A585 Windy Harbour to Skippool Improvement Scheme

TR010035

7.12 Combined Modelling and Appraisal Report

APFP Regulation 5(2)(q)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed
Forms and Procedure) Regulations 2009

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Infrastructure Planning

Planning Act 2008

The Infrastructure Planning
(Applications: Prescribed Forms and
Procedure) Regulations 2009

A585 Windy Harbour to Skippool Improvement Scheme

Development Consent Order 20[ ]

COMBINED MODELLING AND APPRAISAL REPORT

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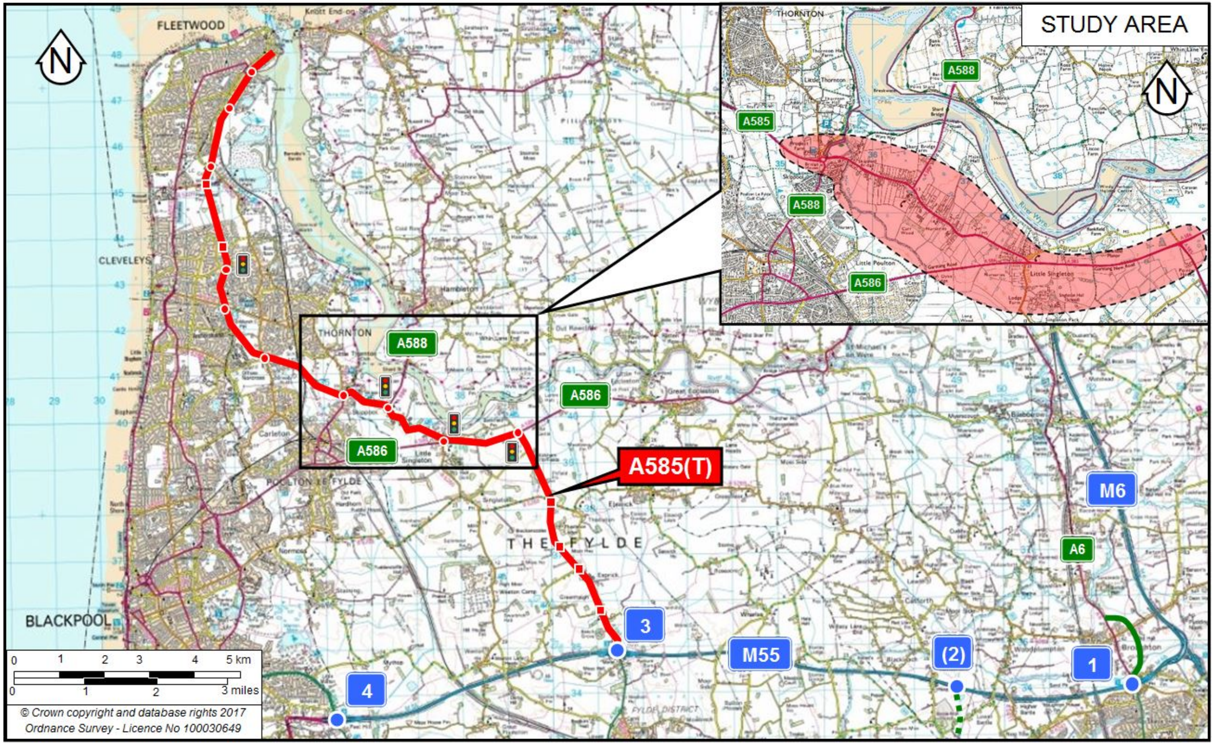
1 Introduction

1.1 Description of the Scheme

1.1.1 The A585(T) is a single carriageway trunk road located in the Lancashire County Council Local Authority and connects the settlements of Singleton, Skippool, Poulton-Le-Fylde, Thornton-Cleveleys and Hambleton along its route from the M55 junction 3 north-west of Preston into the northern part of the Fylde peninsula. The A585 provides the only viable access from the motorway network into Fleetwood and its urban areas. As a result, it suffers from congestion, especially during the peak periods. This congestion is apparent at the A585/A586 signalised junction (Little Singleton) and the A585/A588 signalised junction (Shard Road). There is a third signalised junction just to the east, known as Windy Harbour which, together with Little Singleton and Shard Road, creates further congestion and all three junctions interact thus exacerbating the problems. shows the location and the network in the vicinity of the trunk road. The existing road layout is shown in Figure 1-2. Highways England is now proposing further improvements to the A585 corridor west of the Windy Harbour junction as shown in Figure 1-3.



1.1.2 The A585 Windy Harbour to Skippool Improvement Scheme consists of:

- A 4.85km (3 miles) long dual 2-lane carriageway bypass from Windy Harbour Junction to the Skippool Junction.
- Four new junctions including: conversion of Skippool Junction to a traffic signal-controlled crossroads with A588 Breck Road and B5412 Skippool Road; Skippool Bridge Junction in the form of a three-arm traffic signal-controlled junction with the existing Mains Lane; Poulton Junction in the form of a signal-controlled crossroads connecting the new bypass to A586 Garstang Road East and modification to Little Singleton Junction (also known as Five Lane Ends) to accommodate U-turning traffic including buses. Between Skippool Bridge Junction and Poulton Junction the bypass is on embankment. East of Poulton Junction through to east of Lodge Lane the bypass is mostly in cutting.
- Three new major structures including: replacement of Skippool Bridge; Lodge Lane Bridge and Grange Footbridge.
- Alterations to the existing road network on completion of the bypass include: detrunking the A585 between Skippool Bridge Junction and the end of Garstang New Road east of Little Singleton; applying a reduction in speed limit to 30mph and providing a combined footway/cycleway along Mains Lane between Shard Road Junction and Little Singleton; altering Garstang New Road east of Little Singleton to allow restricted access to farmers' fields and provide a shared footway/cycleway route between Windy Harbour Junction and Little Singleton; applying a reduced speed limit of 30mph along Garstang Road

East between the proposed Poulton Junction and Little Singleton and upgrading the lighting along Mains Lane and Garstang Road East.

1.1.3 The introductory Stage 3 Scheme was based on the Stage 2 Scheme. The Stage 3 Traffic Operational Report [HE548643-ARC-GEN-A585-RP-D-3065], which outlines the traffic operational appraisal undertaken in Stage 3, revealed some design issues with the proposed Scheme junctions identified at Stage 2. Following the revisions to the Stage 3 Scheme the traffic operational assessment has highlighted no significant issues with the updated Stage 3 Preliminary Design. The Stage 3 Traffic Operational Report [HE548643-ARC-GEN-A585-RP-D-3065] can be referred to in Appendix H.

1.1.4 The traffic forecasting results of the sensitivity test undertaken on the Updated Scheme can be referred to in the Stage 3 Scheme Design Update Traffic Forecasting Technical Note [HE548643-ARC-HDG-A585-TN-TR-3023] provided in the Stage 3 Transport Forecasting Package and can be referred to in Appendix F.

1.1.5 The economic appraisal results of the sensitivity test undertaken on the Updated Scheme can be referred to in the Stage 3 Scheme Design Update Economic Appraisal Technical Note [HE548643-ARC-HDG-A585-TN-TR-3024] and can be referred to in Appendix G.

1.1.6 As a result of traffic growth forecast between the base year and design year, the Norcross roundabout and surrounding area is predicted to become severely congested, with and without the proposed A585 Windy Harbour to Skippool Improvement Scheme. The improved throughput of traffic westbound from Skippool junction to Norcross junction as a result of the Scheme could exacerbate this issue. Furthermore, the congestion in the Norcross area limits the throughput of traffic eastbound towards the Scheme area.

1.1.7 Options for improving the operation of the Norcross junction are currently being considered independent of the Windy Harbour to Skippool Scheme assessment, and therefore the Scheme design, environmental, operational and economic assessment assumes no scheme at the A585 Norcross junction (the adjacent Operations Directorate scheme) is in place in the opening year or design year of the A585 Windy Harbour to Skippool Improvement Scheme. Inclusion of the A585 Norcross scheme would require a separate sensitivity test to determine its impact on the A585 Windy Harbour to Skippool Improvement Scheme as the traffic flows approaching the Scheme are constrained by the existing capacity of the upstream A585 Norcross junction. A sensitivity test would address an otherwise possible limitation of the current Scheme appraisal in terms of assessing the chosen Scheme’s resilience to improved throughput of eastbound traffic as a result of any A585 Norcross improvement scheme.

1.1.8 The lack of rail infrastructure means that the Strategic Road Network (SRN) is the only real access option to / from Fleetwood. Bus companies are also discouraged from providing alternative sustainable travel options as the congestion impacts on their ability to deliver reliable timetables. Due to the lack of alternative routes and sustainable transport options, any incidents on this section of the A585 can also lead to significant delays, thereby exacerbating the situation.

1.1.9 Parts of the Fleetwood conurbation suffer from high unemployment and deprivation and this continued congestion will limit the housing and employment growth aspirations and opportunities of the local planning authorities at both Wyre Council and Fylde Council. Developers can be discouraged from investing due to the limited and congested access options.

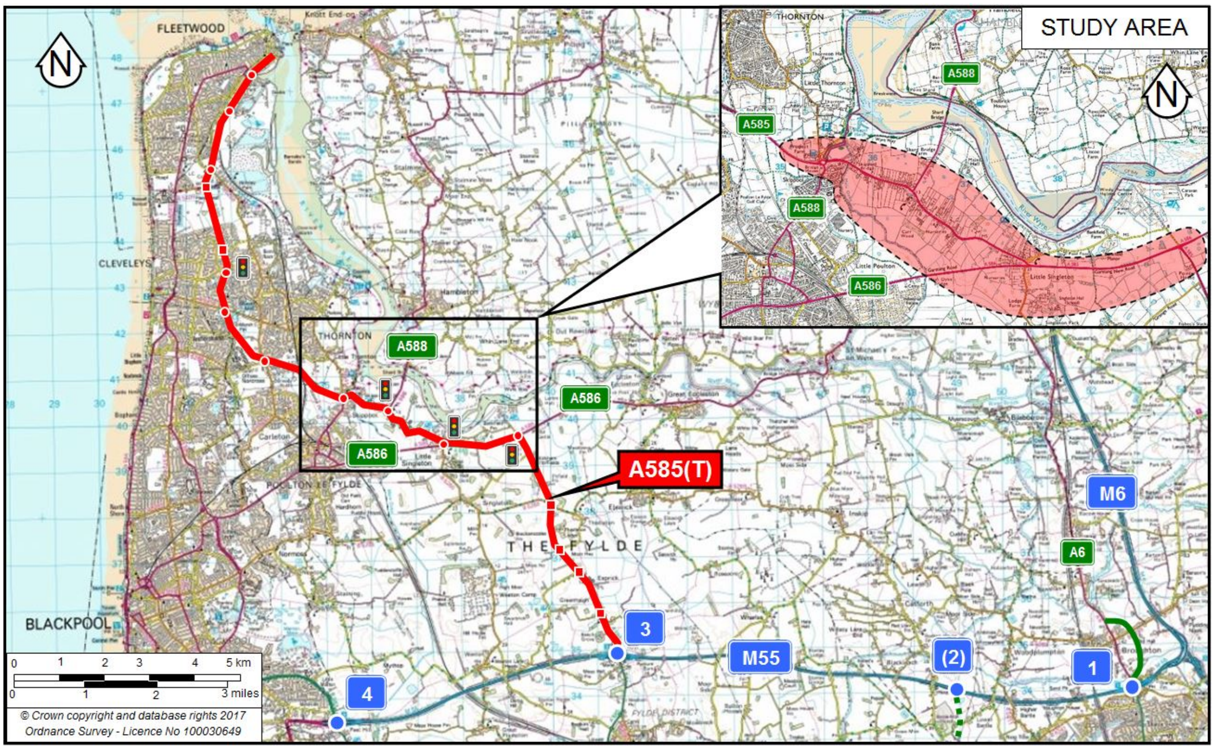


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Figure 1-1: Location and network near the A585

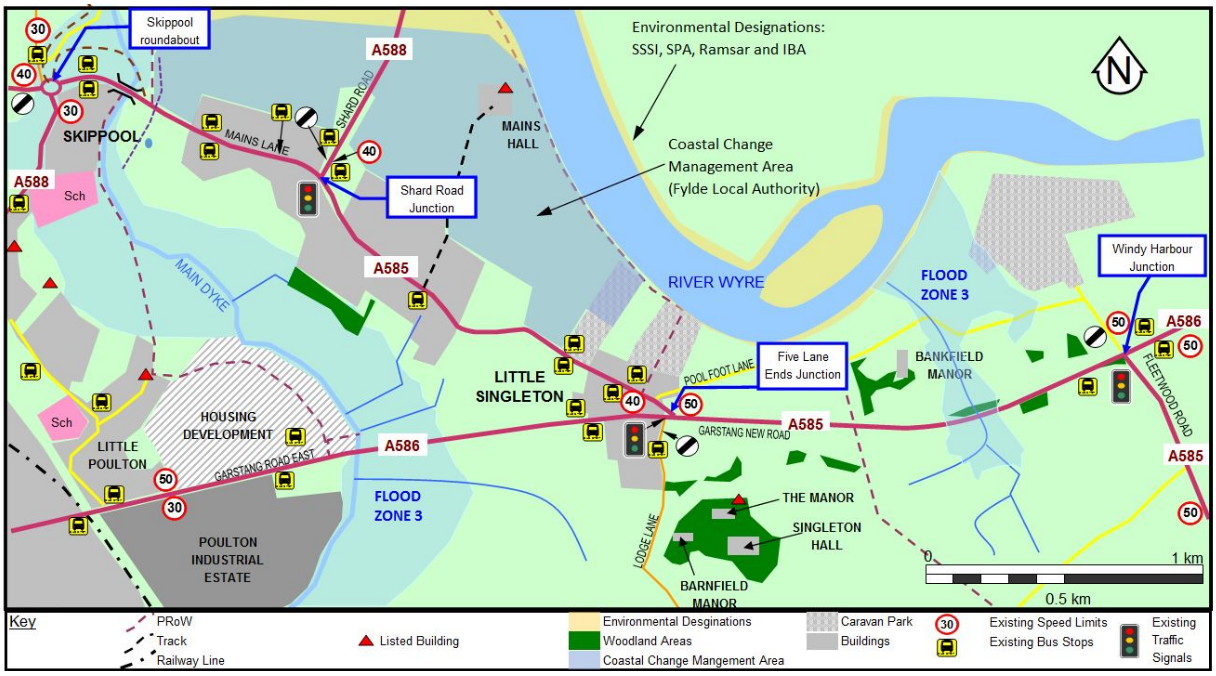

Figure 1-2: A585 Windy Harbour to Skippool Improvement Scheme existing road layout

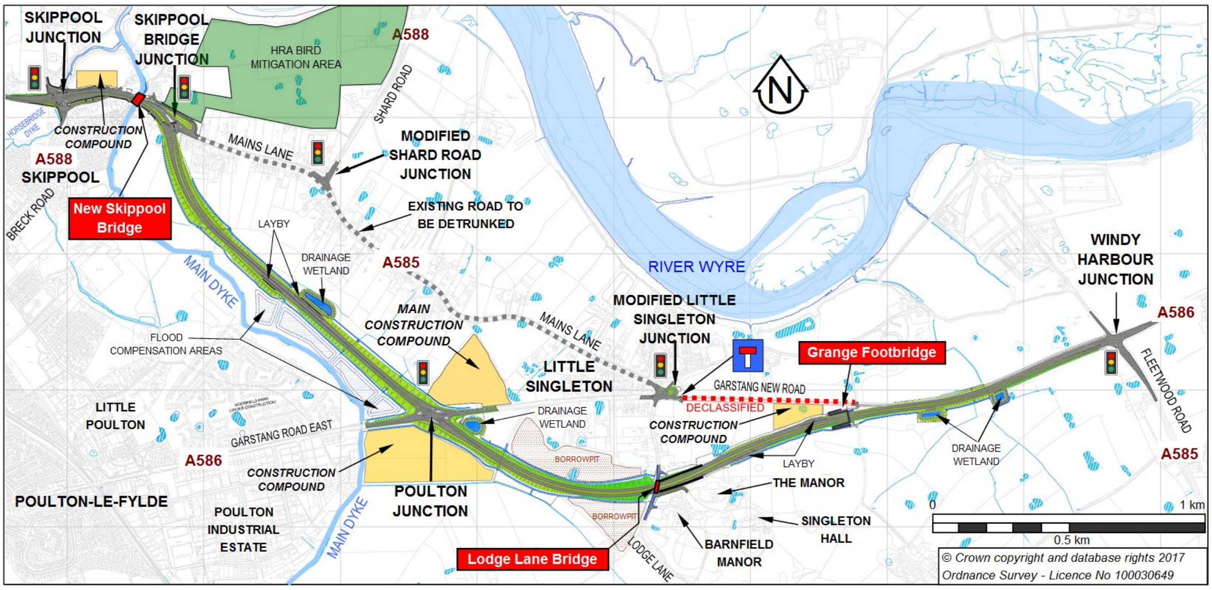

Figure 1-3: A585 Windy Harbour to Skippool Improvement Scheme preferred route

1.2 Statement of Scheme Objectives

1.2.1 The overall project objectives as set out in the Client Scheme Requirements Version 3.4 (and can be referred to in Appendix A) are:

- To support economic growth in the area
- Improve safety along the route
- Improve journey time and reliability
- Reduction of severance for non-motorised users (NMUs) along the exiting Mains Lane.

1.2.2 The Scheme's nine transport objectives are:

- Objective 1 – Deliver capacity enhancements to the SRN whilst supporting the use of sustainable modes
- Objective 2 - Reduce congestion on the existing A585 through Little Singleton, Shard and Skippool Junctions
- Objective 3 – Support employment and residential/commercial development and growth opportunities
- Objective 4 – Improve journey time reliability
- Objective 5 – Reduce severance for NMUs and improve access across the existing A585 between the Little Singleton and Skippool Junctions
- Objective 6 – Reduce/minimise the impact on the wider environment, particularly for air quality and noise
- Objective 7 – Improve connectivity and community cohesion
- Objective 8 – Support the removal of obstacles to economic growth potential in both Wyre and Fylde
- Objective 9 – Complement and realise the full benefits of other Operations Directorate schemes in the region

1.3 Background

1.3.1 Highways England has completed construction of a traffic signal-controlled junction improvement at Windy Harbour Junction as part of the Tranche 3 Pinch Point proposals. This improvement increased the number of lanes turning between Fleetwood Road and Garstang New Road, leading to reduced queuing, and provided enhanced pedestrian and cycle facilities. However, in isolation, this will provide limited benefit to the route as a whole.

1.3.2 The local highway authority at Lancashire County Council (LCC) has a long-held ambition to provide a route known as the M55 to Norcross Link (The Blue Route) to the west of the two junction constraints on the A585 (Little Singleton and Shard). The M55 to Norcross Link route is currently protected for planning purposes as shown in Figure 1-4. However, they now consider that the southerly section of this route between the M55 and the A586 is not economically viable and they wish to remove it from their programme although they are not currently proposing to rescind protection of that route, retaining just that element that would bypass the A585 Little Singleton and Shard Road junctions.

1.3.3 The section of the LCC route between Skippool and the A586 Garstang Road East is similar to the alignment of that section of the proposed Scheme.

1.3.4 Both offline and online options between Windy Harbour junction and Skippool were previously investigated by Highways England. After undertaking studies and modelling work on those options it was announced in October 2017 that the preferred option for this Scheme was a southern bypass.

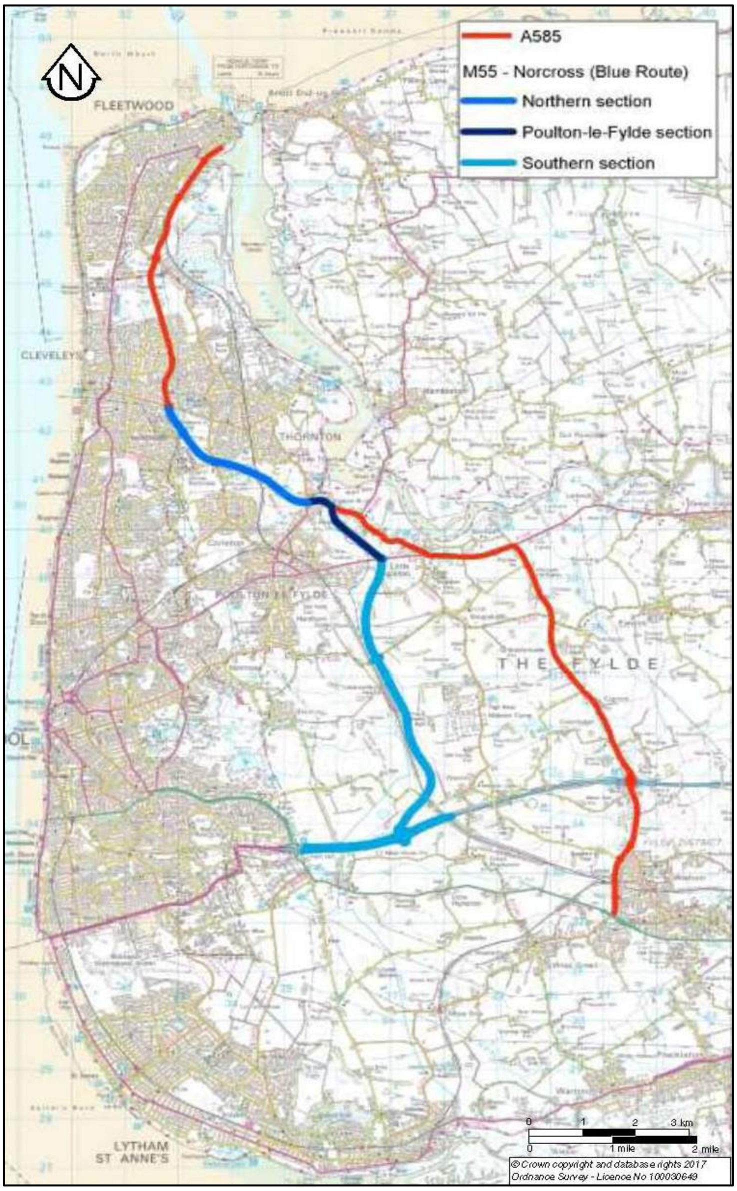

Figure 1-4: M55-Norcross link road, safeguarded route

2 Summary

2.1 High level benefits and costs

2.1.1 Table 2-1 shows the benefits due to the Introductory Scheme model version VDM_04 as well as the adjusted benefits for the Core Scenario.

Table 2-1: Stage 3 Core Scenario Scheme Introductory Scheme Appraisal Results (2010 prices and discounted to 2010)

Present Value of Benefits (initial)	£145,779,069
Present Value of Benefits (adjusted)	£236,637,327
Present Value of Costs	£108,895,457
Initial BCR	1.34
Adjusted BCR	2.17

2.1.2 Table 2-2 shows the benefits due to the Updated Scheme model version VDM_06 as well as the adjusted benefits for the Core Scenario.

Table 2-2: Stage 3 Core Scenario Scheme Updated Scheme Appraisal Results (2010 prices and discounted to 2010)

Present Value of Benefits (initial)	£136,867,090
Present Value of Benefits (adjusted)	£220,511,499
Present Value of Costs	£108,895,457
Initial BCR	1.26
Adjusted BCR	2.02

2.1.3 Two BCRs, an initial BCR (which excludes journey time reliability and wider impacts and weekend benefits) and an adjusted BCR (which includes journey time reliability and wider impacts and weekend benefits) have been presented for the Scheme.

2.1.4 The initial Core Scenario Stage 3 introductory Scheme BCR is 1.34. Adding in Weekend benefits, Journey Time Reliability and Wider Impacts to provide an Adjusted BCR, increases the Core Scenario Stage 3 introductory Scheme BCR to 2.17.

2.1.5 The initial Core Scenario Stage 3 updated Scheme BCR is 1.26 (as reported in Appendix G). Adding in Weekend benefits, Journey Time Reliability and Wider Impacts to provide an Adjusted BCR, increases the Core Scenario Stage 3 updated Scheme BCR to 2.02.

2.1.6 An overall objective of the Scheme, to improve safety along the route, will be achieved, as the Scheme if implemented is shown to reduce the number of accidents and casualties.

2.1.7 The Scheme reduces severance for non-motorised users. The reduced traffic flow on the de-trunked section due to the Scheme has the potential to improve the local environment along the de-trunked section and should encourage walking and cycling.

2.1.8 The Scheme improves road user journey time and reliability and the Scheme's Wider Economic Impacts due to the improved journey times and reliability for business road users supports economic growth in the area. Travel time savings of between 2 and 4.5 minutes per journey are forecast to be saved by road users due to the Scheme.

2.1.9 On this basis the A585 Windy Harbour to Skippool Improvement Scheme Operational and Economic Appraisal has shown that the overall objectives of the Scheme to improve safety along the route, reduce severance for non-motorised users, support economic growth and improve journey time reliability have been met and it is therefore worthwhile in economic terms to proceed with the Scheme.

2.2 Source of Costs

2.2.1 The costs of the Scheme based on Scheme cost estimates covering preparation costs, supervision costs, land costs and construction expenditure were produced on behalf of the Highways England Commercial team, who are responsible for cost estimation within Highways England.

2.2.2 The preparation of Scheme costs for the economic appraisal of the Scheme has been carried out following the principles set out in TAG Unit A1.2 Scheme costs.

2.2.3 Costs are estimated under two broad headings – investment costs and maintenance costs. Investment costs are those that will be incurred in the preparation and construction of the Scheme, including land acquisition costs. Maintenance costs are those that are required for the maintenance of the Scheme.

2.2.4 The Scheme cost estimate of £108.9m in 2010 prices and discounted to 2010 can be referred to in further detail in the Stage 3 Economic Appraisal Package, Section 2.

2.3 Source of Benefits

2.3.1 The sources of benefits of this Scheme include:

- Transport User Benefits
- Accident cost savings
- Construction and Maintenance Delay Assessment
- Air quality and noise
- Greenhouse gases
- Journey time reliability
- Wider economic impact

2.4 Introductory Scheme Demand Growth along the Route (Without Scheme)

2.4.1 Table 2-3 shows the Without Scheme growth in annual average daily traffic (AADT) demand on key links for the Introductory Scheme model version VDM_04 for the Scheme opening year and the design year.

Table 2-3: Core Scenario Without Scheme demand growth along the A585

Link	AADT (2022)	AADT (2037)	AADT change (%)
Skippool Junction to Shard Road Junction Eastbound	17,779	19,862	12%
Shard Road Junction to Little Singleton Junction Eastbound	12,911	15,079	17%
Little Singleton Junction to Windy Harbour Junction Eastbound	15,596	17,864	15%
Windy Harbour Junction to Little Singleton Junction Westbound	15,004	17,239	15%
Little Singleton Junction to Shard Road Junction Westbound	11,706	13,170	13%
Shard Road Junction to Skippool Junction Westbound	16,752	18,192	9%

2.5 Introductory Scheme Demand Growth along the Route (With Scheme)

2.5.1 Table 2-4 shows the With Scheme growth in AADT demand on key links for the Introductory Scheme model version VDM_04 for the scheme opening year and the design year.

Table 2-4: Core Scenario With Scheme demand growth along the A585

Link	AADT (2022)	AADT (2037)	AADT change (%)
Skippool Junction to Skippool Bridge Junction Eastbound	17,970	20,605	15%
Skippool Bridge Junction to Poulton Junction Eastbound	14,411	16,858	17%
Poulton Junction to Windy Harbour Junction Eastbound	19,698	22,841	16%
Windy Harbour Junction to Poulton Junction Westbound	17,391	19,692	13%
Poulton Junction to Skippool Bridge Junction Westbound	13,744	15,760	15%
Skippool Bridge Junction to Skippool Junction Westbound	17,208	19,489	13%

2.6 Key Monetised Benefits and Costs

2.6.1 Table 2-5 shows the key adjusted monetised benefits and costs for the scheme for the Introductory Scheme model version VDM_04.

Table 2-5: Introductory Scheme Core Scenario Key Monetised Benefits and Costs (Including Weekend)

Category	Benefits and costs in £'000 (PV)
Business Users	
Journey Time Savings	£61,812,751
Vehicle Operating Costs	-£2,426,760
Non-Business users	
Journey Time Savings	£121,610,302
Vehicle Operating Costs	-£44,355,641
Reliability	
Business Reliability	£13,789,633
Non-business Reliability	£9,960,742
Safety	
Safety	£10,111,039
Environmental Impacts	
Noise	£1,315,041
Local Air Quality	£256,629
Greenhouse Gases	-£17,889,985
Landscape	Not monetised
Wider Economic Impacts	
Agglomeration	£47,570,939
Market Competition	£2,218,593
Dependent Development	Not Assessed
Labour Supply	£1,240,606
Customer Impact	
Traffic delays due to Construction	-£3,190,738
Traffic impacts due to Maintenance	£1,383,539
Journey Quality	Not Assessed
Developer contributions	
Developer contributions	N/A
Other Impacts	
Indirect tax Revenues (*sign changed from PA table)*	£33,378,114
[Other - please specify]	
Costs	
Cost to Broad Transport Budget	£108,895,457
Cost savings(where relevant)	

2.7 Key Quantified Benefits and Costs

2.7.1 Table 2-6 shows the key quantified benefits and costs for the scheme for the Introductory Scheme model version VDM_04.

Table 2-6: Introductory Scheme Core Scenario Key Quantified Benefits and Costs (Including Weekend)

Category	Quantified impacts	Units
Journey times		
Journey Time Savings	Not Calculated	*(average saving per journey on scheme sections in minutes)**
Safety		
Accidents	28	*(total number saved)*
Fatalities	8	*(total number saved)*
Seriously injured	8	*(total number saved)*
Slightly injured	8	*(total number saved)*
Environmental Impacts		
Number of Noise important areas affected	116	*(number)*
Names of AQMAs	Chapel Street AQMA	*(names)*
Change in NOx emissions	312	*(tonnes)*
Change in PM10 emissions	-50	*(tonnes)*
Change in greenhouse gas emissions	397,268	*(tonnes CO2e)*
Customer Impact: Totals		
Traffic delays due to Construction	Not Calculated	*(total loss on scheme sections in hours)*
Traffic impacts due to Maintenance	Not Calculated	*(total impact on scheme sections in hours)*
Customer Impact: Per journey		
Traffic delays due to Construction (cars)	Not Calculated	*(average loss per journey on scheme sections in minutes) **
Traffic delays due to Construction (LGVs)	Not Calculated	*(average loss per journey on scheme sections in minutes) **
Traffic delays due to Construction (HGVs)	Not Calculated	*(average loss per journey on scheme sections in minutes) **
Traffic impacts due to Maintenance (cars)	Not Calculated	*(average impact per journey on scheme sections in minutes) **
Traffic impacts due to Maintenance (LGVs)	Not Calculated	*(average impact per journey on scheme sections in minutes) **
Traffic impacts due to Maintenance (HGVs)	Not Calculated	*(average impact per journey on scheme sections in minutes) **

**Defined as total saving or loss on all scheme sections per day divided by distance-weighted AADT on scheme sections*

2.8 Key Quantified Benefits and Costs

2.8.1 The strategic outcome for the scheme for the Introductory Scheme model version VDM_04 is shown in Table 2-7.

Table 2-7: Introductory Scheme Core Scenario Key Quantified Benefits and Costs (Including Weekend)

Strategic Outcome	KPI	Scheme Contribution – Qualitative	Scheme Contribution - Quantitative
Making the network safer	The number of KSIs on the SRN.	28 accidents saved. 116 casualties saved, 8 fatal, 40 serious and 68 slight.	Accident Savings of £10.11m
Delivery of better environmental outcomes	Noise: Number of Noise Important Areas mitigated. Biodiversity: Delivery of improved biodiversity, as set out in the Company's Biodiversity Action Plan	Noise – neutral to slight adverse for the most deprived. Neutral to large adverse for least deprived. Air Quality - Slight beneficial to large beneficial for most deprived. Moderate adverse to large adverse for least deprived.	Noise £1.32m Air Quality £0.26m Greenhouse Gases (disbenefit) £17.89m
Helping cyclists / walkers and other vulnerable users	The number of new and upgraded crossings	All junctions will have pedestrian crossing facilities. All existing footpaths will remain available for use and footbridge provided at Grange Road. Cycling available on de-trunked A585 and away from the Scheme.	N/A

3 Summary and Review of Existing Data

3.1 Background

3.1.1 The PCF Stage 0 traffic modelling work for the scheme was undertaken in November 2014. The Stage 1 traffic modelling was begun in September 2015 and was undertaken using S-Paramics. Most of the data used to build the A585 CTF S-Paramics model (for Stage 1 modelling) was based on RSIs carried out in 2008.

3.1.2 The data age of the Road side interviews used to create the matrix for the A585 Windy Harbour to Skippool Improvement Scheme traffic model is as follows:

- ANSA Consultants RSIs - May 2010
- Blackpool RSIs - May/June 2008
- Preston Western Distributor RSIs - April 2014

3.1.3 Both the ANSA and Blackpool RSIs are beyond the 6 year guidance criteria provided by DfT TAG. As stated in TAG M3-1 Section 8 Paragraph 8.1.1, trip matrices should not be taken from existing model unless the following conditions are met:

- The trips having both ends in the Fully Modelled Area which were derived from survey data were based on survey data which are less than six years old.

3.1.4 It was recommended that for Stage 3 the Base Year trip data would be updated to 2015, but advice received from Highways England was to continue to base the Stage 3 Scheme transport model on the Stage 2 base year transport model. This could cause a significant risk to the DCO application as the age of the Stage 2 trip data used to build the Scheme base year transport model demand matrices is in excess of the six-year age requirement stipulated in Government guidance.

3.1.1 The decision to proceed with the continued use of the 2008 and 2010 RSI data has been made by Highways England in order to meet the DCO delivery programme.

3.1.2 It was investigated whether the risk around data age (in reference to the 2008 and 2010 RSI data) could be mitigated by comparing the Stage 2 Scheme transport model trip data with the Trans-Pennine South Regional Traffic Model trip data which is reported in technical note HE548643-ARC-GEN-A585-TN-D-3019 Base Year Matrix Acceptance. The work was undertaken to compare the TPS RTM which has been developed using mobile phone data records produced by Telefonica for an average weekday in March 2015 with the Stage 2 Scheme transport model which is based on 2008-2010 trip data. The technical note showed there is little correlation in the distribution of demand in the Scheme base year transport model and the TPS RTM, however it was also demonstrated that as the TPS RTM had not been validated in sufficient detail in the Scheme assessment area, it was deemed to be an insufficient measure to verify whether the Scheme Base Year transport model reflects current trip patterns.

3.1.3 The Local Development Review (2008-2015) was carried out and reported in HE548643-ARC-HDG-A585-TN-TR-3025 “Local Development Review 2008-2015”. The review of local development provided an overview of local housing and employment development occurring between 2008-2015 and reported the change in local development since the 2008-2010 RSIs were collected. This will not validate the trip data in the Scheme transport model, however the review provided an indication of the increase in local development which would contribute to new trip-making that would not be accounted for by the RSIs. Any change in trip patterns to existing trip making would also not be accounted for by the RSIs undertaken in 2008-2010.

3.1.4 Despite this limitation of the data available it was decided by Highways England to continue using a model with the data available i.e. (2010 and 2008) Road side interview data. The reason for this was:

- Given the location of the Scheme Highways England took the view that the pattern of origin/destinations would not change significantly between 2008 and 2018 as for example, the alternative routes towards Fleetwood/Cleveleys are constrained by the River Wyre.
- Road schemes constructed in the vicinity of the A585 between 2008 and 2018 were deemed unlikely to have changed trip patterns.

3.1.5 Highways England also noted that although the matrix is based on old RSI data, 2015/2016 ATC data has been used to create a 2015 base year model. The data obtained from the traffic surveys provided a significant proportion of the count data for the purposes of matrix expansion, re-basing, matrix estimation and model validation.

3.1.6 There was no new data collected for PCF Stage 3 of the A585 Windy Harbour to Skippool Improvement Scheme. The PCF Stage 3 Transport Data Package [HE548643-ARC-HGN-A585-RP-TR-3164] can be referred to in Appendix B and is therefore encapsulated by the Stage 2 Traffic Data Collection Report [HE548643-ARC-GEN-A585-RP-TR-2022]. The A585 Windy Harbour to Skippool Improvement Scheme Stage 2 Traffic Data Collection Report (TDCR) includes the details of the data sources used in the Stage 2 model development, calibration and validation.

4 Data Collection

4.1 Overview

4.1.1 In order to support the development of the Scheme traffic model, and to support the development of forecasts which will be used for economic and environmental appraisal, a large set of traffic data was collected during PCF Stage 2.

4.1.2 As identified in the PCF Stage 3 Transport Data Package no new data was collected for the PCF Stage 3 Scheme assessment.

4.1.3 The PCF Stage 3 dataset comprised data collected in the previous PCF Stage 1 and 2 which was used in the development, calibration and validation of the PCF Stage 2 A585 base year traffic model and other previously developed traffic models and data collected by Local Authorities.

4.1.4 This chapter provides a summary of the main data sources used in model development, calibration and validation. The full detail is provided in the Stage 2 Traffic Data Collection Report [HE548643-ARC-GEN-A585-RP-TR-2022] which can be referred to in Appendix C.

4.2 Data Sources

Previous traffic models and traffic data

4.2.1 Table 4-1 provides a summary of the previously developed traffic models and previously collected traffic data used in the development of the A585 base year traffic model. Full details of the previous traffic models and traffic data used in the development of the A585 traffic model are provided in Chapter 3 of the Stage 2 TDCR provided in Appendix C.

Table 4-1: Summary of Previous Traffic Models and Data

Previous Traffic Models		Year Developed	Use in A585 Model Development
1.	A585 Corridor & Thornton-Fleetwood Area Action Plan S-Paramics Model	2010	S-Paramics model zone boundaries were reviewed whilst developing the A585 SATURN model zone boundaries
2.	Further S-Paramics Modelling (PCF 1)	Originally in 2010, later adjusted to 2014 base using TEMPRO	
3.	Blackpool Transport Model (CUBE)	2008	Signal timings were reviewed to determine if they could be used at any of the signalised junctions in the A585 SATURN model.
4.	Central Lancashire Highways & Transport Masterplan (CLHTM) – Preston Western Distributor (PWD)	2014	Counts collected during 2014 at a number of Road Side Interview (RSI) sites in the vicinity of Preston were used as a contribution to the development of the base year matrices for the A585 SATURN model.
Previously Collected Traffic Data		**Year Collected**	**Use in A585 Model Development**
1.	Blackpool RSIs	2008	Used to develop the base year matrices for the A585 SATURN model, after being uplifted to June 2015. The distributions of the trips recorded in these data sets were also used to generate distributions of generalised costs, which were used as inputs to the gravity model that was used in the synthesis of the prior matrix.
2.	A585 & Surroundings RSIs (collected by ANSA)	2010	
3.	RSIs collected for CLHTM (PWD)	2014	
4.	Blackpool Council – Temporary Automatic Traffic Counts (ATCs)	2012-2015	Used to derive factored counts for calibration/validation at screenlines and cordons
5.	Blackpool Council – Permanent ATCs	2012-2015	
6.	Lancashire County Council – Temporary ATCs	2011-2015	
7.	Lancashire County Council – Permanent ATCs	2011-2015	

5 Final Datasets

5.1 Road Side Interviews

5.1.1 Figure 5-1 shows the location of the Blackpool (2008), A585, and Surroundings (ANSA 2010) RSI site locations. Figure 5-2 shows the RSI sites at which interviews were carried out for the development of the PWD model (2014).

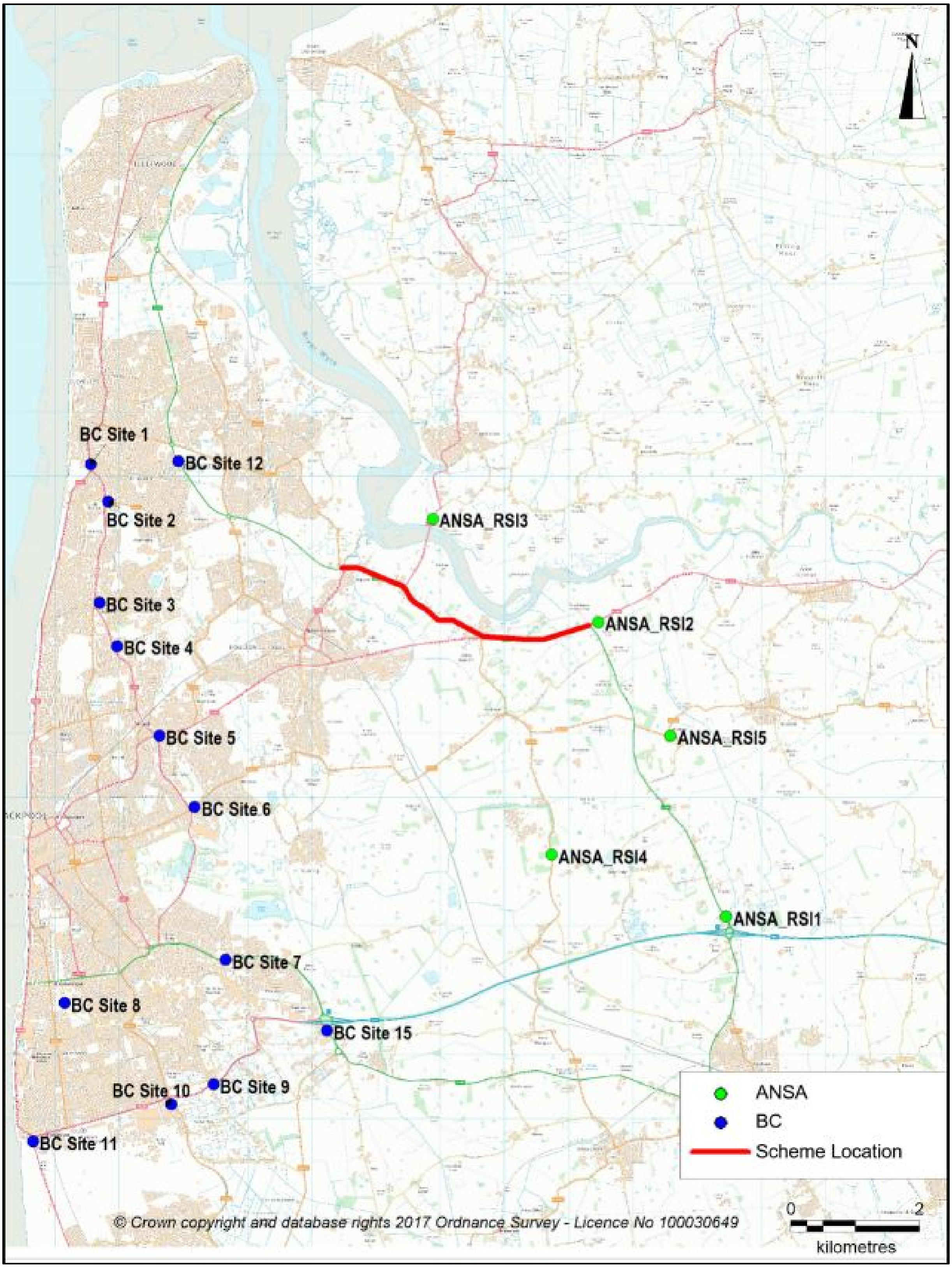

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Figure 5-1: Blackpool and A585 & Surroundings (ANSA) RSI Site Locations

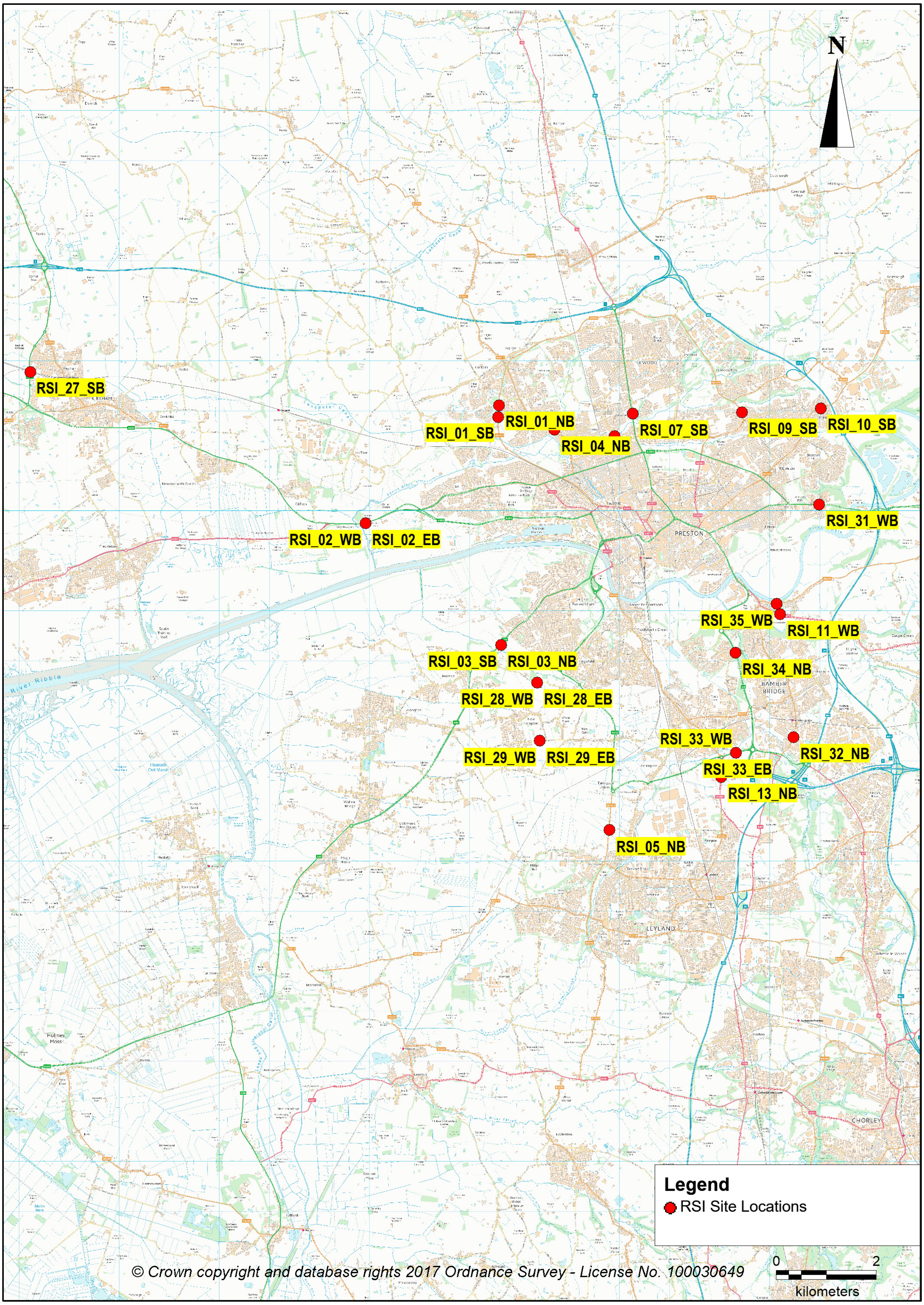

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Figure 5-2: Preston Western Distributor RSI Site Locations

5.2 Traffic Surveys

5.2.1 It was necessary to collect additional data at specific locations for calibration and validation purposes and to derive Yearly Growth Factors (YGFs) and Monthly Seasonality Factors (MSFs) at specific site locations. The traffic survey programme is discussed in the next section.

5.2.2 To supplement the previously collected data and information taken from previously developed traffic models, a programme of traffic surveys was carried out in September/October 2015 and February/March 2016, as summarised in Table 5-1. Further details of the survey programme are provided in Chapter 4 of the Stage 2 TDCR provided in Appendix C.

Table 5-1: Summary of the Traffic Survey Programme

Survey Type	No. of Sites	Direction	Duration	Survey Dates	Use in Model Development
Automatic Traffic Counts (ATCs)	8	All directions at each survey site	2 weeks (24 hours per day)	July, September, October 2015	Matrix development Link calibration and validation along screenlines and cordons
	56	All directions at each survey site	2 weeks (24 hours per day)	February/March 2016	
Classified Junction Counts (CJCs)	64	All turning movements	2 days per site (07:00-19:00 on each day)	July 2015	Turn calibration and validation
Queue Length Surveys	64	Queues on all lanes at each junction approach arm	2 days per site (07:00-19:00 on each day)	July 2015	Network calibration and validation
Manual Classified Counts (MCCs)	9	All movements	1 day (07:00-19:00)	February 2016	Calibration and validation Vehicle classification factors

5.3 TRIS data

5.3.1 In addition to collecting bespoke traffic data to use in the development of the A585 model, existing traffic count information was extracted from Highways England's TRIS website (http://tris.highwaysengland.co.uk) for the months of July 2015 and September 2015. This data was extracted for eight locations in the study area, in fifteen minute intervals. Further details regarding the sites for which data was extracted is provided in Chapter 5 of the Stage 2 TDCR in Appendix C.

5.3.2 The TRIS data was used as observed counts at selected screenlines and cordons and it was also used to identify Yearly Growth Factors (YGFs) and Monthly Seasonality Factors (MSFs) for sites on motorways and 'A' class roads that were then used to convert the data collected to the model base month and year of June 2015.

5.4 Journey Time Data

5.4.1 Data on observed journey times was extracted from the Trafficmaster database for 28 routes in the study area. This data was compared with modelled journey time data to identify whether the journey time validation results meet the relevant criteria.

5.4.2 Each journey time route was sub-divided into several sections for validation purposes, which were constructed from one or more SATURN network links. The observed journey time for each section was extracted from the Trafficmaster data and the sum over the whole route was compared with the modelled journey time summed over the same section and assessed against the TAG criteria for journey time validation.

6 Model Description/Specification

6.1 Network Structure

6.1.1 The A585 traffic model consists of two key model areas: The Fully Modelled Area (FMA) and the External Area.

6.1.2 The FMA is the area over which the proposed scheme is expected to have an influence, focusing on the A585 to the north of the M55 and to the west of the M6, including the principal settlements of Fleetwood, Blackpool, Cleveleys, Poulton-Le-Fylde, Singleton and a number of smaller areas.

6.1.3 The FMA is further sub-divided into the Model Simulation Area or Area of Detailed Modelling (hereafter referred to as the ADM) and the Buffer Area.

6.1.4 The ADM is the area over which significant scheme impacts are expected. This area is characterised by small zones, very detailed networks and junction modelling, with all trip movements represented. The ADM of the A585 traffic model contains a total of 81 signalised junctions, 47 roundabouts and 241 priority junctions.

6.1.5 The Buffer Area is the area over which scheme impacts are expected to be relatively weak in magnitude. All trip movements are represented in the Buffer Area of the A585 base year model, but with larger zones and less network detail than for the ADM.

6.1.6 The External Area is the area outside the anticipated area of scheme influence, characterised in the A585 traffic model by large zones, skeleton networks and fixed speed modelling. The External Area represents a large proportion of the rest of Great Britain, as shown in Figure 6-1.

6.1.7 MapInfo GIS software was used as the primary tool in identifying the roads for inclusion in the model, building the model road network and updating network attributes. The model road network is illustrated in Figure 6-2.

Figure 6-1: Scheme Traffic Model External Area (Road Network)

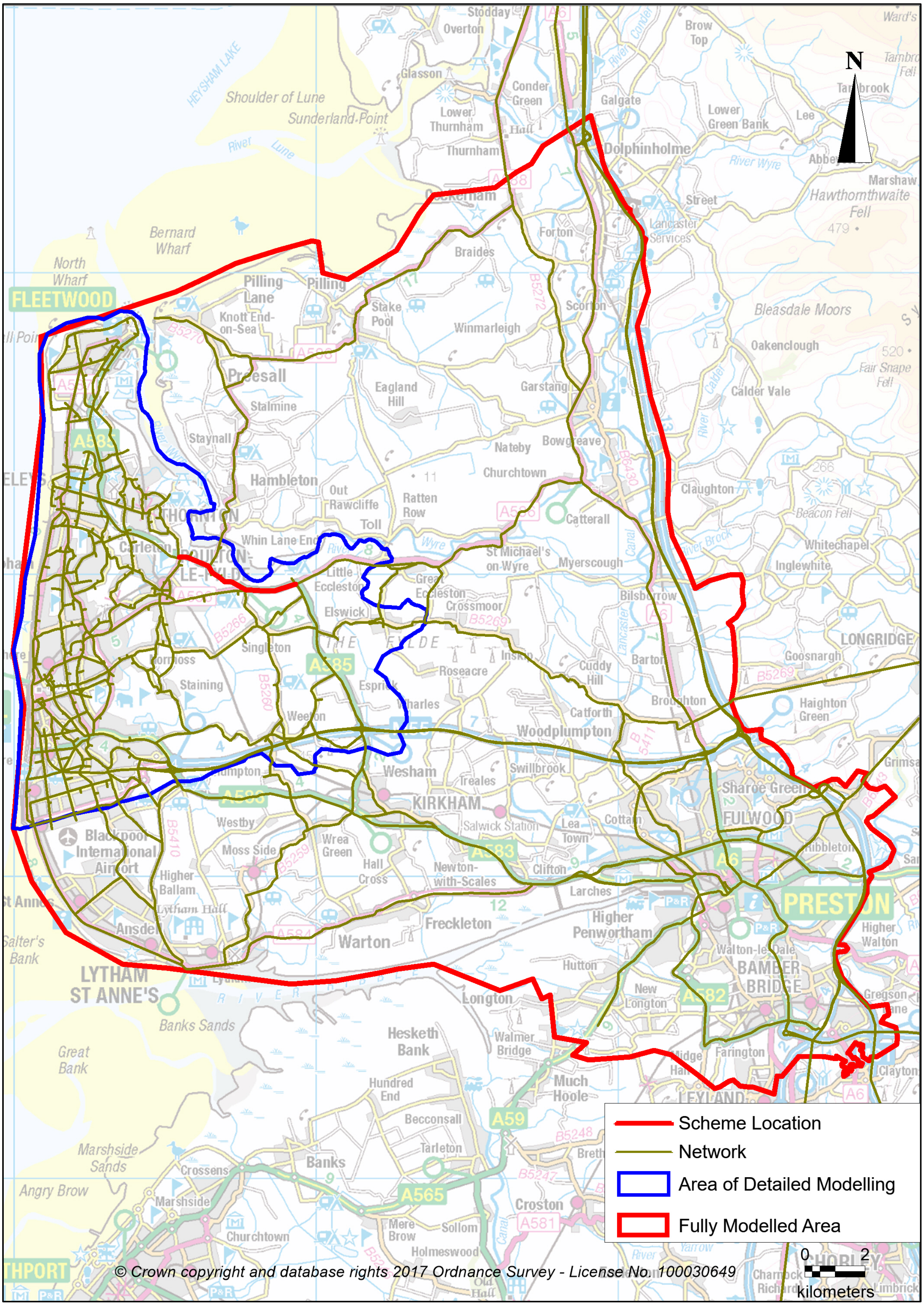

Figure 6-2: Scheme Traffic Model Road Network

7 Model Development

7.1 Introduction

7.1.1 The Stage 3 A585 Windy Harbour to Skippool Improvement Scheme donor base year traffic model (2015) was the validated PCF Stage 2 base year traffic model.

7.1.2 The Stage 2 A585 Windy Harbour to Skippool Improvement Scheme base year traffic model (2015) was validated using the November 2016 v1.6 Transport Analysis Guidance (TAG) release of Values of Time (VoT) and Vehicle Operating Costs (VOC).

7.1.3 The Stage 3 traffic model VoT and VOC values have been updated with the July 2017 v1.8 TAG databook release. The validation details of how the revised Stage 3 traffic model performs in the base year of 2015, by comparing the model with observed data and the accuracy of the Stage 3 base year traffic model can be referred to in the Stage 3 Transport Model Package [HE548643-ARC-HGN-A585-PCF-TR-3000] in Appendix D.

7.1.4 The base year traffic model development detail including the model specification can be referred to in the Stage 2 LMVR provided in Appendix E.

7.1.5 The A585 traffic model development detail is provided in the Stage 2 Local Model Validation Report (LMVR) [HE548643-ARC-GEN-A585-RP-TR-2039] provided in Appendix E.

7.2 Zone Structure

7.2.1 The SATURN model zone structure was designed in accordance with the guidance set out in TAG Unit M3.1 (Section 2.3).

7.2.2 The zone hierarchy for the A585 model is as follows:

Local areas
Output areas
Wards
Districts
Counties
Regions

7.2.3 The base year network contains 190 zones, of which 69 are in the ADM, 25 are in the rest of the FMA and the remaining 96 are in the External Area. Zones in the ADM are the smallest, becoming progressively larger for the rest of the FMA and larger again for the External Area. In some circumstances, special zones were created; for example, a zone was created to represent the Windy Harbour Caravan Park.

7.2.4 The zone structure within simulation area is shown in Figure 7-1.

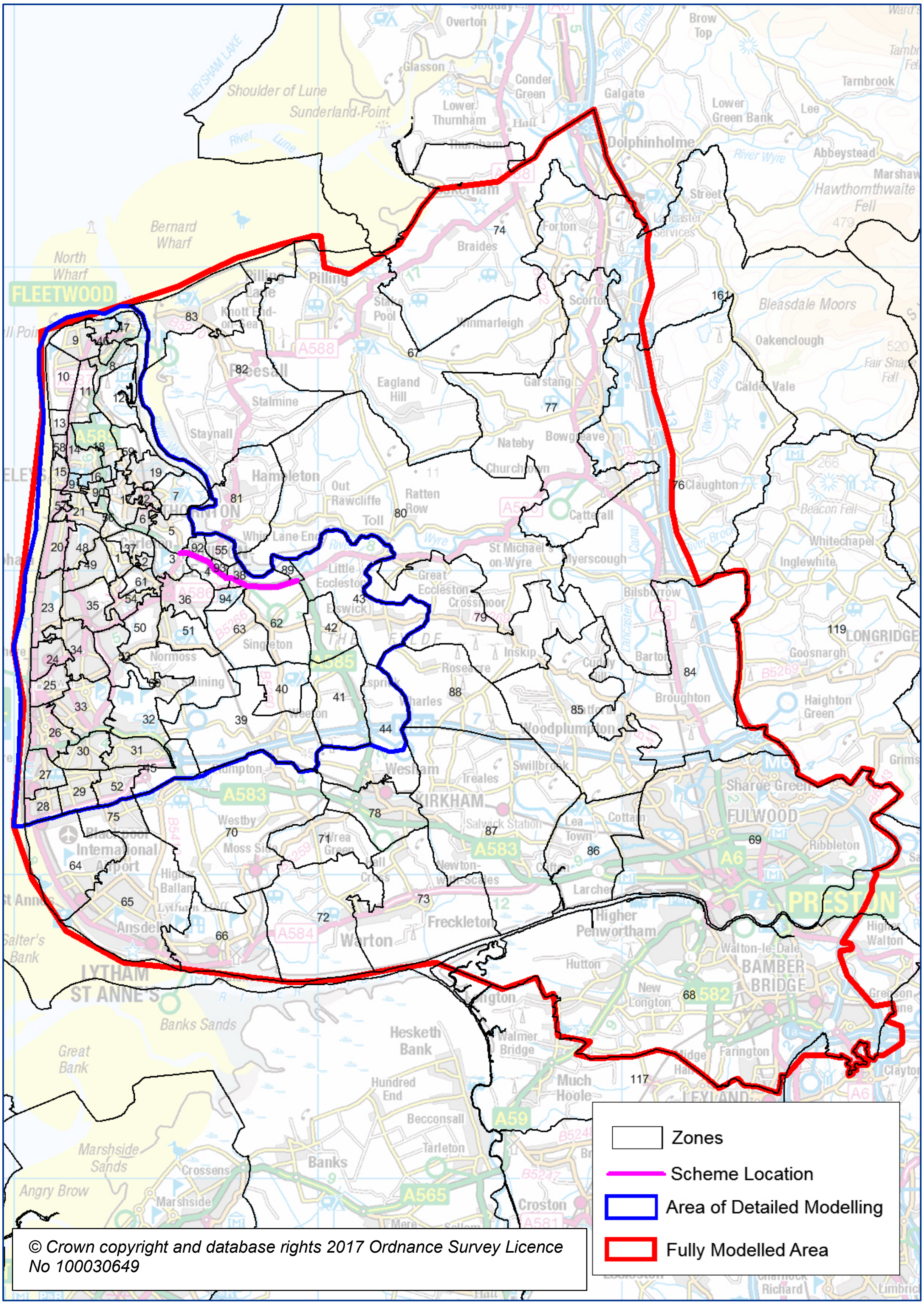

Figure 7-1: Scheme Traffic Model Zone Structure

7.2.5 The list of zones and their geographical boundaries are fully illustrated in the Stage 2 LMVR provided in Appendix E.

7.3 Demand Segmentation

7.3.1 The A585 highway assignment model represents highway demand in three vehicle classes: cars, LGVs and HGVs. The car vehicle type is further split by journey purpose into commuting, employer's business and other trips to allow for variations in perceived travel cost. Table 7-1 shows the five demand segments used in the A585 highway assignment model.

Table 7-1: Scheme Traffic Model User Classes

Vehicle Type	Journey Purpose
Car	Commuting
Car	Employer's Business
Car	Other
LGV	-
HGV	-

7.4 Matrix Building

7.4.1 The approach used to develop the trip matrices differed according to the type of vehicle. For cars, observed data from the RSI data sets listed in section 3.2 was used to calculate trip cost distributions for the three journey purposes. After expansion to traffic counts, the data was used as one of the inputs to a gravity model which synthesised full trip matrices for each purpose in each time period. These matrices were scaled to the assignment hours, using factors derived from the RSI records, subjected to some large-scale manual adjustments to create reasonable priors, and adjusted with matrix estimation process to match traffic counts at a number of calibration locations distributed across the ADM.

7.4.2 No freight modelling was carried out for this model, due to a lack of the trip ends that are required in order to do so. Additionally, no gravity modelling was performed for LGVs or HGVs due to a lack of required data concerning trip ends. The prior matrices for both types of goods vehicle were therefore built from the available RSI records and matrix estimation processes were used to adjust them to a better match to the calibration traffic counts.

7.4.3 The different data sources used in the building of the base year trip matrices are:

- RSI records from several datasets;
- Classified traffic counts at a number of locations across the ADM;
- Trip ends by time period and journey purpose from TEMPRO 7.0;
- Resident Populations by Census 2011 Output Area;
- Generalised costs of travel, produced by assigning the partially observed matrices with the SATURN model;
- Estimates of intra-zonal travel as a proportion of all travel for external zones, derived from Census 2011 journey to work data.

7.5 Network Coding – Link Length

7.5.1 Link lengths were initially measured from base maps using MapInfo and reviewed following receipt of the Ordnance Survey Master Map Integrated Transport Network (ITN) layer. The network was reviewed and updated where needed so that links reflect the corresponding link lengths on the ITN layer.

7.5.2 The SATURN software generates warnings about links for which the crow-fly distance between a link's end points differs significantly from the distance coded into the network, which was obtained from the ITN layer. All instances of these warnings were checked and all discrepancies in distance were found to be a result of the shape and curvature of the roads in question.

7.6 Network Coding – Speeds Assigned

7.6.1 Within the ADM, the speed assigned to each link (Motorway, A and B class roads) was equal to the off-peak cruise speed assigned to the same link in the Trans-Pennine South Regional Transport Model (RTM), where such information was available. Where such information was not available for a particular link, the speed was assumed to be the same as the off-peak cruise speed as derived from the Trafficmaster data.

7.6.2 For all links in the External Area, the speeds were assumed to be equal to the break point speeds provided in Highways England's Technical Note on a Proposed Update to the Speed/Flow Curve Section of the SATURN Manual. The validity of this approach was confirmed following a comparison of these speeds with actual speeds derived from HATRIS (Highways Agency Traffic Information System) and JTDB (Journey Time Database).

7.6.3 The cruise speeds were applied to all links within the ADM based on the link classification. For any given link, the same cruise speed was set in all modelled time periods.

7.7 Network Coding – Speed Flow Curves

7.7.1 The application of SFCs was kept to a minimum in the ADM of the A585 traffic model and considered for links of those kinds that also have lengths greater than 750 metres. SFCs were also applied to some local residential roads to avoid unrealistic rat-run routing.

7.7.2 SFCs were not used unless it was not possible to correctly match the observed and modelled link delay through junction performance alone. This was typically the case on long semi-urban and rural links and also on urban links, where the incidence of bus stops, parking and side roads reduce link capacities without affecting junction capacities. In such cases, SFCs were selectively used and applied.

7.7.3 The parameters used in the SFCs were based on values provided in the Highways England RTM Manual, which in turn are based on the DfT's COBA guidance. SFCs were defined according to the type of road, the number of lanes and the location (rural, sub-urban, urban and small town).

7.7.4 The full detail of all the SFCs can be referred to in the Stage 2 LMVR provided in Appendix E.

7.8 Network Coding – Junction Simulation

7.8.1 All junctions within the ADM were coded in detail to enable the simulation of junction operation and delay. Information used for junction coding was primarily obtained from Google Earth Street view and supplemented with surveyed information where available. Existing / observed signal timings and staging diagrams were used where available. Turning priorities were allocated to turning movements at all nodes.

7.8.2 All roundabouts were coded with no U-turns, unless U-turns are specifically allowed. Large signalised / grade separated roundabouts were exploded to multiple nodes and coded separately.

7.9 Network Coding – Public transport modelling

7.9.1 The proposed scheme focuses on highway improvements rather than any specific improvements to public transport. In addition, there is relatively low use of public transport in the study area. CJC data collected in July 2015 indicates very low usage of public transport or non-motorised modes in the study area. Bus occupancy surveys carried out on 14 July 2016 confirmed this impression, showing that, for the 12-hour period between 07:00 and 19:00, bus vehicle counts were only 0.3% of car vehicle counts and the number of bus passengers was only 1.4% of the number of car passengers.

8 Model Calibration

8.1 Calibration Process

8.1.1 The calibration of a highway assignment model is the process used to ensure that the model adequately reproduces the actual travel patterns in the geographic area under consideration. The Design Manual for Roads and Bridges (DMRB) Volume 12 Section 1 describes the calibration process as *"the estimation of the parameters of a chosen model by fitting to observations".*

8.1.2 The A585 highway assignment model calibration procedure involved a number of tasks, each of which was designed to ensure that the model adequately reproduced the observed base year traffic flows and travel times in the study area. The key tasks were:

- Network calibration:
    - Network inventory checks to confirm that the model extent and coverage is sufficient and that nodes, links and junctions are coded correctly
    - Checking and, where required, adjustment of the highway network to ensure the realistic routing of traffic
    - Review of the model speed flow curves to ensure they represent the operating conditions of the local network
    - Review of modelled flows versus observed counts
    - Review of modelled journey times to ensure they are comparable with observed journey times
    - Checks on the stability of the assignment
- Matrix calibration:
    - Use of matrix estimation procedures (using the SATURN programme SATME2) to modify the input synthetic 'prior' matrices to produce trip matrices that lead to a better fit of the model's outputs to observed traffic flows across the study area
- Assignment calibration:
    - Link flow calibration on screenlines and cordons, by comparing modelled flows and traffic counts
    - Examining the model's behaviour against the relevant convergence criteria to ensure the model provides stable, reliable results

8.1.3 The process and details of network, matrix and assignment calibration are provided in the Stage 2 LMVR Chapter 5 provided in Appendix E.

8.1.4 The Stage 3 base year traffic model update to the Values of Time and Vehicle Operating Costs using the July 2017 v1.8 TAG databook release is documented in the Stage 3 Transport Model Package. The Stage 3 traffic model calibration results can be referred to in further detail in Appendix D.

9 Model Validation

9.1 Highway Model Validation

9.1.1 The validation of a highway assignment model is the process by which modelled data is compared to observed data that is independent from that used in model calibration. The requirement of data independency means that counts used in the matrix estimation should not be used for model validation.

9.1.2 The validation process for the A585 base year traffic model comprised the following:

- Network validation
- Matrix validation
- Assignment validation:
    - Link flow validation (32 links)
    - Turn flow validation (20 turns)
    - Cordon flow validation (1 cordon – two-directional)
    - Journey time validation (14 routes – two-directional)

9.1.3 The validation was based on checks of the following:

- Modelled and observed traffic flows on individual links and screenlines (total vehicles), as a check on the quality of trip matrices and the assignment
- Modelled and observed journey times along routes, as a check on the quality of the network and the assignment

9.1.4 An iterative process was used, whereby the validation of the model was assessed using comparisons of the modelled and observed data as discussed in this chapter. Adjustments made to the model to reduce the differences between the modelled and observed data, which were undertaken as part of the model calibration, are described in Chapter 6 of Stage 2 LMVR in Appendix E.

9.1.5 The validation was undertaken in accordance with the respective TAG Unit M3.1 criteria which is shown in Table 9-1 for the link flow and turning movement validation criteria and Table 9-2 for the journey time validation criteria.

Table 9-1: Link Flow and Turning Movement Validation Criteria and Acceptability Guidelines

Criteria	Description of Criteria	Acceptability Guideline
Flow Difference Criterion (1)	Individual flows within 100 veh/hr of counts for flows less than 700 veh/hr	>85% of cases
	Individual flows within 15% of counts for flows from 700 to 2,700 veh/hr	
	Individual flows within 400 veh/hr of counts for flows more than 2,700 veh/h	
GEH Criterion (2)	GEH < 5 for individual flows	>85% of cases

Source: TAG Unit M3.1, Section 3.2.8, p19

Table 9-2: Journey Time Validation Criteria and Acceptability Guideline

Criteria	Acceptability Guideline
Modelled journey time along routes should be within 15% of surveyed times (or 1 minute if higher than 15%)	> 85% of all routes

Source: TAG Unit M3.1, Section 3.2.10, p20

9.1.6 Flows on individual links (within the ADM) which did not feature in matrix estimation were used in validation. In addition to flow validation, journey time validation was carried out on 28 routes.

9.1.7 The model has adopted processes to help to retain its integrity with the observed data and the matrix estimation has been applied in a controlled and limited way.

9.1.8 The analysis (which can be referred to in Appendix E, Section 5.5, p66-73) shows that, based on total vehicles, the A585 base year traffic model for all three modelled time periods:

- Achieves the acceptability guidelines at the cordon level and individual link level at the independent validation sites
- Achieves the acceptability guidelines for journey times
- Is stable and achieves acceptable levels of convergence

9.1.9 The Stage 2 model validation results suggest that the model performs satisfactorily across all three time periods based on total vehicles.

9.1.10 The base year traffic model validation results remain satisfactory following the Stage 3 update of the VoT and VOC values as shown in Appendix D, Section 4-5, p6-14.

9.2 Variable Demand Modelling

9.2.1 A change in transport conditions, such as the proposed improvements to the A585, will in principle have an impact on transport demand. Variable demand modelling seeks to predict and quantify those changes in demand, where travel choices are made based on the generalised costs of travel.

9.2.2 The Stage 2 LMVR (Section 7, Appendix E) describes the development of the A585 Variable Demand Model (VDM), which was used to predict future changes in demand as a result of the implementation of the A585 Windy Harbour to Skippool Improvement Scheme. The model has been developed in accordance with the guidance set out in TAG Unit M2 Variable Demand Modelling.

9.2.3 A Stage 3 sensitivity analysis was undertaken and reported in [HE548643-ARC-GEN-A585-TN-D-3010] on the A585 Variable Demand Model as a result of the Stage 3 changes to the adopted VoT and VOC values and can be referred to in Appendix D. The realism sensitivity tests undertaken on the A585 variable demand model concluded that the lambda parameter validated using the Stage 2 VoT and VOC values and adopted for the sensitivity test using the Stage 3 TAG release - July 2017 v1.8 TAG databook release VoT and VOC values aligns with the TAG Unit M2 outturn elasticity values.

10 Forecast Assumptions

10.1 Forecast Model Years

10.1.1 Traffic forecasts for the scheme have been prepared for three model years including the scheme opening year and design year and a horizon model year as follows:

Scheme opening year (2022) – was 2021 in Stage 2

Design year (2037) – was 2036 in Stage 2

Horizon year: An additional model year, 2051

10.1.2 The change in scheme opening year and design year from Stage 2 is due to a change in construction start date and construction duration.

10.2 Uncertainty Log

10.2.1 The Uncertainty Log was developed in line with the guidance provided in TAG Unit M4 (Section 2).

10.2.2 The initial stage in the production of the uncertainty log was to review the Local Plans of the relevant local authority. A Local Plan identifies future residential and employment aspirations and are produced as part of the Local Development Framework process.

10.2.3 Information regarding the planning status of future developments in the study area was obtained from Blackpool Council and Fylde Council. Wyre Council was unable to provide the planning status and quantum of future developments within the Wyre Council area and suggested that Highways England prepare this information based on the Wyre Local Plan. Assumptions were therefore made by Highways England regarding the level of certainty, timing, quantum, land-use and trip rates of the developments included in the Stage 3 A585 Uncertainty Log in the Wyre Council Local Authority area.

10.2.4 The following three demand scenarios were appraised and are summarised in Table 10-1.

- Core Scenario incorporating NTEM background national growth and local development identified as Near Certain and More than Likely classification
- Low Growth scenario incorporating Low background national growth and local development identified as Near Certain and More than Likely classification
- Optimistic Growth scenario incorporating High background national growth and local development identified as Near Certain, More than Likely and Reasonably Foreseeable classification

Table 10-1: Demand Scenarios

Scenario	Supply	Demand	TEMPro Constraint
Core	Schemes that are: • Near Certain and • More Than Likely	Developments that are: • Near Certain and • More Than Likely	Standard TEMPro
Optimistic Growth	Schemes that are: • Near Certain • More Than Likely and • Reasonably Foreseeable	Developments that are: • Near Certain • More Than Likely and • Reasonably Foreseeable	High Growth TEMPro
Low Growth	Schemes that are: • Near Certain and • More Than Likely	Developments that are: • Near Certain and • More Than Likely	Low Growth TEMPro

10.2.5 The total number of proposed dwellings and employment from the uncertainty log for individual authorities are shown in Table 10-2.

10.2.6 A development classification of Near Certain and More than Likely (and therefore included in the Core Scenario and used in the Environmental and Operational Assessment of the scheme) was categorised by the Local Authorities in response to the Uncertainty Log Stakeholder consultation as development under construction, approved development proposals or developments with a planning application within the consent process. Development classified as Reasonably Foreseeable is identified as development that may happen, but there is significant uncertainty. Reasonably Foreseeable development includes development identified in the Local Plan or committed policy goals. As identified in TAG Unit M4 Forecasting and Uncertainty, Table A2 Classification of Inputs, p31, 2017 Reasonably Foreseeable development has been excluded from the Core Scenario.

Table 10-2: Summary of Housing and Employment Developments

Council	Near Certain/More than Likely		Reasonably Foreseeable		Total	
	Dwellings	Employment (ha)	Dwellings	Employment (ha)	Dwellings	Employment (ha)
Fylde	6,537	16.71	442	24.28	6,979	40.99
Blackpool	1,252	7.31	-	8.10	1,252	15.41
Wyre	3,716	8.11	2,292	32.08	6,008	40.19
Total	11,505	32.14	2,734	64.46	14,239	96.59

10.2.7 In addition to proposed developments, the treatment of uncertainty in model forecasting should also include any proposed highway infrastructure schemes.

10.2.8 The definition of the 'Without Scheme' network requires the identification of any committed or probable highway schemes within the study area that should be included in the traffic model.

10.2.9 The proposed network improvements which are likely to be in place by each forecast modelled year are included in both, 'Without Scheme' and 'With Scheme' forecast networks.

10.2.10 Following consultation with the Lancashire County Council, the highway schemes described in Table 10-3 have been included in the 'Without Scheme' forecast network:

Table 10-3: Uncertainty Log - Highway Schemes

Ref.	Local Authority	Scheme	Level of Certainty
1	Highways England	A585/A586 Windy Harbour junction improvement	Certain
2	Lancashire	M55 to A583 Preston Western Distributor (PWD)	More than Likely
3	Lancashire	A6 Broughton Bypass	More than Likely
4	Lancashire	East West Link Road (North West Preston) (linked to PWD)	More than Likely
5	Lancashire	M55 new J2 (part of PWD)	More than Likely
6	Lancashire	Cottam Link Road (part of PWD)	More than Likely
7	Fylde	Lytham Moss M55 to St Annes / Heyhouses Link Road	More than Likely

10.2.11 The A585/A586 Windy Harbour junction improvement was already in place by year 2015 and hence, was included in the A585 base year SATURN model.

10.2.12 The proposed scheme was added to the forecast year 'Without Scheme' networks to create the 'With Scheme' scenario for each forecast year.

10.3 Generic Assumptions

10.3.1 The Scheme forecasting approach is summarised in Figure 10-1. The forecasting process commences with the development of the reference case by updating demand factors to each forecast year being appraised. The supply-side factors are then updated (i.e. network changes and cost assumptions) to derive the most likely 'Without Scheme' scenario against which the impact of the various schemes and policies that are to be introduced in the 'With Scheme' scenario can be tested.

10.3.2 The reference case matrices and the reference forecast are the starting point for the variable demand modelling process necessary to develop the Without Scheme and With Scheme forecasts.

10.3.3 Chapter 4 of the Stage 3 Transport Forecasting Package (HE548643-ARC-TTM-A585-RP-ZM-3144) describes the development of the reference case demand matrices for the core and alternative growth scenarios and can be referred to in Appendix F. The development of the forecast year highway networks and the generalised cost assumptions are also discussed in this chapter.

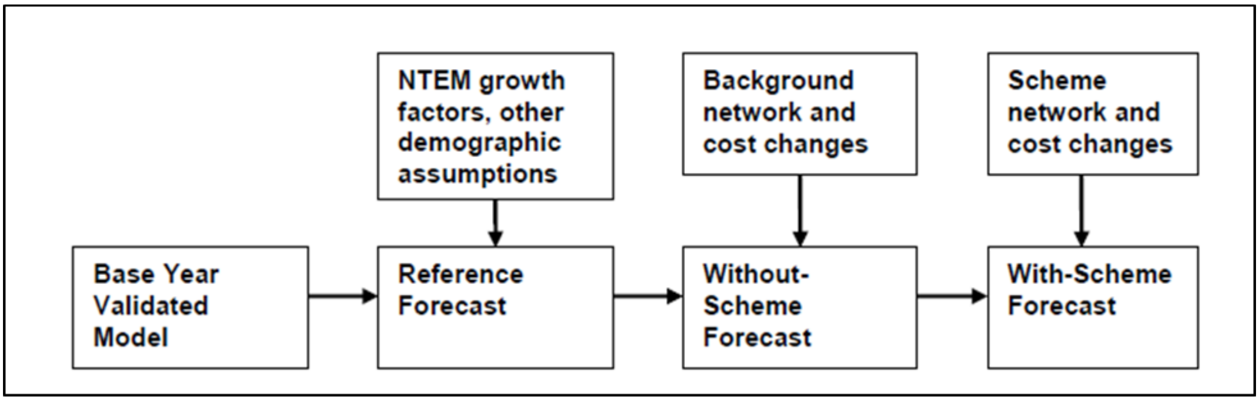

Figure 10-1: Forecasting Methodology - Future Year Matrix Development (Source: TAG Unit M4)

11 Forecast Results

11.1 Forecast Scenarios and Years

11.1.1 Three scenarios were considered, the Core Scenario, Low Growth scenario and Optimistic Growth scenario. The identification and development of the core and alternative growth scenarios has been discussed in greater detail in Sections 3.3 and 3.4 of Stage 3 Transport Forecasting Package [HE548643-ARC-TTM-A585-RP-ZM-3144] provided in Appendix F.

11.1.2 Future year traffic flows are required for the design of the A585 Windy Harbour to Skippool Improvement Scheme and also for environmental, operational and economic assessment purposes.

11.1.3 Two forecast years, the Year of Opening 2022 and the Design Year 2037 were considered for the Scheme design, highway operational assessment and environmental assessment purposes.

11.1.4 Three forecast years, 2022, 2037 and 2051 were considered for the economic assessment of the scheme.

11.2 Core Scenario

11.2.1 The Without Scheme represents elements that are either near certain or more than likely to be delivered. The Without Scheme scenario should represent a realistic view of what is likely to happen in the absence of any specific scheme proposals. It should focus on maintaining present transport facilities and implementing the more certain aspects of regional and local strategies.

11.2.2 The Without Scheme scenario was produced by running the A585 VDM using the reference demand, the changes to the generalised cost assumptions and the revised highway networks to achieve equilibrium of the demand and the travel costs.

11.2.3 The proposed scheme was assessed using the same reference case and generalised cost assumptions used to produce the Without Scheme scenario.

11.2.4 The With Scheme scenario was produced by running the A585 VDM using the reference demand, the changes to the generalised cost assumptions and the revised highway networks to achieve equilibrium of the demand and the travel costs.

11.2.5 The VDM response, model outputs, matrix totals, convergence and network statistics are provided in section 5.4 of Stage 3 Transport Forecasting Package presented in Appendix F.

11.3 Low Growth Scenario

11.3.1 The VDM response, model outputs, matrix totals, convergence and network statistics are provided in section 5.6 of Stage 3 Transport Forecasting Package presented in Appendix F.

11.4 Optimistic Growth Scenario

11.4.1 The VDM response, model outputs, matrix totals, convergence and network statistics are provided in section 5.7 of Stage 3 Transport Forecasting Package presented in Appendix F.

11.5 Stage 3 Scheme Design Update Traffic Forecasting Sensitivity Test

11.5.1 The Stage 3 Introductory Scheme was based on the Stage 2 Scheme design. The Stage 3 Traffic Operational Report [HE548643-ARC-GEN-A585-RP-D-3065], which outlines the traffic operational appraisal undertaken in Stage 3, revealed some design issues with the proposed scheme junctions identified at Stage 2. The following recommendations for Stage 3 include:

- Poulton junction – Long queues on the side roads (A586 Garstang Road) were observed in the Paramics model, due to the large volume of traffic through the junction, which was in roundabout form. This was causing significant delays to the side road. It was recommended that the design of the Poulton junction was re-visited and improved during Stage 3.
- Skippool Bridge junction – Long queues were observed on the Mains Lane approach to the signalised Skippool Bridge junction. These queues were observed to block back across the Old Mains Lane side road and required a high green time allocation to clear them, decreasing the operational efficiency of the junction as a result. It was recommended that a longer multi-lane approach for traffic travelling westbound onto the bypass was included in Stage 3 designs.

- Skippool junction – It was observed that straight ahead/right turning traffic on the Breck Road and Skippool Road approaches to the signalised Skippool junction was blocking left turning traffic from entering the segregated left turn lanes. This was causing delays and decreasing the operational efficiency of the junction. It was recommended that the multi-lane approaches on each arm were extended where possible to minimise the issue.

11.5.2 In addition to the above Stage 3 design changes the Scheme design at the start of Stage 3 included a roundabout at Little Singleton. This was changed during Stage 3 to a revised signalised junction which includes a Q-turn facility for bus services.

11.5.3 The operational modelling assumes no scheme at the Norcross junction is in place in the design year for the A585 Windy Harbour to Skippool Improvement Scheme. Inclusion of the A585 Norcross scheme would require a separate assessment to determine its impact.

11.5.4 Following the revisions to the Stage 3 Scheme design the traffic operational assessment has highlighted no significant issues with the revised Stage 3 Preliminary Design.

11.5.5 The Updated Scheme design drawings and the traffic forecasting results of the sensitivity test undertaken on the amended Stage 3 Scheme design can be referred to in the Stage 3 Scheme Design Update Traffic Forecasting technical note [HE548643-ARC-HDG-A585-TN-TR-3023] which is included in the Stage 3 Transport Forecasting Package provided in Appendix F.

12 Economic Appraisal Approach

12.1 Process

12.1.1 The economic appraisal period is informed by TAG Unit A1.1, paragraph 2.1.1, page 2, which stipulates a 60-year appraisal for projects that are deemed to have an 'indefinite life'. This includes major infrastructure schemes such as highways and bridges.

12.1.2 The 'Public Accounts' relate to the costs faced by Government (either local or central) to implement the scheme. They include the following:

- Investment costs
- Operating costs
- Revenue (for example, through induction of tolls)
- Developer and other contributions, if any
- Grant/subsidy payments, if any
- Indirect tax revenues to the government e.g. through fuel duty that results from the scheme.

12.1.3 The overall Analysis of Monetised Costs and Benefits (AMCB) include benefits due to savings in accidents (number and severity), greenhouse gas emissions, air quality and noise levels as a result of the scheme. These would be negative if they were to increase.

12.1.4 The total benefits are compared with the total costs from the public accounts identified above, to determine the value-for-money of the scheme.

12.1.5 The following elements make up the cost-benefit analysis of the scheme:

- Scheme costs can be defined as the total amount of money spent in construction and maintaining the scheme. These include the following:
    - Preparation costs (planning and designing costs), land acquisition costs, construction costs and supervision costs
    - Maintenance costs.
- The scheme benefits are broadly made up of the following:
    - Road user benefits – due to savings in travel time and vehicles operating costs as a result of the scheme
    - Safety benefits – due to changes in the number and/or severity of accidents as a result of the scheme
    - Construction and maintenance (dis)benefits – due to changes in travel time and vehicle operating costs during the scheme construction and maintenance
    - Environmental benefits – due to changes in greenhouse gas emissions, air quality and noise levels as a result of the scheme
    - Indirect tax revenue – due to change in the amount of fuel purchased and the associated impact to revenue from fuel duty as a result of the scheme
    - Journey time reliability benefits – due to changes in the journey time variability in the network as a result of the scheme
    - Social distribution benefits as a result of the scheme
    - Wider Impacts as a result of the scheme

12.1.6 The economic assessment tables including the TEE, PA and AMCB tables have been presented in two sets, initial and adjusted:

1. Initial transport user benefits – includes weekday AM, IP, PM and OP time periods
2. Adjusted transport user benefits – includes weekend transport user benefits along with weekday transport user benefits, to provide a greater re-assurance around the overall transport user benefits.

12.1.7 The full detail of the economic appraisal approach can be referred to in Chapter 1 of the Stage 3 Economic

Appraisal Package [HE548643-ARC-TTM-A585-RP-ZM-3145] provided in Appendix G.

12.2 Investment Cost

12.2.1 The outturn investment costs for the scheme are adjusted for appraisal purposes and can be referred to in Chapter 2 of the Stage 3 Economic Appraisal Package provided in Appendix G.

12.2.2 The investment costs of the A585 scheme (in 2010 prices and discounted to 2010) as used in the economic assessment is shown in Table 12-1.

Table 12-1: Investment Cost Estimate (2010 prices and discounted to 2010)

Category	Cost (in 2010 prices)
Preparation	£7,618,713
Supervision	£1,604,744
Land	£78,965,855
Construction	£16,514,232
Total	**£104,703,544**

12.3 Maintenance Cost

12.3.1 In addition to the investment costs, it is necessary for the economic assessment to take account of the cost of maintaining the scheme with the current maintenance cost of the existing route.

12.3.2 Maintenance schedules were derived for both the Without and With Scheme Scenarios over the 60-year appraisal period.

12.3.3 Maintenance costs were provided for 2010 market price discounted to 2010.

12.3.4 The Introductory Scheme maintenance costs for the Without and With Scheme Scenarios are shown in Table 12-2.

Table 12-2: Maintenance Costs (2010 prices and discounted to 2010)

Description	Without Scheme	With Scheme	Change
2010 Market price discounted to 2010	£7,515,542	£11,707,456	£4,191,913

13 Economic Appraisal Results

13.1 Transport User Benefits – Core Scenario

13.1.1 Traffic forecasts were prepared using the scheme's core scenario traffic model and were used in the assessment of user benefits using TUBA.

