

IN THE MATTER OF AN APPLICATION  
TO

AN BORD PLEANÁLA

FOR APPROVAL OF (I) THE N6 GALWAY  
CITY RING ROAD PURSUANT TO SECTION  
51 OF THE ROADS ACT 1993 (AS  
AMENDED); (II) THE N6 GALWAY CITY  
RING ROAD MOTORWAY SCHEME 2018; and  
(III) THE N6 GALWAY CITY RING ROAD  
PROTECTED ROAD SCHEME 2018

ABP Ref. ABP-302848-18 and ABP-  
302885-18

Response to Queries raised in Module 2 of  
the N6 Galway City Ring Road in respect of  
Traffic and Climate

Oral Hearing

by

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**16 October 2020**



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# 1 Executive Summary

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1.1.1 The purpose of this document is to respond to submissions made at the Oral Hearing in respect of Module 2 for the N6 Galway City Ring Road (GCRR). Reference is made to the location where the material presented is already available in the published documentation to date

1.1.2 In summary, and as demonstrated in the detailed analysis provided in the sections below:

- **Sustainable Transport for the Future:** All modes of transport have a role to play in the delivery of a sustainable transport solution for Galway City and environs and the N6 Galway City Ring Road (GCRR) is a necessary part of this overall solution.
- **Scheme Need:** The N6 GCRR is an essential part of the GTS which is required to improve the operation of the network for the benefit of all transport modes and to accommodate an increased population in a more compact city.
- **Implementation of the GTS:** Galway City Council is fully committed to the implementation of the GTS and the delivery of elements of the GTS, other than the N6 GCRR, is already well underway with a focus on the short-term delivery of sustainable measures such as cycling, walking and public transport.
- **How the Model Works - Factors Influencing Mode Choice:** Conservative assumptions have been adopted in the analysis of the proposed road development in order to provide a robust assessment of the likely traffic impacts arising. Changing land use and transport policy will influence future travel behaviours resulting in more sustainable transport outcomes.
- **Mode Share Results:** The implementation of demand management in tandem with the full GTS (including the N6 GCRR) and the NPF will result in a step change in sustainable travel.
- **National Policy:** The N6 GCRR aligns with the delivery of Smarter Travel, Project Ireland 2040 and the Climate Action Bill.
- **Design of the Scheme:** The N6 GCRR is appropriately designed to enable the safe operation of the network and facilitate the compact urban growth of the city whilst fulfilling its regional and national function as a TEN-T route. The design of the scheme is compact – close to the city with key new links – facilitating shorter journeys and a more compact city.

## 2 Sustainable Transport for the Future

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### 2.1 Submission content

2.1.1 Many submissions to the oral hearing during Module 2 query why a public transport solution is not advanced and suggest that this would be the most sustainable transport solution for Galway City. This section sets out how all modes of transport have a role to play in the delivery of a sustainable transport solution when coupled with compact urban development.

### 2.2 Smarter Travel

2.2.1 “*Smarter travel – A sustainable Transport Future*” is a policy framework approved by government in 2009 which sets out how the vision of a sustainable travel and transport system can be achieved through proper land use planning which is integrated with transport planning.

2.2.2 Two of the key targets of Smarter Travel to reduce transport demand are:

1. Future population and employment growth will predominantly take place in **sustainable compact forms**, which reduce the need to travel for employment and services.
2. **Alternative transport modes** such as walking, cycling and public transport must be available.

2.2.3 The target of encouraging cities and urban areas to develop in sustainable compact forms is at the core of the National Planning Framework (NPF) policy which was published in 2018. The publication of the NPF has provided a statutory framework against which all current and future planning decisions must be assessed. This will ensure that all future planning decisions and development plans will comply with the goal of achieving compact urban growth.

2.2.4 Since its inception, Smarter Travel has formed the basis of how we plan our transport delivery, and the principals of smarter travel have been applied from the outset.

### 2.3 Galway Transport Strategy (GTS)

2.3.1 In 2016 Galway City and County Councils in partnership with the National Transport Authority (NTA), prepared the Galway Transport Strategy (GTS) which aims to address the current and future transport needs of Galway City and its environs.

- 2.3.2 As part of the development of the Galway Transport Strategy, the needs of all travel modes were considered. The travel demand and requirements of each mode was informed by census data relating to employment and educational travel demand, as well as national household travel survey data which provided additional detail on other types of trips such as shopping and leisure.
- 2.3.3 The GTS places an emphasis on delivering sustainable transport solutions, to reduce the dependency on private car travel whilst providing essential linkages between residential areas and employment areas. Following this overriding principle, a hierarchical approach was adopted for the assessment of the GTS transport strategies which set out the order of interventions required to support sustainable travel choices. These started with interventions for walking and cycling, followed by the need for additional public transport infrastructure (including light rail), and were supported by traffic management and demand management measures aimed at encouraging a shift to sustainable modes. Finally, the need for further road interventions was examined as part of the strategy to provide additional capacity to the network, whilst not undermining the investment in sustainable transport.
- 2.3.4 During the development of the GTS a number of public transport scenarios supported by city centre traffic management solutions were assessed, without the proposed road development in place, based on a review of the future demand for travel in the city and county in 2039. This included an examination of various public transport options ranging from high frequency bus to a light rail system. These scenarios were developed in a hierarchical fashion layering up the level of investment and overall changes required to the existing transport network. In summary, the public transport alternatives assessed are as follows:
1. Upgrades to walking and cycling facilities and a cross city bus network
  2. Upgrades to walking and cycling facilities and a cross city bus network with bus priority through the city centre
  3. As Scenario 2 but with an orbital bus variant
  4. As Scenario 2 but with cross city light rail
- 2.3.5 Following a multicriteria analysis, Scenario 2 (cross city bus network with bus priority through the city centre) was selected as the preferred public transport solution. It is worth noting in the context of submissions made to this oral hearing that Scenario 2 performs at a similar level in terms of mode share to Scenario 4 (Scenario 2 but with cross city light rail). The bus based public transport solution developed delivers an effective solution to enable trips to be made from residential

areas to the key trip attractors particularly the city centre and employment centres such as Parkmore / Ballybrit.

- 2.3.6 Subsequent to the analysis carried out during Phase 2 (and as outlined in section 4.13 of Andrew Archer's Statement of Evidence) a review of the impact of a light rail transit system for Galway, in the context of the increased population and employment forecasts contained within the NPF, was undertaken. This analysis concluded that there would be insufficient demand to justify the implementation of a light rail system. Furthermore, a light rail system in isolation will not resolve forecast congestion issues in Galway.
- 2.3.7 Notwithstanding the above, through the delivery of the bus based network, the GTS identifies a number of transport corridors which will enable the delivery of frequent and reliable public transport services meeting the future needs of the city. Should future development take place along these corridors beyond the forecasts envisaged in the NPF, there is potential to increase the carrying capacity of these transit corridors by introducing higher capacity public transport services.
- 2.3.8 Whilst the delivery of public transport solutions will increase levels of sustainable travel, the analysis indicated that a vastly improved public transport network, in isolation, will not mitigate congestion issues in the city which impacts on public transport as well as all other modes, including active modes.
- 2.3.9 Scenario 2 (cross city bus network with bus priority through the city centre) was then tested with no provision of the N6 GCRR followed by the incremental provision of the N6 GCRR as follows:
- From the existing N6/M6 to the N84
  - From the existing N6/M6 to the N84 and onto the N59
  - From the existing N6/M6 to the N84 and onto the N59 through to the R336. (The full N6 GCRR)
- 2.3.10 Following assessment and a multi-criteria analysis of the above scenarios, the conclusion is that the full N6 GCRR is required to enable the realisation of the maximum benefits of the GTS. Therefore, the recommended option was public transport Scenario 2 combined with the full N6 GCRR i.e. it is not a case of either or, rather a combination of both components within the context of an overall transport strategy.
- 2.3.11 It is important in this regard to note that not all trips on the network can be served efficiently by public transport. However, the GTS is designed in a way that public transport can serve the future growth areas. While the GTS is being public transport led, we need an integrated transport strategy which provides for the needs of all transport modes. Cities that achieve a high level of walking, cycling and public transport use, such

as the examples quoted of Copenhagen and Seville, have invested in all types of infrastructure, including ring roads around the city.

## 2.4 Response to Submissions

Whilst the delivery of public transport solutions will increase levels of sustainable travel, the analysis carried out as part of the development of the GTS indicated that a vastly improved public transport network, in isolation, will not mitigate congestion in the city which impacts on public transport as well as all other modes, including active modes. The N6 GCRR will lead to reduced congestion thereby facilitating faster, more reliable journey times for all modes.

## 3 Scheme Need

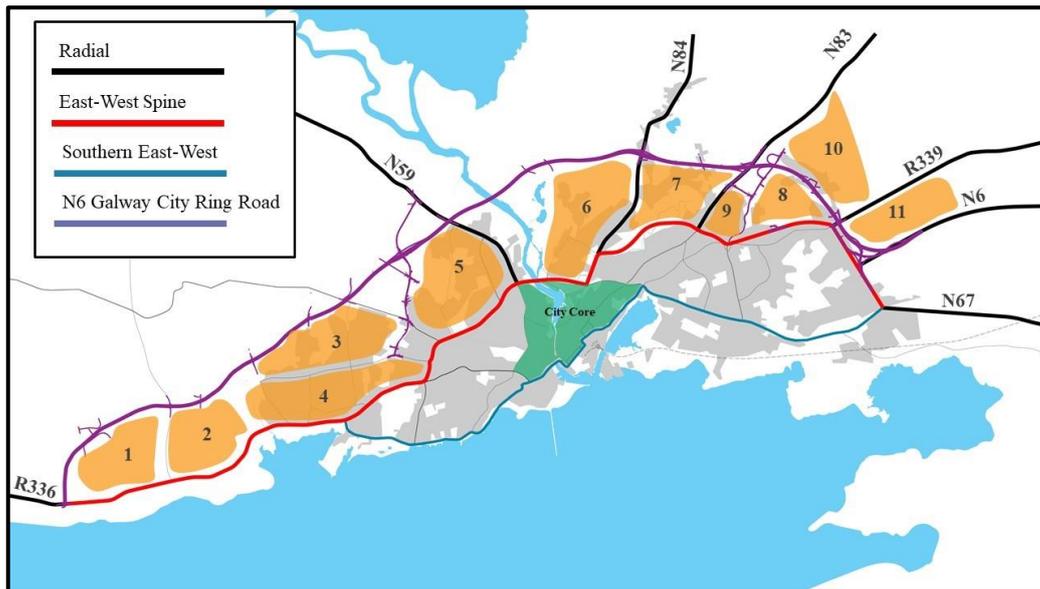
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### 3.1 Submission Context

- 3.1.1 Various submissions raised questions as to why we need the N6 GCRR to solve the congestion and suggest that it is possible to solve the problem with improvements to public transport and provision of infrastructure for active modes only.

### 3.2 Role of the N6 GCRR as part of the GTS

- 3.2.1 The route of the N6 GCRR was developed in parallel with the GTS study so as to inform the GTS of how additions could be made to the road network of Galway City. The GTS concluded that the entirety of the route of the N6 GCRR was part of the strategy. Thus, the N6 GCRR was further developed in this context and in a manner that would achieve the project objectives and align with the GTS.
- 3.2.2 As set out in Brief Summary of the Proposed Road Development at the opening of the oral hearing, the GTS seeks to deliver an integrated network of ‘links’ (routes) and ‘nodes’ (stops and interchange locations) along which people can travel seamlessly, changing corridors and modes as necessary to make their journey. The strategy provides for routing of traffic which currently passes through the centre (to reach edge-of-centre locations) to more suitable orbital routes around the core city centre area. This in turn facilitates prioritisation of active modes (walking and cycling) and public transport in the city centre and across the city centre which is essential to achieve mode shift in favour of more sustainable transport.
- 3.2.3 The proposed N6 GCRR as shown in **Figure 1** provides the orbital route along the northern half of the city which will facilitate more direct journeys, divert through traffic away from the central spine and facilitate the reallocation of road space in the city centre to active modes and public transport.

**Figure 1: Overlay of N6 Galway City Ring Road**

### 3.3 Existing Operation of Road Network

- 3.3.1 The existing N6 is the main artery connecting Galway with the region and the country with most of arrivals to Galway arriving at the N6 Coolagh Roundabout. It was never envisaged that in the long-term the motorway would terminate at a single at-grade junction as it would never be possible to fully disperse traffic and fully connect to all other routes at a singular location such as this. The existing N6 from Coolagh Roundabout to the city is a singular space or road network which is shared by all modes. Congestion along the N6 leads to delays to public transport as well as private cars.
- 3.3.2 Traffic arriving onto the existing N6 is currently controlled by the Urban Traffic Control (UTC) unit at Galway City Council. The signals on the N6 are effectively a cordon used to control access to the city centre. The traffic signals at Briarhill Junction are currently controlled and balanced between giving priority to the N6 traffic and giving priority to the busses to cross through the junction whilst also not giving too much time to this movement as would encourage rat running through Doughiska. However, any delay at Briarhill Junction causes queues or stacking of private cars to the east on to the M6 as far east as the Oranmore Junction in the morning peak hour. The proposed signalisation of the Martin Roundabout to the south of the N6 Coolagh Roundabout is designed to give priority to public transport through this junction.
- 3.3.3 **Drone footage attached** from the AM peak hour on 10 October 2018 shows a clip from the N6 Coolagh Roundabout and Briarhill to Parkmore Junction (see **Figures 4 and 5**), with the bus stuck in the

middle of the congestion and the queues extending eastwards on the N6/M6 as far as the footage covers. Both the Express Bus Services and the City Bus services are impacted by this congestion – this is the existing situation, and this will only get worse without major intervention. This situation is replicated at the Deane Roundabout at the junction of the Western Distributor Road on the western side of the city (see **Figures 2 and 3**).

### 3.4 Junction capacity on the existing road network

- 3.4.1 It is critical that the N6 GCRR achieves a situation where key junctions on the existing road network perform within capacity to relieve congestion and enable implementation of other measures within the GTS. If traffic exceeds the capacity of these junctions the existing congestion will continue, and implementation of the bus priority envisaged at these junctions will not be achievable. In addition, the shift to active modes will not occur as cyclists and pedestrians will not feel safe negotiating a heavily congested network.
- 3.4.2 In particular, the following junctions along the existing east-west spines are critical for this purpose, namely, Briarhill, Ballybane, Tuam Road, Kirwan Junction, Bodkin Junction leading to Quincentenary Bridge on the northern fringe of the city, in addition to the junctions from Martin Roundabout to Monenageisha Junction to Wolf Tone Bridge on the southern edge of the city. To the west of the Quincentenary, the key junctions to free capacity are Newcastle Road, Browne Roundabout, Deane Roundabout and Kingston Road Junction. All of these junctions are at-grade junctions and currently are over capacity which in turn leads to the congestion with the impacts on the public transport set out in Section 3.4.

**Figure 2: Deane Roundabout with queues back to Knocknacarra onto Bishop O'Donnell Road in both AM peak and weekends**



**Figure 3: Ragoon Road queues onto Bishop O'Donnell Road**



**Figure 4: Queues on all approaches to Briarhill Junction**



**Figure 5: M6/N6 approach to Coolagh Roundabout**



## 3.5 Existing Operation of Public Transport

### Existing bus patronage

3.5.1 There have been major improvements to bus services in Galway City in recent years, including new and extended bus lanes, improved frequency, establishment of cross city routes, and the introduction of Leap Cards, Real Time Information at stops, covered bus shelters and the Transport for Ireland (TFI) bus App. Annual passenger journeys on Bus Eireann services increased from 3.82m to 4.71m between 2013 and 2018 (NTA Bus and Rail Statistics). When compared with the other regional cities, bus patronage in Galway is less than Cork but significantly higher than in Limerick and Waterford cities, with Galway having more bus passengers than Limerick and Waterford cities combined.

**Table 1: Bus patronage in Regional Cities**

Option	Population 2016 (CSO)	Bus Passengers 2016(m) NTA	Bus Passengers 2018(m) NTA	Bus passengers per head, 2016
Cork	208,669	12.6	13.91	60.38
Galway	79,934	4.23	4.71	52.54
Limerick	94,192	2.92	3.53	31
Waterford	53,504	0.83	0.84	15.5
Limerick + Waterford	147,696	3.75	4.37	

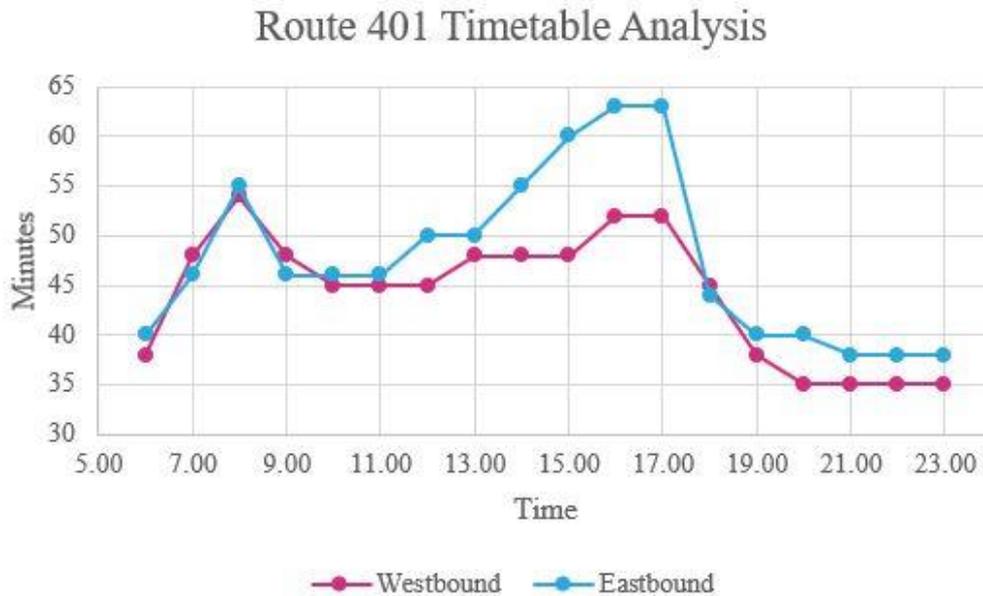
### Performance of Existing Bus Services (source Bus Eireann)

3.5.2 The schedule for the busses in Galway City is presented in Table 2 below. The scheduled journey times during the AM and PM peak periods have been adjusted to take account of traffic congestion encountered on the routes during these times. The most pronounced example can be seen on the 407 Route from Eyre Square to Bóthar an Chóiste which has a scheduled time of 17 minutes in the AM peak and 27 minutes in the PM peak. This is an additional 10 minutes in the schedule to deal with PM peak traffic flows and shows that the operators are adding time to the schedules to try to account for congestion.

**Table 2: Galway City Timetable and Journey Information**

Route	Origin	Destination	Weekday AM Peak Frequency	Distance (km)	Scheduled Journey Time AM Peak (mins)	Scheduled Journey Time PM Peak (mins)
<b>Bus Éireann</b>						
401	Parkmore	Dr. Mannix Road	20 min	12.3	49	47
402	Shangort Rd	Merlin Park Hospital	30 min	13.6	52	54
404	Oranmore (Oran Town Centre)	Westside Shopping Centre	30 min	19.7	55	59
405	Gort Na Bro (B&Q)	Ballybane Ind Est (Hewlett Packard)	20 min	9.2	35	47
407	Eyre Square	Bóthar an Chóiste	30 min	5.6	17	27
409	Eyre Square	Parkmore Industrial Estate	10 min	8.8	30	38
<b>City Direct (Serves west side of Galway City only)</b>						
410	Eyre Square	Cappagh Road		8 km	43 - 58	28
411	Eyre Square	Cappagh Road	20 min	8 km	43 - 58	28
412	Eyre Square	Western Distributor Road	30 mins	8 km	37 - 52	22
414	Eyre Square	Barna	Twice daily	11 km	44 - 59	29

3.5.3 However, data supplied following surveys by Bus Eireann for the six Bus Eireann city bus routes over the day shows that this timetable is not being achieved due to congestion along the routes. For example, an analysis of actual journey time on the route 401 from Parkmore to Salthill via Eyre Square is presented in **Figure 6**. Due to traffic congestion the minimum journey time for the route in the eastbound direction is 38 minutes raising to a maximum of 63 minutes between 16:00 and 18:00, a difference of 25 minutes. In the westbound direction there is a difference of 19 minutes between the minimum journey time of 35 minutes and the maximum times of 54 minutes.

**Figure 6: Route 401 Timetable Analysis (source Bus Eireann)**

- 3.5.4 The westside of the city is primarily serviced by City Direct Services and these four routes benefit from the east and westbound bus priority corridors on the Bishop O'Donnell Road / Seamus Quirke Road between the Deane and Browne Roundabouts. City Direct experience delays of between 15 and 30 minutes to all routes between the hours of 07:30 and 21:00. The main area where City Direct services experience delays is typically from the Cathedral through to Francis Street and Eglinton Street.

### Bus survey 2020

- 3.5.5 It is acknowledged that there have been huge improvements to the services and frequency in recent years, with bus drivers doing their best to try to meet schedules in congested situations. It is evident that, even with the additional time added to timetables to allow for congestion, buses are frequently arriving late and/or journey times are taking longer than indicated on the timetable. From the point of view of the bus user, it is total travel time that is important, i.e. time waiting for the bus and time on the bus. An additional survey was carried out on five weekdays in late January /early February 2020 to verify actual arrival and journey times against the published timetables. Weather conditions were generally good, schools and third level colleges were operating, no major road works or traffic disruptions were experienced, and conditions were considered to be generally representative of normal conditions on the city bus network.

3.5.6 The routes surveyed were the two main cross city routes, the 401 and 405, and the 409. Bus registration numbers, arrival and departures times, and numbers boarding were recorded at the termini and at Eyre Square for the 401 and 405. Survey times were 7:30am to 9:30am and 4:00pm to 6:00pm.

**Table 3: Galway City Bus Journey Time Survey vs Scheduled Journey Time**

Route	Distance (km)	Scheduled Journey Time PM Off Peak (mins)	Scheduled Journey Time PM Peak (mins)	Recorded Average Journey Time PM Peak Incl. waiting time	Recorded Maximum Journey Time PM Peak Incl. waiting time
401 east to west	11	30	47	56	61
405 east to west	9.2	39	47	64	67
409 west to east	8.8	20	30	39	41

3.5.7 The conclusions of this survey are as follows:

- Traffic congestion is adding up to 30 minutes to travel times for bus commuters on journeys which should be taking 30 to 40 minutes for cross city journeys on the 401 and 405 and 20 minutes on the 409
- The length of time buses are taking to cross relatively short distances is remarkable and this acts as a deterrent to using the bus
- Potential improvements to the existing service by increasing bus frequencies on routes would have a limited effect on the frequency and length of delays and thus limited effect on improving the overall service
- Reliability of the service is a problem, particularly in the evenings, which means that people frequently arrive late for work, miss appointments etc.
- Improving the bus component of mode share will be extremely difficult unless the time difference between the bus and the car can be substantially improved

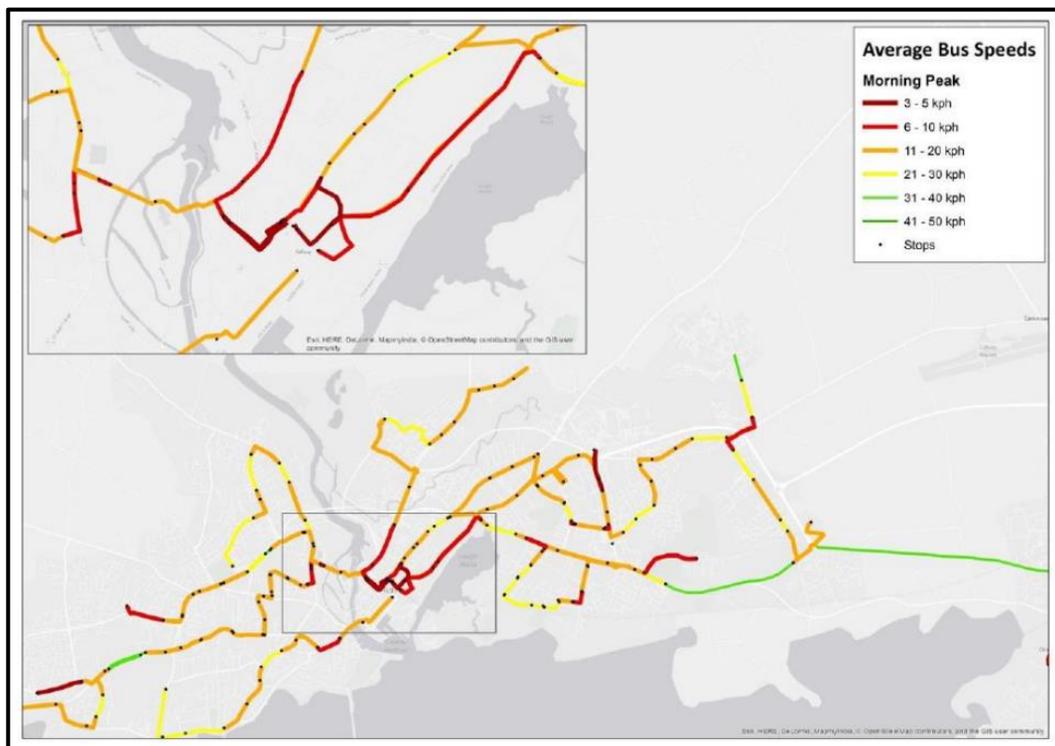
3.5.8 The above are the key issues which the GTS addresses with the provision of improved bus priority through reallocation of road space throughout the city, limiting vehicular movement through the city and

making provision for the displaced vehicular traffic on public transport and active modes within the city and on the N6 GCRR for all other trips.

