AECOM

NAAS/SALLINS TRANSPORT STRATEGY

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Appendix A Baseline Report

Naas Transport Strategy

Baseline Report

Kildare County Council

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Kildare County Council

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1. Introduction

1.1 Context

AECOM have been appointed by Kildare County Council (KCC) to prepare a transport strategy for the town of Naas. This strategy aims to secure long-lasting transport improvements in Naas to ensure growing use of sustainable travel modes for work, education, business and visitor trips.

The purpose of the Baseline Report is to provide context for the development of a future Naas Transport Strategy. The Baseline Report reviews the policy background, the local urban area, key transport indicators, survey data and initial public consultation. The Baseline Report considers the implications of the data for all transport modes; road, rail, bus, cycling and walking. Building on the conclusions of the Baseline Report, numerous strategy options will be developed and brought forward for further assessment to create the draft transport strategy.

While the transport strategy is primarily focused on Naas, the analysis also considers the situation in Sallins due to its close proximity to the north of Naas and the fact it contains a crucial piece of public transport infrastructure; the train station. A key issue will be enhancing access between Naas and Sallins via sustainable modes to increase use of the station and the modal share for rail.

1.2 Project Background

The population of the Naas electoral division was 21,597 in 2016. Over recent decades, Naas has rapidly expanded with the population doubling between since the early 1990s, leading to a spread of housing estates, particularly to the north-east and south-east of Naas Town Centre. This rapid expansion has increased pressure on the town's amenities, transport infrastructure and parking supply. Car dependency is relatively high, with 77.5% of people in Naas and 78.6% of people in Sallins driving to work, which presents a key challenge in the promotion of sustainable travel. While a greater proportion of people use rail in Sallins, there is also a higher level of car use and this is demonstrated through lower amounts of trips by active modes or bus travel compared to larger urban centre of Naas.

The Naas Transport Strategy aims to provide a multi-modal framework to inform future transport infrastructure planning, investment and delivery. The aim of the Strategy is to promote sustainable development in Naas, to connect communities, support the economic and employment base as well as enhancing Naas as a cultural centre with a strong sense of place. The strategy will provide ease of movement across all modes, in line with the Naas Local Area Plan 2019–2025. Specifically, the Strategy is required to:

- Promote the revitalisation and regeneration of the Town Centre
- Improve connectivity and permeability, particularly to the Town centre and Sallins Train Station
- Encourage and facilitate local trips by sustainable modes
- Address existing parking issues in the Town Centre to support local business
- Enhancing the public realm to make Naas more attractive for walking and cycling
- Identify locations for potential Park & Ride sites
- Improve public transport connectivity to and from Naas, improve bus connections with the train station in Sallins, upgrade bus facilities and potentially relocate stops to improve access
- Identify existing congestion areas in Naas and the required improvements to the road network to facilitate future growth in accordance with the National Planning Framework (NPF)
- Capitalise on the opportunities created through the M7 Widening, Osberstown Interchange and Sallins Bypass projects to improve transport accessibility throughout Naas and Sallins
- Reduce car dependency and promote modal shift to sustainable modes

1.3 Strategy Objectives

The Naas Transport Strategy has a series of objectives grouped around five key themes; public transport, cycling, walking, highways and parking. The objectives were developed in collaboration with Kildare County Council. The information presented in the Baseline Report will feed into the development of options to achieve these objectives. The merits of each potential strategy option will be assessed in a Multi-Criteria Analysis (MCA) assessment against the strategy objectives.

The Naas Transport Strategy will aim to achieve the following objectives:

Public Transport Objectives

1. Link residential, employment, education, healthcare and retail facilities with a local bus service
2. Improve the effectiveness, frequency and usefulness of existing bus services
3. Provide bus priority infrastructure in the town centre and along key radial routes
4. Improve public transport shelters, information and visibility
5. Significantly improve bus connectivity between Naas and Sallins Train Station
6. Examine opportunities for a public transport hub in Naas Town Centre.

Cycling Objectives

1. Provide an integrated cycle network for Naas and Sallins in accordance with the National Transport Authority's Cycle Network Plan for the Greater Dublin Area
2. Improve safety for cyclists in Naas and Sallins
3. Prioritise investment in schemes that will deliver the greatest modal shift potential
4. Provide recommendations on the quality of cycle facilities that should be delivered
5. Expand cycle parking at schools, in the town centre and at public transport nodes
6. Engage with schools with the aim of increasing cycling mode share

Walking Objectives

1. Provide an integrated walking network for Naas and Sallins
2. Improve the standard of existing pavements or paths where required
3. Improve permeability to enhance access to homes, job, schools and services
4. Improve safety for pedestrians, particularly for vulnerable road users
5. Engage with schools with the aim of increasing walking mode share

Highway Objectives

1. Reduce unnecessary vehicular trips through Naas town centre
2. Mitigation measures to improve road safety and eliminate collision hotspots
3. Reduce vehicular emissions in town centre by promoting mode transfer to sustainable travel modes
4. Identify missing links and congestion bottlenecks in order to provide recommendations on future road schemes

Parking Objectives

1. Develop a strategy to improve the utilisation of existing car parks in Town Centre
2. Identify locations for a future park and ride site(s)

3. Review existing HGV loading facilities and make recommendations for improvement

1.4 Report Structure

The report is structured into the following sections:

1. Policy Context

   This section reviews the relevant national, regional and local planning policy.

2. Settlement Context

   This section reviews key demographic data regarding population, land-use composition, employment, deprivation and education facilities to assess the transport implications.

3. Transportation Context

   This section reviews key transport information regarding public transport provision, the road network, collisions, modal split, origin-destination data and permeability.

4. Public Consultation

   This section reviews the stakeholder engagement that has taken place and the results of an online survey.

5. Surveys

   This section summarises the survey data which has been collected in respect to parking, walking, cycling and traffic.

6. Conclusion and Next Steps

   This section concludes on the key outcomes of the Baseline Report and outlines the next steps in the strategy process.

2. Policy Context

2.1 National Policy

2.1.1 National Planning Framework

Project Ireland 2040 – National Planning Framework (NPF) provides a high-level strategic planning framework to guide development and investment over the coming decades. The NPF contains a set of ten National Strategic Outcomes (NSOs) to guide future development and investment.

The NPF notes that Naas is located in the Eastern and Midland Region which has experienced high levels of population growth in recent decades, at more than twice the national growth rate. A population of 2.58 million is forecast in the Eastern and Midland Region by 2040; 500,000 more people than live there at present.

Key future planning, development and place-making policy priorities for the Eastern Region which are relevant to Naas include:

- *"Enabling the complementary development of large and county towns in the wider Greater Dublin Area and Midland areas on the key strategic and public transport routes in a regionally co-ordinated manner, with an enhanced emphasis on measures to promote self-sustaining economic and employment based development opportunities to match and catch-up on rapid phases of housing delivery in recent years."*[1]
- *"Building on the progress made in developing an integrated network of greenways, blueways and peatways, that will support the diversification of rural and regional economies and promote more sustainable forms of travel and activity based recreation utilising canal and former rail and other routes."*[1]

From the ten National Strategic Objectives: NSO 1: Compact Growth, NSO 2: Enhanced Regional Connectivity and NSO 4: Sustainable Mobility are the most relevant to Naas' Transport Strategy proposals.

Another applicable objective from the document is the NPF's National Policy Objective (NPO) 27 that states:

- "*Ensure the integration of safe and convenient alternatives to the car into the design of our communities, by prioritising walking and cycling accessibility to both existing and proposed developments, and integrating physical activity facilities for all ages*."[2]

2.1.2 National Development Plan 2018 - 2027

The National Development Plan (NDP) sets out the investment priorities that underpin the successful implementation of the new National Planning Framework. It is designed to guide national, regional and local planning and investment decisions in Ireland over the next two decades.

The National Development Plan demonstrates the Government's commitment to meeting Ireland's infrastructure and investment needs over the next ten years, through a total investment estimated at €116 billion over the life time of the plan.

One of the core investment priorities relevant to Naas outlined in the NDP under the public transport programmes, is the Park-and-Ride Programme. This references the Naas Road as a specific example of where a Park-and-Ride facility could be provided. Naas will benefit indirectly from rail and bus improvements outlined in the NDP, such as electrification of the Kildare railway line and the BusConnects programme. These improvements are outlined in detail in Section 4.1.2.

The NDP also sets out plans for investment in the M7 Naas to Newbridge bypass widening and Sallins bypass as a key project related to National Strategic Objective 2: Enhance Regional Connectivity. At

[1] *Project Ireland 2040 – National Planning Framework, p.35*

[2] *Project Ireland 2040 – National Planning Framework, P82*

this time, these projects are nearing completion with the implementation of the M7 widening and the Sallins bypass due to open in 2020.

2.2 Regional Policy

2.2.1 Regional Planning Guidelines for the Greater Dublin Area 2010 – 2022

The Regional Planning Guidelines the Greater Dublin Area 2010-2020 (RPGs-GDA) provides an overall strategic context for the development plans of each local authority in the Greater Dublin Area including population and housing targets. It also provides a framework for future investment in environmental services, transportation and other infrastructure.

The RPGs-GDA identifies two planning policy zones in the GDA:

- Metropolitan Area - which includes the Kildare towns of Maynooth, Leixlip, Celbridge and Kilcock
- Hinterland Area - includes the rest of Kildare

The RPGs are being replaced by the new Regional Spatial and Economic Strategy under the revised National Planning Framework hierarchy of development plans. The RSES for this region is currently in draft form.

2.2.2 Draft Regional Spatial and Economic Strategy for the Eastern and Midland Region 2019-2031

The Draft Regional Spatial and Economic Strategy (RSES) for the Eastern and Midland Region 2019-2031 sets out a framework to direct future growth of the Eastern and Midland Region over the medium to long term. The RSES will help implement the strategic planning framework set out in the NPF.

The RSES identifies Naas as the county town of Kildare and a Key Town within the Hinterland of Ireland's Eastern and Midland Region. The RSES recognises that there are strong links between Naas and the nearby settlements of Sallins and Newbridge, with a strong interrelationship of services, employment and education in particular between Naas and Newbridge.

A core theme of the RSES in relation to Naas relates to supporting enhanced links to Sallins train station and the provision of more sustainable transport choices for those living and working in Naas.

The draft RSES sets out the following key regional policy objectives related to transport in Naas:

> *"RPO 4.33: Promote the improvement of the transport network within and serving Naas town, including delivery of a robust and efficient walking, cycling and bus network with strong links to Sallins Railway Station, key destinations within the town and to the North West Quadrant and town centre area".*[3]

> *"RPO 8.5: In order to give local expression to the regional level Transport Strategy within the Region in conjunction with the NTA, Local Transport Plans (LTP) will be prepared for selected settlements in the Region".*[4]

The draft RSES also acknowledges the important value of developing and improving the Strategic Metropolitan Greenway network; which includes reference to the Grand Canal Greenway, from Docklands through the southern inner suburbs, to Naas, Newbridge and Kildare and connecting to the Barrow Way.

2.2.3 Transport Strategy for Greater Dublin Area 2016-2035

The Transport Strategy for the Greater Dublin Area 2016-2035 aims to contribute to the economic, social and cultural progress of the GDA by providing for the efficient, effective and sustainable movement of people and goods.

[3] *Regional Spatial and Economic Strategy, P. 56*
[4] *Regional Spatial and Economic Strategy, P. 146*

The strategy outlines a suite of transportation objectives for the GDA including the provision of additional public transport facilities (heavy rail, light rail, bus and bus rapid transit facilities), cycling and walking infrastructure and road network measures up to 2035.

The priorities of the strategy which are relevant to Naas include the following:

- To address urban congestion
- To protect the capacity of the strategic road network
- To reduce the share of trips undertaken by car and increase walking, cycling and public transport mode share
- To provide a safe cycling network
- To enhance the pedestrian environment, in particular to overcome severance and increase permeability
- To consider all-day travel demand from all societal groups

Naas is designated by the GDA as within radial corridor D: Newbridge – Naas – Clondalkin – North Tallaght – to Dublin City Centre, the busiest radial route in and out of Dublin. The GDA Transport Strategy 2016 – 2035 indicates that this corridor is characterised by increasing issues with towns growing quickly outside the existing local catchment of rail and bus services.

The GDA Transport Strategy aims to reconfigure the N7 from its junction with the M50 to Naas in order to rationalise junctions and provide a higher quality of service for strategic traffic. The strategy also intends to widen the M7 from Naas North (Junction 9) to the Junction 11 junction with the M7/M9. This project was completed and opened in 2019.

2.2.4 Greater Dublin Area Cycle Network Plan

The Greater Dublin Area Cycle Network Plan sets out the National Transport Authority's plan for a cycle network throughout the Greater Dublin Area, comprising of an Urban Network, Inter-Urban Network and Green Route Network for the seven Local Authority areas in the GDA. The Cycle Network Plan aims to ensure that cycling as a transport mode is supported and enhanced in order to achieve strategic objectives and reach national goals for cycle usage.

Figure 2.1 illustrates the proposed cycle network plan for Naas and Sallins, showing were investment in cycling infrastructure is expected over the forthcoming years. Key routes will include:

- Route K13 on the Naas branch of the Grand Canal which links with the main greenway
- Route NA2 which links Naas with Sallins train station
- Route NA6 which provides a northern orbital route around Naas
- Route NA5 which provides a southern orbital route around Naas
- Route NA1 provides the main east-west access through Naas town centre

Figure 2.1: Greater Dublin Area Cycle Network Plan - Sheet N18: Naas, Sallins and Kill[5]

[5] *Greater Dublin Area Cycle Network Plan, Sheet N18*

2.3 Local Policy

2.3.1 Kildare County Development Plan 2017 - 2023

The Kildare County Development Plan (CDP) 2017-2023 established a Municipal District system for local administration and Naas is designated within the Naas Municipal District area. The CDP also sets out a number of settlement categories; with Naas designated as the primary Large Growth Town in the County, as illustrated in Figure 2.2.

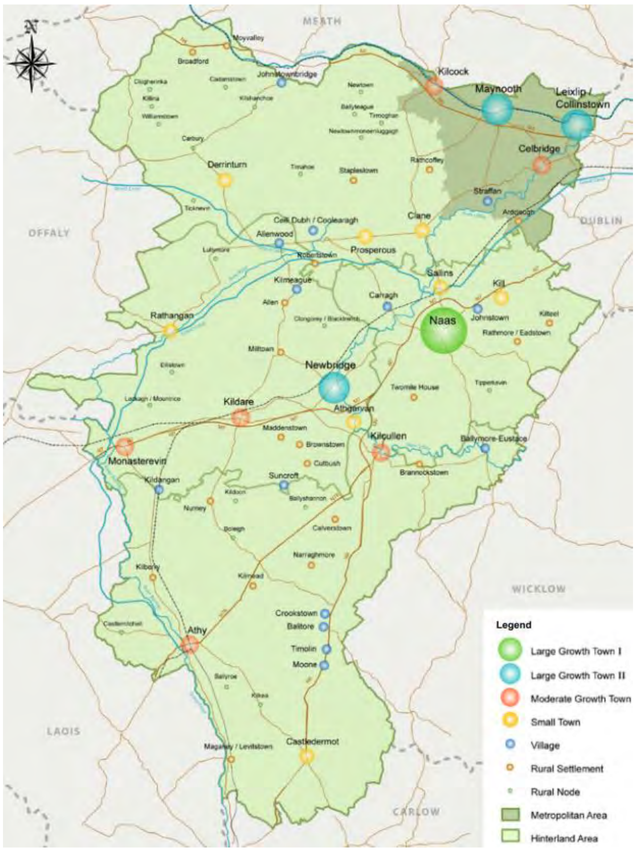

Figure 2.2: Kildare County Development Plan 2017 - 2023 - Settlement Hierarchy Map[6]

The CDP sets out an overall strategy for the proper planning and sustainable development of the functional area of County Kildare over the period 2017-2023. It sets out an overall vision, with strategies, policies and objectives for the County as a whole, all of which are material to local development plans, strategies and development decisions.

Section 6: 'Movement and Transport' sets out the policies and objectives for the County with the overall aim:

> *"To promote ease of movement within and access to County Kildare, by integrating sustainable land use planning with a high quality integrated transport system; to support improvements to the road, rail and public transport network, together with cycleway and pedestrian facilities and to provide for the sustainable development of aviation travel within the county in a manner which is consistent with the proper planning and sustainable development of the county."*[7]

The CDP identifies a number of policies that are relevant to the development of Naas' Transport Strategy. Some of the most relevant are:

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[6] *Kildare County Development Plan 2017 - 2023, P. 54*

[7] *Kildare County Development Plan 2017 – 2023, P127*

- MT1: Promote the sustainable development of the county through the creation of an appropriately phased integrated transport network that services the needs of communities and businesses;
- MT2: Support sustainable modes of transport by spatially arranging activities around existing and planned high quality public transport systems;
- MT3: Influence people's travel behaviour and choices towards more sustainable options by working closely with relevant organisations in improving and accessing public transport facilities;
- MT4: Develop sustainable transport solutions within and around the major towns in the county that encourage a transition towards more sustainable modes of transport, whilst also ensuring sufficient road capacity for trips which continue to be taken by private vehicles;
- MT7: Focus on improvements to the national, regional and local network that provide additional capacity in order to reduce congestion and provide for current and future demand;
- MT8: Seek to address urban congestion with particular emphasis on facilitating improved bus transport movement and reliability and improved links to bus and railway stations; and
- MT13: Support the N7 Newlands Cross to Naas (TEN-T) Study and the N4 Junction 1 (M50) to N4 Junction 1 (Leixlip) (TEN-T) Study and to facilitate, where appropriate, any improvements/measures that may arise as a result of the studies.[8]

The following CDP Movement and Transportation Objectives are also material to the development of Naas' Transport Strategy:

- MTO3: Review and implement Integrated Transport Studies for Maynooth, Leixlip, Celbridge, Naas, Newbridge, Kildare and Athy in conjunction with the DTTAS, TII and the NTA and to prepare new Integrated Transport Studies for other towns, villages and settlements as required, to provide a framework to cater for the movement of pedestrians, cyclists, public transport and private vehicles;
- PTO4: Work with statutory agencies and stakeholders to promote and facilitate the development of a public transport hub near Naas which will connect road, rail transport and public bus transport; and
- WCO4: Secure the development of the following specific cycle schemes (subject to funding from the NTA) as part of GDA Cycle Networks Projects:
  - Dublin Road Corridor Scheme Naas;
  - Naas to Sallins;
  - Kill to Naas.[9]

There is also a Traffic and Transportation Management objective in the CDP to:

- TMO 2: Carry out a review of Traffic Management Plans including the following towns in conjunction with the NTA: Maynooth, Naas, Newbridge, Kildare, Celbridge, Athy.

Furthermore, the CDP identifies a number of roads and motorway improvement objectives which are material to Naas' Transport Strategy, including:

- Priority Road and Bridge Project: Inner Relief Road, Naas;
- Regional Roads: R407 Kilcock to Naas via Clane Inner Relief Road;
- Regional Roads: R409 Naas to Junction of R403 at Blackwood;
- Regional Roads: R410 Naas to county boundary via Eadestown;
- Regional Roads: R411 Naas to county boundary via Ballymore;

[8] *Kildare County Development Plan 2017 – 2023, P130-131*
[9] *Kildare County Development Plan 2017 – 2023, P132-133*

- Regional Roads: R445 Naas to county boundary at Killinure via Newbridge, Kildare and Monasterevin;
- Regional Roads: R448 Naas to Kilcullen and junction with M9; and
- M20: Complete an additional interchange along the M7 Naas by-pass, providing access to Millennium Park.[10]

While a number of the aforementioned projects and roads / motorway objectives are at regional level, the creation of a robust Transport Strategy for Naas must take account of all surrounding infrastructure projects and objectives in order to ensure the most sustainable and interconnected transport system.

Kildare County Council made Variation No.1 of the County Development Plan in 2020, with public consultation on the variation held in January-February. The changes in the variation are designed to bring the CDP in line with the National Planning Framework and RSES documents, to replace guidance from the former National Spatial Strategy. The variation designates Naas as a 'Key Town' which is economically active, with a varied economy and high quality transport links. In respect to sectoral opportunities in Naas, the variation notes the following opportunities for the town:

- *"High quality high-density indigenous and Foreign Direct Investment within Millennium Park and the northwest quadrant of Naas town.*
- *Technology, IT and digital/tech sector including incubator units and shared space. Strengthen employment base through Tech Hub–MERITS Co-working space providing supports for technology entrepreneurs.*
- *High-tech manufacturing and research; Food processing and research including, the development of food incubation units.*
- *Re-intensification of industrial lands in the north east of the town. Exploit historic and amenity assets, regeneration of town centre to provide significant retail and commercial functions."*

2.3.2 Naas Town Development Plan 2011 – 2017

The Naas Town Development Plan 2011-2017 is the extant local area plan for Naas. The Development Plan sets out the previous Town Council's overall strategy for the proper planning and sustainable development of Naas over the plan period. Until the adoption of the Draft Naas Local Area Plan (LAP) 2019 – 2025, the Town Development Plan 2011-2017 remains the extant Plan for Naas and the policies and objectives contained are of material consideration to all development decisions and the formation of the Naas Transport Strategy.

Chapter 7 of the Naas Town Development Plan, 'Movement and Transport', contains the most relevant policies which are still applicable to development in Naas and which can feed into the direction of the Naas Transport Strategy. Some core material policies and objectives include:

- General Movement and Transport (GT)1: To co-operate with other agencies to promote and facilitate the implementation of a sustainable transportation strategy for Naas;
- GT2: To support and promote the use of sustainable transportation modes in Naas and to seek to develop Naas as a "model town" for sustainable transport where pedestrian and cyclist activities are accommodated and encouraged;
- GT3: To support sustainable modes of transport and to ensure that land use planning and zoning are fully integrated with the provision and development of high quality transportation systems;
- GT4: To promote and encourage the development and growth of Naas in line with the principles of sustainable development and to continue to support the policies and recommendations as outlined in the Integrated Framework Plan for Land-Use for Naas and the Naas Traffic Management Plan;

[10] *Kildare County Development Plan 2017 – 2025 P138-142*

- GT5: To provide a road network which is safe and efficient for all road users while being cognisant of the requirements of all traffic, including motorised vehicles, pedestrians and cyclists;
- GT6: To ensure that Naas is well-connected to both the national road network and local centres of population;
- GT8: To improve road safety within the town centre by implementing gateway entry treatments and other speed reduction measures (incl. 50kph signage) inside the Ring Road;
- GT10: To co-operate with the public transport authorities and any other relevant bodies towards the improvement of the public transport system and to establish the feasibility of a park and ride system in Naas.
- Traffic and Public Transport (TM) 3: To encourage the implementation and expansion of local bus services to link key trip generators and attractors in the town, particularly residential, employment, educational and retail centres;
- Parking (PK)1: To optimise the use of existing parking stock, and to provide, facilitate and regulate the provision of parking spaces conveniently located to serve the various land uses; and
- Sustainable Travel (STO)6: To encourage Iarnród Éireann, Bus Éireann and private companies to improve the frequency and quality of public transport facilities to, from and within the town.

The following Roads Improvement, Realignment and Widening Objective is also relevant to the Naas Transport Strategy as it is yet to come to fruition:

- RWO3: To develop a network of bus priority routes including along the Sallins Road, Dublin Road and Newbridge Road and to widen these roads where necessary to improve traffic capacity and for the provision of footpaths, cycle tracks, public lighting and appropriate traffic calming.

2.3.3 Draft Naas Local Area Plan 2019 – 2025

Once adopted, the draft Naas Local Area Plan 2019-2025 will replace the Naas Town Development Plan 2011-2017. The draft LAP has been devised taking account of all national and regional policies, in particular the requirements set out by the National Planning Framework and Kildare County Development Plan 2017-2023.

The draft LAP seeks to build upon Naas' existing assets and sets out the long-term strategic vision for Naas as a successful county town that promotes sustainable growth and a high quality of life for residents in the years leading up to 2025 and beyond. Through the pre-draft public consultation process, the draft LAP has identified seven core themes which the LAP has used to inform and shape the vision for policies, objectives and actions that will address Naas' challenges over the plan period.

The seven core themes are: Town Centre Regeneration, Economic Development, Urban Design, Sustainable Movement, Home and Communities, Heritage and Culture, and Environment and Climate Change.

Key components of the core vision for Naas, with particular relevance to Transport Strategy, as set out in the draft LAP, include:

- To ensure that the growth planned for the town up to 2040 and beyond occurs in a sustainable and sequential manner, while prioritising a low carbon, compact, consolidated and connected pattern of development;
- To develop Naas as a vibrant and culturally rich town, supported by an inclusive, sustainable, all-of-life residential community;
- To create a distinct sense of place and community in which people will continue to choose to live, work, do business and visit;

- Movement, connectivity and permeability to key destinations within the town and wider region will be prioritised and a greater emphasis on safe active transport routes and an enhanced public transport network; and
- There will be a clear emphasis on linking the town centre to the Northwest Quadrant (NWQ) lands, developing key transport modes, community facilities and amenities and delivering a high quality and connected employment quarter with diverse residential and amenity areas.[11].

The vision for Naas from the draft LAP is visually represented in Figure 2.3.

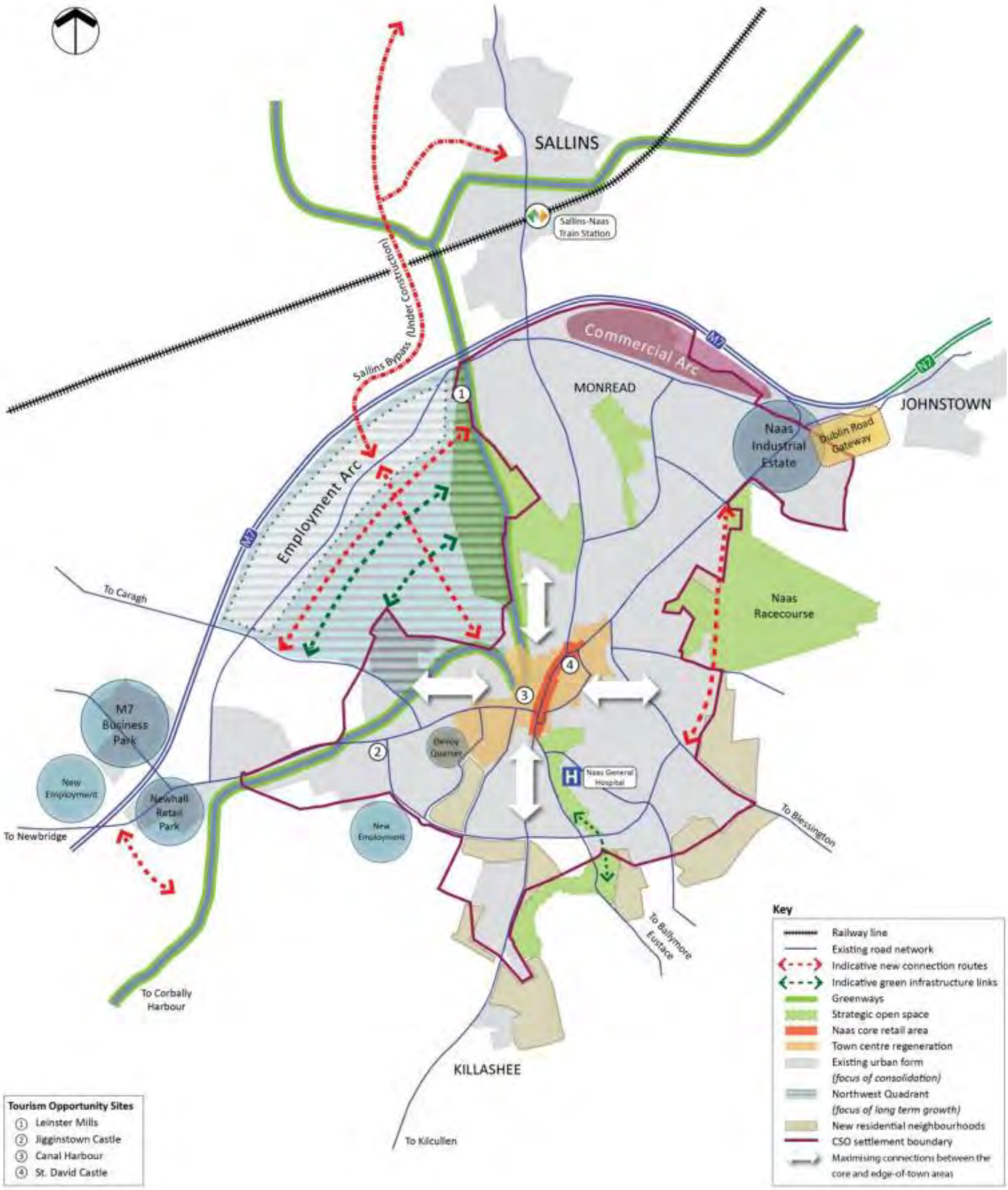


Figure 2.3: Naas Development Strategy Map[12]

2.3.3.1 LAP Transport Policies and Objectives

The draft Naas LAP sets out a number of Transportation and Movement policies and objectives, one of which is the preparation of a Transport Strategy in Naas. The following list of policies, objectives and actions of the draft LAP therefore must be taken account of to ensure the Transport Strategy aligns:

[11] *Draft Naas LAP 2019 – 2025, p. 7*
[12] *Draft Naas LAP 2019 – 2025, p. 9*

- Policy MT1: Movement and Transportation:
- Objective MTO1.1: To co-operate and liaise with the Department of Tourism, Transport and Sport, the NTA and TII in relation to securing appropriate improvements/extensions to the transport network within the Naas;
- Objective MTO1.2: To ensure that both existing and new streets are multi-functional, balancing movement, place and safety for all users within an appropriate traffic environment in accordance with the principles of Design Manual for Urban Roads and Streets (DMURS) (2013) and any subsequent revisions;
- Objective MTO1.3: Improve road safety within the Plan area by implementing gateway entry treatments into the town in order to signal to drivers that they are entering an urban area and to adjust driving speed and behaviour accordingly;
- Objective MTO1.4: Investigate the feasibility of diverting HGVs away from the town centre;
- Objective MTO1.5: Provide in conjunction with the relevant stakeholders, appropriately located 'Park and Ride/Stride' facilities in Naas to serve both commuters and local trip makers on journeys into and out of the town; and
- *Action:* To investigate and identify in conjunction with the relevant stakeholders, the optimum location for a public transport interchange immediately adjacent to or in close proximity to Main Street.
- Policy MT2: Walking and Cycling: It is the policy of the Council to promote enhanced permeability for pedestrians and cyclists within Naas in order to improve access to residential areas, the town centre, schools, recreational facilities, employment hubs, shops, public transport services and other amenities. This includes providing improved connectivity across the Grand Canal and enhanced links through the Northwest Quadrant, Canal Harbour and east-west links through the town;
- Objective MTO2.1: Support and promote the use of sustainable active transport modes in Naas and seek to provide for a connected network of walking and cycling infrastructure in the town in conjunction with the National Transport Authority and other statutory agencies, and to promote Naas as 'model town' for active transport;
- Objective MTO2.2: Identify opportunities to create local permeability routes within existing housing developments where appropriate. This shall be carried out in the context of a Permeability Strategy for the entire town (the preparation of which shall commence within 12 months of the adoption of the Plan);
- Objective MTO2.3: Ensure footpaths in the town provide adequate access for persons with a disability or who have impaired mobility;
- Objective MTO2.4: Maximise connectivity for pedestrians and cyclists in Core Regeneration Areas and Key Development Areas and identify strategic links in existing areas in order to maximise access to local services, schools, transport services and amenities;
- Objective MTO2.5: Continue to work with Waterways Ireland to progress the delivery of: (i) Naas to Sallins Greenway (ii) Naas to Corbally Harbour Greenway;
- Objective MTO2.6: Support cycling as a more convenient and safe method of transport by working with the National Transport Authority to implement the Greater Dublin Area Cycle Network Plan proposals for Naas;
- Objective MTO2.7: Create new pedestrian and cycle links across the Grand Canal that enhance connectivity in the area and links residential areas, the town centre, community facilities and public spaces/amenities;

- Objective MTO2.8: Ensure that all development within Naas allows for connectivity (pedestrian, cyclist and vehicular) to adjacent lands in accordance with the National Transport Authority's Permeability Best Practice Guide (2015);
- Objective MTO2.9: To provide adequate, secure and sheltered bicycle parking facilities at appropriate locations at: (i) In the town centre (ii) Employment areas (iii) Designated neighbourhood centres (iv) Adjacent to heritage, community and amenity destinations; and
- *Action*: Progress delivery of Naas to Sallins Greenway and Naas to Corbally Harbour Greenway;
- *Action*: To examine the feasibility of developing new pedestrian and cycle links located north of Abbey Bridge and at the Canal Harbour.
- Policy MT3: Parking: It is the policy of the Council to manage the provision of car parking to provide for the needs of residents, business and visitors to Naas Town Centre;
- Objective MTO3.2: To support the provision of strategically located 'Park and Stride' and 'Park and Ride' sites conveniently located to the town centre/schools/amenities and employment areas as an alternative to providing additional car parking within the town centre; and
- *Action*: To prepare a Parking Strategy as part of the Naas Transport Strategy to improve access to and use of existing car parking and to identify suitable opportunities for on-street and off-street parking, a 'park and ride' facility in the vicinity of the Town Centre and 'park and stride' sites to cater for schools within the town.
- Policy MT4: Public Transport: It is the policy of the Council to promote the sustainable development of Naas by supporting and guiding the relevant national agencies in delivering improvements to the public transport network and to public transport services;
- Objective MTO 4.1: Secure the implementation of major public transport projects identified in the Transport Strategy for the Greater Dublin Area 2016-2035;
- Objective MTO 4.2: Promote the provision of improved public transport services and facilities to serve the population of Naas through ongoing liaison with the Department of Transport, Tourism and Sport, TII, the NTA, other statutory agencies and public transport providers';
- Objective MTO 4.4: Support the provision of new or upgraded public transport infrastructure within Naas.;
- Objective MTO 4.5: Engage and co-operate with the NTA, Dublin Bus, Irish Rail, Local Link and other stakeholders to improve the provision of public transport in Naas including the delivery of a bus link between Naas and Sallins Train Station, 'Park and Ride/Stride' facilities, and the provision of bus priority measures to ensure the improved movement of bus services through the town centre and local neighbourhoods;
- Objective MTO 4.6: Support infrastructural improvements to the railway including the 4-tracking the line to Kildare Town and electrification of the Dublin–Cork Railway line;
- Objective MTO 4.7: Provide a priority bus route in particular on the Dublin and Sallins Roads linking Sallins Train Station, Naas Town Centre and Millennium Park;
- Objective MTO 4.8: Support the provision of a public transport interchange/hub adjacent to, or in close proximity to Main Street linking existing residential areas and key expansion areas to the town centre and educational and community facilities; and
- Objective MTO 4.9: Support in conjunction with Irish Rail, the extension of Sallins Train Station and/or its relocation to the west of the existing station and the development of an ancillary 'Park and Ride' facility to serve the population of Naas and the wider region.

- **Policy MT5: Road and Street Network:** It is the policy of the Council to maintain, improve and extend the local road network in and around Naas to ensure a high standard of connectivity and safety for all road users.
- **Policy MT6: Strategic Road Connection:** To Plan for the long term needs of Naas in its regional role and context and to provide improvement capacity and movement on strategic routes in order to reduce town congestion and to improve connections to the national road network.[13]

2.3.3.2 Strategic Transportation Projects

The draft LAP outlines 12 Strategic Transportation Projects for Naas which are either currently at Public Consultation Stage, expected to be progressed during the lifetime of the plan or as part of any future planning application and are material to the development of the Transport Strategy. These include:

- SPO1.1: Naas Inner Relief Road;	- SPO1.7: Northwest Quadrant Link;
- SPO1.2: Kilcullen Road Cycle Scheme;	- SPO1.8: Naas to Corbally Harbour Greenway;
- SPO1.3: Naas to Kill Cycle Scheme;	- SPO1.9: New junction at Murtagh's Corner linking Corban's Lane to Main Street;
- SPO1.4: Naas to Sallins Greenway;	- SPO 1.10: Complete the roadway linking Aldi Distribution Centre to Millennium Park Road;
- SPO1.5: Dublin Road Corridor Cycle;	- SPO 1.11: Access road serving lands zoned Q(1)9;
- SPO1.6: Sallins Road Cycle Scheme;	- SPO 1.12: Naas to North of Baltinglass Greenway.[14]

2.3.3.3 Key Development Areas

The draft LAP identifies two Key Development Areas (KDA's): Naas West (west of town centre) and KDA: Rathasker Road West (Devoy Link Road), as illustrated by Figure 2.4 and Figure 2.5 respectively.

Each KDA comprises strategic greenfield lands for sequentially developed new housing. The movement and transport connections within each development must provide linkages to the surrounding Naas network. Therefore these KDA's are core material considerations to the development of Naas' Transport Strategy.

[13] *Draft Naas LAP 2019 – 2025, p. 36-46*
[14] *Draft Naas LAP 2019 – 2025, p. 46-47*

Figure 2.4: KDA Naas West[15]

Figure 2.5: KDA Rathasker Road West[16]

[15] Draft Naas LAP 2019 – 2025, p. 127
[16] Draft Naas LAP 2019 – 2025, p. 130

2.3.3.4 Core Regeneration Areas

The draft LAP also identifies six Core Regeneration Areas (CRA's):

1. Main Street
2. Castle Quarter
3. Canal Quarter
4. Corban's Lane
5. Devoy Quarter
6. Northeast Gateway

The locations of these sites are illustrated in Figure 2.6.

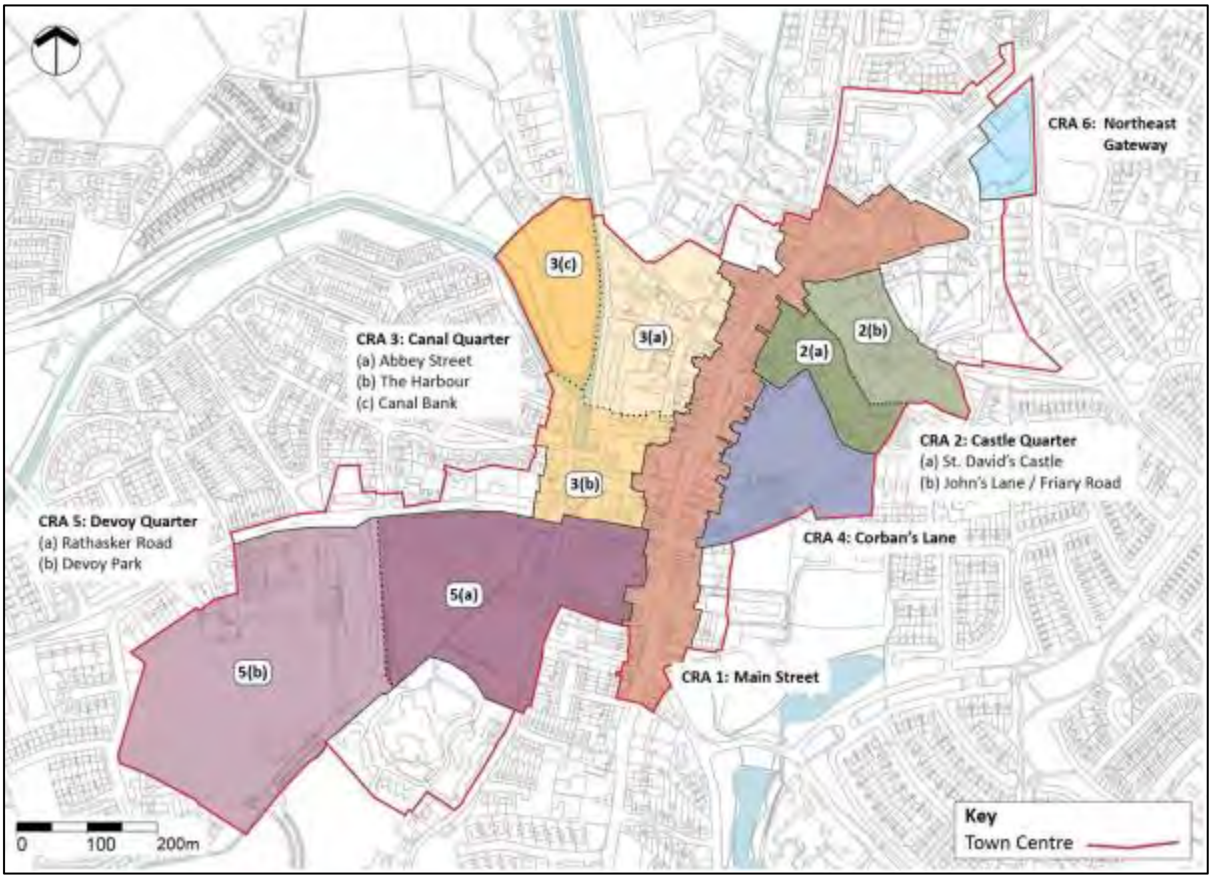


Figure 2.6: Core Regeneration Areas Map[17]

Within each CRA, design principles are outlined which must be taken into consideration to ensure appropriate connectivity and permeability is provided to enhance the public realm and public experience within Naas.

[17] *Draft Naas LAP 2019 – 2025, p. 97*

3. Settlement Context

3.1 Population Change

The Central Statistics Office (CSO) Settlement boundary contained 21,393 people in Naas and 5,849 people in Sallins during 2016. Figure 3.1: shows the change in population between 2011 and 2016 on a square kilometre grid for the surrounding area. This indicates that all areas of Naas and Sallins are growing with the exception of the south-west fringe where there has been a modest population decline. In general, Naas and Sallins experienced similar levels of growth as the surrounding towns of Clane, Newbridge and Blessington but less growth than Saggart on the western fringe of Dublin.

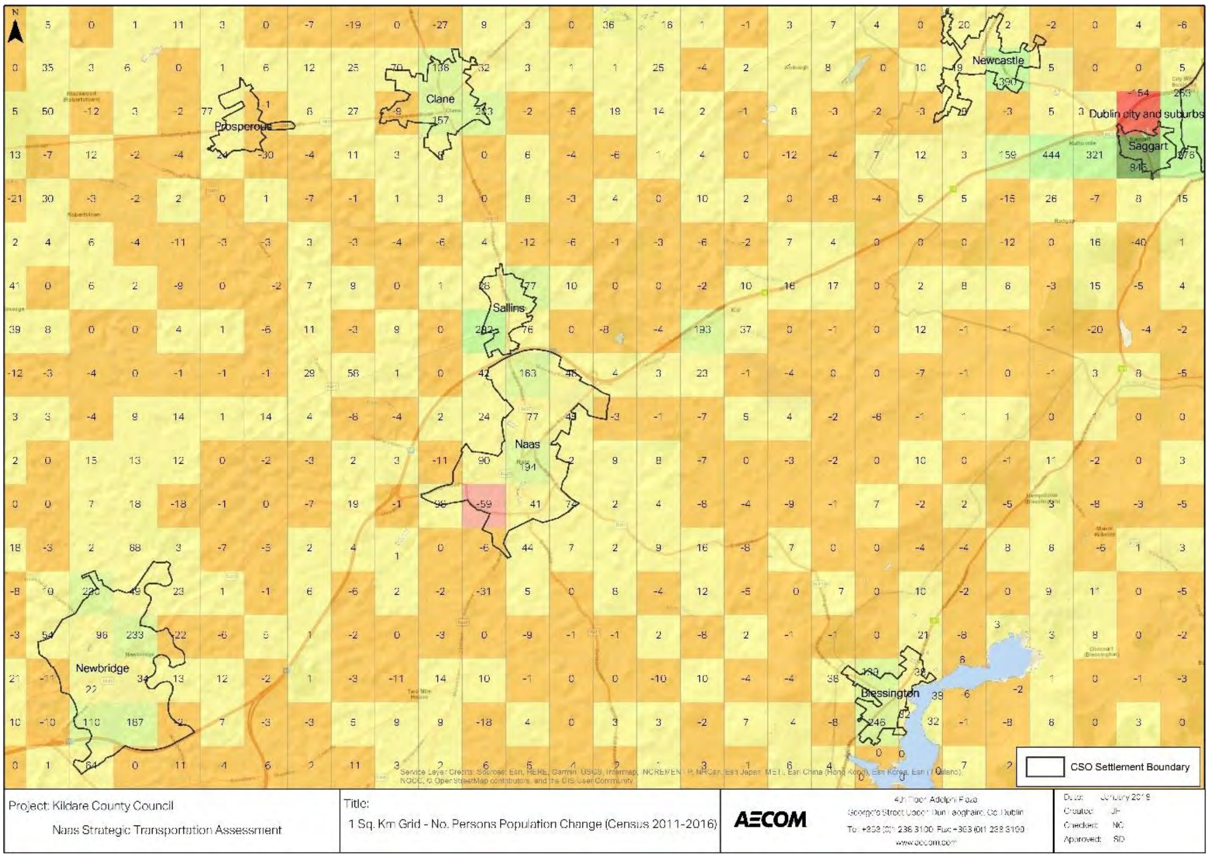


Figure 3.1: Regional Population Change on Square km Grid (Census, 2011-2016)

Figure 3.2 shows the main areas of residential construction in Naas and Sallins during 2001-2016. This demonstrates that most of the residential construction has been near Sallins or in the western and southern areas of Naas. There has been very little infill development throughout the established central and eastern parts of Naas during this period. The growth of the outer suburbs, where walking and cycling distances to key locations are longer, will increase the likelihood of car use rather than sustainable modes. Intensification of existing built-up areas near public transport corridors and mixed-use development would be preferable to reduce car dependency.

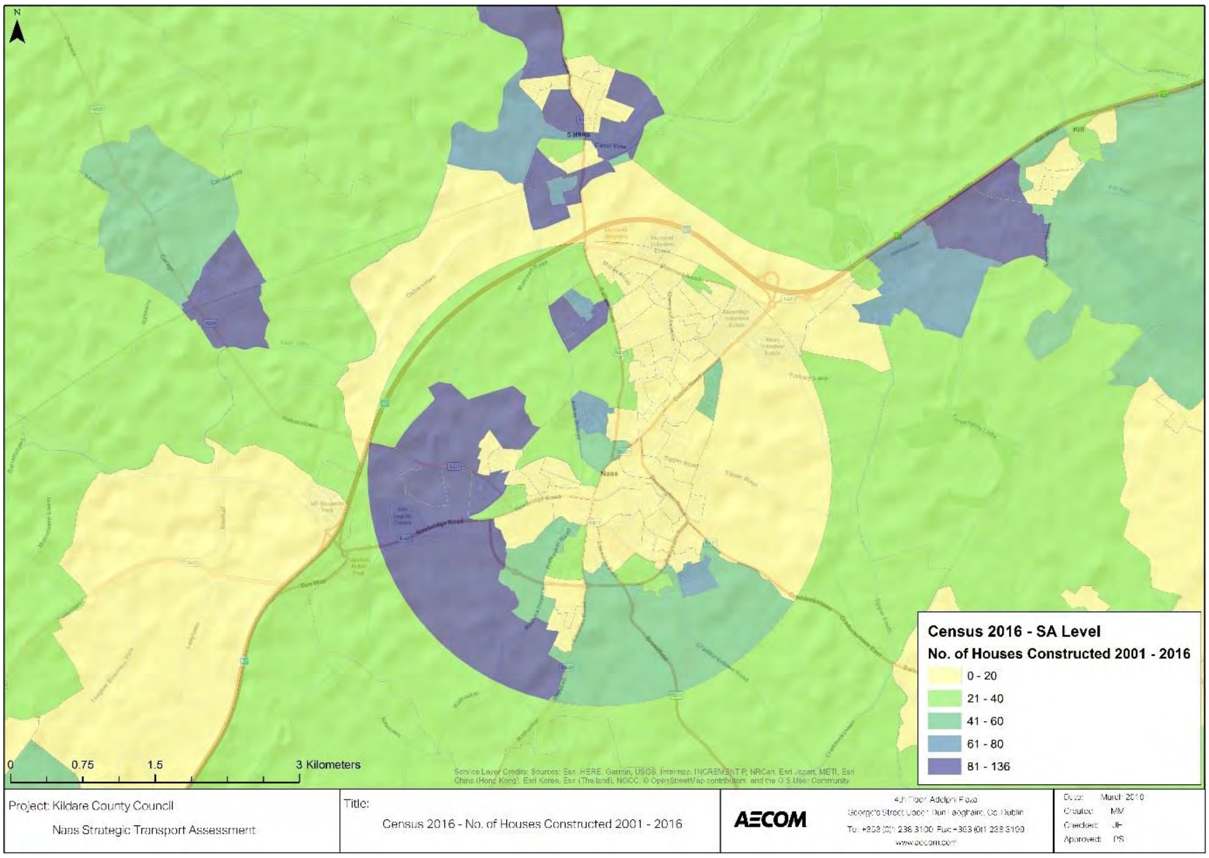


Figure 3.2: Number of Houses Constructed During 2001-2016 (Census, 2016)

3.2 Land Use Composition

Figure 3.3 provides an overview of the split between commercial and residential buildings in Naas and Sallins using the GeoDirectory (2018) dataset. This indicates that commercial activities are concentrated in the centre of Naas as well as in industrial estates on the northern and western periphery. Sallins only has a small number of commercial buildings and the settlement primarily consists of residential housing. While there is strong commercial presence throughout Naas, it is concentrated in the centre and in a small number of suburban clusters. As a result , there is a clear spatial separation of land-use activities in suburban areas with little evidence of mixed-use development which would promote shorter trips and active modes. Even in Naas town centre, mixed-use development can be limited and there is scope for improving this through schemes to encourage living above ground floor retail and the construction of greater amounts of mixed-use buildings.

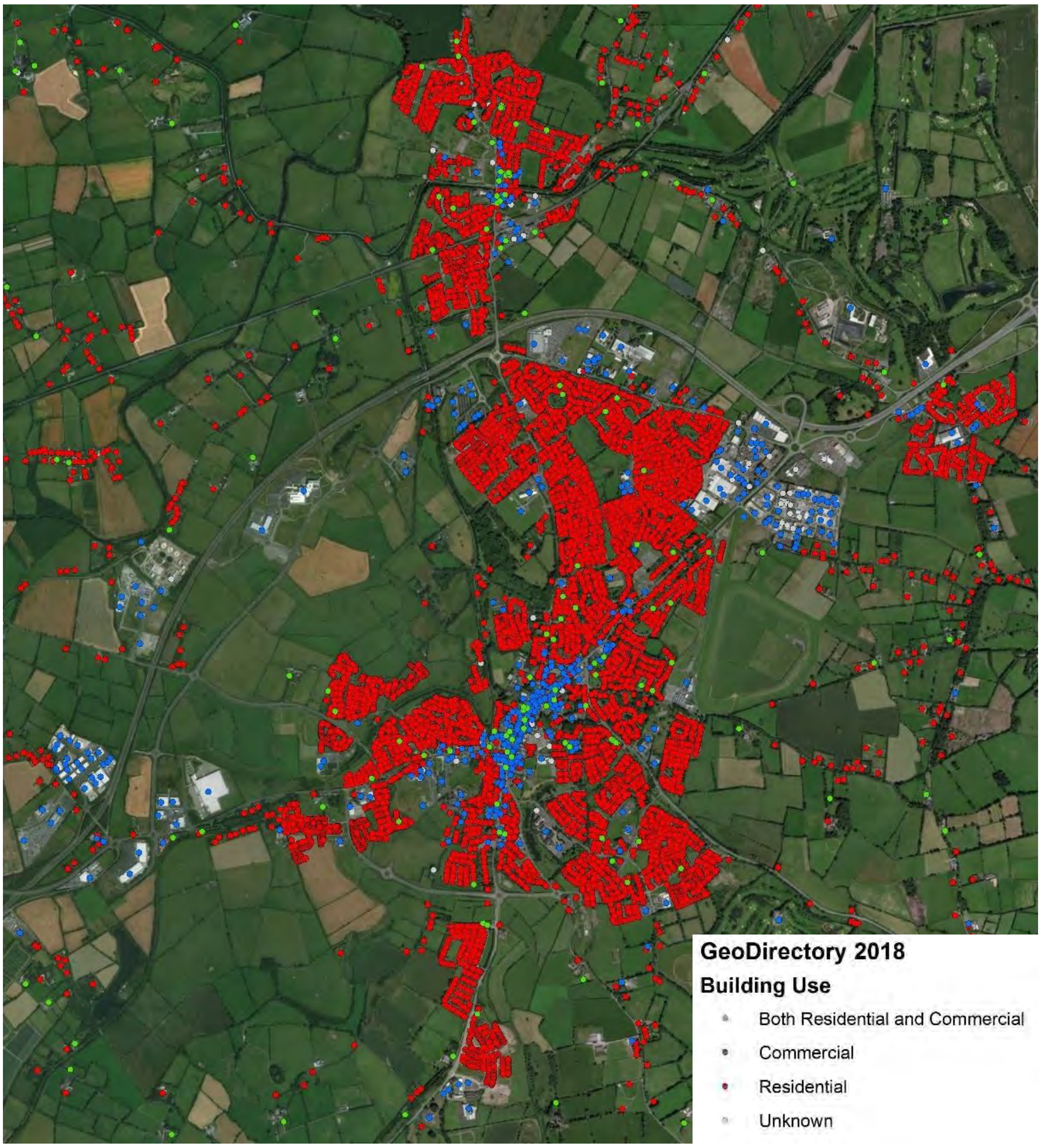


Figure 3.3: Residential and Commercial Buildings in Naas/Sallins (GeoDirectory, 2018)

Figure 3.4 shows the housing density in the study area according to the number of residential units per hectare (UPH). This highlights that residential densities are extremely low throughout Naas, with many areas containing less than 10 units per hectare. Low residential density has implications for the provision of local public transport as these densities are too low to provide enough patronage to support a frequent bus service. As a result, new bus routes intended to serve these areas would have to link with major trip producers/attracters like the hospital to be viable. The housing estates in the north of Naas near Monread Road have slightly higher housing densities than the rest of the town and there is one cluster of high density development in Sallins near the train station which is 50+ UPH.

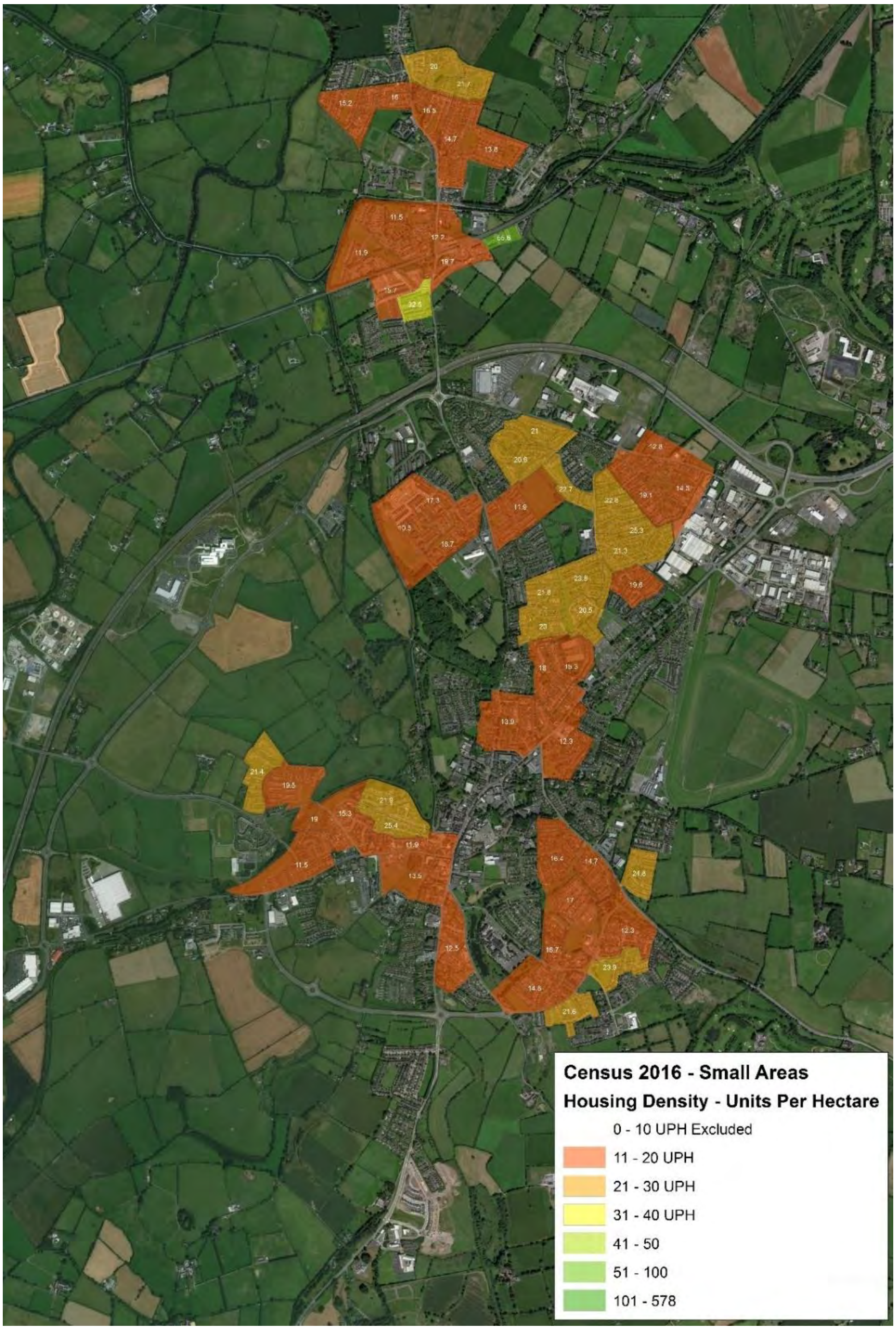


Figure 3.4: Census Small Areas (2016) – Housing Density

3.3 Job Density

Figure 3.5 shows the density of jobs throughout Naas and Sallins. In Sallins, there are a small amount of jobs in the centre of the village, but the settlement is primarily residential. In Naas, the highest job densities are focused in the centre of the town, the north-east and adjacent to the M7 corridor.

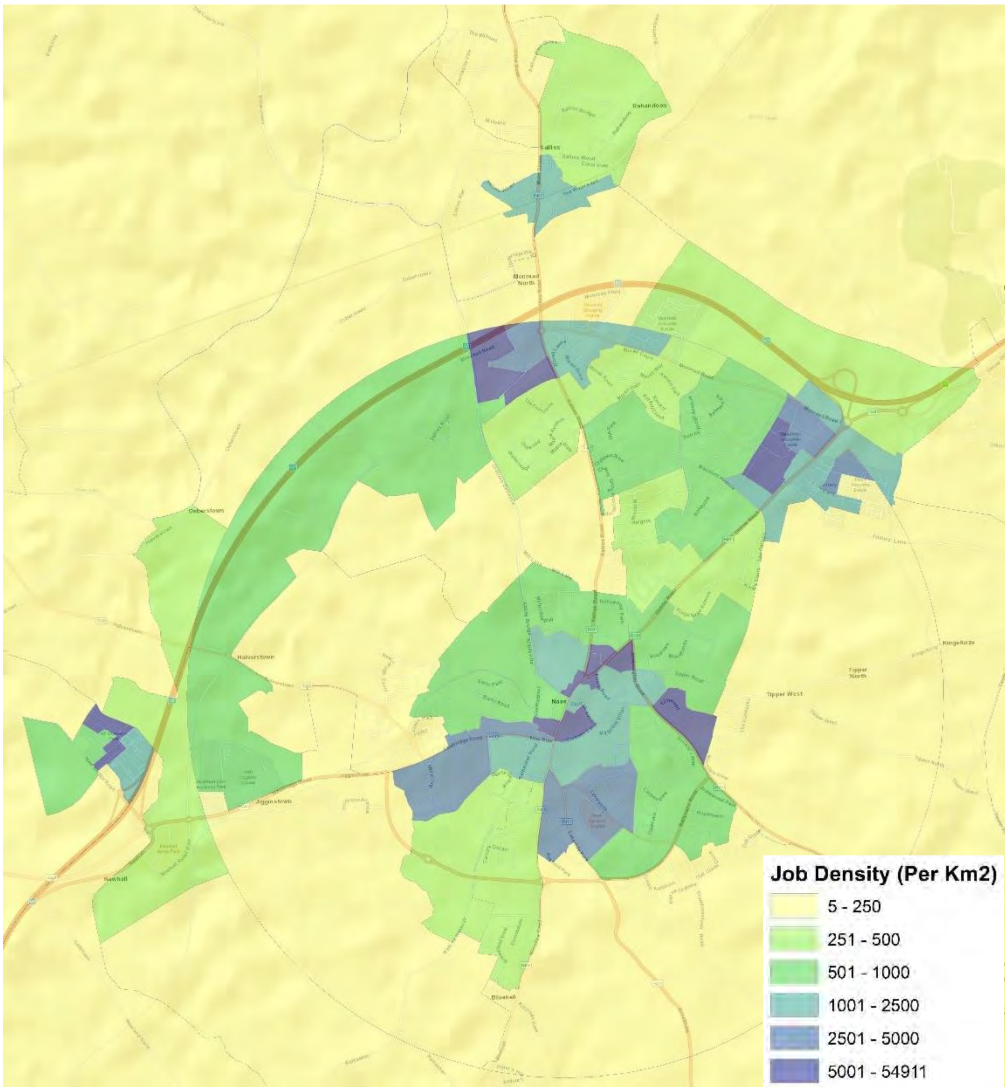


Figure 3.5: Census Workplace Zones (2016) – Number of Jobs Per Sq. KM

3.4 Deprivation Index

The Pobal Deprivation Index (2016) is used to determine the relative affluence or disadvantage of geographical areas in the study area. A map of the 2016 Pobal HP Deprivation Index at CSO Small Area level is shown in Figure 3.6. This shows that the majority of Naas and Sallins is marginally above average or affluent. There are pockets of marginally below average or disadvantaged areas across central and western Naas, as well as northern Sallins. However, overall the study area is not characterised by extreme disadvantage or affluence.

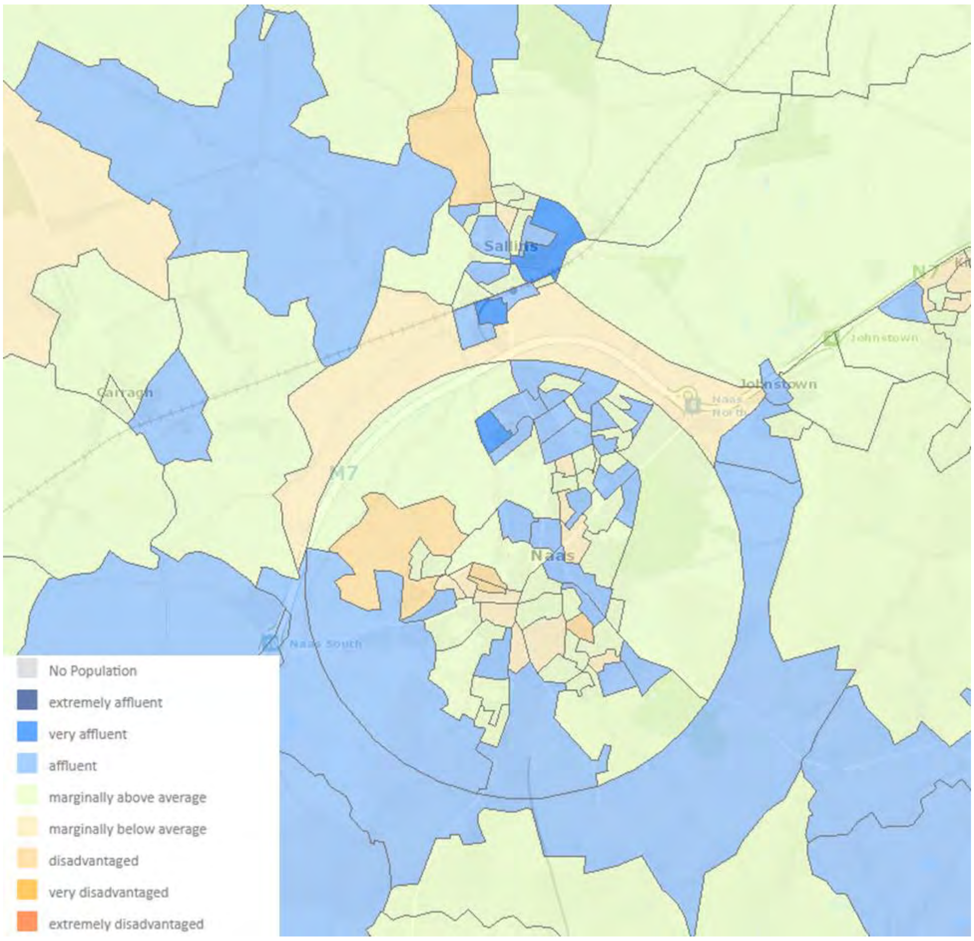


Figure 3.6: Pobal Deprivation Index 2016 – Naas and Sallins (CSO Small Areas)

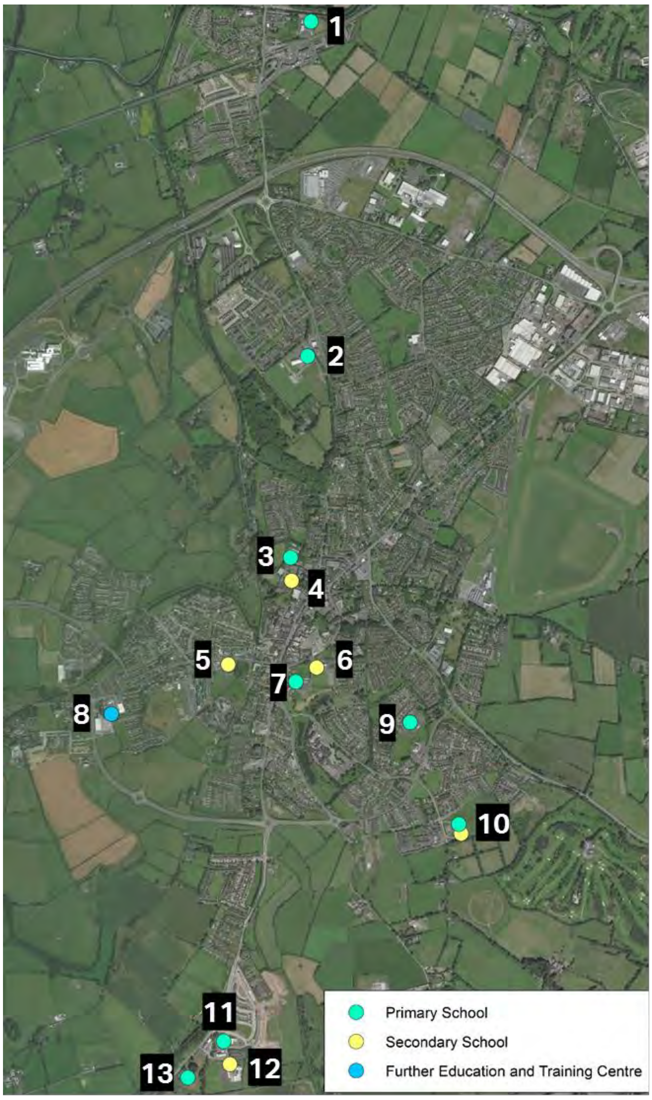
3.5 Schools and Education Facilities

Figure 3.7 shows the location of the primary schools, secondary schools and the third level training centre. Naas has seven primary schools which are spatially distributed fairly evenly throughout the town. Northern Naas has the fewest number of primary schools, but this area is relatively close to Sallins primary school.

Naas has four secondary schools located in the central and southern areas of the town. The lack of secondary school in Sallins or northern Naas is likely to limit the ability of pupils to walk to school as they have to make longer trips which are more suited to car or bus journeys. By late 2021, it is planned that Naas Community College secondary school will move from Craddockstown Road to Millennium Park in northern Naas and this will reduce trip distances for some pupils.

From a sustainable transport perspective, a critical issue is the recent development to the south of Naas of Gaelscoil Nás Na Ríogh, Piper's Hill College and St David's National School. The peripheral location of these schools means that many pupils will be travelling too far for walking to be an attractive transport option. As a result, in order to reduce car journeys to these schools it will be essential to ensure that both suitable bus services and safe and attractive cycling facilities are provided.

There is only one third level education facility within the study area; the further education and training centre in the west of Naas. This will mean that all third level students who attend university will travel from Naas to Maynooth, Dublin and other locations for education.



No.	Level	Name
1	Primary	St. Laurence's National School
2	Primary	Scoil Bhríde
3	Primary	Mercy Convent Primary School
4	Secondary	St Mary's College
5	Secondary	Gael Choláiste Chill Dara
6	Secondary	Meánscoil Iognáid Rís
7	Primary	St. Corban's Boys National School
8	Third Level	Naas Further Education and Training
9	Primary	Holy Child National School
10	Primary	Naas Community College
-	Secondary	Naas Community National School
11	Primary	Gaelscoil Nás Na Ríogh
12	Secondary	Piper's Hill College
13	Primary	St. David's National School

Figure 3.7: Location of Education Facilities in Naas and Sallins

4. Transport Context

4.1 Public Transport

4.1.1 Existing Public Transport

4.1.1.1 Destinations Served

There are a multitude of bus and rail services which provide access to Naas and Sallins. Table 4.1: provides an overview of the radial public transport routes to Naas and the connections they provide to the west and east. It should be noted that all local Bus Eireann services will change operator in late-2019 and will be run by Go-Ahead Ireland as a result of a competitive tendering process by the NTA[18].

Table 4.1: Summary of Destinations Served by Radial Naas Public Transport Services

Operator	Route	Westbound Destinations	Eastbound Destinations
Irish Rail	Dublin – Cork	Newbridge, Kildare, Portlaoise, Mallow, Cork	Hazelhatch & Celbridge, Dublin Heuston
-	Dublin – Limerick	N/A: No Services	N/A: No Services
-	Dublin – Waterford	Newbridge, Kildare, Carlow, Kilkenny, Waterford	Hazelhatch & Celbridge, Dublin Heuston
-	Dublin – Galway	Newbridge, Kildare, Tullamore, Athlone, Athenry, Galway	Hazelhatch & Celbridge, Dublin Heuston
-	Dublin - Portlaoise	Newbridge, Kildare, Portlaoise	Hazelhatch & Celbridge, Dublin Heuston, Dublin Connolly, Dublin Pearse, Grand Canal Dock
-	Limerick – Galway – Dublin	N/A: No Services	Dublin Heuston
Bus Eireann	124[19]	Newbridge, Kildare, Portlaoise	Dublin
-	126	Newbridge, Kildare	Dublin
-	130	Kilcullen, Athy	Dublin
Dublin Coach	726 (N7 Service)	Newbridge, Kildare, Portlaoise	Red Cow Luas, Dublin Airport
-	Kildare – Naas Supplementary Service	Newbridge, Kildare	N/A
Kyanitedale Ltd	826	Newbridge, Kildare, Monasterevin	N/A
JJ Kavanagh	737	N/A	Heuston Station, Dublin City Centre, Dublin Airport
-	717	Athy, Kilkenny, Clonmel	Red Cow Luas, Dublin City Centre, Dublin Airport
Bernard Kavanagh	817	Kilcullen, Athy, Kilkenny	Red Cow Luas, Dublin City Centre

[18] NTA press release on the transfer of Go-Ahead Ireland bus routes: https://www.nationaltransport.ie/news/nta-announces-preferred-bidder-for-bus-services-on-kildare-commuter-corridor/

[19] *Weekend Only Service*

As well as radial bus services, there are also a small number of orbital bus services (Table 4.2). Orbital bus routes are particularly important in Naas as they provide a vital link to the train station in Sallins, which is beyond walking distance for most residents.

Table 4.2: Summary of Destinations Served by Naas Orbital Public Transport Services

Operator	Route	Northbound Destinations	Southbound Destinations
JJ Kavanagh	139[20]	Sallins, Clane, Maynooth, Leixlip, Ongar, Blanchardstown	N/A
Kenneally's Bus	846	Sallins, Clane	N/A
Local Link	880	N/A	Kilcullen, Carlow

The location of radial bus and rail services in the town are shown in Figure 4.1. While there are many different radial bus routes, the service frequency provided by each route varies considerably. Northern areas of Naas have poor access to bus services compared to central and southern areas of the town. Figure 4.2 shows the orbital bus routes in Naas and this highlights the limited number of services in contrast with radial routes. In general, orbital bus routes are accessible to residents living along the central spine of the town, but the lack of routes means that residents living in the eastern or western periphery do not have access to an orbital bus service.

[20] *PSO Funded TFI Route*

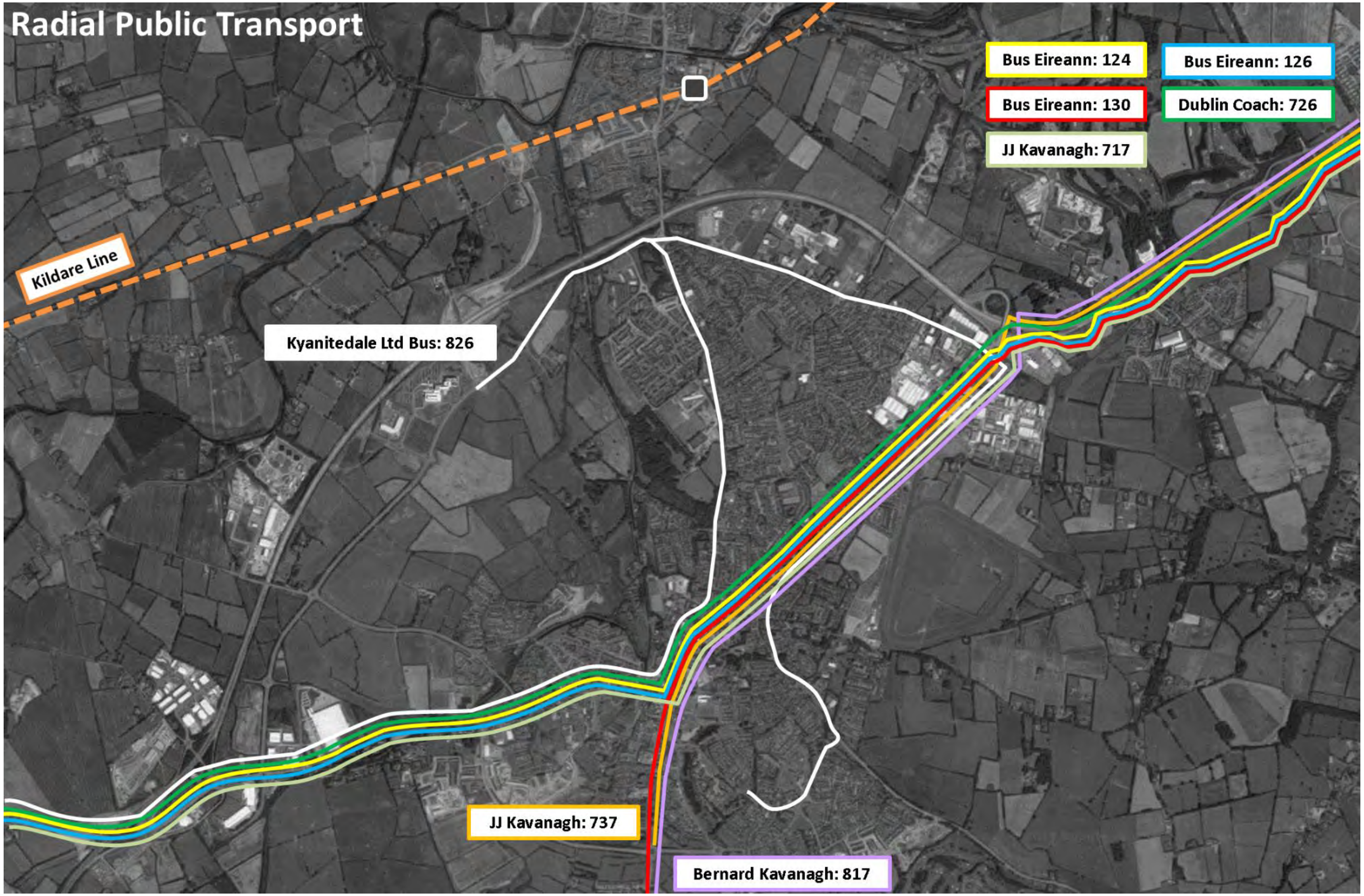


Figure 4.1: Location of Radial Bus Services in Naas and Sallins

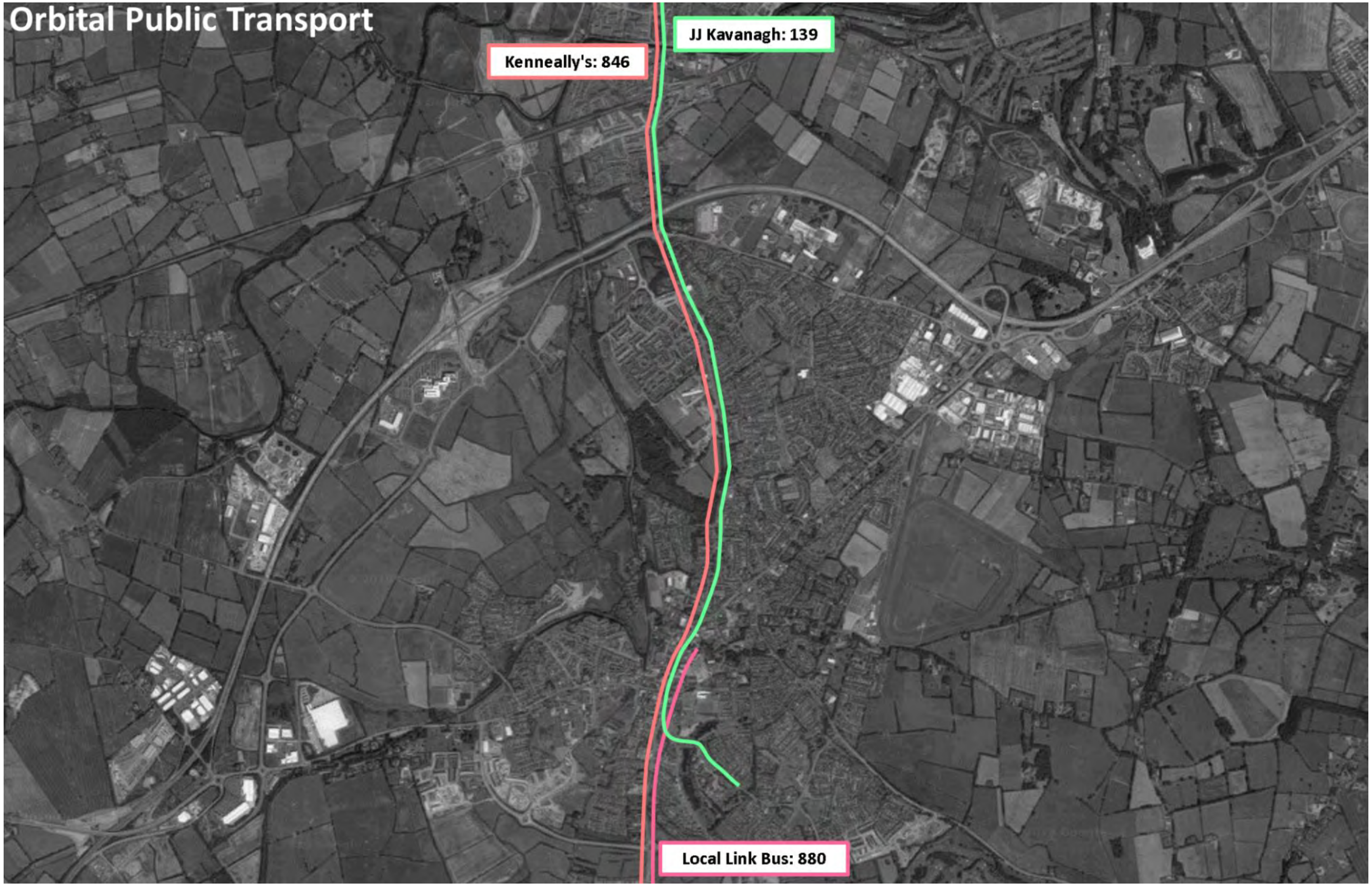


Figure 4.2: Location of Orbital Bus Services in Naas and Sallins

At present, the primary interchange for bus services is located on the main street next to the taxi rank where there are shelters, seats and real time information (Figure 4.3).

Figure 4.3: Bus Interchange Infrastructure on the Main Street

The quality of bus stops varies considerably across the town in comparison with the high quality interchange on the main street; with shelters and timetables being less common in non-central areas. Figure 4.4 shows an example of poor bus stop infrastructure on the R445 where a Bus Eireann stop does not have timetable information, a shelter or a footpath for pedestrians to reach it safely.

Figure 4.4: Example of Poor Bus Stop Infrastructure on R445

4.1.1.2 Rail Services

In relation to rail services, Sallins and Naas station is located on the major western rail commuter corridor which connects Dublin to the regional cities (Figure 4.5). Inbound services are primarily to Heuston station, which connects to the Luas red line for transfer into the city centre, but there are an increasing number of train services which connect with Connolly, Tara Street and Grand Canal Dock in the city centre via the Phoenix Park Tunnel. Sallins and Naas train station is in the Short Hop Zone which allows passengers to avail of cheaper rail fares.

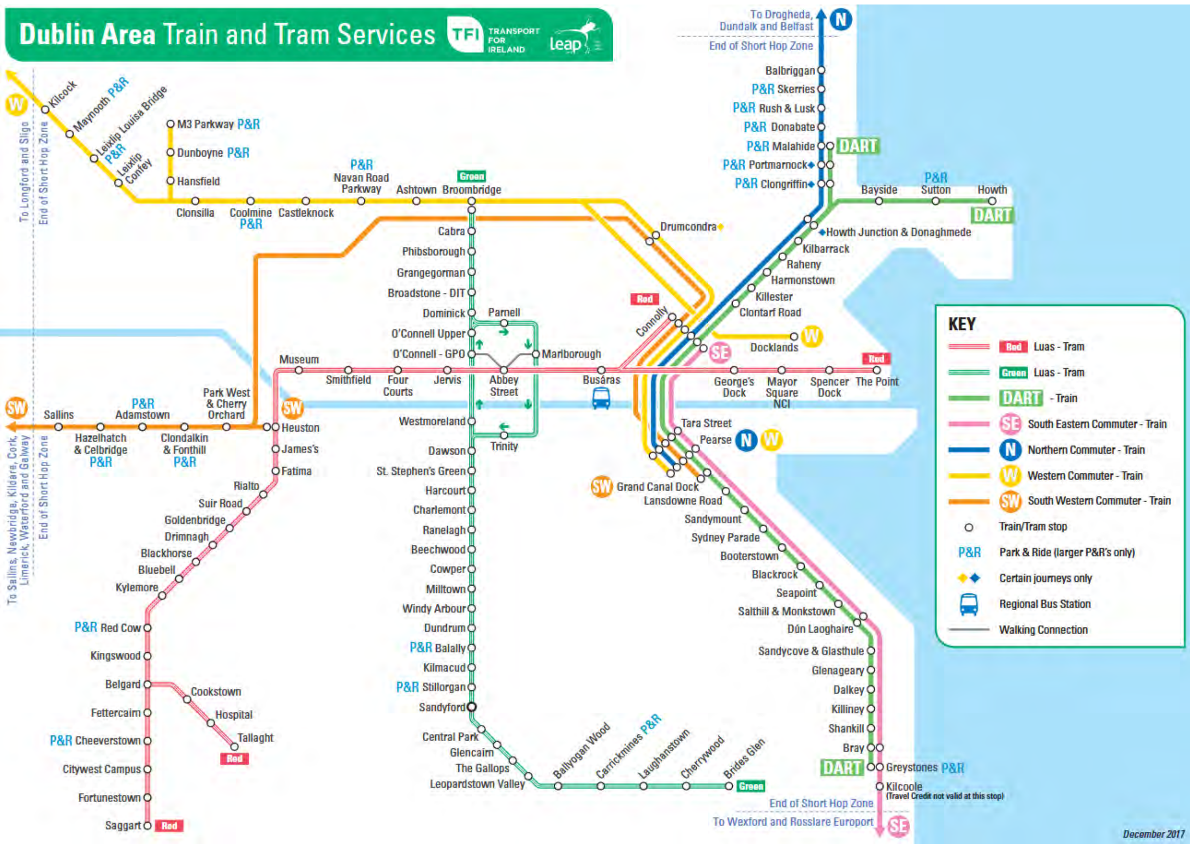


Figure 4.5: Dublin Area Light and Heavy Rail Network (Transport for Ireland)

In 2017, the National Heavy Rail Census recorded that 1,783 people boarded a train per day at Sallins & Naas station which is a dramatic increase on the 916 people who boarded in 2012. In respect to alightings, 1,394 people alighted at Sallins & Naas station per day in 2017, increasing from 943 people in 2012. Travel demand will have been growing along the rail corridor as employment levels increase but a major contributory factor which has increased demand on the Kildare line in recent years has been the introduction of Phoenix Park Tunnel and direct services to Dublin City Centre. A profile of the increase in demand on the Kildare line between 2016-2017, partly as a result of the opening of the Phoenix Park Tunnel, is shown in Figure 4.6.

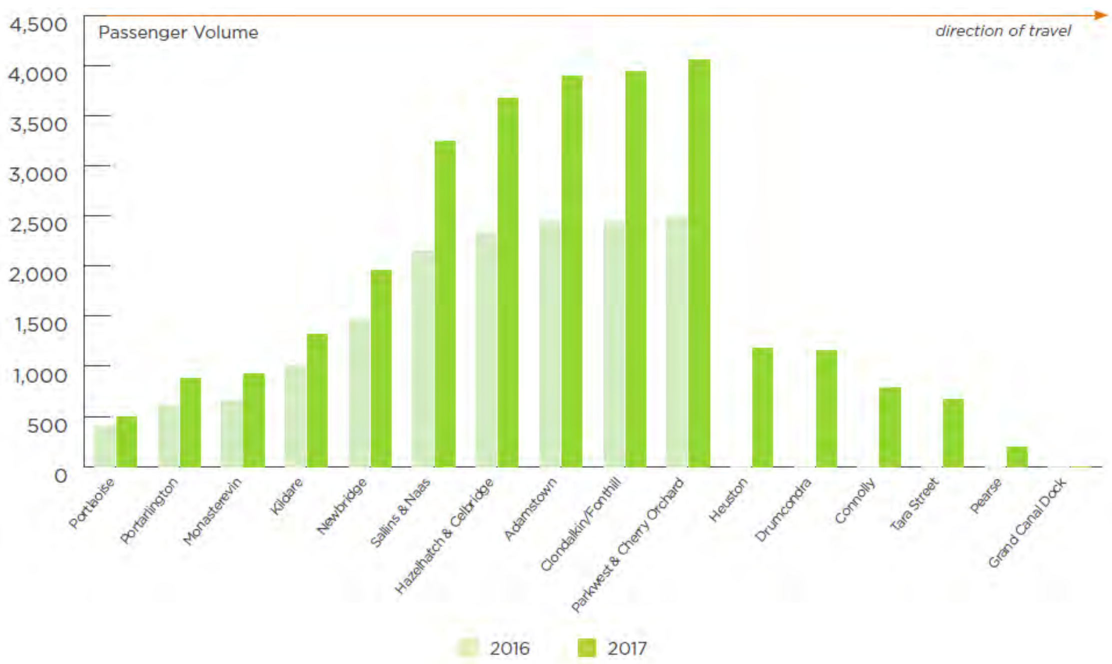
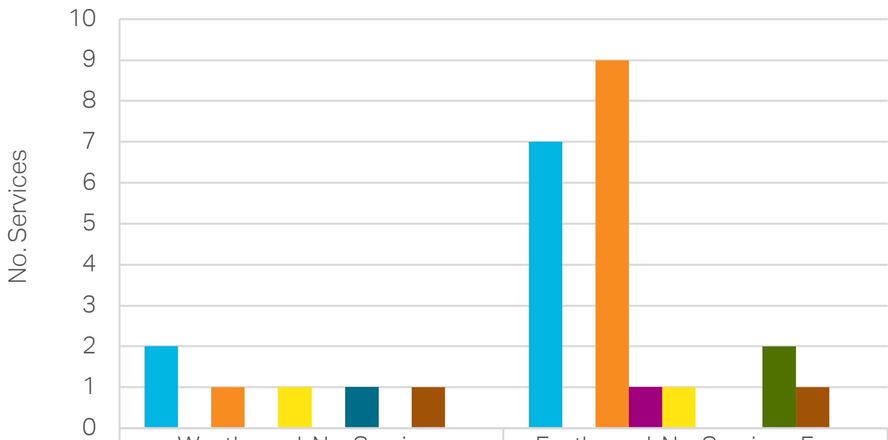


Figure 4.6: Profile of Demand by Station on the Kildare Line - Eastbound (Heavy Rail Census, 2017)

4.1.1.3 Frequency of Services

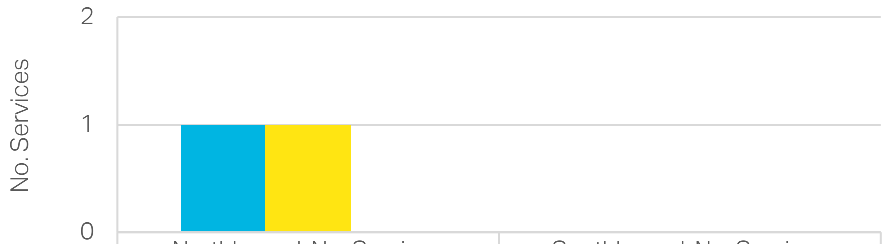
Figure 4.7 provides a summary of the frequency of radial public transport services in the 7am-8am morning peak. This highlights that Bus Eireann Route 126 is the highest frequency public transport service in the direction of Dublin with rail providing the second highest frequency service. In the westbound direction, bus and rail services are much less frequent with only 1-2 services in the peak hour.



	Westbound: No. Services From Naas: 7-8am	Eastbound: No. Services From Naas: 7-8am
All Trains	2	7
BE: 124	0	0
BE: 126	1	9
BE: 130	0	1
DC: 726 (N7 Service)	1	1
DC: Kildare Service	0	0
Kyan: 826	1	0
JJ:737	0	2
JJ: 717	1	1
BK: 817	0	0

Figure 4.7: Frequency of Radial Public Transport Services

Figure 4.8 provides a summary of the frequency of orbital public transport services in the 7am-8am morning peak. Compared to radial public transport, the orbital routes are very low frequency. Critically in the morning peak; there are only two bus services linking Naas with the train station in Sallins even though there are 7 train departures in the same period. The two bus services to the station also leave Naas at the same time around 7am, meaning that bus services to the station do not operate during most of the 7am-8am period.



	Northbound: No. Services From Naas: 7-8am	Southbound: No. Services From Naas: 7-8am
JJ: 139	1	0
Ken: 846	1	0
LL: 880	0	0

Figure 4.8: Frequency of Orbital Public Transport Services

4.1.2 Planned Public Transport Changes

The National Development Plan (2018-2027) states that the railway will be converted to diesel/electric as far as Celbridge as part of the DART expansion programme by 2027 with additional fleet capacity throughout the network (Figure 4.9). Electrification will significantly improve the speed of train services in the direction of Naas/Sallins and reduce noise/air pollution. It can be expected that integration into the DART network will result in higher frequencies to match the current 10 minute peak frequency. At present, it is not planned that the DART network will be extended beyond Celbridge to Sallins/Naas.

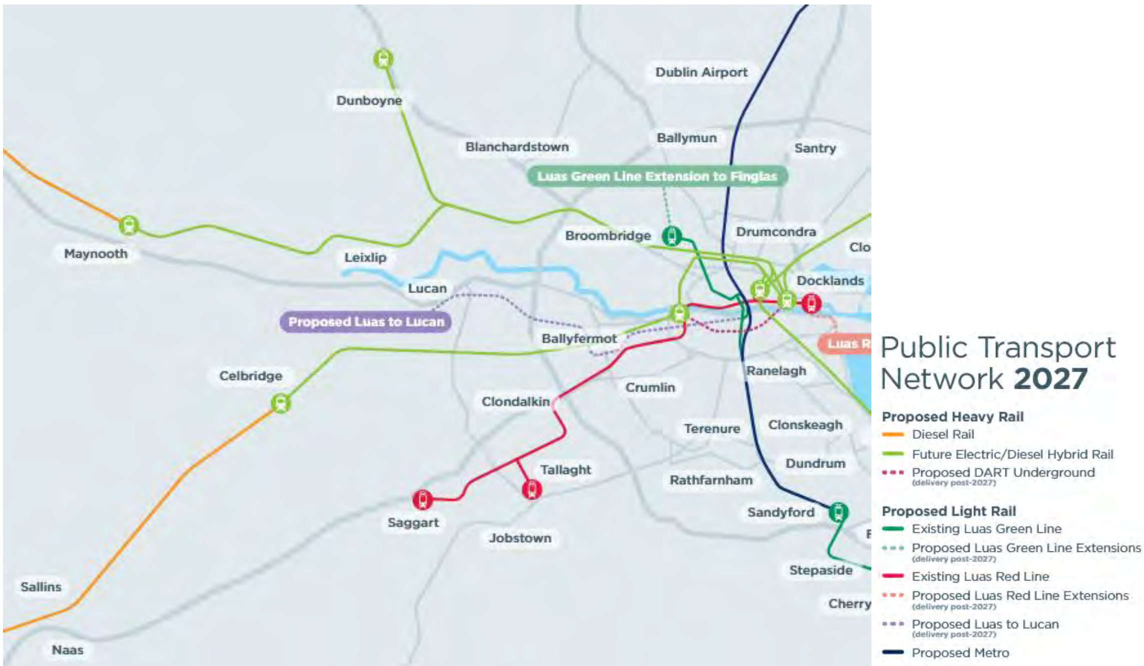


Figure 4.9: National Development Plan (2018-2027) Planned Rail Infrastructure

Figure 4.10 shows the future heavy rail network in Dublin city centre as a result of the DART expansion programme. The new stations planned for Heuston West, Cabra and Glasnevin will greatly improve the service on the Kildare railway line and integrate it with the rest of the DART network. This will mean that rail passengers from Kildare will be able to access three stations in the north inner city by travelling via the Phoenix Park Tunnel to Connolly without need to transfer at Heuston station. However, the NDP states that the electrification of the railway line will cease at Celbridge, which means that passengers from Naas will have to travel on diesel trains and change onto the DART to access these locations.

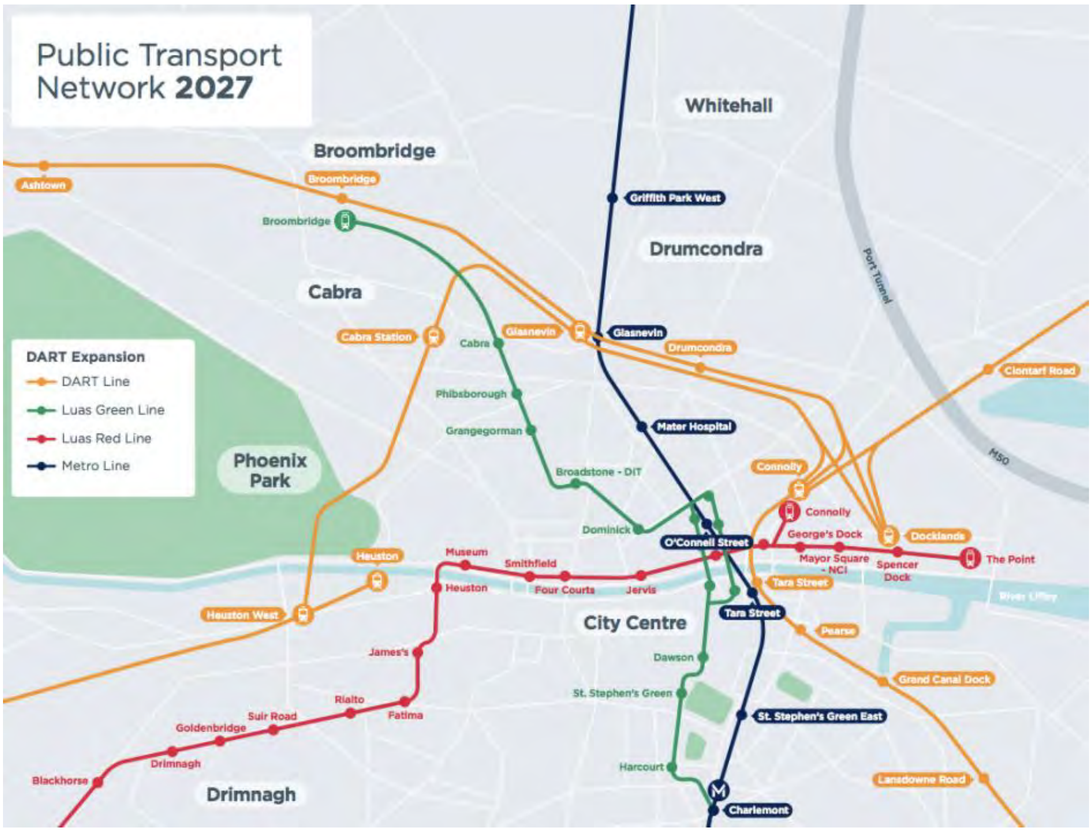


Figure 4.10: DART Expansion in Dublin City Centre[21]

The BusConnects programme will redesign the urban bus network in Dublin and introduce greater bus priority, modern ticketing and other innovations. The redesigned urban bus network will not extend as far as Naas, but accessibility from train stations along the Kildare line will increase with the introduction of greater orbital bus services e.g. the W8 service linking Hazelhatch & Celbridge station with Maynooth, Saggart and Tallaght. This will allow rail passengers from Naas to transfer onto orbital services and access a greater number of locations in the Greater Dublin Area.

[21] https://www.nationaltransport.ie/transport-investment/dart-expansion/

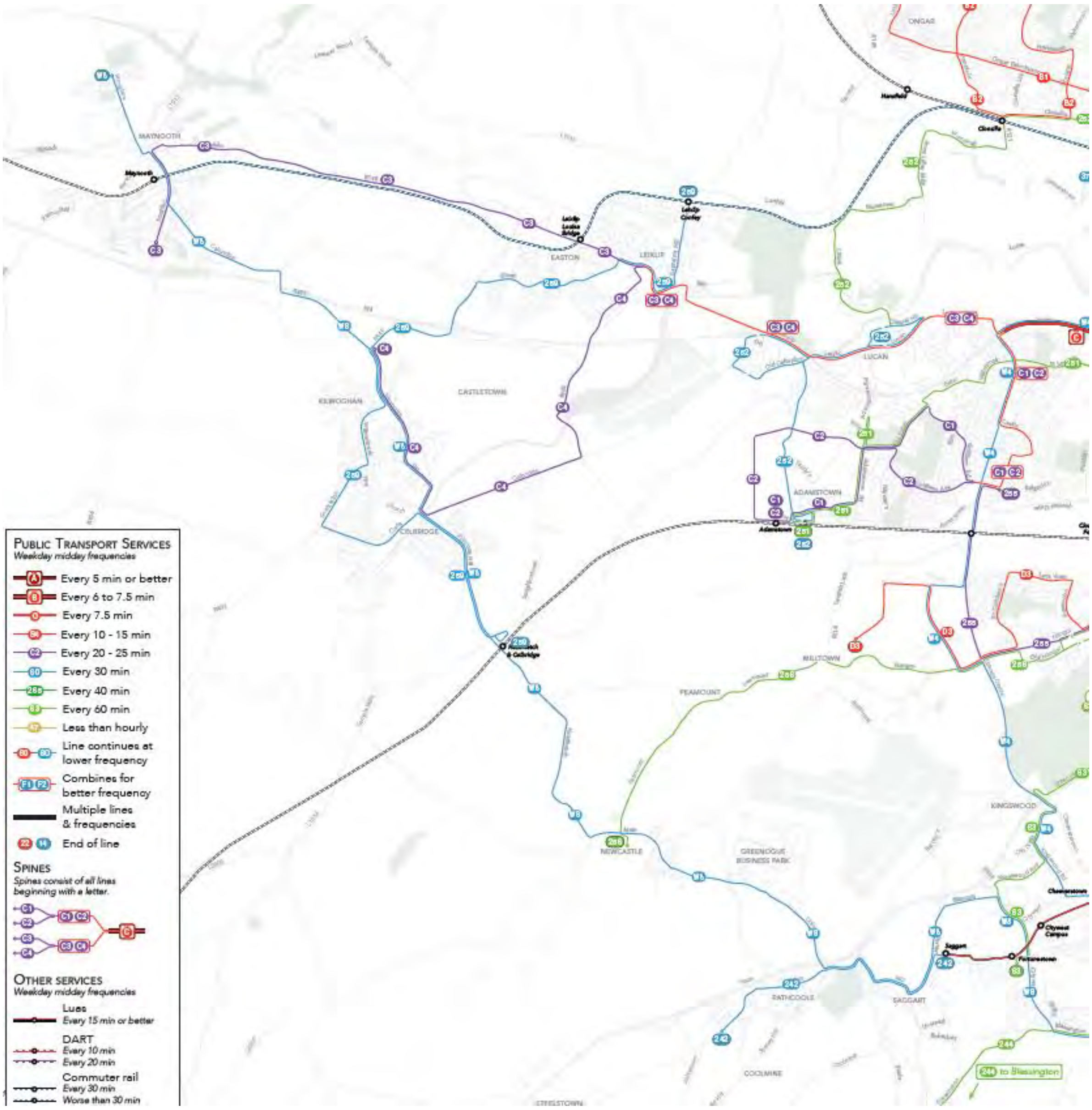


Figure 4.11: Proposed Draft BusConnects Network in West Dublin and Kildare

4.2 Road Network

The major roads in Naas and Sallins are shown in Figure 4.12. The main east-west access road through Naas is the R445, Dublin/Newbridge Road, along with the R409 in the west of the town. The main north-south access is provided by the R407, Sallins Road, and the R448, Kilcullen Road, which is the only link road between Naas and Sallins prior to the completion of the Sallins bypass in 2020. The primary orbital distributor roads in Naas are the R447 south ring, the Millennium Park Road in the north-west and the Monread Road in the north-east. Both Naas and Sallins have access to the M7 motorway from Junction 9 in the east and Junction 10 in the west. As part of the Sallins bypass, a new M7 junction will be created between junction 9 and 10, which will enhance access to the motorway from Sallins and Naas.

The main approach roads, town centre links and orbital roads are described in far greater detail with photos in the road network survey of walking and cycling facilities in Section 6.2.

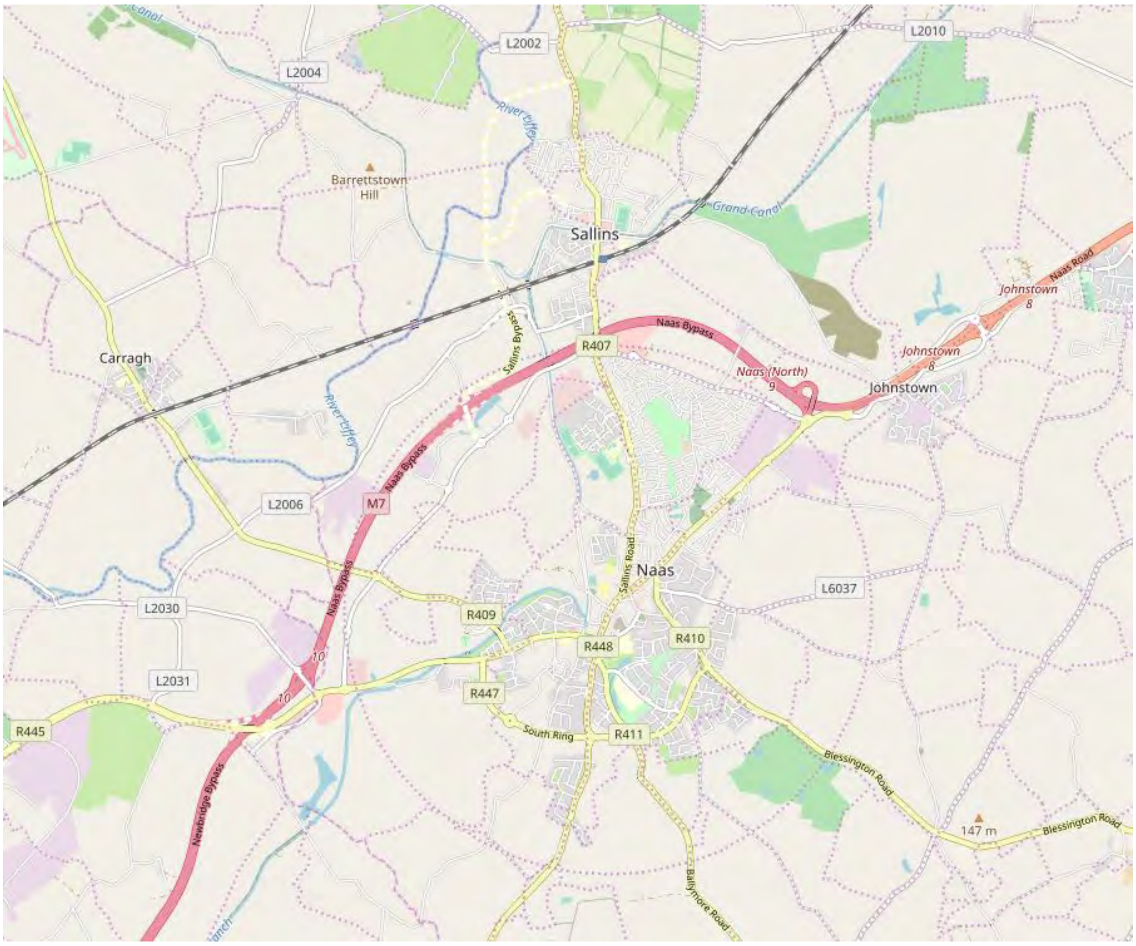


Figure 4.12: Major Roads in Naas and Sallins

4.3 Collisions

Figure 4.13 shows the Road Safety Authority (RSA) database of collisions in Naas and Sallins during 2008-2016. Collision severity is divided by the RSA into; fatal, serious and minor collisions.

In respect to fatal collisions, there have been 3 fatal collisions in central Naas on the R445 and R448; two of which involved a pedestrian. In Sallins, there has been one fatal collision in Sallins on the R407 between a car and a pedestrian.

There have been 9 serious collisions on urban roads in Naas during the 2008-2016 period covered by the RSA data. Notably, seven of these serious collisions took place in 2016 and this suggests that road safety is declining. The three town centre serious collisions, which occurred on the R445/448, and all involved a pedestrian striking a car or goods vehicle. There have been four collisions on, or near, the R409 corridor, consisting of; a junction incident, a housing estate collision, a roundabout collision and a collision near K Leisure. All of these collisions, with the exception of the K Leisure collision, involved a collision between a motor vehicle and a cyclist. In the case of the collision in the Radharc An Chaislean housing estate; this involved the injury of a child. On the outskirts of Naas, there have been a serious collision on the M7 mainline near Junction 10 in 2014 which involved a motorbike.

In Sallins, there was a serious collision between a car and pedestrian on Hunters Wood, a housing estate road off the R407. Throughout the study area there have been numerous minor collisions, which are clustered in the following locations: on the Naas bypass, the R407 through Sallins and the R445/R448 through central Naas.

In addition to the RSA data, in recent years there have been some high profile collisions which should be noted. In 2017, a 16 year old was killed when he was struck by a vehicle when crossing the road outside the Castlefen estate in northern Sallins. In 2018, there was a serious collision between a car and a pedestrian on Canal Bridge in Osberstown, just south of Sallins.

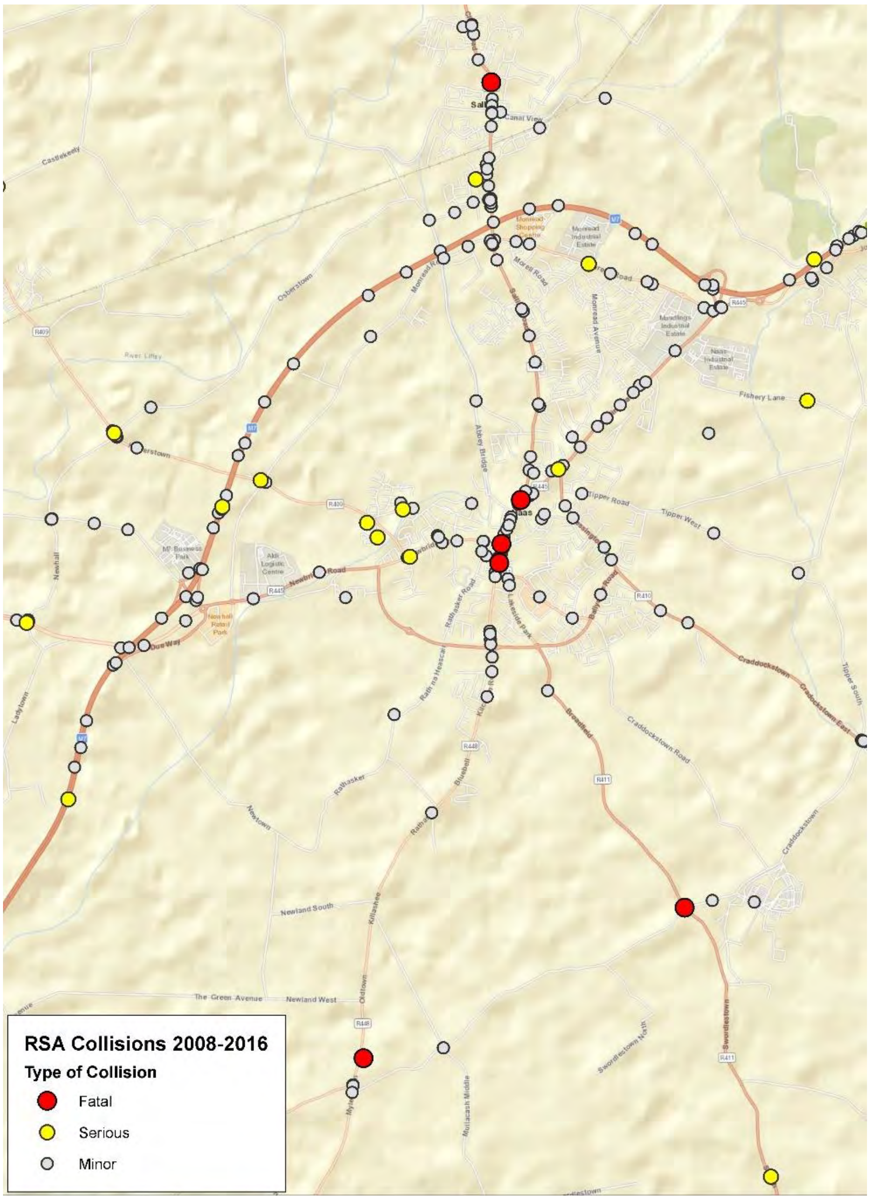


Figure 4.13: RSA Collisions 2008 – 2016 in Naas and Sallins

Figure 4.14 shows the RSA collisions in central Naas and this highlights a clear relationship between serious/fatal collisions occurring at, or near, major road junctions. In response to this, it will be important to consider whether new crossing points or improvements to existing infrastructure are required to create a safe urban environment.

Figure 4.14: RSA Collisions 2008 – 2016 in Naas Town Centre

4.4 Modal Split

4.4.1 Work Trips

Figure 4.15 shows the modal split for work trips by Naas residents. This highlights that Naas residents are highly car dependent with 77.5% of commuters travelling by private car. Public transport use is relatively low with only 4.2% and 3.5% using bus and rail respectively. The percentage for active modes is quite high with 9.6% walking and 2.6% cycling to work, this most likely reflects the fact that Naas is a large urban centre with a mixture of land-uses which encourage shorter trips.

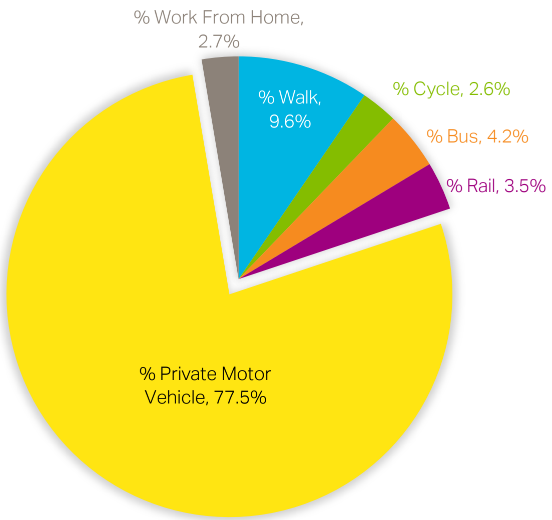


Figure 4.15: Naas Modal Split – Work Trips

Figure 4.16 shows the modal split for work trips by Sallins residents. Car dependency is slightly higher (78.6%) than in Naas and there is a lower percentage for active modes; reflecting the smaller number of local jobs in Sallins. Due to the proximity of the rail station, the percentage of trips by rail is far higher than Naas (12.3%) and this is the primary mode of public transport.

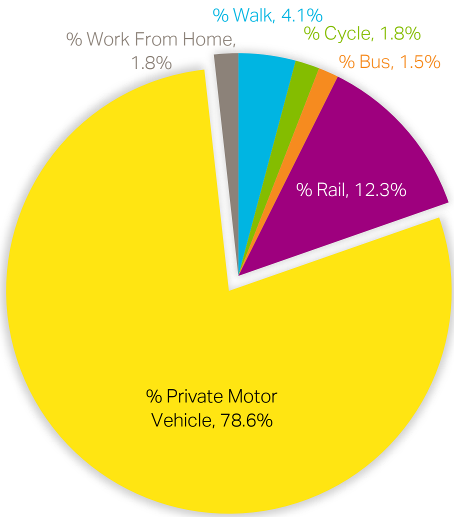
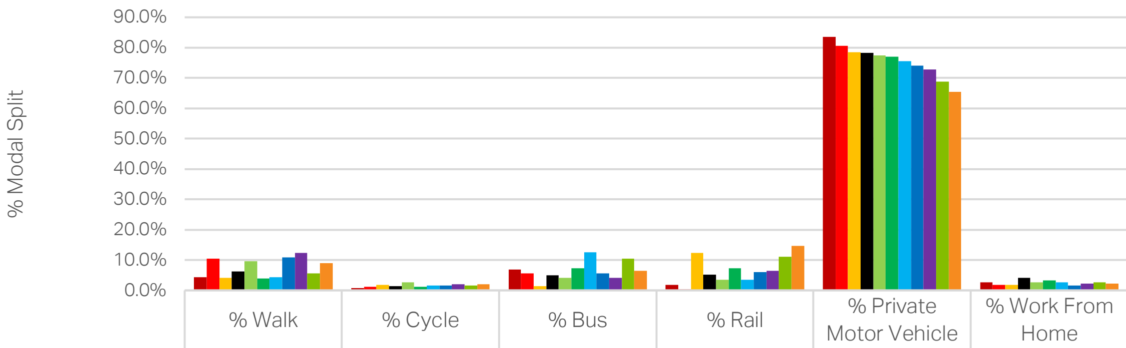


Figure 4.16: Sallins Modal Split – Work Trips

Figure 4.17 compares the modal split for work trips in Naas and Sallins with the county average and other similar urban centres across the Greater Dublin Area. The levels of car use are slightly below the county average in Naas and above average in Sallins. In general, the amount of sustainable travel in Naas/Sallins is quite low in comparison with other Kildare towns, such as Maynooth which has much lower levels of car dependency (65.5%), primarily due to its city centre (Connolly) rail service and its access to the Dublin Bus network. Notably, Sallins has the second highest modal share for rail out of the comparison towns but both Naas and Sallins perform poorly in relation to bus modal share. The relatively high levels of walking observed in Naas are comparable to the results in similar sized towns such as Navan or Newbridge.



	% Walk	% Cycle	% Bus	% Rail	% Private Motor Vehicle	% Work From Home
Clane	4.4%	0.7%	6.9%	1.8%	83.6%	2.6%
Navan	10.4%	1.2%	5.5%	0.3%	80.7%	1.9%
Sallins	4.1%	1.8%	1.5%	12.3%	78.6%	1.8%
County Kildare	6.2%	1.4%	5.0%	5.2%	78.2%	4.1%
Naas	9.6%	2.6%	4.2%	3.5%	77.5%	2.7%
Dunboyne	3.8%	1.3%	7.2%	7.3%	77.0%	3.3%
Celbridge	4.3%	1.5%	12.5%	3.4%	75.6%	2.6%
Kildare Town	11.0%	1.7%	5.6%	6.0%	74.1%	1.6%
Newbridge	12.3%	1.9%	4.2%	6.4%	72.8%	2.3%
Leixlip	5.7%	1.5%	10.4%	11.0%	68.8%	2.6%
Maynooth	9.1%	2.0%	6.5%	14.6%	65.5%	2.3%

Figure 4.17: Modal Split Comparison – Work Trips

4.4.2 Education Trips

Figure 4.18 shows the modal split for education (school and college) trips by Naas residents. This shows that the primary mode of travel for education trips is the private motor vehicle (48.6%), followed by walking (30.6%) and bus (16.9%). Very few students use rail or cycling to reach education facilities.

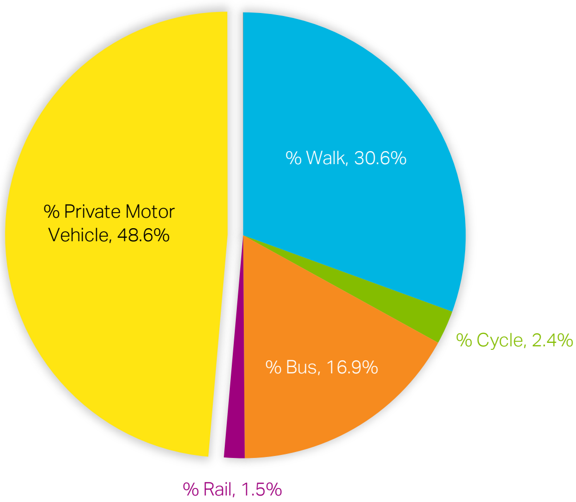


Figure 4.18 Naas Modal Split – Education Trips

Figure 4.20 shows the modal split for education (school and college) trips by Sallins residents. While the private motor vehicle is still the primary mode of transport for education trips (36.4%) its modal share is significantly lower than Naas as a higher percentage travel by bus or rail.

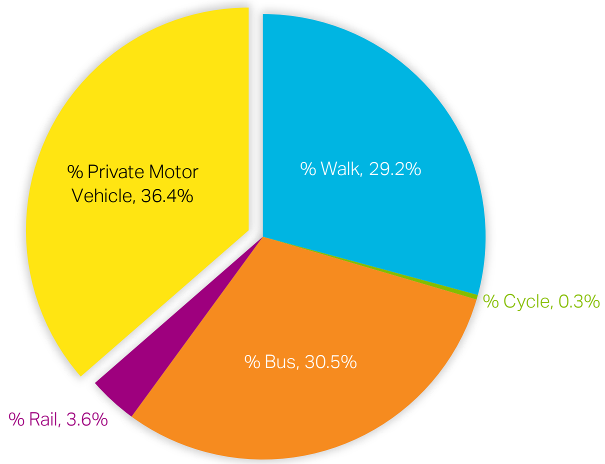
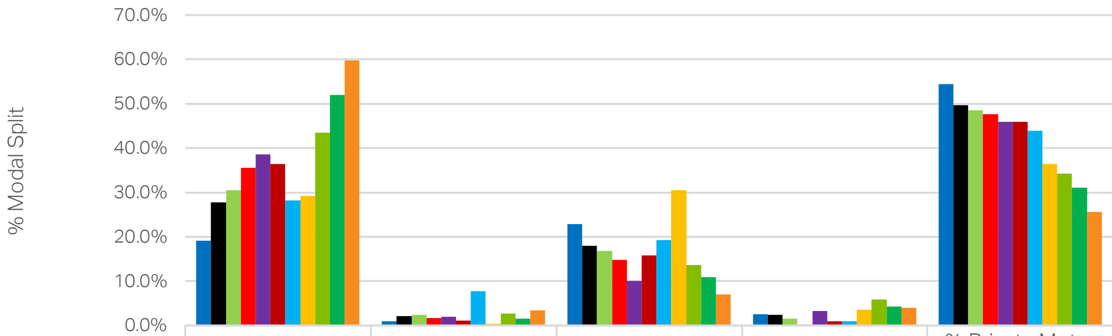


Figure 4.19: Sallins Modal Split – Education Trips

Figure 4.20 compares the modal split for education trips in Naas/Sallins with other similar urban centres in the Greater Dublin Area. Car use is slightly lower than the county average in Naas, but it remains very high in comparison to Leixlip, Maynooth or Dunboyne where there is a much higher percentage of walkers. Of the comparison towns, Sallins has the highest level of bus travel for education trips, possibly reflecting the lack of local secondary school. Other towns have similarly low levels of cycling and rail travel for education trips.



	% Walk	% Cycle	% Bus	% Rail	% Private Motor Vehicle
Kildare Town	19.2%	0.9%	22.9%	2.6%	54.4%
County Kildare	27.8%	2.1%	18.0%	2.3%	49.7%
Naas	30.6%	2.4%	16.9%	1.5%	48.6%
Navan	35.6%	1.7%	14.8%	0.2%	47.7%
Newbridge	38.6%	2.0%	10.0%	3.3%	46.0%
Clane	36.4%	1.1%	15.8%	0.9%	45.9%
Celbridge	28.1%	7.7%	19.2%	0.9%	44.0%
Sallins	29.2%	0.3%	30.5%	3.6%	36.4%
Leixlip	43.5%	2.7%	13.6%	5.9%	34.2%
Dunboyne	52.0%	1.6%	11.0%	4.3%	31.2%
Maynooth	59.8%	3.4%	7.0%	4.0%	25.6%

Figure 4.20: Modal Split Comparison – Education Trips

4.5 Origin-Destination Analysis

The Place of Work, School or College - Census of Anonymised Records (POWSCAR, 2016) dataset was used to assess the origin and destinations of trips to and from the study area.

4.5.1 Trips from Naas and Sallins

4.5.1.1 Work Trip Destinations

Figure 4.21 shows the work destinations for residents of Naas and Sallins across all travel modes. This highlights that are a large volume of work trips which are internal to Naas or its immediate surrounds and to nearby Newbridge in the west. In respect to Dublin, the clearest concentration of work trips is to Dublin city centre and outer suburban locations near the M50 such as Sandyford, Blanchardstown or Tallaght.

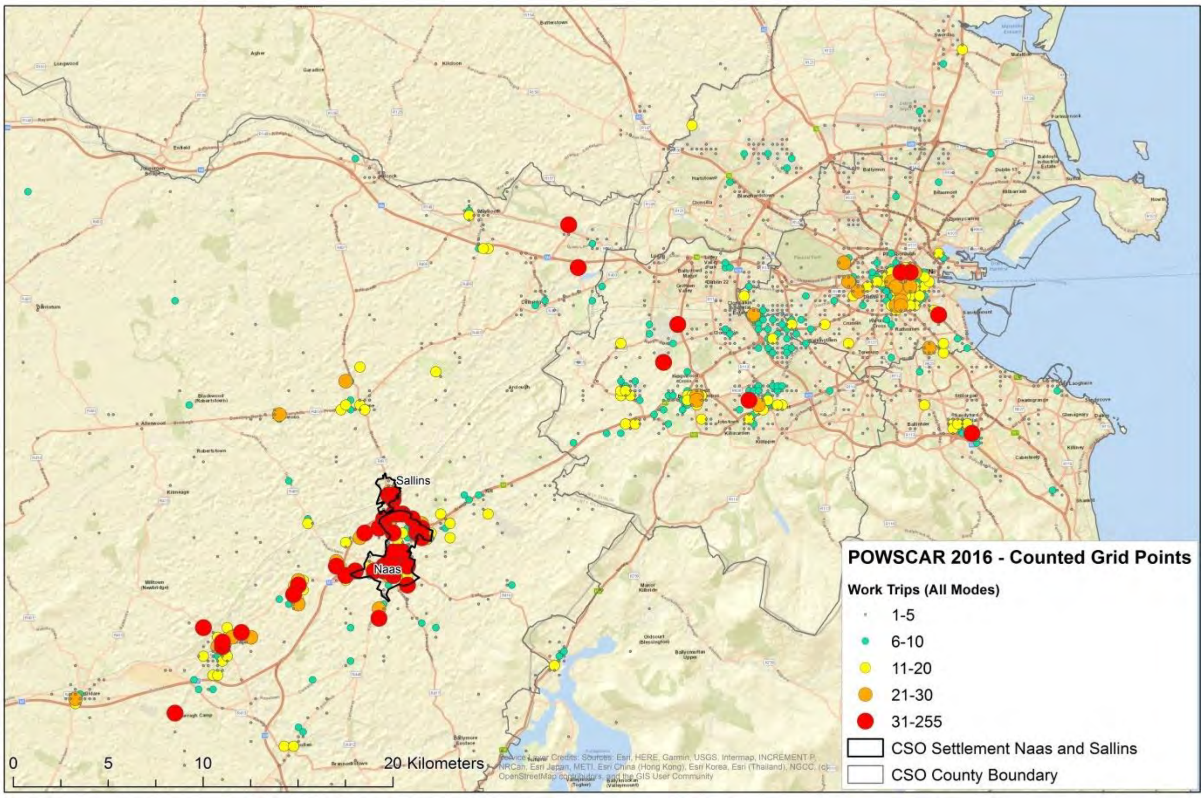


Figure 4.21: Destination of Work Trips from Naas and Sallins (CSO Settlements - POWSCAR, 2016)

4.5.1.2 Education Trips Destinations

Figure 4.22 shows the education destinations for residents of Naas and Sallins across all travel modes. This highlights that most school trips are internal to Naas and Sallins. Outside the local area, there are several concentrations of education destinations which represent third level institutions such as; Maynooth, Trinity College Dublin, University College Dublin and Dublin City University.

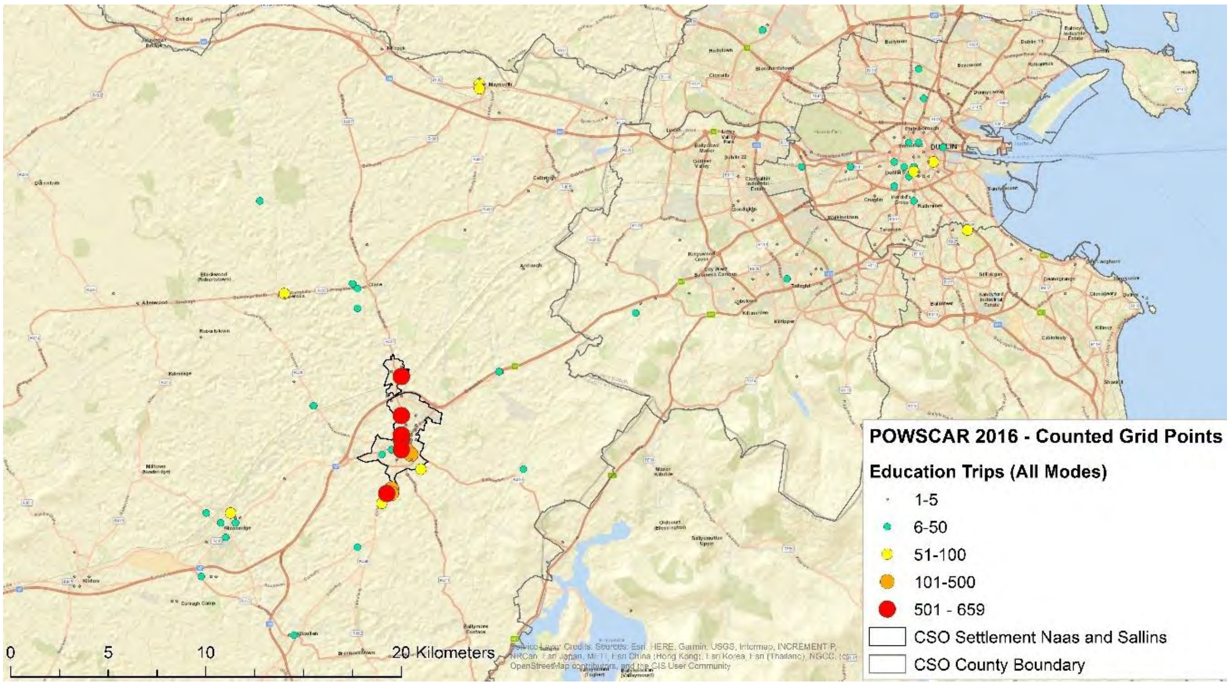


Figure 4.22: Destination of Education Trips from Naas and Sallins (CSO Settlements - POWSCAR, 2016)

4.5.2 Trips to Naas and Sallins

4.5.2.1 Work Trips

Figure 4.23 shows the origin of work trips to the Naas electoral divisions from other locations in the Greater Dublin Area. This highlights that Naas has a relatively large employment catchment which is primarily focused along the M7 corridor but extends into Dublin, Wicklow, Laois and Meath.

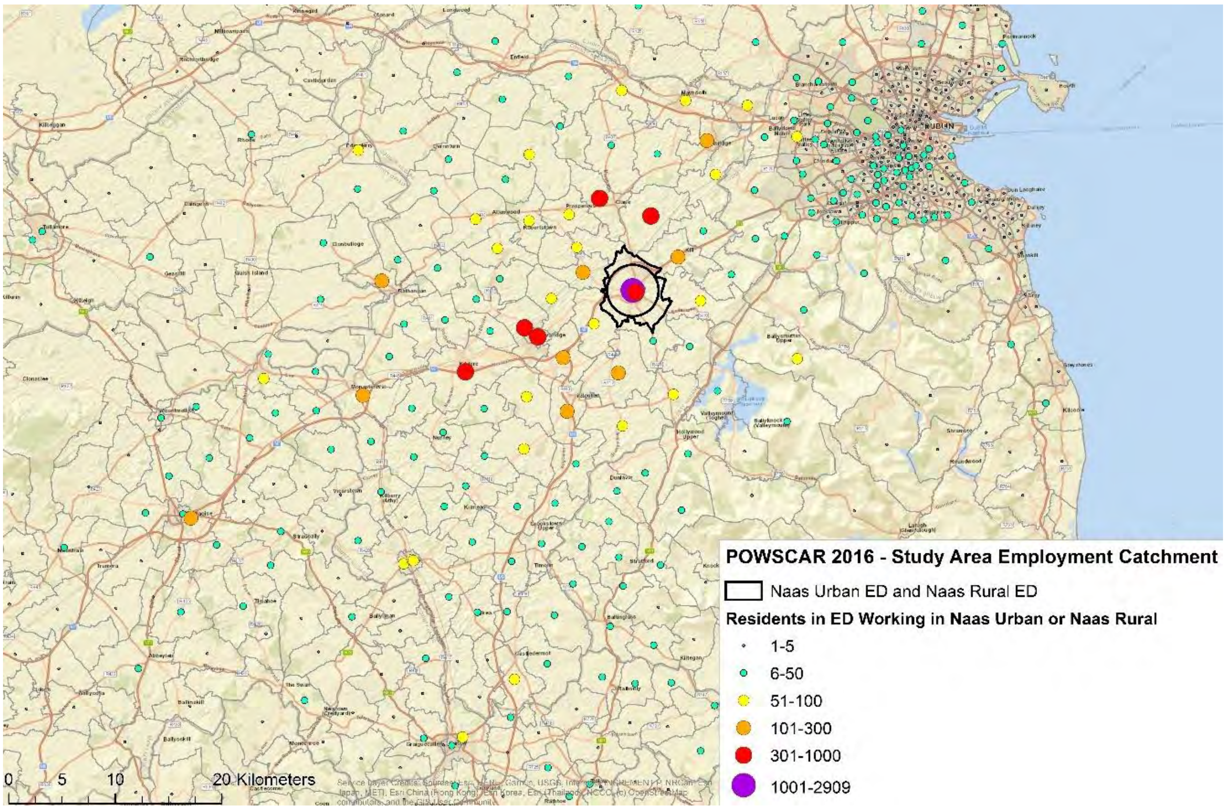


Figure 4.23: Origin of Work Trips to Naas Electoral Divisions (POWSCAR, 2016)

Figure 4.24 shows the main employment destinations within the Naas and Sallins study area. This highlights that the largest concentration of jobs is located in central and northern Naas along with locations in adjacent to M7 junctions. Sallins attracts few employment trips in comparison to Naas.

According to the POWSCAR data, key employment trip attractors across the study area include: Naas General Hospital, the town centre, Kildare County Council Offices, Maudlins Industrial Estate on the R445, Tesco Extra retail park on Monread Road and the Millennium Business Park.

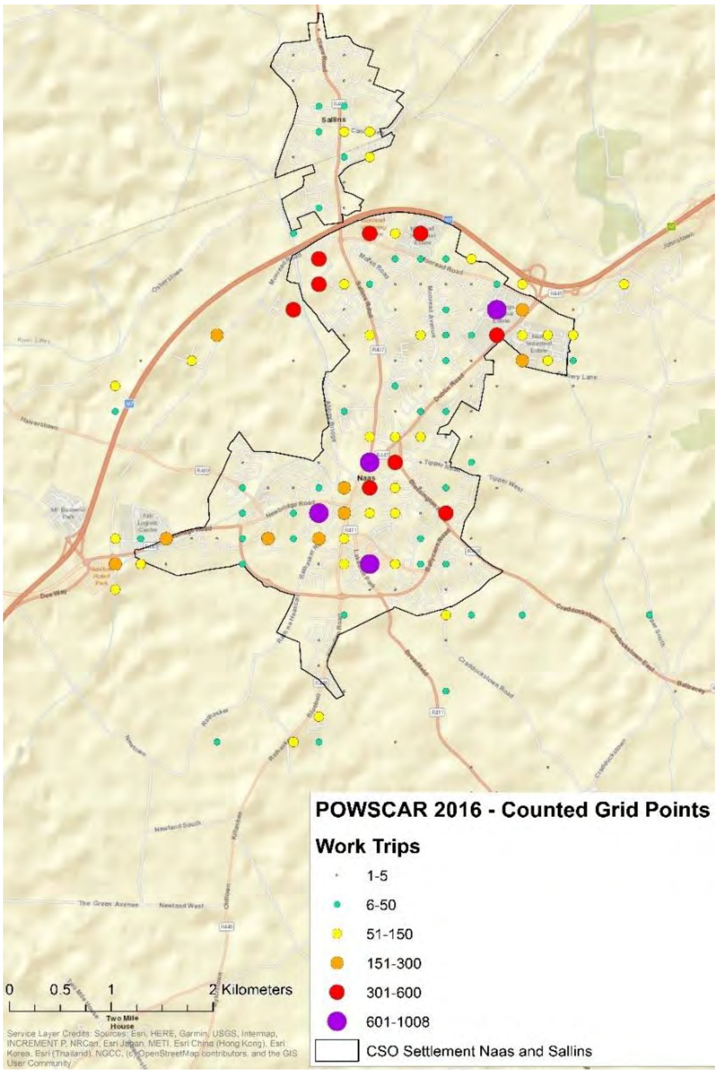


Figure 4.24: Destination of Work Trips in Naas and Sallins Area (POWSCAR, 2016)

4.5.2.2 Education Trips

Figure 4.25 shows the main education destinations within the Naas and Sallins study area. This highlights the different size of schools in the area, with the largest schools located in central Naas or south of the town on the R448 Kilcullen Road.

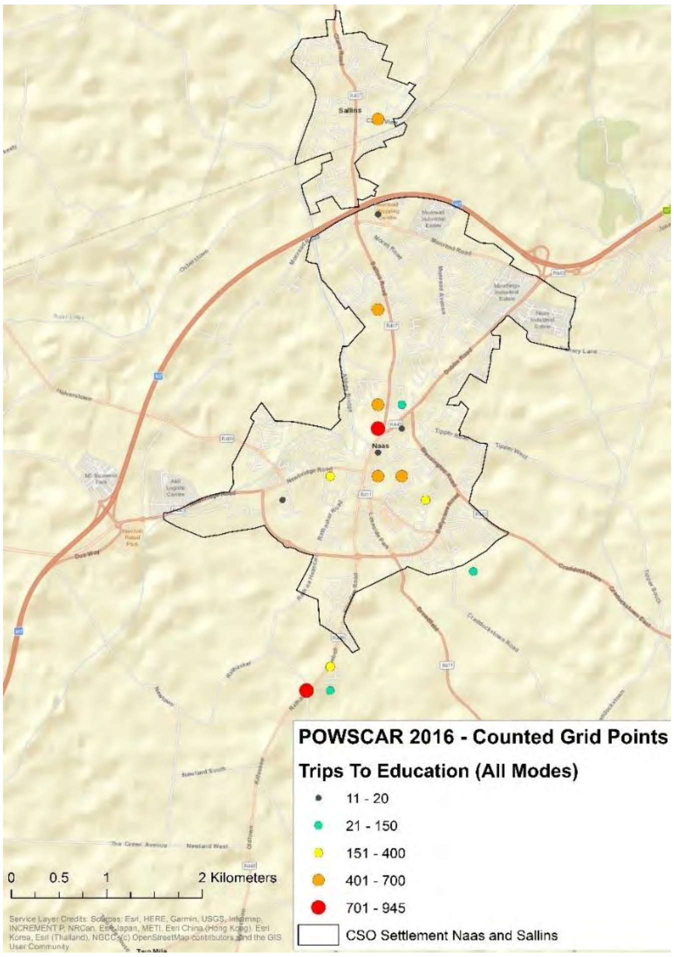


Figure 4.25: Destination of Education Trips in Naas and Sallins Area (POWSCAR, 2016)

4.6 Active Mode Permeability

4.6.1 Permeability analysis

In order to assess permeability and walking catchments in Naas and Sallins, an accurate path network was developed. An example of this network is shown in Figure 4.26 with the pedestrian paths shown as dotted red lines. The advantage of this path network is that it can accurately assesses pedestrian movement; rather than simply representing walking distances on the road network.

The path network covers all of Naas, Sallins and Johnstown. The baseline path network ends where pavements cease on the approach roads to the study area. The network was originally extracted from Open Street Map and then extensively modified using aerial photography, Google Street View and site visits to identify paths, cut-throughs and public tracks.

The resulting path network is used to assess the walking distance catchment for key destinations in Naas and Sallins.

Figure 4.26: Example of Path Network in Naas near Hospital

4.6.2 Key Permeability Barriers

Naas and Sallins are spatial separated by several large linear barriers; the Grand Canal, the railway line and the M7 Motorway (Figure 4.27). There are several crossing points, but these corridors constrain permeability and improving access will be critical as the town expands. In the west, Naas town is bordered by the Naas and Corbally branches of the Grand Canal and east-west access will need to be improved as development takes place in the western area of the town. Within the town, there are also large impermeable blocks which can cause longer indirect trips for cyclists and pedestrians. Examples of this include; the racecourse, the GAA club and the hospital.

Figure 4.27: Identified Barriers to Permeability in the study area

Within Naas, the primary issue affecting permeability is the prevalence of cul-de-sac housing estates with high perimeter walls. An example of this is shown in Figure 4.28 where a residence is spatially adjacent to an Aldi supermarket but the actual walking distance is significantly further due to the routing of the existing path network. These situations create longer trip distances which encourage car use and inconvenience walkers.

Figure 4.28: Example of Indirect Travel due to Cul-De-Sac Design and Boundary Walls

In addition to these issues, there are also barriers created by impermeable design. Figure 4.29 shows an example of this from Piper's Hill College on the R448 where a dedicated cycle lane has been built from Naas to the school, but the final design has not removed the fencing/shrubbery to enable its use.

Figure 4.29: Barrier to School Cycle Lane on R448

In Figure 4.30, two housing estates were originally designed to have a connecting path and a gap was left in the boundary wall, but a steel fence has been added at a later point to intentionally stop permeable movement between the two residential areas. There are numerous examples of impermeable design such as this across Naas and Sallins.

Figure 4.30: Barrier to Permeability between Castlesize Lane and Liffey Walk

4.6.3 Rail Catchment

Figure 4.31 shows the actual walking catchment for 1km trips to the train station. Furthermore, a circular 1km as-the-crow-flies circular catchment shows the theoretical catchment area that could be achieved if there were no permeability restrictions. Existing access to the station is relatively good with limited scope for expanding the catchment area beyond improving paths to housing estates in northern Sallins. The distance of the station from Naas can be observed through the fact that a 1km walk reaches only the extreme edge of the town.

Figure 4.31: 1km Walking Distance to Sallins and Naas Train Station

As Naas is a large town, walking distance to the station varies significantly across the urban area. Figure 4.32 shows the walking catchment to the station for 1km, 3km and 5km respectively. This indicates that most of northern Naas is within 1-3km walking distance of the station which may be too far for many pedestrians. Furthermore, most of central and southern Naas is a 3-5km walking distance from the station, which is a trip distance more suitable for cyclists or buses.

Figure 4.32: 1km, 3km and 5km walking distance to Sallins and Naas Train Station

4.6.4 Bus Catchment

Figure 4.33 shows the actual walking catchment for 500 metre long trips to bus stops in Naas and Sallins. The catchment distance is based on the Sustainable Residential Development in Urban Areas (2009) guidelines[22], which define a public transport corridor as 500 metres for a bus stop or 1km for light or heavy rail.

In general, bus stops are extensive across the study area and the coverage encompasses most residential areas. An exception is Monread Road where there is no bus service even though there are numerous houses and retail destinations in this area. Throughout the town, the prevalence of boundary walls around housing estates restricts permeability to bus stops located on main roads. The quality of bus stop infrastructure and the bus route service varies considerably across the study area. These aspects will also need to be improved in tandem with permeability to increase patronage.

[22] *Page 43, 'Walking distances from public transport nodes (e.g. stations / halts /bus stops) should be used in defining such corridors. It is recommended that increased densities should be promoted within 500 metres walking distance of a bus stop, or within 1km of a light rail stop or a rail station.' Link: https://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/DevelopmentandHousing/Planning/FileDownLoad%2C19164%2Cen.pdf*

Figure 4.33: 500m Walking Distance to Bus Stops

4.6.5 Hospital Catchment

Figure 4.34 shows the actual walking catchment for 1km trips to the hospital. The catchment to the west and south is constrained by the lack of rear entrance to the hospital while indirect routing is an issue in all directions. There is some scope to expand the existing catchment with new paths and short-cuts.

