A66 Northern Trans-Pennine Project
TR010062

3.7 Transport Assessment

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3.7 TRANSPORT ASSESSMENT

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1 Introduction

1.1.1 This document comprises of the Transport Assessment that has been produced to support the Development Consent Order (DCO) application for the A66 Northern Trans-Pennine Project ('the Project').

1.2 Purpose of document

1.2.1 The purpose of this Transport Assessment (TA) is to assess the impact of the Project on the strategic and local highway network, road safety and local sustainable modes of transport. It is submitted as part of the DCO application, provided under Regulation 5(2)(q) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009. The TA links to, and summarises, many other key pieces of technical work undertaken as part of this project. These are appended or referenced where appropriate. The TA is designed to communicate the findings of this technical work which are relevant to the consideration of the DCO application.

1.3 Project background

1.3.1 The A66 Northern Trans-Pennine (NTP) Project ('the Project') is proposed by National Highways (NH). Options appraisal has been undertaken through a staged process (see **Chapter 3: Assessment of Alternatives** of the **Environmental Statement** (Document Reference 3.2)) and a Preferred Route was announced in March 2020. The design has been developed, assumptions tested and validated, and an Environmental Impact Assessment (EIA) undertaken in support of an application for a DCO. The design has continued to develop throughout the preliminary design stage based on modelling work, stakeholder engagement and feedback from statutory consultation.

1.3.2 The A66 route is a key national and regional strategic transport corridor and link for a range of travel movements. It carries high levels of freight traffic and is an important route for tourism and connectivity for nearby communities. There are no direct rail alternatives for passenger or freight movements along the corridor.

1.3.3 Despite the strategic importance of the A66, the route between the M6 at Penrith and the A1(M) at Scotch Corner is only intermittently dualled and has six separate sections of single carriageway. The route also carries local slow moving agricultural vehicles and other traffic making short journeys, which can have an impact on other users, especially on the single carriageway sections. The variable road standards, together with the lack of available diversionary routes when incidents occur, affects road safety, reliability, resilience and attractiveness of the route.

1.3.4 If the existing A66 route is not improved, it will constrain national and regional connectivity and may threaten the transformational growth envisaged by the Northern Powerhouse initiative (Transport for the North, 2019)[1] and the achievement of the Government levelling up agenda.

[1] Transport for the North (2019) Strategic Transport Plan

1.3.5 The A66 forms part of the most direct route between the Tees Valley, north, south and west Yorkshire, the East Midlands, eastern England, north Cumbria, and the central belt of Scotland and Cairnryan (for access to Ireland). The recent improvements to bring the A1(M) carriageway to motorway standards between Leeming Bar and the A66(M) is also expected to increase the attractiveness of south-to-north movements along the A66.

1.3.6 The need for improvements to the A66 corridor was identified in the Northern Trans-Pennine Routes (NTPR) Strategic Study announced as part of the first *Road Investment Strategy 1 (RIS1)* in December 2014 (Department for Transport, 2015a)[2]. The study was one of six national strategic studies. Funding for the A66 corridor improvements was committed to in the *Road Investment Strategy 2 (RIS2)* in March 2020 (Department for Transport, 2020)[3].

1.3.7 Subsequently to the Preferred Route Announcement (PRA) it was determined that works are also required to the terminal junctions with the M6 at Penrith (J40) and the A1(M) at Scotch Corner, in order to ensure the entire route achieves consistent standards and meets the project objectives - these also form part of the Project. Work was initially undertaken during the options development stage to develop micro-simulation models for the terminal junctions. These models have since been updated in the preliminary design stage to reflect the latest junction designs and traffic demand.

1.4 Project objectives

1.4.1 NH has been appointed by the Secretary of State (SoS) to be the strategic highways company and therefore highway authority, traffic authority and street authority for the Strategic Road Network (SRN)[4] as set out in *Strategic Road Network Initial Report* (Highways England, 2017)[5] and pursuant to the Infrastructure Act 2015. The SRN includes the section of A66 between the M6 at Penrith (J40) and the A1(M) at Scotch Corner. The objectives for the project which are presented by theme in Table 1-1 are as follows:.

Table 1-1: A66 Project objectives

Theme	Project Objectives
Economic	Regional: Support the economic growth objectives of the Northern Powerhouse and Government levelling up agenda.
	Ensure the improvement and long-term development of the SRN through providing better national connectivity including freight.
	Maintain and improve access for tourism served by the A66.
	Seek to improve access to services and jobs for local road users and the local community.

[2] Department for Transport (2015a) Road investment strategy: 2015 to 2020
[3] Department for Transport (2020) Road investment strategy: 2020 to 2025
[4] The SRN is the network of major roads in England for which National Highways is responsible. It comprises approximately 4,300 miles of motorways and major 'trunk' A-roads.
[5] Highways England (2017) Strategic Road Network Initial Report

Theme	Project Objectives
Transport	Improve road safety, during construction, operation and maintenance for all, including road users, non-motorised users (NMU), road workers, local businesses and local residents.
	Improve journey time reliability for road users.
	Improve and promote the A66 as a strategic connection for all traffic and users.
	Improve the resilience of the route to the impact of events such as incidents, roadworks and severe weather events.
	Seek to improve NMU provision along the route.
Community	Reduce the impact of the route on severance for local communities.
Environment	Minimise adverse impacts on the environment and where possible optimise environmental improvement opportunities.

1.4.2 Part 4 Aims and Objectives of *Highways England: Licence* (Department for Transport, 2015b)[6] states that National Highways has a duty to *"minimise the environmental impacts of operating, maintaining and improving its network and seek to protect and enhance the quality of the surrounding environment" and "conform to the principles of sustainable development".* Since the publication of this document in 2015, Highways England became known as National Highways therefore it is now the National Highways licence.

1.5 Project description

1.5.1 The project includes upgrading the existing single lane sections of the A66 to dual two-lane all-purpose roads with a speed limit of 70 miles per hour (mph), with the exception of a section of the A66 from the M6 junction 40 through Kemplay Bank which will have a speed limit of 50mph. The project also includes amendments to existing junctions and accesses within these sections. The project has been split into eight schemes. A description of each scheme detailed in Chapter 3.

1.6 Selection of the Project

1.6.1 Full details of the options identification and selection process, along with the development of the Preferred Route can be found in the **Project Development Overview Report (PDOR)** (Document Reference 4.1)**.**

1.7 Consultation

1.7.1 An extensive programme of engagement was undertaken at earlier stages in the Project including options consultation, one-to-one meetings with potentially affected landowners and focus groups comprising key stakeholders. The purpose of this early consultation and engagement was to consult on and help to refine the potential options that had been identified and select a preferred route.

1.7.2 In summer 2019, potential routes were further consulted upon and in spring 2020, the Preferred Route, based on feedback and development work at that time, was announced. The responses to this consultation

[6] Department for Transport (2015b) Highways England: Licence

were considered in identifying the Preferred Route as documented in the **Consultation Report** (Document Reference 4.4).

1.7.3 The statutory consultation for the Project was held over a six-week period between Friday 24 September to Saturday 6 November 2021, to enable the public to review the draft proposals and provide feedback. A *PEI Report* was prepared for that consultation and provided a preliminary view of the likely significant environmental effects of the Project based on the assessments that had been undertaken up to that point.

1.7.4 All consultation responses received during the statutory consultation have been recorded and considered and this feedback has informed refinement of the design. Further targeted consultation has been held during January to April 2022 to seek feedback on aspects of the Project design that had been amended as a result of design development in response to comments received during the statutory consultation.

1.7.5 The comments received in response to the statutory and targeted consultation exercises have been used to produce a Consultation Report in accordance with section 37 of the PA 2008, which is included as part of the DCO application within the **Consultation Report** (Document Reference 4.4). The Consultation Report accompanies the application and summarises the views and comments received and outlines how regard has been had to those comments in the Project design.

1.8 Funding and delivery

1.8.1 The Road Investment Strategy (RIS), setting out government policy, explains the intent to fund investment in the Project as explained further in the funding statement (Document Reference 2.10).

1.9 Report structure

1.9.1 The chapters are structured as follows:

- Chapter 2 describes the relevant planning policy influencing the Project;
- Chapter 3 describes the development proposals;
- Chapter 4 describes the strategic base model development;
- Chapter 5 describes the strategic forecast model development;
- Chapter 6 describes the operational model development;
- Chapter 7 describes the forecast strategic network performance;
- Chapter 8 describes the forecast local network performance;
- Chapter 9 describes the road safety assessment;
- Chapter 10 describes the sustainable transport assessment;
- Chapter 11 describes the construction impact assessment; and
- Chapter 12 concludes the report.

2 Planning policy

2.1.1 This section sets out the relevant national, regional and local transport and planning policy which has been reviewed with a view to establishing the policy context of the Project. Other relevant strategies and guidance are also considered. A Planning Policy Compliance Statement has been produced which will accompany the DCO application.

2.2 National

National networks national policy statement

2.2.1 The *'National Policy Statement for National Networks'* sets out the need for development of road, rail and strategic rail freight interchange projects on the national networks and the policy against which decisions on major road and rail projects will be made.

2.2.2 It provides planning guidance for promoters of nationally significant infrastructure projects on the road and rail networks, and is the primary basis for the examination of the Application and decision making by the Secretary of State[7].

2.2.3 While the Secretary of State will use this National Policy Statement (NPS) as the primary basis for making decisions on development consent applications for national networks nationally significant infrastructure projects in England, other NPSs may also be relevant to decisions on national networks National Significant Infrastructure Projects (NSIP)s.

2.2.4 The compliance of the Project with the National Policy Statement for National Networks (NPS NN) is considered in detail in the NPS NN Accordance Table which is provided as an appendix to the **Legislation and Planning Compliance Statement** document (Document Reference 3.9).

2.2.5 The Government's vision and strategic objectives for national networks is to ensure they meet the country's long-term needs; support a prosperous and competitive economy and improve overall quality of life, as part of a wider transport system through network:

- with the capacity and connectivity and resilience to support national and local economic activity and facilitate growth and create jobs;
- which support and improve journey quality, reliability and safety;
- which support the delivery of environmental goals and the move to a low carbon economy; and
- which join up our communities and link effectively to each other.

2.2.6 The NPS NN (paragraph 2.2) recognises that there is a 'critical need' to improve the national road and rail networks to address road congestion to provide safe, expeditious and resilient networks that better support

[7] Section 104 of the Planning Act 2008 requires the Secretary of State to have regard to any national policy statement which has effect in relation to development of the description to which the application relates

social and economic activity; and to provide a transport network that is capable of stimulating and supporting economic growth.

2.2.7 Paragraph 2.6 confirms that the development of the national networks helps to support national and local economic growth, and that *'improved and new transport links can facilitate economic growth by bringing businesses closer to their workers, their markets and each other'.*

2.2.8 The Government has concluded that at a strategic level there is a 'compelling need' for development on the national networks (paragraph 2.10). '*The Examining Authority and the Secretary of State should start their assessment of applications for infrastructure covered by this NPS on that basis'*.

2.2.9 Identifying the need for development on the national road network, paragraph 2.13 confirms that the SRN provides critical links between cities and joins up communities, playing a vital role in people's journeys and drives prosperity by supporting new and existing development, encouraging trade and attracting investment. It confirms that a well-functioning SRN is '*critical in enabling safe and reliable journeys and the movement of goods in support of national and regional economies.'*

2.2.10 The NPS NN (paragraph 2.22) confirms the importance of improving the road network as without doing so 'it will be difficult to support further economic development, employment and housing and this will impede economic growth and reduce people's quality of life. The Government has therefore concluded that at a strategic level there is a compelling need for development of all national road networks.'

2.2.11 The Government's policy of making enhancements to the existing national road network is set out in paragraph 2.23 as including:

i. junction improvements, new slip roads and upgraded technology to address congestion and improve performance and resilience at junctions which are a major source of congestion;
ii. implementing 'smart motorways' to increase capacity and improve performance; and
iii. improvements to trunk roads in particular dualling of single carriageway strategic trunk roads and additional lanes on existing dual carriageways to increase capacity and to improve performance and resilience.

2.2.12 The NPS NN sets out that, subject to the detailed policies and protections contained in the NPS and the legal constraints set out in the Planning Act 2008 (PA 2008), there is a 'presumption in favour' of granting development consent for national network NSIPs that fall within the need for infrastructure established in the NPS NN.

2.2.13 Paragraph 3.16 outlines Government's commitment to sustainable travel in developing a high-quality cycling and walking environment to bring about a step change in cycling and walking across the country.

2.2.14 Paragraph 3.17 states that the Government also expects applicants to identify opportunities to invest in infrastructure in locations where the national road network severs communities and acts as a barrier to cycling and walking, by correcting historic problems, retrofitting the latest

solutions and ensuring that it is easy and safe for cyclists to use junctions.

2.2.15 Paragraph 4.3 of the NPS NN states that: 'in considering any proposed development, and in particular, when weighing its adverse impacts against its benefits, the Examining Authority and Secretary of State should consider:

- Its potential benefits including the facilitation of economic development, including job creation, housing and environmental improvements and any long-term or wider benefits; and
- Its potential adverse effects, including any longer-term and cumulative adverse impacts, as well as measures to avoid, reduce or compensate for any adverse impacts'.

National Planning Policy Framework, July 2018

2.2.16 The National Planning Policy Framework (NPPF) sets out the government's planning policies for England and how these are expected to be applied and is an important and relevant consideration in decisions on nationally significant infrastructure projects. The overall strategic aims of the NPPF and NPS (linked to the PA 2008) are consistent, however the two have differing but equally important roles to play. The NPSNN acknowledges the following at paragraph's 1.18 and 1.19:

2.2.17 "The NPPF makes clear that it is not intended to contain specific policies for NSIP's where quite particular considerations can apply. The National Networks NPS will assume that function and provide transport policy which will guide individual development brought under it".

2.2.18 "The NPS provides guidance and imposes requirements on matters such as good scheme design, as well as the treatment of environmental impacts. So, both documents seek to achieve sustainable development and recognise that different approaches and measures will be necessary to achieve this".

2.2.19 Paragraph 7 of the NPPF states that the purpose of the planning system is to contribute to the achievement of sustainable development. Paragraph 10 explains that there is a *'presumption in favour of sustainable development' 'at the heart of the Framework', 'so that sustainable development is pursued in a positive way'*.

2.2.20 The NPPF places particular emphasis on the provision of net gain in terms of the conservation and enhancement of the natural environment (Paragraph 174), with requirements for measurable net gains for biodiversity.

2.2.21 As defined within the NPPF, the purpose of the planning system is to contribute to the achievement of sustainable development. The objective of sustainable development can be outlined as follows:

2.2.22 'meeting the needs of the present without compromising the ability of future generations to meet their own needs. At a similarly high level, members of the United Nations – including the United Kingdom – have agreed to pursue the 17 Global Goals for Sustainable Development in

the period to 2030. These address social progress, economic well-being and environmental protection'

2.2.23 Sustainable development is an inherent element of the Project, which has been developed to ensure the best balance between maximising benefits and minimising environmental impacts. The Project objectives also ensure that net gain is achieved across the three inter-related sustainable development objectives set out in the NPPF (economic, social and environmental).

Planning Practice Guidance

2.2.24 Planning Practice Guidance (PPG) (published 2014) provides advice on when Transport Assessments and Transport Statements are required, and what they should contain.

2.2.25 Following the withdrawal of The Department for Transport Document Guidance on Transport Assessment guidance on the preparation of supporting documentation in highway assessment terms is now provided in the PPG suite of documents and in particular in 'Travel Plans, Transport Assessments and Statements in decision taking'[8] .

2.2.26 It states that the 'key issues to consider at the start of preparing a Transport Assessment or Statement may include:

- the planning context of the development proposal;
- appropriate study parameters (i.e. area, scope and duration of study);
- assessment of public transport capacity, walking/cycling capacity and road network capacity;
- road trip generation and trip distribution methodologies and/ or assumptions about the development proposal;
- measures to promote sustainable travel;
- safety implications of development; and
- mitigation measures (where applicable) – including scope and implementation strategy'.

2.2.27 The guidance also identifies the importance of appropriately considering cumulative impacts arising from other committed development.

2.2.28 Circular 02/13, published in September 2013, is the response to the changes brought about by the Localism Act 2011 and the NPPF, which established a new remit for NH to promote sustainable development. Circular 02/13, explains how NH will engage with the planning system. It also maintains how NH will fulfil its remit to be a delivery partner for sustainable economic growth while maintaining, managing and operating a safe and efficient SRN.

2.2.29 The circular refocused the role of the SRN towards enabling and supporting development and growth, seeking to create the conditions in which the barriers to opportunity were removed to offer greater certainty to Local Planning Authorities when working on development of their Local Plans.

[8] Gov.uk: Guidance, Travel Plans, Transport Assessments and Statements 6 March 2014

Transport Investment Strategy 2017

2.2.30 The Transport Investment Strategy (TIS) was published by the DfT in July 2017. The TIS seeks to:

- create a more reliable, less congested, and better-connected transport network that works for the users who rely on it;
- build a stronger, more balanced economy by enhancing productivity and responding to local growth priorities;
- improve our global competitiveness by making Britain a more attractive place to trade and invest; and
- support the creation of new housing.

National Infrastructure Delivery Plan 2016-2021

2.2.31 The National Infrastructure Delivery Plan 2016 (NIDP), published in March 2016, states in its Executive Summary that:

'Infrastructure is the foundation upon which our economy is built. The government remains determined to deliver better infrastructure in the UK to grow the economy and improve opportunities for people across the country'.

Road Investment Strategy 2 (RIS2) 2020 to 2025 (published April 2020)

2.2.32 RIS2 is the Governments five-year strategy for investment in and management of the strategic road network from April 2020 to March 2025.

2.2.33 The Strategic Vision seeks to ensure that the SRN is 'future ready', whatever may emerge. It then describes a long-term vision for what the SRN should be like in 2050 and the steps that will help us achieve it. This will give NH, along with its customers, suppliers and other stakeholders, a clear sense of the Government's objectives for the SRN, and a direction of travel for the way ahead across future road periods.

2.3 Regional policy and guidance

Transport for North (TfN) Strategic Transport Plan 2019

2.3.1 TfN is a statutory body of elected leaders and a partnership of business leaders from across the whole of the North of England who collectively represent all of the region's 15 million citizens.

2.3.2 The TfN Strategic Transport Plan provides an opportunity to drive major improvements in strategic connectivity throughout the North, taking a pan-Northern view for the first time. It proposes to encourage trade and inward investment by improving links to the North's ports and airports, and faster links between the economic assets that they serve. This proposes to make the North a more attractive place for businesses to invest and to base themselves and will also support the aspirations of the North's visitor and tourism economy. It signals an opportunity to invest in the people who live in the North to improve living standards, health, productivity and opportunities for all.

2.3.3 In the TfN Strategic Transport Plan the A66 is included in both the Major and SRNs. The plan references the NTPR Study which assessed the strategic and economic case for improving the A66 between the A1(M) at Scotch Corner and the M6 at Penrith. TfN have been working closely with the Department for Transport (DfT) and NH on this Strategic Road Study.

2.3.4 According to the TfN Strategic Transport Plan, east-west connectivity is a significant barrier for future growth in the north, as well as being a key constraint to agglomeration and transforming the North's economy. TfN are seeking alternative resilient road routes for east-west links above and beyond the current M62 east-west road link (such as the A66, A69, A628 and A59).

Tees Valley Strategic Economic Plan: The Industrial Strategy for Tees Valley 2016-2026.

2.3.5 The Tees Valley Strategic Economic Plan (SEP) sets out the growth ambitions and priorities for the Tees Valley over a ten-year period to 2026. The SEP is currently being refreshed to create an Industrial Strategy that will include all the latest priorities to improve, diversify and accelerate growth in the local economy.

2.3.6 The SEP highlights six growth generating themes, one of which is 'Transport & Infrastructure' with the aim to facilitate local, regional, national, and international digital and conventional infrastructure. There are ambitions to improve connectivity within the Tees Valley, across the Northern Powerhouse and the wider UK.

2.3.7 Key priorities include the improvement of east-west connectivity and the dualling of the A66 between the A1(M) and the M6 to provide direct access to key northern markets and south-west Scotland.

2.3.8 Improvement in east-west road connectivity is also required to provide a high quality, resilient corridor along the A66 from the A1(M) to the international gateway at Teesport; and provide fast communications within the sub-region as well as to the North East region and rest of the country.

2.3.9 In terms of roads, major highways such as the A1 (M), A66 and A19, A174 and A1053 along with other key road links within the urban centres, form the strategic road network, which is critical in supporting key housing and employment sites across the Tees Valley.

2.4 Local

2.4.1 The following policy review provides an overview of relevant local planning policy for the Project. This includes a review of Local Planning Authorities which are situated on the route alignment, and those which are neighboring it.

County Level Local Plans and Policy Documents on Route Alignment (On-Route)

Cumbria County Council

2.4.2 Local plans in Cumbria for residential and certain business development are prepared by district councils.

2.4.3 Local plans within the Cumbria district which are relevant to the proposed A66 Project are outlined as follows:

- Allerdale Borough Council.
- Carlisle City Council.
- Eden District Council.
- South Lakeland District Council.
- Lake District National Park Authority.
- Yorkshire Dales National Park Authority.

2.4.4 In addition to relevant district plans, the Cumbria Local Plan aims to provide a safe and well managed highway network, secure infrastructure improvements and support local economic growth.

2.4.5 The County Council also has the responsibility for the preparation of the **Cumbria Transport Plan Strategy 2011-2026 (2011)** which outlines highways and infrastructure investment requirements across the county. Highways and transport improvements to enable these have been identified in the form of improvements to the A66.

North Yorkshire County Council

2.4.6 For North Yorkshire, local plans for residential and certain business developments are prepared by district councils.

2.4.7 District and Borough Councils, and National Park Authorities, prepare Local Plans to set-out the policy framework for all development except for minerals and waste matters across their area, with policies balancing housing and business development with wider environmental considerations.

2.4.8 The county council comments on any cross-boundary issues presented by local plans through the "duty to co-operate" between local authorities in plan-making.

2.4.9 Local plans within North Yorkshire which are considered relevant to the proposed Project include:

- Hambleton District Council.
- Harrogate Borough Council.
- Richmondshire District Council.
- Craven District Council.

Local Authority Level Local Plans and Policy Documents on Route Alignment (On-Route)

Durham County Council

2.4.10 County Durham's Local Plan consists primarily of the **County Durham Plan (2020).** The plan provides the policy framework for the county up to

2035 to support the development of a thriving economy, so that residents can experience the benefits that ensue as a result. The plan sets out how many new homes and jobs are needed and where they will go, what infrastructure is needed and how important landscapes and habitats can be protected.

2.4.11 In addition to the adopted Local Plan, the **Whorlton Village Neighbourhood Plan 2015-2035 (2017)** is located to the north of the existing A66. The Neighbourhood Plan provides an overview of development requirements for the Whorlton Village Conservation Area.

2.4.12 The ambition for County Durham is to build a successful and sustainable future in which all residents have the opportunity to access good housing and employment in an environment which delivers a healthy and fulfilled lifestyle.

Eden District Council

2.4.13 Eden's Local plan consists primarily of the **Eden Local Plan (2018).** In addition to the Local Plan (2018) there are supplementary planning documents (SPDs) that provide additional clarity on specific subjects identified within the local plan. The following SPDs are considered relevant and discussed within the 'other relevant documentation' section below:

- North Pennines Area of Outstanding Natural Beauty (AONB) Planning Guidelines SPD and Management Plan (2019).
- Cumbria Landscape Character guidance and Toolkit.

2.4.14 A partial review of the adopted Local Plan (2018) is currently being progressed. The review primarily focuses on ensuring that policies focus on climate change and ensuring new development is of a high-quality design.

Richmondshire District Council

2.4.15 Richmondshire's Local Plan primarily consists of the Richmondshire Core Strategy (2014). The following adopted and emerging plans have been considered for the proposed A66 Project.

- Adopted policy: Richmondshire Local Plan 2012-2028, Core Strategy (2014). The Core Strategy was formally adopted in December 2014. It provides the strategic development policies for the part of the district that is outside the Yorkshire Dales National Park.
- Emerging policy: A revised Local Plan (2018-2038) is currently in preparation, preferred options consultation has been closed and the pre-submission consultation was held in quarter four of 2021. Due to its point within the emerging policy process and its subsequent weighting, this document has not been reviewed.
- Additional considerations: In addition to adopted and emerging policy, the Richmondshire District Economic Action Plan (2016-20) (EAP) provides an overview of priority areas that need to be addressed to deliver economic growth across the district.

2.5 Local Plans and Policy Documents neighbouring the route alignment (Off-Route)

2.5.1 The following local plans and policy documents are also considered important and relevant to the Project due to their geographical nature, in so far that they neighbour the Local Authorities along the route alignment. These are as follows:

Allerdale Borough Council

2.5.2 Allerdale's Local Plan comprises documents for the use and development of land within the Borough until 2029, outside of the Lake District National Park. The Local Plan consists of:

- Part 1: Allerdale Local Plan (Part 1) Strategic and Development Management Policies (2014) (SDMP). The SDMP contains the Council's main collection of planning policy documents outlining the growth and spatial strategy for the local area. The SDMP (2014) also provides planning policies for managing development proposals through the planning application process.
- Part 2: Allerdale Local Plan Site Allocations Development Plan (2020) (SADP) ensures that sufficient land is available in appropriate locations to deliver the development requirements and policies identified within the SDMP (2014). Part 2 identifies land for housing, employment, retail, gypsy and travelers and open space for the plan area. The document also identifies an area suitable for wind energy development, in line with national Government guidance.

2.5.3 As the SADP (2020) identifies the same strategic objectives as the SDMP (2014) and all other policies relate to site specific development, the SADP (2020) has not been reviewed.

2.6 Summary

2.6.1 The Project is supported by, and aligns with, national, regional, and local planning and transport policies. The Project will create a high quality, reliable route from Penrith to Scotch Corner that meets the future needs of traffic demand, enables economic growth, and improves the quality of life for local communities, whilst reducing journey times for users. It will improve connectivity and accessibility for walkers, cyclists, and horse riders through the provision of improved facilities on the local network around the A66.

2.6.2 Table 2-1 provides a summary of the Transport Assessment compliance to the policies stated within this section.

Table 2-1: A66 Northern Trans-Pennine policy consideration

Policy Reference		Section Reference
NPSNN	Paragraph 5.212 - Where appropriate, local models should be taken into account when schemes are developed, and options considered.	8 - Forecast local network performance
	Paragraph 2.2 - recognises that there is a 'critical need' to improve the national road networks to address road congestion to provide safe, resilient networks; and to provide a transport network that is	7.3 - User experience, 9 – Road Safety

Policy Reference		Section Reference
	capable of stimulating and supporting economic growth.	
	Paragraph 5.216 – Impacts on non-motorised user access should be mitigated.	10.5 – Impacts of the Project
	Paragraph 3.16 - outlines Government's commitment to sustainable travel in developing a high-quality cycling and walking environment to bring about a step change in cycling and walking across the country.	10 – Sustainable Transport (specifically 10.5 – Impacts of the Project – Walking and cycling Impacts)
	Paragraph 4.64 – Adaption measures should be implemented during the construction phase where necessary.	11 – Construction impact assessment
NPPF	Paragraph 7 – the purpose of the planning system is to contribute to the achievement of sustainable development.	10 – Sustainable Transport
	Section 9 – supports development that provides safe and sustainable access.	9 - Road Safety, 10 – Sustainable Transport
Circular 02/13	The focus of the SRN is to support development and growth, seeking to remove barriers to opportunity.	3 - Development Proposals, 10 - Sustainable Transport
TIS	Supports creating a transport network that is more reliable, less congested and better connected.	7 – Forecast strategic network performance, 8 – Forecast local network performance
NIDP	Executive Summary - The UK government is determined to delivery better infrastructure to grow the economy and improve opportunities for people across the country.	3 - Development Proposals
RIS2	Ensure that the SRN is 'future ready', whatever may emerge.	7 – Forecast strategic network performance, 8 – Forecast local network performance
TfN	TfN considers the east-west connectivity as a significant barrier for future growth in the north and are seeking resilient road routes for east-west links	7 – Forecast strategic network performance, 8 – Forecast local network performance
SEP	Improvement in east-west road connectivity is required to provide a high quality, resilient corridor along the A66 from the A1(M) to the international gateway at Teesport.	3 – Development proposals
Cumbria Transport Plan Strategy 2011 – 2026	The Cumbria Local Plan aims to provide a safe and well managed highway network.	9 – Road Safety
County Durham Plan	The ambition for County Durham is to build a sustainable future future in which all residents have the opportunity to access good housing and employment	10 – Sustainable Transport
Whorlton Village Neighbourhood Plan	The vision and objective of the Plan is to make Whorlton village a better and sustainable place to live.	10 – Sustainable Transport

Policy Reference		Section Reference
Eden Local Plan	The primary focus is on ensuring that policies focus on climate change and ensuring new development is of a high-quality design.	10 – Sustainable Transport
Richmondshire Local Plan	Seek to achieve sustainable development through spatial planning.	10 – Sustainable Transport
SDMP	Allderdale's vision for 2029 includes sustainable and safe communities with a well-connected economy and sustainable transport.	9 – Road Safety, 10 – Sustainable Transport

3 Development Proposals

3.1 Overview

3.1.1 The A66 Northern Trans-Pennine project is a programme of works to improve the A66 between the M6 at Penrith and A1 at Scotch Corner. The Project will involve upgrading single carriageway sections of road to dual carriageway standard and making improvements to the junctions along the route. Parts of the Project involve online widening of the carriageway and some are offline (in other words, new sections of road that follow a different route but reconnect into the main A66 alignment).

3.1.2 The Project has been split into a number of schemes as shown in Figure 3-1, and as described below.

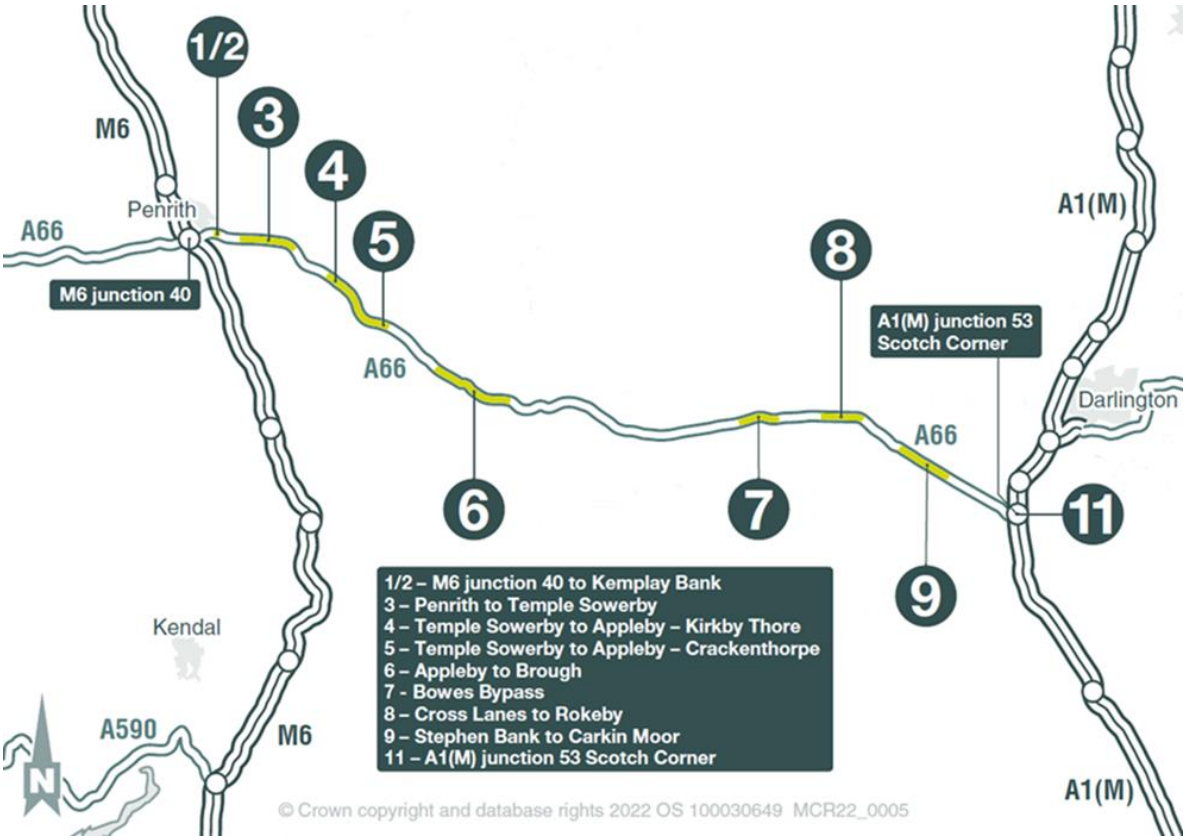

Figure 3-1: A66 Northern Trans Pennine scheme Map

M6 Junction 40 to Kemplay Bank

3.1.3 The M6 Junction 40 to Kemplay Bank scheme would provide a three-lane circulatory carriageway with spiral markings, within the footprint of the current roundabout at M6 Junction 40. The A66 eastern arm of the roundabout would be widened to three lanes in each direction between M6 Junction 40 and Kemplay Bank Roundabout to increase capacity for local movements around Penrith. Widening would be required on the following five approach arms to M6 Junction 40 to provide additional lanes and a dedicated left turn facility, each controlled under its own signal phase: M6 North, M6 South, A66 East, A66 West, and A592 Ullswater Road.

3.1.4 All existing local accesses would be accommodated and it is proposed to relocate the existing access to Skirsgill Depot by approximately 95m to the east of its existing access. This scheme would also include signal controlled crossings serving the existing shared cycle/footway connection on the western side.

3.1.5 All existing pedestrian and cycle connections would be retained on the Penrith South Bridge western side alongside Skirsgill Business Park. This would also be the case for the Skirsgill North-West pedestrian and cycle connections. The existing cycle/pedestrian route to Skirsgill Depot would be directed through a signal controlled crossing at the roundabout, to provide a safer replacement for the existing uncontrolled crossing of the A66 Eastern Arm. This would be an improvement to the walking and cycling safety of this route.

3.1.6 The existing police platform located on the Penrith North Bridge to the eastern side, between the M6 off slip and A592, is to be retained in its current location. The existing police platform on the Penrith South Bridge western side would be relocated further into the widened verge to allow for the new dedicated left-hand lane from the M6 off slip.

3.1.7 Further to the east, at Kemplay Bank Roundabout, the scheme would pass beneath the existing roundabout via two underpass structures that would carry the circulatory carriageway. This would comprise a new dual carriageway under Kemplay Bank Roundabout allowing free-flowing east-west traffic, reducing congestion and improving access to Penrith and the A6.

3.1.8 This scheme would include new on-slip and off-slip roads with the A6 and A686 allowing users to safely join and leave the A66 in both directions, serving the local road network with links to Penrith, Eamont Bridge and other local settlements. Minor realignment of the A6 and A686 arms would be required to accommodate the new slip roads serving the local road network.

3.1.9 It is proposed that the speed limit between M6 Junction 40 and Kemplay Bank would be reduced from the National Speed Limit to 50mph in both directions (approximately 2.3km). This allows for the retention and extension of an existing underpass from Carleton Avenue which provides access to the Police and Fire site to the south of the existing A66. As this is a critical access requirement, retaining it has avoided the need to construct a replacement underpass or overbridge to maintain access (therefore reducing construction impacts and reducing embodied carbon). This existing underpass would be extended to accommodate the widening of the A66. The reduced speed limit is considered acceptable for this section of the route due to the proximity to key junctions with the A6, A686 and M6 and associated safety considerations.

3.1.10 A police observation point would be included on the Kemplay Bank overbridges for speed enforcement purposes.

3.1.11 Signalisation of the Kemplay Bank Roundabout would be retained to facilitate safe crossing at all five arms. Cycleways and footways currently located through the centre of the roundabout would be re-

routed around the roundabout. The existing emergency exit from the fire station linked with the existing traffic signals would be maintained throughout construction and would remain in place once the works are complete.

3.1.12 A replacement layby would be provided on the eastbound carriageway between the M6 Junction 40 and Kemplay Bank Roundabout. The existing layby on the westbound carriageway between Kemplay Bank Roundabout and M6 Junction 40 would be removed and would not be replaced due to the proximity of adjacent junctions.

3.1.13 Replacement land would be provided to compensate the local community for land take from public open space alongside Wetheriggs Park, as a result of widening the existing A66 to the north.

3.1.14 The scheme would include lighting provision, extending and in some locations replacing the current provision.

3.1.15 Three ponds would be required for this scheme for the purpose of drainage of the road network and to manage water quality before the water is discharged into the surrounding watercourses. The western-most of these ponds is proposed to be located to the south of the existing A66 to the east of the West Coast Mainline, the second is proposed to be located to the south of the A66 in the open fields between the M6 and the A6, and the eastern-most pond is situated to the south of the A66 to the east of the Fire, Police and Ambulance site. Access tracks would be constructed to allow vehicular access to facilitate the maintenance of these ponds. The locations of these ponds have been selected to ensure effective drainage, minimise impacts on future proposed development in the area, and minimise environmental impacts.

3.1.16 Utility works would be required for gas, electricity, water and communications providers services throughout the length of the scheme.

3.1.17 No demolition of property is required as part of this scheme. The scheme would involve minor demolition works, such as roadside features, drainage and kerbing associated with the upgrading of the existing A66.

Penrith to Temple Sowerby

3.1.18 The Penrith to Temple Sowerby scheme would provide full dualling of the existing 5.2km length of single carriageway A66 between Penrith and Temple Sowerby. The scheme would predominantly involve online widening using the existing carriageway to form the westbound half of the dual carriageway. The second carriageway would be constructed to the north of the existing carriageway to form the new eastbound carriageway.

3.1.19 A new grade-separated junction would be constructed to replace the existing junction to Center Parcs to connect the local road network and Center Parcs with the new alignment of the A66. The northern side of this junction would have shallower graded embankment slopes in order to integrate the junction more appropriately into the surrounding

landscape. The extent of this grading would allow the land to be returned to agriculture following construction. The junction would cater for all movements on and off the A66, making it easier and safer for users to join the A66 and preventing tail backs at peak times.

3.1.20 New left-in/left-out junctions would be provided to the B6262 and to St Ninian's Church on the Winderwath Estate, with associated merge and diverge lanes to enable safe access to homes and businesses. Improved parking provision would be provided for access to St Ninian's Church to enhance accessibility to this heritage asset.

3.1.21 An existing access serving Whinfell Holme Wastewater Treatment Works would be converted to left-in/left-out. This access is proposed to be relocated to the east of its current location, to minimise the need for widening over the existing Shell Oil high pressure gas pipeline which crosses the A66 in a north-south direction.

3.1.22 Works to widen the carriageway would reduce the current parking provision at the NH A66 Information Hub (formerly the Llama Karma Kafe). It is proposed that this area be converted to an amenity parking area with a new footpath providing access to the Countess Pillar historic monument to the east of this site, to provide an enhancement and accessibility for the public to an important heritage feature along the route. Landscape and biodiversity mitigation planting would take the Countess Pillar and its prominence along the A66 route into consideration to ensure it continues to be a known feature.

3.1.23 The scheme removes existing at-grade crossing points of the A66. An overpass and one underpass have been included to facilitate the safe crossing of the A66. The overbridge, which would serve as an agricultural access and as a Public Right of Way, is proposed to be situated approximately 260m to the east of the existing junction with the B6262, and the underpass is proposed to be situated approximately 180m to the east of the existing entrance to Whinfell Park.

3.1.24 An east/west walking and cycling link, connecting Penrith with Temple Sowerby, would be provided along the length of this scheme (predominantly to the north of the A66) which would also be utilised as an access track for pond maintenance as well as serving as a local access route for landowners. All other pedestrian, cyclist and horse-rider facilities that would be severed by the scheme are to be reconnected via grade-separated crossings.

3.1.25 New layby facilities would be provided on the proposed A66 mainline in both eastbound and westbound directions to replace existing provision which would be lost due to the implementation of the scheme. Observation platforms will be included in the eastbound layby at chainage 22400 and in the westbound layby.

3.1.26 No lighting would be provided on the length of the scheme.

3.1.27 Seven ponds are proposed at low points in the scheme to attenuate drainage and run-off from the road in order to manage the water quality before it is discharged into the surrounding watercourses. Shared and dedicated access tracks would be provided to the north and to the south

of the road to facilitate access to ponds for maintenance purposes and to accommodate landowner movements.

3.1.28 Utility works would be required for gas, electricity, water and communications providers services throughout the length of the scheme.

3.1.29 The existing farm buildings at High Barn are proposed to be demolished to accommodate the offline section of the A66 to the east of the new grade-separated junction. The proposals also include the demolition of the Lightwater Cottages to the south of the A66 to facilitate and accommodate a replacement left-in/left-out access to the Winderwarth Estate. The scheme would involve minor demolition works, such as roadside features, drainage and kerbing associated with the existing A66 and other local roads.

Temple Sowerby to Appleby

3.1.30 The Temple Sowerby to Appleby scheme would comprise a new offline bypass around the north of Kirkby Thore, and then pass to the north of Crackenthorpe parallel to the old Roman road before tying into the existing Appleby Bypass. This route would include a number of new junctions and improvements throughout its length to connect the scheme to the existing road network. The existing 8.5km A66 would be de-trunked.

3.1.31 The new A66 diverts from the existing A66 in a north-easterly direction from the end of Temple Sowerby Bypass, crossing over Priest Lane and under Station Road before turning south after passing north of the village. Continuing in a southerly direction, the route would pass under Fell Lane where a new grade separated junction would be provided. Main Street would be stopped up just to the south of the new route with a new link from Main Street to Fell Lane to the north of the route to reconnect the village.

3.1.32 The scheme then continues under the realigned Sleastonhow Lane where a new overbridge would be provided. The realignment of Sleastonhow Lane avoids and runs to the south of the veteran oak tree. The new A66 would then cross the SAC and SSSI designated Trout Beck and its associated floodplain on a new multi-span viaduct before heading in a south-easterly direction towards Crackenthorpe.

3.1.33 A false bund would be created on the south side of the new A66, around the north of Kirkby Thore. The false bund, formed by creating an embankment above existing ground levels, would increase the depth of cutting to visually screen the road and to reduce noise impacts to the village of Kirkby Thore. These embankments would be graded out on the village side to allow them to fit better into the surrounding landscape and to enable the land on which they are constructed to be returned to agricultural use following construction.

3.1.34 A new compact grade-separated junction is proposed to be provided at Long Marton. In order to facilitate this junction, the route of Long Marton Road would require some realignment. This realignment would move the road away from the Roman Camp, 350m to the east of Redlands

Bank Scheduled Monument. This route would provide full access to the new A66 and maintain the existing link between the communities of Bolton and Long Marton. East of Long Marton the route would run in a south-easterly direction and has been designed to follow the line of the Roman Road towards Appleby. The scheme would connect to the existing A66 Appleby Bypass at the eastern end of the scheme.

3.1.35 The existing eastbound diverge slip road linking to the B6542 close to the Appleby Fair field would be maintained to allow access into Appleby. The existing westbound merge slip road at this location would be changed to a two-way road to allow traffic from Appleby to access the de-trunked (old) A66 and head west to the new Long Marton junction and beyond.

3.1.36 In order to improve local connectivity at the western end of the scheme, the existing junction at the eastern end of the Temple Sowerby bypass would be improved. The improved junction would provide connections between the existing A66 and the local road network. A short section of road would connect from Temple Sowerby Bypass junction to the existing A66, allowing access for local traffic and other road users from Temple Sowerby to Crackenthorpe and to wider settlements.

3.1.37 A new grade-separated junction would be provided at Fell Lane to the north of Kirkby Thore. Fell Lane would pass over the proposed A66 alignment on a bridge structure. This junction would maintain the key local connection onto the A66 at Kirkby Thore and also provide access for communities to the north as well as the British Gypsum site. This would contribute to a reduction in the number of Heavy Goods Vehicles (HGV) movements through Kirkby Thore. New merge and diverge lanes would be incorporated as part of this junction to enable users to safely join and leave the A66 in both directions. A connector road, on the northern side of the new A66, would also be constructed which would provide a link from the new junction to Main Street. The property Whinthorn House, together with an agricultural barn, would need to be demolished to accommodate the route at this location.

3.1.38 Accommodation works would be undertaken to ensure that access to properties is suitably maintained. The existing underpass would be widened and undergo redesign to maintain access for Spittals Farm. A new accommodation overbridge would be used to carry an existing bridleway over the new A66 at its north-westernmost extent and to maintain access for Crossfell House Farm. To the eastern extent of the route, a new accommodation overbridge would maintain access over the new A66 for Rogerhead Farm.

3.1.39 New layby facilities would be provided on the proposed A66 mainline in both eastbound and westbound directions to replace existing provision which would be lost due to the implementation of the scheme.

3.1.40 No lighting would be provided on the length of the scheme.

3.1.41 15 ponds are proposed at low points in the scheme to attenuate drainage and run-off from the road in order to manage the water quality before it is discharged into the surrounding watercourses. Shared and dedicated access tracks are proposed to be provided to the north and to

the south of the road to facilitate access to ponds for maintenance purposes and to accommodate landowner movements.

3.1.42 Utility works would be required for gas, electricity, water and communications services throughout the length of the scheme.

3.1.43 An east to west walking and cycle route is proposed to be provided along the length of the de-trunked existing A66, utilising the verge and adjacent land where necessary, providing connectivity for users between Temple Sowerby and Appleby. All other pedestrian, cyclist and horse-rider facilities that would be severed by the scheme are to be reconnected via grade-separated crossings.

3.1.44 Two residential properties (Winthorn and Dunelm) and two barns located opposite (but not associated with) Spittals Farm and on the north-eastern side of Main Street would require demolition. The scheme would involve minor demolition works, such as roadside features, drainage and kerbing associated with the existing A66 and other local roads.

Appleby to Brough

3.1.45 The Appleby to Brough scheme comprises dualling an 8.3km length of single carriageway between Coupland Beck and Brough. A number of junction improvements are proposed to enable access on and off the A66 to improve user safety and reduce congestion.

3.1.46 The western extent of the scheme comprises 2.6km of online widening with a new eastbound carriageway to the north of the existing carriageway. The westbound carriageway would follow the line of the existing A66. The dualled section includes junction improvements to enable access on and off the A66 to improve user safety and reduce congestion.

3.1.47 An improved left-in/left-out junction from the eastbound carriageway would be provided at Café 66. This would loop to the rear of the building and also serve as access to agricultural land at the western end of the scheme.

3.1.48 A replacement underpass would be provided for New Hall Farm and Far Bank End. A left in/left out junction would be provided on the westbound carriageway. Access tracks would link the underpass and each carriageway, providing access to the A66 in all directions for farms, properties and land at this location.

3.1.49 A new compact grade-separated junction would provide a link to the B6259 to Sandford/Warcop as well as providing links for Public Rights of Way. A new underpass is proposed to facilitate access to agricultural land on the south side of the new A66 and for footpath connectivity to be provided adjacent to Wheatsheaf Farm.

3.1.50 From Wheatsheaf Farm the central length of the scheme is proposed to be located approximately 50m to the south of the existing A66. It would follow an alignment utilising the line of the existing A66 as the eastbound carriageway and a new westbound carriageway would be constructed directly to the south of the line of the existing A66 alignment

in order to reduce the extent of construction within the designation of the North Pennines Area of Outstanding Natural Beauty.

3.1.51 New viaducts would be provided to cross over Moor Beck and Cringle Beck together with a new bridge on the Warcop westbound junction. These are being provided to minimise any effects on the becks as they have been found to be functionally linked to the River Eden Special Area of Conservation downstream and support multiple species protected by this designation. Land has also been identified in the area in order for flood compensation areas to be provided.

3.1.52 A new local road would be provided to the north of the new A66 dual carriageway, in this central section, in order to maintain local access and facilitate movement on and off the A66 to both Warcop and the Ministry of Defence (MoD) facility.

3.1.53 This scheme encroaches up to 150m into the AONB, and results in the demolition of the MoD tank storage and refuelling compound which would be replaced within an extension to the MoD's existing landscape maintenance compound located approximately 600m further east.

3.1.54 Land from two residential properties on the north side of the existing A66 would be required to facilitate the construction of the new local access road through this section.

3.1.55 The central section of the scheme would pass through the existing Brough Hill Fair site and this would need to be replaced on a like for like basis. A replacement site has been identified adjacent to the current site making use of the MoD bivvy (camping) site. A level of remediation of the bivvy site would be required to facilitate the Brough Hill Fair.

3.1.56 New junctions would be provided at Warcop on the westbound and eastbound carriageways facilitating access to the A66 in both directions and providing access to the village of Warcop and the realigned existing A66. These junctions would maintain access to the village of Warcop, the relocated MoD facility, side roads, properties and land to the north and south of the A66 via a new overbridge located to the east of Moor Beck bridge.

3.1.57 A local road would be provided to the south of the new A66 connecting Flitholme and Langrigg allowing residents a connection to the new westbound carriageway and local roads to the south via Musgrave Lane.

3.1.58 The proposed left-in/left-left out priority junctions would be approximately 0.6km apart and designed to utilise existing side road connections and minimise earthworks.

3.1.59 The eastern length of the scheme would continue to follow an alignment to the south of the existing A66 before tying into the Brough Bypass.

3.1.60 The de-trunked sections of the existing A66 would enable use for access to the local road network west of Warcop and a new local road would be provided to the north from Turks Head into Brough. This would encroach approximately 130m into the AONB. A left-only T-junction with appropriate diverge and merge tapers on the westbound carriageway would be provided to maintain access to agricultural land and properties on the south side of the new dual carriageway. Eastbound local

movements to Brough would be via the accommodation bridge to join with the local road into Brough.

3.1.61 A new access road and an overbridge for farm traffic, walkers, cyclists and horse-riders would be provided at the eastern end of the scheme near West View Farm, providing access to land on the north side of the A66 from the farm located to the south, as well as providing footpath and bridleway connectivity. This overbridge and access road connection does fall within the AONB and would therefore be designed to minimise the footprint and visual impact. There would be an encroachment of up to 134m into the AONB.

3.1.62 New layby facilities would be provided on the proposed mainline in both eastbound and westbound directions to replace existing provision which would be lost due to the implementation of the scheme. Observation platforms will be included in the eastern most of the eastbound laybys and in the westbound layby

3.1.63 No lighting would be provided on the length of the scheme.

3.1.64 18 ponds are proposed at low points in the scheme to attenuate drainage and run-off from the road in order to manage the water quality before it is discharged into the surrounding watercourses. Shared and dedicated access tracks are proposed to be provided to the north and to the south of the road to facilitate access to ponds for maintenance purposes and to accommodate landowner movements.

3.1.65 Utility works would be required for electricity, water and communications providers services throughout the length of the scheme.

3.1.66 An east to west walking and cycle route is being provided along the length of this scheme, providing connectivity for users between Appleby and Brough. All pedestrian, cyclist and horse-rider facilities that would be severed by the scheme are to be reconnected via grade-separated crossings.

3.1.67 The MoD tank storage and refuelling compound would be demolished and replaced within the MOD's existing landscape compound located 600m to the east. The scheme would involve minor demolition works, such as roadside features, drainage and kerbing associated the existing A66 and other local roads.

Bowes Bypass

3.1.68 The Bowes Bypass scheme would closely follow the existing A66 alignment to the north of the village of Bowes over a length of 3km. The current line of the existing A66 would form the westbound dual carriageway, with a new adjacent eastbound carriageway constructed to the north.

3.1.69 The existing A66 to the west of Bowes passes through the North Pennines AONB. At the westernmost end of this scheme, the AONB boundary abuts the existing edge of pavement of the westbound A66 (i.e. the existing highway verge falls within the AONB boundary). Work to connect the new dual carriageway with the existing dual carriageway

falls approximately 10m within the AONB boundary at this location for a length of approximately 300m.

3.1.70 Clint Lane overbridge would be reconstructed to accommodate the upgraded (wider) A66 dual carriageway. This structure would be replaced like-for-like to ensure all access and existing facilities are maintained.

3.1.71 Lyndale Farm Underpass would be extended under the new carriageway to maintain access to Lyndale Farm.

3.1.72 At the junction with the A67, a bridge would carry the new eastbound carriageway over the A67. The eastbound diverge slip road would be relocated north to make way for the new eastbound A66 carriageway. Two new slip roads would accommodate traffic travelling to and from the east providing access to and from the A67 and Bowes village. The A67 would be widened at the junction to accommodate a new right turn lane for the eastbound on-slip. The existing westbound on-slip road would have minor improvements made to create a safer merge.

3.1.73 Ruins (former Bowes Railway Station) and a barn structure immediately north-east of the junction would be removed. Black Lodge Farm underpass would be extended to the north under the new eastbound carriageway.

3.1.74 Access from Bowes to the A66 (via the Roman road known as The Street, and locally known as Low Road) would be stopped up. The upgraded grade-separated Bowes junction would provide safer access to the A66 for local traffic.

3.1.75 The existing westbound layby to the west of the existing Low Road access would be relocated to the easternmost extent of the scheme.

3.1.76 East of Bowes an accommodation overbridge would be constructed to allow Low Broats Farm and High Broats Farm to have continued access to the A66 via the improved junction with the A67. Additionally, a parallel accommodation access would be provided to ensure Mid Low Fields Farm, East Low Fields Farm and Bowes Cross Farm have continued access to the A66 again via the improved junction with the A67.

3.1.77 The house at Low Broats Farm and three associated farm buildings are proposed to be demolished to facilitate the new eastbound carriageway.

3.1.78 Access to and from Hulands Quarry would be made safer by closure of the existing central reserve gaps on the A66 and by upgrading the junction geometry. The existing central reserve gap at Bowes Cross Farm would be closed, along with access from the premises onto the A66, in order to improve safety.

3.1.79 The scheme would include lighting provision, extending and in some locations replacing the current provision.

3.1.80 Six ponds are proposed at low points in the scheme to attenuate drainage and run-off from the road in order to manage the water quality before it is discharged into the surrounding watercourses. Shared and dedicated access tracks are proposed to be provided to the north and to

the south of the road to facilitate access to ponds for maintenance purposes and to accommodate landowner movements.

3.1.81 Utility works would be required for electricity, water and communications provider services throughout the length of the scheme.

3.1.82 The ruins of the former Bowes Station and Low Broats Farm buildings would be demolished. The scheme would involve minor demolition works, such as roadside features, drainage and kerbing associated with the existing A66 and other local roads.

Cross Lanes to Rokeby

3.1.83 The Cross Lanes to Rokeby scheme would mostly follow the 4.4km existing A66 alignment, with a new adjacent westbound carriageway constructed to the south between the B6277 at Cross Lanes and the existing Tutta Beck Cottage access. Both carriageways would then be routed to the south of the Old Rectory and St Mary's Church, re-joining the existing dualled A66 at Rokeby.

3.1.84 A new compact grade-separated junction would be constructed at Cross Lanes, west of the Organic Farm Shop and Café. An overbridge would carry a new single carriageway link between the B6277 Moorhouse Lane (to the north) and Rutherford Lane (to the south). Traffic would be able to leave and join the A66 via new priority junctions, maintaining all movements. The existing accesses from the B6277 and Rutherford Lane onto the A66 would be stopped up. Moorhouse Lane (to the south) would be stopped up and realigned to connect the new grade-separated Cross Lanes Junction.

3.1.85 Access to the Cross Lanes Organic Farm Shop and Café from the Cross Lanes Junction would be provided via the realigned Moorhouse Lane. An accommodation access would spur from Moorhouse Lane and run parallel to the A66, would lead to Birk House Farm.

3.1.86 Access to Ivy and Smithy Cottages, Cross Lanes Farmhouse and Streetside Farm would be provided by a connection to the new junction link road on the north. North Bitts Farm would also connect to the new Cross Lanes Junction via an accommodation access.

3.1.87 The junction at Cross Lanes has been designed to minimise impact upon existing woodland, land parcels and watercourses. Tutta Beck would be realigned through the Cross Lanes Junction.

3.1.88 Access to Poundergill would be maintained via Rutherford Lane.

3.1.89 The new A66 dual carriageway would mostly follow the existing A66 alignment between Cross Lanes and Rokeby junctions. Layby provision along this section would be maintained by the construction of new laybys serving the eastbound and westbound carriageways either side of Streetside Farm. Streetside Farm's existing access onto the A66 would be stopped up and an accommodation access parallel to the A66 (to the north), would lead to the Cross Lanes Junction.

3.1.90 The existing Tutta Beck Cottages access onto the A66 would be stopped up. Here, the new A66 dual carriageway would divert to the south of the Old Rectory before realigning with the existing A66 at

Rokeby. A new three arm compact grade-separated junction would be constructed west of the Old Rectory allowing westbound traffic to leave and join the A66, and eastbound traffic to leave the A66. The Rokeby Junction would be constructed in an underbridge arrangement with the westbound loop passing beneath the predominantly at grade A66. The junction has also been located to avoid impacts upon a number of veteran trees where possible, located to the north of the junction.

3.1.91 Accommodation accesses would spur off from the new Rokeby Junction to maintain access to Tutta Beck Cottages and Ewe Bank Farm (to the south) and Rokeby Grange (to the north).

3.1.92 The new Rokeby Junction would maintain HGV access to Barnard Castle via the C165 Barnard Castle Road.

3.1.93 The existing A66 would be de-trunked west of the Grade II* listed Church of St Mary along its length to the C165 Barnard Castle Road. A roundabout would manage traffic movements between the de-trunked A66, C165 and the new eastbound merge local to the Rokeby Park Registered Park and Gardens (RPG). A new eastbound merge would ensure all movements are possible at Rokeby (when the provision at Rokeby Junction is considered).

3.1.94 The existing access from Tack Room Cottage onto the A66 (to the south) would be stopped up. Access would be replaced via an accommodation access to the new Rokeby Junction. The access track has been designed with a 15m offset from Jack Wood Ancient Woodland to minimise impact to the woodland which is located directly to the south. The Tack Room Cottage existing access to/from Greta Bridge would be maintained. A new cycleway would connect Greta Bridge to the Tack Room Cottage access route, and thus the Rokeby Junction, allowing cyclists to travel to/from Barnard Castle and Greta Bridge more safely.

3.1.95 New layby facilities would be provided on the proposed mainline in both eastbound and westbound directions to replace existing provision which is lost due to the implementation of the scheme. Both laybys would include observation platforms.

3.1.96 No lighting would be provided on the length of the scheme.

3.1.97 Six ponds are proposed at low points in the scheme to attenuate drainage and run-off from the road in order to manage the water quality before it is discharged into the surrounding watercourses. Shared and dedicated access tracks are proposed to be provided to the north and to the south of the road to facilitate access to ponds for maintenance purposes and to accommodate landowner movements.

3.1.98 Utility works would be required for electricity, water and communications provider services throughout the length of the scheme.

3.1.99 No demolition of property is required as part of this scheme. The scheme would involve minor demolition works, such as roadside features, drainage and kerbing associated with the upgrading of the existing A66.

Stephen Bank to Carkin Moor

3.1.100 The 5km Stephen Bank to Carkin Moor scheme would comprise a new offline dual carriageway section between Stephen Bank and Carkin Moor Farm. The new dual carriageway would pass to the north of the existing A66 and the properties at Fox Hall and Mainsgill Farm, re-joining the existing A66 alignment to the east of Mainsgill Farm. The existing A66 would be de-trunked and would be used in part as a collector road for local access to surrounding villages and properties.

3.1.101 A new accommodation underpass would be provided to the north of Dick Scot Lane to allow access to land to the north of the scheme. This underpass would also allow the existing Hutton Magna 12 bridleway, which currently ends at the A66 to the west, to pass beneath the proposed A66 alignment.

3.1.102 New layby facilities would be provided on the proposed mainline in both eastbound and westbound directions to replace existing provision which would be lost due to the implementation of the scheme. Both laybys would include observation platforms

3.1.103 To maintain access to Collier Lane, a section of the existing A66 to the west of Ravensworth Lodge would be realigned over a distance of approximately 600m to facilitate connection to the new Collier Lane Overbridge. New drainage ponds would be provided to the west of Ravensworth Lodge and to the East of Fox Hall Cottages. The proposed alignment of the A66 in this location has been designed to be in cutting at this location.

3.1.104 Mains Gill Junction, which is a proposed new compact grade-separated junction to the west of Moor Lane, would provide connectivity between the de-trunked A66 and the proposed mainline of the new A66. This new junction is proposed to be placed in a cutting beneath the proposed alignment of the A66 and connects to the de-trunked A66 to the west of Mainsgill Farm.

3.1.105 The southern section of Moor Lane would be stopped up and the highway realigned to connect to the Mains Gill Junction link road. The existing bridleway 20.23/5/1, which currently ends at the A66, would be diverted to the west to allow it to be rerouted along the proposed realigned section of Moor Lane and beneath the A66 via Mains Gill Junction. It would then connect with a realigned bridleway 20.55/6/1 which passes to the south of the de-trunked A66 along the western boundary of Mainsgill Farm. The existing route of bridleway 20.55/6/1 which proceeds through the busy entrance of Mainsgill Farm would be extinguished as part of this diversion.

3.1.106 Two new drainage ponds are proposed to be provided in the vicinity of Mainsgill Farm, one to the western boundary and one to the north of the existing A66 alignment.

3.1.107 The proposed alignment passes through the current cutting formed by the existing A66 at the Carkin Moor Scheduled Monument. To minimise the impact on the monument, the vertical alignment of the road is

proposed to be lifted within the existing cutting and a retaining structure is proposed to be provided to the southern boundary.

3.1.108 The existing connection between the A66 and to Warrener Lane would be removed, and a new link provided between Warrener Lane and the de-trunked A66, allowing vehicles travelling from Hartforth to access the proposed A66 alignment via Mains Gill Junction. The alignment of this new link road is proposed so as to avoid the footprint of the scheduled remains of the Roman fort and prehistoric enclosed settlement at Carkin Moor.

3.1.109 A further 3 ponds would be provided at the eastern extent of the scheme in between the existing A66 and the new Warrener Lane link. One of these ponds is a replacement for an existing attenuation pond which is proposed to be removed to accommodate the earthworks needed for the scheme, whilst the other two offer storage for water run-off from both the A66 and also the new Warrener Lane link. Shared and dedicated access tracks are proposed to be provided to the north and to the south of the road to facilitate access to ponds for maintenance purposes and to accommodate landowner movements.

3.1.110 A new bridleway underpass would be provided to allow bridleway 20.30/8/1, which currently crosses the A66 at grade in the vicinity of the junction with Warrener Lane, to be grade-separated.

3.1.111 This new bridleway, which is to be provided alongside the de-trunked A66, would also be linked with the existing Hutton Magna 12 bridleway at the western end of the scheme.

3.1.112 Utility works would be required for electricity, water and communications services throughout the length of the scheme.

3.1.113 No lighting would be provided on the length of the scheme.

3.1.114 No demolition of property is required as part of this scheme. The scheme would involve minor demolition works, such as roadside features, drainage and kerbing associated with the existing A66 and other local roads.

A1(M) Junction 53 Scotch Corner

3.1.115 The A1(M) Junction 53 Scotch Corner scheme would widen the existing Middleton Tyas Lane approach at Scotch Corner roundabout from one lane to two lanes. A length of existing footway and existing signage and lighting columns would be relocated to the edge of the widened carriageway, and road markings would require amendment to tie in with the existing arrangement.

3.1.116 An additional lane would also be provided on the northern bridge of the circulatory carriageway, increasing the provision in this area to three lanes. No structural amendments are envisaged to be required to the existing structure to accommodate the additional lane. Some amendment to the existing traffic signal arrangement would be required to allow poles to be located in new verges.

3.1.117 Utility works would be required for gas, electricity, water and communications services throughout the length of the scheme.

3.1.118 No demolition of property is required as part of this scheme. The scheme would involve minor demolition works, such as roadside features, drainage and kerbing associated with the existing A66 and other local roads.

4 Strategic Base Model development

4.1 Overview

4.1.1 This section describes the base model development process and data sources used for the A66 dualling Project. This process has been undertaken in line with the DfT Traffic Analysis Guidance (TAG) and agreed with NH' Transport Planning Group, and through consultation with Stakeholders.

4.1.2 The modelling used throughout the Project is based on the Northern Regional Transport model (NRTM). The NRTM is one of five Regional Transport Models (RTM's) developed by NH for several purposes including:

- Assessing programme level strategies across the regions.
- To provide a starting point for the development of detailed scheme specific models, where networks, volumetric counts and availability of travel demand data can reduce the traffic modelling programme.

4.1.3 The A66 Traffic Model (A66TM) was originally developed at the early stages of this study, namely PCF[9] Stages 1 and 2. The work was undertaken between 2017 and 2019, to assess the options being considered for the Project. It was based on the NRTM and was built on data collected in or before 2015. All data was rebased (adjusted) such that the model represented conditions in a 2015 base year.

4.1.4 The traffic model has since been updated in PCF Stage 3 such that it is suitable to inform the DCO application. The RTMs are typically updated every five years to ensure they are based on the most up to date information available. Therefore, the Project team has taken the opportunity to update the base year model from 2015 to 2019 in parallel to the development of the second generation of the Regional Traffic Models (RTM2). 2019 represents the most recent year experiencing "normal" network conditions prior to the Covid-19 pandemic.

4.2 Model purpose

4.2.1 The traffic model has been developed to analyse the impact of the Project on traffic flows and journey times on the road network. The model has a focus on the area immediately affected by the Project, but it also covers the whole of Great Britain. It includes a representation of the road network and looks at where the demand for trips start and end, split into five user classes. Understanding patterns of travel for different user classes allows for the way the Project provides benefits to businesses and individuals to be assessed. The model is used to inform traffic forecasts for three modelled years: 2029 (opening year), 2044

[9] The Project Control Framework (PCF) is the framework that was launched by the then Highways Agency (now National Highways) and Department for Transport on 1st April 2008 to ensure that major improvement projects are delivered which meet customers' aspirations in a cost efficient and timely manner. The project lifecycle contains 8 stages, inclusive of stage 0. A project team typically has to go through these stages to successfully deliver the project. PCF stage 1 focuses on Options Identification, PCF2 on Option Selection, and PCF3 on Preliminary Design.

(intermediate year) and a horizon year of 2051, the furthest year that national travel demand projections are available.

4.3 Data Collection to Inform Statutory Consultation Design

4.3.1 Data collection to inform the development of the A66TM has been ongoing since the initial development of the NRTM in 2015.

4.3.2 A review of existing data and models from the NRTM identified a significant amount of existing information for the A66 corridor, but some additional data to support the Project was identified in relation to volumetric traffic data. Therefore, data collection was undertaken at various points between November 2017 and March 2019 as the study developed. The following data was collected:

- Automatic Traffic Counts (ATC)- collected over a period of two weeks at 27 locations within proximity of the A66 corridor, covering 24 hours, undertaken in November 2017
- Manual Classified Link Counts (MCC)- undertaken at 12 locations where ATCs could not be carried out due to the nature of the road location, over a period of 12 hours (07:00-19:00) on the same weekday- Thursday 23rd November 2017
- Manual Classified Turning Counts- undertaken at junctions along the A66 corridor over a period of 12 hours (07:00-19:00) on the same weekday- Thursday 23rd November 2017
- Recent volumetric and classified count data collected by Cumbria County Council for the update of the Penrith Traffic Model, used to improve the Penrith cordon in the A66TM (over a period of 12 hours, 07:00-19:00 collected in June 2018)
- Data collected in April 2019 of minor side road flows along the A66 corridor previously not available.

4.3.3 It should be noted that this project specific data has been retained within the modelling to inform the DCO application, given it will still be less than 5 years old at the time of submission. All data has been collected and processed in line with the guidance contained within TAG units M1.2[10] and M2.2[11]. Checks of the data have been undertaken to ensure that the data collected is representative. Factors have been applied to data where necessary to ensure it is representative of the model base year. Further information can be found in **Combined Modelling and Appraisal Report** (Document Reference 3.8).

4.3.4 Other data used within the model included:

- Demand data - existing origin-destination data from March 2015 collected as part of the NRTM
- Journey time data - March 2015 TrafficMaster data used for the development of the NRTM, covering the whole NRTM area
- Operational data - this included classified link and junction turning counts, video footage and additional signal timing data at the M6 J40

[10] TAG Unit M1.2 Data Sources and Surveys, DfT May 2020
[11] TAG Unit M2.2 Base Year Matrix Development, DfT May 2020

and A6/A66 junction at Penrith and A1(M)/A66 junction at Scotch Corner.

4.4 Data Collection to Inform the DCO Application

4.4.1 The commentary below provides details on what data collection has been possible since the start of the Covid-19 Pandemic in early 2020 in order to inform the DCO application. This section covers the following types of data:

- Traffic flow data
- Travel time data
- Origin destination demand data
- Network data.

Traffic flow data

4.4.2 The A66TM base year is 2019, in line with the RTM2 models and representing the most recent year experiencing "normal" network conditions prior to the Covid-19 pandemic. Traffic data has not been collected from the end of March 2020 to October 2021, and from December 2021 to February 2022 in line with TAG guidance. TAG Unit M1.2[12] states that *"surveys should typically be carried out during a 'neutral', or representative, month avoiding main and local holiday periods, local school holidays and half terms, and other abnormal traffic periods."* Traffic conditions during the above-mentioned periods are considered to be abnormal due to the disruption caused by the Covid-19 pandemic.

4.4.3 The model is based on observed data. The process to collect data and to use this within the model has been undertaken in line with the DfT's TAG and agreed with NH' Transport Planning Group, and through consultation with Stakeholders, such that it is suitable to inform the application.

4.4.4 Data has been collected and used based on an assumed hierarchy of counts. The hierarchy was developed based on the relative strengths of each data set which is discussed in TAG Unit M1.2. In line with the methodology applied for NRTM, a set of criteria has been applied to select which counts to use.

4.4.5 For the SRN, WebTRIS data has been used where possible. Where WebTRIS data was unavailable, other data sources (listed below) were considered in line with that for non-SRN roads. The following lists the hierarchy for non-SRN roads, whereby the counts higher up the hierarchy are used as a priority over counts further down:

- DfT ATC data. The DfT's road traffic statistics team have approximately 300 automatic traffic counters at locations on Great Britain's road network. The automatic traffic counters are permanent installations and record information including vehicle length and wheelbase, to classify vehicles.

[12] Dft Transport Analysis Guidance Unit M1.2 Data Sources and Surveys

- Local Authority data. Local authority traffic count data collected from Durham, Cumbria and the North East Combined Authority.
- March 2020 surveys. A data collection exercise was undertaken in March 2020 for two weeks by Nationwide Data Collection (NDC) and Advanced Traffic Research (ATR). The traffic count surveys were undertaken on non-SRN roads using automatic traffic counters.
- DfT MCC data. Approximately 8,000 manual traffic counts are carried out each year for the Department for Transport's road traffic statistics. The counts are conducted on a weekday by a trained enumerator, for a 12-hour period (7am to 7pm). The counts are carried out between March and October, excluding all public holidays and school holidays (as recommended in TAG Unit M1.2).
- Teletrac Navman data. Synthetic count data produced from anonymised fleet vehicle Global Positioning Service (GPS) data. By developing a relationship between Teletrac Navman data and known count locations, this relationship can be used to calculate traffic flows at a location where the flow is not known.
- RTM1 count data. Traffic count data collected as part of the development of NH Regional Traffic Model development (referred to as “RTM classic”).

4.4.6 Figure 4-1: 2019 A66TM RTM Count Locations shows the collated count dataset.

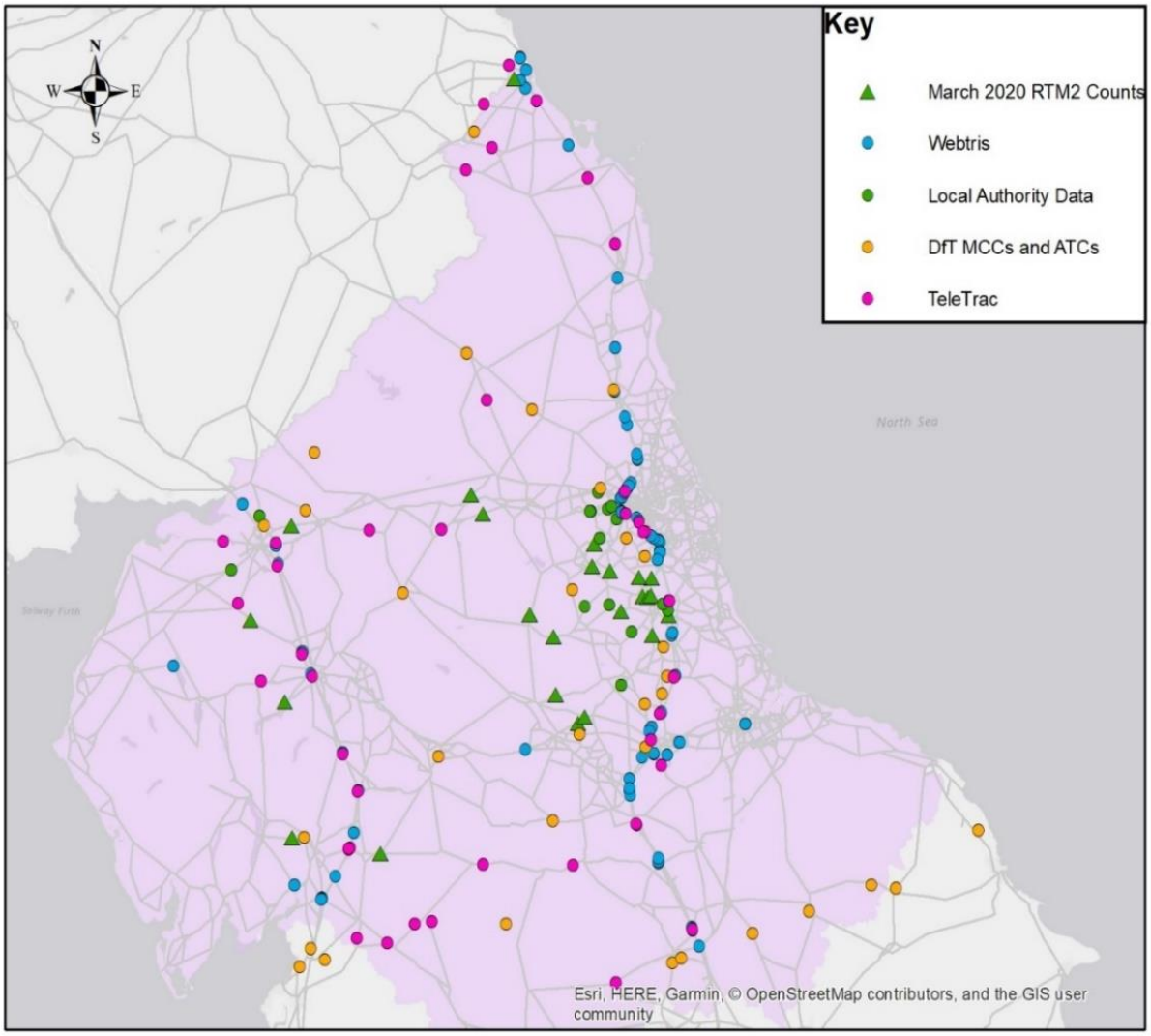

Figure 4-1: 2019 A66TM RTM Count Locations

Travel time data

4.4.7 Journey time data has been obtained from the DfT's Teletrac Navman GPS dataset for the North. The data contains average journey times for each link in the OS MasterMap Highways Network mapping product in 15-minute intervals and has been provided for the North England region for March, June and October 2019, for three representative (neutral) months.

Origin destination demand data

4.4.8 Travel demand data refers to the movements that people make in terms of their origins and destinations. Taken at an aggregate level, these movements form trip matrices which represent all movements within a network, often referred to as the trip distribution.

4.4.9 The need to update or check the continued validity of movements within the 2015 car matrices was recognised, given the prominence of this issue in TAG. The Covid-19 pandemic rendered any methodology involving Roadside Interview Surveys unviable.

4.4.10 A check of the 2015 movements within the A66TM was made against the March 2019 Mobile Network Data (MND) collected as part of the RTM update. This found that that the trip patterns within the modelled area were consistent. Given that there have been no significant developments within the area since 2015 that would significantly affect the patterns of movement on the A66, it was considered that the traffic distribution patterns from the 2015 data provided an appropriate starting point for the Stage 3 modelling work. The matrices have been grown from 2015 to 2019 using National Traffic Model (NTM) data taken from TEMPRO.

4.4.11 The base year HGV matrices were updated using observed 2018 freight movements based on available data supplied by Transport for the North and MDS Transmodal[13].

4.4.12 The base year Light Goods Vehicle (LGV) matrices have been updated to reflect 2019 movements. LGV data has been sourced from Teletrac Navman. This data is a record of the GPS movements from vehicles fitted with certain proprietary satellite navigation systems. Each record in the OD (Origin-Destination) dataset relates to a single trip from a Teletrac Navman vehicle. The data has been provided for the North England region for March, June and October 2019, representing three neutral (representative) months.

Network data

4.4.13 Network data has been provided in the form of digitised road network, taken from Ordnance Survey's Highways Network. This corresponds to the Teletrac Navman journey data provided by the DfT.

4.5 Modelling software

4.5.1 Model composition and software is based on the NRTM and keeps the same structure of a highway supply model built using SATURN (Simulation and Assignment of Traffic to Urban Road Networks) software and a variable demand model system which uses a combination of the DfT's DIADEM (Dynamic Integrated Assignment and DEmand Modelling) Variable Demand Modelling software and a bespoke graphical user interface (GUI) known as the National Highways Integrated Demand Interface (HEIDI).

4.5.2 SATURN operates as a static equilibrium highway assignment model which incorporates both simulation and assignment loops. The highway assignment model uses SATURN software version 11.4.07H.

4.5.3 DIADEM software is designed to enable practitioners to easily set up variable demand models. DIADEM provides a user-friendly method for setting up a multi-stage transport demand model and finding equilibrium between demand and supply, using the SATURN package as the supply model. The variable demand model uses the bespoke version of the software version developed specifically for NH.

[13] MDS Transmodal is a firm of transport economists which specialises particularly in freight modes of transport.

4.5.4 HEIDI is a bespoke programme developed to assemble trip end data and to organise and implement forecast model runs. HEIDI invokes a DIADEM run which in turn invokes SATURN. HEIDI version 6.2h has been used for the A66 forecast model runs.

4.6 Geographical coverage

4.6.1 Initial modelling of the full dualling of the A66 using the NRTM provided an indication of the extent of reassignment and hence a basis for determining the geographical coverage of the network and the differing levels of network detail required.

4.6.2 The network inherited from NRTM includes an area of simulation network, where detailed junction modelling is included, and buffer network, where the network representation is link based.

4.6.3 In order to inform the Statutory Consultation design, the extent of both the simulation area and buffer area within the A66TM were both retained from NRTM, however the simulation area was further subdivided to include fully modelled, intermediate and external areas containing different levels of simulation coding. This reflected the need to improve the network detail included within the fully modelled area of the A66TM. Detail coding was therefore added within the fully modelled area to reflect more local roads within the A66 corridor.

