

Leitrim County Council
**N4 Carrick-on-Shannon to
Dromod Project**
Option Selection Report

274219-ARUP-02-OS-RP-YE-000025

P07 | 14 March 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 274219-ARUP-02-OS-RP-YE-000011

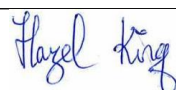
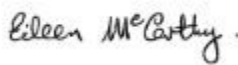
Ove Arup & Partners Ireland Ltd

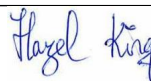
Arup
50 Ringsend Road
Dublin 4
D04 T6X0
Ireland
www.arup.com

ARUP

Document verification

ARUP

Job title		N4 Carrick-on-Shannon to Dromod Project		Job number	
Document title		Option Selection Report		274219-ARUP-02-OS-	
				File reference	
Document ref		274219-ARUP-02-OS-RP-YE-000025			
Revision	Date	Filename			
P01	01 Nov 2021	Description	First draft		
			Prepared by	Checked by	Approved by
		Name	Lisa Hanly	Hazel King	Eileen McCarthy
		Signature			
P02	09 March 2022	Filename			
		Description	Response to client review		
			Prepared by	Checked by	Approved by
		Name			
P03	11 March 2022	Filename			
		Description	Issue for Peer Review		
			Prepared by	Checked by	Approved by
		Name			
P04	22 July 2022	Filename	274219-ARUP*02-OS-RP-YE-000025		
		Description	Final OSR Draft Tracked Changes		
			Prepared by	Checked by	Approved by
		Name	Lisa Hanly	Mary Hurley	Eileen McCarthy
P05	22 July 2022	Signature			
		Filename	274219-ARUP*02-OS-RP-YE-000025		
		Description	Final OSR Draft		
			Prepared by	Checked by	Approved by
P05	22 July 2022	Name	Lisa Hanly	Mary Hurley	Eileen McCarthy
		Signature			

P06	14 March 2023	Filename	274219-ARUP*02-OS-RP-YE-000025		
		Description	Final OSR (With tracked Changes)		
			Prepared by	Checked by	Approved by
		Name	Lisa Hanly	Hazel King	Eileen McCarthy
		Signature			
P07	14 March 2023	Filename	274219-ARUP*02-OS-RP-YE-000025		
		Description	Final OSR		
			Prepared by	Checked by	Approved by
		Name	Lisa Hanly	Hazel King	Eileen McCarthy
		Signature			



Contents

	Page
7 Stage 1 Option Corridors Assessment	411
7.1 Introduction	411
7.2 Findings from Public Consultation No. 2	424
7.3 Stage 1 Engineering Assessment of Options	425
7.4 Stage 1 Road Safety Impact Assessment	453
7.5 Stage 1 Environmental Assessment of Options	455
7.6 Stage 1 Options – Economic Assessment of Option Corridors	726
7.7 Framework Matrix	734
7.8 Recommendation	749

7 Stage 1 Option Corridors Assessment

7.1 Introduction

7.1.1 Overview

This chapter details the assessment of the Stage 1 Option Corridors identified as part of the road alternative which were considered for their potential to deliver or contribute towards a sustainable transport solution along the N4 corridor between Carrick-on-Shannon and Dromod. An *option*, as defined in TII PAG Unit 4.0¹ (*Consideration of Alternatives and Options*), refers to a specific road-based measure (new route, road upgrade, junction improvements etc.). An option corridor is defined as a corridor within which the existing road could be maintained, optimised, and improved or new road infrastructure could be constructed. The Stage 1 Assessment of the remaining alternatives is documented in Chapter 6 of this report and the road alternative is not compared against those alternatives.

The option corridors were assessed under the criteria of Engineering, Environmental and Economy in this chapter. The Stage 1 Option Corridors are described in Section 7.1.2. and shown on Figures 7.1.1.1. Section 7.1.3 outlines the broad methodology utilised to carry out the assessment of option corridors.

7.1.2 Description of Option Corridors

A total of 10 option corridors have been taken forward for Stage 1 Assessment. Of these, six option corridors are to the west of Node J at Drumsna Junction (Blue West, Cyan, Orange, Purple West, Dark Green and Black) and four option corridors are to the east of Node J (Blue East, Green, Yellow and Purple East). The option corridors are presented in the order that they were incrementally developed with the Blue Option Corridor west and east of Drumsna Junction representing the minimal intervention option plus the maximum reuse of the existing infrastructure. The Management Option was brought through the initial sifting even though it was apparent that it would have difficulty in meeting some of the project objectives, especially in the urban area. However, it was brought through Stage 1, in line with PAG Unit 4, to ensure that an equivalent assessment of it was completed to inform the true viability of the option in more detail than the sifting exercise. All other option corridors include varying portions of new infrastructure. Figure 7.1.1.1 presents an overview of the option corridors and nodes. A flowchart showing the Stage 1 assessment process is provided in Plate 7.1.1.

¹ Transport Infrastructure Ireland, 2016. Project Appraisal Guidelines for National Roads Unit 4.0- Consideration of Alternatives and Options PE-PAG-02013 October 2016. Available from: <https://www.tiipublications.ie/library/PE-PAG-02013-01.pdf>

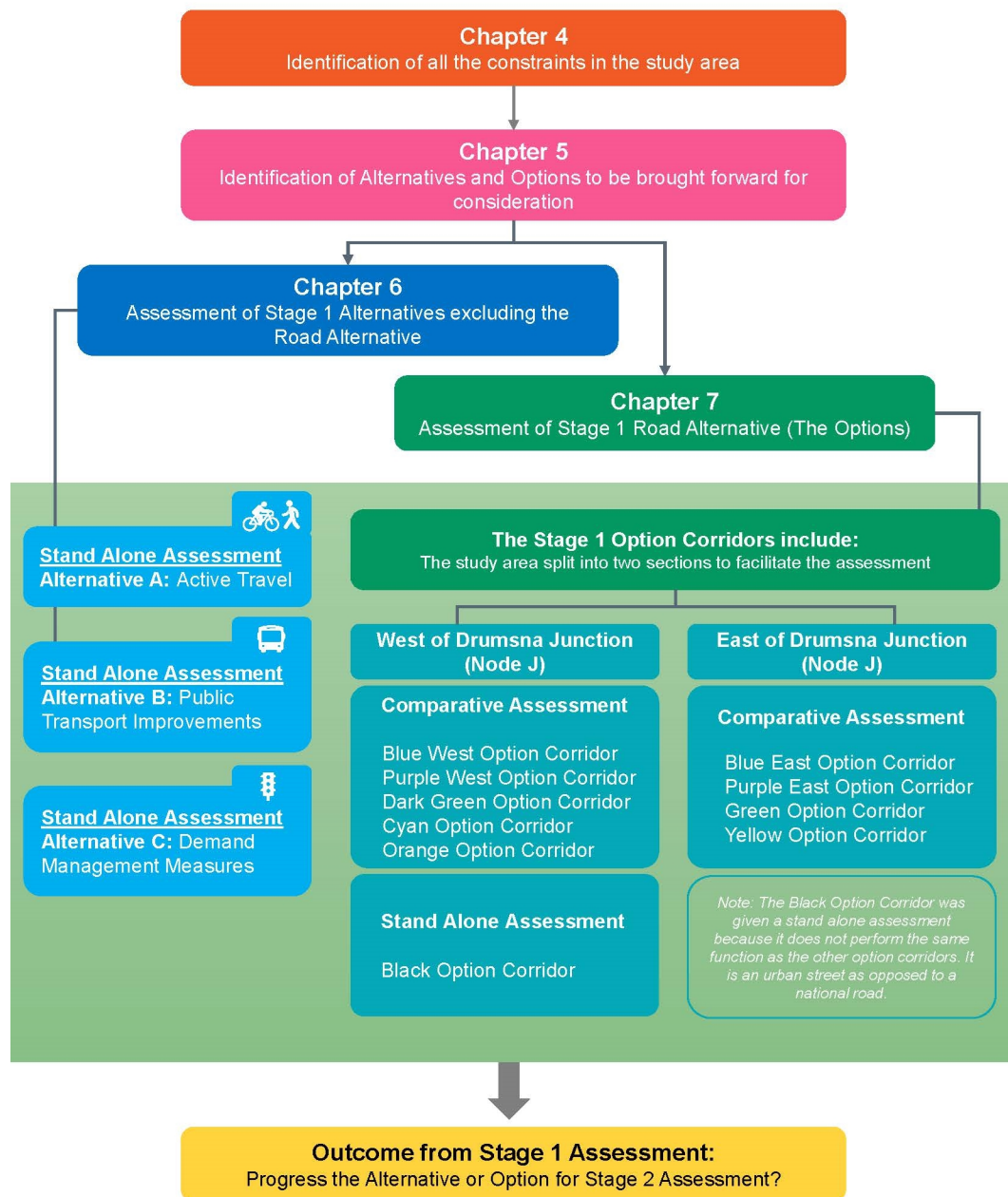


Plate 7.1.1 Stage 1 Assessment Process Flowchart

7.1.2.1 Option Corridors West of Drumsna Junction (Node J)

Cyan Option Corridor

The Cyan Option Corridor is an off-line proposal, south of the existing N4 which deviates from the existing N4 at Cloongownagh at Node A approximately 2.3km to the northwest of Cortober, Co. Roscommon. It progresses in an easterly direction and has a link back connecting to the existing N4 at Node B at Tumna. It continues eastwards in proximity to the existing railway line, crosses the R368 east of the railway station at Node C, crosses the River Shannon at Cordrehid and rejoins the existing N4 at a junction at Lissenghan at Node D. The existing N4 between Lissenghan at Node D and Drumsna Junction at Node J will be subject to an on-line upgrade as shown on Plate 7.1.2.

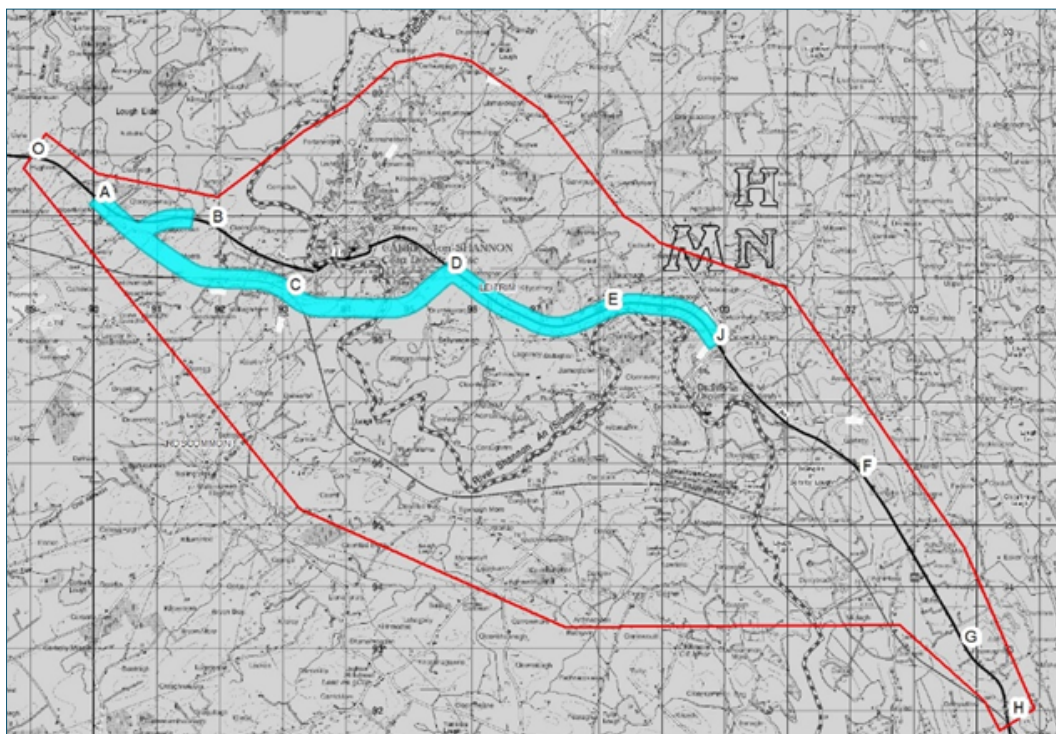


Plate 7.1.2 Cyan Option Corridor

Orange Option Corridor

The Orange Option Corridor commences at Node B where it deviates from the existing N4 at Meera approximately 1.0km to the northwest of Cortober. It continues to the rear of the West Gate Business Park, crossing the R368 east of the railway station at Node C. It crosses the River Shannon at Cordrehid and rejoins the existing N4 at a junction at Lissenghan at Node D before following the existing N4 to the Drumsna Junction at Node J. An on-line upgrade is proposed for the existing N4 between Lissenghan at Node D and Drumsna Junction at Node J as shown on Plate 7.1.3.

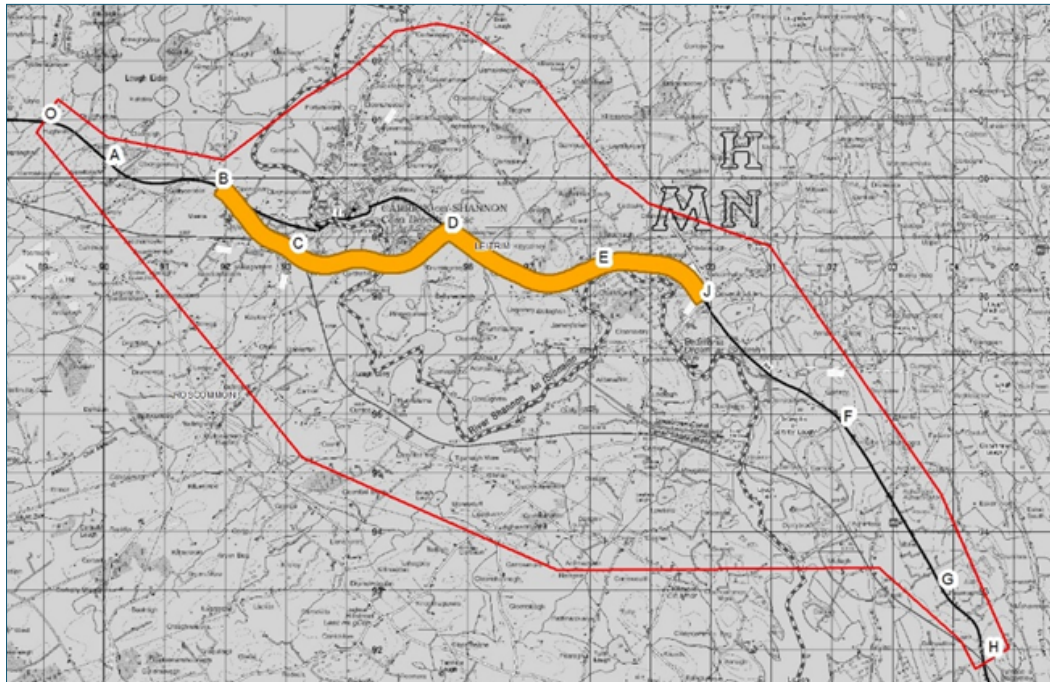


Plate 7.1.3 Orange Option Corridor

Purple West Option Corridor

The Purple Option Corridor is located north of the existing N4 and deviates from the N4 at Tumna at Node B approximately 1.5km to the northwest of Cortober. It continues north-eastwards, with a junction at the R280 at Cartown. It continues south-eastwards and rejoins the existing N4 at a junction at Tully at Node E. It then continues with an on-line upgrade of the existing N4 to the Drumsna Junction at Node J as shown on Plate 7.1.4.

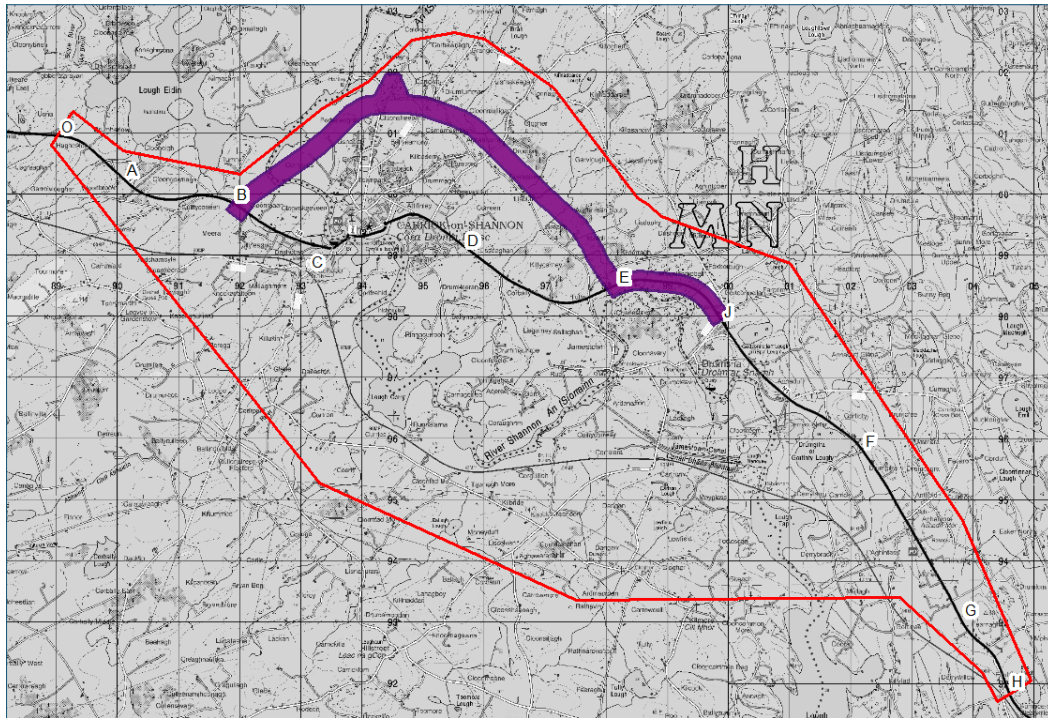


Plate 7.1.4 Purple West Option Corridor

Dark Green Option Corridor

The Dark Green Option Corridor deviates from the existing N4 at Tumna at Node B approximately 1.5km to the northwest of Cortober. It continues north-eastwards, crossing the River Shannon at Corryolus, and meets the R280 at a junction at Cartown. It continues south-eastwards and rejoins the existing N4 at the Drumsna Junction at Node J as shown on Plate 7.1.5.

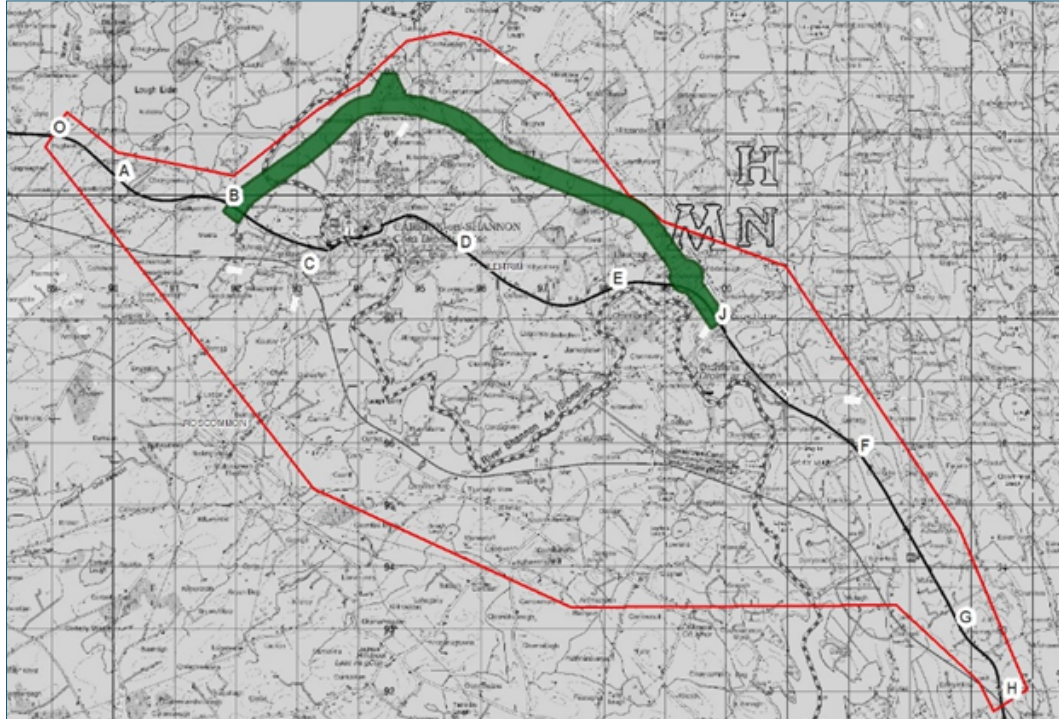


Plate 7.1.5 Dark Green Option Corridor

Blue West Option Corridor

The Blue West Option Corridor comprises the Management Option which considers interventions on the existing infrastructure to address the identified transport problems. It commences at Node O in Usna and follows the existing N4 to Node J at Drumsna Junction as shown on Plate 7.1.6. It includes a rationalisation of a number of junctions and private accesses between Cloonman & Drumsna Junction, and also includes an upgrade of the existing roundabouts to signalised junctions.

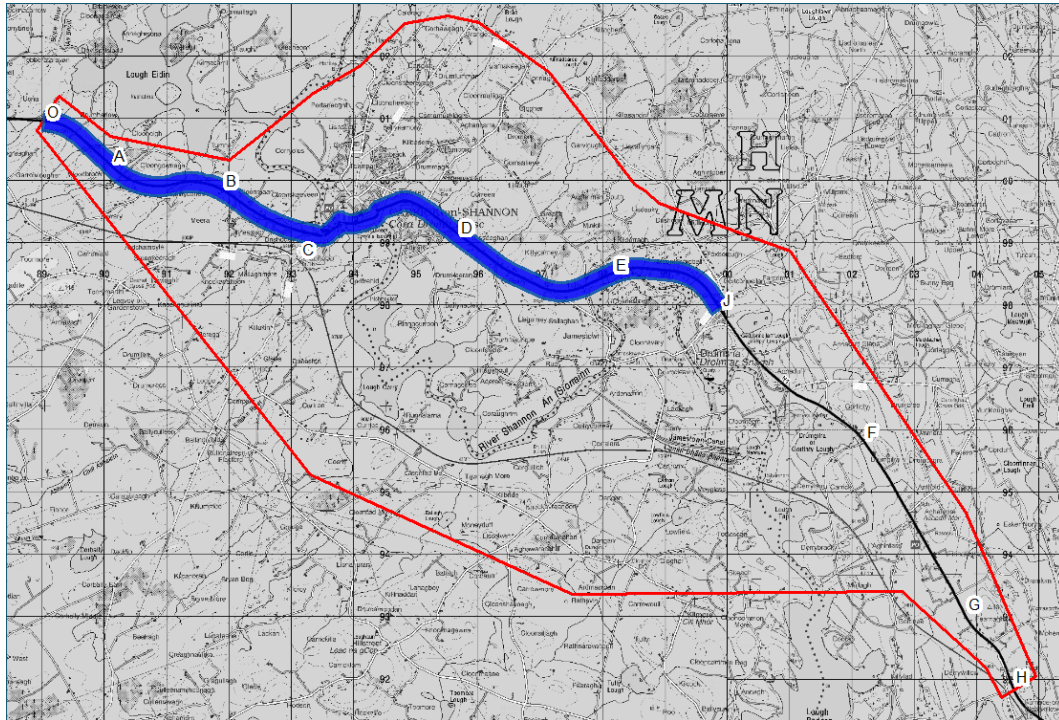


Plate 7.1.6 Blue West Option Corridor

Black Option Corridor

The Black Option Corridor comprises an urban street improvement within Carrick-on-Shannon. It was identified initially for its potential to address the lack of connectivity between the R280, Summerhill Road, Castlecara Road and onto the N4. As part of the Option Sifting process (See Appendix A.5.2.3), the Black Option was tested to establish whether it alone can address the project objectives thus negating the need to invest more significantly in an off-line bypass option corridor. It was then tested in combination with an off-line bypass to understand whether it retains a function even if an off-line bypass is also required. Given the location of this option corridor within the urban environment, and its function to provide connectivity for all modes in the northwest of the town, this option corridor was assessed as an urban street with the physical infrastructure required to support active travel measures. This option corridor is shown on Plate 7.1.7.

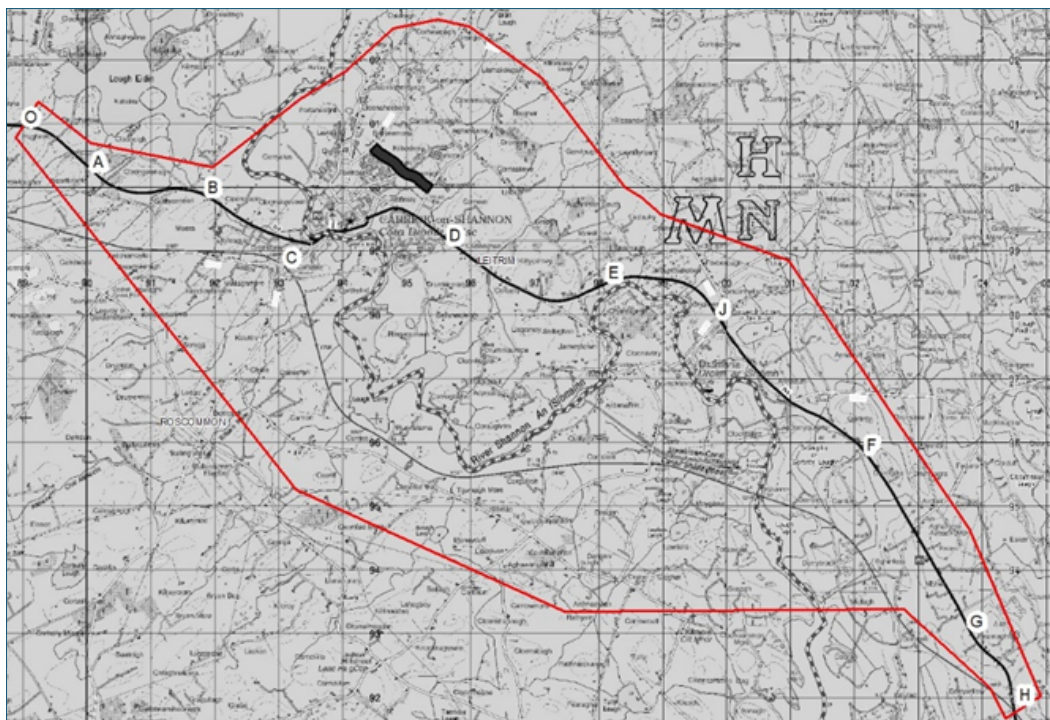


Plate 7.1.7 Black Option Corridor

7.1.2.3 East of Drumsna Junction (Node J)

Green Option Corridor

The Green Option Corridor comprises a full on-line upgrade of the existing N4 single carriageway between Lissenghan at Node J and Faulties at Node H as shown on Plate 7.1.8.

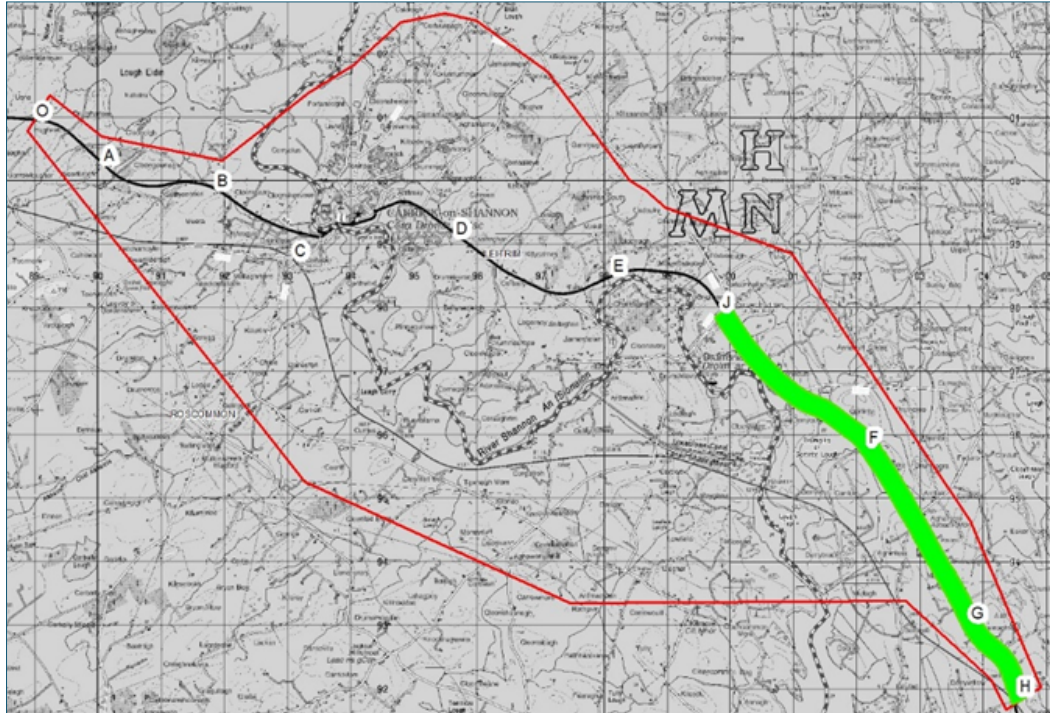


Plate 7.1.8 Green Option Corridor

Yellow Option Corridor

The Yellow Option Corridor comprises an on-line upgrade of the existing N4 single carriageway between Lissenghan at Node J and Fernaught, with a short off-line section proposed between Fernaught at Node G and Faulties at Node H as shown on Plate 7.1.9.

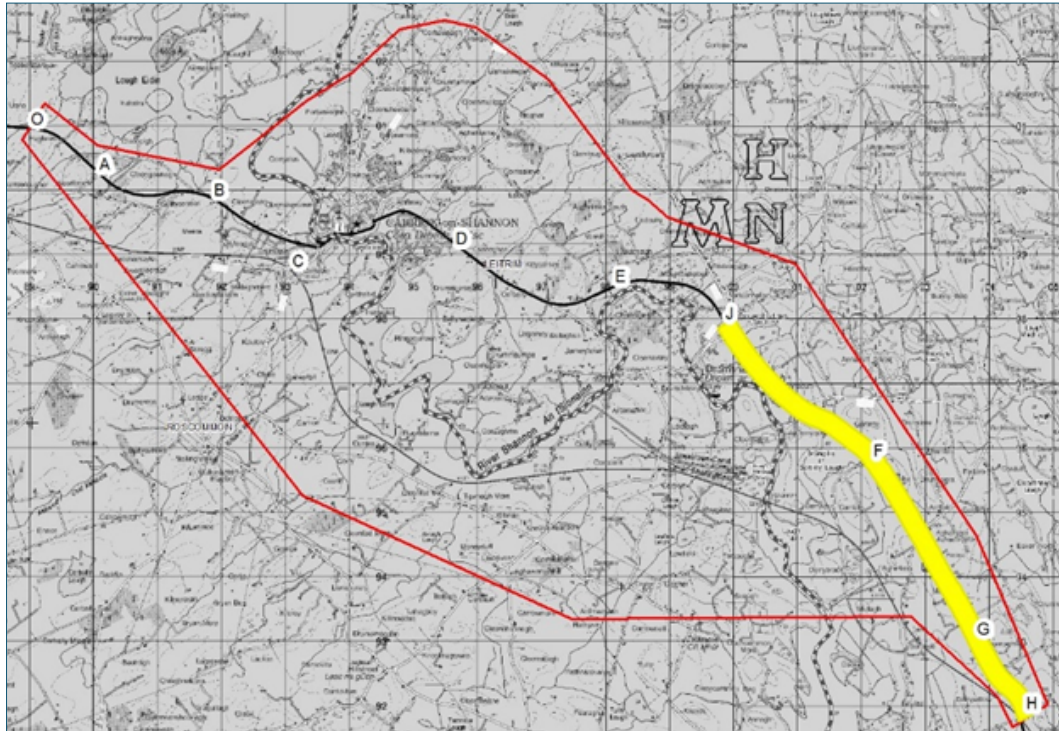


Plate 7.1.9 Yellow Option Corridor

Purple East Option Corridor

The Purple Option Corridor comprises an on-line upgrade of the existing N4 between Drumsna Junction at Node J and Drumgildra at Node F. A short off-line deviation to the east of Aghamore is proposed between Nodes F and G with the remaining N4 upgraded between Aghamore at Node G and Faulties at Node H as shown on Plate 7.1.10.

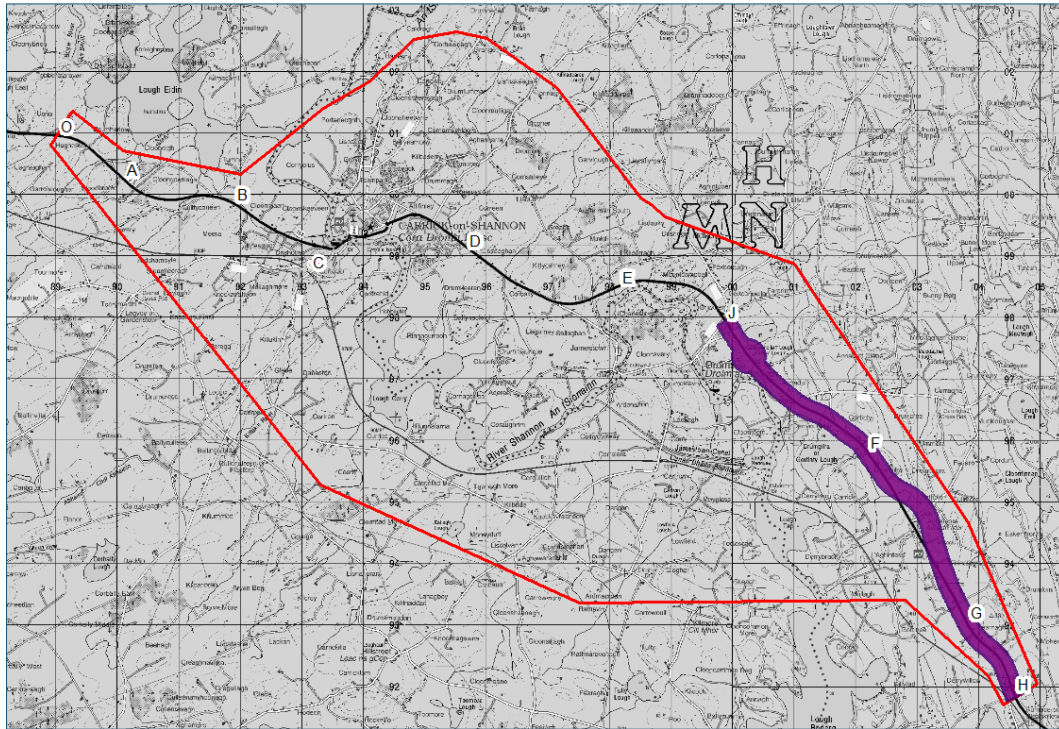


Plate 7.1.10 Purple East Option Corridor

Blue East Option Corridor

The Blue Option Corridor comprises the Management Option which considers interventions on the existing infrastructure to address the identified transport problems. It does not propose a full on-line upgrade as per the Green Option Corridor, but it does involve rationalising accesses which are directly on to the N4 and this would include the provision of some parallel access roads, albeit less extensive than the Green Option Corridor. It follows the existing N4 between Node J at Drumsna Junction and Faulties at Node H as shown on Plate 7.1.11.

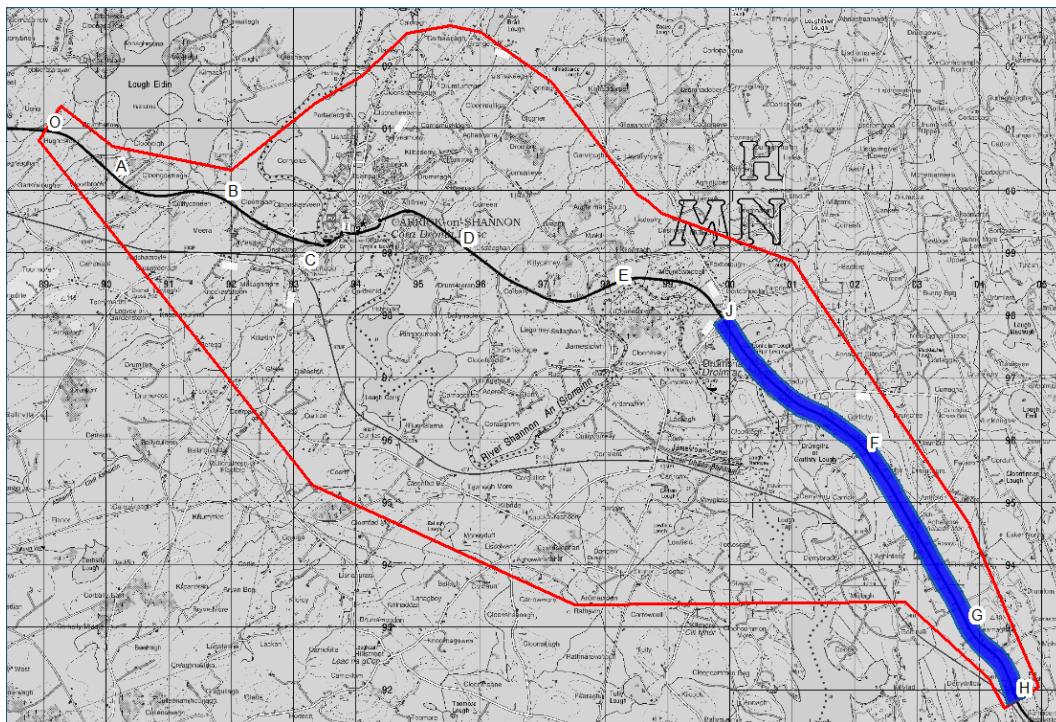


Plate 7.1.11 Blue East Option Corridor

7.1.3 Assessment Methodology of Option Corridors

The Stage 1 Assessment of these option corridors is undertaken under the assessment criteria of Engineering, Environment and Economy. It is a comparative assessment and requires consideration by each specialist. Each specialist will define the assessment criteria based on their expert opinion and best practice. Cognisance will be given to Chapter 3 of the Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis (PAG, 2016)² on what to include as sub-criteria.

The assessment was undertaken on 300m wide corridors, while taking cognisance of the design and the indicative fenceline within the corridor, for all option corridors with the exception of the Black Option Corridor which used a 150m wide corridor.

The assessments were split into two sections west of Drumsna Junction (Node J) and east of Drumsna Junction (Node J). After the initial option sifting process, it was determined that a road based transport solution along the section of the N4

² Transport Infrastructure Ireland, 2016. Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis. Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

under consideration would seek to maintain/utilise the existing Drumsna Junction overbridge. This resulted in a common point (Node J) where all options converge, making this point the ideal location to split the assessment.

The cross-section has not yet been determined however, a fenceline has been developed within the corridor which predicts the worst-case landtake scenario within which a road design could sit accounting for earthworks, attenuation ponds etc. which was utilised for the assessment of all topics under the Engineering, Environmental criteria. As the cross-section has not yet been determined, in an effort to understand the cost implications of the various scenarios, the Economy section assesses the minimum cross-section i.e. the Management Option, in addition to a Type 1 Single Carriageway and a Type 2 Dual Carriageway. Cost estimates are presented for each. This is further developed in the Stage 2 Economy assessment.

As set out in the National Development Plan 2021 – 2030, the intervention hierarchy prioritises the maintenance of the existing network, followed by optimising its use before moving to new infrastructure i.e. maintain, optimise, improve, new. Upgrades to existing infrastructure or investment in new road networks will be considered where other interventions have been demonstrated to be inadequate at meeting the Project Objectives, with an increasing level of cost occurring as move from optimise to improve to new infrastructure. Therefore, it is also necessary to assess the incremental build-up of intervention when considering the Economy criterion as there are significant differences in cost depending on the level of intervention.

As noted above the Blue Option Corridor represents the Management Option which comprises the maximum reuse of the existing infrastructure. All the remaining option corridors include a portion of new infrastructure. Two design scenarios were developed to inform the assessment of what is the appropriate level of intervention required to provide the optimum transport solution. These design scenarios were developed using a single carriageway and a dual carriageway cross-section. These two design scenarios were assessed under the Economy criteria only. The Environmental assessment was undertaken using the dual carriageway cross-section to ensure that the worst-case impacts are assessed. In the final compilation of the matrix for Stage 1 assessment, the Economy assessment will also present the costs which align with the Environment and Engineering assessments. Figures 7.3.2.0 to 7.3.15.6 show the option corridors with the two design scenarios.

7.2 Findings from Public Consultation No. 2

Public participation is an important part of the development of a project and in particular during the early phases of a project. Public Consultation No. 2 took place between the 19 May 2021 and 25 June 2021 to inform the public of feasible alternatives and options identified and seek their feedback and suggestions on same. This consultation formed part of the option selection process. As this consultation included both Alternative and Options the findings are included in Section 6.2 Findings from Public Consultation No.2 of this report and not repeated here.

7.3 Stage 1 Engineering Assessment of Options

7.3.1 Introduction

As part of the Option Selection Process, an assessment of the engineering methods employed for the preliminary design of each option corridor is required to establish the most preferred option from a purely engineering perspective. A number of criteria have been selected to assess the option corridors based on engineering parameters.

This section details the Stage 1 Assessment of the Option Corridors with respect to the engineering constraints identified in Section 4 Engineering of this report. Section 7.3.2 outlines the methodology that was used to carry out the study and Section 7.3.3 details the options assessment. A summary of the assessment is presented in Section 7.3.4.

The option corridors are assessed in two sections, west and east of Node J at Drumsna Junction. The assessment is mindful that any design scenario could be realigned within its corridor and therefore the overall impact of the option is also assessed to identify possible impacts within the 300m wide corridor.

7.3.2 Methodology

The engineering assessment criteria have been identified under the following headings: Geometry, Trip Length, Junction Strategy, Constructability and Traffic. The various assessment methodologies employed under each of these headings are outlined in Section 7.3.3.

The assessment of each of the option corridors under the above criteria is included in the summary assessment matrix and includes both quantitative and qualitative assessments. Each criterion shall be scored based on the seven-point scale and an integer shall be assigned according to the impact levels listed in Table 7.3.1 below:

Table 7.3.1 TII PAG Unit 7.0 Multi Criteria Analysis Seven Point Scale

Assessment Score	Description
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

A ranking was then given as Preferred, Intermediate, or Least Preferred.

A number of option corridors with the potential for road based solutions have been taken forward to the Stage 1 Preliminary Options. Six option corridors are to the west of Node J at Drumsna Junction (Cyan, Orange, Purple West, Dark Green, Blue West and Black) and four option corridors are to the east of Node J (Purple East, Green, Yellow and Blue East). Each option corridor converges at Node J, therefore, the assessment will score, rank and compare the Cyan, Orange, Purple West, Dark Green and Blue West Option Corridors to the west of Node J at Drumsna Junction, and east of Node J at Drumsna junction the assessment will score, rank and compare the Purple East, Green, Yellow and Blue East Option Corridors.

7.3.3 Stage 1 - Engineering Assessment of Options

7.3.3.1 Geometry

The geometric assessment comprises the calculation of the percentage of the length of each option corridor that achieves at least desirable minimum curvature, both horizontally and vertically to ensure that what is designed is safe.

Each option corridor has been assessed on its horizontal and vertical components and was scored on the worst-case scenario. Where an option achieves at least desirable minimum horizontal and vertical curvature, a score of 7 was given. An alignment achieving between 95% and 100% desirable curvature received a score of 6, and so on in decreasing increments of 5% until any alignment, horizontal or vertical, below 75% would receive a score of 1.

Stage 1 Geometric Assessment of Option Corridors West of Drumsna Junction (Node J)

The Black Option Corridor has been assessed separately as a standalone assessment. The Black Corridor achieves 100% desirable curvature and is given a score of 7.

Table 7.3.2 Geometric Assessment of the Option Corridors West of Node J at Drumsna Junction

Option Corridor	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Cross-section Assessed	Dual Carriageway	Dual Carriageway	Dual Carriageway	Dual Carriageway	Management Option	Urban Street
Geometry						
% Horizontal Des. Min. Curvature	100%	100%	100%	100%	81%	100%
% Vertical Des. Min. Curvature	100%	100%	100%	100%	98%	100%
Scoring						
PAG Score	7	7	7	7	3	7
Preference	Preferred	Preferred	Preferred	Preferred	Least Preferred	N/A

The Cyan, Orange, Purple West and Dark Green Option Corridors achieve 100% desirable minimum curvature both horizontally and vertically. Therefore, these options ranked equally as Preferred. The Blue West Option Corridor, which represents the existing mainline, consists of a horizontal geometry achieving less than 85% desirable curvature. Scoring only 3, the Blue West Option Corridor is ranked Least Preferred.

Stage 1 Geometric Assessment of Option Corridors East of Drumsna Junction (Node J)

Table 7.3.3 Geometric Assessment of the Option Corridors East of Node J at Drumsna Junction

Option Corridor	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Cross-section Assessed	Single Carriageway	Single Carriageway	Dual Carriageway	Management Option
Geometry				
% Horizontal Des. Min. Curvature	100%	100%	100%	84.9%
% Vertical Des. Min. Curvature	100%	100%	100%	90.1%
Scoring				
PAG Score	7	7	7	3
Preference	Preferred	Preferred	Preferred	Least Preferred

7.3.3.2 Trip Length

Methodology

The Trip Length parameter does not measure the length of new construction of an option, it is a measure of the travel distance from a common start point to a common end point. For West of Drumsna Junction, the measure is from Node O (most westerly point on all of the option corridors) to Node J (Drumsna Junction) and East of Drumsna Junction the measure is from Node J to Node H (most easterly point on all option corridors) with respect to each of the option corridors.

The trip lengths of each option corridor are tabulated and assessed in Table 7.3.4 and Table 7.3.5. Scores were based around the existing trip length (Blue Option Corridor) west and east of Node J at Drumsna Junction respectively. The existing trip length is given a score of 4 (neutral). A trip length within $\pm 10\%$ of the existing situation received a score of 3 or 5 respectively. A trip length between $\pm 10\%$ and $\pm 20\%$ of the existing situation received a score of 2 or 6 respectively. A score of 1 or 7 was given to an option having a trip length more than $\pm 20\%$ of the existing situation.

Stage 1 Trip Length Assessment of Option Corridors West of Drumsna Junction (Node J)

The Blue West Option Corridor offers the shortest trip length west of Node J at Drumsna Junction. However, this option would see traffic continue to travel through Carrick-on-Shannon. By their nature, each of the option corridors bypassing Carrick-on-Shannon would result in a greater trip length; although, none of which exceed 10% longer than the existing situation.

The Black Option Corridor was not scored under this assessment criteria as it does not pass through Nodes O or J. If the Black Corridor alone was to be implemented, the existing N4 mainline and trip length through Carrick-on-Shannon would remain as it is currently.

Table 7.3.4 Trip Length Assessment of the Option Corridors West of Node J at Drumsna Junction

Option Corridor	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR
Cross-section Assessed	Dual Carriageway	Dual Carriageway	Dual Carriageway	Dual Carriageway	Management Option
Trip Length					
Trip Length (O-J) (m)	12,416	12,534	13,344	13,215	12,376
Scoring					
PAG Score	3	3	3	3	4
Preference	Intermediate	Intermediate	Least Preferred	Intermediate	Preferred

Stage 1 Trip Length Assessment of Option Corridors East of Drumsna Junction (Node J)

Although the Yellow Option Corridor offers the shortest trip length, in reality, the negligible differences of only -2m to +12m make the Green, Yellow and Blue East Option Corridors indistinguishable under this assessment, and so are all ranked Preferred. The Purple East Option Corridor is ranked Least Preferred, with a trip length approximately 106m longer than the existing, but perhaps has the greatest potential to improve safety along the national primary route by bypassing the village of Aghamore.

Table 7.3.5 Trip Length Assessment of the Option Corridors East of Node J at Drumsna Junction

Option Corridor	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Cross-section Assessed	Single Carriageway	Single Carriageway	Dual Carriageway	Management Option
Trip Length				
Trip Length (J-H) (m)	7,864	7,878	7,982	7,876
Scoring				
PAG Score	5	4	3	4
Preference	Preferred	Preferred	Least Preferred	Preferred

7.3.3.3 Junction Strategy

Methodology

This assessment was separated into two parts: 1) an at-grade assessment and 2) a grade separated assessment. The assessments consider the number of junctions along each of the option corridors. It is TII policy, and an aim of each option corridor, to rationalise the number of junctions along the national primary route where possible to minimise conflict points. This is important to improve road safety and may assist in providing consistent junction layouts. At-grade junctions will cause delays on the mainline, with the delay increasing as the number of at-grade junctions increases. At-grade junctions also have the potential to increase delay on the adjoining local road networks. However, it is vital to provide sufficient connectivity between the national primary route to the regional and local networks via junctions. Conversely, a higher number of grade separated junctions provides greater connectivity to the mainline with no significant delay experienced by the mainline traffic.

The number of at-grade junctions were counted along each option corridor and a score of 7 was given where there were no junctions which would cause delay i.e. at-grade junctions. This score would be reduced by 1 for every junction causing delay until a score of 1 would be given to an option corridor with six or more at-grade junctions.

Conversely, the number of grade separated junctions were counted along each option corridor and a score of 1 was given where there were no grade separated junctions. In keeping with the at-grade assessment, this score would be increased by 1 for the introduction of every grade separated junction until a score of 7 would be given to an option with six or more grade separated junctions.

Finally, the average score of both sub-assessments would determine the overall score for the Junction Strategy assessment. Summaries of the number of junctions in west and east of Node J at Drumsna Junction for each option corridor, along with the Junction Strategy assessments, are tabulated below.

Stage 1 Junction Strategy Assessment of Option Corridors West of Drumsna Junction (Node J)

Each option corridor aims to reduce the number of junctions onto the national primary route while providing sufficient connectivity to the regional and local network. The Purple West Option Corridor is the Preferred option under this assessment west of Node J at Drumsna Junction. The Cyan, Orange and Dark Green Option Corridors are each ranked Intermediate. The Dark Green Option Corridor would be preferred of these three as this option holds more potential to provide grade separation. It is not envisaged that the Cyan and Orange Option Corridors could cater for grade separated junctions. The Blue West Option Corridor would not reduce the number of at-grade junctions onto the N4 as it retains all existing accesses through Carrick-on-Shannon town. Therefore, it does not sufficiently perform to award it a score greater than 1 and is therefore ranked as the Least Preferred option to the west of Node J at Drumsna Junction.

The Black Option Corridor has been assessed separately as a standalone assessment. The Black Option Corridor would need to provide sufficient junctions to facilitate connectivity between the R280, the Summerhill Road and the Castlecara Road. It is not envisaged that grade separation would be either practical or necessary on this corridor. The table below shows how the Black Option Corridor performs in the Junction Strategy Report.

Table 7.3.6 Junction Strategy Assessment of the Option Corridors West of Node J at Drumsna Junction

Option Corridor	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Cross-section Assessed	Dual Carriageway	Dual Carriageway	Dual Carriageway	Dual Carriageway	Management Option	Urban Street
Junction Strategy						
# Signalised Junction / Roundabouts	2	2	2	3	6	3
# Priority Junction / Left In - Left Out	0	0	0	0	19	0
<i>At-Grade Assessment Score</i>	<i>5</i>	<i>5</i>	<i>5</i>	<i>4</i>	<i>1</i>	<i>4</i>
# Grade Separated	0	0	1	0	0	0
<i>Grade Separated Assessment Score</i>	<i>1</i>	<i>1</i>	<i>2</i>	<i>1</i>	<i>1</i>	<i>1</i>
Scoring						
PAG Score	3	3	4	3	1	3
Preference	Intermediate	Intermediate	Preferred	Intermediate	Least Preferred	N/A

Stage 1 Junction Strategy Assessment of Option Corridors East of Drumsna Junction (Node J)

The Purple East Option Corridor and Blue Option Corridor are the Preferred and Least Preferred options respectively east of Node J at Drumsna Junction. The Purple East Option Corridor would remove all at grade junctions from the N4 and offers the greatest opportunity to provide grade separated junctions. Although the Green and Yellow Option Corridors would reduce the number of direct junctions onto the national primary route, these options do not provide for additional grade separation. The Blue East Option Corridor would not reduce the number of at-grade junctions onto the N4 significantly but would retain the existing grade separated junction at Drumsna.

Table 7.3.7 Junction Strategy Assessment of the Option Corridors East of Node J at Drumsna Junction

Option Corridor	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Cross-section Assessed	Single Carriageway	Single Carriageway	Dual Carriageway	Management Option
Junction Strategy				
# Signalised / Roundabouts	0	0	0	0
# Priority / Left In - Left Out	3	4	0	15
<i>At-Grade Assessment Score</i>	<i>4</i>	<i>3</i>	<i>7</i>	<i>1</i>
# Grade Separated	1	1	2	1
<i>Grade Separated Assessment Score</i>	<i>2</i>	<i>2</i>	<i>3</i>	<i>2</i>
Scoring				
PAG Score	3	3	5	2
Preference	Intermediate	Intermediate	Preferred	Least Preferred

7.3.3.4 Constructability

Methodology

Constructability of all of the option corridors will be complicated due to the extent of existing residential housing, commercial businesses, farms, local roads and accesses dotted along the length of the corridors. Disruption to residents and local traffic will need to be minimised throughout the construction period.

There are many factors that influence the constructability of an option. This assessment has primarily been broken into four sections; total construction length, undesirable lengths, structures and crossings, and major utility interfaces. The undesirable lengths consist of lengths of on-line construction, cuts and fill larger than 10m, and lengths of construction within a floodplain all of which bring complexity to the construction phase. Structures and crossings comprise watercourse, rail and road infrastructure crossings for example, bridges and culverts. The only major utility network assessed as part of the Stage 1 Assessment is the ESBI Network as there is no Gas Networks Ireland infrastructure within the study area.

Stage 1 Constructability Assessment of Option Corridors West of Drumsna Junction (Node J)

The Blue West Option Corridor is preferred as this option consists only of small-scale interventions which would be relatively simple to construct and cause minimal disruption. Although this option corridor would require some watercourse crossings and would interfere with some utilities, there would be no proposals for on-line mainline construction which could cause significant disruptions.

The Cyan Option Corridor is ranked Least Preferred as this option would require the greatest total length of construction, undesirable construction lengths, including the joint longest section of on-line upgrades, the biggest amount of structures and a high level of interference with existing utilities. Both the Cyan and Orange Option Corridors score negatively under the length of on-line construction due to the section between Correen and Drumsna all being on-line. However, this reuse of existing will score positively for these option corridors under other assessment criteria.

The Orange, Purple West and Dark Green Option Corridors are ranked Intermediate, with the Orange Option Corridor being the Least Preferred of these three options due to the longest section of on-line upgrades, construction within the floodplain, and the highest interference with existing utilities.

The Black Option Corridor has been assessed separately as a standalone assessment. The Black Option Corridor scores well under this assessment with only a short section of new construction, few watercourse crossings and no interaction with known existing utilities. Although it is not envisaged that any cuts or embankments larger than 10m would be necessary, it is noted that this alternative would require some significant earthworks to comply with geometry standards, due to the topography within the corridor.

Table 7.3.8 Constructability Assessment of the Option Corridors West of Node J at Drumsna Junction

Option Corridor	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR		BLACK OPTION CORRIDOR
Cross-section Assessed	Dual Carriageway	Dual Carriageway	Dual Carriageway	Dual Carriageway	Management Option		Urban Street
Constructability							
Mainline New Construction Length (m)	11,177	9,304	9,972	9,843	0		1,120
	Least Preferred	Intermediate	Intermediate	Intermediate	Preferred		N/A
'Undesirable' Length							
Length of On-line Construction (m)	4,815	4,815	1,750	525	0		0
Length Cut > 10m	90	0	340	560	0		0
Length of Fill > 10m	490	340	600	940	0		0
Length of Floodplain Crossings	1,428	1,466	1,202	945	0		40
Total 'Undesirable' Length	6,823	6,621	3,892	2,970	0		40
	Least Preferred	Least Preferred	Intermediate	Intermediate	Preferred		N/A

Option Corridor	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Cross-section Assessed	Dual Carriageway	Dual Carriageway	Dual Carriageway	Dual Carriageway	Management Option	Urban Street
Structures and Crossings						
# New River Shannon Crossings	1	1	1	1	0	0
# Stream Crossings	15	12	10	10	4	6
# Rail Crossings	0	0	0	0	0	0
# Road Overbridges	2	3	4	3	0	0
# Road Underbridges	1	1	1	2	0	0
Total Structures / Crossings	19	17	16	16	5	6
Main Utility Crossings						
ESB - 38kV (OH)	1	2	1	1	0	0
ESB - 38kV (UG)	1	1	0	0	1	0
ESB - 110kV	4	4	3	3	1	0
ESB - 220kV	0	0	0	0	0	0
Total Main Utility Crossings	6	7	4	4	2	0
	Intermediate	Least Preferred	Intermediate	Intermediate	Preferred	N/A

Option Corridor	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR		BLACK OPTION CORRIDOR
Cross-section Assessed	Dual Carriageway	Dual Carriageway	Dual Carriageway	Dual Carriageway	Management Option		Urban Street
Scoring							
PAG Score	2	3	3	3	4		4
Rank	Least Preferred	Intermediate	Intermediate	Intermediate	Preferred		N/A

Stage 1 Constructability Assessment of Option Corridors East of Drumsna Junction (Node J)

The Blue East Option Corridor is again Preferred east of Node J at Drumsna Junction due the extent and nature of works proposed.

The Purple East, Green and Yellow Option Corridors score equally in terms of structures and utility crossings, therefore the nature of the construction lengths is the defining factor. The Green Option Corridor is ranked Least Preferred as it is a wholly on-line upgrade option and would require the most on-line construction.

Table 7.3.9 Constructability Assessment of the Option Corridors East of Node J at Drumsna Junction

Option Corridor	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Cross-section Assessed	Single Carriageway	Single Carriageway	Dual Carriageway	Management Option
Constructability				
Mainline Construction Length (m)	7,864	7,878	7,616	0
	Intermediate	Least Preferred	Intermediate	Preferred
'Undesirable' Length				
Length of On-line Construction	6814	7878	5212	0
Length Cut > 10m	0	0	0	0
Length of Fill > 10m	0	0	0	0
Length of Floodplain Crossings	0	0	0	0
Total 'Undesirable' Length	6,814	7,878	5,212	0
	Intermediate	Least Preferred	Intermediate	Preferred
Structures and Crossings				
# New River Shannon Crossings	0	0	0	0
# Stream Crossings	2	2	2	3

Option Corridor	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Cross-section Assessed	Single Carriageway	Single Carriageway	Dual Carriageway	Management Option
# Rail Crossings	0	0	0	0
# Road Overbridges	3	3	3	0
# Road Underbridges	0	0	0	0
Total Structures / Crossings	5	5	5	3
	Least Preferred	Least Preferred	Least Preferred	Preferred
Main Utility Crossings				
ESB - 38kV (OH)	0	0	0	0
ESB - 38kV (UG)	0	0	0	0
ESB - 110kV	0	0	0	0
ESB - 220kV	1	1	1	1
Total Main Utility Crossings	1	1	1	1
	Preferred	Preferred	Preferred	Preferred
Scoring				
PAG Score	3	2	3	4
Preference	Intermediate	Least Preferred	Intermediate	Preferred

7.3.3.6 Traffic

Methodology

The traffic assessment compares how the Option Corridors perform against the Do-Minimum scenario for the future years of 2030 and 2045. The criteria assessed was the change in AADT over the River Shannon Bridge as this gives a corresponding assessment of the number on the proposed option corridor i.e. a high reduction of traffic numbers on the River Shannon Bridge gives a higher traffic number on the proposed bypass, which in turn then gives a reduction in the congestion and an improvement on journey time. The Do-Minimum scenario ($\pm 1\%$) is given a score of 4 (Neutral). A change in AADT of up to $\pm 10\%$ from this scenario received a score of 3 or 5, depending on whether it is plus 10% or minus 10% respectively, where a reduction in AADT is deemed positive. A change in AADT between $\pm 10\%$ and $\pm 20\%$ from this scenario received a score of 2 or 6. A score of 1 or 7 was given to an option predicting a change in AADT of more than $\pm 20\%$ from this scenario. The final score for the assessment is based on the average change in AADT over the 2030 and 2045 scenarios. The Do-Minimum AADT across the River Shannon Bridge for the years 2030 and 2045 is 16,844 and 17,066 respectively.

Stage 1 Traffic Assessment of Option Corridors West of Drumsna Junction (Node J)

The introduction of any of the option corridors will reduce AADT over the River Shannon Bridge. The Orange Option Corridor is ranked Preferred, providing the greatest reduction. This can be attributed to being the shortest option corridor with tie-in points to the existing N4 closest to Carrick-on-Shannon. The Blue Option Corridor is least preferred as it would offer an insignificant difference.

The selection of an Option Corridor east of Node J will have no impact on AADT over the River Shannon Bridge, and therefore the traffic assessment east of Drumsna Junction is omitted.

As a standalone assessment, the Black Option Corridor would also offer an insignificant difference in AADT over the River Shannon Bridge and is given a score of 4.

Table 7.3.10 Traffic Assessment of the Option Corridors West of Node J at Drumsna Junction

Option Corridor	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Cross-section Assessed	Dual Carriageway	Dual Carriageway	Dual Carriageway	Dual Carriageway	Management Option	Urban Street
Traffic (AADT on River Shannon Bridge)						
Year 2030	12,839	12,756	13,862	13,888	16,662	16,793
Change in AADT	-23.8%	-24.3%	-17.7%	-17.5%	-1.1%	-0.3%
Year 2045	13,626	12,884	14,043	14,074	16,962	16,999
Change in AADT	-20.2%	-24.5%	-17.7%	-17.5%	-0.6%	-0.4%
Scoring						
PAG Score	7	7	6	6	4	4
Preference	Intermediate	Preferred	Intermediate	Intermediate	Least Preferred	N/A

7.3.4 Summary

The engineering assessment of the Stage 1 Option Corridors has examined each of the option corridors under the headings Geometry, Trip Length, Junction Strategy, Constructability and Traffic. The methodology used to assess the option corridors under each heading has been detailed throughout Section 7.3.3. The option corridors were scored based on the seven-point scale before a ranking was given as Preferred (P), Intermediate (I) or Least Preferred (LP) under each heading.

7.3.4.1 Summary of Engineering Assessment West of Drumsna Junction (Node J)

Cyan Option Corridor

The Cyan Option Corridor is one of the preferred options in terms of Geometry and comparable to the Orange, Purple and Dark Green Option Corridors under Trip Length and Junction Strategy, although grade separation is not deemed feasible at this stage. However, the Cyan Option Corridor is ranked as the Least Preferred option under Constructability with the most total construction length, joined most on-line upgrade, significant construction within the floodplain and the most structures & stream crossings required of all of the options west of Drumsna Junction. The Cyan Option Corridor would offer a significant reduction in AADT over the River Shannon Bridge.

Orange Option Corridor

The Orange Option Corridor is one of the preferred options in terms of Geometry and comparable to the Cyan, Purple and Dark Green Option Corridors under Trip Length and Junction Strategy, although grade separation is not deemed feasible at this stage. Although the Orange Option Corridor would require the shortest amount of new off-line construction, this option would require the most construction within the floodplain and contains the most major utility interaction. The Orange Option Corridor is ranked preferred under the traffic assessment as it would offer the greatest reduction in AADT over the River Shannon Bridge.

Purple West Option Corridor

The Purple Option Corridor is one of the preferred options in terms of Geometry and the preferred option alone in terms of Junction Strategy. Both of these criteria may have the greatest influence to improve safety on this section of the national primary route. The Purple Option Corridor is marginally ranked Least Preferred for Trip Length, although it does not exceed 10% longer than the existing route. Moderate constructability impacts are envisaged along this Option Corridor due to a variety of on-line construction, floodplain crossing, deep cuts and large embankments. This option corridor offers an intermediate reduction in AADT over the River Shannon Bridge.

Dark Green Option Corridor

The Dark Green Option Corridor is one of the preferred options in terms of Geometry and may hold the potential to cater for grade separation. Construction of a new roadway within this option corridor would require large sections of deep cuts and high embankments, but a shorter section of floodplain crossing, and only minimal length of on-line construction compared to the Purple West Option Corridor. The Dark Green Option Corridor also offers an intermediate reduction in AADT over the River Shannon Bridge.

Blue West Option Corridor

The Blue West Option Corridor scores well under Trip Length but would see the national primary route continue through Carrick-on-Shannon and over the existing River Shannon Bridge and would not relieve through traffic or improve journey time within the study area. The Blue Option Corridor is the Preferred option under Constructability as this option is expected to have little construction impacts and cause minimal disruptions due to only small-scale interventions. However, the Blue Option Corridor scores poorly under Geometry and Junction Strategy; due to maintaining the existing sub-standard mainline alignment and not adequately reducing the number of junctions onto the national primary route. The Blue West Option Corridor would have an insignificant, if not negligible, effect on reducing AADT over the River Shannon Bridge.

Black Option Corridor

The Black Option Corridor is a short link road which aims to improve connectivity within Carrick-on-Shannon and reduce some of the through traffic the town centre. This corridor alone would have no impact on the existing national primary route outside of the town due to lack of physical intervention. The Black Option Corridor could achieve at least desirable minimum geometry but would require some significant earthworks for a relatively short section of new roadway. This option corridor does not interfere with any known major utility network infrastructure. The Black Option Corridor does not pass through Nodes O or J and was therefore excluded from the Trip Length assessment; but in the event this alternative alone is implemented, the existing trip length, that of the Blue Option Corridor, would remain. Three at-grade junctions would be required as part of this corridor to facilitate connectivity between the R280, the Summerhill Road and the Castlecara Road. At this stage it is deemed grade separation would not be practical nor warranted on this corridor. The Black Option Corridor would have an insignificant, if not negligible, effect on reducing AADT over the River Shannon Bridge.

Table 7.3.11 Engineering Assessment Matrix of Option Corridors - West of Drumsna Junction (Node J)

Option Corridor	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Cross-section Assessed	Dual Carriageway	Dual Carriageway	Dual Carriageway	Dual Carriageway	Management Option	Urban Street
Geometry	New off-line route designed to achieve at least desirable minimum curvature. On-line upgrade also designed to achieve at least desirable minimum curvature.	New off-line route designed to achieve at least desirable minimum curvature. On-line upgrade also designed to achieve at least desirable minimum curvature.	New off-line route designed to achieve at least desirable minimum curvature. On-line upgrade also designed to achieve at least desirable minimum curvature.	New off-line route designed to achieve at least desirable minimum curvature. On-line upgrade also designed to achieve at least desirable minimum curvature.	With no off-line route or on-line upgrades, the substandard mainline would remain as existing.	A new link road designed to achieve at least desirable minimum curvature for an urban street.
Trip Length	A bypass route by nature will be longer than the existing. Within 10% longer than the existing route.	A bypass route by nature will be longer than the existing. Within 10% longer than the existing route.	A bypass route by nature will be longer than the existing. Longest, and therefore Least preferred, yet still within 10% of the existing route.	A bypass route by nature will be longer than the existing. Within 10% longer than the existing route.	Assessment criteria considers the existing as the baseline or 'Neutral'.	N/A
Junction Strategy	Would reduce the number of junctions onto the national primary route. Appears grade separation not suitable, therefore limited to at-grade junctions.	Would reduce the number of junctions onto the national primary route. Appears grade separation not suitable, therefore limited to at-grade junctions.	Would reduce the number of direct access and junctions onto the national primary route. Would include grade separation and therefore reduce delay on the national primary route.	Would reduce the number of direct access and junctions onto the national primary route. May hold potential to cater for grade separation.	Would not significantly reduce the number of direct access or junctions onto the national primary route.	Would require 3 at-grade junctions to provide effective connectivity.

Option Corridor	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Cross-section Assessed	Dual Carriageway	Dual Carriageway	Dual Carriageway	Dual Carriageway	Management Option	Urban Street
Constructability	Would require the most new off-line construction, joined most on-line upgrade, significant construction within the floodplain and the most structures & crossings of all of the options.	Would require the shortest amount of new off-line construction, but joined longest on-line upgrade, and the longest floodplain crossing. Similar to other options in terms of structures and utility crossings.	Would require some sections of deep cuts and high embankments with some on-line construction and floodplain crossings. Similar to other options in terms of structures and utility crossings.	Would require large sections of deep cuts and high embankments, but a shorter section of floodplain crossing and only minimal length of on-line construction. Similar to other options in terms of structures and utility crossings.	Small scale interventions which would be easy to construct causing minimal disruption.	No on-line works other than to construct junctions. Would require moderately large cuts and embankments.
Traffic	Would offer a significant reduction in AADT over the River Shannon Bridge.	Would offer the greatest reduction in AADT over the River Shannon Bridge.	Would offer an intermediate reduction in AADT over the River Shannon Bridge.	Would offer an intermediate reduction in AADT over the River Shannon Bridge.	Would offer an insignificant / negligible reduction in AADT over the River Shannon Bridge.	Would offer an insignificant / negligible reduction in AADT over the River Shannon Bridge.

Option Corridor	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Cross-section Assessed	Dual Carriageway	Dual Carriageway	Dual Carriageway	Dual Carriageway	Management Option	Urban Street
Scoring						
Qualitative Assessment	One of the preferred options in terms of Geometry and comparable under Trip Length and Junction Strategy, although grade separation is not deemed feasible at this stage. The Least Preferred option under Constructability with the most new off-line construction, joined most on-line upgrade, significant construction within the floodplain and the most structures & crossings of all of the options. Would offer a significant reduction in AADT over the River Shannon Bridge.	One of the preferred options in terms of Geometry and comparable under Trip Length and Junction Strategy, although grade separation is not deemed feasible at this stage. Although requiring the shortest amount of new off-line construction, this option would require the most construction within the floodplain and contains the most utility crossings. Would offer the greatest reduction in AADT over the River Shannon Bridge.	One of the preferred options in terms of Geometry and the preferred option alone in terms of Junction Strategy; both which may have the greatest influence to improve safety. Marginally ranked Least Preferred for Trip Length, although within 10% of the existing route along with the other options. Intermediate constructability impacts due to a variety of on-line construction, floodplain crossing, deep cuts and large embankments. Would offer an intermediate reduction in AADT over the River Shannon Bridge.	One of the preferred options in terms of Geometry and may hold the potential to cater for grade separation. Would require large sections of deep cuts and high embankments, but a shorter section of floodplain crossing and only minimal length of on-line construction. Would offer an intermediate reduction in AADT over the River Shannon Bridge.	Scores well under Trip Length and Constructability. However, this route runs through Carrick-on-Shannon and would not relieve through traffic or improve journey time. Is expected to have little construction impacts due to small scale intervention. Scores poorly under Geometry and Junction Strategy which have significant safety impacts. Would offer an insignificant / negligible reduction in AADT over the River Shannon Bridge.	A short link road to improve connectivity and reduce some of the through traffic in Carrick-on-Shannon. Would have no impact on the existing national primary route outside of the town alone due to lack of physical intervention. Some significant earthworks would be required for a short section of new roadway. Would offer an insignificant / negligible reduction in AADT over the River Shannon Bridge.
PAG Score	3	3	4	3	3	3
Preference	Intermediate	Intermediate	Preferred	Intermediate	Least Preferred	N/A

Table 7.3.12 Summary Engineering Scoring Matrix of Option Corridors to the West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE OPTION CORRIDOR	BLACK OPTION CORRIDOR
Cross-section	Dual Carriageway	Dual Carriageway	Dual Carriageway	Dual Carriageway	Management Option	Urban Street
Geometry	7	7	7	7	4	7
Trip Length	3	3	3	3	4	N/A
Junction Strategy	3	3	4	3	1	3
Constructability	2	3	3	3	4	4
Traffic	7	7	6	6	4	4
Scoring						
Qualitative Assessment	Minor or Slightly Negative	Minor or Slightly Negative	Not Significant or Neutral	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Score / Impact Level	3	3	4	3	3	3
Preference	Intermediate	Intermediate	Preferred	Intermediate	Least Preferred	N/A

7.3.4.2 Summary of Engineering Assessment East of Drumsna Junction (Node J)

Purple East Option Corridor

The Purple Option Corridor is one of the preferred options in terms of Geometry and the preferred option alone in terms of Junction Strategy as it holds the most potential to provide grade separation at junctions. It is ranked Least Preferred in terms of Trip Length as it provides a longer route to bypass the village of Aghamore. Providing this off-line bypass would enhance the safety on the national primary route and would also result in less on-line upgrade construction, although significant on-line works would still be required.

