (2) **Central** L V Crosses Sligo Lowland Agricultural LCA and small part of Glencar Valley LCA. Very small embankments required at crossing of L7413-0 as far as L34041-0 and no embankments/cuttings required within Glencar Valley LCA. Negatively impacts on visually significant vegetation at L3404-0 as with all options. [Moderately Negative to Major Negative] (1.5) VISUAL Visual Impact Index = 20 [Moderately Negative] (2) **North** L V LANDSCAPE Close to N16 but inside Glencar Valley LCA. Runs along existing N16 alignment to County Boundary. [Moderately Negative to Major, or Highly Negative] (1.5) VISUAL Visual Impact Index = 25.5 [Moderately Negative] (2)	**1.9**
	Archaeology & CH		**South** ACH Significant negative Impacts on CHC47 Mill Race; Moderate Impacts on CHC62 & CHC63; Slight Impacts on CHC76 & CHC77 [Moderately Negative to Major, or Highly Negative] (1.5)	**2**

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
			Central ACH Slight Impacts on CHC11 Ringfort & CHC72 Old Road [Minor, or Slightly Negative] (3) **North** ACH Profound negative impacts on CHC8 ringfort (partial removal) and CHC27 enclosure (partial removal); Slight negative impact on CHC52 [Moderately Negative to Major, or Highly Negative] (1.5)	
	Architectural H		**South** AH Significant impact on AHC 14, 15 & 35. Moderate impact on AHC 19. [Moderately Negative to Major, or Highly Negative] (1.5) **Central** AH Significant Impact on AHC 33. [Moderately Negative to Major, or Highly Negative] (1.5) **North** AH Moderately negative impact on AHC 24 (vernacular structure) [Minor, or Slightly Negative] (3)	**2**
Environmental total Index				**37.15**
Environmental average Index				**2.86**

Table 5-2: 05(S)/12(N) Preferred Route – MCA, Safety

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
SAFETY	Collision Reduction		Collision reduction arising from the proposed scheme have been calculated with reference to the Department of Environment publication '*A Guide to Road Safety Engineering in Ireland, 1996 DoE*' and the '*Certificate in Road Safety Audits, 2016 TMS/UCD*'. These publications outline the collision savings predicted with new scheme improvements to be in the region of 30% - 40%. In order to produce a conservative economic assessment of the likely collision reductions arising from the proposed scheme a **30%** reduction factor in collisions over the appraisal period has been applied. This is considered to be generally similar for each of the route options being assessed. The total collision cost savings over the 30 year appraisal period amount to circa €6.8m. This item has not been included in the 'Quantitative Assessment' as a generic approach to each option has been undertaken at Route Selection Stage. Moderately Positive, to Major or Highly Positive (6.5) This option received a higher index ranking of 0.5 greater than option 12, for the following reasons: ➢ The RSIA and the Road Safety Audit Stage F, both rank Option 05 as being a high preference option;	**6.5**
	Security		The proposed new route will either include a dedicated cycle/pedestrian track, or will facilitate the use of the existing N16 as a suitable track. Direct domestic and agricultural tracks, will as far as practicable be removed from the national primary route and accommodated via the provision of new improved junction arrangements. Traffic model analysis indicate that the provision of the scheme will not impact on future plans to pedestrianise certain sections of Sligo City. Major, or Highly Positive (7)	**7**
			Safety average Index	**6.75**

Table 5-3: Option 05(S)/12(N) – MCA, Economy

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
ECONOMY	Efficiency and Effectiveness	Forecast Year (2047) **Excl. Safety** Present Value of Costs: €25.827m; Present Value of Benefits: €25.618m; Benefit to Cost Ratio: 0.992; Not Significant, or Neutral (4) *Residual Period (2077)* ***Excl. Safety*** *Present Value of Costs: €25.827m;* *Present Value of Benefits: €34.432m;* *Benefit to Cost Ratio: 1.333;*		**4**
	Wider Economic Impacts		Competition in the market (Neutral) Agglomeration (Neutral) Inward Investment (Neutral)	**4**

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
			Labour Supply (Neutral) Urban Regeneration (Neutral) Not Significant, or Neutral (4)	
	Transport Quality and Reliability	N16 journey times from the Leitrim boundary to Sligo City Centre Do – Minimum (2047) AM Peak: 10:12 minutes; Do – Minimum (2047) PM Peak: 10:34 minutes; Average: 10:23 minutes Do – Something (2047) AM Peak: 08:47 minutes; Do – Something (2047) PM Peak: 09:42 minutes; Average: 09:14 minutes Journey Time Saving: 01:09 minutes Moderately Positive (6)		**6**
	Funding Impacts	It is not apparent at the current time as to whether there will be any non-exchequer funding for the project. Therefore a 'Neutral' score is applied.		**4**
			Economy average Index	**4.5**

Table 5-4: Option 05(S)/12(N) – MCA, Accessibility and Social Inclusion

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
ACCESSIBILITY & SOCIAL INCLUSION	Deprived Geographical Areas		The Pobal HP deprivation Index, generally shows the electoral divisions between Sligo and Enniskillen, to be in the 'marginally above average' and 'marginally below average' brackets; that is with the exception of areas in the Drumcliff East and Glencar electoral divisions, which are considered to be affluent based on the results of 2011 CSO data. Minor, or Slightly Positive (5)	**5**
	Vulnerable Groups		The new road scheme will improve journey time and journey reliability to Sligo, however this is appropriately covered under 'Economy'. In this regard, for the purposes of Route Selection comparison, a neutral score is considered appropriate. Not Significant, or Neutral (4)	**4**
			Accessibility & Social Inclusion average Index	**4.5**

Table 5-5: Option 05(S)/12(N) – MCA, Integration

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
INTEGRATION	Transport Integration		The route option as assessed in the 'Traffic and Transport' Assessment provides for a good strategic connection. The project via the provision of adjacent cycling/walking facilities will improve the connectivity of existing sustainable transport networks, particularly between Sligo and Glencar. Moderately Positive (6)	**6**
	Land use Integration		It is an objective of the County Sligo Development Plan to realign and upgrade the existing N16. The N16 is defined as a Strategic Radial Corridor within the Border Regional Planning Guidelines (2010-2022). It is an important infrastructural element in developing the Region and is defined as a 'key priority' in terms of improvement requirements. Major, or Highly Positive (7)	**7**
	Geographical Integration		The N16 is part of the comprehensive network of routes which support the Trans-European Transport Network. Major, or Highly Positive (7)	**7**
	Other Government Policy Integration		Within the context of the National Spatial Strategy the N16 is as a 'strategic linking corridor', providing North Western International access and access from Sligo through the Central Spine of the Country to the East. Major, or Highly Positive (7)	**7**
			Integration average Index	**6.75**