N3 Virginia Bypass
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ASSESSMENT OF ALTERNATIVES

SYSTRA

N3 VIRGINIA BYPASS

ASSESSMENT OF ALTERNATIVES

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1.1 Overview

1.1.1 Transport Infrastructure Ireland's (TII) Project Appraisal Guidelines (PAG) Unit 4.0: Consideration of Alternatives and Options, requires that all modes and demand management alternatives are considered and discussed as part of the assessment of possibilities to address the transportation issue in question.

1.1.2 This document presents the Assessment of Alternatives for the N3 Virginia Bypass Project. The objective of this report is to identify and consider the range of transport management and modal alternatives that may address the project objectives of the N3 Virginia Bypass project and to inform the selection of the most appropriate options to bring forward for further consideration.

1.1.3 Using the TII's definitions, the difference between alternatives and options from a project appraisal perspective are that:

- **Alternatives** – "An alternative refers to a specific transport mode (road, rail, bus, air, etc.) or demand management proposal (fiscal, control, ITS measures etc.) which could address the need for an intervention".
- **Options** – "Options refer to the specific road-based options that fall under the remit of TII. At Phase 2: Option Selection stage a number of options are considered and brought through a structured appraisal process in order to identify a single preferred option".

1.1.4 The objective of this report is to present the baseline evidence to inform the decision-making process in the Assessment of Alternatives. This has been done with reference to the National Investment Framework for Transport in Ireland (NIFTI) Intervention Hierarchy which broadly dictates that sustainable mode enhancements should be prioritised where possible over road based solutions to benefit private mode users.

1.1.5 The report will assess potential modes of travel, such as; road, bus, rail, demand management measures or active modes. This assessment will conclude on the preferred mode of transport to achieve the project objectives.

1.2 Project Summary

1.2.1 Virginia's main street is also a national primary route (the N3) and must therefore cater for high levels of car and goods traffic that is moving through the national road network. Thus, the Main Street struggles to serve its original purpose as people oriented commercial centre of a small rural town. The main street retains its original cross section and the large volume of national network trips passing through it results in localised congestion, pollution, and an unsafe environment. The desired end-state in Virginia is a low traffic main street and a safe, healthy, and liveable urban centre environment. It is clear that the present role of the road as a national primary route contributes to a vehicle dominated environment and prevents the re-establishment of a people-orientated, safe, and unpolluted town centre. The purpose, therefore, of the present study is to create a better town centre environment by reducing vehicular dominance to an acceptable level. In the case of Virginia, this means removing all

passing truck related traffic except for local deliveries from the main street, thus reducing pollution and increasing safety by a significant margin. It also means reducing car traffic to a level at which pedestrian crossings and a traffic calmed environment become more achievable.

Typical Journey Times

1.2.2 Tail backs into the town in excess of between 2 and 3km are a daily occurrence and this adds significant journey times of between 10 to 20 minutes (and more) both morning and evening above the expected journey time when driving through the town.

Existing Level of Service

1.2.3 The existing level of traffic along the N3 between Virginia and Maghera is in the order of 13,000 Annual Average Daily Traffic. The average journey speed at peak times demonstrates that the existing single carriageway road does not have the capacity to accommodate the existing traffic flows at a Level of Service D. Whilst an unsatisfactory situation for those travelling through the town, it is also unsafe and unsustainable for those wishing to undertake business or enjoy the facilities provided by the local main street. The project therefore aims to resolve the congestion issue for the benefit of both through traffic of all kinds and to improve the local environment for the benefit of residents, students, workers, and visitors in Virginia.

1.3 Project Appraisal Guidelines

1.3.1 Transport Infrastructure Ireland (TII) Project Appraisal Guidelines (PAG) Unit 4.0 – Consideration of Alternatives and Options (October 2016) provides guidance on the difference between alternatives and options from a project appraisal perspective:

- **Alternatives** – "An alternative refers to a specific transport mode (road, rail, bus, air, etc.) or demand management proposal (fiscal, control, ITS measures etc.) which could address the need for an intervention".
- **Options** – "Options refer to the specific road-based options that fall under the remit of TII. At Phase 2: Option Selection stage a number of options are considered and brought through a structured appraisal process in order to identify a single preferred option".

1.3.2 The Assessment of Alternatives exercise presented in this report is solely focused on identifying the preferred alternative mode for the N3 Virginia Bypass project.

1.4 Project Objectives

1.4.1 The Project Objectives of the N3 Virginia Bypass Project, as presented in Table 1.1, were developed as part of the Phase 1 (Concept and Feasibility) Project Brief and updated as the project progressed. These objectives were developed on the basis of the existing policy context and existing network deficiencies.

1.4.2 As part of the Assessment of Alternatives process, the project objectives will be used to inform the selection of the preferred alternative mode of transport to bring forward for further detailed assessment.

Table 1. Project Objectives

Appraisal Heading	Objective
Economy	To be consistent with the National Planning Framework objective of enhancing regional accessibility and enhance connectivity between the 4 cities and the Northern and Western region. To promote and grow the Northern and Western regional economy by creating better transport linkage for people, goods and services, including road based public transport, between Dublin, Cavan and onward to the Northern and Western region. Improve attractiveness for inward investment and employment in the Virginia, Cavan and the North West Region through improved transport network efficiency and connectivity, including Public Transport and Active Travel connectivity. Provide a scheme at an investment cost that offers good value for money.
Safety	To improve road safety by reducing the rate and severity of collisions on the road network and to support the RSA Road Safety Strategy to reduce road deaths and serious injuries by 50% by 2030. To improve safety for vulnerable road users.
Environment	To improve the environment in Virginia town through the reduction of through / strategic traffic. To support sustainable development principles and measures to minimise effects on the environment including potential climate change effects. To protect and enhance biodiversity including both legally protected areas and other areas. To reduce pollutants and heavy metals from road surface water drainage from entering watercourses, Lough Ramor pNHA and into the River Boyne and River Blackwater Special Area of Conservation (SAC) and Special Protected Area (SPA), supporting the Water Framework Directive objective for Lough Ramor to restore Good Quality status. To support sustainable and equitable mobility to encourage modal shift to help meet Irelands Climate change goals.

Appraisal Heading	Objective
Accessibility & Social Inclusion	Improve journey time reliability for all travel modes including bus public transport between Virginia town, Cavan Town and the North West Region. To improve accessibility for all, in particular vulnerable groups and those in deprived areas, to key facilities such as: • employment, including access to remote working hubs, • education, • health care, • and other essential services, within Virginia town Cavan Town, the North West Region and Dublin. Improve quality of life in towns and communities by: • removing strategic and commercial traffic from Virginia town. • reducing rat running of traffic on the unsuitable local road network.
Integration	To facilitate active travel and road connectivity with public transport interchanges, e.g. bus stops and transport park and share hubs (mobility hubs). To support sustainable development through the provision of appropriate access and adherence to the principles of compact urban growth. To improve transport links between Dublin, including Dublin Port and Dublin Airport, Cavan, the Border and the North-West Region. Improve connectivity for movement around the town and between local communities, including Maghera, for all transport modes, including pedestrians and cyclists.
Physical Activity	Reduce strategic traffic through Virginia town to enable improvement of the public realm environment and to facilitate improvements for safe walking and cycling and provide a healthier environment conducive to active travel. To provide improved connectivity for Vulnerable Road Users (VRUs) to key destinations e.g. Schools, workplaces, Virginia

Appraisal Heading	Objective
	Town, Virginia Primary Care Centre, tourist facilities, sports complexes and Lough Ramor amenity, village centres).

1.5 Structure of this Report

1.5.1 The remainder of this report is structured as Follows:

- **Chapter 2: Baseline Review** – this Chapter examines the existing situation in detail, from which potential solution can start to be considered;
- **Chapter 3: Assessment of Potential Solutions** – following on from the analysis in Chapter 2 this chapter assesses a range of potential solutions (across transport modes and/or demand management) that could be applied to help address the issues noted in Chapter 2;
- **Chapter 4: Common Appraisal Framework Assessment of Alternatives** – this chapter details the results of a Multi Criteria Analysis to identify the preferred mode according to the Common Appraisal Framework headings;
- **Chapter 5: Summary and Conclusions** .

2. BASELINE REVIEW

2.1 Data Sources and Analysis Tools

2.1.1 The baseline review draws upon numerous data sources to present the existing situation in and around the Virginia area in respect to modal choice, origin-destination of travel, road safety issues and public transport. The main data sources used in this analysis are:

- Census 2016 commuting data;
- General Transit Feed Specification (GTFS) Data base;
- Census 2016 POWSCAR data; and
- NTA's Eastern Regional Model.

2.2 Traffic Data

Typical Journey Times

2.2.1 As mentioned above, congestion is a major problem for traffic travelling through Virginia Main Street daily and this has significant economic impact for businesses in the town. Tail backs into the town in excess of between 2 and 3km are a daily occurrence and this can add significant time above the expected journey time when driving through the town. Anecdotal evidence from locals suggest that congestion is at its worst during the Friday evening peak hour.

2.2.2 Traffic survey data which was commissioned for this project during September/October 2020 backs this up. So times were extracted for a northbound and southbound route through Virginia town between two points (Lisduff and Lisgrea as shown in the map below).

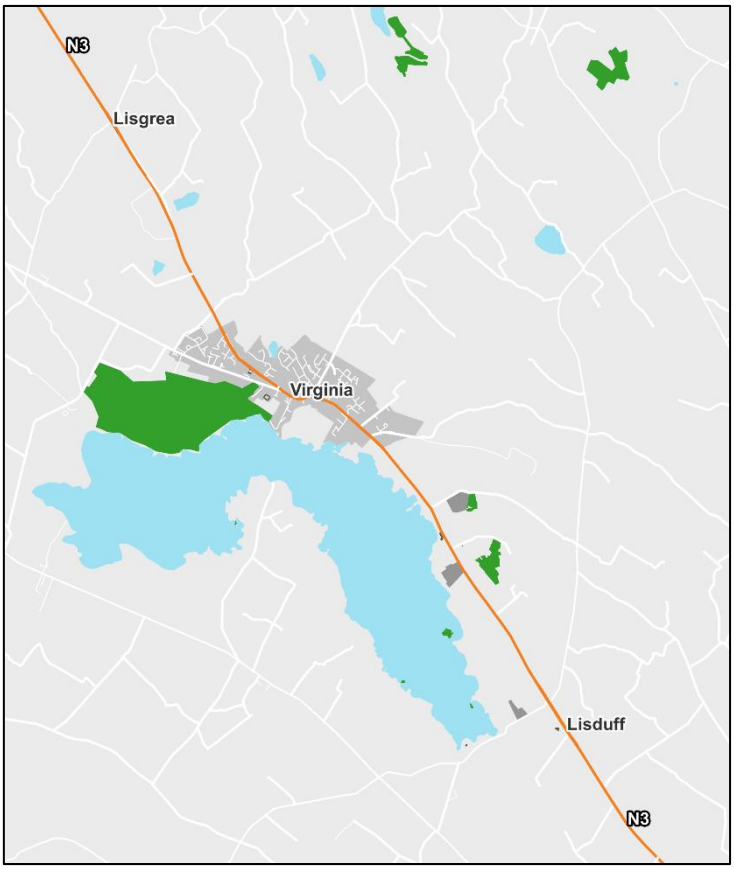

Figure 2-1 Journey Time Routes along the N3 between Lisduff and Lisgrea

2.2.3 Data from Friday the 25th of September 2020 showed that traffic travelling through the town in the northbound direction was 6 minutes slower during the evening peak hour (approx. 14 ½ minutes) compared with the average time taken outside of the peak hours (approx. 8 ½ minutes). Over the 9km distance between Lisduff and Lisgrea, this equates to an average speed of 37 kph during the Friday evening peak hour versus 64kph outside of the peak hours.

2.2.4 But as the traffic surveys were undertaken during a period in which the country was under Level 3 travel restrictions (which involved limited numbers for social gatherings and advising people to not travel outside their county, amongst other restrictions), the data does not represent the typical scenario. So the same exercise was undertaken in Google Maps for a typical Friday evening during the peak hour. It suggests that for the same route, taken on a Friday after 4pm can take anywhere between 16 – 30 minutes as shown below. This equates to an average speed over the 9km distance of between 18 – 34 kph and is double the 14 ½ minute journey time from the 2020 traffic surveys mentioned above.

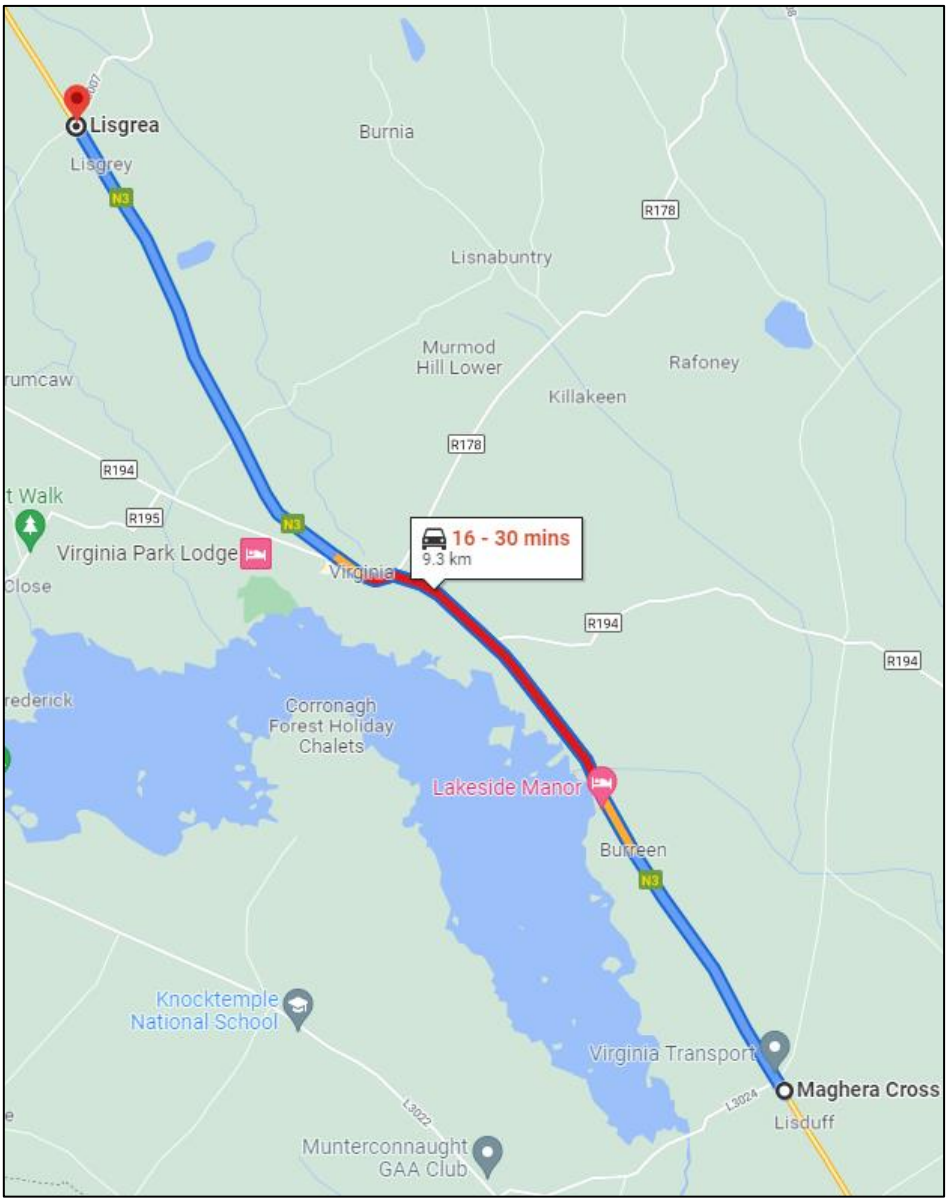

Figure 2-2 Northbound route through Virginia town on a typical Friday evening as suggested by Google Maps ©

2.2.5 The same exercise was undertaken for the equivalent route in the southbound direction along the N3. Data from Thursday the 8th of October 2020 showed that traffic travelling through the town in the southbound direction was 5 minutes slower during the evening peak (approx. 14 minutes) compared with the average time taken outside of the peak hours (approx. 9 minutes). Over the 9km distance between Lisgrea and Lisduff, this equates to an average speed of 38 kph during the evening peak hour versus 60kph outside of the peak hours.

2.2.6 But as mentioned above, these surveys were undertaken during a period where travel restrictions were in place and don't represent the typical scenario. So the same exercise was undertaken in Google Maps and suggests that for the same route, on a typical Thursday evening after 4pm can take anywhere between 10 – 18 minutes as shown below. This equates

to an average speed over the 9km distance of between 30 – 54 kph and is 4 minutes slower than the journey time from the 2020 traffic surveys mentioned above.