4.6.4 Whilst updating the A66TM to inform the DCO application, the A66TM has been refined. The model's geographical extent included the same area as the initial A66TM model; however, the Transport Reliability Area (TRA) was extended further north and south at either end of the A66 along the M6 and A1(M). This was revised to account for impacts from the schemes identified within the forecasting undertaken to inform consultation design. The TRA is shown in Figure 4-2**.**

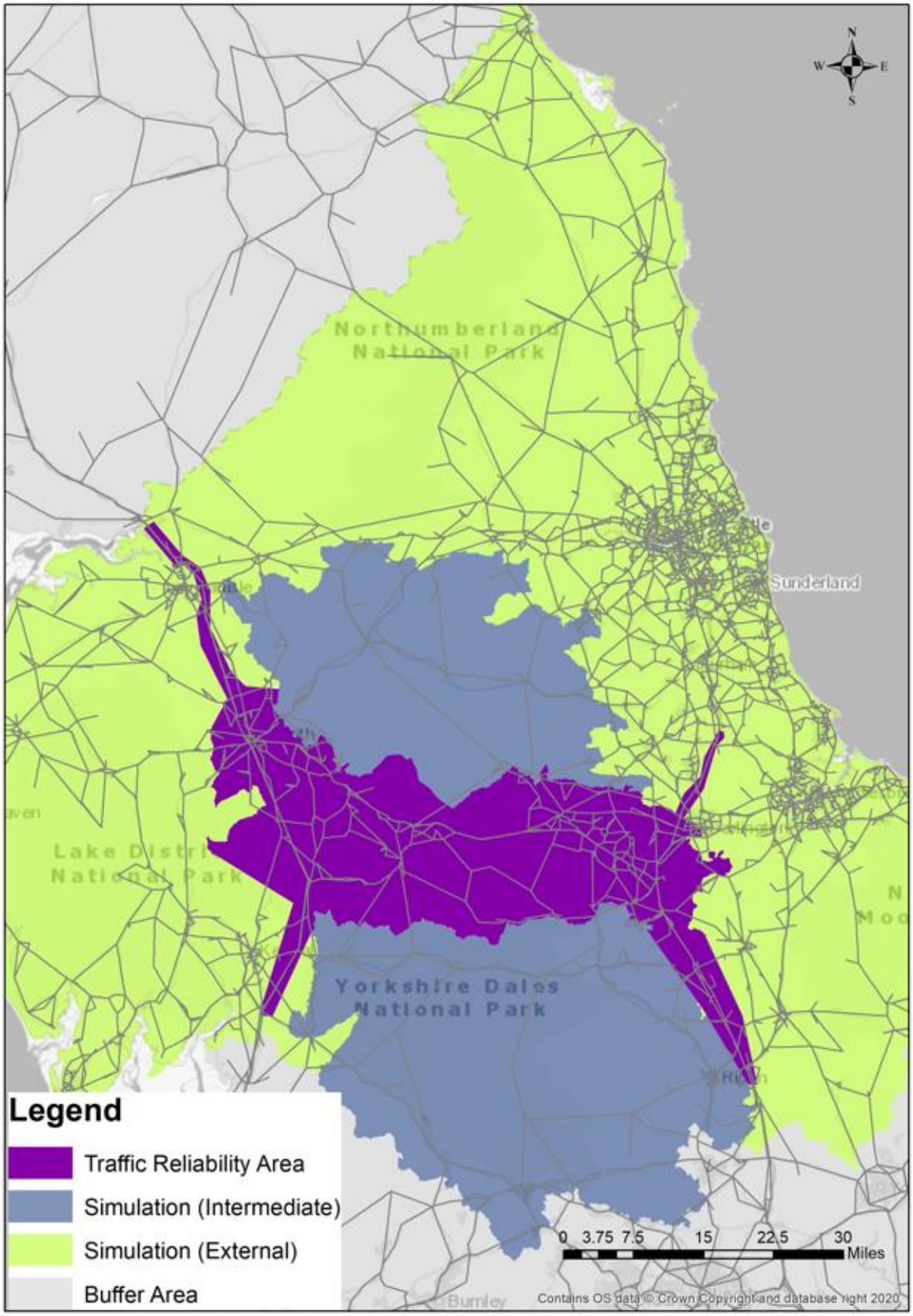

Figure 4-2: Stage 3 A66TM Modelled Area and Traffic Reliability Area

4.7 Time Periods and Demand Segmentation

4.7.1 The NRTM is based on two three-hour periods covering the AM and PM peaks together with a 6-hour interpeak. There is evidence that at the terminal junctions it is more appropriate to isolate the true AM and PM peak hours / periods, such that the traffic flow levels align with those within the operational models for the junctions, particularly at the M6 Junction 40. Therefore, the model time periods used within the A66TM update are:

- AM Peak Hour (08:00-09:00)
- Inter-Peak Period (10:00-16:00)
- PM Peak Average Hour (16:00-18:00)
- Off-Peak Period (19:00-07:00).

4.7.2 The base year model represents an average March weekday in 2019. Vehicle class definitions are from the COBA (COst Benefit Analysis) manual. The car user class is split into Car Commute, Car Employers Business and Car Other trips to allow for variations in the perceived costs of travel between different journey purposes. LGVs have all been assumed to be employer's business trips, and other goods vehicles (OGV1 and OGV2) along with Passenger Service Vehicles (PSV) have been combined with HGVs. As the number of PSVs picked up in the manual counts were so low it was assumed they would have a negligible effect combined with the HGV movements.

4.7.3 The highway assignment model user classes are as follows:

- User class 1 – Car, Employers Business
- User class 2 – Car, Commute
- User class 3 – Car, Other
- User class 4 – Light Goods Vehicles
- User class 5 – Heavy Goods Vehicles

4.7.4 The demand model also includes the following rail purposes:

- Rail – Commuting
- Rail – Other
- Rail – Employers Business
- (Goods vehicles are excluded from the demand model)

4.8 Highway Assignment Technique and Generalised Costs

Assignment procedures

4.8.1 The assignment procedure adopted for the highway model is based on an equilibrium assignment with multiple demand segments for an average hour in AM peak, interpeak and PM peak time periods.

4.8.2 The assignment technique uses Wardrop equilibrium assignment, achieved through the use of Franke-Wolfe user equilibrium algorithm in SATURN.

4.8.3 The assignment methodology includes the following:

- Path-based algorithm
- Blocking back

- Each time period is modelled as a standalone model with no interaction with the previous time period.

Assignment units

4.8.4 The assignment works across the multiple user classes with traffic flow measured in passenger car units (PCU) as defined below:

- Car and LGV = 1 PCU/vehicle; and
- HGV = 2.5 PCU/vehicle

4.8.5 This is consistent with the NRTM.

Generalised costs

4.8.6 The generalised costs within the assignment model are essential as they affect traffic routing on the road network. They are applied in the following form:

*Generalised Cost = Time + PPK/PPM*Distance + Toll*

4.8.7 Where PPM is Pence per Minute, and PPK is Pence per Kilometre.

4.8.8 An Excel workbook was provided by NH with source data which reflects the May 2021 v1.15 release of the TAG Databook.

4.8.9 Table 4-1 and Table 4-2 show the PPM and PPK generalised cost parameters used, which are all in 2010 prices.

Table 4-1: Value of Time Costs Parameters – PPM

Element	User Class	AM Peak	Inter Peak	PM Peak
Car	Employers Business	30.92	31.68	31.36
	Commute	20.73	21.07	20.81
	Other	14.31	15.24	14.98
LGV		22.41	22.41	22.41
HGV		44.63	44.63	44.63

Table 4-2: Vehicle Operating Cost Parameters – PPK

Element	User Class	AM Peak	Inter Peak	PM Peak
Car	Employers Business	12.55	12.55	12.55
	Commute	6.14	6.14	6.14
	Other	6.14	6.14	6.14
LGV		13.75	13.75	13.75
HGV		42.15	42.15	42.15

4.8.10 The costs used for the assignment are based on 2010 perceived prices (without taxation) and therefore, the toll charge for User Class 1 (employers' business) is lower than the cost for both commuting or other user class categories (UC2 and UC3). Additionally, toll charges for LGVs have been calculated using a weighted average of personal and freight trips based on Table A1.3.4 in the latest TAG Databook, giving a default proportional split of 12% for LGV personal and 88% for LGV freight.

4.9 Model Calibration and Validation

4.9.1 The A66TM prior matrices were created from the NRTM prior matrices, re-zoning demand to fit with the improved model representation along the A66 corridor. The NRTM prior matrices were developed using mobile phone data (referred to as MPOD) with short distance trips being infilled synthetically and regional adjustment factors applied to a achieve satisfactory starting position.

4.9.2 The A66TM was calibrated using matrix estimation. This was applied to refine the trip estimates across the various screen line and ad-hoc count site locations. Matrix estimation was undertaken as two separate runs in line with the NRTM and subsequent A66TM work. This included a blend consisting of a fully unconstrained and a constrained matrix estimation run as follows:

- Fully unconstrained matrix estimation for all OD pairs across all vehicle types.
- Constrained matrix estimation for cars with OD pairs frozen for skim distances greater than 20km. LGVs and HGVs remain unconstrained.

4.9.3 A blend of 30:70 was used to create the final assignment matrices (30% unconstrained, 70% constrained) from the pair of matrix estimation runs. By using a blend of matrix estimation runs, it ensured that changes due to matrix estimation were limited for long distance car trips.

4.9.4 The model validation process is summarised below as follows:

- Trip matrix validation
- Link flow validation
- Journey time validation
- Route choice validation.

4.9.5 The matrix validation results post matrix estimation are presented in Table 4-3, which shows the number (No.) and the percentage (%) of screen line sites meeting the validation criteria.

Table 4-3: Model Screenline Performance (All Vehicles)

Performance Measure	AM Peak		Inter-Peak		PM Peak	
	No.	%	No.	%	No.	%
All screenlines or cordons within 5% of observed flows	6	33%	11	61%	9	50%
All screenlines or cordons within 10% of observed flows	15	83%	16	89%	14	78%
All screenlines or cordons within GEH <4	9	50%	14	78%	10	56%
All screenlines and cordons with GEH <7.5	15	83%	18	100%	17	94%

Table 4-4: Model Link Performance Summary (All Vehicles)

Performance Measure	AM Peak	Inter-Peak	PM Peak
All Links (494)			
- within GEH of 5.0	60%	71%	68%
- within GEH of 7.5	80%	89%	85%
- pass cal/val guidance link criterion	85%	85%	85%
By Calibration/Validation			
Calibration Counts (341)			
- within GEH of 5.0	59%	71%	68%
- within GEH of 7.5	80%	90%	86%
- pass cal/val guidance link criterion	85%	85%	85%
Validation Counts (153)			
- within GEH of 5.0	62%	72%	70%
- within GEH of 7.5	80%	90%	88%
- pass cal/val guidance link criterion	85%	85%	85%
By Road Type			
SRN link Counts (230)			
- within GEH of 5.0	63%	74%	70%
- within GEH of 7.5	80%	90%	86%
- pass cal/val guidance link criterion	85%	85%	85%
Non-SRN link Counts (264)			
- within GEH of 5.0	57%	67%	66%
- within GEH of 7.5	81%	88%	85%
- pass cal/val guidance link criterion	85%	85%	85%

4.9.6 The journey time results are presented in Table 4-5 which shows the number (No.) and the percentage (%) of routes meeting the validation criteria.

Table 4-5 Journey Time Validation Summary

Road Class	Number of routes	AM Peak		Inter Peak		PM Peak	
		No.	%	No.	%	No.	%
SRN	14	14	100%	14	100%	14	100%
Non-SRN	20	20	100%	20	100%	20	100%
Total	**34**	**34**	**100%**	**34**	**100%**	**34**	**100%**

4.9.7 In summary, the validation results demonstrate that the model performs well against TAG criteria.

4.10 Variable Demand Modelling (VDM)

4.10.1 TAG Unit M2 provides guidance on the need for variable demand modelling and the modelled approach was undertaken in accordance with this guidance. Given the scale of the Project and the estimated cost, there is a need to include the impacts of variable demand.

4.10.2 The variable demand modelling system developed for the A66TM is largely unchanged from that developed for the NRTM. Changes are limited to updating it and recalibrating it to reflect the improved A66TM networks and zonings systems and recalibrated demand. The reasoning

behind the specification of the structure of the VDM are contained in the NRTM Model Development Report[14] and remain valid for the A66TM.

4.10.3 The VDM model applies to the entire modelled area (simulation and buffer area) and predicts the key traveller responses of:

- Mode Choice (between Car Available Car Users and Rail)
- Destination Choice (a change of origin and or to destination)
- Macro Time of Day Choice (MTOD) (a change of time period in which travel is made).

4.10.4 Public Transport supply and demand is represented as inter-urban rail travel only, as it was considered to be the main competitor to car travel when the RTM's were developed. This assumption and its representation in the model have been retained for the A66TM.

[14] North Regional Model, Model Validation Report, National Highways, March 2017

5 Strategic Forecast Model development

5.1 Overview

5.1.1 Forecasting the impact of transport projects including option testing and appraisal involves running traffic models with different sets of precautionary assumptions. The Project follows advice from DfT. In July 2020 DfT issued *'Appraisal and Modelling Strategy: A route map for updating TAG (Transport Analysis Guidance) during uncertain times'*. The Appraisal and Modelling Strategy route map sets out the DfT's approach to appraisal in a time of change. Amongst many issues, the Route Map considers both long term Office for Budget Responsibility (OBR) growth revisions issued in March 2020 at the time of the budget, and growth revisions issued in July 2020 in their Fiscal Sustainability Report in response to Covid-19 impacts in the period up to 2025. These revisions in tandem represent a significant reduction in growth compared to any previous OBR update. An appraisal update was issued in November 2021, which provided minor updates to the appraisal parameters issued in July 2020. The November 2021 parameters have therefore been used within the modelling to inform the DCO application.

5.1.2 It should be noted that the appraisal update issued by DfT also accounts for the department's latest view on likely technology changes within the forecast years. Most pertinently this reflects anticipated changes to the vehicle fleet in terms of the mix of fuel types and fuel efficiency.

5.1.3 The NTPR Strategic Study identified nine route options. These nine options were assessed and appraised using the NRTM. Two end-to-end options for the A66 route were identified as the preferred route.

5.1.4 In order to inform the consultation design, the A66TM (A66 Traffic Model) was developed. This work was undertaken between 2017 and 2019, to assess the options being considered. It was based on the NRTM and had a 2015 base year. Further economic appraisal, including analysis of factors such as journey times, road safety and route resilience was also undertaken. A preferred route was identified and modelled using the A66TM, the results of which (in terms of modelled traffic forecasts) were presented for Statutory Consultation within the **Local Traffic Report**.[15]

5.1.5 Two scenarios have been developed for the forecast modelling work:

- The Do Minimum (DM) – reflects forecast conditions in the assessment year including all committed developments and with forecast year population in place.
- The Do Something (DS) – reflects the Do Minimum (DM) forecast but with the addition of the A66 Northern Trans-Pennine Route Project.

5.2 Forecast year matrix development

5.2.1 TAG Unit M4 – Forecasting and Uncertainty provides guidance for forecasting the impact of transport projects including option testing and appraisal. In transport scheme appraisal, modelling is used to establish

[15] National Highways - A66 Northern Trans-Pennine Project Local Traffic Report.

the difference between two forecasts, namely the DM and DS scenarios. In order to do this an understanding of errors and associated uncertainty and what impact this may have on the analysis is required.

Forecast years

5.2.2 The following forecast traffic model years have been defined based on information provided for the Project construction and data availability for predicting future demand:

- 2029 – opening year
- 2044 – intermediate year, 15 years post construction
- 2051 – horizon year[16] for use in the economic assessment.

Uncertainty log

5.2.3 An uncertainty log is required for transport model forecasting. The purpose of an uncertainty log is to record the central forecasting assumptions that underpin the core scenario, as well as uncertainty around those central assumptions. The uncertainty log should summarise all known uncertainties in the modelling and forecasting, listing each source of uncertainty together with the following information:

- The core scenario assumptions, describing development and infrastructure assumptions for the central case
- The likelihood that the scheme or development will go ahead
- The range of assumptions around each input or parameter.

5.2.4 The initial data collection concentrated on interrogation of the planning portals to obtain submitted planning applications in all nearby Local Authority Districts for all live applications, including applications approved in the last three years and potential developments up to local plan horizon years, or 2035 in the case of the TfN list of developments. Any built schemes along the A66 corridor since 2019 were identified and also included. Table 5-1 shows the information sources used to collect the uncertainty log data.

Table 5-1: Information Sources for Developments

Local Authority	Sources
Cumbria County Council	Strategic Economic Plan, Cumbria LEP Infrastructure Plan. Additional input from Eden District Council Local Plan, Carlisle District Local Plan, Copeland Borough Council Local Plan, Barrow in Furness Draft Local Plan
North Yorkshire County Council	Online planning portals, submitted planning applications, live and approved in the last three years. Additional input from Richmondshire District Council
Durham County Council	County Durham Plan – preferred options document, SHLAA
Darlington Borough Council	Darlington Employment Land Review, LDF Core Strategy, SHLAA

[16] 2051 is the furthest year that national travel demand projections are available.

Local Authority	Sources
Hartlepool Council	Hartlepool Employment Land Review
Stockton Borough Council	Stockton Local Plan
Redcar and Cleveland Borough Council	South Tees Regeneration Masterplan
Middlesbrough Council	Middlesbrough Local Plan
Tees Valley Combined Authority	Strategic Infrastructure Plan
South Lakeland District Council	South Lakeland Local Plan
Gateshead Borough Council	Core Strategy and Urban Core Plan, Making Spaces for Growing Places
North Tyneside Council	North Tyneside Local Plan
Sunderland City Council	Sunderland Local Plan
Newcastle City Council	Core Strategy and Urban Core Plan, Newcastle Employment Land Review, SHLAA, Benwell Scotswood Area Action Plan
Transport for the North (TfN)	Draft Strategic Transport Plan, TfN Development Log

5.2.5 Updates were then applied using the latest information from the following sources:

- Local Development Plans and Planning portals
- Council and NH websites
- TfN development and infrastructure interventions Logs.

5.2.6 To ensure accuracy the uncertainty log was issued to Cumbria County Council (incorporating feedback from the district councils within Cumbria), Durham County Council, North Yorkshire County Council, Richmondshire District Council and Tees Valley Combined Authority (representing the councils within the Tees Valley) for their review and to update with any additional strategic sites not yet included. Responses were received from all and updates incorporated as appropriate.

5.2.7 All development data was entered with details of the data source, development location, planning reference, size, planning status and predicted trip generation provided where available.

5.2.8 An estimation of the number of jobs for each development was required so that development sites could be filtered by size when identifying sites for inclusion in the core scenario and for the subsequent calculation of trip generation during the demand modelling process. Information collected on employment sites recorded in the uncertainty log generally covered development type and development size, (based on floor space size), but not necessarily the number of jobs. Therefore, a consistent approach was applied across all employment sites based on the site area and employment type categories.

5.2.9 For each employment site job numbers were derived by taking the gross external area and converting to gross internal area, and then net floor

area using factors developed from TRICs[17] (Trip Rate Information Computer System) data. The net floor area per employment type was then used to calculate the total number of jobs using data from the "Homes & Communities Agency – Employment Density Guide – 3rd Edition – November 2015".

5.2.10 For developments within the Core Area (see 5.2.12 below), Transport Assessments were collated, and their trip generation information recorded to incorporate more accurate trip data.

Core scenario

5.2.11 The complete uncertainty log contains all the sites identified in the data collection process regardless of certainty level, geographical location or size. In selecting development sites for inclusion in the core scenario, filters were applied as follows:

- Level of Certainty – Filter applied in line with TAG, (Near Certain or Reasonably Foreseeable).
- Geographical Location – Filters were applied to sites geographically to select those within the core boundary, noting that for development sites remote from the scheme, there would be little difference in traffic impact if these schemes were explicitly represented in the model or included as part of the overall TEMPRO growth.
- Size of Development – Similarly, filters were applied based on the size of individual development and whether it was 'big enough'[18], noting that for developments that did not generate significant traffic there would be little difference in traffic impact if these schemes were explicitly represented in the model or included as part of the overall TEMPRO growth.

5.2.12 For selection of core scenario developments, a boundary was drawn up based on a combination of development density, Local Authority districts and geographical proximity to the A66. The areas have been categorised as:

- Core area – the A66 corridor largely including the south-west part of County Durham comprising Barnard Castle and the Borough of Darlington, Richmondshire District and the Eden District of Cumbria (shown in Figure 5-1).
- Wider area – area outside of the core area (largely including Cumbria, County Durham, Northumberland and Local Authorities in Tyne & Wear and the Tees Valley).

5.2.13 Size criteria for developments based on number of households for residential developments or jobs for employment developments were established. In developing the criteria, consideration was given to the level of trip generation that might impact on the A66 corridor traffic.

5.2.14 Figure 5-1 shows both the core scenario developments and other developments included in the uncertainty log, the core boundary. Those

[17] http://www.trics.org/system.html
[18] For details on the criteria used please see **3.8 Combined Modelling and Appraisal Report**

that are included within the Core Scenario are both large enough to be considered and are likely enough to come forward (see 5.2.11).

5.2.15 Figure 5-2 and Figure 5-3 show all core area employment and residential developments. The full list of all development sites in the uncertainty log is shown in **Appendix A – Development Uncertainty Log**.

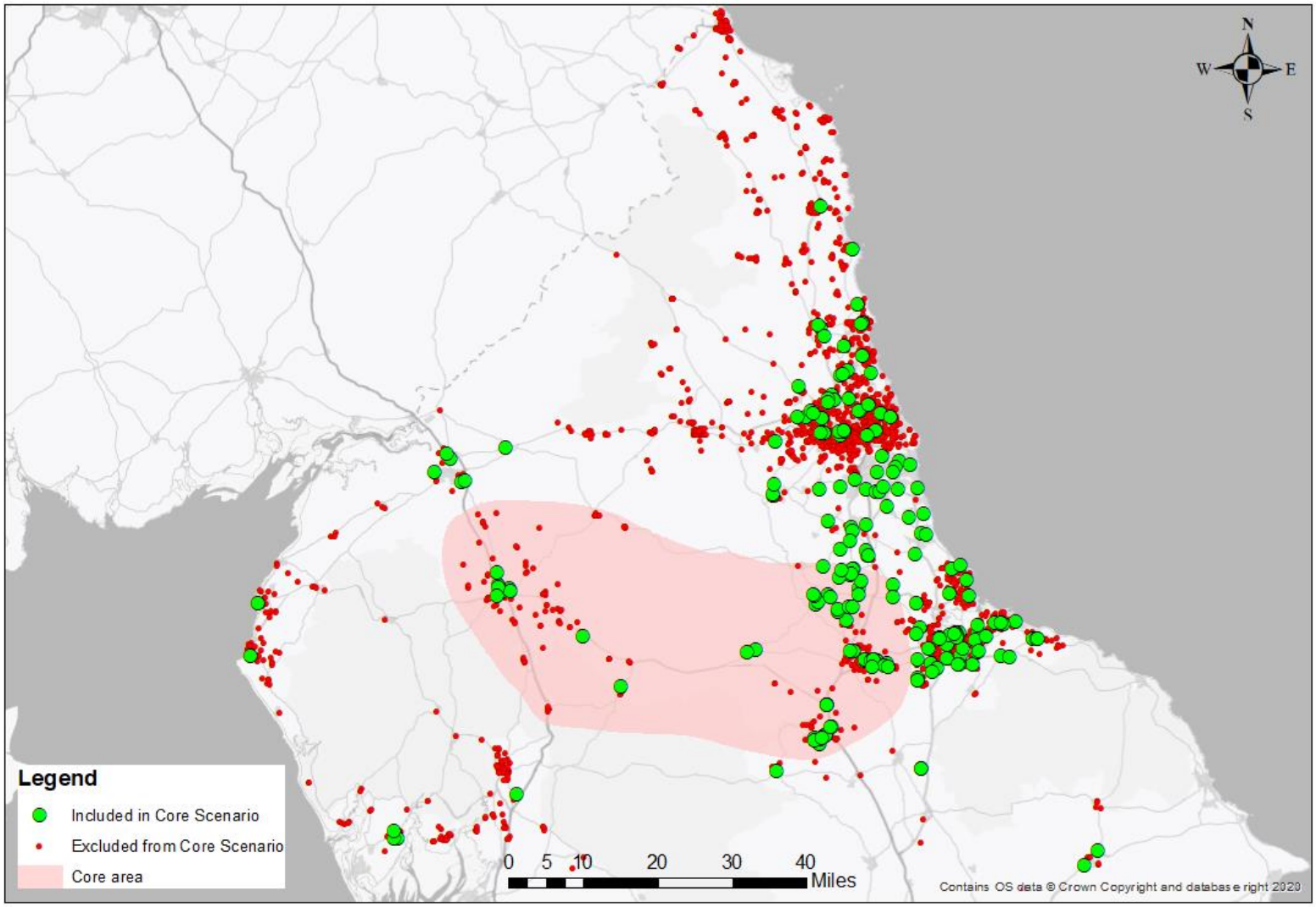

Figure 5-1: All Uncertainty Log Developments

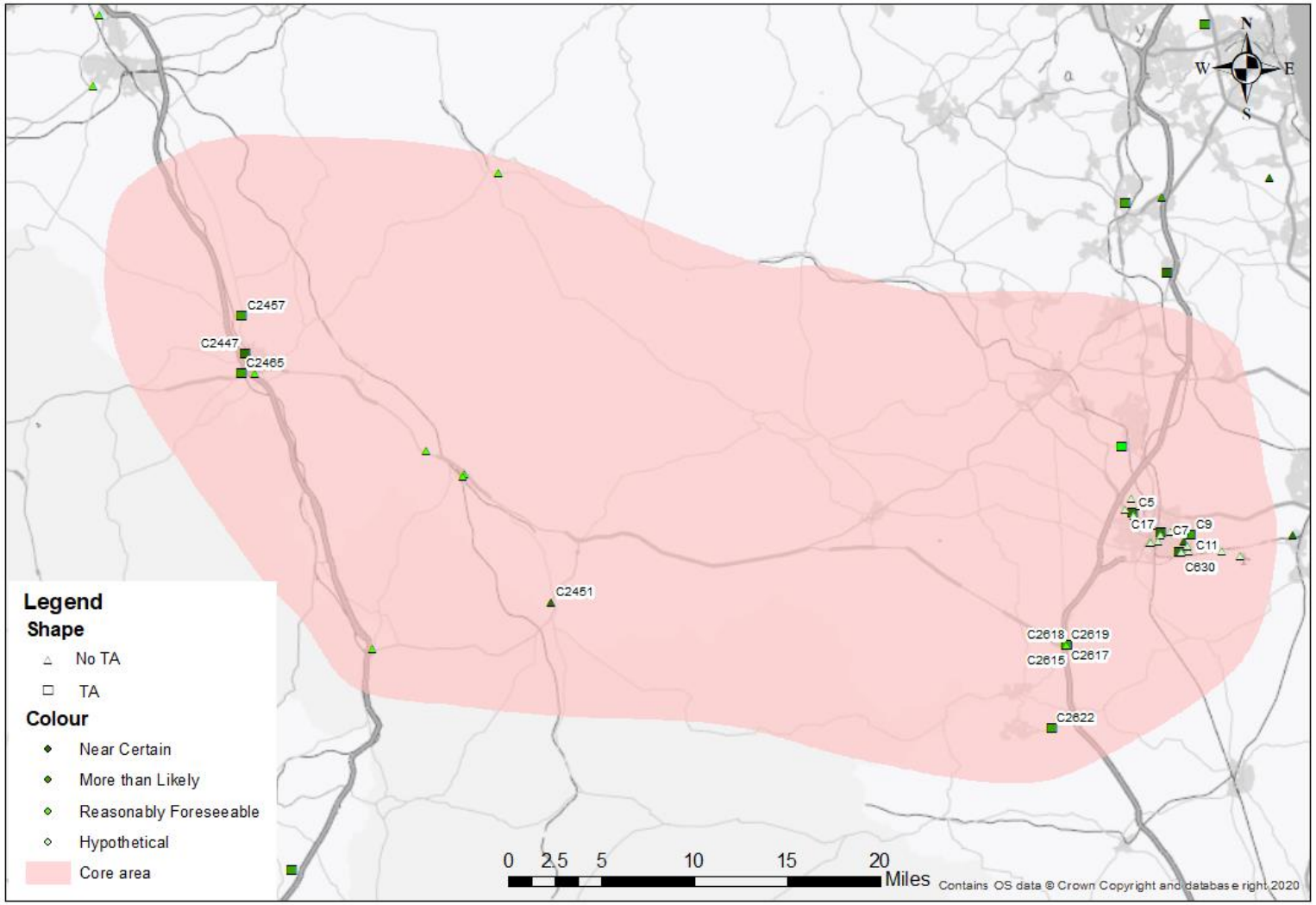

Figure 5-2: Core Area Employment Developments

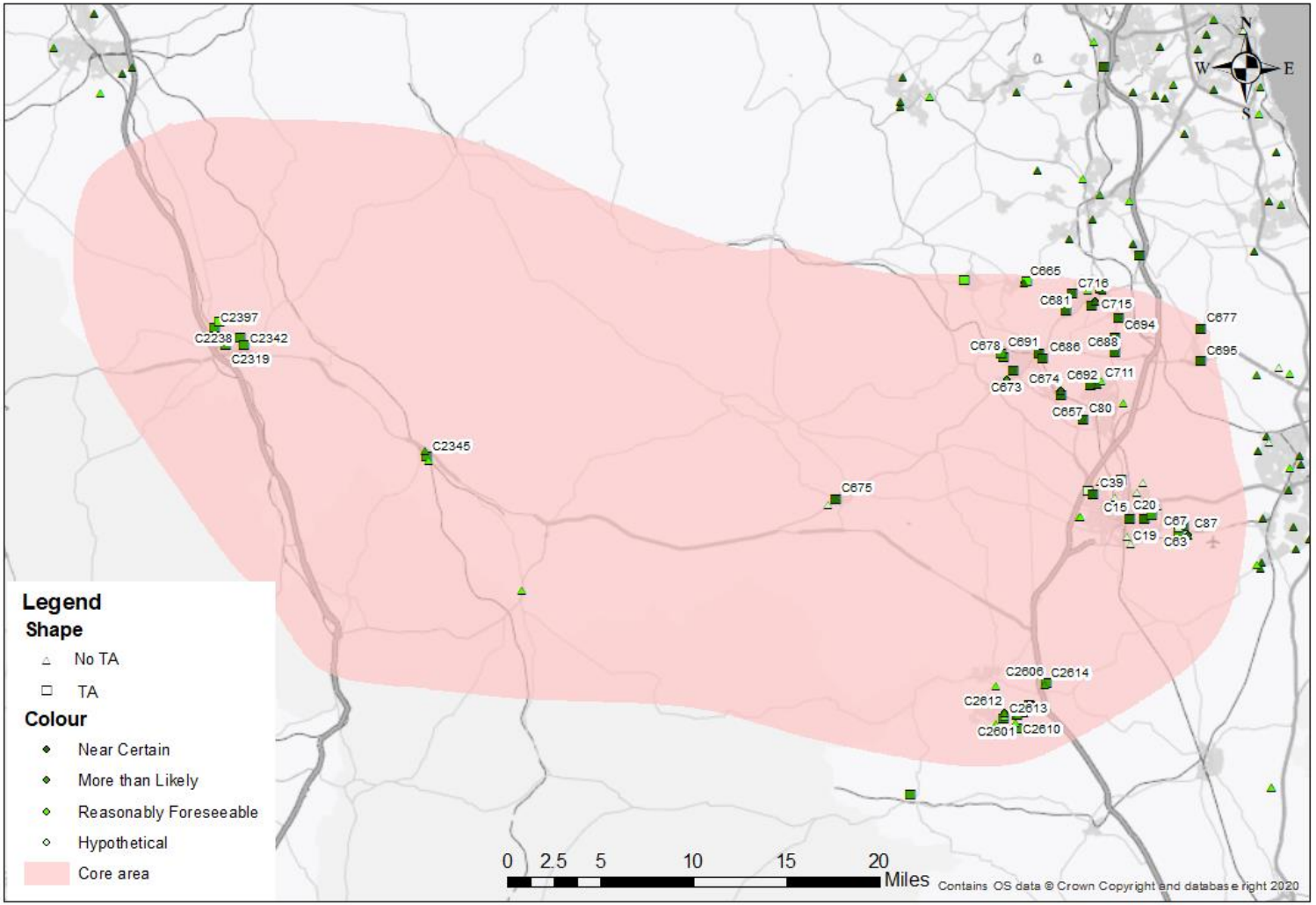

Figure 5-3: Core Area Residential Developments

Development trips

5.2.16 Trips for developments selected to be explicitly represented in the model forecast demand have been included as follows:

- Trip generation – establish the number of trips produced or attracted to a development site based on quantum of households or jobs.
- Trip distribution – distribute the development trips across the model zone system, based on existing distributions within the model.
- Constraining to Balancing Areas – controlling overall trip growth so that the development and background trips comply with National Trip End Model (NTEM) growth forecasts. The NTEM control is applied using designated balancing areas.

5.2.17 An extensive data collection exercise was undertaken to collate the TA information for each of the developments listed in the uncertainty log. Where available, forecast trip levels were generally only provided for the peak hours. Therefore, where TAs were available, NTEM trip rates for the respective developments were scaled to align with that forecast by the detailed assessments. The trips forecast for each development considered can be found in **Core Scenario Development Trip Generation** in **Appendix A – Development Uncertainty Log**.

5.2.18 To distribute the generated trips, developments were assigned to model zones primarily based on their location. Where a site area covered multiple zones, a single zone was chosen based on land usage composition being most like the development. The distribution from these assigned zones was then used to distribute the trips using a SATURN based approach taking distribution proportions from the base matrix.

5.2.19 Due to the large trip generation expected, the Eden 41 Business Park and Scotch Corner Designer Outlet were deemed too large and close to the Project to load onto an existing zone, without the supporting existing network connectivity. Two new zones were therefore created specifically for these developments. The trip distributions for these new zones were sourced from multiple nearby zones providing distribution compositions considered similar in land usage to the respective developments.

5.2.20 For the Scotch Corner Retail Park, the trip distribution is based on multiple donor zones selected nearby to the site covering a mix of rural and urban locations, including Darlington town centre, to reflect the different trip patterns that would be expected at the site.

5.2.21 Balancing areas were used to control the background growth to a level which results in an overall growth, including the development trips, in line with NTEM. Balancing areas are collections of zones, in this case representing grouped district areas, where the demand will be constrained to an overall growth level for each forecast year.

Reference Forecast Demand and Supply

5.2.22 The DfT NTEM provides growth figures for trip origin and destination (or production/attraction[19]). The forecasts consider population, employment, housing, car ownership and trip rates. NTEM v7.2 has been used for the Stage 3 model forecasting to calculate growth factors for both car and rail uses.

5.2.23 Freight growth factors for goods vehicles are based on Road Traffic Forecasts (RTF) 2018 Scenario 1 which uses central projections of GDP, fuel price, and population. RTF data is provided on a five-yearly basis from 2015 to 2050. Factors for the modelled years were calculated by interpolating the RTF data.

Combined reference forecast demand

5.2.24 The reference forecast refers to the forecast demand growth factors being applied to the base demand but without taking account of changes in cost which are later included through VDM. These matrix totals are presented in Table 5-2, Table 5-3 and Table 5-4 below.

Table 5-2: Highway Reference Forecast Demand - AM Peak (pcu/hr)

Vehicle type/ purpose	2019 Base	2029 Ref	Growth %	2044 Ref	Growth %	2051 Ref	Growth %
EB	579,018	618,377	6.8%	675,028	16.6%	703,389	21.5%
Commute	3,302,016	3,500,883	6.0%	3,785,833	14.7%	3,924,863	18.9%
Other	1,646,480	1,815,335	10.3%	2,029,278	23.3%	2,125,006	29.1%
LGV	751,106	842,229	12.1%	1,009,005	34.3%	1,065,760	41.9%
HGV	284,138	283,591	-0.2%	294,772	3.7%	300,131	5.6%
Total	6,562,758	7,060,415	7.6%	7,793,917	18.8%	8,119,149	23.7%

Table 5-3: Highway Reference Forecast Demand – Inter Peak Peak (pcu/hr)

Vehicle type/ purpose	2019 Base	2029 Ref	Growth %	2044 Ref	Growth %	2051 Ref	Growth %
EB	508,367	542,564	6.7%	591,676	16.4%	616,210	21.2%
Commute	1,300,580	1,379,132	6.0%	1,491,595	14.7%	1,546,497	18.9%
Other	2,918,620	3,219,595	10.3%	3,599,782	23.3%	3,769,546	29.2%
LGV	561,879	630,230	12.2%	755,024	34.4%	797,483	41.9%
HGV	267,153	266,621	-0.2%	277,128	3.7%	282,166	5.6%
Total	5,556,599	6,038,142	8.7%	6,715,204	20.9%	7,011,902	26.2%

[19] Home-based trip ends are split by production (home) and attraction (the reason for travel). Across a suitably large geographical area, it is usually best to scale the attractions to match the productions, as the productions are based on the most relevant and reliable data (resident population) and the fit of production trip ends to planning assumptions is usually better.

Table 5-4: Highway Reference Forecast Demand - PM Peak (pcu/hr)

Vehicle type/ purpose	2019 Base	2029 Ref	Growth %	2044 Ref	Growth %	2051 Ref	Growth %
EB	605,848	646,883	6.77%	705,853	16.51%	735,365	21.38%
Commute	2,716,123	2,880,057	6.04%	3,114,865	14.68%	3,229,375	18.90%
Other	3,225,905	3,561,127	10.39%	3,984,065	23.50%	4,172,809	29.35%
LGV	546,359	612,634	12.13%	733,940	34.33%	775,217	41.89%
HGV	199,293	198,917	-0.19%	206,783	3.76%	210,551	5.65%
Total	7,293,528	7,899,617	8.31%	8,745,506	19.91%	9,123,317	25.09%

5.2.25 Input and output model growth by vehicle type/ purpose for each forecast year is shown below in Table 5-5, comparing trip growth from NTEM or RTF (input trip growth) and the trip growth from the SATURN reference matrices (output trip growth), across the full model. The table shows the growth in the reference case matrices align with that in the respective forecast at a national level.

Table 5-5: Input and Model Vehicle Trip Growth

Vehicle type/ purpose	2029		2044		2051	
	NTEM/ RTF	Model	NTEM/ RTF	Model	NTEM/ RTF	Model
Car – EB	6%	7%	15%	16%	20%	21%
Car – Commute	5%	6%	14%	15%	18%	19%
Car – Other	9%	10%	22%	23%	28%	29%
LGV	12%	12%	34%	34%	42%	42%
HGV	1%	0%	7%	4%	9%	6%

5.3 Forecast year networks development

The Do Minimum (DM) forecast networks reflect the Base 2019 year but with the addition of the Core Scenario schemes in Table 5-6 from the Uncertainty Log and are included in all forecast years.

Table 5-6: Schemes included in Forecast Models

Scheme name	Description	Opening year
	RIS1 Highways England Schemes	
A19/A1058 Coast Road	Upgrade to fully grade separated three level interchange serving the A19 and A1058 Coast Road	2019 (April)
A19 Testos	Full grade separated junction with flyover for the A19	2021
A1 Northumberland	Alnwick to Ellingham and Morpeth to Felton dualling	2024
A1 Northumberland Mousen Bends	Dualling of 3-mile section between Belford and Adderstone incorporating the Mousen Bends	2028
A1 Scotswood	Widening within the existing highway boundary to three lanes between junctions	2022/23
A1 Birtley to Coal House	Improving 4 miles of the A1 by widening of the carriageway between junctions 65 (Birtley) and 67 (Coal House)	2024/25
A19 Norton Wynyard	Widening of the A19 between Norton and Wynyard in both directions from two to three lanes	2022
A19 Downhill Lane	Construction of a new bridge to the south of the existing A1290 bridge across the A19	2022

Scheme name	Description	Opening year
A69 Junction Upgrades	Grade separate Bridge End and Styford Roundabout at Hexham and Corbridge to make route between Newcastle and Hexham fully grade separated.	2022 (Hexham)
A19 Elwick Closures	Safety improvements on the A19. Gaps closed that previously allowed right turns at Elwick North, Elwick South and Dalton Piercy on the A19	2019 October
	Local Highway Schemes	
A167 Sunderland Bridge	A167/B6300 Sunderland Bridge Improvement. T-junction replaced with roundabout	2020
Carlisle Southern Link Road	New road connecting Junction 42 M6 with the A595 to the West. Route will include new junctions linking existing radial routes into Carlisle and the Garden Village	2024
Cumbria – Brigham Broughton	Upgrade to replace staggered junction at Broughton Brigham on A66 with a four-arm roundabout	2026
Northallerton Link Road	New link road and overbridge to join two new developments at Northallerton	2022
Wallsend Road, Howdon	New signals at Wallsend Road/Howdon A19 junction	2020
J40 and Kemplay Bank signal improvements	Junction improvements at M6 J40 and Kemplay Bank	2028
Whitehouse Farm North Tyneside	Circulatory carriageway widening on the A188/A189 roundabout and new signalised crossing points	2022
South Tees Improvements	Improvements to South Tees site access points, Trunk Road, Dockside Road, Cargo Fleet Roundabout, Southern Cross Improvements Stainton Way/Dixons Bank, Stainton Way Western Extension, A19 Mandale Interchange and Mandale Roundabout, Longlands to Ladgate Lane, Eston Road Signals	2029 onwards

5.3.1 The Do Something (DS) network reflects the Do Minimum (DM) forecast network but with the addition of the A66 Northern Trans-Pennine Route Project Route which is divided into 9 sections, as shown in Table 5-7.

Table 5-7: A66 Corridor NTPP Assumptions

Scheme Number	A66 Corridor Location	Description
0102	M6 Junction 40 to Kemplay Bank	Three-lane circulatory and signalised flared four lane junction approaches Introduction of an Underpass at the Kemplay Bank Junction. Section between Junction 40 and east of Kemplay reduced to 50mph
03	Penrith to Temple Sowerby	Online dualling between Penrith and Temple Sowerby.
0405	Temple Sowerby to Appleby	Primarily offline dualling around Kirkby Thore and Crackenthorpe.
06	Appleby to Brough	A mix of both online and offline dualling between Appleby and Brough

07	Bowes Bypass	Online dualling with a new Bridge on the Bowes Bypass
08	Cross Lanes to Rokeby	Mostly online dualling between Boldron and Greta Bridge. Cross Lanes junction west of Moorhouse Lane and Rokeby junction west of Rokeby Park.
09	Stephen Bank to Carkin Moor	A mix of online and offline dualling between Smallways and Forcett Lane. Westbound merge provided at Browson Bank
11	A1(M) Junction 53 Scotch Corner	Minor upgrades to junction

6 Operational Model Development

6.1 Overview

6.1.1 The purpose of operational junction modelling is to assess in detail the operational impacts on the network of the Project during normal operation, this chapter will provide a summary of the operational model development. Operational assessments were carried out at some of the key junctions on and around the Project.

6.1.2 Section 6.2 and Section 6.3 provides an overview of the detailed microsimulation modelling which has been undertaken for the following major interchanges:

- M6 Junction 40 and Kemplay Bank roundabout
- A1(M) Scotch Corner

6.1.3 Vissim modelling software has been used for the assessment of these junctions.

6.1.4 Operational models have also been developed at a number of other locations along the route and within the surrounding area impacted by the Project. The location and development of these models are discussed further in Section 6.4.

6.1.5 Assessment has been undertaken for the following:

- 2019 Base year
- 2044 DM forecast year
- 2044 DS forecast year

6.2 M6 Junction 40 and Kemplay Bank

Model Characteristics

6.2.1 The model of the junctions has been developed using the PTV Vissim traffic modelling software (version 11) and prepared in accordance with the relevant sections of TAG Unit M3-1.

6.2.2 The model includes Junction 40 of the M6 and Kemplay Bank roundabout, which are located in close proximity. Junction 40 is a grade separated roundabout and Kemplay Bank is a large at-grade roundabout. Both junctions are signal controlled and positioned towards the southern edge of Penrith, with strategic and local significance. The full extent of the model is shown in Figure 6-1.

6.2.3 The signal control at both roundabouts is simulated using PCMOVA.

6.2.4 Survey data has been profiled into 15-minute intervals and assigned through the model using staticrouting, using a November 2017 base year[20], covering two evaluation modelling periods:

- AM Peak Period (07:30-09:30)
- PM Peak Period (16:30-18:30)

[20] The Covid pandemic precluded the collection of any representative traffic data in 2020 or 2021, therefore the base year of 2017 for these models was retained.

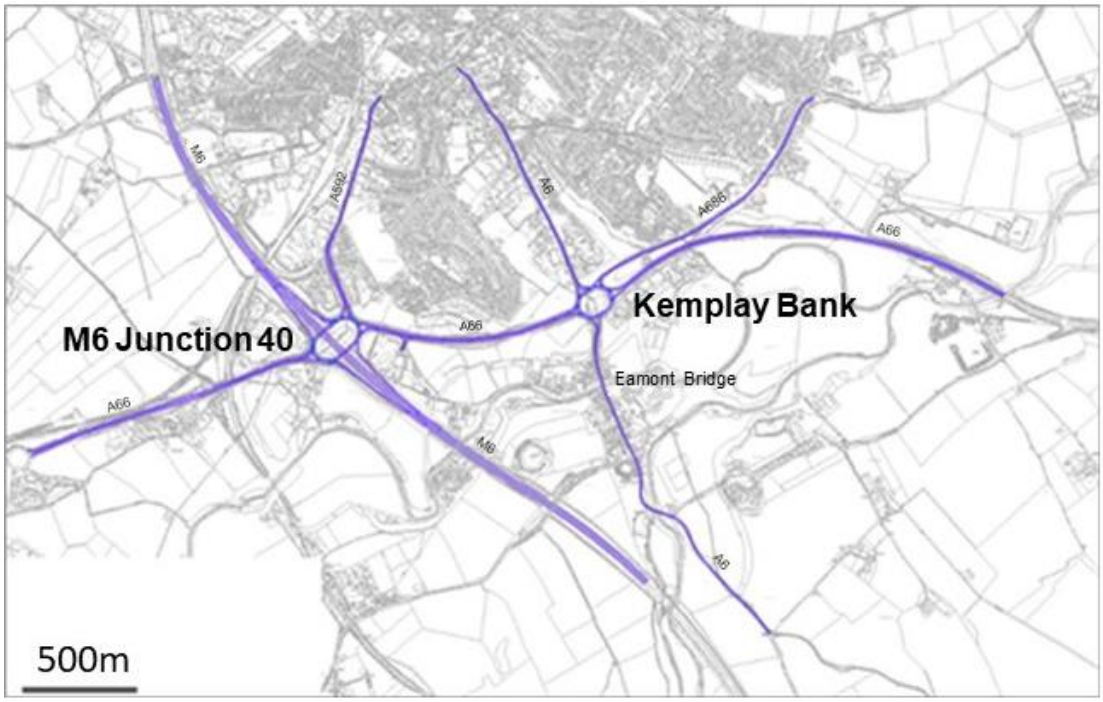

Figure 6-1: M6 J40 and Kemplay Bank (A6/A66) -- Vissim Model Extents

Data Collection

6.2.5 Manual Classified Turning Counts (MCTCs) were undertaken at the M6 Junction 40 and Kemplay Bank. The junctions were surveyed on Thursday 23rd November 2017 for a 12-hour period (07:00 to 19:00). The following peak periods were identified and have been modelled in detail:

- Weekday AM (07:30-09:30)
- Weekday PM (16:30-18:30)

6.2.6 The Skirsgill Depot access on the A66 Westbound carriageway, between Kemplay Bank and M6 Junction 40, was included in the model for completeness. These flows were deduced from the differences occurring in turning count flows from the Kemplay Bank A66 WB exit arm to the M6 Junction 40 A66 WB entrance arm.

6.2.7 WebTRIS data has been used for the M6 main line and to complement the turning counts at Junction 40. Data has been obtained in 15-minute intervals, for the same survey date. The survey locations used to inform the model construction are shown in Figure 6-2.

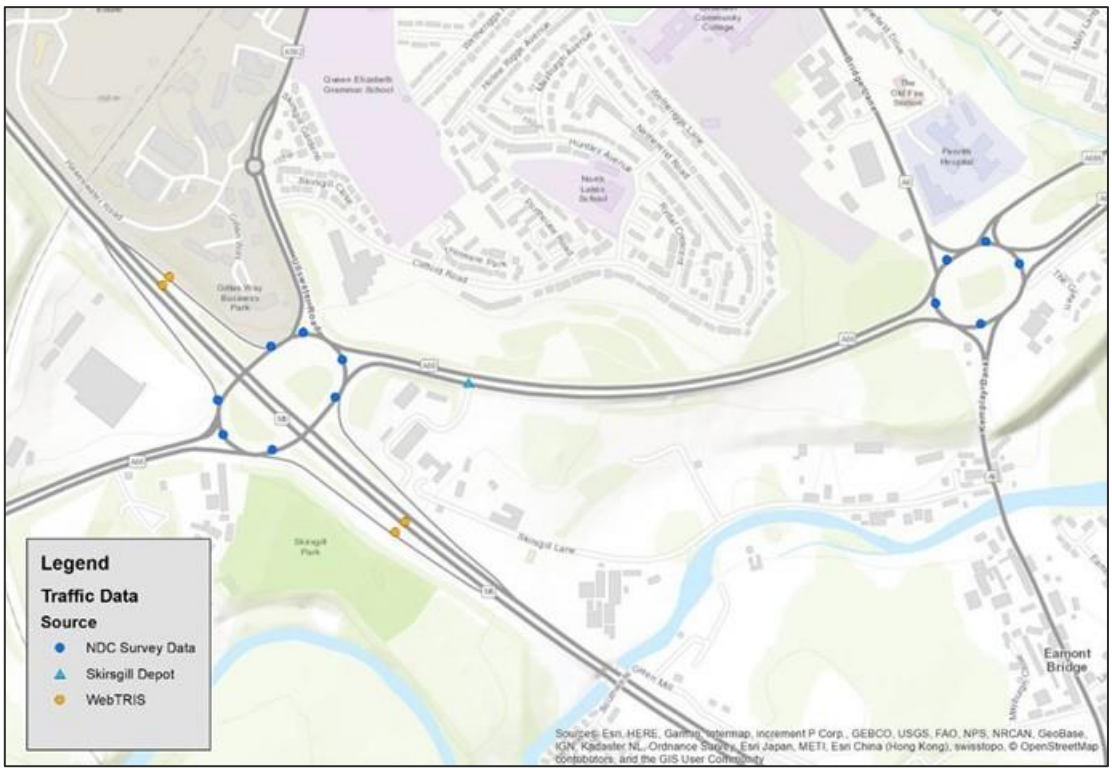

Figure 6-2: Survey Locations

6.2.8 Public transport data has been obtained by identifying services using the network from Cumbria County Council and obtaining bus timetables from service providers.

6.2.9 TrafficMaster data was requested from the Department for Transport for the study area for all of November 2017, which includes the date of the MCTCs. The monthly average journey time for the evaluation period was extracted for each route and vehicle categories.

Base Model Development

6.2.10 Three standalone pedestrian crossing have been included in the model, these are on exit arms and located as below:

- A Puffin crossing on the westbound A66 exit of Junction 40
- A Toucan crossing on the westbound A66 exit of Junction 40
- A Pelican crossing on the northbound M6 on-slip exit of Junction 40.

6.2.11 Traffic flows are assigned within the model using static vehicle routing decisions, the proportion of vehicles assigned to any given route is calculated in a spreadsheet and is based upon balanced surveyed counts.

6.2.12 The calibration process involves coding the highway network and behavioural characteristics of vehicles to achieve a match between observed and modelled data.

6.2.13 Maximum green times have been adjusted during the calibration process to match observed timings and queuing on approach arms. The

signals at Eamont Bridge have been coded using VisVAP[21] and use signal timings derived from the Cableless Linking Facility (CLF) plans found in the signal controller specifications. The network has been coded using typical gap times and headways for priority rules, of three seconds and 8m respectively.

6.2.14 Given the location of the model area, pedestrian volumes are assumed to be low. Survey videos of the junction show little usage of the pedestrian crossings and therefore a value of between 8 and 20 pedestrians per hour has been assumed for the various crossing locations.

6.2.15 The model has been validated against observed TrafficMaster journey time data. The observed travel times have been compared to the modelled travel times. The travel time routes are shown in Figure 6-3 below.

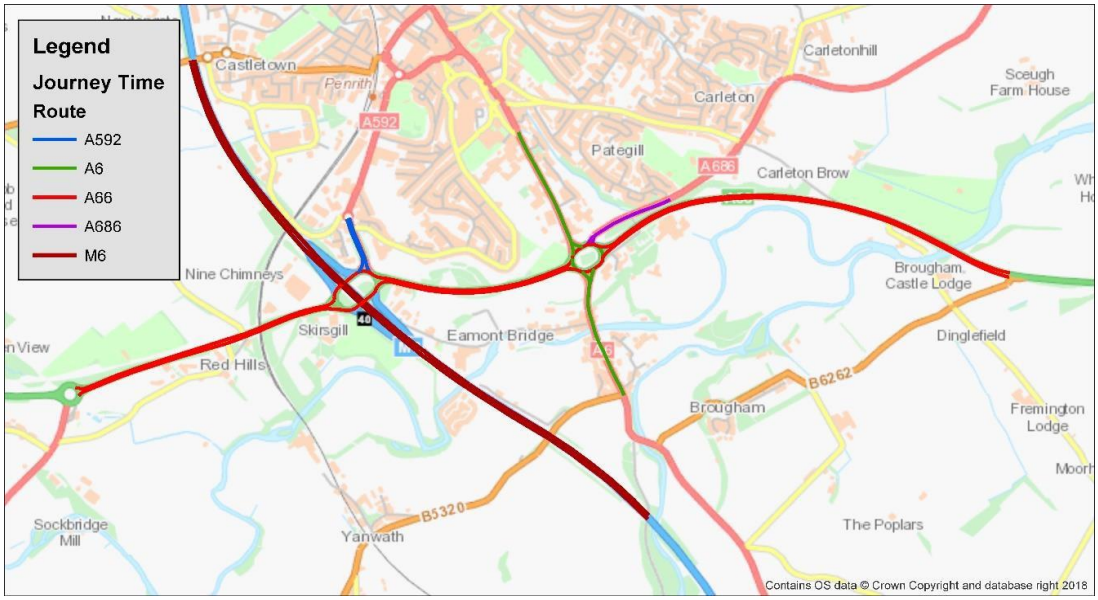

Figure 6-3: Journey Time Validation Routes

Model Validation

6.2.16 The model has been calibrated against the turning movement counts, which correlate well against the observed flows, with the GEH criteria being met in both the AM and PM peaks.

6.2.17 Table 6-1 shows the travel time performance for all routes for the AM peak hours model. The AM Peak model meets the validation criteria for 90% of routes (versus the expected 85% of routes stated by TAG) across the two-hour evaluation period and is calibrated well with respect to journey times.

6.2.18 The modelled time for the A686 westbound does not meet the criteria in the 07:30-08:30 or the 08:30-09:30 period. A review of the observed journey time data indicates that the information for this route is based on

[21]VisVAP enhances the use of free-defined signal control logic using Vehicle Actuated Programming

a limited number of recordings and that the journey time varies from day to day. For example, the average journey time, for the A686 westbound route on the traffic survey date (Thursday 23rd November 2017) between 08:30-09:30 is recorded at 59 seconds which accords with the modelled result. The average journey time for the month used within the validation process is significantly longer, however there is no information available such as additional traffic flow information or information regarding additional roadworks to provide an explanation for this significantly longer journey time. Therefore it can be concluded that the modelled journey time matches the expected journey time for the flow level input.

Table 6-1: AM Peak Hour M6 Junction 40 and Kemplay Bank Model Journey Time Results

Route	Length (m)	Modelled (s)	Observed (s)	Diff. (Obs. - Mod)	(%) Diff.	TAG criteria	Av. Speed (km/h)
07:30-08:30							
A66 Eastbound	5,002	276	290	14	5%	✓	65
A66 Westbound	4,980	263	322	58	18%	✓	68
M6 Northbound	3,246	116	106	-9	-9%	✓	101
M6 Southbound	3,224	113	108	-5	-5%	✓	102
A592 Northbound	288	27	27	0	1%	✓	39
A592 Southbound	296	55	61	6	10%	✓	19
A6 Northbound	1,333	177	206	29	14%	✓	27
A6 Southbound	1,335	182	185	2	1%	✓	26
A686 Eastbound	468	29	27	-2	-9%	✓	58
A686 Westbound	457	49	88	40	45%	×	34
08:30-09:30							
A66 Eastbound	5,002	291	328	37	11%	✓	62
A66 Westbound	4,980	267	305	38	12%	✓	67
M6 Northbound	3,246	114	107	-8	-7%	✓	102
M6 Southbound	3,224	115	104	-11	-11%	✓	101
A592 Northbound	288	28	26	-1	-5%	✓	37
A592 Southbound	296	57	68	11	16%	×	19
A6 Northbound	1,333	198	197	-1	-1%	✓	24
A6 Southbound	1,335	195	184	-12	-6%	✓	25
A686 Eastbound	468	29	27	-2	-8%	✓	58
A686 Westbound	457	56	214	158	74%	×	29

6.2.19 Table 6-2 shows the travel time performance for all routes in the PM peak model. The PM Peak model meets the validation criteria for 90% of routes across the two-hour evaluation period and is therefore calibrated well with respect to journey times. The modelled time for the A686 eastbound, and the A595 northbound do not meet the criteria in the 17:30-18:30 period. Both of these journey times are on the exit from the junctions under consideration, and the observed delays are most likely caused by downstream congestion or issues that are not represented within the model. Observation of the survey videos reveals that the

delays caused are not sufficient to block back into the junctions, and therefore they are not considered material to the operation of the junctions.

Table 6-2: PM Peak Hour M6 Junction 40 and Kemplay Bank Model Journey Time Results

Route	Length (m)	Modelled (s)	Observed (s)	Diff. (Obs. - Mod)	(%) Diff.	TAG criteria	Av. Speed (km/h)
16:30-17:30							
A66 Eastbound	5,002	300	360	60	17%	✓	60
A66 Westbound	4,980	277	305	27	9%	✓	65
M6 Northbound	3,246	117	106	-11	-10%	✓	100
M6 Southbound	3,224	114	103	-11	-11%	✓	101
A592 Northbound	288	27	29	2	6%	✓	39
A592 Southbound	296	96	86	-9	-11%	✓	11
A6 Northbound	1,333	186	195	9	4%	✓	26
A6 Southbound	1,335	196	185	-10	-6%	✓	25
A686 Eastbound	468	29	29	0	-1%	✓	58
A686 Westbound	457	86	90	4	5%	✓	19
17:30-18:30							
A66 Eastbound	4,980	260	302	42	14%	✓	69
A66 Westbound	3,246	114	106	-8	-8%	✓	102
M6 Northbound	3,224	115	106	-9	-8%	✓	101
M6 Southbound	288	26	28	2	8%	✓	40
A592 Northbound	296	65	79	14	18%	×	16
A592 Southbound	1,333	176	165	-11	-7%	✓	27
A6 Northbound	1,335	184	174	-10	-6%	✓	26
A6 Southbound	468	29	29	0	2%	✓	58
A686 Eastbound	457	50	85	35	41%	×	33
A686 Westbound	5,002	300	360	60	17%	✓	60

6.2.20 Observed journey times along the A686 westbound route vary from day to day. Combined with the journey time route being relative short, although modelled times are within 60 seconds, validation could not be achieved for all time periods. The models are deemed to be validated to acceptable standards and are considered suitable to be used to assess the proposed scheme at M6 junction 40 and Kemplay Bank, including the interaction between these two locations.

6.3 Scotch Corner

Model Characteristics

6.3.1 The model of the junctions has been developed using the PTV Vissim traffic modelling software (version 11) and prepared in accordance with the relevant sections of TAG Unit M3-1.

6.3.2 The model includes the Scotch Corner roundabout, the A6055/A1(M) roundabout north of Scotch Corner, the Barracks Bank roundabout south of Scotch Corner and the access road leading to the Scotch Corner Services.

6.3.3 Scotch Corner is a large grade separated signal-controlled roundabout and the A6055/A1(M) and Barracks Bank roundabouts are both priority-controlled. The northern A6055/A1(M) roundabout has strategic importance as it leads to the A1(M) northbound. The full extent of the model is shown in Figure 6-4.

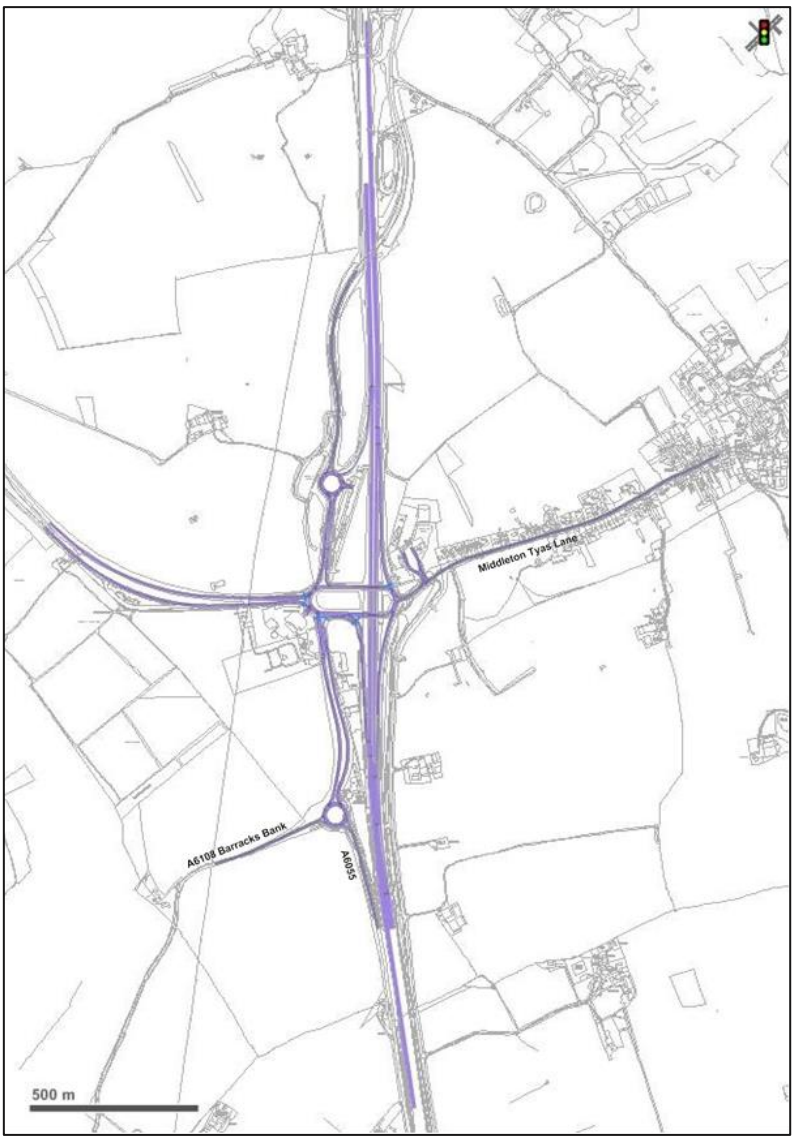

Figure 6-4: Scotch Corner – Vissim Model Extent

6.3.4 Approach arms to each junction are long enough to allow for journey time validation and to accommodate any queueing. Local roads, minor arms and junctions along the extended approach arms have not been modelled.

6.3.5 The base model has been developed using Ordnance Survey (OS) CAD tiles, Google Maps imagery and traffic survey video files.

6.3.6 The model represents two time periods:

- AM Peak Period (07:30-09:30)
- PM Peak Period (16:30-18:30)

Data Collection

6.3.7 Classified turning counts were undertaken at Scotch Corner on Thursday 14 March 2019, for a 12- hour period (07:00 to 19:00). Survey locations are shown in Figure 6-5.

6.3.8 The A1(M) mainline flows upstream of the junction were included in the model for completeness. These flows were deduced from the count flows on the off-slips and the mainline flow downstream of these slip-roads.

6.3.9 Survey videos have been reviewed which indicate a very low level of pedestrian usage at this location, in each case, significantly less than 20 pedestrians per hour. Given the location of the junction, and the lack of amenities that would generate pedestrian traffic then this is not surprising. In the absence of detailed counts, a maximum of 20 pedestrians per hour has been assumed at crossings locations.

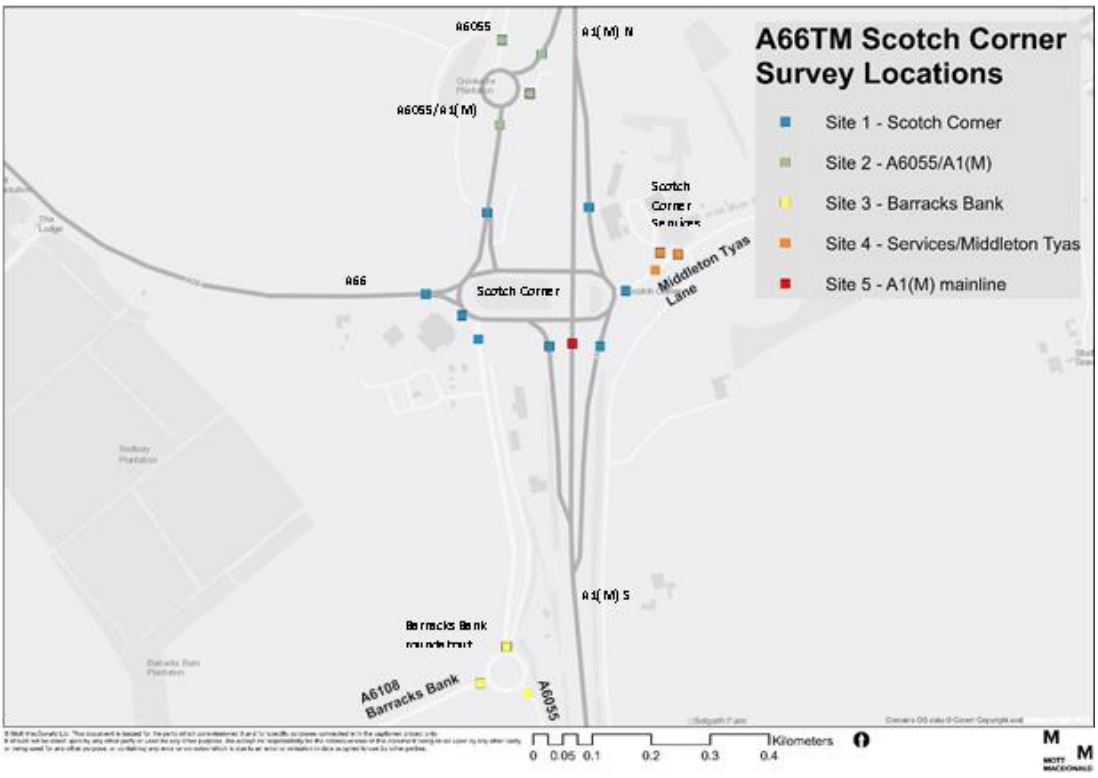

Figure 6-5: Scotch Corner Survey Locations

6.3.10 2019 ANPR (Automatic Number Plate Recognition) journey time data has been used for model validation. It should be noted that the primary reason for collecting ANPR data was to determine origin destination movements through Scotch Corner and adjacent junctions. Interrogation of the ANPR journey time data highlighted some concerns with the observed data originating at the A6108. This data has not been used in the model validation.

6.3.11 The ANPR survey was undertaken on the road network at the same time as the turning count surveys (07:00 to 19:00 on Thursday 14th March 2019).

Base Model Development and Model Validation

6.3.12 The model has been developed using the same methodology as that discussed for Junction 40 and Kemplay Bank in Section 6.2. The travel time routes used to validate the model are shown in Figure 6-6.

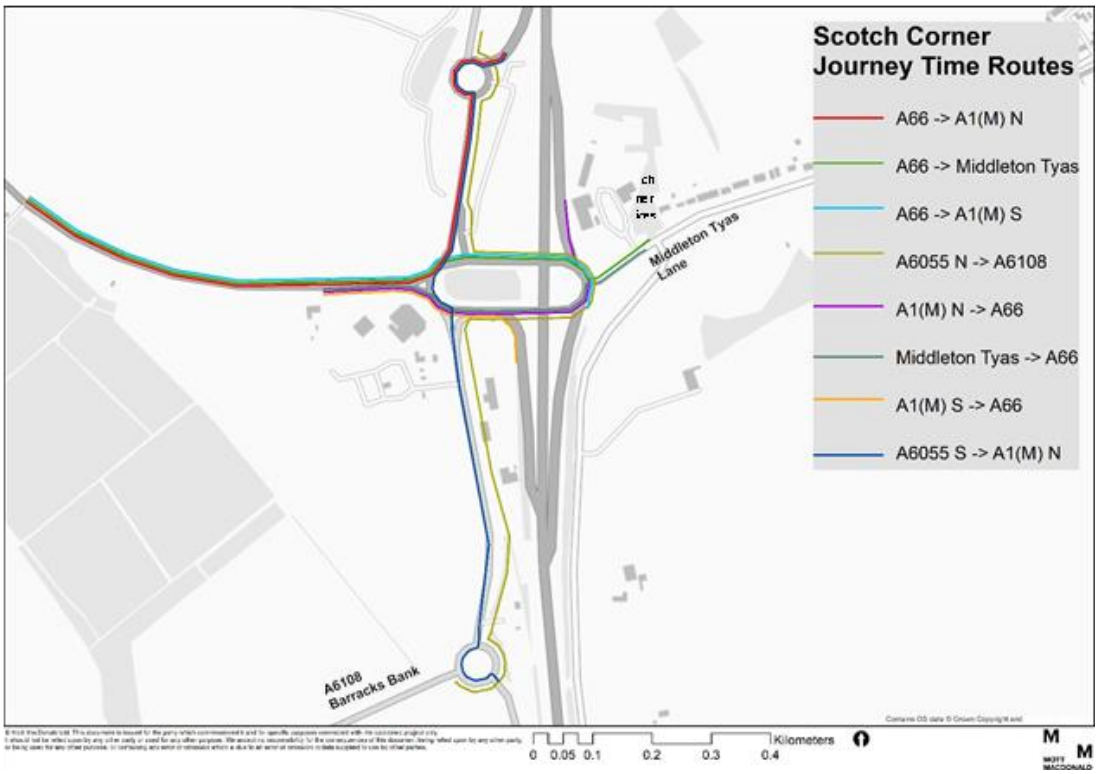

Figure 6-6: Travel Time Routes

6.3.13 Table 6-3 shows the travel time performance for all routes for the AM peak hour model. The AM Peak model meets the validation criteria for 88% of routes across the two-hour evaluation period.

6.3.14 It should be noted that there are concerns with the observed journey time for the A66 to A1(M) N route. The observed journey time would result in unrealistically high vehicle speeds along the given section of road. Google Maps route planner information indicates that the model does reflect existing conditions, showing the actual journey time “typically two mins” in duration. A visual validation, including a review of the traffic survey video footage and comparing Google Maps route planner information, indicates that the model does reflect existing conditions. With limited queuing on approach arms and no obvious congestion or delay.

Table 6-3: AM Peak Hour Scotch Corner Model Journey Time Results

Route	Length (m)	Modelled (s)	Observed (s)	Diff. (Obs-Mod)	(%) Diff.	TAG criteria	Av. Speed (km/h)
07:30-08:30							
A66 - A1(M) N	1,168	79	56	-23	29%	×	33
A66 - Middleton Tyas	1,125	82	78	-4	5%	✓	31
A66 - A1(M) S	1,051	90	89	-1	1%	✓	26
A6055 N - A6108	1,575	130	149	19	14%	✓	27
A1(M) N - A66	619	72	78	6	9%	✓	19
Middleton Tyas - A66	580	75	83	8	11%	✓	17
A1(M) S - A66	397	50	59	9	19%	✓	18
A6055 S - A1(M) N	1,277	98	105	7	7%	✓	28
08:30-09:30							
A66 - A1(M) N	1,168	80	55	-25	45%	×	33
A66 - Middleton Tyas	1,125	80	72	-8	12%	✓	31
A66 - A1(M) S	1,051	88	88	0	0%	✓	27
A6055 N - A6108	1,575	128	139	11	8%	✓	28
A1(M) N - A66	619	72	78	6	8%	✓	19
Middleton Tyas - A66	580	75	84	9	11%	✓	17
A1(M) S - A66	397	49	55	6	11%	✓	18
A6055 S - A1(M) N	1,277	97	106	9	8%	✓	28

6.3.15 The PM Peak model meets the validation criteria for 81.25% of routes across the two-hour evaluation period.

6.3.16 The validation results illustrate a similar pattern to the AM. The observed journey time for the A66 to A1(M) N route is considered to be too quick, a visual validation, including a review of the traffic survey video footage and comparing Google Maps route planner information, indicates that the model does reflect existing conditions. With the actual journey time “typically two mins” in duration.

Table 6-4: PM Peak Hour Scotch Corner Model Journey Time Results

Route	Length (m)	Modelled (s)	Observed (s)	Diff. (Obs-Mod)	(%) Diff.	TAG criteria	Av. Speed (km/h)
16:30-17:30							
A66 - A1(M) N	1,168	83	56	-27	49%	×	31
A66 - Middleton Tyas	1,125	82	76	-6	8%	✓	31
A66 - A1(M) S	1,051	90	95	4	5%	✓	26
A6055 N - A6108	1,575	134	152	18	12%	✓	26
A1(M) N - A66	619	72	77	5	7%	✓	19
Middleton Tyas - A66	580	76	84	8	9%	✓	17
A1(M) S - A66	397	50	54	4	7%	✓	18
A6055 S - A1(M) N	1,277	97	93	-4	4%	✓	28
17:30-18:30							
A66 - A1(M) N	1,168	80	55	-25	45%	×	33
A66 - Middleton Tyas	1,125	81	78	-3	4%	✓	31
A66 - A1(M) S	1,051	88	87	-1	1%	✓	27
A6055 N - A6108	1,575	125	153	28	18%	×	28
A1(M) N - A66	619	69	78	9	11%	✓	20
Middleton Tyas - A66	580	71	78	7	9%	✓	18
A1(M) S - A66	397	47	54	7	12%	✓	19
A6055 S - A1(M) N	1,277	97	93	-4	4%	✓	28

6.3.17 In the AM and PM peak periods 88% and 81% respectively of journey times fall within 15% of the observed times, and 100% of journey time routes are within 1-minute of observed times. A visual validation exercise indicates the model replicates existing conditions well. In conclusion, the model provides a suitable representation of the operation of Scotch Corner, including the interaction between the peripheral roundabouts and Scotch Corner Services.

6.4 Local Junction models

Assessment locations

6.4.1 Operational assessments were carried out at some of the key junctions on and around the Project. The scope of the operational assessment was discussed with officers of Cumbria County Council, Durham District Council and North Yorkshire County Council. Models have been developed for fifteen junctions in the vicinity of the A66. Assessment has been undertaken at the junctions listed in Table 6-5 and shown in Figure 6-7.

Table 6-5: Junction Models

Ref. No.	Junction Name	Location	Type
Cumbria County Council			
1	Ullswater Roundabout	Penrith – A592 Ullswater Road / Haweswater Road	Roundabout
2	Ullswater Road	Penrith – A592 Ullswater Road / Clifford Road	Priority Junction
3	Stricklandgate Gyratory	Penrith – A6 Stricklandgate / Brunswick Square	Priority Junction
4	Roper Street	Penrith – A6 Roper Street / Victoria Road / Kilgour Street	Traffic Signals
5	Eamont Bridge	Eamont Bridge – A6 / Skirsgill Lane	Traffic Signals
6	Center Parcs	A66 / Center Parcs Whinfell Forest access	Priority Junction
7	Kirkby Thore – A66 Eastbound	Kirkby Thore – A66 Eastbound / Fell Lane	Priority Junction
8	Kirkby Thore – A66 Westbound	Kirkby Thore – A66 Westbound / Fell Lane	Priority Junction
9	Kirkby Stephen Roundabout	Kirkby Stephen – A685 North Road / Silver Square Roundabout	Roundabout
10	Kirkby Stephen Signals	Kirkby Stephen – A685 Victoria Square / B6259 Nateby Road	Traffic Signals
11	Brough - A66 Eastbound	Brough - A66 Eastbound / A685	Priority Junction
12	Brough - A66 Westbound	Brough - A66 Westbound / A685	Priority Junction
13	Stainmore - A66	A66 / Stainmore	Priority Junction
Durham County Council			
14	Bowes - A66 Eastbound	Bowes - A66 Eastbound onslip / A67	Priority Junction
15	Bowes - A66 Westbound	Bowes - A66 Westbound onslip / A67	Priority Junction
16	Hulands Quarry	A67 / Hulands Quarry Access	Priority Junction
17	Barnard Castle Bridge	Barnard Castle Bridge – A67 / B6277	Traffic Signals
18	Smallways	Smallways – A66 / Lanehead / A66 / Low Lane	Priority Junction
North Yorkshire County Council			
19	Moor Lane	A66 / Moor Lane / Mainsgill Farm	Priority Junction

Ref. No.	Junction Name	Location	Type
20	Forcett Lane	A66 / Forcett Lane	Priority Junction
21	Hargill / Moor Road	A66 / Hargill / Moor Road	Priority Junction

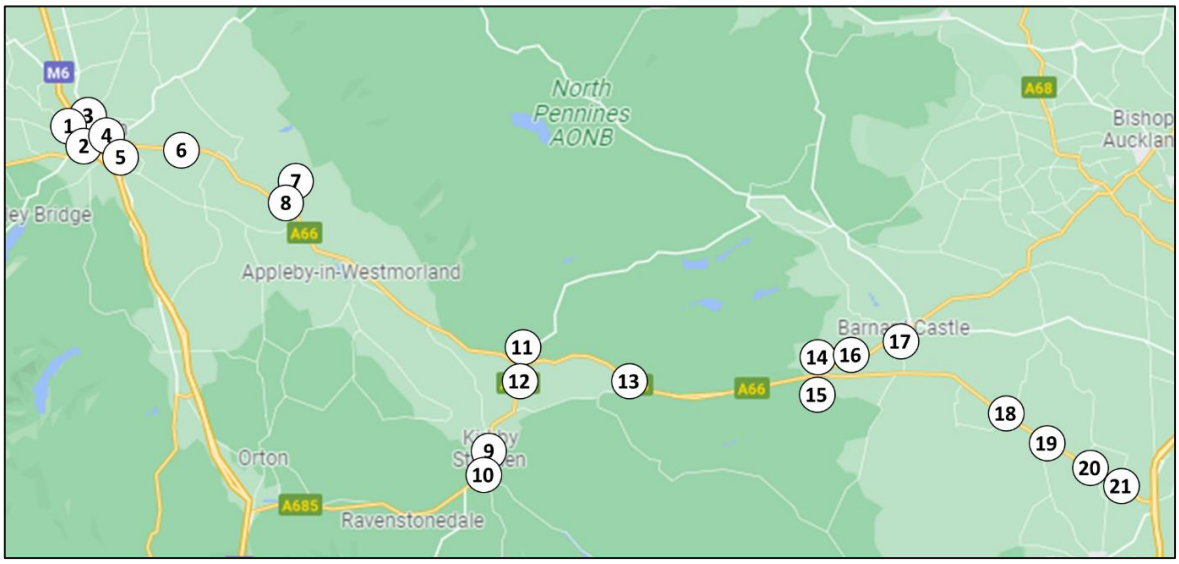

Figure 6-7: Junction Model Locations

6.4.2 The traffic surveys data used to support the development of the wider strategic model, have been used in the development of the junction models. This is detailed below in Table 6-6.

Table 6-6: Operational Analysis Survey Data

Ref. No.	Location	Type	Date
Cumbria County Council			
3	Roper Street	MCTC	Tuesday 26th June 2018
4	Eamont Bridge	ATC	22nd November 2017-5th December 2017
5	Center Parcs	ATC	22nd November 2017-5th December 2017
10	Brough - A66 Eastbound	MCTC	Thursday 23rd November 2017
11	Brough - A66 Westbound	MCTC	Thursday 23rd November 2017
Durham County Council			
14	Bowes - A66 Westbound	ATC	23nd November 2017-6th December 2017
17	Smallways	MCTC	Thursday 23rd November 2017
North Yorkshire County Council			
18	Moor Lane	MCTC	Wednesday 11th September 2019
20	Hargill / Moor Road	MCTC	Thursday 9th April 2019

6.4.3 The MCTC surveys were undertaken for a 12-hour period (07:00 to 19:00), while the ATC were undertaken for a 2-week period. It should be noted that Factors have been applied to data where necessary to ensure it is representative of the 2019 model base year as discussed in 4.3.3.

6.4.4 As full turning count data was not available for each junction modelled data has been used in the following manner.

- To obtain turning movements for junction arms where only ATC data is available, turning proportions were taken from the modelled 2019 flows for the relevant junction and applied to the observed ATC flow.
- In a number of locations, observed flows were not available for the junction arms. In these instances, the modelled 2019 flows were used.

6.4.5 Junctions have been assessed for the AM and PM peak periods of 08:00-09:00 and 17:00-18:00, apart from at locations where observed peaks are significantly different namely:

- At Moor Lane committed flows from a TA[22] that proposes the expansion of an existing commercial development. In this instance the development peak period has been identified as 11:15-12:15 on a Saturday, and therefore an assessment of this period has been undertaken as the most onerous period.
- The Center Parcs access road where the peak traffic flows occur on a Friday associated with the visitor change over periods, namely 10:00-11:00 in the morning (visitors from the previous week leaving) and 15:00-16:00 in the afternoon (visitors for the following week arriving).

Priority junction model development

6.4.6 For the roundabouts and priority junctions, Junctions 9 software was used, which comprises of ARCADY (Assessment of Roundabout Capacity And DelaY) and PICADY (Priority junction CApacity and DelaY).