13.1.2 TUBA estimates the monetised impacts which will be generated with the scheme in place. These benefits will change over time as traffic growth takes place and the value attributed to those benefits is converted to present values through the process known as discounting.

13.1.3 All the TUBA user benefits are in 2010 prices and discounted to 2010. In the interest of proportionate reporting the initial transport user benefits including the weekday AM, IP, PM and OP time periods are tabulated.

13.1.4 Table 13-1 shows the resultant initial core scenario transport user benefits generated by the scheme using the AM, IP, PM and OP time periods in terms of travel time and vehicle operating costs. User benefits added to the indirect tax revenues gives the total benefits.

Table 13-1: Initial Core Scenario Transport User Benefits (2010 prices and discounted to 2010)

Description	Benefit
Travel Time	£164.81m
Vehicle Operating Cost	-£38.58m
User Charges	£0
Total User Benefits	**£126.23m**
Indirect Tax Revenue	£27.56m
Total Benefits	**£153.79m**

13.2 Transport User Benefits by Journey Purpose

13.2.1 Table 13-2 shows the transport user benefits and charges segregated by journey purpose and vehicle class of the transport system for the Introductory Scheme.

Table 13-2: Initial Core Scenario Transport User Benefits by Journey Purpose and Vehicle Class (2010 prices and discounted to 2010 in £m)

User Class	Time Benefit	Fuel VOC benefit	Non-Fuel Benefit	User Charges	Total User Benefits	% of user Benefits
Car-Commuting	£38.28	£0.43	-£5.14	£0	£33.57	27%
Car-Business	£5.29	£0.03	£0.23	£0	£5.55	4%
Car-Other	£65.05	£0.34	-£31.42	£0	£33.97	27%
LGV Personal-Other	£2.33	-£0.41	-£0.12	£0	£1.79	1%
LGV Freight-Business	£37.58	-£3.41	-£0.15	£0	£34.01	27%
OGV1-Business	£8.14	-£1.13	£0.71	£0	£7.72	6%
OGV2-Business	£8.14	£0.10	£1.37	£0	£9.61	8%
Total	**£164.81**	**-£4.05**	**-£34.53**	**£0**	**£126.23**	**100%**

13.3 Transport User Benefits by Time Period

13.3.1 Figure 13-1 presents the user benefits profile for AM peak, Inter-peak, PM peak and Off-peak for forecast years 2022, 2037 and 2051.

13.3.2 The results show that the there is a slight decrease in travel time benefits for the morning peak period, off-peak period and weekend inter-period over forecast years, while the evening peak period and inter-peak period shows fairly similar benefits over the forecast years 2022 and 2037 while the benefits increase in 2051.

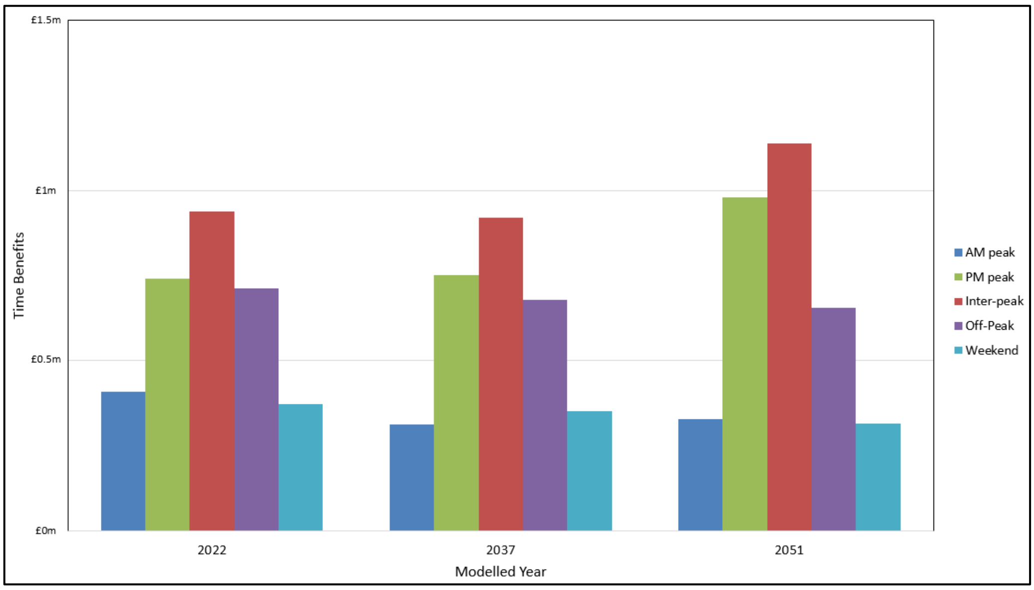

Figure 13-1: Introductory Scheme Core Scenario Transport User Benefit Profile by Time Period (2010 prices and discounted to 2010)

13.3.3 Table 13-3 presents the transport user benefits by time period as a result of the Introductory Scheme.

Table 13-3: Introductory Scheme Core Scenario Transport User Benefits by Time Period (2010 prices and discounted to 2010)

Benefit Type	AM Peak	Inter-Peak	PM Peak	OP	WE	Total Initial	Total Adjusted
Travel Time	£18.7m	£59.0m	£49.7m	£37.4m	£18.6m	**£164.8m**	**£183.4m**
VOCs	-£.2m	-£.8m	£.4m	-£3.5m	-£.2m	**-£4.1m**	**-£4.3m**
Non-Fuel VOC	-£2.1m	-£15.5m	-£9.1m	-£7.9m	-£8.0m	**-£34.5m**	**-£42.5m**
Total	**£16.4m**	**£42.7m**	**£41.0m**	**£26.1m**	**£10.4m**	**£126.2m**	**£136.6m**
% Benefits (Without Weekend)	13%	34%	32%	21%	-	**100%**	**-**
% Benefits (With Weekend)	12%	31%	30%	19%	8%		100%
Hours per week	10 (2×5)	27.5 (5.5×5)	15 (3×5)	15 (3×5)	12 (6×2)		
Benefits per hour/week (sum over 60 years)	**£1.6m**	**£1.6m**	**£2.7m**	**£1.7m**	**£0.9m**		

13.4 Geographical Distribution of Transport User Benefits

13.4.1 Analysis of the transport user benefits on a geographical basis was carried out to understand the benefits to residents within large geographical areas (or sectors) as a result of constructing the scheme.

13.4.2 The scheme's traffic model contains 190 zones between which trips are assigned on the road network. Although, the TUBA program has sufficient capacity to read this data from the matrices, it is only able to analyse benefits, geographically, between a much smaller number of zones, which in this context are known as 'sectors'.

13.4.3 The TUBA program was run with 17 sectors defined for the appraisal of the scheme as shown in Figure 13-2. The sectoral system becomes progressively coarser with increasing distance from the scheme.

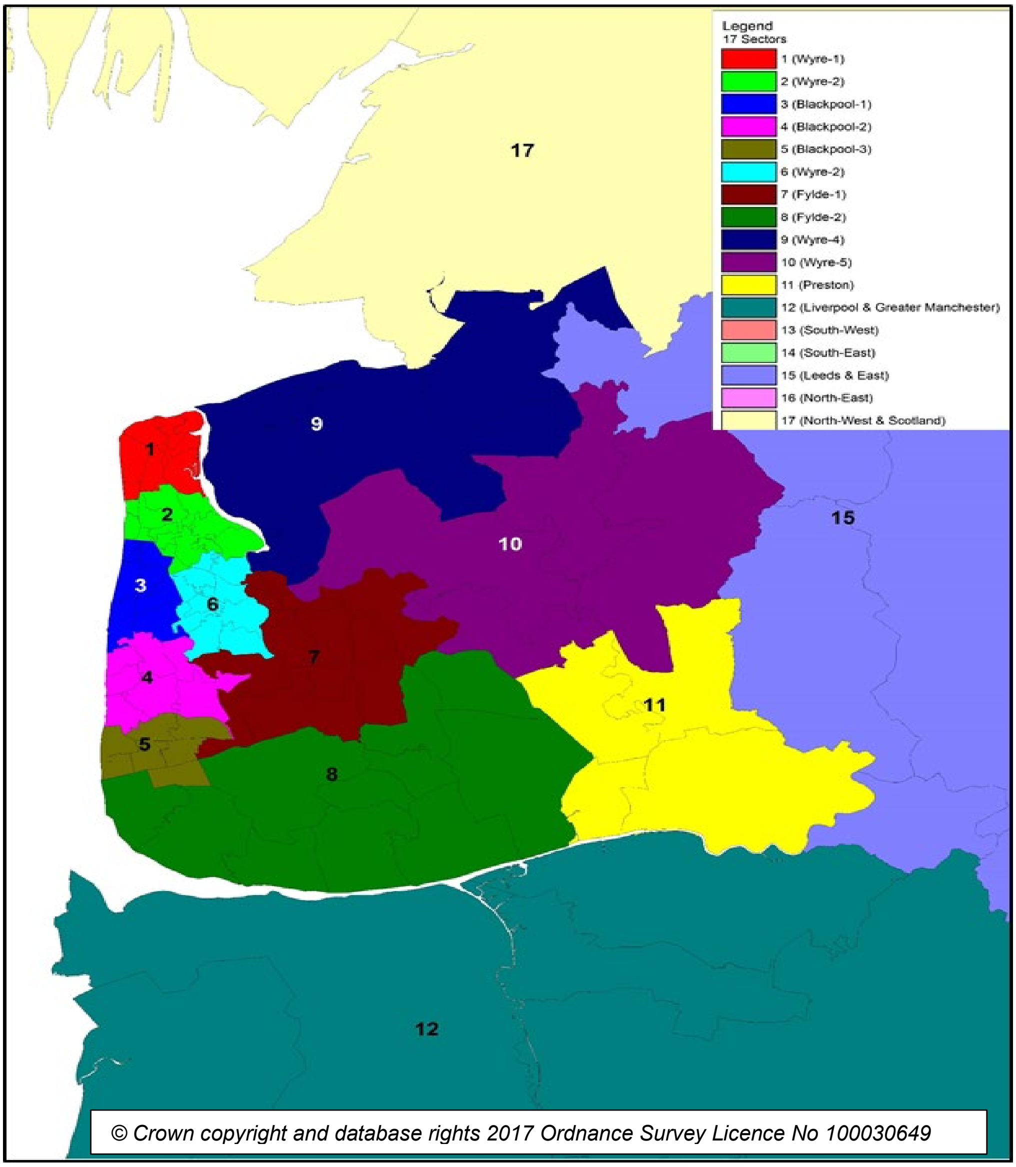

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Figure 13-2: TUBA Sectors

13.4.4 The initial core scenario weekday user time benefits from each sector to sector were extracted from the TUBA output file as shown in Table 13-4 for the Introductory Scheme.

Table 13-4: Introductory Scheme Initial Core Scenario Sectoral Transport User Benefits (2010 prices and discounted to 2010)

Sector ID	Sector Name	Benefits by Origin	Benefits by Destination	Average Benefits	% of Total User Benefits
1	Wyre-1	£9.81m	£13.85m	£11.83m	9%
2	Wyre-2	£12.40m	£23.59m	£18.00m	14%
3	Blackpool - 1	£10.80m	£8.75m	£9.77m	8%
4	Blackpool - 2	£9.68m	£5.82m	£7.75m	6%
5	Blackpool - 3	£1.87m	£3.04m	£2.46m	2%
6	Wyre-3	£11.65m	£7.35m	£9.50m	8%
7	Fylde - 1	£6.03m	£4.80m	£5.42m	4%
8	Fylde - 2	£13.68m	£10.69m	£12.19m	10%
9	Wyre-4	£2.75m	£6.67m	£4.71m	4%
10	Wyre-5	£10.80m	£16.83m	£13.82m	11%
11	Preston	£8.01m	£6.82m	£7.41m	6%
12	Liverpool & Greater Manchester	£17.65m	£9.56m	£13.61m	11%
13	South-West	£0.35m	-£0.50m	-£0.08m	0%
14	South-East	£0.90m	£0.00m	£0.45m	0%
15	Leeds & East	£5.70m	£5.27m	£5.48m	4%
16	North-East	£0.06m	£0.05m	£0.05m	0%
17	North-West & Scotland	£4.10m	£3.64m	£3.87m	3%
Total				£126.23m	

13.5 Alternative Scenario Results – Low and Optimistic Growth Scenarios

13.5.1 The user benefits for the low and optimistic growth scenarios are reported in the Stage 3 Economic Appraisal Package provided in Appendix G.

13.6 Stage 3 Scheme Design Update Economic Appraisal Sensitivity Test

13.6.1 The Updated Scheme design sensitivity test user benefits for the core and optimistic growth scenarios are reported in the Stage 3 Scheme Design Update Economic Appraisal technical note [HE548643-ARC-HDG-A585-TN-TR-3024) which is included in the Stage 3 Economic Appraisal Package provided in Appendix G.

13.7 Monetised Safety Assessment

13.7.1 The safety impacts of the scheme were assessed quantitatively and monetised and incorporated into the overall economic assessment for the scheme. Accident saving benefits have been calculated using the Cost and Benefit to Accidents – Light Touch (COBALT) program (Version 2013.2), a spreadsheet application developed by the DfT to undertake the analysis of the impacts on accidents as part of the economic appraisal of road schemes.

13.7.2 COBALT compares accidents by severity and associated costs across the network in the Without Scheme scenario with those in the With Scheme scenario, using details of link and junction characteristics and forecast traffic volumes. Accident rates and costs used in COBALT are consistent with those defined in the Design Manual for Roads and Bridges (DMRB) Volume 8. The resulting safety benefits calculated by COBALT were then added to the overall benefits to derive the BCR for the scheme.

13.7.3 Further detail regarding the Scheme Safety Assessment can be referred to in Chapter 4 of the Stage 3 Economic Appraisal Package provided in Appendix G.

13.8 Introductory Scheme Safety Assessment Results

13.8.1 COBALT results were classified into three categories:

i. Economic assessment
ii. Accident savings
iii. Casualty reduction

13.8.2 The results pertain to the total costs of accidents on the study network over the appraisal period (discounted to and in the 2010 price base) for the Without Scheme and With Scheme forecasts, and the total economic benefit of the scheme. The benefit is the With Scheme cost subtracted from the Without Scheme cost.

13.8.3 The casualty results relate to the difference in number of fatal, serious and slight casualties between the Without and With Scheme.

13.8.4 A summary of the economic results of the accident assessment for the core, low and optimistic scenarios are shown in Table 13-5 for the Introductory Scheme.

13.8.5 The accident benefits are calculated as a difference between accident costs of the Without Scheme and With Scheme scenarios. Hence, an overall positive value indicates that there are accident benefits (or savings) and a negative value indicates accident disbenefits.

Table 13-5: Introductory Scheme Accident Benefits (2010 prices and discounted to 2010)

Scenario	Accident Costs (£m)		Accident Benefits saved by scheme (£m)	QUADRO Accident Costs (£m)		Total Accident Benefits Saved by the Scheme (£m)
	Without Scheme	With Scheme		Without Scheme	With Scheme	
Core	£726.26	£716.16	£10.11	0.0049	0.0001	£10.11
Low Growth	£664.86	£653.79	£11.07	0.0049	0.0001	£11.07
Optimistic Growth	£791.93	£780.45	£11.48	0.0049	0.0001	£11.48

13.8.6 The number of accidents saved by the scheme for the core, low and optimistic growth scenarios are shown in Table 13-6 for the Introductory Scheme. The accidents saved as a result of the scheme are calculated as the difference between the number of accidents in the Without Scheme and the With Scheme Scenarios.

Table 13-6: Introductory Scheme Accident Savings

Scenario	Total Accidents		Accidents Saved
	Without Scheme	With Scheme	
Core	15,641	15,613	28
Low Growth	14,289	14,228	61
Optimistic Growth	17,087	17,030	57

13.8.7 The change in the number of casualties between the With Scheme and the Without Scheme scenarios is shown in Table 13-7 for the Introductory Scheme.

Table 13-7: Introductory Scheme Casualties Summary

Scenario	Number of Casualties						Casualties Saved		
	Without Scheme			With Scheme					
	Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight
Core	171	2079	19254	163	2039	19186	8	40	68
Low Growth	157	1899	17608	149	1856	17500	8	43	108
Optimistic Growth	187	2276	21005	178	2232	20904	8	45	101

13.9 Introductory Scheme Construction Delay Assessment

13.9.1 Traffic management during construction tends to result in changes to journey times and vehicle operating costs. Construction work also has an impact on accidents. These impacts need to be appraised within the economic assessment of a scheme.

13.9.2 Generally, the presence of roadworks results in increased travel costs and hence, the benefits due to construction works are normally negative.

13.9.3 Part of the scheme will be constructed along the existing alignment and hence traffic will inevitably get delayed at certain times during the various construction phases. Delays to traffic can, however, be kept to a minimum by using effective traffic management measures.

13.9.4 Queues and Delays at Roadworks (QUADRO) V4R15 is used to compute the cost of construction works in terms of time delay, vehicle operating costs and accident costs, as well as incorporating the costs of the roadworks themselves for the Core Scenario. User dis-benefits are assessed based on queues developing at the roadwork or additional time taken to travel via an alternative route.

13.9.5 Following a review of the Traffic Management Plans and programmes provided by BAM Morgan Sindall Joint Venture (bmJV), an assessment of the delay to road users due to the construction of the scheme using QUADRO was carried out.

13.9.6 The results of the construction delay assessment for each of the Introductory Scheme construction phases is shown in Table 13-8.

13.9.7 The overall Introductory Scheme transport (dis)benefits (including indirect tax revenue and greenhouse gas benefits) during construction of scheme is approximately -£3.19 million.

13.9.8 Further detail regarding the Scheme Construction Delay Assessment can be referred to in Chapter 5 of the Stage 3 Economic Appraisal Package provided in Appendix G.

Table 13-8: Introductory Scheme Core Scenario (dis) Benefits during Construction Phases (2010 prices and discounted to 2010)

Phase	Description	Transport User Benefits	Fuel Carbon Emission	Indirect Tax Revenue (ITR)	Present Value of Benefits (PVB)
Phase1	Skippool Junction	-£549,544	£356	£27,532	-£521,656
Phase2	Skippool Junction	-£557,844	£356	£27,960	-£529,528
Phase 1	Skippool Bridge Junction North phase	-£715,632	£514	£35,513	-£679,605
Phase 1	Skippool Bridge Junction South phase	-£728,384	£547	£36,182	-£691,655
Phase 1,2& 3	Poulton Junction	-£16,679	-£1	£196	-£16,484
Phase 1&2	Lodge Lane Bridge	-£7,966	£0	£113	-£7,853
Phase 1	Garstang to Windy Harbour	-£491,315	£11	£23,494	-£467,810
Phase 2	Garstang to Windy Harbour	-£273,517	£5	£12,885	-£260,627
Phase 3	Garstang to Windy Harbour	-£16,415	£1	£894	-£15,520
Total		**-£3,357,296**	**£1,789**	**£164,769**	**-£3,190,738**

13.10 Maintenance Delay Assessment

13.10.1 In addition to assessing the delay to road users during construction, it is necessary for the economic assessment to take account of the cost of maintaining the new section of the scheme during the 60 year appraisal period. It is currently expected that the bypassed section of the existing A585 between Little Singleton and Grange junction would be detrunked and its maintenance responsibility would be transferred to the local highway authority and therefore those maintenance costs are not included.

13.10.2 The (dis)benefits to the transport user arising because of the regular maintenance work of the proposed scheme was assessed using the Highways England Transport Planning Group's Queues and Delays at Roadworks (QUADRO) software (version 4 release 15).

13.10.3 Table 13-9 summarises the maintenance benefits for the scheme.

13.10.4 Further detail regarding the Scheme Maintenance Delay Assessment can be referred to in Chapter 6 of the Stage 3 Economic Appraisal Package provided in Appendix G.

Table 13-9: Summary of maintenance benefits (2010 prices and discounted to 2010)

S.No.	Description	Without Scheme	With Scheme	Net Impact
1	User Impact	-£1,727,590	-£339,177	£1,388,413
2	Fuel carbon emission	-£11,938	£480	£12,418
3	Indirect Tax Revenue	£22,926	£5,634	-£17,292
4	**Maintenance PVB = (1+2+3)**	**-£1,716,602**	**-£333,063**	**£1,383,539**

13.11 Greenhouse Gases, Air Quality and Noise Assessment

13.11.1 The effects of the scheme on the following indicators have been monetised in line with TAG Unit A3 - Environmental Impact Appraisal:

- Greenhouse Gases - The emission factor toolkit (EFT) version 8 was used to generate the carbon emissions for the opening year 2022 and the design year 2037 both with and without the Scheme. The total emissions were then input into the TAG greenhouse gas worksheets to generate the monetarised values. Emissions from EFT can only be generated up to the year 2030 and therefore the 2030 emissions are used to represent the design year and the remaining years of the 60-year appraisal period. This is likely to over-estimate the impact on carbon emissions as there would be a greater number of Ultra Low Emissions Vehicles (ULEV) beyond 2030 than is assumed in the assessment.

- Local Air Quality - The local air quality monetarisation has been generated by calculating emissions of NOx and concentrations of PM10 for inclusion in the local air quality worksheets. Calculations were undertaken for the opening year and design year both with and without the Scheme.

- Noise - The daytime and night-time predicted road traffic noise levels have been converted to an L_{Aeq} value in accordance with TAG Unit A3 and used to populate the TAG noise workbook (Dec 2017 version) spreadsheet to produce a monetarised value for the Scheme.

13.11.2 The Environmental Statement [HE548643-ARC-EGN-A585-RP-LE-3088] contains further detail in relation to the methodology and assessment results for the air quality and noise assessments.

13.12 Introductory Scheme Economic Appraisal Summary Tables

13.12.1 The appraisal process involves several stages.

13.12.2 The first stage is the development of the Transport Economic Efficiency (TEE) tables considering the effects on users and based primarily on the outputs of the traffic model consisting of monetised travel time benefits, vehicle operating cost savings and benefits during construction and maintenance. When added to the noise, local air quality, greenhouse gas emission (dis)benefits and accident benefits, these give the initial Present Value of Benefits (PVB) in 2010 prices.

13.12.3 The second stage considers the effects of the scheme on public accounts. The Public Accounts (PA) tables are made up of the costs incurred by Government as a result of the scheme, including investment and operating costs. Revenues to the Government are also included (as negative costs) which are made up of changes in tax revenues because of the scheme. Changes in tax revenues are directly linked to changes in fuel expenditure, which is a function of speed and distance of travel. The Present Value of Costs (PVC) is the net total from the Public Accounts (PA) table.

13.12.4 Stage 3 brings the user benefits and scheme costs together with the accident and greenhouse gas impacts, where they can be quantified in the Analysis of Monetary Costs and Benefits (AMCB) tables. The Analysis of Monetised Costs and Benefits (AMCB) compares the PVB and the PVC to generate the measures of economic worth, the NPV and the scheme's Initial BCR. The NPV is calculated by subtracting the present value of costs (PVC) from the total present value of benefits (PVB). The BCR is calculated by dividing the PVB by the PVC.

13.12.5 A positive NPV and a BCR greater than one indicate that the benefits due to the scheme outweigh its costs and so it is positive in economic terms.

13.12.6 Further analysis including the appraisal of weekend benefits, Wider Impacts and Journey Time Reliability allow the calculation of the Adjusted BCR.

13.13 The Transport Economic Efficiency Table

13.13.1 The transport economic efficiency (TEE) results for the Introductory Scheme has been presented in two sets. The transport user benefits are initially presented for the AM, IP, PM and OP. The second set includes an assessment of the weekend benefits.

13.13.2 The Transport Economic Efficiency Tables for the Core, Low and Optimistic Growth scenarios can be referred to in Chapter 8.2 of the Economic Appraisal Package provided in Appendix G.

13.14 The Public Accounts Table

13.14.1 TAG Unit A1.1, paragraph 2.5.4, page 5, guidance on the Public Accounts (PA) assessment states that the Present Value of Costs (PVC) should only include impacts on the 'Broad Transport Budget' i.e. the costs and revenues which directly affect the public budget available for transport. All other impacts, including operating costs and revenues for private sector transport providers and impacts on wider government finances, should be included in the Present Value of Benefits (PVB). Changes in indirect tax revenue should be reported in the 'Indirect tax revenues' row of the PA table, with increases in indirect tax revenue reported as negative values.

13.14.2 The Public Accounts (PA) tables for the Introductory Scheme have been presented in two sets. The Public Accounts tables are initially presented for the AM, IP, PM and OP. The second set includes an assessment of the weekend benefits. These tables are provided in Chapter 8.3 of the Economic Appraisal Package provided in Appendix G.

13.15 The Analysis of Monetised Costs and Benefits Table

13.15.1 The Analysis of Monetised Costs and Benefits (AMCB) table summarises all of the monetised impacts of a scheme that are considered sufficiently robust for inclusion in the scheme and any alternative options in terms of the measures of economic worth Net Present Value (NPV = PVB - PVC) and Benefit-Cost Ratio (BCR = PVB / PVC). The AMCB table combines information from the TEE and PA tables with monetised estimates of other impacts (such as accidents and greenhouse gases).

13.15.2 The final AMCB table should include monetised estimates of noise, air quality, greenhouse gas, journey quality, physical activity and accident impacts, where appropriate, based on guidance in TAG Unit A3 – Environmental Impact Appraisal and TAG Unit A4.1 – Social Impact Appraisal. Monetised estimates of other impacts, such as journey time reliability or Wider Impacts, should not be included in the AMCB table.

13.15.3 The AMCB tables for the Introductory Scheme have been presented in two sets. The AMCB tables are initially presented for the AM, IP, PM and OP. The second set includes an assessment of the weekend benefits. These tables are provided in Chapter 8.4 of the Economic Appraisal Package provided in Appendix G.

13.15.4 The initial AMCB table for the Introductory Scheme is shown in Table 13-10 for the Core Scenario.

Table 13-10: Initial Introductory Scheme Core Scenario AMCB Table

Noise	£1,315,041	*(12)*
Local Air Quality	£256,629	*(13)*
Greenhouse Gases	-£17,889,985	*(14)*
Journey Ambience		*(15)*
Accidents	£10,111,039	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£33,299,266	*(1a)*
Economic Efficiency: Consumer Users (Other)	£34,664,265	*(1b)*
Economic Efficiency: Business Users and Providers	£56,311,573	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£27,711,241	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Present Value of Benefits (see notes) (PVB)	£145,779,069	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)*
Broad Transport Budget	£108,895,457	*(10)*
Present Value of Costs (see notes) (PVC)	£108,895,457	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£36,883,612	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	**1.34**	BCR=PVB/PVC
	2022 to 2081	

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions. All entries are discounted to present values in 2010 prices and values.

13.15.5 The Low and Optimistic Growth Scenario AMCB tables can be referred to in Chapter 8 of the Stage 3 Economic Appraisal Package provided in Appendix G.

13.17 Introductory Scheme Journey Time Reliability Results

13.17.1 Table 13-11 presents the Core Scenario economic assessment of the valuation of the journey time variability by trip purpose over a 60-year appraisal period for the modelled time periods (AM, IP, PM, OP and WE) for the Introductory Scheme.

13.17.2 Further detail regarding the Scheme Journey Time Reliability assessment can be referred to in Chapter 9 of the Stage 3 Economic Appraisal Package provided in Appendix G.

Table 13-11: Introductory Scheme Core Scenario Journey Time Variability Economic Assessment by Trip Purpose (£) – Modelled Time Periods (2010 prices and discounted to 2010)

Car-Commuting	Car-Business	Car-Other	LGV	HGV	Total
3,539,136	732,229	6,421,606	4,995,750	8,061,654	23,750,375

13.18 Introductory Scheme Wider Impacts

13.18.1 The scale and breakdown of the wider economic impacts of the scheme by type are set out in Table 13-12.

13.18.2 The scheme is expected to generate c£26m of Wider Impacts in the Fylde District, £16 m in the Wyre District, £42m in the Preston District and £7 m in the Blackpool District (in 2010 prices and discounted to 2010), producing a total of £93.6m over the full 60-year appraisal period across all time periods. If it was considered that the benefits from Preston over-estimates the total Wider Impacts, this LAD could be excluded. Excluding Preston, the total Core Scenario Wider Impacts for the Introductory Scheme is £51m.

13.18.3 Further detail regarding the Scheme Wider Impacts assessment can be referred to in Chapter 10 of the Stage 3 Economic Appraisal Package provided in Appendix G.

Table 13-12: Introductory Scheme Core Scenario Wider Economic Impacts (PVB £ - 2010 prices and discounted to 2010) – Net Present Value (60-year Appraisal Period)

Description	Fylde	Wyre	Preston	Blackpool	Total	Total (excl. Preston)
Agglomeration	25,378,867	15,427,985	42,096,987	6,764,087	89,667,925	47,570,939
Output in Imperfectly Competitive market	682,926	1,046,239	363,453	489,428	2,582,046	2,218,593
Labour supply impact	413,353	421,097	173,850	406,156	1,414,456	1,240,606
Total Wider Impacts	**26,475,146**	**16,895,321**	**42,634,289**	**7,659,671**	**93,664,427**	**51,030,138**

13.19 Introductory Scheme Distributional Impact Appraisal

13.19.1 The purpose of Distributional Impact (DI) analysis is to attempt to identify those who would gain or lose from a transport intervention with particular emphasis on the potential impact upon equality through identifying the effects upon those who are disadvantaged compared to the majority of the population. This means that it is now necessary to attempt to disaggregate the benefits and dis-benefits of schemes between different socio-economic groups affected by the scheme. It is no longer acceptable to consider solely the effects upon society as a whole.

13.19.2 The requirement for a DI analysis only applies to the following eight scheme impacts. Some of these will always be relevant to highway schemes, some will sometimes be relevant, and some will hardly ever be relevant.

- User benefits (journey times and vehicle operating costs)
- Noise
- Air quality
- Accidents
- Security
- Severance

- Accessibility
- Personal affordability

13.19.3 The effect of these impacts is assessed on the extent to which they affect the following eight social groups:

- Income distribution (income groups)
- Children
- Young males
- Older people
- Disabled
- Black and minority ethnic groups
- Those without access to a car
- Carers

13.19.4 These groups have been identified as vulnerable in TAG Unit A4.2, Section 5, page 24. For example, young males are more likely to be involved in car accidents than other groups. Some impacts are assessed only for specific groups (e.g. user benefits are only related to income distribution, and not other groups such as children and young people).

13.19.5 The scheme was not assessed quantitatively for severance as the changes will not result in significant changes to traffic flow however qualitatively the scheme is beneficial as it reduces severance for walkers, cyclists and horse riders and improves access across the existing A585 between the Little Singleton and Skippool junctions. Previously there were no controlled crossing points along the A585 between Skippool and Little Singleton junctions. Signalised pedestrian crossings have been introduced at Skippool, Shard Road and Little Singleton junctions. In addition, the footpaths will be improved and a combined footway and cycleway will be implemented. The routes for pedestrians and cyclists will follow the existing road network rather than the bypass as this provides direct links between communities along routes with lower traffic flows. Further information regarding the reduced severance of walkers, cyclists and horse riders due to the scheme can be referred to in The Environmental Statement Chapter 2 (TR010035/APP/6.2) and Figure 2-3 De-Trunking Proposals [HE548643-ARC-EGN-A585-RP-LE-3072].

13.19.6 The reduced traffic flow on the de-trunked section due to the Scheme has the potential to improve the local environment along the de-trunked section and should encourage walking and cycling.

13.19.7 The scheme DI appraisal can be referred to in Chapter 11 of the Stage 3 Economic Appraisal Package provided in Appendix G.

13.20 Introductory Scheme Overall Appraisal Summary

13.20.1 The existing A585 traffic flow, which is in excess of the recommended flow range of a single lane carriageway, causes congestion issues on the road network, particularly in peak periods. The congestion leads to unreliable journey times and safety impacts in the villages of Little Singleton and Skippool and surrounding areas.

13.20.2 The PCF Stage 3 Scheme economic assessment was undertaken to facilitate the quantification and monetisation of the Scheme costs and benefits of the proposed Scheme. The economic assessment brings the user benefits and Scheme costs together with the accident and environmental impacts, where these can be quantified in an Analysis of Monetary Costs and Benefits which generates the measures of economic worth, the Net Present value (NPV) and the Initial Benefit-Cost Ratio (BCR) of the Scheme.

13.20.3 As outlined in TAG Unit Section 3.4 the AMCB table includes costs and benefits for which the evidence on monetisation is considered most robust. There are other significant Scheme benefits, including Wider Impacts, Reliability and Weekend User Benefits where the evidence on monetisation is less well developed and therefore the analysis presented in the AMCB table does not provide a full measure of value for money and should not be used as the sole basis for decisions. Further appraisal of monetised estimates of Reliability, Wider Impacts and weekend user benefits was analysed to allow the calculation of the Adjusted BCR to contribute to the Scheme evidence base.

13.20.4 Traffic forecasts were prepared to illustrate the sensitivity of transport user benefits to the core scenario as well as local and national uncertainties in traffic growth. As such, in addition to the Core Scenario, two additional growth scenarios, the Low Growth Scenario and Optimistic Growth Scenario were assessed.

13.20.5 Combining the Scheme cost estimated at £108.9m in 2010 prices discounted to 2010 and the user benefits/dis-benefits, provides an overall economic appraisal of the Introductory Scheme. The Introductory Scheme BCR for all the growth scenarios are presented in Table 13-13 which includes an Initial BCR appraised using the AM, IP, PM and OP time periods and an adjusted BCR which includes an appraisal of the AM, IP, PM, OP and Weekend time periods and an appraisal of Journey Time Reliability and Wider Impacts.

Table 13-13: Introductory Scheme Appraisal Results (2010 prices and discounted to 2010)

Description	Metric	Core Scenario	Low Growth Scenario	Optimistic Growth Scenario
Excluding Journey Time Reliability Benefits and Wider Impacts	TUBA Benefits	£153,793,544	£129,221,067	£171,221,638
	Accident Benefits	£10,111,039	£11,071,939	£11,480,839
	Construction & Maintenance Appraisal	-£1,807,199	-£1,807,199	-£1,807,199
	AQ, GHG and Noise	-£16,318,315	-£16,318,315	-£16,318,315
	Present value of Benefits (**PVB**)	£145,779,069	£122,167,492	£164,576,963
	Present value of Cost (**PVC**)	£108,895,457	£108,895,457	£108,895,457
	Net Present Value (**NPV**)	£36,883,612	£13,272,035	£55,681,506
	Initial Benefit-Cost Ratio (BCR)	**1.34**	**1.12**	**1.51**
Including Journey Time Reliability Benefits and Wider Impacts	TUBA Benefits (including Weekend)	£169,871,289	£144,910,463	£187,694,828
	Accident Benefits	£10,111,039	£11,071,939	£11,480,839
	Construction & Maintenance Appraisal	-£1,807,199	-£1,807,199	-£1,807,199
	AQ, GHG and Noise	-£16,318,315	-£16,318,315	-£16,318,315
	Journey Time Reliability Benefits	£23,750,375	£23,750,375	£23,750,375
	Wider Impacts	£51,030,138	£51,030,138	£51,030,138
	Present value of Benefits (**PVB**)	£236,637,327	£212,637,401	£255,830,666
	Present value of Cost (**PVC**)	£108,895,457	£108,895,457	£108,895,457
	Net Present Value (**NPV**)	£127,741,870	£103,741,944	£146,935,209
	Adjusted Benefit-Cost Ratio (BCR)	**2.17**	**1.95**	**2.35**
Journey Time Reliability as % of PVB		10.0%	11.2%	9.3%
Wider Impacts as % of PVB		21.6%	24.0%	19.9%

13.20.6 The purpose of economic assessment is to help support decision making for major investment by summarising the impact on the Economic Case of the transport intervention.

13.20.7 The Scheme has been assessed and evaluated in accordance with The Department for Transport (DfT) Transport Analysis Guidance (TAG) Units A1, A2, A3 and A4 Economic, Environmental and Social Impact Appraisal which recommends that options should be appraised using cost-benefit analysis in accordance with the Green Book [HMT, 2003). This is achieved through, wherever feasible, attributing monetary values to the impacts of the proposal. Cost-benefit analysis quantifies in monetary terms as many of the costs and benefits of a proposal as feasible, including items for which the market does not provide a satisfactory measure of economic value.

13.20.8 The accident cost savings shows that the Scheme provides better accident measures and reduces accidents. An overall Scheme objective, to improve safety along the route, will be achieved, as the Scheme if implemented is shown to reduce the number of accidents and casualties.

13.20.9 The Scheme reduces severance for non-motorised users. The reduced traffic flow on the de-trunked section due to the Scheme has the potential to improve the local environment along the de-trunked section and should encourage walking and cycling.

13.20.10 The introductory Scheme Core Scenario initial BCR is 1.34. Adding in Weekend benefits, Journey Time Reliability and Wider Impacts to provide an Adjusted BCR, increases the introductory Scheme Core Scenario BCR to 2.17.

13.20.11 The Scheme continues to provide user benefits when taking into account both Local and National economic uncertainty.

13.20.12 The Scheme improves road user journey time and reliability and the Scheme’s Wider Economic Impacts due to the improved journey times and reliability for business road users supports economic growth in the area.

13.20.13 The A585 Windy Harbour to Skippool Improvement Scheme Economic Assessment has shown that the overall objectives of the Scheme to improve safety along the route, reduce severance for non-motorised users, support economic growth and improve journey time reliability have been met and it is therefore worthwhile in economic terms to proceed with the Scheme.

14 Introductory Scheme Data Annex

14.1 Scheme costs

14.1.1 Table 14-1 shows the scheme investment cost profile in 2010 prices.

Table 14-1: Scheme investment cost profile in 2010 prices

Year	2010 factor prices (not discounted)	2010 market prices (discounted)
2018	£6,101,452	£5,513,881
2019	£5,516,587	£4,816,752
2020	£46,352,006	£39.103,173
2021	£60,586,731	£49,383,360
2022	£7,474,556	£5,886,378
TOTAL	**£126,031,332**	**£104,703,544**

14.1.2 Table 14-2 shows the scheme operation and maintenance cost profile in 2010 prices

Table 14-2: Scheme O&M cost profile in 2010 prices

Year	2010 factor prices (not discounted)	2010 market prices (discounted)
Opening year	£0	£0
Year 2	£0	£0
Year 3	£0	£0
Year 4	£0	£0
Year 5	£0	£0
Year 6	£427,818	£283,674
Year 7	£438,161	£280,708
Year 8	£448,473	£277,598
Year 9	£458,851	£274,418
Year 10	£469,374	£271,218
Year 11	£480,080	£268,023
Year 12	£491,000	£264,850
Year 13	£502,188	£261,725
Year 14	£513,684	£258,663
Year 15	£525,504	£255,666
…		
Year 59	£1,461,582	£156,511
Year 60	£1,495,838	£154,763

14.2 Scheme benefits / disbenefits

14.2.1 Table 14-3 shows the average journey times during the construction period along the scheme by phase for the Introductory Scheme.

Table 14-3: Average journey times during construction period along the scheme by phase (minutes)

	Phase 1	*Phase 2 (if relevant)*	*Phase 3 (if relevant)*
Without scheme	Not assessed	Not assessed	Not assessed
With scheme	Not assessed	Not assessed	Not assessed

14.2.2 Table 14-4 shows the average journey time along the scheme for the Introductory Scheme.

Table 14-4: Introductory Scheme Core Scenario average journey times along the scheme (minutes)

Year	Direction	AM Peak			Inter Peak			PM Peak		
		DM	DS	Diff (savings)	DM	DS	Diff (savings)	DM	DS	Diff (savings)
2022	A585 EB	05:3	03:2	02:14	05:27	03:1	02:15	05:36	03:1	02:18
	A585 WB	05:4	03:0	02:36	05:43	03:0	02:41	07:11	03:0	04:04
2037	A585 EB	05:4	03:2	02:22	05:52	03:1	02:36	06:00	03:2	02:37
	A585 WB	06:0	03:0	02:56	06:12	03:0	03:09	08:04	03:1	04:54

14.3 Safety

14.3.1 The number of accidents by year are shown in Table 14-5 for the Introductory Scheme.

Table 14-5: Introductory Scheme Number of accidents by year

Year	Without scheme	With scheme	Difference
2022	275.70	274.40	1.30
2023	272.20	270.90	1.30
2024	268.70	267.50	1.20
2025	265.30	264.00	1.30
2026	261.90	260.60	1.30
2027	258.50	257.20	1.30
2028	255.10	253.90	1.20
2029	251.80	250.60	1.20
2030	251.10	249.90	1.20
2031	250.40	249.20	1.20
2032	249.70	248.50	1.20
2033	249.00	247.70	1.30
2034	248.30	247.00	1.30
2035	247.50	246.20	1.30
2036	246.70	245.50	1.20
2037	246.00	244.70	1.30
2038	245.30	244.10	1.20
2039	244.50	243.50	1.00
2040	246.30	245.40	0.90
2041	248.10	247.20	0.90
2042	249.90	249.10	0.80
2043	251.70	251.00	0.70
2044	253.50	252.90	0.60
2045	255.30	254.70	0.60
2046	257.10	256.60	0.50
2047	258.80	258.50	0.30
2048	260.60	260.40	0.20
2049	262.40	262.20	0.20
2050	264.20	264.10	0.10
2051	266.00	266.00	0.00
2052	266.00	266.00	0.00
2053	266.00	266.00	0.00
2054	266.00	266.00	0.00

Year	Without scheme	With scheme	Difference
2055	266.00	266.00	0.00
2056	266.00	266.00	0.00
2057	266.00	266.00	0.00
2058	266.00	266.00	0.00
2059	266.00	266.00	0.00
2060	266.00	266.00	0.00
2061	266.00	266.00	0.00
2062	266.00	266.00	0.00
2063	266.00	266.00	0.00
2064	266.00	266.00	0.00
2065	266.00	266.00	0.00
2066	266.00	266.00	0.00
2067	266.00	266.00	0.00
2068	266.00	266.00	0.00
2069	266.00	266.00	0.00
2070	266.00	266.00	0.00
2071	266.00	266.00	0.00
2072	266.00	266.00	0.00
2073	266.00	266.00	0.00
2074	266.00	266.00	0.00
2075	266.00	266.00	0.00
2076	266.00	266.00	0.00
2077	266.00	266.00	0.00
2078	266.00	266.00	0.00
2079	266.00	266.00	0.00
2080	266.00	266.00	0.00
2081	266.00	266.00	0.00

14.3.2 The number of fatal casualties by year are shown in Table 14-6 for the Introductory Scheme.

Table 14-6: Introductory Scheme Number of fatal casualties by year

Year	Without scheme	With scheme	Difference
2022	3.00	2.80	0.20
2023	3.00	2.80	0.20
2024	2.90	2.80	0.10
2025	2.90	2.70	0.20
2026	2.80	2.70	0.10
2027	2.80	2.70	0.10
2028	2.80	2.60	0.20
2029	2.70	2.60	0.10
2030	2.70	2.60	0.10
2031	2.70	2.60	0.10
2032	2.70	2.60	0.10
2033	2.70	2.60	0.10
2034	2.70	2.60	0.10
2035	2.70	2.60	0.10
2036	2.70	2.60	0.10
2037	2.70	2.60	0.10
2038	2.70	2.50	0.20
2039	2.70	2.50	0.20
2040	2.70	2.60	0.10
2041	2.70	2.60	0.10
2042	2.70	2.60	0.10
2043	2.80	2.60	0.20
2044	2.80	2.60	0.20
2045	2.80	2.70	0.10
2046	2.80	2.70	0.10
2047	2.80	2.70	0.10
2048	2.90	2.70	0.20
2049	2.90	2.80	0.10
2050	2.90	2.80	0.10
2051	2.90	2.80	0.10
2052	2.90	2.80	0.10

Year	Without scheme	With scheme	Difference
2053	2.90	2.80	0.10
2054	2.90	2.80	0.10
2055	2.90	2.80	0.10
2056	2.90	2.80	0.10
2057	2.90	2.80	0.10
2058	2.90	2.80	0.10
2059	2.90	2.80	0.10
2060	2.90	2.80	0.10
2061	2.90	2.80	0.10
2062	2.90	2.80	0.10
2063	2.90	2.80	0.10
2064	2.90	2.80	0.10
2065	2.90	2.80	0.10
2066	2.90	2.80	0.10
2067	2.90	2.80	0.10
2068	2.90	2.80	0.10
2069	2.90	2.80	0.10
2070	2.90	2.80	0.10
2071	2.90	2.80	0.10
2072	2.90	2.80	0.10
2073	2.90	2.80	0.10
2074	2.90	2.80	0.10
2075	2.90	2.80	0.10
2076	2.90	2.80	0.10
2077	2.90	2.80	0.10
2078	2.90	2.80	0.10
2079	2.90	2.80	0.10
2080	2.90	2.80	0.10
2081	2.90	2.80	0.10

14.3.3 The number of serious casualties by year are shown in Table 14-7 for the Introductory Scheme.

Table 14-7: Introductory Scheme Number of serious casualties by year

Year	Without scheme	With scheme	Difference
2022	36.70	35.80	0.90
2023	36.20	35.40	0.80
2024	35.70	34.90	0.80
2025	35.30	34.50	0.80
2026	34.80	34.00	0.80
2027	34.40	33.60	0.80
2028	33.90	33.10	0.80
2029	33.50	32.70	0.80
2030	33.40	32.60	0.80
2031	33.30	32.50	0.80
2032	33.20	32.40	0.80
2033	33.10	32.30	0.80
2034	33.00	32.20	0.80
2035	32.90	32.10	0.80
2036	32.80	32.00	0.80
2037	32.70	31.90	0.80
2038	32.60	31.80	0.80
2039	32.50	31.80	0.70
2040	32.70	32.00	0.70
2041	33.00	32.30	0.70
2042	33.20	32.50	0.70
2043	33.40	32.80	0.60
2044	33.70	33.00	0.70
2045	33.90	33.30	0.60
2046	34.20	33.50	0.70
2047	34.40	33.80	0.60
2048	34.60	34.00	0.60
2049	34.90	34.30	0.60
2050	35.10	34.50	0.60
2051	35.40	34.80	0.60
2052	35.40	34.80	0.60
2053	35.40	34.80	0.60
2054	35.40	34.80	0.60
2055	35.40	34.80	0.60
2056	35.40	34.80	0.60
2057	35.40	34.80	0.60
2058	35.40	34.80	0.60
2059	35.40	34.80	0.60
2060	35.40	34.80	0.60
2061	35.40	34.80	0.60
2062	35.40	34.80	0.60
2063	35.40	34.80	0.60
2064	35.40	34.80	0.60
2065	35.40	34.80	0.60
2066	35.40	34.80	0.60
2067	35.40	34.80	0.60
2068	35.40	34.80	0.60
2069	35.40	34.80	0.60
2070	35.40	34.80	0.60
2071	35.40	34.80	0.60
2072	35.40	34.80	0.60
2073	35.40	34.80	0.60
2074	35.40	34.80	0.60
2075	35.40	34.80	0.60
2076	35.40	34.80	0.60
2077	35.40	34.80	0.60
2078	35.40	34.80	0.60
2079	35.40	34.80	0.60
2080	35.40	34.80	0.60
2081	35.40	34.80	0.60

14.3.4 The number of slight casualties by year are shown in Table 14-8 for the Introductory Scheme.

Table 14-8: Introductory Scheme Number of slight casualties by year

Year	Without scheme	With scheme	Difference
2022	2022	339.00	336.70
2023	2023	334.70	332.40
2024	2024	330.50	328.20
2025	2025	326.30	324.00
2026	2026	322.10	319.90
2027	2027	318.00	315.80
2028	2028	313.90	311.70
2029	2029	309.80	307.70
2030	2030	309.00	306.90
2031	2031	308.10	306.00
2032	2032	307.30	305.20
2033	2033	306.40	304.30
2034	2034	305.60	303.40
2035	2035	304.70	302.50
2036	2036	303.80	301.60
2037	2037	302.90	300.70
2038	2038	302.00	300.00
2039	2039	301.10	299.20
2040	2040	303.30	301.50
2041	2041	305.50	303.90
2042	2042	307.70	306.20
2043	2043	309.90	308.50
2044	2044	312.10	310.80
2045	2045	314.30	313.10
2046	2046	316.50	315.40
2047	2047	318.70	317.70
2048	2048	320.90	320.00
2049	2049	323.10	322.30
2050	2050	325.30	324.60
2051	2051	327.50	327.00
2052	2052	327.50	327.00
2053	2053	327.50	327.00
2054	2054	327.50	327.00
2055	2055	327.50	327.00
2056	2056	327.50	327.00
2057	2057	327.50	327.00
2058	2058	327.50	327.00
2059	2059	327.50	327.00
2060	2060	327.50	327.00
2061	2061	327.50	327.00
2062	2062	327.50	327.00
2063	2063	327.50	327.00
2064	2064	327.50	327.00
2065	2065	327.50	327.00
2066	2066	327.50	327.00
2067	2067	327.50	327.00
2068	2068	327.50	327.00
2069	2069	327.50	327.00
2070	2070	327.50	327.00
2071	2071	327.50	327.00
2072	2072	327.50	327.00
2073	2073	327.50	327.00
2074	2074	327.50	327.00
2075	2075	327.50	327.00
2076	2076	327.50	327.00
2077	2077	327.50	327.00
2078	2078	327.50	327.00
2079	2079	327.50	327.00
2080	2080	327.50	327.00
2081	2081	327.50	327.00

14.4 Environment

14.4.1 The NOx emissions by year are shown in Table 14-9 for the Introductory Scheme.

Table 14-9: Introductory Scheme NOx emissions (tonnes)

Year	Without scheme	With scheme	Difference
Opening year	110.9	118.0	7.1
Year 2	108.0	114.9	7.0
Year 3	105.1	111.9	6.8
Year 4	102.2	108.8	6.7
Year 5	99.3	105.8	6.5
Year 6	96.4	102.7	6.4
Year 7	93.5	99.7	6.2
Year 8	90.6	96.6	6.1
Year 9	87.6	93.6	5.9
Year 10	84.7	90.5	5.8
Year 11	81.8	87.5	5.6
Year 12	78.9	84.4	5.5
Year 13	76.0	81.4	5.3
Year 14	73.1	78.3	5.2
Year 15	70.2	75.3	5.0
…			
Year 60	67.3	72.2	4.9

14.4.2 The PM10 emissions by year are shown in Table 14-10 for the Introductory Scheme.

Table 14-10: Introductory Scheme PM10 emissions (tonnes)

Year	Without scheme	With scheme	Difference
Opening year	102285.3	102235.6	-49.7
Year 2	102313.0	102255.2	-57.8
Year 3	102340.7	102274.7	-66.0
Year 4	102368.4	102294.2	-74.2
Year 5	102396.1	102313.8	-82.3
Year 6	102423.8	102333.3	-90.5
Year 7	102451.6	102352.9	-98.7
Year 8	102479.3	102372.4	-106.9
Year 9	102507.0	102391.9	-115.0
Year 10	102534.7	102411.5	-123.2
Year 11	102562.4	102431.0	-131.4
Year 12	102590.1	102450.6	-139.6
Year 13	102617.8	102470.1	-147.7
Year 14	102645.5	102489.6	-155.9
Year 15	102673.2	102509.2	-164.1
…			
Year 60	102701.0	102528.7	-172.3

14.4.3 The greenhouse gas emissions by year are shown in Table 14-11 for the introductory scheme.

Table 14-11: Introductory Scheme Greenhouse gas emissions (tonnes CO2e)

Year	Without scheme	With scheme	Difference
Opening year	645,989	650,834	4,845
Year 2	655,544	660,525	4,981
Year 3	665,099	670,217	5,118
Year 4	674,654	679,909	5,255
Year 5	684,209	689,601	5,391
Year 6	693,764	699,292	5,528
Year 7	703,320	708,984	5,665
Year 8	712,875	718,676	5,801
Year 9	722,430	728,368	5,938
Year 10	731,985	738,059	6,075
Year 11	741,540	747,751	6,211
Year 12	751,095	757,443	6,348
Year 13	760,650	767,135	6,484
Year 14	770,205	776,827	6,621
Year 15	779,761	786,518	6,758
…			
Year 60	789,316	796,210	6,894

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Appendix A – Client Scheme Requirements Version 3.4

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Client Scheme Requirements

The Client Scheme Requirements is produced in SSP and reviewed at each subsequent Stage. The information given here is updated accordingly as the design evolves. Therefore certain sections below can only be completed / updated once a preferred option is selected. Where this applies to a section this will be indicated in the guidance notes below.

PROJECT DEFINITION			
PROJECT TITLE As defined in the Highways England Delivery Plan. The title provided here will be used by the MP Programme Hub for establishing the set-up documentation and populating other products.	**A585 Windy Harbour to Skippool Improvement**		
ID NUMBERS PIN number is assigned by the MP Programme Hub when it is entered onto the ORACLE cost system. MS number is assigned by the MP Programme Hub when it is entered onto the PowerSteering system.	**PIN NUMBER** 548643	**MAJOR SCHEME MS NUMBER** MP-0290	
SCHEME CONTACT INFORMATION	DfT Sponsor: Not applicable Only applicable to Tier 1 and novel or contentious projects	MP Project Manager: David Hopkin	Project Sponsor: Bruce Allan
	OD Senior User: Mike Sinnott (delegated from Bruce Parker)	Other Key Consultees: Local Authorities – Fylde Borough Council, Wyre Borough Council, Lancashire County Council. MPs – Ben Wallace, Wyre and Preston North Mark Menzies, Fylde; Paul Maynard, Blackpool North and Cleveleys; Cat Smith, Lancaster and Fleetwood	
SCHEME TYPE Where scheme type is uncertain in the options phase this should be completed once a preferred option is selected. Types may include Junctions, widening and bypasses, complex infrastructure projects, smart motorways.	**Off-line D2 bypass of existing route with at-grade junctions**		
ROAD AND/OR GEOGRAPHIC LOCATON	The A585 is a trunk road which runs from M55 Junction 3 at Kirkham to Fleetwood in Lancashire. The road runs a total distance of just under 14 miles. The majority of the road is two-lane single carriageway with some localised widening around junction, situated in rural areas, with the Mains Lane section passing through the residential areas of Singleton and Skippool, to the junction with the A588. It then continues as Amounderness Way, with sections of dual carriageway on the approaches to Fleetwood. The scheme will be focusing on the 2-lane section between Windy Harbour Junction, linking A586 Garstang Road to the A585 Garstang New Road, and Skippool roundabout (junction with the A588) though Little Singleton village		
PROJECT DESCRIPTION A high level statement of the scope is required. A full project description is to be added once the preferred option can be defined and solution type identified. This should be consistent with descriptions provided in the Roads Investment Strategy (RIS) Investment Plan and/or Highways England Delivery Plan or any changes to that clearly identified.	The scheme is part of Highways England's Regional Investment Programme (RIP) for the North West. The measures it includes were announced in the December 2014 *Road Investment Strategy (RIS),* as: **"A585 Windy Harbour to Skippool:** a new offline bypass of the village of Little Singleton, reducing the impact of traffic on the local community and removing a major bottleneck on the main road to Fleetwood". The scheme proposal is an offline bypass of the section of the current A585, known as Mains Lane/Garstang New Road (between the junction with A586 at Windy Harbour and the junction with the A588 and B5412 at Skippool). The scheme would bypass the two congested junctions at Little Singleton and Shard Road, reduce the impact of traffic on the local community and remove a major bottleneck on this route. There were two options taken to consultation, an online option and a 2.5 mile Southern bypass (an earlier Northern bypass having been already discounted). The Southern bypass option, which was taken forward as the preferred option, is an offline dual carriageway bypass. The existing route between Skippool and Skippool Bridge would be upgraded to a dual two lane all-purpose road, with a majority of the widening occurring to the north of the existing route. At Skippool Bridge junction the route transfers into a new offline dual two lane all-purpose bypass travelling southeast towards the A586. A new at-grade junction (Poulton Junction) is proposed with the A586 Garstang Road East, which is situated east of the Garstang Road Industrial Estate. The route then progresses offline in an eastward direction, and moves into deep cutting (up to 8.6m) to pass under a new bridge carrying the B5260 Lodge Lane and will		

	continue in cutting to the north east of The Manor. The link upgrades Garstang New Road towards the recently-improved Windy Harbour Junction. The existing section of Garstang New Road immediately east of Grange Roundabout would become redundant.
STATUS Indicate the current Stage that the project is in. Note that this document is reviewed at every stage.	PCF Stage 3: Preliminary Design
CHALLENGES AND ISSUES	
Summarise the identified transport related problems with reference to the current conditions	The proposals for the scheme were developed in response to the problems identified on the A585 in the South Pennines Route Based Strategy Evidence Report (February 2014). The Evidence Report identifies the following problems with the route: • The route is noted as an area with a particularly high collision risk • The route is noted to suffer from “delays and congestion.” • Issues have been highlighted along the A585 for cyclists and vulnerable road users including: difficulties at junctions; crossings and navigating the road safely; and the general poor maintenance of facilities for cyclists and vulnerable road users along this section of the route. A major scheme was identified as being required to address the problems in this location, and a Strategic Outline Business Case was prepared. In addition to the current capacity challenges, which are the cause of significant delays during peak times, the future modelling outputs show a worsening of the situation. Forecasts show delays will continue to get worse; and that congestion would increase with journey times increasing by up to 35% along the route, if no action is taken. Any failure to deliver the scheme will constrain Wyre and Fylde Council’s Local Plan aspirations, as there will be limited infrastructure capacity to support new development. Smaller junction improvements schemes have been announced by Operations Directorate, which would complement the Major Projects scheme. These are at Norcross Roundabout, to the east of Skippool, and M55 junction 3, the motorway junction leading on to the A585. The Major Projects scheme coupled, with the planned junction improvements will help address the wider congestion issues along the route.
STRATEGIC CASE Summarise the strategic case for a solution, explaining how the scheme will contribute to the RIS Strategic Vision and the Highways England Strategic Business Plan. Illustrate the alignment of the scheme with local, regional and national objectives. Refer to previous study work which has addressed the strategic case for the scheme.	The A585 is the main transport link to the northern part of the Fylde Peninsula and the only trunk road in and out of this area. Limited access via other modes of transport, and the lack of direct local road routes, makes the A585 the most attractive route for strategic traffic heading to the M55 and M6. As a result, the A585 suffers delays and congestion – especially in peak periods – and has a particularly high collision risk. The tourism offer on the Fylde Coast also ensures the route has high traffic flows on weekends. The Department for Transport’s Road Investment Strategy was announced in 2015. It sets out the ambition for the next 25 years to “revolutionise our roads and create a modern SRN that supports a modern Britain, making a real difference to people’s lives and businesses’ prospects.” As part of this, the A585 Windy Harbour to Skippool scheme was announced as a scheme for delivery in the first roads period (2015-2020). The draft Wyre Local Plan contains proposals for 4,500 homes in the peninsula, but, due to the need for linkages to the regional economic hub of Preston and beyond (via the M55/M6) these are dependent upon sufficient transport connectivity, which the A585 cannot currently deliver. Wyre Council has stated its support for the bypass, as it will increase capacity of the network (especially, more than the discounted online option) and therefore better support the level of planned residential development. Enhanced highways capacity is also key to economic development within the Wyre peninsula, with the potential expansion of the Hillhouses Economic Development Zone, to accommodate advanced manufacturing and chemical industry activity. This is situated partway along the route; and would generate further strategic inbound traffic. The Port of Fleetwood is located at the end of the A585. The port has recently lost its roll-on, roll-off ferry operations, however proposals to continue the use of the port are being developed. These include installation, operation and maintenance activities for the large offshore wind and energy projects planned for the Irish Sea. Capacity problems on the A585 route are therefore a constraint to development and economic growth within the area; as such the improvement scheme will unlock economic growth. Improvements to this section of the A585 are supported by Lancashire County Council as well as Fylde and Wyre Boroughs, and form a crucial part of their Fylde Coast Highways and Transport Masterplan, designed to support local economic development.

<table>
<tr>
<td>**TRANSPORT OBJECTIVES**
Define the high level objectives of the scheme, in terms of desired outcomes, such as improvement in journey times, reliability, safety, or catering for economic and housing growth. Where applicable, reference the objectives identified in the high level business case prepared through route strategies.

More detailed objectives (flowing from the high level objectives) should be developed as the design evolves and particularly once the preferred option is selected. These detailed objectives, comprised of specific, targets and measures should reflect the guidance given in WebTAG and be consistent with the Appraisal Summary Table (AST).

There should also be an objective to deliver a scheme which matches or improves on the value for money of the selected option, as it has been assessed at completion of the Option Phase and set out in the AST and Value for Money (VfM) assessment. This should be consistent with objectives provided in the RIS Investment Plan and/or Highways England Delivery Plan or any changes to that clearly identified.</td>
<td colspan="2">The overall strategic objectives of the project are:

To support economic growth in the area
Improve safety along the route
Improve journey times and reliability
Reduction of severance for non-motorised users (NMUs) along the existing Mains Lane.

Below this, a number of specific transport objectives have been developed, as follows (further detail on performance is provided under KPIs below):

Deliver capacity enhancements to the SRN whilst supporting the use of sustainable modes
Reduce congestion on the existing A585 through Little Singleton, Shard and Skippool Junctions;
Support employment and residential/commercial development and growth opportunities;
Improve journey time reliability;
Reduce severance for NMUs and improve access across the existing A585 between the Little Singleton and Skippool junctions;
Reduce/minimise the impact on the wider environment, particularly for air quality and noise;
Improve connectivity and community cohesion;
Support the removal of obstacles to economic growth potential in both Wyre and Fylde; and
Complement and realise the full benefits of other Operations Directorate schemes in the region.
</td>
</tr>
<tr>
<td rowspan="3">**PERFORMANCE SPECIFICATION**
Provide a view on how the proposals relate to the RIS Performance Specification together with an indication of how they support delivery of the Key Performance Indicators (KPIs).</td>
<td colspan="2">The Road Investment Strategy’s Performance Specification sets eight Key Performance Indicators. These indicators, and outline proposals for how the scheme can meet them, are set out below.</td>
</tr>
<tr>
<td>1. “Making the network safer” (40% reduction in the number of people killed or seriously injured on the network, against the 2005–09 average baseline, by end of 2020) - The scheme aims to address this objective as far as possible.</td>
<td>For the existing single carriageway roads within the scheme footprint, the 5-year average KSI (2009 – 2014) is 7.79 which is above the national KSI average for A-road single carriageway of 7.34.

The preferred route safety assessment shows that 28 accidents are forecast to be saved due to the scheme compared to the Do Minimum resulting in an overall benefit of £10.1million. There is estimated to be a reduction on all types of casualties over the 60-year appraisal period with the scheme in place of; 8 fatal, 40 serious and 68 slight.</td>
</tr>
<tr>
<td>2. “Improving user satisfaction” (by and from 31st March 2017 at least 90% of people responding to the National Road Users’ Satisfaction Survey are fairly or very satisfied) The scheme aims to bring substantial journey time benefits and improvement in reliability and resilience, which should contribute to this indicator’s achievement. Careful attention will be needed to developing proposals to maintain, and improve if possible, user satisfaction during construction.</td>
<td>According to the National Road User Survey, overall KPI performance has decreased by 9% on trunk roads in the North West over the past 5 years.

Business users are predicted to benefit significantly from the provision of the scheme through reduced travel time amounting to £59.15m (PV) over the 60-year appraisal period. The value of net journey time changes (£) by time band is as shown in the table below
<table>
<tr><td>0-2mins</td><td>2-5mins</td><td>>5mins</td></tr>
<tr><td>14.91</td><td>43.95</td><td>0.3</td></tr>
</table>
As can be seen, the majority of business users are expected to receive journey time benefits of between 2-5 minutes.</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td>Commuters and other users are also expected to benefit significantly by the scheme through reduced travel time amounting to £105.66m (PV) over the 60-year appraisal period.
The value of the net journey time changes (£) by time band are shown in the table below<table><tr><td>0-2mins</td><td>2-5mins</td><td>>5mins</td></tr><tr><td>36.01</td><td>68.76</td><td>0.89</td></tr></table>The majority of commuter and other users are also expected to receive journey time benefits of between 2-5 minutes.</td></tr>
<tr><td></td><td>3. “Supporting the smooth flow of traffic” (97% network availability at a minimum) – During the development of the scheme, measures to understand how resilience can be improved will be considered. The other part of the indicator, 85% of motorway incidents to be cleared within the hour, is not applicable.</td><td>Through the provision of a D2AP carriageway, the route has improved resilience compared to the former two-lane single carriageway; for example, enabling the route to remain operational while a single lane is closed either during planned roadworks or maintenance activities or as a result of an emergency response to an incident on the link. However, there is no quantifiable evidence for this KPI at this stage of scheme assessment.</td></tr>
<tr><td></td><td>4. “Encouraging economic growth” – Highways England will report on average delay and cost this to measure this indicator. The scheme proposals include bypasses of currently congested junctions at Little Singleton and Shard, together with increased capacity. Therefore, the announced measures aim to contribute to the achievement of this indicator by tackling existing locations known for delay. The scheme also aims to support growth and development in the area.</td><td>There is no development site directly dependent upon the A585 scheme, although there are commitments to build new housing in both Wyre and Fylde that would put increasing pressure on the existing network without improvements.
Wyre Borough Council has a commitment to deliver 4,500 new homes in the Wyre Peninsula, served by the A585, in their emerging Local Plan. The Council has stated that the bypass option is their preferred option, due to its greater carrying capacity to accommodate development growth.
There are also 6,979 new dwellings proposed in Fylde Borough, a small proportion of which are in the vicinity of the scheme, and these will similarly impact on future demand on the existing network.</td></tr>
<tr><td></td><td>5. “Delivering better environmental outcomes” (Halting biodiversity loss and mitigating at least 1,150 Defra Noise important areas by the end of the first Road Period) – There are Defra Noise important areas on or adjacent to the route which the scheme will look to mitigate where possible. The scheme will progress using the Planning Act 2008 statutory process, and the National Networks National Policy Statement is relevant in setting out the requirements for the Environmental Impact Assessment and design information to accompany the application for development consent.</td><td>Interim findings of the Schemes operational noise model show that there are ten noise important areas within the noise study area. Long term there would be four noise important areas that would benefit from the Scheme (with **reductions of at least 3dB and up to 12dB)** and there would be negligible changes at the other six.
The biodiversity assessment is currently being undertaken and the landscape masterplan being finalised as part of the Environmental Impact Assessment. The biodiversity metric will form part of the biodiversity assessment based on the masterplan and initial calculations show that the Scheme will deliver net gain rather than just ‘halting biodiversity loss’.</td></tr>
</table>

	6. "Helping cyclists, walkers, and other vulnerable users of the Network" (reporting on the number of new and upgraded crossings delivered during the Road Period) There are opportunities to improve crossings on the existing route and so contribute to this indicator's achievement.	'Walkers, Cyclists and Horse riders' (WCH) CCTV surveys have been undertaken as part of the Stage 3 works. This identified the various existing WCH routes used by the public along the scheme length. The new bypass will aim to separate WCH's from vehicle users. Keeping traffic along the new stretch of all-purpose bypass and provide combined footway/cycleway from Skippool junction to Windy Harbour junction via the detrunked Mains Lane and decommissioned sections of Garstang New Road. As part of the scheme new controlled crossing points are to be provided at all junctions along the scheme route, to provide a safe means for WCH to cross the road (and bypass).
	7. "Achieving real efficiency" (saving at least £1.212 billion across 5 years) – The scheme already is working with, and will continue to work with, other Road Investment Strategy schemes with the explicit intention of identifying and delivering efficient ways of working.	The RIS target for the project is to deliver £1.9 million worth of efficiencies. There have so far been £1.6 million of efficiencies assured at level 2, with a further potential of £3.9 million efficiencies identified. These efficiencies range from stakeholder engagement to buildability advice. To date based on the July 2018 submission of the efficiency register, the recognised figure is £123.5k.
	8. "Keeping the Network in good condition" (at least 95% of road surface to be in adequate condition) – The start on site by the end of the current Road Period will provide an opportunity to address the current poor condition of the strategic asset, and so contribute to the achievement of this indicator.	The scheme will provide the provision of a new bypass, with new construction of pavement, drainage and other Highways England infrastructure assets. These will be provided so that no maintenance is required within the first 5 years. For the strategic asset, surveys have been undertaken to understand the existing condition, and where the condition is in an inadequate state, the scheme will address and repairs these to ensure a maintenance free period of 5 years post construction. As part of the detrunking works the asset to be handed over to the local authority will be assessed and repaired accordingly.
	Proposals detailing with the specifics around how the scheme will meet the above Key Performance Indicators will be developed once further design and assessment work has been carried out in the PCF Development Phase. The scheme contribution to the Key Performance Indicators has been updated in line with the qualitative and quantitative information that is available during PCF Stage 3.	
OPTIONS AND OUTPUTS		
OPTIONS At the start of the Options phase provide a list of the principal options which have been identified as meriting further investigation from the pre-options feasibility work, eg route strategies options assessment report, including details of any complementary measures.	There were two options assessed during the course of Stage 2. • A bypass to the south of the current route: beginning with a section of online dualling to the west of Windy Harbour; tying into the Pinch Point scheme improvements before moving offline, providing a new junction with the A586 and tying back in at a new junction east of Skippool. • Online improvements including a section of dualling tying into the Windy Harbour Pinch Point works; a one-way gyratory at Little Singleton and junction improvements at Shard.	
TRANSPORT AND ROAD INFRASTRUCTURE DELIVERABLES List the principal elements of the scheme when they have been defined in the Development Phase. This should be consistent with the Roads Investment Strategy (RIS) Investment Plan and/or Highways England Delivery Plan or any changes to that clearly identified.	The scheme will be a 4.86km (3 miles) of new two-lane all-purpose dual-carriageway bypass connecting Windy Harbour Junction and Skippool Junction, and bypassing the Singleton and Shard Road junctions on the existing route. The proposed scheme includes 4 new junctions; o Conversion of Skippool Junction to a traffic signal-controlled crossroads with A588 Breck Road and B5412 Skippool Road o Skippool Bridge Junction in the form of a three-arm traffic signal-controlled junction with the existing Mains Lane	

- Poulton Junction connecting to A586 Garstang Road East
- Conversion of Little Singleton Junction (also known as Five Lane Ends) to a roundabout

And four new structures;

- Skippool Bridge
- Lodge Lane Bridge
- (Skippool Clough Culvert – following a condition survey, may need strengthening as it passes below the new Skippool Junction)
- Grange Footbridge

TIME FRAMES

Include the planned Phase and Stage dates, as given in the Project Schedule.

Option Phase			Development Phase			Construction Phase		
Stage	**From**	**To**	**Stage**	**From**	**To**	**Stage**	**From**	**To**
1	April 2015	May 2016	3	Sept 2017	Sept 2018	6	Mar 2020	Feb 2022
2	Nov 2015	Sept 2017	4 / 5 (in parallel)	Sept 2018	June 2020	7	Feb 2022	Feb 2023

CONSTRAINTS

Special conditions that impact on the delivery should be noted; for example, particular environmental considerations. Factors influencing the required time table; for example, the timing of planned housing developments should be noted. Details should be provided of any other bodies involved in the delivery of the scheme or of complementary measures.

- The *Road Investment Strategy* timescale requiring a start on site by the end of the 2019/20 financial year (HE IDC/Dft Change control)
- The proximity of the Wyre Estuary, a site with several environmental designations. Which include SSSI, SPA, Ramsar, SAC, important bird area, recommended marine conservation zone. Note there is no specific single environmental body responsible for the estuary; current responses are below.
- A flood zone located to the south of the current A585 which a bypass solution would potentially pass through (Environment Agency)
- Records of protected species in the area (Natural England if affecting species)
- The proximity of existing housing. and proposals for new development as the Wyre Local Plan is adopted (Wyre BC)
- 515 residential properties are under construction adjacent to the scheme (A586).
- Fylde have provided local development assumptions which have been incorporated into the model.
- A lack of suitable diversion routes when the existing route is affected (LCC)
- A baseline allocation of £135m, which is below current cost estimate (IDC/CPM)

SEB	Consultation	Outstanding areas
Natural England	Project has discussed HRA (wintering birds) and mitigation of wintering birds during construction. Discussions have also been held around licencing for GCN and Bats	Agree a statement of common ground with Natural England. Obtain agreement in principle for Bat and GCN licencing
Environment Agency	Project has presented FRA and Water Framework Directive Assessment with Environment Agency.	Agree a Statement of Common Ground with EA in relation to FRA, WFD. Still need to arrange permits and protective provisions as part of DCO
Historic England	Project consulted with Historic England as part of the consultation process. The feedback received is there are no particular concerns because there are no particular assets affected by the scheme.	No further actions are proposed.
MMO	Initial discussions have been held and it has been confirmed that the area around Skippool Clough Culvert will require a licence.	Payment needs to be arranged for the MMO, so that the licence can be drafted. This will form the Statement of Common Ground for Stage 4 (DCO).

Public Commitments

To describe the announcement made by who, where and when.

Public commitment made in the December 2014 *Road Investment Strategy*:

A585 Windy Harbour to Skippool – a new offline bypass of the village of Little

Singleton, reducing the impact of traffic on the local community and removing a major bottleneck on the main road to Fleetwood.

Reaffirmed as a scheme to start construction by the end of 2019/20 in *Highways England Delivery Plan 2015–2020 and 2017–2018*

During the course of PCF Stage 3 the project carried out statutory consultation. This took place between 21st March 2018 and 8th May 2018. Various materials and notices were used to publicise the consultation including leaflets, statutory notices, media ads and letter drops to local stakeholders and affected parties. The following timescales were provided during the consultation period.

- Submission of planning application – autumn 2018
- Decision by Secretary of State – spring 2020
- Commitment to construct – 2020
- Road opened – 2022

COSTS AND FUNDING

Give the three-point estimate for the Project.
This should show separately the estimated outturn project cost, the programme risk and total cost.

In the Options phase give these estimates for each option listed above under Options and Outputs.
If costs for some options are not available at the start of the options phase include them as they become available.
In the Development phase give the estimate for the preferred option.

Note: The central /most likely outturn project cost estimate plus the central/most likely programme risk figure = the expected outturn cost.
In the Development phase this relates to the preferred option.
In the Options phase there will be a separate expected outturn cost for each option.
Include the assumed construction date used to calculate the Indicative Funding Assumption.

Option	Central/most likely estimate	Range max	Range min
Southern bypass option as per "*Project Description*" field above.	£139.27 million	£195.97 million	£99.93 million

- Estimates presented without portfolio risk.
- Cost estimates produced July 2017.

SOURCE OF FUNDS

Indicate the assumed source of funding for the project.

Department for Transport		Other
The December 2014 *Road Investment Strategy*		None identified currently.

AUTHORISED PHASE BUDGET

Amount	Phase/Stage
£4.13m	Options Phase Budget
£12.9m	Stage 3 & 4 Budget

APPROVAL

AUTHOR The form should either be completed by the Highways England SRO or for Tier 1, novel or contentious projects by the DfT Sponsor, working with the MP Project Manager. The MP Programme Hub and Strategy and Planning may also need to be consulted as appropriate.

Author	David Hopkin, Project Manager
Reviewer	Bruce Allan, Regional Sponsor

APPROVER

The form should be signed off by the following:
1) Programme Internal Sponsor or 2) For Tier 1 projects only - DfT Sponsor

Name	Signature	Date
Bruce Allan, Regional Sponsor (delegated from Programme Internal Sponsor)	[redacted]	19/09/2018

RECORD OF REQUIREMENTS CHANGES

Identify the updates and changes to the Scheme Requirements. The Scheme Requirements is reviewed at each Stage Gate. Changes to the Requirements are subject to the PCF change control processes, inclusion in the Change Register and should be considered in light of the change control process for the Delivery Plan and / or RIS.

Milestone or Change Event	Date	Version No.
First version of CSR for Stage 3		3.1
Updated post Bruce Allan review	03-05-2018	3.2
Further Bruce Allan review/update	31-05-2018	3.3
Updated post Bruce Allan review on 31-05-2018	04-07-2018	3.4

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Appendix B – Stage 3 Transport Data Package

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A585 Windy Harbour to Skippool

Transport Data Package

HE548643-ARC-HGN-A585-RP-TR-3164
28 AUGUST 2018

Registered office Bridge House, 1 Walnut Tree Close, Guildford GU1 4LZ
Highways England Company Limited registered in England and Wales number 09346363

DOCUMENT CONTROL

Document Title	Transport Data Package
Author	Clare-Louise Douglas
Owner	Nicholas Henderson
Distribution	Tom Pettyt, David Hopkin
Document Status	Final Issue – For Implementation

REVISION HISTORY

Version	Date	Description	Author
1.0	14/12/2017	For comment	Clare-Louise Douglas
2.0	08/01/2018	Second issue for acceptance	Clare-Louise Douglas
3.0	30/05/2018	Third issue for acceptance	Clare-Louise Douglas
4.0	28/08/2018	Final issue for Implementation	Clare-Louise Douglas

REVIEWER LIST

Name	Role

APPROVALS

Name	Signature	Title	Date of Issue	Version

This report dated 28/08/2018 has been prepared for Highways England (the “Client”) in accordance with the terms and conditions of appointment dated 16 March 2016 (the “Appointment”) between the client and Arcadis Consulting (UK) Limited (“Arcadis”) for the purposes specified in the Appointment. For the avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

TABLE OF CONTENTS

1 Introduction

1.1 Purpose of the Transport Data Package

1.1.1 The aim of this Transport Data Package is to set out the traffic data to be used in the A585 Windy Harbour to Skippool project, taking into consideration the current stage in the Highways England Project Control Framework (PCF), PCF Stage 3. The Transport Data Package encapsulates the data gathered to support the transport analysis used to underpin the scheme's business case and operational, economic and environmental assessments.

1.1.2 This Transport Data Package summarises existing data. There was no new data collected for the PCF Stage 3 A585 Windy Harbour to Skippool scheme assessment. The A585 Windy Harbour to Skippool traffic model developed at PCF Stage 2 will be used for the Stage 3 assessment. The PCF Stage 2 A585 Windy Harbour to Skippool traffic models have therefore been used as the donor models of the PCF Stage 3 A585 Windy Harbour to Skippool traffic models. The study area of the scheme is shown in Figure 1-2.

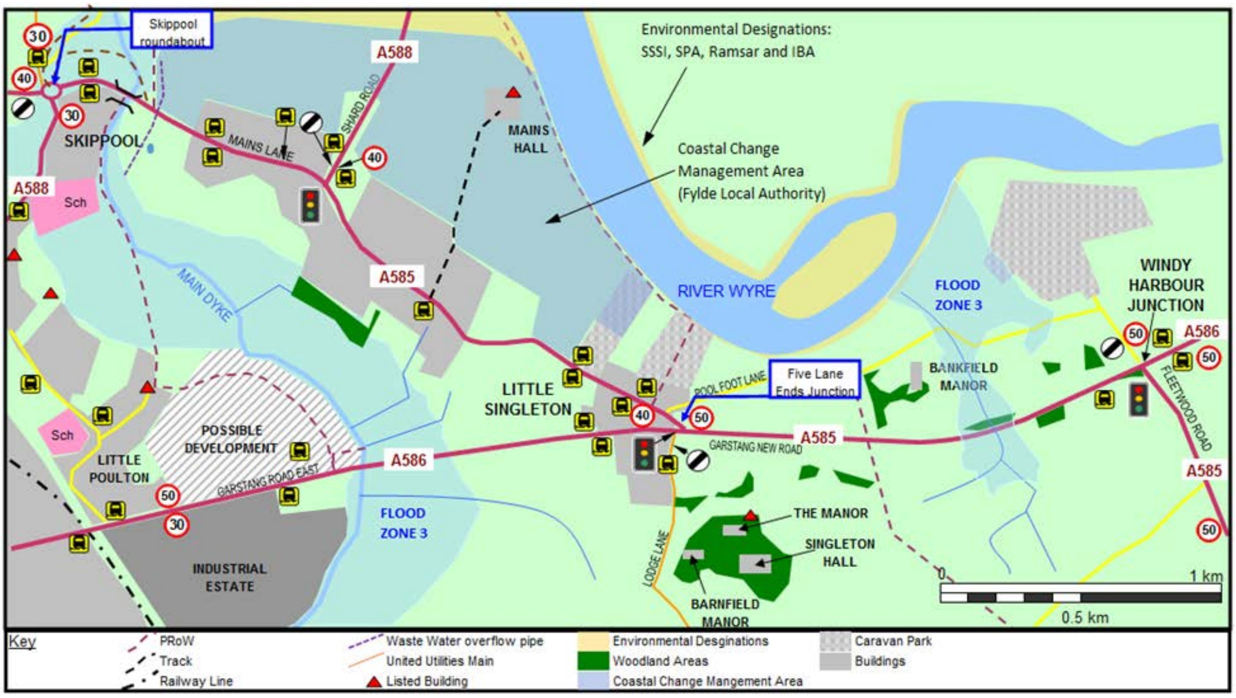
2 Background

2.1.1 The A585 is the major transport link into the northern part of the Fylde/Wyre peninsula. It connects with the motorway network at Junction 3 of the M55. The route from Windy Harbour to Skippool, as shown in Figure 1-1, suffers from congestion during peak periods, leading to unreliable journey times and a poor safety record.

2.1.2 A junction improvement (‘pinch point scheme’) at the A585/A586 crossroads at Garstang New Road, Fleetwood Road and Windy Harbour was implemented in spring 2015. Improvements to the A585 corridor west of A585/A586 Windy Harbour are in the process of consideration by Highways England with planning currently at PCF Stage 3.

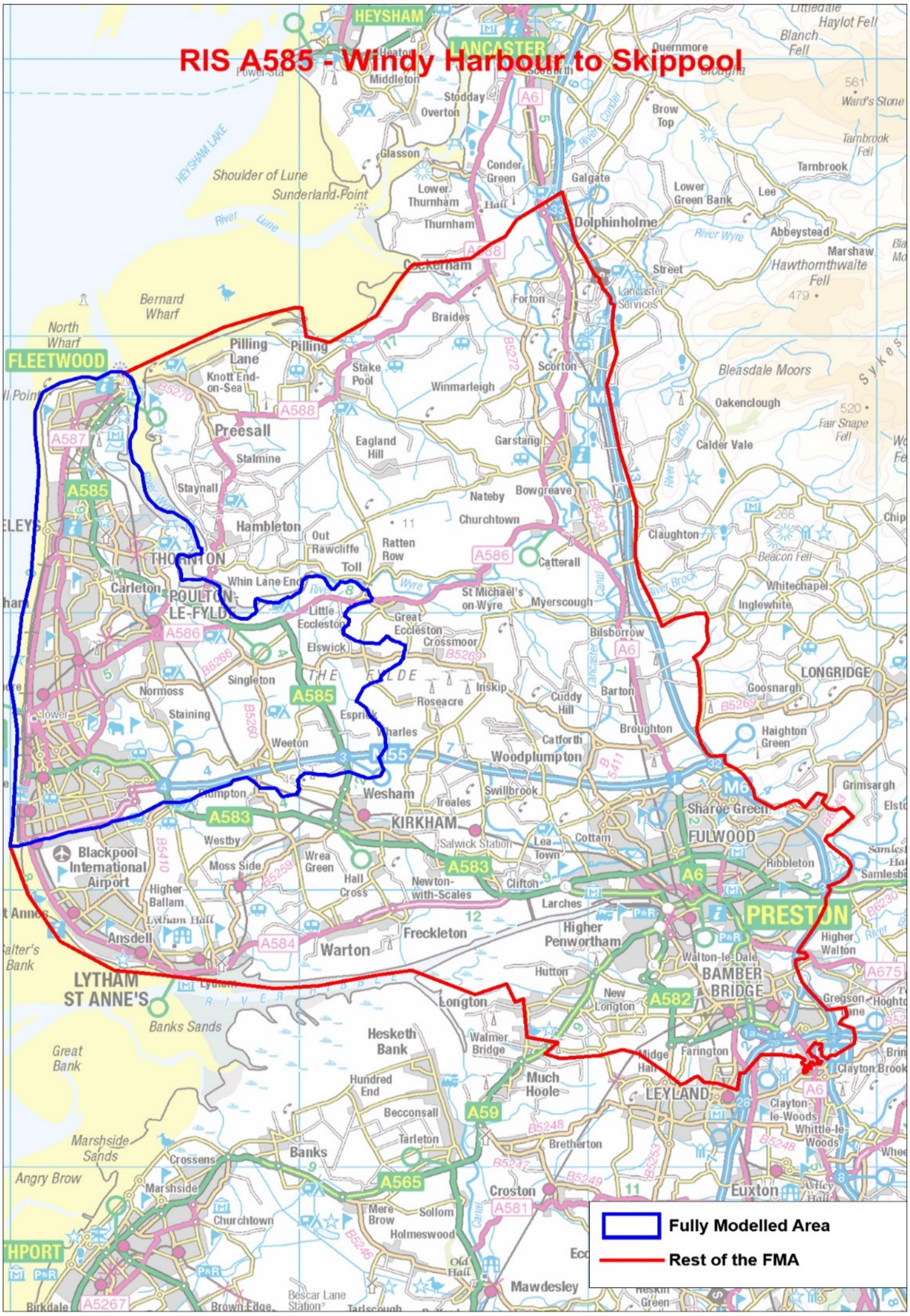
2.1.3 Following Stage 2 of the study which included a 6-week public consultation from 05 September to 17 October 2016, a Preferred Route Announcement was made which selected Option 1, the southern bypass, for improving the A585 between Windy Harbour and Skippool.

Figure 1-1 A585 – Windy Harbour to Skippool: Existing Road Layout



Source: OS data © Crown copyright 2015; Licence – Version 3 of Open Govt. Licence (OGL)

Figure 1-2 Fully Modelled Area (FMA)



Source: OS data © Crown copyright 2015; Licence – Version 3 of Open Govt. Licence (OGL)

2.2 Project Definition

2.2.1 Project Title: A585 Windy Harbour to Skippool Improvement

2.2.2 A585 ID Number (PIN): 548643

2.2.3 Scheme Type: The scheme proposal is an offline bypass of the section of the current A585, known as Mains Lane/Garstang New Road (between the junction with A586 at Windy Harbour and the junction with the A588 and B5412 at Skippool)

2.2.4 PCF Stage: Stage 3

3 Need For Traffic Data

3.1 Scheme Objectives

3.1.1 The overall project objectives as set out in the Client Scheme Requirements Version 3.2 are:

- To support economic growth in the area
- Improve safety along the route
- Improve journey time and reliability
- Reduction of severance for non-motorised users (NMUs) along the exiting Mains Lane.

3.1.2 The scheme's nine transport objectives as set out in the Client Scheme Requirements Version 3.2 are:

- Objective 1 – Deliver capacity enhancements to the SRN whilst supporting the use of sustainable modes
- Objective 2 - Reduce congestion on the existing A585 through Little Singleton, Shard and Skippool Junctions
- Objective 3 – Support employment and residential/commercial development and growth opportunities
- Objective 4 – Improve journey time reliability
- Objective 5 – Reduce severance for NMUs and improve access across the existing A585 between the Little Singleton and Skippool Junctions
- Objective 6 – Reduce/minimise the impact on the wider environment, particularly for air quality and noise
- Objective 7 – Improve connectivity and community cohesion
- Objective 8 – Support the removal of obstacles to economic growth potential in both Wyre and Fylde
- Objective 9 – Compliment and realise the full benefits of other Operations Directorate schemes in the region

3.2 Principal Data Requirements

3.2.1 The traffic data requirements of the scheme in the context of the scheme design and PCF products, are defined in the Appraisal Specification Report, (HE548643-ARC-GEN-A585-RP-D-3038-V4.0) which identifies that no additional survey data will be collected for PCF Stage 3.