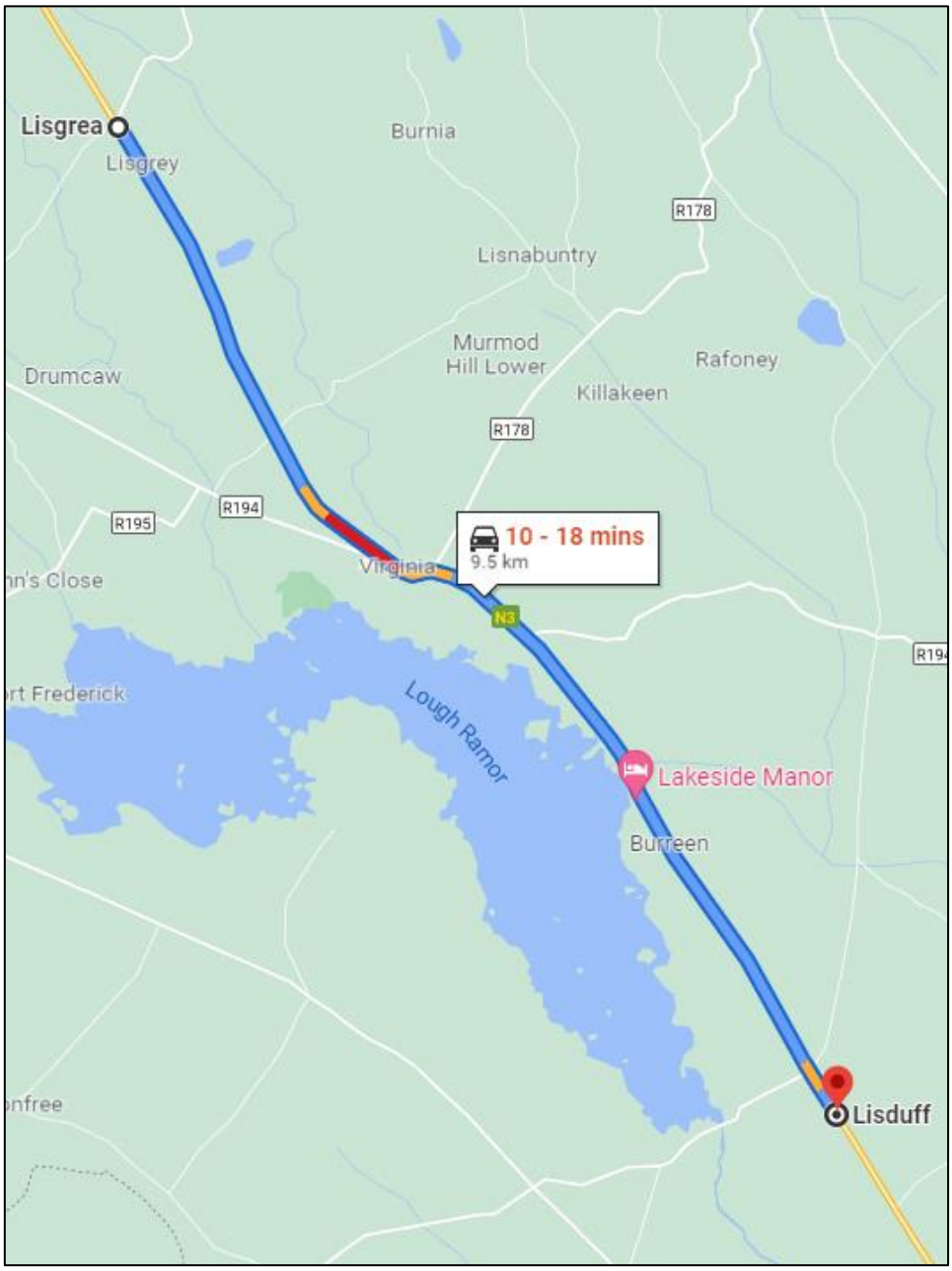

Figure 2-3 Southbound route through Virginia town on a typical Thursday evening as suggested by Google Maps ©

Analysis of traffic profiles

2.2.7 A TII Traffic Monitoring Unit (TMU) is located on the N3 within the study area, between Derver roundabout in Co. Meath and Maghera, Co. Cavan An analysis of the weekly traffic profile from this N3 TII traffic counter (for 2019 – pre Covid-19 movement restrictions) is shown below in Figure 2-4.

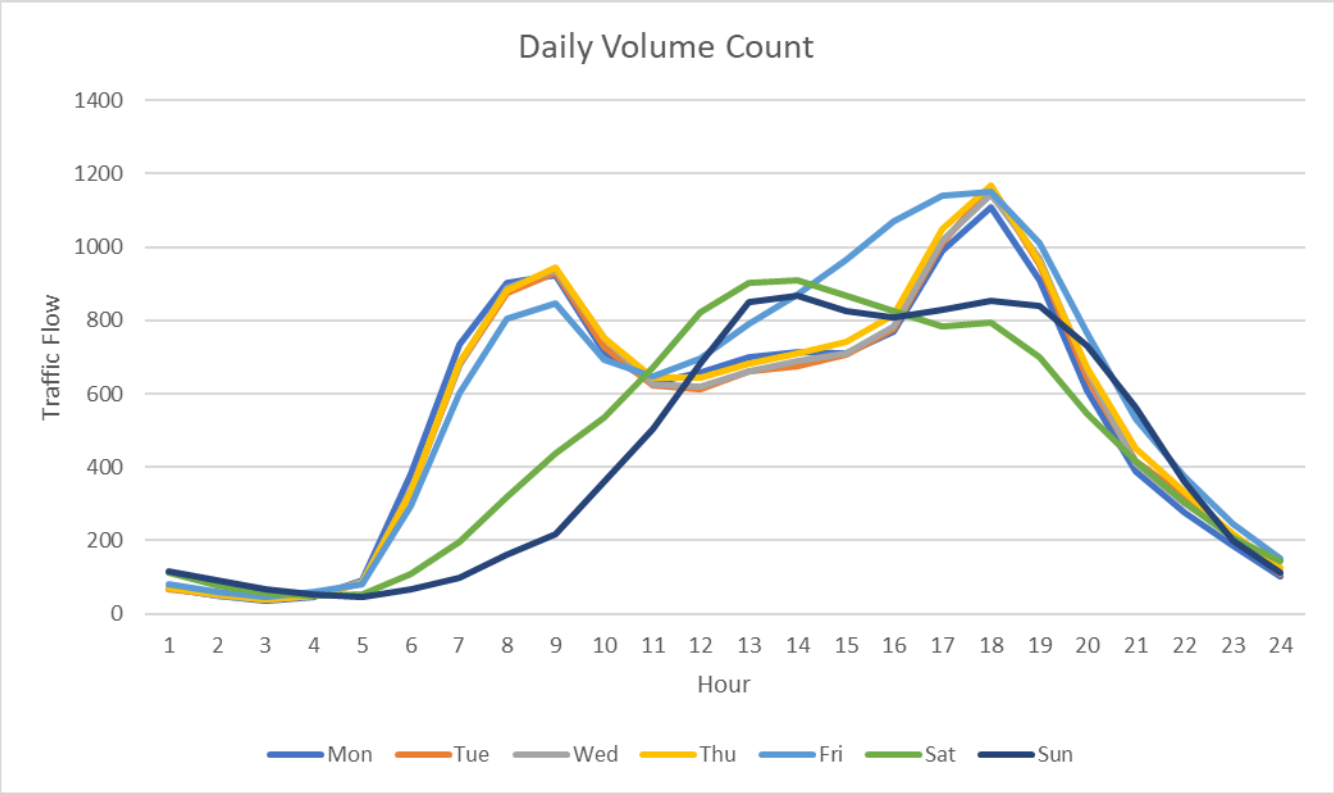

Figure 2-4 ATC Traffic Profile

2.2.8 The graph above highlights the following points–

- The daily profile above is similar to that which would be observed on many roads in Ireland, with two peaks (morning and evening) during the weekdays (implying significant commuter flows), and the PM having higher levels of two-way traffic (implying a wider mix of purposes than simply the return flow of AM peak commuters). But the weekend days also show a high afternoon flow which would be representative of shopping patterns.
- Friday conditions are markedly different from other weekdays, with a lower morning peak at 8am and higher flows leading up to the PM peak (a longer peak period).
- The remaining weekdays show a similar pattern, with some day-to-day variations.

2.3 Analysis of Trip Patterns

2.3.1 Travel patterns strongly influence the range of solutions that are available to solve traffic related issues. The analysis presented below uses the Census 2016 data to explore the typical travel to work and travel to school patterns to help understand the potential to influence these trips to other modes as part of the range of solutions available.

Census Commuting Data O-D Analysis

2.3.2 Using information from the 2016 Census, the CSO has developed a set of aggregate commuting counts. These counts are presented at electoral division (ED) and county level and estimate the likely number of trips which take place between each ED during the morning commuting period. The counts are based on origin and destination EDs for workers and

students who are usually resident in Ireland. The counts include persons who work from home and persons who have no fixed place of work. It should be noted that these figures only represent person trips (i.e. cumulative total of all modes) to work and education and excludes other trip purposes.

2.3.3 This 2016 commuting data has been processed to establish the quantity and direction of strategic commuting trips taking place within the study area, during the AM period. The results of this analysis are shown in Figure 2.1 below, alongside the corresponding data in Table 2.1.

Figure 2-5 Study Area Commuting Trip patterns

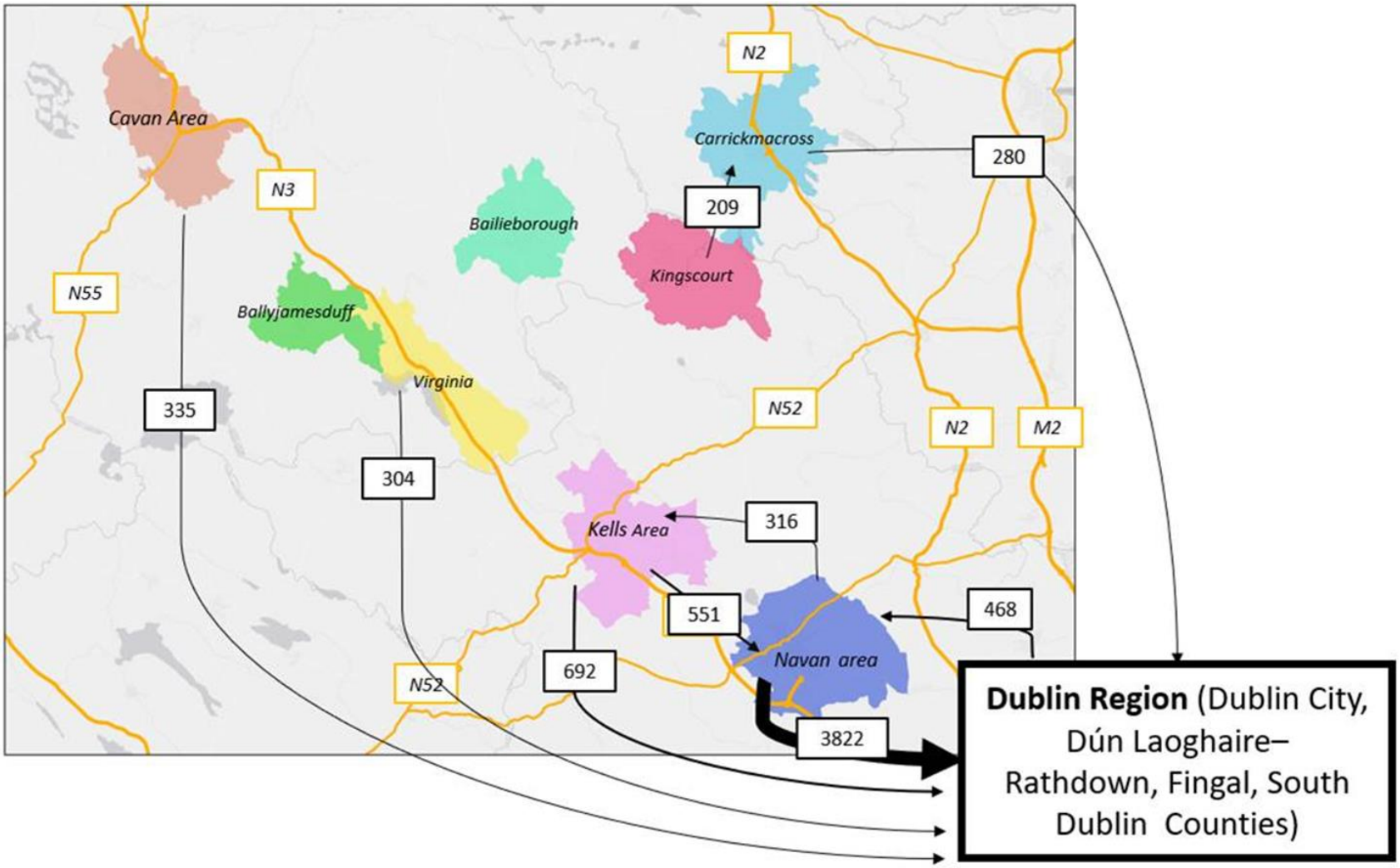

Table 2-1 Study area Commuting Patterns*

FROM\TO	BAILIEBOROUGH	BALLYJAMESDUFF	CARRICKMACROSS	CAVAN AREA	DUBLIN REGION	KELLS AREA	KINGSCOURT	NAVAN AREA	VIRGINIA
Bailieborough	1,083	16	12	108	130	34	34	32	31
Ballyjamesduff	10	1,000	3	176	145	37	3	27	139
Carrickmacross	18	2	2,220	15	280	5	67	25	3
Cavan Area	36	144	7	4,639	335	41	17	46	46
Dublin Region	4	1	13	65	694,899	50	20	468	16
Kells Area	9	6	2	59	692	2,072	8	551	23
Kingscourt	32	1	209	30	179	34	971	83	8
Navan area	9	4	9	78	3,822	316	13	10,031	22
Virginia	42	60	1	155	304	159	6	91	972

**This table shows trip origin and ultimate destination. Trip origins are shown on the vertical axis and destinations are shown on the horizontal axis. For example, 972 trips start and end in the Virginia area during the AM period. Similarly, 155 trips take place from Virginia to the Cavan area.*

2.3.4 Some of the key points to take from the table and figure above include:

- The majority of commuting demand in the area is destined for Dublin. Notably, Cavan, Virginia and Kells contribute 335, 304 and 692 trips respectively. Some of these movements could potentially be served by PT given their alignment to the existing Bus Services on the N3/M3.
- The trips with the most demand are "internal" trips within each of the specified settlements i.e. 972 commuting trips begin and end inside Virginia. Given the relative short distances involved in these trips it is possible that this demand could be served by local bus services or by active modes.
- The highest level of demand within Virginia and the surrounding areas is destined for Dublin, with 304 trips coming from Virginia and an additional 5,583 trips from the surrounding areas during the AM peak period destined for the Dublin area.
- There is also a relatively high level of demand from Virginia to nearby towns with 155 trips to Cavan Town and 159 trips to Kells.

Trip Productions and Attractions

2.3.5 An analysis of census 2016 data has been undertaken to establish trip production and attraction rates in the study area and are illustrated below.