6.4.7 The existing road network layout was constructed in Junctions 9 based on aerial mapping. Vehicle inputs have been created in 15-minute intervals and assigned through the network using fixed routes, created from junction turning count survey data.

6.4.8 The base model performance measures output from Junctions 9 can be found in Table 6-7.

6.4.9 It should be noted that Junctions 9 has no function to incorporate dual carriageways with central reserves, therefore models of side road accesses onto dual carriageways, such as those on the existing dualled sections of the A66 assume the same total flow but on a single carriageway. This assumes a worse case because the model is assuming that traffic exiting the side road and making a right turn would require a gap in traffic from both directions, rather than being able to cross one carriageway at a time as would be the case where facilities within the central reserve exist.

6.4.10 The Ratio of Flow to Capacity (RFC) is a Junctions 9 output and is the main measure of an arm's performance for priority junctions. A junction is predicted to operate within capacity if the RFC is below 0.85, an RFC

[22] Bryan G Hall, Proposed Fuel Service Station, Mainsgill Farm, Richmondshire, Transport Assessment, June 2020

between 0.85 and 1.0 indicates that although performance is within the theoretical capacity it is in excess of the desired capacity, and an RFC higher than 1.0 suggests that the junction will exceed its theoretical capacity.

Table 6-7: Base 2019 Junctions 9 Model Busiest Arm

Junction	Arm	AM Peak			PM Peak		
		RFC	Queue (Vehs.)	Delay (Secs.)	RFC	Queue (Vehs.)	Delay (Secs.)
Ullswater Roundabout	Ullswater Road South	0.44	1	3	0.37	1	3
Ullswater Road	Clifford Road	0.22	0	10	0.42	1	12
Stricklandgate	Stricklandgate	1.01	18	109	0.96	12	76
Center Parcs	Center Parcs[1]	0.57	1	18	0.23	1	9
Kirkby Stephen Roundabout	A685 North	0.34	1	6	0.38	1	6
Brough - A66 Eastbound	A685	0.4	1	9	0.47	1	10
Brough - A66 Westbound	A66 Slip off	0.31	0	7	0.25	0	6
Stainmore – A66	To Barras	0	0	0	0.01	0	6
Bowes - A66 Westbound	To The Street	0.06	0	7	0.05	0	7
Smallways	Smallways	0.12	0	6	0.04	0	6
Mainsgill Farm	Mainsgill Farm	0.49	1	74	Not Applicable		
Forcett Lane	B6274 North[2]	0.09	0	6	0.08	0	6
Hargill / Moor Road	Moor Road	0.22	0	11	0.24	0	12

[1] Center Parcs has the highest RFC in the AM and on average between the AM and PM Peak. The arm with the highest RFC in the PM Peak is A66 Eastbound right turn with a PM Peak RFC of 0.43, Queue of 0.7 and Delay of 12.41
[2] B6274 North has the highest RFC in the AM and on average between the AM and PM Peak. The arm with the highest RFC in the PM Peak is Forcett Lane straight with a PM Peak RFC of 0.09, Queue of 0.1 and Delay of 6.11

6.4.11 The modelled performance of the junctions at each location reflects the observed operational performance, namely that there is little spare capacity at Stricklandgate gyratory within Penrith, and that delays regularly occur at peak times at the existing A66 at-grade Center Parcs access and at the Moor Lane junction. With regard to the Centre Parcs access, it is noted that the ATC was undertaken in the winter months of November and December when the traffic flows are potentially quieter than during the summer months. The additional traffic that may occur during the holiday peak season is considered further in Chapter 8.3.

Signal model development

6.4.12 For signal-controlled junctions the assessment has been undertaken within LINSIG (LINear SIGnal Analysis).

6.4.13 Cumbria County Council and Durham County Council have provided signal specifications for the junctions.

6.4.14 The model network has been developed using OS CAD plans and aerial mapping. Vehicle inputs have been created in 15-minute intervals and assigned through the network using fixed routes, created from junction turning count survey data.

6.4.15 The following is noted regarding the signal phasing.

- An all-red pedestrian phase was included within the Roper Street signals, given its busy urban location within Penrith.
- An UTC (Urban Traffic Control) log was provided for the Eamont Bridge signals to allow an understanding of the frequency at which Skirsgill Lane (a minor the side road) is called together with the average length of green time. As there are no modelled or observed flows for Skirsgill Lane an estimate of this demand was made based on the number of times per hour the signal on this approach is called, together with the expected number of trips generated by the land uses accessed by this road. Within the assessment this side road is assumed to be called 15 times per hour, which equates to once per 2 cycles. The UTC log also provided details of how often the pedestrian cycle was called.
- No pedestrian phase is included within either the Barnard Castle Bridge or Kirby Stephen Signals, which reflects the operation at these locations.

Table 6-8: Base 2019 LinSig Model Busiest Arm

Junction	Arm	AM Peak			PM Peak		
		DoS	Mean Max Queue	Av. Delay	DoS	Mean Max Queue	Av. Delay
Roper Street	Roper Street	82.5%	13	46	80.5%	10	55
Eamont Bridge	A6 Penrith Northbound	102.9%	39	143	87.4%	14	58
Kirkby Stephen Signals	Market Street	63.1%	7	43	71.5%	8	48
Barnard Castle Bridge	A67 Eastbound[1]	45.8%	6	29	46%	6	34

[1] A67 Eastbound has the highest RFC in the PM and on average between the AM and PM Peak. The arm with the highest RFC in the AM Peak is The Sills Southbound with an AM Peak DOS of 46.1%, Queue of 6 and Delay of 31

6.4.16 The modelled performance of the signals at each location reflects the observed operational performance, namely that there is little spare capacity at Roper Street, or at the Eamont Bridge, and that delays of around 30 seconds are common at the Kirkby Stephen Signals or at Barnard Castle Bridge.

7 Forecast strategic network performance

7.1.1 This section of the TA presents the forecasted future traffic impact on the A66 with and without the delivery of the Project.

7.2 Traffic flow forecasts

7.2.1 Table 7-1 to Table 7-3 show the impact of the Project in the three modelled years in terms of Average Annual Daily Traffic (AADT) at a number of locations on the Strategic Road Network.

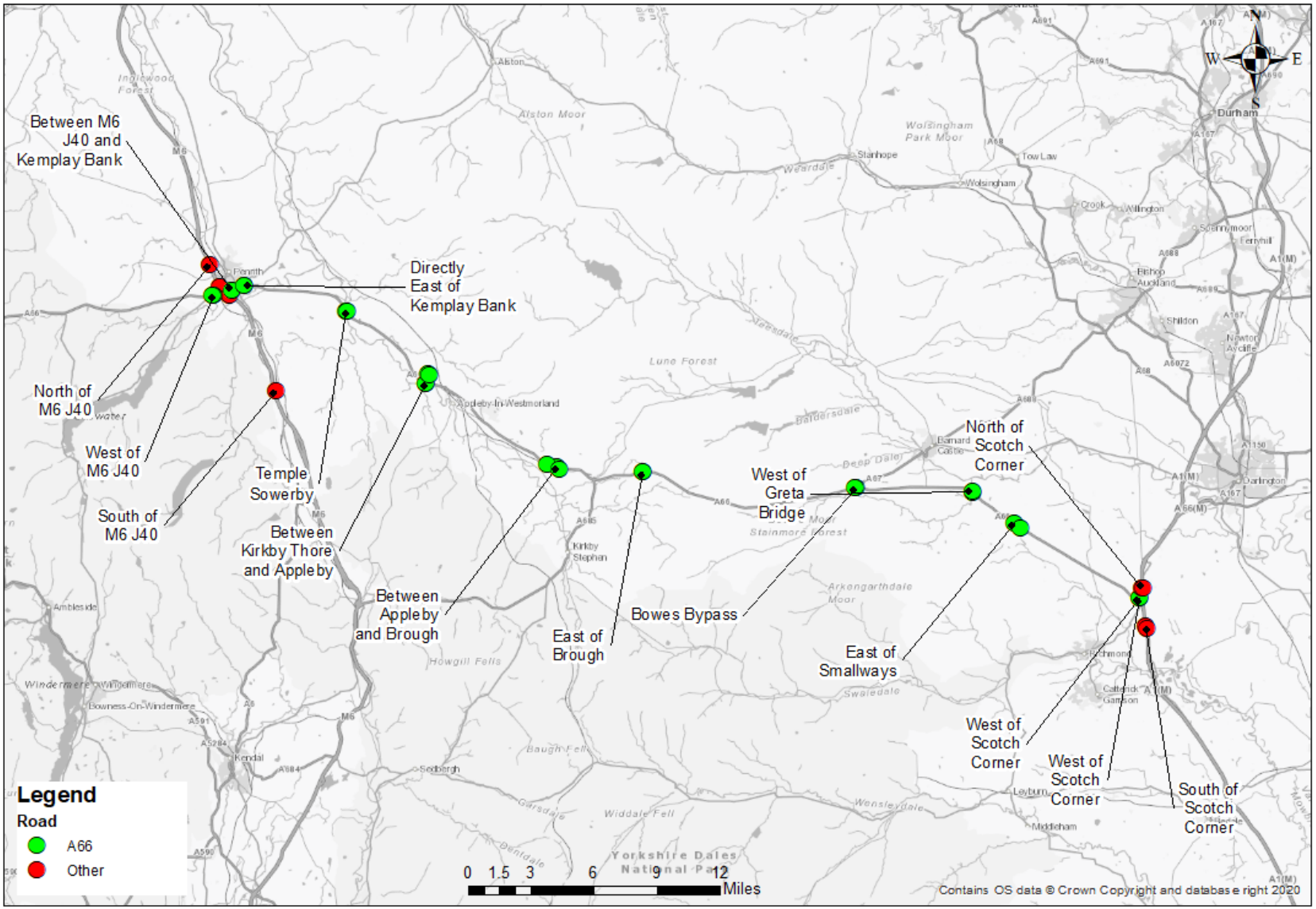

Figure 7-1: A66 Traffic Flow Locations

Table 7-1: 2029 Strategic Flows AADT (vehicles, two-way)

ID	Road	Location	Base 2019	DM 2029	DM 2029 V 2019 Base		DS 2029	DS V DM	
					Increase	%		Increase	%
A	M6	North of M6 J40	54,000	64,700	10,700	20%	66,000	1,300	2%
B	M6	South of M6 J40	39,300	46,100	6,800	17%	44,300	-1,800	-4%
C	A66	West of M6 J40	19,700	22,300	2,600	13%	23,000	700	3%
D	A66	Between M6 J40 and Kemplay Bank	31,800	36,400	4,600	15%	40,900	4,500	12%
E	A66	Directly East of Kemplay Bank	22,100	25,000	2,900	13%	30,900	5,900	24%
F	A66	Temple Sowerby	18,200	20,700	2,500	14%	27,500	6,700	32%
G	A66	Between Kirkby Thore and Appleby	19,500	22,100	2,500	13%	25,300	3,300	15%
H	A66	Between Appleby and Brough	16,300	18,300	2,000	12%	24,500	6,300	34%
I	A66	East of Brough	18,400	21,300	2,900	16%	27,300	5,900	28%
J	A66	Bowes Bypass	15,800	18,500	2,700	17%	24,800	6,300	34%
K	A66	West of Greta Bridge	19,200	22,300	3,100	16%	29,100	6,700	30%
L	A66	East of Smallways	19,100	22,100	3,000	16%	29,500	7,400	34%
M	A66	West of Scotch Corner	19,600	23,000	3,400	17%	30,400	7,400	32%
N	A1(M)	North of Scotch Corner	59,000	73,200	14,200	24%	75,500	2,200	3%
O	A1(M)	South of Scotch Corner	61,900	74,100	12,200	20%	77,400	3,300	4%
		Average (all locations A to O)	**-**	**-**	**-**	**18%**	**-**	**-**	**13%**

7.2.2 The key conclusions from the 2029 strategic flow forecasts are:

- The average traffic growth between 2019 and 2029 DM is 18% across all locations considered in the table above.
- Typically flows on the A66 in 2029 Do Minimum are between 18,000 AADT (between Appleby and Brough) and 36,000 AADT (between M6 Junction 40 and Kemplay Bank).
- The average additional growth on the A66 (locations D to M) due to the Project (DS v DM) is 26%.

- The resultant flows on the A66 in 2029 Do Something are between 25,000 AADT (between Appleby and Brough) and 41,000 AADT (between M6 Junction 40 and Kemplay Bank).

Table 7-2: 2044 Strategic Flows AADT (vehicles, two-way)

ID	Road	Location	Base 2019	DM 2044	DM 2044 V 2019 Base		DS 2044	DS V DM	
					Increase	%		Increase	%
A	M6	North of M6 J40	54,000	79,300	25,200	47%	81,200	1,900	2%
B	M6	South of M6 J40	39,300	57,400	18,100	46%	55,800	-1,600	-3%
C	A66	West of M6 J40	19,700	26,400	6,700	34%	27,500	1,100	4%
D	A66	Between M6 J40 and Kemplay Bank	31,800	41,800	10,000	32%	47,300	5,500	13%
E	A66	Directly East of Kemplay Bank	22,100	28,800	6,700	31%	36,700	7,800	27%
F	A66	Temple Sowerby	18,200	23,900	5,700	31%	32,700	8,800	37%
G	A66	Between Kirkby Thore and Appleby	19,500	25,300	5,800	30%	30,300	5,000	20%
H	A66	Between Appleby and Brough	16,300	21,200	5,000	30%	29,400	8,200	38%
I	A66	East of Brough	18,400	26,100	7,700	42%	33,900	7,900	30%
J	A66	Bowes Bypass	15,800	22,800	7,100	45%	30,900	8,100	35%
K	A66	West of Greta Bridge	19,200	27,000	7,700	40%	36,000	9,100	34%
L	A66	East of Smallways	19,100	26,200	7,100	37%	36,500	10,300	39%
M	A66	West of Scotch Corner	19,600	27,800	8,200	42%	37,200	9,400	34%
N	A1(M)	North of Scotch Corner	59,000	89,100	30,100	51%	91,500	2,400	3%
O	A1(M)	South of Scotch Corner	61,900	89,800	27,900	45%	93,300	3,400	4%
		Average (all locations A to O)	**-**	**-**	**-**	**41%**	**-**	**-**	**15%**

7.2.3 The key conclusions from the 2044 strategic flow forecasts are:

- The average traffic growth between 2019 and 2044 DM is 41% across all locations considered in the table above.
- Typically flows on the A66 in the 2044 DM are between 21,000 AADT (between Appleby and Brough) and 42,000 AADT (between M6 Junction 40 and Kemplay Bank).
- The average additional growth on the A66 (locations D to M) due to the Project (DS v DM) is 30%.

- The resultant flows on the A66 in 2044 DS are between 29,000 AADT (between Appleby and Brough) and 47,000 AADT (between M6 Junction 40 and Kemplay Bank).

Table 7-3: 2051 Strategic Flows AADT (vehicles, two-way)

ID	Road	Location	Base 2019	DM 2051	DM 2051 V 2019 Base		DS 2051	DS V DM	
					Increase	%		Increase	%
A	M6	North of M6 J40	54,000	83,900	29,900	55%	85,900	2,000	2%
B	M6	South of M6 J40	39,300	61,400	22,100	56%	59,600	-1,800	-3%
C	A66	West of M6 J40	19,700	27,900	8,200	42%	29,100	1,200	4%
D	A66	Between M6 J40 and Kemplay Bank	31,800	43,300	11,500	36%	49,400	6,100	14%
E	A66	Directly East of Kemplay Bank	22,100	30,000	7,900	36%	38,700	8,700	29%
F	A66	Temple Sowerby	18,200	24,800	6,600	36%	34,500	9,700	39%
G	A66	Between Kirkby Thore and Appleby	19,500	26,300	6,800	35%	32,000	5,700	22%
H	A66	Between Appleby and Brough	16,300	22,100	5,800	36%	31,100	9,000	41%
I	A66	East of Brough	18,400	27,600	9,200	50%	36,200	8,600	31%
J	A66	Bowes Bypass	15,800	24,200	8,400	53%	33,000	8,800	37%
K	A66	West of Greta Bridge	19,200	28,400	9,200	48%	38,400	10,000	35%
L	A66	East of Smallways	19,100	27,300	8,300	43%	38,800	11,500	42%
M	A66	West of Scotch Corner	19,600	29,200	9,600	49%	39,500	10,200	35%
N	A1(M)	North of Scotch Corner	59,000	93,400	34,400	58%	95,900	2,500	3%
O	A1(M)	South of Scotch Corner	61,900	94,400	32,500	52%	98,200	3,800	4%
		Average (all locations A to O)	**-**	**-**	**-**	**48%**	**-**	**-**	**15%**

7.2.4 The key conclusions from the 2051 strategic flow forecasts are:

- The average traffic growth between 2019 and 2051 DM is 48% across all locations considered in the table above.
- Typically flows on the A66 in 2051 Do Minimum are between 22,000 AADT (between Appleby and Brough) and 43,000 AADT (between M6 Junction 40 and Kemplay Bank).
- The average additional growth on the A66 (locations D to M) due to the Project (DS v DM) is 32%.
- The resultant flows on the A66 in 2051 Do Something are between 31,000 AADT (between Appleby and Brough) and 49,000 AADT (between M6 Junction 40 and Kemplay Bank).

7.2.5 This growth in the DM scenario from 2019 to the forecast year is due to national changes in; population, trip rates, GDP and income, cost of driving, licence holding, and demand for goods.

7.2.6 The growth due to the Project is due to the provision of a higher standard route. The increase in traffic flow reflects people benefiting from the opportunity that the dualling offers.

7.2.7 The improved linkage provided by the Project benefits communities within the north of England, who, due to the rural nature of the region, often lack access to key local services for example, GP surgeries, primary schools and supermarkets. These people are often required to commute over longer distances to access improved employment opportunities. The increased flow also reflects more tourists benefiting from improved links to areas such as the Lake District and the North Pennines AONB, thereby improving the economies within this area.

7.2.8 The following tables provides a summary of the forecast flows by vehicle type at the same locations for the base year, 2019 and for 2044, by hour of day.

- Table 7-4
- Table 7-5
- Table 7-6

Table 7-4: Vehicle Flows By Vehicle Type Base Year 2019

Road	Location	AM		IP		PM	
		Cars + Vans	HGV	Cars + Vans	HGV	Cars + Vans	HGV
M6	North of M6 J40	3,069	516 (14%)	3,135	470 (13%)	3,622	394 (10%)
M6	South of M6 J40	2,134	368 (15%)	2,352	363 (13%)	2,694	292 (10%)
A66	West of M6 J40	1,421	89 (6%)	1,239	111 (8%)	1,461	93 (6%)
A66	Between M6 J40 and Kemplay Bank	1,926	415 (18%)	1,702	407 (19%)	2,010	363 (15%)
A66	Directly East of Kemplay Bank	1,216	298 (20%)	1,196	289 (19%)	1,353	270 (17%)
A66	Temple Sowerby	947	268 (22%)	949	289 (23%)	1,063	260 (20%)
A66	Between Kirkby Thore and Appleby	1,062	280 (21%)	1,011	302 (23%)	1,169	289 (20%)
A66	Between Appleby and Brough	755	289 (28%)	832	311 (27%)	904	285 (24%)
A66	East of Brough	936	261 (22%)	1,016	278 (21%)	1,070	273 (20%)
A66	Bowes Bypass	762	260 (25%)	831	278 (25%)	888	274 (24%)
A66	West of Greta Bridge	1,002	283 (22%)	1,015	303 (23%)	1,137	294 (21%)
A66	East of Smallways	1,006	269 (21%)	1,006	291 (22%)	1,120	286 (20%)
A66	West of Scotch Corner	1,026	269 (21%)	1,008	319 (24%)	1,180	305 (21%)
A1(M)	North of Scotch Corner	4,231	415 (9%)	3,487	366 (9%)	4,428	295 (6%)
A1(M)	South of Scotch Corner	4,156	495 (11%)	3,612	503 (12%)	4,436	448 (9%)

Table 7-5: Vehicle Flows By Vehicle Type Do Minimum 2044

Road	Location	AM		IP		PM	
		Cars + Vans	HGV	Cars + Vans	HGV	Cars + Vans	HGV
M6	North of M6 J40	4,601	570 (11%)	4,828	512 (10%)	5,451	429 (7%)
M6	South of M6 J40	3,305	399 (11%)	3,582	388 (10%)	4,104	309 (7%)
A66	West of M6 J40	1,898	95 (5%)	1,675	119 (7%)	1,955	101 (5%)
A66	Between M6 J40 and Kemplay Bank	2,524	442 (15%)	2,331	425 (15%)	2,740	375 (12%)
A66	Directly East of Kemplay Bank	1,647	318 (16%)	1,635	311 (16%)	1,804	287 (14%)
A66	Temple Sowerby	1,303	286 (18%)	1,321	306 (19%)	1,427	275 (16%)
A66	Between Kirkby Thore and Appleby	1,410	297 (17%)	1,401	319 (19%)	1,551	303 (16%)
A66	Between Appleby and Brough	1,040	306 (23%)	1,175	328 (22%)	1,230	300 (20%)
A66	East of Brough	1,411	278 (16%)	1,543	294 (16%)	1,613	288 (15%)
A66	Bowes Bypass	1,213	277 (19%)	1,308	294 (18%)	1,360	289 (18%)
A66	West of Greta Bridge	1,492	299 (17%)	1,525	319 (17%)	1,634	309 (16%)
A66	East of Smallways	1,450	290 (17%)	1,465	307 (17%)	1,558	284 (15%)
A66	West of Scotch Corner	1,512	290 (16%)	1,539	338 (18%)	1,780	304 (15%)
A1(M)	North of Scotch Corner	6,106	435 (7%)	5,525	404 (7%)	6,733	282 (4%)
A1(M)	South of Scotch Corner	5,952	526 (8%)	5,486	557 (9%)	6,556	464 (7%)

Table 7-6: Vehicle Flows By Vehicle Type Do Something 2044

Road	Location	AM		IP		PM	
		Cars + Vans	HGV	Cars + Vans	HGV	Cars + Vans	HGV
M6	North of M6 J40	4,744	574 (11%)	4,981	515 (9%)	5,655	430 (7%)
M6	South of M6 J40	3,236	387 (11%)	3,545	382 (10%)	3,830	296 (7%)
A66	West of M6 J40	1,971	98 (5%)	1,756	122 (6%)	2,070	102 (5%)
A66	Between M6 J40 and Kemplay Bank	2,925	458 (14%)	2,699	441 (14%)	3,263	393 (11%)
A66	Directly East of Kemplay Bank	2,101	337 (14%)	2,185	333 (13%)	2,604	311 (11%)
A66	Temple Sowerby	1,816	327 (15%)	1,939	328 (14%)	2,305	308 (12%)
A66	Between Kirkby Thore and Appleby	1,626	308 (16%)	1,794	322 (15%)	2,155	312 (13%)
A66	Between Appleby and Brough	1,530	326 (18%)	1,751	337 (16%)	2,038	315 (13%)
A66	East of Brough	1,877	301 (14%)	2,102	309 (13%)	2,345	306 (12%)
A66	Bowes Bypass	1,690	300 (15%)	1,894	309 (14%)	2,104	306 (13%)
A66	West of Greta Bridge	2,056	322 (14%)	2,192	334 (13%)	2,472	325 (12%)
A66	East of Smallways	2,108	313 (13%)	2,224	324 (13%)	2,499	319 (11%)
A66	West of Scotch Corner	2,115	315 (13%)	2,222	354 (14%)	2,584	337 (12%)
A1(M)	North of Scotch Corner	6,254	435 (7%)	5,764	406 (7%)	6,759	300 (4%)
A1(M)	South of Scotch Corner	6,166	540 (8%)	5,686	565 (9%)	6,879	478 (6%)

7.2.9 There are three notable features of the traffic flow on the A66 in the base year:

- Traffic flows are similar across the morning, inter peak and evening peak. This is also true of the flows on the M6, but less so for traffic flows on the A1(M) which are higher in the morning and evening peaks.
- There is a very high proportion of HGVs, typically above 20% within the interpeak, with the exception of the section between the M6 and east of Kemplay Bank. The HGV proportions are similar within the morning peak but lower within the evening peak.
- The proportion of HGVs on the M6 (10-15%) is lower than on the A66 (15-28%), whilst the proportion is lower again on the A1(M) (6-12%).

7.2.10 By 2044 the traffic increase in the DM on the A66 is primarily associated with car and LGV traffic, which has increased by 40-44% between the base and the DM, while the HGV traffic has only grown by 4-7%.

7.2.11 These results show a high proportion of HGVs, however the proportion of HGVs reduces in the DM future year scenario. This reflects the difference in central government projections for these different vehicle classes, as contained in NTEM v7.2, RTF18 and the TAG databook.

7.2.12 Within the DS scenario, the additional traffic attracted to the route is mostly car traffic however there is some additional HGV traffic attracted also.

7.2.13 The forecast journey times along the A66 from the M6 J40 to the A1(M) Scotch Corner without the delivery of the Project are shown in Table 7-7. Journey times shown provide an indication of a typical eastbound and westbound journey time during the day rather than for an individual time period or direction where journey times vary slightly.

Table 7-7: A66 Corridor average journey times (minutes)- DM

Year	Base 2019	DM	DM v Base
2029	54	56	1 (3%)
2044		58	4 (7%)
2051		59	5 (9%)

7.2.14 The results above show that there will be an increase in journey time of approximately five minutes (9%) along the A66 corridor if the Project is not delivered. This is because the single carriageway sections are near their capacity throughout the assessment period. The Congestion Reference Flow (CRF) of a Single Carriageway Road is typically between 22,000 to 23,000 AADT[23], and as can be seen in Table 7-2, almost all single carriageway sections of the route exceed 22,000 AADT by 2044 (with the exception of Appleby to Brough with an AADT of 21,200).

[23] While it is recognised that the DMRB chapter that describes congestion reference flows has been withdrawn, there has been no equivalent measure to replace the CRF. The CRF is therefore being used to indicate at what flow level delays would be likely to occur.

7.2.15 The CRF of a Dual Carriageway Road is much greater (68,000 to 70,000 AADT) than a Single Carriageway Road and therefore the delivery of the Project will provide significantly more capacity.

7.2.16 Traffic flows across the A66 corridor are forecast to increase significantly if the Project is delivered.

7.2.17 The forecast journey times along the A66 from the M6 J40 to the A1(M) Scotch Corner with the delivery of the Project are shown in Table 7-8.

Table 7-8: A66 corridor journey times (minutes)- DS

Year	Base 2019	DM	DS	DS v DM
2029	54	56	45	-10 (-19%)
2044		58	46	-12 (-21%)
2051		59	46	-13 (-22%)

7.2.18 The results above demonstrate journey time savings between M6 J40 and A1(M) Scotch Corner with the delivery of the Project. It is anticipated that users will save between 10 and 13 minutes (19-22%) when travelling along the A66 corridor in future years. Travel times worsen through the modelled period (in both the DM and the DS) due to traffic growth. The rate of deterioration is less within the DS scenario as greater capacity is provided to deal with traffic growth.

7.3 User experience

7.3.1 This section will summarise the key issues in relation to road user experience and the justification for the Project in terms of improving the user experience.

Journey reliability

7.3.2 Detail of the journey times on the route is contained within Chapter 2, Local Transport System, of Combined Modelling and Appraisal Report (Document Reference 3.9). The data shows that speeds are inconsistent across the entirety of the route throughout the year. Sections of the A66 which are dualled generally show speeds approximately 5mph slower than the speed limit. Single carriageway sections of the A66 consistently show higher levels of relative delay, with average speeds across most sections and months around 45-50mph. This represents a speed 10-15mph below the speed limit of a standard single carriageway trunk road (60mph) and 15-20mph below that observed on the dual sections.

7.3.3 Speeds on a Friday and during bank/school holiday show even further reductions, with average speeds as low as 21mph experienced at Kemplay Bank eastbound and 27 mph westbound between Carkin Moor and Stephen Bank in July.

7.3.4 The A66 repeatedly widens and narrows from dual to single carriageway, and the fact that some sections of road do not match

modern standards can cause significant congestion and delay[24] due to lack of overtaking opportunities and slow-moving traffic due to a high proportion of HGVs and the frequent use of the route by agricultural vehicles.

7.3.5 40mph and 50mph speed limits have been adopted on single carriageway sections as a result of safety concerns and local severance problems. With the high percentage of HGVs (22.5% compared to the national average of 12%), this variation of speed limit, together with the variation in road standards and geometry along the route, results in slow-moving traffic, longer journey times and unreliable journeys. Figure 1-4 illustrates the current variations in speed limits on the A66.

7.3.6 Consistency of journey times during incidents has been identified by stakeholders and businesses[25] as a major issue for the A66 between Penrith and Scotch Corner. Due to the varying standard of the route and lack of suitable diversionary routes, the route's ability to maintain smooth traffic flow during periods of disruption such as road traffic accidents and severe weather events is poor. The high elevation of the route at Bowes Moor and Stainmore and severe weather events are common in this area, making the route particularly vulnerable to accidents.

7.3.1 The ability to keep the route open during accidents, incidents and other disruptions is significantly affected by the existence of the single carriageway sections. Generally, traffic movements can be better managed when incidents happen on dual carriageway sections. This is because:

- Where only one lane is affected by the incident, traffic can continue to flow on the second lane, and
- emergency services can access and clear the incident more quickly

7.3.2 The central reserve prevents traffic flow in the opposite direction from being affected. If necessary, HGVs have enough space to turn around and take a different route.

[24] To evidence how the varying standard of the A66 route and lack of diversionary routes affect journey time variability due to major incidents, various National Highways datasets have been identified and analysed. To assist in the assessment of road closures resulting from accident incidents, Stats 19 and National Incident Liaison Officer (NILO) data was used. Network Occupancy Management System (NOMS) data was used for the assessment of maintenance closures. Command and Control data was used for the assessment of accident, maintenance and weather-related closures. In addition to this 2018 TrafficMaster journey time data was used to calculate the standard deviation of journey time for the single and dual carriageway sections.

[25] 20 Local Business and Stakeholders were interviewed in 2019 in relation to the improvements proposed by the Project. The majority of businesses interviewed raised concerns that there were few or no appropriate diversion routes from the A66 if there was an incident. Businesses found that diversion routes were very congested and could take hours to navigate. Some of the companies spoken to were concerned that both light and heavy vehicles were using inappropriate country lanes through villages as diversions, causing further delays for local traffic. In total 75% of the businesses surveyed cited issues surrounding resilience on the A66. Businesses and stakeholders included, Aggregate Industries, British Gypsum, Centre Parks, PD Ports, Tees Valley Combined Authority and Teesside International Airport

Quantitative Assessment of Travel Time Variability and Incident Delay

7.3.3 The journey time reliability assessment uses MyRIAD 2021[26] to compare performance of the Project, in terms of:

- Travel Time Variability (TTV) –
  - MyRIAD determines day to day TTV as the variance and standard deviation (SD) of travel times during congestion, by assessing road type, carriageway speed / flow / capacity characteristics (and hence standard deviation of travel time), route length, link speed (and hence travel time), forecast traffic flows, and proportion of HGV.
  - MyRIAD determines incident TTV as the variance and SD of travel times during incidents, using the same parameters as for daily variability, but additionally MyRIAD assesses incident types, durations, rates (per million vehicle kilometres), likelihood, (and hence queue probabilities), and reduced carriageway capacity (lanes closed).
- In terms of incident delays –
  - MyRIAD determines incident delays using the same parameters as for incident TTV, but additionally MyRIAD assesses mean and maximum queuing delay per vehicle, and hence proportion of diverting traffic.

7.3.4 The results of the MyRIAD assessment are discussed in detail in the **Combined Modelling and Appraisal Report** (Document Reference 3.8). This shows that the total Project MyRIAD benefit is £272m of which

- The TTV (Daily Congestion & Incidents) benefits sum to £151m
- Incident delays on the A66 sum to £120m
- Incident delays on the diversion routes (those routes adjacent to the A66 that are less likely to be used by diverted A66 traffic) sum to £0.5m

7.3.5 This value is significant in scale compared to the overall travel time benefits of the Project which total £620m.[27] It can therefore be concluded that the Project has a significant beneficial impact on travel time variability and incident delay.

Journey Time Variability as a Result of Major Traffic Incidents

7.3.6 Journey time variability as a result of major traffic incidents is often referred to as resilience. Route resilience assessment for the A66 represents the potential for the road to recover to normal operating conditions and travel times, after an incident blockage and carriageway closure longer than 6 hours. [28]

[26] MyRIAD 2021 (Motorway Reliability Incidents And Delays) will calculate the monetised reliability and incident delay impacts of trunk road improvement schemes
[27] For further details see **3.8 Combined Modelling and Appraisal Report**
[28] The dataset behind MyRIAD, removed extreme outlier events to avoid bias within its calculations. The threshold for exclusion was chosen to be 6 hours. Therefore incidents that last for shorter than

7.3.7 The 'resilience' impact of the Project comprises the following elements of unpredictable journey time impacts for road users:

- Travel time delay on the A66 route during incidents and closures longer than 6 hours, with all traffic diverting.
- Travel time delays elsewhere on the strategic road network, during carriageway incident closures longer than 6 hours, with some traffic diverting to the improved A66.
- Travel time delays elsewhere on the local road network, during carriageway incident closures longer than 6 hours, with some traffic diverting to the improved A66.

7.3.8 The results of the resilience assessment are discussed in detail in the **Combined Modelling and Appraisal Report** (Document Reference 3.8). This shows that the total resilience benefit is £19.4m of which

- A66 route resilience sums to £-1.9m[29]
- Strategic network resilience sums to £17.5m
- Local network resilience sums to £3.9m

7.3.9 The overall positive value highlights the benefits to be gained by the Project when closures of greater than 6 hours occur on the road network within the area.

7.4 Conclusions

7.4.1 The average traffic growth on the A66 between 2019 and 2044 Do Minimum is 41% across all locations considered. Typically flows on the A66 in 2044 Do Minimum range from 21,000 AADT (between Appleby and Brough) and 42,000 AADT (between M6 Junction 40 and Kemplay Bank).

7.4.2 This growth in the Do Minimum from 2019 to the forecast year is due to national changes in; population, trip rates, GDP and income, cost of driving, licence holding, and demand for goods.

7.4.3 The average additional growth on the A66 due to the Project is 30%. The resultant flows on the A66 in 2044 Do Something range between 29,000 AADT (between Appleby and Brough) and 47,000 AADT (between M6 Junction 40 and Kemplay Bank).

7.4.4 The growth due to the Project is due to the provision of a higher standard route. The increase in traffic flow reflects people benefiting from the opportunity that the dualling offers.

7.4.5 The improved linkage provided by the Project benefits communities within the north of England, who, due to the rural nature of the region, often lack access to key local services for example, GP surgeries, primary schools and supermarkets. These people are often required to commute over longer distances than average to access improved

6 hours are considered under 'reliability' and those major incidents that impact the network for more than 6 hours are considered under 'resilience'.

[29] This small negative result occurs because while the resilience is improved on the sections dualled as part of the scheme, more traffic is attracted to the route, which then incurs delay when the route is shut for bad weather.

employment opportunities. The project is therefore important as it facilitates these longer distance journeys through improved journey times and journey time reliability. The increased flow also reflects more tourists benefiting from improved links to areas such as the Lake District and the North Pennines AONB, thereby improving the economies within this area.

7.4.6 The forecast journey times along the A66 from the M6 J40 to the A1(M) Scotch Corner without the delivery of the Project will increase by approximately five minutes (9%) if the Project is not delivered. This is because the single carriageway sections are near their capacity throughout the assessment period. With the Project in place it is anticipated that users will save between 10 and 13 minutes (19-22%) when travelling along the A66 corridor in future years.

7.4.7 The MyRIAD assessment has shown that the Project has a significant beneficial impact on Travel Time Variability and Incident Delay by removing the single carriageway sections.

7.4.8 The journey resilience assessment has shown that network wide benefits are to be gained by the Project when closures of greater than 6 hours occur on the road network within the area.

8 Forecast local network performance

8.1 Local impacts

8.1.1 An assessment of the Project comparing Do Something AADT against Do Minimum AADT for the forecast year of 2044 has been undertaken. This section includes AADT flow plots for each scheme area including local roads close to the A66. A series of three plots is shown for each scheme area and show the following:

- Do Minimum 2044 AADT traffic flows (without the schemes)
- Do Something 2044 AADT traffic flows (with the schemes)
- Change in traffic flows from Do Minimum to Do Something 2044

8.1.2 For flow plots which show the change in traffic flows due to the project, the following should be noted.

- Any existing link with a traffic increase is shown in purple.
- Any existing link with a traffic decrease is shown in green.
- Any new link is shown in red. Within this category there is no comparison to be made in traffic as the link did not exist within the Do Minimum.

8.1.3 In addition to the traffic flow plots, a summary table of local roads in each scheme area has been provided to illustrate the changes forecast because of the project. The CRF is included to demonstrate an indicative capacity for each road. The Degree of Saturation (DoS) (ratio of flow to capacity) shows the proportion of traffic at each location relative to the capacity for Do Minimum and Do Something scenarios.

8.1.4 The location of these local roads is shown in Figure 8-1 to Figure 8-3 below.

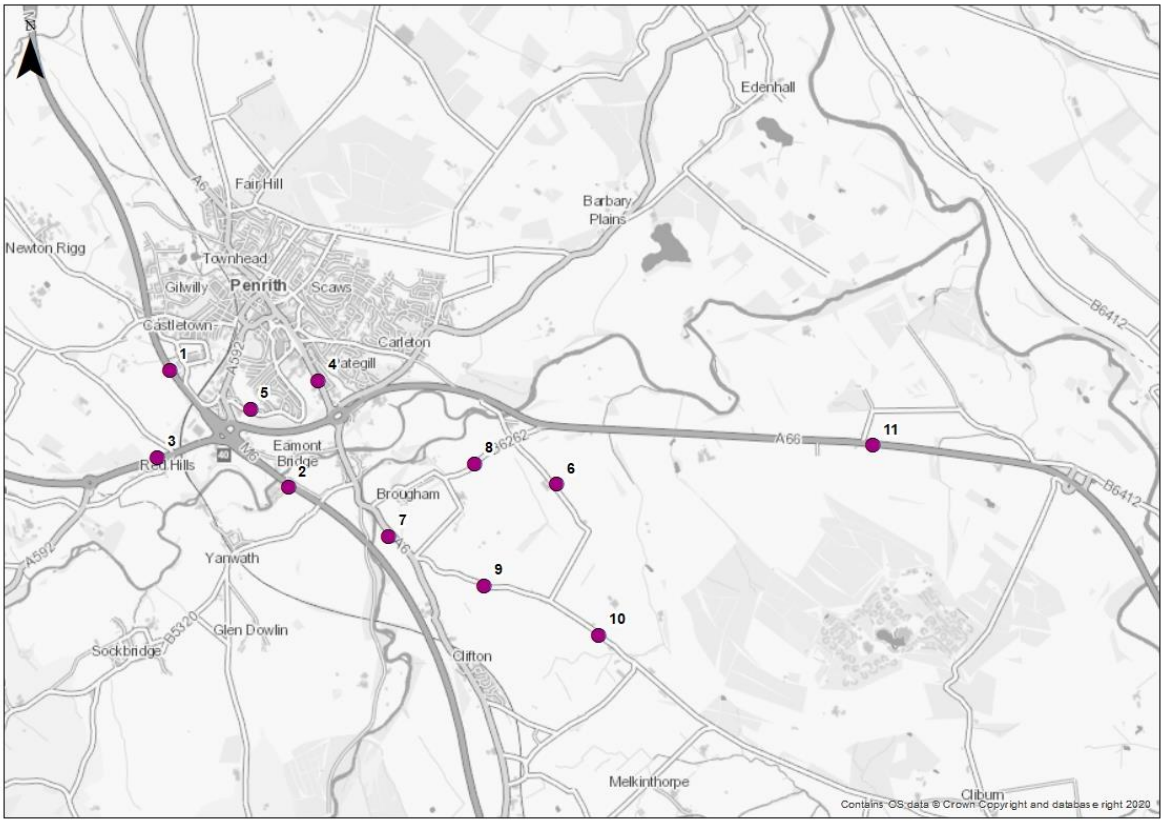

Figure 8-1: Local Road Locations: Penrith to Temple Sowerby

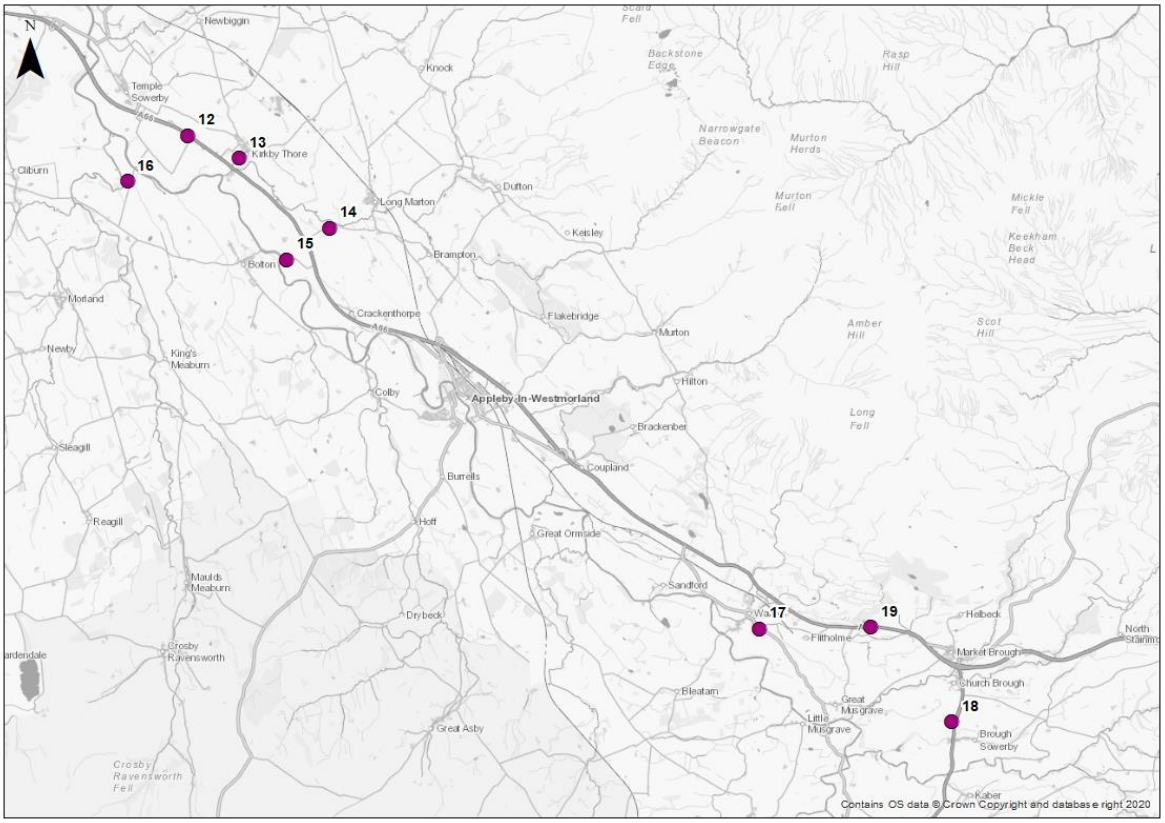

Figure 8-2: Local Road Locations: Temple Sowerby to Brough

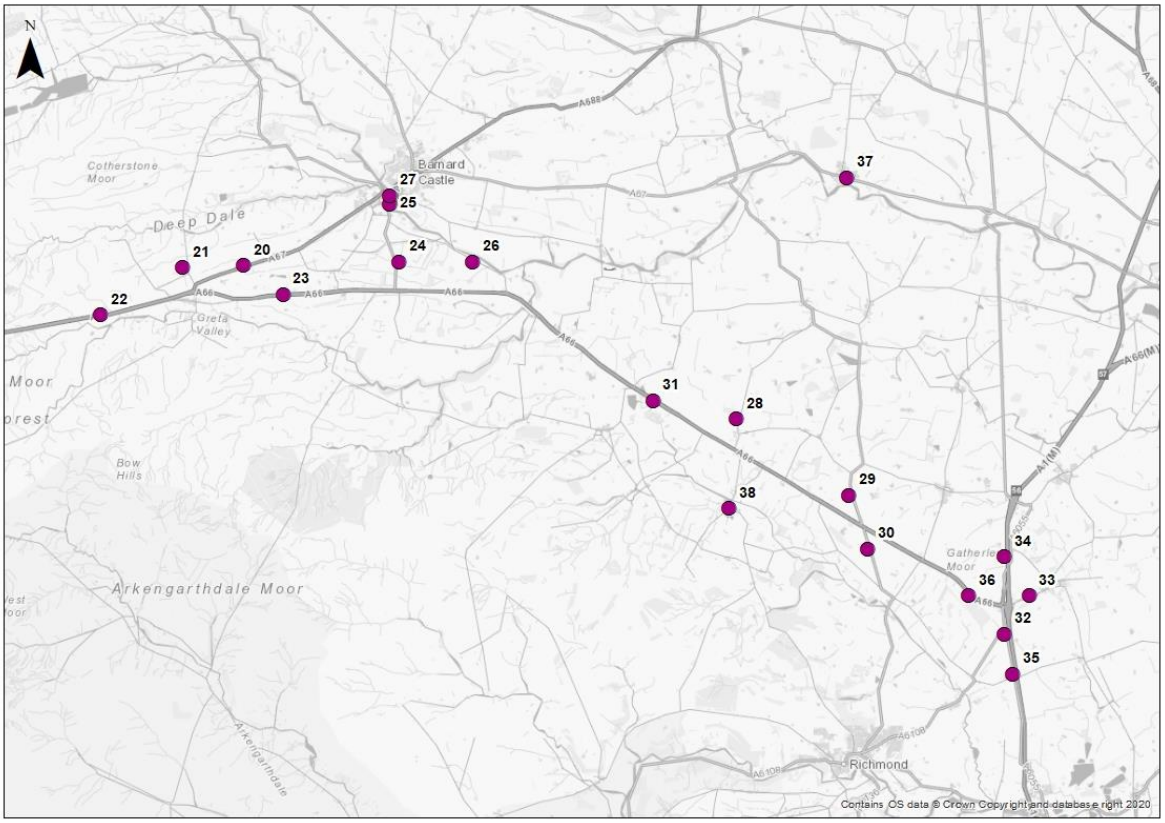

Figure 8-3: Local Road Locations Bowes to Scotch Corner

Schemes 1 and 2 M6 Junction 40 to Kemplay Bank Development Impact

8.1.5 The following flow plots covering the local area around M6 Junction 40 and Kemplay Bank are provided below:

- Figure 8-4: forecast year Do Minimum flows.
- Figure 8-5: forecast year Do Something flows.
- Figure 8-6: forecast year change in flow from Do Minimum to Do Something.

Figure 8-4: M6 Junction 40 and Kemplay Bank – Forecast Year Do Minimum Flows

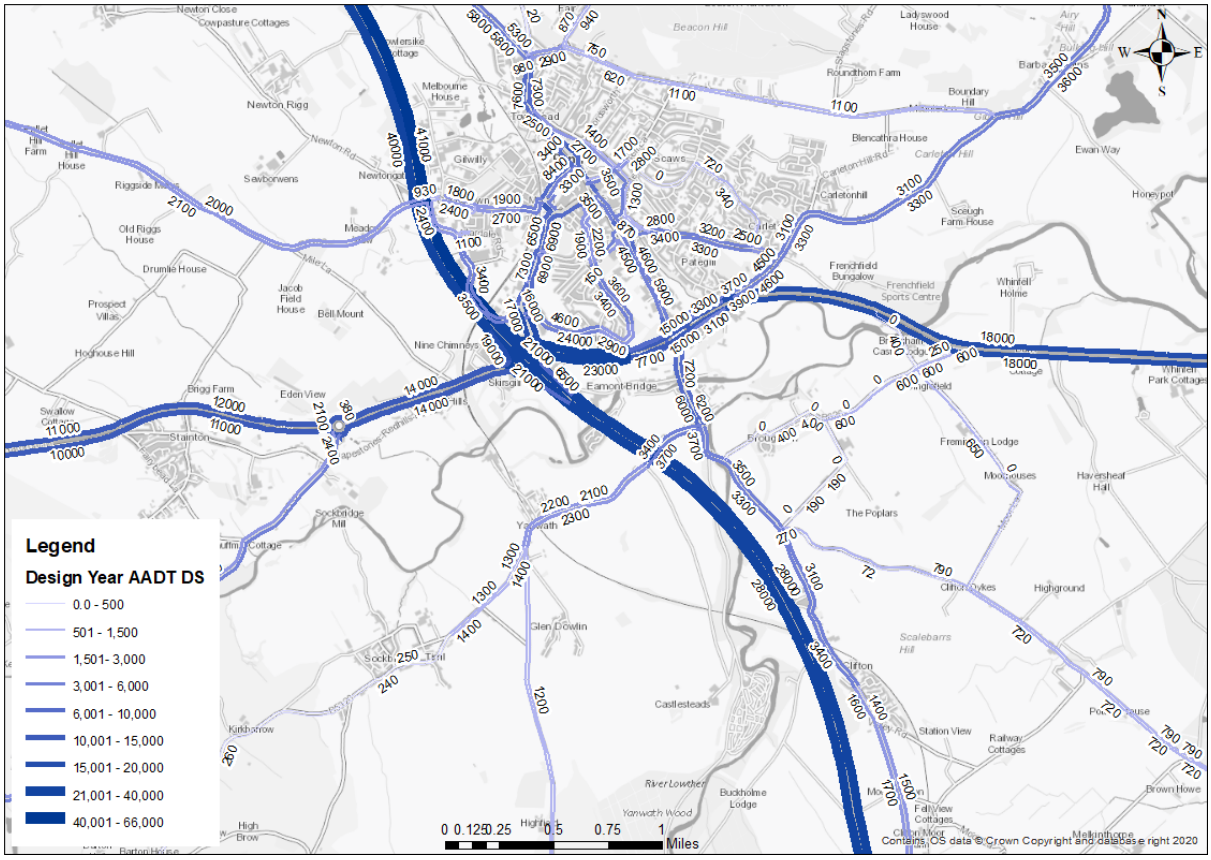

Figure 8-5: M6 Junction 40 and Kemplay Bank – Forecast Year Do Something Flows

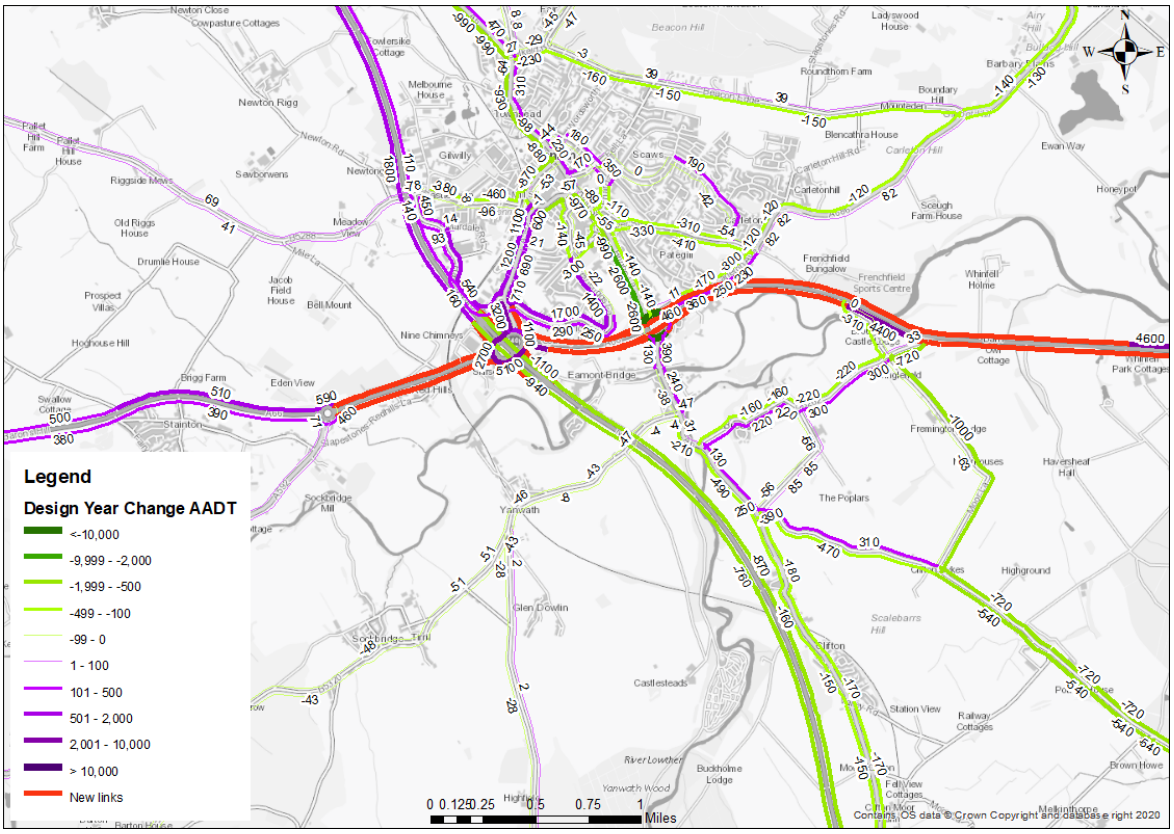

Figure 8-6: M6 Junction 40 and Kemplay Bank – Forecast Year Do Something Flow (Change from Do Minimum)

8.1.6 Table 8-1: M6 Junction 40 to Kemplay Bank Development - Local Road Traffic Flows (AADT) summarises Do Minimum and Do Something traffic information for key links in the local area.

Table 8-1: M6 Junction 40 to Kemplay Bank Development - Local Road Traffic Flows (AADT)

Loc	Road	DM flow (Two-way)	DS flow (Two-way)	Flow change (Two-way)	Percentage change (Two-way)	Indicative Road Capacity	DoS DM	DoS DS
1	M6 north of Junction 40	79,000	81,000	1,900	2%	97,000	82%	84%
2	M6 south of Junction 40	57,000	56,000	-1,600	-3%	97,000	59%	58%
3	A66 west of Penrith	26,000	27,000	1,100	4%	68,000	39%	40%
4	A6 Bridge Lane / Victoria Road within Penrith	16,000	13,000	-2,700	-17%	22,000	72%	60%
5	Clifford Road within Penrith	7,300	9,250	+1950	27%	22,000	33%	42%

8.1.7 The existing flows on the A66 west of Penrith is low in relation to the capacity of the road (ratio of flow to capacity less than 50% for both Do Minimum and Do Something) and therefore the additional flows expected as a result of the scheme will not impact the operation of this

road. An assessment of the impact on key junctions within the area is contained within Chapter 8.3

8.1.8 The increase in AADT on Clifford Road within Penrith 2044 is 1950 vehicles per day, which would equate to around 200 vehicles per hour. This is due to an increase in movements accessing the area to the south of Penrith town centre around Sainsburys and Penrith Leisure Centre from the M6 north and south and the A66 west of Junction 40. These local movements currently use the A66 between Junction 40 and Kemplay Bank. However, as the speed has been reduced on the A66 to reflect the proposed 50mph speed limit, the model is diverting traffic via Clifford Road. This effect has directly led to reductions on the A6 Bridge Lane north of Kemplay Bank.

8.1.9 It is considered unlikely that an impact on this scale would materialise. This is due to Clifford Road being traffic calmed and the Project improving the capacity of the A66, Kemplay Bank and Junction 40. This impact should be monitored during the operational phase.

8.1.10 Flow increases within Penrith are balanced by small traffic reductions on the north side of Penrith, for example on Beacon Edge Road. As the Project provides more capacity and reduces delays at Kemplay Bank, traffic will be attracted to this additional capacity relative to the Do Minimum scenario, thereby providing some relief on the more remote alternative roads.

Penrith to Temple Sowerby Development Impact

8.1.11 The following flow plots covering the local area around Penrith to Temple Sowerby are provided below:

- Table 8-4: forecast year Do Minimum flows.
- Figure 8-8: forecast year Do Something flows.
- Figure 8-9: forecast year change in flow from Do Minimum to Do Something.

Figure 8-7: Penrith to Temple Sowerby - Forecast Year Do Minimum Flows

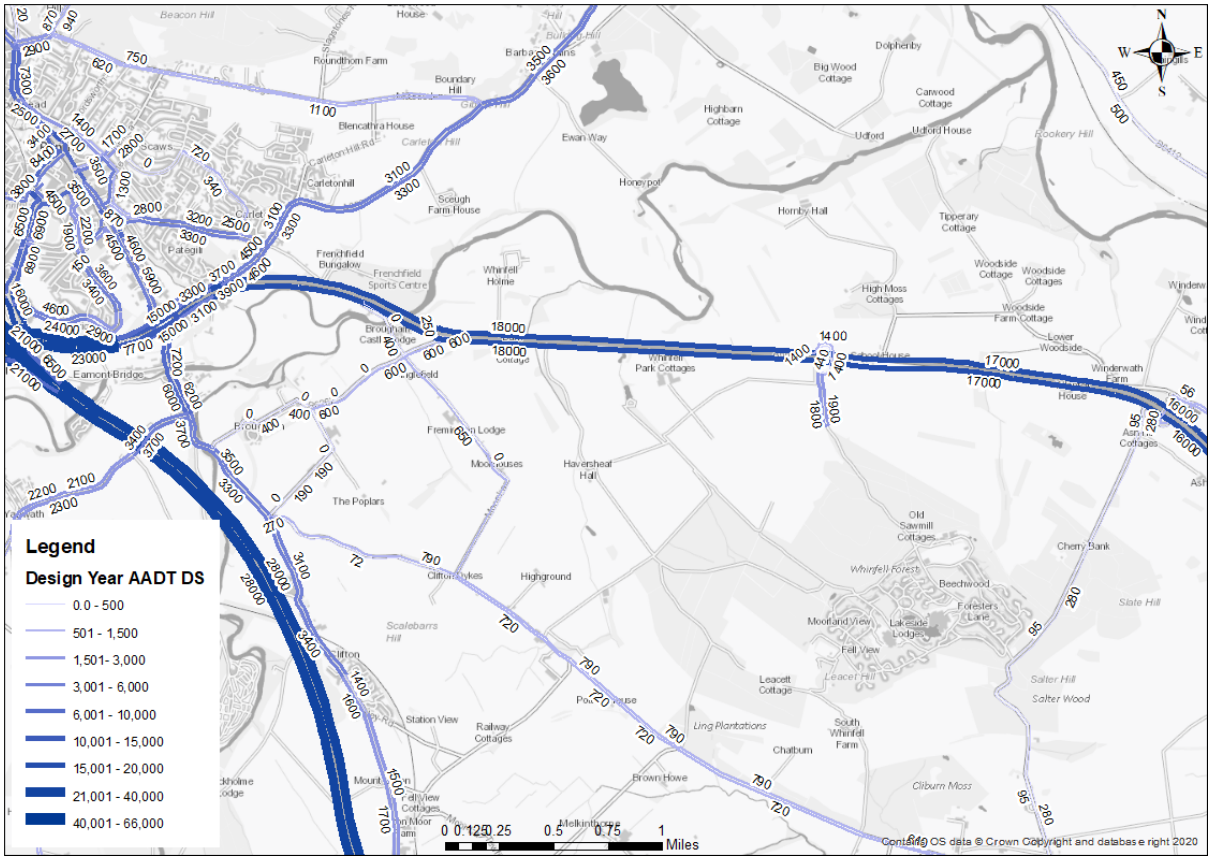

Figure 8-8: Penrith to Temple Sowerby - Forecast Year Do Something Flows

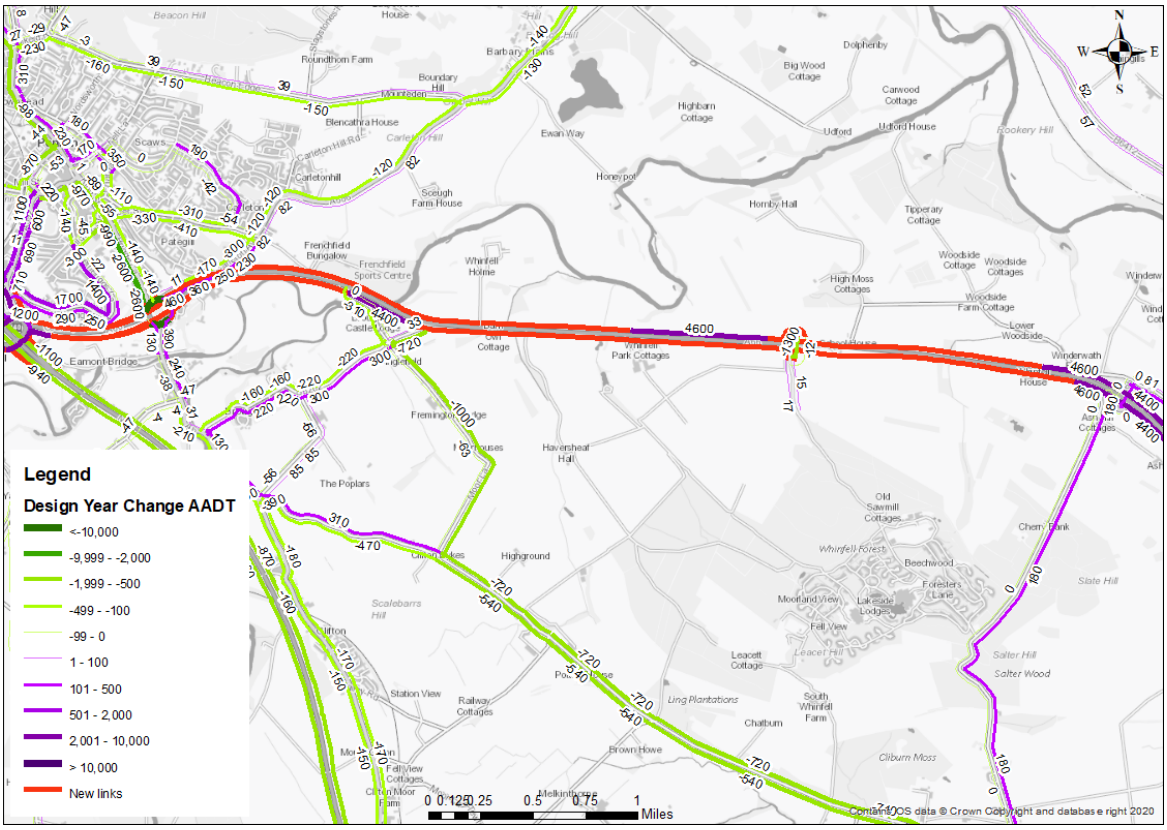

Figure 8-9: Penrith to Temple Sowerby - Forecast Year Do Something Flow (Changes from Do Minimum)

8.1.12 Table 8-2 presents Do Minimum (DM) and Do Something (DS) traffic for key links within the local area.

Table 8-2: Penrith to Temple Sowerby - Local Road Traffic Flows (AADT)

Loc	Road	DM flow (Two-way)	DS flow (Two-way)	Flow change (Two-way)	Percentage change (Two-way)	Indicative Road Capacity	DoS DM	DoS DS
7	A6 at Brougham	7,200	6,800	-360	-5%	22,000	33%	31%
8	B6262 east of Brougham	510	600	87	17%	NA*	NA*	NA*
9	Wetheriggs west of Moor Lane	1,000	870	-170	-16%	11,000	9%	8%
*The CRF of a one lane road with passing places cannot be determined using the standard formulae. See further discussion in Paragraph 8.1.13								

8.1.13 There is a small increase (5%) on the A6 past Brougham as traffic uses the A6 to access the A66.

8.1.14 The impact of the scheme on the B6262 east of Brougham is such that the modelled eastbound flow has reduced to zero as the right turn at the A66 / B6262 has been removed as part of the Penrith to Temple Sowerby scheme. The peak flow within the model occurs in the AM peak and is 44 vehicles per hour. Within the DM scenario the peak hourly flow is 39 vehicles per hour, therefore the 17% growth equates to an additional 7 vehicle per hour due to the Project.

8.1.15 On Wetheriggs, there is a small decrease as the decreased journey time on the A66 relieves traffic on this parallel route. The changes on both roads are not expected to be significant.

Temple Sowerby to Appleby Development Impact

8.1.16 The following flow plots covering the local area around Temple Sowerby to Appleby are provided below:

- Figure 8-10: forecast year Do Minimum flows
- Figure 8-11: forecast year Do Something flows
- Figure 8-12: forecast year change in flow from Do Minimum to Do Something

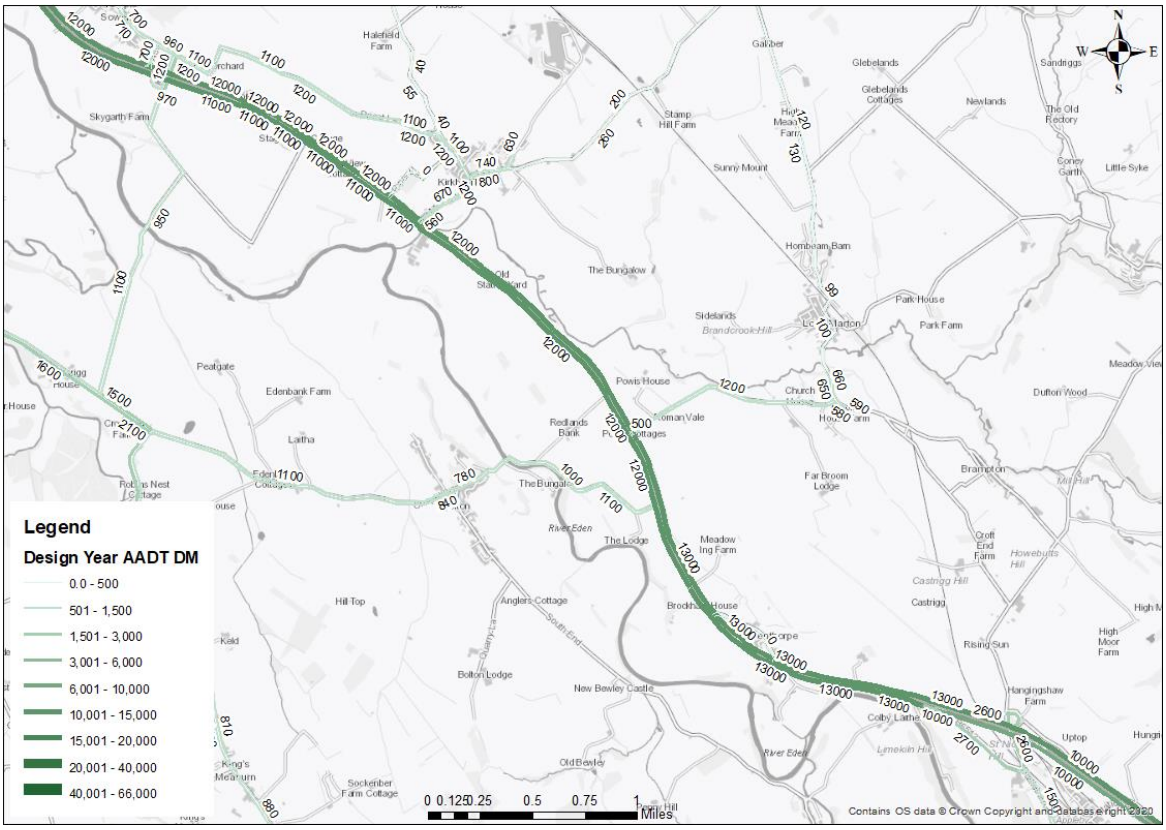

Figure 8-10: Temple Sowerby to Appleby - Forecast Year Do Minimum Flows

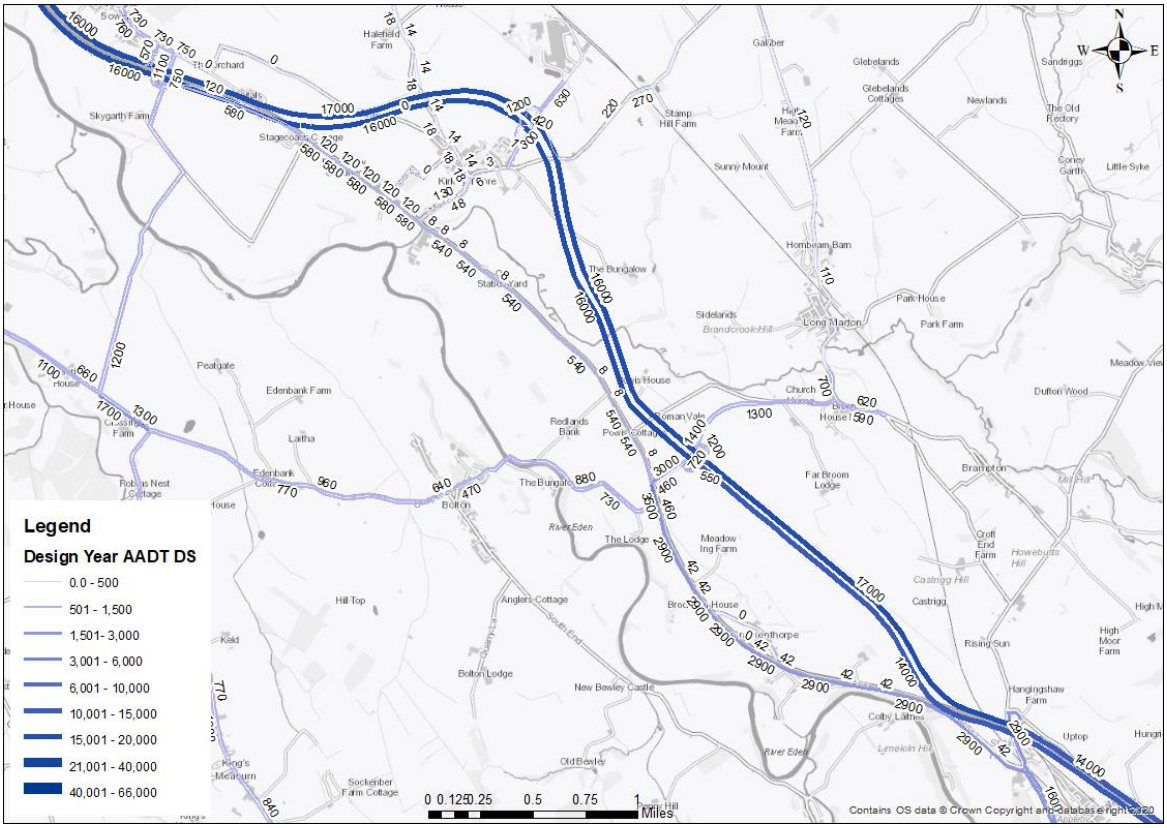

Figure 8-11: Temple Sowerby to Appleby - Forecast Year Do Something Flows

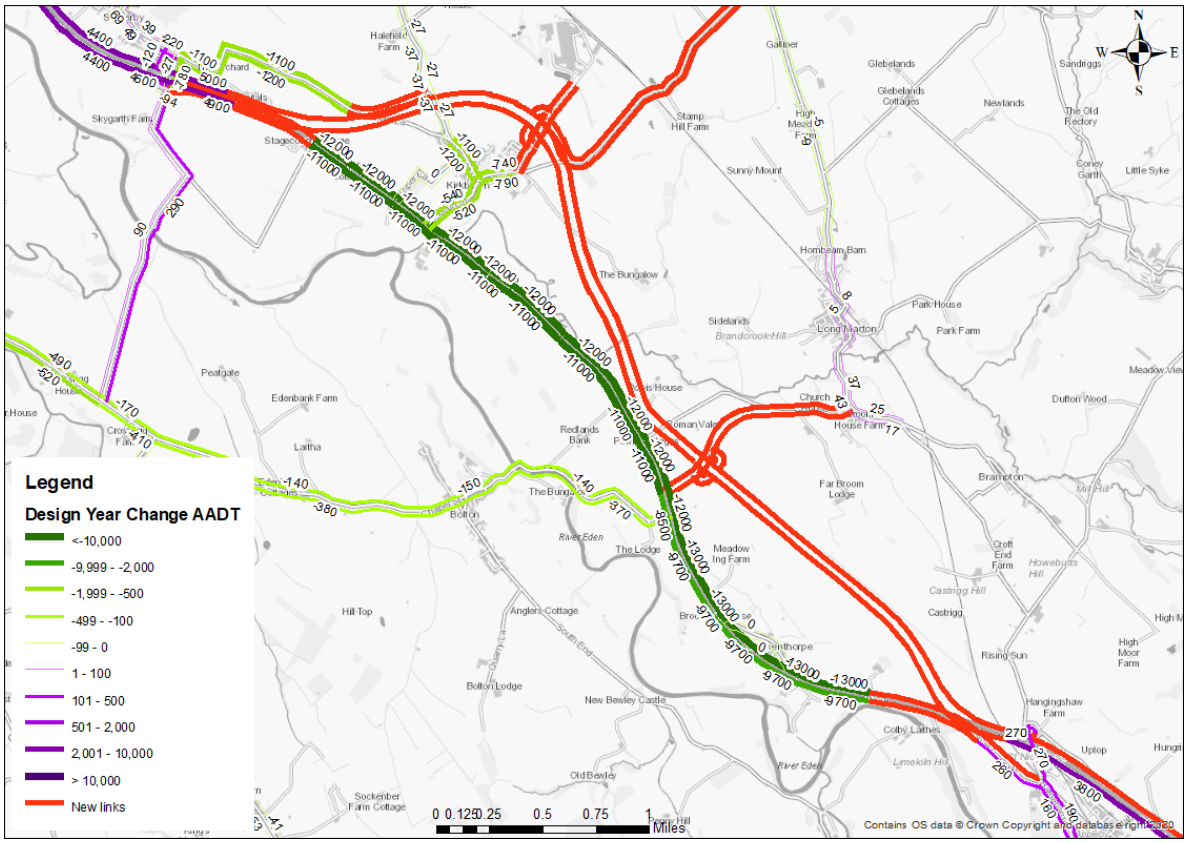

Figure 8-12: Temple Sowerby to Appleby - Forecast Year Do Something Flow (Changes from Do Minimum)

8.1.17 Table 8-3 presents Do Minimum (DM) and Do Something (DS) traffic information for the local area.

Table 8-3: Temple Sowerby to Appleby - Local Road Traffic Flows (AADT)

Loc	Road	DM flow (Two-way)	DS flow (Two-way)	Flow change (Two-way)	Percentage change (Two-way)	Indicative Road Capacity	DoS DM	DoS DS
12	Existing A66 alignment through Kirkby Thore and Crackenthorpe	24,000	550	-23,000	-98%	22,000	107 %	3%
13	Main Street to the South of Kirkby Thore	1,200	180	-1,100	-86%	22,000	6%	1%
14	Long Marton Road	2,600	2,900	270	10%	22,000	12%	13%
15	Chapel Street through Bolton	2,300	1,700	-520	-23%	22,000	10%	8%

8.1.18 The new route removes traffic from the existing A66. In terms of impact on other parts of the local road network there is a decrease in flows on all of the roads except Long Marton as the decreased journey time on the A66 relieves traffic on local roads. The existing Long Marton Road is realigned to the south to tie in with the proposed new A66 junction. Flows are expected to increase by 13% on Long Marton in the Do

Something although the ratio of flow to capacity remains very low so the change will not impact the operation of this road.

Appleby to Brough (Warcop) Development Impact

8.1.19 The following flow plots covering the local area around Appleby to Brough are provided below:

- Figure 8-13: forecast year Do Minimum flows.
- Figure 8-14: forecast year Do Something flows.
- Figure 8-15: forecast year change in flow from Do Minimum to Do Something.