Green Option Corridor

Proposals within the Green Option Corridor would see the existing mainline upgraded to achieve current geometric standards as well as reducing the number of junctions onto the national primary route. However, as a wholly on-line option, this would require major on-line works which would likely cause significant delays and disruptions during construction. The existing grade separated Drumsna junction would be maintained but it is envisaged that all other junctions would remain at-grade.

Yellow Option Corridor

The Yellow Option Corridor would also see most of the existing mainline upgraded to achieve current geometric standards as well as reducing the number of junctions onto the national primary route. By providing an off-line section towards the southern end of the study area, the Yellow Option Corridor could accommodate enhanced overtaking sections over the existing situation and Green Option Corridor while reducing the amount of on-line construction required along the corridor. As for the Green Option Corridor the existing grade separated Drumsna Junction would be maintained but it is envisaged that all other junctions would remain at-grade.

Blue East Option Corridor

The Blue Option Corridor would not see any works done on the existing mainline other than maintenance and overlay to existing mainline pavement when required. This would eliminate the significant delays and disruptions envisaged as a result of a complete on-line upgrade construction. A number of junction and access points would be rationalised to reduce the total number of junctions onto the national primary route. The difference in Trip Length that the Blue, Green and Yellow Option Corridors offer is negligible.

Summary

The engineering assessment of the Option Corridors east of Node J at Drumsna Junction is summarised in Table 7.3.13 and below. The Purple East Option Corridor is ranked as the Preferred Option in this section. Due to the provision of a bypass of Aghamore, this option corridor would see less on-line construction than the Green or Yellow Option Corridors, thus causing less disruption during construction.

Although the Blue East Option Corridor would not propose any on-line works, this option would not address the geometric issues associated with the existing mainline. The Purple East Option Corridor also holds greater potential to offer grade separation at junctions, other than the existing Drumsna junction. The additional Trip Length associated with the Purple Option Corridor is not deemed significant.

Table 7.3.13 Engineering Assessment Matrix of Options Corridors to the East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Cross-section Assessed	Single Carriageway	Single Carriageway	Dual Carriageway	Management Option
Geometry	On-line upgrade designed to achieve at least desirable minimum curvature.	On-line upgrade designed to achieve at least desirable minimum curvature.	On-line upgrade designed to achieve at least desirable minimum curvature. Provides opportunity to bypass Aghamore.	With no off-line route or on-line upgrades, the substandard exiting mainline remains.
Trip Length	An insignificant improvement on the existing situation (12m).	Complete on-line upgrade - negligibly longer than the existing route (2m).	Creates the longest Trip Length due to the bypass of Aghamore, yet still within 10% of the existing route.	Assessment criteria considers the existing as the baseline or 'Neutral'.
Junction Strategy	Would reduce the number of junctions onto the national primary route while continuing to use the existing Drumsna junction to aid traffic flow.	Would reduce the number of junctions onto the national primary route while continuing to use the existing Drumsna junction to aid traffic flow.	Would reduce the number of direct access and junctions onto the national primary route. Has the most potential for grade separated junction which would cause the least amount of delay.	Would not significantly reduce the number of direct access or junctions onto the national primary route.
Constructability	Similar to other options in terms of structures and diversion but proposes less on-line construction due to on off-line section at Faulties.	Similar to other options in terms of structures and diversions but being a completely on-line route has the most proposed on-line construction which would cause disruptions.	Similar to other options in terms of structures and diversion but proposes the least amount of on-line construction due to the bypass of Aghamore.	Small scale interventions which would be easy to construct causing minimal disruption.

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Cross-section Assessed	Single Carriageway	Single Carriageway	Dual Carriageway	Management Option
Scoring				
Qualitative Assessment	One of the preferred options in terms of Geometry. Indistinguishable between Green and Blue in terms of Trip Length. Provides for improvements in junction strategy but also consists of large amounts of on-line upgrade construction.	One of the preferred options in terms of Geometry. Indistinguishable between Yellow and Blue in terms of Trip Length. Provides for improvements in junction strategy but would be the most disruptive to construct due to being a wholly on-line option.	One of the preferred options in terms of Geometry but is less desirable in terms of Trip Length due to the bypass of Aghamore. Has the most potential to provide grade separated, free flowing junctions, and would consist of the least amount of on-line construction.	Scores well under Constructability as expected. Would have little construction impacts due to small scale intervention. Indistinguishable between Green and Yellow in terms of Trip Length. Scores poorly under Geometry and Junction Strategy which have significant safety impacts.
	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Positive	Minor or Slightly Negative
Score / Impact Level	4	4	5	3
Preference	Intermediate	Intermediate	Preferred	Least Preferred

Table 7.3.14 Engineering Assessment Matrix East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Cross-section Assessed	Single Carriageway	Single Carriageway	Dual Carriageway	Management Option
Geometry	7	7	7	4
Trip Length	5	3	3	4
Junction Strategy	3	3	5	2
Constructability	3	2	3	4
Scoring				
Qualitative Assessment	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Positive	Minor or Slightly Negative
Score / Impact Level	4	4	5	3
Preference	Intermediate	Intermediate	Preferred	Least Preferred

7.4 Stage 1 Road Safety Impact Assessment

A Road Safety Impact Assessment (RSIA) was carried out for the Stage 1 Assessment of the Option Corridors described in Section 7.1.2. A copy of the RSIA is included in Appendix A.6.4.1. The Stage 1 Assessment is a high level assessment and assesses corridors only, it does not consider a particular cross-section. However, the safety assessment is already considered in the Engineering assessment.

This study examined the impact the option corridors would have on the existing road network within the study area west of Node J at Drumsna Junction and east of Drumsna Junction at Node J. The RSIA considers effects on the network and takes account of all road users, including vulnerable road users in order to ensure that the implications on road safety of each option corridor is fully assessed as part of the Option Selection Process. The assessment indicates the road safety considerations which shall inform the selection of the preferred transport solution.

In addition to the Option Corridors, the Do-Nothing and Do-Minimum scenarios are also assessed. The Do-Minimum Scenario is described in detail in Section 5.2.4.2 but briefly, it includes transportation projects and services that are already committed to be completed within the appraisal period of the N4 Project. The impact of each proposed option corridor was assessed and categorised as positive, negative or neutral from a safety perspective. An extract of the option corridor's Safety Ratings is provided in Table 7.4.1 and Table 7.4.2 below.

Table 7.4.1 West of Drumsna: Do-Nothing, Do-Minimum and Option Corridors Safety Ratings

	Do-Nothing	Do-Min	Blue	Black	Dark Green	Purple	Cyan	Orange
Safety Rating	Mod. Negative	Slightly Negative	Slightly Positive	Slightly Positive	Highly Positive	Highly Positive	Highly Positive	Highly Positive

Table 7.4.2 East of Drumsna: Do-Nothing, Do-Minimum and Option Corridors Safety Ratings

	Do-Nothing	Do-Min	Blue	Purple	Green	Yellow
Safety Rating	Moderately Negative	Slightly Negative	Slightly Positive	Highly Positive	Moderately Positive	Moderately Positive

The following issues are the major contributory factors to road safety in the study area:

- Significant congestion exists along the N4 corridor especially across the River Shannon bridge crossing in Carrick-on-Shannon
- Single river crossing is sub-standard in terms of alignment and cross-section
- Journey time unreliability due to uncertain quantum of delay
- Journey time variability throughout the day
- Peak hour traffic delay

The issues above could be addressed to varying degrees by each of the option corridors as outlined in the RSIA. Carrick-on-Shannon town centre is the major conflict with the national primary route traffic within the study area. By providing an off-line bypass of Carrick-on-Shannon, which would offer a second crossing point of the River Shannon, safety would be improved for all road users within the town, including pedestrians and the vulnerable. Journey time reliability and peak hour delays would also improve as a result of removing through traffic from the town centre to an appropriate route designed to cater for the strategic traffic.

7.5 Stage 1 Environmental Assessment of Options

7.5.1 Stage 1 Population and Human Health Option Assessment

7.5.1.1 Introduction

This section details the Stage 1 Population and Human Health assessment of the options.

This is a broad ranging topic which “*covers the existence, activities and health of people, usually considering people as groups or ‘populations’*” (EPA 2015)³ Aspects examined in this section primarily relate to potential impacts on socio-economic activities (settlement patterns, population characteristics, activities, and economic) and social well-being and health of people at a community level.

Criteria relevant to the assessment of socio-economic activities include journey characteristics, journey amenity, general amenity, community severance, and economic effects relating to business, tourism and employment and relate to the constraints identified in Section 4.4. The Population constraints are presented with the Stage 1 Option Corridors in Figures 7.5.1.1.0 to 7.5.1.1.5.

Other aspects relevant to population such as natural amenity, built and natural heritage, ecosystem services, material assets and nuisance are dealt with in the following sections:

- Section 7.5.2, Material Assets Non-Agriculture
- Section 7.5.3, Material Assets Agriculture
- Section 7.5.4, Air Quality
- Section 7.5.5, Climate
- Section 7.5.6, Noise and Vibration
- Section 7.5.7, Archaeological, Architectural and Cultural Heritage
- Section 7.5.8, Landscape and Visual
- Section 7.5.9, Biodiversity
- Section 7.5.10, Hydrology
- Section 7.5.11, Hydrogeology
- Section 7.5.12, Soils and Geology

Human health impacts are primarily considered through an assessment of the environmental pathways by which health can be affected such as air, noise, water or soil. Therefore, the health assessment relies on the assessments in the following sections and draws on the findings as necessary to examine whether the effects

³ Extracted from the Advice Notes for Preparing Environmental Impact Statements (EPA draft September 2015)

arising from any identified impacts may have a health impact and to ensure that the effects which may have a health impact are fully considered:

- Section 7.5.4, Air Quality to identify the predicted air quality values adjacent to the proposed option corridors
- Section 7.5.6, Noise and Vibration to identify the predicted noise levels at properties adjacent to the proposed option corridors
- Section 7.5.10, Hydrology to identify areas with any potential impacts on surface water and areas of flood risk
- Section 7.5.11, Hydrogeology to identify areas with any potential impacts on groundwater
- Section 7.5.12, Soils and Geology to identify if there are any areas of contaminated soils

The health assessment also considers health improvement and improvement to services. Other aspects, such as changes in traffic flows which are dealt with in Chapter 3, Traffic Assessment and Cross-Section, have also been considered in relation to the assessment of Socio-economic and Health impacts to ensure that the effects of these issues on population and human health have been addressed.

Section 7.5.1.2 outlines the methodology utilised to carry out the assessment, Sections 7.5.1.3 details the options assessment and a summary is presented in Section 7.5.1.4.

7.5.1.2 Methodology

The assessment in relation to Population and Human Health has been split into two aspects, namely socio-economic activities (Population) and local community health (Human Health). The methodology for these two aspects is set out separately below.

Population

An assessment of Population requires that an understanding of the community is built up through background research, site visits, and conversations with local people and community representatives. For the preliminary options report information has been collected by means of:

- Primary data sources (e.g., demographic data from Census 2016⁴ and Census 2011⁵ produced by the Central Statistics Office)
- Maps of the study area, including Ordnance Survey Ireland (OSi) Discovery Series 1:50,000 Sheet 33⁶

⁴ Central Statistics Office, 2017. Census 2016 Reports. Available at: <https://www.cso.ie/en/census/census2016reports/>

⁵ Central Statistics Office, 2012. Census 2011 Reports. Available at: <https://www.cso.ie/en/census/census2011reports/>

⁶ Ordnance Survey Ireland, 2021. OSi 1:50,000 Discovery Series Sheet 33. Available at: <https://sites.google.com/site/theirelandwalkingguide/publications/maps/osi-discovery/sheet33>

- Spatial data, including Google Maps⁷ and Google Streetview, Open Street Map⁸, Department of Education school maps, and church and parish location maps, supplemented by site visits
- Relevant environmental data collected by other disciplines during their studies
- A review of relevant planning document including the Leitrim County Development Plan (2015-2021)⁹ and the Roscommon County Development Plan (2022-2028)¹⁰ the prevailing Carrick-on-Shannon Local Area Plan (2010-2019)¹¹ and the Cortober Area Plan (2015)¹²
- A review of secondary sources including the National Planning Framework¹³ and the National Development Plan¹⁴ the Regional Spatial and Economic Strategy 2020-2032 (NWRA-RSES)¹⁵
- A review of previous Environmental Impact Assessments (EIAs), including of the Environmental Impact Assessment Report for the N4 Dromod-Roskey Bypass (2004) and the Route Corridor Selection Report (2009) prepared by Roughan & O'Donovan which culminated in a preferred route corridor
- Observation of local settlement and travel patterns and identification of community facilities

⁷ Google, 2022. Google Maps. Available at: <https://www.google.ie/map>

⁸ OSM, 2022. Open Streetmap. Available at: <https://www.openstreetmap.org>

⁹ Leitrim County Council, 2015. Leitrim County Development Plan 2015-2021. Available at: http://www.leitrimcoco.ie/eng/Services_A-Z/Planning-and-Development/Development-Plans/County-Development-Plan/County_Development_Plan_2015-2021 Note the updated Leitrim County Development Plan will come into effect on 21 March 2023, and it does not change this assessment.

¹⁰ Roscommon County Council, 2022. Roscommon County Development Plan 2022-2028. Available at: <https://www.rosdevplan.ie/roscommon-county-development-plan-2022-2028/stage-3-amendments/stage-3-adoption-of-plan>

¹¹ Leitrim Council, 2010. Carrick-on-Shannon Local Area Plan 2010-2019. Available at: http://www.leitrimcoco.ie/eng/Services_A-Z/Planning-and-Development/Development-Plans/Local-Area-Plan/Amendment-2-Carrick-on-Shannon-2010-2019/

¹² Roscommon County Council, 2014. Cortober Area Plan 2014-2020. Available at: http://www.roscommoncoco.ie/en/Services/Planning/Roscommon-County-Council-Planning-Publications/Roscommon-County-Council-Planning-Publications/County_Development_Plan_2014_-_2020/County-Development-Plan-2014-2020/2-Cortober-Area-Plan.pdf

¹³ Government of Ireland, 2018. Project Ireland 2040 Notional Planning Framework. Available at: <https://npf.ie/wp-content/uploads/Project-Ireland-2040-NPF.pdf>

¹⁴ Government of Ireland, 2018. Project Ireland 2040 National Development Plan 2018-2027. Available at: <https://www.gov.ie/pdf/?file=https://assets.gov.ie/37937/12baa8fe0dcb43a78122fb316dc51277.pdf#page=null>

¹⁵ The Northern and Western Regional Assembly, 2020. Regional Spatial and Economic Strategy 2020-2032 (RSES). Available at: <https://www.nwra.ie/rses/>

- Websites identifying local walks and trails, angling rivers and lakes^{16 17 18}

Features relevant to the assessment of Population are discussed in detail in the preceding Chapter 4 - Constraints Study. Many of these relate to the community facilities which are concentrated in Carrick-on-Shannon and Cortober. These include shops and retail centres and services such as hairdressers, schools, sports facilities and playing fields, churches and religious facilities, cemeteries, marinas and moorings, hotels and accommodation, parks and areas of amenity. In addition, there are numerous businesses in and outside of the urban areas which are important for the local economy and employment. There are also linear amenities, most notably the River Shannon, part of the Shannon-erne Blueway, which is used for boating, kayaking, rowing and angling, and also footpaths, Slí na Sláinte routes and cycle routes.

In terms of sensitivity, direct impacts on churches or other religious facilities or sites would be of profound significance, but nearby roads would not necessarily have a significant impact if noise levels were acceptable on standard indices. Noise can also be of significance to visits to cemeteries, although many established cemeteries are located beside major roads.

Schools and nursing homes are also sensitive to noise and to air quality effects while playing fields have a degree of sensitivity to noise and air quality effects. These facilities would also be vulnerable to physical severance, including where there could be a need for at-grade road crossings, even when assisted by signalised pedestrian or cycle lights. Impacts could extend to adjacent roads.

Direct impacts on businesses would have both an economic and employment impact depending on the size and local significance of the business. However, businesses also benefit from improvements in accessibility and reduced traffic congestion.

The Stage 1 Preliminary Options Assessment considers the potential effects that the options could present at a community level, rather than for individuals or identifiable properties; although effects on individual businesses are discussed. Physical effects on individual properties are addressed separately in Section 7.5.2 Material Assets Non-Agriculture, but this assessment does treat the principal communities of Carrick-on-Shannon, Cortober, Jamestown, Drumsna and Aghamore as constraints, along with other named communities or clusters of residential properties. It also takes into account the effect of possible demolitions or acquisitions where these could impact on the wellbeing of the residual community.

¹⁶ Fermanagh Tourist Information Centre, 2021. Kingfisher Cycle Trail. Available at: <https://kingfishercycletrail.com/>

¹⁶ Waterways Ireland, 2021. Blueways. Available at: <https://www.bluewaysireland.org/>

¹⁷ Leitrim Tourism, 2021. Walks and Trails. Available at: <https://leitrimtourism.com/things-to-do/walks-and-trails/>

¹⁸ Inland Fisheries Ireland, 2021. Carrick on Shannon Coarse Angling Centre. Available at: <https://fishinginireland.info/coarse/shannon/carrickonshannon/>

Population Assessment Criteria

The Population assessment is primarily qualitative, although quantitative data will be taken into account where available or relevant to the stage of the assessment, including traffic volumes, pedestrian and cyclist counts, journey time, accident statistics and property counts. There are five principal assessment criteria for the assessment of Population as below. For the preliminary option corridors, an assessment is made of access to community facilities and workplaces.

- **Journey Characteristics and Connectivity**

This criterion takes account of journey patterns based on the nature of the transport network and observed or projected journeys to urban destinations, workplaces and community facilities. Sub-criteria include journey time, journey time reliability, accessibility, and journey connectivity (the availability of connections between desired origins and destinations). These sub-criteria depend also on traffic data and are assessed for all road users including private drivers, commercial drivers, public transport users, cyclists and pedestrians.

- **Journey Amenity**

Relevant effects arise from the proximity to, volume of, or speed of traffic, as it affects the pleasantness, and perceived or actual safety of pedestrians, cyclists, public transport users and drivers. This will also be affected by the facilities available for these road users (e.g. pavement footpaths, cycle paths, crossing facilities, etc), the physical separation of vehicular traffic from pedestrians or cyclists, the nature of any junctions to be negotiated, the proportion of HGVs and the location of public transport stops, including for school buses. For vulnerable road users, age and physical ability are taken into account. Particular issues include the exposure presented by road crossings or junctions, and the legibility of the transport network, i.e. being able to find one's way (including signage).

- **General Amenity and Community Facilities**

Community facilities may be directly or indirectly impacted. There can also be effects on residential quality of life or community wellbeing, or on amenity and recreation, due to a combination of environmental effects (e.g. noise or visual) for which significance has been identified in respective chapters of the assessment. Impacts may also arise where traffic adversely affects people's perception of community identity and belonging. This effect can arise from proximity to traffic (see also severance), from changes in traffic volumes on connecting local roads, or from changes in neighbourhood interaction. There are links between General Amenity and health, or social inclusion given the importance of access to community facilities used by sensitive receptors.

- **Community Severance**

This refers to the ability of people to access community facilities, workplaces, friends or neighbours, particularly as it affects sensitive receptors such as older people, children or people with disabilities. Physical severance can take the form of new severance, for example due to the insertion into the landscape of a new transport facility, or of relief from severance, for example from reductions in

vehicle traffic or the provision of crossings facilities. Social severance can also occur where people feel contained without road boundaries causing their social interaction to diminish. Higher or lower traffic volumes can affect both forms of severance.

- **Economic**

These arise from changes in economic activity affecting local businesses or employment, either directly or indirectly. These effects can occur due to direct impacts on business premises, from changes in accessibility, or from changes in development opportunities for the local economy.

Scoring

The appraisal of impacts for the Population assessment is based on a multi-criteria analysis (MCA) as described in the TII Project Appraisal Guidelines (PAG) for National Roads Unit 7.0 (PE-PAG-02031)². The number and significance of individual effects are assessed and converted to the assessment scores provided in Table 6.5.1.1. Equal importance weighting is applied to the five criteria listed above for the assessment of potential impacts relevant to Population. The options are rated relative to the baseline environment using qualitative as well as quantitative analysis and professional judgement of their significance using the scoring definition listed in Table 7.3.1 of this report.

Human Health

Human health assessment focuses on three main areas: *health protection*, *health improvement* and *improving services* and are the sub-criteria used in the human health assessment. For this Stage 1 Assessment, *health improvement* and *improving services* are combined as a single assessment as there are no distinct differentiating factors between the options corridors in terms of these two criteria.

There is no specific guidance on the assessment of human health; however, a review of current and emerging guidance on assessing health in Environmental Impact Assessments was undertaken and is included in Appendix A.6.5.1 and forms the basis for the methodology set out here. The assessment utilises a standards-based approach. Whilst it is acknowledged that there is stress and anxiety associated with the acquisition of homes and property, the option corridors span the entire study area with associated stress and anxiety across the study area. Therefore, as it is not a differentiator at this Stage 1, the psychological effects are not assessed for each of the option corridors.

For the Stage 1 assessment, the option corridors are assessed in two sections. west of Drumsna (node J) and east of Drumsna (node J).

The assessment of each Option Corridor includes both a quantitative and qualitative assessment. Firstly, each Option Corridor is assessed under the two sub-criteria, namely *health protection* and *combined health improvement and improving services*, and the level of potential impact and its significance is assigned as per Table 7.3.1. Following this an overall assessment of each Option Corridor is completed and scored based on the seven-point scale listed in the section above.

Each of the Option Corridors are then ranked using professional judgement as Preferred, Intermediate or Least Preferred.

Sub-criterion 1: Health Protection

Health protection impacts are primarily considered through an assessment of the environmental pathways by which health can be affected include:

- Noise and Vibration – for example potential exposure of people to noise emissions from vehicles and construction activities
- Air – for example potential exposure of people to dust and air emissions from vehicles and construction activities
- Water – for example potential exposure of people to changes in water quality (surface and ground water) or changes in water flows – flood risk
- Soils – for example potential exposure of people to contaminated land

The results of technical assessments of noise, air, soil and water and any potential hazard directly attributed to what is proposed by the options on these elements informed the health protection assessment.

These technical assessments use standards¹⁹ (such as air quality standards) in order to identify whether significant impacts will arise or not. It is important to point out that health standards do not only exist to protect robust groups within the population but are primarily intended to protect the vulnerable. The standards are set at levels for which there will be no significant health effects, but do not exclude each and every effect, i.e. slight or moderate health effects are possible even below the levels at which health based standards would apply.

Sub-criterion 2: Health Improvement and Improving Services

Projects that have the potential to support regeneration, reduce unemployment and improve socio-economic circumstance, could contribute to improving the health and wellbeing of socio-economically deprived communities.

The assessment of human health for the project, in terms of health improvement, includes an assessment on how the project would impact on the socio-economics of the community.

Improving access to services such as hospitals or recreational facilities will have an impact on the health of a community. Therefore, the assessment of human health for the project includes an assessment on whether or not the project will improve access to these services.

Opportunities for health improvements and improved access to services due to the option corridors were identified and each option corridor scored depending on their ability to provide for the following:

- Economic growth and development of tourism which can result in improved socio-economic status and can have a positive impact on health outcomes

¹⁹ The term standards in this instance covers guidelines for example noise guidelines as such standard are not currently available.

- Increased employment and reduced unemployment, particularly long-term unemployment, can lead to improved health. If this is achieved, there will also be benefits in terms of social health including decreased social inequality
- Opportunities for a potential decrease in road traffic accidents
- Potential for improved public transport and an improved environment for cycling and walking within Carrick-on-Shannon along roads previously occupied by heavy traffic leading to an overall increase in the health benefits

Significance of Human Health Impacts

There is a difficulty in assigning levels of significance to human health impacts. In medicine, as in all science, the concept of statistical significance is used. This involves attaching a value to significance, often expressed as a percentage level of confidence in the data. Confidence measures of 95% or even 99% are often used to measure levels of certainty or changes that are not due to chance alone.

This is a valid approach for the study of the impacts on a *population* but does not absolutely exclude a response on an *individual*. However, it is difficult to assign levels of significance to individual human health impacts without detailed information about that individual. Thus, the significance of health effects are assessed on a group or community basis rather than on an individual basis. There is such a variability in human response that one could never identify all possible individual effects and so, in accordance with the guidance referred to above, it is considered to be more appropriate to assess the significance of health effects at a population level. The significance criteria for the assessment of the health of communities are therefore as outlined in Table 7.5.1.1 below.

Table 7.5.1.1 Significance Criteria Used in the Assessment of Community Health Protection Impacts

Significance Criteria / Degree of Impact	Definition
Major or Highly Negative	The project has the potential to negatively impact on the health status with an associated change in morbidity or impact on the health status of communities or groups of people
Moderately Negative	A moderate negative impact on health status but no change in morbidity or mortality can be attributed to the project
Minor or Slightly Negative	A small negative impact on reported symptoms but no change in health status can be attributed to the project
Not Significant or Neutral	No significant human health impacts are apparent
Minor or Slightly Positive	A small positive impact on reported symptoms but no change in health status can be attributed to the project
Moderately Positive	A moderate positive impact on health status but no change in morbidity or mortality can be attributed to the project
Major or Highly Positive	The project has the potential to positively impact on the health status with an associated change in morbidity or impact on the health status of communities or groups of people

Asthma can be used as an example when using these significance criteria:

- An Imperceptible impact would be one with no measurable effect on asthma
- A Slight impact might be a temporary increase in symptoms but no change in the severity of the underlying condition or treatment required
- A Moderate impact might be an increasing use of inhalers attributable to the proposed road development but no change in underlying condition and no effect on the vast majority of asthmatics
- A Significant effect might be an individual becoming asthmatic or an individual's asthma becoming measurably more severe as a result of the project
- A Very significant effect might be a group of individuals becoming asthmatic or their asthma becoming measurably more severe as a result of the project

A Profound effect might be a measurable increase in the incidence or severity of asthma in a community as a result of the project.

7.5.1.3 Stage 1 Population Options Assessment

Please read this section in conjunction with the Population Impact Summary Tables contained within Appendix A.7.5.1.1

Stage 1 Population Assessment of Options

Black Option Corridor

The Black Option Corridor provides a connection from the L3408 Castlecara Road to the R280 Leitrim Road which would take a proportion of traffic out of the eastern half of the town centre, away from Scoil Mhuire (national school) and locations where congestion regularly occurs, namely at the Carrick Shopping Centre Roundabout, the Relief Road/Dublin Road roundabout, the Dublin Road/Leitrim Road junction and outside Páirc Seán Mac Diarmada during matches.

It is likely to improve access to St Mary's GAA at Cill Tochairt (Kiltoghert) while adding to traffic at the entrance to the pitch. The road here is also part of the Slí na Sláinte walking route. The median line passes through a gap in residential properties in Drummagh, although the corridor includes around seven residential properties. The corridor also includes parts of Oaklands Estate and Ros Airgid on the edge of the Liscara Estate. It would require a junction with the R280 beside one residential property (of three) which offers self-catering accommodation.

Cyan Option Corridor

The Cyan Option Corridor provides a positive impact in terms of journey characteristics as would ensure journey time reliability whilst retaining accessibility and connectivity to the town and onwards to Sligo or Dublin. After the tie-in with the N4, the corridor begins by being quite rural. A guest house is located near the tie-in. Several single properties are located just above the corridor on the L5078 and three further properties fall into corridor, one of which is on the centreline. The

corridor includes lands used by Carrick Quads (and house) for which a significant impact could occur.

The Cyan Option Corridor subsequently follows the railway line, but with the centreline being to the north of the line. The corridor includes McLoughlin Transport Services, CD Carrick Commercials and LVDC Centre, the Bull Field playing fields (including GAA and Carrick Town FC) and the Midland & Western Livestock Market (occasional). The significance of impacts here would depend on the degree to which the playing fields and businesses are physically impacted.

The corridor then follows the railway line to the south. In Cortober, the corridor introduces potential social severance at the R368 Elphin Road on the edge of the community before the railway line and station. To the east, it includes a now disused *eir* depot, the residential estates of Glenpatrick and Sli An Iarainn, with semi-detached properties (on either side of the Elphin Road) and a two property semi-detached house closest to the corridor centreline. To the west, the corridor includes O'Dowd's Fireplaces showroom and a residential property on the R368, as well as Carrick-on-Shannon Railway Station and yard, part of the grounds of an electricity substation, a disused oil depot, and 18 private residential properties on the R370 Frenchpark Road plus the Shannon Gael estate. The corridor also includes the Carrick Poultry business.

The Cyan Option corridor then crosses the River Shannon at Cordrehid in an area that is of high amenity value. Given the open landscape and the proximity of Butler's Marina, this section is well used by boaters, kayakers and anglers; although there is no riverside walking access. Two private moorings have been cut from the river here, one of which serves the Carrick Camping facility which has recently closed (Spring 2020).

On the east bank of the river, the median line of the corridor passes closest to the relatively new Glas na hAbhainn estate where eight properties would front onto the option with a further three being adjacent from the gable end. The corridor then heads east, taking a route just below the residential estates of Cnoc na Sí and Ard na Sí to which environmental effects such as noise and visual would be relevant to residential amenity (see Section 4.9 Noise and 4.10 Landscape & Visual). Two bed and breakfast enterprises are located in these estates along with three more adjacent to the existing N4, although any economic impacts due to the environmental effects of the Cyan Option are likely to be imperceptible. The centreline would impact directly on one residential property just before it meets the existing N4 just before the 50km speed limit and town boundary for Carrick-on-Shannon.

There are two residential properties on the L7426 (south) local road close to the junction with the N4, a farm and one private property on the L7426 (north), another private property backing onto the corridor from the L3656 and approximately 12 more along the N4 (see Section 4.5 Material Assets). The corridor would need to address two existing junctions for Jamestown, of which the L3656 is the principal access. The option corridor continues to follow the existing N4 beside the River Shannon near Jamestown. This section of the river is unnavigable by boats but is popular for kayaking and angling and so a continued impact on amenity would apply, including also during construction. Overall, though, the negative impacts for river use are slight given the level of use and somewhat balanced by positive visual

impacts which the views of the river views provide for the journey amenity of road users of the N4. The corridor to the south includes the Oak Meadows and Grange residential estates in Drumsna which consist of c.25 properties, together with 5 others. At Node J at Drumsna Junction, the Cyan Option Corridor would need to maintain access into Drumsna village and for the R299 to Leitrim Village and Drumshanbo.

In summary, for the Cyan Option Corridor, significant impacts could result given the number of community facilities and businesses, depending on the road design and precise location of the median line selected within the corridor. Most relevant in this regard are the river crossing, the Carrick Town FC pitch and Bull Field changing rooms, Midland and Western Livestock, CD Carrick Commercials and McLoughlin Transport.

Orange Option Corridor

The Orange Option Corridor provides a positive impact in terms of journey characteristics as would ensure journey time reliability whilst retaining accessibility and connectivity to the town and onwards to Sligo or Dublin. In Cortober, the corridor borders the car parking for the Mulvey Centre (retail and entertainment) and is close to a small estate of residential apartments (Hawthorn Crescent). The median line of the corridor falls to the east of the railway line and includes the Midland & Western Livestock Market (occasional), the Bull Field playing fields (including GAA and Carrick Town FC), CD Carrick Commercials and LVDC Centre, McLoughlin Transport Services and the King & Moffat business. The centreline of the corridor would directly impact on the Bull Field playing fields, the Midland & Western Livestock Market and CD Carrick Commercials. Two private properties also fall within the corridor on the west side of the existing N4.

The corridor introduces potential social severance at the R368 Elphin Road on the edge of Cortober at the railway line and station. To the east, the corridor includes an *eir* depot, the residential estates of Glenpatrick and Sli An Iarainn, and, closest to the median line, ten semi-detached properties (on either side of the Elphin Road) and a two-property semi-detached house. To the west, it includes O'Dowd's Fireplaces showroom and a residential property on the R368, as well as Carrick railway station and yard, part of the grounds of an electricity substation, a disused oil depot.

The Orange Option Corridor crosses the River Shannon at Cordrehid in an area that is of high amenity value, and just to the north of the Cyan crossing. Given the open landscape and the proximity of Butler's Marina, this section is well used by boaters and kayakers and is used for some angling, but there is no riverside walking access. Two private moorings have been cut from the river here, one of which serves the Carrick Camping facility, which is located directly on the centreline, but which closed in 2020. The proposed centreline crossing intercepts inlet channels to constructed basins for mooring on both banks making the bridge width much longer. A residential property also falls within the corridor.

On the east bank of the Shannon, the median line of the Orange Option corridor passes closest to the relatively new Glas na hAbhainn estate where eight properties would front onto the option with a further three from the gable end. The corridor takes a route just below the residential estates of Cnoc na Sí and Ard na Sí to which

environmental effects such as noise and visual would be relevant to residential amenity (see Section 7.5.6 Noise and Vibration and Section 7.5.8 Landscape and Visual). Two Bed and Breakfast establishments are located in these estates along with three more beside the N4, although any economic impacts due to the environmental effects of the Orange Option Corridor are likely to be imperceptible. The median line of the corridor impacts directly on one residential property before it meets the existing N4 just before the town boundary. Subsequent potential impacts are as per the Cyan Option Corridor.

Purple West Option Corridor- West of Drumsna Junction/Node J

The Purple West Option Corridor has a significant positive impact in connecting with the R280 to Leitrim village and Drumshanbo, and is also used by some traffic, including HGVs, to access Sligo using the R284. From the tie-in with the existing N4 north of Carrick-on-Shannon, the corridor crosses the River Shannon and would continue above the floodplain of the river to the east. The river here, and more especially the Boyle River and Eidin Lake, is well used for boating, kayaking, and angling. The crossing location at Corryolus is less visible than the alternative crossings to the south in the Orange Option Corridor and Cyan Option Corridor, but a 1km section of the road would be elevated above the river (see Section 7.5.6 Noise and Vibration and Section 7.5.8 Landscape and Visual). There is no riverside access, but a potential significant impact given the visibility of a section of the road combined with the attraction of the undisturbed wetland character of the floodplain. Journey amenity for users of the road would be positive due to views of the river, but comparable to the southern crossing.

At Hartley, 27 residential properties (including one farm) fall within the Purple West Option Corridor. Social severance is likely here along with possible physical severance. Hartley Lodge Guest House is located beside (west) of the corridor. The R280 would likely be connected at a junction beside one residential property and close to the Cartown nightclub (occasional events). No significant issues arise at the L7410.

The L3408 Castlecara Road is crossed at a rather rural location, although the corridor does include four residential properties (one being a farm). Castlecara Road is part of the southern route of the Kingfisher Cycle Trail. The option continues southwards, passing to the rear of a line of 11 residential properties (for an assessment of the environmental effects of Noise and Vibration please see Section 7.5.6 Noise and Vibration). One isolated house is located close to (west of) the median line of the corridor. The corridor also includes farm buildings and a connecting access track to the north. The corridor crosses the L7426 (north) where it includes three residential properties and a farm.

The Purple West Option Corridor presents a potential impact at Jamestown due to proximity of the corridor to the unnavigable section of the River Shannon where there is some kayaking and angling activity. The effect is accentuated in comparison with the Orange Option Corridor by the likelihood of a junction at this location, but partly compensated by the positive effect on journey amenity for users of the N4. Subsequent impacts for the corridor are as for Orange prior to any consideration of design characteristics.

Dark Green Option Corridor

The impacts of the Dark Green Option Corridor, prior to any consideration of design characteristics, are the same as the Purple Option Corridor until after the L3408 Castlecara Road. The L3408 Castlecara Road is crossed at the same rural location as for the Purple Option Corridor, although the corridor includes four residential properties (one being a farm). Castlecara Road forms a section of the Kingfisher Cycle Trail southern route.

The option continues southwards, crossing low intensity grazing land. The Dark Green Option Corridor includes five residential properties (including a farm) on the L7426 and one isolated residential property. The corridor joins the existing N4 just to the north of Node J.

Blue West Option Corridor West of Drumsna Junction/Node J

This Blue West Option Corridor is an on-line option. It provides good connectivity to Sligo, but less so for the R280 which necessitates journeys through the town. The road is also subject to regular congestion which can have a significant impact on journey times at weekends. The option is expected to involve some consolidation of minor road, property and farm accesses with shared access roads to reduce the incidence of single access points onto the N4. In the Western Section, from Node J moving west, property impacts would initially be avoided given the absence of roadside properties. The corridor would continue to follow the unnavigable section of the River Shannon as of now and its proximity would impact slightly on the kayaking and angling activity that occurs along this stretch, although with some compensation due to the visual aspect for drivers and the positive contribution to journey amenity this entails.

Once within the town limits, the Blue West Option would provide a slight positive economic benefit relative to other options by maintaining familiarity with retail outlets beside the road, including the service stations in Cortober and to the south of the town. On entering Cortober, a signalised crossing can be expected at the R368, possibly involving a connection with the Inver Geal apartments. Projected traffic volumes would place pressure on the pinch point that is the existing bridge crossing.

A consolidation of commercial accesses could be expected using shared access road. Signalised junctions with Bridge Street, Dublin Road, the L3412/Carrick Shopping Centre and the L3408 Castlecara Road are proposed and would be necessary to facilitate traffic flow. However, some traffic build up is likely on busy shopping days or during matches at Páirc Seán Mac Diarmada. The maintenance of traffic volumes would have a continued slight negative impact on use of the riverside park due to the environmental effects and physical severance, although the significance of this effect would be greater when comparisons are made to other options for which through traffic would be transferred off-line. This level of traffic could discourage walking and cycling without improvements to existing foot and cycle paths to provide continuity. New crossing facilities for both cyclists and pedestrians would be needed. However, these would be facilitated by the replacement of roundabouts by signalised junctions and would have a positive impact on pedestrian and cyclist journey patterns and amenity. Although there is an existing signalised pedestrian crossing approaching the junction with Bridge Street,

and pedestrian islands elsewhere, physical severance would be exacerbated by growth in traffic volumes unless improved crossing facilities are provided. However, these crossing facilities would also need to have a minimal impact on traffic flow.

Overall, the replacement of roundabout junctions with signalised crossings would have a positive effect on traffic movement and on pedestrian and cyclist journey amenity. The rationalisation of direct entrances to the Blue Option would also assist with traffic flow and reduce collision or accident risk. The design features required for the corridor would need to ensure that traffic movement is maintained or improved if delays are not to occur with consequent negative effects for journey characteristics, journey amenity and the local economy.

There are many private residences along the Blue Option and environmental impacts would be as at present, although trends in traffic flow could worsen these without mitigation (see respective Sections). From the perspective of socio-economics, new impacts would be few relative to other options. However, the town would continue to be traversed by a high volume of traffic and the Blue Option Corridor would need to be combined with many of the interventions being considered for the Active Travel Option. Without this, the Blue Option Corridor would have a negative impact due to continued physical severance from the natural surroundings of the river that has a key role in place making, and on amenity generally, including the town's ability to attract visitors and the economic benefit that is realised.

Table 7.5.1.2 Stage 1 Population Summary Assessment Matrix of Options West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Journey characteristics	Moderate Positive. Would improve journey amenity over this corridor length PAG Score 6	Moderate Positive. Would improve journey amenity over this corridor length PAG Score 6	Significant Positive. Would connect with the R280 and so with Leitrim village and Drumshanbo, potentially reducing some traffic on the R299 PAG Score 7	Significant Positive. Would connect with the R280 and so with Leitrim village and Drumshanbo, potentially reducing some traffic on the R299 PAG Score 7	Moderate Negative. Continued delays in Carrick-on-Shannon and use of R299 as an alternative PAG Score 2	Provides urban connection between community facilities and optional regional connection with R280 PAG Score 7
Journey amenity	Slightly Positive. Bridge view. River at Jamestown Significant positive avoidance of delay PAG Score 5	Slightly Positive. Bridge view. River at Jamestown Significant positive avoidance of delay PAG Score 5	Slightly Positive bridge view. Significant positive avoidance of delay PAG Score 5	Slightly Positive bridge view. Significant positive avoidance of delay PAG Score 6	Slightly Negative (depends on traffic flow). Slightly positive in places, e.g. Bridge View PAG Score 3	Moderately Positive PAG Score 6
General amenity	Moderately Negative. River crossing. River at Jamestown. Bull Field pitch. Proximity to residential estates PAG Score 2	Moderately Negative. River crossing. Mooring Facilities. River at Jamestown. Bull Field pitch. Proximity to residential estates PAG Score 2	Moderately Negative crossing of River Shannon. Slightly Negative at river Jamestown PAG Score 3	Moderately Negative river crossing PAG Score 3	Significant Negative Riverside in Carrick-on-Shannon and Cortober. Impacts on Carrick-on-Shannon and Cortober communities PAG Score 1	Slightly Positive: connectivity including gael scoil, but increased traffic on Casteltara Road PAG Score 5
Community Severance	Moderately Negative. Social severance in Cortober PAG Score 2	Moderately Negative social severance in Cortober PAG Score 2	Slight-Moderate Negative social (& possible physical) severance Hartley PAG Score 2	Slight-Moderate Negative social (& possible physical) severance Hartley PAG Score 2	Significant Negative: Carrick-on-Shannon PAG Score 1	Minor or Slightly Negative: Elysian Meadows PAG Score 3
Economic	Slightly Negative. Businesses in Cortober east (5) and	Slightly Negative. Businesses in Cortober east (6) and west (1) of railway line	Neutral. Proximity to Cartown Nightclub PAG Score 4	Slightly Negative (2) Businesses PAG Score 3	Significant Negative Impact also on tourism PAG Score 1	Neutral PAG Score 4

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
	west (2) of railway line PAG Score 3	PAG Score 3				
Scoring						
Qualitative Assessment	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Positive	Moderately Positive	Major or Highly Negative	Moderately Positive
Score / Impact Level	4	4	5	6	1	6
Preference	Intermediate	Intermediate	Preferred	Preferred	Least Preferred	N/A

Stage 1 Population Assessment Option Corridors East of Drumsna Junction – Node J

Green Option Corridor

The Green Option Corridor represents an on-line upgrade of the existing N4 single carriageway and links with the Dromod-Roosky Bypass. The corridor passes beside Drumgilra Lough to the west and Gortconnellan Lough to the east where there is some angling. It bisects an on-road heritage trail east of Drumsna which follows the L7428, L7429 and L7430 around Gortconnellan Lough taking in locations that inspired the writings of author Anthony Trollope who was postmaster in the village in the 1940s. The first of these roads is served by the R299 overbridge. To the south, Annaduff Church of Ireland is located off the former spur of the N4 (L3630), beside a regularly visited memorial to country musician Tom Dunphy who died in a road accident here in 1975.

Only part of the grounds of the Masonite plant are included in the corridor, but this is followed by another five residential properties with a further five to the north. In Drumsna, three properties and parts of the Oak Meadows estate and The Grange estate fall within the corridor. A further 15 residential properties are included in the corridor after the Masonite plant, seven of which are beside the road and four off a parallel access road.

The Green Option Corridor would continue to pass through the village of Aghamore in the wider community of Annaduff. The location is subject to a reduced speed limit and has a crossing island, but the routing of the corridor through the village means that physical severance, at one level or another, would continue to apply due to the presence of community facilities including St. Mary's Church and cemetery and Annaduff National School which is located just 100m to the east on the L3470 just outside the corridor. The village also includes a guest house. The prominent Top of the Hill pub is currently not in operation.

The corridor includes 5 residential properties just to the south of Aghamore, three of which are on a parallel access road. These are followed by a further 4 properties and a farm. Annaduff GAA and Leitrim GAA Centre of Excellence fall within the corridor along with at least four other properties and farm buildings. To the south, the corridor includes part of the premises of a milling business, McDonogh Feeds, beside the N4, and takes in 2 private properties on the L1475.

The corridor includes junctions with the R201 to Mohill and R299 to Drumsna and Leitrim Village.

Yellow Option Corridor

Potential impacts by the Yellow Option Corridor are similar to the Green Option Corridor, except at the southern end of the corridor at Fernaught before the Dromod-Roosky Bypass. At this location, the Yellow Option Corridor diverts from the line of the existing N4 between Nodes G and H slightly to the west. This brings the corridor down the hill from the existing N4 and would deny southbound drivers the current elevated view of the Shannon lakes (see Section 4.11 Landscape & Visual) which would represent a slight negative effect on journey amenity. The Yellow

Option Corridor would, however, minimise any impact on McDonogh Feeds and avoids impacts on residential properties on the L1475.

Purple East Option Corridor East of Drumsna Junction/Node J

The Purple East Option Corridor east of Drumsna Junction follows a similar route to that of the Green Option Corridor, but follows the line of the existing N4 taking in 2 private properties on the L1475 as well as McDonogh Feeds at Node G. The Purple East Option Corridor includes the same properties and community facilities as the former options between here and Aghamore.

Physical severance is avoided in the middle of Aghamore village, providing relief from the severance associated with the current high traffic volumes for the church. However, social severance, and possible physical severance, could apply to Annaduff National School given that the bulk of residences from which many students would live are to the east of the corridor off the L4370. After Aghamore, the corridor sweeps away to the east between Nodes F and J. This takes the corridor away from Leitrim GAA Centre of Excellence (if not the Annaduff GAA building).

Blue East Option Corridor East of Drumsna Junction/Node J

The Blue East Option Corridor follows the alignment of the existing N4 to the south of Drumsna Junction. The minor L7661 from just east of the river bridge in Drumsna would be closed at the N4 and connected with the L3630 through Annaduff to the south. The very lightly used oblique exit to the road to the N4 would also be closed. The corridor would pass through Aghamore as at present.

Table 7.5.1.3 Stage 1 Population Summary Assessment Matrix of Options East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Journey characteristics	Slightly Positive PAG Score 5	Slightly Positive PAG Score 5	Slight-Moderately Positive PAG Score 5	Slightly Positive PAG Score 5
Journey Amenity	Slightly Negative loss of Shannon view PAG Score 3	Neutral PAG Score 4	Neutral PAG Score 4	Neutral PAG Score 4
General Amenity	Slightly Negative. Impacts on Aghamore and Drumsna. Impacts on Annaduff GAA and Leitrim GAA Centre of Excellence PAG Score 3	Slightly Negative. Impacts on Aghamore and Drumsna. Impacts on Annaduff GAA and Leitrim GAA Centre of Excellence PAG Score 3	Slightly Negative Annaduff GAA PAG Score 3	Annaduff GAA and Leitrim GAA Centre of Excellence included in corridor PAG Score 2
Community Severance	Continued Significant severance in Aghamore PAG Score 1	Continued Significant severance in Aghamore PAG Score 1	Positive relief from severance at Aghamore, but possible new severance at NS PAG Score 5	Continued Significant severance in Aghamore PAG Score 2
Economic	Neutral PAG Score 4	Slightly Negative McDonogh Feeds PAG Score 3	Slightly Negative McDonogh Feeds PAG Score 3	Slightly Negative McDonogh Feeds PAG Score 3
Scoring				
Qualitative assessment	Moderately Negative	Moderately Negative	Not Significant or Neutral	Moderately Negative
Score / Impact level	2	2	4	2
Preference –	Intermediate	Intermediate	Preferred	Intermediate

7.5.1.4 Stage 1 Human Health Options Assessment

Sub-criterion 1: Health Protection

The results of the noise and vibration, air quality, soils and water assessments have informed the health assessment as these are the environmental pathways by which health can be affected.

Noise

As detailed in Section 7.5.6 the assessment of potential noise impacts and ranking of option corridors is based primarily upon property counts, a review of the likely requirement for mitigation measures based on the indicative noise footprint for each option corridor and changes in traffic flows. The potential noise and vibration impacts associated with the construction phase of each option corridor will be of a non-permanent duration (i.e., less than 7 years). Whilst there will be varying impacts associated with each, the construction phase will be undertaken using standard road construction techniques and will be controlled by the implementation of construction noise and vibration limits. Therefore, for the purposes of ranking option corridors, the noise assessment focused on longer terms operational impacts only.

In terms of vibration, road traffic along normal well-maintained surfaces, in line with the proposed option corridors, generates very low levels that are normally not perceptible to building occupants. Therefore, it was assumed that all option corridors will have a comparable low vibration impact during their operational phase and vibration was not assessed further nor included in this health assessment.

A summary of the noise assessment for west of Drumnsa Junction (Node J) is included in Table 7.5.1.4 below and for east of Drumsna Junction (Node J) is included in Table 7.5.1.5 .

Air

As detailed in Section 7.5.4, the air quality assessment is based on the number of sensitive receptors in proximity to each option corridor and the projected traffic volumes accessing the corridors during the operational phase. The construction phase is assessed through the consideration of the number of sensitive properties located in proximity to the likely construction works where dust impacts may be experienced. Sensitive receptor locations are defined in the NRA, 2011 Guidelines²⁰ as residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present. In addition, planning applications²¹ give an indication to the potential number of future sensitive receptors adjacent to the option corridors.

²⁰ National Roads Authority NRA, 2011. Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes, 2011. Available at: <https://www.tii.ie/technical-services/environment/planning/Guidelines-for-the-Treatment-of-Air-Quality-during-the-Planning-and-Construction-of-National-Road-Schemes.pdf>

²¹ Department of House, Planning and Local Government, 2021. National Planning Applications. Available at: <https://data.gov.ie/dataset/national-planning-applications>

The number of existing and potential sensitive receptors in proximity to each option corridor determined the air quality impacts. The zone of interest for the assessment is 0-50m from each indicative fenceline within each option corridor. This is an offset from the edge of the indicative fenceline within each option corridor and assumes that properties within the potential fenceline would be acquired and would therefore not be counted as receptors.

A summary of the air quality assessment for west of Drumsna Junction (Node J) is included in Table 7.5.1.4 below and for east of Drumsna Junction (Node J) is included in Table 7.5.1.5 .

Soils

Potential health impacts due to soils relate to the disturbance of contaminated lands and radon.

Soil Contamination

As detailed in Section 7.5.12, a number of sites of potential areas of contamination have been identified in the study area west of Drumsna Junction (Node J). The results of the soils assessment with respect to contaminated lands are included in Table 7.5.1.4. The soils assessment does not apply to East of Drumsna Junction (Node J) of the option corridors.

Radon

The area of Roscommon and Leitrim within the study area is in a less than 1 per cent area. It is only when radon builds up in buildings that are inhabited by human beings that the health risk occurs. During construction, there will be excavation activities. This will have the potential to cause some release of radon. However, this will almost instantaneously be dissipated and will be harmless. Radon escape from rock will take the path of least resistance. Radon is escaping all the time but when it escapes to the open air there are no health effects.

Water

Potential health impacts due to water relate to water quality and flooding.

Water quality

In terms of surface water, as detailed in Section 7.5.11, the Irish Water Carrick-on-Shannon Public Water Supply abstraction is located in the River Shannon circa 1 km upstream of N4 Carrick-on-Shannon Bridge. This is a large abstraction that supplies well over 50% of Leitrim's water supply and is considered to be of regional importance and its attribute importance is therefore very high.

In terms of groundwater, as detailed in Section 7.5.11, there are no discharge and emissions licensed facilities identified within any of the option corridors. A number of abandoned and historical quarries and pits have been identified within the option corridors west of Drumsna Junction (Node J), however, the potential for the contamination of groundwater from these quarries is expected to be insignificant and therefore with regard to groundwater contamination all the option corridors are considered 'not Significant or Neutral'.

Therefore, the health assessment in relation to the potential to impact on flooding only considered the hydrological assessment as the hydrogeological assessment was not significant or neutral.

Flooding

In terms of groundwater flooding, there are no areas of historic groundwater flooding within any of the option corridors. Therefore, with regard to groundwater flooding all the option corridors are considered not significant or neutral.

Floodplains and flood risk areas were assessed in the hydrological assessment detailed in Section 7.5.11 and are included in this human health assessment.

Based on the above, the health assessment in relation to the potential to impact on water quality only considered the hydrological assessment as the hydrogeological assessment was not significant or neutral.

Sub-criterion 2: Health Improvement and Improving Services

The option corridors have the potential to support regeneration, reduce unemployment and improve socio-economic circumstance, could contribute to improving the health and wellbeing of socio-economically deprived communities. They can facilitate transport of goods and people in a timely, reliable and efficient manner. The full economic benefit will be realised once the full extents of the preferred transport solution is completed. Accessibility to businesses and community facilities in Carrick-on-Shannon, Cortober and the wider study area along with the Business Parks in both towns will be better facilitated by the project and the resulting reduction in congestion. It will also bring with it benefits to business and public facilities in Carrick-on-Shannon town centre by reducing noise and air pollution. This all translates into an increased potential for economic prosperity for the Western Region, which in turn will play a part in reviving the Irish economy.

The human health assessment presented in Table 7.5.1.4 and Table 7.5.1.5 includes an assessment on how the option corridors would impact on the socio-economics of the community and improve access to services such as hospitals or recreational facilities as this will have an impact on the health of a community.

Opportunities for health improvements and improved access to services due to the option corridors were identified and each option corridor scored depending on their ability to provide for the following:

- Economic growth and development of tourism which can result in improved socio-economic status and can have a positive impact on health outcomes
- Increased employment and reduced unemployment, particularly long-term unemployment, can lead to improved health. If this is achieved, there will also be benefits in terms of social health including decreased social inequality
- Opportunities for a potential decrease in road traffic accidents
- Potential for improved public transport and an improved environment for cycling and walking within Carrick-on-Shannon along roads previously occupied by heavy traffic leading to an overall increase in the health benefits

Table 7.5.1.4 Stage 1 Human Health Summary Assessment Matrix of Options West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Sub-criterion 1: Protection of Health Assessment						
Noise	Moderately Negative	Moderately Negative	Minor or Slightly Negative	Minor or Slightly Negative	Not Significant or Neutral	Moderately Negative
Air	Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors	Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors	Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors	Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors	Moderately Negative due to the traffic volumes in proximity to sensitive receptors	Minor Slightly Negative due to a decrease in air quality at sensitive receptors
Soils	Moderately Negative	Moderately Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Water Supply	Minor to Moderate Negative	Minor Negative	Highly Negative	Highly Negative	Not Significant or Neutral	Not Significant or Neutral
Flood risk	Moderate to Major Negative	Moderate to Major Negative	Moderate Negative	Moderately Negative	Not Significant or Neutral	Minor to Moderate Negative
Sub-criterion 1: Summary of Overall Protection of Health Assessment						
Overall Protection of Health Assessment	Moderately Negative	Moderately Negative	Major or Highly Negative	Major or Highly Negative	Moderately Negative	Minor or Slightly Negative
Sub-criterion 2: Summary of Overall Health Improvement and Improving Services Assessment						
Health improvement and improving services	Moderately Positive	Moderately Positive	Minor or Slightly Positive	Minor or Slightly Positive	Moderately Negative	Minor or Slightly Positive

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Scoring						
Overall Qualitative Assessment	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Negative	Minor or Slightly Negative	Moderately Negative	Not Significant or Neutral
Score / Impact Level	4	4	3	3	2	4
Preference - Professional Judgement	Preferred	Preferred	Intermediate	Intermediate	Least Preferred	N/A

Table 7.5.1.5 Stage 1 Human Health Summary Assessment Matrix of Options East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
<u>Sub-criterion 1: Protection of Health Assessment</u>				
Noise	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Not Significant or Neutral
Air	Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors	Moderately Negative due to the traffic volumes in proximity to sensitive receptors	Moderately Negative due to the traffic volumes in proximity to sensitive receptors	Moderately Negative due to the traffic volumes in proximity to sensitive receptors
Soils	N/A	N/A	N/A	N/A
Water Supply	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Flood risk	Minor or Slightly Negative	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
<u>Sub-criterion 1: Summary of Overall Protection of Health Assessment</u>				
Overall Protection of Health Assessment	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Moderately Negative
<u>Sub-criterion 2: Summary of Overall Health Improvement and Improving Services Assessment</u>				
Health improvement and improving services	Minor or Slightly Positive	Minor or Slightly Positive	Minor or Slightly Positive	Minor or Slightly Positive
Scoring				
Overall Qualitative Assessment	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Score / Impact Level	4	4	4	4
Preference - Professional Judgement	Preferred	Intermediate	Intermediate	Intermediate

7.5.1.5 Summary

Summary Population Assessment of Stage 1 Options

The Black Option Corridor has a positive impact by improving connectivity, including for the Gaelscoil, and across the eastern half of Carrick and between the Leitrim Road and the N4. It introduces some severance at Elysian Meadows to the west of the Beeches estate.

The Dark Green Option and Purple West Options are preferred West of Drumsna Junction, but the distinction with the other options, with the exception of Blue West, is slight, as positive and negative effects apply to each. The Cyan and Orange Option Corridors have potential impacts on community facilities and businesses in Cortober, although there are opportunities to avoid or mitigate these. The Cyan Option Corridor extends slightly further north and includes an additional business impact. The River Shannon crossing is prominent but could be mitigated by a bridge design of high standard. However, the Cyan and Orange Option Corridors do approach the bridge by passing beside residential estates with possible environmental effects which are addressed in other sections of this assessment.

By comparison, the Purple West and Dark Green Option Corridors cut through a larger area of countryside, although they are located away from minor roads, minimising amenity impacts. Both options introduce potential community severance in Hartley, but the wider location is relatively rural compared with the more urban location represented by Cortober in the case of Cyan and Orange Option Corridors. The River Shannon crossing is less prominent than for the Cyan and Orange Option Corridors, but the approach is potentially more visible from other sections of the river to the north, presenting potential impacts in terms of amenity and tourism.

The Blue West Option Corridor maintains through traffic flow in Carrick-on-Shannon and Cortober and therefore maintains existing severance between the riverside and the town and at other locations. This also has impacts on amenity and tourism. On the other hand, it contains features including signalised crossings which would facilitate traffic flow and also provide some relief from the severance experienced by pedestrians and cyclists at the numerous roundabout junctions. If the Blue West Option is combined with the proposals for Active Travel and public transport contained in the respective option, then there is potential for cumulative positive impacts, although the severance at the river would remain.

The options east of Drumsna Junction are mainly on-line but differ only with respect to the southern-most alignment and at Aghamore. The Purple East Option Corridor bypasses the centre of Aghamore providing relief from severance, particularly of the church. However, in doing so it raises the possibility of new severance between the church and school with the more numerous residential properties to the east.

Summary Human Health Assessment of Stage 1 Options

In summary, health protection covers the health effects of the option corridors arising from noise, vibration, air emissions, water and soil contamination and psychological issues. Opportunities for health improvements and improved access

to services due to the option corridors were identified and each option corridor was scored depending on their ability to provide for the following:

- Economic growth and development of tourism which can result in improved socio-economic status and can have a positive impact on health outcomes
- Increased employment and reduced unemployment, particularly long-term unemployment, can lead to improved health. If this is achieved, there will also be benefits in terms of social health including decreased social inequality
- Opportunities for a potential decrease in road traffic accidents
- Potential for improved public transport and an improved environment for cycling and walking within the Carrick-on-Shannon along roads previously occupied by heavy traffic leading to an overall increase in the health benefits

The summary of the health assessment is as provided in Table 7.5.1.4 and Table 7.5.1.5 above.

7.5.2 Stage 1 Material Assets Non-Agriculture Option Assessment

7.5.2.1 Introduction

This section details the Stage 1 Assessment of the Option Corridors with respect to the Material Assets Non-Agriculture constraints identified in Section 4.5 Material Assets Non-Agriculture of this report. The Stage 1 Option Corridors as described in Section 7.2 with the Material Assets Non-Agriculture constraints are presented in Figures 7.5.2.1.0 to 7.5.2.14.1.

Section 7.5.2.2 outlines the methodology utilised to carry out the assessment, Sections 7.5.2.3 details the options assessment and a summary is presented in Section 7.5.2.4.

There are ten Option Corridors, six of which are to the west of Node J at Drumsna Junction (Purple West, Dark Green, Black, Orange, Cyan and Blue West) and four which are to the east of Node J (Purple East, Green, Yellow and Blue East).

7.5.2.2 Methodology

The assessment of Material Assets Non-Agriculture is conducted in the context of the constraints identified in Section 4.5 of this report.

For the Stage 1 assessment, the option corridors are assessed in two sections; one west of Drumsna (Node J) and the second is east of Drumsna (Node J). The cross-section of a potential road-based solution within these corridors has not yet been determined. However, a fenceline has been developed for each option corridor within which a road design could sit. This fenceline represents the expected 'worst-case' scenario with respect to landtake.

For this assessment, the potential impacts on the following were assessed:

- The following property types:
 - Residential properties
 - Commercial and industrial properties
 - Amenity Spaces (Recreation, Tourism and Leisure)
 - Proposed developments
- The infrastructure for both public and private utilities/service providers

The assessment of each option corridor includes both a quantitative and qualitative assessment. Firstly, each potential impact on Material Assets Non-Agriculture is quantified and then the level of impact and its significance assigned for each impact as per Table 7.5.2.1. Following this an overall assessment of the cumulative impacts for each option corridor is completed and scored based on the seven-point scale listed in Table 7.3.1 of this report.

Assessment Methodology for Material Assets Excluding Utilities and Services

For the purposes of assessing direct impacts on properties, the indicative fenceline developed for each option corridor was regarded to include all lands required for the construction and operation of new road infrastructure. This included a potential design and a buffer of 10m from the edge of the earthworks associated with the mainline, and a buffer of 3m from the edge of the earthworks associated with the sideroads. Properties within the corridors were also identified as the cross-section is undetermined and the design is fluid and could move anywhere within the corridor.

Level of Impact

The potential impact of the option corridors on non-agricultural properties was assessed according to the significance criteria detailed in Table 7.5.2.1.

Table 7.5.2.1 Criteria for Assessing the Significance of Impact on Non-agricultural Properties

Significance Level / Degree of Impact	Definition
Major or Highly Negative Profound	A non-agricultural property of national or regional importance is fully within the fenceline and will be removed by the proposed option
Moderately Negative	A non-agricultural property or other material asset is fully within the fenceline and may result in the demolition or acquisition of a dwelling or, where acquisition of a property results in loss of employment and total or partial loss of the business
Minor or Slightly Negative	Part of a non-agricultural property or other material asset is within the fenceline
Not Significant or Neutral	An impact on a property which is currently occupied by a public right-of-way, e.g. a road or the non-agricultural property or other material asset is within the Option Corridor but outside the indicative fenceline

The level of impacts for residential, commercial/industrial and amenity properties have been considered under three categories:

- All properties fully within the fenceline are considered as full acquisitions and are major or highly negative or moderately negative impacts depending on the significance of the asset
- Any property holding partially within the fenceline is considered to require partial landtake. Depending on the extent of the landtake these impacts vary from minor or slightly negative to not significant or neutral
- An impact on a property which is currently occupied by a public right-of-way, e.g. a road or the non-agricultural property and all properties that lie within the corridor but outside the fenceline were also included in this assessment as the cross-section is undetermined and the design may need to be realigned within the corridor and in that event, could potentially have a direct impact on these properties. These impacts are considered to be not significant or neutral

This assessment has been carried out and the number of affected properties and a synopsis of the impacts are presented in Section 7.5.2.3.

Assessment Methodology for Utilities and Services Infrastructure

The locations of existing utilities were requested from the relevant utility service providers. At this stage of the assessment of option corridors, it is difficult to consider all utilities that are impacted by all the options.

There are considerable numbers of low voltage ESB lines, servicing every home and business in the study area. These services were not assessed as part of this assessment, as they are required for each of the options and are considered to be a minor constraint and could be readily diverted where necessary. The ESB services that have been assessed (see bullet list below) are considered to be the major utilities for this service provider and pose more significant constraints for the Project.

Similarly, there are numerous small diameter foul, combined and surface water sewers and watermains throughout the Study Area that have not been considered as part of this assessment, as they are located throughout each of the option corridors. Moreover, they are considered to be a minor constraint and could be readily diverted where necessary. The assessment has been carried out based on the larger diameter, more critical services, as detailed in the bulleted list below, as these pose more significant constraints for the Project.

In summary, as a preliminary assessment of the option corridors, impacts on larger utilities and services were assessed. The following utilities and services were considered where they crossed the indicative fenceline for the assessment:

- ESB High Voltage (i.e. 38kV, 110kV and 220kV) Overhead Lines (HV OH)
- ESB High Voltage Underground Lines (HV UG)
- ESB Medium Voltage (i.e. 10kV, 20kV) Overhead Lines (MV OH)
- ESB Substations
- Irish Water watermains with pipe diameter greater than 300mm
- Irish Water foul or combined sewers with pipe diameters greater than 300mm
- Water/wastewater treatment plants
- Telecoms Antennas
- Eir underground services
- E-Net services
- BT services – BT were contacted however it is their policy to not provide electronic data for large swathes of areas however, they did confirm that there are BT fibre optic cables within the N4 study area. BT services are present within the N4 study area at the following locations:
 - Leitrim Leisure Centre
 - Rosebank Retail Park
 - Along the railway line
 - At the train station

In addition, the existing waste facilities within the study area have been identified in Section 4.5 Material Assets Non-Agriculture. The methodology described above for Material Assets Non-Agriculture excluding utilities and services assessment was also used for the waste assessment. The footprint of each option corridor was examined against these constraints identified and any waste facility within this footprint was assessed as an impact.

Level of Impact

The potential impact of the option corridors on non-agricultural properties was assessed according to the significance criteria detailed in Table 7.5.2.2.

Table 7.5.2.2 Criteria for Assessing the Significance of Impact on Non-Agricultural Properties

Significance Level / Degree of Impact	Definition
Major or Highly Negative Profound	Removal of a service or utility that is of national or regional importance
Moderately Negative	Major diversion of High Voltage ESB lines (38kV, 110kV or 220kV) or fibre optic telecoms
Minor or Slightly Negative	Minor diversion of High Voltage ESB lines (38kV, 110kV or 220kV) or fibre optic telecoms
Not Significant or Neutral	The diversion of low and medium voltage ESB network, telecommunications or water supply or foul sewer services

This assessment has been carried out and the assessment and is presented in Section 7.5.2.3.

7.5.2.3 Option Corridors Assessment

Material Assets Non-Agriculture, Excluding Utilities and Services West of Drumsna Junction (Node J)

The impacts on properties are quantified for each option corridor West of Drumsna Junction (Node J) in Table 7.5.2.3. An indicative fenceline is contained with the option corridors in order to aid the assessments. Both an assessment of the properties within the indicative fenceline and properties within the corridors is provided as a design could still move within the corridors.

Table 7.5.2.3 Identification of Property Impacts West of Drumsna Junction (Node J)

Assessment Criteria	Cyan Option Corridor	Orange Option Corridor	Purple West Option Corridor	Dark Green Option Corridor	Blue West Option Corridor	Black Option Corridor
Residential Acquisitions	16	11	3	0	0	0
Residential Partial Landtake	14	28	18	15	15	3
Residential Properties within the Corridor*	114	102	27	27	290	20
Commercial / Industrial Acquisitions	3	2	0	0	0	0
Commercial / Industrial Partial Landtake	2	4	0	0	2	0
Commercial / Industrial Properties within the Corridor*	1	1	0	0	37	0
Amenity Acquisitions	1	0	0	0	0	0
Amenity Partial Landtake	4	0	0	0	0	0
Amenity within the Corridor*	1	1	1	1	2	0
Proposed Development Full Impact	1	1	0	0	0	0
Proposed Development Partial Impact	2	1	0	0	3	0

**These are properties (all types) outside of the footprint of the potential design but within the option corridor.*

Cyan Option Corridor

The Cyan Option Corridor has the greatest number of full residential property acquisitions at 16, none of these properties are of national or regional importance and therefore these impacts are moderately negative. This option corridor requires a further possible partial landtake from 14 residential properties and these impacts are minor or slightly negative. There are 114 additional residential properties within the corridor but outside the fenceline and these impacts are not significant or neutral.

This option corridor requires the full acquisition of 3 commercial/industrial properties (moderately negative), partial landtake from 2 commercial/industrial

property (minor or slightly negative) and there is 1 additional commercial/industrial property within the corridor but outside the fenceline (minor or slightly negative). There is 1 amenity within the fenceline but there is possible landtake from 4 amenities (minor or slightly negative) and there is one amenity within the corridor but outside the fenceline (minor or slightly negative).

There is one planning application fully within the fenceline (moderately negative) and two planning applications partially within the fenceline (minor or slightly negative).

As a result, this option corridor is considered to be Moderately Negative (2) and is ranked as Least Preferred.

Orange Option Corridor

The Orange Option corridor is similar to that of the Cyan Option Corridor. It has the second greatest number of full residential property acquisitions at 11, none of these properties are of national or regional importance and therefore these impacts are moderately negative. It has a further partial landtake from 28 residential properties (minor or slightly negative). There are 102 additional residential properties within the corridor but outside the Fenceline (not significant or neutral). This option corridor would require the full acquisition of two commercial/industrial properties (moderately negative), partial landtake from four commercial/industrial properties (minor or slightly negative) and there is one additional commercial/industrial property within the corridor but outside the fenceline (not significant or neutral). There are no amenities within the fenceline and no partial landtake. There is one amenity within the corridor but outside the fenceline (not significant or neutral).

There is one planning application fully within the fenceline (moderately negative) and one planning application partially within the fenceline (minor or slightly negative).

As a result, this option corridor is considered to be Moderately Negative (2) and is ranked as Least Preferred.

Purple West Option Corridor

There are no impacts on commercial/industrial properties or planning applications, to the west of Drumsna Junction, on the Purple West Option Corridor. It requires the full acquisition of 3 residential properties, neither of these properties are of national or regional importance and therefore these impacts are moderately negative. There is partial landtake from 18 residential properties (minor or slightly negative) and there are 27 additional residential properties within the corridor but outside the fenceline (not significant or neutral). There are no amenities within the fenceline nor the possible landtake from an amenity. There is one amenity within the corridor but outside the fenceline (not significant or neutral).

As a result, this option corridor is considered to be Minor or Slightly Negative (3) and is ranked as Intermediate.