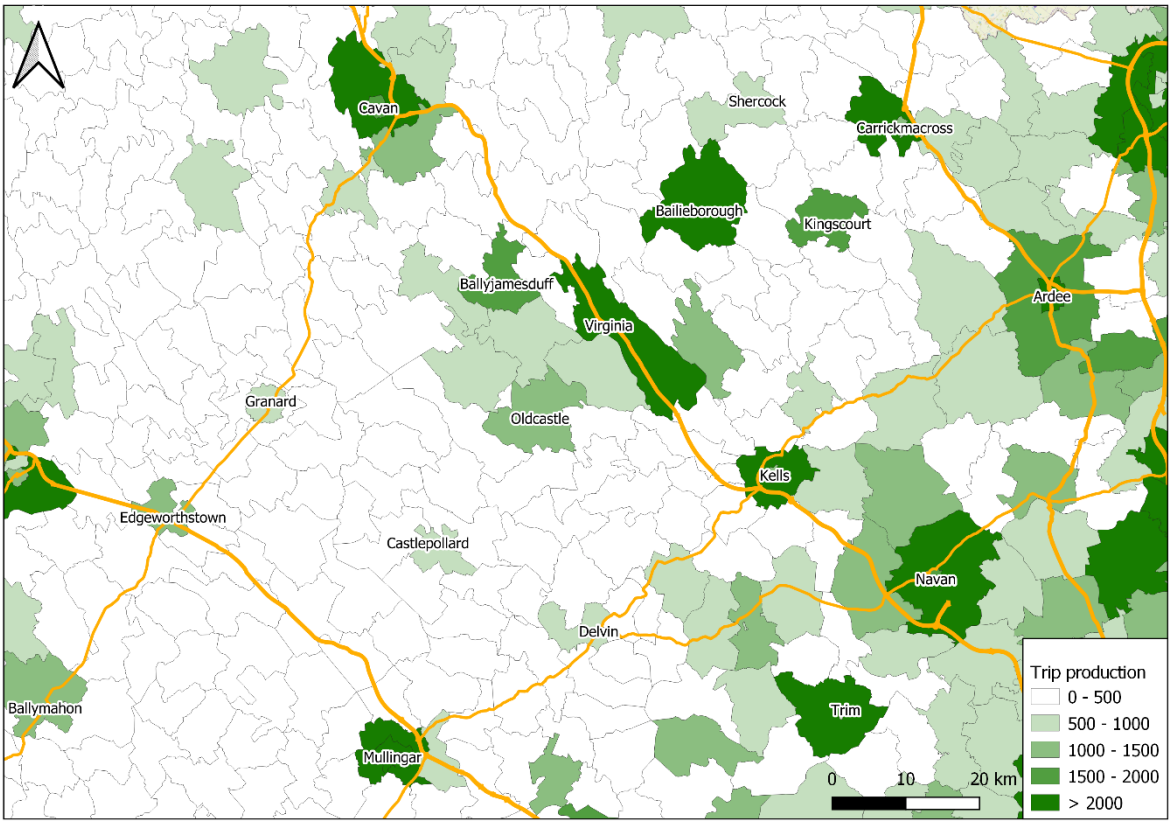

Figure 2-6 Study Area Trip Productions

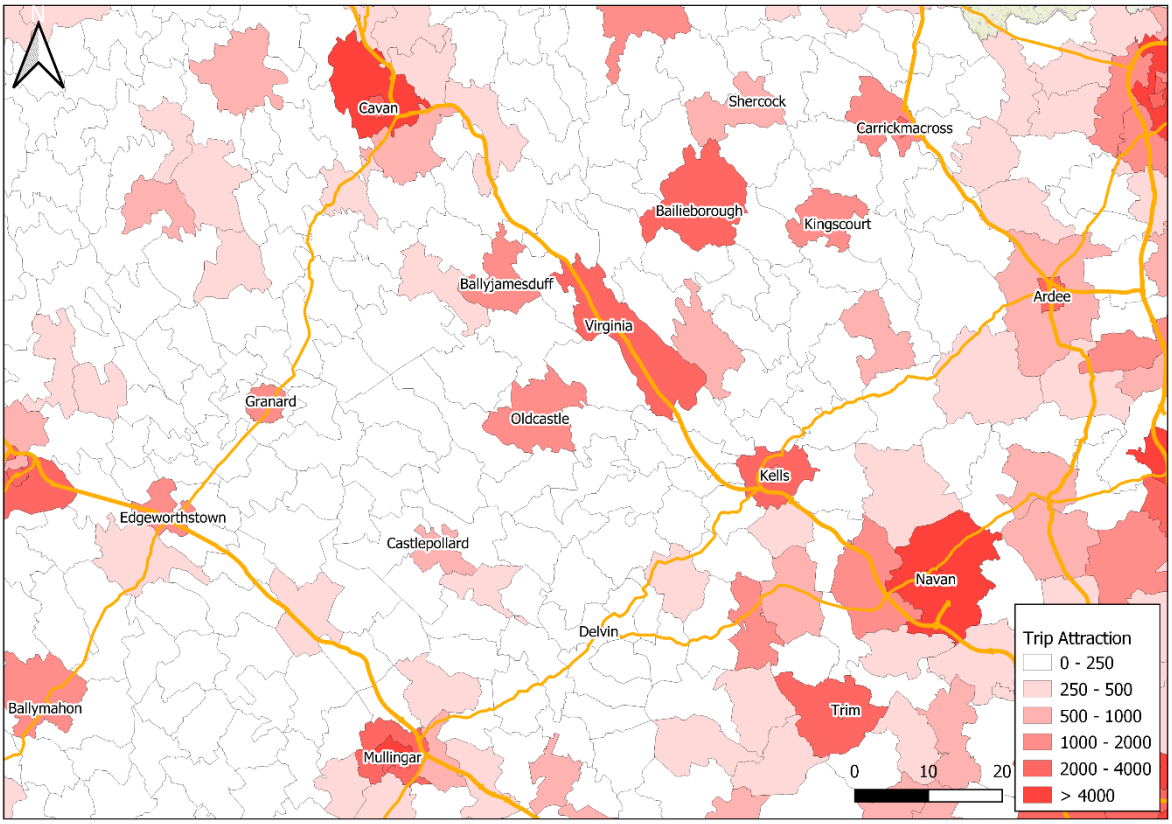

Figure 2-7 Study area Trip Attractions

2.3.6 Figure 2.2 above shows that trip production, which largely relates to population distribution, is largely concentrated within Virginia and some of the major surrounding urban settlements.

2.3.7 Similarly, Figure 2.3 shows that trip attraction in the study area is largely concentrated in the bigger economic centres in the area like Cavan Town and Navan.

2.4 Modal Split

2.4.1 A mode split analysis has been undertaken for the study area using Census 2016 data. The mode share for each of the main modes of travel are presented below for work trips and education trips separately.

2.4.2 The table below shows the modal splits for Virginia, Cavan County and the National Average for Work trips only.

Table 2-2 Modal Split for Work Trips (Census 2016)

Location	Walking	Cycling	PT	Motor Vehicle
Virginia	6.3%	0.8%	5.2%	87.7%
Cavan County	7.0%	0.5%	1.8%	90.7%
National average	9.9%	3.2%	9.9%	77.0%

2.4.3 The figure below provides a graphical comparison of the figures above and highlights that the private motor vehicle is the dominant mode in Virginia and across Cavan County as well as nationally. Both Virginia and Cavan County have similar splits and have low active and public transport levels which reflect their more rural locations. The graph shows a high level of car use for those living in Virginia and thus the importance of the N3 national road in the area. While the level of travel by walking in the area is relatively low, it is almost comparable to the national average (which includes the main cities) so given the rural location of Virginia, these levels are likely higher than most rural towns. This is likely due to the number of people living and working within Virginia town itself and the relatively compact nature of the town. Similarly, the level of public transport use is low in comparison to the national average, but higher than that of the county as a whole.

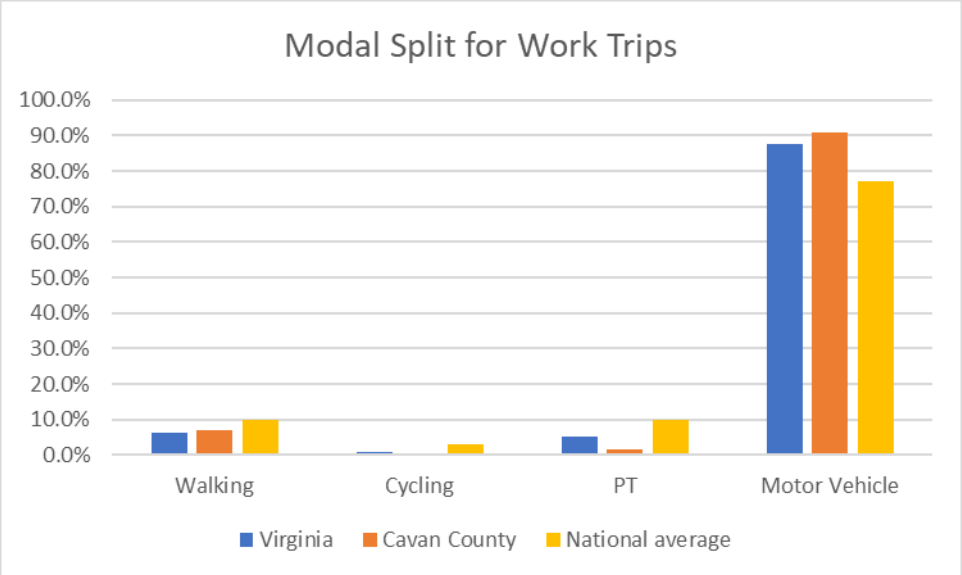

Figure 2-8 Modal Split Comparison for Work Trips (Census 2016)

2.4.4 The table below shows the modal splits for Virginia, Cavan County and the National Average for Education trips only.

Table 2-3 Modal Split for Education Trips (Census 2016)

Location	Walking	Cycling	PT	Motor Vehicle
Virginia	37.7%	2.0%	13.5%	46.9%
Cavan County	13.7%	0.6%	19.5%	66.2%
National average	24.1%	2.4%	21.2%	52.3%

2.4.5 The figure below highlights that the private motor vehicle is also the dominant mode for Education trips across Cavan County as well as nationally. However, in Virginia itself, there is a notably higher mode share for sustainable modes than the county and national averages. Most of this sustainable travel is taken by walking (approx. 38% which is higher than the national average) which again reflects the compact nature of the town and suggests that a lot of students live near their schools. The graph also shows that public transport use is lower than both the county and national average (6% and 8% lower respectively) which would suggest that the existing bus services in Virginia are not a viable alternative to car travel for education trips.

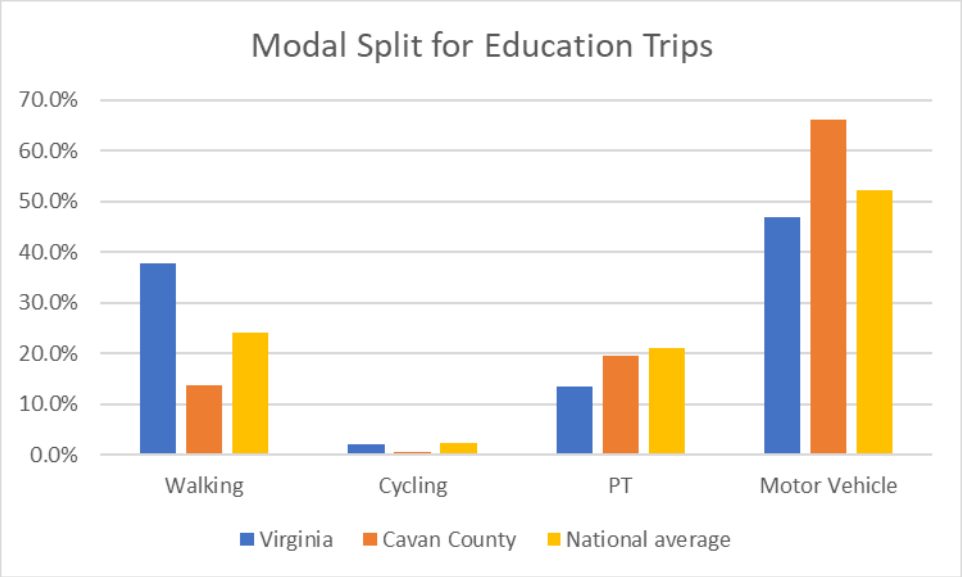

Figure 2-9 Modal Split Comparison for Education Trips (Census 2016)

2.5 Walking and Cycling Activity

2.5.1 The following heat maps show the walking and cycling activity across Virginia with the areas of greatest activity being represented by bright colours and areas of least activity being represented by dark colours.

2.5.2 This data was taken from the STRAVA website which collates information uploaded by users of the Strava application. For a user's activity to be shown on the map, they would have to have the Strava application installed and active on their phone or smart device. Therefore, the following maps only show a sample of the walking and cycling activity in Virginia.

2.5.3 Additionally, Strava is very popular among exercise enthusiasts, so the majority of activity shown in the maps below is likely to be for exercise purposes rather than commuting purposes. Notwithstanding this, these maps can provide a useful insight into the preferred routes used by people walking and cycling.

Figure 2-10 Walking Heat Map for Virginia (Strava 2021)

2.5.4 The map above shows the areas in Virginia where the greatest level of walking activity takes place. As expected, the areas with the highest levels (the bright colours) are focused in and around Virginia town and in particular the Deerpark Forest Park. This level of activity suggests that there is a lot of walking trips across Virginia for either exercise, commuting, shopping or leisure purposes.

Figure 2-11 Cycling Heat Map for Virginia (Strava 2021)

2.5.5 The map above shows the areas in Virginia where the greatest level of cycling activity takes place. The areas with the highest levels of cycling (the bright colours) are more dispersed compared to the walking map with the majority of all radial routes leading into Virginia showing a reasonable level of activity. Given the fact that there is minimal cycle lane provision throughout the town, this suggests that cyclists regularly mix with general traffic on the roads into and around Virginia.

2.6 Existing Public Transport Access

2.6.1 In order to provide an indicative summary of areas which are accessible to public transport or car dependent, a GIS assessment was completed which plotted National Transport Authority (NTA) General-Transit-Feed-Specification (GTFS) stop locations and categorised CSO Small Areas according to access. The analysis categorised CSO Small Area boundaries as being accessible or inaccessible to public transport on the basis of whether they intersect with a public transport catchment buffer (1km for rail or 500m for bus).

2.6.2 A map of Virginia and the wider area which has public transport access is shown below in Figure 2.6. This shows that Virginia itself and the areas along the N3 have a good level of Public Transport access. This generally reflects the nature of Public Transport provision in this area which is predominantly provided along the N3. As there is no train line within the study area below, public transport access is provided solely by buses.

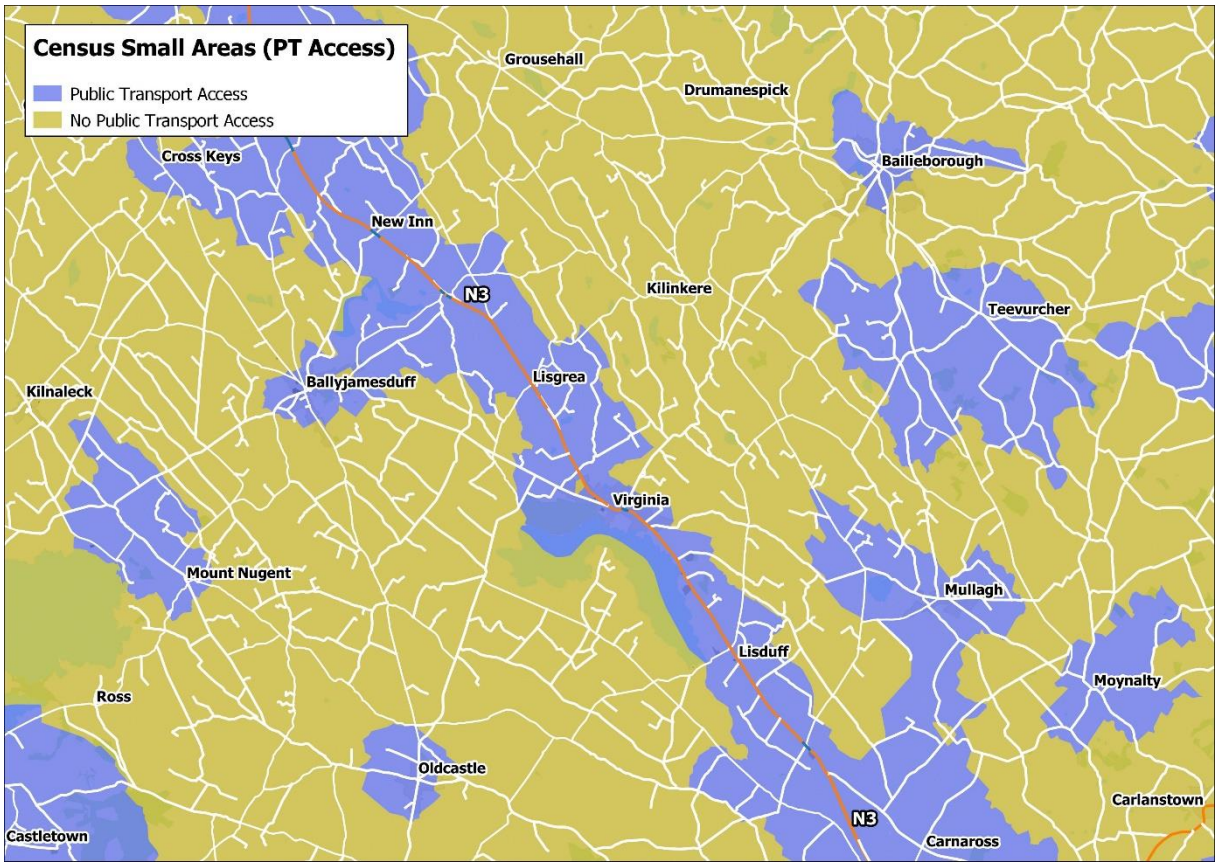

Figure 2-12 Census Small Areas with Public Transport Access

2.7 Assessment of Strategic Road Network

2.7.1 As illustrated in Figure 2.7, below, Virginia is located on the N3 which is the main road between Dublin and Cavan. To the north of Cavan, the N3 crosses the Northern Irish border where it becomes the A509 to Enniskillen. The N3/M3 serves a vast geographical area (over 100km long) and provides a strategic function in terms of connecting Dublin to several towns in the north of the country (as well as connecting the south to the western side of Northern Ireland). The road provide access to peripheral areas of the country with many businesses in these areas depending on the national road for access to both national and international markets.

