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6 Traffic Assessment and Route Cross-Section

6.1 Introduction

This chapter presents the potential traffic and transport impacts that may arise from the proposed N6 Galway City Ring Road (N6 GCRR), hereafter referred to as the proposed road development.

The strategic and local traffic and transport impacts associated with the proposed road development are discussed, assessed and evaluated in this chapter which is set out as follows:

- Transportation Assessment Methodology (**Section 6.2**)
- Receiving Environment (**Section 6.3**)
- Future Environment / Proposed Road Development (**Section 6.4**)
- Assessment of proposed road development using Traffic Model (**Section 6.5**)
- Traffic Impact Assessment (**Section 6.6**)
- Mitigation Measures (**Section 6.7**)
- Residual Impacts (**Section 6.8**)
- Summary (**Section 6.9**)
- References (**Section 6.9**)

6.1.1 Guidelines Utilised

This traffic and transport assessment has been prepared with reference to the following documents:

- Project Appraisal Guidelines for National Roads – Transport Infrastructure Ireland (2016)
- EPA: Revised Guidelines on the Information to be contained in Environmental Impact Statements, (2002 and Draft, September 2015)
- EPA: Advice Notes for Preparing Environmental Impact Statements, (2003 and Draft, September 2015)
- Guidelines on the information to be contained in Environmental Impact Assessment Reports – Environmental Protection Agency (Draft 2017) (referred to as EPA guidelines in this chapter)
- Spatial Planning and National Roads – Guidelines for Planning Authorities - DECLG (2012)
- Traffic and Transport Assessment Guidelines – NRA (2007)

- Traffic Management Guidelines – DEHLG, Department of Transport (DOT), Dublin Transportation Office (DTO) (2003)

6.1.2 Key Assessment Terminology

Presented below are some of the key terms that are used throughout this chapter to describe the traffic situation and potential impacts associated with the proposed road development.

- **Heavy Goods Vehicles (HGVs)** are classified as Articulated / Rigid Trucks and Buses with 2 or 3 more axles and vehicles pulling
- **Light Vehicles (LVs)** are classified as Cars, 4 Wheel Drive, Utility and Light Vans
- **Passenger Car Unit (PCU)** is a unit of traffic volume, with 1 LV = 1 PCU and 1 HGV = Approximately 2 PCUs
- **Annual Average Daily Traffic (AADT)** is an estimate of the average daily traffic volume at a location over the course of a year. Calculation of AADT involves dividing the total traffic volume in the year by the number of days in the year. The AADT is a measure of the total traffic over a road and thus is useful for indicating the cumulative impact of traffic on a road pavement. The AADT thus informs road pavement design and maintenance
- **Peak Hour** is the time of the day that travel demand is at its highest, e.g. where there is a lot of commuter traffic, typically 8am to 9am in the morning when commuters are travelling to work and school with a corresponding peak in the evening, usually from 5pm to 6pm. The PM peak is usually less pronounced than the AM Peak period because commuters return home over a wider spread of time in the evening on the return leg of the commute and school related travel typically occurs outside the evening peak
- **Ratio of Flow to Capacity (RFC)** also referred to as **Volume over Capacity (V/C)** is a means to describe the capacity of each approach road to a junction. An RFC below 0.85 (or 0.90 for a signalised junction) implies an approach road is operating satisfactorily within capacity; between 0.85 (or 0.90 for signalised junctions) and 1.0 RFC implies the approach road is operating within capacity but at less than optimal efficiency; above 1.0 RFC the approach road is deemed to be above capacity, therefore, when a road is at capacity a slight increase in traffic volumes can have a disproportionate impact on the length of queuing and delays
- **Transport Infrastructure Ireland (TII) Project Appraisal Guidelines (PAG)** are a set of "how to" appraisal guidelines to ensure consistency of approach across TII projects and compliance with Department of Transport, Tourism and Sport (DTTAS) requirements. The PAG suite of documents include detailed guidance on Transport Modelling, Economic Appraisal and Multi-Criteria Analysis

- **Model Periods** for which transport demand is extracted are as follows:
  - AM peak (07:00 - 10:00)
  - Inter peak 1 (IP1) (10:00 - 13:00)
  - Inter peak 2 (IP2) (13:00 - 16:00)
  - PM peak (16:00 - 19:00)
  - Off peak (19:00 - 07:00)

6.2 Transportation Assessment Methodology

6.2.1 Introduction

The methodology for the traffic and transportation assessment can be summarised as follows:

- Undertake a **baseline review** in relation to the existing traffic situation, including consultation with Galway City and County Councils, Transport Infrastructure Ireland (TII), National Transport Authority (NTA), etc.
- Undertake **traffic modelling** to assess future year scenarios, with the proposed road development ('Do-Something' [1]) and without the proposed road development ('Do-Minimum'[2]) in place
- **Evaluate the traffic modelling results** which forecast the impact of existing and future traffic on the road network
- **Identify any traffic impacts**, develop and test proposed **mitigation measures** to remove and/or reduce any identified negative traffic impacts of major significance
- **Determine any residual impacts** arising from the forecast traffic combined with the proposed mitigation measures

6.2.2 Baseline Review

As a first step, a Baseline Review was produced to determine the existing traffic conditions in Galway City and surrounding areas.

The baseline review, contained within chapters 1 and 2 of the Traffic Modelling Report (included in **Appendix A.6.1**) and summarised in **Section 6.3** and **6.6**, includes a review of the existing road network and the operating transport conditions for vehicular traffic, walking and cycling infrastructure and public transport services. A number of site visits were carried out and traffic surveys were commissioned to determine the existing traffic levels and conditions. The Baseline Review also included a review of demographic information and latest Census data to understand existing levels of travel demand and traffic patterns on the

[1] 'Do-Something' relates to a situation where the proposed road development is approved and proceeds as expected.

2 'Do-Minimum' relates to a situation where the proposed road development does not proceed.

surrounding road infrastructure. Policy documents relating to the area and other relevant background documentation were also reviewed.

As part of the Baseline Review, extensive consultations were held with many key stakeholders including liaising with TII, Galway County Council and Galway City Council to discuss any planned infrastructure and land use changes in the area. Meetings were also held with the NTA to agree the detailed methodologies for traffic modelling since this authority is now responsible for the development and maintenance of the new regional transport model for the West Regional Model (WRM), centred on Galway, which was used as part of this traffic assessment.

6.2.3 Traffic Modelling

6.2.3.1 Traffic Model Development

West Regional Model

The West Regional Model (WRM) is a strategic transport multi-modal model for the counties Galway, Mayo, Roscommon, Sligo, Leitrim and Donegal, with a focus on the city of Galway. It is part of a hierarchical multi-modal transport modelling system for Ireland (known as the 'Regional Modelling System' RMS) that allows the appraisal of a wide range of potential future transport and land use options. The regional models are focussed on the travel-to-work areas of major population centres (e.g. Dublin, Cork, Galway, Limerick, and Waterford).

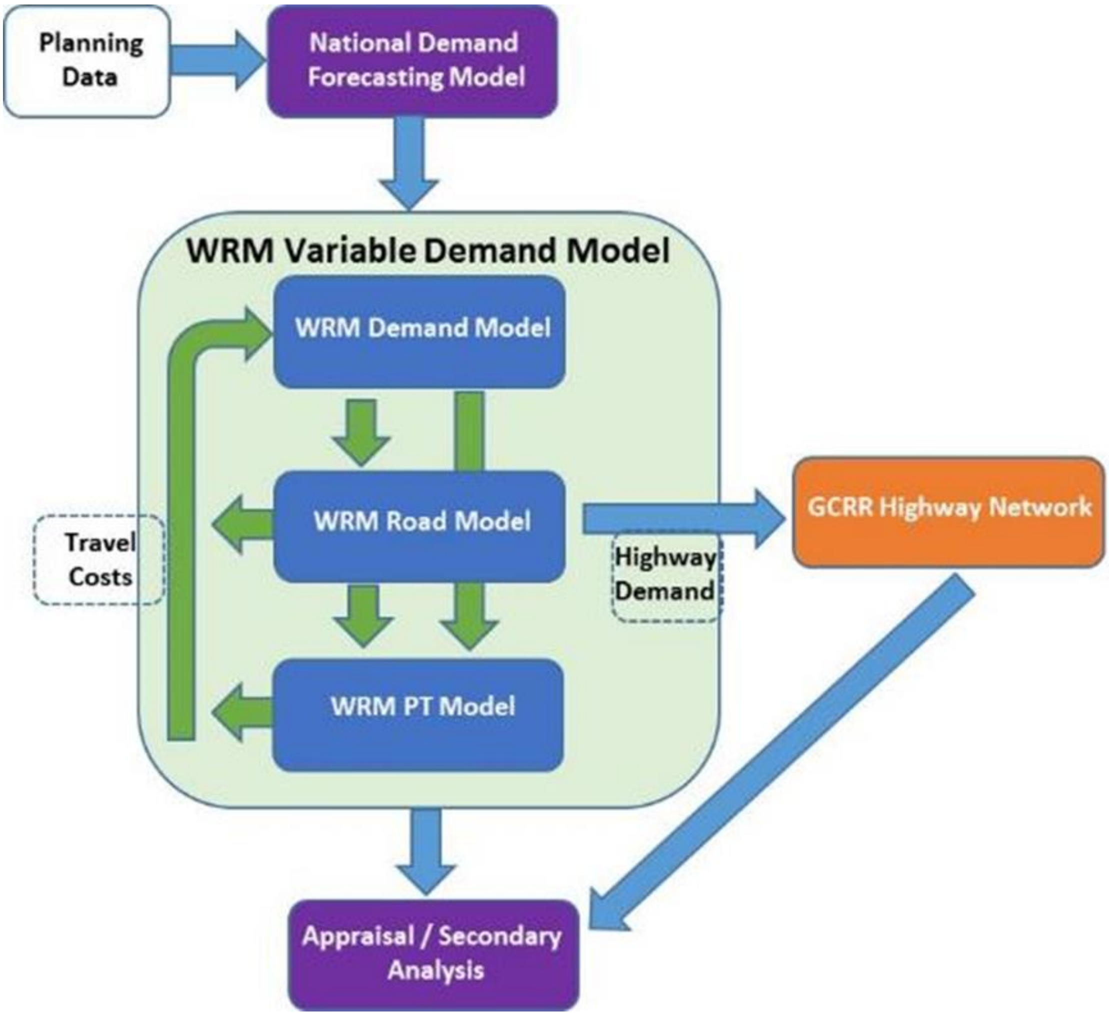
N6 Galway City Ring Road Model

In order to progress the modelling for the design stage (Phase 3 of TII PAG) of the proposed road development it was necessary to improve aspects of the WRM so that the proposed road development model met the required TII PAG model criteria.

To achieve this, the WRM highway models for each time-period (AM, IP1, IP2 and PM) were refined in the area of influence of the proposed road development to provide the base models for the proposed road development assessment (further details of this process are contained within the Traffic Modelling Report, contained in **Appendix A.6.1**).

The completion of the refinement process, resulted in AM, IP1, IP2 and PM highway models of the area of influence of the proposed road development which meet the TII PAG criteria for model development. These highway models are referred to as the **N6 Galway City Ring Road (GCRR) Model**. The demand for these models is derived from the WRM Demand Model and has been used to test the various scenarios required for the proposed road development. The model structure is illustrated in **Plate 6.1** below.

Plate 6.1: N6 GCRR Model Structure



The objective in developing the N6 GCRR Model was to develop a traffic model that accurately reflects existing traffic conditions in the study area at a sufficient level of detail to allow for an accurate traffic assessment. The model software used for the highway assignment element of the model is the SATURN (Simulation Assignment of Traffic to Urban Road Networks) suite of transportation modelling programs. Two peak hour, and two inter-peak hour, models were developed for the purposes of this study to represent the following time periods:

- AM Morning peak period (07:00 – 10:00)
- Average Morning Inter-peak period (10:00 – 13:00)
- Average Afternoon Inter-peak period (13:00 – 16:00)
- PM Evening peak period (16:00 – 19:00)

6.2.3.2 Future Year Model Development

In order to assess the traffic impacts of the proposed road development, two future year models were developed to represent the proposed road development Opening Year (2024) and Design Year (2039).

The future year 'Do-Minimum' networks include the base year network plus all schemes (road and public transport) that are already built, are committed to be built or likely to be built by 2024 and 2039. The list of schemes to be included was developed in coordination with Galway City Council, Galway County Council, TII and NTA.

The future year 'Do-Something' network includes the 'Do-Minimum' schemes plus the proposed road development.

A detailed approach to forecasting travel demand has been developed in order to capture the planned growth in population and employment at a local level in Galway. This approach required input from key stakeholders of the NTA, TII, Galway County Council and Galway City Council.

The following forecast scenarios (and associated demographic forecasts) have been used on this project in order to create future year travel demand:

- **Low Growth Scenario:** NTA Reference Case - These are based on M2F2 Traditional (Scenario 1). The traditional scenario follows the Central Statistics Office (CSO) moderate path of seeing a return towards the 1996 patterns of inter-regional migration (specifically). The population in the West increases at a moderate pace of natural growth in line with the measured outflow of migrants (net) elsewhere
- **Medium Growth Scenario:** TII National Model Medium Growth Scenario
- **High Growth Scenario:** TII National Model High Growth Scenario

In addition to the Core Future Year Scenarios tested (listed above) a further sensitivity test has also been carried out to assess the performance of the proposed road development in conjunction with all the active travel, public transport and road infrastructure proposals included in the **Galway Transport Strategy (GTS)**. As the GTS is a 20-year strategy, this sensitivity test has only been carried out in 2039, Design Year.

Model Application

The models and scenarios described above were used to determine and assess the traffic impacts of the proposed road development.

For further information on model development and application, please refer to the Traffic Modelling Report in **Appendix A.6.1** which contains a full description of the model development and traffic impact analysis process.

6.2.4 Evaluation of traffic modelling results

The traffic model is used to inform various aspects of the EIAR including but not limited to air quality and climate, noise, human beings, population and health and material assets as well as being used to determine traffic impacts associated with the proposed road development (which is the main focus of this chapter).

The AADT flows within the study area were supplied to the design team including environmental experts and used to assess the potential environmental impact of the traffic from the proposed road development. (i.e. air quality and climate, noise, etc.)

The potential traffic impact of the proposed road development is assessed using the N6 GCRR Traffic Model and considers the time periods when traffic congestion is at its most critical in the Galway City area. Key Performance Indicators (KPI) have been identified to assist in the assessment and evaluation of the proposed road development on peak period traffic. Each of the KPIs is quantifiable to allow the scenarios tested to be easily compared against one another to determine traffic related impacts.

The following KPIs have been used to determine traffic impacts:

- Journey Times on Key Routes
- Ratio of Flow (of Traffic) to Capacity ratio at Key Junctions (i.e. a measure of congestion levels)
- Network Statistics

Journey times on key routes have been considered to determine the traffic impact of the proposed road development on the strategic road network. Ratio of Flow to capacity (or degree of saturation ratios) at key junctions have been considered to take account of local traffic impacts. Finally, model network statistics give an overall, general, assessment of the performance of the entire model network (which covers Galway City and its environs) for a given scenario.

