Chapter 7

Traffic and Transport

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7 TRAFFIC AND TRANSPORT

7.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) assesses the impact of the proposed N2 Slane Bypass and Public Realm Enhancement Scheme (hereafter referred to as the 'Proposed Scheme') in terms of traffic patterns, flows and reassignment. The assessment establishes a comprehensive baseline of existing traffic flows. A large study area is included in the assessment as the potential traffic effects extend beyond the immediate vicinity of Slane village.

This assessment considers traffic assigning to the proposed bypass, the impact on the N2 corridor as a whole, the impact within the village of Slane and the impact across the wider road network, including the M1 corridor.

The assessment presented is informed by and should be read in conjunction with the following key chapters of the EIAR: **Chapter 4 – Description of the Proposed Scheme** and **Chapter 5 – Description of the Construction Phase**.

7.2 Methodology

7.2.1 Legislation, Policy and Guidance

7.2.1.1 Legislation

Specific legislation relating to traffic and transport which has been considered as part of the preparation of this chapter includes:

- Roads Act, 1993 – 2023, as amended;
- Roads Regulations 1994 (S.I. No. 119 of 1994), as amended; and
- Roads (Amendment) Regulations 2019 (S.I. No. 486/2019).

7.2.1.2 Policy

Consideration has been given to the following relevant policy documents in the preparation of this chapter; further policy information is provided in detail in **Chapter 2 – Background and Need for the Scheme**:

- National Planning Framework 2040 (Department of Housing, Planning and Local Government [DHPLG], 2018);
- National Development Plan (Department of Public Expenditure and Reform [DPER], 2018);
- National Investment Framework for Transport in Ireland 2021 (Department of Transport, 2021);
- National Roads 2040 [in Draft] (Transport Infrastructure Ireland [TII], 2022);
- Road Safety Strategy 2021-2030 (RSA, 2021);
- National Sustainable Mobility Policy and Action Plan 2022-2025;
- Meath County Development Plan 2021-2027 (MCC, 2021); and
- Eastern and Midland Regional Spatial & Economic Strategy 2019-2031 (Eastern and Midland Regional Assembly [EMRA], 2019).

7.2.1.3 Guidance

The traffic and transportation assessment has been undertaken having regard to the Transport Infrastructure Ireland (TII) document Traffic and Transport Impact Assessment Guidelines (May 2014) and the Institution of Highways and Transportation's (IHT) document, Guidelines for Traffic Impact Assessment (September 1994).

TII Project Appraisal guidelines have been followed in the development of a traffic model for the scheme. An equilibrium assignment model using OmniTrans modelling software has been developed for the study area (defined in **Section 7.2.2**). The model covers AM peak, interpeak and PM peak time periods and uses evidence-based conversion factors to estimate Annual Average Daily Traffic (AADT) on road network links throughout the study area.

Future year traffic predictions are based on TII published growth rates for a Low, Central and High Growth Scenario. As the Central Growth Scenario represents the most likely future year, traffic data outputs for this scenario are used to predict the likely traffic impacts of the Proposed Scheme.

7.2.2 Zone of Influence

The N2 is an untolled corridor that runs broadly parallel to the tolled M1 and M3 motorways. By carrying out an improvement to a section of the N2 corridor, such as the proposed N2 Slane bypass, it has been assessed that there may be significant reassignment of traffic between the M1 and M3 corridors and the N2 corridor. The study area and associated traffic model therefore needs to represent these three alternative corridors, and the various interconnecting roads that link them.

The study area extends as far as the decision points at which long-distance traffic chooses between the N2/M2 corridor and alternative routes via M1 or M3 motorways. This north-south corridor is bisected by the River Boyne. The modelled road network needs to include the alternative Boyne bridges that might be used by local and/or long-distance traffic, and the routes between these bridges and the strategic road network.

The extent of modelled road network and study area is shown in **Figure 7.1**. The network extent includes:

- The N2/M2 between Carrickmacross and the M50;
- The section of the M50 between the M3 and M1 interchanges;
- The regional road R179/R164 from Carrickmacross to Kells, which together with the M3 forms the western alternative to use of the N2 for long-distance traffic; and
- The N33 national route from Ardee to the M1.

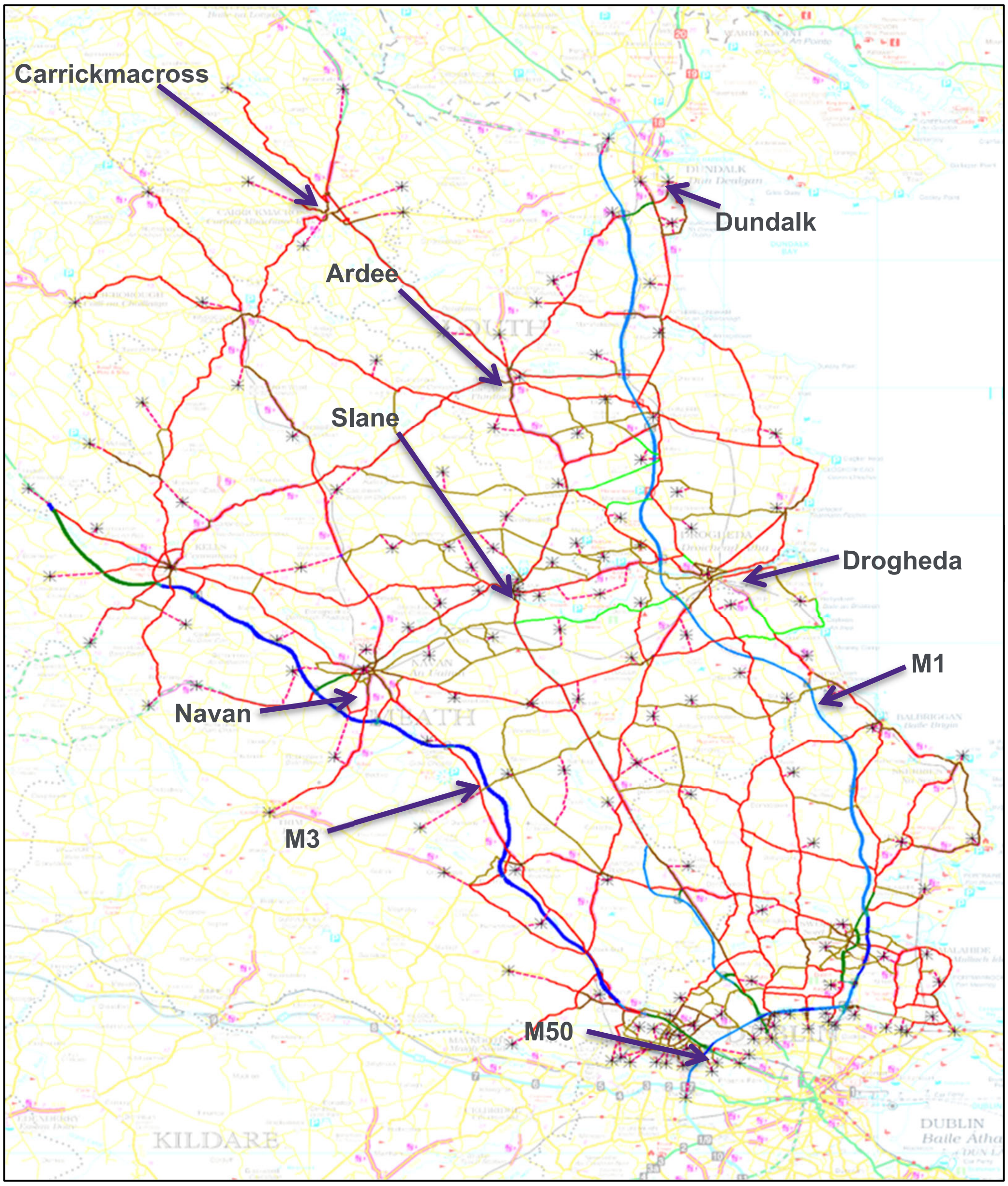


Figure 7.1: Modelled Road Network and Study Area

7.2.3 Sources of Information to inform the Assessment

7.2.3.1 Existing Traffic Data

The traffic assessment has used existing traffic data from a number of data sources:

- Existing traffic data from 16 sites from the TII network of permanent counters (**Figure 7.2**), representing average observed flows over the three mid-weekdays (Tuesday/ Wednesday/ Thursday) from 9-29 May 2019.

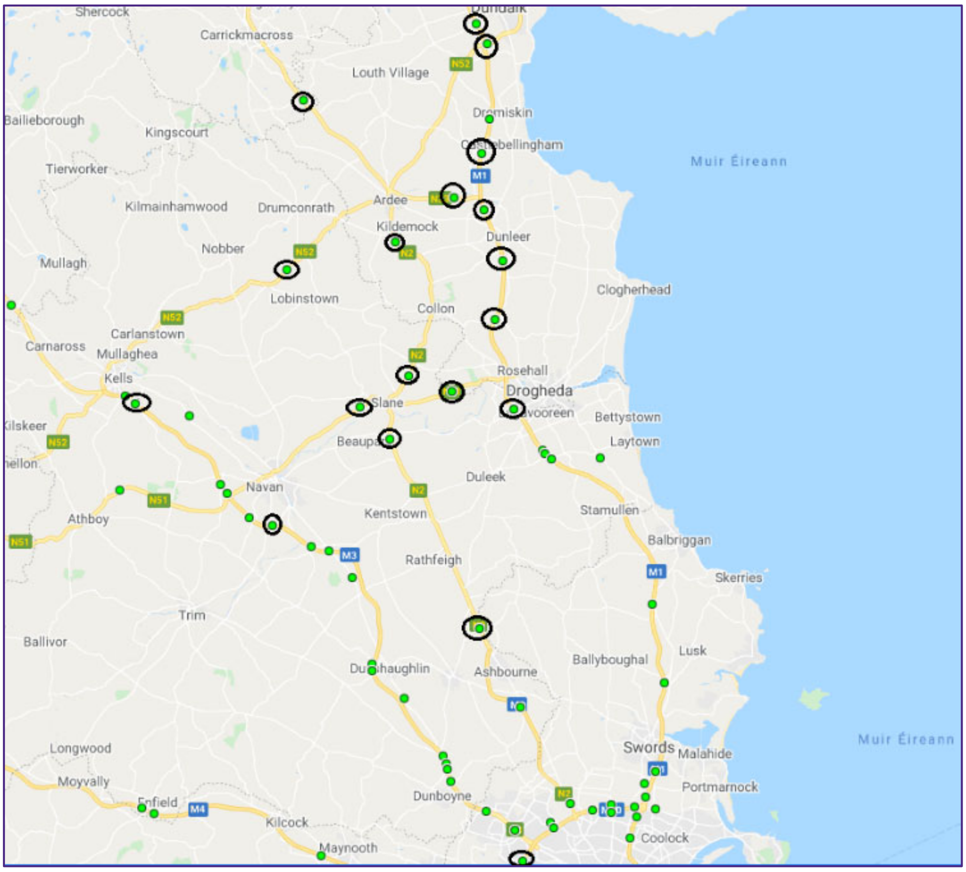


Figure 7.2: Permanent TII Traffic Monitoring Sites for the 2019 Data

- Existing available count data from recent studies:
  - Two weeks of automated traffic count (ATC) data for March and April 2017 collected for TII, at four sites – two on N2, one on N51, one on N52;
  - ATC data collected for the National Transport Authority (NTA) in March 2017 at 29 sites on radial routes around urban areas;
  - Video counts (ten sites) collected for the NTA in March 2017 at sites along an M50 screenline;
  - Video counts at junctions (two sites) collected for Meath County Council (MCC) – survey at N51 Dunmoe carried out on 3rd November 2015 and N52/R162 Castletown carried out on 13th Oct 2016; and
  - Data from the 2013 and 2015 Slane Traffic Management Studies.
- Counts undertaken for this study:
  - Video turning counts undertaken for short periods on Tuesday 16 May 2017 in the AM peak, interpeak, and PM peak, at 29 junctions within the modelled area;
  - Pneumatic tube counters used to record traffic volumes in the week 16-22 May 2017, at three sites on the N2 in and around Slane; and
  - Journey time surveys undertaken along the N2 through the study area: the route was surveyed using a single GPS-equipped survey vehicle, driving the route over two survey days on Tuesday 16 May 16 and Wednesday 17 May 2017.

Figure 7.3, **Figure 7.4**, **Figure 7.5**, **Figure 7.6** and **Figure 7.7** illustrate the data used and the locations within the study area.[1]

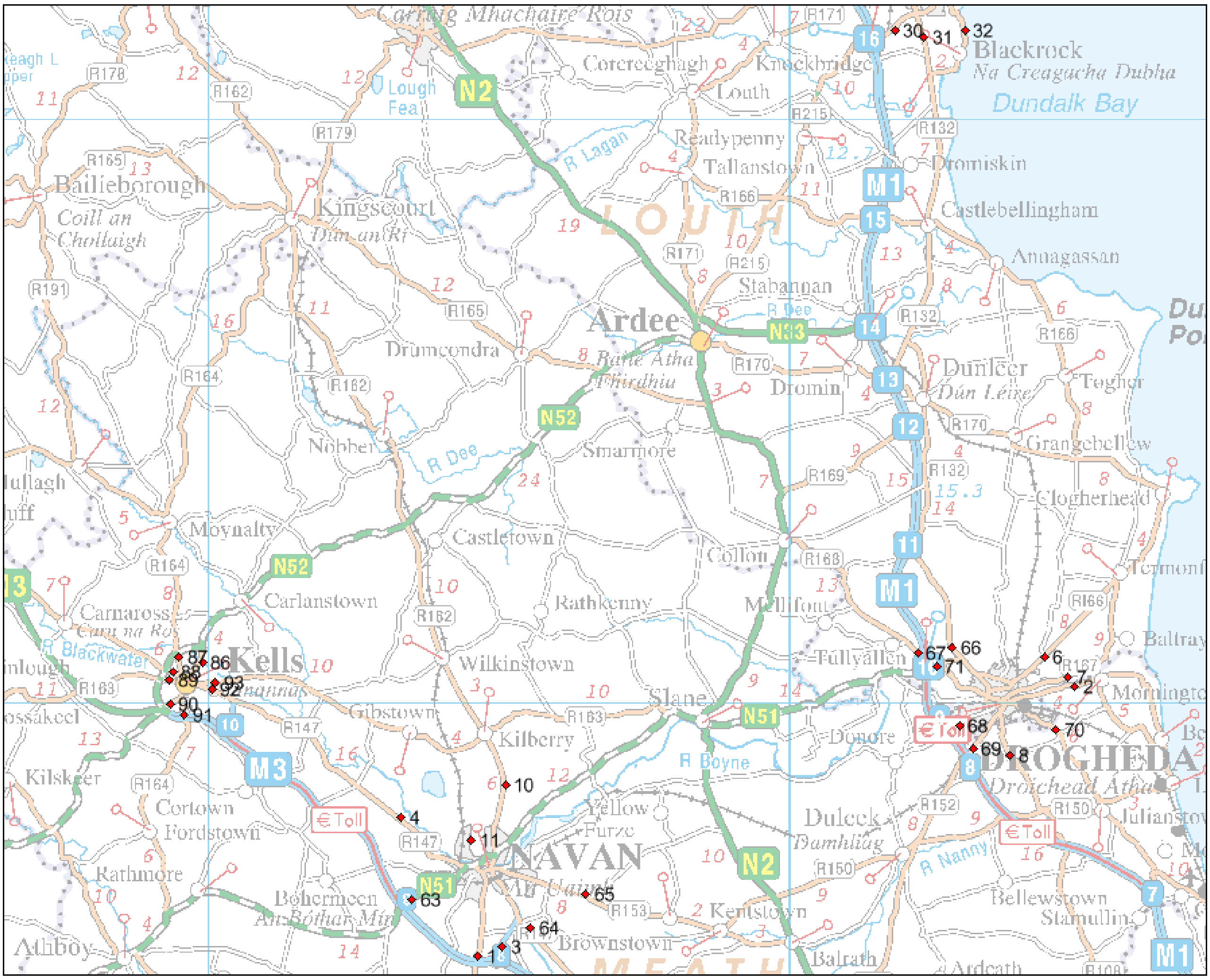


Figure 7.3: Locations of Automatic Count Data from the NTA

[1] Images use OSi background imagery under Ordnance Survey Ireland Licence CYAL50252391 © Ordnance Survey Ireland/Government of Ireland.