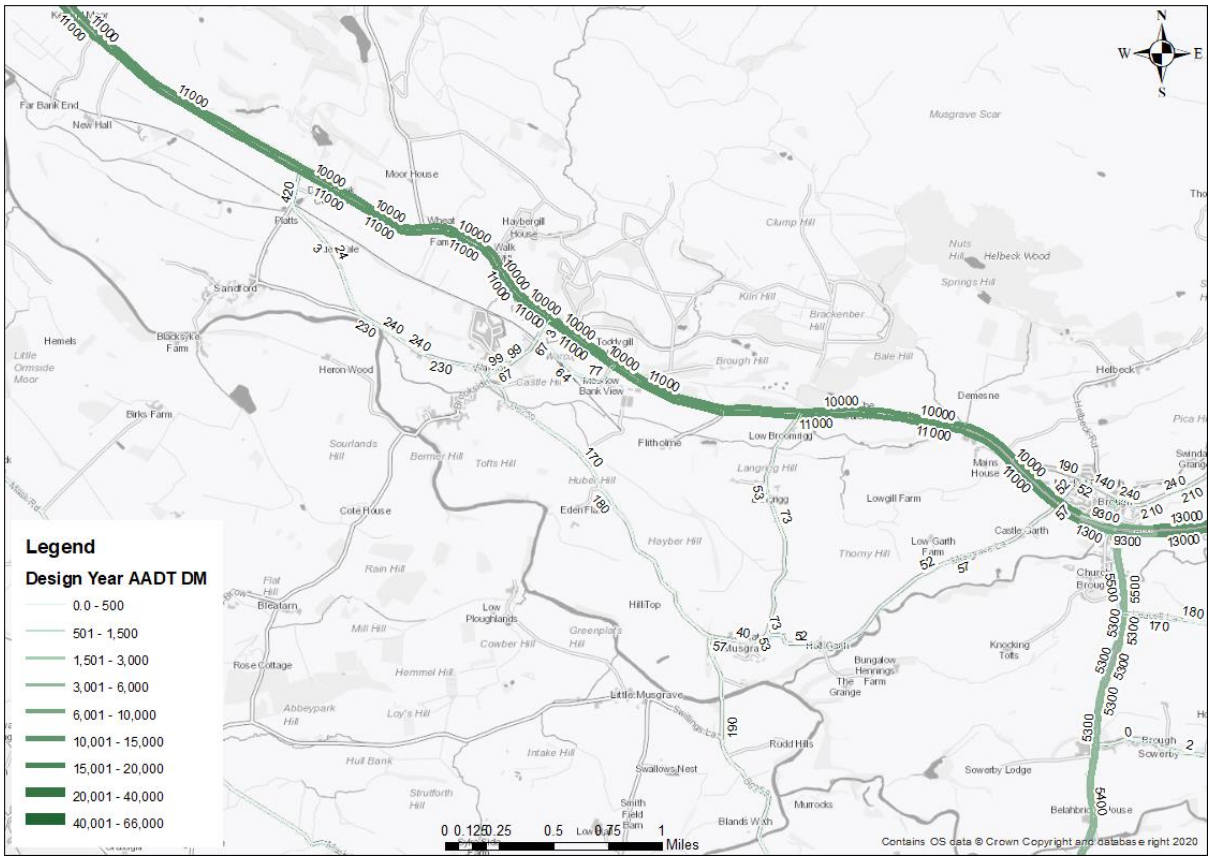

Figure 8-13: Appleby to Brough – Forecast Year Do Minimum Flows

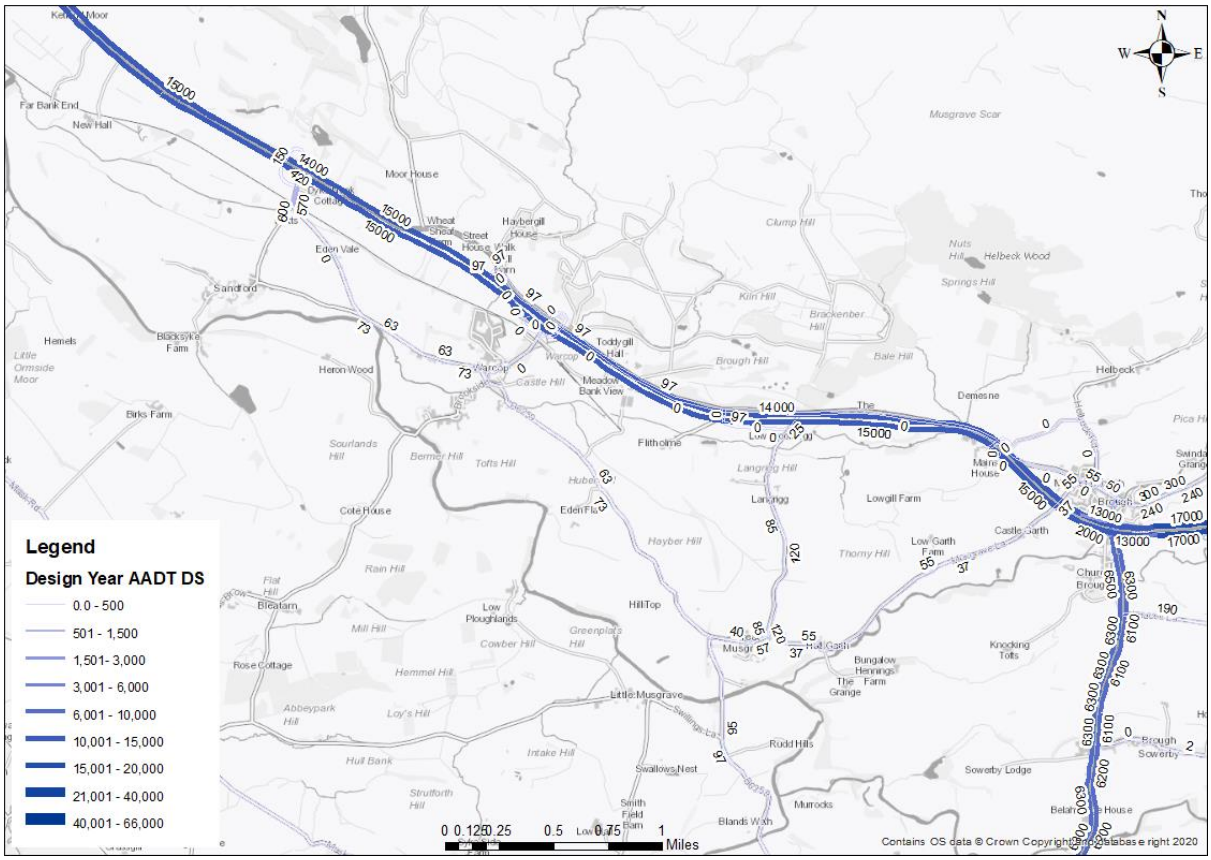

Figure 8-14: Appleby to Brough – Forecast Year Do Something Flows

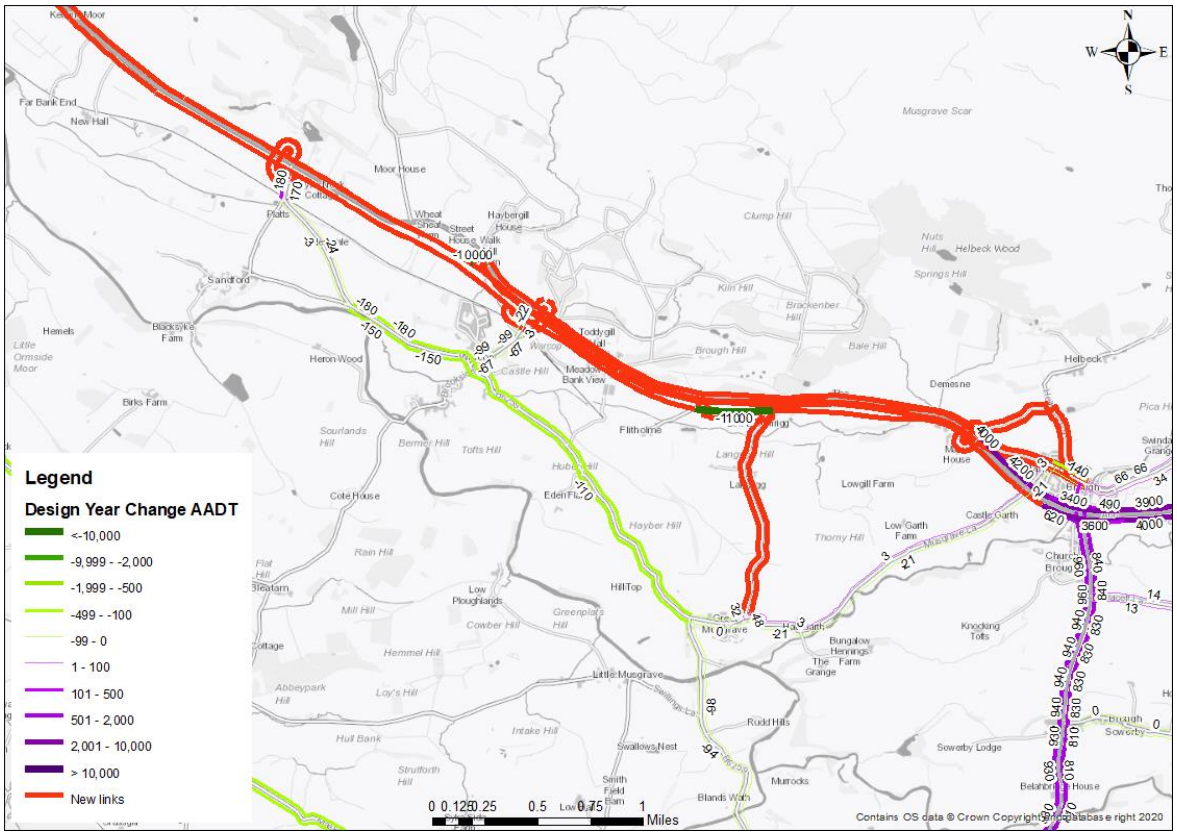

Figure 8-15: Appleby to Brough – Forecast Year Do Something Flow (Changes from Do Minimum)

8.1.20 Table 8-4 presents Do Minimum and Do Something traffic information for the local area.

Table 8-4: Appleby to Brough (Warcop) - Local Road Traffic Flows (AADT)

Loc	Road	DM flow (Two-way)	DS flow (Two-way)	Flow change (Two-way)	Percentage change (Two-way)	Indicative Road Capacity	DoS DM	DoS DS
17	B6259 eastern approach to Warcop	350	140	-220	-62%	22,000	2%	1%
18	A685 between Brough and Kirkby Stephen	11,000	12,000	1,700	16%	22,000	49%	57%

8.1.21 There is a decrease in traffic on the B6259 as a new link from the A66 is provided. The flows on this link are low in both the DM and DS scenarios so the change in flow will have negligible impact on the operation of this road.

8.1.22 The existing flows on the A685 are expected to increase by 16% in the DS scenario. The project will make the A66 route more attractive for traffic travelling to and from the M6 South which is connected to the A66 via the A685. An assessment of the increase of traffic on through Kirkby Stephen is provided in section 8.3.

Bowes bypass (A66/A67) development impact

8.1.23 The following flow plots covering the local area around Bowes Bypass are provided below:

- Figure 8-16: forecast year Do Minimum flows.
- Figure 8-17: forecast year Do Something flows.
- Figure 8-18: forecast year change in flow from Do Minimum to Do Something.

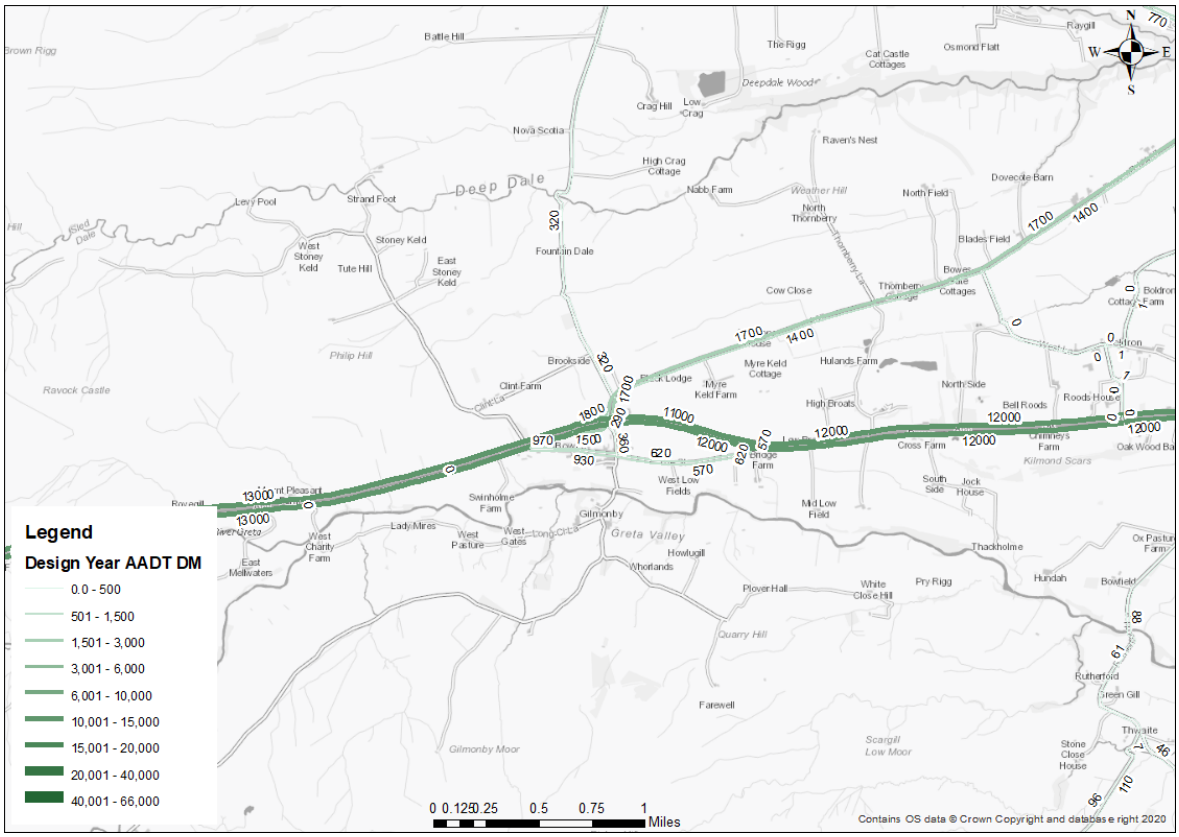

Figure 8-16: Bowes Bypass – Forecast Year Do Minimum Flows

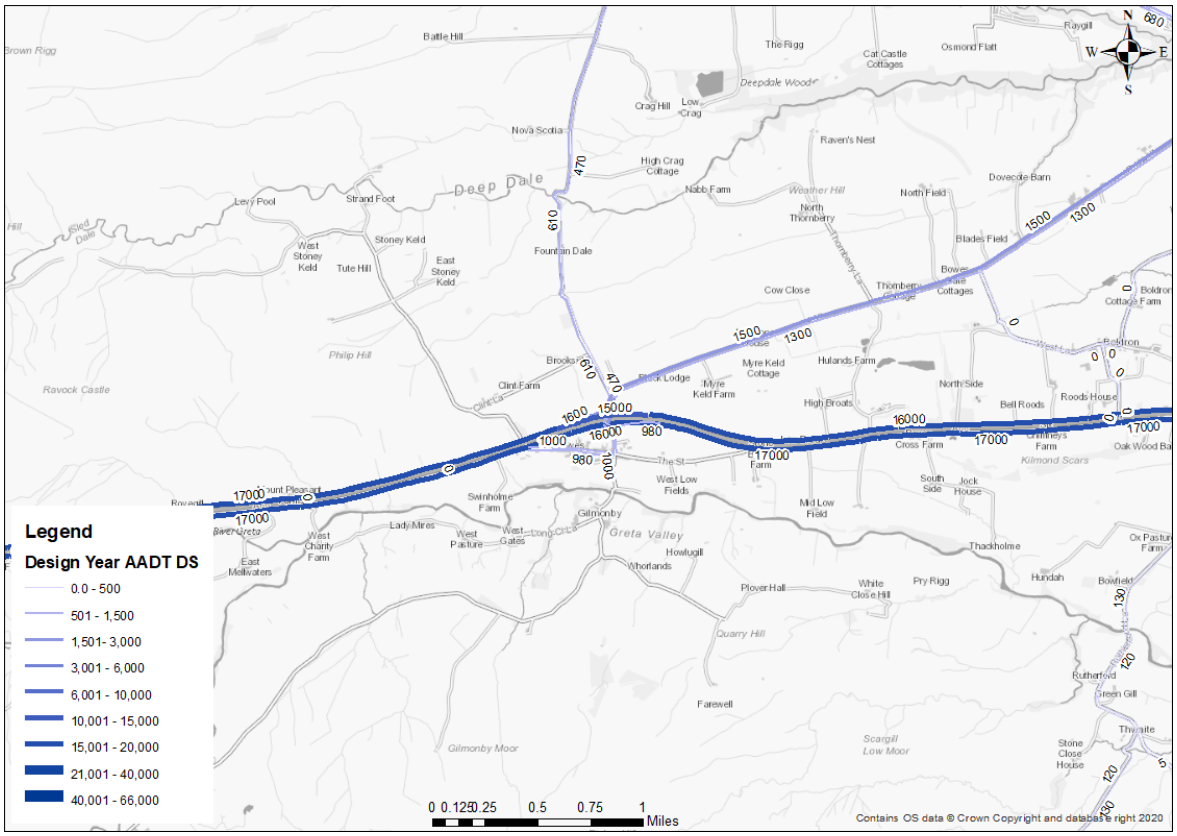

Figure 8-17: Bowes Bypass – Forecast Year Do Something Flows

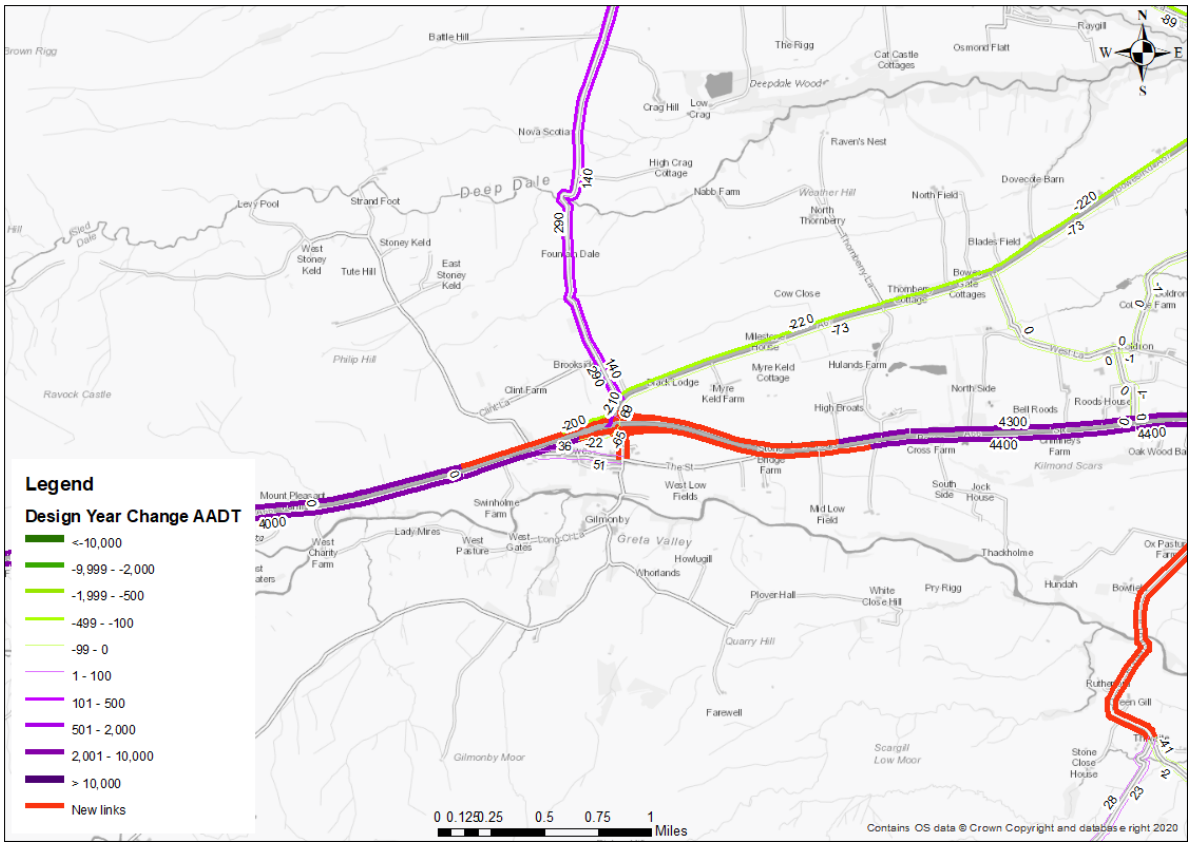

Figure 8-18: Bowes Bypass – Forecast Year Do Something Flows

8.1.24 Table 8-5 presents Do Minimum and Do Something traffic information for the local area.

Table 8-5: Bowes Bypass (A66/A67) - Local Road Traffic Flows (AADT)

Loc	Road	DM flow (Two-way)	DS flow (Two-way)	Flow change (Two-way)	Percentage change (Two-way)	Indicative Road Capacity	DoS DM	DoS DS
20	A67	3,200	2,900	-290	-9%	22,000	14%	13%
21	Unnamed Road North of Bowes	650	1,100	430	66%	22,000	3%	5%

8.1.25 There is a decrease in traffic on the A67 (-9%) as the improved (faster) A66 attracts more longer distance east west traffic from the A67 between Cumbria and the rural areas to the south and west of Darlington. The is an increase of 430 AADT increase on the unnamed link between Bowes and Lartington. The low flows on this link result in the degree of saturation remaining very low in both DM and DS scenarios.

Cross Lanes to Rokeby Development Impact

8.1.26 The following flow plots covering the local area around Cross Lanes to Rokeby are provided below:

- Figure 8-19: forecast year Do Minimum flows.
- Figure 8-20: forecast year Do Something flows.

- Figure 8-21: forecast year change in flow from Do Minimum to Do Something.

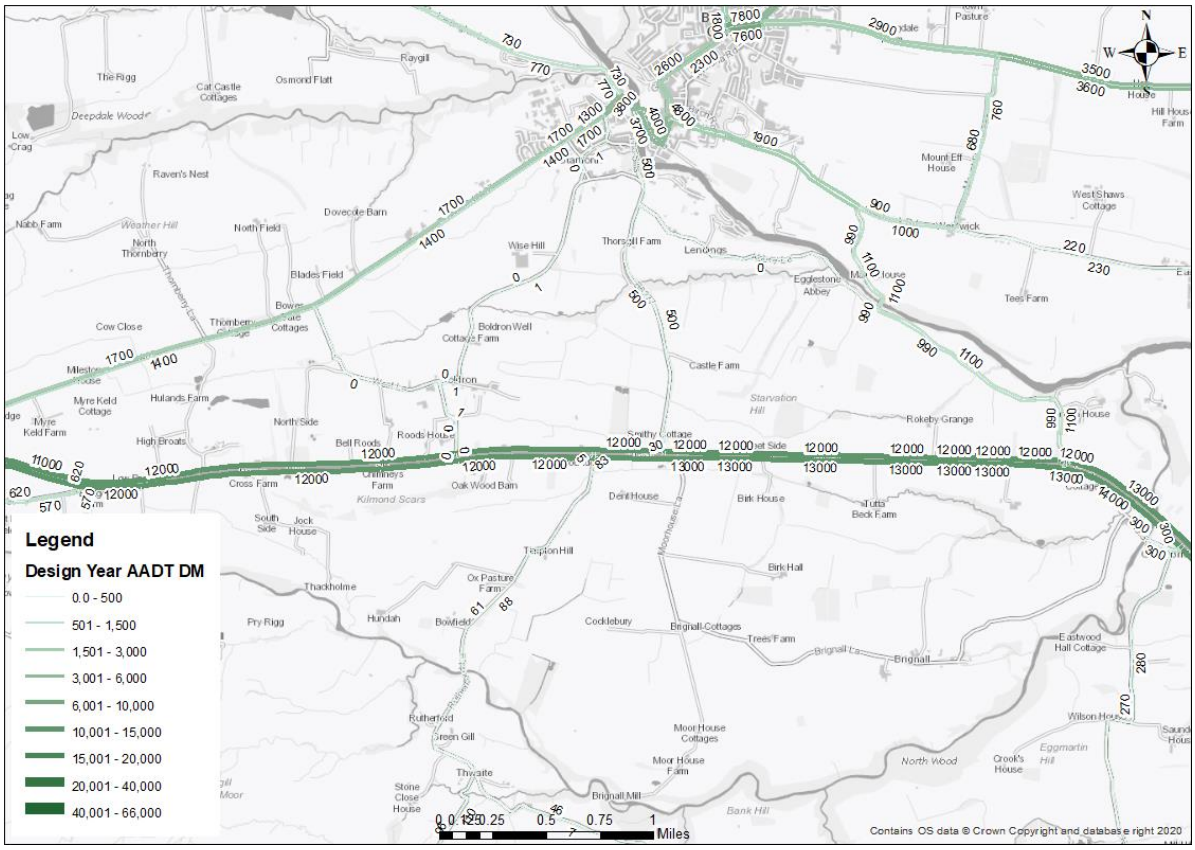

Figure 8-19: Cross Lanes to Rokeby – Forecast Year Do Minimum Flows

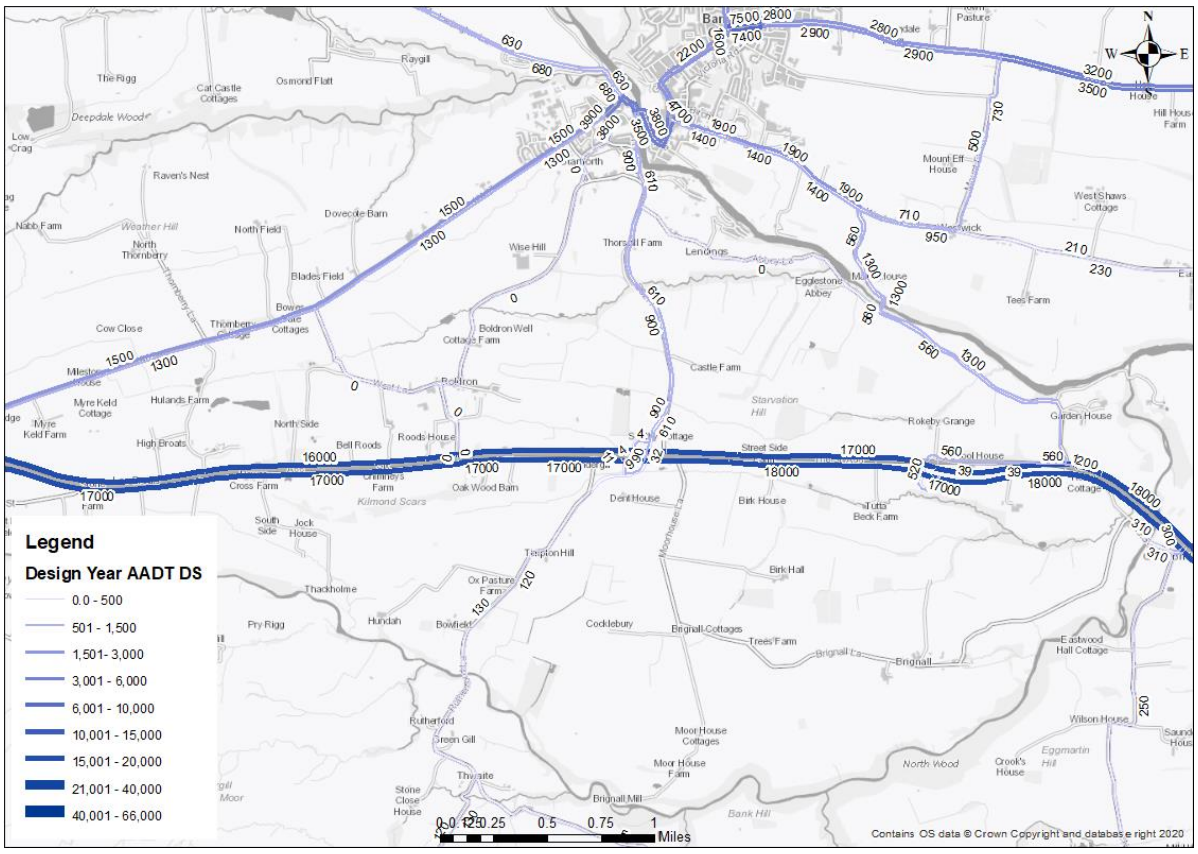

Figure 8-20: Cross Lanes to Rokeby – Forecast Year Do Something Flows

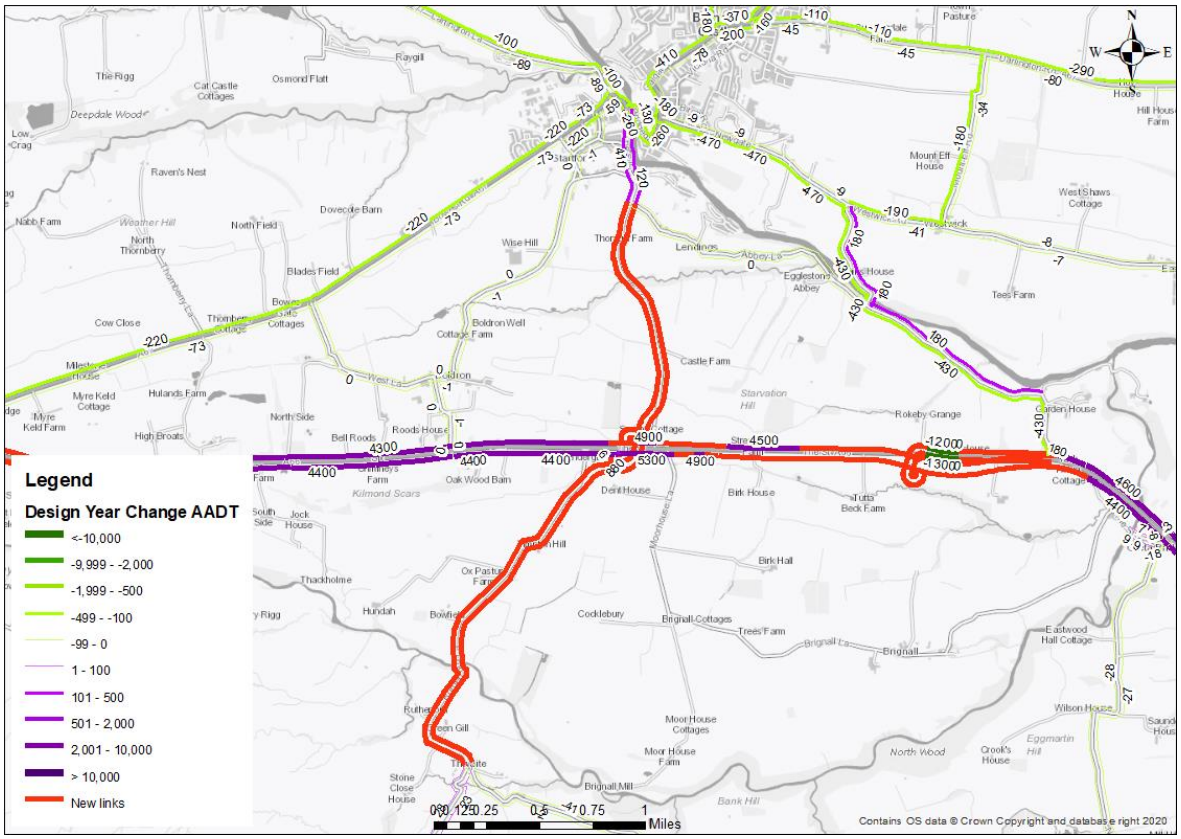

Figure 8-21: Cross Lanes to Rokeby – Forecast Year Do Something Flow (Changes from Do Minimum)

8.1.27 Table 8-6 presents Do Minimum and Do Something traffic information for the local area.

Table 8-6: Cross Lanes to Rokeby - Local Road Traffic Flows (AADT)

Loc	Road	DM flow (Two-way)	DS flow (Two-way)	Flow change (Two-way)	Percentage change (Two-way)	Indicative Road Capacity	DoS DM	DoS DS
24	Moorhouse Lane at Cross Lanes	990	1,500	520	53%	22,000	5%	7%
25	The Sills in Barnard Castle	990	1,500	520	53%	22,000	5%	7%
26	C165	2,100	1,800	-250	-12%	22,000	9%	8%
27	A67 – Barnard Castle Bridge	7700	7300	-400	-5%	22,000	35%	33%

8.1.28 There is an increase in traffic on the B6277 Moorhouse Lane, and a decrease on Barnard Castle Road (C165). This is because the traffic that accesses Barnard Castle from the A66 east has easier access to the B6277 Moorhouse Lane and less easy access to Barnard Castle Road, compared to the existing situation due to the proposed junction arrangements at these locations. The speed limit increase on the A66 makes it more attractive for vehicles to continue along the A66 for longer whilst the proposed new junction alignment at Rokeby Park means

traffic must travel an additional 2.3km compared with the Do Minimum if using the C165 from A66 east towards Barnard Castle.

8.1.29 While there is forecast to be an increase in traffic on the Sills (of 520 vehicles per day, which equates to less than 1 vehicle per minute across the day), the impact on Barnard Castle is one of a general reduction in traffic flow due to the lower flows on the A67, of around 400 vehicles AADT, including on Barnard Castle Bridge, and on Galgate within the town centre. This reduction on the A67 occurs due to the improved A66 attracting more longer distance east west traffic from the A67.

Stephen Bank to Carkin Moor (Layton) Development impact

8.1.30 The following flow plots covering the local area around Stephen Bank to Carkin Moor are provided below:

- Figure 8-22: forecast year Do Minimum flows.
- Figure 8-23: forecast year Do Something flows.
- Figure 8-24: forecast year change in flow from Do Minimum to Do Something.

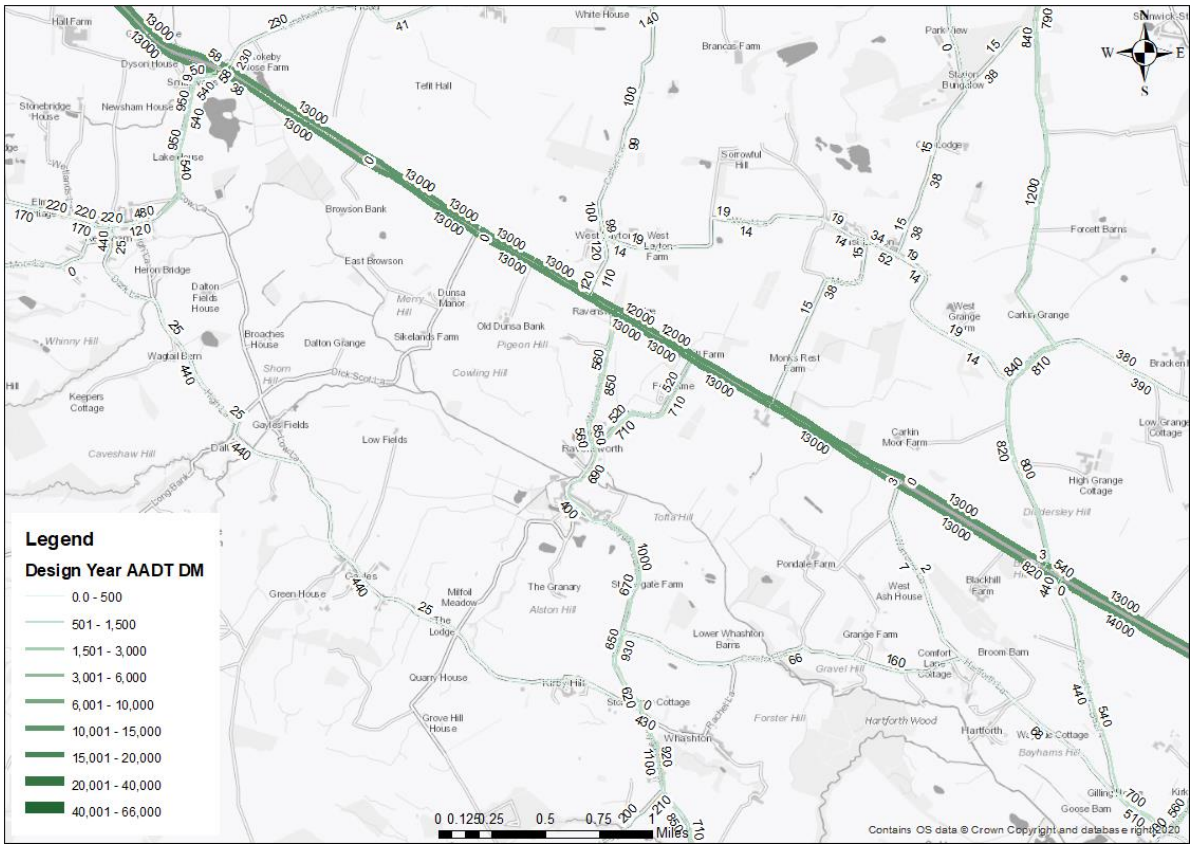

Figure 8-22: Stephen Bank to Carkin Moor – Forecast Year Do Minimum Flows

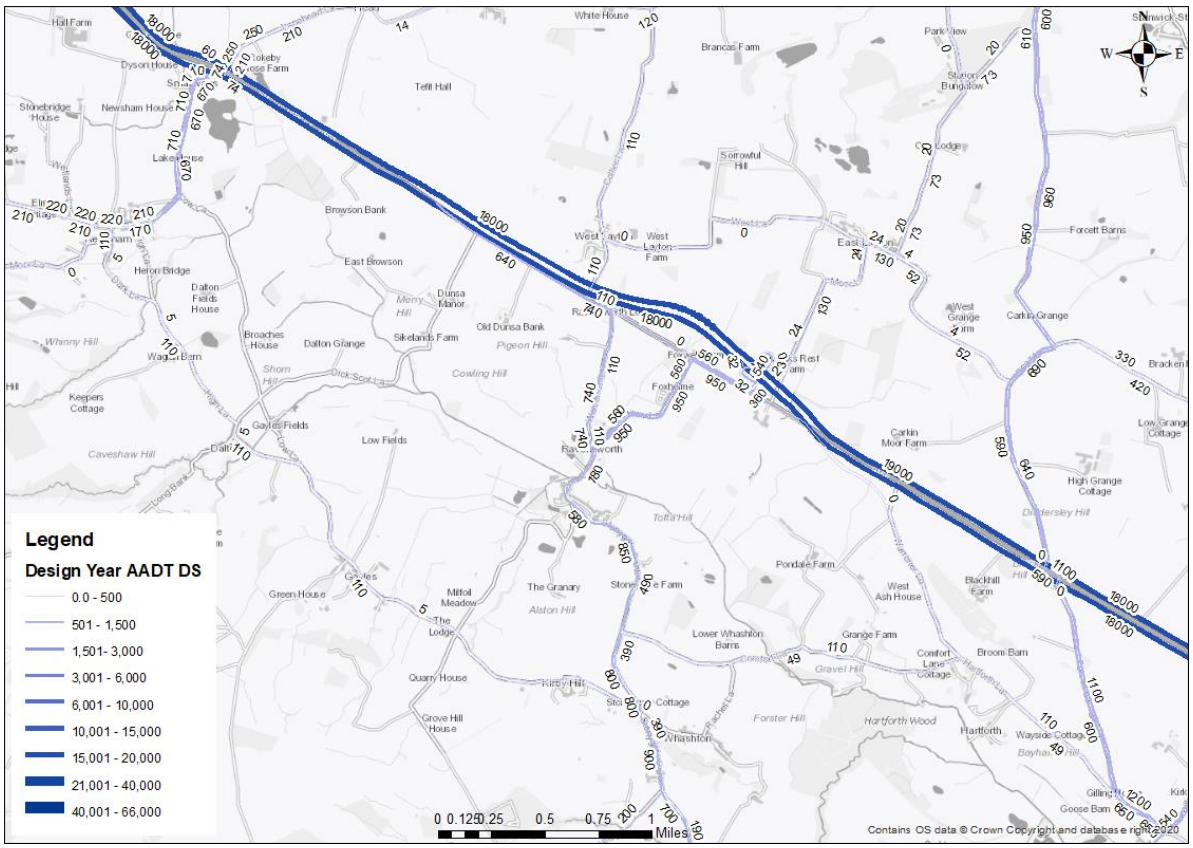

Figure 8-23: Stephen Bank to Carkin Moor – Forecast Year Do Something Flows

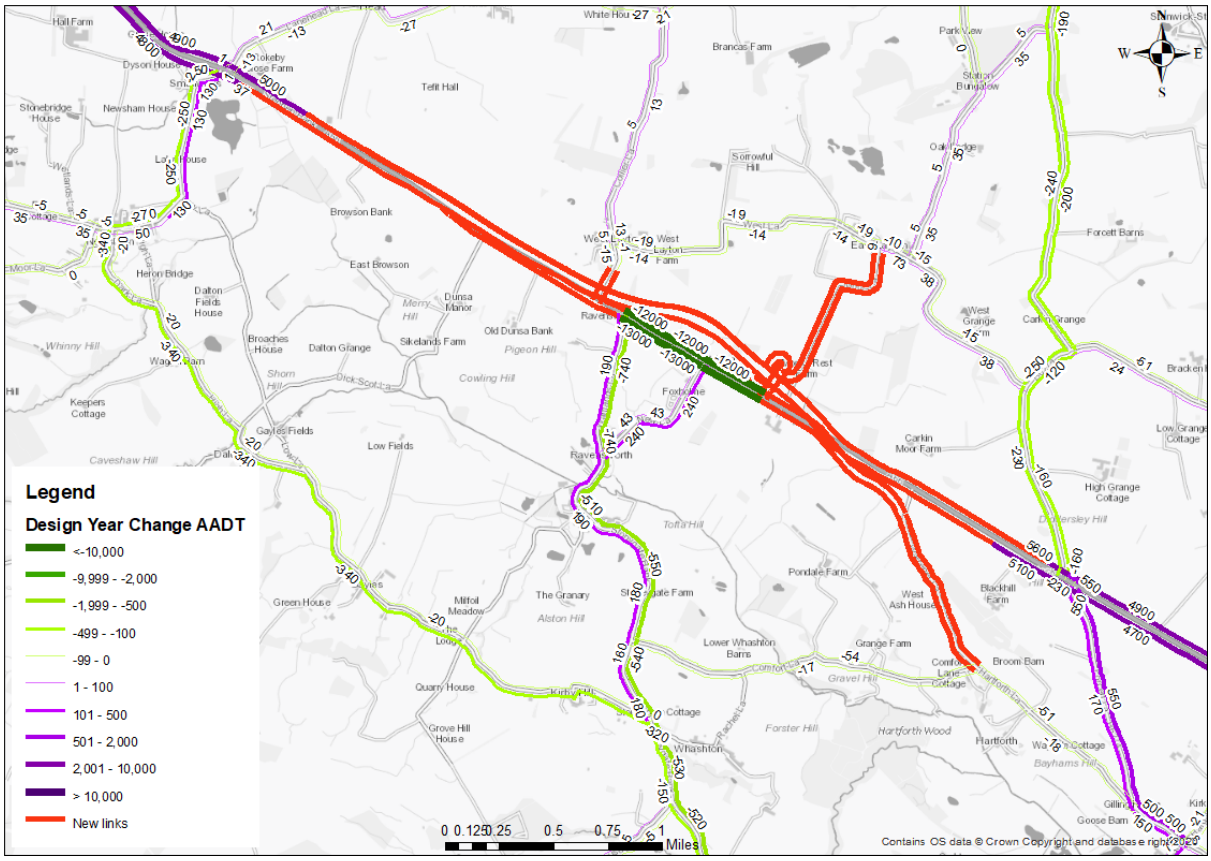

Figure 8-24: Stephen Bank to Carkin Moor – Forecast Year Do Something Flow (Change from Do Minimum)

8.1.31 Table 8-7 presents Do Minimum and Do Something traffic information for the local area.

Table 8-7: Stephen Bank to Carkin Moor (Layton) – Local Road Traffic Flows (AADT)

Loc	Road	DM flow (Two-way)	DS flow (Two-way)	Flow change (Two-way)	Percentage change (Two-way)	Indicative Road Capacity	DoS DM	DoS DS
30	B6274 to the south of the A66	980	1,700	720	74%	22,000	4%	8%
38	Stoneygate Bank Road through Ravensworth	1,700	1,300	-370	-21%	22,000	8%	6%
28	Collier Lane	230	220	-16	-7%	22,000	1%	1%
29	B6274 to the north of the A66	1,600	1,200	-390	-24%	22,000	7%	6%

8.1.32 There is an increase on the B6274 to the south of the A66 however as the route is not heavily trafficked in either the Do Minimum or Do Something, the increase in flow is not likely to impact journey times.

8.1.33 There is a decrease on the parallel Stoneygate Bank Road through Ravensworth. This redistribution of traffic on the roads to the south of the A66 is due to the increase in design speed and capacity on the A66 encouraging traffic to use the A66 for more of their journey.

8.1.34 To the north of the A66 there are small reductions in traffic on Collier Lane and the B6274, as traffic is again redistributed onto the faster A66 for more of their journey.

A1(M) Junction 53 Scotch Corner Development impact

8.1.35 The following flow plots covering the local area around A1(M) Scotch Corner are provided below:

- Figure 8-25: forecast year Do Minimum flows.
- Figure 8-26: forecast year Do Something flows.
- Figure 8-27: forecast year change in flow from Do Minimum to Do Something.

Figure 8-25: A1(M) Scotch Corner – Forecast Year Do Minimum Flows

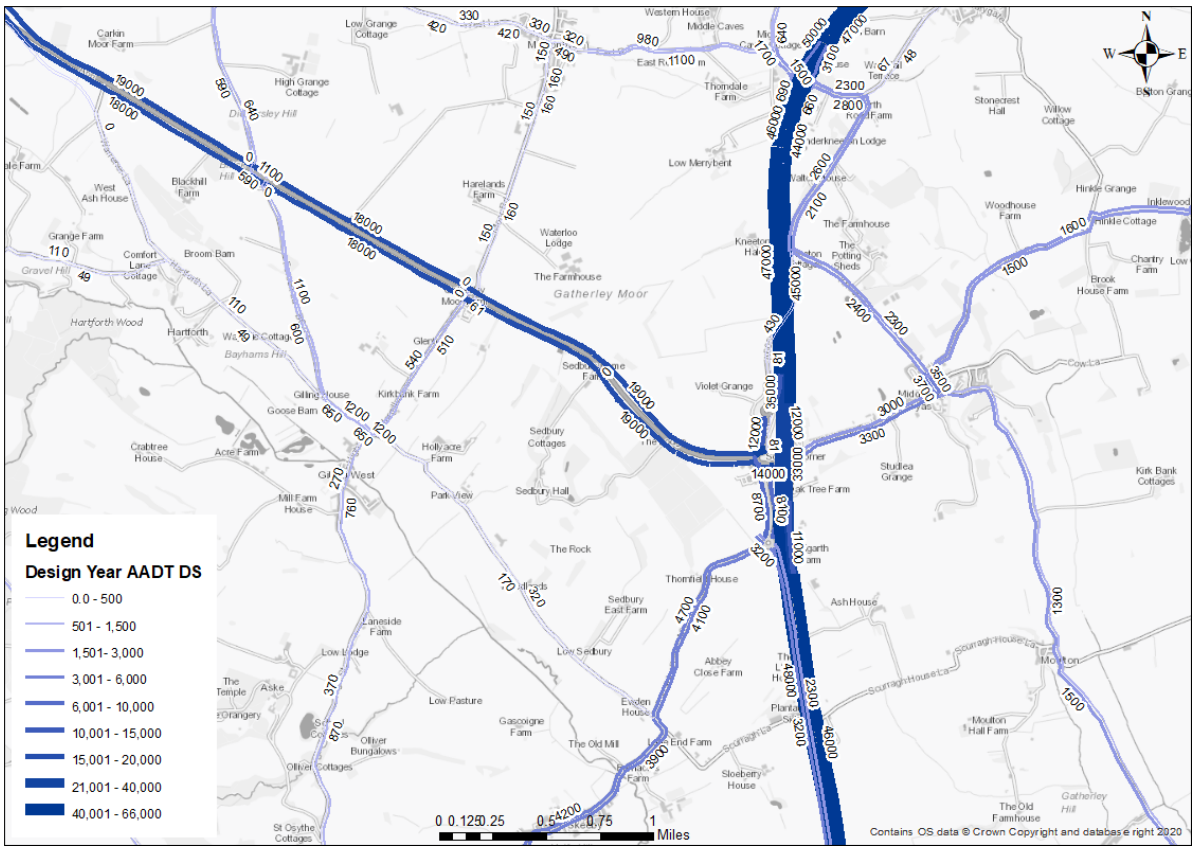

Figure 8-26: A1(M) Scotch Corner – Forecast Year Do Something Flows

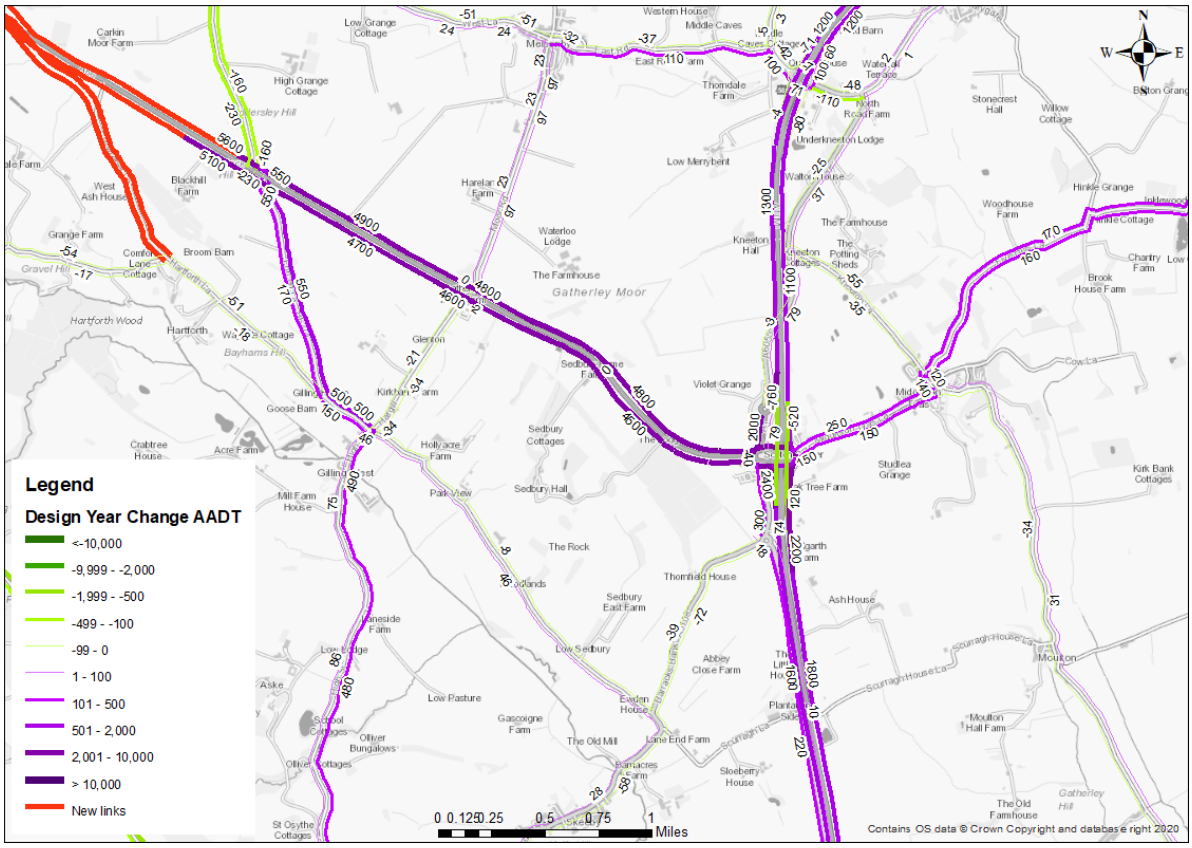

Figure 8-27: A1(M) Scotch Corner – Forecast Year Do Something (Changes from Do Minimum)

8.1.36 Table 8-8 presents Do Minimum and Do Something traffic information for the local area.

Table 8-8: A1(M) Junction 53 Scotch Corner – Local Road Traffic Flows (AADT)

Loc	Road	DM flow (Two-way)	DS flow (Two-way)	Flow change (two-way)	Percentage change (Two-way)	Indicative Road Capacity	DoS DM	DoS DS
34	A1(M) north of Scotch Corner	89,000	92,000	2,400	3%	98,000	91%	93%
35	A1(M) south of Scotch Corner	90,000	93,000	3,400	4%	98,000	92%	95%
32	A6055 south of Scotch Corner	5,300	5,500	230	4%	22,000	24%	25%

8.1.37 There is an increase on the A1(M) north and south of Scotch Corner. These increases are due to the improved A66 attracting more traffic to the strategic road network from the local road network.

8.1.38 There is an increase on the A6055 north of Scotch Corner. The existing flows on the A6055 are low in relation to the capacity of the road and therefore the additional flows expected as a result of the scheme will not impact the operation of the road. It is not expected to see any deterioration in journey times as a result of the project.

8.2 Major junction performance

M6 Junction 40 and Kemplay Bank

8.2.1 An assessment of the M6 Junction 40 scheme has been undertaken. An optimum design layout is proposed that is in accordance with the appropriate design standards and in line with the engineering constraints, user operations, construction costs and safety.

8.2.2 The proposed design includes the following features:

- A 3-lane circulatory carriageway with spiral markings on roundabout.
- Widening on all five approach arms to provide additional lanes and controlled under their own signal phase – this provides a better alignment on approaches; preserves the operation and use of the current depot and emergency services accesses; maintains the active travel route on the western side of the junction by accommodating controlled toucan crossings facilities; and reduces the land take and environmental impact at the junction.

8.2.3 An operational assessment has been undertaken for the M6 Junction 40, testing the scheme design for this junction (to be developed further as scheme development continues) shown in Figure 8-28.

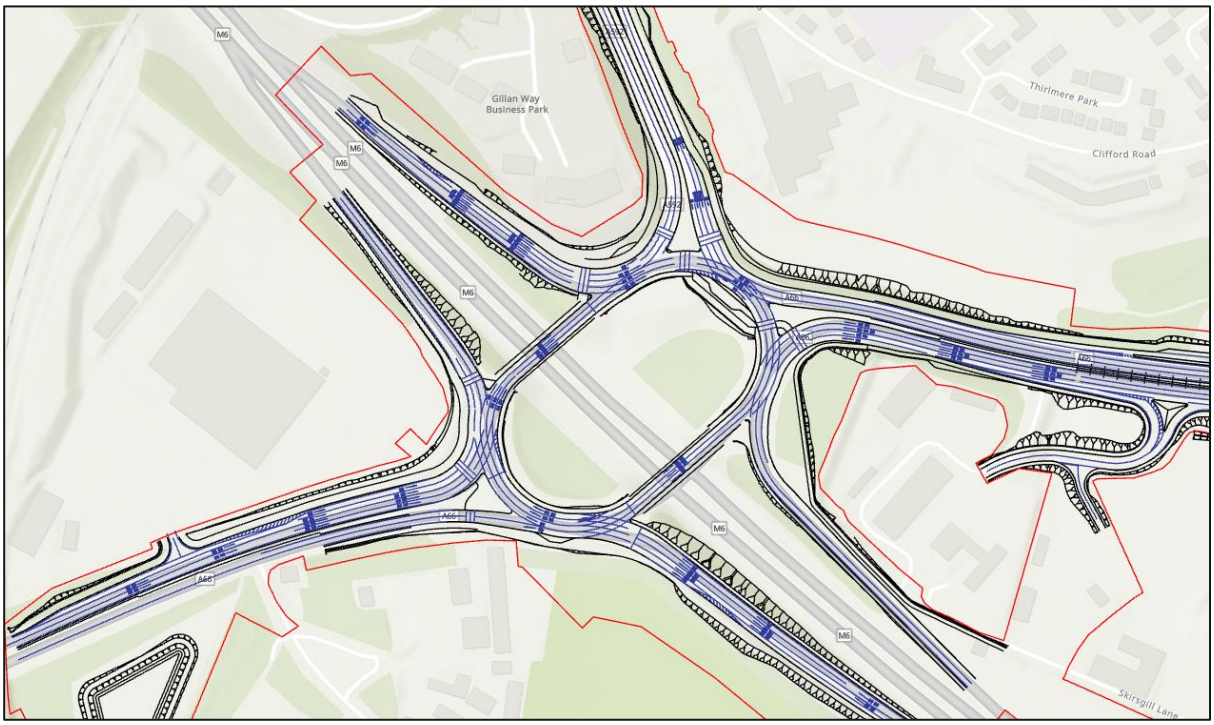

Figure 8-28: M6 J40 scheme design

8.2.4 Design flows for the average weekday have been developed using the following methodology:

- Growth the 2017 Thursday MCTC for M6 Junction 40 and Kemplay Bank to 2019 (the base year of the model). A factor of 1.02 was derived from the WebTRIS data on the A66 east and west of Junction 40, and on the M6 Junction 40 offslips.

- The strategic model has been used to calculate the growth between the base and forecast year. The modelled percentage growth has been calculated from 2019 to 2044 DM and 2044 DS for each movement between the two junctions, and then applied to the (2019) turning count.

8.2.5 Table 8-9 and Table 8-10 outline the capacity assessment results for the AM and PM peak periods for the future forecast year scenarios at the M6 J40.

Table 8-9: M6 Junction 40 Capacity Assessment- 2044 AM Peak

	Do Minimum				Do Something			
	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)
M6 North Offslip	1086	68	184	35	1299	44	129	60
A592 Ullswater Road	885	871	1006	253	1306	66	280	57
A66 East	1293	57	189	50	1538	18	88	28
M6 South Offslip	563	41	162	65	581	25	73	89
A66 West	975	22	115	28	1137	101	196	142

Table 8-10: M6 Junction 40 Capacity Assessment- 2044 PM Peak

	Do Minimum				Do Something			
	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)
M6 North Offslip	1088	49	183	45	1180	31	97	52
A592 Ullswater Road	921	853	1007	324	1417	47	271	52
A66 East	1304	44	190	30	1719	61	279	43
M6 South Offslip	477	40	153	52	503	17	49	74
A66 West	1313	82	268	62	1373	174	347	153

8.2.6 The capacity results in terms of queues and average delay indicate that the proposed design layout will provide design life of the for M6 Junction 40. The largest queue is on the A66 west arm of 347m in the evening peak hour, with an associated delay of 153 seconds. This is a large improvement compared to the DM, where delays of more than 250 seconds are apparent on Ullswater Road in both morning and evening peak hour.

8.2.7 At this location however traffic volumes are known to be particularly variable by day and are influenced by leisure traffic heading to the Lake District and the North Pennines AONB on a Friday afternoon / evening, and additionally by traffic going to and coming from Centre Parcs on Monday and Friday afternoons. Therefore, an additional test has been

undertaken to consider the junction performance on a Friday afternoon. A Friday afternoon traffic count has been synthesised by considering the difference in flow between a typical Thursday (from when the MCTC is available) and a typical Friday. 2017 Webtris ATC data[30] on the A66 east and west of Junction 40, and on the M6 Junction 40 offslips, together with the 2017 ATC from the A592 has been used to generate typical hourly profiles of Thursday and Friday demand at the junction.

8.2.8 In addition to this there may be times during the year, for example during peak holiday periods, when traffic flows may exceed these volumes, however it is not usual practice to generate models for design flows within peak months as providing capacity for flows that occur on a limited number of days within a year would not be economically viable.

8.2.9 Figure 8-29 shows how ATC demand approaching the junction peaks on a Thursday at 16:00 at 3816 vehicles. On a Friday the demand at the junction peaks at 15:00 at 4038 vehicles but remains above 3800 vehicles from midday until 17:00 indicating that the peak lasts for the whole afternoon.

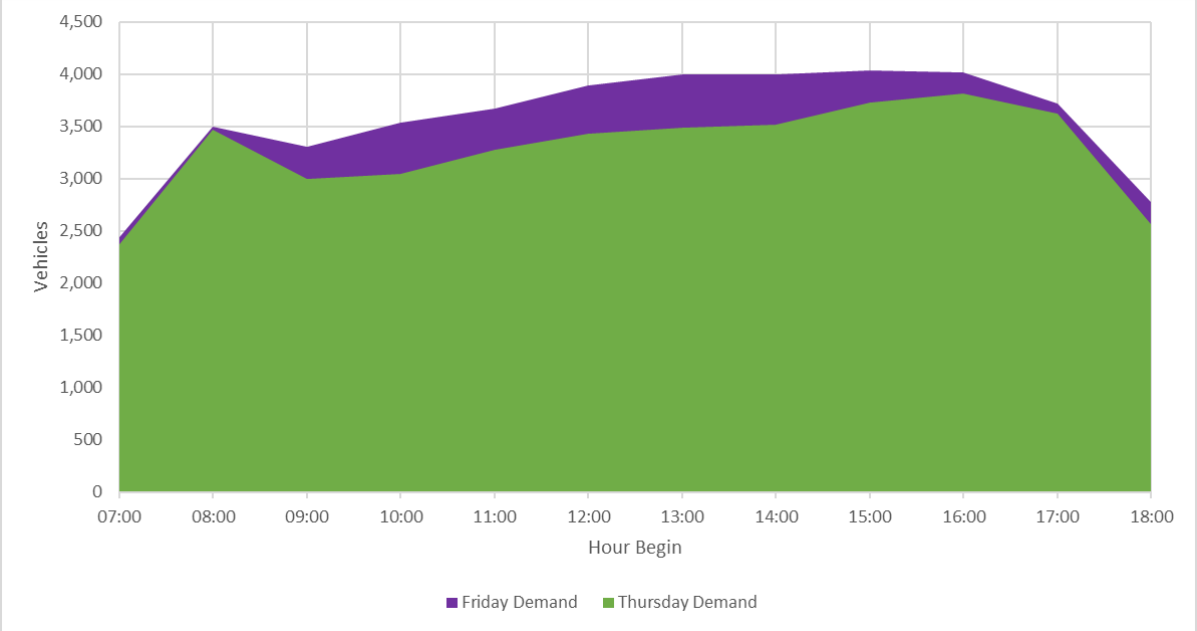

Figure 8-29: Junction 40 2017 demand on a Typical Thursday and Friday

8.2.10 Forecast year flows for 2044 were generated by applying the same traffic growth process to the synthesised Friday demand as discussed in paragraph 8.2.4. The resultant flows were then input into the model. The results for the Friday peak are shown in Table 8-11.

[30] 2017 data was as this was the last year when all of the ATC counters contained a full year of data and matches the 2017 data available on the A592.

Table 8-11: M6 Junction 40 Capacity Assessment- 2044 Friday Peak

	Do Minimum				Do Something			
	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)
M6 North Offslip	1152	177	464	122	1293	38	122	58
A592 Ullswater Road	726	916	1008	471	1344	38	147	53
A66 East	1382	56	220	35	1784	39	150	38
M6 South Offslip	632	142	292	140	661	24	66	84
A66 West	1136	31	122	32	1205	116	213	145

8.2.11 The modelling results show the Friday peak is the most onerous peak in terms of queuing delay. Queuing is forecast to occur on the lanes of A592 and M6 North approaches.

8.2.12 An assessment of the proposed Kemplay Bank scheme has been undertaken. A design layout is proposed that is in accordance with the appropriate design standards and in line with the engineering constraints, user operations, construction costs and safety.

8.2.13 The proposal includes for conversion of the existing at grade roundabout at Kemplay junction into a grade separated interchange with the A66 being placed in an underpass beneath the existing junction, removing between 35 to 50% of the traffic that would otherwise flow through the roundabout. Kemplay Bank will remain signalised with provision for pedestrians to cross through the centre of the junction. The design provides for:

- single lane approaches on the A66 offslips; and
- flared approaches on the remaining arms (A6 north and south) and the A689.

8.2.14 An operational assessment has been undertaken for the layout at Kemplay Bank, testing the design for this junction shown in Figure 8-30.

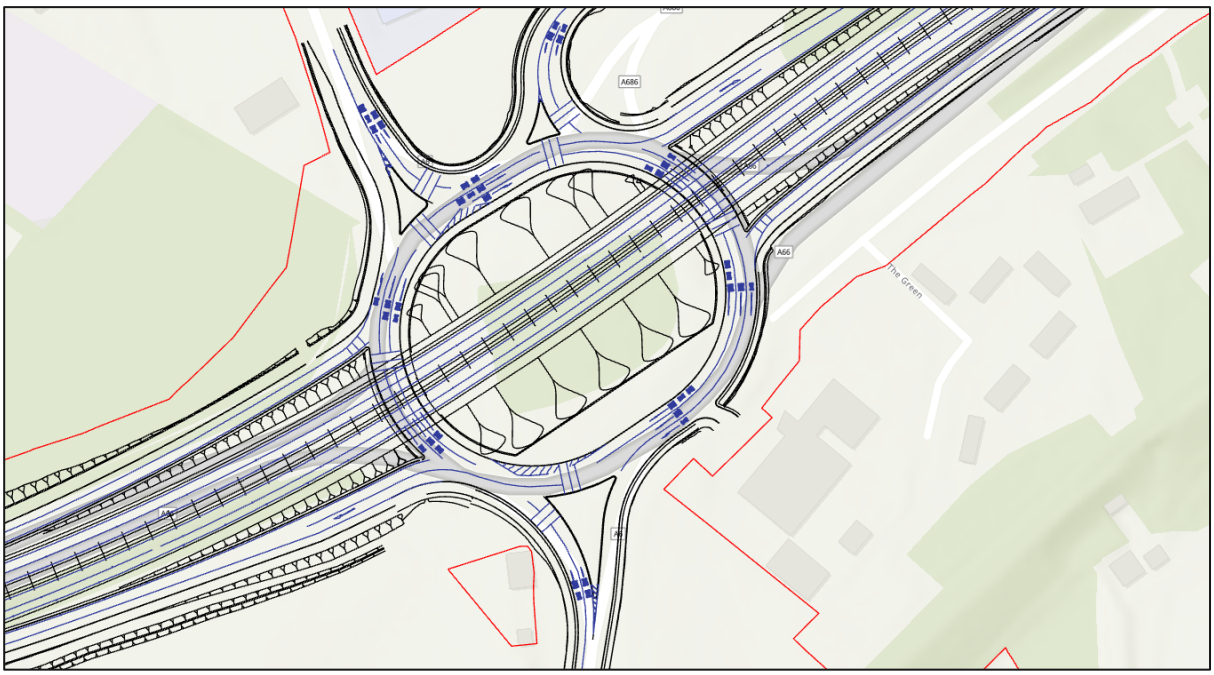

Figure 8-30: A6 / A66 Kemplay Bank Scheme Design

8.2.15 The forecast year flows were developed using the process described in paragraph 8.2.4. Table 8-12 to Table 8-14 outline the capacity assessment results for the forecast year scenarios at Kemplay Bank Roundabout.

Table 8-12: Kemplay Bank Roundabout: 2044 AM Peak

	Do Minimum				Do Something			
	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)
A66 West Offslip	1271	665	957	137	702	9	67	32
A6 Bridge Lane	466	3	32	17	491	8	60	32
A686 Carleton Avenue	494	363	689	179	570	15	113	38
A66 East Offslip	977	46	211	40	330	9	67	43
A6 Kemplay Bank	544	16	84	40	716	11	76	30

Table 8-13: Kemplay Bank Roundabout: 2044 PM Peak

	Do Minimum				Do Something			
	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)
A66 West Offslip	1546	460	854	185	696	25	141	32
A6 Bridge Lane	718	11	92	28	645	17	143	34
A686 Carleton Avenue	421	975	1011	1134	657	38	200	47
A66 East Offslip	1003	249	400	163	266	8	55	40

A6 Kemplay Bank	367	7	40	25	451	4	40	26

Table 8-14: Kemplay Bank Roundabout: 2044 Friday PM Peak

	Do Minimum				Do Something			
	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)
A66 West Offslip	1481	850	1014	346	622	16	104	29
A6 Bridge Lane	643	7	55	25	602	8	77	29
A686 Carleton Avenue	444	370	857	601	569	19	124	37
A66 East Offslip	1054	702	850	416	262	7	47	39
A6 Kemplay Bank	444	11	65	32	479	4	42	25

8.2.16 The modelling results show the PM peak is the most onerous peak in terms of queuing delay, though the junction operates similarly across all peaks in the Do Something scenario. When traffic is at its greatest, queuing and delay will be experienced on all approaches, however non-of these arms are forecast to exceed capacity.

Scotch corner

8.2.17 An operational assessment has been undertaken for the A1(M) J53 Scotch Corner, testing the proposed design shown in Figure 8-31 within Vissim. It should be noted that the drawing shows only the changes proposed to the existing design.

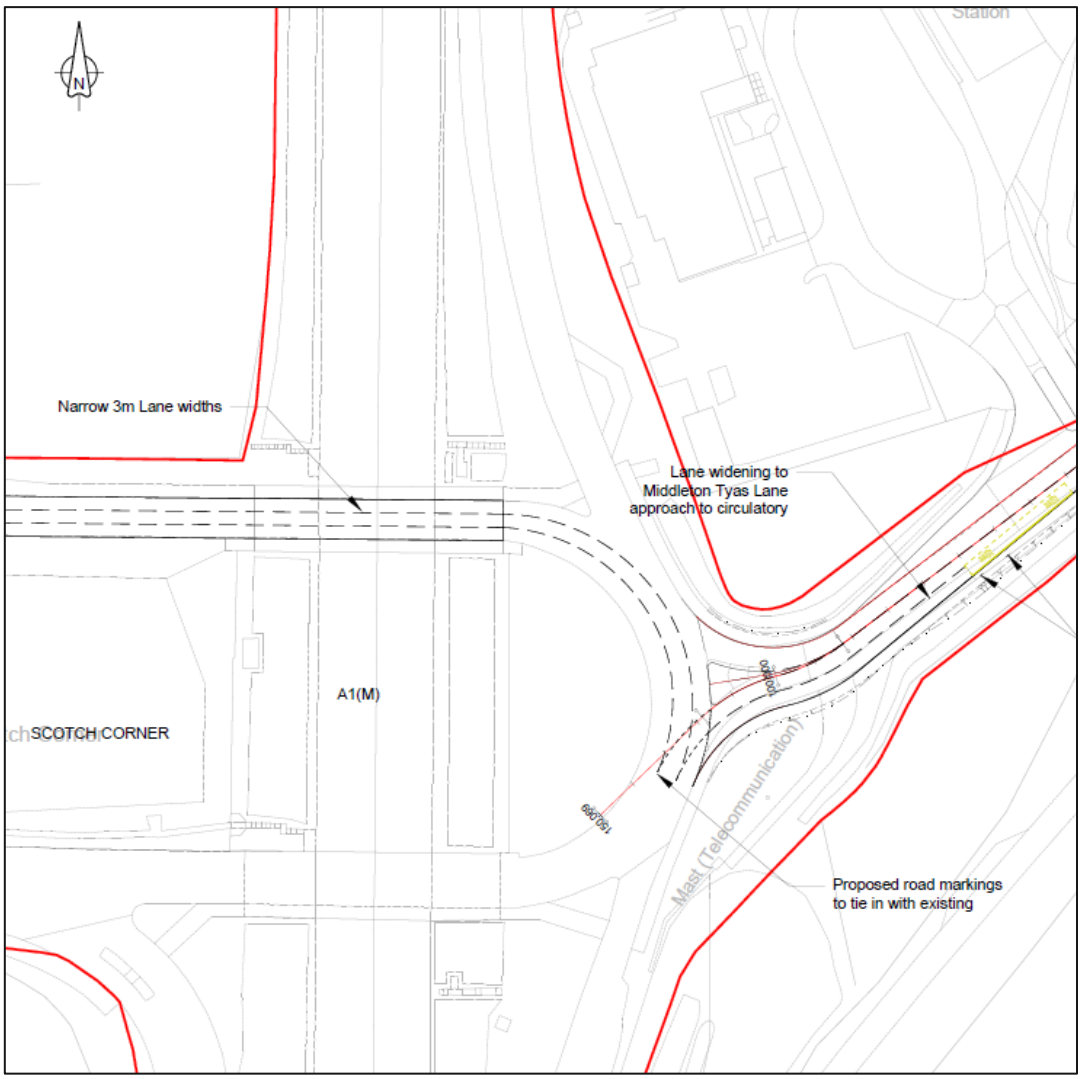

Figure 8-31: A1(M) Junction 53 Scotch Corner scheme design

8.2.18 The strategic model has been used to calculate the growth between the base and forecast year. The modelled percentage growth has been calculated from 2019 to 2044 DM and 2044 DS for each movement within the Vissim model network, and then applied to the observed turning count from March 2019.

8.2.19 Operational assessment results are displayed below in Table 8-15 and Table 8-16 outlining the capacity assessment results for the forecast year scenarios at Scotch Corner.

Table 8-15: Scotch Corner Capacity Assessment- 2044 AM Peak

	Do Minimum				Do Something			
	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)
Middleton Tyas	350	6	69	24	374	3	35	26
A1(M) South Offslip	570	10	81	25	684	15	102	24
A6055 North	31	0	11	13	36	0	10	23

	Do Minimum				Do Something			
	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)
A6055 South	501	9	52	24	501	11	54	21
Holiday Inn	66	1	30	20	84	1	31	25
A66	737	9	105	42	967	7	90	34
A1(M) North Offslip	951	16	116	23	1101	17	119	23

Table 8-16: Scotch Corner Capacity Assessment- 2044 PM Peak

	Do Minimum				Do Something			
	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)	Flow	Ave Queue (m)	Max Queue (m)	Ave Delay (s)
Middleton Tyas	358	76	132	67	374	9	57	35
A1(M) S Offslip	677	15	88	33	912	20	112	30
A6055 North	51	0	10	30	57	0	18	26
A6055 South	822	14	66	35	974	16	66	25
Holiday Inn	79	2	30	45	108	5	31	45
A66	1146	14	112	27	1564	15	172	31
A1 (N) Offslip	1037	14	129	19	1174	41	212	26

8.2.20 The junction is seen to be performing within acceptable limits, with average delays of less than one minute and with average queue lengths of less than 50m on all arms. The maximum queue lengths on the A1 offslips are not forecast to extend beyond the length of the slip roads.

8.3 Local junction performance

Network wide priority junctions

8.3.1 An assessment has been made of the following new junctions proposed by the Project, as shown within the diagrams below.

- Figure 8-32
- Figure 8-33
- Figure 8-34
- Figure 8-35

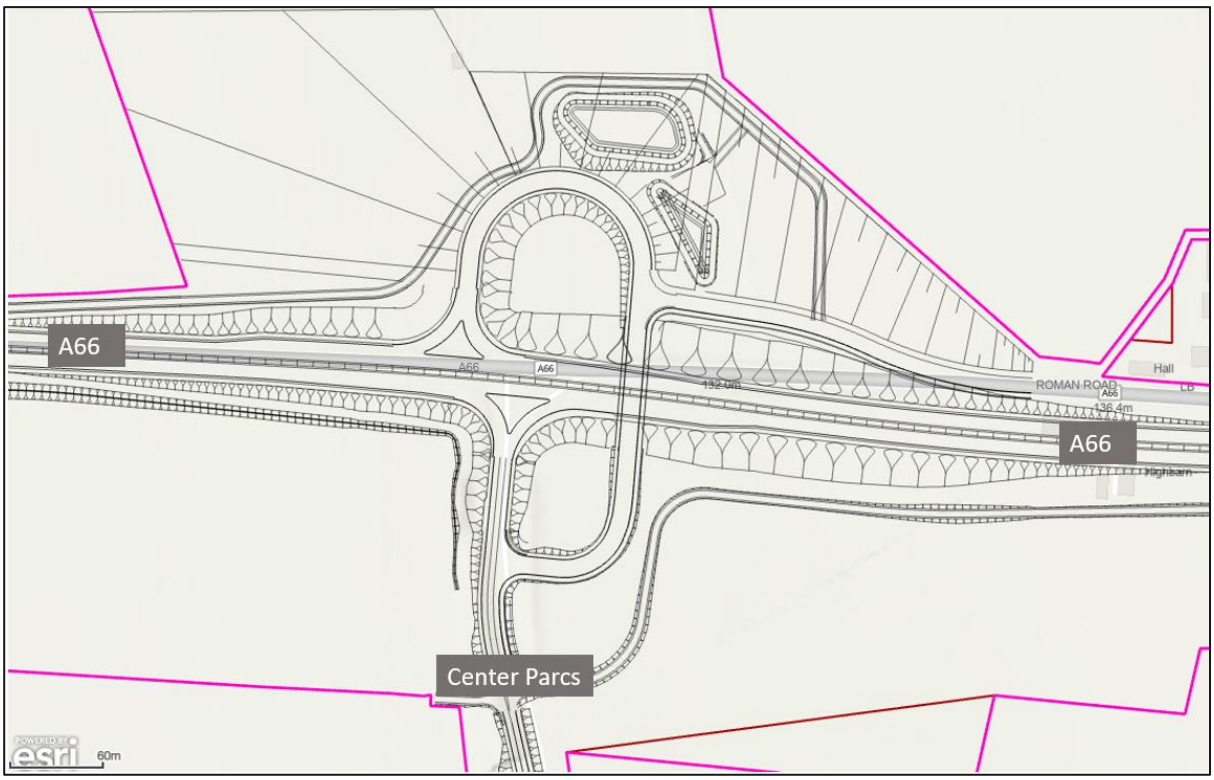

Figure 8-32: A66 Center Parcs proposed junction layout

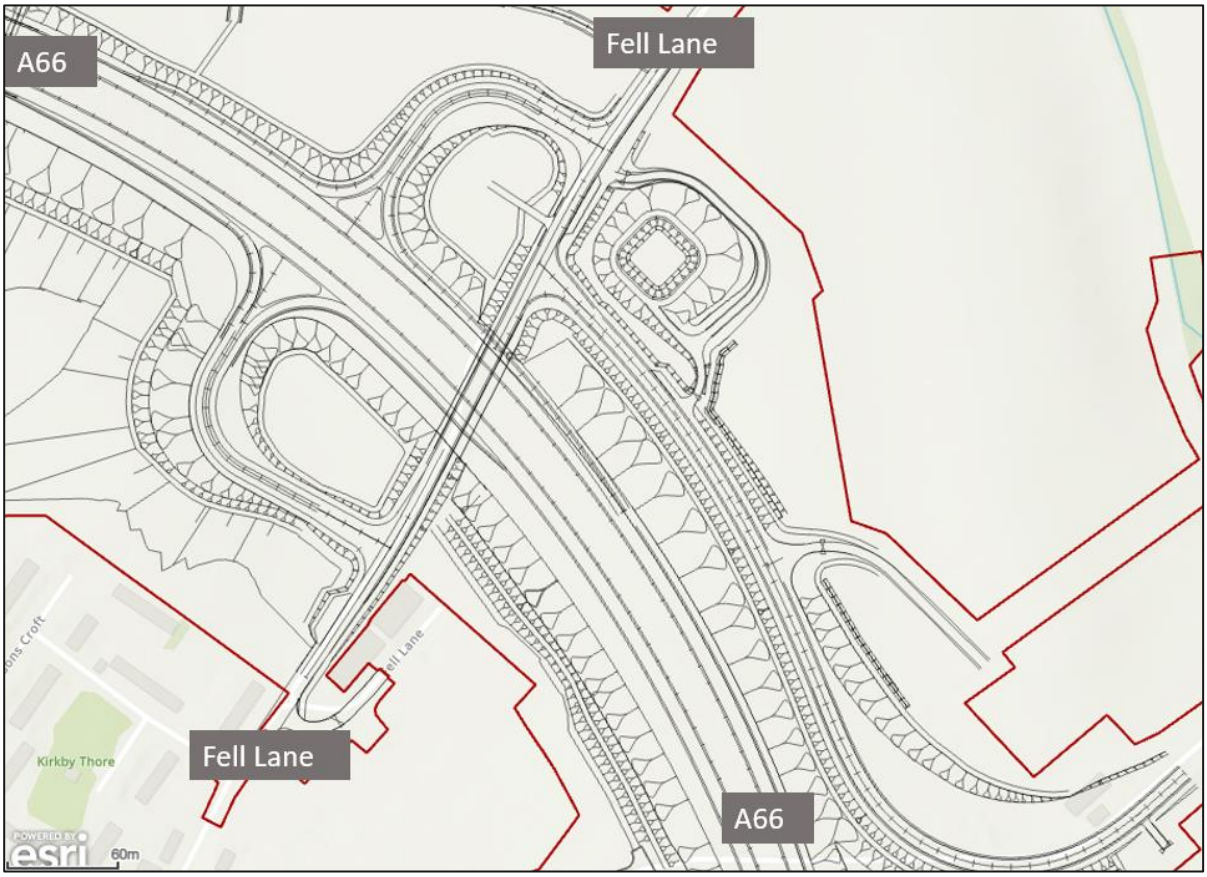

Figure 8-33: A66 Fell Lane (Kirkby Thore) Proposed Junction Layout

Figure 8-34: A66/A67 Bowes Proposed Junction Layout

Figure 8-35: A66 Moor Lane (Mainsgill Farm) Proposed Junction Layout

8.3.2 In addition to this, operational assessments have been undertaken to test the impact of the Project on those existing junctions considered within section 6.4.

8.3.3 Forecast year traffic flows have been developed using the following methodologies.

- The strategic model has been used to calculate the growth between the base and forecast year. The modelled percentage growth has been calculated from 2019 to 2044 DM and 2044 DS for each turning movement at the local junctions under consideration, and then applied to the observed turning movements described in Section 6.4.
- In the locations where observed counts do not exist, flows from the strategic model have been used.
- Paragraph 6.4.11 discussed the issue that the Center Parcs ATC was undertaken in the winter months of November and December when the traffic flows are potentially quieter than during the summer months[31]. The ATC recorded a maximum outgoing flow of 340 vehicles per hour, between 10:00 and 11:00 on a Friday, as guests leave on change over day. Without access to any other flow data, and to represent a worst-case holiday peak demand at this location, a maximum possible flow of 800 vehicles per hour has been assumed to leave during this hour. This is considered to be the maximum an absolute maximum demand that could be accommodated, given that the facility contains around 800 holiday chalets and 1440 parking spaces. It is accepted that some guests may arrive in more than one car per chalet, however as there are two change-over days per week (Monday and Friday), and guests can stay for either 3 days or 7 days, it is unlikely that all guests change over on a single day or could all leave within a single hour on that day.
- Similarly, a total inbound flow of 800 vehicles inbound has been assumed as a peak demand between 15:00 and 16:00.
- While Moor Lane and the road network around the Moor Lane junction are represented within the strategic model, Mainsgill Farm Shop car park is not contained within the strategic model. It is not common practice to represent individual businesses or service stations within strategic models due to the aggregate methodologies used to develop the trip matrices (travel demand). Therefore, the operational assessment of the proposed Moor Lane junction has taken account of the demand from Mainsgill Farm shop by manually assigning the traffic flows from the Transport Assessment discussed in 6.4.5 in addition to the modelled flows within the Strategic model.

8.3.4 Table 8-17 summarises the results of the new A66 junctions proposed as part of the Project, while Appendix C contains the results in detail.

[31] Centre Parcs report however that they have an 80% occupancy throughout the year.

Table 8-17: Assessment of Proposed A66 Junctions – Maximum RFC DS 2044

Junction	AM Peak	PM Peak
Center Parcs	0.61	0.39
Kirkby Thore Eastbound Slip	0.12	0.13
Kirkby Thore Westbound Slip	0.20	0.17
Bowes Eastbound Slip	0.11	0.11
Bowes Westbound Slip	0.15	0.15
Hulands Quarry	0.09	0.09
Mainsgill Farm – Eastbound Slip	0.04	Not Applicable
Mainsgill Farm – Westbound Slip	0.45	
Mainsgill Farm – Access Road	0.32	

8.3.5 The assessment shows that all of the proposed junctions perform within their operational capacity.

8.3.6 Table 8-18 summarises the results of the assessment of the network wide junctions, while Appendix C contains the results in detail.

Table 8-18: Assessment of Network Wide Junctions

Junction	Max RFC			
	DM 2044		DS 2044	
	AM Peak	PM Peak	AM Peak	PM Peak
Ullswater Roundabout	0.54	0.47	0.61	0.61
Ullswater Road	0.64	0.62	0.73	0.79
Stricklandgate	1.09	1.10	1.07	1.10
Kirkby Stephen Roundabout	0.49	0.53	0.49	0.54
Brough Eastbound Slip	0.65	0.74	0.73	0.64
Brough Westbound Slip	0.51	0.41	0.55	0.44
Stainmore	0.01	0.01	0.01	0.02
Bowes Eastbound Slip	Not Applicable		0.11	0.11
Bowes Westbound Slip	0.07	0.05	0.15	0.15
Smallways	0.14	0.28	0.21	0.09
Forcett Lane	0.11	0.17	0.21	0.20
Hargill	0.26	0.31	0.33	0.47

8.3.7 The results show that the junctions displayed are forecast to operate within capacity within the DS Scenario except from Stricklandgate. The junction performs marginally better in the Do Something due to the slight relief that the Project provides within northern Penrith. Bowes Westbound Slip is where the greatest proportional increase in traffic volume can be seen, the RFC increases from 0.07 to 0.15 in the AM peak, and 0.05 to 0.15 in the PM peak.