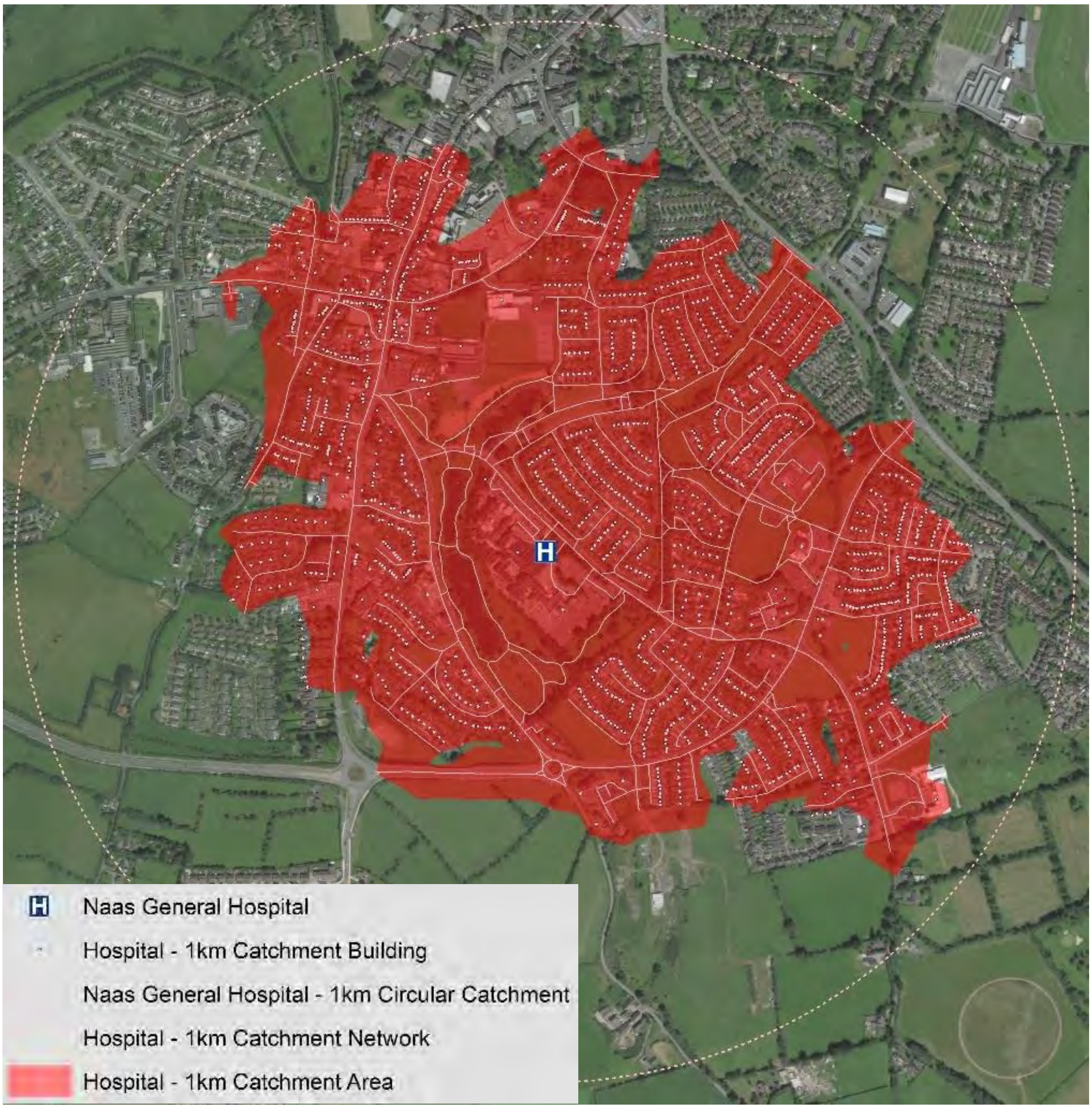


Figure 4.34: 1km Walking Distance to Naas General Hospital

4.6.6 Primary School Catchment

Figure 4.35 shows the actual walking catchment for 1km trips to primary schools in Naas and Sallins. An issue identified is the development of a school complex to the south of Naas on the R448 which is located beyond recognised walking distances from most populated areas, particularly for children. The distribution of primary schools throughout the central areas of Naas and Sallins should be able to facilitate a much higher number of trips by active modes.

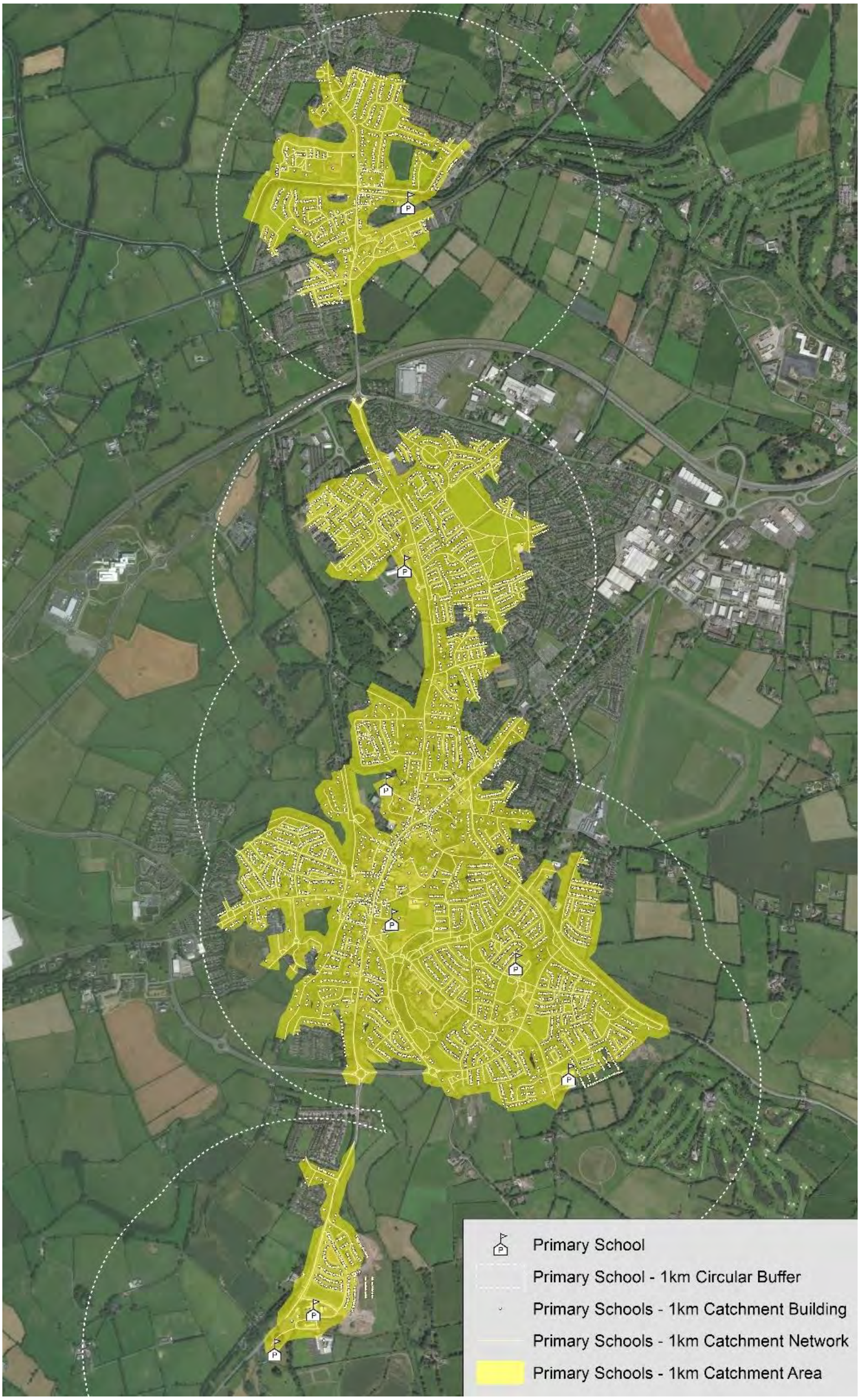


Figure 4.35: 1km Walking Distance to Primary Schools

4.6.7 Secondary School Catchment

Figure 4.36 shows the actual walking catchment for 1km trips to secondary schools. Similar to primary schools, the secondary school to the south of Naas on the R448 will be too far away to walk to for many pupils. Central areas of Naas contain several walking distance secondary schools which are close to residential areas. However, northern Naas and Sallins do not have access to a local secondary school and this is likely to increase car trips for pupils. In future years, Naas Community College school will move to Millennium Park Road which will provide a local secondary school for northern Naas.

Figure 4.36: 1km Walking Distance to Secondary Schools

4.6.8 Sports Amenities Catchment

Figure 4.37 shows the actual walking catchment for 1km trips to sports amenities; K Leisure and the GAA club. This shows that access to the GAA club is restricted and residents in the adjacent Oldtown Demesne estate cannot walk to it even though it is only metres away behind a perimeter wall. Access to K Leisure is better with a series of access paths from the east and south, but its location on the western periphery of the town limits its walking catchment to a significant portion of existing residences.

Figure 4.37: 1km Walking Distance to Sports Amenities

4.6.9 Permeability Statistics

Table 4.3 provides an overview of the walking/cycling catchment for key locations throughout Naas and Sallins. This provides a count of the number of residential and commercial addresses in each catchment area using the GeoDirectory (2018) database. Furthermore, the table provides a breakdown of the percentage of total buildings in the study area which are within walking distance of each location. This highlights that the rail, hospital and sports amenity coverage is very low and covers less than 20% of residential buildings. In comparison, the secondary school catchment is an improvement, but this only covers 35% of residential buildings and is constrained by the lack of secondary school in northern Naas or Sallins. The bus catchment is reasonably strong at nearly 60% of residential buildings but this also means that 40% of houses in Naas and Sallins do not have a bus service within a reasonable walking distance, and some of the houses within the coverage area may only have access to a poor quality bus service.

Table 4.3: GeoDirectory Statistics for Building Coverage of Key Services

	Existing Path Network Catchment		*% of Total Study Area Buildings*	
Catchment	Residential Addresses	Commercial Addresses	Residential Addresses	Commercial Addresses
Rail - 1km	1,485	107	13.7%	8.5%
Bus Stop - 500m	6,445	976	59.4%	77.6%
Primary School - 1km	6,222	797	57.4%	63.4%
Secondary School - 1km	3,799	688	35.0%	54.7%
Hospital - 1km	1,653	288	15.2%	22.9%
Sports Amenities - 1km	1,792	40	16.5%	3.2%

5. Public and Stakeholder Consultation

Early engagement with key stakeholders and the general public prior to developing the Naas Transport Strategy was considered essential in order to gain an appreciation of existing transport issues and opportunities and ensure that the proposals which will be contained within the strategy will meet community needs. Consultation undertaken to date has included a series of workshops with invited stakeholders, an online survey which was open to all members of the public and consultation with school principals who were contacted by email. .

5.1 Stakeholder Consultation Workshops

A series of three stakeholder consultation workshops were held on Tuesday the 5th of March in the Kildare County Council offices in Naas.

- A dedicated workshop was held for local public representatives
- A second workshop was held for Kildare County Council staff members; and
- 'Other' key stakeholders including representatives of the local business community were invited to a third workshop.

The key points raised by all stakeholders are summarised in the following sections.

5.1.1 Session 1: Public Representatives

All local public representatives were invited to the specific consultation workshop organised for this group. The workshop was attended by three councillors from the Naas Municipal District and one local TD. A further two public representatives (one councillor and one TD) who were not in a position to attend on the day submitted written comments which have been included in the summary of the discussion. The key issues raised by local representatives included:

- The need for a local bus network and in particular the need for improved connectivity to Sallins train station;
- The potential for a new feeder bus route between Clane and the train station;
- The existing 139 bus route between Naas and Blanchardstown and whether there may be potential to introduce additional stops;
- The current cost of school bus services (€300/year cost for children living within 3km of their school is considered a disincentive to uptake by some representatives);
- Car parking capacity issues at the train station in Sallins;
- Overcrowding on train services;
- Road safety issues in Sallins;
- Road safety issues for children travelling to school;
- The need for walking and cycling 'buses' to schools;
- Poor conditions for walking and cycling on Sallins Road and the need for improved links between Millennium Park and the town centre;
- The potential to introduce lower speed limits within residential areas/within the ring road;
- Access issues impacting elderly people;
- The importance of the proposed Greenway along the canal corridor from Sallins to Naas Harbour and onwards to Corbally Harbour;
- Making the canal corridor road from Naas Harbour to Osberstown local access only for vehicular traffic;

- The potential for new/expanded Park and Ride facilities both for visitors to Naas Town Centre (to keep non-essential cars out of Naas) and for drivers currently commuting to Dublin on the M7;
- Parking issues within Naas town centre and the importance to town centre retailers of ensuring an adequate supply of car parking;
- A variety of different suggestions for different streets within the town centre in terms of traffic management and street design including: a HGV ban; a one-way street system; the introduction of cycle lanes; the introduction of reduced speed limits; the creation of 'shared space' streets and potential pedestrianisation of Main Street, Poplar Square and Market Square;
- The potential benefits of an Outer Relief Road as compared to a proposed Inner Relief Road;
- The need to demonstrate the benefits of improving permeability in residential areas with a good initial demonstration project ('pick the first one well'); and
- Suggestion that some roads should be preserved as pedestrian routes for leisure walking.

5.1.2 Session 2: Kildare County Council staff

Session 2 was attended by nine Kildare County Council staff members based within the Planning Department, the Roads and Transportation Department and the Fire Service (in addition to the core team involved in the development of the Naas Transport Strategy). The key points discussed by Kildare County Council staff during this workshop included:

- Need for an improved Sallins to Naas bus service and the potential to also improve existing 'Local Link' bus services;
- The need to improve the public realm and develop back streets within the town centre, including addressing the lack of footpaths on some streets;
- The need to remove non-essential traffic from Main Street to support public realm improvements;
- The need to examine a HGV ban in the town centre;
- The need for Public Realm improvement proposals to take the Naas Conservation Area into account – it was noted that a 'Statement of Character' for the Conservation Area is due to be published later this year;
- The need to consider the Regeneration Strategy already developed for the town centre;
- The need to identify the best location for a public transport hub –assessment should consider what location is most accessible to the greatest numbers of people walking and cycling;
- Issues with Taxis in the town centre and need to consider whether taxi rank should be relocated to a new public transport hub;
- The need to consider best way of improving connectivity between Sallins and the canal – potential for a linked street;
- Parking issues in the town centre and the need to assess the potential removal of parking from Main Street;
- Update on progress on existing NTA funded projects (Poplar Square, Kilcullen Road, Dublin Road Cycle scheme);
- The need to integrate a Parking Strategy with Traffic Control Centre Operations;
- The need for integration of the Naas Transport Strategy with the Draft Naas LAP and discussion of population growth projections for Naas and Sallins to 2023 –opinion differs as to how realistic current projections are;
- There is potential for up to 700 housing units in the town centre;

- Potential long term objective to move Sallins Train Station to the west to be discussed with NTA;
- Permeability issues between residential estates;
- Need to improve both road safety and personal safety in certain areas (e.g. need for lighting improvements); and
- The potential for a public transport bridge near the Canal Harbour (although it was also noted that historically elected members have not been supportive of the idea of a new bridge over the canal).

5.1.3 Session 3: Other Stakeholders

Session 3 was attended by other local stakeholders with a strong interest in the Naas Transport Strategy including: Alan Shine (Kildare Chamber of Commerce); John Higgins (Naas Town Coordinator); Dick Gleeson (Naas Town); a representative from Millennium Park and a representative of Cyclist.ie – the Irish Cycling Advocacy Network.

The key points raised by stakeholders who attended this workshop included:

- The need to examine the previously developed Integrated Framework Plan for Land Use and Transportation (IFPLUT) for Naas;
- Potential for a transport hub at the harbour;
- The need for a public transport route from Naas town centre to the train station in Sallins;
- Potential to move the train station to the west of its current location;
- The need to promote liveability and health by reducing emissions within the town centre;
- Main Street parking issues and need to identify appropriate sites for car parking;
- Suggestion that a one-way system should be examined for Naas town centre;
- The growth opportunity within the North West Quadrant;
- The need to incorporate DMURS objectives into all design proposals;
- The need to enable cycling through a network approach providing across town connectivity;
- The need to look at alternative locations for school drop off zones as too many parents are driving to schools;
- Request for engagement with the Kildare Cycle Forum;
- Suggestion that targets for cycling mode share should be set and ongoing monitoring undertaken;
- Issues with the Grand Canal Cycle Route;
- Lack of cycling facilities on Newbridge Road; and
- The need for facilities to assist cyclists making a right turn.

5.2 Online Public Consultation Survey

5.2.1 Introduction

An online public consultation survey was launched on the 5th of March 2019 and remained open for one month. The purpose of the online public consultation was to hear from people who live, work, shop, spend leisure time or attend education within the Naas Transport Strategy study area. To understand current issues related to transport and obtain views on potential solutions. The survey was conducted anonymously and respondents were not asked to provide any personally identifying information. The survey was promoted by Kildare County Council through social media, local newspapers and the council's own website. Skip logic was designed into the survey where possible to ensure that respondents were only asked questions which would be relevant to them based on their previous responses.

Almost 1,000 respondents commenced the survey by clicking 'yes' to the introductory question confirming their consent to participate. However, a significant number of these respondents did not complete the survey or did not complete all questions relevant to them. No question within the survey was compulsory. Therefore, the number of people who responded to each question varies and has been indicated (with 'N') alongside all question results within the following sections.

5.2.2 Respondent Characteristics

A significant majority of all respondents (86%) live within the Naas Transport Strategy study area, while 21% of all respondents stated that they both lived and worked within the area. Sixteen percent of all respondents attend education within the area (and a majority of these also live within the area). Almost three quarters of respondents said that they shop or spend leisure time within the area.

Of the respondents who live outside of the study area, the majority live elsewhere in Kildare. The locations in Kildare where the highest numbers of respondents live include: Kill (13); Newbridge (10); Caragh (9); Clane (7); Eadestown (6) and Kilcullen (6). A further 37 respondents live in 22 other locations throughout Kildare. Twenty-four respondents said they lived in another county, including Dublin (9); Wicklow (5); Carlow (4); Limerick (3); Galway (1); Leitrim (1) and Laois (1).

Over 82% of respondents to the survey stated that they are currently working. Other groups such as retired people (6%), job seekers (1.3%) and students (2.6%) were less well represented amongst respondents to the survey in comparison to the number of people in these categories living in the study area. This is a limitation of the survey which may need to be taken into consideration when drawing conclusions from the results.

5.2.3 Modes Currently Used by Respondents

The survey asked respondents about the travel modes they currently use for both commuting trips (where applicable) and non-commuting trips to/from and within the study area. As shown in Figure 5.1, two thirds of respondents who are currently working or attending education usually travel by car for the longest part of their usual commute, while almost one quarter usually travel using public transport.

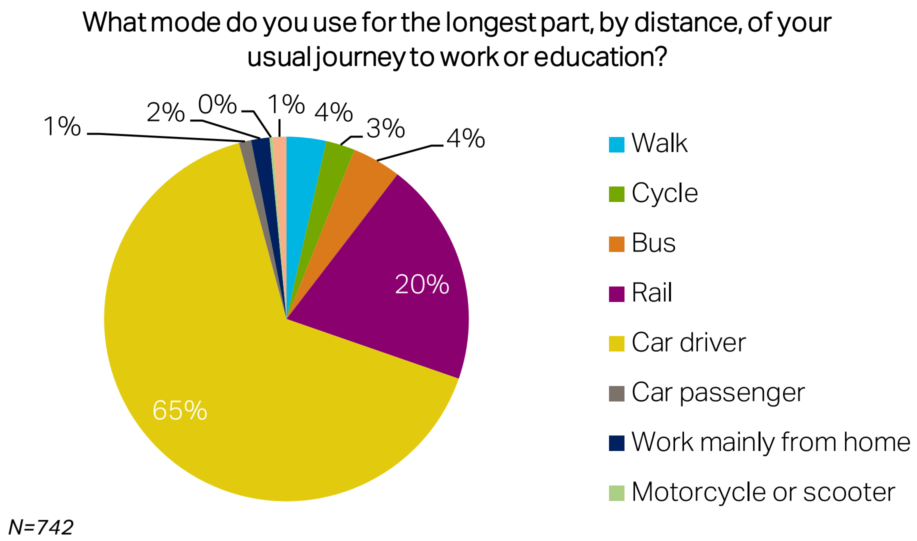


Figure 5.1: Respondents Main Commuting Modes

Twenty-seven percent of respondents in work or education use more than one mode of travel on their usually commute and these respondents were asked to highlight all travel modes they use on their 'usual' journey. This allows for some analysis of how these respondents currently access bus and rail. Some interesting findings in this regard include:

- Fifty-seven percent of respondents who usually commute by train currently travel by private car for part of their usual commute. This highlights the importance of improving connectivity to the train station by bus, cycling and walking.
- Amongst respondents who travel by bus for the longest part of their usual commute, 28% also travel by car for part of their commute, compared to just 3% who also travel by bicycle.

Respondents were also asked how they travel for 'non-commuting' trips. 'Non-commuting' trips are all trips which are not for the purpose of travel to work or to education and could include, for example, trips for shopping or other personal business, visiting friends or family and trips to leisure activities or walking/cycling for leisure. Figure 5.2: Modes used for 'Non-Commuting' Trips (study area residents only) within the study area. Figure 5.3: Modes used for 'Non-Commuting' Trips to/from the Study Area which were defined as trips which cross the study area boundary.

As shown in Figure 5.2, just 9% of respondents living within the study area use the bus for internal non-commuting trips, reflecting the current lack of useful bus services for local travel. Twenty-six percent of respondent's cycle for some internal 'non-commuting' trips.

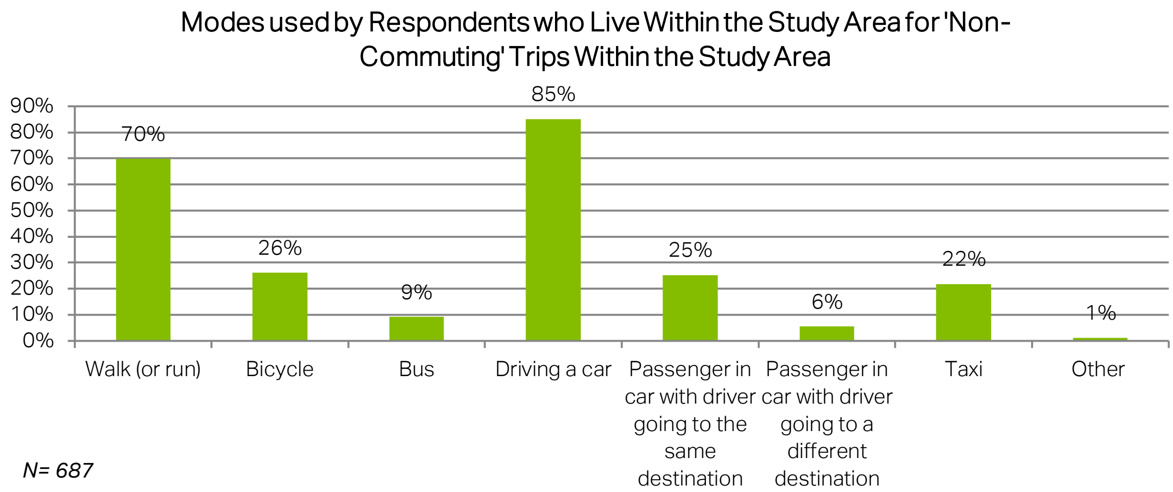


Figure 5.2: Modes used for 'Non-Commuting' Trips (study area residents only)

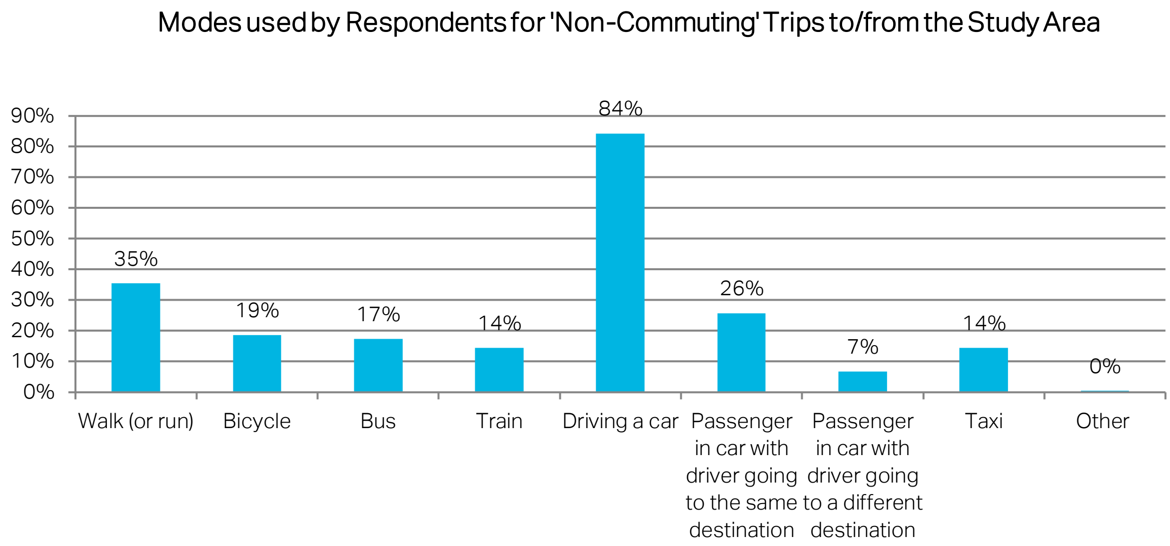


Figure 5.3: Modes used for 'Non-Commuting' Trips to/from the Study Area (all respondents)

5.2.4 Naas Town Centre and Respondents' Shopping Habits

The Naas Transport Strategy will seek to promote the revitalisation and regeneration of the town centre. In order best address this requirement, it was considered important to understand more about respondents' perceptions of the town centre and about their shopping habits.

Figure 5.4 shows how respondents rate Naas town centre according to various criteria including both transport related characteristics and the availability of different kinds of shops and services. An aspect of the town centre which was rated particularly positively by respondents is the variety and quality of restaurants, cafes and/or pubs with 31% rating this as very good. In contrast, just 7% of respondents considered the variety and quality of food shops in the town centre to be very good and 38% considered the variety and quality of food shops to be either poor or very poor. Respondents rate the variety and quality of non-food shops in the town centre even more negatively, with just 2.2% saying this aspect of the town centre is very good and 14.8% saying it is very poor.

Respondents rated the town centre very negatively in terms of traffic congestion with 79% rating it as poor or very poor.

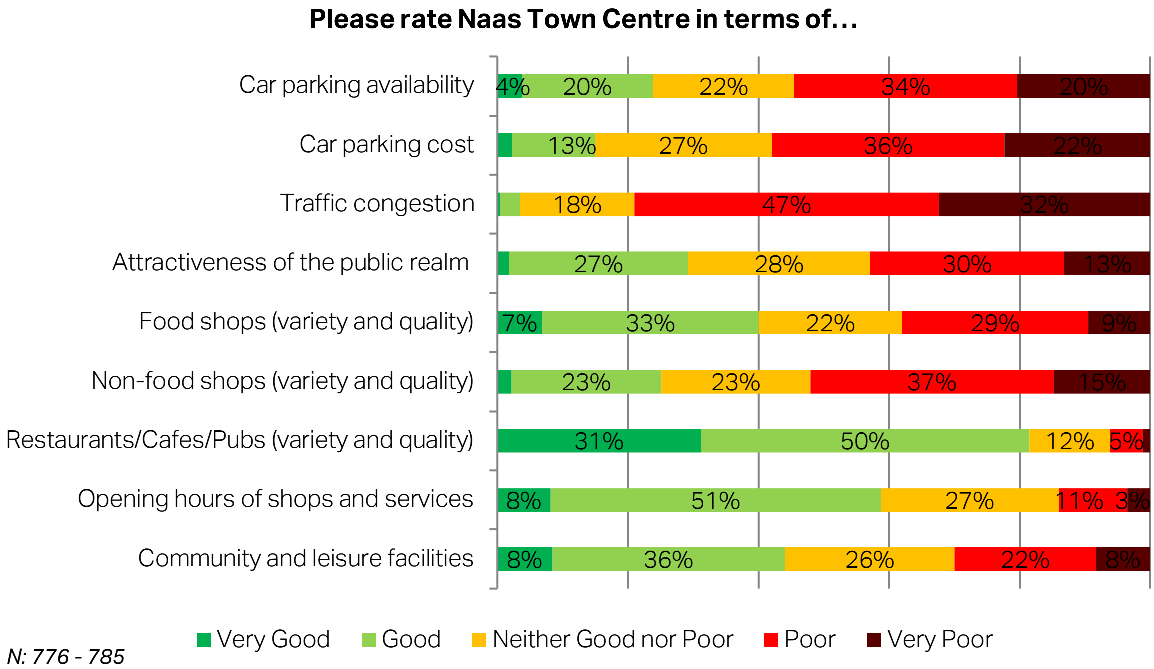


Figure 5.4: Rated Aspects of Naas Town Centre

Respondents living within the study area were asked where they currently do the largest amount of their food shopping and non-food shopping and could select one option only for each. As shown in Figure 5.5, the most popular destination for food shopping amongst respondents is the retail parks off the Monread Road. Only a minority of respondents do most of their non-food shopping within the study area, with most of these selecting one of the two retail park options.

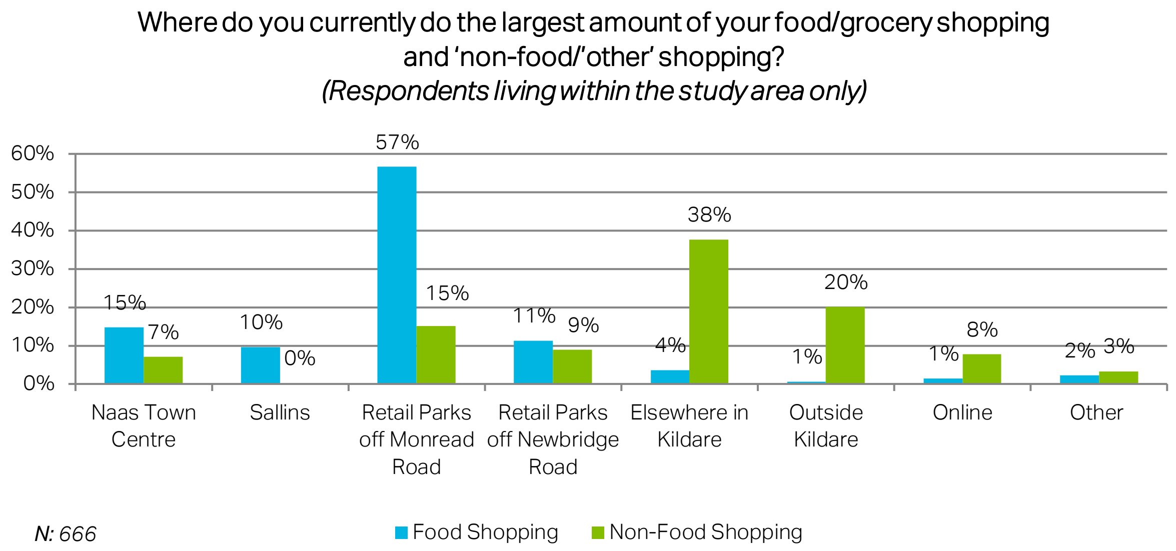


Figure 5.5: Destinations where Respondents Living Within the Study Area do the Largest Amount of their Shopping

5.2.5 Transport in Naas

All respondents were asked to rate Naas's existing transport infrastructure for each of the main modes of travel. The worst rated travel mode is cycling, with a combined 57% of respondents rating existing infrastructure for cycling as either poor or very poor. The combined proportions of people rating existing infrastructure for bus travel and for train travel as poor or very poor are similar at 49% and 50% respectively. The travel mode with the highest proportion of good and very good responses was walking, with 10% of respondents rating existing infrastructure for walking as very good and 43% rating it as good.

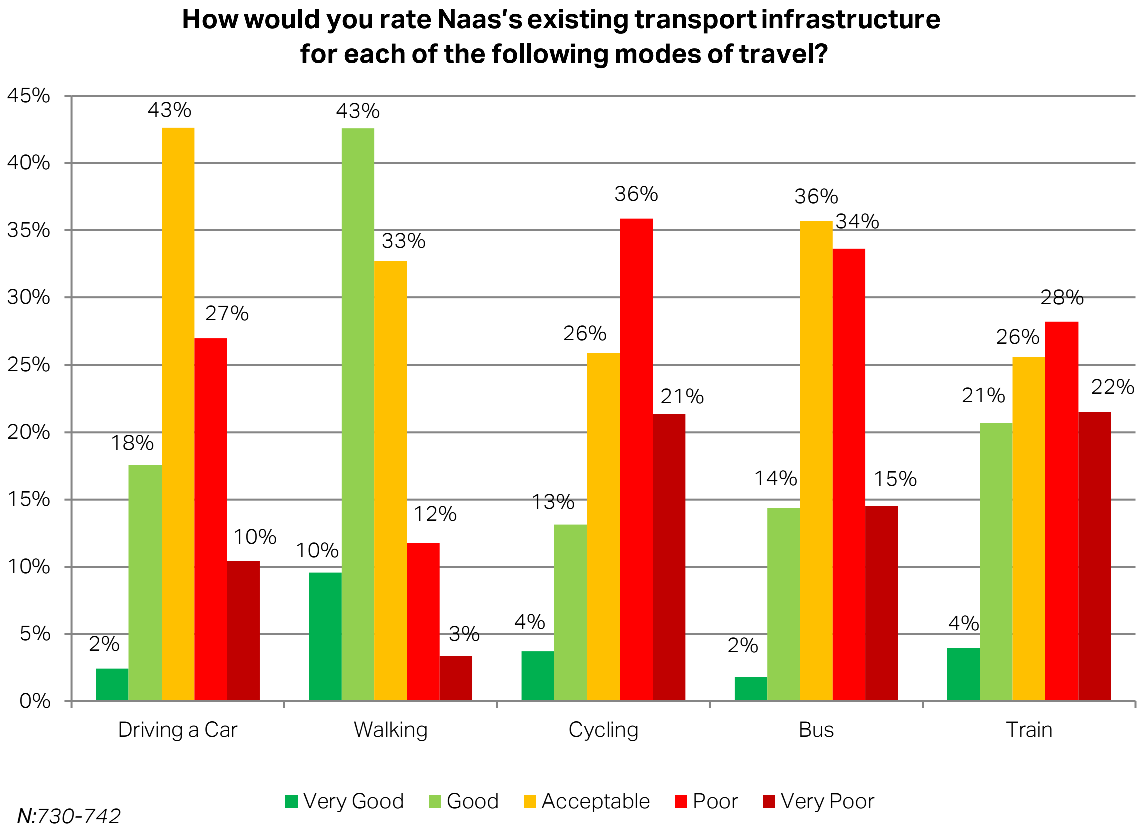


Figure 5.6: Rating of Naas's Existing Transport Infrastructure

The ratings given by respondents to different transport modes have also been examined for the subset of respondents who use each mode as their main commuting mode as shown in Figure 5.7 below. Comparing the two sets of results shows that existing infrastructure for four of the five modes (with train being an exception) is rated more poorly by the respondents who use that particular mode as their main commuting mode than it is rated by respondents overall. This effect is most evident in the case of cycling and bus. Fifty-three percent of respondents who cycle to work or education rate Naas's existing cycling infrastructure as very poor, as opposed to 21% of all respondents. Similarly, 28% of respondents who usually commute by bus rate bus infrastructure as very poor, compared to 15% of all respondents.

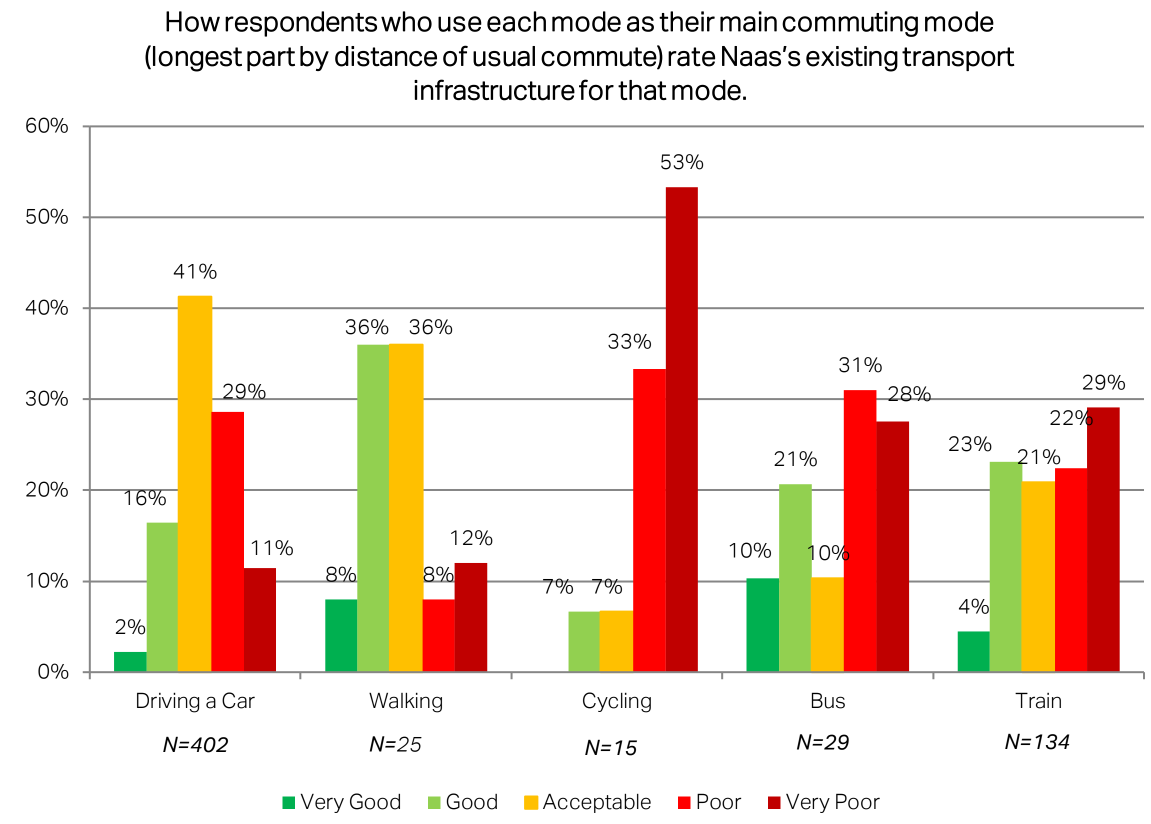


Figure 5.7: Rating of Naas's Existing Transport Infrastructure by Mode Users

Another multiple choice rating question asked respondents to rate a wide selection of potential future changes to transport infrastructure, traffic management and parking management from 'extremely important' to 'not at all important', as shown in Figure 5.8. All potential changes were perceived to be either extremely important or very important by a significant proportion of respondents (between 42% and 80%). The removal of non-essential HGV traffic from the town centre and the creation of improved pedestrian and cycle links to the train station were the options rated as extremely important or very important by the largest proportions of respondents.

The potential changes which were rated as least important included the provision of real time car parking occupancy data and reduced traffic/on-street parking in the town centre. However, a majority of respondents still perceive each of these potential measures to be at least 'somewhat' important, with only approximately one third of respondents rating each to be not important.

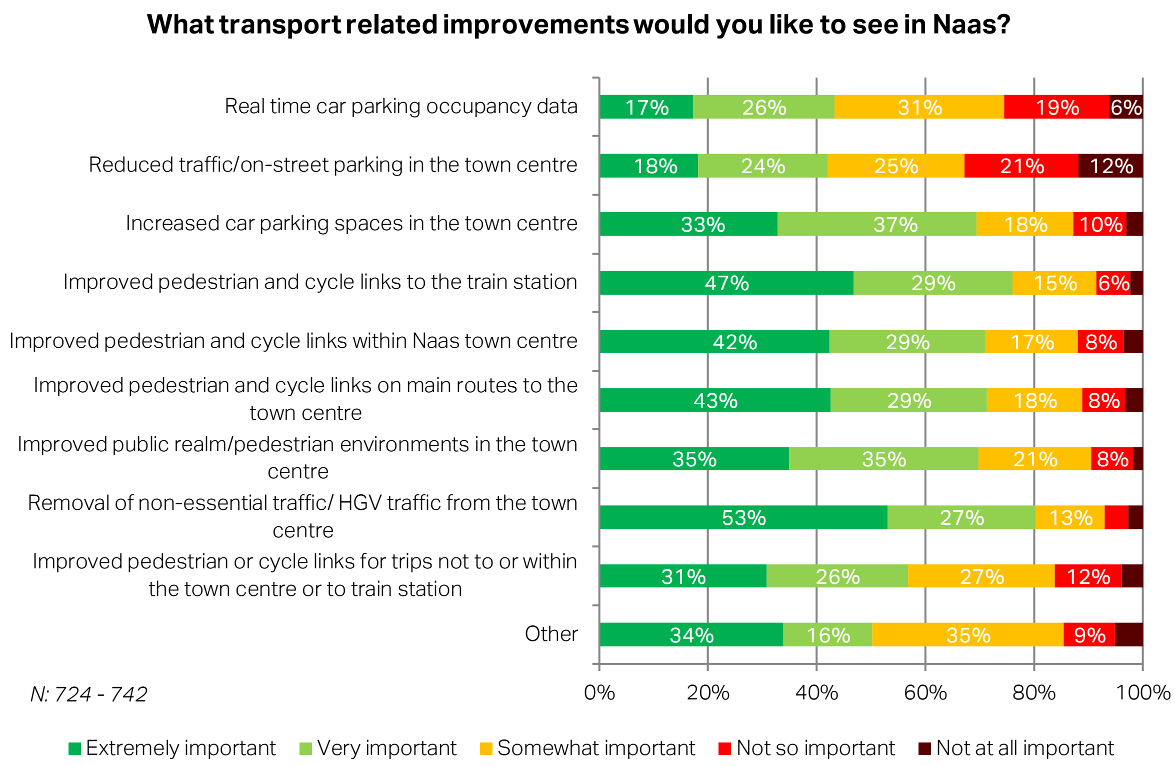


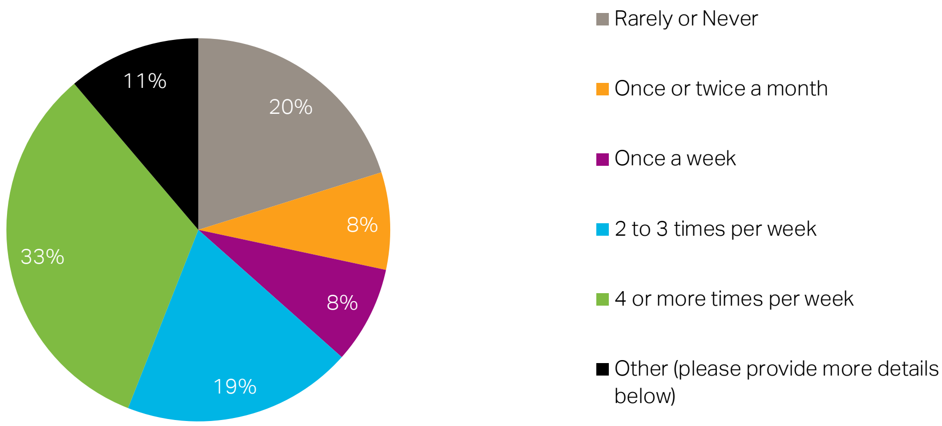
Figure 5.8. Importance of Different Potential Transport Improvements to Respondents

A key objective of the Naas Transport Strategy is to significantly improve connectivity between Naas and Sallins train station. To help understand potential demand for improved public transport to the train station, survey respondents were asked how often they would use a bus service with its own dedicated road link to serve the station.

As shown in Figure 5.9 below, approximately one third of existing train commuters said they would use the service four or more times per week, while a further 19% would use it two to three times per week. Amongst the overall sample the proportion of respondents saying they would use the service this frequently is much lower, but only 34% of the total respondents said they would use it rarely or never and 26% would use it once or twice a month, demonstrating that an improved connection would also benefit people who only use the train for non-commuting trips.

Forty-seven people provided an additional comment alongside their answer for this question. Many of these respondents simply provided further detail on how often they or their family members would use a service. Some commented on the need for a service to be direct/quick to be useful, while others highlighted specific areas other than Naas town centre from which they felt a bus connection to the train station was required including: Caragh; Piper's Hill; Monread; Jigginstown and Johnstown. Two people also commented that they would use the service if it was wheelchair accessible.

If a dedicated bus service from Naas Town Centre with its own dedicated road link to serve Sallins train station existed, how often do you think you would use it?
(Respondents living in study area who normally commute to work by train only)



N: 134

Figure 5.9: Dedicated Bus Service from Naas Town Centre (Existing Train Commuters)

If a dedicated bus service from Naas Town Centre with its own dedicated road link to serve Sallins train station existed, how often do you think you would use it?
(All respondents living in study area)

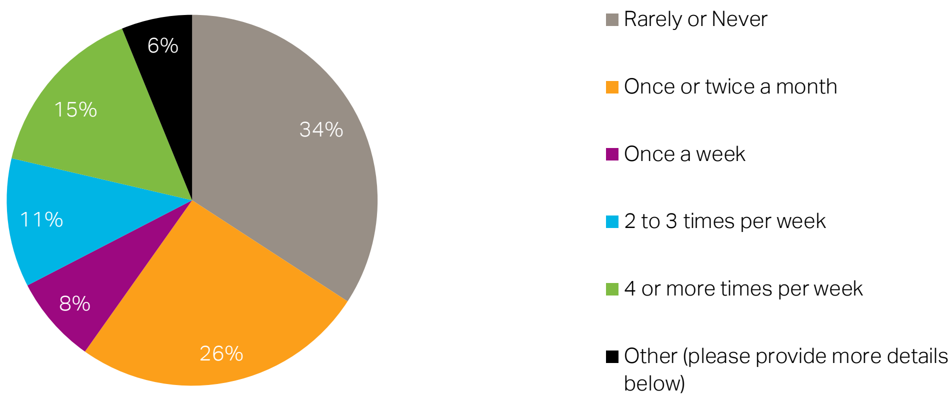


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Figure 5.10 Dedicated Bus Service from Naas Town Centre

5.2.6 School Travel

There is potential for the Naas Transport Strategy to reduce car based trips during the AM peak by making it easier for more school pupils to travel to school by active modes as well as by bus. As many trips to school are relatively short, this section of the survey focused on understand existing uptake of active travel modes for school trips, perceptions of - barriers to active travel to school and the potential changes which would be most likely to encourage respondents to allow their children to use active travel modes. All respondents who said they were a parent or guardian of a child attending either primary or secondary school in Naas were asked these questions. This includes 67 respondents with children within both age groups; 170 respondents with children attending primary school in Naas; and 94 respondents with children attending secondary school in Naas.

As shown in Figure 5.11, one third of parents/guardians of primary school aged children said their primary school aged children travel to school using active modes every day, as compared to 21% of parents/guardians of secondary school aged children. Half of parents/guardians of secondary school aged children said that their children in this age group rarely or never use active travel modes to travel to school, while a slightly lower proportion (45%) of parents/guardians of primary school aged children also said the same. This suggests that there is likely to be significant potential for change.

Many children do not travel the same way every day, with a significant minority of respondents with children in each age group saying that their children use active travel modes either three or four times a week or one or two times per week. This variation is not captured through the Census, which only collects data on pupils' 'usual' travel modes to education.

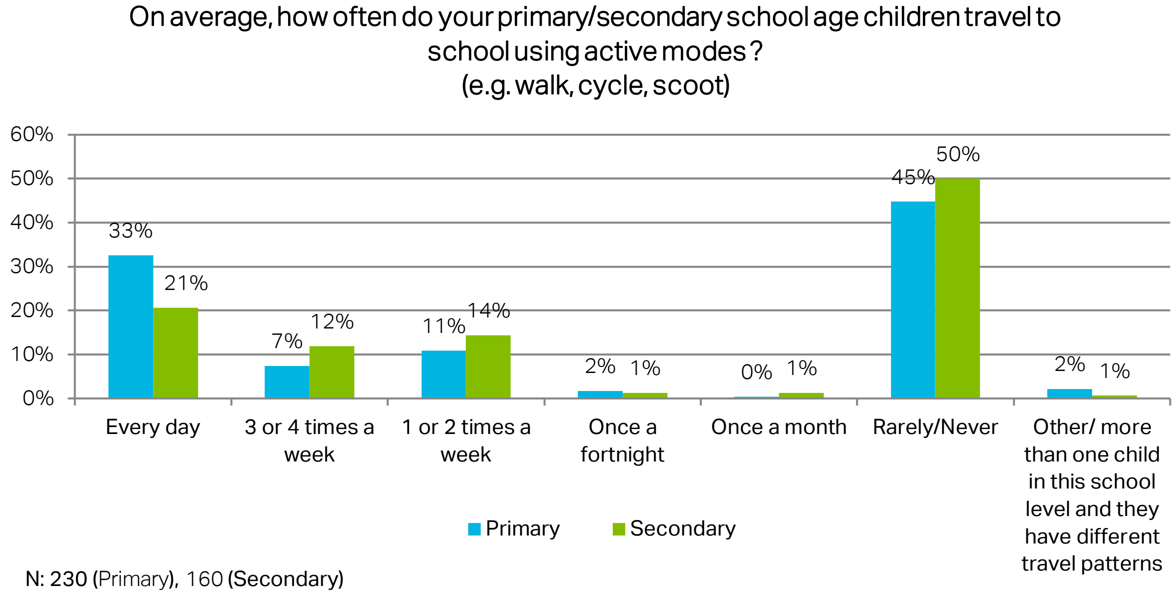


Figure 5.11: Frequency of using Active Travel Modes for School Trips

Figure 5.12 illustrates how respondents' who are parents or guardians of a child in school in Naas perceive different barriers to active travel to school. As shown, the barriers which most stand out include perceived road safety/traffic risk. Related to this a lack of suitable cycle facilities and a lack of walking links or crossing points was also raised as an issue. Amongst barriers not directly related to transport which may be at least partly within the control of individual schools, 'children have too much to carry to school' appears to be the most significant perceived barrier.

As shown in Figure 5.12, 18% of respondents selected 'other' as a major barrier. A number of respondents who didn't select 'other' also left a comment. The majority of the 65 comments respondents made in connection with their responses to this question (separate to other open comment questions) provide more detail on the closed options selected and shown in Figure 5.12, including: lack of suitable safe walking and cycling infrastructure; distance; and a lack of sheltered bicycle and/or scooter parking facilities at specific schools. However, the comments also highlight a number of other issues not clearly covered by the options within Figure 5.12, including:

- A number of respondents noted that restrictive uniform policies which require girls to wear skirts going in the school gate are a barrier to cycling;
- Other school rules can also be a barrier to active travel – e.g. scooters are not allowed at one school, while at another school pupils are currently required to dismount bicycles at the gate;
- There is a demand amongst respondents for school bus services;
- A number of respondents made suggestions for additional entrances and connections at particular schools to facilitate active travel;
- The time at which parents can leave children at school in the mornings presents challenges from some parents in getting to work on time following drop off;
- Parents of children who are wheelchair users face additional challenges on the school trip including insufficient availability of accessible parking spaces and uneven pavements; and
- Dangerous and careless driver behaviour such as mobile phone use, driving through pedestrian red lights, speeding and parking on footpaths is perceived to present significant safety issues.

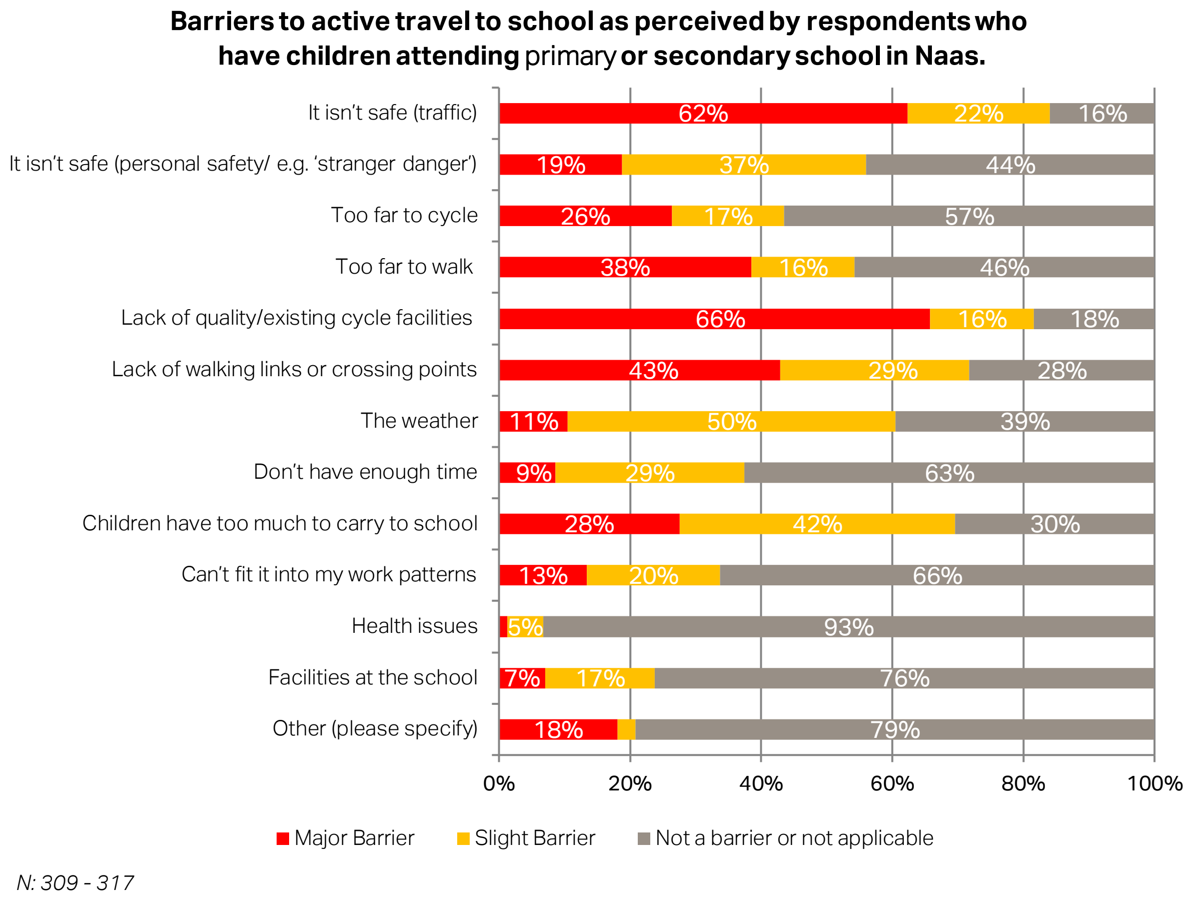


Figure 5.12: Barriers to Active Travel to School

Figure 5.13 illustrates how respondents' who are parents or guardians of a child in school in Naas rate potential changes aimed at encouraging more active travel to school from 'important' to 'not important'. Unsurprisingly considering the responses to the previous question, the potential changes which received the highest number of 'important' ratings included 'safer cycle routes', 'safer walking routes' and 'slower traffic speeds near school'. However, some other options not directly related to infrastructure within the wider area also received a very high number of 'very important' responses, including 'less to carry to school' and 'secure cycle/scooter storage at school'.

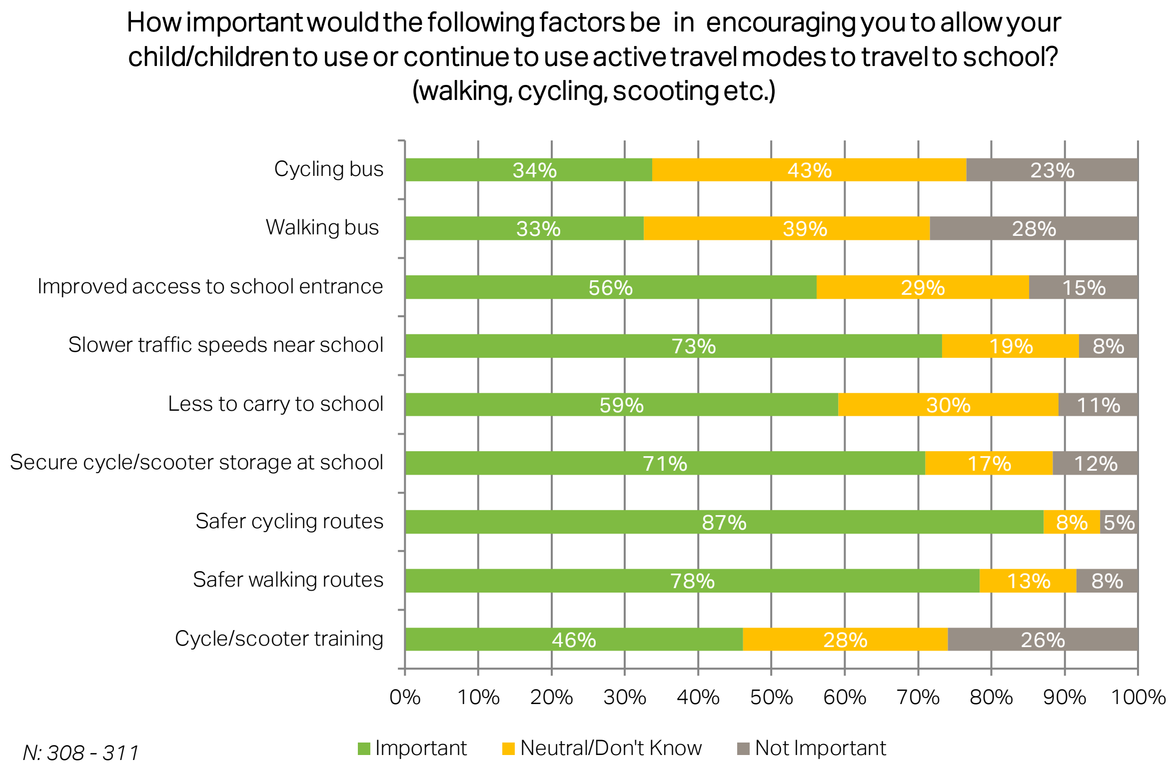


Figure 5.13: Encouraging Factors for Active Travel Modes

5.2.7 Additional Comments

There were two main questions in the survey where respondents had the opportunity to provide an 'open' comment. An open comment box was provided as part of the 'what transport improvements would you like to see in Naas?' question. Additionally, a separate question at the end of the survey invited any additional comments which respondents felt were relevant to inform the Naas Transport Strategy. The latter question asked respondents to be as specific as possible in their comments. As there is substantial overlap between responses to these two questions, comments from both were analysed together. Over 450 individual respondents provided a comment in response to at least one of the questions, indicating the overall high level of interest amongst respondents in improving access for all transport modes within the study area.

The analysis of the open comments from both questions identified fifteen main themes. Comments from each individual respondent were then coded to as many of these themes as were applicable. Table 5.1 below summarises the number of respondents who made a comment related to each theme.

Table 5.1: Number of Respondents Mentioning Key Themes in Open Comment Questions

Open Comment Themes	Number of Respondents
Cycling	135
Traffic congestion/road capacity/car access	134
Bus services	110
Walking	102
Car parking in Naas town centre	84
Road safety issues (not specific to walking/cycling infrastructure - e.g. speeding/traffic calming)	79
Car parking at the train station	72
Public realm (also incl. town centre pedestrian space, trees etc.)	51
Issues with train service excl. car parking (e.g. overcrowding, timetable)	40
Transport strategy/ new road plans/ previous transport studies	31
Connectivity to train station (modes other than bus)	31
Other	25
HGVs	20
Accessibility Issues	12
Other barriers to active travel (excluding safety/transport infrastructure). E.g. school or work times, school rules, trip-end facilities)	10

Some comments provided by respondents were quite general while other respondents provided some very specific comments in relation to existing transport issues they encounter within the study area, and/or their personal suggestions for how these issues should be addressed through the Naas Transport Strategy. The main issues raised by respondents are summarised in Appendix A. All comments received which identified specific locations will also be further considered as part of the option development process.

5.3 School Consultation

All primary and secondary school principals within Naas and Sallins were asked to complete a short survey to help identify and prioritise changes required to encourage and enable more pupils to travel to school using sustainable modes of transport. Respondents were asked what they believed the main barriers to encouraging more pupils to walk or cycle to school are currently and how they would like to see these barriers addressed. They were also asked to provide some short detail on existing initiatives and facilities in their school to support sustainable travel.

The survey was distributed to all schools by email and follow up phone calls were also made to draw attention to the survey. Three schools provided responses, including two primary schools (St. Corban's B.N.S and Killashee M.D.N.S.) and one secondary school (Gael Choláiste Chill Dara). Some of the key points of information gathered through this process included:

- Gael Cholaiste Chill Dara has a large catchment area which means that travel distance is a barrier to active travel to school for many pupils;
- Traffic volume is perceived to be a barrier to encouraging active travel to both Gael Cholaiste Chill Dara and St. Corban's B.N.S;
- All three school principals believe that barriers to active travel to school should be addressed through changes to the street environment or traffic management. A footpath and cycle path to Killashee M.D.N.S. is required, as neither is in place currently. According to the St. Corban's B.N.S principal, a safe corridor to cycle to school is required, while the principal of Gael Cholaiste Chill Dara suggested that warning signage and a reduced speed limit in the vicinity of the school would contribute to addressing the barrier which arises from the school's location on a busy road;
- Of the three schools, only Killashee M.D.N.S. are actively involved in the Green-Schools Programme currently;
- Gael Cholaiste Chill Dara have good quality sheltered bicycle parking. The other two schools do not, but Killashee intend to provide facilities following completion of the planned footpath and cycle path to the school; and
- None of the three schools undertook any activities to promote sustainable travel during the most recent school year. However, Killashee M.D.N.S. indicated their strong intention to encourage walking and cycling in the future once suitable infrastructure is in place.

Separately from the above process, an An Taisce Green-Schools officer who had previously worked with St. Laurence's primary school in Sallins on the 'Travel Theme' of the Green Schools Programme was also contacted and reported that a 'walkability' audit was undertaken with pupils at this school as part of the programme. One of the key points arising was that driver behaviour on Church Avenue and the volume of turning traffic at the junction of the two separate sections of Church Avenue is perceived to create some danger for pupil's walking to school.

6. Surveys

6.1 Parking Survey

The majority of parking surveys were conducted in May 2019, with a number of follow-up additional surveys conducted in August 2019 to resolve data issues and missing results.

6.1.1 Peak Hour Analysis

The analysis of parking survey data focused on the daily peak hour of occupancy, as this would show each car park during their maximum utilisation. The peak hour was calculated by calculating the total number of occupied spaces per hour for each survey type and selecting the hour with the highest value. Table 6.1 shows the peak hour in respect to occupancy for each survey type. This highlights that parking demand varies considerably between on-street, off-street, weekday and weekend surveys. As a result, the surveys are considered separately in the following sections.

Table 6.1: Summary of Peak Hours for Different Parking Surveys

Survey Time	7-8am	8-9am	9-10am	10-11am	11-12am	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Weekday: On-Street								Peak				
Weekday: Off-Street					Peak							
Saturday: On-Street										Peak		
Saturday: Off-Street					Peak							

6.1.2 Weekday On-Street Parking Occupancy

Figure 6.1 shows the percentage occupancy for on-street car parks during the peak hour on a weekday in Naas. This highlights that the greatest occupancy levels occur in areas of peak demand for employment or services; such as near the regional hospital or in central areas adjacent to the main street.

Figure 6.1: % Occupancy in On-Street Car Parks in Naas during Weekday Peak Hour

Figure 6.2 shows the percentage occupancy for on-street car parks in Sallins during the peak hour on a weekday. This shows that on-street parking demand is relatively low during the peak hour on a weekday, with the exception of the south bank of the Grand Canal along the L2005.

Figure 6.2: % Occupancy in On-Street Car Parks in Sallins during Weekday Peak Hour

Table 6.2 shows the on-street parking survey results for a weekday in Naas and Sallins.

Table 6.2: Weekday On-Street Parking Survey Results

Town	Location	Capacity	7-8am	8-9am	9-10am	10-11am	11-12am	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm	Avg. Spaces Occupied	Avg. % Occupied	% Occupied in 2-3pm Peak
Naas	The Sycamores	21	4	3	13	8	12	11	6	5	8	11	15	17	9	45%	24%
Naas	Gleann Na Greine	12	3	2	3	2	6	3	7	4	5	5	8	9	5	40%	33%
Naas	Friary Road	9	7	6	4	7	7	8	8	8	6	6	4	8	7	73%	89%
Naas	Main Street (R445) from Market Square to John's Lane	28	2	9	15	17	16	15	14	14	17	15	16	17	14	50%	50%
Naas	Basin Street	22	3	4	8	18	17	18	13	21	11	11	13	7	12	55%	95%
Naas	The Harbour	8	0	2	2	8	6	4	7	8	5	3	4	2	4	53%	100%
Naas	Abbey Road	35	5	3	5	26	23	21	20	24	18	21	13	10	16	45%	69%
Naas	North Main Street, John's Lane, Friary Road North	48	17	13	24	26	22	33	40	36	35	28	29	38	28	59%	75%
Naas	South Main Street	23	9	10	17	20	16	19	15	16	21	17	18	20	17	72%	70%
Naas	Corban's Lane	45	0	0	17	22	12	21	18	18	16	14	13	21	14	32%	40%
Naas	St Ita's Place	25	13	11	9	11	10	6	10	9	8	9	9	8	9	38%	36%
Naas	R448 (West Side)	18	1	8	6	3	12	12	13	8	8	3	6	8	7	41%	44%
Naas	R448 (East Side)	10	1	1	2	0	1	2	2	5	2	1	5	6	2	23%	50%
Naas	Craddockstown Road	38	1	5	12	28	26	26	20	31	27	23	11	20	19	50%	82%
Naas	Ballycane Road	15	5	2	2	2	7	6	2	5	5	4	2	8	4	28%	33%
Naas	R411 (East side)	46	7	20	26	35	32	32	19	27	26	22	20	16	24	51%	59%
Naas	R448 (East side - West Wood)	12	1	2	1	3	3	2	5	5	5	3	1	2	3	23%	42%

Naas	Kilcullen Road	42	13	11	16	15	29	32	25	24	20	25	10	13	19	46%	57%
Naas	Ballymore Road	16	2	0	1	0	1	0	0	6	1	0	1	1	1	7%	38%
Naas	Limerick Road	9	0	1	2	3	6	6	5	6	4	3	5	9	4	46%	67%
Naas	Harbour View	15	2	2	5	10	14	14	13	11	9	10	8	11	9	61%	73%
Naas	St Martin's Avenue	6	0	0	1	1	2	3	3	2	2	3	3	2	2	31%	33%
Naas	Sarto Road	8	0	0	0	2	3	4	4	2	2	0	3	6	2	27%	25%
Naas	Sallins Road, Dublin Road, Wolfe Tone Street	53	10	16	20	28	27	38	29	33	34	31	26	26	27	50%	62%
Naas	Main Street and Market Square	42	9	6	1	30	25	24	21	27	21	27	14	18	19	44%	64%
Sallins	Chapel Lane - Nolans Butchers	10	2	3	6	4	3	2	2	4	6	4	3	1	3	33%	40%
Sallins	Chapel Lane	55	14	13	20	11	10	8	14	13	18	17	16	21	15	27%	24%
Sallins	Sallins Wood (North Quays)	30	13	12	12	8	9	8	13	11	18	13	17	22	13	43%	37%
Sallins	Church Avenue (South Quays)	32	15	16	25	21	20	18	23	22	21	21	19	20	20	63%	69%
Sallins	Sallins Main Street	11	0	1	5	5	3	2	3	2	5	4	4	4	3	29%	18%
Sallins	Millbank (North Quays)	11	2	2	2	3	1	2	3	5	4	4	5	8	3	31%	45%

6.1.3 Weekday Off-Street Parking Occupancy

Figure 6.3 shows the percentage occupancy for off-street car parks on a typical weekday during the peak hour in Naas. This highlights that the greatest occupancy levels can be observed near central areas adjacent to the main street and the Kildare County Council Offices. In addition, Sallins train station, which is not shown in the map, is operating near maximum capacity as can be observed in the full survey results in Table 6.3.

Figure 6.3: % Occupancy in Off-Street Car Parks in Naas during Weekday Peak Hour

Table 6.3 shows the full survey results for off-street car parks in Naas and Sallins during a weekday.

Table 6.3: Weekday Off-Street Parking Survey Results

Name	Capacity	7-8am	8-9am	9-10am	10-11am	11-12am	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm	Avg. Spaces Occupied	Avg. % Occupied	% Occupied in 11-12am Peak
Sallins Train Station	253	226	235	237	239	242	241	240	238	237	236	196	117	224	88%	96%
Maxol Petrol Station R445 Dublin Road	10	3	5	3	6	5	3	3	4	3	5	4	2	4	38%	50%
Tesco Car Park	90	8	18	22	48	66	52	55	38	29	52	39	42	39	43%	73%
Front of Sizzlers Hair Design on R445	20	6	8	10	17	16	17	17	14	15	15	13	15	14	68%	80%
Rear GameStop R445	10	2	2	2	4	5	5	4	6	7	3	3	1	4	37%	50%
Naas Shopping Centre, Wolfe Tone Street	535	39	180	273	325	339	342	325	324	309	232	92	39	235	44%	63%
McAuley Place off Sallins Rd	70	37	40	60	69	56	65	69	69	62	32	19	23	50	72%	80%
Keenan's Car Park, located off North Main Street & Friary Rd	80	2	4	20	49	45	53	41	45	40	50	31	17	33	41%	56%
Boyles Car Park Friary Rd	100	3	3	9	37	47	49	49	59	62	47	35	21	35	35%	47%
Sunny Laundrette Off Friary Rd	50	4	7	25	37	37	31	36	37	30	32	27	15	27	53%	74%
Hendermans Car Park	120	6	9	23	48	53	58	58	54	52	44	40	25	39	33%	44%
Trax Brasserie	25	1	1	4	4	4	4	4	6	7	6	7	7	5	18%	16%

Teagasc - Friary Rd	28	0	0	2	4	7	7	7	8	10	7	0	0	4	15%	25%
Rear Peter Marks, North Main Street	40	5	5	10	15	20	21	20	20	19	20	14	8	15	37%	50%
Rear of 3-store, North Main Street	36	9	12	16	17	19	21	23	21	20	19	18	10	17	47%	53%
Lemongrass Fusion, off Abbey Rd	30	0	5	7	16	19	15	17	13	22	15	8	4	12	39%	63%
Wink Beauty, Friary Road	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	0%
Cill Corban, Off Corbans Lane	28	0	13	22	18	20	22	24	21	18	16	12	10	16	58%	71%
Cill Corban, Off Corbans Lane	16	0	1	1	1	6	5	11	5	10	7	10	8	5	34%	38%
Corban's Lane	43	0	11	20	20	21	21	22	17	19	21	19	16	17	40%	49%
Rear of VDA Coffee, South Main St	56	6	6	14	21	28	24	27	24	18	15	10	8	17	30%	50%
Front of Baltic Way, South Main Street	18	0	2	2	1	9	5	9	3	3	1	3	3	3	19%	50%
Super Value Car Park, off South Main Street	68	6	9	13	22	44	49	45	24	20	29	31	26	27	39%	65%
Fairgreen Car Park, off Ballymore Road & South Main Street	36	3	9	20	25	28	30	29	25	25	22	20	17	21	59%	78%
Rear Acme Blinds, R445 Newbridge Rd	10	2	2	4	8	6	7	9	5	5	5	2	7	5	52%	60%
Fogarty's Post Office, off Kilcullen Rd	50	2	5	12	17	21	20	22	21	31	13	4	3	14	29%	42%

R448

Rear Swan Dowling, Off Newbridge Road	43	0	2	12	18	19	17	18	19	16	13	13	8	13	30%	44%
Kildare County Council head office car park	458	23	59	273	377	374	377	350	334	330	180	139	54	239	52%	82%
K Leisure Centre	157	31	20	55	95	73	58	56	39	50	49	82	97	59	37%	46%
Barrack Gate Vet Clinic, off Pacelli Road	15	0	2	5	7	4	6	8	6	9	6	10	9	6	40%	27%
Rear Quinlan & Co, off R445	28	2	2	7	0	0	0	0	0	0	0	0	0	1	3%	0%
Rear of Aroma Mocha, North main Street and access off Abbey Rd	25	0	6	5	11	16	15	16	15	17	17	10	6	11	45%	64%
John P Greely & Sons, Millbrook Court	33	4	12	21	22	23	22	14	22	23	16	13	6	17	50%	70%

6.1.4 Saturday On-Street Parking Occupancy

Figure 6.4 shows the percentage occupancy for on-street car parks during the peak hour on a Saturday in Naas. This highlights that the highest occupancies are on streets near the retail outlets on the main street. While in comparison with weekday results, the percentage occupancy near the hospital and peripheral car parks is lower.

Figure 6.4: % Occupancy in On-Street Car Parks in Naas during Saturday Peak Hour

Figure 6.5 shows the percentage occupancy in on-street car parks in Sallins during the peak hour on a Saturday. Occupancy rates are higher than those observed in Sallins for a weekday, with the highest occupancy levels occurring in on-street car parks on the north bank of the Grand Canal.

Figure 6.5: % Occupancy in On-Street Car Parks in Sallins during Saturday Peak Hour

Table 6.4 shows the full survey results for on-street car parks on a Saturday in Naas and Sallins.

Table 6.4: Saturday On-Street Parking Survey Results

Town	Location	Capacity	7-8am	8-9am	9-10am	10-11am	11-12am	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm	Avg. Spaces Occupied	Avg. % Occupied	% Occupied in 4-5pm Peak
Naas	The Sycamores	21	4	6	9	12	9	12	12	6	8	7	7	13	9	42%	33%
Naas	Gleann Na Greine	12	5	5	4	7	6	5	5	5	6	4	6	9	6	47%	33%
Naas	Friary Road	9	3	3	8	7	7	8	8	7	7	7	4	7	6	70%	78%
Naas	Main Street (R445) from Market Square to John's Lane	28	2	4	15	15	14	15	12	16	14	18	13	14	13	45%	64%
Naas	Basin Street	22	3	4	5	11	11	13	9	21	20	20	14	15	12	55%	91%
Naas	The Harbour Parking	8	0	0	0	2	2	5	3	6	6	6	4	5	3	41%	75%
Naas	Abbey Road	35	11	11	15	19	15	20	26	27	5	34	27	24	20	56%	97%
Naas	North Main Street, John's Lane, Friary Road North	48	16	13	19	30	29	36	32	28	31	28	35	42	28	59%	58%
Naas	South Main Street	23	4	6	18	22	18	23	17	20	17	21	15	16	16	71%	91%
Naas	Corban's Lane	45	5	3	5	20	23	16	14	20	21	18	17	18	15	33%	40%
Naas	St Ita's Place	25	14	12	14	15	18	18	13	17	13	18	12	13	15	59%	72%
Naas	R448 (West Side)	18	7	7	9	11	13	11	13	11	11	10	9	6	10	55%	56%
Naas	R448 (East Side)	23	2	6	2	8	7	6	8	9	8	9	14	6	7	31%	39%
Naas	Craddockstown Road	38	0	1	2	4	6	8	12	17	22	22	14	12	10	26%	58%
Naas	Ballycane Road	15	2	2	2	2	2	2	2	2	3	4	2	2	2	15%	27%
Naas	R411 (East side)	46	4	15	18	27	28	21	24	30	29	23	20	18	21	47%	50%
Naas	R448 (East side - West Wood)	12	2	2	2	3	5	2	1	1	2	2	1	0	2	16%	17%

Naas	Kilcullen Road	42	14	27	21	27	29	33	28	30	30	28	24	17	26	61%	67%
Naas	Ballymore Road	16	2	2	3	2	3	5	6	3	6	2	5	1	3	21%	13%
Naas	Limerick Road	9	2	2	1	3	5	6	6	7	4	6	4	6	4	48%	67%
Naas	Harbour View	15	6	9	12	13	12	12	14	13	11	9	12	1	10	69%	60%
Naas	St Martin's Avenue	6	1	3	4	4	4	3	3	2	2	2	1	0	2	40%	33%
Naas	Sarto Road	8	0	0	1	0	1	1	1	1	1	1	1	0	1	8%	13%
Naas	Sallins Road, Dublin Road, Wolfe Tone Street	53	6	11	35	42	42	47	40	32	26	23	40	44	32	61%	43%
Naas	Main Street and Market Square	36	3	2	4	12	10	13	13	15	1	23	10	11	10	27%	64%
Sallins	Chapel Lane - Nolans Butchers	10	2	2	5	4	3	6	4	4	5	4	5	2	4	38%	40%
Sallins	Chapel Lane	55	21	22	26	23	30	28	20	25	27	32	33	35	27	49%	58%
Sallins	Sallins Wood (North Quays)	30	17	17	14	14	13	13	14	25	27	24	23	27	19	63%	80%
Sallins	Church Avenue (South Quays)	32	16	15	18	24	24	25	19	17	19	19	15	18	19	60%	59%
Sallins	Sallins Main Street	11	2	2	5	4	4	6	4	6	6	5	6	4	5	41%	45%
Sallins	Millbank (North Quays)	11	4	4	4	3	6	4	5	9	9	7	6	9	6	53%	64%

6.1.5 Saturday Off-Street Parking Occupancy

Figure 6.6 shows the percentage occupancy for off-street car parks during the peak hour on a Saturday in Naas. This shows that the highest occupancy levels are generally located near the retail outlets on the main street, with the exception of the K Leisure gym car park to the west. In comparison with weekday results, occupancy in peripheral car parks is lower on a Saturday. This includes Sallins train station where the average occupancy in the station car park is 10% on a Saturday.

Figure 6.6: % Occupancy in Off-Street Car Parks in Naas during Saturday Peak Hour

Table 6.5 shows the full survey results for off-street car parks on a Saturday in Naas and Sallins.

Table 6.5: Saturday Off-Street Parking Survey Results

Name	Capacity	7-8am	8-9am	9-10am	10-11am	11-12am	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm	Avg. No. Occupied	Avg. % Occupied	% Occupied in 11-12am Peak
Sallins Train Station	253	24	26	26	30	28	32	30	27	26	21	22	21	26	10%	11%
Maxol Petrol Station R445 Dublin Road	10	2	3	1	4	2	2	3	3	3	1	3	1	2	23%	20%
Tesco Car Park	90	7	14	21	30	59	43	55	52	51	47	36	45	38	43%	66%
Front of Sizzlers Hair Design on R445	20	0	0	4	14	13	16	12	10	10	9	7	10	9	44%	65%
Rear GameStop R445	10	0	2	3	4	4	5	5	6	5	6	4	0	4	37%	40%
Naas Shopping Centre, Wolfe Tone Street	535	21	58	237	307	251	185	145	135	115	94	48	16	134	25%	47%
McAuley Place off Sallins Rd	70	26	25	30	46	41	35	49	50	38	42	32	59	39	56%	59%
Keenan's Car Park, located off Main Street & Friary Rd	80	0	0	12	38	51	52	56	59	60	61	31	14	36	45%	64%
Boyles Car Park Friary Rd	100	3	3	6	22	37	51	50	64	56	49	37	17	33	33%	37%
Sunny Laundrette Off Friary Rd	50	5	8	16	35	35	33	38	37	39	32	13	7	25	50%	70%
Hendermans Car Park	120	2	5	19	51	67	76	73	75	77	50	41	22	47	39%	56%
Trax Brasserie	25	0	6	8	7	7	7	7	7	2	3	8	9	6	24%	28%
Rear Peter Marks, North Main Street	40	3	5	8	12	17	12	12	13	17	18	13	3	11	28%	43%
Rear of 3-store, North Main Street	36	4	13	17	18	16	15	14	14	13	14	13	0	13	35%	44%
Lemongrass Fusion, off Abbey Rd	30	4	4	10	15	21	29	15	18	21	24	13	19	16	54%	70%
Cillcorban, Off Corbans Lane	28	0	0	0	4	4	4	5	0	0	0	0	0	1	5%	14%

Cillcorban, Off Corbans Lane	16	0	0	0	14	14	11	15	11	9	11	8	13	9	55%	88%
Corban's Lane	43	4	4	5	10	10	10	14	19	14	15	13	18	11	26%	23%
Rear of VDA Coffee, South Main St	56	4	5	3	5	3	9	8	9	10	10	8	8	7	12%	5%
Front of Baltic Way, South Main Street	18	2	4	6	7	13	6	4	5	7	8	5	5	6	33%	72%
Super Value Car Park, off South Main Street	68	6	13	11	20	34	38	36	32	32	30	22	23	25	36%	50%
Fairgreen Car Park, off Ballymore Rd. & South Main Street	36	2	12	8	14	21	17	22	21	24	15	12	11	15	41%	58%
Rear Acme Blinds, R445 Newbridge Rd	10	3	5	5	7	9	7	4	4	6	5	6	6	6	56%	90%
Fogarty's Post Office, off Kilcullen Rd R448	50	4	9	14	18	17	13	11	19	17	21	8	4	13	26%	34%
Rear Swan Dowling, Off Newbridge Road	43	1	4	5	5	7	7	6	7	6	5	3	1	5	11%	16%
K Leisure Centre	157	1	19	86	103	105	72	60	50	66	52	14	4	53	34%	67%
Barrack Gate Vet Clinic, off Pacelli Road	15	2	5	8	12	11	12	12	7	10	12	13	7	9	62%	73%
Rear of Aroma Mocha, North main Street and access off Abbey Rd	25	7	12	12	20	21	23	16	10	9	8	7	4	12	50%	84%
John P Greely & Sons, Millbrook Court	33	0	2	7	9	6	8	9	5	5	7	4	1	5	16%	18%

6.2 Road Network: Walking and Cycling Survey

Site visits were conducted on the 30th January 2019 and the 12th June 2019 to identify the existing transport infrastructure for walking and cycling on major roads in the study area. The results of this survey are broken into radial, town centre and orbital routes.

6.2.1 Radial Routes

This section summarises the walking and cycling issues on some of the main radial routes into Naas.

6.2.1.1 Dublin Road

The Dublin Road is the primary connection to Naas Town Centre for traffic approaching from Dublin (Figure 6.7). The Dublin Road has two lanes and is approximately 13.5m wide between the Big Ball Roundabout and the Roseville residential estate.

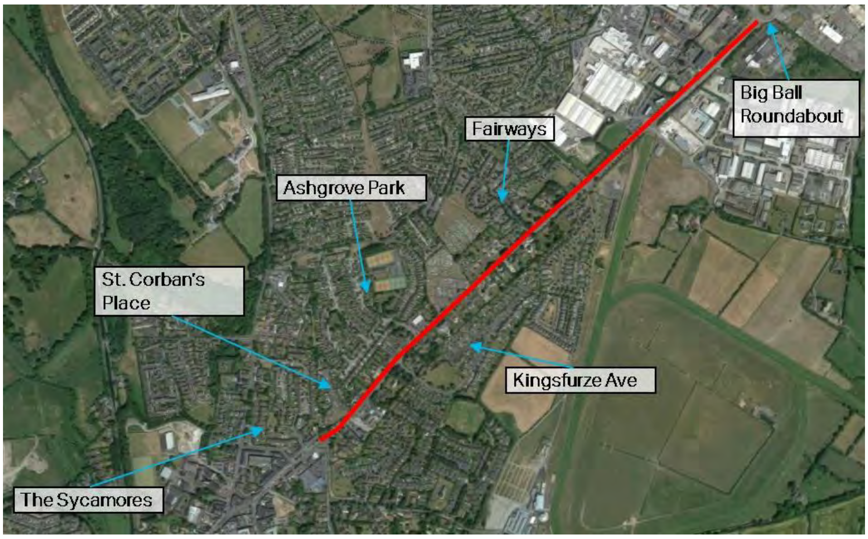


Figure 6.7: Location of Dublin Road

Following the Roseville residential estate entrance, Dublin Road is approximately 10m wide. Pedestrian footpaths of between 2-3 metres width are provided on both sides of Dublin Road and there are four signalised pedestrian crossing points. However, there is no cycling infrastructure provided along the route. A photo of the Dublin Road is shown in Figure 6.8.

Figure 6.8: Photo of Dublin Road

6.2.1.2 Sallins Road

Sallins Road is 3km long road which connects Sallins Village, Sallins Train Station and Naas Town Centre (Figure 6.9). The road connects traffic northbound towards Sallins, and southbound towards Naas; with two traffic lanes and a carriageway width of approximately 6.5m.

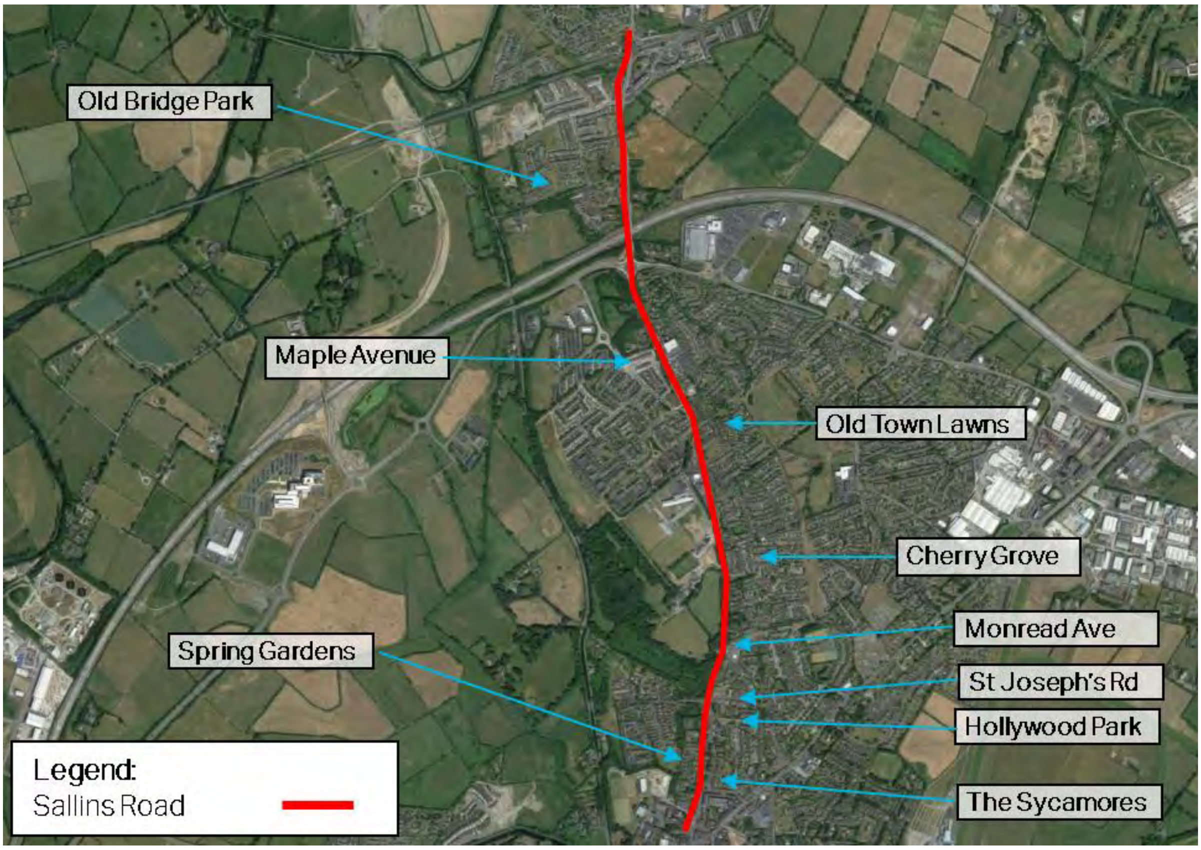


Figure 6.9: Location of Sallins Road

The route includes north and southbound, on-road, cycle lanes. However, the cycle lanes are narrow, unsegregated and discontinuous as they cease at the Applegreen filling station to the south of the Monread Avenue junction (Figure 6.10). Reasonable quality pedestrian footpaths are provided on both sides of Sallins Road for most of the route. A section between the entrance to Hollywood Park and the Sycamores however; only has a pedestrian footpath on the west side of the road.

Figure 6.10: Photo of Sallins Road

6.2.1.3 Kilcullen Road

Kilcullen Road North (Figure 6.11) is approximately 1km long road which connects Naas Town Centre and the southern Kilcullen Road roundabout. Generally, the road has a 9m wide carriageway; with one northbound traffic lane and one southbound traffic lane.

Figure 6.11: Kilcullen Road – North

There are no cycle facilities along Kilcullen Road. Pedestrian footpaths of approximately 2.4m width are provided on both sides of the road for the entire route leading into Naas Town Centre as shown in Figure 6.12.

Figure 6.12: Photo of Kilcullen Road - North

Kilcullen Road South (Figure 6.13) is approximately 1.5km in length; connecting Piper's Hill school campus to Naas. The street width at its widest is 16 metres.

Figure 6.13: Kilcullen Road – South

There are footpaths and cycle lanes are provided from the Kilcullen roundabout to Piper's Hill Campus. There is no direct access from the cycle lane to the schools in Pipers Hill due to a wooden fence and shrubbery which block the route at present. A photo of Kilcullen Road South is shown in Figure 6.14.

Figure 6.14: Photo of Kilcullen Road – South

6.2.1.4 Newbridge Road

Newbridge Road is approximately 1km in length and connects traffic from the west to Naas Town Centre and the Main Street (Figure 6.15). Predominately, Newbridge Road is approximately 8m wide and accommodates a traffic lane in each direction. The road expands to approximately 10.5m width on approach to residential areas.

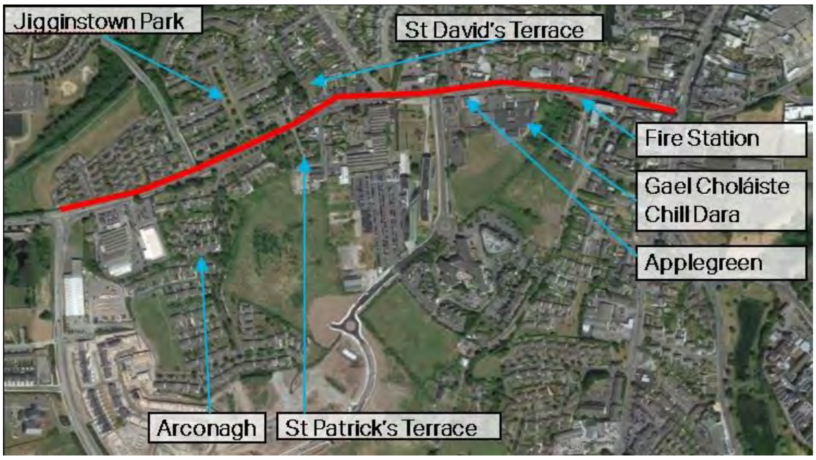


Figure 6.15: Newbridge Road

There are pedestrian footpaths on both sides of Newbridge Road, however, no cycle facilities are provided. Four signalised crossing points along Newbridge Road provide adequate levels of pedestrian permeability. A photo of Newbridge Road is shown in Figure 6.16.

Figure 6.16: Photo of Newbridge Road

6.2.1.5 Ballymore Road

Ballymore Road is approximately 780m long and runs adjacent to the lakeside walking trail between the Main Street / Kilcullen Road / Ballymore Road Junction and the southern R411 Roundabout (Figure 6.17).

Figure 6.17: Ballymore Road

Ballymore Road is approximately 7.5m wide, with one northbound traffic lane and one southbound traffic lane. Pedestrian footpaths are provided on both sides of the road however, there are no cycle lanes on the Ballymore Road (Figure 6.18).

Figure 6.18: Photo of Ballymore Road

6.2.1.6 Craddockstown Road

Craddockstown Road is an approximately 1km long route connecting Ballymore Road to Ballycane Road, on the eastern periphery of Naas Town Centre (Figure 6.19).

Figure 6.19: Craddockstown Road

The road is approximately 8.5m wide in most places and provides good quality footpaths on both sides of the road. There are no cycle facilities on the road. A photo of Craddockstown Road is shown in Figure 6.20.

Figure 6.20: Photo of Craddockstown Road

6.2.1.7 Blessington Road

Blessington Road is an approximately 2km long that traverses the western outskirts of Naas Town Centre, providing a connection between Dublin Road and Ballycane Road (Figure 6.21). The road is characterised by one northbound traffic lane and one southbound traffic lane.

Figure 6.21: Blessington Road

The road is approximately 7m wide throughout, however no cycle facilities are provided. Pedestrian footpaths are provided on both sides of the road of approximately 2m width. A photo of Blessington Road is shown in Figure 6.22.

Figure 6.22: Photo of Blessington Road

6.2.1.8 John Devoy Road

John Devoy Road is approximately 1km in length and provides a connection from Newbridge Road; running adjacent to the Kildare County Council Buildings, to the southern ring road on the outskirts of Naas (Figure 6.23).

Figure 6.23: John Devoy Road

The road is approximately 9.5m wide along the section connecting between Newbridge Road and the John Devoy Roundabout. This section provides approximately 3 metre wide pedestrian footpaths but no cycle facilities. A photo of the John Devoy Road near the Kildare County Council offices is shown in Figure 6.24.

Figure 6.24: Photo of John Devoy Road

South of the John Devoy Roundabout, the road provides access to the recently constructed Elsmore residential development and the Southern Ring Road. This section of John Devoy Road is approximately 10.5m wide and provides good quality cycle lanes, along with wide pedestrian footpaths, on both sides of the road.

6.2.2 Town Centre Routes

This section summarises the walking and cycling issues on some of the town centre routes in Naas.

6.2.2.1 Naas Main Street

Naas Main Street is an approximately 700 metre long and acts as the central commercial point of the town (Figure 6.25). The Main Street is predominately 8 metres in width and accommodates one northbound traffic lane and one southbound traffic lane.

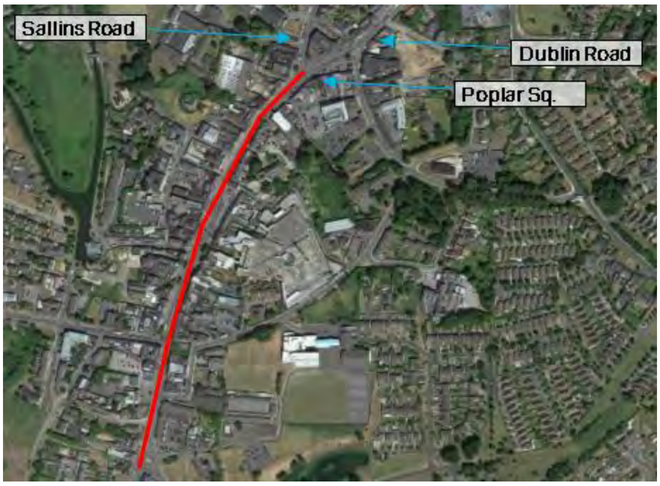


Figure 6.25: Naas Main Street

There are no cycle lanes along the Main Street. However, there are a number of bicycle parking stands in the vicinity of the bus and taxi ranks. Pedestrian footpaths are provided on both sides of Naas Main Street and there is a pedestrian signalised crossing. West side of the Main Street, in the vicinity of the Courthouse to the Post Office, there are footpath widths of up to 9 metres. While on the east side of the Main Street, footpaths are 2 metres (or less) wide. Illegal parking was observed along Main Street, including on footpaths where vehicles create obstructions for pedestrians. A photo of Naas Main Street is shown in Figure 6.26.

Figure 6.26: Photo of Naas Main Street

6.2.2.2 Corban's Lane

Corban's Lane is approximately 500 metre long and connects Naas Main Street to Friary Road and Blessington Road (Figure 6.27).

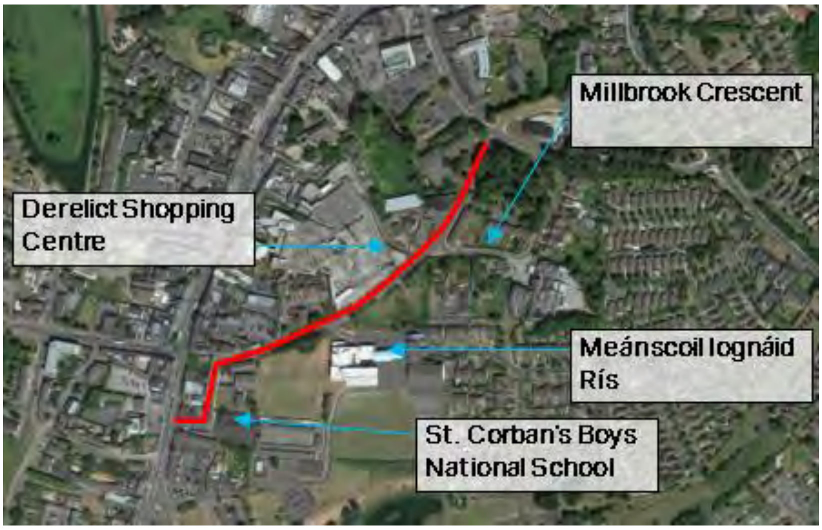


Figure 6.27: Corban's Lane

The route runs adjacent to the derelict Naas Town Centre Shopping Centre and is characterised by a narrow road width of approximately 6m which has both east and west bound lanes (Figure 6.28). There are no cycle facilities along Corban's Lane, however, pedestrian footpaths are provided along the majority of the route, except for at the pinch point to the rear of the school sports facilities. Footpath quality is poor at the rear of the derelict shopping centre.

Figure 6.28: Photo of Corban's Lane

6.2.2.3 St. David's Lane

St. David's Lane is an extremely narrow one-way lane that runs along the southern boundary of the derelict Naas Shopping Centre from Corban's Lane to Naas Main Street (Figure 6.29).

Figure 6.29: St. David's Lane

St. David's Lane is 4m wide and allows traffic to flow in one direction from Corban's Lane into Naas Main Street. A narrow 1m wide footpath is defined by road markings along the route on the southern side of the road, as shown in Figure 6.30. The absence of proper pedestrian footpaths and cycle facilities combined with a narrow traffic lane and extremely poor lighting makes this route hazardous for active modes.

Figure 6.30: Photo of St. David's Lane

6.2.2.4 Friary Road

Friary Road is approximately 400m long, connecting; Dublin Road, Corban's Lane and Blessington Road (Figure 6.31).

Figure 6.31: Friary Road

Friary Road has one lane in each direction for traffic, approximately 6.5m wide in total, and provides good quality pedestrian footpaths of approximately 2.3m width on both sides of the road between the junction with the Dublin road and Millbrook Villas. East of Millbrook Villas, a pedestrian footpath is only provided on the north side of Friary Road until the road ends at the Blessington Road junction. No cycle facilities are provided along the entirety of Friary Road. A photo of Friary Road is shown in Figure 6.32.

Figure 6.32: Photo of Friary Road

6.2.3 Orbital Routes

This section summarises the walking and cycling issues on some of the main orbital routes in Naas.

6.2.3.1 Monread Road

Monread Road is a 2km stretch of carriageway connecting Sallins Road and the Dublin Road, north of Naas Town Centre (Figure 6.33).

Figure 6.33: Monread Road

The Monread Road is approximately 7.5m wide and provides one eastbound traffic lane and one westbound traffic lane. The road expands to approximately 10m in width at points to accommodate dedicated turning lanes into residential and commercial areas along the route. Approximately 2m wide pedestrian footpaths are provided on both sides of Monread Road, but there are no cycle facilities along the route. A photo of Monread Road is shown in Figure 6.34.

Figure 6.34: Photo of Monread Road

6.2.3.2 Southern Ring Road

The Southern Ring Road forms a 1.5km southern connection between the eastern and western extents of Naas; from the Ballycane Road to Newbridge Road (Figure 6.35).

Figure 6.35: Southern Ring Road

The road is approximately 7.5m wide with one lane in each direction; there are three roundabout junctions along the route. The Southern Ring Road has segregated cycle and pedestrian facilities on both sides of the road. However, the cycle markings between the bike and pedestrian lanes have eroded to the point of being no longer visible in places along the route. A photo of the Southern Ring Road is shown in Figure 6.36.

Figure 6.36: Photo of Southern Ring Road

6.2.3.3 Ballycane Road

Ballycane Road is a 1km long road between Ballymore Road Roundabout and Blessington Road (Figure 6.37). The road completes the Southern Ring Road to connect east and west Naas.

Figure 6.37: Ballycane Road

The road is approximately 6.5m wide, characterised by one eastbound traffic lane and one westbound traffic lane. Pedestrian footpaths are provided on both sides of the road, however, there are no cycle facilities along the route. A photo of Ballycane Road is shown in Figure 6.38.

Figure 6.38: Photo of Ballycane Road

6.2.3.4 Millennium Link Road

Millennium Road is approximately 4.5km long and connects the northern and western extent of Naas; from the Sallins road to the R445 at Newhall Retail Park (Figure 6.39). The road is approximately 22m wide with one northbound lane and one southbound lane.

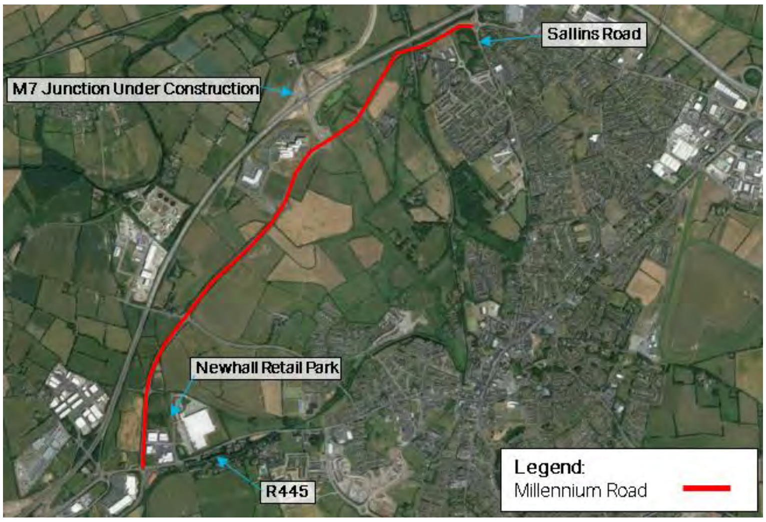


Figure 6.39: Millennium Road

Pedestrian footpaths and cycle lanes are provided along the whole route. Pedestrian and cyclists are separated from the vehicular traffic by a grass verge with bollards along the majority of the route. There are six roundabouts providing access to existing or future enterprise & employment lands. A photo of the Millennium Road is shown in Figure 6.40.

Figure 6.40: Photo of Millennium Road

6.3 Traffic Surveys

6.3.1 Automatic Traffic Counts

The location of the automatic traffic counters is shown in Figure 6.41.

Figure 6.41: ANPR & ATC Survey Locations

The ATC surveys revealed that the R445 west of the roundabout with the Millennium Park Link Road was the most heavily trafficked section of the local road network in Naas with a three-day average AM peak (08:00 – 09:00) total of approximately 2,000 vehicles and PM peak (17:15 – 18:15) total of 1,750 vehicles in both directions.

It should be noted that the ongoing construction works on the neighbouring M7/N7 may have adversely impacted the traffic surveys as traffic may have travelled through Naas in order to avoid any significant delays or temporary traffic management.

Table 6.6: AM and PM Peak Traffic Flows at ATC Counters

ATC	Direction	LV AM	HV AM	All AM	LV PM	HV PM	All PM
1	Eastbound	1,053	49	1,144	646	14	681
	Westbound	839	20	899	978	30	1,068
2	Eastbound	629	10	675	218	1	239
	Westbound	193	4	211	763	6	812
3a	Eastbound	553	15	610	626	14	667
	Westbound	927	26	989	627	9	675
3b	Northbound	546	14	599	594	13	633

ATC	Direction	LV AM	HV AM	All AM	LV PM	HV PM	All PM
	Southbound	778	21	842	584	9	622
4	Eastbound	548	18	617	395	8	423
	Westbound	737	22	795	317	8	346
5	Eastbound	173	1	184	178	1	189
	Westbound	183	1	194	291	0	309
6	Northbound	583	20	673	623	10	672
	Southbound	612	21	692	864	16	949
7	Eastbound	45	0	50	94	0	101
	Westbound	60	0	66	51	0	56
8	Eastbound	122	0	134	101	0	107
	Westbound	167	0	171	247	0	261
9	Northbound	686	14	742	429	1	451
	Southbound	392	12	433	604	9	649
10	Eastbound	242	11	272	269	3	290
	Westbound	292	16	336	295	3	318
11	Northbound	203	1	212	79	0	82
	Southbound	183	1	196	101	0	104
12	Northbound	195	2	211	84	1	92
	Southbound	89	1	100	169	4	186
13	Northbound	953	17	1,023	405	6	432
	Southbound	530	19	575	1,011	15	1,077
14	Eastbound	632	4	680	443	2	480
	Westbound	340	11	370	545	20	590
15	Northbound	306	17	336	317	6	340
	Southbound	234	3	249	581	6	612
16	Northbound	323	1	333	124	0	130
	Southbound	195	7	208	236	8	250
17	Eastbound	479	7	504	170	0	177
	Westbound	226	10	238	304	16	323
18	Eastbound	141	1	146	146	1	154
	Westbound	388	2	403	266	0	274
19	Northbound	425	8	458	500	7	534
	Southbound	505	6	546	506	2	533
20	Northbound	542	14	605	578	3	606
	Southbound	601	20	658	689	10	742
21	Northbound	535	8	575	363	6	379
	Southbound	580	12	625	585	20	632

shows the surveyed AM and PM peak period flows at each ATC counter location.

Table 6.6: AM and PM Peak Traffic Flows at ATC Counters

ATC	Direction	LV AM	HV AM	All AM	LV PM	HV PM	All PM
1	Eastbound	1,053	49	1,144	646	14	681
	Westbound	839	20	899	978	30	1,068
2	Eastbound	629	10	675	218	1	239
	Westbound	193	4	211	763	6	812
3a	Eastbound	553	15	610	626	14	667
	Westbound	927	26	989	627	9	675
3b	Northbound	546	14	599	594	13	633
	Southbound	778	21	842	584	9	622
4	Eastbound	548	18	617	395	8	423
	Westbound	737	22	795	317	8	346
5	Eastbound	173	1	184	178	1	189
	Westbound	183	1	194	291	0	309
6	Northbound	583	20	673	623	10	672
	Southbound	612	21	692	864	16	949
7	Eastbound	45	0	50	94	0	101
	Westbound	60	0	66	51	0	56
8	Eastbound	122	0	134	101	0	107
	Westbound	167	0	171	247	0	261
9	Northbound	686	14	742	429	1	451
	Southbound	392	12	433	604	9	649
10	Eastbound	242	11	272	269	3	290
	Westbound	292	16	336	295	3	318
11	Northbound	203	1	212	79	0	82
	Southbound	183	1	196	101	0	104
12	Northbound	195	2	211	84	1	92
	Southbound	89	1	100	169	4	186
13	Northbound	953	17	1,023	405	6	432
	Southbound	530	19	575	1,011	15	1,077
14	Eastbound	632	4	680	443	2	480
	Westbound	340	11	370	545	20	590
15	Northbound	306	17	336	317	6	340
	Southbound	234	3	249	581	6	612
16	Northbound	323	1	333	124	0	130
	Southbound	195	7	208	236	8	250

ATC	Direction	LV AM	HV AM	All AM	LV PM	HV PM	All PM
17	Eastbound	479	7	504	170	0	177
	Westbound	226	10	238	304	16	323
18	Eastbound	141	1	146	146	1	154
	Westbound	388	2	403	266	0	274
19	Northbound	425	8	458	500	7	534
	Southbound	505	6	546	506	2	533
20	Northbound	542	14	605	578	3	606
	Southbound	601	20	658	689	10	742
21	Northbound	535	8	575	363	6	379
	Southbound	580	12	625	585	20	632

6.3.2 Link Flows

Table 6.7 shows the surveyed link flows for major roads in the study area at peak times.

Table 6.7: Surveyed Link Flows on Major Roads in Naas and Sallins

Link	Street Name		AM	PM
		Direction	Survey	Survey
3	L6035	E	184	189
3	L6035	W	194	309
15	Blessington Road	N	742	451
15	Blessington Road	S	433	649
25	R407	N	599	622
25	R407	S	842	633
88	Ballymore Eustace Road	N	333	92
88	Ballymore Eustace Road	S	208	250
111	L2012	E	617	130
111	L2012	W	795	186
270	R409	E	675	423
270	R409	W	211	346
290	R445	E	1144	812
290	R445	W	899	239
460	R448	S	249	681
460	R448	N	336	1068
494	Main Street South	S	625	675
494	Main Street South	N	575	667
930	Friary Road	E	146	1077
930	Friary Road	W	403	340
981	Blessington Road	W	336	612

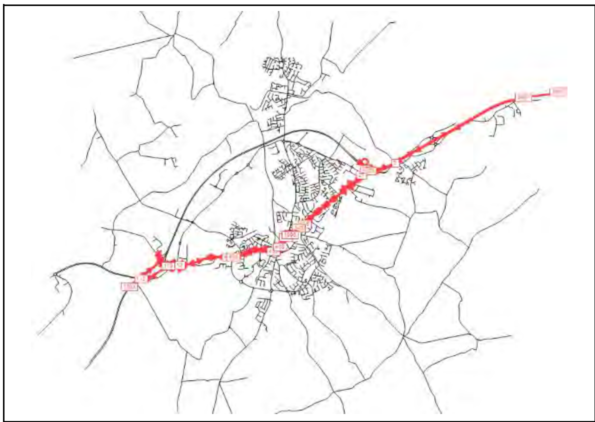
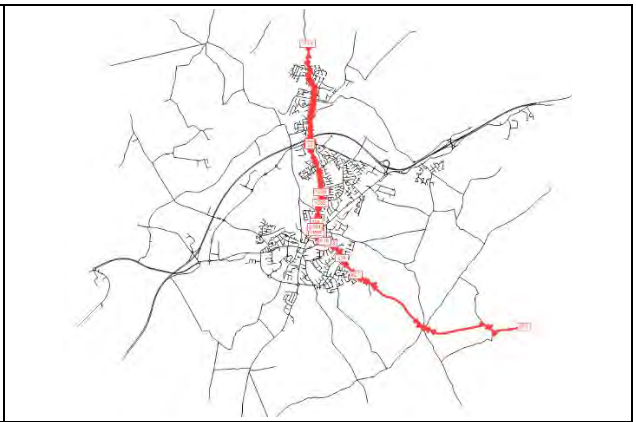
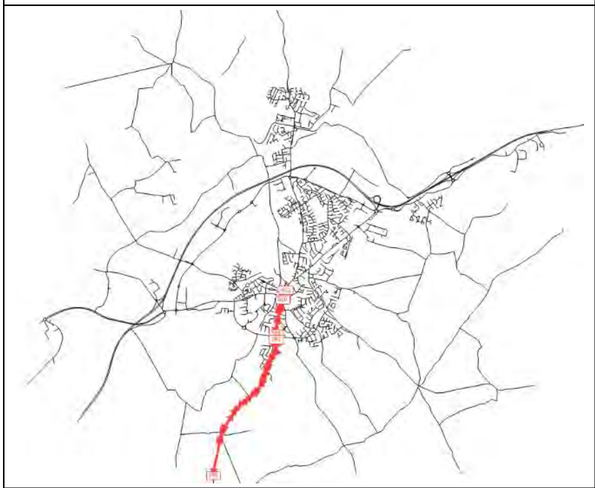
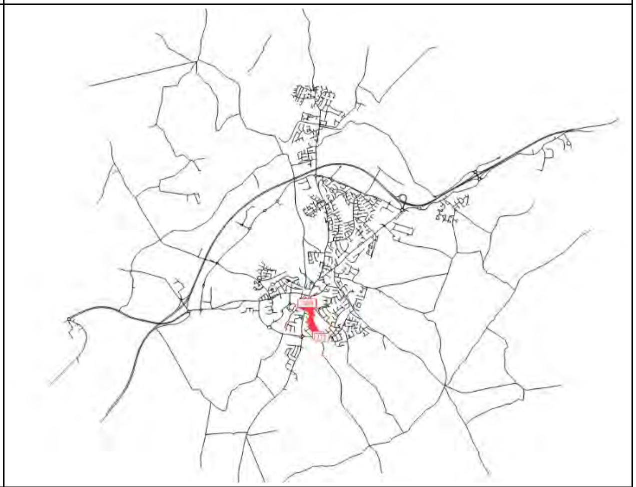
981	Blessington Road	E	272	949
1398	Ballymore Road	N	211	672
1398	Ballymore Road	S	100	154
1568	Newbridge Road	E	680	274
1568	Newbridge Road	W	370	318
1631	Craddockstown Road	N	212	290
1631	Craddockstown Road	S	196	590
1634	Dublin Road	S	658	480
1634	Dublin Road	N	605	104
1641	Kilcullen Road	S	575	82
1641	Kilcullen Road	N	1023	606
1682	Sallins Road	S	546	742
1682	Sallins Road	N	458	534
1684	Tipper Road	W	171	533
1686	Tipper Road	E	134	261
2058	Millennium Link Road	E	610	107
2058	Millennium Link Road	W	989	379
2325	R445	S	692	585
2325	R445	N	673	432
2334	Fishery Lane	E	50	56
2334	Fishery Lane	W	66	101
2400	Craddockstown Road	N	504	177
2400	Craddockstown Road	S	238	323

6.3.3 Journey Times

Journey time information was extracted using Google's journey time API. Routes where drawn up to capture all the main routes through the modelled network to ensure traffic conditions were being modelled correctly. Figure 6.42 shows the routes which were used.

Each route was divided into several sections, typically between signalised and large priority junctions, in order to provide context for each route otherwise the line would be linear, and it would not be possible to identify areas of congestion. Each section of the journey time routes was assigned a start and end coordinate and identifying reference number. The journey time between the coordinates was then calculated by the Google API and the resulting data was used to compare against the modelled journey times.

Google Journey Times were gathered for a one-hour period between 08:15 – 09:15 and 17:00 – 18:00 for each of the three journey time routes and used to validate the results of the AM and PM models.

	
Site 1	Site 2
	
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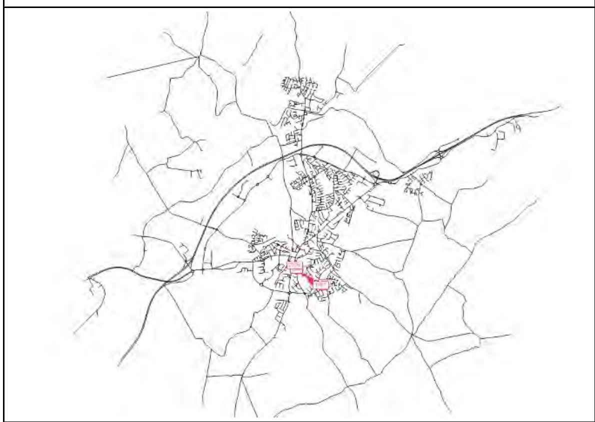
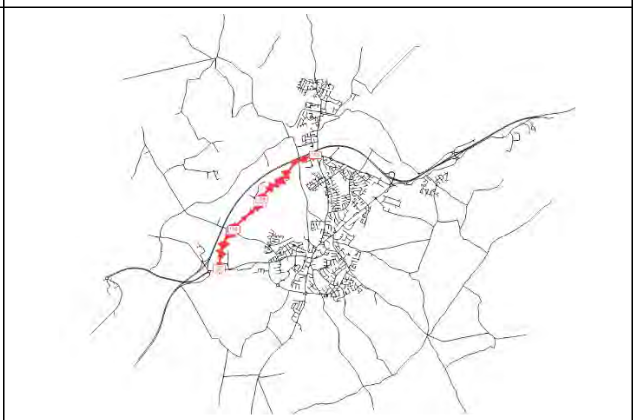
	
Site 5	Site 6

Site 7	Site 8

Figure 6.42: Journey Time Survey Routes

Table 6.8 and Table 6.9 summarise the surveyed journey times for each of the 8 routes assessed during the AM and PM respectively.

Table 6.8: AM Journey Time Results

Journey Time Route	Direction	Surveyed (seconds)
1	EB	1087
	WB	1070
2	NB	1068
	SB	1248
3	NB	410
	SB	343
4	NB	118
	SB	85
5	EB	136
	WB	142
6	EB	303
	WB	295
7	EB	918
	WB	720
8	EB	337
	WB	302

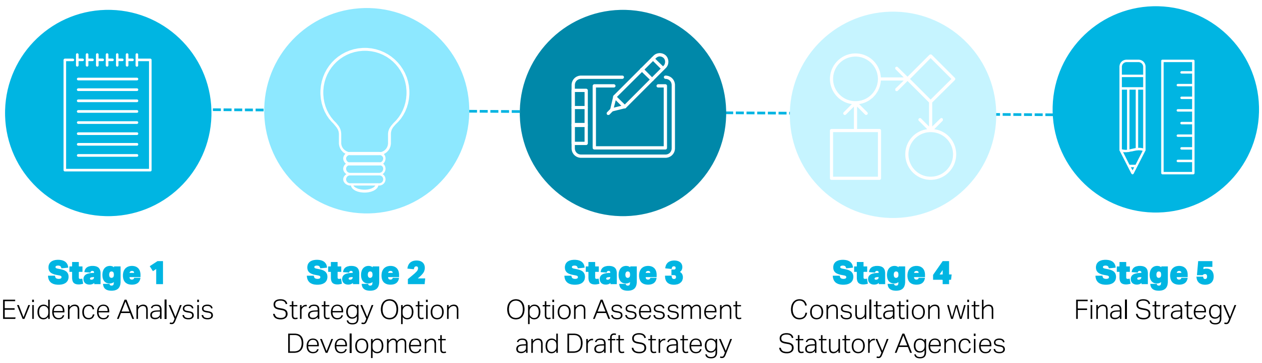
Table 6.9: PM Journey Time Results

Journey Time Route	Direction	Surveyed (seconds)
1	EB	1077
	WB	1770
2	NB	1180
	SB	1453
3	NB	365
	SB	343
4	NB	126
	SB	90
5	EB	111
	WB	128
6	EB	341
	WB	417
7	EB	870
	WB	1286
8	EB	296
	WB	322

7. Conclusion and Next Steps

The Baseline Report has established a comprehensive review of available data to identify problems in the existing transport network and highlight opportunities for improvement in Naas. This evidence will feed into the development of strategy options to improve conditions for all modes of transport; walking, cycling, cars/freight and public transport. In the final strategy report, these options will be assessed in a thorough Multi-Criteria Analysis (MCA) process to identify the preferred solutions for each mode which will form the initial draft transport strategy for Naas and Sallins. The final strategy will be developed through consultation with Kildare County Council and statutory agencies such as Transport Infrastructure Ireland and the National Transport Authority; to produce a refined suite of measures for implementation.

An overview of the strategy development process, of which the Baseline Report represents Stage 1, is shown below:



Appendix A Consultation: Additional Comments

Cycling

- There is significant demand for safer cycling facilities throughout the study area, particularly amongst parents of children.
- Existing cycling facilities are considered in general to be - unsafe, particularly for use by children. Roads and specific locations most frequently mentioned as having insufficient cycling facilities include: Sallins Road, Dublin Road, Caragh Road and Kilcullen Road; (particularly from the Kilcullen Road roundabout into the town centre).
- Numerous respondents mentioned the significant opportunity to provide a greenway along the canal. The need for greenways to have safe junctions where they interact with other roads was also highlighted.
- Existing cycle parking facilities at Sallins Station are considered to be not fit for purpose and there is also a demand for more and higher quality bicycle parking within the town centre.
- The presence of cyclists on footpaths as a result of a lack of safe alternative facilities is perceived to present a safety issue for pedestrians.
- Some respondents highlighted that cyclists do not use existing cycling facilities. However, others highlighted poor maintenance and/or poor quality of existing cycling facilities which may explain why some cyclists choose not to use particular facilities.
- A small number of respondents are against the further development of cycle facilities in certain areas due to a perceived potential loss of parking or the perception that cyclists do not use existing facilities.

Walking

- There is a need for improved pedestrian links and public realm in town centre, particularly Main Street and Poplar Square.
- There are some footpaths missing (e.g. Piper's Hill to Killashee) and others perceived to be too narrow (e.g. Sallins Road and SuperValu to Sallins school.
- Standing water on footpaths and spray from passing traffic makes walking very unpleasant between Sunday's Well and Friary Road.
- There is a need for better lighting along the canal and between the hospital and Fairgreen.
- Requests for additional pedestrian crossings at particularly locations – e.g. Sallins Road near church, Dublin Road, Maudlins Avenue, Monread Shops, Monread Road at Smyths/Woodies.
- Request for walking routes on the north side of the Canal from Abbey bridge to the Newbridge Road.
- There is a need for a pedestrian and cycling link to M7 Business Park.
- There is strong demand for the development or improvement of Greenway (pedestrian and cycle only) links along the canals (i.e. the 'mainline' Grand Canal Greenway and the Naas and Corbally branches) and some respondents would also like to see improved links to these facilities.
- The lack of a footpath at the entrance to Monread Park from Monread Avenue was felt to be hazardous by one respondent.
- Uneven and/or narrow pavements disproportionately impact wheelchair users, elderly people and parents with buggies.
- The excessively wide crossing point at the junction of Caragh Road with Newbridge Road and the presence of pedestrian guardrails at this location as well as the presence of guardrails near Scoil Bhríde primary school is perceived as a safety hazard.

- Anti-social behaviour at the Harbour was identified as an issue by two respondents, with one of these specifically stating that they avoid the area for this reason if walking when it is getting dark.

Road Safety (excluding comments specific related to walking/cycling infrastructure covered above)

- Concern about drivers breaking red lights and endangering pedestrians and other drivers – particularly at Murtagh's Corner, Piper's Hill campus, the junction of North Main Street and Sallins Road, the pedestrian crossing at Ballycane Road and within Sallins village.
- Significant concern about speeding, on many roads throughout the study area but particularly on the Kilcullen Road, Sallins Road, Blessington Road, Ring Road between Ballycane Road and Newbridge Road and within Sallins village. Some concern that the opening of Sallins bypass and associated alleviation of congestion within the village may increase traffic speeds there unless traffic calming measures are put in place.
- Traffic speeds in residential estates – request for more 30km/h limits, traffic calming and 'children at play' notices.
- Demand for more traffic calming and safe crossing points around schools as well as more enforcement to prevent car parking on footpaths near schools.
- Concern about potential safety implications for residential areas of the Inner Relief Road proposal.
- Concern about safety implications for children of train commuters parking within residential estates.
- Concern about safety issues at Piper's Hill school campus – children going out into the road to get to and from their parents' cars.
- Concern about issues for drivers trying to exit residential estates on the Kilcullen Road (e.g. Killashee View) as well as Piper's Hill school campus to traffic speeds and/or traffic volumes which restrict visibility.
- Request for a set down/pick up points near schools with safe/supervised access routes for children between these locations and schools.
- 'Nose to kerb' car parking outside 'Swans on the Green' perceived not to be safe as cars stick out onto road and reverse onto road.
- Concern about traffic light sequences at two junctions with pedestrian crossings, including the junction of New Row and Main Street and at the Dublin Road near Kingsfurze Avenue. According to a survey respondent, traffic is often observed still filtering through while the pedestrian green light is on, with some drivers getting stuck and not realising lights have changed and others trying to get through before the lights change again.

Traffic Congestion/Road Capacity/Car Access

- Significant congestion on Kilcullen Road at Piper's Hill school campus and surrounding area during school times is causing problems for residents who have difficulty exiting their estates as well as drivers wishing to drop their children to school.
- Suggestion that deliveries within the town centre could be restricted to specific times rather than blocking traffic lanes during busy times.
- Drivers entering and leaving some of the parking spaces in the town centre contributes to congestion.
- Multiple respondents feel that illegal parking of Garda and Irish Prison Service vehicles in the vicinity of the courthouse is a regular contributor to congestion.
- Request for offline bus stops on Kilcullen Road as there is a concern that buses stopping in existing stops marked on the road will contribute to congestion.
- Buses not pulling in properly in the town centre perceived to be contributing to congestion.

- Parents double parking outside schools and parking on double yellow lines perceived to be contributing to congestion.
- Suggestion that vehicular entrance to Tesco carpark could be moved further away from the junction of Dublin Road and Blessington Road as traffic entering the carpark currently impacts the junction.
- Commuter parking at Osberstown Court estate contributing to congestion at estate entrance.
- Significant delay experienced by drivers exiting Sallins train station during the evening peak.
- Request for additional yellow boxes in particular locations and more enforcement of existing yellow boxes.
- Buses and HGVs stopped at Newbridge/Limerick Road junction cause congestion as large vehicles sometimes cannot move even when they have a green light due to the width of the junction.
- Requests for completion of the ring road.
- Suggestion to provide or lengthen left turn lanes at various junctions including Newbridge Road at the approach to the roundabout junction with the ring road and at the Blessington Road/Dublin Road junction (approach to Dublin Road from Blessington Road and approach to Blessington Road on the Dublin Road from the Sallins direction).

Bus Services

- Numerous comments on the need for an improved bus services to the train station in Sallins from various parts of the study area.
- Request for bus service for Kilcullen Road area for use by secondary school pupils commuting to Piper's Hill campus and by residents connecting to 126 bus and train services.
- New town bus services would encourage more people to use the town centre at weekends and would also be particularly valuable for older people.
- Requests for new bus services for people commuting to work and college which do not travel via the Red Cow Park & Ride site, including, for example, a bus service to Tallaght via Blessington and another to Leopardstown.
- Bus stop requested for Jigginstown for use by routes serving Dublin.
- Lack of clarity regarding existing Esmondale bus stop and whether it should be used by Bus Eireann services.
- Request for town bus service serving Monread Business Park.
- Request for improved service between Naas and Dublin City Centre, particularly at night.
- Requests for additional bus stops between the Red Cow Luas stop and Dublin City Centre but also requests for more direct buses from Naas to Dublin and for buses to serve East Point Business Park.
- Request for bus service connecting Clane, Caragh and Sallins/Naas.
- Request for better bus service to Newbridge.
- Numerous complaints regarding reliability/punctuality of existing bus services between Dublin, Naas and Newbridge.
- Requests for bus shelters – two specific locations mentioned by respondents where there are no shelters currently included Roseville and Odeon Cinema.
- Requests for improved timetable and route information for local bus services and for real time bus information including electronic signage.
- Dissatisfaction with about the condition and quality of vehicles used on particular bus routes.

- Suggestion of amalgamating different types of bus services into one service.
- Suggestion that Naas should be covered by the Dublin Bus network similar to Blessington and Bray.
- Suggestion that bus lanes on N7 to Dublin could improve the attractive of bus services.

Car Parking in Naas Town Centre

- Overall, opinion regarding car parking within Naas town centre is divided. A majority of the respondents who specifically mentioned car parking would like to see greater availability of car parking and/or reduced car parking charges within the town centre. However, a smaller number of respondents believe that removing on-street parking and/or restricting general traffic in the town centre in order to allocate more space to walking would attract more business through making the town centre more pleasant. Some respondents believe that all large towns impose car parking charges and that complaints in relation to problems finding car parking spaces may be exaggerated.
- Many respondents mention the quantity of car parking spaces and/or difficulty in finding parking within the town centre as an issue.
- Some respondents report that the cost of car parking in the town centre discourages them from shopping in the town centre as free parking is available in alternative locations, Monread in particular.
- The suggestion was made that car parking charges should also be imposed at retail parks in order to 'level the pitch' with the town centre.
- There is demand for a greater variety of time periods within car parking pricing structures. Some respondents feel a short stay tariff is required for spaces which currently have a minimum rate of one hour. Some respondents also suggest that a one hour time limit which applies to particular spaces (unless an additional ticket is purchased at the end of the time period) prevents them from conveniently visiting multiple businesses within the town (e.g. hairdresser and lunch).
- Evening and overnight parking for people for people spending leisure time in the town centre at night requires particular consideration. Currently overnight parking is perceived by some to result in limited availability of spaces on Sunday mornings.
- Multiple respondents request greater enforcement of illegal parking behaviour close to the schools located in the town centre.

Train Station Car Parking and Access

- There is a strong view that there is currently excess demand for car parking at the train station in Sallins.
- Some respondents would like to see this issue addressed through the provision of additional car parking capacity but other respondents simply highlight that the situation needs to be addressed and/or mention the potential to address it through improving access to the station by other transport modes, particularly new bus services.
- The cost of car parking at the station is only mentioned by a small number of respondents, with the difficulty in finding spaces and congestion within the area being much more prevalent concerns.
- As a result of car parking issues at the station, some train commuters are parking in nearby residential estates and this is reported to be a safety issue and a contributor to congestion.
- Current parking issues are also perceived by some respondents to be contributing to train capacity issues as some commuters have started to travel on earlier trains in order to secure parking.
- Significant traffic congestion experienced by some respondents leaving the station car park in the evenings.

- Parking/traffic within the station is also reported to be a safety risk to pedestrians.
- Dedicated cycle paths requested to connect both Naas and north of Sallins to the train station.
- Bicycle parking at the train station is not fit for purpose.

Public Realm

- Need for multidisciplinary approach to re-imagine the entire public space/realm along main street, reducing the space allocated to vehicular traffic and increasing pedestrian space, shared space and hard and soft landscaping.
- More pedestrianised areas requested in the town centre by respondents who feel this could improve pedestrian footfall by making it a more desirable place to visit and spend time.
- Request for more and better designed seating within the town.
- Concern about poor condition of footpath surfaces currently within the town centre.
- Better lighting requested along the canal, along Sallins Road and between the hospital and the Fairgreen.
- Concern for trees along the canal which respondents believe are due to be removed as part of the greenway project.
- Tidy Towns have a significant positive impact on how the town looks during the summer months.
- Suggestion that design of road, footpaths and streetscapes should integrate Naas and Sallins better.
- Presence of dilapidated buildings has a negative impact on the public realm in the town.
- Concern that new public pedestrianised spaces may not be well used due to poor weather.

Issues with Train Service (excl. Car Parking)

- Strong consensus that increased capacity is required on train services, particularly during the morning peak, to accommodate recent and ongoing population growth.
- Some requests for increased frequency of train services, but much less prevalent than capacity concerns.
- Some concern about potential safety issue due to overcrowding on the train platform.
- Suggestion that 'short hop zone' for train tickets should be extended to Newbridge and Kildare to reduce the demand for car parking spaces at Sallins.
- Request for an earlier train from Sallins (at 6am) to ease congestion on the N7 and on the Luas (as some commuters start work in the IFSC at 7am or earlier and currently have to use the Red Cow Park & Ride).

Proposed Road Schemes and Other/Previous Transport Studies

- A number of respondents expressed their opposition or support for the Naas Inner Relief Road (NIRR) project which was the subject of a separate statutory 'Part 8' process, including a separate public consultation at around the same time this survey was undertaken. It should be noted that the NIRR proposal was rejected by councillors from Naas Municipal District in a vote in June 2019 and therefore will not be proceeding any further in the short term. However, the NIRR proposal will be retained as one of the potential longer-term road options which will be modelled as part of the Naas Transport Strategy.
- Request to consider findings of previously completed Naas Age Friendly town study.
- Support for new bypass for Sallins.

Heavy Goods Vehicles

- Suggestion that HGV deliveries within the town centre should be restricted during school drop off times in the mornings.
- Concern about HGVs which are perceived to be unnecessarily driving through the town centre.
- Requests for HGV ban within town centre. It should be noted that some respondents would prefer HGVs to continue to use the town centre rather than being directed onto the proposed Inner Relief Road (Route 2). However, other respondents feel that there are already sufficient alternative routes and that a HGV ban should not be dependent on the construction of the Inner Relief Road.
- Concern about volume and speed of HGVs in Sallins village.
- Lane widths at Newbridge Road/Fairgreen Street junction mean that HGVs and buses waiting for a green light cause a build-up of traffic as the lanes are not wide enough for cars to use the parallel lane.

Accessibility

- Request for local link buses to serve housing estates to bring people with mobility issues to town centre.
- High kerbs within the town and cars blocking some dropped kerbs make it difficult for people using a wheelchair or mobility scooter to cross the road at particular locations.
- Uneven and narrow pavements present particular difficulties for wheelchair users and for parents with buggies.
- Request for more disabled parking spaces on street, at Kildare County Council offices and at Poplar Square.
- Real time parking information should advise on disabled parking space availability.
- Request for more monitoring/enforcement of abuse of disabled parking bays.

Appendix B Strategic Transport Modelling Report

B.1 VISUM Model Development Report

AECOM Imagine it. Delivered.

Naas/Sallins Transport Strategy

VISUM Model Development Report

Kildare County Council

September 2020

Prepared for:

Kildare County Council

Prepared by:

AECOM Ireland Limited

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Figures

Tables

1 Introduction

1.1 Introduction

AECOM was commissioned by Kildare County Council to provide assistance in the preparation of a Transport Strategy for Naas. AECOM's role was to develop an understanding of the transport issues in Naas and make recommendations on a strategic implementation plan of improvement measures and interventions in relation to walking, cycling, public transport, public realm, car parking, traffic movement, linkages and town approaches.

The Naas Transport Strategy aims to shape the town as an attractive and thriving town centre by creating a framework for sustainable transportation and a quality urban environment. This will involve the development of a high quality and people focused realm, with a connected, engaged, healthy and prosperous community.

To aid this cause, Kildare County Council have commissioned AECOM to develop a strategic model to inform the Council on the impact of their network improvements and planning proposals. This report outlines the methodology adopted to produce a VISUM macro-simulation model of Naas with a base year of 2018. The model, which incorporates survey data and census data, will aid the preparation of a strategic assessment of all approaches to and movement within Naas, with the aim of providing a framework for effective interventions.

1.2 Study Area

The study area for Naas is shown in Figure 1.1. As highlighted, the model extents incorporate Naas Town, the M7 and the Sallins Area. However, it should be stated at the outset that the data collection was restricted to the network south of the M7 and no data was collected for the Sallins area.

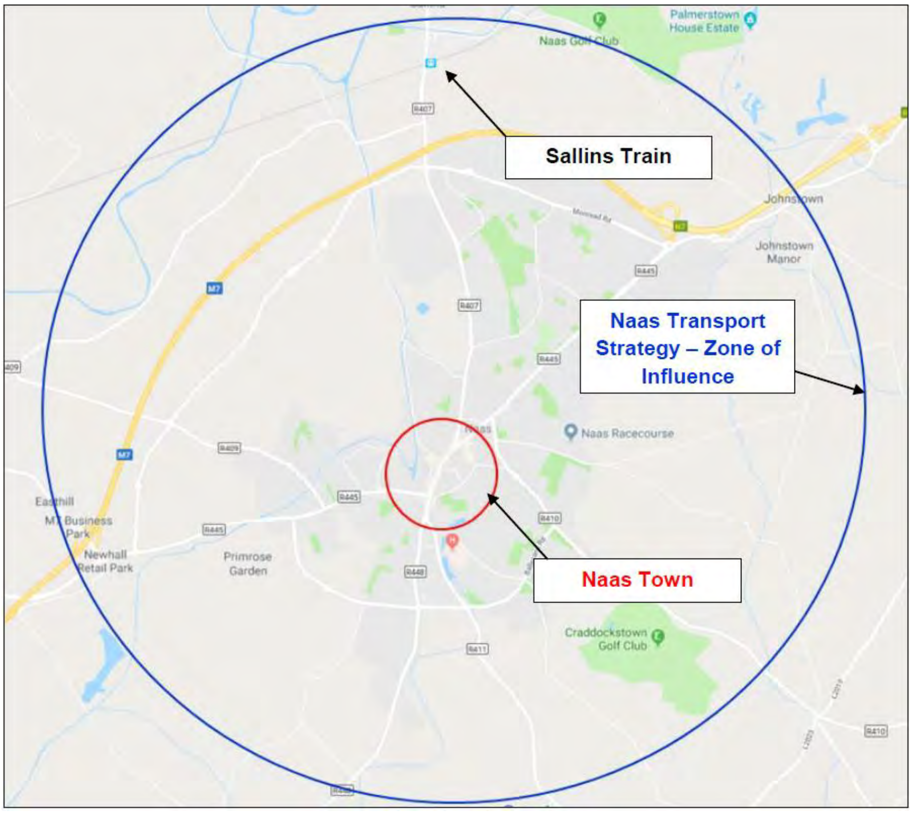


Figure 1.1 Strategic Model Study Area

1.3 Key Objectives

A key component of the strategic model is to facilitate and encourage stakeholders to work together to achieve the following objectives:

- Improve the transport functionality and linkages to Naas's historic town centre;
- Assess measures to support connectivity with Sallins Train Station;
- Develop measures to support retail in Naas Town Centre – Parking Strategy;
- Develop a Cycle Strategy; and
- Develop a Walking Strategy.

1.4 Report Structure

The report takes the following structure:

- Chapter 2: Proposed Uses of the Model and Key Model Design Considerations;
- Chapter 3: Model Parameters and Modelling Standards;
- Chapter 4: Survey Data;
- Chapter 5: Network Construction;
- Chapter 6: Matrix Development;
- Chapter 7: Network Calibration and Validation;
- Chapter 8: Route Choice Calibration and Validation;
- Chapter 9: Links and Turns Calibration and Validation;
- Chapter 10: Limitations; and
- Chapter 11: Summary.

2 Proposed Uses of the Model and Key Model Design Considerations

2.1 Proposed Uses of the Model

Naas' current footprint originates in the 1960's which saw the emergence of the town as a major commuter town for the city of Dublin and as a result, the town is characterised by low-density, car-orientated developments located along the major arterial routes of the town; namely the R445, R448, R410 and R407. Recent development during the 2000's saw the erosion of the town centre's retail base and the expansion of suburban residential developments and peripheral retail developments.

It is intended that this Study will require demand projections for 2023 (+5 years) and 2030 (+12 years). To accommodate future growth, the model will be used to assess the following infrastructure scenarios:

- Devoy Link Road;
- N7 Upgrade and Sallins By-pass.
- Naas Inner Relief Road;
- New junction at Murtagh's Corner;
- Completion of roadway linking Aldi Distribution Centre to Millennium Park Road;
- Northwest Quadrant Link Street;
- Construction of an Inner Orbital Route (including associated canal crossing);
- Construction of an Outer Orbital Route; and
- Implementation of HGV restrictions in the town centre.

3 Model Parameters and Modelling Standards

3.1 Model Description and Setup

As mentioned in the Introduction, the model has been developed using the macro simulation software VISUM, version 18.02-13. VISUM is a comprehensive strategic traffic and transport planning package used around the world to assess new infrastructure, traffic management changes, local plan forecasting, economic analysis etc.

The model has been developed as a Highway model, meaning it can assess highway schemes, changes in demands such as local plans etc. However, the model does not have the functionality to assess changes in mode choice as a result of planning or policy proposals.

3.1.1 Assignment Method and Convergence

In terms of the assignment procedure, assignment with ICA (Intersection Capacity Analysis) has been used to route vehicles through the road network. This assignment has two main features; firstly, it used equilibrium assignment LUCE (Linear User Cost Equilibrium) which is recommended to achieve faster convergence than other standard equilibrium assignments. In addition to this, LUCE is also advantageous as it provides stable route distributions and fast blocking back (queuing) model calculations.

The second feature is the method of calculating node impedance via ICA. This method uses the Highway Capacity Manual (6th Edition) calculations to assess delays of the individual turns through priority and signalised junctions. The method considers gap acceptance, follow up times (the time in which a vehicle requires to make the same movement as the lead vehicle), shared lanes, conflict priorities etc., to calculate the mean delay at the junction. These delays are fed back into the equilibrium assignment LUCE to assess the new cost of the routes.

Before the results of any traffic assignment are used to inform decisions, the stability (of degree of convergence) of the assignment must be confirmed at the appropriate level. The importance of achieving convergence, at an appropriate level, is related to the need to provide stable, consistent and robust model results. Convergence was achieved using two criteria, the Delta %GAP (the difference in cost between the chosen route and the minimum cost route) and an absolute difference in link flows. The delta gap criterion was set to 0.012% whereas the difference was set to less than 1% for 98% of the links. Figure 3.1 presents the criteria as setup within the VISUM model.

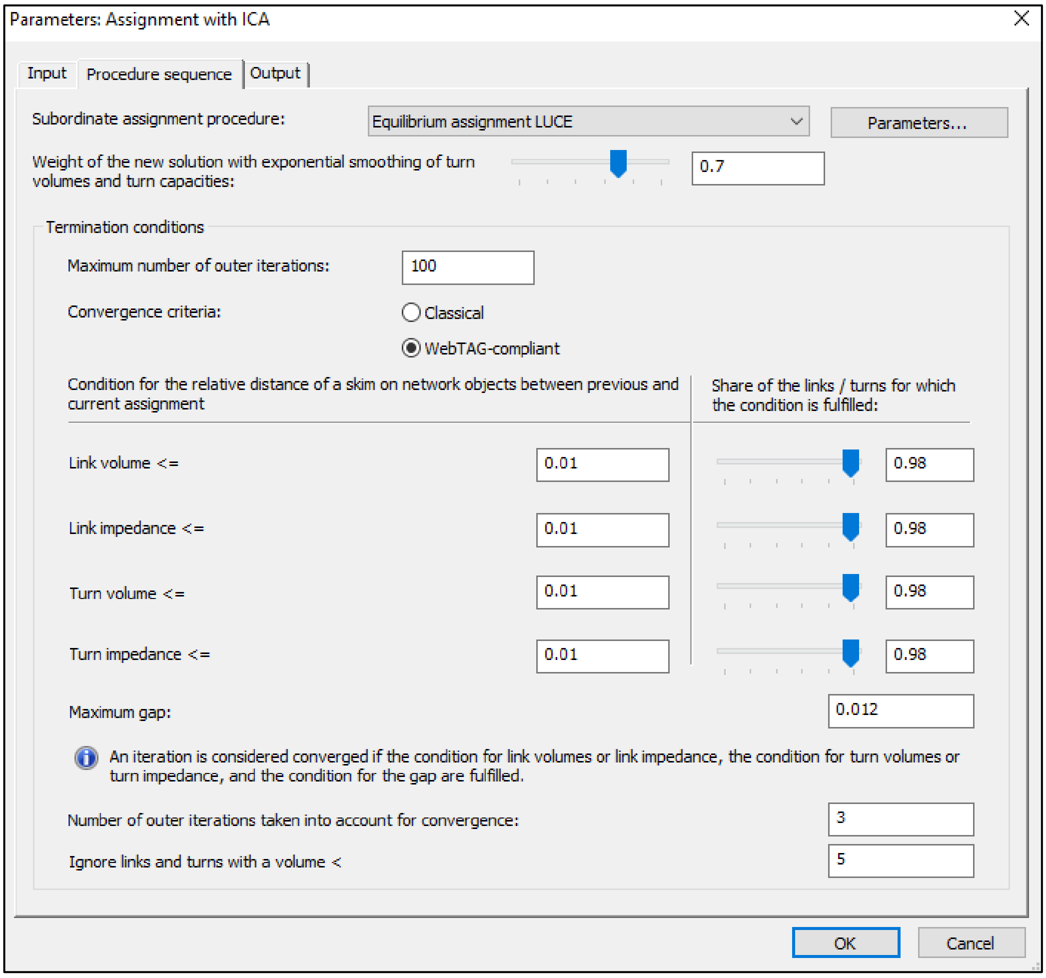


Figure 3.1 Convergence Criteria

With regards to convergence statistics, both AM and PM models converged within 11 and 19 iterations respectively. Table 3.1 and Table 3.2 present the convergence statistics for each iteration in the AM and PM models.

