

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

274219-ARUP-02-OS-RP-YE-000024

P07 | 14 March 2023

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Job number 274219

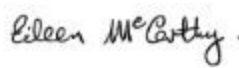
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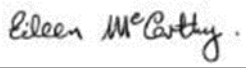
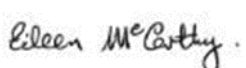
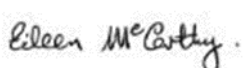
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Document verification

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Job title		N4 Carrick-on-Shannon to Dromod Project		Job number 274219	
Document title		Option Selection Report		File reference	
Document ref		274219-ARUP-02-OS-RP-YE-000024			
Revision	Date	Filename	274219-ARUP-02-OS-RP-YE-000011.docx		
P01	01 Nov 2021	Description	First draft		
			Prepared by	Checked by	Approved by
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P02	9 Mar 2022	Filename	274219-ARUP-02-OS-RP-YE-000024		
		Description	Responses to client review		
			Prepared by	Checked by	Approved by
		Name			
		Signature			
P03	11 Mar 2022	Filename	274219-ARUP-02-OS-RP-YE-000024		
		Description	Issued for Peer Review		
			Prepared by	Checked by	Approved by
		Name			
		Signature			
P04	22 July 22	Filename	274219-ARUP-02-OS-RP-YE-000024		
		Description	Final Draft with Tracked Changes		
			Prepared by	Checked by	Approved by
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		Signature			
P05	22 July 22	Filename	274219-ARUP-02-OS-RP-YE-000024		
		Description	Final OSR Draft		

			Prepared by	Checked by	Approved by
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		Signature			
P06	14 March 2023	Filename	274219-ARUP-02-OS-RP-YE-000024		
		Description	Final OSR – For Publication (including 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-000024		
		Description	Final OSR		
			Prepared by	Checked by	Approved by
		Name	Lisa Hanly	Hazel King	Eileen McCarthy
		Signature			
Issue Document verification with document					☒

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6 Stage 1 Alternatives Assessment

6.1 Introduction

6.1.1 Overview

As outlined in Section 5.1, an *alternative*, as defined in TII Project Appraisal Guidelines (PAG) Unit 4.0 (*Consideration of Alternatives and Options*)¹, refers to a specific transport mode (road, rail, bus, air etc.) or demand management proposal (fiscal, control, Intelligent Transport Systems (ITS) etc.) which could address the need for an intervention. The assessment of the ‘road alternative’ is documented separately in Chapter 7 of this report as there are various option corridors for the road alternative in terms of intervention hierarchy to be assessed and compared to identify the best performing option.

This chapter sets out the Stage 1 Alternatives which were considered for assessment of their potential to deliver, or contribute towards, a sustainable transport solution along the N4 corridor between Carrick-on-Shannon and Dromod. The criteria under which these alternatives were assessed and the analysis which concluded whether these alternatives were worthy of further assessment is also detailed in this chapter.

The alternatives to be considered must be reasonable, proportionate, and relative to the project, with assessment and presentation reflecting the requirements of the EU Environmental Impact Assessment (EIA) directive². As outlined in TII PAG Unit 4.0, the initial step focussed on drafting a long list of potential alternatives that may address the need for intervention. Alternatives on this initial list were then qualitatively assessed against the stated project objectives to establish, at a fundamental level, if these alternatives would respond, in whole or in part, to the transportation problems identified on the corridor. This initial long list included a range of alternatives which were developed incrementally from small scale improvements to more significant investments and were grouped under the headings of Active Travel, Public Transport and Demand Management, each of which is described in more detail below.

Due to the nature of alternatives, they are assessed separately, for their own merit, as stand-alone entities to determine how well they could resolve the transport issues identified and meet the project objectives and are not assessed against each other. Equally the alternatives are not compared against the options for the road alternative assessed in Chapter 7. A flowchart showing the Stage 1 assessment process is provided in Plate 6.1.1.

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

² European Union, 2018. (Planning and Development) (Environmental Impact Assessment) Regulations. (SI 296 of 2018) Available from: <http://www.irishstatutebook.ie/eli/2018/si/296/made/en/print>

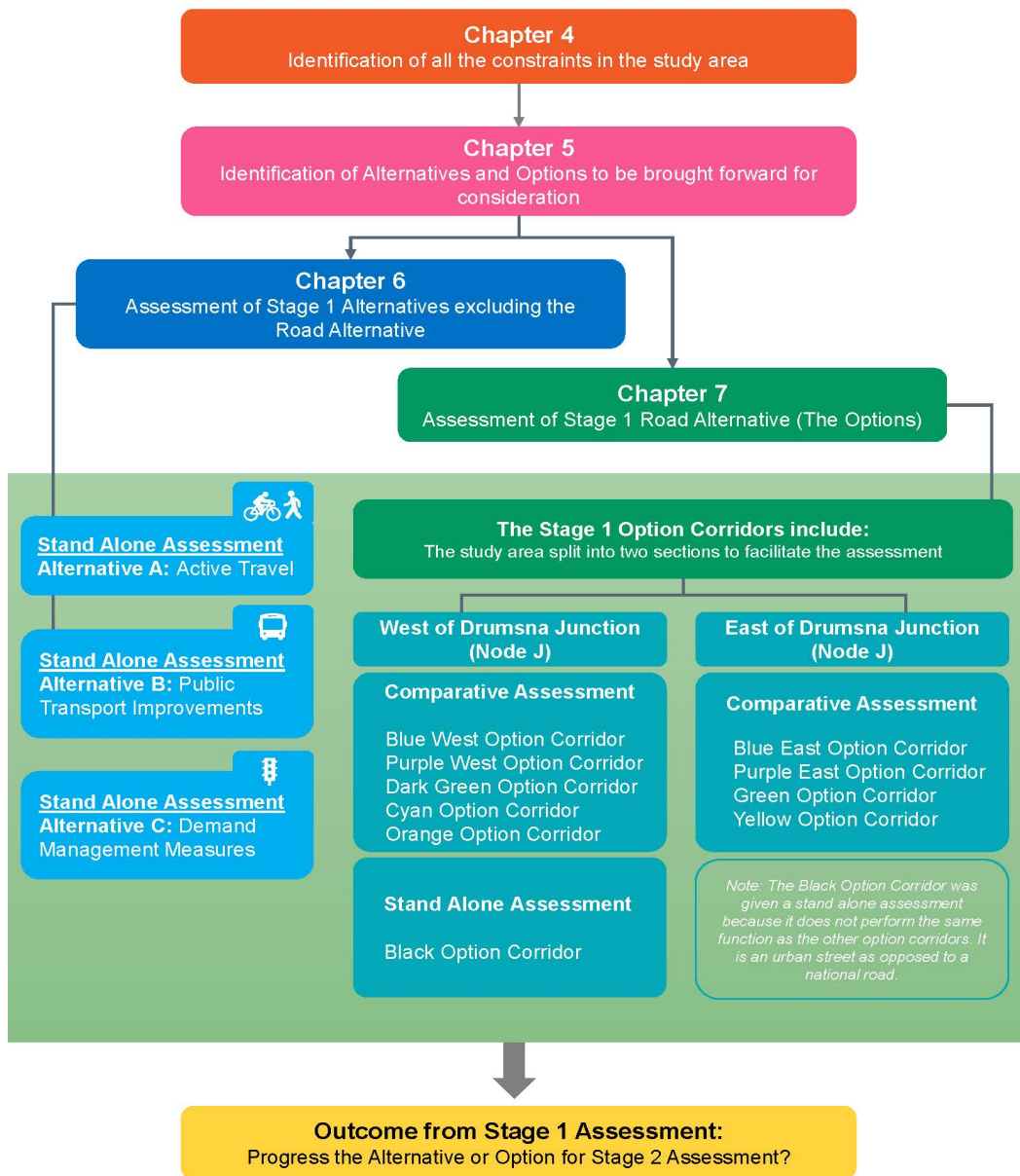


Plate 6.1.1 Flowchart of the Stage 1 Assessment Process

The alternatives will be assessed under the criteria of Engineering, Environment and Economy in this chapter. The Stage 1 Alternatives are described in Section 6.1.2 Description of Alternatives and shown on Figures 6.1.1.0, 6.1.2.0 and 6.1.3.0 Section 6.1.3 outlines the broad methodology utilised to carry out the Stage 1 assessment of alternatives.

6.1.2 Description of Alternatives

Analysis of traffic patterns in the study area has revealed that a considerable number of short distance trips within the Carrick-on-Shannon and Cortober area are made by car. This is a contributing factor to existing congestion on the N4. Improvements to the walking and cycling infrastructure within the town, in addition to enhancements to local bus services would support an increase in sustainable trip making. Measures to reduce the demand for such short trips is also considered in this assessment. These measures could lead to a reduction in traffic levels and congestion in the town. As part of the project appraisal process, these measures will be assessed as an alternative to building new road infrastructure. However, these measures could also form part of a wider multimodal transport solution for Carrick-on-Shannon and its environs.

Possible alternatives were tested against the project objectives and only the alternatives which were deemed feasible (excluding the road alternative) were included in the Stage 1 assessment (see Section 5.2.5 above for the Output of the Sifting Matrix). Post sifting, the alternatives to be assessed at Stage 1 are as follows:

- Alternative A: Active Travel
- Alternative B: Public Transport Improvements
- Alternative C: Demand Management

6.1.2.1 Alternative A: Active Travel

Alternative A comprises improvements to cycling and walking facilities and includes the elements as follows (Refer to Figure 6.1.2.0):

- Development of a comprehensive cycle network
- Improved facilities for cyclists (cycle parking, changing areas, e-bike charging, etc.)
- Improvements to pedestrian facilities (e.g. improved crossings and footpath provision)
- Improve permeability (non-motorised) within the town
- Potential pedestrianisation of key streets
- Construction of a new pedestrian and cycle bridge over the River Shannon

Alternative A will involve the addition of cycle facilities and walking facilities on the existing street network. This will involve additional road markings, signage and possible kerbing to delineate the space required for such facilities and will not require land acquisition and significant construction, with the exception of the additional dedicated pedestrian/cycle facility across the River Shannon. New infrastructure would be required to deliver an additional bridge crossing over the River Shannon adjacent to the existing bridge crossing.

6.1.2.2 Alternative B: Public Transport Improvements

Alternative B comprises improvements to public transport and includes the following measures (Refer to Figure 6.1.1.0):

- Development of an enhanced public transport network
- Increased frequency on the rail network
- Improved parking facilities at Carrick-on-Shannon railway station
- Linking of nearby urban settlements with Carrick-on-Shannon and key trip attractors in the town
- Increase in public transport (bus) services (i.e. up to every 20 minutes during peak periods)
- Development of a mobility hub in the town centre facilitating interchange with other modes
- Provision of demand responsive mini-bus services connecting isolated areas to Carrick-on-Shannon and Cortober

Alternative B will involve an improvement and/or new bus services on the existing street network. This will involve additional signage and possible bus-stops but will not require land acquisition and significant construction.

Alternative B will also include improvements to the rail service which will be accomplished without new rail infrastructure construction. The addition of new facilities at the rail station could include line markings and signage to delineate parking for cyclists and/or vehicles.

6.1.2.3 Alternative C: Demand Management

Alternative C involves reducing demand for car trips through Carrick-on-Shannon and includes the following measures (Refer to Figure 6.1.3.0):

- Rationalise parking along the existing N4 corridor
- Provision of Park & Stride³ sites on periphery of town centre
- Development of a car free town centre
- Development of remote working hubs
- Delivery of centrally located mixed use developments

Alternative C will involve measures to reduce the need to make the trip by car in the first instance. As such, it will be a reduction measure as opposed to a provision measure with a reassignment of on-street parking/existing traffic lanes to provide walking or cycling facilities in the urban realm, which will not require land acquisition as lands already owned by the Local Authority could be utilised and will

³ Park & Stride means leaving the car about 10 minutes' walk from the school gate and making the last leg of the journey to school on foot. For parents or grandparents doing the walk to and from the car is 15–20 minutes towards the recommended 30 minutes of physical exercise we should all be doing every day.

not require significant construction. The creation of Park and Stride sites will be located on existing brownfield sites or reassigned existing parking lots.

6.1.3 Assessment Methodology of Alternatives

The Stage 1 assessment of alternatives is undertaken under the assessment criteria of Engineering, Environment and Economy. It is a stand-alone 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 PAG Unit 7 – Multi Criteria Analysis on what to include as sub-criteria.

Alternatives are assessed separately in their own right as stand-alone entities and alternatives are not assessed against each other because they do not share a commonality which affords comparison. Equally the alternatives are not compared against the options as, if they do not meet the Project Objectives on their own, the process moves onto the next level in the hierarchy with an assessment of ‘interventions’. However, the alternatives are retained as could then be identified as complimentary to the options and may form part of the overall package that represents the optimum transport solution.

The potential impacts and their magnitude will be identified for each alternative, based on the seven-point scale, under each heading, in line with the TII PAG multi-criteria assessment. The seven-point impact scale is presented below in Table 6.1.1:

Table 6.1.1 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

If there is a particular element of one of the alternatives which gives the overall alternative a poor impact rating or equally if there is a particular element which gives a major or highly positive impact, this should be reflected in the qualitative description. This will inform the decision on which elements within the alternatives should progress to Stage 2 assessment.

6.2 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 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.

Although an in-person consultation could not take place due to Government restrictions with respect to Covid-19, the consultation was conducted using an on-line consultation room which allowed the public to walk around virtually and view the project material as if they were at an in-person event. In addition, users could book a telephone call or online meeting to talk to the Project Liaison Officer (PLO) and a member of the project team, to discuss the project and consultation material.

Information boards documenting the work completed to date and the feasible alternatives and options identified were displayed. The alternatives included active travel measures, improvement to the public transport and measures to reduce demand as detailed in Section 6.1 and the options included the option corridors as detailed in Section 7.1. Maps showing the proposed option corridors with the key constraints gathered during the Constraints Study were also displayed in both pdf format and an interactive web map.

The analytics of the on-line consultation room and the project website showed the consultation room had 2,337 visitors during the public consultation period. Further detail on the statistics for the public consultation are available in Appendix A.6.2.1 Report on Public Consultation No. 2.