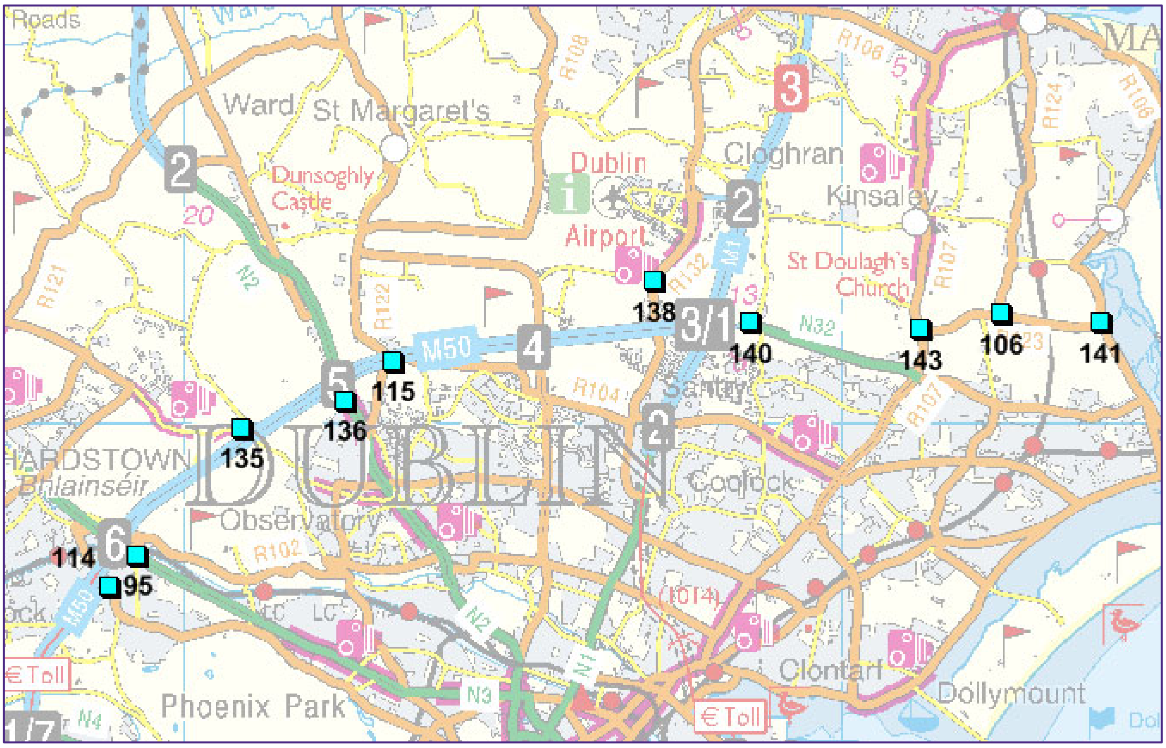


Figure 7.4: Locations of M50 Screenline Data from the NTA

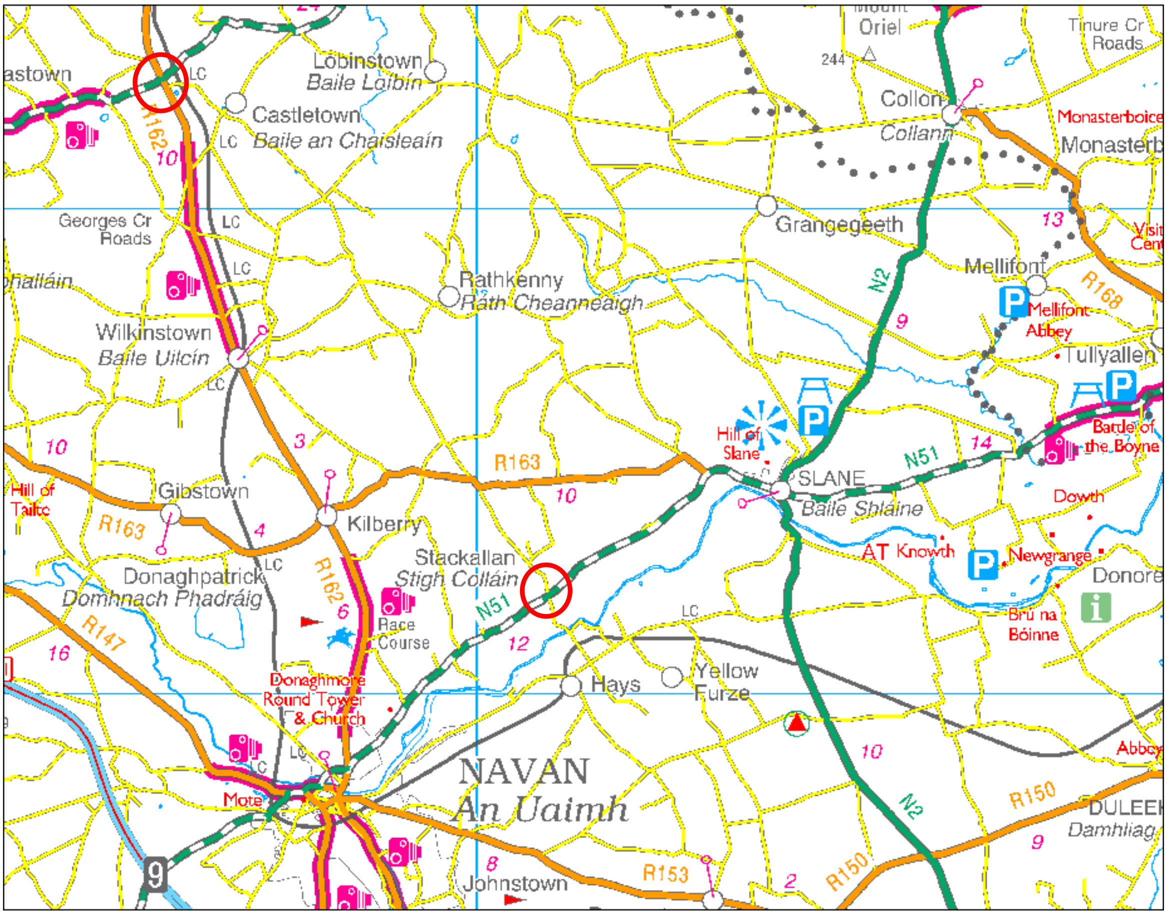


Figure 7.5: Locations of Existing Count Data from MCC

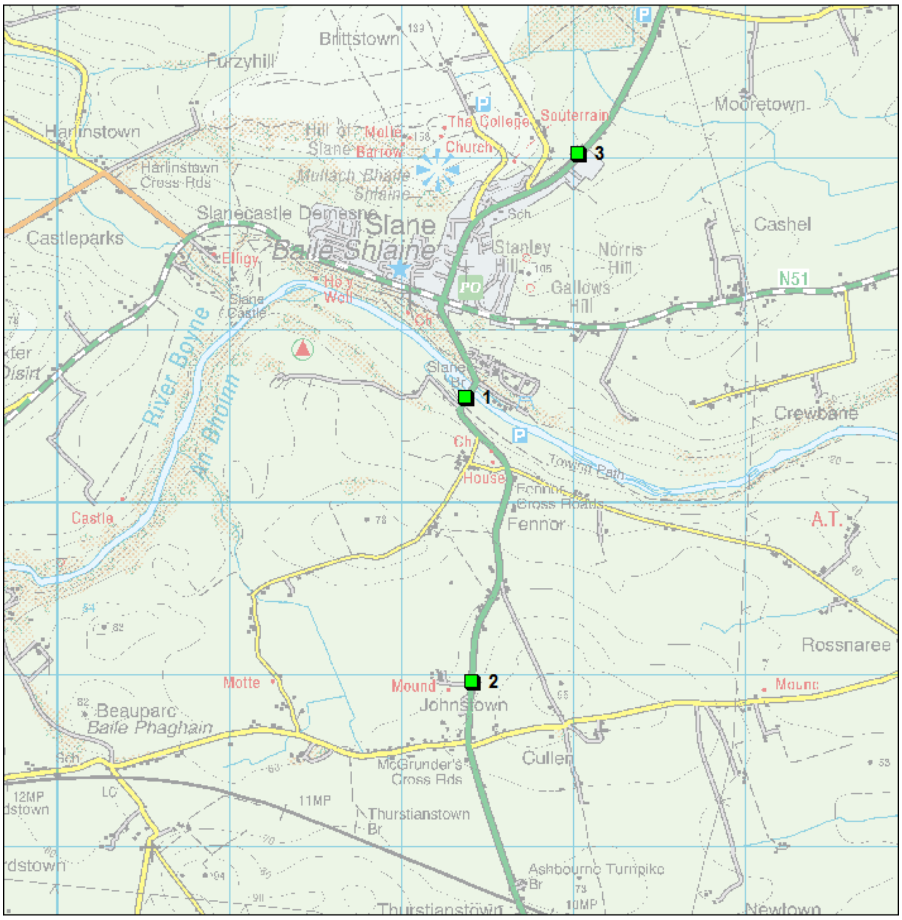


Figure 7.6: Locations for the May 2017 Traffic Flow Surveys

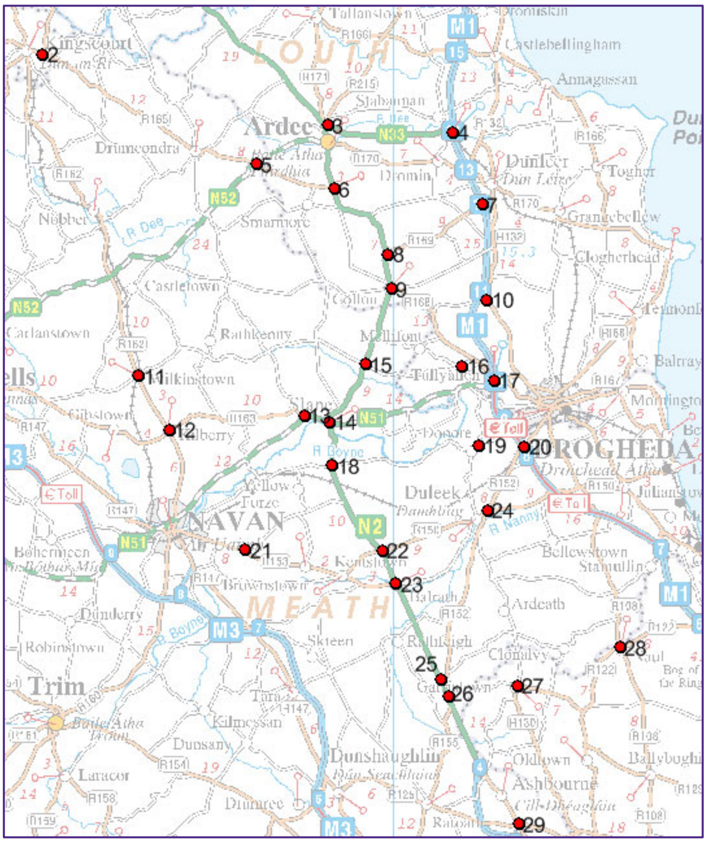


Figure 7.7: Locations for the May 2017 Junction Surveys

- ATC count data on the N51 from 2018;
- The N2 Ardee to Castleblayney and Clontibret to Border schemes: data collected for Monaghan County Council. Video counts were carried out on Wednesday 8 May 2019 and cover a 24-hour period with data at 15-minute intervals. The southern part of that study area overlaps with the area of the N2 Slane Bypass model; and
- The N2 Rath to Kilmoon study: data collected for Meath County Council. Video junction turning counts were carried out on Tuesday 3 December 2019, and cover AM peak and PM peak periods at 15-minute intervals.

The locations for which traffic data was used are shown in **Figure 7.8, Figure 7.9** and **Figure 7.10**.

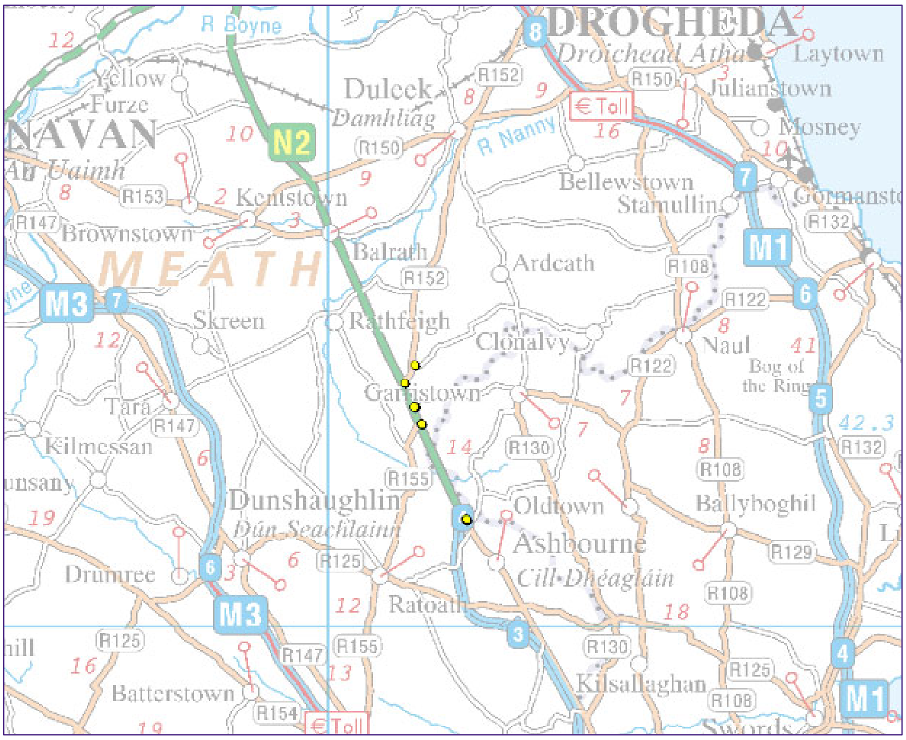


Figure 7.8: Locations of used Counts from the N2 Rath-Kilmoon Study

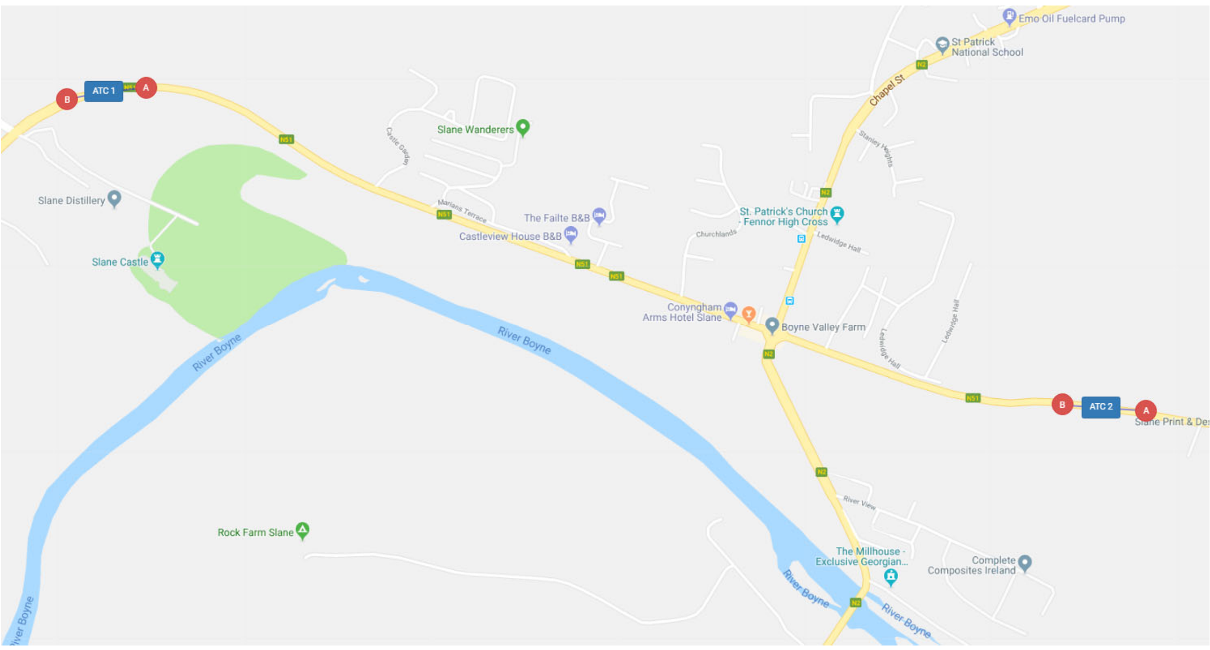


Figure 7.9: Locations of 2018 ATC counts on the N51

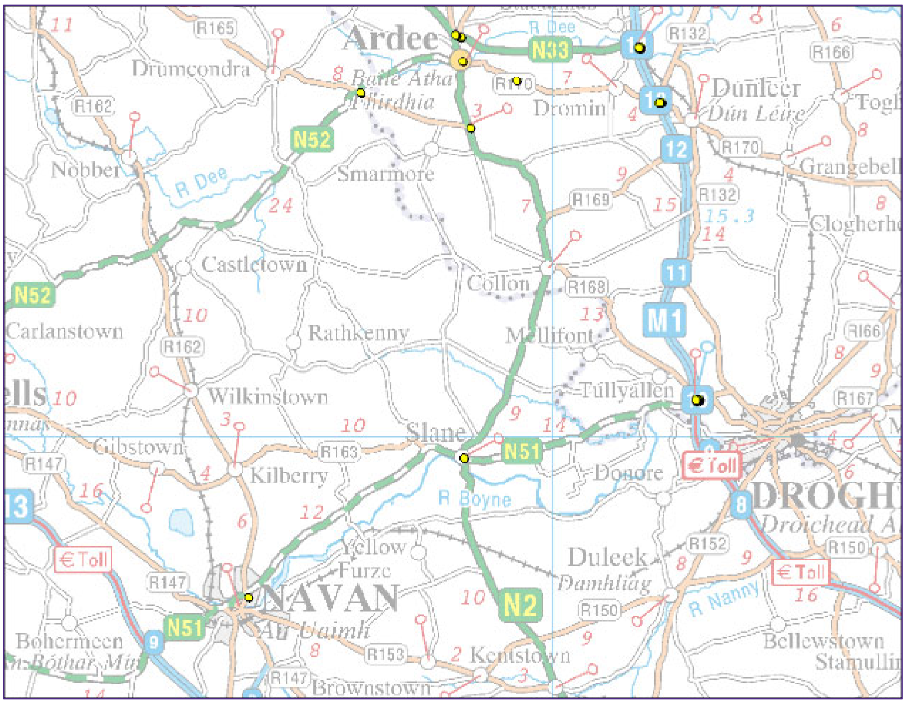


Figure 7.10: Locations of Junction Count Data from the N2 Monaghan study

7.2.3.2 GPS Data

GPS trace data from May 2017 was utilised to assess/model traffic routes through the study area. The data consists of processed GPS traces from ‘probe vehicles’. Probe vehicles carry satellite navigation or a fleet management system from one of the companies who supply their data to INRIX[2], or those with a mobile phone that is accessing a navigation app from one of these companies.

These traces have been anonymised. Each trip record comes with a device identifier, which allows linkage across trips within the dataset. Each GPS location fix comes with a timestamp, so that the data gives information on journey times/speeds, on trip origins and destinations, and on the routes that were chosen.

This data was used as the basis for the speed-flow curve used on each link of the traffic model, and to provide data on trip patterns within the traffic model.

7.2.4 Key Parameters for Assessment

The parameters for assessment are based on the traffic modelling carried out to inform the Proposed Scheme design and comprise consideration of the following:

- Presentation of the existing conditions: observed base year traffic flows on the N2 and N51 corridors, in Slane village and on the wider strategic road network;
- Description of the traffic growth assumptions used in the traffic modelling work, and the network changes assumed to occur in the Do-Minimum Scenario, which is the base year existing road network with the addition of other committed road schemes;
- Forecast traffic flow and traffic journey times that are likely to occur in the Do-Minimum Scenario if the Proposed Scheme is not built;
- Forecast traffic flow and traffic journey times that are likely to occur in the Do-Something Scenario i.e. if the Proposed Scheme is built;
- Information on the pedestrian and cycling strategy; and

[2] Transportation analysis company which provides location-based data and analytics.

- Assessment of the principal impacts of the Proposed Scheme in terms of:
  - Total net impact on traffic journey times;
  - Location and scale of changes in traffic flow and traffic congestion;
  - Changes in journey times for a sample of journeys; and
  - Impacts in relation to pedestrian and cycling activity.

For the operational phase, link AADT is used as the key parameter for assessment. Comparisons have been made between future year scenarios with and without the Proposed Scheme in place. This enables an evaluation to be made as to the significance of the impact of the Proposed Scheme in terms of volumes of daily traffic.

The overall impact of the scheme on network performance is also assessed which includes consideration of the following parameters:

- Impact on N2, N51, M1 and M3 corridors;
- Impact within Slane village, including of active travel;
- Consideration of traffic reassignment across the wider network;
- Journey times impact;
- Effects on heavy goods vehicles (HGVs); and
- Effects on pedestrian and cyclist movement and active travel.

During the construction phase, there will be a need to generate additional traffic trips to enable site staff and plant/materials access to and from the site. This will temporarily increase traffic in the locality of Slane. The assessment will give consideration as to the likely impact this traffic will have locally. This assessment is described in **Chapter 5 – Description of the Construction Phase.**

7.2.5 Assessment Criteria and Significance

A traffic impact less than 5% of the pre-existing traffic volume on a road link is considered to be a negligible impact.

Traffic effects in terms of noise and air quality impact are considered elsewhere in this EIAR, refer to **Chapter 9 – Noise and Vibration** and **Chapter 10 – Air Quality**.

The traffic and transport assessment describes the expected changes in traffic assignment as a result of the Proposed Scheme and provides a quantitative description of the impacts.

7.2.6 Data Limitations

It is noted that due to the unprecedented COVID-19 pandemic, government restrictions during both 2020 and 2021 presented unique challenges for the project team to progress the EIAR. In March 2020, Ireland began imposing restrictions on movement in order to combat the spread of COVID-19. Most workplaces, shops and schools were closed, and all unnecessary travel beyond 5 km from home was discouraged. The compilation of the information necessary for the EIAR including environmental surveys was carried out at times when travel restrictions had been eased and lifted and subsequently did not present any significant difficulties.

The COVID-19 pandemic and the associated government restrictions on passenger car and public transport journeys has had impacts on travel patterns and traffic flows. However, the baseline traffic counts were undertaken prior to the pandemic.

Post pandemic, remote working has become the norm for many workers. A sensitivity test has been carried out on traffic flows and patterns using TII counter data to check if there have been any material changes between pre- and post-pandemic traffic behaviour in the study area. This test checked if any changes that have occurred are of sufficient magnitude to raise doubt that the traffic modelling assumptions. The conclusion is that post pandemic traffic volumes and patterns have re-established on the road network to a level that is consistent with pre-pandemic traffic trends and therefore there is no clear evidence that the traffic modelling assumptions made are no longer valid, and as such is deemed to not affect the certainty or predictability of the assessment.

7.3 Description of Existing Environment (Baseline Scenario)

7.3.1 Baseline Daily Traffic Flows

Traffic volumes on the road network vary with time of day, which day of the week and also seasonal effects such as school opening periods, summer holidays, increased summer tourism etc. Therefore, to present a 'typical' day, representing baseline daily traffic on the road network in the vicinity of Slane village and on the wider strategic road network, a representation consisting of average 24 hour observed flows over the mid-weekdays Tuesday, Wednesday and Thursday from neutral months have been utilised. Neutral months are those in a typical year where seasonal traffic volume variations are less prevalent. This data has been derived from TII automatic counters and is presented in **Figure 7.11** below. Where available, the data has been compiled from neutral months in 2019 or where not available, derived from earlier years and factored to a 2019 base.

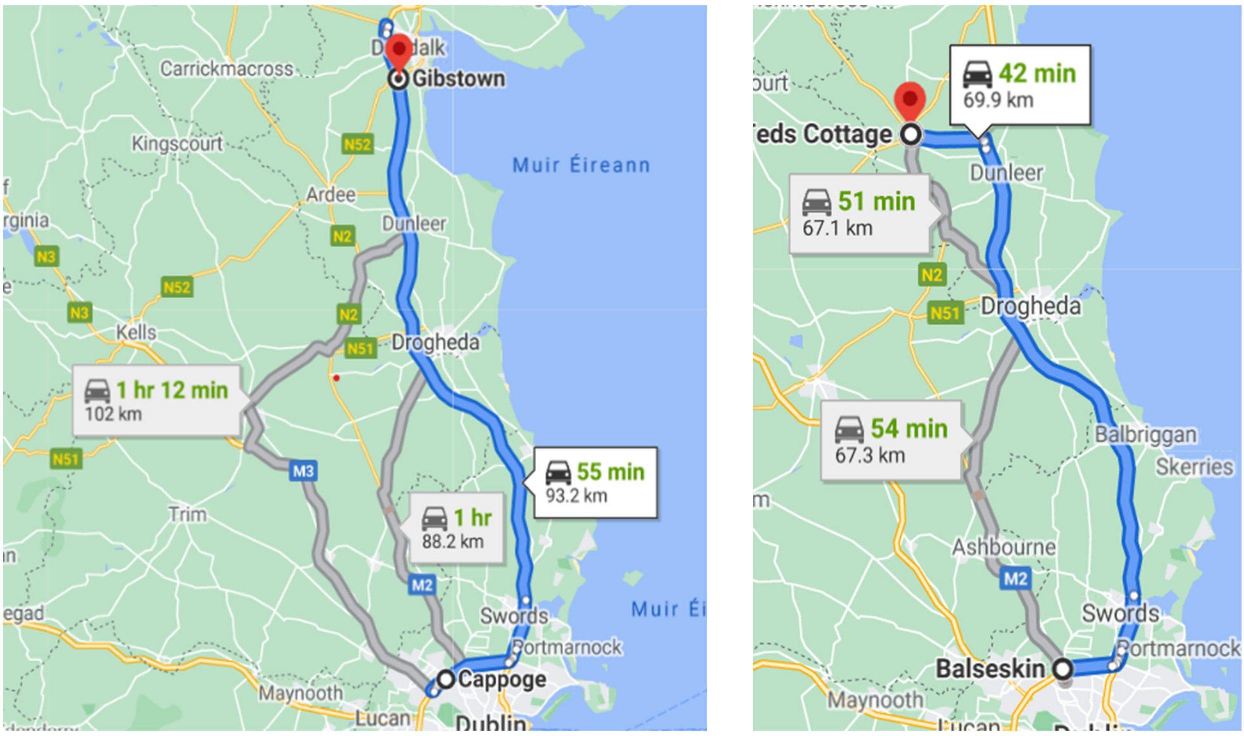
The data shown is typical daily traffic flow volumes with % HGV content on the N2, M1, N51, N33, N52 and M3 corridors.

Source: *Google Maps, Imagery ©2022*

Figure 7.11: Observed Data from 2019 TMU Counters (% HGV)

The N2 and the M1 corridors, and to a lesser extent the M3, are comparable routes in terms of distance and journey times between origins and destinations from, for instance, a location on the northern end of the M50 to a location north of Ardee. Using the Journey Planner tool in Google Maps, the following distances and journey times are shown for typical north-south journeys from the M50 to points north of Ardee.

As can be seen in **Figure 7.12** below, the distances and journey times are similar and therefore there is an existing balance in terms of route choice, particularly between the N2 and the M1.



Source: *Google Maps, Map Data ©2022*

Figure 7.12: Google Maps Journey Times and Distances

The baseline data shows a number of existing traffic volume trends; the M1 is the main north-south corridor in the study area and it carries the highest traffic volumes, reflecting its capacity as a motorway and status as part of the TEN-T North Sea-Mediterranean Corridor**.** The typical daily traffic volumes in vehicles per day (veh/day) on the M1 are:

- Approx. 115,170 veh/day with over 9,210 HGVs between the M50 and Swords;
- Approx. 67,450 veh/day with 6,070 HGVs between Donabate and Lusk;
- Approx. 67,460 veh/day with 6,070 HGVs between Lusk and Balbriggan;
- Approx. 39,820 veh/day with 4,780 HGVs between Balbriggan and Drogheda;
- Between 40,040 veh/day with 4,800 HGVs to 45,390 veh/day with 5,000 HGVs between Drogheda and Dunleer; and
- North of Dunleer, the typical traffic volumes reduce to 39,440 veh/day, with 5,130 HGVs.

On the N2 corridor, typical daily traffic volumes are:

- Approx. 48,720 veh/day, with 6,820 HGVs on the section north of the M50;
- Approx. 33,630 veh/day, with approx. 3,360 HGVs south of Ashbourne;
- Approx. 18,890 veh/day, with approx. 2,080 HGVs north of Ashbourne;
- Approx. 9,200 veh/day, with approx. 1,300 HGVs south of McGruder's Cross;
- Approx. 7,700 veh/day, with approx. 1,160 HGVs north of Slane;
- Approx. 7,760 veh/day, with approx. 780 HGVs south of Ardee; and
- Approx. 11,340 veh/day, with approx. 1,700 HGVs north of Ardee.

The increase in traffic on the N2 north of Ardee reflects the traffic that transfers between the M1 and the N2 via the N33 route. On the M3 corridor, the route typically carries a daily traffic volume of:

- Approx. 88,140 veh/day, with 5,290 HGVs on the section north of the M50;
- Approx. 45,620 veh/day, with 3,650 HGVs at Dunboyne;
- Approx. 24,020 veh/day, with 2,880 HGVs north of Dunboyne;
- Approx. 23,090 veh/day, with 2,770 HGVs north of Dunshaughlin;
- Approx. 22,200 veh/day, with 2,665 HGVs between Dunshaughlin and Navan;
- Approx. 20,260 veh/day, with 2,630 HGVs south of Navan; and
- Approx. 14,000 veh/day, with 1,960 HGVs north of Navan.

The key link road between the N2 and the M1 is the N33 between Ardee and Junction 14 on the M1. It typically carries 13,740 veh/day, with 1,370 HGVs. The N33 and the N2 north of Ardee is part of the TEN-T comprehensive network and is the principal link intended to be utilised by N2 strategic traffic north of Ardee. However, as noted above, there is not much difference in journey times between the N33/M1 route and the option to use the N2 for traffic to/from the M50. The fact that the M1 is a tolled route will tend to further tip the balance of route choice to the N2 corridor for some road users.

In November 2013, TII engaged with its various Public-Private Partnerships (PPPs) contract partners to arrange to allow goods vehicles with a design gross vehicle weight exceeding 3,500 kg and having two or more axles toll-free passage on selected PPP schemes from the 1 to 30 of November 2013 inclusive. Both the M1 and the M3 took part in this exercise which would impact on traffic flows on the N2. To monitor the impacts of the toll-free period ATCs were installed across the road network.