Dark Green Option Corridor

The Dark Green Option Corridor also has no impacts on commercial/industrial properties or planning applications. It does not require the full acquisition of any residential property and therefore the impact is not significant or neutral. There is partial landtake from 15 residential properties (minor or slightly negative) and there are 27 additional residential properties within the corridor but outside the fenceline (not significant or neutral). There are no amenities within the fenceline nor the possible landtake from an amenity. There is one amenity within the corridor but outside the fenceline (not significant or neutral).

As a result, this option corridor is considered to be Minor or Slightly Negative (3) and is ranked as Intermediate.

Blue West Option Corridor

The Blue West Option Corridor is the management ('on-line') option; therefore, it has the fewest direct impacts to residential properties as this option seeks to reutilise the existing N4 and requires no full acquisition of a property. It requires a partial landtake from 15 residential properties (minor or slightly negative) and there are 290 residential properties within the corridor but outside the fenceline (not significant or neutral). There are no full acquisitions or commercial/industrial properties but there is partial landtake from two commercial/industrial (minor or slightly negative) and there are 37 commercial/industrial within the corridor but outside the fenceline (not significant or neutral).

There are no amenities within the fenceline nor the possible landtake from an amenity. There are two amenities within the corridor but outside the fenceline (not significant or neutral). There are no planning applications directly impacted by the Blue West Option Corridor.

As a result, this option corridor is considered to be minor or slightly negative (3) and is ranked as Preferred as it has no moderately negative impacts associated with it, unlike the Purple and Dark Green Option Corridors which are also scored as being Minor or Slightly Negative (3) which have two and one moderate negative impacts respectively.

Black Option Corridor

The Black option corridor is the link to the north of Carrick-on-Shannon. It has no impacts on commercial/industrial properties, planning applications or amenities and requires no full acquisition of a residential property. It does require partial landtake from three residential properties (minor or slightly negative) and there are 20 residential properties within the corridor but outside the fenceline (not significant or neutral).

As a result, this option corridor is considered to be Minor or Slightly Negative (3). This option corridor is not compared to the other option corridors and as such has not been ranked.

The assessment matrix of these impacts for each option corridor is presented in Table 7.5.2.4 below.

Table 7.5.2.4 Assessment Matrix of Material Assets Non-Agriculture, excluding Utilities and Services – West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Residential	There are 16 moderately negative, 14 minor or slightly negative and 114 not significant or neutral impacts associated with this option corridor	There are 11 moderately negative, 28 minor or slightly negative and 102 not significant or neutral impacts associated with this option corridor	There are 3 moderately negative, 18 minor or slightly negative and 27 not significant or neutral impacts associated with this option corridor	There are 15 minor or slightly negative and 27 not significant or neutral impacts associated with this option corridor	There are 15 minor or slightly negative and 290 not significant or neutral impacts associated with this option corridor	There are 3 minor or slightly negative and 20 not significant or neutral impacts associated with this option corridor
Commercial / Industrial	There are 3 moderately negative, 2 minor or slightly negative and 1 not significant or neutral impact associated with this option corridor	There are 2 moderately negative, 4 minor or slightly negative and 1 not significant or neutral impacts associated with this option corridor	There are 0 commercial / industrial impacts associated with this option corridor	There are 0 commercial / industrial impacts associated with this option corridor	There are 2 minor or slightly negative and 37 not significant or neutral impacts associated with this option corridor	There are 0 commercial / industrial impacts associated with this option corridor
Amenity	There are 4 minor or slightly negative and 1 not significant or neutral impacts associated with this option corridor	There is 1 not significant or neutral impacts associated with this option corridor	There is 1 not significant or neutral impact associated with this option corridor	There is 1 not significant or neutral impacts associated with this option corridor	There are 2 not significant or neutral impacts associated with this option corridor	There are 0 amenity property impacts associated with this option corridor
Proposed Development	There are 1 moderately negative and 2 minor or slightly negative impacts associated with this option corridor	There is 1 moderately negative and 1 minor or slightly negative impact associated with this option corridor	There are 0 proposed development impacts associated with this option corridor	There are 0 proposed development impacts associated with this option corridor	There are 3 minor or slightly negative impacts associated with this option corridor	There are 0 proposed development impacts associated with this option corridor

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Overall Assessment	There are 20 moderately negative, 22 minor or slightly negative and 118 not significant or neutral impacts associated with this option corridor	There are 14 moderately negative, 33 minor or slightly negative and 104 not significant or neutral impacts associated with this option corridor	There are 3 moderately negative, 18 minor or slightly negative and 27 not significant or neutral impacts associated with this option corridor	There are 15 minor or slightly negative and 28 not significant or neutral impacts associated with this option corridor	There are 20 minor or slightly negative and 329 not significant or neutral impacts associated with this option corridor	There are 3 minor or slightly negative and 20 not significant or neutral impacts associated with this option corridor
Scoring						
Overall Qualitative Assessment	Moderately Negative	Moderately Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Score / Impact Level	2	2	3	3	3	3
Preference - Professional Judgement**	Least Preferred	Least Preferred	Intermediate	Intermediate	Preferred	N/A

*These are properties (all types) outside of the footprint of the potential design but within the option corridor

Utilities and Services West of Drumsna Junction (Node J)

The assessment for the number of conflicts with utilities and services for each Option Corridor West of Drumsna Junction (Node J) is presented in Table 7.5.2.5 below. These impacts range from crossing of the option corridor to diversions of kilometres of service ducts and pipelines.

Table 7.5.2.5 Number of Utilities and Services Conflicts - West of Drumsna Junction (Node J)

Assessment Criteria	Cyan Option Corridor	Orange Option Corridor	Purple West Option Corridor	Dark Green Option Corridor	Blue West Option Corridor	Black Option Corridor
ESB High Voltage (i.e. 38kV, 110kV and 220kV) Overhead Lines (HV OH) [crossings of the indicative fenceline]	6 No.	7 No.	4 No.	4 No.	3 No.	0 No.
ESB High Voltage Underground Lines (HV UG) [crossings of the indicative fenceline]	1 No.	1 No.	0 No.	0 No.	1 No.	0 No.
ESB Medium Voltage (i.e. 10kV, 20kV) Overhead Lines (MV OH) [crossings of the indicative fenceline]	2 No.	2 No.	2 No.	2 No.	1 No.	0 No.
ESB Substations	None	None	None	None	None	None
Irish Water watermains with pipe diameter greater than 300mm	0m length	0m length	766m length	444m length	0m length	80m length
Irish Water foul or combined sewers with pipe diameters greater than 300mm	0m length	0m length	0m length	0m length	215m length	0m length
Water / wastewater treatment plants	None	None	None	None	None	None
Licenced waste facilities	None	None	None	None	None	None
Telecoms Antenna	None	None	None	None	None	None
Eir underground services	5790m length	5696m length	3003m length	1905m length	29025m length	99.7m length
ENet	126m length	107.4m length	0m length	0m length	3744m length	0m length
BT services	<i>At the time of writing BT have not provided electronic location data however the generalised descriptive locations provided indicated that the locations where they do occur coincides with the locations of similar sized underground utilities. It is determined that the impacts on BT underground utilities would not be considerable enough to influence the comparative assessment.</i>					

Cyan Option Corridor

The Cyan Option Corridor has six conflicts with High Voltage Overhead lines two of which are long skewed crossings. In addition, there is one conflict with one High Voltage Underground line. These are considered to be moderately negative in significance.

Furthermore, there are two conflicts with medium voltage ESB lines and one conflict with a relatively short length of Eir Underground services and as such these impacts are considered to be not significant or neutral.

As a result, this option corridor is considered to be Moderately Negative (2) and is ranked as Intermediate due to the difficulty associated with the long skewed ESB crossings.

Orange Option Corridor

The Orange Option Corridor has seven conflicts with High Voltage Overhead Line crossings, two of which are long skewed crossings. In addition, there is one conflict with a High Voltage Underground line, these are considered to be moderately negative in significance.

There are two conflicts with medium voltage ESB lines and one conflict with a relatively short length of Eir Underground services and as such these impacts are also considered to be not significant or neutral.

As a result, this option corridor is considered to be Moderately Negative (2) and is ranked as Intermediate due to the difficulty associated with the long skewed ESB crossings.

Purple West Option Corridor

The Purple West Option Corridor has four conflicts with High Voltage Overhead Line crossings. This includes an angle tower near the centreline of the Purple West Option Corridor. These are considered to be moderately negative in significance.

There are two conflicts with medium voltage ESB lines and one conflict with a relatively short length of Irish Water watermains with pipe diameter greater than 300mm and one conflict with Eir Underground services and as such these impacts are also considered to be minor or slightly negative.

As a result, this option corridor is considered to be Moderately Negative (2) and is ranked as Intermediate due to the difficulty associated with the change in direction of one of the High Voltage Overhead crossings.

Dark Green Option Corridor

The Dark Green Option Corridor has four conflicts with High Voltage Overhead Line crossings. This includes an angle tower near the centreline of the Dark Green Corridor. These are considered to be moderately negative in significance.

There are two conflicts with medium voltage ESB lines and one conflict with a relatively short length of Irish Water watermains with pipe diameter greater than 300mm and one conflict with Eir Underground services and as such these impacts are also considered to be minor or slightly negative.

As a result, this option corridor is considered to be Moderately Negative (2) and is ranked as Intermediate due to the difficulty associated with the change in direction of one of the High Voltage Overhead crossings.

Blue West Option Corridor

The Blue West Option Corridor has four conflicts with High Voltage Overhead Line crossings and one conflict with one High Voltage Underground line, these are considered to be Moderately Negative in significance.

There is one conflict with medium voltage ESB lines and one conflict with a relatively short length of Irish Water watermains with pipe diameter greater than 300mm as such these impacts are also considered to be not significant or neutral.

There is an extensive length of Eir Underground services, circa 29km in conflict with the Blue Option Corridor and this impact is considered to be moderately negative.

As a result, this option corridor is considered to be Moderately Negative (2) and is ranked as Preferred.

Black Option Corridor

The Black Option Corridor is a standalone option which will have little to no impact on the surrounding area's utilities. This option corridor has no conflicts with the ESB network but does have a conflict with a relatively short length of Irish Water watermains with pipe diameter greater than 300mm and one conflict with Eir Underground services and as such these impacts are also considered to be not significant or neutral.

As a result, this option corridor is considered to be Not Significant or Neutral (4). This option corridor is not compared to the other option corridors and as such has not been ranked.

Table 7.5.2.6 Assessment Matrix of Utilities and Services – Options West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Utilities and Services	There are 7 Moderately Negative and 3 Not Significant or Neutral impacts associated with this option corridor	There are 8 Moderately Negative and 3 Not Significant or Neutral impacts associated with this option corridor	There are 4 Moderately Negative and 4 Not Significant or Neutral impacts associated with this option corridor	There are 4 Moderately Negative and 4 Not Significant or Neutral impacts associated with this option corridor	There 5 Moderately Negative and 2 Not Significant or Neutral impacts associated with this option corridor	There are 2 Not Significant or Neutral impacts associated with this option corridor
Licenced Waste Facilities	There are 0 Licenced waste facilities impacts associated with this option corridor	There are 0 Licenced waste facilities impacts associated with this option corridor	There are 0 Licenced waste facilities impacts associated with this option corridor	There are 0 Licenced waste facilities impacts associated with this option corridor	There are 0 Licenced waste facilities impacts associated with this option corridor	There are 0 Licenced waste facilities impacts associated with this option corridor
Scoring						
Qualitative Assessment	Includes two long skewed ESB crossings Moderately Negative	Includes two long skewed ESB crossings Moderately Negative	Includes an angle tower / change in direction of HV line Moderately Negative	Includes an angle tower / change in direction of HV line Moderately Negative	 Moderately Negative	 Not Significant or Neutral
Score / Impact Level	2	2	2	2	2	4
Preference - Professional Judgement	Intermediate	Intermediate	Intermediate	Intermediate	Preferred	N/A

Overview - West of Drumsna Junction (Node J)

In the overall ranking of the option corridors for West of Drumsna Junction (Node J) in terms of Material Assets Non-Agriculture the number of property acquisitions were weighted more heavily than conflicts with utilities as these utilities can be diverted as part of the works. Table 7.5.2.7 summarises the order of ranking for the option corridors in West of Drumsna Junction (Node J).

Table 7.5.2.7 Summary Material Assets-Non-Agriculture Assessment Matrix of Option Corridors West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Properties	There are 20 Moderately Negative, 22 Minor or Slightly Negative and 118 Not Significant or Neutral impacts associated with this option corridor	There are 14 Moderately Negative, 33 Minor or Slightly Negative and 104 Not Significant or Neutral impacts associated with this option corridor	There are 3 Moderately Negative, 18 Minor or Slightly Negative and 27 Not Significant or Neutral impacts associated with this option corridor	There are no Moderately Negative, 15 Minor or Slightly Negative and 28 Not Significant or Neutral impacts associated with this option corridor	There are no Moderately Negative, 20 Minor or Slightly Negative and 329 Not Significant or Neutral impacts associated with this option corridor	There are no Moderately Negative, 3 Minor or Slightly Negative and 20 Not Significant or Neutral impacts associated with this option corridor
Services and Utilities	There are 7 Moderately Negative and 3 Not Significant or Neutral impacts associated with this option corridor	There are 8 Moderately Negative and 3 Not Significant or Neutral impacts associated with this option corridor	There are 4 Moderately Negative and 4 Not Significant or Neutral impacts associated with this option corridor	There are 4 Moderately Negative and 4 Not Significant or Neutral impacts associated with this option corridor	There 5 Moderately Negative and 2 Not Significant or Neutral impacts associated with this option corridor	There are 2 Not Significant or Neutral impacts
Scoring						
Overall Qualitative Assessment	Moderately Negative	Moderately Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Score / Impact Level	2	2	3	3	3	3
Preference - Professional Judgement	Least Preferred	Least Preferred	Intermediate	Intermediate	Preferred	N/A

Material Assets Non-Agriculture, Excluding Utilities and Services - East of Drumsna Junction (Node J)

The impacts on properties are quantified for each option corridor in East of Drumsna Junction (Node J) in Table 7.5.2.8.

Table 7.5.2.8 Identification of Property Impacts – East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Residential Acquisitions	16	14	13	0
Residential Partial Landtake	24	22	30	3
Residential Properties within the Corridor*	47	52	46	86
Commercial / Industrial Acquisitions	0	0	1	0
Commercial / Industrial Partial Landtake	0	3	3	2
Commercial / Industrial Properties within the Corridor*	1	0	0	1
Amenity Acquisitions	0	0	0	0
Amenity Partial Landtake	1	1	0	1
Amenity within the Corridor*	0	0	2	0
Proposed Development Full Impact	0	0	0	0
Proposed Development Partial Impact	0	0	0	0

**These are properties (all types) outside of the footprint of the potential design but within the option corridor.*

Yellow Option Corridor

The Yellow Option Corridor requires the full acquisition of 16 residential properties, none of these properties are of national or regional importance and as such these impacts are moderately negative. This option corridor requires a further possible partial landtake from 24 residential properties and these impacts are minor or slightly negative. There are 47 additional residential properties within the corridor but outside the fenceline and these impacts are not significant or neutral.

This option corridor does not require full acquisition of a commercial/industrial property, but requires partial landtake from one commercial/industrial property (minor or slightly negative) and there is one additional commercial/industrial property within the corridor but outside the fenceline (not significant or neutral).

There are no amenities within the fenceline but there is possible landtake from one amenity (minor or slightly negative). There are no amenities within the corridor but outside the fenceline. There are no planning applications directly impacted by the Yellow Option Corridor.

As a result, this option corridor is considered to be Moderately Negative (2) and is ranked as Least Preferred.

Green Option Corridor

The Green Option Corridor requires the full acquisition of 14 residential properties, none of these properties are of national or regional importance and as such these impacts are moderately negative. This option corridor requires a further possible partial landtake from 22 residential properties and these impacts are minor or slightly negative. There are 52 additional residential properties within the corridor but outside the fenceline and these impacts are not significant or neutral.

This option corridor requires no full acquisition of a commercial/industrial property but does require partial landtake from three commercial/industrial properties (minor or slightly negative) and there are no additional commercial/industrial properties within the corridor but outside the fenceline (not significant or neutral).

There are no amenities within the fenceline but there is possible landtake from one amenity (minor or slightly negative). There are no amenities within the corridor but outside the fenceline. There are no planning applications directly impacted by the Green Option Corridor.

As a result, this option corridor is considered to be Moderately Negative (2) and is ranked as Intermediate.

Purple East Option Corridor

The Purple East Option Corridor requires the full acquisition of 13 residential properties, none of these properties are of national or regional importance and as such these impacts are moderately negative. This option corridor requires a further possible partial landtake from 30 residential properties and these impacts are minor or slightly negative. There are 46 additional residential properties within the corridor but outside the fenceline and these impacts are not significant or neutral.

This option corridor requires the full acquisition of one commercial/industrial property (moderately negative), partial landtake from three commercial/industrial property (minor or slightly negative) and there are no additional commercial/industrial properties within the corridor but outside the fenceline.

There are no amenities within the fenceline or possible landtake from an amenity and there are two amenities within the corridor but outside the fenceline (not significant or neutral). There are no planning applications directly impacted by the Purple East Option Corridor.

As a result, this option corridor is considered to be Moderately Negative (2) and is ranked as Intermediate.

Blue East Option Corridor

The Blue East Option Corridor requires no full acquisition of a residential property. This option corridor requires possible partial landtake from three residential properties and these impacts are minor or slightly negative. There are 86 additional residential properties within the corridor but outside the fenceline and these impacts are not significant or neutral.

This option corridor requires no full acquisition of a commercial/industrial property but does require partial landtake from two commercial/industrial property (minor or slightly negative) and there is one additional commercial/industrial property within the corridor but outside the fenceline (not significant or neutral).

There are no amenities within the fenceline but there is possible landtake from one amenity (minor or slightly negative). There are no amenities within the corridor but outside the fenceline. There are no planning applications directly impacted by the Blue East Option Corridor.

As a result, this option corridor is considered to be Minor or Slightly Negative (3) and is ranked as Preferred.

The assessment matrix of these impacts for each option corridor is presented in Table 7.5.2.9 below.

Table 7.5.2.9 Assessment Matrix of Material Assets Non-Agriculture excluding Utilities and Services – East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Residential	There are 16 Moderately Negative, 24 Minor or Slightly Negative and 47 Not Significant or Neutral impacts associated with this option corridor	There are 14 Moderately Negative, 22 Minor or Slightly Negative and 52 Not Significant or Neutral impacts associated with this option corridor	There are 13 Moderately Negative, 30 Minor or Slightly Negative and 46 Not Significant or Neutral impacts associated with this option corridor	There are 3 Minor or Slightly Negative and 86 Not Significant or Neutral impacts associated with this option corridor
Commercial / Industrial	There is 1 Not Significant or Neutral impacts associated with this option corridor	There are 3 Minor or Slightly Negative impacts associated with this option corridor	There is 1 Moderately Negative and 3 Minor or Slightly Negative impacts associated with this option corridor	There are 2 Minor or Slightly Negative and 1 Not Significant or Neutral impacts associated with this option corridor
Amenity	There are 1 Minor or Slightly Negative impacts associated with this option corridor	There are 1 Minor or Slightly Negative impacts associated with this option corridor	There are 2 Not Significant or Neutral impacts associated with this option corridor	There are 1 Minor or Slightly Negative impacts associated with this option corridor
Proposed Development	There are 0 proposed development impacts associated with this option corridor	There are 0 proposed development impacts associated with this option corridor	There are 0 proposed development impacts associated with this option corridor	There are 0 proposed development impacts associated with this option corridor
Overall Assessment	There are 16 Moderately Negative, 25 Minor or Slightly Negative and 48 Not Significant or Neutral impacts associated with this option corridor	There are 14 Moderately Negative, 26 Minor or Slightly Negative and 52 Not Significant or Neutral impacts associated with this option corridor	There are 14 Moderately Negative, 33 Minor or Slightly Negative and 48 Not Significant or Neutral impacts associated with this option corridor	There are 0 Moderately Negative, 6 Minor or Slightly Negative and 87 Not Significant or Neutral impacts associated with this option corridor
Scoring				
Qualitative Assessment	Moderately Negative	Moderately Negative	Moderately Negative	Minor or Slightly Negative
Score / Impact Level	2	2	2	3
Preference - Professional Judgement	Least Preferred	Intermediate	Intermediate	Preferred

Utilities and Services - East of Drumsna Junction (Node J)

The assessment for the number of conflicts with utilities and services for each Option Corridor East of Drumsna Junction (Node J) is presented in Table 7.5.2.10 below. These impacts range from crossing of the option corridor to diversions of kilometres of service ducts and pipelines.

Table 7.5.2.10 No. of Utilities and Services Conflicts – East of Drumsna Junction (Node J)

Option Corridor	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
<i>ESB High Voltage (i.e. 38kV, 110kV and 220kV) Overhead Lines (HV OH)</i> [crossings of the indicative fenceline]	1 No.	1 No.	1 No.	1 No.
<i>ESB High Voltage Underground Lines (HV UG)</i> [crossings of the indicative fenceline]	None	None	None	None
<i>ESB Medium Voltage (i.e. 10kV, 20kV) Overhead Lines (MV OH)</i> [crossings of the indicative fenceline]	None	None	None	None
<i>ESB Substations</i>	None	None	None	None
<i>Irish Water water mains with pipe diameter greater than 300mm</i>	5023m length	5659m length	3391m length	7398m length
<i>Irish Water foul or combined sewers with pipe diameters greater than 300mm</i>	None	None	None	None
<i>Water / wastewater treatment plants</i>	None	None	None	None
<i>Licensed waste facilities</i>	None	None	None	None
<i>Telecoms Antenna</i>	None	None	None	None
<i>Eir underground services</i>	9100m length	10781m length	11061m length	14675m length
<i>ENet</i>	None	None	None	None
<i>BT services</i>	<i>At the time of writing BT have not provide electronic location data however the generalised descriptive locations provided indicated that the locations where they do occur coincides with the locations of similar sized underground utilities. It is determined that the impacts on BT underground utilities would not be considerable enough to influence the comparative assessment.</i>			

The Purple East, Green, Yellow and Blue East Option Corridors are in conflict with the following services and utilities:

- High Voltage Overhead Line crossings, which are considered to be moderately negative impacts particularly as there is a 220kV Overhead crossing of all the options near Aghamore
- Irish Water watermains with pipe diameter greater than 300mm which are considered to be not significant or neutral impacts. The lengths of each conflict are relatively similar ranging from circa 3.4km to 7.4km
- Eir Underground services which are considered to be not significant or neutral impacts. The lengths of each conflict are relatively similar ranging from circa 9.1km to 14.7km

Based on the assessment of utilities and services and licenced waste facilities there is no distinguishable difference among the options west of Drumsna Junction (Node J) and so they are all deemed Intermediate.

Table 7.5.2.11 Assessment Matrix of Utilities and Services – East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Utilities and Services	There is 1 Moderately Negative and 2 Not Significant or Neutral impacts associated with this option corridor	There is 1 Moderately Negative and 2 Not Significant or Neutral impacts associated with this option corridor	There is 1 Moderately Negative and 2 Not Significant or Neutral impacts associated with this option corridor	There is 1 Moderately Negative and 2 Not Significant or Neutral impacts associated with this option corridor
Licenced waste facilities	There are 0 licenced waste facility impacts associated with this option corridor	There are 0 licenced waste facility impacts associated with this option corridor	There are 0 licenced waste facility impacts associated with this option corridor	There are 0 licenced waste facility impacts associated with this option corridor
Scoring				
Qualitative Assessment	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Score / Impact Level	2	2	2	2
Preference - Professional Judgement	Intermediate	Intermediate	Intermediate	Intermediate

Overview East of Drumsna Junction (Node J)

In the overall ranking of the option corridors for East of Drumsna Junction (Node J) in terms of Material Assets Non-Agriculture the number of property acquisitions are weighted more heavily than conflicts with utilities as utilities can be diverted as part of the works.

Table 7.5.2.12 below summarises the order of ranking for the route options in East of Drumsna Junction (Node J).

Table 7.5.2.12 Summary Material Assets-Non-Agriculture Assessment Matrix of Option Corridors – East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Properties	There are 17 Moderately Negative, 25 Minor or Slightly Negative and 48 Not Significant or Neutral impacts associated with this option corridor	There are 14 Moderately Negative, 26 Minor or Slightly Negative and 52 Not Significant or Neutral impacts associated with this option corridor	There are 14 Moderately Negative, 33 Minor or Slightly Negative and 48 Not Significant or Neutral impacts associated with this option corridor	There are 0 Moderately Negative, 6 Minor or Slightly Negative and 87 Not Significant or Neutral impacts associated with this option corridor
Services and utilities	There is 1 Moderately Negative and 2 Not Significant or Neutral impacts associated with this option corridor	There is 1 Moderately Negative and 2 Not Significant or Neutral impacts associated with this option corridor	There is 1 Moderately Negative and 2 Not Significant or Neutral impacts associated with this option corridor	There are 1 Moderately Negative and 2 Not Significant or Neutral impacts associated with this option corridor
Scoring				
Overall Qualitative Assessment	Moderately Negative	Moderately Negative	Moderately Negative	Minor or Slightly Negative
Score / Impact Level	2	2	2	3
Preference - Professional Judgement	Least Preferred	Intermediate	Intermediate	Preferred

7.5.2.4 Summary

The overall ranking preferences for the option corridors west and east of Drumsna Junction (Node J), in terms of material assets non-agriculture are shown in Table 7.5.2.7 and Table 7.5.2.12 respectively.

It has been determined that the Preferred Option Corridor west of Drumsna Junction (Node J) is the Blue West Option Corridor in relation to Material Assets Non-Agricultural. The Purple West and Dark Green Option Corridors are both Intermediate and the Cyan and Orange Option Corridors are Least Preferred from a Material Assets Non-Agricultural perspective.

East of Drumsna Junction (Node J) the Blue East Option Corridor is also the Preferred Option Corridor. The Purple East and Green Option Corridors are Intermediate, and the Yellow Option Corridors is Least Preferred.

7.5.3 Stage 1 Material Assets-Agriculture Option Assessment

7.5.3.1 Introduction

This section details the Stage 1 Assessment of the Options in the context of the agricultural constraints identified in Section 4.6 Material Assets – Agriculture of this report.

The Material Assets- Agriculture constraints are presented with the Stage 1 Option Corridors in Figures 7.5.3.1.0 to 7.5.3.3.5.

Section 7.5.3.2 outlines the methodology that was used to carry out the study, including the assessment criteria. The assessment criteria is presented in Section 7.5.3.3 and the assessment in 7.5.3.4, with Section 7.5.3.5 outlining the general summary of the Stage 1 Material Assets- Agriculture assessment of the options.

7.5.3.2 Methodology

The options included in this assessment fall under the following headings:

- Do-Minimum Option (Planned and Committed Projects)
- Management Option (interventions on the existing infrastructure to address the identified transport problems as described in Section 7.1 of this document)
- Do-Something Road Based Options

A total of ten option corridors have been taken forward to the preliminary options as described in Section 7.1 of this report. There are six option corridors to the west of Node J at Drumsna Junction (Purple West, Dark Green, Black, Orange, Cyan and Blue East) and four option corridors to the east of Node J at Drumsna Junction (Purple East, Green, Yellow and Blue East). Please see Figures 7.5.3.1.0 to 7.5.3.3.5 for locations.

The following guidelines and legislation were referred to when undertaking this Stage 1 Material Assets- Agriculture assessment of options:

- European Union (2018) (Planning and Development) (Environmental Impact Assessment) Regulations. (SI 296 of 2018)²²
- Environmental Protection Agency (EPA) (August 2017) Guidelines on the Information to be contained in Environmental Impact Assessment Reports³³
- Transport Infrastructure Ireland (TII) (2016) Project Appraisal Guidelines Unit 7.0 - Multi Criteria Analysis, PE-PAG-02031²

This assessment is a combination of a desktop assessment of available data sources combined with the on-site survey conducted in August 2020 as part of the Constraints Study. The desktop study considered the following sources of information:

²² European Union, 2018. Regulations SI 296 of 2018, Planning and Development, Environmental Impact Assessment. Available at: <https://www.irishstatutebook.ie/eli/2018/si/296/made/en/print>

- Aerial mapping/photography
- Property Registration Authority of Ireland (PRAI) database
- Soil mapping data from the Teagasc Irish Soil Information System
- Data regarding agriculture in Counties Roscommon and Leitrim from the Central Statistics Office (CSO)

Information regarding the location and types of farm yards, farm types, land use/cropping and land quality was obtained from the site survey and examination of the afore mentioned desktop sources of information. The information in Table 4.6.1 of Section 4.6.2.3, Material Assets – Agriculture Constraints Study is used to categorise the sensitivity of farms. The following features along each option corridor have been identified from desktop research and site survey:

- Farm size and type was determined by referencing the CSO data for the study area and farm types were also recorded from the field survey
- Yards and farm facilities were identified using aerial photography²³ and site survey
- Dairy, equine farms, horticultural and other highly sensitive enterprises were identified from aerial photography²³ and site survey. Their folios were identified using the PRAI²⁴ data
- Good and poor quality land and areas of woodland/scrub/forestry were initially identified by using the Teagasc Irish Soils Information System²⁵, aerial photography²³ and verified during the site survey.

Scoring procedure

Quantitative and qualitative assessments of impacts were undertaken for this assessment using the PAG Unit 72 scoring method. The PAG seven point scale descriptions are listed in Table 7.3.1 of this report.

In the first instance, individual assessments are carried out on each criterion followed by an overall assessment. A score was assigned to each option corridor based on the TII PAG seven point scale, and the overall preference for each option corridor of Preferred, Intermediate, or Least Preferred was assigned using a combination of the assessment criteria results and professional judgement.

7.5.3.3 Assessment Criteria

A 300m wide corridor is assessed for each of the option corridors except the 150m wide Black Option Corridor which underwent a stand-alone assessment rather than a comparative assessment. The assessment criteria as set out in Section 3.1.5 of the PAG Unit 72 Guidelines were used to conduct this assessment:

²³ Google Aerial Mapping, 2021. Available at: <https://www.google.com/maps>

²⁴ Property Registration Authority, 2021. Available at: <https://www.landdirect.ie/index>

²⁵ Teagasc, 2022. Irish Soil Information System. Available at: <http://gis.teagasc.ie/soils/>

- Farm size (25ha) was assumed identical along all corridors based on the CSO data for the relevant electoral divisions (see Section 4.6.3.3 and Tables 4.6.4 and 4.6.5 of the Constraints Study)
- Farm type was assessed, with reference to the CSO data (see Section 4.6.3.3 and Tables 4.6.4 and 4.6.5 of the Constraints Study) and the site survey
- Landtake and removal of buildings (impacts on farm yards) and/or facilities was assessed by examining the sub-criteria total landtake, landtake of agricultural land (Corine data), quality of landtake (i.e. area of poor quality alluvial and peat soils), length on-line/off-line and number of impacts on farm yards and facilities along each corridor. On-line sections are assumed to have 50% of the landtake of off-line sections
- The degree of severance in this assessment is determined by the length of each corridor which is off-line.
- Farm viability describes the capacity of a farm to survive, grow and develop. High viability is associated with large farm size, good land quality and intensive land-use. Farm viability is in the low – medium range along all the corridors. This is assessed with reference to farm size, enterprise types and soil types (see Sections 4.6.3.2 and 4.6.3.3 of the Constraints Study). The viability of high sensitivity land parcels (dairy and equine) is assumed to be higher than medium enterprises (beef and sheep).

7.5.3.4 Stage 1 Material Assets- Agriculture Option Corridor Assessment

Assessment of Option Corridors West of Node J

The Do-Minimum Option as described in Section 7.1 of this document will have minimal impacts on agriculture. The impact from this option is assessed as Neutral (i.e., 4 on the PAG seven point scale).

The Black Option Corridor is the shortest corridor having the lowest landtake and overall impact levels. It is 0.6km off-line and has an agricultural landtake of 14ha. In addition to the Black Option Corridor there are two option corridors which follow an alignment north of Carrick-on-Shannon (Purple West and Dark Green).

The Purple West Option Corridor is 10.8km long and is on-line for 2kms. It has the second highest landtake of agricultural land when adjusted for on-line sections. The area of agricultural land within the corridor is 236ha and 214ha when adjusted for the on-line section. There are 63ha within the corridor classified as ‘Lands principally occupied by agriculture, with significant areas of natural vegetation’. The area of poor-quality land (peats and alluvial soils) is 71ha. There are no highly sensitive enterprises and five farm yards within the corridor (none of the farm yards are highly sensitive).

The Dark Green Option Corridor is 10.6km long and is off-line for its entirety. It has the highest landtake of agricultural land. The area of agricultural land within the corridor is 239ha. There are 93ha within the corridor classified as ‘Lands principally occupied by agriculture, with significant areas of natural vegetation’. The area of poor quality land (peats and alluvial soils) is 119ha. There are no highly

sensitive enterprises and six farm yards within the option corridor (none of the farm yards are highly sensitive).

The Blue West Option (Management Option as described in Section 7.1 of this document) is on-line and crosses through Carrick-on-Shannon. This option will have minimal impacts on agriculture, requiring very little landtake to allow for on-line improvements and traffic management. The Blue West Option Corridor is the longest overall (12.2km). The area of agricultural land within the corridor is 218ha, however when adjusted by 50% to allow for a lower expected landtake on the on-line sections the landtake is 109ha. There is 29ha within the corridor classified as 'Lands principally occupied by agriculture, with significant areas of natural vegetation'. The area of poor quality land (peats and alluvial soils) is 128ha. This corridor impacts on one high sensitivity enterprise. There are six farm yards within the corridor, none of which are high sensitivity.

There are two option corridors west of Node J which follow an alignment south of Carrick-on-Shannon (Cyan and Orange).

The Cyan Option Corridor is the second longest overall (11.9km), however it is on-line for 5.3km. The area of agricultural land within the corridor is 267ha, however the landtake along the on-line section (5.3km) is discounted by 50% to allow for a lower expected landtake and therefore the adjusted landtake is 208ha. There are 50ha within the corridor classified as 'Lands principally occupied by agriculture, with significant areas of natural vegetation'. The area of poor quality land (peats and alluvial soils) is 105ha. This option corridor impacts on two highly sensitive enterprises. There are eight farm yards within the corridor, three of which are high sensitivity.

The Orange Option Corridor is the shortest (9.3km). It is on-line for 4.8km. The area of agricultural land within the corridor is 200ha, and when adjusted by 50% to allow for a lower expected landtake on the on-line sections the landtake is 148ha. There are 48ha within the corridor classified as 'Lands principally occupied by agriculture, with significant areas of natural vegetation'. The area of poor-quality land (peats and alluvial soils) is 85ha. It affects one high sensitivity enterprise and there are six farm yards within the corridor, one of which is high sensitivity.

Table 7.5.3.1 Stage 1 Material Assets- Agriculture Summary Assessment Matrix of Options West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Quantitative Assessment						
Assessment criteria 1 – Farm Size	25ha (compared to the national average of 32.7ha) PAG Score 2	25ha (compared to the national average of 32.7ha) PAG Score 2	25ha (compared to the national average of 32.7ha) PAG Score 2	25ha (compared to the national average of 32.7ha) PAG Score 2	25ha (compared to the national average of 32.7ha) PAG Score 2	25ha (compared to the national average of 32.7ha) PAG Score 2
Assessment criteria 2 – Farm Type	Low – medium sensitivity – mainly beef / sheep farms (97 – 98% of total ²⁶). Some high sensitivity farms ²⁷ at western end of the corridor PAG Score 3	Low – medium sensitivity – mainly beef / sheep farms (97 – 98% of total ²⁶). Some high sensitivity farms at western end of the corridor PAG Score 3	Low – medium sensitivity – mainly beef / sheep farms (97 – 98% of total ²⁶). PAG Score 4	Low – medium sensitivity – mainly beef / sheep farms (97 – 98% of total ²⁶). PAG Score 4	Low – medium sensitivity – mainly beef / sheep farms (97 – 98% of total ²⁶). Some high sensitivity farms at western end of the corridor PAG Score 3	Low – medium sensitivity – mainly beef / sheep farms (97 – 98% of total ²⁶). PAG Score 4
Assessment criteria 3 – Landtake Sub-criteria – Landtake	267ha of agri land adjusted to 208ha for on-line sections	200ha of agri land adjusted to 148ha for on-line sections	236ha of agri land adjusted to 214ha for on-line sections	239ha of agri land adjusted to 239ha for on-line sections	218ha of agri land adjusted to 109ha for on-line sections	14ha of agri land
Assessment criteria 3 – Landtake Sub-criteria – Length on-line / off-line	5.3km (44%) of entire length (6.6km off-line)	4.8km (52%) of entire length (4.5km off-line)	2km (19%) of entire length (8.8km off-line)	0km (0%) of entire length (10.6km off-line)	12.2km (100%) of entire length is on-line	0.0 km (0% - 1.2 km off-line)

²⁶ Table 2 of 2010 Census of Agriculture, data for Co Roscommon and Co Leitrim, CSO Electoral Division Data and site survey²⁷ 1 Dairy Farm and 1 Agri-Tourism Farm

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Assessment criteria 3 – Landtake Sub-criteria – Impacts On farm yards	8 farm yards / facilities within corridor (3 of which are high sensitivity)	6 farm yards / facilities within corridor (including severance of a highly sensitive entrance lane)	5 farm yards / facilities within corridor (no high sensitivity yards)	6 farm yards / facilities within corridor (no high sensitivity yards)	6 farm yards / facilities within corridor (no high sensitivity yards)	None
Assessment criteria 3 – Landtake Sub-criteria – Quality of landtake	105ha of poor quality land (39%). 50ha of land with significant areas of natural vegetation (19%) ²⁸ PAG Score 2	85ha of poor quality land (43%). 48ha of land with significant areas of natural vegetation (24%) ²⁸ PAG Score 3	71ha of poor quality land (30%). 63ha of land with significant areas of natural vegetation (27%) ²⁸ PAG Score 2	119ha of poor quality land (50%). 93ha of land with significant areas of natural vegetation (39%) ²⁸ PAG Score 2	128ha of poor quality land (59%). 29ha of land with significant areas of natural vegetation (13%) ²⁸ PAG Score 4	9ha of poor quality land (56%). No significant areas of natural vegetation ²⁸ PAG Score 4
Assessment criteria 4 – Severance (length off-line)	6.6km off-line PAG Score 2	4.5km off-line PAG Score 3	8.8km off-line PAG Score 2	10.6km off-line PAG Score 2	0km off-line PAG Score 4	1.2km off-line PAG Score 4
Assessment criteria 5 – Viability	Expected overall impact is likely to be slight adverse. Expected impacts on a low number of highly sensitive enterprises. Viability slightly higher along southern options PAG Score 3	Expected overall impact is likely to be slight adverse. Expected impacts on a low number of highly sensitive enterprises. Viability slightly higher along southern options PAG Score 3	Expected overall impact is likely to be slight adverse. Expected impacts on a low number of highly sensitive enterprises. Viability slightly lower along northern options PAG Score 4	Expected overall impact is likely to be slight adverse. Expected impacts on a low number of highly sensitive enterprises. Viability slightly lower along northern options PAG Score 4	Expected overall impact is likely to be slight adverse. Expected impacts on a low number of highly sensitive enterprises. Viability similar to Cyan and Orange PAG Score 3	Expected overall impact is likely to be slight adverse or Neutral. Baseline level is low - medium viability. PAG Score 4

²⁸ With reference to Corine 2018 data and Teagasc Soils Data. Poor quality land = soil series 05RIV (alluvial soils) and soil series 1xx peats

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Scoring						
Qualitative Assessment	Minor adverse (with effects which are tending towards moderate adverse) Higher expected impact on highly sensitive enterprises – but number of these is very low. Higher quantity of alluvial wet soils south of Carrick-on-Shannon – but overall soil quality is medium. Second highest landtake. Highest impacts on yards. Minor or Slightly Negative	Higher expected impact on highly sensitive enterprises – but number of these is very low. Higher quantity of alluvial wet soils south of Carrick-on-Shannon – but overall soil quality is medium. Lowest landtake and preferred of the off-line options. Minor or Slightly Negative	Minor adverse (with effects which are tending towards moderate adverse) No impact on highly sensitive enterprises. Overall soil quality is low – medium. Similar landtake to Cyan – second highest. Site visit would indicate lower viability farming north of Carrick-on-Shannon. Minor or Slightly Negative	Minor adverse (with effects which are tending towards moderate adverse) No impact on highly sensitive enterprises. Overall soil quality is low - medium. Highest landtake – but also highest area of poor quality soils. Site visit would indicate lower viability farming north of Carrick-on-Shannon. Minor or Slightly Negative	Neutral (with effects which are tending towards minor adverse) On-line options will have lower predicted impacts on agriculture. Not Significant or Neutral	Neutral No impact on highly sensitive enterprises. Overall soil quality is low - medium. Lowest landtake. Site visit would indicate lower viability farming north of Carrick-on-Shannon. Not Significant or Neutral
Score / Impact Level	3	3	3	3	4	4
Preference	Intermediate	Intermediate	Intermediate	Least preferred	Preferred	N/A

Assessment of Option Corridors East of Node J

There are four option corridors east of Node J.

The Purple East Option Corridor is 8km long and it is on-line for 6.2km. There are ten farm yards within the corridor, none of which are high sensitivity. The landtake of the corridor is 148ha after discounting the on-line section by 50%. There is 52ha within the corridor classified as 'Lands principally occupied by agriculture, with significant areas of natural vegetation'. The area of poor quality land (peats and alluvial soils) is 39ha.

The Green Option Corridor is 7.9km long and all of this is on-line. There are 11 farm yards within the corridor, none of which are high sensitivity. The landtake of the corridor is 117ha after discounting the on-line sections by 50% because it is all on-line. There is 51ha within the corridor classified as 'Lands principally occupied by agriculture, with significant areas of natural vegetation'. The area of poor quality land (peats and alluvial soils) is 41ha.

The Yellow Option Corridor is 7.9km long and it is on-line for 6.9km. There are 11 farm yards within the corridor, none of which are high sensitivity. The landtake of the corridor is 132ha after discounting the on-line section by 50%. There is 51ha within the corridor classified as 'Lands principally occupied by agriculture, with significant areas of natural vegetation'. The area of poor quality land (peats and alluvial soils) is 41ha.

The Blue East Option Corridor "Management Option" is 7.9km long and all of this is on-line. There are 11 farm yards within the corridor, none of which are high sensitivity. The landtake of the corridor is 117ha after discounting the on-line sections by 50% because it is all on-line. There is 51ha within the corridor classified as 'Lands principally occupied by agriculture, with significant areas of natural vegetation'. The area of poor quality land (peats and alluvial soils) is 41ha.

Table 7.5.3.2 Stage 1 Material Assets- Agriculture Summary Assessment Matrix of Options East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Quantitative Assessment				
Assessment criteria 1 – Farm Size	25 ha (compared to the national average of 32.7ha) PAG Score 2	25 ha (compared to the national average of 32.7ha) PAG Score 2	25 ha (compared to the national average of 32.7ha) PAG Score 2	25 ha (compared to the national average of 32.7ha) PAG Score 2
Assessment criteria 2 – Farm Type	Low – medium sensitivity – mainly beef / sheep farms (98% of total) PAG Score 3	Low – medium sensitivity – mainly beef / sheep farms (98% of total) PAG Score 3	Low – medium sensitivity – mainly beef / sheep farms (98% of total) PAG Score 3	Low – medium sensitivity – mainly beef / sheep farms (98% of total) PAG Score 3
Assessment criteria 3 – Landtake Sub-criteria – Landtake	234ha of agri land adjusted to 132ha for on-line sections	234ha of agri land adjusted to 117ha for on-line sections	243ha of agri land adjusted to 148ha for on-line sections.	234ha of agri land adjusted to 117ha for on-line sections
Assessment criteria 3 – Landtake Sub-criteria – Length on-line / off-line	6.9km (87%) of entire length (1km off-line)	7.9km (100%) of entire length	6.2km (78%) of entire length (1.75km off-line)	7.9km (100%) of entire length
Assessment criteria 3 – Landtake Sub-criteria – Impacts on farm yards	11 farm yards / facilities within corridor	11 farm yards / facilities within corridor	10 farm yards / facilities within corridor	11 farm yards / facilities within corridor
Assessment criteria 3 – Landtake Sub-criteria – Quality of landtake	41ha of poor quality land (17%). 51ha (22%) of land with significant areas of natural vegetation PAG Score 3	41ha of poor quality land (18%). 51ha (22%) of land with significant areas of natural vegetation PAG Score 3	39ha of poor quality land (16%). 52ha (21%) of land with significant areas of natural vegetation PAG Score 3	41ha of poor quality land (18%). 51ha (22%) of land with significant areas of natural vegetation PAG Score 3
Assessment criteria 4 – Severance (length off-line)	1km off-line PAG Score 4	0km off-line PAG Score 4	1.75km off-line PAG Score 4	0km off-line PAG Score 4

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Assessment criteria 5 – Viability	Baseline level is low - medium viability PAG Score 4	Baseline level is low - medium viability PAG Score 4	Baseline level is low - medium viability PAG Score 4	Baseline level is low - medium viability PAG Score 4
Scoring				
Qualitative Assessment	Minor Adverse Mainly on-line (except for 1km) and therefore impacts are low. Compared to other options it will have second highest predicted landtake. (Ranked 3) Minor or Slightly Negative	Minor Adverse (tending towards Neutral) Mainly on-line and therefore impacts are low. Compared to other options It will have a similar landtake to Blue East Option Corridor i.e. the second lowest predicted landtake (Ranked 2) Minor or Slightly Negative	Minor Adverse Mainly on-line and therefore impacts are low. However, compared to other options it is a dual carriageway, is off-line for longest distance and will have highest predicted landtake. (Ranked 4) Minor or Slightly Negative	Minor Adverse (tending towards Neutral) On-line and therefore impacts are low. Compared to other options it will have lowest predicted landtake. (Ranked 1) Minor or Slightly Negative
Score / Impact Level	3	3	3	3
Preference	Intermediate	Preferred	Least Preferred	Preferred

7.5.3.5 Summary

The preferred options are:

- West of Node J the Blue West Option Corridor (Management Option); and
- East of Node J the Blue East Option Corridor (Management Option) and the Green Option Corridor.

West of Node J the effects of the Black Option Corridor will be neutral (PAG Score 4) because this option is very short.

West of Node J the effects of the Blue West Option Corridor will have adverse effects which are low due to the on-line nature of the option and therefore the overall PAG Score is 4 (neutral). Hence the Blue West Option Corridor is the preferred Option Corridor West of Node J.

West of Node J the Orange, Cyan and Purple Option Corridors with PAG scores of 3 have a lower preference than the Blue West Option Corridor and a higher preference than the Dark Green Option Corridor.

West of Node J the Dark Green Option Corridor is least preferred with a PAG score of 3.

East of Node J, there is little to differentiate the predicted significance levels and all options have a PAG Score of 3. These have all been assessed as slight adverse – Neutral because the options are predominantly on-line. Based on the qualitative and quantitative assessments the Green and Blue East Option Corridors will have the lowest impact and are preferred because they are entirely on-line. The Purple East Option Corridor east of Node J is assigned the lowest preference because it has the longest length off-line.

7.5.4 Stage 1 Air Quality Option Assessment

7.5.4.1 Introduction

This section details the Stage 1 Air Quality assessment of the options with respect to the Air Quality constraints identified in Section 4.7 Air Quality of this report.

The constraints relating to Air Quality are identified among various other Environmental constraints. These are presented with the Stage 1 Options in the following figures:

- Sensitive Receptor Locations: Population Stage 1 Figures 7.5.1.1.0 to 7.5.1.1.5
- Designated Sites: Biodiversity Stage 1 Figures 7.5.9.1.0 to 7.5.9.1.5
- Integrated Pollution Control (IPC) or Waste Licences: Soils and Geology Stage 1 Figures 4.5.12.1.1 to 4.5.12.1.5

Section 7.5.4.2 outlines the methodology that was used to carry out the study, including the assessment criteria. The assessment is presented in Section 7.5.4.3 with Section 7.5.4.4 outlining the general summary of the Stage 1 Air Quality assessment of the options.

7.5.4.2 Methodology

The multi-criteria air assessment was undertaken with reference to the TII Project Appraisal Guidelines for National Roads Unit – 7.0 – Multi Criteria Analysis. The assessment includes both a quantitative and qualitative element. Each impact is scored qualitatively based on the PAG seven-point scale and an integer is assigned according to the impact levels as listed in Table 7.3.1.

Using a combination of the impact scores and professional judgement a determination is made as to whether each option corridor assessed is Preferred, Intermediate or Least Preferred. The Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports²⁹ were also referred to when undertaking this assessment, particularly Table 3.3 in determining the significance of the impact.

The Air Quality assessment has been prepared in accordance with the National Roads Authority (NRA) Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes³⁰ and in accordance with the requirements of the TII Project Management Guidelines 2019³¹, and the TII Project

²⁹ Environmental Protection Agency (EPA), 2017. Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. Available at: <http://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf>

³⁰ NRA, 2011. Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes. Available at: <https://www.tii.ie/technical-services/environment/planning/Guidelines-for-the-Treatment-of-Air-Quality-during-the-Planning-and-Construction-of-National-Road-Schemes.pdf>

³¹ Transport Infrastructure Ireland, 2019. Project Management Guidelines PE-PMG-02041. Available at: <https://www.tiipublications.ie/library/PE-PMG-02041-02.pdf>

Manager's Manual, 2019 and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG-02031, October 2016².

In December 2022, TII published PE-ENV-01107: Air Quality Assessment of Proposed National Roads – Standard to supersede the 2011 TII Air Quality Guidelines. Section 1.9 of PE-ENV-01107 states that *‘where projects requiring approval under Section 51, Section 177AE or Part 8 have, at the date of publication of this SD, commenced planning and design, and in particular, where technical advisor contracts have been executed, this SD should be:*

- *treated as advice and guidance;*
- *employed to the greatest extent reasonably practicable; and*
- *applied in a proportionate manner, having regard to the characteristics and location of the project/maintenance works and the type and characteristics of potential impacts.’*

As this air quality assessment was undertaken well in advance of the publication of the new guidance, the assessment relied on the 2011 guidance.

7.5.4.3 Assessment Criteria

The air quality assessment is based on the number of sensitive receptors in proximity to each option corridor and the projected traffic volumes accessing the corridors during the operational phase. The construction phase is assessed through the consideration of the number of sensitive properties located in proximity to the likely construction works where dust impacts may be experienced.

Section 2.3, Route Selection Process Stage 1 Preliminary Options Assessment, of the NRA, 2011 Guidelines³⁰ includes the initial steps to assess air quality within a study area as follows:

“The specific objectives of the air quality input to the Stage 1 Preliminary Options Assessment of the Route Selection Process are to characterise the existing and ambient air quality in the study area and to initially identify all sensitive receptor locations within the study area likely to be impacted by the proposed scheme before feasible route options are identified. Once feasible route options are identified, and in order to undertake the preliminary options assessment, the total number of sensitive receptors (e.g. residential properties) within 50m of the carriageway of each feasible route option should be recorded with a view to eliminating those routes with the greater number of sensitive receptors likely to be impacted by the proposed scheme.”

The existing and ambient air quality and the initial identification of sensitive receptor locations within the study area are included in the Air Quality Constraints Section 4.7. The air quality conditions for this assessment are in line with the baseline conditions set out in Section 4.7.

The scope of the air quality assessment is described in Section 2.3 of the NRA, 2011 Guidelines as follows:

“Identify and record all sensitive receptor locations within the study area and all sensitive receptors within 50 m of the carriageway of each feasible route option that are, or have the potential to be, significantly affected by a proposed scheme”

In line with the NRA, 2011 Guidelines, a quantitative assessment of potential air quality impacts on existing and potential sensitive receptors was undertaken.

Sensitive receptor locations are defined in the NRA, 2011 Guidelines as residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present. In addition, planning applications³² give an indication to the potential number of future sensitive receptors adjacent to corridors.

Traffic data is provided for the base year (2020) for each option. This data is considered in the assessment of options.

7.5.4.4 Stage 1 Air Quality Option Corridor Assessment

The number of existing and potential sensitive receptors in proximity to each option corridor determines air quality impacts. The zone of interest for the assessment is 0-50m from each indicative road fenceline within each option corridor. This is an offset from the edge of the indicative road fenceline within each option corridor and assumes that properties within the potential fenceline would be acquired and would therefore not be counted as receptors.

Stage 1 Air Quality Assessment – Options West of Node J at Drumsna Junction

The numbers of sensitive receptors in proximity to each option corridor and the air quality assessment determinations are outlined in Table 7.5.4.1 for the options west of Node J.

The number of sensitive receptors is relatively similar among the Cyan, Orange, Purple West and Dark Green Option Corridors, with the Blue West Option corridor having a great deal more receptors, followed by the Cyan Option corridor and the Orange Option corridor respectively.

The Cyan Option Corridor is an off-line proposal, south of the existing N4 which deviates from the existing N4 at Cloongownagh at Node A. It continues eastwards and rejoins the existing N4 at Lissenghan at Node D. The existing N4 between Lissenghan at Node D and Node J at Drumsna Junction will be subject to an on-line upgrade. The Cyan Option Corridor passes through two residential estates located within 50m of the corridor centreline between Nodes C and D which make up a large majority of the properties counted within the 0-50m distance.

The Orange Option Corridor commences at Node B where it deviates from the existing N4 at Meera. It continues east and rejoins the existing N4 at Lissenghan at

Node D before following the existing N4 to the Drumsna Junction at Node J. An on-line upgrade is proposed for the existing N4 between Lissenghan at Node D and Drumsna Junction at Node J. The Orange Option Corridor also passes through two residential estates located within 50m of the corridor centreline between Nodes C and D which make up a large majority of the properties counted within the 0-50m distance. As outlined in Table 7.5.4.1, the Orange Corridor has a slightly higher number of both existing and potential receptors in proximity.

The Purple West Option Corridor is located north of the existing N4 and deviates from the N4 at Tumna at Node B. It continues north-eastwards, with a junction to the R280 at Cartown. It continues south-eastwards and rejoins the existing N4 at Tully at Node E. It then continues with an on-line upgrade of the existing N4 to the Drumsna Junction at Node J. As outlined in Table 7.5.4.1, compared with the other options the Purple West Option Corridor has a lower number of both existing and potential receptors in proximity.

The Dark Green Option Corridor deviates from the existing N4 at Tumna at Node B. It continues north-eastwards, crossing the River Shannon at Corryolus, and meets the R280 at Cartown. It continues south-eastwards and rejoins the existing N4 at the Drumsna Junction at Node J. As outlined in Table 7.5.4.1, the Dark Green Corridor has the lowest number of both existing and potential receptors in proximity.

The Blue West Option Corridor comprises the Management Option which considers interventions on the existing infrastructure to address the identified transport problems. It commences at Node O at Usna and follows the existing N4 to Node J at Drumsna Junction. The Blue West Option Corridor passes directly through Carrick-on-Shannon which makes up a large majority of the properties counted within the 0-50m distance. As outlined in Table 7.5.4.1, the Blue Option Corridor (West) has the highest number of both existing and potential receptors in proximity.

An impact level of minor or slightly negative was assigned to the Cyan, Orange, Purple West and Dark Green Option Corridors. All four options attract relatively low traffic volumes which are unlikely to generate a significant air quality impact. Nonetheless, the by-pass options are increasing traffic volumes in proximity to new sensitive receptors, thus potentially decreasing air quality. The Blue West Option Corridor has higher traffic volumes in comparison to the other options and has been given an impact level of moderately negative. It should be noted that this on-line option will not introduce new sensitive receptors as it does not deviate from the existing N4.

The Purple West and Dark Green Option Corridors have been rated as Preferred as these options have a slightly lower number of sensitive receptors. The Orange and Cyan Option Corridors are only marginally worse and are rated as Intermediate. The Blue West Option Corridor has been rated as the Least Preferred with the highest sensitive receptors in proximity and AADTs.

Stage 1 Air Quality Assessment of the Black Option Corridor

The Black Option Corridor comprises an urban street improvement within Carrick-on-Shannon. The option provides connectivity by interconnecting the R280 to the Summerhill Road and on to the Castlecara Road with the development of a new link road. The link road crosses agricultural land and in proximity to residential dwellings both side of the carriageway. Using the same methodologies discussed above, the sensitive receptors 0-50m from the road fenceline and the traffic volumes were analysed for the route. The results are summarised in Table 7.5.4.1

The Black Option Corridor is predicted to result in an increase in road traffic at properties located in proximity to its alignment, therefore decreasing air quality at new sensitive receptor locations. However, the relative number of sensitive receptors and the projected AADTs is not significant from an air quality perspective, therefore the impact is minor or slightly negative.

Table 7.5.4.1 Stage 1 Air Quality Summary Assessment Matrix of Options West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION OPTION CORRIDOR	ORANGE OPTION OPTION CORRIDOR	PURPLE WEST OPTION OPTION CORRIDOR	DARK GREEN OPTION OPTION CORRIDOR	BLUE WEST OPTION OPTION CORRIDOR	BLACK OPTION CORRIDOR
Property Counts - Existing Sensitive Receptors 0 – 50m (from fenceline)	64	68	60	54	116	10
Property Counts - Granted Planning Applications for Sensitive Receptor Developments 0 – 50m (from fenceline)	5	5	3	3	3	3
Total Number of Sensitive Receptors within 0-50m of fenceline	69	73	63	57	119	13
AADTs (2030)	6,652	6,030	5,518	5,492	10,433	4,966
Scoring						
Qualitative Assessment	Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors Minor or Slightly Negative	Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors Minor or Slightly Negative	Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors Minor or Slightly Negative	Minor or Slightly Negative due to the traffic volumes in proximity to sensitive receptors Minor or Slightly Negative	Moderately Negative due to the traffic volumes in proximity to sensitive receptors Moderately Negative	Minor or Slightly Negative due to a decrease in air quality at sensitive receptors Minor or Slightly Negative
Score / Impact Level	3	3	3	3	2	3
Preference	Intermediate	Intermediate	Preferred	Preferred	Least Preferred	N/A

Stage 1 Air Quality Assessment – Options East of Node J at Drumsna Junction

The numbers of sensitive receptors in proximity to each option corridor, AADTs and the air quality assessment determinations are outlined in Table 7.5.4.2 for the options east of Node J at Drumsna Junction.

The Green Option Corridor comprises an on-line upgrade of the existing single carriageway between Lissenghan at Node J and Faulties at Node H. The Yellow Option Corridor comprises an on-line upgrade of the existing N4 between Lissenghan at Node J and Fernaught, with a short off-line section proposed between Fernaught at Node G and Faulties. As outlined in Table 7.5.4.2 the Green Option Corridor has a marginally higher number of sensitive receptors in proximity than the Yellow Option corridor.

The Purple Option Corridor comprises an on-line upgrade of the existing N4 between Drumsna Junction at Node J and Drumgildra at Node F. A short off-line deviation to the east of Aghamore is proposed between Nodes F and G with the remaining N4 upgraded between Aghamore at Node G and Faulties at Node H. The Purple Option corridor has the lowest number of sensitive receptors within the 0-50m distance compared to the other options in the eastern section. This is due to the lower property counts in the off-line section of this corridor. On this basis the Purple East Option corridor would result in marginally lower potential air quality impacts.

The Blue East Option Corridor comprises the Management Option which considers interventions on the existing infrastructure to address the identified transport problems. It follows the existing N4 between Node J at Drumsna Junction and Faulties at Node H. As outlined in Table 7.5.4.2 the Blue East Option Corridor and the Green Option Corridor have the highest number of existing and potential receptors in proximity.

An impact level of Moderately Negative was assigned to all options. All options result in relatively low traffic volumes which are unlikely to generate significant air quality impacts. Nonetheless, the by-pass options are increasing traffic volumes in proximity to new sensitive receptors, and thus potentially decreasing air quality.

Although the Purple East Option Corridor has slightly higher traffic volumes relative to the other options, it also has the lowest number of sensitive receptors. This has been rated as the Preferred option corridor on the basis of the low sensitive receptors. There is very little difference in projected traffic volumes on the Yellow, Green and Blue East Option corridors.

Table 7.5.4.2 Stage 1 Air Quality Summary Assessment Matrix of Options East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Property counts - existing sensitive receptors				
0 – 50m	108	116	60	116
Property counts - granted planning applications for sensitive receptor developments				
0 – 50m	5	3	3	3
Total sensitive receptors				
Total No. of Receptors within 0 – 50m	113	119	63	119
AADTs – average across routes				
AADTs (2030)	7,494	7,510	8,631	7,566
Scoring				
Qualitative Assessment	Moderately Negative due to the traffic volumes in proximity to sensitive receptors	Moderately Negative due to the traffic volumes in proximity to sensitive receptors	Moderately Negative due to the traffic volumes in proximity to sensitive receptors	Moderately Negative due to the traffic volumes in proximity to sensitive receptors
Score / Impact Level	2	2	2	2
Preference	Intermediate	Intermediate	Preferred	Intermediate

7.5.4.5 Summary

The results from the Stage 1 Air Quality Assessment of the Option Corridors conclude that the Purple West Option Corridor and Dark Green Option Corridors are the Preferred Options on west of Node J at Drumsna Junction and the Purple East Option Corridor is the Preferred option east of Node J at Drumsna Junction. This determination is based on the consideration of the numbers of sensitive receptors and traffic volumes associated with each option. The impact of the Black Option Corridor was found to be minor or slightly negative.

7.5.5 Stage 1 Climate Option Assessment

7.5.5.1 Introduction

This section details the Stage 1 Assessment of the Options with respect to the Climate constraints identified in Section 4.8 Climate of this report.

Section 7.5.5.2 outlines the methodology that was used to carry out the study, including the assessment criteria. The assessment is presented in Section 7.5.5.3 with Section 7.5.5.4 outlining the general summary of the Stage 1 Climate assessment of the options.

7.5.5.2 Methodology

The multi-criteria climate assessment was undertaken with reference to the TII Project Appraisal Guidelines for National Roads Unit – 7.0 – Multi Criteria Analysis¹. The assessment includes both a quantitative and qualitative element. Each impact is scored qualitatively based on the seven-point scale listed in Table 7.3.1 of this report and an integer is assigned according to the impact level.

Using a combination of the impact scores and professional judgement a determination was made as to whether each option corridor assessed is Preferred, Intermediate or Least Preferred. The Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports³³ were also referred to when undertaking this assessment, particularly Table 3.3 in determining the significance of the impact.

The Climate assessment has been prepared in accordance with the requirements of the TII Project Management Guidelines 2019³¹, and the TII Project Manager's Manual, 2019³⁴ and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG-02031, October 2016².

7.5.5.3 Assessment Criteria

The climate assessment evaluates potential carbon emissions from road traffic during the operational phase while also considering potential embodied carbon from the construction phase of each corridor. In addition, the traffic data provided for each option is considered in the assessment.

7.5.5.4 Stage 1 Climate Option Corridor Assessment

From a climate perspective, greater corridor lengths have the potential to increase carbon emissions from road traffic during the operational phase due to an increase in vehicle kilometres travelled. In addition, the more materials required to construct

³³ Environmental Protection Agency, 2017. Guidelines on the Information to be contained in Environmental Impact Assessment Reports. Available at: <http://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf>

³⁴ Transport Infrastructure Ireland (TII), 2019. Project Manager's Manual for Major National Road Projects PE-PMG-02042. Available at: <https://www.tiipublications.ie/library/PE-PMG-02042-01.pdf>

an option corridor, the greater the embodied carbon generated for the construction phase.

Stage 1 Climate Assessment – Options West of Node J at Drumsna Junction

The corridor lengths, AADTs, vehicle kilometres travelled, and the estimated embodied carbon associated with each option are listed followed by the climate assessment determination in Table 7.5.5.1 for the section west of Node J at Drumsna Junction.

As outlined in Table 7.5.5.1 all off-line options were rated as Major or Highly Negative as the embodied carbon in the materials required to construct the new road infrastructure have the potential to result in a significant negative impact on carbon emissions and thereby climate. The works will require the use of materials which generate carbon, for example concrete, bitumen and aggregates.

The Blue Option corridor (West) is the Preferred option as it follows a mainly on-line route, resulting in the lowest vehicle kilometres travelled and thus lower operational carbon during the operational phase and the least embodied carbon associated with the construction phase relative to the other options.

The Orange, Dark Green and Cyan Option corridors (West) are slightly longer than the Blue Corridor respectively, deviating relatively further from the on-line corridor. This will result in marginally higher carbon emissions at both the construction and operational phases, in comparison to the Blue Option corridor.

The Purple Option corridor (West) requires the longest off-line route relative to the other options, resulting in the highest vehicle kilometres travelled and generating the most carbon emissions at the construction and operational phases. The Purple Option corridor is the Least Preferred option.

Stage 1 Climate Assessment- Black Option Corridor

Using the same methodologies discussed above, the Black Option corridor was assessed, but not compared to the other options as it was subject to a stand-alone assessment. The results are summarised in Table 7.5.5.1 .

The Black Option corridor is 2.51km in length. The impact is rated as moderately negative as the embodied carbon in the materials required to construct the new road infrastructure have the potential to result in a negative impact on climate due to the use of materials which generate carbon, for example concrete, bitumen and aggregates.

The option will result in a slight overall increase in traffic volumes in comparison to the do-nothing scenario, which contributes to an increase in carbon emissions, and thus has a negative impact on climate.

It is worthy to note, although a comparative assessment is not being conducted on the Black Option Corridor, the corridor length is significantly shorter than the option corridors both west and east of Node J which would result in less vehicle kilometres travelled at an operational phase and generate the least carbon emissions at the construction phase relative to the other options.

Table 7.5.5.1 Stage 1 Climate Summary Assessment Matrix of Options West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Operational Carbon kgCO ₂ eq	47,617,580	47,524,052	47,885,871	47,925,244	47,328,758	47,317,562
Embodied Carbon kgCO ₂ eq	14,333,913	12,716,968	16,917,740	15,800,963	4,359,259	890,676
Scoring						
Qualitative Assessment	Major or Highly Negative due to the additional vehicle kilometres travelled and the embodied carbon	Major or Highly Negative due to the additional vehicle kilometres travelled and the embodied carbon	Major or Highly Negative due to the additional vehicle kilometres travelled and the embodied carbon	Major or Highly Negative due to the additional vehicle kilometres travelled and the embodied carbon	Moderately Negative due to the additional vehicle kilometres travelled and the embodied carbon	Moderately Negative as the embodied carbon in the materials required to construct the new road infrastructure have the potential to result in a negative impact on climate
Score / Impact Level	1	1	1	1	2	2
Preference	Intermediate	Intermediate	Least Preferred	Intermediate	Preferred	N/A

Stage 1 Climate Assessment – Options East of Node J at Drumsna Junction

The corridor lengths, AADTs, vehicle kilometres travelled, and the estimated embodied carbon associated with each option are listed followed by the climate assessment determination in Table 7.5.5.2 for the section east of Node J at Drumsna Junction.

As outlined in Table 7.5.5.2, all off-line options were rated major or highly negative as the embodied carbon in the materials required to construct new road infrastructure have the potential to result in a significant negative impact on carbon emissions and thereby, climate. The works will require the use of materials which generate carbon, for example concrete, bitumen and aggregates.

The Purple East Option Corridor requires the longest off-line route relative to the other options, resulting in the highest vehicle kilometres travelled and generating the most carbon emissions at both construction and operational phases. Consequently, the Purple East Option Corridor is the Least Preferred option of the options west of Node J at Drumsna Junction.

The Blue East Option Corridor is the Preferred option as it is projected to have the lowest vehicle kilometres travelled at an operational phase. The preference for the Blue East Option Corridor is marginal from a climate perspective.

Table 7.5.5.2 Stage 1 Climate Summary Assessment Matrix of Options East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Operational carbon kgCO ₂ eq	47,935,919	47,473,001	47,885,871	47,328,758
Embodied carbon kgCO ₂ eq	5,228,183	4,363,122	7,759,091	806,221
Scoring				
Qualitative Assessment	Moderately Negative due to the additional vehicle kilometres travelled and the embodied carbon	Moderately Negative due to the additional vehicle kilometres travelled and the embodied carbon	Major or Highly Negative due to the additional vehicle kilometres travelled and the embodied carbon	Moderately Negative due to the additional vehicle kilometres travelled and the embodied carbon
Score / Impact Level	2	2	1	2
Preference	Intermediate	Intermediate	Least Preferred	Preferred

7.5.5.5 Summary

The Blue West Option Corridor and Blue East Option Corridors were found to be the Preferred options from a climate perspective. These preferences were determined from an assessment of overall corridor length and assumed scale of construction works generating embodied carbon. The preference is marginal over the other options.

The Black Option Corridor was found to have a moderately negative impact to climate due the embodied carbon associated with the new road infrastructure and an increase in operational carbon emissions.

7.5.6 Stage 1 Noise and Vibration Option Assessment

7.5.6.1 Introduction

This section details the Stage 1 Assessment of the Option Corridors with respect to the Noise and Vibration constraints identified in Section 4.9 Noise and Vibration of this report.

The Noise and Vibration constraints are presented with the Stage 1 Option Corridors in Figures 7.5.6.1.0 to 7.5.6.2.5.

Section 7.5.6.2 describes the methodology and lists the assessment criteria used to assess and rank the option corridors. The assessment criteria are presented in Section 7.5.6.3. The Stage 1 Noise and Vibration assessment of the options is conducted in Section 0. Finally, a summary is presented in Section 7.5.6.5.

7.5.6.2 Methodology

The option corridors are described in Section 7.1.2. In summary, a total of ten option corridors have been taken forward to the preliminary options (Stage 1). Six of the option corridors are to the west of Node J at Drumsna Junction (Purple West, Dark Green, Orange, Cyan, Blue West and Black) and four option corridors are to the east of Node J (Purple East, Green, Yellow and Blue East).

This assessment has ranked the corridors in order of preference, except for the Black Option Corridor west of Node J which is given a stand-alone assessment. The assessment considers the potential impacts of each option corridor with respect to noise and vibration on the surrounding environment through which they pass. An indicative dual carriageway design (worst case scenario) was used to conduct the assessment.

The noise impact assessment is conducted in accordance with the relevant guidance provided in Section 5.0 of the National Roads Authority (NRA), 2004 Guidelines for the Treatment of Noise and Vibration in National Road Schemes (TII Noise Guidelines 2004)³⁵, within Section 2 of the 2014 Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (TII Noise Guidelines 2014)³⁶, in accordance with the requirements of the TII Project Management Guidelines 201931, and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG-02031, October 20162 and Design Manual for Roads and Bridges (DMRB) (UKHA, 2020)³⁷.

³⁵ NRA, 2004. Guidelines for the Treatment of Noise and Vibration in National Road Schemes. Available at: https://www.tii.ie/technical-services/environment/planning/Guidelines_for_the_Treatment_of_Noise_and_Vibration_in_National_Road_Schemes.pdf

³⁶ Transport Infrastructure Ireland, 2014. Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes. Available at: https://www.tii.ie/technical-services/environment/planning/Good_Practice_Guidance_for_the_Treatment_of_Noise_during_the_Planning_of_National_Road_Schemes.pdf

³⁷ Design Manual for Roads and Bridges (DMRB) (UKHA, 2020). Available at: <https://www.standardsforhighways.co.uk/dmrbr/>

In terms of operational noise, the NRA 2004 Noise and Vibration Guidelines and TII Noise Guidelines 2014 consider it appropriate to set the design goal for road traffic noise for new national roads in Ireland as follows:

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

Both the NRA 2004 and TII 2014 noise documents acknowledge that it may not always be sustainable to achieve this design goal. In such circumstances, a structured approach should be taken in order to ameliorate as far as practicable road traffic noise through the consideration of measures such as alignment changes, barrier type (e.g., earth mounds) or low noise road surfaces.