All three KPIs are used for the traffic impact assessment as one KPI may reveal a traffic impact that is not picked up by another KPI. For this reason all three KPIs are used to inform the full range of potential traffic impacts.

The impacts of the proposed road development, both at the strategic and at local levels, are rated as positive, negligible, minor, moderate or major, as appropriate and these categories are described as follows:

- **Positive:** effects improve conditions
- **Negligible:** effects that are of such low importance that they are not material to decision-making
- **Minor Significance:** effects that are of low importance in the decision-making process
- **Moderate Significance:** effects of the proposed road development that may be judged to be important at a local scale (i.e. in the planning context) only
- **Major Significance:** effects of the proposed road development which are of greater than local scale importance (i.e. strategic significance)

The likelihood (low, medium or high) and duration (short, medium or long term) of the predicted impacts is also assessed and noted. As per EPA guidelines, short-term equates to 1-7 years, medium term is between 7 and 15 years and long term is between 15 and 60 years. This method of rating impacts allows the traffic modelling scenarios to be compared in a clear, concise and measurable way.

Mitigation measures of traffic impacts of major significance identified are developed and are further evaluated if required.

The remaining residual impacts are also considered.

6.3 Receiving Environment

6.3.1 Existing Road Network

The existing road network is shown on **Plate 6.2**. The existing N6 is a four lane carriageway between Coolagh, Briarhill and the N59 Moycullen Road, with varying median width, and a number of at-grade roundabouts and signalised junctions. There are various forms of at-grade junctions including roundabouts, signals and priority junctions on the R338 from its junction with the N59 Moycullen Road to the R336 Coast Road.

The M6 motorway becomes the N6 National Road to the east of Galway City and is the primary access to Galway from the east. The existing N6 connects to the local road network at Coolagh Roundabout, an at-grade junction which experiences congestion during the morning peak hour. The existing N6 then turns north to Briarhill Junction, an at-grade signalised junction, which connects to R339 Monivea Road and onto Parkmore Road. This junction experiences capacity problems (refer to **Section 6.3.5** below) during both the morning and evening peak hour due to the volume of traffic trying to access/egress the Industrial Estates at Parkmore, Ballybrit and Briarhill.

The existing N6 continues as a dual carriageway to the at-grade signalised junction at the Ballybane Junction and onto the N83 Tuam Road[3], again a signalised junction. This particular junction experiences delays at peak hours due to the traffic volumes on the N83 Tuam Road being equivalent to the volumes on the existing N6. The dual carriageway continues to the Kirwan Roundabout, i.e. the junction of the existing N6 and the N84 Headford Road. This five arm at-grade roundabout experiences delays at peak hour due to the strongest demand controlling the flows onto the roundabout (refer to **Section 6.3.5** below). Again, the traffic volumes on the N84 Headford Road are of the same order as the traffic volumes on the existing N6 at this point.

The N6 Headford Road between the Kirwan Roundabout and the Bodkin Junction is one of the busiest roads in the city carrying approximately 32,000 vehicles per day. This short section also has two additional traffic signals to facilitate access to retail and residential areas. The existing N6 over the Quincentenary Bridge, to the west of the Bodkin Junction, carries approximately 34,600 vehicles per day (as per 2012 traffic count data). This volume decreases on the west of the river as traffic

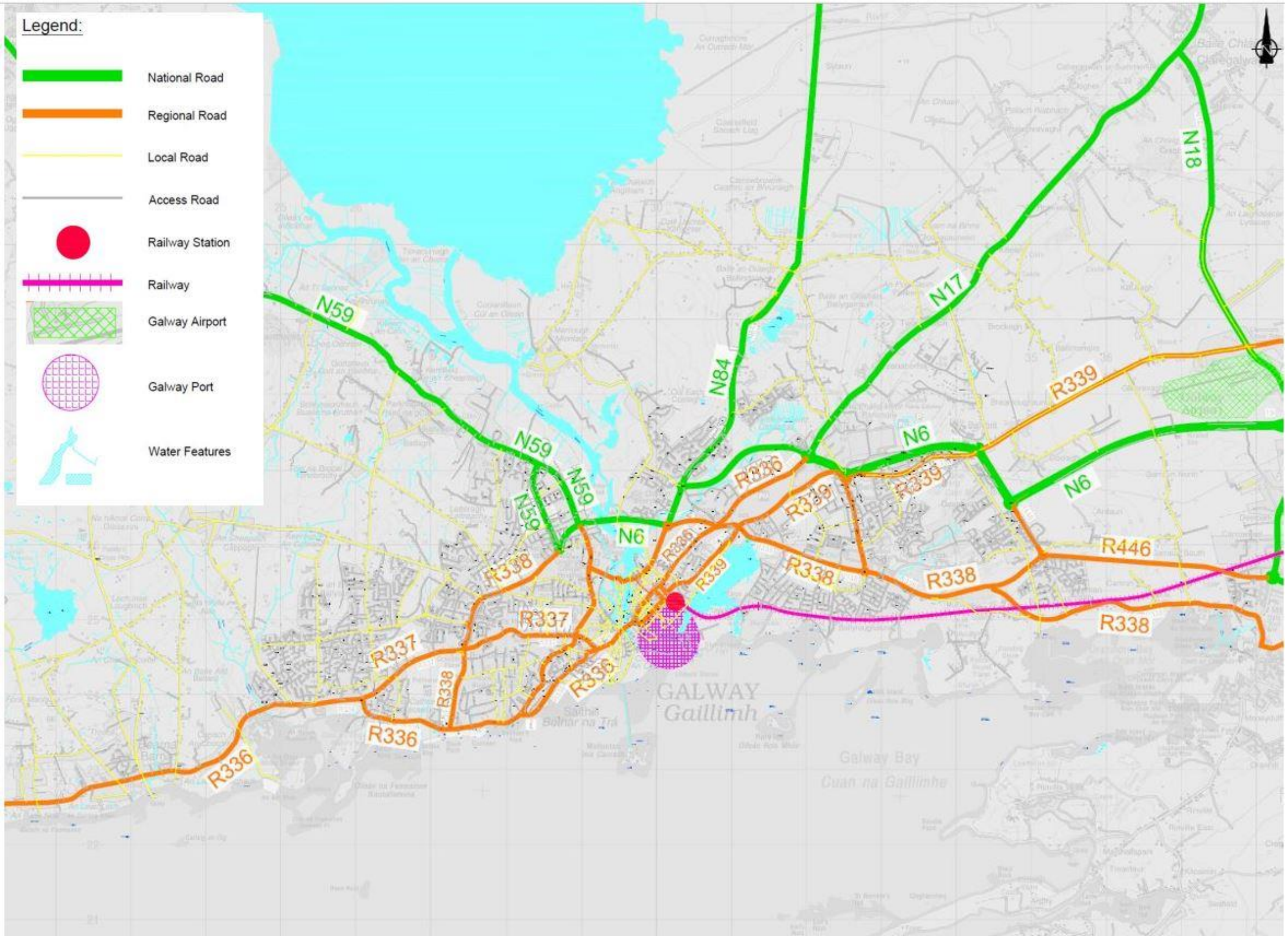
[3] Formally known as the N17 Tuam Road

accesses the university and the hospital at the existing N6/Newcastle Road and existing N6/N59 Browne Roundabout Junctions, However, the R338 Seamus Quirke Road to the west of Browne Roundabout, which is a single carriageway plus bus lanes, carries approximately 24,000 vehicles per day along a busy street with frontage, retail accesses, cyclists and high pedestrian usage.

The R338 then connects to the R336 Coast Road by continuing south along Threadneedle Road. There are two major secondary schools, and three primary schools in the vicinity of Threadneedle Road, all of which contribute to delay.

Therefore, the existing N6 weaves a route through many at-grade junctions from east to west around Galway City. The proximity of the junctions and the frequency of these junctions does not facilitate movement of vehicles in a timely manner or in a reliable manner. It also hinders and discourages modal shift as the public transport vehicles are also experiencing similar delays and such congested streets are perceived as dangerous for cyclists and pedestrians.

Plate 6.2: Existing Road Network



6.3.2 Existing Travel Patterns

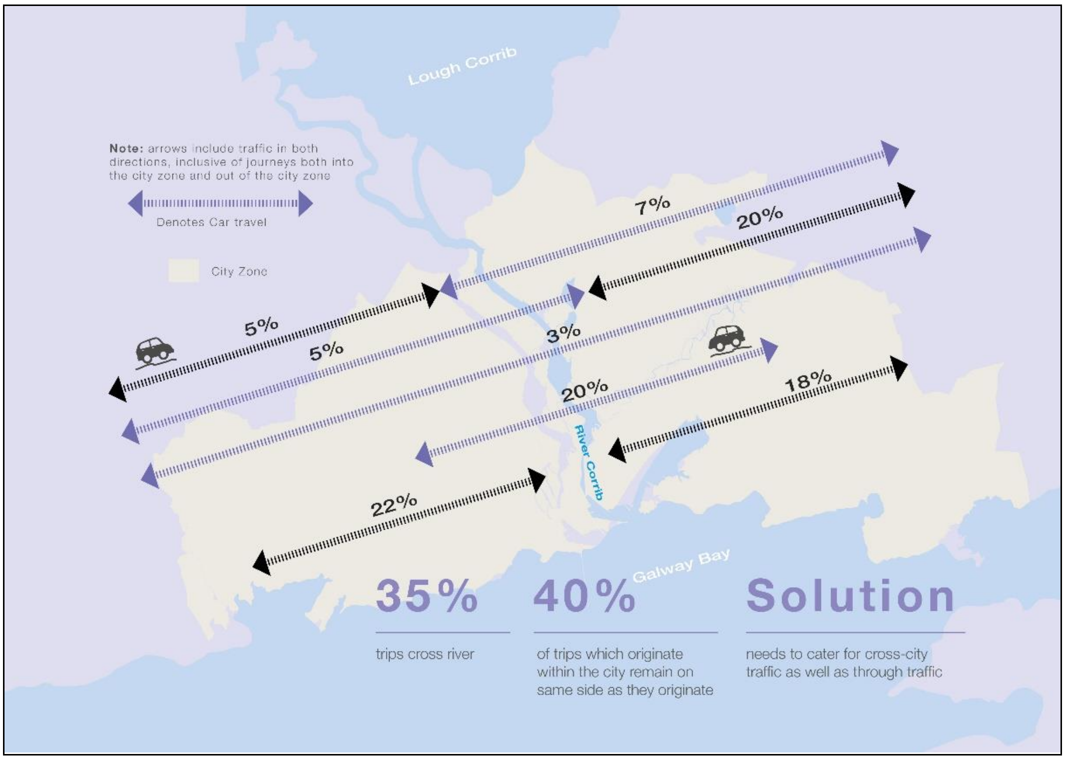
An analysis of desire lines for travel in Galway City and its environs has been undertaken using the West Regional Model to gain an understanding of travel patterns in the proposed road development study area. This has been developed using the extensive information on trip origins and destinations incorporated into the base year transport model. The model is divided up into approximately 300 zones, which have been aggregated to 16 sectors for the purposes of establishing the desire lines or demand between the sectors. The desire line analysis can be further aggregated into a broad representation of strategic travel patterns in Galway City and its environs focusing on trips that cross the River Corrib and that either travel into Galway City or travel through the city.

Plate 6.3 below is a schematic diagram to illustrate the travel patterns for private car trips to, from or through Galway City in the 2012 Base Year morning peak hour (extracted from the traffic model). Red arrows show movements that cross the River Corrib and green arrows show movements that do not cross the River Corrib.

As discussed in **Chapter 3, Need for the Proposed Road Development**, in total 35% of total car trips into and around Galway City cross the River Corrib. Of this total number of cross-river trips, approximately 3% are bypass traffic. Some 40% of all trips remain on the same side of the city as where they started i.e. that is to say the trip commences in the city and terminates in the city but does not cross the river.

One of the strongest movements is from the west side of Galway City to the east side of Galway City and vice versa which represents 20% of all trips. This analysis implies that any proposed development must cater for movements from one side of the city to the other in addition to through traffic, rather than a conventional bypass of the city which would mainly cater for through traffic. This analysis also demonstrates the importance of an integrated solution which supports modal shift for shorter commutes.

Plate 6.3: Travel Patterns 2012 Base Year Morning Peak Hour



6.3.3 Existing AADT on key links

The following Average Annual Daily Traffic (AADT) flows were estimated based on traffic counts undertaken by Galway City Council November 2012 and 2013 along the existing N6:

- N6 between Coolagh Roundabout and Monivea Road – 21,400 AADT
- N6 at Galway Racecourse – 19,900 AADT
- N6 between Tuam Road and Kirwan Roundabout – 22,400 AADT
- N6 River Corrib Crossing – 34,600 AADT

These volumes are significant volumes given the fact that these roads are also part of the street network serving Galway City.

Existing Peak Hour Flows and Level of Service

Average weekday peak hour traffic flows on the existing N6, within the Galway urban area have been derived from the November 2012 traffic surveys and are presented in **Table 6.1**.

Table 6.1: N6 Peak Hour Traffic Volumes (November 2012)

Road	Location	C'way	Direction	AM Peak (08:00 - 09:00)	PM Peak (17:00 - 18:00)
N6	Quincentenary Bridge	Single	Eastbound	1,614	1,357
			Westbound	1,466	1,520
N6	North of Bodkin Roundabout	Single	Northbound	1,315	1,132
			Southbound	1,286	1,052
N6	Terryland	Single	Eastbound	925	885
			Westbound	1,000	1,000
N6	Galway Racecourse	Dual	Eastbound	881	1,178
			Westbound	905	1,357
N6	Coolagh	Dual	Northbound	1,274	731
			Southbound	490	1,201
N6	Ardaun	Dual	Eastbound	601	1,183
			Westbound	930	603

TA 79/99 of the UK DMRB is used to determine the capacity of urban roads. This standard is not formally implemented in Ireland but is considered as background reading which indicates good practice. Within this standard, classifications such as Urban Motorways or Urban All Purpose roads are used, with further sub-classification of Urban All Purpose Roads as UAP1 to UAP4. The existing N6 in Galway can be defined as a UAP2 which refers to a "good standard single/dual carriageway road with frontage access and two side roads per km". From TA 79/99, a 2 lane UAP2 road has a capacity of approximately 1,470 vehicles per hour for a 7.3m wide 2 lane single carriageway. This capacity increases to 3,200 vehicles per hour for a 7.3m wide 2 lane dual carriageway. This does not account for capacity issues at the junctions.

When the existing volumes are compared against the theoretical capacity, the 4 lane single carriageway section of the existing N6 between the Quincentenary Bridge and Terryland are frequently at or above the capacity threshold defined in TA 79/99, which results in congestion on the route and a reduced level of service. Lower traffic volumes are carried on the dualled eastern section of the N6 Bóthar na dTreabh, however congestion is still experienced along this section, due to capacity restrictions at junctions, of which there are many as this also forms part of the street network serving Galway City.

6.3.4 Journey Time Reliability Assessment

Peak hour congestion on the road network in Galway, predominantly caused by junction capacity issues, results in increased journey times in peak periods in Galway. This leads to a reduction in journey time reliability in the city during these periods.