Table 3.1 AM ICA Convergence Statistics

Iteration	Gap	Acceptable Links (Volume)	Acceptable Turns (Volume)	Acceptable Links (Impedance)	Acceptable Turns (Impedance)	Gap of Inner Assignment	Absolute Link Volume Difference (Mean)	Absolute Turns Volume Difference (Mean)
1	0.0000	0%	0%	0%	0%	0.0	0.0	0.0
2	0.0447	69%	75%	97%	90%	0.0	16.6	12.0
3	0.0293	80%	83%	99%	92%	0.0	3.9	2.7
4	0.0173	83%	86%	100%	94%	0.0	2.9	2.1
5	0.0130	86%	88%	99%	96%	0.0	2.5	1.8
6	0.0102	88%	89%	100%	96%	0.0	2.6	1.9
7	0.0073	94%	94%	100%	97%	0.0	0.8	0.6
8	0.0051	96%	96%	100%	98%	0.0	0.6	0.5
9	0.0041	97%	97%	100%	98%	0.0	0.4	0.3
10	0.0036	98%	98%	100%	99%	0.0	0.4	0.3

11	0.0031	98%	97%	100%	99%	0.0	0.5	0.4

Table 3.2 PM ICA Convergence Statistics

Iteration	Gap	Acceptable Links (Volume)	Acceptable Turns (Volume)	Acceptable Links (Impedance)	Acceptable Turns (Impedance)	Gap of Inner Assignment	Absolute Link Volume Difference (Mean)	Absolute Turns Volume Difference (Mean)
1	0.000000	0%	0%	0%	0%	0.000005	0.0	0.0
2	0.085760	71%	76%	96%	90%	0.000007	18.6	13.5
3	0.071811	87%	89%	99%	90%	0.000005	2.5	1.8
4	0.062154	84%	87%	99%	91%	0.000006	1.6	1.1
5	0.054418	88%	90%	99%	92%	0.000008	1.4	1.0
6	0.046173	83%	87%	99%	92%	0.000007	1.6	1.1
7	0.042172	87%	89%	99%	92%	0.000009	1.6	1.1
8	0.035694	92%	93%	99%	93%	0.000006	1.3	0.9
9	0.032455	95%	95%	100%	94%	0.000007	0.6	0.5
10	0.029024	97%	96%	100%	95%	0.000007	0.4	0.3
11	0.025017	96%	96%	100%	95%	0.000007	0.5	0.4
12	0.022024	93%	94%	99%	95%	0.000007	0.8	0.5
13	0.020437	96%	96%	100%	95%	0.000008	0.5	0.4
14	0.017708	97%	97%	100%	96%	0.000008	0.4	0.3
15	0.016569	95%	96%	99%	97%	0.000007	0.6	0.4
16	0.014924	95%	95%	99%	97%	0.000007	0.6	0.4
17	0.013516	98%	98%	100%	97%	0.000007	0.3	0.2
18	0.012443	99%	99%	100%	97%	0.000007	0.2	0.2
19	0.012105	99%	99%	100%	98%	0.000007	0.2	0.1

3.1.2 Speed Flow Curves

To keep the model consistent with the TII National Transport Model, speed flow curves were adopted from the National model and imported into the Naas model. However as this is an urban model mainly consisting of short sections of carriageway with junctions, the speed flow curves have been limited to the external links as per WebTAG guidelines:

> *"In models of urban areas, junction delays should normally be modelled explicitly. In these models, the use of speed/flow relationships should generally be restricted to motorways and dual carriageway links."*

Source: TAG Unit M3.1 Appendix D Speed / Flow Relationships

Figure 3.2 highlights the network where speed flow curve relationships have been removed.

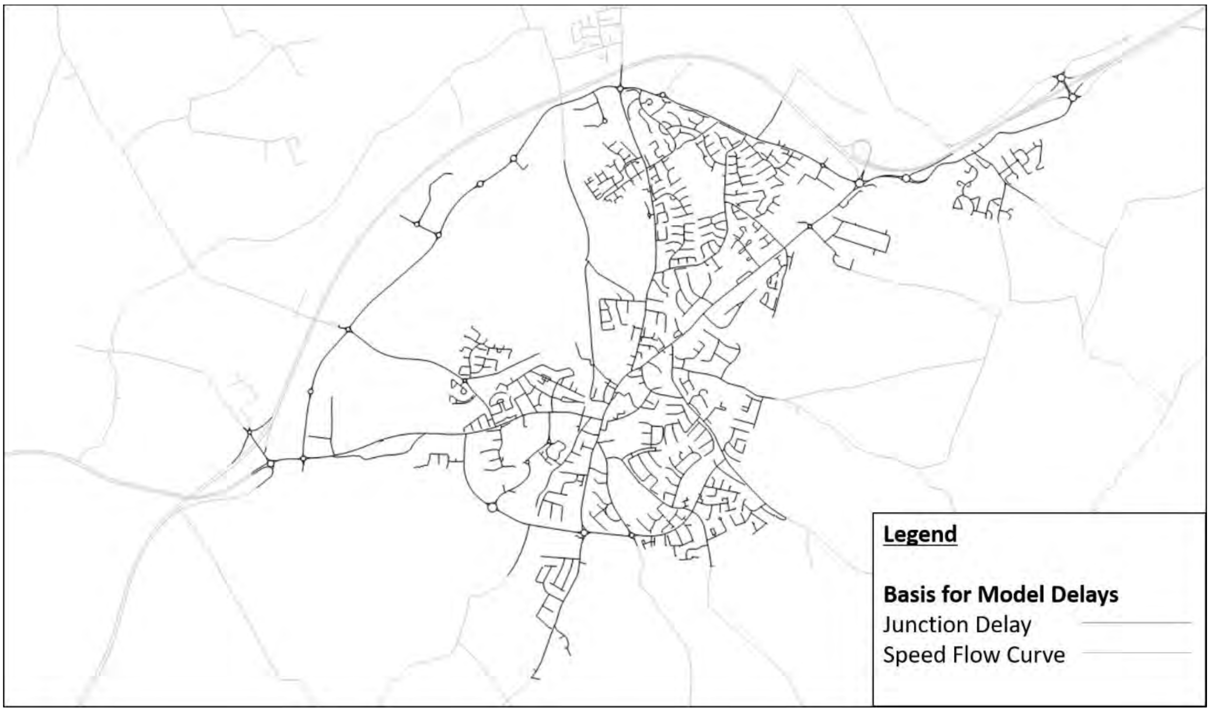


Figure 3.2 Links with No Speed Flow Relationship Curves

3.1.3 Generalised Costs

The route choice through the network is based on the 'generalised cost' of each route option, represented by a combination of time and distance as follows:

Generalised Cost = Value of Time * Time + Vehicle Operating Cost * Distance + Road User Charge (Tolls)

The following costs were derived from the Project Appraisal Guidelines for National Roads Unit 6.11 - National Parameters Values Sheet.

Table 3.3 Generalised Costs

Vehicle Type	Time Cost (cents / hr)	Length Cost (cents / km)
Light Vehicles	794.4433	9.8533
Heavy Vehicles	1192.0870	77.5820

3.1.4 Blocking Back

As part of the ICA assignment, Blocking Back (queuing) has been assessed. Blocking Back is presented on the network if the link or turn capacity is breached by the traffic demand. Figure 3.3 illustrates the queueing that was observed in the AM model at the M7 / R445 Newbridge Road roundabout.

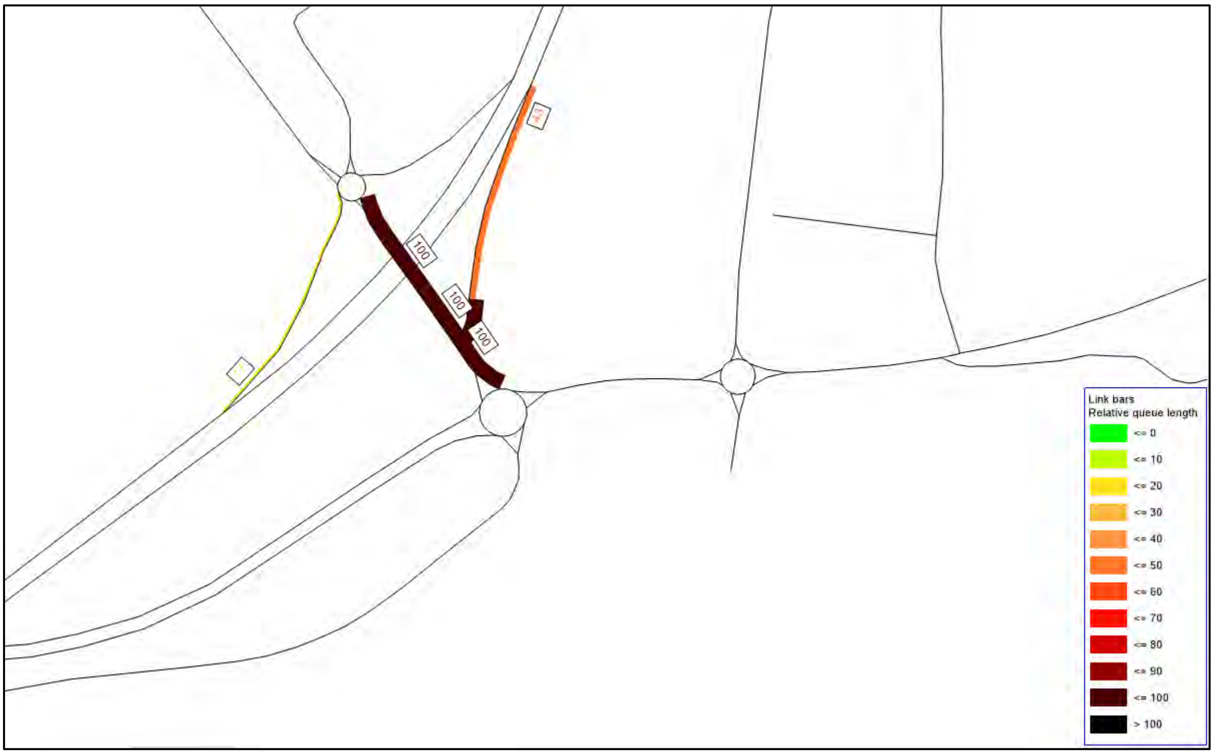


Figure 3.3 Network Queueing Example

3.2 Acceptability Guidelines

The purpose of calibration and validation is to develop a model that is fit for purpose and does not produce unduly misleading or biased results. It is essential that the model is validated to as high a standard as possible, given the data available, to ensure that the model is a robust representation of observed conditions.

- It is important to clearly define calibration and validation. Calibration can be defined as the adjustments to a model intended to reduce the differences between modelled and observed data;
- The differences between modelled and observed data should be quantified and then assessed using some criteria. This is commonly known as validation; and
- The purpose of calibration and validation is to develop a model that is fit for purpose and does not produce unduly misleading or biased results that are material in the context of the schemes or policies being tested.

The validation of a model should compare modelled and observed journey times along main routes, as a check on the quality of the network and the assignment. The following should also be checked:

- Assigned flows and counts totalled for a cordon, as a check on the quality of the trip matrices;
- Assigned flows and counts on individual links and turning movements at junctions, as a check on the quality of the assignments; and
- Modelled and observed journey times (survey data) along routes, as a check on the quality of the network and the assignment.

3.2.1 Matrix Estimation

The purpose of matrix estimation is to refine estimated trips not observed in the surveys i.e. synthesised. Changes to the prior demand matrices should be assessed to ensure that the matrix estimation has not significantly changed the original origin / destination patterns. However, there might be valid reasons for large changes and these should be explained within the report. There are various methods to assess any change which may have occurred during the matrix estimation process. This report focuses on two methods which are:

- trip length distributions, prior to and post matrix estimation; and
- sector to sector level matrices, prior to and post matrix estimation, with absolute and percentage changes.

The guidance on change between the prior and estimated matrix are presented in Table 3.4.

Table 3.4 Matrix Estimation Criteria

Measure	Significance Criteria
Trip-length distribution	Means <=5%; Standard deviation <=5%
Sector-sector matrices	Differences <= 5%

3.2.2 Link Count Calibration

For link flow calibration, the measures used are:

- The absolute percentage differences between modelled flows and counts; and
- The GEH statistic, which is a form of Chi-squared statistic that incorporates both relative and absolute errors, and is defined as follows:

$$GEH = \sqrt{\frac{(M-C)^2}{(M+C)/2}}$$

where GEH is the GEH statistic;
M is the modelled flow; and
C is the observed flow.

The calibration criteria and acceptability guidelines for hourly link flows and turning movements are set out in Table.

Table 3.5 Calibration Criteria

Criteria Description	Acceptability
Individual flows within 100 veh/h of counts for flows less than 700 veh/h	> 85%
Individual flows within 15% of counts for flows less than 700 to 2700 veh/h	> 85%
Individual flows within 400 veh/h of counts for flows more than 2700 veh/h	> 85%
GEH<5 for individual flows	> 85%

Source: Table 5.1.3, PAG Unit 5.1 – Construction of Transport Models

With regard to link flow calibration, PAG provides the following further guidance:

- the criteria should be applied to both link flows and turning movements;
- the acceptability guideline should be applied to link flows but may be difficult to achieve for turning movements;
- the comparisons should be presented for cars, but not for Light Goods Vehicles (LGVs) and Ordinary Goods Vehicles (OGVs) unless sufficiently accurate link counts have been obtained; and
- the comparisons should be presented separately for each modelled period or hour.

The guidance also states that the two measures (individual flow and GEH) are broadly consistent and link flows that meet either criterion should be regarded as satisfactory. Therefore, links will be considered to have passed the validation criterion if criteria 1 or criteria 2 are met.

3.2.3 Journey Time Validation

For journey time validation, the measure used is the percentage difference between modelled and observed journey times, subject to an absolute maximum difference. The validation criterion and acceptability guidelines for journey times are defined in Table 3.6.

Table 3.6 Validation Criteria

Criteria Description	Acceptability
Differences between modelled and observed journey times < 15% and/or 60s	> 85%

Source: Table 5.1.3, PAG Unit 5.1 – Construction of Transport Models

A summary of the journey time validation results is provided within the body of this report. However a more detailed profile assessment is presented within the appendices.

4 Survey Data

4.1 Introduction

In order to develop an accurate model and demonstrate its accuracy compared with real-world conditions, it is necessary to use a variety of data sources and types. The purpose of this chapter is to summarise the data collection undertaken and highlight data used to calibrate and validate the Visum model, with information provided on the background to the work and the methods by which the commissioned surveys were carried out. For the purposes of this model, traffic count data was used to calibrate the model and journey times were used to validate the model.

The data listed below was collected to construct the demand matrices and calibrate / validate the model:

- Automatic Number Plate Recognition (ANPR) Survey;
- Automatic Traffic Counts (ATC);
- Junction Turning Counts (JTC);
- Google Journey Times;
- Census data (total population and total daytime population); and
- Place of Work, School or College, Census of Anonymised Records (POWSCAR) data.

4.2 Travel Demand Data

4.2.1 ANPR & ATC Surveys

Data was provided by KCC for ANPR and ATC surveys that were undertaken at 22 sites in Naas from Monday 24th September to Sunday 30th September 2018 using ANPR technology to match and record passing vehicles. A summary of the survey locations is provided in Table 4.1 and shown in Figure 4.1. Each location was surveyed in both directions in order to capture link counts and origin-destination data over the surveyed period. The ATC surveys captured data for a continuous seven-day period while the ANPR surveys captured data from 07:00 – 19:00 on the 25th September and 26th September 2018.

Table 4.1 ANPR & ATC Survey Locations

Site	Location
1	West of R445 (Newbridge Road) / Millennium Park Link Road roundabout
2	West of R409 / Millennium Park Link Road roundabout
3a	West of R407 (Sallins Road) / Monread Road / Millennium Park Link Road roundabout
3b	North of R407 (Sallins Road) / Monread Road / Millennium Park Link Road roundabout
4	West of R445 (Dublin Road) / Monread Road / N7 roundabout
5	South of Johnstown Road
6	South of R445 (Dublin Road) / Monread Road / N7 roundabout
7	South of Naas Industrial Estate on Fishery Lane
8	Tipper Road east of Naas
9	R410 (Blessington Road north of R410 / Ballycane Road junction
10	R410 (Blessington Road) south of Craddockstown Golf Club
11	South of Craddockstown Road / Ballycane Road junction
12	South of R411 (Ballymore Road) / South Ring Road roundabout

Site	Location
13	South of R448 (Kilcullen Road) / South Ring Road roundabout
14	East of R445 (Newbridge Road) / R409 junction
15	South of R448 (Kilcullen Road) / R411 (Ballymore Road) junction
16	South of R411 (Ballymore Road) / Craddockstown Road junction
17	South of Craddockstown Road / Lakelands junction
18	Friary Road east of Corban's Lane junction
19	R407 (Sallins Road) south of R407 / Monread Avenue junction
20	R445 (Dublin Road) north of R445 / Ashgrove Park junction
21	R445 (Main Street) south of R445 / Basin Street junction

Figure 4.1 ANPR & ATC Survey Locations

4.2.2 Automatic Traffic Count Survey Data

The ATC surveys revealed that the R445 west of the roundabout with the Millennium Park Link Road was the most heavily trafficked section of the local road network in Naas with a three-day average AM peak (08:00 – 09:00) total of approximately 2,000 vehicles and PM peak (17:15 – 18:15) total of 1,750 vehicles in both directions.

It was noted that the ongoing construction works on the neighbouring M7/N7 may have adversely impacted the traffic surveys as traffic may have travelled through Naas in order to avoid any significant delays or temporary traffic management.

Table 4.2 shows the surveyed AM and PM peak period flows.

Table 4.2 AM & PM Peak Traffic Flows

ATC	Direction	LV AM	HV AM	All AM	LV PM	HV PM	All PM
1	Eastbound	1,053	49	**1,144**	646	14	**681**
	Westbound	839	20	**899**	978	30	**1,068**
2	Eastbound	629	10	**675**	218	1	**239**
	Westbound	193	4	**211**	763	6	**812**
3a	Eastbound	553	15	**610**	626	14	**667**
	Westbound	927	26	**989**	627	9	**675**
3b	Northbound	546	14	**599**	594	13	**633**
	Southbound	778	21	**842**	584	9	**622**
4	Eastbound	548	18	**617**	395	8	**423**
	Westbound	737	22	**795**	317	8	**346**
5	Eastbound	173	1	**184**	178	1	**189**
	Westbound	183	1	**194**	291	0	**309**
6	Northbound	583	20	**673**	623	10	**672**
	Southbound	612	21	**692**	864	16	**949**
7	Eastbound	45	0	**50**	94	0	**101**
	Westbound	60	0	**66**	51	0	**56**
8	Eastbound	122	0	**134**	101	0	**107**
	Westbound	167	0	**171**	247	0	**261**
9	Northbound	686	14	**742**	429	1	**451**
	Southbound	392	12	**433**	604	9	**649**
10	Eastbound	242	11	**272**	269	3	**290**
	Westbound	292	16	**336**	295	3	**318**
11	Northbound	203	1	**212**	79	0	**82**
	Southbound	183	1	**196**	101	0	**104**
12	Northbound	195	2	**211**	84	1	**92**
	Southbound	89	1	**100**	169	4	**186**
13	Northbound	953	17	**1,023**	405	6	**432**
	Southbound	530	19	**575**	1,011	15	**1,077**
14	Eastbound	632	4	**680**	443	2	**480**
	Westbound	340	11	**370**	545	20	**590**

ATC	Direction	LV AM	HV AM	All AM	LV PM	HV PM	All PM
15	Northbound	306	17	**336**	317	6	**340**
	Southbound	234	3	**249**	581	6	**612**
16	Northbound	323	1	**333**	124	0	**130**
	Southbound	195	7	**208**	236	8	**250**
17	Eastbound	479	7	**504**	170	0	**177**
	Westbound	226	10	**238**	304	16	**323**
18	Eastbound	141	1	**146**	146	1	**154**
	Westbound	388	2	**403**	266	0	**274**
19	Northbound	425	8	**458**	500	7	**534**
	Southbound	505	6	**546**	506	2	**533**
20	Northbound	542	14	**605**	578	3	**606**
	Southbound	601	20	**658**	689	10	**742**
21	Northbound	535	8	**575**	363	6	**379**
	Southbound	580	12	**625**	585	20	**632**

4.2.3 Junction Turning Count Survey Data

JTC surveys were undertaken on the 27th September 2018 for each of the junctions shown in Figure 4.2 and Table 4.3. A total of 14 junctions were surveyed.

Figure 4.2 JTC Survey Locations

Table 4.3 JTC Survey Locations

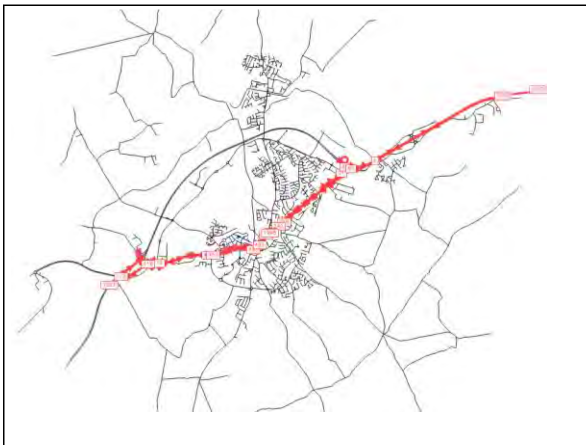
Site	Location
A	Johnstown Road / Johnstown Gardens junction
B	R445 (Dublin Road) / Monread Road / N7 roundabout
C	R445 (Dublin Road) / Fishery Lane roundabout
D	R445 (Dublin Road) / The Gallops junction
E	R445 (Dublin Road) / R410 (Blessington Road) junction
F	R410 (Blessington Road) / Tipper Road junction
G	R410 (Blessington Road) / Friary Road junction
H	R410 (Blessington Road) / Ballycane Road junction
J	Ballycane Road / Craddockstown Road junction
K	R411 (Ballymore Road) / South Ring Road roundabout
L	R448 (Kilcullen Road) / South Ring Road roundabout
M	R445 (Newbridge Road) / R448 (Kilcullen Road) junction
N	R445 (Dublin Road) / R407 (Sallins Road) junction

Site	Location
O	Millennium Park Link Road / Millennium Park Access Road junction

The data received was analysed to assess the movement and flows of each junction for light vehicles and heavy vehicles. This was carried out for the AM Peak: 08:00 – 09:00 and PM Peak: 17:15 – 18:15.

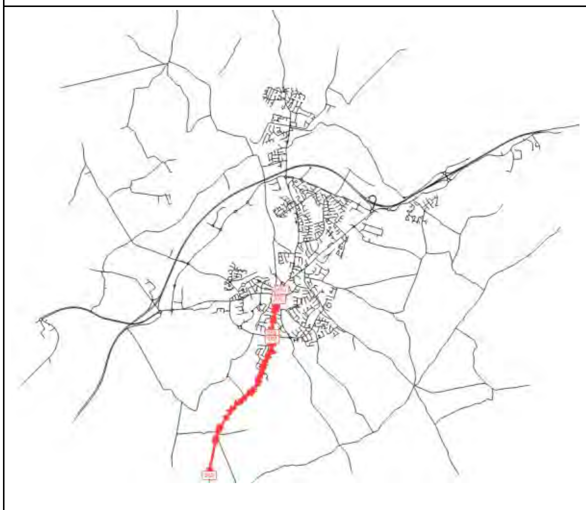
4.2.4 Journey Times

Journey time information was extracted using Google's journey time Application Programming Interface (API). Routes were drawn up to capture all the main routes through the modelled network to ensure traffic conditions were being modelled correctly. Figure 4.3 displays the routes which were used.

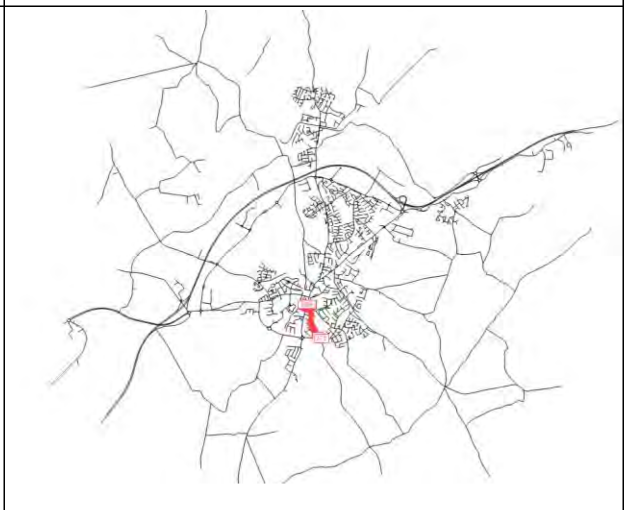


Site 1

Site 2



Site 3



Site 4

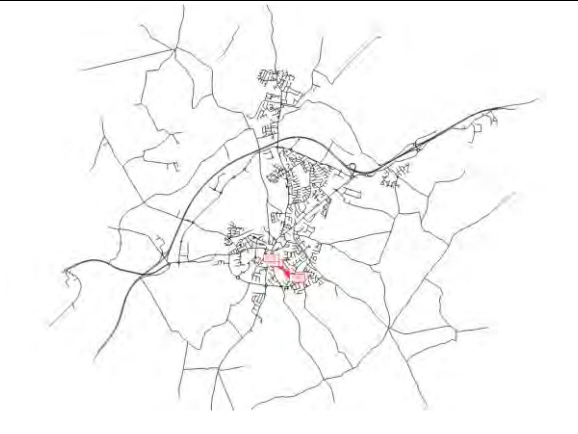
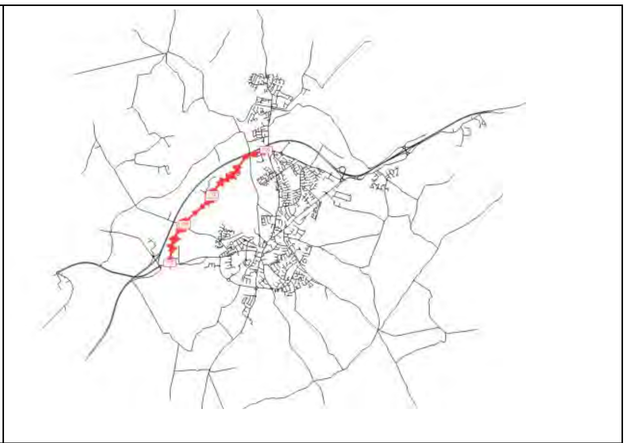
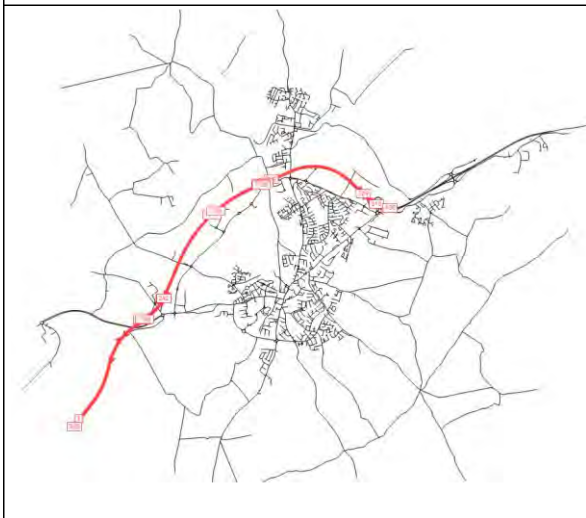
	
Site 5	Site 6
	
Site 7	Site 8

Figure 4.3 Journey Time Routes

Each route was divided into several sections, typically between signalised and large priority junctions, in order to provide context for each route, otherwise the line would be linear, and it would not be possible to identify areas of congestion. Each section of the journey time route was assigned a start and end coordinate and identifying reference number. The journey time between the coordinates was then calculated by the Google API and the resulting data was used to compare against the modelled journey times.

Google Journey Times were gathered for a one-hour period between 08:15 – 09:15 and 17:00 – 18:00 for each of the three journey time routes and used to validate the results of the AM and PM models.

4.2.5 POWSCAR and Census Data

As part of the matrix development process, the number of households, population, number of businesses and the worktime population were collected for each of the Small Areas (SAs) within the Naas study area in order to use an evidence-based approach to origin and demand volumes. Data from the 2016 POWCAR survey was also used in order to determine the origin and destination point for residents travelling to work and school between 07:30 and 09:00.

Chapter 6 describes in greater detail how the POWSCAR and census data were used in the matrix development process.

5 Network Structure

5.1 Network Development

To following steps were taken to establish a robust network for use in the assignment procedure:

1. Th network was extracted from open source data (open street map), this provided all the necessary links and nodes structure for the Naas road network;
2. A review of the network against aerial photography and on-site observations was undertaken to identify any omitted or incorrect coding from the open source;
3. The national model link type information was imported into the Naas model;
4. Junction details where then added e.g. flare lengths on the approaches to junctions etc;
5. In terms of signalised junctions, the signal staging / timing was applied to these nodes as provided by KCC;
6. Roundabouts use Kimber calculations to derive delay, therefore geometry information was added to each roundabout e.g. inscribe diameter; and
7. Network checks were then undertaken to calibrate and validate the network construction.

5.2 Model Zoning System

The zoning structure is presented below. The zoning system is compatible with the land use zoning objectives and also with the two regional transport models relevant to Naas, TII's National Transport Model and The NTA's Eastern Regional Model.

Figure 5.1 Naas Zone Structure

5.3 Modelled Time Periods

In the absence of any queue length data, the AM and PM peak periods have been identified by using the total number of vehicles crossing the ATCs and the total number of turns from the JTC surveys within the modelled area. The following peak periods were identified:

- Morning peak (AM): 08:15 – 09:15; and
- Evening peak (PM): 17:00 – 18:00.

Figure ***5.2*** and Figure 5.3 illustrate the total number of turns and Figure 5.4 and Figure 5.5 illustrate the number of vehicles that were counted by the ATCs within the morning and evening period. As shown, 08:15 – 09:15 and 17:00 – 18:00 were found to be the peak hours within the modelled network.

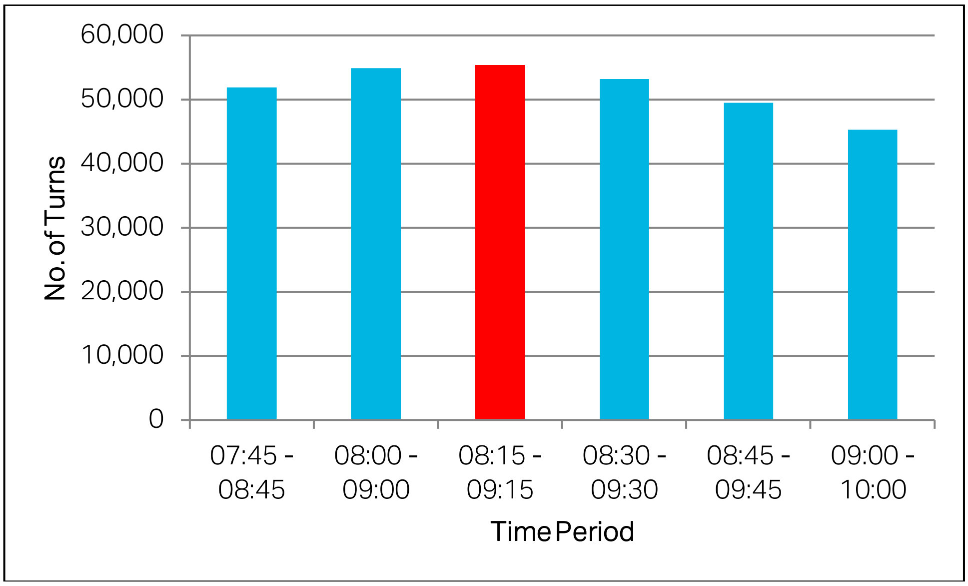


Figure 5.2 AM Total Turns

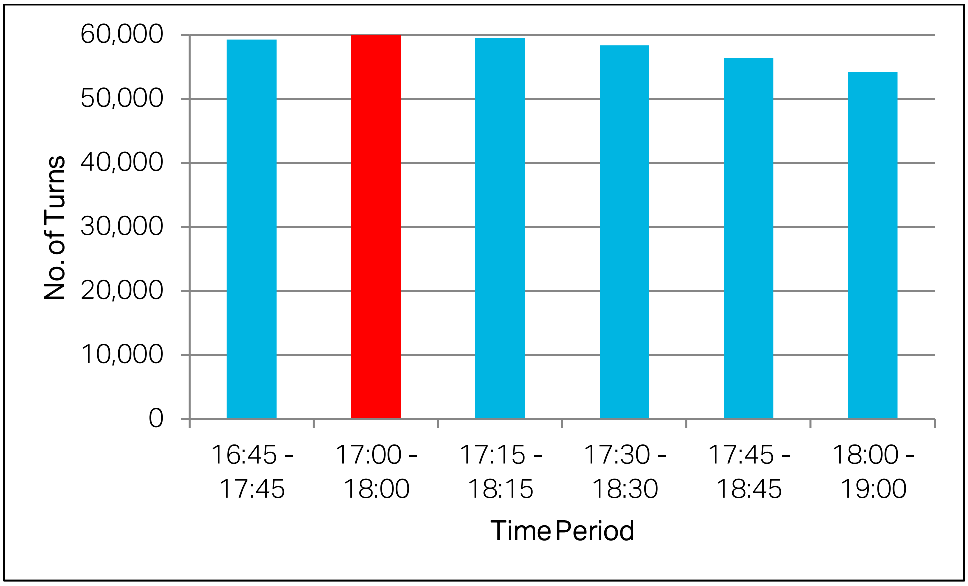


Figure 5.3 PM Total Turns

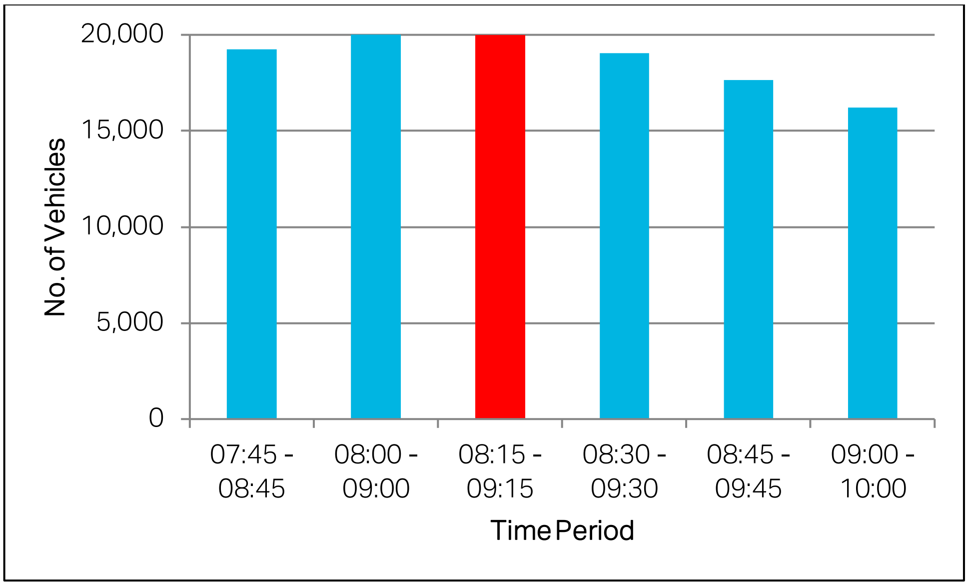


Figure 5.4 AM Vehicle Counts

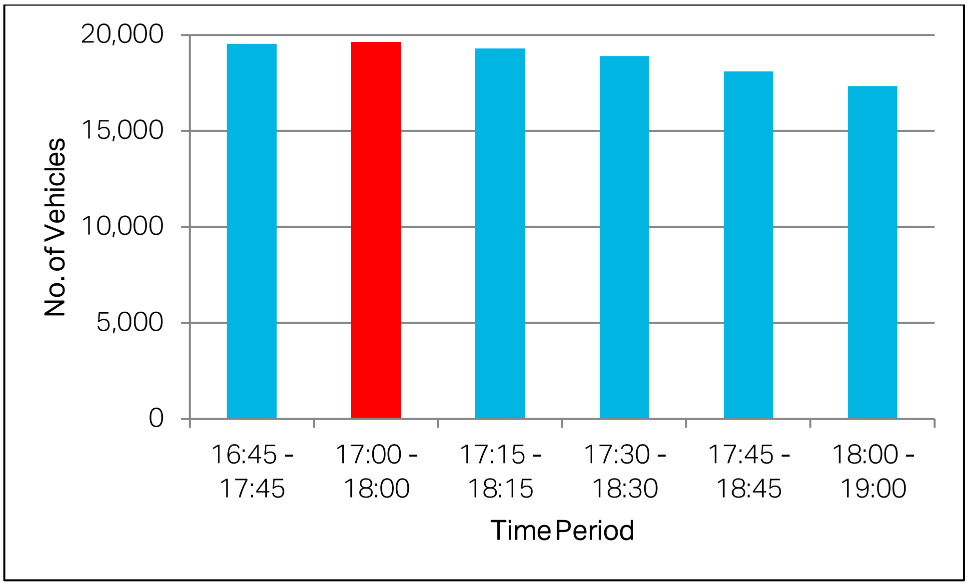


Figure 5.5 PM Vehicle Counts

5.4 Public Transport

Despite the limited number of public transport services that operate through Naas, all public services have been modelled in order to accurately replicate their impact on the network, e.g. preventing vehicles from passing when passengers are boarding or alighting. The N7, 126, 130, 139, 826 and 846 services have been included in the VISSIM model with their timetables taken from their respective operator's website. Figure 5.6 shows the public transport routes in the VISUM models.

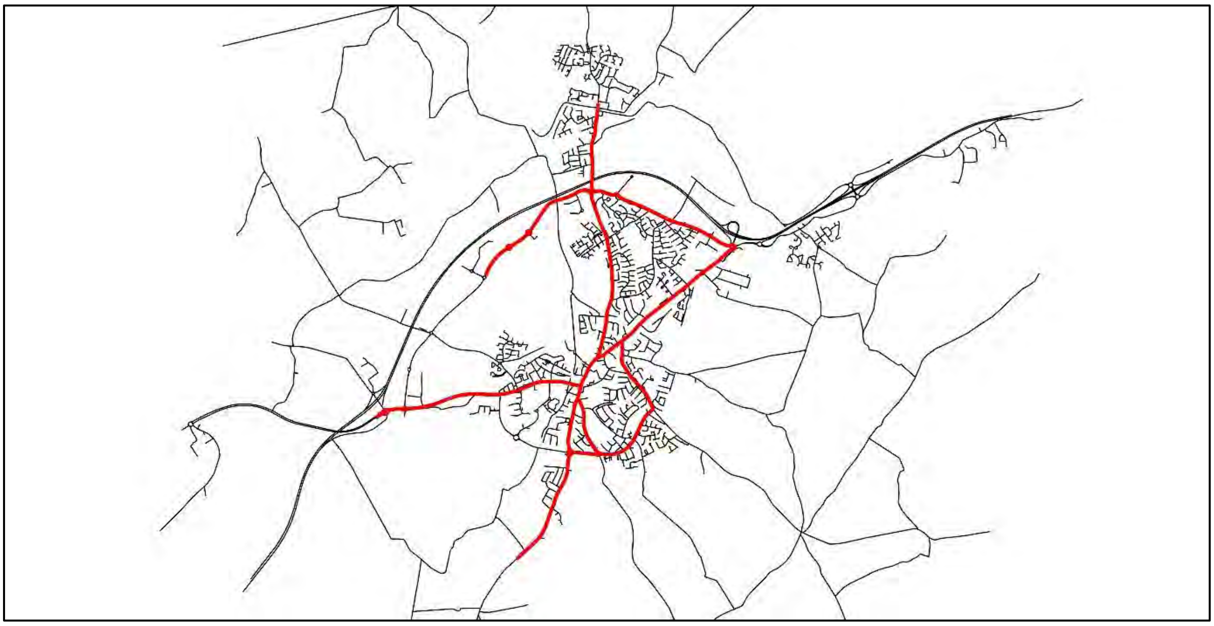


Figure 5.6 Public Transport (Bus) Routes

5.5 Vehicle Classes and Composition

Two vehicle classes have been used which have been adopted from the Ireland National Model. No information on trip purpose was available during the matrix development, therefore the demand matrices only consider Light Vehicles (LVs) and Heavy Vehicles (HVs).

5.6 Calibration Adjustments

As part of the model calibration process, adjustments were made to the model in order to better represent the observed conditions of the network and to align with the surveyed journey times. The adjustments included:

- Gap acceptance;
- Pedestrian crossings;
- Link speeds (including reduced speed areas); and
- Signal timings.

5.6.1 Gap Acceptance

Gap acceptance is the time in which a driver will accept when entering a traffic flow from a minor arm. Other factors should also be considered such as visibility, the perceived risk i.e. high speeds on the main carriageway etc. The gap time adjustments that were made only affect the key junctions around Naas. These changes were undertaken to better replicate the observed delay.

The gap acceptance was reduced from its default value to between 2 and 4 seconds. Figure 5.8 high-lights the junctions where the gap acceptance was adjusted.

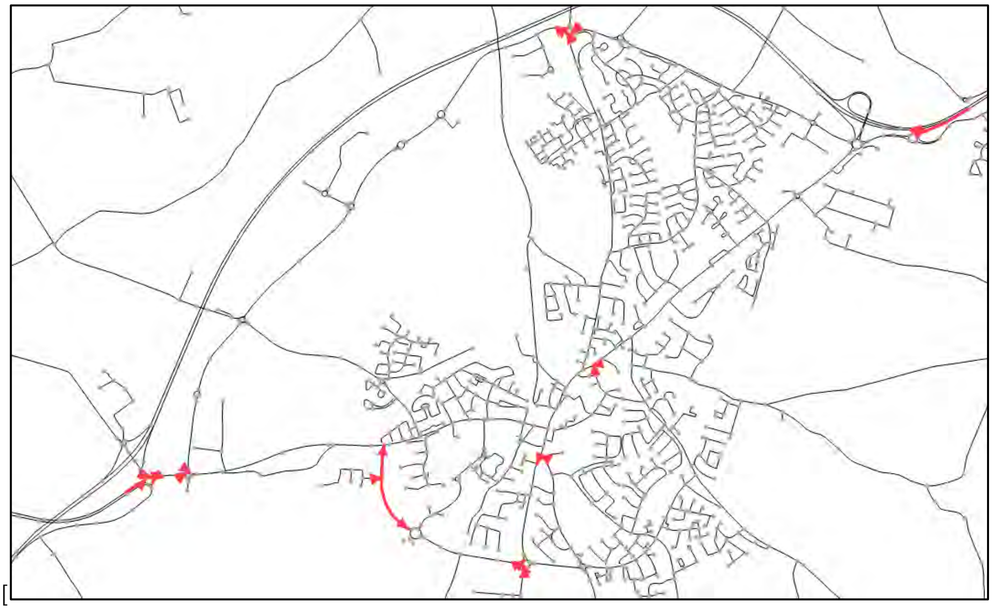


Figure 5.7 AM Model Locations of Gap Acceptance Adjustments

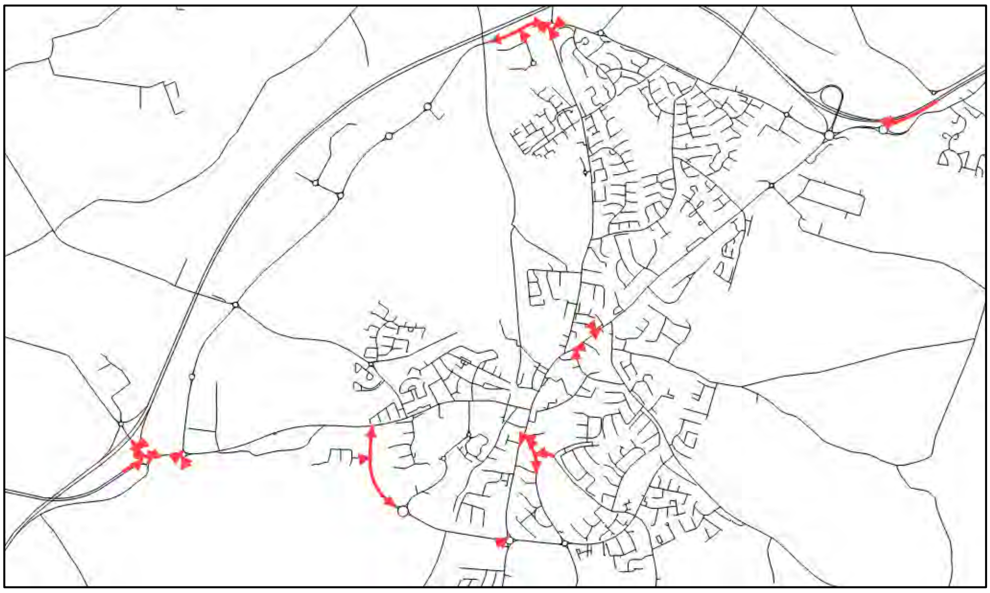


Figure 5.8 PM Model Locations of Gap Acceptance Adjustments

5.6.2 Pedestrian Crossings

Further adjustments were undertaken to better represent the delays experienced at pedestrian crossings throughout Naas. Signalised pedestrian crossings are primarily located on the arterial routes through the town e.g. the R445 Newbridge Road and throughout the town centre where there is a large volume of traffic and pedestrian activity is at its greatest. It was therefore crucial to accurately model the delay caused by the activation of the signalised crossings in order to improve the calibration of journey times through the network.

It was also necessary to add traffic signals to non-signalised crossings such as the zebra crossing at the Wolfe Tone Street / R445 Dublin Road junction. This is due to the inability to model pedestrian crossings wherein vehicles must give way to pedestrians in VISUM.

5.6.3 Link Speeds

Not all behaviours can be modelled within VISUM, including parallel parking delays, double parking, pedestrians crossing without using crossing facilities, temporary traffic management etc., therefore adjustments were made to the link speeds to ensure some recognition of these behaviours could be captured in the journey times.

Figure 5.9 illustrates the modelled link speeds within Naas.

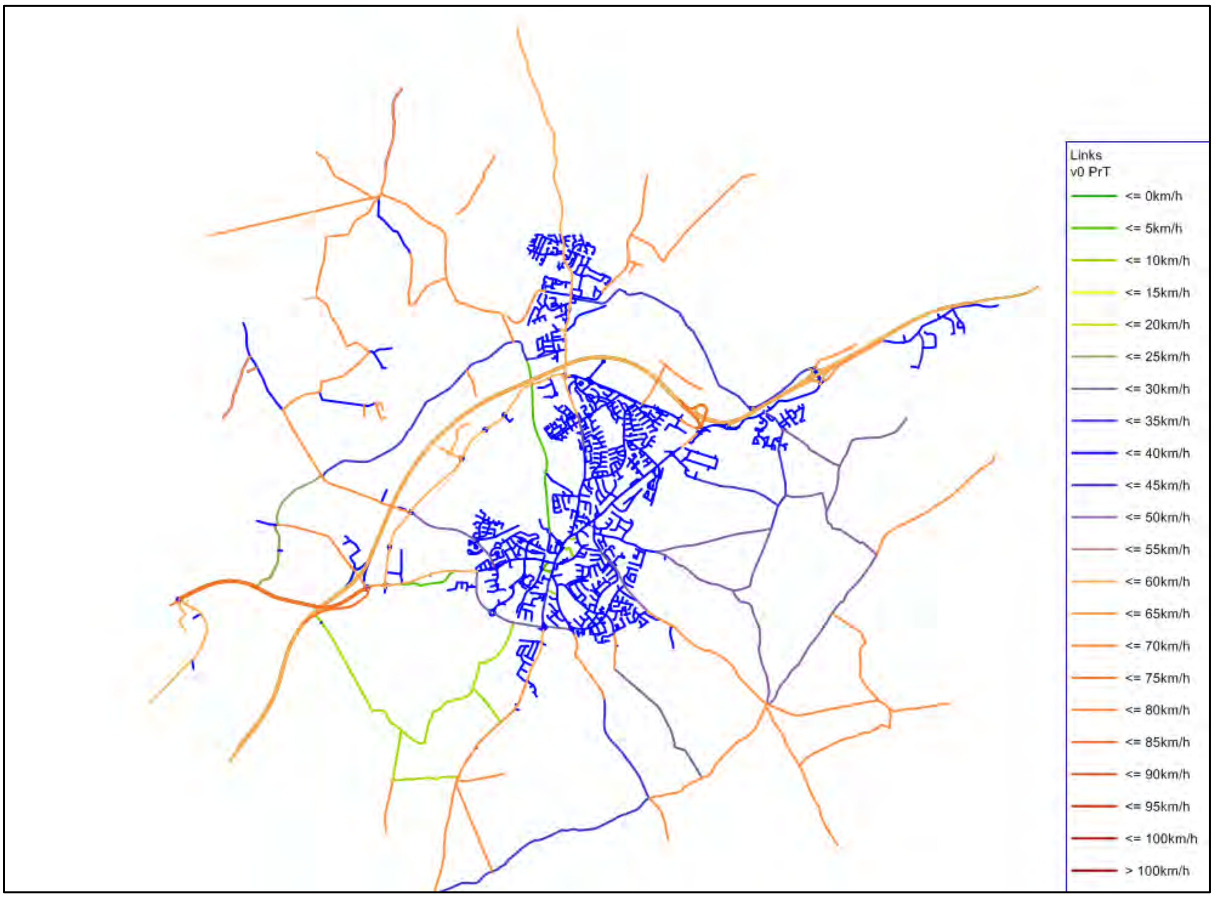


Figure 5.9 Naas Link Speeds

It was necessary to adjust the link speed of several links throughout the modelled network in order to replicate the perceivable costs that cannot be accurately modelled. For example, it was found that many vehicles were using the canal towpath to travel from the town centre of Naas to Sallins as opposed to using the R407 Sallins Road. It was therefore necessary to reduce the link speed to 5km/h on the towpath.

Further information relating to the adjustment of link speeds is provided in Chapter 7: Calibration and Validation.

5.6.4 Signal Timings

Traffic signal timing data was provided to AECOM by KCC for the majority of junctions within the study area. From this, it was revealed that certain junctions within the modelled network are demand dependent for both vehicles and pedestrians and therefore have varying cycle sequences. Due to the limitations within VISUM, the stage times were coded as fixed times, and required adjustments to account for certain stages not being called during each cycle.

6 Matrix Development

This chapter details the development of the prior matrices and the matrix estimation process. Separate matrices were created to represent the AM peak (08:15-09:15) and the PM peak (17:00-18:00), with a light and heavy vehicle matrix created for each time period.

6.1 ANPR Analysis

ANPR survey data for traffic surveys carried out by Nationwide Data Collection on the 25th and 26th of September 2018 were analysed in order to determine the origin and destination of trips within the modelled network. A total of 22 bi-directional ANPR counters were used in the survey which provided a register of the time and location that a vehicle was observed at between 07:00 and 19:00. For each day of the survey, approximately 25,000 individual vehicles were observed with several thousand of them crossing over multiple ANPR counters.

In order to establish the origin, destination and period of time in which the trips were made, a set of criteria was established. For both the AM and PM periods, a 15-minute interval between observations was set as it was determined that each ANPR counter could be reached from another within the peak periods. For those vehicles which exceeded the interval, it was assumed that there had been a break in their journey and therefore the last recorded ANPR counter was its destination. For the AM period, only vehicles observed between 08:00 and 09:30 were counted and for the PM period, vehicles observed between 16:45 and 18:15 were counted. This provided a 15-minute "warmup" and "cooldown" period either side of the peak hours; 08:15 – 09:15 and 17:00 – 18:00.

For each period, the data was deconstructed into the number of ANPR counters that a vehicle had been observed crossing and the time in which it occurred. This information was then used in conjunction with the time period criteria discussed previously in order to establish individual trips e.g. if a vehicle had been observed crossing ANPR counter "1E" at 07:41, crossed counter "6S" at 08:01, counter "21N" at 08:08 and then "4E" at 08:29, it was determined that the vehicle's origin was counter "6S" and its destination "21N" in the 08:00 – 08:15 period as the 15-minute interval between observations had been exceeded. If any subsequent counter crossings were observed within the period then they were considered to be part of a new trip and the aforementioned criteria would be applied. This was critical for the PM period as a large number of vehicles had previously been observed in the AM period.

Data was also provided regarding single-matched vehicles which were observed only crossed one ANPR counter on the day of each survey.

6.2 POWSCAR Data

POWSCAR data was obtained for Naas, the wider County Kildare area and South Dublin which detailed an individual's home and place of work or education within a small area boundary, their mode of travel and the approximate time of their departure.

An equivalence matrix was established which detailed the VISUM model zone equivalent of each small area. For small areas beyond the extents of the modelled area, they were assigned to "route zones" e.g. the town of Kill, the South Dublin area etc. were assigned to route zone "1011" for the N7 North and the town of Blessington was assigned to route zone "1014" for the R410. This enabled an approximately 5000 x 5000 small area matrix to be aggregated into a 223 x 223 VISUM zone matrix.

However due to this method of equivalence and in cases where a small area had one or more equivalent VISUM zone, all of the vehicle movements associated with the small area were assigned to one VISUM zone. It was therefore necessary to disaggregate the matrix in order to determine the vehicle movements for each zone.

6.2.1 Sectoring

A total of 18 sectors were established within the modelled area based on the location of the ANPR counters. However, due to the location of the ANPR counters, it was not possible to establish accurate cordons within the modelled area. As a result, vehicles movements to and from many of the sectors cannot be accurately determined. However, journey planning tools and professional judgement were used to sector the modelled area as best as possible.

Each sector contained several zones including the route zones for external movements. Using these equivalent zones, sector matrices for the ANPR traffic counts and the POWSCAR data were established. These sectors allowed the 44 x 44 ANPR matrices and 223x223 POWSCAR matrices to be aggregated into 18 x 18 sector matrices.

With sector matrices for both and ANPR counts and the POWSCAR survey data, it was then possible to scale the POWSCAR matrices to correspond with the observed vehicle movements. By using the POWSCAR data to determine the origins and destinations of trips and the ANPR data to determine the number of trips, it was possible to estimate an evidence-based matrix for the AM and PM peak periods.

6.3 Matrix Disaggregation

Upon review of the 223 VISUM zones, it was determined that vehicle movements for 54 of the zones could not be accurately determined. They were therefore combined into the route zones discussed previously and the modelled area was reduced accordingly to represent a 169 x 169 zone matrix.

The POWSCAR matrices were firstly sorted by their sector and the corresponding scaling factor was then applied to each zone within the sector. Due to rounding errors caused by the scaling of vehicle movements, this resulted in underestimations and overestimations of the movements in some zones ranging from 0% to 3.8%.

It was then necessary to calculate the distribution of vehicle movements within each small area to identify the origin and destination of movements throughout the network. To calculate the distribution of the origins for the AM period, the number of residential addresses in each zone was divided by the total number of residential addresses in the relevant small area. This methodology was deemed suitable as the majority of trips in the AM period are related to commutes to places of work and education. This resulted in a percentage split of the origins for each small area across its zones. To calculate the distribution of destinations in the AM period, the number of commercial addresses in each zone was divided by the total number of commercial addresses in the relevant small area. A manual adjustment was also required as additional information such as the number of employees per zone or the total Gross Floor Area (GFA) per zone was not provided. This manual adjustment was used in zones that have fewer, but larger commercial addresses e.g. factories, business parks.

As highlighted previously, the POWSCAR data does not cover the PM peak period. Therefore it was necessary to reverse the AM flows in order to represent the journey home from places of work and education. The same methodology was followed for the PM period but the places of work and education were used as the origins and the residential addresses were used as the destinations.

6.4 Matrix Estimation

Once the prior matrices were produced, the matrices were assigned to the network. As discussed previously, the uncertainties with the origins and destinations of trips within Naas impacted the level of calibration within the town; particularly in the town centre. Matrix estimation therefore adjusted these origin and destination trips to better represent the link flows within the town.

Table 6.1 highlights the level of calibration before and after matrix estimation.

Table 6.1 Prior and Post Matrix Estimation Calibration Results

	AM Peak		PM Peak	
	Prior M.E	Post M.E	Prior M.E	Post M.E
Links	73%	93%	84%	89%
Turns	69%	86%	63%	78%

Main Turns	73%	90%	75%	94%

Although the matrix estimation has satisfied all the link count calibration, there have been adjustments to the trip length distributions as illustrated in Figure 6.1 and Figure 6.2.

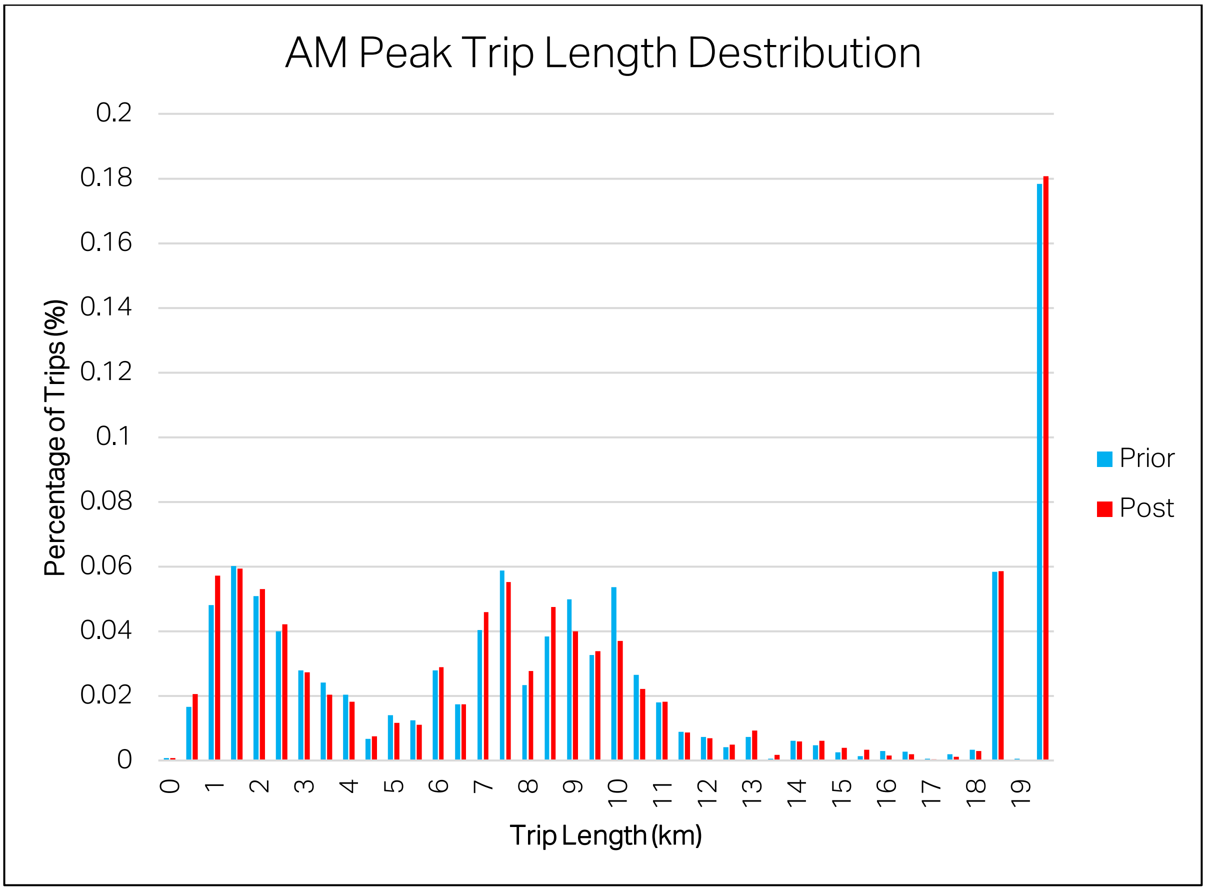


Figure 6.1 AM Trip Length Distribution Comparison

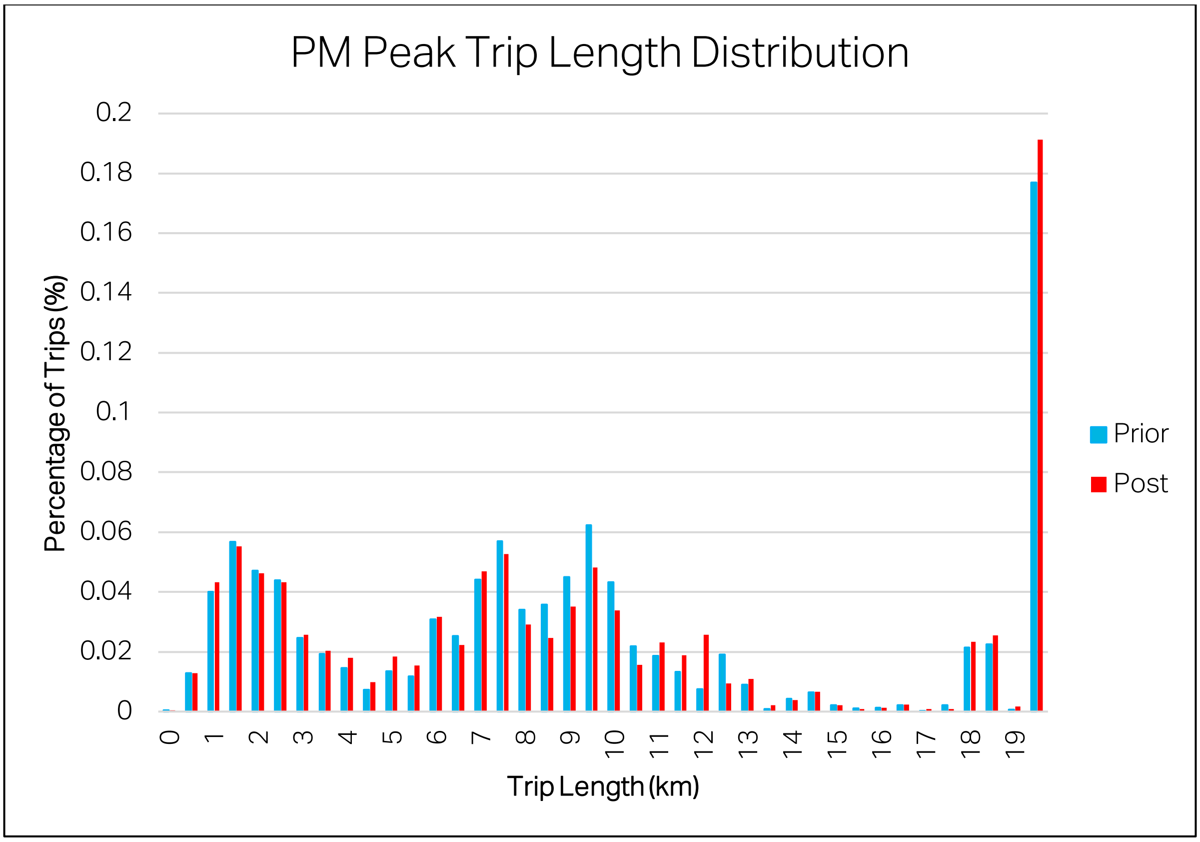


Figure 6.2 PM Trip Length Distribution Comparison

Generally the trip distributions for both AM and PM present large variations within the 0 to 3km range, consistent with the diameter of the ANPR cordon. This is a result of a lack of information in the OD movements within the town centre. All other distributions display a similar profile, albeit with slight variations due to the compensatory effect from the town centre adjustments.

In order to assess the changes between areas of the network as a result of matrix estimation, the zoning system has been grouped into sectors as illustrated in Figure 6.3.

Figure 6.3 Sectoring Diagram

Although the area north of the M7, which includes Sallins, has been allocated a number of zones, it should be noted that there is no origin / destination information within these zones. This is due to data limitations which restrict the modeller from estimating to / from or between these zones. As such, the demands from these areas have been incorporated into the route zones.

Using an equivalence table between the zoning system and the sectors, the car demand matrix was aggregated to create a sector matrix. This was undertaken for both the prior and final demand matrix to assess the impact of the matrix estimation process, which is presented in Table ***6.2*** and Table 6.3.

Table 6.2 AM Peak Sectoring – Absolute Change in Demand (Final - Prior)

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	0	40	0	3	10	3	0	0	15	0	0	4	16	0	4	1	13	8
2	16	0	0	9	91	8	1	0	2	19	0	0	3	1	0	2	2	1
3	0	2	0	6	118	59	0	0	0	1	0	1	1	0	2	3	25	6
4	12	10	3	0	135	51	35	0	1	13	0	16	8	0	0	1	9	35
5	0	7	11	1	18	112	6	0	1	10	0	3	8	0	5	2	36	14
6	3	2	1	1	71	0	20	0	0	29	0	0	19	0	2	1	21	2
7	6	24	0	2	8	0	0	0	1	0	0	0	0	0	0	0	7	3
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	2	3	0	0	0	4	0	13	15	6	5	0	2	10
10	3	37	2	7	47	28	6	0	15	0	0	6	16	0	1	3	9	13
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	2	2	2	32	6	0	111	1	0	0	6	0	1	11	19	9
13	0	20	0	5	12	14	3	0	127	64	0	2	0	6	5	5	27	395
14	0	0	0	1	6	0	0	0	9	14	0	0	7	0	0	0	24	89
15	11	0	0	6	5	4	7	0	46	1	0	21	16	15	0	6	7	24
16	8	0	1	3	26	30	11	0	2	7	0	61	14	19	20	0	14	0
17	7	1	1	3	9	48	6	0	3	14	0	109	14	4	11	2	0	11
18	0	9	0	6	15	9	2	0	3	53	0	0	112	0	0	0	5	0

Table 6.3 PM Peak Sectoring – Absolute Change in Demand (Final - Prior)

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	0	5	0	75	0	3	15	0	0	8	0	3	0	0	0	3	1	2
2	3	0	0	9	62	5	34	0	0	43	0	6	37	0	2	2	3	35
3	0	0	0	4	3	3	0	0	0	0	0	0	0	0	0	3	2	0
4	1	0	1	1	18	26	2	0	0	5	0	16	2	0	0	2	4	8
5	0	6	1	274	5	20	4	0	7	16	0	9	10	0	5	135	370	10
6	25	11	9	6	29	0	9	0	0	50	0	25	29	0	13	60	37	6
7	4	56	2	34	13	0	0	0	0	60	0	10	8	0	0	14	11	25
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	11	0	0	0	45	47	2	0	0	0	0	64	41	0	11	0	0	3
10	8	15	2	61	4	21	10	0	13	0	0	31	9	26	15	2	11	33
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	6	2	36	7	0	1	0	13	17	0	0	0	1	10	10	3	2
13	20	2	24	19	1	4	0	0	1	31	0	0	0	0	0	1	70	311
14	0	0	0	0	0	0	0	0	4	0	0	0	10	0	0	8	0	7
15	12	1	2	9	3	1	4	0	15	4	0	35	6	2	10	1	2	0
16	4	0	0	7	13	2	2	0	0	1	0	3	1	0	1	0	5	0
17	12	1	3	23	35	2	5	0	2	9	0	19	8	0	5	4	0	0
18	1	3	3	12	27	12	0	0	2	24	0	2	250	7	4	2	0	0

The matrix estimation process has had a more significant impact on short trips in both the AM and PM peak periods. This is highlighted by the large changes (>100) in zone-to-zone movements within Naas. In the AM peak period, eight out of the nine changes in vehicle movements greater than 100 vehicles involved neighbouring sectors while in the PM peak period, all five involved neighbouring sectors.

It is thought that due to the likelihood of inaccuracies in the ANPR survey results due to a lack of coverage and the number of 'single matches' i.e. vehicles which were only observed by one ANPR camera, the number of vehicles originating in one sector and terminating in a neighbouring sector may have been over-estimated.

7 Network Calibration and Validation

Prior to assigning demand matrices to the network, various calibration and validation network checks are required to ensure the network has been built robustly. The following sections provide a sample of checks which were carried out to identify any issues with the network coding to minimise abortive work during the model calibration and validation steps.

7.1 General Network Elements

Figure 7.1 and Figure 7.2 provide information on the network elements for the highway network and public transport network. Figure 7.1 highlights that the model consists of 169 zones which are connected to the network by 469 connectors, approximately 2.8 connectors per zone. The network also consists of 25 main nodes, these main nodes group isolated junctions together such as the individual priority entries onto a roundabout which when grouped form the junction.

Number: 19	Filter	Total	Filtered	Selected	Active	Passive
Nodes	Not specified	1997	1997	1997	1997	0
Links	Not specified	4388	4388	4388	4388	0
Turns	Not specified	11352	11352	11352	11352	0
Zones	Not specified	169	169	169	169	0
Connectors	Not specified	468	468	468	468	0
Main nodes	Not specified	25	25	25	25	0
Main turns	Not specified	990	990	990	990	0
Main zones	Not specified	0	0	0	0	0
Territories	Not specified	0	0	0	0	0
OD pairs	Not specified	28561	28561	28561	28561	0
Main OD pairs	Not specified	0	0	0	0	0
Paths	Not specified	99	99	99	99	0
Sharing Stations	Not specified	0	0	0	0	0
Points of interest	Not specified	0	0	0	0	0
GIS objects	Not specified	0	0	0	0	0
Screenlines	Not specified	0	0	0	0	0
Count locations	Not specified	0	0	0	0	0
Detectors	Not specified	0	0	0	0	0
Toll systems	Not specified	0	0	0	0	0

Figure 7.1 Network Statistics

In terms of public transport routes there are 20 services routeing through the Naas network. Each route has a total of 58 stop points (bus stops).

Number: 10	Filter	Total	Filtered	Selected	Active	Passive
Stop points	Not specified	58	58	58	58	0
Stop areas	Not specified	59	59	59	59	0
Stops	Not specified	59	59	59	59	0
System routes	Not specified	0	0	0	0	0
Main lines	Not specified	0	0	0	0	0
Lines	Not specified	7	7	7	7	0
Line routes	Not specified	20	20	20	20	0
Time profiles	Not specified	20	20	20	20	0
Vehicle journeys	Not specified	34	34	34	34	0
Vehicle journey sections	Not specified	34	34	34	34	0

Figure 7.2 Public Transport Statistics

7.2 Network Checker

VISUM has an inbuilt network checker which provides a review of the various network elements within the model. These checks are split into three distinct areas, General, PrT (Private) and PuT (Public) as shown in Figure 7.3.

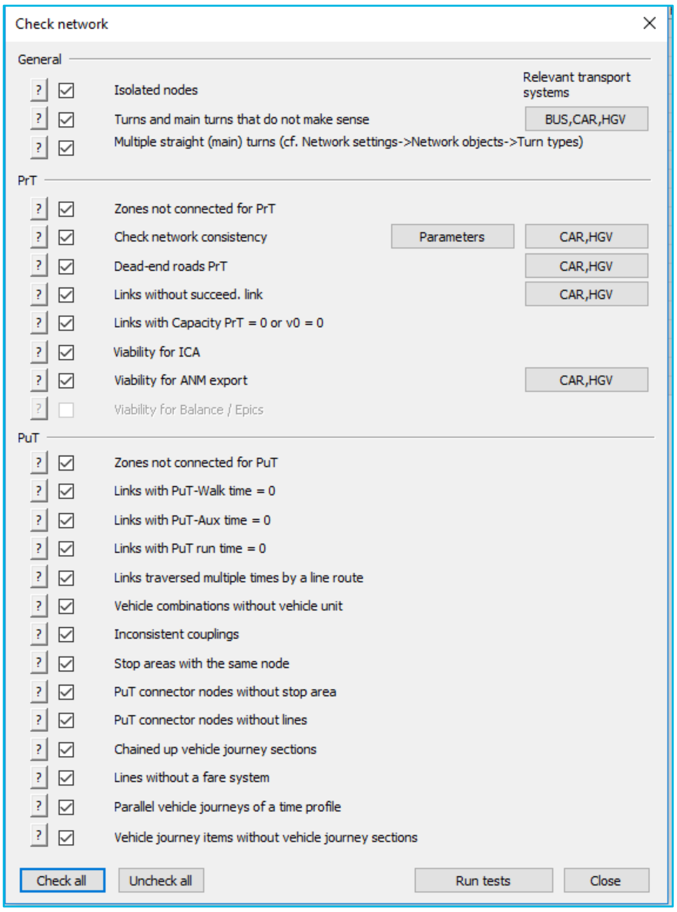


Figure 7.3 VISUM Inbuilt Network Checker

The main checks which require further attention are the following:

- Zones not connected for PrT;
- Viable for ICA; and
- Links with capacity PrT = 0 or V0 = 0.

From the three key checks above, Zones not connected for PrT and Viable for ICA were shown to have issues. Further review revealed that the ICA issues related to crosswalk lengths which were not set; however these have no impact on the ICA calculations or delay. In terms of the missing zone connectors, these are related to zones which currently have no development, therefore no demand or connection road (as shown in Figure 7.4.

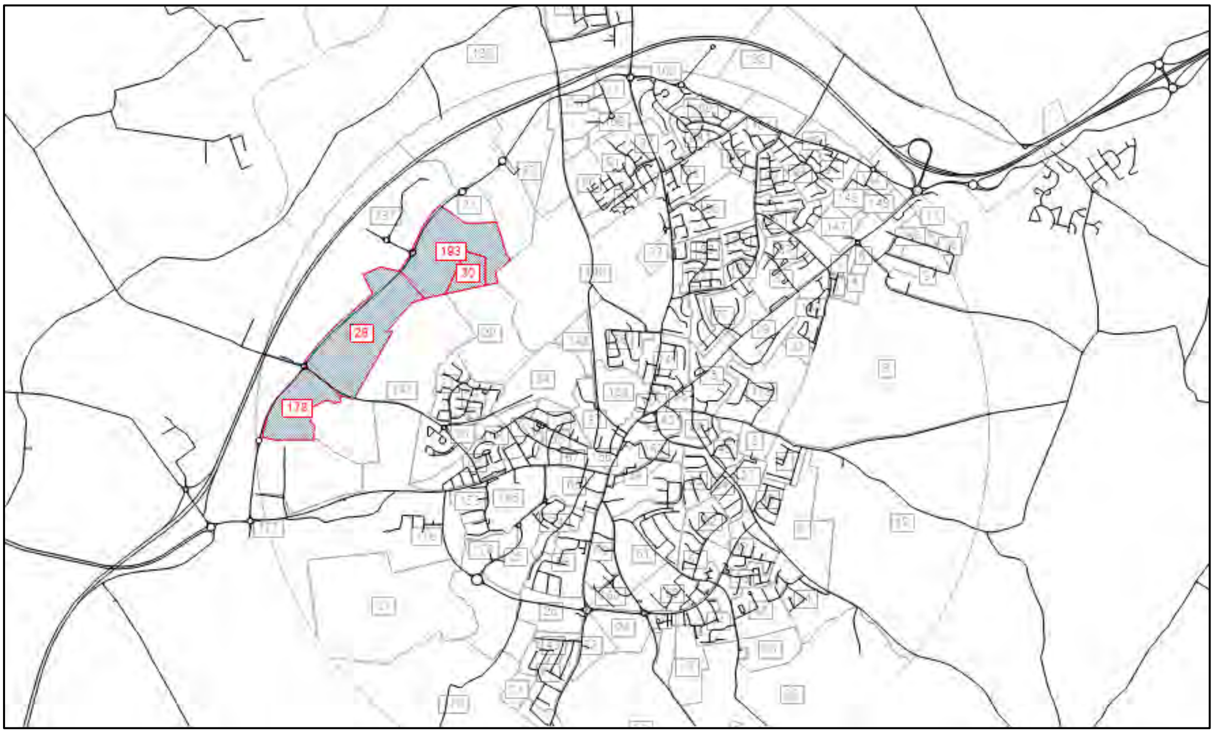


Figure 7.4 Zones with No Connectors

7.3 Overview of the Network Elements

Figure 7.5 presents the number of lanes on each link within the modelled network. As indicated, the model includes the roadworks on the M7 with lanes restricted to two lanes in each direction. Also it should be highlighted that the figure does not highlight localised flares. Generally the road network is single carriageway as expected for a historic town which is fed by rural roads.

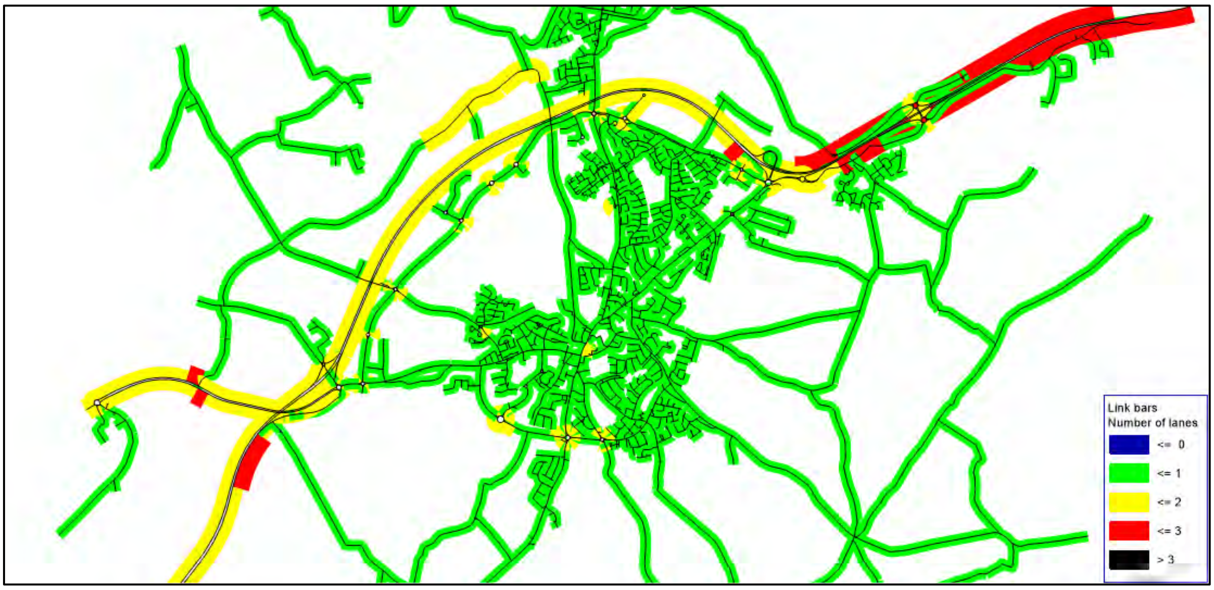


Figure 7.5 Number of Lanes

Figure 7.6 displays the road capacities. The M7 is represented by a thick black line indicating a capacity in excess of 3000 vehicles per hour, whereas the centre of Naas generally has road capacities less than 1400 vehicles per hour. The Newbridge road is a dual carriageway with a capacity 2,700 vehicle per hour.

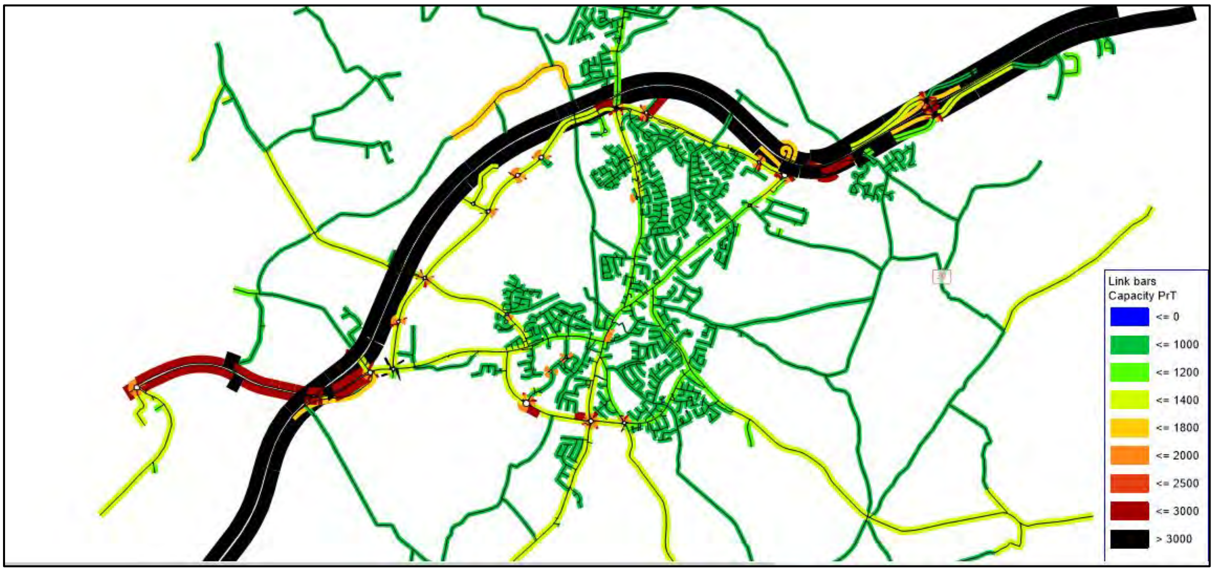


Figure 7.6 Link Capacity

7.4 Detailed Junction Checks

It is essential that each junction is modelled as accurately as possible, with detailing on lane markings, flare lengths, lane usage and signal timings being coded as presented on site. There are however limitations with time varying attributes, such as signals that are vehicle actuate, as VISUM is unable to model varying times, also any time limited restrictions such as bus lanes which operate at certain times throughout the day.

The screenshots illustrated in Figure 7.7 to Figure 7.10 have been taken to illustrate the junction coding against aerial photography.

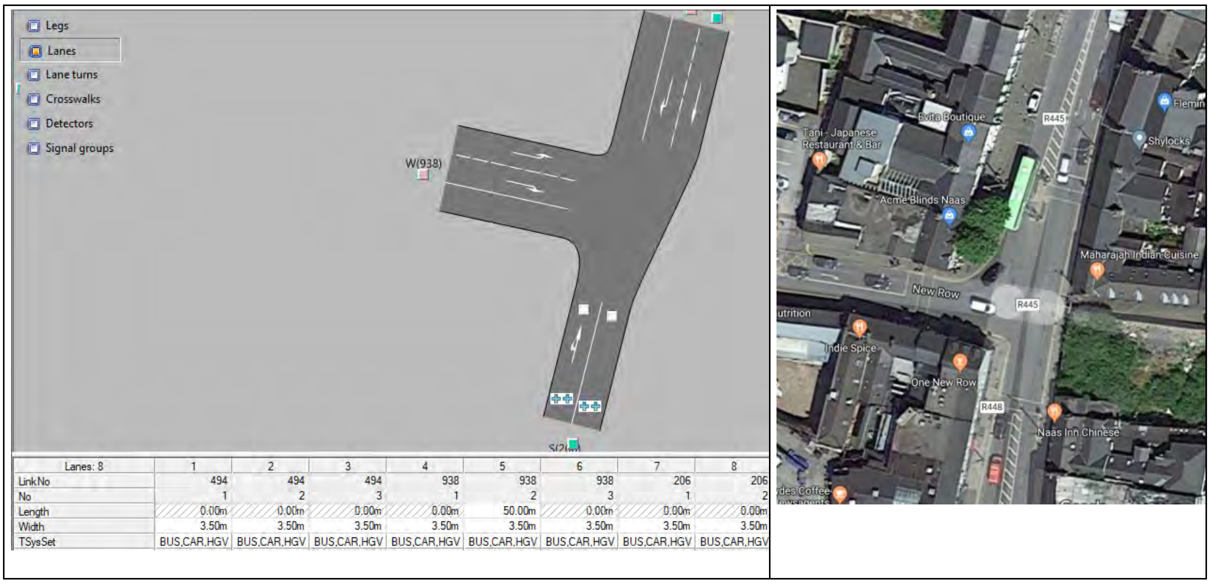
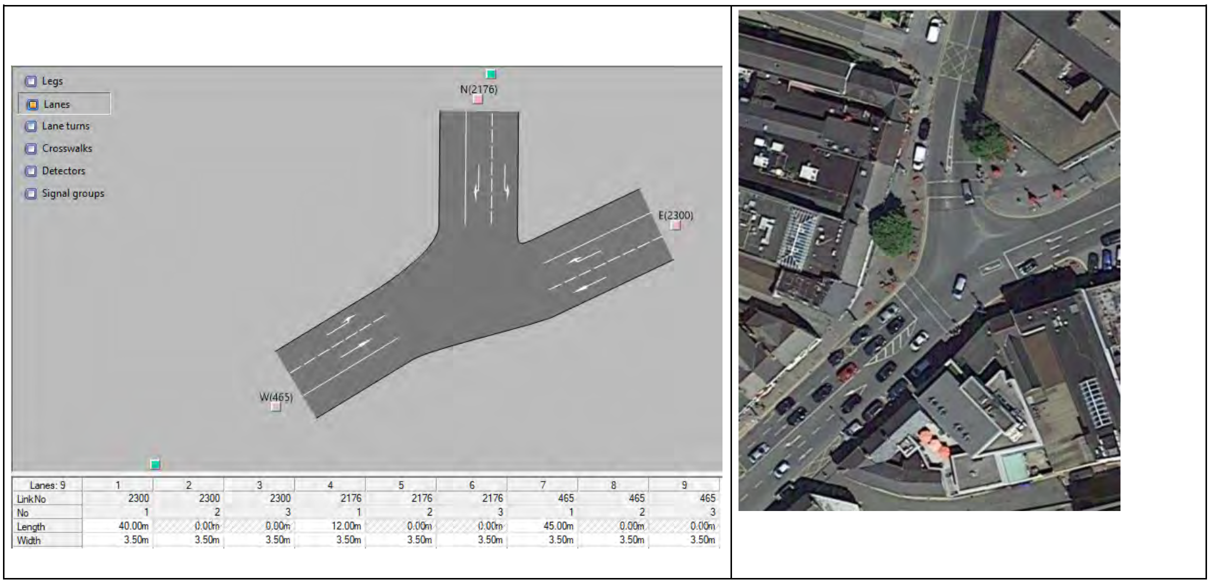


Figure 7.7 New Row / Main Street Junction (Murtagh's Corner)

Lanes: 9	1	2	3	4	5	6	7	8	9
LinkNo	2147	2147	2147	802	802	802	801	801	801
No	1	2	3	1	2	3	1	2	3
Length	30.00m	0.00m	0.00m	50.00m	0.00m	0.00m	45.00m	0.00m	0.00m
Width	3.50m	3.50m	3.50m	3.50m	3.50m	3.50m	3.50m	3.50m	3.50m
TSysSet	BUS,CAR,HGV	BUS,CAR,HGV	BUS,CAR,HGV	BUS,CAR,HGV	BUS,CAR,HGV	BUS,CAR,HGV	BUS,CAR,HGV	BUS,CAR,HGV	BUS,CAR,HGV

Figure 7.8 Dublin Road / Blessington Road



Lanes: 9	1	2	3	4	5	6	7	8	9
LinkNo	2300	2300	2300	2176	2176	2176	465	465	465
No	1	2	3	1	2	3	1	2	3
Length	40.00m	0.00m	0.00m	12.00m	0.00m	0.00m	45.00m	0.00m	0.00m
Width	3.50m	3.50m	3.50m	3.50m	3.50m	3.50m	3.50m	3.50m	3.50m

Figure 7.9 Sallins Road / North Main Street

Lanes: 8	1	2	3	4	5	6	7	8
LinkNo	90	90	90	2227	2227	460	460	460
No	1	2	3	1	2	1	2	3
Length	0.00m	0.00m	0.00m	0.00m	0.00m	0.00m	5.00m	0.00m
Width	3.50m	3.50m	3.50m	3.50m	3.50m	3.50m	3.50m	3.50m

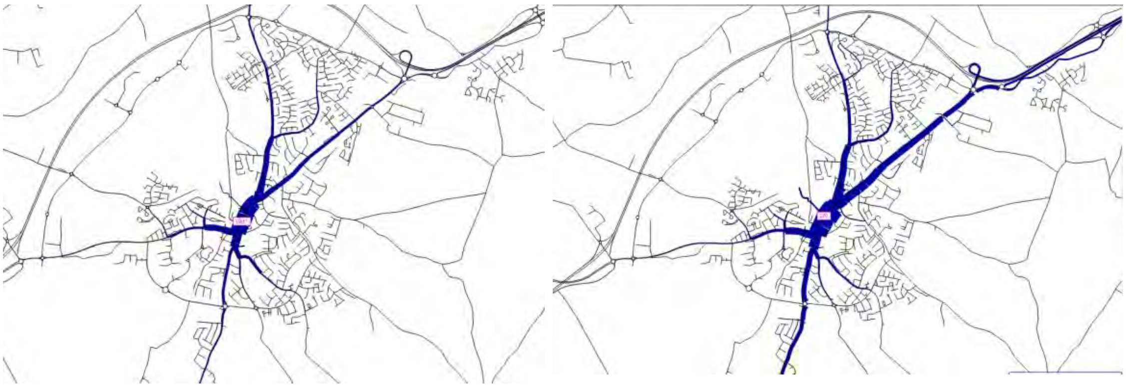
Figure 7.10 Kilcullen Road / Ballymore Road

8 Route Choice Calibration and Validation

8.1 Distribution Analysis

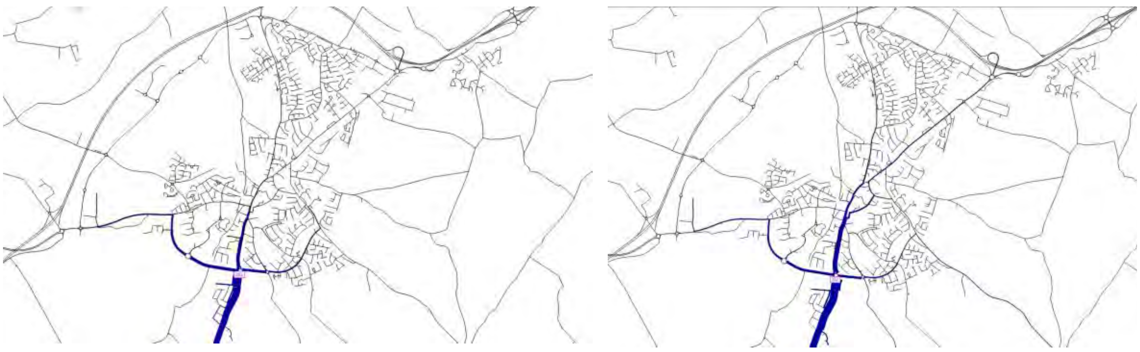
Flow distribution and screenline counts have been used for calibration. The flow distribution demonstrates the route choice through the network to ensure sensible routes are being used.

Figure 8.1 to Figure 8.5 present the routes being used to travel through Naas from the main arteries in and out of the town to demonstrate that sensible routes are being taken.



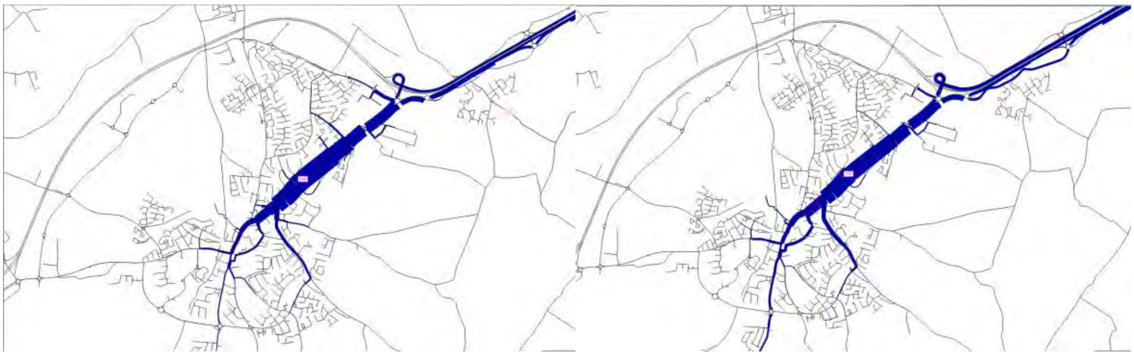
AM Peak (two way distribution through Naas) PM Peak (two way distribution through Naas)

Figure 8.1 Trip Distribution via Town Centre



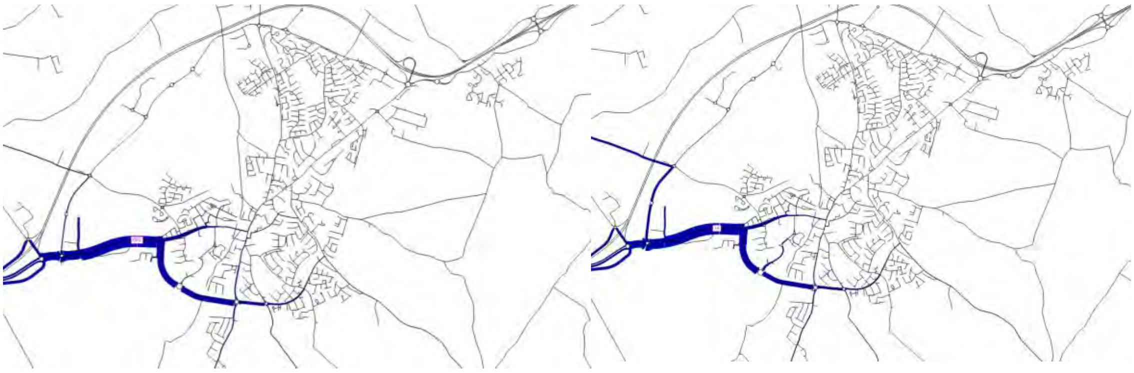
AM Peak (two way distribution through R448) PM Peak (two way distribution through R448)

Figure 8.2 Trip Distribution via R445



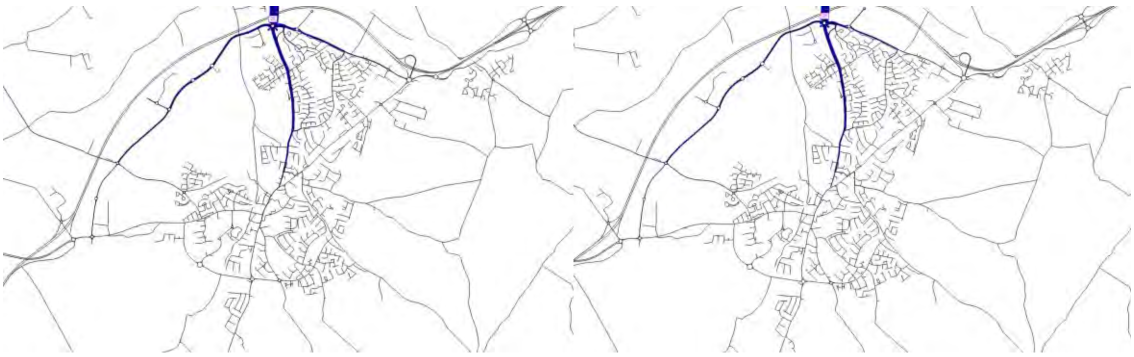
AM Peak (two way distribution through Dublin Road) PM Peak (two way distribution through Dublin Road)

Figure 8.3 Trip Distribution via Dublin Road



AM Peak (two way distribution via R445) PM Peak (two way distribution via R445)

Figure 8.4 Trip Distribution via R445



AM Peak (two way distribution via Sallins Road) PM Peak (two way distribution via Sallins Road)

Figure 8.5 Trip Distribution via Sallins Road

9 Links and Turns Calibration and Validation

The following chapter provides evidence on the validity of the model, these checks are:

- Link flows to meet criteria using either GEH or individual flow criteria; and
- Journey times.

9.1 Calibration

The calibration process considers link flow data to present the model's correlation against observed data. In addition to this, link flow regression analysis and turning count data has been used as supporting evidence to the calibration.

9.1.1 Link Count Calibration

Table 9.1 and

Table ***9.2*** show the link count validation for both the AM and PM peak periods.

Table 9.1 AM Peak Link Calibration

Number of Links	GEH <5	Average GEH	Flows < 100 vehs
44	86.4%	2.2	93.2%

Table 9.2 PM Peak Link Calibration

Number of Links	GEH <5	Average GEH	Flows < 100 vehs
44	88.7%	2.0	88.7%

A comprehensive breakdown of all link count validation is provided in Appendix A.

9.1.2 Link Count Regression Analysis

Supporting evidence on the link count validation has been presented in the form of a regression analysis. The regression analysis compares all the survey and modelled data to present an overview on how well the data compares. Figure 9.1 and Figure 9.2 illustrates the analysis. The slope (y) must lie between 0.95 and 1.05 and/or the R^2 value is less than 0.9 to pass WebTAG criteria. The figures illustrate that models correlate well with the survey data with regards to link count validation.

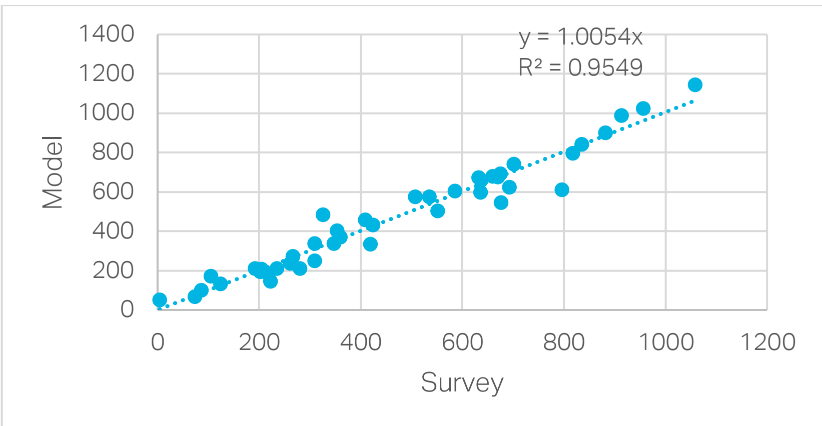


Figure 9.1 AM Peak Regression Analysis

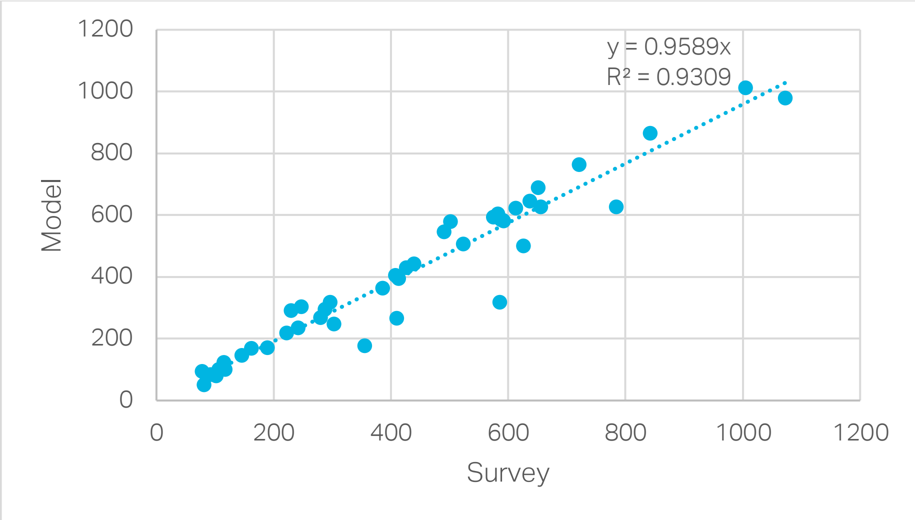


Figure 9.2 PM Peak Regression Analysis

The regression analysis satisfies the criteria, albeit the PM model has some outliers which have been attributed to the on-going roadworks which have been difficult to model accurately.

9.1.3 Turn Count Calibration (supporting evidence)

In support of the link counts data, additional checks were undertaken on the individual turning movements within the model. The tables below indicate that the AM peak has 88.4% of its turns within the GEH or individual flow criteria, whereas the PM peak has 83.1%, which is marginally lower than the 85% pass rate. Given that generally strategic models do not consider turning counts as part of the calibration, these results are considered positive.

Table 9.3 AM Peak Turn Calibration

Number of Turns	GEH <5	Average GEH	Flows < 100 vehs
130	88.4%	4.16	88.4%

Table 9.4 PM Peak Turn Calibration

Number of Turns	GEH <5	Average GEH	Flows < 100 vehs
130	83.8%	4.33	83.1%

9.2 Journey Time Validation

For journey time validation, modelled and surveyed journey time data was compared to assess whether the percentage difference was less than 15% and/or the absolute maximum difference was less than 60 seconds. Table 9.5 and Table 9.6 summarise the journey times for each of the 8 routes under assessment and show the difference between the modelled journey times and the surveyed journey times.

Table 9.5 AM Journey Time Comparison

Journey Time Route	Direction	Surveyed (s)	Modelled (s)	Difference (%)	Difference (s)	Pass / Fail
1	EB	1087	1235	13.6%	148	Pass
	WB	1070	1204	12.5%	134	Pass
2	NB	1068	1152	7.9%	84	Pass
	SB	1248	1140	8.7%	108	Pass
3	NB	410	440	7.2%	30	Pass
	SB	343	329	4.0%	14	Pass
4	NB	118	89	24.4%	29	Pass
	SB	85	77	11.5%	10	Pass
5	EB	136	156	14.7%	20	Pass
	WB	142	126	11.3%	16	Pass
6	EB	303	286	5.6%	17	Pass
	WB	295	273	7.5%	22	Pass
7	EB	918	1002	9.1%	84	Pass
	WB	720	757	5.1%	37	Pass
8	EB	337	330	2.0%	7	Pass
	WB	302	298	1.5%	4	Pass

Table 9.6 PM Journey Time Comparison

Journey Time Route	Direction	Surveyed (s)	Modelled (s)	Difference (%)	Difference (s)	Pass / Fail
1	EB	1077	1234	14.6%	157	Pass
	WB	1770	1603	9.4%	167	Pass
2	NB	1180	1208	2.4%	28	Pass
	SB	1453	1242	14.5%	211	Pass
3	NB	365	389	6.6%	24	Pass
	SB	343	333	2.9%	10	Pass
4	NB	126	78	38.1%	48	Pass
	SB	90	76	15.7%	14	Pass
5	EB	111	144	29.3%	33	Pass

	WB	128	87	32.1%	41	Pass
6	EB	341	286	16.2%	55	Pass
	WB	417	273	34.5%	144	Fail
7	EB	870	885	1.7%	15	Pass
	WB	1286	971	24.5%	315	Fail
8	EB	296	298	0.9%	3	Pass
	WB	322	293	9.0%	29	Pass

Both AM and PM models present a good level of validation against the observed journey times, albeit the PM peak fails at Route 6 westbound and Route 7 westbound, these routes are shown in Figure 9.3.

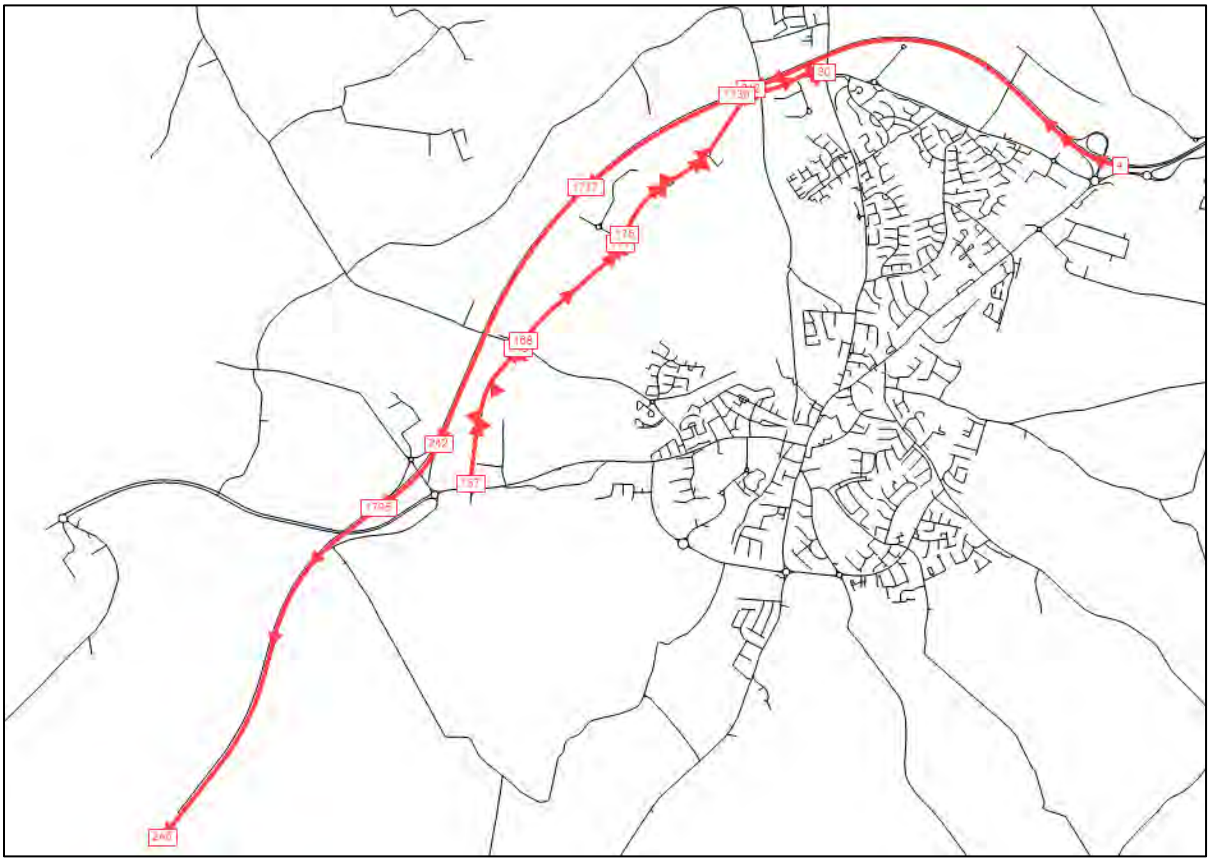


Figure 9.3 Journey Routes which fall outside the Criteria (PM Peak)

Journey time comparison using time / distance profile graphs can be found in the Appendix B.

10 Limitations

Although the AM and PM models have been successfully calibrated and validated using the provided survey data, it should be noted that it is equally important to highlight a traffic model's limitations as it is to highlight its strengths. The following chapter discusses areas that need to be considered when reviewing results or planning future model updates.

10.1 Model Limitations

There was found to be an absence of JTC survey data for several key junctions throughout Naas town, Sallins, north and east of Naas. As a result, traffic entering and exiting these parts of the network rely heavily on other sources of data. In the case of Sallins there is no data collection, therefore it could not be modelled with any confidence.

The off-street and on-street parking survey information that was provided was insufficient to accurately replicate the volume and frequency of vehicles parking throughout the network. For example, several key town centre car parks were not surveyed due to various reasons, including being denied access.

A lack of surveys at key attractors such as Meánscoil Iognáid Rís, St Mary's College, Kildare County Council offices or the Hospital has resulted in professional judgment being used to estimate the number of vehicles entering and exiting the associated zones.

Due to the ongoing major roadworks on the N7 / M7 which were present during the surveyed period in September 2018, the routes, departure times, volume of traffic, driver behaviour and therefore surveyed data may not reflect the normal conditions of the network.

Signal data provided by KCC highlighted that the traffic signals within Naas operate using MOVA. MOVA varies the signal timings through the peak hour and day based on traffic demand. VISUM is unable to adjust signals therefore must take an average signal times over the modelled period. Although this has been highlighted as a limitation, it should be noted that all strategic models use fixed signal times.

Due to the gaps within the ANPR cordon / screenlines and the number of 'single matches' i.e. vehicles which were only observed by one ANPR camera, the number of vehicles originating in one sector and terminating in a neighbouring sector is high. Although this might be a behavioural trend within Naas i.e. short distance car trips, there is no supporting evidence to prove or disprove this, therefore it should be noted when reviewing model outputs.

The following should be considered in any future model refresh:

- No further data should be collected until the M7 /N7 roadworks are completed and the network has settled into normal travel patterns. Surveyed junctions which were significantly impacted by the M7 / N7 roadworks should be resurveyed, e.g. the Dublin Road (R445) / Monread Road roundabout adjacent to the M7 on and off slips.
- Collection of additional JTCs would improve the calibration of the model, especially within the Town centre and Sallins.
- Major developments which attract / produce high number of trips should be surveyed to validate modelling assumptions.

The above information should be used to recalibrate the VISUM model to ensure the model is operating as expected with the normal operation of the M7 / N7.

11 Summary

The model has been developed using various data sources. The network construction has utilised open source data which has been checked and validated using aerial photography and site investigation notes, whereas the demand matrices have been developed using ANPR, traffic count data and census data. The AM and PM Peak models have been successfully calibrated, with link count calibration achieving a 93% and 89% pass rate respectively. All journey time routes in the AM peak validate, however two journey time routes fail in the PM peak but remain within acceptable PAG limits.

Figure 11.1 to Figure 11.4 present the network performance of the AM and PM peak which further exhibits the validity of the model. The figures present the Level of Service (LoS) at the junctions within Naas and the traffic volumes. LoS presents information on junction delays, whereby LoS A equates to a mean delay less than 10 seconds and LoS F equates to a mean delay over 80 seconds.

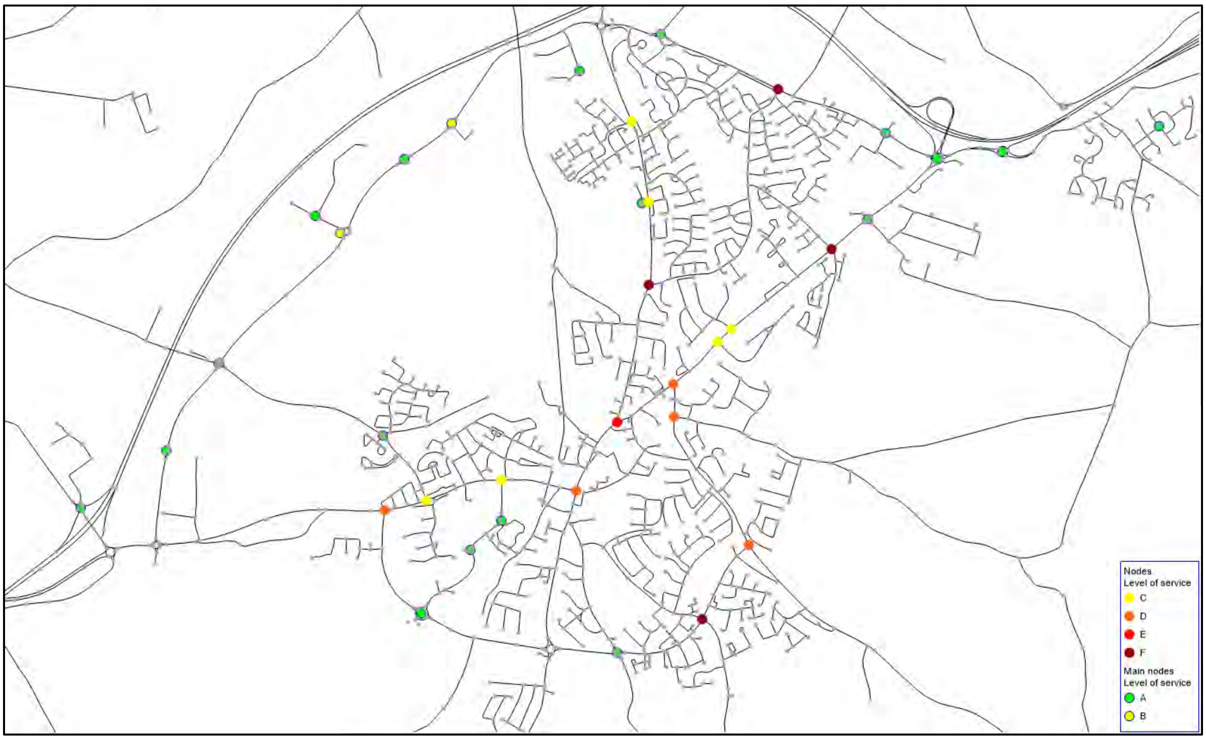


Figure 11.1 AM Junction LoS

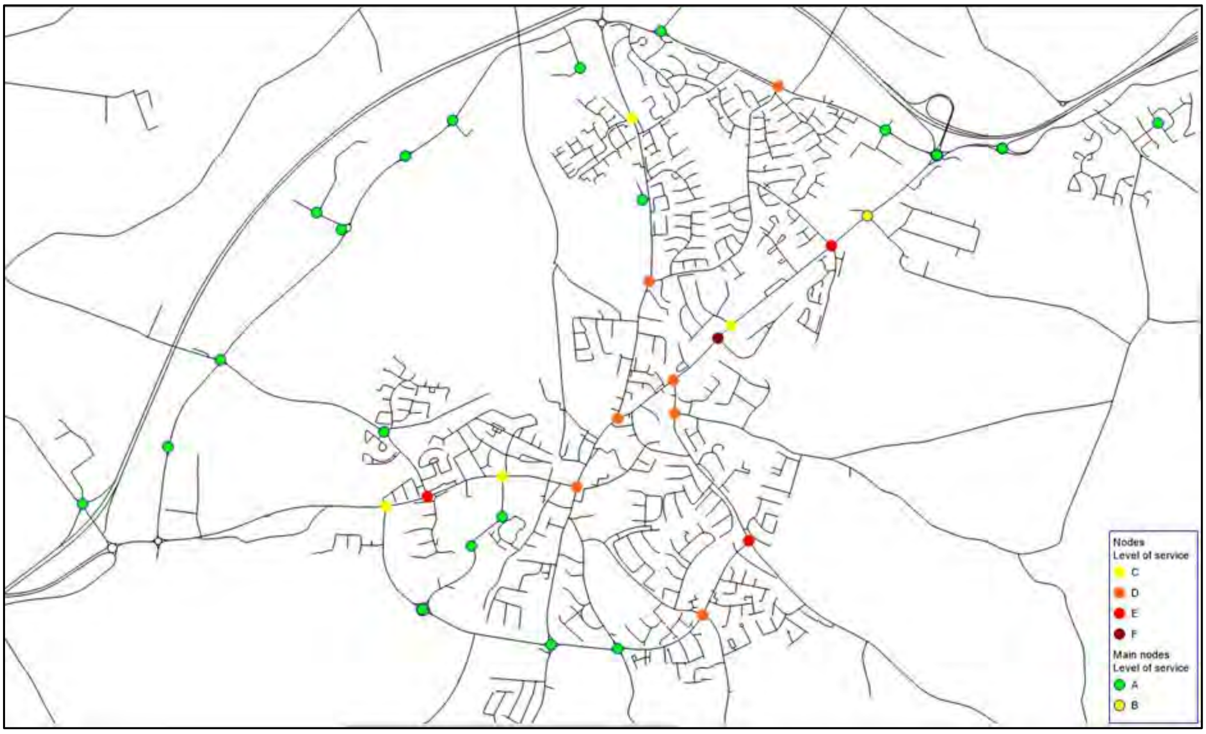


Figure 11.2 PM Junction LoS

Both the AM and PM peaks highlight issues within the town centre, along Dublin Road, Main Street and the Newbridge Road. The junctions along these streets display a LOS ranging from a C to and F. There are also junction problems on Sallins Road and Blessington Road.

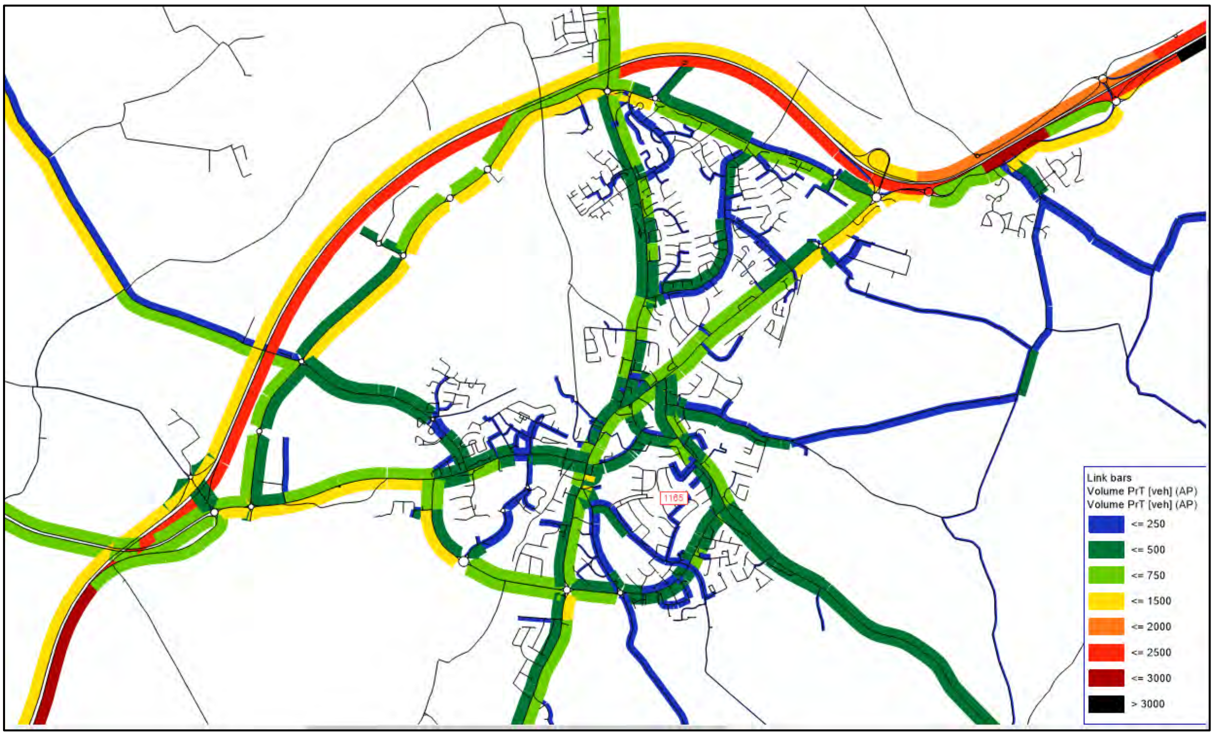


Figure 11.3 AM Link Flows

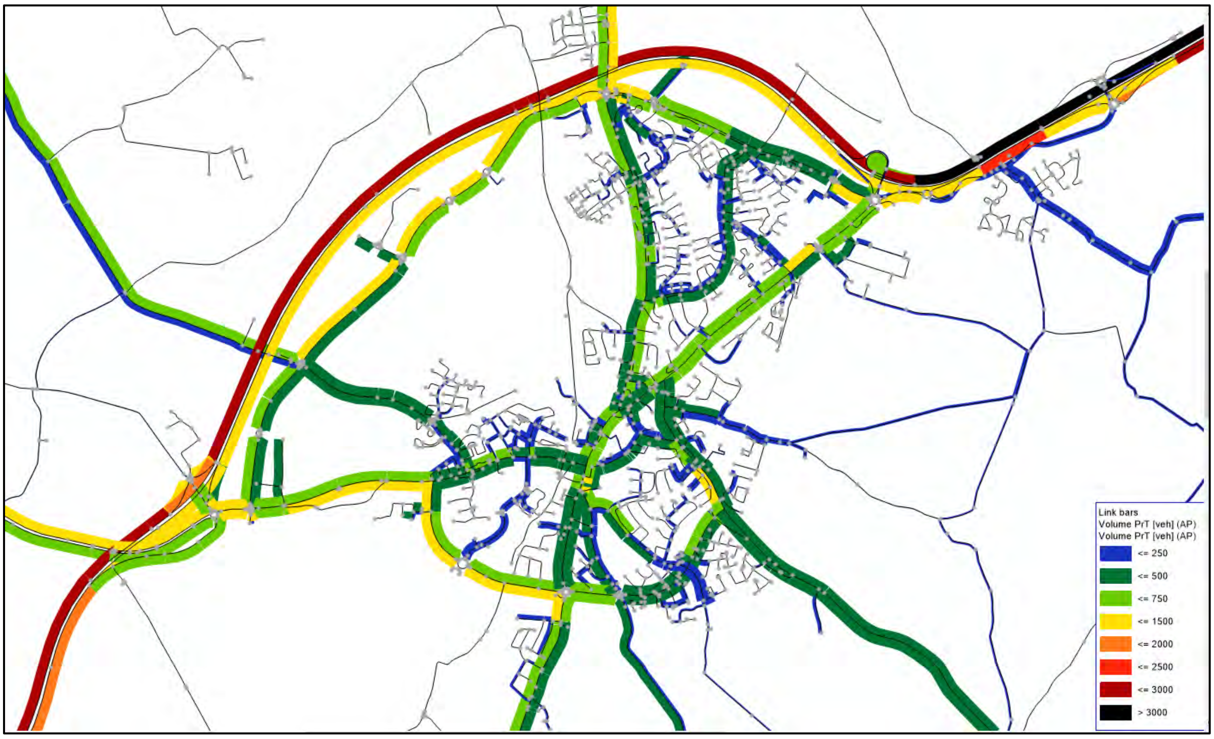


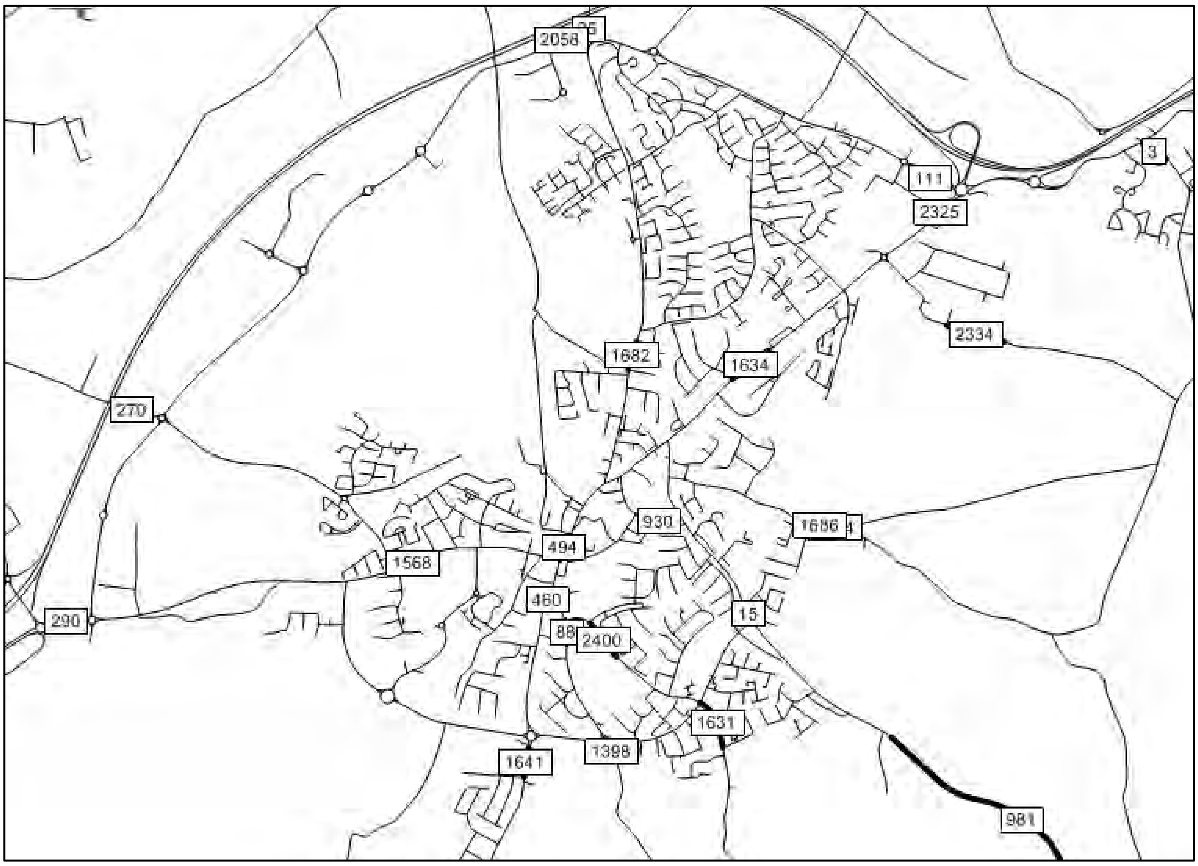
Figure 11.4 PM Link Flows

The largest flows are observed along the partial ring road to the south and west of Naas town. Also all junctions, with the exception of a pedestrian crossing within Naas town centre, display a LoS A, which equates to a delay that is ≤ 10 seconds per vehicle whereas LoS F is greater than 80 seconds.