Signalised junction assessment

8.3.8 Summary results of the assessment of the signalised junctions are contained within the following tables (Table 8-19 to Table 8-22). Full results are shown in Appendix C.

Table 8-19: Roper Street Junction LinSig Results – Degree of Saturation

Arm	DM 2044		DS 2044	
	AM	PM	Am	PM
Victoria Road North	91.4%	85.9%	92.4%	78.0%
Roper Street	101.6%	87.1%	90.7%	77.6%
Victoria Road South	99.0%	75.9%	85.8%	63.3%
Kilgour Street	96.3%	88.6%	93.4%	63.5%

8.3.9 Roper Street junction is exceeding its theoretical capacity in the DM scenario with both Roper Street and Kilgour Street exceeding their theoretical capacities. The assessment shows that this is expected to be relieved by the Project, however this is because traffic has rerouted onto Clifford Road within the model. As discussed in paragraph 8.1.9 it is likely that this traffic would in fact remain on the A6 Bridge Lane / Victoria Road. Therefore, the improvement in the operation of the Roper Street Junction shown in the table above would not be anticipated as a result of the Project.

Table 8-20: Eamont Bridge Junction LinSig Results – Degree of Saturation

Arm	DM 2044		DS 2044	
	AM	PM	Am	PM
A6 Penrith	110.3%	89.5%	107.6%	91.5%
A6 Eamont Bridge	106.2%	89.5%	106.4%	90.9%
Skirsgill Lane	57.5%	57.5%	57.5%	57.5%

8.3.10 Eamont Bridge exceeds its theoretical capacity in the AM Peak both in the Do Minimum and Do Something. In the PM Peak it is within the desired capacity in both scenarios. This assessment shows that the Project does not contribute to any worsening of the conditions at this location.

Table 8-21: Kirkby Stephen Junction LinSig Results – Degree of Saturation

Arm	DM 2044		DS 2044	
	AM	PM	AM	PM
Market Street	93.1%	104.2%	96.9%	106.3%
High Street	88.4%	100.5%	95.0%	105.5%
B6259	11.0%	12.0%	11.5%	12.5%

8.3.11 The Kirkby Stephen signalised interchange exceeds its theoretical capacity in the PM Peak both in the Do Minimum and Do Something. In the AM Peak it is within, but close to the desired capacity in both scenarios. It should be noted that this assessment only looks at the operation of the Market Street / High Street / B6259 junction in isolation.

In reality there are traffic issues here that are difficult to represent in a traffic model, such as the interaction between parked cars, pedestrian crossings and the constrained signalised junction. The assessment shows that will be a congestion issue in future years on the network at Kirkby Stephen irrespective of the Project.

Table 8-22: Barnard Castle Bridge Junction LinSig Results – Degree of Saturation

Arm	DM 2044		DS 2044	
	AM	PM	AM	PM
A67 Bridgegate	53.3%	55.8%	51.6%	50.3%
A67 The Sills	52.8%	55.7%	50.0%	50.7%
B6277 The Sills	22.0%	36.5%	37.7%	51.4%

8.3.12 Barnard Castle Bridge is considered to operate within capacity on all arms and in both the Do Minimum and Do Something Scenarios.

8.4 Local severance

8.4.1 Details of the severance assessment, including the assessment methodology, assessment parameters, legislation and policy framework and assumptions and limitations are contained in **Chapter 13 Population and Human Health** of the **Environmental Statement** (Document Reference 3.2). A summary of the impact of the project is included below.

M6 Junction 40 to Kemplay Bank

8.4.2 Access for walkers and cyclists across the M6 Junction 40 and Kemplay Bank roundabouts will be retained, as will the existing shared use cycle/footway runs along the north side of the A66.

Penrith to Temple Sowerby

8.4.3 A parallel shared cycleway/footway will be provided on the north side of the A66 between Penrith and Temple Sowerby. Two existing rural routes (Byway 311013 and Footpath 311004), which currently terminate at the A66, will be connected via the new route and grade-separated junction, creating enhanced opportunities for walking and cycling. By providing a safe crossing of the A66 and a 6-mile segregated route between Penrith and Temple Sowerby, the scheme will encourage active travel, physical activity and access to the countryside.

Temple Sowerby to Appleby

8.4.4 A new shared cycle/footway will be provided alongside the de-trunked A66 from Kirkby Thore to the western extent of Appleby. The new 5-mile segregated route will encourage active travel, physical activity and access to the countryside.

Appleby to Brough

8.4.5 A shared cycleway/footway is proposed to run alongside the dual carriageway from east of Appleby to Brough. The route will connect into

10 existing Public Rights of Way (PRoW) which currently terminate at the A66. Proposed safe crossing points at grade-separated junctions and shared underpasses will improve pedestrian access and remove the severance caused by the existing A66. The new 5-mile segregated route and improved north-south connectivity on the rural PRoW network will encourage active travel, physical activity and access to the countryside.

Bowes Bypass

8.4.6 To the northeast of Bowes, a new accommodation underpass will reconnect Footpath 6, which is currently severed by the existing A66. This will provide better links for the east of Bowes to rural PRoW on the north side of the A66. Further east, the gap in the central reservation will be closed to prevent walkers from crossing the dual carriageway and PRoW on the south side of the A66 will be diverted westwards to the accommodation underpass. These changes will result in better provision for walkers to the east of Bowes.

Cross Lanes to Rokeby

8.4.7 A 2-mile shared cycleway/footway is proposed to run alongside the dual carriageway from Cross Lanes junction to Greta Bridge, where it will connect to an existing cycle route through the village. The grade-separated junction at Cross Lanes will connect existing footpaths to the north and south of the A66 and provide a safe crossing point for cyclists travelling between Rutherford Lane and the B6277. At Rokeby, three existing footpaths on the north side of the A66 will be joined to the new shared cycleway/footway and connected to the PRoW network south of the A66 via the new grade-separated junction. The new shared cycleway/footway will provide a safer option for cyclists travelling from Greta Bridge to Barnard Castle, who currently use a route including steps down to a poorly maintained path leading onto the A66 carriageway. These changes are considered to improve the provision for walkers and cyclists to the southeast of Barnard Castle. This will encourage active travel, physical activity and access to the countryside.

Stephen Bank to Carkin Moor

8.4.8 A shared path for horse-riders and pedestrians is proposed alongside the de-trunked A66, connecting into four existing footpaths and four bridleways, which currently either terminate at the A66 or cross it via road verges and at-grade crossings. Proposed safe crossing points at grade-separated junctions and shared underpasses will improve access for walkers and horse riders and reduce the severance caused by the existing A66. The new 2.5-mile segregated route and improved crossings will encourage walking and horse riding, promoting physical activity and access to the countryside.

A1(M) Junction 53 Scotch Corner

8.4.9 Access for walkers and cyclists across the A1(M) Junction 53 via Toucan crossings will be retained.

9 Road safety

9.1.1 This chapter considers the effect of the Project on road safety. Improved road safety is one of the specific Project objectives listed in Table 1-1 of this report.

9.1.2 This firstly sets out the comments provided in response to the Road Safety Audits (RSA) undertaken for the Project, including the Designers' Responses, in order to demonstrate the suitability of the Project design in safety terms.

9.1.3 Collision data has been obtained and analysed to determine whether there are any localised safety issues.

9.1.4 COBALT analysis is also presented, which shows how the provision of a safer road design for the sections of the A66 upgraded as part of the Project translates into a reduction in accident levels over a 60-year period. This analysis also considers the effects on accident levels of traffic diversions resulting from the Project as some drivers will transfer onto routes with different accident rates to those routes that they are currently using.

9.2 Road Safety Audit 1 and Designers Response

9.2.1 The design team has carefully considered the problems and recommendations in the Stage 1 Road Safety Audit (RSA1) Report and has provided a response to all problems and recommendations raised by the Road Safety Audit Team.

9.2.2 The Road Safety Audit was undertaken in accordance with the Road Safety Audit Brief and the requirements of GG119. The audit comprised an examination of the documents provided in the Brief, and these are listed in Appendix D.

9.2.3 The issues raised by the RSA1 are summarised in Table 9-1.

Table 9-1: Summary of RSA1 issues raised

Category	Summary of Recommendations	Count
Visibility	Recommendations to provide suitable visibility and sight distances	43
Walkers cyclists and horse riders	Recommendations to provide modified / alternative facilities to reduce/eliminate conflict with walker's cyclists and horse riders	23
Signing and marking	Recommendations to review proposed road signs and lane markings such that appropriate provision is made	15
Junction Arrangement	Recommendations around layout, carriageway width, segregation and sight lines at junctions	14
Alignment	Recommendations to provide suitable geometry in terms of vertical and horizontal alignment	13
Access Junction	Recommendations around location of access junctions	11
Vehicle Restraint System (VRS)	Recommendations around the adequate provision of VRS	11

Category	Summary of Recommendations	Count
Laybys and Passing Bays	Recommendations around the location of laybys and passing bays	8
Traffic Speed	Recommendations made to limit traffic speeds	7
Headlight dazzle	Recommendations to provide screening to reduce risk of headlight dazzle	6
Bus stops	Recommendations on the location of bus stop locations	5
Insufficient Provision	Recommendations to provide sufficient localised carriageway and set-backs such that the design is suitable for all users	5
Lighting	Recommendations around the provision of adequate lighting	5
Merging and Weaving	Recommendations to reduce risk of accidents occurring during lane change manoeuvres such as side swipe collisions	5
Drainage	Recommendations around suitable drainage provision throughout the scheme extents.	4
General	Recommendations around the removal of Adverse Camber, provision of Timber Fences and relocation of Snow Gates	3
Total		**178**

9.2.4 The design team have considered each recommendation provided by the Audit Team and have accepted the recommendations where appropriate, with agreement from NH as the Overseeing Organisation. The RSA1 Response Report for each scheme contains a decision log of the actions taken, and the justification for doing so.

9.2.5 All responses to the RSA recommendations were taken through a decision log process with the Overseeing Authority. The Overseeing Authority is NH for the trunk road network and is the Local Highway Authority for local roads and the old de-trunked A66, where it will be adopted.

9.2.6 Where recommendations may have altered the red line boundary, those design changes were agreed with NH and were implemented within the design. Additional changes to the design within the red line boundary will be made at Detailed Design stage as required ahead of the Stage 2 Road Safety Audit.

9.3 Collision data

9.3.1 Collision data (for injury accidents only) for a 7-year period between 2013 and 2019 in the vicinity of the six schemes has been obtained. Given the significant change in traffic flows caused by the COVID-19 pandemic, the 2020 and 2021 data are excluded as being non-typical.

9.3.2 While data covering the period since 2019 has not been included in our analysis of collisions, it should be noted that in the last six months (December 2021 – May 2023) there have been a total of 6 fatal accidents on the single carriageway sections of the A66, at the following locations:

- Rokeby
- Kirkby Thore (in two separate incidents)
- Warcop (in three separate incidents)

9.3.3 The total number of accidents on the single and dual carriageway sections are shown in Table 9-2 for the whole A66 between Penrith and Scotch Corner.

Table 9-2: A66 Accident Statistics

Year	Road Standard	Fatal	Serious	Slight	Grand Total
2013	Single	0	6	13	19
	Dual	0	5	15	20
2014	Single	0	2	16	18
	Dual	0	5	20	25
2015	Single	3	4	12	19
	Dual	2	6	18	26
2016	Single	0	2	11	13
	Dual	1	3	15	19
2017	Single	2	6	14	22
	Dual	1	3	12	16
2018	Single	2	6	15	23
	Dual	1	1	16	18
2019	Single	1	1	6	8
	Dual	1	3	5	9
Grand Total	**Single**	**8**	**27**	**87**	**122**
	Dual	**6**	**26**	**101**	**133**
	All Sections	**14**	**53**	**188**	**255**

9.3.4 Between 2013 and 2019, there were 255 accidents which occurred along the route, equating to an average of 36 accidents per year. 74% resulted in slight injuries, 21% resulted in serious injuries and 5% resulted in fatality. Over the seven-year period, accidents which resulted in fatalities increased, with five fatal accidents in 2015, including three which involved head-on collisions at the Warcop bends and at Crackenthorpe. There were also 3 fatalities in both 2017 and 2018.

9.3.5 To compare the single and dual carriageway sections, the number of million vehicle kilometres driven on each section needs to be considered to calculate an accident rate. This is shown in Table 9-3 below.

Table 9-3: Accident Rates on Dual and Single Carriageway Sections – Accidents per million vehicle kilometres (mvkm)

Year	Single	Dual
2013	0.14	0.08
2014	0.12	0.07
2015	0.08	0.06
2016	0.14	0.04
2017	0.12	0.06
2018	0.10	0.10
2019	0.04	0.03
Average	**0.11**	**0.06**

9.3.6 The accident rate of a single carriageway section (0.11 accidents per mvkm) is 73% higher than that of the dual carriageway sections (0.06 accidents per mvkm).

9.3.7 A summary of the collision data analysis for each scheme is provided below. This data has been analysed and summarised in **Appendix E** for the scheme sections.

M6 Junction 40 to Kemplay Bank

9.3.8 At the M6 junction 40 a total of 16 collisions occurred during this period, 15 of which were slight and one was serious. None of the collisions at this location were fatal. All of the collisions involved motor vehicles. The collisions were caused by a number of factors including rear end shunts at signals and poor lane changing manoeuvres on the circulatory of the roundabout resulting in side impact collisions.

9.3.9 Eighteen collisions were recorded at Kemplay Bank, 14 of which were slight and four were serious. One collision involved a pedal cycle and the rest involved motor vehicles. The majority of the collisions were rear end shuts at the roundabout and three other collisions were side impact collisions from poor lane changing manoeuvres.

Penrith to Temple Sowerby

9.3.10 A total of 28 collisions occurred at this location, 19 of which were slight and eight were serious and one was fatal. The fatal collision occurred when an HGV driver drifted into oncoming traffic. Fatigue was reported as the cause of the collision.

9.3.11 Half of the reported collisions involved an HGV. These collisions were due to overtaking manoeuvres, drivers failing to look or failing to judge another vehicles' path or speed.

9.3.12 A third of the collisions on this segment occurred during the hours of darkness. There are no street lights present along this section of the A66

Temple Sowerby to Appleby

9.3.13 At this location there were 48 collisions. 39 collisions were considered as slight, six were considered as serious and three were fatal.

9.3.14 All three fatalities involved HGVs. Two of the fatalities were head on collisions, where vehicles have drifted across the centre line into oncoming traffic. The third fatality was a result of a poor overtaking manoeuvre.

9.3.15 A quarter of the collisions on this segment occurred during the hours of darkness.

Appleby to Brough (Warcop)

9.3.16 There were a total of 45 collisions at this location during the eight year period. 31 of which were slight, 11 were serious and three were fatal.

9.3.17 All three fatalities were head on collisions, where vehicles have drifted across the centre line into oncoming traffic.

9.3.18 One collision involved a pedestrian. A road worker who was setting out temporary traffic management and was hit by a passing vehicle at low speed, resulting in a slight injury.

Bowes bypass

9.3.19 Eight collisions occurred at this location, of which seven were slight and one was serious. The majority of collisions occurring on this segment of the A66 are a result of overtaking manoeuvres.

9.3.20 All of the reported collisions occurred in daylight hours.

Cross Lanes to Rokeby

9.3.21 There was a total of 15 collisions at this location, ten of which were slight and five were serious. The majority of the collisions were a result of slowing and turning into side roads across oncoming traffic on the A66.

9.3.22 The majority of collisions in this segment of the A66 occurred during daylight hours and in dry/fine weather conditions.

Stephen Bank to Carkin Moor (Layton)

9.3.23 47 collisions occurred in the location including 32 slight, 13 serious and two fatal. One fatal collision occurred when a vehicle swerved to avoid a stationary vehicle who was waiting to turn right onto Collier Lane and hit a third vehicle head on.

9.3.24 The clusters of collisions at the junctions are mainly caused by slowing or turning traffic. One of which resulted in a fatal collision. Several of these collisions resulted in rear end shunts.

9.3.25 One collision involved a pedestrian, who stepped out in front of an oncoming vehicle. The pedestrian reportedly had dementia and therefore this collision is not attributed to driver error or to poor junction/highway design.

9.3.26 The majority of collisions in this segment of the A66 occurred during daylight hours and in dry/fine weather conditions.

A1(M) / A66 scotch corner

9.3.27 There was a total of 15 collisions at this location, 13 slight and two serious.

9.3.28 Most of the recorded collisions occur due to rear end shuts caused by failing to observe traffic ahead being to slow down or stop at the give way line. Five of these occur on the approach to Scotch Corner junction, from the A66.

9.3.29 Two collisions were due to turning/U-turn manoeuvres in the gap in the central reservation. Two collisions were due to excessive speed on the circulatory. One collision involved a motorbike which resulted in serious injury when the rider overshot the stopline at the junction.

9.3.30 Two thirds of collisions occurred in daylight and in fine/dry weather.

Summary

9.3.31 The A66 has a higher-than-average number of accidents in some sections of the route, with a number of accident cluster sites. A number of these sites are either located in single carriageway sections or in dual sections adjacent to single carriageway sections. All fatalities recorded along scheme sections were a result of drivers drifting into oncoming traffic or poor overtaking manoeuvres on single carriageway sections, with a significant proportion of non-fatal collisions also a result of poor overtaking manoeuvres on single carriageway sections.

9.3.32 Varying standards along the route with a mixture of single and dual carriageway sections leads to difficulties with overtaking, poor forward visibility, and difficulties at junctions as a result of short merges and diverges and right turning traffic off and on to the A66.

9.4 Project impact on accidents (COBALT)

9.4.1 The safety appraisal assesses the likely change in the number of road accidents within the area of focus and influence of the A66 route, as a result of the Project improvements. It also predicts the consequent change in the number and severity of casualties in terms of individuals who are killed or injured.

Cobalt methodology

9.4.2 COBALT (Cost and Benefit to Accidents – Light Touch) is the DfT's recommended computer program for undertaking the analysis of the impact of a road scheme on accidents. This programme will be used to appraise the impact of the A66 NTP Project on accidents.

9.4.3 The current version of the software is V2.1 (July 2021). The TAG parameters file associated with TAG Databook V1.17 were used to run the software and includes up to date values for default accident rates and the monetary value of these accidents.

9.4.4 COBALT assesses the safety aspects of road schemes using detailed inputs of either (a) separate road links and road junctions that would be impacted by the scheme; or (b) combined links and junctions. The

assessment is based on comparison of accidents by severity and associated costs across an identified network with DM and DS forecasts, using details of link and junction characteristics, relevant accident rates and costs and forecast traffic volumes by link and junction.

9.4.5 The accident analysis is based on the results of the A66TM. A combined link and junction appraisal has been undertaken. The program looks at the differences in junction and link properties, as well as the differences in traffic flows, to calculate the overall impact on accidents as a result of the A66 Project.

9.4.6 The area of impact selected for accident appraisal in COBALT is consistent with guidance: “the network should extend far enough from the improvement to include all links on which there is a substantial difference in the assigned traffic flows between ‘Without Scheme’ and ‘With Scheme’ networks.” There is no defined magnitude for ‘substantial difference’ in TAG or COBALT advice, so conventional criteria are applied for A66, whereby the included area of focus and influence is where (in the A66TM forecast assignment) there is a predicted change of at least +/-5% in AADT flows, and a flow difference of at least +/-50 vehicles per day AADT, in the DS scenario compared with the DM scenario. The resulting study area accident appraisal is shown in Figure 9-1.

9.4.7 COBALT default link and combined link and junction accident rates, categorised by road type and location, are applied to all roads in the study area.

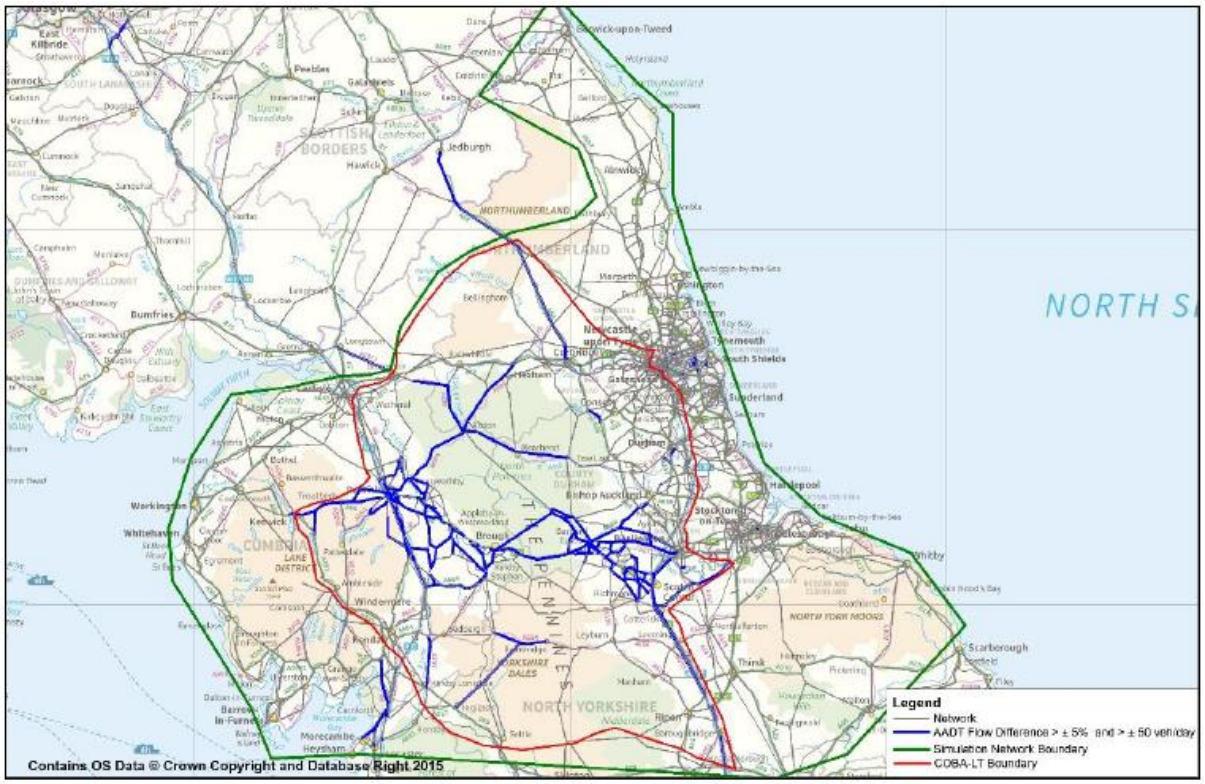

Figure 9-1: PCF2 COBALT Study Area

COBALT results

9.4.8 Implications for the social welfare of users, in terms of road safety and accidents, are appraised using COBALT for the project's area of focus and influence. The net impact, is summed over the 60-year economic appraisal period 2029 – 2088[32], inclusive.

9.4.9 Table 9-4 shows the number of accidents saved by introducing the A66 improvements. Over the 60-year appraisal period, the project saves 281 personal injury accidents, of which 3% are fatal, 21% are serious, and 76% are slight. Overall, the project saves 6,975 accidents, of which 4% involve personal injury and 96% are damage-only.

Table 9-4: Number of Accidents Saved

Accident Severity	Do Minimum (DM)	Do Something (DS)	No. Accidents Saved
Fatal PIA	619	612	7
Serious PIA	4,912	4,854	58
Slight PIA	73,727	73,511	216
Sub-Total All PIA	79,258	78,977	281
Damage-Only	999,484	992,790	6,694
All Accidents	**1,078,742**	**1,071,767**	**6,975**

[32] In line with the Principles of Cost Benefit Analysis as set out in *TAG Unit A1.1 Cost Benefit Analysis (DfT July 2021).*

9.4.10 Table 9-5 shows the number of casualties saved over the 60-year period. There is an overall reduction of 530 casualties, of which 3% are fatal, 28% are serious, and 69% are slight.

Table 9-5: Number of Casualties Saved

Casualty Severity	Do Minimum (DM)	Do Something (DS)	No. Casualties Saved
Fatal Casualties	1,251	1,237	14
Serious Casualties	11,381	11,233	148
Slight Casualties	100,234	99,866	368
All Casualties	**112,866**	**112,336**	**530**

9.4.11 Accident reductions occur across the whole network as the increased flow on the improved A66 also removes traffic from other roads on the surrounding road network (for example rural links with a poorer safety record) therefore in total 14 fatalities, and 148 serious accidents are saved by the Project.

9.4.12 Table 9-6 and Table 9-7 show a breakdown of the COBALT assessment on each scheme on the A66 corridor, and on each scheme section in terms of accidents and casualties. It should be noted that this analysis considers the impact of implementing the complete Project on each individual scheme section.

Table 9-6: Cobalt Assessment Results – Accidents Saved

Scheme No.	Scheme	Personal Injury Accidents Saved	Fatal and Serious Accidents Saved
0102	M6 Junction 40 to Kemplay Bank	17	2
03	Penrith to Temple Sowerby	-1	6
0405	Temple Sowerby to Appleby	142	18
06	Appleby to Brough	86	17
07	Bowes Bypass	-17	1
08	Cross Lanes to Rokeby	-23	2
09	Stephen Bank to Carkin Moor	56	13
11	A1(M) Junction 53 Scotch Corner	-20	-2
All Schemes Total		**240**	**57**

Table 9-7: Cobalt Assessment Results – Casualties Saved

Scheme No.	Scheme	Fatal Casualties Saved	Serious Casualties Saved	Slight Casualties Saved
0102	M6 Junction 40 to Kemplay Bank	0	3	23
03	Penrith to Temple Sowerby	2	13	9
0405	Temple Sowerby to Appleby	4	39	184
06	Appleby to Brough	5	36	129

Scheme No.	Scheme	Fatal Casualties Saved	Serious Casualties Saved	Slight Casualties Saved
07	Bowes Bypass	0	3	-17
08	Cross Lanes to Rokeby	1	4	-23
09	Stephen Bank to Carkin Moor	4	28	87
11	A1(M) Junction 53 Scotch Corner	0	-2	-25
All Schemes Total		**15**	**123**	**368**

9.4.13 Within the whole study area, the Project saves 281 accidents over the 60-year period, resulting in 368 fewer casualties. 15 fatalities and 123 serious casualties are forecast to be saved on the new A66 Scheme sections.

9.4.14 However, as traffic flows on the whole A66 between Penrith and Scotch Corner also increases due to these improvements (including on the non-improved sections), PIA and casualty numbers on the non-improved sections will increase. This is shown in Table 9-8 and Table 9-9.

9.4.15 The saving on the improved sections for fatal and serious accidents is greater than the increase on the non-improved sections, therefore a net saving of 9 fatalities and 83 serious injuries is forecast to occur.

Table 9-8: Cobalt Assessment Results – Accidents Saved

Scheme	Personal Injury Accidents Saved	Fatal and Serious Accidents Saved
A66 Schemes Total	240	57
A66 Dual Carriageway Sections	-320	-21
A66 Total	**-80**	**36**

Table 9-9: Cobalt Assessment Results – Casualties Saved

Scheme	Fatal Casualties Saved	Serious Casualties Saved	Slight Casualties Saved
A66 Schemes Total	15	123	368
A66 Dual Carriageway Sections	-6	-40	-409
A66 Total	**9**	**83**	**-41**

10 Sustainable transport

10.1.1 This section provides an overview of the provision for travel in the vicinity of the Project by sustainable modes of transport. It also seeks to identify the current type and quality of provision as well as improvements delivered as part of the Project.

10.1.2 A Walking, Cycling and Horse-Riding Assessment and Review (WCHAR) has been undertaken for the Project, **2.4 Walking, Cycling and Horse-Riding Proposals**. The purpose of the WCHAR is to ensure that walking cycling and horse-riding facilities are considered within the Project.

10.1.3 The aims of carrying out the WCHAR are:

- To gain an appropriate understanding of all relevant existing facilities for walkers, cyclists and equestrians (users) in the local area.
- To provide background user information that can be referred to throughout the development of the highway Project.
- To identify opportunities for improvement for users.

10.2 Walking and cycling

10.2.1 The WCHAR identified the following trip generators[33] in the vicinity of the Project that could be attractive to walkers, cyclists and equestrians.

Penrith

10.2.2 Penrith is home to a number of community facilities, including schools, healthcare facilities, parks and leisure facilities. There are areas of safeguarded open space to the north of the A686 in the Thacka Breack area and to the west of the Kemplay. There are a number of parcels of public open space protected by the Eden Local Plan land, which are found in close proximity to the section.

10.2.3 There are a number of residential properties in close proximity to the Project, with concentrations of residential areas found towards the north of the route, in Pategill and Wetheriggs and to the south in Eamont Bridge.

10.2.4 Table 10-1 summarises other trip generators in the vicinity of the study route located within this section.

[33] Trip generators are houses, shops, businesses or any facilities which produce or attract person trips, in this case pedestrian, cyclist or equestrian trips.

Table 10-1: Trip Generators – Penrith

Type	Trip Generator
Community facilities	Penrith Community Fire Station Penrith Rugby Union Football Club Carletonhall Park Cumbria Constabulary Headquarters Penrith Hospital Penrith Fire Station King Arthur's Round Table, which is a Neolithic earthwork hence, dating from about 2000 BC, but much later believed to be King Arthur's jousting arena Ullswater Community College
Recreational facilities	Penrith Ruby Union Football Club Recreation Ground King Arthur's Round Table, which is a Neolithic earthwork hence, dating from about 2000 BC, but much later believed to be King Arthur's jousting arena Penrith Cricket Club
Commercial and Industrial uses	Esso Petrol Station B&M Bargains KFC
Other	Land at Carleton Hall Farm, just outside Penrith, has been allocated as a site for housing in the Eden Local Plan 2014-2031 Submission Draft. The land is found between Carleton Avenue and the A66 and is 3.8 ha in size Immediately to the north, another parcel of land has been allocated for housing in the Eden Local Plan 2014 – 2031 Submission Draft. The land is to the north of Carleton Avenue and is 11.62 ha in size.

Temple Sowerby

10.2.5 Temple Sowerby is surrounded by pastures and contains some community facilities such as a primary school, a medical surgery and hotels. The National Trust Property Acorn Bank is also located nearby the village. A bypass around Temple Sowerby opened in 2007 and was received well.

10.2.6 Table 10-2 summarises other trip generators in the vicinity of the study route located within this section.

Table 10-2: Trip Generators – Temple Sowerby

Type	Trip Generator
Community facilities	Temple Sowerby Medical Practice St James' Church Temple Sowerby Church of England Primary School
Recreational facilities	Frenchfield Sports Centre Whinfell Park Cricket Ground Center Parcs
Commercial and Industrial uses	Temple Sowerby House Hotel & Restaurant The Kings Arms Hotel Eden Garage

Kirkby Thore

10.2.7 Kirkby Thore is a small village consisting of residential housing, a farm, a church, holiday cottages and a village store. A small bistro and a petrol station are located along the A66, just south of Kirkby Thore.

10.2.8 Table 10-3 summarises other trip generators in the vicinity of the study route located within this section.

Table 10-3: Trip Generators – Kirkby Thore

Type	Trip Generator
Community facilities	Low Moor Caravan and Camping Park Kirkby Thore Primary School St Michaels's Church Post Office
Recreational facilities	Kirkby Thore Recreation Ground
Commercial and Industrial uses	Kirkby Thore Filling Station The Bridge Bistro Bridge End Farm British Gypsum

Appleby-in-Westmorland

10.2.9 Appleby-in-Westmorland is a market town with its own castle which has rooms available as a hotel. There are many other hotels within the village alongside small shops, community facilities, including schools, healthcare facilities, and leisure facilities.

10.2.10 Table 10-4 summarises other trip generators in the vicinity of the study route located within this section.

Table 10-4: Trip Generators – Appleby-in-Westmorland

Type	Trip Generator
Community facilities	Appleby Medical Practice Appleby Train Station Appleby Primary School Appleby Grammar School St Lawrence's Church Saint Methodist Church Our Lady of Appleby RC Church Kingdom Hall of Jehovah's Witnesses
Recreational facilities	Appleby Bowling Green Appleby Eden Cricket Club King George's Field
Commercial and Industrial uses	East of Eden Scrapyard Appleby Creamery Cross Croft Industrial Estate Appleby Manor Country House Hotel Crown & Cushion - Public house A number of commercial units on Ridge Street, Boroughgate and the Sands

Warcop

10.2.11 Warcop village largely consists of a military training area which provides tank and infantry training and is considered as one of the Ministry of Defence's (MoD) largest army training areas in the UK. Outside of the military establishments there is a residential area with a church, primary school, parish hall and a holiday home.

10.2.12 Table 10-5 summarises other trip generators in the vicinity of the study route located within this section.

Table 10-5: Trip Generators – Warcop

Type	Trip Generator
Community facilities	Warcop Methodist Church, Saint Columba's Church Post Office
Recreational facilities	Chamley Arms – Public House Warcop Training Area
Commercial and Industrial uses	The Warcop Training Area (WTA) is a UK Ministry of Defence military training area. Part of the Defence Training Estate, the area consists of approximately 24.000 acres (9,700 ha) of MoD freehold land to the north and south of the A66.

Brough

10.2.13 Brough is a small town split by the A66 into Market Brough located on the north side of the A66, with its twin village Church Brough lying on the southern side of the A66. Together they boast of an English Heritage Castle, small shops, a primary school, a medical practice, lodgings and eateries.

10.2.14 Table 10-6 summarises other trip generators in the vicinity of the study route located within this section.

Table 10-6: Trip Generators – Brough

Type	Trip Generator
Community facilities	Brough Community Primary School Brough Church Brough Castle Church Brough
Commercial and Industrial uses	Swanson House – Restaurant Premier Village Stores & Off Licence The Inn at Brough Tea Rooms Golden Fleece – Public House Oil Solutions Grand Prix Coaches Brough Trading Estate

Bowes, Rokeby and Greta Bridge, and Ravensworth

10.2.15 Bowes is a village in County Durham built around a mediaeval castle and is where the A66 and A67 roads meet. Bowes consists of a primary school, hotels, churches, a village hall, a small playground and a campsite.

10.2.16 Rokeby is a civil parish that includes the hamlet of Greta Bridge, mainly consisting of hotels and holiday homes. Rokeby Park north of the A66 consists of a grade two house and lands and is a protected national heritage park.

10.2.17 Ravensworth is a village in North Yorkshire consisting of a residential area, garden centre, primary school, a large village green and a pub.

10.2.18 Table 10-7 summarises other trip generators in the vicinity of the study route located within this section.

Table 10-7: Trip Generators – Bowes, Rokeby and Greta Bridge, and Ravensworth

Type	Trip Generator
Bowes	
Community facilities	Bowes Hutchinson Church of England Primary School St Giles Church Bowes and Gilmonby Village Hall
Commercial and Industrial uses	The Ancient Unicorn Inn - Public House / B&B Bowes Castle
Rokeby and Greta Bridge	
Community facilities	Rokeby Park The Morritt Hotel and Garage Spa
Commercial and Industrial uses	The Morritt Hotel and Garage Spa
Ravensworth	
Community facilities	Ravensworth Church of England Primary School Ravensworth Castle (remains of)
Commercial and Industrial uses	The Bay Horse Inn Public House Fox Hall Inn Mainsgill Farm

10.2.19 A site visit was conducted as part of the design process. The level of use, conditions and suitability of each route were recorded, and potential improvements and connections noted.

10.3 Bus

10.3.1 A review of local bus routes and bus stops within the vicinity of the Project has been undertaken. The tables below summarise bus services and frequencies within 5km of the A66 between Penrith Junction 40 and Scotch Corner.

10.3.2 The table below shows bus services in the vicinity of the A66 Study Route within Eden District, Cumbria.

Table 10-8: Bus Services and Frequencies – Eden District

Route No	Route Description	Monday-Friday	Saturday	Sunday
104	Carlisle > Penrith > Newton Rigg > Center Parcs Whinfell Forest	25-30 min	30 min	2 hours
106*	Kendal > Grayrigg > Tebay > Orton > Shap > Lowther > Clifton > Penrith (Stagecoach)	*One service for Tue, Wed and Fri only	No Service	No Service
X4 X5	Workington > Cockermouth > Keswick > Penrith	30 min	30 min	2 hours

Route No	Route Description	Monday-Friday	Saturday	Sunday
	Penrith > Keswick > Cockermouth > Workington	1 hour	1 hour	2 hours
508	Penrith > Pooley Bride > Ullswater > Patterdale	2-3 hours	2No Service3 hours	2No Service3 hours
563	Appleby > Kirkby Thore > Penrith	2-3 hours	No Service	No Service
	Penrith > Kirkby Thore > Appleby	1 hour 35 min – 2 hour 50 min	No Service	No Service
141*	Newbiggin > Newton Relgny > Ivegill > Carlisle (Fellrunner Bus)	*One service for the 2nd Thursday of each month	No Service	No Service
132*	Langwathby > Penrith > Skelton > Blencow > Penrith (Fellrunner Bus)	*One service every Friday	No Service	No Service
130*	Langwathby > Lazonby > Carlisle (Fellrunner Bus)	*One service every Wednesday	No Service	No Service
131*	Langwathby > Renwick > Armathwaite > Carlisle (Fellrunner Bus)	*One service every Friday	No Service	No Service
134*	Armathwaite > Ainstable > Lazonby > Great Salkeld > Penrith (Fellrunner Bus)	*One service every Wednesday	No Service	No Service
135*	Langwathby > Ousby > Culgaith > Penrith (Fellrunner Bus)	*One service every Thursday	*One service every Saturday	No Service
136*	High Bankhill > Lazonby > Great Salkeld > Penrith (Fellrunner Bus)	*One service every Tuesday	No Service	No Service
137*	Penrith > Glassonby > Renwick > Lazonby > Penrith (Fellrunner Bus)	*One service every Thursday	No Service	No Service
138*	Langwathby – Culgaith – Ousby – Penrith (Fellrunner Bus)	*One service every Tuesday	No Service	No Service
139*	Melmerby > Gamblesby > Little Salkeld > Langwathby > Penrith (Fellrunner Bus)	*One service every Tuesday	No Service	No Service
140*	Melmerby > Skirwith > Langwathby > Penrith (Fellrunner Bus)	*One service every Wednesday	No Service	No Service
111*	Burnbanks (Haweswater) > Bampton > Helton > Asham > Penrith (Fellrunner Bus)	*One service every Thursday	No Service	No Service
506*	Appleby > Penrith Shap > Tebay > Kendal (Stagecoach)	*One service on College days only	No Service	No Service
574	Kirkby Stephen > Brough > Appleby > Kirkby Thore > Penrith (Classic Coaches)	*One service every Tuesday	No Service	No Service
573	Appleby > Ormside > Appleby (Robinsons Coaches)	2 services running – 2 hour and 30 min apart only on Fridays	No Service	No Service

Route No	Route Description	Monday-Friday	Saturday	Sunday
	Appleby > Knock > Milburn > Appleby (Robinsons Coaches)	2 services running – 2 hour and 30 min apart only on Fridays	No Service	No Service
	Appleby > Margarets Way > Appleby (Robinsons Coaches)	2 services running – 2 hour and 30 min apart only on Fridays	No Service	No Service
562*	Bolton > Crosby Ravensworth > Morland > Penrith (Fellrunner Bus)	*One service every Tuesday	No Service	No Service
502*	Brough > Kirkby Stephen > Sedbergh > Kendal (Stagecoach)	*One service on College days only	No Service	No Service
571*	Brough > Kirkby Stephen > Ravenstonedale > Tebay > Grayrigg > Kendal (Cumbria Classic Coaches)	*One service every Monday	No Service	No Service
572*	Ravenstonedale > Kirkby Stephen > Barnard Castle (Cumbria Classic Coaches)	*One service every Wednesday	No Service	No Service
569*	Ravenstonedale > Kirkby Stephen > Hawes	*Service suspended until Spring 2019	No Service	No Service
S4	Dent > Sedbergh > Cautley > Kirkby Stephen > Brough (Western Dales Bus)	* 4 services running: 1 – 2 hours apart only on Friday	No Service	No Service
S5	Kirkby Stephen > Ravenstonedale > Newbigin on Lune > Kendal (Western Dales Bus)	* 3 services running: 2 - 3 hours apart only on Thursday	No Service	No Service

10.3.3 The figure below shows bus services in the vicinity of the A66 Study Route within Durham.

Table 10-9: Bus Services and Frequencies – Durham County

Route No	Route Description	Monday-Friday	Saturday	Sunday
572	Ravenstonedale > Kirkby Stephen > Barnard Castle (Cumbria Classic Coaches)	*One service every Wednesday	No Service	No Service
B66	Newcastle > Blackpool (JH Coaches)	*One service for Mon and Fri only	No Service	One service only
70	Barnard Castle > Ingleton (Scarlet Band)	3 hours	No Service	No Service
71	Green Lane > Barnard Castle (Scarlet Band)	1 hour – 1 hour 30 min	No Service	No Service
	Harmire Road > Barnard Castle (Scarlet Band)	1 hour – 2 hour 40 min	No Service	No Service
	Startforth > Barnard Castle (Scarlet Band)	1 hour 50 min – 2 hour 20 min	No Service	No Service
72	Boldron > Barnard Castle (Scarlet Band)	3 hours	No Service	No Service

Route No	Route Description	Monday-Friday	Saturday	Sunday
73	Langdon Beck > Barnard Castle (Scarlet Band)	3 services running: 2 hours apart only on Wednesday	No Service	No Service
74	Stainton Grove > Barnard Castle (Scarlet Band)	1 hour 30 min – 3 hours	1 hour 30 min – 3 hours	No Service
79	Richmond > Barnard Castle	2 hour – 2 hour 45 min	2 hour – 2 hour 45 min	No Service
83	Cockfield > Barnard Castle (Scarlet Band)	40 min – 2 hours	40 min – 2 hours	No Service
84	Darlington > Barnard Castle (Scarlet Band)	2 hours	2 hours	No Service
95	Middleton-In-Teesdale > Barnard Castle (Scarlet Band)	2 hours – 2 hours 40 min	2 hours – 2 hours 40 min	No Service
96	Middleton-In-Teesdale > Barnard Castle (Scarlet Band)	2 hours – 3 hours 30 min	2 hours – 3 hours 30 min	No Service
X75	Darlington > Barnard Castle (Arriva)	30 min – 1 hour 10 min	40 min – 1 hour 10 min	No Service
X76	Darlington > Barnard Castle (Arriva)	1 hour – 1 hour 10 min	1 hour – 1 hour 10 min	No Service

10.3.4 The figure below shows bus services in the vicinity of the A66 Study Route within Richmondshire.

Table 10-10: Bus Services and Frequencies – Richmondshire

Route No	Route Description	Monday-Friday	Saturday	Sunday
29	Richmond > Darlington (Dales and District)	2 hours – 2hours 40 min	2 hours – 2hours 40 min	No Service
79	Barnard Castle > Richmond (Hodgsons Coach Operators Ltd)	2 hours	2 hours – 2hours 20 min	No Service
79A	Richmond > Eppleby Circular (Hodgsons Coach Operators Ltd)	*One service every Thursday	No Service	No Service

10.4 Rail

10.4.1 As part of the WCHAR a review of rail stations and services has been undertaken Within the 5km radius of the A66 study route, there are four railway stations. Their respective train services have been identified as:

10.4.2 Penrith:

- Glasgow Central to London Euston
- Edinburgh Waverley to London Euston
- Glasgow Central to Manchester Airport; and
- Edinburgh Waverley to Manchester Airport.

10.4.3 Langwathby and Appleby:

- Leeds to Carlisle.

10.4.4 Warcop:

- No services - under restoration.

10.4.5 Table 10-11 provides a summary of services to / from Penrith railway station.

Table 10-11: Summary of Train Services from Penrith rail station

Operator	Route Description	Monday-Saturday	Sunday	07:00 - 09:00 hrs	16:00 – 18:00 hrs
Virgin Trains (West Coast Main Line)	Glasgow Central > London Euston	21 trains a day	12 trains a day	3	3
Virgin Trains (West Coast Main Line)	Edinburgh Waverley > London Euston	5 trains a day	3 trains a day	1	1
TransPennine Express (TransPennine North West)	Glasgow Central > Manchester Airport	8 trains a day	5 trains a day	1	1
TransPennine Express (TransPennine North West)	Edinburgh Waverley > Manchester Airport	8 trains a day	7 trains a day	1	1

10.4.6 Table 10-12 provides a summary of services to / from Langwathby and Appleby railway stations.

Table 10-12: Summary of Train Services from Appleby and Langwathby rail stations

Operator	Route Description	Monday-Saturday	Sunday	07:00 - 09:00 hrs	16:00 – 18:00 hrs
Northern	Leeds > Carlisle	7	5	1	1

10.4.7 The majority of rail services close to the Project are accessed at Penrith which offers several routes to other major UK cities. Rail provision elsewhere is limited with only Appleby and Langwathby offering a service between Leeds and Carlisle. There are no direct rail alternatives for passenger or freight movements along the corridor.

10.5 Impacts of the Project

10.5.1 The following sections discusses the impacts to sustainable travel resulting from the Project.

Walking and cycling impacts

10.5.2 **Document 2.4 Walking, Cycling and Horse-riding Proposals**, describes the A66 NTP design proposals for the infrastructure features aimed at improving facilities for WCH on the local network around the A66.

10.5.3 Where PRoWs are severed by or converge at the upgraded A66 carriageway, then they have been gathered and redirected to the nearest grade-separated crossing facility in order to provide a safe place to cross the dual carriageway. The nearest crossing may be a new grade-separated junction, an accommodation underpass or overbridge, or a designated WCH underpass or bridge. All schemes have some level of betterment compared with the provision on the existing single carriageway sections. For most schemes, this includes a parallel shared multi-user route segregated from the dual carriageway. This parallel provision is in the form of either a new path adjacent to the dualling or has been provided along the verge of the old de-trunked A66, where it remains.

Table 10-13: Summary of east-west parallel provision

Scheme	WCH Proposals
Schemes 1 and 2	No change as part of design - existing Toucan crossings and shared cycle/footway around junction 40, and parallel shared cycle/footway on north side of A66 between Junction 40 and Kemplay Bank into Penrith to be retained to be retained
Scheme 3	Shared cycle/footway parallel to scheme running entire length. Segregated crossings of dual carriageway at Brougham and Center Parcs to reconnect and tie in existing PRoW with new route. New route ties into existing provision at each end of the scheme.
Schemes 4 and 5	Shared cycle/footway in verge of old de-trunked A66 running entire length. Segregated crossings of dual carriageway at several locations to reconnect and tie in existing PRoW. New route ties into existing provision at each end of the scheme.
Scheme 6	Shared cycle/footway parallel to scheme running entire length. Segregated crossings of dual carriageway at several locations to reconnect and tie in existing PRoW. New route ties into existing provision at each end of the scheme.
Scheme 7	Segregated crossing of dual carriageway for PRoW at Bowes Cross Farm to Hulands Quarry. Existing footway to be retained under Bowes junction, signed National Cycle Route to be retained over new Clint Lane bridge.
Scheme 8	Shared cycle/footway parallel to the scheme from Cross Lanes to Greta Bridge, connecting into existing cycleway at Greta Bridge. Segregated crossings of dual carriageway at Cross Lanes and Rokeby reconnect and tie in existing PRoW.
Scheme 9	Shared bridle/footway in verge of old de-trunked A66 running entire length. Segregated crossings of dual carriageway at several locations to reconnect and tie in existing PRoW.
Scheme 11	no change as part of design - existing Toucan crossings and shared cycle/footway to be retained

Bus impacts

10.5.4 Discussions have been held with officers of Cumbria County Council, Durham County Council and North Yorkshire County Council and representatives of the following bus operators:

- Stagecoach
- Western Dales Bus
- Barnard Castle Coaches
- Hodgesons Buses
- Cumbria Classic Coaches

10.5.5 The outcome of the discussions is shown in Table 10-14. It should be noted that the formal bus stops that are currently on the A66 at Bowes and Rokeby Park do not comply with design standards for a high-speed dual carriageway, nor do the unmarked bus stops at Whinfell Park and at Warcop.

Table 10-14: Bus Routes impacted by project

Scheme	Bus Routes impacted	Bus Stops impacted
1 and 2 M6 Junction 40 to Kemplay Bank	None	None

Scheme	Bus Routes impacted	Bus Stops impacted
3-Penrith to Temple Sowerby	104 The 104 can use the new A66 grade separated to access Center Parcs.	Unmarked bus stops[34] (eastbound and westbound) on A66 at Whinfell Park. Buses currently stop within the A66. Discussions with the operator have indicated that these stops are very lightly used (the operator suggested 1 drop off per year), therefore no provision for the stops is provided within the scheme. Discussions are ongoing with Cumbria County Council to determine the need or otherwise for any alternative provision
4 and 5 Temple Sowerby to Appleby	563, S6 The 563 and S6 can continue to use the existing A66 through Kirkby Thore using the Temple Sowerby Bypass Junction, and short link road connecting from the Temple Sowerby Bypass junction to the existing A66.	None
6 – Appleby to Brough (Warcop)	S6 S6 routes unaffected as bus can use the new local road to the north of the new A66 dual carriageway in the central section of the scheme, and the new A66 grade separated junction at Warcop.	4 unmarked bus stops are located on the A66 in this area; 2 adjacent to the junction with the access road into Warcop village, and a further 2 stops on the A66 some 500m to the south east. As the new local road to the north of the new A66 dual carriageway would be controlled by Cumbria County Council, they would decide if these stops should be reinstated.
7- Bowes Bypass	None	There are two bus bays on A66 adjacent to the overbridge at the western end of Bowes. Cumbria Classic Coaches stated that they have never seen these bus stops used and agreed that this could be removed.

[34] There is no infrastructure, or signage for the 'unmarked' bus stops referred to in this table. Timetables provided by the operator accessed via the internet do list these stops.

Scheme	Bus Routes impacted	Bus Stops impacted
		Discussions are ongoing with Durham County Council to determine the need or otherwise for any alternative provision. The existing bus bays on the A66 slip roads at the A66/A67 junction, and within Bowes Village would be retained. These alternative locations are closer to the population within the village of Bowes, therefore no impact on users is anticipated.
8 – Cross Lanes to Rokeby	79 The 79 will use the new Rokeby Junction	One on eastbound merge onto A66 at Rokeby Park Hodgesons Buses stated bus stop very rarely used and agreed that this could be removed. Discussions are ongoing with Durham County Council to determine the need or otherwise for any alternative provision. Alternative stops will be retained at Barningham Lane End (accessed from the A66 Greta Bridge junction), and on Barnard Castle Road adjacent to Rokeby Park. These alternative locations are closer to the settlements in this area, therefore no impact on users is anticipated.
9 – Stephen Bank to Carkin Moor (Layton)	Hodgesons Buses state they run school buses to West Layton in this area which use, but do not stop on the A66. The 79 will need to make a small detour to access New Lane from the A66 via the Mains Gill grade separated junction.	None
11 – A1(M) Junction 53 Scotch Corner	None	None

10.5.6 A small number of rarely used stops would be removed:

- in the case of those at Bowes and Cross Lanes to Rokeby there are alternative bus stops that would remain open that are closer to the resident population.
- In the case of the bus stop on A66 at Whinfell Park, discussions are ongoing with Cumbria County Council to consider whether any reprovision is necessary, particular given the very low reported usage of the stop.

10.5.7 It is therefore concluded that the Project does not lead to any negative impacts on the identified bus routes.

Rail impacts

10.5.8 As stated in Chapter 3 of **4.1 Project Development Overview Report,** one of the issues identified during the Pre-project phase was that there is no rail line to provide an alternative main mode and public transport route to the A66 between Darlington and Penrith. Given this lack of rail provision the Project is not anticipated to impact upon any rail services within the area.

11 Construction impact assessment

11.1 Introduction

11.1.1 An assessment has been undertaken of the traffic impact during construction of the project. **Chapter 2.8 Construction, operation and long-term management** of **the Environmental Statement Volume 1** (Document Reference 3.2) provides an outline description of proposals for construction of the project. This information includes assumptions on:

- overall construction programme
- works phasing
- working hours
- workforce
- construction compounds
- construction vehicle movements.

11.1.2 The assumptions pertinent to the traffic impact assessment are provided in Chapters 11.3 to 11.6 below.

11.1.3 In addition to this additional construction advice has been provided by specialist construction advisor Sir Robert MacAlpine (SRM). SRM have provided preliminary indicative information relating to Temporary Traffic Management (TTM) proposals, and potential compound locations such that the impact of; traffic management measures, and construction worker travel, on road capacity can be appraised during project construction. This information is provided in chapter 11.2 and 11.5 below.

11.1.4 The **Construction Traffic Management Plan** forms Annex B13 of Environmental Management Plan (EMP) (Document Reference 2.7). Annex B13 is an extended essay plan for the Construction Traffic Management Plan (CTMP) for the Project. It will be completed on an iterative basis by the Principal Contractor (PC) as the Project progresses through detailed design and will be used to agree the final TTM measures for implementation during the construction of the Project.

11.1.5 Feedback on this plan received by the PC, the Project team and stakeholders will be used to inform future versions of the CTMP for the Project. Major local businesses and other stakeholders that are likely to be impacted by the proposed traffic management will also be consulted regarding the CTMP.

11.1.6 The **Construction Worker Travel and Accommodation Plan** document forms Annex B10 of the EMP. Annex B10 is an extended essay plan for the Construction Worker Travel and Accommodation Plan (CWTAP) for the Project. It will be completed on an iterative basis by the PC as the Project progresses through detailed design and will describe the approach to managing travel and accommodation for construction workers during the construction phase.

11.1.7 The CWTAP will set out the procedures that will be put in place to ensure successful delivery of sustainable transportation for the daily movement of the construction workforce and provides a solution for

meeting the temporary increase in local accommodation demand generated by the Project during construction. The PC will use the essay plan as a basis for producing further iterations of the CWTAP as appropriate at detailed design and construction stage.

11.2 Preliminary Indicative TTM

M6 Junction 40 to Kemplay Bank

11.2.1 Scheme 1 will require a number of TTM layouts due to the short nature of the construction areas and the nature of the carriageway they sit upon. These will include:

- Narrow lanes and/or lane closures on the exit and entry slips
- Off peak lane closures
- Off peak slip road closures
- Lane narrowing on the gyratory
- Reduced speed limits
- Temporary traffic signals

11.2.2 These works have not been programmed in detail at this point. Further details of these activities will be added to this plan as the project design develops. In terms of the operational capacity of M6 Junction 40 a number of assumptions have been made. Given the limited space available to work, it is assumed that all works would occur overnight at this location. Traffic management would therefore be used to create a working area that would be placed into position every night. This would be placed back at the side of the road every morning to allow traffic to operate in the following manner:

- Reduce flares on the A66 eastbound, M6 southbound offslip, A592 and A66 westbound slip, such that there are only two lanes at the roundabout stopline.
- The M6 northbound offslip is currently only two lanes. Two narrow lane operation would remain with the traffic management withdrawn to the side of the carriageway.
- Reduce the width of the circulatory carriageway from three lanes to two narrow lanes.

11.2.3 The modelling undertaken below considers the impact of daytime traffic management arrangements, and not the impact of the traffic management that would be in place overnight, as it is during the daytime when the traffic impact would be expected to be largest due to the heavier daytime flows.

11.2.4 Scheme 2 requires extensive construction in the footprint of the existing roundabout at Kemplay Bank. Available space is very limited and as such the TTM measures will include.

- Narrow lanes and/or lane closures on A66 and Kemplay Bank
- Off peak lane closures
- Off peak road closures
- Reduced speed limits
- Temporary traffic signals

11.2.5 For programming purposes, the phasing has been developed into two sections east and west of Kemplay Bank.

11.2.6 In total there will be four traffic management phases. The first three phases for both sections will have distinct traffic management phases, and the timings are unlikely to match the other, before they all combine into a single final phase (Phase 4) when the underpass will be constructed.

11.2.7 The following phases are anticipated East of Kemplay Bank:

- Phase 1 – On the eastern side of the roundabout both eastbound and westbound traffic and Kemplay Bank will be diverted towards the nearside verge. This will allow for the site clearance works to take place, offline construction of the new eastbound entry slip, and for the central reservation to be hardened in preparation for future phases.
- Phase 2 – Eastbound traffic will exit Kemplay Bank onto the new eastbound entry slip and merge with the original A66. From there it will remain unchanged from phase 1. Westbound traffic will remain unchanged from phase 1.
- Phase 3 – Eastbound traffic will exit Kemplay Bank in a single lane onto the new eastbound entry slip and will run in contraflow with the westbound traffic in a 2-lane eastbound and 1 lane westbound arrangement. Westbound traffic will have both lanes diverted onto the hardened central reservation at Ch12260 and will run in contraflow to eastbound traffic that is running in a single lane. Traffic will use the newly constructed eastbound entry slip on approach to Kemplay Bank.

11.2.8 West of Kemplay Bank the following is anticipated:

- Phase 1 – Both east and westbound traffic between M6 Junction 40 and Kemplay Bank will be diverted towards the nearside verge, maintaining the permanent effective carriageway width of 7.3m, but utilising a 4m for the nearside lane and 3.3m for the offside lane. This allows sufficient space for cyclists to use the nearside lane, whilst still allowing HGVs to use the offside lane on approach to the roundabout.
- Phase 2 – Eastbound traffic will remain running against the nearside verge, where it will run in contraflow with the westbound traffic. Westbound traffic will be diverted across the central reservation to run in contraflow with the eastbound traffic between M6 Junction 40 and Kemplay Bank.
- Phase 3 – Both east and westbound traffic will run in contraflow on the newly constructed westbound entry slip and carriageway widening between M6 Junction 40 and Kemplay Bank.

11.2.9 Phase 4 will be common to both sections. Within this phase, eastbound traffic will use the newly constructed carriageway widening between M6 Junction 40 and Kemplay bank, the newly constructed eastbound exit and entry slips, before re-joining the existing A66. Westbound traffic will use the newly constructed westbound exit and entry slips and carriageway widening between M6 Junction 40 and Kemplay bank.

11.2.10 For all construction phases, in terms of the operational capacity of Kemplay Bank Roundabout the following has been assumed following discussion with SRM.

- Removal of the flared approaches on the A66 eastbound, A6 southbound, A6 northbound, and A686.
- The A66 westbound is currently only two lanes. These would be maintained.
- Reduce the width of the circulatory carriageway from three lanes to two narrow lanes.

Penrith to Temple Sowerby

11.2.11 Scheme 3 is largely built offline, with a later switch to run traffic on the newly constructed eastbound carriageway while the westbound carriageway is also constructed offline. To carry out this work there is a requirement to create two short lengths of temporary carriageway to provide links between the existing and new carriageways.

11.2.12 Within the first phase, all traffic will remain on the existing A66 without any intrusion from road works. Where traffic is routed onto newly constructed carriageway in later phases, in 1+1 single lane contraflow, carriageway widths will be maintained at 4m.

Temple Sowerby to Appleby

11.2.13 This scheme is being carried out to create a new 6.6km section of dual carriageway. The majority of the new dual carriageway will be built entirely offline, with physical traffic management measures only required on the A66 around the tie-in points between existing and new carriageway.

11.2.14 In phase 1 all traffic will remain on the existing A66, without any intrusion from road works. In phase 2 traffic will use the newly constructed eastbound carriageway to run in contraflow. In the final phase traffic will run on the open dual carriageway with only local traffic management measures required.

Appleby to Brough

11.2.15 This scheme is being carried out to create a new 7.5km section of dual carriageway. The majority of the new dual carriageway being built entirely offline with physical traffic management measures only required on the A66 around the tie-in points between existing and new carriageway.

11.2.16 In Phase 1, all traffic to remain on the existing A66 without any intrusion from road works. In Phase 2, traffic will use the existing A66 up to the point that it is diverted on the newly constructed dual carriageway. In Phase 3 the newly constructed dual carriageway will open, with only local off-peak restrictions to reinstate central crossover points.

Bowes bypass

11.2.17 Scheme 7 consists of a single scheme to create a new 2.6km section of dual carriageway. The works will include:

- Offline construction of the new eastbound carriageway
- Construction of new structures and slip roads
- Altering carriageway levels

11.2.18 In phase 1 all traffic will remain on the existing A66 without any intrusion from road works. In phase 2 traffic will run partially on the new westbound carriageway in contraflow. In phase 3 traffic will run in contraflow on newly constructed eastbound carriageway. A final phase will see the new carriageway open with only local off-peak restrictions

Cross Lanes to Rokeby

11.2.19 This scheme is being carried out to create a new 3.5km section of dual carriageway.

11.2.20 The majority of the Westbound carriageway is to be built largely offline, with an earlier phase being required to complete a short section of the new eastbound carriageway. This is due to the existing carriageway not having the width to allow for contraflow running whilst still allowing adequate space to work safely.

Stephen Bank to Carkin Moor

11.2.21 This scheme is being carried out to create a new 4.9km section of dual carriageway.

11.2.22 Scheme 9 sees the majority of the new dual carriageway being built entirely offline, with new link roads and temporary diversions being built during phase 1. This is to avoid the construction pinch points that occur when traffic is required to use the existing carriageway at the new carriageway tie-in points during phase 2.

A1(M) Scotch Corner

11.2.23 This scheme is being carried out to offer improvements to the capacity around the A1(M) junction 53 gyratory and create additional stacking space on Middleton Tyas Lane.

11.2.24 The works will include:

- Offline construction at Middleton Tyas Lane
- Off peak lane closures
- Road closure of Middleton Tyas Lane

11.2.25 Given the limited space available to work, it is currently assumed that all works would occur overnight at this location. Traffic management would therefore be used to create a working area that would be placed into position every night. This would be placed back at the side of the road every morning to allow traffic to operate in the usual manner throughout the day. Additionally, some peak closures of the Middleton Tyas Lane arm may be required.

11.3 Assumed Construction Scenarios

11.3.1 The overall construction programme is shown in **Chapter 2.8 Construction, operation and long-term management** of the **Environmental Statement Volume 1** (Document Reference 3.2).

11.3.2 There are seven construction scenarios which are modelled in SATURN to derive the impacts on road users. The overlap of TTM between the A66 schemes and the durations of roadworks in each construction phase is shown in Figure 11-1.

11.3.3 Construction impact scenarios are defined according to information provided by the specialist construction advisor SRM.

11.3.4 To assess the user impacts of A66 construction within the A66TM, the proposed construction programme has been simplified into seven construction scenarios to allow the traffic impacts to be assessed. In each construction scenario, the scheme sections which are modelled as being under construction are as follows

- Scenario A – Schemes 01, 03, 04/05, 06, 07, 11
- Scenario B – Schemes 01, 03, 04/05, 06, 07
- Scenario C – Schemes 01, 03, 04/05, 06, 07, 08
- Scenario D – Schemes 02, 03, 04/05, 08, 09
- Scenario E – Schemes 02, 03, 09
- Scenario F – Schemes 02, 09
- Scenario G – Scheme 02

11.3.5 The overlap of TTM between the A66 schemes and the durations of roadworks in each construction phase is shown in Figure 11-1.

A66 Schemes & Phases	In Model Scenario	Qtr	Year 1 2024				Year 2 2025				Year 3 2026				Year 4 2027				Year 5 2028			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
		No. Days	91	91	92	92	90	91	92	92	90	91	92	92	90	91	92	92	91	91	92	92
Schm01 Phs1	A B C	732																				
Schm02 Phs1	D E F G	365																				
Schm02 Phs2	D E F G	365																				
Schm02 Phs3	D E F G	366																				
Schm03 Phs1	A B C D E	731																				
Schm03 Phs2	A B C D E	365																				
Schm03 Phs3	A B C D E	181																				
Schm04 Phs1	A B C D	731																				
Schm04 Phs2	A B C D	365																				
Schm05 Phs1	A B C D	731																				
Schm05 Phs2	A B C D	365																				
Schm06 Phs1	A B C	366																				
Schm06 Phs2	A B C	365																				
Schm07 Phs1	A B C	182																				
Schm07 Phs2	A B C	184																				
Schm07 Phs3	A B C	365																				
Schm08 Phs1	C D	365																				
Schm08 Phs2	C D	365																				
Schm09 Phs1	D E F	365																				
Schm09 Phs2	D E F	365																				
Schm11 Phs1	A	182																				
Schm11 Phs2	A	0																				
A66TM Construction Scenarios			A		B		C				D				E		F		G			
No. Days			182		184		365				365				181		184		366			

Figure 11-1: A66 NTP Construction Roadworks Assessment Scenarios

11.3.6 An estimate of the number of construction workers that will be required during each month for each scheme has been made by SRM.

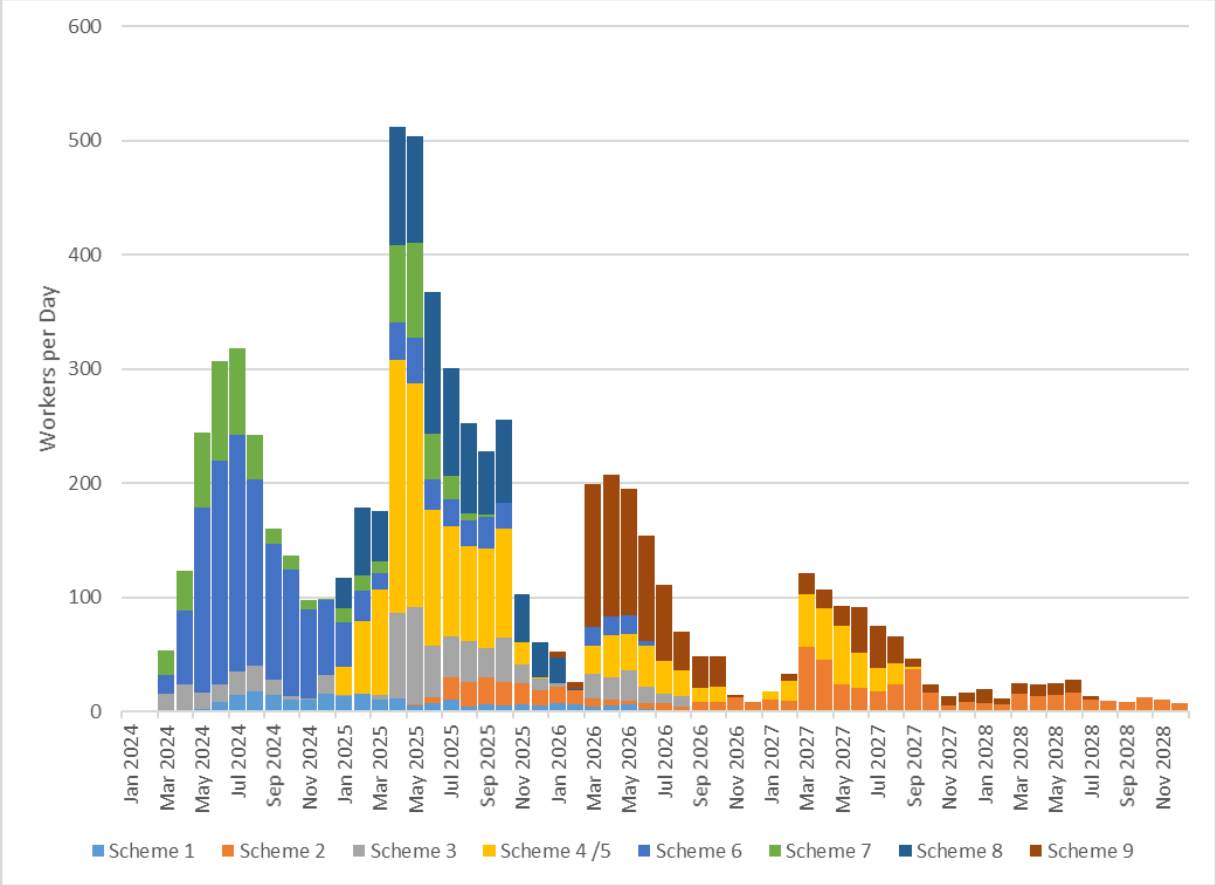

Figure 11-2: Construction workers per day

11.3.7 The figure shows that busiest time for construction will be in 2025, scenario C where up to 500 workers will be on site daily, spread across Schemes 01, 03, 04/05, 06, 07, and 08.

11.4 Construction traffic

11.4.1 **Chapter 2.8 Construction, operation and long-term management** of the **Environmental Statement Volume 1** (Document Reference 3.2) provides details of construction traffic and construction vehicle movements both on and off site.

11.4.2 Goods vehicle traffic associated with Do Something construction have been considered within the traffic modelling within the following categories. The assumptions used in each case are also stated.

- **Offsite traffic movement for imported materials.** This considers the delivery of raw materials (for example concrete, aggregate, steel) from their source location to the construction compound for each scheme. Vehicles flow estimates per day have been provided by considering the total quantity of each material required by each scheme and dividing by the capacity of each lorry and the length of construction period of each scheme.
- **On site traffic movement for imported materials.** SRM have provided estimates of longitudinal site movements for imported

materials for each scheme using assumptions around the anticipated works on site and location of site compounds.

- **On site traffic movement for bulk materials.** SRM have provided estimates of longitudinal site movements for bulk materials for Scheme 3 using assumptions around the anticipated works on site. An average rate of vehicles per month was calculated. The estimates assume on that where schemes can used on site haul roads to move material on the project, 20m3 articulated dump trucks are used.
- **Offsite traffic movement for bulk materials.** For any site with a surplus or deficit of bulk material then SRM provided an estimate of vehicular flow based on calculations of volumes, and destinations of the where the earth is coming from / going to (such as from other schemes or tip location). For material that needs to be sent off scheme 8m^3 road wagons are assumed. For bulk material movements, material has been shared across all schemes to satisfy any shortfalls. Any excess material is deemed to be sent off the project. Therefore, for schemes 1,2,3,4/5 and 6, any excess material is deemed to travel west to the M6 J40 and beyond. For schemes 7,8 and 9 any excess material is deemed to travel east to the A1(M) junction 53 and beyond.

11.4.3 In each case the calculated movements accounted for two-way vehicle trips, of full wagons in and empty wagons out.

11.4.4 Delivery routes (for all offsite movements) for have been plotted as fixed routes within the traffic model. By considering the routes at a scheme level, a build-up of offsite goods vehicle movement has been made for each construction scenario. The estimates of workers per month have been used as an indicator of the general level of activity across each scheme. Therefore, a build-up of offsite goods vehicles has been made, allowing the month with the peak movements within each scenario to be calculated, together with an average number of monthly movements for each scenario. This is shown in Figure 11-3. For each scenario the wagons from the peak month were included within the traffic model.

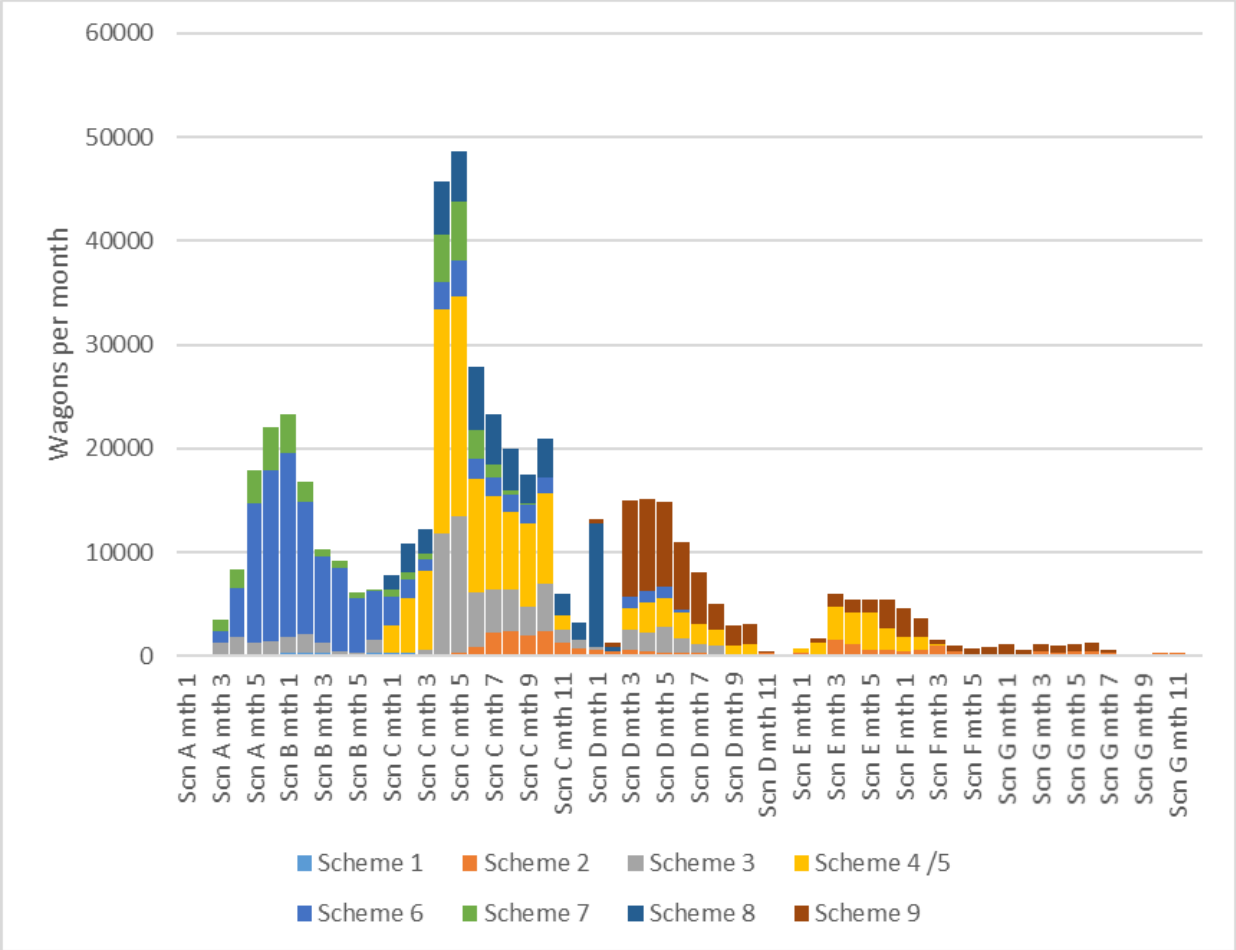

Figure 11-3: Wagons per month

11.4.5 Given that the onsite movements are likely to occur on haul roads, or on the construction site itself, then these movements are not included within the traffic model, but have been passed on to the Environmental teams for

11.5 Staff travel

11.5.1 For a project of this scale and length, several access points or independent haul routes, work areas and compounds will need to be established.

11.5.2 Based on current discussions with the PC it is likely that the compounds will be established close to key road infrastructure to mitigate the impacts on local road users and stakeholders, whilst also reducing the amount of construction work required to construct the compound. Taking note of this, the following indicative locations are listed in **Chapter 2.8 Construction, operation and long-term management** of the **Environmental Statement Volume 1** (Document Reference 3.2):

- Potential compound located to the east of J40 on the M6 close to Cumbria council depot Skirsgill depot adjacent to Junction 40
- Potential compound located to the north of current Center Parcs junction
- Potential compound located to west of Temple Sowerby to Appleby scheme, south of A66

- Potential compound to the south of Ministry of Defence area located centrally on the Appleby to Brough scheme to the south of the existing A66
- Potential compound to north of A66/A67 junction at Bowes, adjacent to the A67
- Potential compound located to the north of the A66 on the Cross Lanes to Rokeby scheme, west of Cross Lanes Organic Farm Shop
- Potential compound located to the north of the A66 on the Stephen Bank to Carkin Moor scheme, north west of Mainsgill Farm Shop.

11.5.3 When selecting locations for compounds or work areas, it will be ensured wherever possible and practical that: the areas are encompassed as part of the permanent works, that impacts to local stakeholders are minimised, and that suitable access and egress points to prevent disruption to the 'live' A66 are provided.

11.5.4 To represent the trips made by construction workers travelling to work within the A66TM additional car journeys were added to the model. The following assumptions were made:

- The maximum number of construction workers required for any single scheme were abstracted from the profiles shown in Figure 11-2.
- The operational times of the site have yet to be determined, therefore in the morning an assumption of half of the workers arriving on site before 08:00, and the remaining arriving between 08:00 and 09:00 was made. Similarly, within the evening half of the workers would leave between 16:00 and 17:00, and the other half between 17:00-18:00. In this way the construction worker travel will have been assumed to fall within the network peak hours. Discussions with SRM have indicated that construction workers would generally arrive to site early (before 07:00) and leave once the job for the day has been completed, which could be at any time between 15:00 and 18:00. In this way the workers would not be expected to routinely travel during a single hour within the network peaks. Therefore, the modelled assumptions are robust.
- Matrices of staff travel were developed, such that staff travelled by car to the nearest model zone to the proposed site. The distribution of trips to each site was taken from the distribution of commute trips within the donor zone. For the larger sites the PC may provide transport (minibuses for example) to transport workers to the busier sites.
- The matrices of construction workers were added for each scenario in which the scheme was operational. In each case the maximum number of monthly workers was assumed for each scheme such that the local impact on the network during the peak month would be represented.

11.5.5 The process to develop procedures that will be put in place to ensure successful delivery of sustainable transportation for the daily movement of the construction workforce is discussed the CWTAP.

11.6 Traffic modelling of construction

11.6.1 Construction effects are measured using the same principles and techniques as are applied to the assessment during normal route operation. Project construction impacts on road users are assessed for the period when existing traffic movements are disrupted by roadworks associated with building the Project, before the Project is completed and open to traffic. Construction roadworks scenarios are represented in the A66TM using the following assumptions.

Speed limits

11.6.2 Speed limits were set with respect to the Traffic Signs Manual (TSM), Chapter 8, Part 1, Table 3.5. In general, speed limits are reduced by 20mph relative to the posted speed limit, so 50mph on dual carriageways and 40mph on single carriageways. For individual construction sections which consist of both single and dual carriageways, the lower speed limit of 40mph was set as it is inappropriate to have the speed limit change in the middle of the works.

11.6.3 The speed limit changes were coded into the model by changing the capacity index associated with such links to index 12 (Rural All-Purpose D2, 50mph) for 50mph dual carriageway sections, or to index 17 (Rural S2 A-Road 40mph) for 40mph single carriageway sections including contraflows. The exception is the Temple Sowerby to Appleby section where the existing road is classified as a lower standard, so index 21 with a similarly low standard is specified when works are present (Rural S2 Other Road, slow with narrow carriageway).

11.6.4 For links with fixed speeds, a reduction of 20mph (to no less than 30mph) was assigned to simulate reduced speeds.

11.6.5 The speed limit has been applied assuming that TTM is present on the complete length of the scheme during the period within which it is being constructed.

Contraflow modelling

11.6.6 Contraflows were assumed to have one lane in each direction, with all turning lanes and flares removed to represent a worst-case assessment. No accesses were removed, or side roads closed.

11.6.7 The lane reductions were coded into the model by reducing the number of lanes to 1 and assigning an appropriate capacity index as discussed above. Two one-way carriageways were maintained instead of combining the coding into one two-way carriageway as this allows the existing coding to be maintained, including all junctions, and removes the requirement to model contraflows on the eastbound and westbound carriageway separately. The impact on modelling results, relative to coding one two-way carriageway, should be negligible.

Narrow lanes

11.6.8 TSM Chapter 8, Part 1, Paragraph D3.4.2 states that the capacity of narrow lanes should be taken to be 10 to 15 percent less than the likely maximum values for the capacity of normal width traffic lanes.

11.6.9 Therefore, all modelled links under contraflow and/or single carriageway works with narrow lanes had their turn capacities (including straight ahead movements) reduced by 12.5%.

Signals

11.6.10 The model coding maintains the signal timings from the base model for any signalised junction.

Overnight Closures

11.6.11 No modelling of overnight closures have been undertaken given that the details of these have yet to be finalised. Traffic Management Plans will be developed as detailed design progresses as discussed within the CTMP**.** Given the relatively low volumes of traffic that travel between 19:00 and 07:00 when closures would be planned then the value of considering the impacts within a highway assignment model (such as the A66TM) becomes less, given that sufficient network capacity should be available within the remaining network. During overnight closures, traffic will be signed via diversionary routes. These routes are listed within Appendix F.

11.7 Traffic Impacts of Construction

11.7.1 Inclusion of TTM carriageway restrictions in the SATURN model may slightly underestimate true vehicle delays during A66 construction and maintenance roadworks, because the model assumes drivers are fully informed of network conditions and available route choices and make optimum decisions. In reality, some drivers may be unwilling or unable to avoid travel time delays through the A66 roadworks, therefore the level of diversion indicated may be an overestimate.