### Pinch Point Analysis

- 3.5.9 Bus Eireann has identified a number of pinch points on the network with the average speed through pinch points as low as 7kph in certain areas. As can be seen from **Figure 7** the main pinch points on the network occur where bus routes intersect with the main traffic routes in the city or on approach to major junctions. This indicates that traffic congestion in the city is having a major effect on bus journey times and reliability.

**Figure 7: Average Bus Speeds AM Peak in Galway City (source Bus Eireann)**



- 3.5.10 There is also a high degree of variance in public transport journey times across the day which results in unreliability in schedules and journey times for public transport users, with the most significant impact on journey times reflecting the peak hour traffic congestion. The introduction of the proposed Cross-City Link as shown on **Figure 8** will resolve the major pinch points in the city centre area.

**Figure 8: Proposed Cross-City Link**

### 3.6 Future Operation Without GTS

3.6.1 Microsimulation of the area (**attached**) encompassing the N84 Headford Road to the N83 Tuam Road to Parkmore Road to the N6/M6 and onto the Martin Roundabout was undertaken for the future year with the NPF traffic forecasts without the N6 GCRR in place and this shows the following levels of congestion in the AM peak hour:

- Queues along the existing N6 eastbound at the N83 Tuam Road junction (between the N83 and N84) extending back through the Kirwan Roundabout thus affecting its operation
- Queues along the R339 westbound at the Briarhill/N6 junction extending back to Carnmore Cross
- Queues along the N83 Tuam Road in the inbound direction extends to almost 5km in length (around 2km further than the Parkmore Road junction)
- Queues along the N6/M6 in the inbound direction extends to almost 4km in length past the M6/R381 junction

3.6.2 Screenshots from the model which illustrate the above points are provided below.

**Figure 9: M6/N6 approach to Coolagh Roundabout**



**Figure 10: N67/Old Dublin Road approach to Martin Roundabout**



**Figure 11: N6/N83 Tuam Rd Junction**



*Note: Background mapping retains an image of the former roundabout at this junction but the coding in the model is for the current signalised junction.*

**Figure 12: N6 Eastbound traffic extending back onto Kirwan Roundabout**



**Figure 13: N83 Tuam Rd/Parkmore Rd junction – inbound queues on Tuam Rd extending past the Parkmore Rd Junction with N83**



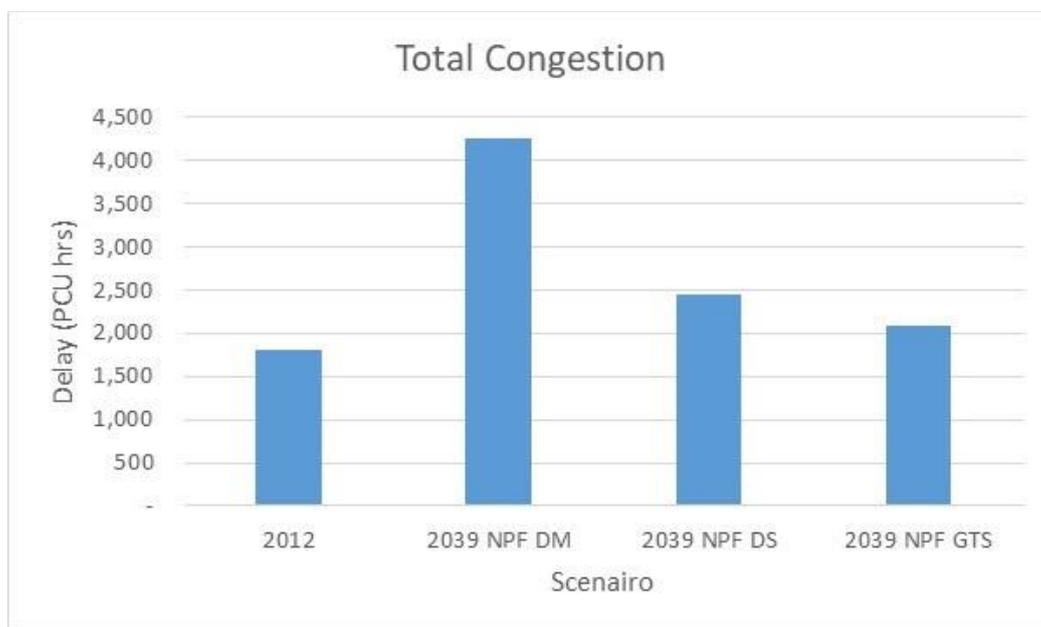
**Figure 14: R339 Westbound approach to N6/Briarhill Junction**



## Impact of not delivering the full GTS

3.6.3 The above figures illustrate the traffic impacts of the Do-Minimum Scenario (without the full GTS in place) under NPF growth forecasts. As illustrated in **Figure 15**, total congestion for the Galway City Administrative Boundary Area (measured in total PCU<sup>1</sup> hours) in the Do-minimum scenario is 135% higher than experienced in the Base Year scenario during the AM peak hour. This amounts to an additional 2,000 hours (sum of delay experienced by all vehicles on the network) queuing during the AM peak hour.

**Figure 15: AM Galway City Administrative Boundary Area Congestion**



3.6.4 The level of congestion experienced in the Do-Minimum Scenario is unmanageable and will have detrimental impacts on all transport modes, having the following effects:

- **Public Transport:** Whilst bus priority can be provided in the city centre and along key corridors, bus services will still be caught up in considerable delays at critical junctions across the city network. This will result in significant operational issues for public transport resulting in an unreliable bus service;
- **Cycling:** The forecast level of delay will result in considerable queues on Bóthar na dTreabh and along a number of radial routes leading into the city. This will create an unpleasant and unsafe environment for cycling;

<sup>1</sup> Total congestion is measured in PCU (passenger car unit) hours which is the sum of a delay experienced by every vehicle in the Galway City network

- **Walking:** Traffic volumes, in particular Heavy Goods Vehicles, will continue to rise in the city centre, resulting in an increase in harmful vehicle emissions and safety issues for pedestrians.
- **Private Car and Freight:** The forecast level of delay will result in journey times from east to west across the city increasing by more than 50% above current levels. This will create a barrier to travel and will constrain the economic growth of the city.
- **All Transport Modes:** All modes of travel will compete for valuable road space and capacity at junctions, leading to an increasingly unsafe transport network for all road users;

3.6.5 As previously noted, a key goal of the NPF is to develop Galway City and the other regional cities as a counter-weight to Dublin, focusing future growth in the city metropolitan area. However, without substantial investment across all transport modes, as set out in the GTS, the forecast level of congestion will inhibit the sustainable growth of the city. This will have considerable socio-economic impacts for Galway City and the entire western region, including:

- People will seek a better quality of life, choosing to live in non-congested areas outside of the city in areas to the north and east of Galway (such as Tuam and Athenry) which have reasonable access to the city;
- Companies will choose to locate elsewhere as employees find it increasingly difficult and stressful to access work;
- Potential investors will choose alternative locations which have quicker and more reliable access to the national road network;

3.6.6 In contrast to the above, the full delivery of the GTS, of which the N6 GCRR is a core component, will allow the city's population and employment to grow by up to 50% in a compact manner, supporting travel by sustainable modes and maintaining a functioning transport network.

### 3.7 Response to Submissions

The N6 GCRR is an integral part of the Galway Transport Strategy. The existing congestion experienced on the Galway Network impacts on the operation of all transport modes, with excessive journey times for private cars, slow and unreliable bus services and an unattractive environment for active modes.

Without the full implementation of the GTS (including N6 GCRR), the forecast demand for travel envisaged under the NPF growth scenarios will exacerbate the operational issues on the network with further delays and journey time reliability issues experienced across all modes.

Under the NPF, Galway is identified as a regional centre in the west of Ireland providing an important social and economic counterbalance to Dublin. Without investment across all transport modes it will not be possible to achieve the sustainable growth of the city as envisaged by the NPF.

## 4 Implementation of the GTS

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### 4.1 Submission content

4.1.1 Submissions raised queries during Module 2 as to the extent to which the GTS has been implemented to date and the programme for its full delivery and this section addresses both aspects.

### 4.2 Implementation of the GTS

4.2.1 The GTS is now being implemented and is included in the Galway City and Galway County Development Plans. Galway City Council have developed service delivery plans, and these are being funded by the National Transport Authority and Transport Infrastructure Ireland as required. The delivery of the GTS is already underway with a focus on providing walking, cycling and public transport to meet the current needs of the city.

4.2.2 Galway City Council sets out the programme of works and services in its Annual Service Delivery Plan, prepared in accordance with Section 134 (A) of the Local Government Act 2001. The plan is approved by council and must take into account the budget expenditure necessary in the financial year. Key projects under the GTS in Galway City Councils' Annual Service Delivery Plan are as follows:

- Galway Cross-City Link: Non-Statutory Public Consultation from 22 October 2020, Variation to Development Plan commenced, planning process to commence in Q1, 2021.
- Salmon Weir Cycling and Pedestrian Bridge: Scheme to be submitted to ABP in Q4, 2020 with Construction Start 2021
- Development of infrastructure priority proposals for the bus network outside of the Cross-City Link zone: Ongoing
- Transport access improvements to Ardaun South: Construction Start Q1, 2021
- Implementation of the Galway Cycling Strategy including greenways, primary, secondary and feeder routes: Construction Start 2021
- BusConnects Galway - Dublin Road, Non Statutory Consultation commenced 8 October 2020.
- Implementation of the GTS remodelled bus service pattern (Bus Connects) in Galway City: Ongoing
- Access improvements to public transport such as improvements to bus stops/shelters: Commenced 2020 with provision of 19 new bus shelters. Programme will continue in 2021

- Sustainable parking management and rollout of complementary initiatives such as bike share and public car share: Ongoing
- Pedestrian access improvements such as walking paths to public transport: Ongoing
- Maintenance, expansion and integration of the Urban Traffic Management Centre (UTMC): Ongoing
- Policy development and forward planning of modal shift options for major developments: Ongoing
- Park & ride site identification: Ongoing
- N6 GCRR: currently at planning hearing. This is a medium-term measure on the GTS programme.

4.2.3 Many of the same objectives and policies in the GTS are also imbedded in the City Development Plan including a number of measures aimed at shifting the focus of travel within the city centre to walking, cycling and public transport. These measures include:

- Concentrating future development in brownfield sites in the city centre (This was later reinforced through the Government's national planning framework)
- Controlling the availability and cost of parking in the city centre
- Development of mobility management plans for major employment centres
- Reduced parking standards for new developments that are located close to public transport corridors
- Restricting traffic from certain streets
- Removing a large proportion of on-street parking in the city centre to provide more priority for pedestrians, cyclists and public transport

4.2.4 The demand management measures outlined above are also being delivered by Galway City Council. For example, the Cross-City Link will restrict general traffic from entering the city centre. Traffic restriction will apply on Salmon Weir Bridge, and along St. Vincent's Avenue, Eglinton Street, Eyre Square and Forster Street and non-essential traffic will be re-routed away from the route to provide priority for public transport, walking and cycling.

4.2.5 The Cross-City Link will enable sustainable development in the city centre on brown field sites. New compact developments in brown field sites at planning or construction include Bonham Quay, Ceannt Station, Crowne Square; others at an advanced design stage include Sandy Road and the Docks area.

- 4.2.6 Galway City Council has applied reduced parking standards in such new city centre brown field sites. For example, in Bonham Quay, a limited provision of car-parking within the development site will result in a high dependency among employees on travel by sustainable modes of transport, such as bus and rail, walking and cycling.
- 4.2.7 The potential impacts of delivering further reductions in levels of parking over and above that assessed in the GTS as an effective demand management measure is addressed in Section 6.3 of this document.

### 4.3 Response to Submissions

The implementation of the GTS is on-going, with the initial measures focussed on active modes and public transport measures. The N6 GCRR is a medium to long term objective of the GTS.

## 5 How the model works: Factors influencing mode choice

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### 5.1 Submission content

5.1.1 Submissions to the oral hearing by Mr Mulligan queried what factors within the transport model influence mode choice. This section gives an overview of the capability of the transport model as well as setting out the factors which influence mode choice and the assumptions underpinning future forecasts.

### 5.2 West Regional Model

5.2.1 The West Regional Model (WRM) is a strategic multi-modal transport model for the counties Galway, Mayo, Roscommon, Sligo, Leitrim and Donegal, with a focus on the city of Galway. It is capable of modelling walking, cycling and public transport in addition to private vehicle trips. The demand for travel within the model was calibrated using the Census Place of Work, School or College of Anonymised Records (POWSCAR) database which was processed and used to calibrate the mode splits and trip length distributions for the commuter and education user classes which occur in the peak hours; and using data from the 2012 National Household Travel Survey (NHTS) which was processed and used to calibrate the mode splits and trip length distributions for the remaining travel in the non-peak hours.

5.2.2 The model is capable of forecasting how a transport scheme may influence a population's choice of travel mode.

5.2.3 The mode of transport which is chosen for an individual trip, is related to the following key factors:

- Car availability for the trip
- Availability & cost of parking at the destination
- The travel time for the trip by each mode (car, public transport, walking & cycling)
- The wait time (related to assumed frequency) for relevant public transport service
- Trip distance
- Cost of journey - public transport fares and vehicle running costs
- Behavioural parameters relating to travel and mode choice

5.2.4 The WRM has been calibrated and validated using observed travel and mode share data to ensure that the impact of each of the above factors

is accurately represented when calculating modal choice. Full details of the model validation is included in Appendix A.6.1 of the EIAR (here).

- 5.2.5 The role of each of the above factors is expanded upon below.

#### ***Car Availability***

- 5.2.6 The choice of mode for a trip is influenced by a person's car availability. An individual who has a car available for a trip, and parking at their destination, will be able to choose from all travel modes when making their trip. Conversely, if a car is not available for the trip, then mode choice will be limited to public transport, walking or cycling.

- 5.2.7 The future year levels of car availability in the model have been assumed to remain consistent with current levels of car ownership. The mode share results, therefore, will be reflective of the fact that there is a greater proportion of households within Galway City that have no car available (~23%) than in Galway County (~9%).

#### ***Parking***

- 5.2.8 A significant growth in population and employment has been accounted for in the future year modelling and appraisal of the scheme, aligned with the forecasts set out in the National Planning Framework (NPF). Whilst the NPF seeks to reduce the demand for car travel through the integration of land use and transport and contains policies aimed at reducing parking provision, the modelling has assumed that car availability (car parking for residents) and car parking spaces at the destination (e.g. the level of parking for employees) will be consistent with existing levels of provision.

#### ***Travel Time***

- 5.2.9 The demand model takes into consideration the relative journey times of each mode of travel (car, public transport, walking and cycling) between each origin and destination. Additionally, the assignment, or routing, of each mode will also take into account improvements in travel time on a particular route, with extra traffic likely to be assigned to a route if it becomes faster as a result of a particular scheme. Therefore, the model takes account of both the travel time by car and any new routes on offer to the car, and the selection of mode is influenced by this travel time versus travel time by other modes.

#### ***Wait time***

- 5.2.10 As with travel time, the demand model also takes into consideration the average wait time for a particular public transport service. These wait times are therefore linked to the assumed frequency for each public transport service.

### ***Trip Distance***

- 5.2.11 The choice of mode for a particular trip, also takes into consideration the distance of the trip, with walking and cycling not being viable options for longer trips.

### ***Cost of Journey***

- 5.2.12 Cost of the journey refers to the monetary or out of pocket costs for a trip and includes public transport fares for trips made by public transport or the cost of fuel and wear and tear for trips made by private vehicle. The relative monetary cost for making a trip are taken into consideration by the mode choice model.

### ***Behavioural parameters***

- 5.2.13 In addition to the above, people's mode share decisions are also influenced by other factors. For example, some people may choose to cycle to work for health reasons even though it may be quicker for them to drive or use public transport. These "behavioural parameters" are also accounted for in the demand model component of the WRM.
- 5.2.14 During the development of the WRM, information from the census and travel surveys (such as the national household travel survey) have been analysed to determine the likelihood of a person to travel by a particular mode. These decision-making parameters are also taken into consideration when modelling future mode choice. It should be noted that these observed behaviours have been assumed to remain constant over time in the WRM.

## **5.3 N6 GCRR Modelling Assumptions**

- 5.3.1 The associated modelling assumptions for the relevant parameters above used in the analysis of this scheme are presented below. Note that Travel Time, Wait Time, Trip Distance, Cost of Journey are set values and are not dependent on these assumptions.

### ***Car Availability***

- 5.3.2 The decline in car ownership among young adults in the past ten years is likely to continue into the future given the recent government policies relating to climate change and vehicle emissions. The assumed levels of car availability within the forecast year model for the N6 GCRR are therefore viewed as conservative in terms of mode share predictions and provide a robust case for assessing the likely traffic impacts of the proposed road development. This conservative approach also allows for a robust assessment of air quality and noise impacts, as both of these assessments utilise the traffic forecasts.

### ***Parking***

- 5.3.3 Whilst the NPF population forecasts have been accounted for in the future year modelling, the reduction of car parking spaces at the origin or destination has not been modelled; rather the same level of parking provision at origin and destination is assumed. These assumptions are viewed as conservative and provide a robust case for assessing the likely traffic impacts of the proposed road development. The impact of this approach is that traffic numbers for assessments such as air and noise are robust but the mode share of private car tends to be higher than would be the case if increased parking restrictions were accounted for.

### ***Behavioural parameters***

- 5.3.4 It should be noted that the observed behaviours noted above have been assumed to remain constant over time. Notwithstanding this, recent changes in government policy, shaped by a national and global desire to reduce carbon emissions, is likely to change people's attitudes towards sustainable travel in the medium to long term. Therefore, the travel behaviour assumptions used in the future year modelling presented to date both in the EIAR and RFI Response are viewed as conservative and provide a robust case for assessing the likely traffic impacts of the proposed road development.

## **5.4 Response to Submissions**

Conservative assumptions have been adopted in the analysis of the proposed road development in order to provide a robust assessment of the likely traffic impacts arising from the proposed road development.

Recent changes in regional and national policy are likely to influence future travel behaviours resulting in more sustainable transport outcomes. Changes in car availability, car parking provision or people's travel behaviour will lead to a greater mode share for sustainable transport than was forecast in the EIAR.

## 6 Mode Share Results

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### 6.1 Submission context

6.1.1 Various assessments of mode share have been presented for various scenarios and differing population and employment forecasts. The initial presentation of data is in the Environmental Impact Assessment Report (EIAR). An update to this data is presented in the Request for Further Information (RFI) Response to address the revised population forecasts in the NPF. Further detail of the NPF scenarios is provided in the Traffic Statement of Evidence which subsequently generated further questioning. Clarity is provided in this section on the differing results presented to date.

### 6.2 EIAR Transport Assessment

6.2.1 For the purposes of preparing the Environmental Impact Assessment Report, the impact of the N6 GCRR was assessed as a stand-alone scheme (i.e. separate from GTS). The strategic and local transport impacts associated with the N6 GCRR are discussed, assessed and evaluated in Chapter 6 of the EIAR.

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

- Undertake a baseline review in relation to the existing traffic situation
- Undertake transport modelling to assess future year scenarios
- Evaluate transport modelling results
- Identify any transport 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

6.2.3 In addition to assessing the impacts of the N6 GCRR as a stand-alone scheme, the traffic assessment for the EIAR also documents the impacts of the N6 GCRR in place with all of the active travel, public transport and road infrastructure proposals included in the GTS. As the full implementation of the GTS is a 20-year strategy, this sensitivity test has only been carried out in the 2039 Design Year. Such a sensitivity test is required as the GTS could have the impact of increasing traffic volumes on the N6 GCRR due to displacement of traffic. Again, where proposed, mitigation measures are checked against this N6 GCRR+GTS Scenario

to ensure that adequate mitigation is provided for any significant negative traffic impacts.

6.2.4 In order to provide a robust assessment, several growth rate sensitivity tests (low, central and high growth) were modelled in the EIAR. These growth scenarios were based on the latest demographic forecasts available at the time and were provided by the NTA (low growth) and Transport Infrastructure Ireland (TII Central Growth and TII High Growth).

6.2.5 The EIAR evaluated the traffic impact of the N6 GCRR using the following key performance indicators:

- **Journey times on key routes** – to understand strategic impacts
- **Network statistics** – Network wide indicators of congestion and delay
- **Ratio of flow to capacity at key junctions** – to understand local impacts, congestion and queues

6.2.6 Changes in the forecast mode share because of the implementation of the N6 GCRR as a stand-alone project and in combination with the GTS were also reported.

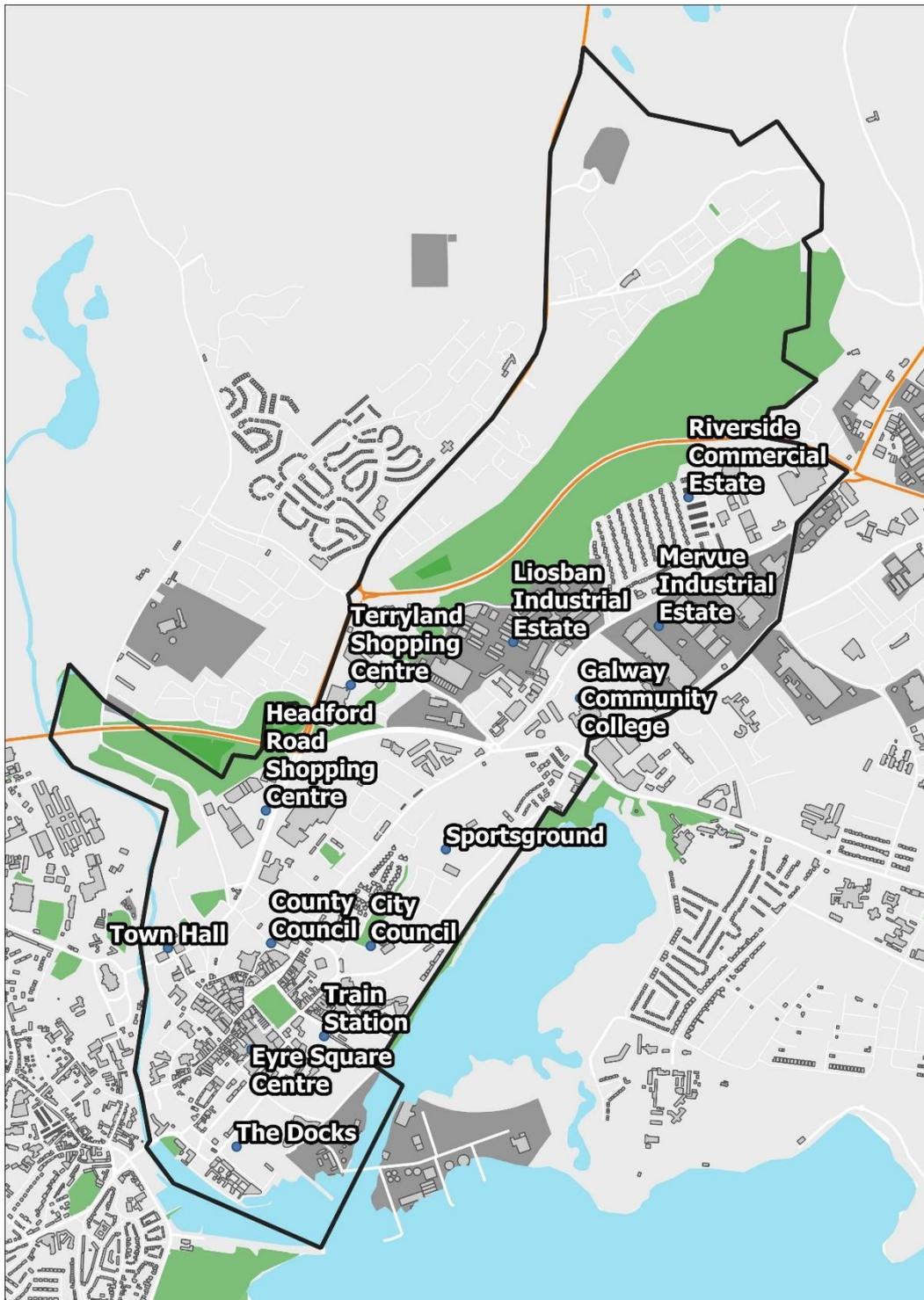
6.2.7 Additionally, traffic forecasts for each scenario were provided to various disciplines (Air, Noise & Climate) in order to determine the relative impacts of the scheme. High growth scenario forecast traffic flows were then used to determine what mitigation measures are necessary.