Firstly, the study suggests that users are aware of the route options available to them as for example, some HGV traffic transferred from the N2 to the M1 during the toll holiday as drivers are aware of the higher level of service provided by the higher standard M1 (as drivers decided to transfer during November) but chose to revert to the N2 (or other route) when the toll was reinstated. The study suggests that the volume of HGVs usually on the N2 between Slane and Ardee, avoiding the tolls is of the order of 84 to 230 HGVs per day. This range is based on the average daily HGV flows on the N2 from the month before the toll holiday and the month of the toll holiday at different locations on the N2. The largest decrease was recorded as 230 (-38%) at Slane bridge and the least recorded as 84 (-13%) south of Ardee. Whilst this effect is not insignificant, the majority of N2 HGV traffic did not reassign to the M1.

To further consider the issue of route switching between the M1 and the N2 corridors, the count data from the N2 Monaghan study shown in **Figure 7.10** was considered in greater detail. From these counts, the following is noted:

- Approx. 987 veh/day with 142 HGVs turn from the N2 south towards the M1; and
- Approx. 1,294 veh/day with 135 HGVs turn south from the N33 onto the N2.

While this is not definitive, these indicators represent what could be route switchers who use the M1 north of the N33 and the N2 south of the N33 in order to avoid the M1 tolls. At a maximum, this data suggests that some 277 HGVs could be using the N2 to avoid the M1 tolls but there may be other valid reasons why this traffic uses this route e.g. traffic from Dundalk to/from Navan. The data does however serve to put context on potential HGV toll avoidance, suggesting that no more than approx. 24% of HGVs in Slane might be route switchers to avoid the M1 tolls.

Typical daily traffic on the N51 consists of 5,160 veh/day, with 360 HGVs on the east side of Slane, and typically 6,990 veh/day with 630 HGVs on the west side of Slane.

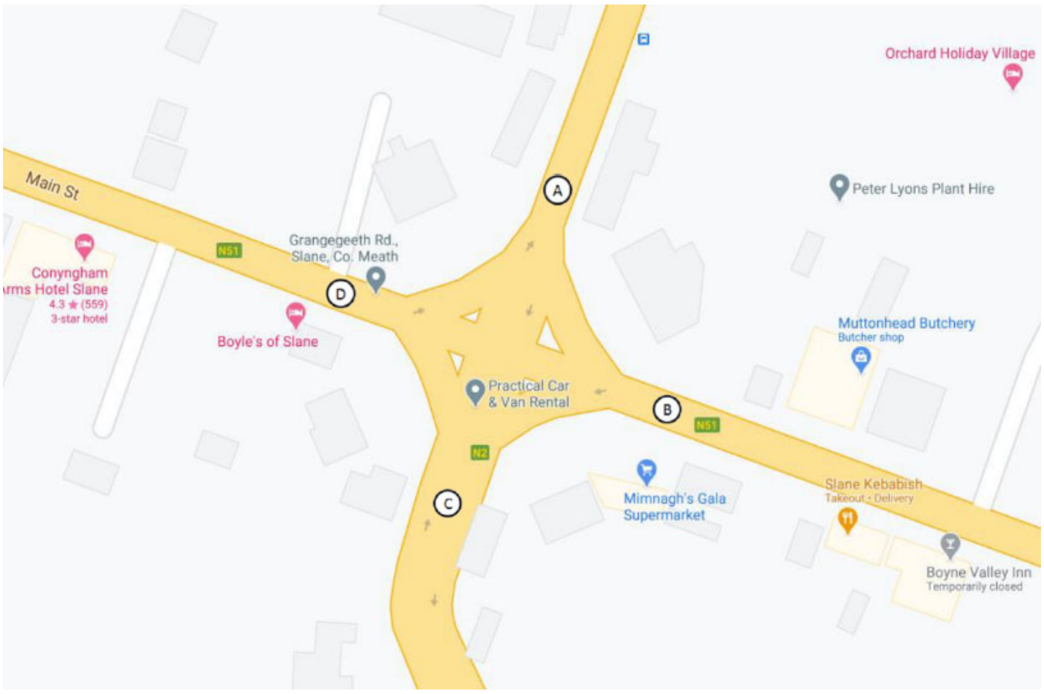
7.3.2 Baseline Traffic in Slane village

Both the N2 and N51 national roads pass through the village of Slane. On the N2, existing traffic has to negotiate the narrow sub-standard existing Boyne bridge and the relatively high gradients and narrow roads. A one-way system operates for traffic to cross the River Boyne, with the segregation of HGV traffic from other traffic operating in the southbound direction.

All traffic has to negotiate the traffic light-controlled junction (The Square) in the centre of the village. Capacity at this junction is limited and the space available for some traffic manoeuvres is inadequate e.g. right turning HGV traffic is particularly problematic. Given these constraints, delays and congestion frequently occur.

Based on the traffic count undertaken in Slane for the N2 Monaghan scheme in May 2019, the daily traffic flow on the N2 in Slane is approx. 8,755 veh/day with approx. 1,520 HGVs on the south side of the Square, and 10,360 veh/day with 1,490 HGVs on the north side of the Square. The N51 in Slane carries approx. 6,070 veh/day with 490 HGVs on the east side and approx. 10,240 veh/day with 1,070 HGVs on the west side. The HGV content is particularly significant, with approx. 2,300 HGVs passing through the village per day.

A capacity analysis was undertaken at the N2/N51 junction to assess the current operating performance of the junction during AM and PM peak hours. On Tuesday 16 May 2017, junction turning counts were undertaken on each of the four arms of the N2/N51 intersection in Slane village. **Figure 7.13** below shows the naming convention for each arm of the junction.



Source: *Google Maps, Map Data ©2022*

Figure 7.13: N2 / N51 Junction with Nomenclature

Using central growth factors from TII's Project Appraisal Guidelines for National Roads Unit 5.3, Travel Demand Projections, these traffic movements were factored to represent a 2019 base year. The growth factors used for both heavy vehicles (HV) and light vehicles (LV) are set out in **Table 7-1** below.

Table 7-1: TII Traffic Growth Factors (Central) – Meath Area

Year	Annual Growth Factor – LV	Annual Growth Factor – HV
2016 – 2030	1.0173	1.0365

Traffic data, in the form of junction turning traffic for the AM peak (08.00 to 09.00) and PM peak (17.00 to 18.00) were extracted from the count data and used in this analysis.

The turning movement volumes, presented as Passengers Car Units (PCUs) and the geometric parameters of the junction were inputted into the LinSig junction modelling software. LinSig predicts capacities, queues and delays at the junctions; the capacity of a junction is determined by the Degree of Saturation (DOS) value (reported as a %) and this value is the key performance indicator for assessing the performance of a junction. A junction with a DOS of 90% is considered to be at practical capacity while anything above 90% is considered to be over capacity, that is it does not have sufficient capacity to cater for the demand flows.

The capacity analysis results are summarised under the following headings:

- Degree of Saturation; and
- Mean Max Queue: the maximum predicted queue (in PCUs) during the peak hour.

The Base Year 2019 traffic flows for the junction are presented in **Table 7-2** and **Table 7-4** below. The percentages of each turning movement made up by Heavy Good Vehicles (HGVs) are presented in **Table 7-3** and **Table 7-5**.

Table 7-2: 2019 AM Peak Flows (PCUs)

	A: N2 North	B: N51 East	C: N2 South	D: N51 West
A: N2 North	0	26	317	231
B: N51 East	33	0	57	159
C: N2 South	145	28	0	103
D: N51 West	163	198	143	0

Table 7-3: 2019 AM Peak HGV%

	A: N2 North	B: N51 East	C: N2 South	D: N51 West
A: N2 North	0.0%	36.2%	15.4%	13.7%
B: N51 East	39.0%	0.0%	6.1%	8.2%
C: N2 South	23.1%	4.0%	0.0%	37.2%
D: N51 West	14.0%	6.5%	11.2%	0.0%

Table 7-4: 2019 PM Peak Flows (PCUs)

	A: N2 North	B: N51 East	C: N2 South	D: N51 West
A: N2 North	0	29	157	548
B: N51 East	27	0	55	264
C: N2 South	374	51	0	160
D: N51 West	208	145	78	0

Table 7-5: 2019 PM Peak HGV%

	A: N2 North	B: N51 East	C: N2 South	D: N51 West
A: N2 North	0.0%	3.8%	10.0%	7.0%
B: N51 East	4.1%	0.0%	0.0%	2.5%
C: N2 South	6.6%	0.0%	0.0%	7.3%
D: N51 West	5.5%	3.9%	11.0%	0.0%

Table 7-6 and **Table 7-7** present the results from the capacity assessment at the existing junction in Slane for the AM and the PM peak, respectively.

Table 7-6: 2019 AM Peak Results

Lane Description	2019 AM Peak		
	79.0% DOS		
	Mean Max. Queue (PCU)	Demand Flow (PCU)	Degree of Saturation (%)
N2 (N) – Ahead & Left	9.7	343	79.0%
N2 (N) – Right	6.7	231	72.9%
N51 (E) – Left, Ahead & Right	6.5	249	76.4%
N2 (S) – Left & Ahead	3.7	248	49.7%
N2 (S) – Right	0.6	28	14.6%

Lane Description	2019 AM Peak		
	79.0% DOS		
	Mean Max. Queue (PCU)	Demand Flow (PCU)	Degree of Saturation (%)
N51 (W) – Left, Ahead & Right	11.7	504	78.7%

The results in **Table 7-6** demonstrates that N2/N51 junction operates within its working capacity for the traffic volumes in the baseline 2019 AM peak. However, it is noted that queues do form in the AM peak hour (1 PCU is equivalent to 5.75 m length) and given the short inadequate left and right turn lanes at the junction, queuing will reduce efficiency further as turning traffic is unable to access the turning lanes in an efficient way.

Table 7-7: 2019 PM Peak Results

Lane Description	2019 PM Peak		
	125.3% DOS		
	Mean Max. Queue (PCU)	Demand Flow (PCU)	Degree of Saturation (%)
N2 (N) – Ahead & Left	3.9	186	44.2%
N2 (N) – Right	74.1	548	125.3%
N51 (E) – Left, Ahead & Right	39.1	346	118.1%
N2 (S) – Left & Ahead	61.9	534	120.0%
N2 (S) – Right	0.8	51	8.3%
N51 (W) – Left, Ahead & Right	46.4	431	118.4%

The results in **Table 7-7** show that N2/N51 junction operates significantly above its working capacity during the baseline 2019 PM peak hour, with all arms having a DOS of above 90% for at least one of the traffic manoeuvres. Only the left lane of the N2 (N) and the right lane of the N2 (S) operate within practical capacity during the baseline 2019 PM peak.

The above analysis shows that under baseline conditions, the junction at the Square in Slane is near its capacity in the AM peak and that its capacity is exceeded in the PM peak. The junction is prone to traffic delays and congestion.

The operation of the traffic light one-way system at the existing River Boyne bridge is also a source of delay to traffic on the N2 and long queues also regularly form at this location.

7.3.2.1 Baseline Traffic Profiles around Slane

Baseline traffic profiles are established utilising various sources of data:

- ATC count data on the N51 from May 2018, converted to an estimate of Annual Average Daily Traffic (AADT) using the expansion factors outlined in TII-PE-PAG-02039 and interpolated to the 2019 baseline year using the TII Traffic Growth Factors (Central).
- ATC count data on the N2 (Slane Bridge, North of McGruder's Cross and N2 Northern approach) in May 2017, converted to Annual Average Daily Traffic (AADT) using the expansion factors outlined in TII-PE-PAG-02039 and interpolated to the 2019 baseline year using the TII Traffic Growth Factors (Central).

7.3.2.1.1 N51 (West of Slane, East of R163 Junction – ATC 1)

Figure 7.14 below shows the daily traffic for the baseline 2019 year on the N51 West of Slane. The profile shows morning and evening peaks. At this location, the estimate of AADT for 2019 is 8,150 vehicles with 13.7% being HGVs.

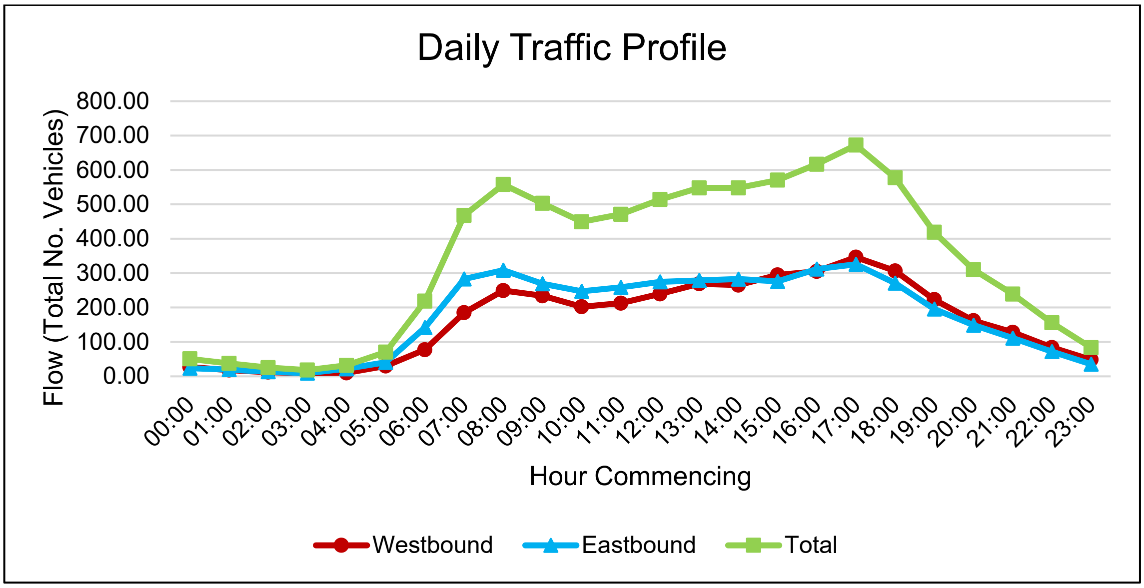


Figure 7.14: Daily Traffic Profile – N51 West of Slane

The peak hours on the N51 West of Slane are 08.00 to 09.00 and 17.00 to 18.00. **Figure 7.15** below shows the daily HGV% profile. HGVs on this route peak at around 04.00 with this hour accounting for 40% of the HGV traffic on this section of the N51.

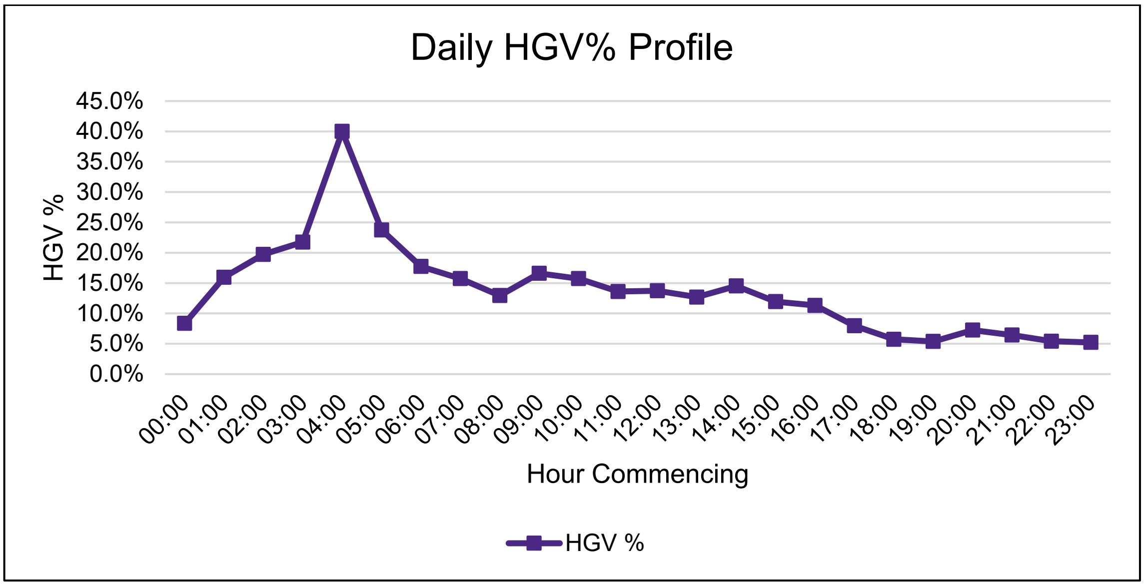


Figure 7.15: Daily HGV%– N51 West of Slane

7.3.2.1.2 N51 East of Slane (ATC 2)

Figure 7.16 below shows the daily traffic for the baseline 2019 year on this section of the N51. The profile shows morning and evening peaks. At this location, the estimate of AADT for 2019 is 4,721 vehicles with 10.5% being HGVs.

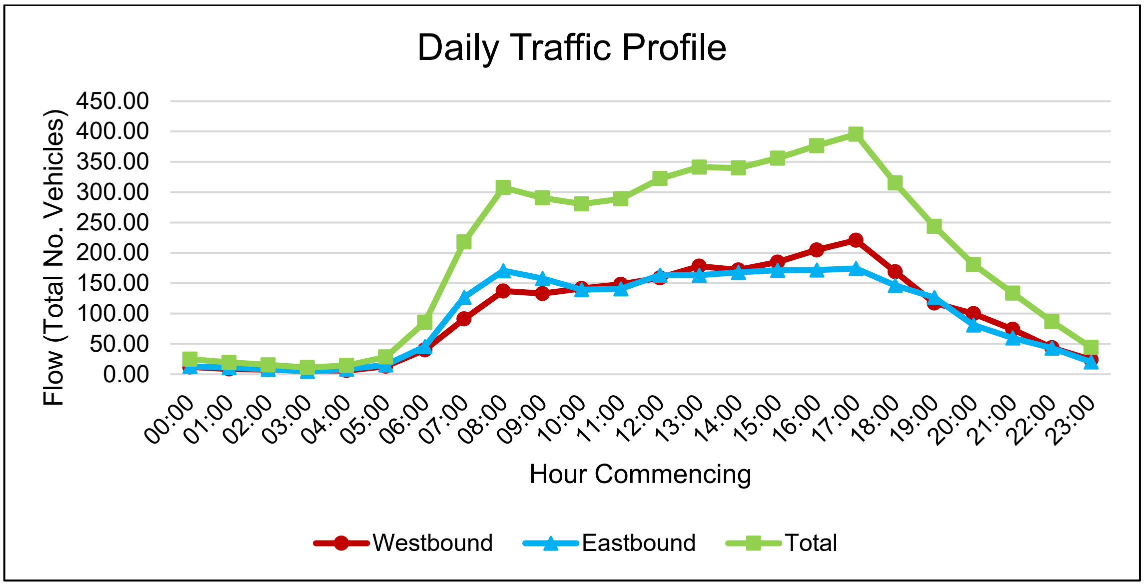


Figure 7.16: Daily Traffic Profile – N51 East of Slane

The peak hours on the N51 East of Slane are 08.00 to 09.00 and 17.00 to 18.00.

Figure 7.17 below shows the daily HGV% profile. HGVs on this route peak at around 04.00 with this hour accounting for 37% of the HGV traffic on this section of the N51.

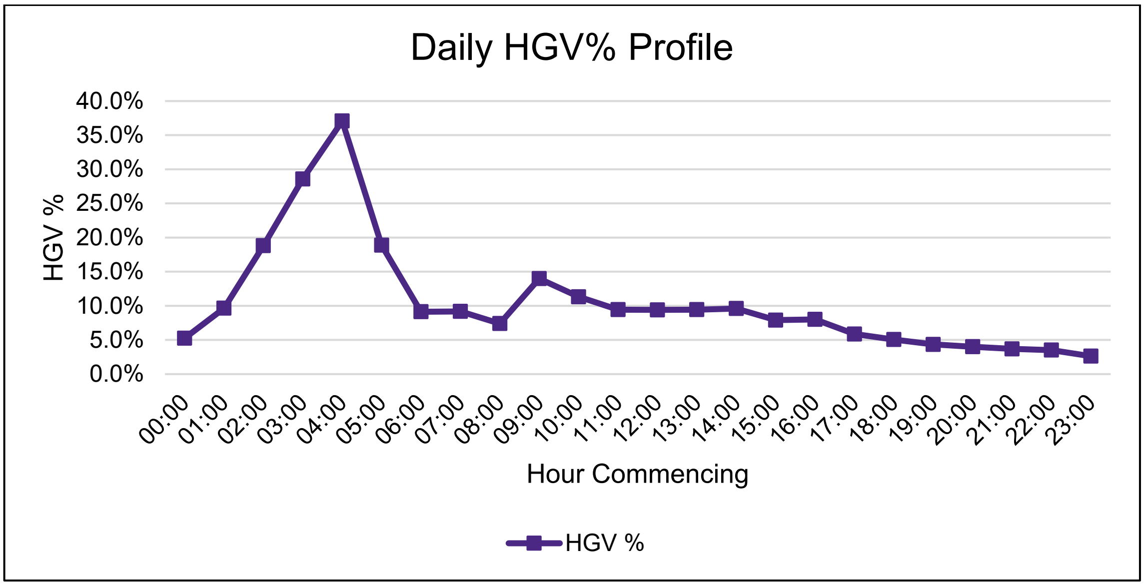


Figure 7.17: Daily HGV%– N51 East of Slane

7.3.2.1.3 N2 Slane Bridge (Southern approach to Slane village)

Figure 7.18 below shows the daily traffic for the baseline 2019 year. The profile shows distinct morning (for southbound traffic) and evening peaks (for northbound traffic). At this location, the estimate of AADT for 2019 is 8,247 vehicles with 7.0% being HGVs.

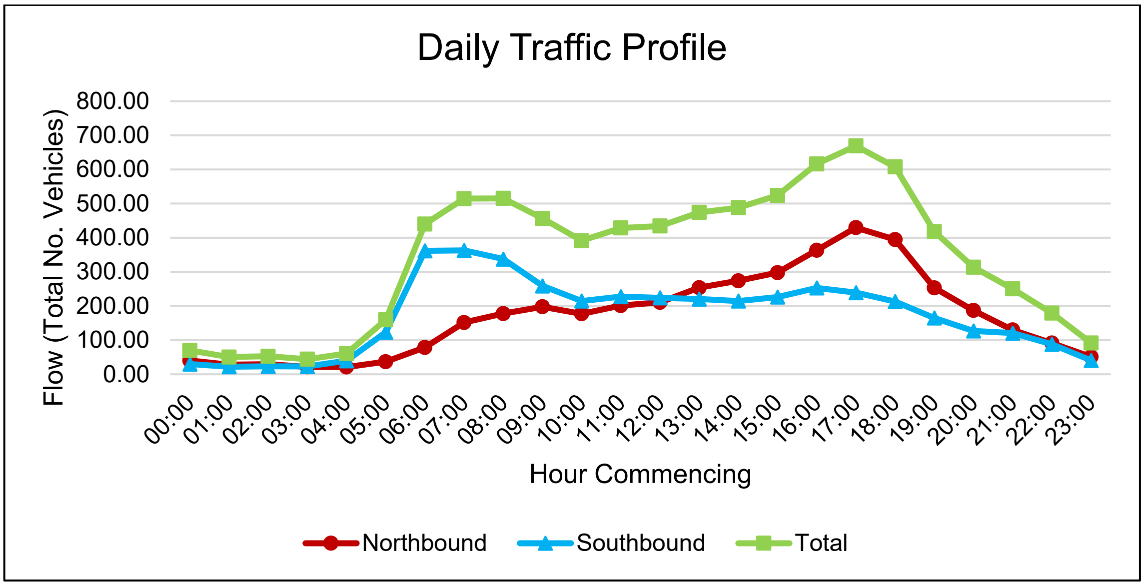


Figure 7.18: Daily Traffic Profile – N2 (Slane Bridge)

The AM and PM peak hours on the N2 (Slane Bridge) are 07.00 to 08.00 and 17.00 to 18.00 with distinct southbound peaks in the morning and northbound peak in the evening. **Figure 7.19** below shows the daily HGV% profile on Slane Bridge. The profile for HGVs varies but peaks in HGV flows occur in the early morning, circa 04.00 and again between 10am and 11am.