An analysis of observed journey times on three key routes around Galway and its environs was carried out to show the variance in journey times between the peak and off-peak periods in the base year. The three key routes are shown on **Plate 6.4**. The difference between the peak and off-peak journey times is a measure of the level of congestion during the peak, and increasing congestion results in worsening journey time reliability.

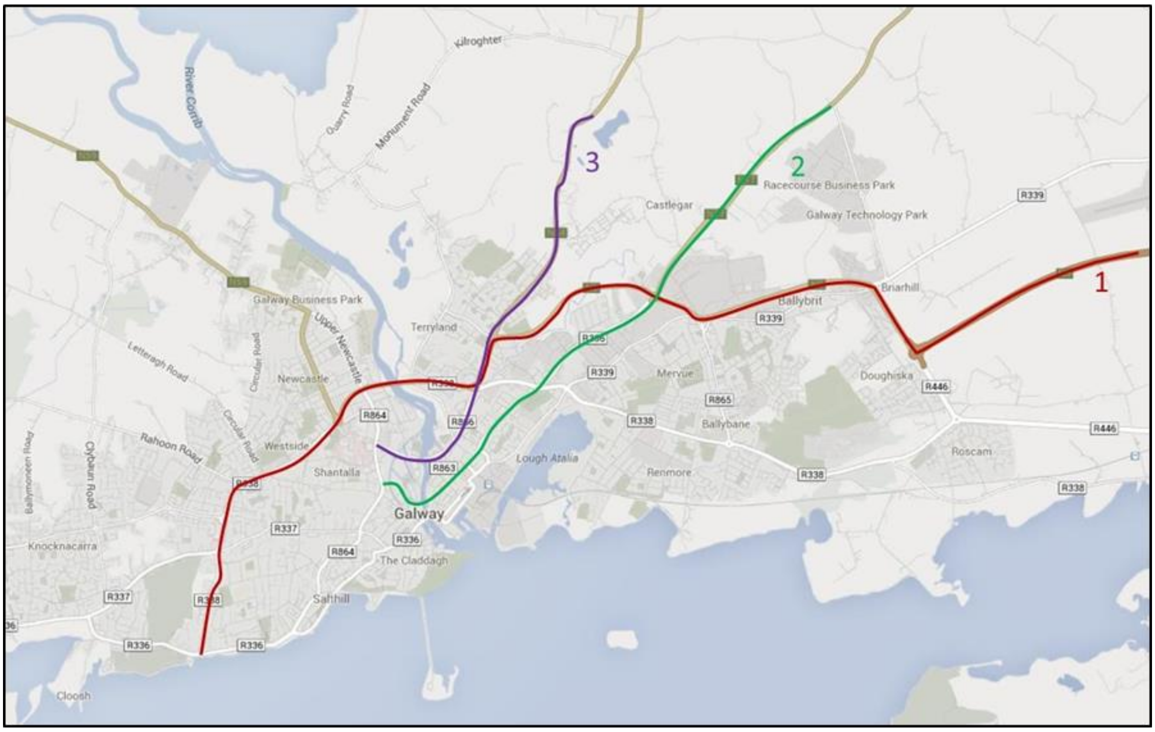
Observed travel times in 2012 Base Year on each of the routes in the inbound direction in the morning peak period versus the off-peak period are tabulated in **Table 6.2** below.

This assessment of journey time shows that the travel times on these three key routes in the morning peak hour are on average more than double the off-peak travel times.

Table 6.2: Journey Time Reliability

		2012 Observed Journey Times (minutes)			
		Off-peak average hour	Morning peak hour	Difference	% Difference
Inbound	Route 1 IN	14	28	14	100%
	Route 2 IN	14	25	11	79%
	Route 3 IN	8	19	11	138%
	Average	12	24	12	105%

Plate 6.4: Journey Time Reliability Routes



6.3.5 Junction Capacity Assessment

In the urban area, junction capacity is the key contributor to road congestion, over and above link capacity. Therefore, an assessment of the ratio of flow to capacity was undertaken at signalised junctions and roundabouts, plus other key junctions in the study area as shown on **Plate 6.5**. Data was extracted from the 2012 AM Peak Base Year traffic model to show the maximum volume-to-capacity ratio for the turns at each junction. The volume to capacity ratios are then related to level of delay and congestion at the junctions.

Plate 6.5: Volume/Capacity Ratios at Junctions (2012)

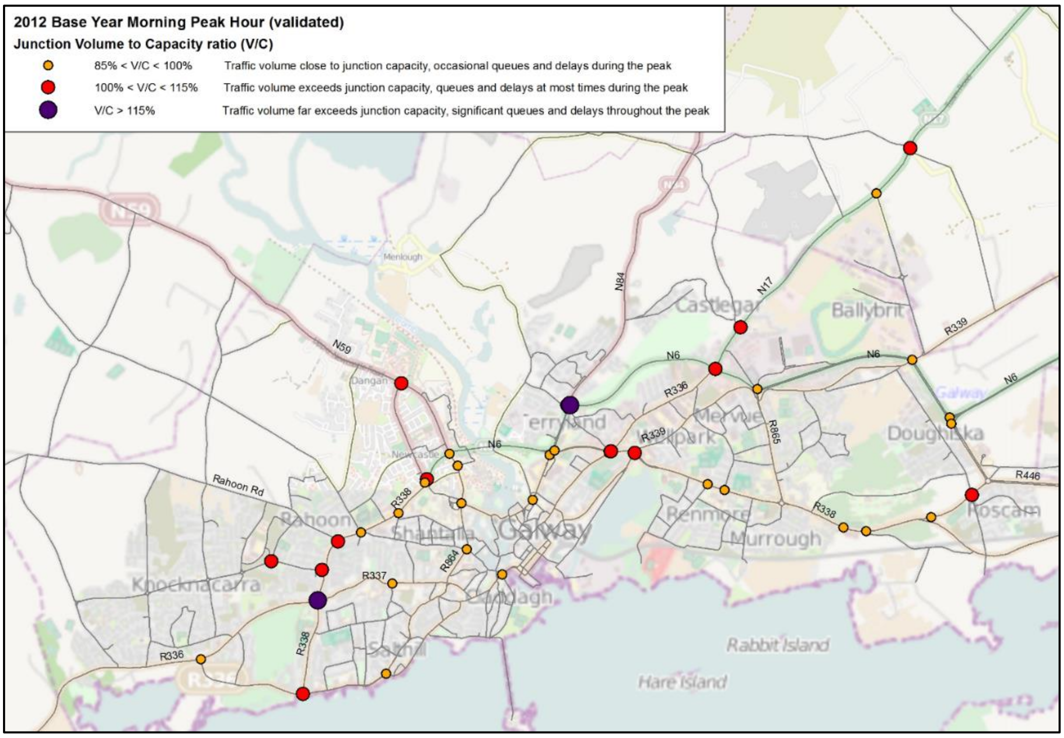


Table 6.3 summarises the number of junctions with a max turn RFC within standard ranges of 0.85-1.00, 1.00-1.15 and >1.15. Junctions with a RFC greater than 1 are over capacity. Ideally junctions should operate at a RFC ratio of < 0.85 (or 0.90 for signalised junctions), which would allow 15% spare capacity in the junction to cope with an unexpected event or natural growth.

This analysis demonstrates that the existing network is restricted by junction capacity. The junctions on the critical corridors accessing the city, namely the junctions of the N84 Headford Road, N83 Tuam Road and N59 Moycullen Road junctions with the existing N6, currently have no spare capacity at peak hour as shown on **Plate 6.5** above. These junctions are operating at greater than 100% of their capacity, which in turn leads to delays at these junctions. As these junctions are the main arteries into the city and the main junctions on the circumferential route around the city, this is a significant issue for the Gateway of Galway.

In addition, approximately 40% of all junctions on the key access routes across the study area are operating above 85% capacity during peak periods. This demonstrates that the network is finely balanced with minimal spare capacity to allow for any unforeseen event or natural growth.

Table 6.3: Junction Volume/Capacity Ratio (2012)

Sector	Sector Name	0.85 – 1.00	1.00 – 1.15	> 1.15
1	City Centre	2	0	0
2	City West	2	0	0
3	City East	3	1	0
4	R338 West	5	1	0
5	R338 East	1	2	0
6	N6	8	4	1
7	Western Distributor	0	0	0
8	R336	4	0	0
9	N59/Newcastle Road	0	1	0
10	N84	0	0	1
11	N83	2	1	0
12	R339	0	0	0
13	N6 from M6	0	0	0
Total	-	27	10	2

6.3.6 Alternative Modes

6.3.6.1 Existing Bus Network Conditions

Galway City is served by Bus Éireann and a small number of private operators. The city bus infrastructure is very much discontinuous, with priority measures only provided along sections of key corridors and not continuous over any significant portion of the network. As such the city bus network is subject to delay, impacting the attractiveness of the bus as a mode of choice.

In addition to the city bus network, a number of regional bus service providers operate to and from the city. Regional, intercity and private tourist coach services are subject to delays due to infrastructural deficiencies approaching and within the city centre, where the principal destinations are located at Ceannt Station, Fairgreen Coach Station, Eyre Square/Merchants Road and Galway Cathedral. These delays, along with multiple centralised destinations in the city centre and a lack of cohesion with the city bus routes and ticketing systems, discourage use of regional bus services for commuters from surrounding towns and villages which are served directly by regional buses.

National coach services benefit from high-quality road connectivity from the east and south, increasingly of motorway standard with the relatively recent construction of the M6 and the current development of the M17/M18, which will also improve connectivity to the north-east. Similar to the regional services, there are numerous operators providing intercity services to and from the city, with a resultant high number of arrivals and departures daily from Ceannt Station and Fairgreen Station.

These services are also subject to delays due to infrastructural deficiencies approaching and within the city centre, which discourages use of public transport between cities, and may impact on tourism in Galway City if accessibility of the city is not improved.

6.3.6.2 Existing Rail Network

Galway City is served by the existing single-track heavy commuter rail line from the east, terminating in the city centre at Ceannt Station. The rail line connects to Oranmore/Garraun and Athenry to the east. From Athenry there is a connection to the Western Rail Corridor service from Limerick and Ennis, and the main line continues east to Dublin.

There are 10 daily services scheduled from Ceannt Station to Heuston, and 9 scheduled return services from Heuston to Ceannt, with journey time being as short as 130 minutes.

There are eight scheduled daily services between Ceannt Station and Colbert Station in Limerick, and eight scheduled return services, with journey time being as short as 90 minutes.

6.3.6.3 Existing Pedestrian Network

The majority of the study area is provided with pedestrian facilities of varying quality. Within the city centre, there are pedestrian-only streets which are a key asset to the local economy, in particular the tourism/shopping thoroughfare of William Street, Shop Street and Quay Street. Other pedestrian facilities of note include the city canal network and the promenade at Salthill.

There have also been major junction improvement schemes in recent years which have considerably improved the pedestrian offering across the city and suburbs.

However, numerous locations throughout the study area remain where the quality of the pedestrian facilities is poor. At certain locations in the city centre, private and public vehicular traffic impacts on the safety and comfort of pedestrians. There are streets throughout the city with substandard or missing footpaths, limited or no crossing facilities, and permeability issues resulting from the manner in which residential areas have been developed. Some suburban residential areas are accessible by direct routes, but these are substandard and not suitable for use by mobility impaired pedestrians, while others have no footpaths provided for pedestrian access to main thoroughfares. The absence of permeability within housing areas often leads to excessively circuitous trips for pedestrians to walk a relatively short distance. All of these factors discourage walking as a mode for short trips.

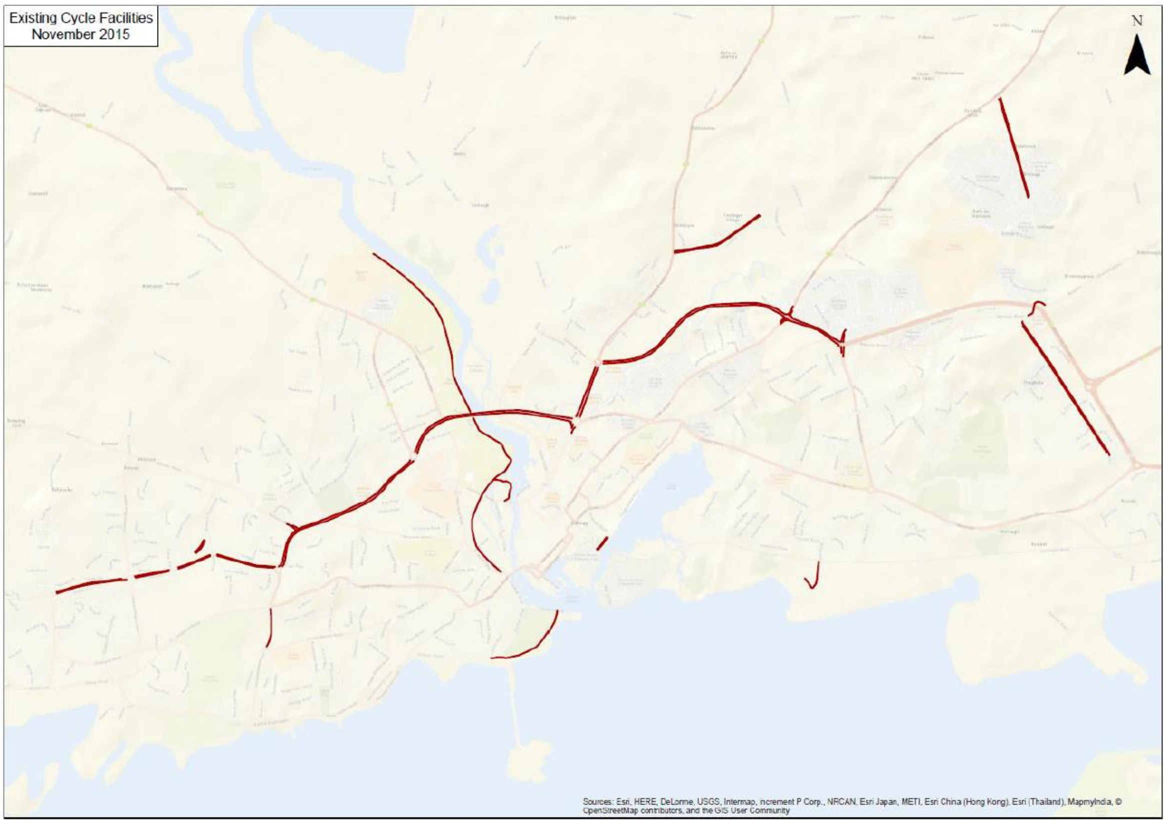
6.3.6.4 Existing Cycle Network

Although the city's generally flat topography is conducive to cycling as a suitable mode of travel, the current mode share of 5% is relatively low. Similar to the bus network, the existing network of cycle infrastructure is limited and discontinuous.

Plate 6.6 below shows the extent of the current cycle network.

The volume of vehicular traffic on the narrow city centre streets of Galway City also contributes to an environment that is neither appealing nor perceived as particularly safe for cycling. While there have been numerous improvements in recent years to the cycle network, not least the roll-out of the Bike Share Scheme, and several schemes in development aimed at enhancing the network, the cycling environment remains limited. This is particularly true in areas outside the city, where many towns and villages are within cycling distance of the city and each other, such as Bearna, Oranmore, Moycullen and Claregalway.