The PLO and representatives from the project team were available throughout the consultation period to answer questions and explain the material on display as needed. A copy of the brochure and feedback form was posted to anyone who requested a hard copy. This level of engagement is in excess of the level of engagement at in-person consultations held in the past at this stage of similar projects as it provided greater opportunity for individual meetings and feedback on the project.

Over 190 individual on-line meetings with landowners, stakeholders, business owners and residents within the study area were held during the consultation period. These were held at the request of the private individuals and drawings were prepared for each one to show the proximity of their property to the proposed option corridors. A copy of a map was also issued to a landowner upon request by post or email.

Submissions from the public of suggestions of possible modifications to these, or additional information on further constraints, which may not have been taken into account in the Constraints Study, were welcomed. In excess of 2,300 submissions were received.

The submissions received were reviewed by the project team (including the environmental specialists) and these along with information gathered through the individual meetings, informed the Stage 1 Assessment of alternatives and options for a transport solution. Broadly speaking to the west of Drumsna Junction (Node

J) a trend in the submissions was identified; residents living to the south of Carrick-on-Shannon objected to the Cyan, Orange and Blue West Option Corridors and residents living to the north of Carrick-on-Shannon objected to the Dark Green, Purple West, and Black Option Corridors.

Overall, the analysis of the submissions identified key themes which are summarised as follows:

1. Previous Schemes and Need Case

- a. Support for and objections to the alignment of the proposed project with national, regional and local planning policy.
- b. Support for project regarding easing of current traffic congestion and shortening of journey times.
- c. Requests for the documentation associated with previous route corridors from previous projects in this study area.
- d. Carrick-on-Shannon is the only section of this corridor that needs a new bypass and bridge and that the rest of the road is adequate.
- e. The existing N4 road should be upgraded instead of constructing a new bypass route.
- f. Support for project regarding easing of current traffic congestion and shortening of journey times.
- g. Concern that the current Dromod/Roosky dual carriageway cross-section (Type 2 DCW) design is inadequate and should not be replicated on this project.
- h. Queries regarding proposed cross-section type (e.g. single carriageway or dual carriageway).
- i. Anecdotal evidence that traffic delay and congestion is short-lived and only experienced on busy summer weekends e.g. Friday and Sunday evenings or Bank Holidays.
- j. Support for and objections to the alignment of the proposed project with national, regional and local planning policy.

2. Active Travel and Alternative Modes

- a. Identification of the potential interaction between the northern option corridors and the proposed new Blueway from Carrick-on-Shannon to Battlebridge outside Leitrim Village coupled with fears future Irish Waterway's masterplan to install greenways or blueways may be put in jeopardy.
- b. Identification of existing walking and cycle routes in the study area and noting how they may be negatively impacted.
- c. Safety concerns regarding the children in the local communities who walk and cycle to school.
- d. The desire for the provision of active travel facilities outside of the urban areas.

3. Environment

- a. Noting potential environmental impacts such as noise, air, and light pollution that a road could impose on the local community.
- b. Noting potential physical and mental health effects, including sleeping patterns of residents, particularly that of children due to traffic.
- c. Noting potential environmental impacts on biodiversity within the study area, with recurring examples including the Corncrake, Curlew and Warble.
- d. Identification of potential flood risk.
- e. Noting potential impacts on landscape and visual amenity and the peace and tranquillity currently experienced in the countryside.
- f. Noting potential impacts to amenity of the River Shannon and accessibility for users to same e.g. boating, fishing, leisure activities.
- g. Feedback was provided on the significance and location of historic and heritage assets within the study area which need to be considered.
- h. Queries regarding accommodation works necessary for the local residents along the N4, including concerns regarding severance of dwellings and farms.
- i. Concerns regarding the ability to continue to live in their homes in close proximity to the road.

4. Economy

- a. Devaluation of property for properties in close proximity to road.
- b. Concerns regarding possibility of compulsory acquisition of homes.
- c. Economy may be negatively impacted if towns are bypassed. Fears that local tourism and businesses may be impacted.
- d. Inadequate regional connectivity associated with the Black Option Corridor.
- e. Importance tourism plays in area highlighted- and how the project could support this/hinder this.

5. Information Requests

- a. Some of the submissions disliked the use of an on-line platform for the public consultation and noted difficulty with navigating the website to locate the relevant information.
- b. Requests for an extension of duration to the consultation process.
- c. More detailed maps which show more zoomed in detail at particular locations were requested.
- d. Concerns regarding local representatives expressing opinions prematurely on a potential preferred solution and requesting retraction of these statements.

6. Other

- a. Queries regarding the widened corridor on the Purple and Dark Green Option Corridors to the west of Drumsna Junction close to the Hartley Bridge.
- b. Concerns regarding attraction of unnecessary traffic into rural areas.
- c. Noted potential for rise in crime as a result of a new road.
- d. Design suggestions for alternative routes, links and junction forms.

6.3 Stage 1 Engineering Assessment of Alternatives

6.3.1 Introduction

An assessment of the engineering methods employed for the delivery of alternatives is required to establish if the alternative(s) are viable for this project.

This section details the Stage 1 assessment of the alternatives with respect to the engineering constraints identified in Section 4.2 Engineering of this report. Section 6.3.2 outlines the methodology that was used to carry out the study and Section 6.3.3 details the engineering assessment of the alternatives. A summary of the assessment is presented in Section 6.3.4.

6.3.2 Methodology

The engineering assessment criteria for the alternatives have been identified under the following headings: Geometry, Traffic Impacts and Constructability. The various assessment methodologies employed under each of these headings are outlined in Section 6.3.3. The alternatives were scored based on the seven-point scale, under each heading, in line with the TII PAG multi-criteria assessment. The seven-point impact scale is presented in Table 6.1.1 of this report.

6.3.3 Alternatives Assessment

6.3.3.1 Geometry

The geometric assessment does not apply to the assessment of the alternatives as it is not possible to assess the geometry of for example Demand Management Measures or Bus Services.

6.3.3.2 Traffic Impacts

The traffic modelling described in Chapter 3 Traffic Assessment illustrates how the alternatives 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. The Do-Minimum scenario ($\pm 1\%$) is given a score of 4 (not significant or 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 depending on whether it is plus or minus respectively. A score of 1 or 7 was given to an alternative 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 AADTs across the River Shannon Bridge for the years 2030 and 2045 are 16,844 and 17,066 respectively.

The assessment first estimated the changes that each alternative might make to the highway travel demand matrix then assigned the revised matrix to the road network.

It examined the extent to which the alternatives reduced traffic flows in the area, and specifically on the N4 in the vicinity of the River Shannon Bridge.

The changes to the trip matrices were estimated in different ways for the three alternatives:

- Alternative A: Active Travel – an assumed 4% reduction in car travel for journeys shorter than 5km, a distance assumed to short enough for to be reasonable for cycling. The effect is applied only in areas covered by the active travel measures
- Alternative B: Public Transport – the proposed measures were coded into the multimodal model WRM and the impacts on the highway matrix were used to factor the LAM matrices
- Alternative C: Demand Management – similar approach to Alternative A with assumed reductions in car trips from various policy interventions: car-trip rate reduction from planning policies applied to new developments, less need for car travel arising from greater permeability of the town for pedestrians and cyclists, policies to promote working locally, increased parking charges, on-street parking controls, and flexible working hours

Alternative A: Active Travel

The traffic modelling for Alternative A Active Travel indicates that there is a minor reduction of up to 0.8% in traffic volumes crossing the River Shannon Bridge which is attributed to modal shift from private car to the more sustainable modes of walking and or cycling. This is a not significant or neutral impact and has been assigned a PAG Score of 4.

Alternative B: Public Transport

For Alternative B Public Transport, the assessment was split into two distinct categories so that the impacts from bus improvements and the impact from rail enhancements can be determined independently.

Following a review of the existing bus route options, based on analysis of existing services, demand from neighbouring settlements with the town and links to key trip attractors, the following enhancements to bus service provision have been tested in the National Transport Authority's (NTA's) Western Regional Model (WRM) before applying the resultant mode shift to the Local Area Model (LAM) for Carrick-on-Shannon:

- Four new bus services (see Figure 6.1.1.0) serving key towns close to Carrick-on-Shannon at frequent 20 minute intervals in peak hours between 07:00-10:00 and 16:00-19:00. Hourly inter-peak and off-peak.
- A new variant of the existing route 23 bus service between Sligo and Dublin. An increased frequency of every 20 minutes at peak hours between 07:00-10:00 and 16:00-19:00 on the existing inter-urban service, stopping at all settlements between Sligo and Longford as current service with the addition of a stop in Collooney. Hourly inter-peak and off-peak.

The impact of implementing the bus measures was that there was up to a 0.5% reduction in the mode share for cars with the bus enhancements in place.

A separate rail enhancement assessment report was prepared to document the improvements that were assumed (refer to Appendix A.6.3.1). In summary the enhanced rail service was assumed to be in place in 2030 and had the following attributes:

- One train every 30 minutes leaving Sligo from 05:40 to 08:40 AM (allows trains to serve all stops on the line and arrive in Dublin in time to get people to work by 9AM)
- One train every 30 minutes leaving Dublin from 05:00 to 08:00 AM (allows trains to serve all stops on the line and arrive in Sligo in time to get people to work by 9AM)
- Outside of the peak periods there is one service per hour until 22.00 thus increasing the frequency from 8 trains a day to 18 trains per day
- Train speeds were increased by 10% with a reduction in journey time from 190 minutes to 170 minutes

The impact of implementing such measures on the rail, was that there was a 0.01% difference in the mode share for cars with the rail enhancements in place. The greatest impact was seen in a shift from bus to rail.

Table 6.3.3.1 N4 Corridor Mode Share

Mode	Reference Mode Share	Rail Test Mode Share (tested in isolation from bus improvements)
Car	97.16%	97.15%
Rail	1.28%	1.33%
Bus	1.55%	1.52%

Therefore, the overall traffic impact from the rail enhancement is a not significant or neutral impact and has been assigned a PAG score of 4.

Further predictive theoretical mathematical modelling tested the impact of doubling the frequency to 26 trains per day and halving the journey time to 85 minutes. This showed an uplift on rail demand by around 33% and reduction in car trips on the N4 by about 2% which will not achieve the project objectives. A significant level of intervention would be required at significant expense to achieve such a journey time, and it is not certain that such a level of intervention is possible without significant environmental impacts. However, rail will be reviewed again at Phase 3 as part of reporting on Alternatives in the Environmental Impact Assessment Report. A decision on whether additional modelling is necessary in the Phase 3 transport model will be informed by the All Island Rail Strategy, which will be available at that time. During the public consultation on the All Island Rail Strategy, as submission was made on behalf of this project to it.

Alternative C: Demand Management

For Alternative C there is a reduction of up to 10% in traffic volumes crossing the River Shannon Bridge which is classified as a minor or slightly positive impact based on the seven-point scale. This has been assigned a PAG Score of 5.

Summary of Traffic Impact of Alternatives

Alternative C – Demand Management offers the greatest reduction in AADT over the River Shannon Bridge, up to 10% in the Opening Year 2030. Alternative B Public Transport results in the least reduction in AADT over the River Shannon Bridge with the main contribution being from the bus measures, albeit it very small. However, the enhancements to rail do not provide enough improvement in traffic levels to meet the Project Objectives.

Table 6.3.3.2 Traffic Impact Assessment of the Alternatives

	Do- Minimum 2030 AADT	Alternative A Active Travel	Alternative B Public Transport		Alternative C Demand Management
Traffic (AADT on River Shannon Bridge)			Bus Enhancements	Rail Enhancement	
Year 2030	16,844	16,742	16,780	16,844	15,188
Change in AADT	N/A	-0.6%	-0.4%	-0.01%	-9.8%
Year 2045	17,066	16,932	16,984	Not Assessed	15,449
Change in AADT	N/A	-0.8%	-0.5%	N/A	-9.5%
Scoring					
PAG Score	N/A	4	4	4	5

6.3.3.3 Constructability

Constructability of the Active Travel Alternative 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. Detailed construction sequencing and phasing of the works will be assessed as part of any potential Environmental Impact Assessment should this alternative be selected.

The construction impact from Alternative A Active Travel has a minor or slightly negative impact given the scale of the proposed works on new and proposed footways and cycle ways and the potential for numbers of individuals and property owners impacted and has been assigned a PAG Score of 3.

The construction impact from Alternative B Public Transport alternative would have a Not Significant or Neutral impact given the localised scale of the proposed works at implementing bus stops and bus bays, and the lack of physical construction associated with rail improvement in public space. It is anticipated that very few individuals and property owners would be impacted by the proposed public transport improvements and has been assigned a PAG Score of 4.

The construction impact from Alternative C Demand Management alternative would have a slight negative impact given the localised nature of the physical construction works and the potential for low levels of individuals impacted by the works. It has been assigned a PAG Score of 3.

6.3.4 Summary

6.3.4.1 Alternative A Active Travel

Any proposed new infrastructure will meet the contemporary design standards for its application e.g. Design Manual for Urban Roads and Streets, National Cycle Manual and TII Publications etc and will have a Moderately Positive impact on existing infrastructure. This alternative provides a not significant or neutral impact on the AADT over the River Shannon Bridge.

The construction of this new infrastructure will be complicated due to the extent of existing residential housing, commercial businesses, farms, local roads and accesses dotted along the length of the proposed new facilities. Disruption to residents and local traffic will need to be minimised throughout the construction period, and this alternative will provide a minor or slightly negative impact.

Overall Alternative A is assessed as having a Not Significant or Neutral impact.

6.3.4.2 Alternative B Public Transport Improvements

Any proposed new infrastructure will meet the contemporary design standards for its application e.g., Design Manual for Urban Roads and Streets, National Cycle Manual and TII Publications etc and will have a moderately positive impact on existing infrastructure. This alternative offers a slight reduction in AADT over the River Shannon Bridge in the order of 3%.

The construction impact from the proposals associated with this alternative would be not significant or neutral given the localised nature of the works in a public space.

Overall Alternative B is assessed as having a Not Significant or Neutral impact.