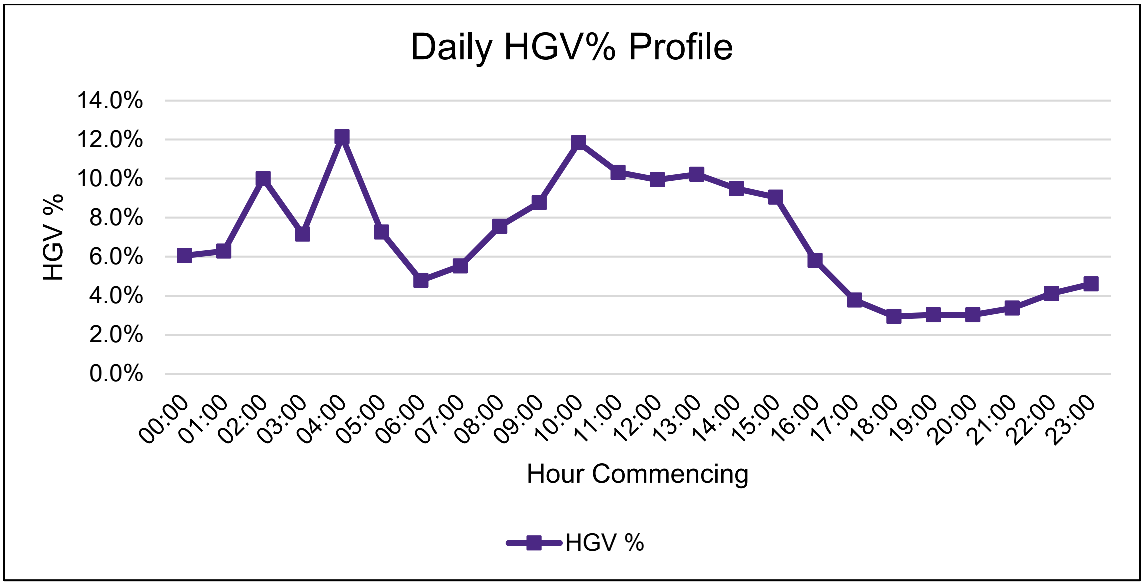


Figure 7.19: Daily HGV% – N2 (Slane Bridge)

7.3.2.2 N2 Southern Approach (North of McGruder's Cross)

Figure 7.20 below shows the daily traffic for the baseline 2019 year. The profile shows distinct morning (for southbound traffic) and evening peaks (for northbound traffic). At this location, the estimate of AADT for 2019 is 7,525 vehicles with 11.3% being HGVs.

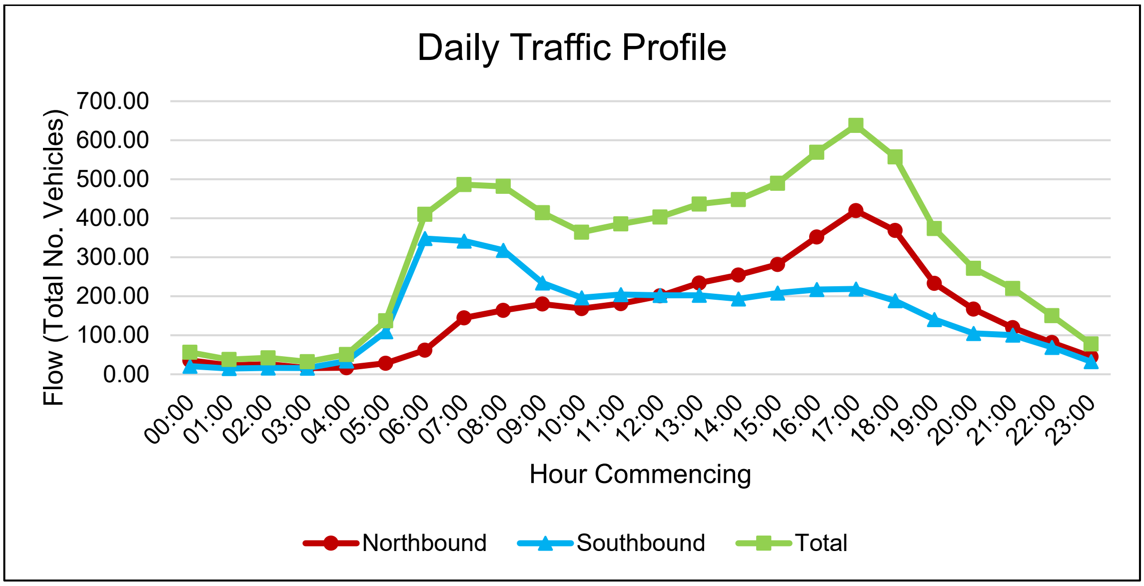


Figure 7.20: Daily Traffic Profile – N2 Southern Approach

The AM and PM peak hours on the N2 South are 07.00 to 08.00 and 17.00 to 18.00 with distinct southbound peaks in the morning and northbound in the evening. **Figure 7.21** below shows the daily HGV% profile. The peak for HGVs occurs between 02.00 and 03.00 at this location.

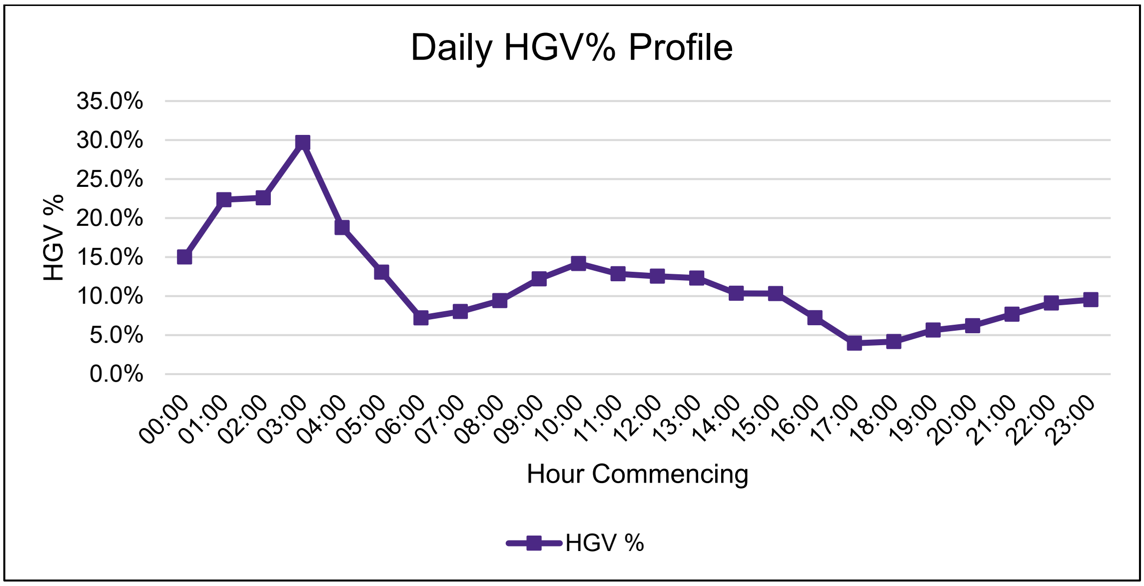


Figure 7.21: Daily HGV% – N2 Southern Approach

7.3.2.2.1 N2 Northern Approach (At 100km/h Speed Limit exiting Slane village)

Figure 7.22 below shows the daily traffic for the baseline 2019 year. The profile shows distinct morning (for southbound traffic) and evening peaks (for northbound traffic). At this location, the estimate of AADT for 2019 is 7,525 vehicles with 11.3% being HGVs.

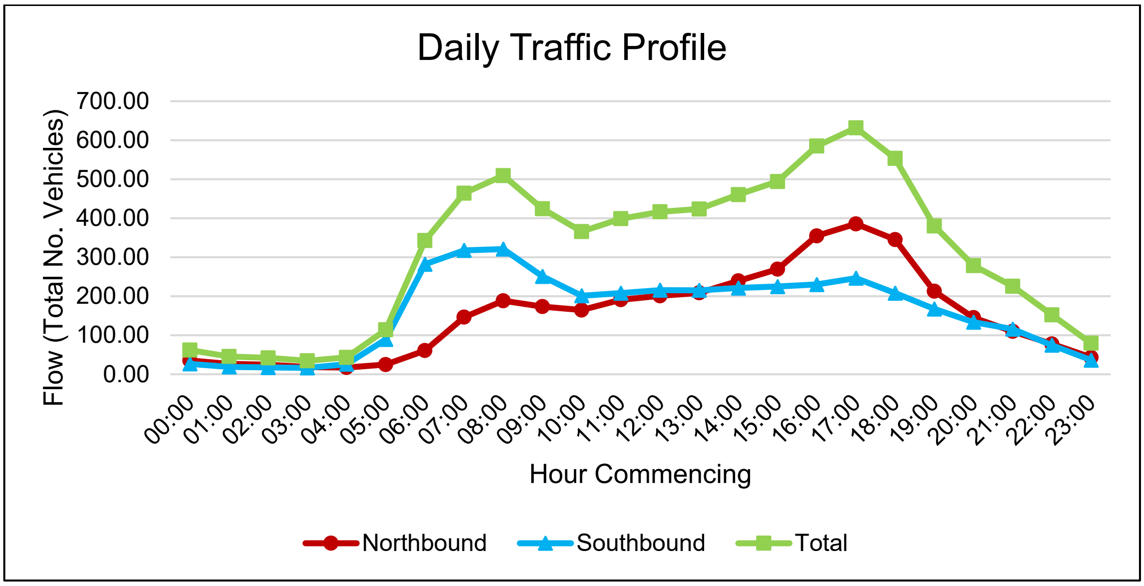


Figure 7.22: Daily Traffic Profile – N2 Northern Approach

The overall peak hours on the N2 North are 08.00 to 09.00 and 17.00 to 18.00 with distinct southbound peaks in the morning and northbound in the evening. **Figure 7.23** below shows the daily HGV% profile. The peak for HGVs occurs between 03.00 and 04.00 at this location.

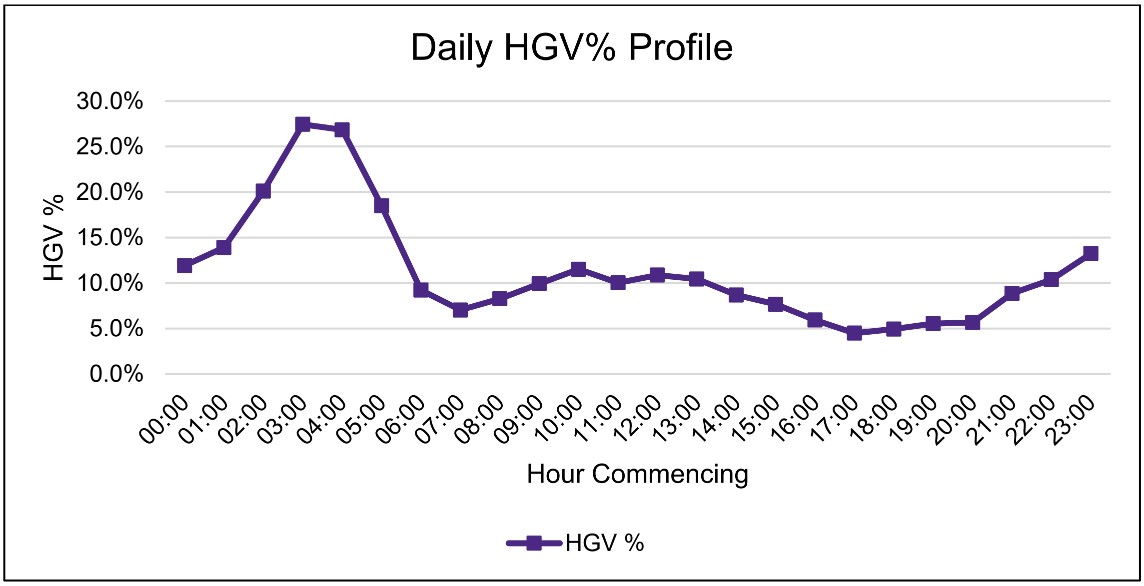


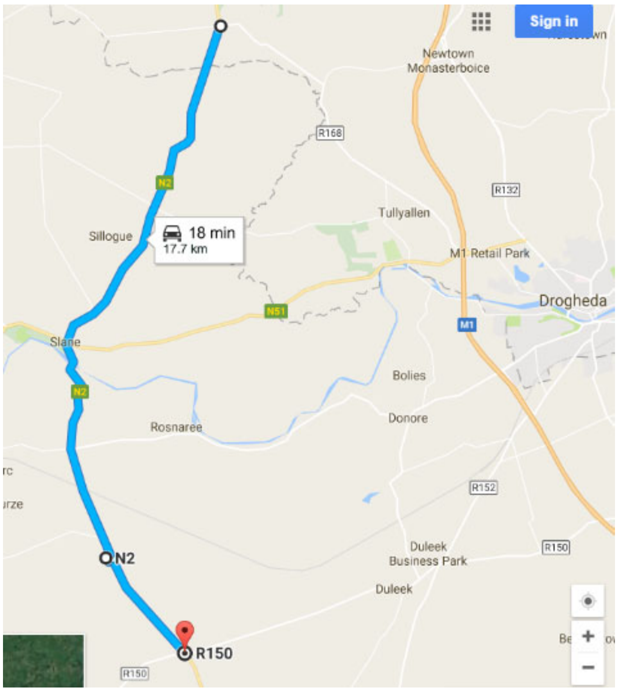
Figure 7.23: Daily HGV% – N2 Northern Approach

7.3.3 Baseline Journey Times/Travel Speeds

Journey time/travel speed surveys were undertaken along the N2 through the study area. The route was surveyed using a single GPS-equipped survey vehicle, driving the route over two survey days Tuesday 16 May and Wednesday 17 May 2017.

Start times for each run were staggered to capture conditions over the whole of each peak hour. The route, illustrated in **Figure 7.24** was undertaken with the driver starting before the initial starting node to allow them to get up to speed with the other vehicles on the road and carrying on beyond the final node.

The driver was instructed to drive at the prevailing speed of other traffic, but not authorized to exceed the speed limit.

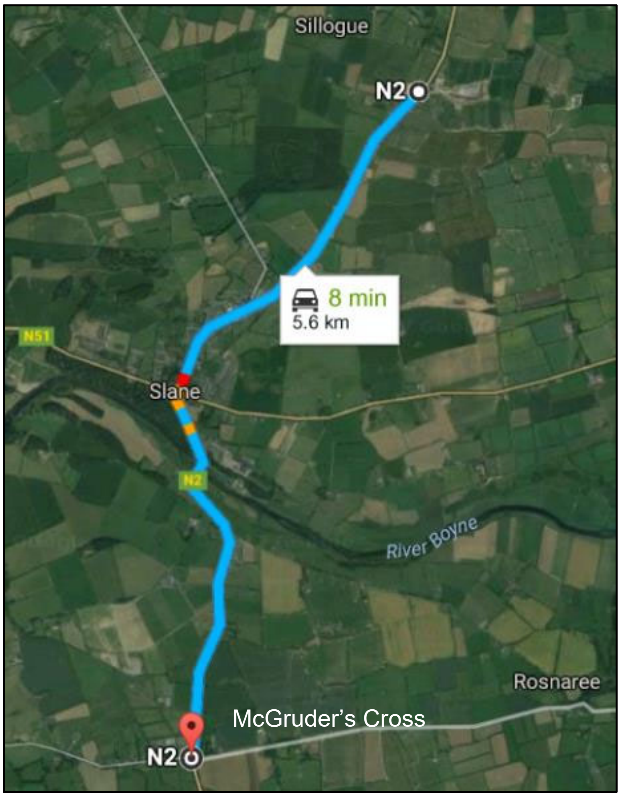


Source: *Google Maps, Map Data ©2022*

Figure 7.24: Journey time survey route and google maps estimate of journey time

The level of service provided on the N2 through Slane is very poor, resulting in delay to through traffic as described in the journey time analysis below.

Data from internet journey planner software (**Figure 7.25**) for the shorter distance from McGruder's Cross through Slane to Knockmooney north of the village suggests that the average speed on the N2 through Slane is around 42 km/h with a journey time of eight minutes.



Source: *Google Maps, Map Data ©2019*

Figure 7.25: Current Journey Time Estimate through Slane Village from Route Planner

Table 7-8 below shows results from the journey time surveys. In each case the minimum observed journey time is taken as an indication of journey speeds in the absence of congestion.

Table 7-8: Observed Journey Times 2017 (in minutes and seconds)

Northbound	Minimum Observed Journey Time	Average Observed Journey Time	Maximum Observed Journey Time
Southern extent of 50 km/h limit to Slane Bridge	01:25	02:17	04:02
Slane Bridge to N2/N51 junction	00:49	02:03	03:52
N2/N51 junction to northern extent of 50 km/h limit	00:48	01:22	02:54
TOTAL	**03:02**	**05:42**	**10:48**
Southbound	**Minimum Observed Journey Time**	**Average Observed Journey Time**	**Maximum Observed Journey Time**
Northern extent of 50km/h limit to N2/N51 junction	00:56	01:45	05:00
N2/N51 junction to Slane Bridge	00:56	02:06	03:03
Slane Bridge to southern extent of 50 km/h limit	00:52	00:57	01:09
TOTAL	**02:44**	**04:48**	**09:12**

Table 7-9 shows delays from the journey time surveys. In each case, the average observed delay and maximum observed delay are expressed as a delay relative to the minimum observed journey time from the table above.

Table 7-9: Observed delays 2017 (in minutes and seconds)

Northbound	Average Observed Delay	Maximum Observed Delay
Southern extent of 50km/h limit to Slane Bridge	00:52	02:37
Slane Bridge to N2/N51 junction	01:14	03:03
N2/N51 junction to northern extent of 50km/h limit	00:34	02:06
TOTAL	**02:40**	**07:46**
Southbound	**Average Observed Delay**	**Maximum Observed Delay**
Northern extent of 50km/h limit to N2/N51 junction	00:49	04:04
N2/N51 junction to Slane Bridge	01:10	02:07
Slane Bridge to southern extent of 50km/h limit	00:05	00:17
TOTAL	**02:04**	**06:28**

Figure 7.26 shows the typical observed journey speeds between each pair of timing points (which included all changes of speed limit).

The outcome of the journey time/travel speed surveys confirm that delays are present and that the overall average travel speed is slow through Slane village.

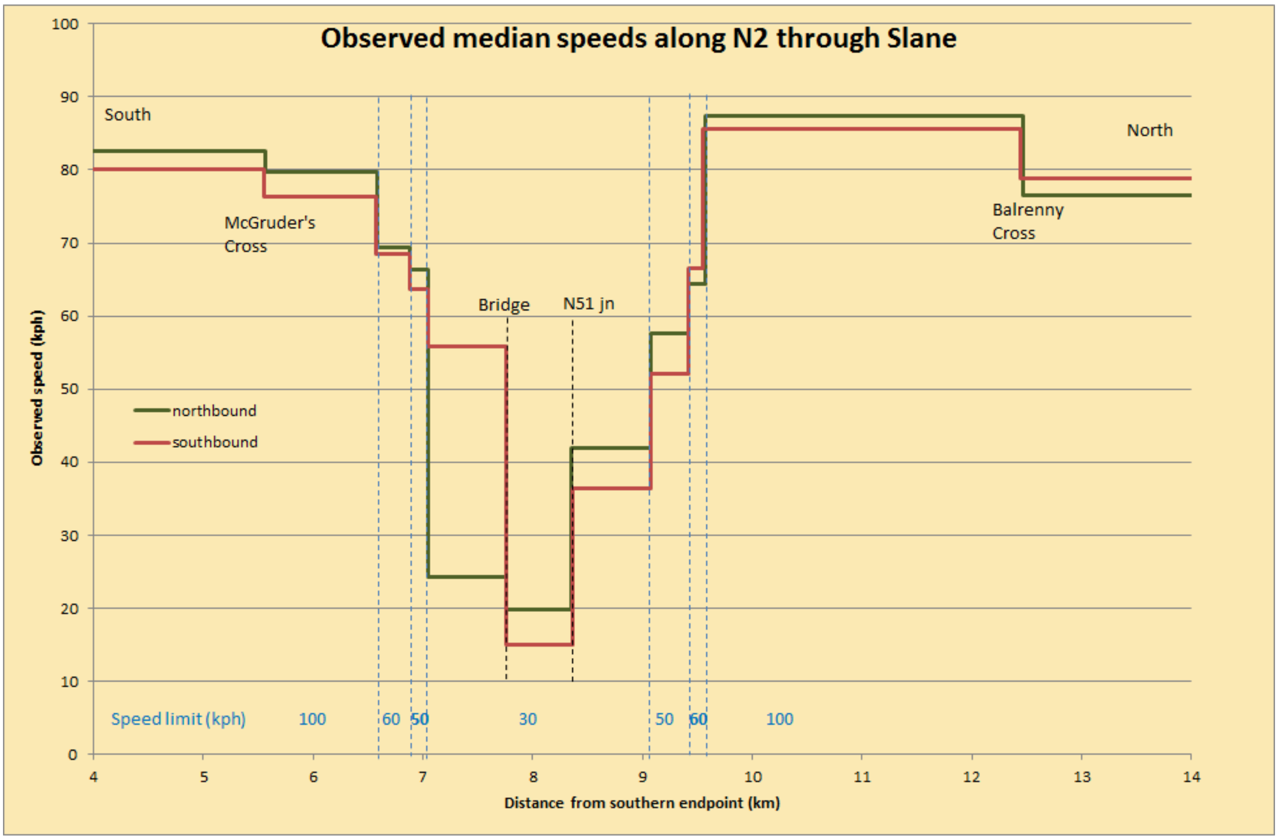


Figure 7.26: Observed Journey Speeds

7.3.4 Walking and Cycling

7.3.4.1 Slane Village

The existing walking and cycling environment within Slane village is not conducive to the encouragement of walking and cycling. The high existing motorised traffic volumes, particularly HGVs passing through the village create an adverse environment in terms of vulnerable road users.

While all pedestrian movements are catered for within the signalised N2/N51 junction at The Square, the refuge afforded to vulnerable road users on the existing traffic islands is limited due to the restricted size of the islands, the volume and heavy nature of the vehicles using the N2 and N51, the narrowness and proximity of the traffic lanes, and the swept path of larger turning vehicles.

A footway is provided on the east side only of the N2 from the north side of Slane bridge to the junction with the N51 with a short length of footway provided on the west side to the properties located immediately to the south of the junction with the N51. North of the junction with the N51, there are footways provided on both sides of the N2. There are locations where the footway provision is severely restricted, in some cases reducing in width to as little as 850mm. This is significantly sub-standard, as the current minimum footpath width for urban areas is 1.8m as set out in the Design Manual for Urban Roads and Streets [DMURS] (DTTAS, 2013). For cyclists, apart from a small section of segregated cycle track at the northern end of the village near the existing traffic calming gateway, there are no meaningful cycle facilities provided.

Figure 7.27: (Above) View of refuge island at the N2/N51 signalised junction in the context of turning HGVs; (Below) Examples of width restrictions on existing footways in Slane village

7.3.4.2 Existing Slane Bridge and Ramparts Way Walking Trail

The existing Slane Bridge is used by walkers, school children, joggers and cyclists in addition to vehicular traffic. Local residents and visitors who walk on the promoted Ramparts Walk must use the bridge to access the ramparts along the Boyne River. To cater for this usage there are narrow on-road footways marked on either side of existing carriageway across Slane Bridge, which are demarcated by road markings only.