Impact Rating Score

Based on the quantitative and qualitative analysis undertaken for each option corridor, all options have been assessed against the following scoring system based on the TII Project Appraisal Guidelines for National Roads Multi Criteria Analysis as listed in Table 7.3.1 of this report.

All option corridors have the potential to generate a negative noise impact at noise sensitive properties impacted by the new and existing alignments.

7.5.6.3 Assessment Criteria

The assessment of potential noise impacts and ranking of option corridors is based primarily upon property counts, a review of the likely requirement for mitigation measures based on the indicative noise footprint for each option, and changes in traffic flows. The following has been conducted to assess the impact rating of each of the option corridors under consideration:

- Property counts have been conducted within four bands from the centreline of each option corridor, i.e., 0 to 50m, 50 to 100m, 100 to 200m and 200 to 300m, in accordance with Section 5.2 of the NRA 2004³⁵ document. Using this information, the Potential Impact Rating (PIR) for each option corridor was established
- The potential noise footprint of the indicative carriageway design for each option was then established taking into account the vertical alignments for varying sections of each option, projected future traffic flows and traffic speed
- An assessment of the potential number of properties likely to be exposed to traffic noise levels at or above 60 dB L_{den} , and consequently require noise mitigation was determined using a noise ‘footprint’ assessment
- A high-level review of changes in traffic noise levels on the existing road network was undertaken based on a comparison between Do Minimum traffic data and the Do Something traffic data for the year 2045, for each route option.
- In terms of vibration, road traffic along normal well-maintained surfaces, in line with this proposed development, generates very low levels that are normally not perceptible to building occupants. For the purposes of this assessment, therefore, it is assumed that all routes will have a comparable low

vibration impact during their operational phase and vibration is not assessed further.

The potential noise and vibration impacts associated with the construction phase of each route will be of an impermanent duration (i.e., less than 7 years). Whilst there will be varying impacts associated with each, the construction phase will be undertaken using standard road construction techniques and will be controlled by the implementation of construction noise and vibration limits. For the purposes of ranking options, this assessment has focused on longer terms operational impacts only.

The ranking of option corridors during their operational phase is focused on the potential operational phase noise impacts which will vary among option corridors.

Stage 1 Assessment Methodology for the Assessment of Potential Impact Rating (PIR)

An assessment of Potential Impact Rating (PIR) based upon the number of noise sensitive receptors (NSRs) within specified distance bands from each of the option corridors is set out in the following section.

The number of properties potentially sensitive to noise and/or vibration within 300m of each of the proposed option corridors has been identified.

Property counts have been undertaken for four bands from the centreline of each option corridor, i.e., 0 to 50m, 50 to 100m, 100 to 200m and 200 to 300m. A weighting value for each distance band has been applied with a weighting factor of 4 for the closest distance band (0 to 50m) down to 1 for the furthest distance band (200 to 300m). For the PIR assessment, the calculated weighted value for each distance band is summed to obtain a total PIR value. The option corridor with the lowest PIR has the lowest potential impact for this assessment criterion.

Stage 1 Assessment Methodology for the Assessment of Noise Footprint and Potential Requirement for Noise Mitigation

It should be noted that the approach used for Stage 1 is a high-level screening assessment and is not used to calculate specific noise levels at individual properties or groups of properties or used to determine the extent of noise mitigation. The procedure used at this stage of the preliminary options assessment is to provide an objective methodology for ranking the potential noise impacts associated with each option on a comparative basis.

Option corridors with the highest number of noise sensitive properties, and therefore with the highest requirement for noise mitigation based on the conditions noted above, are ranked least favourably.

To assess the indicative noise impacts associated with each option, a review of the indicative carriageway design within each corridor has been undertaken. The preliminary indicative dual carriageway design provided for each option was used to determine the likely noise 'footprint' of each and the likely requirement for mitigation at a given receiver. The noise 'footprint' of each carriageway design was determined using the following methodology.

- Each dual carriageway design was overlaid on OS and aerial mapping. The proposed vertical alignment of each route was then reviewed to determine areas of grade, cuttings and embankments along each option corridor
- Using guidance from the TII Noise Guidelines 2014², the approximate distance to a 60 dB L_{den} contour was established using the noise footprint graphs set out in Chapter 5 of the Guidance document
- The noise footprint was determined for individual sections of each dual carriageway design option, taking into account the vertical alignment of the carriageway design, the Annual Average Daily Traffic flows (AADT), traffic speed, and the road surface
- An operational speed of 100km/hr and a standard hot rolled asphalt road surface was assumed along all dual carriageway design options and assuming the following traffic flows based on the 2045 traffic model outputs listed in Table 7.5.6.1 .

Table 7.5.6.1 Traffic Flows Based on the 2045 Traffic Model Outputs

Option Corridor	Section Between Nodes	Traffic Flow (2045 AADT)
West of Drumsna Junction (Node J)		
Black	R280 to Summerhill Road	6,068
	Summerhill Road to Castlecara Road	3,855
Orange	Node B – Node J	5,047
Cyan	Node A – Node J	6,016
Purple West	Node B – R280 Road	4,727
	R280 Road – Node J	3,709
Dark Green	Node B – R280 Road	4,727
	R280 Road – Node J	3,709
Blue West	Node 0 – West of R368	8,648
	N4 – R368 to L3408	16,962
	N4 – L3408 to Node J	9,180
Do-Minimum	N4 – West of R368	8,676
	N4 – R368 to L3408	17,066
	N4 – L3408 to Node J	9,878
East of Drumsna Junction (Node J)		
Purple East	Node J – Node H	9,345
Green	Node J – Node H	9,345
Yellow	Node J – Node H	8,582
Blue East	Node J – Node F	7,869
	Node F – Node H	6,341

Option Corridor	Section Between Nodes	Traffic Flow (2045 AADT)
Do-Minimum	Node J – Node F	8,029

- The number of noise sensitive properties within the 60 dB L_{den} contour for each section of carriageway was counted and a total number between each section was established
- With respect to NRSs along either off-line or on-line option corridors, the following three conditions must be satisfied under the NRA 200435 and TII 201436 noise guidelines for noise mitigation to be provided:
 - The combined expected maximum traffic noise level, i.e., the relevant noise level, from the proposed road development together with other traffic in the vicinity is greater than the design goal of 60 dB L_{den}
 - The relevant noise level is at least 1 dB more than the expected traffic noise level without the proposed road development in place
 - The contribution to the increase in the relevant noise level from the proposed road development is at least 1 dB

Stage 1 Assessment Methodology Change in Traffic Noise Level

Traffic flow data for the year 2045 has been reviewed to provide an analysis on the expected change in noise level associated with the implementation of the various proposed options along the existing N4. For off-line options, traffic along the existing N4 will be diverted to the new proposed alignments.

In the absence of any Irish guidelines or standards relating to the assessment of the effects associated with changes in road traffic noise levels, reference is made to the UK's DMRB. This document provides suggested magnitude rating tables relating to changes in noise levels associated with road traffic noise.

The calculated road traffic noise levels used in this study relate to the design year of 2045, hence in line with the DMRB guidance, the following magnitude of change is applied for the long-term period (design year) as reproduced in Table 7.5.6.2 .

Table 7.5.6.2 Classification of Magnitude of Traffic Noise Impacts in Long-term (DMRB 2020)

Long-term Magnitude	Long-term Noise Change, dB
Major	Greater than or equal to 10.0
Moderate	5.0 to 9.9
Minor	3 to 4.9
Negligible	Less than 3.0

7.5.6.4 Stage 1 Option Corridor Assessment

Stage 1 PIR Assessment of Option Corridors West of Node J at Drumsna Junction

Table 7.5.6.3 summarises the PIR values calculated for the option corridors west of Node J at Drumsna Junction using the weighting values for each distance band discussed above and taking account of existing properties within the 300m band.

Table 7.5.6.3 PIR Assessment Table for Option Corridors West of Drumsna Junction (Node J)

Option Corridor	PIR 0-50m Band	PIR 50-100m Band	PIR 100-200m Band	PIR 200-300m Band	Total PIR
Cyan Option Corridor	64	180	300	238	782
Orange Option Corridor	68	138	300	203	709
Purple West Option Corridor	60	42	70	47	219
Dark Green Option Corridor	64	30	68	43	205
Blue West Option Corridor	404	336	390	266	1,396
Black Option Corridor	40	54	308	136	538

The highest PIR value is associated with the Blue West Option Corridor (1,396). This is the Management Option that follows the existing N4 from Node O to Node J at Drumsna. As this option is fully on-line, it includes the highest number of noise sensitive locations within each distance band as is typically associated with an existing national road in proximity to and through an urban setting.

The next highest PIR value is associated with the Cyan Option Corridor (782) which follows an off-line corridor south of Carrick-on-Shannon between Nodes A and D and joins the existing N4 at Lissenghan (Node D) to follow an on-line corridor to Node J. This option corridor passes in proximity to two residential estates located within 50m of the corridor centreline between Nodes C and D which make up a large majority of the properties counted within the 50 to 300m distance bands.

The Orange Option (709) has a marginally lower PIR value compared to the Cyan Option Corridor but has a higher PIR value compared to the Purple and Dark Green Option Corridors. The Orange Option Corridor follows an off-line route south of Carrick-on-Shannon, but commences at Node B, north of the Cyan Option Corridor, as far as Node C. The Orange Option Corridor follows a similar corridor to the Cyan Option Corridor between Nodes C and D with a deviation north of the Cyan Option Corridor west of the River Shannon. Both option corridors follow the same on-line corridor between Nodes D and J. This option corridor also passes in proximity to

two residential estates located within 50m of the corridor centreline between Nodes C and D which make up a large majority of the properties counted within the 50 to 300m distance bands.

In addition to the noise sensitive buildings along each corridor, both the Cyan and Orange Option Corridors cross the River Shannon south of Carrick-on-Shannon along a section of the river that has a high amenity value used for a mixture of outdoor amenities and boat mooring areas. The noise environment would be increased in the vicinity of a new bridge crossing and the surrounding amenity area for both these options.

The Purple West Option Corridor yields the second lowest overall PIR (219) in the western comparative assessment. This option follows an off-line corridor north of Carrick-on-Shannon between Nodes B and J. The corridor passes through more rural areas compared to the southern option corridors with an associated lower density of noise sensitive buildings. This corridor crosses the River Shannon north of Carrick-on-Shannon which will also increase the ambient noise environment at any amenity areas along the River crossing. The presence of specific amenity areas is however, less frequent in this section of the River Shannon compared to those south of Carrick-on-Shannon.

The Dark Green Option Corridor has the lowest overall PIR (205) in the comparative assessment. This option also follows an off-line corridor through rural areas, following the Purple West Option Corridor but instead of turning south it continues further east before re-joining the existing N4 at Node J. This option corridor also crosses the River Shannon north of Carrick-on-Shannon which, as noted above, will also increase the ambient noise environment at any amenity areas along the river crossing.

The Black Option Corridor has an overall PIR of 538. This is a relatively high score for a short option corridor, and is driven by the proximity to the Oaklands residential housing estate to the south. The majority of NSRs that make up the total PIR are located in the outer distance bands of 100 – 200m and 200 – 300m. The number of NSRs in the 0 – 50m and 50 – 100m bands, i.e. the receptors most exposed to traffic noise, are relatively low by comparison to the outer distance bands.

On the basis of the PIR analysis in isolation, in terms of the comparative assessment, the Blue West Option Corridor has the highest potential noise impact due to the number and distribution of noise sensitive properties in proximity to the on-line route and the Dark Green Option Corridor would result in the lowest potential noise impacts.

Stage 1 PIR Assessment of Option Corridors East of Node J at Drumsna Junction

Table 7.5.6.4 summarises the PIR values calculated for the option corridors east of Node J at Drumsna Junction using the weighting values for each distance band discussed above and taking account of existing properties within the 300m band.

Table 7.5.6.4 PIR Assessment Table for Option Corridors East of Drumsna Junction (Node J)

Option Corridor	PIR 0-50m Band	PIR 50-100m Band	PIR 100-200m Band	PIR 200-300m Band	Total PIR
Purple East Option Corridor	60	81	130	29	300
Green Option Corridor	116	81	100	18	315
Yellow Option Corridor	108	81	100	18	307
Blue East Option Corridor	116	81	100	18	315

The resultant PIR values are all broadly similar among the option corridors east of Node J, with the Green Option Corridor and Blue East Option Corridor having a marginally higher value (315) followed by the Yellow Option Corridor (307). These options follow the same on-line corridor with the exception of the section between Nodes G to H where the Yellow Option follows an off-line path west of the existing N4.

The Purple East Option Corridor follows the same on-line corridor as the Green Option Corridor but deviates between Nodes F and G where it follows an off-line corridor to the east of Aghamore. The Purple East Option Corridor has the lowest PIR (300) compared to the other three options in the eastern section due to the lower property counts in the off-line section of this corridor. On this basis the Purple East Option would result in a marginally lower potential noise impact.

Whilst the PIR assessment provides information on the number of noise sensitive properties in the vicinity of each option corridor, the NRA 2004 and TII 2014 Noise Guidelines acknowledge that the PIR process only provides an initial high-level screening for option ranking.

In addition to property counts, other factors which also dictate the potential noise impact from an option corridor relate to its vertical alignment (cuttings, embankments, at grade, tunnels etc.), road traffic flows and potential for noise mitigation.

Stage 1 Assessment of Noise Footprint and Potential Requirement for Noise Mitigation - West of Node J at Drumsna Junction

In general, sections of road alignments in cut have the smallest noise footprint compared to those associated with high embankments. West of Node J at Drumsna Junction, for traffic flows up to 5,000 AADT, noise footprints extend to distances of 60m from the road edge for high embankments and 25 to 30m from the road edge for sections of cut. The section between Node D and Node E was determined to have a marginally larger footprint (70m) due to a higher traffic AADT and an at-grade alignment for the majority.

Table 7.5.6.5 summaries the number of counted properties likely requiring noise mitigation based on the noise ‘footprint’ for the section west of Node J at Drumsna Junction for the six option corridors.

Table 7.5.6.5 Number of Properties Likely Requiring Noise Mitigation – West of Drumsna Junction (Node J)

Option Corridor	Design Description	Indicative No. of Properties Likely requiring noise mitigation
West of Node J		
Cyan Option Corridor	Cyan Dual Carriageway Design	15
Orange Option Corridor	Orange Dual Carriageway Design	19
Purple West Option Corridor	Purple Dual Carriageway Design	3
Dark Green Option Corridor	Dark Green Dual Carriageway Design	1
Blue West Option Corridor	Blue West Dual Carriageway Design	0
Black Option Corridor	Black Single Carriageway Design	11

For west of Node J at Drumsna Junction, the highest number of properties likely to trigger the requirement for noise mitigation were counted along the Cyan and Orange Option Corridors. The majority of these properties are located between Node C and Node D, within two housing estates north of the option corridor and to the east of the River Shannon. Overall, a marginally higher number of properties were counted along the Orange carriageway.

A low number of properties were counted for the Dark Green (1) and Purple West Options (3) due to the routes passing through rural areas, making these favourable options.

The Blue West (Management) Option is determined to have no properties likely to require mitigation due to the neutral change in noise levels compared to the Do-Minimum scenario.

With respect to the Black Option Corridor, noise mitigation would be required along the northern length of the alignment between Summerhill Road and Leitrim Road as a minimum.

The assessment has concluded therefore that the Cyan, Orange and Black Option Corridors are those likely to generate the greatest noise footprint and require the greatest extent of noise mitigation measures to reduce noise levels to within the TII traffic design goal of 60 dB L_{den} . On this basis, these option corridors are less preferred compared to the Blue West, Purple West, and Dark Green options.

Based on the assessment of the likely requirement for noise mitigation, the Blue West, Purple West and Dark Green options result in the lowest potential noise impacts.

Stage 1 Assessment of Noise Footprint and Potential Requirement for Noise Mitigation - East of Node J at Drumsna Junction

For the section east of Node J at Drumsna Junction, similar footprint distances were calculated to those discussed in the section West of Node J at Drumsna Junction, due to similar traffic flows, particularly between Nodes F and H.

For east of Node J at Drumsna Junction, given three of the options in this section follow an on-line corridor over the majority of their alignments, the noise footprint will be the same as the existing N4. Review of the traffic model outputs confirm no significant change in traffic volumes between the Do-Minimum and Do-Something scenarios along the N4 that would trigger a notable increase in noise levels. The only likely requirement for noise mitigation will therefore be associated with off-line sections, along widened sections of the on-line alignment and/or along parallel roads, new junctions and other ancillary works which have the potential to increase traffic noise levels above 60 dB L_{den} or the prevailing traffic noise level.

For the eastern section of the assessment study area, the 60 dB L_{den} noise footprint and likely requirement for noise mitigation were determined based on a review of the projected future traffic flows and the vertical alignments.

Table 7.5.6.6 summaries the number of properties likely to trigger the requirement for noise mitigation based on their 'footprint' within the eastern section for the four carriageway design options.

Due to the fact that the options in this section follow the on-line corridor for the majority of their alignments with no notable difference in traffic noise levels between the Do-Something and Do-Minimum scenarios, the likely requirement for mitigation is driven by the proximity of NSRs to new parallel roads or junctions which have the potential to result in increased traffic noise levels above 60 dB L_{den}. The assessment is based on indicative layout plans.

Table 7.5.6.6 Number of Properties Likely Requiring Noise Mitigation – East of Drumsna Junction (Node J)

Option Corridor	Design Description	Indicative No. of Properties Likely requiring noise mitigation
East of Node J		
Purple East Option Corridor	Purple East Dual Carriageway Design	7
Green Option Corridor	Green Dual Carriageway Design	13
Yellow Option Corridor	Yellow Dual Carriageway Design	13
Blue East Option Corridor	Blue East Dual Carriageway Design	0

Within the section east of Node J, the highest number of properties likely to trigger the requirement for noise mitigation were counted along the Yellow and Green

carriageways. These properties are located in proximity to new parallel roads and new junctions.

The Purple East option results in a lower number of properties likely to require noise mitigation compared to the Yellow and Green options. The identified properties are located in proximity to new parallel roads and new junctions.

There are no properties identified along the Blue East carriageway that will likely trigger the requirement for noise mitigation due to the absence of parallel roads or any significant new junctions and the similar or marginally lower volume of traffic compared to the Do Minimum scenario.

On the basis of the above analysis, the Purple East and Blue East Option Corridors result in the lowest potential noise impacts compared to the Yellow and Green Option Corridors.

Stage 1 Assessment of Change in Traffic Noise Level -West of Node J at Drumsna Junction

During the operational phase of the Purple West, Dark Green and Blue West Options, traffic noise levels along the existing N4 are reduced by approximately 1 dB or result in a neutral change. With reference to the Design Manual for Roads and Bridges (DMRB) the predicted change in noise level along the existing N4 is categorised as neutral to negligible.

For the Orange Option, traffic noise levels along the existing N4 between Node A and the N4 – junction with R368 are reduced by up to 3 dB and between the N4 – R368 and Node J are reduced by up to 2 dB. Overall, a negligible change in noise level is calculated along the existing N4 with the Orange Option in place.

For the Cyan Option, traffic noise levels along the existing N4 between Node A and the N4 junction with R368 are reduced by up to 4 dB which is categorised as a minor change. Between the N4 junction with R368 and Node J, traffic noise levels are calculated to reduce by approximately 2 dB, defined as a negligible change.

For the Black Option, traffic noise levels along the existing N4 are predicted to be unchanged with the exception of the section of the existing N4 road east of Carrick-on-Shannon and Node J. Along this section, a negligible increase in noise level is predicted as a result of small changes in traffic flow numbers.

In summary, traffic flow data indicates that whilst all options remove an element of traffic out of Carrick-on-Shannon, there is not expected to be a significant reduction in noise levels associated with the residual traffic passing through the town. The highest reductions are achieved with the off-line option corridors to the south, i.e., Cyan and Orange.

Plate 7.5.6.1 shows the assessment break points along the existing N4 west of Node J for the change in noise levels assessment contained in Table 7.5.6.7.

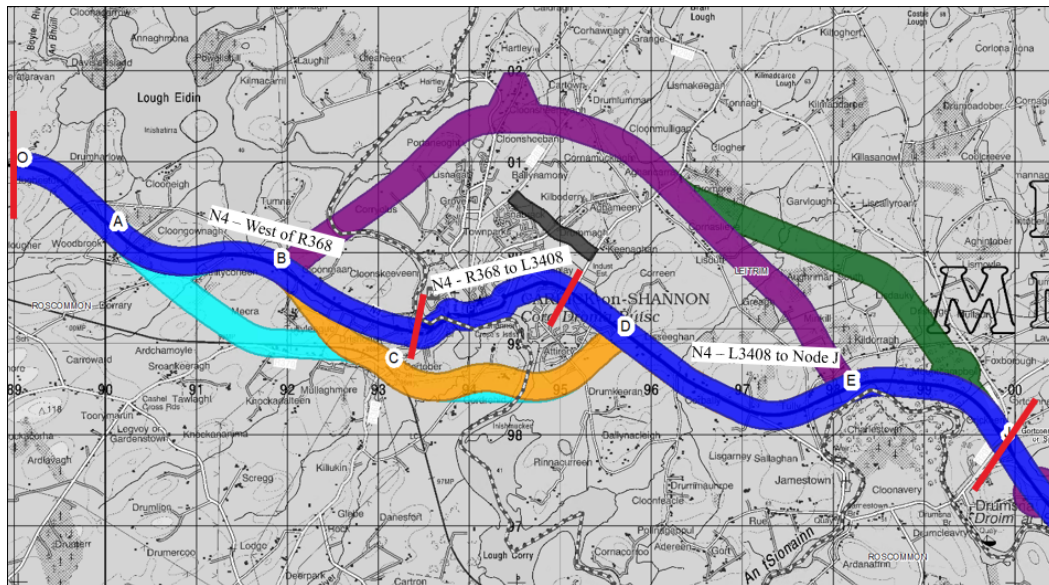


Plate 7.5.6.1 Estimated Change in Noise Levels Assessment Break Points Options West of Node J

Table 7.5.6.7 Estimated Change in Noise Level along Existing N4 West of Drumsna Junction (Node J)

Option Name & Colour	Existing N4 Road Sections West of Node J	Do Minimum AADT (2045)	Do Something AADT (2045)	Change in Noise Level (dB)	DMRB categorisation
West of Drumsna / Node J					
Black Option Corridor	N4 – West of R368	8,676	8,611	+0.0	Negligible
	N4 – R368 to L3408	17,066	16,999	+0.0	Negligible
	N4 – L3408 to Node J	9,878	11,207	+0.5	Negative Negligible
Cyan Option Corridor	N4 – West of R368	8,676	3,424	-4.0	Positive Minor
	N4 – R368 to L3408	17,066	11,926	-1.6	Positive Negligible
	N4 – L3408 to Node J	9,878	12,840	+1.1	Negative Negligible
Orange Option Corridor	N4 – West of R368	8,676	5,170	-2.2	Positive Negligible
	N4 – R368 to L3408	17,066	12,882	-1.2	Negative Negligible
	N4 – L3408 to Node J	9,878	11,280	+0.6	Negative Negligible
Purple West Option Corridor	N4 – West of R368	8,676	7,505	-0.6	Positive Negligible
	N4 – R368 to L3408	17,066	13,852	-0.9	Negative Negligible
	N4 – L3408 to Node J	9,878	8,031	-0.9	Negative Negligible

Option Name & Colour	Existing N4 Road Sections West of Node J	Do Minimum AADT (2045)	Do Something AADT (2045)	Change in Noise Level (dB)	DMRB categorisation
West of Drumsna / Node J					
Dark Green Option Corridor	N4 – West of R368	8,676	7,505	-0.6	Neutral / Positive Negligible
	N4 – R368 to L3408	17,066	13,852	-0.9	
	N4 – L3408 to Node J	9,878	8,031	-0.9	
Blue West Option Corridor	N4 – West of R368	8,676	8,648	0.0	Neutral / Positive Negligible
	N4 – R368 to L3408	17,066	16,962	0.0	
	N4 – L3408 to Node J	9,878	9,180	-0.3	

Stage 1 Assessment of Change in Traffic Noise Level - East of Node J at Drumsna Junction

East of Node J, due to the on-line alignments of the four options, traffic noise levels will remain similar to those in the Do-Minimum scenario, depending on the final alignment design. For the Green, Yellow and Blue East Options, a neutral change in traffic noise levels is expected for the majority of NSRs along the N4 between Nodes J to H. The Purple East Option will result in a reduction in traffic volumes and associated reduction in traffic noise levels along the N4 through Aghamore.

Table 7.5.6.8 Stage 1 Noise and Vibration Summary Assessment Matrix of Options West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Potential Impact Rating (PIR)	782	709	219	205	1,396	538
No. of properties likely to require noise mitigation	15	19	3	1	0	11
Predicted Change in Noise Level (dB) along existing N4 (DMRB Long-term rating)	Minor Positive to Negative Negligible	Positive Negligible to Negative Negligible	Positive Negligible	Neutral to Positive Negligible	Neutral to Positive Negligible	N/A
Scoring						
Qualitative Assessment	Moderately Negative	Moderately Negative	Minor or Slightly Negative	Minor or Slightly Negative	Not Significant or Neutral	Moderately Negative
Score / Impact Level	2	2	3	3	4	2
Preference	Intermediate	Intermediate	Preferred	Preferred	Preferred	N/A

Table 7.5.6.9 Stage 1 Noise and Vibration Summary Assessment Matrix of Options East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Potential Impact Rating (PIR)	307	315	300	315
No. of properties likely to require noise mitigation	13	13	7	0
Predicted Change in Noise Level (dB) along existing N4 (DMRB Long-term rating)	Neutral	Neutral	Neutral to Positive Negligible	Neutral
Scoring				
Qualitative Assessment	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Not Significant or Neutral
Score / Impact Level	3	3	3	4
Preference	Intermediate	Intermediate	Preferred	Preferred

7.5.6.5 Summary

Summary Assessment of Option Corridors West of Node J at Drumsna Junction

Taking account of the assessments set out above, the PIR, the likelihood of required mitigation and associated qualitative assessment for each option corridor within the western section of the study area are summarised in Table 7.5.6.8. With reference to Table 7.5.6.2 the predicted change in noise level associated with each option corridor has been categorised. For example, a minor change in noise level is defined as being a 3 – 4.9 dB change. The change is denoted as positive where a reduction in noise level is predicted and negative in the of a predicted increase in noise level. Taking account of the assessment criteria, the Cyan and Orange Option Corridors are determined to have a moderately negative impact. This is due to the number of properties likely requiring noise mitigation and the PIR values being notably higher compared to the Purple West and Dark Green Option Corridors. Both the Cyan and Orange Option Corridors are also more likely to impact highly sensitive amenity areas along the River Shannon at the river crossing compared to the Purple West Option Corridor. It is noted both the Cyan and Orange Option Corridors provide a marginally greater benefit in terms of traffic noise reduction to noise sensitive properties along the existing N4 through Carrick-on-Shannon.

The Purple West Option Corridor has been determined to have a minor or slightly negative impact due to its low PIR and low number of properties likely to require noise mitigation compared to the Cyan and Orange Option Corridors. Whilst this option will affect a small number of properties along its alignment, it results in a negligible change in noise levels to noise sensitive properties along the existing N4 through Carrick-on-Shannon. This option is preferred alongside the Dark Green and Blue West Option Corridors.

The Dark Green Option Corridor has also been determined to have a minor or slightly negative impact due to its low PIR and low number of properties likely to require noise mitigation compared to the Cyan and Orange Option Corridors. Whilst this option will affect a small number of properties along its alignment, it results in a negligible change in noise levels to noise sensitive properties along the existing N4 through Carrick-on-Shannon. This option is preferred alongside the Purple West and Blue West options.

The Blue West Option Corridor has been determined to have a not significant/neutral impact due to its on-line alignment, whereby properties close to the existing N4 will likely not experience an increase in noise levels due to reduced residual traffic flows, in particular in the town of Carrick-on-Shannon. Therefore, the Blue West Option is Preferred alongside the Purple West and Dark Green options.

On the basis of the above, the Blue West, Dark Green, Purple West Option Corridors are preferred over the Cyan and Orange Option Corridors. Both the Cyan and Orange Option Corridors are ranked as Intermediate on the basis that whilst they have higher potential noise impacts, the impacts could be controlled through further detailed design and noise mitigation at focused locations along the carriageways.

The Black Option Corridor has been determined to have a moderately negative impact. While traffic flow numbers are relatively low, the connector road introduces traffic closer to noise sensitive locations than the existing condition. Once operational, small amounts of traffic will make use of this option resulting in no change and a negligible increase in traffic noise levels on the existing N4 alignment.

Summary Assessment of Option Corridors East of Node J at Drumsna Junction

Taking account of the assessments set out above, the PIR, likelihood of required mitigation and associated qualitative assessment for each option corridor within the eastern section of the study area are summarised in Table 7.5.6.9.

With reference to Table 7.5.6.2 the predicted change in noise level associated with each option corridor has been categorised. For example, a minor change in noise level is defined as being a 3 – 4.9 dB change. The change is denoted as positive where a reduction in noise level is predicted and negative in the case of a predicted increase in noise level.

Taking account of the assessment criteria, the Purple East, Green and Yellow Option Corridors are determined to result in a minor or slightly negative effect. The Blue Option Corridor is determined to result in a not significant or neutral effect.

The Green and Yellow Option Corridors score similarly in terms of PIR and number of properties likely requiring noise mitigation and are ranked Intermediate. This relates to the potential for new impacts at properties adjacent to new junctions or parallel roads. Given the early stage of this assessment, however, these impacts may be further reduced at more detail assessment stages.

The Purple East Option Corridor has the lowest PIR and second lowest number of properties likely requiring noise mitigation. The marginally lower number of affected properties associated with new junction or parallel road layouts coupled with the likely reduction in traffic noise levels along the N4 through Aghamore ranks this route preferred over the Green and Yellow Option Corridors.

The Blue East Option Corridor has no properties likely to require mitigation compared to the other options since the option remains on-line throughout, however traffic flow data indicate that there will be a not significant/neutral impact as noise levels are likely not to increase. Due to its neutral to not significant score, the Blue East Option is therefore preferred alongside the Purple East Option.

7.5.7 Stage 1 Archaeological, Architectural and Cultural Heritage Option Assessment

7.5.7.1 Introduction

This section details the Archaeological, Architectural and Cultural Heritage assessment of the options with respect to the Archaeology, Architectural and Cultural Heritage constraints identified in Section 4.10 Archaeology, Architectural and Cultural Heritage of this report.

The Archaeological, Architectural and Cultural Heritage constraints are presented with the Stage 1 Option Corridors in Figures 7.5.7.1.0 to 7.5.7.1.5. The sites are referenced as per the Leitrim County Development 2015-2021, noting that the Draft Leitrim County Development Plan 2023-2029 will come into effect on 21 March 2023. The proposed additions and deletions to the protected structures listed in the new Plan have been reviewed and this assessment of the Stage 1 Option Corridors remains unchanged.

Section 7.5.7.2 details the methodology that was used to carry out the study and Section 7.5.7.3 outlines the assessment criteria which were used. The Stage 1 Assessment and summary are presented in Section 7.5.7.4.

7.5.7.2 Methodology

For the option corridor assessment, the overall project has been split into two sections, i.e. West of Drumsna Junction (Node J) and East of Drumsna Junction (Node J) and the option corridors assessed are those described in Section 7.1.2.

There are two zones associated with each option corridor referred to in this assessment:

- The potential road “footprint”, in this case a 100m wide corridor around the centreline of the potential landtake required to construct or improve the road
- The road “corridor”, in this case a 250m buffer either side of the “footprint”. The “footprint” sits inside the “corridor”

The Stage 1 Option Corridor Assessment has been carried out with reference to the TII Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes³⁸ and Assessment of Architectural Heritage Impacts of National Road Schemes³⁹, although it should be noted that the guidelines themselves predate the establishment of a preliminary options assessment process.

³⁸ Transport Infrastructure Ireland, 2005. Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes. Available at: <https://www.tii.ie/technical-services/environment/planning/Guidelines-for-the-Assessment-of-Archaeological-Heritage-Impact-of-National-Road-Schemes.pdf>

³⁹ Transport Infrastructure Ireland, 2005. Guidelines for the Assessment Architectural Heritage Impacts of National Road Schemes. Available at: https://www.tii.ie/technical-services/environment/planning/Guidelines_for_the_Assessment_of_Architectural_Heritage_Impact_of_National_Road_Schemes.pdf

Within each option corridor, the methodology addressed a 250m buffer either side of a 100m wide corridor around a centreline of a potential road footprint. This enables a meaningful assessment of potential negative direct and indirect impacts upon the archaeological, architectural and cultural heritage resource, whilst allowing for either single or dual-carriageway options.

A direct impact occurs where an asset is within the 100m wide potential road footprint of an option corridor. An indirect impact may occur where the asset is within the 250m wide buffer zone of an option corridor.

Measurements are taken from the edge of the 100m wide potential road footprint to the upstanding remains of a site or structure, or to the edges of features/monuments seen through aerial photography. Where there are no upstanding remains, the measurement is taken from the edge of the potential road footprint to the centre of the site. These measurements are noted as “Distance from Option” in the assessment tables herein.

The area of greenfield land within each potential road footprint and corridor has been calculated to assist in the assessment of the likelihood of impacts to previously unrecorded archaeological remains.

Potential impacts on key constraints have been assessed, including recorded monuments, protected structures, NIAH structures and designed landscapes.

Assessment Criteria

The TII Project Appraisal Guidelines for National Roads (PAG) Unit 7.0 - Multi Criteria Analysis² (hereafter referred to as the TII PAG) was used as a basis for the assessment of potential impacts on the archaeological, architectural and cultural heritage resource. Impacts were assessed on a scale of 1 – 7 as listed in Table 7.3.1 of this report.

The assessment was informed by the Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports²⁹. Specifically, the significance of effects, as detailed in Table 3.3 of that document, have been aligned with those impacts described above as follows:

Table 7.5.7.1 Alignment of TII and EPA Impact Guidelines

TII Guidelines	EPA Guidelines
Not Significant or Neutral	Imperceptible
	Not Significant
Minor or Slightly Negative	Slight
Moderately Negative	Moderate
	Significant
Major or Highly Negative	Very Significant
	Profound

Due to the more condensed nature of the TII scale of negative impacts in comparison with that provided by the EPA, i.e., TII scale has four levels, EPA scale has seven levels, the impact assessment remains high level at this stage.

7.5.7.3 Stage 1 Archaeological, Architectural and Cultural Heritage Option Corridor Assessment

Table 7.5.7.2 to Table 7.5.7.7 detail the potential impacts of each option corridor west of Drumsna Junction (Node J) on the known archaeological, architectural and cultural heritage resources. A summary of the impacts across each corridor is then presented in Table 7.5.7.8 together with an average impact score and ranking of each option from Preferred to Intermediate to Least Preferred.

Table 7.5.7.2 Cyan Option Corridor Assessment

Site Ref.	Name	Does it have Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH1	Barrow - ring-barrow	Proposed RMP	189m WNW	Indirect	Slight
AH2	Fulacht fia	None (excavated)	c. 24m NW	Neutral	N/A
AH3	Burnt mound	None (excavated)	c. 4m SW	Neutral	N/A
AH4	Excavation-miscellaneous (poss corn-drying kiln)	Proposed RMP	0m	Neutral	N/A
AH5	Excavation-miscellaneous (Pit with charred material)	Proposed RMP	0m	Neutral	N/A
AH5	Excavation-miscellaneous	None (excavated)	0m	Neutral	N/A
AH6	Ringfort-rath	RMP	0m	Direct	Very Significant Negative
AH7	Excavation-miscellaneous	None (excavated)	c. 35m NE	Neutral	N/A
AH8	Excavation-miscellaneous	None (excavated)	c. 61m NE	Neutral	N/A
AH8	Burnt mound	None (excavated)	c. 22m NE	Neutral	N/A
AH9	Redundant record	None (excavated)	c. 109m NE	Neutral	N/A
AH10	House-prehistoric	None (excavated)	c. 33m NE	Neutral	N/A
AH10	Hut site	None (excavated)	c. 76m NE	Neutral	N/A

Site Ref.	Name	Does it have Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH10	Ringfort-rath	Proposed RMP	c. 90m NE	Neutral	N/A
AH10	Enclosure	Proposed RMP	c. 86m NE	Neutral	N/A
AH10	Fulacht fia	None (excavated)	c. 76m NE	Neutral	N/A
AH10	Burnt mound	None (excavated)	c. 132m NE	Neutral	N/A
AH10	Burnt mound	Proposed RMP	c. 116m NW	Indirect	Imperceptible Negative
AH10	Burnt mound	Proposed RMP	c. 114m NW	Indirect	Imperceptible Negative
AH15	Burnt mound	Proposed RMP	0m	Direct	Very Significant Negative
AH14	Ringfort-rath	RMP	c. 50m S	Indirect	Moderate Negative
AH20	Ringfort-rath	Proposed RMP	c. 220m ESE	Indirect	Slight Negative
AH13	Ringfort-rath	RMP	c. 77m NE	Indirect	Slight Negative
AH12	Redundant record	None (SMR)	c. 91m SW	Neutral	N/A
AH16	Redundant record	None (SMR)	c. 112m SW	Neutral	N/A
AH17	Redundant record	None (SMR)	c. 139m NE	Neutral	N/A
AH33	Ringfort-rath	RMP	c. 155m SSW	Indirect	Imperceptible Negative
AH36	Ringfort-rath	RMP	0m	Direct	Very Significant Negative
BH2	Railway Storehouse / warehouse	RPS	0m	Direct	Very Significant Negative
BH2	Railway Goods shed	RPS	0m	Direct	Very Significant Negative
BH2	Water tower	None	0m	Direct	Very Significant Negative

Site Ref.	Name	Does it have Statutory Protection?	Distance from option	Impact Type	Potential Impact level
BH2	Signal box	RPS	0m	Direct	Very Significant Negative
BH2	Waiting Room	RPS	0m	Direct	Very Significant Negative
BH2	Carrick-on-Shannon Railway station	RPS	0m	Direct	Very Significant Negative
BH2	Footbridge	RPS	0m	Direct	Very Significant Negative
AH66	Ringfort-rath	Proposed RMP	c. 19m N	Indirect	Moderately Negative
AH67	Ringfort-rath	Proposed RMP	c. 105m N	Indirect	Slight Negative
AH68	Ringfort-rath	Proposed RMP	c. 121m N	Indirect	Slight Negative
AH65	Ringfort-rath	RMP	c. 200m N	Neutral	N/A
AH142	Bullaun stone	None (SMR)	c. 130m NW	Indirect	Slight Negative
AH142	Burial Ground	RMP	c. 110m NW	Indirect	Slight Negative
AH142	Ecclesiastical enclosure	Proposed RMP	c. 105m NW	Indirect	Slight Negative
AH142	Church	Proposed RMP	c. 110m NW	Indirect	Slight Negative
AH143	Ringfort-rath	RMP	0m	Direct	Very Significant Negative
AH144	Ringfort-rath	RMP	c. 217m SW	Indirect	Imperceptible Negative
AH123	Ringfort-rath	RMP	c. 135m NE	Indirect	Imperceptible Negative
AH124	Ringfort-rath	RMP	c. 225m NE	Indirect	Imperceptible Negative
AH151	Fulacht fia	None (SMR)	0m	Neutral	N/A
AH129	Ringfort-rath	RMP	c.216m N	Indirect	Imperceptible Negative
AH132	Enclosure	RMP	c. 135m NNW	Indirect	Slight Negative

Site Ref.	Name	Does it have Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH150	Fulacht fia	None (excavated)	0m	Neutral	N/A
AH139	Redundant record	None (SMR)	c. 201m N	Neutral	N/A
AH152	Mound	Proposed RMP	0m	Direct	Profound Negative
AH133	Crannog	RMP	c. 123m SSE	Indirect	Slight
AH153	Burnt mound	None (excavated)	0m	Neutral	N/A
DL5	Charlestown House demesne	None	c. 92m S	Neutral	N/A
AH156	Ringfort-rath	RMP	c.226m S	Indirect	Imperceptible Negative
AH154	Hut site & Fulacht fia	None (excavated)	0m	Neutral	N/A
DL6	Mountcampbell House demesne	None	0m	Direct	Slight Negative
AH266	Ringfort-rath	Proposed RMP	c.140m N	Indirect	Imperceptible Negative
AH267	Ringfort-rath	Proposed RMP	c. 20m ENE	Indirect	Significant Negative
DL7	Belmont	None	0m	Direct	Slight Negative
AH270	Ringfort-rath	RMP	0m	Direct	Significant Negative
AH269	Ringfort-rath	RMP	c. 61m SW	Indirect	Slight Negative
AH271	Ringfort-rath	RMP	c. 132m NE	Indirect	Imperceptible Negative
BH8	Drumsna National School	None	c. 24m NE	Indirect	Moderate Negative

Table 7.5.7.3 Orange Option Corridor Assessment

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH20	Ringfort-rath	Proposed RMP	c. 22m W	Indirect	Imperceptible Negative
AH18	Ringfort-rath	Proposed RMP	c. 223m SW	Indirect	Imperceptible Negative

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH19	Ringfort-rath	RMP	0m	Direct	Significant Negative
AH22	Ringfort-rath	RMP	c. 94m NE	Indirect	Slight Negative
AH23	Ringfort-rath and hut site	Proposed RMP	c.192m NE	Indirect	Imperceptible Negative
AH36	Ringfort-rath	RMP	0m	Direct	Very Significant Negative
BH2	Railway Storehouse / warehouse	RPS	0m	Direct	Very Significant Negative
BH2	Railway Goods shed	RPS	0m	Direct	Very Significant Negative
BH2	Water tower	None (NIAH)	0m	Direct	Very Significant Negative
BH2	Signal box	RPS	0m	Direct	Very Significant Negative
BH2	Waiting Room	RPS	0m	Direct	Very Significant Negative
BH2	Carrick-on-Shannon Railway station	RPS	0m	Direct	Very Significant Negative
BH2	Footbridge	RPS	0m	Direct	Very Significant Negative
AH66	Ringfort-rath	Proposed RMP	c. 19m N	Indirect	Significant Negative
AH67	Ringfort-rath	Proposed RMP	c. 105m N	Indirect	Slight Negative
AH68	Ringfort-rath	Proposed RMP	c. 100m NNW	Indirect	Slight Negative
AH65	Ringfort-rath	RMP	c. 98m N	Indirect	Imperceptible Negative
AH142	Bullaun stone	None (SMR)	c. 130m NW	Indirect	Slight Negative
AH142	Burial Ground	RMP	c. 110m NW	Indirect	Slight Negative
AH142	Ecclesiastical enclosure	Proposed RMP	c. 105m NW	Indirect	Slight Negative
AH142	Church	Proposed RMP	c. 110m NW	Indirect	Slight Negative
AH143	Ringfort-rath	RMP	0m	Direct	Very Significant negative
AH144	Ringfort-rath	RMP	c. 217m SW	Indirect	Imperceptible Negative

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH123	Ringfort-rath	RMP	c. 135m NE	Indirect	Slight Negative
AH124	Ringfort-rath	RMP	c. 225m NE	Indirect	Imperceptible Negative
AH151	Fulacht fia	None (excavated)	0m	Neutral	N/A
AH129	Ringfort-rath	RMP	c. 216m N	Indirect	Imperceptible Negative
AH132	Enclosure	RMP	c. 135m NNW	Indirect	Slight Negative
AH150	Fulacht fia	None (excavated)	0m	Neutral	N/A
AH139	Redundant record	None (SMR)	c. 201m N	Neutral	N/A
AH152	Mound	Proposed RMP	0m	Direct	Profound Negative
AH133	Crannog	RMP	c. 123m SSE	Indirect	Slight Negative
AH153	Burnt mound	None (excavated)	0m	Neutral	N/A
DL5	Charlestown House demesne	None	c. 92m S	Neutral	N/A
AH156	Ringfort-rath	RMP	c. 226m S	Indirect	Imperceptible Negative
AH154	Hut site and Fulacht fia	None (excavated)	0m	Neutral	N/A
DL6	Mountcampbell House demesne	None	0m	Direct	Slight Negative
AH266	Ringfort-rath	RMP	c. 140m N	Indirect	Imperceptible Negative
AH267	Ringfort-rath	Proposed RMP	c. 20m ENE	Indirect	Significant Negative
DL7	Belmont	None	0m	Direct	Slight Negative
AH270	Ringfort-rath	RMP	0m	Direct	Significant Negative
AH269	Ringfort-rath	RMP	c. 61m SW	Indirect	Slight Negative
AH271	Ringfort-rath	RMP	c. 132m NE	Indirect	Imperceptible Negative
BH8	Drumsna National School	None (NIAH)	c. 24m NE	Indirect	Moderately Negative

Table 7.5.7.4 Purple West Option Corridor Assessment

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH18	Ringfort-rath	Proposed RMP	c. 210m SW	Indirect	Imperceptible Negative
AH20	Ringfort-rath	Proposed RMP	0m	Direct	Very Significant Negative
AH19	Ringfort-rath	RMP	0m	Direct	Significant Negative
AH22	Ringfort-rath	RMP	0m	Direct	Very Significant Negative
AH21	Ringfort-rath	RMP	c. 101m NW	Indirect	Slight Negative
AH23	Ringfort-rath and hut site	Proposed RMP	c. 98m SE	Indirect	Slight Negative
AH308	Ringfort-rath	RMP	c. 64m NW	Indirect	Slight Negative
AH73	Ringfort-rath	RMP	c. 176m SE	Indirect	Imperceptible Negative
AH74	Ringfort-rath	RMP	c. 239m SE	Indirect	Imperceptible Negative
DL14	Hartley House demesne	None	0m	Direct	Moderately Negative
BH5	House	None	c. 142m SSW	Indirect	Imperceptible Negative
AH85	Ringfort-rath	Proposed RMP	c. 221m SE	Indirect	Imperceptible Negative
AH75	Ringfort-rath	RMP	c. 134m NNW	Indirect	Imperceptible Negative
AH76	Ringfort-rath	RMP	c. 220m NE	Indirect	Imperceptible Negative
AH83	Megalithic structure	RMP	c. 61m W	Indirect	Slight Negative
AH80	Ringfort-rath	RMP	c. 63m S	Indirect	Slight Negative
AH81	Ringfort-rath	RMP	c. 56m S	Indirect	Moderately Negative
DL15	Drumlumman	None	0m	Direct	Slight Negative
AH86	Ringfort-rath	RMP	c. 206m E	Indirect	Imperceptible Negative
AH96	Ringfort-rath	RMP	c. 84m NE	Indirect	Slight Negative
AH96	Enclosure	Proposed RMP	c. 90m NE	Indirect	Slight Negative
AH99	Ringfort-rath	Proposed RMP	0m	Direct	Very Significant Negative

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
DL3	Castlecarra	None	c. 27m SW	Indirect	Slight Negative
AH98	Castle - unclassified	Proposed RMP	c. 186m SW	Indirect	Imperceptible Negative
AH101	Ringfort-rath	Proposed RMP	c. 99m NE	Indirect	Slight Negative
AH110	Ringfort-rath	RMP	0m	Direct	Significant Negative
AH111	Ringfort-rath	RMP	0m	Direct	Significant Negative
AH112	Ringfort-rath	RMP	c. 6m SW	Indirect	Significant Negative
AH116	Ringfort-rath	RMP	c. 44m N	Indirect	Slight Negative
AH115	Ringfort-rath	Proposed RMP	0m	Direct	Very Significant Negative
AH115	Church	Proposed RMP	0m	Direct	Profound Negative
AH119	Enclosure	Proposed RMP	c. 46m SW	Indirect	Slight Negative
AH118	Ringfort-rath	RMP	c. 177m NE	Indirect	Imperceptible Negative
AH127	Ringfort-rath	RMP	c. 70m NE	Indirect	Moderately Negative
AH125	Ringfort-rath	RMP	c. 188m SW	Indirect	Imperceptible Negative
AH126	Ringfort-rath	RMP	c. 117m SW	Indirect	Slight Negative
AH135	Ringfort-rath	RMP	c. 224m NE	Indirect	Imperceptible Negative
AH134	Ringfort-rath	RMP	c. 122m NE	Indirect	Imperceptible Negative
AH131	Ringfort-rath	RMP	c. 111m SW	Indirect	Slight Negative
AH139	Redundant record	None (SMR)	c. 108m W	Neutral	N/A
AH153	Burnt mound	None (excavated)	0m	Neutral	N/A
AH150	Fulacht fia	None (excavated)	0m	Neutral	N/A
AH152	Mound	Proposed RMP	0m	Direct	Profound Negative
AH133	Crannog	RMP	c. 123m SSE	Indirect	Slight Negative
DL5	Charlestown House demesne	None	c. 92m S	Neutral	N/A
AH156	Ringfort-rath	RMP	c. 245m S	Indirect	Imperceptible Negative

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH154	Hut site and Fulacht fia	None (excavated)	0m	Neutral	N/A
DL6	Mountcampbell House demesne	None	0m	Direct	Slight Negative
AH266	Ringfort-rath	RMP	c. 140m N	Indirect	Imperceptible Negative
AH267	Ringfort-rath	Proposed RMP	c. 20m ENE	Indirect	Significant Negative
DL7	Belmont	None	0m	Direct	Slight Negative
AH270	Ringfort-rath	RMP	0m	Direct	Significant Negative
AH269	Ringfort-rath	RMP	c. 61m SW	Indirect	Moderately Negative
AH271	Ringfort-rath	RMP	c. 132m NE	Indirect	Imperceptible Negative
BH8	Drumsna National School	None (NIAH)	c. 24m NE	Indirect	Moderately Negative

Table 7.5.7.5 Dark Green Option Corridor Assessment

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH18	Ringfort-rath	Proposed RMP	c. 210m SW	Indirect	Imperceptible Negative
AH20	Ringfort-rath	Proposed RMP	0m	Direct	Very Significant Negative
AH19	Ringfort-rath	RMP	0m	Direct	Significant Negative
AH22	Ringfort-rath	RMP	0m	Direct	Very Significant Negative
AH21	Ringfort-rath	RMP	c. 101m NW	Indirect	Slight Negative
AH23	Ringfort-rath and hut site	Proposed RMP	c. 98m SE	Indirect	Slight Negative
AH308	Ringfort-rath	RMP	c. 64m NW	Indirect	Slight Negative
DL14	Hartley House demesne	None	0m	Direct	Moderately Negative
BH5	House	None (NIAH)	c. 142m SSW	Indirect	Imperceptible Negative
AH75	Ringfort-rath	RMP	c. 134m NNW	Indirect	Imperceptible Negative
AH76	Ringfort-rath	RMP	c. 220m NE	Indirect	Imperceptible Negative

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH85	Ringfort-rath	RMP	c. 239m S	Indirect	Imperceptible Negative
AH84	Ringfort-rath	RMP	c. 213m W	Indirect	Imperceptible Negative
AH83	Megalithic structure	RMP	c. 37m NW	Indirect	Moderately Negative
AH80	Ringfort-rath	RMP	c. 33m S	Indirect	Moderately Negative
AH81	Ringfort-rath	RMP	c. 69m S	Indirect	Slight Negative
DL15	Drumlumman	None	c. 191m NE	Neutral	N/A
AH96	Ringfort-rath	RMP	c. 74m NE	Indirect	Slight Negative
AH96	Enclosure	Proposed RMP	c. 80m NE	Indirect	Slight Negative
AH99	Ringfort-rath	Proposed RMP	0m	Direct	Very Significant Negative
DL3	Castlecarrá	None	c. 27m SW	Indirect	Slight Negative
AH98	Castle - unclassified	Proposed RMP	c. 186m SW	Indirect	Imperceptible Negative
AH101	Ringfort-rath	Proposed RMP	c. 66m NE	Indirect	Moderately Negative
AH110	Ringfort-rath	RMP	0m	Direct	Very Significant Negative
AH111	Ringfort-rath	RMP	c. 83m SSW	Indirect	Slight Negative
AH116	Ringfort-rath	RMP	c. 38m SW	Indirect	Moderately Negative
AH118	Ringfort-rath	RMP	c. 198m SSW	Indirect	Imperceptible Negative
AH117	Ringfort-rath	RMP	c. 54m NNE	Indirect	Slight Negative
AH137	Ringfort-rath	RMP	c. 217m SE	Indirect	Imperceptible Negative
AH261	Ringfort-rath	RMP	c. 105m NE	Indirect	Slight Negative
DL6	Mountcampbell House demesne	None	0m	Direct	Significant Negative
AH266	Ringfort-rath	RMP	c. 73m SW	Indirect	Slight Negative
AH154	Hut site and fulacht fia	None (SMR)	c. 164m W	Neutral	N/A
DL5	Charlestown House demesne	None	c. 204m SSW	Neutral	N/A
AH267	Ringfort-rath	Proposed RMP	c. 20m ENE	Indirect	Significant Negative

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
DL7	Belmont	None	0m	Direct	Slight Negative
AH270	Ringfort-rath	RMP	0m	Direct	Significant Negative
AH269	Ringfort-rath	RMP	c. 61m SW	Indirect	Moderately Negative
AH271	Ringfort-rath	RMP	c. 132m NE	Indirect	Imperceptible Negative
BH8	Drumsna National School	None (NIAH)	c. 24m NE	Indirect	Moderately Negative

Table 7.5.7.6 Blue West Option Corridor Assessment

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
BH1	Woodbrook House	RPS	c. 177m N	Indirect	Slight Negative
DL1	Woodbrook House	Principal structure in RPS	0m	Direct	Moderately Negative
AH1	Barrow - ring-barrow	Proposed RMP	74m SW	Indirect	Slight Negative
AH2	Fulacht fia	None (excavated)	0m	Neutral	N/A
AH3	Burnt mound	None (excavated)	c. 4m SW	Neutral	N/A
AH4	Excavation-miscellaneous (poss corn-drying kiln)	Proposed RMP	0m	Neutral	N/A
AH5	Excavation-miscellaneous (Pit with charred material)	Proposed RMP	c. 9m SW	Neutral	N/A
AH5	Excavation-miscellaneous	None (excavated)	0m	Neutral	N/A
AH6	Ringfort-rath	RMP	c. 36m SW	Indirect	Slight Negative
AH7	Excavation-miscellaneous	None (excavated)	0m	Neutral	N/A
AH8	Excavation-miscellaneous	None (excavated)	0m	Neutral	N/A
AH8	Burnt mound	None (excavated)	0m	Neutral	N/A
AH9	Redundant record	None (excavated)	c. 22m NE	Neutral	N/A
AH10	House-prehistoric	None (excavated)	0m	Neutral	N/A
AH10	Hut site	None (excavated)	0m	Neutral	N/A

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH10	Ringfort-rath	Proposed RMP	0m	Neutral	N/A
AH10	Enclosure	Proposed RMP	0m	Neutral	N/A
AH10	Fulacht fia	None (excavated)	0m	Neutral	N/A
AH10	Burnt mound	None (excavated)	0m	Neutral	N/A
AH10	Burnt mound	Proposed RMP	0m	Direct	Significant Negative
AH10	Burnt mound	Proposed RMP	0m	Direct	Significant Negative
AH13	Ringfort-rath	RMP	c. 200m S	Indirect	Imperceptible Negative
AH15	Burnt mound	Proposed RMP	0m	Direct	Significant Negative
AH14	Ringfort-rath	RMP	c. 50m S	Indirect	Moderately Negative
AH18	Ringfort-rath	Proposed RMP	c. 210m SW	Indirect	Imperceptible Negative
AH20	Ringfort-rath	Proposed RMP	0m	Direct	Very Significant Negative
AH19	Ringfort-rath	RMP	0m	Direct	Significant Negative
AH22	Ringfort-rath	RMP	c. 95m NE	Indirect	Slight Negative
AH23	Ringfort-rath and hut site	Proposed RMP	c. 179m NE	Indirect	Imperceptible Negative
AH24	Ringfort-rath	RMP	c. 195m NE	Indirect	Imperceptible Negative
AH27	Ringfort-rath	RMP	c. 158m NE	Indirect	Imperceptible Negative
BH3	Group of houses	RPS	c. 69-188m SSW	Indirect	Imperceptible Negative
AH63	House - 17th century	Proposed RMP	0m	Direct	Profound Negative
BH4	Hollywell House	RPS	c. 51m SW	Indirect	Moderately
BH4	Post Box, Limestone steps, Carrick-on-Shannon Bridge	RPS RPS Proposed RMP	0m	Direct	Very Significant Negative (on-line through town)
AH64	Historic Town (Carrick on Shannon)	RMP	0m	Direct	Significant Negative

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
BH4	Governor House Leitrim County Council (Gaol) The Lodge Old Court House Hatley Manor College	RPS RPS RPS RPS None	c. 146-186m NW	Indirect	Slight Negative
BH4	Hoist, Quayside	RPS	0m	Direct	Very Significant
BH4	Old Barrel Store / Carrick-on-Shannon Tourist Information	RPS	0m	Direct	Negative
BH4	Remains of Tower	RPS	0m	Direct	Very Significant
BH4	Old Quay Walls, Quayside	RPS	c. 10m NW	Indirect	Significant Negative
BH4	Glasshouse, Hatley Manor	RPS	c. 225m NW	Indirect	Imperceptible Negative
BH4	Stable Folly, Hatley Manor	RPS	c. 185m NW	Indirect	Imperceptible Negative
BH4	Terrace House	RPS	c. 148m NW	Indirect	Imperceptible Negative
BH4	Carrick-on-Shannon Lawn Tennis Club (gates / railings / walls)	None (NIAH)	c. 131m NW	Indirect	Imperceptible Negative
BH4	National Irish Bank	RPS	c. 117m NNW	Indirect	Imperceptible Negative
BH4	Victoria Parochial Hall	None (NIAH)	c. 56m NNW	Indirect	Imperceptible Negative
BH4	Carrick-on-Shannon Post Office	RPS	c. 158m NNW	Indirect	Imperceptible Negative
BH4	Market Yard & Buildings	RPS	c. 116m N	Indirect	Imperceptible Negative
BH4	McCann Memorial Clock	RPS	c. 163m N	Indirect	Imperceptible Negative
BH4	Milestone / milepost	None (NIAH)	c. 150m N	Indirect	Imperceptible Negative
BH4	Armstrong (house)	None (NIAH)	c. 154m N	Indirect	Imperceptible Negative
BH4	Costello Memorial Chapel	RPS	c. 163m N	Indirect	Imperceptible Negative
BH4	Dunne's (house)	None (NIAH)	c. 193m N	Indirect	Imperceptible Negative
BH4	P. Flynn & Co. end of terrace six bay three storey public house	RPS	c. 168m N	Indirect	Imperceptible Negative
BH4	Town Hall	RPS	c. 41m N	Indirect	Slight Negative

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
BH4	Teagasc	RPS	c. 40m N	Indirect	Slight Negative
BH4	Frances Fashions (house)	None (NIAH)	c. 61m N	Indirect	Slight Negative
BH4	Campbell's Londis Supermarket	None (NIAH)	c. 27m N	Indirect	Slight Negative
BH4	Allied Irish Bank	None (NIAH)	c. 208m N	Indirect	Imperceptible Negative
BH4	Reynold's Butchers / Moonstone Jewellers end of terrace 4 bay, 2 storey house	RPS	c. 203m N	Indirect	Imperceptible Negative
BH4	End of terrace three bay two storey former presbytery	RPS	c. 230m N	Indirect	Imperceptible Negative
BH4	James McGuire end of terrace three bay two storey former presbytery	RPS	c. 245m N	Indirect	Imperceptible Negative
BH4	Raval, end of terrace three bay two storey house	RPS	c. 242m N	Indirect	Imperceptible Negative
BH4	Carrick-on-Shannon Court House	RPS	c. 76m N	Indirect	Slight Negative
DL16	Shannon Lodge	None	0m	Neutral	N/A
BH4	Carrick-on-Shannon Rectory	None (NIAH)	c. 76m NW	Indirect	Slight Negative
AH72	Ringfort - unclassified	RMP	c. 128m NW	Indirect	Imperceptible
AH143	Ringfort-rath	RMP	0m	Direct	Very Significant Negative
AH144	Ringfort-rath	RMP	c. 217m SW	Indirect	Imperceptible Negative
AH123	Ringfort-rath	RMP	c. 135m NE	Indirect	Imperceptible Negative
AH124	Ringfort-rath	RMP	c. 225m NE	Indirect	Imperceptible Negative
AH151	Fulacht fia	None (excavated)	0m	Neutral	N/A
AH129	Ringfort-rath	RMP	c. 216m N	Indirect	Imperceptible Negative
AH132	Enclosure	RMP	c. 135m NNW	Indirect	Slight Negative
AH150	Fulacht fia	None (excavated)	0m	Neutral	N/A
AH139	Redundant record	None (SMR)	c. 201m N	Neutral	N/A

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH152	Mound	Proposed RMP	0m	Direct	Profound Negative
AH133	Crannog	RMP	c. 123m SSE	Indirect	Slight Negative
AH153	Burnt mound	None (excavated)	0m	Neutral	N/A
DL5	Charlestown House demesne	None	c. 92m S	Neutral	N/A
AH156	Ringfort-rath	RMP	c. 226m S	Indirect	Imperceptible Negative
AH154	Hut site and Fulacht fia	None (SMR)	0m	Neutral	N/A
DL6	Mountcampbell House demesne	None	0m	Direct	Slight Negative
AH266	Ringfort-rath	RMP	c. 140m N	Indirect	Imperceptible Negative
AH267	Ringfort-rath	Proposed RMP	c. 20m ENE	Indirect	Significant Negative
DL7	Belmont	None	0m	Direct	Slight Negative
AH270	Ringfort-rath	RMP	0m	Direct	Significant Negative
AH269	Ringfort-rath	RMP	c. 61m SW	Indirect	Moderately Negative
AH271	Ringfort-rath	RMP	c. 132m NE	Indirect	Imperceptible Negative
BH8	Drumsna National School	None (NIAH)	c. 24m NE	Indirect	Moderately Negative

Table 7.5.7.7 Black Option Corridor Assessment

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH82	Ringfort	RMP	143m NNW	Indirect	Imperceptible

Table 7.5.7.8 Stage 1 Archaeological, Architectural and Cultural Heritage Summary Assessment Matrix of Options West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Impacts to number of sites subject to statutory protection	Major Negative: 12 Moderate Negative: 2 Minor Negative: 5 Not Significant: 8	Major Negative: 9 Moderate Negative: 2 Minor Negative: 6 Not Significant: 10	Major Negative: 1 Moderate Negative: 8 Minor Negative: 9 Not Significant: 12	Major Negative: 2 Moderate Negative: 6 Minor Negative: 8 Not Significant: 7	Major Negative: 10 Moderate Negative: 7 Minor Negative: 16 Not Significant: 30	Major Negative: 0 Moderate Negative: 0 Minor Negative: 0 Not Significant: 1
Impacts to number of sites not subject to statutory protection	Major Negative: 2 Moderate Negative: 3 Minor Negative: 9 Not Significant: 27	Major Negative: 1 Moderate Negative: 3 Minor Negative: 7 Not Significant: 9	Major Negative: 5 Moderate Negative: 3 Minor Negative: 8 Not Significant: 10	Major Negative: 2 Moderate Negative: 5 Minor Negative: 4 Not Significant: 6	Major Negative: 1 Moderate Negative: 4 Minor Negative: 5 Not Significant: 24	Major Negative: 0 Moderate Negative: 0 Minor Negative: 0 Not Significant: 0
Scoring						
Overall Qualitative Assessment	Major impacts to a range of heritage assets including archaeological and built heritage sites. Potential impact to previously unrecorded archaeological remains within greenfield areas. Major or Highly Negative	Major impacts to a range of heritage assets including archaeological and built heritage sites. Potential impact to previously unrecorded archaeological remains within greenfield areas. Major or Highly Negative	Moderate impacts to a range of heritage assets including archaeological and built heritage sites. Potential impact to previously unrecorded archaeological remains within greenfield areas. Moderately Negative	Moderate impacts to a range of heritage assets including archaeological and built heritage sites. Potential impact to previously unrecorded archaeological remains within greenfield areas. Moderately Negative	Major and Moderate impacts to a range of heritage assets including archaeological and built heritage sites. This is an on-line upgrade and as such requires the least greenfield area and it is likely that a modified footprint through the town of Carrick-on-Shannon could be utilised. Major or Highly Negative	No Major impacts to any statutorily protected heritage assets or to those not subject to protection at this time. Potential impact to previously unrecorded archaeological remains within greenfield areas. Not Significant or Neutral

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Score / Impact Level	1	1	2	2	1	4
Preference - Professional Judgement	Least Preferred	Least Preferred	Preferred	Preferred	Intermediate	N/A

The Purple West Option and Dark Green Option Corridors are the Preferred options West of Drumsna Junction (Node J) due to the least number of major impacts to statutorily protected heritage assets and sites that have been identified as being of archaeological or built heritage merit, which are not subject to statutory protection.

The Cyan Option and Orange Option Corridors are considered to represent the Least Preferred options. This is due to the high amount of direct negative major impacts on archaeological and built heritage sites that are subject to statutory protection, as well as a number of sites that are of archaeological and built heritage merit, which are not protected.

The Blue West Option is also ranked as having potential major negative impacts on recorded archaeological and built heritage sites. However, this option represents an on-line upgrade through Carrick-on-Shannon Town and as such is highly unlikely to require a footprint of 100m in width. In addition, this option requires the least amount of previously undisturbed greenfield due to it representing an on-line upgrade of the existing road. As such, this option is considered to be of Intermediate preference.

Table 7.5.7.9 to Table 7.5.7.12 detail the potential impacts of each option corridor East of Drumsna Junction (Node J) on the known archaeological, architectural and cultural heritage resource. A summary of the impacts across each corridor is then presented in Table 7.5.7.13, together with an average impact score and ranking of each option from Preferred to Intermediate to Least Preferred.