6.2.8 Table 6.32 in Chapter 6 of the EIAR 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 city centre over a 24-hour period for all trips made by all user classes.

#### **City Centre Area**

6.2.9 During the development of the NTA's WRM, Galway City was divided into 5 sectors. Galway City Centre is included in Sector 1 and reporting on city centre mode shares relates to trips in to, and out of, this sector over a 24-hour period. This city centre sector is illustrated in **Figure 16**.

Figure 16: EIAR City Centre Area



6.2.10 The base year and design year results from the EIAR are repeated in **Table 4** below. As the GTS sensitivity test results are only applicable to the 2039 scenario, the 2024 scenario has not been included in this table.

**Table 4: Mode Share Percentages for City Centre (extract from Table 6.32 of EIAR)**

Option	% Car	% Public Transport	% Walk	% Cycle
2012 Base Year	66.7%	3.9%	26.3%	3.1%
2039 Do-Minimum	67.4%	4.3%	25.2%	3.1%
2039 Do-Something N6 GCRR	68.6%	4.1%	24.5%	2.8%
2039 Do-Something N6 GCRR + GTS	67.3%	5.0%	24.9%	2.8%

- 6.2.11 Note the above table is also included as Table 6.5.1 in Appendix A.6.1 of the EIAR.
- 6.2.12 The mode share analysis shows that there is a low public transport mode share of just 4% in the Base Year. The impact of the Do-Something N6 GCRR option on mode share is minimal. 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 in 2039 as presented in the EIAR using the TII central growth forecast.
- 6.2.13 Since the completion of the EIAR, further work has been undertaken to assess the scheme. This additional work included a National Planning Framework (NPF) 2040 scenario to examine the impacts of the updated population and employment forecasts on the scheme. The NPF recognises the role that Galway and the other regional cities will play in providing a counter-weight to Dublin and assigned a population growth forecast of 50%-60% for Galway City. This compares to a population growth of only 14% for the city as presented in the TII central growth forecast contained in Chapter 6 of the EIAR.
- 6.2.14 The following section of this document presents the results of the NPF scenarios.

## 6.3 NPF Forecasts

### Clarification request

- 6.3.1 The RFI requested clarification on how traffic forecasts are likely to respond to the population growth targets contained in the NPF. The population growth forecast for Galway City under the NPF is approximately 55%, contrasting with a forecast of 22% for Galway County. A substantial proportion of the forecast population increase in Galway County is located in the Galway City Administrative Boundary Area as shown in **Figure 18**.

6.3.2 The following sections present the assumptions used in the NPF scenario tests and the resulting mode share forecasts. Finally, this section will analyse what impact changing national and local policy (such as the implementation of demand management) is likely to have on mode share forecasts.

### NPF Population and Employment Forecasts

6.3.3 To develop travel demand for the 2039 National Planning Framework (NPF) West Regional Model (WRM) scenarios, it was first necessary to prepare a Land Use Planning Spreadsheet containing population, employment and education forecasts for Galway City and County in 2039. To help determine the distribution of the forecast population and employment growth, members of the Galway City and County planning departments carried out a thorough review of the NPF forecasts at a local / street level. Using local knowledge, the planning departments were able to provide a further level of disaggregation using the following information:

- Existing planning applications (including SHDs)
- Existing land use zoning and plot ratios
- Existing & emerging policy

6.3.4 Using the information above, the planning teams refined the NPF demographic targets, attributing growth to areas earmarked for development, and established the final set of NPF planning assumptions which are significantly higher than present-day figures.

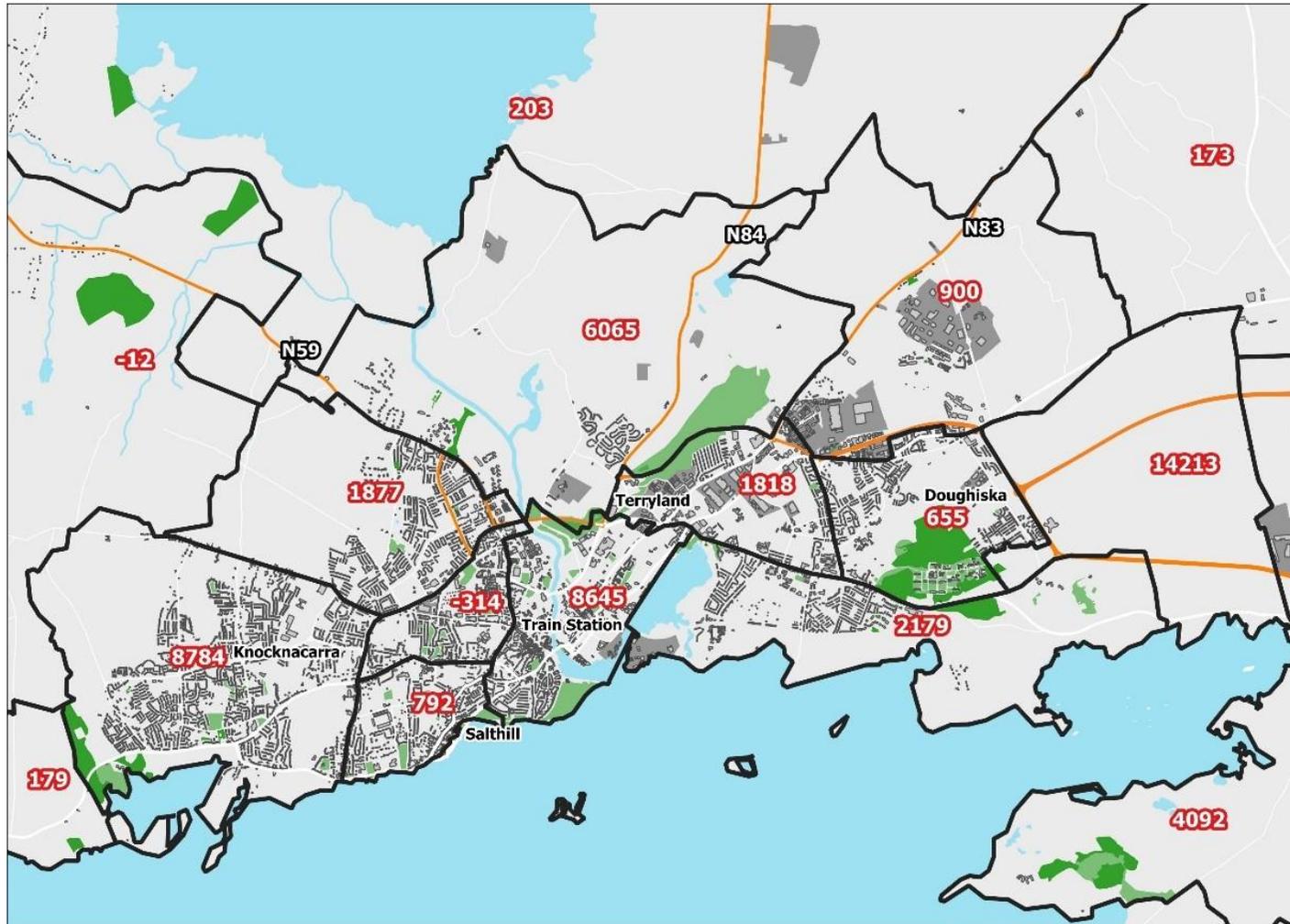
6.3.5 **Table 5** below outlines the 2016 and 2039 NPF population forecasts for Galway City and County.

**Table 5: Population Distribution**

Scenario	2016 Census	2039 NPF Forecasts	
		Total	% Increase from 2016
<b>2039 Galway City Population</b>	78,668	121,741	55%
<b>2039 Galway County Population</b>	179,390	218,459	22%
<b>Galway Total</b>	<b>258,058</b>	<b>340,200</b>	<b>32%</b>

6.3.6 **Figure 17** below illustrates the distribution of the additional city population (~43,000).

Figure 17: NPF 2039 City Population Growth



## NPF Mode Shares

6.3.7 As in the EIAR, the performance of the N6 GCRR, in the context of the higher NPF population and employment forecasts, was assessed using the following key performance indicators:

- **Journey times on key routes** – to understand strategic impacts
- **Network statistics** – Network wide indicators of congestion and delay
- **Ratio of flow to capacity at key junctions** – to understand local impacts, congestion and queues

6.3.8 Again, as in the EIAR, in addition to assessing the impacts of the N6 GCRR as a stand-alone scheme, the traffic assessment also documents the impacts of the N6 GCRR in place with all of the active travel, public transport and road infrastructure proposals included in the GTS and, again, mode share was reported in this part of the NPF traffic assessment.

6.3.9 It should be noted that, as per the Corrigendum submitted at the oral hearing, the mode share values contained within the RFI Response for the city centre area were not consistent with the city centre boundary used in the EIAR (and shown in **Figure 16** above). The corrected values, as presented in Andrew Archer’s Statement of Evidence on Traffic (Table 6 of the Traffic Statement of Evidence), are set out below.

**Table 6: NPF 24-hour City Centre Mode Share Percentages**

Option	% Car	% Public Transport	% Walk	% Cycle
2012 Base Year	66.7%	3.9%	26.3%	3.1%
<b>NPF Forecast</b>				
2039 Do-Minimum NPF Scenario	61.2%	5.4%	29.3%	4.1%
2039 Do-Something N6 GCRR NPF Scenario	64.1%	5.0%	27.6%	3.3%
2039 Do-Something N6 GCRR plus Galway Transport Strategy NPF Scenario	56.0%	6.8%	31.2%	6.0%

6.3.10 When comparing the 2039 Do-Minimum NPF Scenario to the 2039 Do-Something NPF N6 GCRR plus GTS Scenario, the results indicate:

- A 5.2% reduction in car travel in Galway City Centre down to 56%. This equates to a reduction of circa 7,300 car trips in the city centre per day
- A relative 26% increase in public transport use. This is an approximate increase of 2,000 public transport trips per day
- A relative 6% increase in the amount of walking. This equate to approximately 2,600 more walking trips
- A 46% relative increase in the number of people cycling, which is an increase of over 2,700 cycle trips per day compared to the Do-Minimum Scenario

6.3.11 In overall terms, the results show a general reduction in the mode share for car when comparing the EIAR and NPF scenario mode share results. This demonstrates the benefits of the NPF policy of locating the forecast population and jobs within the city centre and settlements easily served by public transport, and then the further improvement to the mode share that can be achieved through the full implementation of the GTS in tandem with this land use policy.

6.3.12 When analysing the mode share results, it is important to note that, for a variety of reasons, there is a considerable proportion of travel demand in Galway City which cannot be served efficiently by public transport, walking and cycling.

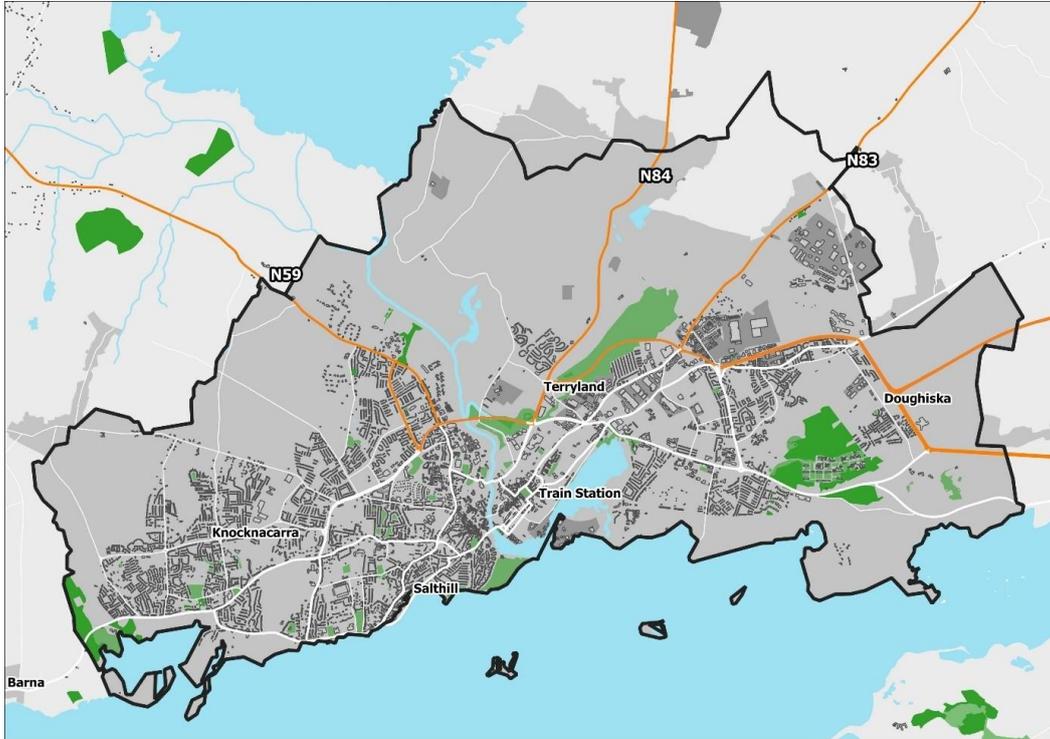
6.3.13 Currently 42% of all trips destined for Galway City (the Galway City administrative boundary) originate within Galway County. Whilst the NPF will concentrate a large proportion of the future population growth in urban centres and areas accessible by public transport, given Galway City's position as the primary employment centre for the region, this pattern can be expected to continue into the future.

6.3.14 Given the longer distances involved, these trips cannot be completed by walking or cycling. Furthermore, given the dispersed nature of these trips (i.e. they originate from all across the county as opposed to being concentrated in certain areas) it is not possible to provide for most of these trips by public transport in a manner that will make public transport a viable alternative to the private car.

6.3.15 The GTS is a transport strategy for all modes and provides the necessary capacity for those trips which can be made by public transport, walking and cycling and those which cannot, while at the same time allowing the city to grow by 50%. Further analysis of forecast travel patterns in the NPF GTS Scenario revealed that, within the Galway City Administrative Boundary Area shown in **Figure 18** below, car use is forecast to grow by 30% to 2039 whereas sustainable travel (walking, cycling + public transport) will grow by 60%. This shows that the

sustainable travel proposals contained with the GTS will be effective in targeting those trips capable of switching.

**Figure 18: Galway City Administrative Boundary Area**



## 6.4 Impacts of demand management on mode share

### Demand management and the GTS

6.4.1 Transport demand management measures attempt to manage people's travel rather than seeking to provide more physical capacity for travel. Transport demand management measures do, however, complement investment in sustainable transport infrastructure and can be used either to reduce the capacity for private vehicles or to provide priority in traffic for new or existing public transport services.

6.4.2 The Galway Transport Strategy outlines a number of Demand Management measures aimed at shifting the focus of travel within the city centre to walking, cycling and public transport. These demand management measures include:

- Concentrating future development in brownfield sites in the city centre (This was later reinforced through the Government's national planning framework)
- Controlling the availability and cost of parking in the city centre
- Development of mobility management plans for major employment centres

- Reduced parking standards for new developments that are located close to public transport corridors
  - Restricting traffic from certain streets
  - Removing a large proportion of on-street parking in the city centre to provide more priority for pedestrians, cyclists and public transport
- 6.4.3 Many of the demand management measures outlined above are also important objectives being delivered under the GTS and examples of such can be found in other projects being progressed by Galway City Council.
- 6.4.4 Increased levels of demand management in Galway City, as envisioned in the GTS, combined with behavioural changes in the way we travel at a national level (for example reduced levels of car ownership) will complement the infrastructure investment in the GTS. This will support the drive for more sustainable mode shares, resulting in an even greater proportion of the future population travelling by sustainable modes of transport.

### **Reduced Levels of Parking for New Development**

- 6.4.5 In addition to the travel demand measures set out in Smarter Travel, the *'Sustainable Urban Housing: Design Standards for New Apartments – Guidelines for Planning Authorities'* was published by the Department of Housing, Planning and Local Government in March 2018. The document provides direction for local authorities taking account of the current and future need for housing in line with the National Planning Framework (NPF) and Project Ireland 2040. The document outlines a number of Specific Planning Policy Requirements (SPPRs) which planning authorities and An Bórd Pleanála are required to apply in carrying out their functions.
- 6.4.6 Based on the NPF projections there is a need to build 550,000 new households nationally by 2040 to accommodate a 1 million person increase in population. The objective is for these new households to be located in as sustainable a location as possible within our towns and cities to address increasing pollution and commuting times and enable the state to feasibly provide and justify supporting infrastructure.
- 6.4.7 For large scale, higher density residential developments located within an accessible urban location the guidelines state that “the default policy is for car parking provision to be minimised, substantially reduced or wholly eliminated in certain circumstances.” The criteria for these locations is to be within a 15-minute walk of the city centre, 10-minute walk to rail or tram or 5-minute walk to high frequency (10min peak hour frequency) bus services.

6.4.8 As presented in the Planning & Policy and Traffic Statements of Evidence, recent large-scale proposed developments in the city centre, such as the Land Development Agency’s planned 1,000 residential development on Sandy Road, large scale Office/Retail development at Bonham Quay and the redevelopment of Céannt Station as a large mixed-use development, are aligned with these NPF sustainable development principles and will be delivering substantially lower levels of parking than currently exist in Galway City Council’s maximum parking standards. **Table 7** below outlines the amount of parking spaces permitted at these developments and the level of parking permissible under existing parking ratios for the city.

**Table 7: Parking Provision in New City Centre Developments**

Development	Parking Spaces Provided	Parking Spaces Permitted based on Development Plan Ratios	% below existing permitted ratios
Bonham Quay	131	687	80%
Céannt Station Redevelopment	572	1772	68%

### Mode Share with Reduced Parking

6.4.9 To demonstrate the potential impact of reduced levels of parking for new developments on mode share in Galway, a sensitivity test was carried out whereby the level of car ownership (a proxy for car parking at trip origins) was reduced by 50% for all new developments within Galway City in alignment with National Policy.

6.4.10 The results of this test are shown in the **Table 8** below. Again, these results are for the city centre area shown in **Figure 16** over a 24-hour period. This table shows that there will be a reduction of car mode share to 44.9% under the NPF growth assumptions when the N6 GCRR is combined with all other GTS measures including the stricter parking demand management measure. This compares to 56% without the parking management measure in place as presented in **Table 6** above.

**Table 8: 2039 NPF Galway City Centre Mode Share with Demand Management**

Option	% Car	% Public Transport	% Walk	% Cycle
2039 Do-Something N6 GCRR + GTS with 50% parking provision	44.9%	8.1%	41.6%	5.4%

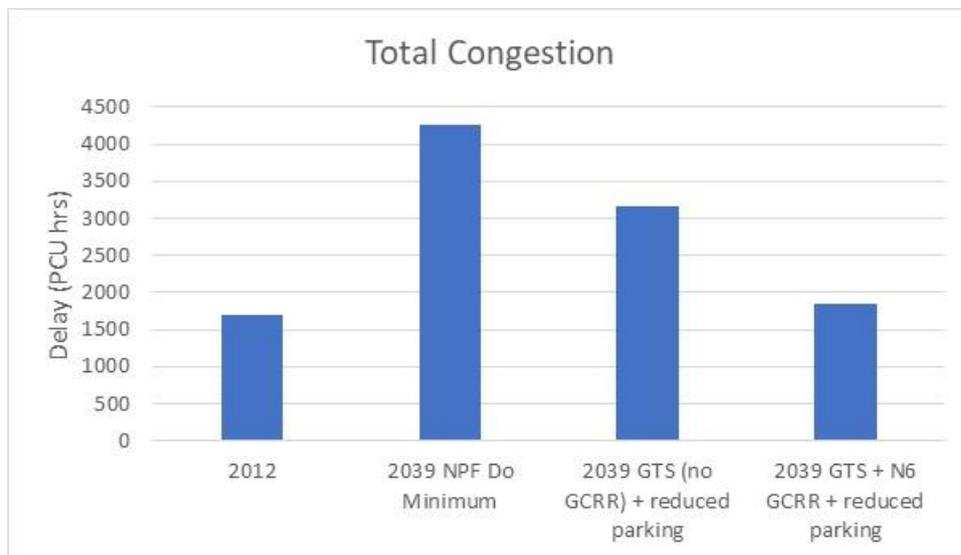
6.4.11 These mode share results show that provision of transport alternatives via the GTS measures provide the transport alternative to support the land use policy change envisaged in NPF. It is not one without the other as can be seen in the following sections on congestion.

6.4.12 The delivery of substantially reduced parking levels for new developments situated in close proximity to high capacity public transport corridors is recognised as an effective tool in encouraging sustainable travel and is enshrined in national policy. As evidence in **Table 7**, this guidance has been followed in Galway City in recent applications, and the City Council will continue to encourage the delivery of sustainable development in the future, aligned with national policy and best practice.

### 6.4.13 Congestion with Reduced Parking

6.4.14 **Figure 19** below compares total AM congestion across the Galway City administrative area (measured in total PCU hours) for the 2039 GTS scenario with and without the N6 GCRR in place and with the above reduced parking restrictions of 50% in all new developments in place.

**Figure 19: AM Galway City Administrative Boundary Area Congestion**



6.4.15 This analysis demonstrates that the implementation of the GTS, with the assumed reduction in parking provision, and without the N6 GCRR, will lead to some reduction in the total level of congestion on the network (25% reduction versus the Do-Minimum). However, this is 86% greater than the level of queuing and congestion that would be experienced in the base year scenario. Without the N6 GCRR in place, the key radial routes and N6 Bóthar na dTreabh will experience very high levels of congestion and queuing. This would ultimately result in isolation of areas of the city and county, leading to further relocation of activities away from the city core, reduction in the range of employment

opportunities and an overall reduction in the quality of life of the residents of the city. Additionally, this level of congestion would ultimately cause a sprawl of the population to well-connected towns outside of the city, such as Athenry, Oranmore and Tuam, making it more difficult to achieve the NPF objectives of compact growth within Galway City.

6.4.16 The introduction of the N6 GCRR with the assumed reduction in parking provision results in a much greater reduction in congestion when compared to the 2039 Do-Minimum scenario (55%+) and will result in a level of congestion comparable to the base year (2012). This is in the context of a 50% growth in population and clearly demonstrates the benefits of the proposed road development. Furthermore, this analysis shows that, even with the GTS and further parking restrictions in place, the proposed road development is required to reduce congestion, ensure journey time reliability for all modes, provide an attractive place to live and do business and support the growth aspirations of the city. In addition, the N6 GCRR will also have the following benefits:

- It will further reduce vehicular trips in the city centre
- It will further reduce HGV volumes in the city centre
- It will improve the connectivity between east and west of the city
- It will reduce harmful emissions in the city centre

## 6.5 Mode Share Results for Galway City

6.5.1 During the hearing, a number of queries were raised with respect to the impact of the proposed road development and GTS on mode share values for the entire city as well as the city centre. **Appendix A** of this document presents mode share results for Galway City Centre and Galway City Administrative Boundary Area for the following scenarios as presented in Section 7.2 – 7.4 above:

- 2039 – GTS -TII Central Growth Case Scenario (Used in EIAR)
- 2039 – GTS - National Planning Framework (NPF) Forecasts (Used in **RFI Response**)
- 2039- GTS - NPF forecasts with additional Parking Demand Management Measures in Place

6.5.2 In addition, **Appendix A** presents the following traffic summary results for the same scenarios:

- **Network statistics** – Network wide indicators for the Galway City and its environs
- **Journey times** on key routes – to understand strategic impacts

- **Ratio of flow to capacity at key junctions** – to understand local impacts, congestion and queues

## 6.6 Response to Submissions

This section and **Appendix A** provide clarity on the reporting of mode share forecasts presented in the EIAR and mode share forecasts with the NPF forecasts presented in the RFI.