3.2.2 The principal requirements for traffic data are to:

- Support the development of a robust traffic model
- Support the development of forecasts which will be used for economic and environmental appraisal

3.2.3 The data required is defined by the modelling approach adopted, which for this scheme is a SATURN based traffic assignment model using demand matrices developed based on the methodology set out in the ASR. This involved the collection of the latest traffic data and Road Side Interview (RSI) data collected for previous studies, including the A585 Corridor & Thornton-Fleetwood Area Action Plan (A585 CTF) S-Paramics Model, Blackpool Transport Model and the Central Lancashire Highways and Traffic Model, and then processing it to the current year using matrix estimation.

3.2.4 The data summarised in this report was also used to support the development of an up-to-date microsimulation model (in S-Paramics software) in order to carry out operational assessment of the proposed scheme options.

3.2.5 The base model will be developed in SATURN for the morning, (AM), Inter Peak (IP) and evening (PM) model hours on an average weekday in June 2015. These time periods were identified from the automatic traffic count (ATC) data collected specifically for this study.

3.3 Use of Existing and New Survey Data

3.3.1 The PCF Stage 0 traffic modelling work for the scheme was undertaken in November 2014. The Stage 1 traffic modelling was begun in September 2015 and was undertaken using S-Paramics. Most of the data used to build the A585 CTF S-Paramics model (for Stage 1 modelling) was based on RSIs carried out in 2008.

3.3.2 Highways England guidance (*'TAME Advice Note 1 v1.0', June 2015*) applicable to non-Smart Motorways Programme Major Projects in the early stages of the Project Control Framework advises, *"*Whilst WebTAG indicates that matrixes with supporting survey data greater than six years should be the subject of extensive redevelopment work, this will be relaxed to 10 years.*"* The age of the RSI data used in the development of the Stage 2 traffic model (whilst deemed acceptable for PCF Stage 2) will be in excess of 10 years old when the A585 Windy Harbour to Skippool Development Consent Order is submitted. The traffic model flows have been updated using 2015 control data including traffic counts undertaken in 2015 and/or information taken from TEMPRO (Trip End Model Presentation Program) however the underlying trip data (based on the RSIs) has not been updated.

3.3.3 The A585 Windy Harbour to Skippool scheme is now at PCF Stage 3 Preliminary Design and the traffic model would be expected to be finalised and of sufficient quality to stand up to scrutiny for a Development Consent Order (DCO). As stated in TAG Unit M3-1 Highway Assignment Modelling Section 8 Paragraph 8.1.1, trip matrices should not be taken from existing model unless the following conditions are met:

- The trip having both ends in the Fully Modelled Area which were derived from survey data were based on survey data which are less than six years old.

3.3.4 It is reported in the Design Manual for Roads and Bridges (DMRB), Volume 12, Section 1, Part 1, The Application of Traffic Appraisal to Trunk Roads Schemes, models built primarily on data 6 years old or greater are considered too old for assessment purposes.

3.3.5 It is reported in IAN 176/13 Guidance Note for the Production of an Appraisal Specification Report Paragraph 3.2.1, p 7, June 2013, "It should be borne in mind that the DMRB guidance indicates the age of data at the time of use of the model; whether this is for scheme appraisal, for presentation at public consultation or evidence at public inquiry or NSIP submission." IAN 176/13 also reports that "Mitigation measures should be planned from the earliest practicable point."

3.3.6 The decision to proceed with the continued use of the 2008 RSI data has been made in order to meet the DCO delivery programme.

3.3.7 As part of the Stage 2 data collection activities, traffic surveys were undertaken in July and September/October 2015 and February/March 2016. The data obtained from the traffic surveys provided a significant proportion of the count data for the purposes of matrix expansion, re-basing, matrix estimation and model validation.

3.3.8 There was no new data collected for PCF Stage 3 of the A585 Windy Harbour to Skippool scheme.

3.3.9 The PCF Stage 3 Transport Data Package is therefore encapsulated by the Stage 2 Traffic Data Collection Report [HE548643-ARC-GEN-A585-RP-TR-2022_v5.0] which can be referred to in Appendix A. The A585 Windy Harbour to Skippool Stage 2 Traffic Data Collection Report (TDCR includes the details of the data sources used in the Stage 2 model development, calibration and validation.

Appendix A Stage 2 A585 Windy Harbour to Skippool Traffic Data Collection Report

Working on behalf of Highways England

TRAFFIC DATA COLLECTION REPORT

A585 - Windy Harbour to Skippool

HE548643-ARC-GEN-A585-RP-TR-2022

02 AUGUST 2017

Incorporating

CONTACTS

NICK HENDERSON
Project Manager

dd +44 (0)1483 803153
[redacted]
e nicholas.henderson@arcadis.com

Arcadis.
The Surrey Research Park
10 Medawar Road
Guildford
GU2 7AR
United Kingdom

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Reviewer List

Name	Role
Marcus Chick	TAME
Richard Steinberger	Senior Transport Planning and Economics Advisor, TAME
David Hopkin	Highways England MP Project Manager

Approvals

Name	Signature	Title	Date of Issue	Version

TRAFFIC DATA COLLECTION REPORT

A585 - Windy Harbour to Skippool

Author	Mahesh S. / Alex Walton / Mark Hudson [redacted]
Checker	Amy Leather/ Saeed Ishtiaq [redacted]
Approver	Nick Henderson [redacted]
Report No	HE548643-ARC-GEN-A585-RP-TR-2022
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Version	Date	Author	Changes
1.0	09/09/2016	Mahesh S	Preliminary - Issued for comments
2.0	20/01/2017	Mahesh S	Minor amendments to address TAME comments on v1.0
3.0	08/03/2017	Mark Hudson	Added chapter 4 about RSI data collection and cleaning
4.0	10/04/2017	Mark Hudson	Updated following TAME review.
5.0	02/09/2017	Tom Rankin	Final – Issued for implementation

This report dated 02/09/2017 has been prepared for Highways England (the “Client”) in accordance with the terms and conditions of appointment dated 16 March 2016 (the “Appointment”) between the client and Arcadis Consulting (UK) Limited (“Arcadis”) for the purposes specified in the Appointment. For the avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

CONTENTS

1 INTRODUCTION

1.1 Purpose of the Traffic Data Collection Report

1.1.1 The aim of this Traffic Data Collection Report (TDCR) is to set out the traffic data to be used in the A585 Windy Harbour to Skippool project, taking into consideration the current stage in the Highways England Project Control Framework (PCF) process and any subsequent stages and statutory steps. The study area of the A585 scheme is shown in Figure 1-2.

1.1.2 The report collates, summarises and reviews existing data. Additional surveys undertaken, and associated data analysis, are described up to the point the data is to be used in the model building process. The outputs from the data collection process are summarised and relevant observations discussed.

1.2 Background

1.2.1 The A585 is the major transport link into the northern part of the Fylde/Wyre peninsula. It connects with the motorway network at Junction 3 of the M55. The route from Windy Harbour to Skippool, as shown in Figure 1-1, currently suffers from significant congestion during peak periods, leading to unreliable journey times and a poor safety record.

1.2.2 A junction improvement (‘pinch point scheme’) at the A585/A586 crossroads at Garstang New Road, Fleetwood Road and Windy Harbour was implemented in spring 2015. Further improvements to the A585 corridor west of A585/A586 Windy Harbour are in the process of consideration by Highways England with planning currently at PCF Stage 2.

1.2.3 Following an options sifting process and a Value Engineering Workshop held during PCF Stage 1, both online and offline solutions are being considered for the A585 between A585/A586 Windy Harbour and Skippool, including significant junction improvements in addition to single and dual carriageway options. Offline options include a bypass either to the north or the south of Little Singleton. Online options comprise the introduction of a gyratory (one-way) road system within Little Singleton, local widening and junction improvements including roundabouts and signals.

Figure 1-1 A585 – Windy Harbour to Skippool: Existing Road Layout

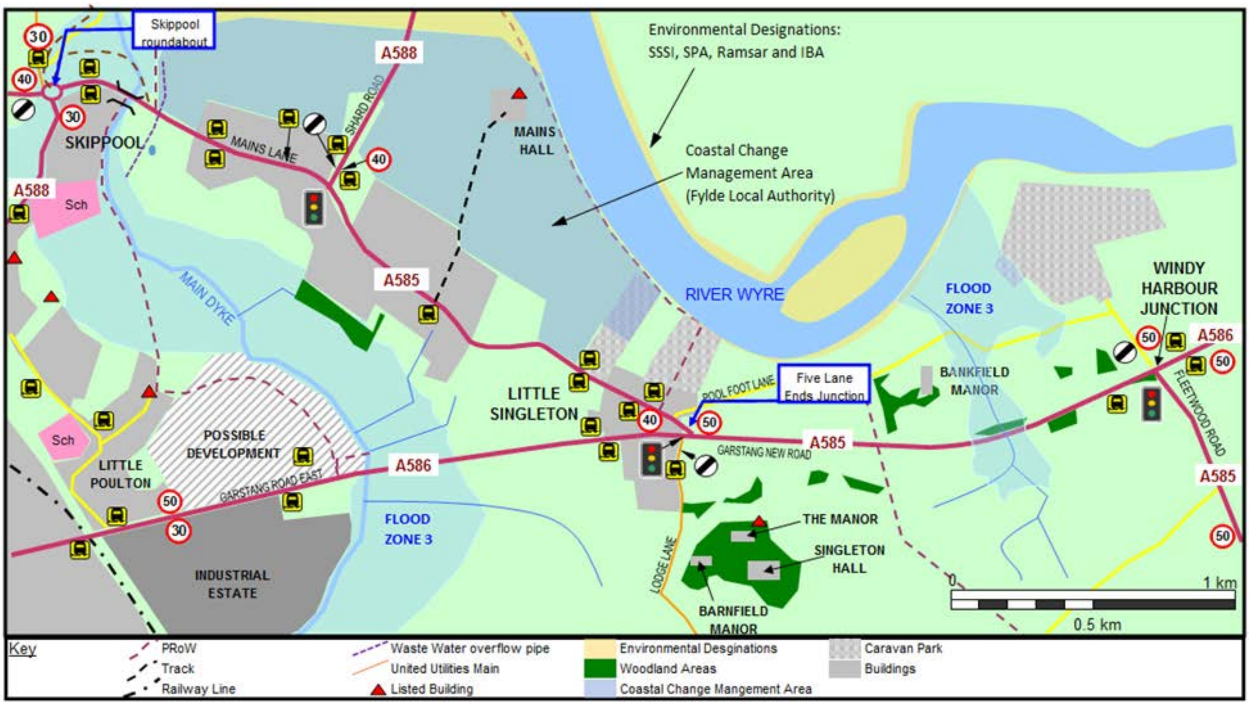

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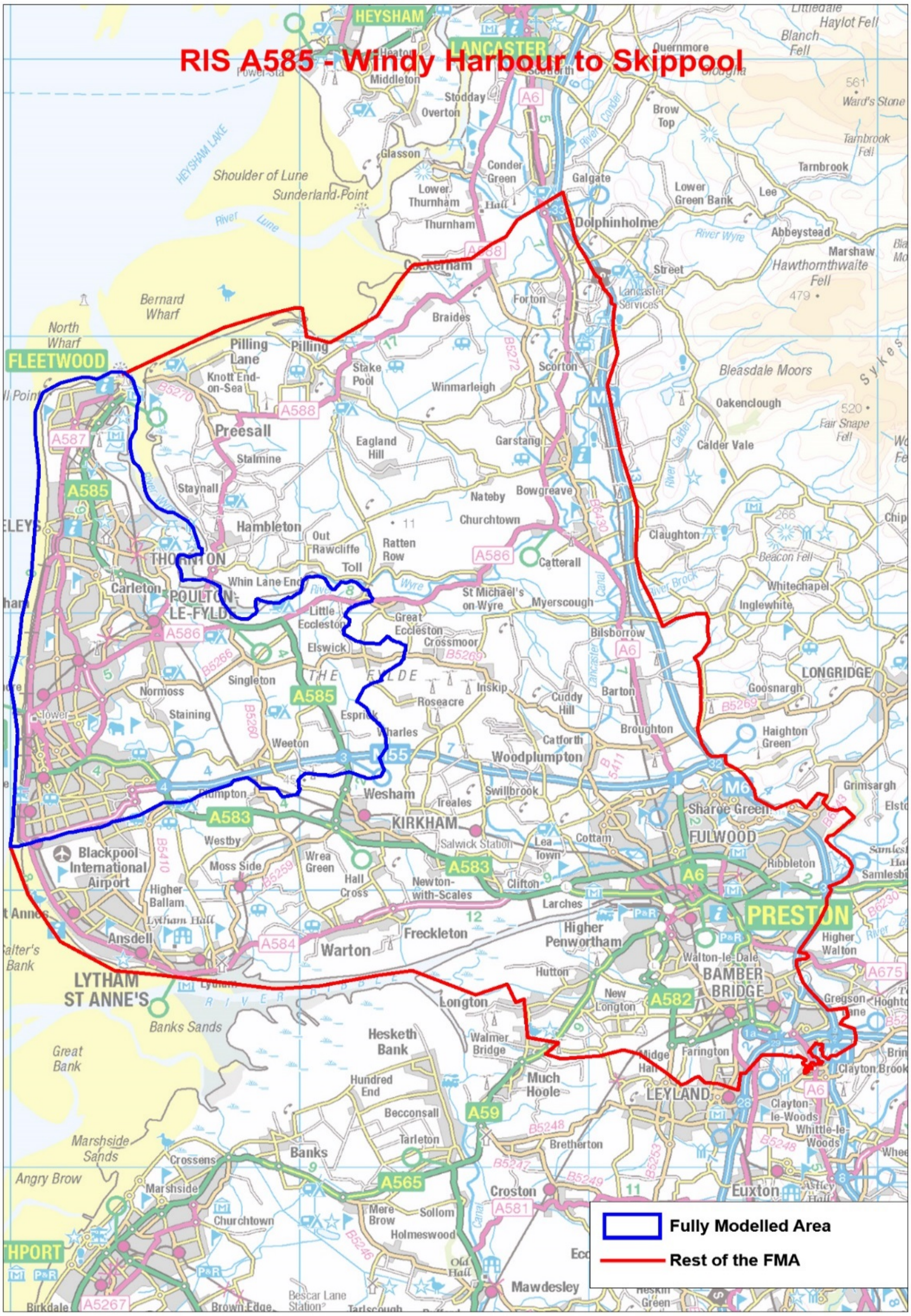
Figure 1-2 Fully Modelled Area



Source: OS data © Crown copyright 2015; Licence – Version 3 of Open Govt. Licence (OGL)

1.3 Project Definition

1.3.1	Project Title:	RIS A585 – Windy Harbour to Skippool
1.3.2	A585 ID Number (PIN):	548643
1.3.3	Scheme Type:	Major Project – Improvement Scheme
1.3.4	PCF Stage:	Stage 2

2 NEED FOR TRAFFIC DATA

2.1 Scheme Objectives

2.1.1 The Options Assessment Report (OAR) produced by Highways England identified the following seven transport objectives for the A585 Windy Harbour to Skippool junction improvement options study:

- **Objective 1**: Reduce congestion on the existing A585 through Little Singleton, Shard and Skippool junctions
- **Objective 2**: Improve journey time reliability
- **Objective 3**: Reduce severance and improve access across the existing A585 between the Little Singleton and Skippool junctions
- **Objective 4**: Reduce/minimise the impact on the wider environment for air quality and noise
- **Objective 5**: Improve connectivity and community cohesion
- **Objective 6**: Reduce the obstacles to the economic growth potential in both Wyre and Fylde
- **Objective 7**: Compliment and realise the full benefits of the earlier Pinch Point scheme at Windy Harbour junction

2.1.2 Wider objectives as outlined in the Strategic Outline Business Case (SOBC) include supporting employment and residential/commercial development opportunities, delivering capacity enhancements to the Strategic Road Network (SRN) whilst supporting the use of sustainable modes and improving access to the Enterprise Zone at Warton.

2.2 Principal Data Requirements

2.2.1 The traffic data requirements in the development and appraisal of the A585 Windy Harbour to Skippool scheme in the context of the scheme design, PCF products, economic appraisal and environmental assessment are defined in the Appraisal Specification Report (HE548643-HYD-GEN-A585-RP-TR-2044-v3.0).

2.2.2 The principal requirements for traffic data are to:

- Support the development of a robust traffic model
- Support the development of forecasts which will be used for economic and environmental appraisal

2.2.3 The data required is defined by the modelling approach adopted, which for this scheme is a SATURN based traffic assignment model using demand matrices developed based on the methodology set out in the ASR. This involves the collection of a large set of the latest traffic data and Road Side Interview (RSI) data collected for previous studies, including the A585 Corridor & Thornton-Fleetwood Area Action Plan (A585 CTF) S-Paramics Model, Blackpool Transport Model and the Central Lancashire Highways and Traffic Model, and then processing it to the current year using matrix estimation.

2.2.4 The data summarised in this report will also be used to support the development of an up-to-date microsimulation model (in S-Paramics software) in order to carry out operational assessment of the proposed scheme options.

2.2.5 The base model will be developed in SATURN for the AM, Inter Peak (IP) and PM peak hours on an average weekday in June 2015. These time periods will be identified from the ATC data collected specifically for this study.

2.3 Use of Existing and New Survey Data

2.3.1 The PCF Stage 0 traffic modelling work for the A585 Windy Harbour to Skippool scheme was undertaken by Mouchel Ltd. in November 2014. The Stage 1 traffic modelling (using S-Paramics) was undertaken by Arcadis (commencing in September 2015). Most of the data used to build the A585 CTF S-Paramics model (for Stage 1 modelling) was based on RSIs carried out in 2008

2.3.2 Highways England guidance provided to Hyder on 9 June 2015 (‘*TAME Advice Note 1 v1.0*’ by Roger Himlin) states that, *“Traffic models can use data up to 10 years old, however the data should not be older than 10 years, by the time of public consultation”.* The majority of the RSI data used in the development of the Stage 0 A585 CTF S-Paramics model is less than 10 years old; therefore, the previous model matrices and metadata will be used as far as possible to assist matrix production for this study. However, to ensure robust results, these matrices will be updated using 2015 control data including traffic counts undertaken in 2015 and/or information taken from TEMPRO (Trip End Model Presentation Program) as appropriate.

2.3.3 As part of new data collection activities, traffic surveys were undertaken in July and September/October 2015 and February/March 2016. The data obtained from the traffic surveys will provide a significant proportion of the count data for the purposes of matrix expansion, re-basing, matrix estimation and model validation.

3 AVAILABILITY OF PREVIOUS TRAFFIC MODELS AND TRAFFIC DATA

3.1 Previously Developed Traffic Models

3.1.1 A review of previously developed traffic models within or in close proximity to the study area was undertaken to assess their suitability and availability. The following models were considered to be relevant to the A585 scheme:

- A585 Corridor - Thornton-Fleetwood (CTF) S-Paramics model
- Further recent S-Paramics modelling under this commission (PCF Stage 1)
- The Blackpool Transport Model (CUBE) (including matrices already used in the A585 CTF model)
- The Central Lancashire Highways & Traffic Model (CLHTM); including modelling undertaken for the Preston Western Distributor (PWD) scheme

3.1.2 A summary of these previously developed traffic models is provided in Table 3-1.

Table 3-1 Previously Developed Traffic Models

Traffic Model		Year Developed	Remarks
1	A585 CTF S-Paramics model	2010	Validated for flow, but not fully validated for JT (AM peak).
2	Further S-Paramics modelling under this commission (PCF Stage 1)	Originally in 2010, later adjusted to 2014 base using TEMPRO	Validated only for the study area. Limited spatial extent. Of sufficient quality only for operational assessment.
3	Blackpool Transport Model (CUBE)	2008	Model has not been maintained, no LMVR available.
4	CLHTM (PWD)	2014	Model lacks detail in the A585 scheme area.

3.1.3 Where appropriate, some of the data used in the development of the models described in Table 3-1 will be used to develop the SATURN model for the A585 Windy Harbour to Skippool scheme, as set out in Section 3.2.

3.2 Previously Collected Traffic Data

3.2.1 As part of the development of the traffic models set out in Section 3.1.1, the following data was obtained from previous A585 studies:

- Road Side Interview (RSI) data
- Automatic Traffic Count (ATC) data
- Manual Classified Link Count (CLC) data
- Manual Classified Junction Count (CJC) data

3.2.2 A summary of the traffic data obtained from previous studies is provided in Table 3-2.

Table 3-2 Summary of Previously Collected Traffic Data

Traffic Data		Year Collected	Remarks
1	Blackpool RSIs	Collected in 2008	Data is within the ten-year time horizon specified in TAME Advice Note 1 v1.0. Extensive coverage of the A585 study area.
2	A585 & Surroundings RSIs (ANSA)	Collected on 11th, 12th and 13th May 2010	
3	RSIs collected for the Preston Western Distributor Model	Collected on 22/04/2014	Data is relatively recent; however, all RSIs are outside the A585 study area.
4	Blackpool Council – Temporary ATCs	2012 to 2015	Data is relatively recent; with some coverage of the A585 study area.
5	Blackpool Council – Permanent ATCs	2012 to 2015	
6	Lancashire County Council – Permanent ATCs	2011 to 2015	Data is relatively recent; with some coverage of the A585 study area.
7	Lancashire County Council – Temporary ATCs	2011 to 2015	Data is relatively recent; with extensive coverage of the A585 study area.

3.2.3 This previously collected data was reviewed for its suitability for developing the SATURN model for the A585 Windy Harbour to Skippool scheme.

3.2.4 RSIs and traffic counts carried out in Blackpool in 2008 were used in the development of the A585 Corridor & Thornton-Fleetwood CTF S-Paramics model. Based on consideration of the CTF model's area of influence and the Blackpool RSIs, data from five additional RSI sites (as collected by ANSA in May 2010, and referred to as the 'A585 and surroundings' RSIs) were obtained. Some of the Blackpool RSI sites were not used in the S-Paramics model, but have also been used in the development of the SATURN model for the current A585 scheme.

3.2.5 Figure 3-1 shows the location of the Blackpool and the A585 and Surroundings RSI sites.

3.2.6 As part of the development of the CLHTM (PWD) model, RSI data was collected at a number of sites, which are shown in Figure 3-2. Although all of these sites are located outside the FMA of the proposed A585 SATURN model, the trips they intercepted may pass through the FMA and so will be used, as appropriate, in the building of observed matrices for the new model.

3.2.7 Table 3-3 shows the exact dates on which RSIs were collected at the above-mentioned sites.

Table 3-3 Dates of RSIs

RSI Source	Site #	Date of RSI
ANSA RSIs	A1	13-May-2010
	A2	11-May-2010
	A3	12-May-2010
	A4	12-May-2010
	A5	11-May-2010
Blackpool RSIs	B1	9-May-2008
	B2	9-May-2008
	B3	13-Jun-2008
	B4	23-May-2008
	B5	23-May-2008
	B6	23-May-2008
	B7	13-Jun-2008
	B8	16-May-2008

RSI Source	Site #	Date of RSI
	B9	16-May-2008
	B10	16-May-2008
	B11	6-Jun-2008
	B12	9-May-2008
	B15	6-Jun-2008
PWD RSIs	All Sites	22-Apr-2014

3.2.8 Some of the RSI data, those collected in 2008 and 2010, we received from the consultants who had developed the previously used A585 CTF model. Information was cleaned from model development technical reports, also supplied, about how the raw RSI records had been checked for reasonableness.

3.2.9 An analysis of the data that we received led to us to infer that the 2010 ANSA interview records supplied were not from the cleaned dataset that had been produced by the previous modelling consultants. As a consequence, a cleaning procedure was applied to these data, but only to the 2010 ANSA records since our analysis allowed us to conclude that the supplied 2008 and 2014 data did come from the cleaned datasets produced by the previous consultants.

3.2.10 A description of the analysis that was carried out on the supplied RSI data and a discussion of the way in which the 2010 ANSA records were cleaned is given in Chapter 4.

Figure 3-1 Blackpool and A585 & Surroundings RSI Site Locations

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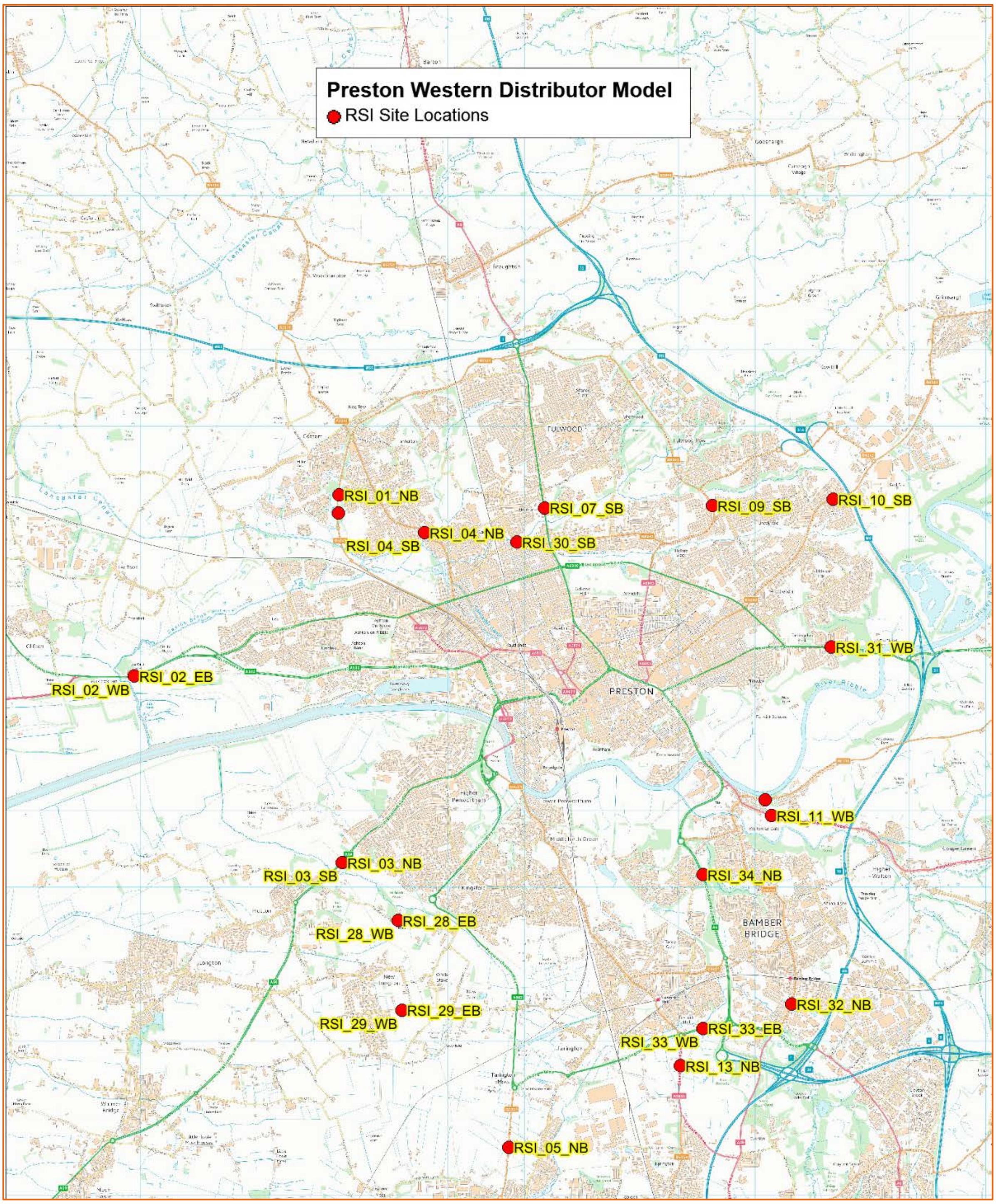
Figure 3-2 CLHTM PWD RSI Site Locations



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3.2.11 Blackpool Council has permanent Automatic Traffic Count (ATC) data counters placed at approximately 21 sites. In addition, the Council also maintains temporary ATC counters at several locations and has provided the most recent data at these locations. The Blackpool Council ATC data locations are illustrated in Figure 3-3.

3.2.12 Figure 3-4 and Figure 3-5 illustrate the Lancashire County Council (LCC) permanent and temporary ATC count locations. ATC data at some of these sites dates back to 2008, while some sites contain data as recent as August 2015**.**

Figure 3-3 Blackpool Council ATC Data Locations

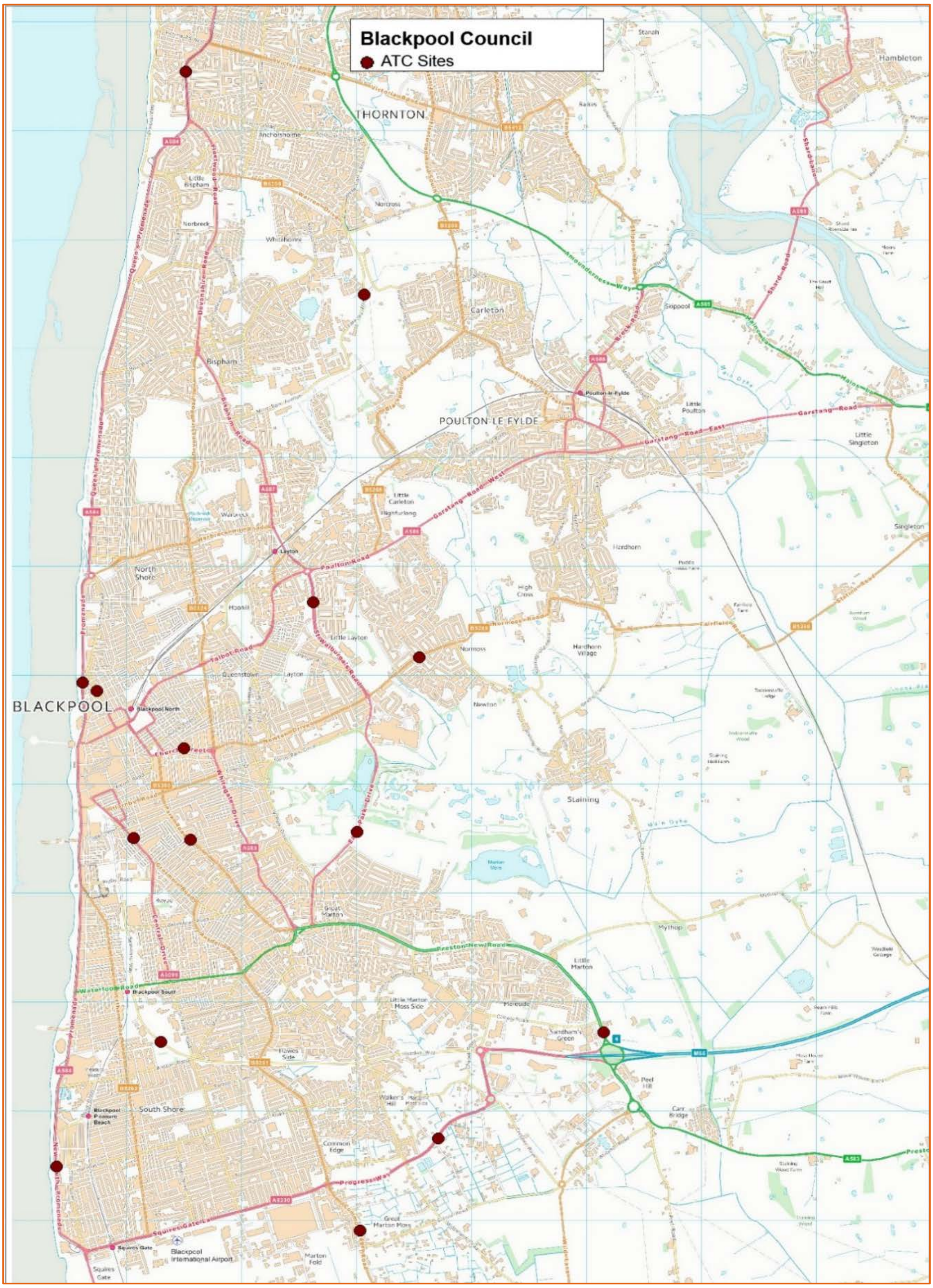

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Figure 3-4 Lancashire County Council Permanent ATC Site Locations

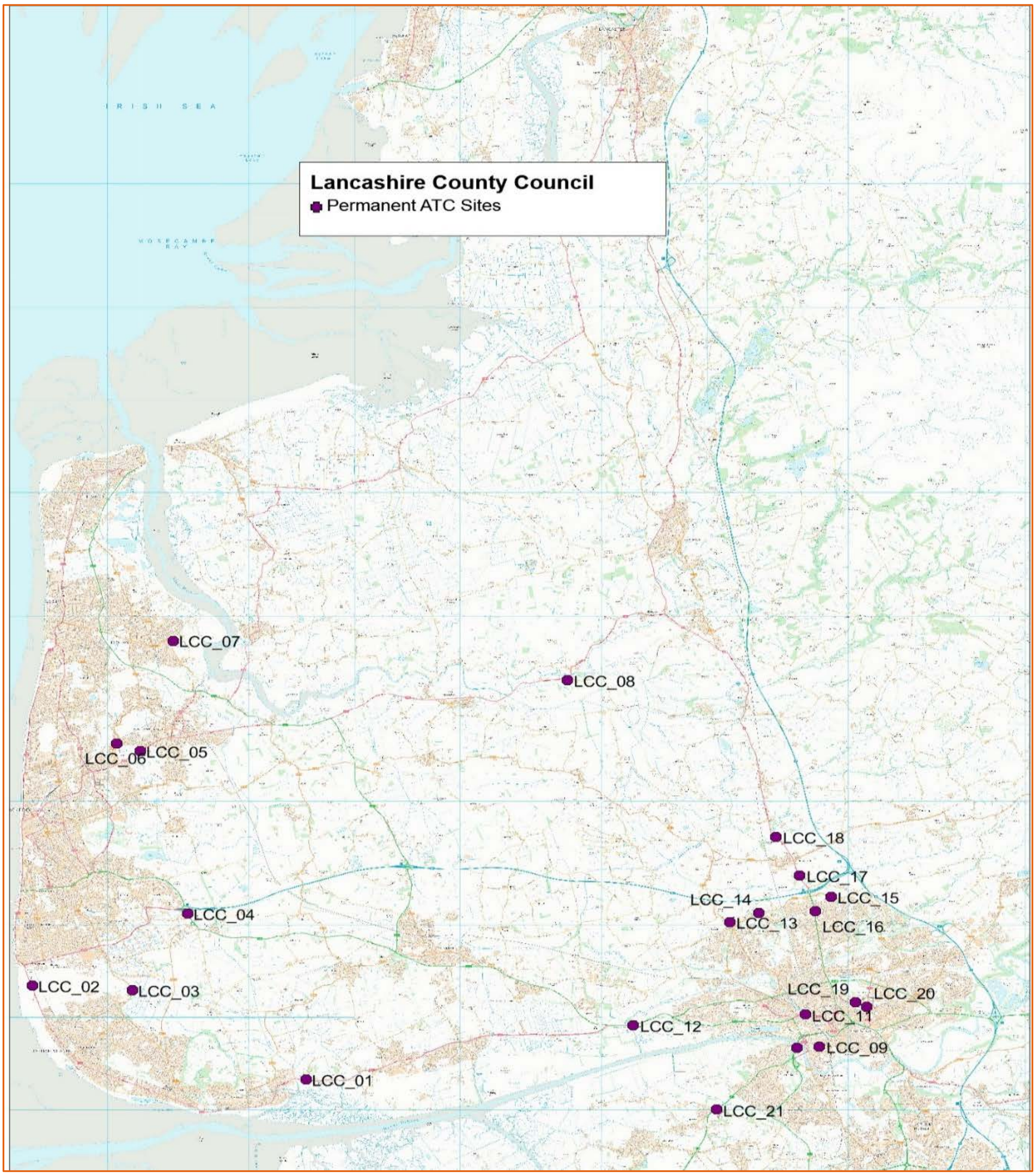

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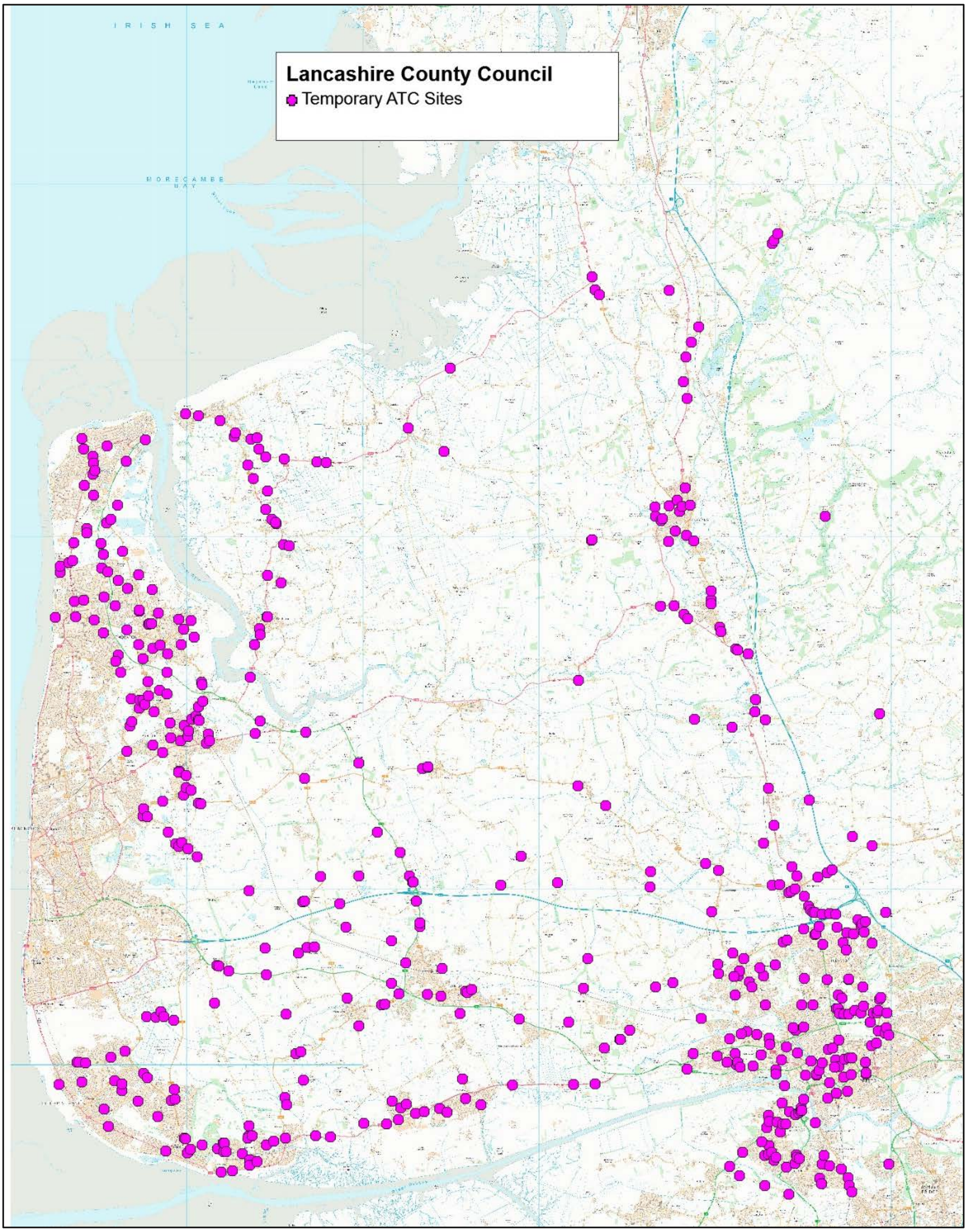
Figure 3-5 Lancashire County Council Temporary ATC Site Locations



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3.3 Summary

3.3.1 Table 3-4 provides a summary of the previously developed traffic models and previously collected traffic data discussed in this chapter. Where appropriate, these data sources have been used in the A585 model development process, as described in the final column of the table.

Table 3-4 Summary of Previous Traffic Models and Traffic Data

Previous Traffic Models		**Year Developed**	**Use in A585 Model Development**
1	A585 CTF S-Paramics Model	2010	S-Paramics model zone boundaries were reviewed whilst developing the A585 SATURN model zone boundaries.
2	Further S-Paramics modelling (PCF 1)	Originally in 2010, later adjusted to 2014 base using TEMPRO	
3	Blackpool Transport Model (CUBE)	2008	Signal timings were reviewed to determine if they could be used at any of the signalised junctions in the A585 SATURN model.
4	Central Lancashire Highways & Transport Masterplan (CLHTM) – Preston Western Distributor (PWD)	2014	Counts collected during 2014 at a number of Road Side Interview (RSI) sites in the vicinity of Preston were used as a contribution to the development of the base year matrices for the A585 SATURN model.
Previous Traffic Data		**Date Collected**	**Use in A585 Model Development**
1	Blackpool RSIs	Collected in 2008	Used to develop the base year matrices for the A585 SATURN model, after being uplifted to June 2015 traffic counts. The distributions of the trips recorded in these data sets were also used to generate distributions of generalised costs, which were used as inputs to the gravity model that was used in the synthesis of the prior matrix.
2	A585 & Surroundings RSIs (collected by ANSA)	Collected in 2010	
3	RSIs collected for CLHTM (PWD)	Collected in 2014	
4	Blackpool Council - Temporary ATCs	2012 to 2015 data	Used to derive factored counts for calibration/validation at screenlines and cordons.
5	Blackpool Council - Permanent ATCs	2012 to 2015 data	
6	Lancashire County Council – Permanent ATCs	2011 to 2015 data	
7	Lancashire County Council – Temporary ATCs	2011 to 2015 data	

3.3.2 However, it was still necessary to collect additional data at specific locations for calibration and validation purposes and to develop a robust traffic model in accordance with WebTAG requirements. Additional data was also needed to derive Yearly Growth Factors and Monthly Seasonality Factors at specific site locations. The traffic survey programme is discussed in Chapter 5.

4 RSI DATA COLLECTION AND CLEANING

4.1 Introduction

4.1.1 The development of the new SATURN model builds on work undertaken by former consultants in respect of the A585 Corridor – Thornton-Fleetwood (CTF) Action Area Plan, in which an S-Paramics microsimulation model was built. As the A585 CTF model and the new SATURN model share parts of their fully modelled areas, the observed trips that were used to inform the matrix building of the CTF model are relevant to the SATURN model.

4.1.2 As described in section 3.2, the observed trips used in the previous models were derived from roadside interview (RSI) records that were collected in different years. The previously built models that are of significance to the current modelling comprise the following:

- A585 CTF – S-Paramics microsimulation model
- Blackpool Cube Model
- Preston Western Distributor – SATURN assignment model

4.1.3 The A585 CTF model was developed in 2010 and the interviews used to inform its matrix building were taken from a set that were conducted in 2008, though not all of the RSIs in that set were used for that model. The full set of interviews is referred to in this document as ‘BCC 2008’, and it comprises records collected at 13 sites numbered 1-12 and 15.

4.1.4 Five additional RSIs were conducted in 2010 in order to complete a cordon that was identified by the CTF model’s commissioned consultants. The interviews at these five sites were carried out by Ansa Consultants Ltd, and so the records resulting from them are referred to in this document as ‘ANSA 2010’. The locations and designations of all these sites are illustrated in Figure 3-1.

4.1.5 The PWD SATURN model used trip information collected from interviews conducted in 2014 at 19 sites forming a cordon around Preston to the west of, and excluding, the M6. The interviews and their records are referred to in this document as ‘PWD 2014’ and their locations and designations are illustrated in Figure 3-2.

4.1.6 It is important to note that the BCC 2008 and ANSA 2010 interviews were conducted in one direction only at each site. These directions are included in Table 4-1 and Table 4-2, in the next sections. By contrast, most of the PWD interviews were conducted in both directions of travel through each site, as shown in Table 4-3.

4.2 Overview of the BCC 2008 RSI records

4.2.1 The roadside interviews conducted in 2008 were located at the sites prefixed with ‘BCC’ in Figure 3-1. Data were obtained for 13 sites, numbered from 1-12 and with an additional site numbered 15.

4.2.2 The dataset was obtained from the previously commissioned consultants who were responsible for building the A585 CTF S-Paramics model. Due to contractual issues, it was not possible to obtain from those consultants the prior matrices that had been developed from this BCC 2008 data (in conjunction with the ANSA 2010 data) and so it has been necessary to re-process the raw interview data.

4.2.3 Of the 13 sites for which trip data was collected, two were collected via postcard completion, while the remaining 11 were collected via roadside interviews. Table 4-1 summarises the information available about these datasets, showing the survey method, number of trip records received and a description of the interview/intercept location.

4.2.4 Each record has a number of attributes including origin purpose, destination purpose, origin postcode and destination postcode. Each interview was allocated to a time with a resolution of 30 minutes in the range 07:00 to 18:30, which indicates the start of the 30-minute long time slice containing the interview.

4.2.5 The origin and destination purposes were classified into 10 categories, including home, place of work, employer’s business, and education and shopping. With a separate purpose recorded for each trip’s origin and destination, it is possible to classify each recorded trip into standard home-based and non-home-based purposes. This information is needed in order to link the interview data with the SATURN assignment user classes during matrix building, and also to construct separate from-home, return-home and non-home-based observations that can be used to build trip matrices in production-attraction format for use in a variable demand model. Each record was also classified into a vehicle type, which is needed in order to apply the correct scaling factor to a record when expanding it to the relevant traffic count at the interview site.

Table 4-1 Summary of received BCC 2008 RSI records

Site No.	Description	Interview Direction	Date	Survey Method	No. of Records
1	Kelso Avenue north of Queens Promenade	South	09/05/2008	Postcard	307
2	Warren Drive east of A587 Fleetwood Rd	West	09/05/2008	Postcard	230
3	Red Bank Road east of A587 Devonshire Rd	West	13/06/2008	Interview	374
4	Moor Park Avenue east of A587 Bispham Rd	West	23/05/2008	Interview	609
5	A586 Poulton Rd east of A587 Bispham Rd	West	23/05/2008	Interview	504
6	Newton Drive east of A587 North Park Dr	West	23/05/2008	Interview	1206
7	A583 Preston New Road east of Preston Old Road	West	13/06/2008	Interview	574
8	Yeadon Way	North	16/05/2008	Interview	630
9	A5230 Progress Way east of Midgeland Rd	West	16/05/2008	Interview	1244
10	Common Edge Rd south of Squires Gate Lane	North	16/05/2008	Interview	950
11	A584 Clifton Drive south of Squires Gate Lane	North	06/06/2008	Interview	1115
12	A585 Amounderness Way south of Victoria Rd	South	09/05/2008	Interview	1238
15	A583 Preston New Rd south of M55 J4	North	06/06/2008	Interview	1356

4.2.6 The trip data extracted from roadside interviews invariably needs to be passed through some cleaning procedures in order to remove invalid records. Invalid records can be generated in a number of ways, and can result in miscoded or missing origins, destinations and trip purposes. The BCC 2008 dataset was cleaned by the previous consultants by considering logical cordon-to-cordon movements to filter the raw interview data and remove any illogical movements.

4.2.7 A copy of the A585 CTF Model Build Report (MBR)[1] was obtained and this contains tables showing the number of records in the BCC RSIs after cleaning had been carried out by the previous consultants,

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[1] 'A585 Corridor & Fleetwood – Thornton Area Action Plan: Transport Model Matrix Build Report', prepared by ANSA Consultants Limited for AmeyMouchel; October 2010.

and information about the number of records that were removed as a result. The number of records in the spreadsheets received for the individual RSI sites led us to conclude that the supplied data had already been cleaned.

4.3 Overview of the ANSA 2010 RSI records

4.3.1 The roadside interviews conducted in 2010 were located at the sites prefixed with 'ANSA' in Figure 3-1. As in the case of the BCC 2008 interview data, it was not possible to obtain the prior matrices that had been previously developed from this ANSA 2010 data (in conjunction with the BCC 2008 data), and so it has been necessary to re-process the raw interview data.

4.3.2 Data were collected at five sites, interviewing travellers in a single direction only at each one. Table 4-2 summarises the data received for these sites, showing the number of trip records received and a description of the interview/intercept location.

Table 4-2 Summary of received ANSA 2010 RSI records

Site No.	Description	Easting	Northing	Interview Direction	Date	No. of Records
1	A585 Fleetwood Road	341446	435145	South	13/05/2010	1742
2	Garstang Road	339453	439731	West	11/05/2010	1191
3	Shard Bridge	336875	441338	South	12/05/2010	1388
4	Singleton Road	338729	436108	North	12/05/2010	876
5	Thistleton Road	340580	437963	South	11/05/2010	654

4.3.3 Each record has a number of attributes including origin and destination purposes, origin and destination postcodes, as well as others that have not been used, such as gender and age group. As in the case of the BCC 2008 records, each interview was allocated to a time with a resolution of 30 minutes in the range 07:00 to 18:30, indicating the start of the time slice that contained the interview.

4.3.4 The origin and destination purposes were classified into 12 categories, including home, place of work, employer's business, and education and shopping. Each record was classified into a vehicle type, which is needed in order to apply the correct scaling factor to a record when expanding it to the relevant traffic count at the interview's site.

4.3.5 As in the case of the BCC 2008 interview records, the ANSA 2010 records were cleaned by the previous consultants to remove illogical movements. Arcadis received a total of 5,851 records over the five ANSA 2010 interview sites, but this number did not match the number of clean records given in the MBR. Therefore, it was concluded that the ANSA 2010 interview data that were received from the previous consultants were those that had not been passed through the cleaning process described in the MBR.

4.3.6 It did not prove possible to obtain the cleaned ANSA 2010 interview records, and so all of these RSI datasets required checking and cleaning for illogical/invalid movements before the observed trips could be used to build matrices for the SATURN model. This cleaning process is described in section 4.5.

4.4 Overview of the PWD 2014 RSI records

4.4.1 The roadside interviews conducted in 2014 were located at the sites shown in Figure 3-2. These data were collected to be used as inputs to the matrix building process for the Preston Western Distributor SATURN model. The RSIs form a cordon around Preston to the west of (and excluding) the M6.

4.4.2 Interviews were conducted at a total of 19 sites, with trips through all sites being intercepted in both directions. However, not all of the 38 possible combinations of site and direction were surveyed, and a total of 26 data files were obtained containing PWD 2014 RSI records, which are summarised in Table 4-3.

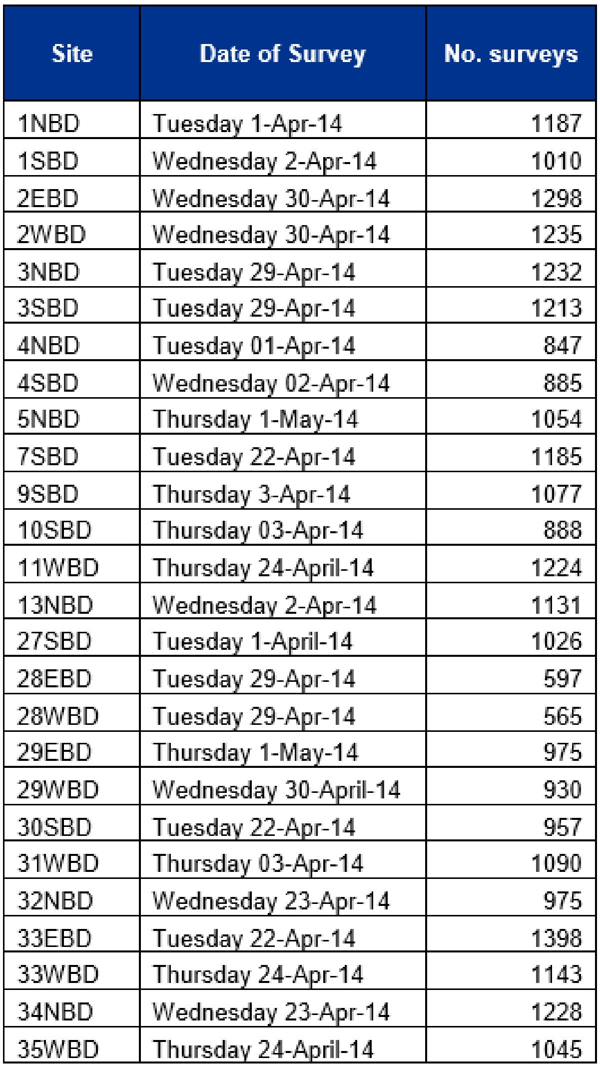
Table 4-3 Summary of received PWD 2014 RSI records

Site No. & Direction	Easting	Northing	No. of records
Site 1NBD	350577	432108	1051
Site 1SBD	350567	431878	879
Site 2EBD	347911	429752	1261
Site 2WBD	347911	429752	1130
Site 3NBD	350620	427323	1116
Site 3SBD	350620	427323	1040
Site 4NBD	351690	431622	753
Site 4SBD	351690	431622	735
Site 5NBD	352788	423622	921
Site 7SBD	353253	431942	899
Site 9SBD	355436	431974	982
Site 10SBD	357011	432053	638
Site 11WBD	356204	427935	1050
Site 13NBD	355020	424682	1064
Site 27SBD	341211	432774	895
Site 28EBD	351343	426571	525
Site 28WBD	351343	426571	464
Site 29EBD	351398	425406	829
Site 29WBD	351398	425406	783
Site 30SBD	352891	431497	799
Site 31WBD	356980	430129	984
Site 32NBD	356465	425480	785
Site 33EBD	355316	425168	1263
Site 33WBD	355316	425168	1017
Site 34NBD	355310	427166	1115
Site 35WBD	356127	428144	874

4.4.3 At each site, surveys were conducted over twelve hours from 07:00 to 19:00. As with the other surveys, the typical information collected from each traveller included the start and end locations of the trip, the journey purpose at each end of the trip, the vehicle type and the time of the survey. The survey time was, as for the 2008 and 2010 RSI datasets, allocated to a 30-minute time slice.

4.4.4 A copy of the PWD model LMVR was obtained, which contains a table listing the number of vehicles (over all types) surveyed at each site. This table is reproduced as Table 4-4, below.

Table 4-4 Copy of Table 7-2 from PWD model LMVR, showing the total number of vehicles surveyed at each PWD 2014 RSI site



Site	Date of Survey	No. surveys
1NBD	Tuesday 1-Apr-14	1187
1SBD	Wednesday 2-Apr-14	1010
2EBD	Wednesday 30-Apr-14	1298
2WBD	Wednesday 30-Apr-14	1235
3NBD	Tuesday 29-Apr-14	1232
3SBD	Tuesday 29-Apr-14	1213
4NBD	Tuesday 01-Apr-14	847
4SBD	Wednesday 02-Apr-14	885
5NBD	Thursday 1-May-14	1054
7SBD	Tuesday 22-Apr-14	1185
9SBD	Thursday 3-Apr-14	1077
10SBD	Thursday 03-Apr-14	888
11WBD	Thursday 24-April-14	1224
13NBD	Wednesday 2-Apr-14	1131
27SBD	Tuesday 1-April-14	1026
28EBD	Tuesday 29-Apr-14	597
28WBD	Tuesday 29-Apr-14	565
29EBD	Thursday 1-May-14	975
29WBD	Wednesday 30-April-14	930
30SBD	Tuesday 22-Apr-14	957
31WBD	Thursday 03-Apr-14	1090
32NBD	Wednesday 23-Apr-14	975
33EBD	Tuesday 22-Apr-14	1398
33WBD	Thursday 24-Apr-14	1143
34NBD	Wednesday 23-Apr-14	1228
35WBD	Thursday 24-April-14	1045

4.4.5 The PWD model's LMVR states that all interview records were checked, both in terms of the journeys' specified start and end locations, and the journey purpose. To check the start and end locations were valid, each survey record was used to plot a desire line representing the movement for the surveyed trip. The desire line was checked against the survey location and if it did not logically pass the site, the record was discarded. Some records were found that would represent a logical trip if the desire lines' direction were flipped – e.g. the desire line points northbound but the interview was conducted in the southbound direction. These records were either allocated to the interview in the opposite direction, if it existed, or were kept with the current interview with the record's origin and destination interchanged, if it did not.

4.4.6 It can be seen from a comparison of Table 4-3 and Table 4-4 that the number of vehicles surveyed is greater than the final number of records that was supplied for these RSIs, and so we can conclude that Arcadis was supplied with the PWD 2014 records after they had been cleaned to remove illogical movements and incomplete survey records.

4.5 Cleaning the supplied ANSA 2010 RSI records

4.5.1 As noted in sections 4.2 and 4.3, the BCC 2008 and ANSA 2010 data that were received from the A585 CTF model's consultants could not be assumed to be in their final cleaned state, after the removal of illogical trips, and so these datasets were analysed and cleaned, as necessary, by Arcadis prior to their use in the new A585 SATURN model.

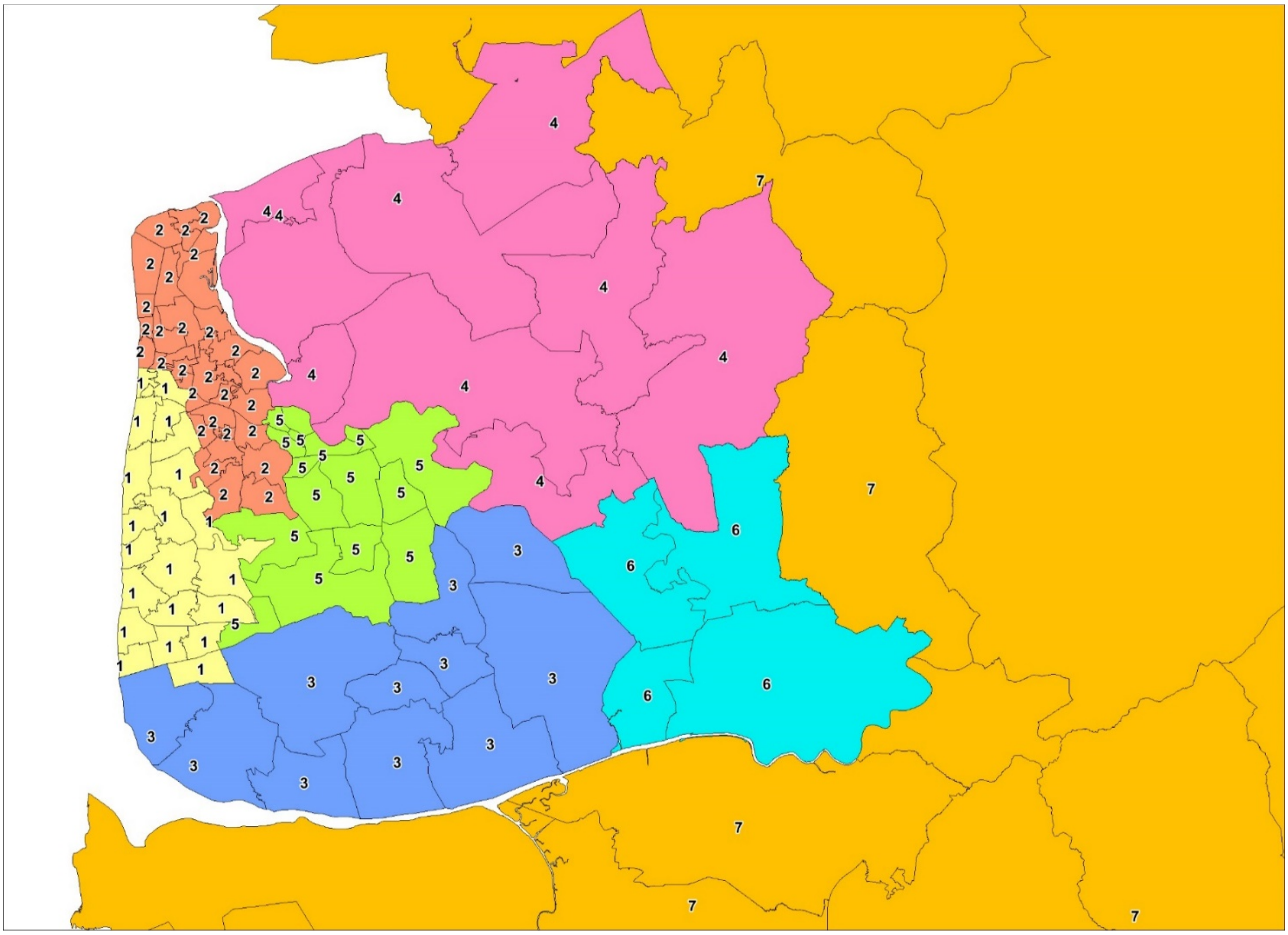
4.5.2 The cleaning process was essentially the same as that used to clean the PWD 2014 records – desire lines were constructed between the origin and destination of each record and these were compared to the location and direction of the interview in which they were included to see whether the journey was feasible.

4.5.3 It was not practical to check every record manually and so a spreadsheet-based procedure was devised, which considered the angle subtended at each interview site by a line drawn between the origin and destination points and used reasonable limits on the angle to assess a journey's feasibility.

4.5.4 Based on this angle, a number of rules were devised to assess whether the direction of travel between the trip's origin and destination via the RSI site was likely. As in the case of the PWD 2014 cleaning, carried out by other consultants, some movements were also examined to see whether they could be valid if their origin and destination were transposed.

4.5.5 After the automatic cleaning had been applied to the ANSA 2010 records, all of the remaining records were allocated to a system of 7 sectors to help identify inter-sectoral movements that did not seem reasonable. These sectors were chosen to reflect the important movements within the study area when considered together with the Windy Harbour to Skippool scheme. The sectoral system used for checking the RSI movements is shown in Figure 4-1. This sectoral system is also used in the comparison of the final car and goods vehicle prior matrices to the interview data, as reported in the LMVR.

Figure 4-1 The 7-sector system used to aggregate RSI records, to conduct final checks on movements after automated cleaning



4.5.6 Every record that, post automated cleaning, appeared to be unlikely when considered from the sectoral point of view was checked individually, using tools such as online route finders to assess the movement's reasonableness. A number of records were removed from the post-cleaning data for each ANSA site as a result of these final visual checks.

4.5.7 The final numbers of ANSA 2010 interview records that have been used in matrix building are given in Table 4-5.

Table 4-5 Final numbers of ANSA 2010 records after all rounds of cleaning

Site No.	Car Records	LGV Records	HGV Records	All Records
Site 1 SB	1158	208	94	1460
Site 2 WB	869	127	32	1028
Site 3 SB	935	163	51	1149
Site 4 NB	713	75	7	795
Site 5 SB	508	32	13	553

4.6 Summary of final expanded RSI data used in matrix building

4.6.1 The final sets of interview records that had passed the different rounds of cleaning were expanded to traffic counts by vehicle type at the relevant MCC and ATC locations. Factors were calculated separately to expand the records to a whole period and to the average assignment hours.

4.6.2 The different expansion factors were needed so that period-to-hour factors could be calculated for converting the outputs of the gravity model (used to synthesise car trips, as described in the LMVR) to assignment hours, and so that goods vehicle matrices could be built directly from the interview data.

4.6.3 After expansion of the recorded trips, the BCC 2008 and ANSA 2010 data – collected in a single interview direction – were transposed and converted into trips travelling through the interview sites in the unobserved direction. This transposition was applied to both the car and goods vehicle records.

4.6.4 Necessarily, the origins and destinations of all RSI records had been allocated to SATURN zones before any cleaning took place, and these zones were ultimately used to convert the cleaned data into partially observed matrices that could then be used as inputs to the SATURN trip matrix building processes. These are all discussed in detail in the LMVR.

4.6.5 Although the RSI datasets for 2008, 2010 and 2014 together contain several thousand records, most of the records provided by the PWD 2014 dataset (of which there are almost 24,000) consist of movements within the large model zones allocated to Preston and its environs. These records therefore do not necessarily contribute to a large number of different zonal movements in the partial matrices.

4.6.6 Table 4-6 summarises the number of non-zero cells in the final partial matrices, by time period and vehicle type, with the contributions from transposed trips separated out. The table shows the number of non-zero cells as an absolute count and as a percentage of all relevant cells in the matrix. Two counts/percentages are given: taken over the whole matrix, which has 190×190 = 36,100 cells, and taken over only movements within the FMA, which consists of zones numbered 1-94 and therefore covers 8,836 movements and cells.

Table 4-6 Summary of non-zero cell counts and proportions for the final partially observed matrices used in matrix building for the A585 SATURN model

Time Period	Vehicle Type	Non-zero cells (%) (original records)		Non-zero cells (%) (transposed records)		Total non-zero cells (%)	
		All Cells	I-I Only	All Cells	I-I Only	All Cells	I-I Only
AM	Car	2532 (7.0%)	1469 (16.6%)	1890 (5.2%)	1299 (14.7%)	4036 (11.2%)	2471 (28.0%)
	LGV	1544 (4.3%)	789 (8.9%)	1077 (3.0%)	669 (7.6%)	2442 (6.8%)	1326 (15.0%)
	HGV	678 (1.9%)	256 (2.9%)	370 (1.0%)	168 (1.9%)	1020 (2.8%)	409 (4.6%)
IP	Car	3631 (10.1%)	1956 (22.1%)	2720 (7.5%)	1746 (19.8%)	5593 (15.5%)	3165 (35.8%)
	LGV	1544 (4.3%)	789 (8.9%)	1077 (3.0%)	669 (7.6%)	2442 (6.8%)	1326 (15.0%)
	HGV	663 (1.8%)	245 (2.8%)	398 (1.1%)	191 (2.2%)	1031 (2.9%)	419 (4.7%)
PM	Car	2705 (7.5%)	1520 (17.2%)	1864 (5.2%)	1312 (14.8%)	4147 (11.5%)	2511 (28.4%)
	LGV	1544 (4.3%)	789 (8.9%)	1077 (3.0%)	669 (7.6%)	2442 (6.8%)	1326 (15%)
	HGV	659 (1.8%)	242 (2.7%)	384 (1.1%)	179 (2%)	1015 (2.8%)	406 (4.6%)

4.6.7 Table O-1 in Appendix O summarises the number of interview records by vehicle type, time period and site, in comparison with the computed traffic count at each site in the model's base month and year.

5 TRAFFIC SURVEY PROGRAMME

5.1 Introduction

5.1.1 In line with the data requirements outlined earlier and the modelling approach set out in the ASR, and to supplement the previously collected data that will be used in model development, Arcadis (formerly Hyder Consulting (UK) Ltd.) undertook a programme of traffic surveys during July and September/October 2015 and February/March 2016 as summarised in Table 5-1. Appendix A provides further details of the ATC survey programme.

Table 5-1 Overview of the Traffic Survey Programme

Survey Type	Contractor	No. of Sites	Direction	Duration	Survey Dates (2015)
Automatic Traffic Count (ATC)	Tracsis	8	1 & 2 - EB/WB 3 & 4 - NB/SB 5 & 6A - EB/WB 6B & 7 – NB/SB	2 weeks (24 hrs each day)	Sites 1, 3 & 7: 6-19 July & 11 September to October 1. Sites 2, 4 & 5: 6-19 July & 11-24 September. Site 6A: 6-19 July & 15-28 September. Site 6B: 6-19 October.
Classified Junction Count (CJC)	Tracsis	12	All turning movements	2 days per site (07:00-19:00 on each day)	Sites 1 to 11 & 13: 14 July
	CTS	20			Sites 1 to 11 & 33: 15 July Sites 23 to 30: 9 July
	ANSA	20			Sites 12 to 22 & 34: 15 July Sites 23 to 30: 8 July
	Modal TP	12			Sites 12 to 22 & 34: 16 July
Queue Length Survey	Tracsis	12	Queues on all lanes at each junction approach arm	2 days per site (07:00-19:00 on each day)	Sites 1 to 11 & 13: 14 July
	CTS	20			Sites 1 to 11 & 33: 15 July Sites 23 to 30: 9 July
	ANSA	20			Sites 12 to 22 & 34: 15 July Sites 23 to 30: 8 July
	Modal TP	12			Sites 12 to 22 & 34: 16 July
Survey Type	**Contractor**	**No. Sites**	**Direction**	**Duration**	**Survey Dates (2016)**
Automatic Traffic Count (ATC)	Tracsis	56	See Table 4-2 & Appendix A	2 weeks (24 hrs each day)	6-12 February 22 February to 3 March
Manual Classified Count (MCC)	CTS	9	See Table 4-4	1 day (07:00-19:00)	9 February

5.1.2 The specification of each survey type is provided in the following sections. A discussion on how each data type will be used in model development is included in subsequent sections.

5.2 Automatic Traffic Counts

5.2.1 ATC surveys were carried out to record the volume of traffic passing along a specified road, classified by vehicle size and direction. 24 hour counts were collected over 14 consecutive days at seven locations. The ATC data collected at each site included the following:

- Vehicle counts for each 15-minute period throughout the 14-day period (e.g. 07:30 to 07:45; 07:45 to 08:00 and so on)
- Separate counts for vehicles travelling in each direction
- ATC data was provided in twelve vehicle class bins, which can be aggregated into Cars, Light Goods Vehicles (LGVs) and Heavy Goods Vehicles (HGVs) as required

5.2.2 A list of 2015-ATC sites and 2016-ATC sites are provided in Table 5-2 and Table 5-3 maps of the site locations are shown in Figure 5-1 and Figure 5-2.

5.2.3 The ATC sites chosen to collect data for calibration and validation along screenlines and cordons were identified following a review of the proposed A585 scheme and the previously collected data.

5.2.4 ATC data was initially collected from 6 to 19 July 2015 by Tracsis (formerly Sky High Technology Ltd.). As a result of equipment malfunctions, a full dataset was only returned for four sites and, of the sites with missing data, three had no more than 3.5 days of data. Further ATC surveys were therefore carried out in September 2015 and the 2SD and IoD tests (as described in detail in Chapter 9) were carried out to remove any outliers.

5.2.5 Following a review of the gaps in count data, additional ATCs (for 56 locations) were collected in February and March 2016.

Table 5-2 2015 List of ATC Surveys

No.	Unique Site ID	Road Name	Easting, Northing	Survey Dates (2015)
1	2015ATC_01	A585 west of junction with A586 and Windy Harbour Road	338064, 439457	6-19 July 11 Sept – 1 Oct
2	2015ATC_02	A585 west of junction with B5412 and Breck Road (Skippool junction)	335274, 440576	6-19 July 11-24 September
3	2015ATC_03NB	A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), north of junction with Queen’s Promenade	331524, 442183	6-19 July 11-24 September
4	2015ATC_03SB	A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), north of junction with Queen’s Promenade	331524, 442183	6-19 July 11 Sept – 1 Oct
5	2015ATC_04	A587 Plymouth Rd, north of junction with A586 Poulton Rd and A586 Westcliffe Drive	332447, 438073	6-19 July 11-24 September
6	2015ATC_05	A583 Preston New Road, east of junction with A587 E Park Drive	332816, 434726	6-19 July 11-24 September
7	2015ATC_06A	A585 south of roundabout junction with Amounderness Way/Fleetwood Road/Norcross Lane	333812, 441367	6-19 July 15-28 September
8	2015ATC_06B	A585 north of junction with Amounderness Way/Rossall Lane B5409	332503, 445305	- 6-19 October
9	2015ATC_07	A587 Broadway, north of junction with Rossall Lane	331790, 445173	6-19 July 11 Sept – 1 Oct

Table 5-3 2016 List of ATC Surveys

No.	Unique Site ID	Road Name	Easting, Northing	Survey Dates (2016)
1	2016ATC_01	A584 Clifton Drive North	330716, 431420	6 -12 February 22 – 28 February
2	2016ATC_02	B5261 Common Edge Road	332821, 432195	6 -12 February 22 – 28 February
3	2016ATC_03	Cropper Road	334476, 432698	6 -12 February 22 – 28 February
4	2016ATC_04	B5260	338461, 433587	6 -12 February 22 – 28 February
5	2016ATC_05	A585	341606, 434444	6 -12 February 22 – 28 February
6	2016ATC_06	A584 South Promenade	330511, 433636	6 -12 February 22 – 28 February

No.	Unique Site ID	Road Name	Easting, Northing	Survey Dates (2016)
7	2016ATC_07	B5262	330962, 433639	6 -12 February 22 Feb – 03 Mar
8	2016ATC_08	St Anne's Road	331482, 433823	6 -12 February 22 – 28 February
9	2016ATC_09	B5261 Hawes Side Lane	332247, 433637	6 -12 February 22 Feb – 03 Mar
10	2016ATC_10	Vicarage Lane	333095, 433520	6 -12 February 22 Feb – 03 Mar
11	2016ATC_11	Ashworth Road	334100, 433631	6 -12 February 22 – 28 February
12	2016ATC_12	B5260	338528, 434340	6 -12 February 22 – 28 February
13	2016ATC_13	Bradshaw Lane	339941, 434831	6 -12 February 22 – 28 February
14	2016ATC_14	A584	330576, 436335	6 -12 February 22 Feb – 03 Mar
15	2016ATC_15	Market Street	330640, 436317	6 -12 February 22 – 28 February
16	2016ATC_16	A586	331025, 436533	6 -12 February 22 – 28 February
17	2016ATC_17	B5124	331678, 437008	6 -12 February 22 Feb – 03 Mar
18	2016ATC_18	Layton Road	332160, 437217	6 -12 February 22 – 28 February
19	2016ATC_19	Dinmore Avenue	333399, 438112	6 -12 February 22 Feb – 03 Mar
20	2016ATC_20	Holls Lane	335513, 439083	6 -12 February 22 – 28 February
21	2016ATC_21	Bracewell Avenue	336271, 439215	6 -12 February 22 Feb – 03 Mar
22	2016ATC_22	North Drive	332095, 441909	6 -12 February 22 – 28 February
23	2016ATC_23	North Drive	332175, 442541	6 -12 February 22 – 28 February
24	2016ATC_24	West Drive	332277, 443153	6 -12 February 22 – 28 February
25	2016ATC_25	Luton Road	332155, 442059	6 -12 February 22 Feb – 03 Mar
26	2016ATC_26	B5258 Warren Drive	332116, 441556	6 -12 February 22 Feb – 03 Mar
27	2016ATC_27	Ashfield Road	332371, 440590	6 -12 February 22 – 28 February
28	2016ATC_28	Moor Park Avenue	332727, 439735	6 -12 February 22 Feb – 03 Mar
29	2016ATC_29	A586 Poulton Road	333072, 438081	6 -12 February 22 – 28 February

No.	Unique Site ID	Road Name	Easting, Northing	Survey Dates (2016)
30	2016ATC_30	No data - site numbering retained for logging purposes		
31	2016ATC_31	Clifton Road (Cherry Tree Road)	333585, 434240	6 -12 February 22 – 28 February
32	2016ATC_32	Yeadon Way	331188, 433742	6 -12 February 22 Feb – 03 Mar
33	2016ATC_33	Anchorsholme Lane	333460, 441881	6 -12 February 22 – 28 February
34	2016ATC_34	B5269	340574, 438018	6 -12 February 22 – 28 February
35	2016ATC_35	B5260 Fox Lane Ends	339349, 432084	6 -12 February 22 – 28 February
36	2016ATC_36	Vicarage Lane	333142, 433606	6 -12 February 22 – 28 February
37	2016ATC_37	B5266 Newton Drive	333230, 436916	6 -12 February 22 – 28 February
38	2016ATC_38	A586 Poulton Road	332821, 438006	6 -12 February 22 – 28 February
39	2016ATC_39	Moor Park Avenue	332104, 439407	6 -12 February 22 – 28 February
40	2016ATC_40	Luton Road	331924, 442124	6 -12 February 22 Feb – 03 Mar
41	2016ATC_41	Anchorsholme Lane East	332086, 442357	6 -12 February 22 Feb – 03 Mar
42	2016ATC_42	B5412 Victoria Road West	332065, 442707	6 -12 February 22 – 28 February
43	2016ATC_43	B5260 Weeton Road	338466, 437329	6 -12 February 22 – 28 February
44	2016ATC_44	B5266 Station Road	336784, 437389	6 -12 February 22 – 28 February
45	2016ATC_45	Back Lane	340328, 436567	6 -12 February 22 – 28 February
46	2016ATC_46	B5269 Mile Road	339613, 438246	6 -12 February 22 – 28 February
47	2016ATC_47	Grange Road	339443, 439223	6 -12 February 22 – 28 February
48	2016ATC_48	A586	339545, 439783	6 -12 February 22 – 28 February
49	2016ATC_49	A588 Shard Road Arm	336851, 441268	6 -12 February 22 – 28 February
50	2016ATC_50	B5260 Singleton Road	338717, 436177	6 -12 February 22 – 28 February
51	2016ATC_51	B5258 Warren Drive Arm	331816, 441607	6 -12 February 22 – 28 February
52	2016ATC_52	Red Bank Road Arm	331680, 440042	6 -12 February 22 – 28 February

No.	Unique Site ID	Road Name	Easting, Northing	Survey Dates (2016)
53	2016ATC_53	A585 Amounderness Way Arm	332909, 442230	6 -12 February 22 – 28 February
54	2016ATC_54	A583 Preston New Road WB	333704, 434478	6 -12 February 22 – 28 February
55	2016ATC_55	A587 Kelso Avenue SB	331529, 442473	6 -12 February 22 – 28 February
56	2016ATC_56	A587 St. Walburga's Road SB	332638, 437637	6 -12 February 22 – 28 February
57	2016ATC_57	A5230 Progress Way WB	333954, 432966	6 -12 February 22 – 28 February

Figure 5-1 2015 ATC Site Locations

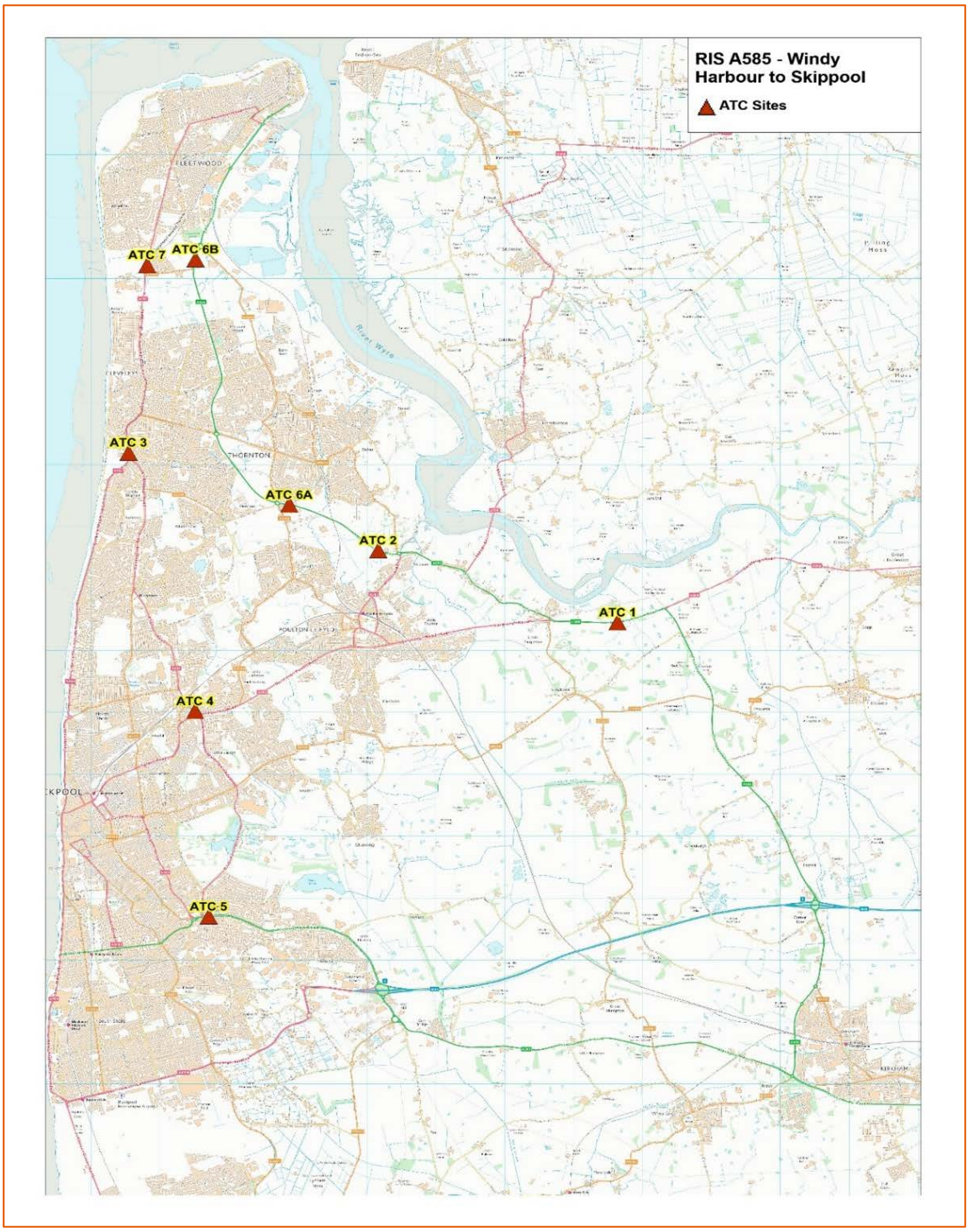


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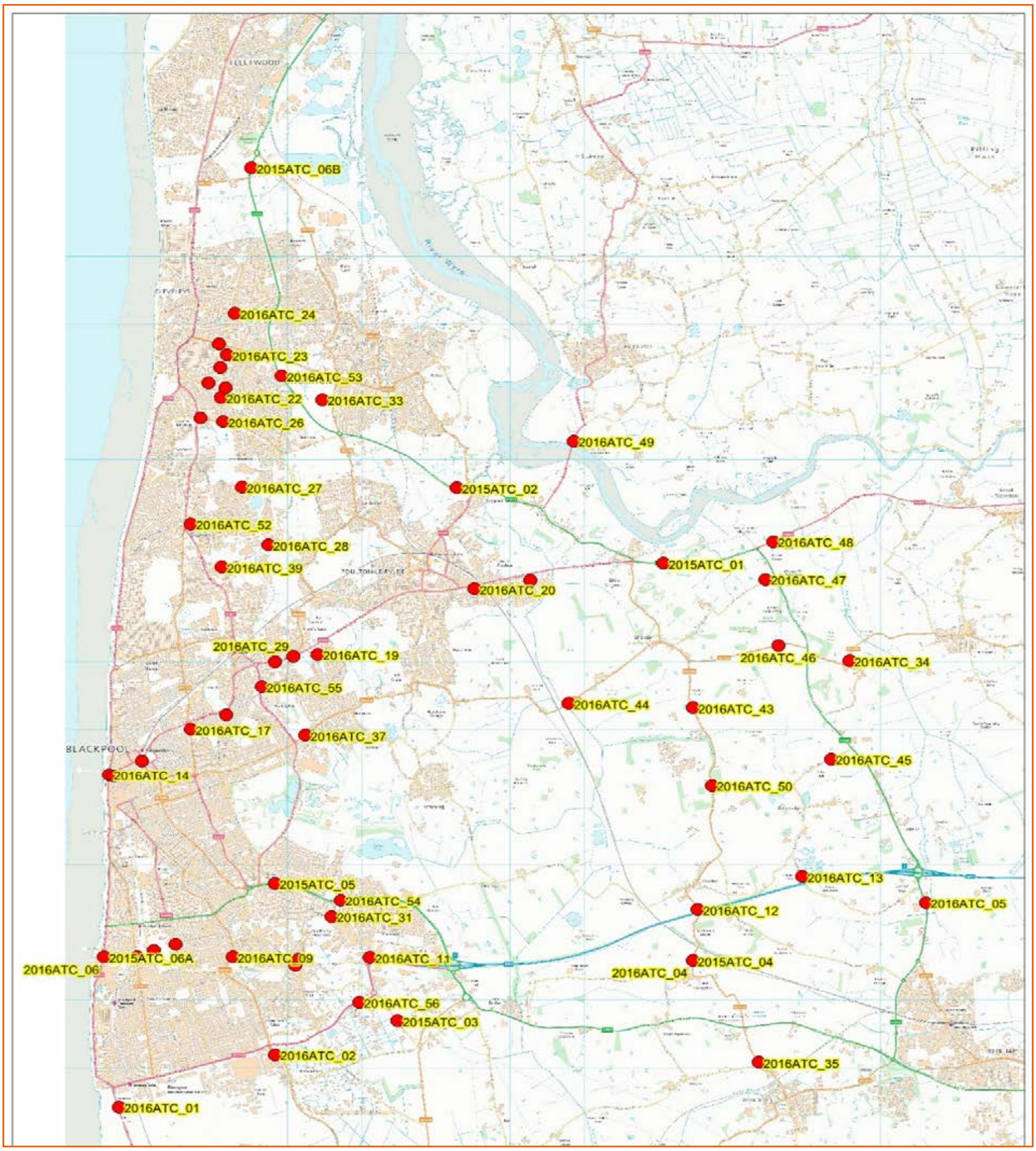
Figure 5-2 2016 ATC Site Locations



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5.3 Classified Junction Counts and Queue Length Surveys

5.3.1 Classified Junction Counts (CJCs) and Queue Length Surveys were conducted from 07:00-19:00 on 8 to 16 July 2015 at 32 junctions in the study area. The CJCs recorded the origin arm and destination arm for all vehicles (by class) passing through each junction. The Queue Length Surveys identified the average maximum length of the queue present at each junction during the survey time period.

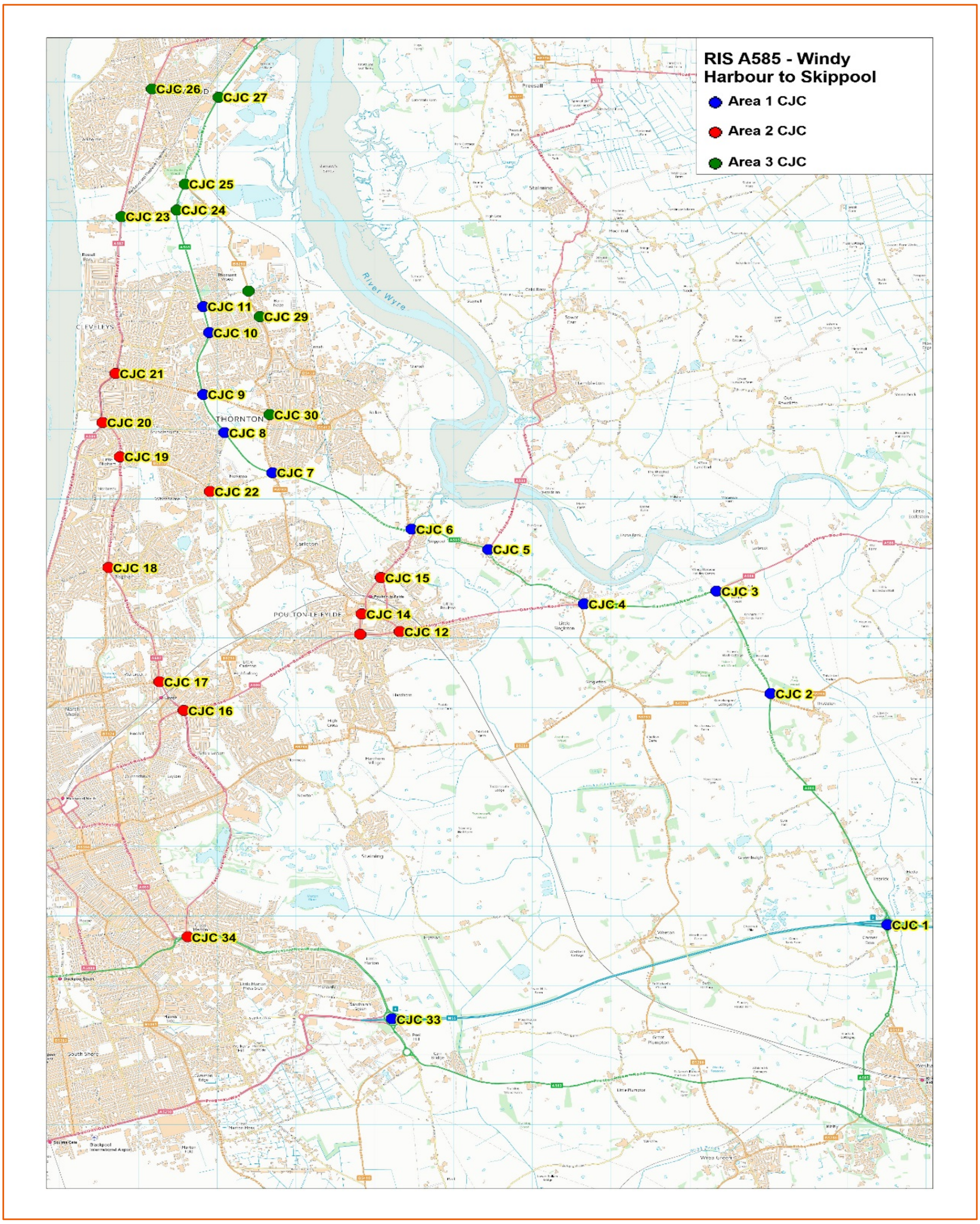
5.3.2 As recommended in WebTAG Unit M1.2 Section 3.3, ATCs were carried out in February/March 2016 for comparison purposes and to confirm the robustness of the CJC data, as described in Section 5.2.5.