6.3.4.3 Alternative C Demand Management

Any proposed new infrastructure will meet the contemporary design standards for its application which will have a moderately positive impact. This alternative provides a slight reduction in AADT over the River Shannon Bridge having a minor or slightly positive impact.

Construction of any new infrastructure will be complicated due to the extent of existing residential housing, commercial businesses, farms, local roads and accesses, especially within Carrick-on-Shannon town. Disruption to residents and local traffic will need to be minimised throughout the construction period and this alternative will provide a slightly negative impact.

Overall Alternative C is assessed as having a Minor or Slightly Positive impact with a PAG Score 5.

Table 6.3.4.1 Stage 1 Engineering Summary Assessment Matrix of Alternatives

NON-COMPARATIVE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Geometry	N/A	N/A	N/A
Traffic Impacts	Not Significant or Neutral PAG Score 4	Not Significant or Neutral PAG Score 4	Minor or Slightly Positive PAG Score 5
Constructability	Minor or Slightly Negative PAG Score 3	Not Significant or Neutral PAG Score 4	Minor or Slightly Negative PAG Score 3
Scoring			
Qualitative assessment	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Positive
Score / Impact level	4	4	5

6.4 Road Safety Impact Assessment of Alternatives

A Road Safety Impact Assessment (RSIA) was carried out for the Stage 1 assessment of the Alternatives described in Section 6.1.2. A copy of the Road Safety Impact Assessment is included in Appendix A.6.4.1.

This study examined the impact the Alternatives would have on the Road Safety within the study area. 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 Alternative are fully assessed as part of the Option Selection Process. The assessment indicates the road safety considerations which shall contribute to the selection of the preferred transport solution. The alternative proposals will not satisfactorily address the road safety issues identified in the Project Objectives however, they can contribute to safety improvements, generally.

Provisions for improved public transport services and/or public transport infrastructure would result in very small reduction in AADT in private vehicles. Likewise, the introduction of the Active Travel Alternative comprising a comprehensive cycle network and improved walking facilities, including a new pedestrian bridge over the River Shannon, would see a reduction in AADT by private vehicles. Enhanced permeability within Carrick-on-Shannon would also reduce the need for local trips to be made by car. Demand reduction proposals may see the reallocation of road space and vehicle restrictions among other possible traffic management approaches. These alternatives may improve vulnerable road user safety, traffic flows and may reduce congestion in the area. This may then possibly reduce the number of collisions overall with each of the Alternatives offering a Moderately Positive impact on road safety.

Active Travel: Proposals will improve safety for vulnerable road users in the urban areas of Carrick-on-Shannon and Cortober. It is also proposed to provide active travel facilities throughout the entire route. It is assumed that this would be via a shared use footpath/cycle track along the existing N4. Such a route would improve the facilities for vulnerable road users.

Public Transport: Public Transport improvements would improve safety for bus users at bus stops when provided to current standards. This Alternative would seek to increase bus usage which is to be encouraged.

Demand Management: This is a localised alternative in Carrick-on Shannon and does not address the strategic nature of the N4 route. The reduction in car trips is to be encouraged from both a sustainability and road safety viewpoint. All road users within Carrick-on Shannon would benefit in terms of road safety.

The impact of each Alternative was assessed and categorised as positive, negative or neutral from a safety perspective. An extract of the Alternatives Safety Ratings is provided in Table 6.4.1 below.

Table 6.4.1 Alternatives Safety Rating

	Active Travel Proposals	Public Transport Proposals	Demand Management Proposals
Safety Rating	Moderately Positive	Moderately Positive	Moderately Positive

6.5 Stage 1 Environmental Assessment of Alternatives

Stage 1 Population and Human Health Assessment of the Alternatives

6.5.1.1 Introduction

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

This is a broad ranging topic which “*covers the existence, activities and health of people, usually considering people as groups or ‘populations’*” (EPA 2015)⁴. 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.

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 6.5.2, Material Assets Non-Agriculture
- Section 6.5.3, Material Assets Agriculture
- Section 6.5.4, Air Quality
- Section 6.5.5, Climate
- Section 6.5.6, Noise and Vibration
- Section 6.5.7, Archaeological, Architectural and Cultural Heritage
- Section 6.5.8, Landscape and Visual
- Section 6.5.9, Biodiversity
- Section 6.5.10, Hydrology
- Section 6.5.11, Hydrogeology

⁴ Extracted from the Advice Notes for Preparing Environmental Impact Statements (EPA draft September 2015)

- Section 6.5.12, 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 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 6.5.4, Air Quality to identify the predicted air quality values adjacent to the proposed alternatives
- Section 6.5.6, Noise and Vibration to identify the predicted noise levels at properties adjacent to the proposed alternatives
- Section 6.5.10, Hydrology to identify areas with any potential impacts on surface water and areas of flood risk
- Section 6.5.11, Hydrogeology to identify areas with any potential impacts on groundwater
- Section 6.5.12, 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 6.5.1.2 outlines the methodology utilised to carry out the assessment, Sections 6.5.1.3 details the options assessment and a summary is presented in Section 6.5.1.4.

6.5.1.2 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

The assessment of Population requires an understanding of the community, built up through background research, site visits, and conversations with local people and community representatives. For the Stage 1 Assessment, information has been collected from the following sources:

- Primary data sources (e.g., demographic data from Census 2016⁵ and Census 2011⁶ produced by the Central Statistics Office)

⁵ Central Statistics Office, 2017. Census 2016 Reports. Available from: <https://www.cso.ie/en/census/census2016reports/> [Accessed July 2021]

⁶ Central Statistics Office, 2012. Census 2011 Reports. Available from: <https://www.cso.ie/en/census/census2011reports/> [Accessed July 2021]

- Maps of the study area, including Ordnance Survey Ireland (OSI) Discovery Series 1:50,000 Sheet 33⁷
- Spatial data, including Google Maps and Google Streetview, Open Street Map, 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)⁸ and the Roscommon County Development Plan (2022-2028)⁹, the prevailing Carrick-on-Shannon Local Area Plan (2010-2019)¹⁰ and the Cortober Area Plan (2015)¹¹
- A review of secondary sources including the National Planning Framework¹² and the National Development Plan¹³, the Regional Spatial and Economic Strategy 2020-2032 (NWRA-RSES)¹⁴
- A review of previous Environmental Impact Assessments (EIAs), including of the Environmental Impact Assessment Report for the N4 Dromod-Rooskey 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 Ordnance Survey Ireland, 2021. OSI 1:50,000 Discovery Series Sheet 33. Available from: <https://sites.google.com/site/theirelandwalkingguide/publications/maps/osi-discovery/sheet33> [Accessed July 2021]

⁸ Leitrim County Council, 2015. Leitrim County Development Plan 2015-2021. Available from: http://www.leitrimcoco.ie/eng/Services_A-Z/Planning-and-Development/Development-Plans/County-Development-Plan/County_Development_Plan_2015-2021/ [Accessed July 2021]

⁹ Roscommon County Council, 2022. Roscommon County Development Plan 2022-2028. Available from: https://www.rosdevplan.ie/roscommon-county-development-plan-2022-2028/stage-3-amendments/stage-3-adoption-of-plan-Publications/County_Development_Plan_2014_-_2020/County-Development-Plan-2014-2020/

¹⁰ Leitrim Council, 2010. Carrick-on-Shannon Local Area Plan 2010-2019. Available from http://www.leitrimcoco.ie/eng/Services_A-Z/Planning-and-Development/Development-Plans/Local-Area-Plan/Amendment-2-Carrick-on-Shannon-2010-2019/ [Accessed July 2021]

¹¹ Roscommon County Council, 2014. Cortober Area Plan 2014-2020. Available from: 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 [Accessed July 2021]

¹² Government of Ireland, 2018. Project Ireland 2040 National Planning Framework. Available From <https://npf.ie/wp-content/uploads/Project-Ireland-2040-NPF.pdf> [Accessed July 2021]

¹³ Government of Ireland, 2018. Project Ireland 2040 National Development Plan 2018-2027. Available From: <https://www.gov.ie/pdf/?file=https://assets.gov.ie/37937/12baa8fe0dcb43a78122fb316dc51277.pdf#page=null> [Accessed August 2020]

¹⁴ The Northern and Western Regional Assembly, 2020. Regional Spatial and Economic Strategy 2020-2032 (RSES). Available from: <https://www.nwra.ie/rses/> [Accessed July 2021]

- Websites identifying local walks and trails, angling rivers and lakes^{15 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, sli-na'slainge 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 are acceptable on standard indices. Noise could have significance in the case of 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 as part of Active Travel measures; even when assisted by signalised pedestrian or cycle lights.

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 Alternatives Assessment considers the potential effects that the alternatives 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 6.5.2 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.

Population Assessment Criteria

¹⁵ Fermanagh Tourist Information Centre, 2021. Kingfisher Cycle Trail. Available from: <https://kingfishercycletrail.com/> [Accessed June 2021]

¹⁶ Waterways Ireland, 2021. Blueways. Available from <https://www.bluewaysireland.org/> [Accessed June 2021]

¹⁷ Leitrim Tourism, 2021. Walks and Trails. Available from: <https://leitrimtourism.com/things-to-do/walks-and-trails/> [Accessed August 2021]

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

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 alternatives, 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.

Population 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). 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 Preliminary Alternatives are rated relative to the baseline environment using qualitative as well as quantitative analysis and professional judgement of their significance using the scoring definitions listed in Table 6.1.1 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 alternatives 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.

The assessment of each alternative includes both a quantitative and qualitative assessment. Firstly, each alternative 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. Following this an overall assessment of each alternative is completed and scored based on the seven-point scale listed in Table 6.1.1 of this report.

Sub-criterion 1: Health Protection

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

- 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 Alternative 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 alternatives were identified and each alternative 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 health benefits

Significance of Human Health Impacts

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

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 is 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 6.5.1.1 below.

Table 6.5.1.1 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 moderately 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 moderately 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 increased 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.

6.5.1.3 Stage 1 Population and Human Health Assessment of Alternatives

Stage 1 Population Assessment of Alternatives

Alternative A: Active Travel

This alternative comprises improvements to cycling and walking facilities. An improved infrastructure for walking and cycling would facilitate a move to active transportation with benefits for journey patterns, journey amenity and health. Improved pedestrian crossings and footpaths, and a comprehensive cycle network, supported by new signage, road markings and kerbing, will allow for more permeability, providing a positive impact on journey characteristics by allowing pedestrians and cyclists to reach their destinations easily and swiftly. Journey amenity will be improved in terms of greater safety and through the separation of pedestrians and cyclists from vehicles. Cyclist amenity will be enhanced by the proposals for cycle parking. There will be a positive impact for journey characteristics and amenity due to pedestrianisation of key areas, combined with reduced severance with the provision of a new pedestrian and cycle bridge across the River Shannon. Some negative impacts on vehicle traffic flow and general amenity can be expected during construction.

Facilities for active travel could potentially lead to a transference of a proportion of local journeys from private vehicles. This would have economic benefits in other respects by improving the general environmental amenity.

Alternative B: Public Transport Improvements

Alternative B comprises improvements to public transport. The availability of enhanced and frequent public transport, including a minibus service to outlying areas would have a positive impact on journey characteristics and complement investment in active travel, particularly by facilitating journey patterns for people with limited mobility or without access to a private vehicle. The development of a mobility hub and demand-responsive minibus services would be an innovative complementary benefit for journey characteristics, especially if providing a link between Cortober (including the station) and Carrick-on-Shannon to which significant severance currently applies at the R368/N4 junction and crossings of the N4 to the pedestrian bridge across the Shannon. Additional signage and bus stops, along with the improvements to footpaths and pedestrian crossings, would have a positive impact on journey amenity and accessibility of public transport users once in town. Public transport improvements would themselves reduce vehicle demand and support additional active travel. Some negative impacts on vehicle traffic flow and general amenity can be expected during construction.

Increased car parking at the railway station and new rail infrastructure would encourage more use of rail services and have a positive impact on journey

characteristics. At present, it can be difficult to find spaces and overflow of parking on to adjacent road is an annoyance for local residents and can present a hazard. Bicycle theft has also been an issue. Therefore, new car parking and cycle facilities would also have a positive impact on journey amenity.

Alternative C: Demand Management

Alternative C involves reducing demand for car trips through Carrick-on-Shannon and is a reduction measure rather than a provision measure. It would not require land development and significant construction. A reassignment of on-street parking/existing traffic lanes to provide walking or cycling facilities would rather have a positive impact on the urban realm and therefore on general amenity in the town. Measures to reduce demand for car trips, such as changes in junction radii, introducing shared pedestrian/cycle/vehicle space, reduced speed limits and parking reductions on some streets, and time restricted vehicle entry, would all have a positive effect by removing unnecessary demand and inducing some transfer of journeys to active travel or public transport. The negative impact on vehicle journey time and driver journey amenity must be considered, but as informing a strategic decision through a comparison with the positive impact for general amenity and the journey amenity of pedestrians and cyclists.

A key consideration will be to avoid reduction in business activity in the town centre. The creation of Park and Stride sites will have a positive impact in this respect. In general, businesses in Carrick-on-Shannon have performed better than in some other rural towns, although there has been a gradual replacement of traditional shops by cafes and services. These enterprises would benefit from environmental enhancements made possible by reduced car use but are also dependent on customer access and accessible car parking.