The mode share analysis demonstrates the benefits of the NPF policy of locating the forecast population and jobs within the city centre and settlements easily served by public transport, and the further improvement to mode share that can be achieved through the full implementation of the GTS in tandem with this land use policy.

This section also demonstrates how the introduction of parking demand management in conjunction with the full implementation of the GTS will lead to a further increase in sustainable travel. Finally, analysis of forecasts levels of congestion in the city demonstrates that the N6 GCRR will still be required to serve future demand even with more sustainable levels of parking as envisaged in the NPF and GTS.

## 7 Compliance with National Policy

### 7.1 Submission content

7.1.1 This section sets out how the N6 GCRR as part of the GTS supports the delivery of Smarter Travel, and the National Planning Framework. In addition, the relevant goals outlined in the Climate Action Plan, 2019 are outlined and assessed.

### 7.2 Smarter Travel

7.2.1 In addition to Smarter Travel targets 1 and 2 described earlier, Smarter Travel policy also defines 5 key goals. Each of the goals are detailed in the table below along with a description of how the N6 GCRR and GTS meet these goals.

**Table 9: N6 GCRR and GTS Alignment with Smarter Travel**

Smarter Travel – Key Goals	N6 GCRR and GTS Response
<i>1. Improve quality of life and accessibility to transport for all and, in particular, for people with reduced mobility and those who may experience isolation due to lack of transport.</i>	<p>The N6 GCRR and GTS will result in substantially less delay across city network, delivering improved public transport performance, reduced journey times for all users including those on public transport and a considerable reduction in traffic in the city centre.</p> <p>The N6 GCRR and GTS will result in reduce levels of congestion and traffic in the city centre, creating a safe and healthier environment more conducive to walking and cycling.</p> <p>The result of all of these improvements will be a significantly improved environment for travel for all road users, improved accessibility throughout the city and an improved quality of life.</p>
<i>2. Improve economic competitiveness through maximising the efficiency of the transport system and alleviating congestion and infrastructural bottlenecks</i>	<p>The N6 GCRR and GTS will significantly reduce existing and forecast traffic congestion improving the efficiency and resilience of the transport network.</p> <p>The delivery of an efficient transport network will reduce social barriers to movement and improve the economic efficiency of Galway and the entire western region.</p>
<i>3. Minimise the negative impacts of transport on the local and global environment though reducing localised air pollutants and greenhouse gas emissions</i>	<p>The delivery of the N6 GCRR and GTS will reduce car traffic and HGV traffic in Galway city centre, resulting in improved air quality.</p> <p>The Galway Transport Strategy will involve a considerable investment in public transport, walking and cycling, which will result in increased trip making by sustainable modes particularly when delivered in tandem with the NPF planning policy and demand management measures.</p>

Smarter Travel – Key Goals	N6 GCRR and GTS Response
<p>4. <i>Reduce overall travel demand and commuting distances travelled by the private car</i></p>	<p>The full delivery of the GTS will provide an efficient transport network for all transport modes, thereby creating an attractive city - encouraging future populations and businesses to locate in the city in a compact form as envisioned by the NPF.</p> <p>The considerable investment in public transport, walking and cycling, will result in increased trip making by sustainable modes and will result in shorter trip lengths when delivered in tandem with the NPF planning policy.</p>
<p>5. <i>Improve security of energy supply by reducing dependency on imported fossil fuels.</i></p>	<p>As presented in the Climate Statement of Evidence, Section 7.2.23 &amp; 7.2.24, compact growth, enhanced regional accessibility, sustainable mobility and transition to a low carbon and climate resilient society are National Strategic Outcomes in the NPF and are underpinned by the strategic investment priorities in the National Development Plan (NDP). This planning framework is based upon compact connected urban growth to support ambitious growth targets in the four regional cities (including Galway) so that they become stronger accessible regional cities of scale.</p> <p>The NPF prefers a compact growth approach with a focus on the development of infill and brownfield sites to achieve a target of 50% of future housing being provided within the footprint of the existing built-up area in Galway. This development template together with the integration of transport and land use in the statutory development plans will facilitate the provision of improved public transport and other active modes thereby encouraging modal shift. The delivery of the Galway City Ring Road is listed as a key future growth enabler for Galway in the NPF.</p> <p>This compact growth settlement will ultimately result in shorter commutes and improved modal split which in turn reduces dependency on imported fossil fuels.</p>

## 7.3 Smarter Travel Mode Share Targets

7.3.1 In addition to the targets and goals mentioned above, the Smarter Travel Policy document also outlines mode share targets for various modes of transport. These targets include:

- Nationwide work-related commuting by car will be reduced from a current modal share of 65% to 45%;
- Car drivers will be accommodated on other modes such as walking, cycling, public transport and car sharing (to the extent that commuting by these modes will rise to 55% by 2020)

7.3.2 The mode share results contained in the EIAR and Section 6 of this document, have been presented over a 24-hour period, capturing all journey purposes throughout the day. To align with Smarter Travel policy, relating to commuting only, mode share results for the AM Peak Period (the busiest commuter period) are presented in **Appendix A**.

Tables 2 and 4 of this appendix show that the GTS with Parking Demand Management scenario result in a mode share for sustainable travel of 57.4% (42.6% for car) for the city centre and 47.9% (52.1% for car) for the Galway City Administrative Boundary Areas. This broadly aligns with Smarter Travel policy targets and represents a step change in sustainable travel within Galway City Centre and its environs.

## 7.4 National Planning Framework

7.4.1 The key strategic outcomes of the National Planning Framework are detailed in Table 11 below along with a description of how the N6 GCRR and GTS meet these outcomes as set out also in Appendix B to the Planning & Planning Context Statement of Evidence presented to the hearing earlier.

**Table 10: Strategic outcomes of the National Planning Framework**

Strategic Outcome	Provision of N6 GCRR
NS01 - Compact growth	The N6 GCRR provides the necessary infrastructure to attract traffic from the city centre zone and allow the city to grow to the necessary densification identified in the NPF. By tackling the city's congestion issues, it will provide a better quality of life for the city's inhabitants and a safer environment in which to live. By reducing the number of cars on the roads within the city centre and improving streetscapes, workers and students are facilitated to commute using multi-modal transport means. This includes travelling on foot, by bicycle and on the public transport system.
NS02 - Enhanced regional accessibility	The N6 GCRR provides a strategic route across the River Corrib without the need to go through the city. The road alignment and junction layout for the N6 GCRR have been designed to preserve the strategic function of the proposed road in the longer term and to ensure that the future accessibility requirements for the West Region, i.e. the county areas and hinterland beyond the city zone, are sustained at a level to support a safe and efficient service that will support a viable regional economy.
NS03 - Strengthened Rural Economies and Communities	As a Gateway to Connemara and the West Region, connectivity and accessibility to and through Galway City is essential in aiding the region to revitalise, improve and develop into the future. Accessibility and connectivity for areas within the county is of significant public interest and a key driver for this proposed road development.  Providing well developed transport links to the West Region, enables enterprises and the local economy of the west to grow and develop as a

Strategic Outcome	Provision of N6 GCRR
	<p>viable alternative to the east coast corridor which is of significant public interest at a national level. More sustainable and reliable infrastructure links to and from the Gaeltacht areas of the West Region, enables Irish language speakers to remain in their native areas out of choice, and develop its economy in a way that is both language and culture friendly. This can help redress the recent pattern of decline in population in such rural areas and support more sustainable communities. This is of public interest as it is of national interest to preserve our heritage including our native language, our first official language. Provision of reliable transport infrastructure also facilitates improved access to employment, education, vital services such as hospitals and amenities for all users.</p> <p>As outlined above, the proposed road development will support and encourage more sustainable travel with the reallocation of road space to walking, cycling and public transport and the extension of these networks into the county areas. This is of overriding public interest at a local level in Galway itself, but more importantly for the entire West Region as Galway is at the core of the region and needs to be able to function efficiently to serve the region.</p>
NS04 - Sustainable Mobility	<p>When considered within the wider context of the comprehensive suite of transportation measures in the GTS, the N6 GCRR will reduce congestion thereby reducing emissions and it will facilitate significant planned improvements in the public transport network and services as well as enhanced provision for active modes. The GTS and GCRR are necessary to address existing congestion and to provide for sustainable growth in the city region with future residential and employment development taking place within the footprint of the existing built-up area and on greenfield lands supported by the proper provision of public transportation, cycling and walking options.</p>
NS05 - A strong economy, supported by Enterprise, Innovation and Skills	Refer to response to NS02 and NS03.
NS06 - High quality international connectivity	<p>The N6 GCRR is of European importance given that the TEN-T comprehensive network designation extends west of the city to the terminus of the proposed road development and will provide a link to the West Region of the standard of a comprehensive route in accordance with TEN-T</p>
NS07 - Enhanced amenity and heritage	Refer to response to NS02 and NS03.

Strategic Outcome	Provision of N6 GCRR
NS08 - Transition to a low carbon and climate resilient society	The N6 GCRR, notwithstanding its scale, is one component in the overall integrated sustainable transport solution for Galway City and its environs. It facilitates the opportunity to develop and deliver more sustainable transport modes and in doing so is an integral part of the overarching GTS. The N6 GCRR attracts non-essential traffic from the city centre facilitating the reallocation of road space to more active and sustainable transport modes. It will also reduce traffic congestion and facilitate real improvements in public transport priority in the city centre. This will lead to the opportunity to have a modern, functioning public transport service with the associated improvements in terms of a more comprehensive network, integrated ticketing, increased frequency and more reliable journey time. The resulting cleaner safer environment in the city also supports a modal transfer from car transport to increased levels in walking and cycling. This is smarter travel with all components working together. Therefore, it is necessary to assess the entirety of the strategy for transport and all the associated measures rather than focus on the project as an isolated single component in the context of a discussion on carbon generation.
NS09 - Sustainable management of water and other environmental resources	The drainage of the existing road network, having evolved in a different era is not managed in a sustainable manner. In contrast the design for drainage provision on the N6 GCRR accords with best environmental practices and ensure that the associated drainage will secure sustainable management of water.
NS10 - Access to quality childcare, education and health services	Having an integrated transport strategy which includes the N6 GCRR enables increased and better access to facilities thereby contributing to an environment with more and better choices and flexible opportunities. This contributes to the promotion of increased social inclusion.

## 7.5 Climate Action Plan

7.5.1 The goals relevant to the N6 GCRR outlined in the Climate Action Plan, 2019 are detailed in **Table 11** along with a description of how the proposed road development relates to the Plan.

**Table 11: Relevant Goals of the Climate Action Plan 2019 and the N6 GCRR response**

Relevant Goal	N6 GCRR Response
Reduce CO <sub>2</sub> eq. emissions from the transport sector by 45–50% relative to 2030 pre-NDP projections	As outlined in the Statement of Evidence of Sinead Whyte, the proposed N6 GCRR is projected to result in an increase in 45,627 tonnes of CO <sub>2</sub> per annum in 2039. This is based on worst-case assumptions, excluding the Climate Action Plan 2019 projections for electric vehicle (EV) fleet. The provision of 840,000 EV by 2030 and the increased reliance on renewable energy sources, will have the effect of significantly reducing carbon emissions predicted due to the proposed road development.
Modal shift: <ul style="list-style-type: none"> <li>• Expand sustainable-travel measures</li> <li>• Promote compact growth</li> </ul>	<p>When considered within the wider context of the comprehensive suite of transportation measures in the Galway Transport Strategy (GTS), the N6 GCRR will reduce congestion thereby reducing emissions and it will facilitate significant planned improvements in the public transport network and services as well as enhanced provision for active modes. The GTS is necessary to address existing congestion and to provide for sustainable growth in the city region with future residential and employment development taking place within the footprint of the existing built-up area and on greenfield lands supported by the proper provision of public transportation, cycling and walking options.</p> <p>The N6 GCRR provides the necessary infrastructure to attract traffic from the city centre zone and allow the city to grow to the necessary densification identified in the NPF. By tackling the city's congestion issues, it will provide a better quality of life for the city's inhabitants and a safer environment in which to live. By reducing the number of cars on the roads within the city centre and improving streetscapes, workers and students are facilitated to commute using multi-modal transport means. This includes travelling on foot, by bicycle and on the public transport system.</p>
Introduce legislation to ban the sale of new fossil fuel cars from 2030 and to stop the granting of NCTs from 2045.	The ban of sale of fossil fuel cars and the stop in granting of NCT in 2045 will have the effect of full transfer to EV or biofuels. In addition, the Plan includes a commitment to ensure that ESB Networks and EirGrid plan network and deliver on connecting renewable energy sources to meet the 2030 70% RES-E target. This will have the effect of significantly reducing carbon emissions from the operation of the proposed road development.

Relevant Goal	N6 GCRR Response
Increase the use of biofuels to contribute to the growth of renewable energy and reduction of greenhouse gas emissions in the transport sector	The increased use of biofuels will have the effect of reducing carbon emissions from the operation of the proposed road development.

7.5.2 This section responds to a number of queries raised on the projected increase in carbon emissions due to the proposed road development and the potential implications for Ireland's climatic obligations.

7.5.3 Contrary to the comments made by Catherine Connolly TD, a detailed assessment of the potential impact of the proposed road development on carbon and climate is included in the N6 GCRR EIAR with an update included in the Statement of Evidence of Sinead Whyte (20 February 2020). This Statement includes reference to the climate and biodiversity emergency of May 2019 as well as other recent relevant publications. Since the adjournment of the oral hearing in March 2020, the Supreme Court quashed the National Mitigation Plan in July 2020. Mitigation measures to reduce carbon generation outlined in the EIAR and updated in the Statement of Evidence of Sinead Whyte, are not reliant on the National Mitigation Plan and therefore the quashing of the Plan has no relevance to the climate assessment for the proposed N6 GCRR development.

7.5.4 On 7 October 2020, the Climate Action and Low Carbon Development (Amendment) Bill was published to amend the Climate Action and Low Carbon Development Act 2015. The Bill commits Ireland in law to move to a climate resilient and climate neutral economy by 2050. The Bill includes the following key elements:

- Establishes a 2050 emissions target of net zero;
- Introduces system of successive 5-year, economy-wide carbon budgets starting in 2021;
- Strengthens the role of the Climate Change Advisory Council in proposing carbon budgets;
- Introduces a requirement to annually revise the Climate Action Plan and prepare a National Long Term Climate Action Strategy at least every decade. The 2019 Climate Action Plan will replace the former National Mitigation Plan, and will be annually revised starting next year;
- Introduces a requirement for all Local Authorities to prepare individual Climate Action Plans which will include both mitigation and adaptation measures.

7.5.5 As outlined in the Statements of Evidence of Sinead Whyte and Eileen McCarthy (18 February 2020), measures are proposed to mitigate the generation of carbon during the construction and operational phases including:

- A reduction of approximately 123,000 tonnes of CO<sub>2</sub> from that reported in the EIAR by specifying of the use of low carbon concrete as well as other changes;
- Reduction of tunnel lengths;
- Removal of cut and cover tunnel at Briarhill;
- Sourcing construction materials locally;
- Rock crushing will be undertaken on site where possible, to reduce the requirement to import crushed stone to site;
- Full implementation of the Construction Traffic Management Plan which will minimise congestion and encourage car sharing and the use of public transport.

7.5.6 The Statement of Evidence of Sinead Whyte states that the proposed N6 GCRR is projected to result in an increase in 45,627 tonnes of CO<sub>2</sub> per annum in 2039. This is based on worst-case assumptions, excluding the Climate Action Plan projections for electric vehicle (EV) fleet. The provision of 840,000 EV by 2030 and the increased reliance on renewable energy sources, will have the effect of significantly reducing carbon emissions predicted due to the operation of the proposed road development.

7.5.7 In July 2020, the Environmental Protection Agency (EPA), updated Ireland's greenhouse gas emissions projections to 2040. Under the "With Additional Measures" scenario, transport emissions are projected to decrease by 37.8% over the period 2019 to 2030. This scenario assumes the implementation of the measures outlined in the 2019 Climate Action Plan. In addition, by 2030 it is estimated that renewable energy generation increases to approximately 70% of electricity consumption. The report concludes that, Ireland will meet its 2030 target under the Effort Sharing Regulation as long as there is early and full implementation of the Climate Action Plan measures.

## 7.6 Response to Submissions

The proposed N6 GCRR complies with Smarter Travel in that it supports the integration of land use and transport policy supporting compact growth as set out in the NPF. Compact growth will lead to a smaller denser city over time that makes it easier to deliver Smarter Travel including walking, cycling and public transport. This project aims to deliver a network that delivers more space for walking, cycling and public transport and enables shorter more direct journeys which aligns with the NPF.

The goals outlined in the Climate Action Plan will have the effect of significantly reducing carbon emissions predicted due to the proposed N6 GCRR through the increase in EVs and other measures.

## 8 COVID-19 Sensitivity Test

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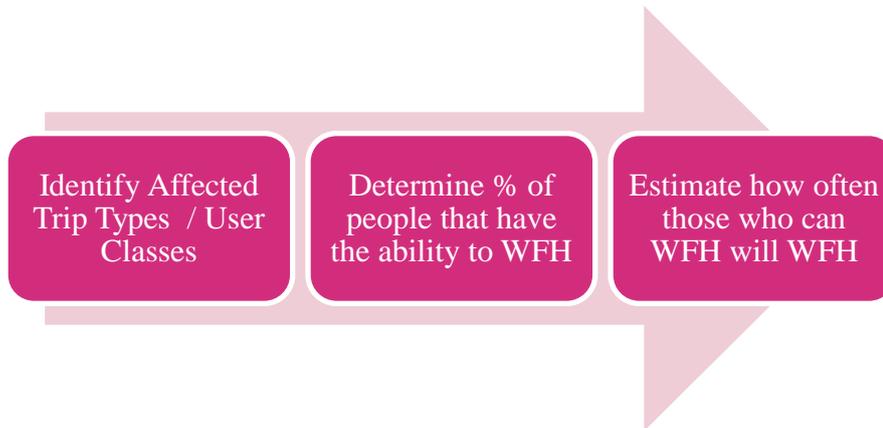
### 8.1 Introduction

- 8.1.1 As a result of the pandemic, working from home has become normal practice for many people in Ireland. In a post-Covid environment it is expected that many people will chose to carry on this trend either regularly or occasionally.
- 8.1.2 Whilst the likely medium and long-term effects of the Covid pandemic on future travel behaviours is difficult to predict, sensitivity testing can be undertaken to predict a potential likely outcome based on a review of various travel user needs and their potential travel preferences.
- 8.1.3 This section of the report identifies those people whose working circumstances allow them to work remotely and subsequently estimates what proportion of these people may do so in the future and for how often.

### 8.2 Estimating impact of home working on future travel demand

- 8.2.1 At this stage it is not feasible to accurately predict whether travel behaviours will return to ‘normal’ in the post-pandemic world, or to what degree aspects of our current travel behaviours will remain permanently changed. Notwithstanding this, the project team have undertaken some analysis in order to provide a high level estimation of the potential medium to long-term impacts of the pandemic on travel behaviours in Galway based on CSO information on journey purposes and employee trips, in addition to attitudinal surveys which gauge the impacts of Covid 19 on travel behaviours. For this reason, the post-Covid travel behaviours presented below should be viewed as a sensitivity test presenting a potential outcome and not a single definitive forecast
- 8.2.2 The methodology used to estimate this impact on travel demand in the future includes the following steps:
- 8.2.3 **Step 1:** Identify the trip types (e.g. commuting and business) which may be affected by changes in working patterns. This has been done by examining the various trip “user classes” in the design year traffic model.
- 8.2.4 **Step 2:** Determine what proportion of affected trip types/ user classes will have the ability to work from home (WFH). This has been done by examining census data relating to job type in Galway City and County.

- 8.2.5 **Step 3:** Estimate how often those who can work from home, will work from home. This has been done using the results of attitudinal surveys carried out during the Covid-19 Pandemic.



### Step 1 – Identifying affected Trip Types

- 8.2.6 Work trips / commuting trips are only one of the many trip types which occur on the transport network. The WRM which has been used to assess the impacts of the N6 GCRR breaks down traffic on the road network into the following User Classes:

1. Taxi
2. Business trips – Travel for business purposes e.g. face to face meetings
3. Commuting trips – Trips from home to work
4. “Other trips” - Made up of several trip categories including Education trips (parent dropping a child to school), Food shopping trips, Visits to friends/relatives and trips made by retired people
5. Freight – Trips that involve the transport of goods, produce etc. by light and heavy goods vehicles

- 8.2.7 In a post-pandemic environment, it is assumed that User Classes 1, 4, and 5 will not substantially change travel habits. For example, school children will still attend schools, people will visit friends/relatives, delivery vehicles will still be required to deliver freight etc. Consequently, only the following user classes will be substantially impacted by increased home working:

- 2: Business trips
- 3: Commuting trips

- 8.2.8 The table below outlines the pre-Covid traffic demand across the entire WRM in the AM peak hour for each user class. The forecast traffic flows for the design year (2039) of the N6 GCRR Do-Something scenario which was reported on by SYSTRA as part of the Further

Information request following the publication of the National Planning Framework (NPF) was used in this analysis.

**Table 12: Traffic Demand pre-Covid in the AM peak hour**

User Class	Pre-Covid
1	3,634
2	7,512
3	54,116
4	108,420
5	7,595
Total	181,278

8.2.9 The total traffic demand in the AM peak hour across the model network is 181,278. Since User Classes 1, 4 and 5 are expected to remain largely unchanged post-Covid, this means that 119,649 trips (66% of total trips on the network) will be largely unaffected by any changes to the level of home working.

8.2.10 Approximately 34% (61,628) will be impacted by increased levels of home working. This 34% is comprised of:

- Business Trips (User Class 2): 7,512
- Commuting Trips (User Class 3): 54,116

## Step 2: Ability to Work from Home

8.2.11 As part of the 2016 Census, residents were asked to fill in their occupation under several headings. The results for both Galway City and Galway County (County plus City) are stated below.

**Table 13: Occupation Split of Workers in Galway (2016 Census)**

Occupation	City	County	City (%)	County (%)
Managers, directors and senior officials	2,519	8,332	7%	7%
Professional occupations	8,789	23,921	25%	21%
Associate professional and technical occupations	4,427	12,536	13%	11%
Administrative and secretarial occupations	3,388	11,035	10%	10%
Skilled trades occupations	3,100	18,216	9%	16%

Occupation	City	County	City (%)	County (%)
Caring, leisure and other service occupations	2,369	8,936	7%	8%
Sales and customer service occupations	3,034	7,504	9%	7%
Process, plant and machine operatives	3,131	11,595	9%	10%
Elementary occupations	3,857	9,844	11%	9%
<b>Total</b>	<b>34,614</b>	<b>111,919</b>	-	-

8.2.12 From the table above it has been assumed that the following occupations could not work remotely to perform their roles and therefore won't change their travel patterns post-Covid:

- Skilled trade occupations
- Caring, leisure and other service occupations
- Process, plant and machine operatives
- Elementary occupations

8.2.13 Through adding the percentages of the remaining occupations, it was estimated that in the city of Galway, 64% of workers have the potential to work remotely in the future. This reduces to 57% if looking at the county as a whole. For the purposes of preparing a robust assessment we have assumed 64% have the ability to work from home in the remainder of our analysis. This is considered a very conservative assessment, as in reality a number of professions (for example office administration staff working within the health sector or manufacturing) will still be required to travel to their place of work to support on-site operations.

### Step 3 - Estimating how often people will work from home

#### Commuting Trips

8.2.14 A travel behaviour and attitude survey of office workers administered by SYSTRA in the UK in June, prior to the introduction of Covid-19 restrictions, found that respondents were making commuting journeys (i.e. not working from home) 84% of their working days before the introduction of Covid-19 restrictions.