11.7.2 During construction of the A66, strategic alternate routes for long distance traffic will be signed for instance via the M62 and the A69. The strategic diversions will be signed well in advance of the works using for example the variable message sign systems on the M6, A1(M), M1 and M62 to allow road users to make early decisions on route choices.

11.7.3 Robust assumptions have been made regarding the extent of TTM required, (see chapter 11.6). For example, for any scheme that is under construction, a speed limit of 40mph for the whole scheme length. In practice, and where it is considered safe to do so, it may be possible for alternative TTM and speed limits to be implemented, for instance where the new route is built offline from the existing route. In this way the model may represent an overestimate of the true vehicle delay.

11.7.4 The impacts identified within this will help inform the potential issues that may arise during construction such that mitigation can be considered and implemented where possible. The project team will monitor the

journey times on the A66 to ensure excessive delays are not occurring due to the works. If delays on the A66 are causing inappropriate local routes to be used then the project team will consider if any adjustments can be made to the TTM with the aim of reducing the delays.

11.7.5 TTM arrangements for construction and maintenance roadworks are generally designed to achieve the following:

- TTM with sufficient capacity to accommodate traffic demands.
- Journey times that do not increase significantly from existing conditions.
- Minimal duration, length and frequency of TTM phases, carriageway closures and diversions.
- Advanced warning of roadworks in the calendar and on the road network, to allow drivers to re-route and to minimise traffic disruption.

11.7.6 The A66TM has been run using the 2028 traffic demand, noting that this will be a worst-case scenario. Table 11-1 shows the resultant travel times on the A66 from M6 Junction 40 to Penrith.

Table 11-1: M6 Junction 40 to Scotch Corner Change in Journey Time – Construction scenarios (mm:ss)

Scenario	AM Peak		Inter Peak		PM Peak	
	Ebnd.	Wbnd.	Ebnd.	Wbnd.	Ebnd.	Wbnd.
Do Minimum	54:32	55:25	55:43	55:45	56:21	56:20
Scenario A	+11:26	+13:51	+12:17	+12:25	+13:43	+13:33
Scenario B	+11:26	+13:51	+12:17	+12:25	+13:43	+13:33
Scenario C	+14:19	+16:32	+15:11	+15:14	+16:34	+16:27
Scenario D	+13:58	+11:17	+12:52	+11:59	+12:57	+14:21
Scenario E	+05:21	+02:20	+04:16	+03:36	+04:07	+05:02
Scenario F	+00:45	-01:15	-00:33	+00:21	-00:38	+01:22
Scenario G	-04:51	-06:24	-06:26	-05:17	-06:37	-02:31
Do Something	-09:42	-10:17	-10:35	-10:46	-11:05	-10:58

11.7.7 The longest travel times on the A66 are within scenarios C and D where the travel time is expected to increase form around 55 minutes to a maximum of 1 hour and 10 minutes (scenario C) and 1 hour and 8 minutes within scenario 4. Travel time results are indicative of the scenarios in which most disruption will occur on the remainder of the road network as the A66 traffic will have most cause to seek an alternative route. Therefore, the remaining analysis will focus on conditions on the remainder of the network within these two construction scenarios.

Construction scenario C

11.7.8 An assessment has been undertaken comparing modelled AADT during construction scenario C against that modelled for the DM scenario. Appendix G.1 includes flow plots for each scheme including local roads

close to the A66 showing the flow difference. Within the plots the following should be noted.

- Any existing link with a traffic increase is shown in purple.
- Any existing link with a traffic decrease is shown in green.
- Any new link is shown in red. Within this category there is no comparison to be made in traffic as the link did not exist within the Do Minimum.

11.7.9 In addition to the traffic flow plots, a summary table of local roads in Cumbria (Table 11-) and in Durham and North Yorkshire (Table 11-3) has been provided to illustrate the changes forecast because of the project. CRF of each link is included to demonstrate an indicative capacity for each road. The DoS shows the proportion of traffic at each location relative to the capacity for DM and construction scenario C.

11.7.10 Long distance rerouting occurs on the following routes

- The A69 between Newcastle and Carlisle
- The B6277 between Middleton in Teesdale and Brampton
- The A684 between Bedale and Sedbergh
- The A65 / A59 between Harrogate and Kirkby Longsdale

11.7.11 The result of this east west rerouting is that the A1(M) becomes less busy north of Wetherby, and the M6 becomes busier between Lancaster and Penrith. This long- distance rerouting minimises local traffic disruption.

11.7.12 In terms of the local diversions in Cumbria the following is noted:

- The is a significant modelled increase on Wetheriggs / Chapel Street (circa 11,000 vehicles AADT) as significant volumes of traffic avoid the A66 construction at Penrith to Temple Sowerby. This route is not considered to be suitable for such heavy traffic volumes given the substandard width and lack of centre line markings, indeed it is doubtful that such large volumes of traffic could be accommodated by this route. The modelled journey time on the route is reflective of the speed on the route in uncongested conditions. However, as the strategic model lacks the detail to represent all issues on this route, the modelled journey time within this more congested scenario is unrepresentative.
- There is a 12% (830 vehicle AADT) increase on the A6 at Brougham. The increase on Eamont Bridge is more limited at (325 vehicles AADT) which corresponds to around 30 vehicles per hour.

11.7.13 In terms of the local diversions in Durham and North Yorkshire the following is noted:

- There is a significant increase of +2100 AADT (+56%) on the A67 to the east of Brough as traffic uses the A67 and the A688 to undertake east west movements as opposed to the A66.
- An increase of +2000 AADT (+23%) through Barnard Castle. The flow through Barnard Castle would be regulated to some degree by the traffic signals on the historic bridge over the River Tees.
- An increase of +1600 AADT (+24%) through Gainford. It should be noted that the A67 is routed through the main street of Gainford.

11.7.14 Given the forecast increases noted in on Wetheriggs, and on the A67 through Barnard Castle and Gainford, journey times on the A66 will be monitored during the construction phase to ensure significant unnecessary delays are avoided, to minimise traffic increases on unsuitable local roads.

Table 11-2: Scenario C: Construction impacts - Cumbria

Loc	Road	DM flow (two-way)	Scenario C flow (two-way)	Flow Change (two-way)	Percentage Change (two-way)	Indicative Road Capacity	DoS DM	DoS Scenario C
1	M6 north of Junction 40	64,000	61,000	-3,400	-5%	98,000	66%	62%
2	M6 south of Junction 40	46,000	48,000	1,900	4%	98,000	47%	49%
3	A66 west of Penrith	22,000	20,000	-1,800	-8%	22,000	101%	92%
4	A6 Bridge Lane / Victoria Road within Penrith	12,000	13,000	940	8%	22,000	56%	61%
5	Clifford Road within Penrith	5,700	5,100	-610	-11%	22,000	26%	23%
6	Moor Lane Penrith	1,500	12,000	10,000	674%	22,000	7%	53%
7	A6 at Brougham	6,800	7,600	830	12%	22,000	31%	35%
8	B6262 east of Brougham	350	380	26	7%	22,000	2%	2%
9	Wetheriggs west of Moor Lane	850	1,600	700	82%	22,000	4%	7%
10	Wetheriggs east of Moor Lane	2,400	13,000	11,000	460%	22,000	11%	60%
11	A66 Mainline Scheme 3	22,000	7,400	-15,000	-67%	22,000	101%	33%
12	Existing A66 alignment through Kirkby Thore and Crackenthorpe	21,000	5,200	-15,000	-74%	11,000	187%	48%
13	Main Street to the South of Kirkby Thore	1,600	750	-830	-52%	11,000	14%	7%
14	Long Marton Road	2,200	2,000	-180	-8%	22,000	11%	9%
15	Chapel Street through Bolton	1,900	12,000	10,000	535%	11,000	18%	112%
16	Moorland Lane	1,900	1,600	-280	-15%	22,000	9%	7%
17	B6259 eastern approach to Warcop	340	330	-10	-3%	22,000	2%	1%
18	A685 between Brough and Kirkby Stephen	8,600	7,300	-1,400	-16%	22,000	39%	33%
19	A66 Mainline Scheme 6	18,000	15,000	-3,600	-20%	22,000	83%	66%

Table 11-3: Scenario C construction impacts – Durham and North Yorkshire

Loc	Road	DM flow (two-way)	Scenario C flow (two-way)	Flow Change (two-way)	Percentage Change (two-way)	Indicative Road Capacity	DoS DM	DoS Scenario C
20	A67 East of Brough	3,700	5,700	2,100	56%	22,000	17%	26%
21	Unnamed Road North of Bowes	490	500	13	3%	11,000	4%	5%
22	A66 Mainline Scheme 7	22,000	18,000	-3,400	-16%	22,000	99%	83%
23	A66 Mainline Scheme 8	19,000	14,000	-5,500	-29%	22,000	86%	62%
24	Moorhouse Lane at Cross Lanes	140	200	57	39%	11,000	1%	2%
25	The Sills in Barnard Castle	890	870	-20	-3%	11,000	8%	8%
26	C165	2,800	2,900	110	4%	11,000	25%	26%
27	A67 – Barnard Castle Bridge	8,800	11,000	2,000	23%	22,000	40%	49%
28	Collier Lane	170	170	1	1%	11,000	2%	2%
29	B6274 to the north of the A66	1,100	1,100	2	0%	11,000	10%	10%
30	B6274 to the south of the A66	870	910	42	5%	11,000	8%	8%
31	A66 Mainline Scheme 9	22,000	17,000	-5,100	-23%	11,000	199%	153%
32	A6055 south of Scotch Corner	4,800	4,800	-31	-1%	98,000	5%	5%
33	Middleton Tyas	5,300	5,100	-140	-3%	98,000	5%	5%
34	A1(M) north of Scotch Corner	72,000	70,000	-2,700	-4%	22,000	329%	317%
35	A1(M) south of Scotch Corner	74,000	72,000	-1,600	-2%	22,000	336%	328%
36	A66 Mainline West of Scotch Corner	23,000	18,000	-5,000	-22%	22,000	104%	81%
37	A67 through Gainford	6,700	8,300	1,600	24%	22,000	30%	38%
38	Stoneygate Bank Road through Ravensworth	1,100	1,000	-120	-10%	22,000	5%	5%

Construction scenario D

11.7.15 An assessment has been undertaken comparing modelled AADT during construction scenario D against that modelled for the DM scenario. Appendix G.2 includes flow plots for each scheme including local roads close to the A66 showing the flow difference. Within the plots the following should be noted.

- Any existing link with a traffic increase is shown in purple.
- Any existing link with a traffic decrease is shown in green.
- Any new link is shown in red. Within this category there is no comparison to be made in traffic as the link did not exist within the DM scenario.

11.7.16 In addition to the traffic flow plots, a summary table of local roads in Cumbria (Table 11-4) and in Durham and North Yorkshire (Table 11-5) has been provided to illustrate the changes forecast because of the project.

11.7.17 Long distance rerouting occurs on the following routes

- The A69 between Newcastle and Carlisle
- The A684 between Bedale and Sedbergh
- The A65 / A59 between Harrogate and Kirkby Longsdale

11.7.18 The result of this east west rerouting is that the A1(M) becomes less busy north of Wetherby, and the M6 becomes busier between Lancaster and Penrith. This long distance rerouting minimises local traffic disruption.

11.7.19 In terms of the local diversions in Cumbria the following is noted:

- The modelled increase on Wetheriggs / Chapel Street is lower than in scenario C as some of the new links are available for use on Scheme 4/5.
- There is a +570 AADT (+8%) decrease on the A6 at Brougham.
- There is a +2,000 AADT (+35%) increase on Clifford Road, due to local movements from trips accessing the area around Sainsburys and Penrith Leisure Centre from the M6 north and south and the A66 west of Junction 40. These local movements currently use the A66 between Junction 40 and Kemplay Bank. During the construction phase the model is showing that these trips reroute given the capacity reduction anticipated at Kemplay Bank.

11.7.20 In terms of the local diversions in Durham and North Yorkshire, it should be noted that Scheme 9 Stephen Bank to Carkin Moor is constructed in addition to Scheme 8 Cross Lanes to Rokeby. Therefore, the impact is generally larger than during scenario D.

11.7.21 A significant increase occurs on the A67 to the east of Brough +2600 AADT (+70%) as traffic uses the A67 and the A688 to undertake east west movements as opposed to the A66.

- An increase of +2400 AADT (+28%) through Barnard Castle. The flow through Barnard Castle would be regulated to some degree by the traffic signals on the historic bridge over the River Tees.

- An increase of +2900 AADT (+43%) through Gainford.

11.7.22 To the south of the A66 the following routes are impacted:

- Barningham Road through Newsham (+300 AADT)
- High Lane through Dalton (+1050 AADT)
- Springs Lane north of Richmond (+470 AADT)

11.7.23 To the north of the A66 the following routes are impacted:

- B6274 between the A66 and Winston (+760 AADT)
- East Road and West Lane through Melsonby and East Layton (+260 AADT)

11.7.24 In each case the vehicle flow increases are relatively modest at a daily level however the impacts would be greatest within some of the small villages along the routes.

11.7.25 Given the forecast increases noted at the locations in paragraphs 11.7.19 to 11.7.24 above, journey times on the A66 will be monitored during the construction phase to ensure significant unnecessary delays are avoided, to minimise traffic increases on unsuitable local roads

Table 11-4: Scenario D construction impacts – Cumbria

Loc	Road	DM flow (two-way)	Scenario D flow (two-way)	Flow Change (two-way)	Percentage Change (two-way)	Indicative Road Capacity	DoS DM	DoS Scenario D
1	M6 north of Junction 40	64,000	64,000	-520	-1%	98,000	66%	65%
2	M6 south of Junction 40	46,000	48,000	2,200	5%	98,000	47%	49%
3	A66 west of Penrith	22,000	22,000		0%	22,000	99%	99%
4	A6 Bridge Lane / Victoria Road within Penrith	12,000	9,100	-3,400	-27%	22,000	56%	41%
5	Clifford Road within Penrith	5,700	7,700	2,000	35%	22,000	26%	35%
6	Moor Lane Penrith	1,500	5,800	4,300	283%	22,000	7%	26%
7	A6 at Brougham	6,800	6,200	-570	-8%	22,000	31%	28%
8	B6262 east of Brougham	350	1,300	990	280%	22,000	2%	6%
9	Wetheriggs west of Moor Lane	850	1,200	330	38%	22,000	4%	5%
10	Wetheriggs east of Moor Lane	2,400	6,900	4,600	194%	22,000	11%	32%
11	A66 Mainline Scheme 3	22,000	14,000	-7,900	-36%	22,000	101%	65%
12	Existing A66 alignment through Kirkby Thore and Crackenthorpe	21,000	13,000	-7,300	-35%	11,000	187%	121%
13	Main Street to the South of Kirkby Thore	1,600	1,000	-540	-34%	11,000	14%	10%
14	Long Marton Road	2,200	2,200		0%	22,000	11%	11%
15	Chapel Street through Bolton	1,900	6,100	4,200	215%	11,000	18%	55%
16	Moorland Lane	1,900	1,400	-490	-26%	22,000	9%	6%
17	B6259 eastern approach to Warcop	340	330	-9	-3%	22,000	2%	2%
18	A685 between Brough and Kirkby Stephen	8,600	7,300	-1,300	-15%	22,000	39%	33%

Loc	Road	DM flow (two-way)	Scenario D flow (two-way)	Flow Change (two-way)	Percentage Change (two-way)	Indicative Road Capacity	DoS DM	DoS Scenario D
19	A66 Mainline Scheme 6	18,000	15,000	-2,800	-15%	22,000	83%	70%

Table 11-5: Scenario D construction impacts – Durham and North Yorkshire

Loc	Road	DM flow (two-way)	Scenario D flow (two-way)	Flow Change (two-way)	Percentage Change (two-way)	Indicative Road Capacity	DoS DM	DoS Scenario D
20	A67 East of Brough	3,700	6,200	2,600	70%	22,000	17%	28%
21	Unnamed Road North of Bowes	490	560	68	14%	11,000	4%	5%
22	A66 Mainline Scheme 7	22,000	19,000	-2,600	-12%	22,000	99%	87%
23	A66 Mainline Scheme 8	19,000	14,000	-5,300	-28%	22,000	86%	62%
24	Moorhouse Lane at Cross Lanes	140	360	220	151%	11,000	1%	3%
25	The Sills in Barnard Castle	890	820	-73	-8%	11,000	8%	7%
26	C165	2,800	2,100	-650	-23%	11,000	25%	20%
27	A67 Barnard Castle Bridge	8,800	11,000	2,400	28%	22,000	40%	51%
28	Collier Lane	170	190	22	13%	11,000	2%	2%
29	B6274 to the north of the A66	1,100	1,800	670	60%	11,000	10%	16%
30	B6274 to the south of the A66	870	400	-470	-54%	11,000	8%	4%
31	A66 Mainline Scheme 9	22,000	14,000	-8,300	-38%	22,000	99%	62%
32	A6055 south of Scotch Corner	4,800	4,700	-120	-3%	22,000	22%	21%
33	Middleton Tyas	5,300	5,000	-290	-5%	98,000	5%	5%
34	A1(M) north of Scotch Corner	72,000	68,000	-4,100	-6%	98,000	74%	70%

Loc	Road	DM flow (two-way)	Scenario D flow (two-way)	Flow Change (two-way)	Percentage Change (two-way)	Indicative Road Capacity	DoS DM	DoS Scenario D
35	A1(M) south of Scotch Corner	74,000	72,000	-1,900	-3%	98,000	75%	73%
36	A66 Mainline West of Scotch Corner	23,000	16,000	-7,100	-31%	22,000	104%	71%
37	A67 through Gainford	6,700	9,600	2,900	43%	22,000	30%	44%
38	Stoneygate Bank Road through Ravensworth	1,100	850	-290	-25%	22,000	5%	4%

11.8 Public transport construction impact

11.8.1 The outline assumptions for the construction of the Project discussed in **Chapter 2.8 Construction, operation and long-term management** of **the Environmental Statement Volume 1** (Document Reference 3.2) can be implemented without the need for any closures that would impact upon the bus routes listed in Section 10.3, as it is anticipated that all vehicular movements would be allowed at the A66 junctions during the construction phases listed in Section 11.1.1 above.

11.8.2 There are several bus bays that will be removed by the project as listed in Table 10-:

- The unmarked bus stops at Whinfell Park
- Two bus bays on A66 adjacent to the overbridge at the western end of Bowes
- One bus bay on the eastbound merge onto A66 at Rokeby Park

11.8.3 It is anticipated that these will be removed as part of the construction phase, however the impact of this is expected to be minimal as discussed in Table 10-14.

11.8.4 There are several bus stops that are adjacent to the work areas, most notably the existing bus bays on the A66 slip roads at the A66/A67 junction. It is anticipated that if these bays are not accessible during the construction phase, suitable alternative locations would need to be found through the ongoing development of the CTMP.

11.8.5 Agreement within the traffic management plan would also be required to provide a suitable alternative location for the four unmarked bus stops on the A66 on the Appleby to Brough section, should it be decided that these stops are to be retained, as discussed in Table 10-.

11.8.6 There may be additional short term overnight closures, as discussed in 11.6.11, which may involve diversions to bus routes. Details of these closures are yet to be finalised, therefore consideration of the impact of such closures on any bus routes will need to be made during the planning of such closures through the traffic management plan.

11.9 Construction Impact Summary

11.9.1 The temporary traffic management proposals have been used to generate traffic modelling scenarios to allow the impact of the construction phase to be appraised. There are seven construction scenarios which are modelled to derive the impacts on road users.

11.9.2 The longest travel times on the A66 are within Scenarios C and D where the travel time is expected to increase from around 55 minutes to a maximum of 1 hour and 10 minutes (scenario 3) and 1 hour and 8 minutes within scenario 4. Travel time results are indicative of the scenarios in which most disruption will occur on the remainder of the road network as the A66 traffic will have most cause to seek an alternative route.

11.9.3 The model is being used as a diagnostic tool to identify potential issues, so mitigation measures can be put in place to prevent such rerouting

occurring. A number of links along which rerouting is shown to occur within the model. These routes include:

- Clifford Road within Penrith
- Wetheriggs / Chapel Street to the south of the A66 between Penrith and Temple Sowerby
- The A67 to the east of Brough, through Barnard Castle and through Gainford
- Stoneygate Bank Road through Ravensworth, Barningham Road through Newsham, High Lane through Dalton and Springs Lane north of Richmond.
- B6274 between the A66 and Winston, and East Road and West Lane through Melsonby and East Layton.

11.9.4 Journey times on the A66 will be monitored during the construction phase to ensure significant traffic rerouting does not occur. If the routes above are being used excessively measures will be implemented to reduce their use.

11.9.5 The outline TTM strategy for the Project does not anticipate any closures that would impact upon the bus routes, as it is anticipated that all vehicular movements would be allowed at the A66 junctions during the construction phases.

11.9.6 There may be additional short term overnight closures, which may involve diversions to bus routes. Details of these closures are yet to be finalised, therefore consideration of the impact of such closures on any bus routes will need to be made during the planning of such closures.

12 Conclusion

12.1.1 This document comprises of the Transport Assessment that has been produced to support the DCO application for the Project.

12.1.2 The existing A66 route is a key national and regional strategic transport corridor and link for a range of travel movements. It carries high levels of freight traffic and is an important route for tourism and connectivity for nearby communities. There are no direct rail alternatives for passenger or freight movements along the corridor.

12.1.3 The project includes upgrading the existing single lane sections of the A66 to dual two-lane all-purpose roads with a speed limit of 70mph, with the exception of a section of the A66 from the M6 junction 40 through Kemplay Bank which will have a speed limit of 50mph. The project also includes amendments to existing junctions and accesses within these sections.

12.1.4 The project has been split into eight schemes. A description of each scheme detailed in Chapter 3.

12.2 Planning policy

12.2.1 The Project is supported by, and aligns with, national, regional and local planning and transport policies. The Project will create a high quality, reliable route from Penrith to Scotch Corner that meets the future needs of traffic demand, enables economic growth and improves the quality of life for local communities, whilst reducing journey times for users. It will improve connectivity and accessibility for walkers, cyclists and horse riders through the provision of improved facilities on the local network around the A66.

12.2.2 The Transport Assessment is in compliance with the policies previously set out in Section 2. A summary of these polices can be seen in Table 2-1.

12.3 Road safety

12.3.1 The A66 has a higher-than-average number of accidents in some sections of the route, with a number of accident cluster sites. A number of these sites are either located in single carriageway sections or in dual sections adjacent to single carriageway sections. Varying standards along the route with a mixture of single and dual carriageway sections leads to difficulties with overtaking, poor forward visibility, and difficulties at junctions as a result of short merges and diverges and right turning traffic off and on to the A66.

12.3.2 A road safety appraisal has been undertaken using COBALT which assesses the likely change in the number of road accidents within the area of focus and influence of the A66 route, as a result of the scheme improvements.

12.3.3 Over the 60-year appraisal period, the project saves 281 personal injury accidents, of which 3% are fatal, 21% are serious, and 76% are slight. There is an overall reduction of 530 casualties, of which 3% are fatal, 28% are serious, and 69% are slight.

12.4 Network performance

12.4.1 Work has been undertaken to update the NRTM such that it is suitable to inform the DCO application. The RTMs are typically updated every five years to ensure they are based on the most up to date information available. Therefore, the Project team has taken the opportunity to update the base year model from 2015 to 2019 in parallel to the development of the second generation of the RTMs.

12.4.2 The A66TM base year is 2019, in line with the RTM2 models and representing the most recent year experiencing "normal" network conditions prior to the Covid-19 pandemic. Traffic data has not been collected from the end of March 2020 to October 2021, and from December 2021 to February 2022 in line with TAG guidance. TAG Unit M1.2[35] states that *"surveys should typically be carried out during a 'neutral', or representative, month avoiding main and local holiday periods, local school holidays and half terms, and other abnormal traffic periods."* Traffic conditions during the above-mentioned periods are considered to be abnormal due to the disruption caused by the Covid-19 pandemic.

12.4.3 The models have been calibrated and validated to a base year of 2019. The opening year will be 2029 and the forecast year is 2044. The modelling assessment considers the absolute performance of the Project in the forecast year of 2044. Where it has been necessary to draw comparison between Do Something and Do Minimum scenarios, this has been done for the forecast year of 2044.

12.4.4 The average traffic growth on the A66 between 2019 and 2044 DM is 41% across all locations considered. Typically flows on the A66 in the 2044 DM range from 21,000 AADT (between Appleby and Brough) and 42,000 AADT (between M6 Junction 40 and Kemplay Bank).

12.4.5 This growth DM from 2019 to the forecast year is due to national changes in; population, trip rates, GDP and income, cost of driving, licence holding, and demand for goods.

12.4.6 The average additional growth on the A66 due to the Project in 2044 is 30%. The resultant flows on the A66 in 2044 Do Something range between 29,000 AADT (between Appleby and Brough) and 47,000 AADT (between M6 Junction 40 and Kemplay Bank).

12.4.7 The growth due to the Project is due to the provision of a higher standard route. The increase in traffic flow reflects people benefiting from the opportunity that the dualling offers.

12.4.8 The improved linkage which would be provided by the Project benefits communities within the north of England, who, due to the rural nature of the region, often lack access to key local services for example, GP surgeries, primary schools and supermarkets. These people are often required to commute over longer distances than average to access improved employment opportunities. The project is therefore important as it facilitates these longer distance journeys through improved journey

[35] Dft Transport Analysis Guidance Unit M1.2 Data Sources and Surveys

times and journey time reliability. The increased flow also reflects more tourists benefiting from improved links to areas such as the Lake District and the North Pennines AONB, thereby improving the economies within this area.

12.4.9 The forecast journey times along the A66 from the M6 J40 to the A1(M) Scotch Corner without the delivery of the Project will increase by approximately five minutes (9%) if the Project is not delivered. This is because the single carriageway sections are near their capacity throughout the assessment period. With the Project in place it is anticipated that users will save between 10 and 13 minutes (19-22%) when travelling along the A66 corridor in future years.

12.4.10 The MyRIAD assessment has shown that the Project has a significant impact on Travel Time Variability and Incident Delay by removing the single carriageway sections.

12.4.11 The journey Resilience assessment has shown that network wide benefits are to be gained by the Project when closures of greater than 6 hours occur on the road network within the area.

12.5 Sustainable transport

12.5.1 Where PRoWs are severed by or converge at the upgraded A66 carriageway, then they have been gathered and redirected to the nearest grade-separated crossing facility in order to provide a safe place to cross the dual carriageway. The nearest crossing may be a new grade-separated junction, an accommodation underpass or overbridge, or a designated WCH underpass or bridge. All schemes have some level of betterment compared with the provision on the existing single carriageway sections.

12.5.2 No Project impacts are anticipated on bus or rail services.

12.6 Construction impact assessment

12.6.1 An assessment has been undertaken of the traffic impact during construction of the project. **Chapter 2.8 Construction, operation and long-term management** of the **Environmental Statement Volume 1** (Document Reference 3.2), provides an outline description of proposals for construction of the project. There are seven construction scenarios which are modelled to derive the impacts on road users.

12.6.2 No modelling of overnight closures have been undertaken given that the details of these have yet to be finalised. Traffic Management Plans will be developed as detailed design progresses to enable the safe and smooth delivery of the Project.

12.6.3 The longest travel times on the A66 are within Scenarios C and D where the travel time is expected to increase from around 55 minutes to a maximum of 1 hour and 10 minutes (scenario 3) and 1 hour and 8 minutes within scenario 4. Travel time results are indicative of the scenarios in which most disruption will occur on the remainder of the road network as the A66 traffic will have most cause to seek an alternative route.

12.6.4 Long distance rerouting occurs on the following routes

- The A69 between Newcastle and Carlisle
- The B6277 between Middleton in Teesdale and Brampton
- The A684 between Bedale and Sedbergh
- The A65 / A59 between Harrogate and Kirkby Longsdale

12.6.5 The result of this east west rerouting is that the A1(M) becomes less busy north of Wetherby, and the M6 becomes busier between Lancaster and Penrith. This long- distance rerouting minimises local traffic disruption.

12.6.6 The model is being used as a diagnostic tool to identify potential issues, so mitigation measures can be put in place to prevent such rerouting occurring. There are a number of links along which rerouting is shown to occur within the model. These routes include:

- Clifford Road within Penrith
- Wetheriggs / Chapel Street to the south of the A66 between Penrith and Temple Sowerby
- The A67 to the east of Brough, through Barnard Castle and through Gainford
- Stoneygate Bank Road through Ravensworth, Barningham Road through Newsham, High Lane through Dalton and Springs Lane north of Richmond.
- B6274 between the A66 and Winston, and East Road and West Lane through Melsonby and East Layton.

12.6.7 Journey times on the A66 will be monitored during the construction phase to ensure significant traffic rerouting does not occur. If the routes above are being used excessively measures will be implemented to reduce their use.

13 Glossary and abbreviations

13.1 Glossary

13.1.1 The table below sets out the glossary for terms commonly used in the A66 project.

Table 13-1: Glossary

Term	Definition
(The) Act	The Planning Act 2008
Annual average daily traffic (AADT)	The total volume of vehicle traffic of a motorway or road for a year divided by 365 days.
Applicant	National Highways
Application	This refers to an application for a Development Consent Order. An application consists of a series of documents and plans which are submitted to the Planning Inspectorate and published on its website.
Appraisal	A process that looks at the worth of a course of action.
Area of Outstanding Natural Beauty (AONB)	An area of countryside considered to have significant landscape value.
Assessment	A process by which information about effects of a proposed plan, project or intervention is collected, assessed and used to inform decision-making.
Baseline environment	The environment as it appears (or would appear) immediately prior to the implementation of the project together with any known or foreseeable future changes that will take place before completion of the project.
Benefit Cost Ratio (BCR)	The benefit cost ratio is a presentation of the amount of benefit being bought for every £1 of cost to the public purse – the higher the BCR the greater the benefit for every £1 spent.
Best Practicable Means	The best practicable environmental option - defined in the Control of Pollution Act 1974 and Environmental Protection Act 1990 as measures which are 'reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to financial implications'.
Biodiversity	The variety of life forms, the different plants animals and microorganisms, the genes they contain and the ecosystems they form.
Cableles Linking Facility (CLF)	A method used for coordinating the timings of adjacent signal installations by the use of clocks synchronised to mains electricity supply frequency.
Compensation	Measures taken to offset or compensate for residual adverse effects that cannot be mitigated, or for which mitigation cannot entirely eliminate.
Consent	A statutory permission given to an applicant by a statutory authority, such as the local planning authority or the Secretary of State, that allows a development to be carried out within a specific area of land.
Consultation	A process by which regulatory authorities, statutory and non-statutory bodies are approached for information and opinions regarding a development proposal.
Design Manual for Roads and Bridges	A set of documents that provide a comprehensive manual system which accommodates all current standards, advice

Term	Definition
(DMRB)	notes and other published documents relating to the design, assessment and operation of trunk roads.
Development Consent Order (DCO)	The means of obtaining permission for developments categorised as nationally significant infrastructure projects.
Effect	Term used to express the consequence of an impact (expressed as the 'significance of effect'), which is determined by correlating the magnitude of the impact to the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria. For example, land clearing during construction results in habitat loss (impact), the effect of which is the significance of the habitat loss on the ecological resource.
Enhancement	A measure that is over and above what is required to mitigate the adverse effects of a project.
Environmental assessment	A method and a process by which information about environmental effects is collected, assessed and used to inform decision-making.
Environmental Assessment Report	Documents the findings of an Environmental Assessment.
Environmental designation	A defined area which is protected by legislation that is threatened by change from manmade and natural influences (for example Ramsar sites, Sites of Special Scientific Interest and Special Areas of Conservation).
Examination stage	The formal, legal process governed by the Planning Act 2008 and related legislation. The examination stage is operated and led by the Planning Inspectorate on behalf of the Secretary of State.
Examining authority	The person(s) appointed by the Secretary of State (SoS) to assess the DCO application and make a recommendation to the SoS.
Flood zones	Flood Zones refer to the probability of river and sea flooding. They are available to view on the Environment Agency's website.
Grade-separated junction	Roads crossing the carriageway pass at a different level, so as not to disrupt the flow of traffic. Slip roads connect the carriageway to the junction.
Impact	Change that is caused by an action (for example land clearing (action) during construction which results in habitat loss (impact)).
Lane 1	The nearside lane.
Lane gain	Where the left hand lane of the entry slip road becomes lane 1 of the carriageway.
Lane drop	Where lane 1 diverges from the carriageway into the exit slip road.
Legislation	A law or set of laws proposed by a government and given force/made official by a parliament.
Listed building	A structure which has been placed on the Statutory List of Buildings of Special Architectural or Historic Interest to protect its architectural and historic interest.
Local Impact Report	A report produced by a local authority which gives details of the likely impact of the proposed development on the local

Term	Definition
	authority's area (or any part of that area). As part of the examination process, the Planning Inspectorate will invite relevant local authorities to submit local impact reports by a given deadline.
Mitigation	Measures including any process, activity, or design to avoid, reduce, remedy or compensate for negative environmental impacts or effects of a development.
Mitigation measures	Methods employed to avoid, reduce, remedy or compensate for significant adverse impacts of development proposals.
Monitoring	A continuing assessment of the performance of the project, including mitigation measures. This determines if effects occur as predicted or if operations remain within acceptable limits, and if mitigation measures are as effective as predicted.
National Infrastructure Delivery Plan (NIDP)	A national policy document issued by the government which describes how the government will support the delivery of key infrastructure projects and programmes to the end of this Parliament.
National Networks National Policy Statement 2014 (NN NPS)	A national policy document issued by the government which sets out the government's objectives and the need for the development of nationally significant infrastructure projects on road and rail networks in England. It is also known as National Policy Statement for National Networks. The NN NPS is the basis for the examination of a Development Consent Order application by the Planning Inspectorate and decisions by the Secretary of State. It was adopted as national policy by the UK Parliament in March 2015.
Nationally Significant Infrastructure Project (NSIP)	Large scale developments which require a type of consent known as 'development consent' under procedures governed by the Planning Act 2008.
Net present value	Net present value (NPV) is simply calculated as the sum of future discounted benefits minus the sum of future discounted costs.
Operational	The functioning of a project on completion of construction.
Order limit	The extent of land required for the Project
Phase 1 Habitat Survey	Recognised standard methodology for collating information on the habitat structure of a particular site.
Planning Act 2008 (PA) (as amended)	Act of Parliament which sets out the statutory requirements and planning application process for nationally significant infrastructure projects, such as energy, water, transport and waste. Applications for Development Consent Order are submitted following the processes set out in the Planning Act. The Act has subsequently been amended.
Planning Inspectorate	The government agency responsible for operating the planning process for nationally significant infrastructure projects and for examining applications for development consent under the Planning Act 2008, on behalf of the Secretary of State.
Preliminary design	The design on which the application for development consent is based.
Programme	A series of steps that have been identified or series of projects that are linked by dependency.

Term	Definition
Receptor	A defined individual environmental feature usually associated with population, fauna and flora that has potential to be affected by a project.
Registered Parks and Gardens	Parks and gardens listed on a register that includes sites of particular historic importance and of special historic interest in England. The main purposes of the register is to celebrate designed landscapes of note and to encourage appropriate protection.
Regulations	Official rules or acts to control something, generally made in relation to legislation.
Scoping Opinion	The process of identifying the issues to be addressed by the EIA process. It is a method of ensuring that an assessment focuses on the important issues and avoids those that are considered to be not significant.
Secretary of State (SoS)	The Secretary of State for Transport.
Sensitivity	The extent to which the receiving environment can accept and accommodate change without experiencing adverse effects.
Statutory	Related to legislation or prescribed in law or regulation.
Traffic modelling or forecasting	The process used to estimate the number of vehicles using a specific section of road or defined network of roads.
VisVAP	Enhances the use of free-defined signal control logic using Vehicle Actuated Programming
Walkers, cyclists and horse riders (WCH)	Walkers, cyclists and horse riders using the network.

13.2 Abbreviations

13.2.1 The table below sets out the abbreviations for terms commonly used in the A66 project.

Table 13-2: Abbreviations

Acronym	Definition
A66TM	A66 Traffic Model
AADT	Average Annual Daily Traffic
AAWT	Average Annual Weekday Traffic
ANPR	Automatic Number Plate Recognition
AONB	Area of Outstanding Natural Beauty
ATC	Automatic Traffic Count
ATR	Advanced Traffic Research
COBALT	Cost and Benefit to Accidents – Light Touch
CRF	Congestion Reference Flow
DCO	Development Consent Order
DfT	Department for Transport
DI	Distributional Impacts
DIADEM	Dynamic Integrated Assignment and Demand Modelling Software
DM	Do Minimum
DS	Do Something
DoS	Degree of Saturation
DTDV	Day to Day Variability
EIA	Environmental Impact Assessment
GPS	Global Positioning Service

Acronym	Definition
GUI	Graphical User Interface
HDV	Heavy Duty Vehicle
HEIDI	National Highways Integrated Demand Interface
HGV	Heavy Goods Vehicle
IP	Inter peak
ITN	Integrated Transport Network
LinSig	A software tool by JCT Consultancy which allows traffic engineers to model traffic signals and their effect on traffic capacities and queuing
LGV	Light Goods Vehicle
LSOA	Lower Super Output Area
MCC	Manual Classified Count
MCTC	Manual Classified Turning Count
MMQ	Mean Max Queue
MND	Mobile Network Data
MoD	Ministry of Defence
mph	miles per hour
MPOD	Mobile Phone Data
MToD	Macro Time of Day
MyRIAD	Motorway Reliability Incidents and Delays
NDC	Nationwide Data Collection
NH	National Highways
NMU	Non-Motorised User
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NPS NN	National Policy Statement for National Networks
NRTM	Northern Regional traffic Model
NSIP	Nationally Significant Infrastructure Project
NTEM	National Trip End Model
NTM	National Traffic Model
NTP	North Trans-Pennine
NTPR	North Trans-Pennine Routes
OBR	Office for Budget Responsibility
OD	Origin – Destination
OGV	Other Goods Vehicles
OS	Ordnance Survey
OS ITN	Ordnance Survey Integrated Transport Network
PCU	Passenger Car Unit
PDOR	Project Development Overview Report
PPG	Planning Practice Guidance
PPK	Pence per Kilometre
PPM	Pence per Minute
PRA	Preliminary Risk Assessment
PRC	Practical Reserve Capacity
PRoW	Public Right of Way
PSV	Passenger Service Vehicles
RIS	Road Investment Strategy
RPG	Registered Park and Gardens
RTF	Road Traffic Forecasts (Published by the Department for Transport)
RTM	Regional Traffic Model

Acronym	Definition
RSA	Road Safety Audit
SAC	Special Area of Conservation
SATURN	Simulation and Assignment of Traffic to Urban Road Networks
SD	Standard Deviation
SPD	Supplementary Planning Documents
SRM	Sir Robert MacAlpine
SRN	Strategic Road Network
TA	Transport Assessment
TAG	Transport Analysis Guidance (Published by the Department for Transport)
Tempro	Modelling Software used to interrogate the National Trip End Model
TfN	Transport for the North
TIS	Traffic Investment Strategy
TRA	Traffic Reliability Area
TRICS	Trip Rate Database
TTM	Temporary Traffic Management
TTV	Trave Time Variability
UC	User Class
UTC	Urban Traffic Control
VDM	Variable Demand Model
Vissim	German for "Traffic in cities - simulation model"
VPD	Vehicles per Day
WCH	Walkers, Cyclists and Horse-riders
WCHAR	Walking, Cycling and Horse Riding Assessment and Review
WebTRIS	National Highways Web based Traffic count Information System
WTA	Warcop Training Area

A Uncertainty Log

A.1 Development Uncertainty Log

ArupID	Author	SiteNm	X	Y	Dev	Land Use	NetArea	TotDwell	2029	2039	2044	2051	Uncertainty	Big Enough	Core Wide	TA
1	Teesvalley	Heighington Lane North	426464	522445	Emp	B2/B8	26970	0	26970	26970	26970	26970	Reasonably Foreseeable	1	C	1
2	Teesvalley	Faverdale Reserve Site	427318	518008	Emp	B2/B8	36000	0	7200	14400	14400	14400	Hypothetical	1	C	0
3	Teesvalley	Morton Palms (Alderman Best Way)	432282	513463	Emp	B1	50400	0	18144	28224	30240	30240	Hypothetical	1	C	0
4	Teesvalley	Faverdale East Business Park (St Modwens)	428060	517347	Emp	B2/B8	100000	0	25000	35000	35000	35000	Hypothetical	1	C	0
5	Teesvalley	Faverdale Industrial Area (Argon)	427448	516721	Emp	B2/B8	6305	0	6305	6305	6305	6305	Near Certain	1	C	1
6	Teesvalley	Faverdale Industrial Area (Remainder)	427486	516576	Emp	B2/B8	25968	0	6856	8569	8569	8569	Hypothetical	1	C	0
7	Teesvalley	Yarm Road Industrial Area	431902	514355	Emp	B2/B8	59295	0	59295	59295	59295	59295	Near Certain	1	C	0
8	Teesvalley	Yarm Road South Extension	431639	513329	Emp	B2/B8	132192	0	43623	43623	43623	43623	Hypothetical	1	C	0
9	Teesvalley	Yarm Road North (Dean and Chapter)	432417	514839	Emp	B2/B8	127000	0	25400	50800	50800	50800	Near Certain	1	C	1
11	Teesvalley	Yarm Road North (Dean and Chapter)	432417	514839	Emp	A3	2500	0	2500	2500	2500	2500	More than Likely	1	C	1
12	Teesvalley	McMullen Road West	430662	515204	Emp	B2/B8	40600	0	36540	40600	40600	40600	Hypothetical	1	C	0
14	Teesvalley	Central Park (vacant land only)	429810	514838	Emp	B1	28000	0	22736	28000	28000	28000	Hypothetical	1	C	0
15	Teesvalley	Central Park	429816	514727	Res	C3	0	359	359	359	359	359	Near Certain	1	C	1
16	Teesvalley	Central Park South (Business Startup Center)	429596	514358	Emp	B1	3199	0	3199	3199	3199	3199	Hypothetical	1	C	0
17	Teesvalley	Central Park (Local Centre)	429880	515075	Emp	A1	1700	0	1700	1700	1700	1700	Near Certain	1	C	1
18	Teesvalley	Durham Tees Valley Airport	436740	513100	Emp	B2/B8	101250	0	94365	101250	101250	101250	Hypothetical	1	C	0
19	Teesvalley	Lingfield Point Phase 1	431131	514771	Res	C3House	0	273	273	273	273	273	Near Certain	1	C	1
20	Teesvalley	Lingfield Point (ex Phase 1)	431715	515017	Res	C3	0	331	268	331	331	331	More than Likely	1	C	1
21	Teesvalley	Lingfield Point	431715	515017	Emp	B1	13666	0	9566	13666	13666	13666	More than Likely	1	C	1
22	Teesvalley	Lingfield Point	431715	515017	Emp	A1	2700	0	2700	2700	2700	2700	More than Likely	1	C	1
25	Teesvalley	Geneva Lane/Geneva Bakery	429565	513278	Res	C3	0	216	216	216	216	216	Hypothetical	1	C	0
26	Teesvalley	Former Corus site, Whessoe Road	428545	516693	Res	C3	0	250	220	250	250	250	Hypothetical	1	C	0
33	Teesvalley	North West Urban Fringe (West Park Garden Village)	426240	517131	Res	C3	0	1200	516	1116	1176	1176	Hypothetical	1	C	1
34	Teesvalley	Eastern Urban Fringe, Great Burdon	432223	515914	Res	C3	0	1250	200	700	750	750	Hypothetical	1	C	0
35	Teesvalley	Hopetown Park	428603	515861	Res	C3	0	110	110	110	110	110	Hypothetical	1	C	0
37	Teesvalley	Feethams / Beaumont Street	428866	514271	Emp	B1	3000	0	3000	3000	3000	3000	Hypothetical	1	C	0
39	Teesvalley	West Park	426690	516860	Res	C3House	0	213	202	213	213	213	Near Certain	1	C	1
41	Teesvalley	Feethams East (former bus depot)	429045	514255	Emp	A4	3135	0	3135	3135	3135	3135	Hypothetical	1	C	0
42	Teesvalley	Feethams East (former bus depot)	429045	514255	Emp	D2Cinema	3526	0	3526	3526	3526	3526	Hypothetical	1	C	0
60	Teesvalley	Albert Road Retail Park	429125	515676	Emp	A1	1737	0	1737	1737	1737	1737	Hypothetical	1	C	0
61	Teesvalley	Albert Road Retail Park	429125	515676	Emp	A1Food	2177	0	2177	2177	2177	2177	Hypothetical	1	C	0
62	Teesvalley	Land to the South of Burtree Lane	428603	518037	Res	C3	0	380	267	380	380	380	Hypothetical	1	C	0
63	Teesvalley	Land off Sadberge Road, Middleton St George, Darlington	434469	514151	Res	C3House	0	234	0	0	0	0	Near Certain	1	C	1
64	Teesvalley	Elm Tree Farm	430480	517084	Res	C3	0	150	0	0	0	0	Hypothetical	1	C	0
67	Teesvalley	High Stell/Gendon Gardens, Middleton St.George	434106	513628	Res	C3	0	198	0	0	0	0	More than Likely	1	C	1
68	Teesvalley	Land north of Coniscliffe Road (Southern Coniscliffe Park)	425472	514970	Res	C3	0	535	0	0	0	0	Reasonably Foreseeable	1	C	0
80	Teesvalley	School Aycliffe West	425840	523342	Res	C3House	0	101	101	101	101	101	Near Certain	1	C	1
81	Teesvalley	Land at Berrymead Farm / Land North of White Horse Pub	429102	518165	Res	C3	0	370	0	0	0	0	Reasonably Foreseeable	1	C	1
82	Teesvalley	Land South of Neasham Road	429920	512631	Res	C3	0	700	0	0	0	0	Hypothetical	1	C	0
85	Teesvalley	Maxgate Farm, Station Road, Middlton st George	434020	514041	Res	C3	0	260	0	260	260	260	Hypothetical	1	C	0
87	Teesvalley	Land Off Yarm Road South of Railway Line, MSG (High Scrogg Farm)	434928	513365	Res	C3	0	330	0	330	330	330	Near Certain	1	C	0
89	Teesvalley	Middleton St George, New School	435105	513465	Emp	B2/B8	40938	0	8188	0	0	0	Hypothetical	1	C	0
90	Teesvalley	Land at Coniscliffe Grange South, Staindrop Road	425576	514991	Res	C3	0	985	0	788	985	985	Reasonably Foreseeable	1	C	0
92	Teesvalley	John Fowler Way, West Park	426793	517085	Emp	A1Food	1820	0	1820	1820	1820	1820	Hypothetical	1	C	0
93	Teesvalley	Land to the South of Woodlands Hospital (Dunelm)	432140	513889	Emp	A1	3670	0	3670	3670	3670	3670	Hypothetical	1	C	0
105	Teesvalley	Skerningham Masterplan	430940	517925	Res	C3	0	4500	1260	2160	2790	3240	Hypothetical	1	C	0
106	Teesvalley	Greater Faverdale Masterplan (Burtree Garden Village)	427317	518006	Res	C3	0	2000	0	0	0	0	Hypothetical	1	C	0
130	Teesvalley	South of Maritime Avenue	451665	532266	Res	C3	0	400	0	160	200	200	Near Certain	1	W	0
135	Teesvalley	Mayfair	452182	528728	Res	C3House	0	261	261	261	261	261	Near Certain	1	W	0
142	Teesvalley	Upper Warren	448481	534644	Res	C3House	0	500	475	500	500	500	Near Certain	1	W	0
147	Teesvalley	Britmag	450399	535359	Res	C3House	0	479	456	479	479	479	Near Certain	1	W	0
158	Teesvalley	South West Extension (Claxton)	448020	529184	Res	C3	0	1260	882	1260	1260	1260	Near Certain	1	W	0
168	Teesvalley	High Tunstall	447783	532560	Res	C3	0	1200	768	1200	1200	1200	Hypothetical	1	W	0

ArupID	Author	SiteNm	X	Y	Dev	Land Use	NetArea	TotDwell	2029	2039	2044	2051	Uncertainty	Big Enough	Core Wide	TA
173	Teesvalley	Wynyard Park North	442766	527920	Res	C3House	0	400	368	400	400	400	Hypothetical	1	W	0
206	Teesvalley	Acklam Gardens (Central Whinney Banks)	447657	518272	Res	C3House	0	304	294	304	304	304	Near Certain	1	W	0
208	Teesvalley	Police HQ, Ladgate Lane	450467	515759	Emp	B1	11621	0	0	0	0	0	Hypothetical	1	W	0
209	Teesvalley	Ladgate Woods (Police HQ site)	450367	515736	Res	C3House	0	467	432	467	467	467	Near Certain	1	W	0
212	Teesvalley	Grey Towers Village	453221	513881	Res	C3House	0	453	373	453	453	453	Near Certain	1	W	0
219	Teesvalley	Brackenhoe East	451047	517402	Res	C3House	0	350	331	350	350	350	Near Certain	1	W	0
228	Teesvalley	Snow centre	450319	520890	Emp	D2	13802	0	13802	13802	13802	13802	Near Certain	1	W	0
234	Teesvalley	Middlehaven - office	449685	520985	Emp	B1	68000	0	14960	47600	51000	51000	Hypothetical	1	W	0
235	Teesvalley	Middlehaven - retail	449685	520985	Emp	A1	3150	0	3150	3150	3150	3150	Hypothetical	1	W	0
237	Teesvalley	Gresham	449000	519665	Res	C3House	0	273	0	0	0	0	Hypothetical	1	W	0
238	Teesvalley	Gresham	449000	519665	Res	C3Flat	0	450	450	450	450	450	Hypothetical	1	W	0
242	Teesvalley	Stainsby (Stainsby Hall Farm/Stainsby Hill Farm)	447189	515892	Res	C3House	0	850	631	850	850	850	Hypothetical	1	W	0
243	Teesvalley	Stainsby (Brookfield Woods/Brookland Park)	447448	515195	Res	C3House	0	299	299	299	299	299	Near Certain	1	W	0
244	Teesvalley	Hemlington Grange (Elderwood Park phases 1-4 and Ashwood Park phase 1	450251	513982	Res	C3House	0	655	641	655	655	655	Near Certain	1	W	0
245	Teesvalley	Hemlington Grange (outline consent)	449876	514007	Res	C3House	0	575	368	575	575	575	More than Likely	1	W	0
249	Teesvalley	Newham Hall Farm	451650	513626	Res	C3House	0	1100	425	1049	1100	1100	Hypothetical	1	W	0
262	Teesvalley	Tees AMP	448078	520288	Emp	B2/B8	23865	0	23865	23865	23865	23865	Near Certain	1	W	0
268	Teesvalley	Cargo Fleet West	450960	520323	Emp	A1	3500	0	3500	3500	3500	3500	Hypothetical	1	W	0
275	Teesvalley	University Building One - Southfield Road	449429	519706	Emp	D1College	5800	0	5800	5800	5800	5800	Hypothetical	1	W	0
298	Teesvalley	Centre North East	449553	520458	Res	C3Flat	0	300	0	0	0	0	Near Certain	1	W	0
304	Teesvalley	1-29 Station Street	449381	520703	Emp	B2/B8	9159	0	0	0	0	0	Old Use	1	W	0
305	Teesvalley	1-29 Station Street	449381	520703	Res	C3Flat	0	337	337	337	337	337	Near Certain	1	W	0
306	Teesvalley	Centre Square	449754	520238	Emp	B1	19466	0	19466	19466	19466	19466	Near Certain	1	W	1
310	Teesvalley	Stainton Vale Farm	447226	514715	Res	C3House	0	740	355	740	740	740	Hypothetical	1	W	0
313	Teesvalley	Grove Hill (excluding Bishopton Road)	449742	518009	Res	C3House	0	270	258	270	270	270	Hypothetical	1	W	0
322	Teesvalley	Cornell Quarter, Woodlands Road	449727	519761	Res	C3Flat	0	300	300	300	300	300	Near Certain	1	W	0
328	Teesvalley	BoHo X office	449524	520932	Emp	B1	8611	0	8611	8611	8611	8611	Reasonably Foreseeable	1	W	0
331	Teesvalley	Denmark Street Car Park	449045	520430	Emp	D1College	5629	0	5629	5629	5629	5629	Near Certain	1	W	0
336	Teesvalley	Low Grange Farm	454176	520448	Res	C3	0	1250	338	713	750	750	Near Certain	1	W	0
339	Teesvalley	Church Hill, Skelton (A+B)	466065	519475	Res	C3	0	267	267	267	267	267	Near Certain	1	W	0
340	Teesvalley	Greenfield Extenson South of Marske	462476	523068	Res	C3House	0	1000	500	960	1000	1000	More than Likely	1	W	0
342	Teesvalley	Kirkleatham Business Park	459045	522617	Emp	B1	25000	0	17000	20000	20000	20000	Hypothetical	1	W	0
343	Teesvalley	Kirkleatham Business Park	459045	522617	Emp	B2/B8	24000	0	0	0	0	0	Near Certain	1	W	0
346	Teesvalley	Skelton Industrial Estate Extension (Housing part)	466929	519593	Res	C3	0	400	288	400	400	400	Near Certain	1	W	0
351	Teesvalley	Skelton Industrial Estate Extension	467169	519602	Emp	A1	3482	0	3482	3482	3482	3482	Near Certain	1	W	0
373	Teesvalley	High Farm, Teesville	453520	519345	Res	C3House	0	294	294	294	294	294	Near Certain	1	W	0
374	Teesvalley	The Closes, Redcar. Havelock Park	459830	522790	Res	C3	0	342	342	342	342	342	Near Certain	1	W	0
376	Teesvalley	Mannion Park, Grangetown	456000	520000	Emp	B1	11500	0	0	0	0	0	More than Likely	1	W	0
380	Teesvalley	Longbank Farm, Ormesby	454065	516537	Res	C3	0	320	288	320	320	320	More than Likely	1	W	0
385	Teesvalley	Galley Hill Farm, Guisborough	459168	515710	Res	C3House	0	326	326	326	326	326	Near Certain	1	W	0
390	Teesvalley	Land at North East of Wilton International Site	457893	522872	Emp	B2/B8	87181	0	87181	87181	87181	87181	Near Certain	1	W	1
409	Teesvalley	West of Kirkleatham Lane	459227	522954	Res	C3House	0	550	308	528	550	550	More than Likely	1	W	0
412	Teesvalley	Cleveland Gate, Guisborough (Employment)	461131	515535	Emp	A1Food	5730	0	5730	5730	5730	5730	Near Certain	1	W	0
420	Teesvalley	Kilton Lane, Brotton	469290	519350	Res	C3	0	270	167	270	270	270	Hypothetical	1	W	0
427	Teesvalley	Land north of Woodcock Wood and West of Flatts Lane	454392	516937	Res	C3House	0	400	384	400	400	400	More than Likely	1	W	0
445	Teesvalley	Former Visqueen Site	443586	517297	Res	C3	0	450	450	450	450	450	Near Certain	1	W	0
457	Teesvalley	Allens West	441320	514887	Emp	B2/B8	38500	0	19712	77	0	0	Old Use	1	W	0
459	Teesvalley	Allens West	441320	514887	Res	C3House	0	845	412	843	845	845	Near Certain	1	W	0
466	Teesvalley	The Rings	444037	514155	Res	C3	0	480	480	480	480	480	Near Certain	1	W	0
469	Teesvalley	Little Maltby Farm, Low Lane	445444	513005	Res	C3House	0	1155	1155	1155	1155	1155	Near Certain	1	W	0
483	Teesvalley	Summerville Farm	441674	521995	Res	C3House	0	340	340	340	340	340	Near Certain	1	W	0
484	Teesvalley	Pipe Mill (Corus), Portrack Lane	446014	519595	Emp	B2/B8	22500	0	0	0	0	0	Old Use	1	W	0
485	Teesvalley	Pipe Mill (Corus), Portrack Lane	446012	519804	Emp	B1	11613	0	11613	11613	11613	11613	Near Certain	1	W	0

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486	Teesvalley	Corus Pipe Mill	446014	519595	Res	C3	0	322	322	322	322	322	Near Certain	1	W	0
495	Teesvalley	Morley Carr Farm	441242	510995	Res	C3	0	350	350	350	350	350	Near Certain	1	W	0
498	Teesvalley	Tall Trees	441127	510502	Res	C3House	0	288	288	288	288	288	Near Certain	1	W	0
518	Teesvalley	Victoria Park (Estate)	444698	519524	Res	C3Flat	0	254	0	0	0	0	Old Use	1	W	0
521	Teesvalley	Queens Park North	444581	520249	Res	C3House	0	400	320	400	400	400	Old Use	1	W	0
525	Teesvalley	Land off Grangefield Road (Thompsons Scrap Yard/Millfield)	443730	519156	Res	C3House	0	600	386	600	600	600	Reasonably Foreseeable	1	W	0
529	Teesvalley	Tees Marshalling Yard	446291	519192	Res	C3	0	1100	0	0	0	0	Reasonably Foreseeable	1	W	0
541	Teesvalley	Tithebarn Land	440995	520646	Res	C3House	0	340	0	0	0	0	Near Certain	1	W	0
543	Teesvalley	Land at Wynyard Village (Wynyard Village Western Extension)Phase F	440808	527194	Res	C3House	0	279	0	0	0	0	More than Likely	1	W	0
550	Teesvalley	Wynyard Park	443733	527380	Res	C3House	0	400	0	0	0	0	Reasonably Foreseeable	1	W	0
554	Teesvalley	Land West Of Yarm Lea	440792	510847	Res	C3House	0	495	0	0	0	0	Reasonably Foreseeable	1	W	0
614	Teesvalley	Mount Leven Farm, Leven Bank Farm, Yarm	444266	512241	Res	C3House	0	332	226	332	332	332	Near Certain	1	W	0
625	Teesvalley	Hardwick Redevelopment	441894	521448	Res	C3	0	635	635	635	635	635	Hypothetical	1	W	0
630	Teesvalley	Ingenium Parc	431480	513392	Emp	B2/B8	100000	0	83000	100000	100000	100000	Near Certain	1	C	1
631	Teesvalley	South Industrial Zone	454239	522313	Emp	B2/B8	174000	0	174000	174000	174000	174000	More than Likely	1	W	1
632	Teesvalley	Lackenby	455341	521552	Emp	B2/B8	93000	0	93000	93000	93000	93000	Reasonably Foreseeable	1	W	1
633	Teesvalley	Dorman Point	454715	521428	Emp	B2/B8	140000	0	140000	140000	140000	140000	Reasonably Foreseeable	1	W	1
634	Teesvalley	The Foundry	456224	525186	Emp	B2/B8	464000	0	464000	464000	464000	464000	Reasonably Foreseeable	1	W	1
635	Teesvalley	Steel House	457747	524265	Emp	B1	15794	0	15794	15794	15794	15794	Reasonably Foreseeable	1	W	1
636	Teesvalley	Long Acres	457543	524644	Emp	B2/B8	186000	0	186000	186000	186000	186000	Reasonably Foreseeable	1	W	1
637	Durham	INTEGRA61	430430	537494	Emp	B2	170859	3781	139763	170944	170944	170944	Near Certain	1	W	1
642	Durham	Aykley Heads	426775	543543	Emp	B1a	12260	6000	6130	12260	12260	12260	More than Likely	1	W	1
646	Durham	Jade Park	439290	545775	Emp	B2/B8	14458	Unknown	0	0	0	0	Near Certain	1	W	0
647	Durham	Former LG Phillips site	429989	544063	Emp	B2/B8	21073	Unknown	0	0	0	0	More than Likely	1	W	0
651	Durham	Black & Decker (Durham Gate)	427481	534508	Res	C3	507	507	289	289	289	289	Near Certain	1	C	0
653	Durham	Bracks Farm	421945	529083	Res	C3	300	300	201	201	201	201	Near Certain	1	C	1
654	Durham	British Oxygen Co Vigo Lane	427565	553797	Res	C3	233	233	157	157	157	157	Near Certain	1	C	1
656	Durham	Copelaw	429274	524849	Res	C3	600	600	410	770	1400	1400	Reasonably Foreseeable	1	C	0
657	Durham	Dale Farm Land at Dale Road	423856	525404	Res	C3	340	340	125	275	340	340	Near Certain	1	C	1
658	Durham	Electrolux	426558	533164	Res	C3	425	425	240	425	425	425	Near Certain	1	C	1
661	Durham	Former Cape Asbestos Works Durham Road (The Grange)	430194	538614	Res	C3	360	360	74	74	74	74	Near Certain	1	W	0
662	Durham	Former Cemex Site	419252	526777	Res	C3	100	100	99	99	99	99	More than Likely	1	C	0
665	Durham	Former Riding Carpets Site	420735	535193	Res	C3	213	213	58	58	58	58	Near Certain	1	C	0
666	Durham	Former Tudhoe Grange Upper School, St Charles Road	426227	534575	Res	C3	110	110	110	110	110	110	Reasonably Foreseeable	1	C	0
667	Durham	Genesis Site Berry Edge South	410025	550481	Res	C3	482	482	330	421	421	421	Near Certain	1	W	0
668	Durham	High Riggs (land adj Darlington Road)	406242	517233	Res	C3	107	107	49	49	49	49	Near Certain	1	C	1
669	Durham	High West Road	415495	535356	Res	C3	250	250	155	250	250	250	Reasonably Foreseeable	1	C	1
670	Durham	Integra 61 Land South Of Bowburn & West Of The A688	430652	537491	Res	C3	270	270	270	270	270	270	Near Certain	1	W	1
671	Durham	Lambton Park	430164	551743	Res	C3	400	400	282	400	400	400	Near Certain	1	W	0
672	Durham	LAND AT AND TO WEST OF K HARTWALL LTD BUTCHERS RACE GREEN LANE	427275	534601	Res	C3	108	108	57	57	57	57	Near Certain	1	C	1
673	Durham	Land at Former Catkin Way	419749	527554	Res	C3	101	101	101	101	101	101	Near Certain	1	C	1
674	Durham	Land at Spout Lane	423941	525850	Res	C3	278	278	98	98	98	98	Near Certain	1	C	0
675	Durham	Land At The East Of Deerbolt HMYOI And North Of Bowes Road	404430	516445	Res	C3	162	162	149	149	149	149	Near Certain	1	C	1
677	Durham	Land At The Former Sedgefield Community Hospital Salters Lane	435973	531141	Res	C3	100	100	100	100	100	100	Near Certain	1	C	1
678	Durham	Land At The North Of Woodhouses Farm And South Of Etherley Moor Wigd	418956	528709	Res	C3	234	234	234	234	234	234	More than Likely	1	C	1
679	Durham	Land at Woodham College	427432	526759	Res	C3	100	100	100	100	100	100	Reasonably Foreseeable	1	C	0
681	Durham	Land North of Durham Road	424324	532717	Res	C3	300	300	270	300	300	300	Near Certain	1	C	1
682	Durham	Land north of West Chilton Terrace	428582	530391	Res	C3	135	135	135	135	135	135	Near Certain	1	C	1
684	Durham	Land rear of Newfield Terrace Newfield Farm	424535	552447	Res	C3	274	274	28	28	28	28	Near Certain	1	W	0
685	Durham	Land South Of A182SeahamCounty Durham	442527	546569	Res	C3	1500	1500	480	840	1500	1500	Near Certain	1	W	0
686	Durham	Land South of Douglas Crescent	422350	528613	Res	C3	500	500	378	500	500	500	Near Certain	1	C	1
687	Durham	Land to East of Ash Drive	420969	535326	Res	C3	200	200	135	200	200	200	Reasonably Foreseeable	1	C	1
688	Durham	Land To The East Of Clare Lodge And Durham Road	428579	529119	Res	C3	194	194	115	115	115	115	Near Certain	1	C	1

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691	Durham	Land To The North Of Etherley Moor	418752	529091	Res	C3	150	150	150	150	150	150	More than Likely	1	C	1
692	Durham	Land To The North Of Middridge Road	426481	526245	Res	C3	256	256	87	87	87	87	Near Certain	1	C	1
693	Durham	Land To The South East Of Stewart Drive	440623	537891	Res	C3	250	250	175	250	250	250	Near Certain	1	W	0
694	Durham	Land To The South Of 100 To 106 Dean Road	428904	532059	Res	C3	161	161	161	161	161	161	Near Certain	1	C	1
695	Durham	Land To The South Of Eden Drive	435962	528365	Res	C3	277	277	212	212	212	212	Near Certain	1	C	1
696	Durham	Land to the South of Fenwick Way (Berry Edge Central)	410037	550842	Res	C3	319	319	101	101	101	101	Near Certain	1	W	0
698	Durham	Land To The South Of Wallnook Lane And East Of Recreation Ground	421932	544911	Res	C3	400	400	210	348	348	348	Near Certain	1	W	0
700	Durham	Land West of Browney Lane	424639	538947	Res	C3	292	292	111	111	111	111	Near Certain	1	W	0
701	Durham	Laurel Drive	412541	551245	Res	C3	290	290	155	290	290	290	Reasonably Foreseeable	1	W	0
702	Durham	Low Hills	441928	542297	Res	C3	900	900	210	390	900	900	Near Certain	1	W	0
703	Durham	Middles Farm	420119	551687	Res	C3	296	296	113	113	113	113	Near Certain	1	W	0
704	Durham	Milburngate House	427242	542792	Res	C3	303	303	303	303	303	303	More than Likely	1	W	0
705	Durham	Mount Oswald	426613	540690	Res	C3	291	291	147	147	147	147	Near Certain	1	W	0
706	Durham	North East Industrial Estate	442972	541983	Res	C3	390	390	150	330	390	390	More than Likely	1	W	0
708	Durham	Seaham Colliery	441017	549806	Res	C3	335	335	160	335	335	335	Reasonably Foreseeable	1	C	0
709	Durham	Sherburn Road	429806	542235	Res	C3	420	420	200	420	420	420	Reasonably Foreseeable	1	W	0
710	Durham	Shotley Bridge Hospital	410271	552981	Res	C3	280	280	73	73	73	73	Near Certain	1	W	0
711	Durham	Site O - Cobblers Hall	427110	526437	Res	C3	175	175	25	25	25	25	Near Certain	1	C	0
712	Durham	Sniperley Park	425851	544159	Res	C3	1700	1700	740	1700	1700	1700	Reasonably Foreseeable	1	W	0
715	Durham	Thorn Lighting	426827	533563	Res	C3	403	403	150	150	150	150	Near Certain	1	C	0
716	Durham	Whitworth Park (All Phases)	424806	534203	Res	C3	726	726	259	259	259	259	Near Certain	1	C	1
717	Durham	Land To The West Of Startforth Park	403812	516063	Res	C3	210	210	0	0	0	0	Hypothetical	1	C	0
808	Northumberland	Ellington (land at), Ellington	428156	591699	Res	C3	14	392	335	385	385	385	Near Certain	1	W	0
928	Northumberland	Land at South West Newsham, Blyth	430072	578905	Res	C3	13	275	205	300	300	300	Reasonably Foreseeable	1	W	0
929	Northumberland	Land at South West Sector (Bellway), Cramlington	424630	576359	Res	C3	78	1600	700	767	767	767	Near Certain	1	W	0
937	Northumberland	Land at West Blyth (accessed from Chase Farm), Blyth	429235	580682	Res	C3	22	726	254	254	254	254	Near Certain	1	W	0
945	Northumberland	Land east of Allerburn Lea, Alnwick	419958	613244	Res	C3	13	270	120	220	270	270	Reasonably Foreseeable	1	W	0
961	Northumberland	Land East Of Wansbeck General Hospital, Ashington	429404	587757	Res	C3	28	600	460	600	600	600	Near Certain	1	W	0
977	Northumberland	Land north of Scotland Gate, Choppington	425593	584598	Res	C3	15	327	150	327	327	327	Reasonably Foreseeable	1	W	0
980	Northumberland	Land North of Station Road (Bellway), Cramlington	426021	577419	Res	C3	16	481	302	302	302	302	Near Certain	1	W	0
997	Northumberland	Land S of Dandsfield Square, Amble	427202	603686	Res	C3	10	272	272	272	272	272	Near Certain	1	W	0
1035	Northumberland	Land to the East, Featherstone Grove, Bedlington	425218	582756	Res	C3	4	500	500	500	500	500	Near Certain	1	W	0
1103	Northumberland	New Hartley Area 1, Land to the East of Seaburn Avenue, New Hartley	431087	576943	Res	C3	9	285	285	285	285	285	Near Certain	1	W	0
1137	Northumberland	Police HQ, Smallburn, Ponteland	415429	574035	Res	C3	14	253	253	253	253	253	Near Certain	1	W	0
1145	Northumberland	Prudhoe Hospital Site, Prudhoe	410552	562196	Res	C3	29	404	400	400	400	400	Near Certain	1	W	0
1163	Northumberland	Seaton Vale, Land at Summerhouse Lane, Ashington	429030	587479	Res	C3	23	704	265	265	265	265	Near Certain	1	W	0
1178	Northumberland	South West Sector Application Site (Barratt), Cramlington	424987	576607	Res	C3	22	715	150	362	362	362	Near Certain	1	W	0
1180	Northumberland	South-East of Coquet High School, Amble	426098	603389	Res	C3	22	500	150	450	500	500	Reasonably Foreseeable	1	W	0
1190	Northumberland	St Georges Hospital, Morpeth	420307	586813	Res	C3	20	375	292	292	292	292	Near Certain	1	W	0
1196	Northumberland	St. George's Hospital (land north), Morpeth	419780	587295	Res	C3	42	875	270	570	720	870	Near Certain	1	W	0
1199	Northumberland	Stobhill (land at), Morpeth	421124	584779	Res	C3	17	438	317	317	317	317	Near Certain	1	W	0
1222	Northumberland	Vald Birn UK Ltd, C403 South View to Unity Terrace, Cambois	430231	584744	Res	C3	8	323	150	323	323	323	Reasonably Foreseeable	1	W	0
1247	Northumberland	Windy Edge, Alnwick	420158	613006	Res	C3	13	270	200	270	270	270	Near Certain	1	W	0
1350	Tyne and Wear	BAE Systems	426738	556027	Res	C3	11	300	300	300	300	300	Reasonably Foreseeable	1	W	0
1353	Tyne and Wear	Bedewell Industrial Estate and Disused Playing Fields	432136	564464	Res	C3	10	335	292	292	292	292	More than Likely	1	W	0
1383	Tyne and Wear	Dunston Hill	422641	560676	Res	C3	18	352	352	352	352	352	Reasonably Foreseeable	1	W	0
1393	Tyne and Wear	Exemplar Neughbourhood	426012	562869	Res	C3	41	1000	500	1000	1000	1000	Reasonably Foreseeable	1	W	0
1451	Tyne and Wear	Land at Chuter Ede Education Centre (excluding Brydon Court)	435899	562960	Res	C3	8	280	200	280	280	280	Reasonably Foreseeable	1	W	0
1463	Tyne and Wear	Land at Holborn	435831	566544	Res	C3	5	365	365	365	365	365	Reasonably Foreseeable	1	W	0
1491	Tyne and Wear	Land to North of Town End Farm	434513	559884	Res	C3	22	400	325	400	400	400	Reasonably Foreseeable	1	W	0
1506	Tyne and Wear	MetroGreen - Dunston W	422503	562606	Res	C3	20	480	240	480	480	480	Reasonably Foreseeable	1	W	0
1510	Tyne and Wear	MetroGreen - South	421884	562405	Res	C3	19	289	40	289	289	289	Reasonably Foreseeable	1	W	0
1527	Tyne and Wear	Pipewellgate	425119	563530	Res	C3	1	270	270	270	270	270	Reasonably Foreseeable	1	W	0

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1535	Tyne and Wear	Ryton	415362	563641	Res	C3	32	550	550	550	550	550	Reasonably Foreseeable	1	W	0
1545	Tyne and Wear	Site of former Siemans and Narec Clothier Laboritories	430421	563532	Res	C3	10	334	334	334	334	334	More than Likely	1	W	0
1551	Tyne and Wear	South Shields Community School - Brinkburn Campus	437513	566018	Res	C3	8	272	272	272	272	272	Reasonably Foreseeable	1	W	0
1588	Tyne and Wear	Eastgate House, Manors Central Business Park Argyle Street	425380	564372	Res	C3	0	75	303	303	303	303	Reasonably Foreseeable	1	W	0
1658	Tyne and Wear	Cement works and scrap yard, Pottery Lane East	424589	563513	Res	C3	0	283	120	220	270	283	More than Likely	1	W	0
1659	Tyne and Wear	Cuthbert House, Pilgrim Street	425209	564119	Res	C3	0	321	321	321	321	321	More than Likely	1	W	0
1664	Tyne and Wear	St James Metro Station	424385	564459	Res	C3	0	328	328	328	328	328	Reasonably Foreseeable	1	W	0
1671	Tyne and Wear	Newburn Riverside	417924	564252	Res	C3	30	1000	475	875	875	875	Reasonably Foreseeable	1	W	0
1673	Tyne and Wear	Former Redewood School, Etal Lane	420500	567198	Res	C3	7	253	120	220	253	253	More than Likely	1	W	0
1687	Tyne and Wear	Scotswood Development Area (Phase 1)	420936	563890	Res	C3	12	362	120	220	270	320	More than Likely	1	W	0
1690	Tyne and Wear	Scotswood Development Area Phase 2, Scotswood	420352	564020	Res	C3	30	1368	1205	1358	1358	1358	More than Likely	1	W	0
1706	Tyne and Wear	2 Saint James Boulevard, Newcastle	424279	564341	Res	C3	0	230	350	350	350	350	More than Likely	1	W	0
1708	Tyne and Wear	Newcastle Technopole, Kings Manor	425330	564431	Res	C3	0	162	535	535	535	535	More than Likely	1	W	0
1728	Tyne and Wear	Calder Industrial Materials, Skinnerburn Road	424187	563144	Res	C3	5	700	450	700	700	700	Reasonably Foreseeable	1	W	0
1738	Tyne and Wear	Lower Callerton SLR	417143	567336	Res	C3	30	900	360	760	760	760	More than Likely	1	W	0
1743	Tyne and Wear	Hazlerigg SLR	422755	572174	Res	C3	20	455	375	375	375	375	More than Likely	1	W	0
1748	Tyne and Wear	NGP Cell C	423202	571205	Res	C3	11	393	120	220	270	320	More than Likely	1	W	0
1749	Tyne and Wear	Newcastle Great Park Cell A	421879	571326	Res	C3	36	1200	660	1060	1060	1060	More than Likely	1	W	0
1750	Tyne and Wear	Newcastle Great Park Cell D	421833	570547	Res	C3	27	600	384	384	384	384	More than Likely	1	W	0
1755	Tyne and Wear	Throckley North SLR Phases 3-5	415130	567424	Res	C3	16	412	385	412	412	412	More than Likely	1	W	0
1760	Tyne and Wear	Upper Callerton SLR	419500	568888	Res	C3	46	1200	625	1085	1085	1085	Reasonably Foreseeable	1	W	0
1762	Tyne and Wear	NGP West SLR	421173	570570	Res	C3	38	1000	560	960	960	960	Reasonably Foreseeable	1	W	0
1763	Tyne and Wear	Middle Callerton West	418031	568624	Res	C3	26	513	493	493	493	493	More than Likely	1	W	0
1773	Tyne and Wear	Middle Calleton East	418642	568171	Res	C3	17	600	460	570	570	570	More than Likely	1	W	0
1814	Tyne and Wear	North Tyne Industrial Estate, Whitley Road, Benton	429262	569626	Res	C3	22	495	80	480	495	495	Reasonably Foreseeable	1	W	0
1857	Tyne and Wear	West Chirton South, Norham Road, North Shields	433218	568302	Res	C3	29	399	399	399	399	399	More than Likely	1	W	0
1862	Tyne and Wear	Whitehouse Farm, West Moor	426405	571288	Res	C3	32	427	369	369	369	369	More than Likely	1	W	0
1863	Tyne and Wear	Station Road West, Wallsend (inc East Benton Farm)	428708	568765	Res	C3	31	593	588	588	588	588	More than Likely	1	W	0
1864	Tyne and Wear	Station Road East, Wallsend	428474	568765	Res	C3	29	650	488	488	488	488	More than Likely	1	W	0
1867	Tyne and Wear	Smith's Dock, North Shields	435464	567500	Res	C3	11	701	588	701	701	701	More than Likely	1	W	0
1868	Tyne and Wear	Scaffold Hill Farm, Holystone	430609	569997	Res	C3	23	460	288	288	288	288	More than Likely	1	W	0
1914	Tyne and Wear	Killingworth Moor (strategic site)	429518	570788	Res	C3	192	2000	1710	2000	2000	2000	Reasonably Foreseeable	1	W	0
1915	Tyne and Wear	Murton (strategic site)	432760	570883	Res	C3	243	3300	2283	3000	3000	3000	Reasonably Foreseeable	1	W	0
1971	Tyne and Wear	Balliol East, Benton Road, Longbenton	426988	570027	Res	C3	23	583	281	583	583	583	Reasonably Foreseeable	1	W	0
1979	Tyne and Wear	Tynemouth Golf Course, Tynemouth	435825	569693	Res	C3	36	806	0	320	400	480	Reasonably Foreseeable	1	W	0
2004	Tyne and Wear	Baltic Business Quarter	426105	563533	Emp	A1 - Retail, B	76800	NULL	51200	76800	76800	76800	Reasonably Foreseeable	1	W	0
2006	Tyne and Wear	Bede Industrial Estate	434755	564781	Emp	B1 - Business	18100	0	12000	16100	16100	16100	Reasonably Foreseeable	1	W	0
2007	Tyne and Wear	Boldon Business Park	434071	561372	Emp	B1 - Business	265400	31595	75828	157975	189570	221165	Reasonably Foreseeable	1	W	0
2013	Tyne and Wear	Former Hawthorne Leslie Shipyard, Hebburn	431340	564884	Emp	B2 - General	37000	0	12000	25000	30000	35000	Reasonably Foreseeable	1	W	0
2015	Tyne and Wear	Gateshead Quays	425650	563738	Emp	A1 - Retail, A	61400	NULL	61400	61400	61400	61400	Reasonably Foreseeable	1	W	0
2016	Tyne and Wear	Green Business Park, Hebburn / Jarrow Staithes	431340	564884	Emp	B2 - General	63000	7500	18000	37500	45000	52500	Reasonably Foreseeable	1	W	0
2020	Tyne and Wear	Jackson Street	425591	563045	Emp	A1 - Retail, A	3400	NULL	3400	3400	3400	3400	Reasonably Foreseeable	1	W	0
2024	Tyne and Wear	Land bounded by Chaytor Street, Ellison Place, the Metro Line and Berkley V	433022	565611	Emp	B2 - General	140000	16667	40002	83337	100004	116671	Reasonably Foreseeable	1	W	0
2026	Tyne and Wear	Land east of Lukeâ€™s Lane, Monkton Fell	431521	562663	Emp	B1 - Business	11300	0	9300	9300	9300	9300	Reasonably Foreseeable	1	W	0
2037	Tyne and Wear	Monkton Business Park	431521	562663	Emp	B1 - Business	38000	1000	12000	25000	30000	35000	Reasonably Foreseeable	1	W	0
2038	Tyne and Wear	Old Town Hall Area	425478	563387	Emp	A1 - Retail, A	7600	NULL	7600	7600	7600	7600	Reasonably Foreseeable	1	W	0
2040	Tyne and Wear	Port of Tyne	434407	565563	Emp	B1 - Business	153100	18226	43740	91126	109352	127578	Reasonably Foreseeable	1	W	0
2047	Tyne and Wear	Simonside Industrial Estate	434953	564256	Emp	B1 - Business	18700	0	12000	16700	16700	16700	Reasonably Foreseeable	1	W	0
2050	Tyne and Wear	Wardley Colliery	430503	562010	Emp	B2 - General	364200	43357	104058	216787	260144	303501	Reasonably Foreseeable	1	W	0
2058	Tyne and Wear	Shiremoor West	430567	571127	Emp	B1 - Business	11200	0	9335	9335	9335	9335	Reasonably Foreseeable	1	W	0
2059	Tyne and Wear	A19 Corridor Killingworth Moor	430047	570986	Emp	B1 - Business	170000	0	141665	141665	141665	141665	Reasonably Foreseeable	1	W	0
2064	Tyne and Wear	Balliol Business Park East	426909	570022	Emp	B1 - Business	252900	0	210750	210750	210750	210750	Reasonably Foreseeable	1	W	0
2065	Tyne and Wear	Gosforth Business Park	426081	569842	Emp	B1 - Business	102600	0	85500	85500	85500	85500	Reasonably Foreseeable	1	W	0