Table 7.5.7.9 Yellow Option Corridor Assessment

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH272	Ringfort-rath	RMP	c. 222m E	Indirect	Imperceptible Negative
BH7	St. Mary's RC Church	RPS	c. 100m SW	Indirect	Slight Negative
AH274	Ringfort-rath and burial ground	RMP	c. 208m SW	Indirect	Imperceptible Negative
AH275	Ringfort-rath	RMP	c. 222m S	Indirect	Imperceptible Negative
AH276	Ringfort-rath	RMP	c. 225m W	Indirect	Imperceptible Negative
AH277	Ringfort-rath	RMP	c. 103m SW	Indirect	Slight Negative
AH290	Fulacht fia	Proposed RMP	0m	Neutral	N/A
AH289	Mound	RMP	c. 62m SW	Indirect	Slight Negative
DL9	Cloonteen Cottage	None	c. 177m SW	Neutral	N/A

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
BH9	Nesbitt Mausoleum	RPS, proposed RMP	c. 20m SW	Indirect	Significant Negative
AH288	Graveyard, church, ecclesiastical enclosure, architectural fragment	Proposed RMP	c. 23m SW	Indirect	Significant Negative
BH9	St. Anne's Church	RPS	Immediate SW	Indirect	Significant Negative
AH293	Redundant record	None (SMR)	0m	Neutral	N/A
AH294	Crannog	RMP	c. 60m SW	Indirect	Slight Negative
AH295	Redundant record	None (SMR)	c. 243m SW	Neutral	N/A
AH300	Ringfort-rath	Proposed RMP	c. 73m W	Indirect	Slight Negative
AH297	Ringfort-rath	RMP	c. 20m SW	Indirect	Significant Negative
AH298	Ringfort-rath	RMP	c. 126m NE	Indirect	Slight Negative
AH306	Ringfort-rath	Proposed RMP	0m	Direct	Very Significant Negative
BH15	St. Mary's RC Church	RPS	c. 32m ENE	Indirect	Moderately Negative
AH305	Enclosure	RMP	c. 173m NE	Indirect	Imperceptible Negative
AH45	Standing stone	RMP	0m	Direct	Very Significant Negative
AH46	Bullaun stone and Ritual site - holy well	RMP	c. 80m SW	Indirect	Slight Negative
BH16	House	RPS	c. 5m W	Indirect	Significant Negative

Table 7.5.7.10 Green Option Corridor Assessment

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH272	Ringfort-rath	RMP	c. 222m E	Indirect	Imperceptible Negative

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
BH7	St. Mary's RC Church	RPS	c. 100m SW	Indirect	Slight Negative
AH274	Ringfort-rath and burial ground	RMP	c. 208m SW	Indirect	Imperceptible Negative
AH275	Ringfort-rath	RMP	c. 222m S	Indirect	Imperceptible Negative
AH276	Ringfort-rath	RMP	c. 225m W	Indirect	Imperceptible Negative
AH277	Ringfort-rath	RMP	c. 103m SW	Indirect	Slight Negative
AH290	Fulacht fia	Proposed RMP	0m	Neutral	N/A
AH289	Mound	RMP	c. 62m SW	Indirect	Slight Negative
DL9	Cloontem Cottage	None	c. 177m SW	Neutral	N/A
BH9	Nesbitt Mausoleum	RPS, proposed RMP	c.20m SW	Indirect	Significant Negative
AH288	Graveyard, church, ecclesiastical enclosure, architectural fragment	Proposed RMP	c.23m SW	Indirect	Significant Negative
BH9	St. Anne's Church	RPS	Immediate SW	Indirect	Significant Negative
AH293	Redundant record	None (SMR)	0m	Neutral	N/A
AH294	Crannog	RMP	c. 60m SW	Indirect	Slight Negative
AH295	Redundant record	None (SMR)	c. 243m SW	Neutral	N/A
AH300	Ringfort-rath	Proposed RMP	c. 73m W	Indirect	Slight Negative
AH297	Ringfort-rath	RMP	c. 20m SW	Indirect	Significant Negative
AH298	Ringfort-rath	RMP	c. 126m NE	Indirect	Slight Negative

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH306	Ringfort-rath	Proposed RMP	0m	Direct	Very Significant Negative
BH15	St Mary's RC Church	RPS	c. 32m ENE	Indirect	Moderately Negative
AH305	Enclosure	RMP	c. 173m NE	Indirect	Imperceptible Negative
AH45	Standing stone	RMP	c. 27m SW	Indirect	Slight Negative
AH46	Bullaun stone and Ritual site - holy well	RMP	c. 169m SW	Indirect	Imperceptible Negative
BH16	House	RPS	c. 14m W	Indirect	Significant Negative

Table 7.5.7.11 Purple East Option Corridor Assessment

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH272	Ringfort-rath	RMP	c. 222m E	Indirect	Imperceptible Negative
BH7	St. Mary's RC Church	RPS	c. 100m SW	Indirect	Slight Negative
AH274	Ringfort-rath and burial ground	RMP	c. 208m SW	Indirect	Imperceptible Negative
AH275	Ringfort-rath	RMP	c. 222m S	Indirect	Imperceptible Negative
AH276	Ringfort-rath	RMP	c. 225m W	Indirect	Imperceptible Negative
AH277	Ringfort-rath	RMP	c. 103m SW	Indirect	Slight Negative
AH290	Fulacht fia	Proposed RMP	0m	Neutral	N/A
AH289	Mound	RMP	c. 62m SW	Indirect	Slight Negative
DL9	Cloonteen Cottage	None	c. 177m SW	Neutral	N/A
BH9	Nesbitt Mausoleum	RPS, proposed RMP	c. 20m SW	Indirect	Significant Negative
AH288	Graveyard, church, ecclesiastical enclosure, architectural fragment	Proposed RMP	c. 23m SW	Indirect	Significant Negative

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
BH9	St. Anne's Church	RPS	Immediate SW	Indirect	Significant Negative
AH293	Redundant record	None (SMR)	0m	Neutral	N/A
AH294	Crannog	RMP	c. 60m SW	Indirect	Slight Negative
AH295	Redundant record	None (SMR)	c. 243m SW	Neutral	N/A
AH300	Ringfort-rath	Proposed RMP	c. 73m W	Indirect	Slight Negative
AH297	Ringfort-rath	RMP	c. 20m SW	Indirect	Significant Negative
AH298	Ringfort-rath	RMP	c. 126m NE	Indirect	Slight Negative
AH306	Ringfort-rath	Proposed RMP	0m	Direct	Very Significant Negative
BH15	St. Mary's RC Church	RPS	c. 32m ENE	Indirect	Moderately Negative
AH305	Enclosure	RMP	c. 173m NE	Indirect	Imperceptible Negative
AH45	Standing stone	RMP	c. 27m SW	Indirect	Slight Negative
AH46	Bullaun stone and Ritual site - holy well	RMP	c. 169m SW	Indirect	Imperceptible Negative
BH16	House	RPS	c. 14m W	Indirect	Significant Negative

Table 7.5.7.12 Blue East Option Corridor Assessment

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH272	Ringfort-rath	RMP	c. 222m E	Indirect	Imperceptible Negative
BH7	St. Mary's RC Church	RPS	c. 100m SW	Indirect	Slight Negative
AH274	Ringfort-rath and burial ground	RMP	c. 208m SW	Indirect	Imperceptible Negative
AH275	Ringfort-rath	RMP	c. 222m S	Indirect	Imperceptible Negative
AH276	Ringfort-rath	RMP	c. 225m W	Indirect	Imperceptible Negative
AH277	Ringfort-rath	RMP	c. 103m SW	Indirect	Slight Negative
AH290	Fulacht fia	Proposed RMP	0m	Neutral	N/A

Site Ref.	Name	Statutory Protection?	Distance from option	Impact Type	Potential Impact level
AH289	Mound	RMP	c. 62m SW	Indirect	Slight Negative
DL9	Cloonteen Cottage	None	c. 177m SW	Neutral	N/A
BH9	Nesbitt Mausoleum	RPS, proposed RMP	c.20m SW	Indirect	Significant Negative
AH288	Graveyard, church, ecclesiastical enclosure, architectural fragment	Proposed RMP	c.23m SW	Indirect	Significant Negative
BH9	St. Anne's Church	RPS	Immediate SW	Indirect	Significant Negative
AH293	Redundant record	None (SMR)	0m	Neutral	N/A
AH294	Crannog	RMP	c. 60m SW	Indirect	Slight Negative
AH295	Redundant record	None (SMR)	c. 243m SW	Neutral	N/A
AH300	Ringfort-rath	Proposed RMP	c. 73m W	Indirect	Slight Negative
AH297	Ringfort-rath	RMP	c. 20m SW	Indirect	Significant Negative
AH298	Ringfort-rath	RMP	c. 126m NE	Indirect	Slight Negative
AH299	Ringfort-rath	RMP	c. 225m NE	Indirect	Imperceptible Negative
AH306	Ringfort-rath	Proposed RMP	c. 236m SW	Indirect	Imperceptible Negative
BH15	St. Mary's RC Church	RPS	c. 100m WSW	Indirect	Slight Negative
AH305	Enclosure	RMP	0m	Direct	Profound Negative
AH45	Standing stone	RMP	c. 27m SW	Indirect	Slight Negative
AH46	Bullaun stone and Ritual site - holy well	RMP	c. 169m SW	Indirect	Imperceptible Negative
BH16	House	RPS	c. 14m W	Indirect	Significant Negative

Table 7.5.7.13 Stage 1 Archaeological, Architectural and Cultural Heritage Summary Assessment Matrix of Options East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Impacts to number of sites subject to statutory protection	Major Negative: 1 Moderate Negative: 6 Minor Negative: 6 Not Significant: 5	Major Negative: 0 Moderate Negative: 6 Minor Negative: 7 Not Significant: 6	Major Negative: 1 Moderate Negative: 5 Minor Negative: 7 Not Significant: 6	Major Negative: 0 Moderate Negative: 6 Minor Negative: 7 Not Significant: 6
Impacts to number of sites not subject to statutory protection	Major Negative: 1 Moderate Negative: 0 Minor Negative: 1 Not Significant: 4	Major Negative: 1 Moderate Negative: 0 Minor Negative: 1 Not Significant: 5	Major Negative: 0 Moderate Negative: 0 Minor Negative: 1 Not Significant: 5	Major Negative: 1 Moderate Negative: 0 Minor Negative: 1 Not Significant: 5
Scoring				
Qualitative Assessment	Major and Moderate impacts to a range of heritage assets including archaeological and built heritage sites. Potential impact to previously unrecorded archaeological remains within section of greenfield area. Majorly or Highly Negative	Major and Moderate impacts to a range of heritage assets including archaeological and built heritage sites. This option represents the on-line upgrade and as such does not require as much greenfield as the other two options. Moderately Negative	Major and Moderate impacts to a range of heritage assets including archaeological and built heritage sites. Potential impact to previously unrecorded archaeological remains within section of greenfield area. Moderately Negative	Major and Moderate impacts to a range of heritage assets including archaeological and built heritage sites. This option represents the on-line upgrade and as such does not require as much greenfield as the other two options. Moderately Negative
Overall Score / Impact Level	1	2	2	2
Preference	Least Preferred	Preferred	Intermediate	Preferred

7.5.7.4 Summary

West of Drumsna Junction (Node J)

The Purple West Option and Dark Green Option Corridors are the Preferred options West of Drumsna Junction (Node J) due to the least number of major impacts to statutorily protected heritage assets and sites that have been identified as being of archaeological or built heritage merit, which are not subject to statutory protection.

The Cyan Option and Orange Option Corridors are considered to represent the Least Preferred route options. This is due to the high amount of direct negative major impacts on archaeological and built heritage sites that are subject to statutory protection, as well as a number of sites that are of archaeological and built heritage merit, which are not protected.

The Blue West Option is also ranked as having potential major negative impacts on recorded archaeological and built heritage sites. However, this option represents an on-line upgrade through Carrick-on-Shannon Town and as such is highly unlikely to require a footprint of 100m in width. In addition, this option requires the least amount of previously undisturbed greenfield due to it representing an on-line upgrade of the existing road. As such, this option is considered to be of Intermediate preference.

The Black Option is considered as a stand alone option and is not comparable to the other options. The option will not result in any significant impacts on the known cultural heritage resource.

East of Drumsna Junction (Node J)

The Green Option Corridor is the Preferred option for East of Drumsna Junction (Node J) as this option has no major impacts on sites that are subject to statutory protection. One major impact may occur in relation to an archaeological site that is proposed for inclusion in the next revision of the RMP. This option also represents an on-line upgrade and as such requires the least amount of previously undisturbed greenfield.

The Blue East Option is also ranked as Preferred for East of Drumsna Junction (Node J) as this option has no major impacts on sites that are subject to statutory protection. One major impact may occur in relation to an archaeological site that is proposed for inclusion in the next revision of the RMP. This option also represents an on-line upgrade and as such requires the least amount of previously undisturbed greenfield.

The Purple East Option Corridor is considered to be of Intermediate preference, as this option has one major impact to a site subject to statutory protection, but no major impacts are predicted regarding the archaeological or built heritage resource that is not subject to protection. This option will also traverse a section of greenfield and therefore has more potential to impact previously undiscovered archaeology.

The Yellow Option Corridor is considered to be the Least Preferred option as this option has one major impact to a site subject to statutory protection, and one major impact on an archaeological site that is not subject to protection. This option will also traverse a section of greenfield and therefore has more potential to impact previously undiscovered archaeology.

7.5.8 Stage 1 Landscape and Visual Option Assessment

7.5.8.1 Introduction

This section describes the Stage 1 Assessment of the Option Corridors in the context of the Landscape and Visual constraints identified in Section 4.11 Landscape and Visual of this report. The Stage 1 Option Corridors are described in Section 7.1.2 Description of Option Corridors.

The Landscape and Visual constraints are presented with the Stage 1 Option Corridors in Figures 7.5.8.1.0 to 7.5.8.1.5.

Section 7.5.8.2 outlines the methodology utilised to carry out the Landscape and Visual assessment of the option corridors. The Landscape and Visual assessment of the option corridors is provided in Section 7.5.8.3 with associated summary assessments and scorings presented in Section 7.5.8.4.

7.5.8.2 Methodology

The Landscape and Visual assessment has been carried out in accordance with the following guidelines:

- Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Proposed National Roads – Standard December 2020, Transport Infrastructure Ireland, (TII, 2020)⁴⁰
- Guidelines on the information to be contained in Environmental Impact Assessment Reports, Draft August 2017 Environmental Protection Agency, (EPA, 2017)⁴¹
- Guidelines for Landscape and Visual Impact Assessment, 3ed. April 2013 Landscape Institute & Institute of Environmental Management and Assessment, (GLVIA, 2013)⁴²
- Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis, Transport Infrastructure Ireland, (TII, 2016)²

The overarching approach to the landscape and visual assessment of the option corridors follows the following key steps:

- The principal landscape and visual receptors within the study area identified in the constraints study

⁴⁰ TII, 2020. Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Proposed National Roads – Standard December 2020, Transport Infrastructure Ireland

⁴¹ Environmental Protection Agency, 2017. Guidelines on the Information to be contained in Environmental Impact Assessment Reports. Available from:
<http://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf>

⁴² Landscape Institute, 2013. Guidelines for Landscape and Visual Impact Assessment, 3ed. April 2013, Landscape Institute & Institute of Environmental Management and Assessment

- The likely impacts of each of the option corridors on the landscape and visual receptors is identified and assessed, indicating which, if any, of these are likely to be significant
- The impact of each option corridor on the landscape and visual receptors is assessed and is scored on a seven point scale in accordance with the Project Appraisal Guidelines (TII, 2016)². The scale ranges from 7 to 1 as follows listed in Table 7.3.1 of this report

The assessment involved desktop studies and fieldwork comprising professional evaluation by experienced Landscape specialists.

Sources of Information

The assessment is based on understanding the character of the existing landscape and visual environment with specific reference to:

- Leitrim County Development Plan 2015-2021 (LCC, 2015)⁹
- Carrick-on-Shannon Local Area Plan 2010-2019 (LCC, 2010)¹¹
- Landscape Assessment of County Leitrim (LCC, 2020)⁴³
- Roscommon County Development Plan 2022-2028 (RCC, 2022)¹⁰
- Cortober Local Area Plan 2008-2014 (RCC, 2008)¹²
- Landscape Character Assessment of County Roscommon (RCC, 2022)⁴⁴
- Site-based reviews of the landscape and visual environment

The following online resources have also been accessed as part of the assessment:

- Ordnance Survey Ireland Geohive (<http://map.geohive.ie/mapviewer.html>)⁴⁵
- National Monuments Service: Historic Environment Viewer (<https://maps.archaeology.ie/HistoricEnvironment/>)⁴⁶
- Environmental Protection Agency GIS Mapping (<https://gis.epa.ie/EPAMaps/>)
- Google Aerial Photography and Mapping (<https://www.google.ie/maps>)

A review was also undertaken of the Draft Leitrim County Development Plan, the provisions of which will not take effect until it becomes effective on 21 March 2023. The outcome of this assessment remains unchanged as a result of the new Plan.

⁴³ Environmental Resources Management, 2002. Comhairle Chontae Liatroma, Landscape Assessment of County Leitrim Reference 17896

⁴⁴ MosArt Landscape-Architecture-Research, Macroworks, Judy Osborne et. al., 2008. Landscape Character Assessment of County Roscommon. Available from: <https://www.rosdevplan.ie/roscommon-county-development-plan-2022-2028/stage-3-amendments/stage-3-adoption-of-plan>

⁴⁵ Ordnance Survey Ireland, 2021. GeoHive Mapping Service. Available from: <http://map.geohive.ie/mapviewer.html>

⁴⁶ National Monuments Service, 2021. Historic Environment Viewer Available from: <https://maps.archaeology.ie/HistoricEnvironment/>

7.5.8.3 Option Corridor Assessment

Stage 1 Landscape and Visual Option Corridors Assessment

Ten option corridors are included in the Stage 1 Landscape and Visual assessment. Five of the options (Blue West, Purple West, Dark Green, Orange and Cyan) are located to the west of Node J at Drumsna Junction.

A sixth option (Black) located to the west of Node J comprises a short 1.1km link to the north of Carrick-on-Shannon town centre that connects the R280 at Ballynamony the Summerhill Road at Drummagh, and the Castlecara Road at Keenaghan.

Four options are located to the east of Node J at Drumsna Junction (Blue West, Purple West, Green and Yellow).

Option Corridors: West of Drumsna (Nodes O / A / B to Node J)

In total there are six option corridors located to the west of Node J at Drumsna Junction (Purple West, Dark Green, Black, Orange, Cyan and Blue West). Of these, four provide bypasses of Carrick-on-Shannon town (i.e. two to the north (Purple West and Dark Green) and two to the south (Orange and Cyan)).

The Blue West Option Corridor is a management option centred on the existing N4 corridor from Usna (Node O) west of Cortober to Drumsna Junction (Node J).

The Black Option Corridor is a short link road located to the north of Carrick-on-Shannon town centre.

Black Option Corridor

South of R280, the Black Option Corridor directly impacts the corridor of a local stream (Ballynamony/Lisnabrack) and its associated semi-natural vegetation/tree-lines north of the residential estates of Lis Cara (Ros Airgid) and Oaklands. The option corridor crosses the Summerhill Road with residential development to either side. The residential properties include the attractive historic property of Summer Hill (c.1840). South of Summerhill Road the option corridor cuts through a series of mature field boundaries on a local ridge at Drummagh before dropping down to the Castlecara Road between North West Business and Technology Park and Carrick-on-Shannon Business and Technology Park.

There are no protected landscape, townscape or visual features, however, the Black Option Corridor includes prominent landscape features such as a local ridgeline, strong field boundaries, a stream corridor with semi-natural plantings and residential properties.

Blue West Option Corridor

The Blue West Option Corridor comprises a Management Option which provides for interventions on the existing road infrastructure to address identified transport difficulties.

It is assumed that interventions along the existing road corridor would be localised in extent and primarily within the existing corridor of the road.

Any negative landscape and/or visual impacts are likely to be localised and of temporary or short-term duration. Significant landscape or visual impacts are not anticipated.

Measures may not fully address traffic congestion issues in Cortober/Carrick-on-Shannon and therefore, continuing traffic delays are likely to negatively impact the overall townscape and visual quality of the N4 streetscape.

Cyan Option Corridor & Orange Option Corridor

The Cyan and Orange Option Corridors both provide for a southern bypass of Carrick-on-Shannon and a southern bridging of the River Shannon. Both option corridors follow the same corridor from east of the Shannon crossing and for the most part both option corridors have a similar impact on landscape character.

In crossing the River Shannon both option corridors lie within the River Corridor Landscape Character Type within County Roscommon and within River Floodplain Landscape Character Type and a designated Area of High Visual Amenity located between Cortober and the existing N4 at Correens (Node D) in County Leitrim.

Both river crossing locations (i.e., Orange is approximately 120m north of Cyan between Cordrehid in Roscommon and Attirory in Leitrim) are perpendicular to the north – south flow of the river where established fishing and boating amenities line the west (Roscommon) bank of the river. Both option corridors also follow the existing N4 through Tully, Minkill and Kildorragh (in part between Node D and J), where there are protected views of the River Shannon from the existing N4 (Views 27 & 28, Map 4.12, LCC 2015).

Both option corridors also give rise to the same landscape and visual impacts east of the River Shannon, south of emerging and existing residential development/estates at Glas na hAbhainn, Ard na Slí and Cnoc na Slí (Attirory) and along the existing N4 from Correen, east of Carrick-on-Shannon (Node D) to Drumsna Junction (Node J), where established roadside vegetation and dispersed residential properties lie to either side of the existing N4 from Correen to Tully (Node E). Both options have the same landscape and visual effects on the River Shannon Corridor and Floodplain Character Areas and on the Area of High Visual Amenity and Protected Views V27 and V28.

West of the River Shannon, the Cyan Option Corridor begins at Cloongownagh (Node A), c. 2.5km west of Cortober, and broadly follows the north side of the rail line through Cortober and across Station Road crossing the Killukin Stream and the River Shannon along a broadly straight corridor alignment. The Cyan Option corridor impacts on the (previously re-aligned) entrance of the historic Cloongownagh House, on the established/historic landscape features of Springfield House, where it severs the commercial amenity landholding of Carrick Quads. Thereafter, the Cyan Option Corridor follows the corridor of the rail line – where the station house and other buildings are identified as protected structures – and crosses Station Road between Nos. 1 & 2 Station Road (historic properties) and Nos

1 to 6 Station View. The Cyan Option Corridor cuts straight through local ridgelines at Cortober, west of the Killukin River, and Cordrehid, between the Killukin River and River Shannon – and more south of Carrick Camping than the Orange Option Corridor.

West of the River Shannon, the Orange Option Corridor begins at Meera, c. 0.75km west of Cortober (Node B), cuts through the area of Pairc an Gael, follows the north side of the rail line – where the station house and other buildings are identified as protected structures. The Orange Option Corridor crosses Station Road between No.'s 1 & 2 Station Road (historic properties). The Orange Option Corridor cuts straight through local ridgelines at Cortober, west of the Killukin River, and Cordrehid, between the Killukin River and River Shannon but along a more northern (curving) corridor alignment (than the Cyan Option Corridor) and therefore, more directly across the grounds of Carrick Camping.

Purple West Option Corridor & Dark Green Option Corridor

The Purple West and Dark Green Option Corridors both provide for a northern bypass of Carrick-on-Shannon and a northern bridging of the River Shannon. Both option corridors follow the same corridor from Tumna, west of Cortober (Node B) to the Castlecara Road, north of Carrick-on-Shannon and both option corridors have the same landscape and visual impacts, including impact on landscape character, along this section of corridor.

Common landscape impacts between Tumna and Castlecara include impacts on mature field boundaries and semi-natural river edge vegetation between the existing N4 and the crossing of the River Shannon, which also crosses the proposed blueway route which runs along the River Shannon (Leitrim side of river) upstream of Carrick-on-Shannon. West of Carrick-on-Shannon (within County Leitrim) the Purple West and Dark Green Option Corridors follows an existing ridge with mature field boundaries, from where the corridors turn east across lower lying lands, with semi-natural vegetation at Hartley.

In crossing the River Shannon both option corridors lie within the River Corridor Landscape Character Type within County Roscommon and within a River Floodplain Landscape Character Type and a designated Area of High Visual Amenity (in Corryolus and Portnaeoght) west of Carrick-on-Shannon in County Leitrim. Both option corridors also fall within the extremity of Protected View V8 (Roscommon) from Hartley Bridge (for which planning permission is being sought for its removal and replacement – due to its poor condition).

Both option corridors also give rise to the same visual impacts between Tumna and Castlecara, with visual impacts in crossing the River Shannon corridor (from waterway and future blueway) and for properties viewing the crossing location, for properties at crossings of local roads and R280 through Hartley, Cloonsheerrvagh, Cartown and Drumlumman, Cornamucklagh, Cloonmulligan and Dromore (Castlecara Road).

East of the Castlecara Road, the Purple West Option Corridor takes a more south-easterly alignment to re-join the existing N4 at Tully/Minkill (Node E) from where it follows the alignment of the existing N4 to the Drumsna Junction (Node J). The

option corridor passes close to properties in Keenaghan, Cornaslieve, Garvlough, Aughriman South, Tully and Minkill. The Purple West Option Corridor follows the existing N4 through Tully, Minkill and Kildorragh (between Node E and J), where there are protected views of the River Shannon from the existing N4 (Views 27 & 28, Map 4.12, LCC 2015).

By contrast the Dark Green Option Corridor continues in a more easterly direction to re-join the existing N4 further east at Mount Campbell close to the Drumsna Junction (Node J) – avoiding the Protected Views*. The Dark Green Option Corridor passes close to properties in Garvlough and Aughriman South.

** It is noted that these views and prospects are recommended for removal in the Leitrim Review of Views and Prospects carried out for and included in the Draft Leitrim County Development Plan 2023-2029 (January 2022)*

Table 7.5.8.1 Stage 1 Landscape and Visual Assessment Matrix of Option Corridors West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Landscape Effects	Impact on local ridgelines (County Roscommon), mature trees, field boundaries, roadside plantings. Impact on sports grounds at Pairc an Gael. Impact on River Shannon Corridor / Floodplain LCA. Impact on Area of High Amenity along River Shannon (County Leitrim).	Impact on local ridgelines (County Roscommon), mature trees, field boundaries, roadside plantings. Impact on River Shannon Corridor / Floodplain LCA – with curving crossing. Impact on Area of High Amenity along River Shannon (County Leitrim).	Impact on local ridgelines (County Leitrim), mature trees, field boundaries, roadside plantings. Impact on River Shannon Corridor / Floodplain LCA. Impact on Area of High Amenity along River Shannon (County Leitrim).	Impact on local ridgelines (County Leitrim), mature trees, field boundaries. Impact on River Shannon Corridor / Floodplain LCA. Impact on Area of High Amenity along River Shannon (County Leitrim).	No significant landscape / Townscape impacts expected. Option will Not Significantly reduce traffic congestion through Carrick-on-Shannon and Cortober, which would maintain the adverse effect of traffic on the townscape character.	Impact on local ridgeline, mature field boundaries, stream corridor and associated semi-natural vegetation
Visual Effects	Impact on Protected Views V27 & V28 (Tully / Minkill). Impact on residential properties west of Cortober, at Station Road, east of Cortober (Carrick-on-Shannon), at Glas na hAbhainn, Ard na Slí, Cnoc na Slí, and along existing N4.	Impact on Protected Views V27 & V28 (Tully / Minkill). Impact on residential properties at Station Road, east of Cortober (Carrick-on-Shannon), at Glas na hAbhainn, Ard na Slí, Cnoc na Slí, and along existing N4.	Impact on Protected Views V8 (Hartley), V27 & V28 (Tully / Minkill). Impact from waterbody of Shannon (and future Blueway along river). Impact on properties in Hartley, Cloonsheerrvagh, Cartown and Drumlumman, Cornamucklagh, Cloonmulligan, Dromore, Keenaghan, Cornaslieve, Garvlough, Aughriman South, Tully and Minkill.	Impact on Protected Views V8 (Hartley). Impact from waterbody of Shannon (and future blueway along river). Impact on properties in Hartley, Cloonsheerrvagh, Cartown and Drumlumman, Cornamucklagh, Cloonmulligan, Dromore, Garvlough and Aughriman South.	No significant visual impacts expected.	Impact on residential properties at R280, Ros Airgid, Oaklands and Summerhill Road, including Summer Hill (House)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Scoring						
Qualitative Assessment	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Not Significant or Neutral	Moderate Negative
Score / Impact Level	1	1	1	1	4	2
Ranking Order	4th	5th	3rd	2nd	1st	N/A

** It is noted that these views and prospects are recommended for removal in the Leitrim Review of Views and Prospects carried out for and included in the Draft Leitrim County Development Plan 2023-2029 (January 2022).*

Table 7.5.8.2 Stage 1 Landscape and Visual Summary Scoring Matrix of Option Corridors West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR		BLACK OPTION CORRIDOR
Landscape Impact	1	1	2	2	4		2
Visual Impact	1	1	1	1	4		2
Scoring							
Qualitative Assessment	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Not Significant or Neutral		Moderately Negative
Score / Impact Level	1	1	1	1	4		2
Preference	Least Preferred	Least Preferred	Intermediate	Intermediate	Preferred		N/A

Option Corridors: East of Drumsna Junction (Node J)

In total there are four option corridors (Purple East, Green, Yellow and Blue East) located to the east of Node J at Drumsna Junction. The Green and Blue East (Management) Option Corridors are centred on the existing N4 road corridor. The Yellow Option Corridor runs to west of the existing N4 at the junction with Local Road L1475 at Fearnaght/Faulties. The Purple East Option Corridor includes for new junction east of Drumsna (east of Node J) and runs to the east of the Annaduff Church, School and the existing N4 at Aghamore.

Therefore, for the most part the Purple East – and especially the Green and Yellow Option Corridors will have broadly similar landscape and visual impacts. These are associated with widening of the existing road corridor, with loss of roadside vegetation, impact on roadside properties, accesses, screening, gardens and potentially requiring removal of some dwellings. All option corridors have potential to impact the edge of Gortinty (Drumgilra) Lough.

The impacts will be most significant along particular sections of the N4, where residential properties/other properties closely front the road corridor at:

- L7429 Road Junction (Drumsna/Annaduff)
- R201 Mohill Road Junction (Annaduff)
- Along the N4, and at junctions with L7430 Local Road, fronting Gortinty (or Drumilra) Lough
- L7464 Local Road (Gortinty/Drumgilra)
- Along the N4 through Drumgilra
- Along the N4 through Aghamore – including at Leitrim GAA Centre of Excellence and Annaduff GAA Grounds (Green and Yellow Option Corridors)
- Along N4 from east of Aghamore through Moher and Fearnaght

Blue East Option Corridor

The Blue East Option Corridor comprises a Management Option which provides for interventions on the existing road infrastructure to address identified transport difficulties.

It is assumed that interventions along the existing road corridor would be localised in extent and primarily within the existing corridor of the road.

Any negative landscape and/or visual impacts are likely to be localised and of temporary or short-term duration. Significant landscape or visual impacts are not anticipated.

Purple East Option Corridor

For the most part the Purple East Option Corridor follows the existing N4 from Drumsna to Faulties and landscape and visual impacts common to all option corridors are detailed under Section 7.5.8.3 above.

However, the Purple East Option Corridor also provides for a new junction at Drumsna/Annaduff (east of Drumsna) and for new alignment passing to the east of Annaduff Church and School at Aghamore. Therefore, the option corridor intrudes into the setting of the River Shannon south of Drumsna (Annaduff), west of the existing N4 and Lough Adaff or Spa Lough (also Lough Annaduff or Gortconnollan Lough) east of the N4 at Drumsna.

Further east the Purple East Option Corridor passes east of the existing N4 at Aghamore crossing Local Road L3470 between Annaduff Church/School to the west and a local road with residential properties to the east. The off-line section of the Purple East Option Corridor impacts a series of field boundaries with mature trees⁴⁷.

Green and Yellow Option Corridors

The Green and Yellow Option Corridors are very similar and follow the existing N4 from Drumsna to Fearnaght and landscape and visual impacts common to both option corridors are detailed under Section 7.5.8.3 above.

Between Fearnaght and Faulties (Nodes G to F) the Yellow Option Corridor passes south/west of the existing N4 at its junction with Local Road L1475 – however, there is minimal landscape and visual difference with both corridors.

In contrast to the Purple East Option Corridor, the Green and Yellow Option Corridors follow the existing N4 through Aghamore, where the church grounds, residential properties and sports ground closely front the existing N4 road corridor. Widening of the existing road corridor through this alignment would be likely to give rise to significant landscape and visual impacts.

⁴⁷ Many of the mature trees are Common Ash (*Fraxinus excelsior*) and the now widespread Ash dieback disease (caused by fungal pathogen *Hymenoscyphus fraxineus*) is prevalent on trees nationwide including this area/region.

Table 7.5.8.3 Assessment Matrix of Options Corridors: East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Landscape Effects	Impact on roadside trees, hedgerows and plantings. Potential impact on edge of Gortinty (Drumgilra) Lough. Impact on grounds of residential, sports and other properties.	Impact on roadside trees, hedgerows and plantings. Potential impact on edge of Gortinty (Drumgilra) Lough. Impact on grounds of residential, sports and other properties.	Impact on roadside trees, hedgerows and plantings and on sections of field boundaries. Potential impact on setting of section of River Shannon and Lough Annaduff. Potential impact on edge of Gortinty (Drumgilra) Lough. Likely deep cut through ridge at Aghamore. Impact on grounds of residential properties.	No Significant landscape impacts expected.
Visual Effects	Impact on residential property fronting existing N4 road corridor – including through Aghamore. View and Prospect V25 of River Shannon from N4 at Faulties*.	Impact on residential property fronting existing N4 road corridor – including through Aghamore. View and Prospect V25 of River Shannon from N4 at Faulties*.	Impact on residential property fronting existing N4 road corridor. Less impact on properties through Aghamore than other options. View and Prospect V25 of River Shannon from N4 at Faulties*.	No Significant visual impacts expected.
Scoring				
Qualitative Assessment	Moderately Negative	Moderately Negative	Major or Highly Negative	Not Significant or Neutral
Score / Impact Level	2	2	1	4
Ranking Order	3 rd	2 nd	4 th	1 st

** It is noted that this view and prospect is recommended for removal in the Leitrim Review of Views and Prospects carried out for and included in the Draft Leitrim County Development Plan 2023-2029 (January 2022).*

Table 7.5.8.4 Stage 1 Landscape and Visual Summary Scoring Matrix of Option Corridors East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Landscape Impact	2	2	2	4
Visual Impact	1	1	1	4
Scoring				
Qualitative Assessment	Moderately Negative	Moderately Negative	Major or Highly Negative	Not Significant or Neutral
Score / Impact Level	2	2	1	4
Preference	Intermediate	Intermediate	Least Preferred	Preferred

7.5.8.4 Summary

The Blue (Management) Option Corridor, both west and east, with minimal works within the existing road corridor, is the Preferred option across the full extent of the study area in terms of landscape and visual impacts.

Thereafter, to the west of Drumsna Junction (Node J) option corridors (Purple West and Dark Green), are marked as Intermediate, providing an upstream crossing (of Carrick-on-Shannon) of the River Shannon. These are more preferable compared to downstream crossing option corridors (Cyan and Orange), which are marked as Least Preferred.

As a northern option corridor, Dark Green is more preferable compared to Purple West and as a southern option corridor, Cyan is more preferable compared to Orange.

To the east of Drumsna Junction (Node J) all option corridors follow the existing N4 to a greater or lesser degree, with the Purple East Option Corridor, marked as Least Preferred, diverting around the existing settlement along the N4 at Aghamore. With less landscape impact either the Green or Yellow Option Corridors are more preferable compared to Purple East, as they are both marked as Intermediate.

Across the full study area, the Blue (Management) Option Corridor is the Preferred Option. This is then followed by Dark Green Option Corridor, followed by either the Green or Yellow Option corridors, which are marked as Intermediate.

7.5.9 Stage 1 Biodiversity Option Assessment

7.5.9.1 Introduction

This section details the environmental assessment of the Stage 1 Preliminary Options with respect to the Biodiversity constraints identified in Section 4.12 Biodiversity of Chapter 4 – Constraints Study.

The Biodiversity constraints are presented with the Stage 1 Option Corridors in Figures 7.5.9.1.0 to 7.5.9.2.5.

Section 7.5.9.2 outlines the methodology utilised to carry out the assessment, Sections 7.5.9.3 details the options assessment, and a summary is presented in Section 7.5.9.4.

7.5.9.2 Methodology

There are ten Option Corridors, six of which are to the west of Node J at Drumsna Junction (Purple, Dark Green, Black, Orange, Cyan and Blue) and four which are to the east of Node J (Purple, Green, Yellow and Blue).

The Stage 1 biodiversity assessment is based on the “Option Corridor” which is a corridor within which a road based solution could be constructed and in most cases is a 300m wide corridor centred around a possible alignment centreline for a road.

The assessment is mindful that the possible alignments could be realigned within their option corridors and therefore the overall impact of the option corridor is assessed to identify possible impacts.

The principal objectives of this assessment are to:

- Evaluate all Option Corridor corridors contained within each section, based on ecological criteria, as per the National Road Authority (NRA) Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009)⁴⁸ and the Chartered Institute for Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine (2018)⁴⁹
- Assess the significance of the likely impacts on each of the biodiversity receptors potentially impacted by each option corridor. As per the Transport Infrastructure Ireland (TII)² guidance, this step discounted biodiversity receptors or ecological sites where the risk of significant impacts is unlikely

⁴⁸ National Roads Authority, 2009. Guidelines for Assessment of Ecological Impacts of National Road Schemes. Available at: <https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf>

⁴⁹ Chartered Institute for Ecology and Environmental Management (CIEEM), 2018. Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine. Available at: <https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.1.pdf>

considering where the application of standard mitigation and best practice during construction is unambiguous and success is highly likely

- To assess each option in accordance with Transport Infrastructure Ireland's Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis (TII, 2016)².

To fulfil these objectives, an assessment of the likely or potential impacts of each option corridor on ecological receptors is carried out so that an informed comparison of the option corridors can be made with cognisance of the potential ecological consequences.

Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. Alongside the term “biodiversity”, the terms “ecology” and “ecological” are also used throughout this section of the report as a broader term to refer to the relationships of biodiversity receptors to one another and to their environment.

Biodiversity Stage 1 Assessment Process

The process by which the option corridors were assessed was as follows:

- The key ecological receptors within the study area were identified based on a combination of desktop data, consultation (i.e. relevant bodies/organisations) and field surveys
- The key ecological receptors were assigned an ecological value based on a geographic frame of reference ranging from international to local importance
- The likely impacts of each of the option corridors on the key ecological receptors were identified and assessed, indicating which, if any, of these are likely to be significant, and at what geographical level
- The impacts of each of the option corridors on the key ecological receptors were scored in accordance with the TII approach⁵⁰, on a seven-point scale ranging from ‘Major or Highly Negative (1)’ to ‘Major or Highly Positive (7)’⁵¹;
- The overall cumulative impact of each option corridor across all the key ecological receptors affected was also scored on the same seven-point scale
- The scores attributed to each of the option corridors were assessed comparatively and assigned a preference ranking

Key Ecological Receptors

⁵¹ In respect of the Black Option, this is not comparatively compared, rather assessed as a standalone assessment. However, it is similarly described in as far as is possible based on the detail provided of likely or potential impacts on key ecological receptors

Key ecological receptors are those biodiversity receptors confirmed, or likely to occur, within the study area with an ecological value of local importance (higher value) or greater and, therefore likely to affect the scoring and ranking of the option corridors. These include:

- Designated sites for nature conservation (e.g. SACs, SPAs, NHAs, pNHAs and Nature Reserves)
- Sensitive habitats (e.g. non-designated areas of Annex I habitat⁵², non-Annex I semi-natural woodland habitats and watercourses)⁵³
- Sensitive species (e.g. freshwater pearl mussel *Margaritifera margaritifera* and whooper swan *Cygnus cygnus*)
- Ecological sites (identified from a combination of desktop and field assessment)

The key ecological receptors were initially identified in the constraints study detailed in Section 4.12 - Biodiversity based on collation of available existing information from the desk study and consultations with relevant bodies/organisations and focussed on the known/potential ecological value for the habitats/species present. In the case of the ecological sites, the boundaries were initially defined based on interpretation of orthophotography and collation of available existing habitat information.

Walkover surveys of the study area were undertaken in August and September 2020, along with specialist habitat surveys of two locations within the River Shannon floodplain:

1. Northwest of Carrick-on-Shannon in the townlands of Corryolus and Cloonman
2. In the townlands of Cortober, Cordrehid, Attirory, Rinnacurreen and Drumkeeran to the south of Carrick-on-Shannon

This was further supplemented for this Stage 1 Assessment with an additional field survey undertaken in February 2021. The purpose of the field surveys was to ground truth and verify the orthophotography interpretation and selection of ecological sites, refine site boundaries, assess the ecological evaluation of each of the identified ecological sites and to detect any additional ecological sites not identified during the desk study. Walkover surveys of ecological sites which were located in proximity to, or overlapped with, one or more of the option corridors, were undertaken in February 2021.

In some cases, a small number of ecological sites were viewed from a distance, owing to limited access or winter river levels covering certain areas (EC29, EC30, EC31, EC32, EC48, EC52, EC77 and EC80). Furthermore, in a small number of

⁵² The short-hand names of Annex I habitats is used in this assessment, as per: NPWS, 2019. The Status of European Habitats and Species in Ireland. Volume 2: Habitat Assessments. Available at: https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol2_Habitats_Article17.pdf

⁵³ Watercourses are referred to as per: Environmental Protection Agency, (EPA), 2022. Online Map Viewer. Available at: <https://gis.epa.ie/EPAMaps/>

situations ecological sites could not be viewed at a distance due to the local topography or limited access (EC02, EC03 and EC05). However, assumptions were made on the value of those ecological sites based on local information gathered during previous constraints field surveys and desk studies as necessary.

Where possible, during the site walkover surveys, habitat types were classified using the Guide to Habitats in Ireland (Fossitt, 2000)⁵⁴ and the likelihood/potential for Annex I habitat types was confirmed or inferred based on the professional judgement of the surveyor, with reference to the Interpretation manual of European Union Habitats EUR 28 (CEC, 2013)⁵⁵. Where it was not possible to confirm the presence of Annex I habitats, a precautionary approach was adopted with regards to the identification of the potential presence of Annex I habitats within an ecological site.

It should be noted that the Stage 1 Assessment is based on the option corridors.

Ecological Valuation

The key ecological receptors identified have been valued with regard to ecological valuation guidance set out in Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009)⁵⁶ and Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018)⁵⁷.

The following geographic frame of reference is used when valuing the key ecological receptors:

- International importance
- National importance
- County importance
- Local importance (higher value)

All Annex I habitats that lie outside of European sites, are valued as being of at least national importance, given that these habitats are of high conservation concern. Priority Annex I habitat types that lie outside of European sites may be valued as being of international importance given that they are of the highest

⁵⁶ National Roads Authority, 2009. Guidelines for Assessment of Ecological Impacts of National Road Schemes. Available at: <https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf>

⁵⁷ Chartered Institute for Ecology and Environmental Management (CIEEM), 2018. Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine. Available at: <https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.1.pdf>

conservation concern at a European level (i.e., natural habitat types in danger of disappearance)⁵⁸.

For individual sites (e.g. designated sites, watercourses or ecological sites identified during the Constraints Study), the overall ecological valuation for each of the key ecological receptors was based upon the highest value receptor known to be present, or potentially present, within the site.

Assessment Criteria

The assessment of each option corridor included both a quantitative and qualitative assessment. Firstly, the impacts on each key ecological receptor were assessed.

Although a given option corridor may impact upon a particular key ecological receptor, the direct impact(s) on the site may not necessarily directly impact on the highest value receptor(s). This is accounted for in the assessment as much as possible, based on the level of ecological information available.

To assess the likely ecological impacts of each option corridor on individual key ecological receptors, the following criteria are applied, with the use of professional judgement as to the likelihood of significant effects occurring:

- Potential impacts on an ecological receptor of national/international importance were assessed as being major or highly negative
- Potential impacts on an ecological receptor of county importance were assessed as being moderately negative
- Potential impacts on a receptor of local importance (higher value) were assessed as being minor or slightly negative

To assess the likely cumulative overall ecological impacts for each option corridor, the following criteria were applied, in conjunction with the use of professional judgement as to the likelihood of significant effects occurring:

- Biodiversity impacts are major or highly negative if:
 - the impact is directly on one or more designated sites valued as international or national importance (i.e. SAC, SPA, pNHA or NHA)
- or
- the impacts associated with constructing a road within the option corridor would likely result in an adverse effect on the integrity of the SAC/SPA/pNHA/NHA site (i.e. for SAC/SPA this could equate to the loss of qualifying interest habitat or undermining the conservation objectives and for pNHA/NHA this could relate to the loss of features for which the site is designated)
- Biodiversity impacts are moderately negative if:

⁵⁸ From the definition of “*priority natural habitat types*” in Article 1(d) of the Habitats Directive (Council Directive 92/43/EEC).

- the impact is directly on one or more non-designated ecological sites valued as national or county importance, or numerous ecological sites valued as local high importance

or

- the impacts associated with constructing a road within the option corridor would likely result in permanent/long-term effects on non-qualifying interest Annex I habitat or on a species population considered to be of national importance

or

- Impacts associated with constructing a road within the option corridor would likely have permanent/long-term effects on a habitat(s) or on a species population considered to be of county/local (high) importance
- Biodiversity impacts are minor or slightly negative if:
 - the impact is directly on a small number of ecological sites valued as local (high) importance

or

- the impacts associated with constructing a road within the option corridor would likely have permanent/long-term effects on a habitat(s) or on a species population considered to be of local (high) importance.

Considering these cumulative impacts on the key ecological receptors identified, each option corridor was scored, based on the seven-point scale listed in Table 7.3.1 of this report, and an integer was assigned according to the impact significance.

As all option corridors are likely to have some level of a negative impact on biodiversity, neutral or positive impact scorings do not apply in this assessment, as in the absence of a design and/or mitigation there is no understanding that any option requiring construction could be assessed as neutral or positive.

Each of the option corridors were also comparatively assessed in terms of the overall impact significance, in order to provide a preference ranking. The preference ranking was as follows:

- Preferred
- Intermediate
- Least Preferred

In accordance with the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009)⁵⁶, key ecological receptors within the study area were not assessed against the option corridors where the risk of significant impacts is unlikely, considering where the delivery of standard mitigation and best practice during construction is unequivocal and success is highly likely. For example, with the application of standard pollution control measures during construction and an operational drainage and pollution control system designed to

current standards, sensitive biodiversity receptors downstream of option corridors are not likely to be affected. However, it should be noted that potential watercourse crossings were considered in this assessment, as it cannot be assumed that clear-span crossings will be possible at each crossing point. In addition, potential watercourse crossings will undoubtedly result in habitat loss, with regards riparian habitat, and other indirect impacts on the watercourse in question (e.g. disturbance to QI species, spread of invasive species).

7.5.9.3 Stage 1 Biodiversity Option Corridor Assessment

This section details the biodiversity Stage 1 Preliminary Assessment of the Option Corridors. Key ecological receptors which are located within, or partially within, an option corridor, and on which the option corridors were assessed, are presented in Table 7.5.9.1.

Only direct impacts were considered. Indirect impacts, such as those resulting from air quality impacts/impacts to hydrogeology were not considered at this stage of the assessment.

Table 7.5.9.1 Key Ecological Receptors Located within, or Partially within, an Option Corridor

Site Name	Description	Ecological Value
Lough Eidin pNHA [001643]	Designated site (pNHA). Lake, lakeshore habitat and extensive areas of seasonally flooded wet grassland (callows), with confirmed stand of Annex I 6410 Molinia meadows habitat adjacent to the River Shannon. Important wintering bird site supporting Greenland white-fronted geese.	National
EC02** ⁵⁹	Broadleaf woodland.	Local (high)
EC03** ⁶⁰	Broadleaf woodland.	Local (high)
EC05**	Broadleaf woodland and scrub. Part of ecological site intersects with pNHA. Potential for *91E0 habitat.	International
EC06	Broadleaved / wet woodland within floodplain of the River Shannon. Areas of potential priority Annex I *91E0 habitat.	International
EC12	Immature broadleaved / wet woodland (including some recently planted).	Local (high)
EC16	Broadleaved / wet woodland / scrub, marsh and wet grassland on bank of River Shannon. Areas of confirmed and potential priority Annex I *91E0 habitat.	International
EC27	Broadleaved / wet woodland and scrub.	Local (high)
EC28	Broadleaved / wet woodland and scrub.	Local (high)
EC30	Broadleaved / wet woodland / scrub in River Shannon floodplain. Hydrologically connected to the river. Potential for priority Annex I *91E0 habitat.	International

⁵⁹ Double asterisk** alongside ecological sites in column 1 have been assessed solely on desk study and interpretation of aerial photography

⁶⁰ The asterisk* denotes that the Annex I Habitat is a priority habitat in the context of the Habitats Directive. It is noted that individual parcels of the priority Annex I habitat *91E0 represent a hydrologically and hydrogeologically interconnected habitat across the River Shannon Callows ecosystem, that although occurring in isolation, persists owing to the coherent hydrological and hydrogeological regime that supports them

Site Name	Description	Ecological Value
EC31	Broadleaved / wet woodland / scrub and wet grassland in River Shannon floodplain. Hydrologically connected to the river. Potential for priority Annex I *91E0 habitat.	International
EC32	Broadleaved / wet woodland / scrub and wet grassland in River Shannon floodplain. Hydrologically connected to the river. Potential for priority Annex I *91E0 habitat.	International
EC35	Broadleaved / wet woodland / scrub and wet grassland / marsh habitat on bank of River Shannon. No *91E0 habitat located within corridor footprint.	Local (high)
EC47	Broadleaved / wet woodland and scrub.	Local (high)
EC48	Broadleaved woodland / wet woodland. Potential for priority Annex I *91E0 habitat.	International
EC49	Broadleaved woodland / wet woodland.	Local (high)
EC50	Marsh, wet grassland and scrub. Potential to develop into priority Annex I *91E0 habitat in the short to medium term. Contains an area of Annex I Transition mires habitat [7140].	National
EC51	Broadleaved / wet woodland, scrub and wet grassland. Potential for peatland habitats. Confirmed priority Annex I *91E0 habitat present.	International
EC52	Broadleaved / wet woodland, scrub and wet grassland. Potential for peatland habitats. Confirmed and potential priority Annex I *91E0 habitat present.	International
EC62	Artificial lake with surrounding semi-natural grassland and scrub.	Local (high)
EC63	Broadleaved / wet woodland and wet grassland.	Local (high)
EC77	Broadleaved woodland, scrub, semi-natural grassland and wet grassland. Potential for peatland habitats.	International
EC78	Broadleaved / conifer woodland and wet grassland. Area of recently planted oak woodland bordering N4. Wet grassland with devil's bit scabious <i>Succisa pratensis</i> and potential for Annex II marsh fritillary <i>Euphydryas aurinia</i> butterfly.	Local (high)
EC80	Conifer plantation with border of broadleaf / wet woodland along the River Shannon.	Local (high)
EC87	Broadleaved woodland and mixed conifer / broadleaf woodland.	Local (high)
EC88	Broadleaved and conifer woodland along the River Shannon.	Local (high)
EC97	Lake Gortconnellan or Spa Lough and associated wet grassland and scrub.	County

Site Name	Description	Ecological Value
EC99	Broadleaved / wet woodland, scrub and wet grassland on bank of River Shannon. Potential for priority Annex I *91E0 habitat.	International
EC105	Lake Drumgilra or Gortinty Lough and associated wetland, broadleaved / wet woodland and scrub habitats. Potential for priority Annex I *91E0. Confirmed Whooper swan location along eastern bank of lake.	International
EC112	Broadleaved / wet woodland, scrub and wet grassland.	Local (high)
EC113	Lake Bog Lough and associated wetland, peatland and woodland habitats. Likely to support Annex I peatland and potentially Annex I woodland habitats (e.g., 91D0 and *91E0 respectively).	International
Killukin stream	River known to support brown trout <i>Salmo trutta</i> .	County
River Shannon	Nationally important watercourse of a large scale which runs through numerous counties and intersects a number of upstream (e.g., Lough Arrow SAC [001673]) as well as downstream European sites, the nearest of which is Lough Forbes Complex SAC [001818]. A number of other European sites including the Lower River Shannon SAC [002165] are present in the downstream receiving environment and species for which this is designated are likely to be present throughout the Shannon watercourse.	National
Clougher [Roscommon]	Watercourse	Local (high)
Aghancarra stream	Watercourse	Local (high)
Ardglass stream	Watercourse	Local (high)
Drumsna stream	Watercourse	Local (high)
Unnamed stream – border of Annaduff and Gortinty	Watercourse	Local (high)
Gortinty stream	Watercourse	Local (high)
Cornaslieve_26 stream	Watercourse	Local (high)
Lismoyle_26 stream	Watercourse	Local (high)
Kiltycarney stream	Watercourse	Local (high)

Site Name	Description	Ecological Value
Kildorragh_26 stream	Watercourse	Local (high)
Unnamed stream – Kilmaddoroe Lough to Bran Lough to Carrickevy Lough to the River Shannon	Watercourse	Local (high)
Attifinlay stream	Watercourse	Local (high)
Kilmaddaroe stream	Watercourse	Local (high)
Lisnagat stream	Watercourse	Local (high)
Unnamed stream – border of Annaduff and Derryoughter	Watercourse	Local (high)
Woodbrook house stream	Watercourse	Local (high)
Tumna stream	Watercourse	Local (high)
Knockadalteen_26 stream	Watercourse	Local (high)
Clooneigh_26 stream	Watercourse	Local (high)
Knockananima stream	Watercourse	Local (high)
Aghameeny stream	Watercourse	Local (high)
Killasanowl stream	Watercourse	Local (high)
Unnamed stream – from the Shannon at Annaghbeg to Drumlumman	Watercourse	Local (high)

Ecological Receptors West of Drumsna Junction (Node J)

Table 7.5.9.2 below provides a summary of the number of ecological receptors impacted by each option corridor.

Table 7.5.9.2 No. of Biodiversity Impacts for each Option Corridor – West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Significant impact on sites of International Importance (major or highly negative)	3	2	5	6	3	0
Significant impact on sites of National Importance (major or highly negative)	3	2	2	2	2	0
Significant impact on sites of County Importance (moderately negative)	1	1	0	0	0	0
Significant impact on sites of Local Importance (Higher Value) (minor or slightly negative)	17	15	18	15	22	2

Black Option Corridor

The Black Option Corridor comprises an urban street improvement within Carrick-on-Shannon and provides connectivity by joining the R280 to the Summerhill Road and on to the Castlecara Road.

It intersects two watercourses of local importance (higher value), namely the Lisnagat stream and the Attifinlay stream both of which drain into the River Shannon at Carrick-on-Shannon.

No ecological sites or designated sites are intersected by the Black Option Corridor; however, some landtake of green field sites will be required to facilitate this option. As such it is considered to have a minor negative impact and assigned a PAG score of 3.

Cyan Option Corridor

The Cyan Option Corridor impacts on Lough Eidin pNHA which is ecologically important at a national level. This pNHA site is composed of a mosaic of habitats including wet woodland, wet grassland, improved grassland and raised bog. Areas of the priority Annex I habitat type Alluvial woodland [*91E0] have been confirmed through field surveys within the wider pNHA site. The Cyan Option Corridor could result in c. 1ha of direct habitat loss, with the majority of this likely comprising wet and improved grassland. It must be noted that the priority Annex I habitat *91E0 within the study area represents a hydrologically and hydrogeologically interconnected habitat across the River Shannon Callows ecosystem, and while each ecological site has been individually identified and evaluated, the importance of this habitat lies in its connection with and reliance on the hydrological and hydrogeological conditions and functioning in the wider landscape.

At the most westerly point of the Cyan Option Corridor, between nodes A and C the Cyan Option Corridor intersects two ecological sites: namely EC06 and EC12. EC06 is comprised of broadleaved/wet woodland within floodplain of the River Shannon, with potential *91E0 habitat (a priority Annex I habitat) and thus is of international ecological importance. The Cyan Option Corridor clips a small section of EC06 and would result in direct habitat loss of c. 0.5ha. EC12 is composed of immature broadleaf and wet woodland which provides amenity value for a local business – “Carrick Quads” and is of local importance (higher value). The majority of this ecological site could be lost as a result of the Cyan Option Corridor being progressed.

Further east, between nodes C and D the Cyan Option Corridor intersects a number of ecological sites including EC35, EC50, EC51 and EC52. EC35 consists of broadleaved/wet woodland, scrub and wet grassland/marsh habitat on the bank of the River Shannon. No Annex I habitats were noted within the corridor. EC50 is of national importance due to the presence of marsh, wet grassland, confirmed Transitional mires and quaking bogs 7140 habitat and scrub which is considered to have the potential to develop into priority Annex I Alluvial woodland *91E0 habitat in the short to medium term. Sites EC51 and EC52 are both of international importance due to the confirmed presence of priority Annex I Alluvial woodland

*91EO habitat. The Cyan Option Corridor clips the northern and western boundaries of EC50, EC51 and EC52 before reconverging with the existing N4 at node D. It is estimated that the corridor could result in the direct loss of c. 3.3ha, c. 1.3ha, and c.4.4ha of habitat loss for EC50, EC51 and EC52 respectively.

The penultimate section of Cyan Option Corridor, between nodes D and E intersects three ecological sites including EC62, EC63 and EC78. All three of these ecological sites are of local importance (higher value). EC62 consists of an artificial lake with surrounding semi-natural grassland and scrub, while EC63 comprises a mixture of broadleaf/wet woodland and wet grassland fields. EC78 comprises a combination of broadleaved/conifer woodland and wet grassland, as well as an area of recently planted oak woodland bordering the existing N4 road. However, the only section of this ecological site that is intersected by the Cyan Option Corridor consists of immature mixed broadleaf woodland and scrub.

The final section of the Cyan Option Corridor, between nodes E and J, crosses three ecological sites as it moves eastward along the existing N4 road – EC80, EC87 and EC88, all of which are valued as being of local importance (higher value). EC80 comprises a conifer plantation bordered by broadleaf/wet woodland along the banks of the River Shannon. Although the Cyan Option Corridor crosses into EC80, there is unlikely to be any direct interaction as this ecological site lies on the opposite side of the River Shannon to the existing N4. Both EC87 and EC88 consist of broadleaf/conifer woodlands.

The Cyan Option Corridor crosses a number of watercourses of local importance (higher value), including the Lismoyle_26 stream, the Kilmaddaroe stream, the Woodbrook House stream, the Tumna stream, the Clooneigh_26 stream, the Kiltycarney stream, the Kildorragh stream, the Killasanowl stream and the Knockananima stream, all of which are tributaries of the River Shannon. In addition to the above, the Cyan Option Corridor also crosses one watercourse – the Killukin stream between node C-D, ranked as being of county importance, as it is known to support populations of brown trout *Salmo trutta*. The Cyan Option Corridor between nodes C and D also crosses one watercourse of national importance, the River Shannon. The River Shannon is a large watercourse which runs through numerous counties intersecting a number of European sites upstream and in the downstream receiving environment, including the Lower River Shannon SAC [002165]⁶¹. Habitats and species for which this is designated are likely to be present throughout the River Shannon watercourse.

The Cyan Option Corridor is ranked as Intermediate for the following reasons:

- It would result in direct impacts (c. 1ha) on Lough Eidin pNHA, a site of national importance, as well as another ecological site of national importance, namely EC50 which supports a small area of Annex I 6410 *Molinia* meadow habitat. Lough Eidin pNHA is intersected by three other option corridors, although in respect of landtake, the Cyan Option Corridor results in the lowest area of landtake within the pNHA.

⁶¹ The Lower River Shannon SAC is located in the downstream receiving environment of the proposed corridor and hydrologically connected via the River Shannon.

- It intersects three sites of international importance – EC06, EC51 and EC52 (with a combined estimated total habitat loss of c. 9.5ha), as well as eight ecological sites of local importance (higher value).
- It crosses one watercourse of national importance – the River Shannon, as well as one watercourse of county importance, namely the Killukin stream. A further nine watercourses of local importance (higher value) are potentially impacted by the Cyan Option Corridor.

Orange Option Corridor

The Orange Option Corridor crosses three watercourses between nodes B and C; the Tumna stream, the Knockadalteen_26 stream and the Knockananima stream, all of which are local importance (higher value). This option crosses one watercourse of county importance between node C and D; the Killukin stream (which is known to support populations of brown trout *Salmo trutta* and one watercourse of national importance between nodes C and D, namely the River Shannon.

Between nodes D and E, the Orange Option Corridor crosses two watercourses (the Kilmaddaroe stream and the Kiltycarney stream), both of which are ranked as being of local importance (higher value) and finally, between nodes E and J the Orange Option Corridor crosses an additional three streams, all of which are valued as local importance (higher value); the Lismoyle stream, the Killasanowl stream and the Kildorragh stream.

The Orange Option Corridor does not intersect with any ecological sites between nodes B and C. Further east, between nodes C and D the Orange Option Corridor intersects a number of ecological sites EC35, EC50, EC51 and EC52. EC35 consists of broadleaved/wet woodland, scrub and wet grassland/marsh habitat on the banks of the River Shannon. No Annex I habitats were noted within this option corridor. Site EC50 is of national importance due to the presence of marsh, wet grassland, confirmed Transitional mires and quaking bogs 7140 habitat and scrub which is considered to have the potential to develop into priority Annex I *91E0 habitat in the short to medium term. EC51 and EC52 are both of international importance due to the confirmed presence of priority Annex I *91E0 habitat. The Orange Option Corridor clips the northern and western boundaries of EC50, EC51 and EC52 before converging with the existing N4 at node D. It is estimated that the corridor could result in the direct loss of c. 2.8ha, c.1.2ha and c.4.4ha of habitat loss for EC50, EC51 and EC52 respectively.

The next section of the Orange Option Corridor, between nodes D and E intersects three ecological sites including EC62, EC63 and EC78. All three of these ecological sites are of local importance (higher value). EC62 consists of an artificial lake with surrounding semi-natural grassland and scrub, while EC63 comprises broadleaf/wet woodland and wet grassland fields. EC78 comprises a combination of broadleaved/conifer woodland and wet grassland as well as an area of recently planted oak woodland bordering the N4. However, the only section of this ecological site that is intersected by the Orange Option Corridor consists of immature mixed broadleaf woodland and scrub.

The final section of the Orange Option Corridor, between nodes E and J, crosses three additional ecological sites including EC80, EC87 and EC88, all of which are valued as being of local importance (higher value). EC80 comprises a conifer plantation bordered by broadleaf/wet woodland along the banks of the River Shannon. Although this option crosses into EC80, there is unlikely to be any direct interaction as this ecological site lies on the opposite side of the River Shannon to the existing N4. Both EC87 and EC88 consist of broadleaf/conifer woodlands.

From a biodiversity perspective, the Orange Option Corridor is the Preferred option corridor West of Drumsna Junction (Node J) for the following reasons:

- It would not result in any impacts to Lough Eidin pNHA (national importance) by virtue of its location. As with all other option corridors, however, it would result in impacts of potentially national significance to the River Shannon, as well as one ecological site of national importance EC50.
- It would result in direct impacts on two sites of international importance – EC51 and EC52 (with an estimated combined total habitat loss of c. 8.4ha).
- It would also impact on seven ecological sites (EC35, EC62, EC63, EC78, EC80, EC87 and EC88) which would be significant at the local scale, as the habitats which would be lost there are of local importance (higher value).
- It would also result in impacts to one watercourse of county importance (Killukin stream), as well as resulting in potential impacts on eight watercourses, significant at the local scale.

Purple West Option Corridor

The Purple West Option Corridor crosses a number of watercourses of local importance (higher value), including the Cornaslieve_26 stream, the Kiltycarney stream, an unnamed stream – Kilmaddoroe lough to Bran lough to Carrickevy lough to the River Shannon, the Kilmaddaroe stream, the Tumna stream, an unnamed stream – from the River Shannon at Annaghbeg to Drumlumman, the Lismoyle stream, the Killasanowl stream, the Kildorragh stream and the Aghameeny stream, all of which are tributaries of the River Shannon. In addition to the above, this option also crosses the River Shannon, a watercourse of national importance, northeast of node B as well as potential interactions with the River Shannon between nodes E and J.

The Purple West Option Corridor could considerably impact Lough Eidin pNHA, an ecologically important site at a national level. This pNHA site is composed of a mosaic of habitats including wet woodland, wet grassland, improved grassland, riparian woodland, marsh and raised bog. The Purple Option Corridor cuts through a large proportion of the pNHA and it is estimated that it could result in c. 2.8ha of direct habitat loss, with the majority of this comprising wet grassland and marsh vegetation. Areas of riparian woodland (with priority Annex I alluvial woodland *91E0 habitat) have been confirmed within and adjacent to the pNHA boundary, as has a stand of Annex I 6410 Molinia grassland habitat, which is within the pNHA where it intersects the Purple West Option Corridor.

Between node B and the River Shannon, on the western side of Carrick-on-Shannon the Purple West Option Corridor bisects ecological site EC16. This ecological site is valued as international importance due to the confirmed presence of priority Annex I alluvial woodland *91E0 habitat. This site, located along the banks of the River Shannon, comprises broadleaved/wet woodland, scrub, marsh and wet grassland. The Purple West Option Corridor is estimated to possibly result in the direct loss of c.3.2ha of EC16, c. 0.7ha of which corresponds to priority Annex I alluvial woodland *91E0 habitat.

Extending north towards Hartley Court, the Purple West Option Corridor completely envelops two ecological sites of local importance (higher value), namely EC27 and EC28, which consist mostly of broadleaf/wet woodland and scrub as well as two other ecological sites of international importance (EC30 and EC32). Both EC30 and EC32 comprise broadleaved/wet woodland and scrub mosaics within the River Shannon floodplain, with potential for priority Annex I alluvial woodland *91E0 habitat. It is estimated that the Purple Option Corridor would result in the direct loss of EC30 and EC32 (c. 0.8ha and 1.8ha respectively). As the Purple Option Corridor continues northeast it crosses into another ecological site EC31, a site of international ecological importance. As with EC30 and EC32, habitats present within EC31 include broadleaved/wet woodland, scrub and wet grassland within the River Shannon floodplain. There is also the potential for *91E0 habitat to occur within this site. This option corridor interacts with the eastern boundary of this ecological site and would result in c. 1.2ha of direct habitat loss.

As the Purple West Option Corridor turns eastward towards node E it interacts with EC47, EC48 and EC49. Both EC47 and EC49 are valued as local importance (higher value) comprising broadleaf/wet woodland and scrub. The Purple Option Corridor intersects a small section of EC47; however, it is unlikely that this will result in any impacts on this ecological site. EC48 consists of broadleaved/wet woodland with potential for priority alluvial woodland *91E0 habitat to occur. EC48 is surrounded by flooded drainage ditches. The entire southern half of EC48 (c. 0.4ha) would likely be lost as a result of this option corridor.

The next section of the Purple West Option Corridor, north of node E intersects the western border of EC78, which is valued as local importance (higher value). EC78 comprises four distinct areas and is characterised by a combination of broadleaved/conifer woodland and wet grassland, as well as an area of recently planted oak woodland bordering the existing N4. However, the only section of this ecological site that is intersected by the Purple West Option Corridor consists of immature mixed broadleaf woodland and scrub and an area of mixed broadleaf/conifer woodland.

The final section of the Purple West Option Corridor, between nodes E and J, crosses three additional ecological sites including EC80, EC87 and EC88, all of which are valued as being of local importance (higher value). EC80 comprises a conifer plantation bordered by broadleaf/wet woodland along the banks of the River Shannon. Although this option crosses into EC80, there is unlikely to be any direct interaction as this ecological site lies on the opposite side of the River Shannon to the existing N4. Both EC87 and EC88 consist of broadleaf/conifer woodlands.

From a biodiversity perspective, the Purple West Option Corridor is Least Preferred for the following reasons:

- It is estimated that it would result in considerable impacts on Lough Eidin pNHA (c. 28.2ha of direct habitat loss), the greatest loss of habitat across all of the options that intersect with the pNHA, with the exception of the Dark Green Option. Both the Dark Green Option and the Purple option completely bisect the pNHA. Although not statutorily proposed for designation, pNHA's are afforded strict protection under planning objectives contained within the Leitrim County Development Plan 2015- 2021
- It would also have direct impacts on five sites of international importance including EC16, EC30, EC31, EC32 and EC48 (with an estimated combined total habitat loss of c. 7.4ha)
- It could also result in impacts of potentially national significance to the River Shannon

It would also result in impacts on 10 watercourses and eight ecological sites of local importance (higher value).

In summary, given the interaction between the Purple West Option Corridor and the pNHA and given the strict protection currently afforded to pNHA's under planning objectives contained within the Leitrim County Development Plan 2015-2021 this option has been ranked as Least Preferred. This is reinforced by the interactions between the Purple Option Corridor and five additional ecological sites of international importance.

Dark Green Option Corridor

The Dark Green Option Corridor crosses a number of watercourses of local importance (higher value), including the Cornaslieve_26 stream, an unnamed stream – Kilmaddoroe lough to Bran lough to Carrickevy lough to the River Shannon, the Kilmaddoroe stream, the Tumna stream, an unnamed stream – from the River Shannon at Annaghbeg to Drumlumman, the Lismoyle stream, the Killasanowl stream, the Kildorrigh stream and the Aghameeny stream, all of which are tributaries of the River Shannon. In addition to the above, this option also crosses the River Shannon, a watercourse of national importance, northeast of node B.

The Dark Green Option Corridor would considerably impact Lough Eidin pNHA, an ecologically important site at a national level. This pNHA site is composed of a mosaic of habitats including wet woodland, wet grassland, improved grassland, riparian woodland, marsh and raised bog. The Dark Green Option Corridor cuts through a significant proportion of the pNHA and it is estimated that it could result in c. 2.8ha of direct habitat loss, with the majority of this comprising wet grassland and marsh vegetation. Areas of riparian woodland (with priority Annex I alluvial woodland *91E0 habitat) have been confirmed within and adjacent to the pNHA boundary, as has a stand of Annex I 6410 *Molinia* grassland habitat, which is within the pNHA where it intersects the Dark Green Option Corridor.

Between node B and the River Shannon, on the western side of Carrick-on-Shannon the Dark Green Option Corridor bisects ecological site EC16. This ecological site is valued as international importance due to the confirmed presence of priority Annex I alluvial woodland *91E0 habitat. This site, located along the banks of the River Shannon, comprises broadleaved/wet woodland, scrub, marsh and wet grassland. The Dark Green Option Corridor is estimated to possibly result in the direct loss of c. 3.2ha of EC16, c. 0.7ha of which corresponds to priority Annex I alluvial woodland *91E0 habitat.

Extending north towards Hartley Court, the Dark Green Option Corridor completely envelops two ecological sites of local importance (higher value), namely EC27 and EC28, which consist mostly of broadleaf/wet woodland and scrub as well as two other ecological sites of international importance (EC30 and EC32). Both EC30 and EC32 comprise broadleaved/wet woodland and scrub mosaics within the River Shannon floodplain, with potential for priority Annex I *91E0 habitat. It is estimated that the Dark Green Option Corridor would result in the direct loss of EC30 and EC32 (c. 0.8ha and c. 1.8ha respectively). As this option corridor continues northeast it crosses into another ecological site EC31, a site of international ecological importance. As with EC30 and EC32, habitats present within EC31 include broadleaved/wet woodland, scrub and wet grassland within the River Shannon floodplain. There is also the potential for *91E0 habitat to occur within this site. This option corridor interacts with the eastern boundary of this ecological site and would result in c. 1.2ha of direct habitat loss.

As the Dark Green Option Corridor turns eastward towards node E it interacts with EC47, EC48 and EC49. Both EC47 and EC49 are valued as local importance (higher value) comprising broadleaf/wet woodland and scrub. The Dark Green Option Corridor intersects a small section of EC47, and it is predicted unlikely that any impacts on this ecological site will occur as a result of this option corridor being progressed. EC48 consists of broadleaved/wet woodland with potential for priority Annex I alluvial woodland *91E0 habitat to occur. EC48 is surrounded by flooded drainage ditches. The entire southern half of EC48 (c. 0.4ha) would likely be lost as a result of this option corridor.

The next section of the Dark Green Option Corridor heading towards node J bisects EC77, which is valued as international importance. EC77 comprises broadleaved woodland, scrub, semi-natural grassland and wet grassland based on orthophotography. Given the timing associated with the inclusion of the Dark Green option corridor it was not possible to survey EC77, however based on desktop data and orthophotography EC77 has potential for peatland habitats and associated Annex I habitats. In light of this EC77 was valued as international importance on a precautionary basis. The Dark Green Option Corridor would result in c. 7.5ha of direct habitat loss on EC77.

The final section of the Dark Green Option Corridor, between nodes E and J, crosses three additional ecological sites; EC87 and EC88, both of which are valued as being of local importance (higher value) and consist of broadleaf/conifer woodlands.

From a biodiversity point of view, the Dark Green Option Corridor is the Least Preferred for the following reasons:

- It is estimated that it would result in significant impacts on Lough Eidin pNHA (c. 28.2ha of direct habitat loss), the greatest loss of habitat across all of the option corridors that intersect the pNHA, with the exception of the Purple Option Corridor described above. Both the Dark Green Option and the Purple option completely bisect the pNHA. Although not statutorily proposed for designation, pNHA's are afforded strict protection under Planning objectives contained within the County Development Plan 2015-2021.
- It would also have direct impacts on six sites of international importance including EC16, EC30, EC31, EC32, EC48 and EC77 (this option corridor impacts the greatest number of internationally valued ecological sites.)
- It could result in impacts of potentially national significance to the River Shannon.
- It would also result in impacts on nine watercourses and six ecological sites of local importance (higher value).

As with the Purple Option Corridor described above, the primary reasoning behind the ranking of the Dark Green Option Corridor is the interaction between this option corridor and the pNHA and the strict protection currently afforded to pNHA's under planning objectives contained within the Leitrim County Development Plan 2015-2021. The Dark Green Option Corridor is ranked less preferred than the Purple Option Corridor as it also interacts with six additional ecological sites of international importance.

Blue West Option Corridor

The Blue West Option Corridor crosses a number of watercourses of local importance (higher value), including Clougher stream and the Ardglass stream between nodes O and A, the Woodbrook House stream, the Tumna stream and the Clooneigh stream between nodes A and B, the Aghancarra stream, the Attifinlay stream, the Knockadalteen stream and the Knockananima stream between nodes B and D, the Kiltycarney stream and the Kilmaddaroe stream between nodes D and E and finally the Lismoyle stream, the Kildorrugh stream and the Killasanowl stream between nodes E and J.

The Blue West Option Corridor also crosses one watercourse of national importance, the River Shannon, between nodes B and D.

The Blue West Option Corridor impacts on Lough Eidin pNHA, once between node O and A and once again between nodes A and B. Lough Eidin pNHA is ecologically important at a national level. This pNHA site is composed of a mosaic of habitats including wet woodland, wet grassland, improved grassland and raised bog. Areas of the priority Annex I habitat type Alluvial woodland [*91E0] have been confirmed through survey within the wider pNHA site. The Blue Option Corridor could result in c. 7.9ha of direct habitat loss, with the majority of this likely comprising wet and improved grassland.

As the Blue West Option Corridor begins at node O and progresses towards node A it interacts with two ecological sites of local importance (higher value); EC02 and EC03, both of which consist of mixed broadleaf woodland based on desktop

information and orthophotography, and two ecological sites of international importance; EC05 and EC06. EC06 is comprised of broadleaved/wet woodland within floodplain of the River Shannon, with potential *91E0 habitat (a priority Annex I habitat). The Blue Option Corridor clips a small section of EC06 and would result in direct habitat loss of c. 1.5ha. Based on a review of orthophotography, EC05 has potential to host priority Annex I Alluvial woodland *91E0 habitat as well as other wet grassland habitat for which Lough Eidin pNHA is designated. This is reinforced by the proximity of the site to EC06 and Lough Eidin pNHA.