Plate 6.6: Extent of Existing Cycle Network Infrastructure



6.4 Future Environment / Proposed Road Development

6.4.1 Characteristics of the Proposed Road Development

The proposed road development, as described in detail in **Chapter 5, Description of the Proposed Road Development**, comprises the construction of a single carriageway from the western side of Bearna as far as the Ballymoneen Road and a dual carriageway from Ballymoneen Road to the eastern tie in with the existing N6 at Coolagh, Briarhill, and associated link roads, side roads, junctions and structures. The proposed road development also incorporates some facilities for non-motorised users which have been identified as part of the Galway Transport Strategy.

The design of the proposed road development is shown on **Figures 5.1** to **5.14** of this EIAR.

6.4.1.1 Proposed Road Type and Cross-Section

From the R336 Coast Road to Ballymoneen the mainline carriageway of the proposed road development is a Type 1 Single Carriageway in accordance with TII DMRB DN-GEO-03036 (Cross Sections and Headroom). The design speed of the mainline over this area is 85km/h, and the cross section is as outlined within **Chapter 5, Description of the Proposed Road Development**.

From Ballymoneen Road to the eastern tie in with the existing N6 at Coolagh, Briarhill, the mainline of the proposed road development is a Standard Dual Carriageway Urban Motorway (D2UM) in accordance with TII DMRB DN-GEO-03036. The design speed of the mainline over this area is 100km/h and cross section is as outlined within **Chapter 5, Description of the Proposed Road Development**.

The section of the proposed road development between the N83 Tuam Road and N84 Headford Road Junctions is a 3 lane dual carriageway. The total length of this section is approximately 1,850m.

6.4.2 Selection of Road Type

The appropriate cross section/road type of the proposed road development was determined based on a number of influencing factors which are discussed below.

6.4.2.1 TEN-T Network

As discussed in **Chapter 2, Planning and Policy Context** and **Chapter 3, Need for the Proposed Road Development**, the proposed road development forms part of the Trans European Transport Network (TEN-T) Comprehensive Network which has implications on the choice of cross-section as set out below.

The TEN-T requires that all roads that form part of the network, as a minimum, be a high quality road. Regulation (EU) No 1315/2013 sets out the requirements for high quality roads that shall form part of the network, both Core and Comprehensive, and states under Article 17(3), the following:

"High-quality roads shall be specially designed and built for motor traffic, and shall be either motorways, express roads or conventional strategic roads."

6.4.3 Incremental Assessment

An incremental assessment was undertaken to determine the carriageway cross section, design speed and the extent of the proposed road development. The objective of this assessment was to examine the alternative cross sections available, alternative design speeds and alternative scheme extents in order to determine the most suitable combination.

The incremental assessment identified the following as the most suitable combination for the proposed road development:

- Single carriageway with a design speed of 85km/h from the R336 to Ballymoneen Road
- Type 1 dual carriageway with a design speed of 100km/h from Ballymoneen Road to the N59 Junction
- Urban motorway with a design speed of 100km/h from N59 Junction to the existing N6. It has been determined that the section of the proposed road development between the N84 Headford Road and N83 Tuam Road is to be 3 lanes in each direction, the remaining sections are 2 lanes in each direction

This combination was selected as the most suitable for the following reasons:

- It provides a high level of provision for the transportation infrastructure in Galway City and environs
- The combination complies with the TEN-T regulations noted as it allows access to be restricted to junctions only
- The combination can accommodate the forecast traffic volumes for the Design Year

6.4.3.1 Junction Strategy

The objectives considered in determining the junction strategy include the following:

- Restriction of access to junctions as the proposed road development is of strategic importance and part of the TEN-T Comprehensive Network
- Connectivity to National and Regional road network
- Serve existing travel demand by all modes
- Junctions located so as to relieve traffic congestion
- Sufficient junctions to provide a minimum level of accessibility to the region to support further economic, social and territorial development
- Junction form to deliver capacity as experience has shown that the network breaks down due to junction failure due to capacity problems

- Promote a mobility that is efficient and safe

The junction strategy of the proposed road development has been designed to meet these objectives. The strategy meets the objectives for the following reasons:

- Provides a high quality road with limited access in accordance with TEN-T designation
- Provides connectivity to the national roads via junctions to maximise the transfer of cross-city movements to the new road infrastructure, thus releasing and freeing the existing city centre zone from congestion caused by traffic trying to access a city centre bridge to cross the River Corrib
- Improves connectivity to the Western Region i.e. the county areas and hinterland beyond the city zone
- Caters for the strong demand between zones on either side of the city
- Facilitates crossing the River Corrib without negotiating the city centre
- Provides this additional river crossing with connectivity back to the city either side of the River Corrib Bridge and provides essential city street links to better distribute traffic
- Attracts traffic from the city centre zone thus facilitating reallocation of road space to public transport leading to improve journey time reliability for public transport, supporting a mobility that is efficient and safer environment for active modes
- Facilitates improved city centre environment for all due to reduced congestion, thus encouraging walking and cycling as safe transport modes

6.4.4 Future Transportation Network

6.4.4.1 Future Highway Network

The future year highway networks include the 2012 base network plus all of the schemes that are already built, are committed, or are likely to be built by 2024 and 2039 (Opening and Design Years). The list of schemes to be included was developed in coordination with Galway City Council, Galway County Council, the NTA and TII.

The complete list of road schemes included in the future year networks is available in the Traffic Modelling Report (**Appendix A.6.1**). Some of the key network upgrades included are:

- Kirwan Roundabout Upgrade
- Browne Roundabout Upgrade
- M17/M18 Gort to Tuam Motorway
- Various other junction improvements and reconfigurations throughout Galway City

6.4.4.2 Future Alternative Modes

As mentioned previously, Galway County Council, Galway City Council, and the National Transport Authority (NTA) worked collaboratively in developing an integrated transport strategy to resolve the existing transportation issues in Galway City and its environs. The transportation solution developed includes a smart mobility component, public transport and active mode component and a road component and is known as the Galway Transport Strategy. The Galway Transport Strategy (GTS) aims to address the current and future transport requirements of the city and its connectivity to surrounding towns and villages, including Bearna, Oranmore, Moycullen and Claregalway.

The GTS, which has been adopted by both Galway City and County Councils, sets out a series of actions and measures, covering infrastructural, operational and policy elements to be implemented in Galway over the next 20 years and sets out a framework to deliver the projects in a phased manner. It identifies that Galway has a transport problem due to its reliance on the private car, which has been influenced by the existing public transport network, limited cycling facilities, a large rural hinterland and being the key gateway in and out of Connemara. Combined with this, it has a road and street network which is ill-suited to the high traffic flows currently prevalent and contributing to increased congestion and delay, affecting quality of life and impacting on the functionality of the city. To address this, a fundamental shift is needed towards sustainable travel, reducing the dependency on the private car and taking action to make Galway more accessible and connected, enhancing quality of life within the city for all. Galway City Council are seeking to make Galway an exemplar of Smarter Travel in Ireland. The proposed road development forms part of the GTS as the main road component of the overall transport solution for Galway City and its environs.

The GTS outlines a host of proposed measures for active travel, public transport and general traffic in Galway, to be implemented over a 20-year period. Some of the key proposals included in the Strategy are listed below:

- A Public Transport Corridor through the City Centre with Public Transport Only allowed on the Salmon Weir Bridge, Eglington Street and College Road
- Localised City Centre Traffic Management Proposals
- An outer orbital route (proposed road development) to enhance resilience of the GTS
- Rationalise Bus Route network and increase service frequencies
- Provision for Park and Ride

A full list of the proposals is contained within the GTS Report, “Galway Transport Strategy, An Integrated Transport Management Programme for Galway City and Environs, September 2016”.

6.5 Assessment of Proposed Road Development using Traffic Model

6.5.1 Travel Demand Forecasts

As mentioned previously, the future year traffic forecasts for the proposed road development were developed in accordance with TII project appraisal guidelines and use demographic forecasts from the National Traffic Model (NTM), the National Transport Authority planning unit and Galway City and County Councils.

The following forecast scenarios were agreed, with TII and Galway City and County Council, for use on this project:

- Low: NTA Reference Case - These are based on M2F2 Traditional (Scenario 1). The traditional scenario follows the Central Statistics Office (CSO) moderate path of seeing a return towards the 1996 patterns of inter-regional migration (specifically). The population in the West increases at a moderate pace of natural growth in line with the measured outflow of migrants (net) elsewhere
- Medium: TII National Model Medium Growth Scenario
- High: TII National Model High Growth Scenario

For the medium and high growth scenarios, TII population and employment forecasts were taken at an Electoral Division (ED) level (smallest available) and distributed among the Census Small Areas and model zones based on a combination of the existing distribution and NTAs forecast distributions.

In the case of the Low Growth Scenario, the NTA applied a top-down approach to distribute the population forecasts across the census small areas (CSAs) within the WRM.

An assumption was made that the overall growth in employment would be in line with the population growth. This methodology is consistent with the approach adopted in the demographic forecasts for the TII National Transport Model.

6.5.2 Assessment Years

In addition to the Base Year (2012), two assessment years were modelled, these were 2024 and 2039. 2024 was chosen as the proposed Opening Year of the proposed road development. As per TII Traffic and Transport Guidelines, the proposed road development must also be assessed for a future year of 15 years after the first year of operation, and therefore 2039 is chosen on this basis.

For each of the modelled years, the road network and travel demand included in the traffic model reflects the projected infrastructure and population growth scheduled to be in place at that particular stage.

Two business as usual scenarios (i.e. 'no road development') entitled Do Minimum 2024 and Do Minimum 2039 are used to represent the base situation against which other scenarios are compared. This comparison demonstrates the impact of the proposed road development, when compared to a scenario without the proposed development in place. The two 'development' scenarios are entitled Do Something 2024 and Do Something 2039.

6.5.3 Scenarios Tested

6.5.3.1 Modelled Scenarios

Core Tests

As previously described, the future year 'Do-Minimum' network includes the 2012 base network plus all of the schemes (road and public transport) that are already built, or are committed, or likely to be built by 2024 and 2039.

The future year 'Do-Something' networks include the Do-Minimum schemes plus the proposed road development. In addition to the validated 2012 Base Year network, the following future year networks have been developed and tested using the Medium Growth Travel Demand Forecasts:

- 2024 Opening Year Do-Minimum
- 2024 Opening Year Do-Something
- 2039 Design Year Do-Minimum
- 2039 Design Year Do-Something

Galway Transport Strategy

In addition to the Core Scenarios tested (listed above) a further test has also been carried out to assess the performance of the proposed road development in conjunction with all of the active travel, public transport and road infrastructure proposals included in the Galway Transport Strategy. As the GTS is a 20-year strategy, this sensitivity test has only been carried out in 2039, Design Year.

6.5.3.2 Low and High Growth Sensitivity Tests

Each of the scenarios listed above have been assessed further utilising the Low and High growth travel demand forecasts which have been described in **Section 6.5.1**.

6.6 Traffic Impact Assessment

6.6.1 Identification and Scale of impacts

The impact assessment process introduced in **Section 6.2.3** is used to identify and measure potential traffic impacts generated by the proposed road development. 'Do Minimum' scenarios, i.e. without the proposed road development, are compared to 'Do Something' scenarios, i.e. with the proposed road development in place. Construction impacts associated with constructing the proposed road development etc. will also be assessed.

The 'Do Minimum' and 'Do Something' scenarios are compared for the same year, i.e. 2024 or 2039, and therefore, other than the proposed road development, the same infrastructure is assumed for the scenarios which are being compared.

To recap, and as discussed previously in **Section 6.2.3**, three Key Performance Indicators (KPI) have been identified which will assist in the assessment and evaluation process which will determine the traffic impact of the proposed road development on these roads during peak hours. The three KPIs are:

- **Journey times** on key routes – to understand strategic impacts
- **Network Statistics** – Network wide indicators of congestion and delay
- **Ratio of Flow to Capacity (RFC)** at Key Junctions – to understand local impacts, congestion and queues

Using these KPIs, the traffic impacts of the proposed road development is assessed at both a strategic and local level.

6.6.1.1 Journey Times

To develop an understanding of the potential impact of the proposed road development on key routes serving Galway City and its environs, the projected change in vehicular journey times were assessed. Journey times represent a good basis for strategic traffic impact assessment as they provide a mechanism to quantify the traffic impact along a full route. This KPI is based on a comparison between the 'Do-Minimum' journey times (i.e. without the proposed road development) and the 'Do-Something' journey times (i.e. with the proposed road development). Both the percentage change and absolute change in journey times (seconds) is considered in order to determine the impact, as shown in **Table 6.4** below.

The journey time routes used for the assessment of impact are shown in **Plate 6.7**. This KPI, therefore, assesses the strategic traffic impact of the proposed road development.

The impact scale used for journey times has been developed using the 2011 Census travel statistics for Galway and locally based traffic survey information. These CSO Census 2011 statistics state that the majority of journeys to work (62%) in Galway County took under 30 minutes and only 15% of workers faced a commuting time in excess of 45 minutes.

Table 6.4: Representation of Negative Impact on Vehicle Journey Times

		Absolute Difference (seconds)			
		<60	60-120	120-240	>240
% Change	<5%	Negligible	Negligible	Minor	Moderate
	5-10%	Negligible	Minor	Moderate	Moderate
	10-20%	Minor	Minor	Moderate	Major
	>20%	Minor	Moderate	Major	Major

A Green Box would indicate a positive impact between the Do-Minimum and Do-Something Scenario

Plate 6.7: Journey Time Routes

Table 6.4 is interpreted as follows - the impact is considered “Major” if the change in journey time, when comparing the ‘Do-Minimum’ and ‘Do-Something’ scenarios, is greater than 240 seconds and the percentage change is greater than 10% or the time increase is between 120 – 240 seconds and percentage change is greater than 20%.

In situations where the journey times decrease, i.e. the change in journeys time when comparing the ‘Do-Minimum’ to the ‘Do-Something’ scenarios is negative, this impact is described as ‘Positive’.

Journey times on key routes have been considered in order to determine the traffic impacts on the strategic road network.

The results from this analysis are presented in **Section 6.6.3**.

6.6.1.2 Network Statistics

To further quantify the impact of the proposed road development on the strategic road network the model network statistics are assessed. These statistics provide information on the following parameters (averaged across the entire city network):

- Average Speed – Measured in kilometres per hour (kph)
- Average Delay – Measured in total delay for all vehicles
- Total Network Travel Time – Measures in total travel time for all vehicles
- Total Vehicle Distance Travelled – Measured in total kilometres for all vehicles

This KPI therefore presents an indication of the overall performance of the model network for a given scenario.

As there are several related parameters to consider for this criterion, and in order to avoid confusion, this KPI is measured in absolute terms. i.e. there is either a positive or negative impact on overall network statistics.

This analysis is presented at **Section 6.6.3**.

6.6.1.3 Ratio of Flow to Capacity at Key Junctions

To further understand the potential impact on junction operations of the proposed road development, the Ratio (of traffic flow) over capacity (RFC) at key junctions along the existing N6 corridor have been analysed and compared across scenarios.