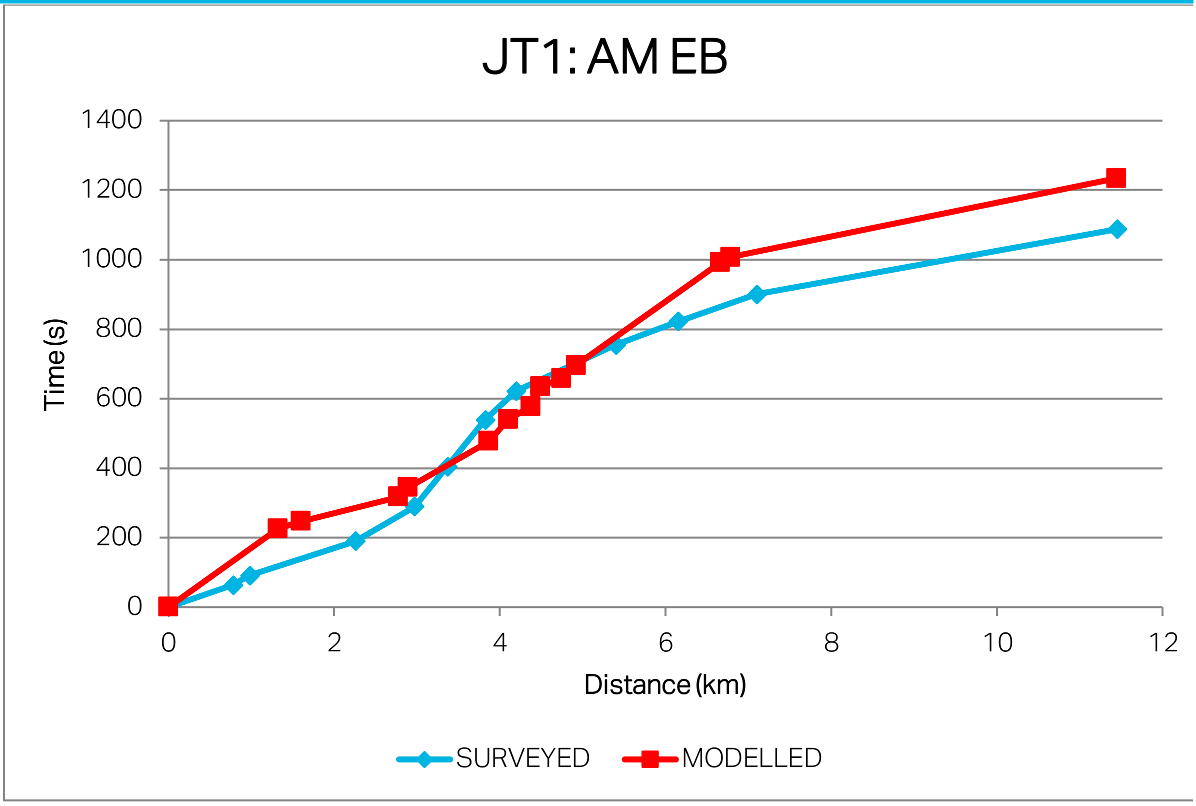
Appendix A Link Flow Comparisons

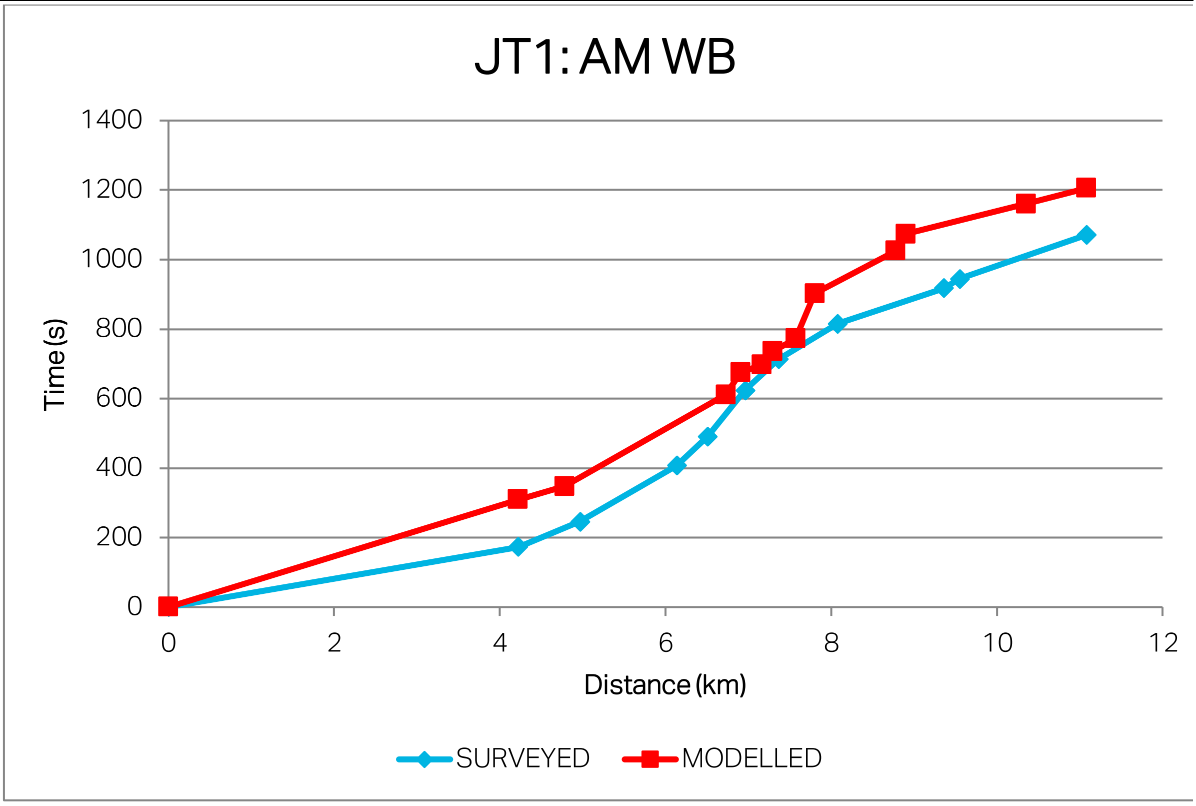
Link	Street Name	Direction	AM Peak Modelled	AM Peak Survey	AM Peak Diff	AM Peak GEH	PM Peak Modelled	PM Peak Survey	PM Peak Diff	PM Peak GEH
3	L6035	E	222	184	-38	2.68	362	189	-173	10.42
3	L6035	W	205	194	-11	0.81	232	309	77	4.66
15	Blessington Road	N	718	742	24	0.89	432	451	20	0.95
15	Blessington Road	S	436	433	-3	0.15	611	649	61	2.47
25	R407	N	654	599	-55	2.18	605	622	17	0.68
25	R407	S	862	842	-20	0.67	612	633	49	1.99
88	Ballymore Eustace Road	N	424	333	-91	4.67	93	92	-1	0.11
88	Ballymore Eustace Road	S	194	208	14	0.97	244	250	7	0.42
111	L2012	E	341	617	276	12.59	117	130	13	1.18
111	L2012	W	865	795	-70	2.44	166	186	21	1.59
270	R409	E	674	675	1	0.03	420	423	3	0.16
270	R409	W	211	211	0	0.01	607	346	-261	11.94
290	R445	E	1111	1144	33	0.97	778	812	82	2.94
290	R445	W	904	899	-5	0.16	224	239	15	1.02
460	R448	S	333	249	-84	4.93	669	681	30	1.15
460	R448	N	368	336	-32	1.68	1224	1068	-29	0.87
494	Main Street South	S	689	625	-64	2.48	853	675	-119	4.38
494	Main Street South	N	566	575	9	0.37	682	667	-4	0.15
930	Friary Road	E	231	146	-85	6.22	1024	1077	56	1.73
930	Friary Road	W	353	403	50	2.55	303	340	38	2.1
981	Blessington Road	W	320	336	16	0.88	590	612	24	0.98
981	Blessington Road	E	271	272	1	0.08	858	949	91	3.03
1398	Ballymore Road	N	282	211	-71	4.5	629	672	43	1.69
1398	Ballymore Road	S	91	100	9	0.92	149	154	6	0.49
1568	Newbridge Road	E	688	680	-8	0.31	403	274	-129	7.04
1568	Newbridge Road	W	368	370	2	0.1	291	318	27	1.56
1631	Craddockstown Road	N	241	212	-29	1.93	291	290	6	0.35
1631	Craddockstown Road	S	214	196	-18	1.23	511	590	79	3.37
1634	Dublin Road	S	649	658	9	0.36	455	480	34	1.58
1634	Dublin Road	N	612	605	-7	0.28	112	104	-4	0.41
1641	Kilcullen Road	S	537	575	38	1.61	104	82	-22	2.25
1641	Kilcullen Road	N	987	1023	36	1.14	506	606	100	4.25
1682	Sallins Road	S	694	546	-148	5.93	656	742	86	3.26
1682	Sallins Road	N	428	458	30	1.41	635	534	-101	4.19
1684	Tipper Road	W	104	171	67	5.68	539	533	1	0.02
1686	Tipper Road	E	122	134	12	1.07	300	261	-39	2.32
2058	Millennium Link Road	E	830	610	-220	8.19	114	107	-7	0.68

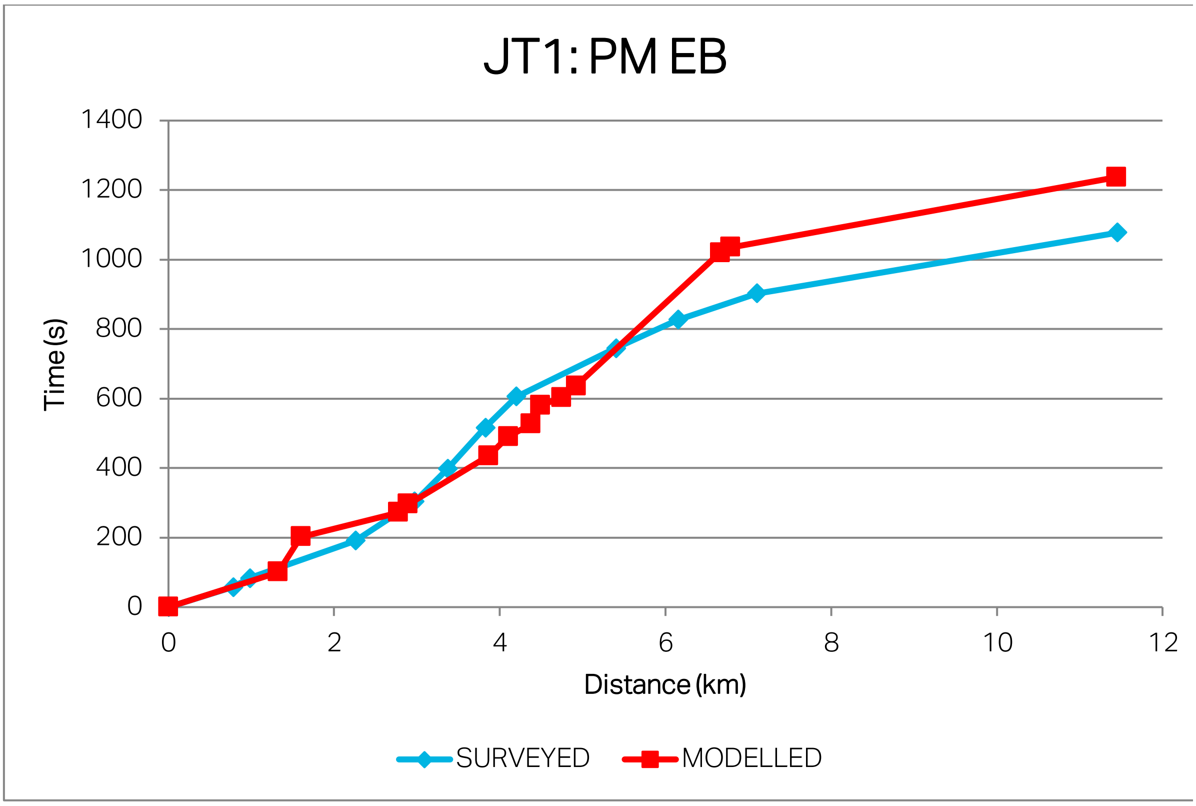
2058	Millennium Link Road	W	958	989	31	1	393	379	-13	0.66
2325	R445	S	714	692	-22	0.85	603	585	-15	0.62
2325	R445	N	683	673	-10	0.37	416	432	16	0.76
2334	Fishery Lane	E	4	50	46	8.82	81	56	-25	3.04
2334	Fishery Lane	W	71	66	-5	0.63	77	101	24	2.56
2400	Craddockstown Road	N	557	504	-53	2.31	189	177	-11	0.8
2400	Craddockstown Road	S	267	238	-29	1.81	262	323	61	3.54



Appendix B Journey Time Validation



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1200
1000
800
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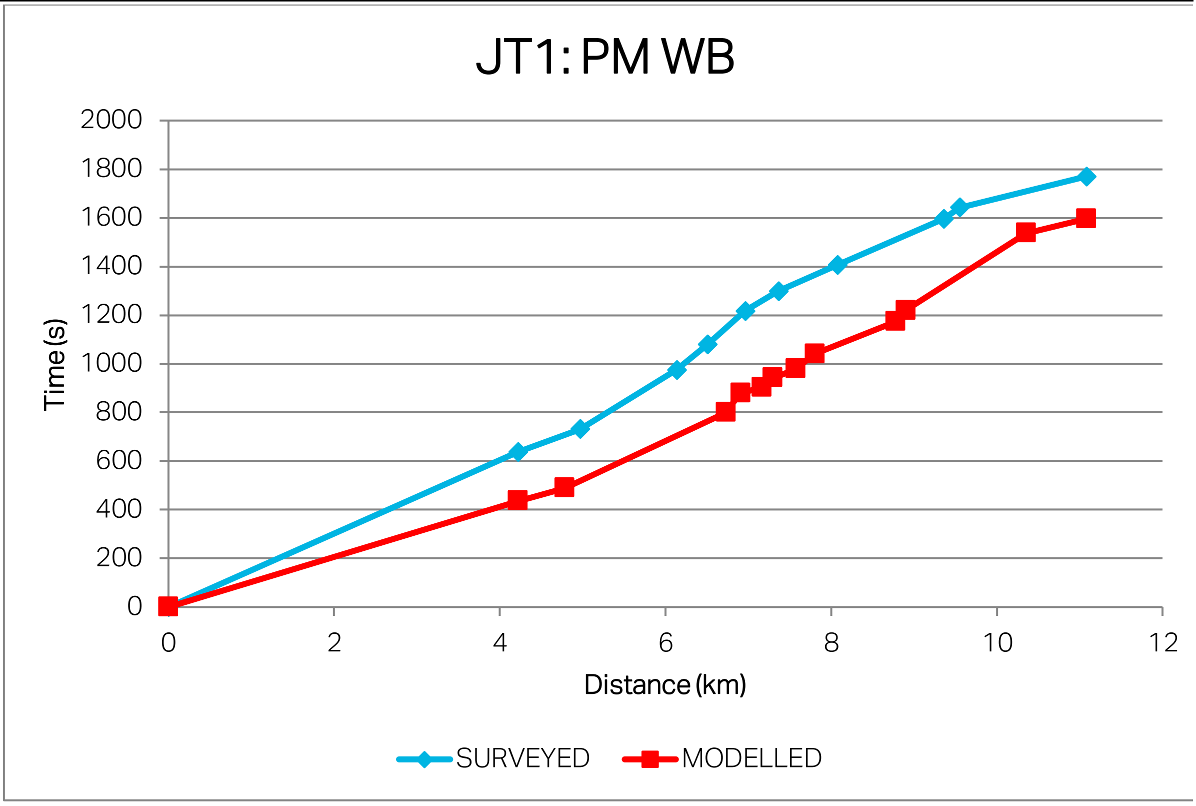
6
8
10
12
Time (s)
Distance (km)
SURVEYED
MODELLED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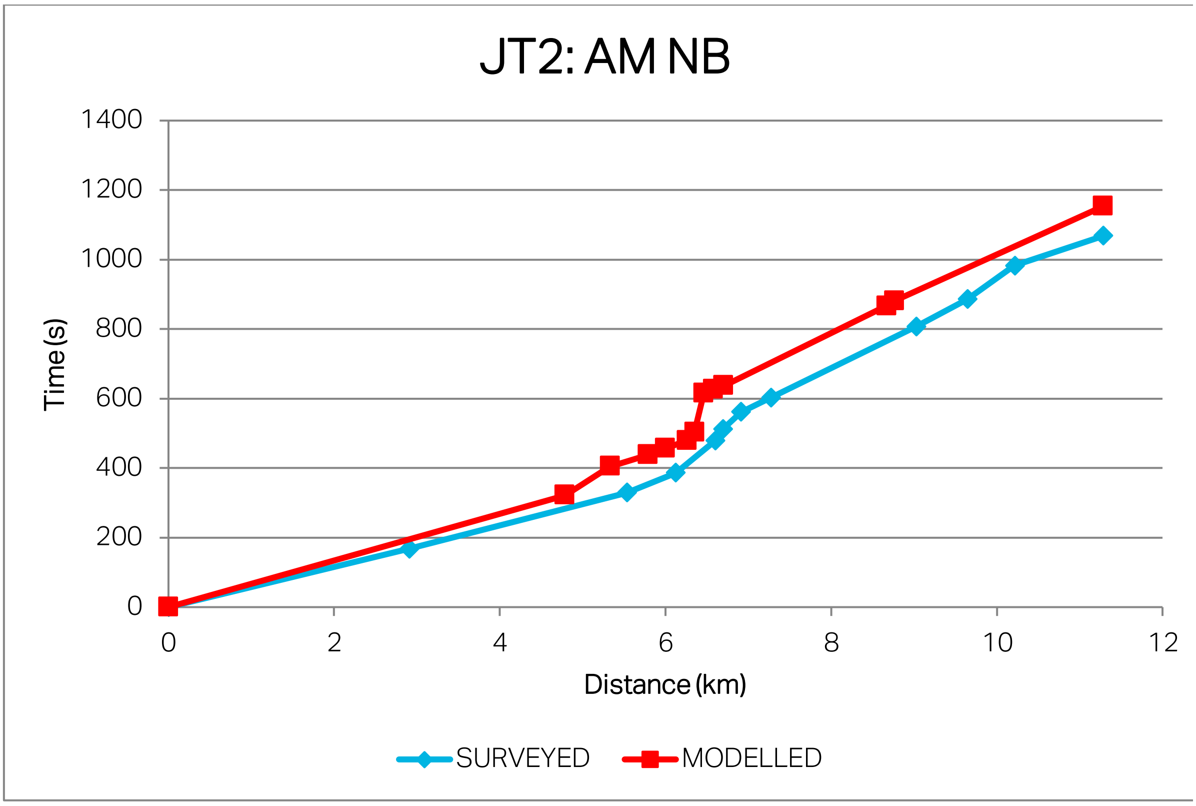
Time (s)
Distance (km)
SURVEYED
MODELLED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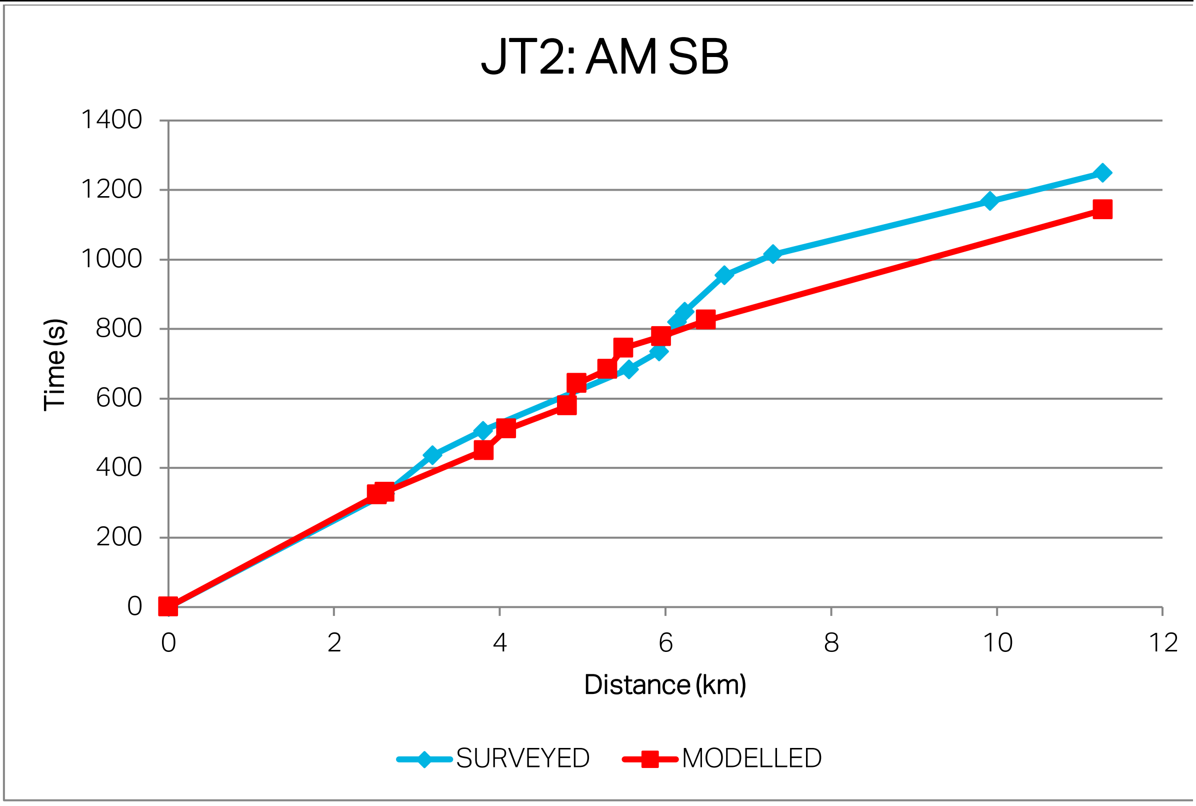
SURVEYED
MODELLED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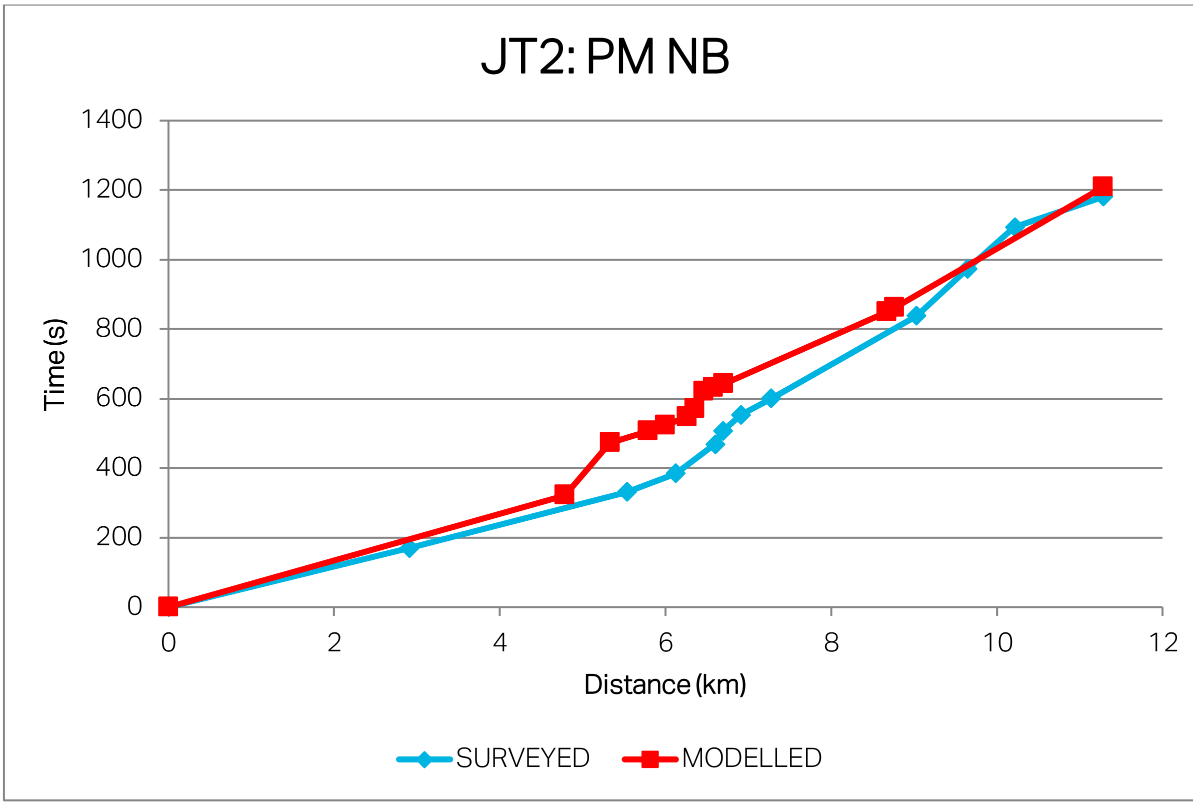
SURVEYED
MODELLED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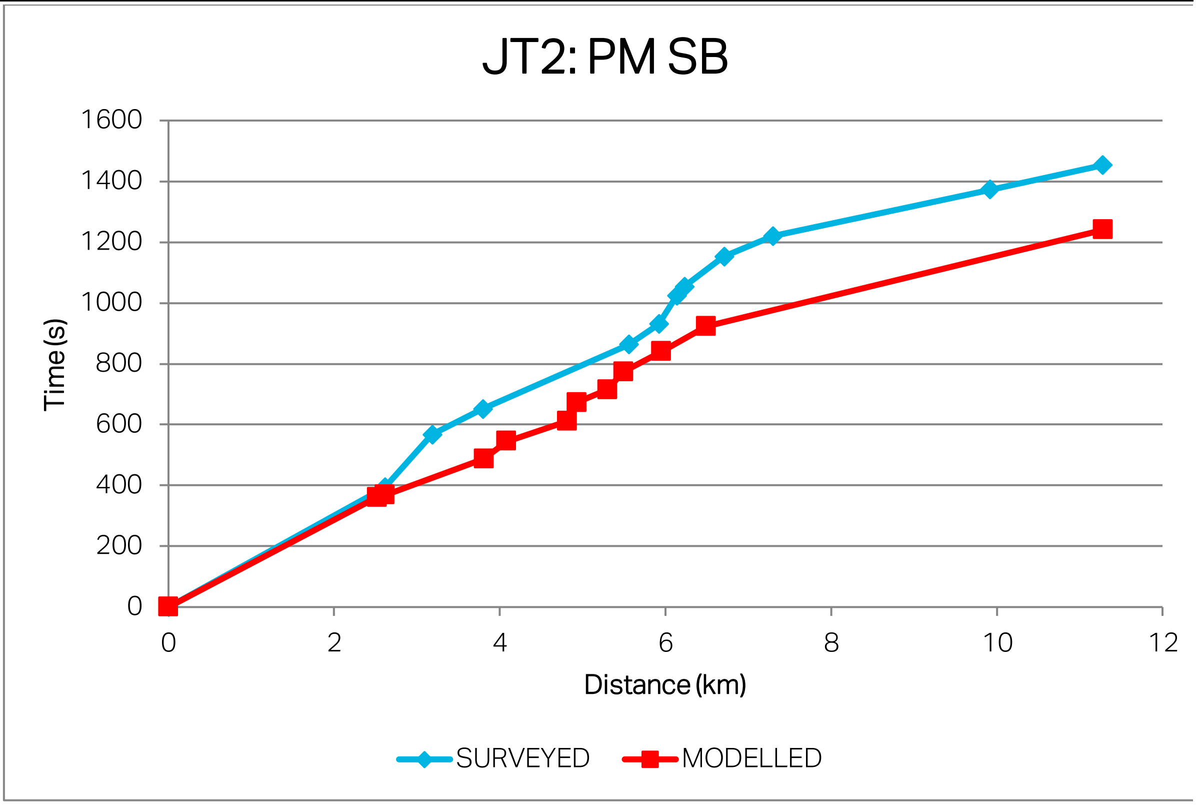
12
Distance (km)
SURVEYED
MODELLED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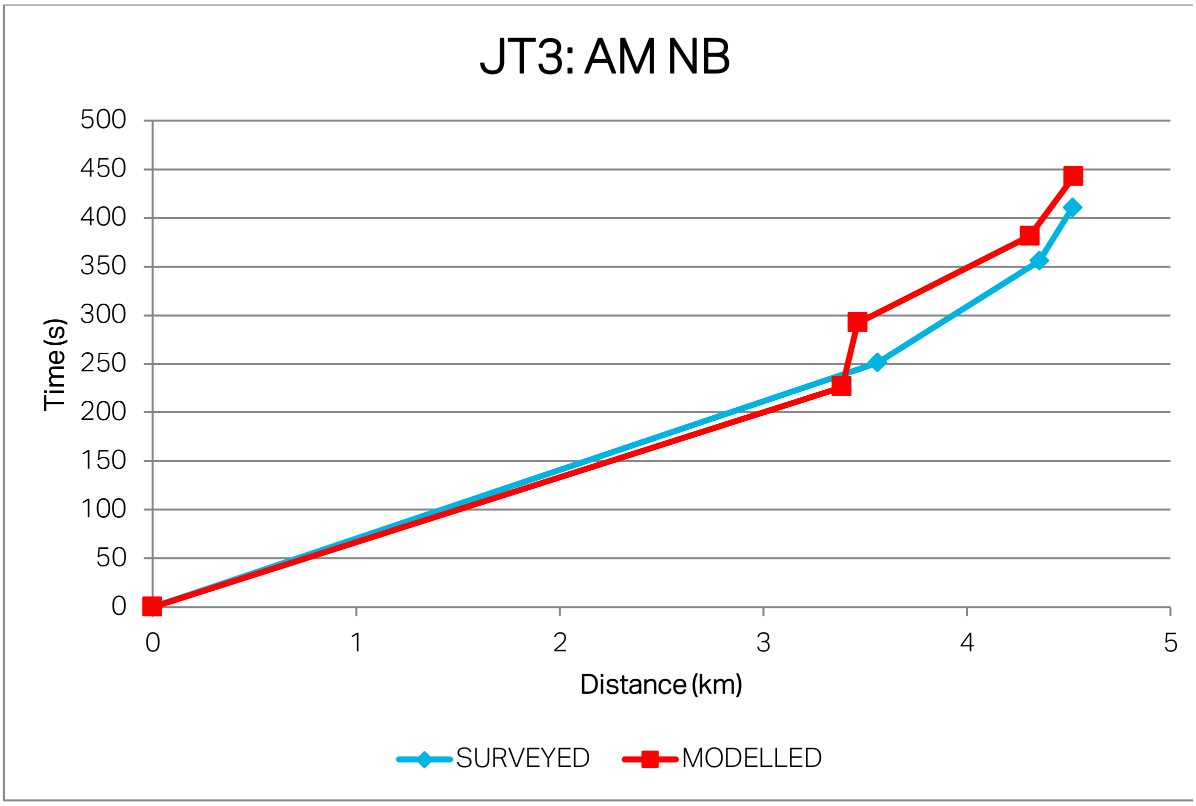
12
Distance (km)
SURVEYED
MODELLED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300
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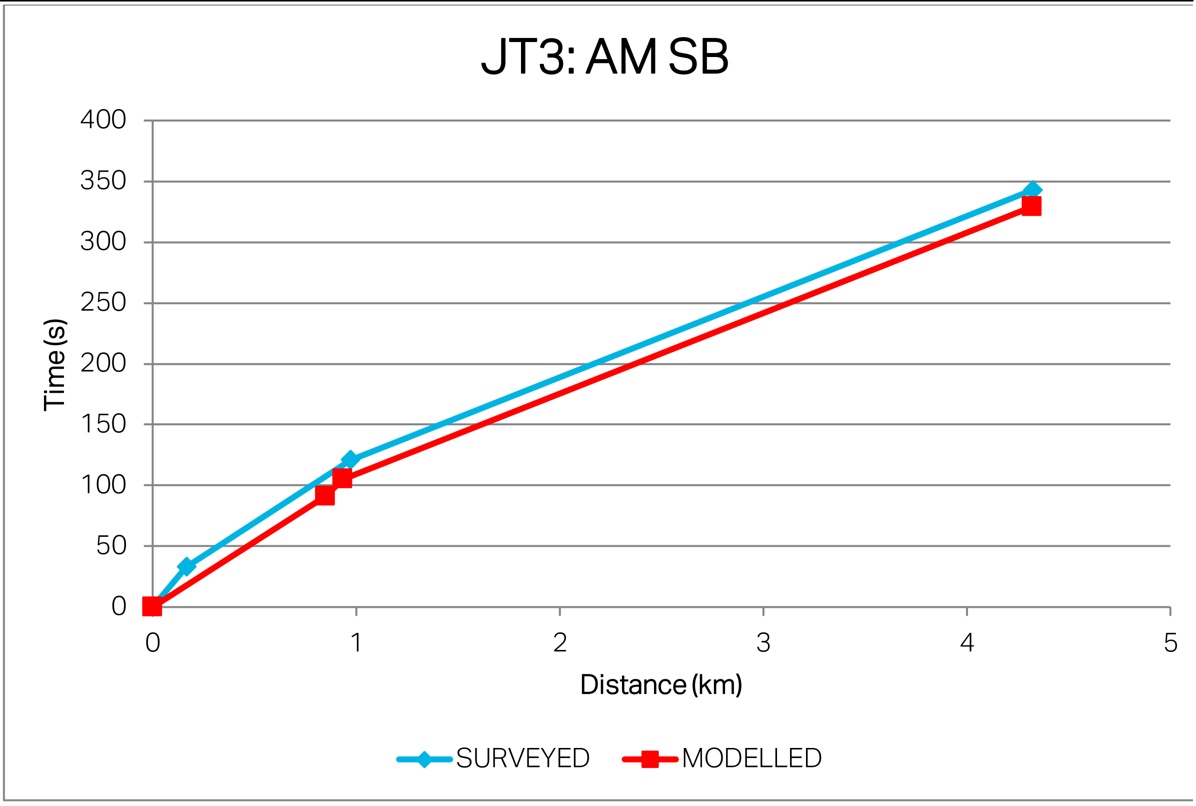
150
100
50
0
0
1
2
3
4
5
Distance (km)
SURVEYED
MODELLED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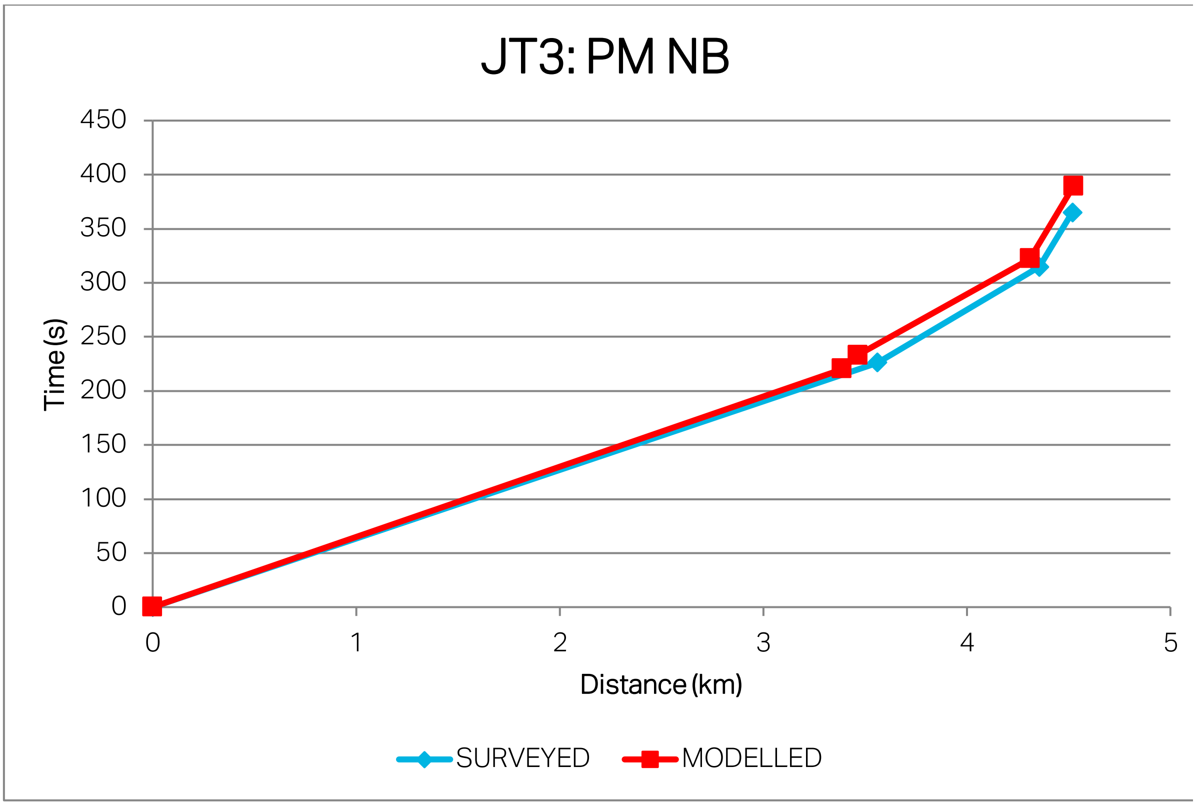
Distance (km)
SURVEYED
MODELLED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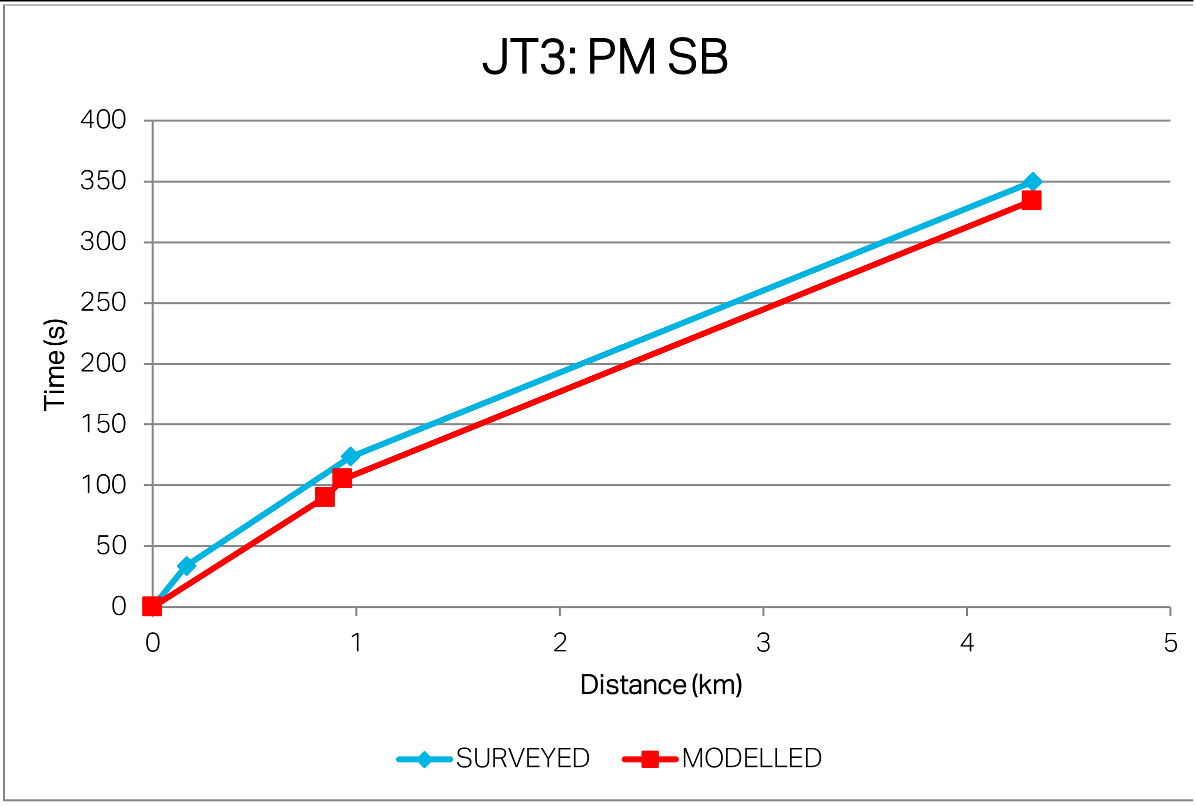
Distance (km)
SURVEYED
MODELLED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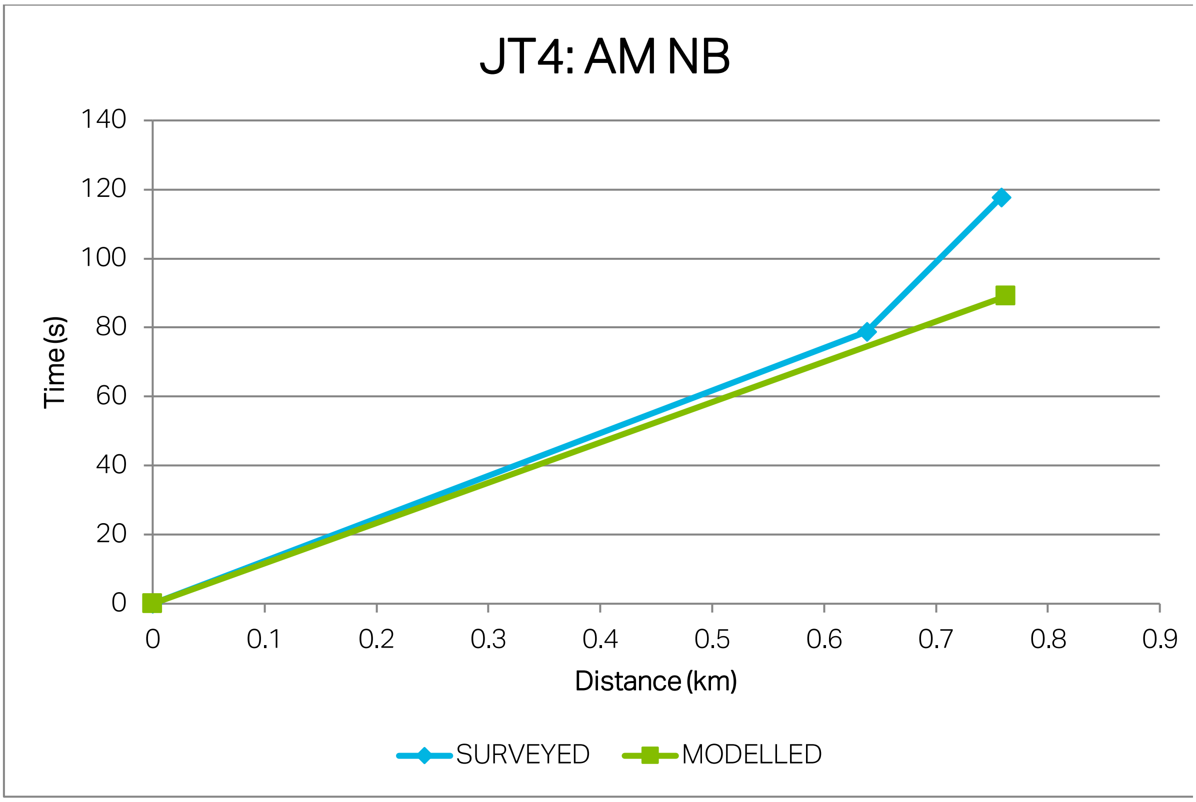
SURVEYED
MODELLED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60
40
20
0
0
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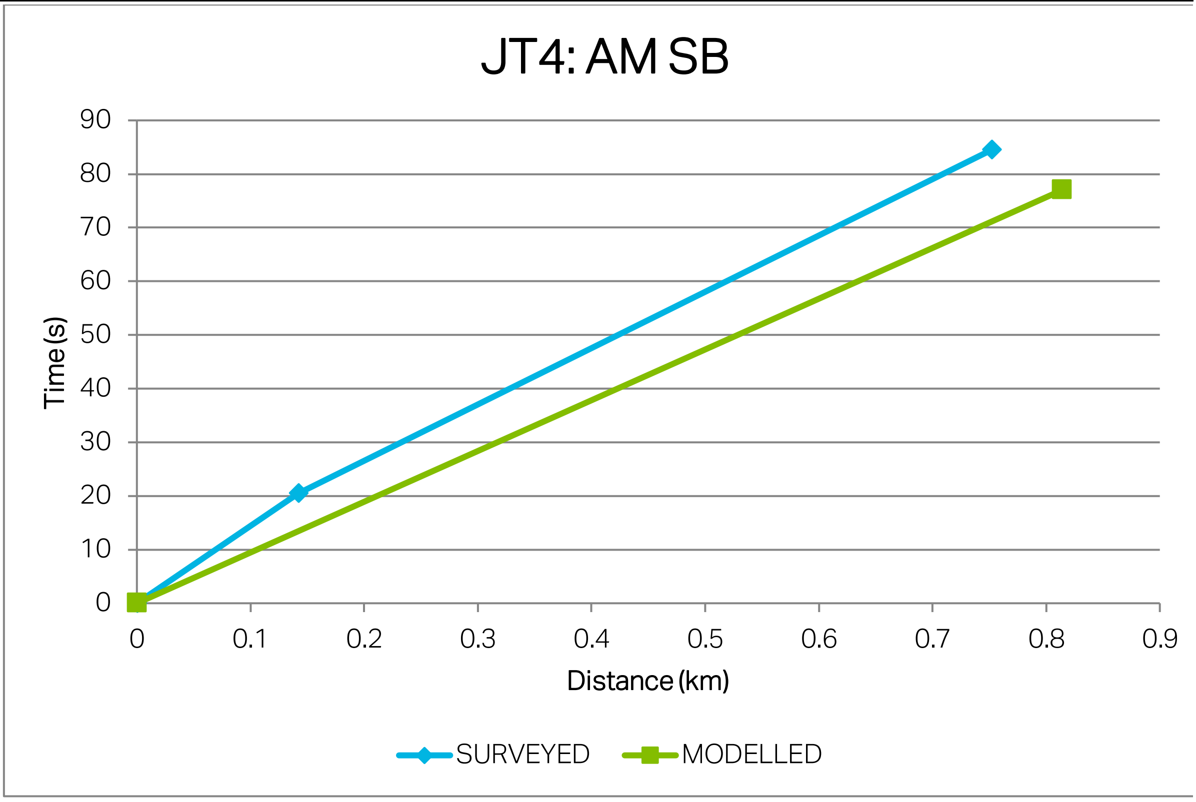
0.6
0.7
0.8
0.9
Distance (km)
SURVEYED
MODELLED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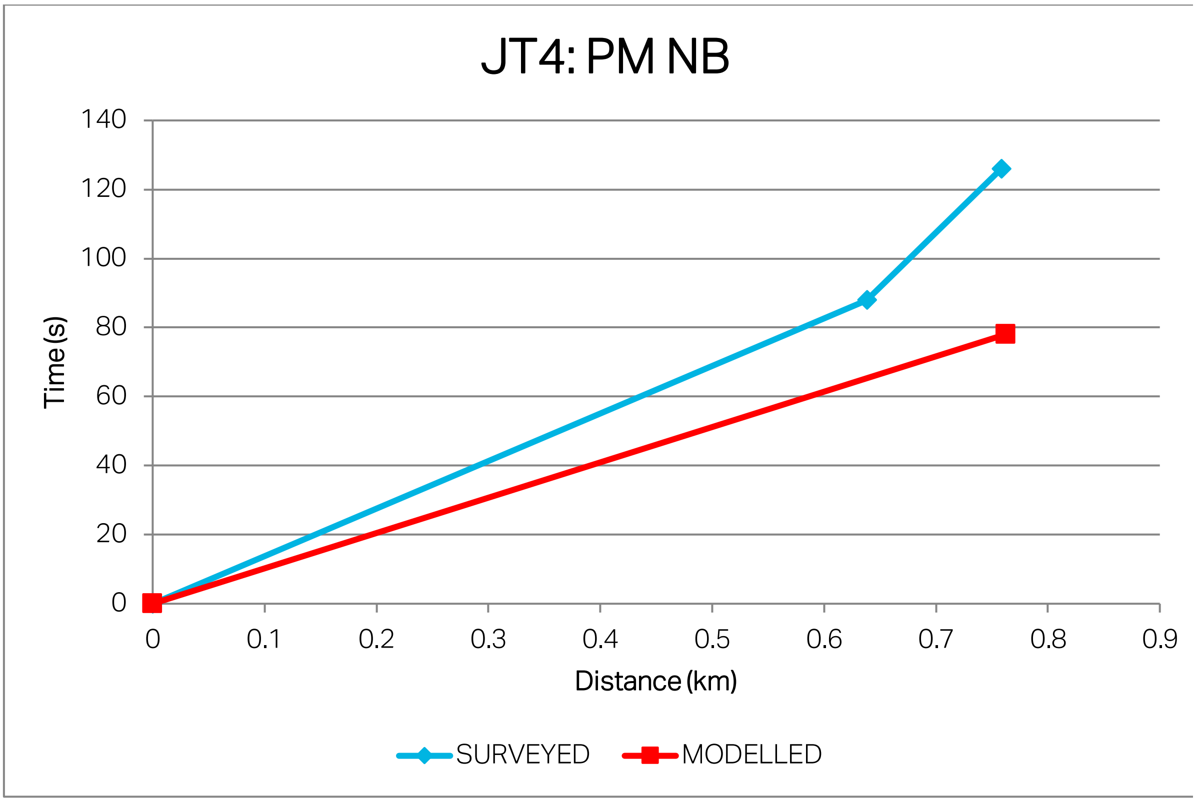
0.9
Distance (km)
SURVEYED
MODELLED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40
20
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Time (s)
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0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Distance (km)
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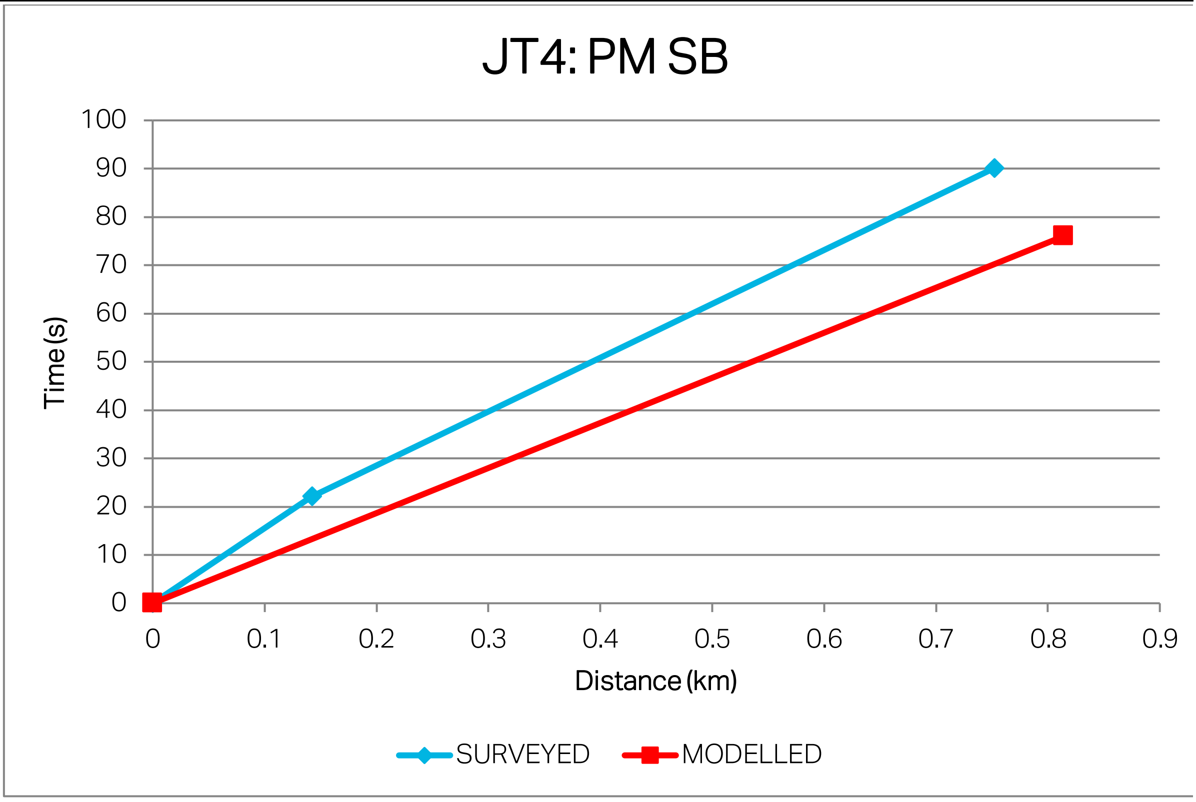
JT4: PM SB
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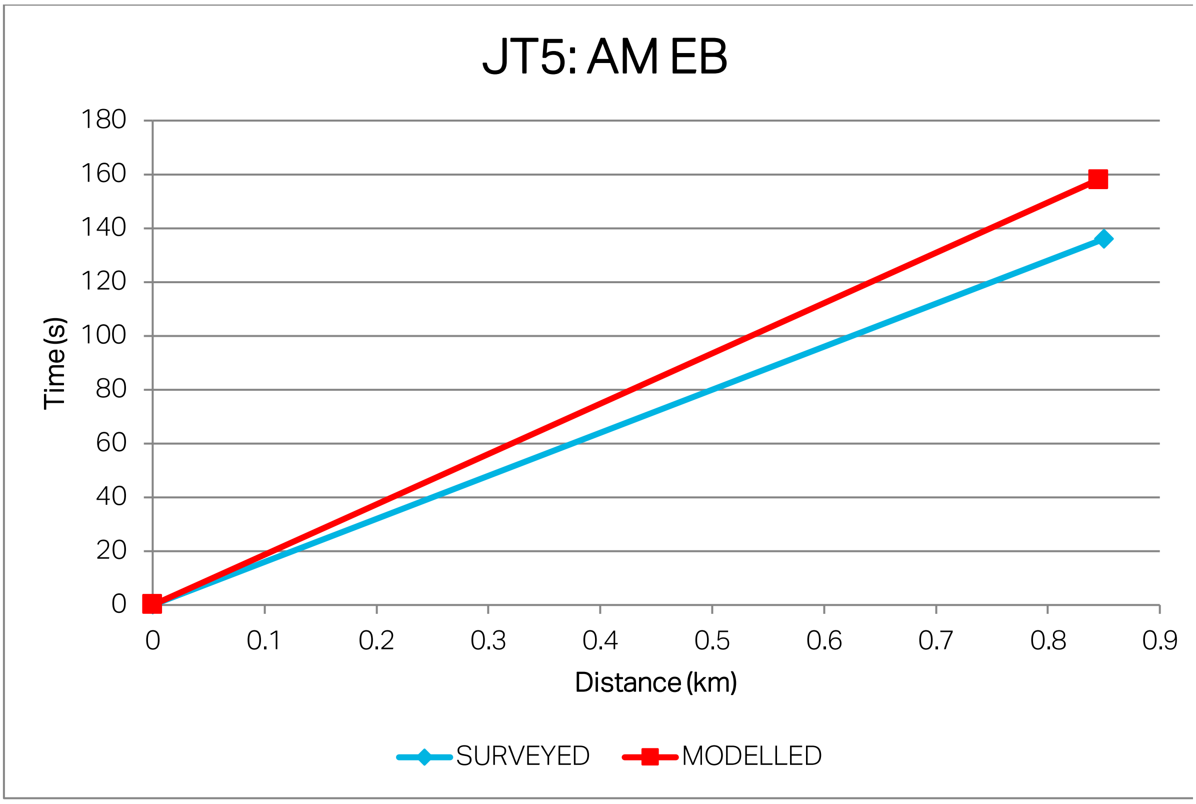
JT5: AM EB
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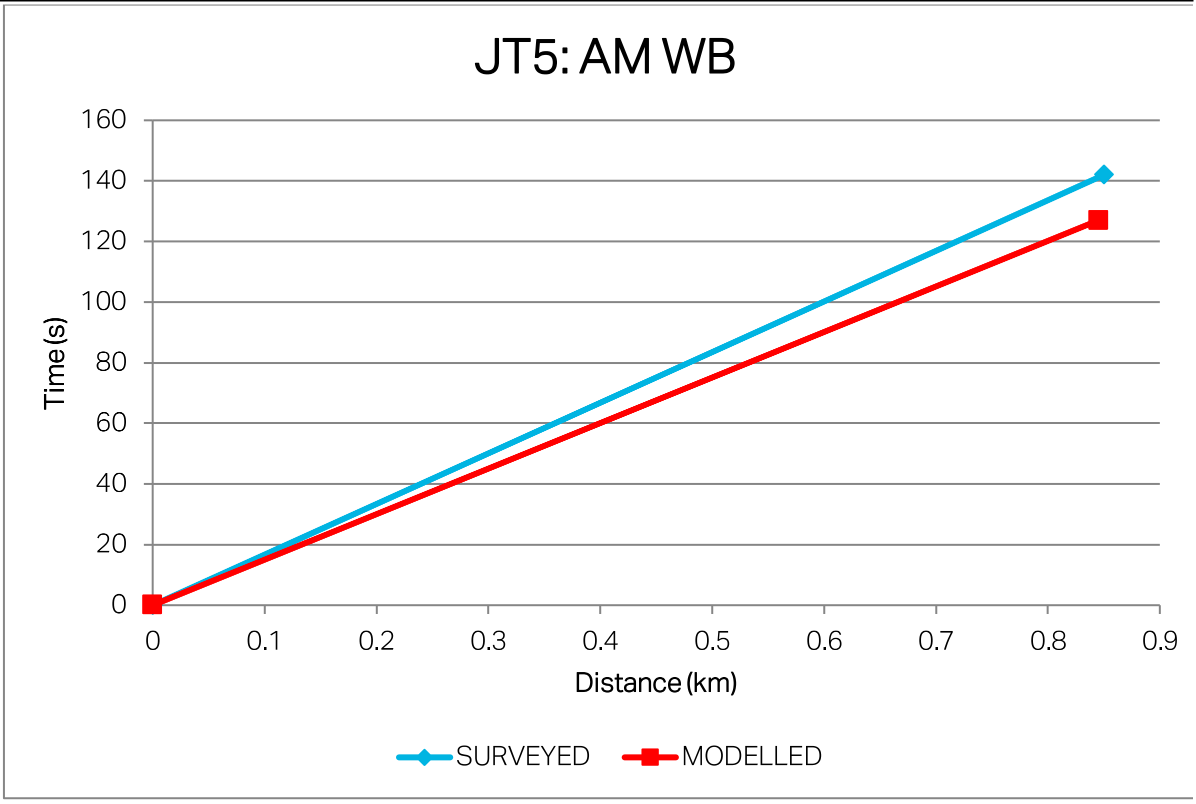
JT5: AM WB
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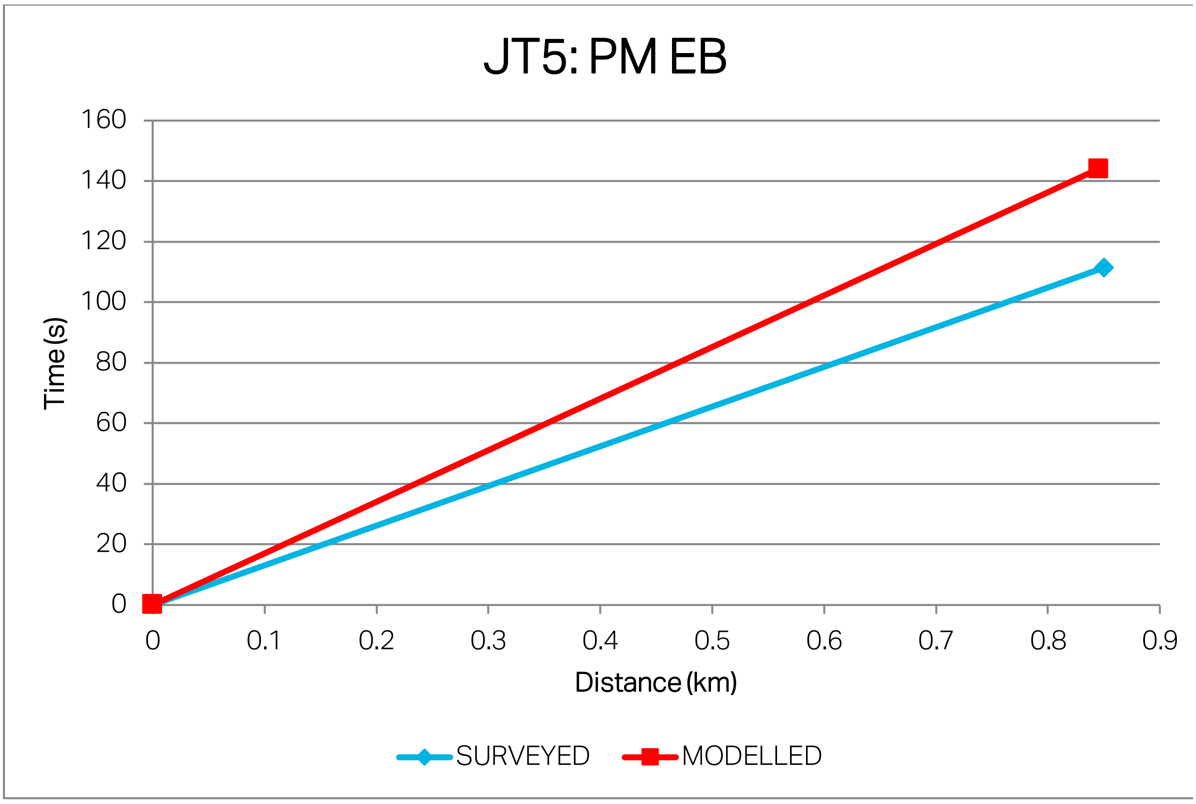
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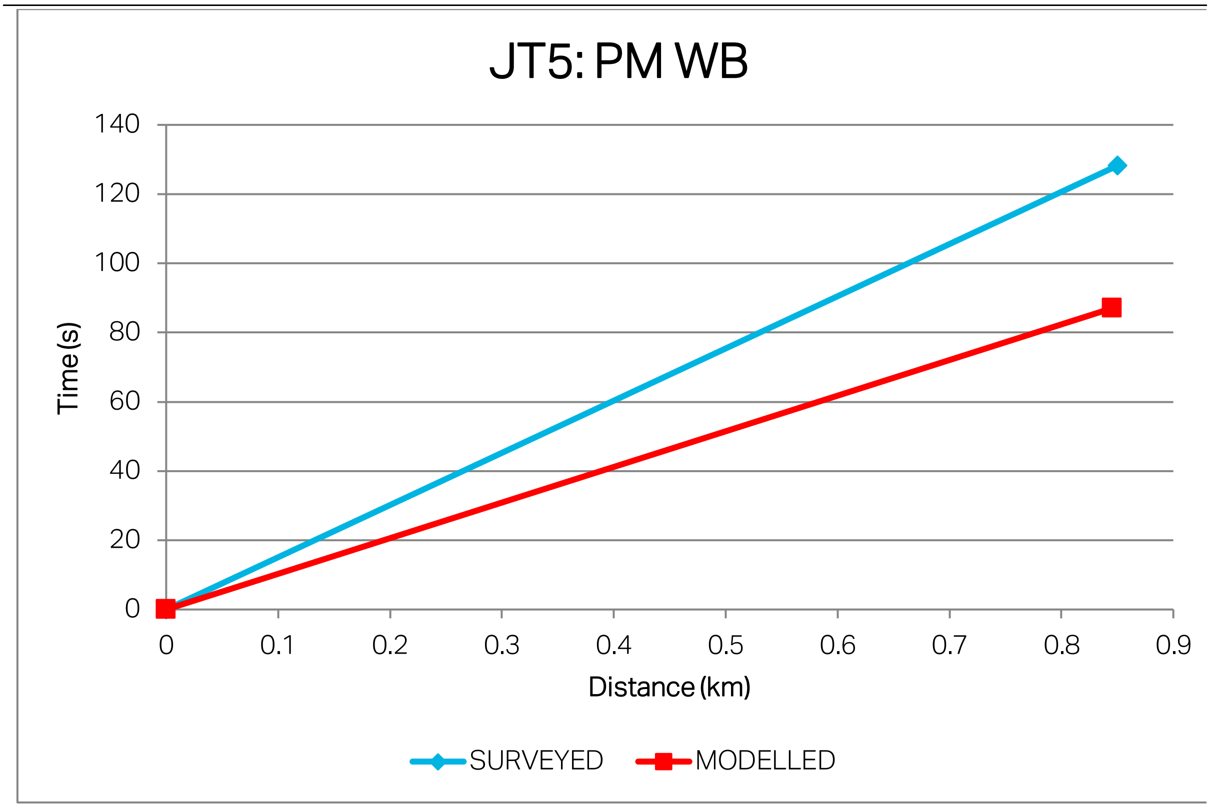
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Distance (km)
SURVEYED
MODELLED

B.2 VISUM Future Year Modelling Report

Naas/Sallins Transport Strategy

Future Year Traffic Modelling Report

Kildare County Council

September 2020

Quality information

Prepared by	Checked by	Verified by	Approved by
Cameron McBain Consultant	John Humphreys Senior Consultant	Philip Shiels Associate Director	Philip Shiels Associate Director

Revision History

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1 Introduction

1.1 Introduction

AECOM was commissioned by Kildare County Council to provide assistance in the preparation of a Transport Strategy for Naas. AECOM's role was to develop an understanding of the transport issues in Naas and make recommendations on a strategic implementation plan of improvement measures and interventions in relation to walking, cycling, public transport, public realm, car parking, traffic movement, linkages and town approaches.

The Naas/Sallins Transport Strategy aims to sustain the town as an attractive and thriving town centre by creating a framework for sustainable transportation and a quality urban environment. This will involve the development of a high quality and people focused realm, with a connected, engaged, healthy and prosperous community.

To aid this cause, Kildare County Council have commissioned AECOM to develop a strategic model to inform the Council on the impact of their network improvements and planning proposals. This report outlines the methodology adopted to assess a number of road transport options in the short to medium-term future. Additionally, several alternative land-use scenarios have been considered to assist the future land-use planning in Naas town.

1.2 Report Structure

The report takes the following structure:

- Chapter 2: Future Year Matrix Development;
- Chapter 3: Assessment of Road Options; and
- Chapter 4: Alternative Land-use Scenarios.

2 Matrix Development

This chapter details the development of the future year vehicular trip matrices used to inform the assessment of road options for the Naas/Sallins Transport Strategy. Matrices were developed for both 2023 and 2030, with separate matrices created to represent the AM peak (08:15-09:15) and the PM peak (17:00-18:00) hour. As with the base year (2018) model development, demand matrices are classified by Light and Heavy vehicle user classes.

2.1 Land-use & Population / Jobs Targets

Kildare County Council provided population and jobs targets for Naas which were originally provided in the Core Strategy of the Kildare County Development Plan 2017-2023. These population and jobs targets were incorporated into a planning sheet provided to AECOM by KCC which projected the additional number of persons and jobs for each zone in the Naas Local Area Model for both 2023 and for 2030.

In total, there was an additional population of 5,275 and 10,221 projected for 2023 and 2030 respectively. In terms of additional jobs, there were 3,339 and 10,171 additional jobs projected for 2023 and 2030 respectively. Figure 2.1 shows the conceptual land-use zoning objectives (provided by KCC Planning Department) along with the Naas LAM zones (these are numbered on the figure), displaying the new residential zones and existing enterprise and employment zones where most of the additional housing and jobs will be based. In Figure 2.1 each LAM zone is shaded according to the combination of land use zoning type.

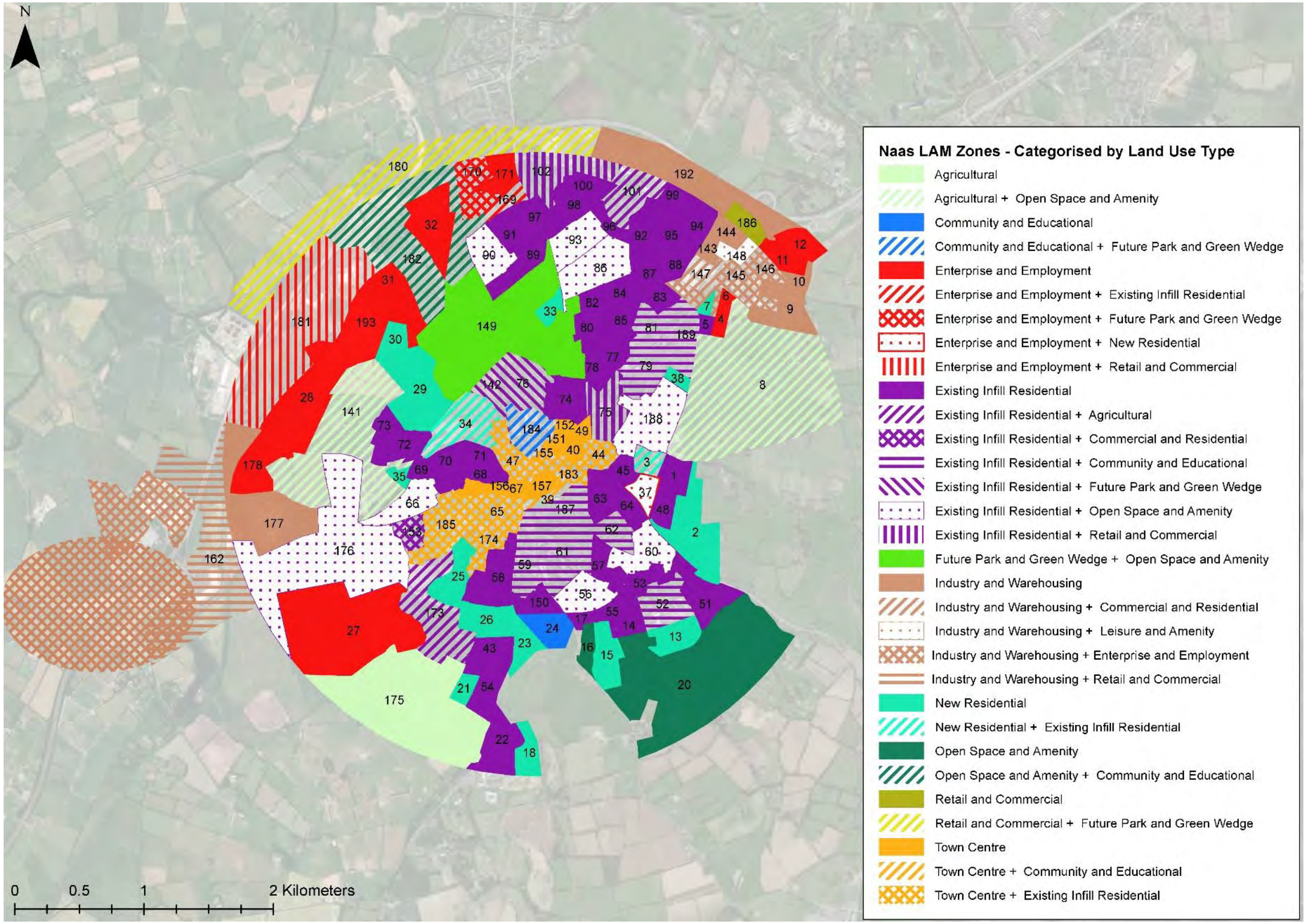


Figure 2.1 Conceptual Land-use Zoning Map & Local Area Model Zones

2.2 Trip Forecasting

In order to convert the additional population and jobs projections into vehicular trips, a tool called TRICS (Trip Rate Information Computer System) was utilised. TRICS is a database of trip rates for developments used in the United Kingdom and Ireland for transport planning purposes, specifically to quantify the trip generation of new developments. As each model zone is based on a specific land-use type, each zone containing additional population/jobs was assigned land-use type and accessibility within TRICS. Table 2.1 T shows the trip rates that were used for developing the future year matrices for the Naas LAM.

Table 2.1 TRICS Trip Rates for each Land-use Type

TRICS Land Use	Accessibility	Rate	AM Peak (08:15-09:15)		PM Peak (17:00-18:00)	
			Arrivals	Departures	Arrivals	Departures
Office	Low/None	1 employee	0.302	0.044	0.037	0.253
	Medium	1 employee	0.197	0.034	0.026	0.173
Residential	Low/None	1 dwelling	0.139	0.404	0.372	0.214
	Medium	1 dwelling	0.127	0.347	0.351	0.212
Industrial Estate	Low/None	1 employee	0.350	0.169	0.075	0.321
Retail Warehousing	Low/None	1 employee	0.392	0.027	0.041	0.324
	Medium	1 employee	0.092	0.045	0.031	0.083

The additional traffic generated by each of the Naas LAM zones as a result of this process are presented in Table 2.2. The resultant additional trips generated were then added to 2018 base year traffic data for Naas in order to develop future year origin and destination trip ends for 2023 and 2030. Future year demand for external zones was assumed to be the same as that given by TII's NTpM. External zone growth between 2018 and 2023 was 12.5% and 14.8% for the AM peak and PM peak respectively, while growth between 2018 and 2030 was 33.0% and 39.6% for the same periods.

Table 2.2 2023 and 2030 Trip Generation Estimates

Additional Trips	AM Departures	AM Arrivals	PM Departures	PM Arrivals
2023	905	1,246	1,250	850
2030	1,149	2,297	2,144	1,046
Total	**2,054**	**3,543**	**3,394**	**1,896**

2.3 Allocation & Distribution of Future Growth

The additional trips for 2023 and 2030 were added to the base year (2018) trip ends. Future year trip distribution was undertaken utilising the furnessing distribution method. In order to carry out the trip distribution process, it was first necessary to 'seed' the cells with no trips in the base year matrices with very small numbers (0.01 vehicles) to allow for future year trips between those specific cells. Otherwise any cell with a zero will remain zero irrespective of the factor applied.

As part of the trip distribution process the matrix totals were doubly constrained to the mean of the forecast trip ends totals. The distribution of these trips was then based on that of the existing sub zone or if the land use type had been updated significantly, a neighbouring zone of existing land use type comparable to that of the updated zone.

2.4 Comparison of KCC Forecast to NTpM

In order to ensure a robust forecasting approach was utilised in line with other similar projects, the trip generation estimates outlined previously were compared to growth forecasts contained in TII's NTpM.

Since the zone structure of the Naas model is compatible with TII's NTpM it was possible to compare the overall future matrix totals based on the KCC and NTpM forecasts.

The 2023 and 2030 forecasts for the NTpM were based on a linear interpolation of the demand in zones related to the Naas model between the base year and future year models. A growth rate percentage was established from the NTpM and applied to develop 2023 and 2030 NTpM forecasts. Table 2.3 below outlines a comparison of the NTpM and KCC growth forecasts for Naas.

Table 2.3 Comparison of KCC Forecast to NTpM Forecasts (LV)

Forecast LV Trip End Summary										
	2016		2023		2030		2016 - 2023		2016 - 2030	
Growth	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
KCC	17,735	15,855	19,799	18,261	22,835	22,365	11.6%	15.2%	28.8%	41.1%
NTpM	17,735	15,855	19,839	17,619	23,232	20,505	11.9%	11.1%	31.0%	29.3%

Figure 2.2 and Figure 2.3 compares the AM and PM matrix totals generated by each of the growth forecasts for light vehicles. There is a clear correspondence between the KCC and TII forecasts with the NTpM forecast producing slightly higher growth in the AM peak and the KCC forecast producing higher growth in the PM peak.

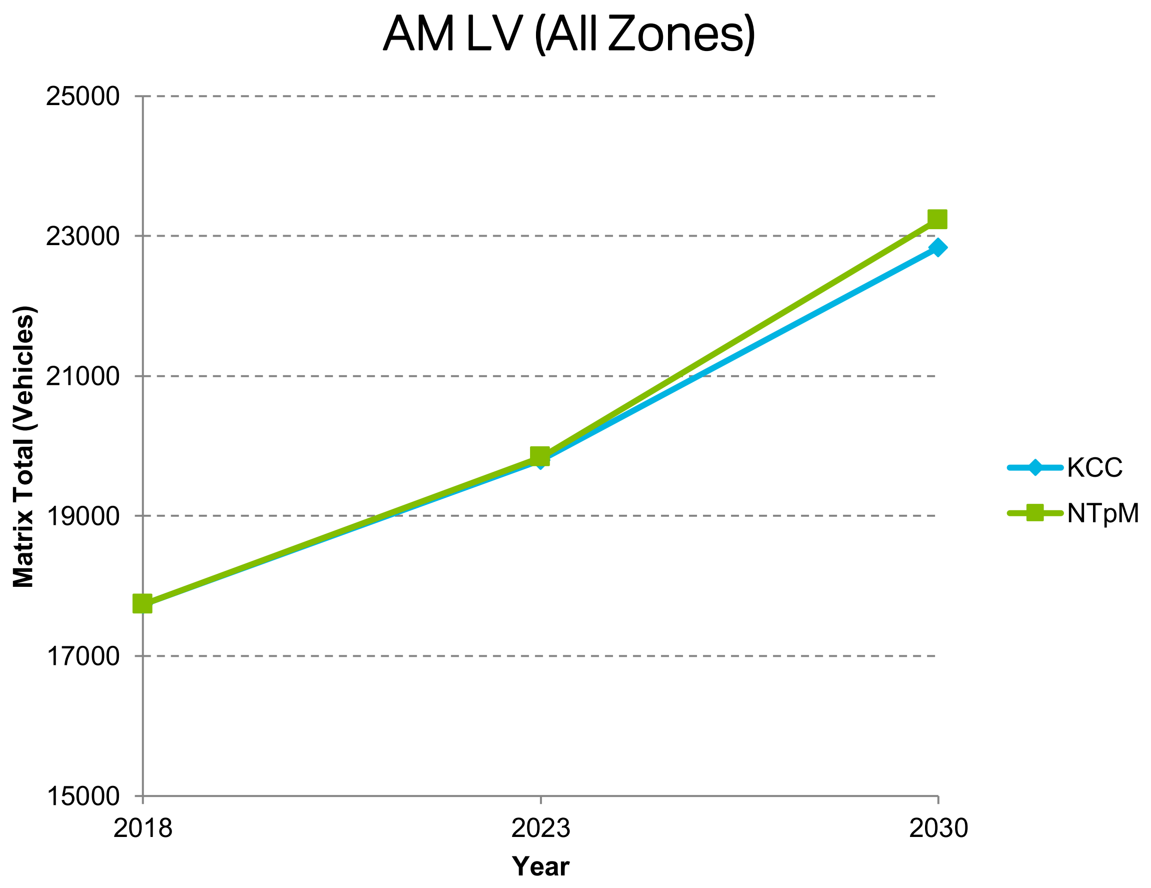


Figure 2.2 Comparison of the KCC and NTpM forecast for the AM Peak Period (LV)

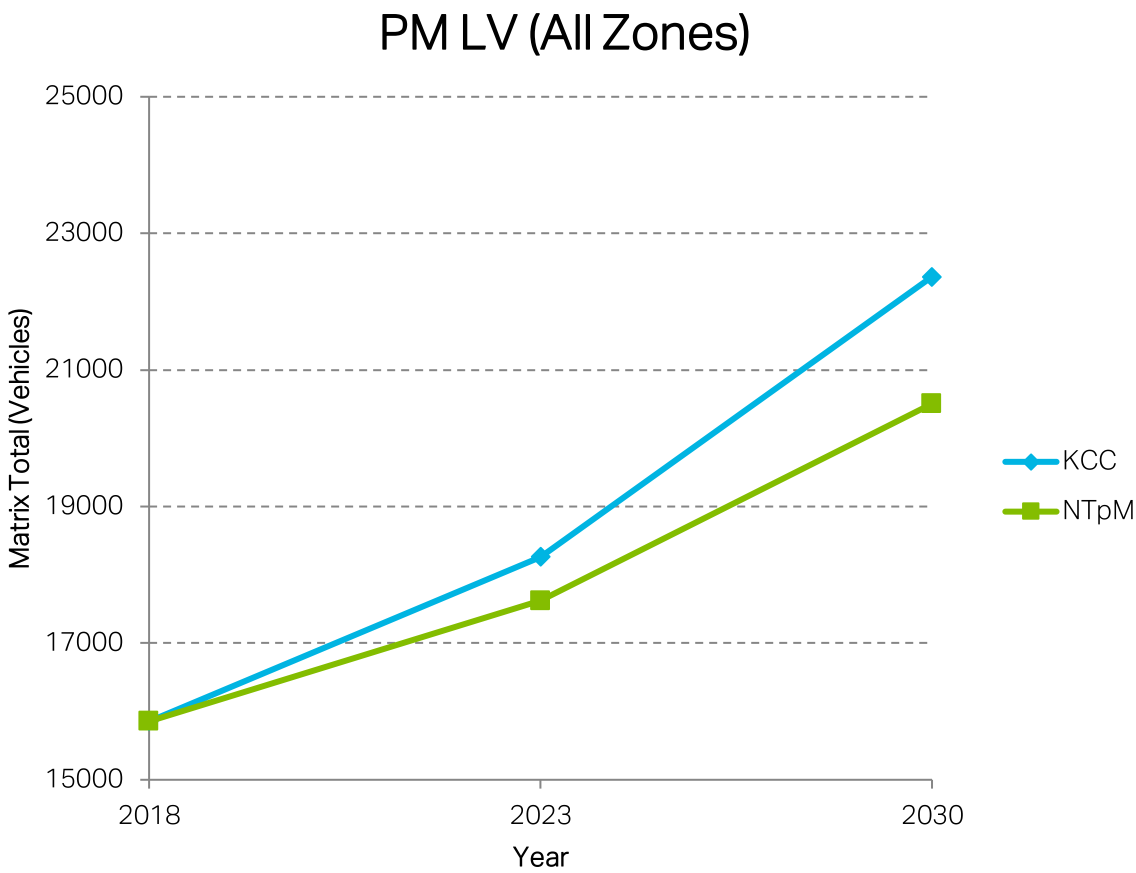


Figure 2.3 Comparison of the KCC and NTpM forecast for the PM Peak Period (LV)

3 Option Assessment

3.1 Overview

A key objective of the Naas/Sallins Transport Strategy is to reduce car dependency in Naas through improvements in public transport services and walking/cycling facilities throughout the town. To create the required capacity for new or improved public transport and waking/cycling facilities, most notably in the town centre, several road measures are required.

The following five road objectives were defined at the outset of the transport strategy and have been used to guide the identification of roads options and their assessment:

1. Reduce unnecessary vehicular trips through Naas town centre
2. Mitigation measures to improve road safety and eliminate collision hotspots
3. Reduce vehicular emissions in town centre by promoting mode transfer to sustainable travel modes
4. Identify missing links and congestion bottlenecks in order to provide recommendations on future road schemes
5. Review existing plans and designs for roads proposals in the Naas area to ensure that they are still relevant in the context of DMURS and the overall transport strategy goal of sustainability.

Eight road options have been proposed with the aim of meeting these objectives, and each of these options were tested using the 2023 and 2030 future year models.

3.2 Road Options

The options considered, which seek to reduce traffic levels and improve the overall management of traffic in Nass town centre are described in the following sections. A total of eight road interventions were identified and assessed for their suitability to meet the objectives of the strategy. The location of all options considered is illustrated in Figure 3.1. The options are as follows:

- Option 1 – The Gallops Avenue
- Option 1 (Alt) – The Gallops Avenue (Alternative Route)
- Option 2 – Upgrade of Murtagh's Corner Junction
- Option 3 – Millbridge Street
- Option 4 – Roadway Linking Aldi Distribution Centre to Millennium Park Road
- Option 5 – Northwest Quadrant Link Street
- Option 6 – Outer Orbital Route
- Option 7 – Town Centre HGV Restrictions
- Option 8 – Upgrade Signalised Junctions to MOVA or SCOOT as Appropriate

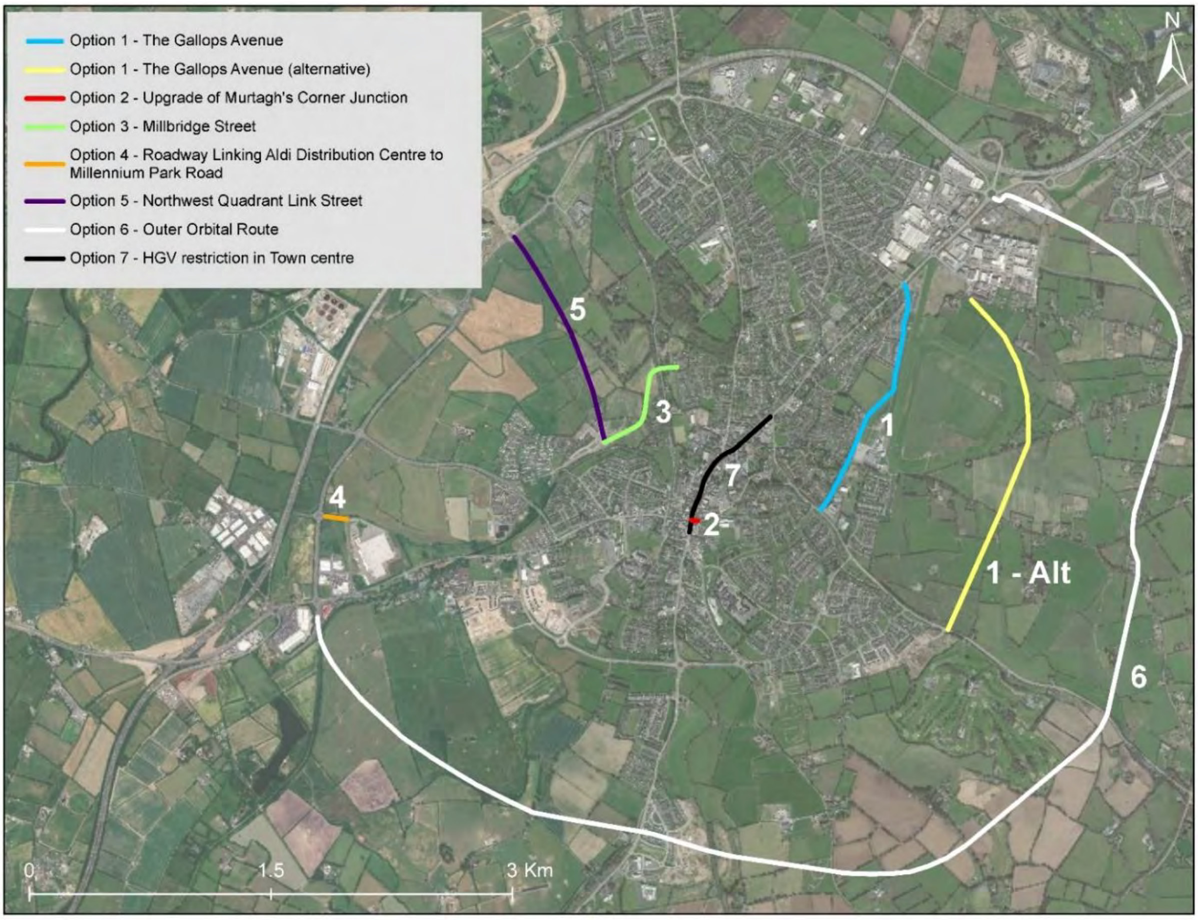


Figure 3.1 Road Options

3.2.1 Road Options Description

Road Option 1: The Gallops Avenue

The Gallops Avenue is a proposed route connecting the R410 Blessington Road to the R445 Dublin Road with the objective of alleviating congestion on the R445 Dublin Road, R410 Blessington Road and R445 Main Street. Reducing traffic on the R445 Dublin Road and Main Street would facilitate the implementation of the bus route, walking/cycling measures and public realm proposals identified in the Naas/Sallins Transport Strategy.

This route is based on the Part 8 planning application for the Naas Inner Relief Road which was not approved by councillors in the Naas Municipal District (17th June 2019). It is proposed that this corridor would be reimagined and redesigned to act as an eastern street connection which facilitates increased permeability for pedestrians and cyclists as well as drivers.

Figure 3.2 shows the traffic reassignment impacts (i.e. the re-routing of traffic) as a result of this proposal in the 2023 AM Peak Naas LAM. The figure shows a reduction in traffic (reduction in traffic is shown in blue) on the R445 Dublin Road, R410 Blessington Road and R445 Main Street as traffic re-routes to the proposed scheme (increase in traffic shown in red).

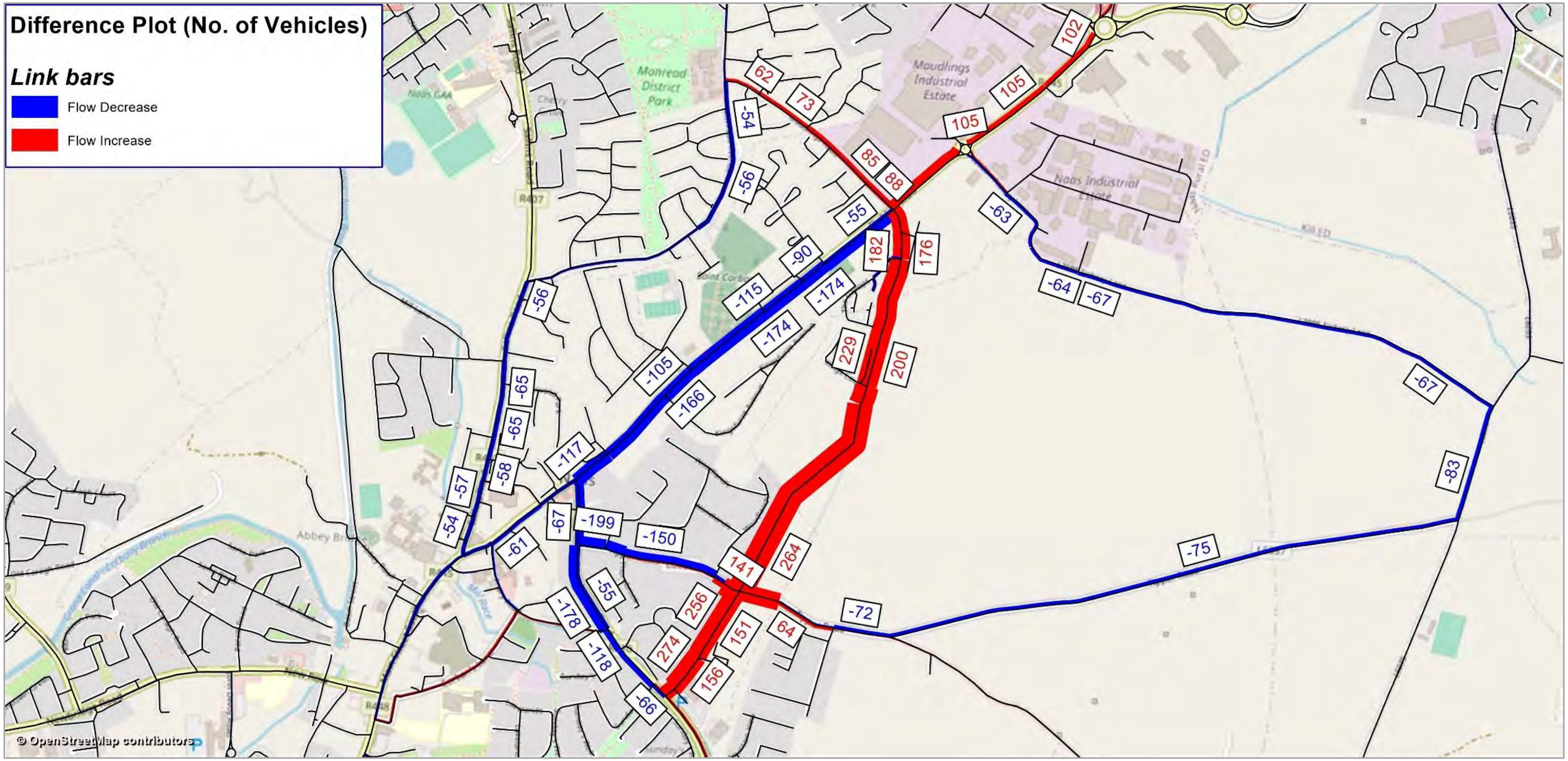


Figure 3.2 Option 1 - 2023 AM Traffic Reassignment Impacts

Option 1(Alt): The Gallops Avenue (Alternative Route)

In addition to the preferred option which was selected for The Gallops Avenue (i.e. Option 1 above), an alternative option on a corridor located to the east of Naas Racecourse was also assessed.

The traffic reassignment impacts of this proposal in the 2023 AM Peak Naas LAM are illustrated in Figure 3.3. The figure shows a reduction in traffic on the R445 Dublin Road, R410 Blessington Road and R445 Main Street, however the scale of benefits when compared to Option 1 are considerably lower. In the 2023 AM peak scenario the reduction in traffic on the Dublin Road is 23.5% in Option 1 compared to 12.2% in Option 1 (Alt), while in 2023 PM the reduction is 18.1% for Option 1 compared to 8.6% for Option 1 (Alt).

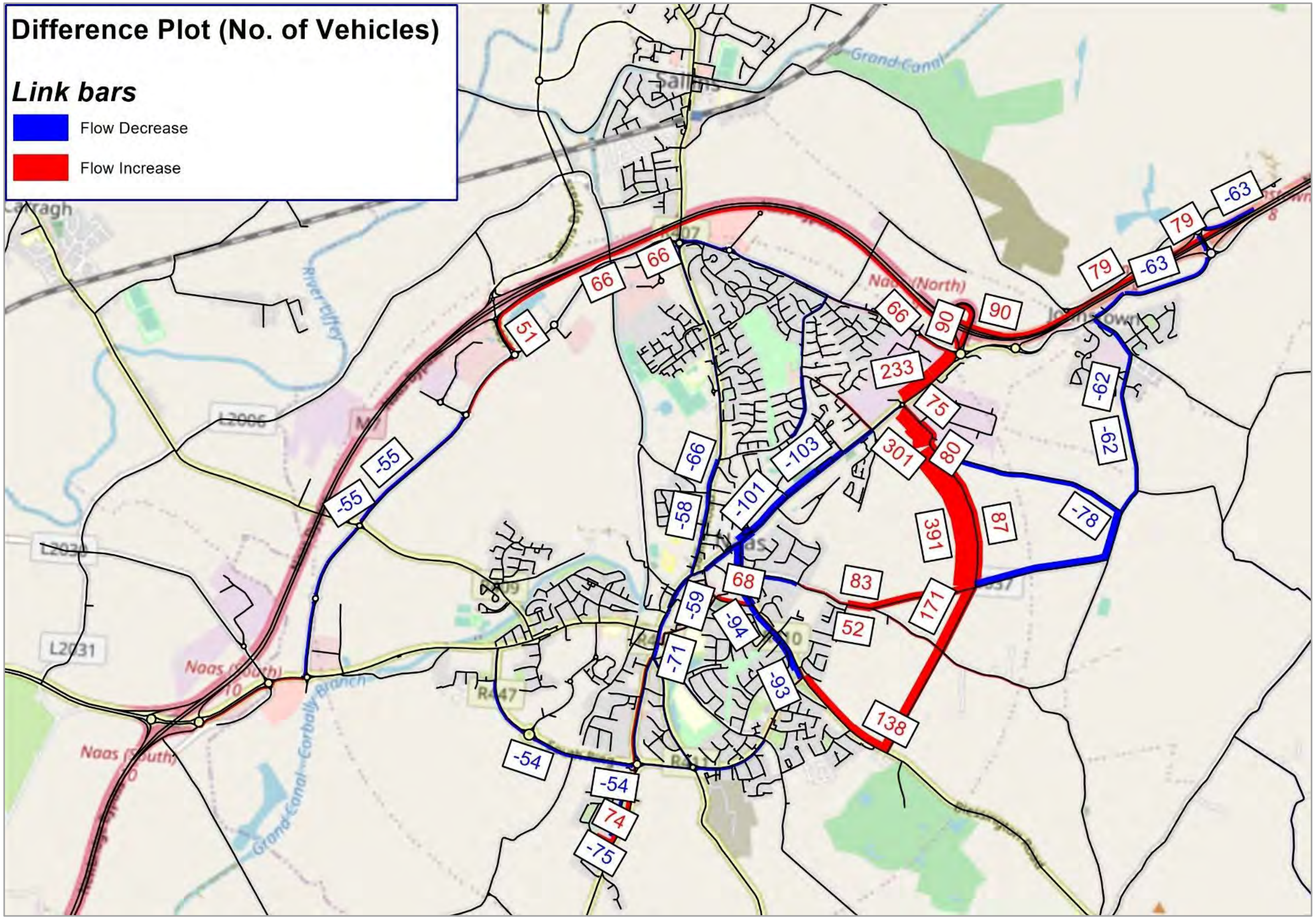


Figure 3.3 Option 1 (Alt) - 2023 AM Traffic Reassignment Impacts

Option 2: Upgrade of Murtagh's Corner Junction

Murtagh's Corner currently operates as a 3-arm junction and under this option it would be upgraded to create a 4-arm junction linking Corban's Lane to Main Street as illustrated in Figure 3.4. The proposal would aim to lead to a reduction in traffic on the Main Street. As part of this proposal, Corban's Lane would also need to be upgraded to cater for an increase in traffic.

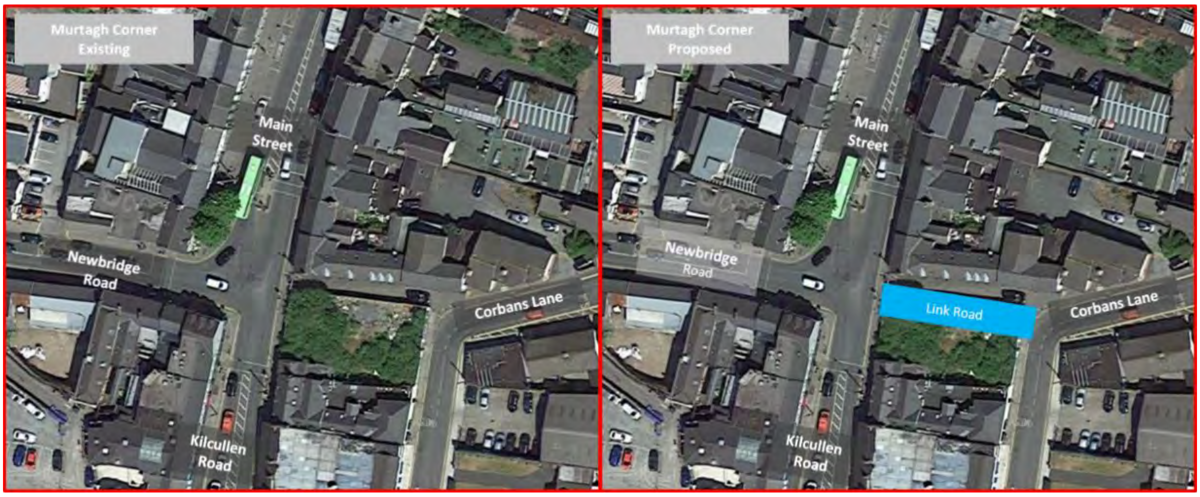


Figure 3.4 Murtagh's Corner Upgrade

The impact of this proposal is illustrated graphically in the 2023 AM Peak Naas LAM in Figure 3.5. The figure shows a reduction in traffic on the R445 Main Street between Murtagh's Corner and the R445 Dublin Road and Friary Road Junction and a subsequent increase in traffic on Corban's Lane and Friary Road.

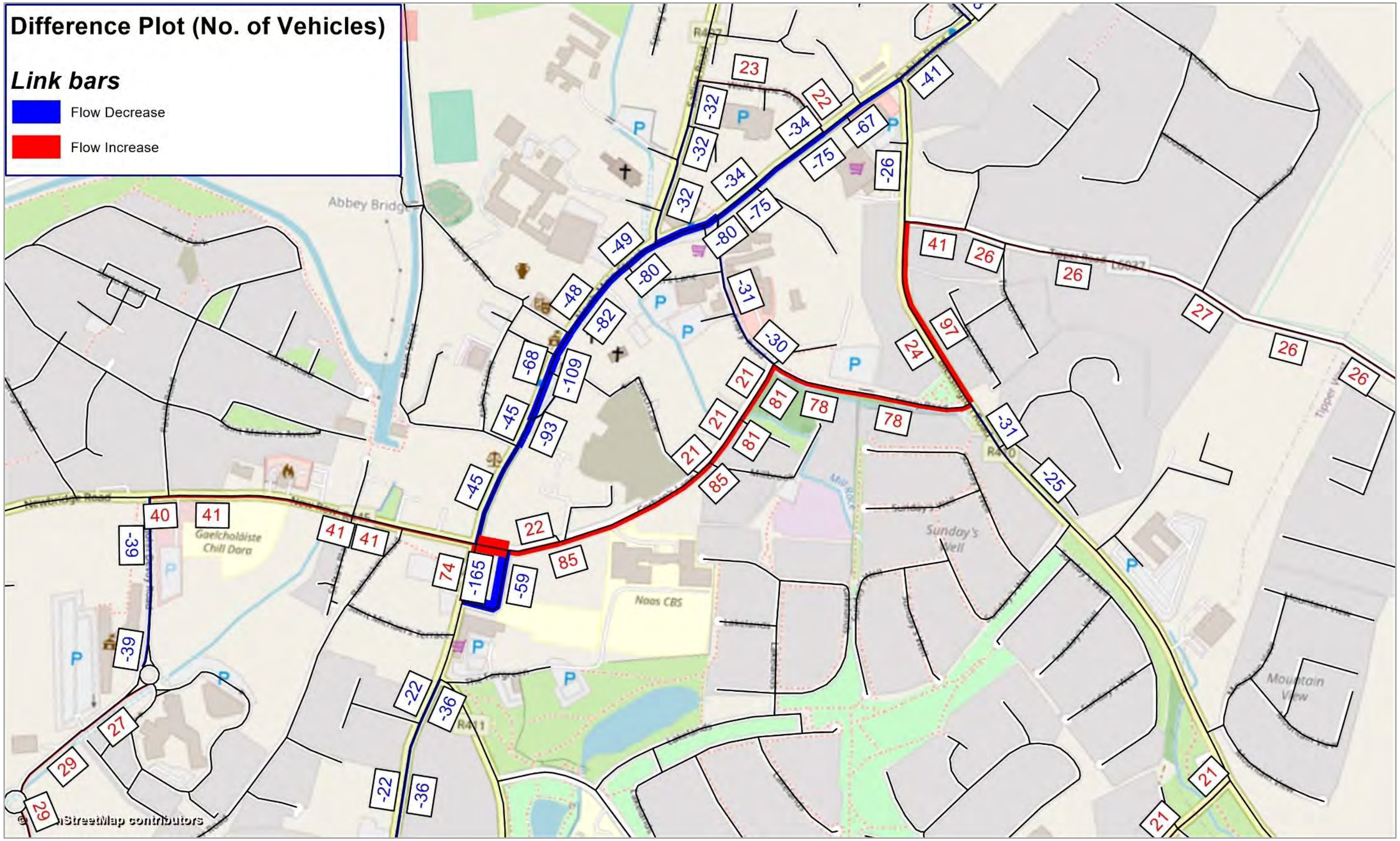


Figure 3.5 Option 2 Murtagh's Corner - 2023 AM Traffic Reassignment Impacts

Option 3: Millbridge Street

Millbridge Street is a proposed option to connect the Old Caragh Road to Millbridge Way. This option will provide greater access between the R409 Caragh Road and the R407 Sallins Road and will require a crossing of the canal. An indicative alignment of the proposal is illustrated in Figure 3.6.

Figure 3.6 Millbridge Street (Indicative Alignment)

The traffic reassignment impacts of this proposal are illustrated in the 2023 AM Peak Naas LAM in Figure 3.7. The figure shows a reduction along the Millennium Park Road, R407 Sallins Road and the R445 Main Street, as traffic between Caragh and Naas now has a direct connection to the Sallins Road.

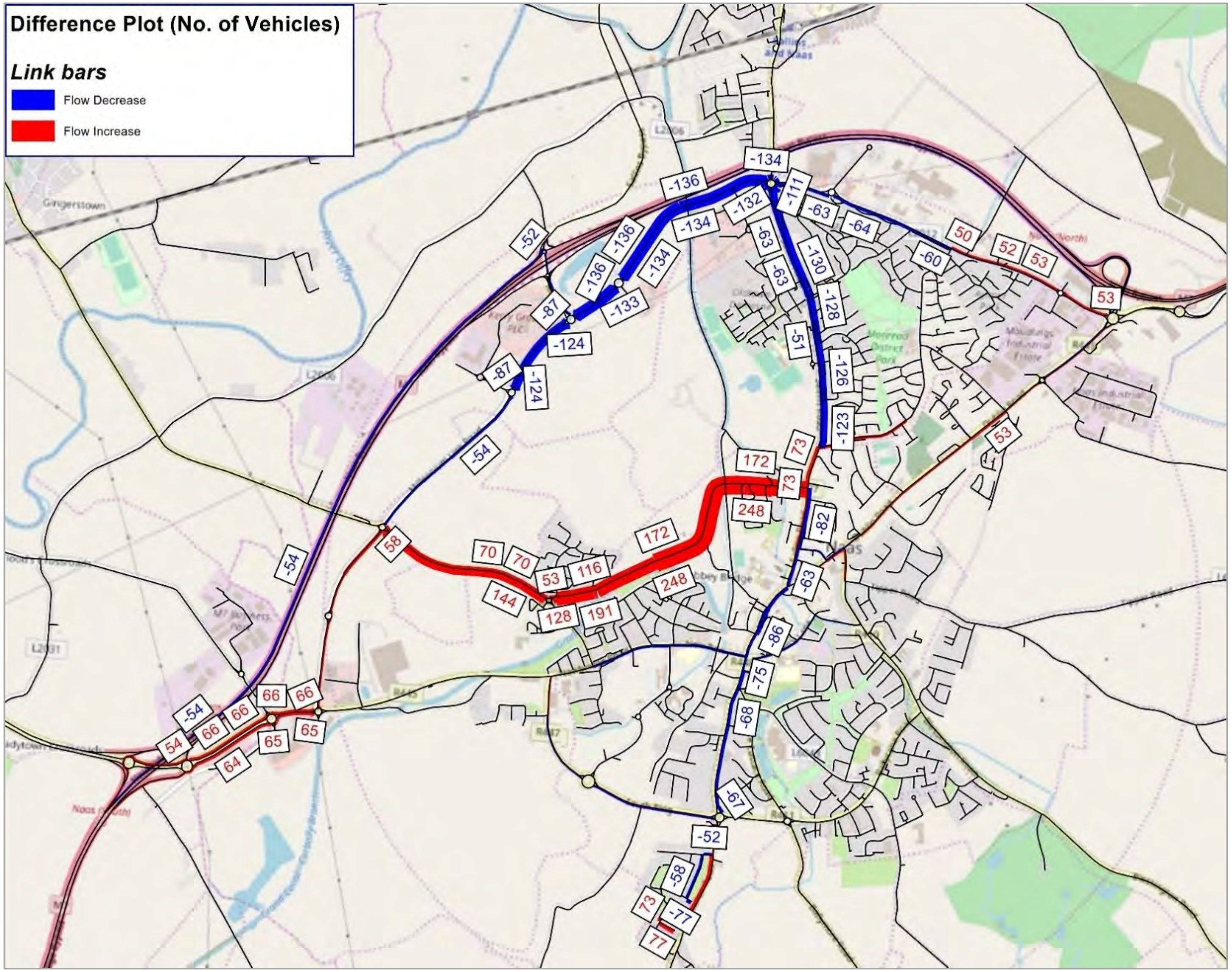


Figure 3.7 Option 3 Millbridge Street - 2023 AM Traffic Reassignment Impacts

Option 4: Roadway Linking Aldi Distribution Centre to Millennium Park Road

This option proposes a new short link from the Aldi Distribution Centre to the existing roundabout on the Millennium Park Road as illustrated in Figure 3.8. The objective of this option is to provide safer access for HGVs onto the road network as currently HGVs have difficulty turning on to the R445 Newbridge Road, most notably during peak times.

Figure 3.8 Roadway Linking Aldi Distribution Centre to Millennium Park Road

Option 5: Northwest Quadrant Link Street

This is a strategic route linking Naas to the M7 and Sallins (via the Sallins Bypass) serving existing urban areas and the potential employment/residential development identified in the RSES for the Northwest Quadrant. As previously discussed under the public transport section, it is envisaged that this link would be a bus-only link (with pedestrian/cycle facilities), however it has also been assessed as a roads option to understand its impact in Figure 3.9.

In terms of traffic reassignment this option would only take traffic off the Caragh Road and Millennium Park Road but would have very little to impact on all other key roads in the network, meaning that this option should only be retained as a public transport option.

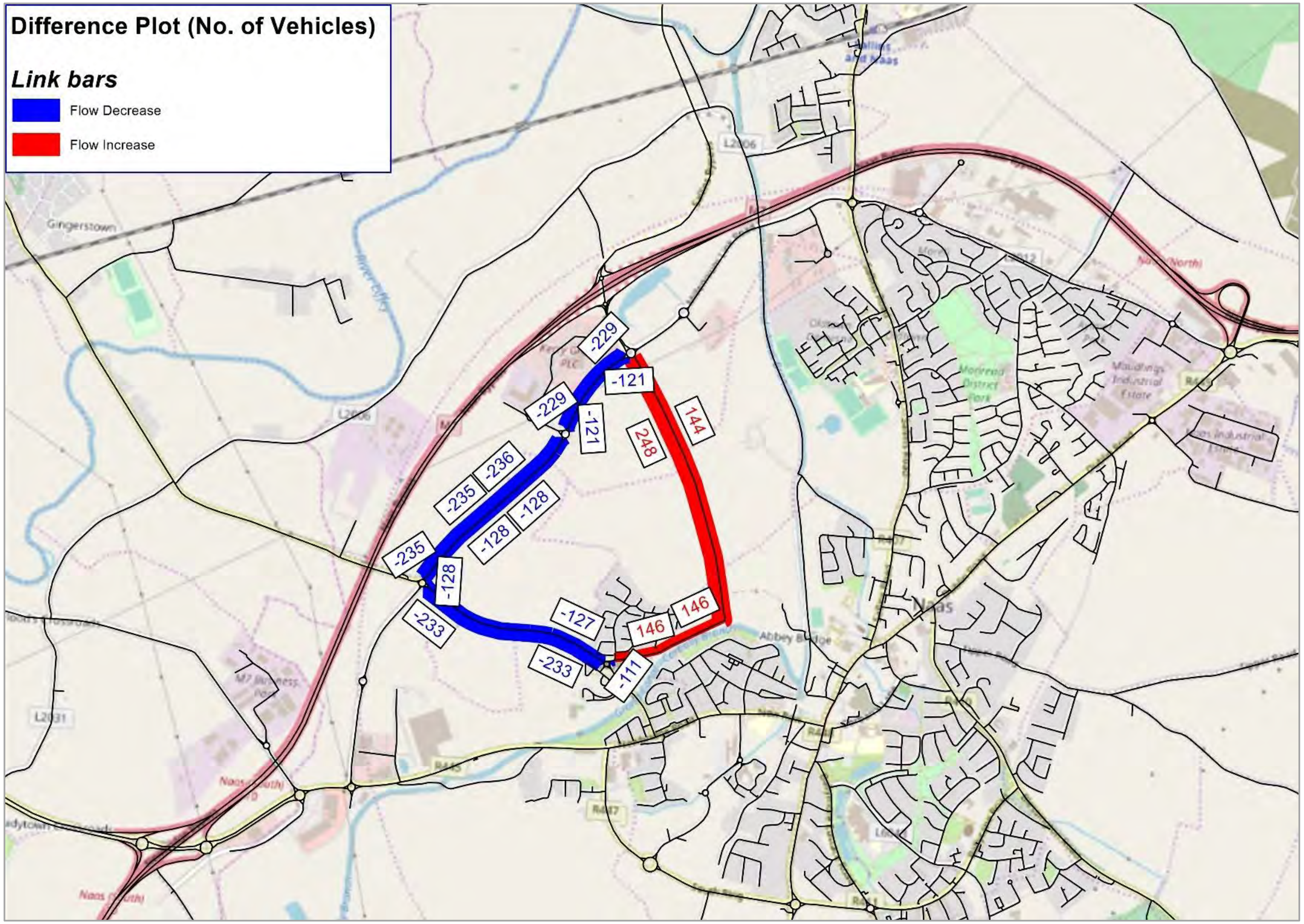


Figure 3.9 Option 5 North West Quadrant Link – 2023 AM Traffic Reassignment Impacts

Option 6: Outer Orbital Route

An indicative Outer Orbital Route as illustrated in Figure 3.10 has been assessed which would start at the Newbridge Road Roundabout on the R445 Newbridge Road and finish at the R445 Dublin Road at the Maudlins Roundabout. This route would be an outer ring and would link with the R448 Kilcullen Road, R411 Ballymore Road and the R410 Blessington Road along with other local roads.

Figure 3.10 shows the traffic reassignment impacts of the proposal and illustrates that the corridor would have limited impact on the town centre but would reduce traffic on the Naas Southern Ring Road and also draw traffic in from a number of local roads.

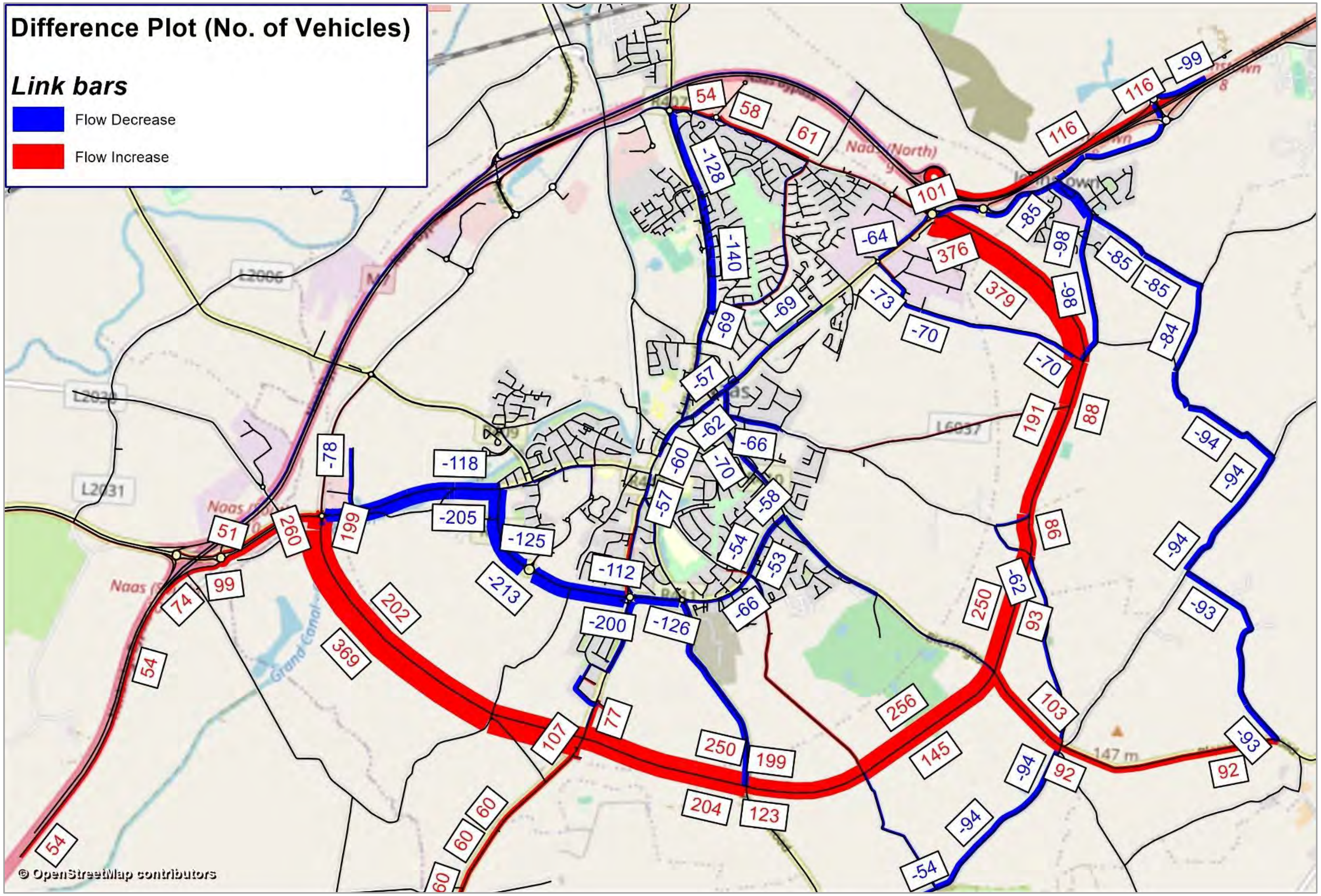


Figure 3.10 Option 6 Outer Orbital Route - 2023 AM Traffic Reassignment Impacts

Option 7: Town Centre HGV Restrictions

While not an infrastructure option, a town centre restriction on HGV through trips was assessed on the R445 Main Street. The restrictions would extend from Murtagh's Corner to the R410 Blessington Road junction, meaning that HGVs would have to use the R410 Blessington Road and Naas Southern Ring Road or the Millennium Park Road as alternative routes. Access for HGVs with deliveries in the town centre (via a permit) would be maintained but would be restricted to specific times of the day.

Figure 3.11 illustrates the impact of the Town Centre HGV Restrictions in the 2023 AM Peak scenario. The figure shows a reduction in HGV traffic through the town centre and an increase in traffic on the Naas Southern Ring Road and Millennium Park Road.

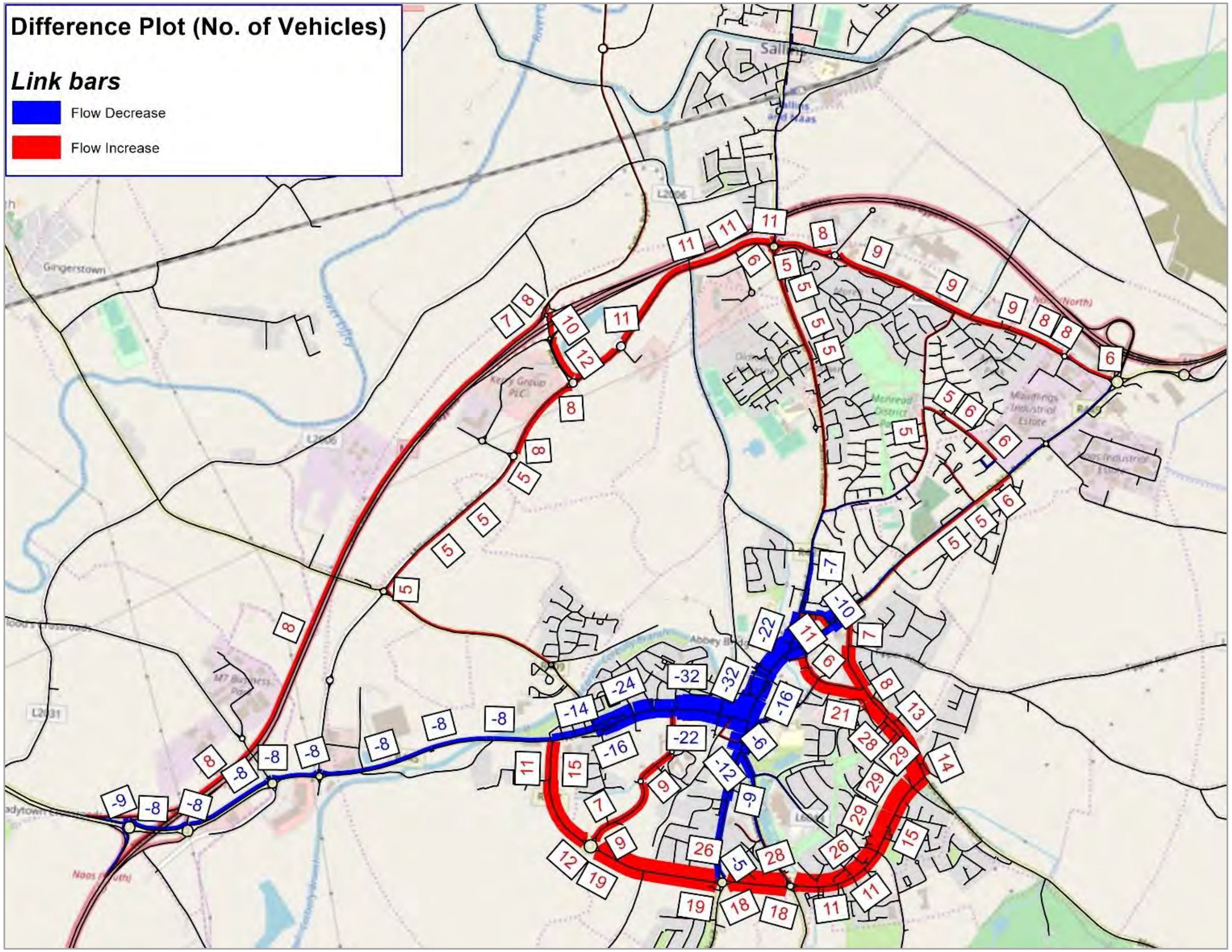


Figure 3.11 Option 7 Town Centre HGV Restrictions - 2023 AM Traffic Reassignment Impacts (No. of HGVs)

3.3 Roads Option Assessment

The roads options have been assessed according to the six CAF criteria against the road's objectives. A table summarising the impact of each option according to the assessment criteria can be found in the full strategy report. The assessment considers the relative merit of each option according to a seven-point scale.

3.3.1 Option 1 Vs. Option 1 Alternative

Although both Option 1 and Option 1 Alternative provide benefits in terms of reduced traffic, Option 1 has the most beneficial impact on the R445 Dublin Road, R410 Blessington Road and R445 Main Street in terms of reducing traffic. In particular on the R445 Dublin Road. Option 1 reduces traffic by 10-11% above Option 1 Alternative (across 2023 AM and PM peak hour models) which is the overall goal of this option, therefore Option 1 Alternative was excluded from further assessment.

3.3.2 Combined Road Options

Each of the road options were assessed in isolation in both the 2023 and 2030 future year models. In addition, a number of road options were combined to assess their cumulative impacts, the following combinations were assessed:

- Options 1 – 7;
- Options 1 & 2 (The Gallops Avenue and Murtagh's Corner Upgrade); and
- Options 1, 2 & 3 (The Gallops Avenue, Murtagh's Corner Upgrade and Millbridge Street).

3.3.3 Impact of Road Options on Town Centre Traffic Levels

Two core objectives in relation to the road's strategy are to remove unnecessary traffic from the town centre and to reduce emissions in the town centre. In order to compare the benefits of each option / combination of options, each was ranked in terms of the amount of traffic reduced on several key roads in the town during the AM & PM peak hours. The six roads used for this comparison are the Main Street, the R445 Dublin Road, the R407 Sallins Road, the R448 Kilcullen Road, the R445 Newbridge Road and Corban's Lane.

Table 3.1 lists all the of options and combinations and their respective ranking in relation to the reduction in traffic on the Main Street and its approach roads. Option 4 (Aldi Distribution Centre Link) has no impact on traffic flows in the town centre as it is a targeted scheme to assess a local safety issue, as such it was excluded from the assessment.

In addition, Option 7 (Town Centre HGV Restriction) when considered in isolation will have a limited impact in relative terms to the other options as HGV proportions when compared to general traffic are low at present in the town centre, therefore this option was also excluded from the assessment.

Table 3.1 Ranking of Road Options Based on Reduction in Traffic Levels (Town Centre and Key Approach Roads)

Option	AM % Reduction	PM % Reduction	Ranking
Do-Minimum	N/A	N/A	N/A
Option 1: Gallops Avenue	-5.6%	-3.3%	5th
Option 2: Murtagh's Corner Junction	-1.7%	-0.8%	7th
Option 3: Millbridge Street	-5.2%	-5.5%	6th
Option 5: NWQ Link	-0.8%	-1.6%	8th
Option 6: Outer Orbital Route	-5.4%	-8.0%	4th
All Options Combined	-15.1%	-17.8%	1st
Option 1 & Option 2	-7.7%	-5.6%	3rd
Option 1, Option 2 & Option 3	-11.3%	-8.9%	2nd

As expected Table 3.1 demonstrates that the combination of all options would have the most beneficial impact in reducing town centre traffic, followed by the combination of Options 1, 2, and 3.

Option 5 ranks 8th overall in the assessment and is therefore not brought forward as it does not perform well in terms of overall objectives of the strategy. However, as discussed previously, Option 5 still has much value as a public transport / cycle / pedestrian link. Option 6 performs well in terms of reducing traffic on the R445 Newbridge Road and R407 Sallins Road as illustrated in Figure 3.6, but would only have a minor impact in reducing traffic through the town centre.

3.3.4 Preferred Roads Measures

As a result of the MCA and town centre traffic reduction assessment, six of the options have been brought forward and will form part of the preferred suite of measures in the transport strategy. These are as follows:

- Option 1 – The Gallops Avenue
- Option 2 – Upgrade of Murtagh's Corner Junction
- Option 3 – Millbridge Street
- Option 4 – Roadway Linking Aldi Distribution Centre to Millennium Park Road
- Option 7 – Town Centre HGV Restrictions
- Option 8 - Upgrade Signalised Junctions to MOVA or SCOOT as Appropriate

Figure 3.12 shows the traffic reassignment impacts of the preferred suite of measures in the town centre (with the exception of Option 8 which is not modelled) and illustrates the reduction in traffic along the R445 Dublin Road, R445 Main Street, R407 Sallins Road and R410 Blessington Road. The introduction of these roads' measures will help to facilitate the implementation of the various public transport, walking and cycling proposals discussed previously in the report.

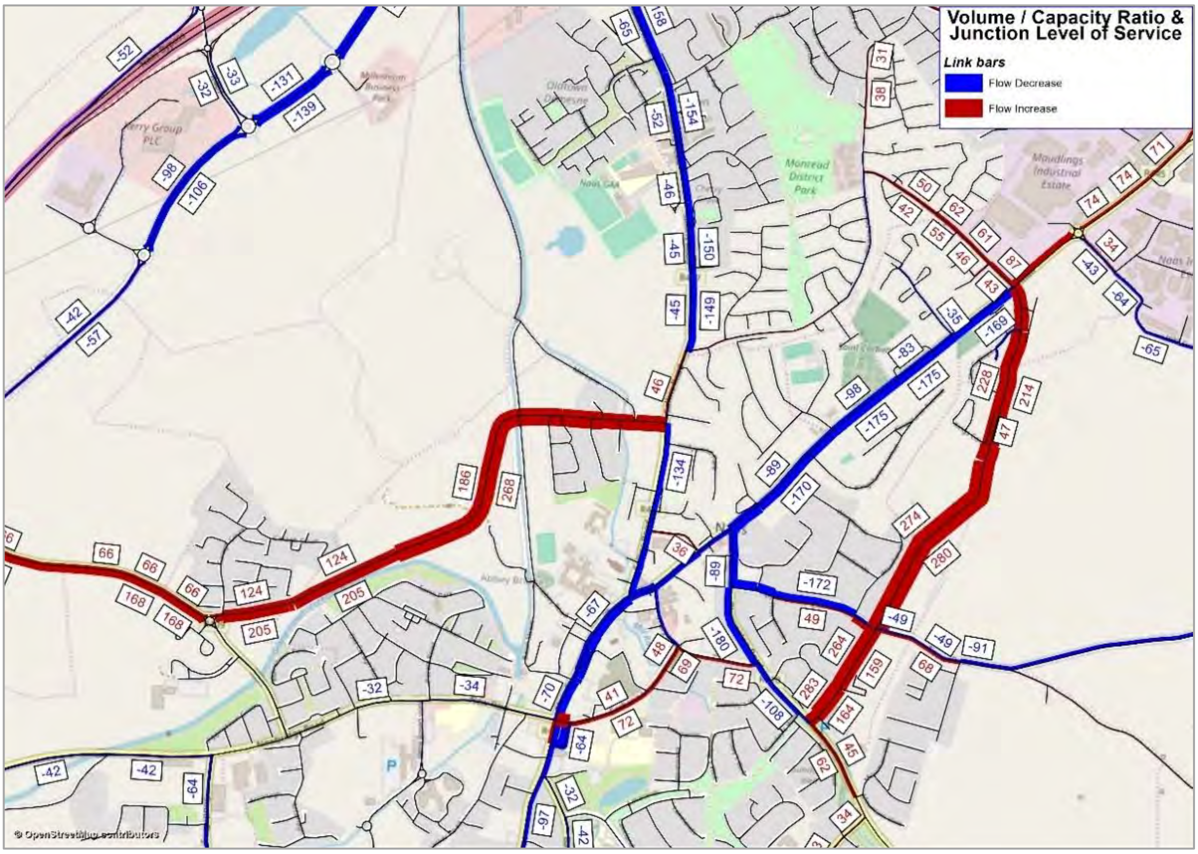


Figure 3.12 Options 1, 2 & 3 (The Gallops Avenue, Murtagh's Corner Upgrade and Millbridge Street) - 2023 AM Traffic Reassignment Impacts

3.3.5 2023 and 2030 Difference Plots

All difference plots for each road option can be found in Appendix A, for the 2023 and 2030 AM and PM peak hours. Appendix B contains bar charts showing the flow differences on six core roads with Naas, namely:

1. Main Street;
2. Dublin Road;
3. Sallins Road;
4. Kilcullen Road;
5. Newbridge Road; and
6. Corban's Lane.

3.4 Implementation

A delivery timeframe of these six options is presented in Table 3.2 and illustrated graphically in Figure 3.13 and Figure 3.14. Note: RD 6, upgrade of signalised junctions to MOVA/SCOOT is not shown on the maps.

Table 3.2 Delivery Timeframe of Road Options

Option	Measure	Type	Short Description	Delivery Timeframe: Short Term (1-2 Years)	Delivery Timeframe: Medium Term (3-5 Years)	Delivery Timeframe: Long Term (6-10 Years)
1	RD 1	Road	The Gallops Avenue			x
2	RD 2	Road	Upgrade of Murtagh's Corner Junction and Link Road to Corban's Lane		x	
3	RD 3	Road	Millbridge Street			x
4	RD 4	Road	Road Linking Aldi Distribution Centre and Millennium Link Road	x		
7	RD 5	Road	HGV Restriction in Town Centre	x		
8	RD 6	Road	Upgrade Signalised Junctions to MOVA or SCOOT as Appropriate	x	x	

Figure 3.13 Preferred Road Measures

Figure 3.14 Preferred Road Measures (Alternative HGV Route)

4 Capacity of Road Network to Support Future Land Use Growth in Naas

4.1 Overview

A key element of the Naas/Sallins Transport Strategy is to aid and inform future land-use proposals that will form the basis for future local area plans in Naas and Sallins. In this regard, a state of the art Strategic Traffic Model (STM) in the software VISUM has been developed to test the impacts of future land-use proposals along with future transport interventions. The STM developed for Naas/Sallins reflects 2018 base year conditions and has been fully calibrated and validated in line with the recommendations set out in TII's Project Appraisal Guidelines.

Kildare County Council is currently in the process of developing the future draft LAP 2021 to 2027. Once adopted, the future draft Naas Local Area Plan 2021-2027 will replace the Naas Town Development Plan 2011-2017.

For the purpose of this Transport Strategy and future year modelling, Kildare County Council Planning Department provided an indicative land-use zoning map for Naas. One of the objectives of the strategic transport modelling was to test the land-use zonings provided in this conceptual map, to understand their impacts on the road network for both the town of Naas and also the strategic road network, specifically junctions 9, 9A and 10 of the N7. Future year traffic generation estimates were developed for two horizon years, 2023 and 2030, based on population and employment projections provided by KCC's Planning Sections.

The remainder of this Appendix outlines the analysis conducted for the horizon years 2023 and 2030 and describes the issues that are predicted to occur as a result of the full build out of the conceptual land-use zoning map. The Section also outlines how issues could potentially be mitigated through lower levels of employment growth and revised land use zoning objectives in critical locations. This analysis will assist the Planning Section in developing appropriate land-use zoning objectives as part of the future draft Naas LAP 2021 to 2027. The land use zoning objectives contained in the future draft Naas LAP 2021 to 2027 will be assessed through use of the STM prior to the draft being published.

4.2 Background

The road options assessed in Section 10 of this report were assessed on the basis of the full build out of the conceptual land-use zoning map. For the purposes of the assessment it was assumed that the full build out of all zoned lands in the indicative map would be delivered by 2030.

The conceptual land-use zoning objectives map, provided by KCC Planning Department, is illustrated in Figure 4.1. The land-use assumptions contained with this map (i.e. location and land-use type) were used in conjunction with industry standard land-use trip rates to generate future vehicular demand for 2030.

Figure 4.1 shows a number of key future employment/industry growth areas in Naas, including growth in the Northwest Quadrant (NWQ) area and in zones close to or along the M7. Residential growth is somewhat more dispersed throughout the town with growth in the NWQ and also along the Kilcullen Road and South Ring Road.

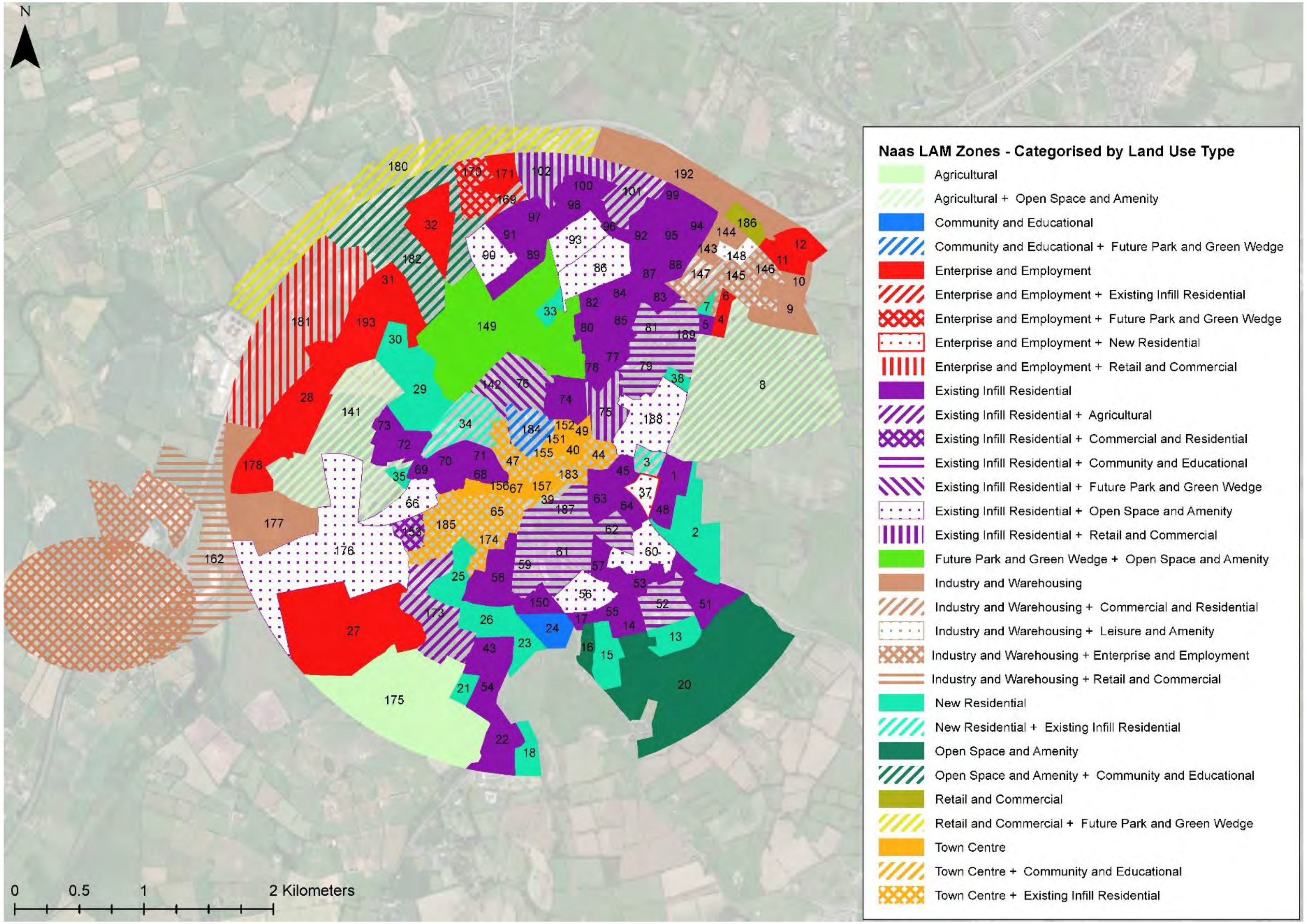


Figure 4.1 Conceptual Land Use Zoning Objectives Map

4.3 Alternative Land-Use Modelling Process

As previously outlined, the objective of the assessment is to analyse the impact of increased traffic levels on the capacity of both the local road network in Naas and the M7 National road network.

The following process was used to assess the alternative land-use scenarios:

1. Use the Naas LAM to develop a baseline 2030 scenario with no growth within Naas (i.e. include only background growth);
2. Use the Naas LAM to develop a 2030 full build out scenario based on the conceptual land use zoning objectives (as previously discussed);
3. Identify the key zones which if fully developed, in line with the conceptual land use zoning objectives, have the potential to directly impact upon the capacity of the National and Local road network;
4. Assess alternative growth proposals for these key zones and assess their impact on both the National and Local road network; and
5. Summarise the impacts and findings of the assessment.

There are a number of committed developments in Naas that are currently been constructed or will be constructed in the coming years. These developments have all been accounted for in a 2023 growth scenario, the 2030 scenario includes projected growth between 2023 and 2030.

It has also been assumed for the purposes of this exercise, which is assessed independently of the transport strategy proposals, that the existing mode shares in Naas also apply in 2023 and 2030. Therefore, the same proportion of car based trips as currently observed in the area will also apply in the 2030 land-use scenarios.

Finally, the exercise is based on the 2030 Do-Minimum Road network which includes the recent M7 upgrade to 3 lanes in each direction, the new Osberstown Interchange and the Sallins Bypass.

4.4 2030 Baseline Scenario - Background Growth

The first task was to establish a 2030 baseline scenario with background growth only to understand how both the M7 and local road network would perform without any additional traffic growth in Naas beyond 2023. This process used the 2023 trip patterns with no further growth for all internal zones in the model, while applying the TII growth rates to external zones, in order to assess what impact the background growth would have.

Figure 4.2 and Figure 4.4 show the queuing in Naas in the 2030 AM and PM Baseline Scenarios, while Figure 4.3 and Figure 4.5 show the Volume/Capacity (V/C) Ratio for traffic on the M7 mainline in both directions in the AM Peak. In terms of queue lengths, there are only some minor queues within Naas town but more importantly there are no queues on the M7 junctions or within the vicinity of the M7 when only background growth is applied.

The V/C Ratio plot demonstrates that capacity issues are starting to develop eastbound in the AM Peak east of Junction 9 (Maudlins) as traffic from Naas travelling towards Dublin joins traffic on the M7 eastbound carriageway. Also, the M7 is operating at 80% capacity eastbound in the AM Peak between Junctions 10 (Newhall) and 9a (Osberstown) as traffic utilises Junction 9a to access Naas and Sallins. Similarly, in the PM peak the same patterns are developing but in the Westbound direction instead.

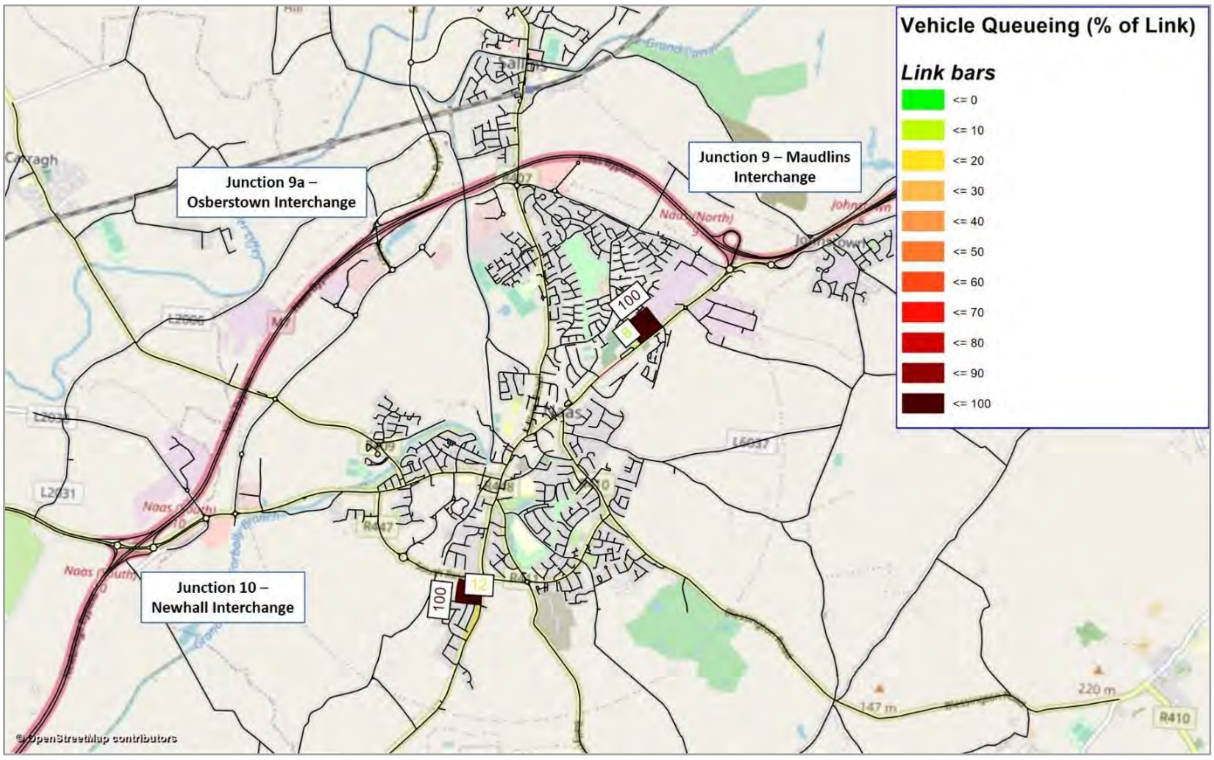


Figure 4.2 2030 AM Background Growth Queue Lengths

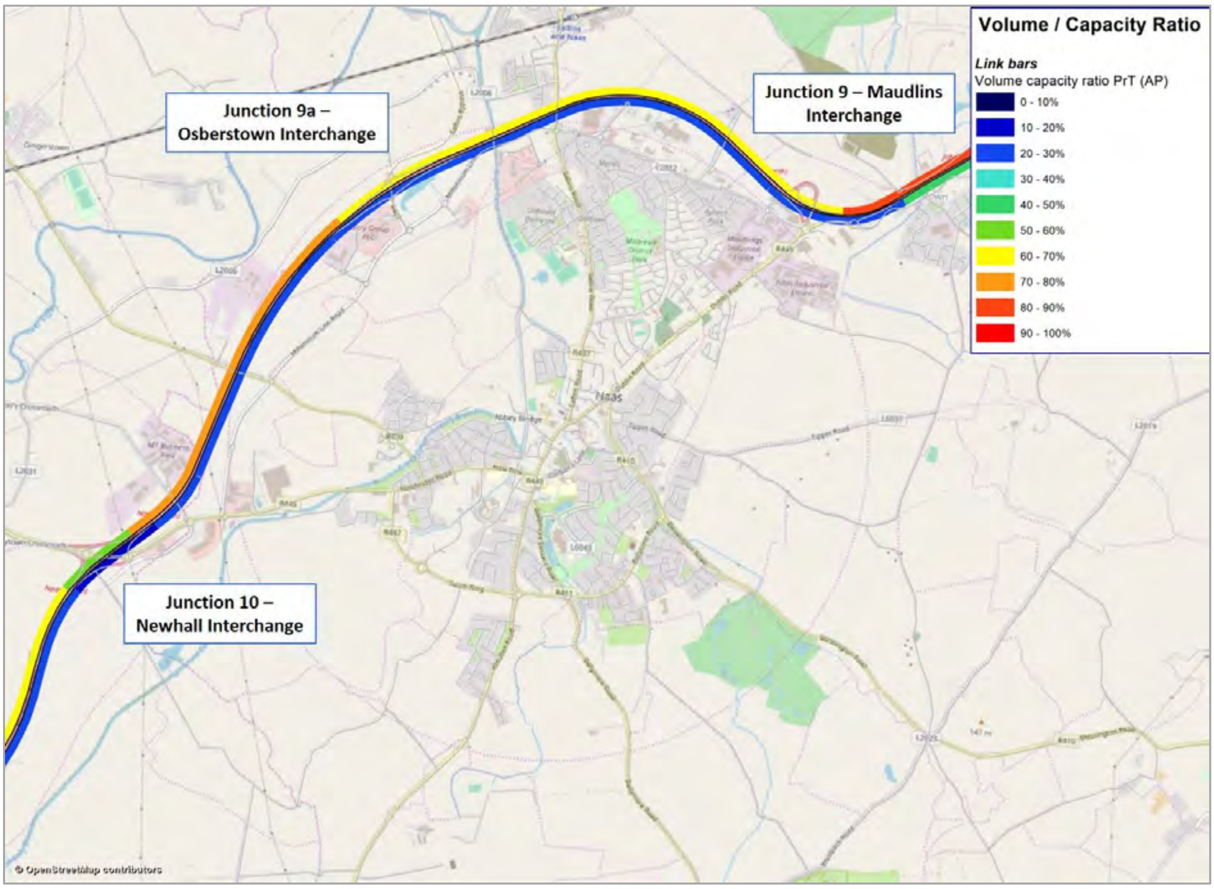


Figure 4.3 2030 AM Background Growth Volume/Capacity Ratio on M7

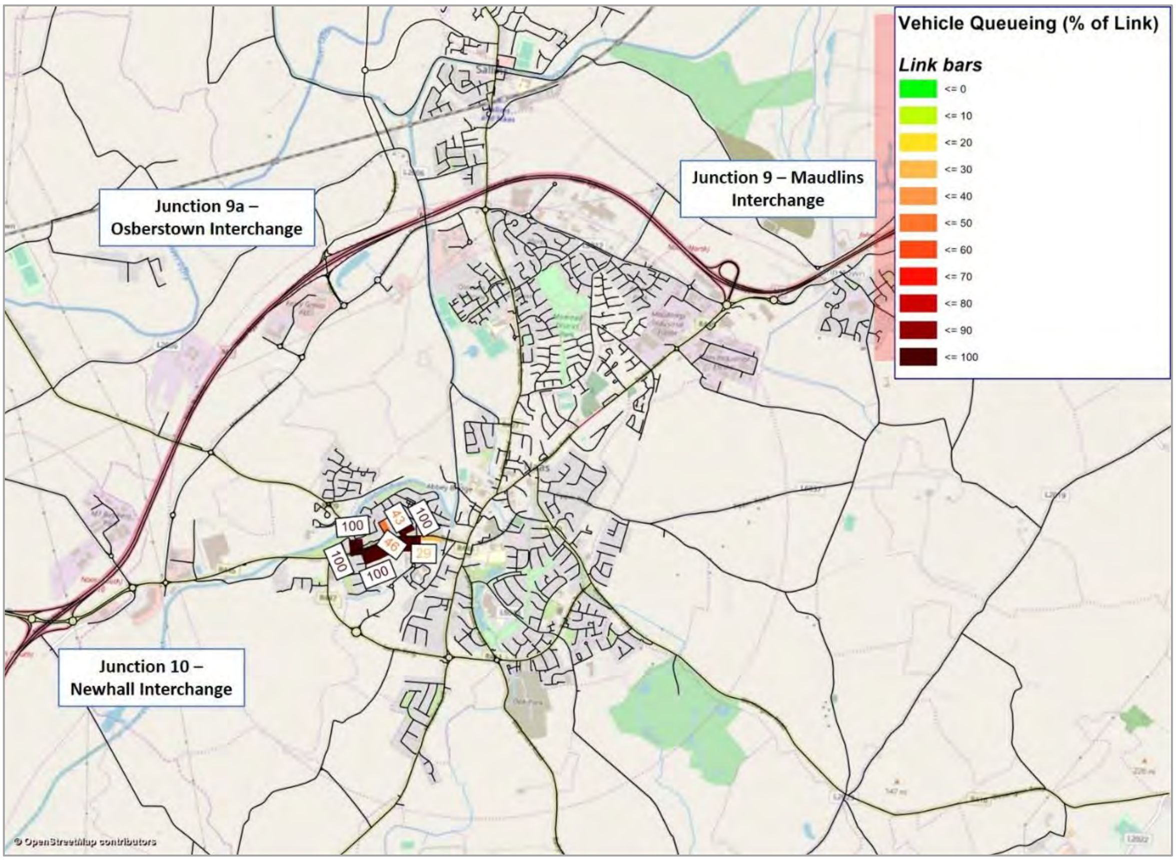


Figure 4.4 2030 PM Background Growth Queue Lengths

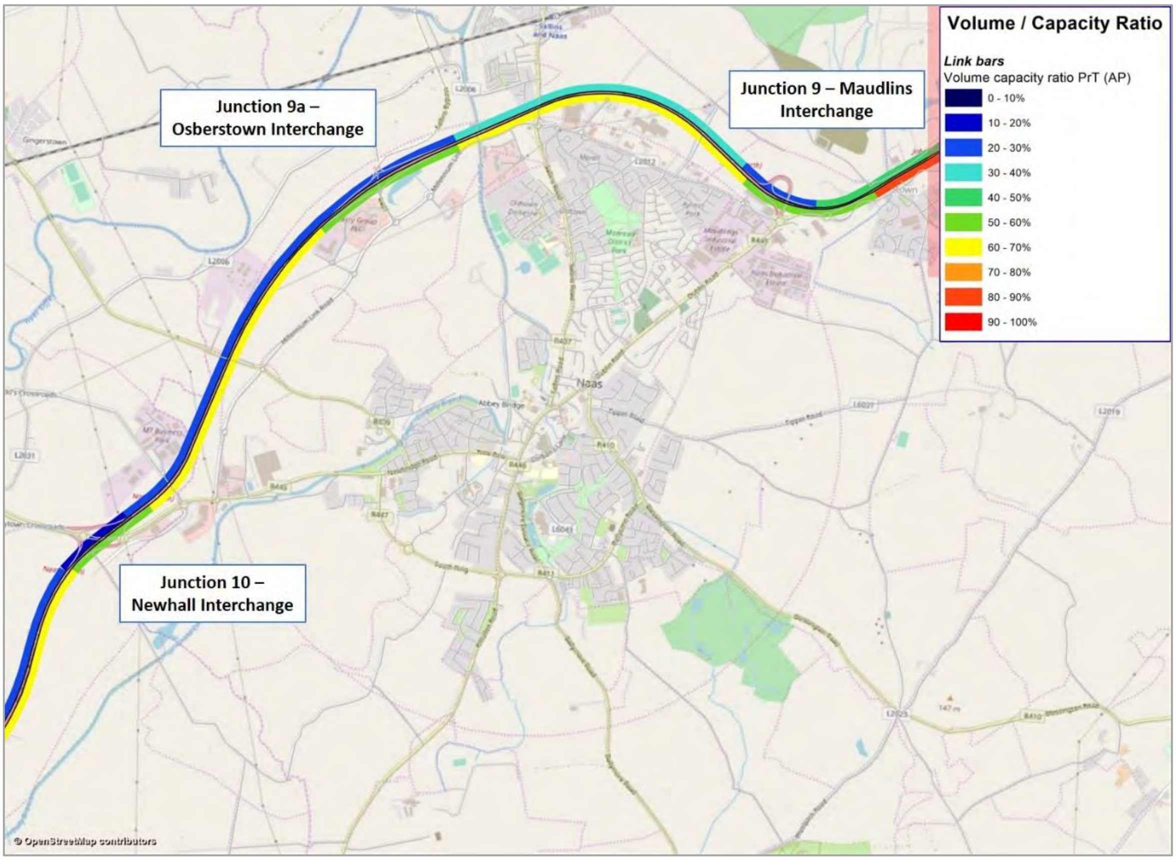


Figure 4.5 2030 PM Background Growth Volume/Capacity Ratio on M7

4.5 2030 Full Build-Out Scenario

The impact of the 2030 full build out scenario on both the local road network and M7 is illustrated in Figure 4.6 to Figure 4.9. Figure 4.6 shows the junctions and road links that will be operating at or above capacity and will experience significant queuing during the AM peak as traffic tries to access the various destinations within the town.

Queuing is experienced in Naas town centre, R445 Newbridge Road, R448 Kilcullen Road, Monread Road, Millennium Park Road and the South Ring road. Most notable is the queuing on the off-ramps of Junction 9 (Maudlins) and Junction 9a (Osberstown) which has the potential to impact on mainline traffic flows on the M7.

Figure 4.8 shows the junctions and road links that will be operating at or above capacity and will experience significant queuing during the PM peak. Queuing is experienced on the R445 Newbridge Road and Millennium Park Road.

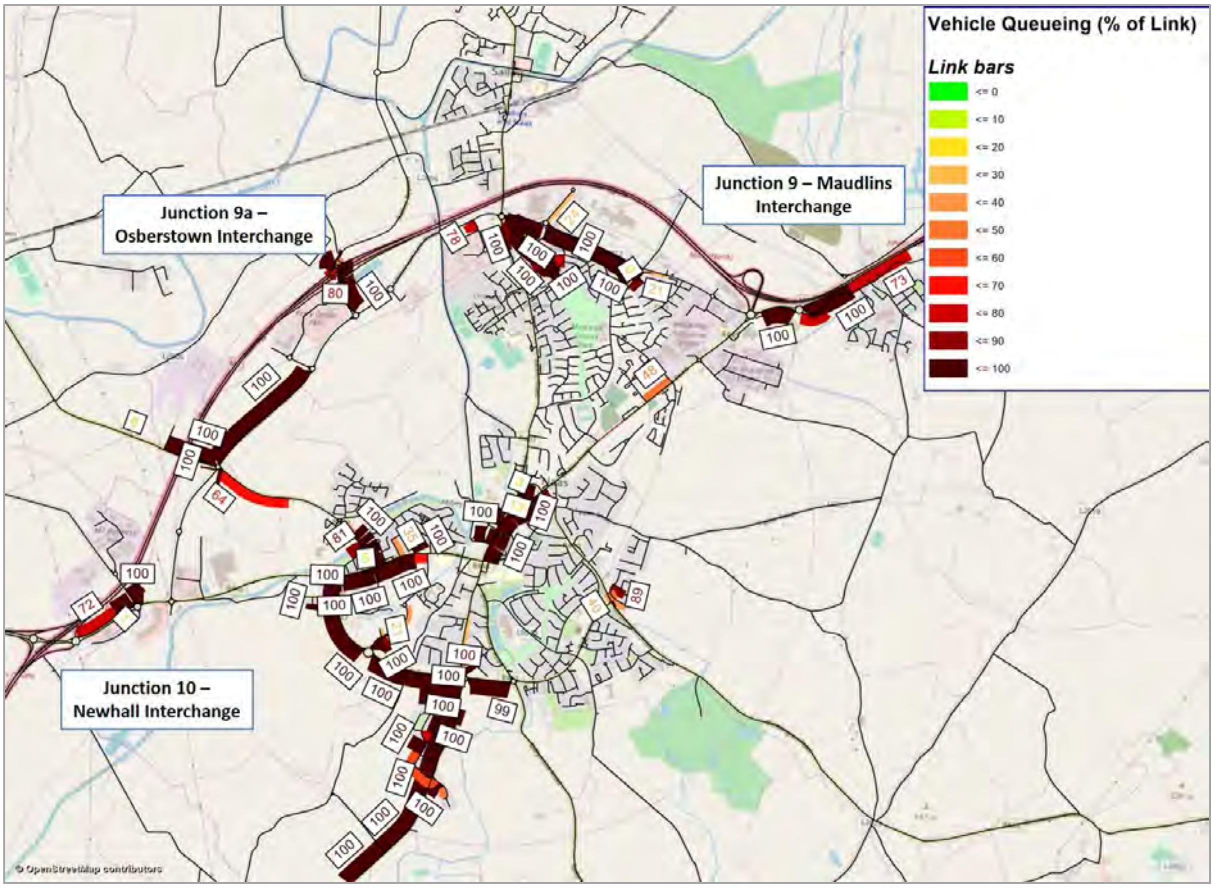


Figure 4.6 2030 AM Full Build Out Scenario Queue Lengths

The V/C Ratio on the M7 mainline itself, as illustrated in Figure 4.7, would not change significantly beyond the 2030 baseline scenario. The main impact would be from the queuing caused by traffic accessing Naas and the potential safety issues associated with this. Similar to the AM peak, the V/C Ratio on the M7 as seen in Figure 4.9 would not change significantly beyond the 2030 baseline scenario.

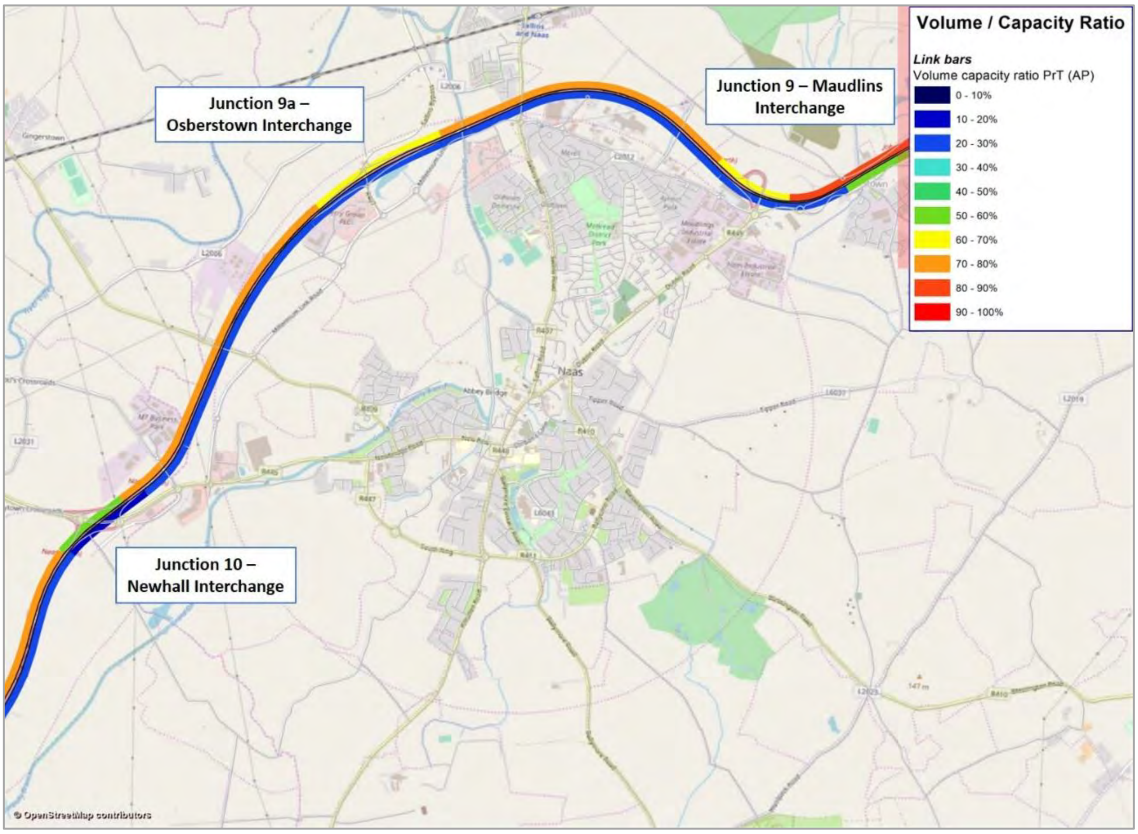


Figure 4.7 2030 AM Full Build-Out Volume/Capacity Ratio on M7

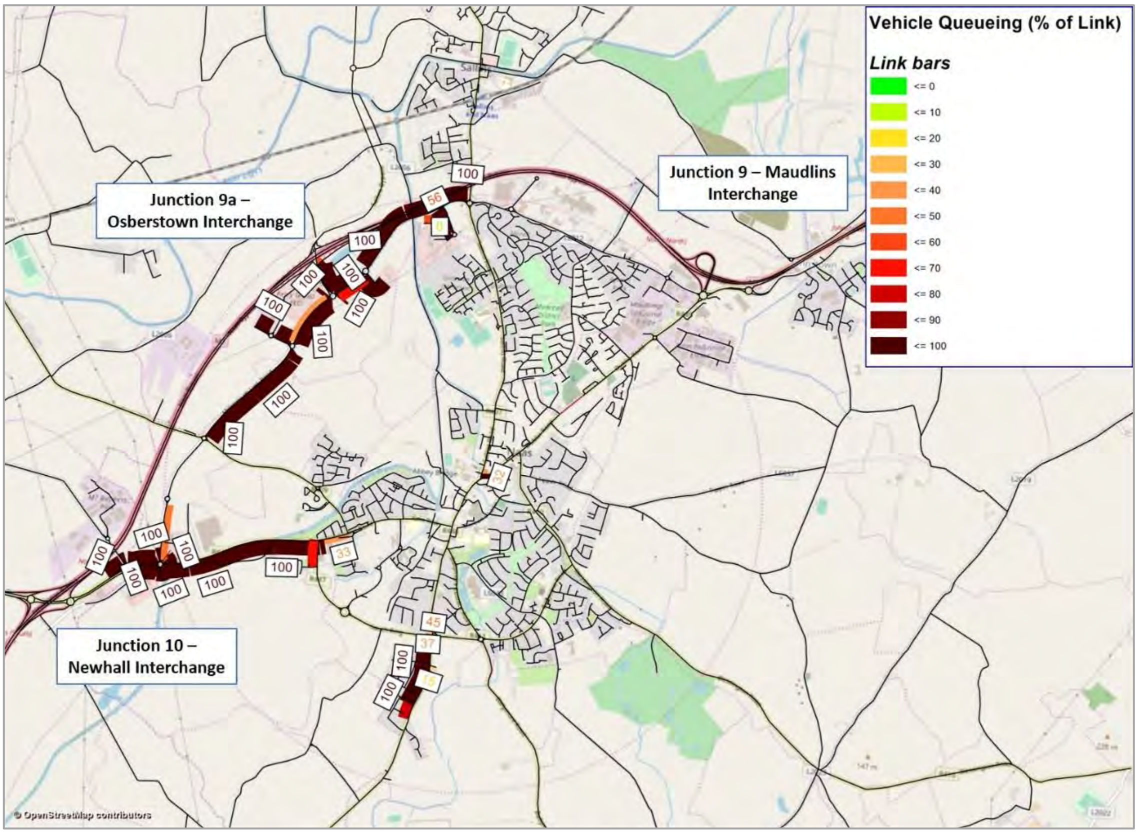


Figure 4.8 2030 PM Full Build Out Scenario Queue Lengths

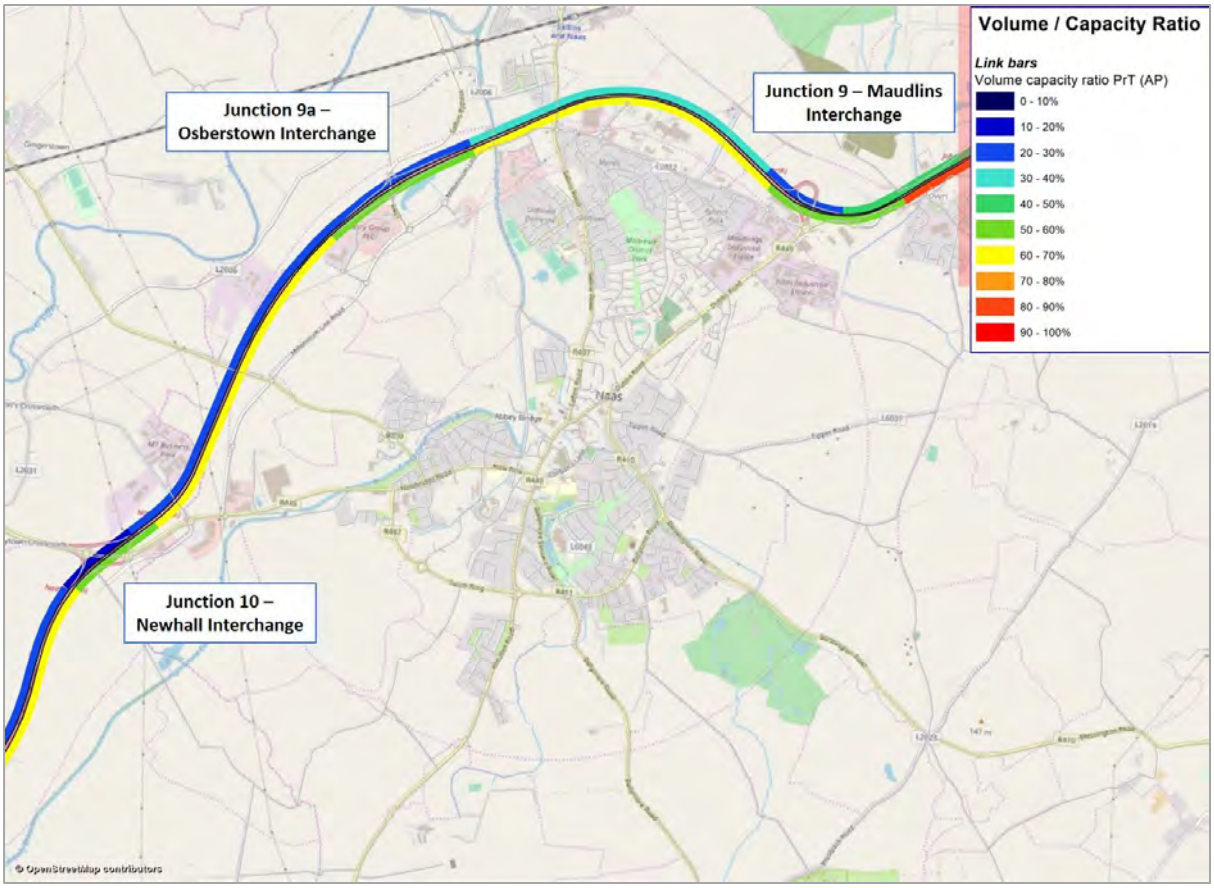


Figure 4.9 2030 PM Full Build-Out Volume/Capacity Ratio on M7

4.6 Identification of Zones Causing Issues

As the full build-out would cause issues with the network as outlined above, the next step was to identify which zones were causing the issues. There are 3,339 jobs projected in Naas by 2023 and 10,171 by 2030. This means that over the seven-year period between 2023 and 2030 that almost 7,000 additional jobs would be created.