The Blue West Option Corridor does not interact with any ecological sites between nodes A and B or B and D.

On the northern side of the River Shannon, just past node D, the Blue West Option Corridor clips the northern section of EC52. EC52 is of international importance due to the confirmed presence of priority Annex I Alluvial woodland *91E0 habitat. The corridor clips the northern boundary of EC50 adjacent to the existing N4. It is estimated that the option corridor could result in the direct loss of c.0.8ha of habitat loss for EC50. Further east, between nodes D and E the Blue Option Corridor intersects three ecological sites of local importance (higher value); EC62, EC63 and EC78. EC62 consists of an artificial lake with surrounding semi-natural grassland and scrub, while EC63 comprises broadleaf/wet woodland and wet grassland fields. EC78 comprises a combination of broadleaved/conifer woodland and wet grassland as well as an area of recently planted oak woodland bordering the existing N4. However, the only section of this ecological site that is intersected by the Blue West Option Corridor consists of immature mixed broadleaf woodland and scrub.

The final section of the Blue West Option Corridor, between nodes E and J, crosses three ecological sites as it moves eastward along the existing N4 – EC80, EC87 and EC88, all of which are valued as being of local importance (higher value). EC80 comprises a conifer plantation bordered by broadleaf/wet woodland along the banks of the River Shannon. Although this option crosses into EC80, there is unlikely to be any direct interaction as this ecological site lies on the opposite side of the River Shannon to the existing N4. Both EC87 and EC88 consist of broadleaf/conifer woodlands.

From a biodiversity perspective, the Blue West Option Corridor is ranked as Intermediate for the following reasons:

- It would result in direct impacts (c.7.9ha) on Lough Eidin pNHA, a site of national importance, at two separate locations. Lough Eidin pNHA is intersected by three other option corridors. However, unlike the Dark Green and Purple options which completely bisect the pNHA, this option only clips a small section of the designated site adjacent to the existing N4, northwest of Carrick-on-Shannon
- It intersects three sites of international importance – EC05, EC06 and EC52 (with a combined estimated total habitat loss of c. 2.8ha), as well as eight ecological sites of local importance (higher value)

- It crosses one watercourse of national importance – the River Shannon, as well as 14 watercourses of local importance (higher value)

Table 7.5.9.3 contains the Assessment Matrix of the option corridors west of Drumsna Junction (Node J) and Table 7.5.9.5 contains the Assessment Matrix of the option corridors east of Drumsna Junction (Node J).

Table 7.5.9.3 Biodiversity Assessment Matrix of Options Corridors West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE OPTION CORRIDOR	BLACK OPTION CORRIDOR*
Significant impact on sites of International Importance	3 Major or Highly Negative impacts	2 Major or Highly Negative impacts	5 Major or Highly Negative impacts	6 Major or Highly Negative impacts	3 Major or Highly Negative impacts	0 Major or Highly Negative impact
Significant impact on sites of National Importance	2 Major or Highly Negative impacts	1 Major or Highly Negative impacts	2 Major or Highly Negative impacts	2 Major or Highly Negative impacts	2 Major or Highly Negative impacts	0 Major or Highly Negative impact
Significant impact on sites of County Importance	2 Moderately Negative impacts	2 Moderately Negative impacts	0 Moderately Negative impact	0 Moderately Negative impact	0 Moderately Negative impact	0 Moderately Negative impact
Significant impact on sites of Local Importance (Higher Value)	17 Minor or Slightly Negative	15 Minor or Slightly Negative	18 Minor or Slightly Negative	15 Minor or Slightly Negative	22 Minor or Slightly Negative	2 Minor or Slightly Negative
Overall Assessment	There are 5 Major or Highly Negative impacts, 2 Moderately Negative and 17 Minor or Slightly Negative impacts associated with this option corridor	There are 3 Major or Highly Negative impacts, 2 Moderately Negative and 15 Minor or Slightly Negative' impacts associated with this option corridor	There are 7 Major or Highly Negative impacts, 0 Moderately Negative and 18 Minor or Slightly Negative impacts associated with this option corridor	There are 8 Major or Highly Negative impacts, 0 Moderately Negative and 15 Minor or Slightly Negative' impacts associated with this option corridor	There are 5 Major or Highly Negative impacts, 0 Moderately Negative and 22 Minor or Slightly Negative impacts associated with this option corridor	There are 0 Major or Highly Negative impacts, 0 Moderately Negative' and 2 Minor or Slightly Negative impacts associated with this option corridor
Scoring						

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE OPTION CORRIDOR	BLACK OPTION CORRIDOR*
Qualitative Assessment	Impacts on Lough Eidin pNHA (a nationally important site), three internationally important sites with potential *91E0 Annex I habitat, the River Shannon (a river of national importance), one ecological site of county importance, one watercourses of county importance (Killukin stream) and 17 ecological sites of local importance (higher value) including eight ecological sites and nine watercourses. Major or Highly Negative	Impacts on two internationally important sites with potential *91E0 Annex I habitat, the River Shannon (a river of national importance), one ecological site of county importance, one watercourses of county importance (Killukin stream) and 15 ecological sites of local importance (higher value) including seven ecological sites and eight watercourses. Major or Highly Negative	Impacts on Lough Eidin pNHA (a nationally important site), five internationally important sites with potential priority Annex I habitat, the River Shannon (a river of national importance), and 18 ecological sites of local importance (higher value) including eight ecological sites and 10 watercourses. Major or Highly Negative	Impacts on Lough Eidin pNHA (a nationally important site), six internationally important sites with potential priority Annex I habitats, the River Shannon (a river of national importance), and 15 ecological sites of local importance (higher value) including six ecological sites and nine watercourses. Major or Highly Negative	Impacts on Lough Eidin pNHA (a nationally important site), three internationally important sites with potential priority Annex I habitat, the River Shannon (a river of national importance) and 11 ecological sites of local importance (higher value) including eight ecological sites and 14 watercourses. Major or Highly Negative	Impacts on two watercourses of local importance (higher value). Minor or Slightly Negative
Score / Impact Level	1	1	1	1	1	3
Preference	Intermediate	Preferred	Least Preferred	Least Preferred	Intermediate	N/A

* This Option Corridor is assessed independently and not compared to the other Option Corridors and as such is not given a preference ranking

Ecological Receptors East of Drumsna Junction (Node J)

Table 7.5.9.4 below provides a summary of the number of ecological receptors impacted by each option corridor.

Table 7.5.9.4 No. of Biodiversity Impacts for each Option Corridors – East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Significant impact on sites of International Importance (Major or Highly Negative)	3	3	3	3
Significant impact on sites of National Importance (Major or Highly Negative)	1	1	1	1
Significant impact on sites of County Importance (Moderately Negative)	1	1	1	1
Significant impact on sites of Local Importance (Higher Value) (Minor or Slightly Negative)	5	5	5	5

Yellow Option Corridor

The Yellow Option Corridor has a largely similar footprint as the Green and Blue Option Corridors and therefore crosses the same watercourses and ecological sites including three sites of international importance (EC99, EC105 and EC113), one site of national importance (River Shannon), one site of county importance (EC97) and seven sites of local importance (higher value).

The Yellow Option Corridor does however differ towards the end of the corridor, between nodes G and H, where it deviates slightly from the existing N4 and crosses further into EC112 (a site of local importance (higher value)) than either the Blue or Green Option Corridors. It is estimated that this option corridor would result in c. 2.5ha of habitat loss of EC112, while the Green and Blue Option Corridors would result in c. 0.8ha of direct habitat loss.

The Yellow Option Corridor was ranked as Intermediate. However, as it crosses slightly further into EC112, it was on a qualitative basis ranked slightly lower than the two preferred options. It is estimated that the difference in total habitat loss at EC112 is minor (c. 1.7ha) especially as this ecological site is valued as local importance (higher value).

Green Option Corridor

The Green Option Corridor crosses three watercourses of local importance (higher value) between nodes J and F; an unnamed stream – border of Annaduff and Derryoughter, an unnamed stream – border of Annaduff and Gortinty and the Drumsna stream and one watercourse of local importance (higher value) between nodes F and G – the Gortinty stream. Additionally, this option corridor interacts with the River Shannon, a nationally important watercourse between nodes J and F.

As the Green Option Corridor begins southeast from node J, it cuts the western edge of EC97. EC97 consists of Gortconnellan/Spa Lough and the associated wet grassland and scrub surrounding the lake. This ecological site has been valued as being of county importance due to the presence of lake and wet grassland habitat, and its potential utilisation by wetland bird species, especially considering its proximity and connectivity (via the Drumsna stream) to the River Shannon.

After EC97, the Green Option Corridor interacts with two ecological sites of international importance prior to reaching node F, namely EC99 and EC105. EC99 is a large site consisting of wet grassland, scrub and broadleaf/wet woodland with potential for priority Annex I Alluvial woodland *91E0 habitat to occur along the banks of the River Shannon. This ecological site runs from the existing N4 along between the River Shannon and the Masonite industrial facility until it reaches the Dublin to Sligo railway line to the south. Although this is a larger site, the Green Option Corridor only cuts a small section of the northern border (c. 2ha). EC105 comprises Grumgilra/Gortinty Lough as well as the surrounding wet grasslands, scrub and broadleaf/wet woodland. This site has been valued as international important due to the potential for priority Annex I Alluvial woodland *91E0 habitat to occur there, as well as the presence of confirmed Birds Directive Annex I Whooper swan *Cygnus cygnus* feeding locations (observed within the wet grassland fields along the south-eastern bank of the lake). As with EC99, this is a large ecological site, however the Green Option Corridor only cuts a portion of the northern border (c. 13.5ha).

There are no interactions between the Green Option Corridor and an ecological site between nodes F and G.

At the final section of the Green Option Corridor, between nodes G and H, the corridor crosses EC112, which is valued as being of local importance (higher value) and EC113 which is valued as being internationally important. EC112 consists of wet grassland and scrub with small areas of broadleaf/wet woodland. EC113 comprises Bog Lough and the associated wet grassland, peatland and woodland habitats, which potentially support Annex I peatland and priority Annex I woodland habitats (e.g., 91D0 (Bog woodland) and *91E0)). This option corridor is estimated to intersect a small section of the western corner (c. 0.7ha) of EC113.

As described in the following sections, all four option corridors to the east of Drumsna Junction (Node J) follow a very similar footprint and interact with the same number of ecological sites and watercourses with any differences between the option corridors being minor. In light of this, all four options are scored similarly (in terms of intersections with ecological sites).

From a biodiversity perspective, the Green Option Corridor is ranked preferred. While it crosses the same numbers of ecological sites as both the Yellow and Purple East Option Corridors, e.g. three sites of international importance, one site of national importance, one site of county importance and seven sites of local importance (higher value), it differs from the Yellow Option Corridor by virtue of its routing along the existing N4 road corridor, resulting in c. 0.8ha of direct habitat loss of EC112 (a site of local importance (higher value) as opposed to c. 2.5ha of habitat loss required for the Yellow Option Corridor.

Purple East Option Corridor

The majority of the Purple East Option Corridor follows the existing N4 with the exception of an off-line deviation around the village of Aghamore between nodes F and G. It also includes a wider footprint to accommodate a proposed junction near Drumsna. The Purple East Option Corridor intersects/crosses the same watercourses and ecological sites as the Green, Yellow and Blue East Option Corridors. These include three sites of international importance (EC99, EC105 and EC113), one site of national importance (River Shannon), one site of County importance (EC97) and seven sites of local importance (higher value).

The only location where this option corridor differs in respect of potential loss of an ecological site, is where it intersects more of EC97, which is ranked as being of county importance. It is estimated that the Purple East Option Corridor would result in an additional loss of EC97 of c. 2ha.

The Purple East Option Corridor was assessed as being the Least Preferred, due to the fact that it would involve slightly more habitat loss of EC97 (a site of county importance) compared with the Green, Yellow and Blue East Option Corridors.

Blue East Option Corridor

The Blue East Option Corridor has an almost identical footprint to the Green Option Corridor and intersects with the same ecological sites and watercourses including three sites of international importance (EC99, EC105 and EC113), one site of national importance (River Shannon), one site of county importance (EC97) and seven sites of local importance (higher value). In light of the similarities between these options, the Green Option and Blue East Option have both been classified as joint Preferred.

Table 7.5.9.5 Biodiversity Assessment Matrix of Option Corridors East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Significant impact on sites of International Importance	3 Major or Highly Negative impacts	3 Major or Highly Negative impacts	3 Major or Highly Negative impacts	3 Major or Highly Negative impacts
Significant impact on sites of National Importance	1 Major or Highly Negative impact	1 Major or Highly Negative impact	1 Major or Highly Negative impact	1 Major or Highly Negative impact
Significant impact on sites of County Importance	1 Moderately Negative impact	1 Moderately Negative impact	1 Moderately Negative impact	1 Moderately Negative impact
Significant impact on sites of Local Importance (Higher Value)	5 Minor or Slightly Negative	5 Minor or Slightly Negative	5 Minor or Slightly Negative	5 Minor or Slightly Negative
Overall Assessment	There are 4 Major or Highly Negative impacts, 1 Moderately Negative and 5 Minor or Slightly Negative' impacts associated with this option corridor	There are 4 Major or Highly Negative impacts, 1 Moderately Negative and 5 Minor or Slightly Negative impacts associated with this option corridor	There are 4 Major or Highly Negative impacts, 1 Moderately Negative and 5 Minor or Slightly Negative impacts associated with this option corridor	There are 4 Major or Highly Negative impacts, 1 Moderately Negative and 5 Minor or Slightly Negative impacts associated with this option corridor
Scoring				
Qualitative Assessment	Impacts on three Internationally important sites with potential to support *91E0 Annex I habitat, the River Shannon (a river of	Impacts on three Internationally important sites with potential to support *91E0 Annex I habitat, the River Shannon (a river of national importance), one	Impacts on three Internationally important sites with potential to support *91E0 Annex I habitat, the River Shannon (a river of national importance), one	Impacts on three Internationally important sites with potential to support *91E0 Annex I habitat, the River Shannon (a river of national importance), one

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
	national importance), one ecological site of county importance and five ecological sites of local importance (higher value) including one ecological site and four watercourses. Major or Highly Negative	ecological site of county importance and five ecological sites of local importance (higher value) including one ecological site and four watercourses. Major or Highly Negative	ecological site of county importance and five ecological sites of local importance (higher value) including one ecological site and four watercourses. Major or Highly Negative	ecological site of county importance and five ecological sites of local importance (higher value) including one ecological site and four watercourses. Major or Highly Negative
Score / Impact Level	1	1	1	1
Preference	Intermediate	Preferred	Least Preferred	Preferred

7.5.9.4 Summary

Key ecological receptors within the study area were identified and assigned an ecological value based on a geographic frame of reference ranging from international to local importance. The likely impacts of each of the option corridors on the key ecological receptors were identified and assessed, indicating which, if any, of these are likely to be significant, and at what geographical level.

The impacts of each of the option corridors on the key ecological receptors were identified and assigned an impact rating. The overall cumulative impact of each option corridor across all the key ecological receptors affected was then scored in accordance with the TII approach², on a seven-point scale ranging from major or highly negative (1) to major or highly positive (7). The scores attributed to each of the option corridors were assessed comparatively and assigned a preference ranking.

Table 7.5.9.6 and Table 7.5.9.7 outline which ecological receptors are impacted by each of the option corridors west of Drumsna Junction (Node J) and east of Drumsna Junction (Node J) respectively.

West of Drumsna Junction (Node J), the Orange Option Corridor was ranked Preferred, whilst the Purple West and Dark Green Corridor were all ranked Least Preferred. The Cyan and Blue corridor were all ranked as Intermediate. The Black Option Corridor was assessed as a stand-alone option and was considered to be minor negative.

East of Drumsna Junction (Node J), the Green and Blue East Option Corridors were ranked Preferred, the Yellow Option Corridor was ranked Intermediate, and the Purple East Option Corridor was ranked Least Preferred.

Table 7.5.9.6 Breakdown of the Key Ecological Receptors which are Impacted by the Proposed Option Corridors – West of Drumsna Junction (Node J)

Option Corridors West of Drumsna Junction (Node J)				
	Receptors of International Importance Impacted	Receptors of National Importance Impacted	Receptors of County Importance Impacted	Receptors of Local Importance (Higher Value) Impacted
Black Option Corridor				• Attifinlay Stream • Lisnagat Stream
Cyan Option Corridor	• EC06 • EC51 • EC52	• Lough Eidin pNHA [001643] • River Shannon • EC50	• Killukin stream	• EC12 • EC35 • EC62 • EC63 • EC78 • EC80 • EC87 • EC88 • Lismoyle_26 stream • Kilmaddaroe stream • Woodbrook House stream • Clooneigh_26 stream • Knockananima stream • Tumna stream • Killasanowl stream • Kildorragh_26 stream • Kiltycarney stream
Orange Option Corridor	• EC51 • EC52	• River Shannon • EC50	• Killukin stream	• EC35 • EC62 • EC63 • EC78

Option Corridors West of Drumsna Junction (Node J)				
	Receptors of International Importance Impacted	Receptors of National Importance Impacted	Receptors of County Importance Impacted	Receptors of Local Importance (Higher Value) Impacted
				• EC80 • EC87 • EC88 • Kiltycarney stream • Kilmaddaroo stream • Knockadalteen_26 stream • Knockananima stream • Tumna stream • Lismoyle_26 stream • Kildorragh_26 stream • Killasanowl stream
Purple Option Corridor	• EC16 • EC30 • EC31 • EC32 • EC48	• Lough Eidin pNHA [001643] • River Shannon		• EC27 • EC28 • EC47 • EC49 • EC78 • EC80 • EC87 • EC88 • Cornaslieve_26 stream • Kiltycarney stream • Lismoyle_26 stream • Kildorragh_26 stream • Unnamed stream - Kilmaddaroo lough to Bran lough to Carrickevy lough to the River Shannon

Option Corridors West of Drumsna Junction (Node J)				
	Receptors of International Importance Impacted	Receptors of National Importance Impacted	Receptors of County Importance Impacted	Receptors of Local Importance (Higher Value) Impacted
				• Kilmaddaroe stream • Tumna stream • Killasanowl stream • Aghameeny stream • Unnamed stream - from the Shannon at Annaghbeg to Drumlumman
Dark Green Option Corridor	• EC16 • EC30 • EC31 • EC32 • EC48 • EC77	• Lough Eidin pNHA [001643] • River Shannon		• EC27 • EC28 • EC47 • EC49 • EC87 • EC88 • Lismoyle_26 stream • Kilmaddaroe stream • Killasanowl stream • Kildorragh_26 stream • Tumna stream • Aghameeny stream • Unnamed stream - from the Shannon at Annaghbeg to Drumlumman • Cornaslieve_26 stream • Unnamed stream - Kilmaddaroe lough to Bran lough to Carrickevy lough to the River Shannon

Option Corridors West of Drumsna Junction (Node J)				
	Receptors of International Importance Impacted	Receptors of National Importance Impacted	Receptors of County Importance Impacted	Receptors of Local Importance (Higher Value) Impacted
Blue Option Corridor	• EC05 • EC06 • EC52	• Lough Eidin pNHA [001643] • River Shannon		• EC02 • EC03 • EC63 • EC63 • EC78 • EC80 • EC87 • EC88 • Clougher stream [Roscommon] • Aghancarra stream • Ardglass stream • Kiltycarney stream • Lismoyle_26 stream • Kildorragh_26 stream • Attfinlay stream • Kilmaddaroe stream • Tumna stream • Woodbrook house stream • Knockadalteen_26 stream • Knockananima stream • Clooneigh_26 stream • Killasanowl stream

Table 7.5.9.7 Breakdown of the Key Ecological Receptors which are Impacted by the Proposed Option Corridors – East of Drumsna Junction (Node J)

Option Corridors East of Drumsna Junction (Node J)				
	Receptors of International Importance Impacted	Receptors of National Importance Impacted	Receptors of County Importance Impacted	Receptors of Local Importance (Higher Value) Impacted
Green Option Corridor	• EC99 • EC105 • EC113	• River Shannon	• EC97	• EC112 • Drumsna stream • Unnamed stream - border of Annaduff and Gortinty • Gortinty stream • Unnamed stream - border of Annaduff and Derryoughter
Yellow Option Corridor	• EC99 • EC105 • EC113	• River Shannon	• EC97	• EC112 • Drumsna stream • Unnamed stream - border of Annaduff and Gortinty • Gortinty stream • Unnamed stream - border of Annaduff and Derryoughter
Purple Option Corridor	• EC99 • EC105 • EC113	• River Shannon	• EC97	• EC112 • Drumsna stream • Unnamed stream - border of Annaduff and Gortinty • Gortinty stream • Unnamed stream - border of Annaduff and Derryoughter

Option Corridors East of Drumsna Junction (Node J)				
	Receptors of International Importance Impacted	Receptors of National Importance Impacted	Receptors of County Importance Impacted	Receptors of Local Importance (Higher Value) Impacted
Blue Option Corridor	• EC99 • EC105 • EC113	• River Shannon	• EC97	• EC112 • Drumsna stream • Unnamed stream - border of Annaduff and Gortinty • Gortinty stream • Unnamed stream - border of Annaduff and Derryoughter

7.5.10 Stage 1 Hydrology Option Assessment

7.5.10.1 Introduction

This section details the Stage 1 Assessment of the Options in the context of the hydrological constraints identified in Section 4.13 Hydrology of this report.

The Hydrology constraints are presented with the Stage 1 Option Corridors in Figures 7.5.10.1.0 to 7.5.10.4.5.

Section 7.5.10.2 outlines the methodology that was used to carry out the study, including the assessment criteria. The assessment is presented in Section 7.5.10.3 with a section dealing with the assessment west of Node J and a section dealing with the assessment east of Node J.

The options included in this assessment fall under the following headings:

- Management Option (Blue Option Corridor) (interventions on the existing infrastructure to address the identified transport problems as described in Section 7.1.2 of this document)
- Do-Something Road Based Options

A total of ten option corridors have been taken forward to the preliminary options as described in Section 7.1.2 of this report. There are six option corridors to the west of Node J at Drumsna Junction (Purple West, Dark Green, Black, Orange, Cyan and Blue West) and four option corridors to the east of Node J at Drumsna Junction (Purple East, Green, Yellow and Blue East).

7.5.10.2 Methodology

The principal objectives of the study are to:

- Complete a desk study and field investigations to obtain relevant hydrological data for each proposed option
- Identify and describe sites of known potential hydrological interest
- Assess the significance of the likely impacts of the proposed road scheme on each of these hydrological receptors along each route option corridor
- To evaluate and compare each option based on hydrological criteria, as per NRA Guidelines on Procedures for Assessment and treatment of Geology, Hydrology and Hydrogeology for National Road Schemes⁶², taking into account interactions with other environmental disciplines

⁶² NRA, Guidelines on Procedures for Assessment and treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

- To assess each option in accordance with the TII Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis (2016)2
- Based on the above assessment, to assess, compare and rank the preferred option in order of preference

In fulfilling these objectives, an assessment on the likely impacts of the options on hydrological constraints and ecological receptors, can be carried out. An informed choice can therefore be made with the knowledge of the potential ecological consequences. This enables the importance of the proposed effects and the scope for mitigating these to be appropriately evaluated.

The extent of the overall study areas has been identified and detailed in Chapter 4 Constraints Study, refer to Hydrology Constraints Figures 4.13.1.0 to 4.13.4.5.

The TII Guidelines provide criteria for ranking of the identified hydrological constraints within the assessment study area. Criteria for rating an impact significance that may arise at each hydrological constraint are provided within Box 4.4 of the TII Guidelines and are reproduced in Table 7.5.10.1 below. The impact significance assessment takes into account the attribute importance and the predicted scale and duration of the likely impacts.

Table 7.5.10.1 Criteria for Rating Impact Significance at Route Selection Stage – Rating of Significant Environmental Impacts at Route Selection Stage from Box 4.4 of the Guidelines and associated TII PAG Scores

Impact Level	Attribute Importance				
	Extremely High**	Very High	High	Medium	Low
Profound (PAG Major or Highly Negative, 1)	Any permanent impact on attribute	Permanent impact on significant proportion of attribute			
Significant (PAG Major or Highly Negative, 1)	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on Significant proportion of attribute		
Moderate (PAG Moderately Negative, 2)	Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute	
Slight (PAG Minor or Slightly Negative, 3)		Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute
Imperceptible (Not			Temporary impact on small	Temporary impact on significant	Permanent impact on small

Impact Level	Attribute Importance				
	Extremely High**	Very High	High	Medium	Low
Significant or Neutral, 4)			proportion of attribute	proportion of attribute	proportion of attribute

***In rating impacts on an 'European site' account must be taken of Article 6(3) and 6(4) of the Habitats Directive (Council Directive 92/43/EEC). Also see guidance contained within Guidelines for Assessment of Ecological Impacts of National Road Schemes (Rev 2, National Roads Authority, 2008)*

The TII Guidelines qualitative significance rating of environmental impacts has been correlated with the equivalent qualitative and quantitative assessment scores from the TII Project Appraisal Guidelines for National Roads (PAG) Unit 7.0 - Multi-Criteria Analysis² and listed in Table 7.3.1. It should be noted that only negative potential impacts are considered in the TII Guidelines whereas the TII PAG multi-criteria assessment is based on the seven-point scale listed in Table 7.3.1 of this report.

Table 7.5.10.2 Correlation of TII Guidelines Significance Rating to an Equivalent TII PAG Score

Significance Rating (TII Guidelines)	Equivalent PAG (Description)	Equivalent PAG (Value)
Profound	Major or Highly Negative	1
Significant	Major or Highly Negative	1
Moderate	Moderately Negative	2
Slight	Minor or Slightly Negative	3
Imperceptible	Not Significant or Neutral	4

The final stage of the assessment methodology was to ensure that the requirements of the TII PAG Unit 7.0 - Multi-Criteria Analysis² were also met by assigning a score to each alternative option based on the scoring procedure within these Guidelines. Where a positive score is assigned, they are from the TII PAG scoring system.

Using the impact scores and professional judgement, the preferred, intermediate or least preferred alternative options were identified.

Stage 1 Options Assessment

Introduction

A total of ten option corridors have been taken forward to the Stage 1 Preliminary Options Assessment as outlined in Table 7.5.10.3 and illustrated with the Hydrology constraints in Figures 7.5.10.1.0 to 7.5.10.4.5.

A preliminary horizontal alignment representing the centreline of the Corridor is provided with the total Corridor width set at 300m (150m either side of the centreline alignment) to allow for movement of the alignment where required. The

total corridor width of 150m is set for the Black Option Corridor (75m either side of the centreline alignment).

The option corridors are assessed in two distinct sections to the west of Drumsna Junction (Node J) and to the east of Drumsna Junction (Node J).

Table 7.5.10.3 Option Corridors

Option Corridors West of Node J	Option Corridors East of Node J
Cyan	Green
Orange	Yellow
Purple West	Purple East
Dark Green	Blue East
Blue West	
Black	

7.5.10.3 Assessment Criteria

In terms of surface hydrology the interception of surface hydrological attributes which are considered in the Option Corridor assessment comprise of features such as watercourses (drains, streams and rivers), standing waterbodies (ponds and lakes), hydro ecological features (comprising wetland and peatland areas, springs and risings, groundwater fed fens), surface water resources (surface water abstractions and potable water supply sources), soft sediments and poor ground conditions and floodplains and flood risk area.

The watercourse intercepted are categorised as follows by their associated catchment areas:

- small drain < 0.25km² (25ha)
- small stream 0.25 to 5km² (25 to 500ha)
- medium stream 5 to 10km² (500 to 1000ha)
- large stream 10 to 20 km²
- small river 20 to 50km²
- medium river 50 to 500km²
- large river > 500km²

The attribute importance has been assigned based on the criteria set out in Box 4.2 of the TII Guidelines. The streams and small rivers in excess of 0.25km² and less than 50 km² are attributed medium given their local value. Rivers in excess of 50km² and less than 500km² are attributed a high importance given their county importance status and the larger rivers in excess of 500km² are attributed a very high status given their national importance. It is assumed that all streams and rivers small to large should be considered to be potentially fishery watercourses with

spawning potential. Watercourses namely drains with catchment areas of less than 25ha are considered to be of low importance given their local low status.

Table 7.5.10.4 Watercourses - Attribute Importance

EPA Name	EPA Code	Catchment Area (km ²)	Attribute Importance
River Shannon	26S02	1,300	Very High
Clogher	26C18	28.6	Medium
Ardglass Stream	26A12	2.9	Medium
Woodbrook House Stream	26W01	2.5	Medium
Clooneigh26	26C55	3.0	Medium
Tumma	26T07	1.3	Medium
Caldragh	N/A	1.65	Medium
Kilmaddaroe Stream	N/A	5.79	Medium
Knockadalteen26	26K30	3.5	Medium
Knockananima Stream	26K25	7.6	Medium
Lisnagat	26L18	1.9	Medium
Attifinlay	26A18	1.1	Medium
Drumercool	26D31	1.43	Medium
Killukin River	26D31	33.9	Medium
Danesfort	26D49	0.2	Low
Tonrevagh R	26T97	21	Medium
Rock26	26R17	2.4	Medium
Attirory Stream	26A26	1.4	Medium
Kilmaddaroe Stream	26K24	8.3	Medium
Pollnagappul	26P05	0.9	Medium
Sallaghan26	26S24	0.2	Medium
Kiltycarney	26K39	0.5	Medium
Lismoyle26	26L41	0.7	Medium
Killasanowl	26K38	3.9	Medium
KilDorragh26	26K41	0.6	Medium
Drumsna R	26D53	17.2	Medium
Gortinty Stream	26G35	8.5	Medium
Drumcleavry R	26D57	13.4	Medium
Ardanaffrin	26A40	0.5	Medium
Antfield	26A30	1.5	Medium

Standing Waterbodies**Floodplains and Flood Risk Areas**

The floodplains intercepted are categorised as follows by their associated catchment areas:

- Floodplain protecting rural lands with 1 to 5 residential or commercial properties including farm yards from flooding – Low Importance
- Floodplain protecting rural lands with 5 or more residential or commercial properties including farm yards from flooding – Medium Importance
- Floodplain protecting urban areas with 1 to 5 residential or commercial properties from flooding – Medium Importance
- Floodplain protecting urban areas with up to 5 – 10 residential or commercial properties from flooding – High Importance
- Floodplain protecting urban areas with greater than 10 residential or commercial properties from flooding – Very High Importance

Table 7.5.10.5 Floodplains and Flood Risk Areas - Attribute Importance

EPA Name	EPA Code	Catchment Area (km ²)	Description	Attribute Importance
River Shannon	26S02	1,300	Carrick-on-Shannon Urban Area with Flood Risk	Very High
Clogher	26C18	28.6	Rural	Low
Ardglass Stream	26A12	2.9	Rural	Low
Woodbrook house Stream	26W01	2.5	Rural	Low
Clooneigh26	26C55	3.0	Rural	Low
Tumna	26T07	1.3	Rural	Low
Caldragh	N/A	1.65	Rural	Low
Kilmaddaroe Stream	N/A	5.79	Rural	Low
Knockadalteen26	26K30	3.5	Urban Area	Medium
Knockananima Stream	26K25	7.6	Urban Area with Flood Risk	High
Lisnagat	26L18	1.9	Urban Area	Medium
Attifinlay	26A18	1.1	Urban Area	Medium
Drumercool	26D31	1.43	Rural	Low
Killukin River	26D31	33.9	Rural	Low
Danesfort	26D49	0.2	Rural	Low
Tonrevagh R	26T97	21	Rural	Low
Rock26	26R17	2.4	Rural	Low

EPA Name	EPA Code	Catchment Area (km ²)	Description	Attribute Importance
Attirory Stream	26A26	1.4	Rural	Low
Kilmaddaroe Stream	26K24	8.3	Rural	Low
Pollnagappul	26P05	0.9	Rural	Low
Sallaghan26	26S24	0.2	Rural	Low
Kiltycarney	26K39	0.5	Rural	Low
Lismoyle26	26L41	0.7	Rural	Low
Killasanowl	26K38	3.9	Rural	Low
KilDorragh26	26K41	0.6	Rural	Low
Drumsna R	26D53	17.2	Rural	Low
Gortinty Stream	26G35	8.5	Rural	Low
Drumcleavry R	26D57	13.4	Rural	Low
Ardanaffrin	26A40	0.5	Rural	Low
Antfield	26A30	1.5	Rural	Low

Surface Water Resources

The Irish Water Carrick-on-Shannon Public Water Supply abstraction is located in the River Shannon circa 1km upstream of Carrick-on-Shannon Bridge. This is a large abstraction that supplies well over 50% of Leitrim's Water Supply and is considered to be of regional importance and its attribute importance is therefore very high.

Hydro-ecology

The identified aquatic ecological sites within the study area are associated with riparian habitat along the River Shannon channel banks and floodplain area and represent wet woodland and wet grassland including alluvial woodland habitat with potential for *91E0. These habitats are considered to be of very high importance due to their value on a national scale. The only designated sites within the Study area are the Lough Drumhalow pNHA (001643) to the north of Carrick-on-Shannon and Lough Boderg and Bofin pNHA (001642) to the South. Designated Sites downstream of the Study Area which are hydrologically connected via the River Shannon are The Lough Forbes Complex SAC and pNHA (001818) and further downstream is the Lough Ree SAC and pNHA (000440). There are other SAC's, and NHA's such as Clooneen Bog SAC, that are not connected hydrologically (via watercourses) with the study area and therefore not relevant to the surface hydrology assessment. In the assessment the pNHA are attributed high status and the SAC's Very High Status to reflect their European importance.

Soft Sediments and Poor Ground Conditions

Areas of identified with soft sediments from GSI quaternary deposit mapping and local site investigation information classified as alluvium, basin peat, cutover peat, fen peat and lacustrine deposits are given a medium attribute value (local higher

value) as their presence can for a road project generate design and construction difficulties and often the requirement for piling or bridge spanning depending on the depth of soft sediments or in the requirement for excavation, removal and handling and material deposition during construction.

Hydrological Features and General Impacts

The general impact description on hydrological features is summarised here as follows:

Table 7.5.10.6 Summary of Impact Description on Hydrological Features

Hydrological Feature	Potential Impact description
Water courses (Morphology)	Disturbance and morphological impacts from road culverts and from associated local realignment and diversion of streams and drains. Impacts would most likely be permanent in nature on a small or significant proportion of the attribute.
Water courses (Fishery and Morphology)	Culverts and bridge piers acting as debris traps resulting in barrier effects to fish passage, flooding and scouring causing local morphological change to the river channel. Impacts would most likely be permanent in nature on a small or significant proportion of the attribute.
Water courses (Water Quality)	Potential pollution from construction (construction runoff (sediments, hydrocarbons, and concrete spills). Impacts would most likely be temporary in nature on a small or significant proportion of the attribute.
Water courses (Water Quality)	Impact from routine road drainage discharges at proposed outfalls on local and downstream water quality. Potential Risk of significant chemical spillage event from HGV impacting on the downstream water quality, impacts would most likely be temporary in nature on a small or significant proportion of the attribute.
Floodplains and Flood Risk Areas	Potential for reduction in flow conveyance due to encroachment of the active (conveying) floodplain area giving rise to upstream afflux. Culverts and road embankment impeding conveyance, contribute to flooding and drainage outfalls causing upstream afflux within the rivers and streams and impacting flow rates. Impacts would most likely be temporary in nature on a small or significant proportion of the attribute.
Floodplains and Flood Risk Areas	Potential for loss of flood storage due to encroachment by the road formation into floodplain and loss of flood storage volume giving rise to local and downstream impacts on flood levels and flood flows. Impacts would most likely be permanent in nature on a small or significant proportion of the attribute.
Surface Water Resources	The impact from a proposed road development on the Carrick-on-Shannon Public Water Supply abstraction are potentially water quality impacts from both Construction and Operational phases. The impact on the flow regime is likely to be minor given the large catchment area of c. 1295 km ² and the potential for a temporary impact on a significant proportion of the attribute.
Surface Water Resources	The construction phase impacts that are likely is an increase in suspended solids from the construction works primarily associated with any new River Shannon Bridge crossing. It should be noted that all watercourses within the study area discharge to the River Shannon and therefore a pathway for pollution is present for the entire footprint of the proposed road-based options. In terms of impact on the Carrick-on-Shannon Public

Hydrological Feature	Potential Impact description
	Water Supply abstraction location, it is only the proposed options that are upstream of the abstraction point that could potentially impact on the attribute. Impacts would most likely be temporary in nature on a significant proportion of the attribute.
Hydro-Ecology (Drying)	Direct encroachment of wetland sites and direct loss of wetland area. Drainage effects by the road development on wetland sites resulting in ecological change as a result of drying. Impacts would most likely be permanent in nature on a small or significant proportion of the attribute.
Hydro-Ecology (Water Quality)	Potential pollution impacts on wetland sites from road construction and operation stages from nearby road drainage outfalls. Impacts would most likely be temporary in nature on a small or significant proportion of the attribute.
Hydro-Ecology (Wetlands Loss)	The main potential impacts associated with road construction is direct loss of riparian and wetland areas by encroachment. Impacts would most likely be permanent in nature on a small or significant proportion of the attribute. The drainage effects of the Road development on such wetland features is likely to be permanent in nature on a small proportion of the attribute given the extensive waterbodies involved. The water quality impacts on such wetland features would most likely be temporary in nature on a small proportion of the attribute given the extensive waterbodies involved.
Designated Sites (Hydrological Regime and Water Quality)	Potential for change in the hydrological regime in respect to water quality and drainage impacts from both construction and operation phases on designated sites both directly or indirectly. Impacts would most likely be permanent in nature on a small or significant proportion of the attribute.
Soft ground (Water Quality)	Soft sediments of peat and alluvium can give rise to construction difficulties requiring either pilling or removal of such sediments with the potential for increased construction runoff impacts and requirement for the deposition of unsuitable construction material. Impacts would most likely be temporary in nature on a small or significant proportion of the attribute.

The potential impacts identified for each of the hydrological features/receptors identified within the study area are evaluated and in many cases, there are multiple impacts associated with potential hydrological flow and water level change, morphology of the channel and water quality both at construction and operation phase quantified for the same feature. In this option assessment these multiple impacts are all considered both cumulatively and individually for each hydrological feature and maximum impact selected and used in the overall selection scoring process.

7.5.10.4 Stage 1 Hydrology Option Corridor Assessment

Stage 1 Hydrological Assessment -Option Corridors West of Drumsna Junction (Node J)

Cyan Option Corridor

Table 7.5.10.7 Stage 1 Hydrological Assessment of Cyan Option Corridor

Hydrological Attribute	Description	Impact
Floodplains and Flood Risk Areas		
River Shannon Floodplain	This corridor crosses the River Shannon floodplain 1.55km downstream of River Shannon Bridge at Attirory and upstream of Lough Corry. The Shannon Floodplain area encroached (based on the CFRAM 100-year present day predicted flood extents) by the proposed design option represents a floodplain width encroached at the centreline of 630m.	This encroachment of the River Shannon floodplain area has a potential for loss of floodplain storage and causing upstream afflux by obstructing the conveyance. This potentially could result in increased flood levels upstream at Carrick-on-Shannon which has low-lying areas of the town at significant flood risk and requiring a flood relief scheme. The crossing is located immediately downstream of a natural narrowing of the floodplain which will reduce the impact on floodplain conveyance and upstream afflux. A major bridge structure is required at this crossing point to minimize upstream afflux effects on flood risk within Carrick-on-Shannon.
Killukin River Basin part of the Shannon Floodplain	The option corridor crosses the Killukin River Basin that includes floodplain area of the River Shannon with an encroachment width of 218m along the alignment centre line.	Storage loss may not result in significant impacts on the flooding regime in the River Shannon due to the very damped nature of the River Shannon flood hydrograph and the large storage available in the River Shannon at Carrick-on-Shannon. The potential loss of flood storage is considered to represent a moderate negative impact (2) on flooding and flood risk given the relatively small portion of the floodplain area encroached to the total floodplain area of c. 1350ha from Lough Eiden and Leitrim Village downstream to Jamestown. The overall impact by this option on flooding in the River Shannon at Carrick-on-Shannon is rated as a significant negative impact (1) given the existing upstream flood risk at Carrick-on-Shannon, the extensive floodplain area encroached and the potential for upstream afflux from the bridge crossing. Extending up to Carrick-on-Shannon.

Hydrological Attribute	Description	Impact
Knockananima Stream Flood Risk Area at	The CFRAM flood risk area associated with the Knockananima Stream is encroached by the proposed option upstream and downstream of the Rail line is encroached by the corridor with the total floodplain area within the corridor at 5.43ha.	This has the potential to impact flooding locally from interference with floodplain conveyance and the loss of flood storage. This impact is rated as a moderately negative impact on flooding and flood risk (2).
Water courses		
River Shannon (Morphology, Water Quality Impacts)	River Shannon catchment to the proposed option crossing is large with a catchment area of c. 1336km². The river channel width from bank to bank is 152m and the floodplain width is 530m at the proposed crossing point making it difficult to avoid the construction of in channel piers and floodplain infilling. Construction activities associated with River Shannon crossing and its floodplain have potential to generate significant pollution from construction activities and associated site runoff, including the potential for concrete and chemical (hydrocarbon) spillages etc. Close proximity of corridor to the Shannon river channel near Tully downstream of Jamestown represent additional construction pollution risks for the River Shannon The entire length of the proposed road scheme will outfall eventually into the River Shannon via the road drainage outfalls discharging directly and via upstream watercourses introducing spillage risks and routine road drainage pollutant in the form of heavy metals.	It is likely that in channel piers will be required at this crossing which increases the potential impact during construction and operation with local changes in the bed morphology surrounding the piers. Physical impact by the bridge structure on flow regime is rated as a local moderately negative impact (2). The crossing point cannot avoid the floodplain area which is wet for a large portion of the year and represents a significant pathway for impact on the river from construction works and a constraint on the period that construction works can take place. Given the scale of construction activities involved within the Shannon channel and floodplain area this impact is rated as moderately negative (2). There is significant dilution available within the River Shannon throughout the year making the impact from routine road drainage discharges at operational stage are rated as minor negative (3). The risk of a serious accidental spillage at the operational phase remains but is of a relatively low risk given the road length, traffic numbers and road design and is rated as moderately negative (2).

Hydrological Attribute	Description	Impact
	There are jetties and moorings for leisure craft activities along the western river bank within the corridor which may be affected by the bridge crossing.	The impact on mooring facilities is considered to represent a minor negative impact (3).
Minor Water courses	The Woodbrook House Stream at Cloongownagh that flows into Lough Eidin is crossed at two locations having catchment areas of 2.13 and 2.52km² respectively. Trib. Of the Knockanima stream (2.86km²). Knockanima stream (5.43km²). Killukin River and floodplain crossed with catchment area of 35km². Small Stream at Cooreen / Lisseeghan (1.0km²) Kilmuddaroe Stream Lisseeghan (6.7km²) 19 no. small drains (i.e. < 25ha in catchment areas) are intercepted.	Potential for flow, morphology and flooding local impacts at these streams. All of the streams and drains intercepted are relatively small (max catchment area < 7km²) and easily culverted providing full span of the stream channels to minimize disturbance. The disturbance impact of culverting and locally realigning the smaller streams and drains is rated as minor negative impact (3). The Killukin River is classed as a small river at a catchment area of 35km² with medium importance, and with the flood basin backed up by flooding in the Shannon the hydrological impact is classed as moderately negative (2) possibly requiring large culverts or a bridge structure and the associated construction difficulties. All of the classified watercourses within the study area are identified by the EPA under the EU water framework directive to be at Risk of deterioration in their water quality status. The potential impact on the water quality from a proposed road development construction and operation within the corridor on these watercourses is rated as a local minor negative impact (3). The impact on the local drains is classed at a minor or slightly negative impact (3).
Surface Water Resources		
Carrick-on-Shannon Public Water Supply Abstraction	This corridor crosses the River Shannon downstream of the Carrick-on-Shannon public water supply abstraction and at 2.5km downstream there will be no direct water quality impact on this high important abstraction source. A short section of the road corridor for 2.4km at the western end is upstream of the abstraction and consequently has a potential	The River Shannon has significant sustained dilution available throughout the year from its large catchment and large upstream Lakes such that the impact on this attribute from the 2.4km section of road development at construction and operation is rated as a minor negative impact (3). The routine Road Drainage discharges at operational stage represent a permanent impact on a small proportion of the attribute and therefore given the very high attribute

Hydrological Attribute	Description	Impact
	for construction runoff to enter the River Shannon via the Woodfield House Stream and Lough Eidin the River Shannon and therefore has the potential during construction to impact the water quality of the source. At Operation phase routine runoff discharges or an accidental spillage has the potential to enter the River Shannon upstream of the abstraction also.	important this represents a moderately negative impact (2). The operational spillage risk from an accident involving an HGV on the abstraction point represents a minor negative impact.
Hydro-Ecology and Designated Sites		
Ecological Sites of Local Higher	Encroachment by Corridor of Sites EC35, EC 50, EC51, EC35 that represent wet woodland, wet Grassland and Marsh Habitats typical of large floodplain areas. The potential impact on hydrology of these habitats is potential drainage effects by the proposed road development involving collector and interceptor ditches, attenuation ponds and outfalls and loading by the road embankment on underlying saturated silt, peaty and alluvial soils resulting in increased drainage flows through displacement of pore water. Sediment laden construction runoff reaching such site and settling out.	The potential impact on the hydrological regime from the construction of the road and the proposed drainage treatment of the road is unlikely to result in any significant dewatering and drainage of these wetland habitats and is considered to represent a minor negative impact (3).
Designated sites of SAC, SPA, NHA and pNHA		There will be no direct impact on any designated sites by the proposed road development and the only indirect impacts are likely to be from sediment laden construction runoff entering the River Shannon system and eventually reaching the downstream sites of Lough Boderg, Lough Bofin pNHA and Lough Forbes Complex SAC. The potential impact is considered given the dilution available in the Shannon, distance from the sites and the flow attenuation provided by the River Shannon to represent a minor negative impact.

Hydrological Attribute	Description	Impact
Soft Sediment and Poor Ground Conditions		
Soft sediments and poor ground conditions	Soft sediments of peat and alluvium can give rise to construction difficulties requiring either pilling or removal of such sediments with the potential for construction runoff impacts and deposition of unsuitable construction material. Of the 9.2km road length 1.18km is in quaternary identified as Cut over peak and 0.80km is alluvium.	Soft sediments identified from the GSI Quaternary mapping represents 21.5% of the route. It is likely that actual amount encountered may be higher along the River Crossings. This is rated as representing a minor negative impact.

Orange Option Corridor**Table 7.5.10.8 Stage 1 Hydrological Assessment of Orange Option Corridor**

Orange Option Corridor	Description	Impact
Floodplains and Flood Risk Areas		
River Shannon Floodplain	This orange option crosses the River Shannon channel and floodplain 1.50km downstream of River Shannon Bridge at Attirory and upstream of Lough Corry. The Shannon Floodplain area encroached (based on the 100year present day predicted flooding extents) by the proposed option represents a floodplain width at the centreline of the corridor crossing of 420m (passing to the south of the housing estate at Attirory).	This encroachment of the River Shannon floodplain area has a potential for loss of floodplain storage and causing upstream afflux by obstructing the conveyance. This potentially could result in increased flood levels upstream at Carrick-on-Shannon which has low-lying areas of the town at significant flood risk and requiring a flood relief scheme. The crossing is located immediately downstream of a natural narrowing of the floodplain which will reduce the impact on floodplain conveyance and upstream afflux. A major bridge structure is required at this crossing point to minimize upstream afflux effects on flood risk within Carrick-on-Shannon.
Killukin River Basin part of the Shannon Floodplain	The option corridor crosses the Killukin River Basin that includes floodplain area of the Shannon with an estimate encroachment width of 302m.	The potential loss of flood storage is considered to represent a moderately negative impact (2) on flooding and flood risk given the relatively small portion of the floodplain area encroached to the total floodplain area of c. 1350ha from Lough Eiden and Leitrim Village downstream to Jamestown. The overall impact by this option on flooding in the River Shannon at Carrick-on-Shannon is rated as a Significant Negative impact (1) given the existing upstream flood risk at Carrick-on-Shannon, the extensive floodplain area encroached and the potential for upstream afflux from the bridge crossing. Extending up to Carrick-on-Shannon.
Knockananima Stream Flood Risk Area	The CFRAM flood risk area associated with the Knockananima Stream flood risk is encroached by the proposed corridor by 0.602ha by 4.90ha.	This has the potential to impact flooding locally from interference with floodplain conveyance and the loss of flood storage. This impact is rated as a moderately negative impact (2).
Water courses		
River Shannon Channel	River Shannon to the Corridor crossing is large with a Catchment area of 1336km² The river channel width from bank to bank at the potential	It is likely that in channel piers will be required at this crossing which increases the potential impact during construction and operation with local changes in the bed morphology surrounding the piers.

Orange Option Corridor	Description	Impact
	crossing point is 202m, which includes inlet channel to mooring basin on both banks, makes it difficult to avoid the construction of in-channel bridge piers. The floodplain width at the crossing point is 420m making it difficult to avoid encroachment of floodplain either as earthen embankments, abutments or support piers. Construction activities associated with River Shannon crossing and its floodplain have potential to generate significant pollution from construction site runoff and potential for concrete and chemical spillages etc. Close proximity of corridor to the Shannon River Channel near Tully downstream of Jamestown represent additional construction pollution risks for the River Shannon. The entire length of the proposed road scheme will outfall eventually into the River Shannon via the road drainage outfalls discharging directly and via upstream watercourses introducing spillage risks and routine road drainage pollutant in the form of heavy metals.	Physical impact by the bridge structure on flow regime is rated as local minor negative impact. The crossing point cannot avoid the floodplain area which is wet for a large portion of the year and represents a significant pathway for impact on the river from construction works and a constraint on the period that construction works can take place. Given the scale of construction activities involved within the Shannon Channel and floodplain area this impact is rated as moderately negative (2). There is significant dilution available within the River Shannon throughout the year making the impact from routine road drainage discharges to be rated as minor negative (3). The risk of a serious accidental spillage at the operational phase remains but is of a relatively low risk given the road length, traffic numbers and road design and is rated as moderately negative (2).
Minor Watercourses	1 tributary stream at Meera / Tullyleague that flows into Lough Eidin c. 3 at 3.496km² in area. Knockanima Stream (5.52km²) Killukin River and floodplain crossed with catchment area of 35km². Small Stream at Cooreen / Lisseeghan (1.0km²). Kilmuddaroe Stream Lisseeghan (6.7km²).	Potential for Flow, morphology and flooding local impacts at these streams. All of the streams and drains intercepted are relatively small (max catchment area < 7km²) and easily culverted providing full span. The disturbance impact of culverting and locally realigning the smaller streams and drains is rated as minor to moderately negative impact (2.5). The Killukin River is classed as a small river at a catchment area of 36km² and with the flood basin backed up by flooding in the Shannon the hydrological impact is classed as moderately negative (2) possibly requiring large culverts or a bridge structure.

Orange Option Corridor	Description	Impact
	11 no. small drains intercepted.	All of the classified watercourses within the study area are identified by the EPA under the EU water framework directive to be at Risk of deterioration in their water quality status. The potential impact on the water quality from a proposed road development construction and operation within the corridor on these watercourses is rated as a local minor to moderately negative impact (2.5). The impact on the local drains is classes at a minor negative impact (3).
Surface Water Resources		
Carrick-on-Shannon Public Water Supply Abstraction	This corridor is downstream of the Carrick-on-Shannon water supply abstraction and at 2.5km downstream there is unlikely to be any water quality impact on this important abstraction source. A short section of the road corridor for 0.6km at the western N4 tie-in is upstream of the abstraction and consequently has a potential for construction runoff to enter the River Shannon via a drainage channel and proximity of the Shannon Floodplain to the corridor and therefore has the potential during construction to impact the water quality upstream of the abstraction source. At Operation phase routine runoff discharges or an accidental spillage has the potential to enter the River Shannon upstream of the abstraction also from this small 600m section of roadway.	The River Shannon has significant dilution available throughout the year from its large catchment and large upstream lakes such that the impact on this attribute from the 0.6km section of road development at construction and operation is rated as a minor negative impact (3). The routine Road Drainage discharge at operational stage represent a permanent impact on a small proportion of the attribute and therefore given the very high attribute important given to this feature the potential impact magnitude represents a moderately negative impact (2). The operational spillage risk from an accident involving an HGV on the abstraction point represents a minor negative impact given its temporary nature.
Hydro-Ecology and Designated Sites		
Hydro-Ecological Receptors	Encroachment by Corridor of Sites EC35, EC50, EC51, EC35 that represent wet woodland, wet Grassland and Marsh Habitats typical of large floodplain areas.	The potential impact on the hydrological regime from the construction of the road and the proposed drainage treatment of the Road is unlikely to result in any significant dewatering and drainage of these wetland habitats and is considered to represent a minor negative impact (3).
Ecological Sites of Local Higher	The potential impact on hydrology of these habitats is potential drainage effects by the	

Orange Option Corridor	Description	Impact
Designated sites of SAC, SPA, NHA and pNHA	proposed road development involving collector and interceptor ditches, attenuation ponds and outfalls and loading by the road embankment on underlying saturated silt, peaty and alluvial soils resulting in increased drainage flows through displacement of pore water. Sediment laden construction runoff reaching such site and settling out.	There will be no direct impact on any designated sites by the proposed road development and the only indirect impacts are likely to be from sediment laden construction runoff entering the River Shannon system and eventually reaching the downstream sites of Lough Boderg, Lough Bofin pNHA and Lough Forbes Complex SAC. The potential impact is considered given the dilution available in the Shannon, distance from the sites and the flow attenuation provided by the River Shannon to represent a minor negative impact (3).
Soft Sediment and Poor Ground Conditions		
Soft sediments and poor ground conditions	Soft sediments of peat and alluvium can give rise to construction difficulties requiring either pilling or removal of such sediments with the potential for construction runoff impacts and deposition of unsuitable construction material. Of the 7.45km road length 1.32km is in quaternary identified as Cut over peak and 0.30km is alluvium.	Soft sediments identified from the GSI Quaternary mapping represents 21.7% of the route. It is likely that actual amount encountered may be higher along the River Crossings. This is rated as representing a minor negative impact (3).

Purple West Option Corridor

Table 7.5.10.9 Stage 1 Hydrological Assessment of Purple West Option Corridor

Purple West Option Corridor	Description	Impact
Floodplains and Flood risk Areas		
River Shannon Floodplain	This corridor crosses the River Shannon floodplain 1.95km upstream of River Shannon Bridge at Corryolus. The Shannon Floodplain area encroached (based on the 100year present day predicted flooding extents) by the proposed option represented a floodplain encroachment width at the centreline of the corridor crossing of 1020m encroaching the Shannon floodplain at three locations along its route.	This has potential for loss of floodplain storage and upstream afflux. The upstream afflux will not impact on the downstream flood risk area in Carrick-on-Shannon and the crossing is sufficiently downstream of Leitrim Village Flood Risk Area as not to be significant in terms of affecting flood risk there. The floodplain storage loss may not result in significant impacts on the flooding regime in the Shannon due to the very damped nature of the Shannon flood hydrograph and the large storage available in the Shannon. The potential loss of flood storage represents a relatively small encroachment of the total floodplain area of c. 1350ha from Lough Eiden and Leitrim Village downstream to Jamestown. The potential loss of flood storage is considered to represent a permanent impact on a small proportion of the very high importance attribute and therefore represents a significant negative impact (1) on flooding and flood risk.
Water courses		
River Shannon Channel	River Shannon to the Corridor crossing is large with a Catchment area of 1290km². The river channel width from bank to bank is 80m at the potential crossing point and the total floodplain width at the river channel crossing is 402m. Construction activities associated with River Shannon crossing and its floodplain have potential to generate pollution from construction site runoff and potential for concrete spillages etc. The entire length of the proposed road will outfall eventually to the	It is likely multiple piers within the floodplain and channel will be required at this crossing which increases the potential impact during construction and operation with local changes in the bed morphology surrounding the piers. Physical impact by the bridge structure on flow regime is rated as local minor negative impact. No impacts on moorings neutral (4). The crossing point cannot avoid the floodplain area which is wet for a large portion of the year and represents a significant pathway for impact on the river from construction works and a constraint on the period that construction works can take place. Given the scale of construction activities involved within

Purple West Option Corridor	Description	Impact
	River Shannon via the road drainage outfalls discharging directly and to upstream drains and tributaries.	the Shannon Channel and floodplain area this impact is rated as moderately negative (2). Pollution from the operation stage via the road drainage is rated as minor negative (3).
Watercourses	1 tributary stream at Meera / Tullyleague that flows into lough Eidin at 3.5km² in area. 1 small spring and drain. 1 small Stream at Lisnagat (<1km²). 1 small stream at Cloonsheeban (1.4km²). 1 small stream (Cloonmulligan) 3.15km². 1 small tributary stream of the Cloonmulligan (c .25km²). 1 medium Stream at Greagh (5.75km²). 1 small trib stream of Greagh at Minkill (1.26km²). 1 small stream at Tully (< 1km²). 20 drains encountered along route.	Potential for flow, morphology and flooding local impacts at these streams. All of the streams and drains intercepted are relatively small (max catchment area < 7km²) and easily culverted providing full span of the stream channels to minimize disturbance. The disturbance impact of culverting and locally realigning the smaller streams and drains is rated as minor negative impacts (3) All of the classified watercourses within the study area are identified by the EPA under the EU water framework directive to be at Risk of deterioration in their water quality status. The potential impact on the water quality from a proposed road development construction and operation within the corridor on these watercourses is rated as a local minor negative impact (3). The impact on the local drains is classed at a minor negative impact (3).
Surface Water Resources		
Carrick-on-Shannon Public Water Supply Abstraction	This option is 910m upstream of Carrick-on-Shannon water supply abstraction intake with the corridor coming to within 680m of the abstraction point. Such close proximity allows very limited travel time and mixing / dilution of a potential spillage before reaching the abstraction point. Construction activities associated with River Shannon crossing and its floodplain have potential to generate pollution from construction site runoff and potential for concrete spillages etc.	This corridor has the potential for significant impact both during construction of the road development and during its operation life through road drainage runoff and HGV spillage risk. This impact on an important and strategic public abstraction of regional importance is considered to represent both at construction and operation a very significant negative impact (1). Mitigation through design can reduce the risk of spillage event reaching the intake point and provide water treatment and retention pond facilities to reduce the impact of routine runoff reducing the operation impact to a moderate negative.

Purple West Option Corridor	Description	Impact
	The road corridor for the first 6km drains to the River Shannon via numerous small streams and drains upstream of the public abstraction point and therefore vulnerable to pollution from both construction works and operation road drainage discharges and accidental spillage.	
Hydro-Ecology and Designated Sites		
Hydro-Ecological Receptors	Encroachment by route option of a pNHA (Lough Eidin) on the northeast side of the River Shannon floodplain for almost 730m occurs.	The potential impact on the hydrological regime from the construction of the road and the proposed drainage treatment of the road is unlikely to result in any significant dewatering and drainage impacts of these wetland habitats and is considered to represent a minor negative impact (3) with the main impact of direct loss of habitat accounted for in the biodiversity section.
Ecological Sites of Local Higher	The route option encroaches ecological sites EC16, EC30 and EC32 that represent wet woodland, scrub and wet grassland Habitats within the Shannon Floodplain. The potential impact on hydrology of these habitats is potential drainage effects by the proposed road development involving collector and interceptor ditches, attenuation ponds and outfalls and loading by the road embankment on underlying saturated silt, peaty and alluvial soils resulting in increased drainage flows through displacement of pore water.	The road development traverses through the Lough Eidin pNHA for c. 730m associated with encroachment into the River Shannon Floodplain Area. The impact on drainage of the associated wetland areas and River Shannon Callows will represent a moderately negative impact (2) on the hydrological regime of a designated site of national importance.
Designated sites of SAC, SPA, NHA and pNHA	Sediment laden construction runoff reaching such sites and settling out.	There will be no direct impact on any other designated sites by the proposed road development and the only indirect impacts are likely to be from sediment laden construction runoff entering the River Shannon system and eventually reaching the downstream sites of Lough Boderg, Lough Bofin pNHA and Lough Forbes Complex SAC. The potential impact is considered given the dilution available in the Shannon, distance from the sites and the flow attenuation provided by the River Shannon to represent a minor negative impact.

Purple West Option Corridor	Description	Impact
Soft Sediment and Poor Ground Conditions		
Soft sediments and poor ground conditions	Soft sediments of peat and alluvium can give rise to construction difficulties requiring either pilling or removal of such sediments with the potential for construction runoff impacts and deposition of unsuitable construction material. Of the 7.98km road mainline length 0.99km is in quaternary identified as cut over peat, 0.34km as basin peat and 0.17km as alluvium. The soft sediment deposits are primarily located in the floodplain areas along this option with the majority of the soft sediment associated with the Shannon crossing.	Soft sediments identified from the GSI Quaternary mapping represents 18.8% of the route. It is likely that actual amount encountered may be higher along the River Shannon crossings. This is rated as representing a minor negative impact (3).

Dark Green Option Corridor**Table 7.5.10.10 Stage 1 Hydrological Assessment of Dark Green Option Corridor**

Dark Green Option Corridor	Description	Impact
Floodplains and Flood Risk Areas		
River Shannon Floodplain	This corridor crosses the River Shannon floodplain 1.95km upstream of River Shannon Bridge at Corryolus. The River Shannon floodplain area encroached (based on the 100-year present day predicted flooding extents) represents a floodplain width encroached at the centreline of the corridor crossing is 835m encroaching the Shannon Floodplain at two locations along its route (Shannon Crossing and to the north of Lisnagat).	This has potential for loss of floodplain storage and upstream afflux. The upstream afflux will not impact on the downstream flood risk area in Carrick-on-Shannon and the crossing is sufficiently downstream of Leitrim Village Flood Risk Area as not to be significant in terms of affecting flood risk there. The floodplain storage loss may not result in significant impacts on the flooding regime in the Shannon due to the very damped nature of the Shannon flood hydrograph and the large storage available in the Shannon. The potential loss of flood storage represents a relatively small encroachment of the total floodplain area of c. 1350ha from Lough Eiden and Leitrim Village downstream to Jamestown. The potential loss of flood storage is considered to represent a permanent impact on a small proportion of the very high importance attribute and therefore represents a significant negative impact (1) on flooding and flood risk.
Water courses		
River Shannon Channel	River Shannon to the Corridor crossing is large with a Catchment area of 1290km². The river channel width from bank to bank is 76m at the potential crossing point and the total floodplain width at the river channel crossing is 393m. Construction activities associated with River Shannon crossing and its floodplain have potential to generate pollution from construction site runoff and potential for concrete spillages etc. The entire length of the proposed road will outfall eventually to the River Shannon via the road	It is likely multiple piers within the floodplain and channel will be required at this crossing which increases the potential impact during construction and operation with local changes in the bed morphology surrounding the piers. Physical impact by the bridge structure on flow regime is rated as local minor negative impact. The crossing point cannot avoid the floodplain area which is wet for a large portion of the year and represents a significant pathway for impact on the river from construction works and a constraint on the period that construction works can take place. Given the scale of construction activities involved within the Shannon channel and floodplain area this impact is rated as moderately negative (2).

Dark Green Option Corridor	Description	Impact
	drainage outfalls discharging directly and to upstream drains and tributaries.	Pollution from the operation stage via the road drainage is rated as minor negative (3). No impacts on moorings neutral (4).
Watercourses	1 tributary stream at Meera / Tullyleague that flows into lough Eidin at 3.5km² in area. 1 small spring and drain. 1 small Stream at Lisnagat (<1km²). 1 small stream at Cloonsheeban (1.4km²). 1 small stream (Cloonmulligan) 3.15km². 1 small tributary stream of the Cloonmulligan (c .25km²). 1 small stream the Aghameeny Stream (1.2km²). 1 small stream the KilMaddaroo Stream (2.75km²) 1 small stream at Drishoge (< 0.5km²) 21 drains encountered along route.	Potential for flow, morphology and flooding local impacts at these streams. All of the streams and drains intercepted are relatively small (max catchment area < 5km²) and easily culverted providing full span of the stream channels to minimize disturbance. The disturbance impact of culverting and locally realigning the smaller streams and drains is rated as minor negative impact (3). All of the classified watercourses within the study area are identified by the EPA under the EU water framework directive to be at Risk of deterioration in their water quality status. The potential impact on the water quality from a proposed road development construction and operation within the corridor on these watercourses is rated as a local minor negative impact (3). The impact on the local drains is classed at a minor negative impact (3).
Surface Water Resources		
Carrick-on-Shannon Public Water Supply Abstraction	This option is 910m upstream of Carrick-on-Shannon water supply abstraction intake with the corridor coming to within 680m of the abstraction point. Such close proximity allows very limited travel time and mixing / dilution of a potential spillage before reaching the abstraction point. Construction activities associated with River Shannon crossing and its floodplain have potential to generate pollution from construction site runoff and potential for concrete spillages etc.	This corridor has the potential for significant impact both during construction of the road development and during its operation life through road drainage runoff and HGV spillage risk. This impact on an important and strategic public abstraction of regional importance is considered to represent both at construction and operation a very significant negative impact (1). Mitigation through design can reduce the risk of spillage event reaching the intake point and provide water treatment and spillage retention area and water quality retention pond facilities to reduce the impact of routine

Dark Green Option Corridor	Description	Impact
	The road corridor for the first 6km drains to the River Shannon via numerous small streams and drains upstream of the public abstraction point and therefore vulnerable to pollution from both construction works and operation road drainage discharges and accidental spillage.	runoff reducing the operation impact to minor negative.
Hydro-Ecology and Designated Sites		
Hydro-Ecological Receptors	Encroachment by route option of a pNHA (Lough Eidin) on the northeast side of the River Shannon floodplain for almost 730m occurs.	The potential impact on the hydrological regime from the construction of the road and the proposed drainage treatment of the Road is unlikely to result in any significant dewatering and drainage impacts of these wetland habitats and is considered to represent a minor negative impact (3) with the main impact of direct loss of habitat accounted for in the biodiversity section.
Ecological Sites of Local Higher	The route option encroaches ecological sites EC16, EC30 and EC32 that represent wet woodland, scrub and wet grassland habitats within the River Shannon floodplain. The potential impact on hydrology of these habitats is potential drainage effects by the proposed road development involving collector and interceptor ditches, attenuation ponds and outfalls and loading by the road embankment on underlying saturated silt, peaty and alluvial soils resulting in increase drainage flows through displacement of pore water.	The road development traverse through the Lough Eidin pNHA for c. 1.12km associated with encroachment into the River Shannon floodplain area. The impact on drainage of the associated wetland areas and River Shannon Callows will represent a Moderate Negative (2) impact on the hydrological regime of a designated site of national importance.
Designated sites of SAC, SPA, NHA and pNHA	Sediment laden construction runoff reaching such sites and settling out.	There will be no direct impacts on any other designated sites by the proposed road development and the only indirect impacts are likely to be from sediment laden construction runoff entering the River Shannon system and eventually reaching the downstream sites of Lough Boderg, Lough Bofin pNHA and Lough Forbes Complex SAC. The potential impact is considered given the dilution available in the Shannon, distance from the sites and the flow attenuation provided by the River Shannon to represent a minor negative impact.

Dark Green Option Corridor	Description	Impact
Soft Sediment and Poor Ground Conditions		
Soft sediments and poor ground conditions	Soft sediments of peat and alluvium can give rise to construction difficulties requiring either pilling or removal of such sediments with the potential for construction runoff impacts and deposition of unsuitable construction material. Of the 7.98km road mainline length 1.13km is in quaternary identified as cut over peak and 0.17km as alluvium. The soft sediment deposits are primarily located in the floodplain areas along this option with the majority of the soft sediment associated with the River Shannon crossing.	Soft sediments identified from the GSI Quaternary mapping represents 16.2% of the route. It is likely that actual amount encountered may be higher along the River Shannon crossings. This is rated as representing a minor negative impact (3).

Blue West Option Corridor**Table 7.5.10.11 Stage 1 Hydrological Assessment of Blue West Option Corridor**

Blue West Option Corridor	Description	Impact
Floodplains and Flood Risk Areas		
River Shannon Floodplain	The Blue West Option Corridor crosses the River Shannon at the existing Carrick-on-Shannon Bridge and avoids the requirement of a bridge structure within the River Shannon and floodplain and avoids any reduction in flow conveyance or reduction in Flood Storage However, the Existing N4 on the western side of the River Shannon near Carrick View Apartments is within a flood risk area and prone to flooding at the predicted 1 in 1000 year return period flood for a distance of almost 200m. On the eastern side of the River Shannon within Carrick-on-Shannon the N4 is also at risk of flooding and historically has flooded there in December 2015 / January 2016 close to the Landmark Hotel for a distance of 130m in addition to another location with a substantial distance of flood encroachment of circa 360m along the N4 close to the Rosebank Retail Park.	The impact on the River Shannon Floodplain and associated Carrick-on-Shannon Flood Risk areas represents a Neutral impact in the respect to utilizing the existing N4 road with some modifications at junctions etc. Substantial sections of this option that utilizes the existing N4 are identified to be within high flood risk areas and have flooded on a number of occasions in the past with the road having to be closed (1999, 2009, 2015/2016 flood events). The section near the Rosebank Retail Park between the two roundabouts for c. 160m has a probability of flooding at 10% in any given year. The flooding in the River Shannon is prolonged and therefore potential extreme events could have the road closed off to traffic for many days. This is not in keeping with the Flood Risk Management Planning guidelines (2009) for major infrastructure projects and consequently is considered to represent a very significant negative impact (1) in respect to flood risk.
Watercourses		
River Shannon	This option will utilize the existing N4 River Shannon Bridge at Carrick-on-Shannon and will not involve further construction encroachment of the River Shannon Floodplain. This limits the impact on the River Shannon both during construction and operational phases. The entire length of the proposed road option will outfall eventually to the River Shannon via the existing road drainage outfalls discharging directly and to upstream drains and tributaries and	Construction as associated with crossing is avoided by this option and therefore there will be no direct impacts of the flow regime or water quality associated with the road crossing. Given the confined nature of the Blue Option Corridor to the existing N4 this could potentially constrain the ability to control and treat construction water runoff before it enters the adjacent watercourses. The construction footprint will be considerably less than the other route options but nevertheless construction in or near watercourses will be required and therefore the construction impact on water quality in

Blue West Option Corridor	Description	Impact
	a number of direct outfalls to the Shannon in the vicinity of Carrick-on-Shannon.	the River Shannon is considered to represent a minor negative impact from this option. Pollution from the operation stage via the road drainage is rated as minor negative (3).
Minor Watercourses	This option uses the Existing N4 road and therefore the existing culverted watercourses encountered will generally be retained. This minimizes disturbance and construction impacts. Some limited construction works will be involved with this management option but area unlikely to involve replacement or upgrade of existing culverts. Some extension may be required and possibly new culverts under realigned sections of local road to facilitate this option.	Given the confined nature of this Blue Option Corridor to the existing N4 this could potentially constrain the ability to control and treat construction water runoff before it enters the adjacent watercourses. The construction footprint will be considerably less than the other route options but nevertheless some construction in or near watercourses will be required and therefore the overall impact on water quality is considered to represent a minor negative impact and an Imperceptible impact on the hydrological regime of these watercourses. At operation stage the use of the existing N4 will not easily facilitate the treatment and attenuation of storm water prior to its discharge and consequently the operational impact of road runoff on the receiving watercourses is considered to also represent a minor negative impact.
Surface Water Abstractions		
Carrick-on-Shannon Public Water Supply	This corridor crosses the River Shannon downstream of the Carrick-on-Shannon water supply abstraction. At 1.05km downstream there is unlikely to be any water quality impact on this important abstraction source. The crossing utilizes the existing masonry arch River Shannon Bridge and therefore has no direct footprint within the River Shannon that might give rise to construction pollution. However the northwestern section of the Blue Option Corridor for 3.6km at the western N4 tie-in end is upstream of the abstraction and consequently has a potential for construction runoff to enter the River Shannon via a drainage channel and proximity of the River Shannon Floodplain to the corridor and therefore has the potential	The River Shannon has significant dilution available throughout the year from its large catchment and large upstream lakes such that the impact on this attribute from the 3.6km upstream section of road development at construction (limited as option utilizes the existing N4 with modifications) and operation used untreated existing drainage outfalls and over the edge drainage. The construction impact on the water supply is rated as a minor negative impact (3). The routine road drainage discharge at operational stage represents an existing permanent impact on a small proportion of the attribute and therefore given the very high attribute importance given to this feature the potential impact magnitude represents a moderately negative impact (2). The operational spillage risk from an accident involving an HGV on the abstraction point

Blue West Option Corridor	Description	Impact
	during construction to impact the water quality upstream of the abstraction source. At operation phase routine runoff discharges or an accidental spillage has the potential to enter the River Shannon upstream of the abstraction also from this small 3.6km section of corridor.	represents a minor negative impact given its temporary nature.
Hydro-ecology and Designated Sites		
Hydro-ecology and Designated Sites	This option is not identified as encroaching any identified Hydro-ecology Sites along its route not potentially capable of changing the hydrological regime within these sites. The corridor is shown to encroach the Lough Eidin pNHA at its western tie end. However, the existing N4 road which will be utilized for this option is shown to be outside the pNHA and consequently will not result in direct impact. Drainage impacts will be limited as the existing N4 is to be retained with limited construction activities that would give rise to impact or proposed changes in land or road drainage along the option.	The potential impact on the hydrological regime from the construction of the road and the proposed drainage treatment of the Road is unlikely to result in any no significant dewatering and drainage of these wetland habitats and is considered to represent a neutral impact (4) on identified sites. There will be no direct impact on any designated sites by the proposed road development and the only indirect impacts are likely to be from sediment laden construction runoff entering the River Shannon system and eventually reaching the downstream sites of Lough Boderg, Lough Bofin pNHA and Lough Forbes Complex SAC. The potential impact is considered given the dilution available in the Shannon, distance from the sites and the flow attenuation provided by the River Shannon to represent a minor negative impact.
Soft Sediment and Poor Ground Conditions		
Soft Ground	Along the Blue Option Corridor there is considerable sections of Soft Sediments and Poor Ground Conditions. Notwithstanding that, this option has limited construction activities utilizing the existing N4 road. However, some localized works associated with junctions and access roads will be built on soft ground.	The impact of soft ground on the Blue Option Corridor is rated as representing a minor negative impact (3).