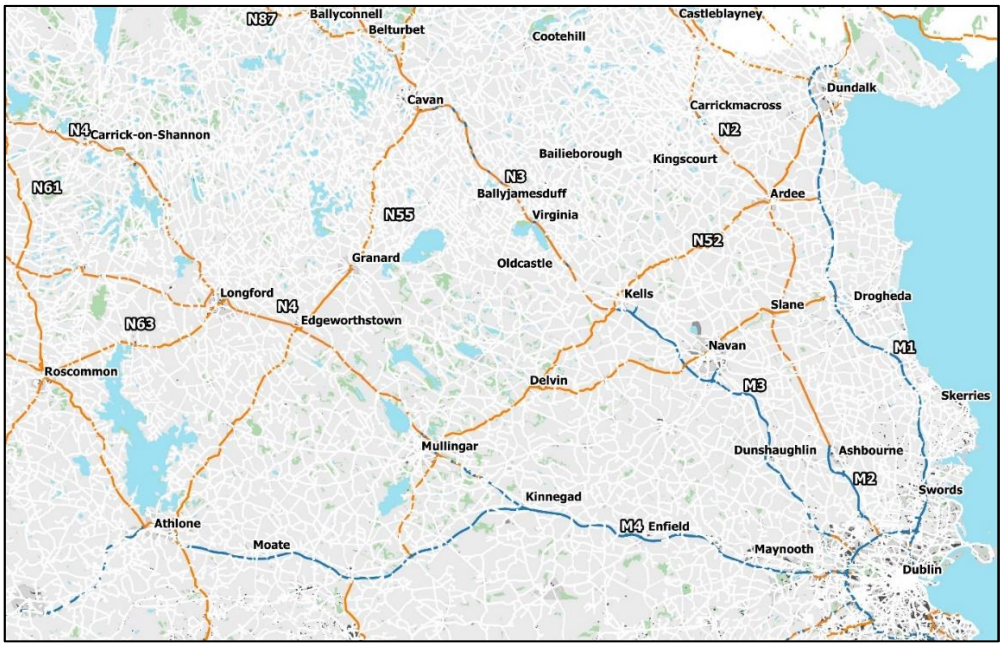

Figure 2-13 N3/M3 Coverage Area

2.8 Summary

2.8.1 Some of the key findings identified in the baseline review are outlined in the Table below.

Table 2-4 Summary of the Key Points in the Baseline Review

ISSUE	KEY POINT
Origin Destination Analysis	There is a significant amount of local trips (Origin & Destination in Virginia) generated within the town. These tend to be shorter distance trips which could be carried out by sustainable modes. There are also high volumes of commuting trips in the area which are destined for Dublin. Notably Cavan, Virginia and Kells contribute the most trips to Dublin along the N3 corridor.
Mode Split	The modal split results show that private motor vehicle is the most used mode of transport, accounting for 88% of work trips and 47% of education trips within Virginia. Public transport usage for both work and education trips is low, but a substantial amount of children travel to school by walking (38%). This suggests that a lot of students live close to their schools.
Public Transport	As there is no train line within the study area below, public transport access is provided solely by buses. The majority of bus services are ones which pass through the N3 corridor on route to Dublin. Consequently, the residential area close to the N3 have a good level of Public Transport access, with the surrounding areas having sparse, or no, coverage.

3. POTENTIAL SOLUTIONS

3.1 Introduction

3.1.1 The objective of this section is to present potential solutions to inform the decision-making process in the Assessment of Alternatives. The TII Project Appraisal Guidelines specify the requirements for the appraisal process for National Road projects. The overall aim of the appraisal process is to provide an assessment of whether a proposal is worthwhile and to clearly communicate conclusions and recommendations. The first step in this process is to identify whether there is need for intervention and this is followed by establishing appropriate objectives for the project. The next step involves considering possible alternatives to a road-based intervention such as public transport or active mode solutions.

3.1.2 The TII's preferred approach is in line with the National Investment Framework for Transport in Ireland (NIFTI) Intervention Hierarchy which broadly dictates that sustainable mode enhancements should be prioritised where possible over road based solutions to benefit private mode users.

3.2 Investment Hierarchy

3.2.1 To support the delivery of the National Planning Framework, and to make best use of existing assets, a hierarchy of the following intervention types will be applied. **Maintaining** the existing transport network will be given first priority. Maximising the value of the network through **optimising** its use will be second in priority. Infrastructural investments will only be considered after these two categories have been assessed as inappropriate for the identified problem. Thus, **upgrades** to **existing** infrastructure are to be considered before **new** infrastructure.

3.2.2 Note that the Assessment of Alternatives is focused on a high-level selection of an appropriate mode of transport to meet the project objectives, rather than assessing specific options.

3.2.3 The remainder of this chapter is aligned with the NIFTI Intervention Hierarchy, as follows:

- Maintain
- Optimise
- Improve
- New

3.3 Maintain

3.3.1 Maintain refers specifically to measures which protect the existing transport network, and keep it at the standard or capability at which it was designed. This includes all protection and renewal investment, and investments targeted at climate resilience.

3.3.2 This can include the following:

- All protection and renewal investment for road, rail and active travel

- Targeted maintenance and renewal measures where asset quality has reduced safety levels
- Targeted maintenance and renewal measures to ensure asset accessibility
- Climate resilience measures

Measure for Detailed Appraisal	Application for Virginia	Acceptability
Protection and renewal investment for road	Maintaining the existing road network around Virginia to ensure the asset quality is brought to a high level which improves safety	Given the existing tight geometries on some sections of existing road network (particularly through the town), there is little scope for widening roads to improve safety and reduce potential accidents. Therefore any existing maintenance is unlikely to have a significant impact in terms of reducing the conflicts between VRUs and general traffic through the town. It is also unlikely to resolve one of the main issues of high volumes of strategic traffic through the town which contributes to congestion.
Protection and renewal investment for public transport	Maintaining the existing public transport network around Virginia which promotes sustainable travel	This measure could help to improve the attractiveness of public transport but given the lack of public transport access around Virginia which is primarily focused along the N3, it is unlikely to achieve significant mode shift to remove the high levels of strategic traffic (including HGVs) which travel through the town on a daily basis and also improve the safety levels around the town for vulnerable road users (VRUs).
Protection and renewal investment for active modes	Maintaining the existing walking and cycling network around Virginia which promotes sustainable travel	This measure could help to improve the attractiveness of walking for short distance trips within Virginia but given the lack of existing cycling infrastructure, it is unlikely to achieve significant mode shift to alleviate congestion levels and improve the safety levels around the town for vulnerable road users (VRUs). It is also unlikely to remove the high levels of strategic traffic (including HGVs) which travel through the town on a daily basis.

Table 3-1 'Maintain' Measures Assessment

3.4 Optimise

3.4.1 'Optimise' refers to measures which are targeted at increasing levels of service of transport infrastructure through enabling and encouraging more efficient behaviour and sustainable use of the network. In the context of Virginia, several Demand Management measures have been examined.

Demand Management Measures

3.4.2 Transport Demand Management programmes are primarily demand oriented rather than supply oriented i.e. they attempt to manage people's travel rather than seeking to provide more physical capacity for travel (such as more roads, bus and train services etc). Transport Demand Management programmes can, however, complement supply oriented programmes which, for example, either reduce the capacity for private vehicles or provide priority in traffic for new or existing public transport services. An example would be where on-street parking availability is reduced as a demand management measure and the space is reallocated to provide for cycle facilities or improved pedestrian environment or public transport priority.

3.4.3 **Land use measures** seek to provide for development which reduces car dependency and encourages the use of alternative modes. Land use policies which support the provision of new development in locations, and at densities, which support walking and cycling and enable the efficient provision of public transport services are to be encouraged. Some examples include:

- Transit oriented development / Increased densities in areas served by public transport;
- Providing for a mix of land uses in close proximity to each other;
- Providing for permeability.

3.4.4 **Fiscal measures** can introduce financial incentives towards sustainable transport modes or financial disincentives to travel by car, particularly at peak periods. The cost of transport has a significant influence on people's travel choices and fiscal demand management measures can be targeted to support public transport use or to influence desire to travel, the choice of route or the time of travel. Some examples include:

- Road Tolling / Pricing;
- Congestion Charging;
- Fuel Duty;
- Public Transport Fare Subsidy;
- Parking Charges / Levies;
- Cycle to Work Scheme;
- Tax Saver Scheme.

3.4.5 **Corridor based demand management strategies** can be very effective in ensuring the efficient operation of the strategic road network. The strategies can combine different demand management approaches and generally aim to make best use of Intelligent Transport Systems such as:

- Variable Speed Limits;
- Incident Detection Systems;
- Variable Message Signs; and
- Ramp Metering on National Routes.

3.4.6 **Traffic Management measures** can also be effective in ensuring the efficient operation of the road network. These can take the form of restrictive measures which ban certain vehicle types through a corridor for various time periods or altogether. Or they can take the form of

measures which seek to prioritise certain movements within a corridor. Some examples include:

- Public transport only corridors
- Banning HGV within certain areas
- Speed limit reductions
- Signal timing changes to priories strategic movements

3.4.7 The availability and price of parking are major determinants of the relative attractiveness of the private car versus sustainable transport options. **Parking management measures** include pricing and supply controls that make car use more expensive and less convenient, thereby increasing the relative attractiveness of non-car modes. Parking has a significant influence on people's travel behaviour. Transport demand management through parking restraint can be targeted to locations where accessibility by alternative modes is high thereby encouraging mode shift to public transport, walking and cycling. Parking restraint can also be applied as a fiscal measure or alongside land use planning measures.

3.4.8 Some examples of parking management include:

- On-Street parking controls;
- Restrictive parking standards for new developments;
- Reduction in availability of parking;
- Workplace / private parking levies.

3.4.9 **Behavioural change programmes** are aimed at encouraging people to choose more sustainable transport options. Existing behavioural change programmes include the Smarter Travel Workplaces and Campuses programme directly managed by the NTA and the Green Schools Travel Module administered by the NTA and run by An Taisce on behalf of the Department of Transport. Requirements for Travel Plans are set out in local authority development plans. As such, the local authorities also play a significant role in the review and monitoring of Travel Plans.

3.4.10 The behavioural change programmes supporting measures comprise:

- Workplace Travel Plans;
- Smarter Travel Campus; and
- Green Schools Programme

3.4.11 **Information, education, promotion and outreach measures** that are aimed at raising awareness, improving understanding of the options available to help people to recognise the travel choices available to them can play an important role in overcoming barriers to switching from private car use to sustainable modes.

3.4.12 The use of technology in the communication of information has developed considerably over recent years and opportunities to take advantage of effective and efficient new methods of communication could be explored.

3.4.13 The information and awareness supporting measures comprise:

- Journey Planner;

- Real Time Passenger Information; and
- Marketing/information campaigns.

3.4.14 One of the features of a successful transport network is how effectively and attractively the opportunities for **interchange between various transport services and modes** are presented. Effective interchange can significantly enhance the opportunity to use sustainable transport to access a range of destinations. Key measures which can play a role in increasing the efficiency of integration and interchange of modes include:

- Interchange facilities for transport hubs/ points where various modes (bus, rail, road, intersect);
- Integrated ticketing and fares structures;
- Bicycle hire / sharing scheme;
- Car pooling; and
- Car sharing.

3.4.15 **Urban design** that creates a visually appealing urban environment is often very conducive to encouraging walking, cycling and public transport. A mobility friendly built environment includes a safe pedestrian environment, safe street crossings, easy to access public destinations, a mix of housing choices, nearby health centres and recreational facilities, within high quality public realm and urban design. Some of the built environment demand management measures which could be considered in the context of Virginia include:

- Public realm and urban design; and
- Community Gains Programmes.

Assessment of Demand Management Measures

3.4.16 As outlined above, there are numerous transport demand management measures available which could be applied within Virginia and its environs. In order to determine those most suitable for the study area, an initial assessment was carried out on a "long-list" of demand management measures.

3.4.17 In order to determine their suitability for implementation in the study area, each option has been appraised against their project **objectives**, their alignment with **national policy** as well as their **deliverability**.

3.4.18 Each option has been assessed regarding their deliverability in terms of feasibility, affordability and public acceptability. These criteria have been defined as follows:

- **Feasibility:** Is the proposal technically and physically feasible?;
- **Affordability:** Is the proposal economically viable and affordable?;
- **Public Acceptability:** Is the proposal likely to be acceptable to the general public?

3.4.19 Following this high-level appraisal, those options deemed as being in-line with existing policy and feasible to deliver were brought forward and included in a Multi-Criteria assessment against other alternatives to establish the most appropriate.

Table 3-2 Shortlisted Demand Management Measures

DM Measure for Detailed Appraisal	Application for Virginia	Acceptability
Providing for a mix of land uses in close proximity to each other	A long term strategic development plan, introduced in the town, designed to minimise the distance between residential, commercial and employment zones. This would act to reduce the overall use of non-active modes	This measure would be beneficial to some extent but would take significant amount of time to put in place and would not resolve the main issues of high volumes of strategic traffic, contributing to congestion.
Counter commuting strategy	Strategy and list of measures developed to encourage people to work locally (eg. In remote working Hubs, etc) or work from Home	This measure would improve conditions for local trips in urban areas, but would not impact long-distance strategic traffic in the town.
Increased Parking Charges / Levies	Increase parking charges in the town centre in an effort to limit trips into the town by car. This could be applied along the length of the N3 as it runs through the town, in addition to other town centre roads to promote alternative modes for shorter, internal trips in the town.	Analysis indicated that many internal educational trips are taken by active modes. But car is used mostly for work and external trips. Therefore one of the main problems of high volumes of strategic traffic within the town wouldn't be resolved by this measure.
Signals / Traffic Management which penalises short trips over strategic trips	Alterations and introduction of signals within the town of Virginia aimed at penalising more local trips and improving journey times for strategic movements	Introducing signals on the main roads in the study area would increase the current congestion, and would not alleviate the level of strategic traffic.
Banning HGVs	Banning HGVs (whilst protecting pickups and deliveries) through the town of Virginia	This measure would be helpful to reduce the high levels of HGV traffic which travel through the town on a daily basis. But given the lack of alternative routes, this measure would only be acceptable as part of a combined solution which provided an alternative route
Speed Limit Reduction	Reducing the speed limit for traffic travelling through the town of Virginia	This measure would be helpful to make the town safer for pedestrians and cyclists but given the town is located on a strategic route (N3) and sees high volumes of traffic passing through it on a daily basis, this measure is only likely to acceptable as part of a combined solution which provided an alternative route which strategic traffic could use.
On – Street Parking Controls and Reallocating space for active modes	Restriction on parking along certain roads (including N3) throughout the town of Virginia and reallocating space where possible to dedicated active mode infrastructure	This measure could be beneficial for some if that space was reallocated for use by active modes. But it is only likely to impact local trips and restricting parking on certain roads could lead to increased parking in uncontrolled areas i.e. residential areas
Flexible Working (Post Covid Behaviours)	The encouragement of flexible working pattern within the town of Virginia and the surrounding area to avoid peak hour trips	This measure would be beneficial to some people who can work from home but wouldn't impact those who don't have the option to work from home. This measure also would not alleviate the high levels of

DM Measure for Detailed Appraisal	Application for Virginia	Acceptability
		HGV traffic which travels through the town on a daily basis.
Work Place / Area wide Mobility Management Plans	Work Place MMP is an on-going strategy that facilitates, promotes, and encourages sustainable, active, and healthy modes of travel and helps reduce single-occupancy car use for journeys to and from a workplace. Area based MMPs cover a particular set of sites in an area that can be linked in order to increase the effectiveness of individual Mobility Management Plans	This measure could be useful to certain businesses within the local area but is only likely to be effective to those who work locally and is unlikely to affect the high levels of strategic traffic which travels through the area.

3.5 Improve

3.5.1 Improve' refers to measures which increase the capability of existing infrastructure, through increasing the standards of that infrastructure, or measures which shift existing capacity to more sustainable modes. These measures can include amongst others, public transport enhancements. In the context of Virginia a forecast Do Nothing scenario has been modelled and compared to an enhanced public transport (Do Something) scenario.

Public Transport Options

3.5.2 In order to estimate future public transport demand in the study area, the National Transport Authority's Eastern Regional Model (ERM) was used to model a 2043 Do Nothing (DN) scenario. The ERM covers the eastern part of the country and includes a public transport model which can be used to assess any Public Transport provision. The DN scenario includes all existing public transport services which include the following bus services –

- Bus Eireann 109x – Cavan to Dublin
- Bus Eireann 187 – Ballyjamesduff to Kells
- Bus Eireann 30 Donegal to Dublin

3.5.3 The following tables and figures detail the forecast year mode share and Public Transport usage for the Virginia area.