There are six zones in the Naas LAM that have been identified from modelling the full-build out scenario that are believed to be responsible for primarily causing the most issues (particularly around M7 junctions) and have been tested as described in the section below. The six zones are located as follows:

- Three zones surrounding Millennium Park Road west of Junction 9a (2,841 additional jobs projected between 2023 and 2030);
- Two zones at the old Donnelly Mirrors and Concrete Pipes site (388 additional jobs forecasted); and
- One zone around M7 Junction 10 (138 additional jobs forecasted).

4.7 Reduction/Removal of Growth & Testing of Scenarios

Once the zones causing issues were determined, 2 alternative land-use scenarios were developed and assessed. The process was to either remove or reduce growth in the zones of interest between 2023 and 2030 and to maintain the growth in all other zones as per the 2030 full build out scenario. The two scenarios that were therefore developed were:

- Alternative A: 0% growth after 2023 in zones of interest; and
- Alternative B: 50% growth after 2023 in zones of interest.

The queue lengths and volume/capacity ratio plots are presented for these two scenarios below for the Do-Minimum network.

Table 4.1 below presents the modelled job growth from 2018 to 2023 in the zones of interest. Table 4.2 below presents the modelled job growth between 2018 to 2030 in each zone of interest for each of the three 2030 future year scenarios tested.

Table 4.1: Modelled Job Growth in Zones of Interest (2018 to 2023)

Site	Jobs Growth 2018 – 2023
Donnelly Mirrors	190
Zone around M7 Junction 10	68
Millennium Park	1389
Total	1647

Table 4.2: Modelled Job Growth in Zones of Interest (2018 to 2030)

Site	2030 Full build	2030 Alternative A	2030 Alternative B
Donnelly Mirrors	578	190	384
Zone around M7 Junction 10	206	68	137
Millennium Park	4230	1389	2810
Total	5014	1647	3331

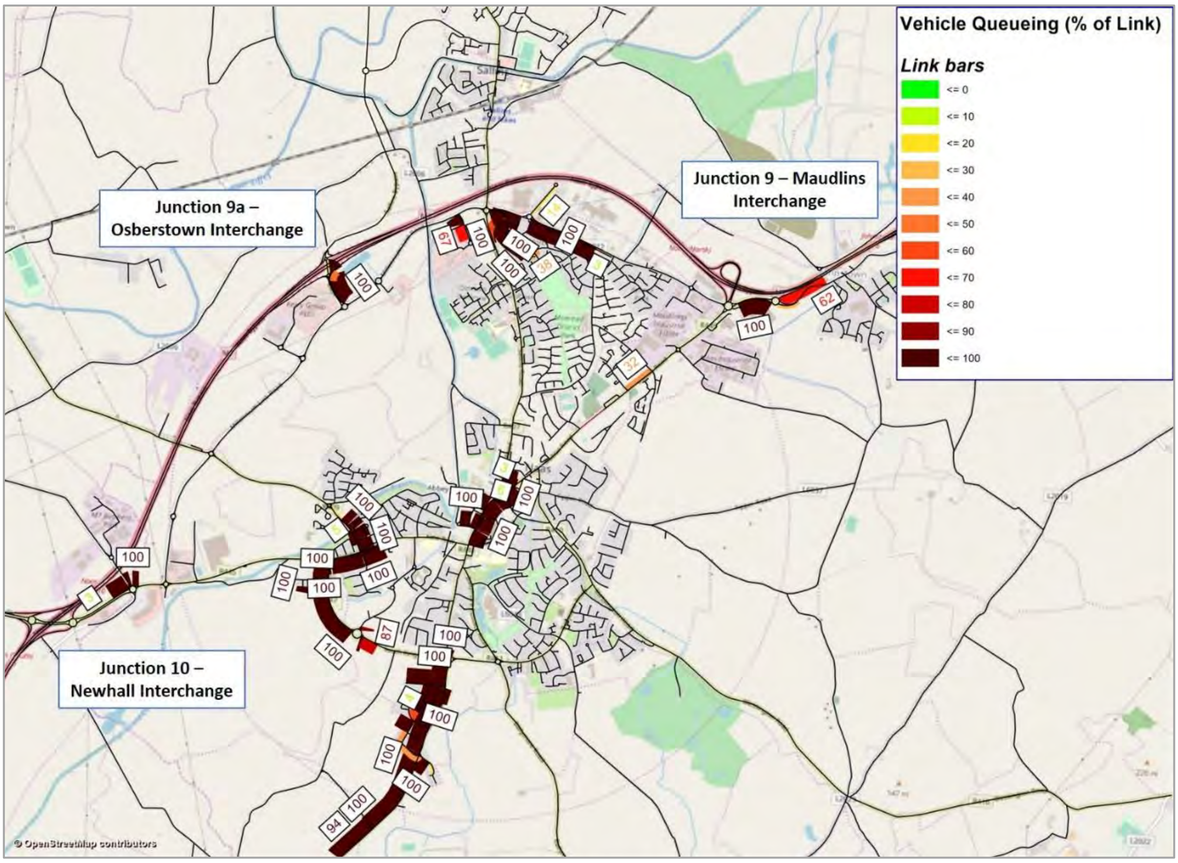


Figure 4.10 2030 AM Alternative A Queue Lengths

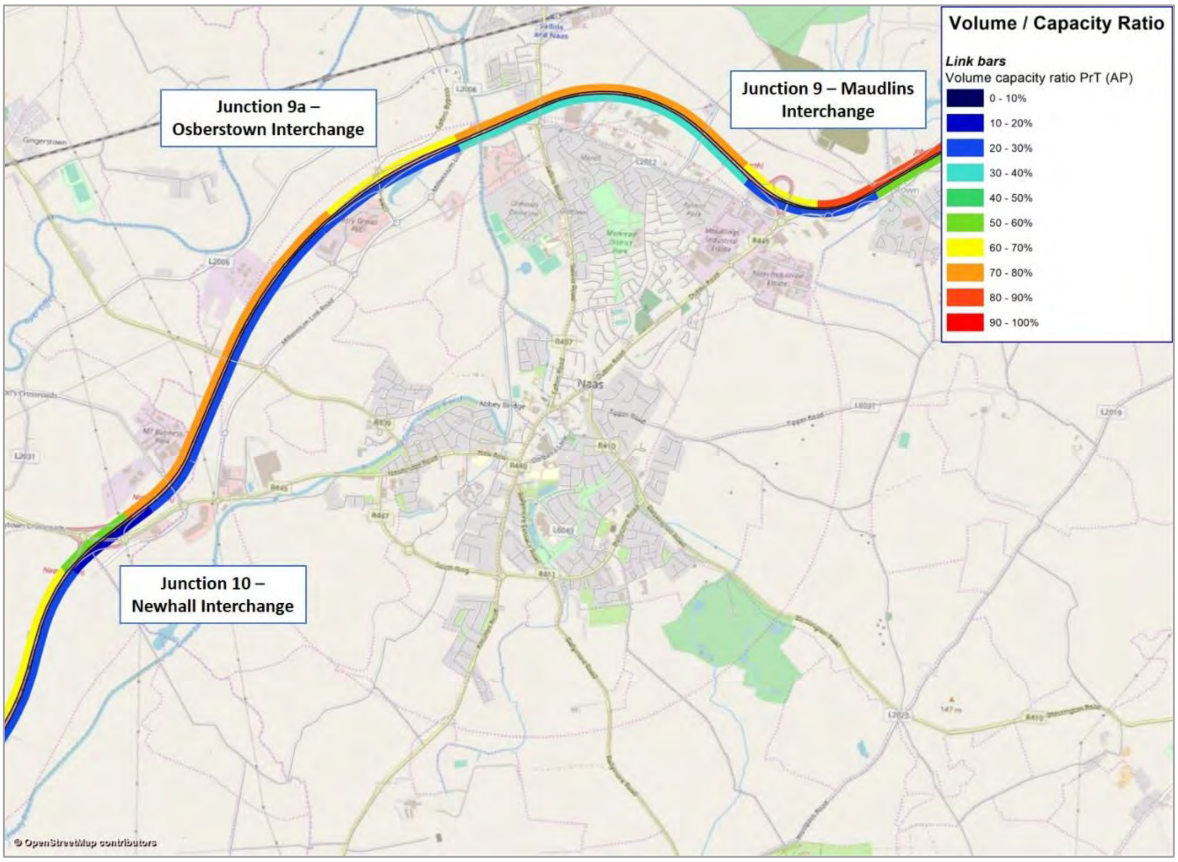


Figure 4.11 2030 AM Alternative A Volume/Capacity on M7

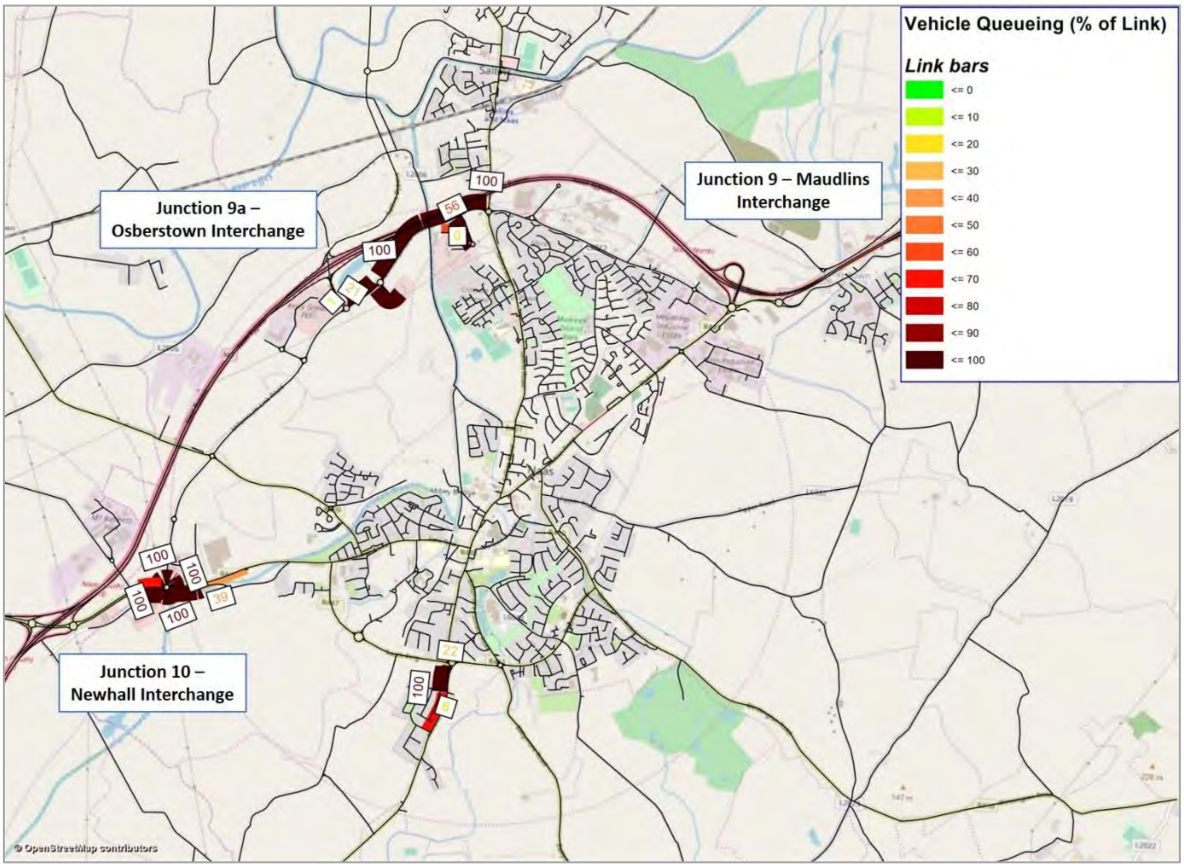


Figure 4.12 2030 PM Alternative A Queue Lengths

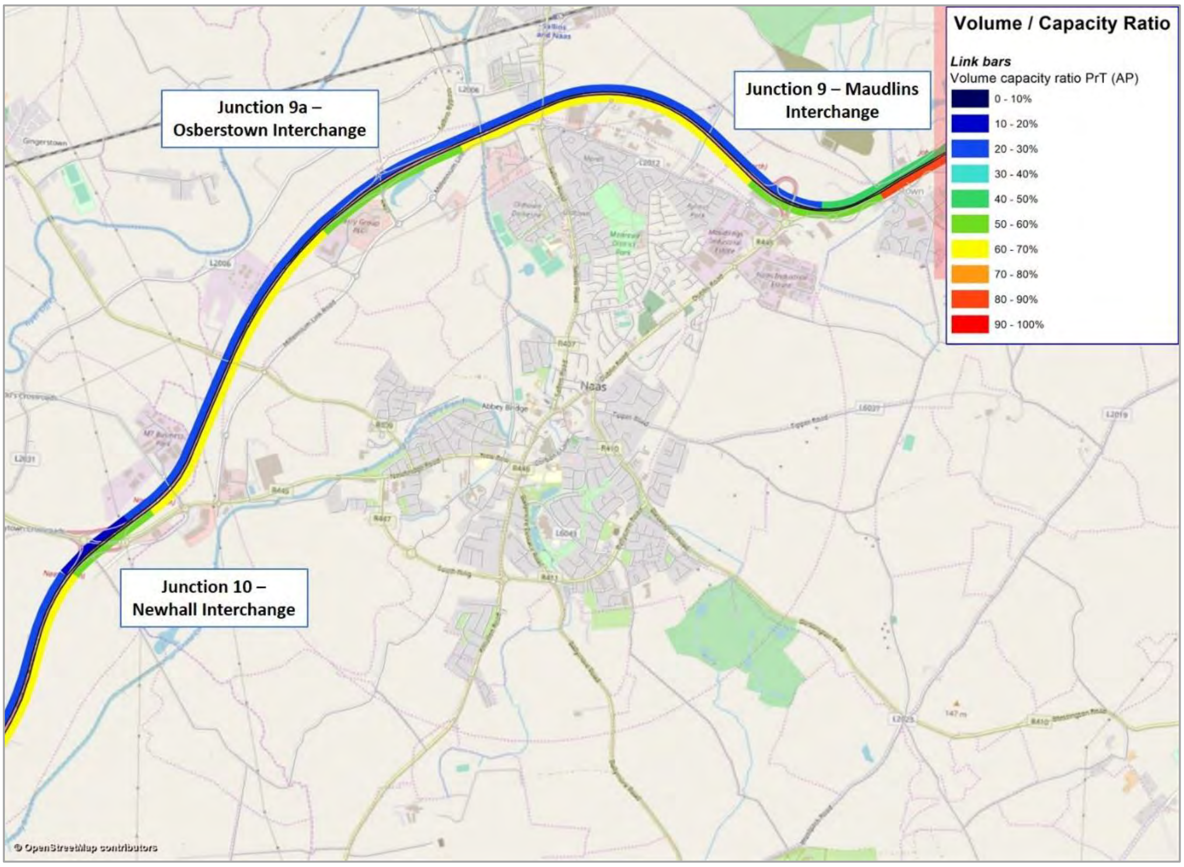


Figure 4.13 2030 PM Alternative A Volume/Capacity on M7

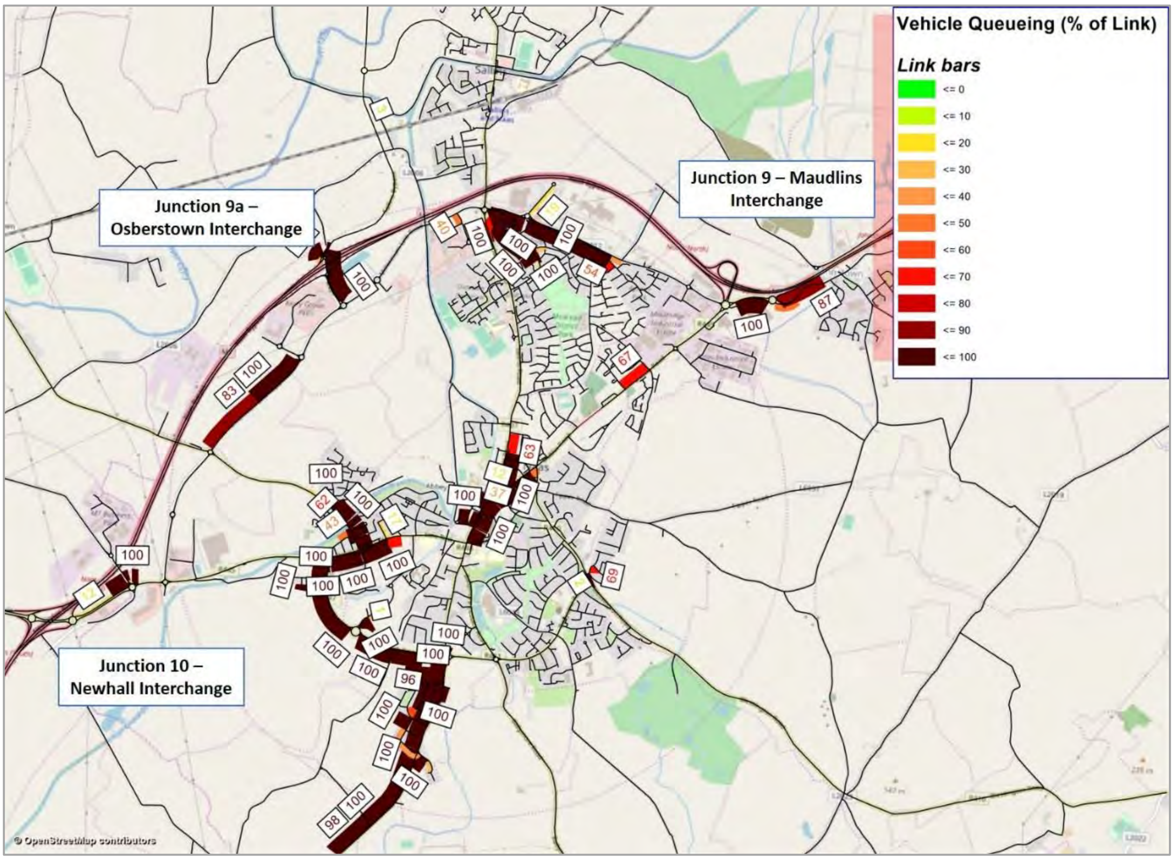


Figure 4.14 2030 AM Alternative B Queue Lengths

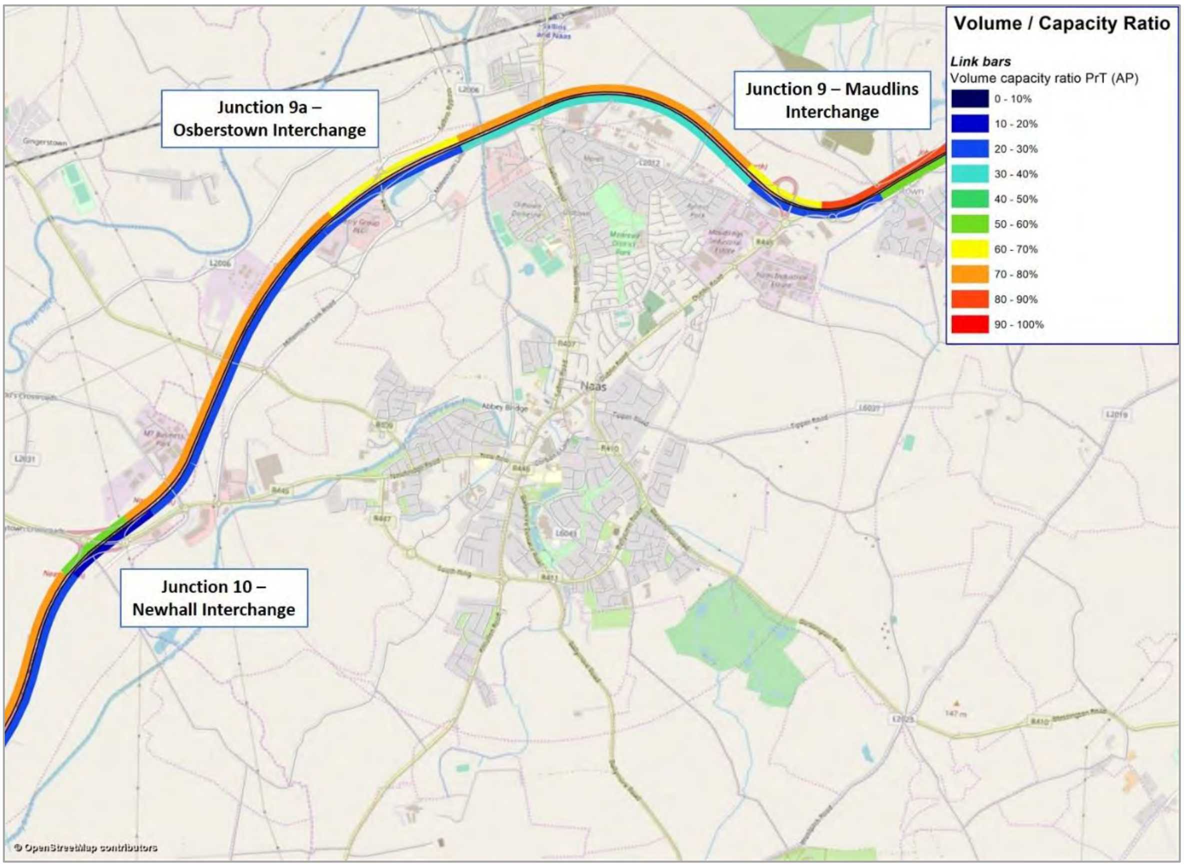


Figure 4.15 2030 AM Alternative B Volume/Capacity on M7

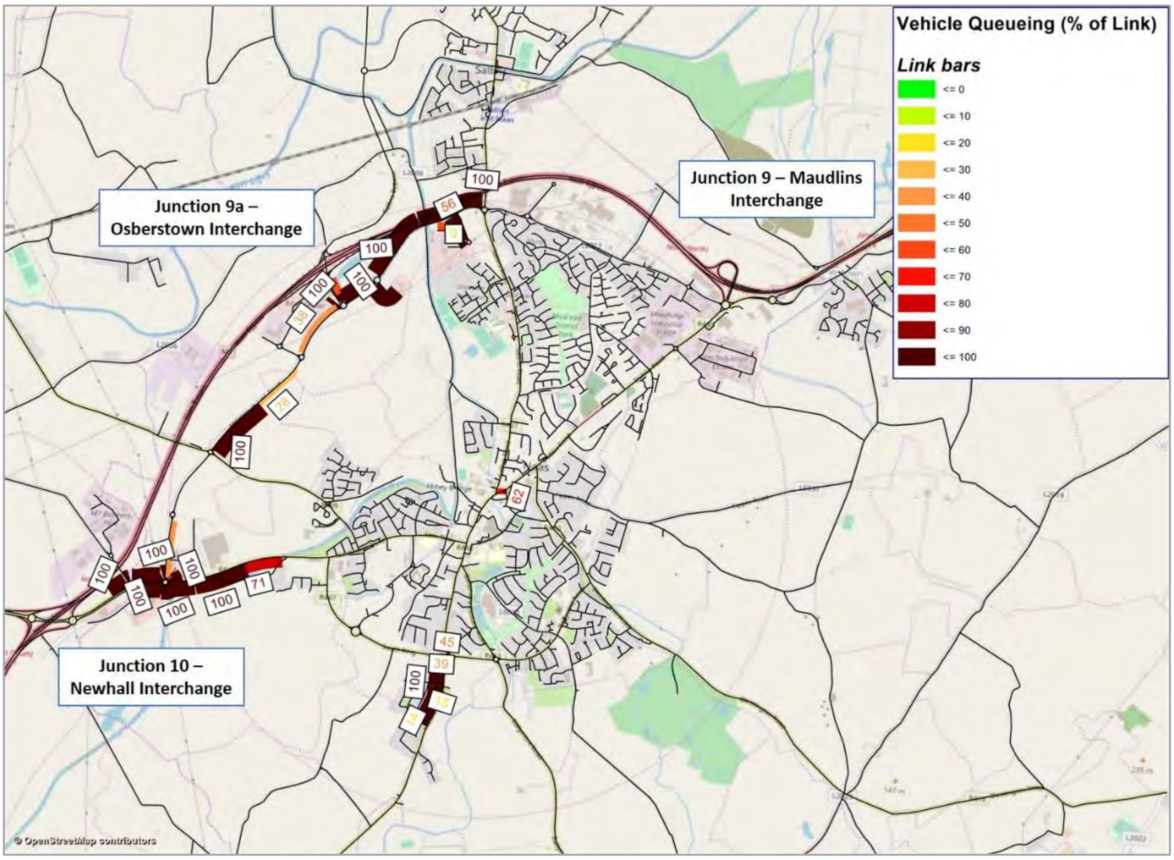


Figure 4.16 2030 PM Alternative B Queue Lengths

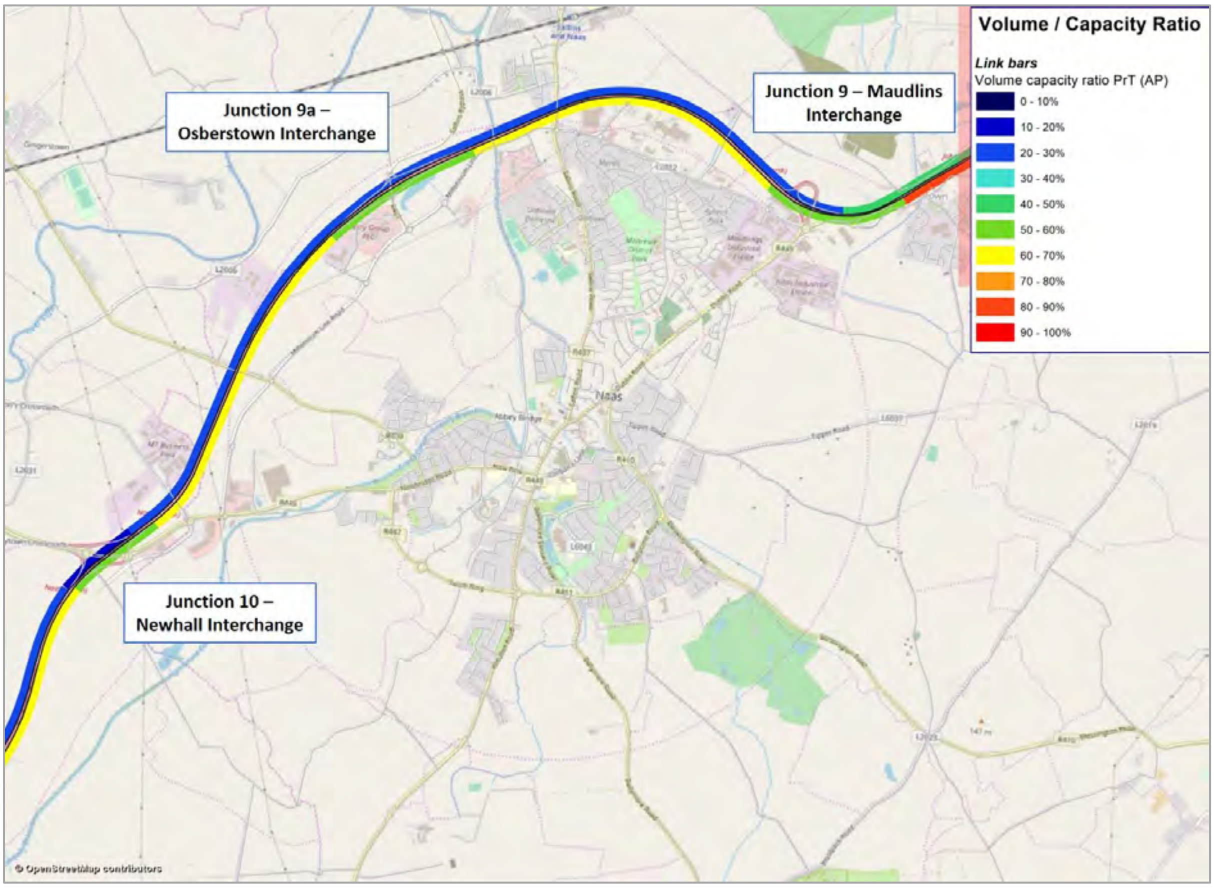


Figure 4.17 2030 PM Alternative B Volume/Capacity on M7

4.8 Analysis of Results

Figure 4.18 shows queuing in the road network as a result of the various land use scenarios. By comparing the full build-out scenario (where 100% of development is completed) with both Alternative A and B, it is evident that the full build-out of the conceptual land-use zoning shows significant queuing at the M7 interchanges. During the AM peak Alternative A shows some queuing at junctions, but it is quite minor when compared to the full build out, while Alternative B shows more queuing, however this queuing is not as significant as the full build-out.

In the PM peak there are notable negative impacts with the full build-out, in particular on the Newbridge Road by the roundabout with Millennium Park Road and on Millennium Park Road in the vicinity of Kerry Group. Both Alternative A and Alternative B show improvements in these areas, again with Alternative A showing the most improvement.

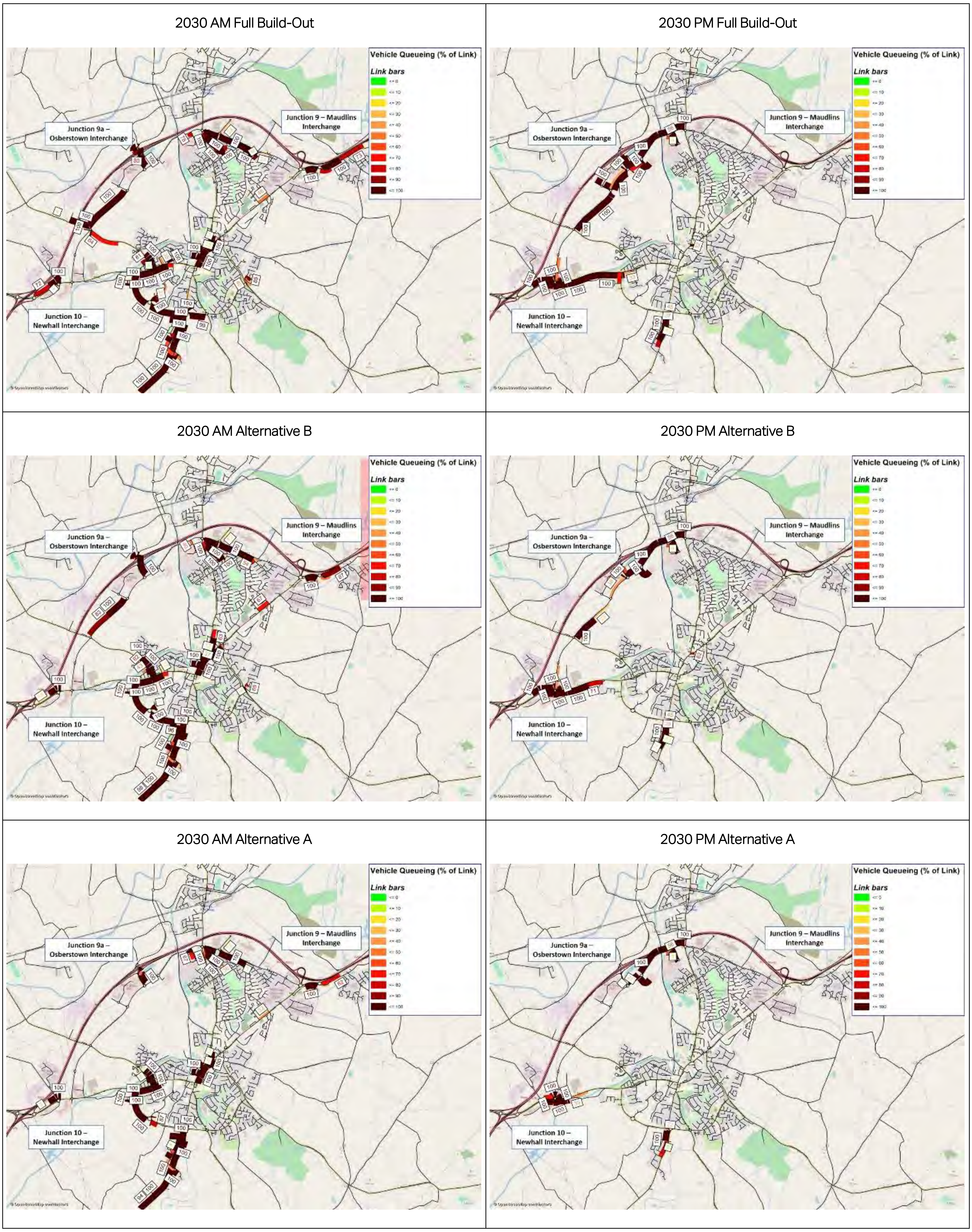


Figure 4.18: Vehicle Queuing Resulting from Different Land Use Scenarios

In conclusion, there are some zones that can be developed around the M7. The zones at Millennium Park Road and at the Cemex/Donnelly Mirrors Site can be developed partially while the zone around the M7 Junction 10 should not be developed as it will create significant issues on the local road network. The Newbridge Road roundabout is already heavily congested at times and any large-scale development in the surrounding area would cause significant issues. It is therefore proposed that the preferred land-use scenario would be as follows:

- Full build out of the conceptual land-use zoning map, except for the six zones previously identified as problematic;
- No growth from 2023 – 2030 in the zone around the M7 Junction 10;
- Reduced growth in the zones along the Millennium Park Road (from 2023 – 2030); and
- Reduced growth in the Cemex/Donnelly Mirrors Site (from 2023 – 2030).

This is illustrated in Figure 4.19. Reduced growth may entail either a reduction in the scale of development or a change in land use purpose with a lower trip generation. The jobs numbers used in the analysis for the alternative growth scenarios are presented in Table 4.1 and Table 4.2. These numbers illustrate that even with reduced growth, there is still significant employment in the zones along the Millennium Park Road and in the Cemex/Donnelly Mirrors Site.

Future Growth in these areas will be tightly managed and will be assessed having regard to:

1. Specific land use proposals and associated trip generation;
2. Improvements and/or proposals to the road network and/or junction capacity;
3. Detailed Traffic Management Plans; and
4. Impact on the national road infrastructure, having regard to the Department's National Planning Policy Guidelines, No. 21 Spatial Planning and National Roads.

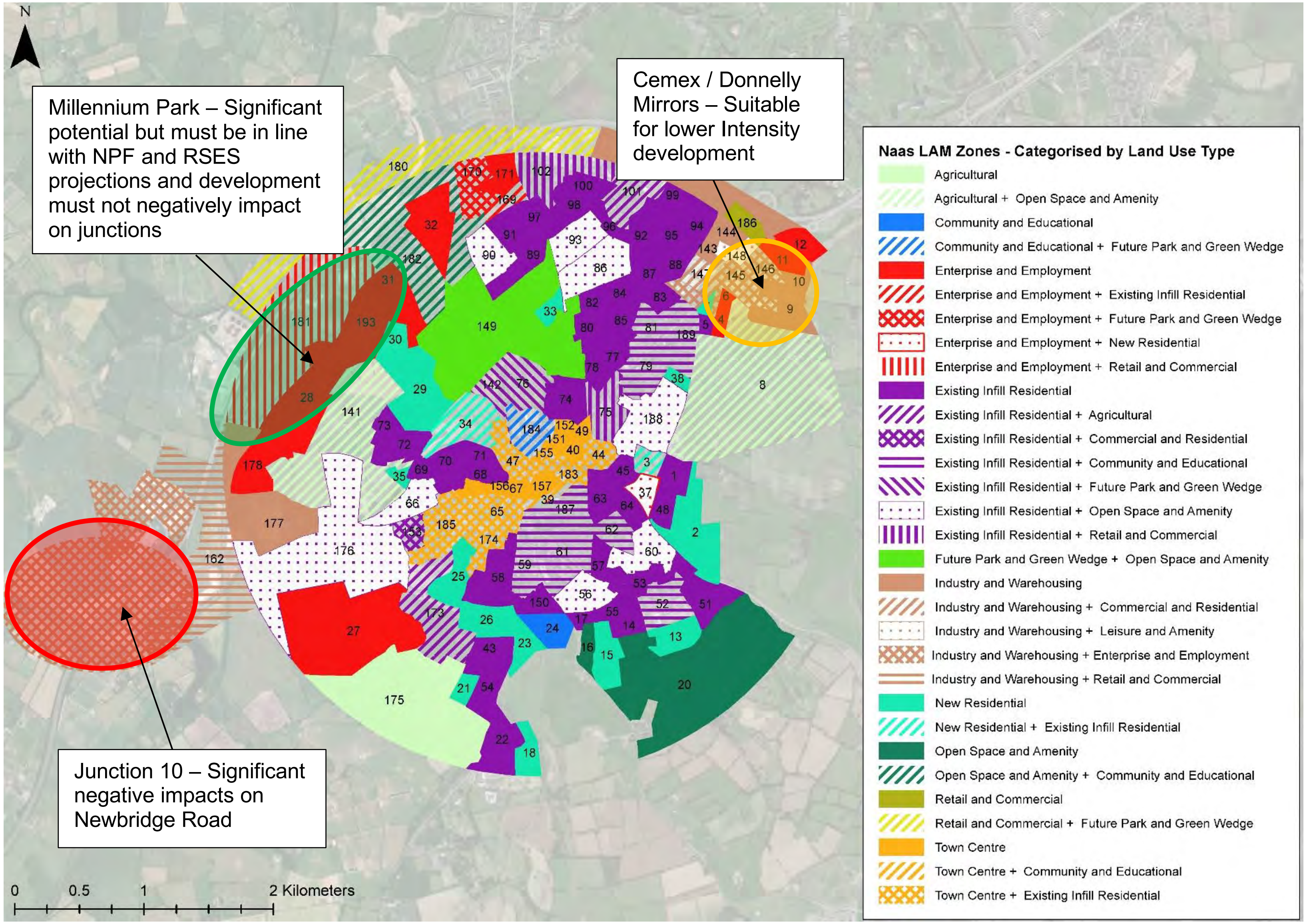


Figure 4.19 2030 Recommended Land-Use Scenario

4.9 Additional Land-use Scenario Testing

Upon the analysis of the results outlined in the previous sub-sections, KCC requested the assessment of four additional land-use scenarios. The objective of the assessment was to compare the preferred land-use scenario identified previously against three alternative scenarios which were developed to aid with the decision-making for the preferred location of a potential new, low trip intensity development in Naas. The four new land-use scenarios were as follows:

1. Preferred Land-use Scenario (outlined in section 4.8);
2. Scenario 1 – Low trip intensity development around M7 Junction 10) and job numbers constrained to 206, with Alternative Scenario B job numbers in the Millennium Park and Cemex / Donnelly Mirrors Zones);
3. Scenario 2 - Low trip intensity development in the Cemex / Donnelly Mirrors Zones with job numbers constrained to 206 in addition to another 100 jobs, Millennium Park with Alternative Scenario B job numbers and the balance of jobs that were allocated to the Cemex / Donnelly Mirrors Zones under Alternative Scenario B and no growth in zone around the M7 Junction 10 from 2023 – 2030); and
4. Scenario 3 - Low trip intensity development located at Millennium Park, with job allocation for this area the same as Alternative Scenario B plus 206 additional jobs, 0% growth in the zone around the M7 Junction 10 between 2023 – 2030 and 50% growth at the Donnelly Mirrors / Cemex site between 2023 – 2030).

The queue length figures (Figure 4.20) show that the impact of locating the low trip intensity development at any of the three sites, has a similar impact on the road network around Naas. There are some differences between the different scenarios, but they are subtle. Importantly, none of the options have a better/worse impact on the junctions of the M7 (9, 9A and 10) when the 206 extra jobs from the new development are added. As such, the question of where to locate the low trip intensity development becomes more of a policy question. The key consideration being that the location of the development should not conflict with the core principles of compact growth and sustainable travel.

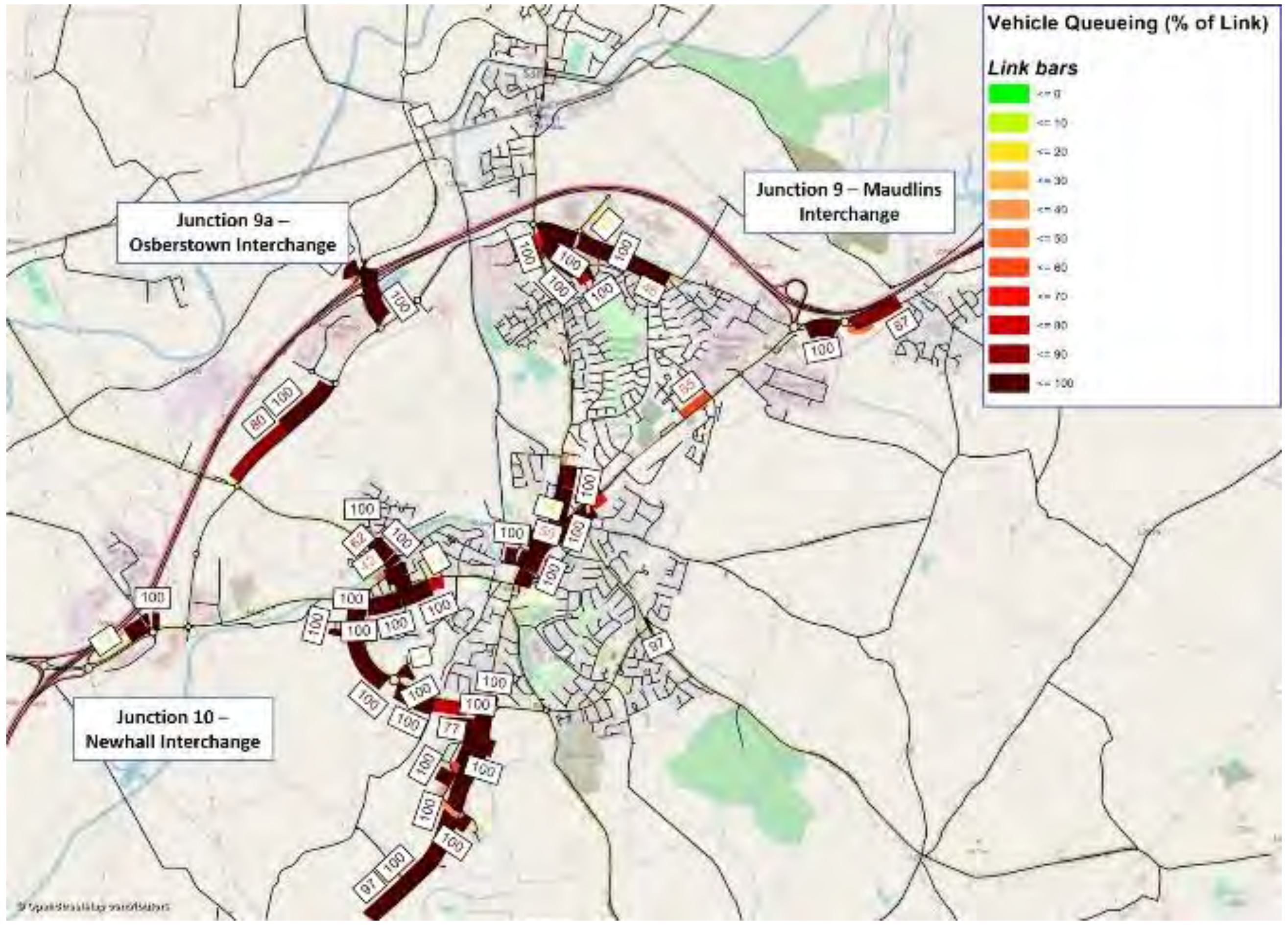
Scenario 1: Although this option does not impact very negatively on the local road network and junctions of the M7 - development around the M7 Junction 10 is the least desirable option on both planning and traffic grounds, being contrary to the overall objective of encouraging town centre growth, accommodating a trans-modal shift to public transport and protection of the capacity of the M7 and it's interchanges. Locating the low trip intensity development around the M7 Junction 10 risks further development in this area and a degradation of traffic conditions around Junction 10.

Scenario 2: The placement of the low trip intensity development at the Cemex/Donnelly Mirrors site would generate traffic during the construction phase but would contribute a lower longer term level of traffic in that area once complete. While the development of this area is never ideal, in traffic terms, the brownfield site must be redeveloped when viewed from a planning perspective. Then the development on the combined site would seem to be a possible development solution with redevelopment involving a low longer term traffic level. In order to improve the aesthetics of this redevelopment on a key site travelling into Naas, the office jobs (which were included in the traffic modelling) could be housed in an architecturally pleasing office building to the front of the site, with the other development obscured. This mixed-use development would also aid in making the site more economically viable to redevelop.

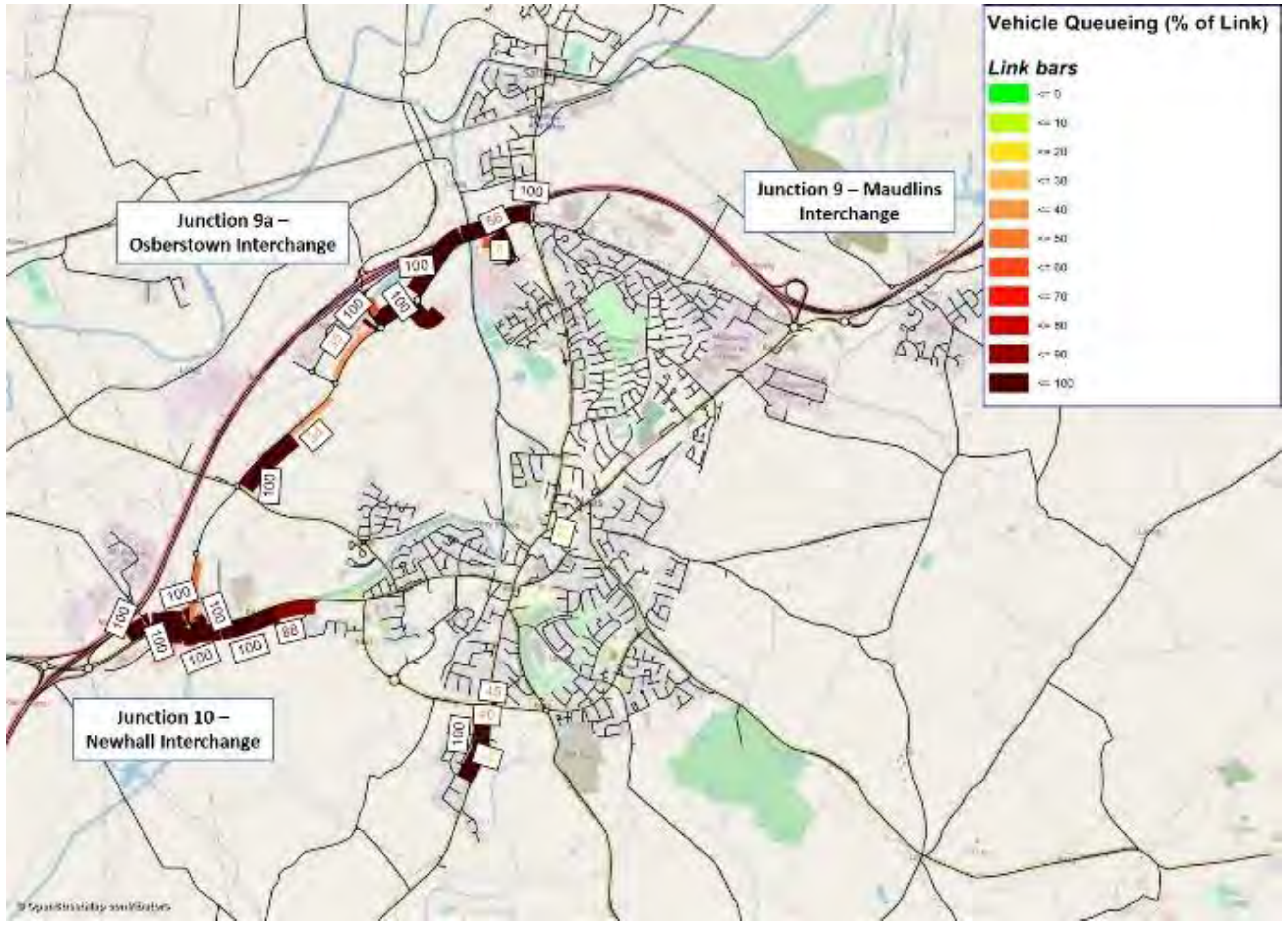
Scenario 3: The placement of the low trip intensity development on the Millennium Park lands between the ring road (new R445) and the M7 motorway, just south-west of the Kerry site/ Volvo site, has a similar impact as the other two sites on traffic at the interchanges and generally throughout the town as Naas grows. However, in order to maintain the potential of this area, the jobs displaced by the development (which would necessarily have a large footprint) would have to be accommodated in the remainder of the lands by increasing the height of the buildings.

Appendix C presents all of the different land-use scenario in terms of their additional job allocation and changes in traffic between 2023 and 2030.

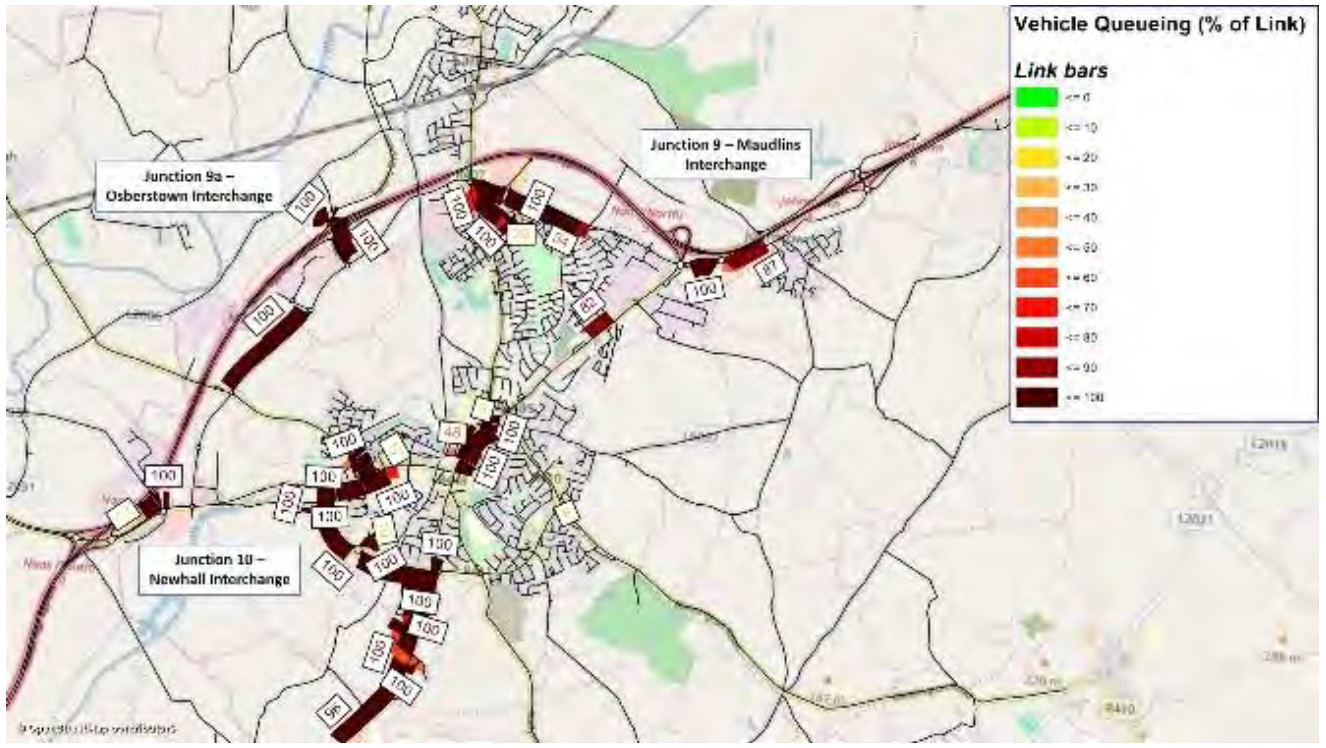
2030 AM Preferred



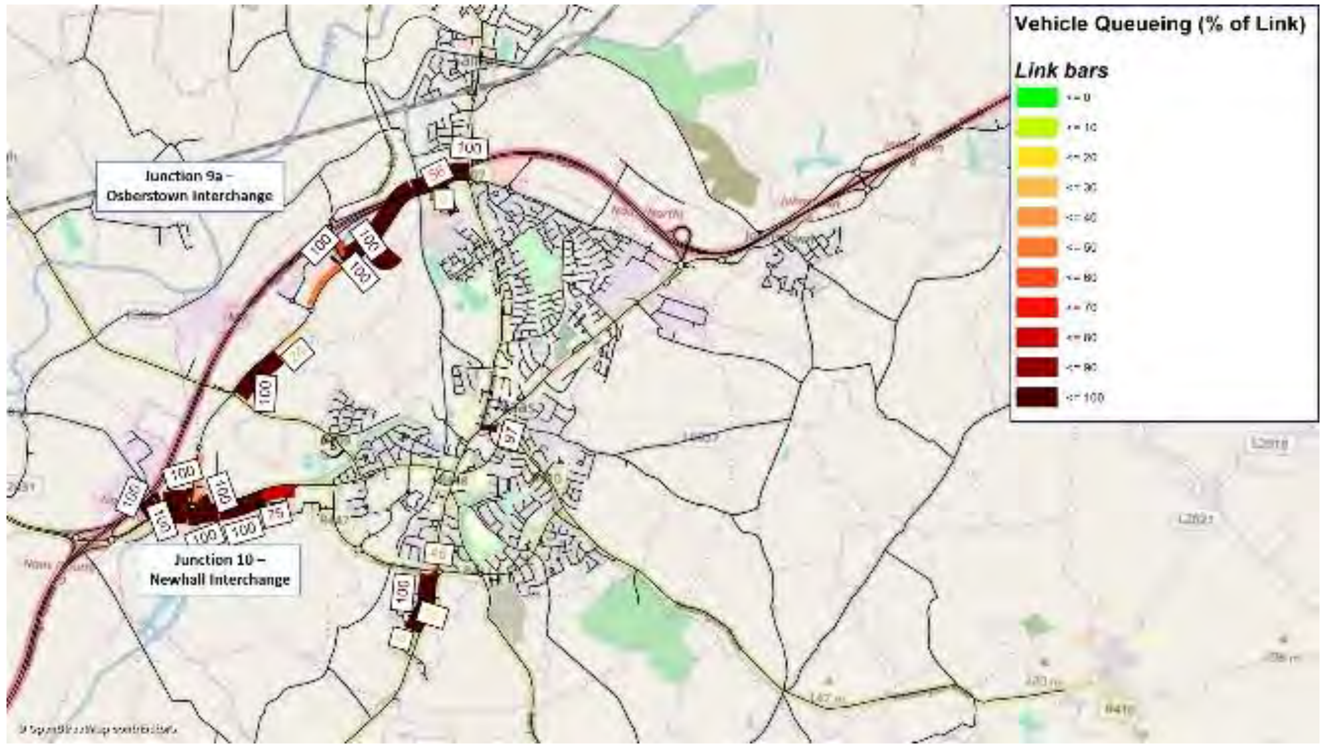
2030 AM Preferred



2030 AM Low Trip Intensity Development 1



2030 PM Low Trip Intensity Development 1



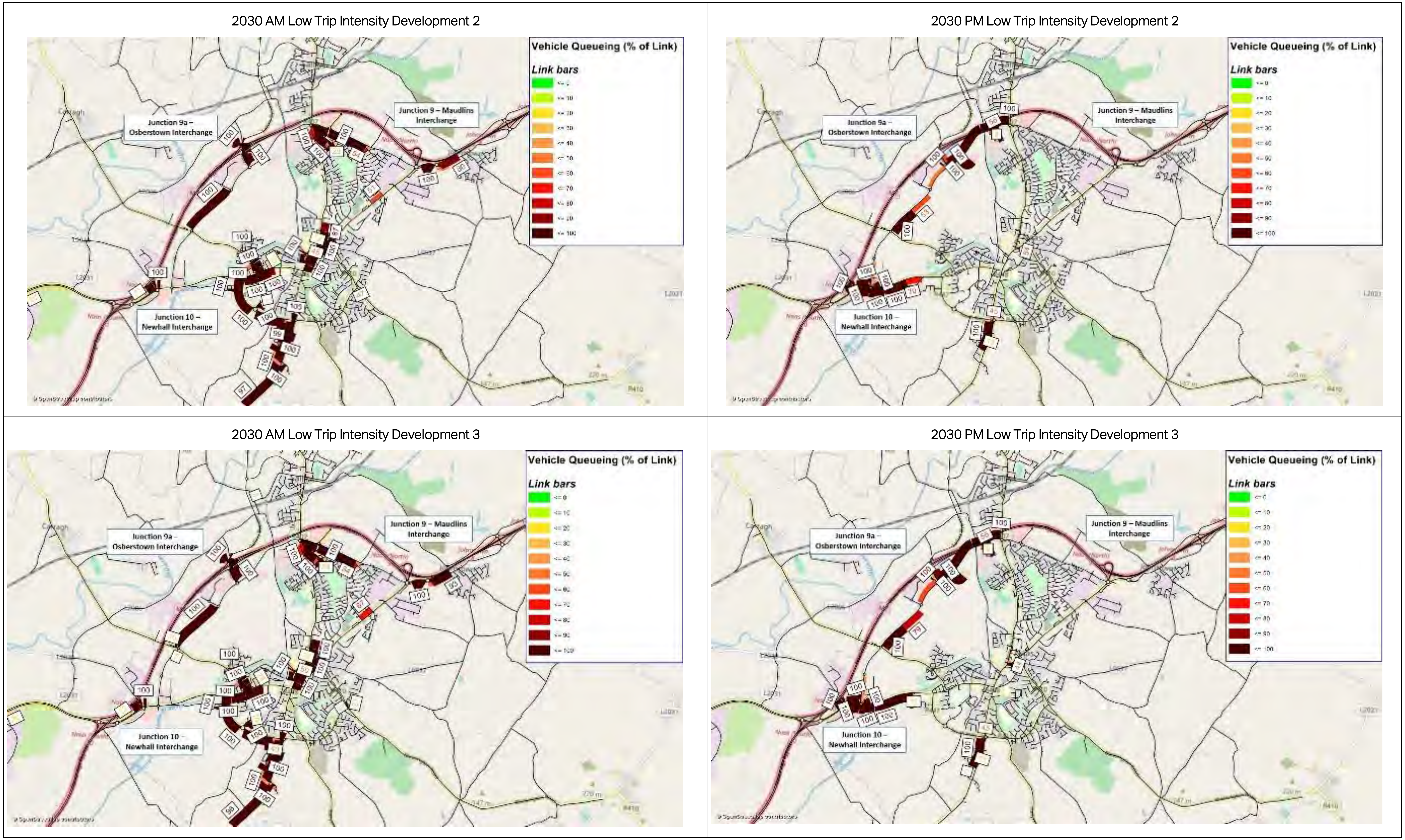


Figure 4.20: Low Trip Intensity Development Options - Queue Lengths

Appendix A: Difference Plots

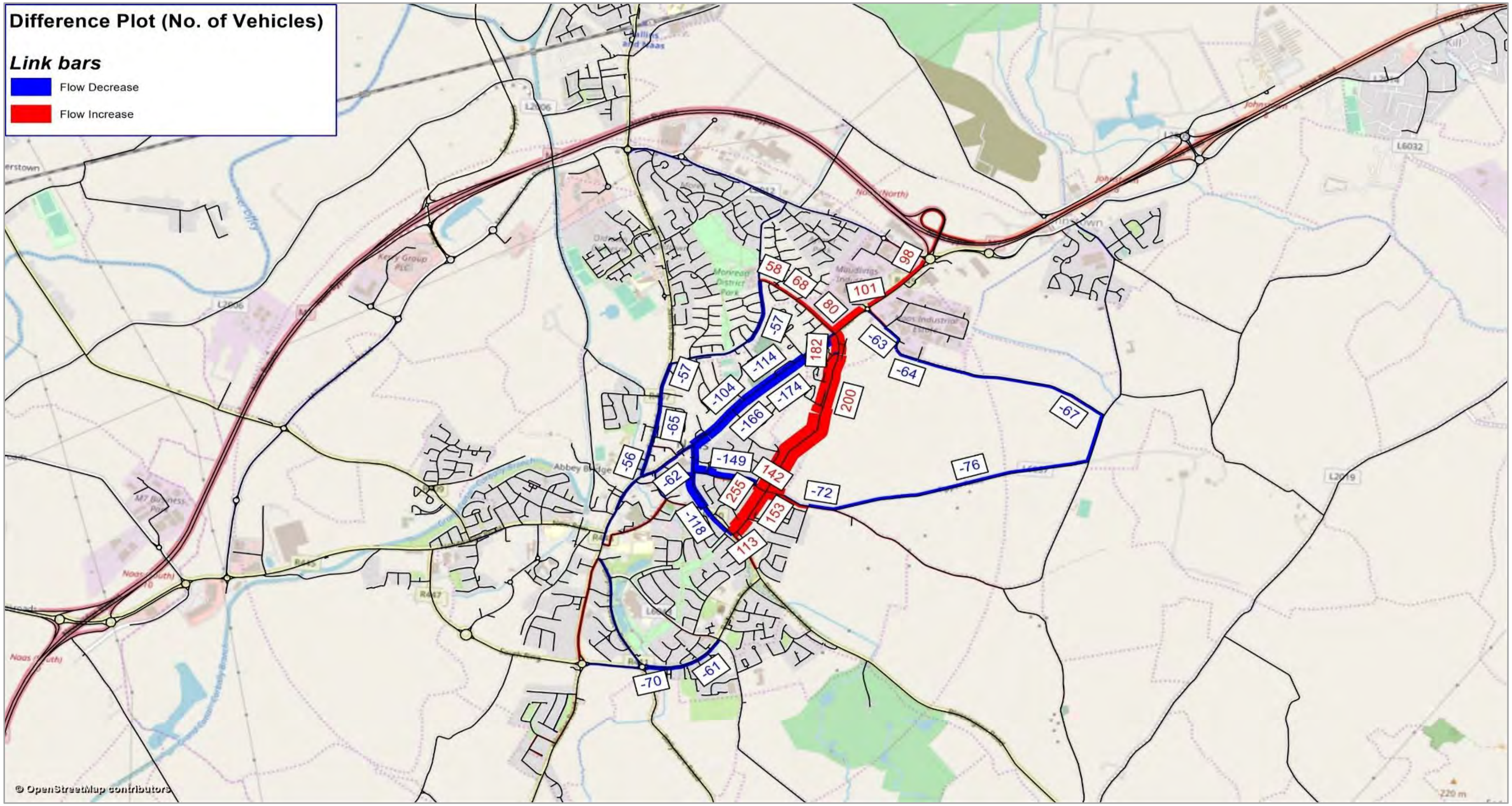


Figure A-1: 2023 AM Option 1 Difference Plot

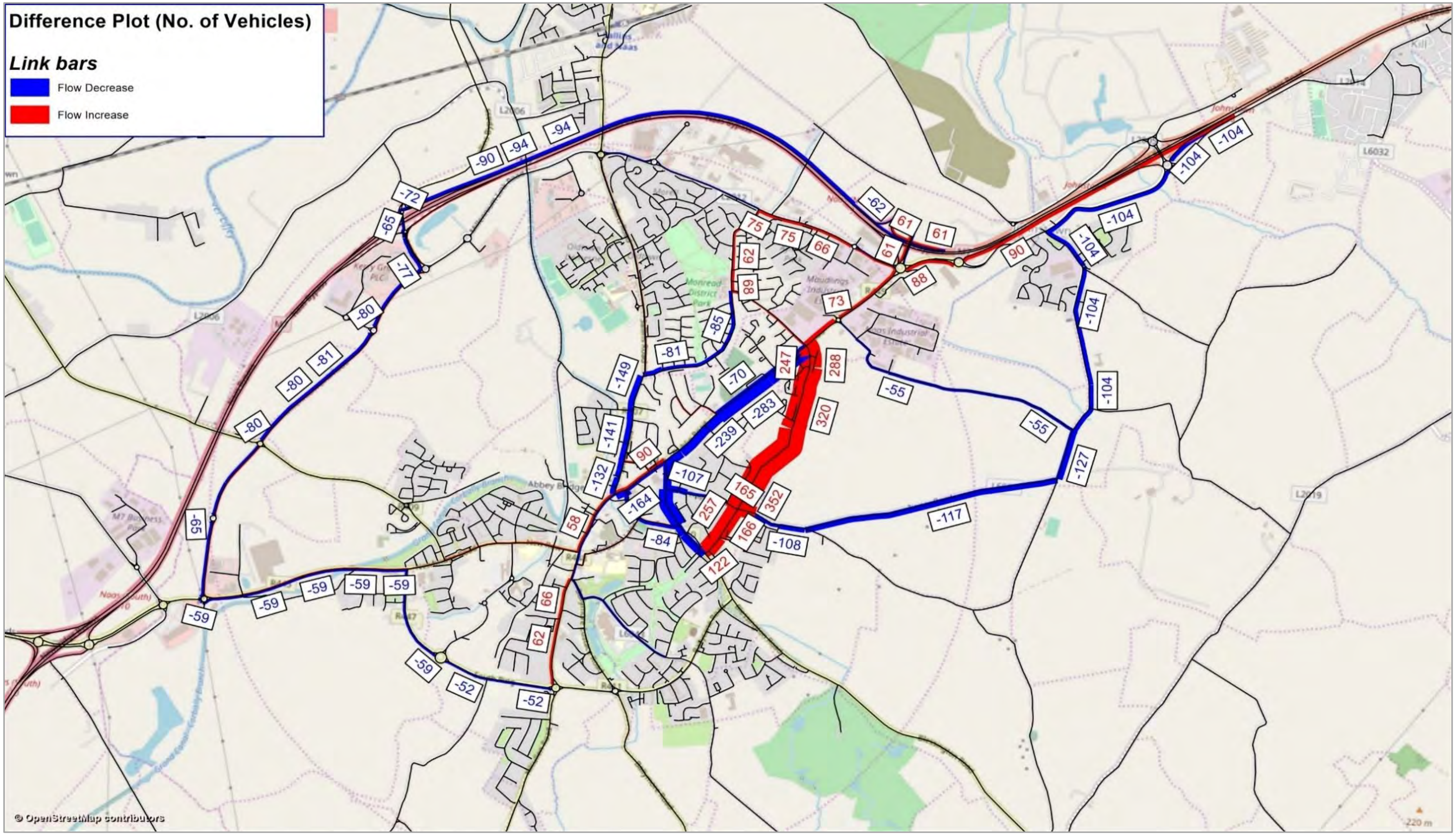


Figure A-2: 2023 PM Option 1 Difference Plot

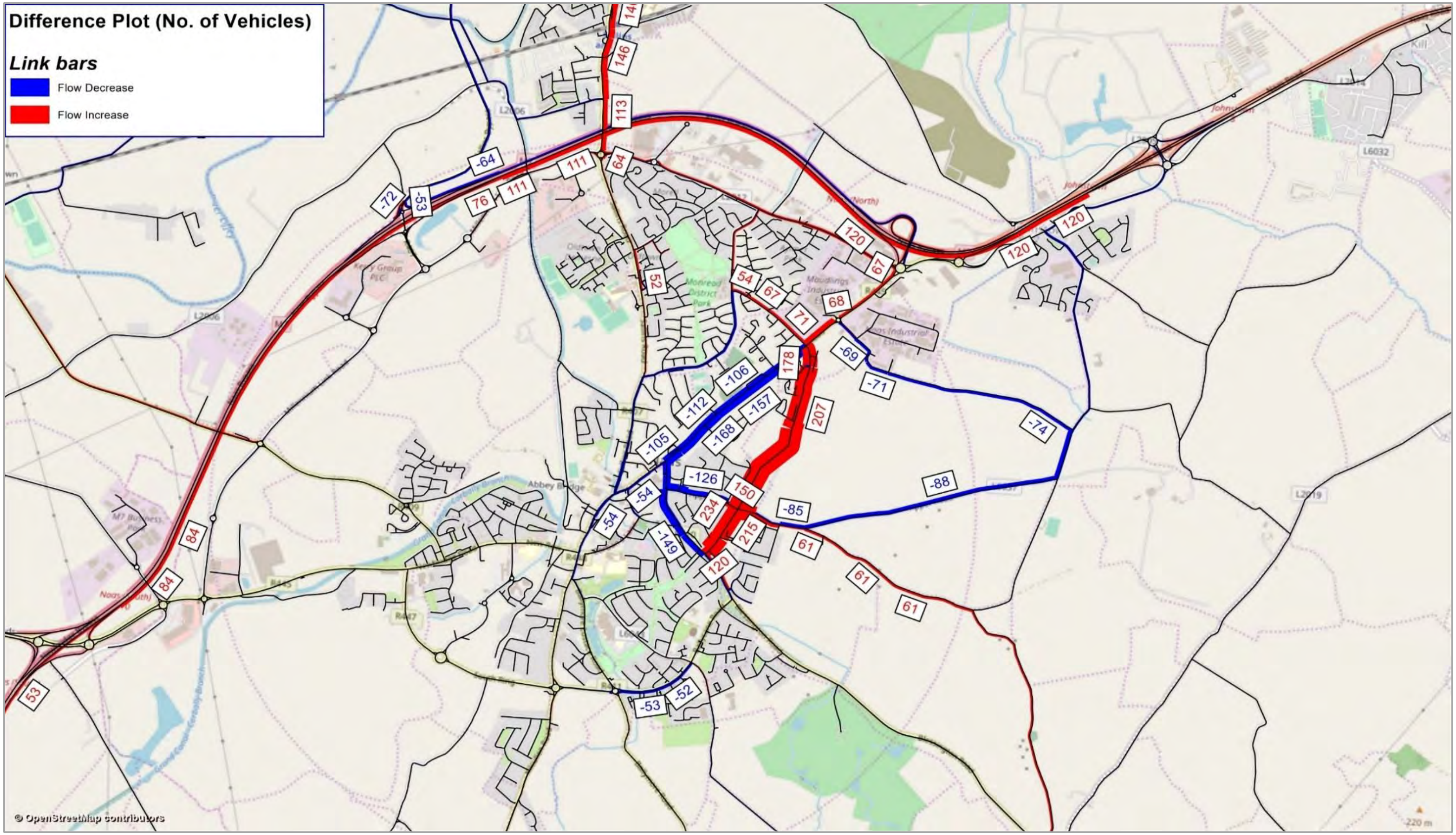


Figure A-3: 2030 AM Option 1 Difference Plot

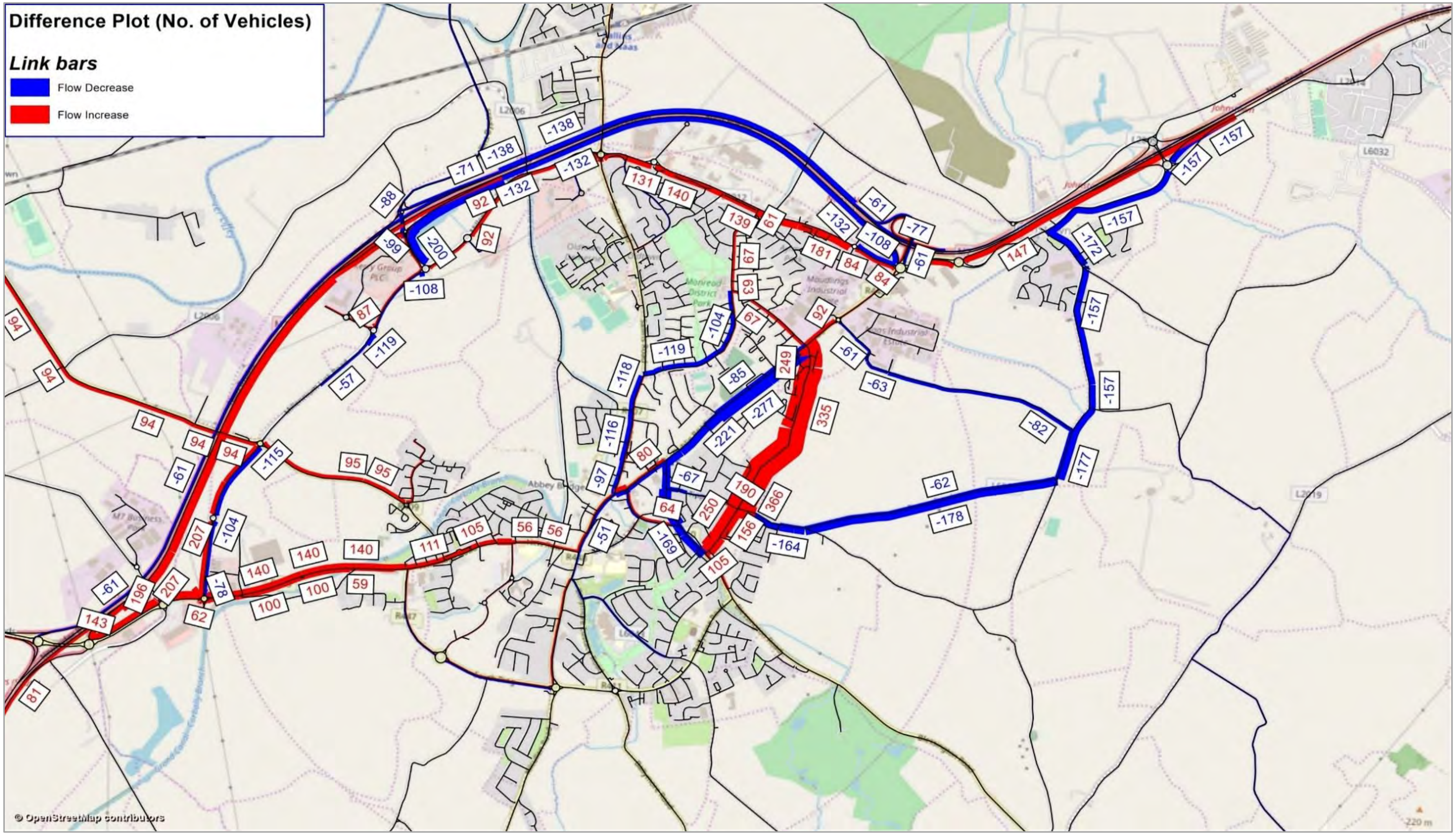


Figure A-4: 2030 PM Option 1 Difference Plot

Figure A-5: 2023 AM Option 1 (Alt) Difference Plot

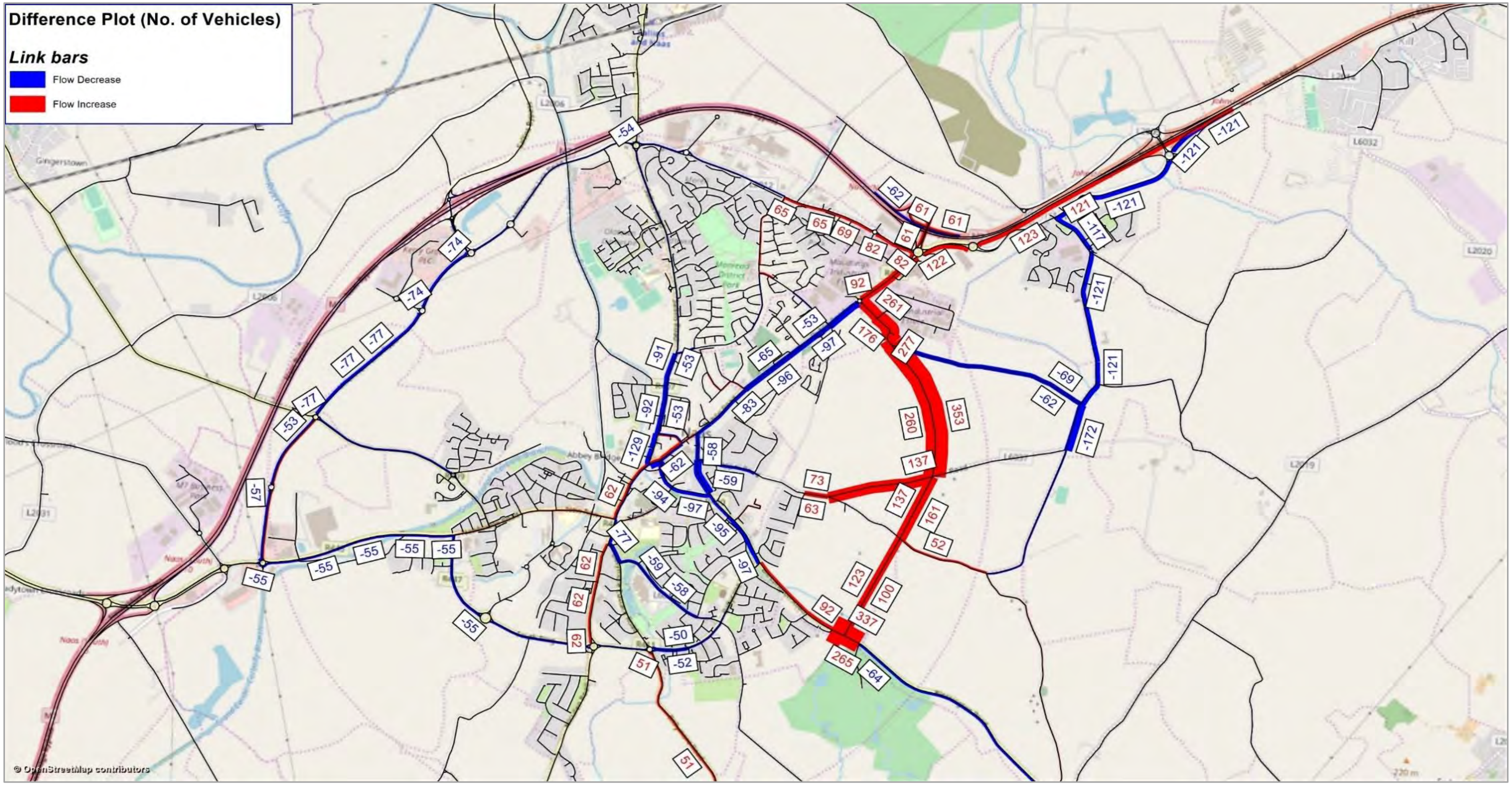


Figure A-6: 2023 PM Option 1 (Alt) Difference Plot

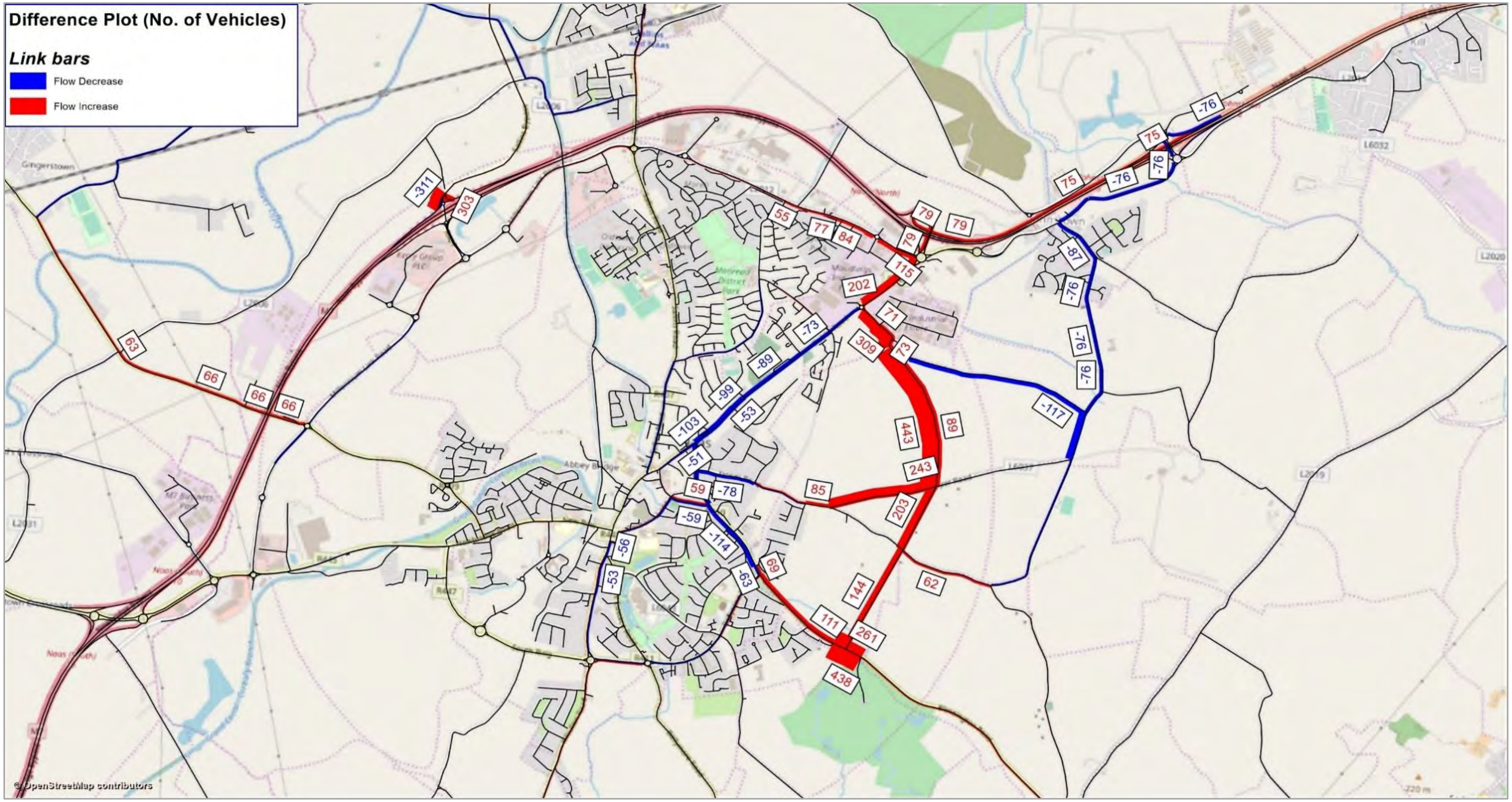


Figure A-7: 2030 AM Option 1 (Alt) Difference Plot

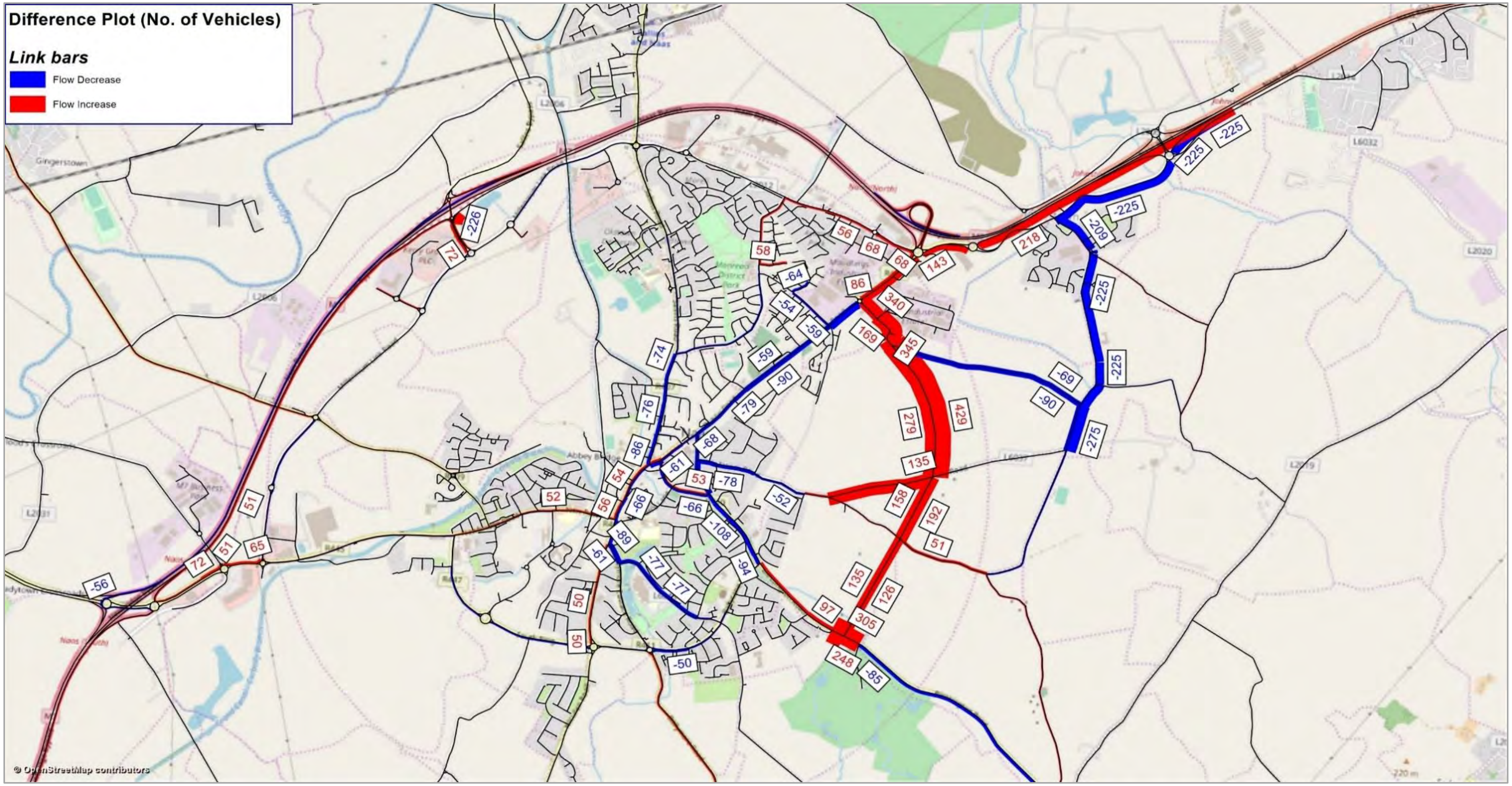


Figure A-8: 2030 PM Option 1 (Alt) Difference Plot

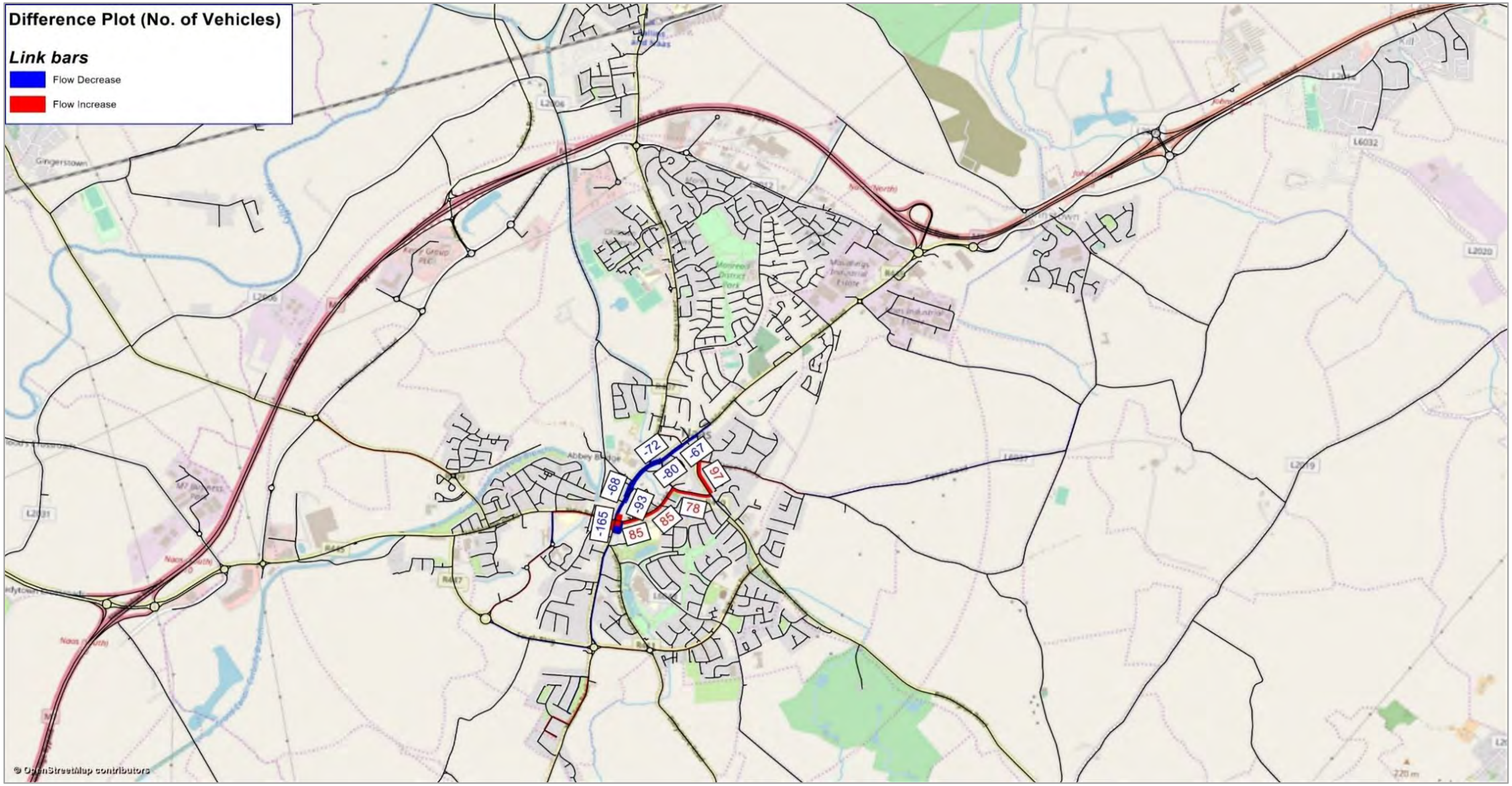


Figure A-9: 2023 AM Option 2 Difference Plot

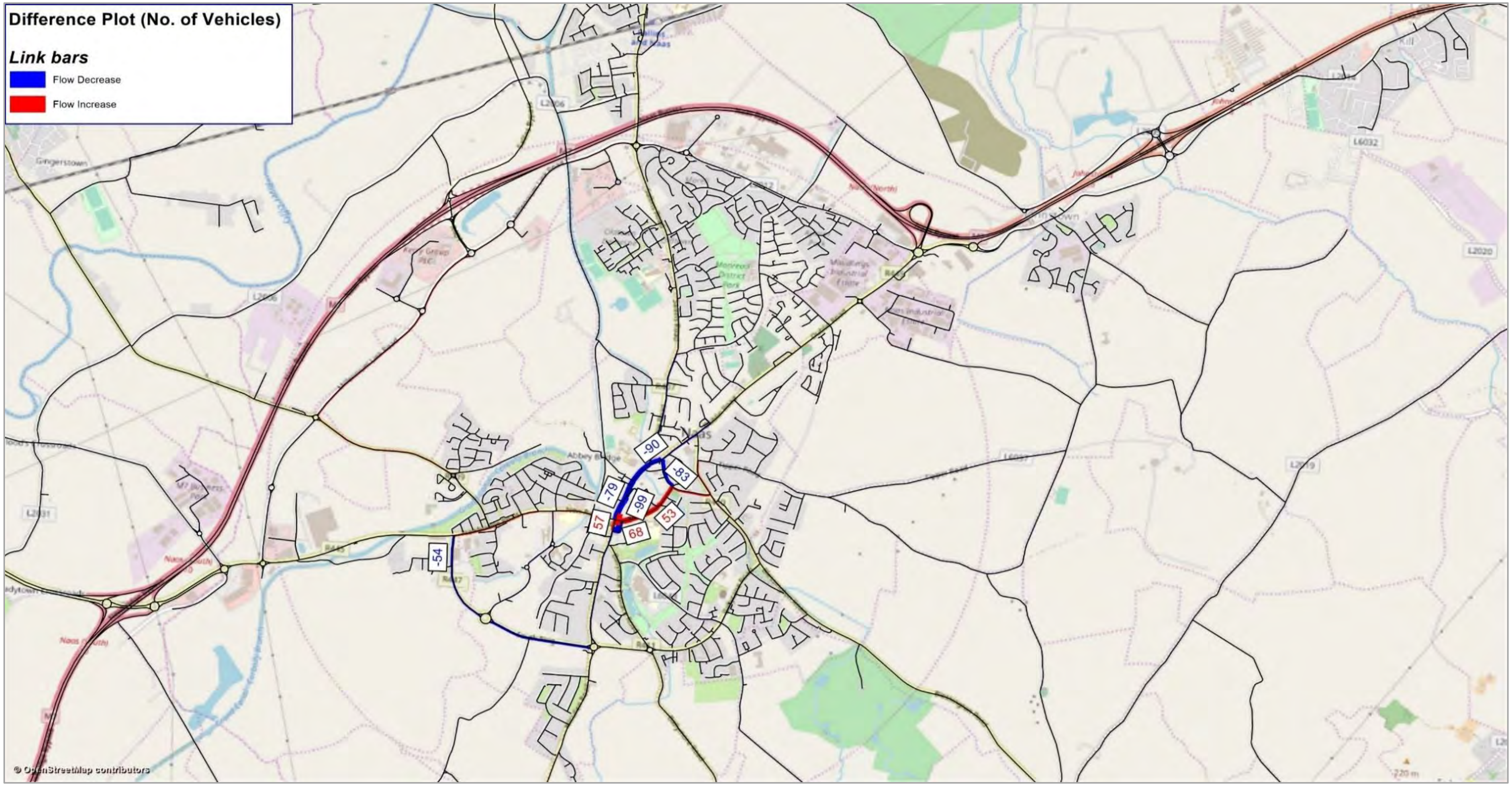


Figure A-10: 2023 PM Option 2 Difference Plot

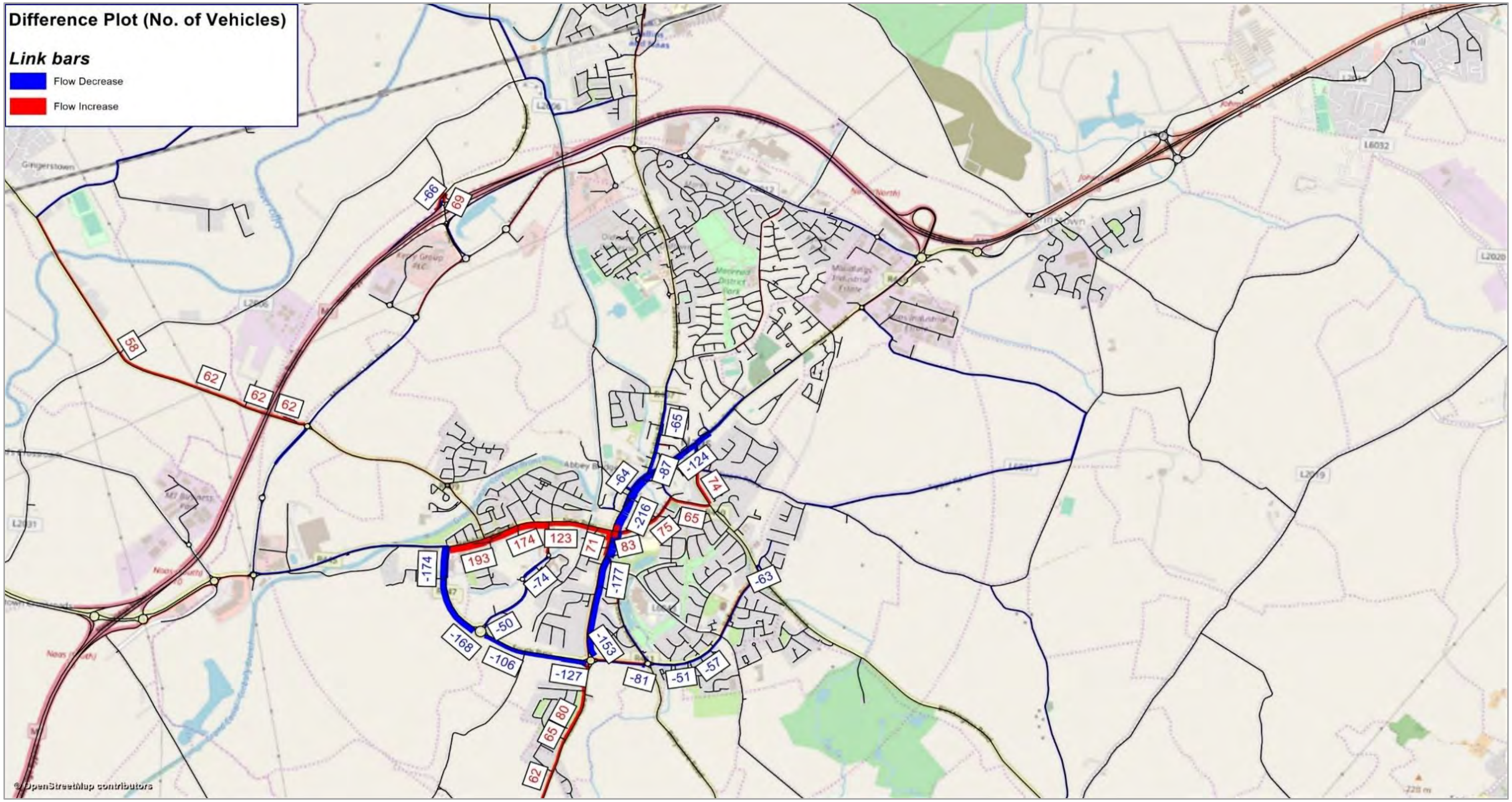


Figure A-11: 2030 AM Option 2 Difference Plot

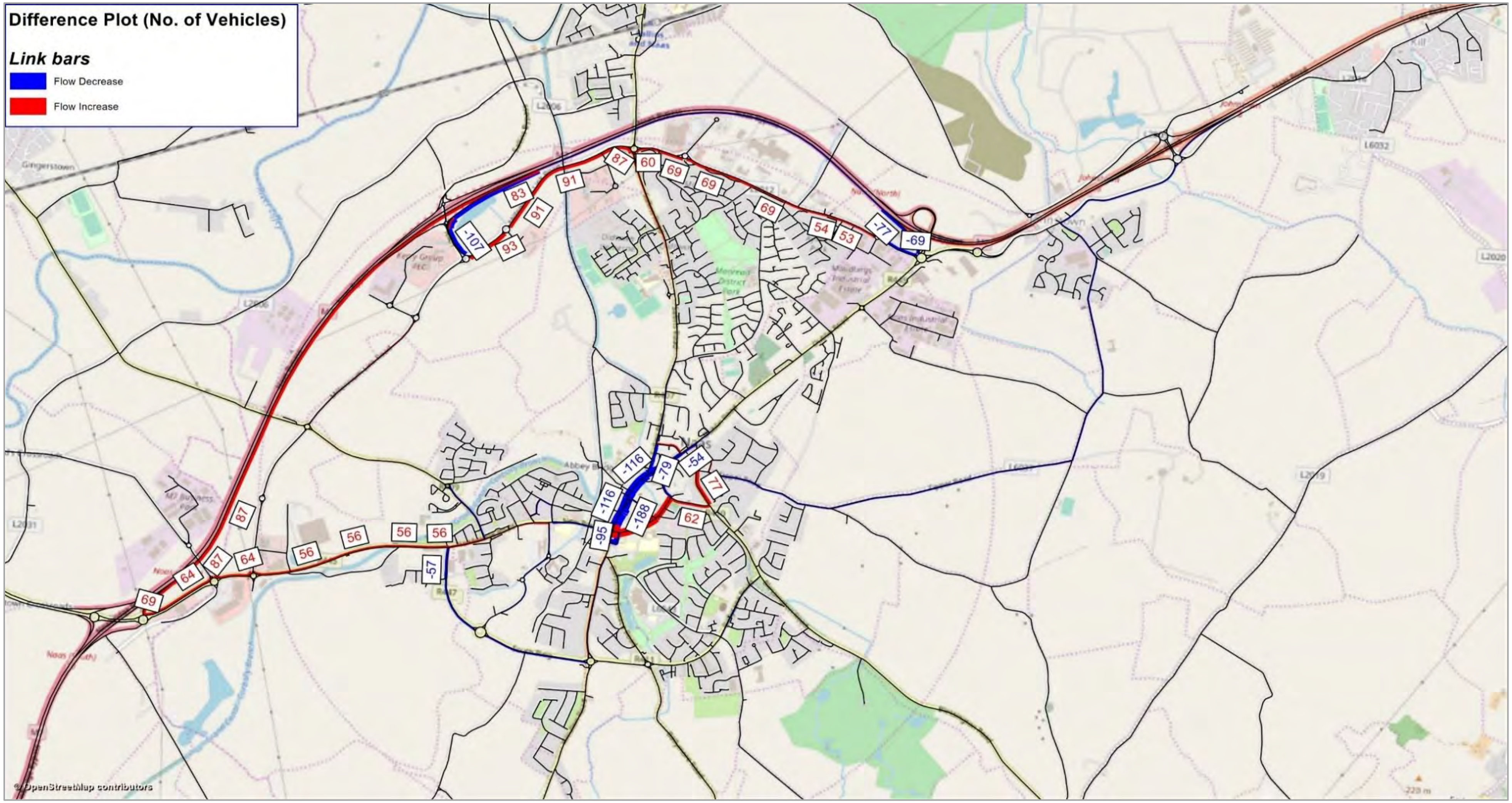


Figure A-12: 2030 PM Option 2 Difference Plot

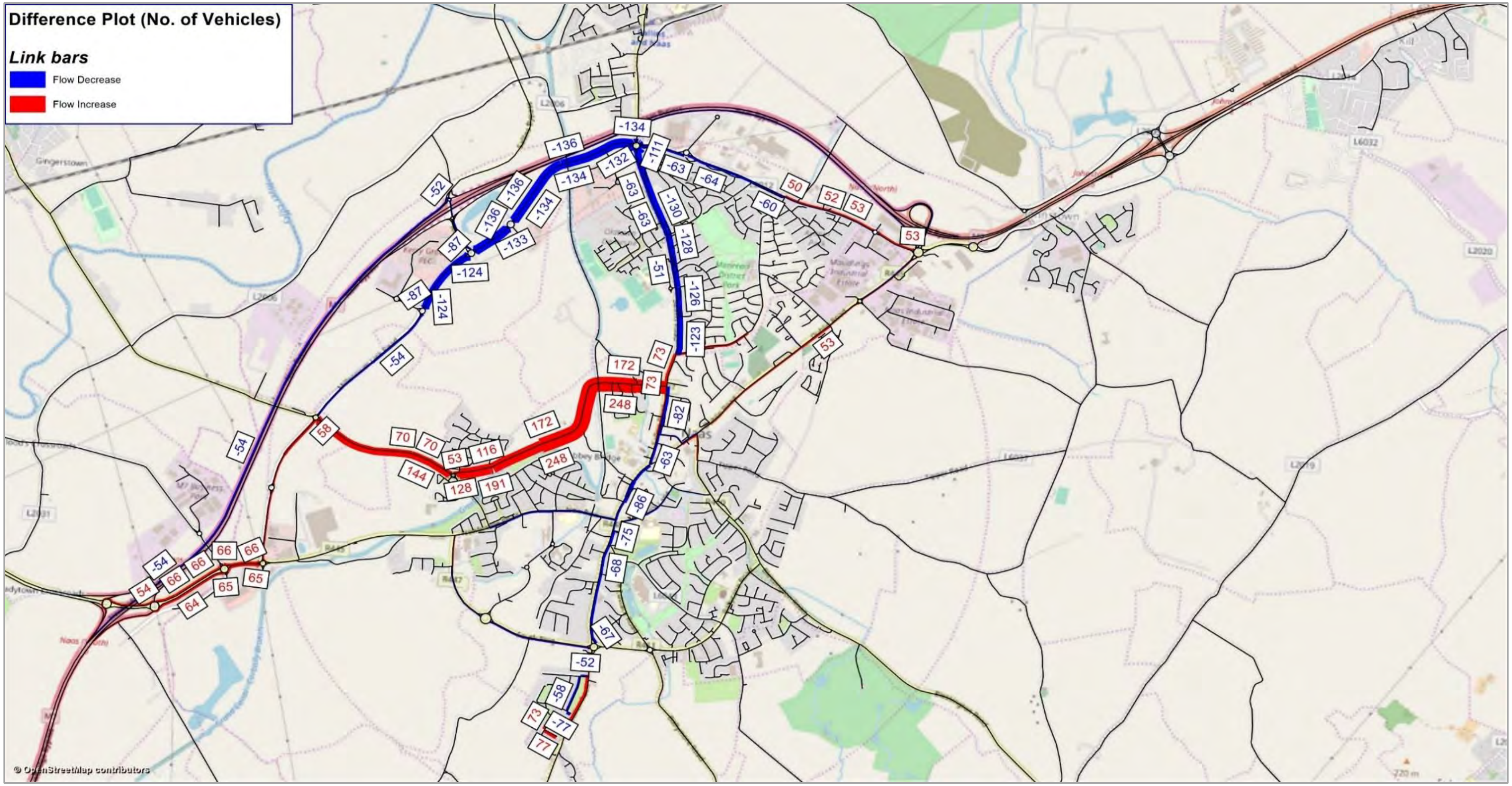


Figure A-13: 2023 AM Option 3 Difference Plot

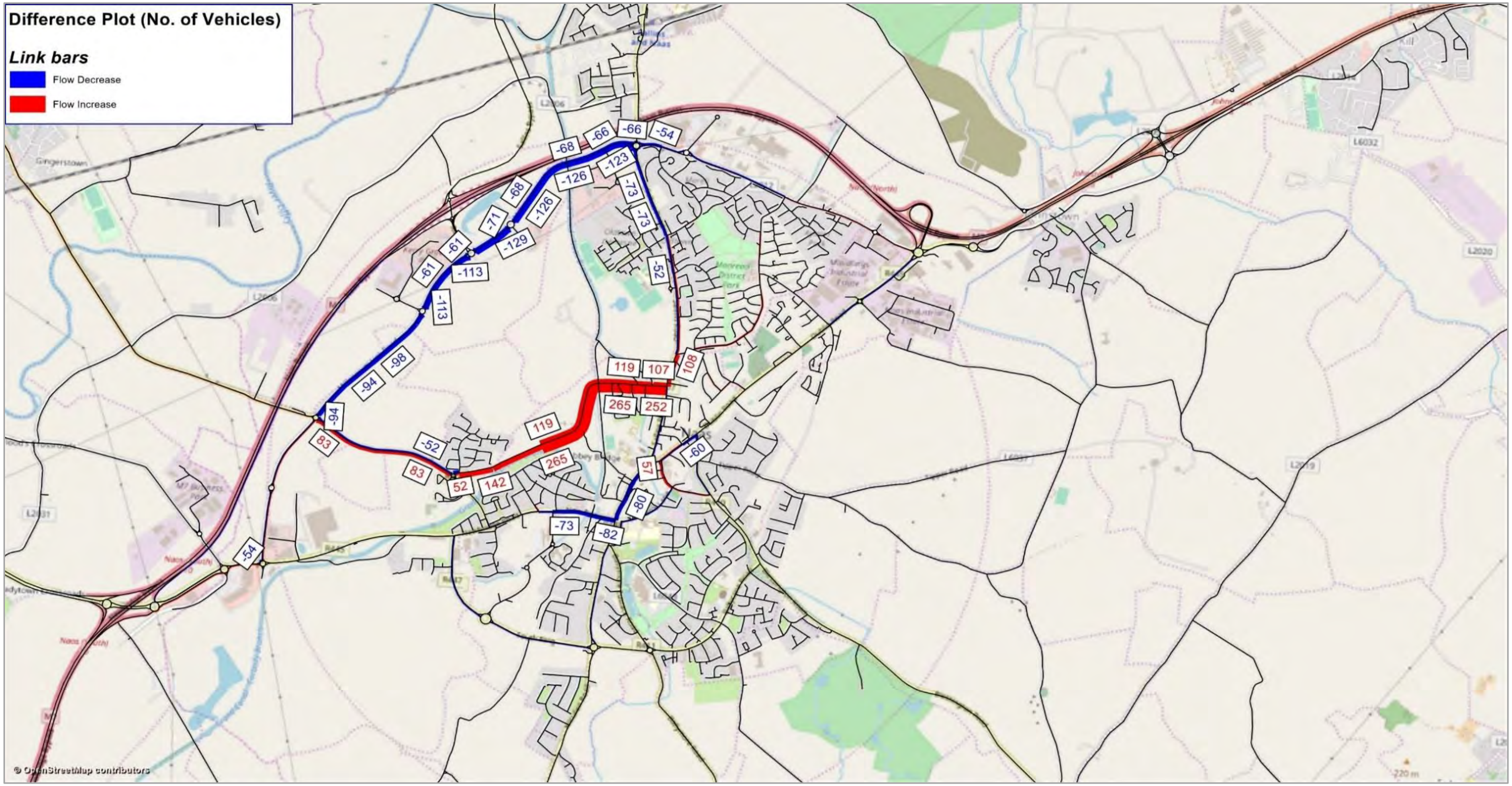


Figure A-14: 2023 PM Option 3 Difference Plot

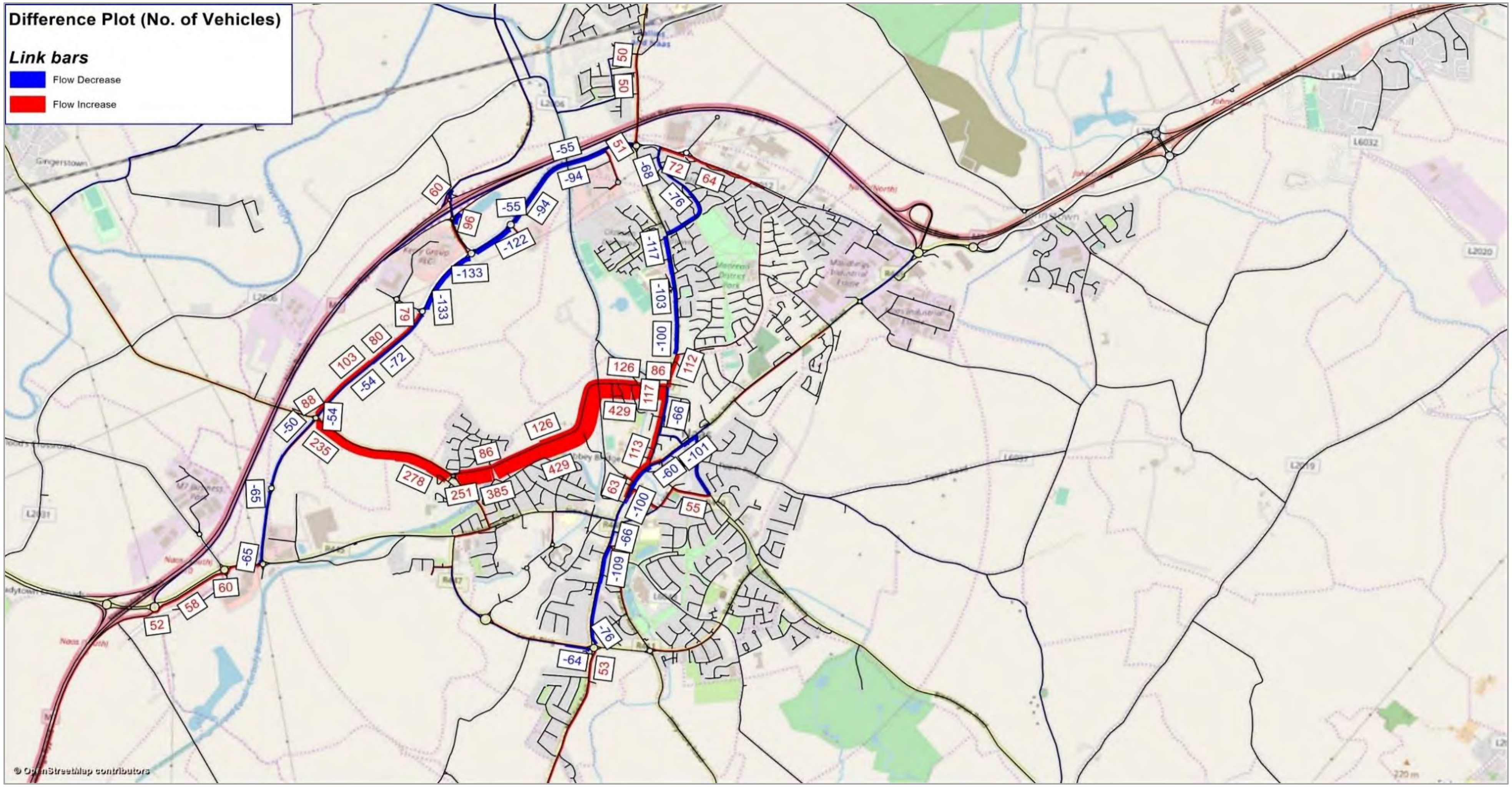


Figure A-15: 2030 AM Option 3 Difference Plot

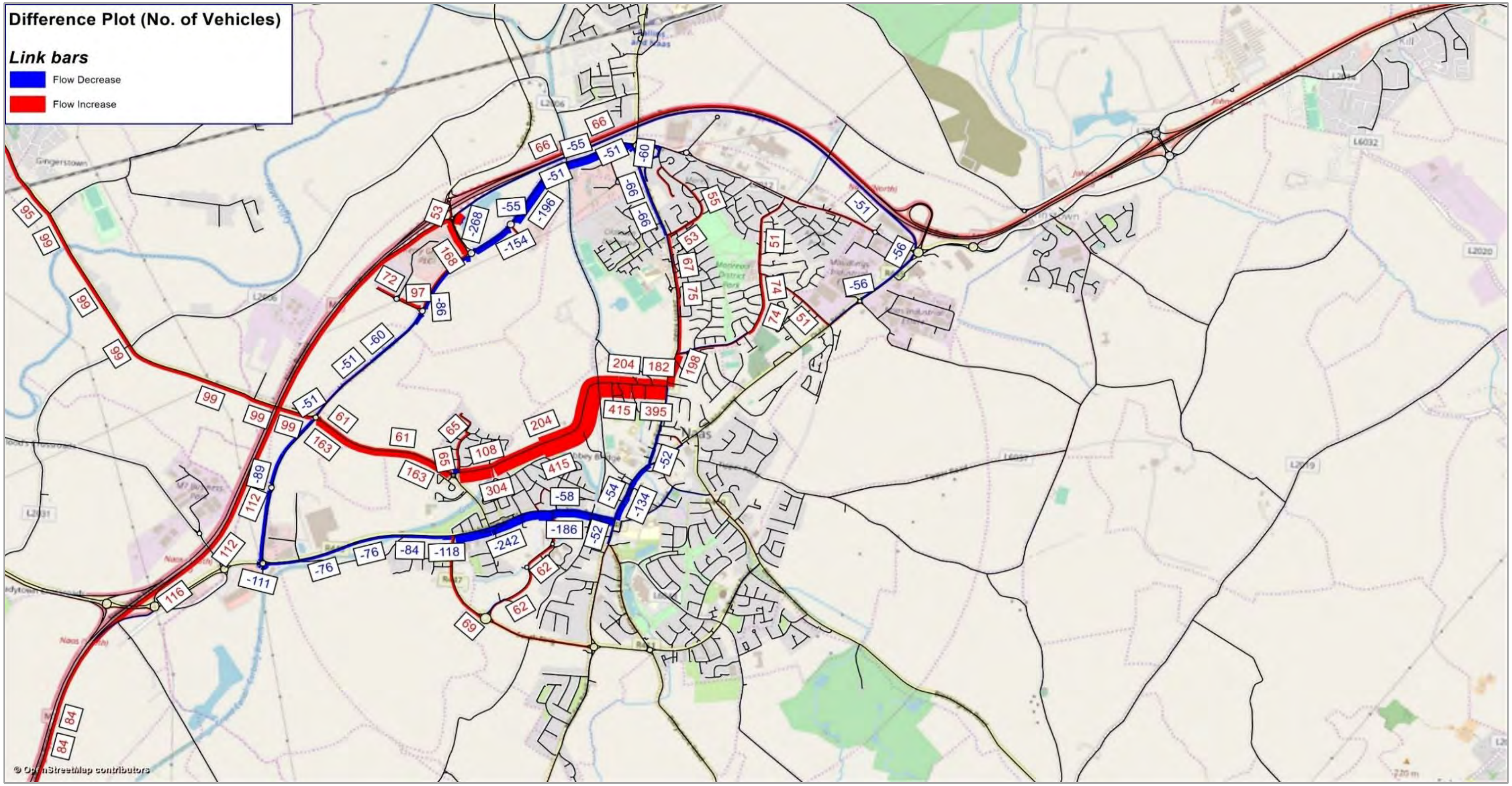


Figure A-16: 2030 PM Option 3 Difference Plot

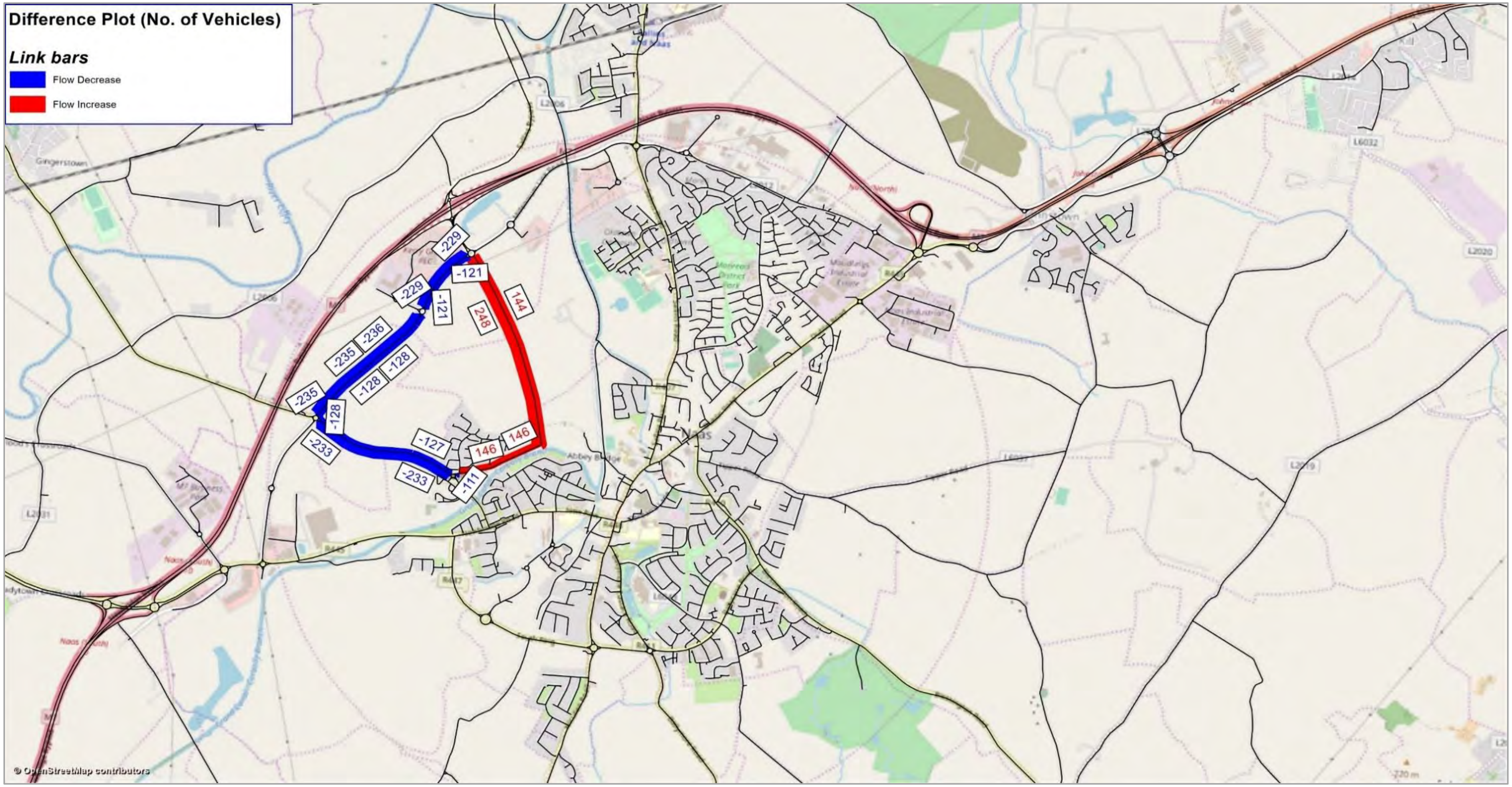


Figure A-17: 2023 AM Option 5 Difference Plot

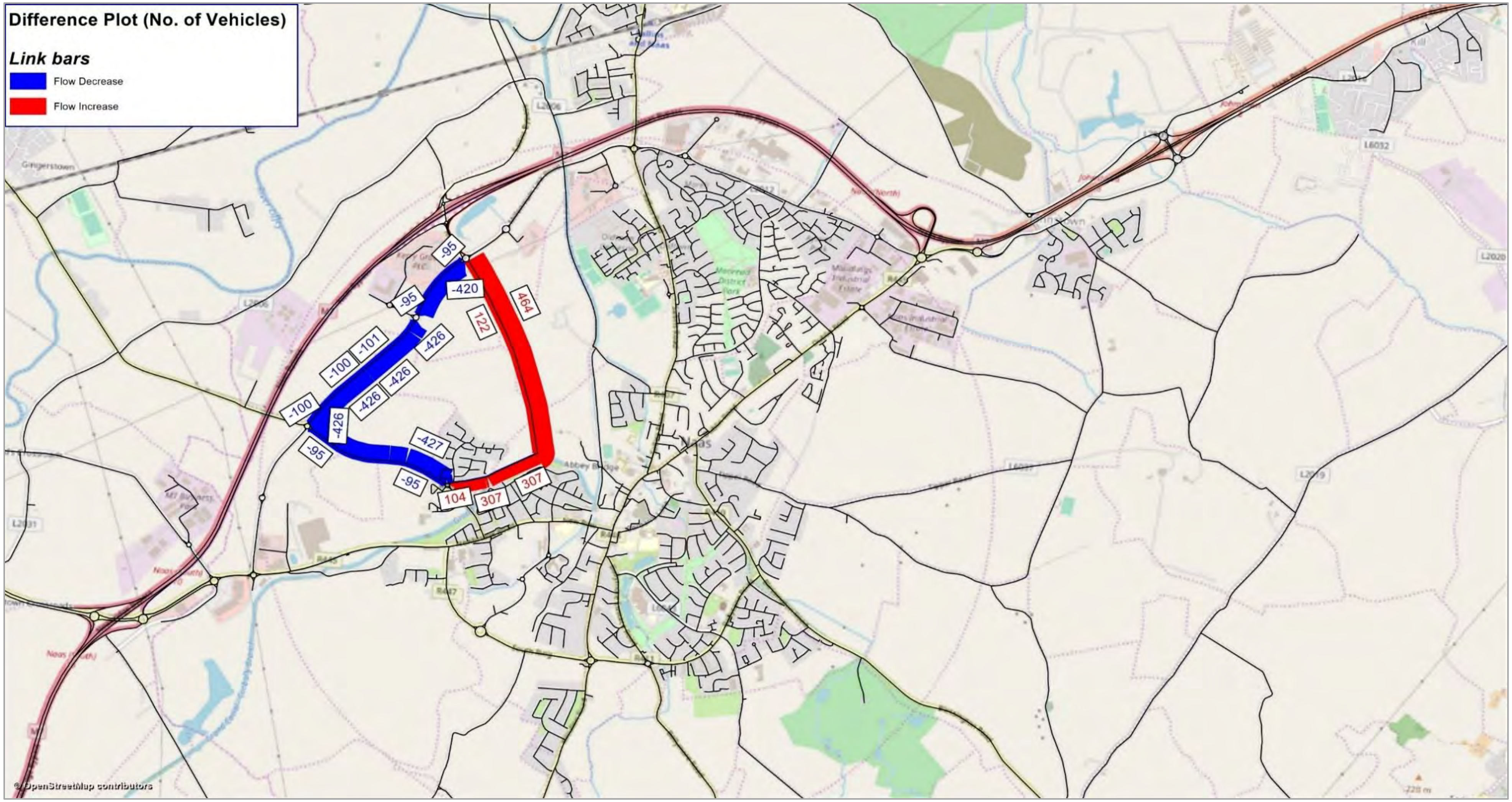


Figure A-18: 2023 PM Option 5 Difference Plot

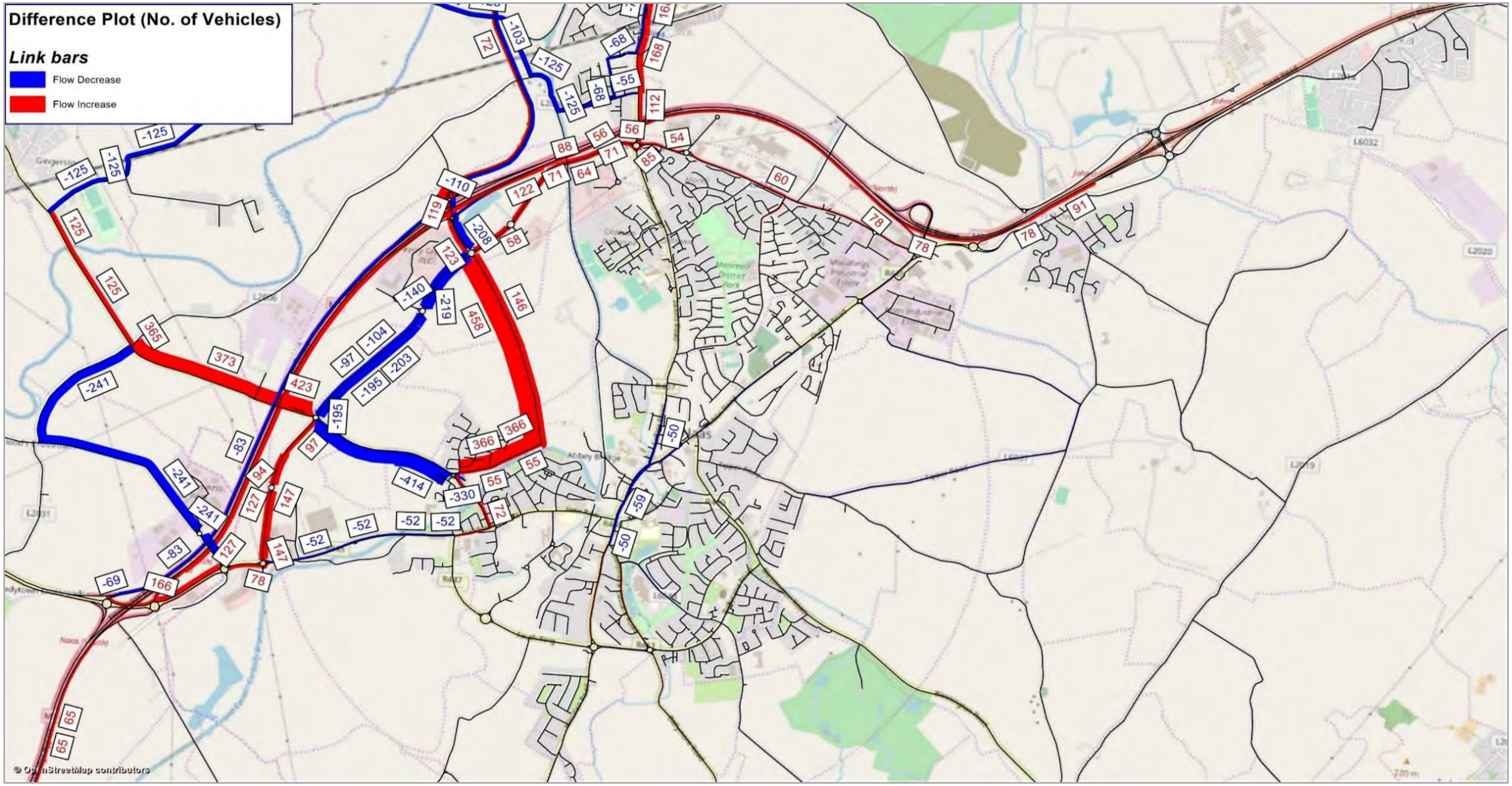


Figure A-19: 2030 AM Option 5 Difference Plot

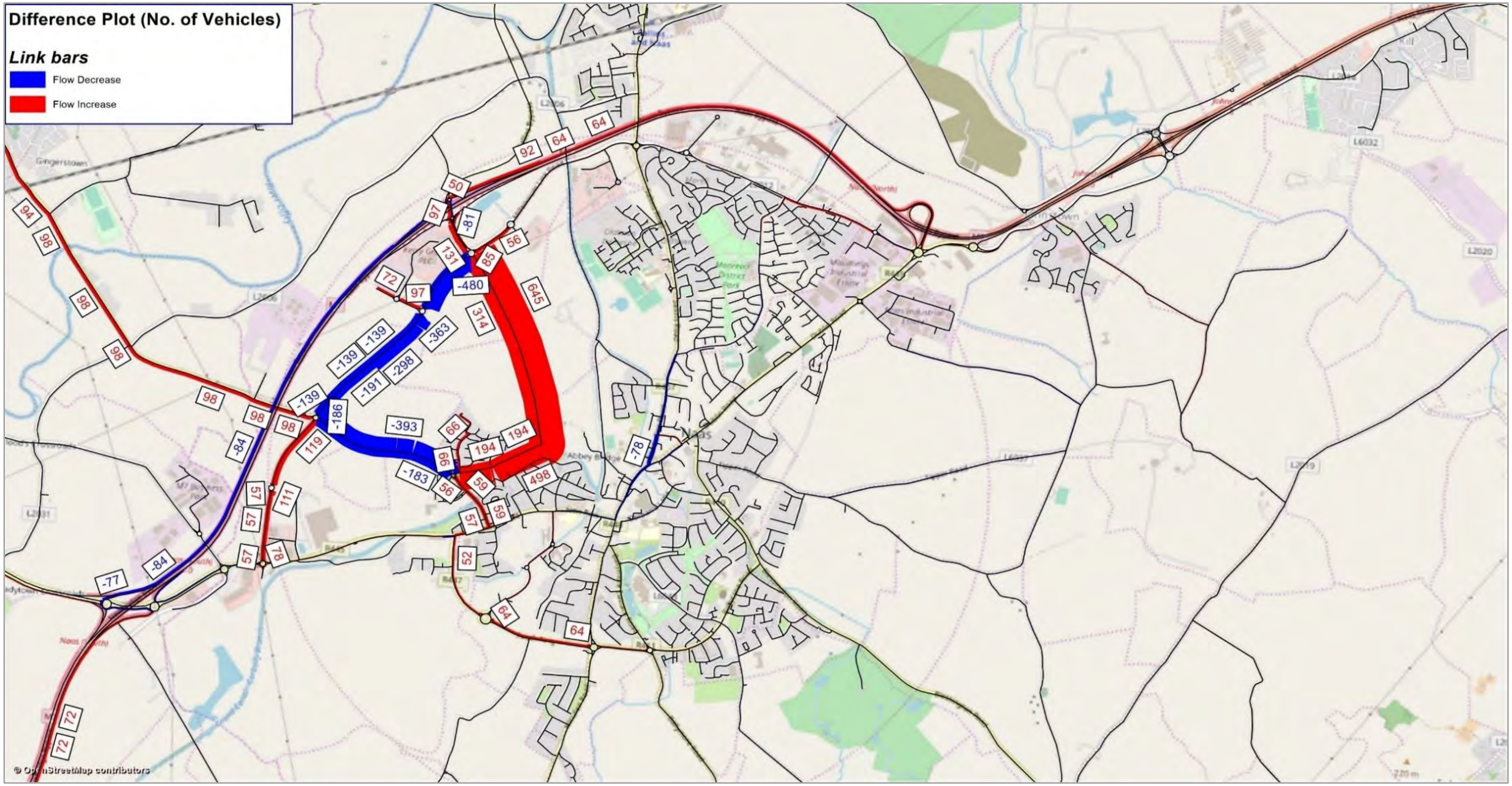


Figure A-20: 2030 PM Option 5 Difference Plot

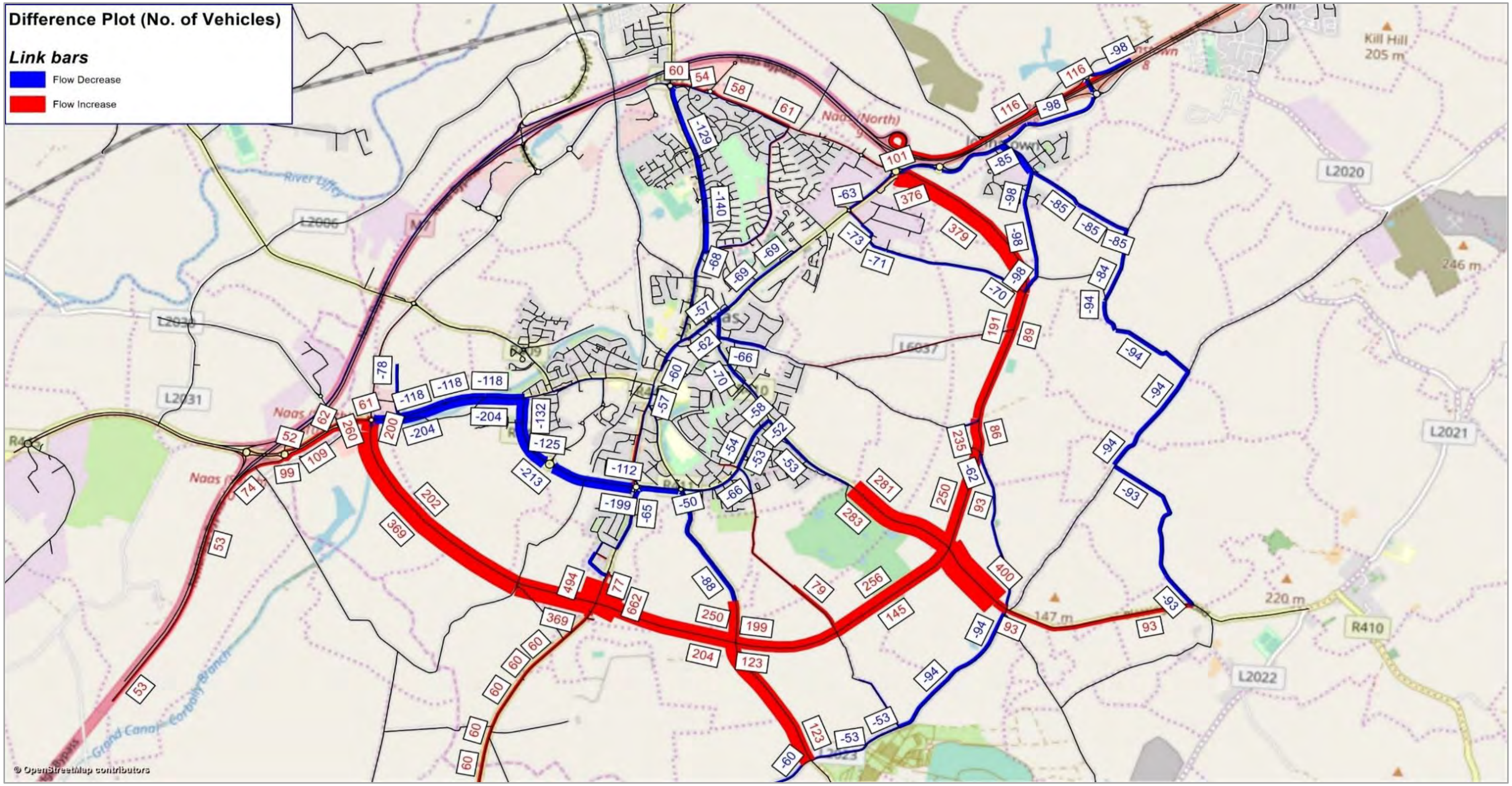


Figure A-21: 2023 AM Option 6 Difference Plot

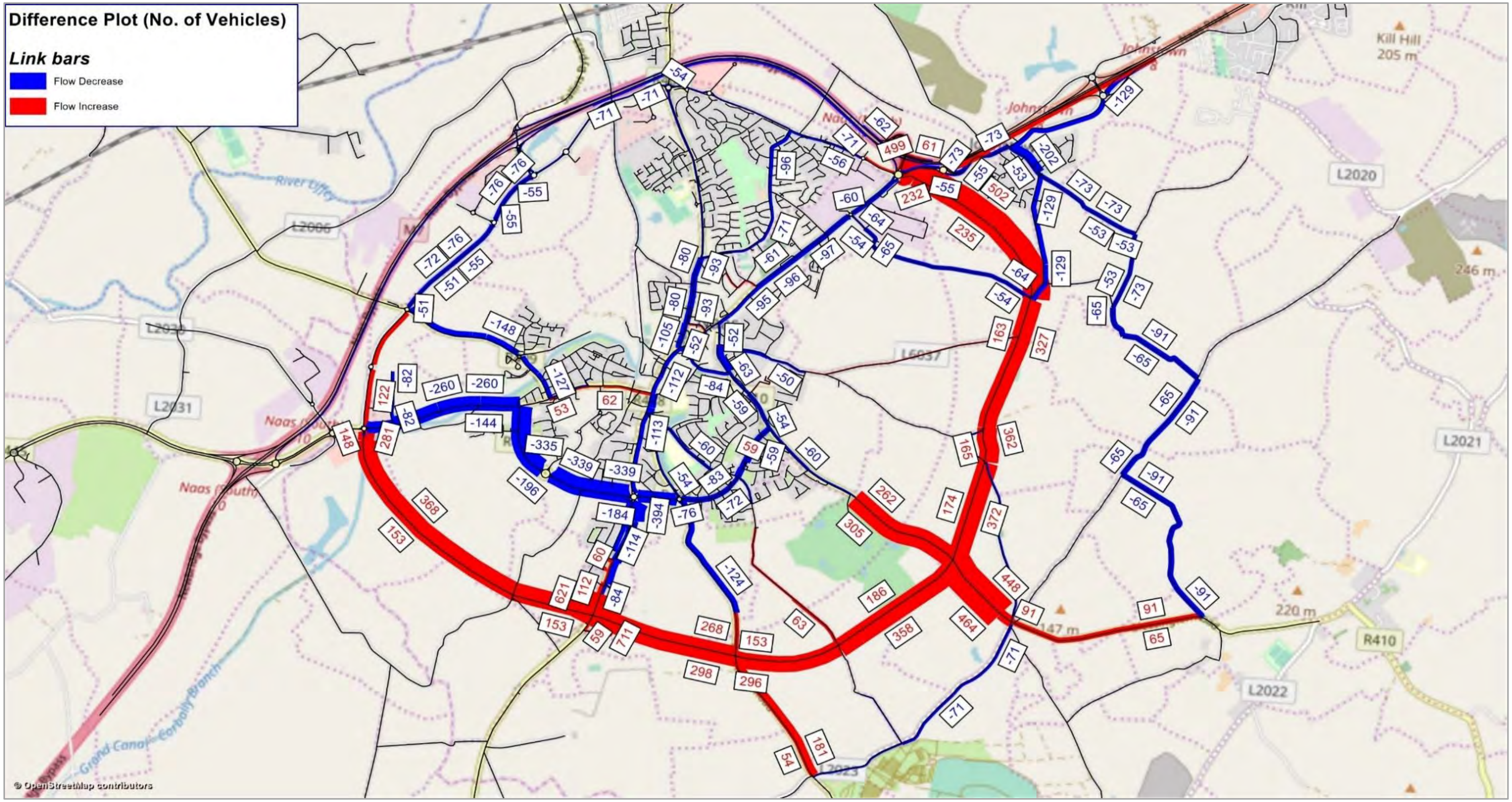


Figure A-22: 2023 PM Option 6 Difference Plot

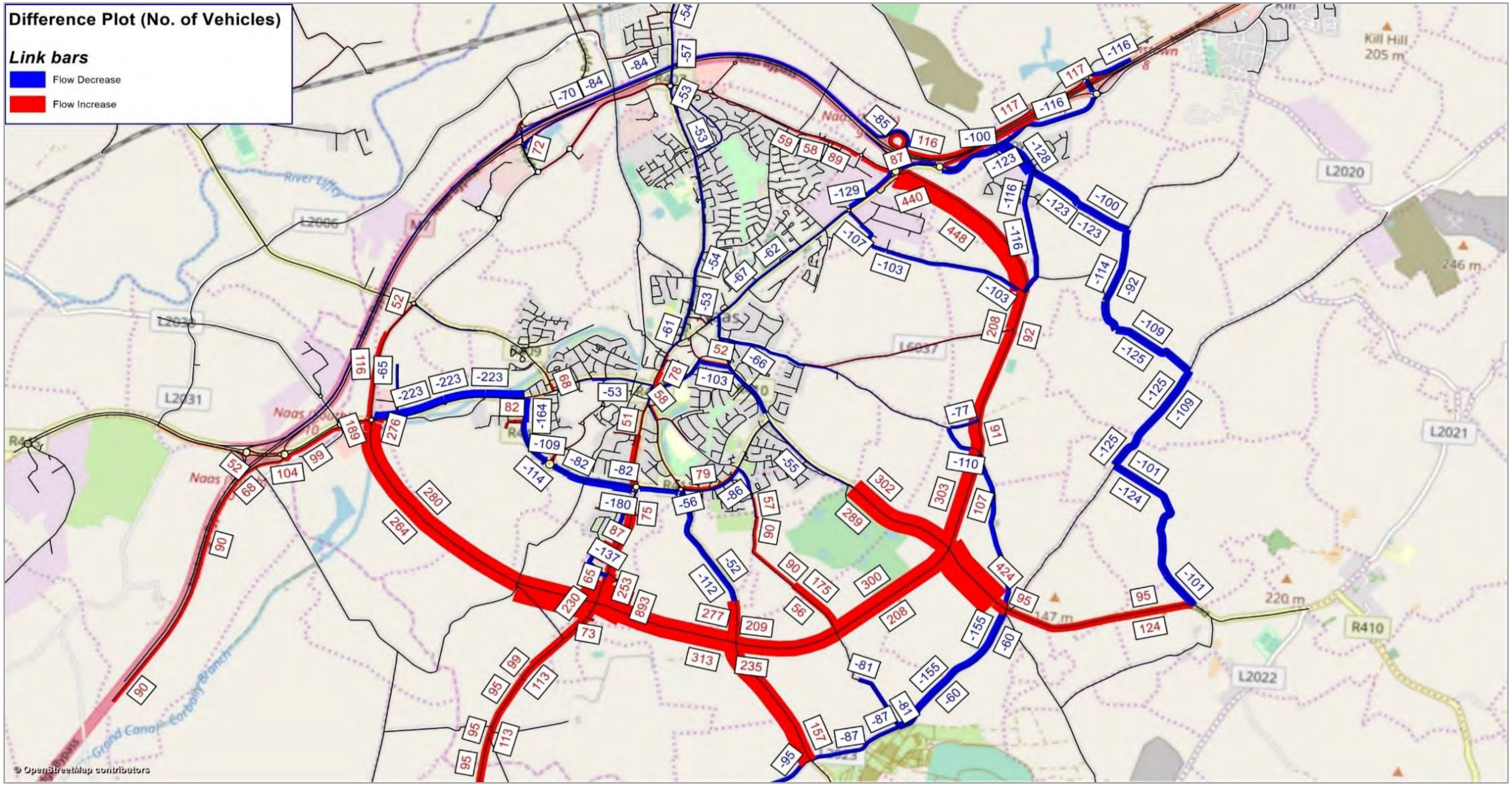


Figure A-23: 2030 AM Option 6 Difference Plot

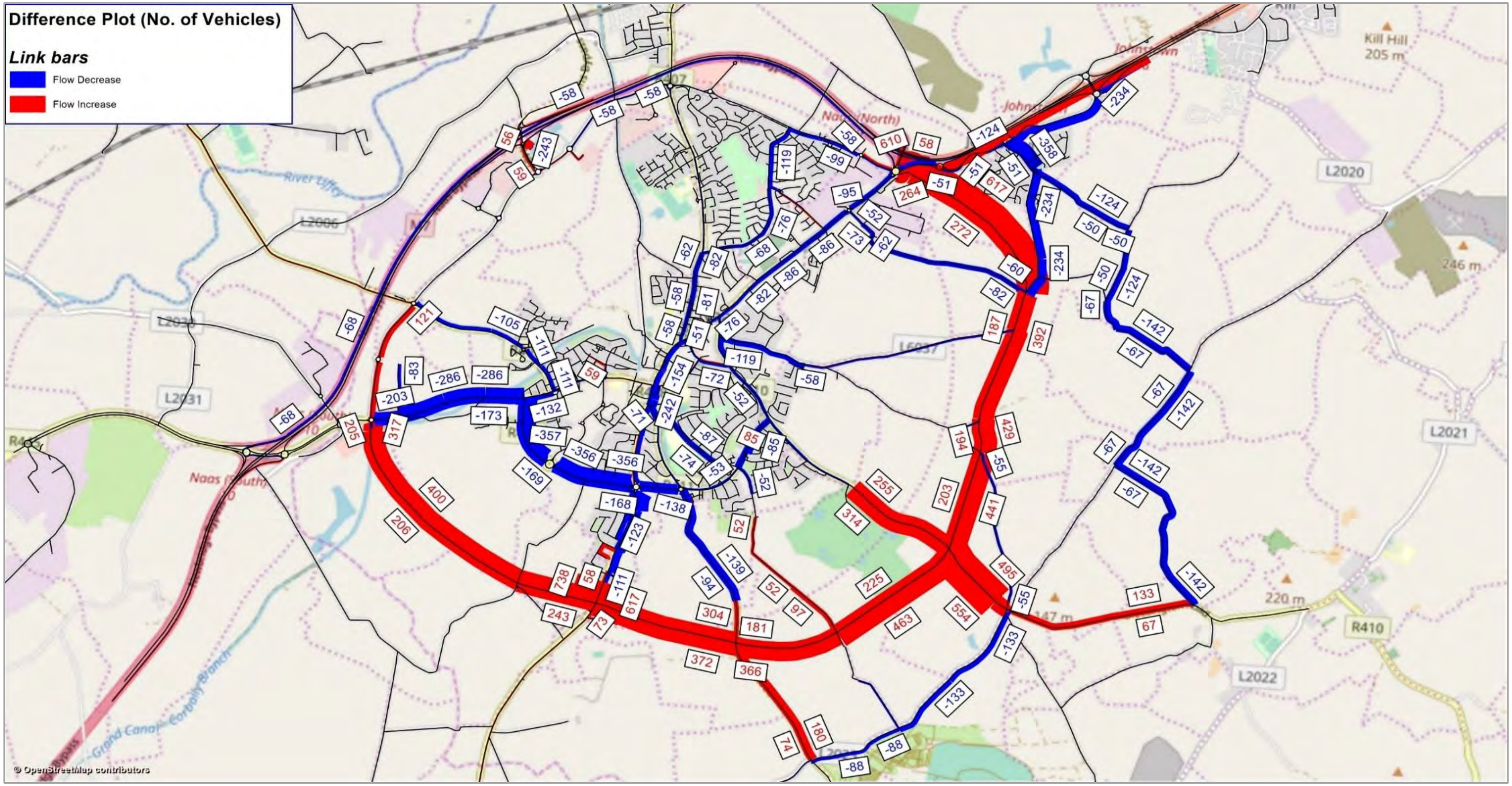


Figure A-24: 2030 PM Option 6 Difference Plot

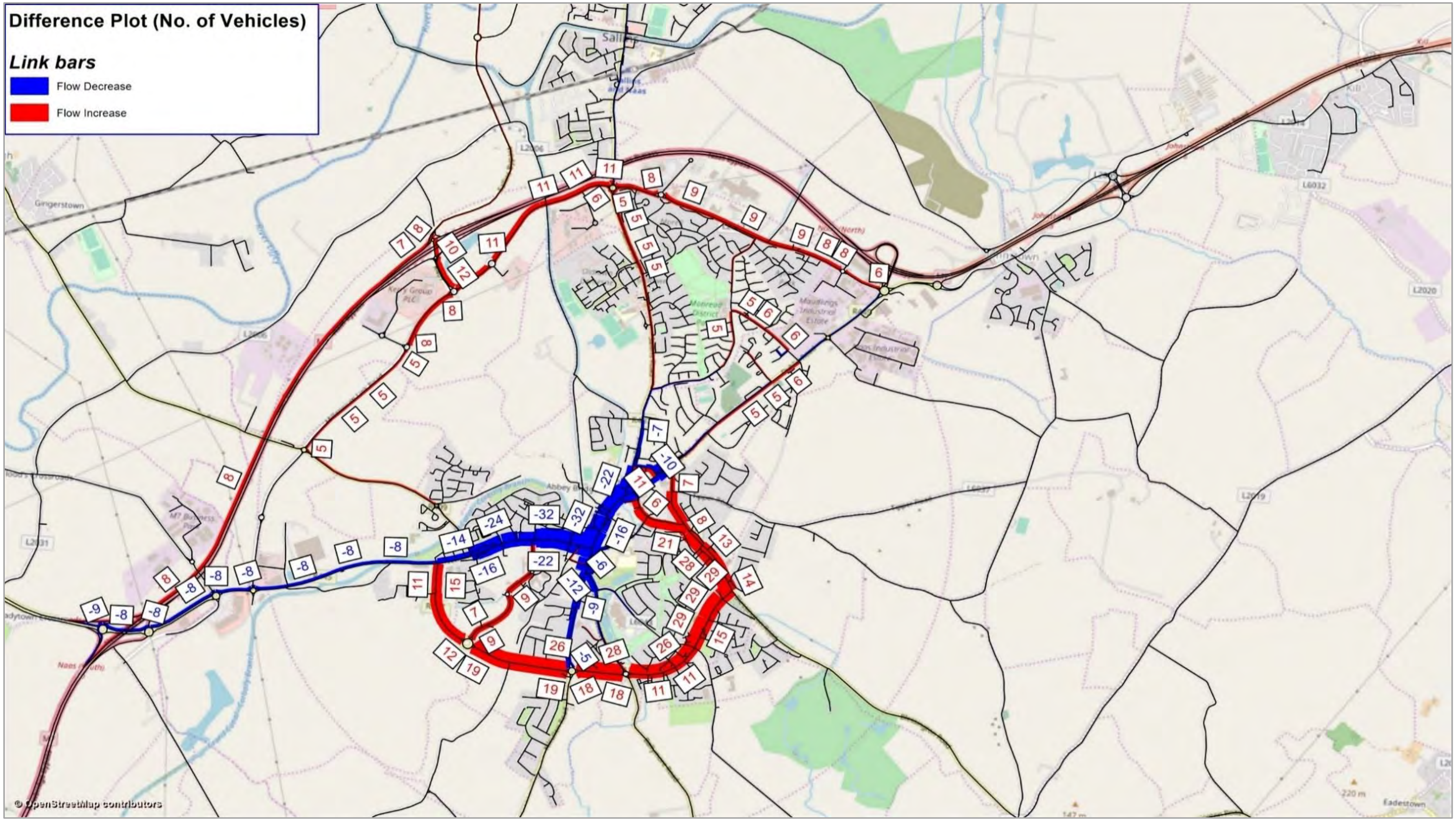


Figure A-25: 2023 AM Option 7 Difference Plot (No. of HGVs)