The footways are approx. 1.0m to 1.1m wide and are therefore significantly below the 1.8m minimum standard. As a result, pedestrians, cyclists or wheelchair users cannot be safely accommodated. For example, two pedestrians cannot pass each other without potentially stepping out into the traffic lane on the bridge. In addition, the absence of any kerb upstand affords vulnerable road users no protection from the heavy traffic running alongside them or from a potential errant vehicle which drifts out of its lane, posing serious safety risks for vulnerable road users, including visually impaired pedestrians.

7.3.4.3 National School

St Patricks National School is located in Slane village, north of the N2/N51 signalised junction. It caters for approximately 280 children, many of whom live within the village. The school operates a Green School policy, which includes the promotion of walking to and from school. There are also 'Walking Buses' organised by parents where groups of children and a number of parents walk to and from school together every morning and afternoon. These children and their parents find themselves walking on the existing footways a few inches from maximum sized articulated trucks travelling along the N2. The road safety risks are obvious when something as simple as an untied shoelace or friendly horseplay could result in a tragedy.

Figure 7.28: (Left) View along the N2 northbound showing children walking to school; (Right) Photo of a 'Walking Bus' on the N2 (from St Patricks NS Website)

Cycling to and from the school is very uncommon, primarily as a result of the lack of facilities and the obvious dangers for young cyclists.

7.3.5 Public Transport

Two bus routes are identified which stop in Slane:

- Bus Eireann Route 190 runs between Drogheda and Trim, stopping in Slane on N51 Main Street West, at a designated bus stop location; and
- Collins Coaches Route 980 runs between Carrickmacross and Dublin, stopping in Slane on the N2 Chapel Street at unmarked location i.e. there is no formal bus stop designation in place.

7.3.6 Boyne Navigation Canal

The Boyne Navigation is a navigational route comprised of a series of canals and river sections, running for approximately 30 km generally parallel to the River Boyne between Oldbridge (Drogheda) and Navan.[3] The proposed bypass crosses a section of the canal at approximately Ch. 1150, south of the River Boyne between Slane Guard Lock (Lock 8) to the west, and Morgan Lock (Lock 7) to the east. The proposed pedestrian/ cycleway bridge also crosses the canal next to the proposed bypass bridge crossing to link to the towpath. The canal at Slane was historically a navigable route, however this section of the navigation canal is currently disused.

7.3.7 Evolution of the Environment in the Absence of the Proposed Scheme

The Proposed Scheme consists of an N2 bypass of Slane plus local traffic management measures and public realm improvements within the village. These measures would, if implemented, transform the traffic regime in and around Slane village.

In the absence of the Proposed Scheme, it is anticipated that traffic problems including traffic congestion and nuisance will continue to persist and will be exacerbated into the future. Road safety issues will remain with increasing potential for collisions as traffic volumes including HGVs increase over time. There would also be limited potential to implement public realm enhancements for the village, as these would be dependent on the bypass being in place along with the associated traffic management measures. The absence of the scheme would also limit the extent to which active travel measures and strong links to any future greenways may be implemented in Slane.

7.3.7.1 Traffic Model Development

The approach to traffic modelling for the scheme was to develop a fixed-matrix equilibrium assignment model, using the OmniTrans software, based on a cordon from the National Transport Model (NTpM).

[3] An Taisce – The Boyne Navigation. Available at: https://www.antaisce.org/boyne-navigation

As part of the scoping process, it was identified that there may be significant reassignment of traffic between the N2 corridor and the M1 and M3 corridors, which run broadly parallel for part of the route. The model therefore needs to represent these three alternative corridors, and the various interconnecting roads that link them. Hence, it was necessary for the model to extend from the M50 in the south to Carrickmacross and Dundalk in the north and from Navan in the west to Drogheda in the east. The model and study area is shown illustratively in **Figure 7.1**.

The model covers the standard three time periods – AM peak hour, PM peak hour, average interpeak hour. 'typical weekday' = average of Monday-Thursday.

Based on local ATC data, the periods of the day to be modelled were selected as:

- **AM peak hour:** 07:30 to 08:30
- **Interpeak hour:** average of 10:00 to 14:00
- **PM peak hour:** 17:00-18:00

The relationship between traffic flows in these modelled periods and average daily flow was derived from ATC data on the N2:

- **For cars and light goods vehicles:** AADT = 3.382 x AM flow + 4.689 x IP flow[4] + 4.382 x PM flow
- **For heavy goods vehicles:** AADT = 3.525 x AM flow + 3.846 x IP flow + 6.672 x PM flow

The model was built from a number of data sources as described above in **Section 7.2.3**. Model calibration/validation was carried out to a base year of 2019. Calibration and validation of the model was satisfactorily achieved in accordance with TII Project Appraisal Guidelines.

7.3.7.2 Do-Minimum Scenario

A future year Do-Minimum scenario was developed, taken to be the base year network including the N2 alignment in its current form with the incorporation of low-cost improvements or safety schemes, such as signage, resurfacing etc., and routine maintenance accounted for in its current and future ability to meet traffic and safety demands, with the addition of committed proposed road schemes as follows:

- The N52 is a national secondary road which forms an important cross-country route, connecting the Midlands area to the Dundalk and the main M1 route to Belfast. Taking account of N52 Ardee Bypass – improvement to the strategic road network that is planned to be built by the opening year whether or not Slane Bypass goes ahead. Therefore, changes have been addressed by adding the scheme in the Do-Minimum network; and
- Improvements are proposed to the N51 at Dunmoe, between Slane and Navan. Once this relatively minor 600m on-line improvement scheme is completed, it is proposed to raise the speed limit on this section of the N51 from 80 km/h to 100 km/h.

Future traffic growth projections are applied to this network for the Do Minimum scenario. These changes have been reflected in all future-year networks.

The future year matrices were then assigned to the Do-Minimum future network to give a future baseline scenario against which the impact of any scheme to address the traffic problems in and around Slane can be assessed.

The forecasting work assumes a projected opening year of 2026, design year of 2041 and a horizon year of 2050, being the year when traffic growth is projected to cease according to TII Project Appraisal Guidance.

For the external zones of the model, representing cordon points at which vehicles enter/leave the study area, the trip end growth forecasts for Low, Central and High growth scenarios were supplied by TII Strategic Planning Unit. These model runs are the source of the published May 2019 PAG growth factors, but for this purpose the growth over time in link flows for each cordon-crossing link form the basis of the growth factors. For the internal zones of the model, within the study area, the trip end growth forecasts used were the published PAG zone-based factors, with each zone being allocated the factors for the NTM zone within

[4] IP = inter-peak flow

which it lies. In both cases, these factors are supplied in the form of annual growth rates for light and heavy vehicles separately, for peak and interpeak periods.

These growth factors were applied to the row and column totals of the base year matrices to give future year trip-ends. Future trip-ends were factored to the average of the row-total-sum and the column-total-sum, and then a Furness process was applied to factor the base year matrices to the future year trip-ends.

Growth for the external zone representing the tolled M50 Liffey crossing (West Link bridge) was capped at the modelled capacity of the link. The resulting numbers of trips in each matrix are shown in **Table 7-10**.

Table 7-10: Trip growth over time

2019	AM	IP	PM
Car	65,199	44,139	74,033
Light Goods Vehicle	10,841	10,207	13,501
Heavy Goods Vehicle	3,855	3,830	2,721
2041 Central	**AM**	**IP**	**PM**
Car	88,174	58,049	100,055
Light Goods Vehicle	13,747	12,860	17,280
Heavy Goods Vehicle	4,876	4,808	3,451
Growth	**AM**	**IP**	**PM**
Car	35.24%	31.51%	35.15%
Light Goods Vehicle	26.81%	25.99%	27.99%
Heavy Goods Vehicle	26.48%	25.53%	26.86%

Figure 7.29 shows the overall growth in modelled trips on the network (AM hour plus inter-peak hour plus PM peak hour, all vehicle types combined). This has been checked against the regional growth rates in PAG Unit 5.3 as an indication that modelled levels of traffic growth are plausible.

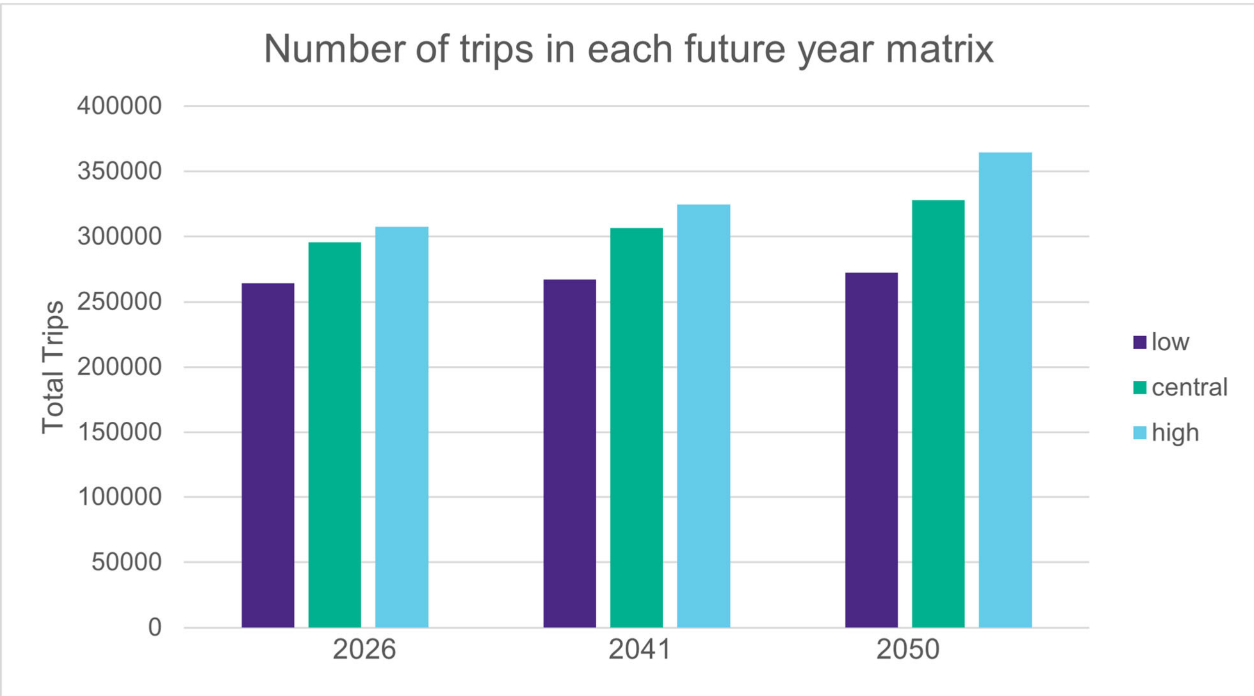


Figure 7.29: Growth rates for 3 future scenarios

Table 7-11: Check against Standard Growth Rates

	Light Goods Vehicles			Heavy Goods Vehicles		
N2 Slane Traffic Study model	**2026**	**2041**	**2050**	**2026**	**2041**	**2050**
Low	13.39%	25.83%	30.35%	22.09%	50.99%	68.21%
Central	14.49%	30.45%	37.45%	23.42%	56.11%	76.11%
High	16.85%	39.68%	54.71%	26.29%	67.49%	100.33%
PAG link-based Mid-East region HV Comparisons (TII PAG 5.3)	**2026**	**2041**	**2050**	**2026**	**2041**	**2050**
			Low	16.53%	47.40%	66.30%
			Central	17.82%	56.76%	83.42%
			High	18.22%	60.88%	91.42%

Note that the High growth factors for external zones were taken from an NTM run in which other upgrade schemes on the N2 were assumed to be in place, in order to allow for possible wide-area reassignment effects. **Figure 7.30** below shows the Do-Minimum design year traffic flows in the vicinity of Slane village and on the wider strategic road network.

Figure 7.30: Design Year 2041, Do-Minimum Scenario (% HGVs)

Table 7-12 below presents the increase in both total traffic flows and HGV flows from the Baseline 2019 scenario to the Design Year 2041 Do-Minimum scenario. This table presents the quantitative assessment of traffic growth predicted over the 22 year period between the two scenarios.

Table 7-12: Design Year 2041 Do-Minimum Increase vs Baseline 2019 Scenario

Location	Baseline 2019 (HGVs)	Do-Minimum 2041 (HGVs)	Total Traffic Increase	% Total Increase	HGV Increase	% HGV Increase
N2 North of M50	48,720 (6,820)	70,250 (7,730)	**21,530**	**44.2%**	**910**	**13.3%**
N2 South of Ashbourne	33,630 (3,360)	43,730 (3,500)	**10,100**	**30.0%**	**140**	**4.2%**
N2 North of Ashbourne	18,890 (2,080)	25,060 (2,760)	**6,170**	**32.7%**	**680**	**32.7%**
N2 South of McGruder's Cross	9,200 (1,300)	10,420 (1,770)	**1,220**	**13.3%**	**470**	**36.2%**
N2 North of Slane	7,700 (1,160)	8,760 (1,490)	**1,060**	**13.8%**	**330**	**28.4%**
N2 South of Ardee	7,760 (780)	9,380 (1,030)	**1,620**	**20.9%**	**250**	**32.1%**
N2 North of Ardee	11,340 (1,700)	14,280 (2,280)	**2,940**	**25.9%**	**580**	**34.1%**
N51 East of Slane and East of the proposed bypass.	5,160 (360)	6,340 (570)	**1,180**	**22.9%**	**210**	**58.3%**
N51 West of Slane	6,990 (630)	8,900 (800)	**1,910**	**27.3%**	**170**	**27.0%**
N33	13,740 (1,380)	16,010 (1,760)	**2,270**	**16.5%**	**380**	**27.5%**
M1 between M50 and Swords	115,170 (9,210)	121,490 (10,930)	**6,320**	**5.5%**	**1,720**	**18.7%**
M1 between Donabate and Lusk	67,450 (6,070)	74,530 (7,450)	**7,080**	**10.5%**	**1,380**	**22.7%**
M1 between Lusk and Balbriggan	67,460 (6,070)	74,530 (7,450)	**7,070**	**10.5%**	**1,380**	**22.7%**
M1 between Balbriggan and Drogheda	39,820 (4,780)	49,770 (6,970)	**9,950**	**25.0%**	**2,190**	**45.8%**
M1 between Drogheda and Dunleer	45,390 (5,000)	52,790 (6,330)	**7,400**	**16.3%**	**1,330**	**26.6%**
M1 North of Dunleer	39,440 (5,130)	43,900 (6,150)	**4,460**	**11.3%**	**1,020**	**19.9%**
M3 North of M50	88,140 (5,290)	88,070 (6,160)	**-70**	**-0.1%**	**870**	**16.4%**
M3 at Dunboyne	45,620 (3,650)	58,830 (5,290)	**13,210**	**29.0%**	**1,640**	**44.9%**
M3 North of Dunboyne	24,020 (2,880)	35,500 (3,910)	**11,480**	**47.8%**	**1,030**	**35.8%**
M3 North of Dunshaughlin	23,090 (2,770)	31,180 (4,050)	**8,090**	**35.0%**	**1,280**	**46.2%**
M3 between Dunshaughlin and Navan	22,200 (2,670)	29,830 (3,280)	**7,630**	**34.4%**	**610**	**22.8%**
M3 South of Navan	20,260 (2,630)	28,140 (3,660)	**7,880**	**38.9%**	**1,030**	**39.2%**
M3 North of Navan	14,000 (1,960)	19,770 (2,770)	**5,770**	**41.2%**	**810**	**41.3%**

Figure 7.30 and **Table 7-12** above show significant increases in traffic volumes including HGVs on the N2 corridor in the future year scenario. N2 traffic around Slane increases by between 13.3% (+1,220 veh/day south of Slane) and 13.8% (+1,060 veh/day north of Slane), accompanied by an increase in HGV traffic between 28.4% (+470 HGVs/day south of Slane) and 36.2% (+330 HGVs/day north of Slane). Traffic on the N51 around Slane increases by between 22.9% (+1,180 veh/day east of Slane) and 27.2% (+1,910 veh/day west of Slane), with increases in HGV traffic of between 27.0% (+170 HGVs/day west of Slane) and 58.3% (+210 HGVs/day east of Slane).

Traffic on the M1 corridor is also shown to increase over time, ranging from 5.5% increase just north of the M50 to 25% increase between Balbriggan and Drogheda. HGV traffic on this corridor is also shown to increase, ranging from 18.7% to 45.8%.

Traffic growth on the N33 between the N2 and M1 corridors is predicted to increase by 16.55%, with an increase in HGVs of 27.5%. Significant traffic growth on the M3 corridor is also predicted.

7.3.8 Do-Minimum Journey Times

Journey times were derived from the traffic model between McGruder's Cross and Knockmooney for the Do-Minimum scenario. **Table 7-13** below presents the difference in journey times from the 2017 survey data to the Design Year 2041 Do-Minimum scenario for the AM Peak, Interpeak and PM Peak hours.

Table 7-13: Journey Times (in minutes and seconds) – 2017 vs 2041 Do-Minimum

Northbound	2017 Survey	Do-Minimum 2041	Journey Time Increase	% Increase
AM Peak	09:17	10:04	00:47	8.44%
Inter-peak	08:44	09:16	00:32	6.11%
PM Peak	09:41	14:14	04:33	46.99%
Southbound	**2017 Survey**	**Do-Minimum 2041**	**Journey Time Increase**	**% Increase**
AM Peak	08:27	10:19	01:52	22.09%
Inter-peak	07:43	08:49	01:06	14.25%
PM Peak	09:18	08:59	-00:19	-3.41%

As expected, the results typically show an increase in journey time during each peak hour period for the 2041 Do-Minimum scenario. This increase is expected due to the traffic growth between 2017 and the design year of 2041. A slight decrease noted for the southbound PM peak is not considered to be significant.

Table 7-14 below presents the network-wide Total Travel Time and Total Travel Distance and Total Travel Tolls for the Do-Minimum 2041 scenario.

Table 7-14: Network Total Statistics

Modelled Hour	Total Travel Time (PCU-hours)	Total Travel Distance (PCU-km)
AM	55,077.5	2,019,252.5
Inter-peak	25,615.6	1,287,420.6
PM	56,311.3	2,145,048.9

7.3.8.1 Impact in Slane Village

7.3.8.1.1 Design Year 2041 (Do-Minimum)

Figure 7.31 below shows forecast traffic flows for the Slane area for the 2041 Do-Minimum scenario.

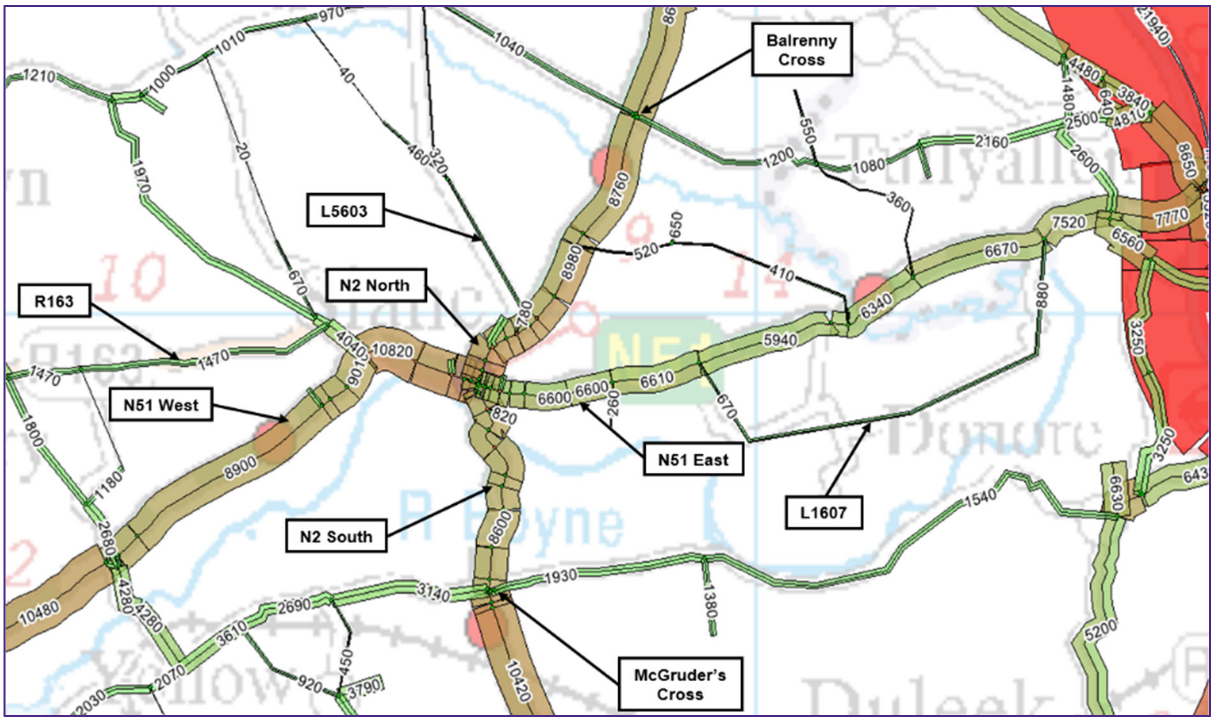


Figure 7.31: Design Year 2041 Do-Minimum, Boyne Valley Area

Figure 7.32 below shows forecast traffic flows for Slane village for the 2041 Do-Minimum scenario.

Figure 7.32: Design Year 2041 Do-Minimum, Slane Village

The most significant figures to note from the above diagram are the four main approaches to the centre of Slane village:

1. 10,380 vehicles (16% HGVs) along the N2 to the north of Slane village;
2. 8,310 vehicles (20% HGVs) along the N2 to the south of Slane village;
3. 6,570 vehicles (9% HGVs) along the N51 to the east of Slane village; and
4. 10,960 vehicles (13% HGVs) along the N51 to the west of Slane village.

All of the above traffic flows pass through the crossroads in Slane village. **Table 7-15** below compares the future year Do-Minimum scenario (2041) the Baseline (2019) traffic volumes within Slane village.

Note the Baseline data is based one junction count in 2019 and may not be representative of the AADT for each arm. As a result of this, the future year Do Minimum does not demonstrate a significant increase in traffic on the N2 in Slane. Notwithstanding, **Table 7-12** above shows traffic on the N2 around Slane increases by over 1,000 veh/day. It would be logical to conclude that this increase would also occur on the N2 in Slane and therefore, the count data used for Baseline is on the high side of the yearly average traffic.

The data presented does, however indicate a significant increase in traffic on the N51 in the village over time.

Table 7-15: Design Year 2041 Do-Minimum Increase vs Baseline 2019 Scenario in Slane Village

Route	Baseline		Do-Minimum		Change	
	Daily Traffic	HGVs	Daily Traffic	HGVs	Daily Traffic	HGVs
N2 South	8,755	1,520	8,310	1,635	-445	+115
N2 North (Chapel Street)	10,362	1,492	10,380	1,650	+18	+158
N51 Main Street West	10,239	1,073	10,960	1,388	+721	+315
N51 Main Street East	6,072	491	6,570	599	+498	+108

7.3.8.2 Walking and Cycling

7.3.8.2.1 Slane Village

In the absence of any intervention, the traffic forecast suggests that traffic passing through Slane will continue to increase over time. In this context and the ongoing need to retain the current capacity of the N2/N51 roads and at the junction at the Square in Slane, there is little scope to improve the provisions for walking and cycling in the village.

The village will remain a hostile environment for vulnerable road users.