RFC is a standard reference for measuring traffic congestion at a junction. It is standard practice to consider that a junction is congested when traffic flows are at 85% of the estimated capacity of a priority junction, or 90% of a signalised junction. At traffic flows above 90% of capacity the delays at a junction become erratic and are difficult to control. A value of 100% means that demand and capacity are equal and no further traffic can progress through the junction without experiencing delays.

A Ratio of Flow to Capacity analysis has been undertaken using information from the proposed road development Highway Network models for each modelling scenario. This analysis considered all approaches to key junctions along the N6/R338 corridor, illustrated in **Plate 6.8** below.

The models were also used to produce an overall summary of the number of links, in the entire network, operating at 90% capacity or above in each scenario.

Plate 6.8: N6/R338 Key Junctions

The scale of the impact is based on the threshold values described above and it is the change in these values arising from the impact of the proposed road development (Do Something) which indicates the extent of localised impact at the junctions assessed. – **Table 6.5**, below, refers to roundabouts and other priority junctions and **Table 6.6** refers to signalised junctions and summarises how the change in the value of these parameters indicates the performance impact.

Table 6.5: Impact on RFC at Key Junctions (Roundabout)

RFC	**Do Something**			
Do Minimum	<75%	75-85%	85-90%	>90%
<75%	Negligible	Moderate	Major	Major
75-85%	Positive	Minor	Moderate	Major
85-90%	Positive	Positive	Minor	Major
>90%	Positive	Positive	Positive	Minor

It is assumed that if a roundabout is currently operating well within capacity (e.g. <75%) and the additional traffic associated with the proposed road development causes the junction to be congested (i.e. over 85%) there is a traffic impact of major significance. Conversely if the junction currently has congestion issues (e.g. 85-90%) and the traffic from the proposed road development causes an increase in congestion, but within the same parameter value band (i.e. 85-90%) the impact of the proposed road development is considered to be of minor significance.

Table 6.6: Impact on RFC at Key Junctions (Signalised)

RFC	Do Something			
Do Minimum	<80%	80-90%	90-95%	>95%
<80%	Negligible	Moderate	Major	Major
80-90%	Positive	Minor	Moderate	Major
90-95%	Positive	Positive	Minor	Major
>95%	Positive	Positive	Positive	Minor

It is assumed that if a signalised junction is currently operating well within capacity (e.g. <80%) and the additional traffic associated with the proposed road development causes the junction to be congested (i.e. over 90%) the traffic impact is of major significance. However, if the junction currently has congestion issues (e.g. 90-95%) and the traffic from the proposed road development causes an increase in congestion, but within the same parameter value band (i.e. 90-95%) the impact on junction performance is considered to be minor significance, i.e. little change – still congested.

6.6.2 Rating Impacts

The impact of the proposed road development under each scenario is rated using the assessment KPI framework detailed above as follows:

- **Step 1:** The relative changes between the 'Do-Minimum' and 'Do-Something' scenarios are categorised as positive, negligible, minor, moderate or major (as above)
- **Step 2:** The likelihood of the negative impacts occurring are rated as either low, medium or high
- **Step 3:** The duration of negative impacts is rated as short, medium or long term. As per EPA guidelines, short-term equates to 1-7 years, medium term is between 7 and 15 years and long term is between 15 and 60 years

This method of rating impacts allows the 'Do-Minimum' and 'Do-Something' scenarios to be compared in a clear, concise and measurable way.

6.6.3 Significance of Impact Assessment

The results of the strategic and local traffic impacts for each scenario are described under each KPI below. In summary, the scenarios compared are:

- 2024 Opening Year Do-Minimum
- 2024 Opening Year Do-Something
- 2039 Design Year Do-Minimum
- 2039 Design Year Do-Something
- 2039 Design Year – Do GTS

The results presented in this section refer to the Medium Growth Forecasts only. The evaluation of Low and High growth sensitivity tests are summarised within **Section 6.7**.

6.6.3.1 Journey Time Analysis

Core Scenarios

The tables below detail the results of the journey time comparison as extracted from the 2024 and 2039 traffic models for the Core Scenarios. **Plate 6.7**, above illustrates each of the journey time routes which have been analysed.

Table 6.7: 2024 AM Peak Journey Time Results

Route Description	2024 DM Seconds	2024 DM Minutes	2024 DS Seconds	2024 DS Minutes	Diff (Seconds)	% Difference
Route 1 – Inbound	1050	17.5	778	13.0	-272	-25.9%
Route 1 – Outbound	684	11.4	680	11.3	-4	-0.6%
Route 2 – Inbound	1334	22.2	1183	19.7	-151	-11.3%
Route 2 – Outbound	1196	19.9	1222	20.4	26	0%
Route 3 – Inbound	433	7.2	305	5.1	-128	-29.6%
Route 3 – Outbound	259	4.3	266	4.4	7	2.7%
Route 4a – Inbound	725	12.1	669	11.2	-56	-7.7%
Route 4a – Outbound	804	13.4	678	11.3	-126	-15.7%
Route 4B – Inbound	1070	17.8	684	11.4	-386	-36.1%
Route 4B – Outbound	1065	17.8	704	11.7	-361	-33.9%
Route 5 – Inbound	1118	18.6	967	16.1	-151	-13.5%
Route 5 – Outbound	1159	19.3	1008	16.8	-151	-13.0%
Route 6 – Inbound	1077	18.0	1177	19.6	100	9.3%
Route 6 – Outbound	944	15.7	959	16.0	15	1.6%
Route 7 – Inbound	1358	22.6	1220	20.3	-138	-10.2%
Route 7 – Outbound	1264	21.1	1214	20.2	-50	-4.0%
Route 8 – Inbound	820	13.7	801	13.4	-19	-2.3%
Route 8 – Outbound	603	10.1	605	10.1	2	0.3%
Route 9 – Inbound	360	6.0	359	6.0	-1	-0.3%
Route 9 – Outbound	360	6.0	358	6.0	-2	-0.6%
Route 10 – Inbound	571	9.5	470	7.8	-101	-17.7%
Route 10 – Outbound	666	11.1	505	8.4	-161	-24.2%
Route 11 – Inbound	1292	21.5	972	16.2	-320	-24.8%
Route 11 – Outbound	1048	17.5	858	14.3	-190	-18.1%

Table 6.8: 2024 IP 1 Journey Time Results

Route Description	2024 DM Seconds	2024 DM Minutes	2024 DS Seconds	2024 DS Minutes	Diff (Seconds)	% Difference
Route 1 – Inbound	695	11.6	674	11.2	-21	-3.0%
Route 1 – Outbound	662	11.0	655	10.9	-7	-1.1%
Route 2 – Inbound	1047	17.5	1122	18.7	75	7.2%
Route 2 – Outbound	1106	18.4	1139	19.0	33	3.0%
Route 3 – Inbound	288	4.8	292	4.9	4	1.4%
Route 3 – Outbound	258	4.3	266	4.4	8	3.1%
Route 4a – Inbound	644	10.7	607	10.1	-37	-5.7%
Route 4a – Outbound	687	11.5	650	10.8	-37	-5.4%
Route 4b – Inbound	597	10.0	610	10.2	13	2.2%
Route 4b – Outbound	840	14.0	552	9.2	-288	-34.3%
Route 5 – Inbound	924	15.4	892	14.9	-32	-3.5%
Route 5 – Outbound	1088	18.1	959	16.0	-129	-11.9%
Route 6 – Inbound	960	16.0	980	16.3	20	0
Route 6 – Outbound	924	15.4	947	15.8	23	2.5%
Route 7 – Inbound	1053	17.6	1026	17.1	-27	-2.6%
Route 7 – Outbound	1245	20.8	1152	19.2	-93	-7.5%
Route 8 – Inbound	629	10.5	664	11.1	35	5.6%
Route 8 – Outbound	603	10.1	630	10.5	27	4.5%
Route 9 – Inbound	358	6.0	358	6.0	0	0.0%
Route 9 – Outbound	359	6.0	358	6.0	-1	-0.3%
Route 10 – Inbound	415	6.9	433	7.2	18	4.3%
Route 10 – Outbound	437	7.3	439	7.3	2	0.5%
Route 11 – Inbound	821	13.7	741	12.4	-80	-9.7%
Route 11 – Outbound	951	15.9	844	14.1	-107	-11.3%

Table 6.9: 2024 IP 2 Journey Time Results

Route Description	2024 DM Seconds	2024 DM Minutes	2024 DS Seconds	2024 DS Minutes	Diff (Seconds)	% Difference
Route 1 – Inbound	730	12.2	680	11.3	-50	-6.8%
Route 1 – Outbound	683	11.4	659	11.0	-24	-3.55
Route 2 – Inbound	1076	17.9	1145	19.1	69	6.4%
Route 2 – Outbound	1139	19.0	1165	19.2	15	1.3%
Route 3 – Inbound	290	4.8	294	4.9	4	1.4%
Route 3 – Outbound	259	4.3	267	4.5	8	3.1%
Route 4a – Inbound	661	11.0	610	10.2	-51	-7.7%
Route 4a – Outbound	712	11.9	651	10.9	-61	-8.6%
Route 4b – Inbound	638	10.6	604	10.1	-34	-5.3%
Route 4b – Outbound	1078	18.0	569	9.5	-509	-47.2%
Route 5 – Inbound	963	16.1	893	14.9	-70	-7.3%
Route 5 – Outbound	1183	19.7	991	16.5	-192	-16.2%
Route 6 – Inbound	1047	17.5	1009	16.8	-38	-3.6%
Route 6 – Outbound	969	16.2	981	16.4	12	1.2%
Route 7 – Inbound	1101	18.4	1030	17.2	-71	-6.4%
Route 7 – Outbound	1421	23.7	1226	20.4	-195	-13.7%
Route 8 – Inbound	628	10.5	651	10.9	23	3.7%
Route 8 – Outbound	662	11.0	679	11.3	17	2.6%
Route 9 – Inbound	358	6.0	358	6.0	0	0.0%
Route 9 – Outbound	360	6.0	358	6.0	-2	-0.6%
Route 10 – Inbound	424	7.1	476	7.9	52	12.3%
Route 10 – Outbound	463	7.7	445	7.4	-18	-3.9%
Route 11 – Inbound	828	13.8	736	12.3	-92	-11.1%
Route 11 – Outbound	1183	19.7	932	15.5	-251	-21.2%

Table 6.10: 2024 PM Journey Time Results

Route Description	2024 DM Seconds	2024 DM Minutes	2024 DS Seconds	2024 DS Minutes	Diff (Seconds)	% Difference
Route 1 – Inbound	715	11.9	688	11.5	-27	-3.8%
Route 1 – Outbound	717	12.0	673	11.2	-44	-6.15
Route 2 – Inbound	1137	19.0	1222	20.4	85	7.5%
Route 2 – Outbound	1163	19.4	1179	19.7	16	1.4%
Route 3 – Inbound	290	4.8	294	4.9	4	1.4%
Route 3 – Outbound	259	4.3	267	4.5	8	3.1%
Route 4a – Inbound	754	12.6	648	10.8	-106	-14.1%
Route 4a – Outbound	789	13.2	685	11.4	-104	-13.2%
Route 4b – Inbound	716	11.9	627	10.5	-89	-12.4%
Route 4b – Outbound	1154	19.2	644	10.7	-510	-44.2%
Route 5 – Inbound	1128	18.8	1004	16.7	-124	-11.0%
Route 5 – Outbound	1160	19.3	1040	17.3	-120	-10.3%
Route 6 – Inbound	1093	18.2	1020	17.0	-73	-6.7%
Route 6 – Outbound	1006	16.8	1030	17.2	24	2.4%
Route 7 – Inbound	1141	19.0	1061	17.7	-80	-7.0%
Route 7 – Outbound	1495	24.9	1313	21.9	-182	-12.2%
Route 8 – Inbound	619	10.3	633	10.6	14	2.3%
Route 8 – Outbound	797	13.3	838	14.0	41	5.1%
Route 9 – Inbound	359	6.0	359	6.0	0	0.0%
Route 9 – Outbound	360	6.0	359	6.0	-1	-0.3%
Route 10 – Inbound	510	8.5	424	7.1	-86	-16.9%
Route 10 – Outbound	491	8.2	476	7.9	-15	-3.1%
Route 11 – Inbound	851	14.2	736	12.3	-115	-13.5%
Route 11 – Outbound	1325	22.1	1023	17.1	-302	-22.8%

The 2024 AM Peak results above show that, in general, the opening of the proposed road development has a significant positive impact on the majority of Journey Time routes analysed.

A number of routes (2, 3, 6) show negligible impacts, with increases in journey times of less than 60 seconds across the entire route. Route 6 inbound experiences a minor impact, where the journey time has increased by 100 seconds across the entire route. These increases are caused by the addition of signalised junctions, for example the N59 Link Road Junctions, which require traffic to slow down where previously it was not necessary.

In this regard it should be noted that the impact of the proposed road development is hugely beneficial for reducing traffic congestion in Galway City in the AM Peak and for reducing journey times.

The 2024 PM Peak results show that, similar to the AM peak, the opening of the proposed road development has a significantly positive impact on the majority of Journey Time routes analysed.

As with the AM peak number of routes show negligible or minor impacts, with relatively small (less than 2 minute) increases across the entire route. These increases are as a result of new signalised junctions, related to the proposed road development, requiring traffic to slow down where previously it was not necessary.

The introduction of the proposed road development reduces traffic congestion and average journey times in Galway City in the PM Peak.

Journey time results for the inter peak periods demonstrate the same pattern as the AM and PM peaks, with positive impacts seen across the majority of routes analysed. Any increases in journey times are negligible in nature.