5.3.3 The CJC locations were chosen based on a review of the scheme location, model study area and the location of screenlines and cordons. In each of the three data collection areas, counts were conducted for two consecutive days at each junction, as detailed in Table 5-4. The locations of the sites are illustrated in Figure 5-3.

Table 5-4 CJC Site List

No.	Area 1 – Junction Description	Survey Dates (2015)
1	M55 Junction 3 roundabout with A585	14 & 15 July
2	A585 Fleetwood Road/Mile Road/Thistleton Road staggered 4-arm priority junction	
3	A585 Garstang New Road/Windy Harbour Road/A585 Garstang Road/A585 Fleetwood Road traffic signals	
4	A585 Mains Lane/Pool Foot Lane/A585 Garstang New Road/Lodge Lane/A586 Garstang Road traffic signals	
5	A585 Mains Lane/A588 Shard Road traffic signals	
6	A585 Amounderness Way/Skippool Road/A585 Mains Lane/Breck Road roundabout	
7	A585 Amounderness Way/Fleetwood Road South/Norcross Lane roundabout	
8	A585 Amounderness Way/Anchorsholme Lane priority junction	
9	A585 Amounderness Way/Victoria Road East/Supermarket Access/Victoria Road West roundabout	
10	A585 Amounderness Way/West Drive traffic signals	
11	A585 Amounderness Way/Bourne Way priority junction	
33	M55 Junction 4 with A583 Preston New Road	
No.	**Area 2 – Junction Description**	
12	A586 Garstang Road East/Lower Green traffic signals	15 & 16 July
13	A586 Garstang Road West/Hardhorn Lane/A585 Garstang Road East traffic signals	
14	A583 Hardhorn Road/B5267 Blackpool Old Road/A583 Queen’s Square	
15	A588 Breck Road/Station Road/Parrys Way	
16	A587 Plymouth Road/A586 Poulton Road/A587 St Walburga’s Road/A586 Westcliffe Drive	
17	A587 Bispham Road/Holyoake Avenue/A587 Plymouth Road/Warbreck Hill Road	
18	A587 Bispham Rd/A587 Devonshire Road/B5124 Devonshire Road/Ingthorpe Avenue/Red Bank Road	
19	A587 Fleetwood Road/Russell Avenue/Warren Drive	
20	A587 Fleetwood Road/Queen’s Promenade/Kelso Avenue	
21	Crescent East/Crescent West/Rossall Road/Brighton Avenue/Victoria Road West	
22	Warren Drive/White Carr Lane	
34	A583 Preston New Road/A587 East Park Drive	
No.	**Area 3 – Junction Description**	
23	A587 Broadway/Rossall Lane	8 & 9 July
24	A585/Rossall Lane	
25	A585/Fleetwood Road	
26	A587 Broadway/Fleetwood Road/Beach Road/Chatsworth Avenue/Hatfield Avenue/Grange Road	
27	A585/Denham Way/Herring Arm Road	
28	B5268 Fleetwood Road North/Bourne Way/Bourne Road	
29	B5268 Fleetwood Road North/West Drive	
30	B5268 Fleetwood Road South/B5268 Fleetwood Road North/Victoria Road East	

Figure 5-3 CJC Site Locations



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5.3.4 CJC data was collected for a continuous twelve-hour period (from 07:00 to 19:00) on a mid-week day (Tuesday, Wednesday or Thursday), with the vehicles making each movement summed for each 15-minute period. All movements at any one junction were counted on the same day.

5.3.5 The vehicle classifications collected were summed as the following:

- Cycles, scooters, mopeds and motorbikes
- Cars and taxis
- Light Goods Vehicles (LGVs)

- OGV1 (all goods vehicles with two axles with twin tires, three axles (rigid))
- OGV2 (all goods vehicles with three axles (articulated), four axles or more (rigid or articulated))
- Buses and Coaches (including Public Service Vehicles (PSVs)).

5.3.6 Pedestrians, equestrians and mobility scooters were excluded from the classified counts. Pedal cycles using marked off-road cycle tracks and traffic signal facilities for crossing the road were also excluded.

5.3.7 Queue length surveys were carried out on two consecutive days for each junction arm at the same 32 junctions within the study area as the CJC survey locations. The data was collected at each junction for a continuous 12-hour period (from 07:00 to 19:00) on a mid-week day (Tuesday, Wednesday or Thursday). Queue lengths were measured via video recording as the maximum length of the vehicle queue present, at all types of junction, at intervals of five minutes.

5.4 Manual Classified Counts

5.4.1 Manual Classified Counts (MCCs) were conducted by CTS Data Collection Services on 9 February 2016 at nine locations, as shown in Table 5-5. In contrast with the CJCs described in section 5.3, the MCCs recorded link flows only, with no information gathered about turning movements.

Table 5-5 2016 MCC Sites

No.	Unique Site ID	Road Name	Easting, Northing	Survey Dates
1	2016MCC_01	B5260 Singleton Road	338730, 436111	9 February 2016
2	2016MCC_02	B5269 Thistleton Road Arm	340581, 437966	9 February 2016
3	2016MCC_03	Moor Park Avenue	331950, 439353	9 February 2016
4	2016MCC_04	B5266 Newton Drive	333165, 436855	9 February 2016
5	2016MCC_05	A583 Preston New Road	333649, 434472	9 February 2016
6	2016MCC_06	Yeadon Way	331143, 433793	9 February 2016
7	2016MCC_07	A5230 Squires Gate Lane	333453, 432539	9 February 2016
8	2016MCC_08	B5261 Common Edge Road	332800, 432220	9 February 2016
9	2016MCC_09	A584 Clifton Drive North	330648, 431646	9 February 2016

5.4.2 MCC Data was collected via high mast video units positioned at the locations set out in Table 5-5. All traffic movements were recorded in fifteen-minute intervals between the times of 07:00 to 19:00 on Tuesday 9 February 2016. The data was provided in a Microsoft Excel spreadsheet.

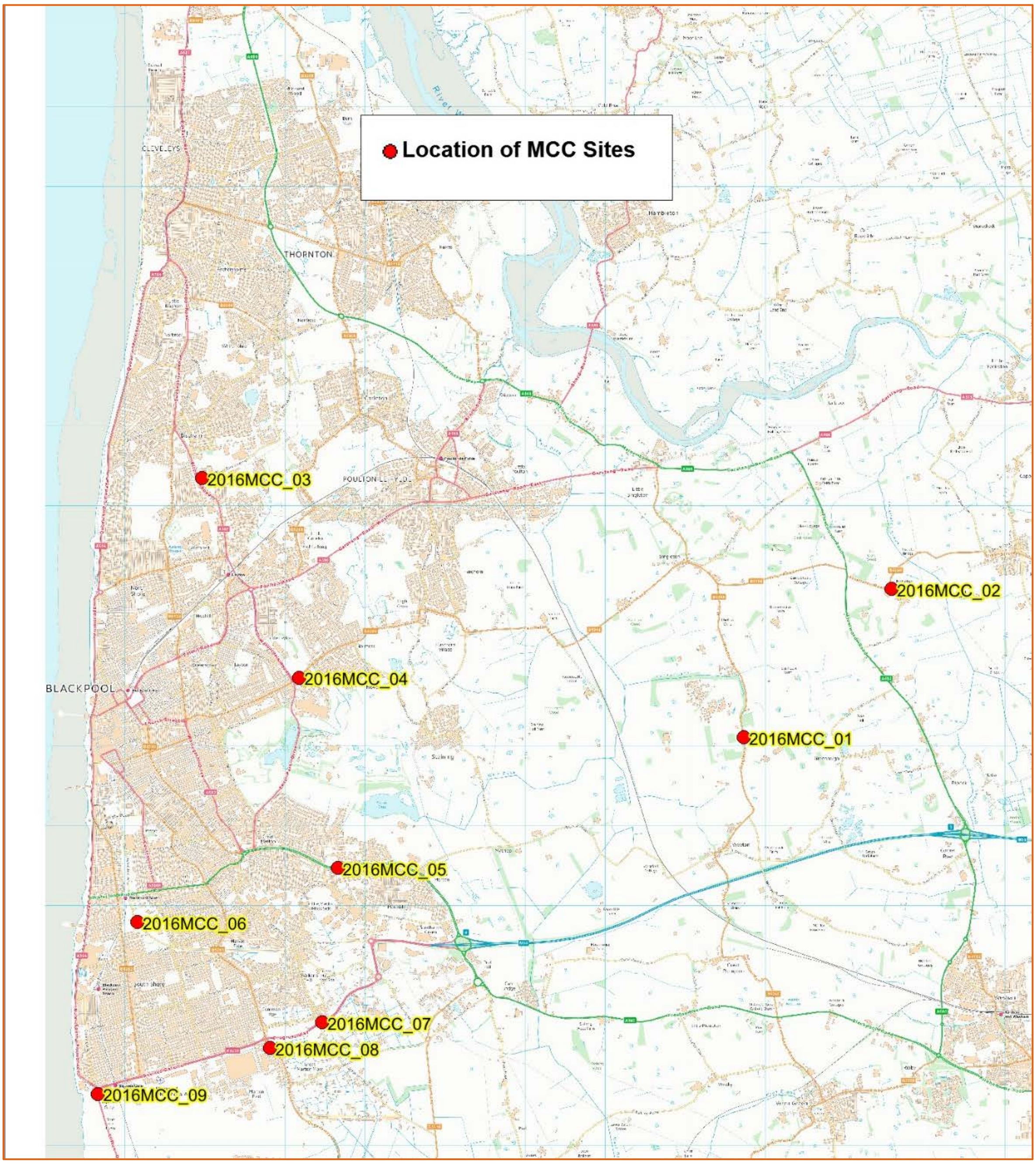
5.4.3 The count data was classified into the following categories:

- Pedal Cycles
- Motor Cycles
- Cars
- LGV
- OGV1
- OGV2
- PSV

5.4.4 Figure 5-4 shows the locations of the MCC sites surveyed in February 2016.

5.4.5 Towards the start of the model development programme, the need for the traffic counts detailed in this section became apparent. The client's desire not to delay the programme by waiting to conduct the counts in a neutral month meant that the data was collected in February 2016. For use in the model, these counts were converted into the model's base month and year by applying seasonality factors and adjustments for year-on-year growth.

Figure 5-4 2016 MCC Site Locations



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6 ATC DATA FROM TRIS DATABASE

6.1 Use of TRIS Data in Model Development

6.1.1 Traffic count information for the months of July 2015 and September 2015 is available on Highways England's TRIS data website (http://tris.highwaysengland.co.uk). The TRIS website includes traffic flow files generated monthly for each count site, with traffic data presented in 15-minute intervals for each day of the month.

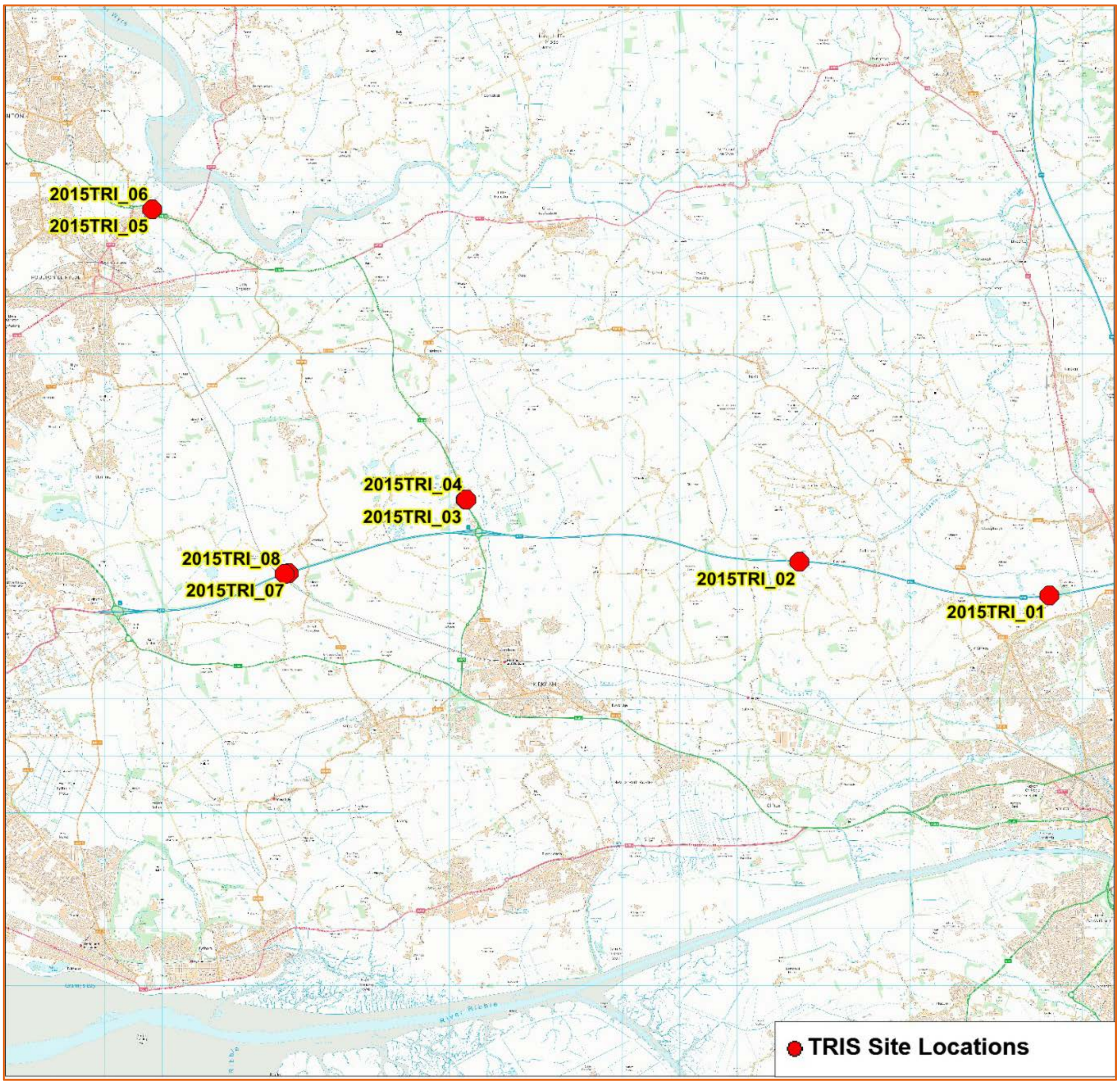
6.1.2 TRIS traffic count data (15-minute count totals) on selected locations in the project study area were downloaded and used in the development of the traffic model.

6.1.3 Table 6-1 and Figure 6-1 shows the list TRIS data sites along with co-ordinates used in model development.

Table 6-1 TRIS Data Sites Used in Model Development

No.	Site Reference ID	Location	Easting, Northing	Direction	Date for which Data was Used
1	2015TRIS_01	M55 eastbound between J3 and J1	E342723 N434810	EB	June 2015
2	2015TRIS_02	M55 westbound between J3 and J1	E347067 N434383	WB	June 2015
3	2015TRIS_03	A585 northbound between M55 and B5269	E341266 N435462	NB	June 2015
4	2015TRIS_04	A585 southbound between B5269 and M55	E341270 N435464	SB	June 2015
5	2015TRIS_05	NB, A585, A588-A588, EAST OF SKIPPOOL	E335808 N440523	NB	June 2015
6	2015TRIS_06	SB, A585, A588-A588, EAST OF SKIPPOOL	E335810 N440525	SB	June 2015
7	2015TRIS_07	M55 eastbound between J4 and J3	E338113 N434174	EB	June 2015
8	2015TRIS_08	M55 westbound between J3 and J4	E338184 N434177	WB	June 2015

Figure 6-1 TRIS Data Site Locations



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6.1.4 The data was used as observed counts at selected screenlines and cordons. It was also used for determining Yearly Growth Factors (YGFs) and Monthly Seasonality Factors (MSFs) at sites on Motorways and A roads.

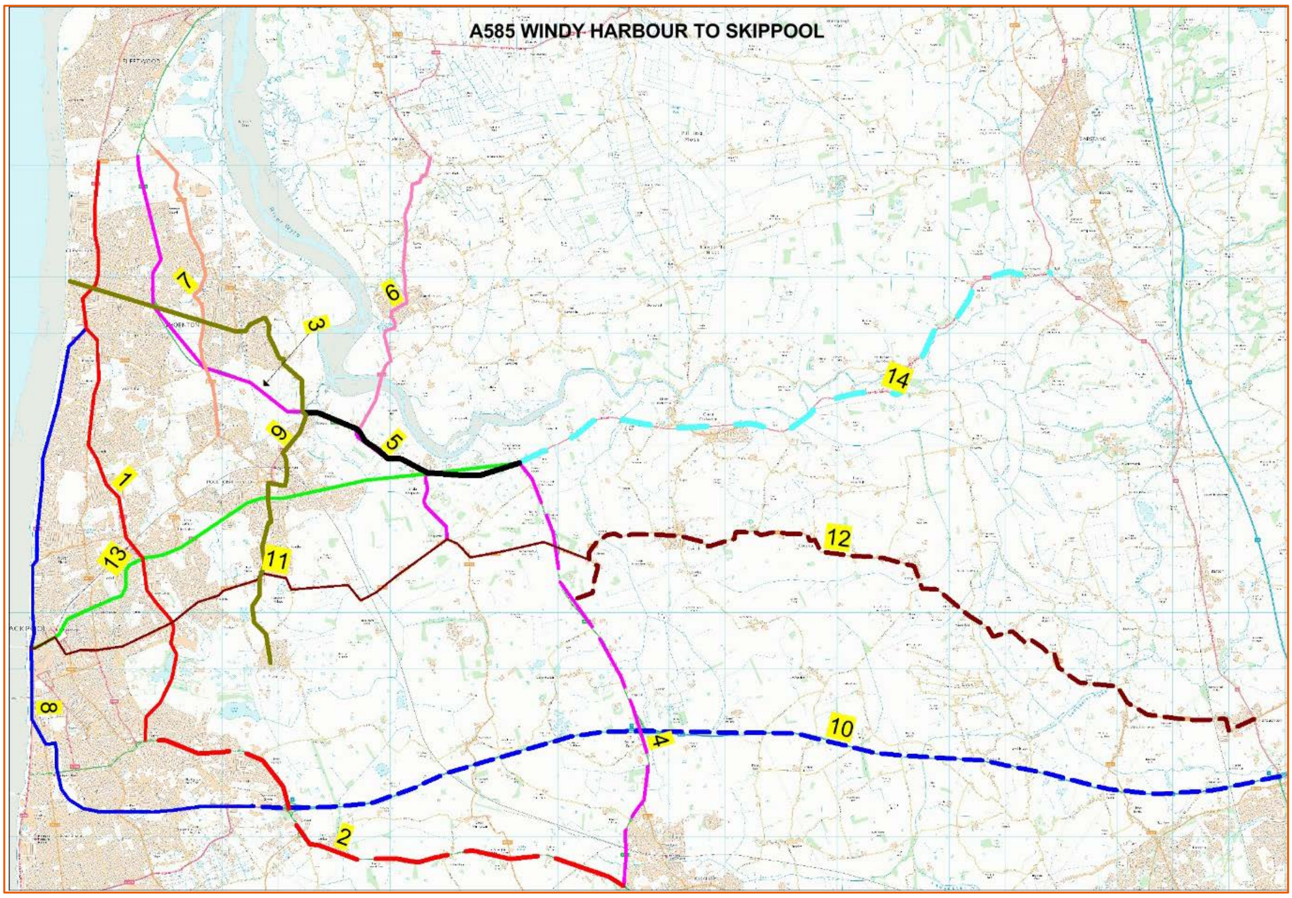
6.1.5 The weekday average traffic flows at TRIS sites (measured in half hour time intervals) are shown in Appendix B.

7 JOURNEY TIME DATA

7.1 Use of Journey Time Data in Model Development

7.1.1 Journey time data was obtained for 14 routes in the study area, as shown in Figure 7-1. Observed journey times were extracted for these routes from the Trafficmaster database. The observed journey times will be compared against the modelled journey times to determine whether the journey time validation results meet the criteria defined in paragraph 3.2.10 of WebTAG Unit M3.1.

Figure 7-1 Journey Time Routes



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7.1.2 The observed journey times on these routes, as derived from the Trafficmaster data, are shown in Table 7-1.

Table 7-1 Observed Journey Times on Routes

JT Route No.	Route Description	Length (km)	Observed JT (secs) Derived from Trafficmaster Data		
			AM Peak Hr	IP Peak Hr	PM Peak Hr
Route 1NB	A587 - S-Park Road to Russel Lane	11.30	1171	1170	1252
Route 1SB	A587 - Russel Lane to S-Park Road	11.28	1191	1165	1205
Route 2NB	A583 - Blackpool Road to Preston Road	10.16	723	715	730
Route 2SB	A583 - Preston Road to Blackpool Road	10.24	692	696	700
Route 3NB	A585 - Singleton (B5260) to Amounderness Way	10.13	775	743	940
Route 3SB	A585 - Amounderness Way to Singleton (B5260)	10.14	786	706	729
Route 4NB	A585 - Blackpool Road to Windy Harbour	8.28	523	524	528
Route 4SB	A585 - Windy Harbour to Blackpool Road	8.29	520	522	517
Route 5NB	A585 - Garstang Road to Skippool Junction	4.28	307	293	332
Route 5SB	A585 - Skippool Junction to Garstang Road	4.28	378	378	316
Route 6NB	A588 - Shard Road to Hall Road	6.83	463	470	463
Route 6SB	A588 - Hall Road to Shard Road	6.83	494	493	491
Route 7NB	B5260 - Carleton Road to Russel Lane	5.75	486	495	542
Route 7SB	B5260 - Russel Lane to Carleton Road	5.75	538	524	543
Route 8NB	M55 Junction 4 towards B5262 up to A584	11.85	1006	1071	1169
Route 8SB	A584 through B5262 up to M55 Junction 4	11.85	998	1066	1127
Route 9NB	Mill Lane towards A588 up to Victoria Road West	10.45	1123	1077	1155
Route 9SB	Victoria Road West towards A588 up to Mill Lane	10.90	1144	1132	1191
Route 10EB	M55 Junction 4 to M55 Junction 1	19.13	615	637	624
Route 10WB	M55 Junction 1 to M55 Junction 4	19.14	636	629	603
Route 11EB	Talbot Square Road (Blackpool) towards A586 up to Thistleton Road	11.52	949	945	983
Route 11WB	Thistleton Road through A586 up to Talbot Square (Blackpool)	11.49	966	985	1001
Route 12EB	B5269 - from Thistleton Road to Broughton Road	16.00	1272	1237	1246
Route 12WB	B5269 - Broughton Road to Thistleton Road	16.00	999	949	949
Route 13EB	Talbot Rd (Blackpool) through A586 to Windy Harbour Skippool Junction	9.92	210	190	197
Route 13WB	Windy Harbour Skippool Junction through A586 up to Talbot (Blackpool)	9.93	601	581	635
Route 14EB	A586 - Garstang Road to The Avenue A6	11.28	628	647	630
Route 14WB	The Avenue A6 to Garstang Road A586	11.28	634	654	647

7.1.3 Note that the lengths of routes 10EB and 10WB are outside the range recommended by WebTAG unit M3.1 (>3 km and <15 km). These routes have been defined as encompassing one motorway junction on each side of M55 junction 3, which is the point at which the M55 connects to the A585. As there is no M55 junction 2, the route runs between M55 junction 1 (with the A6) and M55 junction 4 (with the A583 Preston New Road).

8 ACCIDENT DATA OBTAINED FROM DfT

8.1 Accident Data Collection and Analysis

8.1.1 Accident data for the study area was obtained from the DfT for the last five years from 2011 to 2015. Table 8-1 shows the number of accidents by year and severity, with the accident severity trend illustrated in Figure 8-1.

8.1.2 It can be seen that there were a total of 94 accidents over the five-year period, ranging from a total of 15 to 23 accidents in any one year. Over the five-year period, the majority of accidents was classified as slight (94), with 8 accidents classified as severe and 2 fatal accidents. Figure 8-2 shows the location and severity of these accidents.

Table 8-1 Number of Accidents by Year and Severity (2011 – 2015)

Year	Severity			Total
	Fatal	Severe	Slight	
2011	1	2	14	17
2012	0	0	15	15
2013	1	2	20	23
2014	0	3	16	19
2015	0	1	19	20
TOTAL	**2**	**8**	**84**	**94**

Figure 8-1 Accident Severity Trend (2011 – 2015)

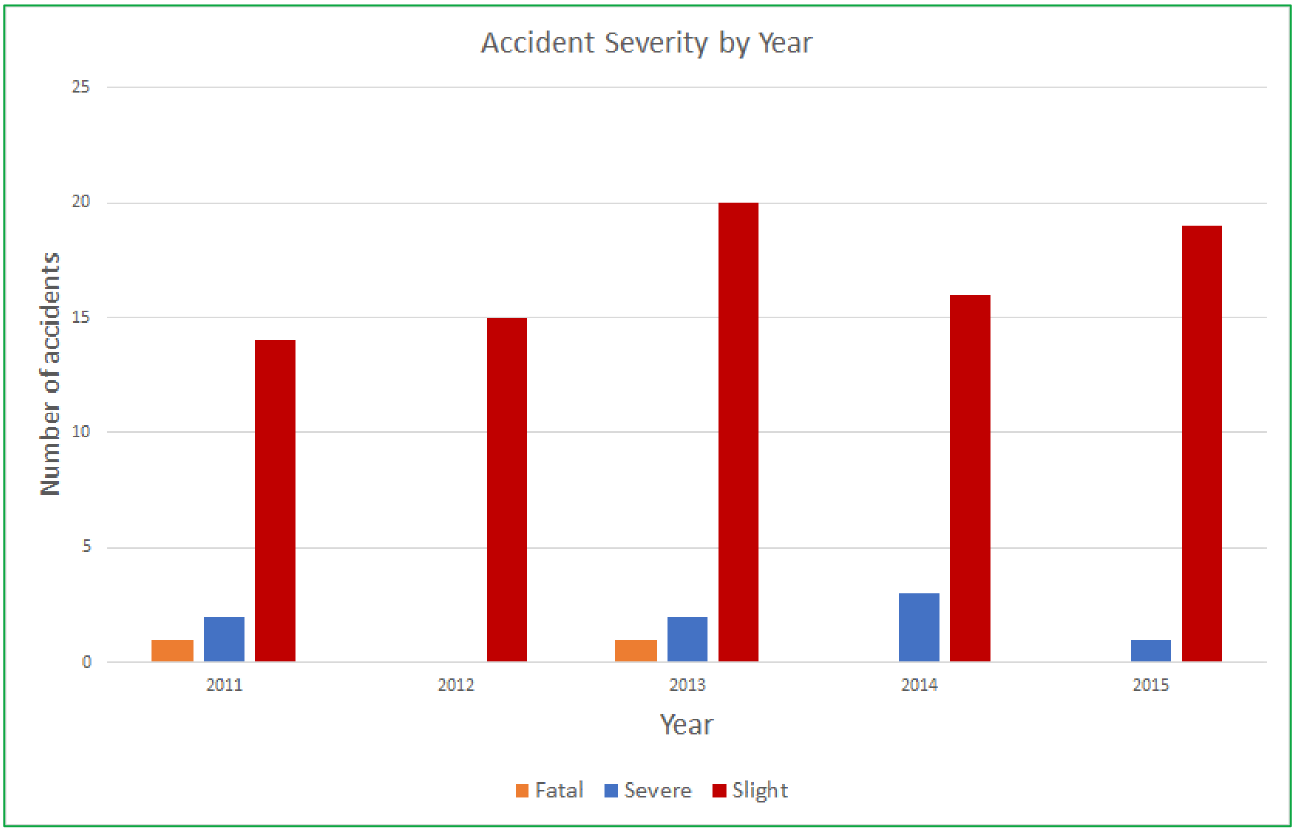
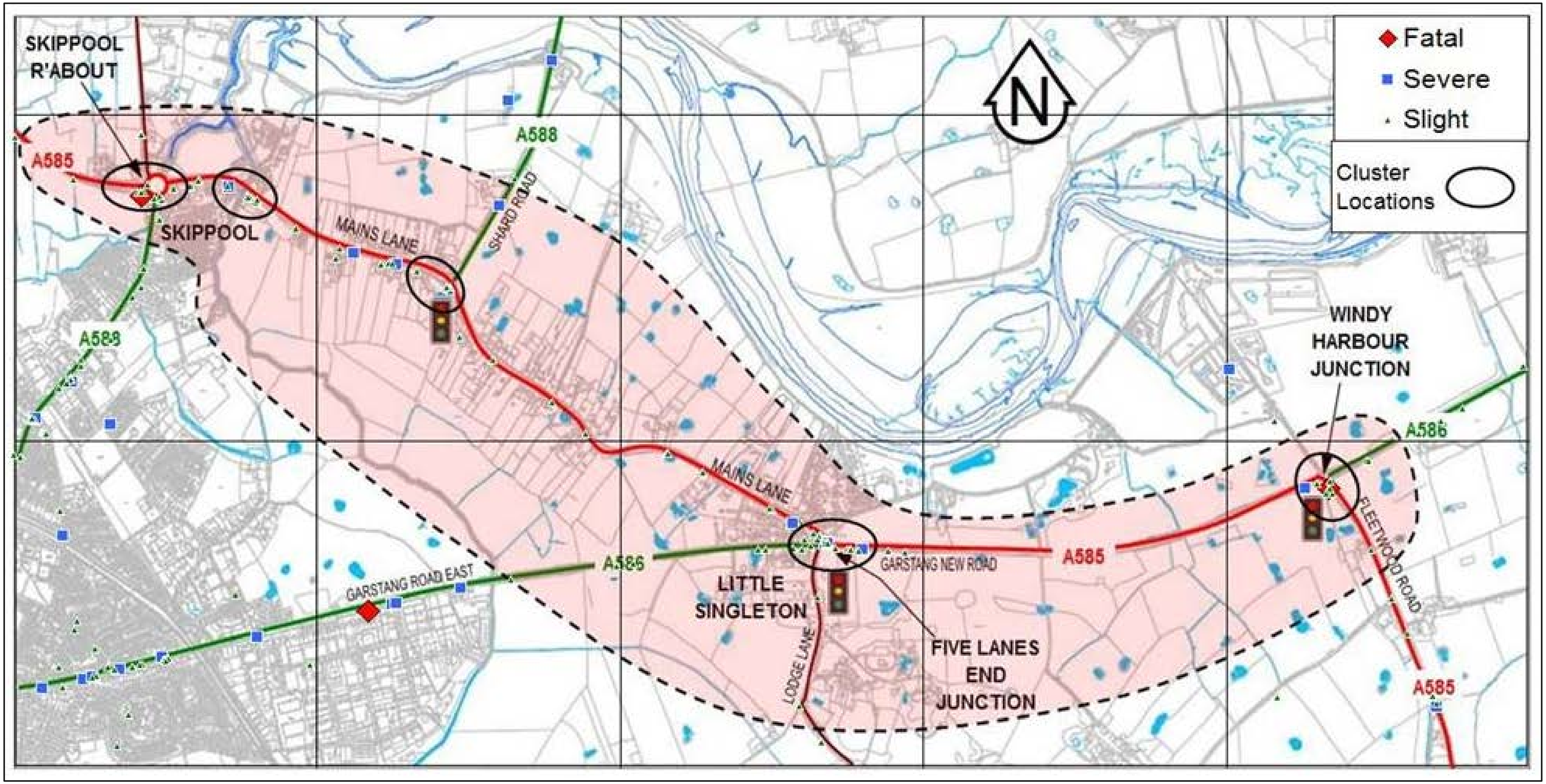


Figure 8-2 Accident Locations and Severity (2011 – 2015)



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9 AUTOMATIC TRAFFIC COUNT DATA ANALYSIS

9.1 ATC Data Checks and Cleaning

9.1.1 The first step in the analysis of the 2015 and 2016 ATC data was to check the datasets provided by the survey company to identify any missing data and report on the extent of any data loss. The checks carried out on the ATC data are detailed in Appendix A.

9.1.2 For the 2015 data, a full dataset was only returned for four sites. Therefore, additional counts were carried out in 2016 as described in Section 5.2.5. There were some reported data losses in some time periods for the 2016 data; however, the combined 2015 and 2016 datasets were considered to be sufficiently complete for use in model development.

9.1.3 A series of data checks were then carried out on the 2015 and 2016 ATC data. Firstly, all weekend and school holiday data (if any) was filtered out from the raw data. Two statistical tests were then performed for each ATC site to identify outliers (for vehicle totals) as follows:

- 2 Standard Deviation (2SD) test – the interval between the 'mean – 2SD' and 'mean +2SD'.
- Index of Dispersion (IoD) test – the Confidence Interval (CI) of the mean.

9.1.4 The above statistical tests were carried out based on guidance provided in Highways England's Technical Note on Traffic Model and Economics Review Data Requirements (dated 21/02/2014).

9.1.5 The 2SD test was applied at each ATC site to identify average peak hour traffic flows that lie within the SD CI. Based on the results of the 2SD test, the days on which the average peak hour flows lie outside the 2SD band were filtered out.

9.1.6 The IoD test was performed on the average peak hour traffic flows that remained after passing the 2SD test. To maintain consistency with previous Technical Notes, and in accordance with the guidance note provided by Highways England on Traffic Model and Economics Review Data Requirements (dated 21/02/2014), the IoD used was the CI of the mean.

9.1.7 All ATC data which failed the IoD test was excluded from model calibration and validation. However, the count data was retained to help with checking where, for example, other count data was unavailable or out of date.

9.1.8 As part of the data checking process, the underlying reasons for the exclusion of data according to the above tests was assessed. Where the (wide) variance of traffic flow data was assessed as being likely due to inherent and persistent variability (i.e. not due to atypical/transient events or incidents or due to equipment malfunction, etc.) then such data was incorporated and a relevant note appended in the database.

9.1.9 It is noted that in the matrix estimation process in SATURN, the most reliable counts (which arguably are the second set of 2015 counts and the 2016 counts) will comprise the sequentially later cards the '77777' dataset for use in the SATURN 'PIJA' analysis. Subject to the availability of alternative counts for calibration purposes, rather than completely excluding ATC data which marginally fails the IoD tests due to inherent traffic flow variability, such ATC data would be incorporated at the 'top' of the 77777 PIJA cards.

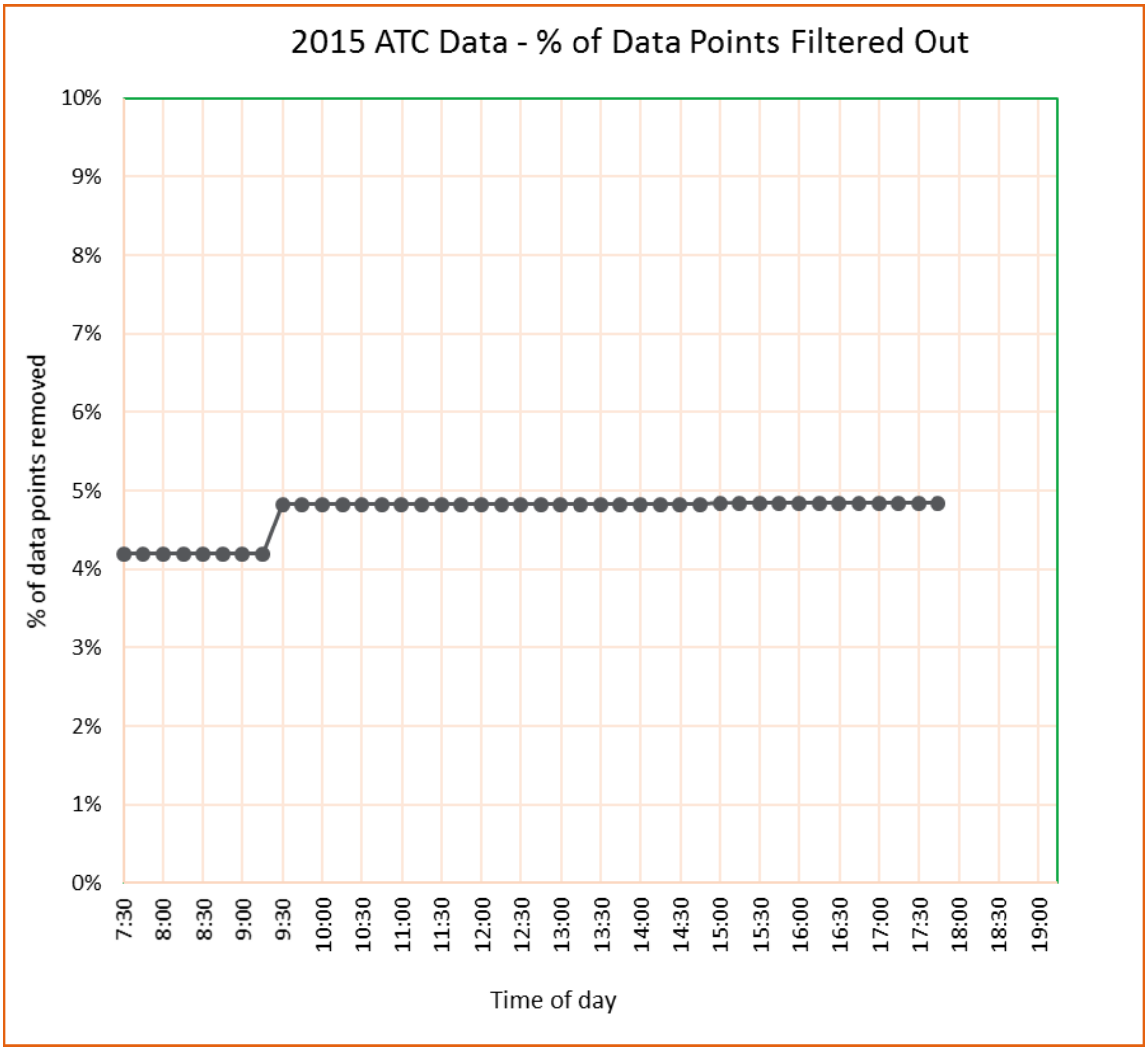
9.1.10 When deciding on the traffic counts to include, the volume of traffic was considered. The significance of the traffic count in the development of the model, and whether it is located on a key part of the network was considered when including or excluding counts.

9.1.11 The peak hour traffic flows (in the clean ATC dataset) as calculated for July 2015, September/October 2015 and February 2016 were multiplied by their appropriate Yearly Growth Factors (YGFs) and Monthly Seasonality Factors (MSFs) (as calculated from the traffic count database) to derive the peak hour traffic flows which were carried forward for model calibration and validation.

9.1.12 Appendix E shows the mean and 2SD plots for all ATC sites collected in July and September/October 2015 and the outliers in the 2015 ATC data points. ATC data which lies outside the LCL and UCL band(s) was filtered out from the spreadsheets. An example plot showing the IoD for ATC 1 – EB direction data is shown in Figure 9-1. Appendix F shows the IoD plots for the count data at all ATC sites. The percentage of 2015 ATC data points excluded during the AM, IP and PM peak hours is shown in Appendix G.

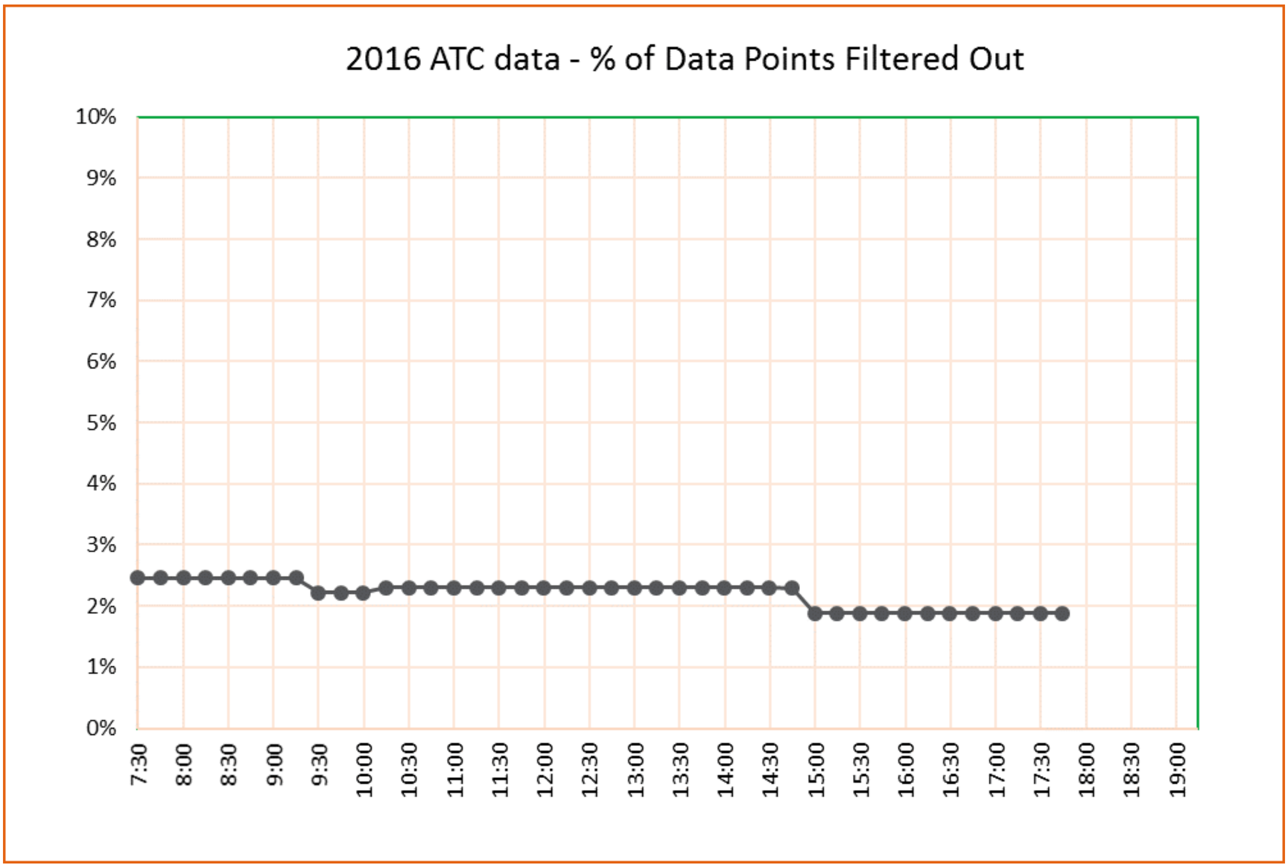
9.1.13 The number of points filtered out by 15-minute time interval (summed across all ATC sites) between 07:30 and 18:00 is shown in Figure 9-1. It can be seen that, at most, 5% of the data points are removed. This indicates that the surveyed 2015 ATC data represents a robust data set during the traffic modelling time window of 07:00 to 19:00.

Figure 9-1 2015 ATC Data – Percentage of Data Points Filtered Out



9.1.14 The percentage of 2016 ATC data points excluded during the AM, IP and PM peak hours is shown in Appendix H and plotted against the time of day in Figure 9-2. It can be seen that less than 3% of data points are removed from any time period; therefore, the 2016 dataset is considered to be sufficiently robust for model development.

Figure 9-2 2016 ATC Data – Percentage of Data Points Filtered Out

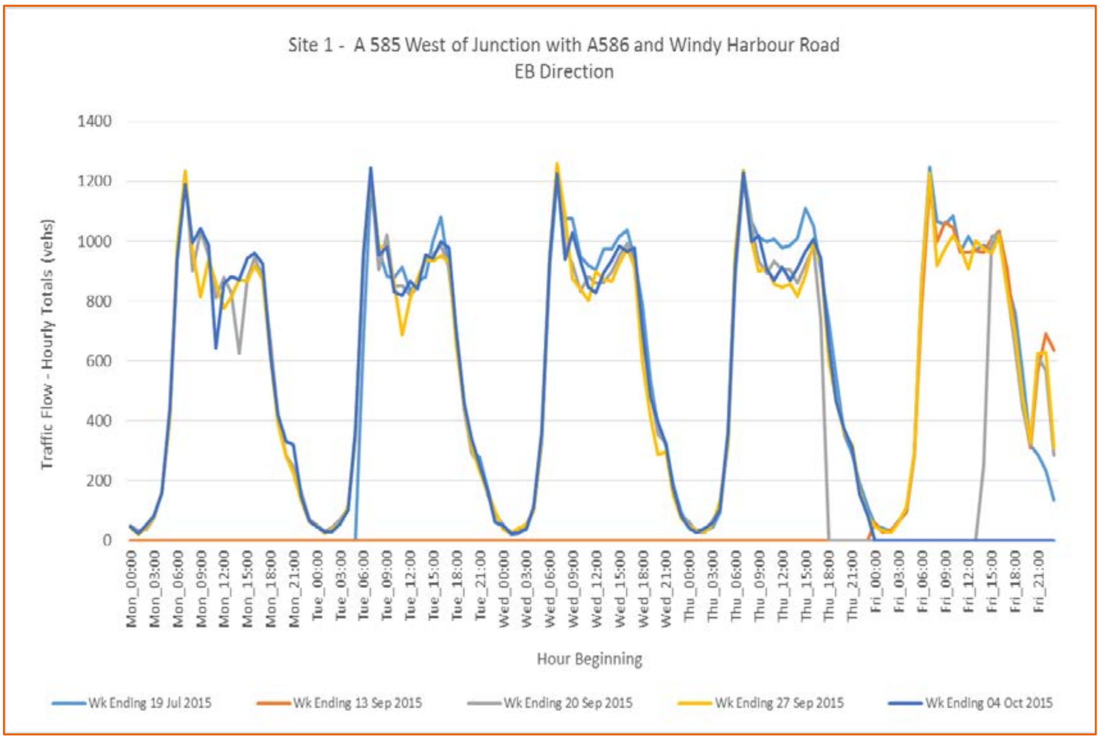


9.2 2015 ATC Weekday and Weekend Traffic Profiles

9.2.1 The 2015 ATC data (hourly flow in vehicles) was plotted for an average weekday and weekend, as shown in Appendix C. As expected, the weekends and weekdays display differing peak characteristics; the weekdays have a characteristic bi-modal profile with a sharp AM and more protracted PM peak and the weekends have a uni-modal profile with a protracted peak starting at approximately 10:00 and continuing until early afternoon. The traffic model being built for Stage 2 appraisal is a weekday peak hour model; therefore, the weekend data was excluded from further analysis.

9.2.2 After excluding weekend data, weekday ATC traffic profiles for each site in each direction were produced for each of the weeks starting in July and September/October 2015. The weekday profile for ATC Site 1 (eastbound) is shown in Figure 9-3 as an example.

Figure 9-3 ATC Site 1 (Eastbound) Weekday Profile



9.2.3 As shown in Figure 9-3, the weekday traffic flow profile at ATC Site 1 (eastbound) followed a similar recurring pattern throughout the weeks of July and September. With the exception of a few (non-recurring) time periods in the Monday and Tuesday profiles (most likely caused by traffic accidents), the traffic profiles indicate that the profile for September at Site 1 (eastbound) was not significantly different from that for July.

9.2.4 Appendix D shows the weekday traffic profiles for all ATC sites on a directional basis. A review of these weekday profiles indicates that, in general for a given weekday, the traffic for each of the months surveyed follows a very similar profile with very little variance, particularly in the peaks.

9.2.5 Some isolated data points and flow periods which deviated from the general profile are listed in Table 9-1. It is noted that some particular data points on the days listed in Table 9-1 were excluded from further analysis as described earlier in this chapter.

Table 9-1 Observed Deviant Traffic Periods

Site No.	Direction	Day of the Week	Week Ending
1	EB	Monday/Friday	20/09/2015 & 04/10/2015
		Tuesday	27/09/2015
	WB	Monday	20/09/2015 & 04/10/2015
2	EB	Tuesday	27/09/2015
	WB	Tuesday	27/09/2015
3	NB	Friday	13/09/2015 & 20/09/2015
	SB	Friday	13/09/2015
5	EB	Friday	13/09/2015 & 20/09/2015
	WB	Friday	13/09/2015 & 20/09/2015
6B	SB	Monday	25/10/2015
		Tuesday	11/10/2015

9.2.6 The 2015 two-way ATC flows (cleaned data) are shown in Appendix I; and the 2016 ATC data is shown in Appendix J.

9.3 Peak Hour Determination

9.3.1 In order to derive the peak hours in the Model Study Area, TRIS data (15-minute totals for July 2015) was downloaded from http://tris.highwaysengland.co.uk/detail/trafficflowdata and processed. There is a total of eight TRIS sites for which July 2015 fifteen-minute count data is available. These sites are described in Chapter 6.

9.3.2 The peak hour as determined at each of the TRIS sites is shown in Table 9-2.

Table 9-2 Peak Hour Based on TRIS Data

Peak Hour Time Period	Number of TRIS Sites Which Show this Peak Hour
07:00 – 08:00	2
07:15 – 08:15	2
07:30 – 08:30	2
08:30 – 09:30	1
14:15 – 15:15	1
16.00 – 17.00	2
16:15 – 17:15	3
16:45 – 17:45	2
17:00 – 18:00	1

9.3.3 Based on the results shown in Table 9-2, the TRIS data does not indicate a distinct one hour peak time period in either the morning or the evening. To help to identify the peak hours, ATC data collected in July/September 2015 and February/March 2016 was processed as described below.

9.3.4 Firstly, the clean 2015 ATC dataset was analysed. The 15-minute traffic counts were averaged across all days for each site in each direction. These average 15-minute counts were then summed across all sites in all directions to obtain the average traffic flow across the entire network during each 15-minute interval.

9.3.5 Rolling hourly counts were then calculated to identify the AM and PM peak hours for the study area. Table 9-3 shows the average 15-minute traffic flow (totals) for each site in each direction during the hours of 06:00 to 10:00 and the subsequent derivation of the AM peak hour.

Table 9-3 Derivation of AM Peak Hour Based on 2015 ATC Data

15-minute Start Period	15-minute Average Across All Sites	Rolling Hourly Totals (vehs)
06:00	64	376
06:15	77	462
06:30	105	558
06:45	130	654
07:00	150	738
07:15	174	805
07:30	200	852
07:45	214	868
08:00	217	851
08:15	221	821
08:30	216	775
08:45	197	731
09:00	187	707
09:15	175	688

15-minute Start Period	15-minute Average Across All Sites	Rolling Hourly Totals (vehs)
09:30	171	686
09:45	173	690
10:00	168	693

9.3.6 It should be noted that, due to the fact that there were some missing data points (for example ATC Site 6B – NB direction), the rolling average hourly totals were calculated across all sites, rather than the actual totals across all sites. The yellow highlighted cells in Table 9-3 indicate the 15-minute start periods at which the highest rolling hourly total occurs (a possible indication of the AM peak hour).

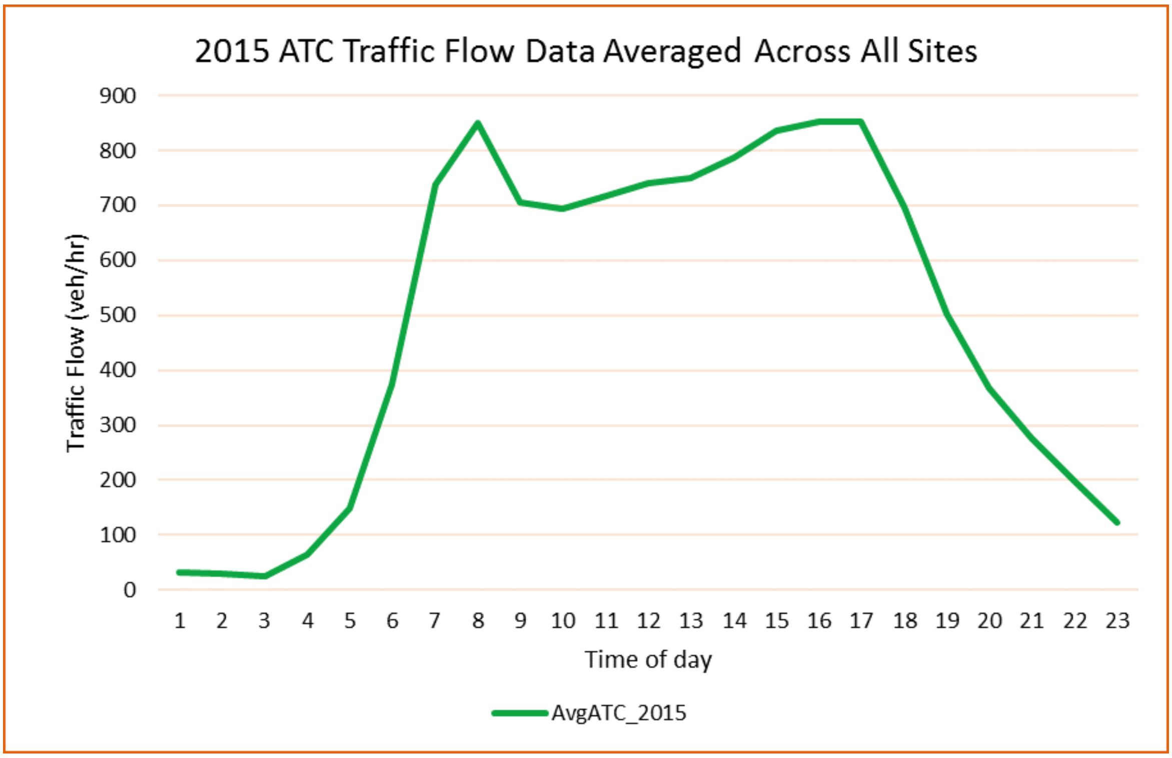
9.3.7 Table 9-4 shows the derivation of the PM peak hour based on the 2015 ATC data. Again, the yellow highlighted cells indicate the 15-minute start period at which the highest rolling hourly total occurs (a possible indication of the PM peak hour).

Table 9-4 Derivation of PM Peak Hour Based on 2015 ATC Data

15-minute Start Period	15-minute Average Across All Sites	Rolling Hourly Totals (vehs)
15:00	205	836
15:15	208	844
15:30	211	849
15:45	213	852
16:00	212	852
16:15	213	861
16:30	214	865
16:45	212	862
17:00	221	852
17:15	217	824
17:30	212	788
17:45	202	746
18:00	193	697
18:15	182	648
18:30	170	597
18:45	153	546
19:00	144	502

9.3.8 The average weekday profile based on the 2015 ATC data is shown in Figure 9-4.

Figure 9-4 Average Weekday Profile Based on 2015 ATC Data



9.3.9 The above plots and inferences based on the 2015 ATC data were presented to Highways England in TDCR Version 1.0 dated 03/12/2015 (HE548643-HYD-GEN-A585_RP-TR-1013-v1.0). Following discussions with Highways England, additional analysis was carried out on the 2015 ATC data to identify the peak hours based on fifteen-minute average flows. Table 9-5 shows the 15-minute average flows averaged across all 2015 ATC sites.

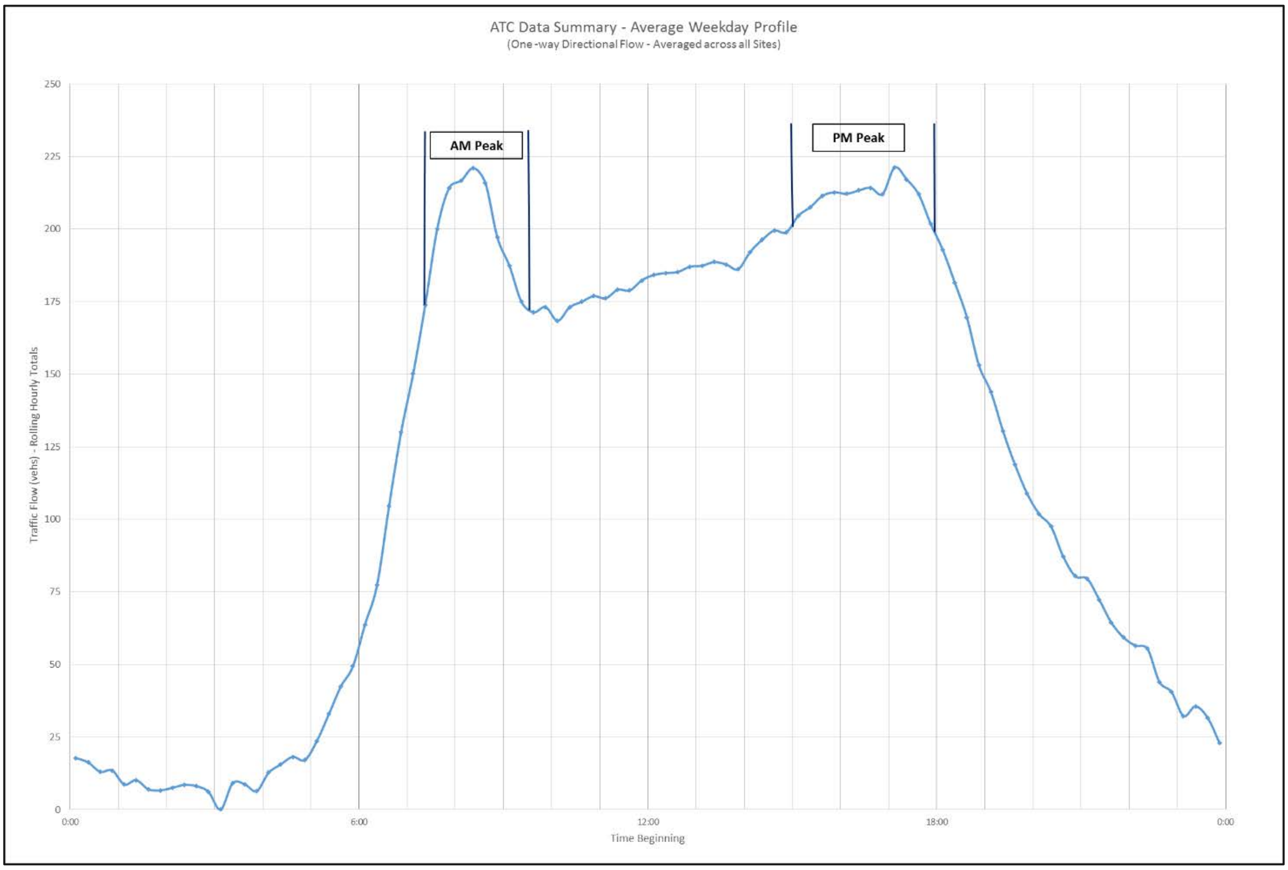
Table 9-5 Derivation of Peak Hour (15-minute Averages; 2015 ATC Data)

Time Period	15-minute Average	Rolling Hourly Totals	Fixed Hourly Totals
12:00	18	61	61
01:00	9	32	32
02:00	8	30	30
03:00	-	24	24
04:00	13	64	64
05:00	24	148	148
06:00	64	376	376
07:00	150	738	738
08:00	217	851	851
09:00	187	707	707
10:00	168	693	693
11:00	176	716	716
12:00	184	741	741
13:00	187	750	750
14:00	192	787	787
15:00	205	836	836
16:00	212	852	852
17:00	221	852	852

Time Period	15-minute Average	Rolling Hourly Totals	Fixed Hourly Totals
18:00	193	697	697
19:00	144	502	502
20:00	102	367	367
21:00	79	276	276
22:00	57	196	196
23:00	32	122	122

9.3.10 Figure 9-5 provides a plot showing the 15-minute average flows plotted by time of day.

Figure 9-5 2015 ATC Data: Average Weekday Profile



9.3.11 Following discussions with Highways England, the following were therefore identified as the peak hours for the traffic model:

- AM peak hour – average one hour between 07:30 and 09:30
- IP hour – average one hour between 09:30 and 15:00
- PM peak hour – average one hour between 15:00 and 18:00

9.3.12 A similar analysis to that performed on the 2015 ATC data was then performed on the 2-16 ATC data to check if there was any significant difference in the peak hours compared to those derived using the 2015 data.

9.3.13 Table 9-6 shows the average 15-minute vehicle totals during the hours of 06:00 to 10:00 as derived from the 2016 data, as well as the rolling hourly totals. The yellow highlighted cells provide an indication of the peak hour, based on the 15-minute starting periods with the highest rolling hourly totals.

Table 9-6 Derivation of AM Peak Hour Based on 2016 ATC Data

15-minute Starting Period	15-minute Average Across All Sites	Rolling Hourly Totals (vehs)
06:00	15	106
06:15	20	138
06:30	31	178
06:45	40	229
07:00	46	291
07:15	60	351
07:30	83	405
07:45	102	443
08:00	106	455
08:15	115	444
08:30	120	412
08:45	114	367
09:00	95	328
09:15	83	305
09:30	75	296
09:45	75	295
10:00	72	296

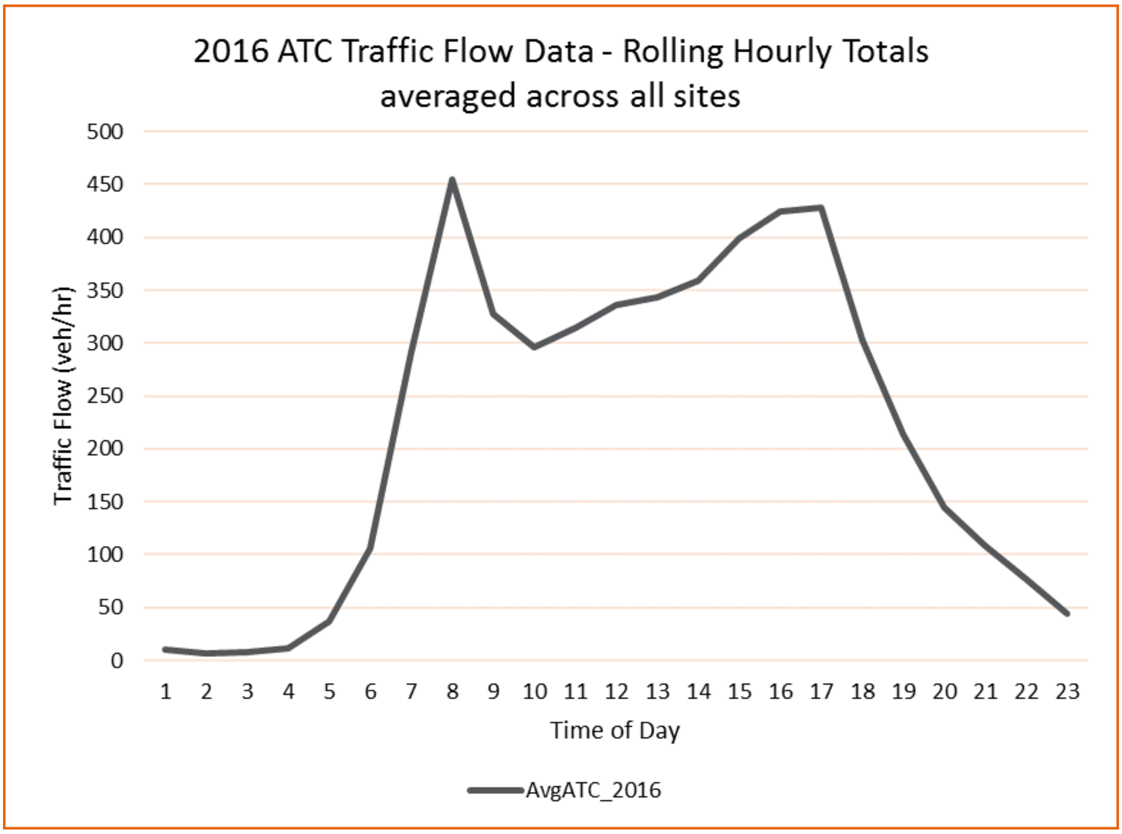
9.3.14 Table 9-7 presents the same data for the hours of 15:00 to 19:00.

Table 9-7 Derivation of PM Peak Hour Based on 2016 ATC Data

15-minute Starting Period	15-minute Average Across All Sites	Rolling Hourly Totals (vehs)
15:00	99	399
15:15	101	404
15:30	100	409
15:45	99	417
16:00	104	425
16:15	105	437
16:30	108	444
16:45	108	441
17:00	116	429
17:15	112	401
17:30	105	367
17:45	95	333
18:00	89	304
18:15	78	278
18:30	71	256
18:45	66	235
19:00	63	214

9.3.15 The average weekday profile based on the 2016 ATC data summary is shown in Figure 9-6.

Figure 9-6 Average Weekday Profile Based on 2016 ATC Data

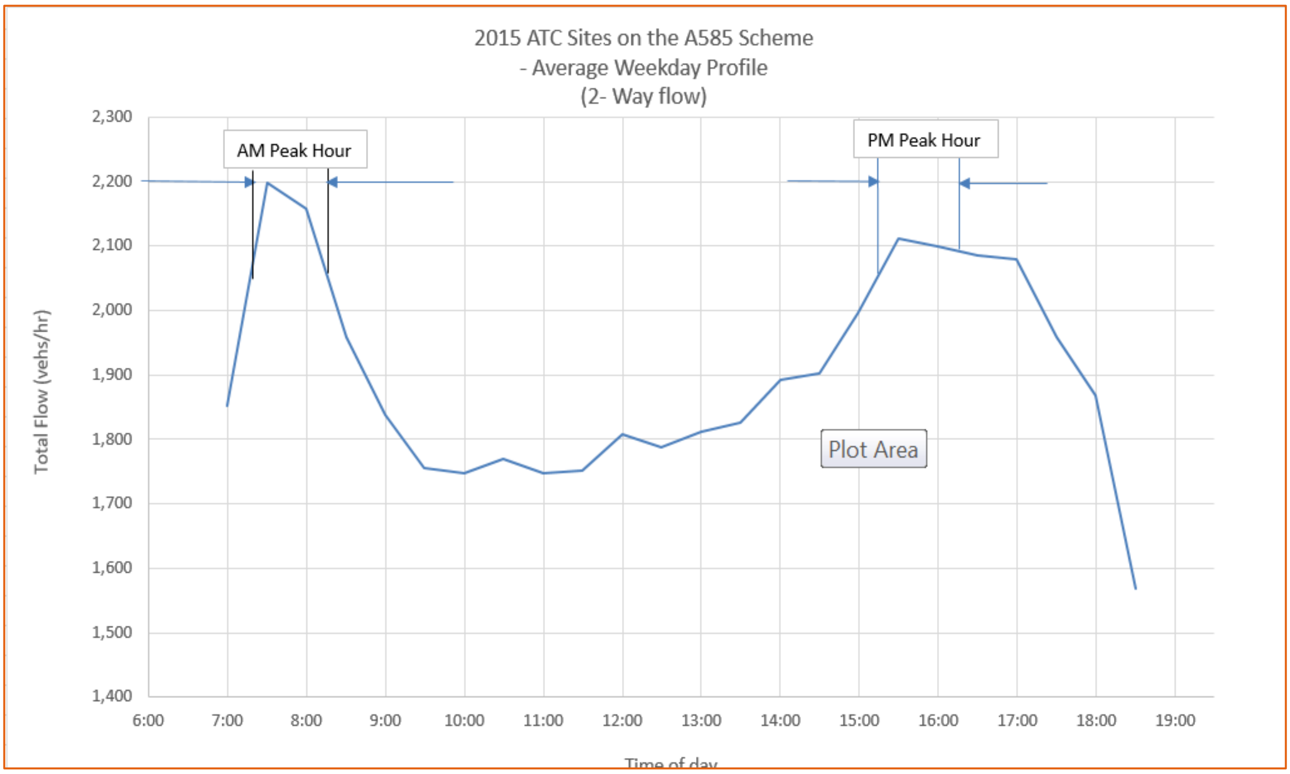


9.3.16 It can be seen that there is no significant difference between the AM and PM peak hours calculated for the 2015 and 2016 ATC data.

9.4 Peak Hour Derivation from A585 ATC Sites

9.4.1 In order to get a better understanding of the peak hours to be used in the study, the weekday ATC profile was plotted by time of the day for the two ATC sites along the A585 scheme; namely 2015ATC_01 and 2015ATC_02. This plot is shown in Figure 9-7.

Figure 9-7 Average Weekday Profile for A585 ATC Sites



9.4.2 As shown in Figure 9-7, the average weekday 2015 A585 ATC data suggests an AM peak hour of 07:30 to 08:30 and a PM peak hour of 15:15 to 16:15. These periods lie within the peak hours suggested by Highways England as listed in Chapter 9.3.14.

9.4.3 Therefore, the peak hours to be used in the model are confirmed as:

- AM peak - average hour between 07:30 and 09:30
- IP - average hour between 09:30 and 15:00
- PM peak - average hour between 15:00 and 18:00.

10 CLASSIFIED JUNCTION COUNT DATA ANALYSIS

10.1 Introduction and CJC Data Checks

10.1.1 Classified Junction Count (CJC) data was collected at 32 sites grouped into three areas, and in each area, counts were undertaken on two days in July 2015. A list of junctions where CJC data was collected is given in Table 5-4 and their locations are shown in Figure 5-3.

10.1.2 The data was collected at each junction by vehicle class for a continuous twelve-hour period (from 07:00 to 19:00) on a mid-week day (Tuesday, Wednesday or Thursday), with each movement summed by 15-minute period.

10.1.3 In order to process the CJC data, it was necessary to first identify any deficient data and exclude this data from the overall dataset to create a clean CJC data set. Three primary kinds of checks were therefore performed on the CJC data as follows:

- GEH check between CJCs (arm total entry flows) on two different days
- Comparison of CJCs (entry and exit flows) with nearby ATC data
- Comparison of CJCs (entry and exit flows) with nearby CJC data

10.1.4 The following sections describe these CJC checks in detail.

10.2 GEH Checks on CJC Data (Day 01 vs Day 02)

10.2.1 The GEH statistic is the form of a Chi-squared statistic that incorporates both relative and absolute errors and is calculated as follows:

$$GEH = \sqrt{\frac{(M-O)^2}{0.5\times(M+O)}}$$

Where *M* is the modelled flow and *O* is the observed flow.

10.2.2 The GEH was calculated for the CJC data in order to compare the variation between the two surveyed days at each CJC site. The GEH statistic was computed for entry arm totals on each approach to each CJC site.

10.2.3 Table 10-1 shows the Area 1 CJC sites along with their respective arms and time periods when the GEH is greater than 5.

Table 10-1 Area 1 CJC Sites where GEH > 5

Area 1 – CJC Sites – Comparison of CJC Data on 14/07/2015 & 15/07/2015								
Site	**Arm Name**	**No. of Instances Where GEH>5**	**Time of Occurrence (Start of 15-minute Period)**					
CJC2	A585 Fleetwood Road (N arm)	1	18:15					
CJC2	A585 Fleetwood Road (S arm)	6	09:45	10:30	17:45	18:15	18:30	18:45
CJC3	A586 Garstang Road (E arm)	2	14:45	18:30				
CJC3	A585 Fleetwood Road (S arm)	2	17:15	18:15				
CJC3	A585 Garstang New Road (W arm)	4	09:00	10:00	12:30	17:00		
CJC4	A585 Garstang New Road (E arm)	3	18:15	18:30	18:45			
CJC4	Lodge Lane (S arm)	1	11:15					
CJC4	A585 Mains Lane	2	12:30	13:00				

Area 1 – CJC Sites – Comparison of CJC Data on 14/07/2015 & 15/07/2015								
Site	Arm Name	No. of Instances Where GEH>5	Time of Occurrence (Start of 15-minute Period)					
CJC5	A585 Main Lane (E)	2	18:30	18:45				
CJC5	A585 Garstang New Road (W)	1	12:30					
CJC6	A585 – E arm	1	08:30					
CJC9	B5412 Victoria Road East	1	07:45					
CJC33	A583 Preston New Road (N)	1	13:30					
CJC33	M55 (E and W arm)	2	09:00	10:45				
CJC33	A583 Preston New Road (S)	2	08:15	09:00				

10.2.4 Based on the GEH comparison shown in Table 10-1 it is clear that within Area 1, there are very few instances where the CJC counts vary significantly across the two days. The majority of the instances occur on the A585 Fleetwood Road south arm at CJC2.

10.2.5 Table 10-2 shows the Area 2 CJC sites along with their respective arms and time periods when the GEH is greater than 5.

Table 10-2 Area 2 CJC Sites Where GEH > 5

Area 2 – CJC Sites – Comparison of CJC data on 15/07/2015 & 16/07/2015					
Site	Arm Name	No. of Instances Where GEH>5	Time of Occurrence (Start of 15-Minute Period)		
CJC12	Garstang Road E EB	2	17:15	17:45	
CJC16	St Walburga's Rd NB	1	07:00		
CJC16	Westcliffe Drive	2	07:00	07:15	
CJC18	Devonshire Road	2	18:00	18:15	
CJC18	Devonshire Road SB	3	17:45	11:30	13:15
CJC18	Bispham Road NB	1	18:00		
CJC19	Russell Avenue EB	2	18:30	18:45	
CJC21	Victoria Road W WB	1	15:15		
CJC22	Warren Drive NB	2	17:15	17:30	
CJC22	Warren Drive EB	2	17:30		
CJC22	White Carr Lane SB	1	11:45	17:30	

10.2.6 Based on the Area 2 GEH comparison shown in Table 10-2 there are very few instances where the GEH is greater than 5, indicating that very few sites show a significant variation between the CJC counts collected on the two different survey days. Table 10-3 shows the Area 3 CJC sites along with their respective arms and time periods when the GEH is greater than 5.

Table 10-3 Area 3 CJC Sites Where GEH > 5

Area 3 – CJC Sites – Comparison of CJC Data on 08/07/2015 & 09/07/2015							
Site	**Arm Name**	**No. of Instances Where GEH>5**	**Time of Occurrence (Start of 15-Minute Period)**				
CJC24	Rossall Lane EB	2	10:30	11:00			
CJC26	Broadway NB	26	***				
CJC26	Chatsworth Avenue EB	9					
CJC26	Grange Road EB	36					
CJC26	Beech Road SB	3	11:45	16:15	17:00		
CJC26	Broadway SB	2	07:45	12:45			
CJC26	Hatfield Avenue WB	8	***				
CJC26	Fleetwood Road NB	4	12:45	13:15	13:30	16:45	
CJC27	Amounderness Way NB	1	13:15				
CJC29	Fleetwood Road N SB	4	09:15	11:45	12:45	13:00	18:15

*** In site 26 the number of instances are high in number and scattered throughout the day.

10.2.7 Based on the results shown in Table 10-3, with the exception of Site 26, Area 3 CJC sites have a limited number of occurrences where the GEH is greater than 5. CJC Site 26 data seems to have significant issues based on the GEH check and there are several time periods during the day when the GEH for this site is greater than 5. On further investigation, it was found that the raw data provided by the survey company had some arm name labelling inconsistencies. These were corrected based on a comparison of the data from both survey days.

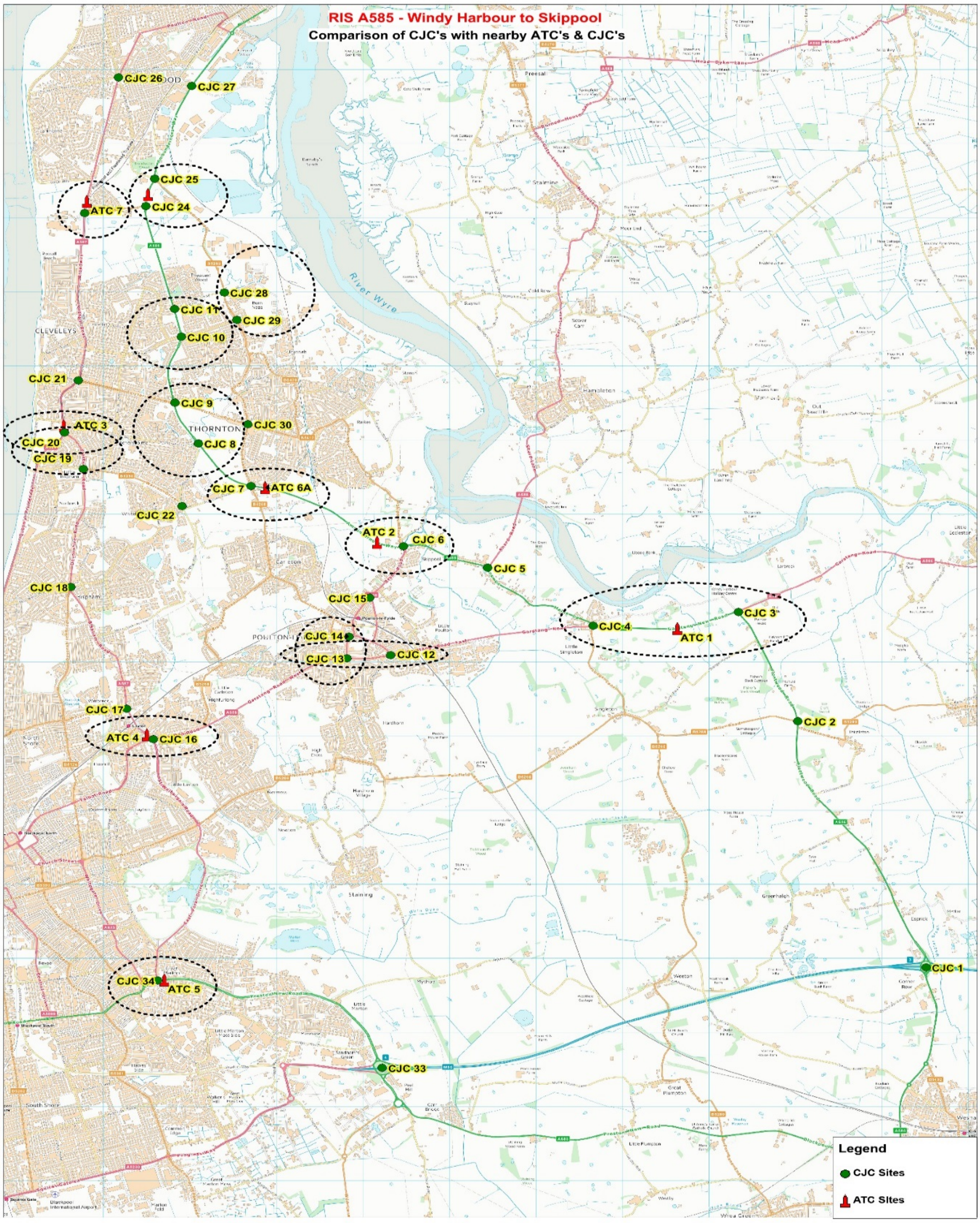
10.3 Comparison of CJCs with ATC Data

10.3.1 Further to the GEH checks, the CJC data at each site (entry and exit flow) was compared to nearby ATC data for each of the days that the CJC data was collected. Based on the location of the ATC and CJC sites, the following CJCs are identified along with the nearby ATCs with which the entry and exit flows have been compared.

- CJC at Site 3 and Site 4 is compared with ATC at Site 1
- CJC at Site 6 is compared with ATC at Site 2
- CJC at Site 7 is compared with ATC at Site 6A
- CJC at Site 16 is compared with ATC at Site 4
- CJC at Site 20 is compared with ATC at Site 3
- CJC at Site 23 is compared with ATC at Site 7
- CJC at Site 34 is compared with ATC at Site 5

10.3.2 Where ATC data was not available, existing CJC data was used to compare against the CJC data collected, as described in Section 10.4. Figure 10-1 shows the location of the CJC and ATC sites used for comparison. Importantly, these checks cover the key corridors in the study area, and provide reassurance that some of the most important traffic data to be used in the calibration and validation process is robust.

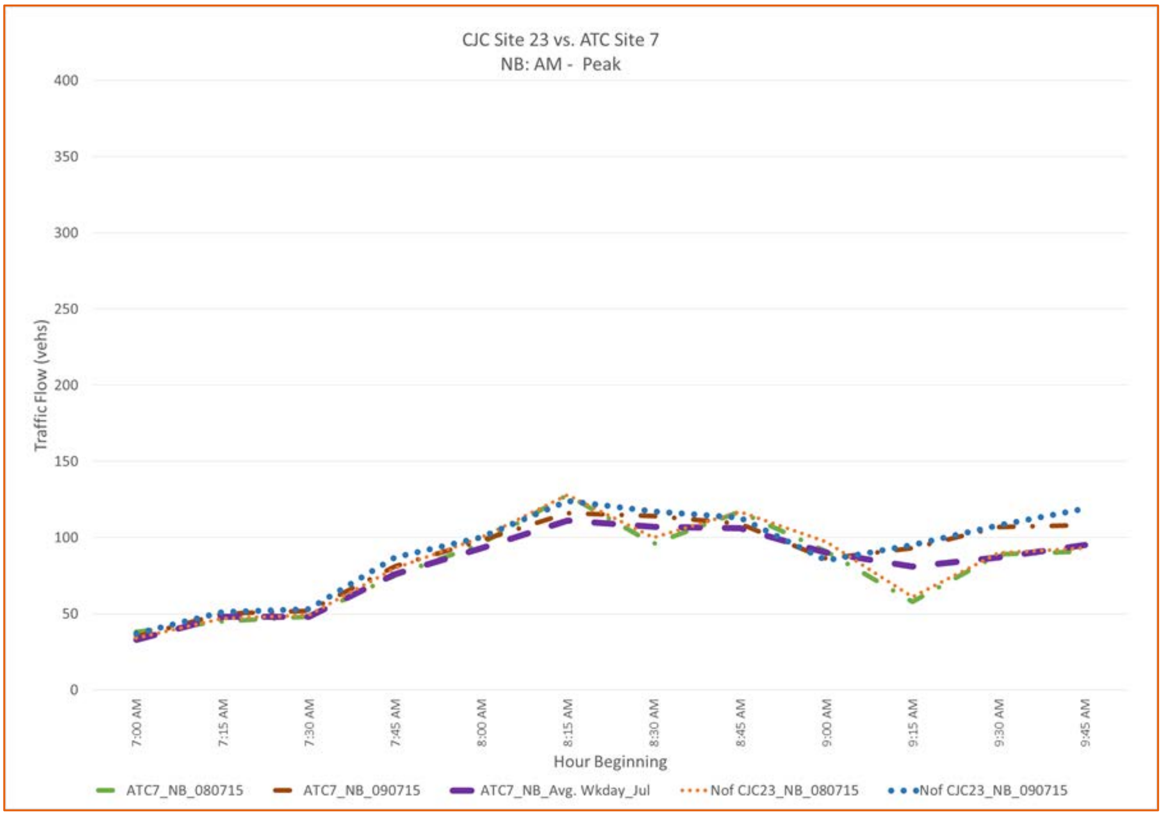
Figure 10-1 Comparison of CJCs with Nearby CJCs & ATCs



Source: OS data © Crown copyright 2015; Licence – Version 3 of Open Govt. Licence (OGL)

10.3.3 Figure 10-2 provides a plot comparing the northbound exit flow at CJC Site 23 versus the northbound entry flow at ATC Site 7 between 07:00 and 10:00 as an example.

Figure 10-2 CJC at Site 23 vs. ATC at Site 7 – NB AM Peak



10.3.4 It can be seen that the exit flows from CJC Site 23 match very closely with the entry flows at ATC Site 7 in the northbound direction on both CJC survey days. Appendix K provides plots which show the CJC versus ATC comparisons at all sites. A review of the plots in Appendix K indicates that in most cases, the general trend of entry and exit flows versus time of day from a junction count matches closely with the profile of the adjacent ATC. However, there are some instances for example at CJC Site 34 where the CJC and ATC profile follow a similar trend, but are slightly displaced.

10.3.5 GEH tests were also carried out to understand the variance between the CJC counts and relevant ATC counts.

10.3.6 Table 10-4 shows the instances where the CJC versus ATC comparison shows a GEH greater than 5.

Table 10-4 GEH Checks – CJC Data Versus Nearby ATC Data

Count Comparison	Remarks	EB/NB		WB/SB	
		14/07/2015	**15/07/2015**	**14/07/2015**	**15/07/2015**
ATC 1 (vs) CJC 3	Negligible traffic leakage	-	-	-	-
ATC 1 (vs) CJC 4	Negligible traffic leakage	-	-	-	2 (18:15, 18:45)
ATC 2 (vs) CJC 6	One local road leakage point	-	1 (17:15)	-	-
Count Comparison	**Remarks**	**15/07/2015**	**16/07/2015**	**15/07/2015**	**16/07/2015**
ATC 3 (vs) CJC 20	One local road leakage point	-	-	-	-
ATC 4 (vs) CJC 16	Traffic Leakage occurs between CJC 16 and ATC 4. Large driveway (Mowbray Drive) to an industrial area is present	5 (07:00, 07:15, 07:30, 09:00, 13:00)	4 (07:00, 07:15, 08:45, 10:00)	4 (07:00, 07:15, 07:30, 08:15)	3 (07:15, 07:30, 10:00)
ATC 5 (vs) CJC 34	Negligible traffic leakage	-	-	1 (08:00)	-
Count Comparison	**Remarks**	**14/07/2015**	**15/07/2015**	**14/07/2015**	**15/07/2015**
ATC 6A (vs) CJC 7	Negligible traffic leakage	-	1 (16:00)	-	-
Count Comparison	**Remarks**	**07/08/2015**	**07/09/2015**	**07/08/2015**	**07/09/2015**
ATC 7 (vs) CJC 23	Negligible traffic leakage	-	-	-	-

10.3.7 Based on the GEH checks reported in Table 10-4 and the plots provided in Appendix K, it is observed that at the majority of comparison locations, negligible traffic leakage occurs between the two counts as a result of there being only a small number of entry/egress points between the two locations.

10.3.8 There are very few occurrences where the entry and exit flows from a CJC vary significantly from the nearby ATC count. One notable exception is at CJC Site 4, where there are several occurrences in the AM peak hour. This could be a result of traffic exiting from CJC Site 16 and heading northbound and potentially turning right onto Mowbray Drive, thus resulting in flow imbalances between the CJC exit and the ATC count.

10.3.9 For those CJC sites which are not in the proximity of any ATC sites, further checks and comparisons were made between CJC data and nearby CJC data as reported in Section 10.4.

10.4 Comparison of CJCs with Nearby CJCs

10.4.1 It is noted that not all CJC sites are located near an ATC site. For those CJC sites which are not in the proximity of any ATC sites, further checks and comparisons were made between the CJC data and any other nearby CJC data to determine if any significant deficiencies exist in the CJC data.