Table 6.5.1.2 Stage 1 Population Summary Assessment Matrix of Alternatives

STAND ALONE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Journey characteristics and connectivity	More connectivity due to pedestrian and cycle paths and crossings PAG Score 7	Potential for improved connectivity between town and hinterland PAG Score 6	Easier local necessary car journeys, and incentive to transfer to walking or cycling PAG Score 6
Journey amenity	Improved journey amenity for pedestrians and cyclists, especially at roundabout junctions PAG Score 7	Improved safety in some cases. Reduced time spent in congestion. Social inclusion benefits PAG Score 5	Improved safety due to reduced traffic PAG Score 5
General amenity and community facilities	Improved physical health and quality of life PAG Score 6	Links to active travel with benefits for health PAG Score 5	More agreeable environment and health benefits PAG Score 6
Community severance (relief from)	Facilitated crossings of roads and junctions PAG Score 7	Reduced severance through direct connections PAG Score 5	Reduced severance at junctions due to transfer of a proportion of traffic PAG Score 5
Economic	Positive impact as access and parking to shops and businesses can be easier and more direct than by car. Permits brief stops at shops with particular benefits for Main and Bridge Street. PAG Score 5	Positive impact on businesses on Main and Bridge Street in particular. PAG Score 6	Balance between improved environment conducive to business and retail and maintaining vehicle access and parking. PAG Score 6
Scoring			
Qualitative assessment	Major or Highly Positive	Minor or Slightly Positive	Moderately Positive
Score / Impact level	7	5	6

Stage 1 Human Health Assessment of Alternatives

The Alternatives which have been considered feasible for this project comprise of public transport proposals and measures to improve active travel and demand management measures. The aim of these proposals is to encourage a shift away from private car usage, therefore reducing the number of private vehicles on the section of the N4 under consideration. This has the potential to relieve existing and forecast capacity issues in the study area. A description of these alternatives is provided in Section 6.1 and can be categorised as follows:

- Alternative A: Active Travel
- Alternative B: Public Transport Improvements
- Alternative C: Demand Management

Sub-criterion 1: Health Protection

Alternative A: Active Travel

The only measure within Alternative A that may have an impact on the protection of human health is the provision of a new pedestrian/cycle facility across the River Shannon west (upstream) of the existing bridge. The noise, air quality, soils and water assessments all consider this to be Not Significant or Neutral and as such it is also Not Significant or Neutral from a protection to human health perspective and given a scoring of 4.

Alternative B: Public Transport Improvements

The noise, air quality, soils and water assessments all consider Alternative B to be Not Significant or Neutral and as such it is also Not Significant or Neutral from a protection to human health perspective and given a scoring of 4.

Alternative C: Demand Management

The noise, air quality, soils and water assessments all consider Alternative C to be not significant or neutral and as such it is also Not Significant or Neutral from a protection to human health perspective and given a scoring of 4.

Sub-criterion 2: Health improvement and improving services

The alternatives 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. 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 includes an assessment on how the alternatives 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 were identified and each alternative 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 health benefits
- Improved access to services including health services. This may include improved access and decreased journey times to health care facilities or hospitals and decreased waiting times for ambulances in cases of emergencies.

The overall assessment of the Stage 1 Alternatives, in terms of human health is presented in Table 6.5.1.3 below.

Table 6.5.1.3 Stage 1 Human Health Summary Assessment Matrix of Alternatives

STAND ALONE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Protection of Human Health	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Health improvement and improving services	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Scoring			
Overall Qualitative Assessment	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Score / Impact Level	4	4	4

6.5.1.4 Summary

With respect to Population, each of the Stage 1 Alternatives is assessed to have a positive impact based on the criteria listed. The alternative of Active Travel is assessed to have the most positive impact based on connectivity and journey amenity especially.

With respect to Human Health each of the Stage 1 Alternatives are deemed to have a Not Significant or Neutral impact.

6.5.2 Stage 1 Material Assets Non-Agriculture Assessment of the Alternatives

6.5.2.1 Introduction

This section details the Stage 1 assessment of the Alternatives with respect to the Material Assets Non-Agriculture constraints identified in Section 4.5 Material Assets Non-Agriculture of this report.

The Stage 1 Alternatives are described in Section 6.1.2 and are presented on figures 6.1.1.0, 6.1.2.0 and 6.1.3.0.

Section 6.5.2.2 outlines the methodology utilised to carry out the assessment of alternatives, Section 6.5.2.3 details the assessment and a summary is presented in Section 6.5.2.4.

6.5.2.2 Methodology

The assessment of Material Assets Non-Agriculture is conducted in the context of the constraints identified in Section 4.5 of this report and the following alternatives proposed:

- Alternative A: Active Travel
- Alternative B: Public Transport Improvements
- Alternative C: Demand Management

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 alternative 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 6.5.2.1. Following this an overall assessment of the cumulative impacts for the alternative is completed and scored based on the seven-point scale listed in Table 6.1.1 of this report.

Assessment Methodology for Material Assets Excluding Utilities and Services

For the purposes of assessing direct impacts on properties, the extents of the works required for each alternative were considered.

Level of Impact

The potential impact of the alternative on non-agricultural properties was assessed according to the significance criteria detailed in Table 6.5.2.1.

Table 6.5.2.1 Criteria for Assessing the Significance of Impact on Non-Agricultural Properties

Significance Level / Degree of Impact	Definition
Major or Highly Negative	A non-agricultural property of national or regional importance is fully required and will be removed by the proposed Alternative
Moderately Negative	A non-agricultural property or other material asset is fully required 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 required
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

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

- All properties considered as full acquisitions are Major or Highly Negative or Moderately Negative impacts depending on the significance of the asset
- Any property holding partially impacted, 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 is considered to be Not Significant or Neutral

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 Alternatives, it is difficult to consider all utilities that are impacted by all the Alternatives.

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 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 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 Alternatives, impacts on larger utilities and services were assessed. The following utilities and services were considered 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-Agricultural Constraints. The methodology described above for Material Assets Non-Agriculture excluding utilities and services assessment was also used for the assessment of waste facilities. The extents of the works for each alternative 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 alternatives on non-agricultural properties was assessed according to the significance criteria detailed in Table 6.5.2.2.

Table 6.5.2.2 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

6.5.2.3 Alternatives Assessment

Three alternatives are proposed:

- Alternative A: Active Travel
- Alternative B: Public Transport Improvements
- Alternative C: Demand Management

Alternative A: Active Travel

The only measure within Alternative A that may have an impact on Material Assets Non-Agriculture is the provision of a new pedestrian/cycle facility across the River Shannon west (upstream) of the existing bridge. However, any landtake potentially associated with this crossing would be from existing paved public lands.

Alternative A: Active Travel is considered to be Not Significant or Neutral from a Material Assets Non-agriculture perspective and given a PAG scoring of 4.

Alternative B: Public Transport Improvements

Alternative B: Public Transport Improvements will have no impacts on Material Assets Non-Agriculture as there is no direct impact on a material asset including utilities/services and is considered to be Not Significant or Neutral and given a PAG scoring of 4.

Alternative C: Demand Management

Alternative C: Demand Management will have no material impacts on Material Assets Non-Agriculture and is considered to be Not Significant or Neutral and given a PAG scoring of 4.

6.5.2.4 Summary

The overall assessment of the Stage 1 Alternatives, in terms of material assets non-agriculture is presented in Table 6.5.2.3 below.

Table 6.5.2.3 Stage 1 Material Assets- Non- Agriculture Summary Assessment Matrix of Alternatives

STAND ALONE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Material Assets Non-agriculture excluding Utilities and Services	The only measure for this alternative that may impact on Material Assets is the provision of a new pedestrian / cycle facility across the River Shannon west (upstream) of the existing bridge. It is not envisaged that there would be any landtake however, any landtake that potentially be associated with this crossing would be from public lands and as such is considered Not Significant or Neutral.	No direct impact on a material asset expected.	No direct impact on a material asset expected.
Utilities and Services	No direct impact on utilities / services expected.	No direct impact on utilities / services expected.	No direct impact on a material assets expected.
Scoring			
Qualitative Assessment	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Score / Impact level	4	4	4

6.5.3 Stage 1 Material Assets – Agriculture Assessment of the Alternatives

6.5.3.1 Introduction

This section details the Stage 1 assessment of the alternatives with respect to the agricultural constraints identified in Section 4.6 Material Assets – Agriculture of this report.

Section 6.5.3.2 outlines the methodology that was used to carry out the study, including the assessment criteria. The assessment is presented in Section 6.5.3.3 with Section 6.5.3.4 outlining the general summary of the Material Assets – Non-Agriculture assessment of the alternatives.

6.5.3.2 Methodology

The following guidelines and legislation were referred to when undertaking this Stage 1 Alternatives assessment:

- European Union (2018) (Planning and Development) (Environmental Impact Assessment) Regulations (SI 296 of 2018)
- Environmental Protection Agency (EPA) (August 2017) Guidelines on the Information to be contained in Environmental Impact Assessment Reports²⁰
- Transport Infrastructure Ireland (TII) (2016) Project Appraisal Guidelines Unit 7.0 - Multi Criteria Analysis, PE-PAG-02031¹

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:

- Aerial mapping/photography²¹
- Property Registration Authority of Ireland (PRAI)²² database
- Soil mapping data from the Teagasc Irish Soil Information System²³

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

²¹ Google Aerial Mapping, 2021. Available at: <https://www.google.com/maps>

²²Property Registration Authority, 2021. Available at: <https://www.landdirect.ie/index>

²³Teagasc, Irish Soil Information System. Available at: <http://gis.teagasc.ie/soils/>

- Data regarding agriculture in Counties Roscommon and Leitrim from the Central Statistics Office (CSO)^{24 25 26}

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 have been identified from desktop and site survey information sources:

- 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 photography²¹ and a site survey
- Dairy, equine farms, horticultural and other high sensitivity enterprises were identified from aerial photography²¹ and site survey. Their folios were identified using the PRAI²² data
- Good and poor quality land and areas of woodland/scrub/forestry were initially identified by using the Teagasc Irish Soils Information System²³, aerial photography²¹ and where possible verified with site surveying

6.5.3.3 Stage 1 Material Assets- Agriculture Assessment of Alternatives

The assessment criteria as set out in Section 3.1.5 of the 2016 PAG Guidelines¹ are used in this assessment. Viability of farms is in the low – medium range at the locations of all the alternatives. 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 (e.g. dairy and equine) is assumed to be higher than medium enterprises (e.g. beef and sheep).

The Do-Something alternatives are described in section 6.1 of this document. These alternatives will have minimal impacts on agriculture, requiring no landtake to allow for improvements to cycling and walking facilities, improvements to public transport and introducing measures to reduce demand for traffic. The impacts from the Do-Something alternatives are assessed as Neutral i.e. 4 on the PAG scoring scale.

²⁴ Central Statistics Office, December 2012. Census of Agriculture 2010 – Final Results. Available from:

<https://www.cso.ie/en/media/csoie/releasespublications/documents/agriculture/2010/full2010.pdf> [Accessed September 2021]

²⁵ Central Statistics Office, 2020. Statistics, Agriculture, Census of Agriculture 2010, Agrimap. Available from: <http://census.cso.ie/agrimap/> [Accessed September 2021]

²⁶ Central Statistics Office, 2020. Statistics, Agriculture, Crops and Livestock June Final Results, Table 4. Available from: <https://www.cso.ie/en/releasesandpublications/er/clsjf/cropsandlivestocksurveyjunefinal2018/> [Accessed on September 2021]

Table 6.5.3.1 Stage 1 Material Assets- Agriculture Summary Assessment Matrix of Alternatives

NON-COMPARATIVE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Assessment Criteria 1 – Farm Size	25 ha (CSO data) compared to national average of 31.2ha PAG Score 2	25 ha (CSO data) compared to national average of 31.2ha PAG Score 2	25 ha (CSO data) compared to national average of 31.2ha PAG Score 2
Assessment Criteria 2 – Farm Type	Low – medium sensitivity – mainly beef / sheep farms (97 – 98% of total) PAG Score 3	Low – medium sensitivity – mainly beef / sheep farms (97 – 98% of total) PAG Score 3	Low – medium sensitivity – mainly beef / sheep farms (97 – 98% of total) PAG Score 3
Assessment Criteria 3 – Landtake Sub-criteria – Landtake Sub-Criteria – Impacts On farm yards	No landtake is expected for cycling and pedestrian facilities. Potential developments will be on-line with existing road infrastructure and located in urban centres. Soil quality will be reflective of the general study area (i.e. medium quality overall) Any potential impact on farm yards likely to be along the edges of existing roads with potential disturbance to farm yard entrances – impacts would either be ‘Not Significant or Neutral’ or ‘Minor or Slightly Negative’. PAG Score 4	No landtake proposed for park & ride facilities and bus lanes. Potential developments will be on-line with existing road infrastructure and located in urban centres. Soil quality will be reflective of the general study area (i.e. medium quality overall) Any potential impact on farm yards likely to be along the edges of existing roads with potential disturbance to farm yard entrances – impacts would be ‘Not Significant or Neutral’ or ‘Minor or Slightly Negative’. PAG Score 4	No landtake required for traffic management measures on the existing road network. Potential developments will be on-line with existing road infrastructure and located in urban centres. Soil quality will be reflective of the general study area (i.e. medium quality overall) Any potential impact on farm yards likely to be along the edges of existing roads with potential disturbance to farm yard entrances – impacts would be ‘Not Significant or Neutral’ or ‘Minor or Slightly Negative’. PAG Score 4

NON-COMPARATIVE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Assessment Criteria 4 – Severance (length off-line)	Landtake proposed would be mainly on-line with existing roads and would not cause significant severance. PAG Score 4	Landtake proposed would be on-line with existing roads and would not cause significant severance. PAG Score 4	Landtake proposed would be on-line with existing roads and would not cause significant severance. PAG Score 4
Assessment Criteria 5 – Viability	Expected overall impact is likely to be slight adverse or Neutral. Baseline level is low - medium viability. PAG Score 4	Expected overall impact is likely to be slight adverse or Neutral. Baseline level is low - medium viability. PAG Score 4	Expected overall impact is likely to be slight adverse or Neutral. Baseline level is low - medium viability. PAG Score 4
Scoring			
Qualitative Assessment	Not Significant or Neutral Impacts on high sensitivity enterprises unlikely – baseline is low – medium sensitivity. Potential impacts confined to edge of farm and no proposed landtake.	Not Significant or Neutral Impacts on high sensitivity enterprises unlikely – baseline is low – medium sensitivity. Potential impacts confined to edge of farm and no proposed landtake.	Not Significant or Neutral Impacts on high sensitivity enterprises unlikely – baseline is low – medium sensitivity. Potential impacts confined to edge of farm and no proposed landtake.
Overall PAG Score	PAG Score 4	PAG Score 4	PAG Score 4

6.5.3.4 Summary

All three alternatives scored 4 in the assessment. Based on this, the expected overall impact is likely to be Not Significant or Neutral for the alternatives presented for this project.