Table 6.11: 2039 AM Peak Journey Time Results

Route Description	2039 DM Seconds	2039 DM Minutes	2039 DS Seconds	2039 DS Minutes	Diff (Seconds)	% Difference
Route 1 – Inbound	1107	18.6	841	13.2	-266	-24.0%
Route 1 – Outbound	688	11.6	680	11.4	-8	-1.2%
Route 2 – Inbound	1376	23.0	1209	20.3	-167	-12.1%
Route 2 – Outbound	1221	20.5	1255	21.7	34	0
Route 3 – Inbound	465	8.0	315	5.3	-150	-32.3%
Route 3 – Outbound	259	4.3	267	4.5	8	3.1%
Route 4a – Inbound	729	12.2	680	11.5	-49	-6.7%
Route 4a – Outbound	827	15.9	683	11.4	-144	-17.4%
Route 4b – Inbound	1212	21.1	770	13.8	-442	-36.5%
Route 4b – Outbound	1105	20.0	707	11.9	-398	-36.0%
Route 5 – Inbound	1268	23.3	1016	17.9	-252	-19.9%
Route 5 – Outbound	1182	22.1	1029	18.4	-153	-12.9%
Route 6 – Inbound	1089	18.1	1110	18.8	21	1.9%
Route 6 – Outbound	956	15.9	978	16.4	22	2.3%
Route 7 – Inbound	1502	27.3	1270	22.5	-232	-15.4%
Route 7 – Outbound	1321	24.2	1257	20.9	-64	-4.8%
Route 8 – Inbound	952	18.7	846	16.7	-106	-11.1%
Route 8 – Outbound	609	10.9	611	9.9	2	0.3%
Route 9 – Inbound	361	6.0	359	6.0	-2	-0.6%
Route 9 – Outbound	360	6.0	358	6.0	-2	-0.6%
Route 10 – Inbound	593	11.1	487	7.6	-106	-17.9%
Route 10 – Outbound	667	11.9	511	16.9	-156	-23.4%
Route 11 – Inbound	1495	27.1	1061	18.5	-434	-29.0%
Route 11 – Outbound	1109	20.9	895	15.8	-214	-19.3%

Table 6.12: 2039 IP 1 Journey Time Results

Route Description	2039 DM Seconds	2039 DM Minutes	2039 DS Seconds	2039 DS Minutes	Diff (Seconds)	% Difference
Route 1 – Inbound	712	11.9	679	11.3	-33	-4.6%
Route 1 – Outbound	667	11.1	657	11.0	-10	-1.5%
Route 2 – Inbound	1057	17.6	1129	18.8	73	6.9%
Route 2 – Outbound	1114	18.6	114+6	19.1	32	2.9%
Route 3 – Inbound	289	4.8	293	4.9	4	1.4%
Route 3 – Outbound	258	4.3	266	4.4	8	3.1%
Route 4a – Inbound	664	11.1	613	10.2	-51	-7.7%
Route 4a – Outbound	700	11.7	653	10.9	-47	-6.7%
Route 4b – Inbound	639	10.7	617	10.3	-22	-3.4%
Route 4b – Outbound	958	16.0	571	9.5	-387	-40.4%
Route 5 – Inbound	968	16.1	902	15.0	-66	-6.8%
Route 5 – Outbound	1162	19.4	988	16.5	-174	-15.0%
Route 6 – Inbound	964	16.1	989	16.5	25	2.6%
Route 6 – Outbound	930	15.5	962	16.0	32	3.4%
Route 7 – Inbound	1073	17.9	1046	17.4	-27	-2.5%
Route 7 – Outbound	1456	24.3	1207	20.1	-249	-17.1%
Route 8 – Inbound	638	10.6	690	11.5	52	8.2%
Route 8 – Outbound	618	10.3	657	11.0	39	6.3%
Route 9 – Inbound	358	6.0	358	6.0	0	0.0%
Route 9 – Outbound	360	6.0	358	6.0	-2	-0.6%
Route 10 – Inbound	415	6.9	435	7.3	20	4.8%
Route 10 – Outbound	439	7.3	438	7.3	-1	-0.2%
Route 11 – Inbound	880	14.7	800	13.3	-80	-9.1%
Route 11 – Outbound	1064	17.7	900	15.0	-164	-15.4%

Table 6.13: 2039 IP 2 Journey Time Results

Route Description	2039 DM Seconds	2039 DM Minutes	2039 DS Seconds	2039 DS Minutes	Diff (Seconds)	% Difference
Route 1 – Inbound	730	12.2	686	11.4	-44	-6.0%
Route 1 – Outbound	683	11.4	661	11.0	-22	-3.2%
Route 2 – Inbound	1076	17.9	1165	19.4	89	8.3%
Route 2 – Outbound	1139	190.	1161	19.4	22	1.9%
Route 3 – Inbound	290	4.8	295	4.9	5	1.7%
Route 3 – Outbound	259	4.3	267	4.5	8	3.1%
Route 4a – Inbound	661	11.0	615	10.3	-46	-7.0%
Route 4a – Outbound	712	11.9	655	10.9	-57	-8.0%
Route 4b – Inbound	638	10.6	619	10.3	-19	-3.0%
Route 4b – Outbound	1078	18.0	594	9.9	-484	-44.9%
Route 5 – Inbound	963	16.1	903	15.1	-60	-6.2%
Route 5 – Outbound	1183	19.7	1028	17.1	-155	-13.1%
Route 6 – Inbound	1047	17.5	1024	17.1	-23	-2.2%
Route 6 – Outbound	969	16.2	1016	16.9	47	4.9%
Route 7 – Inbound	1101	18.4	1048	17.5	-53	-4.8%
Route 7 – Outbound	1421	23.7	1261	21.0	-160	-11.3%
Route 8 – Inbound	628	10.5	672	11.2	44	7.0%
Route 8 – Outbound	662	11.0	694	11.6	32	4.8%
Route 9 – Inbound	358	6.0	358	6.0	0	0.0%
Route 9 – Outbound	360	6.0	359	6.0	-1	-0.3%
Route 10 – Inbound	424	7.1	469	7.8	45	10.6%
Route 10 – Outbound	463	7.7	444	7.4	-19	-4.1%
Route 11 – Inbound	828	13.8	786	13.1	-42	-5.1%
Route 11 – Outbound	1183	19.7	998	16.6	-185	-15.6%

Table 6.14: 2039 PM Peak Journey Time Results

Route Description	2039 DM Seconds	2039 DM Minutes	2039 DS Seconds	2039 DS Minutes	Diff (Seconds)	% Difference
Route 1 – Inbound	731	12.2	691	11.5	-40	-5.5%
Route 1 – Outbound	738	12.3	677	11.3	-61	-8.3%
Route 2 – Inbound	1189	19.8	1308	21.8	119	10.0%
Route 2 – Outbound	1190	19.8	1183	19.7	-7	-0.6%
Route 3 – Inbound	291	4.9	295	4.9	4	1.4%
Route 3 – Outbound	259	4.3	268	4.5	9	3.5%
Route 4a – Inbound	790	13.2	685	11.4	-105	-13.3%
Route 4a – Outbound	1557	26.0	689	11.5	-868	-55.7%
Route 4b – Inbound	772	12.9	633	10.6	-139	-18.0%
Route 4b – Outbound	779	13.0	688	11.5	-91	-11.7%
Route 5 – Inbound	1189	19.8	1020	17.0	-169	-14.2%
Route 5 – Outbound	1271	21.2	1070	17.8	-201	-15.8%
Route 6 – Inbound	1097	18.3	1040	17.3	-57	-5.2%
Route 6 – Outbound	1027	17.1	1080	18.0	53	5.2%
Route 7 – Inbound	1169	19.5	1063	1.7	-106	-9.1%
Route 7 – Outbound	1663	27.7	1440	24.0	-223	-13.4%
Route 8 – Inbound	624	10.4	638	10.6	14	2.2%
Route 8 – Outbound	899	15.0	918	15.3	19	2.1%
Route 9 – Inbound	359	6.0	359	6.0	0	0.0%
Route 9 – Outbound	361	6.0	360	6.0	-1	-0.3%
Route 10 – Inbound	598	10.0	424	7.1	-174	-29.1%
Route 10 – Outbound	534	8.9	489	8.2	-45	-8.4%
Route 11 – Inbound	946	15.8	761	12.7	-185	-19.6%
Route 11 – Outbound	1620	27.0	1124	18.7	-496	-30.6%

The 2039 results show a similar pattern to the 2024 results discussed previously. In general, the opening of the proposed road development has a significantly positive impact on the majority of Journey Time routes analysed in all 2039 modelled periods for the Core Scenarios.

A small number of routes show negligible or minor impacts, with increases in journey times of less than 120 seconds across the entire route. These increases are caused by the addition of new signalised junctions, requiring traffic to slow down where previously it was not necessary.

GTS Sensitivity Test

The tables below outline the results of the journey time comparison as extracted from the traffic model for the 2039 Galway Transport Strategy Sensitivity Test.

These results show a similar pattern to the Core Scenario tests discussed above. In general, the opening of the proposed road development, in conjunction with the other measures proposed in the GTS, has a positive impact on the majority of Journey Time routes analysed, particularly in the AM and PM peak periods.

The results below show more negative impacts on journey times than the DS Core Scenario tests. The reason for this is that the GTS contains a number of proposals which limit vehicular capacity on the city centre network, as a result of increased active mode and public transport priority measures in the city centre, and therefore adds delay to certain sections of the network. Also, traffic management arrangements proposed in the GTS result in the lengthening of some journey time routes which in turn adds to the total journey times.

Table 6.15: 2039 GTS AM Peak Journey Time Results

Route Description	2039 DM Seconds	2039 DM Minutes	2039 GTS Seconds	2039 GTS Minutes	Diff (Seconds)	% Difference
Route 1 – Inbound	1107	18.6	900	15.0	-207	-18.7%
Route 1 – Outbound	688	11.6	685	11.4	-3	-0.4%
Route 2 – Inbound	1376	23.0	1245	20.8	-131	-9.5%
Route 2 – Outbound	1221	20.5	1421	23.7	200	16.4%
Route 3 – Inbound	465	8.0	411	6.9	-54	-11.6%
Route 3 – Outbound	259	4.3	427	7.1	168	64.9%
Route 4a – Inbound	729	12.2	682	11.4	-47	-6.4%
Route 4a – Outbound	827	15.9	724	12.1	-103	-12.5%
Route 4b – Inbound	1212	21.1	767	12.8	-445	-36.7%
Route 4b – Outbound	1105	20.0	662	11.0	-443	-40.1%
Route 5 – Inbound	1268	23.3	1063	17.7	-205	-16.2%
Route 5 – Outbound	1182	22.1	1176	19.6	-6	-0.5%
Route 6 – Inbound	1089	18.1	1066	17.8	-23	0
Route 6 – Outbound	956	15.9	1009	16.8	53	5.5%
Route 7 – Inbound	1502	27.3	1237	20.6	-265	-17.6%
Route 7 – Outbound	1321	24.2	1270	21.2	-51	-3.9%
Route 8 – Inbound	952	18.7	935	15.6	-17	-1.8%
Route 8 – Outbound	609	10.9	635	10.6	26	4.3%
Route 9 – Inbound	361	6.0	359	6.0	-2	-0.6%
Route 9 – Outbound	360	6.0	358	6.0	-2	-0.6%
Route 10 – Inbound	593	11.1	481	8.0	-112	-18.9%
Route 10 – Outbound	667	11.9	715	11.9	48	7.2%
Route 11 – Inbound	1495	27.1	1008	16.8	-487	-32.6%
Route 11 – Outbound	1109	20.9	903	15.1	-206	-18.6%

Table 6.16: 2039 GTS IP 1 Journey Time Results

Route Description	2039 DM Seconds	2039 DM Minutes	2039 GTS Seconds	2039 GTS Minutes	Diff (Seconds)	% Difference
Route 1 – Inbound	712	11.9	702	11.7	-10	-1.4%
Route 1 – Outbound	667	11.1	676	11.3	9	1.3%
Route 2 – Inbound	1056	17.6	1216	20.3	160	15.2%
Route 2 – Outbound	1114	18.6	1260	21.0	146	13.1%
Route 3 – Inbound	289	4.8	403	6.7	114	39.4%
Route 3 – Outbound	258	4.3	427	7.1	169	65.5%
Route 4a – Inbound	664	11.1	635	10.6	-29	-4.4%
Route 4a – Outbound	700	11.7	687	11.5	-13	-1.9%
Route 4b – Inbound	639	10.7	602	10.0	-37	-5.8%
Route 4b – Outbound	958	16.0	628	10.5	-330	-34.4%
Route 5 – Inbound	968	16.1	1018	17.0	50	5.2%
Route 5 – Outbound	1162	19.4	1187	19.8	25	2.2%
Route 6 – Inbound	964	16.1	1009	16.8	45	4.7%
Route 6 – Outbound	930	15.5	1028	17.1	98	10.5%
Route 7 – Inbound	1073	17.9	1038	17.3	-35	-3.3%
Route 7 – Outbound	1456	24.3	1257	21.0	-199	-13.7%
Route 8 – Inbound	638	10.6	688	11.5	50	7.8%
Route 8 – Outbound	618	10.3	702	11.7	84	13.6%
Route 9 – Inbound	358	6.0	358	6.0	0	0.0%
Route 9 – Outbound	360	6.0	358	6.0	-2	-0.6%
Route 10 – Inbound	415	6.9	417	7.0	2	0.5%
Route 10 – Outbound	439	7.3	448	7.5	9	2.1%
Route 11 – Inbound	880	14.7	854	14.2	-26	-3.0%
Route 11 – Outbound	1064	17.7	885	14.8	-179	-16.8%

Table 6.17: 2039 GTS IP 2 Journey Time Results

Route Description	2039 DM Seconds	2039DM Minutes	2039 GTS Seconds	2039 GTS Minutes	Diff (Seconds)	% Difference
Route 1 – Inbound	730	12.2	721	12.0	-9	-1.2%
Route 1 – Outbound	683	11.4	696	11.6	13	1.9%
Route 2 – Inbound	1076	17.9	1251	20.9	175	16.3%
Route 2 – Outbound	1139	19.0	1276	21.3	137	12.0%
Route 3 – Inbound	290	4.8	406	6.8	116	40.0%
Route 3 – Outbound	259	4.3	427	7.1	168	64.9%
Route 4a – Inbound	661	11.0	636	10.6	-25	-3.8%
Route 4a – Outbound	712	11.9	687	11.5	-25	-3.5%
Route 4b – Inbound	638	10.6	607	10.1	-31	-4.9%
Route 4b – Outbound	1078	18.0	633	10.6	-445	-41.3%
Route 5 – Inbound	963	16.1	1027	17.1	65	6.7%
Route 5 – Outbound	1183	19.7	1228	20.5	45	3.8%
Route 6 – Inbound	1047	17.5	1049	17.5	2	0.2%
Route 6 – Outbound	969	16.2	1076	17.9	107	11.0%
Route 7 – Inbound	1101	18.4	1047	17.5	-54	-4.9%
Route 7 – Outbound	1421	23.7	1372	22.9	-49	-3.4%
Route 8 – Inbound	628	10.5	681	11.4	53	8.4%
Route 8 – Outbound	662	11.0	756	12.6	94	14.2%
Route 9 – Inbound	358	6.0	358	6.0	0	0.0%
Route 9 – Outbound	360	6.0	358	6.0	-2	-0.6%
Route 10 – Inbound	424	7.1	418	7.0	-6	-1.4%
Route 10 – Outbound	463	7.7	453	7.6	-10	-2.2%
Route 11 – Inbound	828	13.8	917	15.3	89	10.7%
Route 11 – Outbound	1183	19.7	978	16.3	-205	-17.3%

Table 6.18: 2039 GTS PM Peak Journey Time Results

Route Description	2039 DM Seconds	2039 DM Minutes	2039 GTS Seconds	2039 GTS Minutes	Diff (Seconds)	% Difference
Route 1 – Inbound	731	12.2	711	11.9	-20	-2.7%
Route 1 – Outbound	738	12.3	707	11.8	-31	-4.2%
Route 2 – Inbound	1189	19.8	1388	23.1	199	16.7%
Route 2 – Outbound	1190	19.8	1354	22.6	164	13.8%
Route 3 – Inbound	291	4.9	407	6.8	116	39.9%
Route 3 – Outbound	259	4.3	429	7.2	170	65.6%
Route 4a – Inbound	790	13.2	713	11.9	-77	-9.7%
Route 4a – Outbound	157	26.0	728	12.1	-829	-53.2%
Route 4b – Inbound	772	12.9	607	10.1	-165	-21.4%
Route 4b – Outbound	779	13.0	699	11.7	-80	-10.3%
Route 5 – Inbound	1189	19.8	1063	17.7	-126	-10.6%
Route 5 – Outbound	1271	21.2	1325	22.1	54	4.2%
Route 6 – Inbound	1097	18.3	1015	16.9	-82	-7.5%
Route 6 – Outbound	1027	17.1	1168	19.5	141	13.7%
Route 7 – Inbound	1169	19.5	1050	17.5	-119	-10.2%
Route 7 – Outbound	1663	27.7	1629	27.2	-34	-2.0%
Route 8 – Inbound	624	10.4	669	11.2	45	7.2%
Route 8 – Outbound	899	15.0	873	14.6	-26	-2.9%
Route 9 – Inbound	359	6.0	359	6.0	0	0.0%
Route 9 – Outbound	361	6.0	359	6.0	-2	-0.6%
Route 10 – Inbound	598	10.0	509	8.5	-89	-14.9%
Route 10 – Outbound	534	8.9	557	9.3	23	4.3%
Route 11 – Inbound	946	15.8	859	14.3	-87	-9.2%
Route 11 – Outbound	1620	27.0	1070	17.8	-550	-34.0%

6.6.3.2 Network Statistics (2024 and 2039)

The tables below present Network Statistics from each modelled time-period for all medium growth scenarios.