10.4.2 The following CJC pairs were identified with which to compare entry and exit flows:

- CJC Site 3 and CJC Site 4
- CJC Site 8 and CJC Site 9
- CJC Site 10 and CJC Site 11

- CJC Site 12 and CJC Site 13
- CJC Site 12 and CJC Site 14
- CJC Site 19 and CJC Site 20
- CJC Site 24 and CJC Site 25
- CJC Site 28 and CJC Site 29

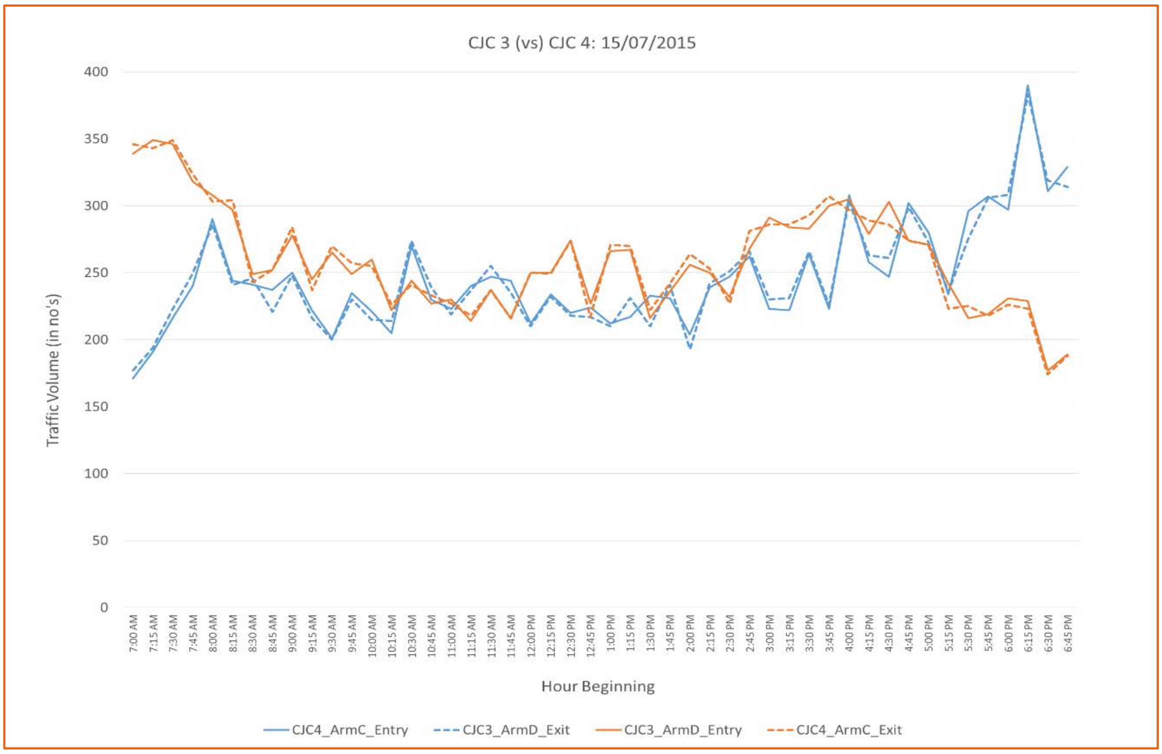
10.4.3 Table 10-5 shows the observations inferred from the comparison of CJC data with data obtained from nearby CJC sites. A broad level inspection of the CJC sites indicates the possibility of traffic leakage into residential areas between some CJC pairs.

Table 10-5 Comparison of CJC Site Data with Nearby CJCs

CJC Site	CJC Site	Remarks	Possible Explanations
3	4	Good match	
8	9	Good match	
10	11	Good match	
12	13	Some leakages observed	Traffic leakage into residential areas
13	14	Slight leakages observed	Traffic leakage into residential areas & market
19	20	Displaced plots on both days	Traffic leakage into residential areas
24	25	Good match	
28	29	Some leakages observed	Traffic leakage into residential areas

10.4.4 Figure 10-3 shows the comparison between CJC at Site 3 and CJC at Site 4 based on counts collected on 15th July 2015. A full set of plots showing the comparisons between other CJC site pairs is provided in Appendix L.

Figure 10-3 CJC at Site 3 vs. CJC at Site 4 – Comparison on 15/07/2015



10.4.5 As shown in Figure 10-3, the entry and exit flows between the CJCs at Sites 3 and 4 match very closely with each other. Given that Site 3 and Site 4 are key junctions in the immediate vicinity of the scheme improvement, the above plot indicates the robustness of the CJC data on 15 July 2015.

10.4.6 Based on all the CJC data checks and comparisons described in this chapter (i.e. GEH checks, CJC vs. ATC comparison and CJC vs. CJC comparison), a decision was taken regarding which CJC data points to use for further analysis and which CJC points to exclude. Table 10-6 shows the CJC data that will be taken forward for modelling purposes for CJC Area 1 along with any relevant remarks and observations on the datasets.

Table 10-6 Area 1 CJC Data to Use in Model Development

Area 1 CJCs – Data Collected on 14/07/2015 & 15/07/2015		
CJC Site No.	**Data to Use**	**Remarks**
1	Average of both days	No issues with the data
2	Use 15/07/2015 data	Data on 15/07/2016 matches much more closely to the adjacent ATC data
3	Use 15/07/2015 data	
4	Use 15/07/2015 data	Exclude 18:15 and 18:45pm data
5	Average of both days	Exclude 18:30 and 18:45 data
6	Average of both days	Exclude 16:00 and 17:15 data on 15/07/2015 Exclude PM peak EB entry on 15/07/2015
7	Average of both days	Exclude 16:00 data on 15/07/2015
8	Average of both days	No issues with the data
9	Average of both days	
10	Use 15/07/2015 data	CJC at Site 10 matches exactly with CJC at Site 11 on 15/07/2015
11	Use 15/07/2015 data	
33	Average of both days	No issues with the data

10.4.7 Table 10-7 shows the CJC data that will be taken forward for modelling for Area 2 CJC sites.

Table 10-7 Area 2 CJC Data to Use in Model Development

Area 2 CJCs – Data Collected on 15/07/2015 & 16/07/2015		
CJC Site No.	**Data to Use**	**Remarks**
12	Use 15/07/2015 data	Only PM peak data available on 16/07/2015
13	Use 15/07/2015 data	
14	Use 15/07/2015 data	
15	Use 15/07/2015 data	
16	Average of both days	No issues with the data
17	Average of both days	
18	For 17:45 to 18:45 use 15/07/2015 data Rest of day – average of both days	Some missing data points, but otherwise no issues
19	Average of both days	No issues with the data
20	Average of both days	
21	Average of both days	
22	For 16:00 to 19:00 use 15/07/2015 data Rest of day – average of both days	Some missing data points, but otherwise no issues
34	Use 15/07/2015 data	No AM peak data available on 16/07/2015

10.4.8 Table 10-8 shows the CJC data to take forward for modelling for Area 3 CJC sites.

Table 10-8 Area 3 CJC Data to Use in Model Development

Area 3 CJCs – Data Collected on 08/07/2015 & 09/07/2015		
CJC Site No.	**Data to Use**	**Remarks**
23	Average of both days	No issues with the data on any date
24	Use 09/07/2015 data	Entry and exit flows between these CJCs show very good flow conservation based on 09/07/2016 data
25	Use 09/07/2015 data	
26	Average of both days	No issues with the data on any date
27	Average of both days	No issues with the data on any date
28	Average of both days	No issues with the data on any date
29	Average of both days	No issues with the data on any date
30	Average of both days	No issues with the data on any date

10.5 Analysis of CJC Data

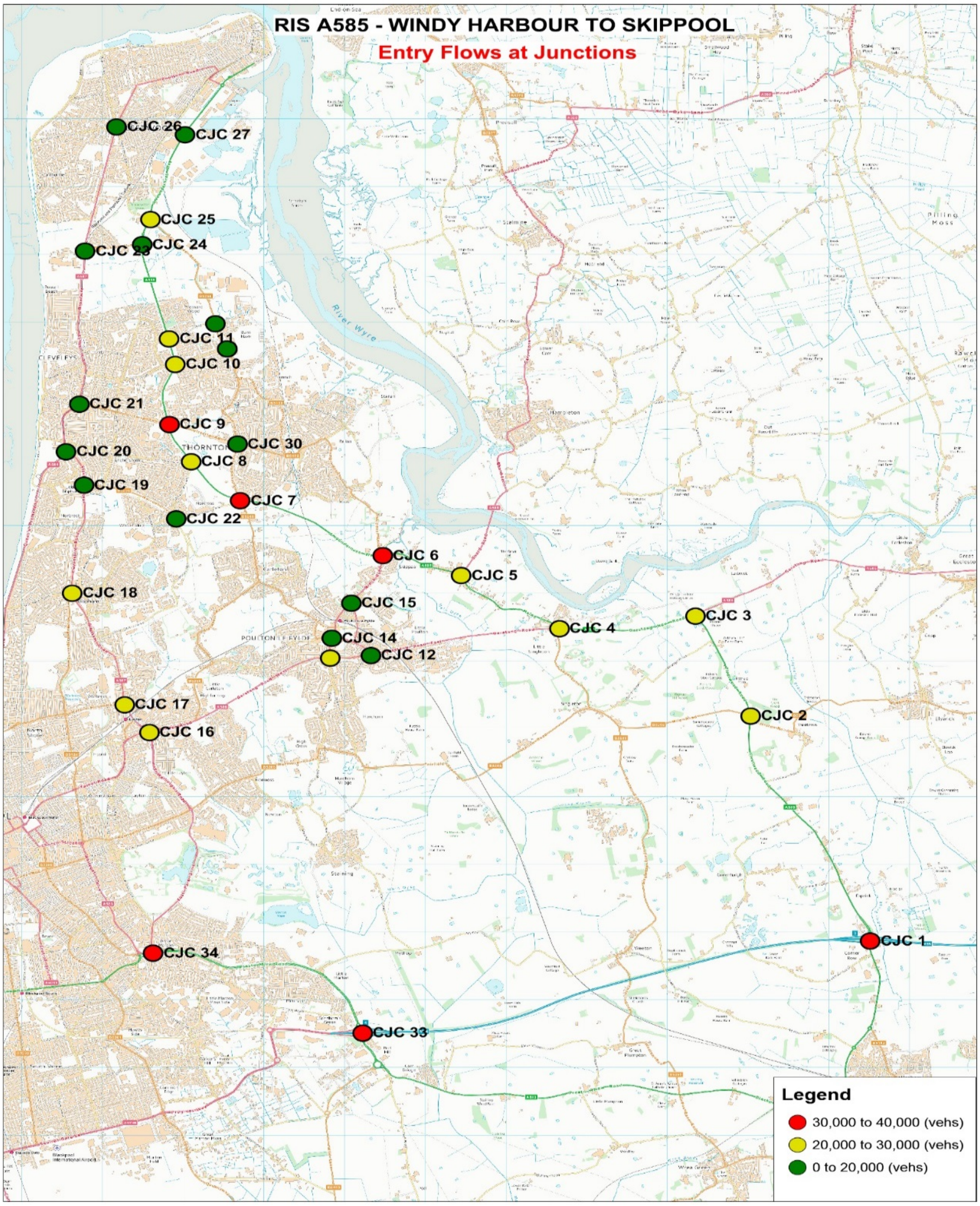
10.5.1 The entry flows were prepared from the CJC data set after removing any deficient points and infilling either based on an adjacent ATC or using another survey day. Table 10-9 shows the entry flows (totals) at all CJC sites for the 12-hour (07:00-19:00) period, which are illustrated in Figure 10-4.

Table 10-9 Total Entry Flows at CJC Sites

Site No.	Site Location	Total Entry Flows (Vehs) 07:00-19:00
1	M55 Junction 3 roundabout with A585	31,138
2	A585 Fleetwood Road/Mile Road/Thistleton Road staggered 4-arm priority junction	22,596
3	A585 Garstang New Road/Windy Harbour Road/A585 Garstang Road/A585 Fleetwood Road traffic signals	27,112
4	A585 Mains Lane/Pool Foot Lane/A585 Garstang New Road/Lodge Lane/A586 Garstang Road traffic signals	24,263
5	A585 Mains Lane/A588 Shard Road traffic signals	20,448
6	A585 Amounderness Way/Skippool Road/A585 Mains Lane/Breck Road roundabout	36,692
7	A585 Amounderness Way/Fleetwood Road South/Norcross Lane roundabout	39,533
8	A585 Amounderness Way/Anchorsholme Lane priority junction	27,286
9	A585 Amounderness Way/Victoria Road East/Supermarket Access/Victoria Road West roundabout	39,125
10	A585 Amounderness Way/West Drive traffic signals	26,175
11	A585 Amounderness Way/Bourne Way priority junction	20,188
12	A586 Garstang Road East/Lower Green traffic signals	17,884
13	A586 Garstang Road W/Hardhorn Lane/A585 Garstang Road East traffic signals	22,303
14	A583 Hardhorn Road/B5267 Blackpool Old Road/A583 Queen’s Square	12,797
15	A588 Breck Road/Station Road/Parrys Way	11,992
16	A587 Plymouth Road/A586 Poulton Road/A587 St Walburga’s Road/A586 Westcliffe Drive	29,415
17	A587 Bispham Road/Holyoake Avenue/A587 Plymouth Road/Warbreck Hill Road	27,065
18	A587 Bispham Rd/A587 Devonshire Road/B5124 Devonshire Road/Ingthorpe Avenue/Red Bank Road	25,581
19	A587 Fleetwood Road/Russell Avenue/Warren Drive	17,050
20	A587 Fleetwood Road/Queen’s Promenade/Kelso Avenue	17,125
21	Crescent East/Crescent West/Rossall Road/Brighton Avenue/Victoria Road West	18,665
22	Warren Drive/White Carr Lane	11,653
23	A587 Broadway/Rossall Lane	13,108
24	A585/Rossall Lane	19,781
25	A585/Fleetwood Road	27,330
26	A587 Broadway/Fleetwood Road/Beach Road/Chatsworth Avenue/Hatfield Avenue/Grange Road	19,445
27	A585/Denham Way/Herring Arm Road	16,948

Site No.	Site Location	Total Entry Flows (Vehs) 07:00-19:00
28	B5268 Fleetwood Road North/Bourne Way/Bourne Road	11,361
29	B5268 Fleetwood Road North/West Drive	11,358
30	B5268 Fleetwood Road South/B5268 Fleetwood Road North/Victoria Road East	18,731
33	M55 Junction 4 with A583 Preston New Road	35,099
34	A583 Preston New Road/A587 East Park Drive	32,313

Figure 10-4 Entry Flows at Junctions (07:00 to 19:00)



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11 QUEUE LENGTH SURVEY ANALYSIS

11.1 Introduction

11.1.1 Queue length surveys were carried out at 32 junctions within the study area on two consecutive days, as set out in Section 5.3.7 and as shown in Table 5-1.

11.1.2 The data was collected at each junction for a continuous 12-hour period (from 07:00 to 19:00) on a mid-week day (Tuesday, Wednesday or Thursday). The queue lengths were measured (by video recording) as the maximum length of the vehicle queue (number of vehicles) present at a signalised junction when the signal for that arm turned green. Queue lengths were recorded in five minute intervals.

11.1.3 Queue lengths were measured by the number of vehicles in the queue and the length of the queue was calculated in metres using the following measurement values: Car/LGV = 5m; OGV1 = 10m; and Bus/OGV2 = 15m.

11.1.4 This section sets out how the queue length data was processed and analysed.

11.2 Queue Length Data Processing

11.2.1 The queue length data collection sites and survey dates are shown in Table 11-1. At some sites, some of the queue length data was found to be missing; however, following a review it was determined that sufficient data was available at each site for model development.

Table 11-1 Queue Length Survey Data

Area	Site	Arm	Survey Dates
Area 1	2015CJC_01	A585 Fleetwood Road (North Arm)	14 & 15 July 2015
	2015CJC_01	M55 Slip Road (East Arm)	
	2015CJC_01	A585 Fleetwood Road (South Arm)	
	2015CJC_01	M55 Slip Road (West Arm)	
	2015CJC_02	A585 Fleetwood Road (North Arm)	
	2015CJC_02	B5269 Thistleton Road	
	2015CJC_02	A585 Fleetwood Road (South Arm)	
	2015CJC_02	B5269 Mile Road	
	2015CJC_03	Windy Harbour Road	
	2015CJC_03	A586 Garstang Road	
	2015CJC_03	A585 Fleetwood Road	
	2015CJC_03	A585 Garstang New Road	
	2015CJC_04	A585 Mains Lane	
	2015CJC_04	Pool Foot Lane	
	2015CJC_04	A585 Garstang New Road	
	2015CJC_04	Lodge Lane	
	2015CJC_04	A586 Garstang Road	
	2015CJC_05	A588 Shard Road	
	2015CJC_05	A585 Mains Lane (SE Arm)	
	2015CJC_05	A585 Mains Lane (NW Arm)	
	2015CJC_06	B5412 Skippool Road	
	2015CJC_06	A585 Mains Lane	
	2015CJC_06	Breck Road	
	2015CJC_06	A585 Amounderness Way	

Area	Site	Arm	Survey Dates
	2015CJC_07	B5268 Fleetwood Road South (North Arm)	
	2015CJC_07	A585 Amounderness Way (East Arm)	
	2015CJC_07	B5268 Fleetwood Road South (South Arm)	
	2015CJC_07	Norcross Lane	
	2015CJC_07	A585 Amounderness Way (West Arm)	
	2015CJC_08	A585 Amounderness Way (NW Arm)	
	2015CJC_08	A585 Amounderness Way (SE Arm)	
	2015CJC_08	Anchorsholme Lane	
	2015CJC_09	A585 Amounderness Way (NW Arm)	
	2015CJC_09	B5412 Victoria Road East	
	2015CJC_09	A585 Amounderness Way (South Arm)	
	2015CJC_09	Morrison's Access/Superstore	
	2015CJC_09	B5412 Victoria Road West	
	2015CJC_10	A585 Amounderness Way (North Arm)	
	2015CJC_10	West Drive (East Arm)	
	2015CJC_10	A585 Amounderness Way (South Arm)	
	2015CJC_10	West Drive (West Arm)	
	2015CJC_11	A585 Amounderness Way (North Arm)	
	2015CJC_11	Bourne Way	
	2015CJC_11	A585 Amounderness Way (South Arm)	
	2015CJC_33	Preston New Road (North Arm)	
	2015CJC_33	M55 Slip Road (East Arm)	
	2015CJC_33	Preston New Road (South Arm)	
	2015CJC_33	M55 Slip Road (West Arm)	
Area 2	2015CJC_12	A586 Garstang Road East (East)	15 & 16 July 2015
	2015CJC_12	A586 Garstang Road East (West)	
	2015CJC_12	Lower Green	
	2015CJC_13	Hardhorn Road (North)	
	2015CJC_13	A586 Garstang Road East	
	2015CJC_13	Hardhorn Road (South)	
	2015CJC_13	A586 Garstang Road West	
	2015CJC_14	Hardhorn Road	
	2015CJC_14	Blackpool Old Road	
	2015CJC_15	Breck Road (North)	
	2015CJC_15	Station Road	
	2015CJC_15	Breck Road (South)	
	2015CJC_15	Parrys Way	
	2015CJC_16	Poulton Road	
	2015CJC_16	St Walburga's Road	
	2015CJC_16	Westcliffe Drive	
	2015CJC_16	Plymouth Road	
	2015CJC_16	Carleton Avenue	

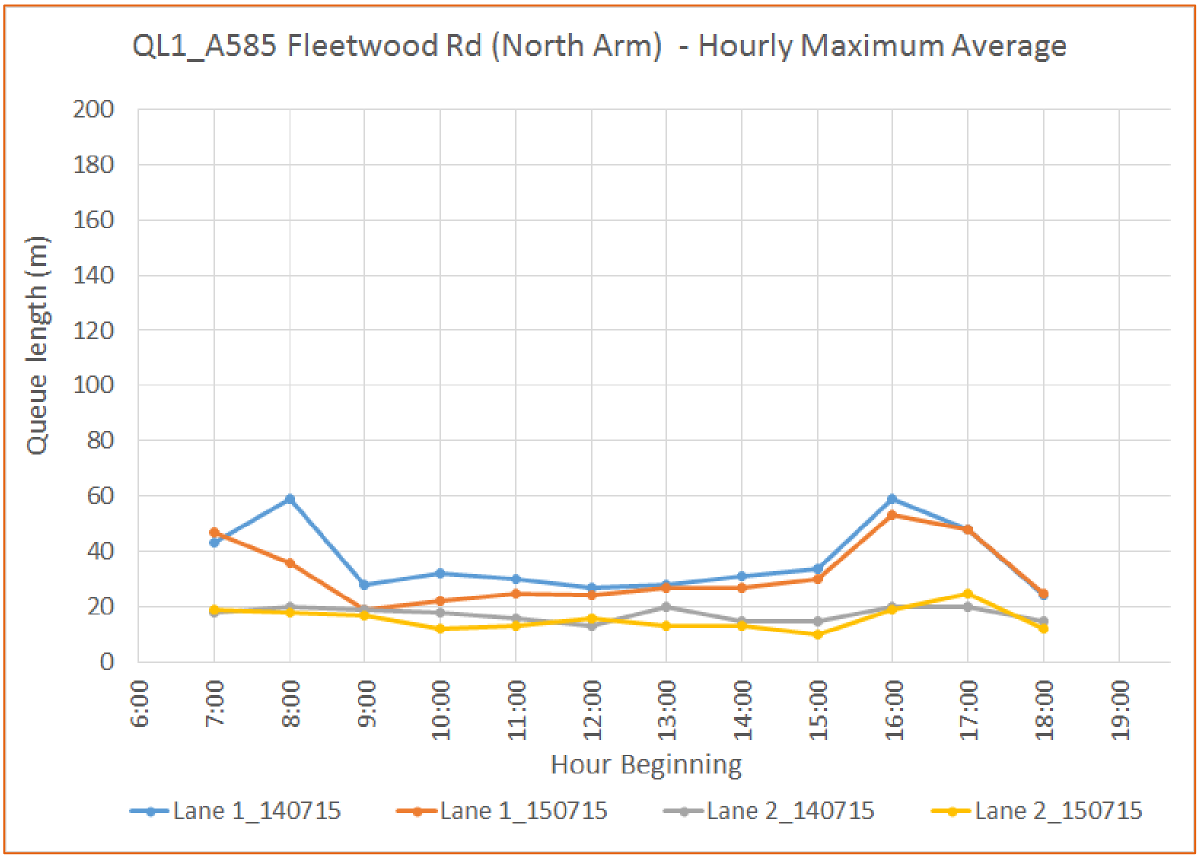
Area	Site	Arm	Survey Dates
	2015CJC_17	Bispham Road	
	2015CJC_17	Holyoake Avenue	
	2015CJC_17	Plymouth Road	
	2015CJC_17	Warbreck Hill Road	
	2015CJC_18	Devonshire Rd (North)	
	2015CJC_18	Red Bank Road (East)	
	2015CJC_18	Bispham Road	
	2015CJC_18	Devonshire Road (South)	
	2015CJC_18	Red Bank Road (West)	
	2015CJC_19	A587 Fleetwood Road (North)	
	2015CJC_19	Warren Drive	
	2015CJC_19	A587 Fleetwood Road (South)	
	2015CJC_19	Russell Avenue	
	2015CJC_20	Kelso Avenue	
	2015CJC_20	Fleetwood Road (East)	
	2015CJC_20	Queen's Promenade	
	2015CJC_21	Brighton Avenue	
	2015CJC_21	Victoria Road West (East)	
	2015CJC_21	Crescent West	
	2015CJC_22	White Carr Lane	
	2015CJC_22	Warren Drive (South)	
	2015CJC_22	Warren Drive (North)	
	2015CJC_34	S Park Drive	
	2015CJC_34	Preston New Road (East)	
	2015CJC_34	Preston New Road (West)	
Area 3	2015CJC_23	A587 Broadway (North Arm)	8 & 9 July 2015
	2015CJC_23	Rossall Lane (East Arm)	
	2015CJC_23	A587 Broadway (South Arm)	
	2015CJC_23	Rossall Lane (West Arm)	
	2015CJC_24	A585 Amounderness Way (North Arm)	
	2015CJC_24	A585 Amounderness Way (South Arm)	
	2015CJC_24	Rossall Lane	
	2015CJC_25	A585 Amounderness (NE Arm)	
	2015CJC_25	Fleetwood Road (SE Arm)	
	2015CJC_25	A585 Amounderness (SW Arm)	
	2015CJC_25	Fleetwood Road (NW Arm)	
	2015CJC_26	Grange Road	
	2015CJC_26	Beech Road	
	2015CJC_26	Broadway (NE Arm)	
	2015CJC_26	Hatfield Road	
	2015CJC_26	Fleetwood Road	
	2015CJC_26	Broadway (SW Arm)	
	2015CJC_26	Chatsworth Avenue	

Area	Site	Arm	Survey Dates
	2015CJC_27	A585 (NE Arm)	
	2015CJC_27	Herringham Road	
	2015CJC_27	A585 (SW Arm)	
	2015CJC_27	Denham Way	
	2015CJC_28	B5268 Fleetwood Road North (North Arm)	
	2015CJC_28	Bourne Road	
	2015CJC_28	B5268 Fleetwood Road North (South Arm)	
	2015CJC_28	Bourne Way	
	2015CJC_29	B5268 Fleetwood Road North (NW Arm)	
	2015CJC_29	B5268 Fleetwood Road North (SE Arm)	
	2015CJC_29	West Drive	
	2015CJC_30	B5268 Fleetwood Road North	
	2015CJC_30	Victoria Road East (East Arm)	
	2015CJC_30	B5268 Fleetwood Road South	
	2015CJC_30	Victoria Road East (West Arm)	

11.2.2 The average maximum queue lengths in metres for each hour were plotted for each lane on each arm at each junction for the respective survey dates

11.2.3 Figure 11-1 shows a typical queue profile plot, showing the average maximum queue length on the A585 Fleetwood Road North Arm for each hour from 07:00 to 19:00.

Figure 11-1 Hourly Average Maximum Queue Length



11.2.4 The other average maximum queue length plots for sites on the A585 are shown in Appendix M. The average maximum queue length plots for the remainder of the sites in the study area are shown in Appendix N.

11.2.5 The locations where significant queues were observed (arbitrarily defined as an hourly average of 75m or more) are shown in Table 11-2.

Table 11-2 Locations with Average Maximum Queue Lengths >75m

Area	Site	Arm	Lane	Date	AM	PM
1	QL1	A585 Fleetwood Road (South Arm)	2	15/07/15		17:00
	QL3	A585 Fleetwood Road	1	15/07/15		16:00-18:00
		A585 Garstang New Road	2	15/07/15		16:00
	QL4	A585 Mains Lane	1	14/07/15	07:00-10:00	16:00-17:00
		A585 Mains Lane	1	15/07/15	07:00-10:00	16:00-17:00
		A585 Garstang New Road	2	14/07/15	08:00	16:00 -18:00
		A585 Garstang New Road	2	15/07/15	07:00-10:00	16:00-18:00
		Lodge Lane	1	14/07/15		16:00-17:00
		A586 Garstang Road	1	14/07/15	08:00	
		A586 Garstang Road	1	15/07/15		16:00
	QL5	A588 Shard Road	2	15/07/15	07:00-9:00	17:00
		A585 Mains Lane (South East Arm)	1	15/07/15	07:00-10:00	16:00-18:00
		A585 Mains Lane (North West Arm)	2	15/07/15	07:00-10:00	16:00-17:00
	QL6	A585 Amounderness Way	1	15/07/15		16:00
	QL7	A585 Amounderness Way (East Arm)	1	15/07/15		16:00
		A585 Amounderness Way (West Arm)	1	15/07/15	08:00	
	QL9	A585 Amounderness Way (North West Arm)	1	14/07/15		17:00
		A585 Amounderness Way (North West Arm)	1	15/07/15		16:00-18:00
	QL10	A585 Amounderness Way (North Arm)	1	14/07/15		16:00
		A585 Amounderness Way (North Arm)	2	15/07/15	08:00	16:00
		A585 Amounderness Way (South Arm)	1	14/07/15		16:00-17:00
		A585 Amounderness Way (South Arm)	2	15/07/15	08:00-10:00	16:00-18:00
2	QL12	A586 Garstang Road East West	1	15/07/15	08:00	
	QL13	A586 Garstang Road East	1	15/07/15	08:00	16:00-17:00
		Hardhorn Road South	1	16/07/15		16:00-17:00
	QL14	Hardhorn Road	1	16/07/15		16:00-17:00
		Blackpool Old Road	1	15/07/15		17:00
		Blackpool Old Road	1	16/07/15		16:00-17:00
		Blackpool Old Road	2	15/07/15		17:00
	QL15	Breck Road South	1	16/07/15		17:00
	QL16	St Walburga's Road	1	15/07/15		16:00-17:00
			1	16/07/15		16:00-18:00
			2	15/07/15		16:00-17:00
			2	16/07/15		16:00-17:00
		Westcliffe Drive	1	16/07/15		16:00-17:00
	QL17	Bispham Road	1	15/07/15	08:00	17:00
		Bispham Road	1	16/07/15	08:00-10:00	16:00
		Plymouth Road	2	15/07/15	08:00	16:00-18:00
		Plymouth Road	2	16/07/15	08:00-10:00	16:00-18:00
	QL19	A587 Fleetwood Road North	1	16/07/15	08:00	
		Warren Drive	1	16/07/15	08:00	17:00

Area	Site	Arm	Lane	Date	AM	PM
	QL21	Victoria Road West East	2	15/07/15	10:00	
		Crescent West	1	15/07/15		16:00-17:00
		Crescent West	1	16/07/15	10:00	16:00-17:00
	QL34	Preston New Road East	3	15/07/15	08:00	16:00-17:00
		Preston New Road East	3	16/07/15		16:00-17:00
3	QL23	A587 Broadway (South Arm)	1	08/7/15		16:00-17:00
		A587 Broadway (South Arm)	1	09/7/15		16:00-17:00
	QL28	B5268 Fleetwood Road North (North Arm)	1	09/7/15		16:00
	QL29	B5268 Fleetwood Road North (South East Arm)	1	08/7/15	09:00	
	QL30	B5268 Fleetwood Road South	1	09/7/15		16:00

11.2.6 The average maximum queue lengths will be used to validate the operational assessment (micro-simulation) model by comparing them against modelled queues at these junctions. The observed queue lengths may also be used for identifying blocking back characteristics during assignment and validation of the SATURN model.

12 GROWTH FACTORS AND SEASONALITY FACTORS

12.1 The Need to Derive Growth Factors

12.1.1 For traffic modelling purposes, it is necessary to convert any available traffic data (either from recent counts or any previously collected data) to the model base year, which in this case is June 2015. The conversion factors used for this are referred to as seasonality factors.

12.1.2 In order to derive seasonality factors for any traffic count, two kinds of factors need to be derived; namely Yearly Growth Factors (YGFs) and Monthly Seasonality Factors (MSFs). A detailed description of these factors and how they are proposed to be used was provided to Highways England in a Technical Note (HE548643-HYD-GEN-A585-TN-TR1034) submitted on 11th May 2016. This chapter summarises the methodology presented in Technical Note 34.

12.2 Yearly Growth Factors (YGFs)

12.2.1 YGFs provide an indication of how traffic volume patterns change (for the same month) across different years. For example, assuming we have the AADT (Annual Average Day Traffic) flows for 2011 and 2015, the YGF for Year 2011 can be calculated as follows:

$$YGF_{2011} = AADT_{2015} / AADT_{2011}$$

12.2.2 YGFs were calculated for count sites located on motorways, A roads, B roads and C roads for 2008 to 2016, as shown in Table 12-1.

Table 12-1 Yearly Growth Factors by Road Type

Road Type	Year								
	2008	2009	2010	2011	2012	2013	2014	2015	2016*
Motorway	0.998	0.987	0.962	0.971	0.999	1.046	1.035	1	1.072
A - Road	0.966	0.963	1.007	1.011	1.017	0.973	0.985	1	0.992
B - Road	1.001	0.964	0.983	1.033	1.014	1.053	1.023	1	0.990
C - Road	0.875	0.979	0.900	-	0.940	0.935	0.965	1	0.991

* Represents a factor for converting February 2016 counts to June 2015

12.3 Monthly Seasonality Factors (MSFs)

12.3.1 Monthly Seasonality Factors (MSFs) provide an indication of how traffic volume patterns change during different months of a year. For example, the MSF for March is used to convert a traffic count in March (of a particular year) to June (of that same year). The MSF in this case has been calculated as follows:

$$\text{March } MSF_{2015} = \text{AWT June}_{2015} / \text{AWT March}_{2015}$$

12.3.2 MSFs were calculated for count sites located on motorways, A roads, B roads and C roads. The MSFs for sites on C Roads for the months of March and July are not considered to be reliable as a result of insufficient data. Table 12-2 shows the MSFs calculated for the different road types.

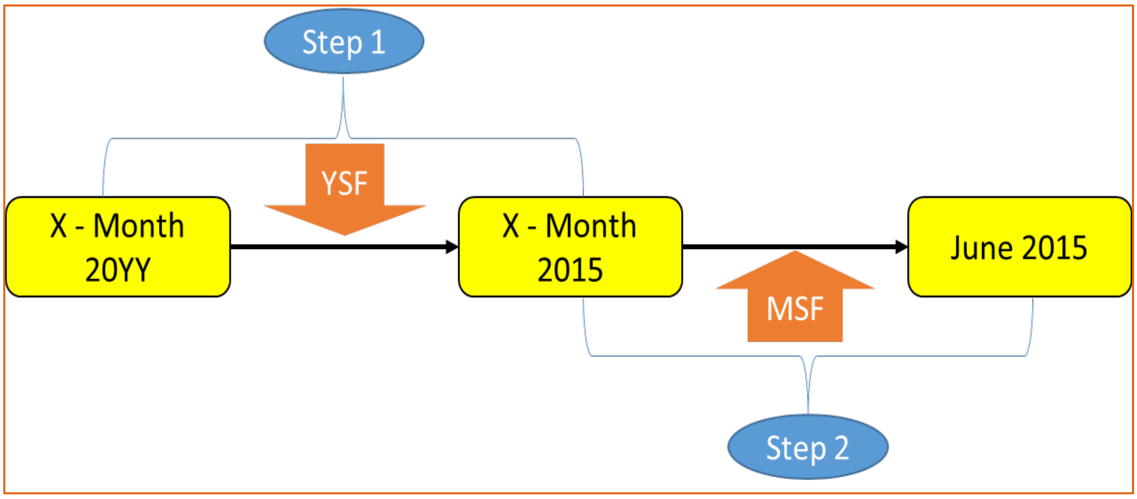
Table 12-2 Monthly Seasonality Factors by Road Type

Road Type	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Motorway	1.196	1.098	1.062	0.957	0.996	1	0.949	0.868	0.921	0.889	1.052	1.156
A - Road	1.219	1.103	1.111	1.059	1.030	1	0.976	0.976	0.970	1.000	0.999	1.057
B - Road	1.048	1.102	1.016	1.059	1.046	1	0.943	1.033	0.967	1.092	1.218	1.131
C - Road	1.091	1.123	NA	0.995	1.067	1	NA	1.046	0.947	0.938	1.056	1.398

12.4 Method to Convert Counts Using YGF and MSF

12.4.1 Following the derivation of YGFs and MSFs, the two-step procedure shown in Figure 12-1 was used to convert counts to the corresponding June 2015 count.

Figure 12-1 Count Conversion Process



I. Convert March$_{2011}$ count to March$_{2015}$ count.

II. Convert March$_{2015}$ count to June$_{2015}$ count.

13 DATA COLLATION AND ORGANISATION

13.1 Data Collation

13.1.1 The ATC counts from the surveys were all compiled into a single access database in Microsoft Excel, with the survey time periods (in 15-minute intervals) in rows and the survey days in columns. All data from the raw counts (including weekends) and blanks for missing data were taken into this master Excel file.

13.1.2 Similar to the ATC counts, CJC counts from all survey companies on each day and for each arm of each junction were collated into a single Excel spreadsheet.

13.2 Data Processing and Organisation

13.2.1 In order to process the ATC data, separate tabs were maintained to identify the ATC data points which were eliminated based on the 2SD test. The points passing this test were then linked to a new tab in the spreadsheet and then IoD tests were carried out on these data points to develop the clean ATC data set.

13.2.2 Appropriate graphs and plots showing statistical parameters such as the mean, maximum, minimum and standard deviation were plotted. The peak hour ATC data (based on the cleaned ATC data set) will be carried forward for traffic modelling for the AM peak hour (average hour between 07:30 and 09:30), the IP peak hour (average hour between 09:30 and 15:00) and the PM peak hour (average hour between 15:00 and 18:00).

13.2.3 The data collated in the master CJC sheet was used to prepare comparison plots between CJCs located at close proximity. Deficient CJC data points were taken note of and filtered out while preparing the final CJC counts for use at each junction. The turning movement traffic volumes will be carried forward for traffic modelling for the AM, PM and IP hours.

14 SUMMARY

14.1 Adequacy of Data Collected

14.1.1 Based on the extent of the study area, the location of screen lines and cordons and the suitability of previously available traffic models and data, several new traffic counts were commissioned in 2015 and 2016 as reported in this TDCR. The data has been subject to extensive review and analysis, and the resulting dataset is now considered sufficiently complete and robust for model development.

14.1.2 Statistical tests performed on the ATC data identified very few outliers (for exclusion) between the hours of 07:00 and 19:00. Comparisons and checks between the CJC and ATC data suggest that (with the exception of a few time periods), the entry and exit flows at CJC sites match closely (or within a reasonable deviation) with nearby ATC/CJC count data.

14.1.3 Based on the data reviewed, and discussions with Highways England, the peak hours for the traffic model were determined to be:

- AM peak hour – average one hour between 07:30 and 09:30
- IP hour – average one hour between 09:30 and 15:00
- PM peak hour – average one hour between 15:00 and 18:00

14.1.4 Table 14-1 summarises the data collected, which is determined to be sufficient for Stage 2 traffic modelling.

Table 14-1 Adequacy of Data Collected

Data Collected		Year & Month	No. of Sites Counted	Adequacy of the Data
1	ATC data	2015 Jul 2015 Sep 2016 Feb	7 sites 8 sites 56 sites	Sufficient for current Stage 2 modelling
2	CJC data	2015 Jul	32 sites	
3	MCC data	2016 Feb	9 sites	
4	Queue Length Surveys	2015 Jul	32 sites	

APPENDIX A

2015 and 2016 ATC General Checklist

2015 ATC Data Checks and Reported Data Losses

ATC No.	Site Description	Area	Reported Data Loss
1	ATC 1: (Area 1) A585, west of junction with A586 and Windy Harbour Road	1	**Jul Wk 1:** No data **July Wk 2:** 14/07 no data from 12am to 6am **Sep Wk 1:** Mon 14/9 14:30-14:45, Thu 17/9 17:45-00:00 **Sep Wk 2:** Fri 18/9 00:00-14:45 **Sep Wk 3:** Mon 28/9 11:30-11:45.
2	ATC 2: (Area 1) A585, west of junction with B5412 and Breck Road (Skippool junction)	1	Fri 18/9 15:00-15:15, Tue 22/9 11:00-11:15
3	ATC 3 - NB: (Area 2) A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), north of junction with Queen's Promenade	2	
	ATC 3 - SB: (Area 2) A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), north of junction with Queen's Promenade	2	**July Wk 1:** No data **July Wk 2:** No data on 13/09. On 14/09 no data from 12am to 2:15am **Sep Wk 1:** Sun 13/9 08:15-09:45, Mon 14/9 15:30 – midnight, Tue 15/09 to Thu 17/9 00:00 (3 days) **Sep Wk 2:** Fri 18/9 00:00-17:00.
4	ATC 4: (Area 2) A587 Plymouth Rd, north of junction with A586 Poulton Rd and A586 Westcliffe Drive	2	
5	ATC 5 - EB: (Area 2) A583 Preston New Road, east of junction with A587 E Park Drive	2	
6A	ATC 6A: (Area 3) A585, south of roundabout junction with Amounderness Way/Fleetwood Road/Norcross Lane	1	
6B	ATC6B: A585 - North of junction with Amounderness Way/ Rossall Lane B5409	3	Data collected only in October 2015
7	ATC 7: (Area 3) A587 Broadway, north of junction with Rossall Lane	3	**Jul Wk 2:** 16/09 No data from 10:15am to midnight 17/09 to 19/09 No data **Sep Wk 1:** Tue 15/9 11:00- midnight, Wed 16/9 and Thu 17/09 no data for entire day (2.5 days) **Sep Wk 2:** Fri 18/9 00:00-16:00 **Sep Wk 3:** Mon 28/9 12:30-12:45

2016 ATC Data Checks and Reported Data Losses

ATC Site No.	Site Description	Direction	Reported Data Loss
2016ATC_01	A584 Clifton Dr. N.	SB	Wk 2 - Data loss, Sat 27th Feb 14:45-15:45
		NB	
2016ATC_07	B5262	SB	Wk 1 - Data loss, Wed 10th 18:15 until Thurs 11th 13:30
		NB	
2016ATC_08	St Anne's Rd.	SB	Site was re-located for Wk 2 data. See Site Plan page.
		NB	
2016ATC_09	B5261 Hawes Side Ln.	SB	Wk 1 - Data loss, Sun 7th Feb 00:00-24:00. Wk 2 - Data loss, Mon 22nd Feb 11:15-12:15, Fri 26th Feb 11:45-12:30 and Sat 27th Feb 15:30-17:15. Wk 3 - Data loss, Wed 03 March IP 10:45 - 2pm
		NB	
2016ATC_10	Vicarage Ln.	SB	Wk 1 - Data loss, Sun 7th Feb 00:00-24:00.
		NB	
2016ATC_11	Ashworth Rd.	SB	Wk 1 - Data loss, Fri 12th 10:00-10:15.
		NB	
2016ATC_14	A584	SB	Wk 1 - Data loss; Sun 7th Feb 05:30-24:00, Mon 8th Feb 18:45-24:00, Tues 9th Feb 14:15-15:00 and Wed 10th Feb 13:30-13:45. Wk 3 - Data loss; Wed 2nd March 10:45 - 12:15.
		NB	
2016ATC_17	B5124	SB	Wk 1 - Data loss, Sat 6th Feb 00:00 - Wed 10th Feb 14:45.
		NB	
2016ATC_18	Layton Rd.	SB	Wk 2 - Data loss, Tues 23rd Feb 12:15-12:45.
		NB	
2016ATC_19	Dinmore Ave.	SB	Wk 1 - Data loss; Sat 6th Feb 12:30-13:30, Wed 10th Feb 19:00 - Thurs 11th Feb 06:00, Fri 12th 18:15-24:00. Wk 2 - Data loss, Mon 22nd Feb 16:30-18:45, Thurs 25th Feb 18:30-19:30.
		NB	
2016ATC_21	Bracewell Ave.	SB	Site moved after Wk 1. See site maps for details. Wk 2 - Data loss; Mon 22nd Feb 15:15-16:15, Tues 23rd Feb 08:15 - Wed 24th 11:45, Thur 25th 00:00 - 24:00. SB direction only - PM data missing on 24/02/2016 Wk 3 - Data loss; Wed 2nd March 09:15 - 10:00.
		NB	
2016ATC_25	Luton Rd.	WB	Wk 2 - Data loss, Fri 26th Feb 11:45 until Sat 27th Feb 12:00.
		EB	
2016ATC_26	B5258 Warren Dr.	WB	Wk 1 - Data loss; Tues 9th Feb 09:45-10:30 and Thurs 11th Feb 01:45 - Fri 12th Feb 02:15.
		EB	
2016ATC_28	Moor Park Ave.	WB	Wk 1 - Data loss, Mon 8th Feb 00:45 until Tues 9th Feb 01:45.
		EB	
2016ATC_37	A586 Poulton Rd.	WB	Site 38 – Wk 1, data loss, Thurs 11th Feb 09:15-11:00.
		EB	
2016ATC_41	Anchorsholme Ln. E	WB	Site 41 - Wk 1 Data loss, Sun 7th Feb 22:30 - Tues 9th Feb 02:45
		EB	
2016ATC_42	B5412 Victoria Rd. W.	WB	Wk 1 - Data loss; Sun 7th Feb 20:00-20:30, Mon 8th Feb 10:15-11:30, Wed 10th Feb 13:15-16:00, Thurs 11th Feb 14:45-15:45. Wk 2 - Data loss; Tues 23rd Feb 13:15-16:15, Wed 24th Feb 13:00-13:45, Sat 27th Feb 10:30-12:45. Wk 3 - Data loss; Wed 2nd March 17:45-19:30, Thur 3rd March 10:00 - 10:45
		EB	
2016ATC_53	A585 Amounderness Way Arm	SB	Wk2 - Data loss, Fri 26th Feb 11:00 until Sat 27th Feb 11:15.
		NB	
2016ATC_54	A583 Preston New Rd. WB	N/A	EB and WB directions for Site 54 included.
		WB	
2016ATC_55	A587 Kelso Ave. SB	N/A	NB and SB directions included here for Site 55.
		SB	
2016ATC_56	A587 St Walburgas Rd. SB	N/A	NB and SB directions for Site 56 included.
		SB	
2016ATC_57	A5230 Progress Way WB	N/A	EB and WB directions for Site 57 included.

A585 North West Priority Scheme: Windy Harbour to Skippool
ATC Locations

Data Tracker
Date: 27/10/2015

Survey Co: Tracsis (formerly Skyhigh)

				Jul-15														Sep-15																				Oct-15																				
ATC No	Description	Area		6	7	8	9	10	11	12	13	14	15	16	17	18	19	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Date Received	Any reported data loss
				Jul-Week 1							Jul-Week 2							Sep-Week 1							Sep-Week 2							Sep-Week 3											Oct-Week 1							Oct-Week 2								
1	ATC 1 EB: (Area 1) A585, west of junction with A586 and Windy Harbour Road	1		🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																			13/10/2015	Jul Wk1: No data July Wk2: 14/07 no data from 12am to 6am Sep Wk1: Mon 14/9 14:30-14:45, Thur 17/9 17:45-00:00 Sep Wk2: Fri 18/9 00:00-14:45 Sep Wk3: Mon 28/9 11:30-11:45.
	ATC 1 WB: (Area 1) A585, west of junction with A586 and Windy Harbour Road			🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																				
2	ATC 2 EB: A585, west of junction with B5412 and Breck Road (Skippool junction)	1		🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																												13/10/2015	Fri 18/9 15:00-15:15, Tue 22/9 11:00-11:15
	ATC 2 WB: A585, west of junction with B5412 and Breck Road (Skippool junction)			🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																													
3	ATC 3 - NB: A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), north of junction with Queen's Promenade	2		🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																												13/10/2015	
	ATC 3 - SB: A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), north of junction with Queen's Promenade	2		🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟨	🟨	🟥	🟥	🟥	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																			13/10/2015	July Wk1: No data July Wk2: No data on 13/09. On 14/09 no data from 12am to 2:15am Sep Wk1: Sun 13/9 08:15-09:45, Mon 14/9 15:30 - midnight Tue 15/09 to Thu 17/9 00:00 (3 days) Sep Wk2: Fri 18/9 00:00-17:00.
4	ATC 4 - NB: A587 Plymouth Rd, north of junction with A586 Poulton Rd and A586 Westcliffe Drive	2		🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																												13/10/2015	-
	ATC 4 - SB: A587 Plymouth Rd, north of junction with A586 Poulton Rd and A586 Westcliffe Drive			🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																													
5	ATC 5 - EB: A583 Preston New Road, east of junction with A587 E Park Drive	2		🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																												13/10/2015	
	ATC 5 - WB: A583 Preston New Road, east of junction with A587 E Park Drive			🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																													
6A	ATC 6A - EB: A585, south of roundabout junction with Amounderness Way/Fleetwood Road/Norcross Lane	1		🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																									
	ATC 6A - WB: A585, south of roundabout junction with Amounderness Way/Fleetwood Road/Norcross Lane			🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																									
6B	ATC6B - NB : A585 - North of junction with Amounderness Way/ Rossall Lane B5409	3																																									🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	26/10/2015	
	ATC6B - SB : A585 - North of junction with Amounderness Way/ Rossall Lane B5409																																										🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩		
7	ATC 7 - NB: A587 Broadway, north of junction with Rossall Lane	3		🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟨	🟥	🟥	🟥	🟩	🟩	🟩	🟩	🟨	🟥	🟥	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																			13/10/2015	Jul Wk2 : 16/09 No data from 10:15am to midnight 17/09 to 19/09 No data at all Sep Wk 1; Tue 15/9 11:00- midnight, Wed 16/9 and Thu 17/09 no data for entire day (2.5 days). Sep Wk 2; Fri 18/9 00:00-16:00 Sep Wk 3: Mon 28/9 12:30-12:45.
	ATC 7 - SB: A587 Broadway, north of junction with Rossall Lane			🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟨	🟥	🟥	🟥	🟩	🟩	🟩	🟩	🟨	🟥	🟥	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																				

Key

🟥 Missing for entire day
🟨 Missing during peak hours or for significant chunks of time during the day
🟩 No reported data loss

A585 Windy Harbour to Skippool
ATC Locations Feb 2016

Checker	MS/HJA
Data Tracker	
Date:	22-03-16

S.No	Type of Count (ATC/MCC)	Site #	Site Descriptions	East	North	Directio	Feb 2016														March 2016				Comments
							6	7	8	9	10	11	12	22	23	24	25	26	27	28	29	1	2	3	
							Sat	Sun	Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	
							Weekend		Weekday										Weekend		Weekday				
							Week 1							Week 2							Week 3				
1	ATC	ATC1	A584 Clifton Dr. N.	53.7745	-3.05276	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩					Wk2 - Data loss, Sat 27th Feb 14:45-15:45.
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩					
2	ATC	ATC2	B5261 Common Edge Rd.	53.7817	-3.021	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
3	ATC	ATC3	Cropper Rd.	53.7865	-2.996	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
4	ATC	ATC4	B5260	53.7949	-2.9357	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
5	ATC	ATC5	A585	53.803	-2.88812	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
6	ATC	ATC6	A584 South Promenade	53.7944	-3.05637	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
7	ATC	ATC7	B5262	53.7945	-3.04953	SB	🟩	🟩	🟩	🟩	🟧	🟥	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	Wk1 - Data loss, Wed 10th 18:15 until Thurs 11th 13:30.
						NB	🟩	🟩	🟩	🟩	🟧	🟥	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
8	ATC	ATC8	St Anne's Rd.	53.7962	-3.04167	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					Site was re-located for week 2 data. See Site Plan page.
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
9	ATC	ATC9	B5261 Hawes Side Ln.	53.7946	-3.03003	SB	🟩	🟥	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟧	🟧	🟩	🟩	🟩	🟩	🟩	Wk1 - Data loss, Sun 7th Feb 00:00-24:00. Wk2 - Data loss, Mon 22nd Feb 11:15-12:15, Fri 26th Feb 11:45-12:30 and Sat 27th Feb 15:30-17:15.
						NB	🟩	🟥	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟧	🟧	🟩	🟩	🟩	🟩	🟩	
10	ATC	ATC10	Vicarage Ln.	53.7937	-3.01714	SB	🟩	🟥	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	Wk1 - Data loss, Sun 7th Feb 00:00-24:00.
						NB	🟩	🟥	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
11	ATC	ATC11	Ashworth Rd.	53.7948	-3.0019	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩					Wk1 - Data loss, Fri 12th 10:00-10:15.
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
12	ATC	ATC12	B5260	53.8017	-2.93483	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
13	ATC	ATC13	Bradshaw Ln.	53.8063	-2.91347	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
14	ATC	ATC14	A584	53.8186	-3.056	SB	🟩	🟥	🟧	🟧	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩	Wk1 - Data loss; Sun 7th Feb 05:30-24:00, Mon 8th Feb 18:45-24:00, Tues 9th Feb 14:15-15:00 and Wed 10th Feb 13:30-13:45.
						NB	🟩	🟥	🟧	🟧	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩	
15	ATC	ATC15	Market St.	53.8185	-3.05502	N/A	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
16	ATC	ATC16	A586	53.8205	-3.04922	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
17	ATC	ATC17	B5124	53.8248	-3.03941	SB	🟥	🟥	🟥	🟥	🟥	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	Wk1 - Data loss, Sat 6th Feb 00:00 - Wed 10th Feb 14:45.
						NB	🟥	🟥	🟥	🟥	🟥	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
18	ATC	ATC18	Layton Rd.	53.8268	-3.03213	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩					Wk2 - Data loss, Tues 23rd Feb 12:15-12:45.
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩					
19	ATC	ATC19	Dinmore Ave.	53.835	-3.01351	SB	🟧	🟩	🟩	🟩	🟧	🟧	🟧	🟧	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	Wk1 - Data loss; Sat 6th Feb 12:30-13:30, Wed 10th Feb 19:00 - Thurs 11th Feb 06:00, Fri 12th 18:15-24:00.
						NB	🟧	🟩	🟩	🟩	🟧	🟧	🟧	🟧	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
20	ATC	ATC20	Holls Ln.	53.844	-2.9816	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
21	ATC	ATC21	Bracewell Ave.	53.8452	-2.97011	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟥	🟧	🟥	🟩	🟩	🟩	🟩	🟩	🟧	🟩	Site moved after wk 1. See site maps for details. Wk2 - Data loss; Mon 22nd Feb 15:15-16:15, Tues 23rd Feb 08:15 - Wed 24th 11:45, Thur 25th 00:00
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟥	🟧	🟥	🟩	🟩	🟩	🟩	🟩	🟧	🟩	
22	ATC	ATC22	North Dr.	53.8689	-3.03417	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
23	ATC	ATC23	North Dr.	53.8746	-3.03309	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
24	ATC	ATC24	West Dr.	53.8801	-3.03168	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
25	ATC	ATC25	Luton Rd.	53.8703	-3.03328	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟥	🟥	🟩	🟩	🟩	🟩	🟩	Wk2 - Data loss, Fri 26th Feb 11:45 until Sat 27th Feb 12:00.
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟥	🟥	🟩	🟩	🟩	🟩	🟩	
26	ATC	ATC26	B5258 Warren Dr.	53.8658	-3.03376	WB	🟩	🟩	🟩	🟧	🟩	🟥	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	Wk1 - Data loss; Tues 9th Feb 09:45-10:30 and Thurs 11th Feb 01:45 - Fri 12th Feb 02:15.
						EB	🟩	🟩	🟩	🟧	🟩	🟥	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
27	ATC	ATC27	Ashfield Rd.	53.8571	-3.02968	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
28	ATC	ATC28	Moor Park Ave.	53.8495	-3.02408	WB	🟩	🟩	🟥	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	Wk1 - Data loss, Mon 8th Feb 00:45 until Tues 9th Feb 01:45.
						EB	🟩	🟩	🟥	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
29	ATC	ATC29	A586 Poulton Rd.	53.8347	-3.01847	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
30	ATC	ATC31	Clifton Orad (Cherry Tree Rd.)	53.8002	-3.00985	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
31	ATC	ATC32	Yeadon Way	53.7954	-3.04613	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
32	ATC	ATC33	Anchorsholme Ln.	53.8689	-3.0134	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
33	ATC	ATC34	B5269	53.835	-2.90449	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
34	ATC	ATC35	B5260 Fox Ln. Ends	53.7815	-2.92192	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
35	ATC	ATC36	Vicarage Ln.	53.7944	-3.01644	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
36	ATC	ATC37	B5266 Newton Dr.	53.8242	-3.01582	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
37	ATC	ATC38	A586 Poulton Rd.	53.8339	-3.02227	WB	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					Site 38 - Wk1, data loss, Thurs 11th Feb 09:15-11:00.
						EB	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
38	ATC	ATC39	Moor Park Ave.	53.8464	-3.03347	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
39	ATC	ATC40	Luton Rd.	53.8708	-3.03681	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
40	ATC	ATC41	Anchorsholme Ln. E	53.873	-3.0344	WB	🟩	🟧	🟥	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	Site 41 - Wk 1 Data loss, Sun 7th Feb 22:30 - Tues 9th Feb 02:45
						EB	🟩	🟧	🟥	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
41	ATC	ATC42	B5412 Victoria Rd. W.	53.8761	-3.03479	WB	🟩	🟧	🟧	🟩	🟧	🟧	🟩	🟩	🟧	🟧	🟩	🟩	🟧	🟩	🟩	🟩	🟧	🟧	Wk1 - Data loss; Sun 7th Feb 20:00-20:30, Mon 8th Feb 10:15-11:30, Wed 10th Feb 13:15-16:00, Thurs 11th Feb 14:45-15:45.
						EB	🟩	🟧	🟧	🟩	🟧	🟧	🟩	🟩	🟧	🟧	🟩	🟩	🟧	🟩	🟩	🟩	🟧	🟧	
42	ATC	ATC43	B5260 Weeton Rd.	53.8286	-2.93637	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
43	ATC	ATC44	B5266 Station Rd.	53.8289	-2.96194	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
44	ATC	ATC45	Back Ln.	53.8219	-2.90793	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
45	ATC	ATC46	B5269 Mile Rd.	53.8369	-2.91913	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
46	ATC	ATC47	Grange Rd.	53.8457	-2.9219	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
47	ATC	ATC48	A586	53.8507	-2.92047	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
48	ATC	ATC49	A588 Shard Rd. Arm	53.8638	-2.96172	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
49	ATC	ATC50	B5260 Singleton Rd.	53.8182	-2.93233	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
50	ATC	ATC51	B5258 Warren Dr. Arm	53.8662	-3.03834	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
51	ATC	ATC52	Red Bank Rd. Arm	53.8521	-3.04005	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
52	ATC	ATC53	A585 Amoundeness Way Arm	53.8719	-3.02186	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟥	🟧	🟩					Wk2 - Data loss, Fri 26th Feb 11:00 until Sat 27th Feb 11:15.
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟥	🟧	🟩					
53	ATC	ATC54	A583 Preston New Rd. WB	53.8024	-3.00809	N/A	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					EB and WB directions for Site 54 included.
						WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
54	ATC	ATC55	A587 Kelso Ave. SB	53.8739	-3.0429	N/A	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					NB and SB directions included here for Site 55.
						SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
55	ATC	ATC56	A587 St Walburgas Rd. SB	53.8306	-3.02497	N/A	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					NB and SB directions for Site 56 included.
						SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
56	ATC	ATC57	A5230 Progress Way WB	53.7888	-3.00398	N/A	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					EB and WB directions for Site 57 included.
						WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					

Key

🟥	Missing for entire day or very large time periods during the day
🟧	Missing during some hours during the day, sometimes isolated 15 minute periods, but sometimes during peak hours also
🟩	No reported data loss
🟨	Data loss occurs only on Weekend

APPENDIX B

Weekday Average Traffic Flows at TRIS Sites

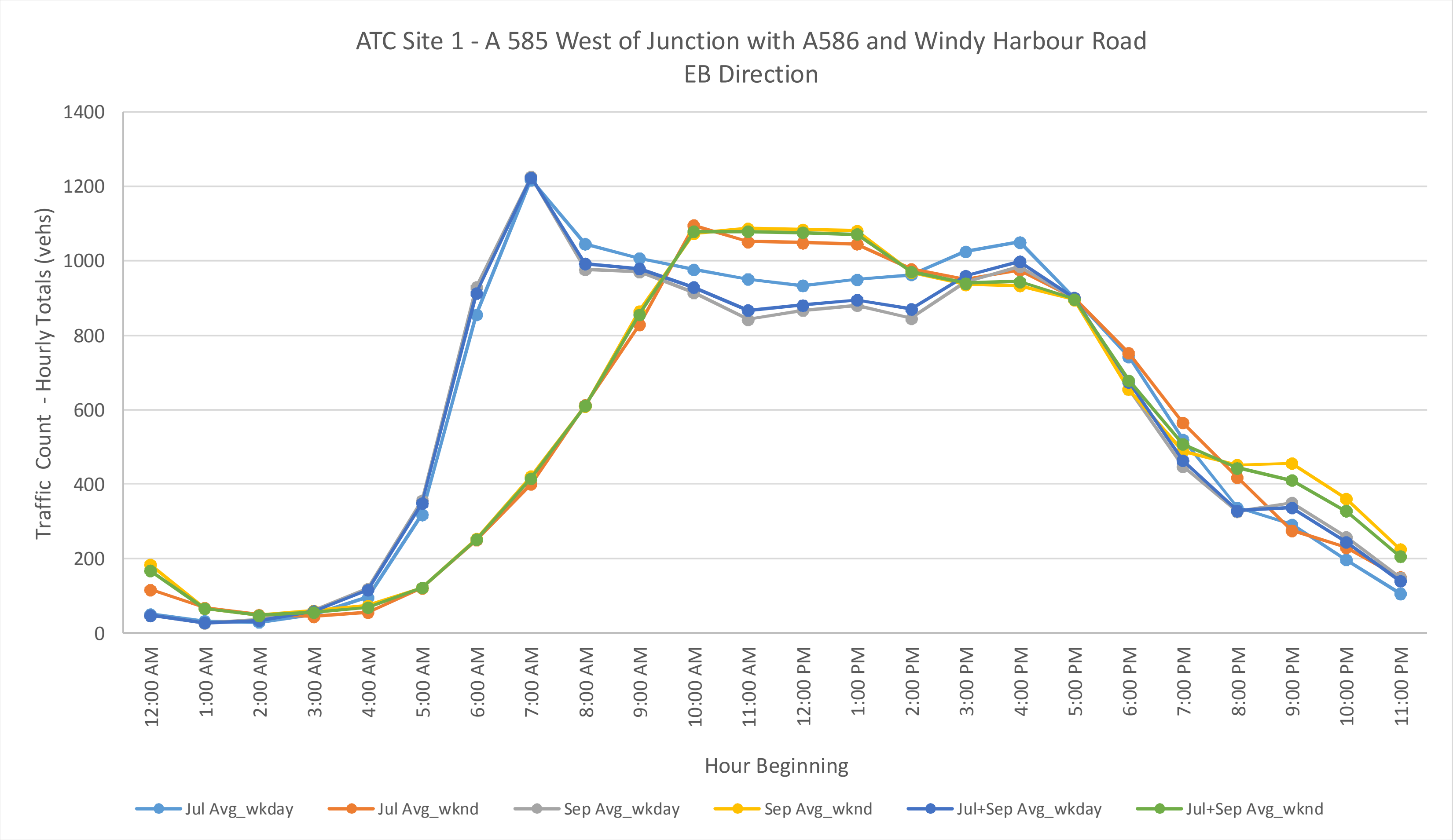
APPENDIX B: 2015 Weekday Average Traffic Flow at TRIS Sites

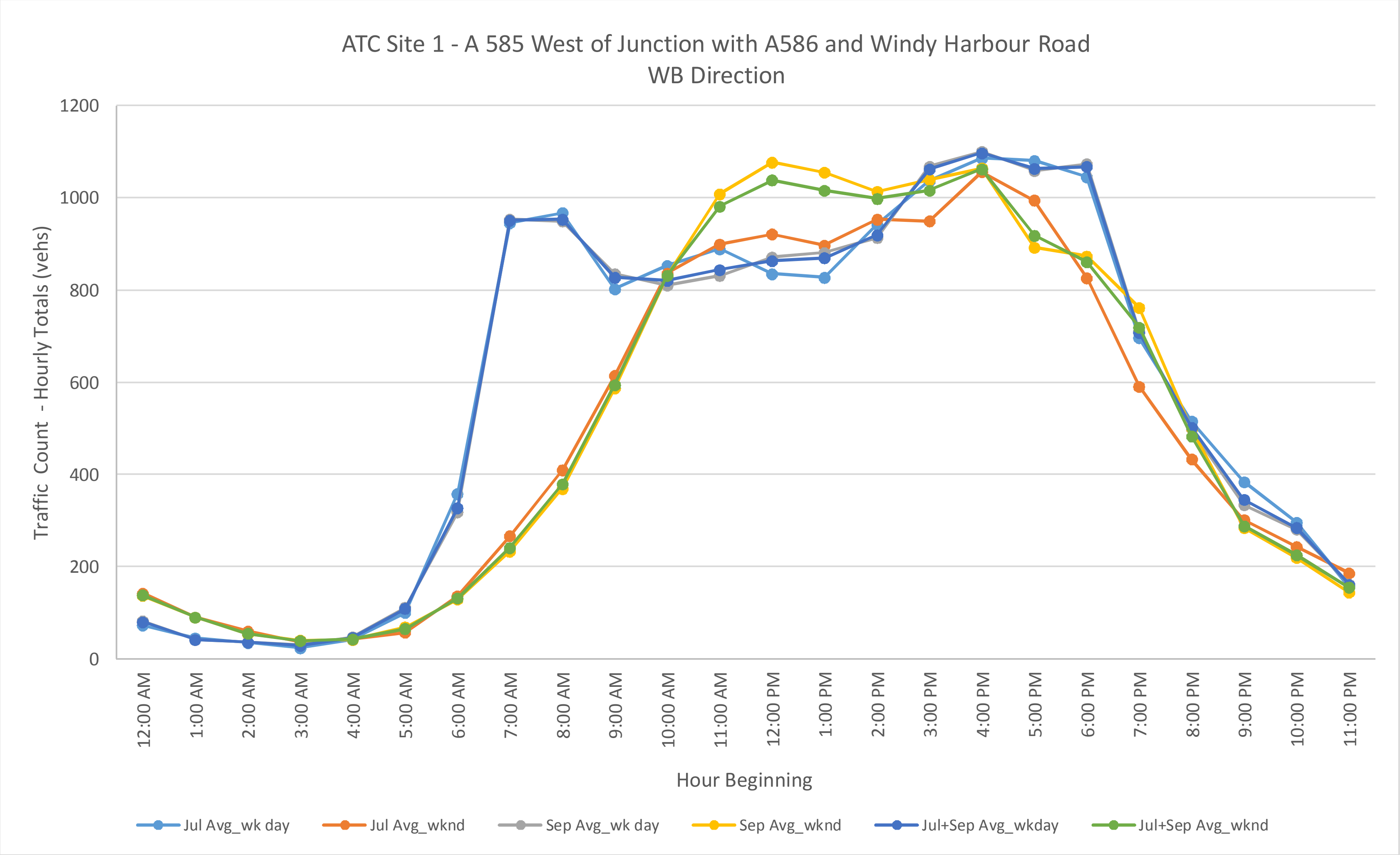
Site_Reference ID	07:00	07:30	08:00	08:30	09:00	09:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	12 -hour flows (vehs)
2015TRIS_01	1254	1481	1478	1241	1095	1027	994	970	931	902	900	905	920	942	972	1015	1106	1210	1432	1562	1596	1457	1085	794	27269
2015TRIS_02	495	1414	1527	1479	1176	1047	943	993	996	1000	976	950	942	952	928	961	957	1025	1153	1376	1463	1505	1333	1060	26651
2015TRIS_03	462	426	494	409	386	346	337	322	337	338	358	364	358	363	360	372	406	405	455	571	613	631	598	525	10236
2015TRIS_04	415	275	578	598	550	479	396	358	361	351	347	350	355	349	358	353	368	374	440	459	482	480	432	368	9876
2015TRIS_05	310	127	411	692	650	560	529	512	481	503	498	495	488	499	484	494	487	513	534	590	645	676	706	681	12565
2015TRIS_06	625	518	317	607	590	511	475	437	446	459	456	479	490	491	511	512	512	536	569	615	652	656	663	621	12748
2015TRIS_07	540	443	182	551	939	1053	988	766	685	667	709	705	704	661	617	592	597	666	637	650	677	774	887	915	16605
2015TRIS_08	885	769	612	326	846	883	784	667	652	626	626	601	592	570	597	570	639	604	669	699	759	878	1005	1030	16889
Total (for TRIS Sites)	**4986**	**5453**	**5599**	**5903**	**6232**	**5906**	**5446**	**5025**	**4889**	**4846**	**4870**	**4849**	**4849**	**4827**	**4827**	**4869**	**5072**	**5333**	**5889**	**6522**	**6887**	**7057**	**6709**	**5994**	**132839**

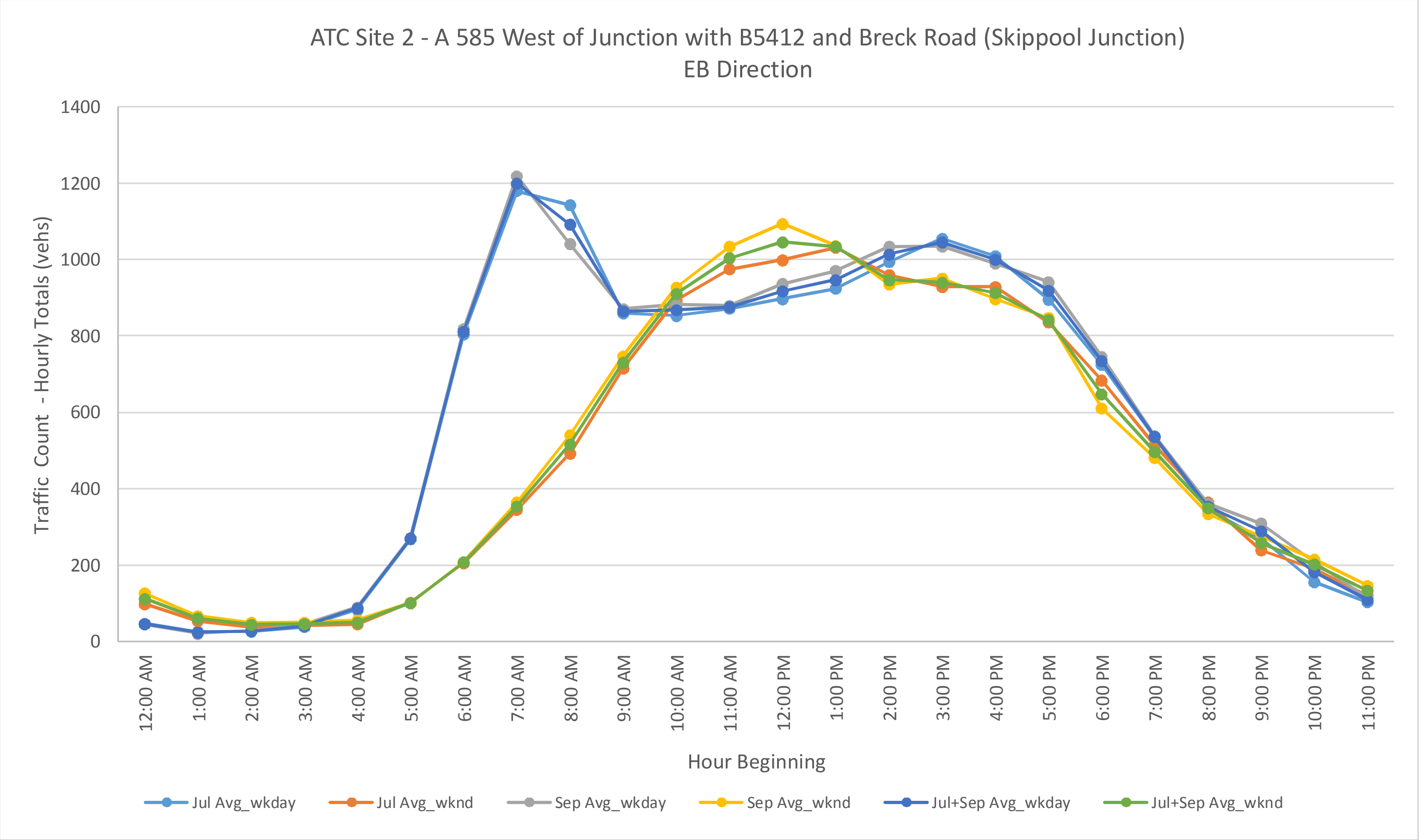
APPENDIX C

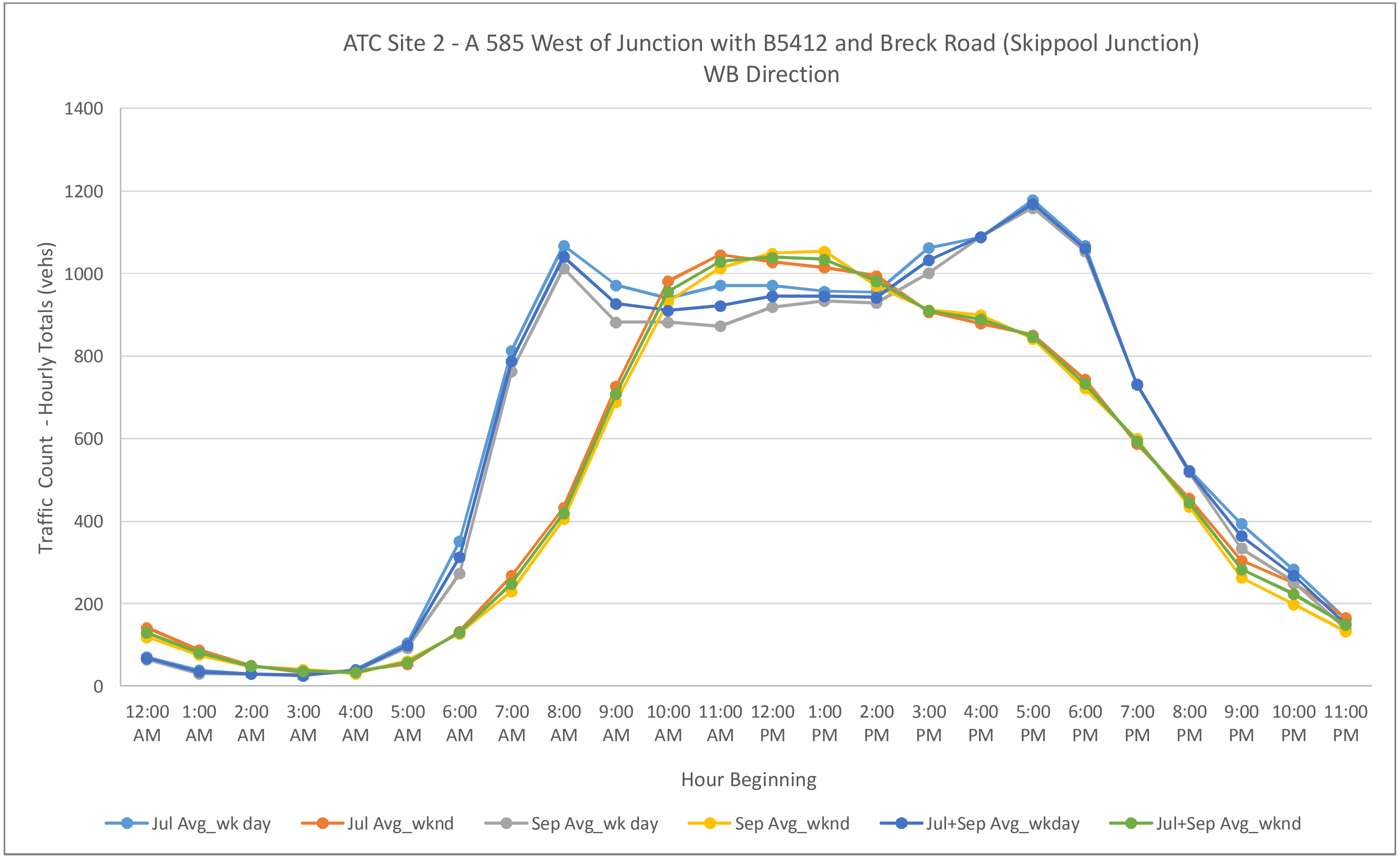
2015 ATC Weekday vs Weekend Profile

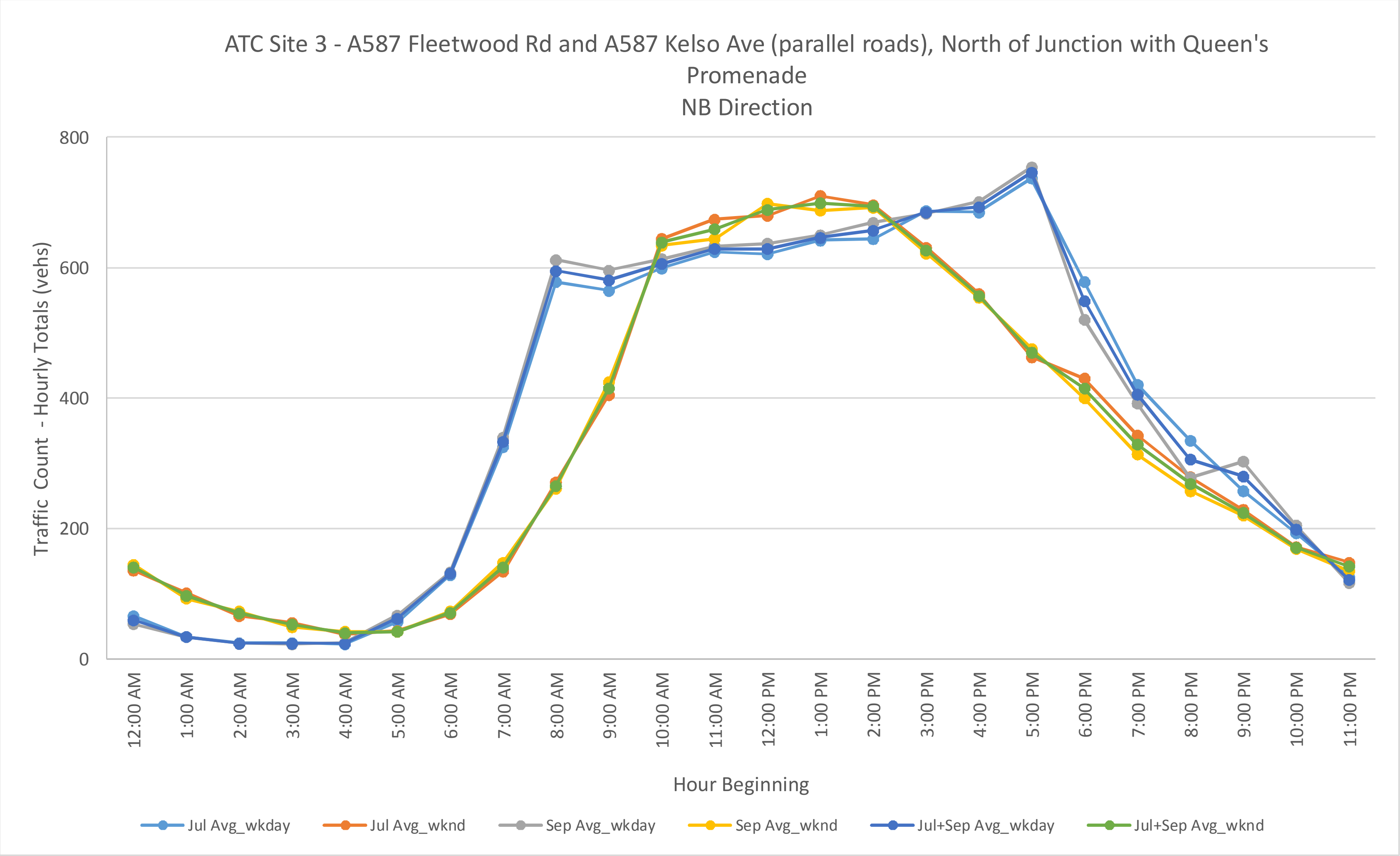
APPENDIX C: 2015 ATC Weekday (vs) Weekend Profiles

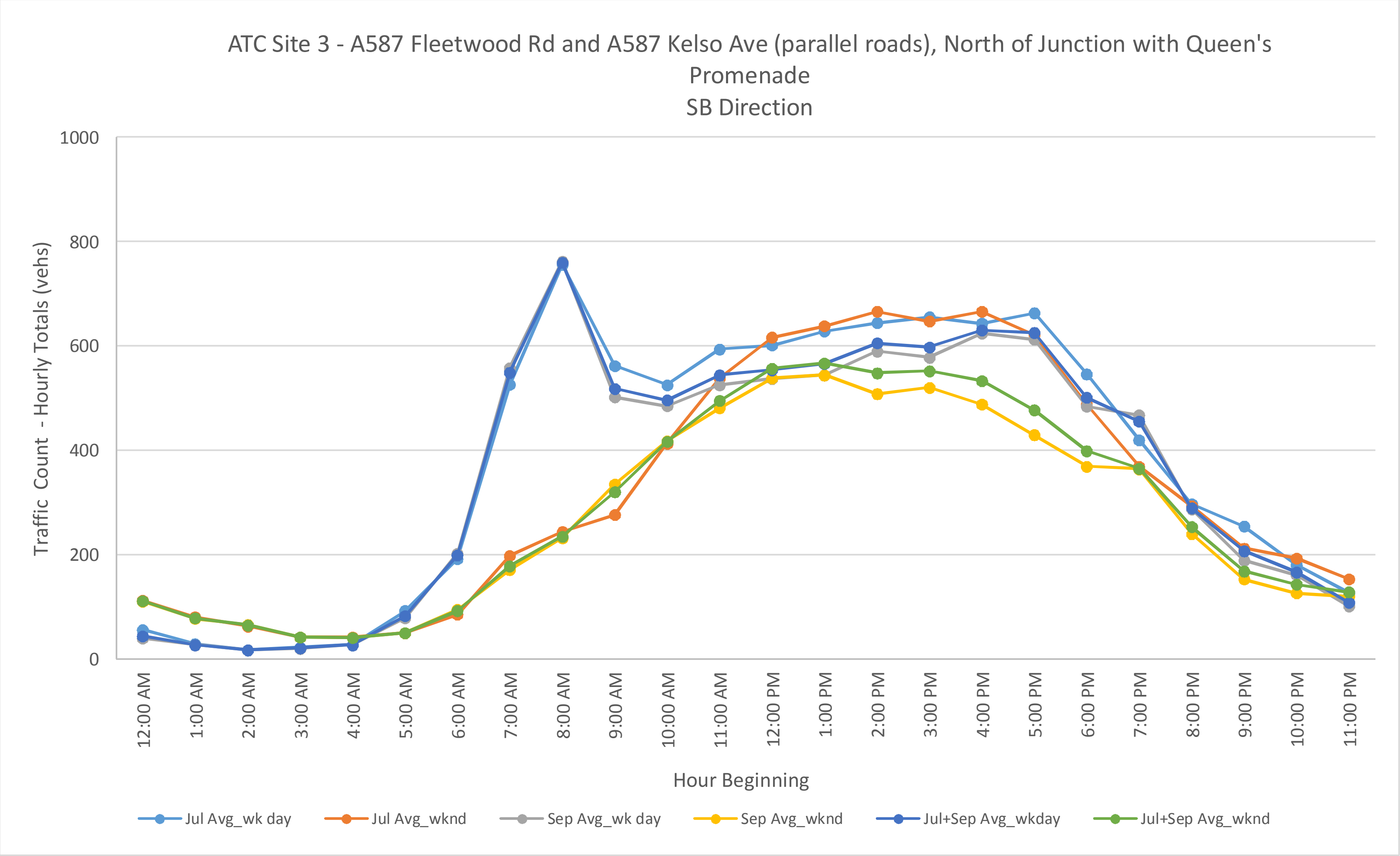


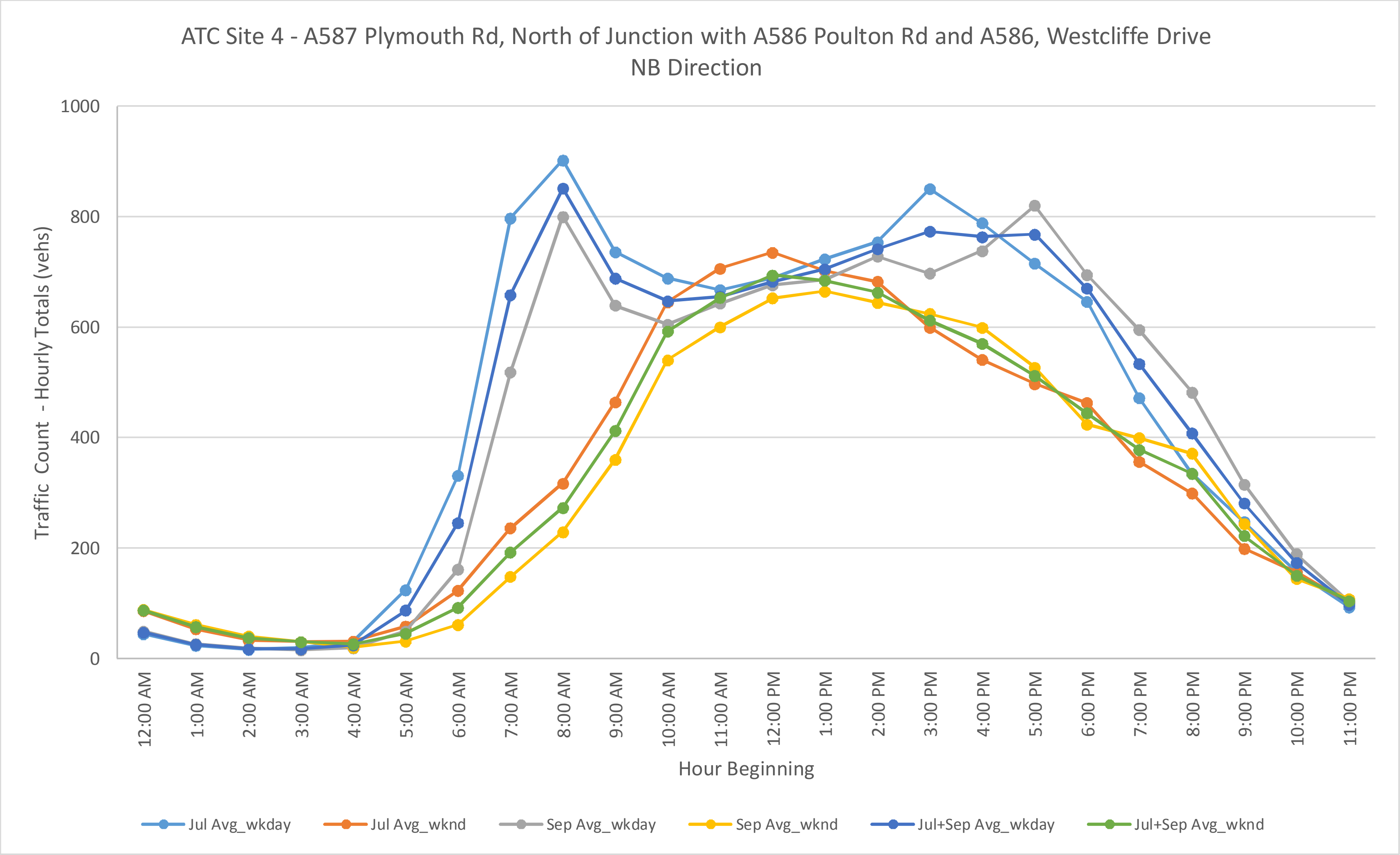

ATC Site 1 - A 585 West of Junction with A586 and Windy Harbour Road
WB Direction
Traffic Count - Hourly Totals (vehs)
0
200
400
600
800
1000
1200
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wk day
Jul Avg_wknd
Sep Avg_wk day
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd


ATC Site 2 - A 585 West of Junction with B5412 and Breck Road (Skippool Junction)
EB Direction
Traffic Count - Hourly Totals (vehs)
0
200
400
600
800
1000
1200
1400
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wkday
Jul Avg_wknd
Sep Avg_wkday
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