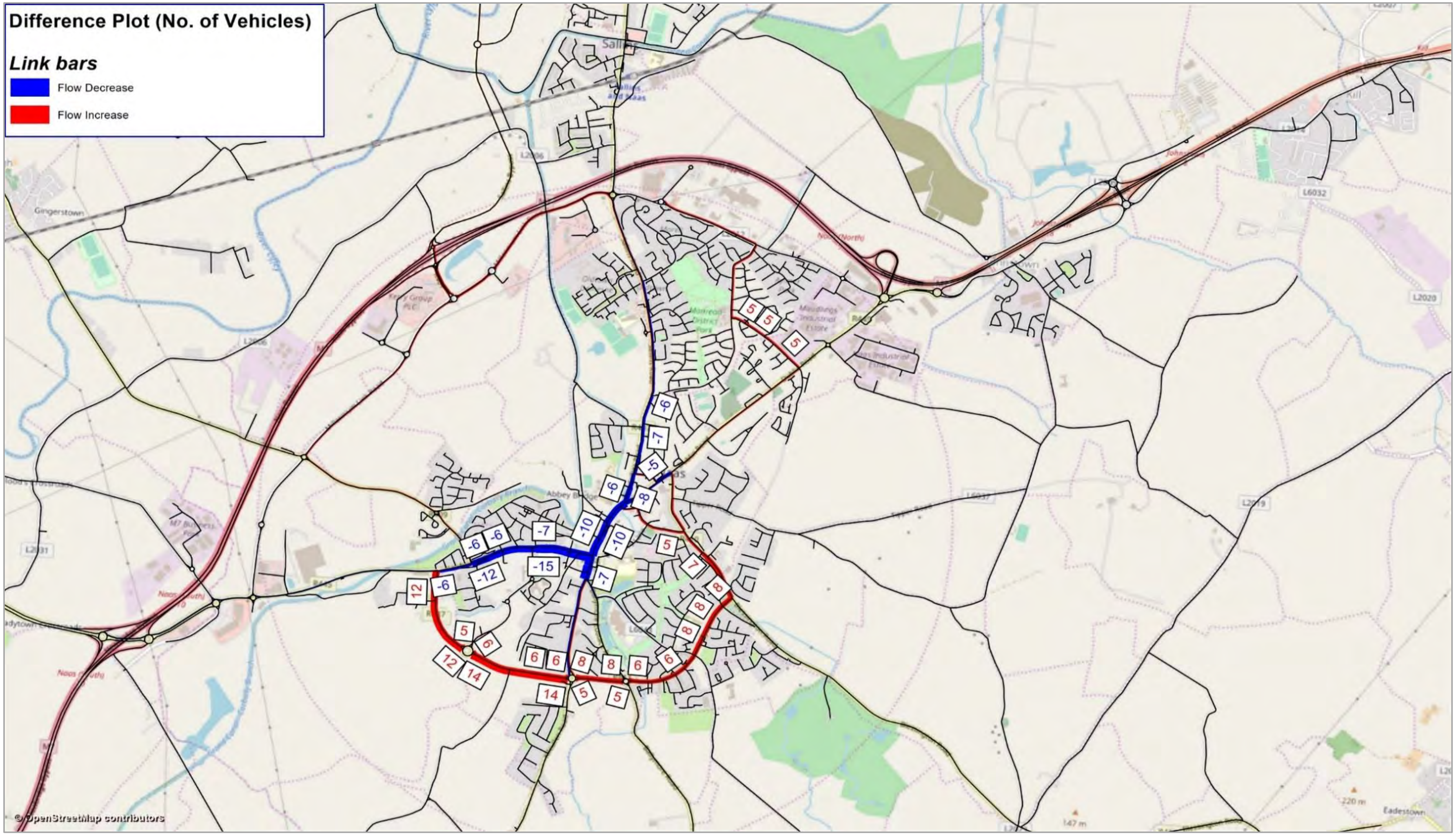


Figure A-26: 2023 PM Option 7 Difference Plot (No. of HGVs)

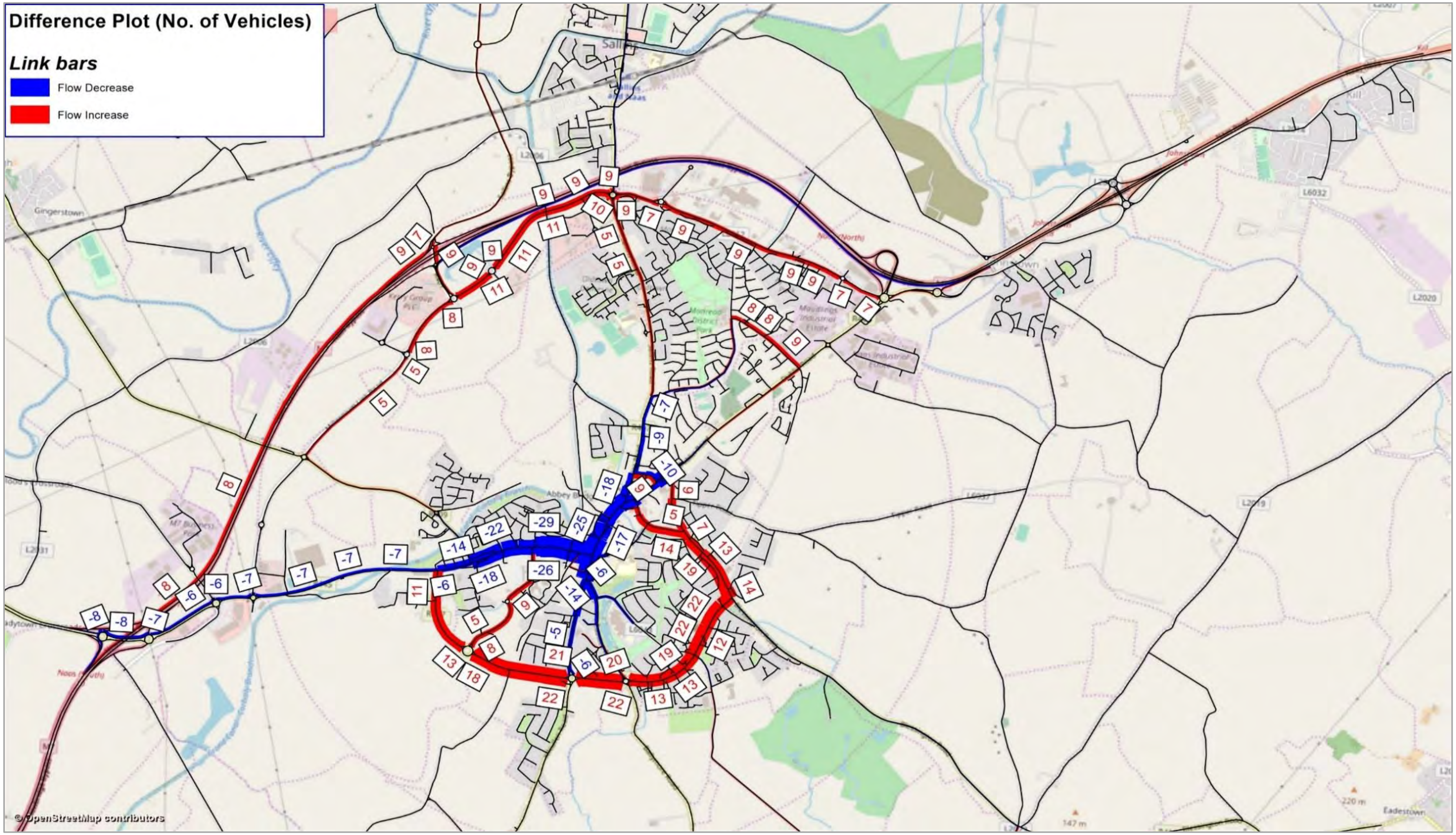


Figure A-27: 2030 AM Option 7 Difference Plot (No. of HGVs)

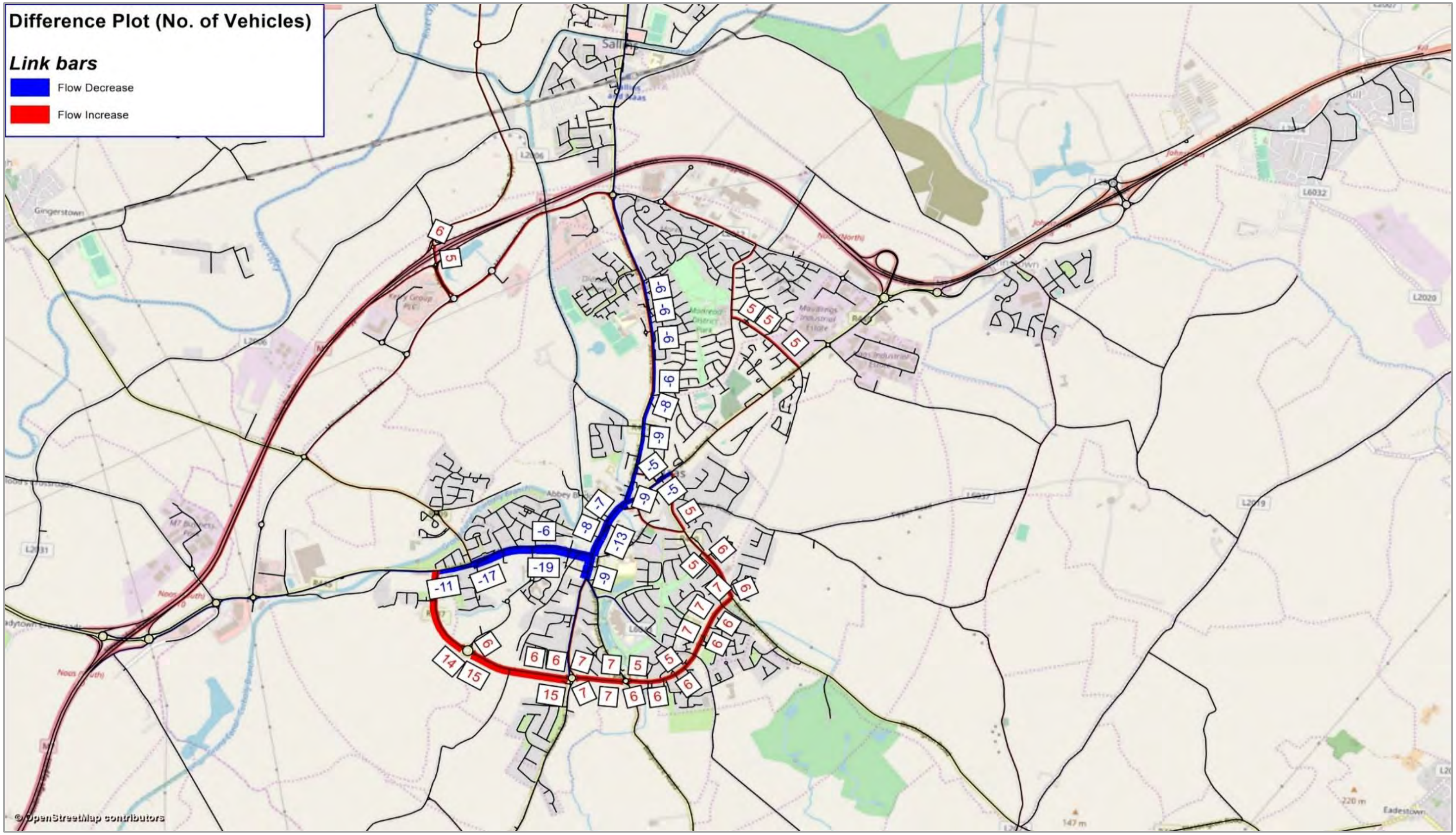


Figure A-28: 2030 PM Option 7 Difference Plot (No. of HGVs)

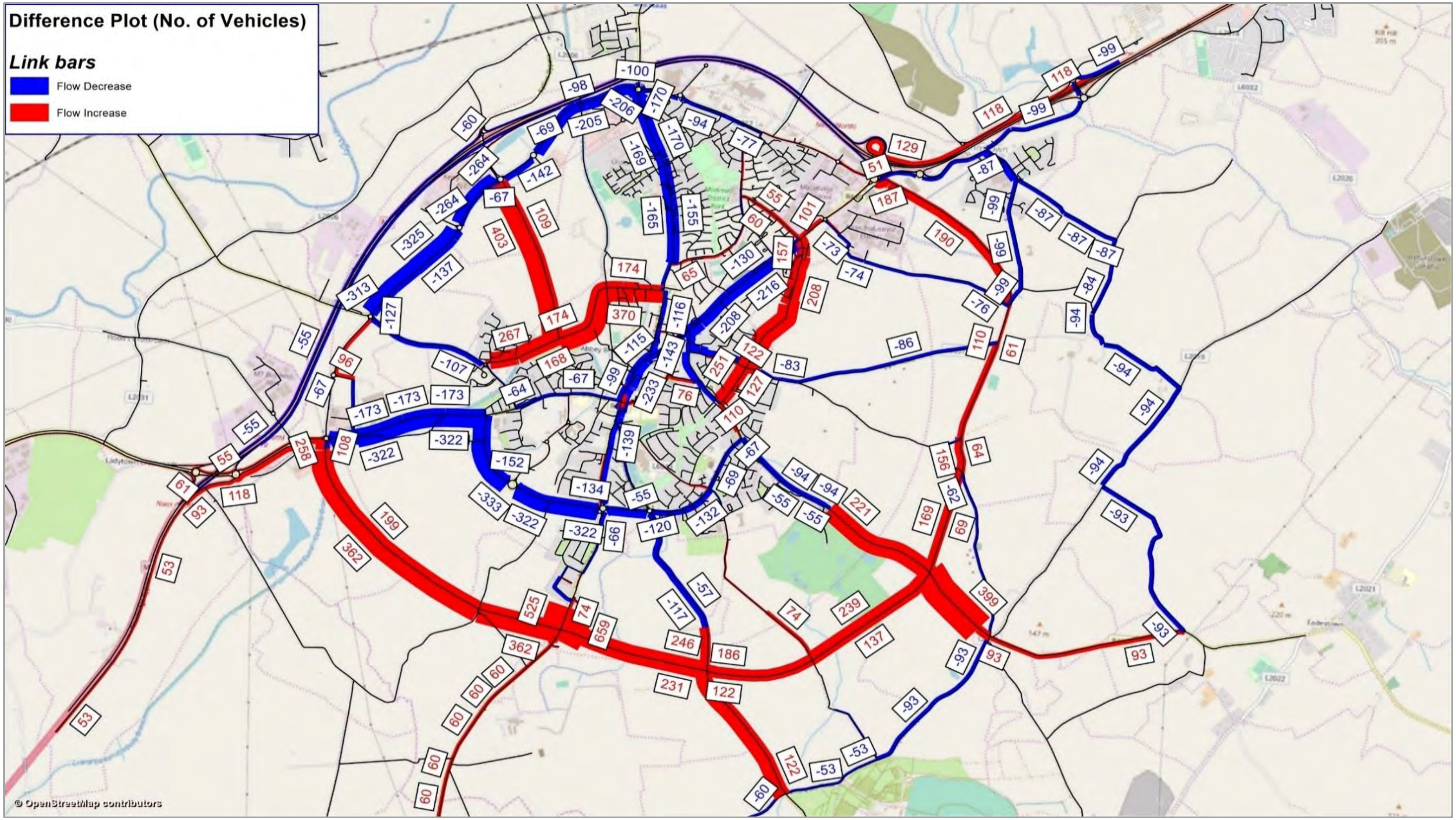


Figure A-29: 2023 AM All Options Difference Plot

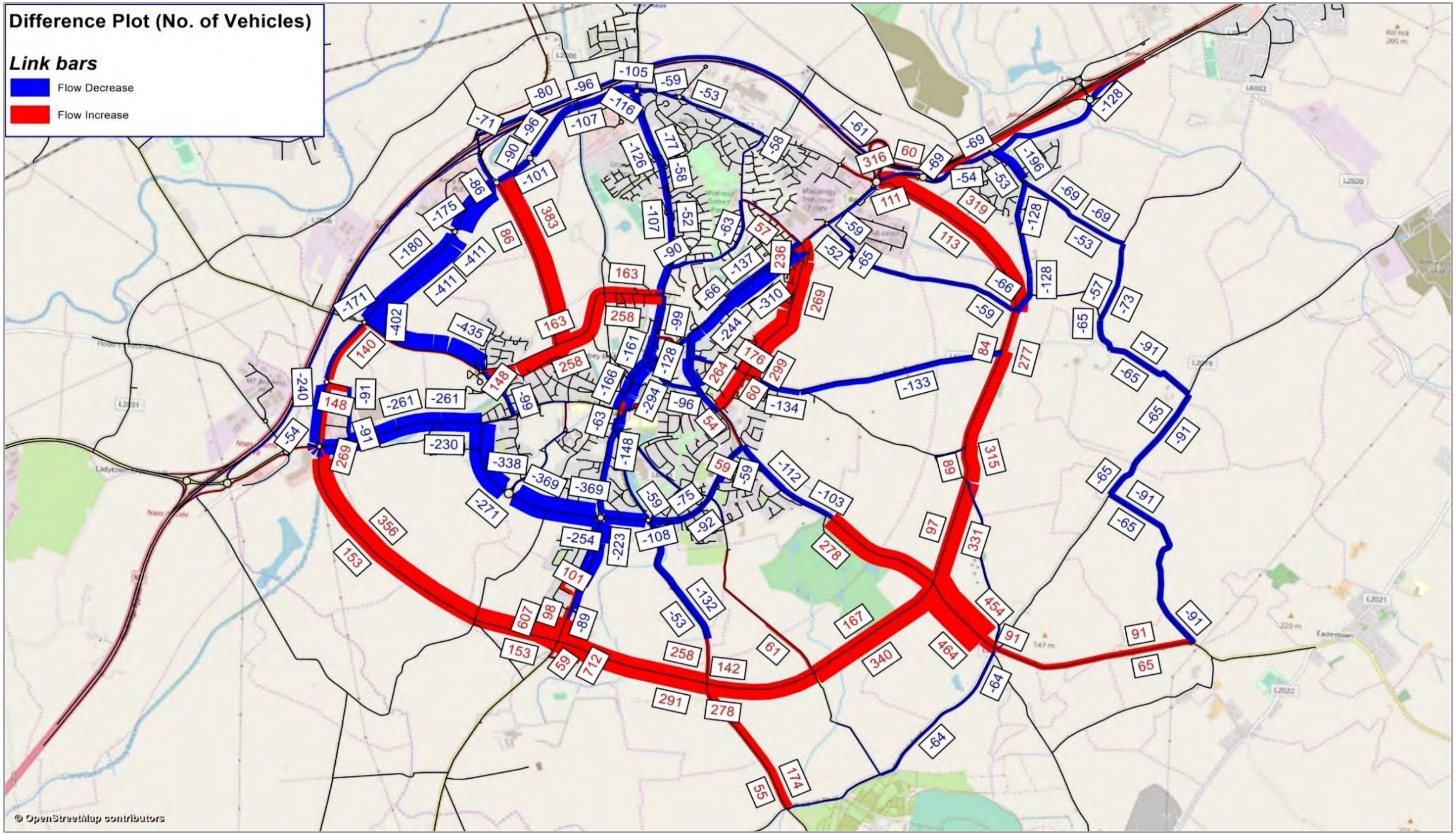


Figure A-30: 2023 PM All Options Difference Plot

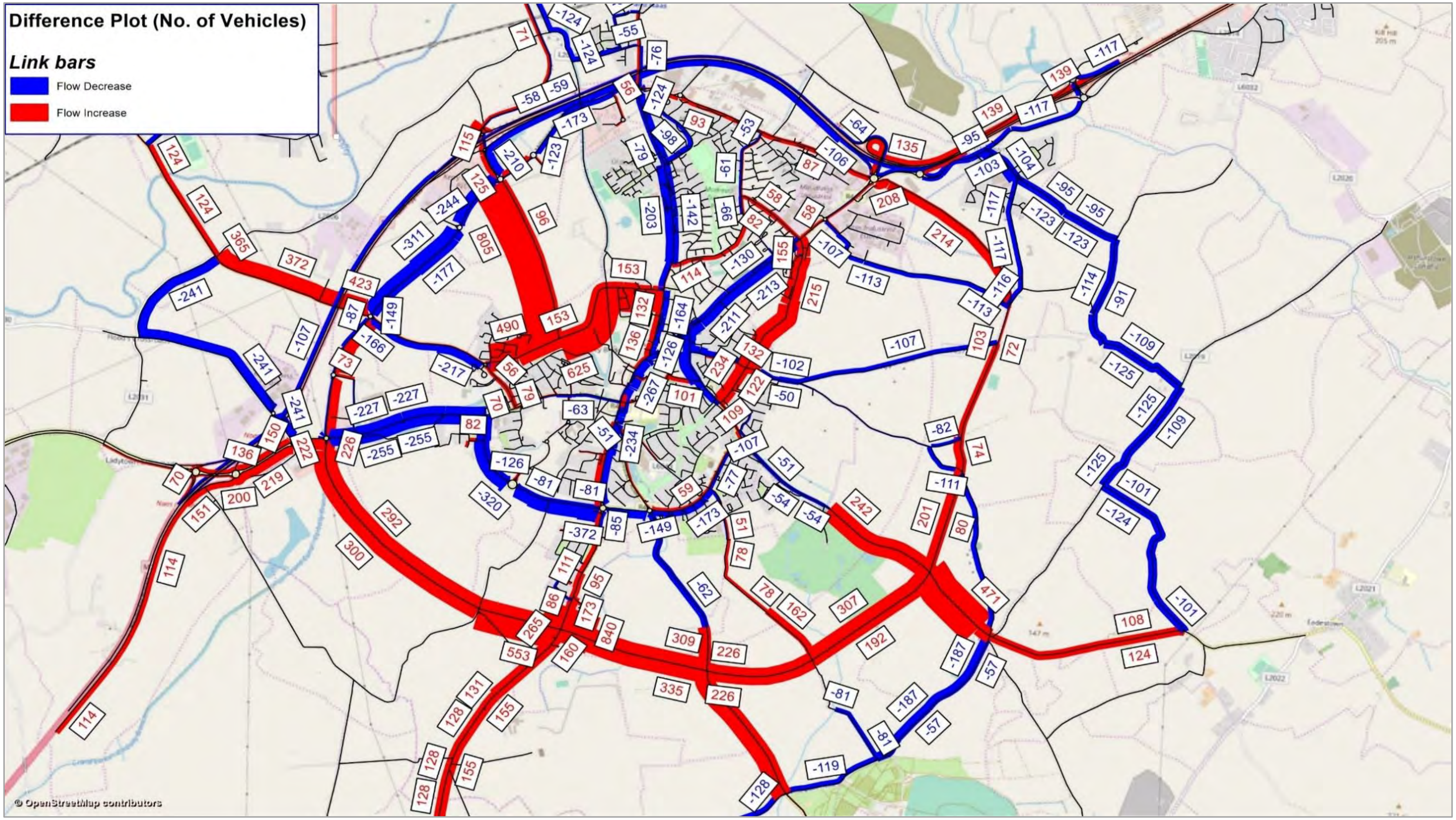


Figure A-31: 2030 AM All Options Difference Plot

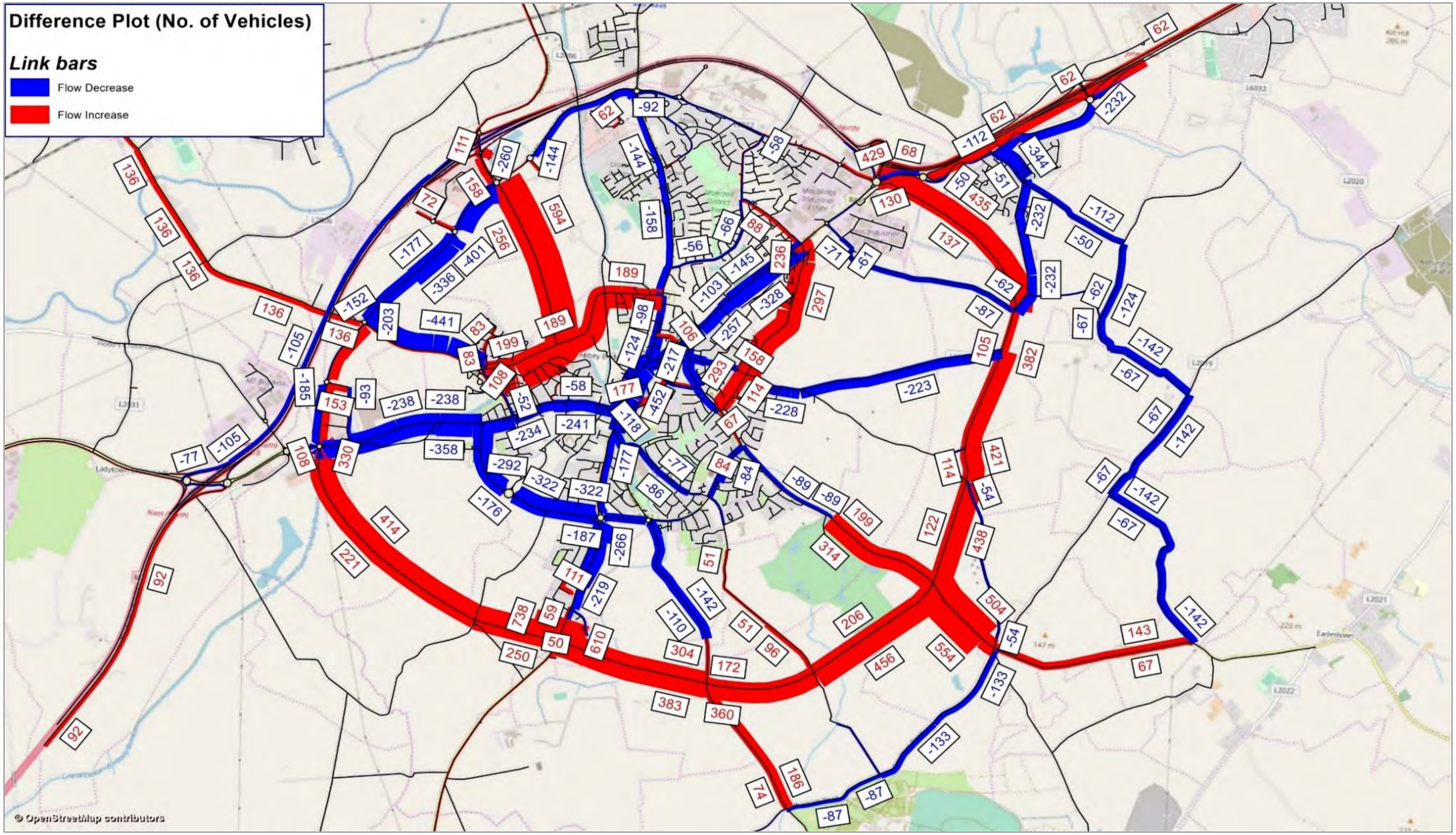


Figure A-32: 2030 PM All Options Difference Plot

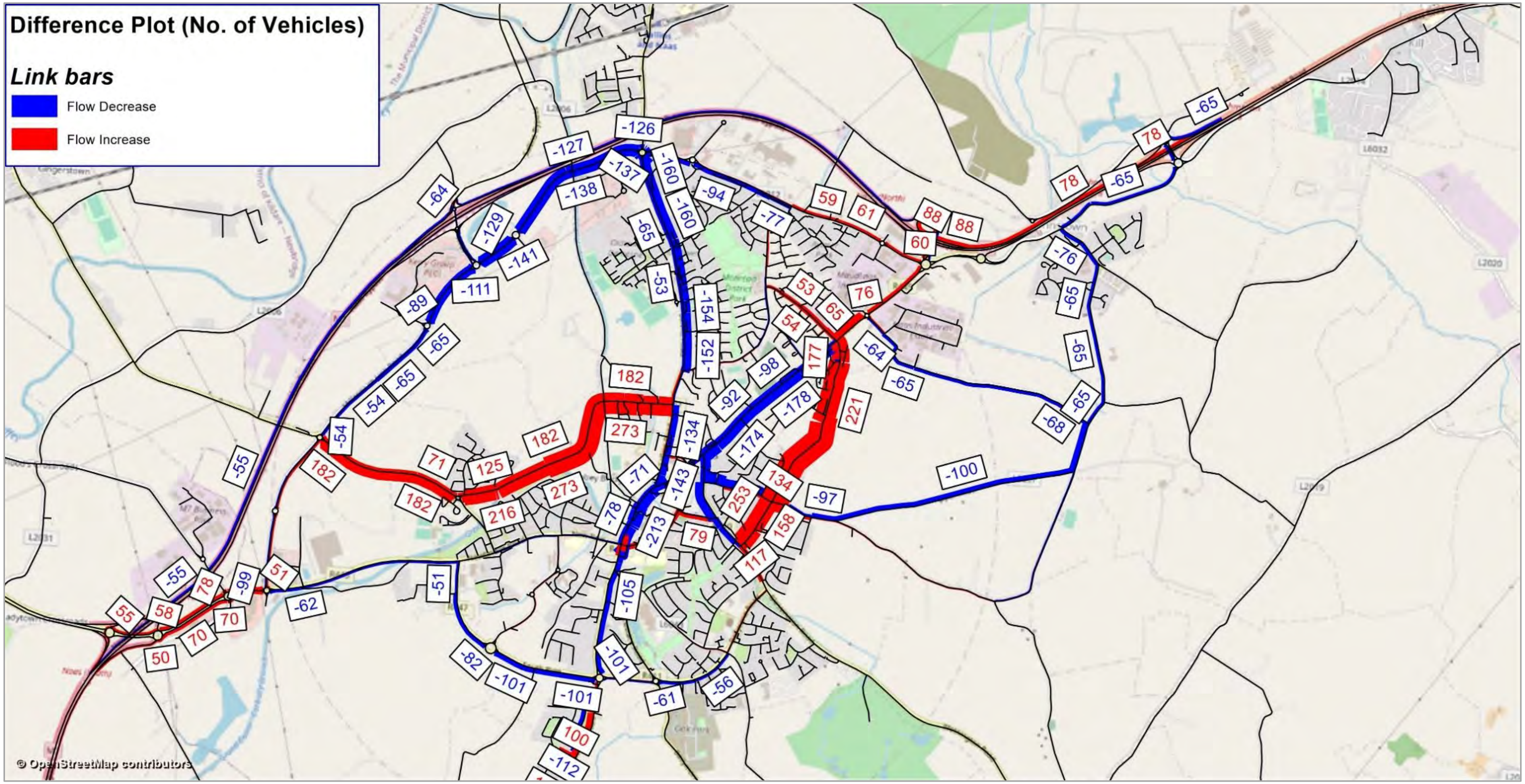


Figure A-33: 2023 AM Options 1, 2, 3 & 7 Difference Plot

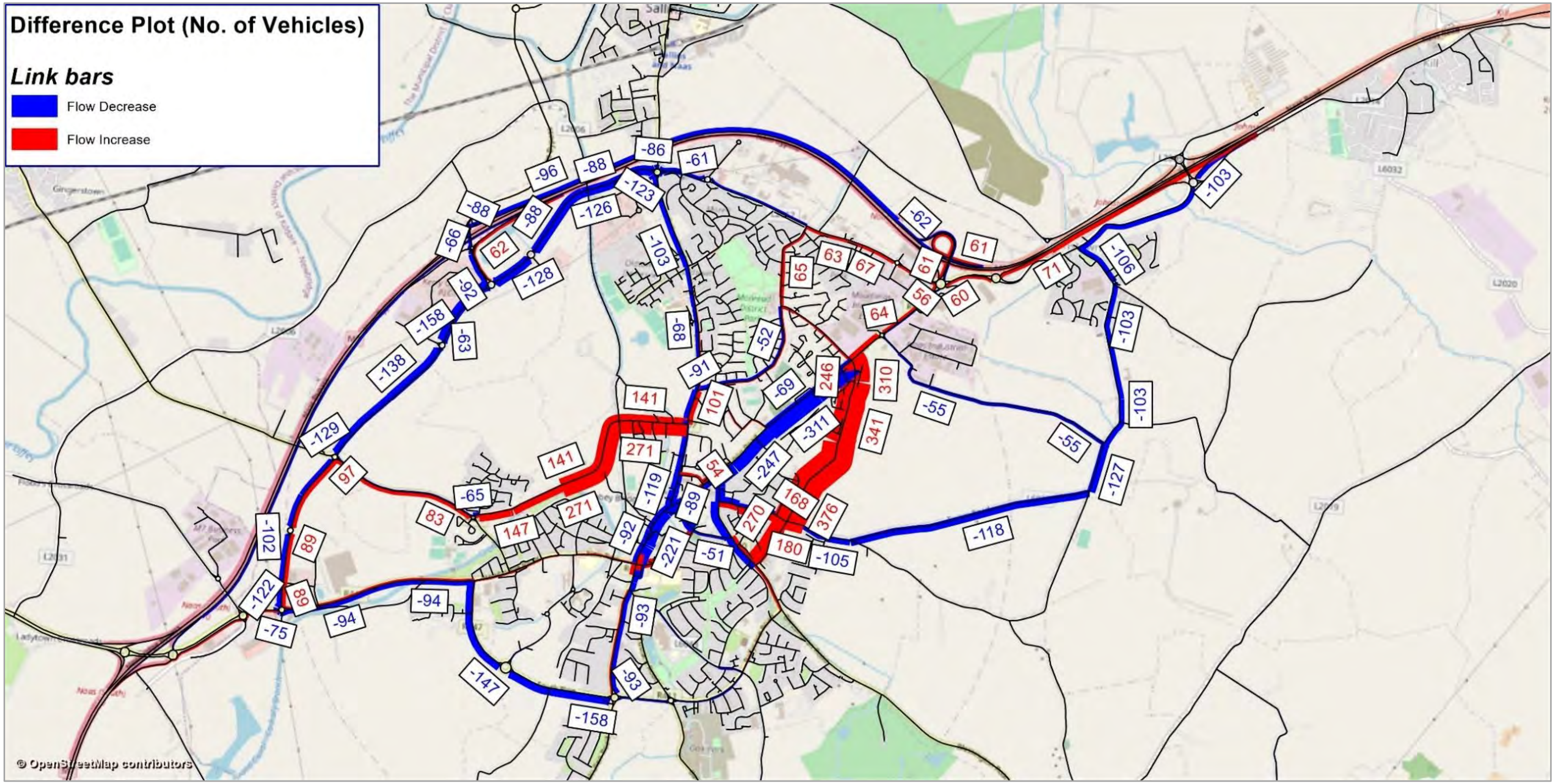


Figure A-34: 2023 PM Options 1, 2, 3 & 7 Difference Plot

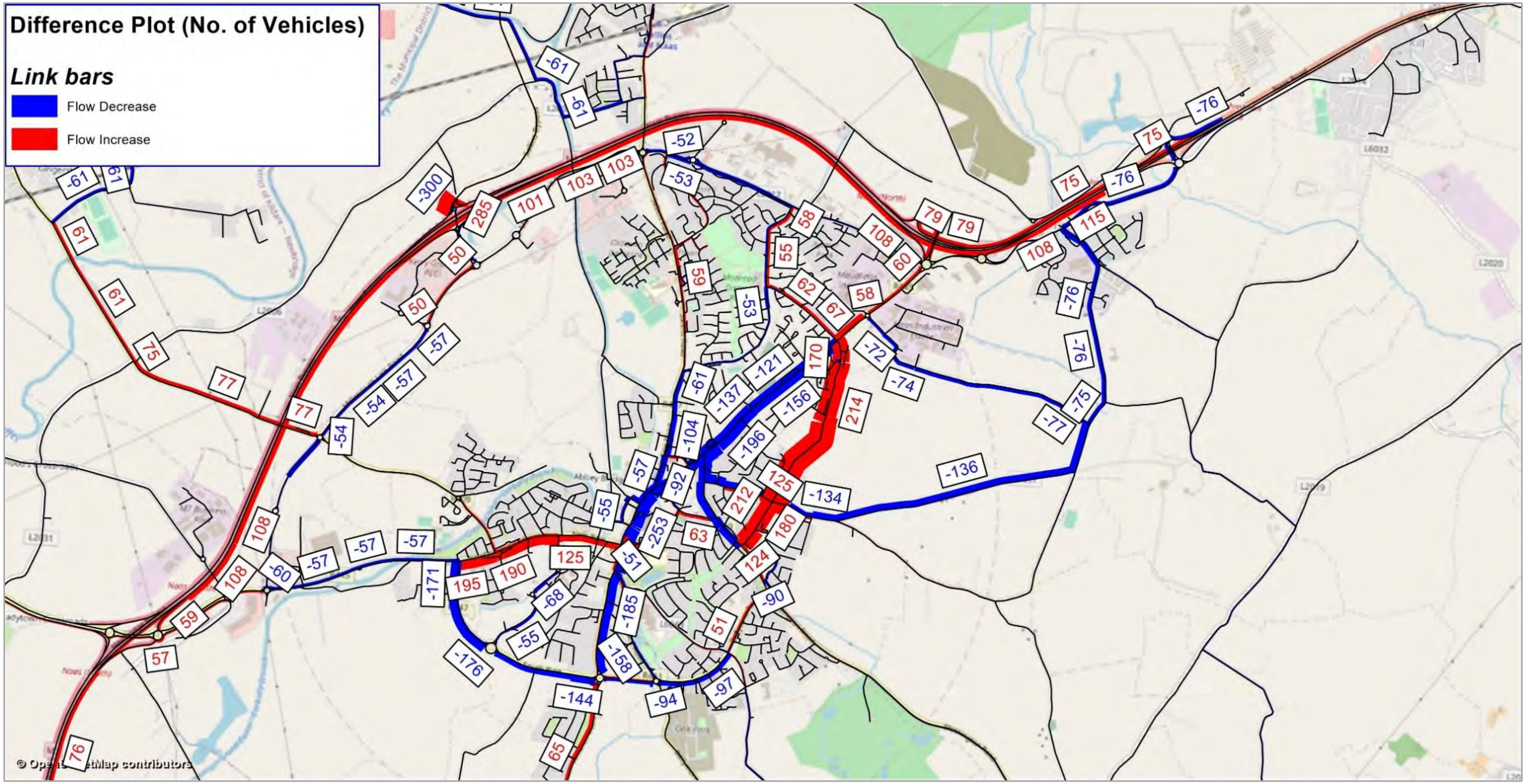


Figure A-35: 2030 AM Options 1, 2, 3 & 7 Difference Plot

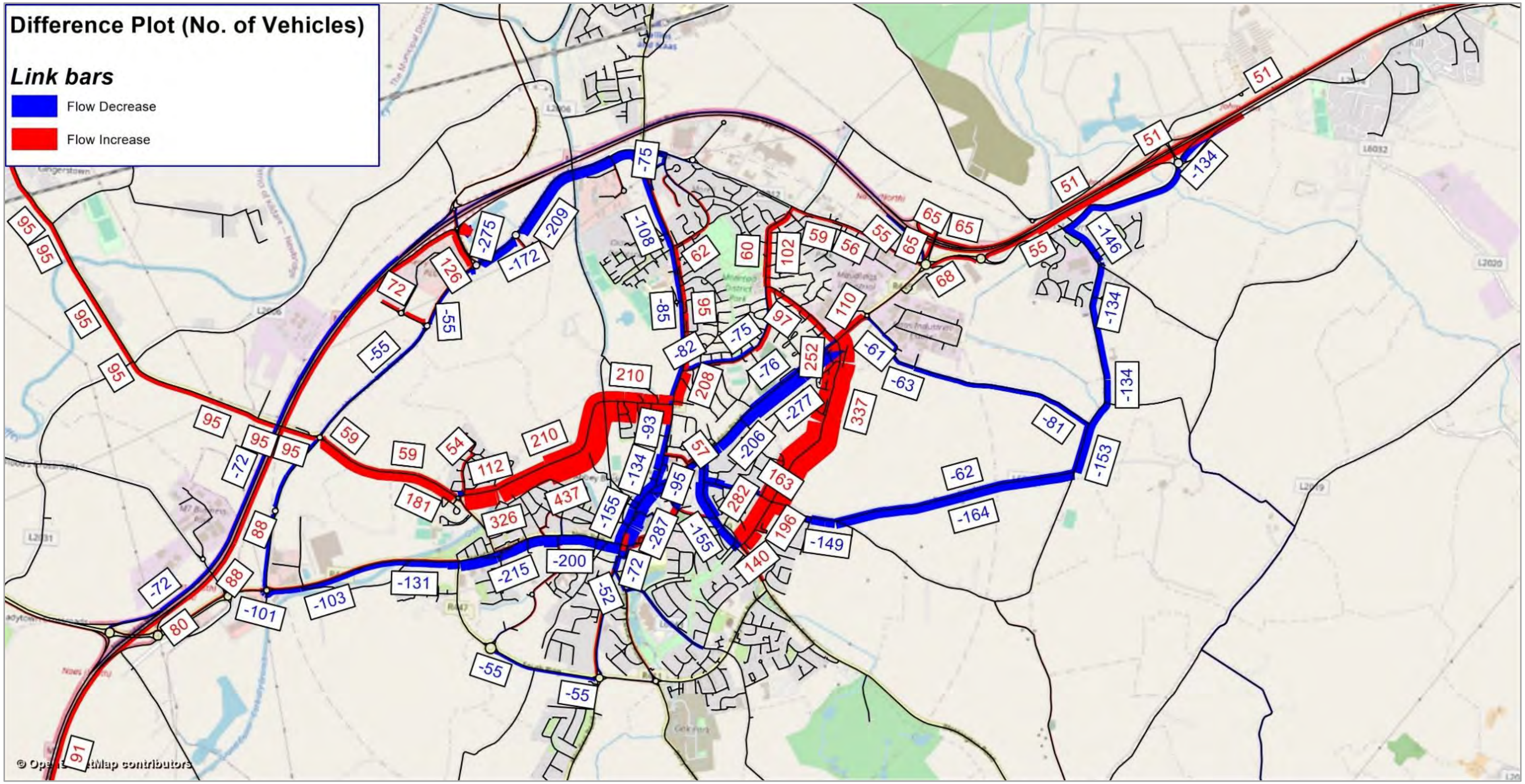
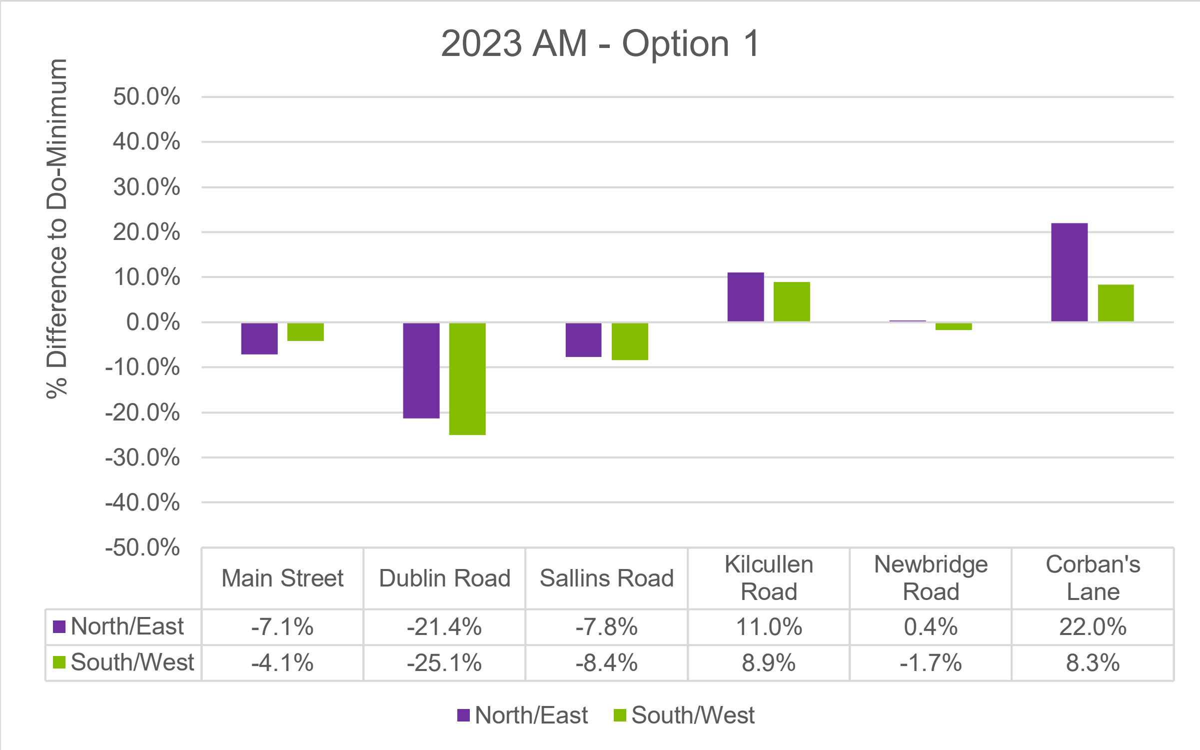


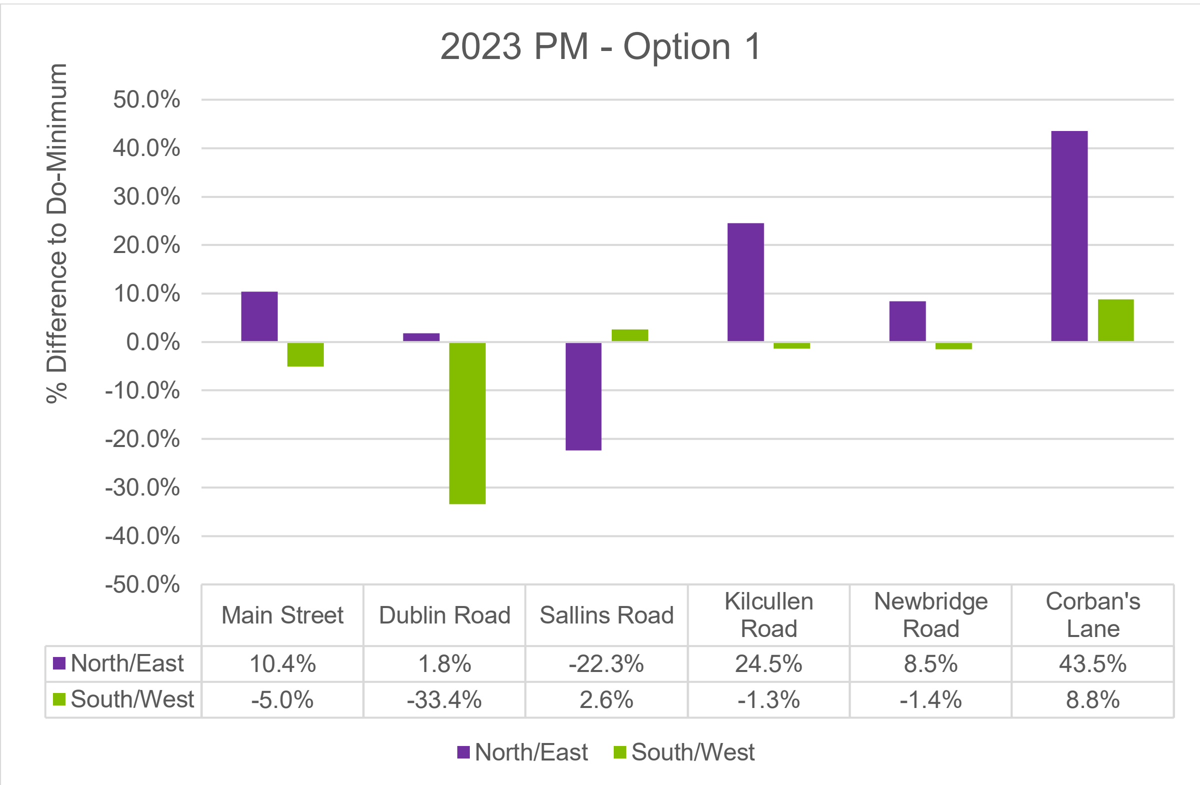
Figure A-36: 2030 PM Options 1, 2, 3 & 7 Difference Plot

Appendix B: Percentage Change on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-7.1%	-21.4%	-7.8%	11.0%	0.4%	22.0%
South/West	-4.1%	-25.1%	-8.4%	8.9%	-1.7%	8.3%

Figure B-1: 2023 AM - Option 1 Flow Difference on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	10.4%	1.8%	-22.3%	24.5%	8.5%	43.5%
South/West	-5.0%	-33.4%	2.6%	-1.3%	-1.4%	8.8%

Figure B-2: 2023 PM - Option 1 Flow Difference on Key Roads

Figure B-3: 2030 AM - Option 1 Flow Difference on Key Roads

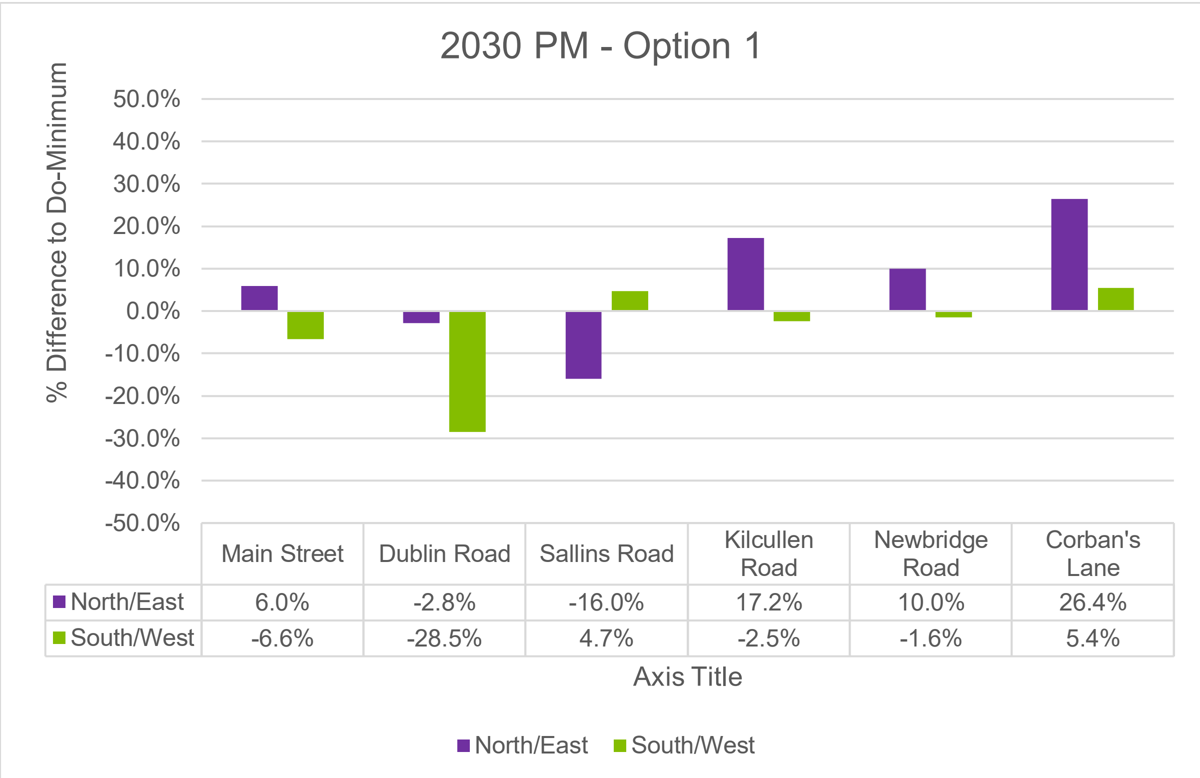
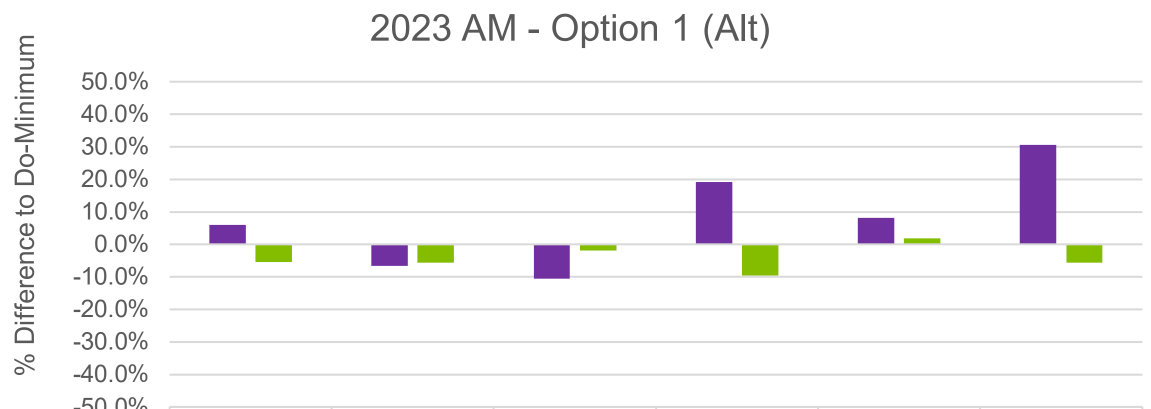


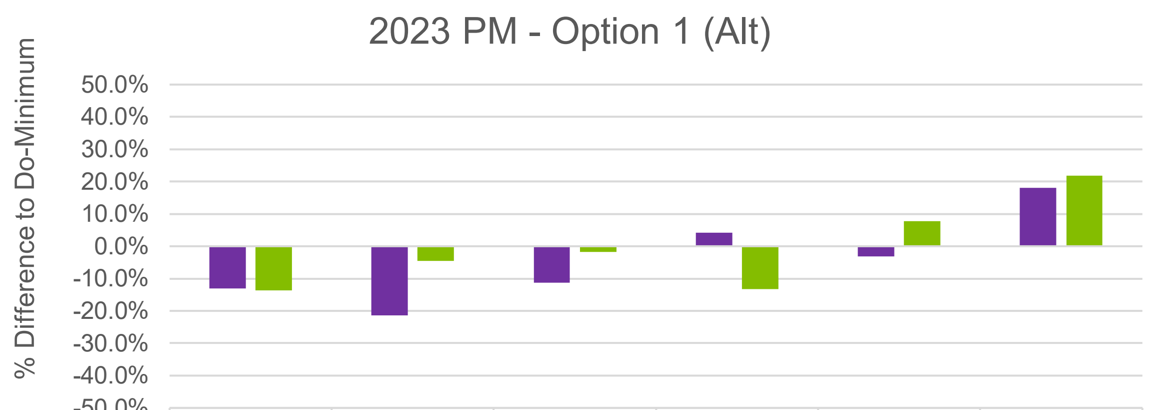
Figure B-4: 2030 PM - Option 1 Flow Difference on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	5.9%	-6.7%	-10.5%	19.1%	8.2%	30.5%
South/West	-5.5%	-5.6%	-1.8%	-9.6%	1.9%	-5.6%

North/East South/West

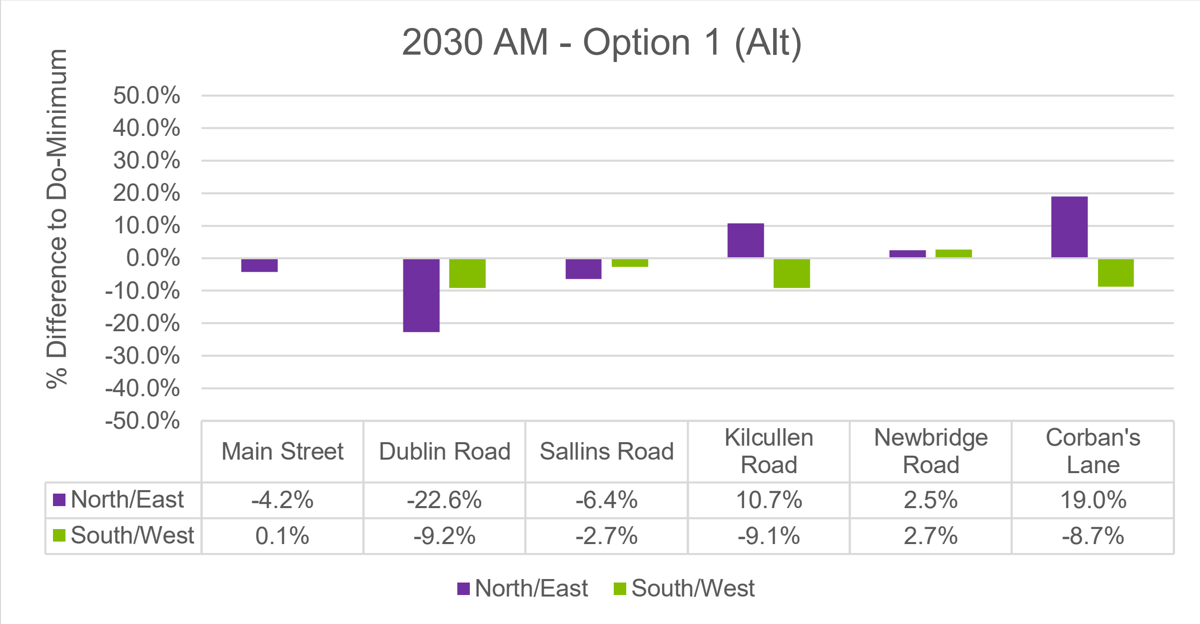
Figure B-5: 2023 AM - Option 1 (Alt) Flow Difference on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-13.1%	-21.4%	-11.3%	4.3%	-3.0%	18.0%
South/West	-13.6%	-4.5%	-1.7%	-13.3%	7.7%	21.8%

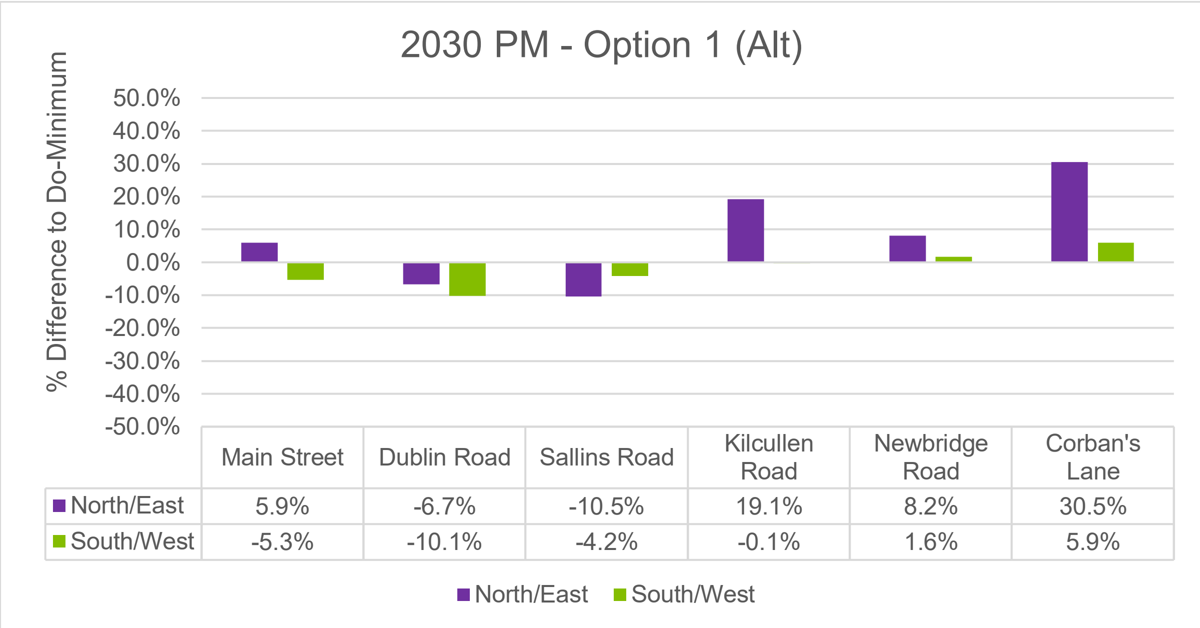
North/East South/West

Figure B-6: 2023 PM - Option 1 (Alt) Flow Difference on Key Roads



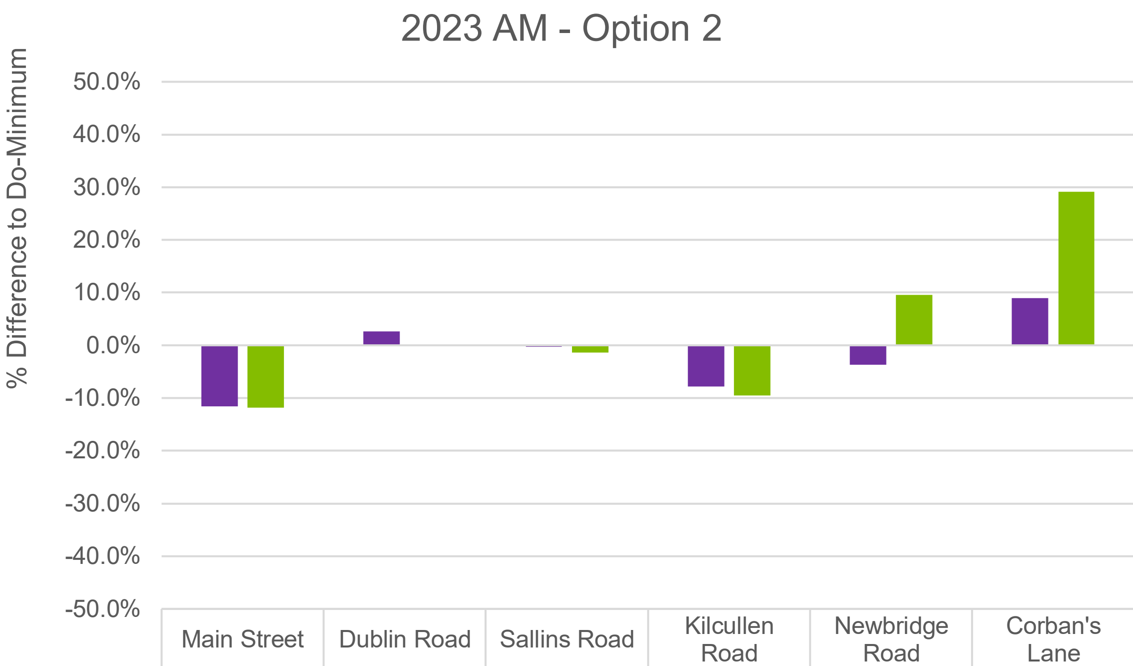
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-4.2%	-22.6%	-6.4%	10.7%	2.5%	19.0%
South/West	0.1%	-9.2%	-2.7%	-9.1%	2.7%	-8.7%

Figure B-7: 2030 AM - Option 1 (Alt) Flow Difference on Key Roads



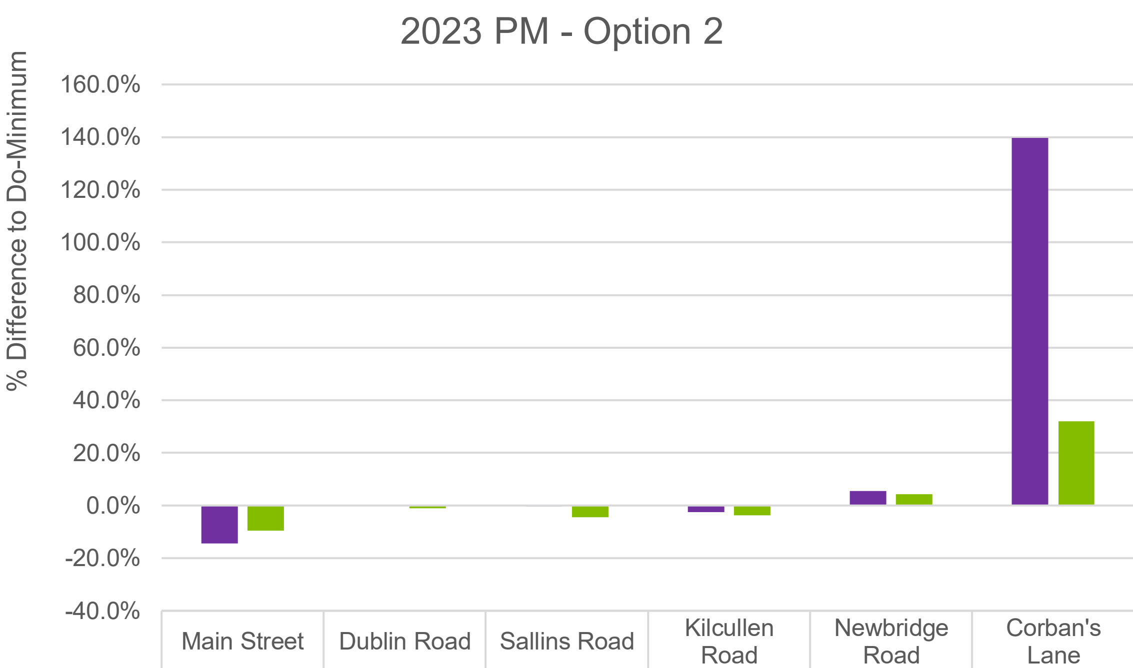
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	5.9%	-6.7%	-10.5%	19.1%	8.2%	30.5%
South/West	-5.3%	-10.1%	-4.2%	-0.1%	1.6%	5.9%

Figure B-8: 2030 PM - Option 1 (Alt) Flow Difference on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-11.5%	2.6%	-0.3%	-7.8%	-3.7%	9.0%
South/West	-11.8%	-0.1%	-1.4%	-9.5%	9.5%	29.2%

Figure B-9: 2023 AM - Option 2 Flow Difference on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-14.4%	0.2%	-0.2%	-2.4%	5.4%	139.8%
South/West	-9.5%	-1.1%	-4.4%	-3.8%	4.3%	32.1%

Figure B-10: 2023 PM - Option 2 Flow Difference on Key Roads

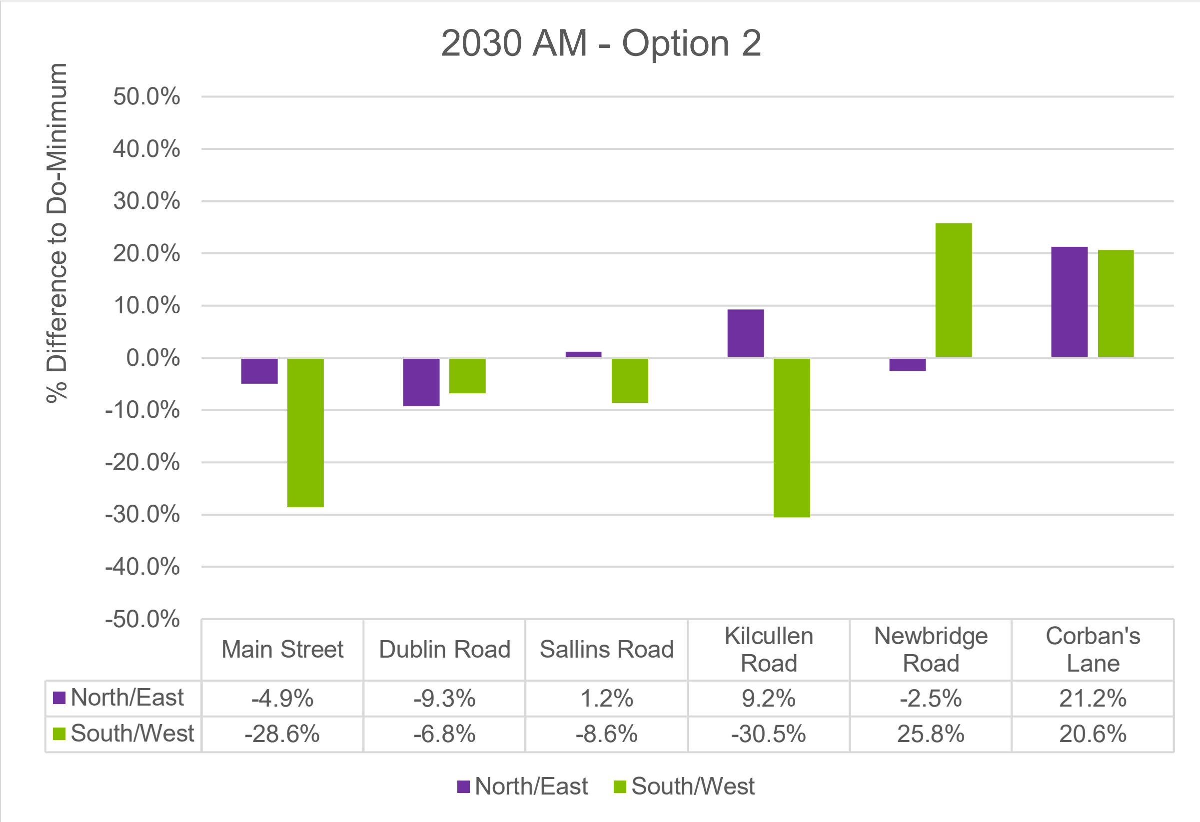


Figure B-11: 2030 AM - Option 2 Flow Difference on Key Roads

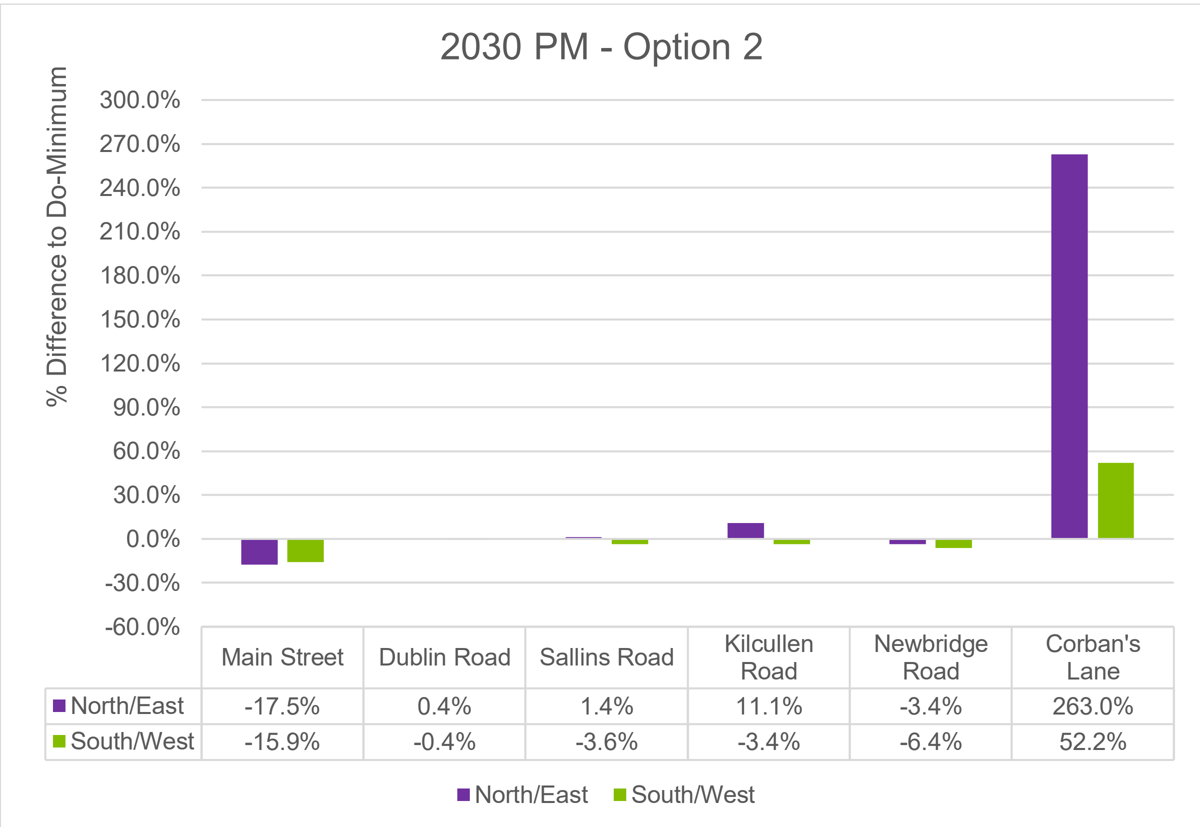
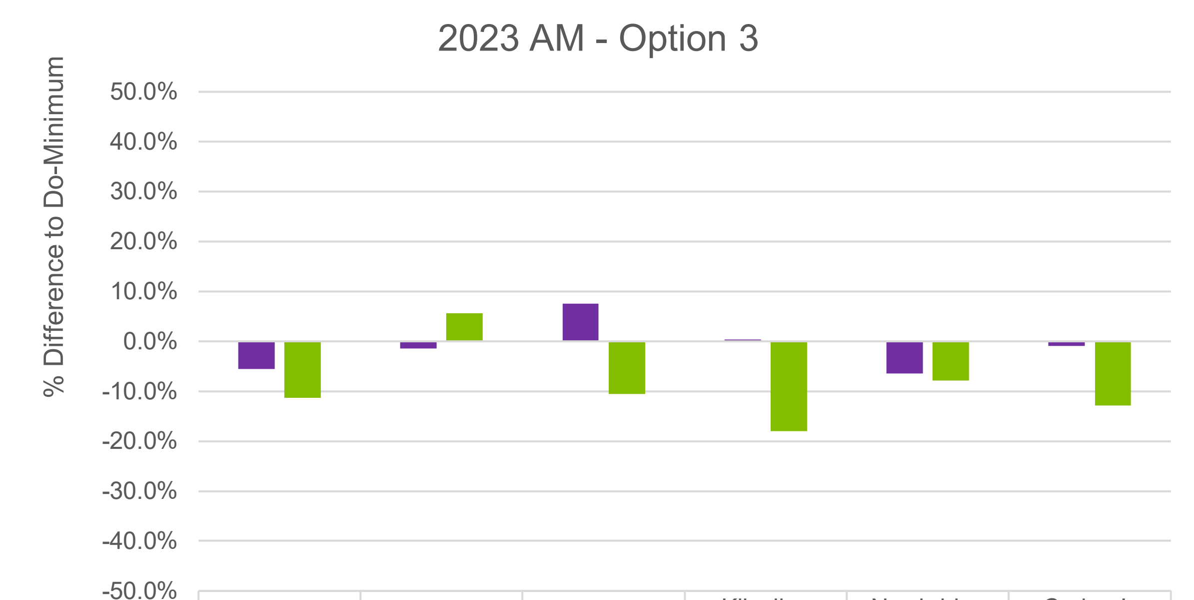
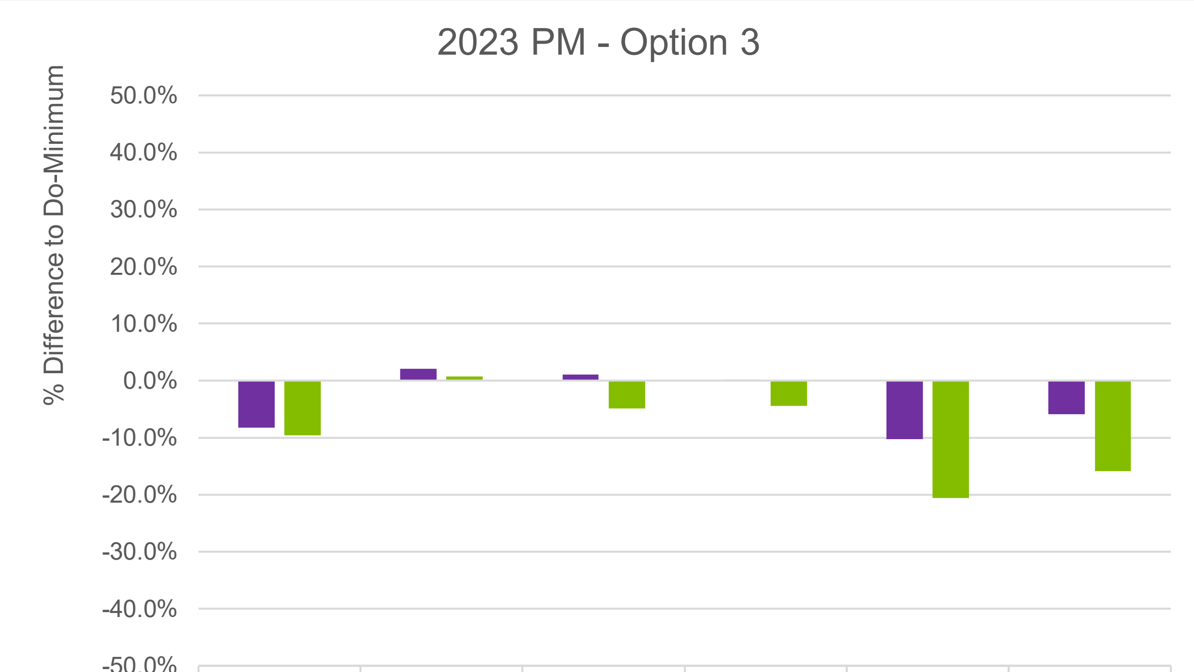


Figure B-12: 2030 PM - Option 2 Flow Difference on Key Roads



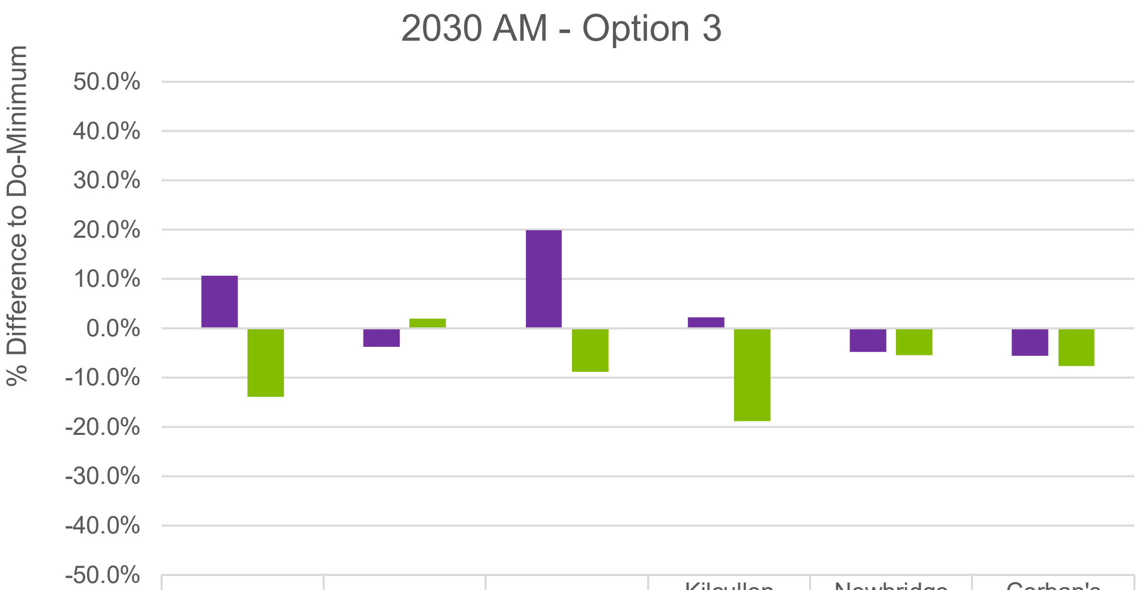
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-5.6%	-1.4%	7.6%	0.4%	-6.5%	-1.0%
South/West	-11.3%	5.6%	-10.6%	-18.0%	-7.8%	-12.9%

Figure B-13: 2023 AM - Option 3 Flow Difference on Key Roads



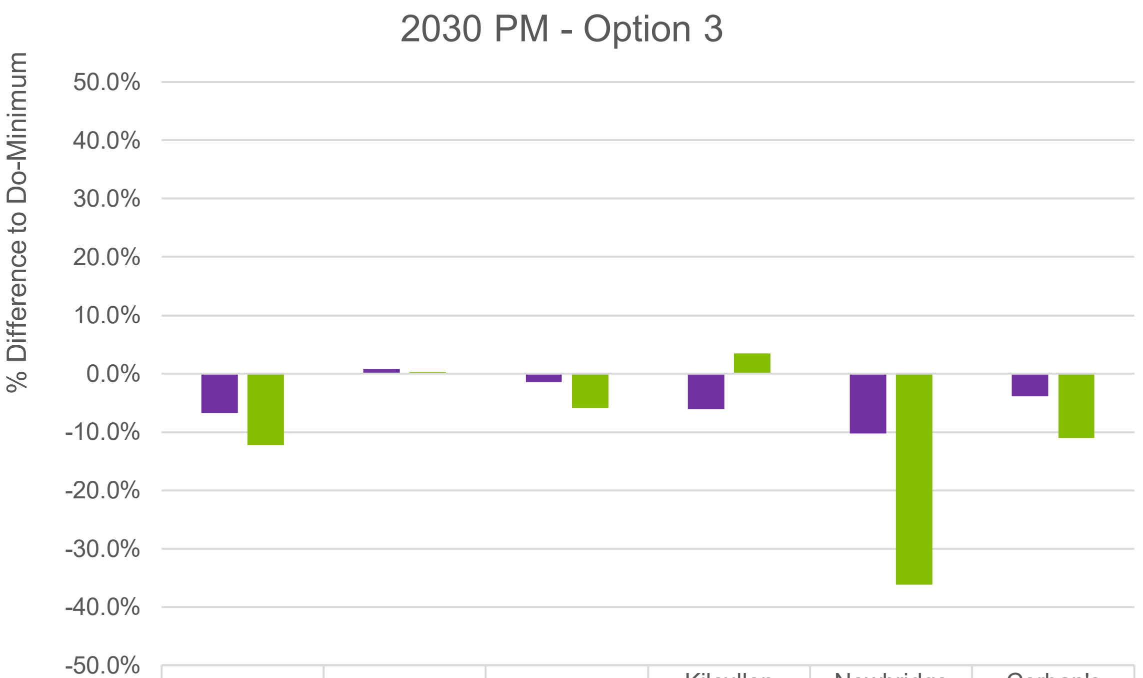
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-8.3%	2.0%	1.0%	0.0%	-10.3%	-5.9%
South/West	-9.6%	0.7%	-4.9%	-4.4%	-20.6%	-15.8%

Figure B-14: 2023 PM - Option 3 Flow Difference on Key Roads



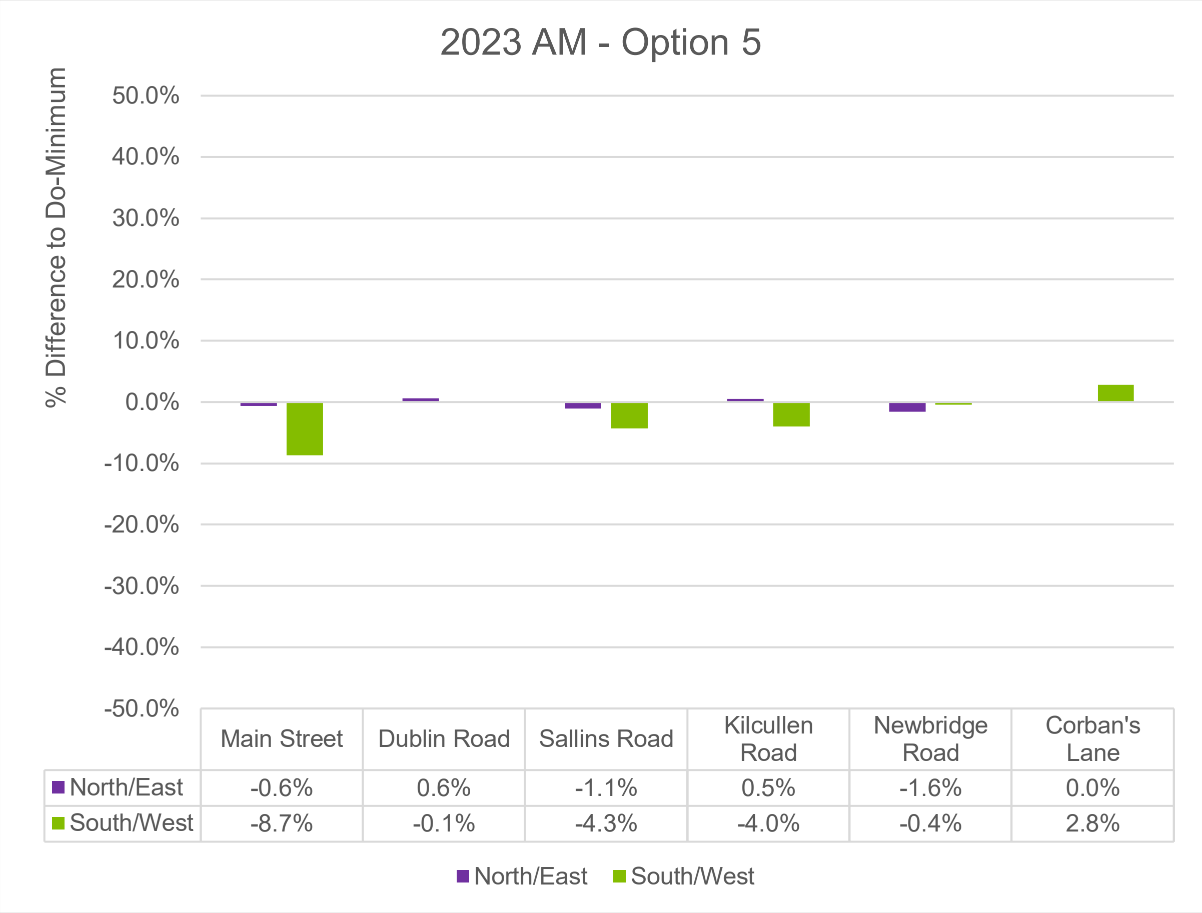
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	10.6%	-3.7%	19.9%	2.2%	-4.8%	-5.5%
South/West	-13.9%	2.0%	-8.8%	-18.8%	-5.4%	-7.7%

Figure B-15: 2030 AM - Option 3 Flow Difference on Key Roads



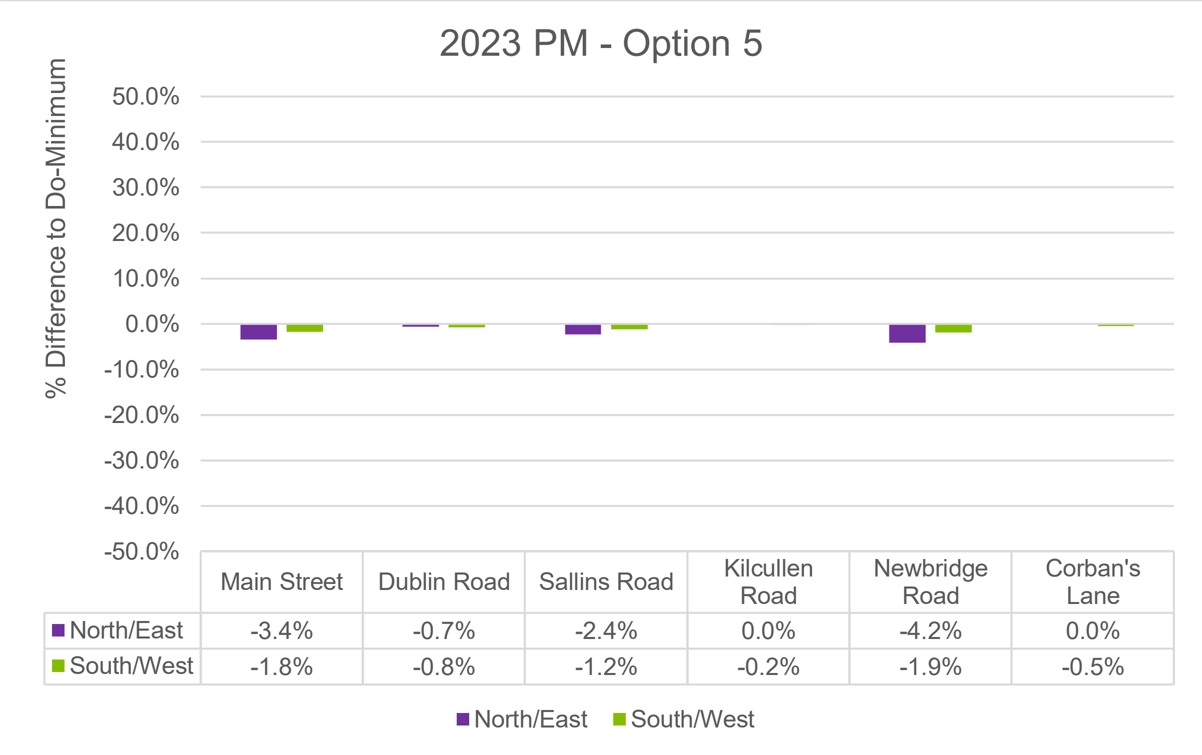
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-6.7%	0.8%	-1.5%	-6.1%	-10.2%	-3.9%
South/West	-12.3%	0.3%	-5.9%	3.5%	-36.2%	-11.1%

Figure B-16: 2030 PM - Option 3 Flow Difference on Key Roads



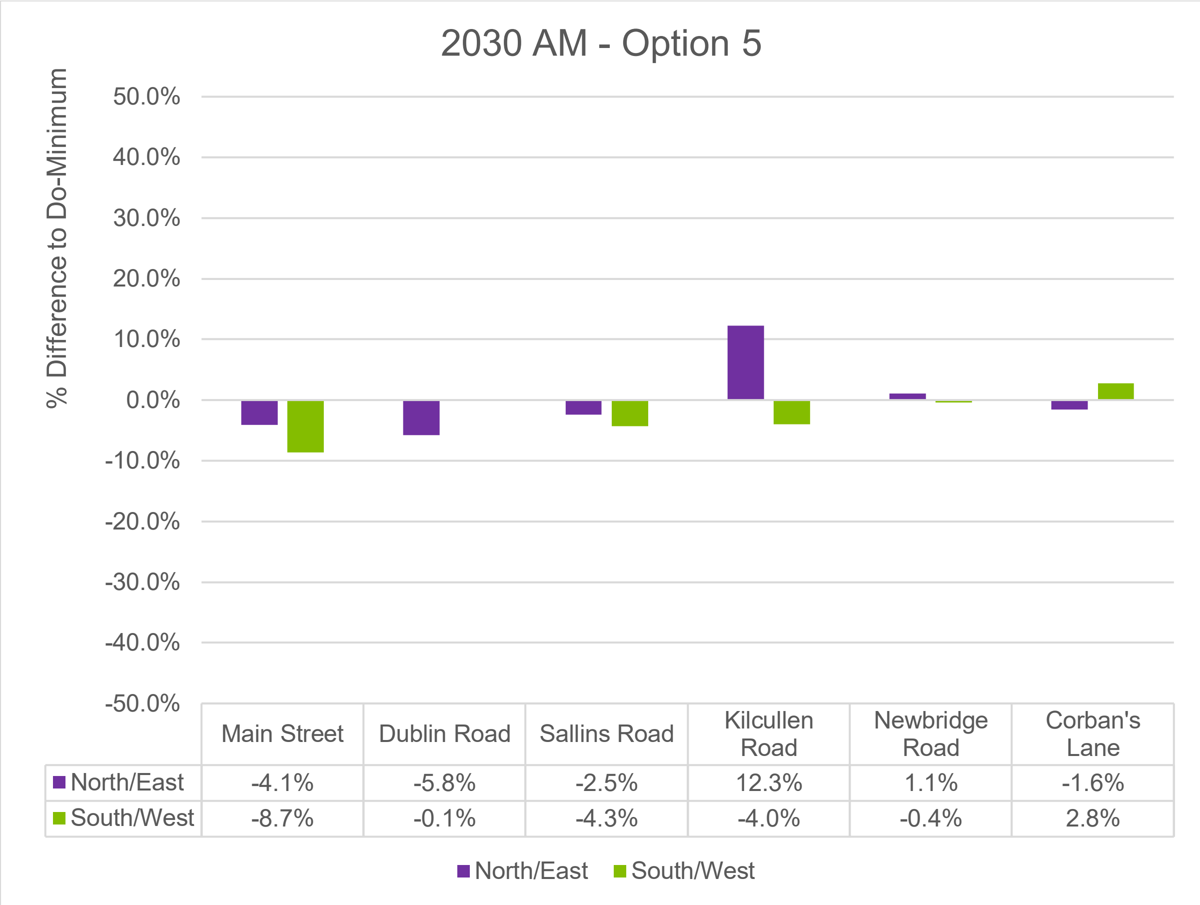
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-0.6%	0.6%	-1.1%	0.5%	-1.6%	0.0%
South/West	-8.7%	-0.1%	-4.3%	-4.0%	-0.4%	2.8%

Figure B-17: 2023 AM - Option 5 Flow Difference on Key Roads



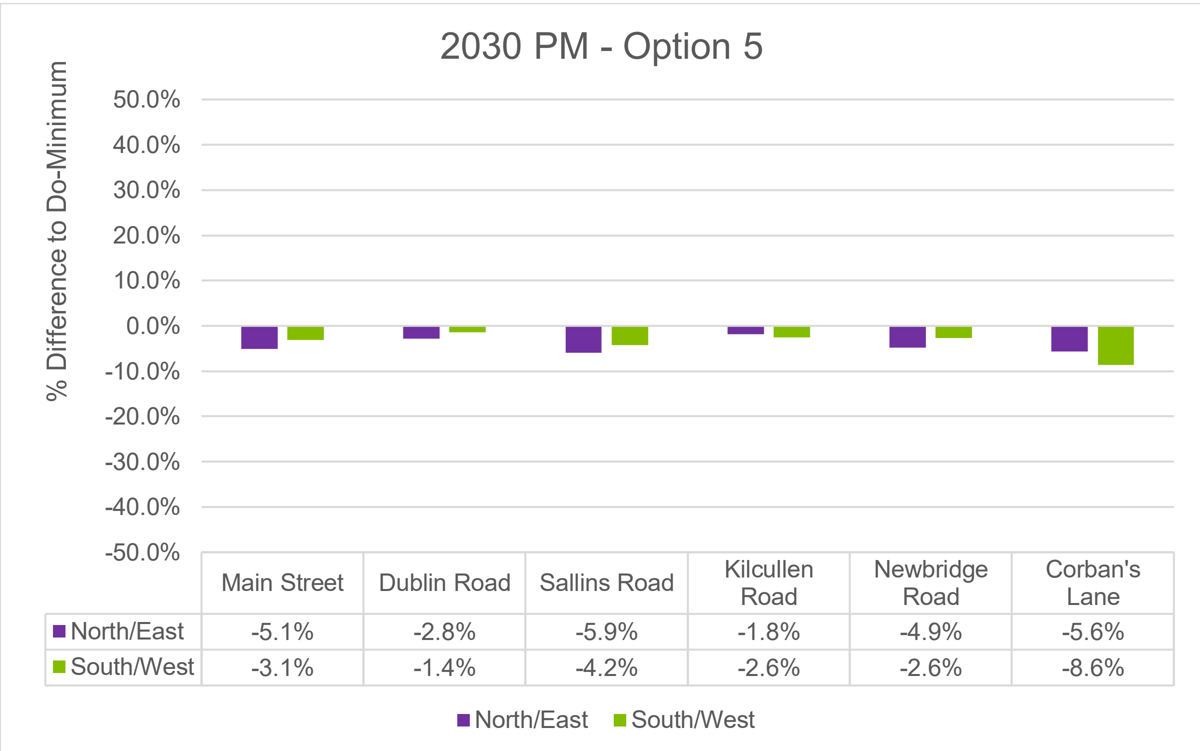
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-3.4%	-0.7%	-2.4%	0.0%	-4.2%	0.0%
South/West	-1.8%	-0.8%	-1.2%	-0.2%	-1.9%	-0.5%

Figure B-18: 2023 PM - Option 5 Flow Difference on Key Roads



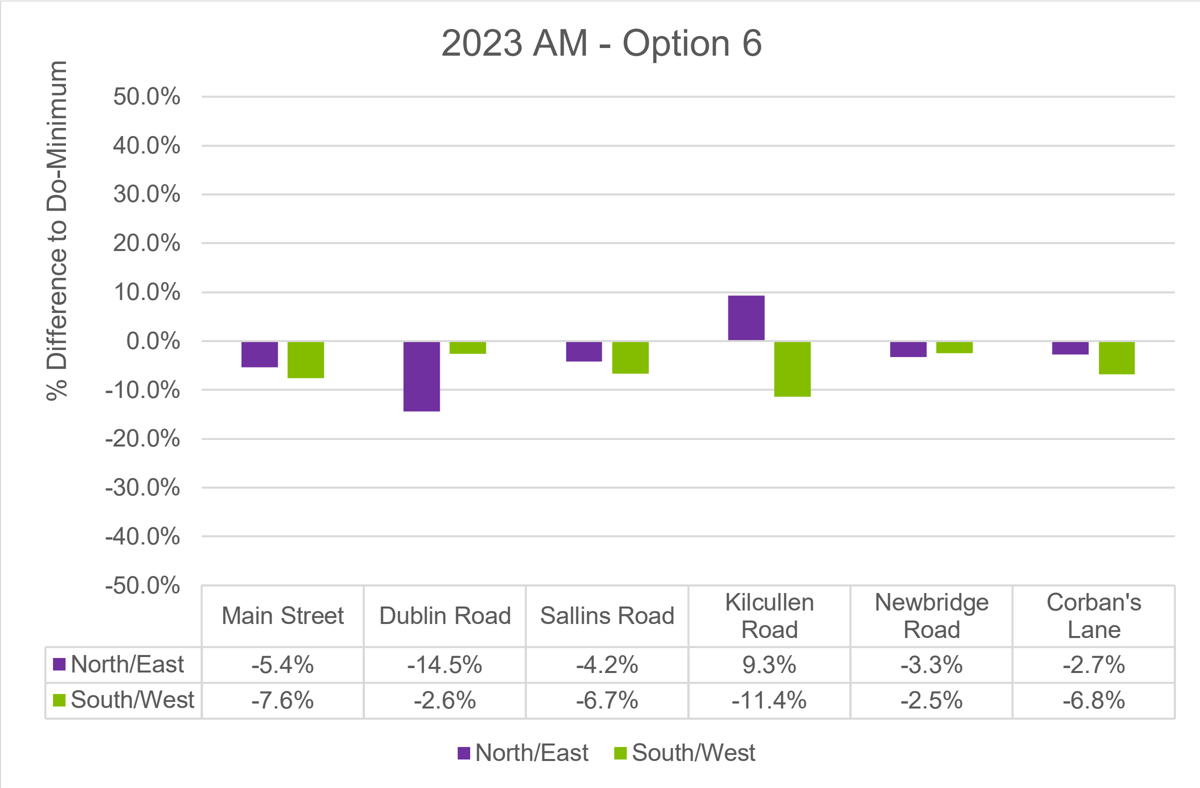
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-4.1%	-5.8%	-2.5%	12.3%	1.1%	-1.6%
South/West	-8.7%	-0.1%	-4.3%	-4.0%	-0.4%	2.8%

Figure B-19: 2030 AM - Option 5 Flow Difference on Key Roads



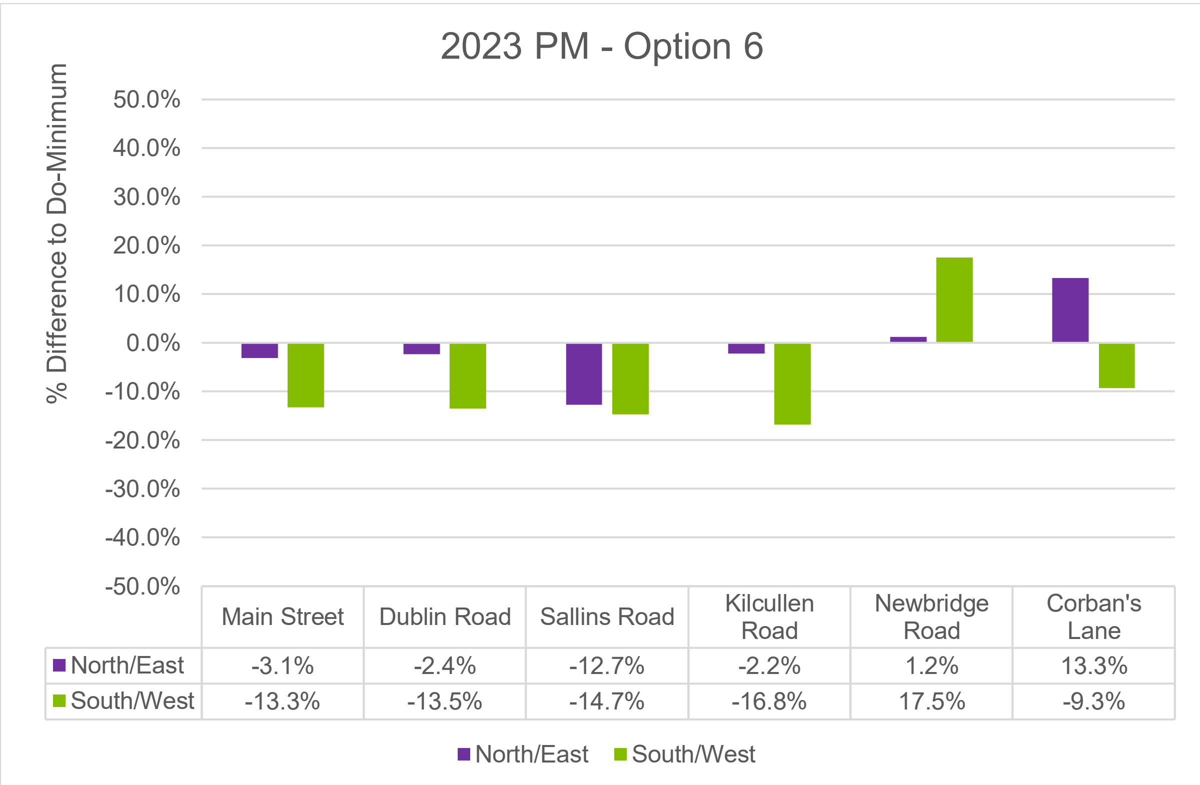
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-5.1%	-2.8%	-5.9%	-1.8%	-4.9%	-5.6%
South/West	-3.1%	-1.4%	-4.2%	-2.6%	-2.6%	-8.6%

Figure B-20: 2030 PM - Option 5 Flow Difference on Key Roads



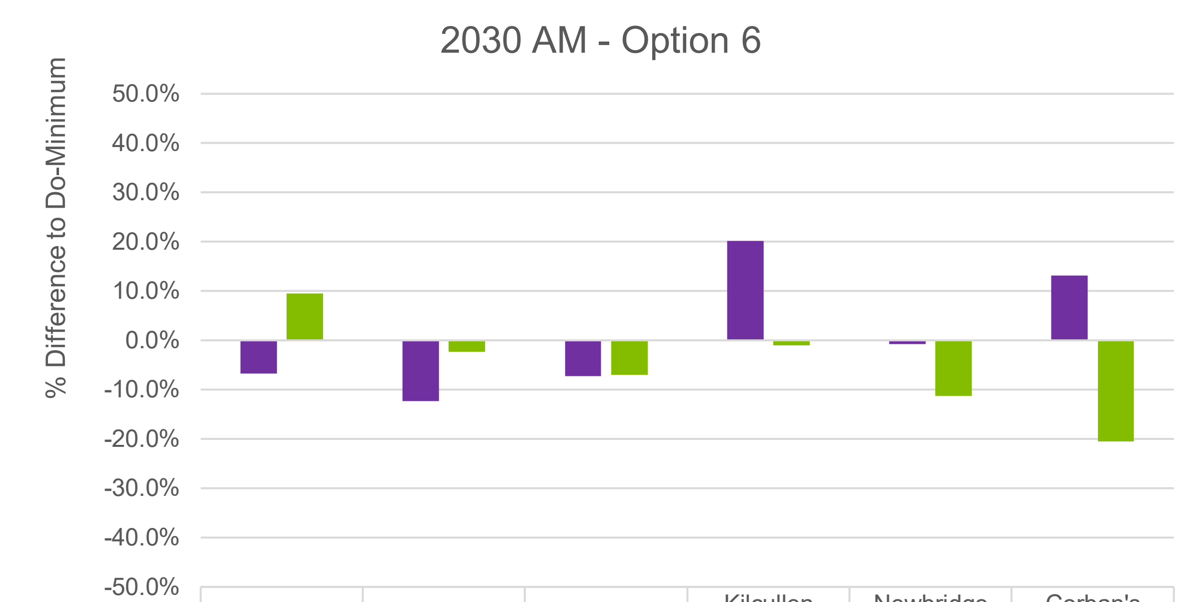
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-5.4%	-14.5%	-4.2%	9.3%	-3.3%	-2.7%
South/West	-7.6%	-2.6%	-6.7%	-11.4%	-2.5%	-6.8%

Figure B-21: 2023 AM - Option 6 Flow Difference on Key Roads



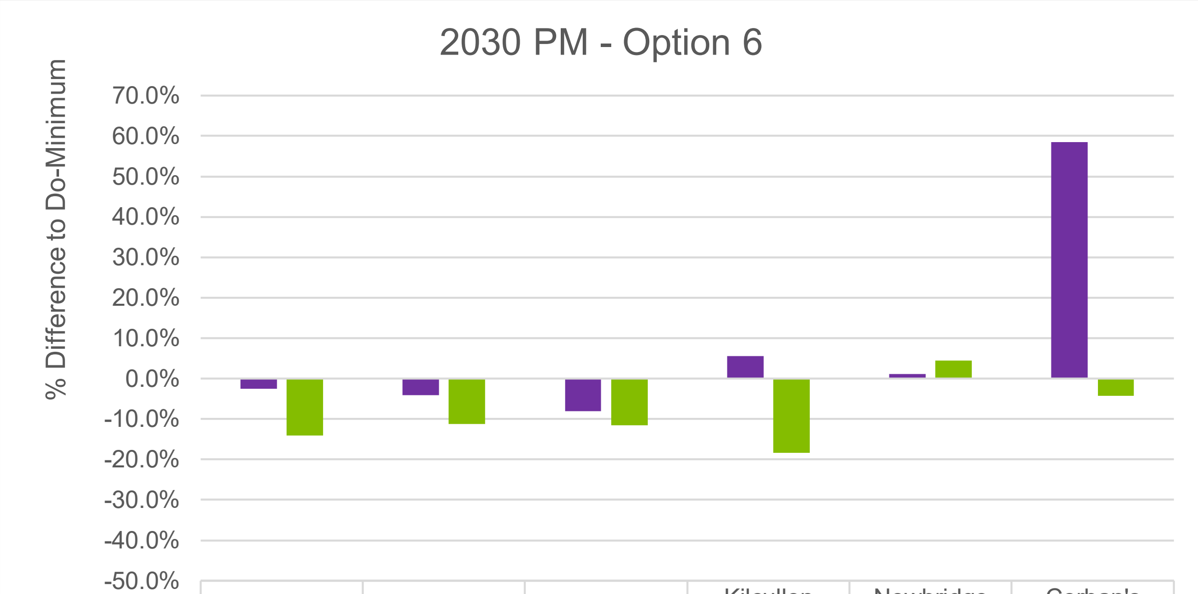
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-3.1%	-2.4%	-12.7%	-2.2%	1.2%	13.3%
South/West	-13.3%	-13.5%	-14.7%	-16.8%	17.5%	-9.3%

Figure B-22: 2023 PM - Option 6 Flow Difference on Key Roads



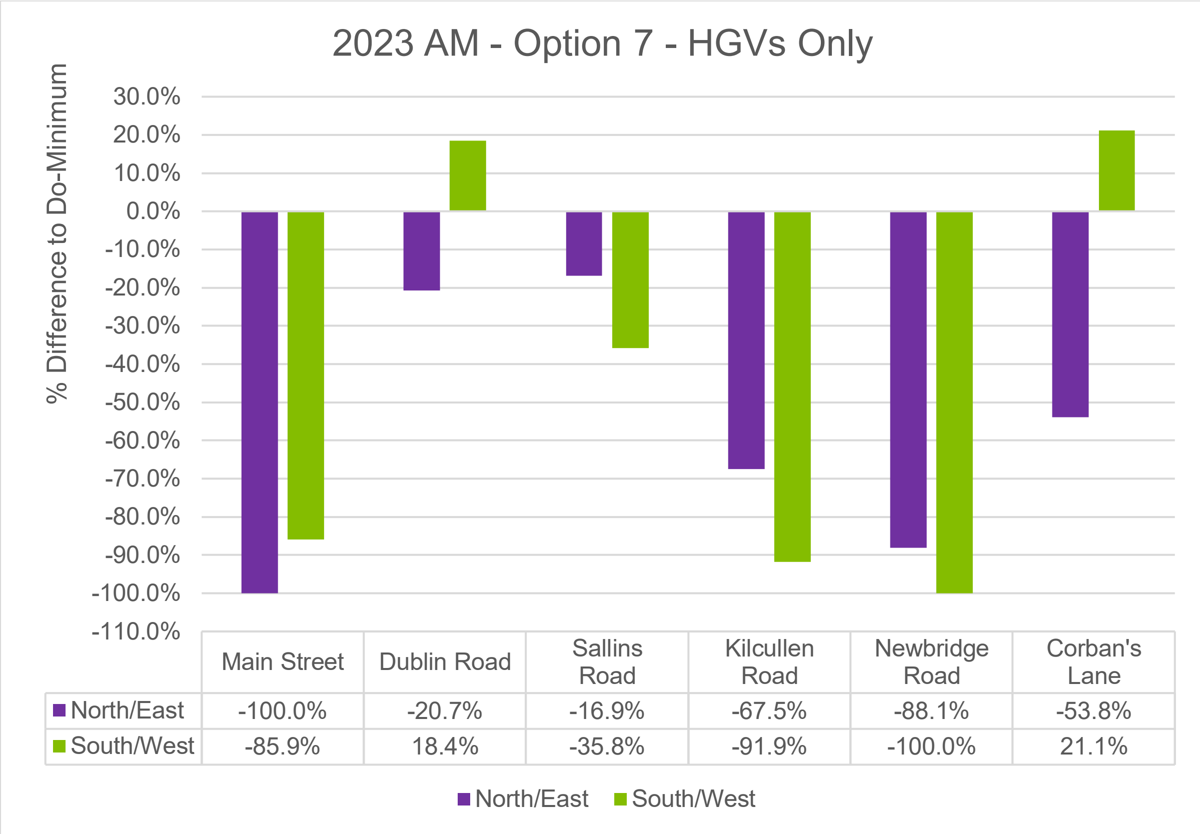
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-6.8%	-12.4%	-7.3%	20.2%	-0.7%	13.1%
South/West	9.5%	-2.3%	-7.0%	-1.0%	-11.2%	-20.5%

Figure B-23: 2030 AM - Option 6 Flow Difference on Key Roads



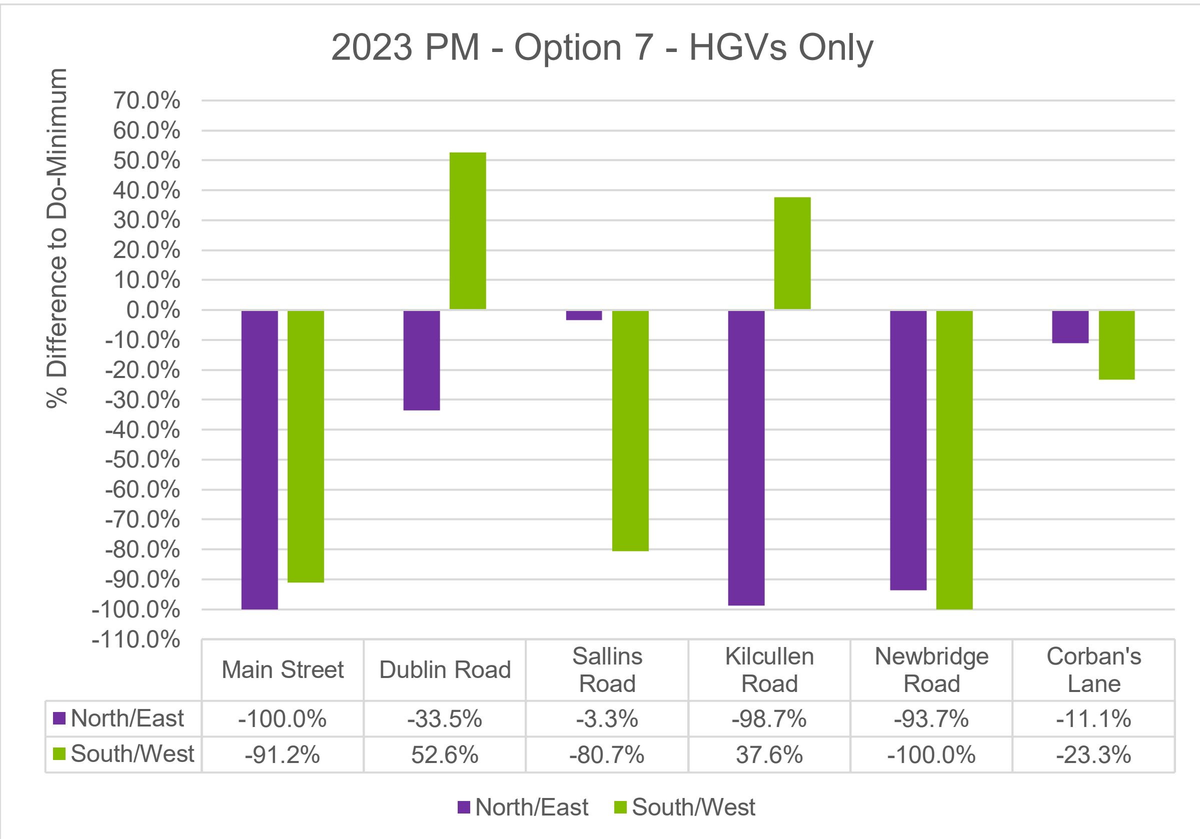
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-2.5%	-4.1%	-8.1%	5.5%	1.2%	58.5%
South/West	-14.2%	-11.3%	-11.6%	-18.3%	4.4%	-4.3%

Figure B-24: 2030 PM - Option 6 Flow Difference on Key Roads



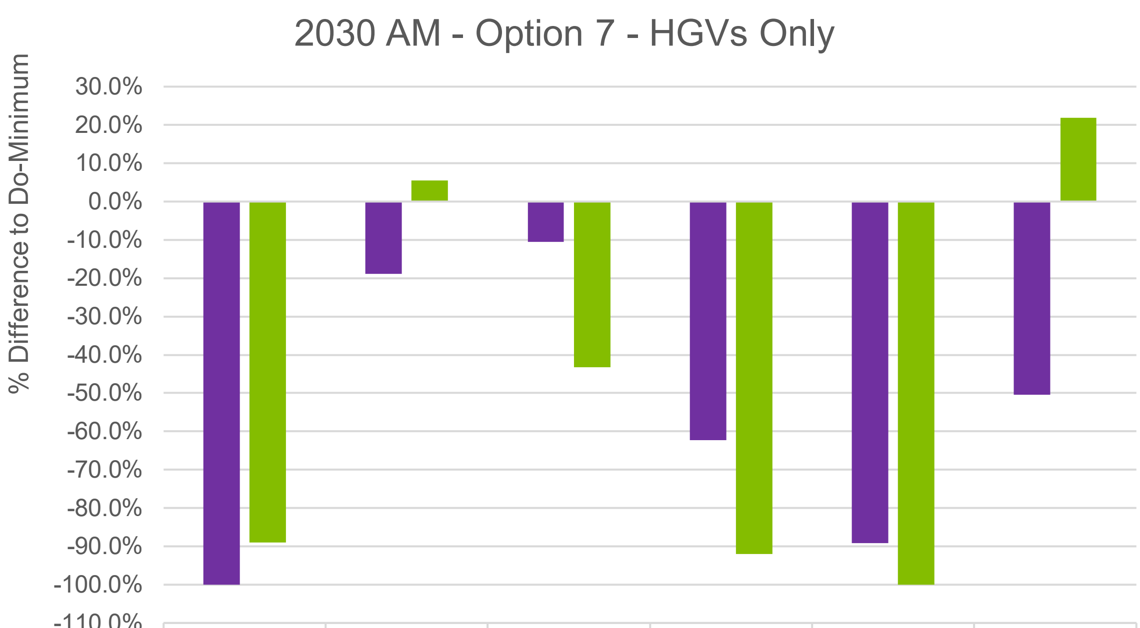
	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-100.0%	-20.7%	-16.9%	-67.5%	-88.1%	-53.8%
South/West	-85.9%	18.4%	-35.8%	-91.9%	-100.0%	21.1%

Figure B-25: 2023 AM - Option 7 - HGVs Only Flow Difference on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-100.0%	-33.5%	-3.3%	-98.7%	-93.7%	-11.1%
South/West	-91.2%	52.6%	-80.7%	37.6%	-100.0%	-23.3%

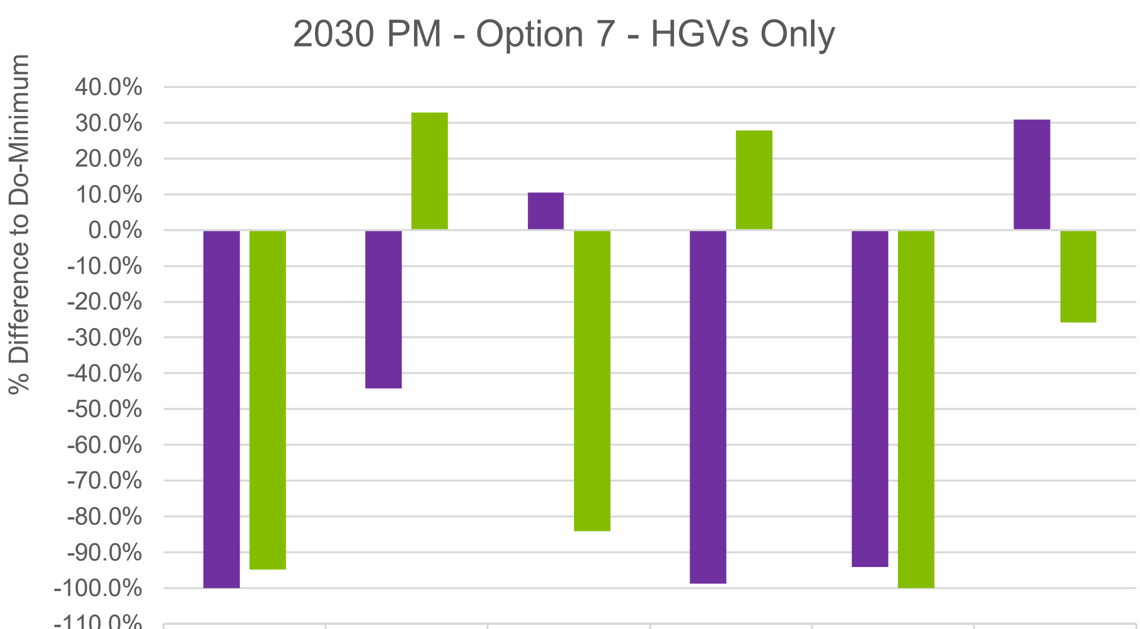
Figure B-26: 2023 PM - Option 7 - HGVs Only Flow Difference on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-100.0%	-18.9%	-10.5%	-62.2%	-89.2%	-50.5%
South/West	-88.9%	5.4%	-43.3%	-92.1%	-100.0%	21.8%

North/East South/West

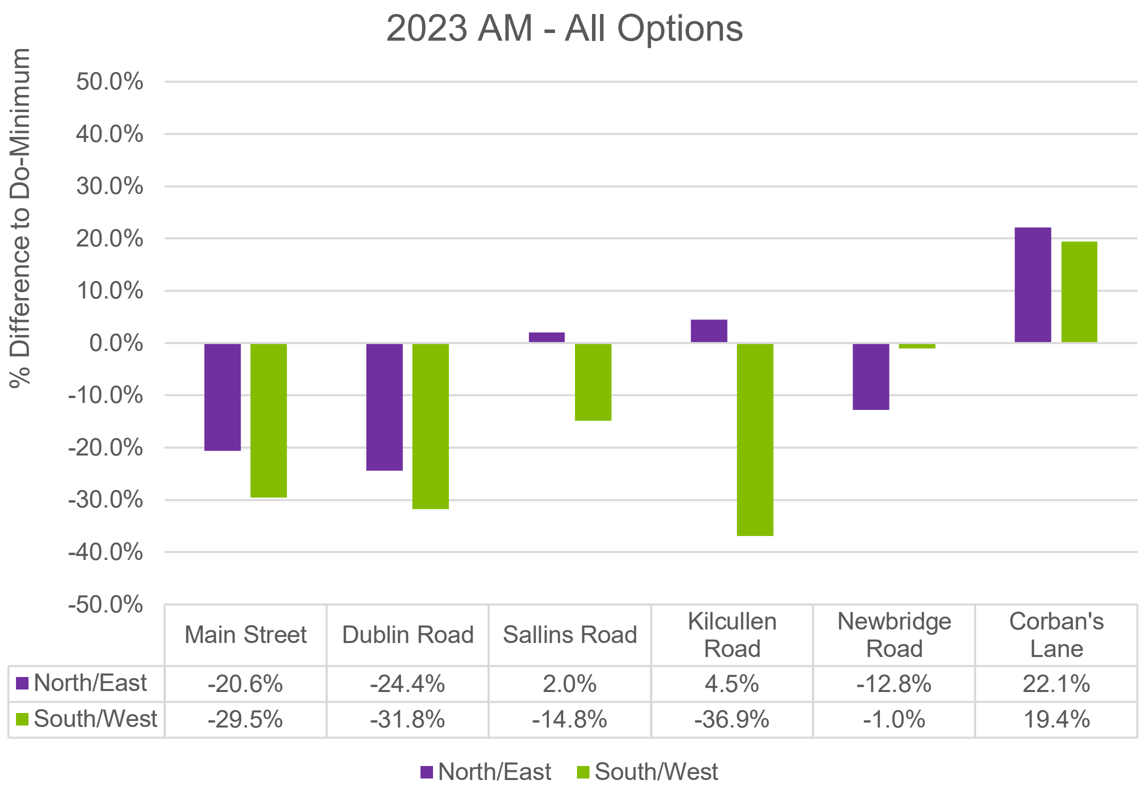
Figure B-27: 2030 AM - Option 7 - HGVs Only Flow Difference on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-100.0%	-44.2%	10.5%	-98.8%	-94.1%	30.9%
South/West	-94.8%	32.8%	-84.1%	27.9%	-100.0%	-25.8%

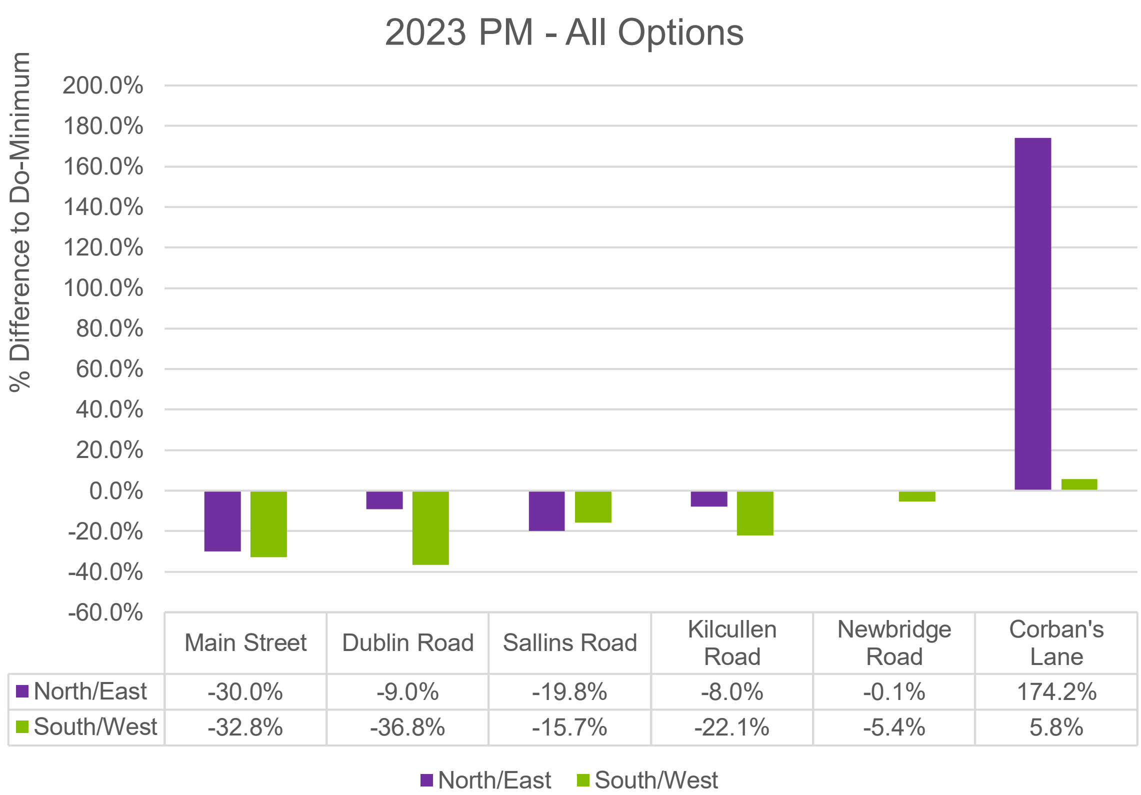
North/East South/West

Figure B-28: 2030 PM - Option 7 - HGVs Only Flow Difference on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-20.6%	-24.4%	2.0%	4.5%	-12.8%	22.1%
South/West	-29.5%	-31.8%	-14.8%	-36.9%	-1.0%	19.4%

Figure B-29: 2023 AM - All Options Flow Difference on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-30.0%	-9.0%	-19.8%	-8.0%	-0.1%	174.2%
South/West	-32.8%	-36.8%	-15.7%	-22.1%	-5.4%	5.8%

Figure B-30: 2023 PM - All Options Flow Difference on Key Roads

Figure B-31: 2030 AM - All Options Flow Difference on Key Roads

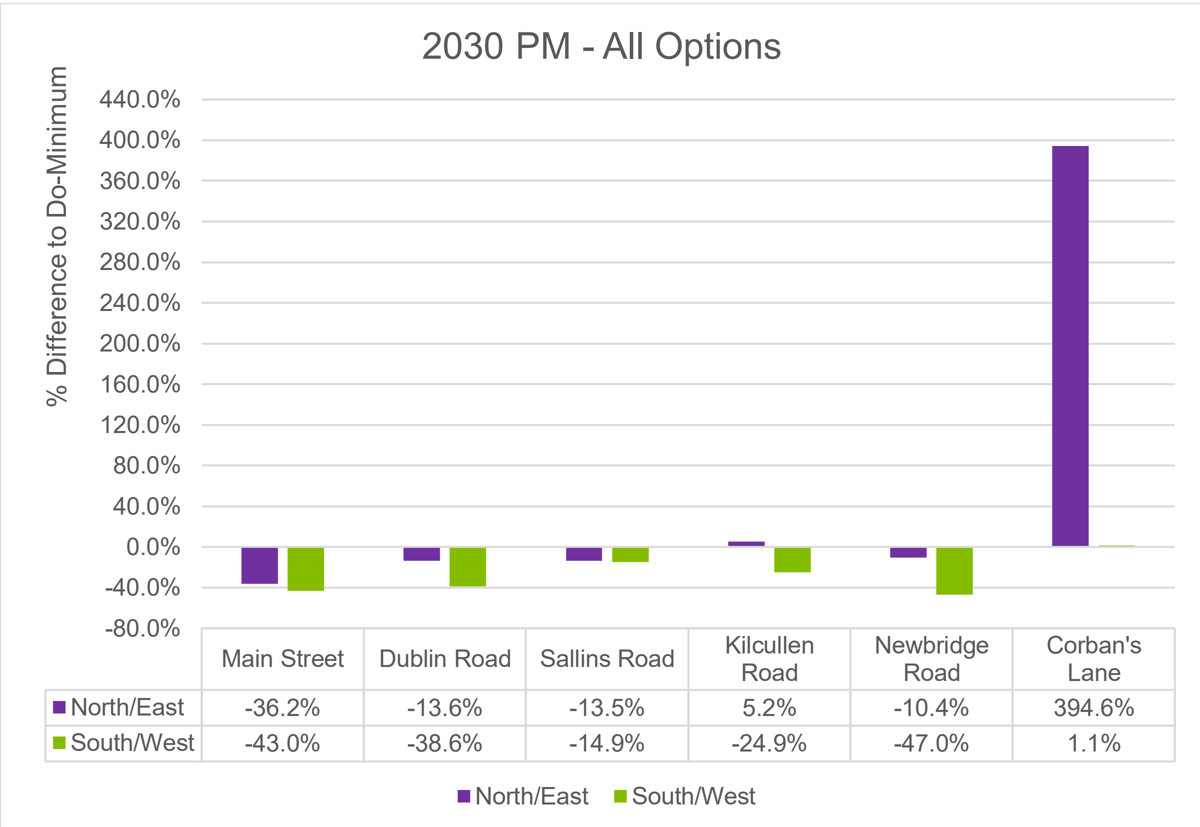
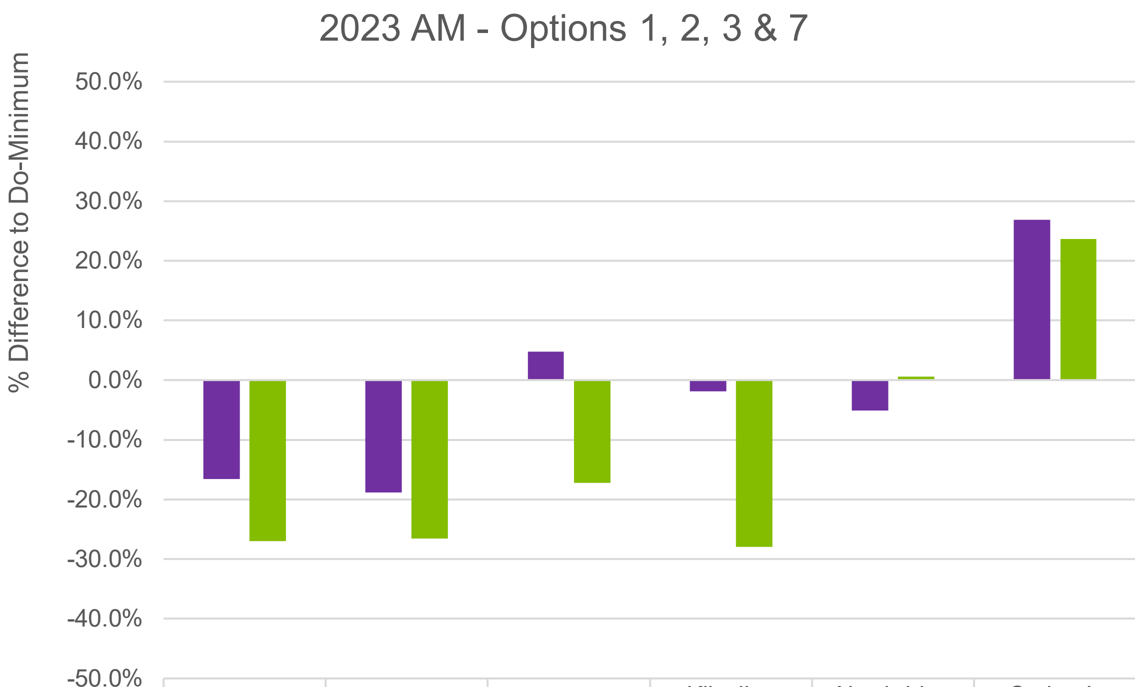


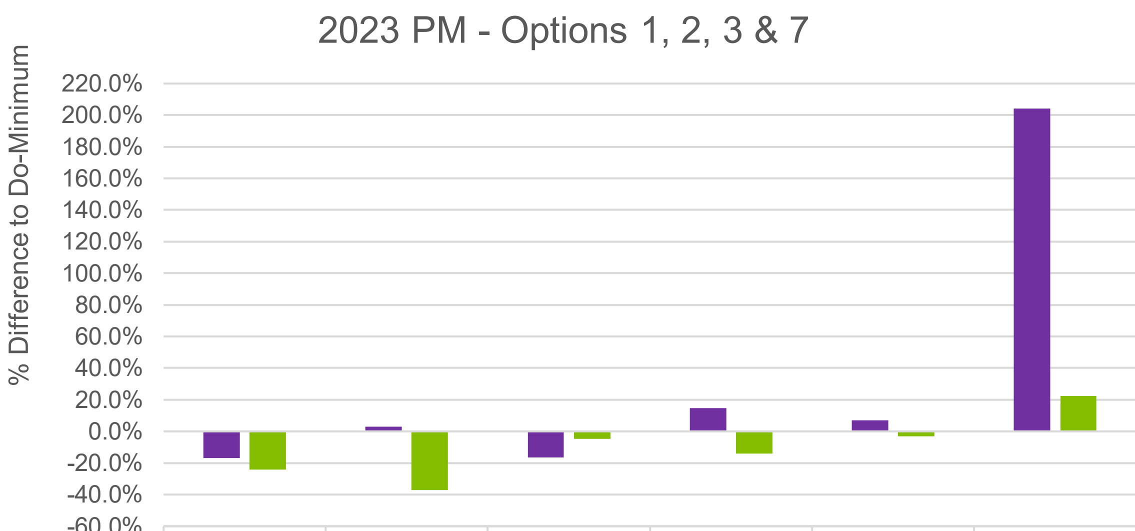
Figure B-32: 2030 PM - All Options Flow Difference on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-16.6%	-18.9%	4.8%	-1.9%	-5.1%	26.9%
South/West	-27.0%	-26.6%	-17.2%	-27.9%	0.6%	23.6%

■ North/East ■ South/West

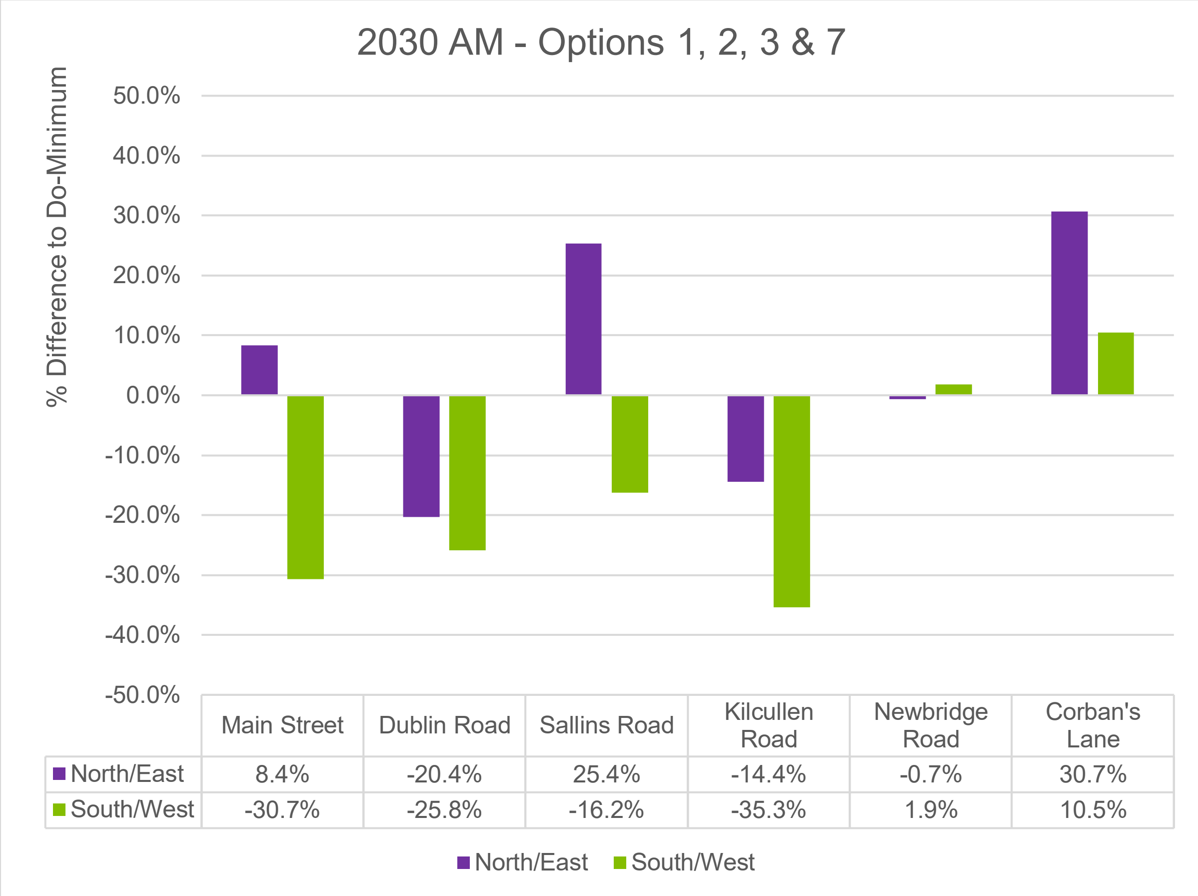
Figure B-33: 2023 AM - Options 1, 2, 3 & 7 Flow Difference on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-16.8%	2.9%	-16.4%	14.9%	7.1%	204.1%
South/West	-24.2%	-37.2%	-4.6%	-13.9%	-3.1%	22.5%

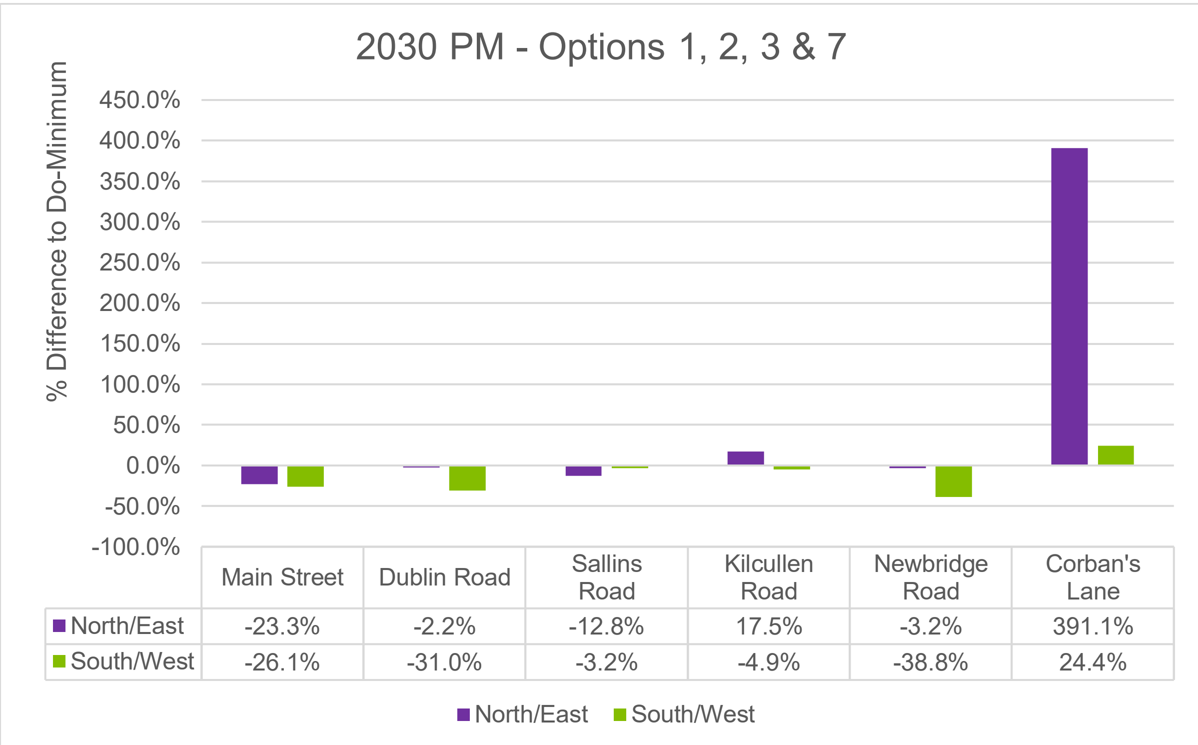
■ North/East ■ South/West

Figure B-34: 2023 PM - Options 1, 2, 3 & 7 Flow Difference on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	8.4%	-20.4%	25.4%	-14.4%	-0.7%	30.7%
South/West	-30.7%	-25.8%	-16.2%	-35.3%	1.9%	10.5%

Figure B-35: 2030 AM - Options 1, 2, 3 & 7 Flow Difference on Key Roads



	Main Street	Dublin Road	Sallins Road	Kilcullen Road	Newbridge Road	Corban's Lane
North/East	-23.3%	-2.2%	-12.8%	17.5%	-3.2%	391.1%
South/West	-26.1%	-31.0%	-3.2%	-4.9%	-38.8%	24.4%

Figure B-36: 2030 PM - Options 1, 2, 3 & 7 Flow Difference on Key Roads

Appendix C: Land-use Scenario Job Allocation & Traffic Demand in Key Areas

Table C-1: Additional Job Allocation (2023-2030)

Site	2030 Full build	2030 Alternative A	2030 Alternative B	2030 Preferred Scenario	2030 Low Trip Intensity Development 1	2030 Low Trip Intensity Development 2	2030 Low Trip Intensity Development 3
Donnelly Mirrors	388	0	194	194	194	116	194
Zone around M7 Junction 10	138	0	69	0	138	0	0
Millennium Park	2841	0	1421	1421	1421	1499	1627
Total	3367	0	1684	1615	1753	1615	1821

Table C-2: Absolute Increase in AM Origin Trip Demand (2023-2030)

Site	2030 Full build	2030 Alternative A	2030 Alternative B	2030 Preferred Scenario	2030 Low Trip Intensity Development 1	2030 Low Trip Intensity Development 2	2030 Low Trip Intensity Development 3
Donnelly Mirrors	15.327	0	7.675	7.675	7.675	6.832	7.675
Zone around M7 Junction 10	6.941	0	3.475	0	6.941	0	0
Millennium Park	142.047	0	71.03	71.03	71.03	73.227	81.232
Total	164.315	0	82.18	78.705	85.646	80.059	88.907

Table C-3: Percentage Increase in AM Origin Trip Demand (2023-2030)

Site	2030 Full build	2030 Alternative A	2030 Alternative B	2030 Preferred Scenario	2030 Low Trip Intensity Development 1	2030 Low Trip Intensity Development 2	2030 Low Trip Intensity Development 3
Donnelly Mirrors	210.8%	0.0%	105.5%	105.5%	105.5%	93.9%	105.5%
Zone around M7 Junction 10	212.1%	0.0%	106.2%	0.0%	212.1%	0.0%	0.0%
Millennium Park	211.5%	0.0%	105.8%	105.8%	105.8%	109.0%	120.9%
Total	**211.4%**	**0.0%**	**105.8%**	**101.3%**	**110.2%**	**103.0%**	**114.4%**

Table C-4: Absolute Increase in AM Destination Trip Demand (2023-2030)

Site	2030 Full build	2030 Alternative A	2030 Alternative B	2030 Preferred Scenario	2030 Low Trip Intensity Development 1	2030 Low Trip Intensity Development 2	2030 Low Trip Intensity Development 3
Donnelly Mirrors	73.769	0	36.888	36.888	36.888	15.584	36.888
Zone around M7 Junction 10	40.524	0	20.263	0	40.524	0	0
Millennium Park	822.696	0	411.348	411.348	411.348	427.684	472.403
Total	**936.989**	**0**	**468.499**	**448.236**	**488.76**	**443.268**	**509.291**

Table C-5: Percentage Increase in AM Destination Trip Demand (2023-2030)

Site	2030 Full build	2030 Alternative A	2030 Alternative B	2030 Preferred Scenario	2030 Low Trip Intensity Development 1	2030 Low Trip Intensity Development 2	2030 Low Trip Intensity Development 3
Donnelly Mirrors	99.0%	0.0%	49.5%	49.5%	49.5%	20.9%	49.5%
Zone around M7 Junction 10	197.3%	0.0%	98.7%	0.0%	197.3%	0.0%	0.0%
Millennium Park	101.8%	0.0%	50.9%	50.9%	50.9%	52.9%	58.5%
Total	**103.8%**	**0.0%**	**51.9%**	**49.6%**	**54.1%**	**49.1%**	**56.4%**

Table C-6: Absolute Increase in PM Origin Trip Demand (2023-2030)

Site	2030 Full build	2030 Alternative A	2030 Alternative B	2030 Preferred Scenario	2030 Low Trip Intensity Development 1	2030 Low Trip Intensity Development 2	2030 Low Trip Intensity Development 3
Donnelly Mirrors	63.487	0	31.749	31.749	31.749	18.684	31.749
Zone around M7 Junction 10	33.302	0	16.651	0	33.302	0	0
Millennium Park	675.362	0	337.676	337.676	337.676	342.07	388.011
Total	772.151	0	386.076	369.425	402.727	360.754	419.76

Table C-7: Percentage Increase in PM Origin Trip Demand (2023-2030)

Site	2030 Full build	2030 Alternative A	2030 Alternative B	2030 Preferred Scenario	2030 Low Trip Intensity Development 1	2030 Low Trip Intensity Development 2	2030 Low Trip Intensity Development 3
Donnelly Mirrors	117.7%	0.0%	58.8%	58.8%	58.8%	34.6%	58.8%
Zone around M7 Junction 10	195.7%	0.0%	97.8%	0.0%	195.7%	0.0%	0.0%
Millennium Park	107.7%	0.0%	53.9%	53.9%	53.9%	54.6%	61.9%
Total	110.7%	0.0%	55.3%	52.9%	57.7%	51.7%	60.2%

Table C-8: Absolute Increase in PM Destination Trip Demand (2023-2030)

Site	2030 Full build	2030 Alternative A	2030 Alternative B	2030 Preferred Scenario	2030 Low Trip Intensity Development 1	2030 Low Trip Intensity Development 2	2030 Low Trip Intensity Development 3
Donnelly Mirrors	10.742	0	5.374	5.374	5.374	5.688	5.374
Zone around M7 Junction 10	5.444	0	2.722	0	5.444	0	0
Millennium Park	111.793	0	55.893	55.893	55.893	57.418	63.888
Total	127.979	0	63.989	61.267	66.711	63.106	69.262

Table C-9: Percentage Increase in PM Destination Trip Demand (2023-2030)

Site	2030 Full build	2030 Alternative A	2030 Alternative B	2030 Preferred Scenario	2030 Low Trip Intensity Development 1	2030 Low Trip Intensity Development 2	2030 Low Trip Intensity Development 3
Donnelly Mirrors	214.5%	0.0%	107.3%	107.3%	107.3%	113.6%	107.3%
Zone around M7 Junction 10	213.5%	0.0%	106.7%	0.0%	213.5%	0.0%	0.0%
Millennium Park	214.2%	0.0%	107.1%	107.1%	107.1%	110.0%	122.4%
Total	214.2%	0.0%	107.1%	102.6%	111.7%	105.6%	115.9%

Appendix C Micro-Simulation Transport Modelling Report

C.1 VISSIM Model Development Report

Naas/Sallins Transport Strategy

VISSIM Model Development Report

Kildare County Council

September 2020

Prepared for:

Kildare County Council

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1 Introduction

1.1 Introduction

AECOM was commissioned by Kildare County Council to provide assistance in the preparation of a Transport Strategy for Naas. AECOM's role was to develop an understanding of the transport issues in Naas and make recommendations on a strategic implementation plan of improvement measures and interventions in relation to walking, cycling, public transport, public realm, car parking, traffic movement, linkages and town approaches.