7.3.8.2.2 Existing Slane Bridge and Ramparts Way Walking Trail

Similarly, traffic is predicted to increase over the existing Slane bridge in the absence of a bypass. Given the very limited capacity of this bridge and the continued operation of the one-way traffic light-controlled system, there is again little or no feasibility for improved walking and cycling provisions within the existing bridge structure.

Given the protected nature of the existing bridge, it was considered inappropriate to construct additional cantilevered boardwalks onto the bridge. A new pedestrian/cyclist bridge adjacent to the existing bridge could be feasible but this would entail constructing another structure within the SAC/SPA and the associated potential impact on the qualifying interests and was therefore not considered reasonable.

7.3.8.2.3 Proposed River Boyne Greenway

Access for pedestrians and cyclists from Slane to the proposed River Boyne Greenway, should it receive planning, would have limited potential for enhancement into the future under the predicted future year traffic conditions on the existing bridge.

7.3.8.2.4 National School

The existing N2 in the vicinity of St Patrick's National School is predicted to carry increased traffic volumes including HGVs in the future, exacerbating the existing situation further.

7.3.8.3 Public Transport

Higher traffic volumes in Slane in the future year are likely to impact on bus public transport by increasing the potential for congestion delays and reduced level of journey quality and service for users.

7.4 Description of Likely Significant Effects

Sections 7.4.1 to **7.4.7** provide a description of the likely significant effects of the Proposed Scheme on traffic and transport in cumulation with other existing development in the area. A description of the likely significant effects in cumulation with approved development i.e., development not yet built, is presented in **Section 7.4.8** based on the detailed methodology for CIA included in **Chapter 25**.

The impact interactions between traffic and transport and other environmental factors are identified and described in **Chapter 26** and assessed throughout **Sections 7.4.1 to 7.4.8**.

The likely significant effects in terms of traffic impact are assessed for the future year 2041 using data derived from the wide area traffic model. The likely significant effects are derived by comparison of the Do-Minimum and the Do-Scheme scenarios in the future year for the Central Growth Scenario.

Construction traffic impacts are detailed in **Chapter 5**, **Section 5.5 Traffic Impact During Construction**.

7.4.1 Design Year 2041 (Do-Scheme)

The Do-Scheme scenario models the proposed bypass as a high-quality dual-carriageway road. A schematic of the proposed bypass is illustrated in **Figure 7.33** below.

On the bypass, the intermediate junction with the N51 and both terminal junctions are modelled as roundabouts with two-lane circulating carriageway and two-lane approaches on the N2 arms. No other intermediate junctions have been modelled. Junction delays are modelled for all new junctions, to avoid exaggerating the benefits of the scheme.

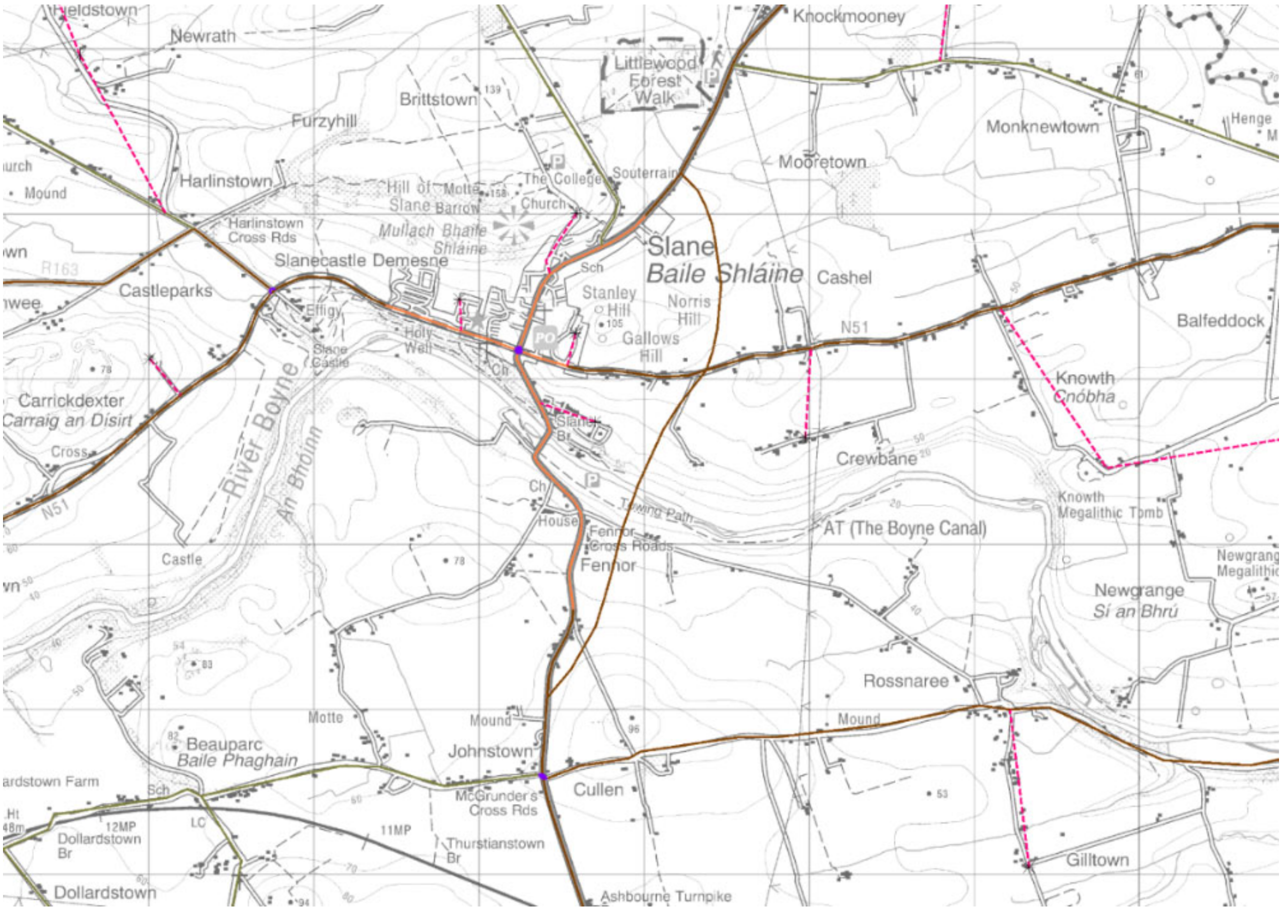


Figure 7.33: Bypass Scheme Alignment

The scheme also includes for public realm improvements in Slane village including traffic management measures, which have been modelled as:

- HGV bans (applying to all heavy vehicles) at two locations: on Slane Bridge and immediately north of the N2/N51 junction;
- The existing signalised crossroads to be replaced by a priority junction, with the north and south arms giving way and the east and west arms having priority;
- Pedestrian crossings are modelled as signalised nodes with traffic both ways having green time for 220 seconds in each 240-second cycle;
- Free-flow speeds reduced to 25 km/h in the centre of the village and to 15 km/h for the very short links at the junction; and
- Free-flow speeds reduced to 60 km/h in the north, east and south of the village.

The forecast flow on the bypass is 13,610 vehicles per day AADT on the southern section which includes the new bridge over the river Boyne, and 11,800 vehicles per day AADT on the northern section. **Figure 7.34** below shows the Do-Scheme design year traffic flows in the vicinity of Slane village and on the wider strategic road network.

Figure 7.34: Design Year 2041, Do-Scheme (% HGV)

Figure 7.35 below compares the traffic flows for the Design Year 2041 Do-Minimum scenario in comparison to the Design Year 2041 Do-Scheme scenario. Red lines in this diagram indicate flow increases due to the scheme, and green lines represent flow reductions due to the scheme.

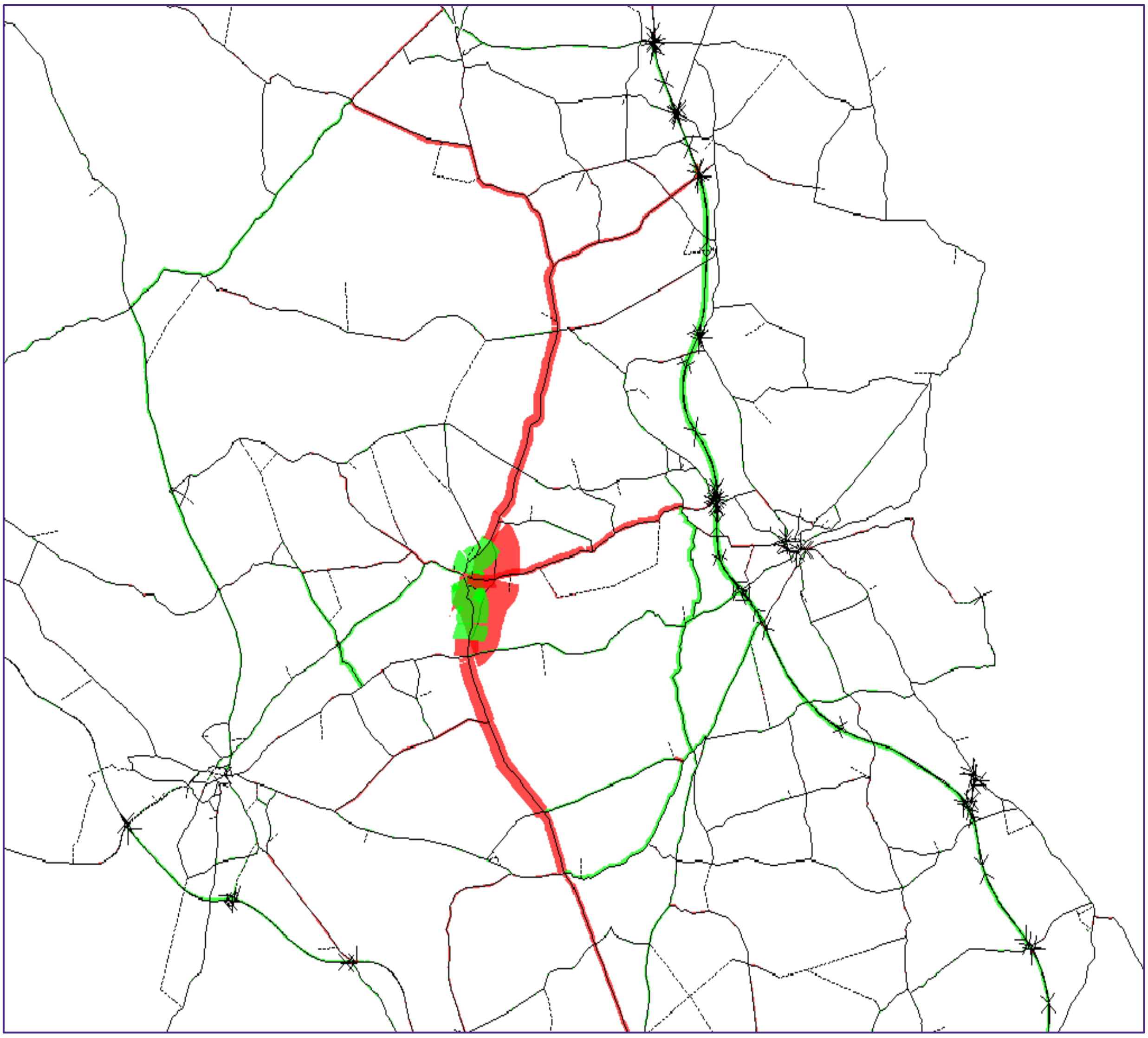


Figure 7.35: Design Year 2041, Do-Minimum vs Do-Scheme

To quantify the traffic effects shown on **Figure 7.35**, **Table 7-16** below compares the quantitative differences in both total traffic flows and HGV flows from the Design Year 2041 Do-Minimum scenario to the Design Year 2041 Do-Scheme scenario.

Table 7-16: Design Year 2041 Traffic Flows – Do-Minimum vs Do-Scheme Scenario

Location	Do-Minimum 2041 (HGVs)	Do-Scheme 2041 (HGVs)	Total Traffic Increase	% Total Increase	HGV Increase	% HGV Increase
N2 North of M50	70,250 (7,730)	70,490 (7,750)	240	**0.3%**	**20**	**0.3%**
N2 South of Ashbourne	43,730 (3,500)	44240 (3,540)	510	**1.2%**	**40**	**1.1%**
N2 North of Ashbourne	25,060 (2,760)	25480 (2,800)	420	**1.7%**	**40**	**1.4%**
N2 South of McGruder's Cross	10,420 (1,770)	14350 (2,150)	3930	**37.7%**	**380**	**21.5%**
N2 North of Slane Bypass	8,760 (1,490)	11690 (1,750)	2930	**33.4%**	**260**	**17.4%**
N2 South of Ardee	9,380 (1,030)	10530 (1,050)	1150	**12.3%**	**20**	**1.9%**
N2 North of Ardee	14,280 (2,280)	14400 (2,300)	120	**0.8%**	**20**	**0.9%**
N51 East of Slane and East of proposed bypass.	6,340 (570)	7720 (540)	1380	**21.8%**	**-30**	**-5.3%**
N51 West of Slane	8,900 (800)	8220 (740)	-680	**-7.6%**	**-60**	**-7.5%**

Location	Do-Minimum 2041 (HGVs)	Do-Scheme 2041 (HGVs)	Total Traffic Increase	% Total Increase	HGV Increase	% HGV Increase
N33	16,010 (1760)	15710 (1,730)	-300	**-1.9%**	**-30**	**-1.7%**
M1 between M50 and Swords	121,490 (10,930)	121,050 (10,890)	-440	**-0.4%**	**-40**	**-0.4%**
M1 between Donabate and Lusk	74,530 (7,450)	73,920 (7,390)	-610	**-0.8%**	**-60**	**-0.8%**
M1 between Lusk and Balbriggan	74,530 (7,450)	73,920 (7,390)	-610	**-0.8%**	**-60**	**-0.8%**
M1 between Balbriggan and Drogheda	49,770 (6,970)	48,890 (6,840)	-880	**-1.8%**	**-130**	**-1.9%**
M1 between Drogheda and Dunleer	52,790 (6,330)	51,240 (6,150)	-1550	**-2.9%**	**-180**	**-2.8%**
M1 North of Dunleer	43,900 (6,150)	44,020 (6,160)	120	**0.3%**	**10**	**0.2%**
M3 North of M50	88,070 (6,160)	88,120 (6,170)	50	**0.1%**	**10**	**0.2%**
M3 at Dunboyne	58,830 (5,290)	59,010 (5,310)	180	**0.3%**	**20**	**0.4%**
M3 North of Dunboyne	35,500 (3,910)	35,680 (3,570)	180	**0.5%**	**-340**	**-8.7%**
M3 North of Dunshaughlin	31,180 (4,050)	31,070 (4,040)	-110	**-0.4%**	**-10**	**-0.2%**
M3 between Dunshaughlin and Navan	29,830 (3,280)	29,250 (3,510)	-580	**-1.9%**	**230**	**7.0%**
M3 South of Navan	28,140 (3,660)	27,570 (3,580)	-570	**-2.0%**	**-80**	**-2.2%**
M3 North of Navan	19,770 (2,770)	19,690 (2,760)	-80	**-0.4%**	**-10**	**-0.4%**
R165 between N52 and N2	4,690 (456)	5,590 (493)	900	**19.2%**	**37**	**8.1%**
R169 between N2 and M1 / R132	5,040 (1,132)	5,980 (1,214)	940	**18.7%**	**82**	**7.2%**
L1600 between McGruders Cross and Donore	1,930 (65)	1,490 (75)	-440	**-22.8%**	**10**	**15.4%**
L1601 between Donore and M1	6,430 (546)	5,750 (515)	-680	**-10.6%**	**-31**	**-5.7%**
R150 between N2 and Duleek	7,370 (340)	6,780 (400)	-590	**-8.0%**	**60**	**17.6%**
L1610 between N2 and Duleek (west of L1004)	4,020 (500)	3,410 (501)	-610	**-15.2%**	**1**	**0.2%**
L1610 between N2 and Duleek (east of L1004)	3,000 (324)	2,260 (289)	-740	**-24.7%**	**-35**	**-10.8%**
R152 East of Kilmoon Cross	14,550 (970)	13,990 (930)	-560	**-3.8%**	**-40**	**-4.1%**
R152 at New Lanes Cross (Duleek)	16,700 (975)	16,210 (915)	-490	**-2.9%**	**-60**	**-6.2%**
R152 between Duleek and M1	12,950 (1,090)	12,220 (965)	-730	**-5.6%**	**-125**	**-11.5%**
R163 opposite Slane Castle	4,040 (770)	4,560 (855)	520	**12.9%**	**85**	**11.0%**

From a strategic road network point of view, the existing N2 through Slane village constitutes a significant ‘bottleneck’ on the N2 route corridor. With the proposed bypass in place, this ‘bottleneck’ is effectively removed. The wide area impact of this is to make the improved N2 corridor a more efficient and attractive route for traffic. Therefore, with the scheme in place, traffic volumes are predicted to increase on the N2 corridor.

From **Table 7-16** and **Figure 7.35**, it is evident the most significant increase in traffic on the N2 is to the south of Slane where a 37.7% increase (approx. +4,000 veh/day) is predicted and to the north of Slane where a 33.4% increase (approx. +3,000 veh/day) is predicted. The increase in traffic on the N2 corridor north of Ardee and south of the junction with the R150 decreases to insignificant effect, as shown in **Table 7-16** and **Figure 7.35**.

Nominal change is predicted on the N51 west of Slane where a 7.6% reduction in traffic volume is predicted. However, an increase of 26% is predicted on the N51 between the bypass and Drogheda. This is primarily due to an increase in traffic travelling towards Drogheda from the N2 Slane bypass.

Corresponding to the attraction of additional traffic to the N2 corridor is a reduction in the traffic on the M1. Examination of **Table 7-16** and **Figure 7.35** shows that this reduction is very modest in the context of the volumes of traffic utilising the M1 with the maximum reduction assessed as 2.9% between Drogheda and Dunleer. This is significantly less than the value of 5%, below which traffic impact is not considered to be significant. Therefore, it is concluded that the N2 Slane Bypass will not have an unacceptably detrimental impact on the volumes of traffic utilising the M1 and will not therefore undermine the state's investment in this key strategic national route.

There are predicted to be some increases in traffic volumes on the regional and local road network. The R163, R169 and R165 all gain some traffic in the Do-Scheme scenario relative to Do-Minimum scenario, as the N2 route is improved.

Local roads L1600, L1601 and L1610 all experience traffic reduction with the proposed scheme in place.

The future year traffic impact of the Proposed Scheme on River Boyne crossings is outlined below; just over half (7,780 veh/day = 57%) of the traffic on the new bridge crossing the River Boyne on the Slane Bypass has switched from the existing Slane Bridge. The Proposed Scheme is predicted to attract some traffic from the nearby Boyne bridges:

- 1,390 vehicles from Broadboyne Bridge near Stackallen;
- 1,200 vehicles from Obelisk Bridge near Tullyallen (which is banned to Heavy vehicles); and
- 1,660 vehicles from the Mary McAleese Bridge on the M1.

7.4.2 Do-Scheme Journey Times

As in **Sections 7.3.3** and **7.3.8** above, journey times were derived from the traffic model between McGruder's Cross and Knockmooney for the Do-Scheme scenario.

Table 7-17 below presents the difference in journey times from the Design Year 2041 Do-Minimum scenario to the Design Year 2041 Do-Scheme scenario for the AM Peak, Inter-peak and PM Peak hours.

Table 7-17: Journey Times (in minutes and seconds) – Design Year 2041 Do-Minimum vs Do-Scheme Scenarios

Northbound	Do-Minimum 2041	Do-Scheme 2041	Journey Time Decrease	% Decrease
AM Peak	10:04	04:53	05:11	51.54%
Interpeak	09:16	04:41	04:35	49.41%
PM Peak	14:14	05:13	09:01	63.39%
Southbound	**Do-Minimum 2041**	**Do-Scheme 2041**	**Journey Time Decrease**	**% Decrease**
AM Peak	10:19	05:03	05:16	51.02%
Interpeak	08:49	04:42	04:07	46.71%
PM Peak	08:59	04:47	04:11	46.66%

The results show a dramatic decrease in journey time during each peak hour period from the Do-Scheme scenario.

Table 7-18 below presents the difference in both the network-wide Total Travel Time and Total Travel Distance from the Design Year 2041 Do-Minimum scenario to the Design Year 2041 Do-Scheme scenario. The comparison indicates significant network wide time savings due to the scheme, with some small increase in distance travelled.

Table 7-18: Network Total Statistics – Design Year 2041 Do-Minimum vs Do-Scheme Scenario

Modelled Hour	Do-Minimum 2041		Do-Scheme 2041		Impact		% Impact	
	Total Travel Time (PCU-hours)	Total Travel Distance (PCU-km)	Total Travel Time (PCU-hours)	Total Travel Distance (PCU-km)	Total Travel Time (PCU-hours)	Total Travel Distance (PCU-km)	Total Travel Time (PCU-hours)	Total Travel Distance (PCU-km)
AM	55,077.5	2,019,252.5	54,921.7	2,021,464.2	-155.8	2,211.7	-0.28%	0.11%
IP	25,615.6	1,287,420.6	25,579.7	1,287,895.8	-35.9	475.1	-0.14%	0.04%
PM	56,311.3	2,145,048.9	56,155.0	2,143,099.1	-156.3	-1,949.8	-0.28%	-0.09%

7.4.2.1 Boyne Valley Area and Slane Village Impact

Figure 7.36 below shows forecast traffic flows for the Boyne Valley area for the 2041 Do-Scheme scenario.

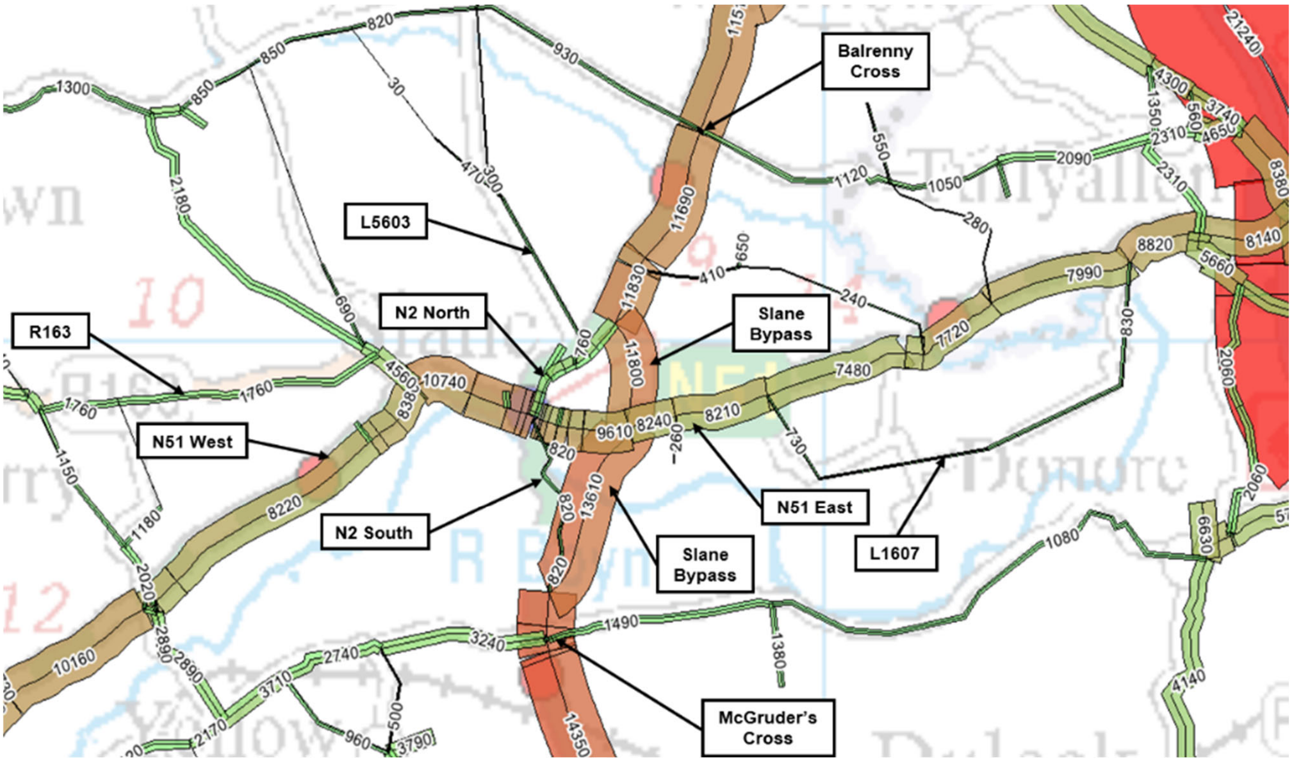


Figure 7.36: Design Year 2041 Do-Scheme Scenario, Boyne Valley Area

A daily flow of 13,610 vehicles is forecast for the southern section of the Slane Bypass in the Design Year. A daily flow of 11,800 vehicles is forecast for the northern section of the bypass. **Figure 7.31** and **Figure 7.32** in **Section 7.3.8.1.1** above illustrate the 2041 Do-Minimum traffic flows in the vicinity of Slane village.