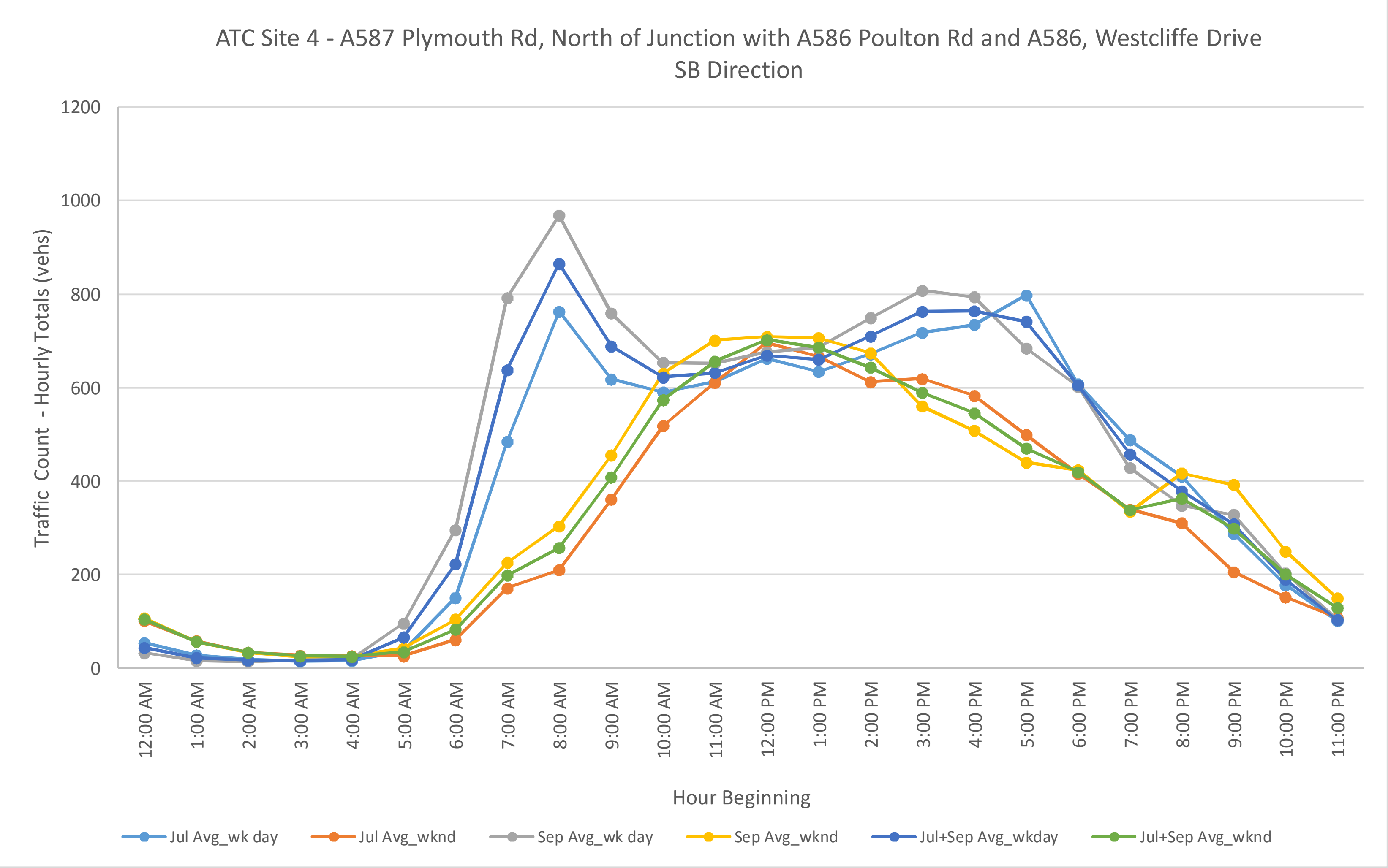

ATC Site 2 - A 585 West of Junction with B5412 and Breck Road (Skippool Junction)
WB Direction
Traffic Count - Hourly Totals (vehs)
1400
1200
1000
800
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wk day
Jul Avg_wknd
Sep Avg_wk day
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

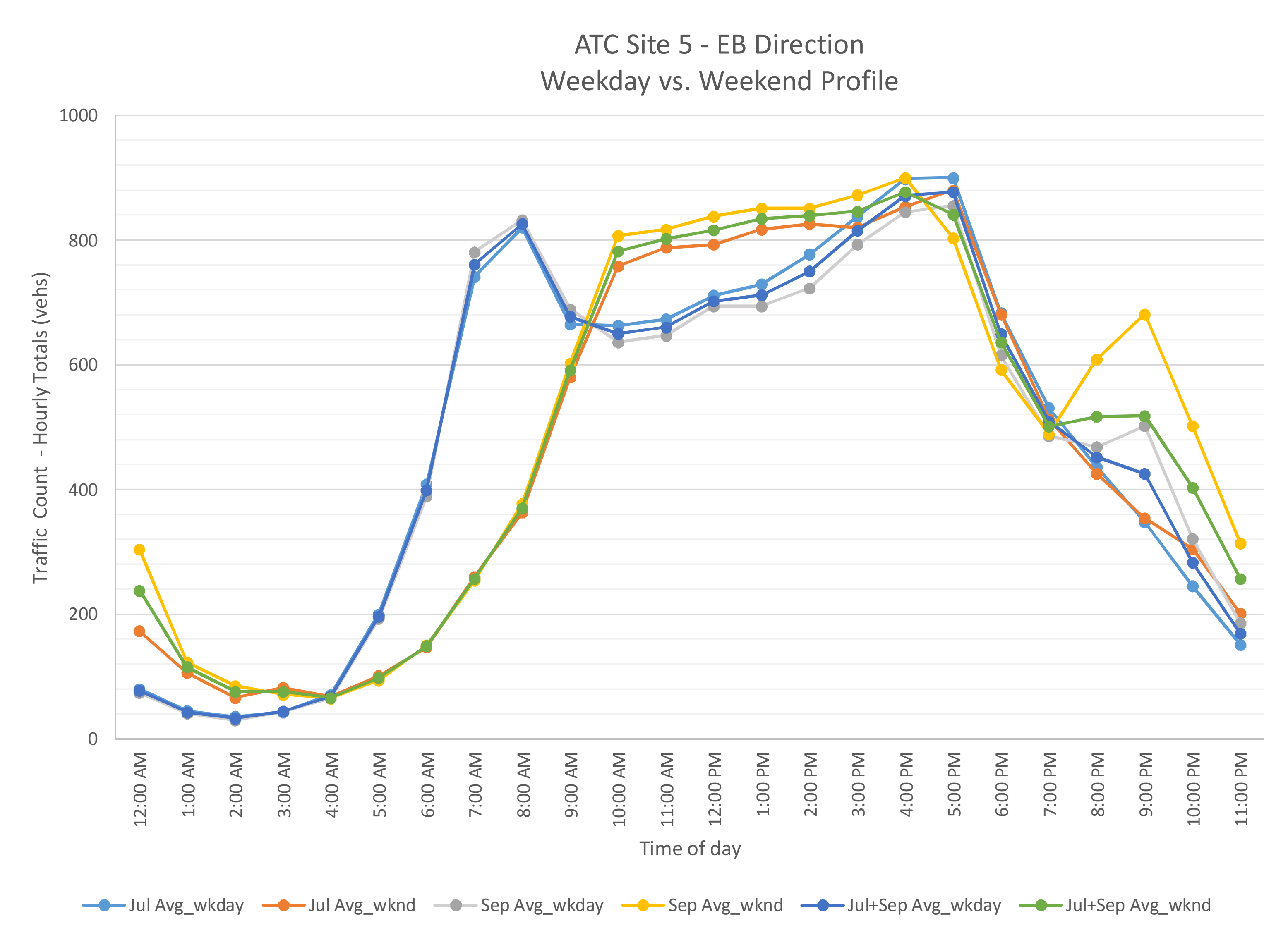

ATC Site 3 - A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), North of Junction with Queen's Promenade
NB Direction
Traffic Count - Hourly Totals (vehs)
0
200
400
600
800
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wkday
Jul Avg_wknd
Sep Avg_wkday
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

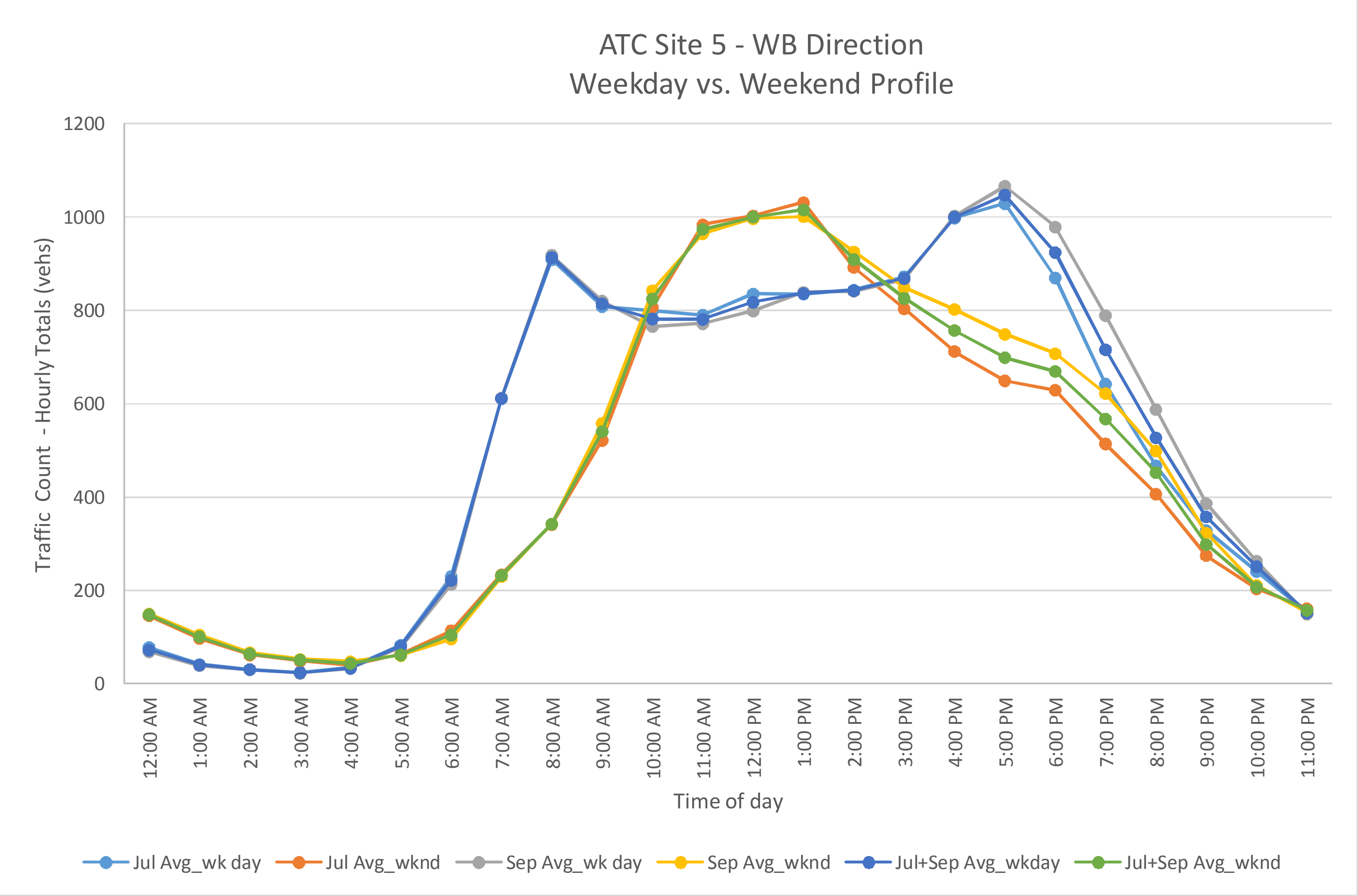

ATC Site 3 - A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), North of Junction with Queen's Promenade
SB Direction
Traffic Count - Hourly Totals (vehs)
0
200
400
600
800
1000
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wk day
Jul Avg_wknd
Sep Avg_wk day
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

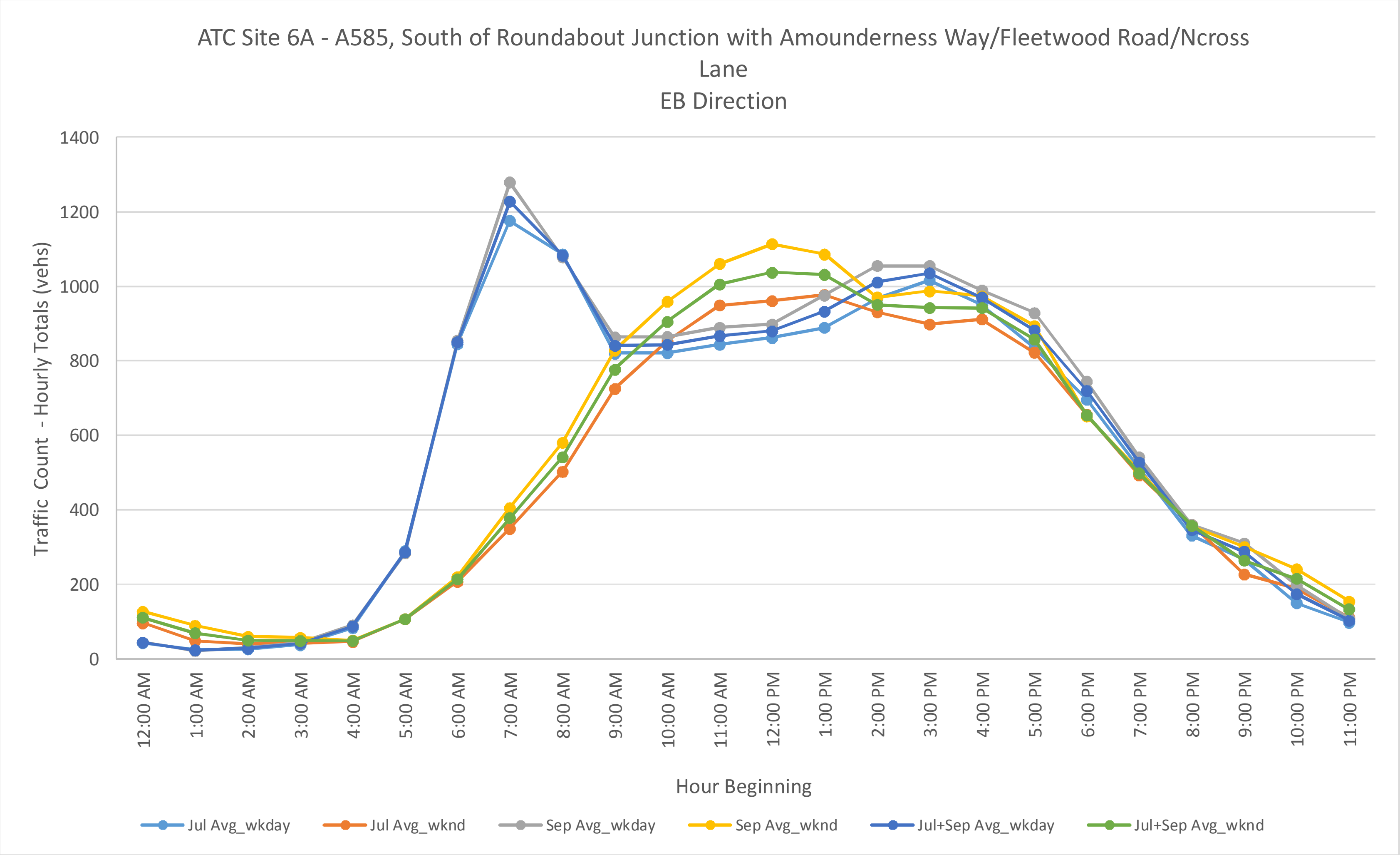


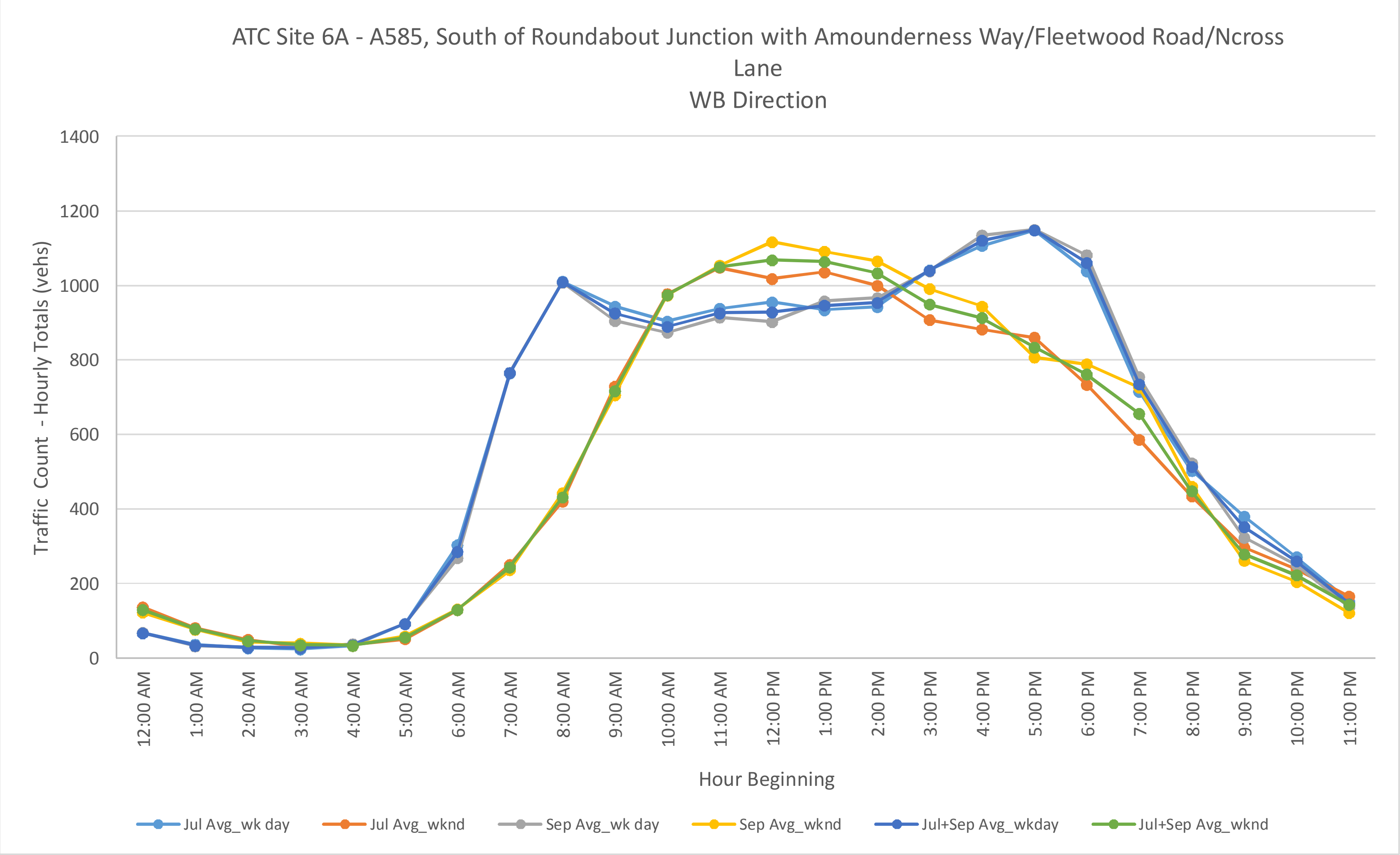
ATC Site 4 - A587 Plymouth Rd, North of Junction with A586 Poulton Rd and A586, Westcliffe Drive
NB Direction

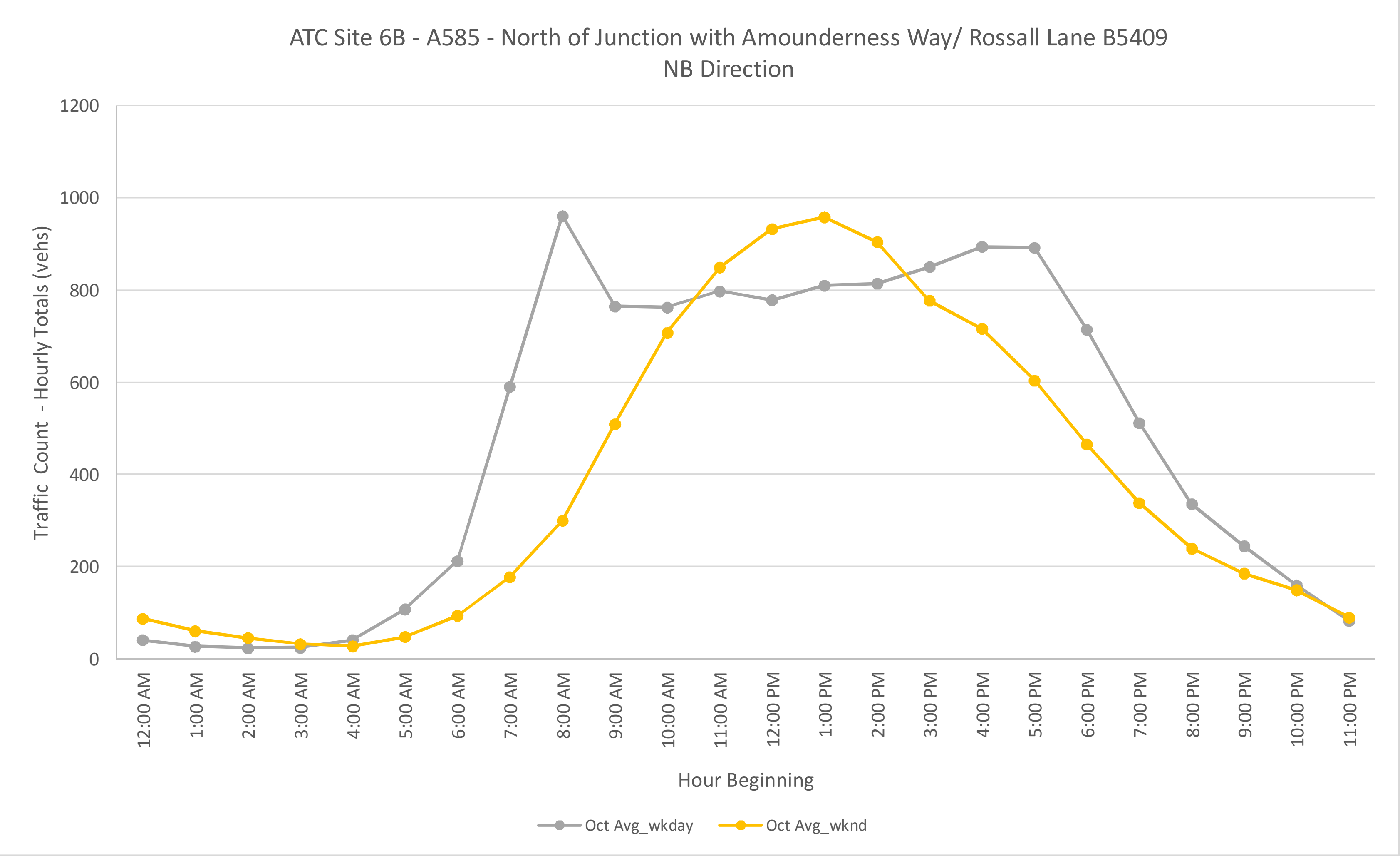

ATC Site 4 - A587 Plymouth Rd, North of Junction with A586 Poulton Rd and A586, Westcliffe Drive
SB Direction
Traffic Count - Hourly Totals (vehs)
0
200
400
600
800
1000
1200
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wk day
Jul Avg_wknd
Sep Avg_wk day
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

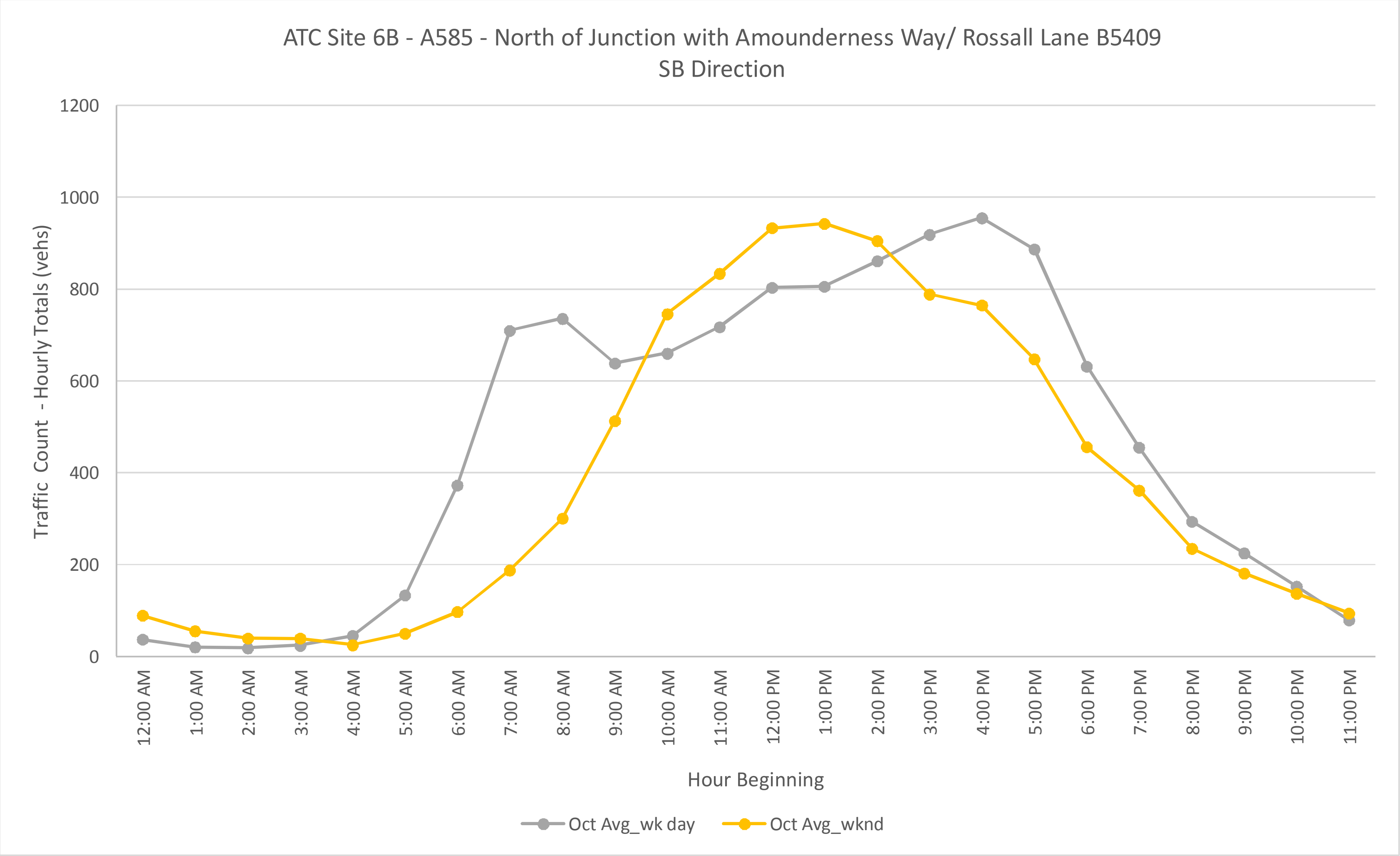

ATC Site 5 - EB Direction
Weekday vs. Weekend Profile
Traffic Count - Hourly Totals (vehs)
0
200
400
600
800
1000
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Time of day
Jul Avg_wkday
Jul Avg_wknd
Sep Avg_wkday
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

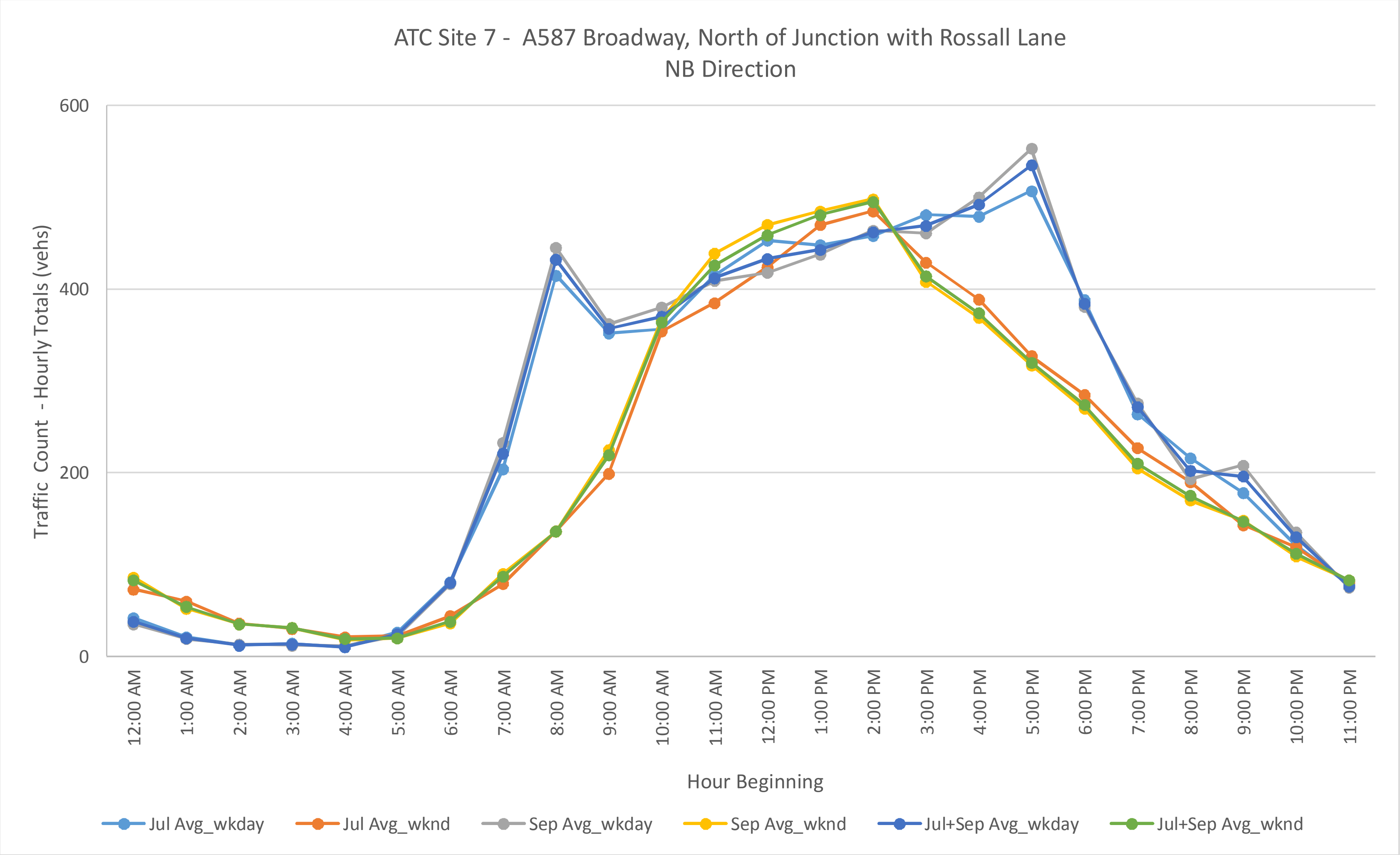

ATC Site 5 - WB Direction
Weekday vs. Weekend Profile
Traffic Count - Hourly Totals (vehs)
0
200
400
600
800
1000
1200
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Time of day
Jul Avg_wk day
Jul Avg_wknd
Sep Avg_wk day
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

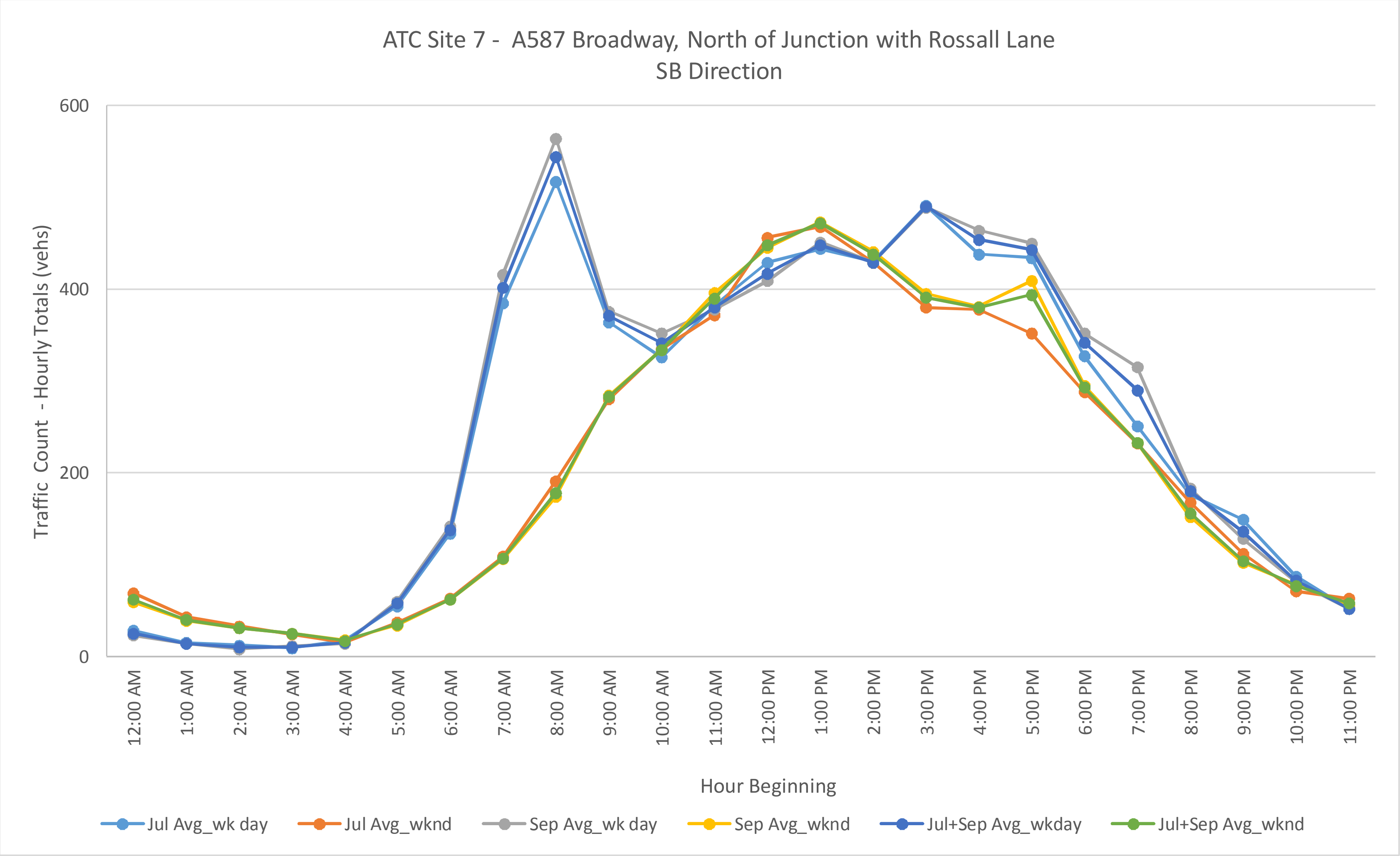

ATC Site 6A - A585, South of Roundabout Junction with Amounderness Way/Fleetwood Road/Ncross Lane
EB Direction
Traffic Count - Hourly Totals (vehs)
1400
1200
1000
800
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wkday
Jul Avg_wknd
Sep Avg_wkday
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd


ATC Site 6A - A585, South of Roundabout Junction with Amounderness Way/Fleetwood Road/Ncross Lane
WB Direction
Traffic Count - Hourly Totals (vehs)
0
200
400
600
800
1000
1200
1400
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wk day
Jul Avg_wknd
Sep Avg_wk day
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd


ATC Site 6B - A585 - North of Junction with Amounderness Way/ Rossall Lane B5409
NB Direction
Traffic Count - Hourly Totals (vehs)
1200
1000
800
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Oct Avg_wkday
Oct Avg_wknd


ATC Site 6B - A585 - North of Junction with Amounderness Way/ Rossall Lane B5409
SB Direction
Traffic Count - Hourly Totals (vehs)
1200
1000
800
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Oct Avg_wk day
Oct Avg_wknd

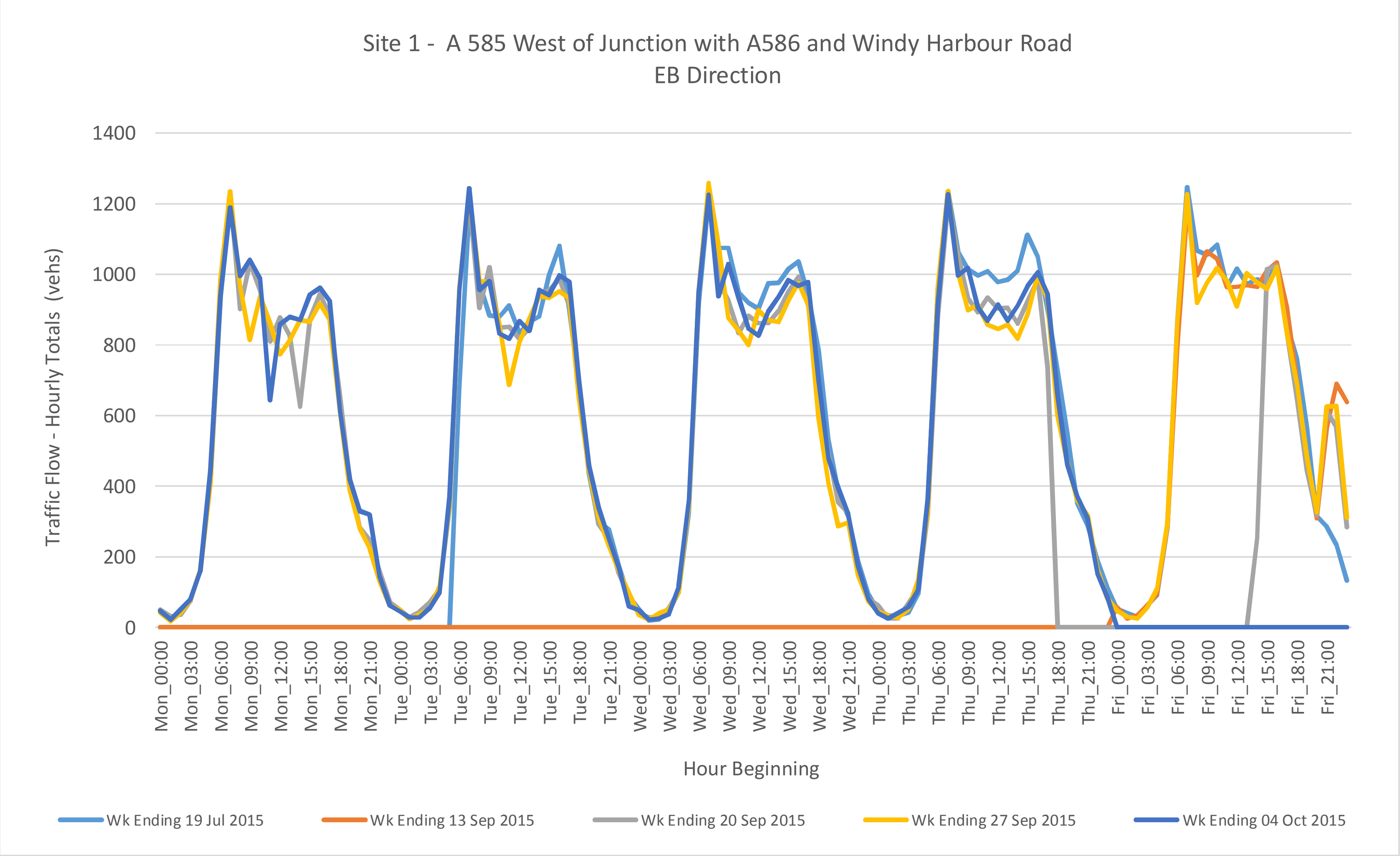

ATC Site 7 - A587 Broadway, North of Junction with Rossall Lane
NB Direction
Traffic Count - Hourly Totals (vehs)
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wkday
Jul Avg_wknd
Sep Avg_wkday
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

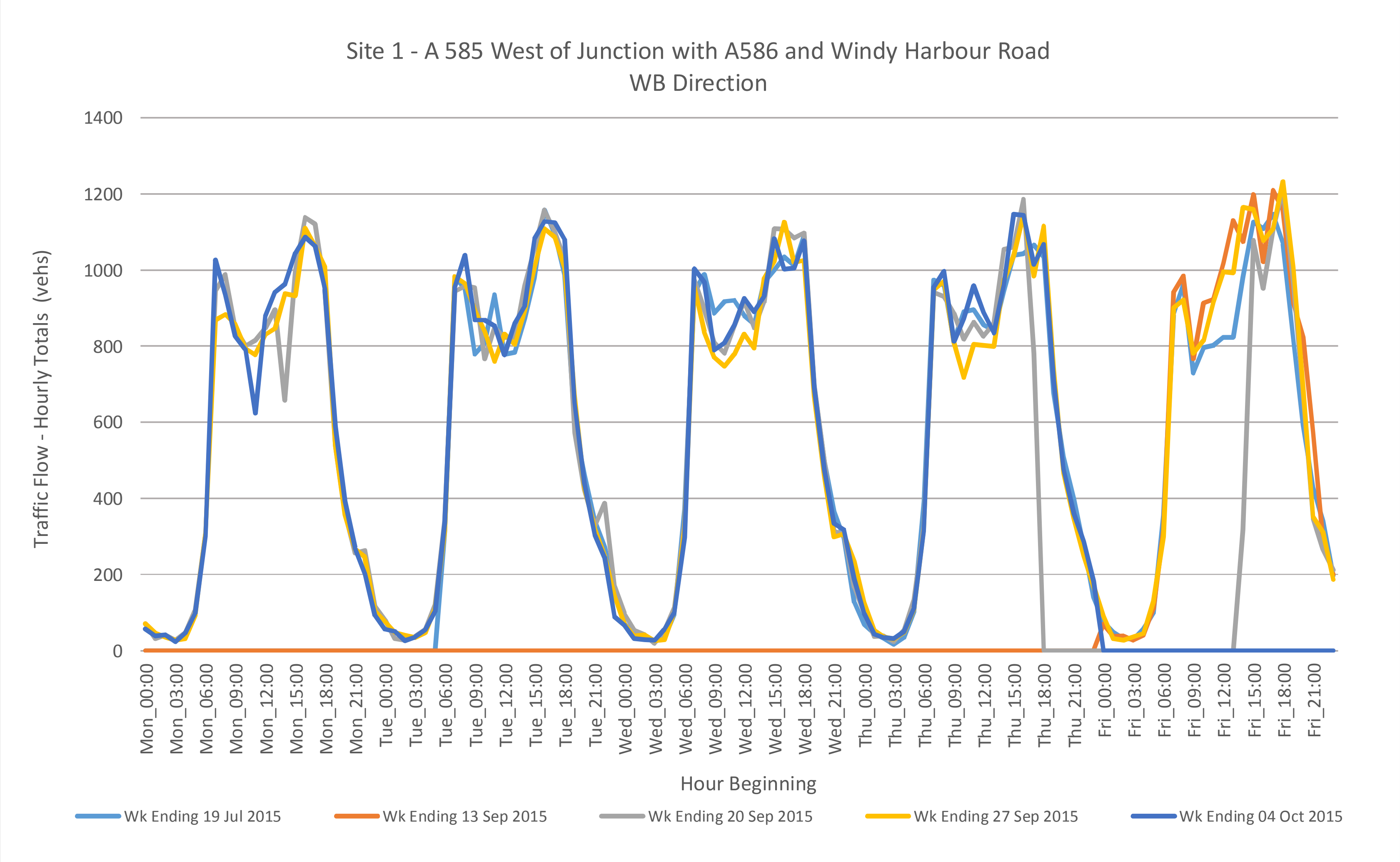

ATC Site 7 - A587 Broadway, North of Junction with Rossall Lane
SB Direction
Traffic Count - Hourly Totals (vehs)
0
200
400
600
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wk day
Jul Avg_wknd
Sep Avg_wk day
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

APPENDIX D

2015 Weekday ATC Profiles

APPENDIX D: 2015 Weekday ATC PROFILES




Site 1 - A 585 West of Junction with A586 and Windy Harbour Road
WB Direction
Traffic Flow - Hourly Totals (vehs)
1400
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
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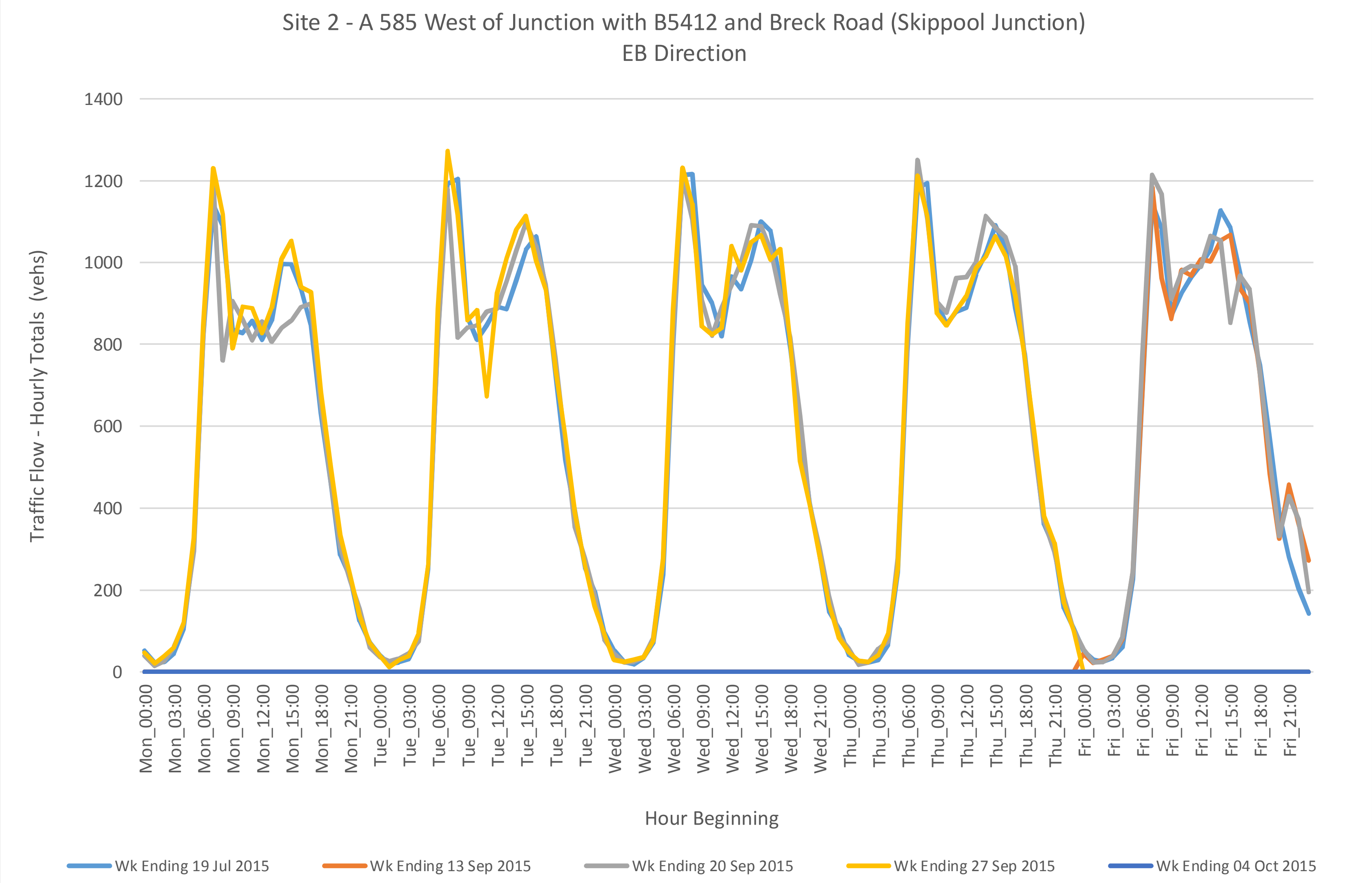
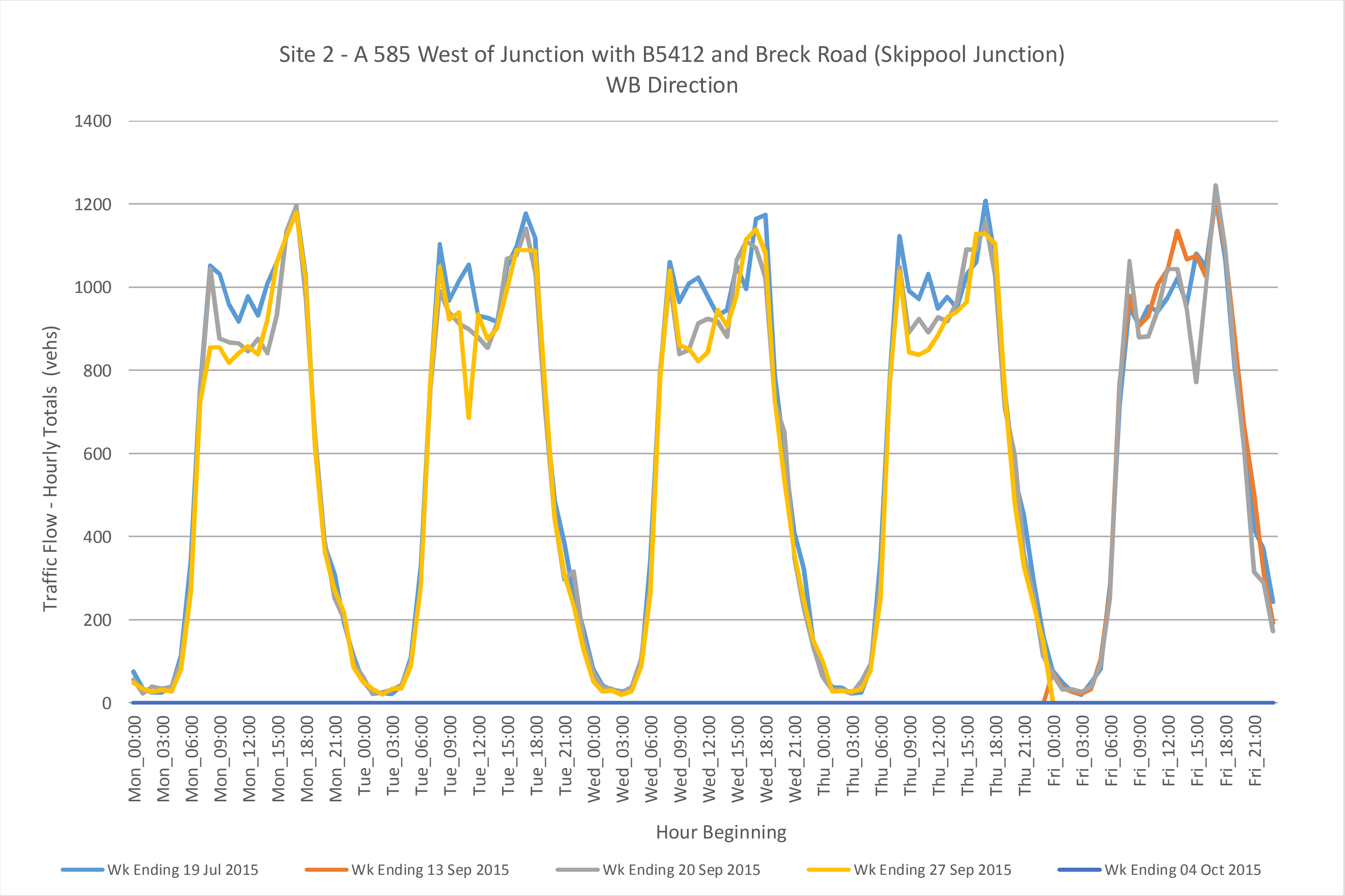
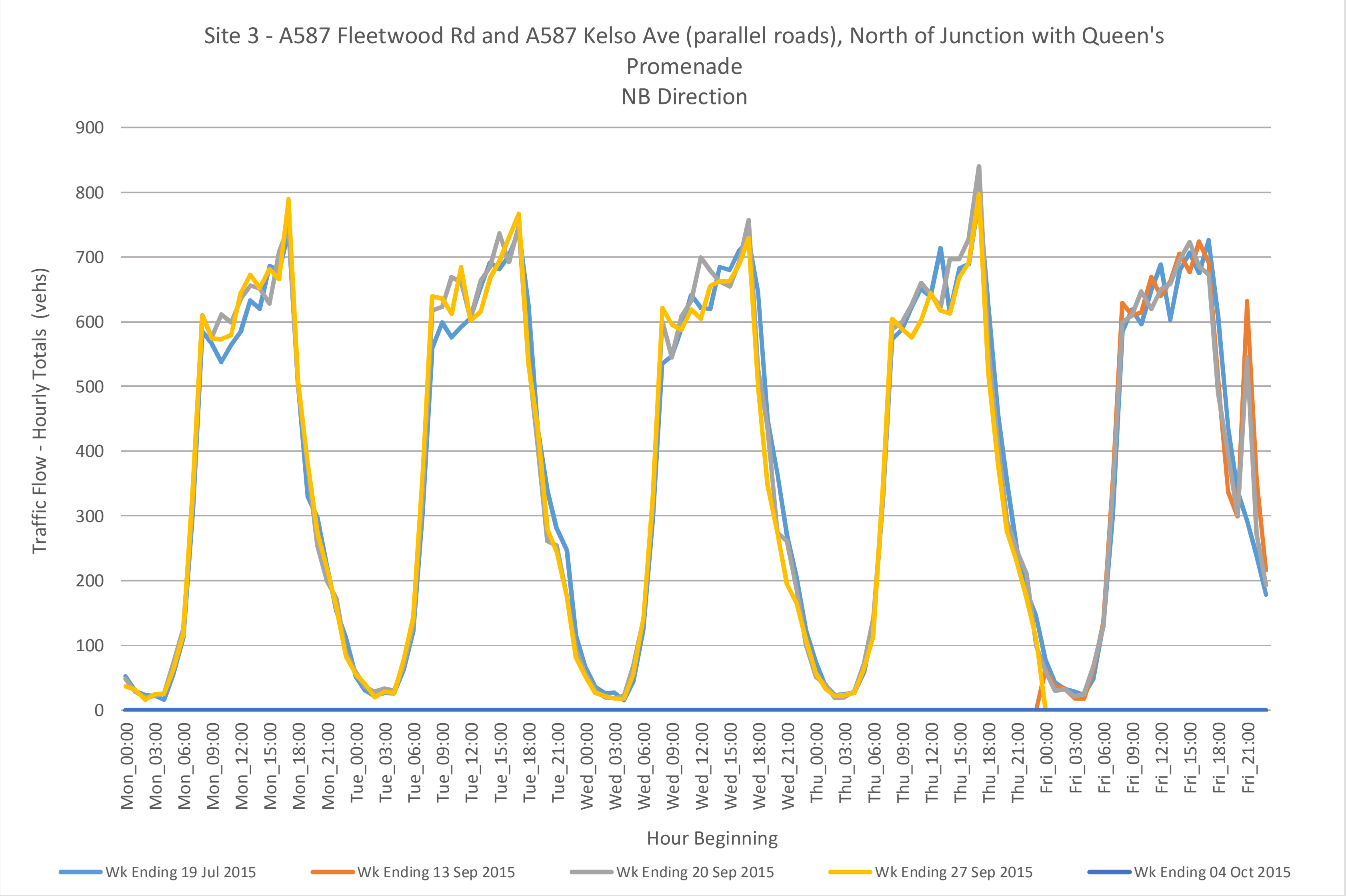
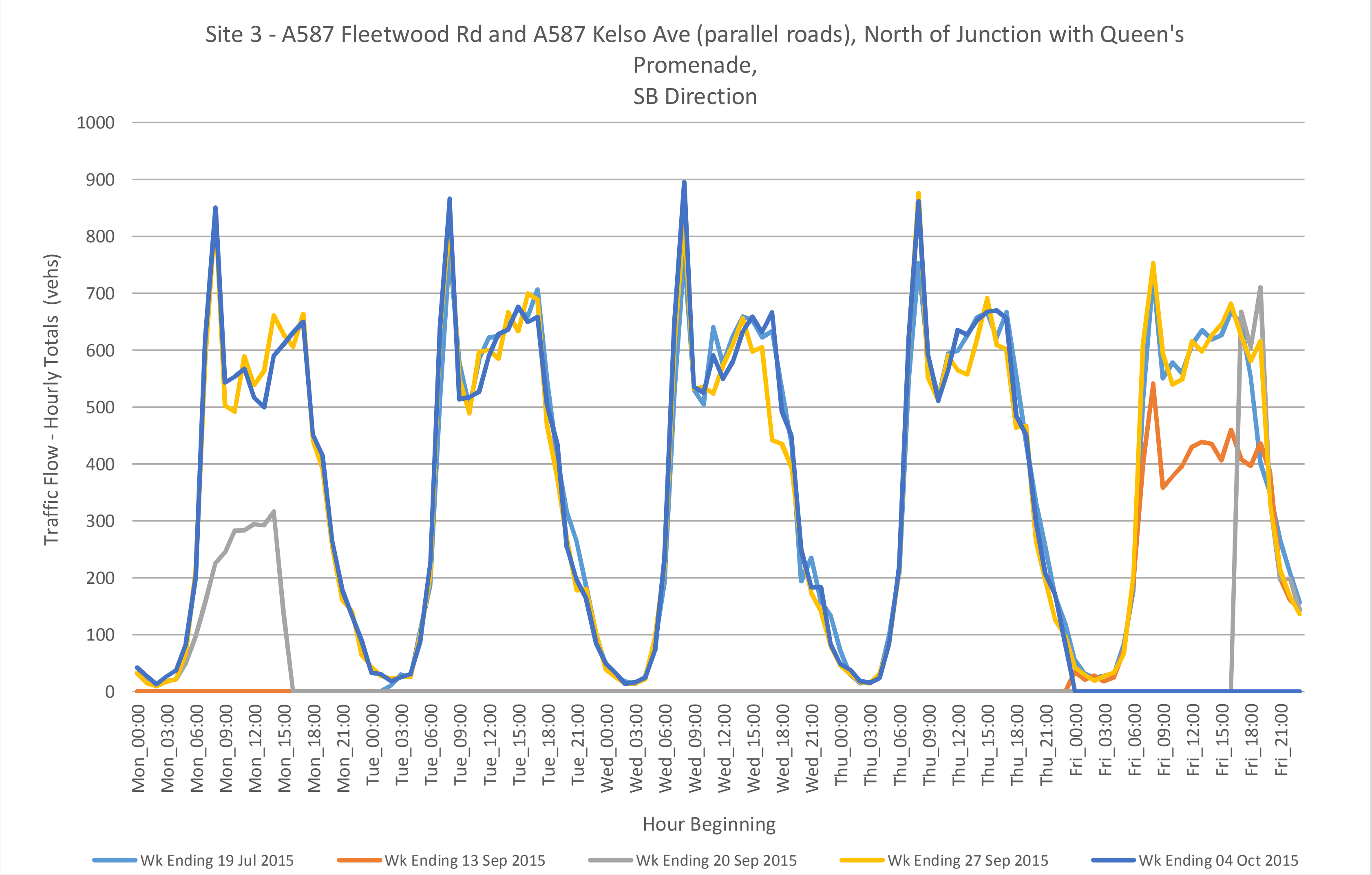
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 2 - A 585 West of Junction with B5412 and Breck Road (Skippool Junction)
EB Direction
Traffic Flow - Hourly Totals (vehs)
1400
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 2 - A 585 West of Junction with B5412 and Breck Road (Skippool Junction)
WB Direction
Traffic Flow - Hourly Totals (vehs)
1400
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 3 - A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), North of Junction with Queen's Promenade
NB Direction
Traffic Flow - Hourly Totals (vehs)
900
800
700
600
500
400
300
200
100
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 3 - A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), North of Junction with Queen's Promenade,
SB Direction
Traffic Flow - Hourly Totals (vehs)
0
100
200
300
400
500
600
700
800
900
1000
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
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Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
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Thu_03:00
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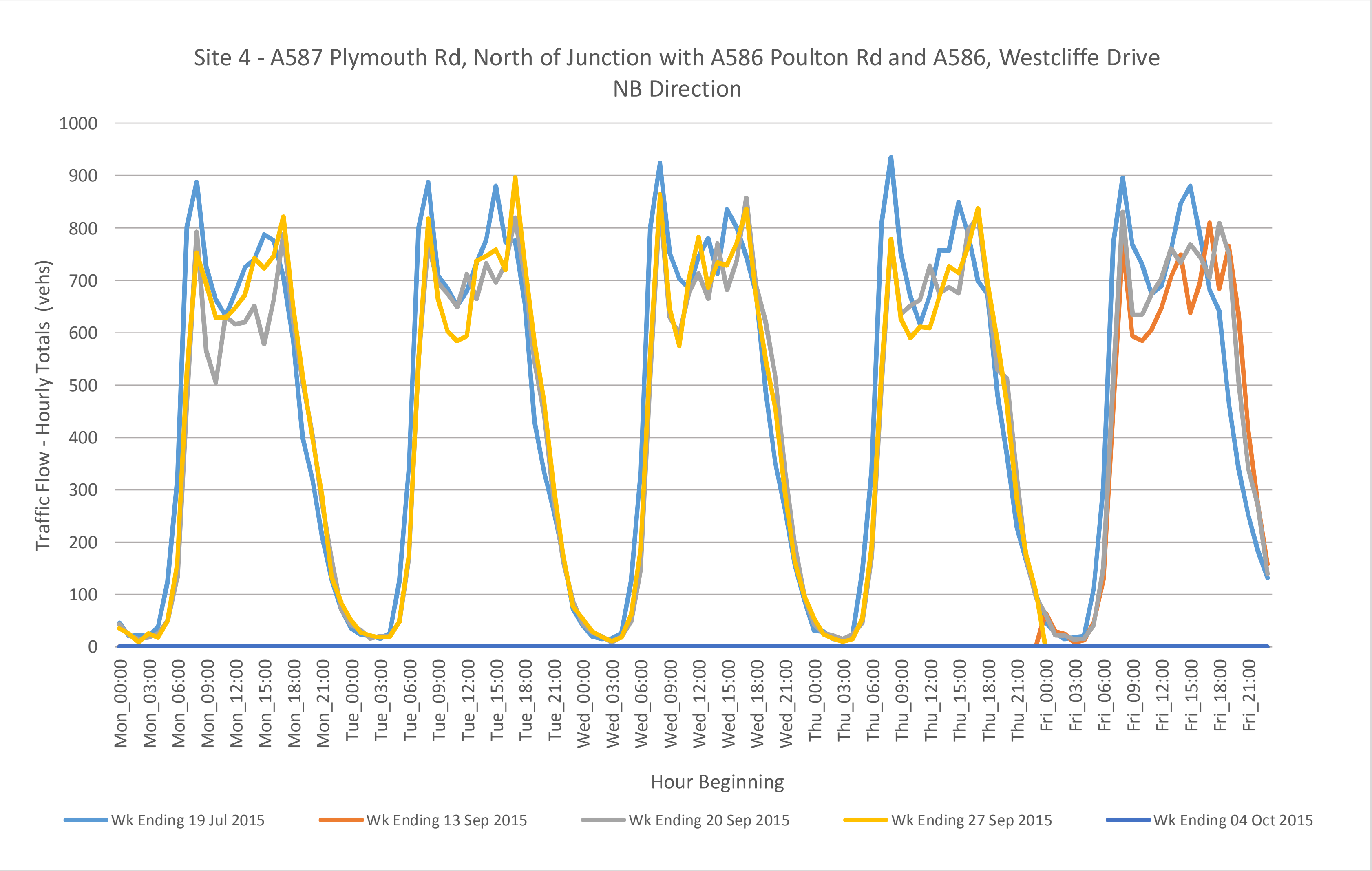
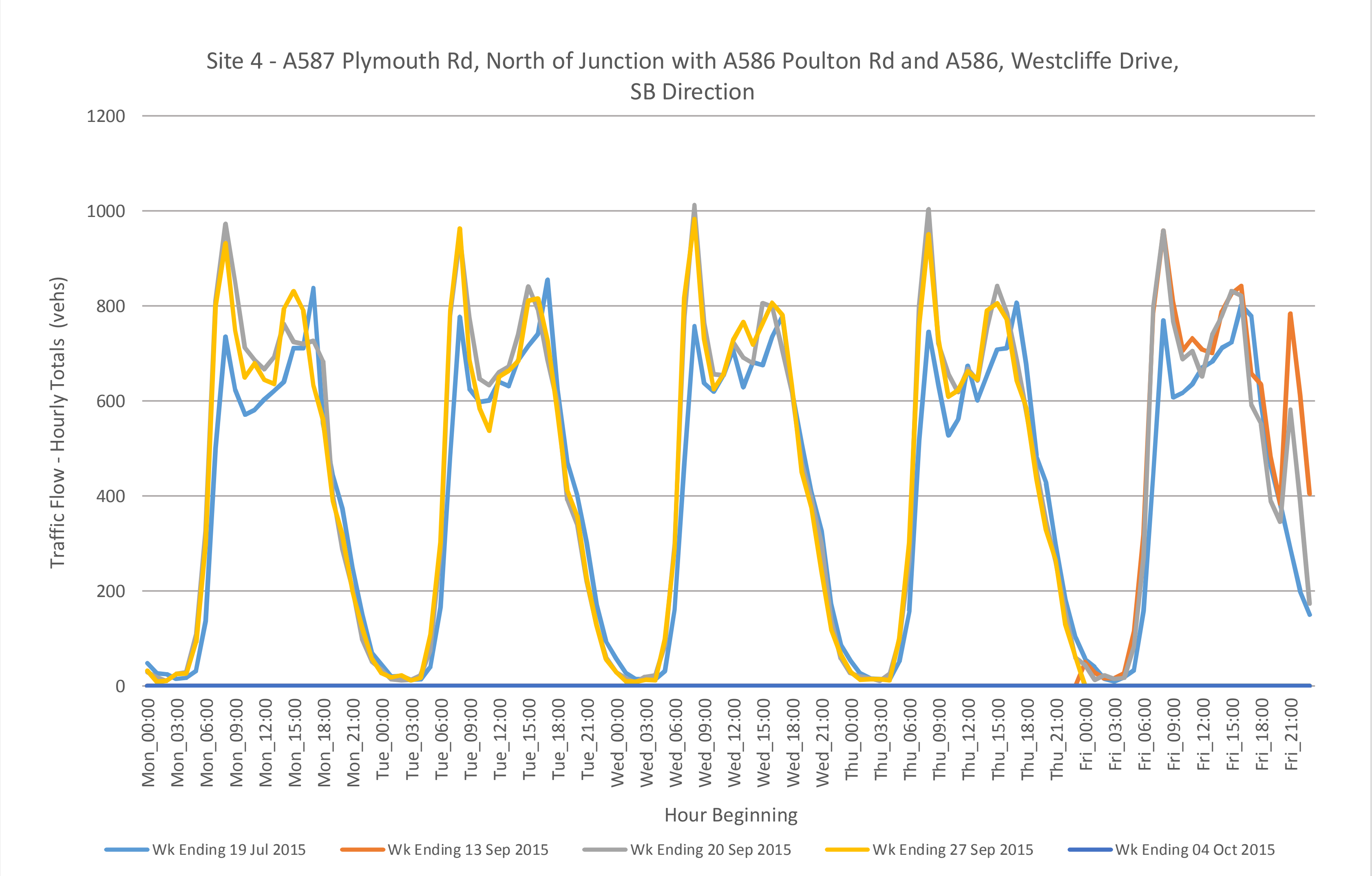
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 4 - A587 Plymouth Rd, North of Junction with A586 Poulton Rd and A586, Westcliffe Drive
NB Direction
Traffic Flow - Hourly Totals (vehs)
1000
900
800
700
600
500
400
300
200
100
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 4 - A587 Plymouth Rd, North of Junction with A586 Poulton Rd and A586, Westcliffe Drive, SB Direction
Traffic Flow - Hourly Totals (vehs)
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
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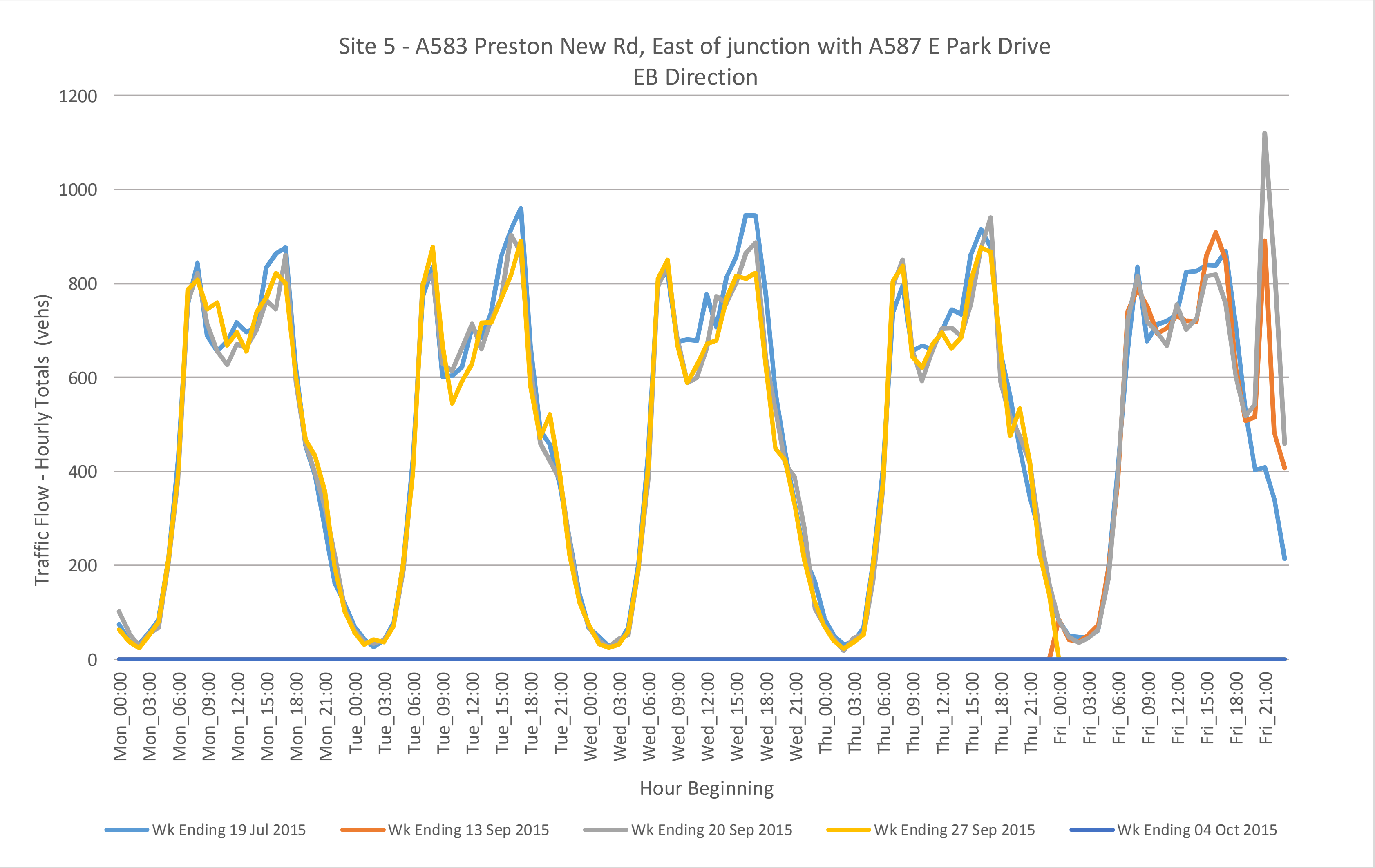
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 5 - A583 Preston New Rd, East of junction with A587 E Park Drive
EB Direction
Traffic Flow - Hourly Totals (vehs)
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
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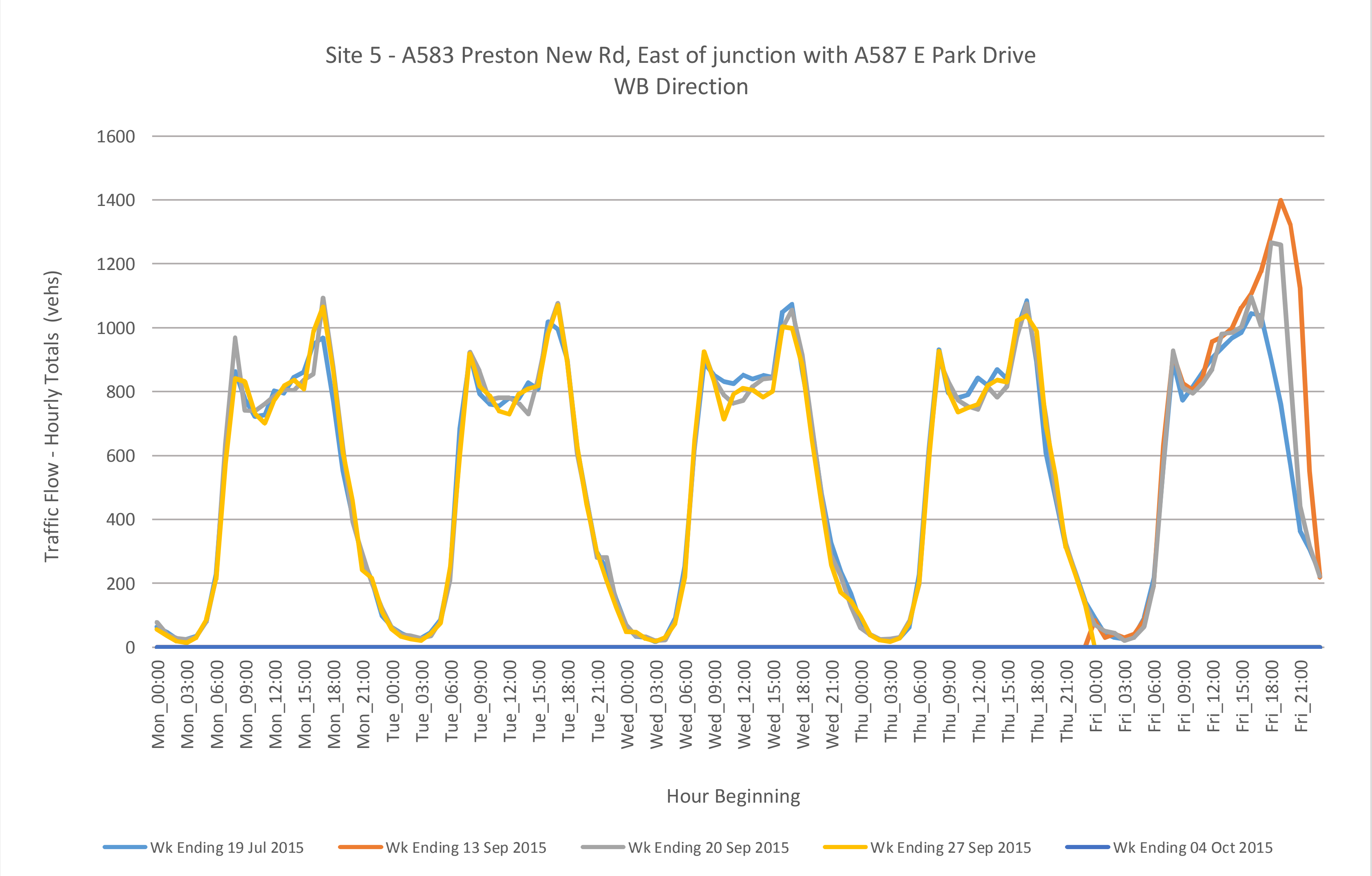
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 5 - A583 Preston New Rd, East of junction with A587 E Park Drive
WB Direction
Traffic Flow - Hourly Totals (vehs)
1600
1400
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
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Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
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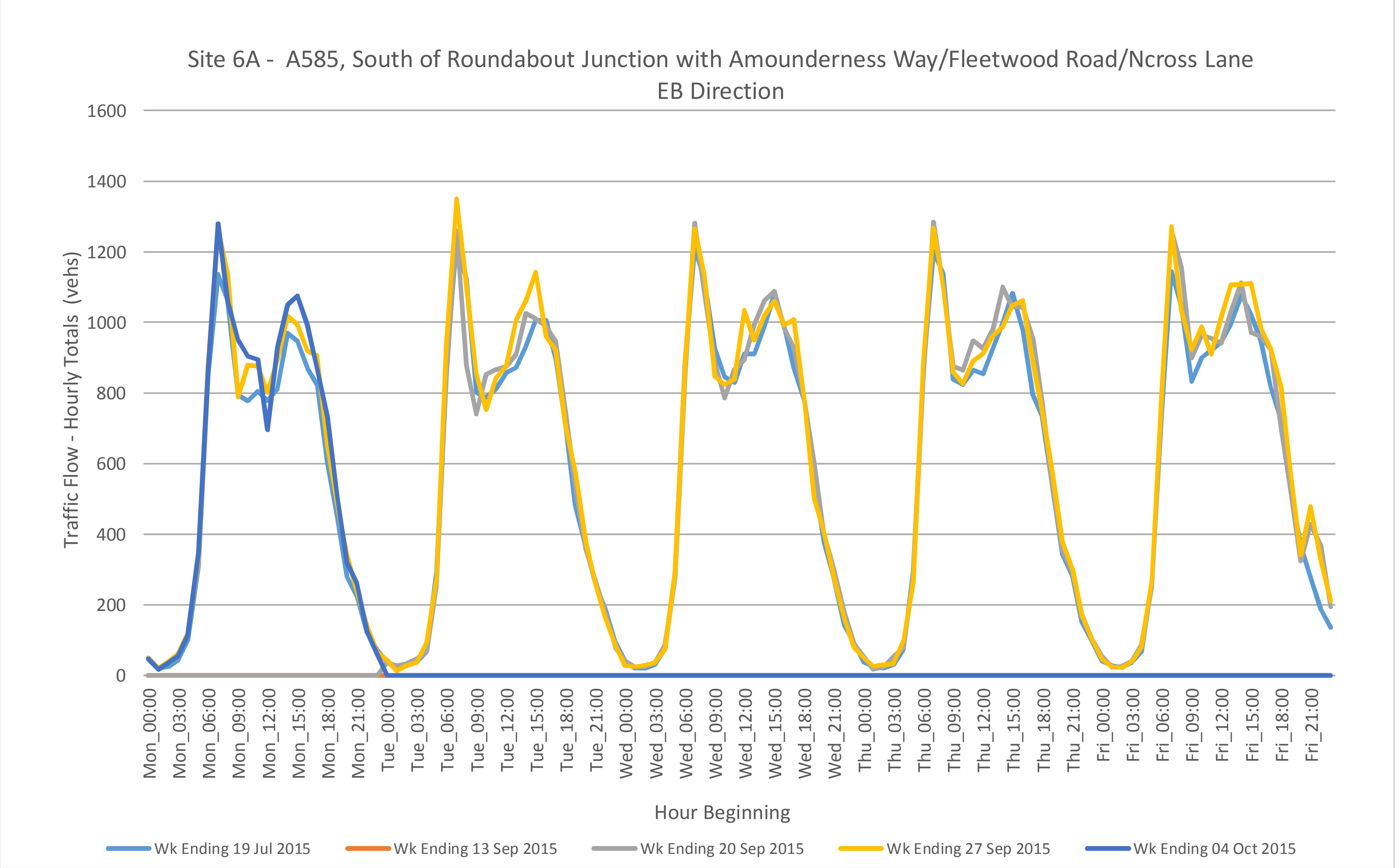
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 6A - A585, South of Roundabout Junction with Amounderness Way/Fleetwood Road/Ncross Lane
EB Direction
Traffic Flow - Hourly Totals (vehs)
1600
1400
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
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Tue_15:00
Tue_18:00
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Wed_06:00
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Wed_15:00
Wed_18:00
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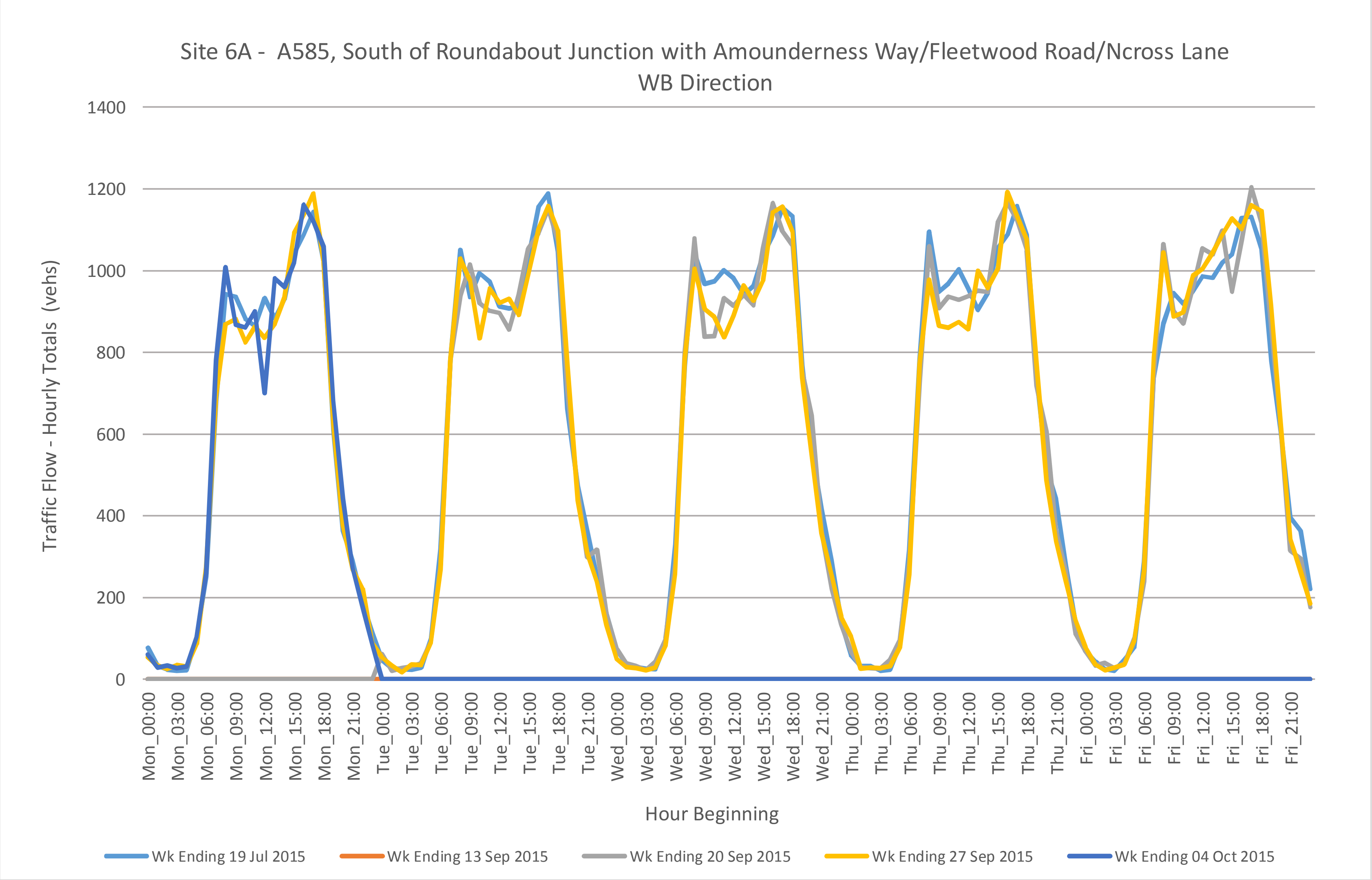
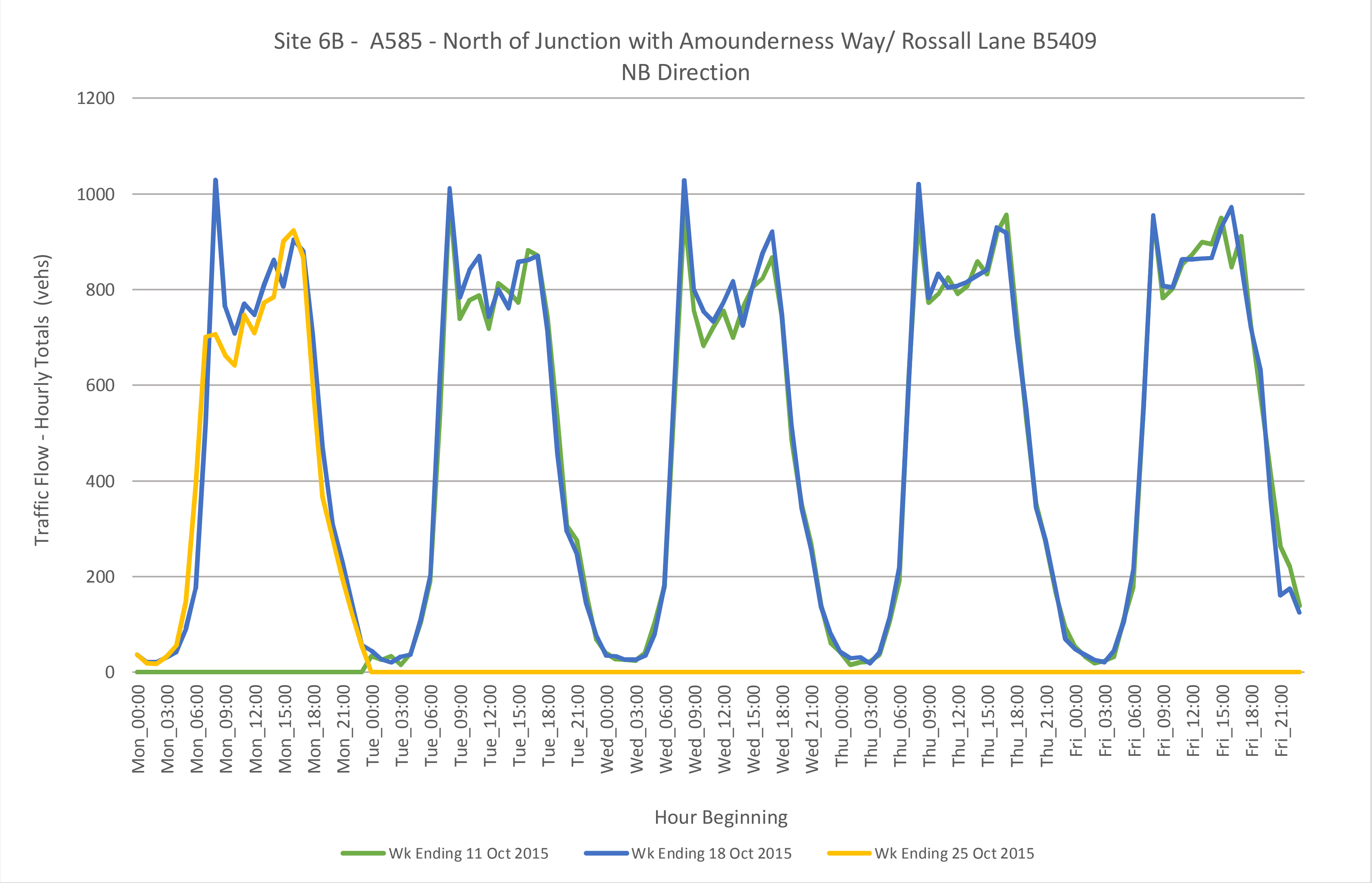
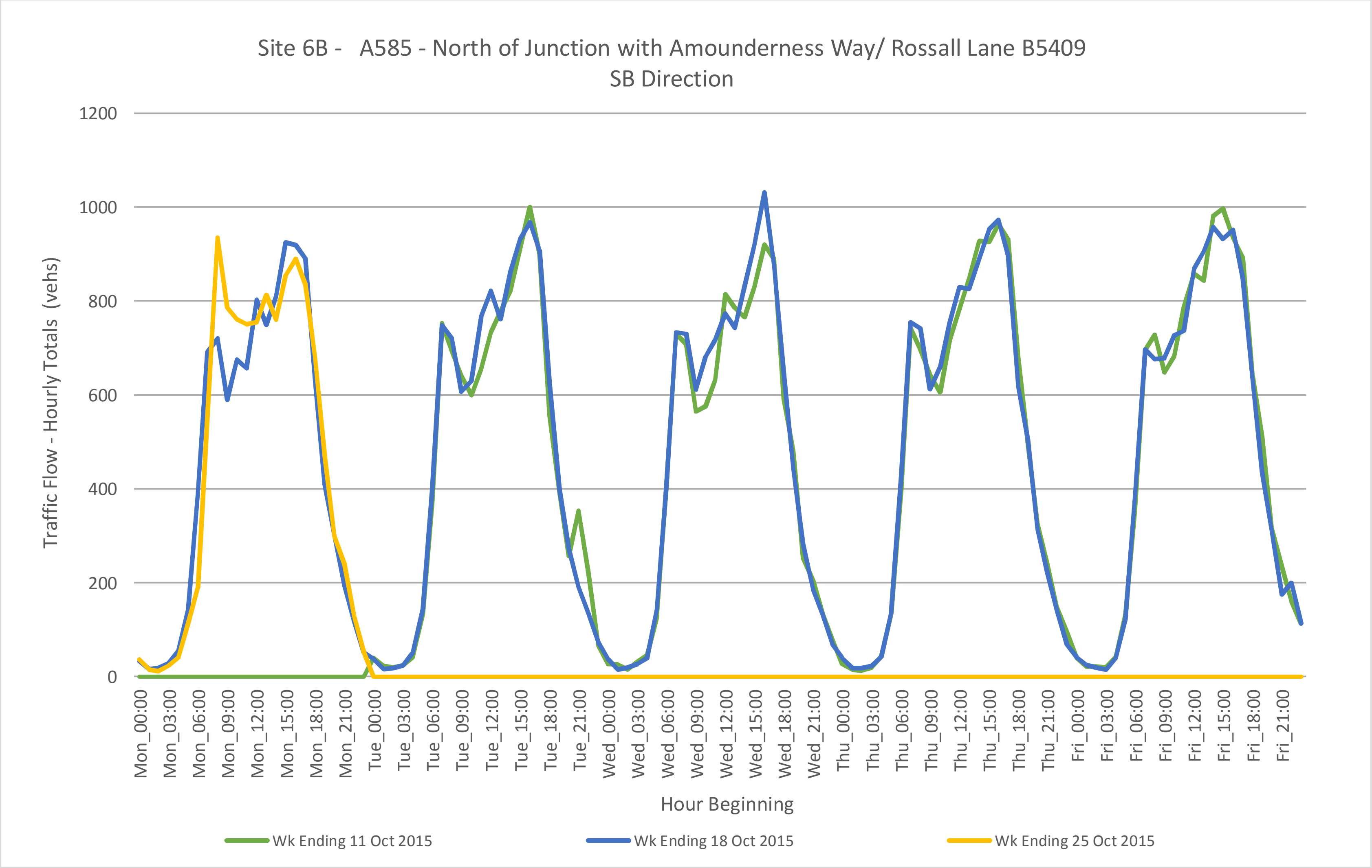
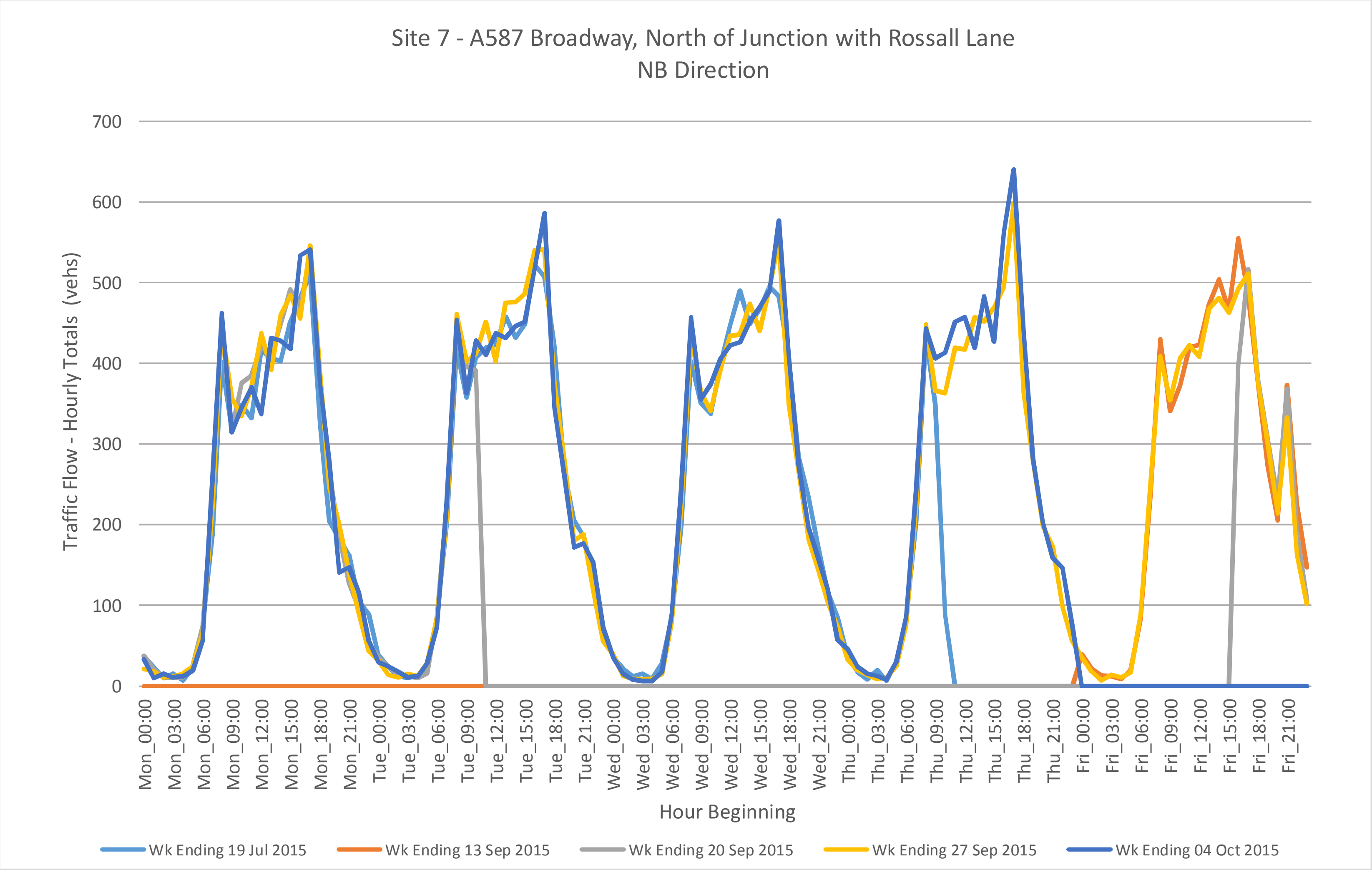
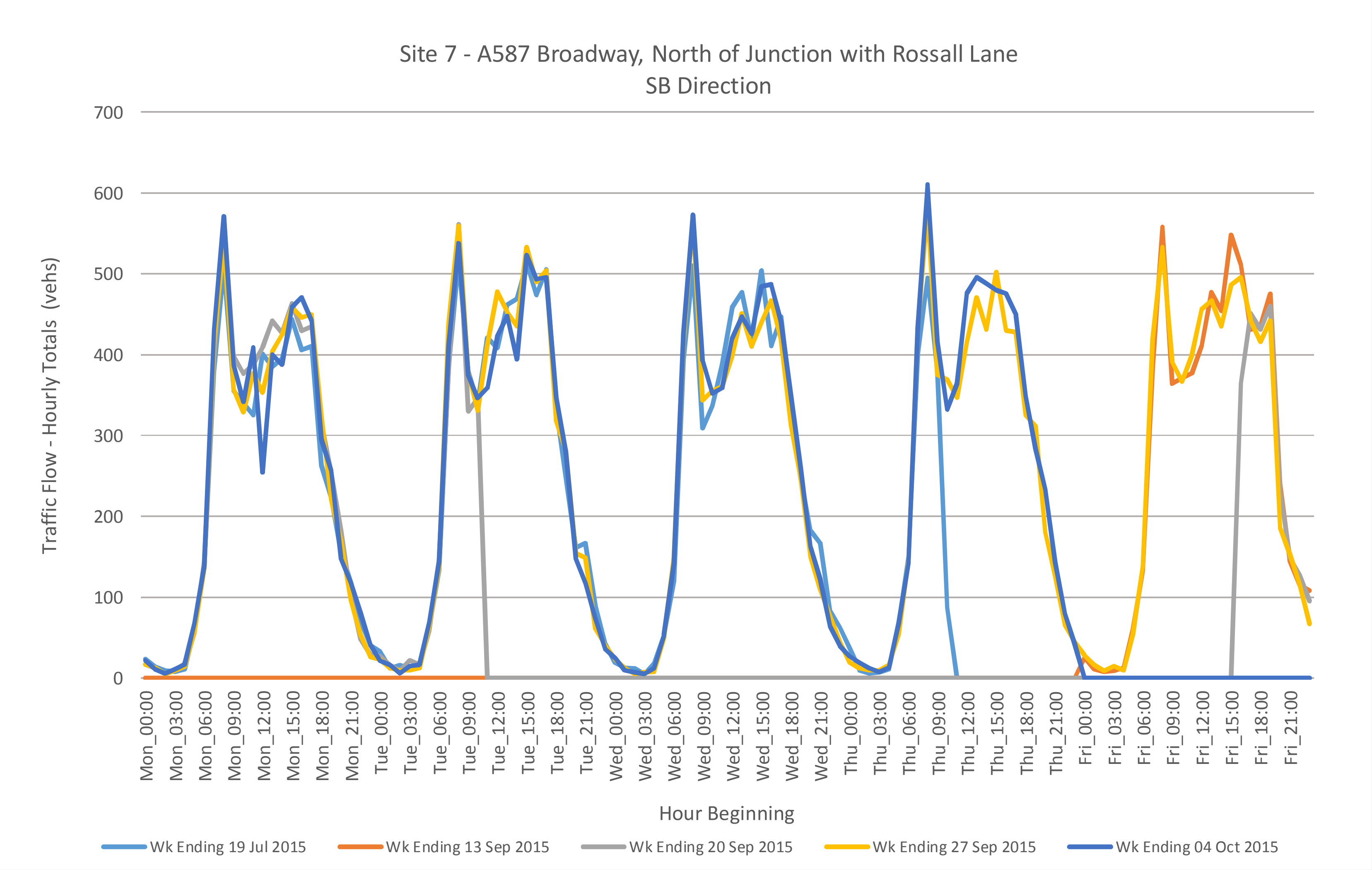
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 6A - A585, South of Roundabout Junction with Amounderness Way/Fleetwood Road/Ncross Lane
WB Direction
Traffic Flow - Hourly Totals (vehs)
0
200
400
600
800
1000
1200
1400
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 6B - A585 - North of Junction with Amounderness Way/ Rossall Lane B5409
NB Direction
Traffic Flow - Hourly Totals (vehs)
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 11 Oct 2015
Wk Ending 18 Oct 2015
Wk Ending 25 Oct 2015