Table 6.19: Network Performance Indicators – Morning Peak Hour

Scenario	Total Vehicle Distance (pcu. Kms)	Total Network Travel Time (pcu. Hrs)	Total Network Delay (pcu. Hrs)	Average Vehicle Speed (kph)	Impact
2024 Do-Minimum	223,666	7,576	2,274	29.5	-
2024 Do-Something	258,719	6,798	1,505	38.1	Positive
2039 Do-Minimum	247,788	8,619	2,812	28.7	-
2039 Do-Something	294,178	7,611	1,738	38.7	Positive
2039 Galway Strategy	294,497	7,756	1,810	38	Positive

Table 6.20: Network Performance Indicators – IP 1

Scenario	Total Vehicle Distance (pcu. Kms)	Total Network Travel Time (pcu. Hrs)	Total Network Delay (pcu. Hrs)	Average Vehicle Speed (kph)	Impact
2024 Do-Minimum	148,147	4,321	920	34.3	-
2024 Do-Something	163,308	4,144	767	39.4	Positive
2039 Do-Minimum	171,081	5,039	1,171	33.9	-
2039 Do-Something	190,786	4,750	916	40.2	Positive
2039 Galway Strategy	192,388	4,932	1,009	39	Positive

Table 6.21: Network Performance Indicators – IP 2

Scenario	Total Vehicle Distance (pcu. Kms)	Total Network Travel Time (pcu. Hrs)	Total Network Delay (pcu. Hrs)	Average Vehicle Speed (kph)	Impact
2024 Do-Minimum	173,045	5,164	1,124	33.5	-
2024 Do-Something	192,752	5,023	980	38.4	Positive
2039 Do-Minimum	196,764	5,929	1,403	33.2	-
2039 Do-Something	223,715	5,731	1,189	39	Positive
2039 Galway Strategy	224,131	5,910	1,292	37.9	Positive

Table 6.22: Network Performance Indicators – Evening peak Hour

Scenario	Total Vehicle Distance (pcu. Kms)	Total Network Travel Time (pcu. Hrs)	Total Network Delay (pcu. Hrs)	Average Vehicle Speed (kph)	Impact
2024 Do-Minimum	206,659	6,669	1,824	31	-
2024 Do-Something	233,756	6,135	1,318	38.1	Positive
2039 Do-Minimum	230,010	7,774	2,453	29.6	-
2039 Do-Something	264,746	6,919	1,593	38.3	Positive
2039 Galway Strategy	266,632	7,128	1,720	37.4	Positive

The tables above demonstrate that the Do-Something (with proposed road development) option reduces the network delay considerably relative to the Do-Minimum, and provides a higher average speed in all time periods in both the Opening and Design Year. The reduction in delay allows traffic to travel further in a shorter period of time, which is illustrated in the increase in vehicle Km's and decrease in Total Travel time in all Do-Something Scenarios.

Analysis of the Galway Transport Strategy (GTS) scenario results indicate an increased level of delay and slightly lower average speeds compared to the "Do-Something" scenario of the same year. This increase in vehicular delay is caused by the proposed implementation of a number of active mode and public transport priority proposals contained within the GTS (e.g. converting the Salmon Weir Bridge to Public Transport Only) which result in decreased highway capacity for general vehicular traffic in Galway City Centre, which is in line with the objectives of the GTS. The level of network delay observed in this scenario is much lower than in the Do-Minimum Scenario of the same year. As with the Core Scenarios this is a result of the proposed road development relieving congestion in the City Centre.

This analysis indicates that the proposed road development will have a significantly positive impact in both Opening and Design Years.

Core Scenarios

The tables below summarise the junction evaluations for the 2024 and 2039 - Medium Growth Scenarios.

Table 6.23: Number of Junction approaches at or over capacity - AM Peak

		2024			2039		
		DM	**DS**	**Impact**	**DM**	**DS**	**Impact**
Key Junctions (N6 / R338)	RFC > 90%	15	9	Positive	18	12	Positive
Entire Network	RFC > 90%	151	78	Positive	200	115	Positive

Table 6.24: Number of Junction approaches at or over capacity - IP 1

		2024			2039		
		DM	**DS**	**Impact**	**DM**	**DS**	**Impact**
Key Junctions (N6 / R338)	RFC > 90%	6	2	Positive	9	5	Positive
Entire Network	RFC > 90%	28	12	Positive	60	26	Positive

Table 6.25: Number of Junction approaches at or over capacity - IP 2

		2024			2039		
		DM	**DS**	**Impact**	**DM**	**DS**	**Impact**
Key Junctions (N6 / R338)	RFC > 90%	8	4	Positive	11	5	Positive
Entire Network	RFC > 90%	53	29	Positive	81	49	Positive

Table 6.26: Number of Junction approaches at or over capacity - PM Peak

		2024			**2039**		
		DM	**DS**	**Impact**	**DM**	**DS**	**Impact**
Key Junctions (N6 / R338)	RFC > 90%	17	4	Positive	20	6	Positive
Entire Network	RFC > 90%	139	62	Positive	193	100	Positive

The above tables show that with the introduction of the proposed road development there is a large decrease in the number of links in the network which have an RFC of over 90%. This is particularly evident in the PM peak period where the number of over-capacity links, at key junctions along the N6/ R338 Corridor, reduces by over 70% in both 2024 and 2039. Similarly, the number of over-capacity links on the entire city network is reduced by 55% and 48% in 2024 and 2039, respectively, as a result of the introduction of the proposed road development.

GTS Sensitivity Test

The tables below summarise the junction evaluations for the 2039 - Medium Growth – Galway Transport Strategy (GTS).

Table 6.27: Number of Junction approaches at or over capacity - AM Peak

		2024			**2039**		
		DM	GTS	Impact	DM	GTS	Impact
Key Junctions (N6 / R338)	RFC > 90%	N/A	N/A	Positive	18	8	Positive
Entire Network	RFC > 90%	N/A	N/A	Positive	200	131	Positive

Table 6.28: Number of Junction approaches at or over capacity - IP 1

		2024			**2039**		
		DM	GTS	Impact	DM	GTS	Impact
Key Junctions (N6 / R338)	RFC > 90%	N/A	N/A	Positive	9	2	Positive
Entire Network	RFC > 90%	N/A	N/A	Positive	60	32	Positive

Table 6.29: Number of Junction approaches at or over capacity - IP 2

		2024			**2039**		
		DM	GTS	Impact	DM	GTS	Impact
Key Junctions (N6 / R338)	RFC > 90%	N/A	N/A	Positive	11	3	Positive
Entire Network	RFC > 90%	N/A	N/A	Positive	81	52	Positive

Table 6.30: Number of Junction approaches at or over capacity - PM Peak

		2024			**2039**		
		DM	GTS	Impact	DM	GTS	Impact
Key Junctions (N6 / R338)	RFC > 90%	N/A	N/A	Positive	20	6	Positive
Entire Network	RFC > 90%	N/A	N/A	Positive	193	123	Positive

The above tables show that, as with the Core Scenarios, the introduction of the Galway Transport Strategy proposals results in a decrease in the number of junctions operating above capacity within the entire city area and along the N6/R338 corridor.

In summary, the RFC analysis has shown that the introduction of the proposed road development will have a considerably positive impact on the key junctions in Galway City.

6.6.4 Assessment of Impact Significance

6.6.4.1 Impact Significance 2024

In 2024 the proposed road development does not result in any traffic impacts of major significance. In terms of the three key performance indicators used, the impact of the proposed road development is rated as having a positive impact.

6.6.4.2 Impact Significance 2039

In 2024 the proposed road development does not result in any traffic impacts of major significance. In terms of the three key performance indicators used, the impact of the proposed road development is rated as having a positive impact.

6.6.5 Construction Impacts

Construction traffic impacts, and associated mitigation measures, of the proposed road development are considered in detail in **Chapter 7, Construction Activities**.

Construction of the proposed road development will add additional traffic to the local networks for the duration of the construction works, as a result of materials supply and disposal, movement of site equipment and travel demand from site workers and visitors. The likelihood of these impacts are high but will be short-term in nature. Dedicated haulage routes were identified and are outlined in **Chapter 7, Construction Activities**.

Existing traffic movements on the local and regional road network will generally not be restricted by the proposed construction works. The proposed road development will ensure the minimum possible disturbance to local residents and existing traffic.

Night time working will be generally avoided, however, it will be necessary to work night shifts during certain critical stages during the project, such as for bridge works and road tie-in points. It is anticipated that, over the expected 36 month construction phase, there will be 10 weeks of night time working.

Existing cyclist and pedestrian movements will be facilitated throughout the construction period.

During construction, detailed traffic management plans in accordance with the mitigation measures and environmental measures set out in the EIAR and incorporating any specific additional requirements of statutory authorities and any conditions imposed by An Bord Pleanála, will clearly set out any temporary traffic restrictions.

6.6.6 Cumulative Impacts

6.6.6.1 Transport Schemes

As detailed in **Sections 6.4**, all core modelling scenarios (Do-Minimum and Do-Something) have taken into account committed transport schemes for Galway City and its environs and those likely to be completed for the various years assessed. The Galway Transport Strategy (GTS) sensitivity test, further analyses the cumulative impacts of complementary transport schemes by assessing the impacts of the proposed road development in conjunction with all of the Public Transport and Active Mode proposals contained within the GTS.

6.6.6.2 Transport Demand

Cumulative traffic volumes have been included in the analysis contained within this chapter through the use of travel demand forecasting. The proposed road development has been assessed in conjunction with three different travel demand scenarios (Low, Medium and High) designed to allow for a robust assessment of traffic growth in Galway over time resulting from increases in population and economic activity.

Further details on the cumulative impacts of traffic flows are detailed within **Chapter 16, Air Quality and Climate**, **Chapter 17, Noise and Vibration**, **Chapter 18, Human Beings, Population and Human Health** and **Chapter 19, Inter Relationships, Interactions, Cumulative Impacts and Other Impacts**.

6.6.6.3 Growth Forecast Sensitivity Tests

This section considers the potential implications on traffic impacts and mitigation requirements of variations in Growth Forecasts (i.e. from those assumed in the Core tests described above). This is done by way of sensitivity testing using the WRM and proposed road development Highway Network Models.

The sensitivity tests are listed below, whilst noting the definition of the basis of the Low and High growth is set out in **Section 6.2.3.2**:

- **Sensitivity Test 1:** 2024 & 2039 Low Growth Forecasts
- **Sensitivity Test 2:** 2024 & 2039 High Growth Forecasts

Sensitivity Test Impact Summary

In summary, there are no traffic impacts of major significance in either of the Low or High Growth Scenarios tested. As with the medium growth scenarios (discussed above) the proposed road development results in some negligible and minor impacts in terms of journey times due to the introduction of signalised junctions. However, the traffic impacts are positive and no mitigation measures are required.

6.7 Mitigation Measures

6.7.1 Construction Phase

As noted, the construction of the proposed road development will cause temporary short term traffic impacts on the local road network. The Construction Environmental Management Plan, included in **Appendix A.7.5** of this report, shall ensure that construction traffic impacts are minimised through the control of site access/ egress routes and site access locations.

6.7.2 Operational Phase

In summary, the traffic modelling indicates that for the Opening (2024) and Design (2039) Years there are no traffic impacts of major significance and therefore no mitigation measures are required.

However, as the proposed road development is a TEN-T route, which is required to cater for strategically important trips at an appropriate level of service, it will be important to protect the operating capacity of the proposed road development well into the future. To do this, measures to manage demand on the transport infrastructure, such as the integration of transport and land use planning, are considered within the development of the Galway Transport Strategy.

6.8 Residual Impacts

6.8.1 Construction Phase

With the implementation of the mitigation measures that have been identified, there will be no major impacts during the construction phase of the proposed road development.

6.8.2 Operational Phase

The proposed road development will see changes to the local, regional and national road network and traffic flows. The modelling work undertaken to assess the traffic impacts of the proposed road development indicates that there will be an overall positive traffic benefit associated with the proposed road development. Further, the proposed road development will provide benefits to existing and new public transport services and walking and cycling routes on the adjoining local and regional road network and other measures proposed by the Galway Transport Strategy.

Therefore, there are no residual negative traffic impacts anticipated.

6.8.3 Forecast Traffic Flows

6.8.3.1 AADT Forecasts

AADT estimates have been calculated using the N6 GCRR Traffic Model and in accordance with TII PAG Guidelines. To further demonstrate the benefits of the proposed road development and to help quantify the level of traffic redistribution which will occur as a result of the proposed road development, forecast traffic flows for the medium growth scenario are presented in this section.

Plate 6.9 illustrates the location of AADT points with corresponding AADT values shown in **Table 6.31**. A complete set of AADT data, including forecast flows for all sensitivity tests (Low, Medium, High) and further details on the methodology used to calculate AADTs, is available in the Traffic Modelling Report contained within **Appendix A.6.1**.

Table 6.31 illustrates that, in the 2039 medium growth scenario, there is significant demand for the proposed road development with AADTs in excess of 49,000 forecast for certain sections. This table also shows that traffic in the city centre is reduced as a result of the introduction of the proposed road development, as evidenced by the reduction in AADTs on Quincentenary Bridge (29% reduction).