6.5.4 Stage 1 Air Quality Assessment of the Alternatives

6.5.4.1 Introduction

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

The Stage 1 Alternatives are presented on Figures 6.1.1.0, 6.1.2.0 and 6.1.3.0.

Section 6.5.4.2 outlines the methodology that was used to carry out the air quality assessment, including the assessment criteria. The air quality assessment is presented in Section 6.5.4.3 with Section 6.5.4.4 outlining the general summary of the Stage 1 Air Quality assessment of the alternatives.

6.5.4.2 Methodology

The three alternatives were each given stand-alone assessments to identify their individual potential impacts and were not rated against each-other.

The multi-criteria air quality 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 and an integer is assigned according to the impact level as listed in Table 6.1.1 of this report.

Using a combination of the impact scores and professional judgement a determination as to the level of the impact of each alternative was provided. The Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports²⁷ 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 Transport Infrastructure Ireland (TII) Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes²⁸ and in accordance with the requirements of the TII Project Management Guidelines³³, and the TII Project Manager's Manual, 2019²⁹ and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG-02031, October 2016¹.

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*

²⁷ Environmental Protection Agency (EPA), 2017. Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. Available at: <https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf>

²⁸ 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>

²⁹ 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>

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.

6.5.4.3 Stage 1 Air Quality Assessment of Alternatives

The alternatives assessment comprises three alternatives:

- Alternative A: Active Travel - includes improvements to cycling and walking facilities
- Alternative B: Public Transport - includes improvements to public transport
- Alternative C: Demand Management - reduces demand

Alternative A: Active Travel

From an air quality perspective Alternative A is likely to result in a positive impact for existing sensitive properties³⁰ along the existing N4 and through Carrick-on-Shannon. The potential change in traffic volumes will depend on the modal shift towards active travel and any potential significant reduction in private vehicles along the road networks. Overall, there is potential for a Minor or Slightly Positive impact to air quality from this alternative.

Alternative B: Public Transport

From an air quality perspective Alternative B is likely to result in a positive impact for existing sensitive properties along the existing N4 and through Carrick-on-Shannon. The potential change in traffic volumes will depend on the modal shift towards public transport and any potential significant reduction in private vehicles along the road networks. Overall, there is potential for a Minor or Slightly Positive impact to air quality from this alternative.

Alternative C: Demand Management

From an air quality perspective Alternative C is likely to result in a positive impact for existing sensitive properties along the existing N4 and through Carrick-on-Shannon. The potential change in traffic volumes will depend on the reduced demand and any resulting potential significant reduction in private vehicles along

³⁰ Department of House, Planning and Local Government, 2021. National Planning Applications. Available from: <https://data.gov.ie/dataset/national-planning-applications>]

the road networks. Overall, there is potential for a Minor or Slightly Positive impact to air quality from this alternative.

Table 6.5.4.1 Stage 1 Air Quality Summary Assessment Matrix of Alternatives

NON-COMPARATIVE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Traffic Volumes	Modal shift resulting in a reduction in private vehicles	Modal shift resulting in a reduction in private vehicles	Reduced demand resulting in reduction in private vehicles
Scoring			
Qualitative assessment	Minor or Slightly Positive	Minor or Slightly Positive	Minor or Slightly Positive
Score / Impact level	5	5	5

6.5.4.4 Summary

The air quality assessment concludes that all three alternatives would result in a potential Minor or Slightly Positive impact to air quality dependent on the reduction in private vehicles on the existing road network.

6.5.5 Stage 1 Climate Assessment of the Alternatives

6.5.5.1 Introduction

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

The Stage 1 Alternatives are presented on Figures 6.1.1.0, 6.1.2.0 and 6.1.3.0.

Section 6.5.5.2 outlines the methodology that was used to carry out the study, including the assessment criteria. The assessment is presented in Section 6.5.5.3 with Section 6.5.5.4 outlining the general summary of the Stage 1 Climate assessment of the alternatives.

6.5.5.2 Methodology

The three alternatives were each given stand-alone assessments to identify their individual impacts and were not assessed against each other.

The multi-criteria climate 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 seven-point scale¹ and an integer is assigned according to the impact levels listed in Table 6.1.1.

Using the impact scores and professional judgement a determination as to the level of the impact of each alternative was provided. The Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports²⁷ 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 2019^{Error! Bookmark not defined.}, and the TII Project Manager's Manual, 2019²⁹ and the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG-02031, October 2016¹.

6.5.5.3 Stage 1 Climate Assessment of Alternatives

The alternatives assessment comprises three alternatives:

- Alternative A includes improvements to cycling and walking facilities
- Alternative B includes improvements to public transport
- Alternative C reduces demand

Alternative A: Active Travel

This is likely to result in a positive impact to climate as the potential change in traffic volumes will depend on the modal shift towards active travel. Any potential significant reduction in private vehicles along the road networks has the potential to reduce carbon emissions. There would be embodied carbon associated with the

construction phase, however this is not expected to be significant, dependent on the works involved. There is potential for a Minor or Slightly Positive impact to climate from this alternative.

Alternative B: Public Transport

This is likely to result in a positive impact to climate as the potential change in traffic volumes will depend on the modal shift towards public transport. Any potential significant reduction in private vehicles along the road networks has the potential to reduce carbon emissions. There would be embodied carbon associated with the construction phase, however this is not expected to be significant, dependent on the works involved. There is potential for a Minor or Slightly Positive impact to climate from this alternative.

Alternative C: Demand Management

This is likely to result in a positive impact to climate as the potential change in traffic volumes will depend on the reduced car trips. Any potential significant reduction in private vehicles along the road networks has the potential to reduce carbon emissions. There would be embodied carbon associated with the construction phase, however this is not expected to be significant, dependent on the works involved. There is potential for a Minor or Slightly Positive impact to climate from this alternative.

Table 6.5.5.1 Stage 1 Climate Summary Assessment Matrix of Alternatives

NON-COMPARATIVE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Vehicle Kilometres	Modal shift resulting in a reduction in traffic volumes and reduction in vehicle kilometres travelled	Modal shift resulting in a reduction in traffic volumes and reduction in vehicle kilometres travelled	Reduced demand resulting in a reduction in traffic volumes and reduction in vehicle kilometres travelled
Embodied Carbon	Low embodied carbon, dependent on works	Low embodied carbon, dependent on works	Low embodied carbon, dependent on works
Scoring			
Qualitative assessment	Minor or Slightly Positive	Minor or Slightly Positive	Minor or Slightly Positive
Score / Impact level	5	5	5

6.5.5.4 Summary

The climate assessment concludes that all three alternatives would result in a potential Minor or Slightly Positive impact to climate dependent on the reduction in vehicle kilometres travelled on the existing road network and the embodied carbon associated with the works.

6.5.6 Stage 1 Noise and Vibration Assessment of the Alternatives

6.5.6.1 Introduction

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

The Stage 1 Alternatives are presented on Figures 6.1.1.0, 6.1.2.0 and 6.1.3.0.

Section 6.5.6.2 outlines the methodology that was used to carry out the study, including the assessment criteria. The assessment is presented in Section 6.5.6.3 with Section 6.5.6.5 outlining the general summary of the Noise and Vibration assessment of the alternatives.

6.5.6.2 Methodology

The noise impact assessment has been 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 Schemes³¹, Section 2 of the 2014 Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes³² and in accordance with the requirements of the TII Project Management Guidelines 2019³³ the TII Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis PE-PAG-02031, October 2016¹ and Design Manual for Roads and Bridges (DMRB) (UKHA, 2020)³⁴.

In terms of operational noise, the NRA 2004 Noise and Vibration Guidelines³¹ and the TII Noise Guidelines 2014³² 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 2004³¹ and TII 2014³² noise documents referred to above acknowledge that it may not always be sustainable to achieve this design goal. In such circumstances, nevertheless, 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.

³¹NRA, 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

³² Transport Infrastructure Ireland (TII), 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

³³ Transport Infrastructure Ireland (TII), 2019. Project Management Guidelines PE-PMG-02041

³⁴ Design Manual for Roads and Bridges (DMRB) (UKHA, 2020).

6.5.6.3 Assessment Criteria

The assessment of potential noise impacts and ranking of option corridors is generally based primarily upon property counts, a review of the likely requirement for mitigation measures based on the indicative noise footprint for each alternative, and changes in traffic flows. As there are no corridors associated with the alternatives, it is not possible to do a property count and so the assessment is entirely qualitative.

Impact Rating Score

Based on the quantitative and qualitative analysis undertaken for each corridor option, 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 6.1.1 of this report.

6.5.6.4 Stage 1 Noise and Vibration Assessment of Alternatives

Alternative A: Active Travel

From a noise point of view this alternative is likely to result in a neutral to potentially positive impact for existing noise sensitive properties along the existing N4 and through Cortober and Carrick-on-Shannon. The potential change in traffic noise levels will depend on the modal shift towards active travel and any potential significant reduction in private vehicles along the road networks.

Alternative B: Public Transport Improvements

From a noise point of view this option is likely to result in a neutral to potentially positive impact for existing noise sensitive properties along the existing N4 and along through Carrick-on-Shannon. The potential change in traffic noise levels will depend on the modal shift towards public transport and any potential significant reduction in private vehicles along the road networks.

Alternative C: Demand Management

From a noise point of view this option is likely to result in a neutral to potentially positive impact for existing noise sensitive properties along the existing N4 and along through Carrick-on-Shannon. The potential change in traffic noise levels will depend on the success of demand reduction on the use of private vehicles along the road networks.

6.5.6.5 Summary

All alternatives are assessed as having a Not Significant or Neutral impact with respect to noise and vibration.

Table 6.5.6.1 Stage 1 Noise and Vibration Summary Assessment Matrix of Alternatives

NON-COMPARATIVE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Potential change in traffic noise levels	Neutral to Not Significant (Positive) dependent on modal shift towards active travel and resultant reduction in private vehicles.	Neutral to Not Significant (Positive) dependent on modal shift towards active travel and resultant reduction in private vehicles.	Neutral to Not Significant (Positive) dependent on modal shift towards active travel and resultant reduction in private vehicles.
Scoring			
Qualitative assessment	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Score / Impact level	4	4	4

6.5.7 Stage 1 Archaeological, Architectural and Cultural Heritage Assessment of the Alternatives

6.5.7.1 Introduction

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

The Stage 1 Alternatives are presented on Figures 6.1.1.0, 6.1.2.0 and 6.1.3.0. 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 Alternatives remains unchanged.

Section 6.5.7.2 outlines the methodology that was used to carry out the study, including the assessment criteria. The assessment is presented in Section 6.5.7.3 with Section 6.5.7.4 outlining the general summary of the Stage 1 Archaeological, Architectural and Cultural Heritage assessment of the alternatives.

6.5.7.2 Methodology

Analysis of traffic patterns in the study area has revealed that a considerable number of short distance trips within the Carrick-on-Shannon and Cortober area are made by car. This is a contributing factor to existing congestion on the N4. Improvements to the walking and cycling infrastructure within the town, in addition to enhancements to local bus services would support an increase in sustainable trip making. As part of the project appraisal process, these measures have been assessed as an alternative to building new road infrastructure. Alternatives assessed are as follows:

- Alternative A: Active Travel
- Alternative B: Public Transport improvements
- Alternative C: Demand Management

The Alternatives Assessment has been carried out with reference to the TII Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes³⁵ and Assessment of Architectural Heritage Impacts of National

³⁵ 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>

Road Schemes³⁶, although it should be noted that the guidelines themselves predate the establishment of an alternative options/preliminary options assessment process.

The methodology addressed an area comprising a 250m buffer either side of where interventions may be required as part of the alternatives. This enables a meaningful assessment of potential positive and negative direct and indirect impacts upon the archaeological, architectural and cultural heritage resource.

A positive impact is possible if it results in a change that improves or enhances the setting of an archaeological/architectural monument/structure with the scale varying from imperceptible positive, if the impact is capable of measurement but is without noticeable consequences, to minor or slightly positive to moderately positive depending on the degree to which it enhances the integrity or sensitivities of the site.

A direct impact occurs where an asset is within the potential footprint of interventions required as part of the alternatives. An indirect impact may occur where the asset is within the 250m wide buffer zone of the proposal. For the purposes of this assessment, the establishment of cycle ways and traffic management measures within the existing road network are not considered to represent interventions that may negatively affect the archaeological, architectural or cultural heritage resource. This is due to the fact that such measures represent a re-use of the existing road network which is neutral when applied to potential impacts on the resource under assessments – these types of impact are classified as neutral.

Measurements are taken from the edge of the proposed interventions to the upstanding remains of a site or structure, or to the edges of features/monuments where they are visible on aerial photography. Where no upstanding remains are visible, and there is no visible indication of subsurface remains (e.g. cropmarks), the measurement is taken from the edge of the potential interventions to the centre of the site as recorded by the RMP, NIAH etc. These measurements are noted as “Distance from Alternative” in the assessment tables herein.

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 Analysis ¹(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 6.1.1 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 Reports. Specifically, the significance of effects, as detailed in Table

³⁶ 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

3.3 of that document, have been aligned with those impacts described above. This alignment is demonstrated in Table 6.5.7.1.

Table 6.5.7.1 Alignment of TII and EPA Impact Guidelines

TII Guidelines	EPA Guidelines
Majorly Positive 7	Profound Positive
	Very Significant Positive
Moderately Positive 6	Significant Positive
	Moderately Positive
Minor or Slightly Positive 5	Slight Positive
	Not Significant Positive
Not Significant or Neutral 4	Imperceptible
	Not Significant
Minor or Slightly Negative 3	Slightly Negative
Moderately Negative 2	Moderately Negative
	Significant Negative
Major or Highly Negative 1	Very Significant Negative
	Profound Negative

Due to the more condensed nature of the TII scale of impacts in comparison with that provided by the EPA, the impact assessment detailed in Section 6.5.7.3 remains high level at this stage.