8.2.15 Once all restrictions are lifted (in a post-Covid environment), respondents predict making commuting journeys on 50% of their

working days, equivalent to a 34% reduction in all commuting journeys carried out by office workers.

- 8.2.16 By combining this data with the Census data, we can estimate the percentage of the total workforce who might work from home once the pandemic has past.

### **Business Trips**

- 8.2.17 A separate series of monthly surveys undertaken by SYSTRA in Scotland is seeking to better understand changes in travel behaviour and attitudes during the pandemic, along with the anticipated changes post-Covid. The most recent surveys at the time of writing were undertaken in September. As part of the surveys, working respondents were asked about their expectations regarding business meetings post-Covid.

- 8.2.18 Before Covid-19 restrictions, a third (34%) of working respondents took part in business meetings, with the majority (61%) travelling to attend between one and four business meetings in an average month.

- 8.2.19 Following the Covid pandemic, 32% expect that virtual meetings will replace all face to face business meetings. 52% expect that virtual meetings will replace some but not all face to face meetings. Of this 52% we have assumed that one half of trips will be replaced by virtual meetings. This would match the results of the previous online survey in section 8.2.15 which stated that respondents predict making commuting trips on 50% of their work days.

- 8.2.20 In total, the results of this survey indicate that approximately 55% of all face to face meetings could be replaced by virtual meetings post-Covid. This reduction has been applied to the business trip user class.

### **Post-Covid Changes to Travel Demand**

- 8.2.21 In summary, the aforementioned analysis finds that:

- 66% of all trips will be unaffected by changes in Home working post Covid-19;
- Of the 34% of trips which are affected, 64% of trips can work from home;
- Of this 64%, daily commuting trips are likely to reduce by approx. 34% on average post Covid-19;
- 55% of business trips will be replaced by virtual meetings

- 8.2.22 The following table shows the changes in traffic demand in the AM peak hour (across the entire model area) post-Covid by incorporating the assumptions on changes to working patterns outlined above.

**Table 14: Estimated Traffic Demand Changes Post-Covid in the AM peak hour**

User Class	Pre-Covid	Post-Covid	Difference	Difference (%)
1	3,634	3,634	-	0%
2	7,512	3,380	4,132	55%
3	54,116	41,913	12,203	23%
4	108,420	108,420	-	0%
5	7,595	7,595	-	0%
<b>Total</b>	<b>181,278</b>	<b>164,943</b>	<b>16,335</b>	<b>9%</b>

8.2.23 The results show a 55% drop in business trips (User Class 2) and a 23% drop in commuting trips (User Class 3). All of this combines to produce a 9% drop in traffic across the entire region post-Covid.

8.2.24 Further details on the analysis outlined above, and underpinning assumptions, are outlined in **Appendix B** of this report.

### 8.3 Implications for N6 GCRR Appraisal

8.3.1 As noted previously, the long-term effects of the Covid pandemic on future travel behaviours is difficult to accurately predict. Therefore, the post-Covid travel behaviours presented in the report should be viewed as a sensitivity test, similar to the various land use forecasts presented in the EIAR and Request for Further Information Response which have included:

- Low Growth Scenario (EIAR);
- TII Central Case Scenario (EIAR);
- High growth scenario (EIAR); and
- NPF Scenario.

8.3.2 The Covid sensitivity assessment outlined above has indicated that the long-term impact of the pandemic could potentially influence travel behaviours and reduce demand for travel by up to 9% as a result of increase working from home.

8.3.3 Through the lifetime of the project, a number of forecast growth scenarios have been assessed, as outlined above. The demographic assumptions used in the central case scenario for the EIAR result in a 20% increase in traffic on the network between 2012 and 2039, whilst the current NPF demographic forecast results in a 32% increase in traffic on the road network over the same period.

8.3.4 Viewed in the context of these forecast growth ranges, the impacts of the Covid pandemic will not alter the outcome of the appraisal to date,

demonstrating the need for the full implementation of the GTS to support the sustainable growth of the city.

## 9 Specific Questions raised in Module 2

9.1.1 The preceding text is designed to outline the background to the traffic modelling undertaken on the N6 GCRR. Specific questions were raised in presentations and submissions in respect of the traffic modelling and these are tabulated with the answers below for ease of reference.

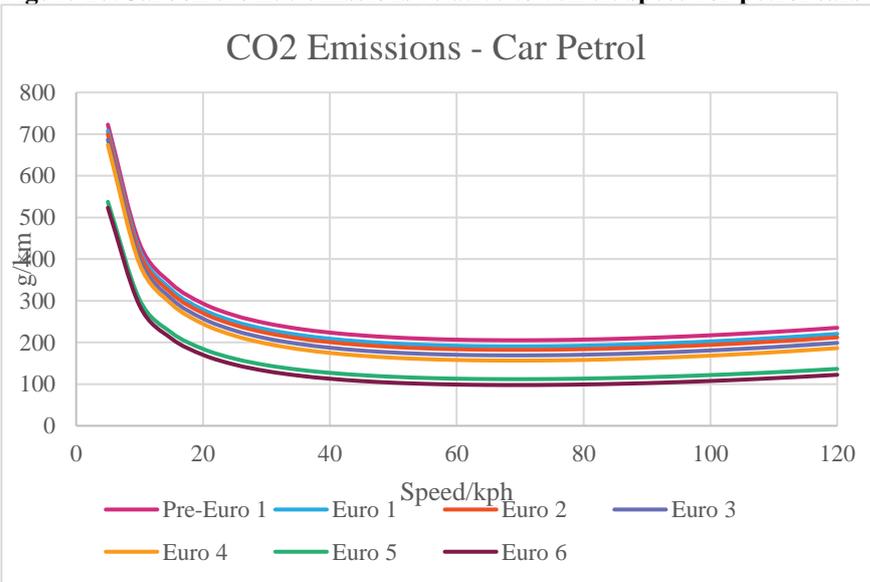
### 9.2 Submission queries by Mr Mulligan

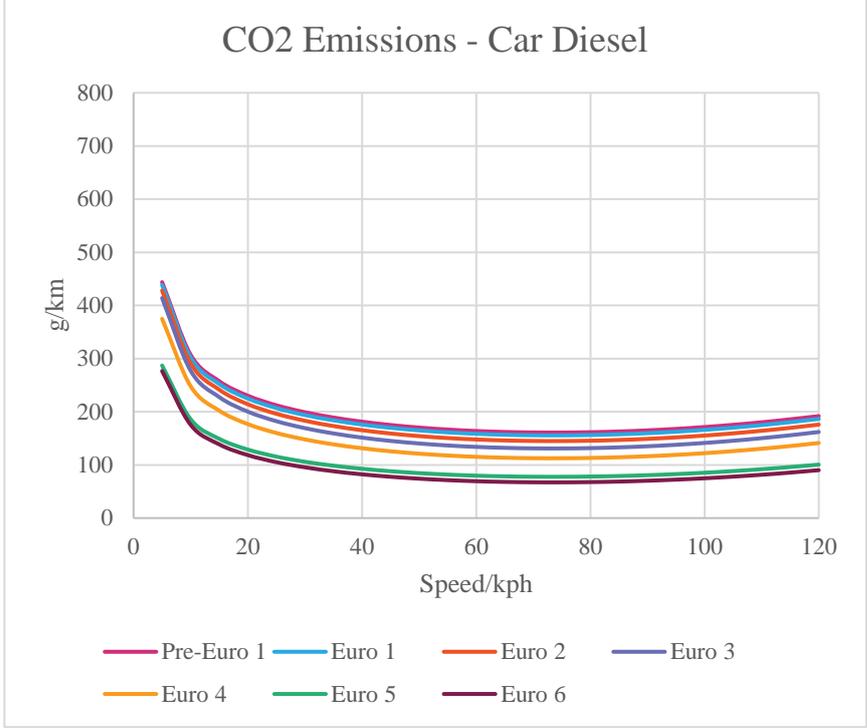
**Table 15: Brendan Mulligan’s Questions and Answers**

Ref. No.	Issue and Response
<b>Q1</b>	Page 11. Have these additional car parking provisions (at Bonham Quay, Ceannt Station and Crown Square) been factored into the model?
<b>A1</b>	<p>As outlined in Section 6.3, a significant growth in population and employment has been accounted for in the future year modelling and appraisal of the scheme, aligned with the forecasts set out in the National Planning Framework (NPF). The named developments are included in this.</p> <p>The modelling has assumed that car availability (level of car parking for residents) and car parking spaces at the destination (e.g. the level of parking for employees) will be consistent with existing levels of provision. As explained in the preceding sections, this is a conservative assumption as newer developments, such as Bonham Quay, will have a lower level of parking provision than existing standards.</p>
<b>Q2</b>	Page 13: What is the boundary of the city centre in relation to Table 8.8?
<b>A2</b>	<b>Figure 16</b> above shows the relevant boundary of the City Centre.
<b>Q3</b>	Page 13: What year do the figures in Table 8.8 relate to?
<b>A3</b>	2039
<b>Q4</b>	Page 13: "It is stated that 'This aligns with Smarter Travel Policy'. While there is a predicted reduction in private car mode share from 69% to 61%, it is still remarkably higher than the Smarter Travel 2009 target of 45%. So, how does it align with the Smarter Travel policy?"
<b>A4</b>	The comparison referenced in this instance is the TII Central Case with the NPF Scenario. The population growth is 14% for Galway City as presented in the TII central growth forecast whereas the population growth forecast for Galway City in the NPF scenario is 55% (refer to Table 5 above). This comparison demonstrates that when the population is concentrated in the urban area, then the private car share mode decreases. This aligns directly with the key targets of Smarter Travel

Ref. No.	Issue and Response
	which are that land use and transport planning must be aligned to achieve a sustainable transport.
<b>Q5</b>	Page 13: “It is remarkable that having provided a network of cycle lanes as provided for in the GTS that the mode share for cycling remains at 3%. Compare this 3% cycle mode share, after constructing the N6 GCRR and implementing the GTS, to the ‘Bicycle Account 2018’ report that in 2018 28% of all trips to, from and in Copenhagen were by cycling. Why is it that the cycling mode share remain at such a low 3%?”
<b>A5</b>	<p>The implementation of the GTS, in tandem with the National Planning framework population and planning assumptions, will lead to a doubling of the mode share for cycling when compared to present day levels (up from 3.1% in the base year to 6% in the 2039 GTS scenario).</p> <p>Comparison of the 2039 Do-Minimum and 2039 Do-GTS Scenarios shows that the implementation of cycling proposals within the GTS will lead to an increase in the mode share for cycling from 4.1% to 6%. This amounts to an extra 2,700 cycle trips per day taking place within the city centre sector illustrated in <b>Figure 16</b>.</p> <p>The implementation of the full GTS; including a network of safe walking and cycling routes, reduction in city centre traffic volumes and an enhanced public realm in the city, will result in a substantial increase in active travel in the city, with combined walking and cycling mode share rising from 33.4% in the Do-Minimum Scenario to 37.2% in the Do-GTS Scenario which equates to an additional 5,300 trips taking place by active mode in the city centre sector shown in <b>Figure 16</b>.</p>
<b>Q6</b>	Page 13: “While there is a predicted growth of 50% in public transport mode share from 4% to 6% it is still very low at 6% given that the GTS provides for more dedicated bus lanes. Why is that?”
<b>A6</b>	<p>Public transport trips to and from the city centre are forecast to increase from 3.9% of all trips in the base year to 6.8% in the 2039 GTS scenario.</p> <p>Comparison of the 2039 Do-Minimum and Do-GTS Scenarios shows an absolute increase of approximately 2,000 Public Transport trips per day taking place within the city centre following the implementation of the GTS public transport proposals.</p> <p>Notwithstanding the above, when analysing the mode share results for public transport, it is important to note that, for a variety of reasons, there is a considerable proportion of travel demand in Galway City which cannot be served efficiently by public transport. For example, currently 42% of all trips destined for Galway City originate within Galway County. Whilst the NPF will concentrate a large proportion of the future population growth in urban centres and areas accessible by public transport, given Galway City’s position as the primary employment centre for the region, this pattern can be expected to continue into the future. Given the longer distances involved, these trips cannot be completed by walking or cycling. Furthermore, given the dispersed nature of these trips (i.e. they originate from all</p>

Ref. No.	Issue and Response
	<p>across the county as opposed to being concentrated in certain areas) it is not possible to provide for these trips by public transport in a manner that will make public transport a viable alternative to the private car.</p> <p>The GTS is a transport strategy for all modes and provides the necessary capacity for those trips which can be made by public transport, walking and cycling and those which cannot, while at the same time allowing the city to grow by 50%. Further analysis of forecast travel patterns revealed that, within the Galway City Administrative Boundary Area shown in <b>Figure 18</b>, car use is forecast to grow by 30% to 2039 whereas sustainable travel (walking, cycling + public transport) will grow by 60%. This shows that the sustainable travel proposals contained with the GTS will be effective in targeting those trips capable of switching.</p>
<b>Q7</b>	Page 14: “Have the number of car parking spaces been factored into the model?”
<b>A7</b>	<p>The existing level of parking is included in the WRM. As mentioned above, and as outlined in Section 6.3, a significant growth in population and employment has been accounted for in the future year modelling and appraisal of the scheme, aligned with the forecasts set out in the National Planning Framework (NPF).</p> <p>The modelling has assumed that car availability (level of car parking for residents) and car parking spaces at the destination (e.g. the level of parking for employees) will be consistent with existing levels of provision.</p>
<b>Q8</b>	Page 14: “Is this why the car mode share remains so high in spite of all the bus lanes and the cycle network proposed and the concentration of so much of the growth of the population in a future compact city?”
<b>A8</b>	As outlined in Section 5.2, the mode of transport chosen for a particular trip is influenced by several factors. One important factor is the availability of car parking which makes travel by private car an attractive option. The analysis in Section 6.4 demonstrates that a reduction in the level of parking, in line with current policy, will result in an increased mode share for sustainable modes of travel.
<b>Q9</b>	From a handwritten note: “There has been talk of Park and Ride for 10 years or more. I would like to ask the applicant have Park and Ride sites been identified and investigated and has a determination been made that they would be suitable?”
<b>A9</b>	<p>The delivery of Park and Ride sites are a key element of the GTS. A park and ride location analysis (included in Appendix E to the GTS) was undertaken to provide recommendations on suitable best practice and policies for Galway and also to identify possible areas within Galway City and its Environs where P&amp;R facilities may be suitable.</p> <p>On the basis of the analysis undertaken, and taking into consideration the criteria for a successful P&amp;R, the study highlighted three potential park &amp; ride locations:</p> <ul style="list-style-type: none"> <li>- N17 (N83);</li> </ul>

Ref. No.	Issue and Response																																																																
	<ul style="list-style-type: none"> <li>- M6; and</li> <li>- Western Distributor Road / Bearna Road.</li> </ul> <p>Additionally, the NTA have recently set up a Park and Ride project office with the specific goal of determining the exact locations and design of Park and Ride sites in Dublin and the Regional Cities.</p>																																																																
<b>Q10</b>	Page 16: "Have the CO <sub>2e</sub> emissions been calculated on the basis that vehicles will be travelling at the posted speed limit of 100km/hr on the motorway section of the proposed road development?"																																																																
<b>A10</b>	Yes																																																																
<b>Comment</b>	Comment: Sinead Whyte might also wish to reconsider her answer that the increase in emissions from (fossil fuelled) vehicles travelling at an average of 120km/hr would be negligible relative to (fossil fuelled) vehicles traveling at an average speed of 100km/hr.																																																																
<b>Answer</b>	<p>Carbon dioxide emissions curves are provided below in <b>Figure 20</b> for petrol cars and <b>Figure 21</b> for diesel cars based on TRL Vehicle emissions equations as published by the UK Department of Transport.</p> <p>As stated at the hearing, the level of emissions at 100kph is similar to the level of emissions at 120kph particularly for the more modern fleet, therefore a negligible increase is expected at a higher speed.</p> <p><b>Figure 20: Carbon dioxide emissions relative to vehicle speed for petrol cars</b></p>  <table border="1"> <caption>Approximate CO2 Emissions (g/km) for Petrol Cars</caption> <thead> <tr> <th>Speed (kph)</th> <th>Pre-Euro 1</th> <th>Euro 1</th> <th>Euro 2</th> <th>Euro 3</th> <th>Euro 4</th> <th>Euro 5</th> <th>Euro 6</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>700</td> <td>650</td> <td>600</td> <td>550</td> <td>500</td> <td>450</td> <td>400</td> </tr> <tr> <td>20</td> <td>350</td> <td>300</td> <td>250</td> <td>200</td> <td>180</td> <td>150</td> <td>120</td> </tr> <tr> <td>40</td> <td>250</td> <td>200</td> <td>180</td> <td>150</td> <td>130</td> <td>110</td> <td>90</td> </tr> <tr> <td>60</td> <td>220</td> <td>180</td> <td>160</td> <td>140</td> <td>120</td> <td>100</td> <td>80</td> </tr> <tr> <td>80</td> <td>210</td> <td>170</td> <td>150</td> <td>130</td> <td>110</td> <td>90</td> <td>70</td> </tr> <tr> <td>100</td> <td>210</td> <td>170</td> <td>150</td> <td>130</td> <td>110</td> <td>90</td> <td>70</td> </tr> <tr> <td>120</td> <td>220</td> <td>180</td> <td>160</td> <td>140</td> <td>120</td> <td>100</td> <td>80</td> </tr> </tbody> </table>	Speed (kph)	Pre-Euro 1	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6	0	700	650	600	550	500	450	400	20	350	300	250	200	180	150	120	40	250	200	180	150	130	110	90	60	220	180	160	140	120	100	80	80	210	170	150	130	110	90	70	100	210	170	150	130	110	90	70	120	220	180	160	140	120	100	80
Speed (kph)	Pre-Euro 1	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6																																																										
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Ref. No.	Issue and Response
	<p data-bbox="419 436 1286 465"><b>Figure 21: Carbon dioxide emissions relative to vehicle speed for diesel cars</b></p>  <p data-bbox="419 488 1286 521"><b>CO2 Emissions - Car Diesel</b></p> <p data-bbox="419 544 1286 1070">The graph plots CO2 emissions (g/km) on the y-axis (0 to 800) against Speed (kph) on the x-axis (0 to 120). The legend identifies the following Euro standards: Pre-Euro 1 (pink), Euro 1 (light blue), Euro 2 (orange), Euro 3 (dark blue), Euro 4 (yellow), Euro 5 (green), and Euro 6 (maroon). Emissions generally decrease as speed increases from 0 to 20 kph and then stabilize or slightly increase at 120 kph. Euro 6 consistently shows the lowest emissions, while Pre-Euro 1 shows the highest.</p>
<b>Q11</b>	From handwritten note: “Does Table 3.10 in the Business Case relate to the City Centre.”
<b>A11</b>	Yes. Table 3.10 relates to the City Centre as shown on <b>Figure 16</b> above.
<b>Q12</b>	Page 19: “Perhaps the applicant could advise if the Business Case has been revised to take account of all the changes in the GHG emissions, modal shift, etc.?”
<b>A12</b>	The changes in the population per NPF which then resulted in changes to the traffic forecasts, the GHG emissions and the modal shift have been documented in the RFI Response with amendments as set out in this document.

Ref. No.	Issue and Response
Q13	Page 19: “Have the carbon emissions of the proposed road development now been priced in at the price it will cost to eliminate those emission at a later date, as the Secretary General of the Department of Public Expenditure and Report, Rover Watt, told the Oireachtas Committed on Climate Change last November would be the case.”
A13	Yes. Refer to Section 9.2 below with the updated benefit to cost ratios computed for the current cost of carbon and the future predicted cost of carbon.
Q14	<i>an independent feasibility study on light rail based on the NPF projections should be done. The light rail previously was not based on NPF figures, that makes a huge difference and so it should be done again.</i>
A 14	<p>SYSTRA have undertaken a modelling assessment of several LRT options for Galway City using NPF demographic forecasts. In summary, the analysis carried out demonstrated that the delivery of a standalone Light Rail system in isolation will not resolve the existing or forecast congestion issues in Galway. In contrast, the implementation of the GTS will significantly reduce congestion levels in the city. As a result, Light Rail does not represent a viable alternative to the GTS.</p> <p>Furthermore, demand analysis reveals that there is likely to be insufficient demand for an LRT service in Galway. This is in part due to the low-density nature of the city and the absence of the critical mass required to support such infrastructure. The level of demand which is forecast to exist in the design year, under NPF forecasts, could be served more efficiently with high frequency bus services as proposed in the GTS.</p>
	<b><u>Clarifications Required by Brendan Mulligan</u></b>
C1	Page 5. Figure 2-1 NTA/GCC Population Growth in Appendix A.8.1 “is not sufficiently clear” to enable one to determine what areas are included. A more detailed map is required from which the boundaries of which zone can be determined.
A1	See <b>Figure 17</b> above which is Figure 2-1 reproduced for clarity.

### **Additional information that Brendan Mulligan suggested should be given to the Inspector.**

- 9.2.1 **Add. Info 1: Page 19. “The applicant might consider making a copy of the revised Business Case available to you Inspector for your consideration.”**
- 9.2.2 In his submission, Mr Mulligan enquired whether the business case for the N6 GCRR had been updated to take account of “Changes in GHG

Emissions, Modal Shift, etc?’. Additionally, he asked whether the carbon emissions had been priced at the price it will cost to eliminate these emissions at a later date as indicated by the department of Public Expenditure and Reform. As previously noted, since the publication of the EIAR, the National Planning Framework (NPF) 2040 has been published as a guide to the high-level strategic planning and development of Ireland over the next 20+ years. In light of the publication of the NPF, population and employment growth forecasts have been developed for Galway City and County aligned with the NPF forecasts for the city and region. In addition, a modelling exercise has been undertaken assessing the impacts of the N6 GCRR and GTS in the context of the NPF Growth Forecasts. The outputs from the NPF model scenarios have been used to update the Cost Benefit Analysis of the scheme.

- 9.2.3 A key action of the Government’s new Climate Action Plan commits to the implementation of a carbon tax rate of at least €80 per tonne by 2030, which is an increase of 400% on the current rate of €20 per tonne.
- 9.2.4 An additional “Cost of Carbon sensitivity test” has been carried out to determine the impact of this increase in the cost of carbon on the forecast Benefit to Cost Ratio (BCR) for the scheme. The results of these updated cost benefit analysis results are shown in **Table 16** below. The table also notes the results presented in the N6 GCRR Business Case with carbon priced at €5.66/tonne.

**Table 16: Cost of Carbon Sensitivity Test**

Option	PVB €	PVC €	NPV €	BCR
Business Case: Do-Something N6 GCRR TII Central Growth Forecast (Carbon €5.66 per tonne)	1,781,208	454,334	1,326,874	<b>3.92</b>
NPF Do-Something N6 GCRR (Carbon €20 per tonne)	2,560,118	451,790	2,108,328	<b>5.7</b>
NPF Do-Something GCRR (Carbon €80 per tonne)	2,541,308	451,790	2,089,518	<b>5.6</b>

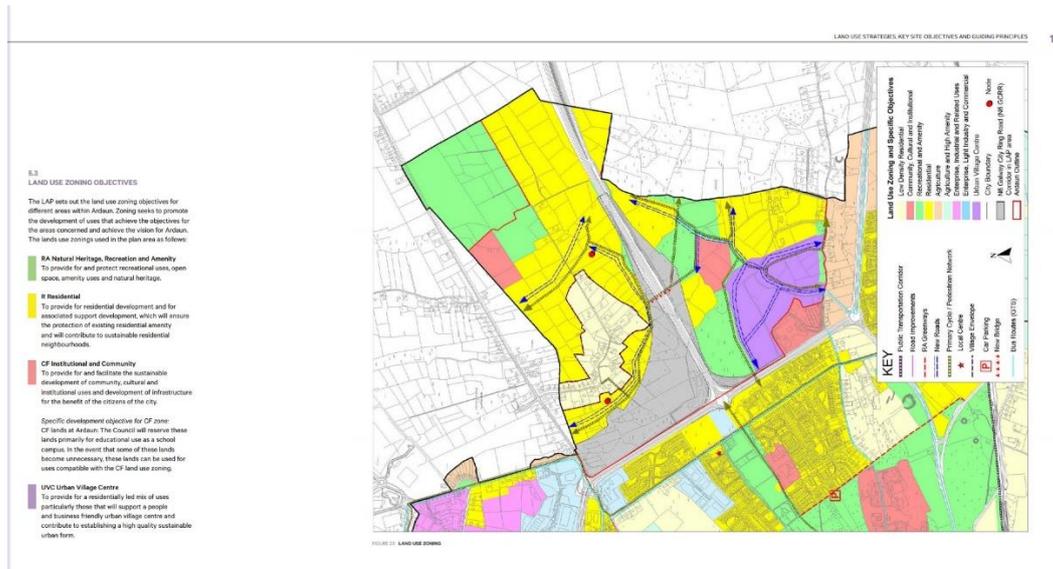
- 9.2.5 The updated results shown above account for changes in travel demand as a result of the NPF growth assumptions, their associated modal split and the impact of carbon cost increases on the emissions generated by vehicular traffic.