ArupID	Author	SiteNm	X	Y	Dev	Land Use	NetArea	TotDwell	2029	2039	2044	2051	Uncertainty	Big Enough	Core Wide	TA
2066	Tyne and Wear	Weetslade East A	426135	572377	Emp	B1 - Business	14000	0	11665	11665	11665	11665	Reasonably Foreseeable	1	W	0
2068	Tyne and Wear	Whitehill Point	434415	566488	Emp	B1 - Business	11300	0	9415	9415	9415	9415	Reasonably Foreseeable	1	W	0
2070	Tyne and Wear	Esso	434048	566816	Emp	B1 - Business	208500	0	173750	173750	173750	173750	Reasonably Foreseeable	1	W	0
2071	Tyne and Wear	Weetslade	425770	571869	Emp	B1 - Business	318600	0	265500	265500	265500	265500	Reasonably Foreseeable	1	W	0
2080	Tyne and Wear	Swan Hunters	430278	565949	Emp	B1 - Business	11300	0	9415	9415	9415	9415	Reasonably Foreseeable	1	W	0
2081	Tyne and Wear	Thermal Syndicate	429736	565646	Emp	B1 - Business	20400	0	17000	17000	17000	17000	Reasonably Foreseeable	1	W	0
2082	Tyne and Wear	Hadrian Road South	431087	566426	Emp	B1 - Business	11500	0	9585	9585	9585	9585	Reasonably Foreseeable	1	W	0
2111	Tyne and Wear	Chapelgarth Site	437082	551888	Res	C3	750	750	563	750	750	750	Near Certain	1	W	0
2128	Tyne and Wear	Former Groves Site, Woodbine Terrace, Pallion	437149	558004	Res	C3	720	720	390	720	720	720	More than Likely	1	W	0
2129	Tyne and Wear	Former Lambton Cokeworks Site (Elba Park)	432091	551337	Res	C3	359	359	359	359	359	359	Near Certain	1	W	0
2133	Tyne and Wear	Heritage Green - Rear of Bee Hive Pub, Coaley Lane	432936	551187	Res	C3	277	277	288	288	288	288	Near Certain	1	W	0
2136	Tyne and Wear	High Ford Estate, Flodden Road	436519	556678	Res	C3	285	285	285	285	285	285	Near Certain	1	W	0
2145	Tyne and Wear	Land at North Road	434606	548134	Res	C3	300	300	300	300	300	300	Near Certain	1	W	0
2148	Tyne and Wear	Land north of Burdon Lane	439668	556967	Res	C3	955	955	395	785	785	785	Reasonably Foreseeable	1	W	0
2155	Tyne and Wear	Phases 2-6, Chester Road	435769	555458	Res	C3	500	500	238	418	418	418	Near Certain	1	W	0
2156	Tyne and Wear	Philadelphia Complex	433660	552393	Res	C3	500	500	309	459	459	459	More than Likely	1	W	0
2161	Tyne and Wear	Ryhope and Cherry Knowle Hospital	439668	556967	Res	C3	800	800	533	773	773	773	Near Certain	1	W	0
2166	Tyne and Wear	Stadium Village, Sheepfolds North	439668	556967	Res	C3	265	265	70	265	265	265	Hypothetical	1	W	0
2172	Tyne and Wear	Teal Farm North	432426	555603	Res	C3	566	566	566	566	566	566	Near Certain	1	W	0
2179	Tyne and Wear	Willow Farm land to south, Ryhope (North)	441111	552143	Res	C3	450	450	335	450	450	450	More than Likely	1	W	0
2180	Tyne and Wear	International Advanced Manufacturing Park	433633	559032	Emp	B1 - Business	0	0	391875	391875	391875	391875	More than Likely	1	W	1
2183	Richmondshire	Duchess of Kent Barracks	419054	497678	Res	C3	6	122	122	122	122	122	Reasonably Foreseeable	1	C	0
2186	Richmondshire	Former Colburn Pipeworks site (Phase 2)	420650	498040	Res	C3	6	201	171	171	171	171	Near Certain	1	C	1
2189	Richmondshire	Harley Hill	419957	497195	Res	C3	50	1085	120	420	570	720	Reasonably Foreseeable	1	C	0
2200	Richmondshire	Land W of Scotton Road	418311	497098	Res	C3	7	126	120	126	126	126	Reasonably Foreseeable	1	C	0
2208	Richmondshire	Windfall Allowance Sites 3 & Under	418326	500334	Res	C3	9	195	194	194	194	194	Reasonably Foreseeable	1	C	0
2217	Ryedale	Agri-Business Park and Business Technology Park, Eden House Road, Malton	480011	473790	Emp	mixed use	3750	3750	3750	3750	3750	3750	Near Certain	1	C	1
2221	Ryedale	Malton Enterprise park	477227	470517	Emp	B1,B2,B8	5109	5109	5109	5109	5109	5109	Near Certain	1	C	1
2225	Cumbria	Station Road, Appleby	368815	520860	Res	C3	0	101	101	101	101	101	More than Likely	1	C	0
2238	Cumbria	Carleton Heights, Penrith	352961	530449	Res	C3	18	560	560	560	560	560	More than Likely	1	C	1
2239	Cumbria	Croftlands East	328786	476254	Res	C3	16	330	180	330	330	330	More than Likely	1	W	0
2319	Cumbria	Land at Southend Road/Castle Hill Road, Penrith	351617	529814	Res	C3	5	161	120	161	161	161	More than Likely	1	C	1
2326	Cumbria	Land Behind Cross Croft, Appleby	369215	519848	Res	C3	5	115	115	115	115	115	Reasonably Foreseeable	1	C	0
2342	Cumbria	Land off Carleton Road, Penrith	353267	529748	Res	C3	8	149	149	149	149	149	More than Likely	1	C	1
2345	Cumbria	Land off Cross Croft/Back Lane, Appleby	369007	520122	Res	C3	5	142	142	142	142	142	More than Likely	1	C	1
2371	Cumbria	Land to west of Faraday Road, Kirby Stephen	377300	508591	Res	C3	5	128	120	128	128	128	Reasonably Foreseeable	1	C	0
2384	Cumbria	Nook Farm (Croftlands West)	328153	476293	Res	C3	16	330	230	330	330	330	Near Certain	1	W	0
2397	Cumbria	Raiselands, Penrith	350723	531226	Res	C3	8	229	229	229	229	229	More than Likely	1	C	1
2400	Cumbria	Salkeld Road/ Fairhill, Penrith	351093	531838	Res	C3	11	250	162	250	250	250	Reasonably Foreseeable	1	C	1
2443	Cumbria	Brough Main Street	366289	522193	EMP	NULL	15000	0	12000	13000	13000	13000	Reasonably Foreseeable	1	C	0
2444	Cumbria	Cross Croft Industrial estate	369594	520099	EMP	NULL	25600	0	12000	23600	23600	23600	Reasonably Foreseeable	1	C	0
2445	Cumbria	East of Burton Road	352657	489835	EMP	B1 - Business	65200	7762	12420	38812	46574	54336	Reasonably Foreseeable	1	W	0
2447	Cumbria	Gilwilly Industrial Estate Extension	350624	530574	EMP	B1 - Business	119100	14179	34026	70889	85068	99247	Near certain	1	C	1
2451	Cumbria	Kirkby Stephen Business Park	377113	509078	EMP	NULL	33300	0	12000	25000	30000	31300	Near certain	1	C	0
2452	Cumbria	Land Adjacent to Bridge End Business Park	349449	481616	EMP	B1 - Business	80488	9582	22998	47912	57494	67076	Reasonably Foreseeable	1	W	0
2453	Cumbria	Land adjacent to Croppers Paper Mill	350830	495961	EMP	B1 - Business	12000	0	10000	10000	10000	10000	Reasonably Foreseeable	1	W	0
2455	Cumbria	Land adjacent to Mainline Business Park	351565	481635	EMP	B2 - General	80700	9607	23058	48037	57644	67251	Reasonably Foreseeable	1	W	0
2456	Cumbria	Land at Elmsfield Park	351908	480068	EMP	B2 - General	30400	0	12000	25000	28400	28400	Reasonably Foreseeable	1	W	0
2457	Cumbria	Land at junction of A6 and B5035 (Eden 41)	350337	533776	EMP	B1 - Business	77000	9167	22002	45837	55004	64171	More than Likely	1	C	1
2458	Cumbria	Land at Lightburn Road	328004	477898	EMP	A1 - Retail, B	32500	3779	9072	18899	22678	26457	Near certain	1	W	1
2459	Cumbria	Land at Milnthorpe Road	351981	478748	EMP	B1 - Business	25800	0	12000	23800	23800	23800	Reasonably Foreseeable	1	W	0
2460	Cumbria	Land North of Gatebeck Lane,Â Gatebeck	354614	485834	EMP	B2 - General	31300	0	12000	25000	29300	29300	More than Likely	1	W	1
2461	Cumbria	Land North of Meadowbank Business Park	352244	494882	EMP	B1 - Business	51500	6131	14712	30651	36782	42913	Reasonably Foreseeable	1	W	0

ArupID	Author	SiteNm	X	Y	Dev	Land Use	NetArea	TotDwell	2029	2039	2044	2051	Uncertainty	Big Enough	Core Wide	TA
2462	Cumbria	Land on Sandside Road and Quarry Lane, Storth	348082	481017	EMP	NULL	30108	0	12000	25000	28108	28108	Reasonably Foreseeable	1	W	0
2465	Cumbria	Land Southwest of Mile Lane	350262	528809	EMP	B1 - Business	39000	2000	12000	25000	30000	35000	More than Likely	1	C	1
2468	Cumbria	Old Tebay Depot	361598	504966	EMP	NULL	14200	0	12000	12200	12200	12200	Reasonably Foreseeable	1	C	0
2469	Cumbria	Scroggs Wood	350962	490566	EMP	B1 - Business	112000	13333	31998	66663	79996	93329	Reasonably Foreseeable	1	W	0
2471	Cumbria	Skelgillside Workshops	372516	546248	EMP	NULL	13100	0	11100	11100	11100	11100	Reasonably Foreseeable	1	C	0
2472	Cumbria	Skirsgill	351466	528869	EMP	NULL	32900	0	12000	25000	30000	30900	Reasonably Foreseeable	1	C	0
2474	Cumbria	The Old Creamery	369521	519971	EMP	NULL	19800	0	12000	17800	17800	17800	Reasonably Foreseeable	1	C	0
2479	Cumbria	Former Corus Steel Works	298769	527179	R	c3	324	0	324	324	324	324	Near Certain	1	W	0
2487	Cumbria	Land at Oldside, Wokington	299487	529839	NR	B2	10	0	41440	41440	41440	41440	Reasonably Foreseeable	1	W	0
2488	Cumbria	Land North of Branthwaite Road, Lillyhall	302580	525558	NR	B2	18	0	70040	70040	70040	70040	Reasonably Foreseeable	1	W	0
2490	Cumbria	Land north of the Port of Workington	299304	530030	NR	B2	9	0	37360	37360	37360	37360	Reasonably Foreseeable	1	W	0
2491	Cumbria	Land off Hallwood Road, Lillyhall	301441	525129	NR	B8	10	0	47850	47850	47850	47850	Reasonably Foreseeable	1	W	0
2492	Cumbria	Land off Joesph Noble Road, Lillyhall	302638	525273	NR	B2	2	0	9520	9520	9520	9520	Reasonably Foreseeable	1	W	0
2493	Cumbria	Land off Jubilee Road, Lillyhall	301718	525536	NR	B8	10	0	49600	49600	49600	49600	Reasonably Foreseeable	1	W	0
2499	Cumbria	Whitecroft, Maryport	303045	535300	R	c3	300	300	265	265	265	265	Reasonably Foreseeable	1	W	0
2525	Cumbria	Land at Edgehill Park (part former Marchon Car Park), Whitehaven	297089	515672	Residential	C3	335	335	335	335	335	335	More than Likely	1	W	0
2537	Cumbria	North of former Marchon Site, Whitehaven	296576	516096	Residential	C3	532	532	532	532	532	532	Reasonably Foreseeable	1	W	0
2544	Cumbria	Red Lonning and Harras Moor Stage 3, Whitehaven	298254	517948	Residential	C3	370	370	370	370	370	370	Reasonably Foreseeable	1	W	0
2556	Cumbria	Brunthill	338013	559841	Emp	B1	370000	370000	370000	370000	370000	370000	Reasonably Foreseeable	1	W	0
2558	Cumbria	Kingmoor Park Harker Estate	339012	560812	Res	c3	311	311	311	311	311	311	Reasonably Foreseeable	1	W	0
2562	Cumbria	Land at Newhouse Farm, south-east of Orton Road	336868	555483	Res	c3	539	539	539	539	539	539	More than Likely	1	W	0
2563	Cumbria	Land between Carleton Road and Cumwhinton Road	342750	553339	Res	c3	400	400	400	400	400	400	Near certain	1	W	0
2565	Cumbria	Land north of Carleton Clinic, east of Cumwhinton Drive	343587	553778	Res	c3	347	347	347	347	347	347	Near certain	1	W	0
2568	Cumbria	Land off Windsor Way	340300	558476	Res	c3	415	415	415	415	415	415	Near certain	1	W	0
2570	Cumbria	Land south of Carlisle Road	352335	560724	Res	c3	260	260	260	260	260	260	Near certain	1	W	0
2571	Cumbria	Land to the south east of junction 44	339556	559604	Res	c3	290	290	290	290	290	290	Near certain	1	W	0
2574	Cumbria	South West Morton	337496	553701	Emp	B1	80000	80000	80000	80000	80000	80000	Reasonably Foreseeable	1	W	0
2575	Cumbria	St Cuthbert's Garden Village	340889	551554	Res	c3	10325	10325	3500	8500	10325	10325	Reasonably Foreseeable	1	W	0
2587	Hambleton	NM5A & D - North Northallerton Area, West of Northallerton - Middlesbrou	442091	491502	Res	c3	472	472	460	472	472	472	More than Likely	1	W	0
2588	Hambleton	NM5C - North Northallerton Area, East of Stokesley Road, Northallerton	442091	491502	Res	c3	645	645	235	645	645	645	Reasonably Foreseeable	1	W	0
2596	Hambleton	TM2A - South West Thirsk Area, West of Topcliffe Road, Sowerby	442091	491502	Res	c3	489	489	300	489	489	489	Near Certain	1	W	0
2598	Hambleton	Winton Road, Northallerton	442091	491502	Res	c3	435	435	35	435	435	435	Reasonably Foreseeable	1	W	0
2599	Richmondshire	Breckenbrough – Catterick SFA	420044	496662	Res	C3	170	170	170	170	170	170	More than Likely	1	C	1
2600	Richmondshire	Brough St Giles, Catterick	421340	498519	Res	C3	289	289	289	289	289	289	More than Likely	1	C	1
2601	Richmondshire	Chartermark Way, Colburn	420154	497807	Res	C3	0	0	0	0	0	0	More than Likely	1	C	0
2602	Richmondshire	Colburndale Phase 2	420539	498125	Res	C3	250	250	250	250	250	250	More than Likely	1	C	1
2604	Richmondshire	Cookson Way, Brough With St Giles	421181	498693	Res	C3	145	145	145	145	145	145	More than Likely	1	C	1
2605	Richmondshire	Cookson Way, Brough with St Giles - Site 128	421340	498519	Res	C3	289	289	289	289	289	289	More than Likely	1	C	1
2606	Richmondshire	Gatherley Road	422590	500555	Res	C3	250	250	250	250	250	250	More than Likely	1	C	1
2610	Richmondshire	Land At Arras Lines And Sour Beck	420047	497846	Res	C3	130	130	130	130	130	130	Near Certain	1	C	1
2611	Richmondshire	Land At Hill Top Farm, Leyburn	410819	490948	Res	C3	127	127	127	127	127	127	More than Likely	1	C	1
2612	Richmondshire	Land to North west of Brewary House, Byng Road, Catterick Garrison	418978	498014	Res	C3	125	125	125	125	125	125	More than Likely	1	C	0
2613	Richmondshire	Le Cateau – Catterick SFA	418937	497441	Res	C3	170	170	150	170	170	170	More than Likely	1	C	1
2614	Richmondshire	North of Caxton Close	422497	500452	Res	C3	124	124	124	124	124	124	More than Likely	1	C	0
2615	Richmondshire	Scotch Corner - Designer Outlet Centre	421690	505299	Emp	A1	23258	23258	23258	23258	23258	23258	More than Likely	1	C	1
2616	Richmondshire	Scotch Corner Designer Village Outlet – Phase 3 – Pre-App details Awaited	421690	505299	Emp	A1	5000	5000	5000	5000	5000	5000	Reasonably Foreseeable	1	C	0
2617	Richmondshire	Scotch Corner Interchange – Triangular area of land Adjacent VOSA weighbr	421690	505299	Emp	B2	0	0	0	0	0	0	More than Likely	1	C	1
2618	Richmondshire	Scotch Corner Phase 2 - Proposed Garden Centre	421690	505299	Emp	A1	10761	10761	10761	10761	10761	10761	More than Likely	1	C	1
2619	Richmondshire	Scotch Corner Services – Redevelopment incl Drive Thru	421690	505299	Emp	A1	5000	5000	5000	5000	5000	5000	More than Likely	1	C	1
2622	Richmondshire	Woodlands Ave, Colburn – Drive Thru Coffee Shop and Class A Units	420421	498151	Emp	A1	5000	5000	5000	5000	5000	5000	More than Likely	1	C	1

A.2 Core Scenario Development Trip Generation

Table 13-3: Development Trip Generation

Ref	Application Number	Authority	Name	Land Use	Classification	Trips per Hour					
						AM		PM		IP	
						O	D	O	D	O	D
C5	21_00184_FUL	Tees Valley	Faverdale Industrial Area (Argon)	B2/B8	Near Certain	10	25	29	6	13	12
C7	18/01055/FUL	Tees Valley	Yarm Road Industrial Area	B2/B8	Near Certain	40	171	152	61	96	91
C9	19_00036_OUT	Tees Valley	Yarm Road North (Dean and Chapter)	B2/B8	Near Certain	222	741	725	329	365	347
C11	19_00036_OUT	Tees Valley	Yarm Road North (Dean and Chapter)	A3	More than Likely	19	22	17	27	15	15
C15	12_00391_FUL	Tees Valley	Central Park	C3	Near Certain	136	36	80	136	58	62
C17	12_00391_FUL	Tees Valley	Central Park (Local Centre)	A1	Near Certain	87	623	517	104	241	229
C19	16_00985_OUT	Tees Valley	Lingfield Point Phase 1	C3	Near Certain	608	166	388	660	271	293
C20	16_00985_OUT	Tees Valley	Lingfield Point (excluding Phase 1)	C3	More than Likely	135	36	86	147	60	65
C21	16_00985_OUT	Tees Valley	Lingfield Point	B1	More than Likely	103	927	770	144	352	334
C22	16_00985_OUT	Tees Valley	Lingfield Point	A1	More than Likely	0	0	10	29	7	7
C39	15/00450/OUT	Tees Valley	West Park	C3	Near Certain	524	192	287	482	221	238
C63	13_00940_OUT	Tees Valley	Land off Sadberge Road,	C3	Near Certain	148	35	48	141	55	60

Ref	Application Number	Authority	Name	Land Use	Classification	Trips per Hour					
						AM		PM		IP	
						O	D	O	D	O	D
			Middleton St George, Darlington								
C67	15_00976_OUT	Tees Valley	High Stell/Gendon Gardens, Middleton St.George	C3	More than Likely	110	55	55	102	48	52
C80	17_00283_FUL	Tees Valley	School Aycliffe West	C3	Near Certain	58	9	23	44	20	22
C87	17/01195/OUT	Tees Valley	Land Off Yarm Road South of Railway Line, MSG (High Scrogg Farm)	C3	Near Certain	43	6	16	42	20	21
C630	21/00987/DC	Tees Valley	Ingenium Parc	B2/B8	Near Certain	265	459	433	208	247	235
C651	7/2011/0230	Durham	Black & Decker (Durham Gate)	C3	Near Certain	70	9	25	68	32	34
C653	DM/14/03136/RM	Durham	Bracks Farm	C3	Near Certain	123	47	71	116	53	57
C654	DM/16/04052/FPA	Durham	British Oxygen Co Vigo Lane	C3	Near Certain	87	33	42	76	35	38
C657	DM/18/00101/OUT	Durham	Dale Farm Land at Dale Road	C3	Near Certain	199	35	67	118	62	67
C658	CMA/7/91	Durham	Electrolux	C3	Near Certain	212	105	140	198	97	104
C662	3/2009/0426	Durham	Former Cemex Site	C3	More than Likely	14	2	5	13	6	7

Ref	Application Number	Authority	Name	Land Use	Classification	Trips per Hour					
						AM		PM		IP	
						O	D	O	D	O	D
C665	3/2003/0275	Durham	Former Riding Carpets Site	C3	Near Certain	29	4	11	29	13	14
C668	DM/20/03070/OUT	Durham	High Riggs (land adjacent to Darlington Road)	C3	Near Certain	54	20	37	53	24	26
C672	7/2013/0269/DM	Durham	Land at and to west of hartwall ltd butchers race green lane industrial estate	C3	Near Certain	80	18	29	62	28	30
C673	DM/17/00244/OUT	Durham	Land at Former Catkin Way	C3	Near Certain	65	23	26	47	24	26
C674	7/2011/0447/DM	Durham	Land at Spout Lane	C3	Near Certain	38	5	14	37	18	19
C675	DM/16/03310/FPA	Durham	Land at the east of Deerbolt HMYOI and north of Bowes Road	C3	Near Certain	67	24	32	51	26	28
C677	DM/16/01522/OUT	Durham	Land at the former Sedgefield community	C3	Near Certain	40	15	22	35	17	18

Ref	Application Number	Authority	Name	Land Use	Classification	Trips per Hour					
						AM		PM		IP	
						O	D	O	D	O	D
			hospital Salters Lane								
C678	DM/17/01765/FPA	Durham	Land at the north of Woodhouses farm and south of Etherley Moor Wigdan walls road	C3	More than Likely	152	55	60	101	55	59
C681	DM/14/02556/OUT	Durham	Land North of Durham Road	C3	Near Certain	201	45	72	156	70	76
C682	DM/15/02326/OUT	Durham	Land north of West Chilton Terrace	C3	Near Certain	131	242	204	105	101	109
C686	DM/18/00817/RM	Durham	Land South of Douglas Crescent	C3	Near Certain	272	84	152	262	114	123
C688	DM/16/03397/FPA	Durham	Land to the east of Clare lodge and Durham Road	C3	Near Certain	89	23	40	76	34	36
C691	DM/16/04062/OUT	Durham	Land to the north of Etherley Moor	C3	More than Likely	96	35	38	64	35	37
C692	DM/16/00985/OUT	Durham	Land to the north of Middridge Road	C3	Near Certain	113	43	63	107	48	52

Ref	Application Number	Authority	Name	Land Use	Classification	Trips per Hour					
						AM		PM		IP	
						O	D	O	D	O	D
C694	DM/16/02426/OUT	Durham	Land to the south of 100 to 106 dean road	C3	Near Certain	72	27	40	68	31	33
C695	DM/15/03808/OUT	Durham	Land to the south of Eden Drive	C3	Near Certain	114	42	61	105	48	51
C711	7/2012/0005/DM	Durham	Site o - cobblers hall	C3	Near Certain	24	3	9	23	11	12
C715	7/2009/0274/DM	Durham	Thorn Lighting	C3	Near Certain	56	7	20	54	25	27
C716	7/2001/0611/DM	Durham	Whitworth Park (All Phases)	C3	Near Certain	344	75	219	219	127	137
C2186	12/00669/OUT	Richmondshire	Former Colburn Pipeworks site (Phase 2)	C3	Near Certain	225	262	304	272	158	170
C2217	14/00426/MOUTE	Ryedale	Agri-Business Park and Business Technology Park, Eden House Road, Malton	mixed use	Near Certain	158	227	285	169	152	144
C2221	10/00150/MOUT	Ryedale	Malton Enterprise Park	B1,B2,B8	Near Certain	22	87	62	13	33	32
C2225	20/0013	Cumbria	Station Road, Appleby	C3	More than Likely	36	5	13	34	16	18

Ref	Application Number	Authority	Name	Land Use	Classification	Trips per Hour					
						AM		PM		IP	
						O	D	O	D	O	D
C2238	16/0811	Cumbria	Carleton Heights, Penrith	C3	More than Likely	39	116	111	53	48	51
C2319	05/0954	Cumbria	Land at Southend Road/Castle Hill Road, Penrith	C3	More than Likely	149	225	421	392	179	191
C2342	19/0426	Cumbria	Land off Carleton Road, Penrith	C3	More than Likely	65	19	36	59	27	29
C2345	11/0989	Cumbria	Land off Cross Croft/Back Lane, Appleby	C3	More than Likely	63	24	35	59	27	29
C2397	14/0405	Cumbria	Raiselands, Penrith	C3	More than Likely	108	35	55	101	45	48
C2447	-	Cumbria	Gilwilly Industrial Estate Extension	B1/B2/B8	Near certain	0	6	4	5	3	3
C2451	19/0198	Cumbria	Kirkby Stephen Business Park	NULL	Near certain	31	136	123	50	77	74
C2457	17/0928	Cumbria	Land at junction of A6 and B5035 (Eden 41)	B1/B2/B8	More than Likely	64	81	80	20	45	43

Ref	Application Number	Authority	Name	Land Use	Classification	Trips per Hour					
						AM		PM		IP	
						O	D	O	D	O	D
C2465	19/0636	Cumbria	Land Southwest of Mile Lane	B1/B2/B8	More than Likely	8	48	43	6	19	18
C2599	16/00145/OUT	Richmondshire	Breckenbrough – Catterick SFA	C3	More than Likely	58	20	33	53	25	26
C2600	21/00529/FULL	Richmondshire	Brough St Giles, Catterick	C3	More than Likely	86	37	31	78	35	37
C2601	21/01051/OUT	Richmondshire	Chartermark Way, Colburn	C3	More than Likely	0	0	0	0	0	0
C2602	12/00669/OUT	Richmondshire	Colburndale Phase 2	C3	More than Likely	225	262	304	272	158	170
C2604	20/00322/FUL	Richmondshire	Cookson Way, Brough with St Giles	C3	More than Likely	54	23	20	49	22	23
C2605	21/00529/FULL	Richmondshire	Cookson Way, Brough with St Giles - Site 128	C3	More than Likely	86	37	31	78	35	37
C2606	11/00521/OUT	Richmondshire	Gatherley Road	C3	More than Likely	143	43	48	125	53	57
C2610	14/00134/OUT	Richmondshire	Land At Arras Lines and Sour Beck	C3	Near Certain	52	17	0	0	10	11
C2611	19/00742/FULL	Richmondshire	Land At Hill Top Farm, Leyburn	C3	More than Likely	54	18	20	45	20	22

Ref	Application Number	Authority	Name	Land Use	Classification	Trips per Hour					
						AM		PM		IP	
						O	D	O	D	O	D
C2612	21/00713/OUT	Richmondshire	Land to North west of Brewary House, Byng Road, Catterick Garrison	C3	More than Likely	19	3	7	19	9	10
C2613	16/00145/OUT	Richmondshire	Le Cateau – Catterick SFA	C3	More than Likely	64	22	36	58	27	29
C2614	21/00797/FULL	Richmondshire	North of Caxton Close	C3	More than Likely	19	3	7	19	9	9
C2615	15/00806/FULL	Richmondshire	Scotch Corner - Designer Outlet Centre	A1	More than Likely	12	21	268	459	138	131
C2617	-	Richmondshire	Scotch Corner Interchange – Triangular area of land Adjacent VOSA weighbridge	B2	More than Likely	0	0	0	0	0	0
C2618	20/00955/FULL	Richmondshire	Scotch Corner Phase 2 - Proposed Garden Centre	A1	More than Likely	1	52	295	193	98	93
C2619	19/00395/FULL	Richmondshire	Scotch Corner Services – Redevelop-	A1	More than Likely	49	49	51	49	36	34

Ref	Application Number	Authority	Name	Land Use	Classification	Trips per Hour					
						AM		PM		IP	
						O	D	O	D	O	D
			ment incl Drive Thru								
C2622	19/00218/FULL	Richmondshire	Woodlands Ave, Colburn – Drive Thru Coffee Shop and Class A Units	A1	More than Likely	18	21	30	29	18	17

B Operational Model Results – Base Year

Table 13-: Ullswater Road Roundabout - 2019 Junctions 9 Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)					
Ullswater Road North Approach	6	463	0.3	2.09	0.23
Ullswater Road South Approach	3	1029	0.8	2.51	0.44
Haweswater Road	6	260	0.2	3.11	0.20
PM Peak (17:00-18:00)					
Ullswater Road North Approach	9	653	0.5	2.30	0.32
Ullswater Road South Approach	3	847	0.6	2.24	0.37
Haweswater Road	8	293	0.3	2.90	0.21

Table 13-4: Ullswater Road T Junction - 2019 Junctions 9 Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)					
Clifford Road Left Turn	8	113	0.3	8.10	0.22
Clifford Road Right Turn	12	8	0.0	9.59	0.02
PM Peak (17:00-18:00)					
Clifford Road Left Turn	8	206	0.7	11.67	0.42
Clifford Road Right Turn	12	12	0.0	10.56	0.04

Table 13-5: Stricklandgate T Junction - 2019 Junctions 9 Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)					
Stricklandgate Straight	13	551	18.1	108.97	1.01
PM Peak (17:00-18:00)					
Stricklandgate Straight	12	525	11.5	76.09	0.96

Table 13-6: Roper Street Signalised Junction - 2019 LinSig Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Mean Max Queue	Av. Delay Per PCU (s/pcu)	Deg Sat
AM Peak (08:00-09:00)					
Roper Street	22	462	12.9	46.3	82.5%
Kilgour Street Left Turn	21	116	2.8	39.7	34.1%
Kilgour Street Straight	18	60	1.6	49.6	30%
Kilgour Street Right Turn	18	154	5.3	75.5	77%
Victoria Road North Approach	7	437	12.1	45.9	80.9%
Victoria Road South Approach	23	397	10.6	43.5	76.3%
PRC for Signalled Lanes (%): 9.1 Total Delay for Signalled Lanes (pcuHr): 21.65 Cycle Time (s): 90 PRC Over All Lanes (%): 9.1 Total Delay Over All Lanes(pcuHr): 21.65					
PM Peak (17:00-18:00)					
Roper Street	33	322	9.6	55.1	80.5%
Kilgour Street Left Turn	25	181	4	32.9	37.7%
Kilgour Street Straight	25	131	3.2	40.5	38.5%
Kilgour Street Right Turn	25	273	8.4	60.3	80.3%
Victoria Road North Approach	13	405	10.2	39.0	72.3%
Victoria Road South Approach	29	369	9.2	38.1	68.3%
PRC for Signalled Lanes (%):11.8 Total Delay for Signalled Lanes (pcuHr): 20.93 Cycle Time (s): 90 PRC Over All Lanes (%):11.8 Total Delay Over All Lanes(pcuHr): 20.93					

Table 13-7: Eamont Bridge Signalised Junction - 2019 LinSig Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Mean Max Queue	Av. Delay Per PCU (s/pcu)	Deg Sat
AM Peak (08:00-09:00)					
A6 Penrith Sbd	26	517	30.4	145.0	102.2%
A6 Penrith Nbd	0	669	0.3	1.6	36.2%
A6 Bridge Sbd	0	517	0.2	1.4	28.1%
A6 Bridge Nbd	28	669	38.7	143.1	102.9%
Skirsgill Lane	(no data)	34	3.2	198.8	57.5%
Skirsgill Lane Exit	0	34	0.0	1.0	1.8%
PRC for Signalled Lanes (%): -14.3 Total Delay for Signalled Lanes (pcuHr): 49.29 Cycle Time (s): 274 PRC Over All Lanes (%): -14.3 Total Delay Over All Lanes(pcuHr): 49.78					
PM Peak (17:00-18:00)					
A6 Penrith Sbd	23	570	17.8	46.7	87.0%
A6 Penrith Nbd	0	434	0.2	1.3	24.1%
A6 Bridge Sbd	0	570	0.2	1.5	31.7%
A6 Bridge Nbd	33	434	13.8	57.6	87.4%
Skirsgill Lane Ebd	(no data)	34	3.2	196.7	57.1%
Skirsgill Lane Wbd	0	34	0.0	1.0	1.9%
PRC for Signalled Lanes (%): 2.9 Total Delay for Signalled Lanes (pcuHr): 16.19 Cycle Time (s): 274 PRC Over All Lanes (%): 2.9 Total Delay Over All Lanes(pcuHr): 16.59					

Table 13-8: Center Parcs T Junction - 2019 Junctions 9 Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Queue	Delay	RFC
AM Peak (10:00-11:00)					
Center Parcs Left Turn	12	248	1.3	17.63	0.57
Center Parcs Right Turn	12	92	0.7	26.53	0.43
A66 Ebd. Right Turn	4	58	0.1	8.15	0.13
PM Peak (15:00-16:00)					
Center Parcs Left Turn	10	103	0.3	9.30	0.23
Center Parcs Right Turn	10	47	0.5	35.76	0.34
A66 Ebd. Right Turn	6	198	0.7	12.41	0.43

Table 13-9: Kirkby Stephen Roundabout - 2019 Junctions 9 Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)					
A685 North	2	284	0.5	5.90	0.34
A685 South	2	255	0.4	5.49	0.30
Silver Street	1	36	0.1	4.95	0.05
PM Peak (17:00-18:00)					
A685 North	4	320	0.6	6.33	0.38
A685 South	2	310	0.6	6.17	0.37
Silver Street	4	56	0.1	5.38	0.08

Table 13-10: Kirkby Stephen Signalised Junction - 2019 LinSig Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Mean Max Queue	Av. Delay Per PCU (s/pcu)	Deg Sat
AM Peak (08:00-09:00)					
Market Street	19	265	6.7	42.5	63.1%
Market Street Exit	0	255	0.1	1.2	14.2%
High Street	15	234	6.1	44.4	61.6%
High Street Exit	0	249	0.1	1.2	13.8%
B6259	29	21	0.5	46.0	10.5%
B659 Exit	0	16	0.0	1.0	0.9%
PRC for Signalled Lanes (%): 42.6 Total Delay for Signalled Lanes (pcuHr): 6.28 Cycle Time (s): 90 PRC Over All Lanes (%): 42.6 Total Delay Over All Lanes(pcuHr): 6.45					
PM Peak (17:00-18:00)					
Market Street	35	286	7.8	47.8	71.5%
Market Street Exit	0	311	0.1	1.2	17.3%
High Street	24	290	8.0	48.4	72.5%
High Street Exit	0	258	0.1	1.2	14.3%
B6259	18	21	0.5	46.0	10.5%
B659 Exit	0	28	0.0	1.0	1.6%
PRC for Signalled Lanes (%): 24.1 Total Delay for Signalled Lanes (pcuHr): 7.97 Cycle Time (s): 90 PRC Over All Lanes (%): 24.1 Total Delay Over All Lanes(pcuHr): 8.17					

Table 13-11: Brough Interchange North Cross Roads - 2019 Junctions 9 Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)					
A66 Ebd. Offslip Left Turn	0	1	0.0	4.72	0.0
A66 Ebd. Right Turn	2	88	0.2	7.79	0.17
A685 Nbd. Right Turn	0	206	0.0	9.17	0.40
PM Peak (17:00-18:00)					
A66 Ebd. Offslip Left Turn	0	3	0.0	4.80	0.0
A66 Ebd. Right Turn	1	91	0.2	9.97	0.18
A685 Nbd. Right Turn	0	246	1.0	9.91	0.47

Table 13-12: Brough Interchange South Cross Roads - 2019 Junctions 9 Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)					
A66 Wbd. Offslip Left Turn	3	212	0.4	6.90	0.31
A66 Wbd. Right Turn	2	14	0.0	6.20	0.03
A685 Sbd. Right Turn	0	57	0.2	5.28	0.12
PM Peak (17:00-18:00)					
A66 Wbd. Offslip Left Turn	1	174	0.3	6.25	0.25
A66 Wbd. Right Turn	2	23	0.0	6.20	0.04
A685 Sbd. Right Turn	0	42	0.1	5.37	0.08

Table 13-13: Stainmore T Junction - 2019 Junctions 9 Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)					
Left Turn	0	0	0.0	0.0	0.0
Right Turn	0	4	0.0	0.0	0.0
A66 Eastbound Right Turn	0	0	0.0	0.0	0.0
PM Peak (17:00-18:00)					
Left Turn	14	0	0.0	0.0	0.0
Right Turn	14	5	0.0	6.43	0.01
A66 Eastbound Right Turn	2	0	0.0	0.0	0.0

Table 13-14: Bowes South Slip T Junction - 2019 Junctions 9 Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)					
Left Turn to A66 Wbd Slip On	0	5	0.0	5.86	0.01
Right Turn to A67 North	0	29	0.1	6.74	0.06
PM Peak (17:00-18:00)					
Left Turn to A66 Wbd Slip On	0	5	0.0	5.71	0.01
Right Turn to A67 North	0	24	0.0	6.55	0.05

Table 13-15: Barnard Castle Bridge Signalised Junction - 2019 LinSig Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Mean Max Queue	Av. Delay Per PCU (s/pcu)	Deg Sat
AM Peak (08:00-09:00)					
Bridgegate	21	296	6.2	28.7	45.8%
The Sills North Approach	18	278	6.0	30.5	46.1%
The Sills South Approach	24	33	0.9	51.0	19.1%
PRC for Signalled Lanes (%):95.4 Cycle Time (s): 90					
PM Peak (17:00-18:00)					
Bridgegate	35	238	5.4	34.0	46.0%
The Sills North Approach	26	328	6.5	25.4	44.8%
The Sills South Approach	27	35	0.9	51.2	20.3%
PRC for Signalled Lanes (%):95.6 Cycle Time (s): 90					

Table 13-16: Smallways Staggered Junction- 2019 Junctions 9 Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)					
Smallways Left Turn	22	16	0.0	5.61	0.03
Smallways Right Turn / Straight	22	66	0.1	6.45	0.12
A66 Wbd Right Turn	2	11	0.0	6.00	0.02
Lanehead Ln Left Turn	8	19	0.0	7.70	0.04
Lanehead Ln Right Turn / Straight	8	32	0.1	10.60	0.09
A66 Ebd Right Turn	10	20	0.0	5.74	0.03
PM Peak (17:00-18:00)					
Smallways Left Turn	3	10	0.0	5.54	0.02
Smallways Right Turn / Straight	3	20	0.0	5.96	0.04
A66 Wbd Right Turn	5	13	0.0	5.79	0.02
Lanehead Ln Left Turn	5	8	0.0	7.01	0.02
Lanehead Ln Right Turn / Straight	5	11	0.0	9.75	0.03
A66 Ebd Right Turn	0	26	0.0	5.92	0.04

Table 13-17: Mainsgill Farm Cross Roads - 2019 Junctions 9 Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Queue	Delay	RFC
Saturday Peak (11:15-12:15)					
Mainsgill Farm Left Turn	(no data)	69	0.3	12.06	0.20
Mainsgill Farm Right Turn	(no data)	41	0.9	73.56	0.49
A66 Wbd Right Turn	13	2	0.0	7.52	0.0
Moor Lane Left Turn	17*	6	0.0	7.91	0.01
Moor Lane Right Turn	17*	3	0.0	45.20	0.04
A66 Ebd Right Turn	7	22	0.1	9.93	0.06
*PM mid-week data taken as no data for Saturday available					

Table 13-18: Forcett Lane Staggered Junction - 2019 Junctions 9 Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)					
Forcett Lane Approach Left Turn / Straight	6	47	0.1	5.52	0.07
Forcett Lane Approach Right Turn	6	0	0.0	0.0	0.0
A66 Wbd Right Turn	0	42	0.1	5.81	0.07
B6274 Left Turn / Straight	11	54	0.1	5.89	0.09
B6274 Right Turn	11	0	0.0	0.0	0.0
A66 Ebd Right Turn	4	54	0.1	5.36	0.08
PM Peak (17:00-18:00)					
Forcett Lane Approach Left Turn / Straight	1	48	0.1	5.93	0.08
Forcett Lane Approach Right Turn	1	0	0.0	0.0	0.0
A66 Wbd Right Turn	2	53	0.1	6.11	0.09
B6274 Left Turn / Straight	19	46	0.1	5.99	0.08
B6274 Right Turn	19	0	0.0	0.0	0.0
A66 Ebd Right Turn	4	50	0.1	5.70	0.08

Table 13-19: Hargill Staggered Junction - 2019 Junctions 9 Base Year Junction Performance

	Observed	Modelled			
	Delay	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)					
Hargill Left Turn	10	0	0.0	0.0	0.0
Hargill Straight / Right Turn	10	84	0.3	10.93	0.22
A66 Wbd Right Turn	9	0	0.0	0.00	0.00
Moor Road Left Turn	5	0	0.0	0.00	0.00
Moor Road Straight / Right Turn	5	15	0.0	6.60	0.03
A66 Ebd Right Turn	0	0	0.0	0.00	0.00
PM Peak (17:00-18:00)					
Hargill Left Turn	17	0	0.0	0.00	0.00
Hargill Straight / Right Turn	17	86	0.3	12.33	0.24
A66 Wbd Right Turn	21	1	0.0	5.14	0.00
Moor Road Left Turn	7	0	0.0	0.00	0.00
Moor Road Straight / Right Turn	7	14	0.0	7.13	0.03
A66 Ebd Right Turn	23	0	0.0	0.00	0.00

C Operational Model Results – Forecast Year

C.1 Design Model Results

The following tables show flow in Vehicles per hour, queue, Delay in Seconds per vehicle and RFC (Ratio of Flow to Capacity)

Table 13-: Ullswater Road Roundabout - 2044 Junctions 9 Results

	Do Minimum				Do Something			
	Flow	Queue	Delay	RFC	Flow	Queue	Delay	RFC
AM Peak Hour (08:00-09:00)								
Ullswater Road North Approach	496	0.3	2.25	0.25	546	0.4	2.49	0.29
Ullswater Road South Approach	1251	1.2	3.02	0.54	1431	1.6	3.62	0.61
Haweswater Road	236	0.3	3.52	0.20	287	0.4	4.33	0.28
PM Peak Hour (17:00-18:00)								
Ullswater Road North Approach	653	0.5	2.50	0.33	851	1.0	3.78	0.50
Ullswater Road South Approach	1084	0.9	2.67	0.47	1403	1.5	3.60	0.61
Haweswater Road	276	0.3	3.32	0.22	343	0.5	4.72	0.33

Table 13-20: Ullswater Road T Junction - 2044 Junctions 9 Results

	Do Minimum				Do Something			
	Flow	Queue	Delay	RFC	Flow	Queue	Delay	RFC
AM Peak Hour (08:00-09:00)								
Clifford Road Left Turn	324	1.7	17.88	0.64	350	2.5	24.65	0.73
Clifford Road Right Turn	6	0.0	14.53	0.03	6	0.0	20.92	0.04
PM Peak Hour (17:00-18:00)								
Clifford Road Left Turn	299	1.6	17.87	0.62	323	3.5	37.84	0.79
Clifford Road Right Turn	10	0.0	14.32	0.04	9	0.1	37.14	0.09

Table 13-21: Stricklandgate T Junction - 2044 Junctions 9 Results

	Do Minimum				Do Something			
	Flow	Queue	Delay	RFC	Flow	Queue	Delay	RFC
AM Peak Hour (08:00-09:00)								
Stircklandgate Straight	579	35.1	188.56	1.09	582	32.5	174.48	1.07
PM Peak Hour (17:00-18:00)								
Stircklandgate Straight	570	38.4	208.95	1.10	592	39.9	208.77	1.10

Table 13-22: Roper Street Signalised Junction - 2044 LinSig Results

	Do Minimum				Do Something			
	Flow	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)	Deg Sat	Flow	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)	Deg Sat
AM Peak (08:00-09:00)								
Roper Street	569	28.8	124.1	101.6%	508	16.3	59.6	90.7%
Kilgour Street Left Turn	128	2.8	32.3	27.8%	121	2.6	32.1	26.3%
Kilgour Street Straight	197	5.3	48.6	61.6%	187	5.0	47.4	58.4%
Kilgour Street Right Turn	308	13.9	110.0	96.3%	299	12.2	95.1	93.4%
Victoria Road North Approach	384	13.6	74.0	91.4%	388	14.1	77.2	92.4%
Victoria Road South Approach	396	18.8	116.7	99.0%	343	10.9	62.4	85.8%
	PRC for Signalled Lanes:-12.9 Total Delay for Signalled Lanes:53.57 Cycle Time (s): 90 PRC Over All Lanes:-12.9 Total Delay Over All Lanes: 53.574				PRC for Signalled Lanes:-3.8 Total Delay for Signalled Lanes:34.11 Cycle Time (s): 90 PRC Over All Lanes:-3.8 Total Delay Over All Lanes:34.11			
PM Peak Hour (17:00-18:00)								
Roper Street	418	12.9	57.9	87.1%	357	9.9	48.0	77.6%
Kilgour Street Left Turn	145	3.0	30.6	29.0%	138	2.8	28.4	25.6%
Kilgour Street Straight	255	7.1	50.3	70.8%	254	6.6	43.9	63.5%
Kilgour Street Right Turn	319	11.1	72.8	88.6%	303	8.6	50.7	75.8%
Victoria Road North Approach	395	12.1	57.5	85.9%	343	9.7	49.7	78.0%
Victoria Road South Approach	334	9.2	48.1	75.9%	266	6.8	42.6	63.3%
	PRC for Signalled Lanes:1.6 Total Delay for Signalled Lanes:28.73 Cycle Time (s): 90 PRC Over All Lanes:1.6 Total Delay Over All Lanes:28.73				PRC for Signalled Lanes:15.5 Total Delay for Signalled Lanes:21.1 Cycle Time (s): 90 PRC Over All Lanes:15.5 Total Delay Over All Lanes:21.1			

Table 13-23: Eamont Bridge Signalised Junction - 2044 LinSig Results

	Do Minimum				Do Something			
	Flow	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)	Deg Sat	Flow	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)	Deg Sat
AM Peak (08:00-09:00)								
A6 Northern Approach Sbd	620	45.0	199.9	106.0%	567	39.3	190.2	105.3%
A6 Northern Approach Nbd	607	0.2	1.5	31.8%	657	0.3	1.5	34.3%
A6 Bridge Sbd	620	0.2	1.5	32.5%	567	0.2	1.4	30.0%
A6 Bridge Nbd	607	44.5	204.5	106.2%	657	48.2	204.3	106.4%
Skirsgill Lane Ebd	34	3.2	198.8	57.5%	34	3.2	198.8	57.5%
Skirsgill Lane Wbd	34	0.0	1.0	1.8%	34	0.0	1.0	1.8%
	PRC for Signalled Lanes:-18.0% Cycle Time (s): 274				PRC for Signalled Lanes:-18.2% Cycle Time (s): 274			
PM Peak Hour (17:00-18:00)								
A6 Penrith Sbd	588	19.5	51.1	89.5%	585	20.1	54.8	90.9%
A6 Penrith Nbd	445	0.2	1.3	24.7%	465	0.2	1.3	25.8%
A6 Bridge Sbd	588	0.2	1.5	32.7%	585	0.2	1.5	32.5%
A6 Bridge Nbd	445	14.7	61.0	89.1%	465	15.9	63.8	90.7%
Skirsgill Lane Ebd	34	3.2	198.8	57.5%	34	3.2	198.8	57.5%
Skirsgill Lane Wbd	34	0.0	1.0	1.9%	34	0.0	1.0	1.9%
	PRC for Signalled Lanes:0.6% Cycle Time (s): 274				PRC for Signalled Lanes:-1.0% Cycle Time (s): 274			

Table 13-24: Center Parcs T Junction - 2044 Junctions 9 Results – Do Minimum

	Do Minimum			
	Flow	Queue	Delay	RFC
AM Peak (10:00-11:00)				
Center Parcs Right Turn	217	84.6	2916.91	2.93
Center Parcs Left Turn	583	214.4	1757.9	1.85
A66 Ebd. Right Turn	136	0.5	12.92	0.35
PM Peak (15:00-16:00)				
Center Parcs Right Turn	137	165.8	>3600	>2
Center Parcs Left Turn	299	10.3	117.84	0.97
A66 Ebd. Right Turn	576	441.2	2456.07	1.65

Table 13-25: Center Parcs T Junction - 2044 Junctions 9 Results – Do Something

	Do Something			
	Flow	Queue	Delay	RFC
AM Peak (10:00-11:00)				
A66 Ebd Left Turn	64	0.1	5.34	0.09
Center Parcs Right Turn	217	2.6	9.11	0.61
PM Peak (15:00-16:00)				
A66 Ebd Left Turn	224	0.6	9.38	0.39
Center Parcs Right Turn	137	0.8	7.48	0.36

Table 13-26: Kirkby Thore Eastbound Slip T Junction - 2044 Junctions 9 Results – Do Something

	Do Something			
	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)				
A66 Ebd Slip Left Turn	70	0.1	5.86	0.11
A66 Ebd Slip Right Turn	59	0.1	7.56	0.12
British Gypsum Right Turn	22	0.0	4.92	0.04
PM Peak (17:00-18:00)				
A66 Ebd Slip Left Turn	68	0.1	5.94	0.11
A66 Ebd Slip Right Turn	63	0.1	7.52	0.13
British Gypsum Right Turn	21	0.0	4.97	0.03

Table 13-27: Kirkby Thore Westbound Slip T Junction - 2044 Junctions 9 Results – Do Something

	Do Something			
	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)				
A66 Wbd Slip Left Turn	28	0.0	5.34	0.04
A66 Wbd Slip Right Turn	29	0.1	7.18	0.06
British Gypsum Right Turn	115	0.3	6.52	0.20
PM Peak (17:00-18:00)				
A66 Wbd Slip Left Turn	31	0.0	5.14	0.05
A66 Wbd Slip Right Turn	18	0.0	7.31	0.04
British Gypsum Right Turn	98	0.2	6.33	0.17

Table 13-28: Kirkby Stephen Roundabout - 2044 Junctions 9 Results

	Do Minimum				Do Something			
	Flow	Queue	Delay	RFC	Flow	Queue	Delay	RFC
AM Peak Hour (08:00-09:00)								
A685 North Approach	408	0.9	7.61	0.49	411	1.0	7.67	0.49
A685 South Approach	360	0.7	6.72	0.43	383	0.8	6.94	0.45
Silver Street	38	0.1	5.51	0.06	30	0.1	5.57	0.05
PM Peak Hour (17:00-18:00)								
A685 North Approach	432	1.1	8.13	0.52	424	1.0	7.95	0.51
A685 South Approach	443	1.1	8.26	0.53	460	1.2	8.41	0.54
Silver Street	60	0.1	6.28	0.10	43	0.1	6.21	0.08

Table 13-29: Kirkby Stephen Signalised Junction - 2044 LinSig Results

	Do Minimum				Do Something			
	Flow	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)	Deg Sat	Flow	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)	Deg Sat
AM Peak (08:00-09:00)								
Market Street	391	14.6	79.9	93.1%	407	17.4	99.2	96.9%
High Street	336	11.4	70.0	88.4%	361	14.7	93.6	95.0%
B6259	22	0.6	46.1	11.0%	23	0.6	46.2	11.5%
	PRC for Signalled Lanes:-3.4 Total Delay for Signalled Lanes:15.49 Cycle Time (s): 90 PRC Over All Lanes:-3.4 Total Delay Over All Lanes:15.75				PRC for Signalled Lanes:-7.7 Total Delay for Signalled Lanes:20.89 Cycle Time (s): 90 PRC Over All Lanes:-7.7 Total Delay Over All Lanes: 21.17			
PM Peak Hour (17:00-18:00)								
Market Street	396	25.0	173.9	104.2%	404	28.4	200.0	106.3%
High Street	422	21.4	127.2	100.5%	443	29.4	186.5	105.5%
B6259	24	0.6	46.3	12.0%	25	0.6	46.4	12.5%
	PRC for Signalled Lanes:-15.8 Total Delay for Signalled Lanes:34.35 Cycle Time (s): 90 PRC Over All Lanes: -15.8 Total Delay Over All Lanes: 34.64				PRC for Signalled Lanes:-18.1 Total Delay for Signalled Lanes:45.71 Cycle Time (s): 90 PRC Over All Lanes:-18.1 Total Delay Over All Lanes: 46.0			

Table 13-30: Brough Interchange North Cross Roads - 2044 Junctions 9 Results

	Do Minimum				Do Something			
	Flow	Queue	Delay	RFC	Flow	Queue	Delay	RFC
AM Peak Hour (08:00-09:00)								
A66 Ebd. Offslip Left Turn	1	0.0	4.79	0.0	19	0.0	5.00	0.03
A66 Ebd. Right Turn	106	0.3	8.96	0.23	134	0.4	10.06	0.29
A685 Nbd. Right Turn	334	2.0	15.53	0.65	377	2.8	20.43	0.73
PM Peak Hour (17:00-18:00)								
A66 Ebd. Offslip Left Turn	3	0.0	4.79	0.0	24	0.0	4.99	0.04
A66 Ebd. Right Turn	83	0.2	8.65	0.18	128	0.4	9.17	0.26
A685 Nbd. Right Turn	386	3.0	20.30	0.74	341	1.8	14.86	0.64

Table 13-31: Brough Interchange South Cross Roads - 2044 Junctions 9 Results

	Do Minimum				Do Something			
	Flow	Queue	Delay	RFC	Flow	Queue	Delay	RFC
AM Peak Hour								
A66 Wbd. Offslip Left Turn	347	1.0	9.79	0.51	367	1.2	10.67	0.55
A66 Wbd. Right Turn	18	0.0	6.59	0.04	16	0.0	6.87	0.03
A685 Sbd. Right Turn	63	0.2	5.54	0.14	93	0.4	6.03	0.21
PM Peak Hour (17:00-18:00)								
A66 Wbd. Offslip Left Turn	283	0.7	7.88	0.41	302	0.8	8.50	0.44
A66 Wbd. Right Turn	28	0.1	6.51	0.05	25	0.1	6.82	0.05
A685 Sbd. Right Turn	50	0.2	5.80	0.10	77	0.3	6.10	0.17

Table 13-32: Stainmore T Junction - 2044 Junctions 9 Results

	Do Minimum				Do Something			
	Flow	Queue	Delay	RFC	Flow	Queue	Delay	RFC
AM Peak Hour								
Left Turn	0	0.0	0.0	0.0	0	0.0	0.0	0.0
Right Turn	5	0.0	7.48	0.01	5	0.0	9.65	0.01
A66 Eastbound Right Turn	0	0.0	0.0	0.0	0	0.0	0.0	0.0
PM Peak Hour (17:00-18:00)								
Left Turn	0	0.0	0.0	0.0	0	0.0	0.0	0.0
Right Turn	5	0.0	8.12	0.01	6	0.0	13.13	0.02
A66 Eastbound Right Turn	0	0.0	0.0	0.0	0	0.0	0.0	0.0

Table 13-33: Bowes Eastbound Slip T Junction - 2044 Junctions 9 Results – Do Something

	Do Something			
	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)				
A67 South Right Turn	59	0.1	6.75	0.11
PM Peak (17:00-18:00)				
A67 South Right Turn	58	0.1	6.64	0.11

Table 13-34: Bowes Westbound Slip T Junction - 2044 Junctions 9 Results

	Do Minimum				Do Something			
	Flow	Queue	Delay	RFC	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)								
Left Turn to A66 Wbd Slip On	5	0.0	5.94	0.01	5	0.0	6.14	0.01
Right Turn to A67 North	35	0.1	6.86	0.07	77	0.2	7.39	0.15
PM Peak Hour (17:00-18:00)								
Left Turn to A66 Wbd Slip On	6	0.0	5.79	0.01	6	0.0	6.11	0.01
Right Turn to A67 North	25	0.1	6.72	0.05	80	0.2	7.39	0.15

Table 13-35: Hulands Quarry T Junction - 2044 Junctions 9 Results

	Do Something 50% West				Do Something 50% East			
	Flow	Queue	Delay	RFC	Flow	Queue	Delay	RFC
PM Peak Hour (17:00-18:00)								
Hulands Quarry	50	0.1	6.83	0.09	50	0.1	6.49	0.09
A67 Right Turn	101	0.1	4.95	0.05	165	0.1	5.08	0.04

Table 13-36: Barnard Castle Bridge Signalised Junction - 2044 LinSig Results

	Do Minimum				Do Something			
	Flow	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)	Deg Sat	Flow	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)	Deg Sat
AM Peak (08:00-09:00)								
Bridgegate	333	7.3	31.1	53.3%	345	7.3	29.1	51.6%
The Sills North Approach	330	7.2	31.0	52.8%	291	6.5	32.1	50.0%
The Sills South Approach	38	1.0	51.5	22.0%	65	1.8	55.3	37.7%
	PRC for Signalled Lanes:68.9% Cycle Time (s): 90				PRC for Signalled Lanes:74.3% Cycle Time (s): 90			
PM Peak Hour (17:00-18:00)								
Bridgegate	313	7.2	34.4	55.8%	271	6.1	34.0	50.3%
The Sills North Approach	384	8.3	29.2	55.7%	317	6.9	30.5	50.7%
The Sills South Approach	63	1.8	55.0	36.5%	133	3.6	50.5	51.4%
	PRC for Signalled Lanes:61.2% Cycle Time (s): 90				PRC for Signalled Lanes:75.0% Cycle Time (s): 90			

Table 13-37: Smallways Staggered Junction - 2044 Junctions 9 Results

	Do Minimum				Do Something			
	Flow	Queue	Delay	RFC	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)								
Smallways Left Turn	71	0.1	6.76	0.13	13	0.0	7.44	0.03
Smallways Right Turn / Straight	60	0.2	8.60	0.14	67	0.3	13.19	0.21
A66 Wbd Right Turn	12	0.0	6.72	0.02	27	0.1	8.30	0.06
Lanehead Ln Left Turn	19	0.1	8.73	0.05	39	0.1	11.25	0.12
Lanehead Ln Right Turn / Straight	34	0.1	13.71	0.12	22	0.1	20.56	0.12
A66 Ebd Right Turn	24	0.0	6.49	0.05	25	0.1	7.60	0.05
PM Peak Hour (17:00-18:00)								
Smallways Left Turn	160	0.4	7.80	0.28	10	0.0	7.86	0.02
Smallways Right Turn / Straight	27	0.1	7.50	0.06	27	0.1	12.54	0.09
A66 Wbd Right Turn	14	0.0	6.26	0.03	22	0.1	7.59	0.05
Lanehead Ln Left Turn	8	0.0	7.44	0.02	16	0.0	9.30	0.04
Lanehead Ln Right Turn / Straight	9	0.0	10.62	0.03	5	0.0	18.93	0.03
A66 Ebd Right Turn	20	0.0	6.37	0.04	20	0.1	8.31	0.05

Table 13-38: Mainsgill Farm Cross Roads - 2044 Junctions 9 Results – Do Minimum

	Do Minimum			
	Flow	Queue	Delay	RFC
Saturday Peak (11:15-12:15)				
Mainsgill Farm Left Turn	108	89.6	2380	>2
Mainsgill Farm Right Turn	74	61.7	2393.28	>2
A66 Wbd Right Turn	2	0.0	11.87	0.01
Moor Lane Left Turn	6	5.8	>3600	>2
Moor Lane Right Turn	3	3.2	>3600	>2
A66 Ebd Right Turn	54	0.3	15.53	0.20

Table 13-39: A66 / Moor Lane Eastbound Slip T Junction - 2044 Junctions 9 Results – Do Something

	Do Something			
	Flow	Queue	Delay	RFC
Saturday Peak (11:15-12:15)				
Moor Lane Left Turn	25	0.0	5.00	0.04
Moor Lane Right Turn	0	0.0	0.0	0.0
From Existing A66 Right Turn	2	0.0	5.35	0.0

Table 13-40: A66 / Moor Lane Westbound Slip T Junction - 2044 Junctions 9 Results – Do Something

	Do Something			
	Flow	Queue	Delay	RFC
Saturday Peak (11:15-12:15)				
A66 Wbd Slip off Left Turn	0	0.0	0.0	0.0
A66 Wbd Slip off Right Turn	229	0.8	11.75	0.45
From Moor Lane Right Turn	2	0.0	5.81	0.0

Table 13-41: Moor Lane / Old A66 T Junction - 2044 Junctions 9 Results – Do Something

	Do Something			
	Flow	Queue	Delay	RFC
Saturday Peak (11:15-12:15)				
From Moor Lane Left Turn	207	0.5	7.52	0.32
From Moor Lane Right Turn	118	0.3	9.61	0.26
Old A66 Wbd Right Turn	182	0.4	7.12	0.28

Table 13-42: Forcett Lane Staggered Junction - 2044 Junctions 9 Results

	Do Minimum				Do Something			
	Flow	**Queue**	**Delay**	**RFC**	**Flow**	**Queue**	**Delay**	**RFC**
AM Peak (08:00-09:00)								
Forcett Lane Approach Left Turn / Straight	38	0.1	6.13	0.07	53	0.1	7.34	0.11
Forcett Lane Approach Right Turn	0	0.0	0.00	0.00	0	0.0	0.00	0.00
A66 Wbd Right Turn	63	0.1	6.68	0.11	46	0.1	7.86	0.10
B6274 Left Turn / Straight	63	0.1	6.63	0.11	56	0.1	7.99	0.12
B6274 Right Turn	0	0.0	0.00	0.00	0	0.0	0.00	0.00
A66 Ebd Right Turn	50	0.1	6.01	0.08	108	0.3	7.97	0.21
PM Peak Hour (17:00-18:00)								
Forcett Lane Approach Left Turn / Straight	34	0.1	6.53	0.06	48	0.1	8.67	0.11
Forcett Lane Approach Right Turn	0	0.0	0.00	0.00	0	0.0	0.00	0.00
A66 Wbd Right Turn	93	0.2	7.36	0.17	62	0.2	9.00	0.15
B6274 Left Turn / Straight	81	0.2	7.11	0.15	62	0.2	8.93	0.14
B6274 Right Turn	0	0.0	0.00	0.00	0	0.0	0.00	0.00
A66 Ebd Right Turn	38	0.1	6.31	0.07	87	0.2	9.21	0.20

	Do Minimum				Do Something			
	Flow	Queue	Delay	RFC	Flow	Queue	Delay	RFC
AM Peak (08:00-09:00)								
Hargill Left Turn	0	0.0	0.00	0.00	0	0.0	0.00	0.00
Hargill Right Turn / Straight	81	0.3	13.89	0.26	78	0.5	20.40	0.33
A66 Wbd Right Turn	1	0.0	5.47	0.00	1	0.0	6.28	0.00
Moor Road Left Turn	0	0.0	0.00	0.00	0	0.0	0.00	0.00
Moor Road Right Turn/ Straight	9	0.0	7.95	0.02	10	0.0	10.88	0.03
A66 Ebd Right Turn	0	0.0	0.00	0.00	0	0.0	0.00	0.00
PM Peak Hour (17:00-18:00)								
Hargill Left Turn	0	0.0	0.00	0.00	0	0.0	0.00	0.00
Hargill Right Turn / Straight	88	0.4	16.70	0.31	83	0.9	35.39	0.47
A66 Wbd Right Turn	17	0.0	5.87	0.03	16	0.0	7.10	0.03
Moor Road Left Turn	0	0.0	0.00	0.00	0	0.0	0.00	0.00
Moor Road Right Turn/ Straight	5	0.0	8.92	0.01	51	0.3	18.22	0.22
A66 Ebd Right Turn	0	0.0	0.00	0.00	0	0.0	0.00	0.00

Table 13-43: Hargill Staggered Junction - 2044 Junctions 9 Results

D Road Safety Audit Scheme Documentation

The Road Safety Audit was conducted using the documents listed in the tables below

Table 13-44: List of documents

Document Number	Revision	Details
HE565627-AMY-GHS-S00-RP-OP-000001	P02	A66 Northern Trans-Pennine - Road Safety Audit Stage 1 Brief
HE565627-ARC-ENM-A66-RP-CH-2017	1.0	A66 Northern Trans-Pennine Project - Walking, Cycling & Horse-Riding Assessment and Review (WCHAR) - Assessment Report
HE565627-AMY-HGN-S00-SH-CH-000002	P03.1	A66 Northern Trans-Pennine – Departures from Standard Checklist
HE565627-AMY-GEN-S00-RP-CH-000001	S1	A66 Northern Trans-Pennine – Category and Standard of Proposed Carriageway

Table 13-45: List of Drawings

Drawing Number	Revision	Details
HE565627-AMY-HGN-S11-DR-CH-000002	P03	Scotch Corner

E Observed Accident Statistics

A66 Northern Trans-Pennine Route

Summary Collision Data

Scheme 1 - M6 Junction 40

Total number of Collisions	16

Severity			No of:		Year							
Slight	Serious	Fatal	Vehicles	casualties	2012	2013	2014	2015	2016	2017	2018	2019
15	1	0	37	20	3	2	0	0	2	2	5	2

Vehicle Type							Age of Casualty		Lighting Conditions	
car	LGV	HGV	motorbike	pedal cycle	pedestrian	other	over 65 yrs	under 16yrs	Daylight	Darkness
26	0	10	1	0	0	0	2	0	15	1

Manoeuvre								Weather		
overtaking	slowing/ stopping	chaning lane	going ahead	waiting to go	turning	waiting to turn	moving off	Dry / fine	raining	Other
0	2	4	9	1	1	0	3	11	2	3

Six of the reported collisions were rear end shunts at the traffic signals, and six occurred due to poor lane changing manoeuvres on the circulatory of the roundabout resulting in side impact collisions.

One collision involved a rider on a motorbike, which occurred in daylight hours, on a fine dry day, and resulted in serious injuries. The collision occurred when a car entered the roundabout into the path of the motorbike.

Two collisions occurred at the location of the ramp meter traffic signals on the northbound on-slip. Both collisions were rear end shunts at low speed.

A66 Northern Trans-Pennine Route **Summary Collision Data**

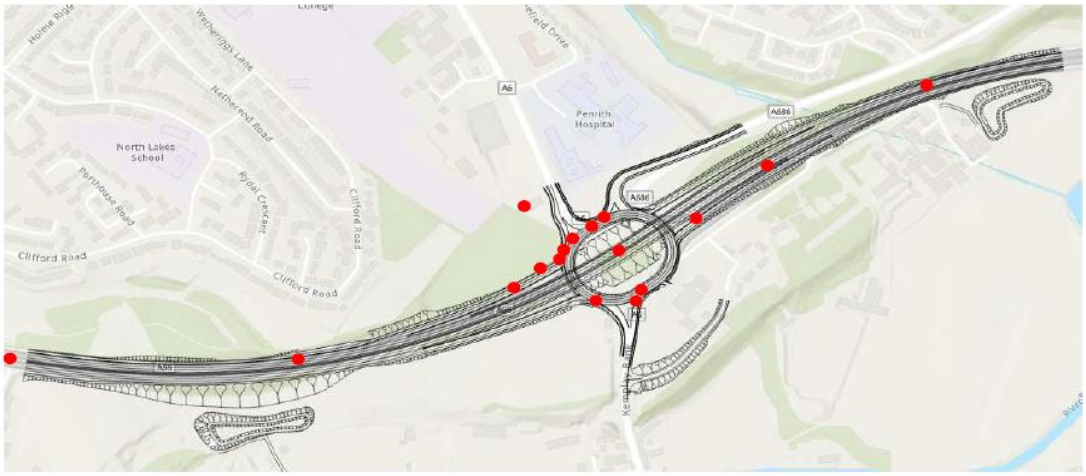
Scheme 2 - Kemplay Bank

Total number of Collisions	18

Severity			No of:		Year							
Slight	Serious	Fatal	Vehicles	casualties	2012	2013	2014	2015	2016	2017	2018	2019
14	4	0	35	26	1	0	5	2	1	2	5	2

Vehicle Type							Age of Casualty		Lighting Conditions	
car	LGV	HGV	motorbike	pedal cycle	pedestrian	other	over 65 yrs	under 16yrs	Daylight	Darkness
29	1	2	2	1	0	0	1	6	17	1

Manoeuvre								Weather		
overtaking	slowing/ stopping	chaning lane	going ahead	waiting to go	turning	waiting to turn	moving off	Dry / fine	raining	Other
0	5	5	10	0	0	0	1	15	1	2



There is an existing at-grade roundabout in this location. Eight of the collisions resulted in rear end shuts at the roundabout. Three other collisions were side impact collisions from poor lane changing manoeuvres.

One collision involved a motorbike, which resulted in serious injuries. The collision occurred in dry weather and in daylight hours. The motorbike left the carriageway and hit a marker post. The cause of the collision is not reported.

One collision involved a pedal cycle, which resulted in slight injuries. The collision occurred on the circulatory of the roundabout when a vehicle exiting the roundabout failed to see the pedal cyclist on the nearside.

The majority of collisions in this segment of the A66 occurred during daylight hours and in dry/fine weather conditions.

A66 Northern Trans-Pennine Route **Summary Collision Data**

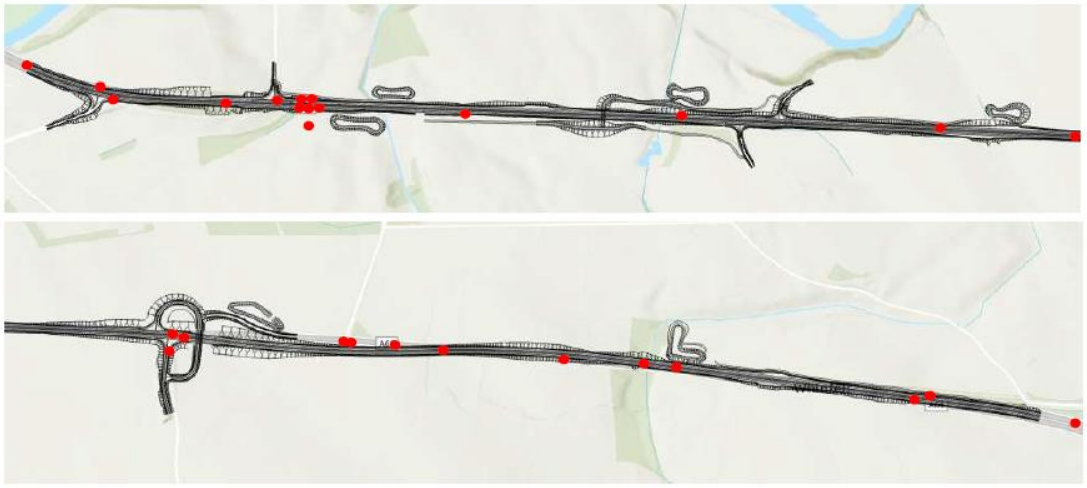
Scheme 3 - Penrith to Temple Sowerby

Total number of Collisions	28

Severity			No of:		Year							
Slight	Serious	Fatal	Vehicles	casualties	2012	2013	2014	2015	2016	2017	2018	2019
19	8	1	69	43	1	4	6	6	3	4	3	1

Vehicle Type							Age of Casualty		Lighting Conditions	
car	LGV	HGV	motorbike	pedal cycle	pedestrian	other	over 65 yrs	under 16yrs	Daylight	Darkness
48	6	14	1	0	0	0	10	1	18	10

Manoeuvre								Weather		
overtaking	slowing/ stopping	chaning lane	going ahead	waiting to go	turning	waiting to turn	moving off	Dry / fine	raining	Other
4	2	1	19	1	2	1	0	17	2	9



There was one recorded fatality in the period from 2012-18, which occurred in 2018. The collision involved an HGV, the driver of which drifted into oncoming traffic, killing a lady in her 70s. The driver of the HGV was also in his 70's. Fatigue was reported as the cause of the collision.

Half of the reported collisions involved an HGV, resulting in one fatality (as above), 4 serious and 9 slightly injured casualties. Three of these collisions involved overtaking manoeuvres. Four of the collisions resulted from drivers failing to look or failing to judge another vehicles' path or speed.

One collision involved a rider of a motorbike, who lost control at a junction as they were moving off from a stopped position. The rider was in his 70's, and sustained slight injuries. This collision did not involve any other vehicles.

A third of the collisions on this segment occurred during the hours of darkness. There are no street lights present along large sections of the A66.

A66 Northern Trans-Pennine Route **Summary Collision Data**

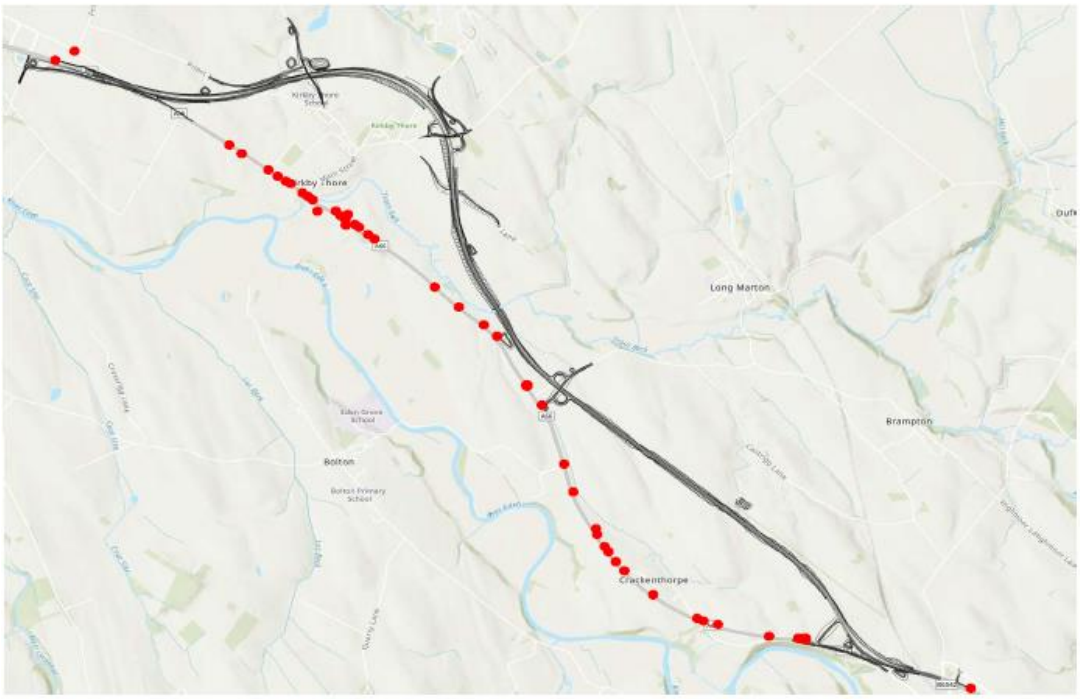
Scheme 4&5 - Temple Sowerby to Appleby

Total number of Collisions	48

Severity			No of:		Year							
Slight	Serious	Fatal	Vehicles	casualties	2012	2013	2014	2015	2016	2017	2018	2019
39	6	3	114	76	7	5	4	6	10	5	9	2

Vehicle Type							Age of Casualty		Lighting Conditions	
car	LGV	HGV	motorbike	pedal cycle	pedestrian	other	over 65 yrs	under 16yrs	Daylight	Darkness
81	1	24	4	0	0	2	13	6	37	11

Manoeuvre								Weather		
overtaking	slowing/ stopping	chaning lane	going ahead	waiting to go	turning	waiting to turn	moving off	Dry / fine	raining	Other
5	4	0	37	1	3	1	1	35	1	12



There have been three fatal collisions in the period from 2012-18, which occurred in 2015, 2017, and 2018. One collision occurred in daylight hours, and two occurred in hours of darkness. All three fatalities involved HGVs. Two of the fatalities were head on collisions, where vehicles have drifted across the centre line into oncoming traffic. The third fatality was a result of a poor overtaking manoeuvre.

Three collisions involved riders on four motorbikes, all of which occurred in daylight hours, on fine dry days. All three collisions occurred at junctions. Two of these collisions resulted in serious injuries and one in slight injuries. Two collisions resulted in rear end shuts, and one was a result of excessive speed and following too closely behind another vehicle.

A quarter of the collisions on this segment occurred during the hours of darkness. There are no street lights present along large sections of the A66.

A66 Northern Trans-Pennine Route **Summary Collision Data**

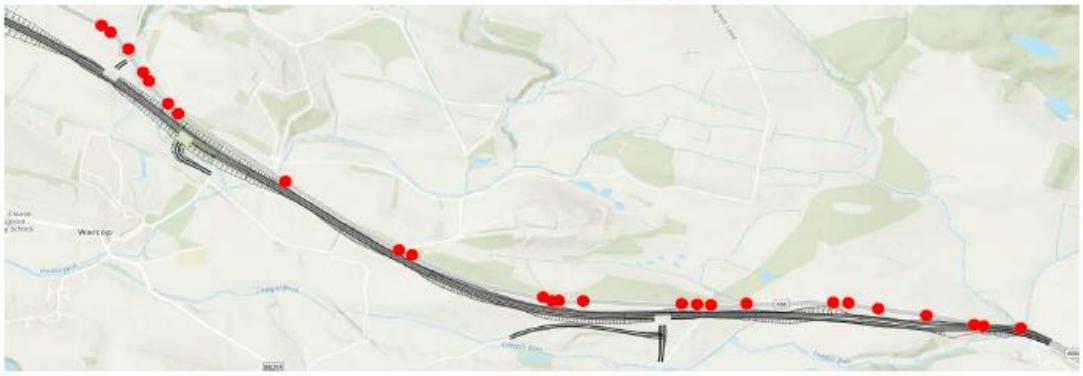
Scheme 6 - Appleby to Brough

Total number of Collisions	45

Severity			No of:		Year							
Slight	Serious	Fatal	Vehicles	casualties	2012	2013	2014	2015	2016	2017	2018	2019
31	11	3	103	67	9	9	7	7	4	6	3	0

Vehicle Type							Age of Casualty		Lighting Conditions	
car	LGV	HGV	motorbike	pedal cycle	pedestrian	other	over 65 yrs	under 16yrs	Daylight	Darkness
65	9	23	3	0	1	3	6	5	32	13

Manoeuvre								Weather		
overtaking	slowing/stopping	chaning lane	going ahead	waiting to go	turning	waiting to turn	moving off	Dry / fine	raining	Other
1	2	1	37	1	3	0	0	37	5	3



There have been three fatal collisions in the period from 2012-18. Two of these occurred in 2015, and one in 2017. Two occurred in hours of daylight, and one in hours of darkness. All three fatalities were head on collisions, where vehicles have drifted across the centre line into oncoming traffic.

There was one collision involving a pedestrian. The pedestrian was a road worker who was setting out temporary traffic management and was hit by a passing vehicle at low speed, resulting in a slight injury. One collision occurred due to icy road conditions during the hours of darkness. Two collisions were caused by cars making poor turning or overtaking manoeuvres.

Three collisions occurred involving motorbikes, two of which resulted in slight and one in serious rider injuries.

A quarter of the collisions on this segment occurred during the hours of darkness. There are no street lights present along large sections of the A66.

A66 Northern Trans-Pennine Route **Summary Collision Data**

Scheme 7 - Bowes Bypass

Total number of Collisions	8

Severity			No of:		Year							
Slight	Serious	Fatal	Vehicles	casualties	2012	2013	2014	2015	2016	2017	2018	2019
7	1	0	17	8	0	0	3	0	0	3	0	1

Vehicle Type							Age of Casualty		Lighting Conditions	
car	LGV	HGV	motorbike	pedal cycle	pedestrian	other	over 65 yrs	under 16yrs	Daylight	Darkness
12	1	4	0	0	0	0	0	0	7	0

Manoeuvre								Weather		
overtaking	slowing/ stopping	chaning lane	going ahead	waiting to go	turning	waiting to turn	moving off	Dry / fine	raining	Other
4	0	1	3	0	0	0	0	6	1	1

The majority of collisions occurring on this segment of the A66 are a result of overtaking manoeuvres.

All of the reported collisions occurred in daylight hours.