The Naas Transport Strategy aims to sustain the town as an attractive and thriving town centre by creating a framework for sustainable transportation and a quality urban environment. This will involve the development of a high quality and people focused realm, with a connected, engaged, healthy and prosperous community.

To aid this cause, Kildare County Council have commissioned AECOM to develop a microsimulation model to inform the Council on the impact of their network improvements and planning proposals. This report outlines the methodology adopted to produce a VISSIM microsimulation model of Naas with a base year of 2018.

1.2 Study Area

The study area for Naas is shown in Figure 1.1. This study area encompasses the proposed network identified in Figure 4.0: Naas Microsimulation Model Proposed Network in the *'Naas Transport Strategy: Brief for Engineering Consultancy Services'* dated October 2018 with greater extents and detail in order to capture junctions and road links which contribute to the town's congested road network.

Figure 1.1 Microsimulation Study Area

The study area covers the town centre of Naas and the major arterial routes through the town including the R445, R410, R407 and R448. Smaller routes through the town such as Friary Road and Corban's Lane are also included in the study area which provide route choice for road users in the town.

1.3 Report Objectives

The primary objective of this report and accompany microsimulation modelling is to produce an accurate traffic model for Naas taking into consideration the character of the town. The traffic model will allow the impacts of transport interventions in the study area to be quantified or monetised and help inform the decision making process in relation to the identification of preferred options.

1.4 Report Structure

The report takes the following structure:

- Chapter 2: Proposed Uses of the Microsimulation Model;
- Chapter 3: Model Parameters and Modelling Standards;
- Chapter 4: Survey Data;
- Chapter 5: Network Construction;
- Chapter 6: Matrix Development;
- Chapter 7: Calibration and Validation; and
- Chapter 8: Summary

2 Proposed Uses of the Microsimulation Models

2.1 Proposed Uses

Naas' current footprint originates in the 1960's which saw the emergence of the town as a major commuter town for the city of Dublin and as a result, the town is characterised by low-density, car-orientated developments located along the major arterial routes of the town; namely the R445, R448, R410 and R407. Recent development during the 2000's saw the erosion of the town centre's retail base and the expansion of suburban residential developments and peripheral retail developments.

It is intended that this Study will inform the Naas Local Area Plan 2021 – 2027 (LAP) which will establish a strategy for the planning and sustainable development of Naas in order to revitalise the town in the wake of the economic recession and prior development trends. The strategy will be informed and shaped by the following seven core themes:

1. Town Centre Revitalisation and Regeneration – the traditional town centre will be the focus for retail, commercial and residential development through the consolidation, regeneration and revitalisation of key sites;
2. Economic Development – continued development of a strong, high quality enterprise and employment base within the town;
3. Public Realm and Urban Structure – improving the public realm and increasing connectivity between neighbourhoods, community areas and employment centres;
4. Connectivity and Movement – improving sustainable travel networks e.g. pedestrian and cycle routes and public transport in order to facilitate safe and efficient travel between established peripheral areas of the town and the town centre;
5. Housing and Community – the delivery of new neighbourhoods with a strong sense of place that contribute to a culture of health and wellbeing within the town;
6. Heritage and Culture – protecting Naas' heritage through the effective reuse or adaptation of specific heritage assets in the town;
7. Environment and Climate Change – the development of a low-carbon and climate change resilient town by promoting the economic, social and environmental benefits of low-carbon developments.

The purpose of the microsimulation models will be to complement the Strategic Traffic Model (STM) and to assess the impacts of proposed traffic management measures and infrastructure improvements within Naas. These include:

- Specific interventions at key junctions throughout the town centre;
- The construction of a new junction at Murtagh's Corner;
- Construction of the Naas Inner Relief Road; and
- Construction of an Inner Orbital Route including its associated canal crossing.

These improvements will be assessed using a base year of 2018 with future growth scenarios for 2023 and 2030.

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3 Model Parameters and Modelling Standards

3.1 Model Description and Setup

As stated in the Introduction, the model has been developed using the microsimulation software VISSIM, version 10.00-02. VISSIM is a detailed microsimulation transport package that can model the interaction of individual vehicles throughout a road network. This makes the software highly suited for detailed junction modelling and the assessment of traffic management and planning proposals in an urban network.

3.2 Assignment Method and Convergence

The model uses dynamic assignment which means each vehicle considers its shortest path based on the time in which the vehicle is being assigned to the network. The model also uses stochastic assignment (via the Kirchhoff equation) to assign demand between the available paths between two zone pairs. The combination of these two assignment methods allows the package to closely replicate on-site driver behaviour.

In order for the model to be calibrated and validated, the model must first build up knowledge of the network, this is carried out using the following steps:

- The traffic demands for light vehicles (LVs) and heavy vehicles (HVs) were assigned to establish all sensible paths through the network. Restrictions were placed on the path searching, including the rejection of any paths greater than 60% of the shortest path. In total 5 model runs were undertaken starting with 85% of the full demand increasing in 5% increments. It should also be noted that paths with no demands were also established;
- A general check on the paths was carried out to remove any nonsensical paths;
- The path search was switched off and the model was run to convergence. This was undertaken by updating the cost file, which required the seed value to be fixed and convergence termination criteria to be set to <15 vehicles of a difference between consecutive iterations; and
- With both cost and paths files complete the model was then run using 10 varying seeds to present an average result. These results were then used to determine the current confidence in the results and to establish how many runs were required to achieve a desired confidence level of 95%.

3.3 Acceptability Guidelines

The purpose of calibration and validation is to develop a model that is robust and does not produce unduly misleading or biased results. It is essential that the model is validated to as high a standard as possible, given the data available, to ensure that the model is a robust representation of observed conditions.

- It is important to clearly define calibration and validation. Calibration can be defined as the adjustments to a model intended to reduce the differences between modelled and observed data.
- The differences between modelled and observed data should be quantified and then assessed using some criteria. This is commonly known as validation.

The validation of a model should compare modelled and observed journey times along main routes, as a check on the quality of the network and the assignment.

3.3.1 Link Count Calibration

For link flow calibration, the measures used are:

- The absolute percentage differences between modelled flows and counts; and

- The GEH statistic, which is a form of Chi-squared statistic that incorporates both relative and absolute errors, and is defined as follows:

$$GEH=\sqrt{\frac{(M-C)^2}{(M+C)/2}}$$

where GEH is the GEH statistic;
M is the modelled flow; and
C is the observed flow.

The calibration criteria and acceptability guidelines for hourly link flows and turning movements are set out in Table 3.1.

Table 3.1 Calibration Criteria

Criteria Description	Acceptability
Individual flows within 100 veh/h of counts for flows less than 700 veh/h	> 85%
Individual flows within 15% of counts for flows less than 700 to 2700 veh/h	> 85%
Individual flows within 400 veh/h of counts for flows more than 2700 veh/h	> 85%
GEH<5 for individual flows	> 85%

Source: Table 5.1.3, PAG Unit 5.1 – Construction of Transport Models

With regard to link flow calibration, WebTAG provides the following further guidance:

- the criteria should be applied to both link flows and turning movements;
- the acceptability guideline should be applied to link flows but may be difficult to achieve for turning movements;
- the comparisons should be presented for cars, but not for Light Good Vehciles (LGVs) and Ordinary Goods Vehicles (OGVs) unless sufficiently accurate link counts have been obtained; and
- the comparisons should be presented separately for each modelled period or hour.

The guidance also states that the two measures (flow and GEH) are broadly consistent and link flows that meet either criterion should be regarded as satisfactory. Therefore, links will be considered to have passed the validation criterion if criteria 1 or criteria 2 are met.

3.3.2 Journey Time Validation

For journey time validation, the measure used is the percentage difference between modelled and observed journey times, subject to an absolute maximum difference. The validation criterion and acceptability guidelines for journey times are defined in Table 3.2

Table 3.2 Validation Criteria

Criteria Description	Acceptability
Differences between modelled and observed journey times < 15% and/or 60s	> 85%

Source: Table 5.1.3, PAG Unit 5.1 – Construction of Transport Models

4 Survey Data

4.1 Introduction

In order to develop an accurate model and demonstrate its accuracy compared with real-world conditions, it is necessary to use a variety of data sources and types. The purpose of this chapter is to summarise the data collection undertaken and highlight data used to calibrate and validate the VISSIM model with information provided on the background to the work and the methods by which the commissioned surveys were carried out. For the purposes of this model, traffic count data was used to calibrate the model and journey times were used to validate the model.

The data listed below was collected to construct the demand matrices and calibrate / validate the model:

- Automatic Number Plate Recognition (ANPR);
- Automatic Traffic Counts (ATC);
- Junction Turning Counts (JTC);
- Google Journey Times;
- Census data (total population and total daytime population); and
- Place of Work, School or College, Census of Anonymised Records (POWSCAR) data.

It should be noted that Census Data, POWSCAR and ANPR data have solely been used for the development of the strategic VISUM model (Ref: Naas VISUM Model Development Report dated September 2020 This strategic model has been used in the development of the VISSIM demand matrices which is discussed in greater detail within Chapter 6.

4.2 Travel Demand Data

4.2.1 ANPR & ATC Surveys

Data was provided by KCC for ANPR and ATC surveys that were undertaken at 22 sites in Naas from Monday 24th September to Sunday 30th September 2018 using ANPR technology to match and record passing vehicles. A summary of the survey locations is provided in Table 4.1 Each location was surveyed in both directions in order to capture link counts and origin-destination data over the surveyed period. The ATC surveys captured data for a continuous seven-day period while the ANPR surveys captured data from 07:00 – 19:00 on the 25th September and 26th September 2018.

Table 4.1 ANPR & ATC Survey Locations

Site	Location
1	West of R445 (Newbridge Road) / Millennium Park Link Road roundabout
2	West of R409 / Millennium Park Link Road roundabout
3a	West of R407 (Sallins Road) / Monread Road / Millennium Park Link Road roundabout
3b	North of R407 (Sallins Road) / Monread Road / Millennium Park Link Road roundabout
4	West of R445 (Dublin Road) / Monread Road / N7 roundabout
5	South of Johnstown Road
6	South of R445 (Dublin Road) / Monread Road / N7 roundabout
7	South of Naas Industrial Estate on Fishery Lane
8	Tipper Road east of Naas
9	R410 (Blessington Road north of R410 / Ballycane Road junction

Site	Location
10	R410 (Blessington Road) south of Craddockstown Golf Club
11	South of Craddockstown Road / Ballycane Road junction
12	South of R411 (Ballymore Road) / South Ring Road roundabout
13	South of R448 (Kilcullen Road) / South Ring Road roundabout
14	East of R445 (Newbridge Road) / R409 junction
15	South of R448 (Kilcullen Road) / R411 (Ballymore Road) junction
16	South of R411 (Ballymore Road) / Craddockstown Road junction
17	South of Craddockstown Road / Lakelands junction
18	Friary Road east of Corban's Lane junction
19	R407 (Sallins Road) south of R407 / Monread Avenue junction
20	R445 (Dublin Road) north of R445 / Ashgrove Park junction
21	R445 (Main Street) south of R445 / Basin Street junction

However, it should be highlighted that only the ATCs highlighted in Figure 4.1 were within the cordoned area.

Figure 4.1 ANPR & ATC Survey Locations

4.2.2 Automatic Traffic Count Survey Data

The ATC surveys revealed that the R445 west of the roundabout with the Millennium Park Link Road was the most heavily trafficked section of the local road network in Naas with a three-day average AM peak (08:00 – 09:00) total of approximately 2,000 vehicles and PM peak (17:15 – 18:15) total of 1,750 vehicles in both directions.

It was noted that the ongoing construction works on the neighbouring M7/N7 may have adversely impacted the traffic surveys via traffic travelling through Naas in order to avoid any significant delays or temporary traffic management.

Table *4.2* shows the surveyed AM and PM peak period flows.

Table 4.2 AM & PM Peak Traffic Flows

ATC	Direction	LV AM	HV AM	All AM	LV PM	HV PM	All PM
1	Eastbound	1,053	49	**1,144**	646	14	**681**
	Westbound	839	20	**899**	978	30	**1,068**
2	Eastbound	629	10	**675**	218	1	**239**
	Westbound	193	4	**211**	763	6	**812**
3a	Eastbound	553	15	**610**	626	14	**667**
	Westbound	927	26	**989**	627	9	**675**
3b	Northbound	546	14	**599**	594	13	**633**
	Southbound	778	21	**842**	584	9	**622**
4	Eastbound	548	18	**617**	395	8	**423**
	Westbound	737	22	**795**	317	8	**346**
5	Eastbound	173	1	**184**	178	1	**189**
	Westbound	183	1	**194**	291	0	**309**
6	Northbound	583	20	**673**	623	10	**672**
	Southbound	612	21	**692**	864	16	**949**
7	Eastbound	45	0	**50**	94	0	**101**
	Westbound	60	0	**66**	51	0	**56**
8	Eastbound	122	0	**134**	101	0	**107**
	Westbound	167	0	**171**	247	0	**261**
9	Northbound	686	14	**742**	429	1	**451**
	Southbound	392	12	**433**	604	9	**649**
10	Eastbound	242	11	**272**	269	3	**290**
	Westbound	292	16	**336**	295	3	**318**
11	Northbound	203	1	**212**	79	0	**82**
	Southbound	183	1	**196**	101	0	**104**

ATC	Direction	LV AM	HV AM	All AM	LV PM	HV PM	All PM
12	Northbound	195	2	**211**	84	1	**92**
	Southbound	89	1	**100**	169	4	**186**
13	Northbound	953	17	**1,023**	405	6	**432**
	Southbound	530	19	**575**	1,011	15	**1,077**
14	Eastbound	632	4	**680**	443	2	**480**
	Westbound	340	11	**370**	545	20	**590**
15	Northbound	306	17	**336**	317	6	**340**
	Southbound	234	3	**249**	581	6	**612**
16	Northbound	323	1	**333**	124	0	**130**
	Southbound	195	7	**208**	236	8	**250**
17	Eastbound	479	7	**504**	170	0	**177**
	Westbound	226	10	**238**	304	16	**323**
18	Eastbound	141	1	**146**	146	1	**154**
	Westbound	388	2	**403**	266	0	**274**
19	Northbound	425	8	**458**	500	7	**534**
	Southbound	505	6	**546**	506	2	**533**
20	Northbound	542	14	**605**	578	3	**606**
	Southbound	601	20	**658**	689	10	**742**
21	Northbound	535	8	**575**	363	6	**379**
	Southbound	580	12	**625**	585	20	**632**

4.2.3 Junction Turning Count Survey Data

JTC surveys were undertaken on the 27th September 2018 for each of the junctions shown in Figure 4.2. A total of 14 junctions were surveyed, however as shown within Figure 4.2 only seven junctions were within the VISSIM model cordon area.

Table 4.3 JTC Survey Locations

Site	Location
A	Johnstown Road / Johnstown Gardens junction
B	R445 (Dublin Road) / Monread Road / N7 roundabout
C	R445 (Dublin Road) / Fishery Lane roundabout
D	R445 (Dublin Road) / The Gallops junction
E	R445 (Dublin Road) / R410 (Blessington Road) junction
F	R410 (Blessington Road) / Tipper Road junction
G	R410 (Blessington Road) / Friary Road junction
H	R410 (Blessington Road) / Ballycane Road junction

J	Ballycane Road / Craddockstown Road junction
K	R411 (Ballymore Road) / South Ring Road roundabout
L	R448 (Kilcullen Road) / South Ring Road roundabout
M	R445 (Newbridge Road) / R448 (Kilcullen Road) junction
N	R445 (Dublin Road) / R407 (Sallins Road) junction
O	Millennium Park Link Road / Millennium Park Access Road junction

Figure 4.2 JTC Survey Locations

The data received was analysed to assess the movement and flows of each junction for light vehicles and heavy vehicles. This was carried out for the AM Peak: 08:00 – 09:00 and PM Peak: 17:15 – 18:15. Figure 4.3 illustrates the turning movement analysis that was carried out for each surveyed junction.

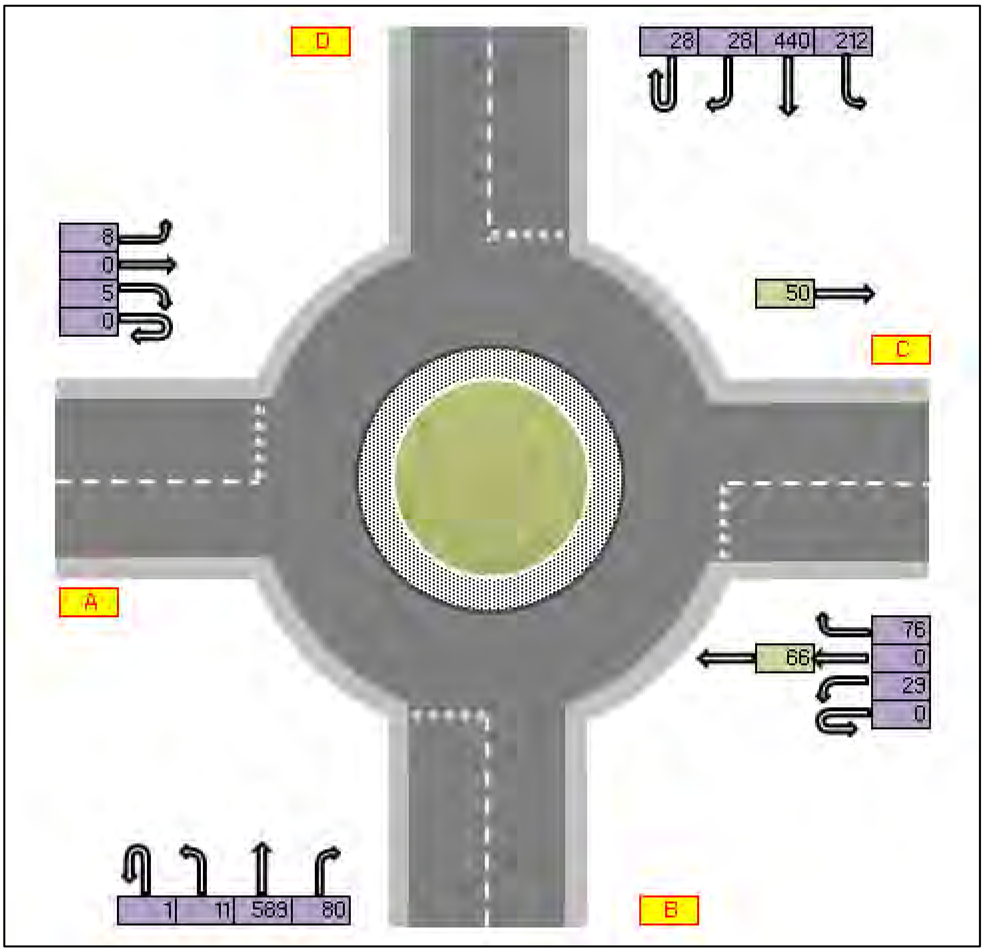


Figure 4.3 R445 (Dublin Road) / Fishery Lane AM Peak

The JTC analysis revealed that Site B (R448 Kilcullen Road / Ring Road roundabout) had the greatest volume of turning movements in the AM peak period with 2,739 vehicles passing through the roundabout. Site B (R445 Dublin Road / Monread Road roundabout) had the greatest volume of vehicles passing through in the PM peak period with approximately 3,359 vehicles.

4.2.4 Journey Times

Journey times for three routes were extracted using Google's journey time Application Programming Interface (API). Each route was divided into several sections, typically between signalised and large priority junctions, in order to provide context for each route, otherwise the line would be linear, and it would not be possible to identify areas of congestion. Each section of the journey time routes was assigned a start and end coordinate and identifying reference number. The journey time between the coordinates was then calculated by the Google API and the resulting data was used to compare against the modelled journey times.

Google Journey Times were gathered for a one-hour period between 08:15 – 09:15 and 17:00 – 18:00 for each of the three journey time routes and used to validate the results of the AM and PM models. Figure 4.2 shows the three routes from which journey time data was extracted for.

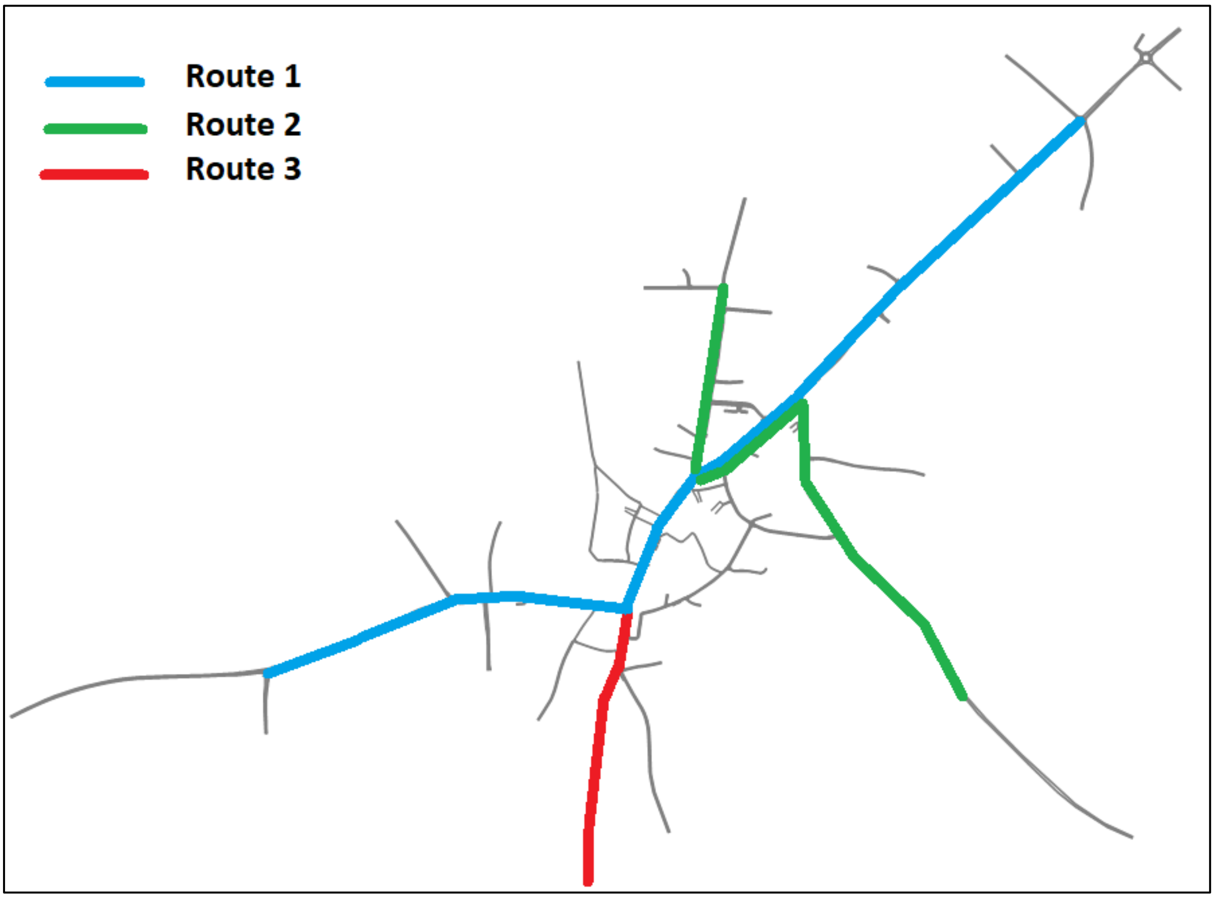


Figure 4.2 Surveyed Journey Time Routes

As shown above, the three journey time routes are:

1. Route 1 – R445 Dublin Road / The Gallops junction to the R445 Newbridge Road / South Ring Road junction (eastbound and westbound);
2. Route 2 – R410 Blessington Road / South Ring Road junction to the R407 Sallins Road / Mill Lane junction (northbound and southbound); and
3. Route 3 – R445 Main Street / R445 Newbridge Road junction to the R448 Kilcullen Road / South Ring Road roundabout.

Due to the segmented nature of the journey time routes, additional routes can be provided if required. For example, a journey time route from the R407 Sallins Road junction to the R448 Kilcullen Road / South Ring Road roundabout can be created using sections from each of the three journey time routes listed above.

5 Network Structure

5.1 Network Development

The network has been developed using aerial photography and video footage and notes taken from site visits to ensure that the current network conditions are replicated accurately. Once the network had been constructed, a review was undertaken to check the following:

- Vehicles adhering to priority controls such as at opposed right turns and roundabouts;
- Vehicle speeds were checked to ensure that the correct speed limits had been applied across the network;
- Vehicle routing was analysed to remove any illogical route choices or prohibited turns; and
- End of period error checks.

5.2 Model Zoning System

The modelled network contains 50 zones which act as the origin and destination point for vehicles in the network. These zones are placed on the network by using parking lots to act as zone connectors. The zoning system was developed based on the following:

- External routes i.e. roads which connect the modelled network to external areas;
- Car parks e.g. the Tesco Superstore on the R445 Dublin Road and the Naas Town Centre car park on Wolfe Tone Street;
- Private off-street parking at local businesses;
- Observed drop-off areas at schools; and
- On-street parking bays.

Figure 5.1 illustrates the modelled VISSIM network and the zoning system.

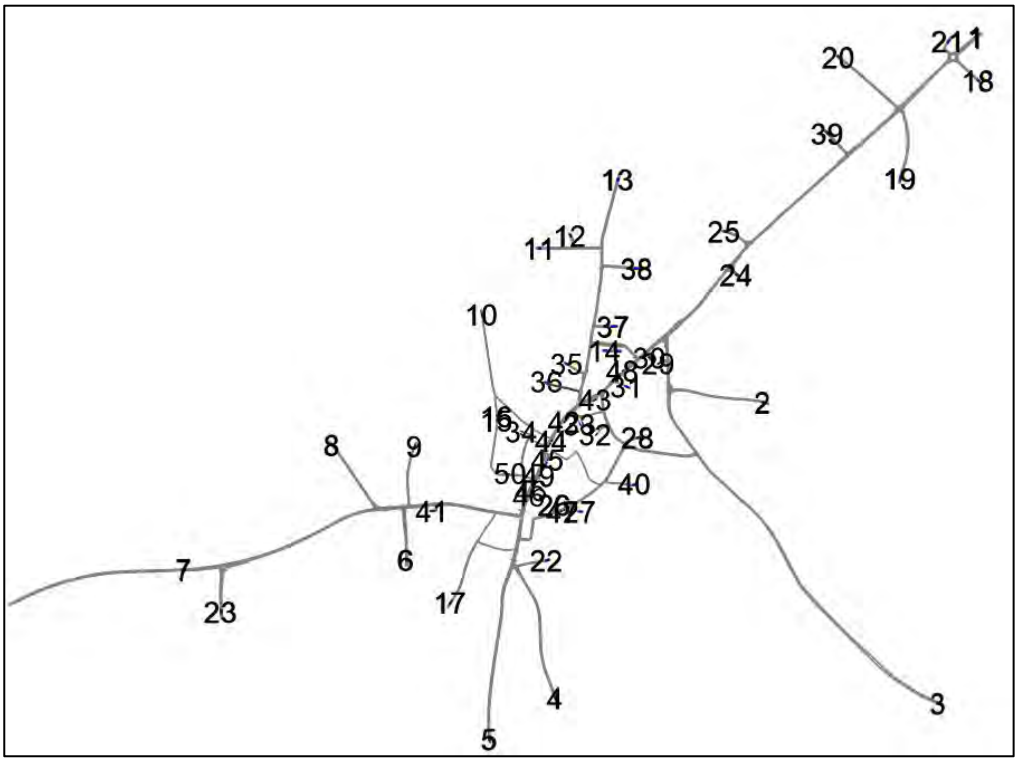


Figure 5.1 VISSIM Zone Structure

5.3 Modelled Time Periods

In the absence of any queue length data, the AM and PM peak periods have been identified by using the total number of vehicles crossing the ATCs and the total number of turns from the JTC surveys within the modelled area. The following peak periods were identified:

- Morning peak (AM): 08:15 – 09:15; and
- Evening peak (PM): 17:00 – 18:00.

Figure 5.2 and Figure 5.3 illustrate the total number of turns and Figure 5.4 and Figure 5.5 illustrate the number of vehicles that were counted by the ATCs and JTCs within the morning and evening period. As shown, 08:15 – 09:15 and 17:00 – 18:00 were found to be the peak hours within the modelled network.

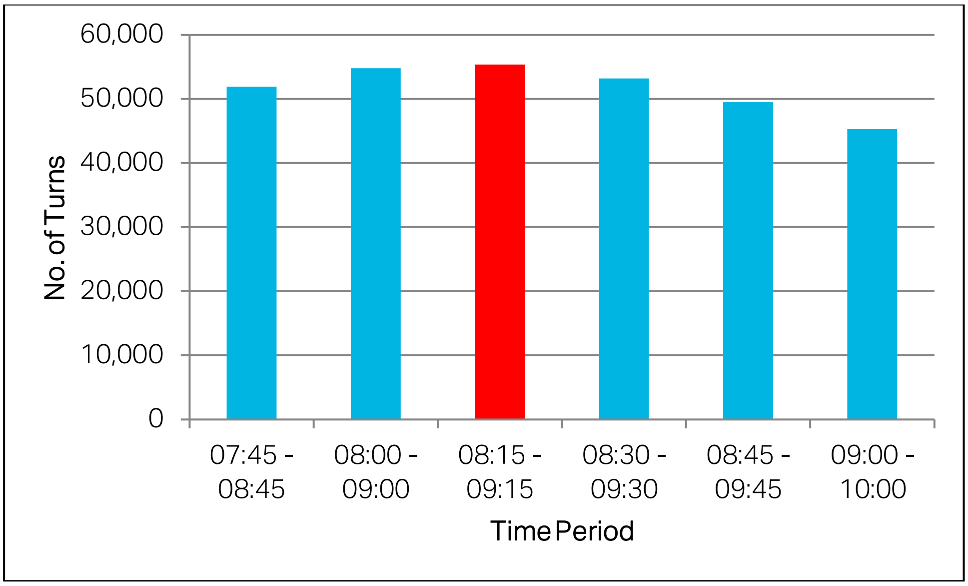


Figure 5.2 AM JTC Counts

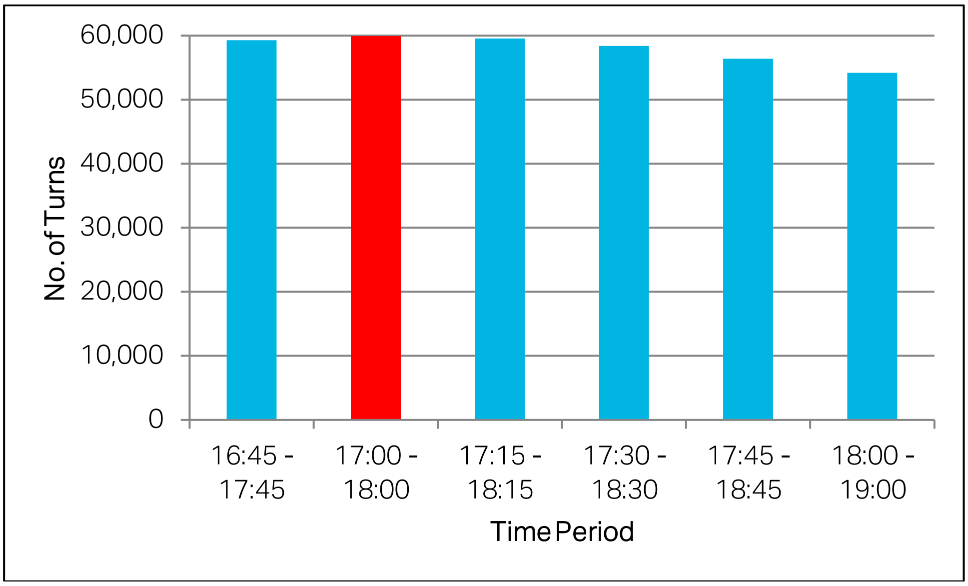


Figure 5.3 PM JTC Counts

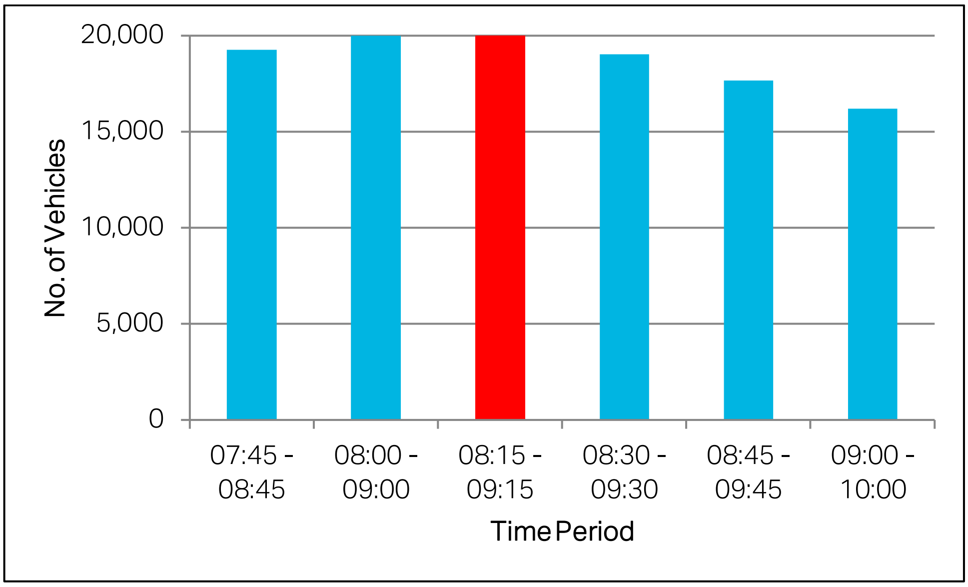


Figure 5.4 AM ATC Counts

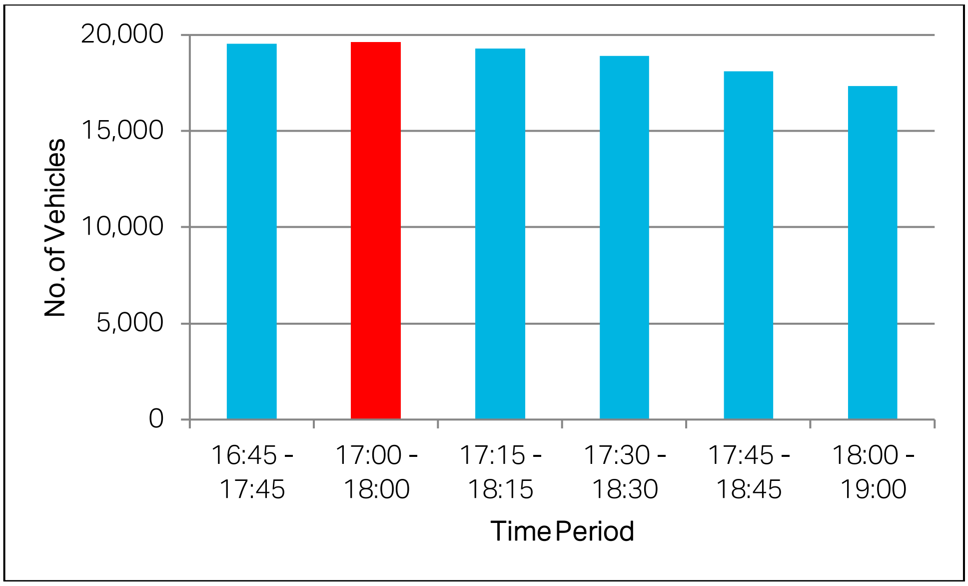


Figure 5.5 PM ATC Counts

5.4 Peak, Build-up and Cool Down Periods

In order to populate the modelled network prior to the peak hour analysis, a 30-minute “build-up” period was also modelled. This ensures that the network is sufficiently saturated prior to the peak hour load. In addition to the “build-up” period, a 30-minute “cool down” period was also modelled so that the end of the peak hour could be fully observed as it dissipates.

In order to apply the surveyed demand on the modelled network, it was necessary to establish a demand profile which distributes the demand into 15-minute periods. There are as shown in Figure 5.6 and Figure 5.7. The build-up and cool down periods took a percentage of their respective peak hours.

CARS & LGVS		
PERIOD		PROPORTION
FROM	TO	%
07:45	08:00	21.60%
08:00	08:15	22.70%
08:15	08:30	26.50%
08:30	08:45	26.20%
08:45	09:00	24.90%
09:00	09:15	22.40%
09:15	09:30	22.00%
09:30	09:45	20.00%

HGVS		
PERIOD		PROPORTION
FROM	TO	%
07:45	08:00	21.60%
08:00	08:15	22.70%
08:15	08:30	26.50%
08:30	08:45	26.20%
08:45	09:00	24.90%
09:00	09:15	22.40%
09:15	09:30	22.00%
09:30	09:45	20.00%

Figure 5.6 AM Demand Profile

CARS & LGVS		
PERIOD		PROPORTION
FROM	TO	%
16:30	16:45	23.60%
16:45	17:00	23.80%
17:00	17:15	24.80%
17:15	17:30	24.80%
17:30	17:45	24.90%
17:45	18:00	25.50%
18:00	18:15	23.90%
18:15	18:30	23.20%

HGVS		
PERIOD		PROPORTION
FROM	TO	%
16:30	16:45	23.60%
16:45	17:00	23.80%
17:00	17:15	24.80%
17:15	17:30	24.80%
17:30	17:45	24.90%
17:45	18:00	25.50%
18:00	18:15	23.90%
18:15	18:30	23.20%

Figure 5.7 PM Demand Profile

5.5 Public Transport

Despite the limited number of public transport services that operate through Naas, all public services have been modelled in order to accurately replicate their impact on the network e.g. preventing vehicles from passing when passengers are boarding or alighting. The N7, 126, 130, 139, 826 and 846 services have been included in the VISSIM model with their timetables taken from their respective operator's website.

Figure 5.8 shows the modelled public transport routes through Naas. As shown, the R445 through the town is the primary corridor for public transport; however, some services also use the R407 Sallins Road and R410 Blessington Road. Figure 5.9 shows the name and operator of each public transport (bus service) route in Naas.

Figure 5.8 Modelled Public Transport Routes

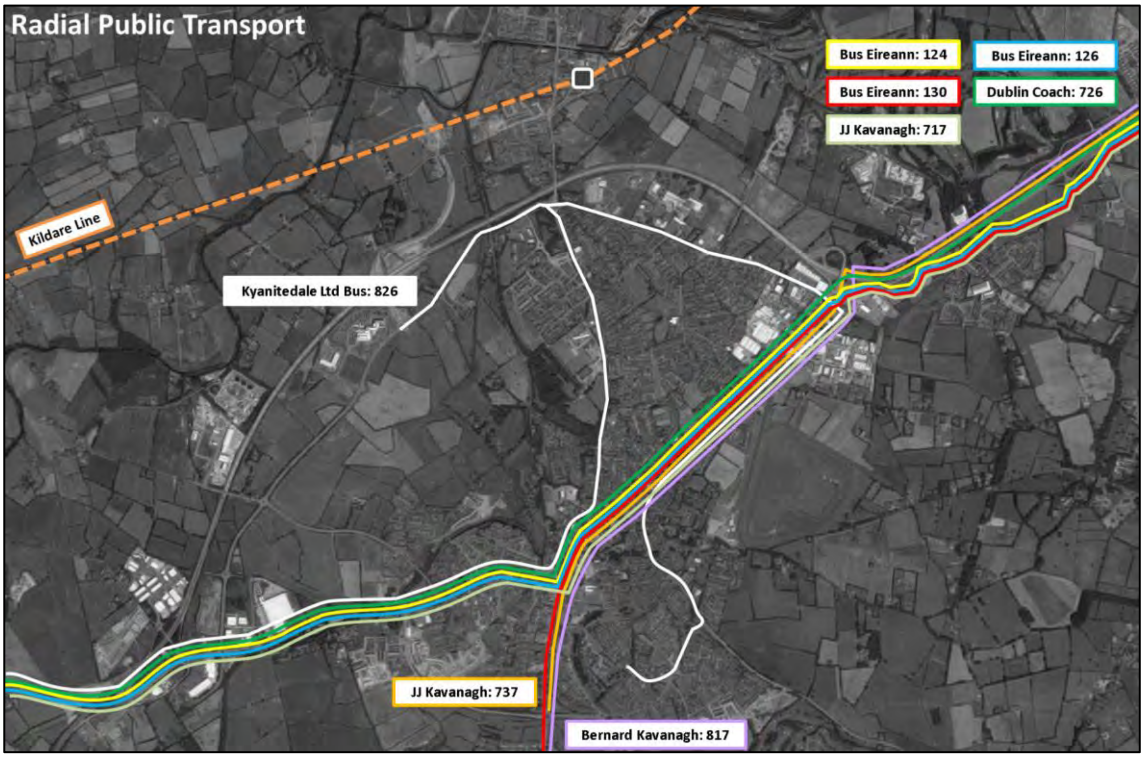


Figure 5.9 Naas Public Transport Routes

5.6 Vehicle Classes and Composition

As the demand matrices are derived from the VISUM model, two vehicle classes have been modelled; these are light vehicles (LVs) and heavy vehicles (HVs).

5.7 Calibration Adjustments

As part of the model calibration process, adjustments were made to the model in order to better represent the observed conditions of the network and to align with the surveyed journey times. The adjustments included:

- Pedestrian crossings;
- Link speeds (including reduced speed areas);
- Gap acceptance; and
- Signal timings.

5.7.1 Pedestrian Crossings

Adjustments were made to both the AM and PM models to better represent the delays resulting from the activation of signalised pedestrian crossings throughout the network. Within Naas, signalised crossings are primarily centred around Main Street with additional crossings on Newbridge Road, Kilcullen Road and Blessington Road. The number of crossing pedestrians was estimated, with a greater number of pedestrians being assigned to crossings in the town centre and near schools (AM peak only) to represent higher usage.

From on-site observations, it was noted that there is a crossing guard adjacent to St Mary's College on Sallins Road. This crossing point was included in the AM model only, with the number of pedestrians and resulting traffic stops being estimated based on journey time due to a lack of data on the number of crossings per 15 minutes.

5.7.2 Link Speeds and Reduced Speed Areas

It is not feasible to model all behaviours within VISSM e.g. vehicles parallel parking, delays caused by pedestrians crossing outside designed crossing areas etc., therefore adjustments were made to the link speeds to ensure some recognition of these behaviours could be captured in the journey times. For example, the section of Main Street adjacent to Naas Town Hall was reduced to 30 km/h to better replicate driver behaviour and the perception of possible downstream delays and obstructions, e.g. parking cars.

VISSIM is unable to regulate vehicle speeds as a result of geometric changes in the road. Therefore, reduced speed areas have been placed at locations where vehicles are expected to slow down to perform turning manoeuvres. Generally, these are placed at junctions, tight corners, areas with reduced visibility or in some cases on links where traffic calming measures e.g. speed humps are located. Figure 5.10 shows the reduced speed areas that have been placed on the model.

Figure 5.10 Reduced Speed Areas

5.7.3 Gap Acceptance

Priority markers are used to control the movement of vehicles through non signalised junctions such as give-way junctions and roundabouts. Each priority marker applies a rule in which the vehicle must consider prior to undertaking a manoeuvre. Generally, the priority markers judge the time gap between vehicles within a stream, however distance gaps were also used in congested locations where 'yellow box' behaviour was observed. Adjustments were required to the time and distance gap criteria to replicate the individual behaviour at each junction.

5.7.4 Traffic Signals

Traffic signal timing data was provided to AECOM by KCC for several junctions within the study area. From this, it was revealed that four junctions within the microsimulation model are demand dependent / MOVA and therefore have varying cycle sequences. It was therefore necessary to adjust the pedestrian demand at these junctions, primarily the R445 Dublin Road / Kingsfurze Avenue / Ashgrove Park junction in order to replicate the congestion and delay that is present in the area. As no pedestrian count information was provided, it was necessary to use professional judgement to determine the volume of crossing pedestrians. Figure 5.11 below presents the format of the Vehicle Actuated Phase (VAP) process which was developed in VISVAP[1] to replicate the onsite traffic controllers.

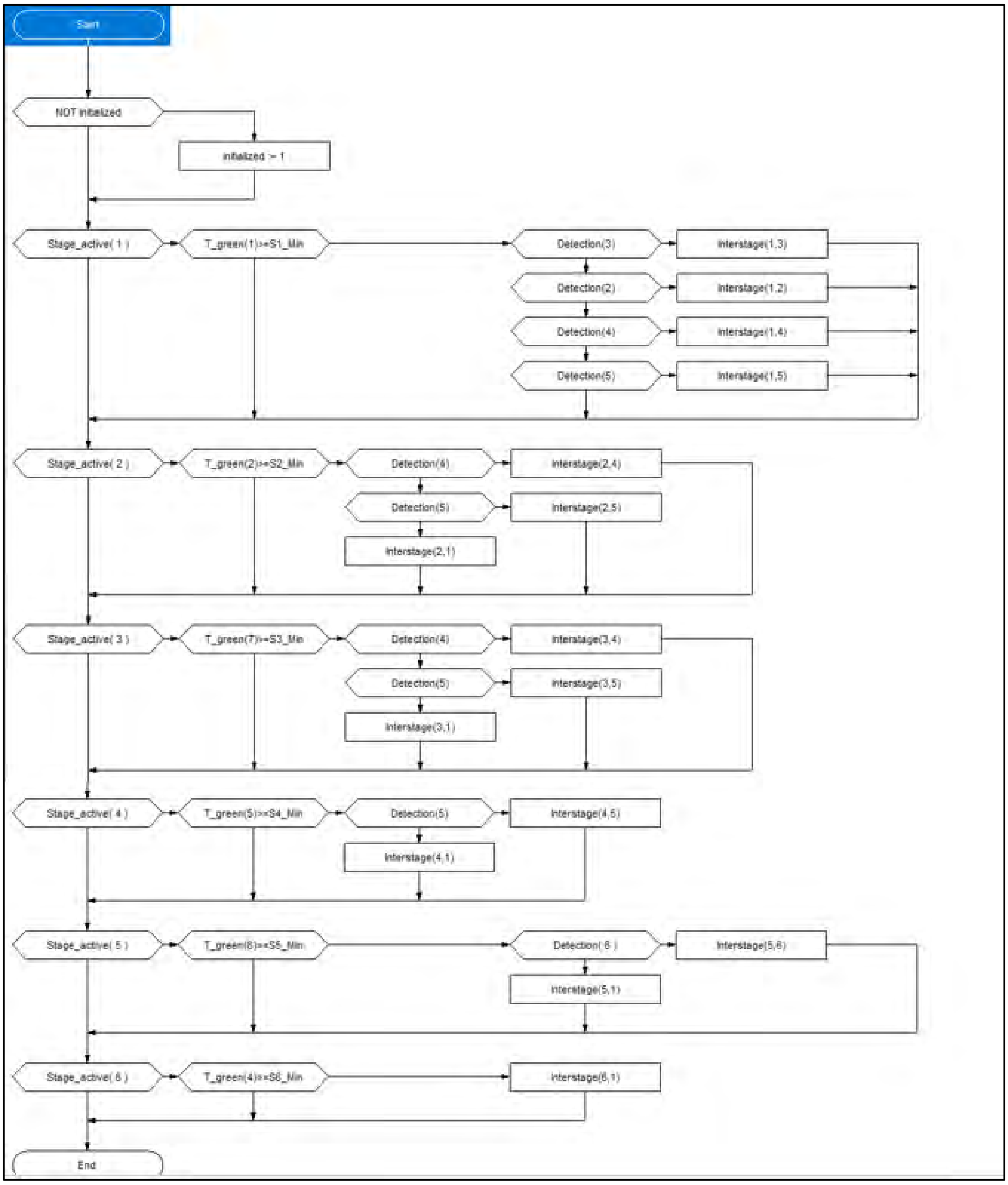


Figure 5.11 VAP file used to Replicate MOVA Controlled Signals.

[1] VISSIM VAP software – referred to as VISVAP

6 Matrix Development

This chapter details the methodology of developing the demand matrices for the AM and PM peak periods for use in the VISSIM model.

6.1 Methodology

The VISSIM model matrices made use of several sources in its development; namely the strategic VISUM model, link counts obtained via the ATC surveys and turning counts obtained via the JTC surveys. The Naas VISUM Model Development Report dated September 2020 details the methodology behind the development of the demand matrices for the VISUM model, however for the VISSIM model, the matrix development process was as follows:

1. The AM and PM VISUM models for Naas were cordoned to the extents of the VISSIM modelled area;
2. The Cordon demand matrices for LVs and HVs were refined using TflowFuzzy (Matrix Estimation) within VISUM to produce a greater level of correlation between modelled and observed traffic movements.
3. Due to the crude zone structure within VISUM, an equivalence table was created which assigned each VISUM zone a corresponding VISSIM zone. In cases where multiple roads could be used to access a VISUM zone, it was necessary to distribute the origin and destination demands from that zone across multiple VISSIM zones proportionally;
4. The demand matrices were then assigned to the VISSIM model to check the level of calibration. Where necessary, adjustments to the demand matrices were carried out to improve calibration;
5. The demand matrices were altered further through the creation of a profile using link count data to determine the distribution of traffic within the peak hour;
6. The resulting matrices were then assigned to the model and used for calibration, validation and results.

Figure 6.1 shows the cordoned VISUM network that was used to produce the demand matrices for the VISSIM models.

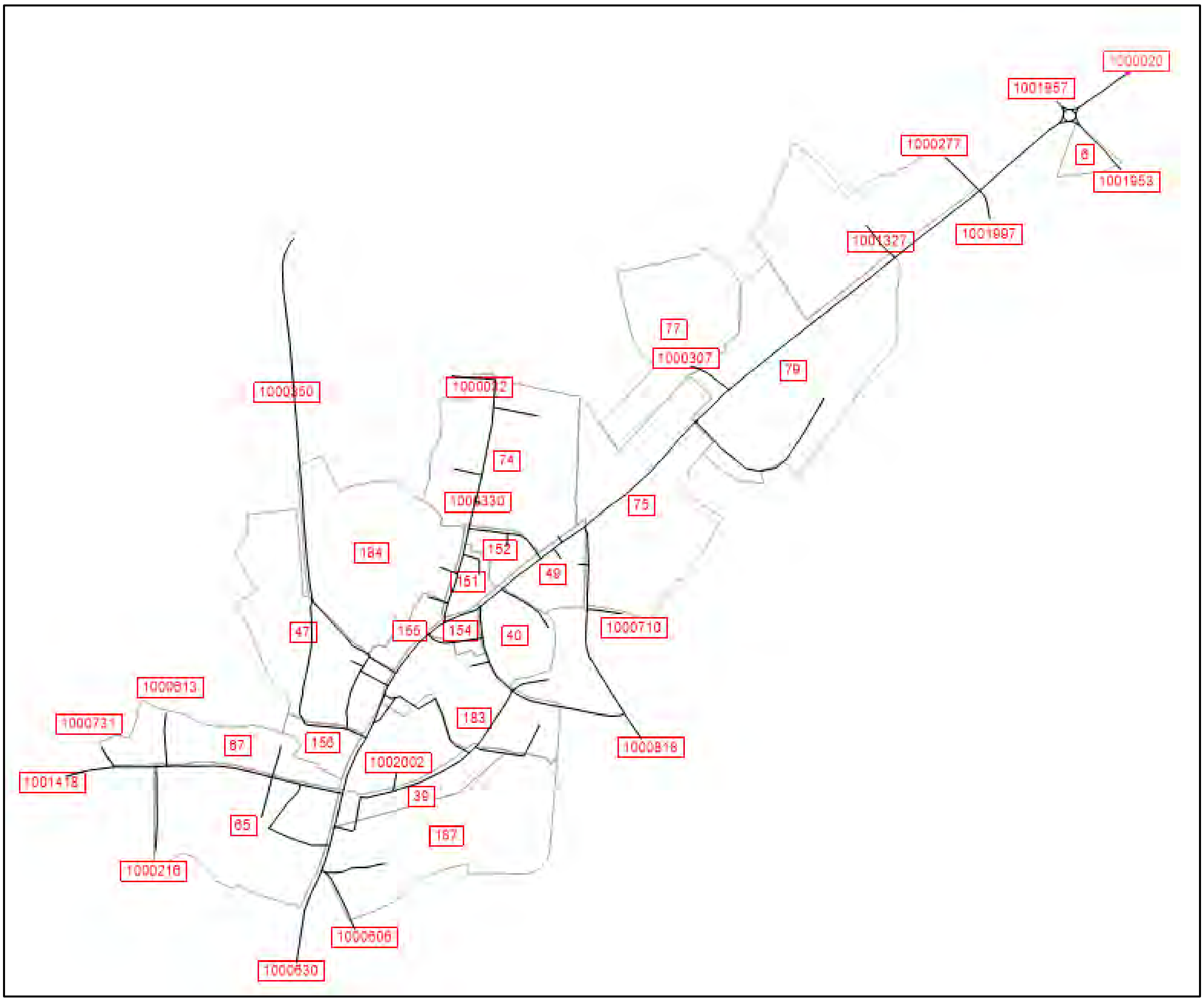


Figure 6.1 Cordoned VISUM Network

7 Calibration and Validation

7.1 Introduction

The following chapter provides evidence on the validity of the model. This requires a variety of checks, including:

- Model convergence;
- Confidence of results;
- Logical routeing through the network;
- Level of calibration for link flows and turns; and
- Journey times.

7.2 Convergence

Both the AM and PM models were run 10 times in order to check for convergence between runs. Table 7.1 shows the convergence results for the two models.

Table 7.1 Convergence Results

Period	Volume on Edges	Volume on Paths	Travel Time on Edges
AM	99.4%	99.6%	85.6%
PM	97.4%	98.8%	76.6%

As shown above, the AM model displayed a 99.4% and 99.6% convergence rate on vehicle volume and 85.6% convergence rate for travel time on edges. This means that between runs, 99.4% and 99.6% of the volume of vehicles on the network were within 10 vehicles of the previous runs. For the PM model, the rate of convergence was slightly lower than the AM with a 97.4% and 98.8% convergence rate for volume on edges and paths and a 76.6% convergence rate for time on edges.

It should be noted that due to the congested nature of the network and the various routes available, a lower rate of convergence for travel time for both the AM and PM models is expected.

7.3 Model Confidence and Required Runs

Dynamic assignment requires the use of several seeds to adjust the distributions within the model to ensure a robust average result is achieved. Using too few seed runs can result in lower confidence in the model results and bring into question the validity of the model results. As part of our quality assurance, an assessment was undertaken on the number of seeds required to provide a high level of confidence. Table 7.2 shows the results of the assessment.

Table 7.2 Model Confidence and Required Runs

Period	Number of Seed Runs	Desired Confidence Level	Seconds around the True Mean Average Delay
AM Peak	60	99%	+/- 2.5 seconds
PM Peak	60	99%	+/- 2.5 seconds

7.4 Calibration

The calibration considers 58 turning counts and 14 link counts within Naas. These turning flows have been assessed against the GEH and individual flow criteria and presented for the AM and PM peaks. Table 7.3 to Table 7.6 shows a summary of the calibration results for the AM and PM peak models for links and turns.

Table 7.3 AM Peak Link Calibration

Number of Links	GEH <5	Average GEH	Maximum GEH	Flows < 100 vehs
14	100.0%	1.97	3.73	100.0%

Table 7.4 AM Peak Turn Calibration

Number of Turns	GEH <5	Average GEH	Maximum GEH	Flows < 100 vehs
58	100.0%	1.40	4.74	100.0%

Table 7.5 PM Peak Link Calibration

Number of Links	GEH <5	Average GEH	Maximum GEH	Flows < 100 vehs
14	92.9%	1.66	10.3	100.0%

Table 7.6 PM Peak Turn Calibration

Number of Turns	GEH <5	Average GEH	Maximum GEH	Flows < 100 vehs
58	98.3%	1.73	5.5	100.0%

As shown above, both the AM and PM models display a high level of calibration with over 90% of the turns and link flows exceeding the calibration criteria. It should be noted that due to a possible error in the survey data, one of the PM link counts may be underestimated; resulting in the high GEH value shown in Table 7.5.

7.5 Validation

The validation process considers journey time data to present the model's validity against observed data. Validation should also provide evidence that the model is displaying the correct traffic conditions, i.e. areas of congestion or delay.

7.5.1 Journey Time Validation

For journey time validation, modelled and surveyed journey time data was compared to assess whether the percentage difference was less than 15% and/or the absolute maximum difference was less than 60 seconds. Table 7.7 and Table 7.8 summarise the journey times for each of the three routes under assessment and show the difference between the modelled journey times and the surveyed journey times.

Table 7.7 AM Journey Time Comparison

Journey Route	Time	Direction	Surveyed (s)	Modelled (s)	Difference (%)	Difference (s)
1		EB	565	591	4.5%	26
		WB	570	603	5.7%	33
2		NB	330	380	15.3%	50
		SB	357	391	9.5%	34
3		NB	128	119	6.7%	9
		SB	101	94	7.2%	7
Validation Criteria: => 85% for either difference					**100% Pass Rate**	

Table 7.8 PM Journey Time Comparison

Journey Route	Time	Direction	Surveyed (s)	Modelled (s)	Difference (%)	Difference (s)
1		EB	555	619	11.6%	64
		WB	676	613	9.4%	63
2		NB	345	362	5.0%	17
		SB	412	390	5.0%	22
3		NB	112	105	6.0%	7
		SB	104	77	26.0%	27
Validation Criteria: => 85% for either difference					**100% Pass Rate**	

Both AM and PM models present a good level of validation against the observed journey times. Appendix A presents a more detailed review of the journey time comparison using time / distance profile graphs.

7.6 Queue Lengths

No queue length survey data was collected and as result, modelled queue lengths could not be compared against the observed. However, based on the conditions experienced during the site investigation, the model presents similar queuing.

Figure 7.1 AM Peak 09:00 Queuing along Sallins Road

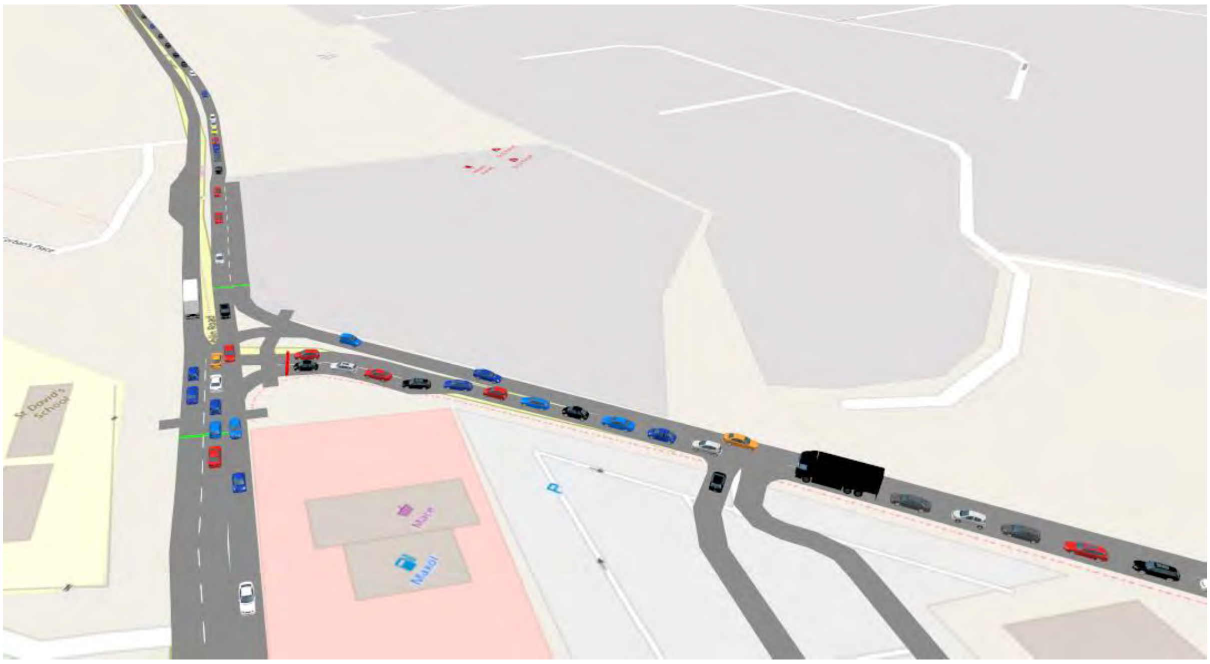


Figure 7.2 AM Peak 08:30 Dublin Road / Blessington Road Junction

Figure 7.3 AM Peak 08:30 New Row / South Main Street / Kilcullen Road Junction

Figure 7.4 PM Peak 17:15 North Main Street Approach to Sallins Road / Dublin Road.

Figure 7.5 AM Peak 08:30 Dublin Road / Blessington Road Junction

8 Model Limitations and Future Model Enhancements

Although the AM and PM models have been successfully calibrated and validated using the provided survey data, it should be noted that it is equally important to highlight the traffic model's limitations as it is to highlight its strengths. The following chapter discusses areas that need to be considered when reviewing results or planning future model updates.

8.1 Model Limitations

There was found to be an absence of JTC survey data for several key junctions throughout the town e.g. the R445 Newbridge Road / John Devoy Road junction and R448 Kilcullen Road / R411 Ballymore Road junction. As a result, traffic entering and exiting these junctions had to be estimated based on downstream ATC surveys and therefore the volume of traffic being generated and attracted by the adjacent area cannot be verified.

The route choice that is available through the network e.g. via Corban's Lane and Friary Road has not been observed by JTC surveys. As a result, the volume of traffic using these routes has been estimated based on the nearest available survey data. Additionally, no video footage of the surveyed junctions or road links was provided which meant that driver behaviour had to be replicated using site observations taken on one visit.

The off-street and on-street parking survey information that was provided was insufficient to accurately replicate the volume and frequency of vehicles parking throughout the network. For example, parking data was provided in one-hour intervals which, due to various retail stores in the town centre which are likely to attract multiple short-stay trips per hour, is not detailed enough for use in microsimulation. Additionally, several key town centre car parks were not surveyed due to various reasons, including being denied access.

A lack of surveys or video footage at key trip attractors and generators in the town e.g. Meánscoil Iognáid Rís or St Mary's College has resulted in professional judgment being used to estimate the number of vehicles entering and exiting the associated zones in the microsimulation model and therefore may not accurately reflect the conditions present in these areas e.g. vehicles stopping on the road for pickups or drop-offs.

Due to the ongoing major roadworks on the N7 / M7 which were present during the surveyed period in September 2018, the routes, departure times, volume of traffic, driver behaviour and therefore surveyed data may not reflect the normal conditions of the network.

Several signalised junctions were found to be using Microprocessor Optimised Vehicle Actuation (MOVA) technology in order to determine the length and frequency of stages. In order to replicate this in the microsimulation model, the associated junctions have instead been replicated using Vehicle Actuation (VA) detectors in proximity to the stop line. Although this results in a similar level of performance being modelled, it should be noted that the junctions will not replicate the behaviour as accurately as a PC-MOVA interface.

All associated limitations with the Naas STM (ref: Naas VISUM Model Development Report dated October 2019) should be considered given that the demands from this model have been used in the development of the microsimulation model.

8.2 Recommendations

The following should be considered in any future model refresh:

- Issue additional parking surveys for both on-street and off-street parking areas with shorter interval periods so that parking can be better replicated in Naas;
- Survey and record (through CCTV) the key trip generators and attractors in Naas such as schools, employment centres and the Naas General Hospital amongst others;

- Issue pedestrian and cycle surveys at signalised crossings; particularly at locations in which future sustainable travel infrastructure improvements are proposed, in order to better determine the impact of the proposed improvements; and
- Issue additional JTC surveys at the town centre locations highlighted in Figure 8.1.

Figure 8.1 Recommended Additional JTC Survey Locations

The highlighted locations in Figure 8.1 are summarised in Table 8.1.

Table 8.1 Recommended Additional JTC Survey Locations

Location	Latitude	Longitude
R445 Newbridge Road / Carragh Road junction	53.215998	-6.6727942
R445 Newbridge Road / John Devoy Road junction	53.216056	-6.6713244
R445 Newbridge Road / Pacelli Road junction	53.216114	-6.6709489
R448 Fairgreen Street / Corban's Lane junction	53.215086	-6.6651660
Corban's Lane / Friary Road junction	53.218054	-6.6595441
Corban's Lane / Church Lane junction	53.216750	-6.6609389
R445 Dublin Road / Friary Road junction	53.219698	-6.6608208
R407 Sallins Road / Wolfe Tone Street junction	53.221317	-6.6613251
R445 Dublin Road / Wolfe Tone Street junction	53.220810	-6.6588682

Further recommendations to improve the accuracy of the OD data used in the STM are provided in the Naas VISUM Model Development Report dated February 2020.

9 Summary

9.1 Summary

The model development report has provided sufficient information in order for the microsimulation models to be used for the client's requirements. The model's strengths and weaknesses have been discussed in great detail and must be considered when reviewing outputs from forecast models.

Based on the survey data provided, the model meets the PAG criteria for both traffic count and journey times data. Although no queue length data was collected, site observations combined with Google typical traffic conditions were used to ensure the model presented similar queuing.

The models would benefit from additional survey data to ensure routes, which are not currently observed, are validated against model assumptions.

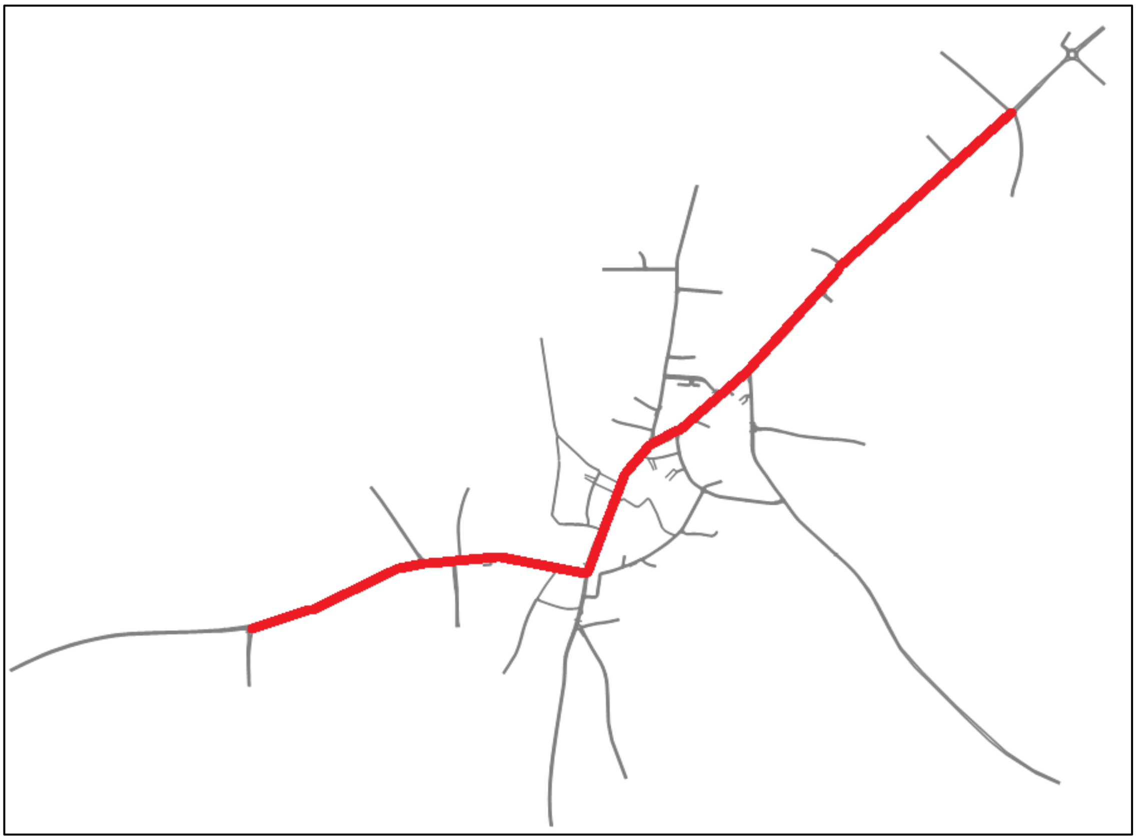
The objectives of this commission have been met, with the successful development of an AM and PM Peak VISSM model of Naas. The models for both the AM and PM peaks have achieved a combined 100% calibration and journey time validation. This is summarised in Table 9.1.

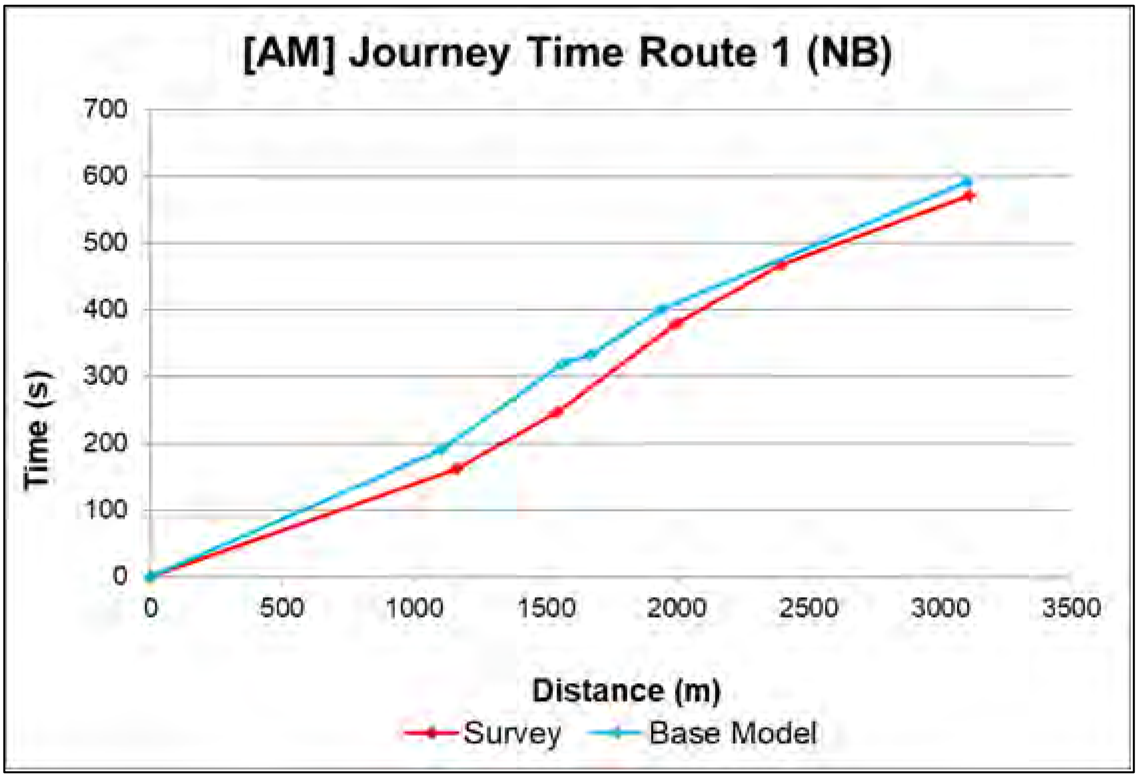
Table 9.1 Calibration and Validation Summary

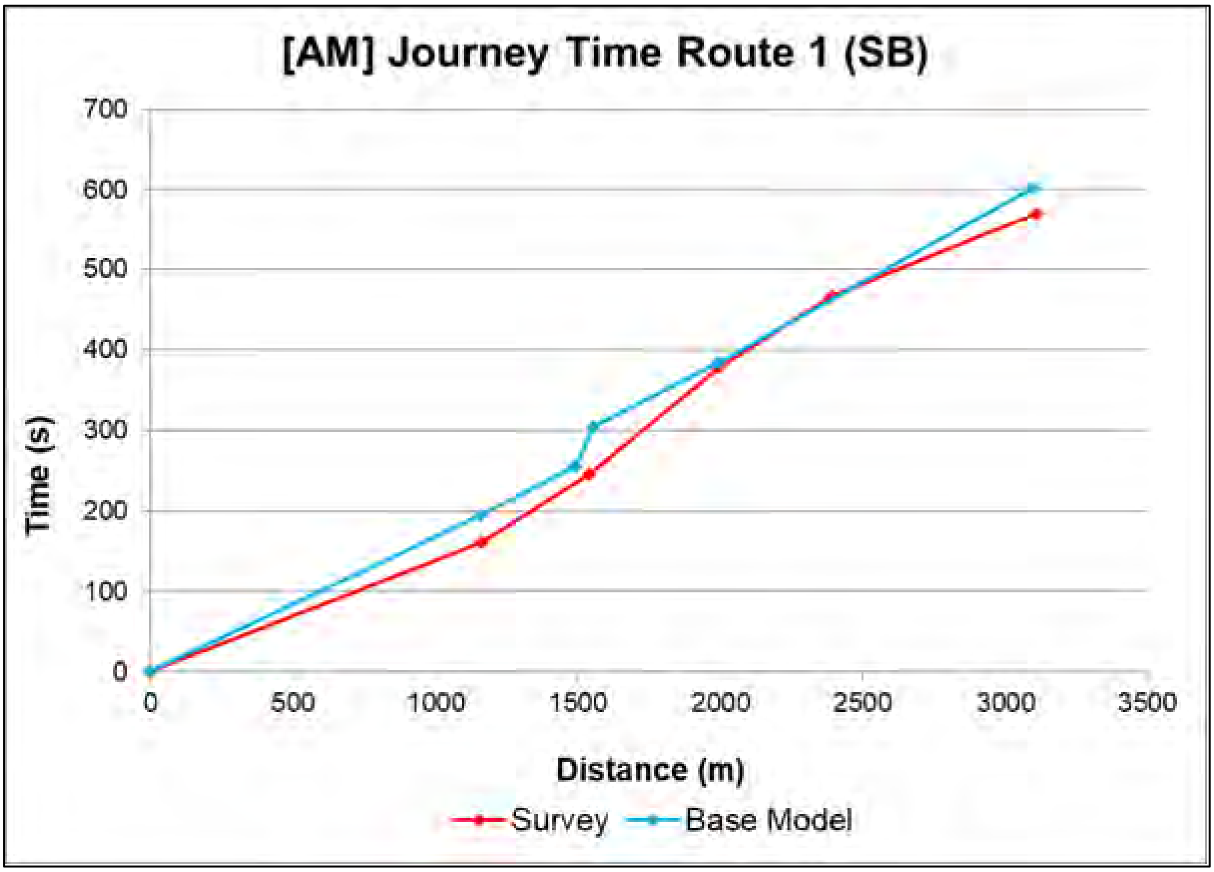
	Criteria	AM Peak	PM Peak
Calibration (links and turns)	Turn GEH <5	100%	98.3%
	Turn difference <100 or 15%	100%	100%
	Link flow GEH <5	100%	92.9%
	Flow difference <100 or 15%	100%	92.9%
	Total calibration	**100%**	**100%**
Validation	Difference <15% or <60 seconds	**100%**	**100%**

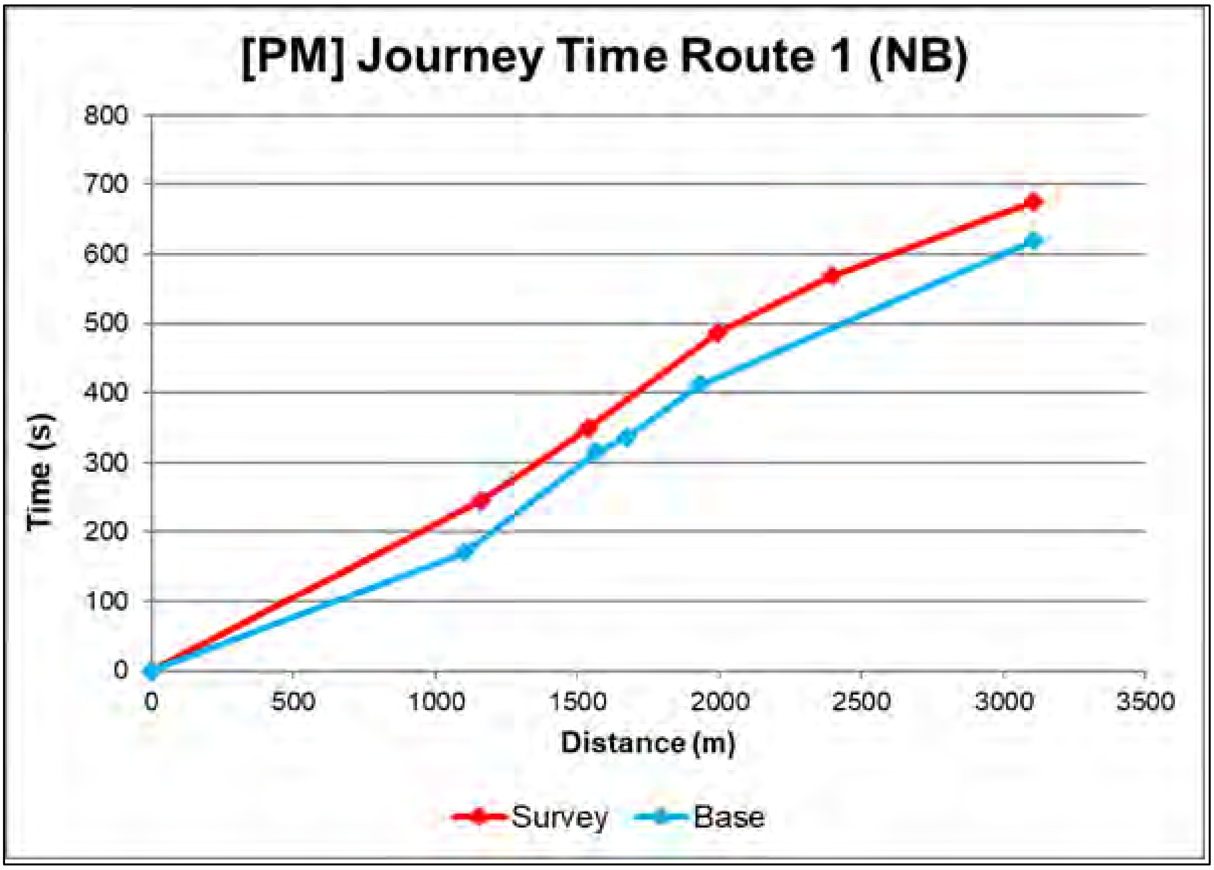
Appendix A – Journey Time Validation

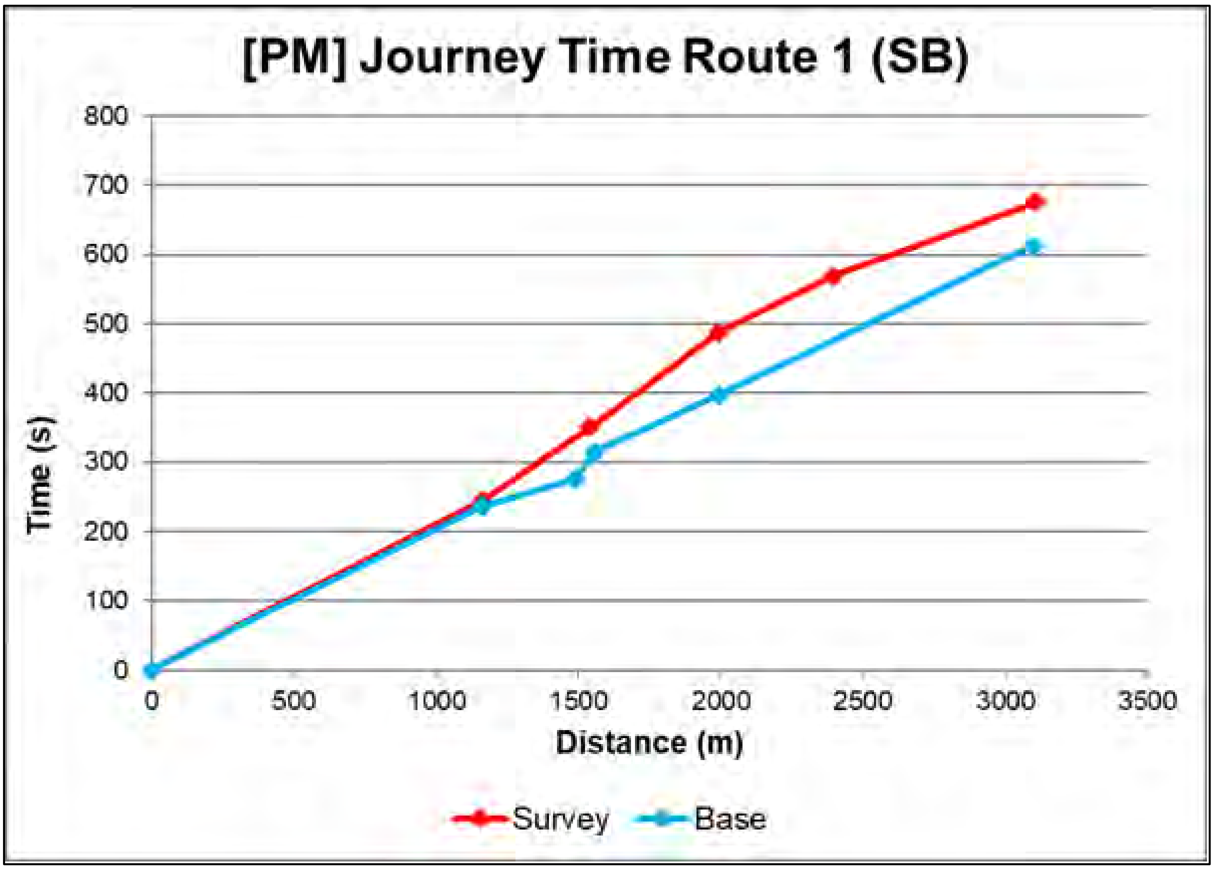
Journey Time Route 1



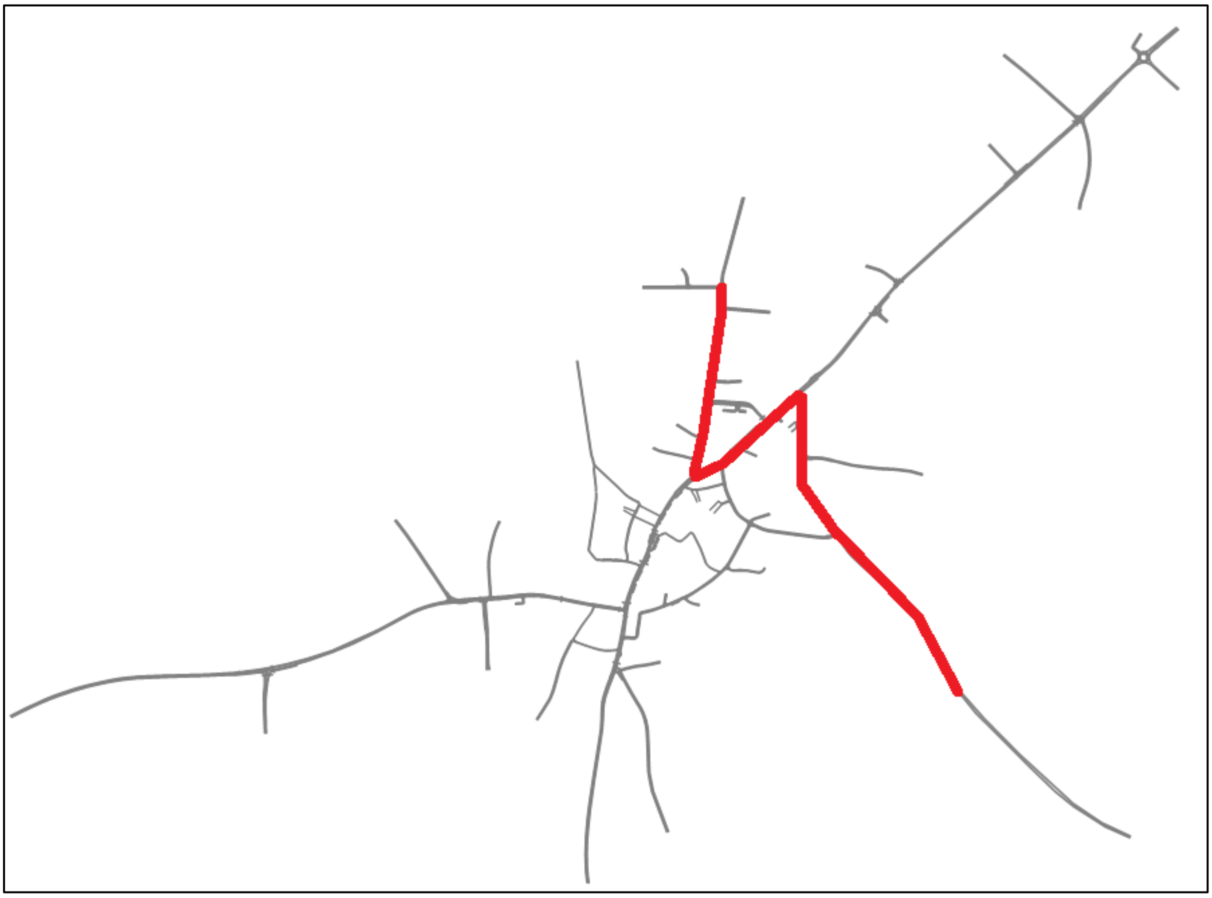


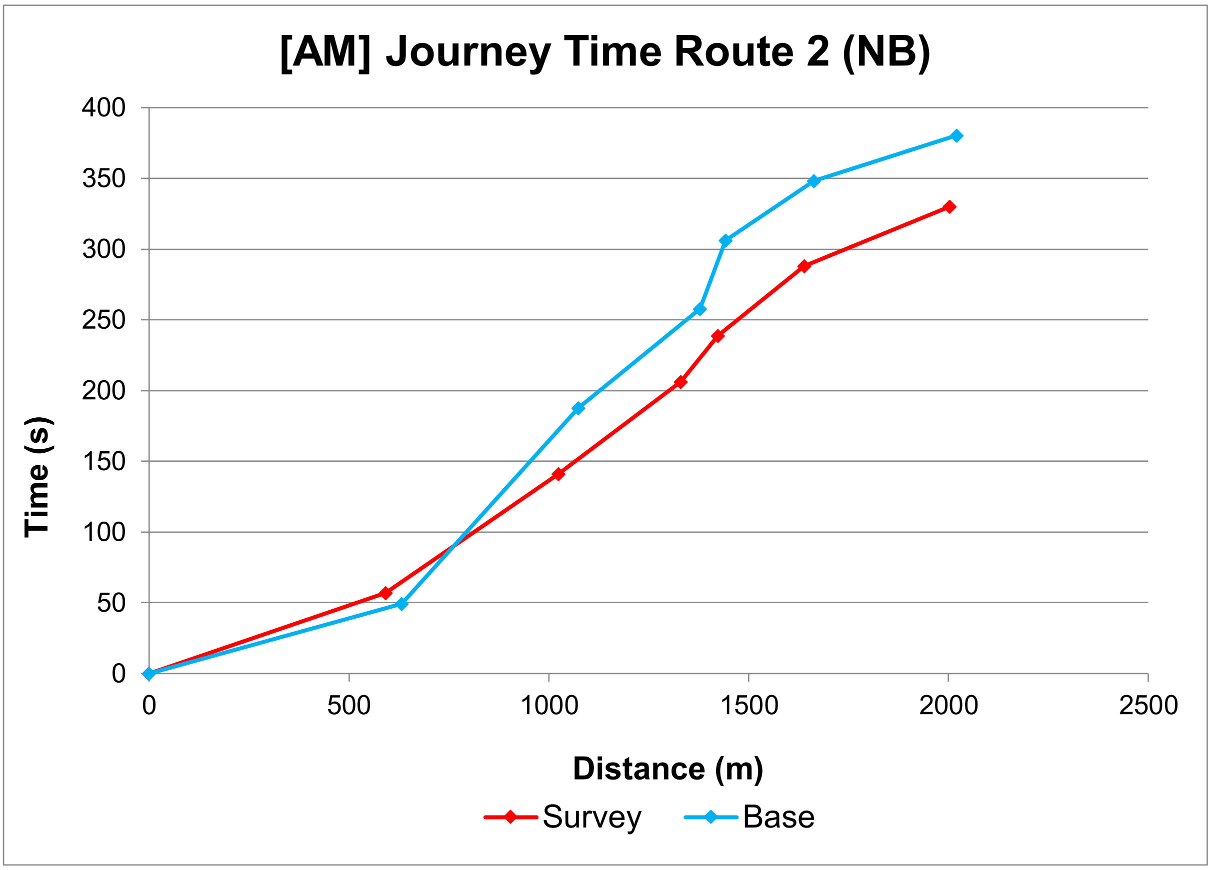

[AM] Journey Time Route 1 (SB)
700
600
500
400
300
200
100
0
Time (s)
0
500
1000
1500
2000
2500
3000
3500
Distance (m)
Survey
Base Model

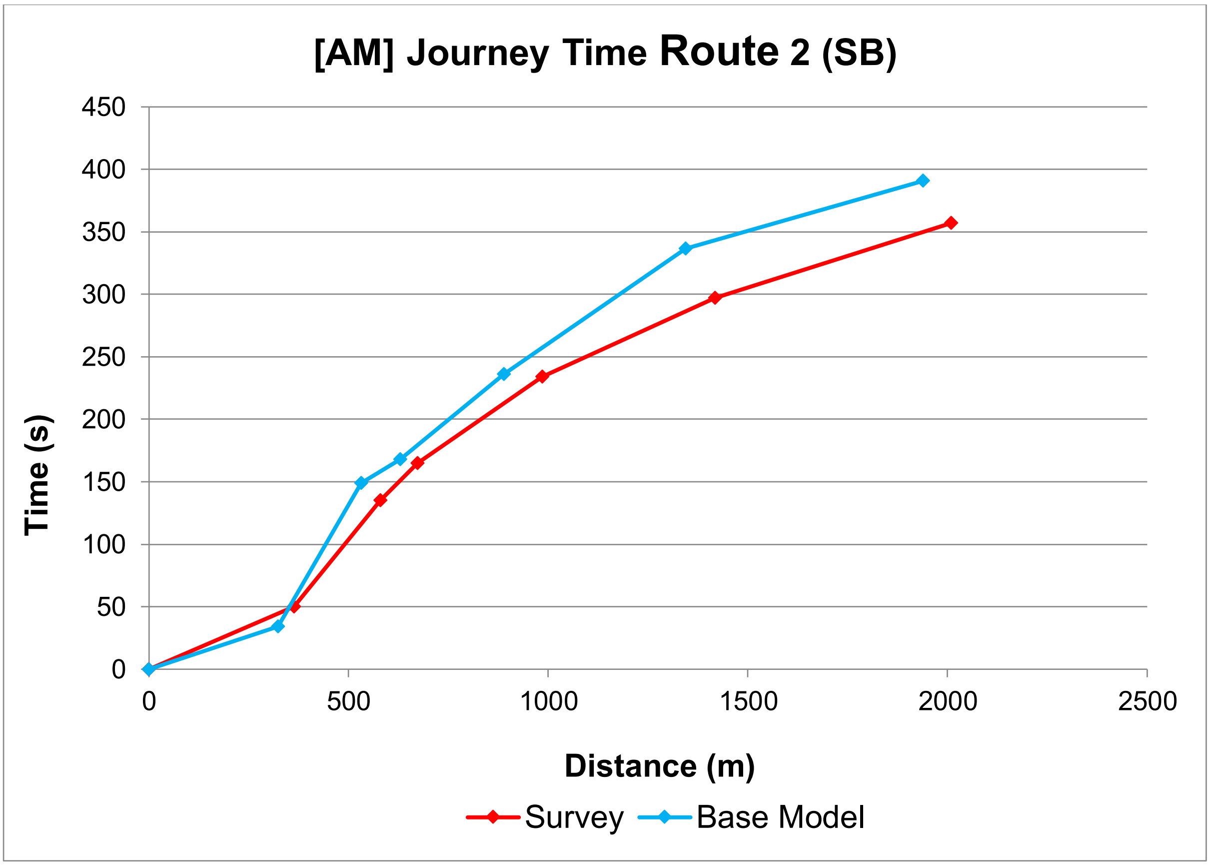

[PM] Journey Time Route 1 (NB)
800
700
600
500
400
300
200
100
0
Time (s)
0
500
1000
1500
2000
2500
3000
3500
Distance (m)
Survey
Base

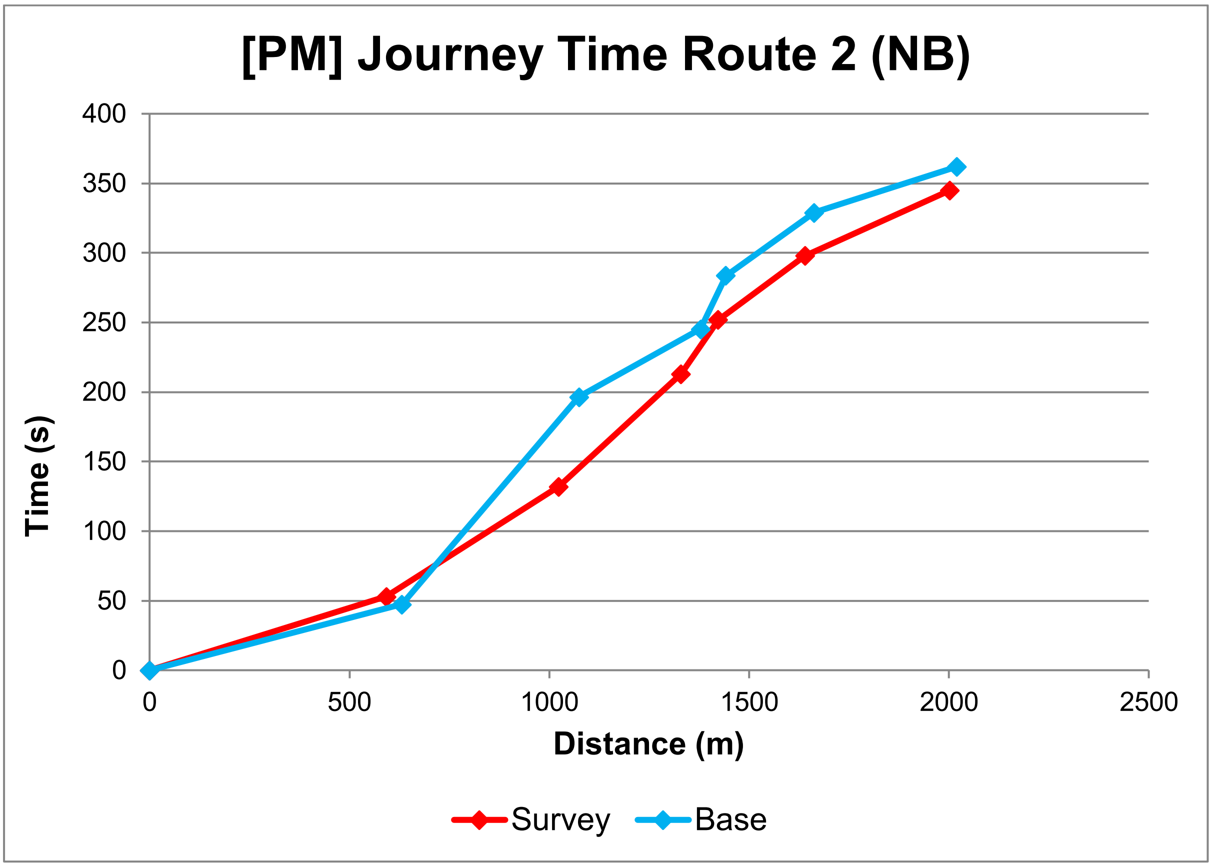

[PM] Journey Time Route 1 (SB)
800
700
600
500
400
300
200
100
0
Time (s)
0
500
1000
1500
2000
2500
3000
3500
Distance (m)
Survey
Base

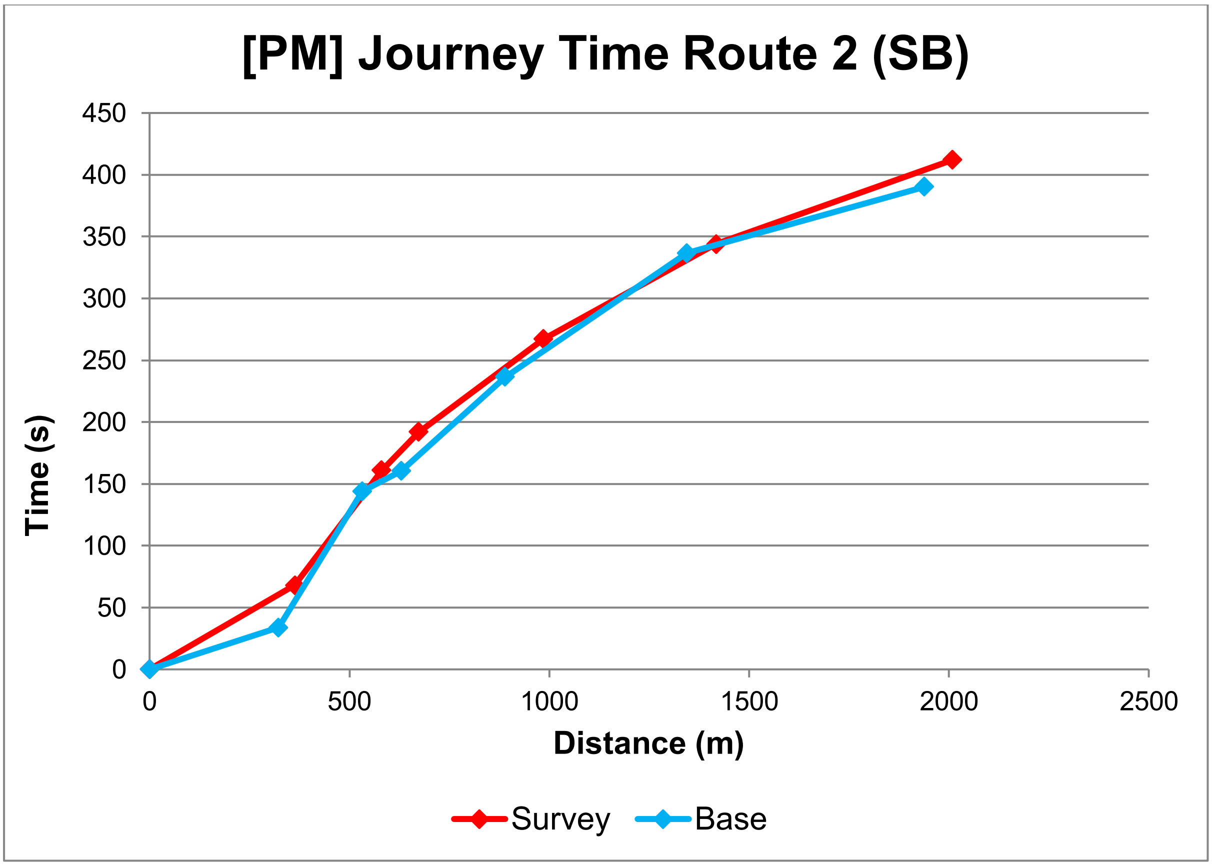
Journey Time Route 2



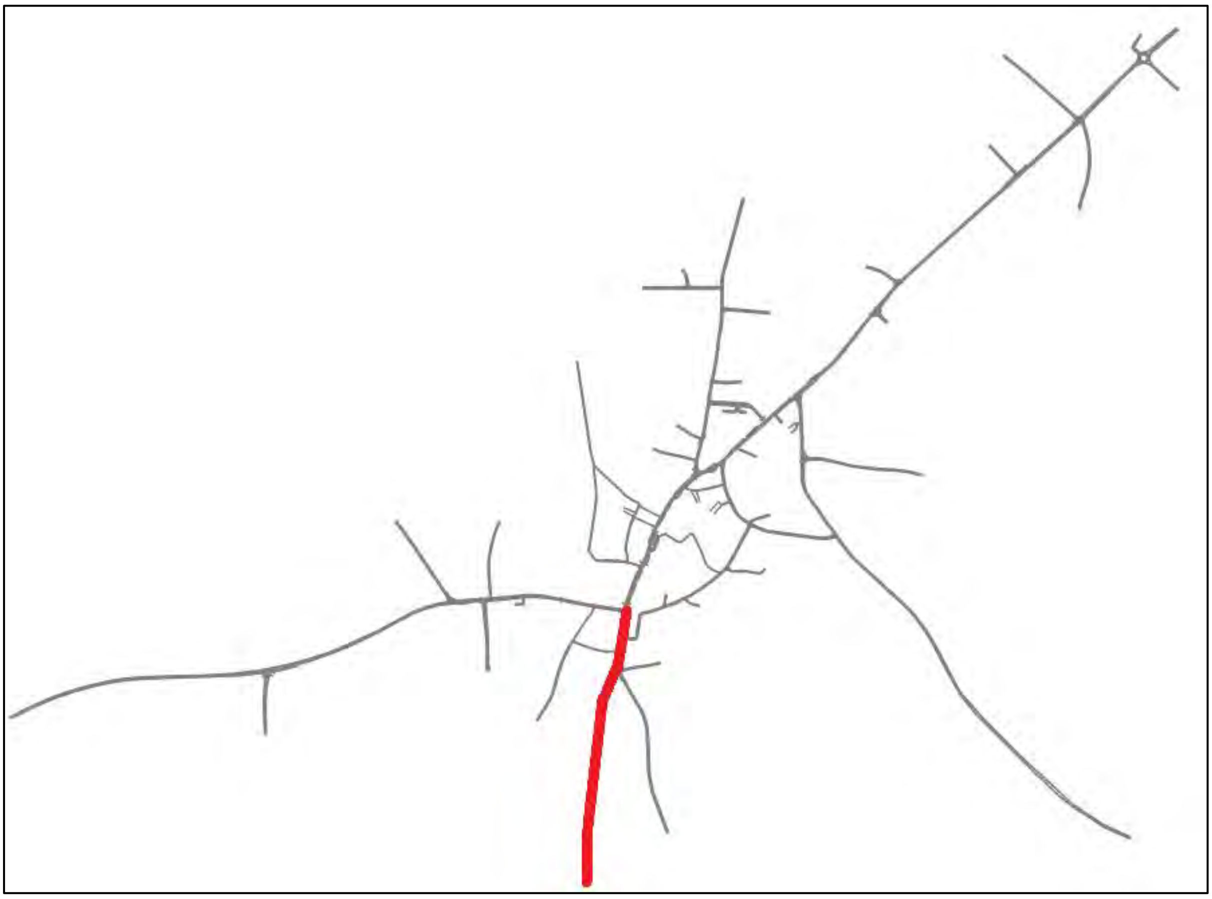

[AM] Journey Time Route 2 (NB)
Time (s)
Distance (m)
0
50
100
150
200
250
300
350
400
0
500
1000
1500
2000
2500
Survey
Base

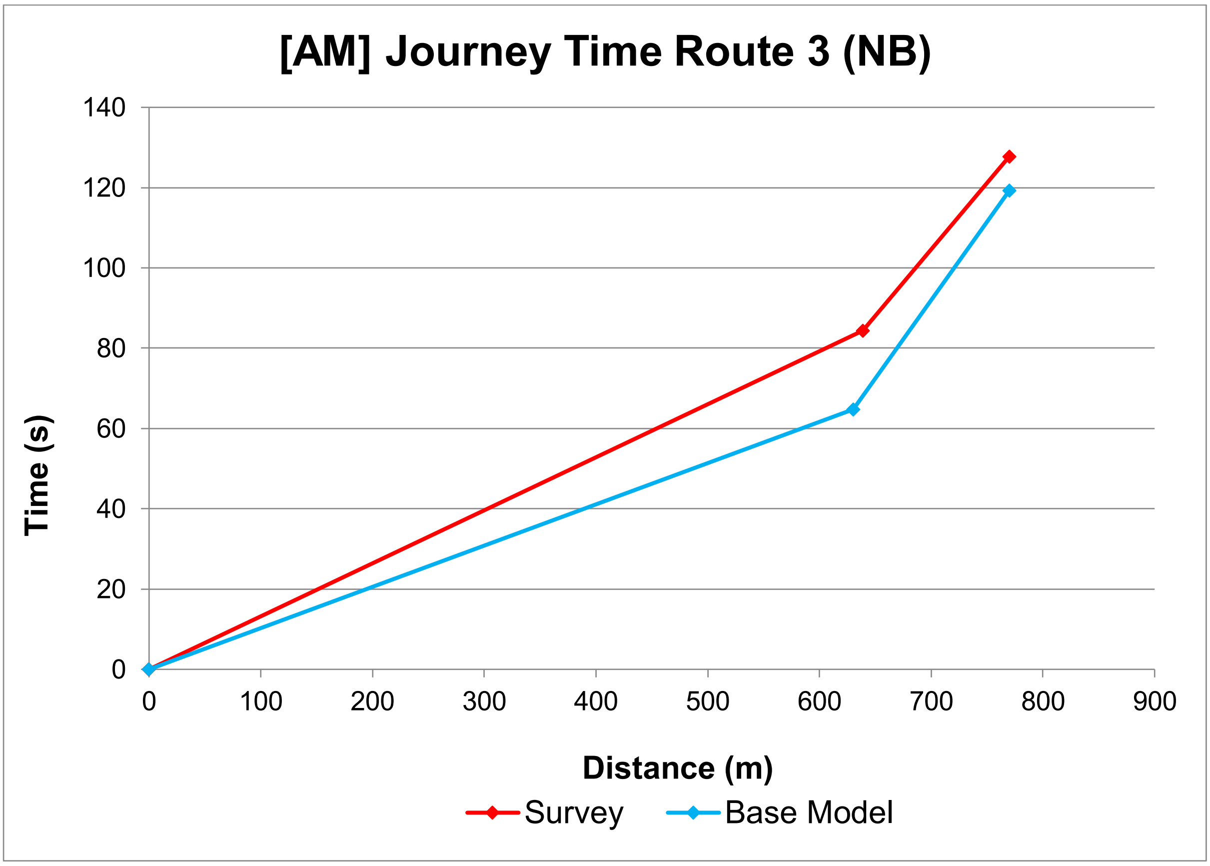

[AM] Journey Time Route 2 (SB)
Time (s)
Distance (m)
0
50
100
150
200
250
300
350
400
450
0
500
1000
1500
2000
2500
Survey
Base Model

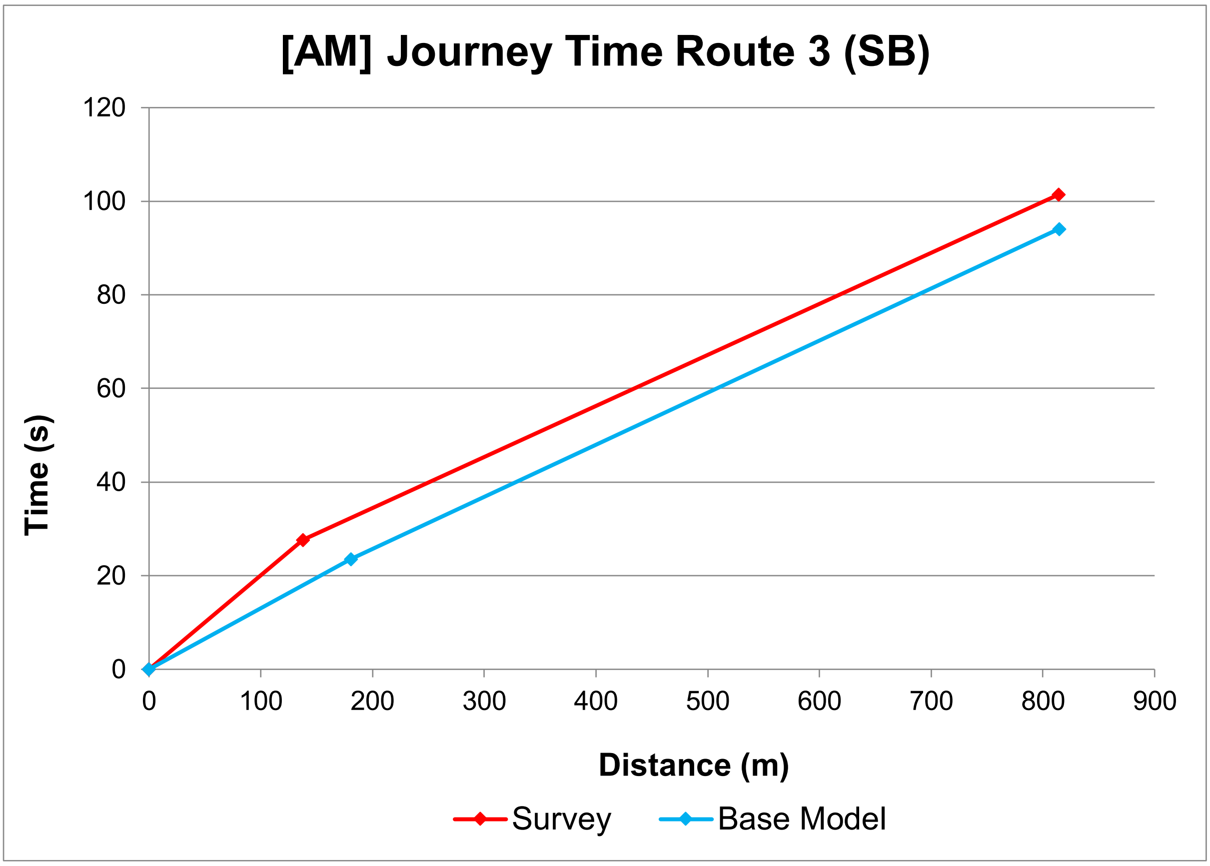

[PM] Journey Time Route 2 (NB)
Time (s)
0
50
100
150
200
250
300
350
400
0
500
1000
1500
2000
2500
Distance (m)
Survey
Base

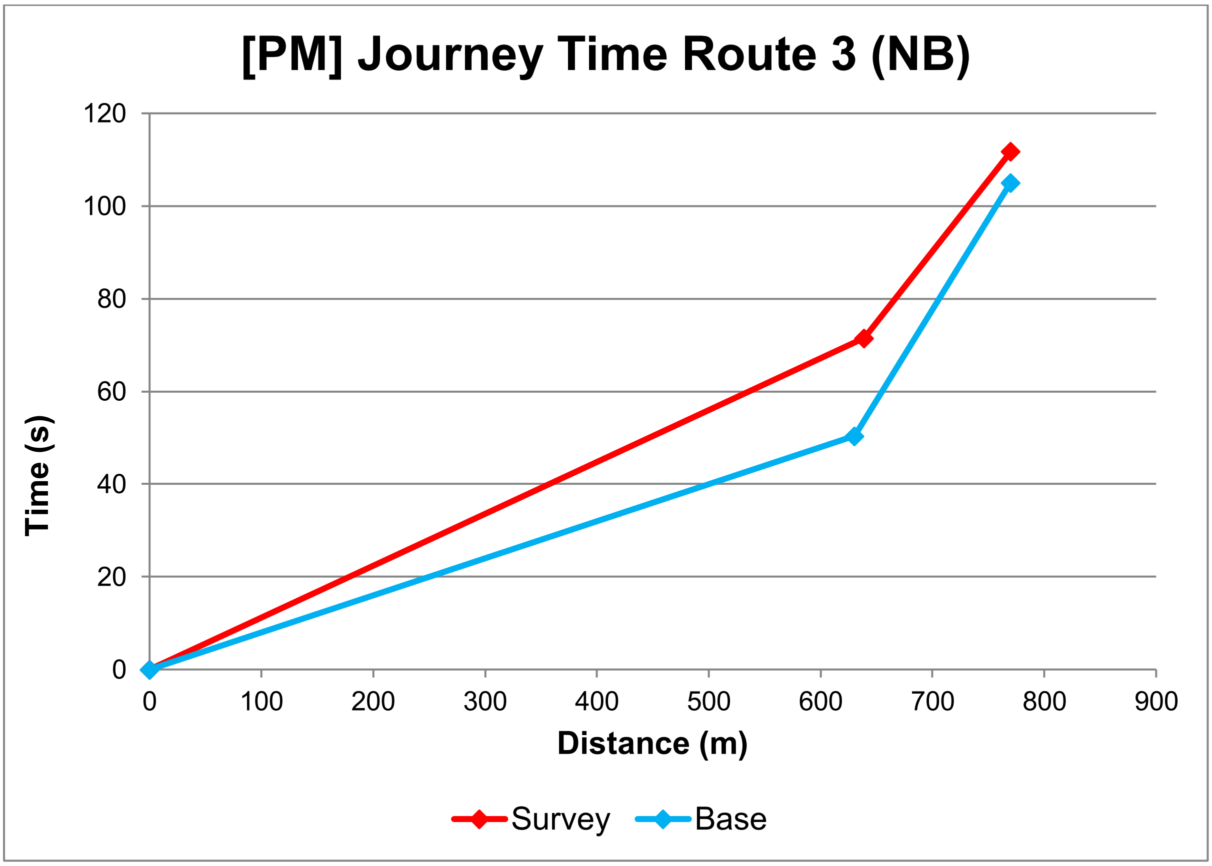

[PM] Journey Time Route 2 (SB)
Time (s)
0
50
100
150
200
250
300
350
400
450
0
500
1000
1500
2000
2500
Distance (m)
Survey
Base

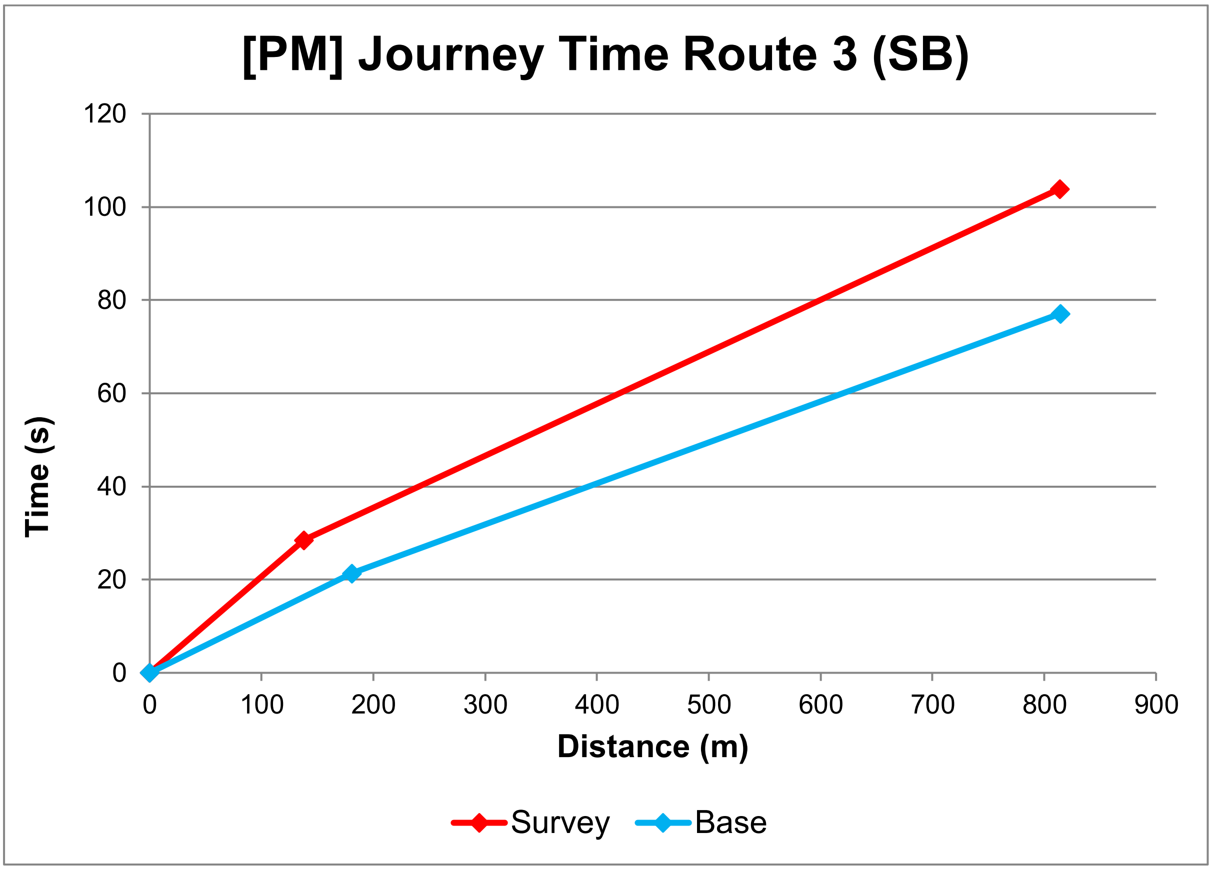
Journey Time Route 3






[AM] Journey Time Route 3 (SB)
Time (s)
Distance (m)
Survey
Base Model


[PM] Journey Time Route 3 (NB)
Time (s)
Distance (m)
Survey
Base


[PM] Journey Time Route 3 (SB)
120
100
80
60
40
20
0
Time (s)
0
100
200
300
400
500
600
700
800
900
Distance (m)
Survey
Base

Appendix B – Google Journey Time Reference Points

ID Point	From	To	ID Point	From	To	ID Point	From	To
1-2	53.268173, -6.521651	53.234854, -6.635083	81-82	53.217757, -6.655726	53.213634, -6.650240	162-163	53.209454, -6.678129	53.209454, -6.678129
3-4	53.234976, -6.635002	53.268245, -6.521889	83-84	53.213634, -6.650240	53.217757, -6.655726	164-165	53.214051, -6.681103	53.209454, -6.678129
5-6	53.234208, -6.636428	53.234902, -6.633221	85-86	53.213634, -6.650240	53.200021, -6.619039	166-167	53.207720, -6.666830	53.207720, -6.666830
7-8	53.233466, -6.636982	53.236781, -6.641017	87-88	53.200021, -6.619039	53.213634, -6.650240	168-169	53.209454, -6.678129	53.207720, -6.666830
9-10	53.236550, -6.640106	53.233345, -6.636822	89-90	53.200021,-6.619039	53.202893,-6.577803	170-171	53.207757, -6.661068	53.207757, -6.661068
11-12	53.233352,-6.636820	53.228759,-6.644932	91-92	53.202893,-6.577803	53.200021,-6.619039	172-173	53.207720, -6.666830	53.207757, -6.661068
13-14	53.228748,-6.644903	53.221489,-6.657409	93-94	53.217772,-6.655754	53.221405,-6.657377	174-175	53.209751, -6.653811	53.209751, -6.653811
15-16	53.221539,-6.657479	53.228791,-6.645010	95-96	53.221405,-6.657377	53.217772,-6.655754	176-177	53.207757, -6.661068	53.209751, -6.653811
17-18	53.219334,-6.661972	53.221447,-6.657567	97-98	53.221405,-6.657377	53.219724,-6.660787	178-179	53.213619, -6.650235	53.213619, -6.650235
19-20	53.221447,-6.657567	53.219334,-6.661972	99-100	53.219724,-6.660787	53.221405,-6.657377	180-181	53.209751, -6.653811	53.213619, -6.650235
21-22	53.215775,-6.665093	53.219334,-6.661972	101-102	53.220786,-6.658877	53.221299,-6.661403	182-183	53.209751, -6.653811	-
23-24	53.219334,-6.661972	53.215779,-6.664985	103-104	53.221299,-6.661403	53.220786,-6.658877	184-185	-	-
25-26	53.215791,-6.665091	53.216064,-6.671018	105-106	53.174000,-6.685584	53.207492,-6.666354	129-130	53.211730,-6.699681	53.220813,-6.695832
27-28	53.216064,-6.671018	53.215791,-6.665091	107-108	53.207492,-6.666354	53.174000,-6.685584	141-142	53.237936,-6.672284	53.239309,-6.665864
29-30	53.216064,-6.671018	53.214130,-6.681142	109-110	53.207492,-6.666354	53.214358,-6.665580	125-126	53.213091,-6.664357	53.209759,-6.653807
31-32	53.214208,-6.681148	53.216076,-6.671007	111-112	53.214325,-6.665458	53.207492,-6.666354	127-128	53.209759,-6.653807	53.213091,-6.664357
33-34	53.214136,-6.681133	53.211730,-6.699681	113-114	53.215781,-6.664980	53.214325,-6.665460	133-134	53.220813,-6.695832	53.231558,-6.682042
35-36	53.211730,-6.699681	53.214211,-6.681156	115-116	53.214358,-6.665580	53.215785,-6.665074	137-138	53.231558,-6.682042	53.237936,-6.672284
37-38	53.211730,-6.699681	53.211524,-6.702442	117-118	53.214204,-6.665407	53.213091,-6.664357	141-142	53.237936,-6.672284	53.239309,-6.665864
39-40	53.211524,-6.702442	53.211730,-6.699681	119-120	53.213091,-6.664357	53.214204,-6.665407	143-144	53.239309,-6.665864	53.237936,-6.672284
41-42	53.211531,-6.702422	53.213181,-6.706318	121-122	53.213091,-6.664357	53.207912,-6.660883	139-140	53.237936,-6.672284	53.231558,-6.682042
43-44	53.213181,-6.706318	53.211531,-6.702422	123-124	53.207912,-6.660883	53.213091,-6.664357	135-136	53.231558,-6.682042	53.220813,-6.695832
45-46	53.211531,-6.702422	53.208376,-6.712588	124-125	53.213091,-6.664357	53.213091,-6.664357	131-132	53.220813,-6.695832	53.211730,-6.699681
47-48	53.208515,-6.712623	53.211531,-6.702422	126-127	53.209759,-6.653807	53.209759,-6.653807	145-146	53.185980,-6.733126	53.211136, -6.708009
49-50	53.264019,-6.670494	53.250145,-6.665210	128-129	53.213091,-6.664357	53.211730,-6.699681	147-148	53.211136, -6.708009	53.232222, -6.688578
51-52	53.250144,-6.665315	53.264019,-6.670494	130-131	53.220813,-6.695832	53.220813,-6.695832	149-150	53.232222, -6.688578	53.236455, -6.639946

ID Point	From	To	ID Point	From	To	ID Point	From	To
52-53	53.264019,-6.670494	53.250145,-6.665210	132-133	53.211730,-6.699681	53.220813,-6.695832	151-152	53.236455, -6.639946	53.234848, -6.631848
53-54	53.250145,-6.665210	53.245039,-6.665943	134-135	53.231558,-6.682042	53.231558,-6.682042	153-154	53.234745, -6.631794	53.236576, -6.640636
55-56	53.245047,-6.666045	53.250144,-6.665315	136-137	53.220813,-6.695832	53.231558,-6.682042	155-156	53.236576, -6.640636	53.232148, -6.688305
57-58	53.244992,-6.665968	53.239529,-6.665498	138-139	53.237936,-6.672284	53.237936,-6.672284	157-158	53.232148, -6.688305	53.211052, -6.707732
59-60	53.239529,-6.665498	53.244994,-6.666061	140-141	53.231558,-6.682042	53.237936,-6.672284	159-160	53.211052, -6.707732	53.185726, -6.732988
61-62	53.239531,-6.665504	53.224556,-6.660788	142-143	53.239309,-6.665864	53.239309,-6.665864	161-162	53.214051, -6.681103	53.209454, -6.678129
63-64	53.224556,-6.660788	53.239531,-6.665504	144-145	53.237936,-6.672284	53.185980,-6.733126	165-166	53.209454, -6.678129	53.207720, -6.666830
65-66	53.224556,-6.660788	53.221316,-6.661408	146-147	53.211136, -6.708009	53.211136, -6.708009	169-170	53.207720, -6.666830	53.207757, -6.661068
67-68	53.221316,-6.661408	53.224556,-6.660788	148-149	53.232222, -6.688578	53.232222, -6.688578	173-174	53.207757, -6.661068	53.209751, -6.653811
69-70	53.221316,-6.661408	53.219376,-6.662011	150-151	53.236455, -6.639946	53.236455, -6.639946	177-178	53.209751, -6.653811	53.213619, -6.650235
71-72	53.219376,-6.662011	53.221316,-6.661408	152-153	53.234848, -6.631848	53.234745, -6.631794	179-180	53.213619, -6.650235	53.209751, -6.653811
73-74	53.219376,-6.662011	53.219693,-6.660865	154-155	53.236576, -6.640636	53.236576, -6.640636	175-176	53.209751, -6.653811	53.207757, -6.661068
75-76	53.219693,-6.660865	53.219376,-6.662011	156-157	53.232148, -6.688305	53.232148, -6.688305	171-172	53.207757, -6.661068	53.207720, -6.666830
77-78	53.219693,-6.660865	53.217757,-6.655726	158-159	53.211052, -6.707732	53.211052, -6.707732	167-168	53.207720, -6.666830	53.209454, -6.678129

Appendix C Micro-Simulation Transport Modelling Report

C.2 VISSIM Future Model Development Report

AECOM Imagine it. Delivered.

Naas/Sallins Transport Strategy

VISSIM Future Year Modelling Report

Kildare County Council

September 2020

Prepared for:

Kildare County Council

Prepared by:

AECOM Ireland Limited
4th Floor
Adelphi Plaza
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Co. Dublin A96 T927
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Table of Contents

Figures

Tables

1 Introduction

1.1 Introduction

AECOM was commissioned by Kildare County Council to provide assistance in the preparation of a Transport Strategy for Naas. AECOM's role was to develop an understanding of the transport issues in Naas and make recommendations on a strategic implementation plan of improvement measures and interventions in relation to walking, cycling, public transport, public realm, car parking, traffic movement, linkages and town approaches.

The Naas Transport Strategy aims to sustain the town as an attractive and thriving town centre by creating a framework for sustainable transportation and a quality urban environment. This will involve the development of a high quality and people focused realm, with a connected, engaged, healthy and prosperous community.

To aid this cause, Kildare County Council have commissioned AECOM to develop a VISSIM microsimulation model to inform the Council on the impact of their network improvements and planning proposals. Full details of the development and calibration/validation of the 2018 Base Year VISSIM model of Naas are provided in the 'Micro-Simulation Transport Modelling Report' (Appendix C of the Naas/Sallins Transport Strategy).

This report outlines the testing of road measures identified as part of the transport strategy in the 2023 Naas micro-simulation model to assess their potential benefits and impact across the entire micro-simulation study area.

1.2 Study Area

The study area for the Naas micro-simulation is shown in Figure 1.1. This study area encompasses the proposed network identified in Figure 4.0: Naas Microsimulation Model Proposed Network in the *'Naas Transport Strategy: Brief for Engineering Consultancy Services'* dated October 2018 with greater extents and detail in order to capture junctions and road links which contribute to the town's congested road network.

The study area covers the town centre of Naas and the major arterial routes through the town including the R445, R410, R407 and R448. Smaller routes through the town such as Friary Road and Corban's Lane are also included in the study area which provide route choice for road users in the town.

Figure 1.1 Microsimulation Study Area

1.3 Report Objectives

The primary objective of this report is to assess and demonstrate the potential impact of three road measures identified as part of the Naas/Sallins Transport Strategy across the modelled study area and to report on the potential benefits and impacts.

1.4 Road Measures Assessed

As part of the transport strategy several road options were identified and through a Multi-Criteria Analysis (MCA) assessment, undertaken against the objectives of the strategy, a suite of preferred road measures were identified as follows:

- Option 1 – The Gallops Avenue
- Option 2 – Upgrade of Murtagh's Corner Junction
- Option 3 – Millbridge Street (Indicative Route)
- Option 4 – Roadway Linking Aldi Distribution Centre to Millennium Park Road
- Option 7 – Town Centre HGV Restrictions
- Option 8 - Upgrade Signalised Junctions to MOVA or SCOOT as Appropriate

All options were assessed using the VISUM strategic traffic model developed to inform the assessment of the transport strategy. Due to the scale and nature of preferred measures the following three were them further assessed in the Naas micro-simulation (VISSIM) model:

- Option 1 – The Gallops Avenue
- Option 2 – Upgrade of Murtagh's Corner Junction
- Option 3 – Millbridge Street (Indicative Route)

Option 1: The Gallops Avenue

The Gallops Avenue is a proposed route connecting the R410 Blessington Road to the R445 Dublin Road with the objective of alleviating congestion on the R445 Dublin Road, R410 Blessington Road and R445 Main Street. Reducing traffic on the R445 Dublin Road and Main Street would facilitate the implementation of the bus route, walking/cycling measures and public realm proposals identified previously. This route is based on the Part 8 planning application for the Naas Inner Relief Road which was not approved by councillors in the Naas Municipal District (17th June 2019). It is proposed that this corridor would be reimagined and redesigned to act as an eastern street connection which facilities increased permeability for pedestrians and cyclists as well as drivers.