**Add. Info 2: Page 27. “...I believe it would be very helpful to you Inspector and to the Board, if a conclusive set of tables for mode share and Greenhouse Gas Emission is now prepared by the applicant for your consideration.”**

- 9.2.6 Refer to **Section 6** of this document and **Appendix A** for full detail of the mode share.
- 9.2.7 The full detail of the potential air quality and climate impacts associated with increased population forecasts per NPF was presented in the Corrigendum to the oral hearing under Section 4.4 with an update to Appendix A.8.3.
- 9.2.8 Refer to Air Quality and Carbon Emissions and Climate Change Statement of Evidence: Carbon emissions at construction phase are presented in Table 4, carbon emissions at operation phase for NPF scenario are presented in Table 5 and carbon emissions at operation phase taking account of electric vehicles are presented in Table 6.

**Add. Info 3: From a handwritten note. “It would be helpful to the Inspector in assessing the negative impact of the proposed road on the potential for Ardaun to be served by active and sustainable travel modes (walking, cycling and public transport) if the massive junction on the proposed N6 GCRR to replace the Coolagh Roundabout, was superimposed on the map from Page 2 of the Review of the Transport Access for the Ardaun :AP prepared by AECOM.**

- 9.2.9 The N6 GCRR does not conflict with the Ardaun Local Area Plan as the timing of the Ardaun Local Area Plan followed the display of the preferred route option for the N6 GCRR in 2015 and the publication of the Route Selection Report in April 2016. The draft Ardaun Local Area Plan (LAP) went on public consultation in September 2017 and took account of the N6 GCRR preferred route option which was published well in advance of this. Therefore, there is no conflict between the N6 GCRR and the Ardaun LAP as the Ardaun LAP took full account of the N6 GCRR including zoning as appropriate as shown in the extract from Ardaun LAP in **Figure 22**. This figure shows the area of the junction which is proposed to replace the Coolagh Roundabout in grey.

**Figure 22: Extract from Ardaun LAP**

9.2.10 The N6-GCRR will facilitate the delivery of the planned new town at Ardaun. The Ardaun LAP was adopted by Galway City Council at Ordinary Meeting 14 May 2018. Included in the Ardaun LAP is the following commitment, *“In the interests of integrating transport and land use planning considerations, Galway City Council will undertake an Area Based Transport Assessment in consultation with the National Transport Authority (NTA) and Transport Infrastructure Ireland (TII) to support the delivery of appropriate transport infrastructure and progress the efficient and sustainable development of Ardaun.”*

9.2.11 Subsequently, Galway City Council in consultation with the National Transport Authority have undertaken a transport-related assessment for the Ardaun LAP titled *Ardaun Local Area Plan – Review of Transport Access*, dated November 2018. The summary of that assessment is outlined in Section 9 of the Report noting the following key points:

9.2.12 **Ardaun South Phase 1:**

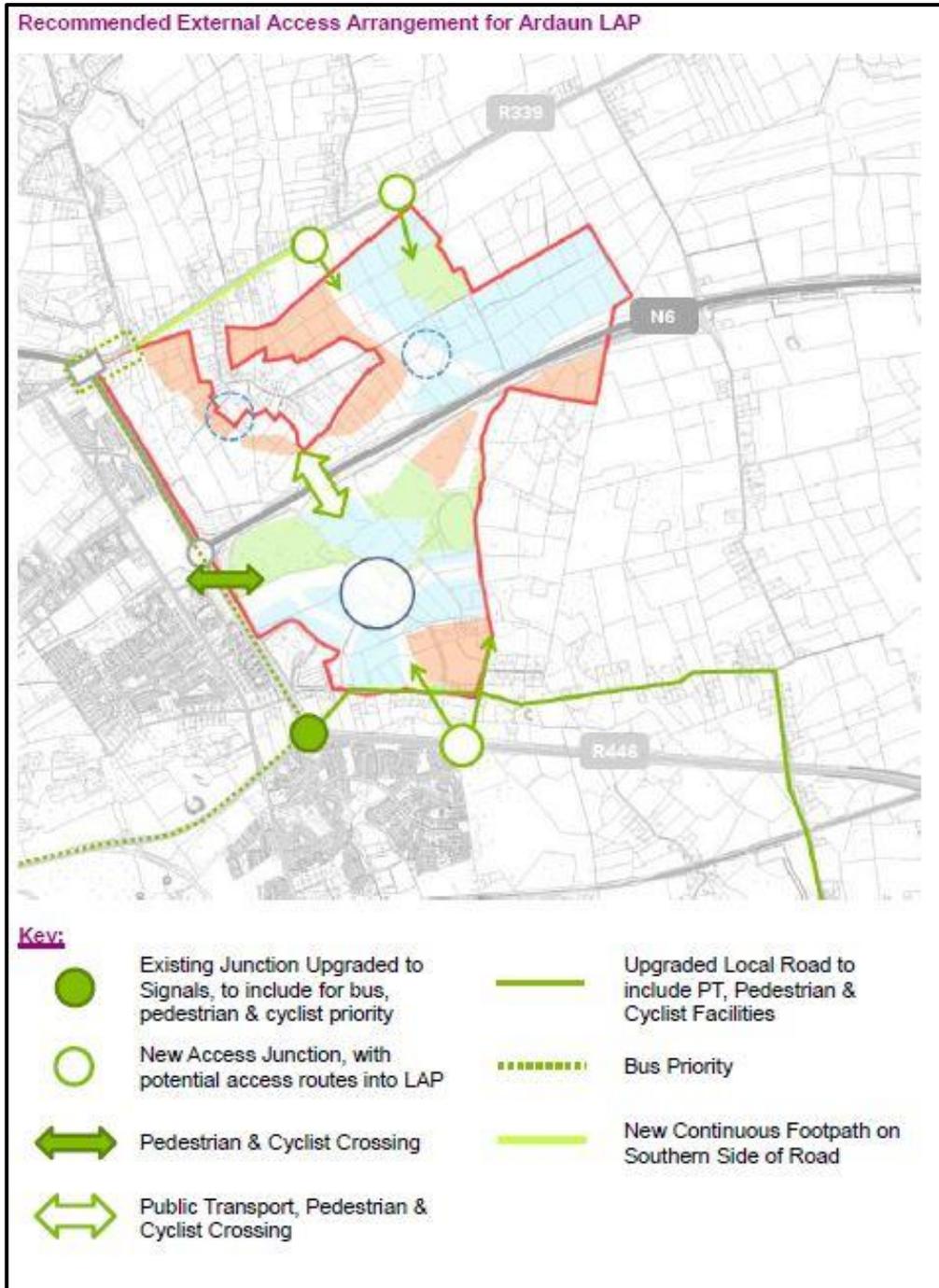
- BEFORE ANY DEVELOPMENT – Upgrade Martin Roundabout to signals, to include for bus, pedestrian & cyclist priority
- During Phase 1 Buildout, a new access at a new junction on the R446 to the east of Martin Roundabout to be provided
- During Phase 1 Buildout, a dedicated pedestrian and cycling link to Doughiska is required
- During Phase 1 Buildout, a public transport, pedestrian and cyclist crossing over the N6 GCRR to link Ardaun North to Ardaun South to be provided.

9.2.13 **Ardaun North:**

- The Ardaun LAP recommends that no development should take place in Ardaun North until the GCRR Briarhill/Parkmore Road/Monivea Road Junction improvements have been delivered.

9.2.14 A graphical illustration of the recommended external access arrangements as extracted from the Executive Summary of this report is shown in **Figure 23**.

**Figure 23: Recommended External Access Arrangements for Ardaun LAP (with N6 GCRR junction extents denoted)**



## 9.3 Submission queries by An Taisce

**Table 17: An Taisce's Questions and Answers**

Ref. No.	Issue and Response
<b>Q1</b>	Why was Parkmore Road never widened (bus lanes and car lanes) in line with significant increase in people working in Parkmore Business Park?
<b>A1</b>	<p>The GTS considered Parkmore and outlined objectives to improve links with Parkmore and in particular a new link between Ballybrit and Parkmore with the extension of the 405 bus route.</p> <p>In addition, bus priority improvements are proposed on the 409 route serving Parkmore. A particular constraint on this route is the Briarhill Junction, and the pinch-point for Public Transport between the Doughiska Road and Parkmore Road.</p> <p>As outlined in Section D.2.2.5 of Appendix D of the GTS, it is proposed to provide bus priority between Doughiska and Parkmore Road.</p>
<b>Q2</b>	Why was a connecting road never built between Ballybrit Business Park and Parkmore Business Park to facilitate a public bus service through both business parks?
<b>A2</b>	<p>The roads in question were developed by the IDA and are IDA roads. Nevertheless, having analysed the Parkmore/Ballybrit area, the N6 GCRR studies developed links to increase the permeability of this area which then presented the opportunity to create a bus route connecting the city centre through Ballybrit to Parkmore which is included as a recommendation of the GTS.</p>
<b>Q3</b>	Why have no bus lanes / clearways been put in place in Galway City for the past ten years, when there is no clear reason for not doing so?
<b>A3</b>	<p>Bus lanes and clearways are measures that are introduced to allow for more effective operation of bus routes. The approach taken to enabling key bus routes is to analyse the source and nature of any delay encountered and thereafter prioritise the case for investment in bus priority measures. The following key priorities have been identified:</p> <ul style="list-style-type: none"> <li>The single most important intervention for public transport is the creation of the Cross-City Link as this is the most congested part of the network and all five city routes converge here which is important as it provides interchange opportunity. This is more important than provision of bus lanes elsewhere. Any strategy that relies on bus lane provision without allowing for free movement of bus across the city centre will not perform as successfully.</li> </ul>

Ref. No.	Issue and Response
	<ul style="list-style-type: none"> <li>• Galway City Council has been installing bus lanes over the last 10 years. Prioritisation is based on analysing the delay being experienced on the core bus routes.</li> <li>• Specifically, in relation to Dublin Road, further bus priority measures are under development, regional bus services and inter-urban bus services. Non Statutory Consultation is underway on this project.</li> </ul>
<b>Q4</b>	Why are there three entrances and four sets of traffic lights on the N6 Bothar na dTreabh between Coolagh Road and Sean Mulvoy Road?
<b>A4</b>	<p>The traffic lights were introduced in the light of the increased traffic demand which arises substantially due to the growth of Galway. The signal-controlled junctions in particular maximise the safety and security of pedestrians, cyclists and facilitate centralised traffic management. This is particularly the case on this stretch of road with significant desire lines across the N6 Bothar na dTreabh between the residential to the west and the services/retail to the east.</p> <p>In the course of catering for a growing population a balance has been struck between access to N6 Bothar na dTreabh and the preservation of capacity on the N6. It should also be noted that some sections of the road network being discussed predate the construction of what is now the N6.</p>
<b>Q5</b>	Why does a city which will expand east towards Oranmore and Athenry need to spend 650 million Euros on a ring road / bypass going west towards Connemara?
<b>A5</b>	<p>The functionality of the scheme has been set out as follows:</p> <ol style="list-style-type: none"> <li>1. The proposed N6 GCRR sits within the overall transport system. It adds a key new east-west spine to the road network and important north-south links to provide the interconnection to the new spine. It addresses the transport problem in Galway City by achieving two key objectives in developing the city's transport system which will enable sustainable and consolidated development.</li> <li>2. It adds trip capacity to the existing transport network thereby reducing trips through the city centre and, in particular, within and on the City Centre Access network as identified by the GTS. As mentioned above, as there are less trips in the city, there is less congestion which in turn makes public transport and active travel modes more attractive.</li> </ol> <p>The new links incorporated as part of the N6 GCRR provide for the strategic need of the national road network and connectivity of Galway City and the West Region to the national road and Ten-T network. Arriving and departing trips to the city can enter and leave the city on routes which do not require them to enter the city centre unless that is their destination. By-passable trips are kept away from the city centre.</p> <p>In providing such functionality it is necessary to create a new East West spine that goes both west in the general direction of Connemara and east in the general</p>

Ref. No.	Issue and Response
	<p>direction of Oranmore and is so doing enhance connectivity towards the national network and Connemara.</p> <p>Furthermore:</p> <ul style="list-style-type: none"> <li>• The continued expansion of the city to the east is contrary to planning best practice and the NPF which advocate a compact urban form. Without the N6 GCRR, the continued deterioration of the transport network will result in the city “spreading” outwards to areas such as Oranmore and Athenry which have good access to the eastern half of the city. This is contrary to planning best practice and the NPF.</li> <li>• In the absence of the N6 GCRR the west of the city will become increasingly isolated and inaccessible as crossing the Corrib becomes increasing difficult as the population, and associated traffic, increases. This will lead to the partition of the city and a duplication of services east and west of the city.</li> <li>• The proposed project supports the integration of sustainable land use and transport policy and will support the compact growth of Galway as set out in the NPF.</li> <li>• The N6 GCRR improves accessibility and permeability further supporting increased density of development, and future growth, which in turn can be better served by public transport.</li> <li>• It will also lead to reduced journey times across the city for all modes improving access to essential services within the city centre avoiding the need for duplication of services, due to increased congestion and restriction of movement.</li> </ul>
<b>Q6</b>	Why are Galway city centre safety and air emissions used as criteria for selecting alternative transport solutions when the study area should be all of Galway City?
<b>A6</b>	The city centre has the highest concentration of population and accounts for the majority of vulnerable road users (pedestrian and cyclists).
<b>Q7</b>	Why is a ring road / bypass being proposed upon which no public bus services are planned to operate?
<b>A7</b>	<p>It is important to note that public transport such as direct local services, as well as inter-urban services, will be able to use the proposed scheme.</p> <p>The proposed public transport services outlined in the GTS have been designed to best link the existing and future residential populations to large trip attractors such as NUIG, the hospital, city centre and large employers. These areas are best served by routes which use the existing local and national road network.</p> <p>The proposed scheme will reduce competition for limited city centre road space making it easier to provide additional capacity for walking, cycling and public transport. This, in turn, will improve the efficiency of the identified public</p>

Ref. No.	Issue and Response
	transport routes which will operate closer to the demand catchments within the city, and make space in the city centre to enable interchange at Eyre Sq between service routes, regional services and intercity services including rail.
<b>Q8</b>	Why has the experience of most modern cities been ignored, in that traffic congestion can only be reduced by prioritising public transport use and road space over private car?
<b>A8</b>	The N6 GCRR is proposed as part of a strategy that prioritises provision of and allocation of road space for active modes and public transport. The GTS as part of the measures proposed to progress this strategy identified the need for “An orbital route (identified as part of the N6 Galway City Ring Road project), is considered to be an important element. Providing additional orbital traffic capacity will increase the opportunities for re-allocation of existing road space for use by pedestrians, buses and cyclists, identified as a key traffic management objective of this strategy”.
<b>Q9</b>	Why is a “bus and local access” proposed which is unworkable, has no legal basis, is unenforceable and will not work?
<b>A9</b>	The precise measures to implement the bus priority will be submitted as part of the planning process for the Cross- City Link. The Bus Gates form part of the proposed Cross-City Link, and so will be part of any approval/permission for Cross-City Link
<b>Q10</b>	Why is the proposed bridge downstream of the Salmon Weir Bridge for pedestrians when the obvious uses for it is buses/light rail/ cars?
<b>A10</b>	As part of the implementation of the GTS a new bridge for active modes is being progressed. The existing Salmon Weir Bridge then becomes available for public transport modes. This is the most sustainable solution maximising the use of the existing infrastructure for public transport and enhancing facilities for active modes by constructing a new bridge specifically for these modes.
<b>Q11</b>	Why would a new ring road / bypass need to be built before the possible improvements in public transport infrastructure (bus lanes) are in place?
<b>A11</b>	<p>As mentioned above the N6 GCRR is being advanced as part of the GTS which is part of the medium/long term measures envisaged. All of the other measures identified including the various public transport measures are identified as short/medium term measures. In order to ensure delivery of a large project such as the N6 GCRR in the envisaged time frame it is necessary to progress the planning phase in parallel to the other measures.</p> <p>As outlined above, it is intended that the GTS will be a public transport, and active mode led strategy with public transport, walking &amp; cycling measures being progressed in the short term (2 - 5 years).</p>

Ref. No.	Issue and Response
Q12	Why are there no direct (i.e. not through Eyre Square) public bus services between Parkmore / Ballybrit and Salthill/ Westside/ Knocknacarra?
A12	The bus routes proposed as part of the GTS will deliver public transport that is convenient, frequent and reliable to enable travel by bus between Parkmore/Ballybrit and Salthill/Westside/Knocknacarra.
Q13	Why is someone's parking space outside their house, or a few meters of their front garden, in the city centre more important than someone's home on the route of the proposed ring road / bypass?
A13	It is anticipated that there will be removal of on-street parking and acquisition of front gardens to deliver bus priority measures. This will require property acquisition in a similar manner as it is proposed to acquire homes as part of the N6 GCRR. The level of impact of acquisition of a home is a more severe impact.
Q14	Why do all alternative routes for the ring road/ bypass start at the N6 (Doughiska) and end at the R336 (Coast Road)?
A14	<p>During the preparation of the GTS several ring road options were considered. These included a ring road from Coolagh to the N84, a ring road from Coolagh to the N59 and finally a ring road from Coolagh to the R336 (Bearna). This analysis concluded that the preferred approach was to develop a ring road from Coolagh to Bearna for the following reasons:</p> <ol style="list-style-type: none"> <li>i. It provides a safer city centre</li> <li>ii. It provides a more socially inclusive transport network</li> <li>iii. It provides greater accessibility</li> <li>iv. It ensures better value for money</li> </ol>

## 9.4 Submission by Galway Cycling Campaign

9.4.1 The submission from the Galway Cycling Campaign included an assessment of the number of river crossings in the Do-Minimum and the Do-Something Scenarios. They contend that the extra river crossings in the Do-Something (with N6 GCRR) scenario is an indication of induced demand.

9.4.2 As outlined in Section 4.8 of the Traffic Statement of Evidence, the modelling approach adopted for the proposed road development assesses induced traffic and, therefore, this has been accounted for in the AADT forecasts highlighted by the Galway Cycling Campaign.

- 9.4.3 The planned growth of the city, as set out under NPF, without an additional river crossing will result in a severe level of congestion experienced by all transport modes which would suppress travel movements either side of the River Corrib. This would ultimately result in the isolation of areas of the city and county, leading to further relocation of activities away from the city core, duplication of services, reduction in the range of employment opportunities and an overall reduction in the quality of life of the residents of the city.
- 9.4.4 The introduction of the N6 GCRR results in a considerable reduction of congestion and releases suppressed demand which existed in the Do-Minimum Scenario. This is the cause for the increase in cross river traffic in the Do-Something scenario.
- 9.4.5 This assessment of induced traffic has shown that the implementation of the proposed road development will result in improved journey times across the network for all modes including public transport, removal of traffic from the city centre, improvement in the city centre environment and improved safety across the city. The delivery of the proposed road development as a core component of the Galway Transport Strategy will provide more space and priority in the city centre for sustainable modes of travel.

## 9.5 Submission by Mr Kilgarriff and Mr Molinar

### Submission content

- 9.5.1 Submissions to the oral hearing by Mr Kilgarriff and Mr Molinar claim that the N6 GCRR is over-engineered and that a dual carriageway with at-grade roundabout junctions will suffice to resolve the transport problem in Galway.

### Design of N6 GCRR Cross-section and Junction Layouts

- 9.5.2 The selection of the cross-section and junction form for the N6 GCRR was determined in the context of the purpose of the road and the traffic volumes in accordance with current design standards. The N6 GCRR is a totally new link on the road network and it has a purpose to disperse traffic arriving from the radials such as the N67, M6/N6, N83, N84 and N59 whilst also forming part of the TEN-T network. The purpose of the road over the section from N6/M6 to the N59 coupled with the volume of traffic on this section leads to it being segregated with access only provided at the grade separated junctions. This is necessary so that it can continue to serve the purpose for which it is designed. It is further designated a motorway to the N59 Letteragh Junction to protect this significant piece of infrastructure into the future. A dual carriageway over this section would have a similar landtake requirement as the

proposed motorway but the key difference is the junction form. The provision of the motorway necessitates the provision of grade separated junctions, and the traffic volumes on the major road combined with the turning traffic onto the radials with which it connects fully justifies the provision of the grade separated junctions. At-grade junctions on the section from N6/M6 to the N59 would fail due to the predicted traffic volumes on the mainline coupled with the turning movements at the junctions and congestion would prevail as is evidenced in the existing scenario at the N6/M6 at-grade junction.

9.5.3 West of the N59 Letteragh Junction, west bound traffic has already been significantly reduced and the residual traffic splits onto the N59 northbound, southbound into the city and westwards towards the R336. Consequently, the section from the N59 Letteragh Junction west has a much lower volume of traffic with at-grade junctions and less segregation to provide connectivity to the existing road network.

9.5.4 Therefore, there are two distinct levels of cross-section provision required for the N6 GCRR with the split point being at Ballymoneen Road Junction as follows:

- R336 to Ballymoneen Road – single carriageway
- Ballymoneen Road to the N6 – urban motorway

9.5.5 As a result of this, the choice of grade separation at the junction is essential as the time which would be required for an at-grade signalised junction to facilitate the through movement on the N6 GCRR would considerably reduce the capacity of all arms of the junction. This would result in increased congestion on the radials intersecting at these junctions and long tailbacks. This in turn would result in blocking back onto the N6 GCRR during peak periods. Therefore, the grade separation at the junctions is essential to remove the through traffic on the N6 GCRR from the signal phasing and is essential to enabling the road to meet its defined objectives as defined in Chapter 3 of the EIAR, for example:

- Improved accessibility to Galway
- Removing conflict of strategic traffic and local traffic
- Fulfilling its designation as a TEN-T route.

### **Reallocation of road space**

9.5.6 The proposed N6 GCRR sits within the overall transport system. It adds a key new east-west spine to the road network and important north-south links to provide the interconnection to the new spine. It adds trip capacity to the existing transport network thereby reducing trips through the city centre and, in particular, within and on the City Centre

Access network as identified by the GTS. As there are less trips in the city, there is less congestion which in turn makes public transport and active travel modes more attractive as this road space is reallocated to such modes.

### **Restriction of access**

- 9.5.7 The new links incorporated as part of the N6 GCRR provide for the strategic need of the national road network and connectivity of Galway City and the West Region to the national road and Ten-T network. Arriving and departing trips to the city can enter and leave the city on routes which do not require them to enter the city centre unless that is their destination. By-passable trips are restricted from accessing or using the city centre thus freeing up road space in the city centre.
- 9.5.8 Access onto the N6 GCRR is also restricted to ensure that this infrastructure is protected into the future, with junctions at key intersections only as it is the junction capacity which is critical to the overall function of the road.

## **Appendix A**

### **Mode Share Results**



## APPENDIX A - MODE SHARE RESULTS

### 1. OVERVIEW

1.1.1 This appendix will present a full set of mode share results and a traffic impact summary for the following modelled scenarios:

- 2039 – Do-Something N6 GCRR + GTS -TII Central Growth Case Scenario (Used in **EIAR Report**);
- 2039 – Do-Something N6 GCRR + GTS - National Planning Framework (NPF) Forecasts (Used in **RFI**);
- 2039 - Do-Something N6 GCRR + GTS - NPF forecasts with additional Parking Demand Management Measures in Place

1.1.2 The last scenario has been modelled to reflect a demand management scenario where car parking provision is reduced for new development in Galway. As discussed in Section 6.3 of this report, this assumption is in line with current local and national policy as demonstrated by the low levels of parking provided at a number of developments recently provided planning permission in the city.

### 1.2 Mode Share Results

1.2.1 This appendix provides a comparison of the Mode Share results, split between private vehicle, public transport, walking and cycling, for each of the following geographic areas:

- City Centre;
- Galway City Administrative Boundary Area; and
- The full West Regional Model Network Area.