Black Option Corridor

The Black Option comprises a new urban street within Carrick-on-Shannon. The option provides connectivity by interconnecting the R280 to the Summerhill Road and on to the Castlecara Road. The option length is approximately 1.2km.

The lands adjacent to the Black Option drain via a number of small drainage channels south southwest to the River Shannon. The contributing catchment area draining by these streams is 1.3km². The flow capacity downstream is limited and therefore road drainage from the Black Option Corridor will require attenuation to prevent downstream impacts and increased flooding, this will be assessed in Phase 3. The western end of this route option encroaches slightly the 100-year flood risk area associated with the River Shannon and the Lisnagat stream. This represents a minor negative impact on flooding and flood risk. The watercourses intercepted by the route heading south southwest are three small streams and two minor drains. The disturbance of these watercourses is rated as a slight negative impact.

This option does not intercept nor discharge directly to the River Shannon and its route drains via the local surface water drains, that downstream are culverted through Carrick-on-Shannon, outfalling to the River Shannon both upstream and downstream of the existing River Shannon Bridge. Importantly the Black Option Corridor drainage enters the River Shannon via the local drains downstream of the Carrick-on-Shannon Public Water Supply abstraction and therefore will not impact this high important regional public water supply source. There are no hydroecological sites along this option nor any impacted downstream.

The route to the north of the Summer Hill Road passes through poor draining peat lands. Soft ground in the form of peat for a length of 430m is present to the northwest of Summerhill Road and alluvium at the eastern end for 105m, almost 45% of the route underlain by potentially soft soil, representing a minor negative impact.

The overall assessment gives a minor negative impact on flooding associated with flooding impact.

Stage 1 Hydrological Assessment- Option Corridors East of Drumsna Junction (Node J)

Yellow Option Corridor

Table 7.5.10.12 Stage 1 Hydrological Assessment of Yellow Option Corridor

Hydrological Attribute	Description	Impact
Floodplains and Flood risk Areas		
Floodplains	This option follows the existing road alignment and therefore avoids direct encroachment into the floodplain area of the River Shannon and the floodplain areas surrounding the lakes at Gortinty Lough and Gortconnellan Lough	There is no direct encroachment into floodplain areas associated with this proposed route and the impact is classified as not significant / neutral (4).
Water courses		
River Shannon Channel	In this eastern section the River Shannon channel is not crossed and the route option avoids its floodplain being an on-line route. However construction works are within close proximity to the floodplain area and the river channel along this section and therefore there is a potential for construction runoff if not controlled and adequately treated to enter the River Shannon via the local drains and streams and via overland routes. The River Shannon provides significant dilution throughout the year due to its large upstream lakes and contributing catchment.	Given the scale of construction activities involved in relatively close proximity to the River Shannon and its floodplain area the construction impact on water quality in the River Shannon is classified as a moderately negative impact (2). Pollution from the operation stage via the road drainage outfalls is rated as minor negative (3).
Watercourses	1 small stream at Drishoge (0.9km² in catchment area). 1 small stream (Foxborough) (3.78km²). 1 small Stream at Crickeen (0.5km²). 1 large stream Gortconnellan Lough Stream (17.1km²). Gortinty Stream (5.6km²). 1 small stream at antfield (0.3km²).	Potential for flow, morphology and flooding local impacts at these streams associated with culvert upgrades and extensions along the upgraded road to meet OPW Section 50 requirements. The disturbance impact of culverting and locally realigning is rated as minor negative impact (3). All of the classified watercourses within the study area are identified by the EPA under the EU water framework directive to be at risk of deterioration in their water quality status. The potential impact on the water quality from a proposed road development construction and operation within the corridor on these

Hydrological Attribute	Description	Impact
	1 small tributary stream of the Cloonmulligan (c .25km²). 14 small drains encountered along route.	watercourses is rated as a local minor negative impact (3). The impact on the local drains is classed at a minor negative impact (3).
Surface Water Resources		
Public Water Supply Abstractions	The Carrick-on-Shannon Public Water Supply Abstraction location is 12km upstream of eastern options and will not be impacted by the proposed route option (Neutral 4). The nearest public water abstraction point downstream is the Longford water supply scheme which abstracts water from Lough Forbes. This Lough is sufficiently downstream, almost 12km downstream of Faulties and the supply is fully treated and disinfected and therefore will not be significantly impact by the proposed route option either during construction or operation phases.	The impact rating on the Carrick-on-Shannon surface water abstraction is neutral (4). The impact rating on the downstream Lough Forbes surface water abstraction is moderately negative (2) arising from a temporary potential HGV accidental spillage risk with the attenuation and storm water treatment included in the design.
Hydro-Ecology and Designated Sites		
Hydro-Ecological Receptors SAC, SPA, NHA and pNHA	There is no direct encroachment by the route option of any designated site (SAC, pNHA, NHA or SPA).	There will be no direct impact on any designated sites by the proposed options between Drumsna Junction and Faulties. The only indirect impacts are likely to be from sediment laden construction runoff entering the River Shannon system and eventually reaching the downstream sites of Lough Boderg, Lough Bofin pNHA and Lough Forbes Complex SAC. The potential construction impact on water quality within downstream SAC is considered to represent a moderately negative impact (2), given the distance and attenuation provided by the River Shannon. The impact of the road drainage outfalls on the water quality of the downstream SAC is considered to represents a moderately negative impact. The impact of a major HGV Spillage on the water quality of the SAC is of low risk but

Hydrological Attribute	Description	Impact
Ecological Sites of Local Higher	The route option runs adjacent to ecological sites EC99 representing wet woodland and wet grassland at Derryoughter and EC105 lake and associated wetland and wet woodland at Gortinty Lough. The potential impact on hydrology of these habitats is potential drainage effects by the proposed road development involving collector and interceptor ditches, attenuation ponds and outfalls and loading by the road embankment on underlying saturated silt, peaty and alluvial soils resulting in increased drainage flows through displacement of pore water. Sediment laden construction runoff reaching such sites and settling out.	given the extremely high importance attribute of this receptor the impact is assessed as a moderately negative impact. Some slight encroachment of EC105 will occur. There is likely to be local drainage effects on these sites from the proposed road construction and road embankment drainage which may result in very localized drying of such habitat immediately adjacent to the road embankment and associated toe drains. This represents a minor negative impact (3). The potential construction impact on water quality within these sites is considered to represent a minor negative impact (3).
Soft Sediment and Poor Ground Conditions		
Soft sediments and poor ground conditions	Soft sediments of peat and alluvium can give rise to construction difficulties requiring either pilling or removal of such sediments with the potential for construction runoff impacts and deposition of unsuitable construction material. Of the 9.88km road mainline length 1.58km is in quaternary identified as Cut over peak and 0.414km as alluvium. The soft sediment deposits are primarily located in the floodplain areas along this option with the majority of the soft sediment associated with the Shannon crossing.	Soft sediments identified from the GSI Quaternary mapping represents 20.2% of the route in section B. This is rated as representing a minor negative impact (3).

Green Option Corridor**Table 7.5.10.13 Stage 1 Hydrological Assessment of Green Option Corridor**

Hydrological attributes	Description	Impact
Floodplains and Flood Risk Areas		
Floodplains	This Option follows the existing road alignment and therefore avoids direct encroachment into the floodplain area of the River Shannon and the floodplain areas surrounding the lakes at Gortinty Lough and Gortconnellan Lough.	There is no direct encroachment into floodplain areas associated with this proposed route and the impact is classified as not significant or neutral (4).
Water courses		
River Shannon Channel	In this eastern section the River Shannon channel is not crossed, and the route option avoids its floodplain being an on-line route. However, construction works are within close proximity to the floodplain area and the river channel along this section and therefore there is a potential for construction runoff if not controlled and adequately treated to enter the River Shannon via the local drains and streams and via overland routes. The River Shannon provides significant dilution throughout the year due to its large upstream lakes and contributing catchment.	Given the scale of construction activities involved in relatively close proximity to the River Shannon and its floodplain area the construction impact on water quality in the River Shannon is classified as a moderately negative impact (2). Pollution from the operation stage via the road drainage outfalls is rated as minor negative (3).
Water courses	1 small stream at Drishoge (0.9km² in catchment area). 1 small stream Foxborough (3.78km²). 1 small Stream at Crickeen (0.5km²). 1 large stream Gortconnellan Lough Stream (17.1km²). Gortinty Stream (5.6km²). 1 small stream at Antfield (0.3km²).	Potential for flow, morphology and flooding local impacts at these streams associated with culvert upgrades and extensions along the upgraded road to meet OPW Section 50 requirements. The disturbance impact of culverting and locally realigning is rated as minor negative impact (3) All of the classified watercourses within the study area are identified by the EPA under the EU water framework directive to be at Risk of deterioration in their water quality status. The potential impact on the water quality from a proposed road development construction and operation within the corridor on these watercourses is

Hydrological attributes	Description	Impact
	1 small tributary stream of the Cloonmulligan (c .25km ²). 14 small drains encountered along route.	rated as a local minor negative impact (3) The impact on the local drains is classed at a minor negative impact (3)
Surface Water Resources		
Public Water Supply Abstractions	The Carrick-on-Shannon Public Water Supply Abstraction location is 12km upstream of the eastern options and will not be impacted by the proposed route option neutral (4). The nearest public water abstraction point downstream is the Longford water supply scheme which abstracts water from Lough Forbes. This Lough is sufficiently downstream, almost 12km from Faulties and the supply is fully treated and disinfected and therefore will not be significantly impact by the proposed route option either during construction or operation phases.	The impact rating on the Carrick-on-Shannon surface water abstraction is neutral (4). The impact rating on the downstream Lough Forbes surface water abstraction is moderately negative (2) arising from a potential HGV accidental spillage risk with the attenuation and storm water treatment included in the design.
Hydro-Ecology and Designated Sites		
Hydro-Ecological Receptors SAC, SPA, NHA and pNHA	There is no direct encroachment by the route option of any designated site (SAC, pNHA, NHA or SPA).	There will be no direct impact on any designated sites by the proposed route option between Drumsna Junction and Faulties. The only indirect impacts are likely to be from sediment laden construction runoff entering the River Shannon system and eventually reaching the downstream sites of Lough Boderg, Lough Bofin pNHA and Lough Forbes Complex SAC. The potential construction impact on water quality within downstream SAC is considered to represent a moderately negative (2), given the distance and attenuation provided by the River Shannon. The impact of the road drainage outfalls on the water quality of the downstream SAC is considered to represents a moderately negative (2). The impact of a major HGV Spillage on the water quality of the SAC is of low risk, but given the extremely high importance

Hydrological attributes	Description	Impact
Ecological Sites of Local Higher	The route option runs adjacent to ecological sites EC99 representing wet woodland and wet grassland at Derryoughter and EC105 lake and associated wetland and wet woodland at Gortinty Lough. The potential impact on hydrology of these habitats is potential drainage effects by the proposed road development involving collector and interceptor ditches, attenuation ponds and outfalls and loading by the road embankment on underlying saturated silt, peaty and alluvial soils resulting in increased drainage flows through displacement of pore water. Sediment laden construction runoff reaching such sites and settling out.	attribute of this receptor the impact is assessed as a moderately negative (2). Some slight encroachment of EC105 will occur. There is likely to be local drainage effects on these sites from the proposed road construction and road embankment drainage which may result in very localized drying of such habitat immediately adjacent to the road embankment and associated toe drains. This represents a minor negative impact (3). The potential construction impact on water quality within these sites is considered to represent a minor negative impact (3).
Soft Sediment and Poor Ground Conditions		
Soft sediments and poor ground conditions	Soft sediments of peat and alluvium can give rise to construction difficulties requiring either pilling or removal of such sediments with the potential for construction runoff impacts and deposition of unsuitable construction material.	Soft sediments identified from the GSI Quaternary mapping represents 20.6% of the route. This is rated as representing a minor negative impact (3).

Hydrological attributes	Description	Impact
	Of the 9.9km road mainline length 1.601km is in quaternary identified as Cut over peak and 0.414km as alluvium. The soft sediment deposits are primarily located in the floodplain areas along this option with the majority of the soft sediment associated with the Shannon crossing.	

Purple East Option Corridor**Table 7.5.10.14 Stage 1 Hydrological Assessment of Purple East Option Corridor**

Hydrological Attributes	Description	Impact
Floodplains and Flood risk Areas		
Floodplains	This option follows the existing road alignment but has a much wider footprint associated with it being a dual carriageway. The option slightly encroaches the River Shannon Floodplain at Tully and again to the south of Gortconnellan Lough and encroaches the northeastern flood area of Gortinty Lough.	The Encroachment of the River Shannon Floodplain and the floodplain of Gortinty Lough by this option represents a minor negative impact (3). on the flooding and the hydrological regime.
Water courses		
River Shannon Channel	In this eastern section the River Shannon channel is not crossed and the route option avoids its floodplain being an on-line route. However construction works are within close proximity to the floodplain area and the river channel along this section and therefore there is a potential for construction runoff if not controlled and adequately treated to enter the River Shannon via the local drains and streams and via overland routes. The River Shannon provides significant dilution throughout the year due to its large upstream lakes and contributing catchment.	Given the scale of construction activities involved in relatively close proximity to the River Shannon and its floodplain area the construction impact on water quality in the River Shannon is classified as a moderately negative impact (2). Pollution from the operation stage via the road drainage outfalls is rated as minor negative (3).
Water courses	1 small stream at Drishoge (0.9km² in catchment area). 1 small stream Foxborough (3.78km²). 1 small Stream at Crickeen (0.5km²). 1 large stream Gortconnellan Lough Stream (17.1km²). Gortinty Stream (5.6km²).	Potential for flow, morphology and flooding local impacts at these streams associated with culvert upgrades and extensions along the upgraded road to meet OPW Section 50 requirements. The disturbance impact of culverting and locally realigning is rated as a minor negative impact (3). All of the classified watercourses within the study area are identified by the EPA under the EU water framework directive to be at Risk of deterioration in their water quality status. The potential impact on the water quality from a proposed road development construction and operation

Hydrological Attributes	Description	Impact
	1 small stream at Antfield (0.3km²). 1 small tributary stream of the Cloonmulligan (c .25km²). 14 small drains encountered along route.	within the corridor on these watercourses is rated as a minor negative impact (3). The impact on the local drains is classed at a minor negative impact (3).
Surface Water Resources		
Public Water Supply Abstractions	The Carrick-on-Shannon Public Water Supply Abstraction location is many 12km upstream of Tully options and will not be impacted by the proposed route option (Neutral 4). The nearest public water abstraction point downstream is the Longford water supply scheme which abstracts water from Lough Forbes. This Lough is sufficiently downstream, almost 12km downstream of end of the scheme near Faulties and the supply is fully treated and disinfected and therefore will not be significantly impact by the proposed route option either during construction or operation phases.	The impact rating on the Carrick-on-Shannon surface water abstraction is neutral (4). The impact rating on the downstream Lough Forbes surface water abstraction is moderately negative (2) arising from a potential HGV accidental spillage risk with the attenuation and storm water treatment included in the design.
Hydro-Ecology and Designated Sites		
Hydro-Ecological Receptors SAC, SPA, NHA and pNHA	There is no direct encroachment by the route option of any designated site (SAC, pNHA, NHA or SPA).	There will be no direct impact on any designated sites by the proposed route option between Drumsna Junction and Faulties. The indirect impacts are likely to be from sediment laden construction runoff entering the River Shannon system and eventually reaching the downstream sites of Lough Bodergh, Lough Bofin pNHA and Lough Forbes Complex SAC. The potential construction impact on water quality within downstream SAC is considered to represent a moderately negative (2) given the distance and attenuation provided by the River Shannon. The impact of the road drainage outfalls on the water quality of the downstream SAC is considered to represents a moderately negative (2).

Hydrological Attributes	Description	Impact
Ecological Sites of Local Higher	The route option runs adjacent to ecological sites EC99 representing wet woodland and wet grassland at Derryougher and EC105 lake and associated wetland and wet woodland at Gortinty Lough. The potential impact on hydrology of these habitats is potential drainage effects by the proposed road development involving collector and interceptor ditches, attenuation ponds and outfalls and loading by the road embankment on underlying saturated silt, peaty and alluvial soils resulting in increased drainage flows through displacement of pore water. Sediment laden construction runoff reaching such sites and settling out.	The impact of a major HGV Spillage on the water quality of the SAC is of low risk but given the extremely high importance attribute of this receptor the impact is assessed as a moderately negative impact (2). Some slight encroachment of EC105 will occur. There is likely to be local drainage effects on these sites from the proposed road construction and road embankment drainage which may result in very localized drying of such habitat immediately adjacent to the road embankment and associated toe drains. This represents a minor negative impact (3).
Soft Sediment and Poor Ground Conditions		
Soft sediments and poor ground conditions	Soft sediments of peat and alluvium can give rise to construction difficulties requiring either pilling or removal of such sediments with the potential for construction runoff impacts and deposition of unsuitable construction material. Of the 9.9km road mainline length 1.35km is in quaternary identified as Cut over peak and 0.477km as alluvium. The soft sediment deposits are primarily located in the floodplain areas along this option with the majority of the soft sediment associated with the Shannon crossing.	Soft sediments identified from the GSI Quaternary mapping represents 19.7% of the route. This is rated as representing a minor negative impact (3).

Blue East Option Corridor**Table 7.5.10.15 Stage 1 Hydrological Assessment of Blue East Option Corridor**

Hydrological Attributes	Description	Impact
Floodplains and Flood Risk Areas		
Floodplains	The Blue Option Corridor uses the existing N4 road alignment and therefore avoids any direct encroachment into the floodplain area of the River Shannon and the floodplain areas surrounding the lakes at Gortinty Lough and Gortconnellan Lough.	There is no direct encroachment into floodplain areas associated with this proposed route and the impact is classified as neutral (4).
Water courses		
River Shannon Channel	In this option the River Shannon channel is not crossed and the route option avoids its floodplain. Being a management option of the existing N4 road the construction activities in this section will be limited and therefore likely to have a imperceptible impact on the nearby watercourses and the River Shannon. The river Shannon provides significant dilution throughout the year due to its large upstream lakes and contributing catchment and therefore any limited construction and construction runoff will have imperceptible impact on water quality.	Given the minor scale of construction activities involved in the management upgrade of the existing N4 no significant construction activities that might give rise to construction pollution of the nearby River Shannon the construction impact on water quality in the River Shannon is classified as a minor negative impact (3). Pollution from the operation stage via the existing road drainage outfalls on the N4 is rated as minor negative impact (3).
Water courses	This option uses the Existing N4 road and therefore the existing culverted watercourses encountered will generally be retained. This minimizes disturbance and construction impacts. Some limited construction works will be involved with this management option but area unlikely to involve replacement or upgrade of existing culverts. Some extension may be required and possibly new culverts under realigned sections of local road to facilitate this option.	Given the confined nature of the Blue Option Corridor to the existing N4, this could potentially constrain the ability to control and treat construction water runoff before it enters the adjacent watercourses. The construction footprint will be considerably less than the other route options but nevertheless some construction in or near watercourses will be required and therefore the overall impact on water quality is considered to represent a minor negative impact and an imperceptible impact on the hydrological regime of theses watercourses. At operation stage the use of the existing N4 will not easily facilitate the treatment and attenuation of storm water prior to its

Hydrological Attributes	Description	Impact
		discharge and consequently the operational impact of road runoff on the receiving watercourses is considered to also represent a minor negative impact.
Surface Water Resources		
Public Water Supply Abstractions	The Carrick-on-Shannon Public Water Supply Abstraction location is 12km upstream of the eastern options and will not be impacted by the proposed route option (neutral - 4). The nearest public water abstraction point downstream is the Longford water supply scheme which abstracts water from Lough Forbes. This Lough is sufficiently downstream, almost 12km downstream of Faulties and the supply is fully treated and disinfected and therefore will not be significantly impact by the proposed route option either during construction or operation phases.	The impact rating on the Carrick-on-Shannon surface water abstraction is neutral (4). The impact rating on the downstream Lough Forbes surface water abstraction is moderately negative (2) from an HGV accidental spillage risk as the existing drainage will be used which has no retention and storm water treatment provided.
Hydro-Ecology and Designated Sites		
Hydro-Ecological Receptors	There is no direct encroachment by the route option of any designated site (SAC, pNHA, NHA or SPA).	There will be no direct impact on any designated sites by the proposed route option between Drumsna and Faulties. The indirect impacts are likely to be from sediment laden construction runoff entering the River Shannon system and eventually reaching the downstream sites of Lough Bodergh, Lough Bofin pNHA and Lough Forbes Complex SAC.
Ecological Sites of Local Higher	The route option runs adjacent to ecological sites EC99 representing wet woodland and wet grassland at Derryoughter and EC105 lake and associated wetland and wet woodland at Gortinty Lough.	The potential construction impact on water quality within downstream SAC is considered to represent an imperceptible neutral impact (4) given the distance and attenuation provided by the River Shannon and the limited constructional activities involved.
Designated sites SAC, SPA, NHA and pNHA	The use of the existing N4 road will avoid causing additional drainage effects on nearby wetland habitats and will significantly limit construction activities to road management activities (i.e. access roads and junctions). The existing road drainage system will be retained by this	The impact of the road drainage outfalls on the water quality of the downstream SAC is considered to represents a moderately negative (2) impact due to the available River Shannon dilution. The impact of a major HGV Spillage on the

Hydrological Attributes	Description	Impact
	option and therefore routine road runoff will discharge without additional treatment and attenuation to the watercourses and eventually into the River Shannon. Sediment laden construction runoff reaching such sites and settling out will be minor given the limited construction activities involved with this option.	water quality of the SAC is of low risk but given the extremely high importance attribute of this receptor the impact is assessed as a moderately negative impact.
Soft Sediment and Poor Ground Conditions		
Soft sediments and poor ground conditions	Soft sediments of peat and alluvium can give rise to construction difficulties requiring either pilling or removal of such sediments with the potential for construction runoff impacts and deposition of unsuitable construction material. This option represents very limited construction works and as such handling of the poor ground conditions will not be a significant factor.	Soft sediments identified from the GSI Quaternary mapping represents c. 20% of the Option Corridor Length. However as the existing road is to be retained the impact of poor ground conditions is rated as representing a neutral impact (4).

Table 7.5.10.16 Stage 1 Hydrology Summary Assessment Matrix of Options West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION
Floodplains and Flood Risk Areas	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Minor or Slightly Negative
River Shannon Watercourse	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Minor or Slightly Negative	Not Significant or Neutral
Minor Watercourses	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Surface Water Resources	Moderately Negative	Moderately Negative	Major or Highly Negative	Major or Highly Negative	Moderately Negative	Not Significant or Neutral
Hydro-ecology and designated sites	Minor or Slightly Negative	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Minor or Slightly Negative	Moderately Negative
Soft Sediments and Poor Ground Conditions	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Scoring						
Qualitative Assessment	Moderately Negative	Moderately Negative	Major Negative	Major Negative	Moderately Negative	Minor or Slightly Negative
Score / Impact Level	2	2	1	1	2	3
Preference	Intermediate	Intermediate	Least Preferred	Least Preferred	Preferred	N/A

Table 7.5.10.17 Stage 1 Hydrology Summary Assessment Matrix of Options East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Floodplains and Flood Risk Areas	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Negative	Not Significant or Neutral
River Shannon Watercourse	Moderately Negative	Moderately Negative	Moderately Negative	Minor or Slightly Negative
Minor Watercourses	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Surface Water Resources	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Hydro-ecology and designated sites	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Soft Sediments and Poor Ground Conditions	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Not Significant or Neutral
Scoring				
Qualitative Assessment	Moderately Negative	Moderately Negative	Moderately Negative	Minor Negative
Score / Impact Level	2	2	2	3
Preference	Intermediate	Intermediate	Intermediate	Preferred

7.5.10.5 Summary

Standalone Black Corridor Assessment

The Black Option representing 1.2km urban street improvement will have an overall minor negative impact on hydrology in terms of flooding and flood risk and minor impact in respect to on watercourses and soft ground. It has been assessed as a stand-alone option and is not compared with other options in the section.

Option Corridors to the West of Drumsna Junction (Node J)

The Blue West Option Corridor which is a management option of the existing N4 road is identified as having the highest score. This reflects lower hydrological impacts than the other options as a result of less requirement for construction work, retention of existing culverts and avoiding a new bridge crossing of the River Shannon and its floodplains. However, this option is not without significant impact in respect to Flood Risk whereby large section of the existing road is within the 100-year flood risk (Zone A) inundation zone both to the east and west of the River Shannon Bridge at Carrick-on-Shannon. A 150m section has been identified as flooding more frequently than a 1 in 10-year flood return period event which would result in road closure and diversions for many days during such events. Taking account of climate change in respect to flooding this is likely to increase in frequency in the medium term (i.e. over the next 50 years) to every other year. The Blue West Option Corridor will also retain the existing road storm drainage which does not meet current design standards in terms of attenuation and storm water quality treatment with almost 5km of the option located upstream of the highly important water abstraction public water supply source from the River Shannon. This represents a moderate negative impact. However, when compared to the other four Option Corridors to the west of Drumsna Junction (Node J) the Blue West Option Corridor scores slightly better and is the Preferred Option from a hydrological perspective.

The remaining options to the west of Drumsna Junction (Node J) are very similar in terms of their overall hydrological impact quantitative rating of major negative (1) and moderate negative (2). The key criterion that affects the differences between the northern options (Dark Green and Purple Option Corridors) and the southern options (Orange and Cyan Option Corridors) preference is impact on flood risk and impact on the Carrick-on-Shannon public water supply abstraction source from the River Shannon. The abstraction location is 1km upstream of Carrick-on-Shannon Bridge and therefore driving the decision between crossing the River Shannon upstream or downstream of Carrick-on-Shannon. All crossings will involve a major bridge structure and local interference with the floodplain and potentially the river channel at the crossing point. The crossings of the River Shannon both upstream and downstream will involve infilling and loss of floodplain area which will slightly impact the Carrick-on-Shannon flood risk area. The downstream crossings, Orange and Cyan Options Corridor, through generation of bridge afflux will potentially impact the Carrick-on-Shannon flood risk area with a greater impact than the upstream crossings for Purple and Dark Green Option Corridors. However given the “Very High” attribute status of the River Shannon Floodplain and the Carrick-

on-Shannon flood risk area the impacts of all upstream and downstream options are quantified as a major negative impact. From a flooding and flood risk only perspective the Preferred Option would be a crossing upstream with Dark Green more preferred than Purple in terms of slightly lesser floodplain encroachment. In respect to Surface Water Resources and the impact on the Carrick-on-Shannon drinking water abstraction and potentially public health concerns, the upstream crossing options are least preferred as there is a much higher risk of water quality impacts on the source both at construction and operation phases than the downstream crossing options.

The Cyan and Orange Option Corridors can only potentially impact this water supply source via the small section of route at their respective western tie-in locations that drain to the River Shannon via the small tributaries that enter the River Shannon. These enter the River Shannon on the opposite bank, upstream of the abstraction point, and therefore the impact assessed as moderate negative but significantly less impacting than the upstream options. Therefore from a hydrological impact the preference is for a downstream crossing option with the Orange Option Corridor being preferred over the Cyan Option Corridor as the Orange Option Corridor has a smaller impact on the Knockananima Stream flood risk area and only a 600m corridor length draining the Shannon upstream of the abstraction point.

Option Corridors to the East of Drumsna Junction (Node J)

For the eastern section there are four Option Corridors Blue East, Yellow, Green and Purple East. The overall impact of these options is a minor negative for the Blue East Option Corridor and moderate negative for the other three options. Therefore, the Blue option is Preferred representing minor negative impact and the Yellow, Green and Purple are given Intermediate preference and represent moderate negative impact scores.

General Conclusion

There are no identified profound impacts associated with any of the Stage 1 Option Corridors and the potential impact to the Carrick-on-Shannon public water supply abstraction source can potentially be reduced through mitigation both for construction and operation phases to reduce the potential risk to a regionally important water supply. The impact on flooding caused by the River Shannon bridge crossing cannot be fully mitigated but can be reduced through the design phase to ensure that flood conveyance is not significantly impeded by any potential bridge structures.

7.5.11 Stage 1 Hydrogeology Option Assessment

7.5.11.1 Introduction

This section details the Stage 1 Assessment of the Options with respect to the hydrogeological constraints identified in Section 4.5 Hydrogeology of this report.

The hydrogeological constraints are presented with the Stage 1 Options on Figures 7.5.11.1.0 to 7.5.11.3.5.

Section 7.5.11.2 outlines the methodology that was used to carry out the study, including the assessment criteria. The assessment criteria is presented in Section 7.5.11.3 with Section 7.5.11.4 dealing with the Stage 1 Assessment of the Options.

The options included in this assessment fall under the following headings:

- Do-minimum Option (Planned and Committed Projects)
- Management Option (on-line improvements, and traffic management measures as described in Section 7.1.2 of this document)
- Do-Something Road Based Options

A total of ten Option Corridors have been taken forward to the preliminary options as described in Section 7.1.2 of this report. There are six option corridors to the west of node J at Drumsna Junction (Purple West, Dark Green, Black, Orange, Cyan and Blue West) and three option corridors to the east of Node J at Drumsna Junction (Blue East, Purple East, Green and Yellow).

7.5.11.2 Methodology

This assessment was prepared in accordance with the requirements of the National Roads Authority (NRA) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, NRA 2009⁶³.

In line with these Guidelines, the assessment study area for this Stage 1 Option Corridors Assessment is a 300m wide corridor within which the fenceline may move. The assessment is carried out within the 300m wide corridors for all the Option Corridors.

The NRA Guidelines⁶³ provide criteria for ranking of the identified hydrogeological constraints within the assessment study area. The criteria are presented in Section 4.14 Hydrogeology. Criteria for rating an impact significance that may arise at each hydrogeological constraint are provided within Box 4.4 of the NRA Guidelines and in Table 7.5.11.1. The impact significance assessment takes into account the attribute importance and the predicted scale and duration of the likely impacts.

⁶³ NRA (2009) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

Table 7.5.11.1 Criteria for Rating Impact Significance at Route Selection Stage – Rating of Significant Environmental Impacts at Route Selection Stage from Box 4.4 of the Guidelines⁶³

Impact Level	Attribute Importance				
	Extremely High**	Very High	High	Medium	Low
Profound	Any permanent impact on attribute	Permanent impact on significant proportion of attribute			
Significant	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on Significant proportion of attribute		
Moderate	Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute	
Slight		Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute
Imperceptible			Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute

***In rating impacts on an 'European site' account must be taken of Article 6(3) and 6(4) of the Habitats Directive (Council Directive 92/43/EEC). Also see guidance contained within Guidelines for Assessment of Ecological Impacts of National Road Schemes (Rev 2, National Roads Authority, 2008)*

The NRA Guidelines qualitative significance rating of environmental impacts have been correlated with the equivalent qualitative and quantitative assessment scores from the TII Project Appraisal Guidelines for National Roads (PAG) Unit 7.0 - Multi-Criteria Analysis2 (listed in Table 7.3.1). The correlation is shown in Table 7.5.11.2. It should be noted that only negative potential impacts are considered in the NRA Guidelines whereas the TII PAG2 multi-criteria assessment is based on the seven point scale presented in Table 7.3.1 of this report.

Table 7.5.11.2 Correlation of NRA Guidelines Significance Rating to an Equivalent TII PAG score

Significance Rating (NRA Guidelines ⁶³)	Equivalent PAG (Description)	Equivalent PAG (Value)
Profound	Major or Highly Negative	1
Significant	Major or Highly Negative	1
Moderate	Moderately Negative	2
Slight	Minor or Slightly Negative	3
Imperceptible	Not Significant or Neutral	4

The final stage of the assessment methodology was to ensure that the requirements of the TII PAG Unit 7.0 - Multi-Criteria Analysis² were also met by assigning a score to each option corridor based on the scoring procedure within these Guidelines. Where a positive score is assigned, they are from the TII PAG scoring system.

Using the impact scores and professional judgement, the preferred, intermediate or least preferred corridors were identified.

The option corridor study comprised a desk study and site visit collating the hydrogeological information available (Constraints Study, Section 4.14).

7.5.11.3 Assessment Criteria

In line with NRA Guidelines, the hydrogeological attributes which are considered in the Option Corridors assessment are presented in Table 7.5.11.3. This table also outlines the assessment criteria that will be applied to each of these features.

Table 7.5.11.3 Hydrogeological Assessment Criteria Summary

Hydrogeological Features to be Assessed	Means of Assessment of Potential Impacts
Karst features along each corridor and the risk presented to them by the road scheme	The proximity to the feature. The length of the corridor within feature protection zone or zone of contribution.
The classification and extent of aquifers underlying each corridor and increased risk presented to them by road scheme	Aquifer classification. Extent of aquifer – provided as the length of the corridor as a percentage which is underlain by a particular aquifer classification. Aquifer vulnerability – provided as the length of the corridor, as a percentage, which is underlain by aquifer which is classified as extreme vulnerability. Removal of subsoil cover or part of aquifer (cuttings along corridors) which may give rise to changes in groundwater level and change in aquifer vulnerability.

Hydrogeological Features to be Assessed	Means of Assessment of Potential Impacts
High yielding water supply wells and springs and increased risk presented by the road scheme	The proximity to the feature. The length of the corridor within protection zone or zones of contribution.
Groundwater dependant habitats and the risk presented to them by the road scheme	The proximity and the position (upgradient or downgradient) to the feature. Removal of subsoil cover or part of aquifer (cuttings along corridor) which may give rise to changes in groundwater level. Removal of part of the habitat by the option corridor.

It should be noted that other low importance hydrogeological features were gathered during the desk study phase of the constraints study and are presented in Section 4.14. This information was gathered to provide the wider context of the scheme, however, the features listed in Table 7.5.11.3 have been used in this assessment to compare the Option Corridors and identify a Preferred Option.

7.5.11.4 Stage 1 Option Corridors Assessment

Karst

There are no significant karst features identified along any of the Option Corridors. Some karst spring type features were identified during the site walkover, however these were relatively minor drainage features and as such are not assigned a feature importance. Therefore, with regard to karst landforms and features all the corridors are considered Neutral.

Aquifer Classification and Groundwater Bodies

The aquifers identified in the constraints study are presented in Section 4.14 of the Constraints Study. The potential impact on the aquifer along each corridor is a combination of the type and extent of the aquifer, aquifer vulnerability and presence of deep cuttings (removal of soil and/or rock to road design elevations) along each option corridor.

The corridors west of Node J are underlain by Regionally Important Aquifer where the bedrock is karstified and dominated by conduit flow (Rkc). East of Node J the area is underlain by three types of aquifers; a Regionally Important Aquifer where the bedrock is karstified and dominated by conduit flow (Rkc), Locally Important Aquifer where the bedrock is generally moderately productive (Lm) and Poor Aquifer where the bedrock is generally unproductive only in local zones (Pl).

In this assessment the aquifer extent and type for the corridors are compared by the depth of cutting in each aquifer type. Cuts between 5 and 10m in depth are considered to be a permanent impact on a small proportion of the aquifer. Cuts greater than 10m in depth are considered to be a permanent impact on a significant proportion of the aquifer.

Roads constructed in deep cuttings can impact on the groundwater by causing dewatering of the groundwater in the vicinity. The deeper the cutting the more significant and more extensive the impact. In addition, the removal of the soil and bedrock in the excavation will increase the vulnerability of the aquifer at that location, as vulnerability is largely dependent on the depth and permeability of subsoil above the aquifer. The potential change in aquifer vulnerability as a result of cutting is be calculated based on the existing elevation at the option centreline, the proposed cutting at the centreline according to the proposed option design and the underlying ground condition properties.

The assessment considers both the increase in Extreme vulnerability areas as a result of development, and the total extent of the route option underlain by Extreme vulnerability aquifers.

The results of the assessment on the aquifers from options west of Node J are summarised in Table 7.5.11.4 and results for the options east of Node J are summarised in Table 7.5.11.5. All the options include cuts greater than 5m deep with the exception of the Green Option where all cuts are less than 5m deep and the Blue West and Blue East Options where no cutting is proposed. The blue option corridors are located in both the western part and the eastern part of the study area.

Table 7.5.11.4 Assessment of Aquifers West of Drumsna Junction (Node J)

Assessment Criteria		CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Assessment of impact on Aquifer classification	Aquifer classification	Rkc	Rkc	Rkc	Rkc	Rkd	Rkc
	Attribute importance	High	High	High	High	High	High
	Total length of cut 5 to 10m (m)	290	100	1420	1080	0	140
	Total length of cut >10m (m)	100	0	330	570	0	0
Assessment of the increase in aquifer vulnerability	Total length of extreme (E), existing conditions (m)	5,200	3,810	1,870	1,210	5940	0
	Total length of extreme (E), proposed design conditions (m)	5,340	3,880	2,130	1,980	5940	0
	Increase in extreme (E) vulnerability (m)	140	70	260	770	0	0
Assessment Summary	Significance rating (NRA Guidelines ⁶³)	Significant	Moderate	Significant	Significant	Imperceptible	Moderate
	Equivalent PAG (Description)	Major or Highly Negative	Moderately Negative	Major or Highly Negative	Major or Highly Negative	Not Significant or Neutral	Moderately Negative
	Equivalent PAG (Value)	1	2	1	1	4	2

Table 7.5.11.5 Assessment of Aquifers East of Drumsna Junction (Node J)

Assessment Criteria		GREEN OPTION CORRIDOR			YELLOW OPTION CORRIDOR			PURPLE EAST OPTION CORRIDOR			BLUE EAST OPTION CORRIDOR		
Assessment of impact on Aquifer classification	Aquifer classification	Rkc	Lm	Pl	Rkc	Lm	Pl	Rkc	Lm	Pl	Rkc	Lm	Pl
	Attribute importance	High	Medium	Low	High	Medium	Low	High	Medium	Low	High	Medium	Low
	Total length of cut 5 to 10m (m)	0	0	0	0	60	230	0	280	140	0	0	0
	Total length of cut >10m (m)	0	0	0	0	0	0	0	0	0	0	0	0
Assessment of the increase in aquifer vulnerability	Total length of extreme (E), existing conditions (m)	610	1,420	1,060	610	1,380	1,020	620	1,610	920	610	1420	1060
	Total length of extreme (E), proposed design conditions (m)	610	1,420	1,060	610	1,400	1,020	620	1,610	920	610	1420	1060
	Increase in extreme (E) vulnerability	0	0	0	0	20	0	0	0	0	0	0	0
Assessment Summary	Significance rating (NRA Guidelines ⁶³)	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Slight	Imperceptible	Imperceptible	Slight	Imperceptible	Imperceptible	Imperceptible	Imperceptible
	Equivalent PAG (Description)	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Negative	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Negative	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
	Equivalent PAG (Value)	4	4	4	4	3	4	4	3	4	4	4	4

Groundwater Resources

Groundwater sources are not considered in the option comparison assessment as there are no high yield water supply springs and wells i.e. public water supplies or group water scheme supplies along the corridors. No Source Protection Zones associated with public or group groundwater supply schemes are located along the option corridors.

The majority of groundwater abstraction wells identified within the corridors are of low importance. The NRA Guidelines suggests that little or no weighting should be given to the number of such wells along each corridor and/or their distance from the centre line when assessing relative impacts. In the case of low yielding water supply wells, the ranking of the level of potential impact is unnecessary, as wells will either have to be replaced or removed.

Groundwater Contamination

There are no discharge and emissions licensed facilities identified within any of the option corridors.

A number of abandoned and historical quarries and pits have been identified within the option corridors west of Node J, refer to Figures 4.15.4.0 to 4.15.4.5 for further details. However, the potential for the contamination of groundwater from these quarries is expected to be insignificant and therefore with regard to groundwater contamination all the corridors are considered Neutral.

Groundwater Flooding

There are no areas of historic groundwater flooding within any of the option corridors. Therefore, with regard to groundwater flooding all the corridors are considered Neutral.

Hydro-ecology

Groundwater dependent habitats which are present within the assessment study area of the corridors comprise Lough Eidin proposed Natural Heritage Area (pNHA) and undesignated areas of Annex I Habitat including Alluvial Forests [*91E0], Transition Mires and Quaking Bogs [7140] and Bog Woodland [*91D0]. These undesignated areas are labelled “ECxx” with the xx being a numeral for each site. Refer to Figures 7.12.0 to 7.12.6. Biodiversity impacts on groundwater dependent habitats are assessed as part of the biodiversity option corridors assessment. The hydrogeological assessment of groundwater dependent habitats focuses on the groundwater components of the features i.e. changes to groundwater level which may impact recharge to the feature, or changes to groundwater quality.

The proximity of the habitat to the corridor is considered with regard to increased pollution risk from untreated surface water run-off or accidental spillage of fuel from the road affecting groundwater quality. However, as per Section 4.4 of the NRA Guidelines, the assessment has considered the application of standard mitigation and best practice during construction is unambiguous and success is highly likely. Therefore, it is assumed that standard drainage design measures will

be put in place to reduce the risk of run-off from the road affecting groundwater quality, reducing this risk.

Based on the potential dewatering assumption noted in Section 7.5.11.4, the presence of dewatering associated with deep cuttings is assessed in conjunction with the options located up or down gradient of the habitat for the potential impact to groundwater level.

If part of the habitat may be removed by an option corridor, impact to the general groundwater regime in this area is considered. Note: the area within the option corridor has been used to establish if an option may directly impact the habitat.

Deep cuttings and habitat removal are therefore considered the primary potential impact to groundwater dependent habitats and the local groundwater regime. Where the groundwater dependent habitat is located within the option corridor this is considered to be a permanent impact on a small proportion. Where there is a cutting of greater than 5m within 100m of the habitat this is considered to be a permanent impact on a significant proportion. The assessed impacts to groundwater dependent habitats are outlined below and summarised in Table 7.5.11.9.

A conservative approach was taken regarding these habitats in advance of detailed design, detailed survey and groundwater monitoring. These features have been assessed as if they are dependent on surface water and groundwater, refer to Section 7.5.10 for the Stage 1 Preliminary Options Assessment for Hydrology. The hydrogeological assessment of these habitats focuses on the groundwater components of the features i.e. changes to groundwater level which may impact recharge to the feature, or changes to groundwater quality.

Lough Eidin pNHA

Lough Eidin pNHA contains extensive areas of wet grasslands which flood in the winter. The pNHA is of national importance and classified to be of Very High importance according to the NRA guidelines. Refer to Figures 7.12.2.0 to 7.12.2.6 for details of its extents.

Lough Eidin pNHA is located within the Purple West, Dark Green and Blue West Option Corridors. There is a cutting greater than 5m deep associated with the Dark Green Option Corridor within 100m of Lough Eidin pNHA. As the proposed cutting is >5m in depth it is considered to be a permanent impact on a significant proportion of the attribute.

There are no cuttings associated with the Purple West or Blue West Option Corridors which are greater than 5m in depth and within 100m of the Lough Eidin pNHA. Therefore, the impact of both the Purple West and Dark Green Options is considered to be a permanent impact on a small proportion of the attribute.

Annex I Habitats

Priority Annex I Habitat [91E0*] Alluvial Woodlands and Annex I Habitats Transition Mires and Quaking Bogs [7140] and Bog Woodland [91D0] identified within the study area are valued by the Project Biodiversity Specialist to be on a national scale. According to the NRA guidelines groundwater dependant habitats

valued on a national scale are considered to be of Very High importance. There are pockets of alluvial woodland across the area. For the purpose of this assessment, they are considered as one attribute as they make up a relatively small proportion of the national habitat.

A summary of the habitats and the impact due to the proposed Option Corridors is provided in Table 7.5.11.6. Refer to Biodiversity Figures 7.5.9.1.0 to 7.5.9.1.5. The potential hydro-ecology impact by the option corridors west of Node J are presented in Table 7.5.11.7. There are no hydro-ecology sites east of Node J and the impact on hydro-ecology from the option corridors are considered to be neutral.

Table 7.5.11.6 Hydrogeological Assessment of the Impact to Annex 1 Habitats

Habitat ID	Description	Location (Option Corridor)	Impact	Justification for Impact
EC16	Broadleaved / wet woodland / scrub, marsh and wet grassland on the banks of River Shannon with areas of confirmed and potential Alluvial Woodland [*91E0] habitat.	Purple and Dark Green	A permanent impact on a small proportion of the attribute	The habitat is located more than 100m from proposed cuts >5m deep
EC28	Potential Alluvial Woodland [*91E0]	Purple and Dark Green	A permanent impact on a significant proportion of attribute	The Purple and Dark Green Option Corridors include cuttings >5m deep located within 20m of the habitat.
EC50	Marsh, wet grassland and scrub with the potential to develop into Alluvial Woodland [*91E0] habitat in the short to medium term. The habitat also contains an area of Annex I Transition mires [7140].	Cyan and Orange	A permanent impact on a small proportion of the attribute	The habitat is located more than 100m from proposed cuts >5m deep
EC51	Broadleaved / wet woodland, scrub and wet grassland with potential for peatland habitats as well as Alluvial Woodland [*91E0]	Cyan and Orange	A permanent impact on a small proportion of the attribute	The habitat is located more than 100m from proposed cuts >5m deep
EC52	Broadleaved / wet woodland, scrub and wet grassland with potential for peatland habitats as well as Alluvial Woodland [*91E0]	Cyan, Orange and Blue	A permanent impact on a small proportion of the attribute	The habitat is located more than 100m from proposed cuts >5m deep
EC88	Broadleaved and conifer woodland along the River Shannon with potential for Alluvial Woodland [*91E0].	Cyan, Orange, Purple, Blue and Dark Green	A permanent impact on a small proportion of the attribute	The habitat is located more than 100m from proposed cuts >5m deep

Table 7.5.11.7 Stage 1 Hydro-ecology Assessment West of Drumsna Junction (Node J)

Option Corridor	Biodiversity Features Dependent on Water	Attribute Importance	Potential Impact: Temporary/permanent Impact on 'X' Proportion of Attribute (from Table 1.2) Box 4.4 ⁶³	Box 4.4 ⁶³ Impact Level	PAG Qualitative Ranking	PAG Value
Black Option Corridor	No groundwater dependant habitats within the study area or within close proximity of the black option corridor.	N/A	N/A	N/A	Not Significant or Neutral	4
Cyan Option Corridor	Alluvial Woodlands [*91E0] habitat	Very High	Small (Permanent)	Significant	Major or Highly Negative	1
	Transition mires [7140]	Very High	Small (Permanent)	Significant	Major or Highly Negative	1
Orange Option Corridor	Alluvial Woodlands [*91E0] habitat	Very High	Small (Permanent)	Significant	Major or Highly Negative	1
	Transition mires [7140]	Very High	Small (Permanent)	Significant	Major or Highly Negative	1
Purple West Option Corridor	Alluvial Woodlands [*91E0] habitat	Very High	Significant (Permanent)	Profound	Major or Highly Negative	1
	Lough Eidin pNHA	Very High	Small (Permanent)	Significant	Major or Highly Negative	1
Dark Green Option Corridor	Alluvial Woodlands [*91E0] habitat	Very High	Significant (Permanent)	Profound	Major or Highly Negative	1
	Lough Eidin pNHA	Very High	Significant (Permanent)	Profound	Major or Highly Negative	1
Blue West Option Corridor	Alluvial Woodlands [*91E0] habitat	Very High	Small (Permanent)	Significant	Major or Highly Negative	1
	Lough Eidin pNHA	Very High	Small (Permanent)	Significant	Major or Highly Negative	1

Table 7.5.11.8 Stage 1 Hydrogeology Summary Assessment Matrix of Options West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Aquifer Classification	Major or Highly Negative: Relatively moderate length of deep cuttings in high importance aquifer. Small increase in extreme vulnerability.	Moderately Negative: Relatively short length of deep cuttings in high importance aquifer and none greater than 10m deep. Small increase in extreme vulnerability.	Major or Highly Negative: Relatively long length of deep cuttings in high importance aquifer. Relatively moderate increase in extreme vulnerability.	Major or Highly Negative: Relatively long length of deep cuttings in high importance aquifer. Relatively large increase in extreme vulnerability.	Not Significant or Neutral: No proposed cutting leading to loss of aquifer or increase in vulnerability.	Moderately Negative: Relatively small length of deep cuttings in high importance aquifer and none greater than 10m deep. No increase in extreme vulnerability
Hydro-ecology	Major or Highly Negative: 2 No. habitats of national importance located within Option Corridor.	Major or Highly Negative: 2 No. habitats of national importance located within Option Corridor.	Major or Highly Negative: 2 No. habitats of national importance located within Option Corridor. Cutting >5m deep located within 100m of alluvial woodland.	Major or Highly Negative: 2 No. habitats of national importance located within Option Corridor. Cutting >5m deep located within 100m of alluvial woodland and Lough Eidin pNHA.	Major or Highly Negative: 2 No. habitats of national importance located within Option Corridor.	Not Significant or Neutral: No groundwater dependant habitats within the Option Corridor.
Scoring						
Qualitative Assessment	Moderately Negative Relatively moderate impact on aquifer and hydro-ecology compared to other options.	Moderately Negative Relatively moderate impact on aquifer and hydro-ecology compared to other options.	Major or Highly Negative Greatest impact on hydro-ecology and aquifers.	Major or Highly Negative Greatest impact on hydro-ecology and aquifers.	Major or Highly Negative Lesser impact on hydro-ecology compared to other options and minimal impact on aquifers.	Moderately Negative Moderate impact on aquifers.
Score / Impact Level	1	1	1	1	1	2
Preference	Intermediate	Intermediate	Least Preferred	Least Preferred	Preferred	N/A

Table 7.5.11.9 Stage 1 Hydrogeology Summary Assessment Matrix of Options East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Aquifer Classification	Minor or Slightly Negative: Relatively moderate length of deep cuttings in medium and low importance aquifers. No cuttings greater than 10m in depth. Small increase in extreme vulnerability	Not Significant or Neutral: No cuttings greater than 5m deep and no increase in extreme vulnerability	Minor or Slightly Negative: Relatively moderate length of deep cuttings in medium and low importance aquifers. No cuttings greater than 10m in depth. No increase in extreme vulnerability	Not Significant or Neutral
Hydro-ecology	Not Significant or Neutral Major or highly negative	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Scoring				
Qualitative Assessment	Minor or Slightly Negative Slight impact on underlying aquifers	Not Significant or Neutral Minimal impact on underlying aquifers and hydro-ecology	Minor or Slightly Negative Slight impact on underlying aquifers	Not Significant or Neutral Minimal impact on underlying aquifers and hydro-ecology
Score / Impact Level	3	4	3	4
Preference	Intermediate	Preferred	Intermediate	Preferred

7.5.11.5 Summary

All the option corridors have been assessed for the hydrogeological constraints identified within each option corridor.

There are no karst features, sources of groundwater contamination or records of historical groundwater flooding identified within the option corridors. There are also no groundwater sources or groundwater abstractions which are considered greater than low importance within the option corridors. Therefore, these features are all considered Neutral when comparing the option corridors.

The assessment is based on the impact to the aquifers and the impact on the groundwater dependant habitats.

Comparison between Option Corridors West of Drumsna Junction (Node J)

West of Node J the Blue West Option Corridor presents the Preferred option as it is associated with the least potential impact on hydro-ecology and the underlying aquifers. The Blue West Option Corridor is not associated with any cuttings and encounters fewer groundwater dependant habitats compared to the other options.

The Orange and Cyan Option Corridors are Intermediate options. There are fewer large cuttings associated with the Cyan Option and Orange Option Corridors and cuttings within close proximity to groundwater dependant habitats are relatively shallow.

The Purple West and Dark Green Option Corridors are Least Preferred as they are associated with significant cuts within relatively close proximity to Alluvial Woodlands [*91E0] habitat and the Lough Eidin pNHA. The Dark Green Option is considered less preferred than the Purple West as it would cause a considerably greater increase in extreme vulnerability compared to the Purple Option.

Comparison between Option Corridors East of Drumsna Junction (Node J)

There are no groundwater dependant habitats located east of Node J and the assessment is based on the impact to the aquifers.

East of Node J the Blue East and Green Options present the least potential impact on hydro-ecology and the underlying aquifers as both are associated with minimal cuttings and are therefore the Preferred options. The Yellow and Purple East Options are associated with a longer length of deep cutting and therefore are less preferred and ranked as Intermediate.

7.5.12 Stage 1 Soils and Geology Option Assessment

7.5.12.1 Introduction

This section details the Stage 1 Preliminary Options Assessment with respect to the Soils and Geology constraints identified in Section 4.17 Soils and Geology of the Constraints Study.

The Option Corridors assessed are those discussed in Section 7.1.2 of the Option Selection Report.

The Soils and Geology constraints are presented with the Stage 1 Option Corridors in Figures 7.5.12.1.1 to 7.5.12.4.5.

Section 7.5.12.2 outlines the methodology that was used to carry out the assessment and outlines the assessment criteria which were used. Section 7.5.12.3 presents the assumptions that were adopted as part of the assessment. The Stage 1 Preliminary Options Assessment is also presented in Section 7.5.12.3 with the summary of the assessment presented in Section 7.5.12.4.

A total of ten option corridors have been developed for Stage 1 Assessment as described in Section 7.1.2 of this report. The option corridor names for inclusion in the tables in this assessment are as follows:

- West of Drumsna Junction (Node J):
 - Cyan Option Corridor
 - Orange Option Corridor
 - Purple West Option Corridor
 - Dark Green Option Corridor
 - Blue West Option Corridor
 - Black Option Corridor
- East of Drumsna Junction (Node J):
 - Green Option Corridor
 - Yellow Option Corridor
 - Purple East Option Corridor
 - Blue East Option Corridor

The following elements of each option corridor will be assessed with respect to Soils and Geology, the basis of these widths is outlined in Section 7.1.2.

- Corridor – approximately a 300m wide corridor with the exception of the Black Option Corridor which is approximately 150m wide

The study area, constraints, and Stage 1 Options considered in the Soils and Geology assessment are shown on the figures listed in the table below.

Table 7.5.12.1 List of figures for the Stage 1 Soils and Geology Assessment

Figure Number	Title	Sheet
Figure 7.15.12.1.0 – Figure 7.15.12.1.5	Soil Deposits Map	Sheet 1 to 6
Figure 7.15.12.2.0 – Figure 7.15.12.2.5	Subsoil Deposits Map	Sheet 1 to 6
Figure 7.15.12.3.0 – Figure 7.15.12.3.5	Bedrock Geology Map	Sheet 1 to 6
Figure 7.15.12.4.0 – Figure 7.15.12.4.5	Geological Pressures	Sheet 1 to 6

7.5.12.2 Methodology

This assessment has been prepared in line with the following guidance:

- NRA, 2009 Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology on National Road Schemes (herein referred to as NRA Guidelines)⁶⁴
- The Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports⁶⁵
- NRA, 2008 Environmental Impact Assessment of National Road Schemes – a Practical Guide⁶⁶

The NRA Guidelines provide useful criteria for rating of the identified soils and geology constraints (herein referred to as Criteria). Each criterion comprises of individual attributes which have been assigned an Importance using Box 4.1 of the NRA Guidelines. The Importance ratings are listed in the table below. The Assessment differentiates between the Option Corridors through the ‘Magnitude of Impact’.

The ‘Magnitude of Impact’ assesses the impact that each Option Corridor has on each criterion attribute, a ‘Magnitude of Impact’ is assigned using Box 5.1 of the NRA Guidelines as presented in the table below. The magnitude of the potential impacts that may arise for each criterion attribute have been assessed based on the information that is currently available.

A ‘Significance of impact’ has then been determined from the table below based on the ‘Importance of Attribute’ and the ‘Magnitude of Impact’. The terminology

⁶⁴ NRA, 2008. Guidelines on Procedures for Assessment and treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

⁶⁵ EPA, 2017. Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. Available from: <https://www.epa.ie/publications/monitoring--assessment/assessment/draft-guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment.php>

⁶⁶ National Roads Authority, 2008. Environmental Impact Assessment of National Road Schemes – a Practical Guide. Available at: <https://www.tii.ie/technical-services/environment/planning/Environmental-Impact-Assessment-of-National-Road-Schemes-Practical-Guide.pdf>

adopted in the summary tables in Section 7.5.12.3 to describe the significance of an impact is that used in Box 5.4 of the NRA Guidelines as it is more succinct and more appropriate for the purposes of this assessment.

The negative and positive potential impacts of the Option Corridors on Soils and Geology have been considered in the analysis. The positives were taken into account by reducing the overall negative impacts of individual attributes.

Table 7.5.12.2 Rating of Significant Environmental Impacts (from Box 5.4 of NRA Guidelines)

Importance of Attribute	Magnitude of Impact			
	Negligible	Small Adverse	Moderate Adverse	Large Adverse
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
High	Imperceptible	Moderate / Slight	Significant / Moderate	Severe / Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

Once an impact level was determined for each associated criterion attribute for each Option Corridor, an overall impact rating was assigned to that criterion using the TII Project Appraisal Guidelines (PAG) for National Roads Unit 7.0 - Multi-Criteria Analysis (MCA)². The scoring system identified in Table 7.3.1 of this report was used to rank Option Corridors is outlined in Section 2.4 of the TII PAG:

7.5.12.3 Assessment Criteria

A preliminary sensitivity analysis of each criterion identified as part of the constraints study (Geomorphology, Soils, Subsoils, Bedrock Geology, Landside Susceptibility, Contaminated Sites, Economic Geology, Geological Heritage) has been undertaken prior to the completion of the Multi-Criteria Analysis (MCA). The purpose of this sensitivity analysis is to identify the criteria that are key differentiators between each of the Option Corridors. The criteria that are identified as being key differentiators will make up the criteria for the MCA.

It should be noted that the Blue West and Blue East Option Corridors have not been assessed as part of this sensitivity analysis as this Option Corridor follows existing infrastructure with only upgrades to junctions planned. The impacts associated with the Blue West Option Corridor are significantly less than the other Option Corridors with minimal earthworks and impact to the Soils and Geology, therefore the impact from these Options are considered Neutral (i.e. 4 on the PAG Unit 7 seven point scale). If it was included as part of the sensitivity analysis it would skew the results rather than meaningfully input into it.

The criterion of earthworks material balance herein referred to as 'Earthworks' did not form part of the preliminary sensitivity analysis as this is considered a significant key differentiator between the Options and will be considered in the MCA in Section 7.5.12.3.

The preliminary sensitivity analysis was completed by undertaking the following steps:

- Calculating the length over which each Option Corridor impacts each criterion and converting this to a percentage of the total Option Corridor Length
- The difference between the range of percentage impact between Option Corridors (Greatest Difference) of a criterion was calculated
- The results from the sensitivity analysis show the criterion as either having a Greatest Difference of $\leq 5\%$ or $> 5\%$. Following a qualitative assessment of the analysis it was concluded that the criterion with a Greatest Difference $> 5\%$ are considered key differentiators and will be included in the Preliminary Options Assessment

The following have been excluded from the Sensitivity Analysis for the following reasons:

- **Geomorphological features:** drumlins and ribbed moraines are considered to be captured in the earthwork and economic geology criterion and therefore have not been assessed as a standalone criterion
- **Subsoils - Glacial Till:** As Glacial Till is widespread throughout the study area and common to all Option Corridors it is not considered a differentiator and was eliminated from the analysis under the Subsoil criterion
- **Economic Geology - Active Quarry and Pit Sites:** are not impacted by the Option Corridors and therefore are not considered under the Economic Geology criterion
- **Contaminated Sites - Urban Wastewater Treatment (UWWT) plants & Water Framework Directive (WFD) Section 4 discharge points:** are not impacted by the Option Corridors and not considered under the Contaminated Sites criterion

The results from the analysis are presented in following two tables.

Table 7.5.12.3 Preliminary Sensitivity Analysis Results – West Drumsna Junction (Node J)

Constraint / Criterion	Impact %				Greatest Difference	Selected as MCA Sub-Criteria (>5%)
	Cyan	Orange	Dark Green	Purple		
Soil Deposits (well drained soil types which are important for agriculture)	0%	0%	3%	2%	3%	No
Soft Soils (Alluvium, Peat and Lacustrine) ¹	62%	62%	51%	48%	14%	Yes
Bedrock (Karst)	0%	0%	0%	0%	0%	No
Bedrock (Volcanic geology)	0%	0%	0%	0%	0%	No
Landslide Susceptibility (moderately high to high)	1%	1%	0%	0%	1%	No
Contaminated Sites ²	32%	20%	9%	7%	25%	Yes
Economic Geology ³	70%	74%	67%	76%	9%	Yes
Geological Heritage	0%	0%	0%	0%	0%	No

Table 7.5.12.4 Preliminary Sensitivity Analysis Results – East of Drumsna Junction (Node J)

Constraint / Criterion	Impact %			Greatest Difference	Selected as MCA Sub-Criteria (>5%)
	Purple	Green	Yellow		
Soil Deposits (well drained soil types which are important for agriculture)	0%	0%	0%	0%	No
Soft Soils (Alluvium, Peat and Lacustrine)*	36%	39%	40%	4%	No
Bedrock (Karst)	0%	0%	0%	0%	No
Bedrock (Volcanic geology)	35%	35%	34%	1%	No
Landslide Susceptibility (Moderately high to high)	1%	1%	1%	0%	No
Contaminated Sites**	16%	15%	13%	3%	No
Economic Geology***	75%	70%	70%	5%	No
Geological Heritage	16%	19%	18%	3%	No

** The subsoils of Alluvium, Peat and Lacustrine deposits are considered in the analysis under the heading of Soft Soils.*

*** The Contaminated Sites criterion includes made ground areas, historic quarry and pit sites, historic industrial sites, licenced industrial sites and waste facilities.*

**** The Economic Geology criterion includes shallow bedrock (based on 'X' or 'E' groundwater vulnerability), high to very high crushed rock and granular aggregate potential areas and mineral resource locations.*

The results of the analysis for the Section West of Drumsna Junction revealed that the criteria of Soil Deposits, Bedrock (Karst and Volcanic Geology), Landslide Susceptibility and Geological Heritage had a Greatest Difference of <5% between the Option Corridors. The criteria of Soft Soils, Contaminated Sites and Economic Geology had a Greatest Difference of >5% and therefore will be brought forward into the MCA for the Stage 1 Preliminary Options Assessment for the Section West of Drumsna Junction.

The analysis for the Section East of Drumsna Junction revealed that there are no key differentiators between the Option Corridors as these for the most part all follow the alignment of the existing N4 corridor.

As mentioned previously the earthworks material balance is a key differentiator for the Options and will also be considered in the MCA in addition to the criteria listed prior.

While some of the Soils and Geology criteria have been excluded for the MCA for the Stage 1 Preliminary Options Assessment, it is possible that these criteria maybe considered in the next stage of the Option Assessments and for the Preferred Option in the EIAR where appropriate.

The following assumptions have been adopted as part of the Stage 1 Preliminary Options Assessment:

1. A buffer zone outside of each of the Option Corridors has not been adopted as the Option Corridor widths are considered to be all-inclusive.
2. All area measurements that are provided as part of the assessment have been rounded up to the nearest 1,000m².
3. Earthwork volumes (i.e. bulk cut/fill and surplus/deficit volumes) have been estimated based on the current carriageway designs produced as part of the Stage 1 Preliminary Options Assessment with the following assumptions:
 - a) Cut volumes are based on 1V:2H slopes.
 - b) Fill volumes are based on 1V:2H slopes.
 - c) Volumes are based on 100mm depth of topsoil on slopes and verges.
 - d) Volumes are based on a 700mm pavement box (250mm bituminous layer, 150mm Clause 804 layer and a 300mm capping layer), including on-line realignments. This pavement box arrangement would be broadly consistent with a subgrade CBR of 4.0%.

- e) Volumes reported are for mainline corridors only (i.e. volumes exclude side roads, excavated material for utilities, gantries and structures).
 - f) Volumes do not consider topsoil removal, over-excavation in soil and rock, temporary works or construction compounds.
 - g) Volumes do not consider any earthwork requirements associated with the River Shannon Bridge crossing, including foundations and abutments.
 - h) Bulk earthwork volumes do not include for excavate and replace volumes associated with soft soils, soft soil excavate and replace volumes will be considered separately.
 - i) Bulk earthwork volumes do not include for excavate and replace volumes associated with made ground areas.
 - j) Volumes have not been classified into material types (suitable, unsuitable or marginal material) as part of Stage 1. Only bulk volumes are considered.
 - k) Opportunities to source material and reuse of material not suitable as general fill is not included in the Stage 1 assessment.
 - l) Volumes relate to in-situ volumes only, material bulking factors have not been applied.
 - m) Volumes have been rounded up to the nearest 1,000m³.
 - n) In the calculation of the bulk earthwork volumes it has been assumed that all existing pavement will not be reused and a new pavement will be constructed.
 - o) The earthwork volumes for the Cyan, Orange, Dark Green and Purple West and Purple East Option Corridors are calculated for a dual carriageway. The adopted carriageway width is in accordance with TII Road Type and Cross-Section Type 2 Dual Carriageway, Publication Number CC-SCD-00005, April 2017.
 - p) The earthwork volumes for the Green and Yellow Option Corridors are calculated for a single carriageway to the east of Drumsna. The adopted single carriageway width is in accordance with TII Road Type and Cross-Section Type 1 Single Carriageway, Publication Number CC-SCD-00001, December 2017.
- 4. The new bridge crossing the Shannon will not be constructed prior to commencement of earthworks. Hence opportunities to move material across the Shannon will be limited.
 - 5. Cut material won on either side of the River Shannon will not be hauled from East to West of the River Shannon and vice versa.
 - 6. Borrow areas sufficiently large enough will be located both east and West of the River Shannon to supply sufficient material to both sides for the proposed earthworks.

7. Disposal of unsuitable material to a licenced facility.
8. Unsuitable cut material has not been accounted for as part of the Stage 1 Assessment.
9. Soft soils, if intersected by the Option Corridors, are assumed to be treated by excavation and replacement.
10. The temporary side slopes which are used to provide stability during the excavation of soft soils are assumed to be 1V:2H for the downslope from the outside edge of verge and 1V:1H for the upslope from the toe of the downslope. This is presented in Plate 7.5.12.1.

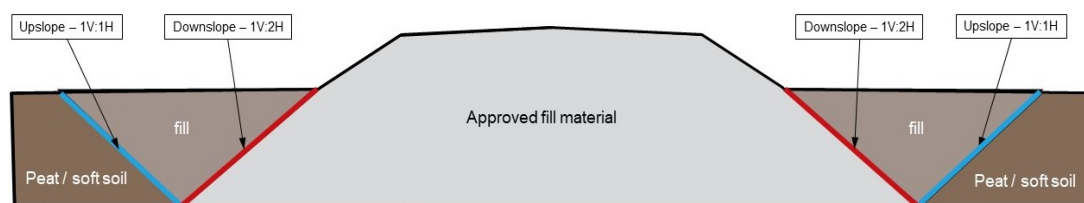


Plate 7.5.12.1 Assumed Soft Soil Excavate and Replace Section

The material from identified potentially contaminated sites (landfills, waste related sites, historic heavy industrial sites, historic quarries and pits and areas of made ground) are considered to require excavation and disposal to an appropriate licenced facility if intersected.

11. The horizontal extents of soft soils have been determined using the GSI Quaternary sediment mapping, the depths are based on available historic ground investigation and the GSI Groundwater Vulnerability map which gives an indication of the thickness of the overburden.
12. The soft soil volumes have been calculated for a dual carriageway section for the Cyan, Orange, Dark Green and Purple West Option Corridors. The adopted carriageway width is in accordance with TII Road Type and Cross-Section Type 2 Dual Carriageway, Publication Number CC-SCD-00005, April 2017.
13. There are no earthworks along the Blue Option Corridor only upgrades to Junctions.