6.5.7.3 Stage 1 Archaeological, Architectural and Cultural Assessment of Alternatives

Three alternatives are proposed:

- Alternative A: Active Travel
- Alternative B: Public Transport Improvements
- Alternative C: Demand Management

For the most part all of the alternatives relate to interventions, initiatives and works located primarily on and within the existing street network, with some elements (e.g. mobility hub (Alternative B); park and stride sites (Alternative C)) provided on existing brownfield/parking areas and therefore, have broadly similar landscape and visual impacts. All of the alternatives, but more so Alternative A, provide for an enhanced pedestrian/cycle friendly environment within Carrick-on-Shannon and Cortober. Alternative A also provides for an enhanced pedestrian/cycle network along the full length of the N4 within the study area.

Alternative A: Active Travel

Alternative A comprises improvements to cycling and walking facilities and includes the elements as follows:

- Development of a comprehensive cycle network
- Improved facilities for cyclists (cycle parking, changing areas, e-bike charging, etc.)
- Improvements to pedestrian facilities (e.g. improved crossings and footpath provision)
- Improve permeability (non-motorised) within the town
- Potential pedestrianisation of key streets
- Construction of a new pedestrian and cycle bridge

The construction of a new pedestrian and cycle bridge represents the only intervention that may negatively affect the archaeological, architectural and cultural heritage resource. The location of the new pedestrian/cycle bridge across the River Shannon west (upstream) of the existing bridge is within the context of a protected view upstream from the existing bridge and the structure will interrupt views of the river and harbour from the bridge. The proposed bridge will be of sufficiently high level to allow for cruising on the river and will also offer new views upstream and downstream to the existing bridge. However, the tie-in of the bridge will also impact on the existing open space on the Cortober side of the river and the quay road/harbour edge area on the Carrick-on-Shannon side of the river. The harbour/river quay walls are protected structures, and the surrounding area lies within the Architectural Conservation Area (ACA) of Carrick-on-Shannon town.

Table 6.5.7.2 Alternative A: New Pedestrian and Cycle Bridge

Site Ref.	Name	Statutory Protection?	Distance from alternative	Impact Type	Potential Impact level
AH 64	Historic Town (Carrick-on-Shannon)	Yes	0m	Direct	Significant Negative
BH 4 /AH 64	Carrick-on-Shannon Bridge	No	25m SE	Indirect	Significant Negative
BH 4	Historic quay side	Yes	0m	Direct	Significant Negative
BH 4	Limestone steps	Yes	20m SE	Indirect	Slight Negative
BH 4	Post Box	Yes	40m south	Indirect	Imperceptible Negative
AH 63	House 17 th century	No	50m south	Indirect	Imperceptible Negative
AH 64	Fortification	Yes	75m east	Neutral	N/A
BH 4	ACA	Yes	0m	Direct	Significant Negative

Alternative B: Public Transport Improvements

Alternative B comprises improvements to public transport in and around Carrick-on-Shannon, and includes the following measures:

- Development of an enhanced public transport network
- Increased frequency on the rail network
- Improved parking facilities at Carrick-on-Shannon railway station
- Linking of nearby urban settlements with Carrick-on-Shannon and key trip attractors in the town
- Increase in public transport services (i.e. up to every 20 minutes during peak periods)
- Development of a mobility hub in the town centre facilitating interchange with other modes
- Provision of demand responsive mini-bus services connecting isolated areas to Carrick-on-Shannon and Cortober

Alternative B will involve an improvement and/or new bus services on the existing street network. This will involve additional signage and possible bus-stops but will not require land acquisition and significant construction.

Alternative B will also include improvements to the rail service which will be accomplished without new rail infrastructure construction. The addition of new facilities at the rail station could include line markings and signage to delineate parking for cyclists and/or vehicles.

This alternative will not negatively affect the archaeological, architectural and cultural heritage resource, as it represents changes to the existing travel network. As such the alternative is considered to be neutral.

The assessment is presented in the summary Table 6.5.7.3.

Alternative C: Demand Management

Alternative C involves reducing demand for car trips through Carrick-on-Shannon and includes the following measures:

- Rationalise parking along the existing N4 corridor
- Provision of Park & Stride sites on periphery of town centre
- Development of a car free town centre
- Development of remote working hubs
- Delivery of centrally located mixed use developments

Alternative C will involve measures to reduce the need to make the trip by car in the first instance. As such, it will be a reduction measure as opposed to a provision measure with a reassignment of on-street parking/existing traffic lanes to provide walking or cycling facilities or urban realm, which will not require land acquisition

and significant construction. The creation of Park and Stride sites will be located on existing brownfield sites or reassigned existing parking lots.

This alternative will not negatively affect the archaeological, architectural and cultural heritage resource. Proposals include for the reduction and removal of traffic within the town centre, which would overall have a moderately to significant positive impact on the built heritage environment, especially, including the designated Architectural Conservation Area. As such the alternative is considered to be Moderately Positive.

The assessment is presented in the summary Table 6.5.7.3.

Table 6.5.7.3 Stage 1 Archaeological, Architectural and Cultural Heritage Summary Assessment Matrix of Alternatives

NON-COMPARATIVE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Impacts to number of sites subject to statutory protection	Major or Highly Negative: 0 Moderately Negative: 3 Minor or Slightly Negative: 1 Not Significant or Neutral: 2	None predicted.	Potential positive impacts on the overall built heritage resource of the town of Carrick-on-Shannon, including protected structures and the ACA.
Impacts to number of sites not subject to statutory protection	Major or Highly Negative: 0 Moderately Negative: 1 Minor or Slightly Negative: 0 Not Significant or Neutral: 0	None predicted.	Potential positive impacts on the overall built heritage resource of the town of Carrick on Shannon, including structures of architectural merit that may not be subject to statutory protection.
Scoring	2	4	6
Qualitative assessment	The construction of a new pedestrian and cycle bridge has the potential to have a Moderately Negative impact on a number of archaeological and built heritage sites subject to statutory protection.	The alternative proposed will not affect the archaeological, architectural or cultural heritage resource and as such the overall affect is Not Significant or Neutral.	The alternative proposed has the potential to result in a Moderately Positive impact on the built heritage environment of Carrick-on-Shannon, due to the removal of traffic.
Score / Impact level	Moderately Negative	Not Significant or Neutral	Moderately Positive

6.5.7.4 Summary

Of the alternatives assessed, Alternative A has the potential to negatively affect the archaeological and architectural heritage resource, due to the construction of a new pedestrian and cycle bridge, adjacent to the existing Carrick-on-Shannon River Shannon Bridge. This would result in direct and indirect impacts on sites and structures that are subject to statutory protection. The remaining proposals associated with this alternative would be neutral in relation to the archaeological, architectural and cultural heritage resource.

Alternative B would be neutral in relation to the archaeological, architectural and cultural heritage resource. This is due to the reuse of the existing road network as part of the alternative proposed. No interventions would be required as part of the proposal.

Alternative C would have an overall Moderately Positive impact on the historic built heritage environment of Carrick-on-Shannon, due to the removal of traffic from the town and the pedestrianisation of streets. This positive impact can be applied to structures that are subject to statutory protection and the overall ACA, along with the structures of built heritage merit within the town that are present.

6.5.8 Stage 1 Landscape and Visual Assessment of the Alternatives

6.5.8.1 Introduction

This section describes the Stage 1 assessment of the alternatives in the context of the Landscape and Visual constraints identified in Section 4.11 Landscape and Visual of this report. The alternatives are described in Section 6.1.2 Description of Alternatives.

The Stage 1 Alternatives are presented on Figures 6.1.1.0, 6.1.2.0 and 6.1.3.0.

Section 6.5.8.2 outlines the methodology utilised to carry out the Landscape and Visual assessment of alternatives. The Landscape and Visual assessment of the alternatives is provided in Section 6.5.8.3 with associated summary assessments and scorings presented in Section 6.5.8.4.

6.5.8.2 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)³⁷
- Guidelines on the information to be contained in Environmental Impact Assessment Reports, Draft August 2017 Environmental Protection Agency, (EPA, 2017)³⁸
- Guidelines for Landscape and Visual Impact Assessment, 3ed. April 2013 Landscape Institute & Institute of Environmental Management and Assessment, (GLVIA, 2013)³⁹
- Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Transport Infrastructure Ireland, (TII, 2016)¹

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

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

³⁷ TII, 2020. Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Proposed National Roads – Standard December 2020, Transport Infrastructure Ireland

³⁸ 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> [Accessed May 2020]

³⁹ 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 alternatives 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 alternative 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)¹. The scale ranges from 7 to 1 as listed in Table 6.1.1 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)⁸
- Carrick-on-Shannon Local Area Plan 2010-2019 (LCC, 2010)¹⁰
- Landscape Assessment of County Leitrim (LCC, 2020)⁴⁰
- Roscommon County Development Plan 2022-2028 (RCC, 2022)⁹
- Cortober Local Area Plan 2008-2014 (RCC, 2008)¹¹
- Landscape Character Assessment of County Roscommon (RCC, 2022)⁴¹
- 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>)⁴²
- National Monuments Service: Historic Environment Viewer (<https://maps.archaeology.ie/HistoricEnvironment/>)⁴³
- Environmental Protection Agency GIS Mapping (<https://gis.epa.ie/EPAMaps/>)⁴⁴
- Google Aerial Photography and Mapping (<https://www.google.ie/maps>)⁴⁵

⁴⁰ Environmental Resources Management, 2002. Comhairle Chontae Liatroma, Landscape Assessment of County Leitrim Reference 17896.

⁴¹ 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>

⁴² Ordnance Survey Ireland, 2021. GeoHive Mapping Service. Available from: <http://map.geohive.ie/mapviewer.html> [Accessed August 2021]

⁴³ National Monuments Service, 2021. Historic Environment Viewer Available from: <https://maps.archaeology.ie/HistoricEnvironment/>

⁴⁴ Environmental Protection Agency, 2021 GIS Mapping. Available from: <https://gis.epa.ie/EPAMaps/>

⁴⁵ Google, 2021. Google Aerial Photography and Mapping. Available from <https://www.google.ie/maps>

6.5.8.3 Alternatives Assessment

Three alternatives are proposed:

- Alternative A: Active Travel
- Alternative B: Public Transport Improvements
- Alternative C: Demand Management

For the most part all of the alternatives relate to interventions, initiatives and works located primarily on and within the existing street network, with some elements (e.g. mobility hub (Alternative B); park and stride sites (Alternative C) provided on existing brownfield/parking areas and therefore, have broadly similar landscape and visual impacts.

The principal exception is the requirement in Alternative A for a new pedestrian/cycle bridge to be provided across the River Shannon west (upstream) of the existing bridge. The location of the proposed bridge is within the context of a protected view upstream from the existing bridge and the structure will interrupt views of the river and harbour from the bridge. The proposed bridge will be of sufficiently high level to allow for cruising on the river and will also offer new views upstream and downstream to the existing bridge. However, the tie-in of the bridge will also impact on the existing open space on the Cortober side of the river and the quay road/harbour edge area on the Carrick-on-Shannon side of the river. The harbour/river quay walls are protected structures, and the surrounding area lies within the Architectural Conservation Area (ACA) of Carrick-on-Shannon town.

All of the alternatives, but more so Alternative A, provide for an enhanced pedestrian/cycle friendly environment within Carrick-on-Shannon and Cortober. Alternative A also provides for an enhanced pedestrian/cycle network along the full length of the N4 within the study area.

The landscape and visual assessment of the alternatives is presented in Table 6.5.8.1.

Table 6.5.8.1 Stage 1 Landscape and Visual Summary Assessment Matrix of Alternatives

NON-COMPARATIVE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Landscape (Townscape) Aspects	Positive streetscape interventions in Carrick-on-Shannon and Cortober and along existing road network. New pedestrian / cycle bridge in Carrick-on-Shannon would be high level (for cruising) and would impact existing open space with mature trees on Roscommon side of river and Quay Street / harbour area on Leitrim side of river. Alternative A will not result in a significant reduction in traffic congestion in Carrick-on-Shannon and Cortober, which will maintain the adverse effects of traffic on the townscape character.	No significant landscape / townscape impacts expected.	No significant landscape / townscape impacts expected.
Visual Aspects	Positive streetscape interventions in Carrick-on-Shannon and Cortober and along existing road network. New pedestrian / cycle bridge in Carrick-on-Shannon impacts protected view west over river / harbour from existing bridge. Alternative A will not result in a significant reduction in traffic through Carrick-on-Shannon and Cortober, which will maintain the adverse effects of traffic on the townscape / visual character.	No significant visual impacts expected.	No significant visual impacts expected.

Scoring			
Qualitative assessment	Localised temporary / short-term Significant Negative impact	Imperceptible or Not Significant impact	Imperceptible or Not Significant impact
	Localised medium / longer-term Slightly Negative impact	Not Significant or Neutral	Not Significant or Neutral
	Minor or Slightly Negative		
Score / Impact level	3	4	4

6.5.8.4 Summary

All the alternatives provide for an enhanced pedestrian/cycle friendly environment within Carrick-on-Shannon and Cortober. Alternative A also provides for an enhanced pedestrian/cycle network along the full length of the N4 within the study area, however it is unlikely to reduce current traffic levels, which is having an adverse effect on the townscape and visual character of the towns. In addition, the provision of the new cycle/pedestrian footbridge will have an adverse impact on the quay side in Carrick-on-Shannon.

The other alternatives seek to either improve public transport (Alternative B), or to reduce traffic demand (Alternative C), and while either should reduce traffic on the existing N4 to some extent, they may not remove increasing pressures on the network and the associated quality of the townscape and visual environment.

6.5.9 Stage 1 Biodiversity Assessment of the Alternatives

6.5.9.1 Introduction

This section details the environmental assessment of the Stage 1 Preliminary Alternatives described in Section 6.1 with respect to the Biodiversity constraints identified in Section 4.12 Biodiversity of Chapter 4 – Constraints Study.

Section 6.5.9.2 outlines the methodology that was used to carry out the assessment and Section 6.5.9.3 details the assessment and a summary is presented in Section 6.5.9.4.