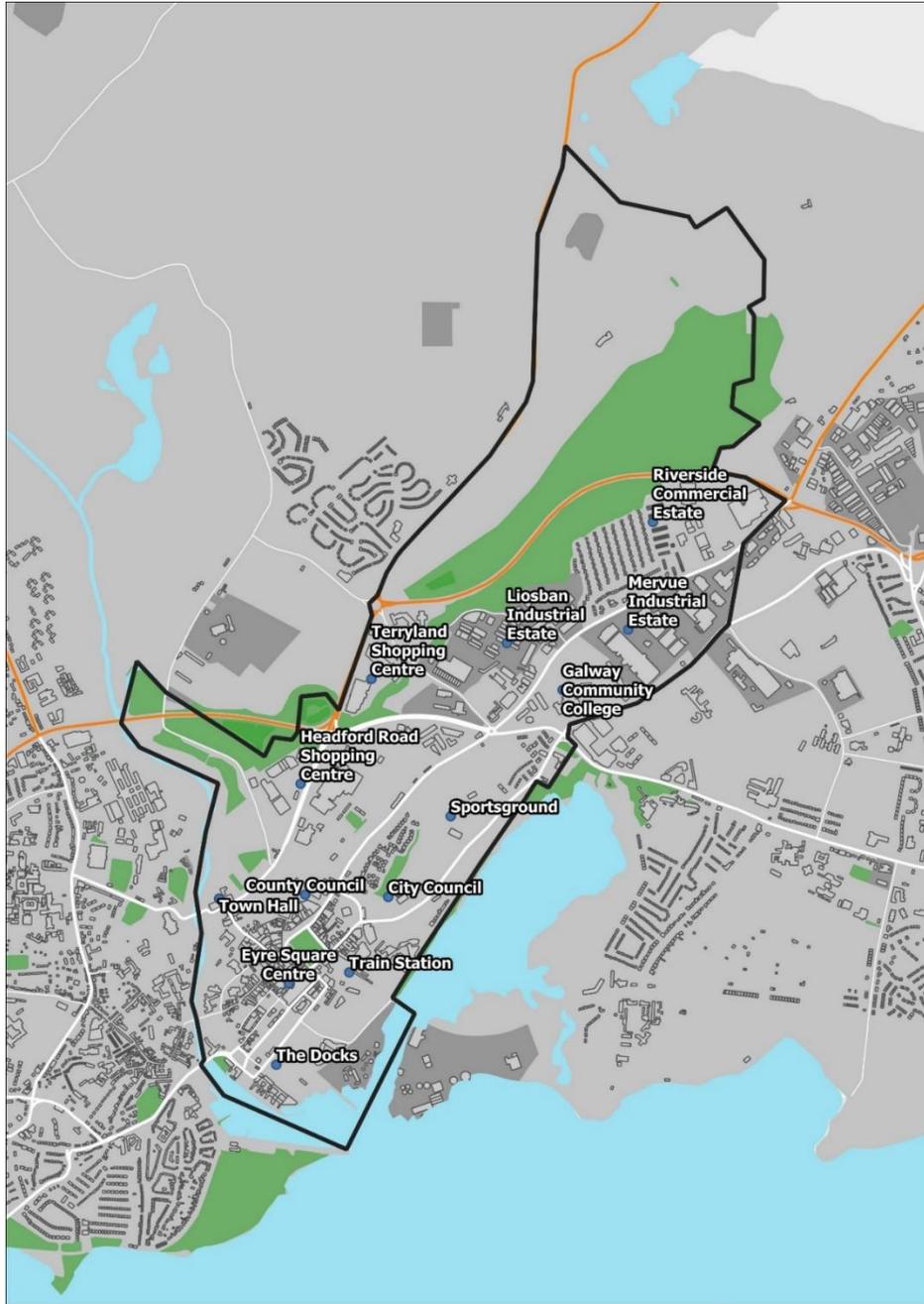
### 1.3 City centre

1.3.1 During the development of the NTA's WRM, Galway City was divided into 5 sectors. The city centre sector is illustrated in the figure below.

#### 24 Hour Mode Share

1.3.2 Table 1 below details the 24 hour mode share of trips in to, and out of , this sector over a 24 hour period for each scenario.





**Figure 1. City Centre Sector**

**Table 1. Galway City Centre Mode Shares (24 hour)**

SCENARIO	CAR (%)	PT (%)	WALK (%)	CYCLE (%)
TII EIAR Do-Something N6 GCRR + GTS	67.3%	5.0%	24.9%	2.8%
NPF Do-Something N6 GCRR + GTS	56.0%	6.8%	31.2%	6.0%
NPF Do-Something N6 GCRR + GTS + Parking Management	44.9%	8.1%	41.6%	5.4%

**AM Peak Hour Mode Share**

1.3.3 Table 2 below details the AM Peak hour mode share of trips in to, and out of , this sector for each scenario.

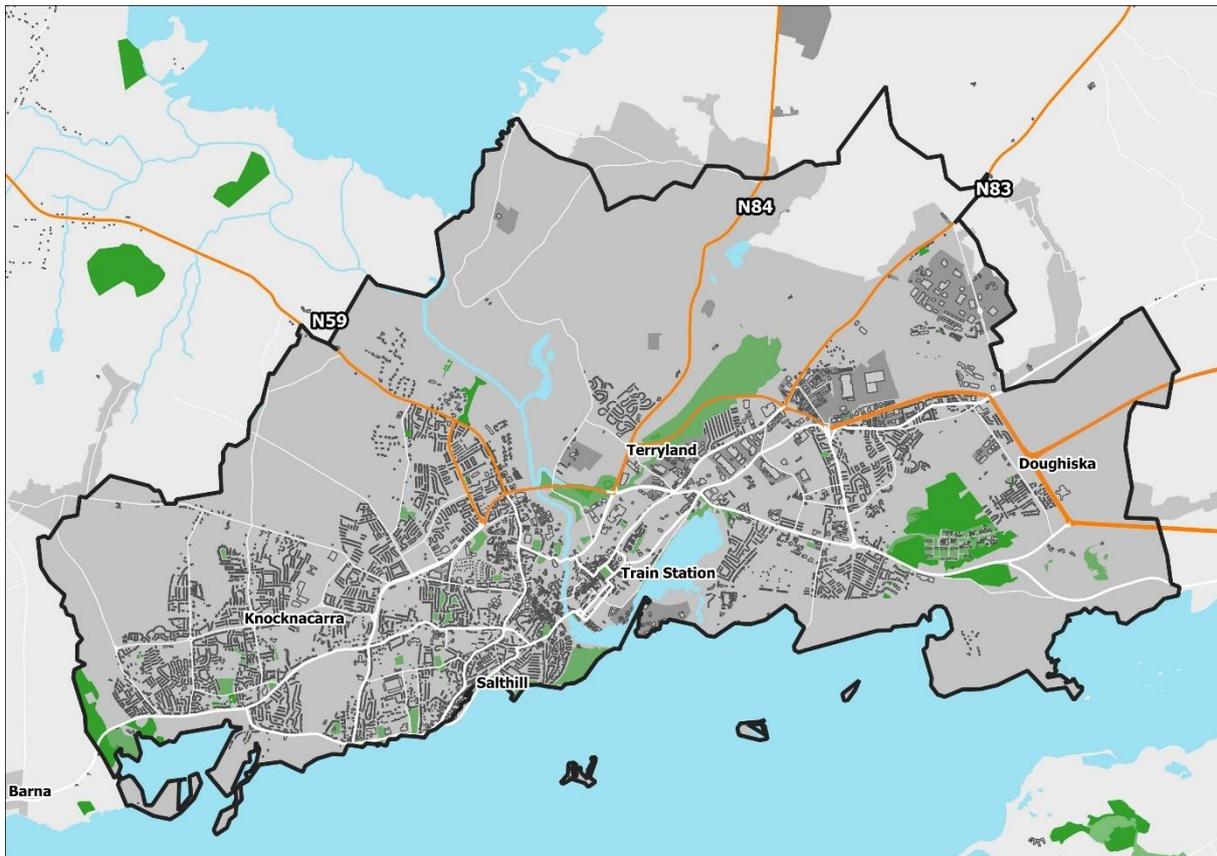
**Table 2. Galway City Centre Mode Shares (AM Peak Hour)**

SCENARIO	CAR (%)	PT (%)	WALK (%)	CYCLE (%)
TII EIAR Do-Something N6 GCRR + GTS	62.7%	7.9%	25.9%	3.5%
NPF Do-Something N6 GCRR + GTS	48.6%	9.7%	33.6%	8.1%
NPF Do-Something N6 GCRR + GTS + Parking Management	42.6%	9.8%	40.8%	6.9%

**1.4 Galway City Administrative boundary**

**24 Hour Mode Share**

1.4.1 The 24 hour Mode share results for the Galway City Administrative Boundary Area, illustrated in Figure 2, are outlined in Table 3 below.



**Figure 2. Galway City Administrative Boundary**

**Table 3. Galway City Administrative Boundary Mode Shares (24 hour)**

SCENARIO	CAR (%)	PT (%)	WALK (%)	CYCLE (%)
TII EIAR Do-Something N6 GCRR + GTS	70.2%	6.1%	20.3%	3.4%
NPF Do-Something N6 GCRR + GTS	65.6%	7.0%	22.6%	4.8%
NPF Do-Something N6 GCRR + GTS + Parking Management	54.9%	8.4%	32.0%	4.7%

### AM Peak Hour Mode Share

1.4.2 Table 4 below details the AM Peak hour mode share of trips in to, and out of , the Galway City Administrative area for each scenario.

**Table 4. Galway City Administrative Boundary Mode Shares (AM Peak Hour)**

SCENARIO	CAR (%)	PT (%)	WALK (%)	CYCLE (%)
TII EIAR Do-Something N6 GCRR + GTS	66.4%	8.9%	21.5%	3.2%
NPF Do-Something N6 GCRR + GTS	59.7%	9.7%	24.7%	6.0%
NPF Do-Something N6 GCRR + GTS + Parking Management	52.1%	10.9%	31.3%	5.7%

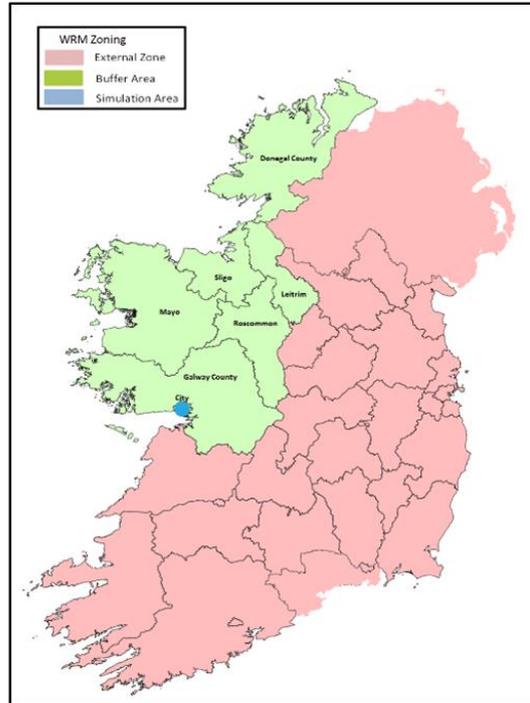
## 1.5 West Regional Model (WRM) full network

1.5.1 The West Regional Model is centred on Galway City and also includes counties Galway, Mayo, Roscommon, Sligo, Leitrim and Donegal. The area covered by the WRM is shown in green in the Figure below.

### 24 Hour Mode Share

1.5.2 The associated mode share (over a 24-hour period) for the entire WRM in each scenario is shown in Table 5.





**Figure 3. Network Extents**

**Table 5. Entire Network Mode Shares (24 hour)**

SCENARIO	CAR (%)	PT (%)	WALK (%)	CYCLE (%)
TII EIAR Do-Something N6 GCRR + GTS	81.6%	3.5%	12.5%	2.4%
NPF Do-Something N6 GCRR + GTS	79.8%	3.8%	13.5%	2.8%
NPF Do-Something N6 GCRR + GTS + Parking Management	78.2%	4.1%	14.9%	2.8%

### AM Peak Hour Mode Share

1.5.3 The AM Peak hour mode share of all trips in the WRM network is shown below in Table 6 for each scenario.

**Table 6. Entire Network Mode Shares (AM Peak Hour)**

SCENARIO	CAR (%)	PT (%)	WALK (%)	CYCLE (%)
TII EIAR Do-Something N6 GCRR + GTS	79.2%	5.2%	13.1%	2.5%
NPF Do-Something N6 GCRR + GTS	77.0%	5.6%	14.3%	3.1%
NPF Do-Something N6 GCRR + GTS + Parking Management	76.0%	5.9%	15.1%	3.0%

## 2. TRAFFIC IMPACT SUMMARY

### 2.1 Overview

2.1.1 This section of the Appendix will provide a summary of the traffic impact of the GTS in each scenario using the following key performance indicators extracted for the AM Peak Hour:

- **Network statistics** – Network wide indicators for the Galway City and its Environs;
- **Journey times** on key routes – to understand strategic impacts; and
- **Ratio of flow to capacity at key junctions** – to understand local impacts, congestion and queues.

### 2.2 Network Statistics

2.2.1 Network performance indicators for the base year and Design Year (2039) scenarios are outlined in the tables below, extracted from each of the relevant model assignments for the Galway City administrative area.

**Table 7. Network Statistics**

SCENARIO	OVER CAPACITY QUEUEING (PCU <sup>1</sup> .HRS)	TRANSIENT QUEUEING (PCU.HRS)	TOTAL VEH DISTANCE (PCU.KMS)	TOTAL NETWORK TRAVEL TIME (PCU.HRS)	AVERAGE SPEED (KPH)
Base Year (2012)	390	1,421	202,684	6,704	30.2
2039 - TII EIAR Do-Something N6 GCRR + GTS	102	1,708	294,497	7,756	38.0
2039 -NPF Do-Something N6 GCRR + GTS	75	2,007	325,157	8,707	37.3
2039- NPF Do-Something N6 GCRR + GTS + Parking Management	75	1,852	313,944	8,108	38.7

2.2.2 The above table shows that the full implementation of the GTS will result in a considerable reduction in the level of over-capacity queuing (queuing resulting from a particular junction or movement experiencing volumes greater than capacity) on the network, when compared to the base year. This is despite the fact that the future year networks will cater for significantly more trips (for example the NPF scenarios include for a 50% increase in the Galway city population).

### 2.3 Journey Times

2.3.1 To develop an understanding of the potential impact of the proposals on key routes serving Galway, the projected change in vehicular journey times were assessed. Journey

<sup>1</sup> PCU (passenger car unit) hours is the sum of a delay experienced by every vehicle in the Galway City network

times represent a good basis for strategic traffic impact assessment as they provide a mechanism to quantify the traffic impact along a full route.

2.3.2 The Journey Time routes used for the impact assessment are shown in the Figure below. The Table below details the average journey time, across all these routes, for each scenario.

**Figure 4 Journey Time Assessment Routes**



2.3.3 The tables below detail the results of the Journey Time comparison as extracted from the 2039 NPF traffic models for the AM peak period.

**Table 8. Average Journey Times**

SCENARIO	AVERAGE JOURNEY TIME (SECONDS)
Base Year (2012)	1,428
2039 -TII EIAR Do-Something N6 GCRR + GTS	1,418
2039 -NPF Do-Something N6 GCRR + GTS	1,430
2039 - NPF Do-Something N6 GCRR + GTS + Parking Management	1,399

2.3.4 The above table shows that the full implementation of the GTS will result in a reduction in the average journey times on the network, when compared to the base year. This is despite the fact that the future year networks will cater for significantly more trips (for example the NPF scenarios include for a 50% increase in the Galway city population).

## 2.4 Ratio of Flow to Capacity

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



2.4.2 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 is able to progress through the junction without experiencing significant delays.

2.4.3 A Ratio of Flow to Capacity analysis has been undertaken using information from the N6 GCRR traffic Model for each modelling scenario and is presented below. This analysis considered the number of links at Key Junctions along the existing N6 /R338 corridor with an RFC over 90%. Figure 5, below, illustrates the location of the Key Junctions considered on the existing N6 / R338 Corridor.



2.4.4 The Table below summarise these junction evaluations for the base year and 2039 - NPF – Scenarios in the AM peak period.

**Table 9 Number of Junctions at or over capacity in the AM Peak**

	Criteria	Base Year (2012)	TII EIAR Do-Something N6 GCRR + GTS	NPF Do-Something N6 GCRR + GTS	NPF Do-Something N6 GCRR + GTS + Parking Management
<b>Key Junctions (N6 / R338)</b>	RFC > 90%	11	8	8	5

2.4.5 As with the other key performance indicators, the above table shows that the full implementation of the GTS will result in a reduction in the number of key junctions in the city operating over capacity compared to the base year. Again, this is despite the fact that the future year networks will cater for significantly more trips.

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## **Appendix B**

### **Covid-19 Sensitivity Test**

# B1

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N6 Galway City Ring Road

# COVID-19 ANALYSIS



**SYSTRA**

# N6 GALWAY CITY RING ROAD

## COVID-19 ANALYSIS

### IDENTIFICATION TABLE

<b>Client/Project owner</b>	Galway County Council
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<b>Study</b>	Covid-19 Analysis
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2	Author			DD/MM/YY	
	Checked by			DD/MM/YY	
	Approved by			DD/MM/YY	

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# 1. INTRODUCTION

## 1.1 Background

1.1.1 In response to the COVID-19 pandemic, the Irish Government imposed restrictions on the movement of people in order to contain the spread of the virus. This commenced with the closure of all schools and colleges from March 13th 2020. Subsequently, the Government have published a medium term strategy for managing the risks of Covid-19. This strategy (“Resilience and recovery 2020 – 2021: Plan for living with Covid-19”) provides a framework of restrictive measures consisting for 5 levels with Level 1 being the least restrictive and 5 being the most restrictive. The lower levels of the framework will be activated when there is low incidence of the disease, with isolated outbreaks and low community transmission. The higher levels will be used to deal with higher incidences of the disease.

1.1.2 The restrictions implemented by Government in order to tackle the spread of the COVID-19 virus have had a significant effect on short-term travel behaviours, influencing both the distance people travel and the mode by which they take that journey.

1.1.3 SYSTRA’s Social and Market Research team has been continuously monitoring how peoples’ attitudes towards the way they live and travel have changed during the Covid-19 pandemic, providing us with an insight into their changing behaviour, and how this may influence working patterns in the longer term.

1.1.4 One of the biggest findings from this research was that there is a desire to spend less time working in the office post Covid-19 and spend more time working remotely, either regularly or occasionally in the future.

## 1.2 Purpose

1.2.1 The purpose of this note is firstly to determine how short-term traffic levels have changed along the N6 Corridor in Galway in response to the varying restrictions put in place by the government to try and curb the spread of the virus.

1.2.2 At this stage it is not feasible to accurately predict whether travel behaviours will return to ‘normal’ in the post-pandemic world, or to what degree aspects of our current travel behaviours will remain permanently changed. Notwithstanding this, the second part of this report seeks to provide a high level estimation of the potential medium-long term impacts of the pandemic on travel behaviours in Galway based on CSO information on journey purposes and employee trips, in addition to attitudinal surveys undertaken in the UK and Ireland which gauge the impacts of Covid 19 on travel behaviours. For this reason, the post Covid travel behaviours presented in the report should be viewed as a sensitivity test presenting a potential outcome and not a single definitive forecast.

## 2. TRAFFIC ANALYSIS

### 2.1 TII Traffic Counters

2.1.1 A comparison of traffic flows between 2019 (pre-Covid-19) and 2020 (with Covid-19) across Galway has been undertaken using Transport Infrastructure Ireland Permanent Traffic Monitoring Units (TMUs) which are located across the national road network in Galway City and County. The locations of the TMUs used in this analysis are shown in the Figure below.

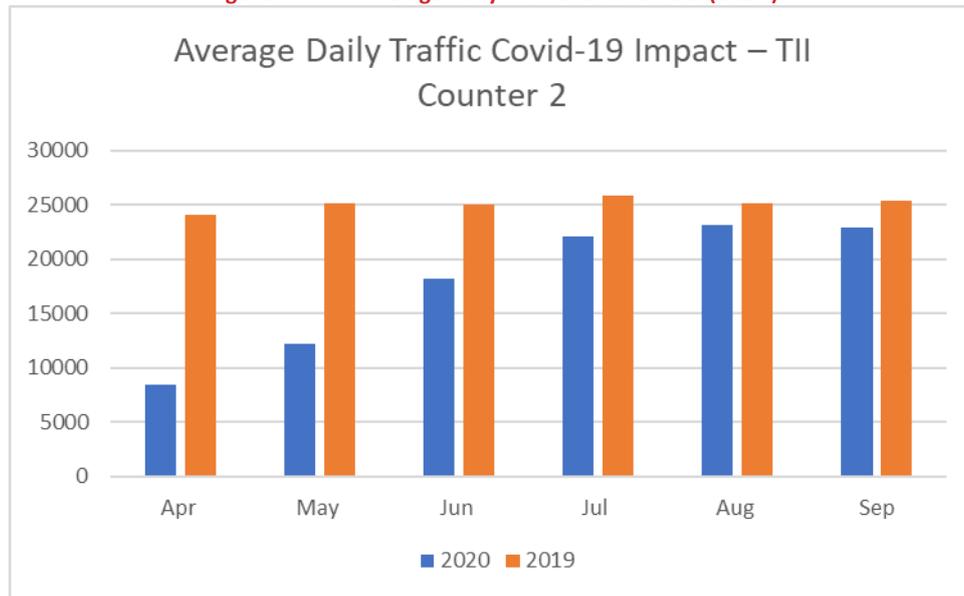
**Figure 1. TII Traffic Counters**



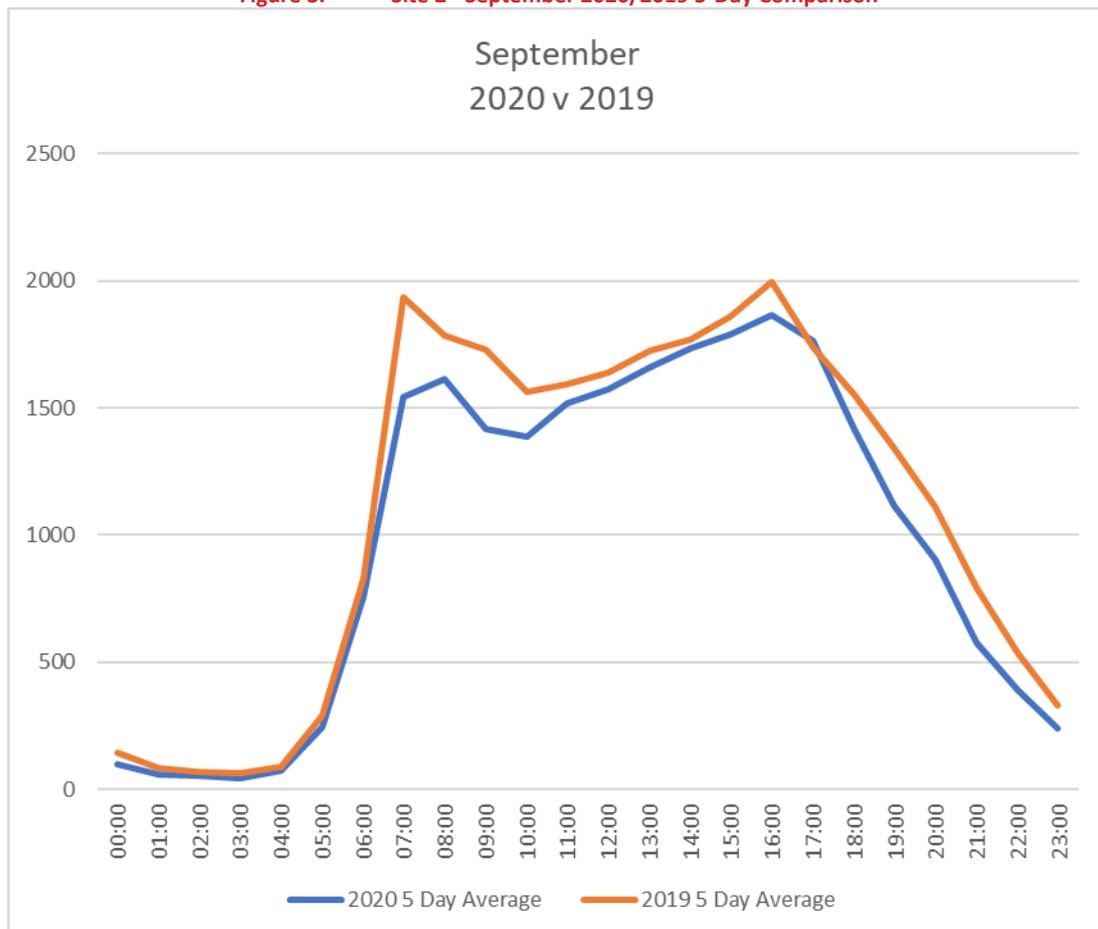
### 2.2 Galway City Traffic Analysis

2.2.1 The following graphs show a comparison of traffic flows at site 2 (along the N6 between the N83 and N84) which is the only TMU located within Galway City.