7.5.12.4 Stage 1 Option Corridors Assessment

The outcome of the sensitivity analysis revealed that the following criteria shall be brought forward to the MCA to assist in determining the Options Selection from a soils and geology perspective:

- Criteria considered for Option Corridors West Node J at Drumsna Junction:

- Contaminated Sites comprising of horizontal extent of made ground, landfills and waste related sites, historic industrial sites, historic quarries and pits and licenced industrial sites
- Economic Geology comprising of horizontal extent of high to very high crushed rock aggregate potential, horizontal extent of high to very high granular aggregate potential and Mineral Localities
- Earthworks comprising of bulk cut and fill volumes, volume of soft soils and overall earthwork balance
- Criteria considered for Option Corridors East of Node J at Drumsna Junction:
- Earthworks comprising of bulk cut and fill volumes and overall earthwork balance

Following a review of these criteria it was decided that the criterion of Soft Soils would be better assessed as an attribute under the criterion of Earthworks as it will be assessed in terms of material management requirements and not in terms of subsoil importance. Plate 7.5.12.2 shows the assessment criteria and associated attributes that will form part of the MCA for the Stage 1 Preliminary Options Assessment.

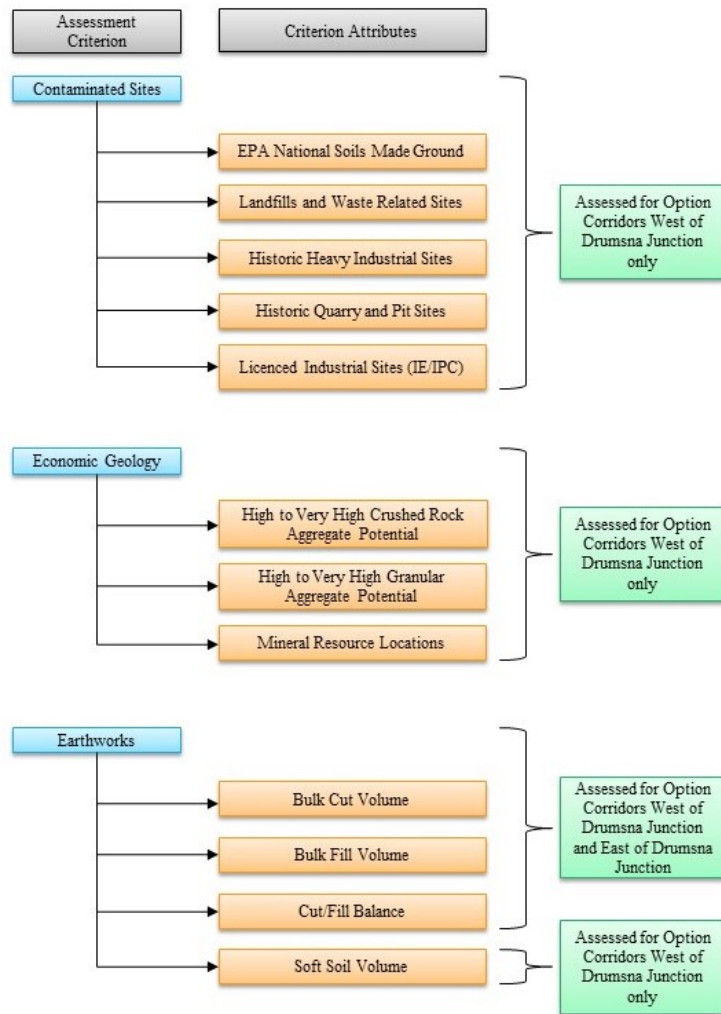


Plate 7.5.12.2 Assessment Criteria and Associated Attributes

Contaminated Sites

A number of sites of potential areas of contamination have been identified through consultation with the relevant authorities and the Constraints Study. The history, contents and volumes of these areas are not known sufficiently to confirm and provide accurate quantities of contaminated material at this stage. Therefore, a conservative approach has been taken, considering the entire plan area identified as comprising potentially contaminated material, as this type of material would require excavation and disposal to an appropriate licenced facility if intersected.

Note that the results from the sensitivity analysis presented in Section 7.5.12.3 demonstrated that contaminated sites are a key differentiator between the Option Corridors West of Drumsna Junction only, therefore, contaminated sites have not been assessed for Option Corridors East of Drumsna Junction.

Importance of Attribute

The made ground deposits recorded on the EPA National Soils mapping have been assessed as part of the contaminated sites assessment. Made ground deposits are considered to be of high importance due to the possible amount of material requiring excavation, its unsuitability for reuse and the material being potentially contaminated, which is considered to have a high significance on a local scale.

Landfills, waste related sites, historic heavy industrial sites, historic quarry and pit sites are considered to be of high importance as the nature of the material at these locations is unknown and these sites are considered to potentially contain material that will need to be disposed to an appropriate licenced facility, this is considered significant on a local scale.

Licensed industrial emission (IE) and integrated pollution control (IPC) sites are considered regulated and licensed facilities where the risk of ground contamination is less likely to occur, these sites are considered to be of low importance on a local scale.

Magnitude of Impact

The extent of the made ground for each Option Corridor has been calculated by clipping the plan area of made ground in the EPA National Soils mapping with each of the Option Corridor boundaries in GIS software ArcMap. The extents and impact of made ground are therefore based on area (m²). The area of made ground intersected by the Options West of Drumsna Junction range between 59,000m² to 155,000m² and are all less than 10.0% of the total corridor areas. Therefore, the impact on made ground is considered to be small adverse.

The identified landfill, waste related sites, historic heavy industrial sites, historic quarry and pit sites and Industrial Emissions/Integrated Pollution Control (IE/IPC) sites have been assessed based on whether or not they are intersected by any of the Option Corridors. Note that the historic heavy industrial sites, historic quarry and pit sites and IE/IPC sites are available as point features, therefore, to account for the horizontal extents a 50m buffer has been applied to these sites in ArcMap as part of the assessment.

Of the 17 No. landfill or waste related sites identified in the Constraints Study three of them are impacted by the Cyan Option Corridor, West of Drumsna Junction:

- Three old permit sites in the Cloongownagh townland along the existing N4, approximately 2.5km west of Carrick-on-Shannon. These are thought to have been used for the recovery and disposal of material as part of the N4 realignment. The Cyan Option Corridor intersects approximately 269,000m² of this site, this is considered to be a moderate adverse impact.

Of the seven historic heavy industrial sites identified in the Constraints Study, two of them will be impacted by the Option Corridors:

- Carrick-on-Shannon historic gas works site - located on the western side of Carrick-on-Shannon near the Carrick-on-Shannon station (E: 593042, N: 798676). The footprint of the site is 2,000m² and is considered small scale, from a review of historic maps it appears that the site was developed into a commercial premise between 1995 and 2000, the risk of significant contaminated material being present is considered low. This site is intersected by the Cyan and Orange Option Corridors and is considered to be a moderate adverse magnitude of impact.
- Carrick-on-Shannon Rail Station- located on the western side of Carrick-on-Shannon (E: 592993, N: 798776). This site is still in use as a train station and has been in use since the late 1800's to early 1900's and may contain contaminated ground. This site is intersected by the Cyan and Orange Option Corridors and is considered to be a moderate adverse magnitude of impact.

Of the 40 No. historic quarry and pit sites identified in the Constraints Study, seven of them will be impacted by the Option Corridors West of Drumsna Junction. The Option Corridors West of Drumsna Junction impact between one and four sites each aside from the Blue Option which does not intersect any. As the area of these sites are small scale in comparison to the overall Corridor areas the impact on these is considered small adverse.

When an IE/IPC site is intersected by an Option Corridor it is considered to have a small adverse magnitude of impact. The Irish Rubber Components Ltd. Industrial Emission Site identified in the Constraints Study is the only IE/IPC site impacted and is intersected by the Orange Option Corridor.

The assessment of potential sites containing contaminated material is presented the following table .

Option Corridors East of Drumsna Junction

Although the contaminated sites criterion is not considered a key differentiator for the Stage 1 Option Corridors East of Drumsna Junction, it is important to note that the following identified potentially contaminated sites are intersected by these Options:

- 3 No. disused landfill/waste related sites
- 5 No. historic quarry sites

Table 7.5.12.5 Summary of Contaminated Sites Assessment for the Option Corridors West of Drumsna Junction (Node J)

Option Corridor	Criterion	Criterion Attributes	Description	Area or Quantity	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall MCA Score (Description)
Cyan Option Corridor	Contaminated Sites	EPA National Soils Made Ground	Extent of Made Ground	151,000 m ²	High	Small Adverse	Moderately / Slight	Moderately Negative
		Landfills and Waste Related Sites	Cloongownagh	269,000 m ²	High	Moderately Adverse	Significant / Moderate	
		Historic Heavy Industrial Sites	Carrick-on-Shannon Gas works site	Intersected	High	Moderately Adverse	Significant / Moderate	
			Carrick-on-Shannon Rail Station	Intersected	High	Moderately Adverse	Significant / Moderate	
		Historic Quarry and Pit Sites	Historic Quarries and Pits	4 No.	High	Small Adverse	Moderately / Slight	
		Licensed Industrial Sites	IE Site - Irish Rubber Components Ltd (P0641-01)	Not Intersected	Low	Negligible*	Imperceptible	
Orange Option Corridor	Contaminated Sites	EPA National Soils Made Ground	Extent of Made Ground	155,000 m ²	High	Small Adverse	Moderately / Slight	Moderately Negative
		Landfills and Waste Related Sites	Cloongownagh	Not Intersected	High	Negligible*	Imperceptible	
		Historic Heavy Industrial Sites	Carrick-on-Shannon Historic Gas works site	Intersected	High	Moderately Adverse	Significant / Moderate	

Option Corridor	Criterion	Criterion Attributes	Description	Area or Quantity	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall MCA Score (Description)
			Carrick-on-Shannon Rail Station	Intersected	High	Moderately Adverse	Significant / Moderate	
		Historic Quarry and Pit Sites	Historic Quarries and Pits	4 No.	High	Small Adverse	Moderately / Slight	
		Licenced Industrial Sites	IE Site - Irish Rubber Components Ltd (P0641-01)	Intersected	Low	Small Adverse	Imperceptible	
Dark Green Option Corridor	Contaminated Sites	EPA National Soils Made Ground	Extent of Made Ground	59,000 m ²	High	Small Adverse	Moderately / Slight	Minor or Slightly Negative
		Landfills and Waste Related Sites	Cloongownagh	Not Intersected	High	Negligible*	Imperceptible	
		Historic Heavy Industrial Sites	Carrick-on-Shannon Historic Gas works site	Not Intersected	High	Negligible*	Imperceptible	
			Carrick-on-Shannon Rail Station	Not Intersected	High	Negligible*	Imperceptible	
		Historic Quarry and Pit Sites	Historic Quarries and Pits	3 No.	High	Small Adverse	Moderately / Slight	
		Licenced Industrial Sites	IE Site - Irish Rubber Components Ltd (P0641-01)	Not Intersected	Low	Negligible*	Imperceptible	

Option Corridor	Criterion	Criterion Attributes	Description	Area or Quantity	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall MCA Score (Description)
Purple West Option Corridor	Contaminated Sites	EPA National Soils Made Ground	Extent of Made Ground	60,000 m ²	High	Small Adverse	Moderately / Slight	Minor or Slightly Negative
		Landfills and Waste Related Sites	Cloongownagh	Not Intersected	High	Negligible*	Imperceptible	
		Historic Heavy Industrial Sites	Carrick-on-Shannon Historic Gas works site	Not Intersected	High	Negligible*	Imperceptible	
			Carrick-on-Shannon Rail Station	Not Intersected	High	Negligible*	Imperceptible	
		Historic Quarry and Pit Sites	Historic Quarries and Pits	1 No.	High	Small Adverse	Moderately / Slight	
		Licensed Industrial Sites	IE Site - Irish Rubber Components Ltd (P0641-01)	Not Intersected	Low	Negligible*	Imperceptible	
Blue West Option Corridor	Contaminated Sites	EPA National Soils Made Ground	Extent of Made Ground	This Option Corridor follows existing infrastructure with only upgrades to junctions planned. Therefore, there are considered	High	Negligible*	Imperceptible	Not Significant or Neutral
		Landfills and Waste Related Sites	Cloongownagh		High	Negligible*	Imperceptible	
		Historic Heavy Industrial Sites	Carrick-on-Shannon Historic Gas works site		High	Negligible*	Imperceptible	

Option Corridor	Criterion	Criterion Attributes	Description	Area or Quantity	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall MCA Score (Description)
			Carrick-on-Shannon Rail Station	no impacts on contaminated sites.	High	Negligible*	Imperceptible	
		Historic Quarry and Pit Sites	Historic Quarries and Pits		High	Negligible*	Imperceptible	
		Licenced Industrial Sites	IE Site - Irish Rubber Components Ltd (P0641-01)		Low	Negligible*	Imperceptible	

**A negligible magnitude of impact is assigned when an identified potentially contaminated site is not intersected by an Option Corridor*

Economic Geology

A number of economic geology sites have been identified across the study area through the Constraints Study, these include:

- High to very high crushed rock aggregate potential
- High to very high granular aggregate potential
- Mineral resource locations

Any Option Corridor intersecting these areas of economic geology would be sterilising resources that are considered to have a high quality on a local scale.

Note that the results from the sensitivity analysis presented in the methodology subsection of this section demonstrated that economic geology sites are a key differentiator between the Option Corridors West of Drumsna Junction only, therefore, economic geology sites have not been assessed for Option Corridors East of Drumsna Junction.

Importance of Attribute

Areas of very high to high crushed rock and granular aggregate potential are considered to be a high-quality resource on a local scale with a high importance.

Mineral resource locations are considered to have a high importance. The removal, partial removal or impact on these sites would result in a loss of a proven high quality, significant and valuable resource on a local scale.

Magnitude of Impact

The extent of the very high to high crushed rock and granular aggregate potential for each Option Corridor has been calculated by clipping the plan area of the GSI Aggregate Potential Mapping in GIS software ArcMap. The extents and impact of very high to high crushed rock and granular aggregate potential are therefore based on area (m²).

The area of very high to high crushed rock potential intersected by the Options West of Drumsna Junction (aside from the Blue West Option) are all greater than 1,000,000m² which is greater than 25% of the total Corridor areas, the impact is considered to be moderate adverse.

The area of very high to high granular aggregate potential intersected by the Dark Green and Purple Options West of Drumsna Junction is 100,000m² which is less than 5% of the total Corridor areas, therefore the impact is considered to be small adverse.

The identified mineral resource locations have been assessed based on whether or not they are intersected by any of the Option Corridors.

When a mineral resource location is intersected by an Option Corridor it is considered to that a very small percentage of the mineral resource will be sterilised

by the Option Corridor. Therefore, the impact of a mineral resource location is considered to be small adverse.

When no areas of very high to high crushed rock and granular aggregate potential or mineral resource locations are intersected by an Option Corridor these criterion attributes are assigned a negligible magnitude of impact.

The assessment of areas of economic geology is presented in the table below.

Table 7.5.12.6 Summary of Economic Geology Assessment for the Option Corridors West of Drumsna Junction (Node J)

Option Corridor	Criterion	Criterion Attributes	Description	Area or Quantity	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall MCA Score (Description)
Cyan Option Corridor	Economic Geology	High to Very High Crushed Rock Aggregate Potential	Extent of High to Very High Potential	1,638,000 m ²	High	Moderately Adverse	Significant / Moderate	Minor or Slightly Negative
		High to Very High Granular Aggregate Potential	Extent of High to Very High Potential	0 m ²	High	Negligible*	Imperceptible	
		Mineral Resource Location	Mineral Resource Location	1 No.	High	Small Adverse	Moderately / Slight	
Orange Option Corridor	Economic Geology	High to Very High Crushed Rock Aggregate Potential	Extent of High to Very High Potential	1,485,000 m ²	High	Moderately Adverse	Significant / Moderate	Minor or Slightly Negative
		High to Very High Granular Aggregate Potential	Extent of High to Very High Potential	0 m ²	High	Negligible*	Imperceptible	
		Mineral Resource Location	Mineral Resource Location	1 No.	High	Small Adverse	Moderately / Slight	
Dark Green Option Corridor	Economic Geology	High to Very High Crushed Rock Aggregate Potential	Extent of High to Very High Potential	1,103,000 m ²	High	Moderately Adverse	Significant / Moderate	Moderately Negative
		High to Very High Granular Aggregate Potential	Extent of High to Very High Potential	100,000 m ²	High	Small Adverse	Moderately / Slight	

Option Corridor	Criterion	Criterion Attributes	Description	Area or Quantity	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall MCA Score (Description)
		Mineral Resource Location	Mineral Resource Location	0 No.	High	Negligible*	Imperceptible	
Purple Option Corridor	Economic Geology	High to Very High Crushed Rock Aggregate Potential	Extent of High to Very High Potential	1,358,000 m ²	High	Moderately Adverse	Significant / Moderate	Moderately Negative
		High to Very High Granular Aggregate Potential	Extent of High to Very High Potential	100,000 m ²	High	Small Adverse	Moderately / Slight	
		Mineral Resource Location	Mineral Resource Location	0 No.	High	Negligible*	Imperceptible	
Blue Option Corridor	Economic Geology	High to Very High Crushed Rock Aggregate Potential	Extent of High to Very High Potential	This Option Corridor follows existing infrastructure with only upgrades to junctions planned. Therefore, there are considered no impacts on economic geology sites.	High	Negligible*	Imperceptible	Not Significant or Neutral
		High to Very High Granular Aggregate Potential	Extent of High to Very High Potential		High	Negligible*	Imperceptible	
		Mineral Resource Location	Mineral Resource Location		High	Negligible*	Imperceptible	

*A negligible magnitude of impact is assigned when an identified area of economic geology is not intersected by an Option Corridor

Earthworks

An earthworks assessment has been carried out to estimate the potential bulk cut/fill and soft soil earthwork volumes for the Option Corridors. The assumptions that were used for this assessment are presented in Section 7.5.12.3.

Bulk Earthworks Volumes

The bulk earthwork volumes for each of the Option Corridors are presented in the two tables below.

Table 7.5.12.7 Bulk Earthwork Volumes for the Option Corridors West of Drumsna Junction (Node J)

Option Corridor	West of River the River Shannon			East of the River Shannon			Total Balance (m ³)
	Sum of Cut m ³	Sum of Fill m ³	Deficit / Surplus m ³	Sum of Cut m ³	Sum of Fill m ³	Deficit / Surplus m ³	
Cyan Option Corridor	137,000	419,000	282,000 (deficit)	60,000	316,000	256,000 (deficit)	538,000 (deficit)
Orange Option Corridor	52,000	200,000	148,000 (deficit)	62,000	303,000	241,000 (deficit)	389,000 (deficit)
Dark Green Option Corridor	5,000	132,000	127,000 (deficit)	788,000	888,000	100,000 (deficit)	227,000 (deficit)
Purple Option Corridor	2,000	91,000	89,000 (deficit)	707,000	660,000	47,000 (surplus)	42,000 (deficit)
Blue Option Corridor	No Mainline Earthwork Volumes						

Table 7.5.12.8 Bulk Earthwork Volumes for the Option Corridors East of Drumsna Junction (Node J)

Option Corridor	Sum of Cut m ³	Sum of Fill m ³	Deficit / Surplus m ³
Purple Option Corridor	221,000	127,000	94,000 (surplus)
Green Option Corridor	81,000	47,000	34,000 (surplus)
Yellow Option Corridor	170,000	107,000	63,000 (surplus)
Blue Option Corridor	No Mainline Earthwork Volumes		

As is presented in the tables above there are large material deficits, ranging between 227,000m³ and 538,000m³ for the Cyan, Orange and Dark Green Option Corridors,

West of Drumsna (Node J). In addition to this there are substantial deficits East (100,000m³ to 256,000m³) and West (89,000m³ to 282,000m³) of the River Shannon. There also are very significant earthworks volumes of cut and very significant volumes of fill for the Purple and Dark Green Option Corridors east of the River Shannon on the section West of Drumsna (Node J). As outlined in the assumptions the River Shannon is a significant constraint to undertaking the Earthworks for the project.

Soft Soil Volumes

An additional challenge for the earthworks material balance are the volumes of soft soils within all of these Option Corridors which will be required to be excavated and replaced with suitable material. Table 7.5.12.9 below summarises the volumes of soft soil deposits within each of the Option Corridors West of Drumsna Junction. The Soft Soils East of Drumsna Junction are not considered in this Stage of the Preliminary Options Assessment as these Options predominately follow the existing N4 alignment and the soft soils are assumed to have been removed as part of the construction of the existing N4.

Table 7.5.12.9 Soft Soil Volumes for the Option Corridors West of Drumsna Junction (Node J)

Option Corridor	West of River the River Shannon	East of the River Shannon	Total Soft Soil (m ³)
	Soft Soil Volume m ³	Soft Soil Volume m ³	
Cyan Option Corridor	112,000	203,000	315,000
Orange Option Corridor	113,000	212,000	325,000
Dark Green Option Corridor	36,000	489,000	525,000
Purple Option Corridor	39,000	454,000	493,000
Blue Option Corridor	No Mainline Earthwork Volumes		

Soft soils are extensive across the study area and are considered significant on a local scale, occurring on the low-lying ground in between drumlin features and on the floodplain of the River Shannon. It will be excavated from areas where it exists under the formation of the proposed Option Corridors in order to achieve a suitable bearing stratum. Given this, the volume of soft soils along each of the Options Corridors are considered as having a high importance.

The following methodology has been adopted in the determination of the soft soil volumes:

1. The polygons for Alluvium, Lacustrine and Peat deposits from the GSI Quaternary Sediment map and the historical ground investigation data have been used to determine the location and plan area for each of the soft soil areas.

The plan area of the soft soil areas considered in this assessment are taken over the entire carriageway width plus the verge plus the embankment slope plus the temporary side slopes with the centre line taken as the centre line of the Option Corridor.

2. The average depth of the soft soils at each identified soft soil area is used in the volume calculation. In areas where there is historic GI the average depths of the soft soils have been estimated from this information. In areas where there is no existing GI, the soft soil depths are based on the average depth across all of the Option Corridors for each soft soil. Depths of these deposits will be confirmed once the Phase 2 Ground Investigation is complete.

The overall earthwork deficit (combining bulk cut and fill volumes and volumes of soft soils) West of Drumsna Junction and West of the River Shannon, the material deficits are in the order of 128,000m³ to 394,000m³ on the Orange, Cyan, Dark Green and Purple Option Corridors. This deficit in suitable engineering fill will need to be sourced within or in the vicinity of these Option Corridors in this area.

East of the River Shannon and West of Drumsna Junction the overall earthwork deficit ranges from 407,00m³ to 589,000m³ on the Orange, Cyan, Dark Green and Purple Option Corridors. This deficit in suitable engineering fill will need to be sourced within or in the vicinity of these Option Corridors in this area.

East of Drumsna Junction there is a surplus of 34,000m³ to 94,000m³ of material as all of the Option Corridors are more or less following the existing alignment of the N4.

It is clear that there are challenges with regards to the availability of suitable engineering fill and the reuse/repurpose of unsuitable material for the construction of all of the Option Corridors both West and East of Drumsna Junction. It is assumed for the purposes of the Stage 1 Preliminary Options Assessment that suitable material can be sourced, and unsuitable material will be disposed of to a licenced facility for all of the Options Corridors. At Stage 2 of the assessment, it is proposed that an exercise will be undertaken to determine opportunities for sourcing suitable material and reusing and repurposing unsuitable material. This exercise will be undertaken using desktop information, Phase 2 ground investigation data, intelligence gathered from the public consultation process and observations from the supervision of the ground investigation.

As a result, the Stage 1 Assessment will focus on the analysis of the bulk earthworks and soft soil volumes for each of the Option Corridors only.

Importance of Attribute

The importance of the Earthworks Criterion Attributes for the Option Corridors for the Cyan, Orange, Dark Green, Purple West, Purple East, Green and Yellow Options are rated as high due to the significance of the volumes of the bulk earthworks and soft soils across all of the Option Corridors on a local scale.

The importance rating of low was given to the Blue Option Corridor as there are no earthworks planned along this Option Corridor, only upgrades to junctions.

Magnitude of Impact

The magnitude of the impact of the bulk earthwork volumes, soft soil volumes and overall earthwork balance have been assessed based on the following limits which are considered appropriate for small, moderate and large earthwork requirements:

- Small Adverse – less than 100,000m³
- Moderate Adverse – between 100,000m³ and 350,000m³
- Large Adverse – greater than 350,000m³

West of Drumsna Junction the Option Corridors have been assessed as follows:

- The large cut volumes of the Purple Option Corridor (709,000m³) and the Dark Green Option Corridor (793,000m³) have been assigned a large adverse magnitude impact due to the high cut volumes in soil and rock. The lesser cut volumes of 197,000m³ on the Cyan Option Corridor and 114,000m³ on the Orange Option Corridor have been given a moderate adverse magnitude of impact.
- The Dark Green Option Corridor has the highest volume of fill (1,020,000m³) followed by the Cyan and Purple Option Corridors (735,000m³ and 751,000m³ respectively) and then the Orange Option Corridor with 503,000m³. Considering the magnitude of these volumes these have all been assigned a large adverse magnitude of impact.
- All Option Corridors have significant soft soil volumes. The Dark Green (525,000m³) and Purple Option (493,000m³) have been assigned a large adverse impact. The Cyan (315,000m³) and Orange (325,000m³) Option Corridors have the lesser volumes and have been assigned a moderate adverse impact.
- When looking at the overall earthwork balance (cut, fill and soft soil volumes) the Cyan Option Corridor has a deficit of 853,000m³, the Orange Option Corridor has a deficit of 714,000m³, the Dark Green Option Corridor has a deficit of 752,000m³ and the Purple Option Corridor has a deficit of 535,000m³ and have all be assigned a large adverse magnitude of impact.
- The Blue Option Corridor has scored negligible on all of the above as there are no earthworks planned on this Option only upgrades to existing junctions.

East of Drumsna Junction the Option Corridors have been assessed as follows:

- The Purple (221,000m³) and Yellow (170,000m³) Option Corridors have the largest cut volumes and have been assigned a moderate adverse impact. The Green Option Corridor gives a small adverse impact based on the lowest cut volume of 81,000m³.
- For the volumes of fill the Purple Option Corridor (127,000m³) and Yellow Option Corridor (107,000m³) have a moderate adverse impact and the Green Option Corridor (47,000m³) has a small adverse impact.

- The cut/fill balance for all of the Option Corridors East of Drumsna result in a surplus which can be reused in the Option Corridors West of the River Shannon to reduce the deficit and lessen the impact of the material imbalance along these Corridors. As a result, the surplus volumes for the Purple (94,000m³), Green (34,000m³) and Yellow (63,000m³) Option Corridors are considered to have a small adverse magnitude of impact.
- The Blue Option Corridor has scored negligible on all of the above as there are no earthworks planned on this Option Corridor only upgrades to existing junctions.

Table 7.5.12.10 Summary of the Earthworks Assessment for the Option Corridors West of Drumsna Junction (Node J)

Option Corridor	Criterion	Criterion Attributes	Description	Volume (m ³) or Quantity	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall MCA Score (Description)
Cyan Option Corridor	Earthworks	Bulk Earthworks	Cut (m ³)	197,000	High	Moderate Adverse	Significant / Moderate	Major or Highly Negative
			Fill (m ³)	735,000		Large Adverse	Severe / Significant	
			Soft Soil (m ³)	315,000		Moderate Adverse	Significant / Moderate	
			Overall Deficit (m ³)	853,000		Large Adverse	Severe / Significant	
Orange Option Corridor	Earthworks	Bulk Earthworks	Cut (m ³)	114,000	High	Moderate Adverse	Significant / Moderate	Major or Highly Negative
			Fill (m ³)	503,000		Large Adverse	Severe / Significant	
			Soft Soil (m ³)	325,000		Moderate Adverse	Significant / Moderate	
			Overall Deficit (m ³)	714,000		Large Adverse	Severe / Significant	
Dark Green Option Corridor	Earthworks	Bulk Earthworks	Cut (m ³)	793,000	High	Large Adverse	Severe / Significant	Major or Highly Negative
			Fill (m ³)	1,020,000		Large Adverse	Severe / Significant	
			Soft Soil (m ³)	525,000		Large Adverse	Severe / Significant	
			Overall Deficit (m ³)	752,000		Large Adverse	Severe / Significant	

Option Corridor	Criterion	Criterion Attributes	Description	Volume (m³) or Quantity	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall MCA Score (Description)
Purple West Option Corridor	Earthworks	Bulk Earthworks	Cut (m³)	709,000	High	Large Adverse	Severe / Significant	Major or Highly Negative
			Fill (m³)	751,000		Large Adverse	Severe / Significant	
			Soft Soil (m³)	493,000		Large Adverse	Severe / Significant	
			Overall Deficit (m³)	535,000		Large Adverse	Severe / Significant	
Blue Option Corridor	Earthworks	Bulk Earthworks	Cut (m³)	This Option Corridor follows existing infrastructure with only upgrades to junctions planned. Therefore, there are no mainline earthwork volumes	Low	Negligible	Imperceptible	Not Significant or Neutral
			Fill (m³)			Negligible	Imperceptible	
			Cut / Fill Balance (m³)			Negligible	Imperceptible	
			Soft Soil (m³)			Negligible	Imperceptible	

Table 7.5.12.11 Summary of the Earthworks Assessment for the Option Corridors East of Drumsna Junction (Node J)

Option Corridor	Criterion	Criterion Attributes	Description	Volume (m³)	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall MCA Score (Description)
Purple East Option Corridor	Earthworks	Bulk Earthworks	Cut (m³)	221,000	High	Moderate Adverse	Significant / Moderate	Moderately Negative
			Fill (m³)	127,000		Moderate Adverse	Significant / Moderate	
			Cut / Fill Balance (m³)	94,000 (surplus)		Small Adverse	Moderate / Slight	
Blue East Option Corridor	Earthworks	Bulk Earthworks	Cut (m³)	This Option Corridor follows existing infrastructure with only upgrades to junctions planned. Therefore, there are no mainline earthwork volumes	Low	Negligible	Imperceptible	Not Significant or Neutral
			Fill (m³)			Negligible	Imperceptible	
			Cut / Fill Balance (m³)			Negligible	Imperceptible	
Green Option Corridor	Earthworks	Bulk Earthworks	Cut (m³)	81,000	High	Small Adverse	Moderate / Slight	Minor or Slightly Negative
			Fill (m³)	47,000		Small Adverse	Moderate / Slight	
			Cut / Fill Balance (m³)	34,000 (surplus)		Small Adverse	Moderate / Slight	
Yellow Option Corridor	Earthworks	Bulk Earthworks	Cut (m³)	170,000	High	Moderate Adverse	Significant / Moderate	Moderately Negative

Option Corridor	Criterion	Criterion Attributes	Description	Volume (m ³)	Importance of Attribute	Magnitude of Impact	Significance of Impact	Overall MCA Score (Description)
			Fill (m ³)	107,000		Moderate Adverse	Significant / Moderate	
			Cut / Fill Balance (m ³)	63,000 (surplus)		Small Adverse	Moderate / Slight	

A standalone assessment has been undertaken of the Black Option Corridor to determine the baseline impacts on the Soils and Geology within this Option. A summary of the assessment for each of the criterion that were included in the sensitivity analysis is provided in the table below.

Table 7.5.12.12 Standalone Assessment Table – Black Option Corridor

Assessment Criteria	Black Option Corridor
Soil Deposits (well-drained soil types which are important for agriculture)	The Black Option Corridor does not intersect any soil types that are important for agriculture (well drained), therefore the significance of the impact on agricultural soils is Imperceptible .
Bedrock (Karst)	The Black Option Corridor does not intersect any karst features, therefore the significance of the impact on karst features is Imperceptible .
Bedrock (Volcanic Geology)	The Black Option Corridor does not intersect any volcanic bedrock formations, therefore the significance of the impact on volcanic geology is Imperceptible .
Landslide Susceptibility (Moderately high to high susceptibility)	The Black Option Corridor does not intersect areas of moderately high to high landslide susceptibility, therefore the significance of the impact on landslide susceptibility is Imperceptible .
Contaminated Sites	Approximately 6.0% of the Black Option Corridor intersects made ground with no identified potentially contaminated sites. Due to the unknown nature of the material across made ground areas these areas are considered to have a high importance. Given the small percentage of the Black Option Corridor that is underlain by made ground the magnitude is considered to be small adverse.

Assessment Criteria	Black Option Corridor
	Therefore, the significance of the impact on contaminated sites is considered to be Moderate / Slight .
Economic Geology	Approximately 8.0% of the Black Option Corridor intersects areas of high to very high crushed rock aggregate potential, with no high to very high granular aggregate potential areas, active quarries or pits or mineral localities intersected. Areas of high to very high crushed rock aggregate potential are considered to have a medium importance as these areas do not have a high significance on a local scale. Given the small percentage of the Black Option Corridor that is underlain by high to very high crushed rock aggregate potential the magnitude is considered to be small adverse. Therefore, the significance of the impact on economic geology is considered to be Slight.
Geological Heritage	The Black Option Corridor does not intersect any recorded geological heritage areas, therefore the significance of the impact on geological heritage is considered to be Imperceptible .
Earthworks	The earthwork requirement for the Black Option Corridor is considered to have a high importance on a local scale. The earthwork volumes for the Black Option Corridor are as follows, the magnitude of impact is considered to be small adverse:

Assessment Criteria	Black Option Corridor
	Bulk Cut Volume = 40,000m³ Bulk Fill Volume = 54,000m³ Bulk Cut / Fill Balance = 14,000m³ (Deficit) Soft Soil Volume = 41,000m³ Therefore, the significance of the impact on earthworks is considered to be Significant / Moderate.
Qualitative Assessment	Significant earthwork requirement when considering the short corridor length.
Score / Impact Level	1
PAG Description	Major or Highly Negative.

7.5.12.5 Summary

West of Drumsna Junction (Node J)

West of Drumsna Junction the Blue West Option Corridor is the Preferred Option Corridor, the Purple West, Dark Green and Orange Option Corridors are of Intermediate preference, and the Cyan Option and the Purple West Corridor are the Least Preferred (Refer to Table 7.5.12.13).

Table 7.5.12.13 Stage 1 Soils and Geology Summary Assessment Matrix of Options West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Contaminated Sites	Moderately Negative	Moderately Negative	Minor or Slightly Negative	Minor or Slightly Negative	Not Significant or Neutral	Moderate / Slight
Economic Geology	Minor or Slightly Negative	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Not Significant or Neutral	Slight
Earthworks	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Not Significant or Neutral	Significant / Moderate
Scoring						
Qualitative Assessment	Largest impact on potential contaminated sites and largest overall earthwork deficit (853,000m³) Major or Highly Negative	Second largest impact on potential contaminated sites and third largest overall earthwork deficit (714,000m³) Moderately Negative	Smallest overall earthwork deficit (535,000m³) Moderately Negative	Second largest overall earthwork deficit (752,000m³) and the most significant bulk cut and fill volumes. Major or Highly Negative	Minimal impact on Soils and Geology. Not Significant or Neutral	Major or Highly Negative
Score / Impact Level	1	2	2	2	4	1
Preference	Least Preferred	Intermediate	Intermediate	Least Preferred	Preferred	N/A

The reasons are as follows:

- The Cyan Option Corridor intersects the largest number of identified potentially contaminated sites and the second largest area of made ground which results in a Significant impact on the soils and geology. The Cyan Option Corridor also intersects the largest area of high to very high aggregate potential (1,638,000m³). With respect to earthworks, the Cyan Option Corridor has the largest earthwork deficit (853,000m³) when both the bulk earthworks deficit and the soft soil volumes are combined. The Cyan Option Corridor is considered the Least Preferred Option West of Drumsna Junction.
- The Orange Option Corridor intersects a similar quantity of Made Ground and Crushed Rock Aggregate Potential as the Cyan Option and also intersects the historic gas works site and the railway station. The bulk earthworks volumes are similar to that of the Cyan Option but the overall deficit when combining both the bulk earthworks and soft soil volumes is less (714,000m³). This is considered an Intermediate Option West of Drumsna Junction.
- The Dark Green Option Corridor has the largest cut and fill earthwork volume requirement, the largest soft soil volume and a significant earthwork deficit. The combined deficit between soft soil and bulk earthworks is 752,000m³. Its impact level has been ranked similar to that of the Cyan Option as due to the large volumes of both cut and fill and the similar overall deficits. The Cyan Option does impact the attribute of Contaminated Sites more than the Dark Green but the bulk earthworks on the Dark Green Option is so significant that it brings this Option in line with the Cyan Option.
- The Purple West Option Corridor intersects the smallest area of made ground and the least number of identified potentially contaminated sites. The Purple Option Corridor intersects the second smallest area of high to very high aggregate potential, however, this area is still considered significant. In terms of earthworks, this Option has a significant cut and fill earthwork volume requirement, however it's combined bulk earthworks and soft soil deficit is significantly less (535,000m³) than the other Options. As a result, the Purple West Option Corridor is considered more preferable than the Dark Green, Cyan and Orange Option Corridors West of Drumsna Junction and is Intermediate.
- The Blue West Option Corridor is considered to have minimal impact on the Soils and Geology as there are no earthworks planned only upgrades to existing junctions. It is therefore considered the Preferred Option Corridor West of Drumsna Junction.
- The Black Option Corridor has a significant earthwork requirement when considering the short corridor length and area and is considered to have a Major or Highly Negative impact.

East of Drumsna Junction (Node J)

East of Drumsna Junction the Blue East Option Corridor is the Preferred Option Corridor, the Green and Yellow Option Corridors are of Intermediate preference, and the Purple East Option Corridor is least preferred (Refer to Table 7.5.12.14).

The reasons are as follows:

- The Purple Option Corridor has the largest cut and fill earthwork volume requirement. This results in the Purple Option Corridor being the Least Preferred Option Corridor East of Drumsna Junction
- The Yellow Option Corridor has the second largest cut and fill earthwork requirement and is considered Intermediate East of Drumsna Junction
- The Green Option Corridor has the smallest cut and fill earthwork requirement (excluding the Blue Option Corridor). As a result, the Green Option Corridor is considered Intermediate and more preferable than the Yellow Option Corridor East of Drumsna Junction
- The Blue Option Corridor is considered to have least impact on the Soils and Geology and therefore is considered the Preferred Option Corridor East of Drumsna Junction.

Table 7.5.12.14 Stage 1 Soils and Geology Summary Assessment Matrix of Options East of Drumsna Junction (Node J)

Assessment Criteria	Yellow Option Corridor	Green Option Corridor	Purple East Option Corridor	Blue East Option Corridor
Earthworks	Moderately Negative	Minor or Slightly Negative	Moderately Negative	Not Significant or Neutral
Scoring				
Qualitative Assessment	Second largest cut and fill earthwork volume. Moderately Negative	Smallest cut and fill earthwork volume. Minor or Slightly Negative	Largest cut and fill earthwork volume. Moderately Negative	Minimal impact on Soils and Geology. Not Significant or Neutral
Score / Impact Level	2	3	2	4
Preference	Intermediate	Intermediate	Least Preferred	Preferred

7.6 Stage 1 Options – Economic Assessment of Option Corridors

7.6.1 Introduction

As part of the Stage 1 Assessment of the option corridors an economic assessment of each of option corridor described in Section 7.1.2 was undertaken in accordance with the requirements of the TII Cost Management Manual.

Section 7.6.2 outlines the methodology utilised to carry out the cost assessment, Sections 7.6.3 details the cost assessment to the west of Node J at Drumsna, Section 7.6.4 details the cost assessment to the east of Node J at Drumsna and a summary is presented in Section 7.6.5.

As outlined in Section 7.1 it is necessary to assess an incremental build-up of intervention when considering Economy as there are significant differences in cost depending on the level of intervention. As noted above the Blue Option Corridor represents the Management Option which comprises the maximum reuse of the existing mainline infrastructure. All the remaining option corridors include a portion of new mainline infrastructure. For the option corridors to the west of Drumsna Junction, two design scenarios were developed to inform the assessment of what is the appropriate level of intervention required to provide the optimum transport solution. These design scenarios were developed using a single carriageway and a dual carriageway cross-section and are costed accordingly. This exercise was undertaken so that an understanding of the cost differential between various cross-sections is obtained. However, in the final compilation of the matrix for Stage 1 assessment, the Economy assessment will also present the costs which align with the Environment and Engineering assessments. The Black Option Corridor comprises an urban street type intervention.

7.6.2 Methodology

7.6.2.1 Overview

The methodology adopted in preparing the Stage 1 cost estimate ranges comprised the following elements:

- Horizontal and vertical alignments were developed for each of the option corridors in order to establish an indicative footprint and indicative earthworks quantities. Refer to the plan and profile details presented in Figures 7.3.2.0 to 7.3.15.6
- As the cross-section has not been determined as this early stage, an incremental approach to the cross-section selection is required which necessitates the requirement for cost estimates for reuse of the existing cross-section (i.e., Management Option), a Type 1 Single Carriageway and Type 2 Dual Carriageway

- Option corridors within the street network of the town of Carrick-on-Shannon will be designed as an urban street to the Design Manual for Urban Roads and Streets (DMURS) design standard
- All major quantities and grouping thereof were determined in accordance with the TII Method of Measurement for each Option Corridor
- Assessment and quantification of land use and planning impacts for input to the land and property cost
- Identification and assessment of advance works and other contracts required for the delivery of each Option Corridor
- Compilation of cost estimate ranges using the TII's database of unit rates where applicable
- Comparative assessment to out-turn and forecast costs from previous schemes was undertaken to ensure cost ranges were comparable
- For the option scenarios to the west of Drumsna Junction, a direct comparison was undertaken for the four dual carriageway scenarios and also a separate comparison was undertaken for the five single carriageway scenarios which identified any significant differences in the cost assessment
- Compilation of cost estimates using the TII's database of unit rates where applicable
- Comparative assessment of out-turn and forecast costs from previous schemes was undertaken to ensure costs were comparable
- Once all elements of the overall costs were compiled, a Project Specific Risk Contingency allowance of 15% was applied to the costings
- Inflation allowances for construction and Land and Property costs amounting to 3% were applied to the estimates as well as an overall 5% Programme Risk
- Costs were categorised into nine ranges, similar to cost ranges set out in Chapter 5 of the National Development Plan but with the inclusion a new category for costs less than €20M. The costs for each of the option corridors are also quoted in multiples of the lowest cost option corridor in each section, i.e. the cheapest option is given a value of X or Y with X applicable west of Drumsna and Y applicable east of Drumsna and the other option corridors are a multiple of that. The PAG Score rating is also included in the table below, with 1 being the most expensive and 7 being the most financially beneficial.

Table 7.6.2.1 Cost Range Categories

Category	Cost Range	PAG Score
i	€0 - €1M	7
ii	€1M - €10M	7
iii	€10M+	6
A	€20M - €50M	5

Category	Cost Range	PAG Score
B	€50M - €100M	4
C	€100M - €250M	3
D	€250M - €500M	2
E	€500M - €1BN	1
F	€1BN+	1

No Cost Benefit Analysis (CBA) was undertaken for the Stage 1 economic assessment. The economic assessment is limited to construction and delivery costs and is for comparative purposes only.

7.6.2.2 Option Corridors to be Assessed

There are six option corridors to the west of Drumsna and four option corridors to the east of Drumsna. However, as the cross-section within the option corridors is not defined at this stage, a total of 14 scenarios are considered in the Stage 1 cost assessment to enable a robust comparison and assessment. The differing scenarios within a corridor refer to the cross-section type utilised namely Type 1 Single Carriageway, Type 2 Dual Carriageway or urban street, and this is summarised below in Table 7.6.2.1 and Table 7.6.2.2.

Please note, the Economic assessment is the only Stage 1 Assessment which considers both single and dual cross-sections within each option corridor.

The Blue West Option Corridor contains the Management Option and considers management improvements only to the existing cross-section and the Black Option Corridor assumes an urban street type cross-section. Within the Purple West Option Corridor, Dark Green Option Corridor, Cyan Option Corridor and the Orange Option Corridor two design scenarios are costed and assessed as set out in Table 7.6.2.1. To the east of Drumsna Junction, each corridor contains one design scenario as set out in Table 7.6.2.2.

Table 7.6.2.1 Scenarios within Option Corridors West of Drumsna Junction (Node J)

Option Corridor	Scenario Reference	Description
Blue West	Scenario 1	Management Option / Existing cross-section
Purple West	Scenario 1 (Red)	Single Carriageway
	Scenario 2 (Purple)	Dual Carriageway
Dark Green	Scenario 1 (Dark Green)	Single Carriageway
	Scenario 2 (Grey)	Dual Carriageway
Cyan	Scenario 1 (Cyan)	Single Carriageway
	Scenario 2 (Pink)	Dual Carriageway
Orange	Scenario 1 (Brown)	Single Carriageway
	Scenario 2 (Orange)	Dual Carriageway
Black	Scenario 1	Urban Street Link

Table 7.6.2.2 Scenarios within Option Corridors East of, Drumsna Junction (Node J)

Option Corridor	Scenario Reference	Description
Blue East	Scenario 1	Management Option / Existing cross-section
Green	Scenario 1	Single Carriageway
Yellow	Scenario 1	Single Carriageway
Purple East	Scenario 1	Dual Carriageway

Both the new construction length (i.e. the length of new mainline construction associated with each option) and the trip travelled length (i.e. the distance from Node O on the existing N4 to the Node J on the existing N4) were considered in the breakdown of costs. The trip lengths travelled for each option are given in Table 7.6.2.3 and Table 7.6.2.4 below. The options are split into west and east of Drumsna (Node J).

Table 7.6.2.3 Trip Lengths of Option Corridors West of Drumsna Junction (Node J)

Option Corridor	Scenario Reference	Description	Trip Length – West of Point J (km)	New Mainline Construction (km)
Purple West	Scenario 1 (Red)	Single Carriageway	13.385	9.972
	Scenario 2 (Purple)	Dual Carriageway	13.344	10.009
Dark Green	Scenario 1 (Dark Green)	Single Carriageway	13.219	9.843
	Scenario 2 (Grey)	Dual Carriageway	13.219	9.843
Cyan	Scenario 1 (Cyan)	Single Carriageway	12.416	11.177
	Scenario 2 (Pink)	Dual Carriageway	12.416	11.177
Orange	Scenario 1 (Brown)	Single Carriageway	12.534	9.268
	Scenario 2 (Orange)	Dual Carriageway	12.534	9.304
Blue West	Scenario 1	Management Option / Existing cross-section	12.376	0
Black	Scenario 1	Urban Street Link	N/A	1.107

Table 7.6.2.4 Difference in Trip Lengths of Options East of Drumsna Junction (Node J)

Option Corridor	Scenario	Description	Trip Length - East of Point J (km)	New Mainline Construction (km)
Blue East	Scenario 1	Management Option / Existing cross-section	7.876	0
Purple East	Scenario 1	Dual Carriageway	7.982	7.616
Yellow	Scenario 1	Single Carriageway	7.864	7.865
Green	Scenario 1	Single Carriageway	7.878	7.864

The cost estimate ranges for each scenario were completed. For all of the 14 scenarios assessed, cost rankings are provided (with 1 being the most expensive option).

7.6.3 Cost Estimate Ranges West of Drumsna Junction (Node J)

Table 7.6.3.1 details the ten scenario cost estimate ranges for the Stage 1 Option Corridors to the west of Drumsna Junction and provides a ranking. Section 7.6.3.1 summarises the assessment of the single carriageway scenarios, Section 7.6.3.2 summarises the assessment of the dual carriageway scenarios.

Table 7.6.3.1 Cost Estimate Ranges West of Drumsna Junction (Node J)

Option Corridor	Scenario Number / Reference Design	Cost Range Category / Factor Relative to Lowest	PAG Score and Preference Dual Carriageway	PAG Score and Preference Single Carriageways
Purple West	Scenario 2 (Purple Design - T2 Dual)	C / 3.2X	PAG Score 3 Preferred	
	Scenario 1 (Red Design - T1 Single)	C / 2.6X		PAG Score 3 Intermediate
Dark Green	Scenario 1 (Dark Green Design - T1 Single)	C / 2.8X		PAG Score 3 Intermediate
	Scenario 2 (Grey Design - T2 Dual)	C / 3.3X	PAG Score 3 Intermediate	
Cyan	Scenario 1 (Cyan Design - T1 Single)	C / 3.2X		PAG Score 3 Least Preferred
	Scenario 2 (Pink Design - T2 Dual)	C / 3.8X	PAG Score 3 Least Preferred	
Orange	Scenario 2 (Orange Design - T2 Dual)	C / 3.4X	PAG Score 3 Intermediate	
	Scenario 1 (Brown - T1 Single)	C / 2.6X		PAG Score 3 Intermediate
Blue West	Scenario 1 (Blue Design - T1 Single)	B / X		PAG Score 4 Preferred
Black	Scenario 1 (Black Design- Urban Street)	(iii)	N/A	N/A

7.6.3.1 Single Carriageway Summary

The Blue West Option Corridor (Management Option) is the Preferred option in terms of costs on the single carriageway options with the Cyan Option Corridor being the most expensive and Least Preferred, noting that the Cyan Option Corridor (Cyan Design) involves the longest new construction length and is approximately 20% longer than the Orange Option Corridor (Brown Design). The Orange Option

Corridor (Brown Design), Dark Green Option Corridor (Dark Green Design) and Purple West Option Corridor (Red Design) are ranked as Intermediate.

7.6.3.2 Dual Carriageway Summary

The Cyan Option Corridor (Pink Design) involves the longest length of new construction, is the most expensive option and therefore is ranked Least Preferred from a cost perspective. The Purple West Option Corridor (Purple Design) is the least expensive and is therefore the Preferred option from a cost perspective. Both the Cyan Option Corridor (Pink Design) and Orange Option Corridor (Orange Design) are ranked as Intermediate.

As seen in the summaries above, the cost differential between the single and dual carriageway cross-sections does not change the cost estimate range. As noted earlier in the methodology, in the final compilation of the matrix for Stage 1 assessment, the Economy assessment will present the costs which align with the Environment and Engineering assessments.

7.6.4 Cost Estimate Ranges East of Drumsna Junction (Node J)

The cost estimate ranges for the four Stage 1 Option Corridors to the east of Drumsna Junction are detailed in Table 7.6.4.1 and also provide a ranking based on cost.

Table 7.6.4.1 Cost Estimate Ranges East of Node J at Drumsna Junction

Option Corridor	Scenario Number / Reference Design	Option Comparison Estimate	PAG Score and Preference
Yellow	Scenario 1 (Yellow Design - T1 Single)	C / 2.9Y	PAG Score 3 Intermediate
Green	Scenario 1 (Green Design - T1 Single)	B / 2Y	PAG Score 4 Intermediate
Purple East	Scenario 1 (Purple - T2 Dual)	C / 5.3Y	PAG Score 3 Least Preferred
Blue East	Scenario 1 (Blue - T1 Single)	A / Y	PAG Score 5 Preferred

The comparison of the option corridors to the east of Drumsna shows a significant cost differential between the single carriageway cross-section and the dual carriageway cross-section. The Stage 2 Assessment will compare the associated benefits arising from the implementation of a dual carriageway versus a single carriageway in terms of safety benefits and capacity to inform the selection of the preferred cross-section.

7.6.5 Summary

Overall Corridor Summary to West of Drumsna Junction (Node J)

The Blue West Option Corridor is the Preferred Option from a cost perspective with the Cyan Option Corridor having the most expensive scenario and is the Least Preferred. The Orange and Purple West Option Corridors are ranked as Intermediate overall.

Overall Corridor Summary to East of Drumsna Junction (Node J)

The Blue East Option Corridor is the Preferred Option from a cost perspective with the Purple East Option Corridor having the most expensive scenario and is the Least Preferred. The Green and Yellow Option Corridors are ranked as Intermediate overall.

7.7 Framework Matrix

7.7.1 Introduction

This section presents the outputs of the assessments of the engineering, environment and economy of the option corridors initially in summary matrices for each of these three criteria. Thereafter an overall summary framework matrix is presented to determine which options are carried through to Stage 2 assessment.

7.7.2 Summary Engineering Framework Matrix

The engineering assessment of the Stage 1 Option Corridors examined each of the option corridors under the headings Geometry, Trip Length, Junction Strategy, Constructability and Traffic. The methodology used to assess the option corridors under each heading has been detailed throughout Section 7.3.3. The summary of the process in the determination of their ultimate ranking provided in 7.3.3. The summary tables are provided in Table 7.7.2.1 and Table 7.7.2.2 below.

Table 7.7.2.1 Summary Engineering Scoring Matrix of Option Corridors - West of Drumsna Junction (Node J)

Assessment Criteria	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE OPTION CORRIDOR	BLACK OPTION CORRIDOR
Geometry	7	7	7	7	4	7
Trip Length	3	3	3	3	4	N/A
Junction Strategy	3	3	4	3	1	3
Constructability	2	3	3	3	4	4
Traffic	7	7	6	6	4	4
Scoring						
Qualitative Assessment	Minor or Slightly Negative	Minor or Slightly Negative	Not Significant or Neutral	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Score / Impact Level	3	3	4	3	3	3
Preference	Intermediate	Intermediate	Preferred	Intermediate	Least Preferred	N/A

Table 7.7.2.2 Summary Engineering Scoring Matrix of Option Corridors East of Drumsna Junction (Node J)

Assessment Criteria	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Geometry	7	7	7	4
Trip Length	5	3	3	4
Junction Strategy	3	3	5	2
Constructability	3	2	3	4
Scoring				
Qualitative Assessment	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Positive	Minor or Slightly Negative
Score / Impact Level	4	4	5	3
Preference	Intermediate	Intermediate	Preferred	Least Preferred

7.7.3 Summary Environmental Framework Matrix

Each of the option corridors were ranked in each of the environmental disciplines in Section 7.5 of this report. The rankings are summarised below Table 7.7.3.1 for the option corridors west of Drumsna Junction (Node J) and Table 7.7.3.2 for the option corridors east of Drumsna Junction (Node J), with respect to their impacts on each environmental discipline as follows: Preferred, Intermediate, and Least Preferred.

The overall ranking for each option corridor in terms of the environment took into consideration the overall number of Preferred, Intermediate and Least Preferred rankings. Subsequently, during the course of the assessment process *Population, Human Health, Material Assets- Non- Agriculture, Biodiversity, Hydrology and Soils and Geology* were identified as being significant disciplines with respect to the N4 Carrick-on-Shannon to Dromod Project specifically. Therefore, these disciplines are shown in italics in the summary tables and are referred to as “key environmental disciplines” in the proceeding text.

7.7.3.1 West of Drumsna Junction (Node J)

Cyan Option Corridor

When totalling all the environmental rankings the Cyan Option Corridor has four Least Preferred and one Preferred ranking. Furthermore, when looking at the key environmental disciplines, the Cyan Option Corridor has two Least Preferred and one Preferred. This has resulted in an overall ranking as Least Preferred for the Cyan Option Corridor.

Orange Option Corridor

When totalling all the environmental rankings, the Orange Option Corridor has three Least Preferred and two Preferred rankings. However, when considering the key environmental disciplines, the Orange Option Corridor has one Least Preferred and two Preferred. This has resulted in an overall ranking as Preferred for the Orange Option Corridor.

Purple West Option Corridor

When totalling all the environmental rankings, the Purple West Option Corridor has four Least Preferred and four Preferred rankings. Also, when considering the key environmental disciplines, the Purple West Option Corridor has two Least Preferred and one Preferred. This has resulted in an overall ranking as Least Preferred for the Purple West Option Corridor.

Dark Green Option Corridor

When totalling all the environmental rankings, the Dark Green Option Corridor has five Least Preferred and four Preferred rankings. When considering the key environmental disciplines, the Dark Green Option Corridor has three Least Preferred and one Preferred. This has resulted in an overall ranking as Intermediate for the Dark Green Option Corridor.

Blue West Option Corridor

When totalling all the environmental rankings, the Blue West Option Corridor has three Least Preferred and eight Preferred rankings. Furthermore, when considering the key environmental disciplines, the Blue West Option Corridor has two Least Preferred and three Preferred rankings. This has resulted in an overall ranking as Preferred for the Blue West Option Corridor.

7.7.3.2 East of Drumsna Junction (Node J)

Yellow Option Corridor

When totalling all the environmental rankings, the Yellow Option Corridor has two Least Preferred and one Preferred ranking. However, when considering the key environmental disciplines, the Yellow Option Corridor has one Least Preferred and one Preferred. This has resulted in an overall ranking as Intermediate for the Yellow Option Corridor.

Green Option Corridor

When totalling all the environmental rankings, the Green Option Corridor has zero Least Preferred and four Preferred ranking. However, when considering the key environmental disciplines, the Green Option Corridor has zero Least Preferred and one Preferred. This has resulted in an overall ranking as Intermediate for the Green Option Corridor.

Purple East Option Corridor

When totalling all the environmental rankings, the Purple East Option Corridor has five Least Preferred and three Preferred ranking. However, when considering the key environmental disciplines, the Purple East Option Corridor has two Least Preferred and one Preferred. This has resulted in an overall ranking as Least Preferred for the Purple East Option Corridor.

Blue East Option Corridor

When totalling all the environmental rankings, the Blue East Option Corridor has zero Least Preferred and ten Preferred rankings. However, when considering the key environmental disciplines, the Blue East Option Corridor has zero Least Preferred and four Preferred. This has resulted in an overall ranking as Preferred for the Blue East Option Corridor.

Table 7.7.3.1 Stage 1 Summary of Environmental Assessment Matrices -Option Corridors West of Drumsna Junction (Node J)

Environmental Discipline	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
<i>Population*</i>	Intermediate	Intermediate	Preferred	Preferred	Least Preferred	Moderately Positive
<i>Human Health*</i>	Preferred	Preferred	Intermediate	Intermediate	Least Preferred	Not Significant or Neutral
<i>Material Assets Non-Agriculture*</i>	Least Preferred	Least Preferred	Intermediate	Intermediate	Preferred	Minor or Slightly Negative
Material Assets Agriculture	Intermediate	Intermediate	Intermediate	Least Preferred	Preferred	Not Significant or Neutral
Air Quality	Intermediate	Intermediate	Preferred	Preferred	Least Preferred	Minor or Slightly Negative
Climate	Intermediate	Intermediate	Least Preferred	Intermediate	Preferred	Moderately Negative
Noise and Vibration	Intermediate	Intermediate	Preferred	Preferred	Preferred	Moderately Negative
Archaeology, Architecture and Cultural Heritage	Least Preferred	Least Preferred	Preferred	Preferred	Intermediate	Not Significant Neutral
Landscape and Visual	Least Preferred	Least Preferred	Intermediate	Intermediate	Preferred	Moderately Negative
<i>Biodiversity*</i>	Intermediate	Preferred	Least Preferred	Least Preferred	Intermediate	Minor or Slightly Negative
<i>Hydrology*</i>	Intermediate	Intermediate	Least Preferred	Least Preferred	Preferred	Minor or Slightly Negative
Hydrogeology	Intermediate	Intermediate	Least Preferred	Least Preferred	Preferred	Moderately Negative
<i>Soils and Geology*</i>	Least Preferred	Intermediate	Intermediate	Least Preferred	Preferred	Major or Highly Negative

Environmental Discipline	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Scoring						
Qualitative Assessment	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Moderately Negative
Score / Impact Level	1	1	1	1	1	2
Preference	Least Preferred	Preferred	Least Preferred	Intermediate	Preferred	N/A

**Environmental Disciplines written in italics are considered to be key environmental disciplines in this study area of this particular project*

Table 7.7.3.2 Stage 1 Summary of Environmental Assessment Matrices - Option Corridors East of Drumsna Junction (Node J)

Environmental Discipline	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
<i>Population*</i>	Intermediate	Intermediate	Preferred	Intermediate
<i>Human Health*</i>	Preferred	Intermediate	Intermediate	Intermediate
<i>Material Assets Non-Agriculture*</i>	Least Preferred	Intermediate	Intermediate	Preferred
Material Assets Agriculture	Intermediate	Preferred	Least Preferred	Preferred
Air Quality	Intermediate	Intermediate	Preferred	Intermediate
Climate	Intermediate	Intermediate	Least Preferred	Preferred
Noise and Vibration	Intermediate	Intermediate	Preferred	Preferred
Archaeology, Architecture and Cultural Heritage	Least Preferred	Preferred	Intermediate	Preferred
Landscape and Visual	Intermediate	Intermediate	Least Preferred	Preferred
<i>Biodiversity*</i>	Intermediate	Preferred	Least Preferred	Preferred
<i>Hydrology*</i>	Intermediate	Intermediate	Intermediate	Preferred
Hydrogeology	Intermediate	Preferred	Intermediate	Preferred
<i>Soils and Geology*</i>	Intermediate	Intermediate	Least Preferred	Preferred

Environmental Discipline	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Scoring				
Qualitative assessment	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Score / Impact level	2	2	2	2
Preference	Intermediate	Intermediate	Least Preferred	Preferred

**Environmental Disciplines written in italics are considered to be key environmental disciplines in this study area of this particular project*

7.7.4 Summary Economic Framework Matrix

The cost estimate ranges of the Stage 1 Option Corridors examined each of the option corridors for cost estimates of reuse of the existing cross-section (i.e., Management Option), a Type 1 Single Carriageway and Type 2 Dual Carriageway. The methodology used to assess the option corridors is included in Section 7.6. The summary of the process in the determination of their ultimate ranking is provided in Section 7.6.5. In the final compilation of the economic matrix for Stage 1 assessment, the Economy assessment will only present the costs of the scenario with the cross-section which align with the Environment and Engineering assessments. This has necessitated a comparison of the single carriageway costs versus the dual carriageways where both cross-section types are assessed within an option corridor, as opposed to rankings per cross-section type in Table 7.6.3.1.

The summary tables provided below present the costs which align with the Environment and Engineering assessments.

Table 7.7.4.1 Economy Assessment West of Drumsna Junction (Node J)

Option Corridor	Scenario Number / Reference Design	PAG Score / Preference
Purple West	Scenario 2 (Purple Design – T2 Dual)	3 Intermediate
Dark Green	Scenario 2 (Grey Design – T2 Dual)	3 Intermediate
Cyan	Scenario 2 (Pink Design – T2 Dual)	3 Least Preferred
Orange	Scenario 2 (Orange Design – T2 Dual)	3 Intermediate
Blue West	Scenario 1 (Blue Design – T1 Single)	4 Preferred
Black	Scenario 1 (Black Design- Urban Street)	N/A

Note Purple West was the Preferred dual carriageway option when ranked against the other dual carriageway options in Table 7.6.3.1; however, it is now compared against the Blue West single carriageway and the ranking changes to Intermediate.

Table 7.7.4.2 Economy Assessment East of Drumsna Junction (Node J)

Option Corridor	Scenario Number / Reference Design	PAG Score / Preference
Purple East	Scenario 1 (Purple - T2 Dual)	3 Least Preferred
Green	Scenario 1 (Green Design - T1 Single)	4 Intermediate
Yellow	Scenario 1 (Yellow Design - T1 Single)	3 Intermediate
Blue East	Scenario 1 (Blue - T1 Single)	5 Preferred

7.7.5 Summary Framework Matrix

To determine if option corridors warrant being brought through to Stage 2 for further assessment, each of the option corridors were evaluated under the headings of Engineering, Environment and Economy. These are now compiled together and summarised in a singular matrix in Table 7.7.5.1 and Table 7.7.5.2 for west and east of Drumsna respectively. Based on the findings from those assessments they were then re-tested against the project objectives.

It is worthy to note that although an option corridor may perform well when evaluated in terms of Engineering, Environment and Economy, if they do not meet the Project Objectives following the Stage 1 Assessment they will not function as a useful transport solution and so further studies as part of the Stage 2 assessment would be purposeless.

Table 7.7.5.1 Stage 1 Framework Matrix of Option Corridors West of Drumsna Junction (Node J)

	CYAN OPTION CORRIDOR	ORANGE OPTION CORRIDOR	PURPLE WEST OPTION CORRIDOR	DARK GREEN OPTION CORRIDOR	BLUE WEST OPTION CORRIDOR	BLACK OPTION CORRIDOR
Engineering						
PAG Description	Minor or Slightly Negative	Minor or Slightly Negative	Neutral	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
PAG Score	3	3	4	3	3	3
Ranking	Intermediate	Intermediate	Preferred	Intermediate	Least Preferred	
Environment						
PAG Description	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Moderately Negative
PAG Score	1	1	1	1	1	2
Ranking	Least Preferred	Preferred	Least Preferred	Intermediate	Preferred	
Economy (Costs which align with the Environment and Engineering assessments)						
PAG Description	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Not Significant or Neutral	N/A
PAG Score	3	3	3	3	4	
Ranking	Least Preferred	Intermediate	Intermediate	Intermediate	Preferred	
Progress to Stage 2?	YES	YES	YES	YES	NO	YES

Table 7.7.5.2 Stage 1 Framework Matrix of Option Corridors East of Drumsna Junction (Node J)

	YELLOW OPTION CORRIDOR	GREEN OPTION CORRIDOR	PURPLE EAST OPTION CORRIDOR	BLUE EAST OPTION CORRIDOR
Engineering				
PAG Description	Neutral	Not Significant or Neutral	Slightly Positive	Slightly Negative
PAG Score	4	4	5	3
Ranking	Intermediate	Intermediate	Preferred	Least Preferred
Environment				
PAG Description	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
PAG Score	2	2	2	2
Ranking	Intermediate	Intermediate	Least Preferred	Preferred
Economy (Costs which align with the Environment and Engineering assessments)				
PAG Description	Minor or Slightly Negative	Not Significant or Neutral	Minor or Slightly Negative	Minor or Slightly Positive
PAG Score	3	4	3	5
Ranking	Intermediate	Intermediate	Least Preferred	Preferred
Progress to Stage 2?	YES	YES	YES	NO

7.7.5.1 West of Drumsna Junction (Node J)

Cyan Option Corridor

The Cyan Option Corridor was ranked as Intermediate in terms of Engineering, Least Preferred in terms of Environment and Least Preferred in terms of Economy.

When tested against the project objectives following the Stage 1 assessment, it was found to still be feasible as a possible solution to the transport issues identified and therefore, should be progressed to Stage 2 for further assessment.

Orange Option Corridor

The Orange Option Corridor was ranked as Intermediate in terms of Engineering, Preferred in terms of Environment and Intermediate in terms of Economy.

When tested against the project objectives following the Stage 1 assessment, it was found to still be feasible as a possible solution to the transport issues identified and therefore, should be progressed to Stage 2 for further assessment.

Purple West Option Corridor

The Purple West Option Corridor was ranked as Preferred in terms of Engineering, Least Preferred in terms of Environment and Intermediate in terms of Economy.

When tested against the project objectives following the Stage 1 assessment, it was found to still be feasible as a possible solution to the transport issues identified and therefore, should be progressed to Stage 2 for further assessment.

Dark Green Option Corridor

The Dark Green Option Corridor was ranked as Intermediate in terms of Engineering, Intermediate in terms of Environment and Intermediate in terms of Economy.

When tested against the project objectives following the Stage 1 assessment, it was found to still be feasible as a possible solution to the transport issues identified and therefore, should be progressed to Stage 2 for further assessment.

Blue West Option Corridor

The Blue West Option Corridor was ranked as Least Preferred in terms of Engineering, Preferred in terms of Environment and Preferred in terms of Economy. As set out in Section 7.1.2 the Management Option was brought through the initial sifting to ensure that an equivalent assessment of it was completed to inform the true viability of the option in more detail than the sifting exercise. Further analysis was undertaken during the Stage 1 Assessment under the three criteria, and this has informed the decision on this option.

It is unsurprising that the Blue West Option Corridor has been identified as Preferred in terms of Environment and Economy as it is the “Management Option” which most closely retains the existing environment. Based on the structure of the Environmental assessment (i.e. testing against the existing environment as a

baseline) the resulting environmental impacts relative to the existing situation would be of a smaller scale than those for new road infrastructure. Similarly, due to the minimal amount of works required to implement the option proposals, the Economic assessment would return a favourable ranking. However, the Engineering assessment is telling in this regard as the Blue West Option Corridor scores poorly under Geometry and Junction Strategy; due to maintaining the existing sub-standard mainline alignment. Whilst the Blue West Option does include for rationalisation of some of the accesses in the rural areas, it does not improve on the existing sub-standard mainline alignment and it does not reduce the congestion in the urban areas, therefore, it does not deliver significant improvement under the project objective of “Safety”. Moreover, as it is maintaining the status quo, it does little to provide for the Project Objectives under the criteria of “Accessibility and Social Inclusion”, “Integration” or “Physical Activity”. The minimal removal of traffic from the town of Carrick-on-Shannon reflects on how little impact this option corridor offers to improve place making and community, provide any meaningful opportunity to realise improved accessibility or sustainable trip making, as can be seen in both the ‘Population and Human Health assessments which both ranked this option corridor as Least Preferred. It cannot deliver on the project objectives set out for the TEN-T comprehensive network, nor can it provide enhanced connectivity across the River Shannon, nor improve the connectivity to the Northwest Region. The Blue Option Corridor also lacks ability to enhance a safe and healthy environment for the communities along the N4 corridor.

Based on the findings from the Stage 1 assessments, the Blue West Option Corridor does not meet the project objectives sufficiently and does not warrant being brought forward for further assessment in Stage 2.

7.7.5.2 East of Drumsna Junction (Node J)

Yellow Option Corridor

The Yellow Option Corridor was ranked as Intermediate in terms of Engineering, Intermediate in terms of Environment and Intermediate in terms of Economy.

When tested against the project objectives following the Stage 1 assessment, it was found to still be feasible as a possible solution to the transport issues identified and therefore, should be progressed to Stage 2 for further assessment.

Green Option Corridor

The Green Option Corridor was ranked as Intermediate in terms of Engineering, Intermediate in terms of Environment and Intermediate in terms of Economy.

When tested against the project objectives following the Stage 1 assessment, it was found to still be feasible as a possible solution to the transport issues identified and therefore, should be progressed to Stage 2 for further assessment.

Purple East Option Corridor

The Purple East Option Corridor was ranked as Preferred in terms of Engineering, Least Preferred in terms of Environment and Least Preferred in terms of Economy.

When tested against the project objectives following the Stage 1 assessment, it was found to still be feasible as a possible solution to the transport issues identified and therefore, should be progressed to Stage 2 for further assessment.

Blue East Option Corridor

The Blue East Option Corridor was ranked as Least Preferred in terms of Engineering, Preferred in terms of Environment and Preferred in terms of Economy.

Again, it is unsurprising that the Blue East Option Corridor has been identified as Preferred in terms of Environment and Economy as it is the “Management Option” which most closely retains the existing environment. Based on the structure of the Environmental assessment (i.e. testing against the existing environment as a baseline) the resulting environmental impacts would be of a smaller scale than those for new road infrastructure. Similarly, due to the minimal amount of works required to implement the option, the Economic assessment would return a favourable ranking. However, the Engineering assessment is revealing in this regard as the Blue East Option Corridor scores poorly under Geometry and Junction Strategy; due to maintaining the existing sub-standard mainline alignment. Whilst the Blue East Option does include for rationalisation of some of the accesses in the rural areas, it does not improve on the existing sub-standard mainline alignment and it does not deliver significant improvement upon the project objective of “Safety”. Moreover, as it is maintaining the status quo, it does little to provide for the Project Objectives under the criteria of “Accessibility and Social Inclusion”, “Integration” or “Physical Activity”.

Based on the findings from the Stage 1 Assessments, the Blue East Option Corridor does not meet the project objectives and does not warrant being brought forward for further assessment in Stage 2.

7.8 Recommendation

Following the Stage 1 Options assessment it is recommended that all option corridors with the exception of the Blue Option Corridor (the Management Option) are progressed to the Stage 2 assessment for a more detailed analysis in the Option Selection Process.