The principal objectives of the assessment are to:

- Evaluate the alternatives based on ecological criteria, as per the National Road Authority (NRA) Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009)⁴⁶ and Chartered Institute for Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine (2018)⁴⁷
- Assess the significance of the likely impacts on each of the biodiversity receptors potentially impacted by each alternative. As per Transport Infrastructure Ireland (TII) guidance⁴⁶, this step discounts biodiversity receptors or ecological sites where the risk of significant impacts is unlikely, considering where the application of standard mitigation and best practice during construction is unambiguous and success is highly likely
- To assess each alternative in accordance with Transport Infrastructure Ireland's Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis (TII, 2016)¹

In fulfilling these objectives, an assessment of the likely or potential impacts that the alternatives will have on ecological receptors will be carried out. This will provide an informed judgment surrounding the alternatives' impact with knowledge of the potential ecological consequences.

6.5.9.2 Methodology

The process by which the proposed alternatives were assessed was as follows:

- The key ecological receptors within the study area were identified based on a combination of desktop studies, consultation (with relevant bodies/organisations) and field surveys

⁴⁶ 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>

⁴⁷ 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>

- The key ecological receptors were assigned an ecological valuation based on a geographic frame of reference ranging from international to local importance
- The likely impacts of each of the alternatives on the key ecological receptors were identified and assessed, indicating which, if any, of these were likely to be significant, and at what geographical level
- The impacts of alternatives on the key ecological receptors were scored in accordance with the TII approach¹, on a seven-point scale ranging from ‘Major or Highly Negative’ to ‘Major or Highly Positive’⁴⁸

A final determination as to the significance of the impacts caused by the alternatives was then provided.

Key Ecological Receptors

Key ecological receptors are those biodiversity receptors confirmed, or likely to occur, within the overall study area with an ecological value of local importance (higher value) or greater; and therefore, likely to be impacted by transport alternatives:

- Designated sites for nature conservation (e.g. SACs, SPAs, NHAs, pNHAs and Nature Reserves)
- Sensitive habitats (e.g. non-designated areas of Annex I habitat⁴⁹, non-Annex I semi-natural woodland habitats and watercourses⁵⁰)
- 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 focus 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 constraints 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

⁴⁸ In respect of the Black Option and the Active Travel and Public Transport Option, these are not comparatively compared, rather assessed as standalone assessments. However, they are similarly described in as far as is possible based on the detail provided of likely or potential impacts on key ecological receptors.

⁴⁹ 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

⁵⁰ Watercourses are referred to as per EPA, 2022. Online Map Viewer. Available at: <https://gis.epa.ie/EPAMaps/>

2. In the townlands of Cortober, Cordrehid, Attirory, Rinnacurreen and Drumkeeran to the south of Carrick-on-Shannon

This was further supplemented by an additional field survey undertaken in February 2021. The aim of the field surveys was a ground truthing exercise to 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 document additional ecological sites not identified in the desk study.

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). In a small number of situations ecological sites could not be viewed at a distance due to the local topography or limited access (EC02, EC03 and EC05). However, assumptions have been made on the value of those ecological sites based on local information gathered during previous surveys and the desk study, as necessary.

Where possible, during the site walkover surveys, habitat types were classified using the Guide to Habitats in Ireland (Fossitt, 2000)⁵¹ and the likelihood or potential for Annex I habitat types was confirmed where possible or inferred based on the professional judgement of the surveyor, with reference to the Interpretation manual of European Union Habitats EUR 28 (CEC, 2013)⁵². 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.

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)⁴⁶ and Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018)⁴⁷.

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

⁵¹ Fossitt, J.A., 2000. A Guide to Habitats in Ireland. Heritage Council, Kilkenny. Available at: <https://www.npws.ie/sites/default/files/publications/pdf/A%20Guide%20to%20Habitats%20in%20Ireland%20-%20Fossitt.pdf>

⁵² Commission of the European Communities (CEC), () 2013. Interpretation manual of European Union Habitats EUR28. European Commission, DG Environment. Available at: https://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf

being of international importance given that they are of the highest conservation concern at a European level (i.e., natural habitat types in danger of disappearance⁵³).

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 ecological site.

Assessment Criteria

The assessment of the alternatives included both a quantitative and qualitative assessment. Firstly, the impacts on each key ecological receptor are assessed.

Although a given alternative 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 the alternatives 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 the alternatives, 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:

⁵³ From the definition of “*priority natural habitat types*” in Article 1(d) of the Habitats Directive. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043>

- 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 each alternative was then scored, based on the seven-point scale and an integer was assigned according to the impact significance as listed in Table 6.1.1 of this report.

As the alternatives are each assessed individually and are not assessed against each other an assessment score is assigned but they are not assigned as Least Preferred, Intermediate or Preferred.

6.5.9.3 Alternatives Assessment

The Alternatives which have been considered feasible for this project comprise of public transport proposals and measures to improve active travel and demand management measures. The aim of these proposals is to encourage a shift away from private car usage, therefore reducing the number of private vehicles on the section of the N4 under consideration. This has the potential to relieve existing and forecasted capacity issues in the study area. A description of these alternatives has been provided within previous sections of this report but can be categorised as follows:

- Alternative A: Active Travel
- Alternative B: Public Transport Improvements
- Alternative C: Demand Management

For the most extent all of the alternatives relate to interventions, initiatives and works primarily on and within the existing street network, with some elements (e.g. mobility hub (Alternative B); park and stride sites (Alternative C)) provided on existing brownfield/parking areas and therefore, have broadly similar biodiversity

impacts. Neither of these alternatives interact with any ecological sites or watercourses identified.

The principal exception to this is the requirement in Alternative A with the inclusion of a new pedestrian/cycle bridge to be provided across the River Shannon west (upstream) of the existing bridge. The inclusion of this new pedestrian/cycle bridge would result in potentially significant effects on the River Shannon, a river of national importance, including shading effects, direct disturbance to species within the watercourse, potential contamination of the watercourse from construction run-off, etc.

All of the alternatives, but more so Alternative A, provide for an enhanced pedestrian/cycle friendly environment within Carrick-on-Shannon and Cortober. Alternative A also provides for an enhanced pedestrian/cycle network along the full length of the N4 within the study area.

The alternatives (i.e. Active Travel, Public Transport and Demand Management Measures) are subject to stand alone assessments rather than a comparative assessment as these could be implemented as standalone measures or implemented as complementary measures to the Option Corridors assessed in Chapter 7 of this report as part of the overall transport solution. Table 6.5.9.1 shows which ecological receptors are impacted by the alternatives.

Table 6.5.9.1 Breakdown of the Key Ecological Receptors which are Impacted by the Proposed Alternatives

	Receptors of International Importance Impacted	Receptors of National Importance Impacted	Receptors of County Importance Impacted	Receptors of Local Importance (Higher Value) Impacted
Alternative A: Active Travel	N/A	River Shannon	N/A	N/A
Alternative B: Public Transport	N/A	N/A	N/A	N/A
Alternative C: Demand Management	N/A	N/A	N/A	N/A

Table 6.5.9.2 Stage 1 Biodiversity Summary Assessment Matrix of Alternatives

STAND ALONE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Significant impact on sites of International Importance (Major or Highly Negative) (Number)	0	0	0
Significant impact on sites of National Importance (Major or Highly Negative) (Number)	1	0	0
Significant impact on sites of County Importance (Moderately Negative) (Number)	0	0	0
Significant impact on sites of Local Importance (Higher Value) (Minor or Slightly Negative) (Number)	0	0	0
Scoring			
Qualitative Assessment	Potential impacts on the River Shannon (a nationally important watercourse). On a precautionary basis assuming a new cycle / pedestrian bridge will be constructed over the River Shannon. Will be reassessed if no new bridge / structures are required. Moderately Negative	It is not envisaged that this alternative would require greenfield landtake therefore, no likely impacts of any ecological sites or watercourses are predicted Not Significant or Neutral	It is not envisaged that this alternative would require greenfield landtake therefore, no likely impacts of any ecological sites or watercourses are predicted Not Significant or Neutral
Score / Impact Level	2	4	4

6.5.9.4 Summary

Neither Alternative B or Alternative C (i.e. Public Transport Improvements or Demand Management) will impact directly on any watercourses or any ecological sites, at any geographical scale. Additionally, given the nature and scale of the works as outlined in Section 6.1 neither of these Alternatives are likely to result in indirect effects on any ecological sites.

The majority of proposed measures contained within Alternative A will not result in any impacts to ecological sites identified. However, Alternative A does propose the construction of a new pedestrian/cycle bridge across the River Shannon, a nationally important watercourse. Likely significant effects are predicted on the River Shannon as a result of the construction of a new pedestrian/cycle bridge.

6.5.10 Stage 1 Hydrology Assessment of the Alternatives

6.5.10.1 Introduction

This section details the Stage 1 assessment of the alternatives in the context of the hydrological constraints identified in Section 4.13 Hydrology of this report.

Section 6.5.10.2 outlines the methodology that was used to carry out the study, including the assessment criteria. The assessment is presented in Section 6.5.10.3 and a summary provided in Section 6.5.10.4.

6.5.10.2 Methodology

The principal objectives of the study are to:

- Complete a desk study and field investigations to obtain relevant hydrological data for each proposed alternative
- Identify and describe sites of known potential hydrological interest
- Assess the significance of the likely impacts of the proposed alternatives on each of these hydrological receptors
- To evaluate and compare each alternative based on hydrological criteria, as per NRA (2008) Guidelines on Procedures for Assessment and treatment of Geology, Hydrology and Hydrogeology for National Road Schemes⁵⁴, taking into account interactions with other environmental disciplines
- To assess each alternative in accordance with the TII (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis ¹
- Based on the above assessment, to determine the scale of the impact of each of the alternatives

In fulfilling these objectives, an assessment on the likely impacts of the alternatives 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 area 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 PAG 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 PAG Guidelines and are reproduced in Table 6.5.10.1. The impact significance assessment takes into account the attribute importance and the predicted scale and duration of the likely impacts.

⁵⁴ 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>

Table 6.5.10.1 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 Significant or Neutral, 4)			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 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 Analysis 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 presented in Table 6.1.1 of this report.

Table 6.5.10.2 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 Analysis 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.

6.5.10.3 Alternatives Assessment

The impact of the alternatives with their many components on hydrology will essentially be aimed at reducing and managing traffic numbers. Such alternatives will result in reduction in private car numbers from the existing situation which potentially will reduce slightly the pollutant loads from the road drainage. The drainage currently is running off via outfalls and over the edge discharges to the watercourses and with reduced traffic numbers there may be a slightly reduced risk of traffic accidents and spillages that might contribute to a serious pollution incident from a HGV or smaller pollution risks from private vehicles. In terms of the effect on the water quality in the receiving watercourses and the downstream River Shannon the alternatives are unlikely to generate sufficient reduction in pollutant load as to register a perceptible impact on surface water quality due to the dilution available in this waterbody. However, the initiative is to take local private cars off the network entirely and replace with sustainable trips and may have a slightly more measurable positive impact on the smaller watercourses. Some components of the smarter travel alternative will require some infrastructure works, however it is assumed that these will be located on existing roads, or brownfield sites and are already serviced by existing drainage networks, therefore there is no anticipated impact on hydrology as part of the Stage 1 assessment of alternatives. (e.g. Park and stride facilities and new cycle/walking facilities). It is therefore considered that the alternatives represent a Not Significant or Neutral impact on hydrology.

Table 6.5.10.3 Stage 1 Hydrology Assessment Matrix of Alternatives

STAND ALONE ASSESSMENT			
ASSESSMENT CRITERIA	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Floodplains and Flood Risk	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
River Shannon	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Minor Watercourses	Not Significant or Neutral	Minor or Slightly Positive	Minor or Slightly Positive
Surface Water Resources	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Hydro-ecology	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Soft sediments	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Scoring			
Qualitative Assessment	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Score / Impact Level	4	4	4

6.5.10.4 Summary

All alternatives are assessed as having a Not Significant or Neutral impact with respect to hydrology.

6.5.11 Stage 1 Hydrogeology Assessment of the Alternatives

6.5.11.1 Introduction

This section details the Stage 1 assessment of the alternatives with respect to the hydrogeological constraints identified in Section 4.5 Hydrogeology of this report.

The Stage 1 Alternatives are presented on figures 6.1.1.0, 6.1.2.0 and 6.1.3.0.

Section 6.5.11.2 outlines the methodology that was used to carry out the study, including the assessment criteria. The assessment is presented in Section 6.5.11.3 with Section 6.5.11.4 outlining the general summary of the Hydrogeology assessment of the alternatives.

6.5.11.2 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 2009⁵⁵.

The NRA Guidelines provide criteria for ranking of the identified hydrogeological constraints within the assessment study area. Criteria for rating an impact significance that may arise at each hydrogeological constraint are provided within Box 4.4 of the NRA Guidelines⁵⁵ 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.

Table 6.5.11.1 Criteria for Rating Impact Significance at Route Selection Stage – Rating of Significant Environmental Impacts at Route Selection Stage from Box 4.4 of the Guidelines

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		

⁵⁵ NRA, 2009. Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Available at: <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>

Impact Level	Attribute Importance				
	Extremely High**	Very High	High	Medium	Low
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 Guidelines⁵⁶ 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 Analysis¹, as shown in Table 6.5.11.2. It should be noted that only negative potential impacts are considered in the NRA Guidelines⁵⁶ whereas the TII PAG¹ multi-criteria assessment is based on the seven-point scale presented in Table 6.1.1 of this report.

Table 6.5.11.2 Correlation of NRA Guidelines Significance Rating to an Equivalent TII PAG¹ score

Significance Rating (NRA Guidelines ⁵⁵)	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 Analysis¹ 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.

6.5.11.3 Stage 1 Hydrogeology Assessment of Alternatives

Alternative A (Active Travel) this includes the construction of a new pedestrian and cycle bridge over the River Shannon. This would include intrusive works adjacent to the River Shannon which may encounter groundwater the underlying aquifer and/or require temporary dewatering. The impact would be temporary on a small portion of the underlying regionally important aquifer. The regionally important aquifer is considered of high importance and therefore the potential impact is considered to be imperceptible.

It is expected that Alternative B (Public Transport Improvements) requires very limited construction works and no excavations associated. Therefore, the likely impacts are expected to be minimal and considered to be imperceptible on any hydrogeological constraint.

Alternative C (Demand Management) may involve the use of brownfield sites. This may include minimal construction works including reassignment of road space/parking measures. This has the potential to present temporary impact on small proportion of the underlying regionally important aquifer. The regionally important aquifer is considered of high importance and therefore the potential impact is considered to be imperceptible.