Table 3-3 2043 Do Nothing Scenario Total Bus Boardings & Alightings in Virginia (All routes mentioned above)

AREA	BOARDINGS (AM)	ALIGHTINGS (PM)
Virginia	89	55

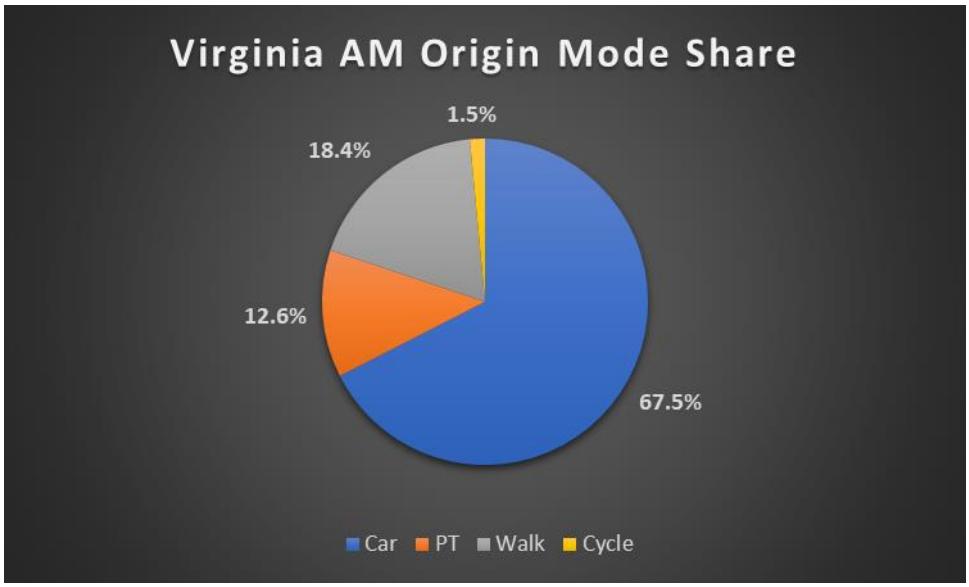

Figure 3-1 AM Origin Mode Share in Virginia

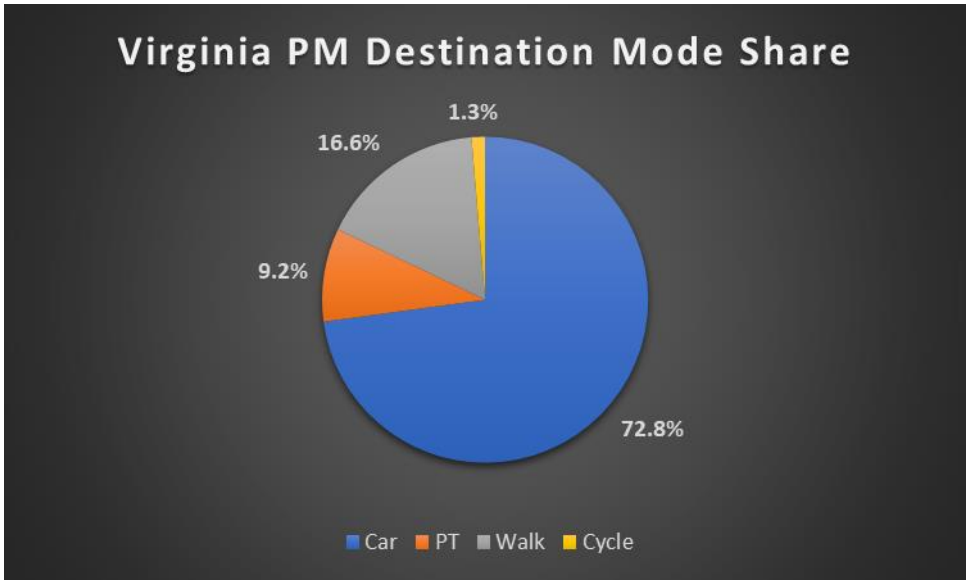

Figure 3-2 PM Origin Mode Share in Virginia

Proposed Public Transport Enhancements

3.5.4 In order to assess the potential demand for enhanced public transport services in the study area, a number of Public Transport (bus) enhancements were developed and assessed using the NTA's ERM.

3.5.5 Given there is no existing rail line withing the study area or near Virginia, a rail based solution is unlikely to be feasible in the short to medium term. It would require significant costs in terms of the infrastructure and planning required.

3.5.6 Also given the low density and dispersed nature of population and job centres within the surrounding area (as referenced in Figure 2-6 and Figure 2-7), a rail based option is also unlikely to have sufficient demand to make it viable or for it to have a significant impact on traffic levels through Virginia. Additionally, there are no plans from Irish Rail to explore the feasibility of creating a new line along this corridor.

3.5.7 In summary, the following transport interventions have been modelled and analysed as part of one scenario:

- **Inter-Urban Bus** - Increased frequency of existing inter-urban buses along the N3 serving Virginia (Bus Eireann Route 109x which runs from Cavan to Dublin city centre) to 4 buses per hour during peak periods.

- **Local Bus –** A new local bus service to exclusively serve the towns of Ballyjamesduff, Virginia and Bailieborough with a frequency of every 15 mins during peak periods. The route is illustrated in the figure below:

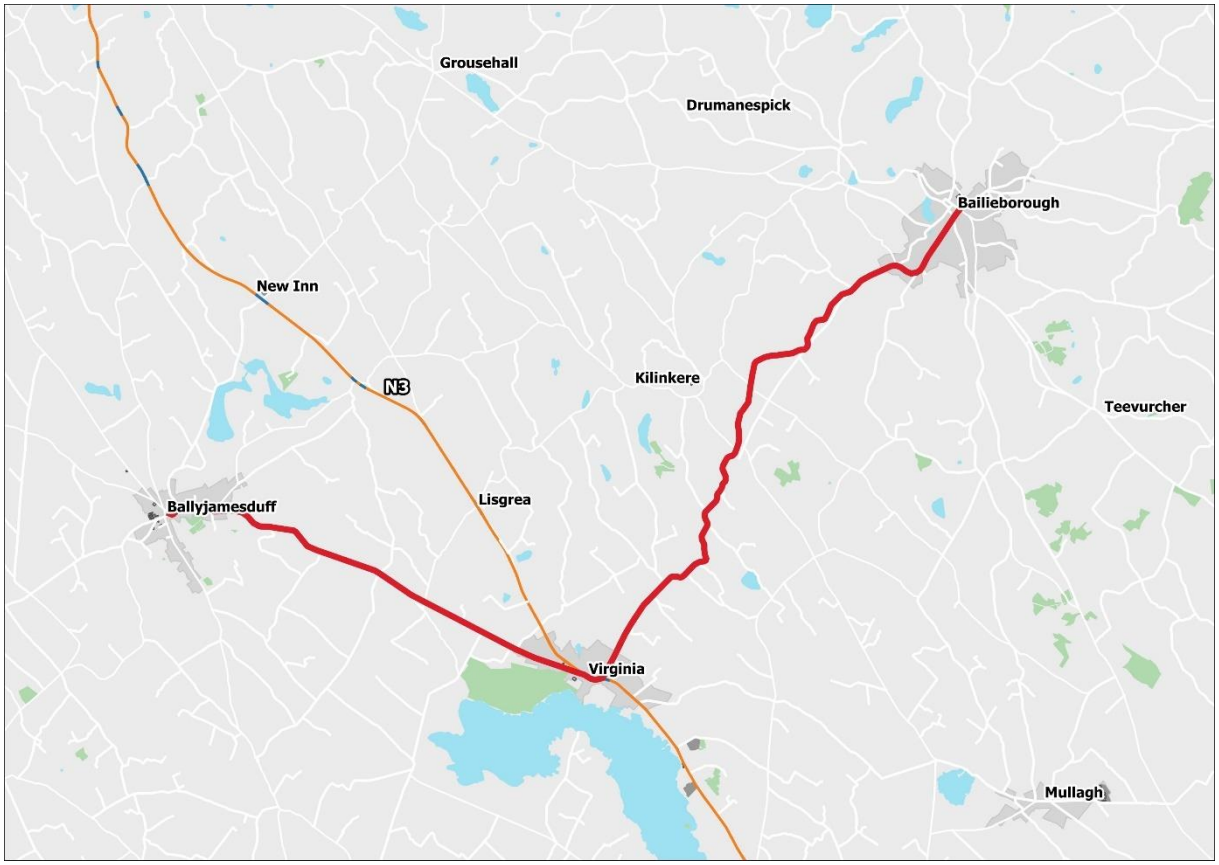

Figure 3-3 Proposed Local Bus Service in Study Area

3.5.8 These proposals are above the current Connecting Ireland Rural Mobility Plan proposals for the area which aim to maintain the existing level of service along the N3 corridor.

Bus Boardings and Alightings Comparison

3.5.9 The tables below show the comparison of the Do-Nothing and Do-Something results for the bus boardings and alightings in Virginia for the AM and the PM periods. In the AM peak hour, we see an increase of 226 people boarding the increased frequency Bus Eireann 109x service (between Cavan and Dublin city centre) in Virginia. Additionally, a total of 79 people board the new local bus in Virginia town. The other two routes in Virginia (Bus Eireann route 30 and 187) experienced similar boarding and alighting numbers within Virginia in both scenarios (Do Nothing and Do-Something) and thus haven't been shown below.

3.5.10 Meanwhile in the PM period, there is an increase of 137 people alighting the increased frequency Bus Eireann 109x service (between Dublin city centre and Cavan) in Virginia. Additionally, a total of 68 people alight the new local bus in Virginia town. Similar to the AM period, the other services experience similar numbers in both scenarios and thus haven't been shown below.

Table 3-4 2043 Do Nothing and Do Something Total Bus AM Boardings in Virginia

TIME PERIOD	DN	DS	
	Route 109x	Route 109x	New Local Service
AM	67	294	79

Table 3-5 2043 Do Nothing and Do Something Total Bus PM Alightings at Virginia

TIME PERIOD	DN	DS	
	Route 109x	Route 109x	New Local Service
PM	48	185	68

Mode Share Comparison

3.5.11 As a result of the proposed public transport enhancements, there is a forecast reduction of 2.3% in car use and a subsequent 6.2% increase in PT use in the AM period. There is also a 3.9% drop in the number of active mode trips. This suggests that the new bus services would replace some walking trips and overall we only see a 2.3% drop in the amount of car use for trips beginning in the Virginia area.

3.5.12 Similarly, in the PM peak, there is a 2.1% drop in estimated car use and a subsequent 4.7% increase in Public transport use. However, there is also a combined 2.7% drop in active mode trips. This would again suggest that the new local bus services are encouraging some people to replace walking and cycling trips with bus trips.

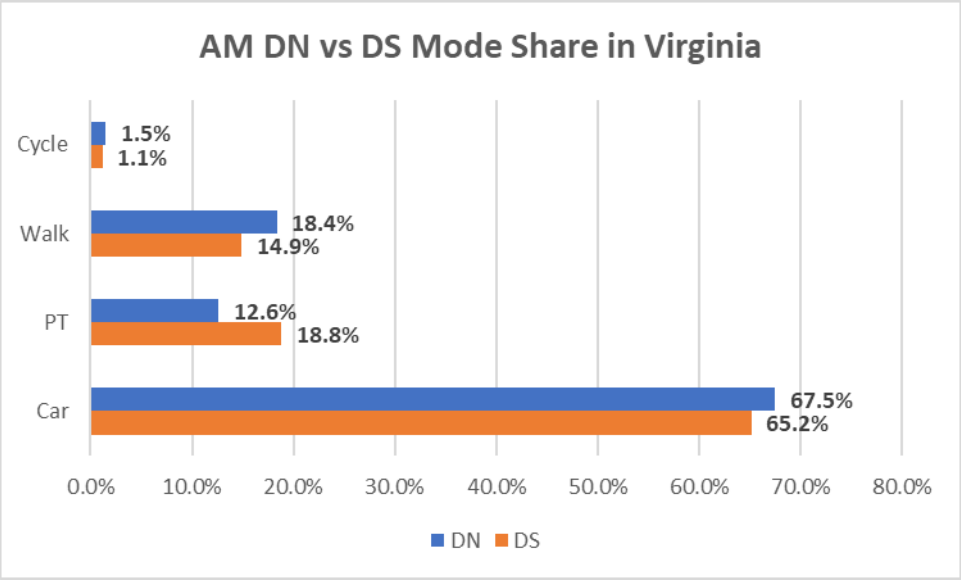

Figure 3-4 AM Mode Share Comparison in Virginia

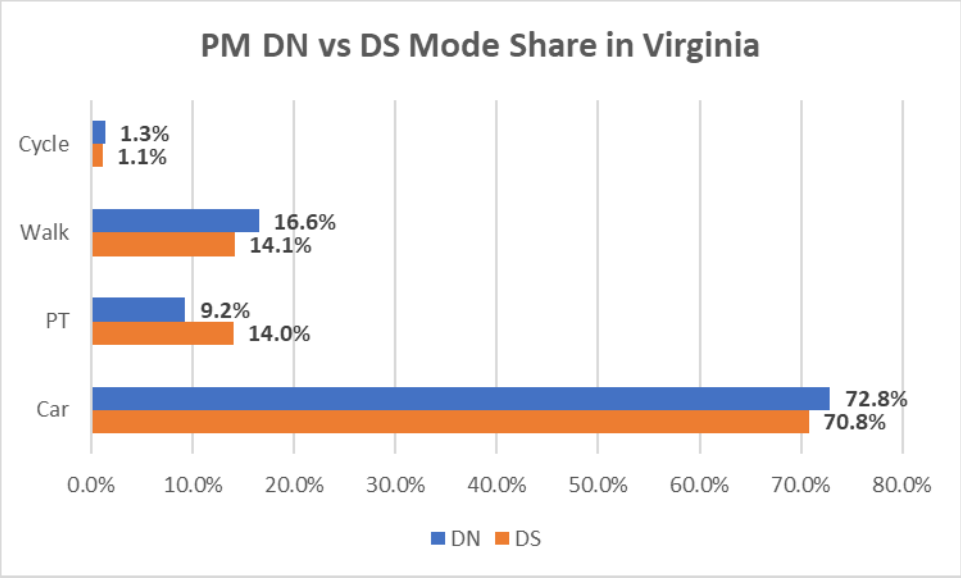

Figure 3-5 PM Mode Share Comparison in Virginia

Impact on Road Network

3.5.13 In order to assess the impact of these enhanced public transport proposals on the road network and the subsequent level of vehicular traffic, the Virginia Local Area Model (LAM) has been assigned with this new demand (accounting for modal shift) and compared to the Do Nothing scenario.

Network Performance Indicators

3.5.14 The tables and figures below present a summary of the network performance statistics for the Do Nothing and Do Something (enhanced PT scenario) for the AM and PM peak. The following network statistics are presented for each scenario:

- **Transient Queues**: represents time spent in queues at junctions which are not over capacity, for example, at a signalised junction where the queue is able to clear during a single cycle. This is presented in total pcu.hours which is essentially the volume of vehicles on the network multiplied by the time spent in transient queues.
- **Over-capacity queues**: occur where the volume of turning movements exceed junction capacity, such that a permanent queue builds – for example at a signalised junction where a queue is unable to clear in a single cycle. Similar to transient queues, over-capacity queues are presented in total pcu.hours
- **Total Travel Time**: represents the total travel time for all vehicles on the network in the modelled period measured in pcu.hours.
- **Total Travel Distance**: represents the total distance travelled by vehicles on the road network in the modelled period measured in pcu.kms
- **Average Speed**: represents the average speed of all vehicles travelling on the network within the modelled time period measured in kph.

Table 3-7: Network Performance Indicators (AM Peak)

	DO NOTHING	DO SOMETHING
Transient Queues (pcu.hrs)	110	106
Over Capacity Queues (pcu.hrs)	0	0
Total Travel Times (pcu.hrs)	3,021	2,994
Total Travel Times (pcu.kms)	181,744	180,271
Average Speed (km/hr)	60	60

3.5.15 Analysis of the AM peak network performance statistics indicates that, in general, the proposed public transport enhancements have a negligible effect on the entire network. The DS scenario experiences a small drop in overall network delay (i.e. queues) when compared against the Do Minimum scenario. It also achieves the same average speed and a similar total travel time and total distance travelled (just under a 1% reduction in travel time and distance).

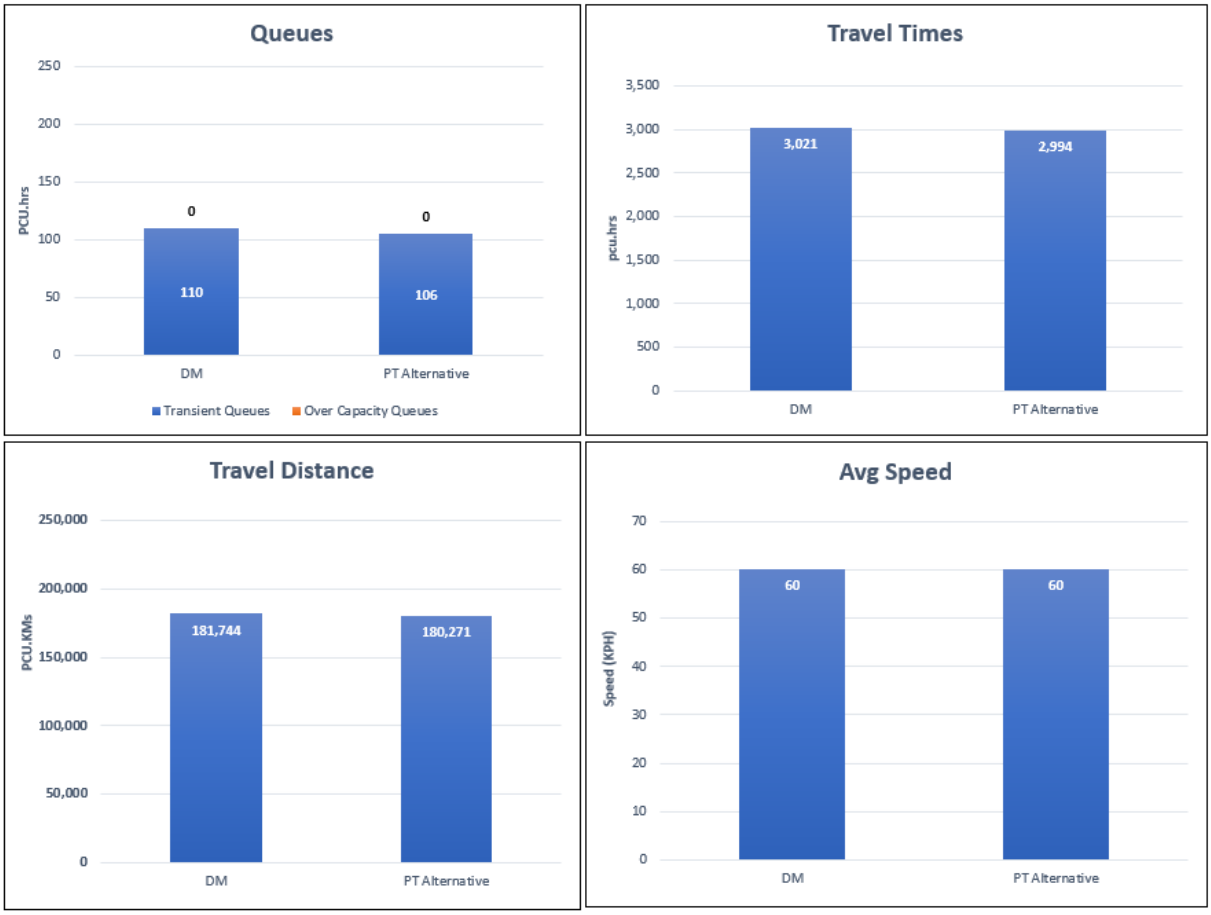

Figure 3-6 AM Network Statistics comparison

Table 3-8: Network Performance Indicators (PM Peak)

	DO NOTHING	DO SOMETHING
Transient Queues (pcu.hrs)	114	113
Over Capacity Queues (pcu.hrs)	102	94
Total Travel Times (pcu.hrs)	3,385	3,358
Total Travel Times (pcu.kms)	202,175	200,655
Average Speed (km/hr)	60	60

3.5.16 An analysis of the PM peak network performance statistics show a similar trend and indicate that in general the proposed public transport enhancements have a negligible effect on the entire network. The DS scenario experiences a small drop in overall network delay (i.e. queues) when compared against the Do Minimum scenario. It also achieves the same average speed and a similar total travel time and total distance travelled (just under a 1% reduction in travel time and distance).