**Figure 2. Average Daily Traffic 2020 vs 2019 (Site 2)**



**Figure 3. Site 2 - September 2020/2019 5-Day Comparison**



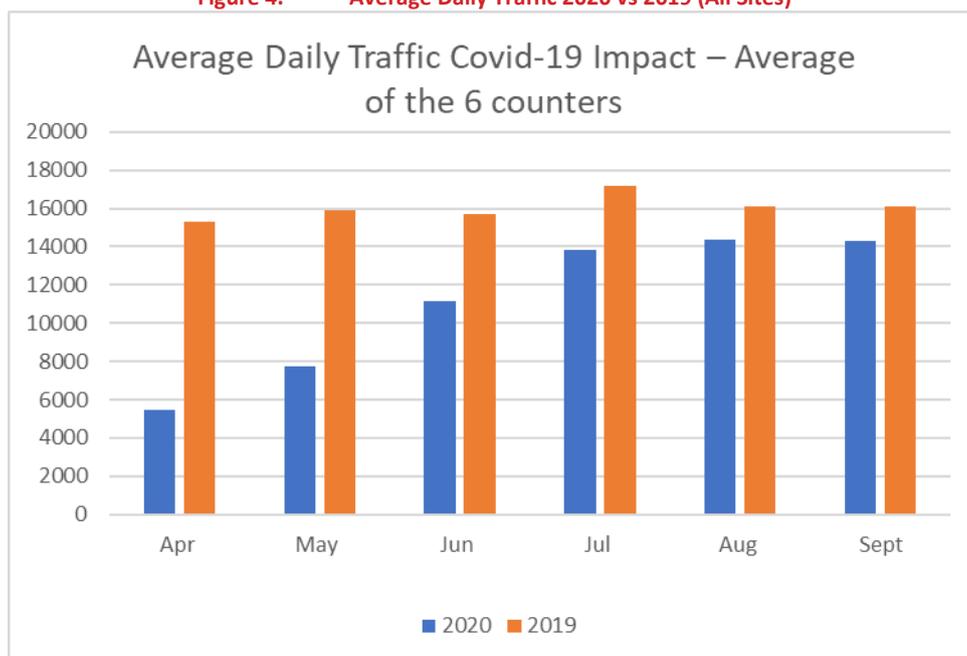
2.2.2 The above figures show that during April (when complete lockdown restrictions were in place), traffic levels along the N6 were at 35% of those seen in the previous April. During September (when restrictions has eased), traffic levels had returned to approximately 90% of those seen in the previous September.

2.2.3 Analysis of the daily profile in the September for the average workday shows the AM period (7 – 10 AM) is 84% of the 2019 values whereas the Inter Peak period (10AM – 4PM) and the PM period (4 – 7 PM) are both at 95% of 2019 values.

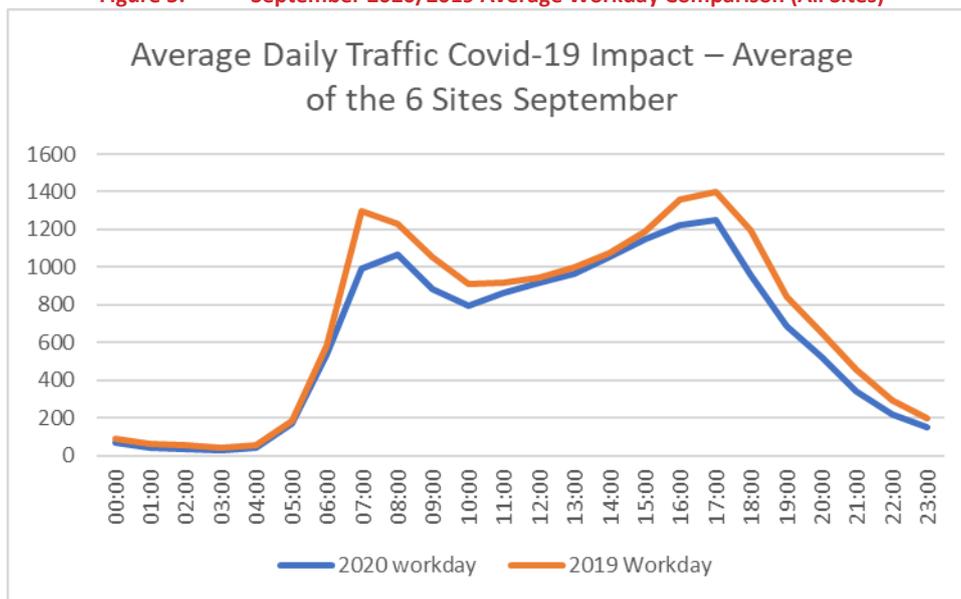
### 2.3 Galway City and County Traffic Analysis

2.3.1 The following graphs show a comparison of traffic flows at all sites shown in Figure 1 covering Galway City and the main radial routes into Galway City.

**Figure 4. Average Daily Traffic 2020 vs 2019 (All Sites)**



**Figure 5. September 2020/2019 Average Workday Comparison (All Sites)**



- 2.3.2 The monthly comparisons both show a similar upward trend in traffic following the initial restrictions, with traffic returning to approximately 90% of the levels seen during September 2019.
- 2.3.3 The graphs from September show that, across all sites, traffic flows are 89% of those observed in the same period in 2019 (pre-Covid). Analysis of the daily profile in the September for the average workday shows the AM period (7 – 10 AM) is 82% of the 2019 values whereas the Inter Peak period (10AM – 4PM) is comparable to pre-Covid levels (5% drop off) and the PM period (4 – 7 PM) is 87% of 2019 values.

### 3. ESTIMATING IMPACT OF HOME WORKING ON FUTURE TRAVEL DEMAND

#### 3.1 Introduction / Overview

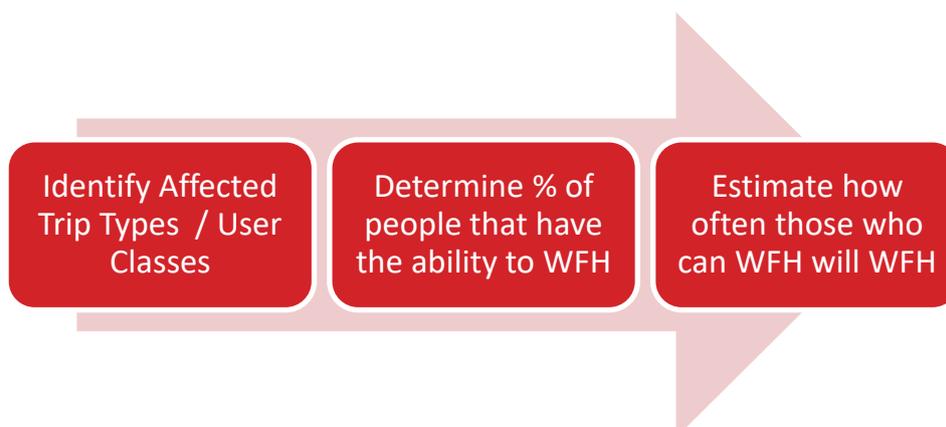
3.1.1 As a result of the pandemic, working from home has become normal practice for many people in Ireland. In a post Covid environment it is expected that many people will chose to carry on this trend either regularly or occasionally.

3.1.2 Whilst the likely medium and long term effects of the Covid-pandemic on future travel behaviours is difficult to predict, sensitivity testing can be undertaken to predict a potential likely outcome based on a review of various travel user needs and their potential travel preferences.

3.1.3 This section of the report identifies those people whose working circumstances allow them to work remotely and subsequently estimates what proportion of these people may do so in the future and for how often.

3.1.4 The methodology used to estimate this impact on travel demand in the future includes the following steps:

- **Step 1:** Identify the trip types (e.g. commuting and business) which may be affected by changes in working patterns. This has been done by examining the various trip “user classes” in the design year traffic model.
- **Step 2:** Determine what proportion of affected trip types/ user classes will have the ability to work from home. This has been done by examining census data relating to job type in Galway City and County.
- **Step 3:** Estimate how often those who can work from home, will work from home. This has been done using the results of attitudinal surveys carried out during the Covid-19 Pandemic.



## 3.2 Step 1: Identify Affected Trip Types

### Trip Types

3.2.1 Work trips / commuting trips are only one of the many trip types which occur on the transport network. The WRM which has been used to assess the impacts of the N6 GCRR breaks down traffic on the road network into the following User Classes:

1. Taxi
2. Business trips – Travel for business purposes e.g. face to face meetings
3. Commuting trips – Trips from home to work
4. “Other trips” - Made up of several trip categories including Education trips (parent dropping a child to school), Food shopping trips, Visits to friends/relatives and trips made by retired people
5. Freight – Trips that involve the transport of goods, produce etc. by light and heavy goods vehicles

3.2.2 In a Post pandemic environment, it is assumed that User Classes 1, 4, and 5 will not substantially change travel habits. For example school children will still attend schools, people will visit friends/relatives, delivery vehicles will still be required to deliver freight etc. Consequently, only the following user classes will be substantially impacted by increased home working:

- 2 : Business trips; and
- 3: Commuting trips

3.2.3 The table below outlines the pre-Covid traffic demand across the entire WRM in the AM peak hour for each user class. The forecast traffic flows for the design year (2039) of the N6 GCRR Do-Something scenario which was reported on by SYSTRA as part of the Further Information request following the publication of the National Planning Framework (NPF) was used in this analysis.

**Table 1. Traffic Demand Pre Covid in the AM peak hour**

USER CLASS	PRE COVID
1	3,634
2	7,512
3	54,116
4	108,420
5	7,595
<b>Total</b>	<b>181,278</b>

3.2.4 The total traffic demand in the AM peak hour across the model network is 181,278. Since user classes 1, 4 and 5 are expected to remain largely unchanged post Covid, this means that 119,649 trips (66% of total trips on the network) will be largely unaffected by any changes to the level of home working.

3.2.5 Approximately 34% (61,628) will be impacted by increased levels of home working. This 34% is comprised of:

- Business Trips (User Class 2): 7,512; and
- Commuting Trips (User Class 3): 54,116.

3.2.6 The following sections of this report will determine what proportion of the above trips have the ability to work from home and to what extent (how many days a week) they are likely to work from home.

### 3.3 Step 2: Ability to work from home

3.3.1 By using data on job types from the 2016 Census, an estimate has been made of the percentage of people in Galway who have the ability to work remotely and those who need to travel to work as part of their job (e.g. tradesmen, manufacturing, etc).

3.3.2 As part of the 2016 Census, residents were asked to fill in their occupation under several headings. The results for both Galway City and Galway County (County plus City) are shown below.

**Table 2. Occupation Split of Workers in Galway (According to the 2016 Census)**

OCCUPATION	CITY	COUNTY	CITY (%)	COUNTY (%)
Managers, directors and senior officials	2,519	8,332	7%	7%
Professional occupations	8,789	23,921	25%	21%
Associate professional and technical occupations	4,427	12,536	13%	11%
Administrative and secretarial occupations	3,388	11,035	10%	10%
<b>Skilled trades occupations</b>	<b>3,100</b>	<b>18,216</b>	<b>9%</b>	<b>16%</b>

OCCUPATION	CITY	COUNTY	CITY (%)	COUNTY (%)
<b>Caring, leisure and other service occupations</b>	<b>2,369</b>	<b>8,936</b>	<b>7%</b>	<b>8%</b>
Sales and customer service occupations	3,034	7,504	9%	7%
<b>Process, plant and machine operatives</b>	<b>3,131</b>	<b>11,595</b>	<b>9%</b>	<b>10%</b>
<b>Elementary occupations</b>	<b>3,857</b>	<b>9,844</b>	<b>11%</b>	<b>9%</b>
Total	34,614	111,919	-	-

3.3.3 From the table above it has been assumed that the following occupations could not work remotely to perform their roles and therefore wouldn't change their travel patterns post Covid:

- Skilled trade occupations
- Caring, leisure and other service occupations
- Process, plant and machine operatives
- Elementary occupations

3.3.4 Through adding the percentages of the remaining occupations, it was estimated that in the city of Galway, 64% of workers have the potential to work remotely in the future. This reduces to 57% if looking at the county as a whole. For the purposes of preparing a robust assessment we have assumed 64% have the ability to work from home in the remainder of our analysis. This is considered a very conservative assessment, as in reality a number of professions (for example office administration staff working within the health sector or manufacturing) will still be required to travel to their place of work to support on site operations.

3.3.5 The city value of 64% also broadly tallies with a recent piece of research done by AECOM in Ireland entitled 'Covid-19 Impacts on Travel Behaviour'<sup>1</sup> which estimated that 69% of people would like to spend less time working in an office environment post-Covid.

<sup>1</sup> <https://infrastructure.aecom.com/2020/workforce-mobility-what-changed-travel-patterns-mean-for-the-office-of-the-future>

### 3.4 Step 3: Estimate how often people will work from home

3.4.1 As outlined above, up to 64% of those making commuting trips have the ability to work from home. This section will determine the extent to which people who fall into this category are likely to work from home and consequently what the reduction in total travel demand could be.

#### Commuting Trips

3.4.2 A travel behaviour and attitude survey<sup>2</sup> of office workers administered by SYSTRA in the UK in June prior to the introduction of Covid-19 restrictions, found that (see figure 6 , below):

- 62% of workers spent 5 days in the office per week;
- 27% of workers spent 3-4 days in the office per week;
- 8% of workers spent 1-2 days in the office per week; and
- 3% of workers spent less than 1 day in the office per week

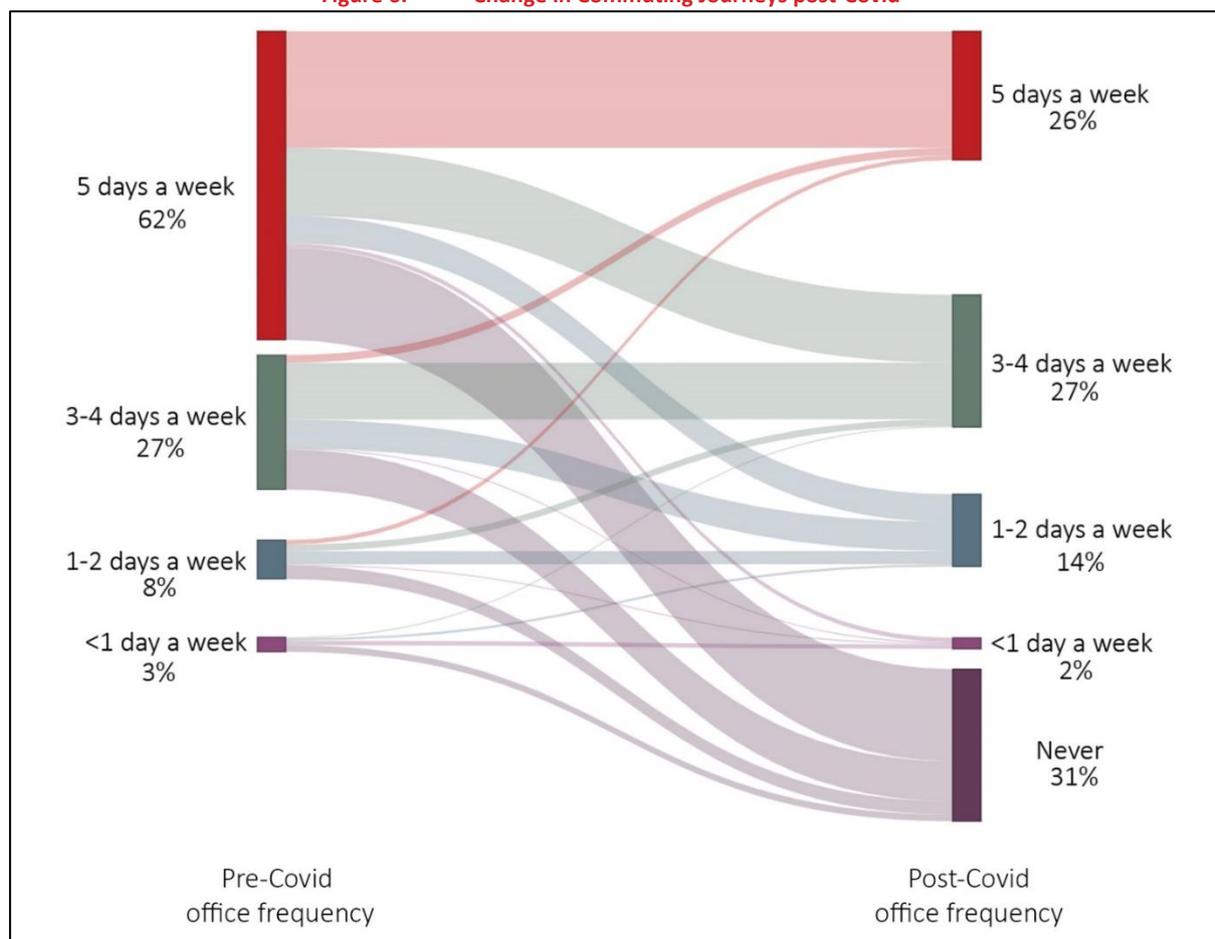
3.4.3 This equates to respondents making commuting journeys (i.e. not working from home) 84% of their working days before the introduction of Covid-19 restrictions.

3.4.4 Once all restrictions are lifted (In a post-Covid environment), respondents predict making commuting journeys on 50% of their working days, equivalent to a 34% reduction in all commuting journeys.

3.4.5 By combining this data with the Census data, we can estimate the percentage of the total workforce who might work from home once the pandemic has past.

<sup>2</sup> <https://www.systra.co.uk/en/covid-19/covid-19-research-insights/article/nearly-a-third-of-office-workers-never-want-to-return-to-the-office2>

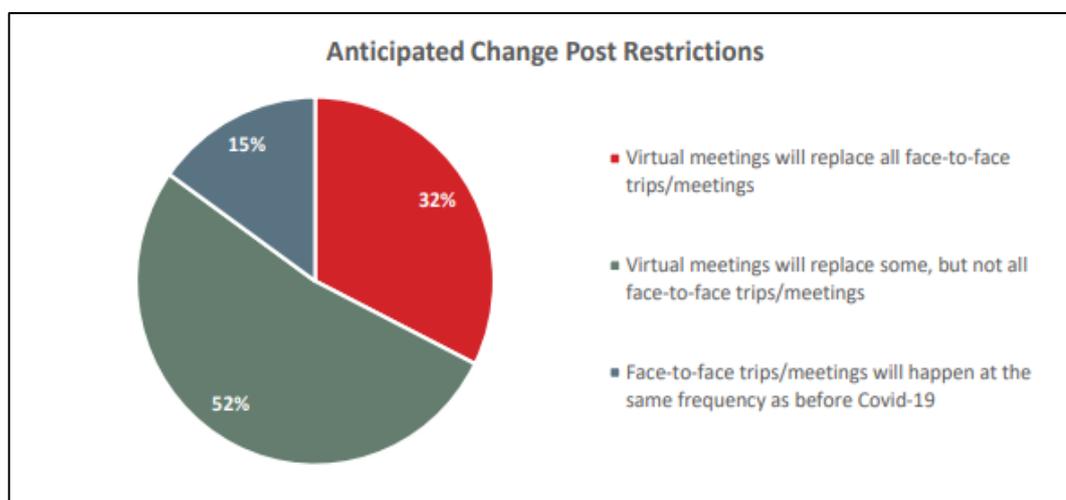
**Figure 6. Change in Commuting Journeys post-Covid<sup>2</sup>**



### Business Trips

- 3.4.6 A separate series of monthly surveys<sup>3</sup> undertaken by SYSTRA in Scotland is seeking to better understand changes in travel behaviour and attitudes during the pandemic, along with the anticipated changes post Covid. The most recent surveys at the time of writing were undertaken in September. As part of the surveys, working respondents were asked about their expectations regarding business meetings post Covid.
- 3.4.7 Before Covid-19 restrictions, a third (34%) of working respondents took part in business meetings, with the majority (61%) travelling to attend between one and four business meetings in an average month.

**Figure 7. Change in Business Trips post Covid<sup>3</sup>**



3.4.8 Following the Covid Pandemic, 32% expect that virtual meetings will replace all face to face business meetings. 52% expect that virtual meetings will replace some but not all face to face meetings. Of this 52% we have assumed that one half of trips will be replaced by virtual meetings. This would match the results of the previous online survey in section 3.4.4 which stated that respondents predict making commuting trips on 50% of their work days.

3.4.9 In total, the results of this survey indicate that approximately 55% of all face to face meetings could be replaced by virtual meetings post Covid. This reduction has been applied to the business trip user class.

3.4.10 Given the nature of stated preference surveys (which can sometimes result in hypothetical bias) and given the timing of the survey (during summer months) it is considered that the estimated proportion of business trips which will be replaced by virtual meetings assumed above is conservative.

### 3.5 Post Covid Changes to Traffic Demand

3.5.1 In summary, the aforementioned analysis finds that:

- 66% of all trips will be unaffected by changes in Home working post Covid-19;
- Of the 34% of trips which are affected, 64% of trips have the ability to work from home;
- Of this 64%, daily commuting trips are likely to reduce by approx. 34% on average post Covid-19;
- 55% of business trips will be replaced by virtual meetings

3.5.2 The following table shows the changes in traffic demand in the AM peak hour (across the entire model area) post Covid by incorporating the assumptions on changes to working patterns outlined above.

<sup>3</sup> [https://www.nestrans.org.uk/wp-content/uploads/2020/10/20200928\\_Nestrans\\_Tracking-Survey\\_W3-Final-Report\\_v1.0.pdf](https://www.nestrans.org.uk/wp-content/uploads/2020/10/20200928_Nestrans_Tracking-Survey_W3-Final-Report_v1.0.pdf)

**Table 3. Estimated Traffic Demand Changes Post Covid in the AM peak hour**

USER CLASS	PRE COVID	POST COVID	DIFF	DIFF (%)
1	3,634	3,634	-	0%
2	7,512	3,380	4,132	55%
3	54,116	41,913	12,203	23%
4	108,420	108,420	-	0%
5	7,595	7,595	-	0%
<b>Total</b>	<b>181,278</b>	<b>164,943</b>	<b>16,335</b>	<b>9%</b>

3.5.3 The results show a 55% drop in business trips (user class 2) and a 23% drop in commuting trips (user class 3). All of this combines to produce a 9% drop in traffic across the entire region post Covid.

### 3.6 Implications for N6 GCRR Appraisal

3.6.1 As noted previously, the long term effects of the Covid-pandemic on future travel behaviours is difficult to accurately predict. Therefore the post Covid travel behaviours presented in the report should be viewed as a sensitivity test, similar to the various land use forecasts presented in the EIAR and Further Information submission which have included:

- Low Growth Scenario (EIAR);
- TII Central Case Scenario (EIAR);
- High growth scenario (EIAR); and
- NPF Scenario.

3.6.2 The Covid sensitivity assessment outlined above has indicated that the long-term impact of the pandemic could potentially influence travel behaviours and reduce demand for travel by up to 9% as a result of increase working from home.

3.6.3 Through the lifetime of the project, a number of forecast growth scenarios have been assessed, as outlined above. The demographic assumptions used in the central case scenario for the EIAR result in a 20% increase in traffic on the network between 2012 and 2039, whilst the current NPF demographic forecast results in a 32% increase in traffic on the road network over the same period.

3.6.4 Viewed in the context of these forecast growth ranges, the impacts of the Covid pandemic will not alter the outcome of the appraisal to date, demonstrating the need for the full implementation of the GTS to support the sustainable growth of the city.

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