Site 6B - A585 - North of Junction with Amounderness Way/ Rossall Lane B5409
SB Direction
Traffic Flow - Hourly Totals (vehs)
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 11 Oct 2015
Wk Ending 18 Oct 2015
Wk Ending 25 Oct 2015


Site 7 - A587 Broadway, North of Junction with Rossall Lane
NB Direction
Traffic Flow - Hourly Totals (vehs)
700
600
500
400
300
200
100
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015

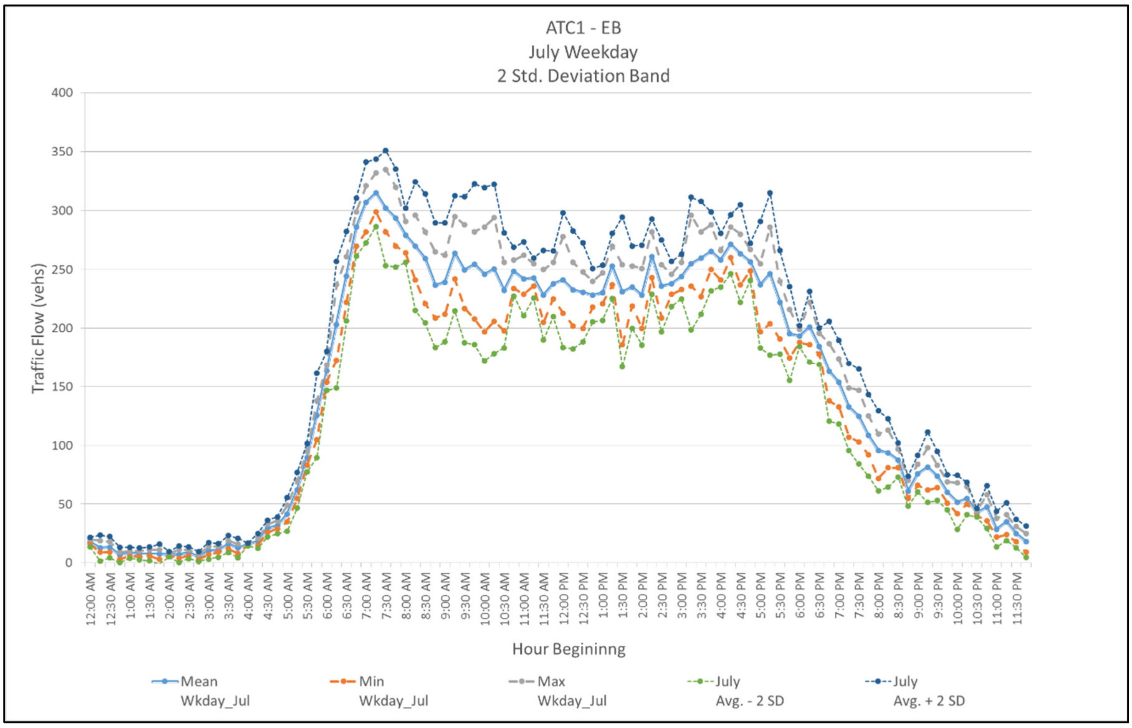

Site 7 - A587 Broadway, North of Junction with Rossall Lane
SB Direction
Traffic Flow - Hourly Totals (vehs)
0
100
200
300
400
500
600
700
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015

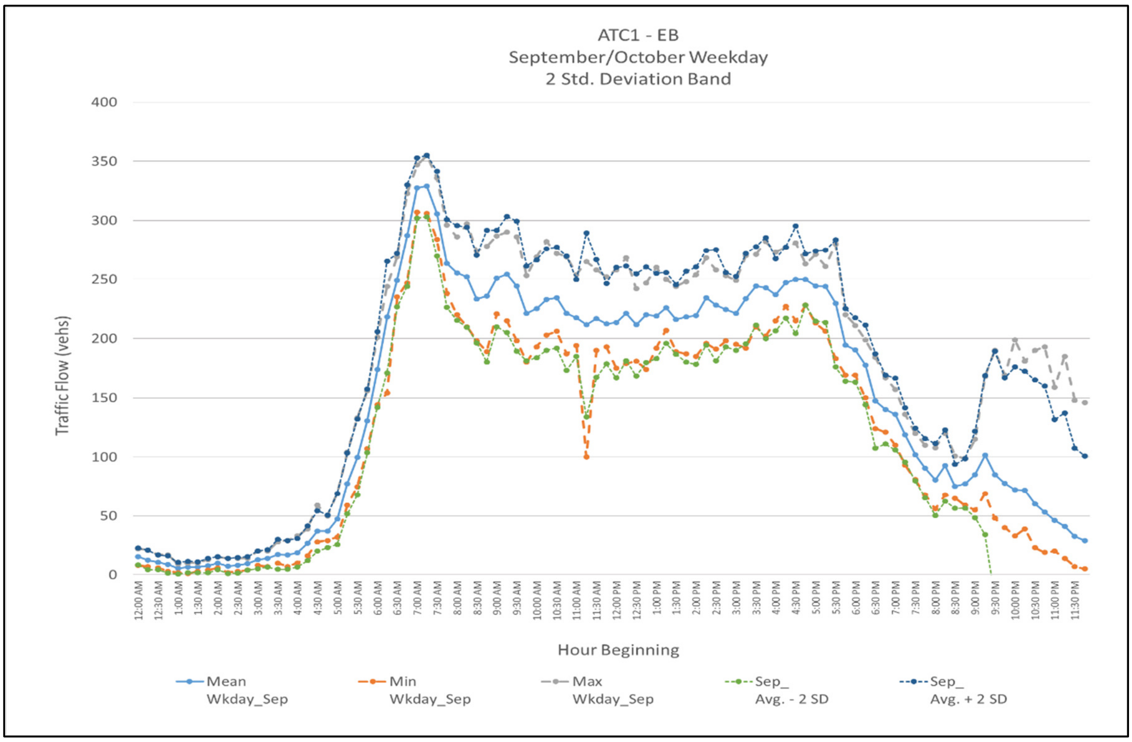
APPENDIX E

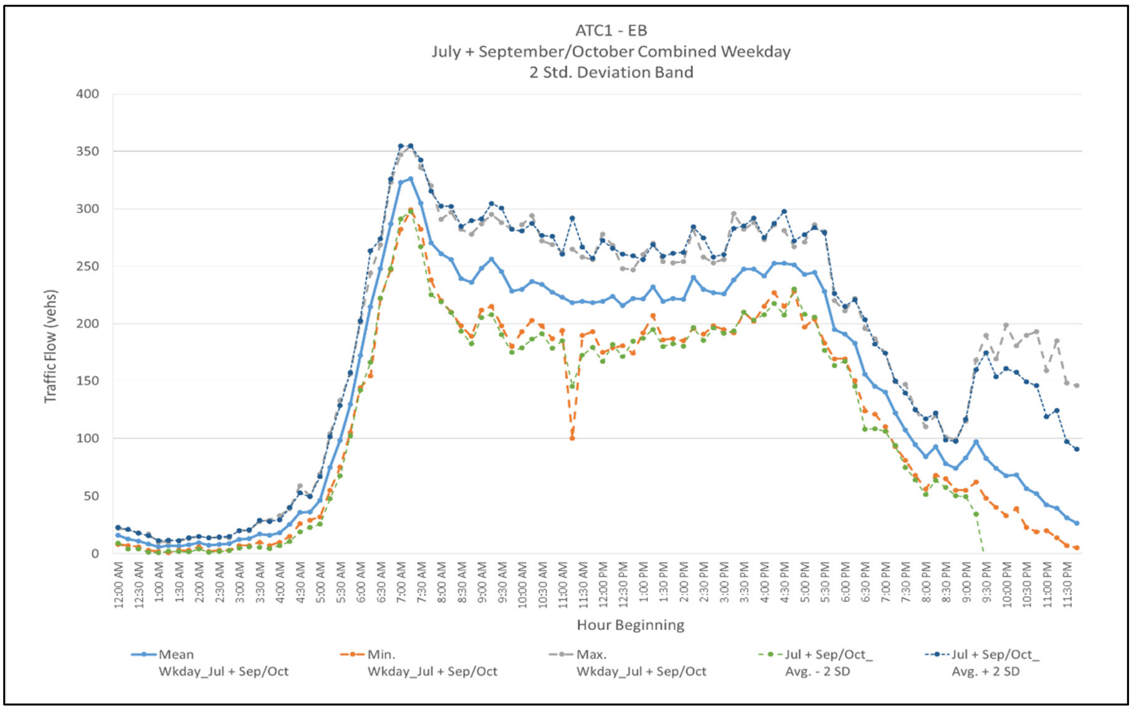
2015 ATC Data: Mean and 2SD Band Plots

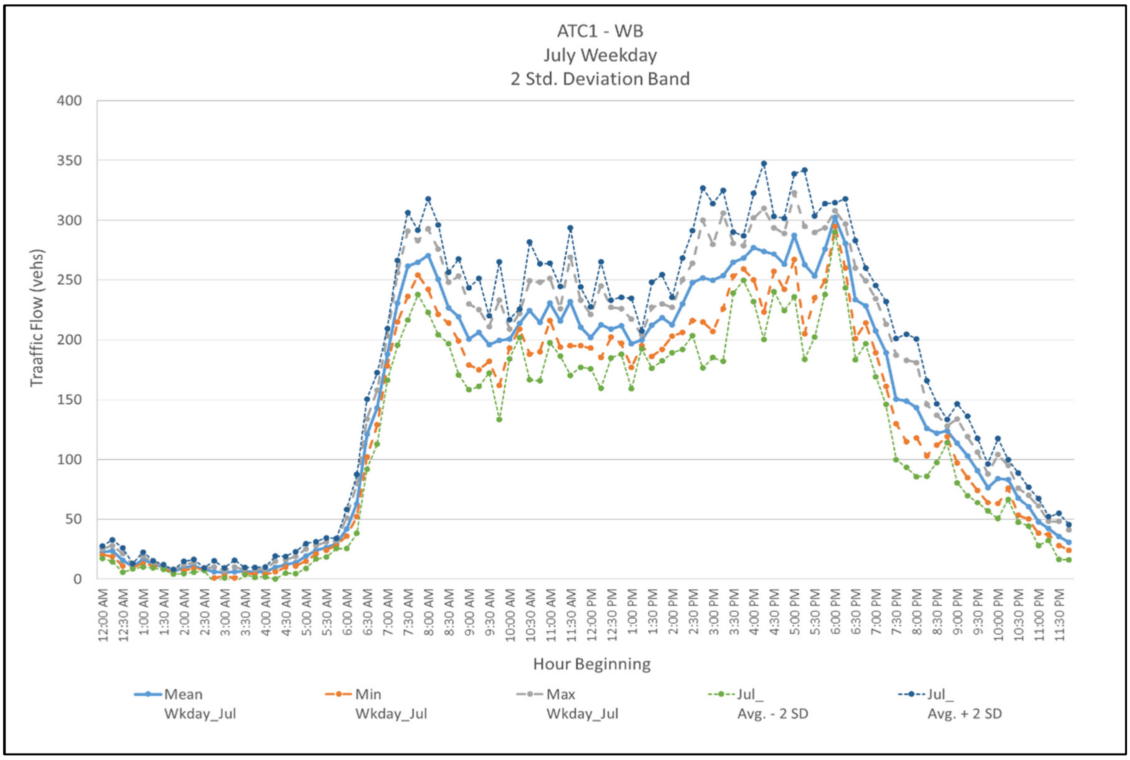
APPENDIX E: 2015 ATC data - TWO STD. DEVIATION TESTS

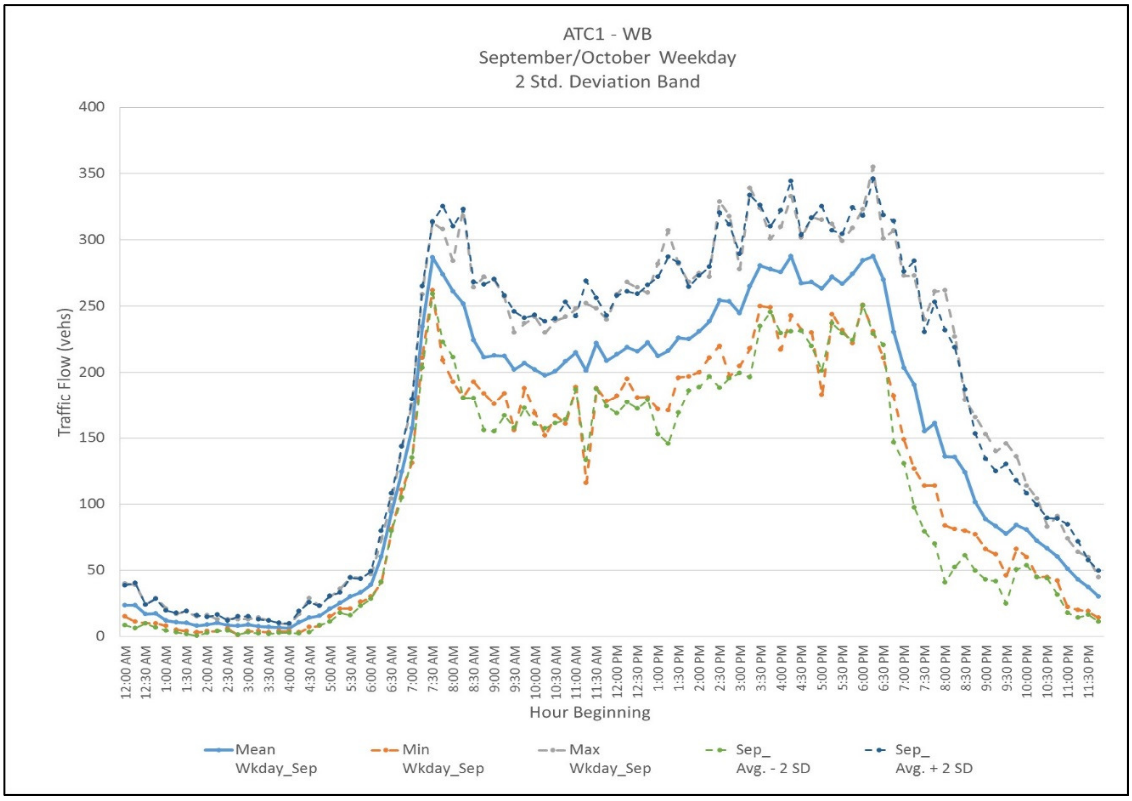
ATC 1

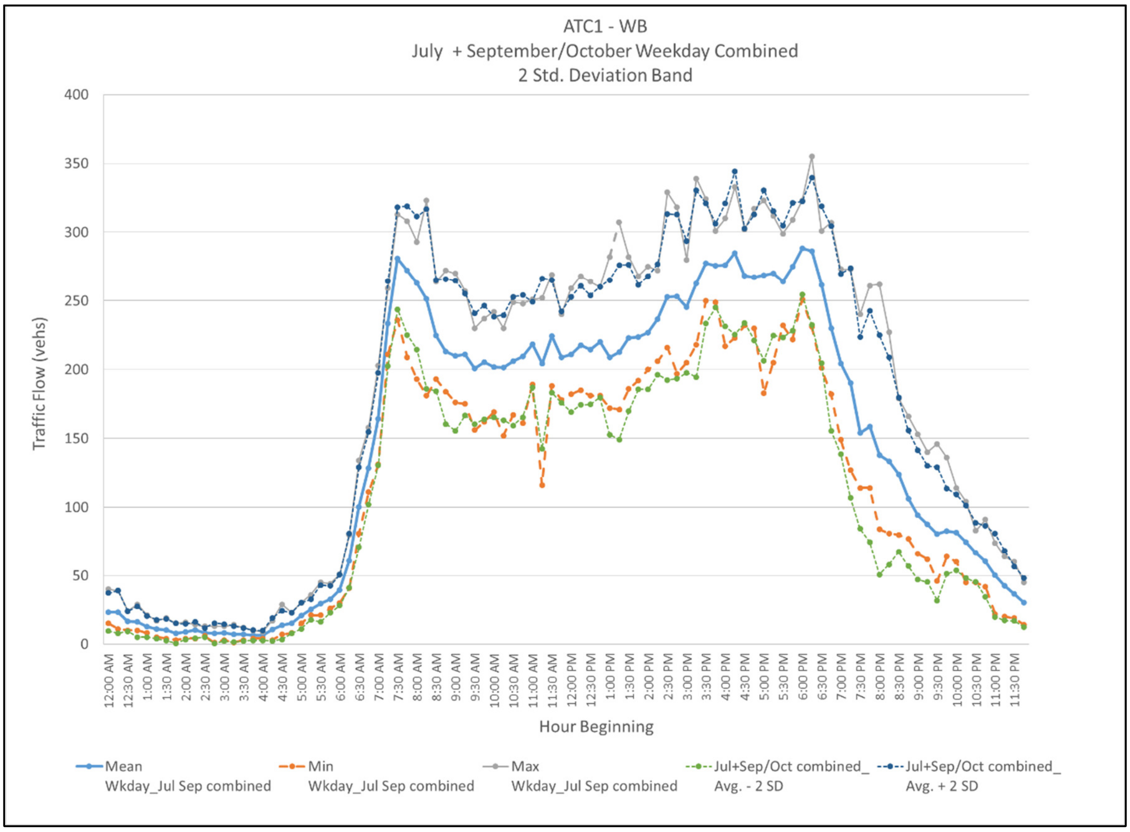




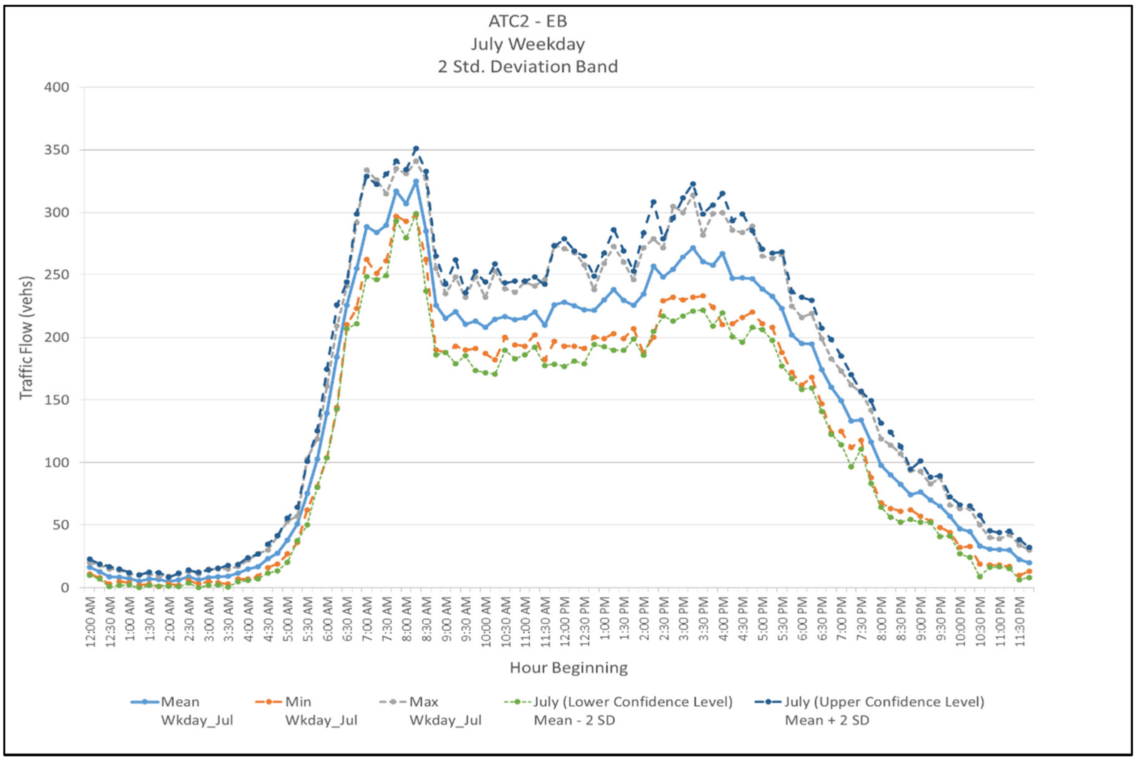

ATC1 - EB
July + September/October Combined Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul + Sep/Oct
Min. Wkday_Jul + Sep/Oct
Max. Wkday_Jul + Sep/Oct
Jul + Sep/Oct_ Avg. - 2 SD
Jul + Sep/Oct_ Avg. + 2 SD

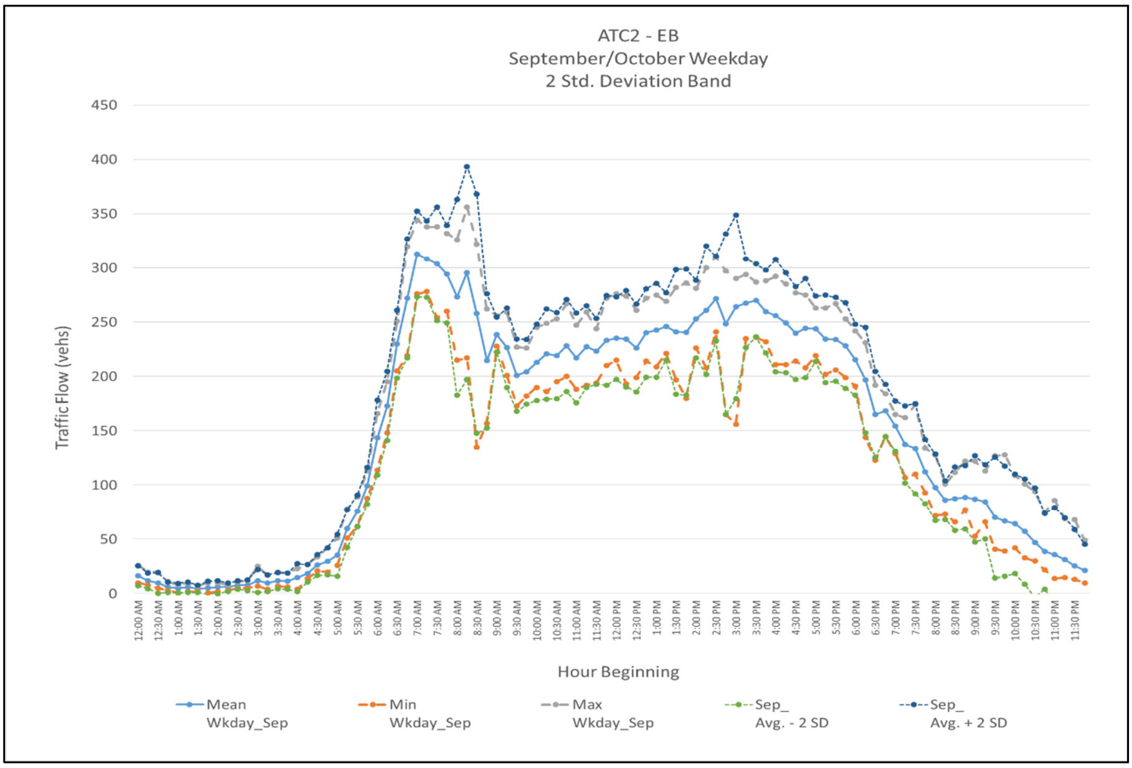

ATC1 - WB
July Weekday
2 Std. Deviation Band
Traaffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
Jul_ Avg. - 2 SD
Jul_ Avg. + 2 SD

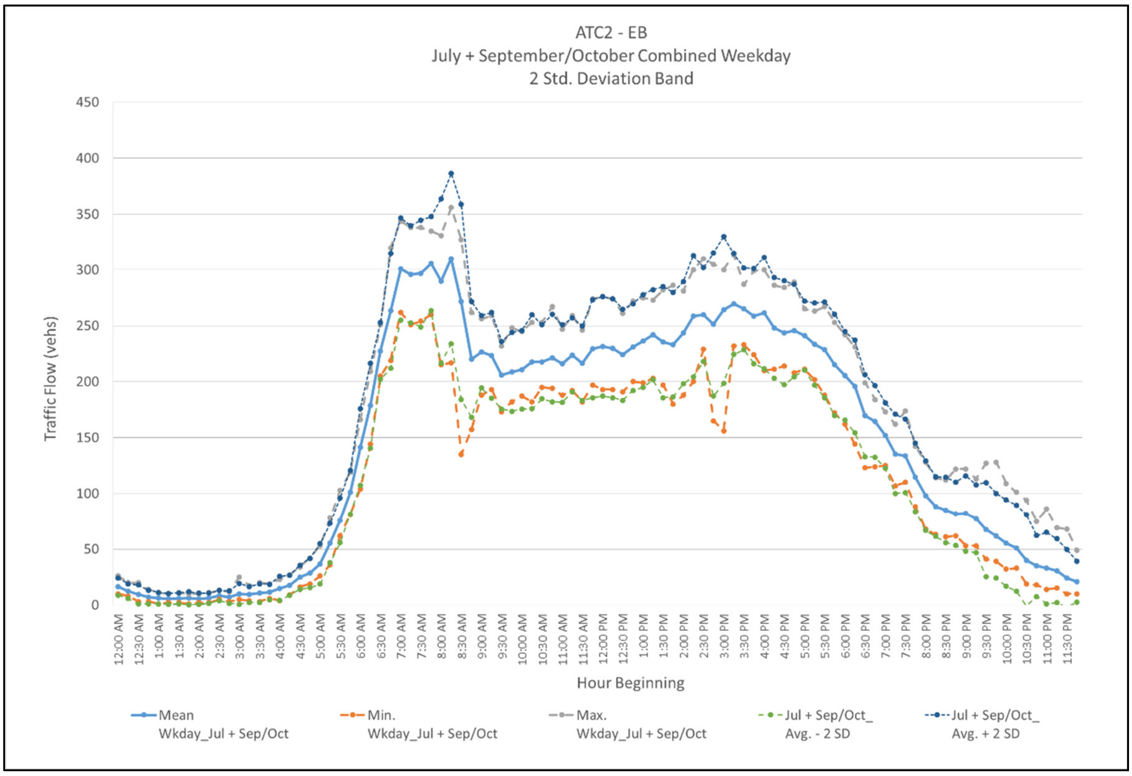

ATC1 - WB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD

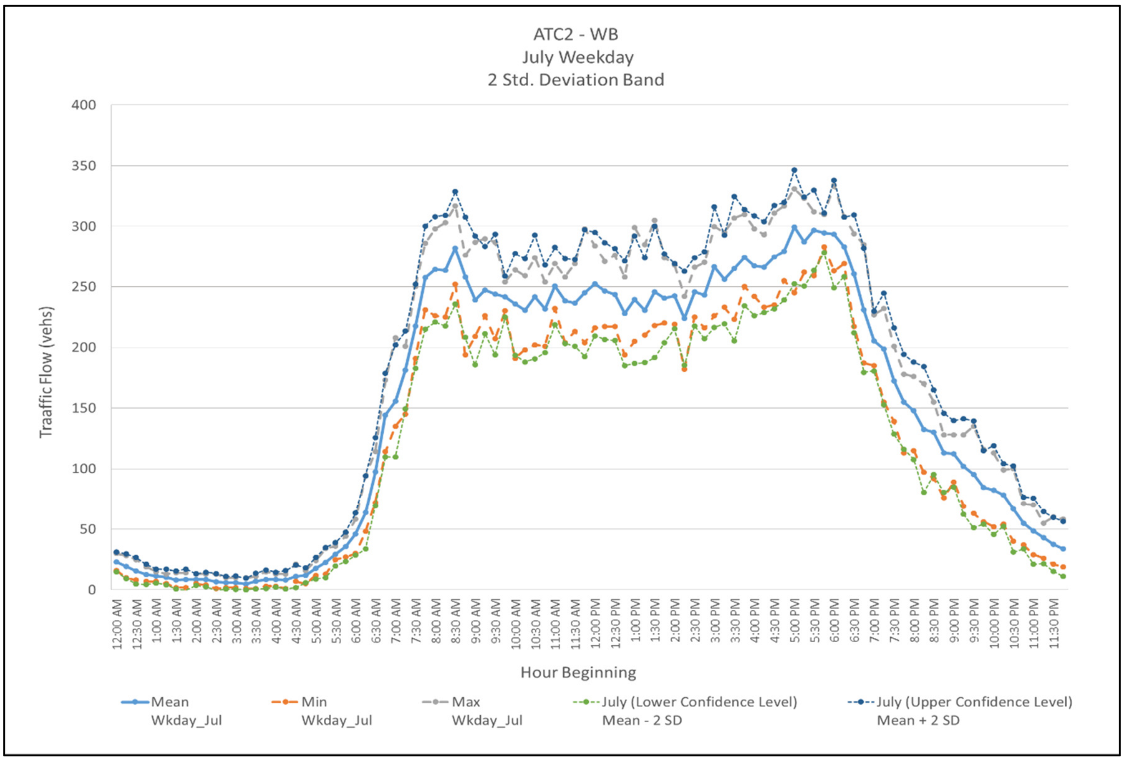

ATC1 - WB
July + September/October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul+Sep/Oct combined_ Avg. - 2 SD
Jul+Sep/Oct combined_ Avg. + 2 SD

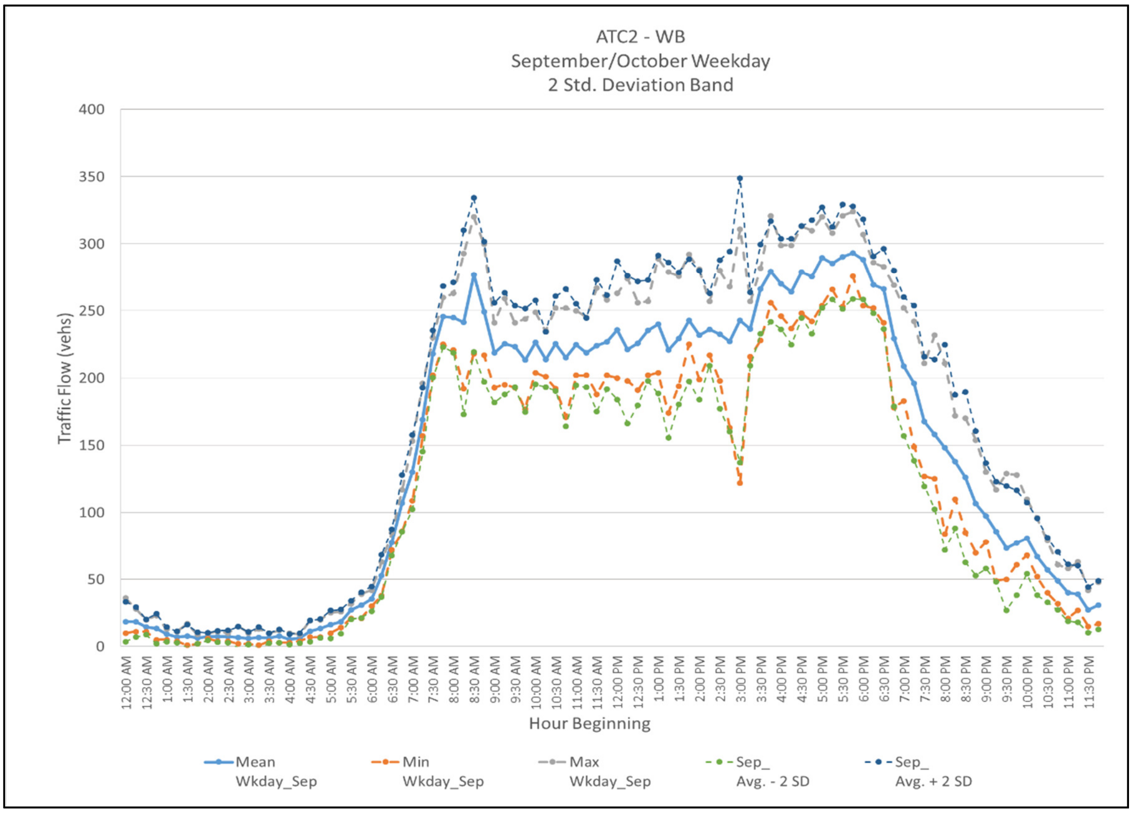
ATC 2

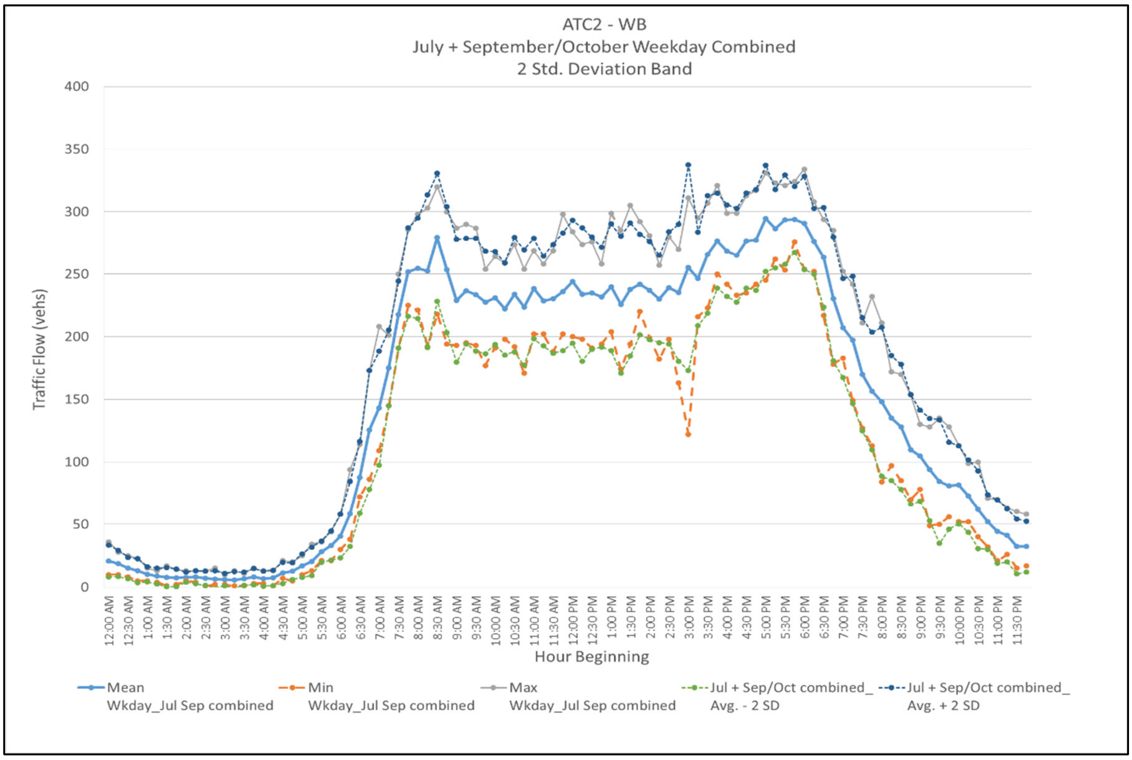

ATC2 - EB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July (Lower Confidence Level) Mean - 2 SD
July (Upper Confidence Level) Mean + 2 SD


ATC2 - EB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
450
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC2 - EB
July + September/October Combined Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
450
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul + Sep/Oct
Min. Wkday_Jul + Sep/Oct
Max. Wkday_Jul + Sep/Oct
Jul + Sep/Oct_ Avg. - 2 SD
Jul + Sep/Oct_ Avg. + 2 SD


ATC2 - WB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July (Lower Confidence Level) Mean - 2 SD
July (Upper Confidence Level) Mean + 2 SD


ATC2 - WB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC2 - WB
July + September/October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
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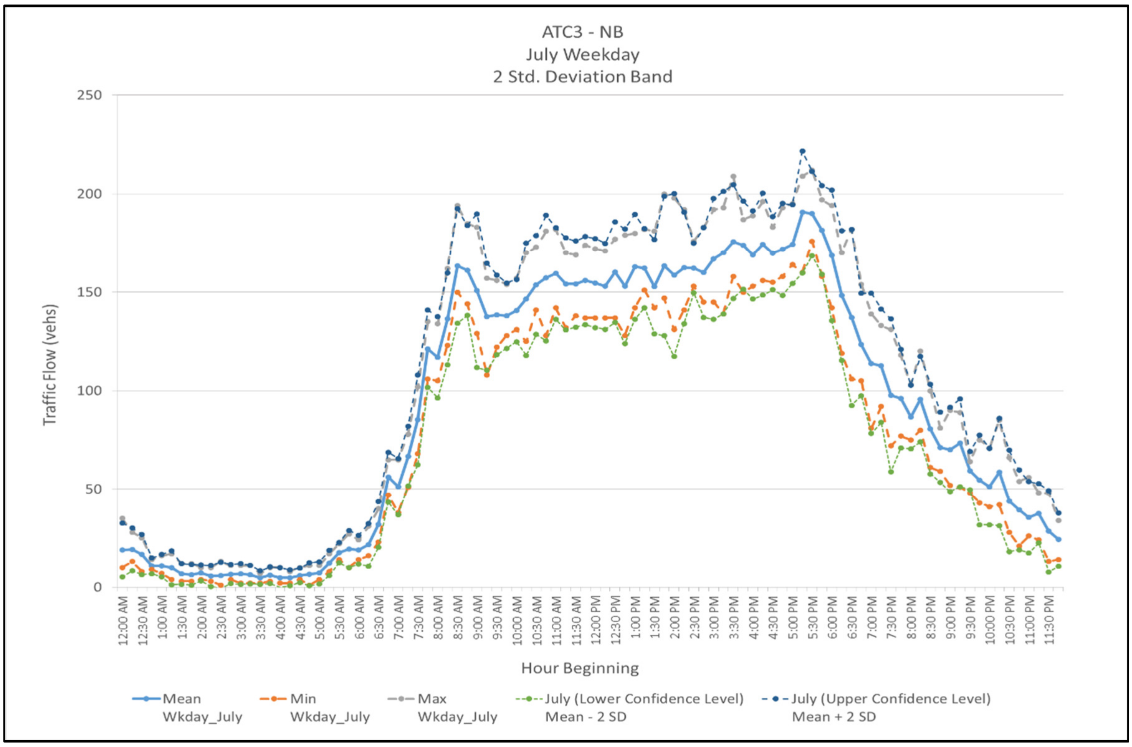
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul + Sep/Oct combined_ Avg. - 2 SD
Jul + Sep/Oct combined_ Avg. + 2 SD

ATC 3


ATC3 - NB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
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11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
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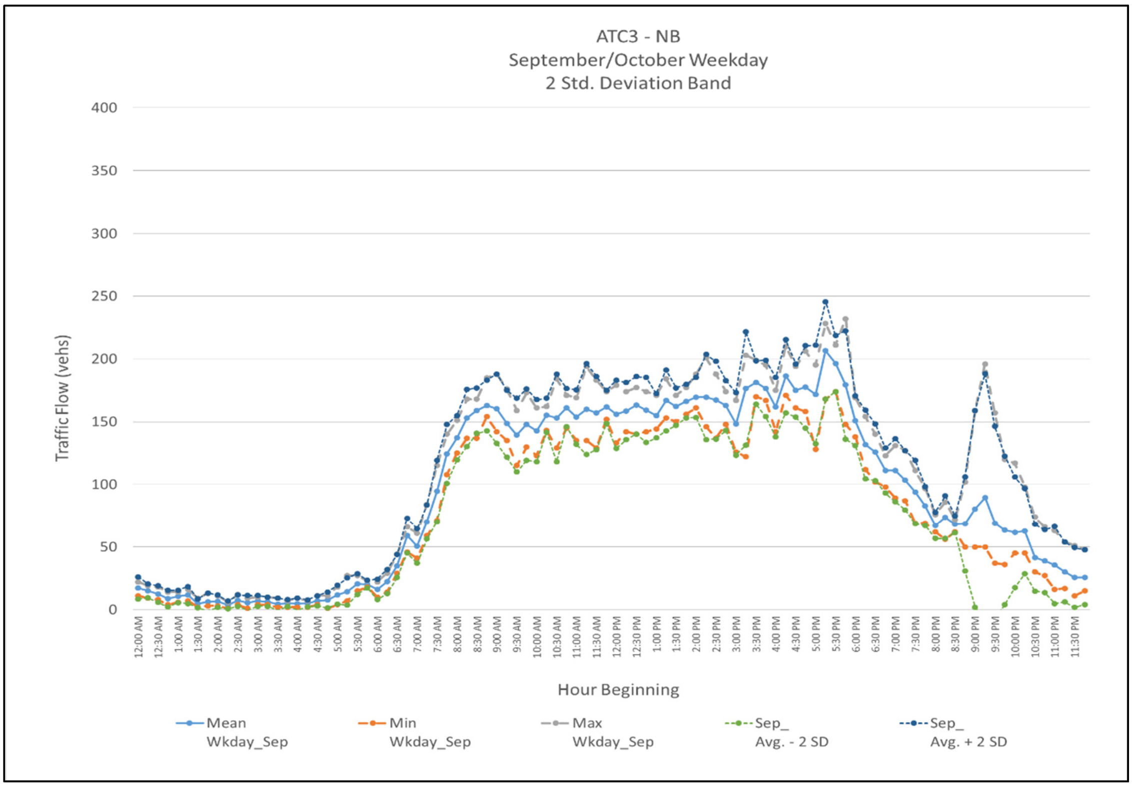
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_July
Min Wkday_July
Max Wkday_July
July (Lower Confidence Level) Mean - 2 SD
July (Upper Confidence Level) Mean + 2 SD


ATC3 - NB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
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100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
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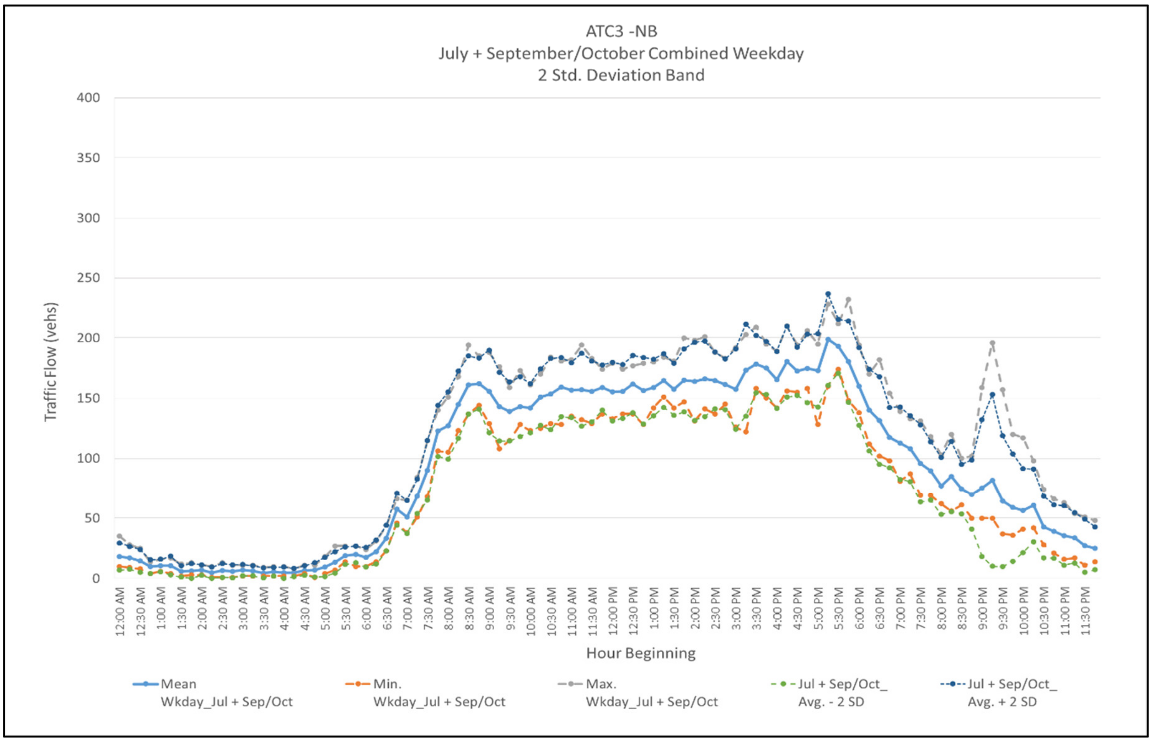
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC3 -NB
July + September/October Combined Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
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250
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150
100
50
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12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
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3:00 AM
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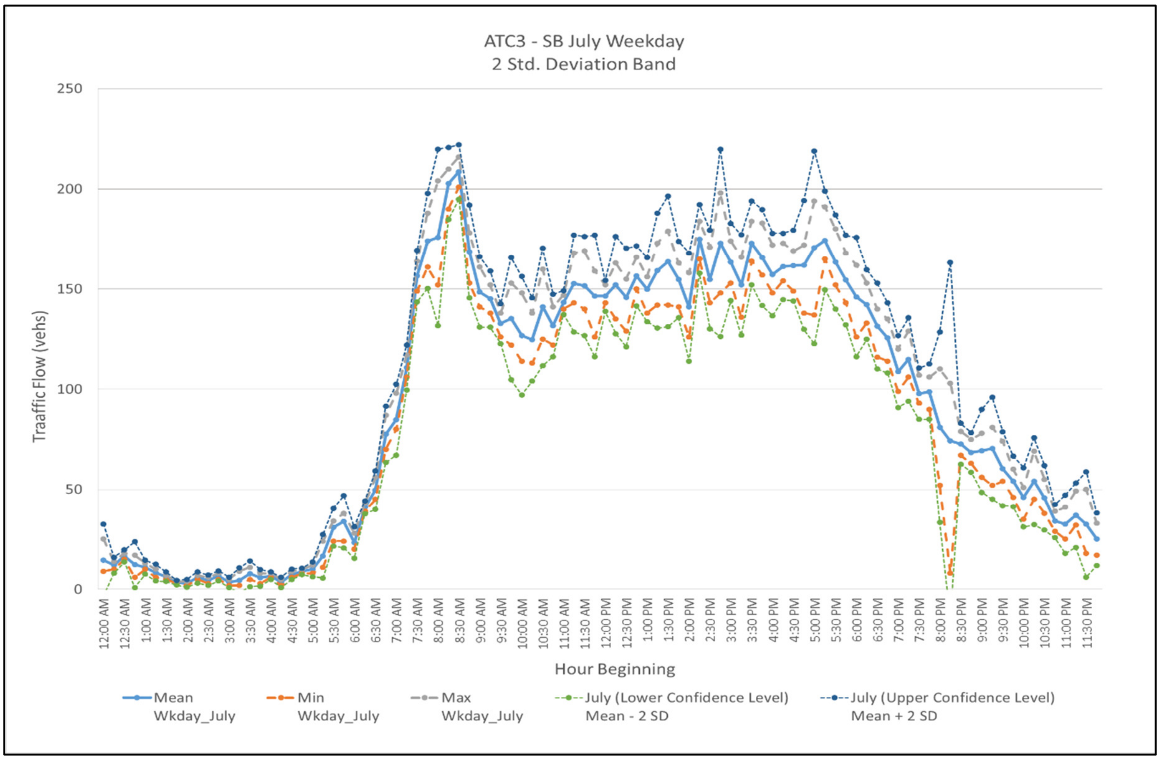
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul + Sep/Oct
Min. Wkday_Jul + Sep/Oct
Max. Wkday_Jul + Sep/Oct
Jul + Sep/Oct_ Avg. - 2 SD
Jul + Sep/Oct_ Avg. + 2 SD


ATC3 - SB July Weekday
2 Std. Deviation Band
Traaffic Flow (vehs)
250
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100
50
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12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
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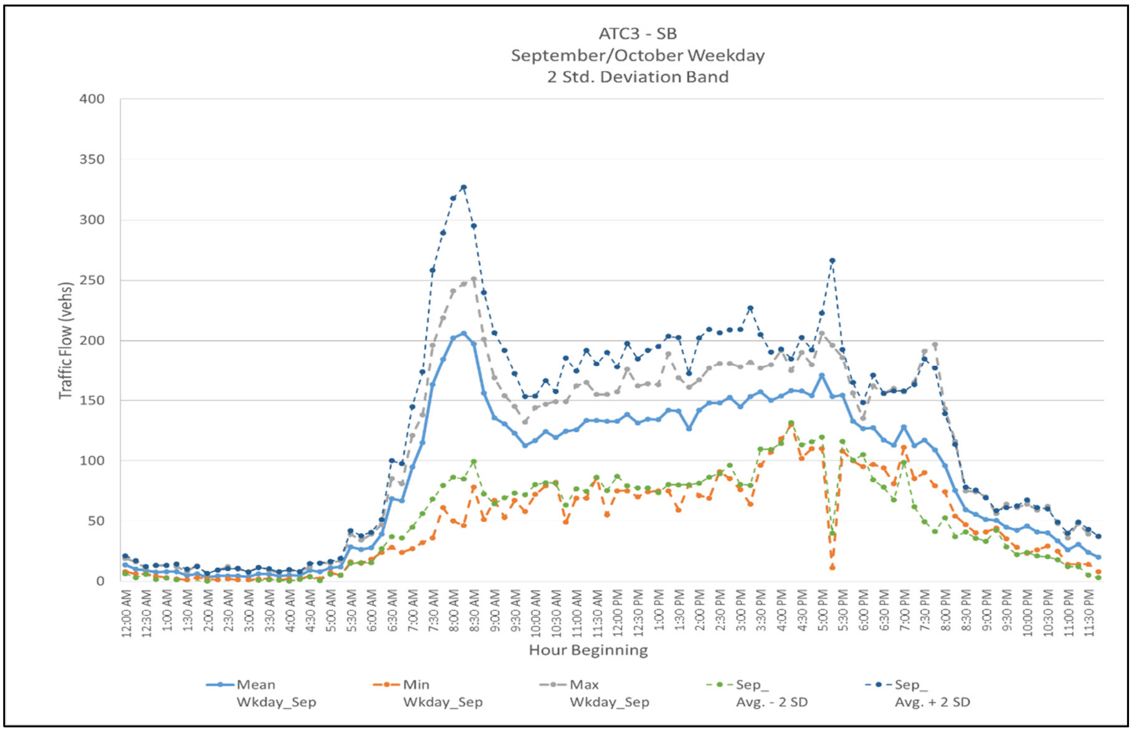
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_July
Min Wkday_July
Max Wkday_July
July (Lower Confidence Level) Mean - 2 SD
July (Upper Confidence Level) Mean + 2 SD


ATC3 - SB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
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400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
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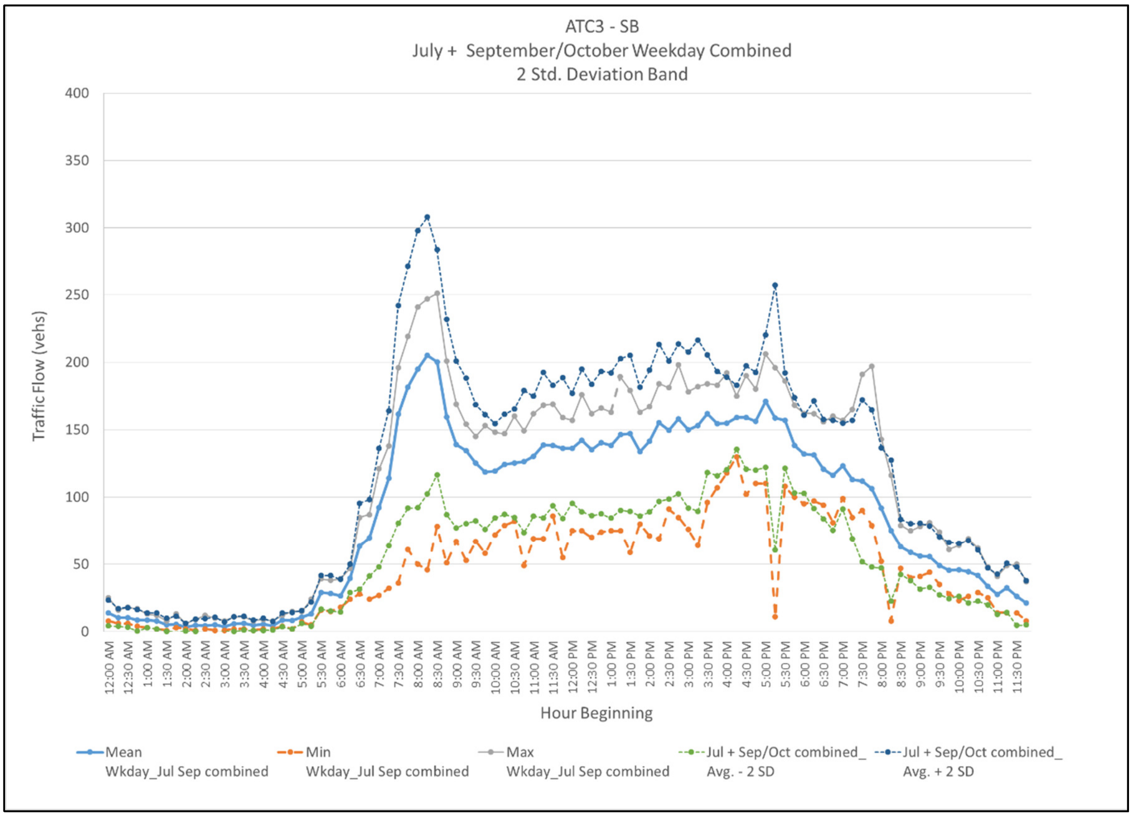
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC3 - SB
July + September/October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
0
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250
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350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
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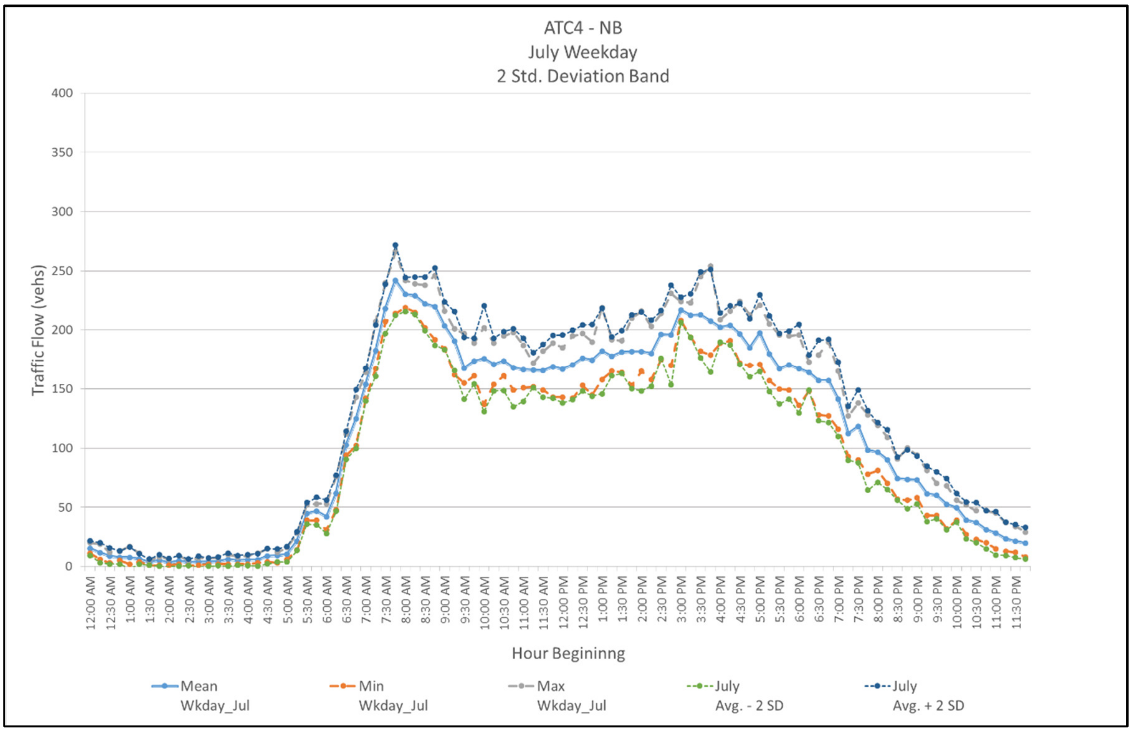
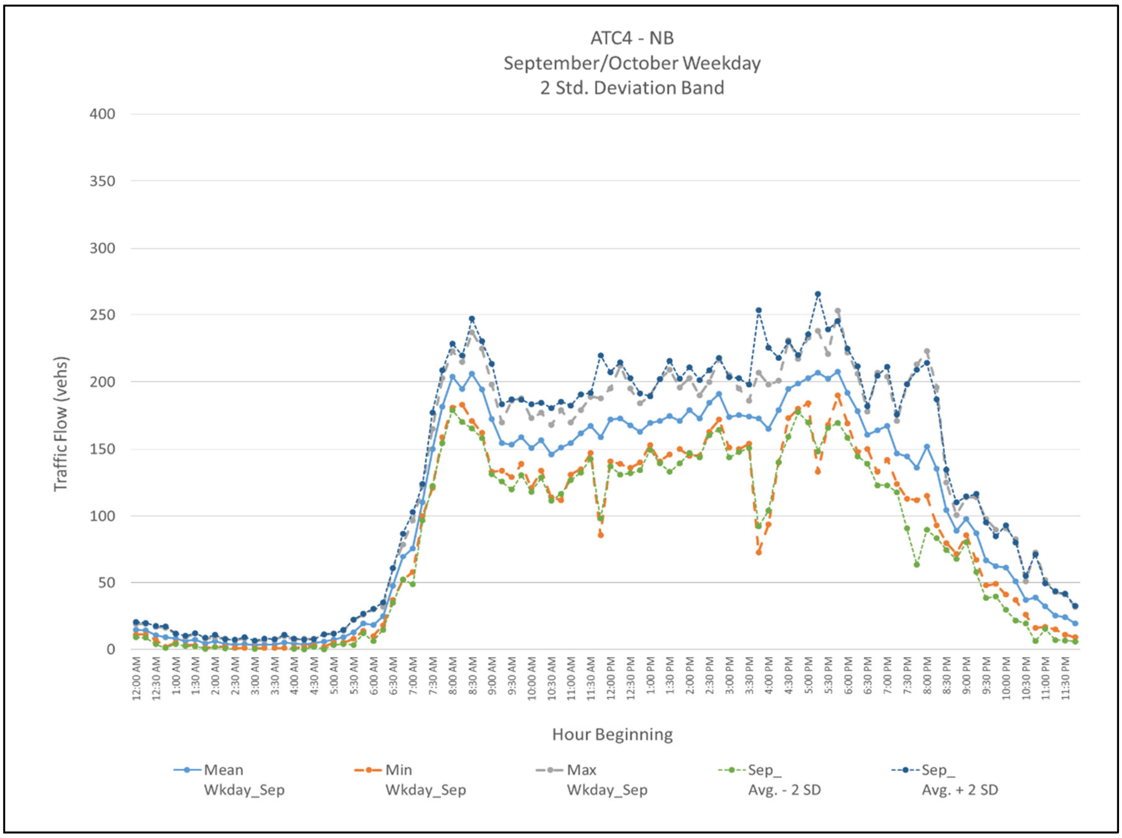
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul + Sep/Oct combined_ Avg. - 2 SD
Jul + Sep/Oct combined_ Avg. + 2 SD

ATC 4


ATC4 - NB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
11:30 PM
Hour Begininng
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July Avg. - 2 SD
July Avg. + 2 SD


ATC4 - NB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
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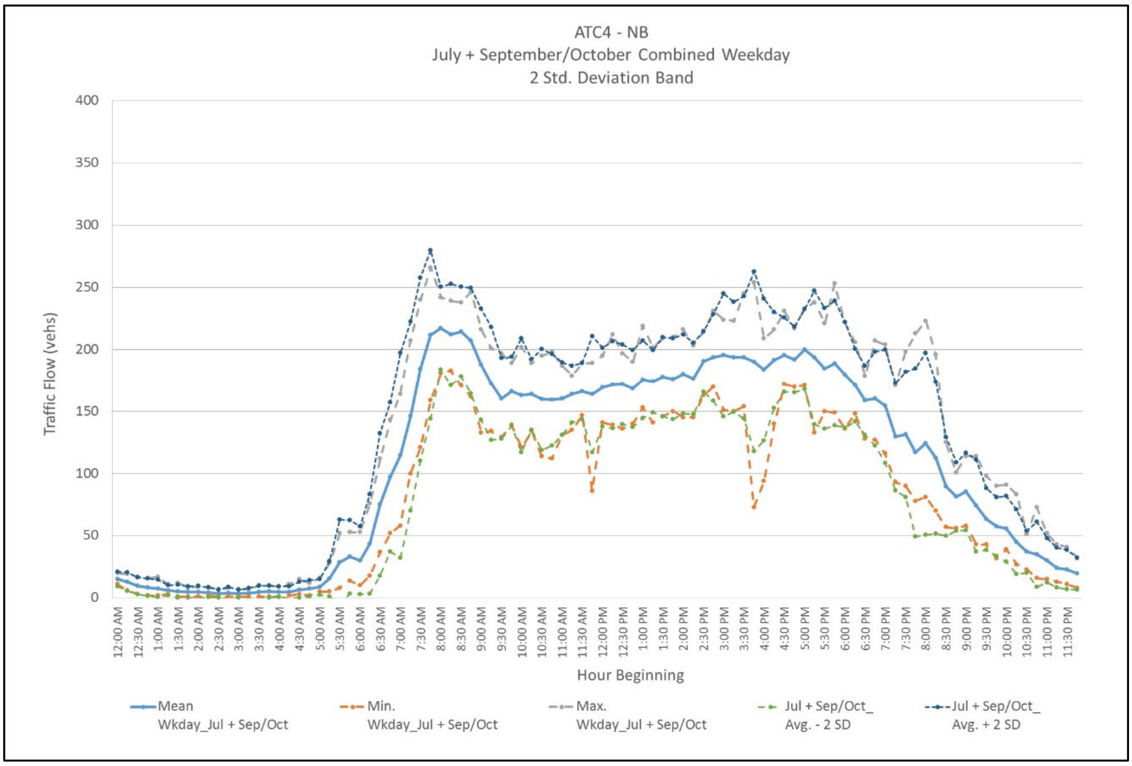
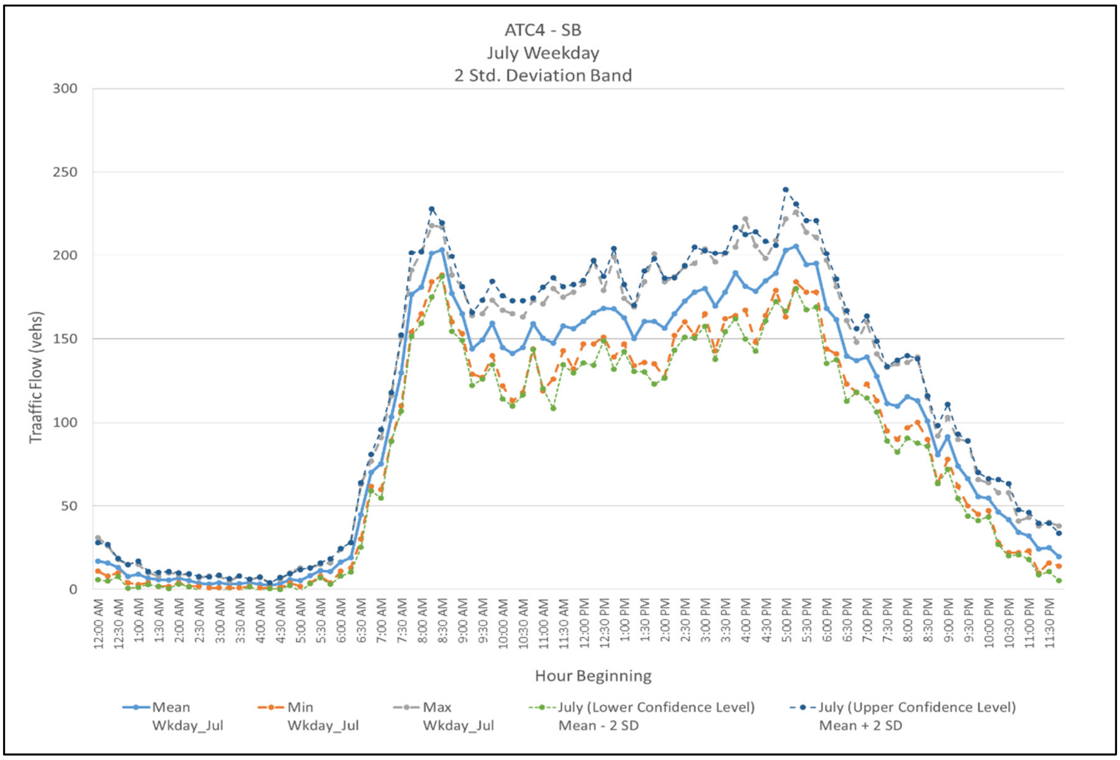
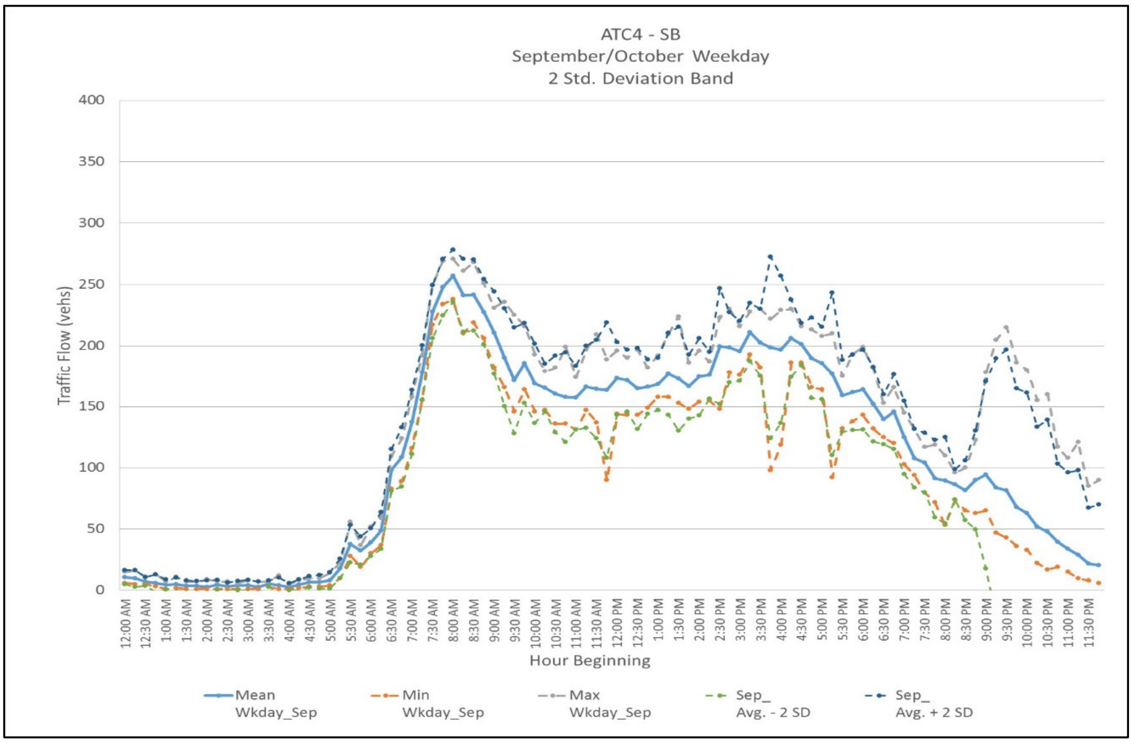
0
12:00 AM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC4 - NB
July + September/October Combined Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
Hour Beginning
12:00 AM … 11:30 PM
Mean Wkday_Jul + Sep/Oct
Min. Wkday_Jul + Sep/Oct
Max. Wkday_Jul + Sep/Oct
Jul + Sep/Oct_ Avg. - 2 SD
Jul + Sep/Oct_ Avg. + 2 SD


ATC4 - SB
July Weekday
2 Std. Deviation Band
Traaffic Flow (vehs)
300
250
200
150
100
50
0
Hour Beginning
12:00 AM … 11:30 PM
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July (Lower Confidence Level) Mean - 2 SD
July (Upper Confidence Level) Mean + 2 SD


ATC4 - SB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
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12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
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10:00 PM
10:30 PM
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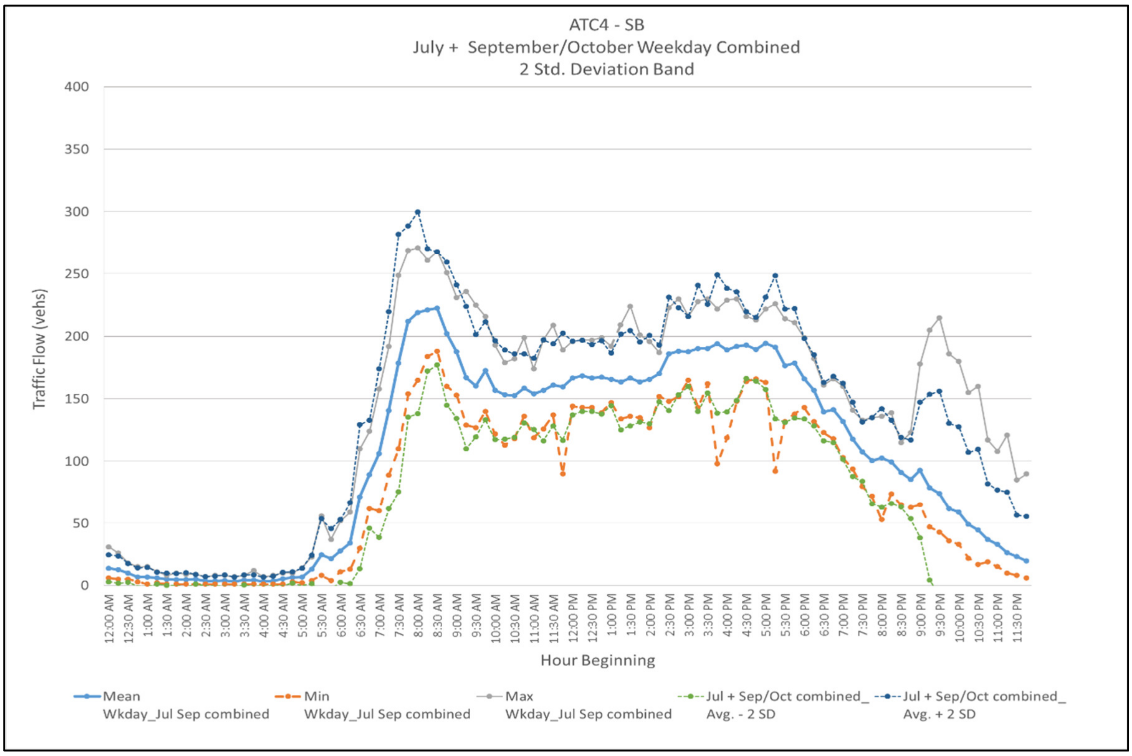
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC4 - SB
July + September/October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
0
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350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
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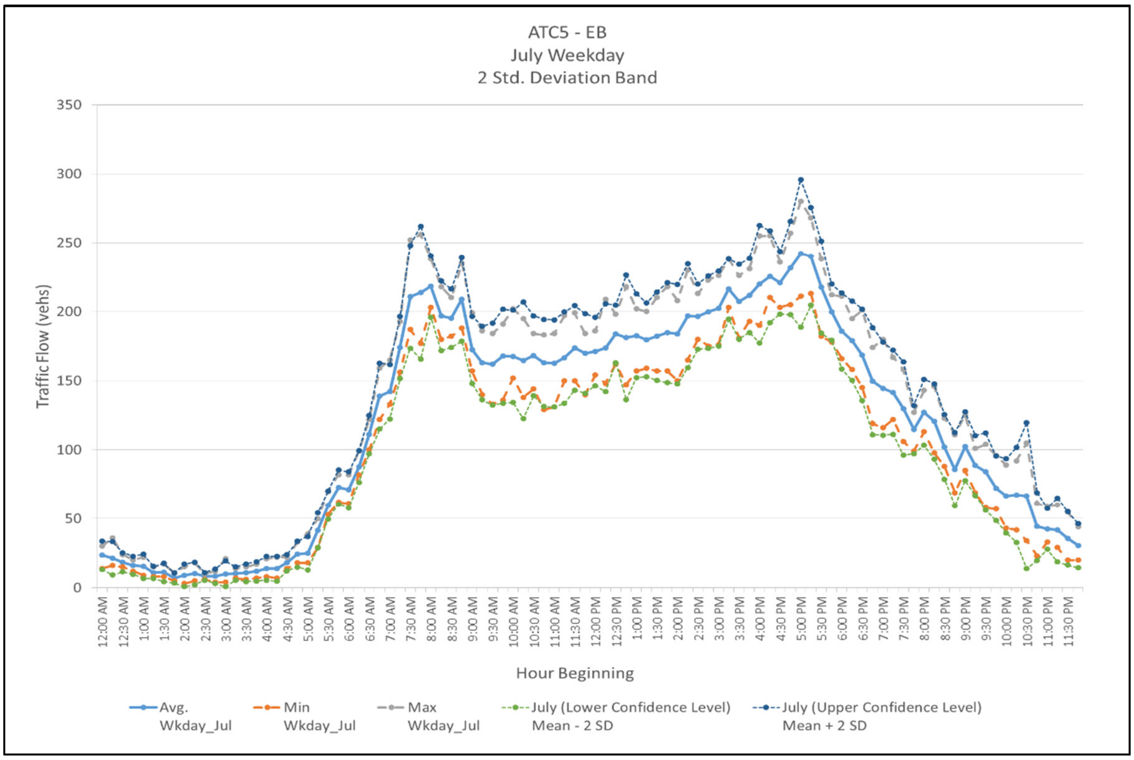
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul + Sep/Oct combined_ Avg. - 2 SD
Jul + Sep/Oct combined_ Avg. + 2 SD

ATC 5


ATC5 - EB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
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12:00 AM
12:30 AM
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1:30 AM
2:00 AM
2:30 AM
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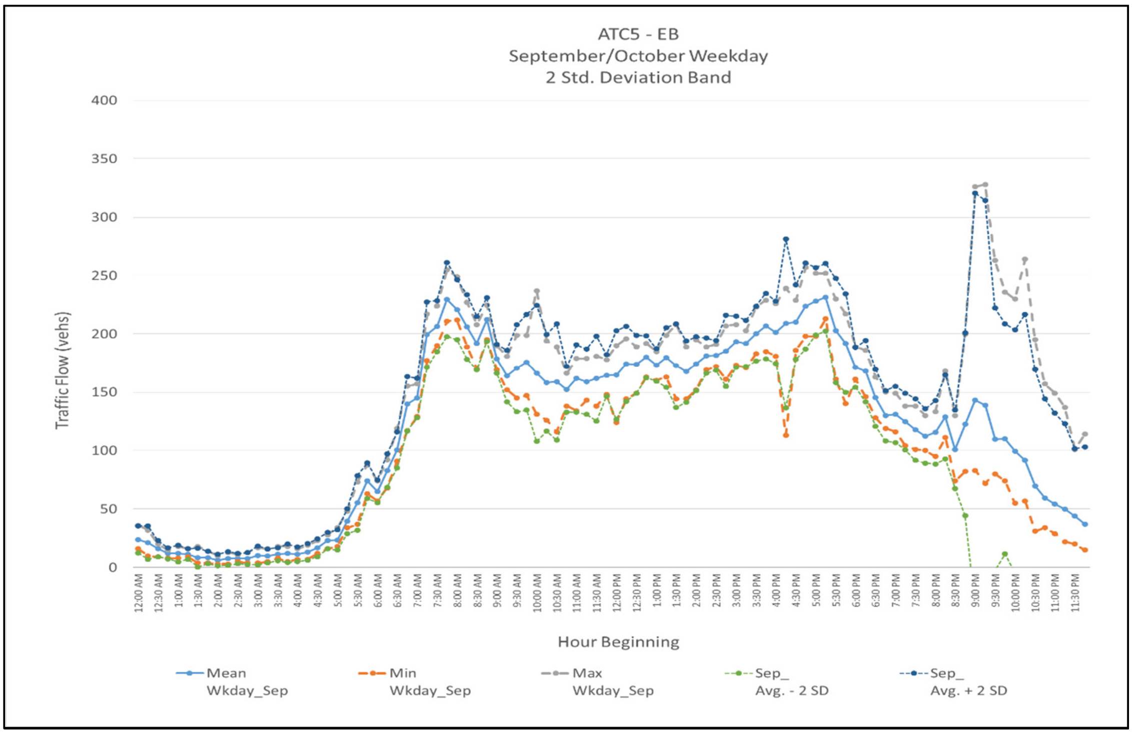
Hour Beginning
Avg. Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July (Lower Confidence Level) Mean - 2 SD
July (Upper Confidence Level) Mean + 2 SD