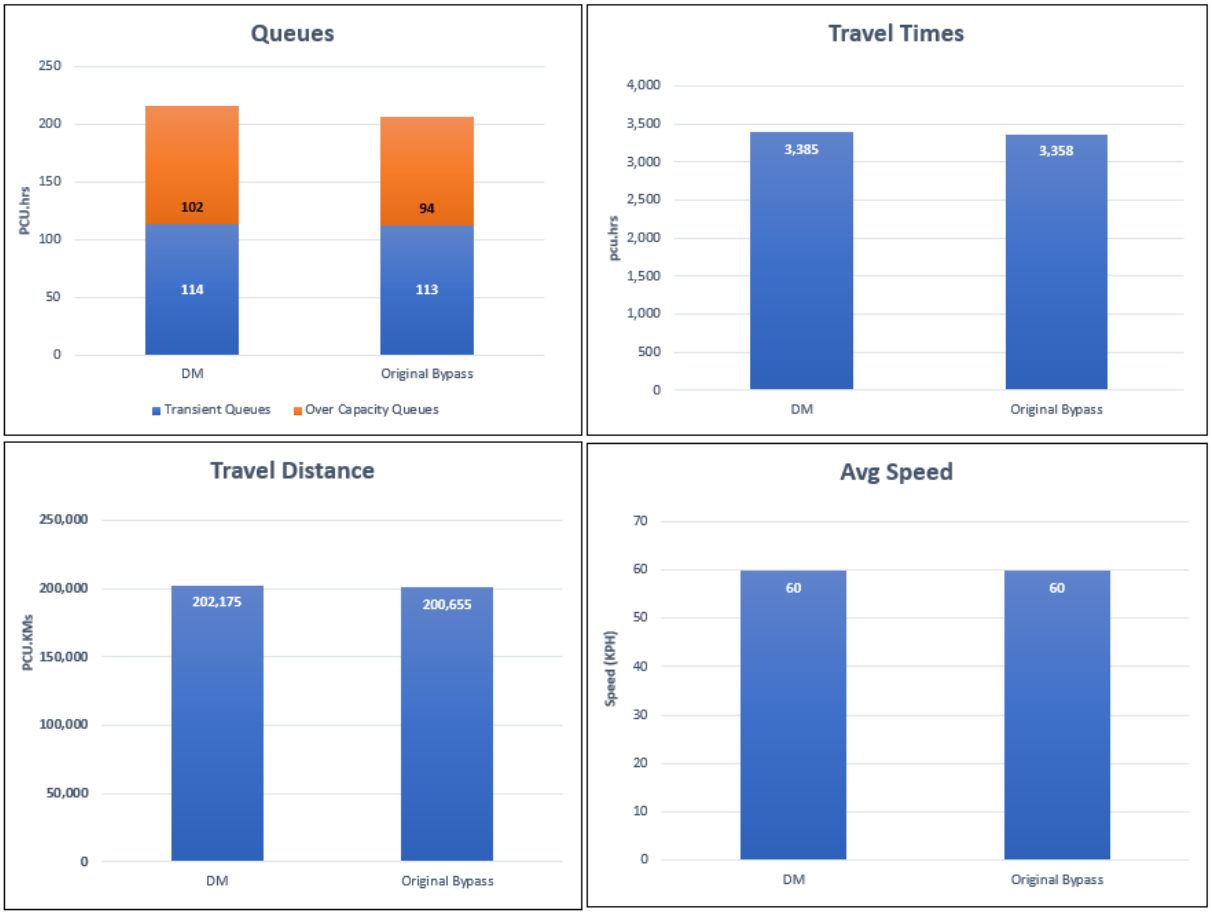

Figure 3-7 PM Network Statistics comparison

Reduction of Traffic Volumes in Virginia Town

3.5.17 Currently Virginia experiences considerable congestion within its Town Centre as shown earlier in section 2.2. One of the key objectives of any transport intervention would be to help alleviate this congestion and provide an improved environment and more accessibility for vulnerable road users within Virginia. Therefore, an analysis has been undertaken to assess the reduction in traffic through Virginia town following the inclusion of the additional PT services. The results are presented in the following tables for all traffic travelling through the town during the AM and PM peak hours.

3.5.18 In the AM period, the results show that proposed Public Transport services have a negligible impact on the traffic volumes passing through Virginia with only a 1% reduction seen.

Table 3- 9: Reduction in Traffic (AM Peak)

	TOTALS (PCUS)		DIFF (%)
TYPE	DN	DS	
Total	1,883	1,868	-1%

3.5.19 Again in the PM the results show that proposed Public Transport services have a negligible impact on the traffic volumes passing through Virginia with only a 1% reduction seen.

Table 3-10: Reduction in Traffic (PM Peak)

	TOTALS (PCUS)		DIFF (%)
TYPE	DN	DS	
Total	2,020	2,007	-1%

3.5.20 These results demonstrate that local bus services are not an alternative for the majority of existing vehicular trips passing through the town.

Enhanced Public Transport Scenario Summary

3.5.21 Following the increased frequency of inter urban buses along the N3 and the addition of new local services for Virginia town, in the AM peak hour, we see an increase of 226 people boarding the increased frequency Bus Eireann 109x service (between Cavan and Dublin city centre) in Virginia. Additionally, a total of 79 people board the new local bus in Virginia town.

3.5.22 Meanwhile in the PM, we also see an increase of 137 people alighting the increased frequency Bus Eireann 109x service (between Dublin city centre and Cavan) in Virginia. Additionally, a total of 68 people alight the new local bus in Virginia town.

3.5.23 As a result of the proposed public transport enhancements, there is a forecast reduction of 2.3% in car use and a subsequent 6.2% increase in PT use in the AM period. But there is also a 3.9% drop in the number of active mode trips. This suggests that the new local bus services are replacing some walking trips and overall we only see a 2.3% drop in the amount of car use for trips beginning in the Virginia area.

3.5.24 Similarly, in the PM peak, there is a 2.1% drop in car use observed and a subsequent 4.7% increase in Public transport use. However there is also a combined 2.7% drop in active mode trips. This would again suggest that the new local bus services are replacing some walking and cycling trips.

3.5.25 Following the inclusion of the public transport enhancements, the road network performance indicators in both the AM and PM indicate that in general the proposed public transport enhancements have a negligible effect on the entire network. The enhanced public transport scenario provides a marginal decrease in overall network delay (i.e. queues) when compared against the Do Nothing scenario. It also achieves the same average speed and a similar total travel time and total distance travelled (just under a 1% reduction in travel time and distance).

3.5.26 Given there is considerable congestion within Virginia Town Centre. One of the aims of any intervention would be to help alleviate this congestion and provide an improved environment and more accessibility for vulnerable road users within Virginia. In AM and PM, the results show that the proposed Public Transport services have a negligible impact on the traffic volumes passing through Virginia with only a 1% reduction seen.

3.5.27 Overall, the enhancements to public transport have only resulted in a small shift away from the private vehicle with the car still being the dominant mode within Virginia. As a result, congestion is still likely to be an issue and the enhancements are unlikely to impact the high level of strategic traffic travelling through the town and the subsequent potential conflicts with VRUs.

3.6 New

3.6.1 'New' encompasses all measures which entail significant increases to transport infrastructure capacity. These measures can include dedicated walking and cycling infrastructure, new rail and bus services or new road infrastructure.

3.6.2 As mentioned under some of the previous NIFTI Intervention Hierarchy headings, new walking and cycling infrastructure would be beneficial to some VRUs but it is unlikely to help solve some of the other key objectives of the project which seek to reduce congestion through the town and also to reduce the high levels of strategic traffic which travel through the town on a daily basis.

3.6.3 An increased public transport scenario was already modelled as part of the 'Improve' measures which resulted in a very small shift to public transport (from the private car). Similarly, to new active mode infrastructure, this is unlikely to help solve some of the key objectives of the project which seek to reduce congestion through the town and also to reduce the high levels of strategic traffic which travel through the town on a daily basis.

3.6.4 Therefore, the next option to consider was a road based solution. A bypass of the town has been modelled for the same forecast year as the public transport scenario (2043). Given the original Virginia Bypass was granted Part 8 Planning in 2003, this design was modelled at this stage. The original scheme length is approximately 9.2km, extending from the townland of Lisduff (southeast of Virginia) to the townland of Cornaslieve (northwest of Virginia) as shown in the figure below.

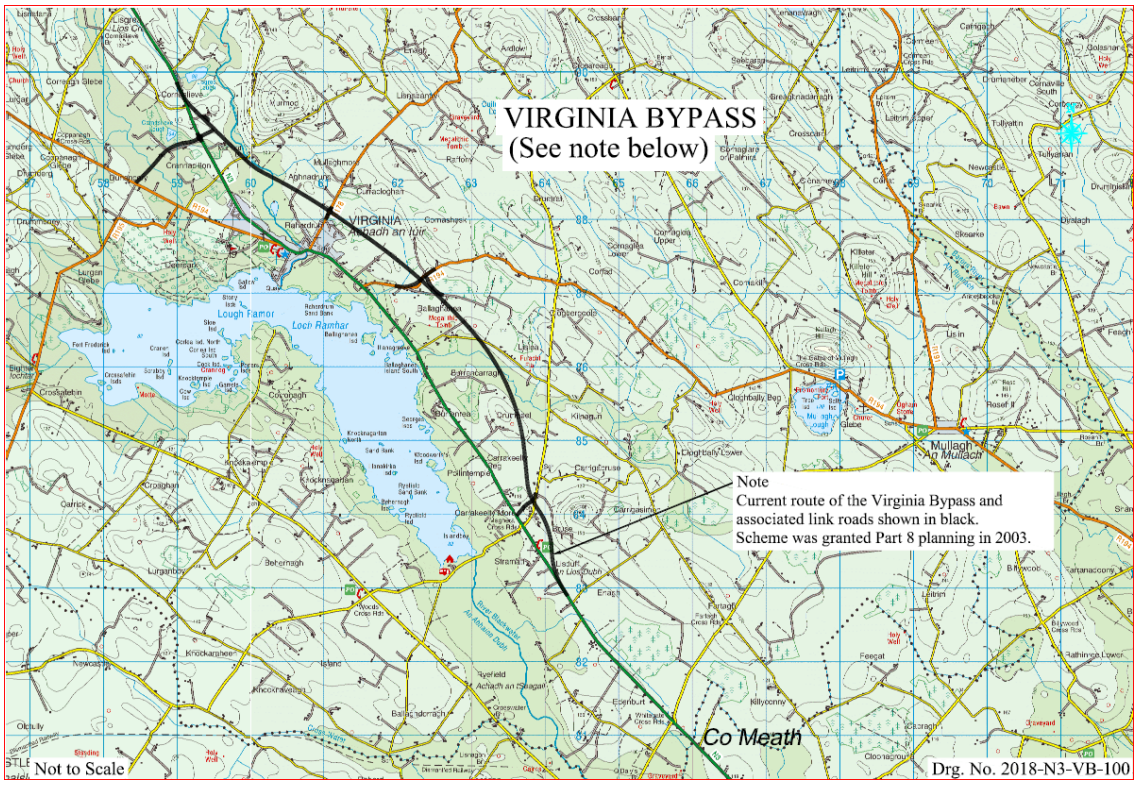

Figure 4-1 N3 Virginia Bypass (2003)

Network Performance Indicators

3.6.5 The tables and figures below present a summary of the network performance statistics for the Do Nothing and Do Something (2003 Virginia Bypass) for the AM and PM peak. The following network statistics are presented for each scenario:

- **Transient Queues**: represents time spent in queues at junctions which are not over capacity, for example, at a signalised junction where the queue is able to clear during a single cycle. This is presented in total pcu. hours which is essentially the volume of vehicles on the network multiplied by the time spent in transient queues.
- **Over-capacity queues**: occur where the volume of turning movements exceed junction capacity, such that a permanent queue builds – for example at a signalised junction where a queue is unable to clear in a single cycle. Similar to transient queues, over-capacity queues are presented in total pcu.hours
- **Total Travel Time**: represents the total travel time for all vehicles on the network in the modelled period measured in pcu.hours.
- **Total Travel Distance**: represents the total distance travelled by vehicles on the road network in the modelled period measured in pcu.kms
- **Average Speed**: represents the average speed of all vehicles travelling on the network within the modelled time period measured in kph.

Table 4-6: Network Performance Indicators (AM Peak)

	DO NOTHING	DO SOMETHING
Transient Queues (pcu.hrs)	110	76
Over Capacity Queues (pcu.hrs)	0	0
Total Travel Times (pcu.hrs)	3,021	2,886
Total Travel Times (pcu.kms)	181,744	182,903
Average Speed (km/hr)	60	63

3.6.6 An analysis of the AM peak network performance statistics indicates that, in general, a road based solution could have a positive impact on the entire network. The DS scenario provides a 32% drop in overall network delay (i.e. queues) when compared against the Do Minimum scenario. It also achieves a higher average speed (5% increase) and a lower total travel time (4% reduction). The total distance travelled does increase slightly given the bypass is slightly longer to travel than the existing distance along the N3.

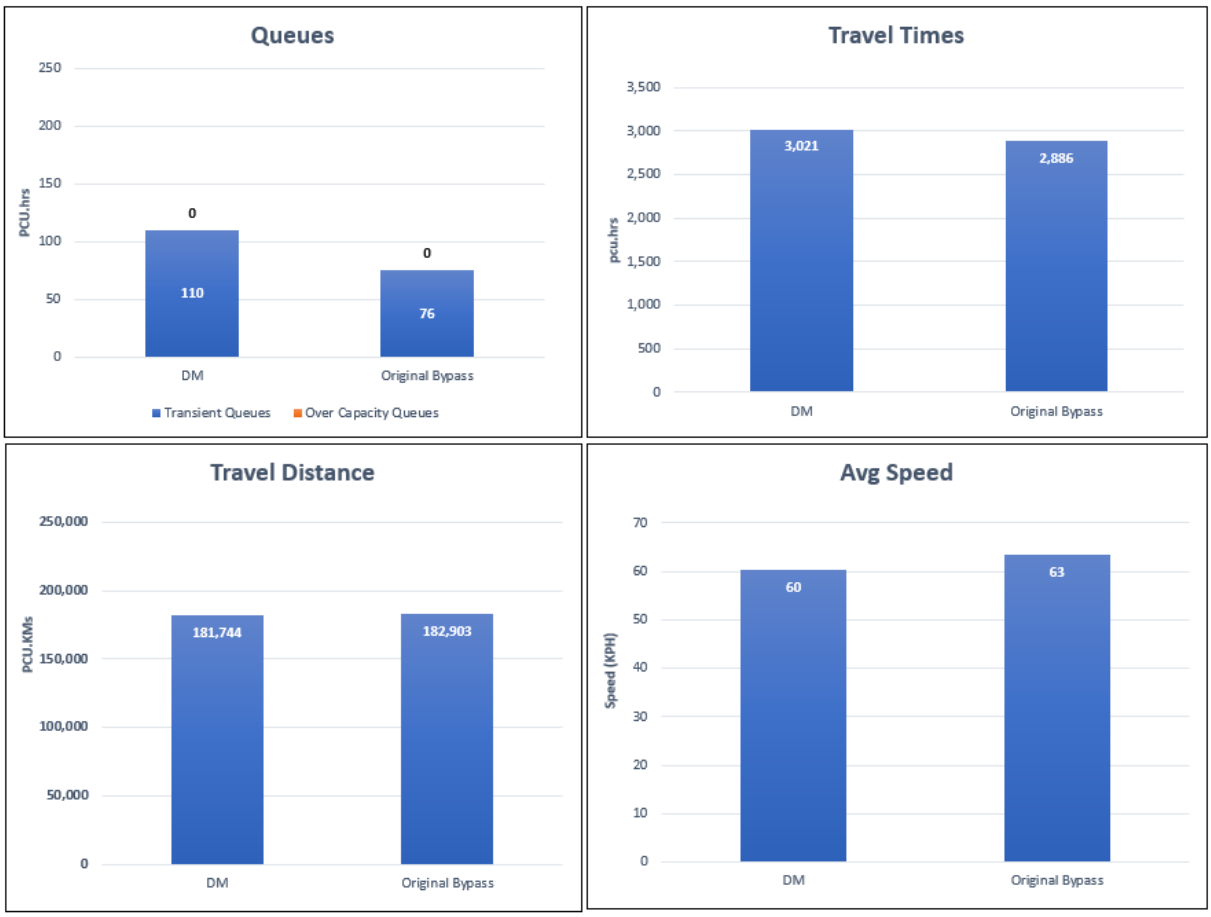

Figure 4-2 AM Network Statistics comparison

Table 4-2: Network Performance Indicators (PM Peak)

	DO NOTHING	DO SOMETHING
Transient Queues (pcu.hrs)	114	86
Over Capacity Queues (pcu.hrs)	102	16
Total Travel Times (pcu.hrs)	3,385	3,187
Total Travel Times (pcu.kms)	202,175	206,158
Average Speed (km/hr)	60	65

3.6.7 An analysis of the PM peak network performance statistics indicates that a road based solution would have a positive impact on the entire network. The DS scenario shows a 53% drop in overall network delay (i.e. queues) when compared against the Do Minimum scenario. It also achieves a higher average speed (8% increase) and a lower total travel time (6% reduction). The total distance travelled does increase slightly given the bypass is slightly longer to travel than the existing distance along the N3.