A66 Northern Trans-Pennine Route **Summary Collision Data**

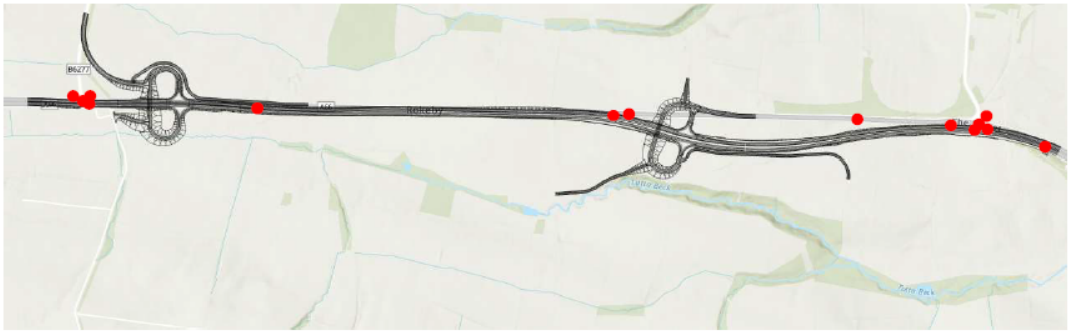
Scheme 8 - Cross Lanes to Rokeby

Total number of Collisions	15

Severity			No of:		Year							
Slight	Serious	Fatal	Vehicles	casualties	2012	2013	2014	2015	2016	2017	2018	2019
10	5	0	33	32	4	2	0	2	2	1	2	2

Vehicle Type							Age of Casualty		Lighting Conditions	
car	LGV	HGV	motorbike	pedal cycle	pedestrian	other	over 65 yrs	under 16yrs	Daylight	Darkness
21	3	8	0	0	0	1	5	3	11	4

Manoeuvre								Weather		
overtaking	slowing/ stopping	chaning lane	going ahead	waiting to go	turning	waiting to turn	moving off	Dry / fine	raining	Other
0	5	0	6	0	7	0	0	11	3	1



Seven of the reported collisions were a result of slowing and turning into side roads across oncoming traffic on the A66.

The majority of collisions in this segment of the A66 occurred during daylight hours and in dry/fine weather conditions.

A66 Northern Trans-Pennine Route **Summary Collision Data**

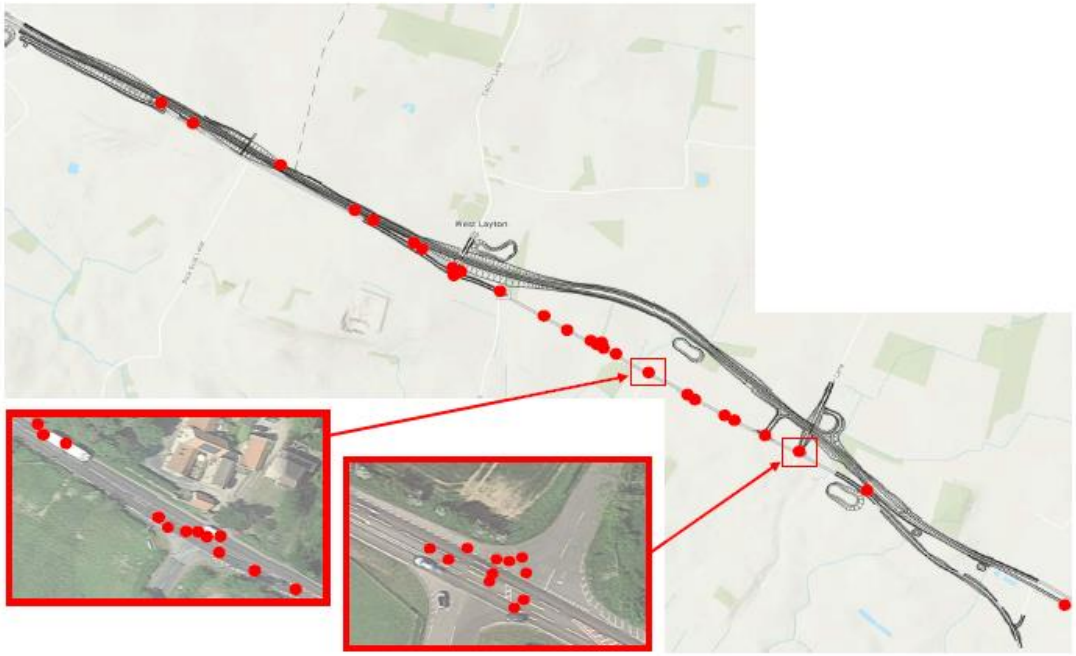
Scheme 9 - Stephen Bank to Carkin Moor

Total number of Collisions	47

Severity			No of:		Year							
Slight	Serious	Fatal	Vehicles	casualties	2012	2013	2014	2015	2016	2017	2018	2019
32	13	2	119	92	15	4	6	5	1	10	4	2

Vehicle Type							Age of Casualty		Lighting Conditions	
car	LGV	HGV	motorbike	pedal cycle	pedestrian	other	over 65 yrs	under 16yrs	Daylight	Darkness
82	8	25	0	0	1	4	16	13	44	3

Manoeuvre								Weather		
overtaking	slowing/stopping	chaning lane	going ahead	waiting to go	turning	waiting to turn	moving off	Dry / fine	raining	Other
1	10	0	29	3	7	0	1	36	8	3



There was one fatality on this segment of the A66 in the period from 2012-18. This collision occurred when a vehicle swerved to avoid a stationary vehicle who was waiting to turn right onto Collier Lane, and hit a third vehicle head on.

The clusters of collisions at the junctions are mainly caused by slowing or turning traffic. Several of these collisions resulted in rear end shunts.

One collision involved a pedestrian, who stepped out in front of an oncoming vehicle. The pedestrian reportedly had dementia and therefore this collision is not attributed to driver error or to poor junction/highway design.

The majority of collisions in this segment of the A66 occurred during daylight hours and in dry/fine weather conditions.

A66 Northern Trans-Pennine Route **Summary Collision Data**

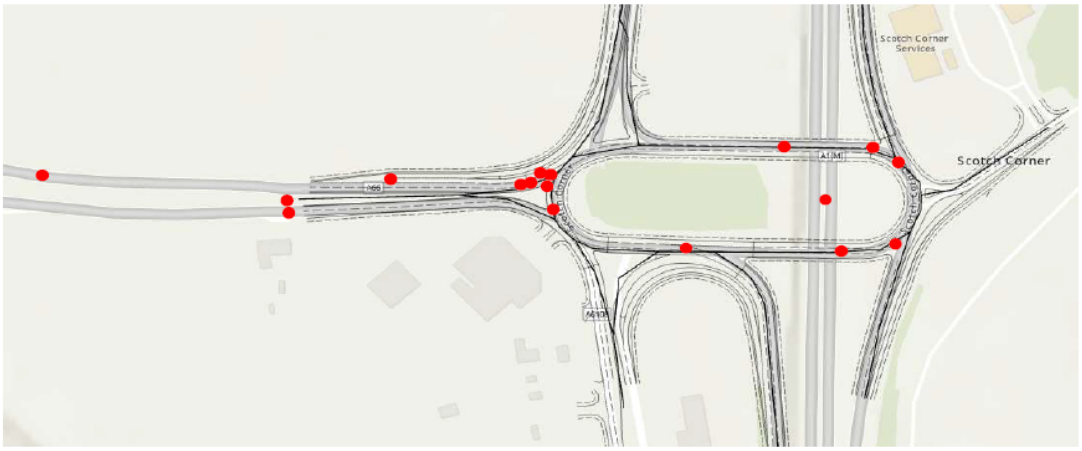
Scheme 11 - A1(M) / A66 Scotch Corner

Total number of Collisions	16

Severity			No of:		Year							
Slight	Serious	Fatal	Vehicles	casualties	2012	2013	2014	2015	2016	2017	2018	2019
14	2	0	35	25	6	1	0	1	2	3	1	2

Vehicle Type							Age of Casualty		Lighting Conditions	
car	LGV	HGV	motorbike	pedal cycle	pedestrian	other	over 65 yrs	under 16yrs	Daylight	Darkness
24	4	5	1	0	0	1	4	1	12	4

Manoeuvre								Weather		
overtaking	slowing/ stopping	chaning lane	going ahead	waiting to go	turning	waiting to turn	moving off	Dry / fine	raining	Other
0	7	1	8	0	3	0	0	10	4	2



Eight of the recorded collisions occur due to rear end shuts caused by failing to observe traffic ahead being to slow down or stop at the give way line. Five of these occur on the approach to Scotch Corner junction, from the A66.

Two collisions were due to turning/U-turn manoeuvres in the gap in the central reservation.

Two collisions were due to excessive speed on the circulatory.

One collision involved a motorbike which resulted in serious injury when the rider overshot the stopline at the junction.

Two thirds of collisions occurred in daylight and in fine/dry weather.

F Construction Phase – Proposed Diversionary Routes

F.1 Diversion Routes

Package B consists of individual schemes named as:

- Scheme 1 M6 Jct 40
- Scheme 2 M6 Jct 40 to Kemplay Bank
- Scheme 3 A66 Penrith to Temple Sowerby

The diversion routes that are likely to be required for scheme 1, M6 J40 improvements are

- Northbound exit slip – Traffic diverted north to M6 junction 41 and back south to junction 40.
- Northbound entry slip - Traffic diverted south to M6 junction 39 and back north to junction 40.
- Southbound exit - Traffic diverted south to M6 junction 39 and back north to junction 40.
- Southbound entry slip - Traffic diverted north to M6 junction 41 and back south to junction 40.
- A592 Ullswater Road – Road closed between the gyratory at M6 J40 and Skirsgill Gardens, Traffic diverted via Ullswater road, Castlegate, A6 south, and the A66 to M6 J40.
- A66 Between M6 J40 and Kemplay Bank – Traffic diverted via M6 north to Junction 41, A6 south to Kemplay Bank.

The diversion routes that are likely to be required for scheme 2, Kemplay Bank are

- A66 Between M6 J40 and Kemplay Bank – Traffic diverted via M6 north to Junction 41, A6 south to Kemplay Bank.
- A66 west of Kemplay Bank – HGVs via A1(M), A69, M6. Regular diversion via A685, M6 J39 north to M6 J40. Non-motorway traffic via B6262/A6 after approval from local authority.
- A6 Bridge Lane – Road closed between Tynefield Drive and Kemplay Bank gyratory. Traffic diverted via A686 Carleton Avenue, Carleton Road and A6 Victoria Road
- A686 Carleton Lane – Road closed between Carleton Road and Kemplay Bank gyratory. Traffic diverted via Carleton Road and A6 Victoria Road

The diversion routes that are likely to be required for scheme 3, Penrith to Temple Sowerby are as follows

- Eastbound mainline closure – HGVs via M6, A69, A1(M). Regular diversion via A685, M6 J39 north to M6 J40. Non-motorway traffic via B6262/A6 after seeking approval from local authority.

- Westbound mainline closure - HGVs via A1(M), A69, M6. Regular diversion via A685, M6 J39 north to M6 J40. Non-motorway traffic via B6262/A6 after seeking approval from local authority.

Package A consists of three separate schemes as identified in the initial preferred route consultation and announcement:

- Scheme 4 Temple Sowerby to Appleby – Kirkby Thore
- Scheme 5 Temple Sowerby to Appleby – Crackenthorpe
- Appleby to Brough

The diversion routes that are likely to be required for the Temple Sowerby to Appleby scheme and Appleby to Crackenthorpe are as follows

- Eastbound mainline closure – HGVs via M6, A69, A1(M). Regular diversion via A685, M6 J39 north to M6 J40. Non-motorway traffic via B6262/A6 after seeking approval from local authority.
- Westbound mainline closure - HGVs via A1(M), A69, M6. Regular diversion via A685, M6 J39 north to M6 J40. Non-motorway traffic via B6262/A6 after seeking approval from local authority.
- Consultation will be required to agree local routes with the local authority once a program has been defined.

The diversion routes that are likely to be required for the Appleby to Brough scheme are as follows

- Eastbound mainline closure – Heavy goods vehicles will be diverted via the approved route of M6 North, A69 East, A1 South, A1(M) South to junction 53 for the A66 at Scotch Corner, where the diversion will end.
- Local traffic will be allowed through to the junction of the B6542 at Appleby.
- Westbound mainline closure – Heavy goods vehicles will be diverted via the approved route of A1(M) North from Scotch Corner, A1 North, A69 West, and M6 South to junction 4o for the A66.
- Local traffic will be allowed through to the junction of the A685 at Brough.
- The A685 is not suitable for vehicles over 4.4m or 14’6” due to a low rail bridge at Kirkby Stephens. Mitigation measures will be required to ensure that high vehicles don’t reach this structure.

Package C consists of three separate schemes:

- Scheme 8 Cross Lanes to Rokeby
- Scheme 9 Stephen Bank to Carkin Moor
- Scheme 10 A1(M) Scotch Corner

The diversion routes that are likely to be required for the Cross Lanes to Rokeby scheme are as follows

- Eastbound mainline closure – Diverted traffic will travel towards Barnard Castle until it reaches the narrow weight restricted bridge on A67

Bridgegate, and here HGV traffic will be split from light vehicles. The regular diversion will continue across the bridge, to the junction with Newgate where It will continue on to Westwick Road and exit on to Abbey Road where it will use Abbey Bridge and Abbey Lane until it reaches its junction with the A66, at which point the diversion will end.

- HGV's will follow the B6277 and on to Abbey Lane, through agreement with the local authority, until it reaches its junction with the A66 where the diversion will end.
- Westbound mainline closure – Traffic diverted from the A66 at its junction with Barnard Castle/Abbey Lane, HGVs will split from light traffic at Abbey bridge, so as to avoid the weight restricted bridge in Barnard Castle. The regular diversion will cross Abbey Bridge and continue on to Westwick Road and Newgate until it reaches its junction with the A66. From here it will continue to follow the A67 until it reaches its junction with the A66 where the diversion will end.
- HGV's will continue along Abbey Lane and on to the B6277 until it reaches its junction with the A67, from there it will follow the A67 until it reaches its junction with the A66 where the diversion will end.
- To avoid having to send traffic on the wider diversion route, there may be a requirement to implement a convoy working system between the junction of Barnard Castle/Abbey Lane, and the eastern end of the scheme.

The diversion routes that are likely to be required for the Stephen Bank to Carkin Moor scheme are as follows

- Eastbound mainline closure – Diverted traffic will exit the A66 at its junction with the A67. It will travel towards Barnard Castle until it reaches the narrow weight restricted bridge on the A67 at Bridgegate, and here HGV traffic will be split from light vehicles. The regular diversion will continue across the bridge on the A67 to its junction with Newgate. At this point it will be re-joined by the HGV traffic. Traffic will take the A688 north to the A68 and head east towards the A1(M). Traffic will head south on the A1(M) until it reaches junction 53 for the A66 Scotch Corner, where the diversion will end.
- HGV's will separate from the regular diversion at Barnard Castle and follow the B6277, through agreement with the local authority, until it reaches its junction with the Abbey Lane and Abbey Road. From here it will use Abbey Bridge and continue on Abbey Road until it reaches its junction with Westwick road and Newgate. At the junction of Newgate and the A67 it will re-join the regular diversion
- Westbound mainline closure - Traffic will be diverted from the A66 junction with the A1(M) at Scotch Corner, along the A1(M) north to its junction with the A68. It will follow the A68 until it reaches its junction with the A688 and head south until it reaches the A67 at Barnard Castle, at which point the diversion will split and form a separate HGV diversion. The regular diversion will continue on the A67 through Barnard Castle and remain on the A67 until it reaches its junction with the A66 where the diversion will end.

- The HGV diversion will leave the A67 at Newgate Road and continue on to Warwick Road. It will exit Warwick Road and on to Abbey Road where it will cross the narrow Abbey Road bridge before arriving at the junction with the A66 where the diversion will end.

The diversion route that will be required for the Junction improvement works at A1(M) Scotch Corner will be as follows

- Middleton Tyas Road will be closed at its junction with Scurragh House Lane. Traffic will be diverted via Middleton Tyas Lane, north on to Kneeton Lane and then south on the A6055 until it reaches Junction 53 at Scotch Corner where the diversion will end.

Continued consultation will be required to agree local routes with the local authorities once a detailed program of closures has been defined, such that conflicts with other constraints (for example other planned road works) can be avoided.

G Traffic Impact During Construction

G.1 Construction Scenario C

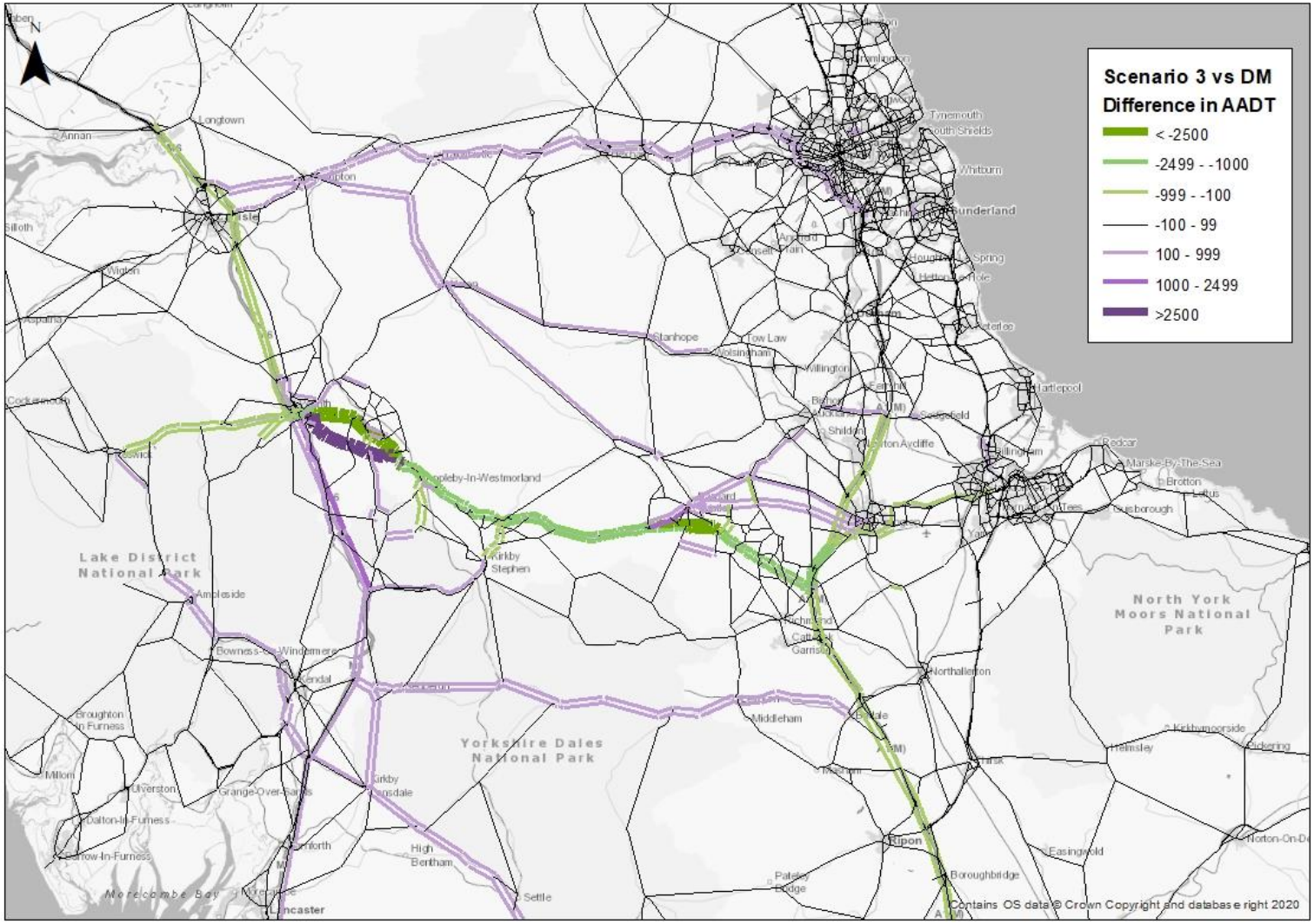


Figure 13-1: Scenario C Overview

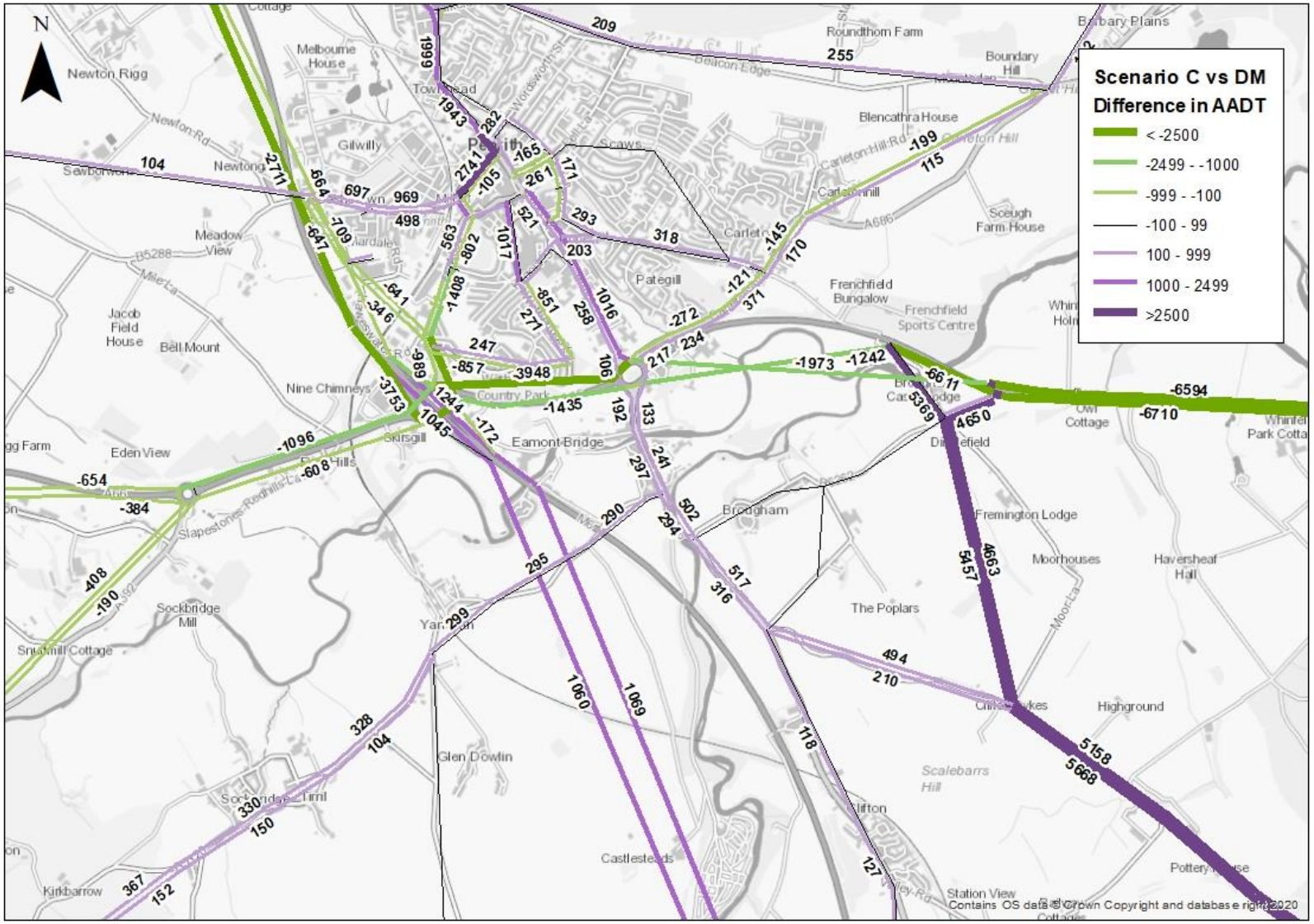


Figure 13-2: Scenario C M6 Jnc 40 and Kemplay Bank

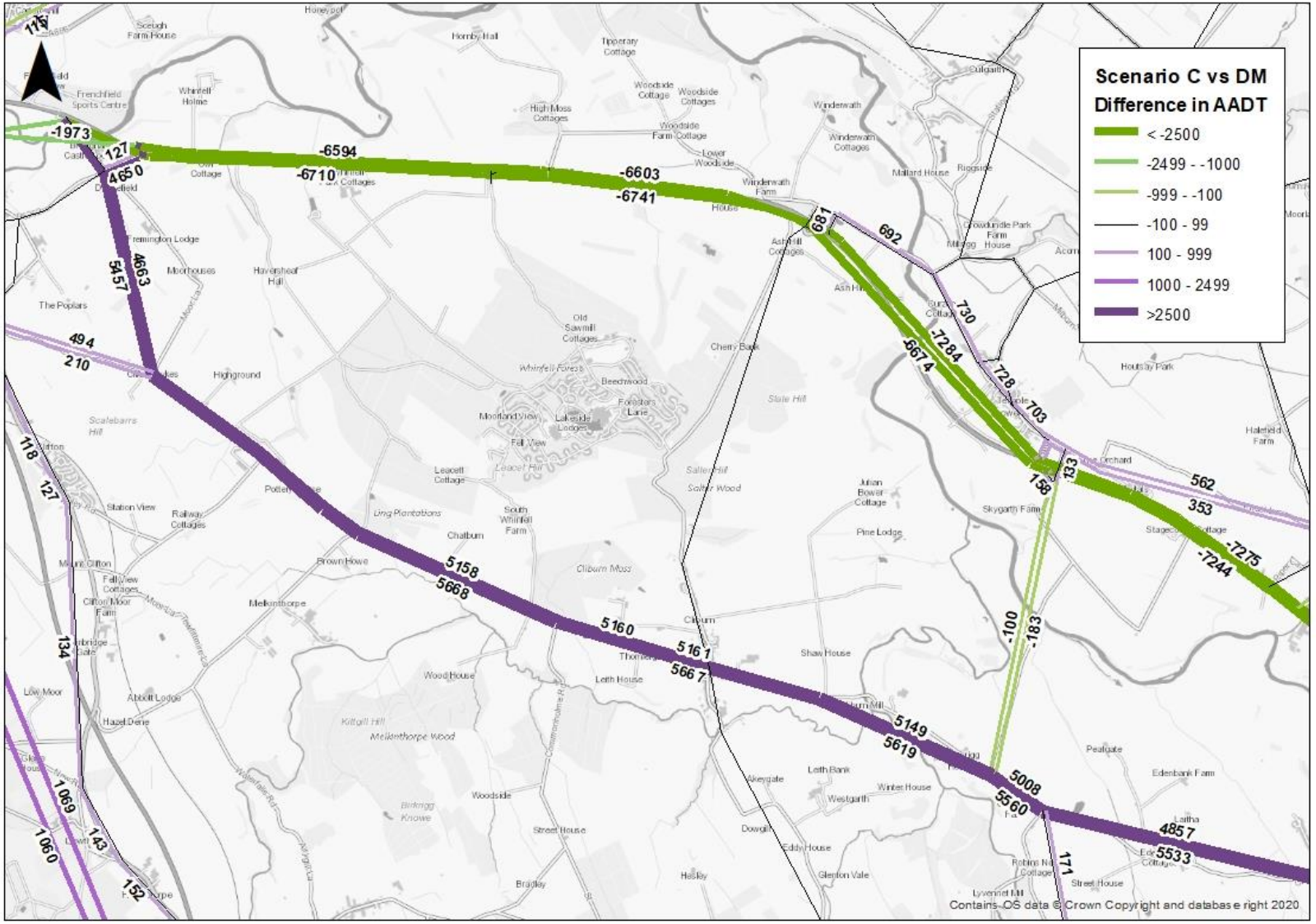


Figure 13-3: Scenario C Penrith to Temple Sowerby

Figure 13-4: Scenario C Temple Sowerby to Appleby

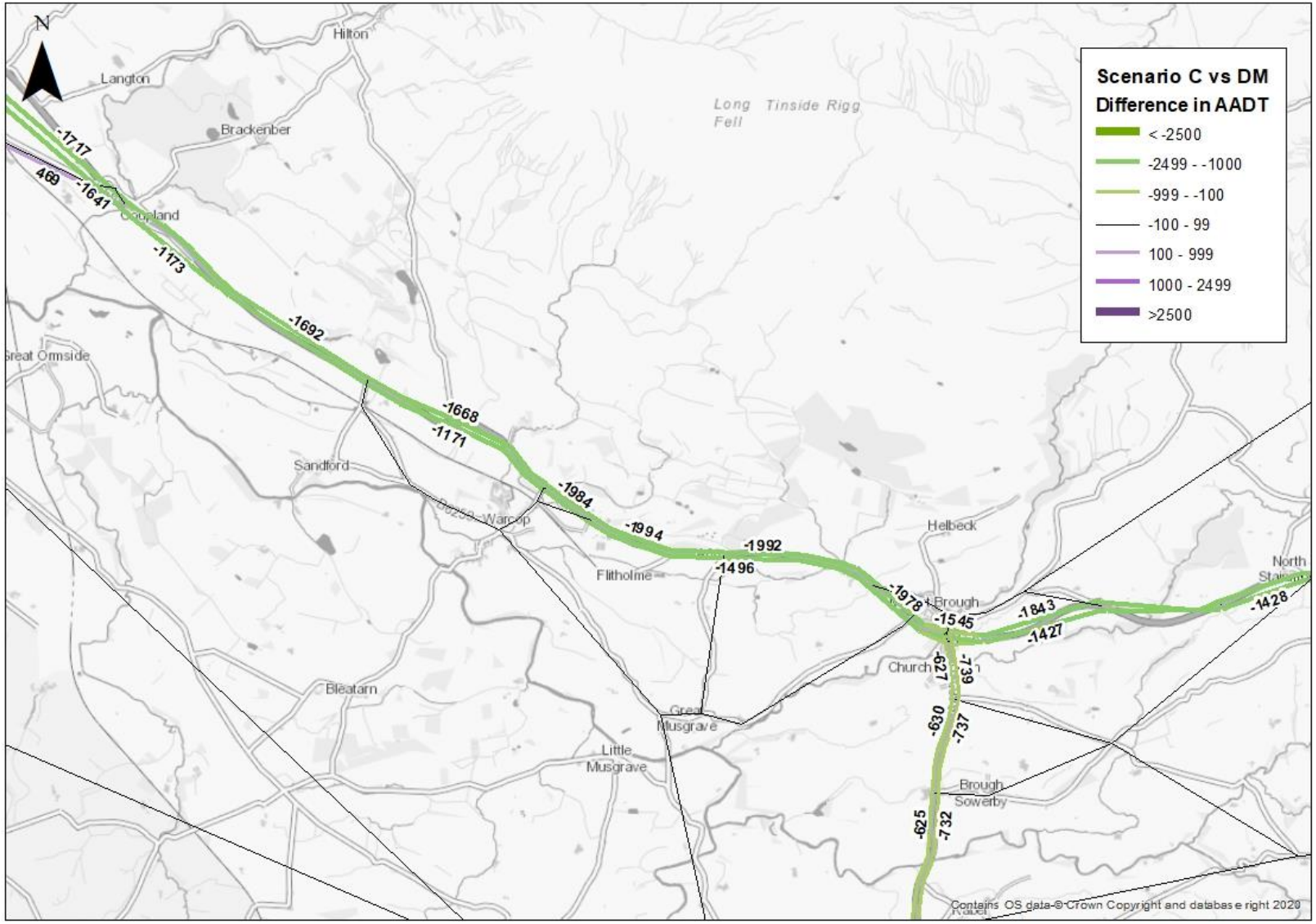


Figure 13-5: Scenario C Scheme 6 Appleby to Brough

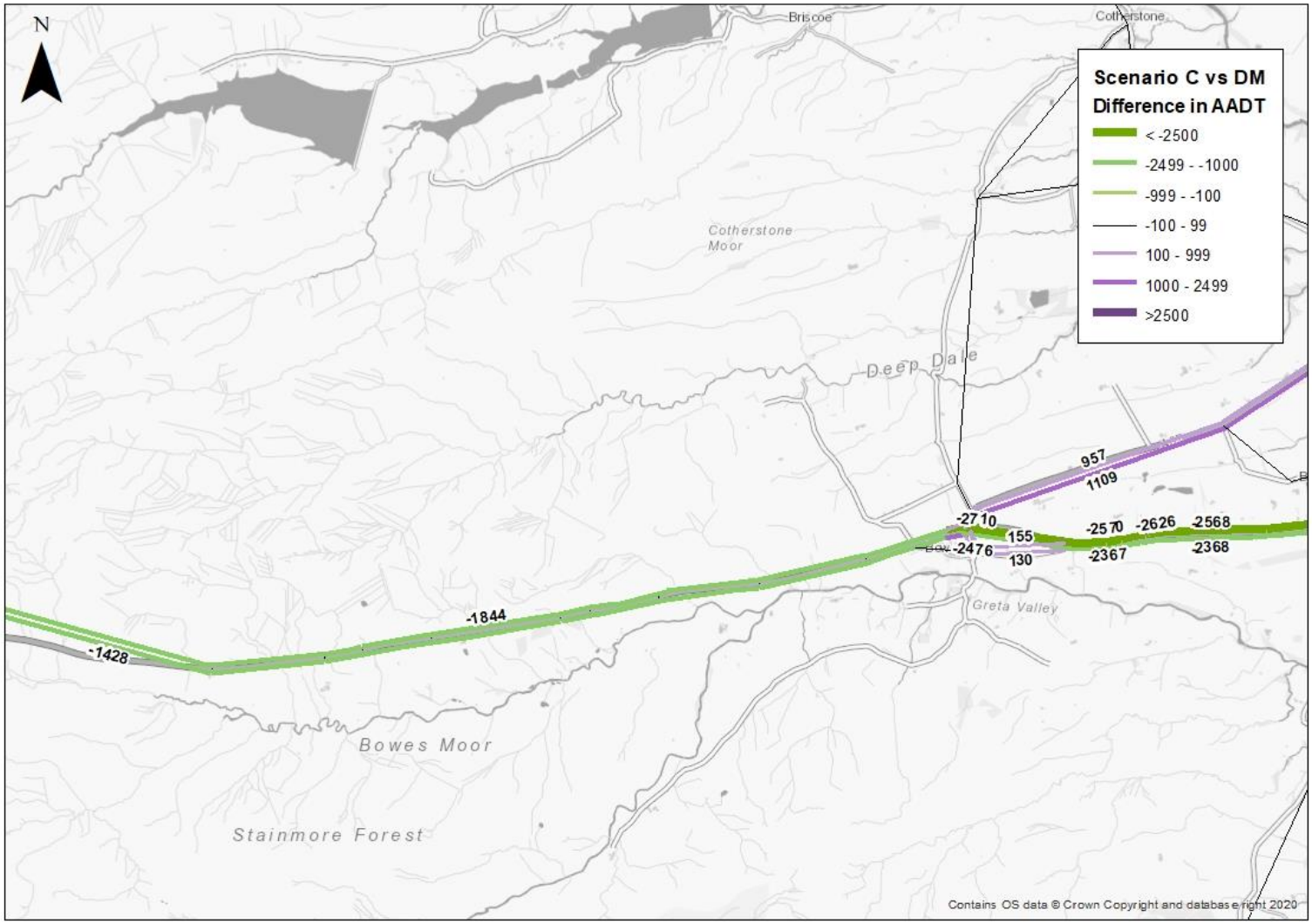


Figure 13-6: Scenario C Bowes Bypass

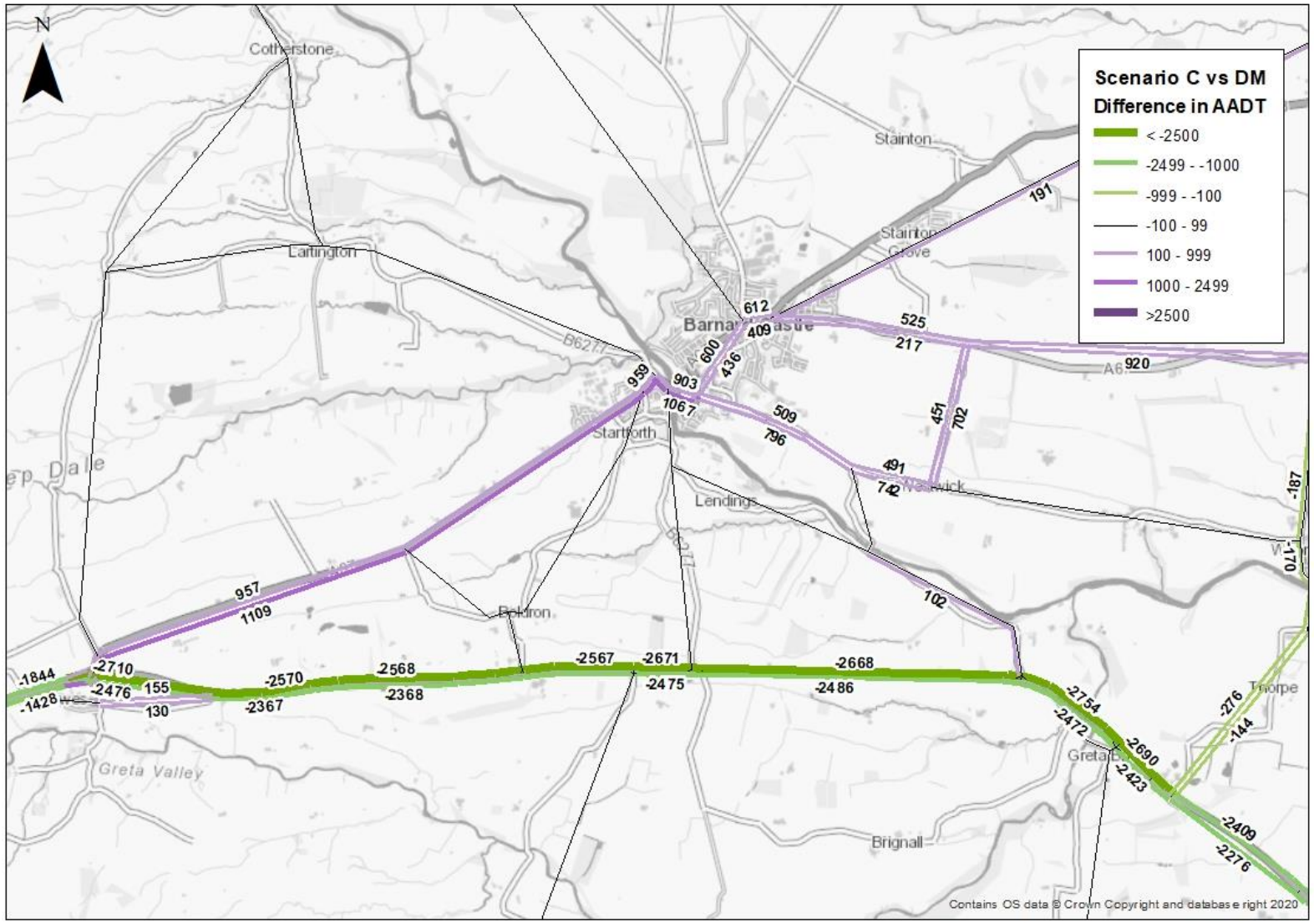


Figure 13-7: Scenario C Cross Lanes to Rokeby

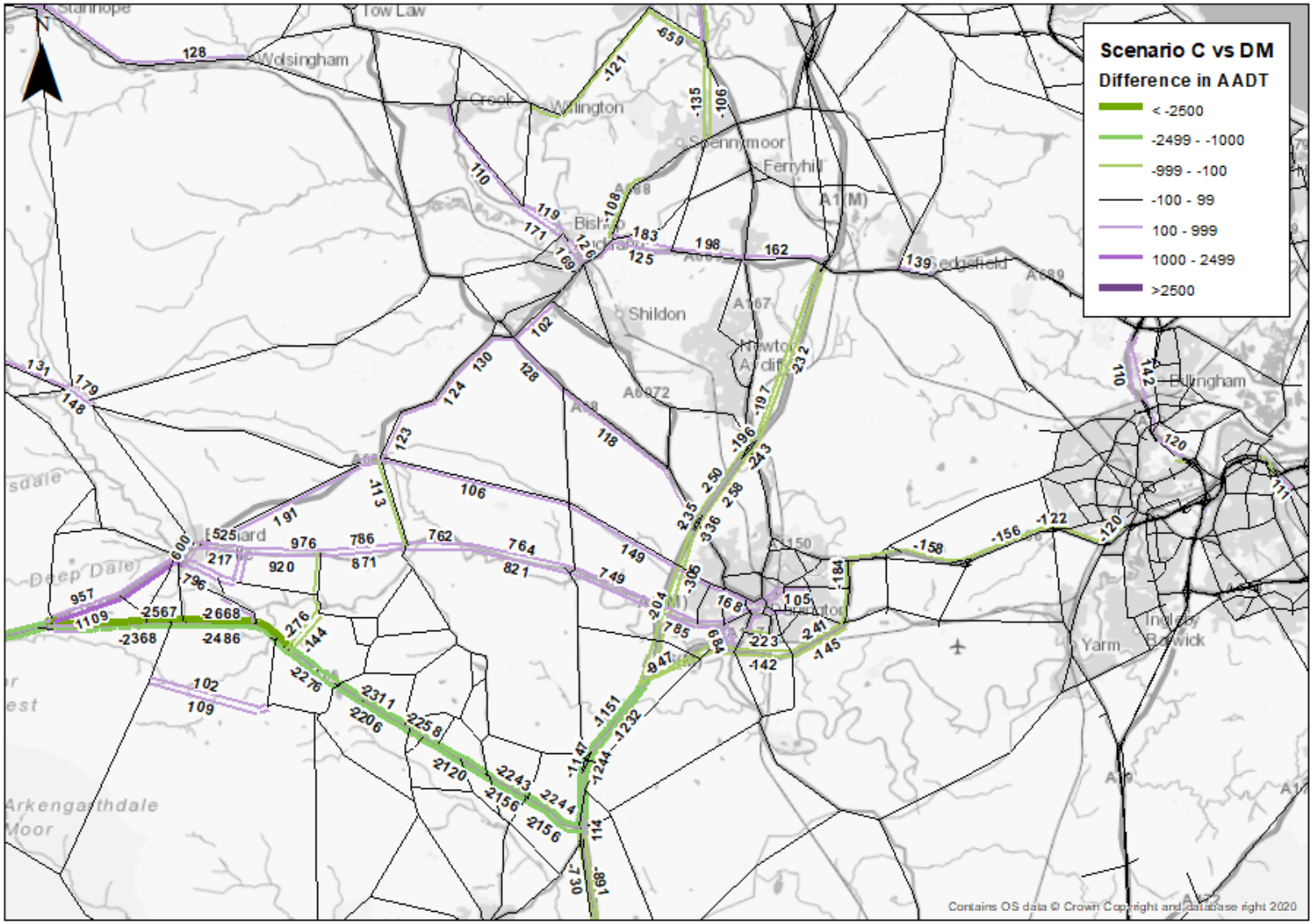


Figure 13-8: Scenario C Stephen Bank to Carkin Moor & A1(M) North

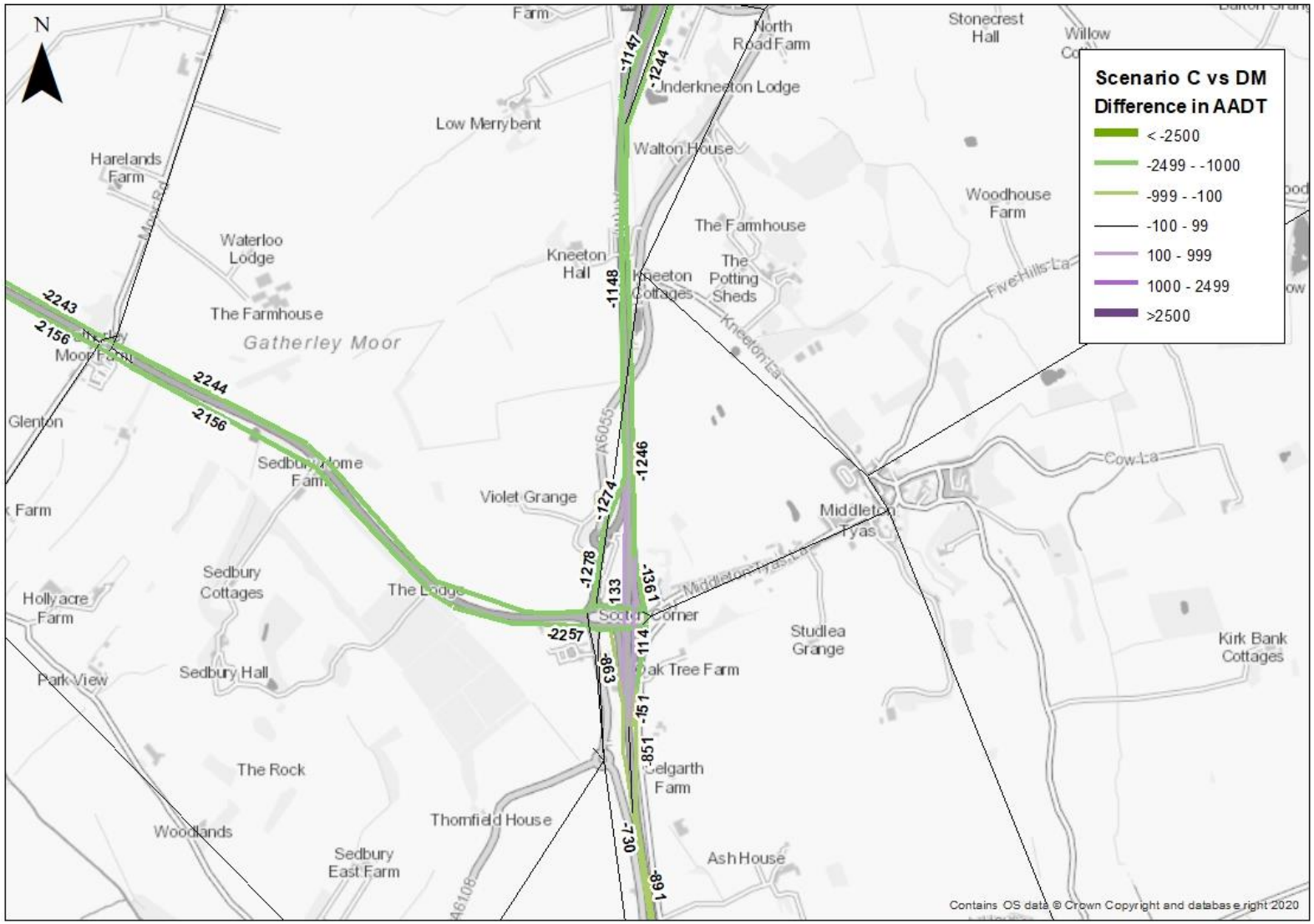


Figure 13-9: Scenario C: A1(M) Scotch Corner

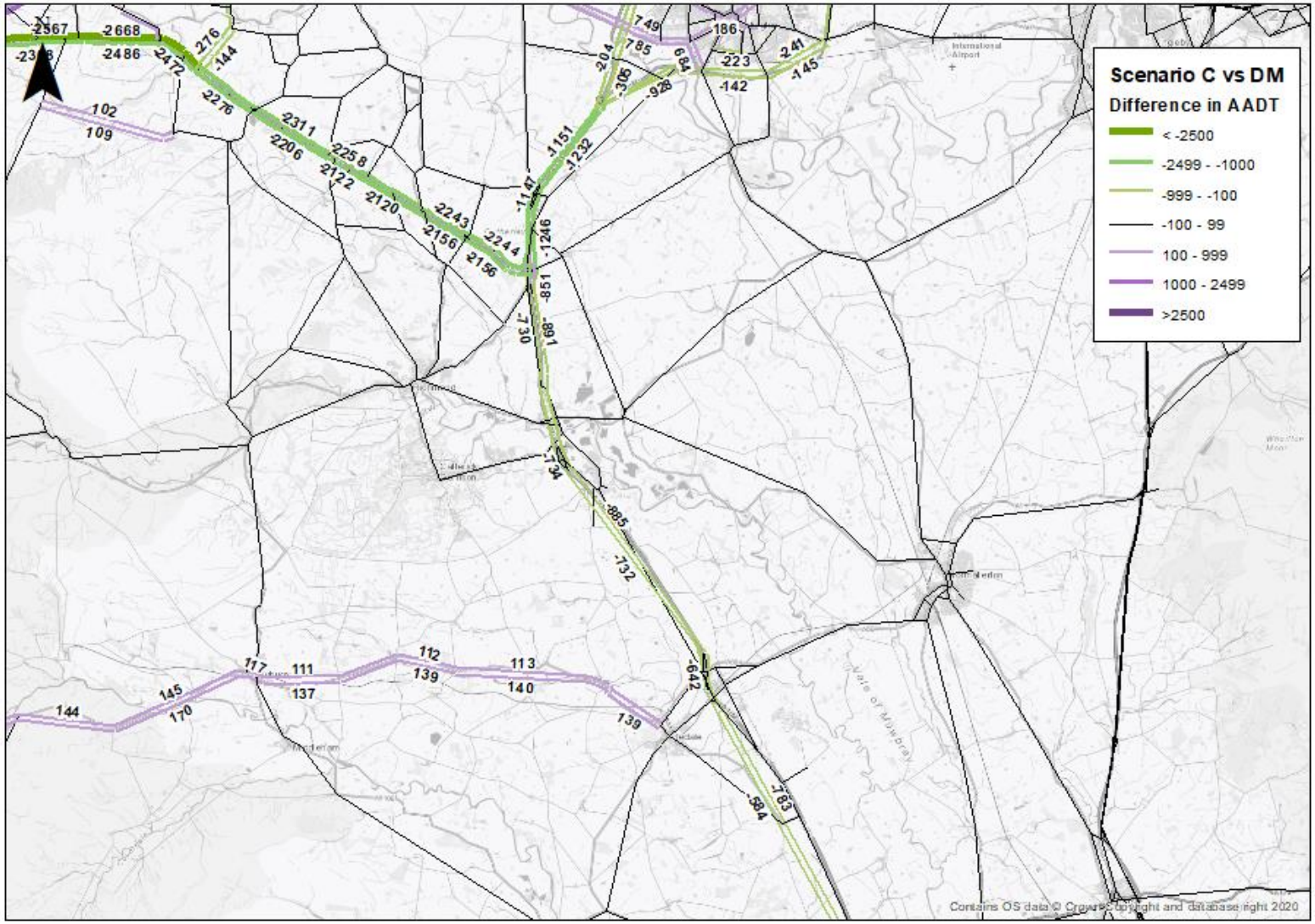


Figure 13-10: Scenario C A1(M) South

G.2 Construction Scenario D

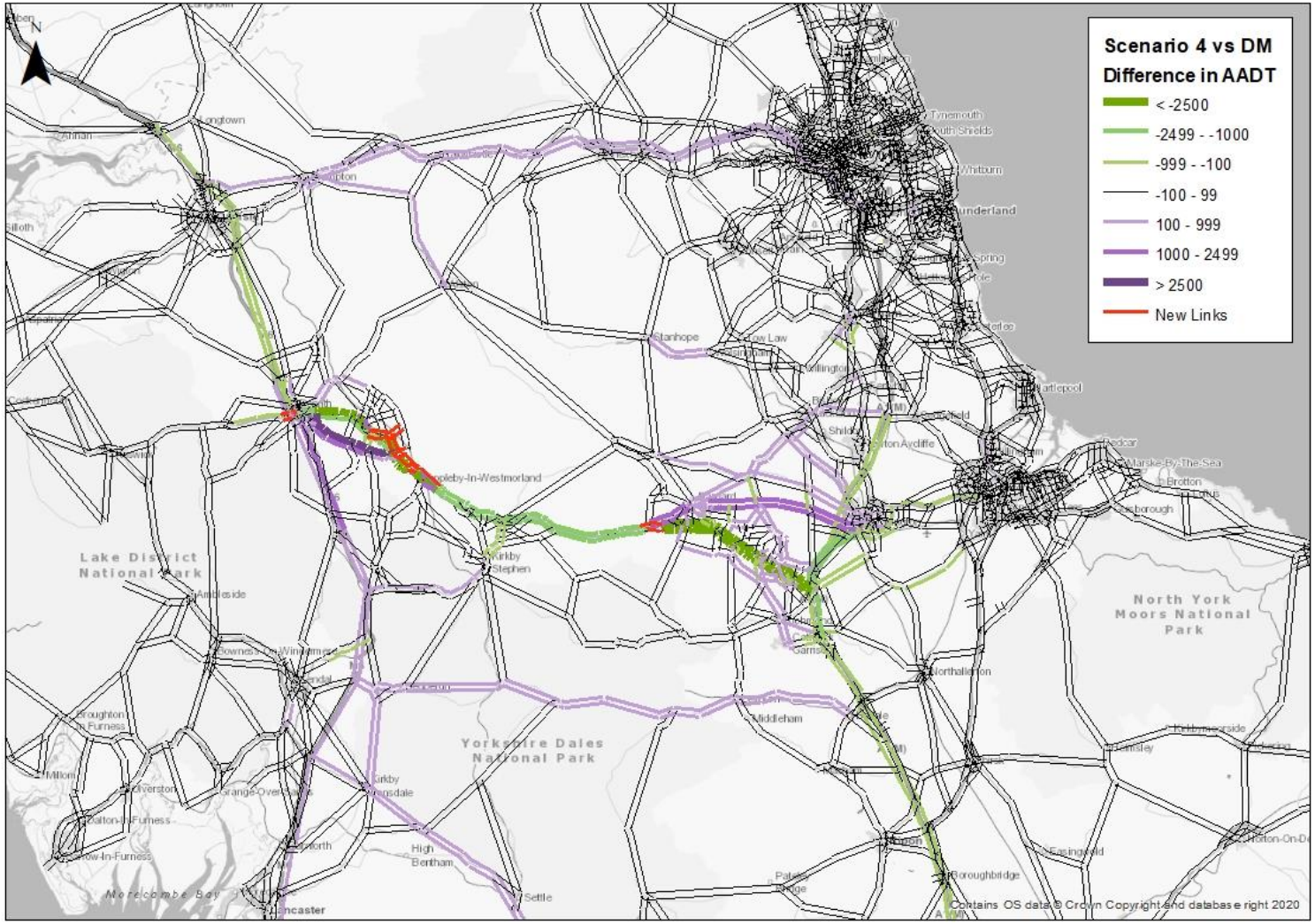


Figure 13-11: Scenario D Overview

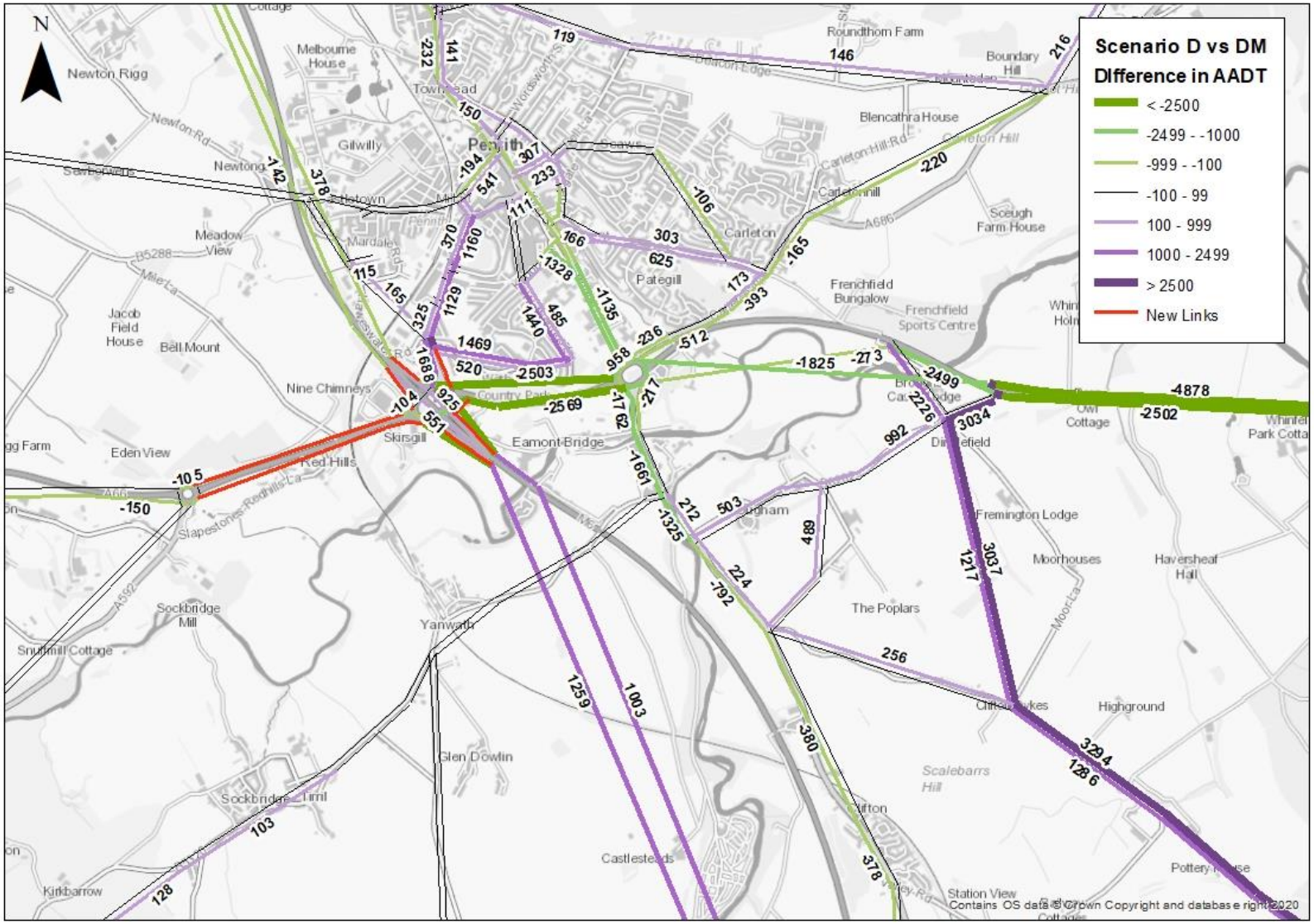


Figure 13-12: Scenario D M6 Jnc 40 and Kemplay Bank

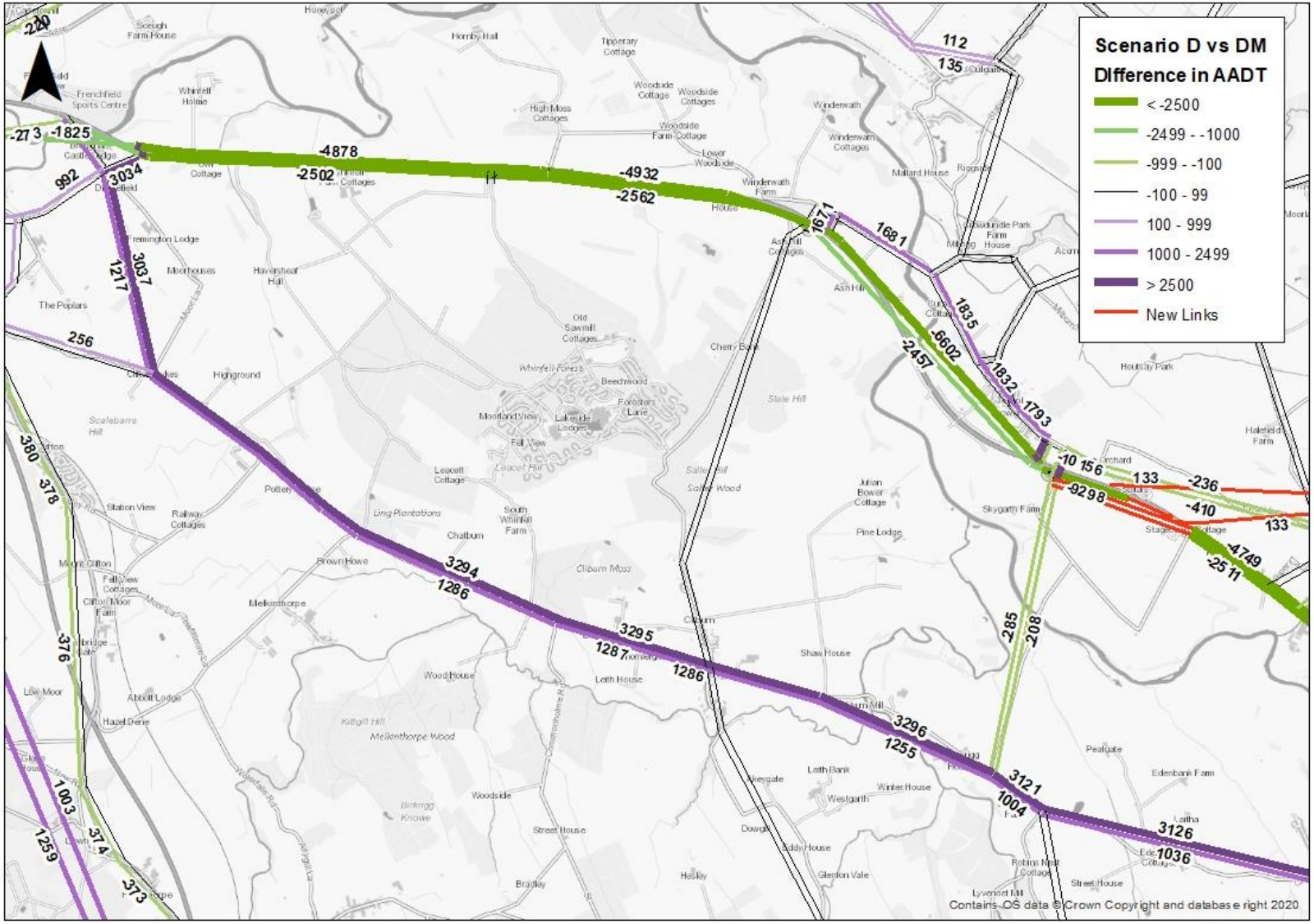


Figure 13-13: Scenario D Penrith to Temple Sowerby

Figure 13-14: Scenario D Temple Sowerby to Appleby

Figure 13-15: Scenario D Appleby to Brough

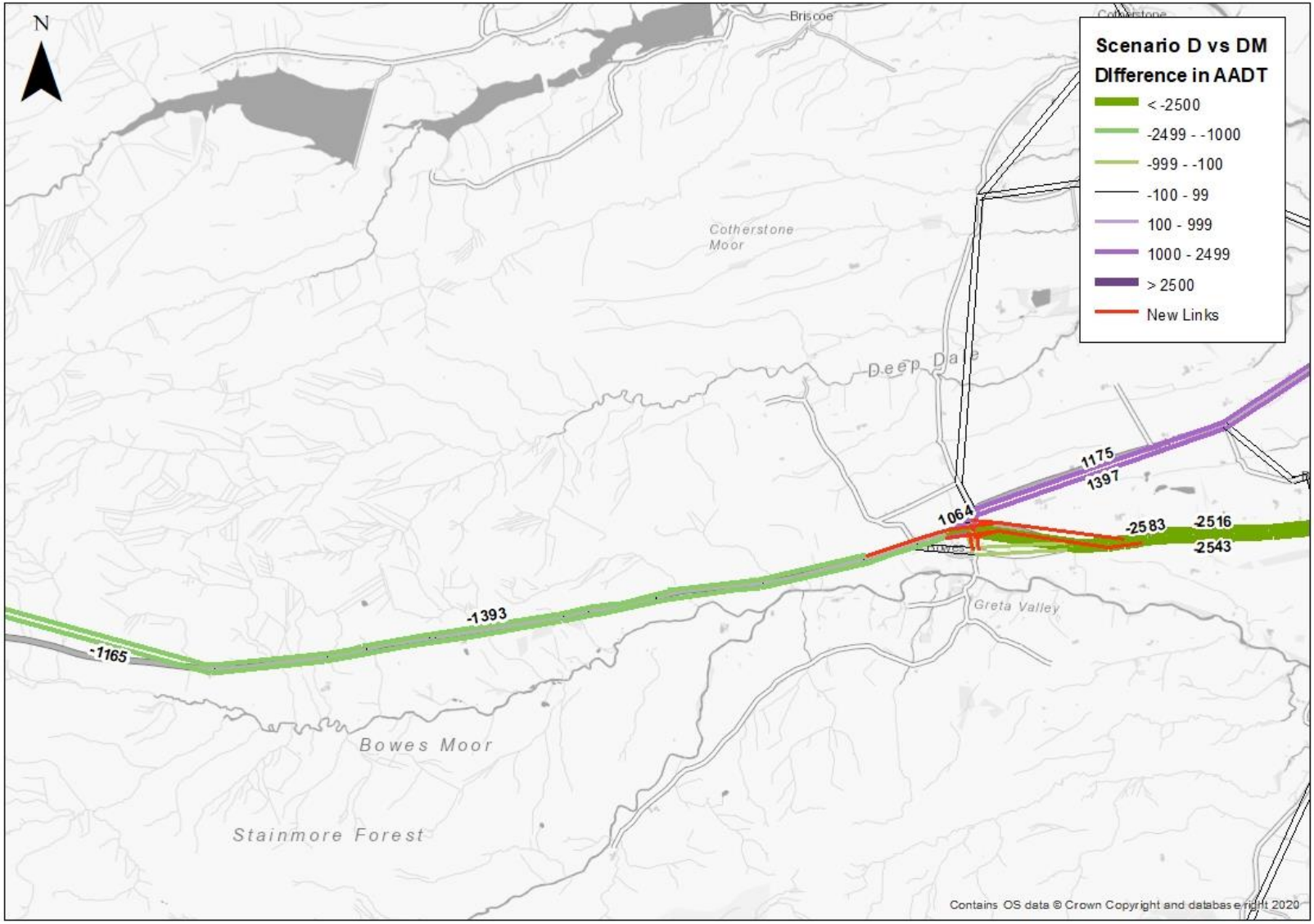


Figure 13-16: Scenario D Bowes Bypass

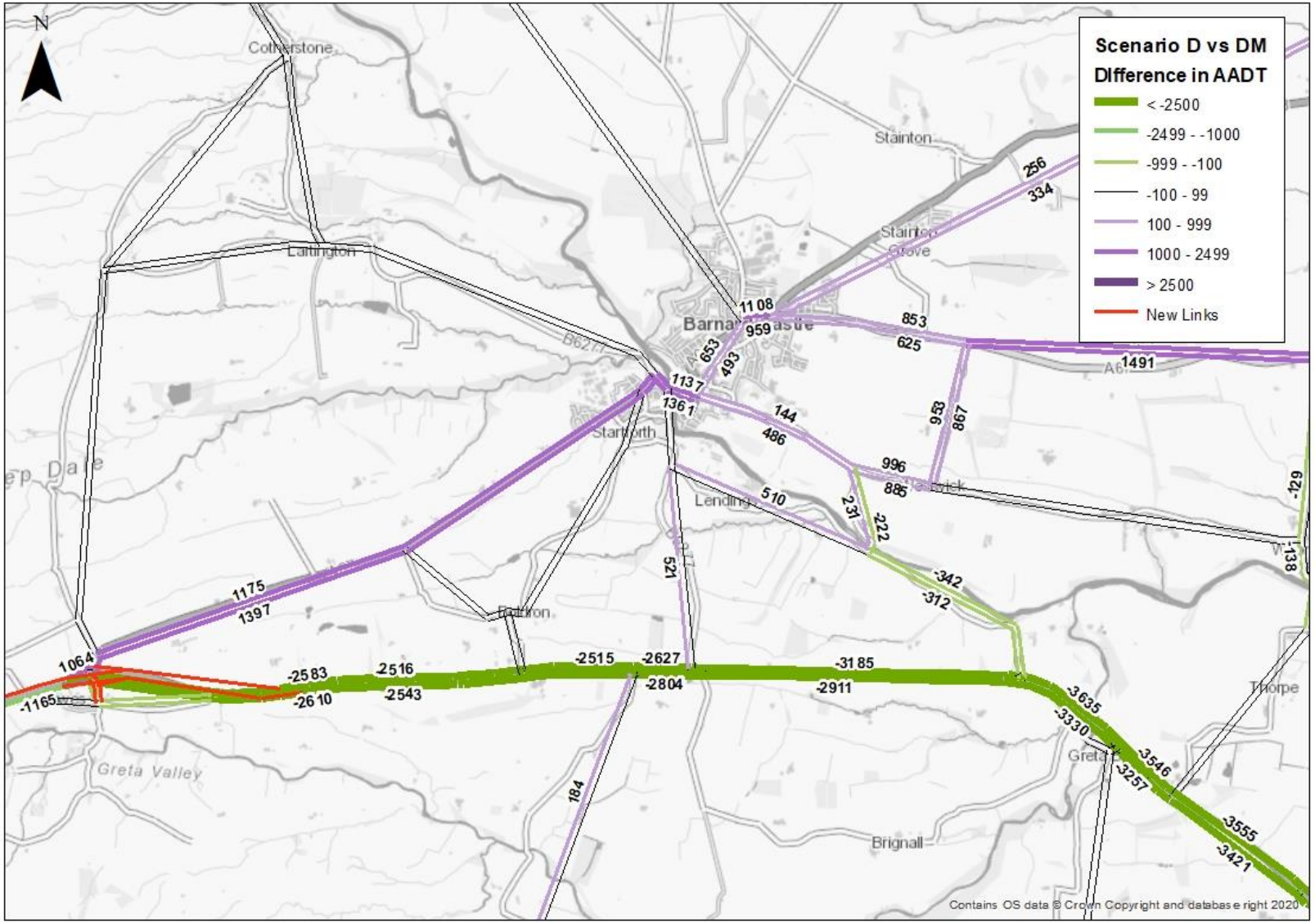


Figure 13-17: Scenario D Cross Lanes to Rokeby

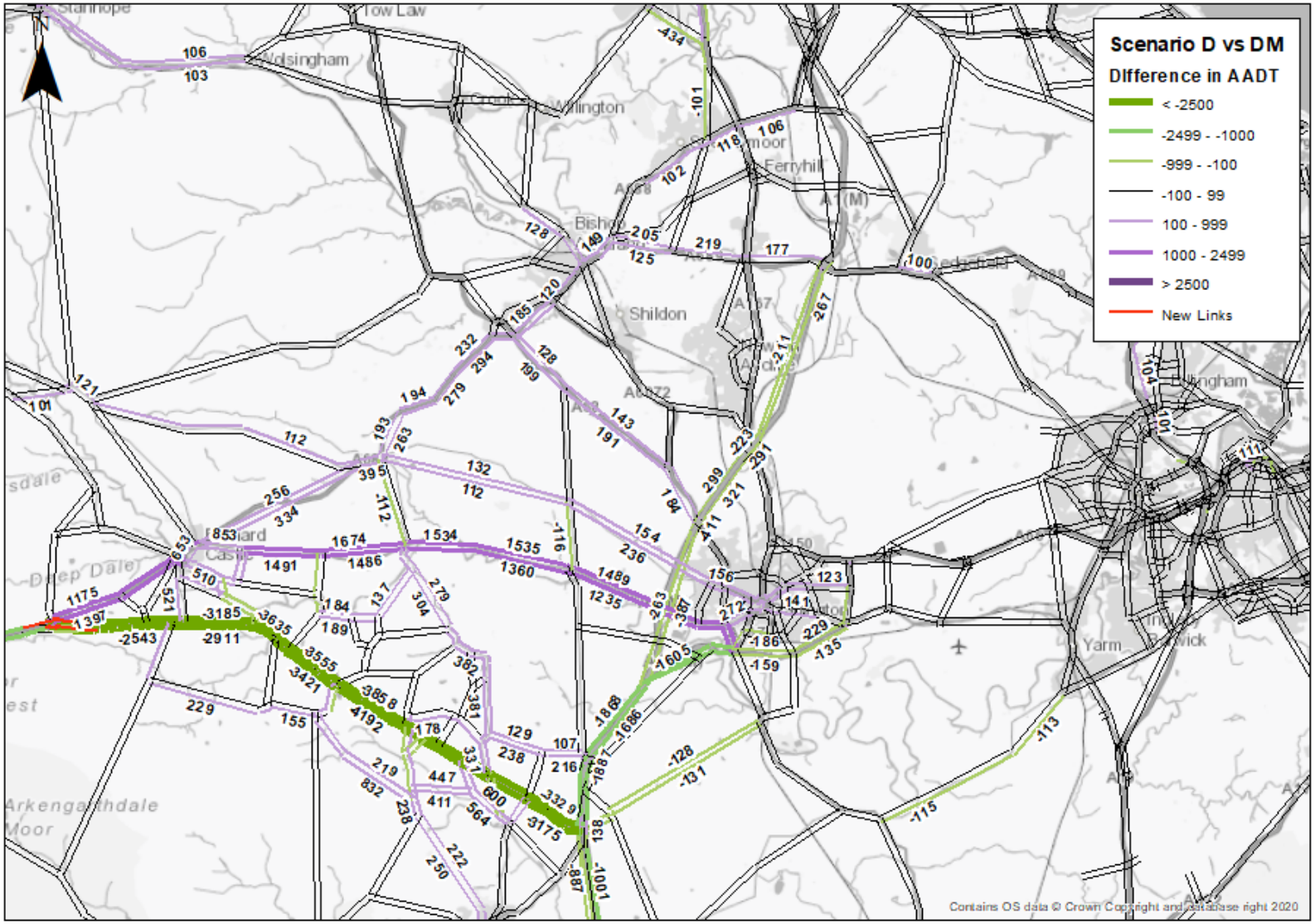


Figure 13-18: Scenario D Stephen Bank to Carkin Moor & A1(M) North

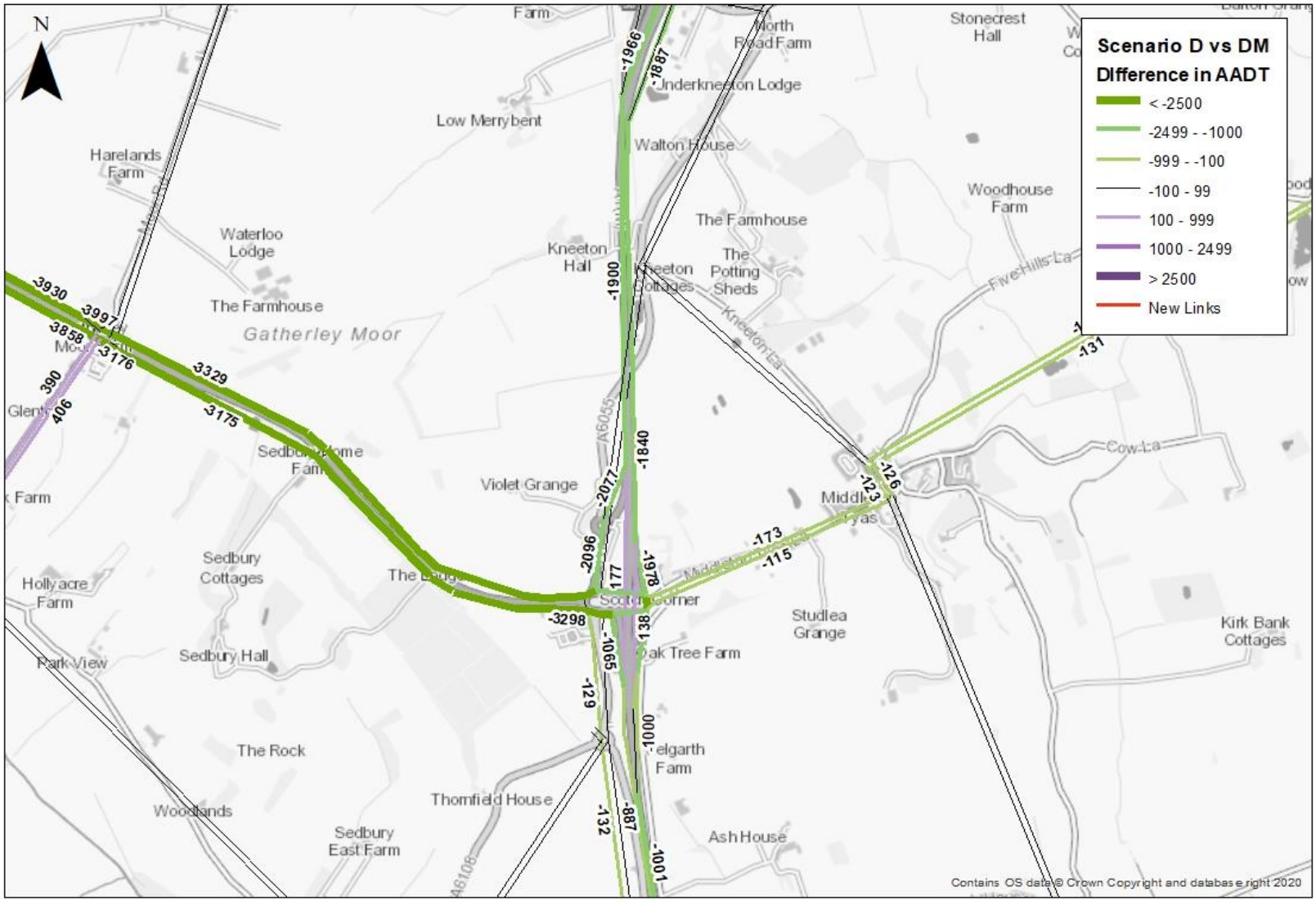


Figure 13-19: Scenario D A1(M) Scotch Corner

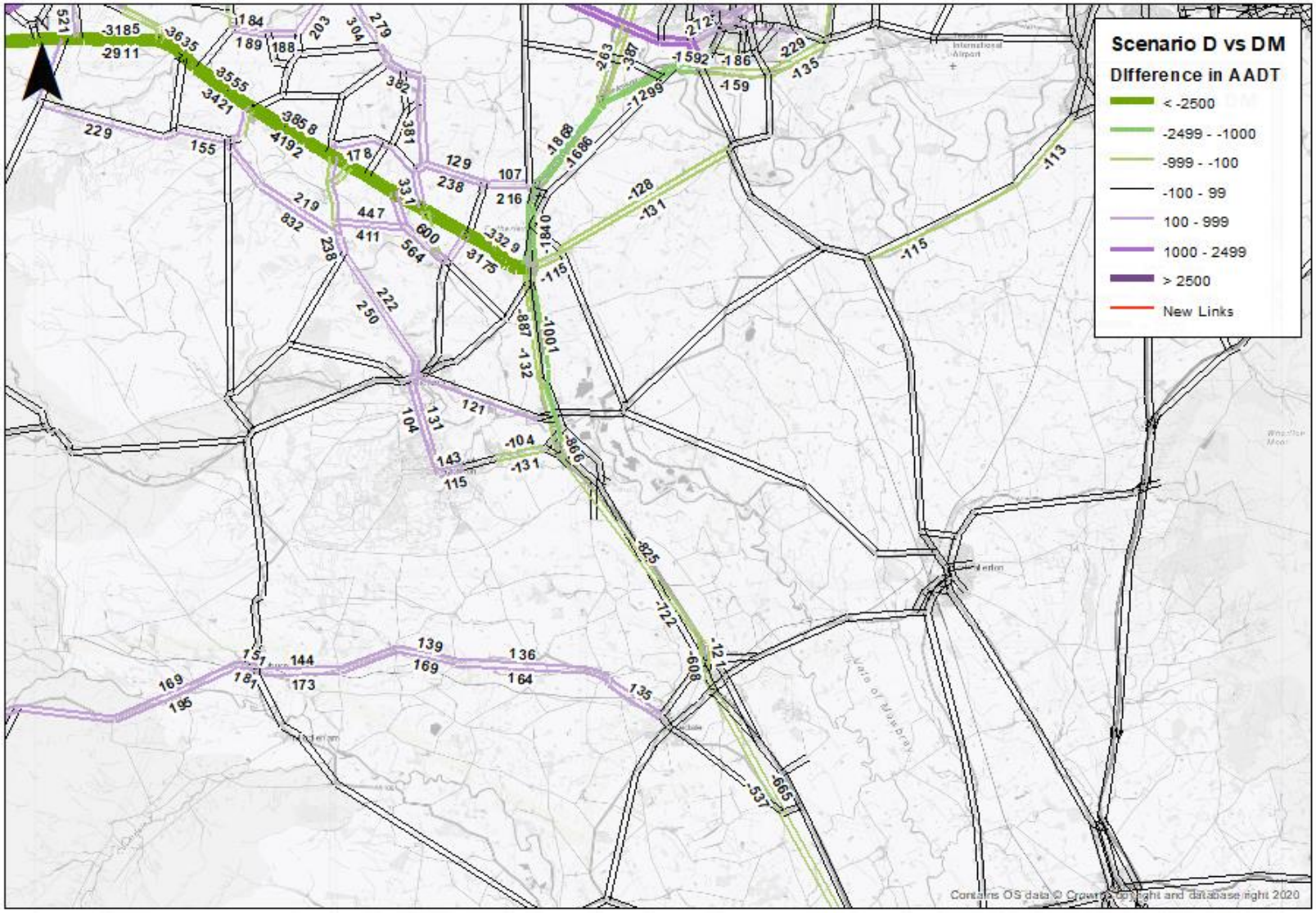


Figure 13-20: Scenario D A1(M) South