Table 6.5.11.3 Stage 1 Hydrogeology Stage 1 Summary Assessment Matrix of Alternatives

STAND ALONE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Aquifer classification (groundwater quality)	Imperceptible impact	Imperceptible impact	Imperceptible impact
Scoring			
Qualitative assessment	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Score / Impact level	4	4	4

6.5.11.4 Summary

All three alternatives were assigned a PAG score of 4 in the assessment. Based on this, the expected overall impact on hydrogeological constraints is likely to be insignificant (Not Significant or Neutral) for the alternatives presented for this project.

6.5.12 Stage 1 Soils and Geology Assessment of the Alternatives

6.5.12.1 Introduction

This section details the Soils and Geology Environmental Assessment of the Stage 1 alternatives with respect to the soils and geology constraints identified in Section 4.17 Soils and Geology of the Constraints Study.

The soils and geology constraints are presented with the Stage 1 Alternatives in Figures 6.1.1.0 to 6.1.3.0.

Section 6.5.12.2 outlines the methodology that was used to carry out the assessment, along with the assessment criteria which were used and presents the assumptions that were adopted as part of the assessment. The assessment is presented in Section 6.5.12.3 with the summary of the assessment presented in Section 6.5.12.4.

The alternatives are referenced as Alternative A Active Travel, Alternative B Public Transport Improvements and Alternative C Demand Management and are described in Section 6.1.2.

6.5.12.2 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).⁵⁶
- The Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.⁵⁷
- NRA, 2008 Environmental Impact Assessment of National Road Schemes – a Practical Guide.⁵⁸

The NRA Guidelines provide useful criteria for rating of the identified soils and geology constraints (herein referred to as Criteria) that are presented in Table 4.15.11 of the Section 4.17 Soils and Geology of the Constraints Study. Each criterion comprises of individual attributes which have been assigned an

⁵⁶ National Roads Authority, 2009. Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, Ireland: Available at: <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>

⁵⁷ Environmental Protection Agency, 2017. Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, Draft. Available at: <https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf> [Accessed: 17 February 2021]

⁵⁸ 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>

Importance using Box 4.1 of the NRA Guidelines. The Importance ratings are listed in the table below.

Table 6.5.12.1 Ratings for the Significance of Environmental Impact⁵⁹

Importance of Attribute	Magnitude of Impact			
	Negligible	Small Adverse	Moderately Adverse	Large Adverse
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant / Moderately	Profound / Significant	Profound
High	Imperceptible	Moderately / Slight	Significant / Moderately	Severe / Significant
Medium	Imperceptible	Slight	Moderately	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderately

The ‘Magnitude of Impact’ assesses the impact that each alternative has on each criterion attribute, a ‘Magnitude of Impact’ is assigned using Box 5.1 of the NRA Guidelines as presented in the table above. 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 above based on the ‘Importance of Attribute’ and the ‘Magnitude of Impact’. The terminology adopted in the assessment table in Section 6.5.12.3 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.

It should be noted that the alternatives are assessed separately in their own right as stand-alone entities and are not assessed against each other.

The negative potential impacts of the alternatives 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.

Once a significance of impact was determined for each associated criterion attribute for each alternative, 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)¹. TII PAG multi-criteria assessment is based on the seven-point scale presented in Table 6.1.1 of this report.

Assessment Criteria

A sensitivity analysis was not undertaken for the alternatives assessment as these have been assessed as standalone assessments in which the criteria identified as part of the constraints study is considered. The soils and geology criteria which

⁵⁹Box 5 Guidelines for Assessment of Ecological Impacts of National Road Schemes
<https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf>

have been considered as part of the Stage 1 Preliminary Alternatives Assessment are as follows:

- Soil Deposits (well-drained soil types which are important for agriculture)
- Bedrock (Karst)
- Bedrock (Volcanic Geology)
- Landslide Susceptibility
- Contaminated Sites
- Economic Geology
- Geological Heritage
- Earthworks

6.5.12.3 Alternatives Assessment

The do-something alternatives are described in section 6.1.2 of this document. Based on the information available these alternatives will have a Minor or Slightly Negative, or Not Significant or Neutral impact on soils and geology.

Table 6.5.12.2 Stage 1 Soils and Geology Summary Assessment Matrix of Alternatives

NON-COMPARATIVE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Soil Deposits	The impact on soil types that are important for agriculture (well drained) is Imperceptible.	The impact on soil types that are important for agriculture (well drained) is Imperceptible.	The impact on soil types that are important for agriculture (well drained) is Imperceptible.
Bedrock (Karst)	The impact on karst features is Imperceptible.	The impact on karst features is Imperceptible.	The impact on karst features is Imperceptible.
Bedrock (Volcanic Geology)	The impact on volcanic bedrock formations is Imperceptible.	The impact on volcanic bedrock formations is Imperceptible.	The impact on volcanic bedrock formations is Imperceptible.
Landslide Susceptibility	The impact on landslide susceptibility is Imperceptible.	The impact on landslide susceptibility is Imperceptible.	The impact on landslide susceptibility is Imperceptible.
Contaminated Sites	Proposed new pedestrian / cycle links will have a moderate / slight impact on some historical quarry and pit sites and potential areas of made ground across Carrick-on-Shannon.	The improved parking facilities at Carrick-on-Shannon railway station will have a slight impact on an area of potential contamination.	The impact on contaminated sites is Imperceptible.
Economic Geology	As the proposed works for Alternative A are predominately throughout Carrick-on-Shannon and Cortober the impact on economic geology is considered Imperceptible.	The impact on economic geology is Imperceptible.	The impact on economic geology is Imperceptible.
Geological Heritage	The impact on Geological Heritage areas is Imperceptible.	The impact on Geological Heritage areas is Imperceptible.	The impact on Geological Heritage areas is Imperceptible.

NON-COMPARATIVE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Earthworks	A potential new pedestrian and cycle bridge over the River Shannon will have a moderate / slight impact on earthworks. The earthworks at the proposed location may comprise of soft soil and made ground.	The impact on earthworks is expected to be imperceptible.	The impact on earthworks is expected to be imperceptible.
Scoring			
Qualitative assessment	Slight impact on identified contaminated sites and on earthworks. Minor or Slightly Negative	Minimal impact on 1 identified contaminated site. Not Significant or Neutral	No impact on Soils and Geology. Not Significant or Neutral
Score / Impact level	3	4	4

6.5.12.4 Summary

Each of the Alternatives have been assessed against the Soils and Geology criteria. Alternative A is considered as having a Minor or Slightly Negative impact due to the intersection of potential new pedestrian/cycle links with identified historic quarry or pit sites and potential made ground areas and also due to the earthworks associated with the proposed new pedestrian and cycle bridge. The impact of Alternatives B and C on Soils and Geology is considered Not Significant or Neutral.

6.6 Stage 1 Economic Assessment of Alternatives

6.6.1 Introduction

As part of the Stage 1 Assessment of Alternatives an economic assessment of each of these alternatives was completed. Alternatives to be assessed are described in detail in Section 6.1.2 and include the following:

- Alternative A: Active Travel - comprises improvements to cycling and walking facilities
- Alternative B: Public Transport - includes improvements to public transport
- Alternative C: Demand Management - comprises reducing demand for car trips through Carrick-on-Shannon/Cortober

Section 6.6.2 outlines the methodology utilised to carry out the cost assessment, Sections 6.6.3 details the cost and a summary is presented in Section 6.6.4.

6.6.2 Methodology

The methodology adopted in preparing the Stage 1 cost estimates comprises a high level costing of the civil works elements associated with each of the proposed measures contained within each alternative. These costs were then categorised using the cost ranges set out in Chapter 5 of the National Development Plan but with an additional three ranges included to account for lower ranges. These categories are set out in Table 6.6.1 below.

Table 6.6.1 Cost Range Categories

Category	Cost Range	PAG Score
i	€0 - €1M	7
ii	€1M - €10M	7
iii	€10M+	6
A	€20M - €50M	5
B	€50M - €100M	4
C	€100M - €250M	3
D	€250M - €500M	2
E	€500M - €1BN	1
F	€1BN+	1

For Alternative B Public Transport, it is not possible to quantify the operational cost for bus and rail services in isolation. Therefore, for the purposes of the Stage 1 assessment, only the new physical infrastructure elements were considered (e.g. car park improvements, bus stops and Intelligent Traffic Systems (ITS)).

Similarly, for Alternative C, there is little infrastructure associated with implementing demand management measures as this alternative relies primarily on policy change. Therefore, costs associated with Alternative C are minimal in contrast to the other measures. The ultimate target of alternative is to secure public support which will in turn support the making of more sustainable trips. At Stage 2, specific demand management measures which can be delivered as part of the project without relying on policy change will be included in the project and the costs.

Due to the nature of the works associated with the alternatives and the variability in infrastructure required, it is not possible to quantify exact costs for the civil works in the absence of further investigation and studies. Therefore, a pragmatic approach has been implemented to estimate cost quoting ranges which is more appropriate for the purposes of the assessment at Stage 1.

6.6.3 Assessment of Alternatives

Table 6.6.2 Cost Estimate Range – Summary Assessment Matrix of Alternatives

NON-COMPARATIVE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Cost Range Category (€ M)	(iii)	(ii)	(i)
Scoring			
Qualitative Assessment	Moderately Positive	Major or Highly Positive However, the operational costs of Public Transport are not considered	Major or Highly Positive
PAG Score / Impact Level	6	7	7

6.6.4 Summary

From a new infrastructure and civil construction cost perspective, Alternative C is the most cost-effective alternative. However, there is a great deal of change required in policy and public opinion to implement this. Alternative A is the least cost effective, requiring the highest investment in construction. Alternative B lies in between both options, but it must be noted that the operational costs associated with bus and rail have not been assessed at this stage.

6.7 Alternatives Framework Matrix

A summary of the Engineering, Environment and Economic assessments outlined in the preceding sections are presented below in Table 6.7.1 to Table 6.7.2 with the overall ranking from each of these tables included in Framework Matrix Presented in Table 6.7.3. Alternatives are assessed separately in their own right as stand-alone entities and alternatives are not assessed against each other. Equally the alternatives are not compared against the options as these will be complementary to the options and may form part of the overall package that represents the optimum transport solution.

Table 6.7.1 Stage 1 Engineering Summary Assessment Matrix of Alternatives

STAND ALONE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Geometry	N/A	N/A	N/A
Traffic Impacts	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Positive
Constructability	Minor or Slightly Negative	Not Significant or Neutral	Minor or Slightly Negative
Scoring			
Qualitative assessment	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Positive
Score / Impact Level	4	4	5

Table 6.7.2 Stage 1 Environmental Summary Assessment Matrix of Alternatives

STAND ALONE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Population	Major or Highly Positive	Minor or Slightly Positive	Moderately Positive
Human Health	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Material Assets Non-Agriculture	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Material Assets Agriculture	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Air Quality	Minor or Slightly Positive	Minor or Slightly Positive	Minor or Slightly Positive
Climate	Minor or Slightly Positive	Minor or Slightly Positive	Minor or Slightly Positive
Noise and Vibration	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Archaeology, Architecture and Cultural Heritage	Moderately Negative	Not Significant or Neutral	Moderately Positive
Landscape and Visual	Minor or Slightly Negative	Not Significant or Neutral	Not Significant or Neutral
Biodiversity	Moderately Negative	Not Significant or Neutral	Not Significant or Neutral
Hydrology	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Hydrogeology	Not Significant or Neutral	Not Significant or Neutral	Not Significant or Neutral
Soils and Geology	Minor or Slightly Negative	Not Significant or Neutral	Not Significant or Neutral
Scoring			
Qualitative assessment	Not Significant or Neutral	Minor or Slightly Positive	Moderately Positive
Score / Impact level	4	5	6

Table 6.7.3 Economic Summary Assessment Matrix of Alternatives

NON-COMPARATIVE ASSESSMENT			
Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Cost Range Category (€ M)	(iii)	(ii)	(i)
Scoring			
Qualitative Assessment	Moderately Positive	Major or Highly Positive However, the operational costs of Public Transport are not considered	Major or Highly Positive
PAG Score / Impact Level	6	7	7

Table 6.7.4 Framework Matrix of Alternatives

Assessment Criteria	ALTERNATIVE A ACTIVE TRAVEL	ALTERNATIVE B PUBLIC TRANSPORT IMPROVEMENTS	ALTERNATIVE C DEMAND MANAGEMENT
Engineering	Not Significant or Neutral	Not Significant or Neutral	Minor or Slightly Positive
Environment	Not Significant or Neutral	Minor or Slightly Positive	Moderately Positive
Economy	Moderately Positive	Major or Highly Positive However, the operational costs of Public Transport are not considered	Major or Highly Positive
Progress to Stage 2?	YES with the exception of the new pedestrian / cycle bridge over the River Shannon	YES with the exception of significant rail service improvements	YES

6.8 Recommendation

Following the Stage 1 Alternatives assessment it is recommended that all the Alternatives are progressed to the Stage 2 assessment for a more detailed analysis in the Option Selection Process with the following exceptions:

- **Alternative A:** The traffic modelling (see Section 6.4 Engineering) indicates that there is a minor reduction of up to 0.8% in traffic volumes crossing the River Shannon Bridge which is attributed to modal shift from private car to the more sustainable modes of walking and or cycling. This is insignificant or neutral. However, the pedestrian/cycle bridge element of Alternative A proposal has potential negative environmental impacts attributed to it as detailed in Sections 6.5.1 to 6.5.12. Thus, the additional pedestrian/cycle bridge over the River Shannon element of Alternative A is not advanced as it does not deliver sufficiently on the Project Objectives in terms of providing congestion relief or minimising environmental impacts
- **Alternative B:** improvements to rail services element of Alternative 2 public transport do not deliver sufficiently on the Project Objectives. This is demonstrated in detail in Appendix A.6.3.1 Enhanced Rail Service Model Test. The modelling analysis showed that the introduction of an enhanced rail service along the Sligo to Dublin railway line is forecast to result in no meaningful impacts on traffic levels. Therefore, further consideration of rail services improvements will not be taken forward to the Stage 2 Alternatives