Plate 6.9: Proposed Road Development AADT Locations

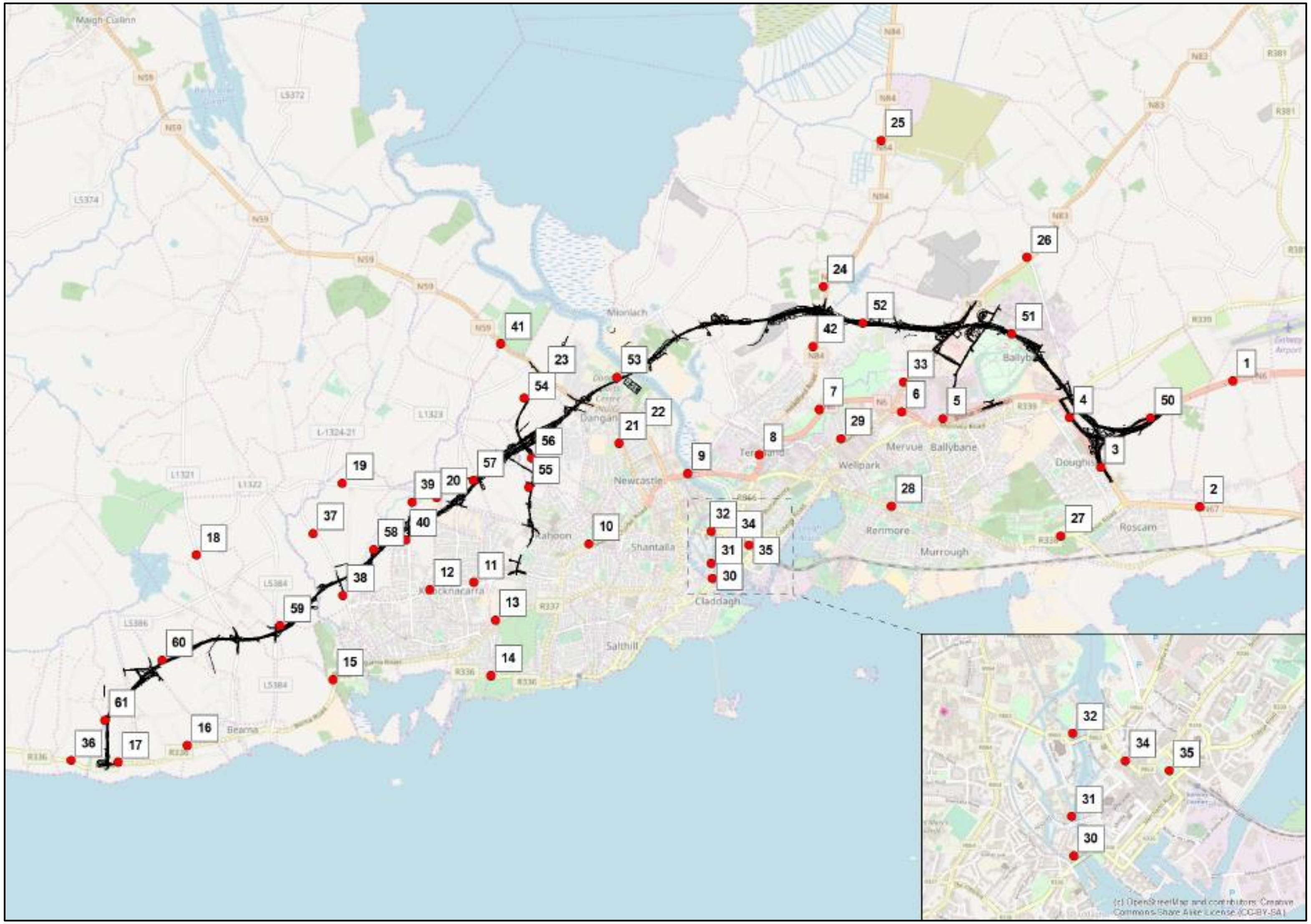


Table 6.31: Proposed Road Development AADT 2039 Design Year – Medium Growth

AADT Point	Location	2039 Do-Minimum Medium Growth		2039 GTS Medium Growth	
		AADT	%HGV	AADT	%HGV
1	N6 South of Galway Airport	23,382	8%	36,008	6%
2	R446 Westof Oranmore Business Park	22,588	10%	26,107	8%
3	R446 South of N6 Roundabout	18,807	7%	29,040	6%
4	N6 South of Briarhill	31,459	7%	18,862	6%
5	N6 Near Ballybrit Business Park	25,974	7%	15,553	5%
6	N6 Between N83 and R865	26,749	6%	18,766	3%
7	N6 Between N84 and N83	20,691	5%	11,307	4%
8	N6 East of Quincentenary Bridge	24,315	6%	23,215	5%
9	N6 On Quincentenary Bridge	34,546	7%	24,442	5%
10	R338 at Westside Playing fields	14,061	5%	7,556	1%
11	Western Distributor Road	11,657	2%	7,964	1%
13	R337 Kingston Road, Kingston	11,955	4%	7,148	0%
15	R336 Barna Road. Barna Woods	16,273	2%	4,313	0%
30	Wolfe Tone Bridge	18,074	4%	14,606	4%
31	O'Briens Bridge	9,725	4%	9,037	3%
32	Salmon Weir Bridge	17,910	1%	14,613	2%
36	R336 West of N6	10,875	3%	13,093	3%
41	N59-North of GCRR Link Road	17,749	2%	18,582	2%
42	N84 South of GCRR	14,298	6%	19,788	5%
50	N6 GCRR – Briarhill Junction			36,008	6%
51	N6 GCRR – Parkmore			38,705	5%
52	N6 GCRR – Between N83 and N84			49,876	5%
53	N6 GCRR – New Corrib Crossing			36,353	4%
54	N6 GCRR – N59 Lnk Road			11,530	4%
55	N6 GCRR – Rahoon Link Road			6,172	3%
56	N6 GCRR - Letteragh Link Road			13,709	3%
57	N6 GCRR – Ballymoneen to N59			20,920	3%
58	N6 GCRR – West of Ballymoneen			16,953	3%
60	N6 GCRR – At Truskey West			11,155	3%
61	N6 GCRR – North of Terminus			11,155	3%

6.8.3.2 Trip Redistribution and Overcapacity Demand

Induced traffic is the concept that car traffic grows to fill the available capacity of a road network.

The traffic modelling undertaken takes account of induced travel demand to varying degrees. The modelling results consider the redistribution effect of trips due to the introduction of new infrastructure and services (i.e. trip patterns changing because of lower costs of travel). It also takes account of re-routing of trips as a result of the provision of additional capacity on the network. The mode shift of trips from active modes and public transport to car (and vice versa) is also taken into account in the modelling results.

Induced development, is the phenomenon whereby new development is concentrated in the vicinity of high capacity transport corridors. The modelling undertaken for the proposed road development, takes account of forecast growth in the region as set out in local and regional plans (for low, medium and high growth scenarios), but does not include for the redistribution of growth that may occur along the corridor of the proposed road development.

It has been assumed that the forecast population and employment figures, and hence overall travel demand, will be the same in both the Do-Minimum and Do-Something Scenarios. These demographic forecasts have been agreed by Galway City and County Council and are based on the development plans for these areas which will not change with the opening of the proposed road development.

It is the role of the Planning Authorities to ensure that any development which could undermine the strategic function of the proposed road development will be appropriately mitigated. This may include the implementation of demand management measures to maintain the capacity and strategic function of the proposed road development.

Examination of the Do-Minimum and Do-Something traffic totals on the crossings of the River Corrib indicate that the proposed road development will lead to an increase of circa 19,000 AADT in 2039. It is important to highlight the fact that this increase is caused primarily by two factors:

1. The **redistribution of trips** with the opening of the proposed road development
2. **Release of overcapacity demand**[4] caused by congestion on the existing River Corrib crossings in the Do-Minimum network

Trip Redistribution

The introduction of the proposed road development reduces congestion on the River Corrib crossings leading to decreases in journey times from east to west across Galway City. The decrease in travel costs for these movements will result in a change in peoples living and working patterns in the city and its environs (e.g.

[4] Overcapacity demand refers to the difference between the desired trips and the actual trips undertaken.

potentially longer commuting patterns). This redistribution of trips contributes to the increase in cross city traffic described above.

Overcapacity Demand

In the Do-Minimum scenario, traffic congestion is at such a level that not all the trips which desire to cross the city (i.e. demand flow) can reach the River Corrib crossings in the assigned model periods. As actual flows (i.e. actual flows on the River Corrib crossing) are used to calculate the forecast AADT figures, the difference between demand flow and actual flow (which is known as the overcapacity demand) is not accounted for in the Do-minimum AADT figures. In the Do-something scenarios, demand flow and actual flows are closely aligned and therefore no overcapacity demand exists.

6.8.3.3 Galway Transport Strategy Forecasts

As outlined in **Section 6.4.3.2**, Galway County Council, Galway City Council, and the National Transport Authority have worked collaboratively in developing a multi-modal integrated transport strategy to resolve the existing transportation issues in Galway City and its environs. As a critical component of the overall transport solution for Galway, the proposed road development releases capacity in the city centre transport network and facilitates the implementation of key public transport and active mode proposals such as:

- A public transport corridor through the city centre with public transport only allowed on the Salmon Weir Bridge, Eglington Street, College Road and Eyre Square
- Localised City Centre Traffic Management proposals
- Rationalised Bus Route network with increase services and bus priority
- Improved Cycle Network

These measures in turn will result in an increase in sustainable travel and improvements to pedestrian safety throughout the city centre.

Table 6.32 below presents the mode share between private vehicle, public transport, walking and cycling for the 2012 Base Year, 2024 Opening Year and 2039 Design Year, extracted from the traffic model for the 24-hour period.

The mode share analysis shows that there is a low public transport mode share of just 4% in the Base Year. As can be seen below, the impact of the Do-Something options on mode share is minimal, with Car Mode share increasing by circa 1% in both 2024 and 2039 as a result of the opening of the proposed road development.

The GTS test increases Public Transport mode share to 5.0%, which is a 16% increase in Public Transport trips relative to the Do-Minimum Scenario.

Table 6.32: Mode Share Percentages

Option	% Car	% PT	% Walk	% Cycle
2012 Base Year	66.7%	3.9%	26.3%	3.1%
2024 Do-Minimum	67.4%	4.2%	25.4%	3.0%
2024 Do-Something	68.4%	4.0%	24.9%	2.7%
2039 Do-Minimum	67.4%	4.3%	25.2%	3.1%
2039 Do-Something	68.6%	4.1%	24.5%	2.8%
2039 GTS	67.3%	5.0%	24.9%	2.8%

Due to the fact that the proposed road development forms a constituent element of the wider reaching Galway Transport Strategy, it is appropriate that the forecast flows in the future year network should be reviewed in the context of the full implementation of the GTS. These flows are outlined in **Table 6.33**. Analysis of these figures indicate that the full implementation of the GTS leads to a smaller increase in traffic crossing the River Corrib in 2039, with total bridge crossings of circa 13,000 higher than the Do-Minimum Scenario. As outlined above, this increase is related to changes in trip distribution and the release of overcapacity demand linked to the opening of the proposed road development.

Table 6.33: Galway Transport Strategy AADT 2039 Design Year – Medium Growth

AADT Point	Location	2039 Do-Minimum Medium Growth		2039 GTS Medium Growth	
		AADT	%HGV	AADT	%HGV
1	N6 South of Galway Airport	23,382	8%	35,906	6%
2	R446 Westof Oranmore Business Park	22,588	10%	25,861	9%
3	R446 South of N6 Roundabout	18,807	7%	29,747	6%
4	N6 South of Briarhill	31,459	7%	17,225	6%
5	N6 Near Ballybrit Business Park	25,974	7%	15,158	5%
6	N6 Between N83 and R865	26,749	6%	20,663	3%
7	N6 Between N84 and N83	20,691	5%	8,536	7%
8	N6 East of Quincentenary Bridge	24,315	6%	21,668	5%
9	N6 On Quincentenary Bridge	34,546	7%	34,950	4%
10	R338 at Westside Playing fields	14,061	5%	7,681	1%
11	Western Distributor Road	11,657	2%	3,062	0%
13	R337 Kingston Road, Kingston	11,955	4%	9,888	1%
15	R336 Barna Road. Barna Woods	16,273	2%	4,815	0%
30	Wolfe Tone Bridge	18,074	4%	13,568	4%
31	O'Briens Bridge	9,725	4%	7,155	1%
32	Salmon Weir Bridge	17,910	1%	-	0%
36	R336 West of N6	10,875	3%	13,013	3%
41	N59-North of GCRR Link Road	17,749	2%	17,749	2%

AADT Point	Location	2039 Do-Minimum Medium Growth		2039 GTS Medium Growth	
		AADT	%HGV	AADT	%HGV
42	N84 South of GCRR	14,298	6%	20,171	4%
50	GCRR – Briarhill Junction			35,906	6%
51	GCRR – Parkmore			38,783	5%
52	GCRR – Between N83 and N84			49,104	5%
53	GCRR – New Corrib Crossing			37,986	4%
54	GCRR – N59 Lnk Road			11,862	4%
55	GCRR – Rahoon Link Road			5,300	3%
56	GCRR - Letteragh Link Road			14,584	3%
57	GCRR – Ballymoneen to N59			22,111	3%
58	GCRR – West of Ballymoneen			19,015	3%
60	GCRR – At Truskey West			10,566	3%
61	GCRR – North of Terminus			10,566	3%

6.9 Summary

There will be no traffic negative impacts of major significance as a result of the introduction of the proposed road development. The traffic impact analysis carried out in **Section 6.6** shows that the introduction of the proposed road development results in significant benefits in terms of junction operation, network performance and journey time savings. By providing an alternative route around the city, the proposed road development will result in reduced traffic levels and congestion in the City Centre.

The RFC analysis in the peak travel periods shows that the proposed road development leads to almost a 50% reduction in the number of junctions operating at or close to capacity. Similarly, journey times on key routes around, and into, the city are reduced during peak periods because of the introduction of the proposed road development. For example, the existing N6, following the opening of the proposed road development experiences journey time savings of between 40% - 50% during peak periods.

As a constituent element of the Galway Transport Strategy the proposed road development will tackle the city's congestion issues, the proposed road development will provide a better quality of life for the city's inhabitants and provide a much safer environment in which to live. By reducing the number of cars on the roads within the city centre and improving streetscapes, workers and school children are facilitated to commute using active modes and on the public transport system. As a result, more sustainable travel will be supported and encouraged.

In the absence of the proposed road development, traffic conditions in the city centre will continue to deteriorate resulting in a situation whereby crossing the city becomes increasingly difficult. This restricted movement of people will lead to changes to where people live and work over time, with people choosing to live and work on one side of the city or another as the delay experienced travelling across the city becomes too great. This change in travel behaviour, or suppression of trip making, will constrain the economic development of Galway City and its environs. The proposed road development will provide the required capacity for all modes of transport in Galway to support economic growth into the future. Further economic benefits of the proposed road development are detailed within the Phase 3 Cost Benefit Analysis Report (included in **Appendix A.6.2**) which estimates that the Net Present Value of the proposed road development to the local and national economy will be in the region of €1.04bn - €1.46bn, with a benefit to cost ratio of approximately 4:1, over the 30-year assessment period.

6.10 References

Transport Infrastructure Ireland, Project Appraisal Guidelines;

- Unit 4: Definition of Alternatives
- Unit 5.1: Construction of Transport Models
- Unit 5.2: Data Collection
- Unit 5.3: Travel Demand Projections
- Unit 5.4: Traffic Modelling Report
- Unit 6.11: National Parameter Values Sheet
- Unit 16.1: Estimating AADT on National Roads
- Unit 16.2: Expansion Factors for Short Period Traffic Counts

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