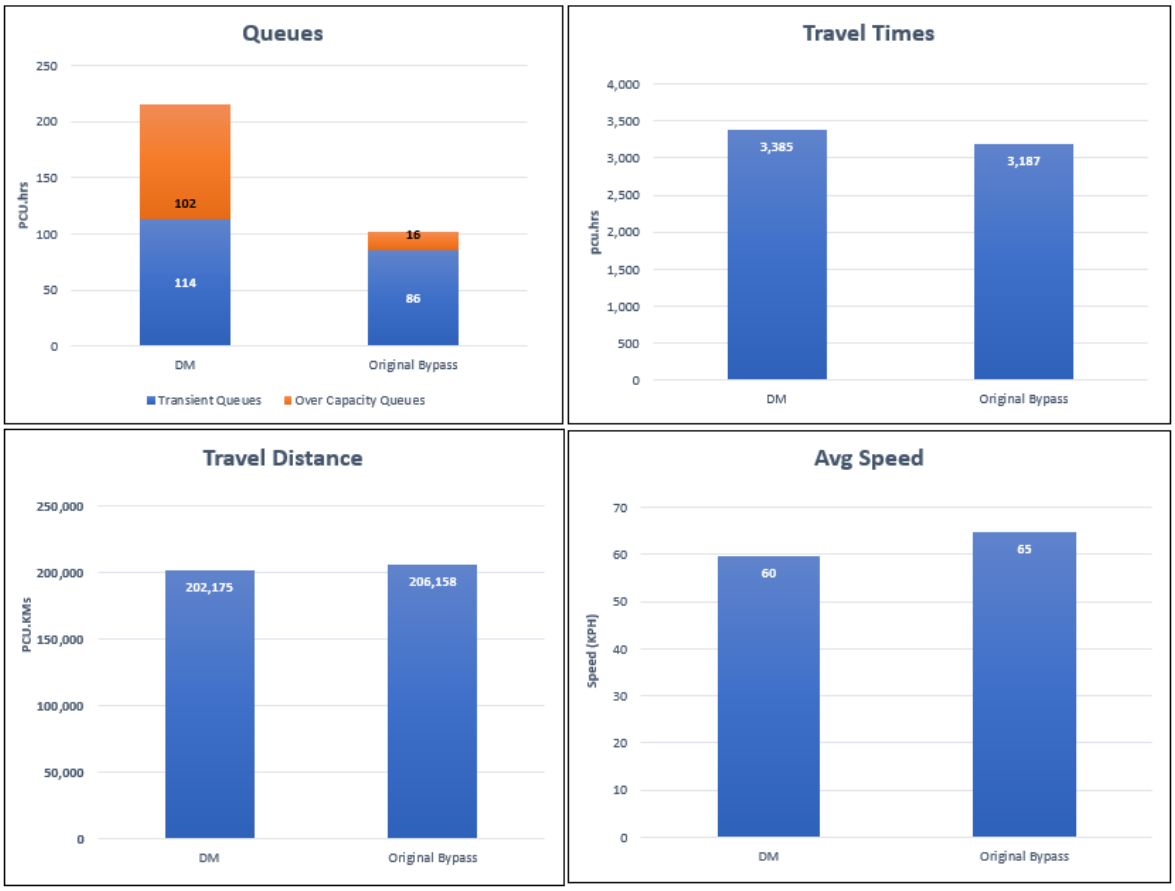

Figure 4-3 PM Network Statistics comparison

Reduction of Traffic Volumes in Virginia Town

3.6.8 An analysis has been undertaken to assess the reduction in traffic through Virginia town following the inclusion of the 2003 bypass. The results are presented in the following tables for all traffic travelling through the town during the AM and PM peak hours.

3.6.9 In the AM period, the results show that the 2003 bypass has a significant impact on the traffic volumes passing through Virginia with a 68% reduction seen.

Table 4-3: Reduction in Traffic (AM Peak)

	TOTALS (PCUS)		DIFF (%)
TYPE	DN	DS	
Total	1,883	594	-68%

3.6.10 Similarly, in the PM period, the results show that the bypass will have a considerable impact on the traffic volumes passing through Virginia with a 66% reduction.

Table 4-4: Reduction in Traffic (AM Peak)

	TOTALS (PCUS)		DIFF (%)
TYPE	DN	DS	
Total	2,020	681	-66%

Do Something Road Option Summary

3.6.11 Following the inclusion of the 2003 version of the Virginia bypass, the network statistics show a positive impact on the entire network (Virginia and the surrounding areas i.e. Ballyjamesduff, Bailieborough etc). In the AM we see a 32% drop in overall network delay (i.e. queues) when compared against the Do Minimum scenario. It also achieves a higher average speed (5% increase) and a lower total travel time (4% reduction). The total distance travelled does increase slightly given the bypass is slightly longer to travel than the existing distance along the N3.

3.6.12 Meanwhile in the PM, we see a 53% drop in overall network delay (i.e. queues) when compared against the Do Minimum scenario. It also achieves a higher average speed (8% increase) and a lower total travel time (6% reduction). The total distance travelled does increase slightly given the bypass is slightly longer to travel than the existing distance along the N3.

3.6.13 Given there is considerable congestion within Virginia Town Centre. One of the aims of any intervention would be to help alleviate this congestion and provide an improved environment and more accessibility for vulnerable road users within Virginia. Therefore, an analysis has been undertaken to assess the reduction in traffic through Virginia town following the inclusion of the 2003 bypass.

3.6.14 In AM the results show that the 2003 bypass has a significant impact on the traffic volumes passing through Virginia with a 68% reduction seen. The PM also sees a big impact on the traffic volumes passing through Virginia with a 66% reduction seen.

3.6.15 The results suggest the potential of a road based option in terms of removing traffic from the town centre.

3.7 Multi-Modal/Hybrid Options

3.7.1 Several multi modal/hybrid options were also assessed using the NIFTI process and the flow chart below shows a summary of the options and process followed. Each point is also expanded upon below too.

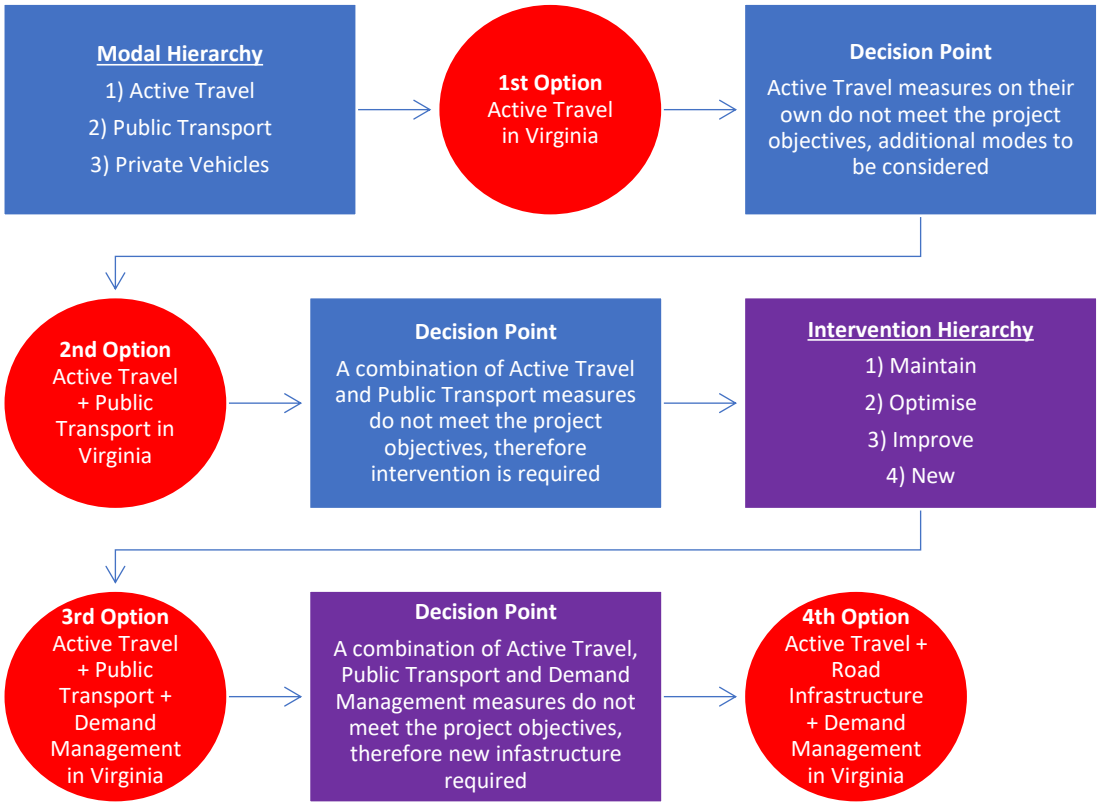

Figure 4-4 Multi-Modal options assessed using NIFTI

1st Option/Decision Point

3.7.2 In the case of Virginia, SYSTRA considered if active travel infrastructure could result in a sufficient reduction in traffic flow through the main street. This is clearly possible for some local car travel but would have no effect on trips using the national road network for long distance movement. Active travel measures would also have no effect on goods vehicle movement and therefore do not achieve any of the desired elimination of goods traffic from the main street.

2nd Option/Decision Point

3.7.3 SYSTRA then considered a combined set of public transport and active travel measures. Enhanced public transport measures could alleviate some traffic from the main street each day but given the dispersed nature of travel movements along the N3 and the high modal split of cars in the area (approx. 90% of trips for work made by car as per the 2016 Census of both Virginia and County Cavan), it is unlikely to achieve the mode transfer required. It would also have no effect on goods vehicle movements. This was validated using the NTA's ERM whereby increased inter urban bus frequencies were tested and only resulted in an approx. 2% drop in car use. The proposals assessed are above the current Connecting Ireland Rural Mobility Plan proposals for the area which aim to maintain the existing level of service along the N3 corridor too. Rail options were discounted as there isn't an existing rail line near Virginia and Iarnród Éireann do not intend to provide a rail line in the short to medium term.

3.7.4 Therefore, a combination of public transport (bus) and active travel measures would be unable to achieve the mode transfer required.

NIFTI Intervention Hierarchy

3.7.5 After being unsuccessful in finding a solution to meet the project objectives using NIFTI's Modal Hierarchy, the process then moved towards using NIFTI's Intervention Hierarchy. The hierarchy sets out a framework to follow when an intervention is deemed necessary and uses four headings -

- **Maintain** - refers to measures which protect the existing transport network.
- **Optimise** - refers to measures to encouraging more sustainable use of the network.
- **Improve** - refers to measures which increase the capability of existing infrastructure.
- **New -** encompasses all measures which entail significant increases to transport infrastructure capacity.

Maintain

3.7.6 In the context of Virginia, "Maintain" measures were deemed a non-viable option as protecting the existing network and keeping it at the standard or capability at which it was designed, would not meet the project objectives.

3rd Option/Decision Point – "Optimise"

3.7.7 Under "Optimise", several Demand Management measures were examined in the study area –

- **Land Use measures** i.e. providing for a mix of land uses in close proximity and thus reducing the need for car travel.
- **Fiscal measures** i.e. Tolls, congestion charging, parking charges.
- **Traffic Management measures** i.e speed limit reductions, banning HGVs, signals which penalise short trips.
- **Behavioural change programmes** i.e. Workplace travel plans, flexible home working.

3.7.8 The above-mentioned demand management measures were all deemed unviable solutions for various reasons including the lack of an alternative route for most of the national road traffic to use, only affecting certain businesses within the study area including those who can work from home and not dealing with the key objective of reducing traffic levels through the town.

3.7.9 Therefore, building upon the previous options, a combination of active travel, public transport (bus) and demand management measures would be unable to achieve the extremely high levels of mode transfer and/or traffic rerouting required.

Improve

3.7.10 Solutions under the "Improve" heading were also discounted as bus enhancements were addressed above and not deemed viable. Also increasing the capacity of the existing N3 was ruled out given the existing built environment through the town of Virginia. Recent street enhancements in the town have made some improvements for pedestrians by improving footways and providing additional pedestrian crossings, however, it has not improved bus reliability or helped to remove strategic traffic through the town.

4th Option/Decision Point – "New"

3.7.11 Under the last heading in the Intervention Hierarchy, a combination of new infrastructure and traffic management measures was examined. This included new road infrastructure to allow the large volume of strategic traffic to bypass the town of Virginia (in the morning and evening peak hours, the level of strategic traffic on the N3 which travels through the town is around 70% in both directions – as indicated by the base year traffic models built for Phase 2), active travel infrastructure to promote sustainable travel for short trips around Virginia itself and traffic management measures (a combination of both planned/approved measures like a 30kph speed limit, additional zebra crossings, longer pedestrian/cyclist crossing times at signals) which aim to make the town safer and more attractive for vulnerable road users (VRUs) and pedestrians. These 'combination of measures' were found to meet the project objectives of promoting sustainable travel, making the town a safer environment for VRUs and reducing the high level of strategic traffic which travels through Virginia town each day.

3.8 Summary and conclusions

3.8.1 Table 3.9, below, contains a list of potential alternatives modes which have been considered according to National Investment Framework for Transport in Ireland (NIFTI) Intervention Hierarchy including do-nothing, maintenance, optimisation, improvement and new infrastructure. This table provides a non-exhaustive list of examples of the types of options/measures which could be considered, and includes; demand management and active modes, bus, rail and road. This Assessment of Alternatives is focused on a high-level assessment to identify the preferred mode of travel to meet the project objectives.

3.8.2 But the overall findings of the assessment using the NIFTI Intervention Hierarchy has found that a hybrid multi modal option which comprises new road and active travel infrastructure

with some traffic management measures solution is the preferred solution to meet the key project objectives which are –

- Reducing congestion through the town and thus make the area safer for more vulnerable road users
- Reducing the high level of strategic traffic that travels through the town each day on the national road network
- Reduce traffic through town to enable Improvement of the town centre environment for walking and cycling

Table 3-7 Examples of potential alternatives to address the objectives for each mode of transport

NIFTI Hierarchy for Intervention	Potential Options	Description of option as per PE-PAG-02013 – Unit 4.0 – Consideration of Alternatives and Options
N/A	Do-Nothing	No other investment in the transport network (other than regular maintenance) during the appraisal period.
MAINTAIN	Do-Minimum (Base Case)	Road protection and renewal investment – new asphalt coverage, accessibility and safety issues addressed
		Public transport protection and renewal
		Walking and Cycling network protection and renewal
OPTIMISE	Demand/ Traffic Management	On-Street Parking Controls and increased Parking Charges
		Counter commuting strategy
		Flexible Working (Post Covid Behaviours)
		Work Place / Area wide Mobility Management Plans
	Safety Improvements	Re-arrange existing vertical and horizontal signalization within and outside urban areas to address congestion
	Information Technology System (ITS)	ITS signal optimization within study area, especially in urban centers
	Road Based Management Option	Providing for a mix of land uses in close proximity to each other
IMPROVE	Active Travel	Add vertical and horizontal signalisation for cyclists to existing roads and widen existing footpaths

NIFTI Hierarchy for Intervention	Potential Options	Description of option as per PE-PAG-02013 – Unit 4.0 – Consideration of Alternatives and Options
	Bus Based Public Transport	Enhanced Inter-urban services
		Increased frequency and extended hours of operation
		Dedicated Bus corridors
	Rail Based Public Transport	Increased frequencies especially during peak hours
	Road Based Transport	Potential road improvement schemes include: Junction capacity upgrades; removing dangerous bends
	Hybrid Options	Combine Active Travel, Bus PT and Road Based measures
NEW	Active Travel	Segregated pedestrian/cycle network with continuous cycle track through settlements
		Off road pedestrian/cycle tracks following similar routes
	Bus Based Public Transport	Introduction of new, local and inter-city bus services
	Rail Based Public Transport	Introduction of a new Rail Line with associated services.
	Road Based Transport	Introduction of new bypass roads in the study area
	Hybrid Options	Combine new Active Travel infrastructure, Bypass Road schemes and Demand management/Traffic management measures

4. COMMON APPRAISAL FRAMEWORK ASSESSMENT OF ALTERNATIVES

4.1.1 A Multi-Criteria Analysis (MCA) assessment was carried out to identify the preferred mode of transport to achieve the project objectives. In the MCA, each of the alternative modes are rated according to a three point scale of preference, from low preference to high preference, as shown in Table 6.2.