Figure 7.37 below shows forecast traffic flows for Slane village for the 2041 Do-Scheme scenario.

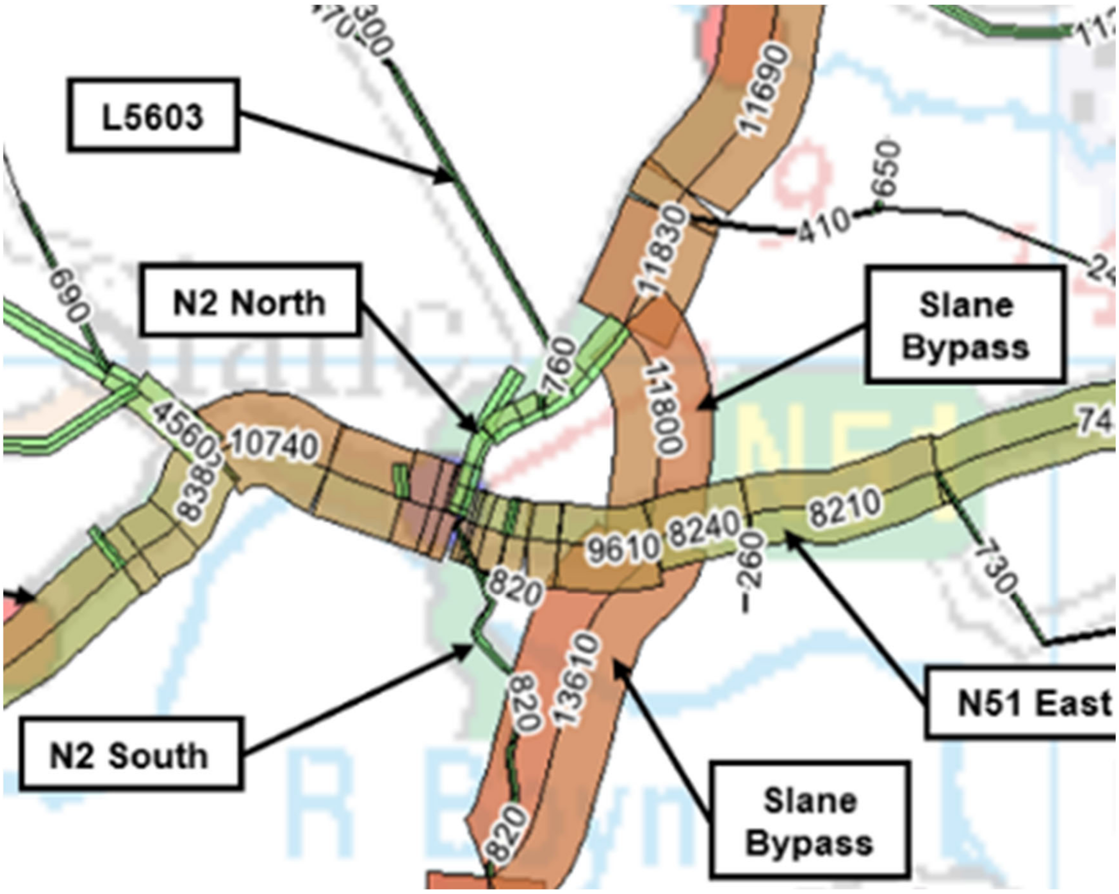


Figure 7.37: Design Year 2041 Do-Scheme Scenario, Slane Village

The most significant figures to note from the above diagram are the four main approaches to the centre of Slane village:

- 2,330 vehicles (0% HGVs) along the old N2 to the north of Slane village;
- 820 vehicles (10% HGVs) along the old N2 to the south of Slane village;
- 9,610 vehicles (16% HGVs) along the N51 to the east of Slane village; and
- 10,740 vehicles (13% HGVs) along the N51 to the west of Slane village.

7.4.2.2 Comparison with Do-Minimum Scenario in Slane village

Figure 7.38 below shows the difference for total traffic flows between the Do-Minimum and Do-Something scenarios at Slane village for the Design Year 2041. Green represents traffic flow decrease due to the Slane Bypass, while red shows the traffic increase due to the Slane Bypass. The figure shows the change in traffic in both directions and the total shown is the net effect, eg, the N51 west of the village is predicted to have an increase in eastbound flow with a decrease in westbound flow, with the net effect of an overall modest reduction in daily traffic of 80 vehicles per day.

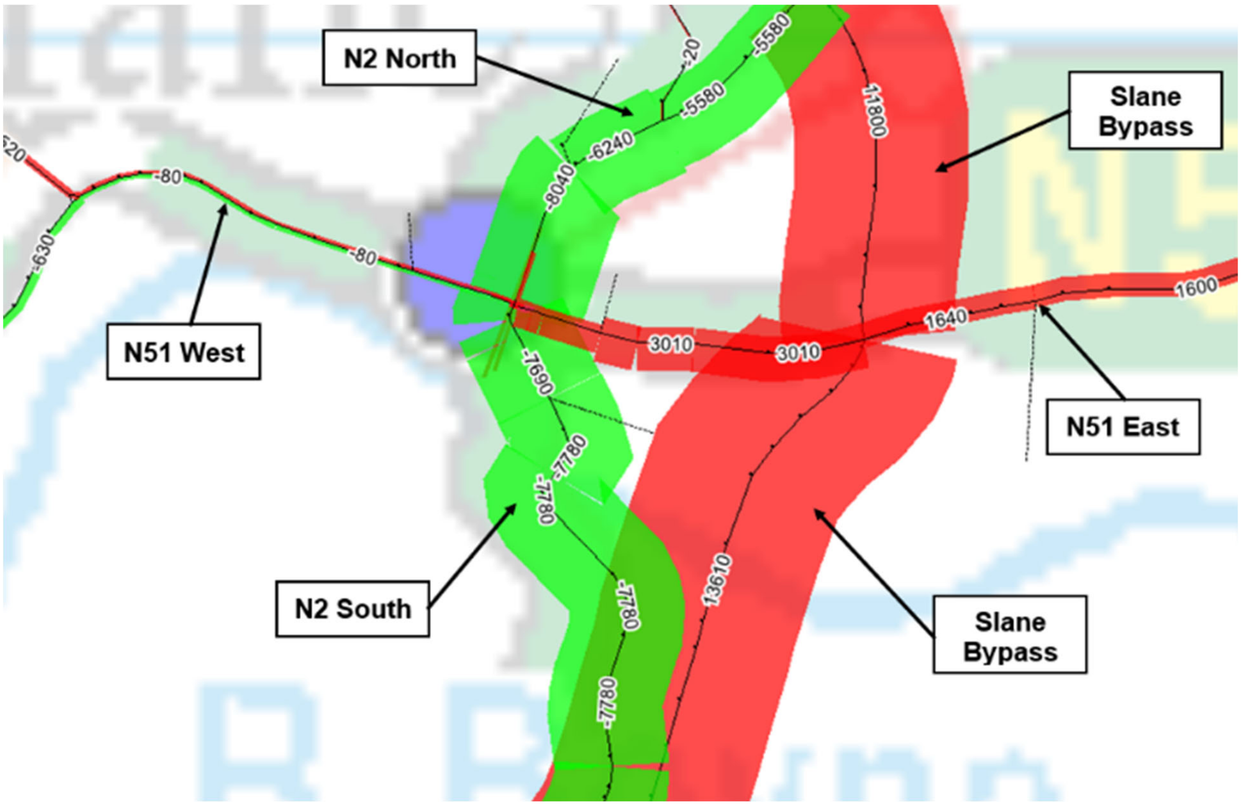


Figure 7.38: Design Year 2041, Do-Minimum vs Do-Scheme Scenarios

Table 7-19 below shows the percentage differences of the traffic flows described above.

Table 7-19: Design Year 2041 Do-Minimum vs Do-Scheme Total Flow (% HGV) in Slane Village

Approach	Do-Minimum	Do-Scheme	% Change
N2 North – Chapel Street	10,380 (16%)	2,330 (0%)	77% Decrease
N2 South	8,310 (20%)	820 (10%)*	88% Decrease
N51 Main Street East	6,570 (9%)	9,610 (16%)	45% Increase
N51 Main Street West	10,960 (13%)	10,740 (13%)	1% Decrease

Table 7-20 below shows the difference in HGV flows between the Do-Minimum and Do-Something scenarios on the main approaches to Slane.

Table 7-20: Design Year 2041 Do-Minimum vs Do-Something HGV Flow in Slane Village

Approach	Do-Minimum	Do-Scheme	% Change
N2 North – Chapel Street	1,650	0	100% Decrease
N2 South	1,635	84*	95% Decrease
N51 Main Street East	599	1,496	150% Increase
N51 Main Street West	1,444	1, 388	4% Decrease

* Heavy vehicles modelled travelling to / from Slane Industrial Estate, River View Housing Estate, and other locally generated service vehicles.

The Do-Scheme scenario includes for the amended road and junction layout and traffic calming measures proposed in Slane village, including the proposed HGV bans north and south of the village centre and urban speed limits. The proposed HGV ban consists of a 3-axle ban i.e. vehicles with three or more axles will be prohibited.

As can be seen from the above traffic flows, the proposed scheme is predicted to divert the vast majority of traffic, particularly heavy vehicles, from the existing N2 through Slane. This is a significant benefit, particularly as there are sensitive receptors such as the local primary school along this route and significant traffic volumes, including HGVs, are diverted from the existing sub-standard Slane bridge across the Boyne.

The overall impact of the north-south bypass on the predicted traffic on the N51 in the village is less beneficial. Providing the bypass and proposed traffic management measures in Slane will increase traffic, including HGVs, on the N51 Link between the centre of village and the bypass. This predicted increase in traffic is predominantly attributable to the reassignment of significant portions of north-west and south-west traffic to the bypass when the scheme is implemented. This is also a key reason why the turning movements at 'the 'Square' are significantly reduced. HGV turning movements at the 'Square' are practically eliminated due to the HGV bans diverting all these movements to the bypass. The north-west and majority of south-west traffic now passes through the village as 'straight ahead' movements rather than turning movements at the junction. Only locally generated HGV traffic including services, e.g. bin lorries, are expected to need to make turns at the 'Square' in this scenario. With the proposed bypass in place the patterns of traffic change significantly, with less right-turning at the 'Square' being a significant benefit.

Due to this fundamental change in traffic patterns in the village, it is appropriate to re-designate the junction at the 'Square' to favour the passage of east-west traffic under a priority control arrangement. The predominantly 'straight ahead' movements can pass through the village most safely and with the most efficiency. The proposed traffic management measures, including raised tables, signalised pedestrian crossings, and minimum carriageway widths, will reduce travel speed. This is a significantly safer and more efficient arrangement, albeit with the disadvantage of increasing traffic on the east side of the village.

The impact on traffic on the N51 west of the junction is not significant with a slight decrease in total traffic with a slight increase in HGV content predicted.

Notwithstanding the increase in traffic predicted on the N51 between the village and the bypass, the overall traffic volumes travelling through Slane decrease significantly with the bypass in place, which will relieve congestion in the village allowing the existing road infrastructure to better cater for the residual traffic and allow for reallocation of road space for vulnerable road users.

7.4.2.2.1 Junction Capacity Assessment

Figure 7.39 and **Figure 7.40** below display the predicted 2041 design year AADT flows for the central growth scenario at the existing N2/N51 junction in Slane for the Do-Minimum and Do-Scheme scenarios respectively.

These diagrams further illustrate that, although the proposed scheme is predicted to cause an increase in traffic on the N51 to the east of the junction, there is a major reduction in traffic on the existing N2 and a significant reduction in turning movements at the junction.

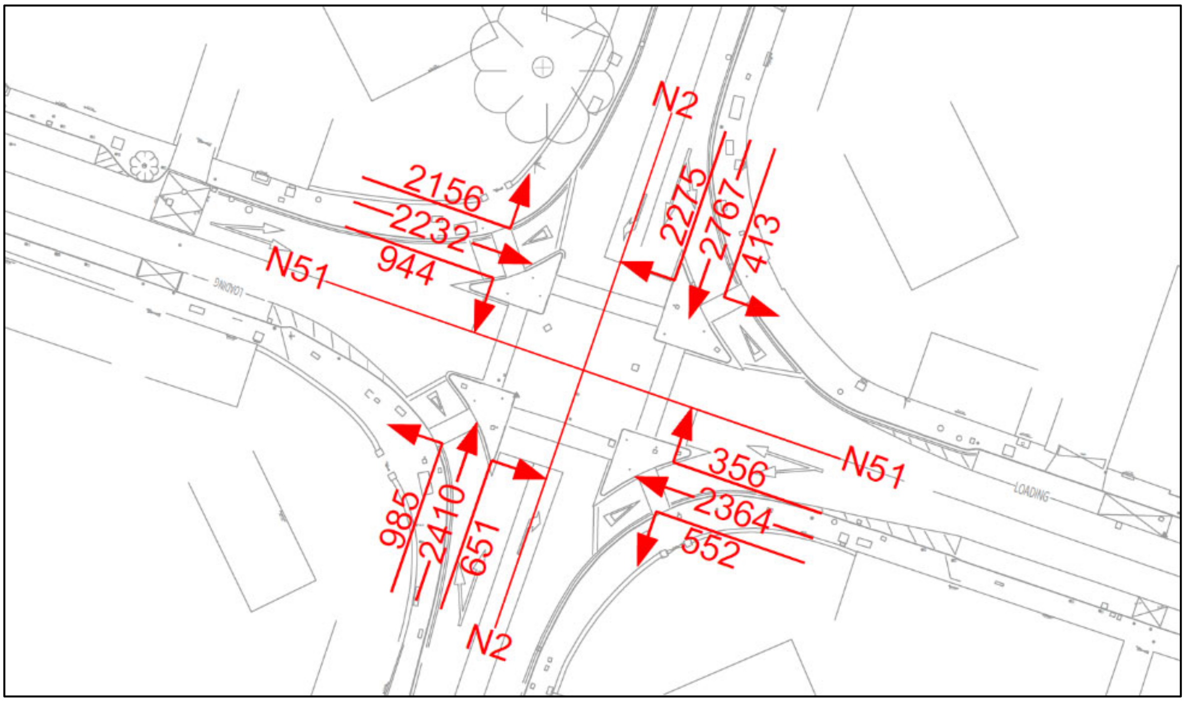


Figure 7.39: AADT Flows for Slane Existing N2/N51 Junction – Do-Minimum Scenario

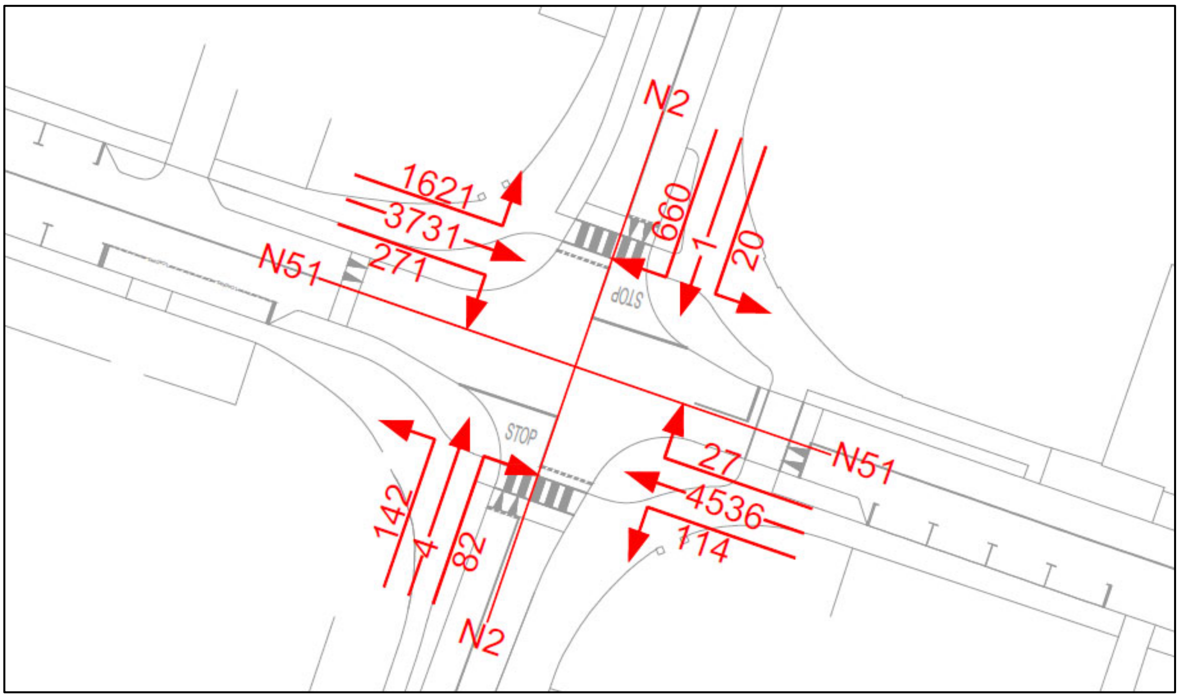


Figure 7.40: AADT Flows for Slane Improved N2/N51 Junction – Do-Scheme Scenario

Figure 7.41 and **Figure 7.42** below display the predicted 2041 design year daily heavy vehicle total flows for the central growth scenario at the N2/N51 junction in Slane for the Do-Minimum and Do-Scheme scenarios respectively. These diagrams further illustrate that, although the proposed scheme is predicted to cause a substantial increase in heavy vehicle traffic on the N51 to the east of the junction, the residual volume of heavy vehicle traffic on the N2 is negligible with heavy vehicle turning movements only required at the junction for local access. Note: the model predicts zero heavy vehicles on the N2 North but in reality, there will be a need for local service vehicles, such as refuse lorries or perhaps bus services, to access this section of the village and therefore a nominal amount of heavy vehicles is to be expected.

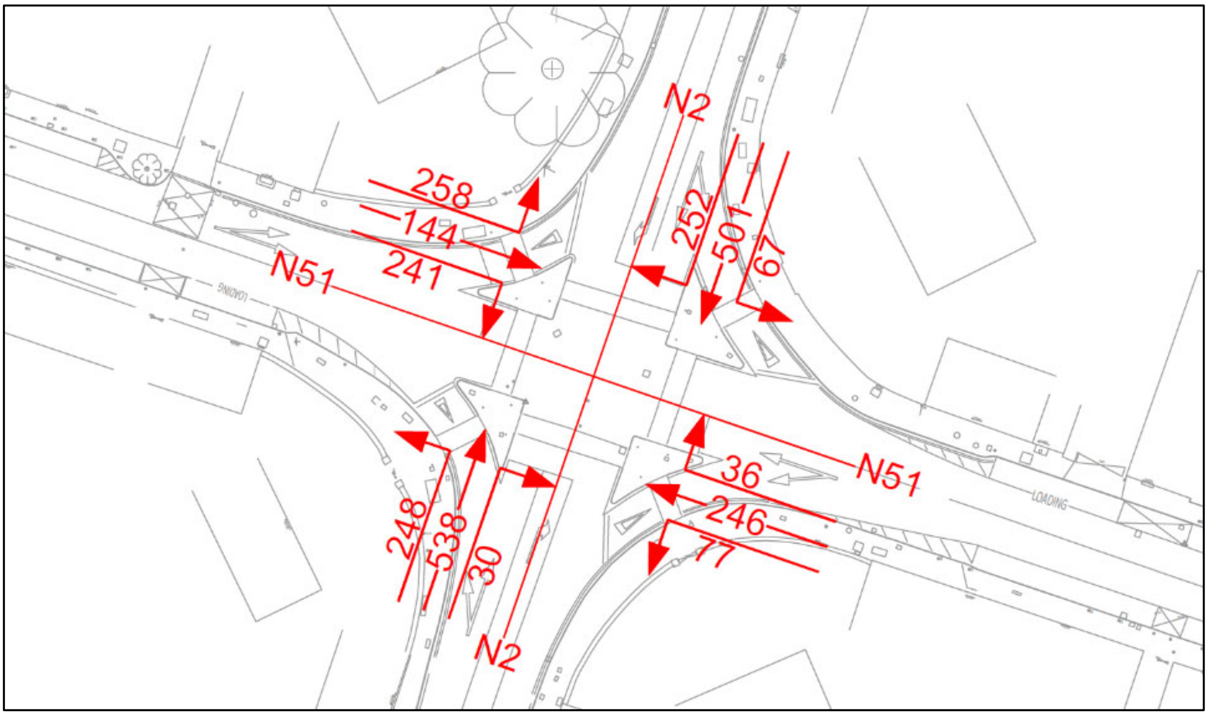


Figure 7.41: Daily Heavy Vehicle Total Flows for Slane Existing N2/N51 Junction – Do-Minimum Scenario

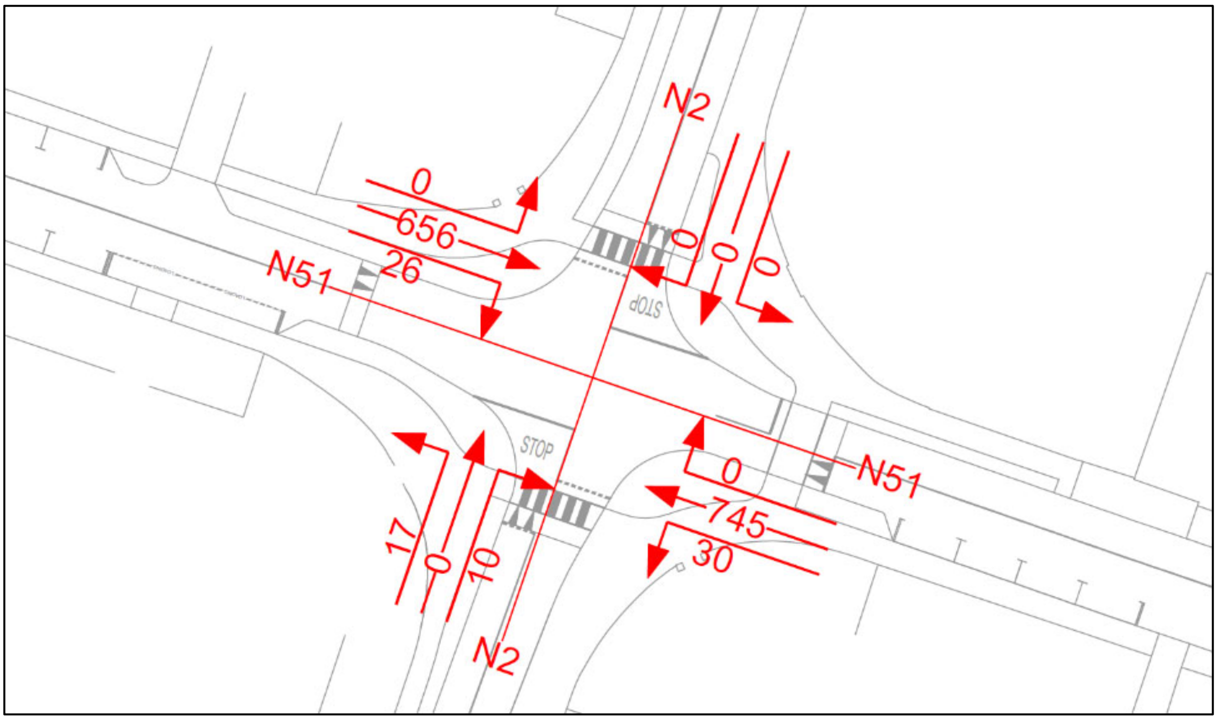


Figure 7.42: Daily Heavy Vehicle Total Flows for Slane Improved N2/N51 Junction – Do-Scheme Scenario

Given that the proposed N2 Slane Bypass is expected to divert the majority of traffic from the existing N2 through Slane, it is considered that a signalised junction is no longer the most appropriate arrangement for the interface between the N2 and N51 in the village centre. As discussed above, the appropriate arrangement is to give the dominant flow priority, which is east-west traffic in the future scenario with the bypass in place.