Option 2: Upgrade of Murtagh's Corner Junction

Murtagh's Corner currently operates as a 3-arm junction and under this measure it would be upgraded to create a 4-arm junction linking Corban's Lane to Main Street as illustrated in Figure 1.2. The proposal would aim to lead to a reduction in traffic on the Main Street. As part of this proposal Corban's Lane would also need to be upgraded to cater for an increase in traffic.

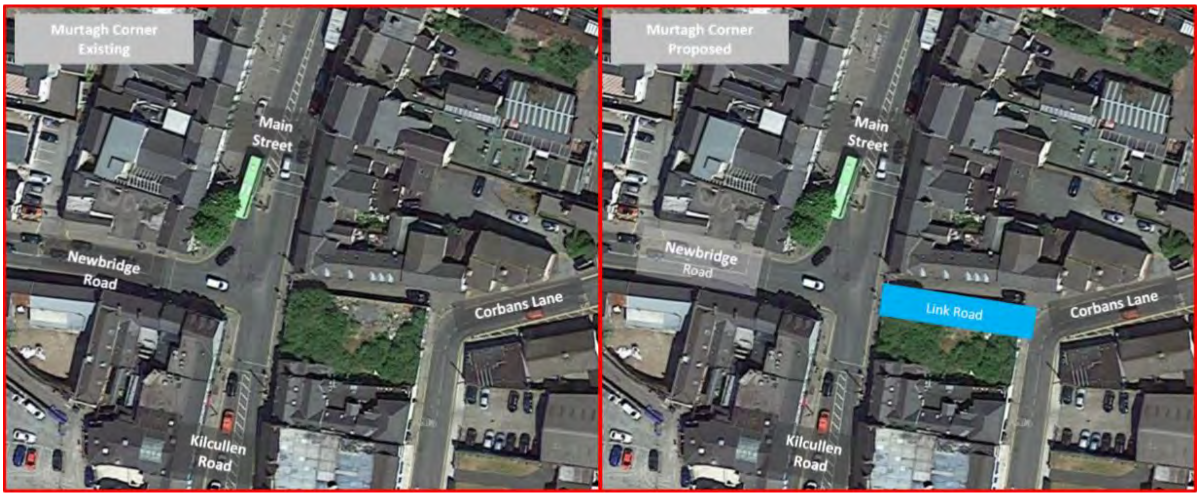


Figure 1.2 Murtagh's Corner Upgrade

Option 3: Millbridge Street – Indicative Route

Millbridge Street is a proposed option to connect the Old Caragh Road to Millbridge Way. This option will provide greater access between the R409 Caragh Road and the R407 Sallins Road and will require a crossing of the canal. The primary purpose of this option is to provide local access to the lands to the west of the canal. This road is intended for public transport, walking and cycling usage, while its suitability to carry private vehicle traffic will be examined during detailed design. An indicative alignment of the proposal is illustrated in Figure 1.3.

Figure 1.3 Millbridge Street (Indicative Alignment)

2 Development of 2023 Naas VISSIM Micro-Simulation

2.1 Overview

To assess the proposed road options, the level of traffic in 2018 Base Year VISSIM models was updated to 2023 in line with the VISUM strategic traffic models. The process of updating the 2018 models to 2023 and the process of running and assessing the 2023 Do-Minimum and 2023 Do-Something (Road Options 1, 2 and 3) is outlined in the following sections.

2.2 Development of 2023 Do-Minimum Models

This section of the report details the development of the 2023 matrices for the AM peak hour (08:15–09:15). The matrices were developed in 15 minute increments for LV and HV, starting at 07:45 and finishing at 09:45, this allowed a demand profile to be established. The 2023 matrices were developed by applying the VISUM strategic traffic model growth factors. Using the forecasting methodology of the VISUM model provided consistency between the traffic levels in both the strategic and micro-simulation models. A summary of the assumptions underpinning the development of the 2023 matrices are set out in the following section.

2.2.1 Land Use and Growth Assumptions

Kildare County Council provided future growth projections and a conceptual land-use map for use in the study. These targets were incorporated into a planning sheet provided to AECOM by KCC. Using the targets provided, the additional persons and jobs for each zone were projected to the relevant traffic model zones.

Due to the large scale zoning system within VISUM, an equivalence table was developed for VISSIM which assigned each VISUM zone to a corresponding VISSIM zone. Where there was multiple routes/roads that could be used to access a VISUM zone, it was necessary to distribute the origin and destination demands from that zone across multiple VISSIM zones proportionally. This maintained the relationship and consistency between the VISUM and VISSIM models.

The projections showed an additional population of 5,275 and 3,339 extra jobs for 2023 based on the data provided by KCC.

2.3 Methodology of Running the 2023 Do-Something Models

2.3.1 Convergence

A summary of the methodology used in the convergence process for the 2023 Do-Minimum and Do-Something Options is set out in the following sections.

2.3.2 Run for Paths, Costs & Convergence

The first step was to set up the dynamic assignment parameters. This involved setting the scaling total volume to 55%. Furthermore, the settings to search new paths and search paths for O-D pairs with zero volume were turned on, as this would ensure that if a 55% reduction in demand results in no trips between zones, these will be highlighted where there may actually be demand in the matrix. The Choice parameters were set up to avoid long detours, reject paths with total costs which were too high and limit the total number of paths to 3. Convergence criteria of travel time on paths, travel time on edges and volume on edges were set at consistent percentages.

Before the models were run for paths, the surcharge for a number of them were removed and set to zero (the surcharge for these links were saved and assigned to the links once the search for paths run was complete). This was to ensure that all paths within the model can be found when the model is run to search for paths. Links with surcharges show a higher cost and path to travel on. If the surcharge value is left on these links and ran for paths, the model would avoid using these routes as the cost would be too high for vehicles to choose this route. This would result in an illogical route choice and may impact results taken from the model.

Once the above parameters were set up for dynamic assignment, the model was run 5 times. This searched and found all the paths in the models. A path check was carried out to ensure that all the paths were sensible. This review was carried out by checking the paths from zones and to zones.

After the run for paths was completed, the next step was to carry out the costs stage of the convergence. Paths were turned off and the model was run from 55% to 85% in 5% increments. The model was checked during the run to ensure there was no locking up on the network.

The final step involved running the model for convergence. This required watching the model and ensuring that if it locks up, then the previous BEW file must be used. It also involved watching and assessing the convergence outputs from the CVA file. These outputs included the link turning, link counts, paths and the summary results that show the converge of paths travel time, edges travel time and edges volume results.

Following the run for Paths and Costs, the models were run for convergence. In order to do this, the models were run between 30 and 60 times.

2.3.3 Random Seed and Random Seed Increment

The random seed for convergence was set to 43 and the random seed increment to 0. Once the convergence was completed, random seed increment were set to 1 to gather results and carry out evaluations on the models.

2.3.4 Data Collection Points, Queue Results and Vehicle Network Performance

Once the models were converged, they were set up to extract the pertinent data needed to carry out analysis and comparisons of the Options against the Base model. This required inputting approximately 40 data collection points into each of the Base, Option 1, Option 2 and Option 3 models for 2018 and 2023 at the same locations. Furthermore, the under evaluation and measurement definition were assigned to analyse the demand on key links and junctions within the models. The location of the data collection points on the network can be seen in Figure 2.1.

Figure 2.1 Data Collection Points

Approximately 15 queue counters were inserted into each of the models to provide queue results. The locations at the key junction are shown in Figure 2.2.

Figure 2.2 Queue Counter Locations

2.3.5 Number of Runs

Once the data collection points and queue counters were installed, each of the models were run 30 times. This higher number of runs was chosen as it reduced the unpredictability of results and provides greater accuracy than a lower number of runs would achieve.

3 2023 Micro-Simulation Modelling

3.1 Overview

Preferred road measures 1, 2, and 3 were modelled using the Naas Micro-Simulation model to assess their performance and impact both on the wider road network and on the local area they serve. Each measure was compared against the 2023 AM Peak Do-Minimum scenario and assessed against the following:

1. Network Statistics – Performance/impact of the measure across the entire modelled road network.
2. Changes in Vehicle Flow – Change in the number of vehicles passing a specific data collection point in the network (i.e. increase/decrease in flow as a results of the toad measure).
3. Change in Queue Length – Change in the queue lengths (in meters) through various junctions located throughout the modelled road network.

3.2 Network Statistics

The performance of each of the 3 measures relative to the 2023 Do-Minimum scenario is provided in Table 3.1. The results relate to the performance of the measure in respect to the entire modelled road network in VISSIM. All proposed measures show a reduction in average delays per vehicle, with Measure 1 (Gallops Avenue) providing the largest benefit across the entire modelled road network.

In relation to average speeds, all measures show an increase over the 2023 Do-Minimum scenario with Measure 1 once again generating the largest increase. Measures 1, 2 and 3 all lead to an overall increase in distance travelled as vehicles reroute to access the new road links.

Table 3.1 2023 AM Peak Network Statistics (Do-Minimum and Road Measures 1, 2 and 3)

Network Statistics	2023 Do-Minimum	2023 Measure 1 (Gallops Avenue)		2023 Measure 2 (Murtagh's Corner)		2023 Measure 3 (Millbridge Street)	
Average Delay Per Vehicle (sec)	198.7	152.0	-24%	189.9	-4%	174.1	-12%
Average Stops per Vehicle	5.0	3.7	-26%	5.0	-1%	4.8	-5%
Average Speed of Vehicle (km/hr)	15,9	19.1	20%	16.5	3%	17.6	10%
Total Distance Travelled (km)	9924	10397	5%	9455	1%	10320	4%

3.3 Change in Vehicle Flow

The change in vehicle flow between the 2023 AM Do-Minimum and Measures 1, 2 and 3 was assessed at 38 different locations throughout the modelled road network. The purpose of the assessment was to understand the potential re-routing impacts of the measures across the modelled study area. The 38 locations which are illustrated in Figure 3.1 are as follows:

1. Sallins Road (Southbound)
2. Wolfe Tone Street (Eastbound Left Turn Lane)
3. Blessington Road (Southbound)
4. Friary Road (Southbound)
5. North Main Street (Southbound)
6. Wolfe Tone Street (Eastbound Right Turn Lane)

7. Sallins Road (Southbound Left Turn Lane)
8. Sallins Road – North of Mill Lane (Southbound)
9. Sallins Road – North of Mill Lane (Northbound)
10. Dublin Road (Southbound)
11. Dublin Road (Northbound)
12. Tipper Road Right (Northbound)
13. Tipper Road Left (Southbound)
14. South Main Street (Northbound)
15. South Main Street – Right Turn (Southbound)
16. South Main Street – Straight Ahead (Southbound)
17. Corban's Lane (Northbound)
18. Corban's Lane (Southbound)
19. Friary Road (Northbound)
20. Blessington Road (Northbound)
21. Blessington Road (Southbound)
22. Blessington Road - North of Tipper Road Junction (Northbound)
23. Friary Road – East of Corban's Lane Junction (Eastbound)
24. Friary Road – East of Corban's Lane Junction (Westbound)
25. Dublin Road – Between Friary Road and Wolfe Tone Street (Eastbound)
26. Dublin Road – Between Friary Road and Wolfe Tone Street (Westbound)
27. Wolfe Tone Street (Westbound)
28. Wolfe Tone Street – from Carpark (Westbound)
29. Dublin Road – Between Blessington Road and Wolfe Tone Street (Southbound)
30. Dublin Road – Between Blessington Road and Wolfe Tone Street (Northbound)
31. Dublin Road - Right onto Blessington (Between Wolfe Tone Street and Blessington Road)
32. Main Street - Between Sallins Road & Friary Road (Northbound)
33. Main Street - Right onto Sallins Road (between Sallins Road & Friary Road)
34. Main Street - Between Sallins Road & Friary Road (Southbound)
35. Corban's Lane (Eastbound)
36. Corban's Lane (Westbound)
37. Mill Lane (Westbound)
38. Mill Lane (Eastbound)

Table 3.2 shows the number of vehicles in the 2023 Do-Minimum model and each of the 3 measures assessed at each of the 38 data collection points. The table also provides the percentage change in flow at each location between the 2023 Do-Minimum and the relevant measure. Changes in vehicle flows in excess of 5% between the 2023 Do-Minimum and each Measure are high in red (>5%) and green (<5%).

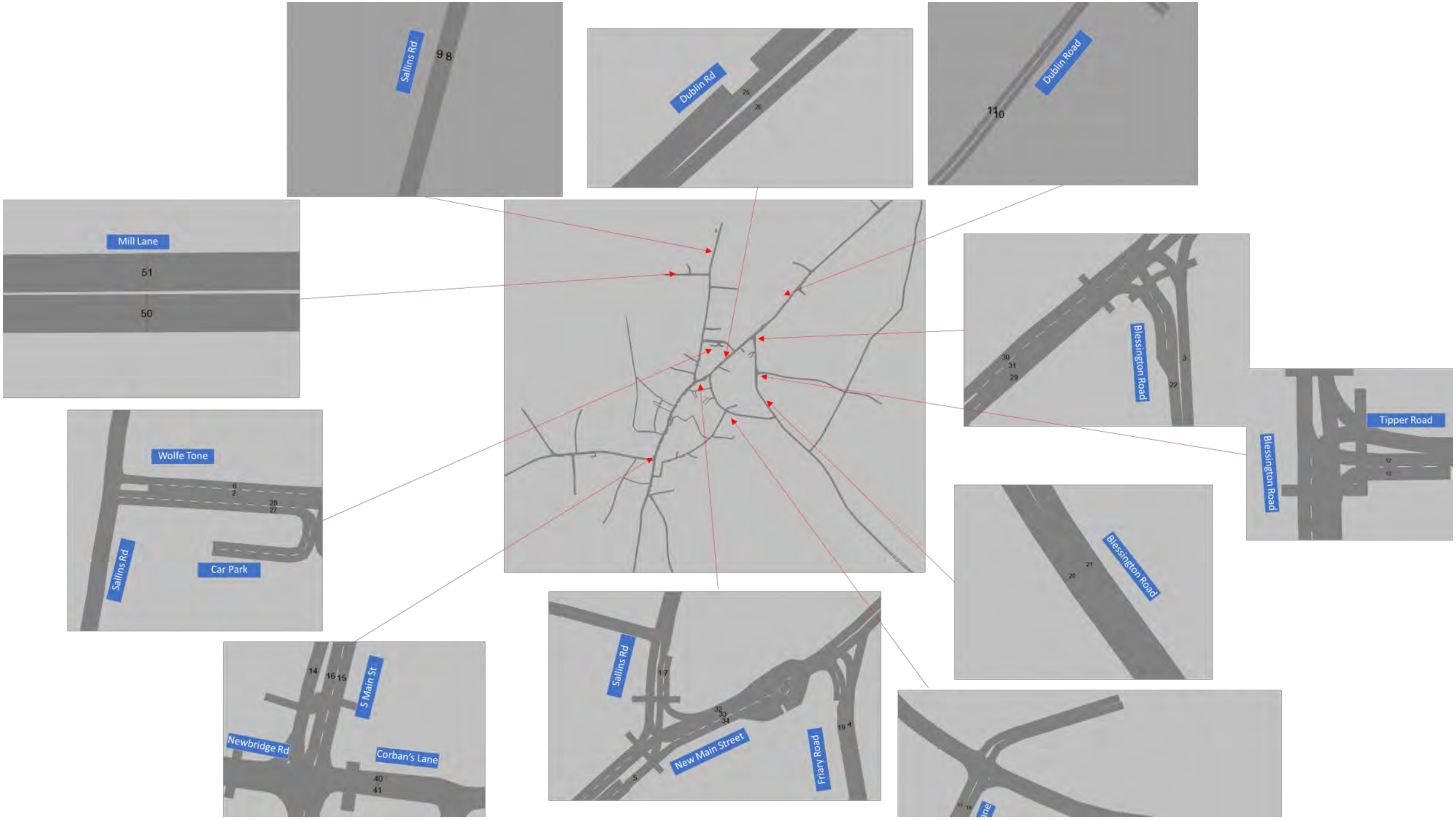


Figure 3.1 Queue Length Counter Locations

Table 3.2 2023 AM Peak Change in Vehicle Flow (Do-Minimum and Road Measures 1, 2 and 3)

Counter	2023 Do-Minimum	2023 Measure 1 (Gallops Avenue)		2023 Measure 2 (Murtagh's Corner)		2023 Measure 3 (Millbridge Street)	
1	204	218	7%	211	3%	197	-3%
2	66	67	2%	64	-3%	65	-2%
3	465	323	-31%	421	-9%	393	-15%
4	181	184	2%	279	54%	204	13%
5	602	583	-3%	480	-20%	569	-5%
6	263	253	-4%	206	-22%	218	-17%
7	130	119	-8%	126	-3%	138	6%
8	581	570	-2%	528	-9%	583	0%
9	461	483	5%	472	2%	463	0%
10	691	404	-42%	709	3%	706	2%
11	627	336	-46%	644	3%	651	4%
12	65	195	200%	72	11%	73	12%
13	201	34	-83%	189	-6%	180	-10%
14	674	594	-12%	610	-9%	562	-17%
15	486	472	-3%	523	8%	516	6%
16	278	290	4%	128	-54%	220	-21%
17	219	357	63%	304	39%	242	11%
18	351	435	24%	512	46%	354	1%
19	332	203	-39%	294	-11%	247	-26%
20	523	360	-31%	596	14%	581	11%
21	571	190	-67%	552	-3%	497	-13%
22	447	481	8%	486	9%	489	9%
23	195	355	82%	243	25%	244	25%
24	474	429	-9%	438	-8%	371	-22%
25	537	379	-29%	488	-9%	472	-12%
26	472	468	-1%	462	-2%	459	-3%
27	29	29	0%	28	-3%	28	-3%
28	236	266	13%	251	6%	267	13%
29	718	774	8%	737	3%	775	8%
30	428	275	-36%	446	4%	449	5%
31	246	266	8%	156	-37%	172	-30%
32	477	393	-18%	398	-17%	457	-4%
33	185	167	-10%	147	-21%	142	-23%
34	398	365	-8%	270	-32%	372	-7%
35	-	-	-	115	-	-	-
36	-	-	-	186	-	-	-
37	-	-	-	-	-	125	-
38	-	-	-	-	-	183	-

Road Measure1: Gallops Avenue

The results for Measure 1 show a significant reduction (-42% & 46%) in traffic on the Dublin Road (Counters 10 and 11) which is due to the transfer of traffic from the Dublin Road to the Gallops Avenue. In addition, traffic levels reduce on Blessington Road and also in the town centre (Main Street, Wolfe Tone Street and Sallins Road (Left Turn).

The assessment shows an increase in traffic on Tipper Road, Friary Road and Corban's Lane as traffic re-routes to access Gallops Avenue.

Road Measure 2: Murtagh's Corner

The proposal to upgrade Murtagh's Corner shows a reduction in traffic in both directions on North Main Street due to the rerouting traffic as a result of the new direct road link through to Corban's Lane. This re-routing of traffic away from Main Street in turn leads to an increase in traffic on Corban's Lane, Friary Road and Blessington Road.

Due to the dynamic assignment of traffic in the VISSIM model there is some re-routing of traffic between the Poplar Square, Friary Road, Wolfe Tone Street and Blessington Road junctions. As part of the implementation of Measure 2 and the resulting increase in traffic via Corban's Lane, Friary Road and Blessington Road the existing traffic signals timings at the junctions along the Main Street/Dublin Road would need to be reviewed to optimise the flow of traffic at peak times.

Road Measure 3: Millbridge Street

The assessment of Millbridge Street leads to a reduction in traffic on Main Street and an increase on Sallins Road (6%) as traffic reroutes to Millbridge Street. There is also some local re-routing of traffic between the Poplar Square, Friary Road, Wolfe Tone Street and Blessington Road junctions due to the dynamic assignment of traffic in the VISSIM model. As per Measure 2 the traffic signals timings at the junctions along the Main Street/Dublin Road would need to be reviewed to optimise the flow of traffic at peak times.

3.4 Change in Queue Lengths

The performance of each of the 3 road measures in relation to queuing relative to the 2023 Do-Minimum is provided in Table 3.3. The locations included in the assessment are illustrated in Figure 3.2, a total of 23 locations were included in the assessment. Queuing is presented in meters with each vehicle occupying approximately 6m.

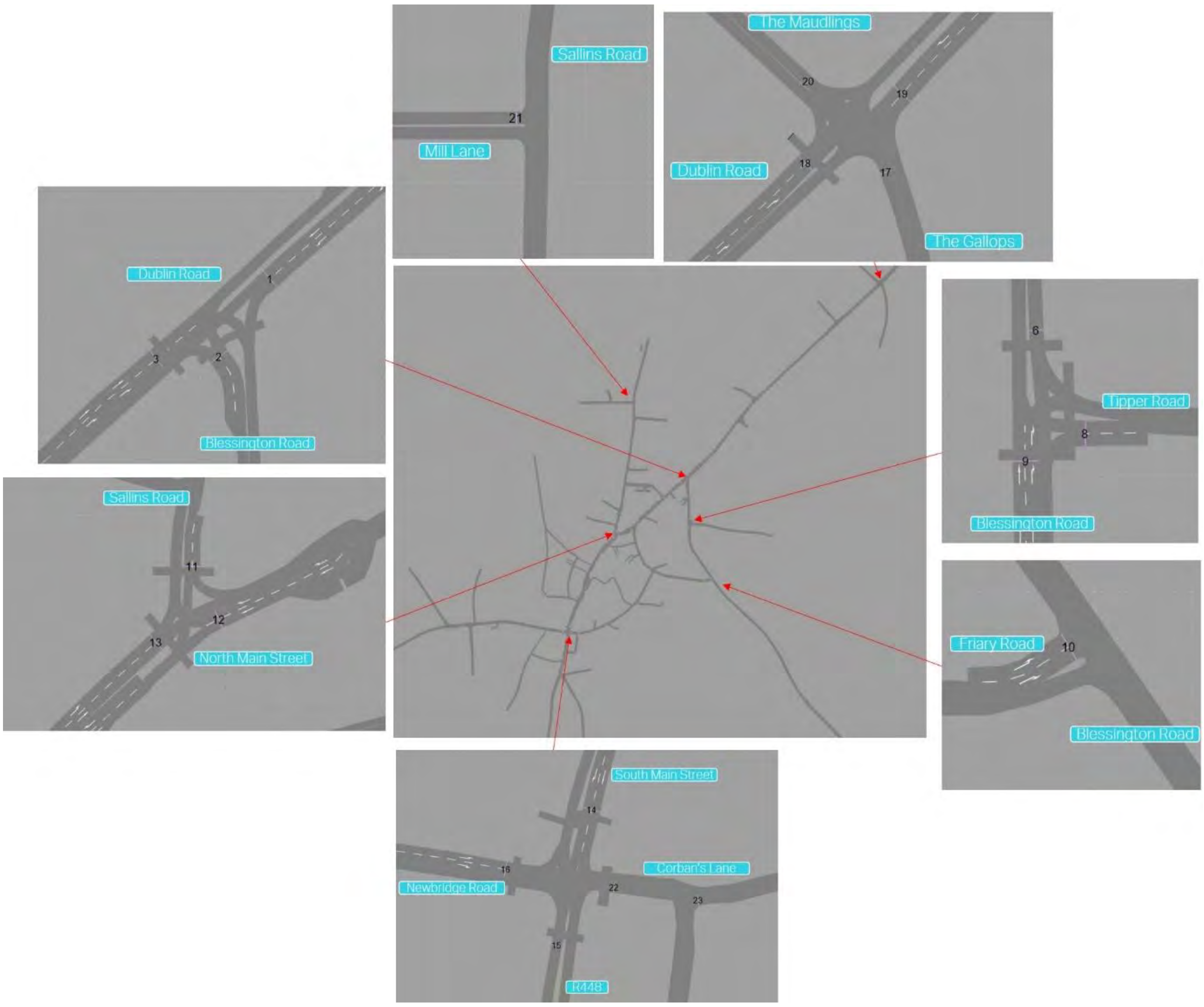


Figure 3.2 Queue Length Counter Locations

Table 3.3 2023 AM Peak Change in Queue Length (Do-Minimum and Road Measures 1, 2 and 3)

Counter	2023 Do-Minimum	2023 Do-Minimum	2023 Measure 1 (Gallops Avenue)		2023 Measure 2 (Murtagh's Corner)		2023 Measure 3 (Millbridge Street)	
1	Dublin Road (Southbound)	207m	28m	-86%	145m	-30%	177m	-15%
2	Blessington Road (Northbound)	105m	17m	-84%	113m	8%	114m	9%
3	Dublin Road (Northbound)	183m	30m	-84%	50m	-73%	48m	-74%
6	Blessington Road (Southbound)	45m	44m	-3%	31m	-32%	30m	-34%
8	Tipper Road	98m	107m	8%	147m	49%	164m	67%
9	Blessington Road (Northbound)	148m	34m	-77%	221m	49%	251m	69%
10	Friary Road (Eastbound)	15m	2m	-83%	15m	5%	8m	-48%
11	Sallins Road (Southbound)	324m	388m	20%	417m	29%	351m	8%
12	North Main Street (Southbound)	224m	70m	-69%	42m	-81%	55m	-75%
13	North Main Street (Northbound)	228m	169m	-26%	181m	-21%	72m	-68%
14	South Main Street (Northbound)	71m	46m	-35%	41m	-42%	29m	-58%
15	Kilcullen Road (Northbound)	133m	53m	-60%	324m	144%	72m	-46%
16	Newbridge Road Eastbound)	261m	129m	-50%	50m	-81%	21m	-92%
17	East Dublin Road Gallops Avenue	-	109m	-	-	-	-	-
18	South Dublin Road Gallops Avenue	-	182m	-	-	-	-	-
19	North Dublin Road Gallops Avenue	-	43m	-	-	-	-	-
20	West Dublin Road Gallops Avenue	-	72m	-	-	-	-	-
21	Mill Lane / Sallins Road	-	-	-	-	-	23m	-
22	Corban's Lane Signal	-	-	-	52m	-	-	-
23	Corban's Lane Junction	-	-	-	22m	-	-	-

Road Measure 1: Gallops Avenue

The results for Measure 1 show a reduction in queuing through the Dublin Road/Blessington Road junction (as illustrated in Figure 3.3), Poplar Square junction and also the Murtagh's Corner junction. There is a minor increase in queuing on the Tipper Road due to the increase in traffic volumes associated with the opening of the Gallops Avenue link. In addition, there is also an increase in queueing on the Sallins Road southbound at Poplar Square, however this relates to the re-routing of traffic due to the dynamic assignment in VISSIM (i.e. traffic rerouting from Wolfe Tone Street to Sallins Road).

Figure 3.3 Dublin Road/Blessington Road Junction (2023 AM Do-Minimum versus Measure 1)

Road Measure 2: Murtagh's Corner

The proposal to upgrade Murtagh's Corner shows a reduction in queuing on the Newbridge Road and Main Street arms of Murtagh's Corner (as illustrated in Figure 3.4) and a reduction through the Poplar Square junction. The assessment show an increase in queueing on the Kilcullen Road, however the as part of the implementation of the proposal and signal stages/phases and signal times would be tested and optimised to maximise the efficiency of the junction.

An increase in queuing is noted through the Blessington Road/Tipper Road junction, which is due to the re-routing of traffic from Main Street/Dublin Road to Corban's Lane, Friary Road and Blessington Road. As previously noted, the existing traffic signals timings at the junctions along Main Street/Dublin Road would need to be reviewed to optimise the flow of traffic at peak times.

Figure 3.4 Murtagh Corner Junction (2023 AM Do-Minimum versus Measure 2)

Road Measure 3: Millbridge Street

The assessment of Millbridge Street leads to an reduction in queuing through the Murtagh's Corner junction and also through the Poplar Square junction as illustrated in Figure 3.5 and Figure 3.6 respectively. As per Measure 2 an increases in queuing is also noted through the Blessington Road/Tipper Road junction. The existing traffic signals timings at the junctions along the Main Street/Dublin Road would need to be reviewed to optimise the flow of traffic at peak times.

Figure 3.5 Murtagh's Corner Junction (2023 AM Do-Minimum versus Measure 3)

Figure 3.6 Poplar Square Junction (2023 AM Do-Minimum versus Measure 3)

4 Conclusion

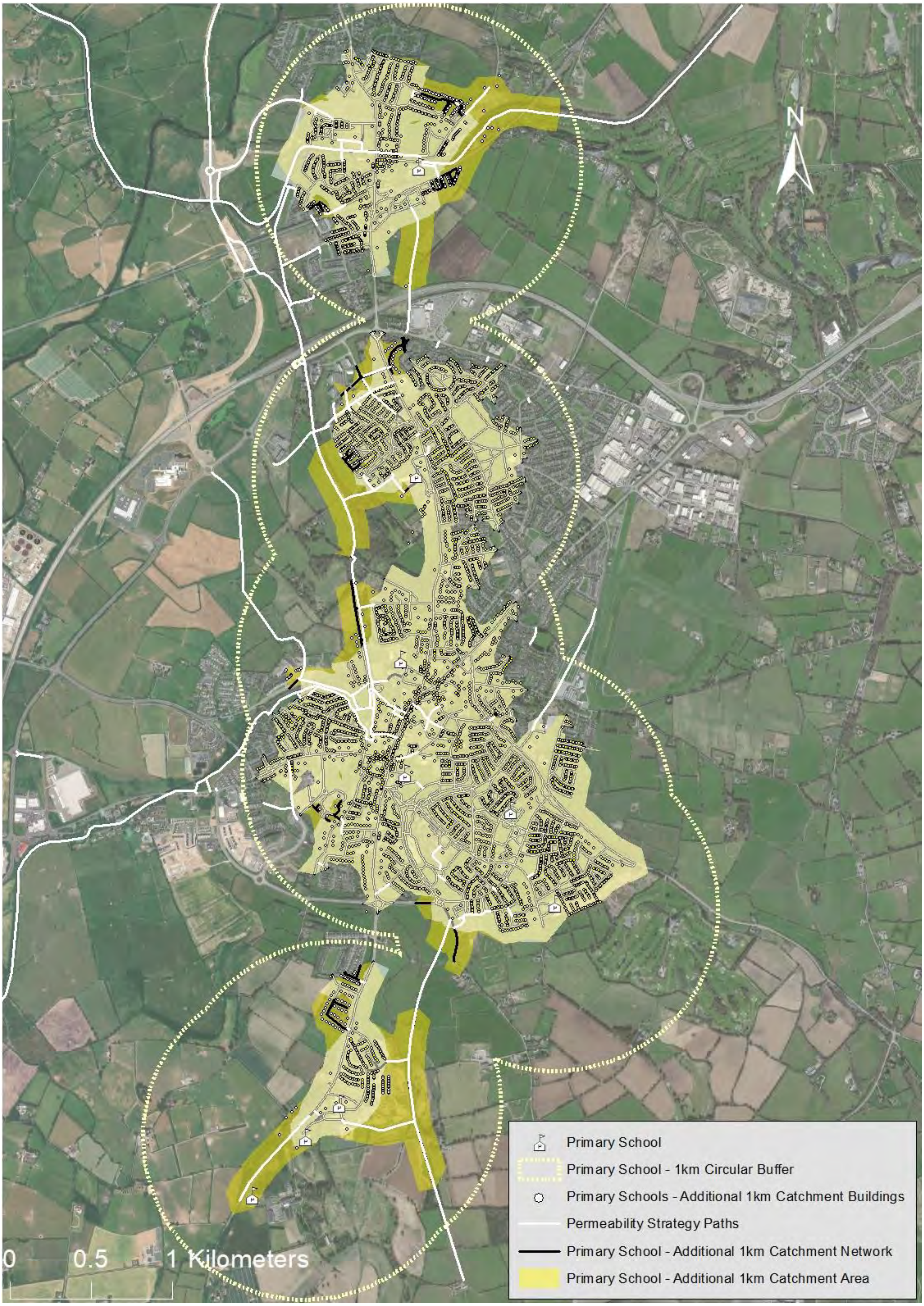
The assessment has shown the benefits of all 3 road measures assessed in the 2023 VISSIM micro-simulation model in terms of the overall performance of the road network, reduced flows through Naas town centre and reduced queuing at key town centre junctions.

The assessment has also demonstrated that the proposals, most notably Option 2 and 3 are likely to have an impact on the performance of a number of other junctions in the town due to the re-routing of traffic (e.g. Dublin Road/Blessington Road and Blessington Road/Tipper Road). Therefore the implementation of the options would need to be further assessed as part of the option appraisal/design process to understand upstream/downstream impacts of the proposal.

Appendix D: A3 Versions of Maps in Naas/Sallins Transport Strategy

Appendix D A3 Versions of Maps

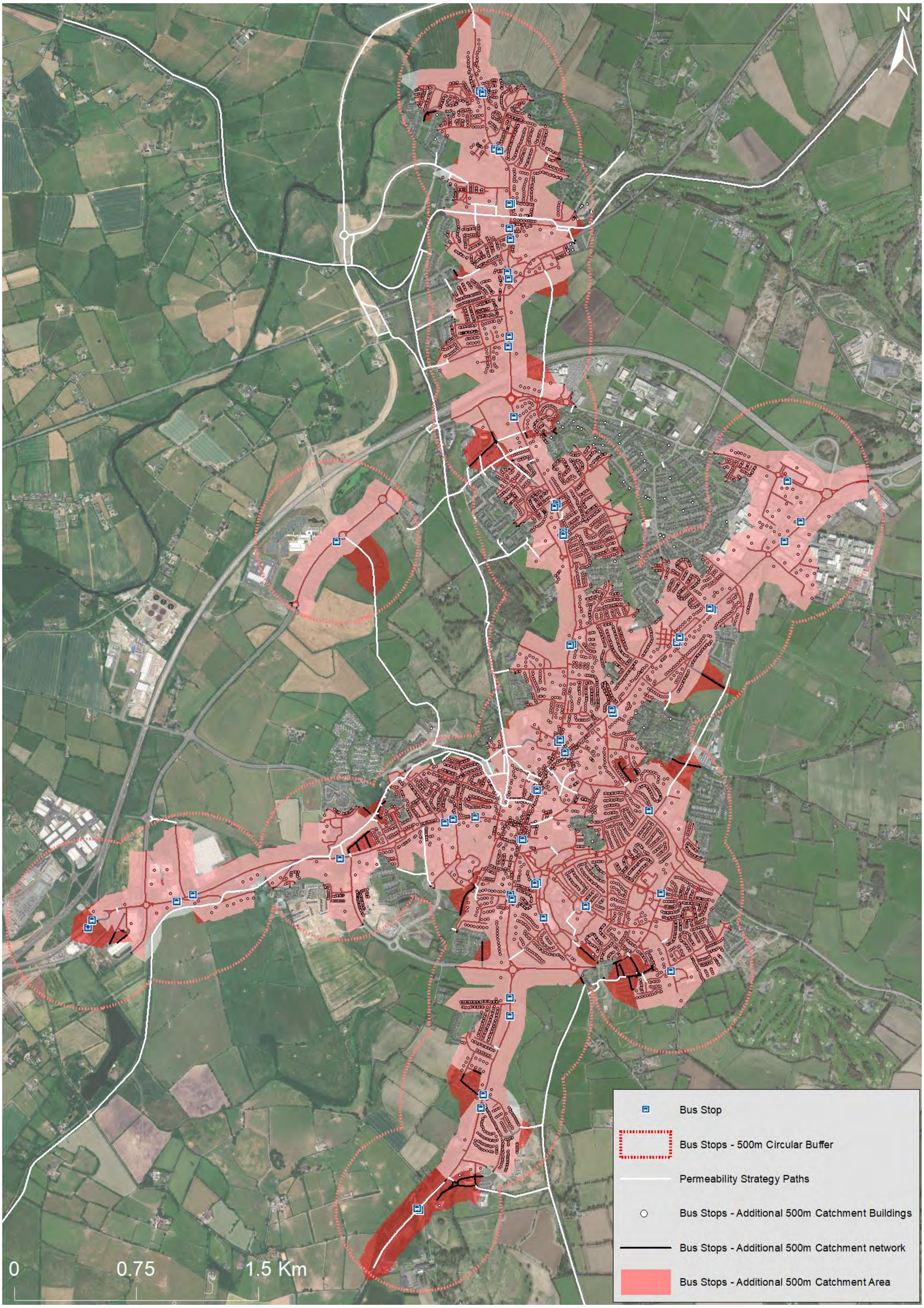
D.1 Primary Schools Catchment – 1km



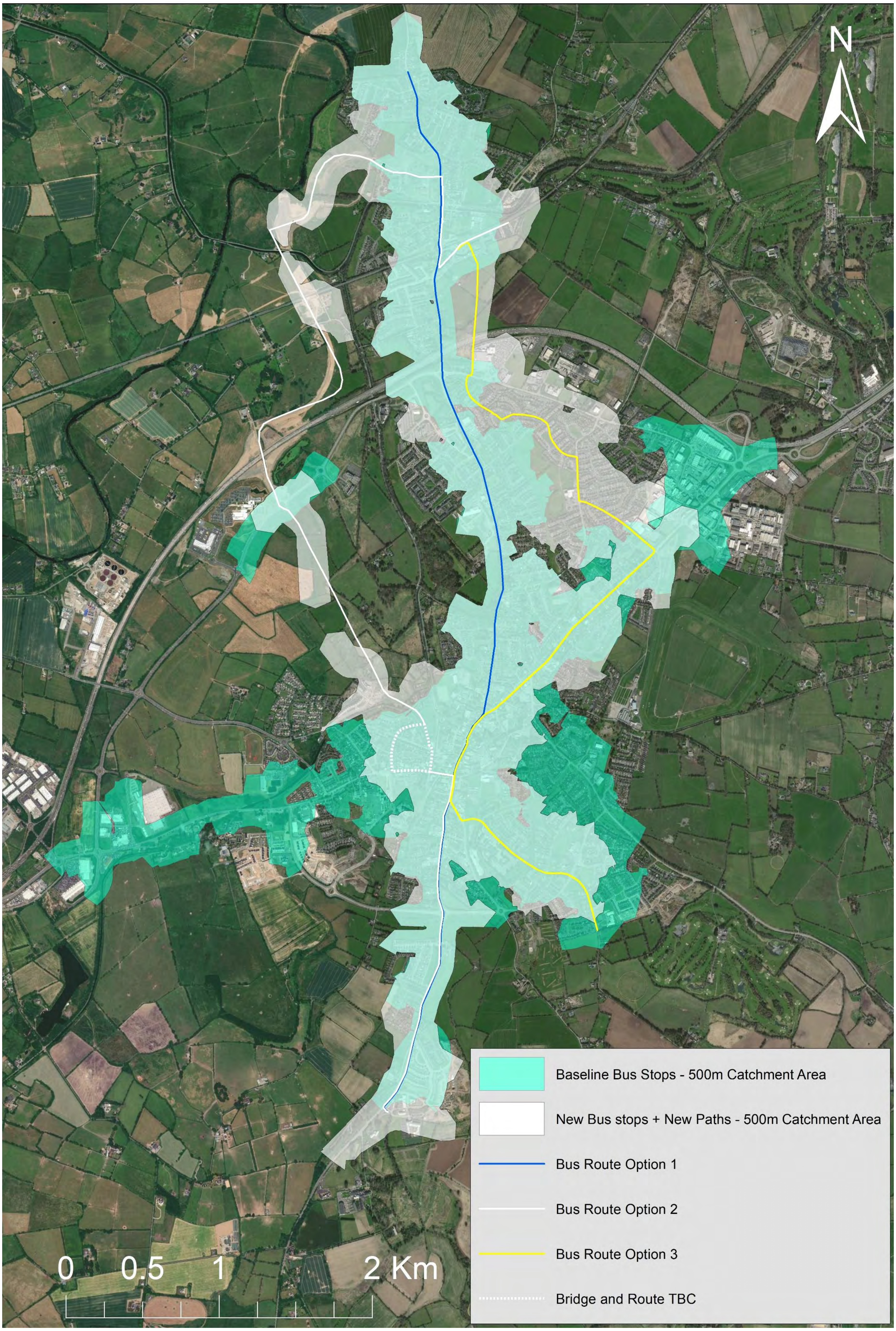
D.2 Secondary Schools Catchment – 1km

D.3 Retail – Tesco Extra Catchment – 1km

D.4 Existing Bus Stop Catchment – 500m

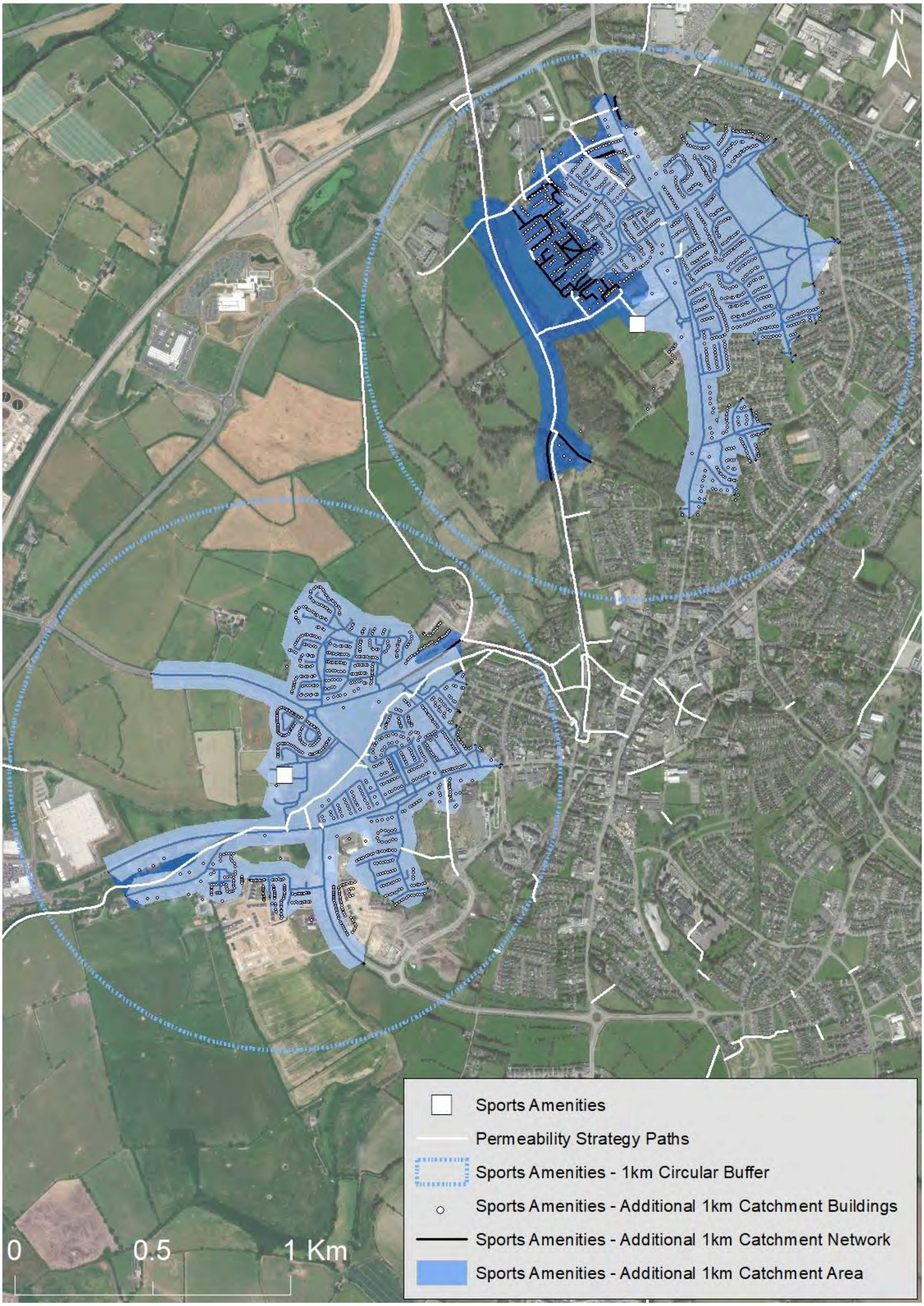


D.5 Bus Coverage – Existing and Future Bus Services – 500m



D.6 Sallins Train Station Catchment – 1km

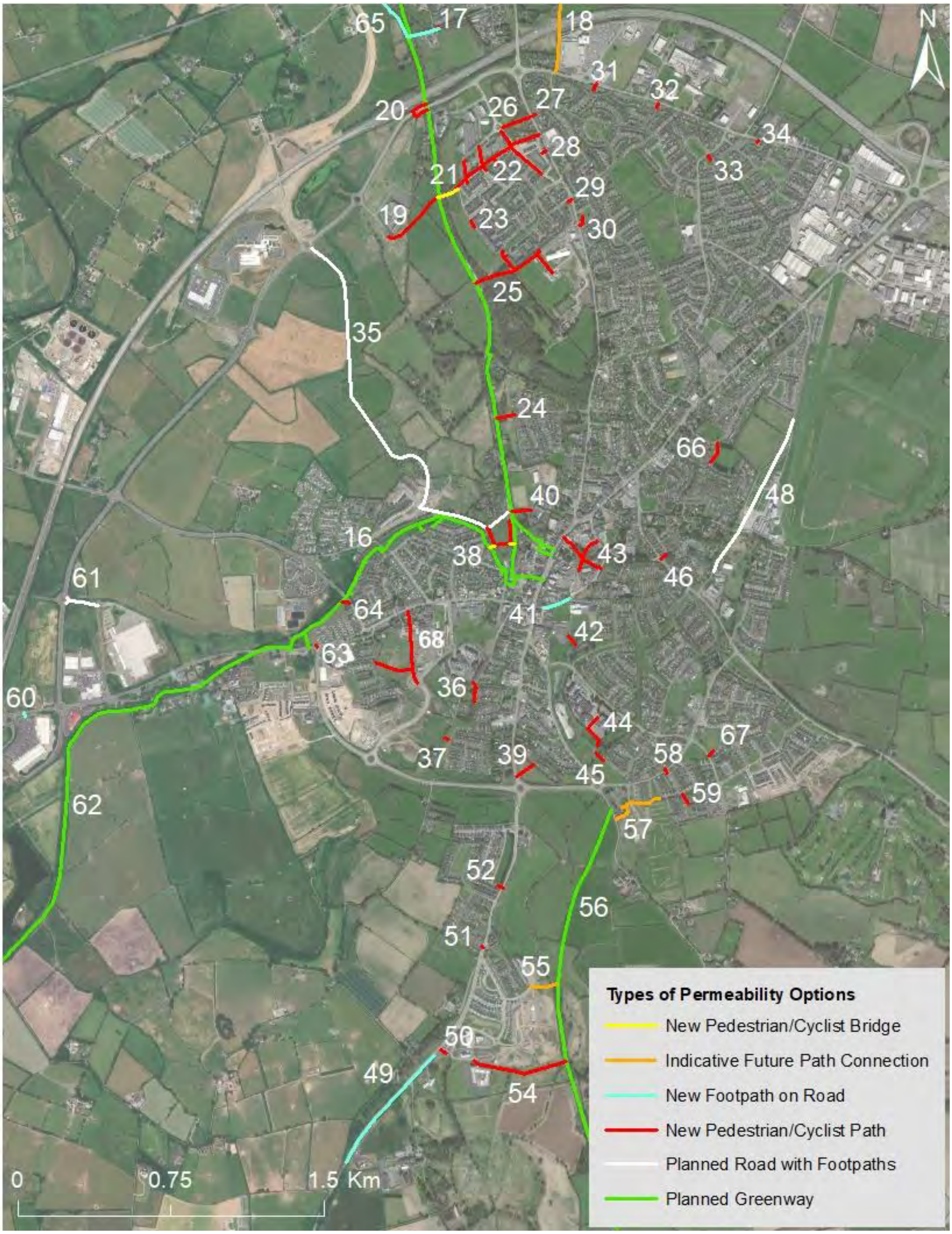
D.7 Sport Amenities Catchment -1km



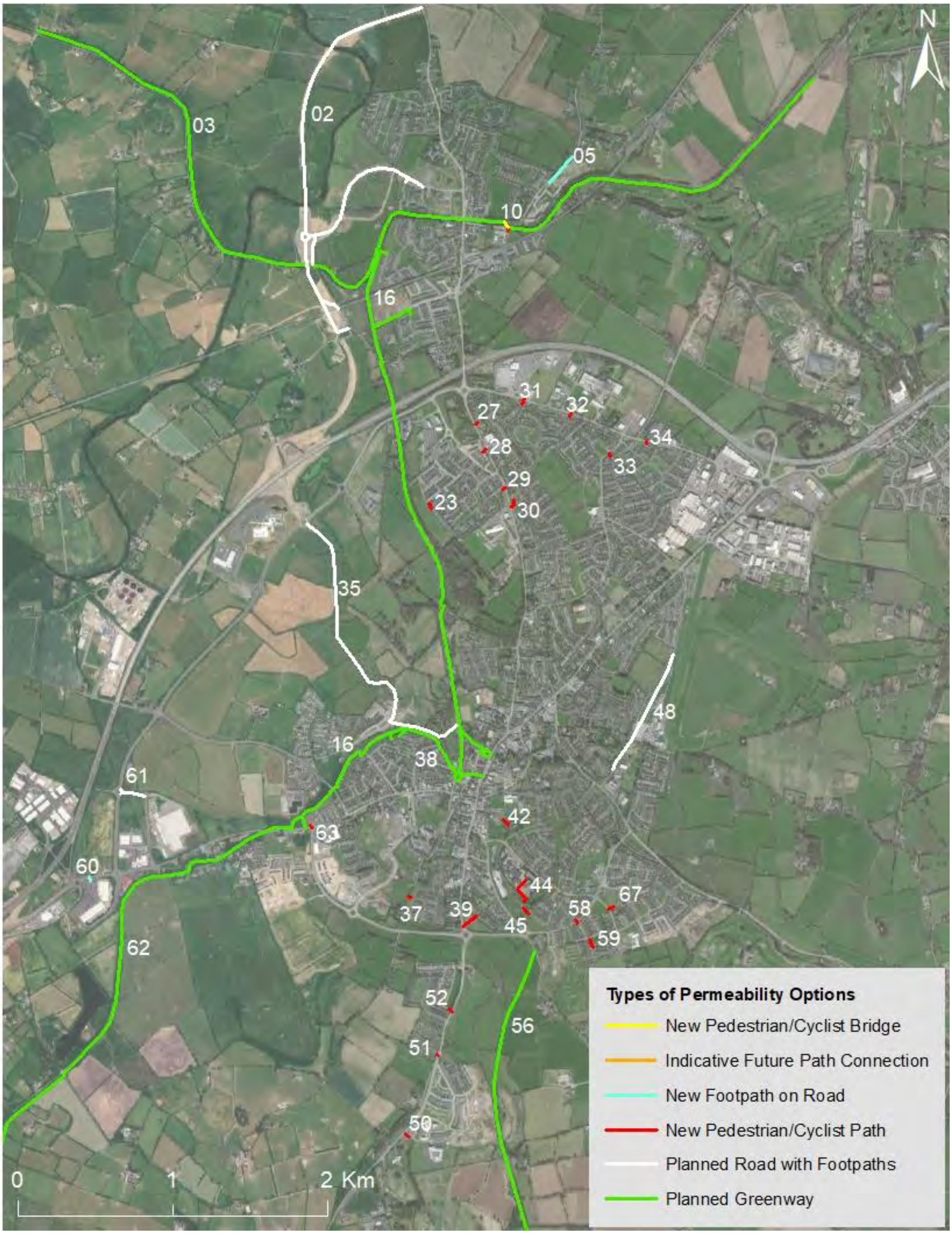
D.8 Hospital Catchment – 1km

D.9 Permeability Strategy in Sallins

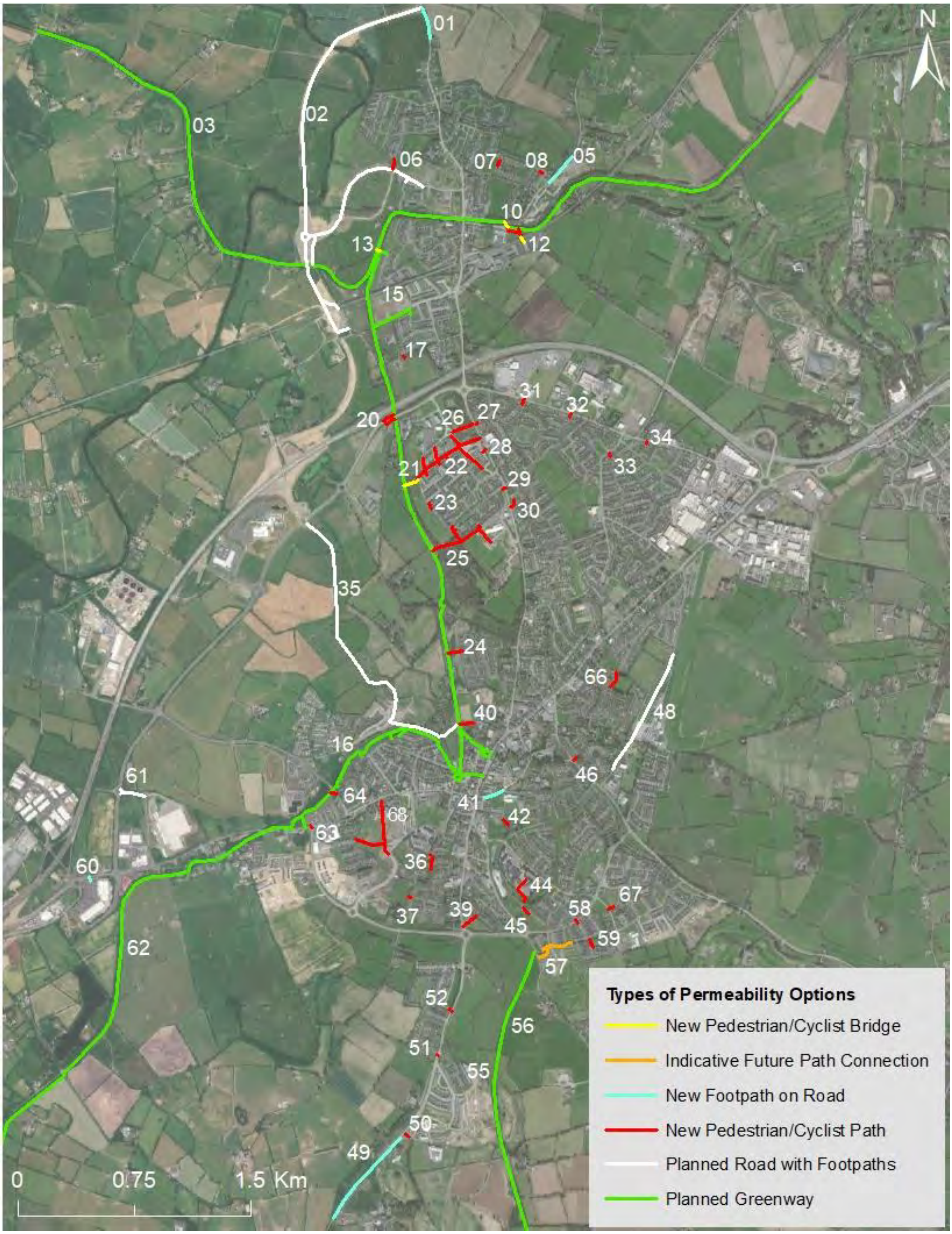
D.10 Permeability Strategy in Naas



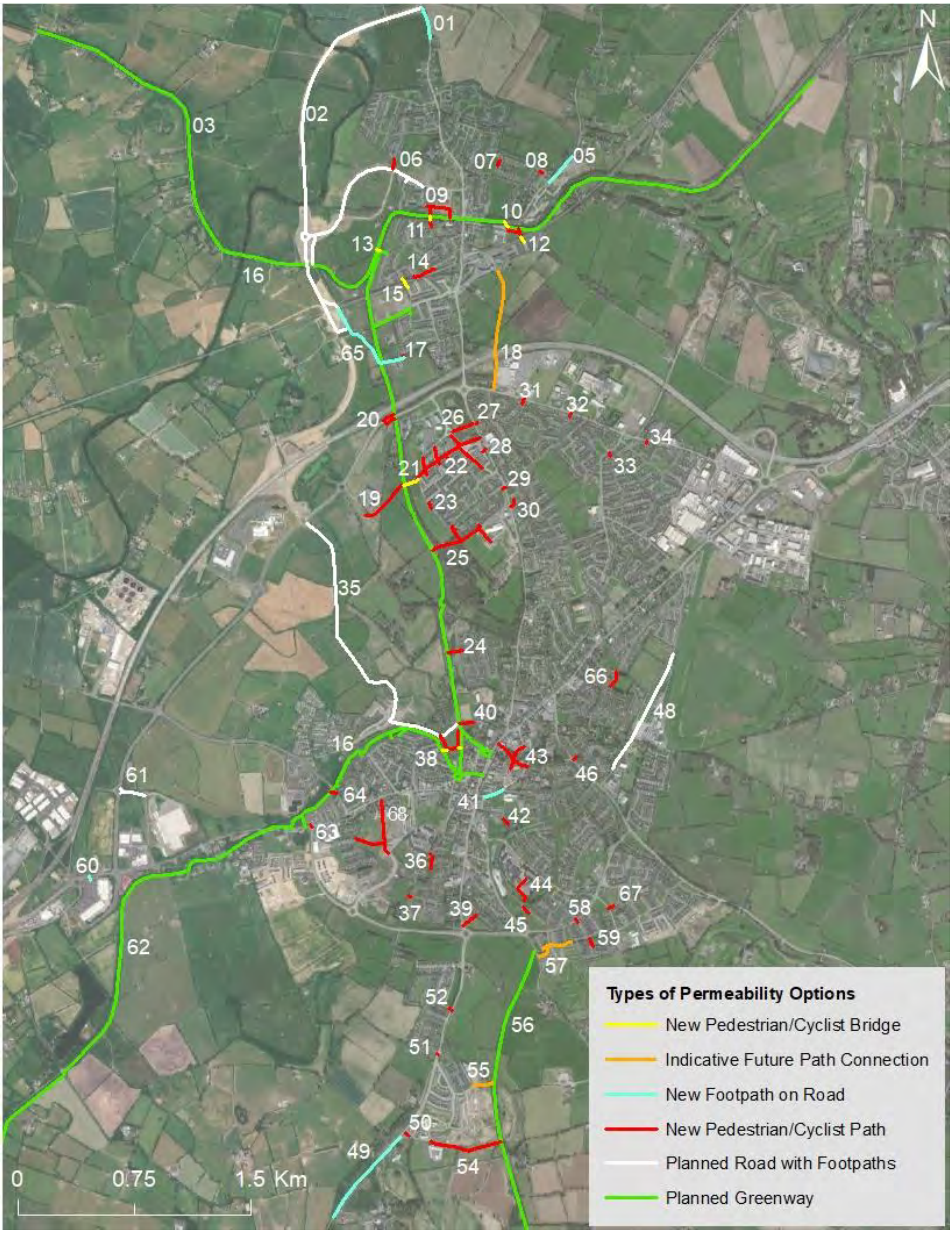
D.11 Short Term Permeability Measures with Road/Greenway Schemes



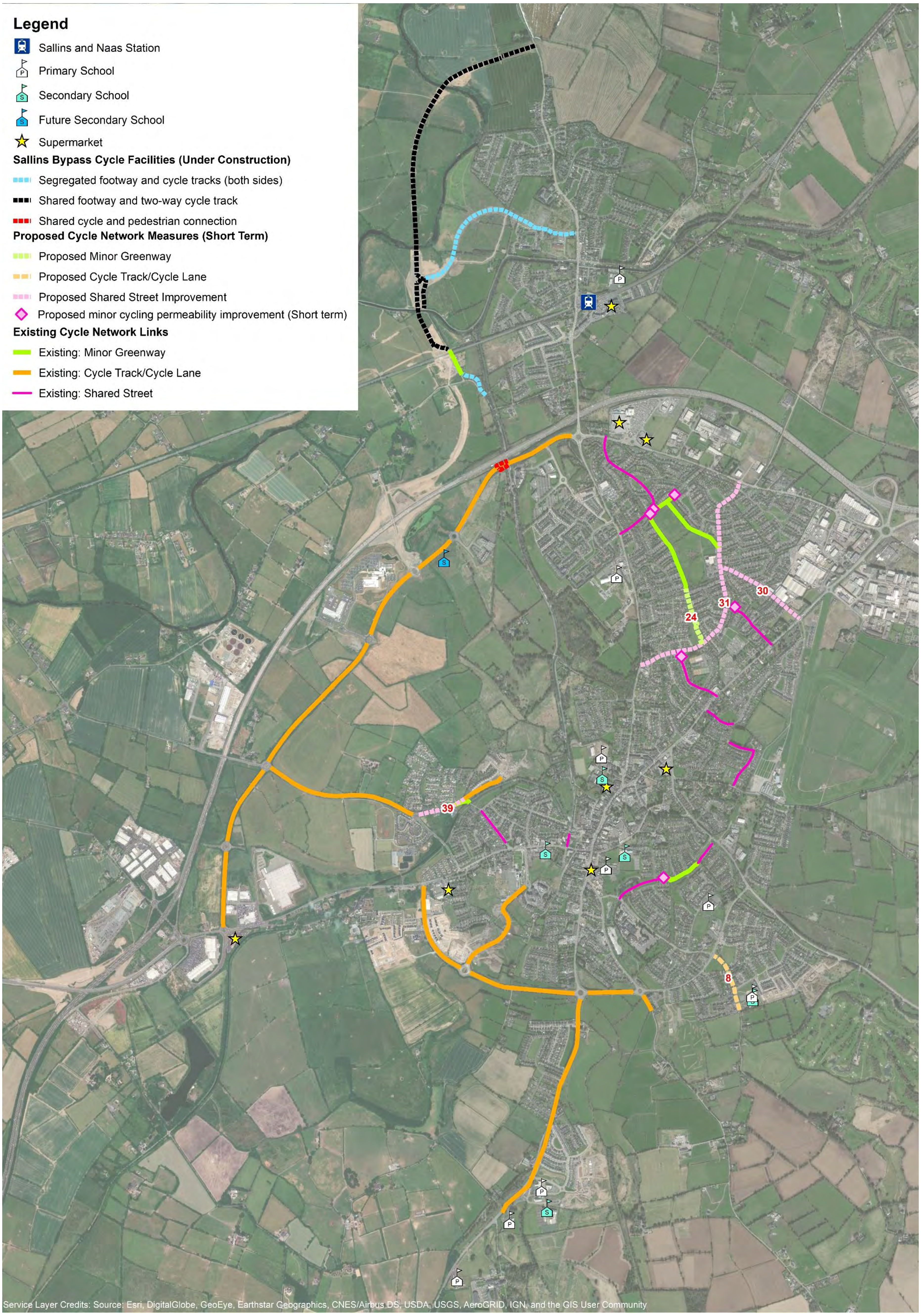
D.12 Short and Medium Term Permeability Measures with Road/Greenway Schemes



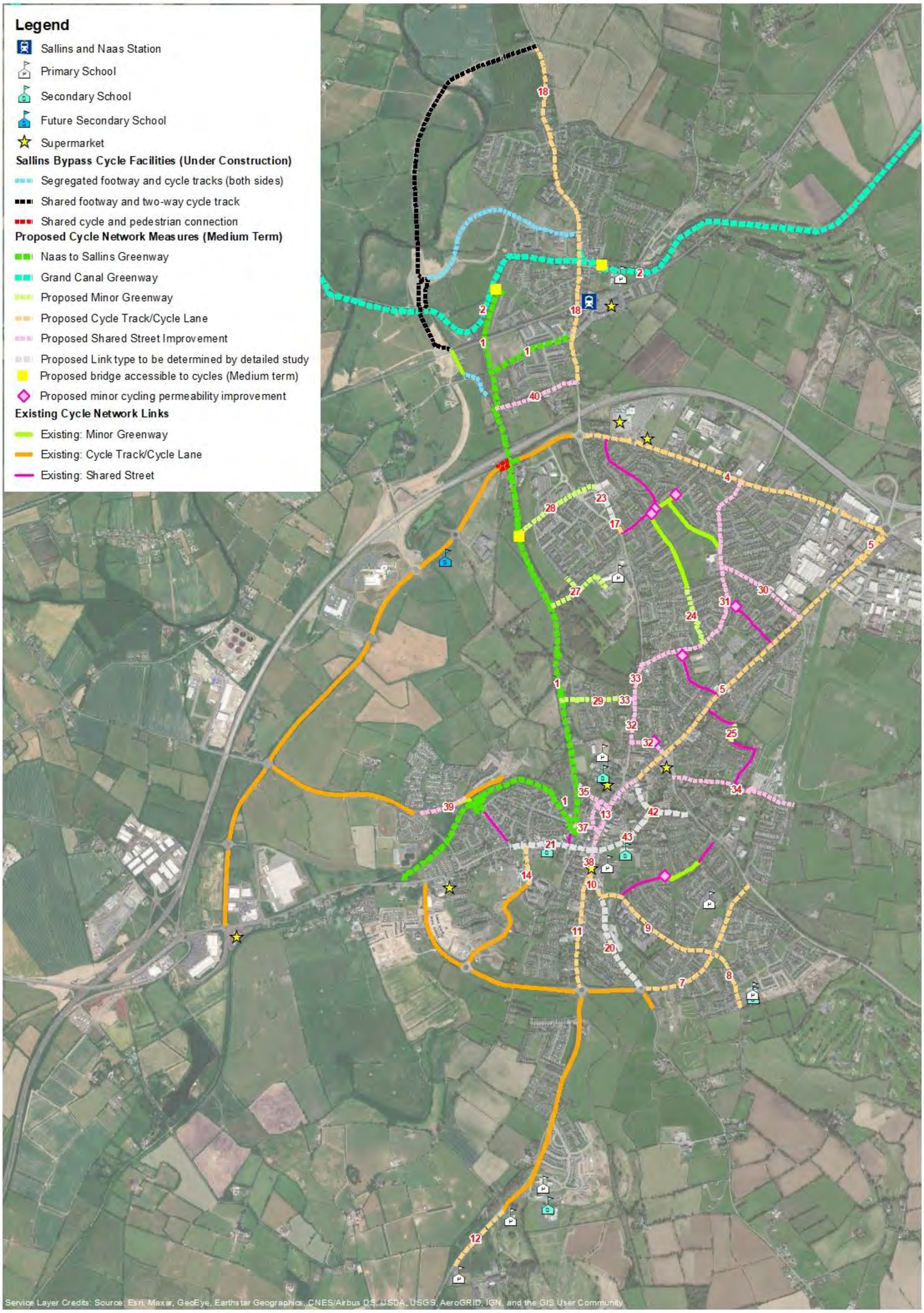
D.13 Short, Medium and Long Term Permeability Measures with Road/Greenway Schemes



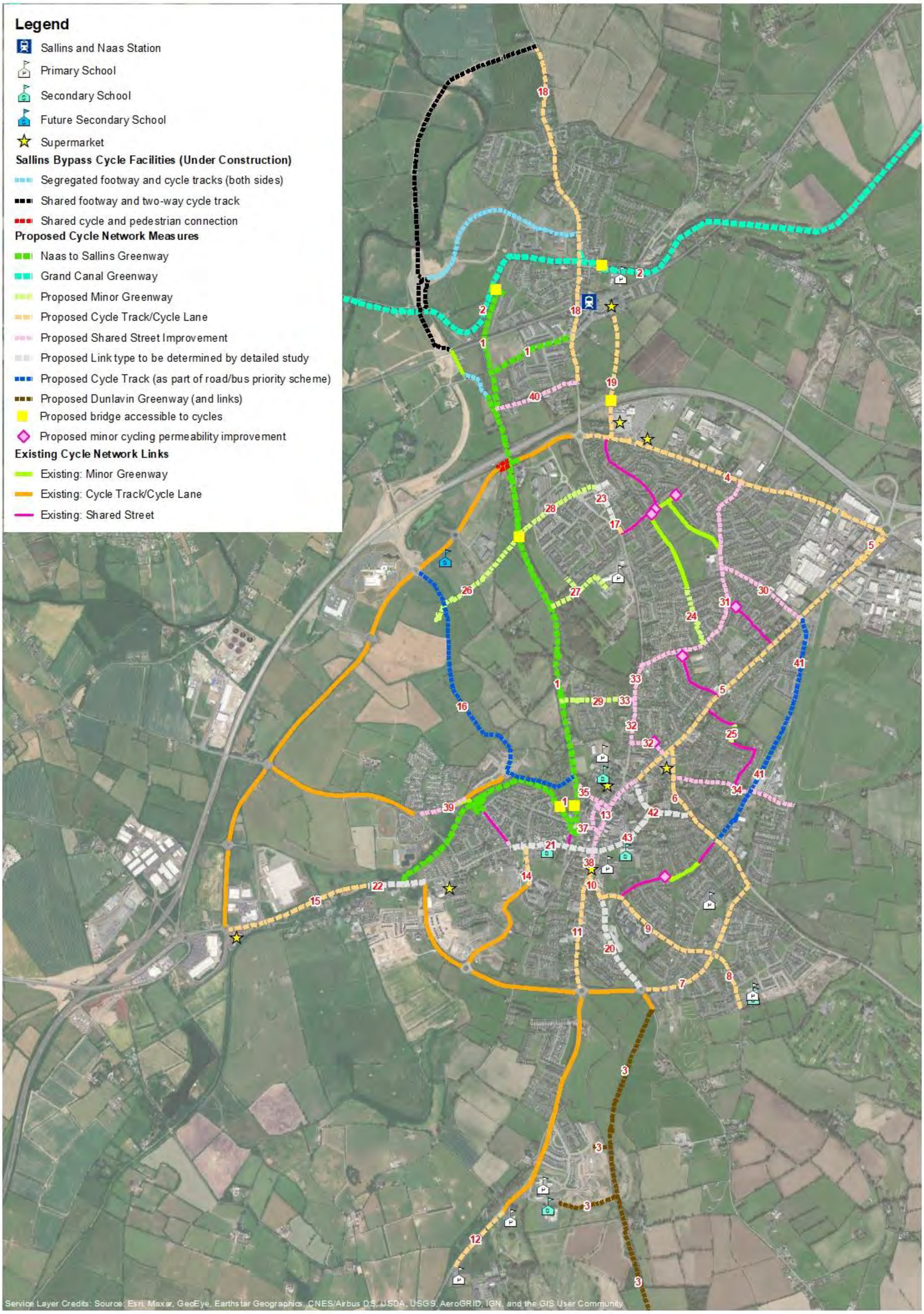
D.14 Short Term Cycling Measures



D.15 Short and Medium Term Cycling Measures



D.16 Short, Medium, Long Term Cycling Measures



Appendix E Public Realm Report

AECOM

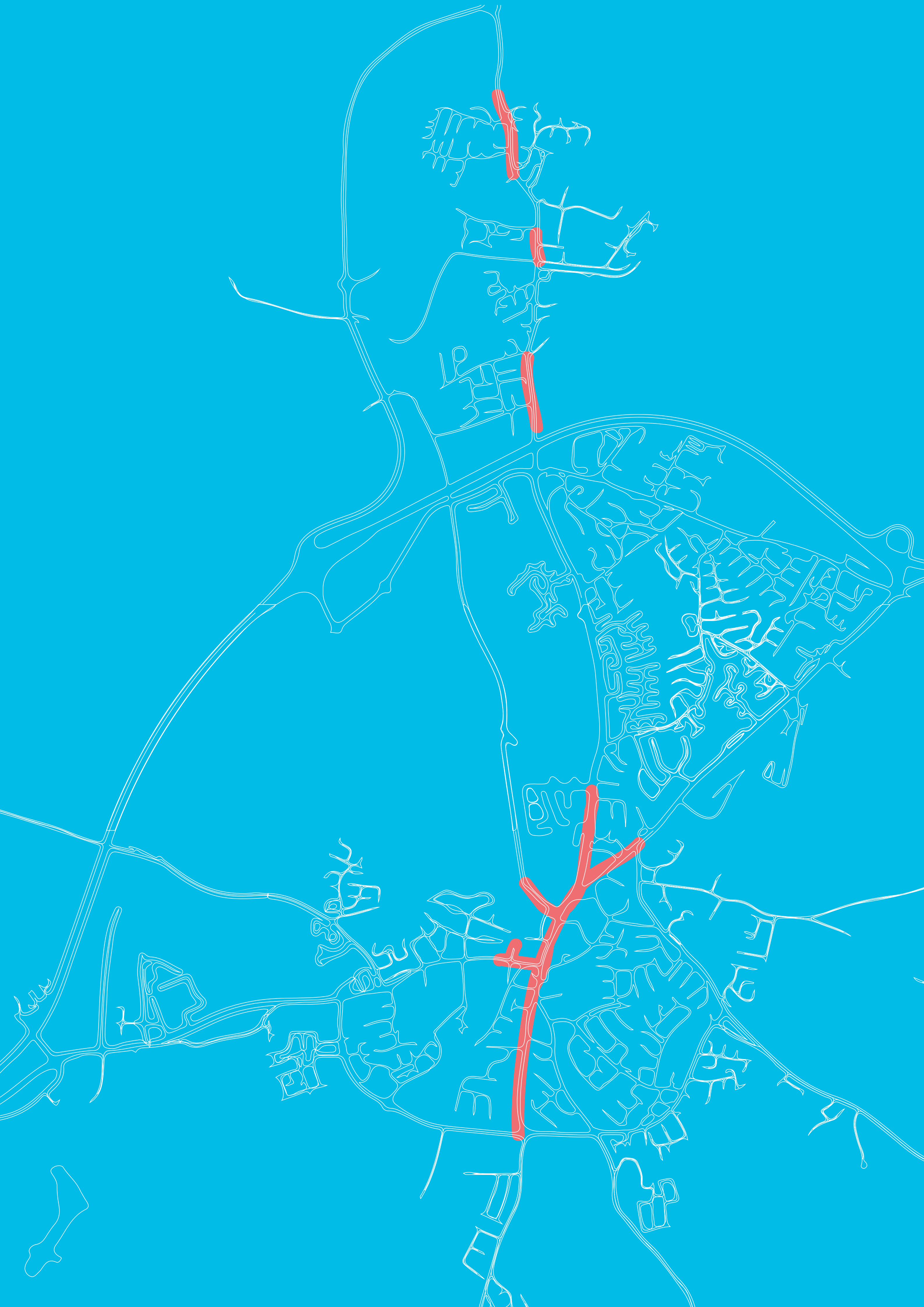
NAAS SALLINS

KILDARE, IRELAND

Kildare County Council

Public Realm

September 2020



Grand Canal Walk Naas
Kildare Co Co

Contents Page

Figures List

Murtagh's Corner

Proposed layout for a new through road and gateway to Naas main street, utilising new crossing points and an extended public realm.

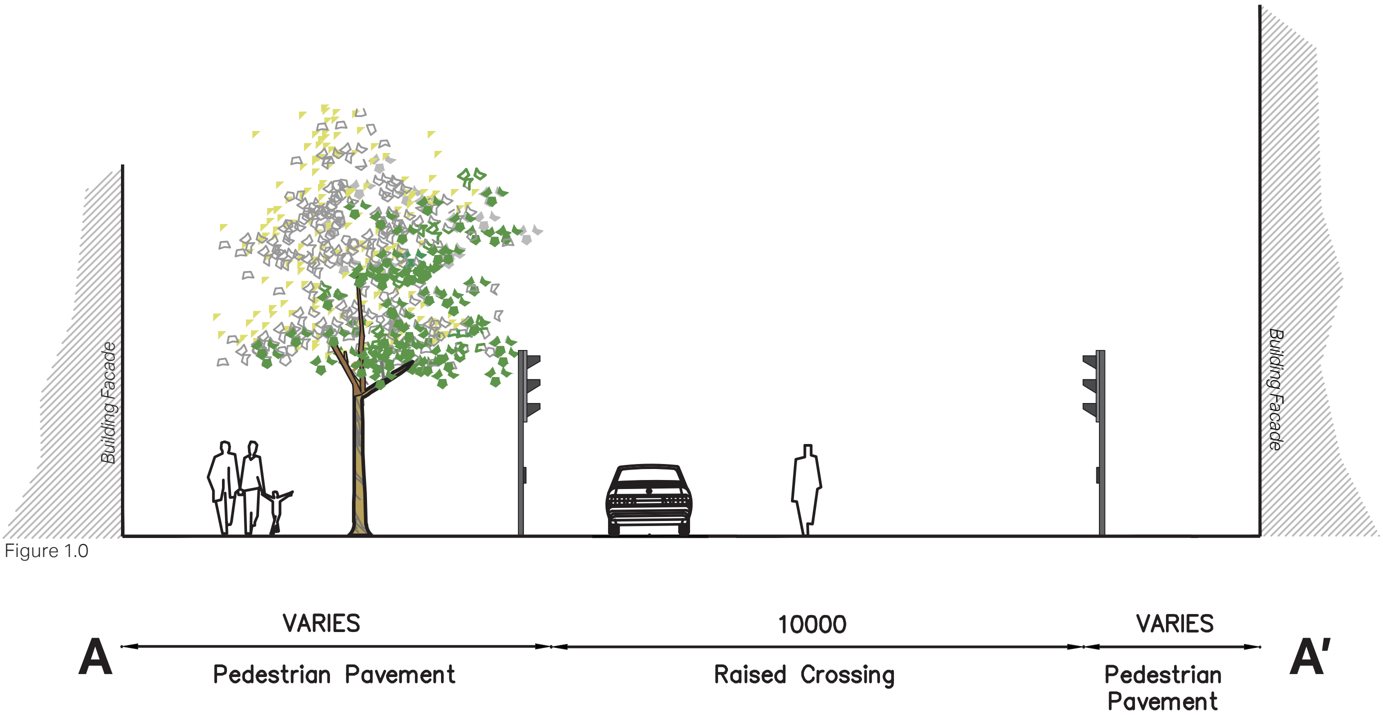
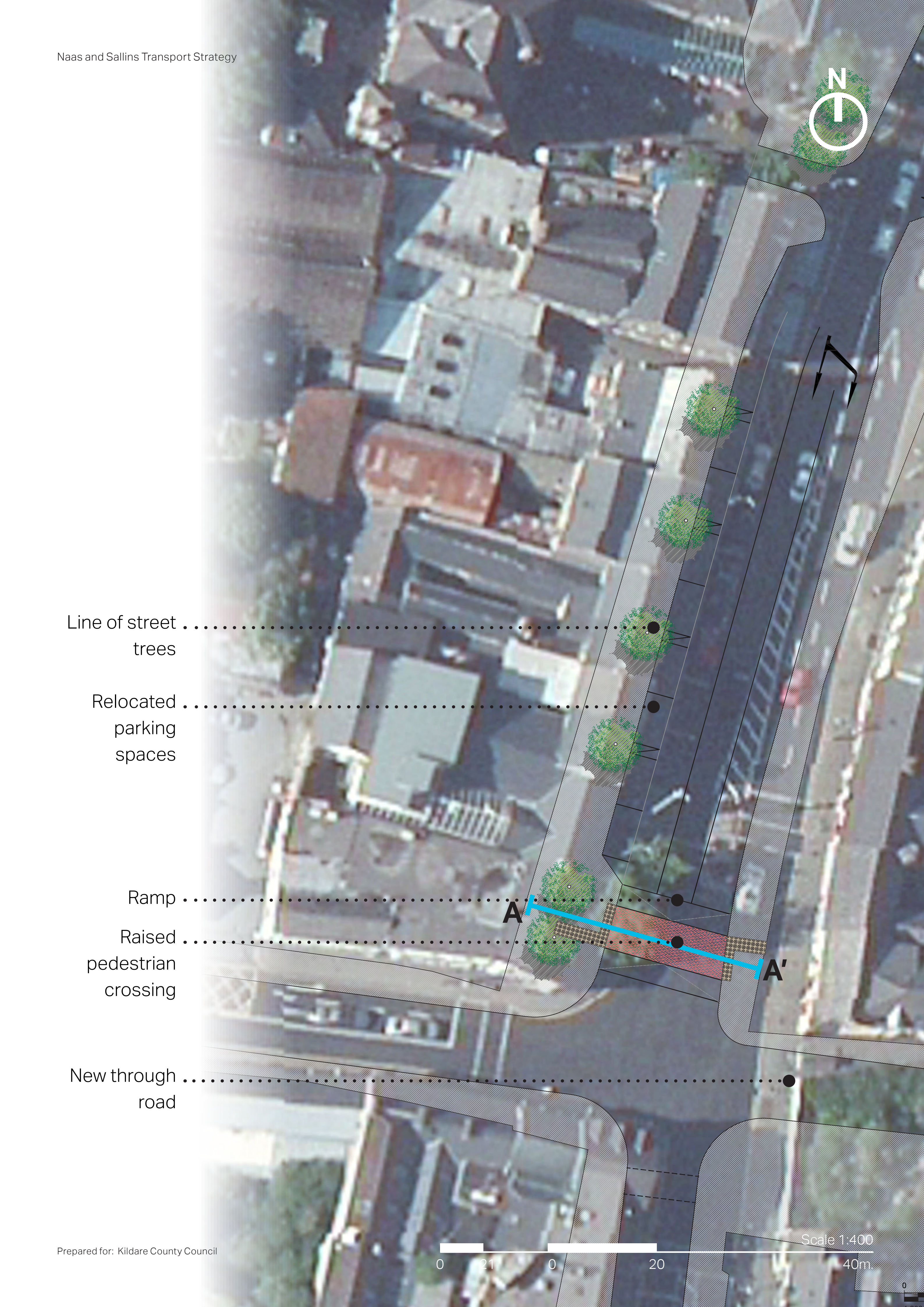


Figure 1.0

Figure 1 .1


N
Line of street trees
Relocated parking spaces
Ramp
Raised pedestrian crossing
New through road
A
A'
Scale 1:400
0
20
40m

Basin Street

Proposed layout for Basin Street and its connection to Abbey Street, from South Main Street. It outlines new residential parking with integrated street trees.

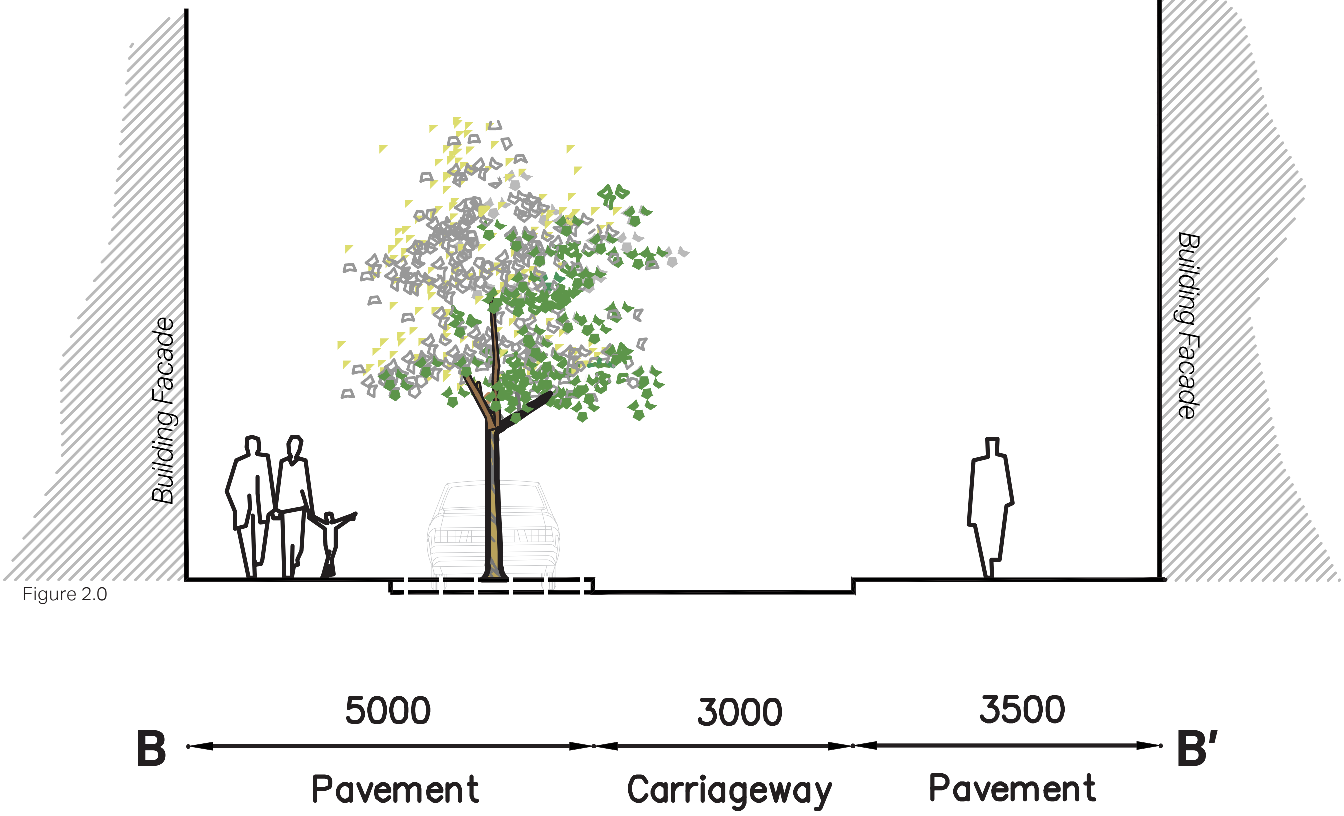
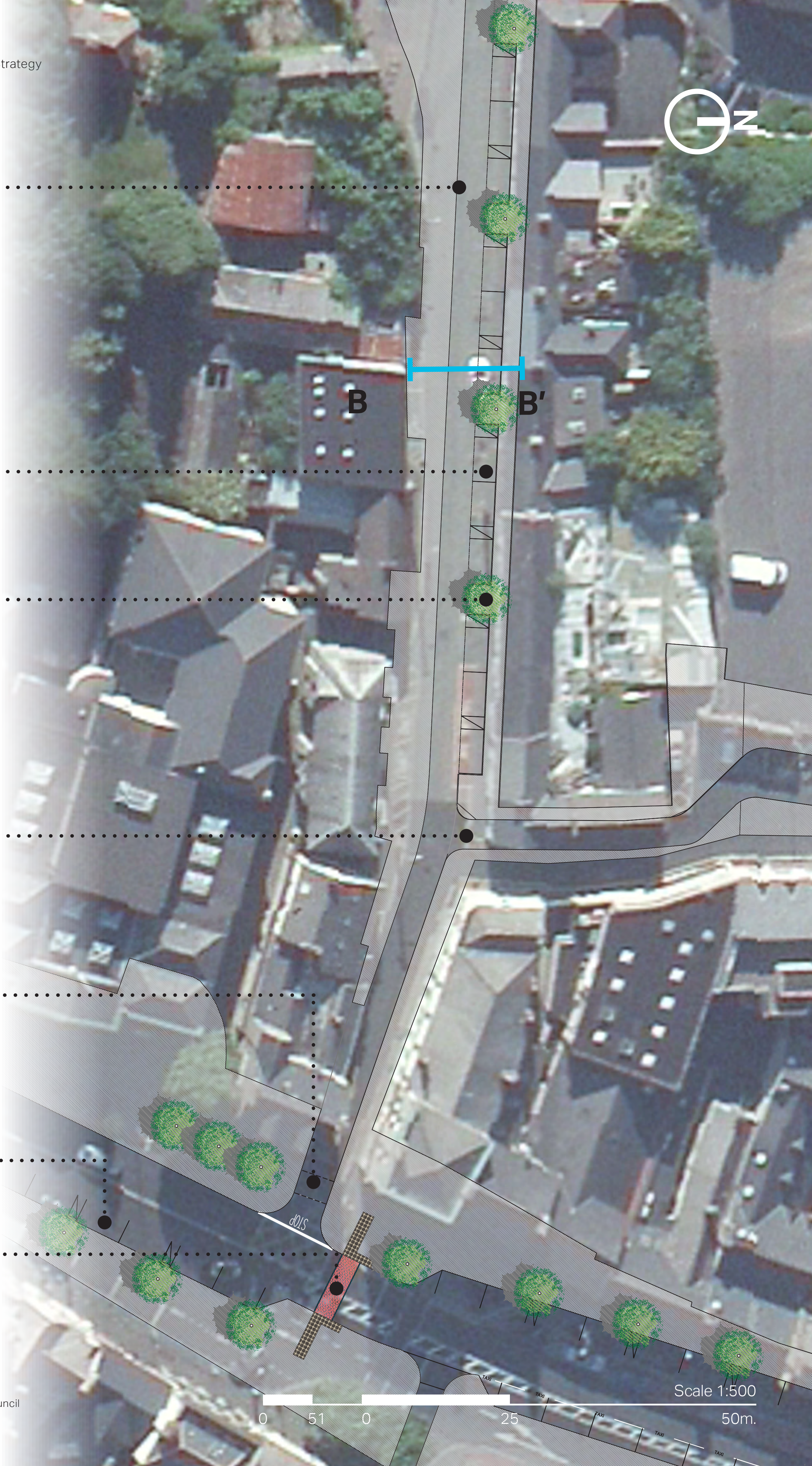


Figure 2.0

Figure 2.1


Basin Street will be resurfaced with a coloured Bitmac as per the Greenway Drawings
Parallel parking
Street trees
Shared space through to Abbey Street
Raised pedestrian Table
Parallel parking
Controlled raised pedestrian crossing
B
B′
STOP
Scale 1:500
0 5 10 25 50m.

South Main Street and Plaza

Proposed layout for the plaza space on South Main Street with extended bus stations.

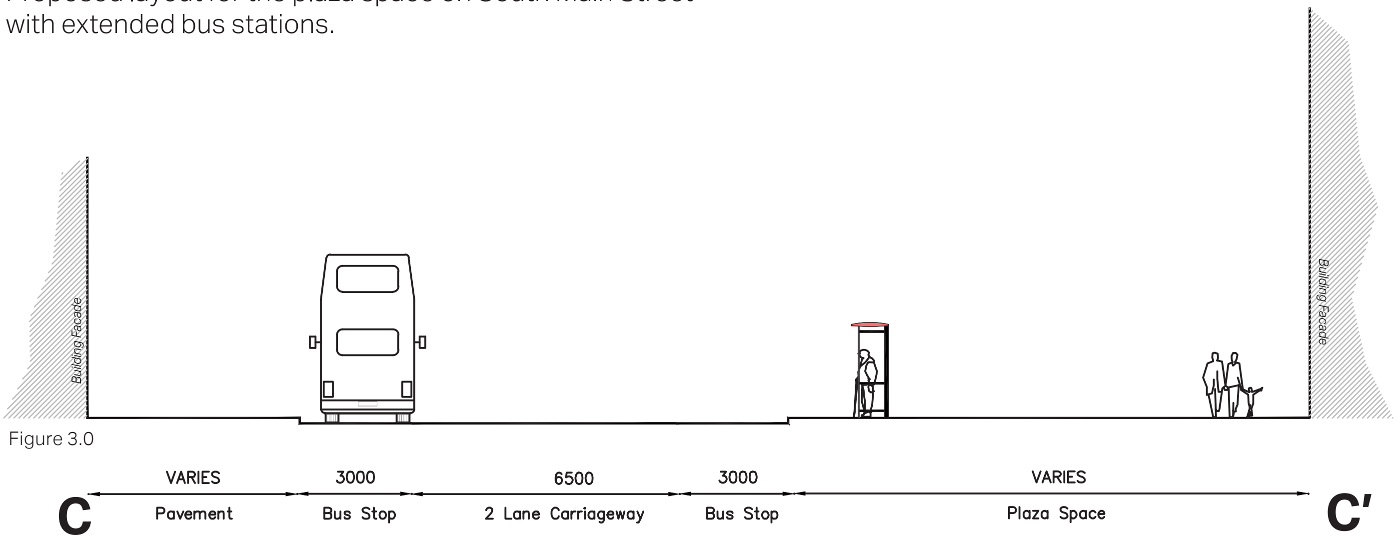
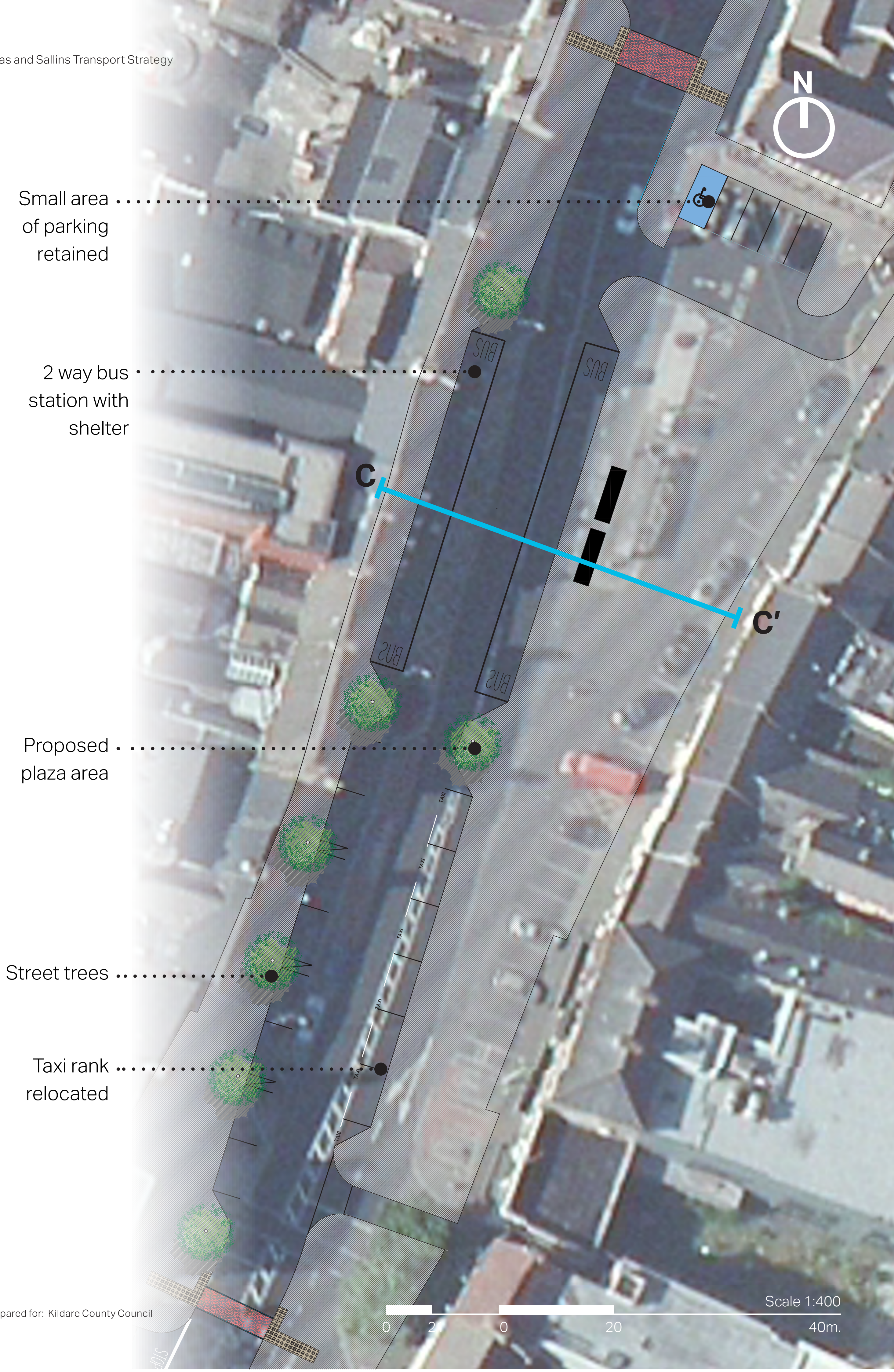


Figure 3.0

Figure 3.1


Small area of parking retained
2 way bus station with shelter
Proposed plaza area
Street trees
Taxi rank relocated
N
BUS
C
C'
TAXI
Scale 1:400
0
2
0
20
40m.

Poplar Square

Proposed layout for plaza space in Poplar Square, with bus station, crossing points and relocated parking.

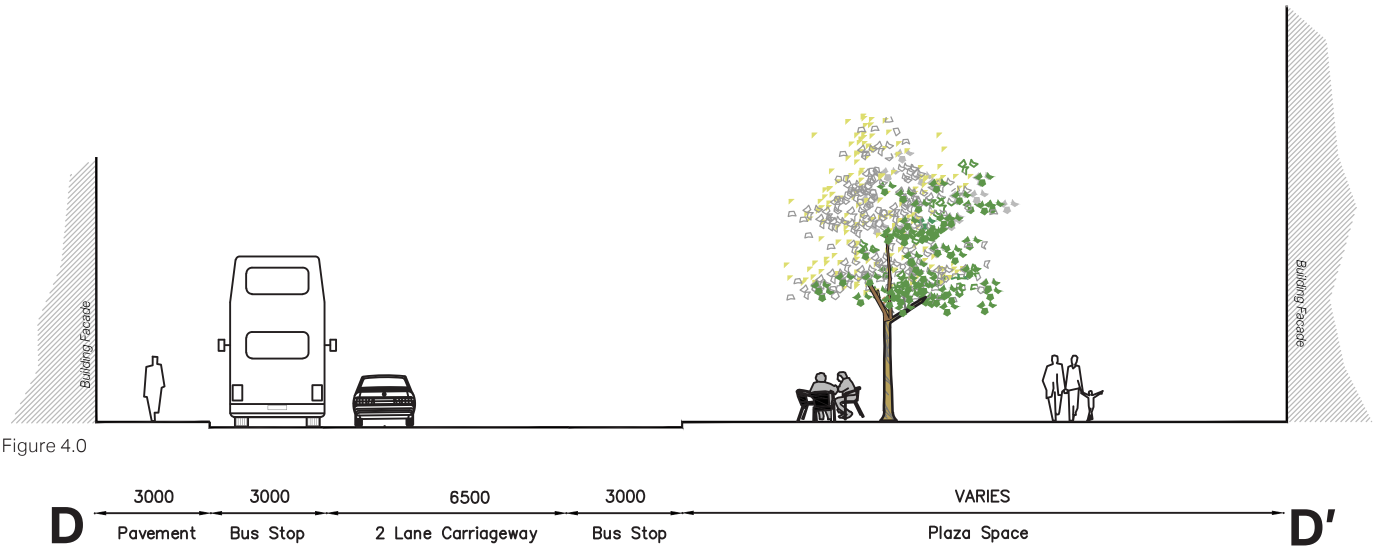
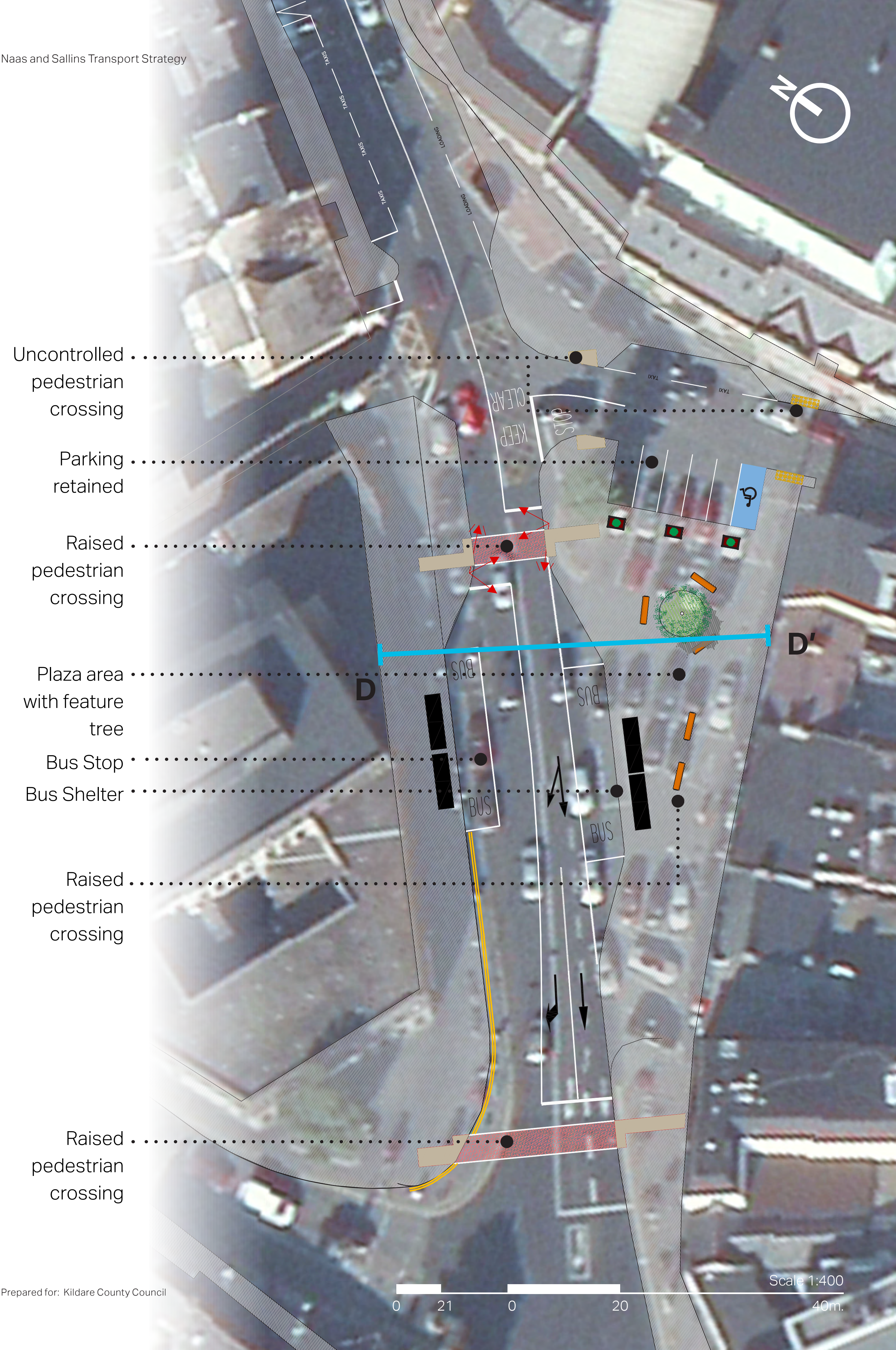


Figure 4.0

Figure 4.1


Uncontrolled pedestrian crossing
Parking retained
Raised pedestrian crossing
Plaza area with feature tree
Bus Stop
Bus Shelter
Raised pedestrian crossing
Raised pedestrian crossing
TAXIS
LOADING
KEEP CLEAR
STOP
BUS
D
D'
Scale 1:400
0 21 0 20 40m.

Abbey Street

Proposed layout for Abbey Street and integrated parking.

Sallins Road- North Gateway

Proposed layout for the Northern Gateway on Sallins Road.

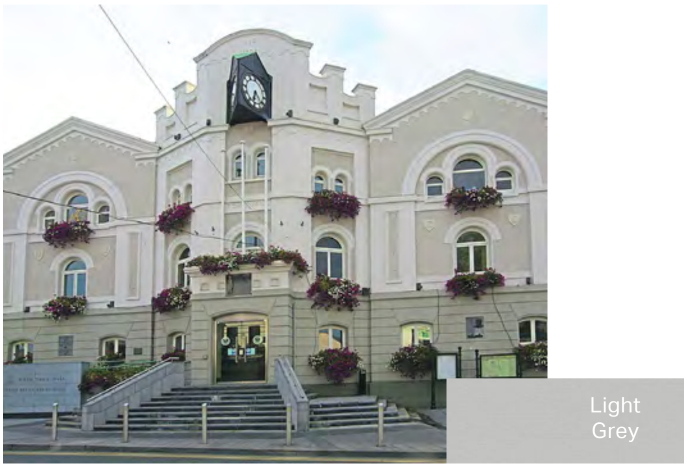
Naas - Colour Palette

Bank c1810-1850

Bank c1810-1850

Church

House c1770-1790



Town Hall Library

Court House

Stone Name	Type	Colour	Joint	Suitable for Pedestrians	Suitable for Vehicles
Granite	Flammed and Brushed Granite			Yes	Yes
Granite	Natural Granite Pavers			Yes	Yes
Concrete	Pre-cast Concrete Setts			Yes	Yes
Clay Pavers	Natural Clay Pavers			Yes	No
Concrete	Pre-cast Colour Concrete Setts			Yes	Yes

Materiality: Hardworks

Demonstrated above and over leaf, a hierarchical categorisation of paving finishes are described for the application of any public realm improvements within Naas Town.

The success of any paving structure is dependant on the appropriate associated structural build-up, bedding and jointing associated with the surface material. The full specification of these structural elements must be detailed by suitably qualified engineers, and constructed in accordance with capable and experienced design contractors.

Specification

The main factors which influence the design of the surface layer of paving are the support structure and the magnitude and type of loading applied to the paved area. This directly impacts on the possible options for the size and depth of the paving unit and will also affect the recommended build up, bedding and jointing.

A properly constructed pavement, with a build-up appropriate for its use, will be more robust over time and avoid failures leading to uneven paving and trip hazards. Before any natural stone paving unit is specified, the 'SCOTS Natural Stone Surfacing – Good Practice Guide must be consulted.

At present the preferred materiality is cast in situ concrete with an aggregate finish and should be considered as a base specification for particular interventions.

Aging and Maintenance

Paving will change in colour and appearance over time due to environmental factors. UV light, freeze thaw action, salt damage, chemicals, general staining, graffiti, fungus, algae and moss all will affect the appearance of the paving surface.

The use of protective substances can reduce the affect these factors have upon the surface.

Naas - Materiality

Overview

Offering an indication of the general approach to the materiality, these three hardworks types are chosen in the context of the town's foremost public spaces. Each of the **Contemporary, Feature** and **Standard** hardworks palettes are developed through consideration of existing conditions and best-practice public realm improvement works.

Materiality & Modularity

These materials offer consideration for the quality of the space, simplicity and availability of proposed materials, and consistency of workmanship across all public realm works.

Developed in detail opposite, each of the three hardworks palettes are demonstrated as a modular system of readily available component parts and materials. The texture and colour of each ensures compatibility with the surrounding areas and elements of Naas Town centre, depending on the spatial typology and built environment that it is designed to complement.

Durability & Workmanship

For any proposed hardworks in the town, Kildare County Council is to require a sample panel of pavement to be constructed for all paving materials, so as to establish specified standards and finishing for the scheme.

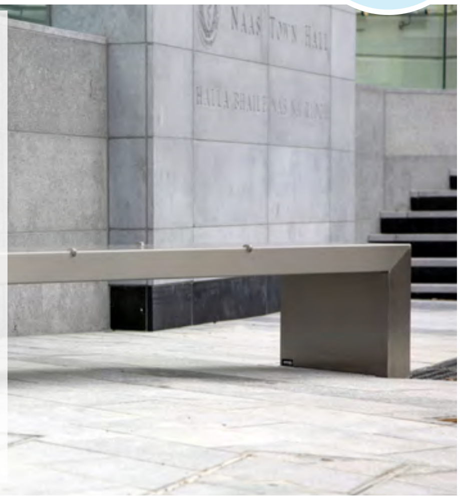
All materiality and construction is to adhere to British Standards (BS), ensuring quality of goods and build.

Feature Paving - Granite

Granite in-use at Naas Town hall

In September 2011, Naas Town Council completed an extensive revamp to the area fronting its town hall. Sensitively creating a redesigned approach to the landmark building, improving access for all while providing a well designed fresh new look to the building.

Naas Town Hall,



Mid-light grey

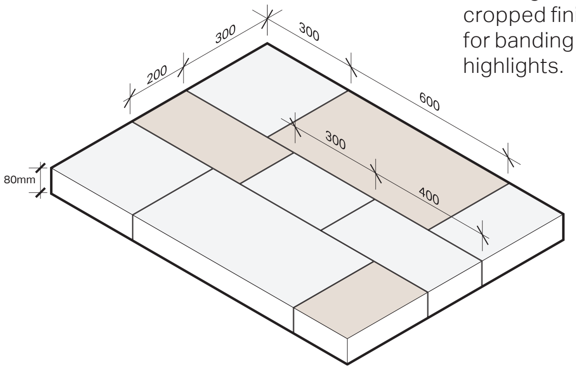
Mid-light grey

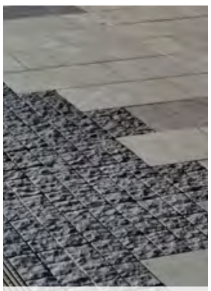
Material

Augmenting and promoting the quality of town centre heritage, a high quality granite stone palette is considered for primary streets, public plazas and market spaces.

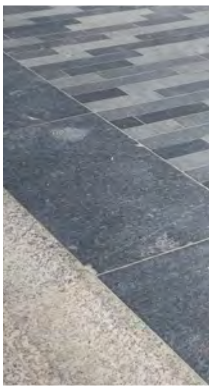
Finish

Flamed finish is to be used for pedestrian thoroughfares; cropped finish for banding and highlights.





Clean transition between cropped granite (left) and feature paving.



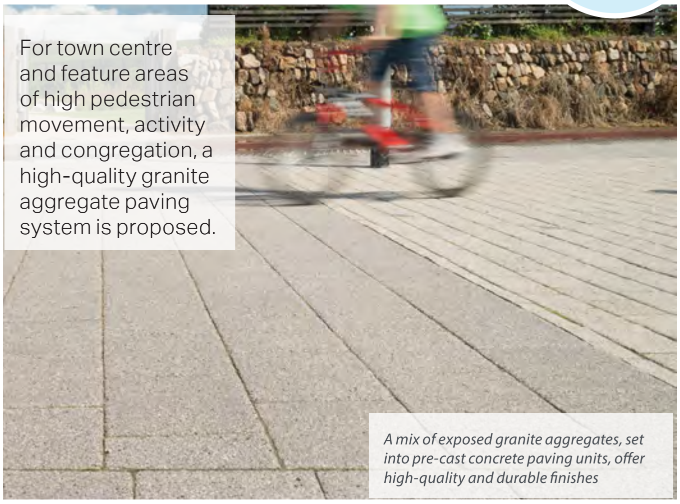
Maintenance

Low maintenance and very high durability, granite setts offer great strength and resilience in busy environments.

Approval of materials must be obtained in advance of bulk order.

Secondary Paving - Granite

Ideal for high-traffic areas

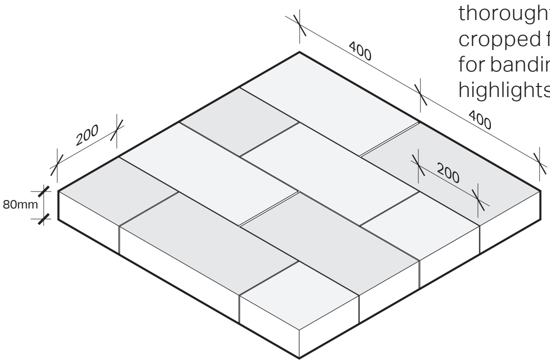


For town centre and feature areas of high pedestrian movement, activity and congregation, a high-quality granite aggregate paving system is proposed.

A mix of exposed granite aggregates, set into pre-cast concrete paving units, offer high-quality and durable finishes

Material
Augmenting and promoting the quality of town centre heritage, a high quality granite stone palette is considered for primary streets, public plazas and market spaces.

Finish
Flamed finish is to be used for pedestrian thoroughfares; cropped finish for banding and highlights.



Maintenance
Very Low maintenance requirements..

Drainage
Each flag is to allow for water drainage into joints between flags and into the sub-base.

Tertiary Paving - Concrete

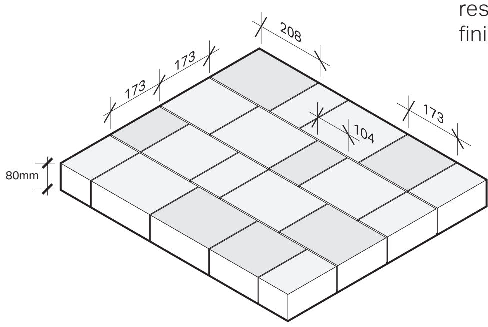
Attractive, durable and cost effective design

Pre-cast 'Tegula' style concrete units are to be adopted for local and residential areas.

A durable and well-worn material

Material
A durable and versatile material, it can be used in a variety of areas such as; driveways, car parks and pathways.

Finish
Silver grey, mid-grey, graphite colours and burnt red/orange colour; each are solid modular units with a n polished skid resistance surface finish.



Maintenance
Need for topping up joints early as it requires a committed management regime.

Drainage
Each flag is to allow for water drainage into joints between flags and into the sub-base.

Sallins Village Centre

Proposed layout for a new plaza space with cycle lanes and pedestrian footpaths connecting north to south.

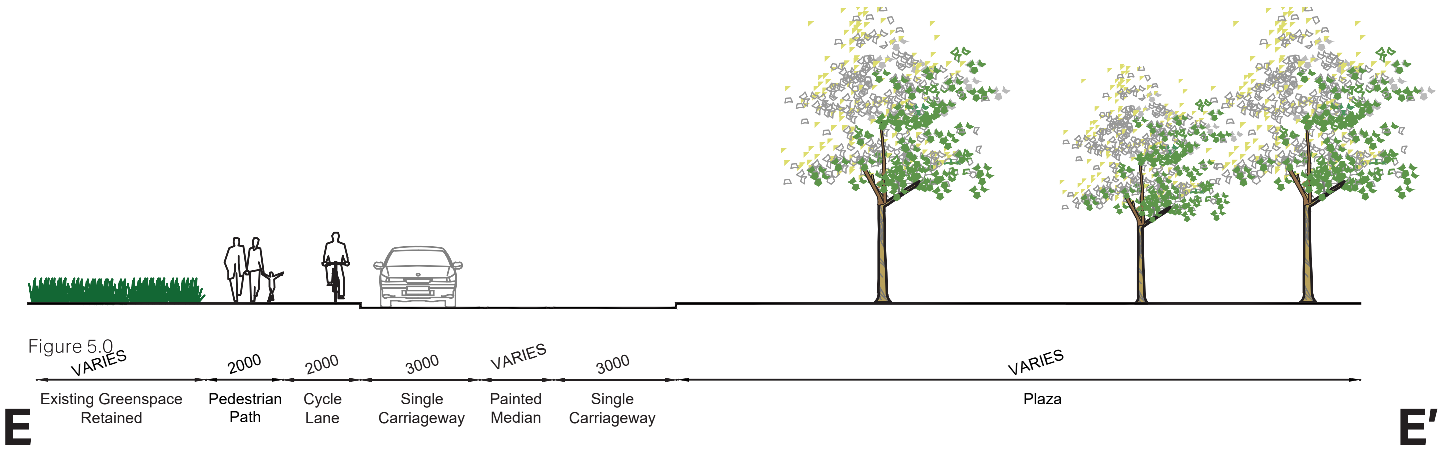
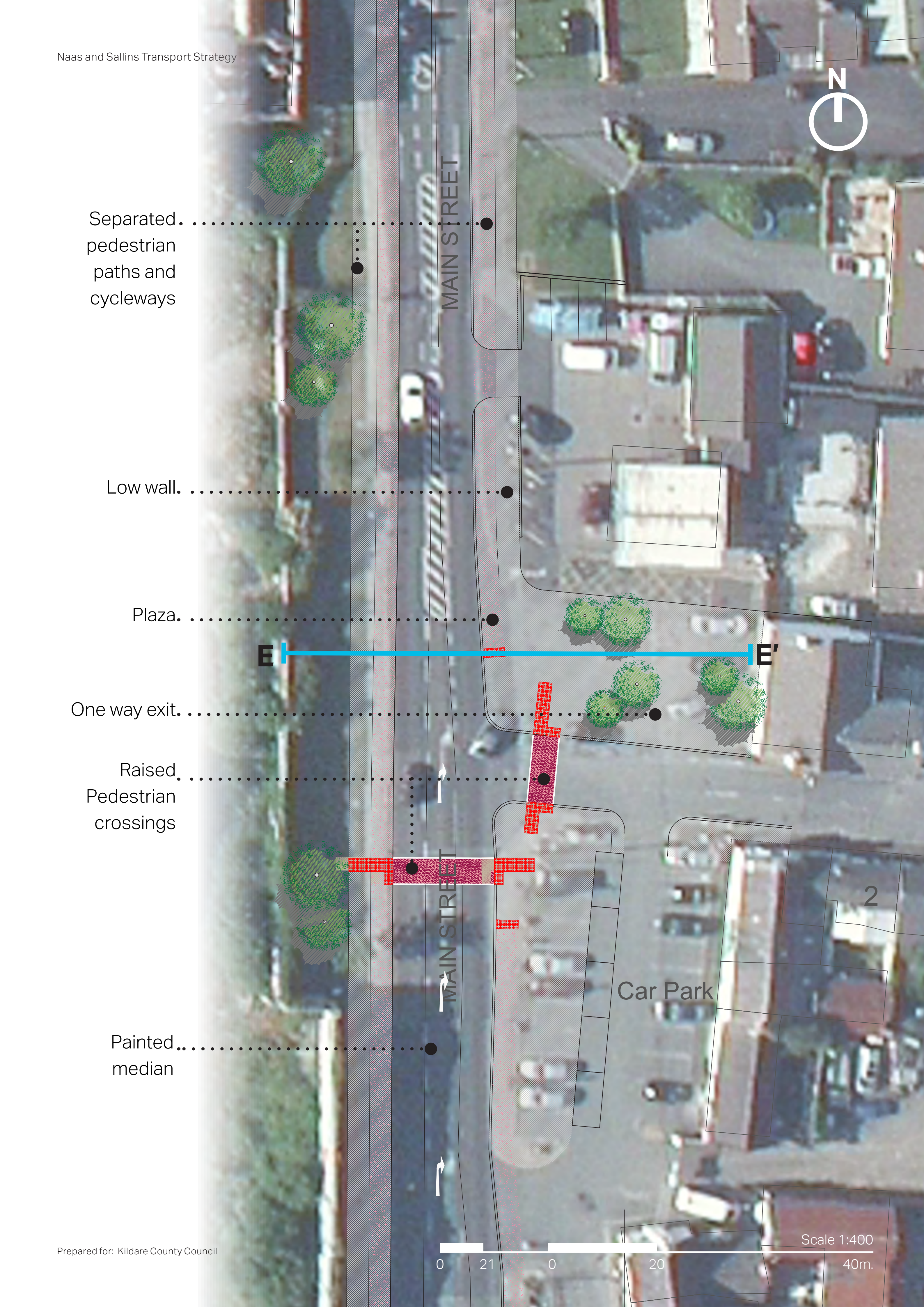


Figure 5.0

Figure 5.1


N
Separated pedestrian paths and cycleways
MAIN STREET
Low wall
Plaza
E
E'
One way exit
Raised Pedestrian crossings
MAIN STREET
2
Car Park
Painted median
Scale 1:400
0
21
0
20
40m.

Sallins Northern Gateway

Proposed layout for a the northern gateway with a planted median and incorporated cycleway and food path,

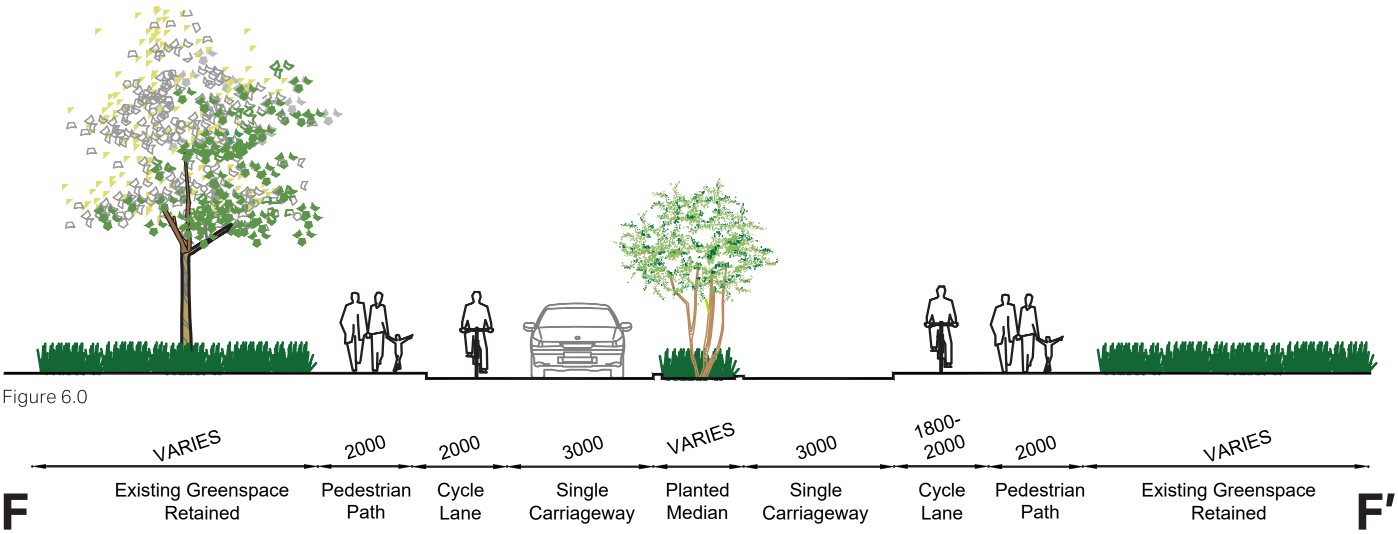
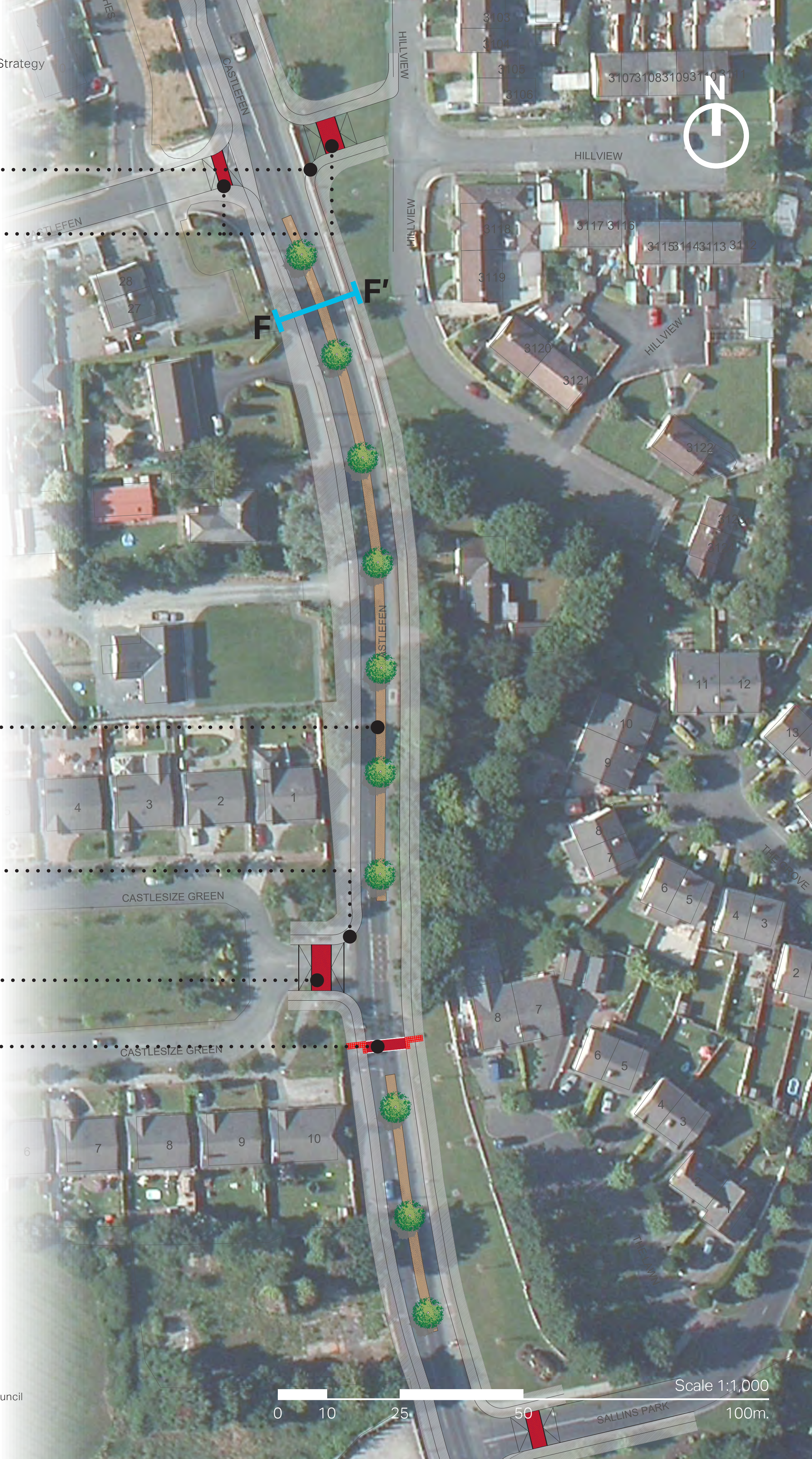


Figure 6.0

Figure 6.1


Turning radii reduced
Raised pedestrian crossings
Planted median with trees (2m clear stem)
Turning radii reduced
Raised crossing
Pedestrian crossing retained
F
F'
N
HILLVIEW
CASTLEFEN
CASTLESIZE GREEN
SALLINS PARK
Scale 1:1,000
0
10
25
50
100m.

Bus Street

Proposed layout for a bus street with planted verges and pedestrian pathways.

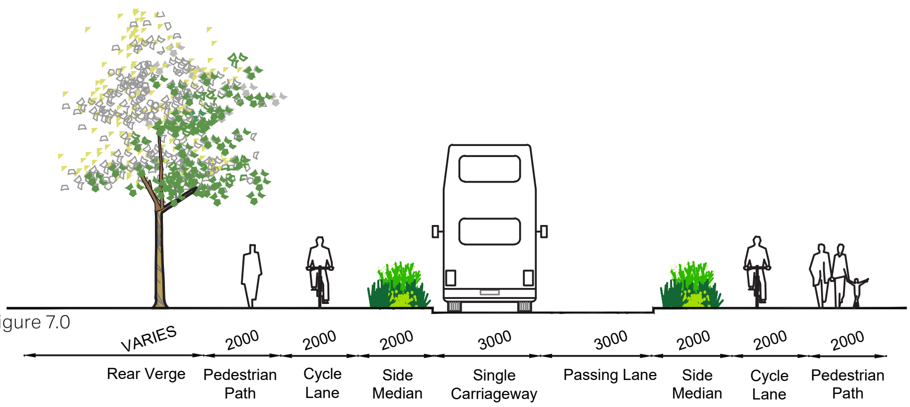
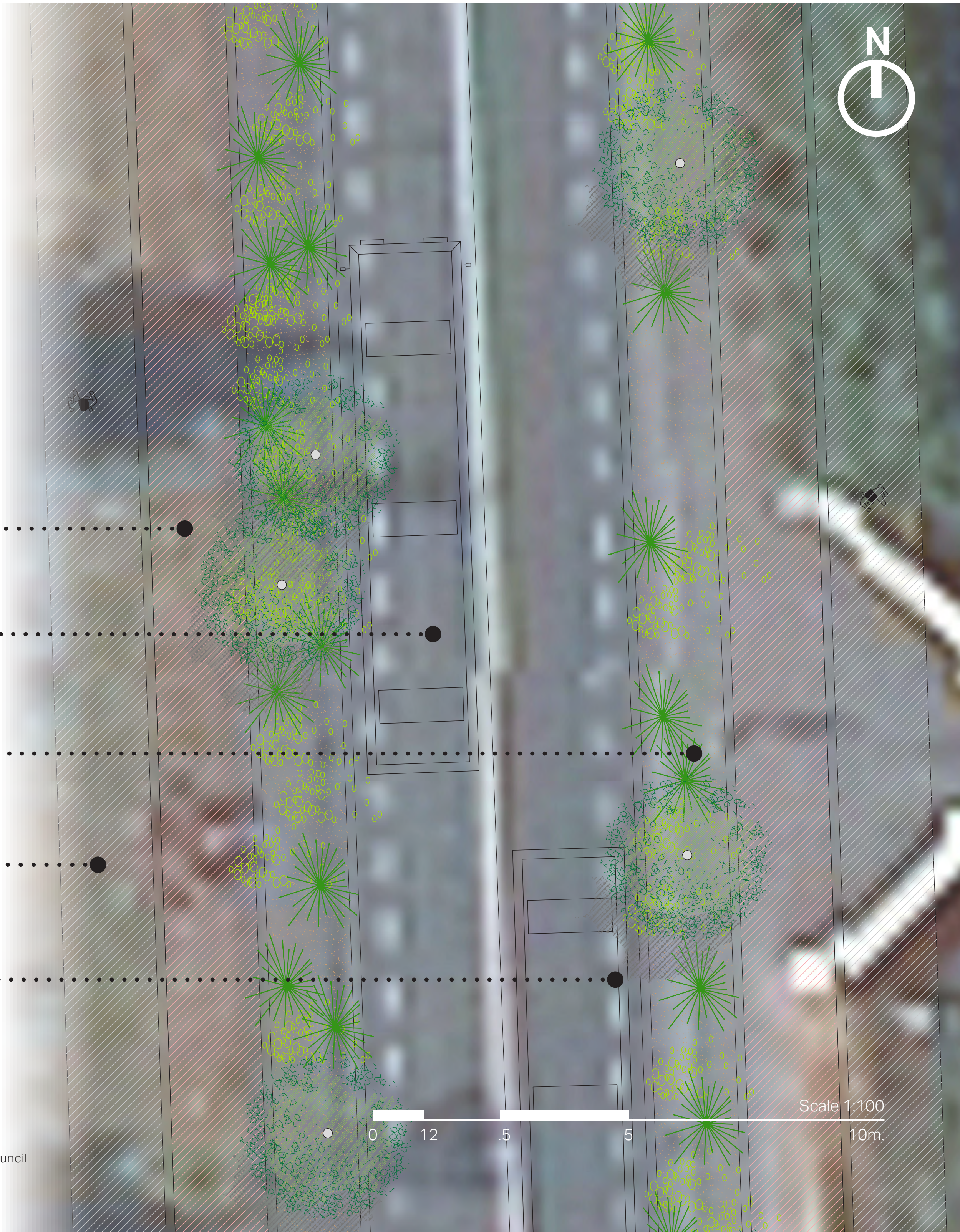
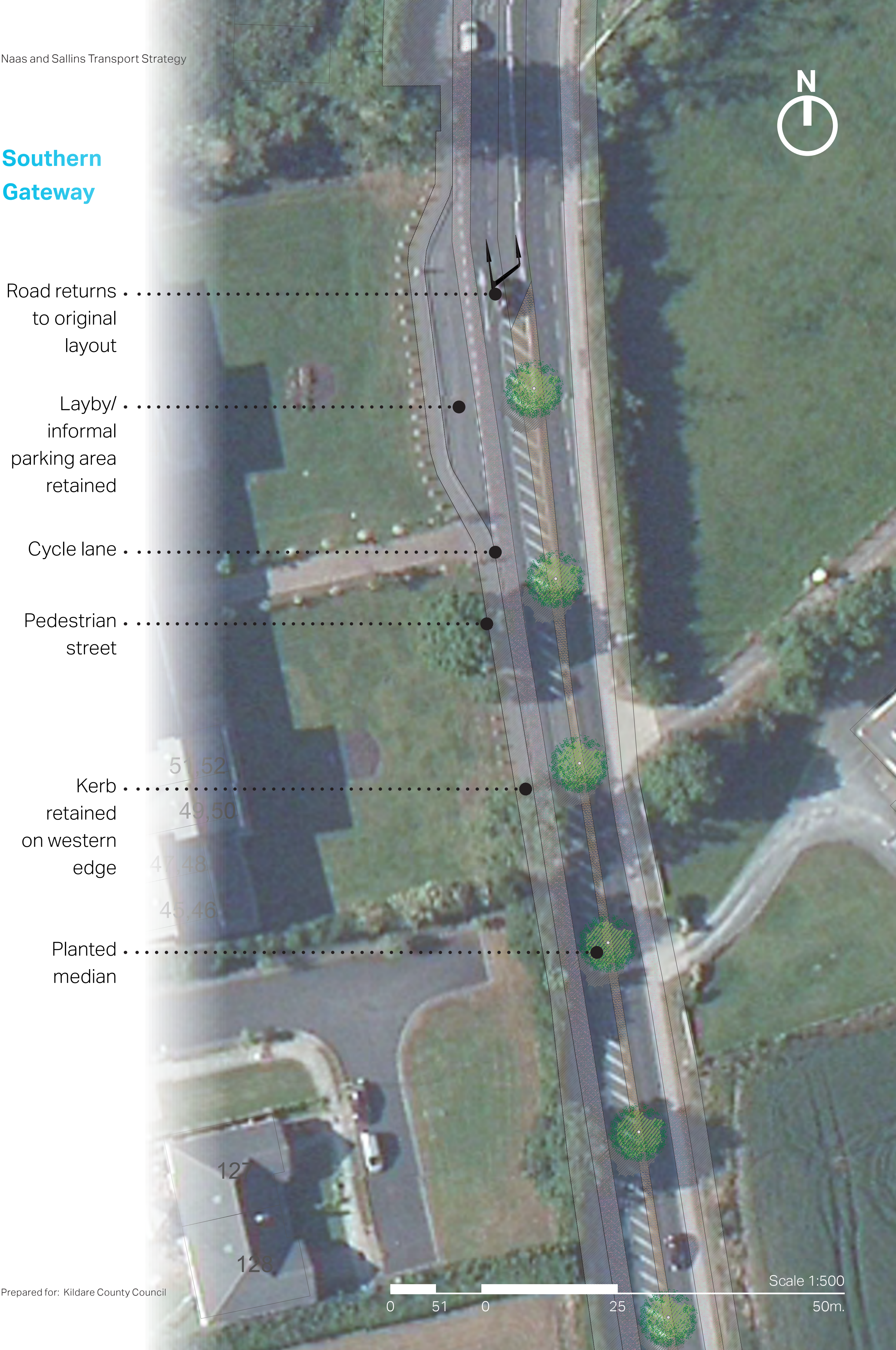


Figure 7.0



Southern Gateway



Street Tree Typologies

Potential species for street trees in **Naas.**

Acer platanoides

Height: 15m - 20m

Width: 4m - 6m

An old French cultivar which has an egg-shaped crown at first. The columnar crown makes this tree very suitable for narrow streets and avenues. These usually grow as multi-stemmed trees. Very tolerant to a city climate and has a good wind resistance.

Platanus hispanica

Height: 15m - 20m

Width: 4m - 8m

Plane trees are very resistant to hard surfaces but surface roots can push the surrounding paving upwards. In the autumn the leaves turn colour to a brownish yellow. Fallen leaves do not rot easily and remain on the ground around the tree. Takes pruning very well, even in old wood.

Liquidambar styraciflua

Height: 10m - 12m

Width: 4m - 6m

Liquidambar styraciflua is eminently suitable as an avenue and street tree because of the regular, slim, pyramidal shape of its crown. The autumn colour is yellow to reddish-violet.

Proposed species for the planted median within **Sallins.**

Carpinus betulus

Height: 15m - 18m

Width: 3m - 6m

'Fastigiata' has a very compact and closed crown with a strictly vertical trunk. The tree can eventually attain a width of 15 m. It is column-shaped only when young. Several cultivated varieties of the hedge beech are popular as avenue and street trees.

Acer campestre

Height: 6m - 8m

Width: 3m - 5m

Strikingly narrow, small to medium size tree. The upper lateral branches are longer than the central leader. The branches grow from the trunk at an angle of about 30°, thereby producing the columnar crown. Does not grow well enclosed by paved surfaces.

Ulmus 'Columella'

Height: 15m - 20m

Width: 2m - 4m

Remarkably slim columnar crown, fairly open. The dark green leaves emerge quite late and are relatively small. Its narrow shape makes it eminently suitable as an avenue and street tree. This elm is specifically bred because it is completely resistant to Dutch elm disease.

Sallins Colour Palette

Bridge Osberstown c1850-1890

Sallins Railway Station

Farm House Clane Road c1870

Water Pump c1860

Former Odlums Mill

Sallins National School c1838

Stone Name	Type	Colour	Joint	Suitable for Pedestrians	Suitable for Vehicles
Granite	Burnished Granite			Yes	No
Granite	Natural Granite Pavers			Yes	Yes
Concrete	Pre-cast Concrete setts			Yes	Yes
Clay Pavers	Natural Clay pavers			Yes	No
Concrete	Pre-cast Colour Concrete Setts			Yes	Yes

Materiality: Hardworks

Demonstrated above and over leaf, a hierarchical categorisation of paving finishes are described for the application of any public realm improvements within Sallins Town.

The success of any paving structure is dependant on the appropriate associated structural build-up, bedding and jointing associated with the surface material. The full specification of these structural elements must be detailed by suitably qualified engineers, and constructed in accordance with capable and experienced design contractors.

Specification

The main factors which influence the design of the surface layer of paving are the support structure and the magnitude and type of loading applied to the paved area. This directly impacts on the possible options for the size and depth of the paving unit and will also affect the recommended build up, bedding and jointing.

A properly constructed pavement, with a build-up appropriate for its use, will be more robust over time and avoid failures leading to uneven paving and trip hazards. Before any natural stone paving unit is specified, the 'SCOTS Natural Stone Surfacing – Good Practice Guide must be consulted.

At present the preferred materiality is cast in situ concrete with an aggregate finish and should be considered as a base specification for particular interventions.

Aging and Maintenance

Paving will change in colour and appearance over time due to environmental factors. UV light, freeze thaw action, salt damage, chemicals, general staining, graffiti, fungus, algae and moss all will affect the appearance of the paving surface.

The use of protective substances can reduce the affect these factors have upon the surface.

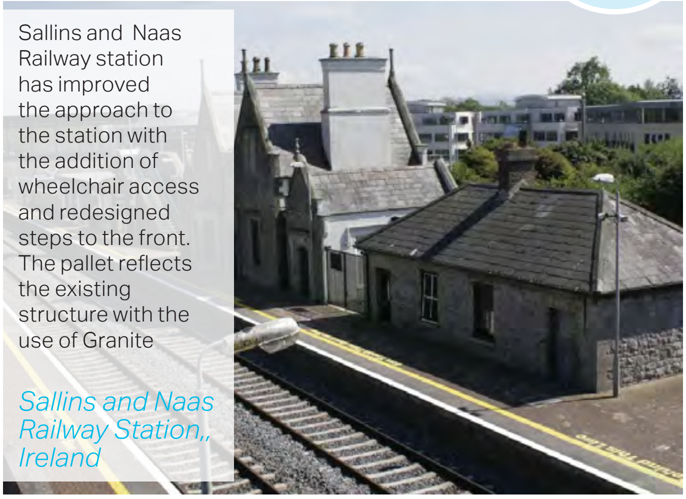
Sallins Materiality

Overview

Offering an indication of the general approach to the materiality, these three hardworks types are chosen in the context of the town's foremost public spaces and as the predominant colours within Sallins structure are similar to those of Naas it has resulted in the use of a uniformed approach to materials. Each of the **Contemporary, Feature** and **Standard** hardworks palettes are developed through consideration of existing conditions and best-practice public realm improvement works.

Feature Paving - Granite

Granite in-use at Sallins Railway Station



Sallins and Naas Railway station has improved the approach to the station with the addition of wheelchair access and redesigned steps to the front. The pallet reflects the existing structure with the use of Granite

Sallins and Naas Railway Station,, Ireland

Materiality & Modularity

These materials offer consideration for the quality of the space, simplicity and availability of proposed materials, and consistency of workmanship across all public realm works.

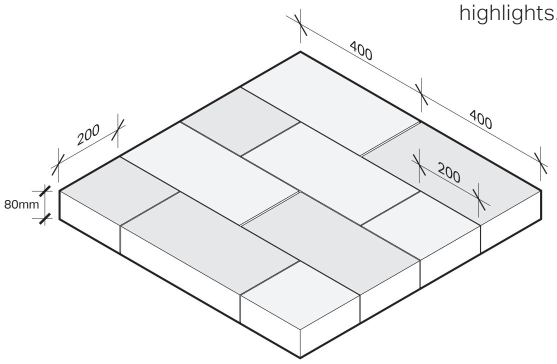
Developed in detail opposite, each of the three hardworks palettes are demonstrated as a modular system of readily available component parts and materials. The texture and colour of each ensures compatibility with the surrounding areas and elements of Sallins, depending on the spatial typology and built environment that it is designed to complement.

Material

A high quality granite stone palette is considered for primary streets, public plazas and market spaces.

Finish

Flamed finish is to be used for pedestrian thoroughfares; cropped finish for banding and highlights.



Durability & Workmanship

For any proposed hardworks in the town, Kildare County Council is to require a sample panel of pavement to be constructed for all paving materials, so as to establish specified standards and finishing for the scheme.

All materiality and construction is to adhere to British Standards (BS), ensuring quality of goods and build.

Maintenance

Very Low maintenance requirements..

Drainage

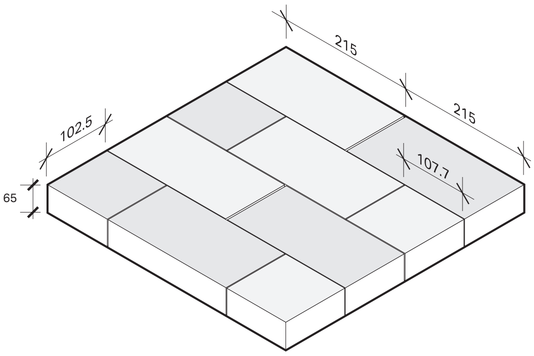
Each flag is to allow for water drainage into joints between flags and into the sub-base.

A durable and traditional material

Secondary Paving - Brick Pav

Material
A traditional look and feel without compromising durability.

Finish
Natural colours in browns and/yellows/ red. Each are solid modular units with an expected product life of 120 years.



Maintenance
Can either be 'dry lay' on sand or 'wet lay' on a mortar base. Both easy to maintain. Won't fade and over time it develops more character.

Drainage
Water drains though joints, particularly if 'dry lay'.

Attractive, durable and cost effective design

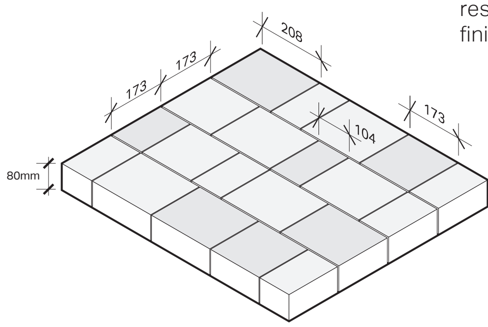
Tertiary Paving - Concrete

Pre-cast concrete units are to be adopted for local and residential areas.

A durable and well-worn material

Material
A durable and versatile material, it can be used in a variety of areas such as; driveways, car parks and pathways.

Finish
Silver grey, mid-grey, graphite colours and burnt red/orange colour; each are solid modular units with a n polished skid resistance surface finish.



Maintenance
Need for topping up joints early as it requires a committed management regime.

Drainage
Each flag is to allow for water drainage into joints between flags and into the sub-base.

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