4.1.2 The MCA assessment uses the six Department of Transport (DoT) Common Appraisal Framework (CAF) headings (Economy, Safety, Environment, Accessibility and Social Inclusion, Integration, Physical Activity) to assess the suitability of each mode on it's own against the project objectives.

4.1.3 Table 6.3 presents the results of the MCA process. The scoring for each category is based on the potential for each mode of transport to achieve, or contribute to achieving, the project objectives as outlined in Chapter 1 of this Report. This process assesses each transport mode individually in respect to its sole ability to respond to the objectives.

4.1.4 In the MCA, a low ranking in one category does not exclude the transport mode from playing an important role as a complementary measure to support the preferred mode. The mode of transport with the greatest number of medium and high preference responses overall is selected as the preferred mode of transport.

Table 6-1 Ranking

Ranking	Color
Low Preference	
Medium Preference	
High Preference	

		Road	Bus	Rail	Demand/Traffic Management	Active Modes	Hybrid Option (Road / PT / DM / Active Modes)
Economy	**Statement**	The vast majority of travel to/from the Virginia study area is conducted by car and so the magnitude of the positive impacts achieved by a road intervention will be greater than for other modes. Improved road infrastructure would support the economy of the area by facilitating the efficient movement of workers, students, tourists and freight as it will benefit long distance, strategic traffic, as well as more local trips.	Public transport use in the area is low for both work and education trips. A bus based option was modelled in the ERM and was found to achieve a 5% – 6% mode shift to PT. However, the majority of this shift came from active travel modes with a 2% drop in car use in the area was seen following the combined PT proposals. Assessment of network statistics of the modelled Bus Scenario revealed it is likely to have only a minimal impact on traffic levels and delays in the study area.	There is no existing rail line withing the study area or near Virginia nor are there plans for the introduction of a Rail line in this corridor. a rail based solution is unlikely to be feasible in the short to medium term. It would require significant costs in terms of the infrastructure required. However, given the low and dispersed nature of population and job centers within the surrounding area, a rail based option is unlikely to have sufficient demand to make it viable.	Demand management measures such as increased parking charges in the town center would potentially raise revenue, however, this could result in vehicles rerouting and parking in less suitable locations (e.g. nearby residential roads). Other types of traffic management such as banning general traffic could result in longer journey times and additional vehicles travelling on less safe roads. Other suitable Demand Management measures are likely to only result in marginal impacts in terms of economic benefit.	An infrastructure solution focused on active modes alone would only improve access to nearby destinations over short distances and as such are unlikely to remove any long distance strategic traffic from the N3 in the area. As a result, the benefits are likely to be negligible in respect to supporting the economy of the region when compared to other modes.	Most travel to/from the Virginia study area is conducted by car and so the magnitude of the positive impacts achieved by a road intervention will be greater than for other modes. Improved road infrastructure would support the economy of the area by facilitating the efficient movement of workers, students, tourists and freight as it will benefit long distance, strategic traffic, as well as more local trips. The new road infrastructure will improve journey time reliability and quality of journey experience which buses can also benefit from (both long distance services passing through the area using a potential bypass and services which stop in Virginia will also benefit from the removal of strategic traffic through the town).
	Ranking	High Preference	Medium Preference	Low Preference	Low Preference	Low Preference	High Preference
Safety	**Statement**	A road solution would potentially bypass Virginia town which would improve safety in the Town by removing traffic, and in particular HGVs, from areas with a lot of VRUs.	Mode transfer from car to bus would reduce the number of vehicles on the road and associated collisions. Due to the current number of car trips, this would only have a very modest impact on safety, unless extremely high levels of mode transfer took place. Modelled proposals in the ERM indicate that the achievable mode shift would only be in the region of 2% away from car use.	Mode transfer from car to rail would reduce the number of vehicles on the road and associated collisions. Due to the current number of car trips, this would only have a modest impact on safety, unless extremely high levels of mode transfer took place. A rail based option wasn't modelled given the lack of an existing rail line or policy context for rail in the area.	Variable speed limits or introduction of more signalized junctions could potentially result in a small reduction in collisions. Banning HGVs from the town would improve safety and could result in a small reduction in collisions. However, in practice, a HGV ban would only be suitable if there was a suitable alternative route available for HGVs. Otherwise a ban could result in HGVs using unsuitable, more local and regional roads.	There would be a significant safety benefit from improving infrastructure for pedestrians/cyclists as it would provide a segregated route which would remove them from interaction with road traffic. But any active mode measure is also unlikely to reduce the level of strategic long distance traffic on the N3 and thus have a negligible impact on safety through the town.	A road solution would potentially bypass Virginia town which would improve safety in the Town by removing traffic, and in particular HGVs, from areas with a lot of VRUs. Any modal shift away from car trips that may arise from a quicker and more reliable bus service (through the provision of a bypass) would also improve safety in the town by reducing car trips. There would also be a significant safety benefit from improving infrastructure for pedestrians/cyclists as it would provide a segregated route which

		Road	Bus	Rail	Demand/Traffic Management	Active Modes	Hybrid Option (Road / PT / DM / Active Modes)
							would remove them from interaction with road traffic. By providing a bypass of the town, a HGV ban could be applied through the town which would improve safety and could result in a reduction in collisions.
	Ranking	High Preference	Medium Preference	Low Preference	Low Preference	Medium Preference	High Preference
Environment	**Statement**	Improving roads or capacity could increase the attractiveness of travel by car and potentially result in increased vehicle kilometers. However, a bypass of the existing urban centre would reduce noise/air pollution in Virginia town.	Providing bus priority in combination with increased frequency makes trips reliable and quicker, which will increase the attractiveness of travel by bus. This would encourage people to change mode from car to bus for some trips. Even a small amount of mode transfer would reduce the number of cars on the road, which would lower air and noise pollution in the area and in local towns. In order to be environmentally efficient, large buses need to be relatively full and this could be challenging to achieve due to the established car dependency observed in the study area. Overall, while the bus will result in a moderate positive impact for the environment, extremely high levels of mode transfer would be required for a high preference benefit to occur. Modelled proposals in the ERM indicate that the introduction of a local bus service could result in a marginal shift from car to bus (~2% and a bigger	The introduction of a rail line through the area could increase the attractiveness of rail travel, which would encourage people to change mode from car to train for some of their trips. Even a small amount of mode transfer would reduce the number of cars on the road, which would lower air and noise pollution in the area and in local towns. In order to be environmentally efficient, trains need to be relatively full and this could be challenging to achieve due to the established car dependency observed in the study area. Overall, while the train will result in a moderate positive impact for the environment, extremely high levels of mode transfer would be required for a high preference benefit to occur. As the rail line and destinations served is fixed it is difficult for rail to serve the	Demand management measures such as increased parking charges or banning HGVs through Virginia could reduce traffic in the area and reduce local emissions. It should be noted that a HGV ban would only be suitable if there was an alternative, suitable, route available for HGVs. Otherwise a ban could result in HGVs using unsuitable, more local and regional roads with an associated negative environmental impact elsewhere.	Improving segregated facilities for active modes would make walking/cycling safer and more attractive, promoting mode transfer from private cars and public transport over short distances. Active modes do not produce emissions and any mode transfer from cars to walking and cycling would reduce air/noise pollution and produce a modest environmental benefit. However, this is only likely to occur for short distance trips, or within urban areas, rather than throughout the whole study area. This means that the overall positive impact on the environment will be geographically constrained, resulting in a medium rather than high preference benefit.	Improving roads or capacity could increase the attractiveness of travel by car and potentially result in increased vehicle kilometers. However, a bypass of the existing urban centre would reduce noise/air pollution in Virginia town. Providing bus priority in combination with increased frequency makes trips reliable and quicker, which will increase the attractiveness of travel by bus. This would encourage people to change mode from car to bus for some trips. Even a small amount of mode transfer could reduce the number of cars on the road, which could lower air and noise pollution in the area and in local towns. In order to be environmentally efficient, large buses need to be relatively full and this could be challenging to achieve due to the established car dependency observed in the study area. Demand management measures such as banning HGVs (in combination with a bypass) through Virginia could reduce traffic in the area and reduce local emissions.

		Road	Bus	Rail	Demand/Traffic Management	Active Modes	Hybrid Option (Road / PT / DM / Active Modes)
			shift in mode from active modes (walking and cycling) to the bus services (~4%). This would have a negative environmental impact.	dispersed travel patterns in the study area. A rail based option wasn't modelled given the lack of an existing rail line. However, due to factors such as a lack of population density and dispersed trip patterns, a rail option is unlikely to attract significant use.			Improving segregated facilities for active modes would make walking/cycling safer and more attractive, promoting mode transfer from private cars and public transport over short distances. The provision of a new road could facilitate improved bus reliability for buses stopping in the town (due to reduced congestion at peak times) and for services which do not stop in Virginia using a transport park and share hub (mobility hub). Transfer of car users to non-car modes for part of their trips could have a positive impact on the environment. However, there will be other impacts on the environment as a result of new infrastructure.
	Ranking	Medium Preference	Medium Preference	Low Preference	Low Preference	Medium Preference	Medium Preference
Access and Social Inclusion	**Statement**	Accessibility would be enhanced by provision of additional road capacity and associated reduction in congestion. However, the expense related to car ownership would exclude the lowest income groups, and this would reduce the benefit to social inclusion. All income groups would benefit indirectly through bus/coach services which would benefit from reduced congestion and have an opportunity to operate on the new road.	Buses are affordable to all users which would enhance social inclusion. As a bus solution could be integrated with existing bus services in the study area, this would improve accessibility across a large area. Without an intervention on the existing legacy road network, there will be no tangible improvement in reliability and efficiency of regional and inter-urban public transport journeys.	As rail can in theory be used by everyone, social inclusion would be enhanced. However, the dispersed nature of the population in the area means that only those located close to Virginia Town would have access to the train station.	Demand management measures would do little to improve accessibility and the introduction of fiscal measures would increase the cost of travel and negatively affect social inclusion.	Walking requires no expenditure and cycling only requires a modest one-off investment for a bicycle, so improvements to active modes would benefit all social groups. However, active mode infrastructure would do little to improve accessibility for those residing outside of the town as the long distances involved would be too far for most users. Therefore the impact would be small as it would be focused on the town alone	Accessibility would be enhanced by provision of additional road capacity and associated reduction in congestion. The provision of more reliable bus services with accessible and safe bus stops at transport park and share hubs (mobility hubs) would improve social inclusion. Demand management measures would do little to improve accessibility or social inclusion. Dedicated active infrastructure would also benefit all social groups over short distances given the low or zero cost of travel.

		Road	Bus	Rail	Demand/Traffic Management	Active Modes	Hybrid Option (Road / PT / DM / Active Modes)
						rather than the entire study area.	
	Ranking	Medium Preference	Low Preference	Low Preference	Low Preference	Low Preference	High Preference
Integration	**Statement**	A road project would enhance connectivity within the north-east of the country and support policy objectives. At a regional level, the Virginia Bypass is an objective in the North Western Regional Spatial and Economic strategy. It also forms part of the Cavan Development Plan and National Development Plan.	Improved bus services in the area could integrate with local bus services to improve transport links between other major towns in the north east of the country, while also supporting land-use development.	A rail solution would support integration in respect to land-use plans and densification in the town centre. However, the dispersed nature of the population in the area means that only those located close to Virginia Town would have access to the train station.	Demand management measures could reduce congestion around Virginia which would improve transport links between other major towns in the border and north west regions. However, the implementation of fiscal demand management measures would increase the cost of travel which would negatively affect integration overall.	Active mode users would not be able to travel far enough to improve links between major towns in the area.	A transport corridor would enhance connectivity to the border and north-west region and support policy objectives. At a regional level, the Virginia Bypass is an objective in the North Western Regional Spatial and Economic strategy. It also forms part of the Cavan Development Plan and National Development Plan. Faster and more reliable bus services in the area could integrate with local bus services to improve transport links between other major towns in the north of the country, while also supporting land-use development. Demand management measures like a HGV ban could reduce congestion through Virginia. Active mode users would not be able to travel far enough to improve links between major towns in the area.
	Ranking	High Preference	Medium Preference	Medium Preference	Low Preference	Low Preference	High Preference
Physical Activity	**Statement**	A road option is unlikely to impact physical activity levels but could incorporate improvements to pedestrian and cycling infrastructure. Improvements could be made in the area to enhance walking and cycling facilities between settlements. Additionally, if a bypass is brought forward it would	Improving bus infrastructure would have an impact on physical activity. Mode transfer from car to bus would result in more people walking to bus stops to access services. However, modelling indicates that the introduction of local bus services will also lead to a reduction in those walking or	Adding rail infrastructure would have an impact on physical activity. Mode transfer from car to rail would result in more people walking to train stations to access services.	Demand management measures would have limited impact on physical activity.	The greatest benefit from improving infrastructure for walking and cycling would be in respect to encouraging a greater amount of physical activity. Again, the impact would be focused within the town along given the long distances that some outside of Virginia would have to travel.	The provision of a multi-modal transport solution, incorporating segregated active travel facilities and facilities to park and cycle will encouraging a greater amount of physical activity. Faster and more reliable bus services would also result in higher levels of physical activity given the walk to/from stops. Demand management

		Road	Bus	Rail	Demand/Traffic Management	Active Modes	Hybrid Option (Road / PT / DM / Active Modes)
		remove significant amounts of traffic from Virginia Town Centre therefore improving the environment for walking and cycling.	cycling over short distances and instead using bus.				measures would have limited impact on physical activity.
	Ranking	Medium Preference	Low Preference	Medium Preference	Low Preference	High Preference	High Preference

4.2 MCA Conclusion

4.2.1 The results of the MCA are summarised in Table 6.2 and shows that the greatest number of high and medium preference ratings are achieved through a hybrid solution which combines multiple modes. Following this, the second highest rated is a roads option and active modes in third with bus and rail close behind. Demand management does not perform strongly in the MCA assessment on it's own but is effective through a potential hybrid solution.

Table 6-2 MCA Summary

Option	Road	Bus	Rail	Demand/ Traffic Management	Active Modes	Hybrid Option (Road / PT / DM / Active Modes)
Economy	High Preference	Medium Preference	Low Preference	Low Preference	Low Preference	High Preference
Safety	High Preference	Medium Preference	Low Preference	Low Preference	Medium Preference	High Preference
Environment	Medium Preference	Medium Preference	Low Preference	Low Preference	Medium Preference	Medium Preference
Access and Social Inclusion	Medium Preference	Low Preference	Low Preference	Low Preference	Low Preference	High Preference
Integration	High Preference	Medium Preference	Medium Preference	Low Preference	Low Preference	High Preference
Physical Activity	Medium Preference	Low Preference	Medium Preference	Low Preference	High Preference	High Preference
Preferred Option	No	No	No	No	No	Yes

4.2.2 Therefore, the conclusion of this analysis is that a hybrid multi-modal transport solution which comprises potential road, bus, demand management, active travel facilities and park and share hubs (mobility hubs) to allow for modal shift is the most appropriate mode to achieve the project objectives.

5. CONCLUSIONS

5.1 Summary

5.1.1 This report has drawn upon a wide range of spatial and statistical data and traffic modelling tools to analyse the demand for travel in the study area. The baseline review process quantified the existing number of trips by each transport mode and identified the key desire lines of travel in the study area.

5.1.2 The Assessment of Alternatives was focused on the selection of an appropriate intervention which would fulfil the project objectives. An assessment which follows the NIFTI Intervention Hierarchy and a Multi-Criteria Analysis assessment was conducted, which drew upon the evidence presented in the baseline review and, initial modelling analysis, to assess the suitability of different options in achieving the project objectives on its own.

5.1.3 The Potential Solutions assessment which aligns which NIFTI, assessed different options and combinations of options by improving the existing network and prioritising sustainable mode enhancements where possible over road based solutions to benefit private mode users.

5.1.4 While the MCA looked at the suitability of each mode according to the six DoT Common Appraisal Framework themes (Economy, Safety, Environment, Accessibility and Social inclusion, Integration and Physical Activity) against the project objectives.

5.2 Recommendation

5.2.1 This report recommends that the project should proceed with a hybrid multi-modal transport solution which comprises potential road, demand management, active travel facilities and park and share hubs (mobility hubs) on the basis of the assessment presented in this report. The analysis has made it clear that a hybrid multi-modal transport solution is the best placed as the primary mode to achieve the project objectives.

SYSTRA

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Bangkok, Beijing, Brisbane, Delhi, Hanoi, Hong Kong, Manila, Seoul, Shanghai, Singapore, Shenzhen, Taipei

Africa:
Abidjan, Douala, Johannesburg, Kinshasa, Libreville, Nairobi

Latin America:
Lima, Mexico, Rio de Janeiro, Santiago, São Paulo

North America:
Little Falls, Los Angeles, Montreal, New-York, Philadelphia, Washington

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