It is proposed that the signals and turning lanes will be removed and instead a priority junction will be provided. The east-west N51 will form the major arms of this junction with traffic on north-south N2 giving way. The predicted peak hour traffic volumes are outlined in **Table 7-21** and **Table 7-22** below for the AM and PM peak hours respectively. It is clear that the predominant traffic demand is East to West and vice-versa, with the scheme in place.

Table 7-21: Do-Scheme AM Peak Hour Traffic Movements

Approach Arm	N2 (North)	N2 (South)	N51 (East)	N51 (West)
N2 (North)	0	0	1	54
N2 (South)	0	0	5	6
N51 (East)	0	1	0	392
N51 (West)	138	68	340	0

Table 7-22: Do-Scheme PM Peak Hour Traffic Movements

Approach Arm	N2 (North)	N2 (South)	N51 (East)	N51 (West)
N2 (North)	0	0	1	57
N2 (South)	0	0	5	24
N51 (East)	6	10	0	435
N51 (West)	171	2	321	0

The capacity of the proposed junction has been assessed using the traffic modelling software package LinSig for both the Do-Minimum (existing junction) and for the Do-Scheme scenario with the proposed priority junction in place. The capacity analysis results are summarised under the following headings:

- Degree of Saturation (DOS); and
- Mean Max. Queue – This refers to the maximum predicted queue in PCUs (where 1 PCU length is circa 5.75m) during the peak hour.

The results of the junction performance for the Do-Scheme scenario are presented in **Table 7-23** and **Table 7-24** below for the AM and PM peak hour traffic demand respectively.

Table 7-23: Operating Performance Comparison Existing Junction vs Priority Junction – 2041 AM Peak Hour

Approach Arm	Existing Junction (Optimised Signal Sequence)		Priority Junction	
AM Peak Hour	DoS	Mean Max Queue (PCUs)	DoS	Mean Max Queue (PCUs)
N2 (North)	72.1%	11.7	15.2%	0.2
N2 (South)	53.7%	7.0	2.4%	0.0
N51 (East)	41.1%	6.2	22.1%	0.1
N51 (West)	72.0%	13.4	35.5%	2.5

Table 7-24: Operating Performance Comparison Existing Junction vs Priority Junction – 2041 PM Peak Hour

Approach Arm	Existing Junction (Optimised Signal Sequence)		Priority Junction	
PM Peak Hour	DoS	Mean Max Queue (PCUs)	DoS	Mean Max Queue (PCUs)
N2 (North)	58.8%	6.4	15.8%	0.2
N2 (South)	70.7%	10.4	5.6%	0.0
N51 (East)	56.7%	8.4	25.8%	0.2
N51 (West)	72.2%	12.1	30.4%	0.2

Without the bypass in place, the existing junction is assessed to operate close to its practical capacity with degrees of saturation over 70% on approaches in both peak hours. Queues of 13.4 PCUs (approx. 77 m) and 12.1 PCUs (approx. 70 m) are predicted on the N51 (West) in the AM and PM peak hours respectively. Even with the lowest predicted Mean Max Queue of 6.2 PCUs (approx. 36 m), queuing on all arms will block the relatively short left and right turn lanes at the junction during the AM and PM peak hours, further reducing the operational capacity of the junction to function efficiently.

With the proposed bypass and junction rearrangement in place, the traffic volumes decrease overall. The priority junction works very well in terms of providing priority for the dominant traffic flow and the analysis shows the degree of saturation dropping to 35% and under. This demonstrates the proposed junction arrangement performs well in this future year scenario.

The N2 North arm has a degree of saturation of around 15% and minor delays may occur. It is noted that the use of the signalised toucan crossing (signalised pedestrian/ cyclist crossing) at the junction will offer further opportunities for traffic from the N2 to proceed.

The analysis shows that the removal of the signalised junction and prioritisation of traffic flow on the N51, will facilitate the residual traffic volumes on the east-west route passing efficiently and safely through the village.

The Design Manual for Urban Roads and Bridges TA 79/99 relates to the traffic capacity for an urban road. Based on the characteristics of the N51 through Slane, it is considered that this road is an Urban All-Purpose Road (UAP) 4, which is a busy high street carrying local traffic with frontage activity including loading and unloading. Taking into consideration the carriageway width of the N51 it is estimated that the capacity of the road is circa 1,500 vehicles per hour. With reference to **Table 7-21** and **Table 7-22** above, the maximum peak hour two way traffic volume predicted on the N51 is 778 vehicles on the east side of the junction and 1010 vehicles on the west side of the junction. The level of peak hour traffic on the N51 on either side of the junction is well below the theoretical capacity of the road. This means that the N51 has the characteristics to safely cater for the predicted traffic reassignment when the bypass is in place.

7.4.3 Consideration of Induced Traffic

Induced traffic may be considered to be new trips or changes to existing trips (eg, change a trip destination) that could arise as a result of a particular transport intervention such as the N2 Slane Bypass and Public Realm Enhancement Scheme.

The traffic model developed for the scheme is a "fixed-matrix" traffic model, meaning that the volume of demand for each journey is assumed independent of journey cost. This means that additional trips or changes in trips (demand responses) that might be generated by a particular scheme are not considered. The only response considered by standard traffic models is change of route within the modelled area.

In the context of the proposed scheme, it is expected that the transport benefits arising from the scheme would not be of the order to generate a significant amount of induced traffic. However, with the growing importance of decarbonisation of transport, it was considered worthwhile to carry out a sensitivity test, to check what the scale of change in carbon emissions from demand responses to the scheme is likely to be.

A high-level estimate of the likely scale of induced traffic for the scheme was generated, by applying UK WebTAG transport planning recommended values of the sensitivity of demand to cost. By applying these sensitivity parameters to trips which divert to the proposed scheme in the future year Do Scheme scenario, the potential impact of further induced traffic can be quantified.

The result of the sensitivity test is that there could be a 1.5% increase in the traffic volumes using the bypass, suggesting that the effect of induced traffic is at a very low level and will have little or no impact on the environment.

7.4.4 HGV Surveys

In order to assess the likely impact of the scheme on HGV trips on the N2 and in the vicinity of Slane village, a survey of hauliers and local businesses was undertaken. A sample of 76 No. hauliers and businesses were invited to participate in the survey seeking to qualitatively ascertain the following:

- Establish haulage/HGV use of the N2 corridor and why this route is chosen by hauliers/local businesses; and
- Establish the impact of a HGV ban or toll placed on the existing N2 corridor in absence of a bypass.

Establish reaction to the Proposed Scheme where a bypass of Slane is provided with HGV bans on the existing N2 into Slane village. Sample response was poor with most declining to participate. However, a number of local HGV-generating businesses did respond. Analysis of the responses demonstrates the following:

- 70% use the N2 corridor as it is the fastest and cheapest route;
- 50% access the Slane village area and so bypass plus HGV bans will impact negatively;
- 70% confirm HGV ban on the existing N2 with no bypass would impact their business negatively or very negatively; and
- With no bypass and HGV bans on the existing N2, 70% would use other untolled local and regional roads.

7.4.5 Walking and Cycling

The proposed scheme is a multi-modal transport solution, designed to provide transport infrastructure to improve a wide range of transport needs within the study area. It addresses many transport needs in the region and locally in Slane. It improves the balance of the various travel modes and seeks to make alternative modes more attractive to both local residents and visitors, thereby reducing vehicular trips and promoting greater modal shift to more sustainable travel modes.

7.4.5.1 Slane Village

With the implementation of the north-south bypass and the traffic management measures for residual East-West traffic in place, the local environment in Slane village will improve significantly for the promotion of increased walking and cycling. Traffic calming measures are included in the scheme to control traffic speeds, particularly important on the N51 through the village. Overall, through traffic in Slane will be reduced. This will enable the reallocation of existing road space to the benefit of vulnerable road users.

The public realm enhancement proposals include for significant reduction of carriageway widths, particularly on the north-south old N2 and the reallocation of this space to improved walking and shared walking/cycling spaces. A significant component of the scheme's active travel proposals is the provision of a shared pedestrian / cyclist facility running along the east side of the old N2 from the junction at the Square to St. Patrick's National School located north of the village centre.

On the south side of the junction, a pedestrian footway is provided on the east side of the road from the junction and across the existing river bridge. An additional link, providing access for pedestrians to the proposed car park at the N51 joins the footpath along the old N2 South at approximately Ch. 880. A one-way cycle track is proposed beside the footpath on the east side of the road extending from the existing bridge to the car park's pedestrian link. This cycle track is proposed for northbound cyclists who will be travelling uphill.

Improved pedestrian/cyclist permeability and accessibility is provided by including dedicated road crossings. For road safety reasons, traffic light-controlled crossings are proposed on the N51 as this is the predominant route for residual traffic. A toucan pedestrian/cyclist crossing is proposed at the N2 / N51 junction.

On the existing N2, zebra crossings are proposed at the reconfigured junction. Pedestrian crossings are also provided at each raised table. The provision of road crossings and raised tables are outlined in **Table 7-25** below.

Table 7-25: Raised Table Locations and Road Crossings

Location		Crossing Types
N51 Main Street West	Castle Hill Junction	• N51: Signalised Pedestrian Crossing • Side Road: Uncontrolled Crossing
	At the Village Space	• Signalised Pedestrian Crossing
N2 / N51 Junction	The Square	• N2 Chapel Street: Zebra Crossing • N2 South: Zebra Crossing • N51 Main Street East: Toucan Pedestrian / Cyclist Crossing
N51 Main Street East	Ledwidge Hall junction	• N51: Signalised Pedestrian Crossing • Side Road: Uncontrolled Crossing
N2 Chapel Street	Chapel Street	• Uncontrolled Crossing
	Health Centre	• Zebra Crossing

Footpaths within the village are to be resurfaced with paving stones and kerbs are to be replaced with natural stone units installed with consistent upstand height. These provisions, in addition to proposals to provide planting between the road and footpath at appropriate locations, will enhance the quality of the footpaths increasing pedestrian comfort.

Cycle stands are to be provided for securing bicycles at suitable locations along the footpaths around the village centre. The stands will be located where the bicycles will not limit the available footpath width to below minimum standards. It is also proposed that cycle stands are provided within the site of the new off-street car park. The provision of cycle stands near the village centre further promotes cycling as a viable transport option for Slane.

It is also proposed that the car park in Slane will include for electric vehicle charging points, thus improving facilities to encourage the change from petrol/diesel powered vehicles to electric.

A full description of the proposed walking and cycling facilities is outlined in **Chapter 4 – Description of the Proposed Scheme**.

Full details of the public realm enhancements proposed for Slane village are illustrated in **Volume 3 – Technical Drawings**, drawing series **MDT0806-RPS-01-PR-DR-C-GA9000-GA9008** (General Arrangement), **MDT0806-RPS-01-PR-DR-C-GA9201** (General Arrangement – Car Park), **MDT0806-RPS-01-PR-DR-C-GE9000-GE9011** (Public Realm Geometrics), **MDT0806-RPS-01-PR-DR-C-KP9000-KP9008** (Public Realm Kerbs and Pavement) and **MDT0806-RPS-01-PR-DR-C-RM9000-RM9006** (Public Realm Road Markings & Signals).

7.4.5.2 Existing Slane Bridge and Ramparts Way Walking Trail

With the substantial reduction in traffic on the old N2 and the banning of through HGV traffic, there is scope to reallocate existing road space on the existing Slane bridge. As noted above, an enhanced pedestrian facility is to be provided north-south along the east side of the existing N2. This facility aims to provide a key link to/from the village and the existing Boyne bridge and the existing Ramparts Way walking trail along the towpath. An approx. 2 m wide segregated walkway provides the continuity of this facility across the existing Boyne bridge.

These provisions, including the proposed link from the car park, would considerably strengthen the accessibility of the leisure facilities along the River Boyne to both residents and visitors to Slane alike.

A dedicated cycle lane is proposed for the east side of the road between the existing River Boyne bridge and the proposed pedestrian access to the proposed car park. This provision is made to facilitate uphill cyclists negotiating the high existing gradients. The uphill cycle lane is expected to be mostly utilised by visitor cyclists, looking to access Slane village for leisure purposes.

7.4.5.3 Wider Provisions

The bypass incorporates a combined pedestrian/cyclist path to facilitate active travel along the route. The scheme also provides for a new footway link on the N51 between the village and the bypass and for a pedestrian/cyclist link from the bypass to the existing towpath along the Boyne Canal, providing access to the river walkway with its high amenity value. To complete active travel links between the village, a further section of footway is to be provided at the northern end of the village to link to the northern bypass tie-in. The active travel links between the village and the bypass provide opportunities for active travel loops for both residents and visitors to Slane.

7.4.5.4 National School

With the introduction of the proposed scheme, the traffic situation on the existing N2 north will be transformed with the significant reduction in general traffic volumes and the elimination of HGV traffic from the route. The proposed public realm enhancements reallocate significant space to increase the widths of the existing footways and include extension of the proposed north-south shared area to the school.

The existing N2 north will become much more conducive to walking and cycling to and from the school. Raised table areas will reduce traffic speed and will provide both formal and informal road crossing opportunities, increasing accessibility generally for vulnerable road users.

Active travel for the residents of Slane will be further promoted by the provision of east/west links from residential developments to the village centre, community facilities (including St Patrick's National School), etc. Provision of these links would reduce distances from residential areas and will further promote walking and cycling as the preferred mode of travel to and from the National School. However, these pedestrian/cyclist links are not specifically included in this scheme but the Active Travel Unit of Meath County Council in conjunction with the NTA are seeking to advance this project separately.

7.4.6 Public Transport

As well as improving general connectivity for bus public transport through provision of the bypass, local public transport in Slane will be facilitated by the removal of large volumes of traffic from the village, making access to bus public transport more efficient locally.

To accommodate existing and future bus services, the existing bus-stops located on the N51 to the west side of the junction are retained in the proposed design. These stops currently serve the Bus Eireann Route 190 runs between Drogheda and Trim.

In the current situation, there are no formal signs or road markings designating the location where Collins Coaches stop to pick up/drop off passengers on the existing N2 in Slane. Under the Proposed Scheme, it is proposed to improve the provision for north-south buses by providing in-line bus stops on the southbound and northbound sides of the old N2 north of the junction.

Under the scheme, there will be HGV bans in place to the north and south of the village. Public transport services will be exempt as the ban will apply to 3 or more axle vehicles.

7.4.7 Boyne Navigation Canal

The section of the Boyne Navigation Canal at Slane is currently disused. However, clearance for and future navigation as well as safety aspects in terms of clearance has been included for in the vertical alignment for the bridge design, in consultation with the Inland Waters Association of Ireland (IWAI). As this is designed-in measure, there is no impact to future navigation should this canal section reopen.

7.4.8 Cumulative Impacts

A cumulative impact assessment (CIA) has been undertaken to consider potential for cumulative impact of the Proposed Scheme with other approved development. The detailed methodology for the CIA is described in **Chapter 25 – Cumulative Effects**. The assessment has considered cumulative sources and impact pathways which could impact on agricultural enterprise.

The projects listed in **Appendix 25.2** have been assessed. Each project has been considered on a case-by-case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved. Projects were screened-in to the CIA where located within the zone of influence (ZoI) of the Proposed Scheme or where projects have the scope to potentially alter the traffic volumes and/or flows assessed in this chapter for the determination of traffic impact. The projects that were screened-in to the traffic and transport CIA are listed in **Table 7-26**.

Table 7-26: Projects Screened-in for Potential Cumulative Effects on Traffic and Transport

Project Code	Project Location	Project Type	Potential for Cumulative Effect
PR 1	Stanley Hill, Slane, Co. Meath	Wastewater Treatment Tank	Potential for increased traffic volumes during both the construction and operational phases.
PR 2	Millhouse, Slane, Co. Meath	Restaurant	
PR 3	Ledwidge Hall, Drogheda Road, Slane, Co. Meath *(now constructed)*	Residential Development	
PR 4	Ledwidge Hall Green, Drogheda Road, Slane, Co. Meath *(now constructed)*	Residential Development	
PR 5	Former Parochial House, The Square, and adjacent Art Gallery, Main Street, Slane, Co. Meath	Commercial Building	
PR 6	Conyngham Arms Hotel, Main Street, Slane, Co. Meath	Hotel	
PR 7	Slane Wastewater Treatment Plant, Castle Hill, Navan Road, Slane, Co. Meath	Wastewater Treatment Plant	
PR 12	Mullaghdillon, Slane, Co. Meath	Quarry	
PR 13	Harlinstown, Slane, Co. Meath	Road works	Potential for traffic disruption
PR 14	The Black & White Thatched Pub, (Formerly the Tourist's Rest) Balfeddock, Slane Co. Meath	Restaurant & Accommodation	Potential for increased traffic volumes during both the construction and operational phases.
PR 15	Lands adjacent to (and north of) former Parochial House (The Orchard) (A Protected Structure), The Square, Slane Co Meath	Residential Development	
PR 25	Collon Business Park, Collon, Co. Louth	Industrial building	
PR 27	Veldonstown Road, Kentstown, Co. Meath	Residential Development (53 units)	
PR 28	Veldonstown Road, Kentstown, Co. Meath	Residential Development (25 units)	
PR 30	Brownstown, Kentstown, Navan, Co Meath	Commercial Building	
PR 31	Kells Road, Collon, Co Louth	Business Park	
PR 33	Kentstown, Co. Meath	Residential Development	
PR 34	Ardee Street, Collon, Co Louth	Residential Development	
PR 39	Watery Lane, Tullyallen, Co Louth	Residential Development	
PR 41	Old Slane Road & Mell, Tullyallen, Drogheda, Co Louth	Residential Development	
PR 44	Drogheda IDA Business and Technology Park, Donore Road, Drogheda, Co. Meath	Data storage facility	
PR 45	Indaver Waste to Energy Facility, Carranstown, Duleek, Co Meath, Eircode A92 EP23	Waste To Energy Facility	
PR 46	Phase #2 Kestrel Manor, Matthews Lane/Platin Road Lagavoreen, Drogheda Co. Meath	Residential Development	
PR 49	Ballymakenny , Twenties, Yellowbatter & Moneymore	Residential Development	
PR 50	Bryanstown, Drogheda, Co. Meath	Residential Development	
PR 51	Marsh Road, Drogheda, Co Louth	Residential Development	
PR 52	Termon Abbey, Newfoundwell Road, Drogheda	Residential Development	
PR 54	Marsh Road, Newtown, Lagavooren	Residential Development	
PR 55	Ardee, Co Louth	Road works, N52 Ardee Bypass	New bypass scheme in a town to the north of Slane village

Project Code	Project Location	Project Type	Potential for Cumulative Effect
PR 57	29-32 Trinity Street, Drogheda, Co Louth	Residential Development	Potential for increased traffic volumes during both the construction and operational phases.
PR 61	Phase 10 Avourwen Platin/ Duleek Road, Lagavooren, Drogheda Co. Meath	Residential Development	
PR 63	Bryanstown Cross Route (Rear Of Martello Village), Drogheda, Co. Meath	Residential Development	
PR 64	Mell, Drogheda, Co Louth	Commercial Development	
PR 65	Leonards Cross, Slane Road, Mell Drogheda	Residential Development	
PR 66	Lands to the east of the M1 motorway and west of, the Rathmullan Road, Oldbridge Drogheda Co Meath	Residential Development	
PR 69	North Road, Moneymore, Drogheda Co. Louth	Residential Development	
PR 70	Twenties Lane, Moneymore, Drogheda Co Louth	Residential Development	
PR 72	Yellowbatter , Drogheda, Co Louth	Residential Development	
PR 73	Ballymakenny Road, Yellowbatter, Drogheda Co Louth	Residential Development	
PR 74	Yellowbatter, Drogheda, Co Louth	Residential Development	
PR 75	Ballymakenny Road, Yellowbatter, Drogheda Co. Louth	Commercial Development	
PR 78	Cord Road Greenhills Road North Strand Road, Drogheda, Co Louth	Residential Development	
PR 79	Yellowbatter, Drogheda, Co Louth	Residential Development	
PR 80	Newtown View Marsh Road, Newtown, Lagavooren	Residential Development	

To ensure a robust assessment, the ZoI for the traffic impact assessment was set over a wide study area. For projects PR 1 to PR 54 and PR 57 to PR 80, each of these developments, while modest in scale, has potential for cumulative traffic impact in the operational phase and potential cumulative impact during construction where additional temporary traffic generation may occur. Impacts may comprise increased temporary traffic volumes on the local road network if works are undertaken simultaneously or elongation of impact if works are undertaken concurrently. The operational traffic impact assessment has considered future growth in traffic demand over the full study area so whilst not specifically considering each of these proposed developments, is considered to have taken account of future year changes in traffic volumes and patterns.

For PR 13, this comprises modest road works which has the potential to lead to some traffic disruption caused by installation of the underpass section. However, this is considered short-term and not likely to cause significant negative cumulative impact with the Proposed Scheme.

For PR 55, this development lies approx. 15 km to the north of the Proposed Scheme and entails the construction of an N52 single carriageway bypass of Ardee. The Do-Minimum scenario for the traffic impact assessment for the Proposed Scheme includes for this N52 scheme to be completed, and so any potential cumulative effects are taken into account in the assessment of the Proposed Scheme.

7.5 Mitigation

7.5.1 Construction Phase

In order to manage the likely construction-related traffic movements and the normal traffic movements in the Slane area, construction traffic management shall incorporate the measures set out in detail in **Chapter 5, Section 5.5.1** (Traffic Management During Construction).

7.5.2 Operational Phase

The mitigation proposed for the operational phase of the Proposed Scheme is embedded into the operational assessment. The overall impact is considered to be positive and therefore no specific additional operational mitigation measures are required.

7.6 Monitoring

7.6.1 Construction Phase

The construction traffic management measures shall be periodically reviewed by the appointed contractor to respond to dynamic conditions in the receiving environment.

7.6.2 Operational Phase

No specific operational monitoring is required.

7.7 Chapter References

DHPLG (2018) National Planning Framework 2040

DoT (2022) National Sustainable Mobility Policy and Action Plan 2022-2025;

DoT (2021) National Investment Framework for Transport in Ireland 2021

DPER (2018) National Development Plan

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