ATC5 - EB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
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12:00 AM
12:30 AM
1:00 AM
1:30 AM
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10:30 PM
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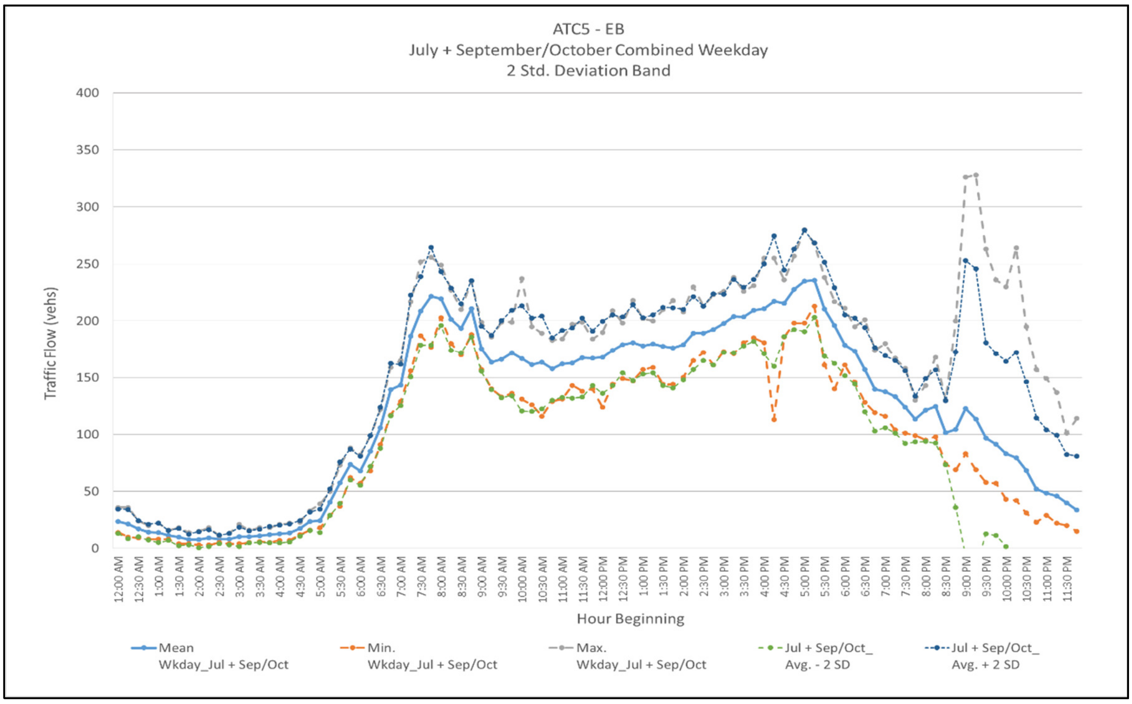
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC5 - EB
July + September/October Combined Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
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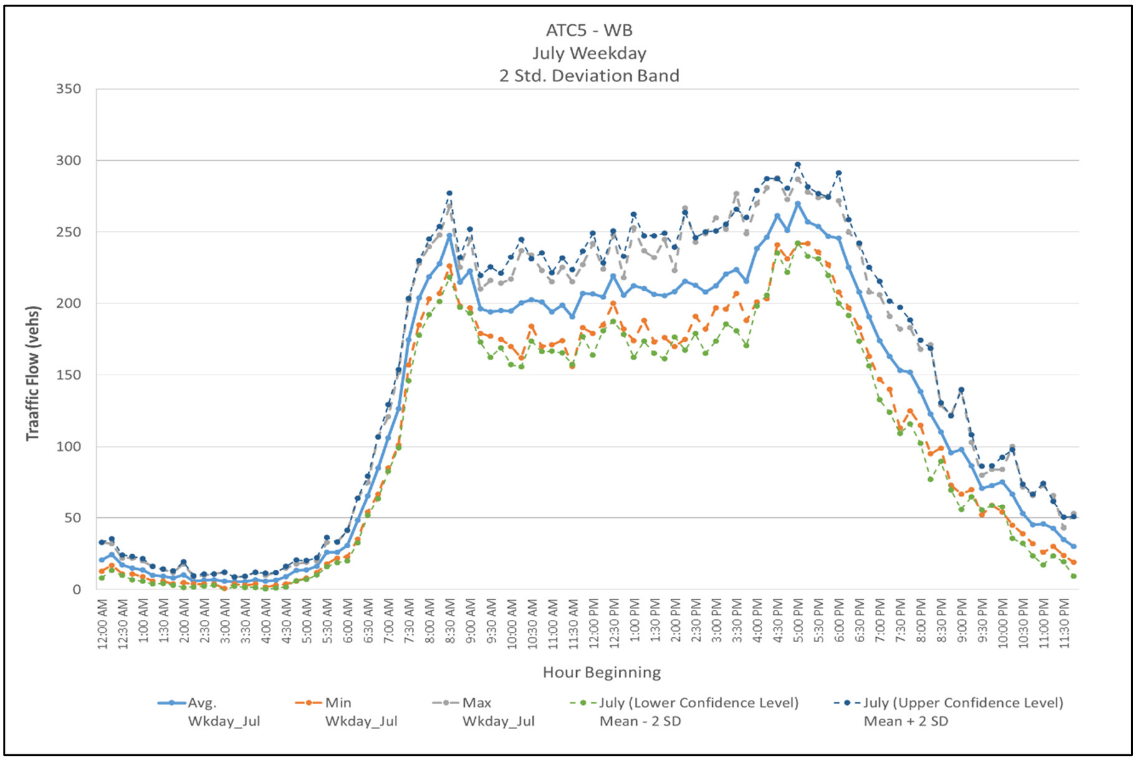
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul + Sep/Oct
Min. Wkday_Jul + Sep/Oct
Max. Wkday_Jul + Sep/Oct
Jul + Sep/Oct_ Avg. - 2 SD
Jul + Sep/Oct_ Avg. + 2 SD


ATC5 - WB
July Weekday
2 Std. Deviation Band
Traaffic Flow (vehs)
350
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12:00 AM
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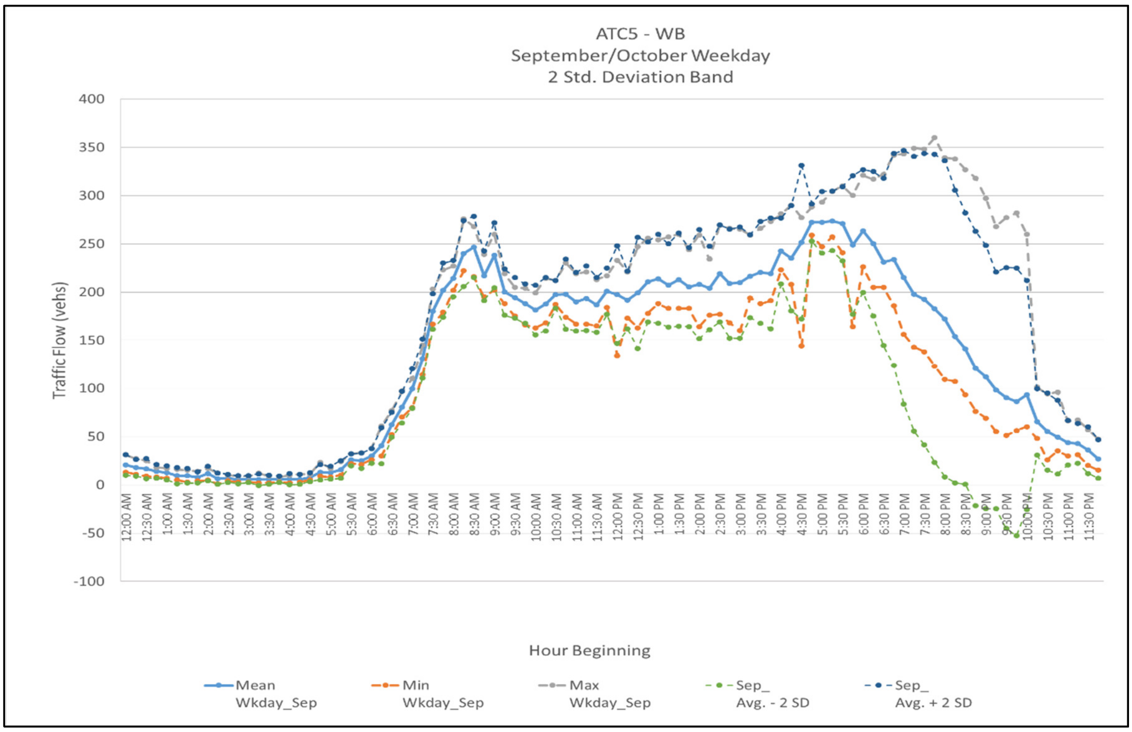
Hour Beginning
Avg. Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July (Lower Confidence Level) Mean - 2 SD
July (Upper Confidence Level) Mean + 2 SD


ATC5 - WB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
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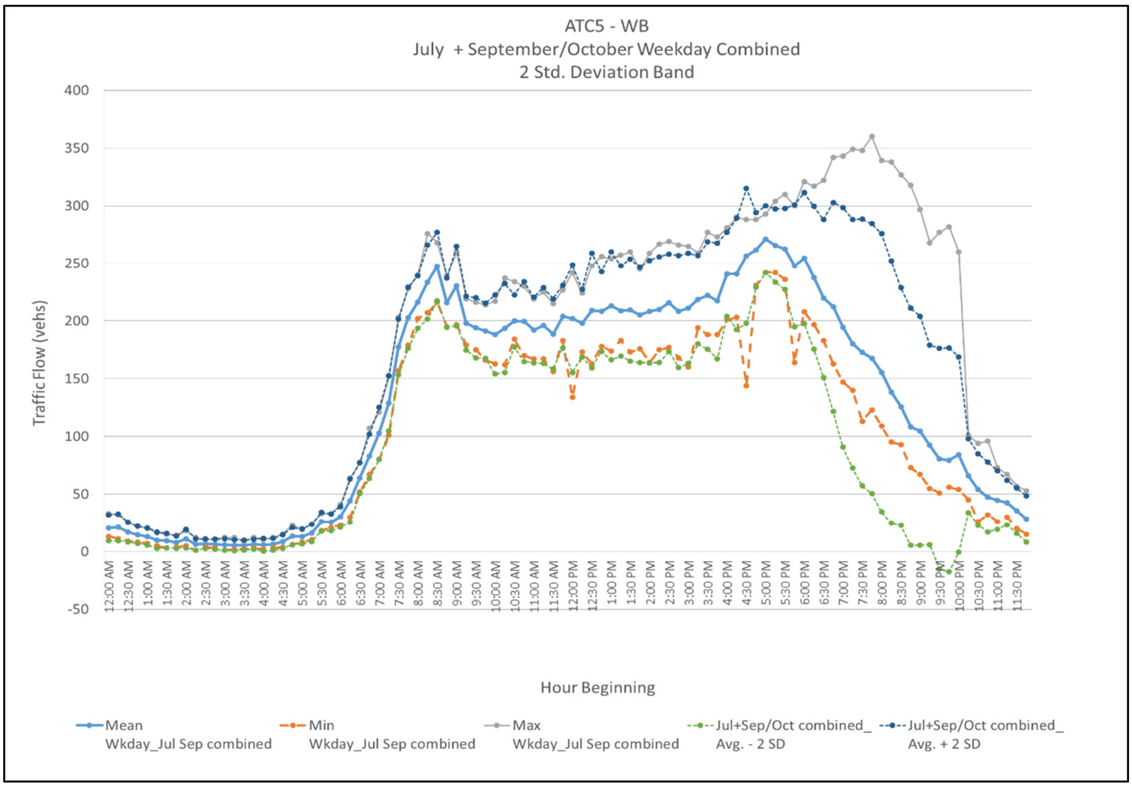
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC5 - WB
July + September/October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
400
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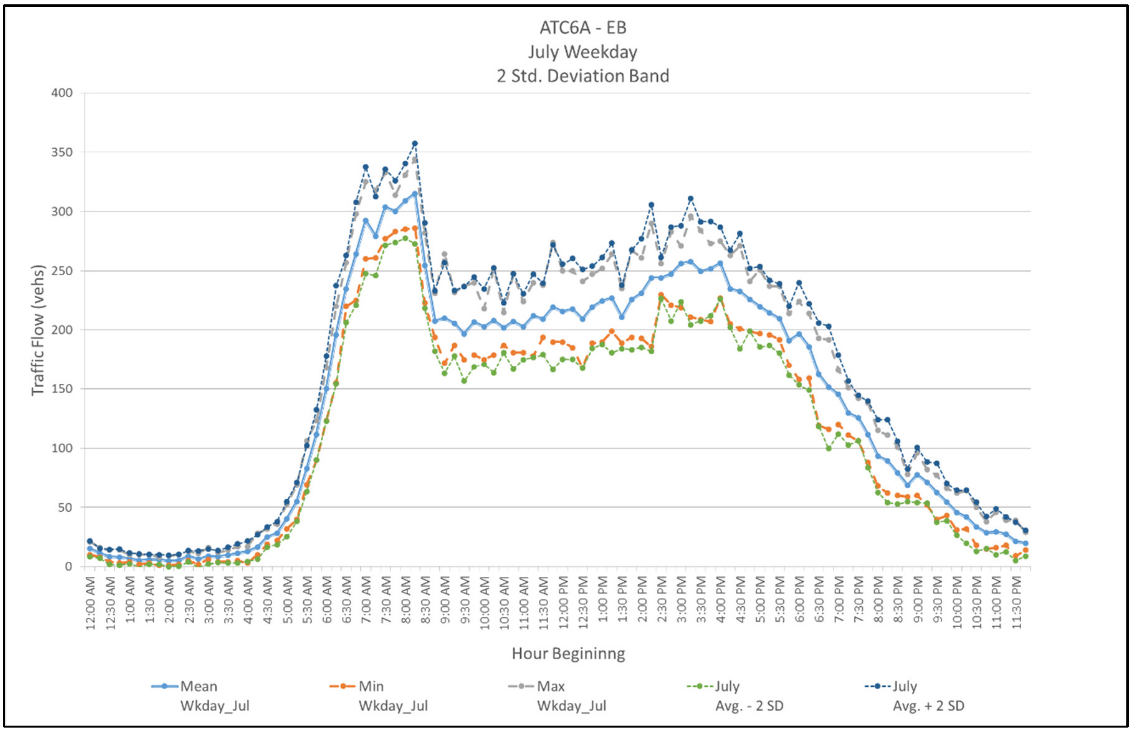
11:30 PM
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul+Sep/Oct combined_ Avg. - 2 SD
Jul+Sep/Oct combined_ Avg. + 2 SD

ATC 6A


ATC6A - EB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
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12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
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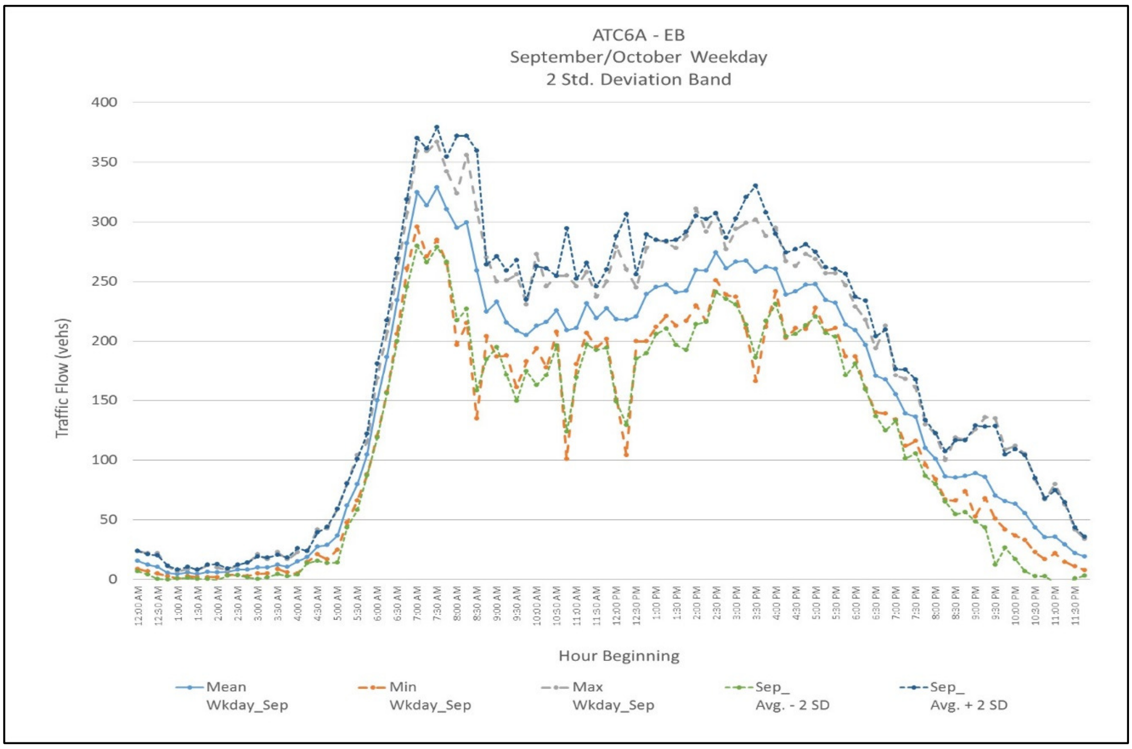
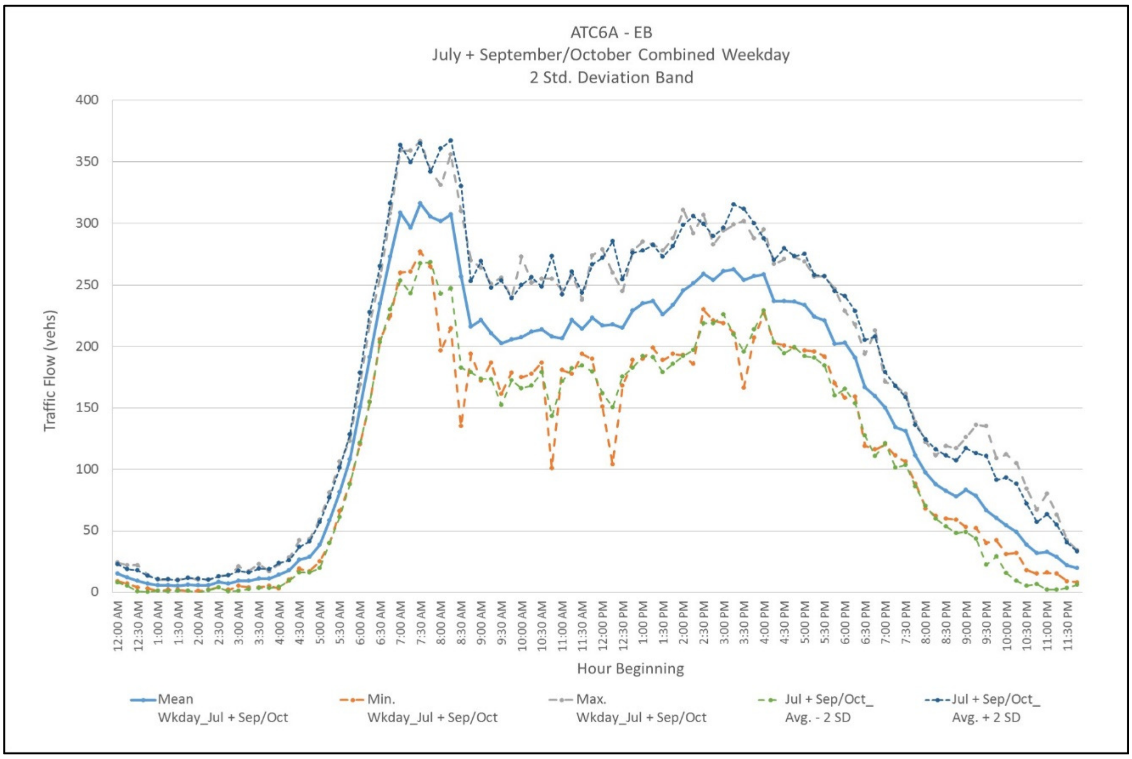
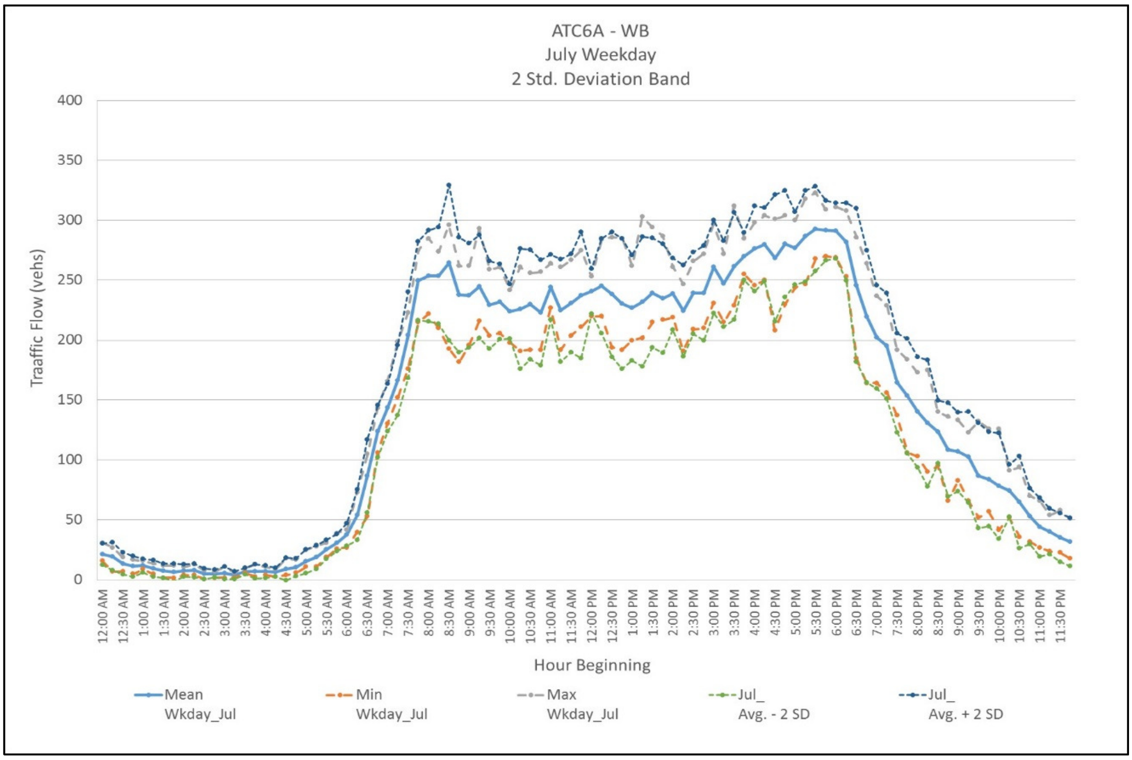
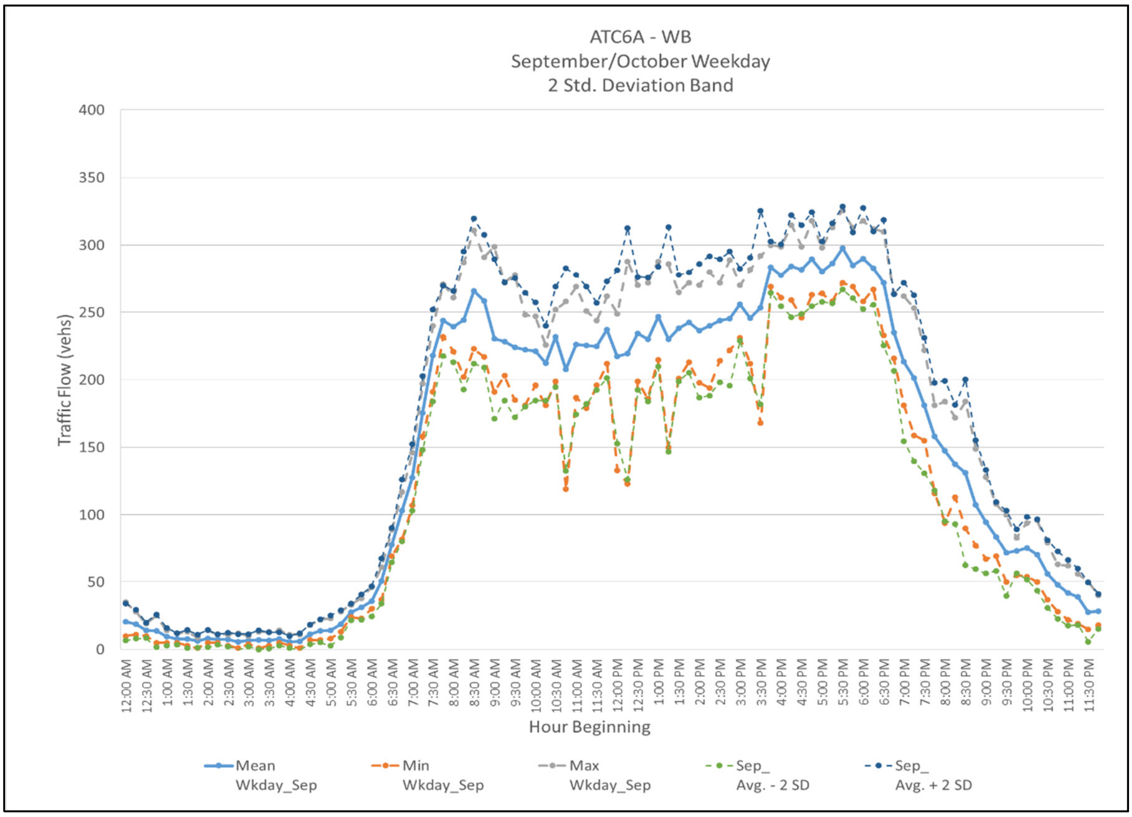
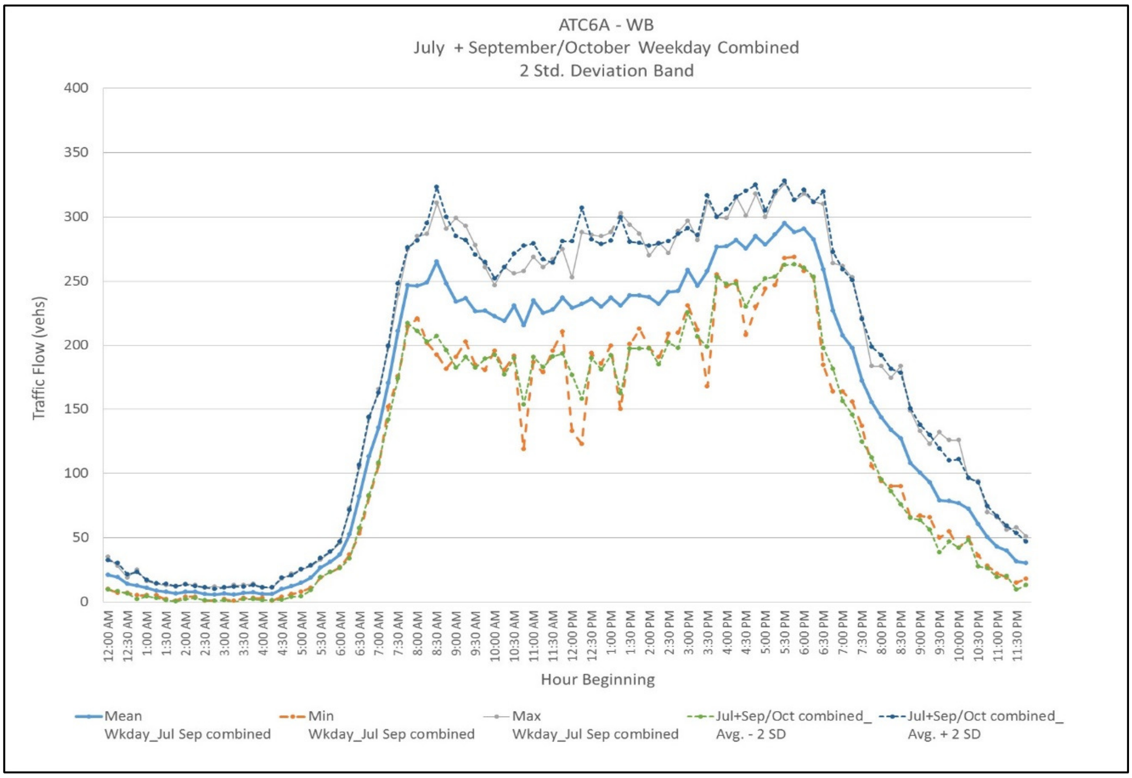
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Begininng
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July Avg. - 2 SD
July Avg. + 2 SD


ATC6A - EB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD

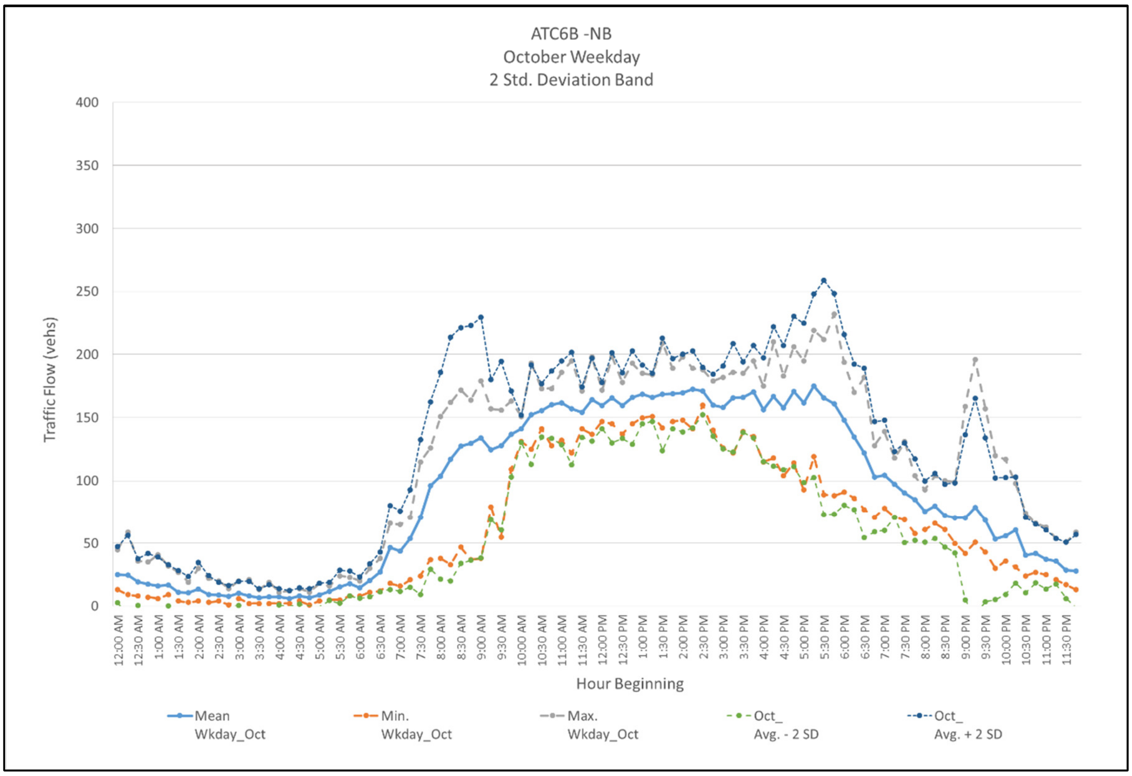

ATC6A - EB
July + September/October Combined Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
Hour Beginning
12:00 AM
11:30 PM
Mean Wkday_Jul + Sep/Oct
Min. Wkday_Jul + Sep/Oct
Max. Wkday_Jul + Sep/Oct
Jul + Sep/Oct_ Avg. - 2 SD
Jul + Sep/Oct_ Avg. + 2 SD

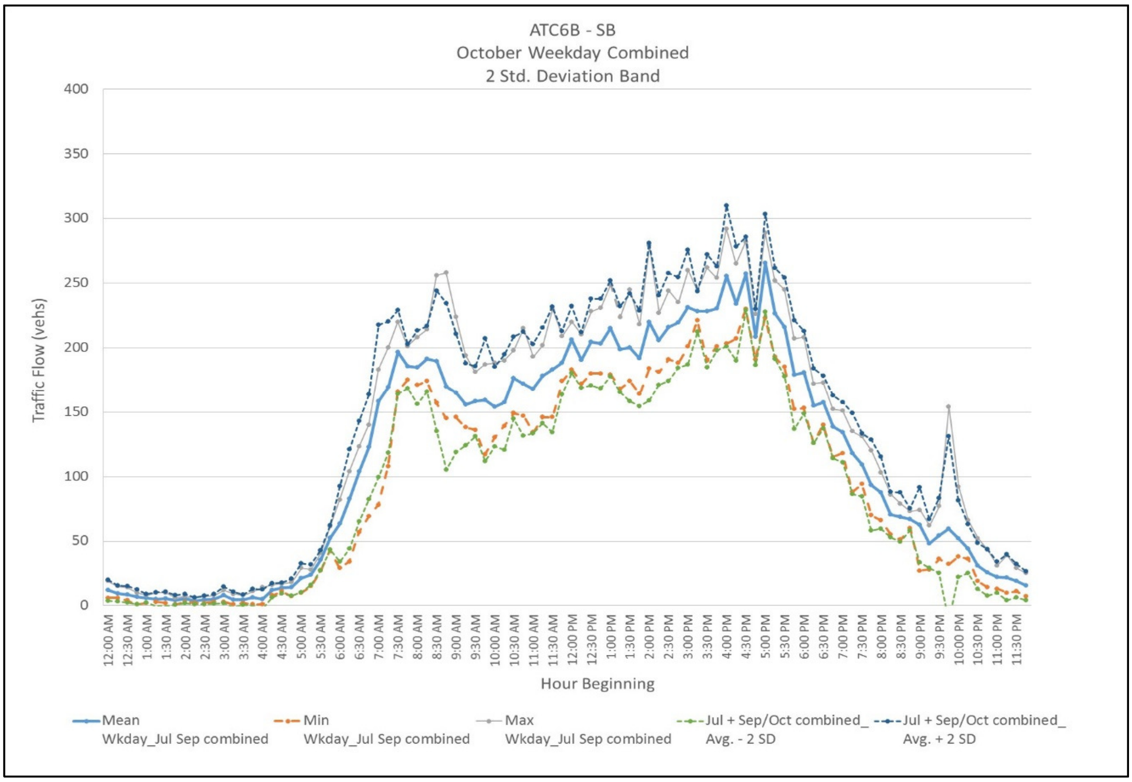

ATC6A - WB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
Hour Beginning
12:00 AM
11:30 PM
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
Jul_ Avg. - 2 SD
Jul_ Avg. + 2 SD


ATC6A - WB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC6A - WB
July + September/October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul+Sep/Oct combined_ Avg. - 2 SD
Jul+Sep/Oct combined_ Avg. + 2 SD

ATC 6B


ATC6B -NB
October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Oct
Min. Wkday_Oct
Max. Wkday_Oct
Oct_ Avg. - 2 SD
Oct_ Avg. + 2 SD


ATC6B - SB
October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
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2:00 PM
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3:00 PM
3:30 PM
4:00 PM
4:30 PM
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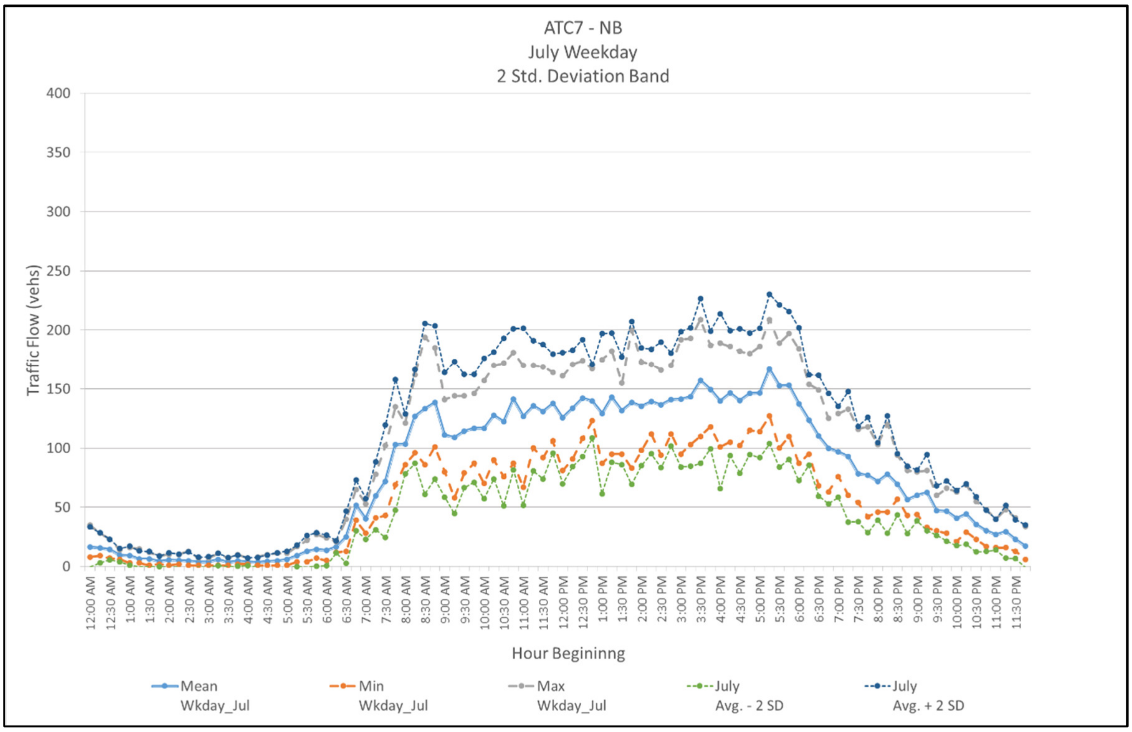
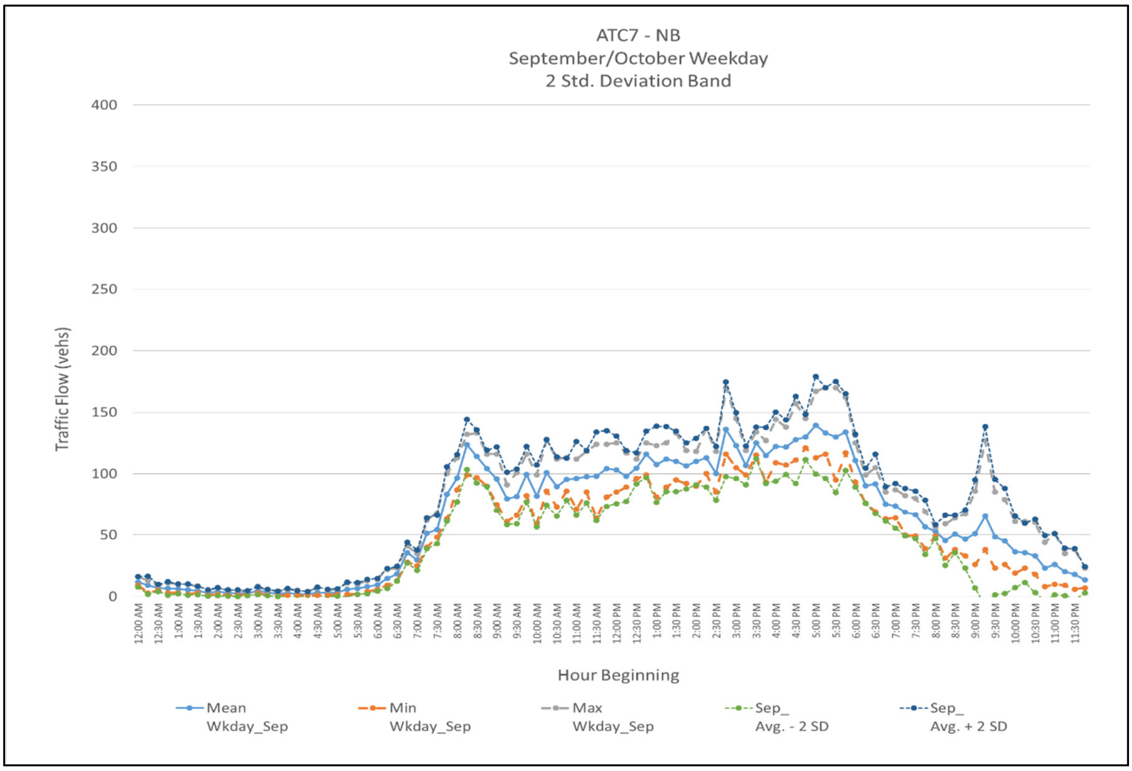
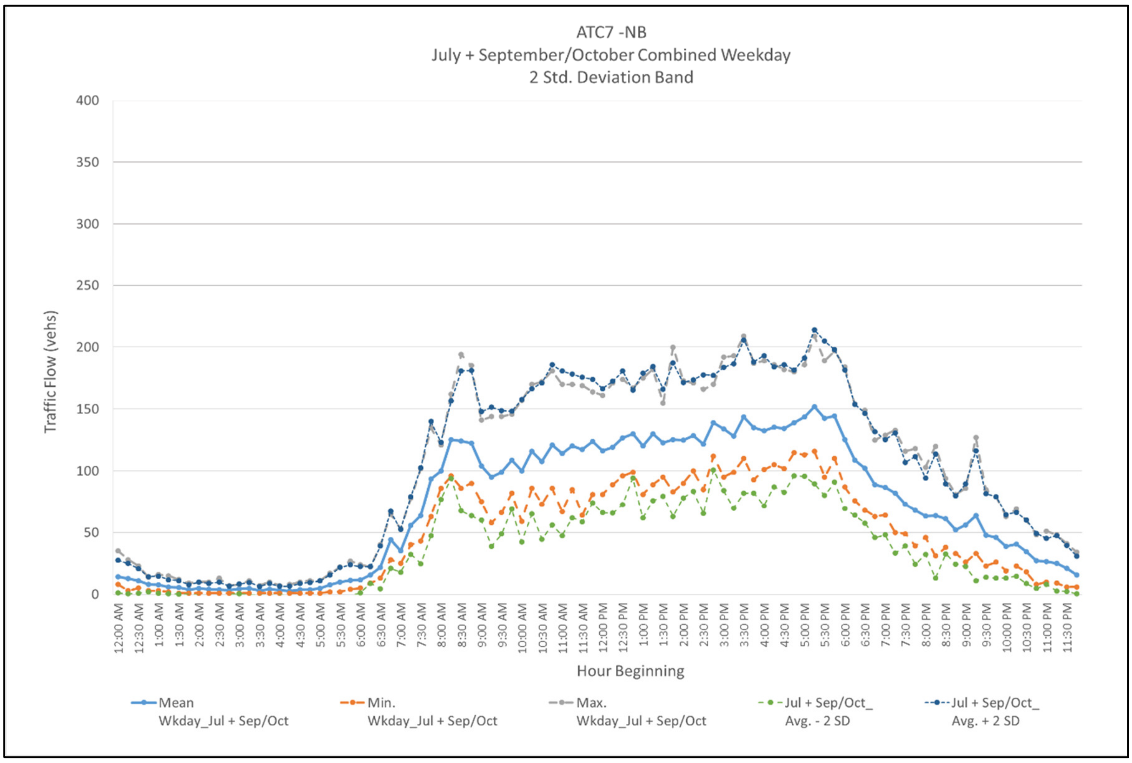
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul + Sep/Oct combined_ Avg. - 2 SD
Jul + Sep/Oct combined_ Avg. + 2 SD

ATC 7


ATC7 - NB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
11:30 PM
Hour Beginninng
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July Avg. - 2 SD
July Avg. + 2 SD


ATC7 - NB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC7 -NB
July + September/October Combined Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
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11:30 AM
12:00 PM
12:30 PM
1:00 PM
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3:30 PM
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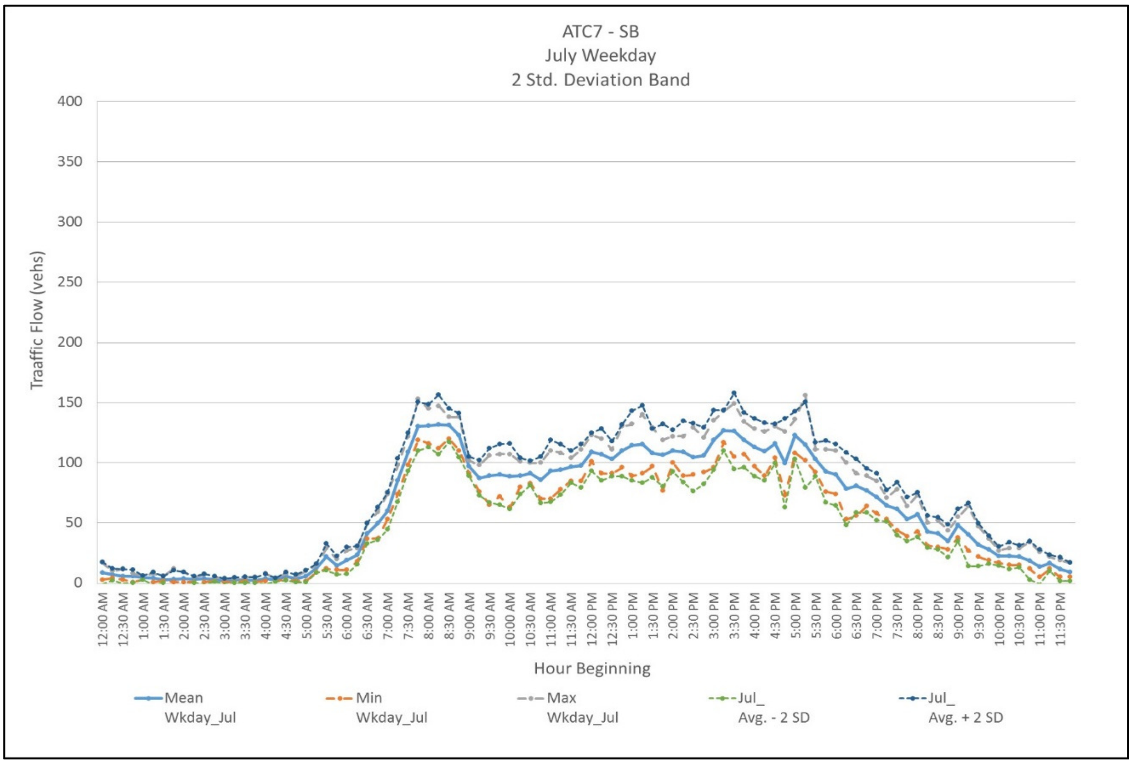
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul + Sep/Oct
Min. Wkday_Jul + Sep/Oct
Max. Wkday_Jul + Sep/Oct
Jul + Sep/Oct_ Avg. - 2 SD
Jul + Sep/Oct_ Avg. + 2 SD


ATC7 - SB
July Weekday
2 Std. Deviation Band
Traaffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
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6:30 AM
7:00 AM
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11:30 AM
12:00 PM
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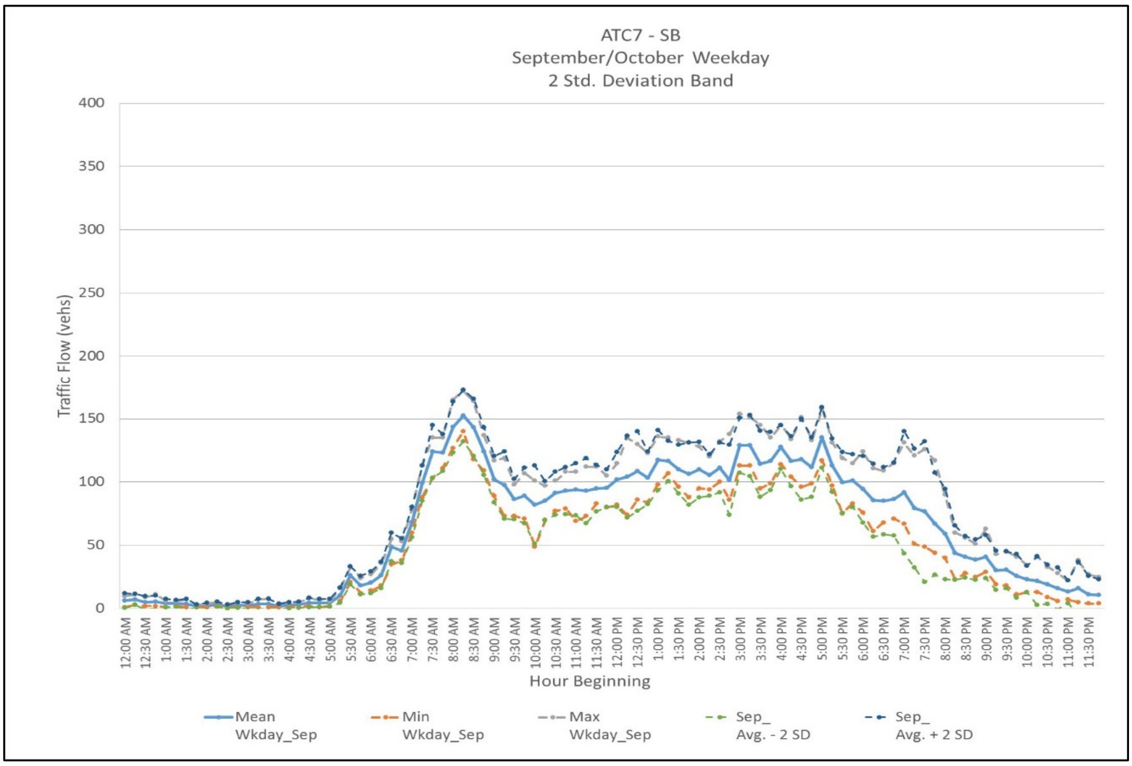
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
Jul_ Avg. - 2 SD
Jul_ Avg. + 2 SD


ATC7 - SB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
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10:00 AM
10:30 AM
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11:30 AM
12:00 PM
12:30 PM
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1:30 PM
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3:00 PM
3:30 PM
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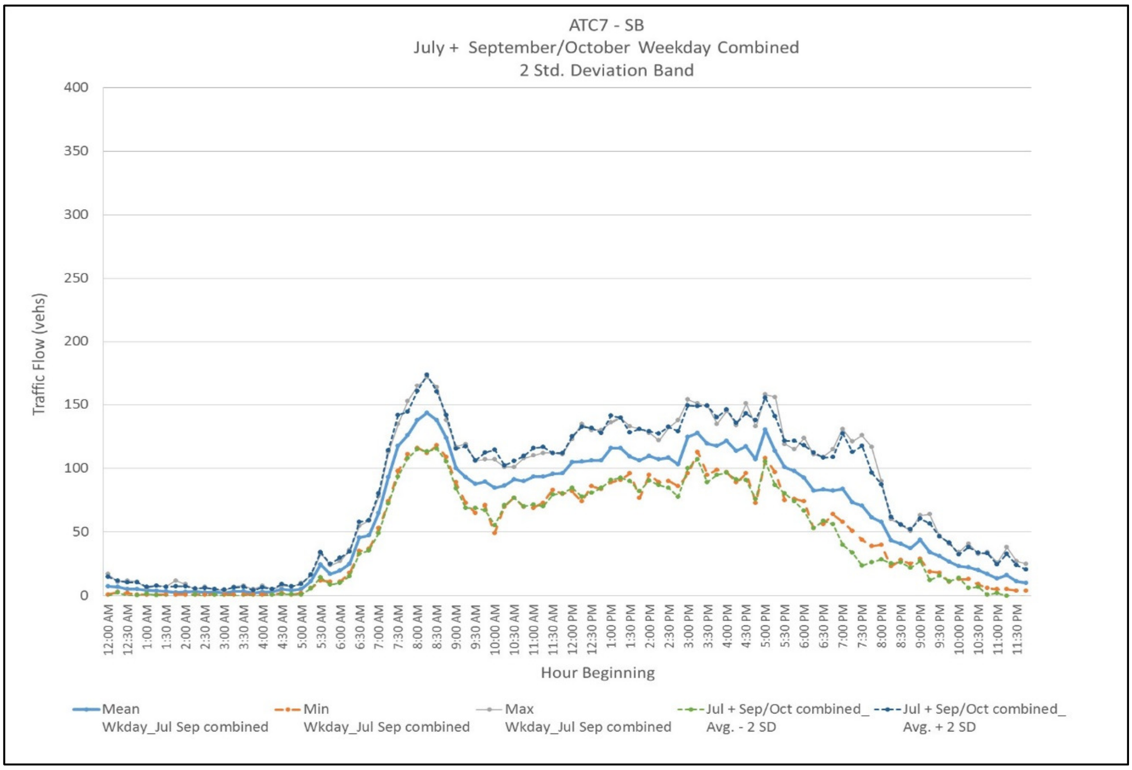
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC7 - SB
July + September/October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
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1:30 PM
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3:00 PM
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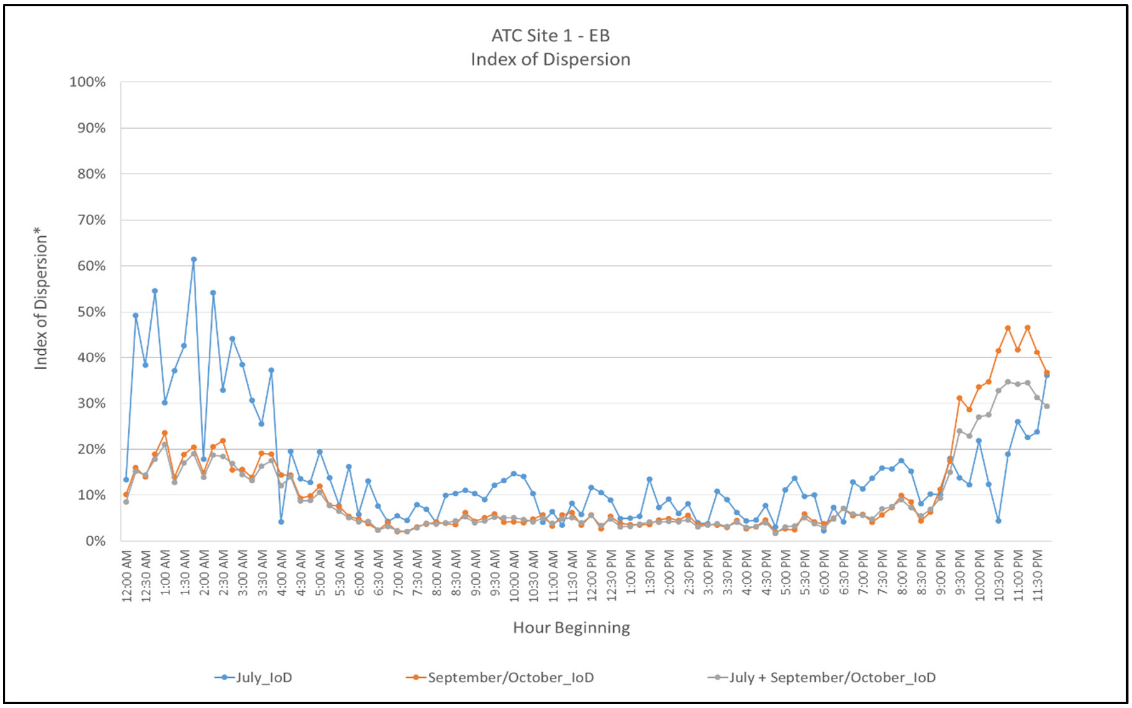
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul + Sep/Oct combined_ Avg. - 2 SD
Jul + Sep/Oct combined_ Avg. + 2 SD

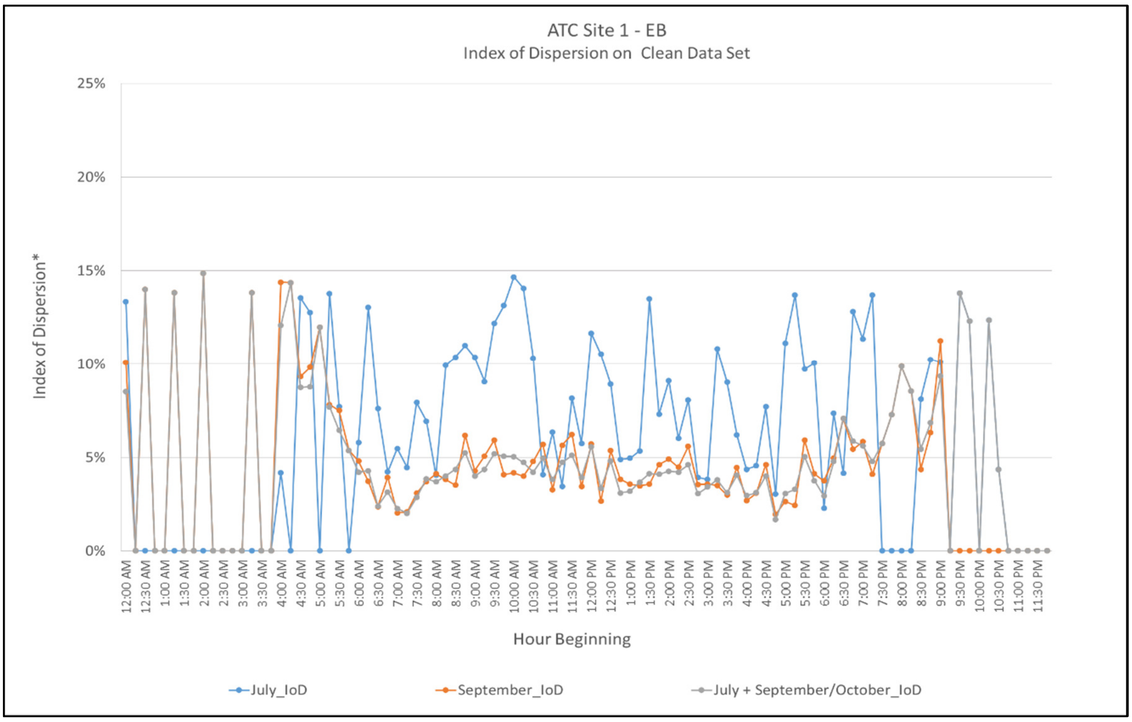
APPENDIX F

2015 ATC Data: Index of Dispersion Plots

APPENDIX F: 2015 ATC - INDEX OF DISPERSION PLOTS

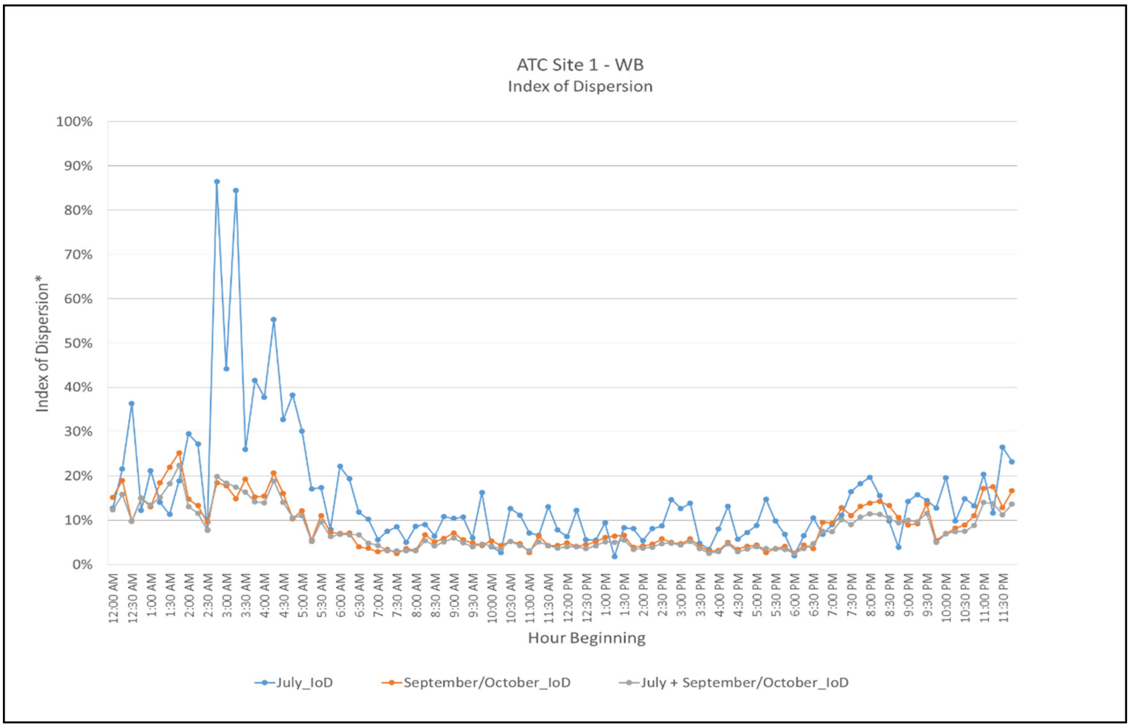


*IoD = 95%CI of Average 15 minute flows

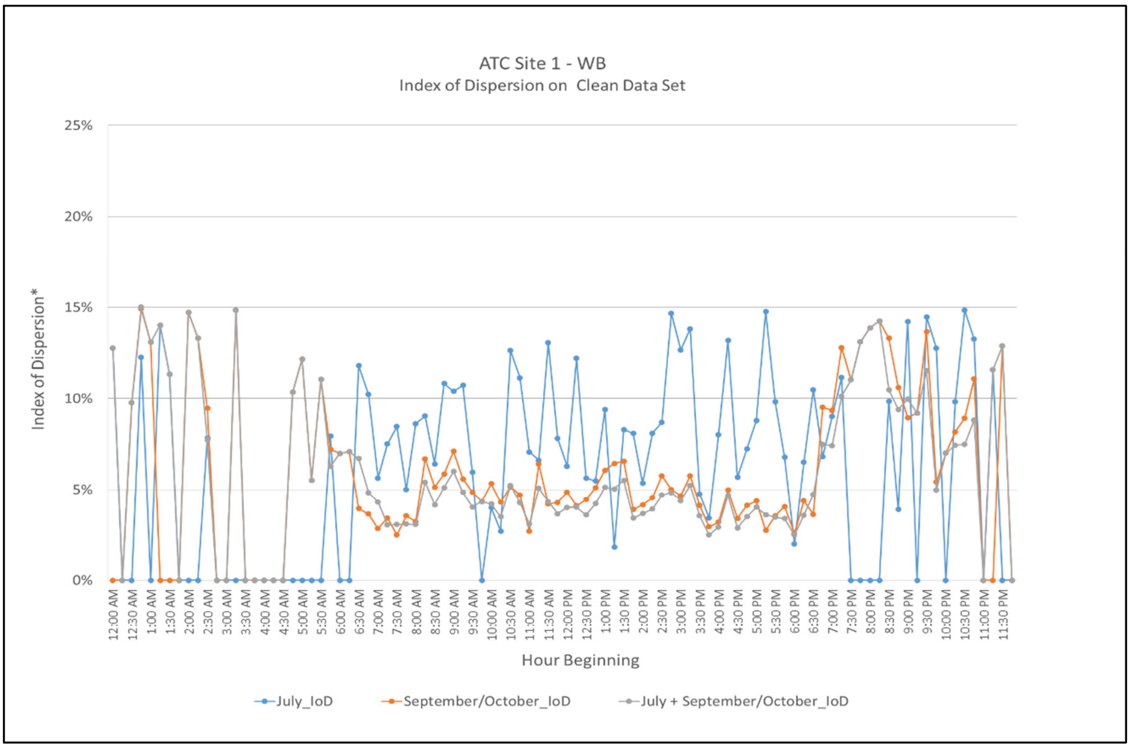


*IoD = 95%CI of Average 15 minute flows

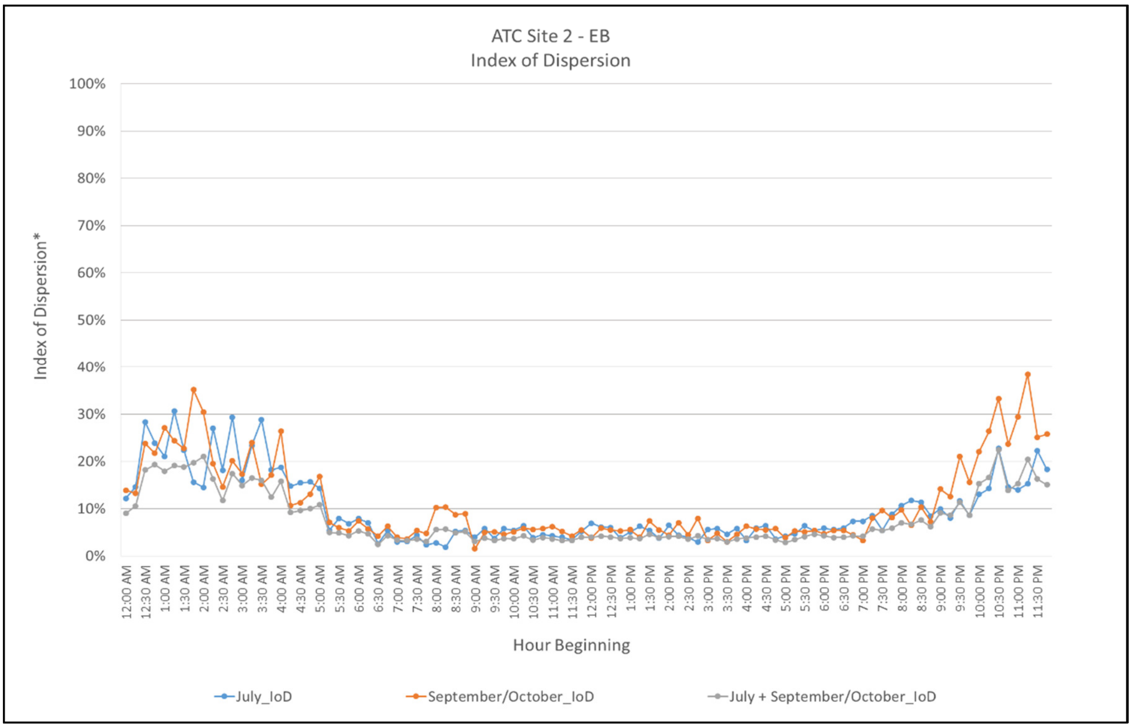
Zero value indicates that data points at that hour beginning were excluded based on the IoD test



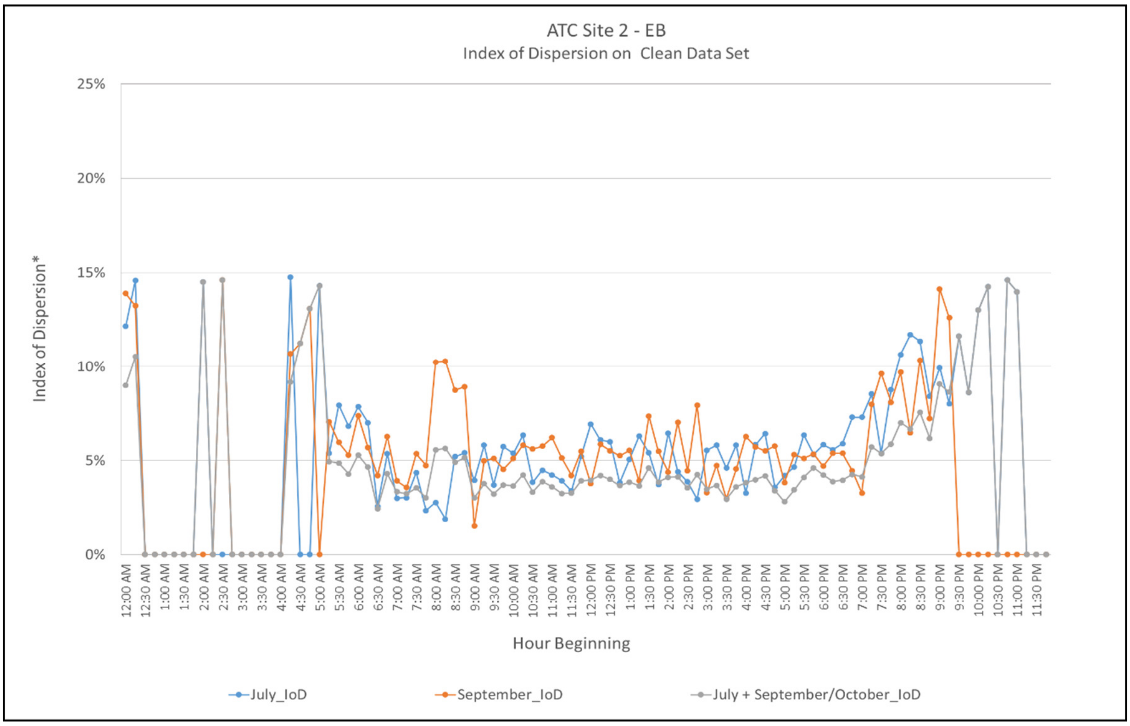
*IoD = 95%CI of Average 15 minute flows



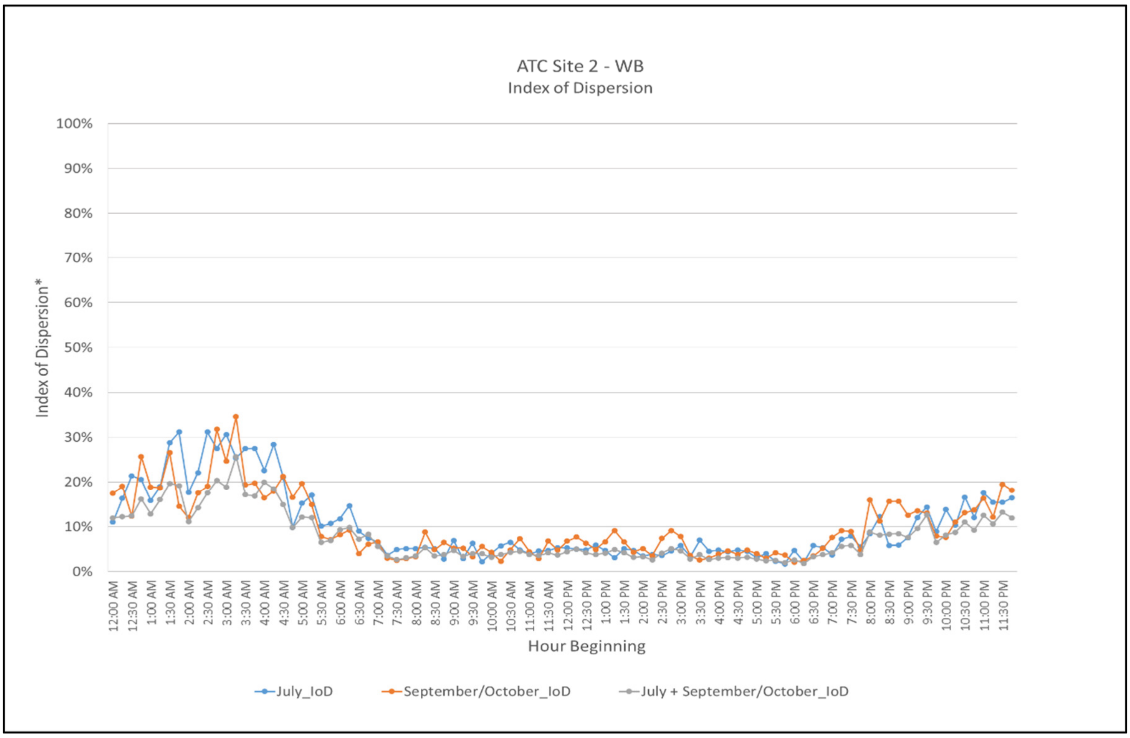
*IoD = 95%CI of Average 15 minute flows
Zero value indicates that data points at that hour beginning were excluded based on the IoD test

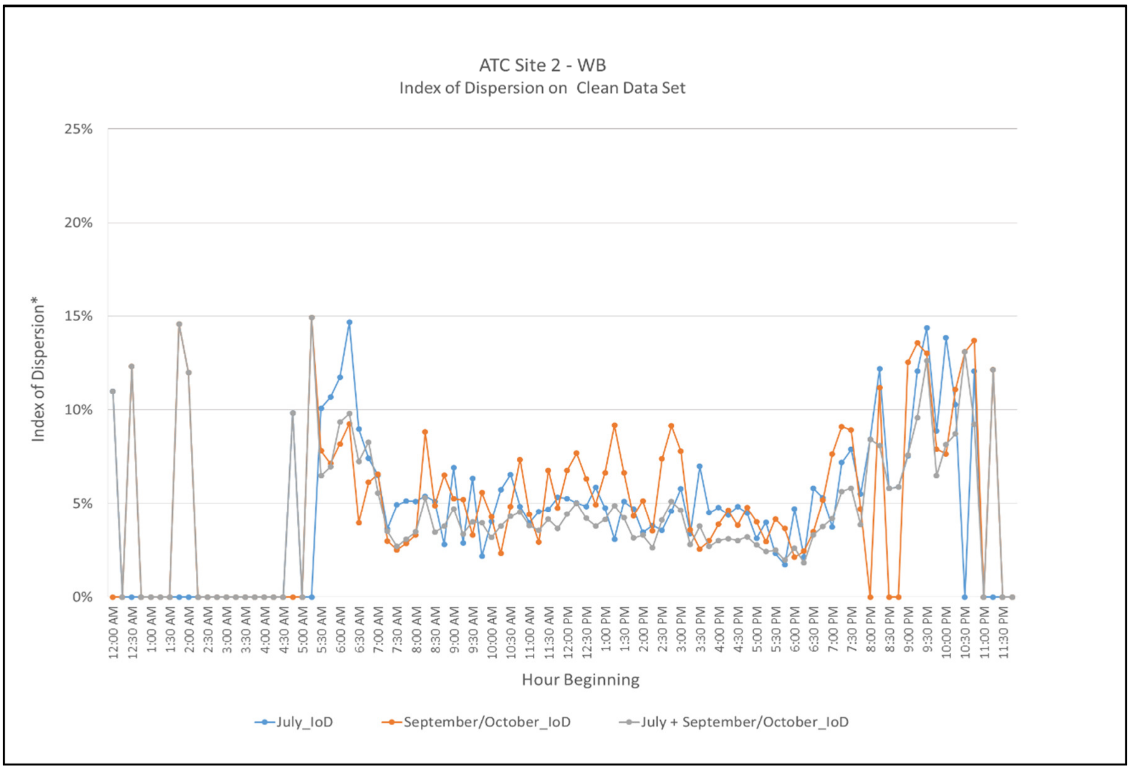


*IoD = 95%CI of Average 15 minute flows

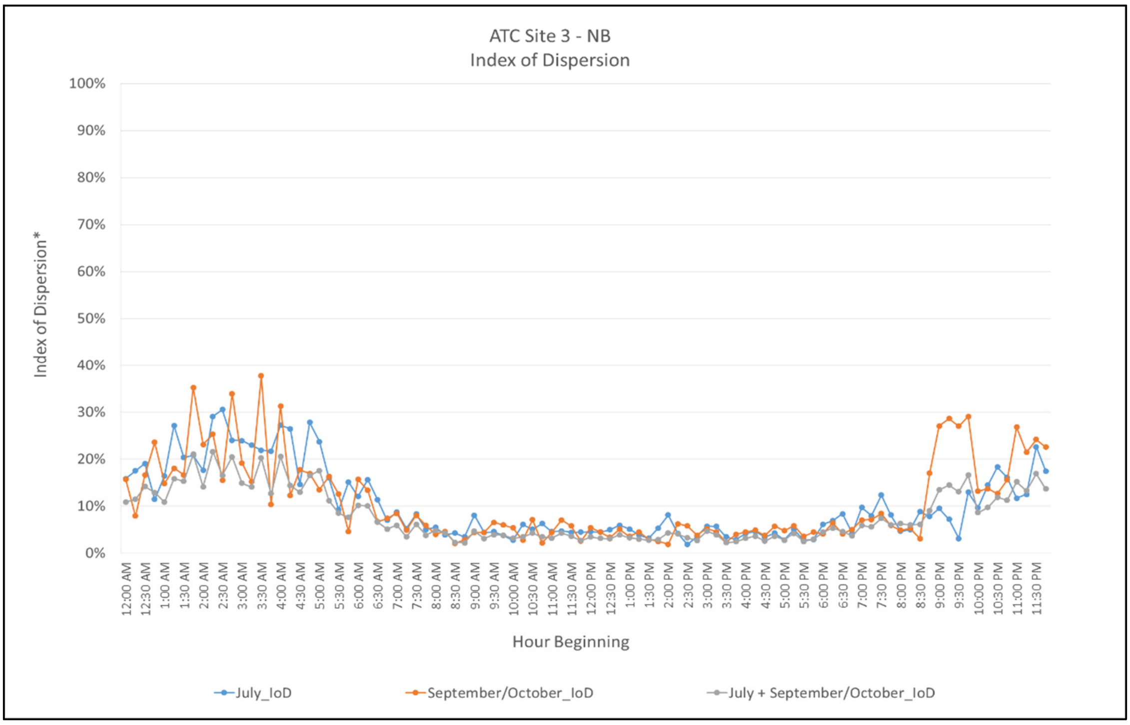


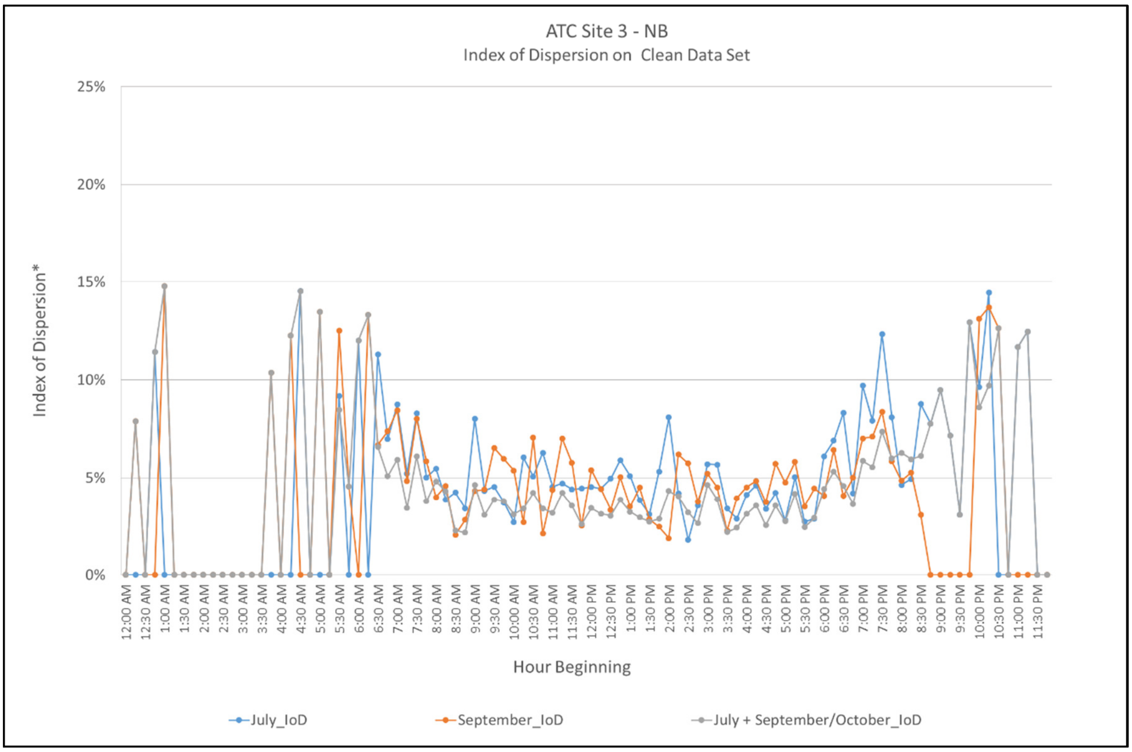
*IoD = 95%CI of Average 15 minute flows
Zero value indicates that data points at that hour beginning were excluded based on the IoD test





*IoD = 95%CI of Average 15 minute flows
Zero value indicates that data points at that hour beginning were excluded based on the IoD test





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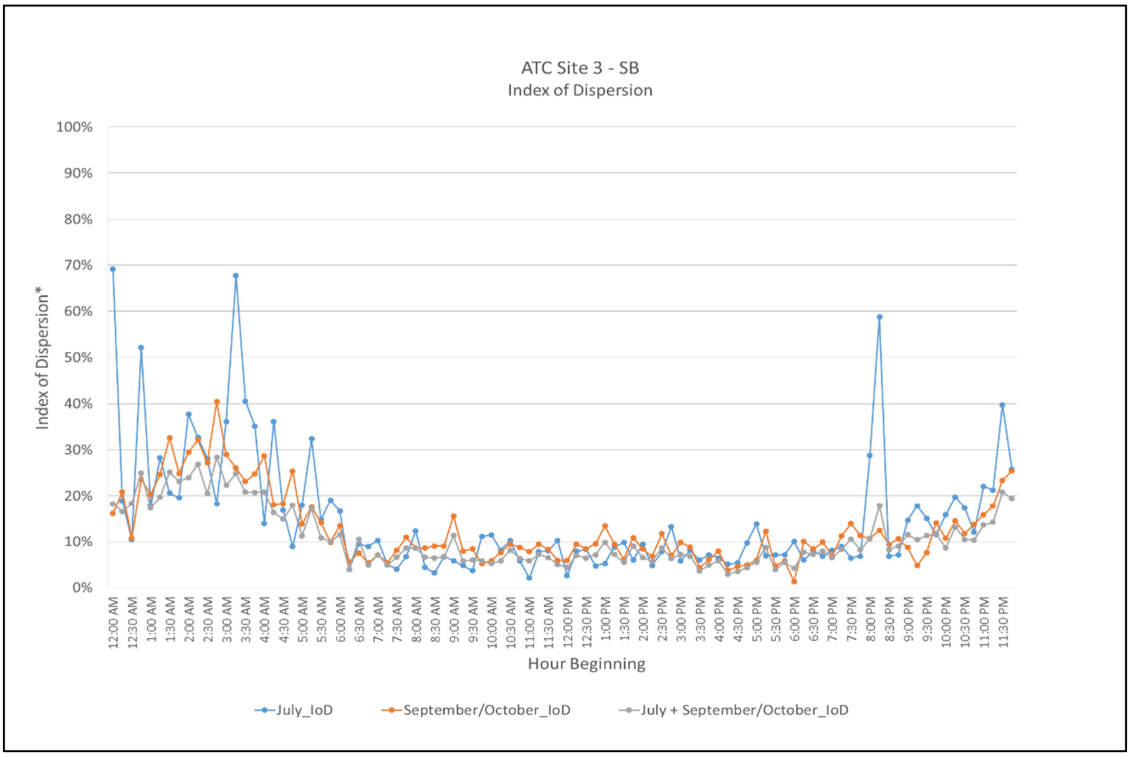
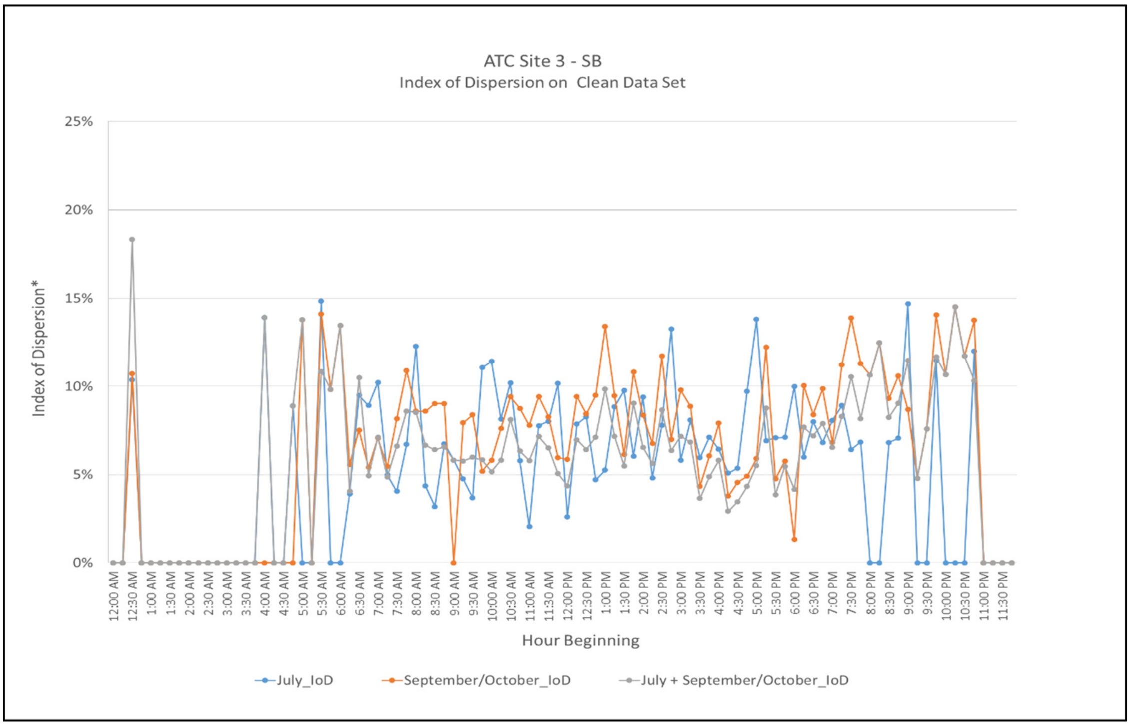


*IoD = 95%CI of Average 15 minute flows



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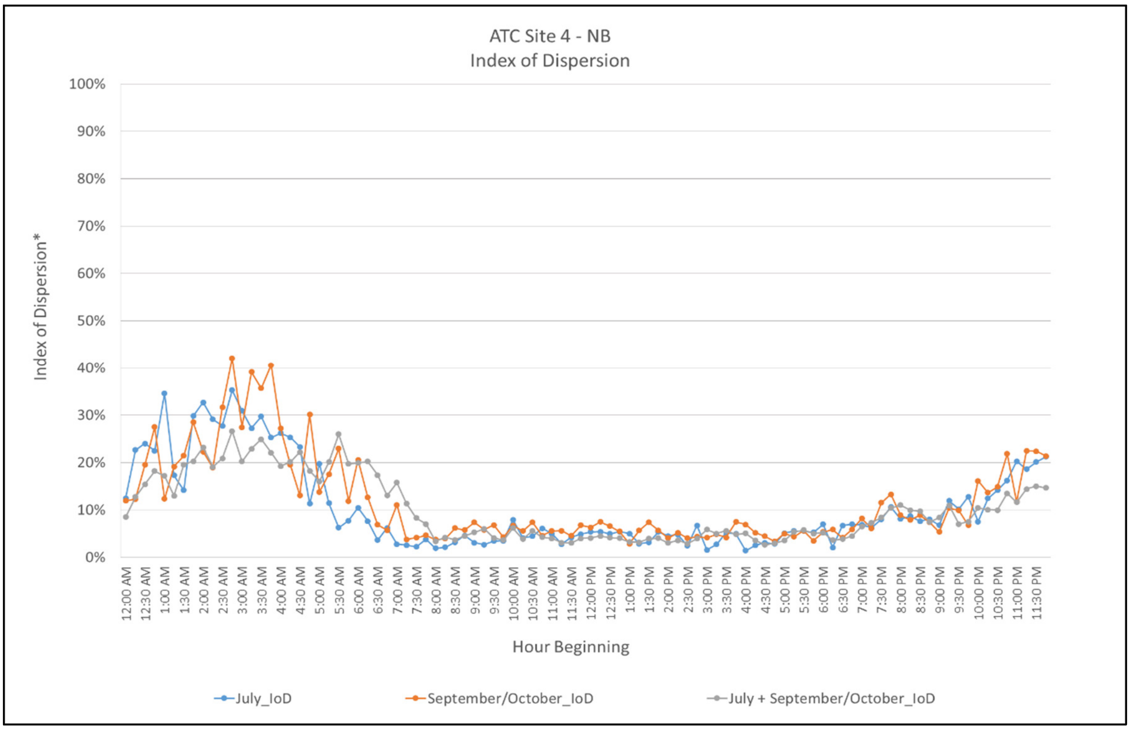
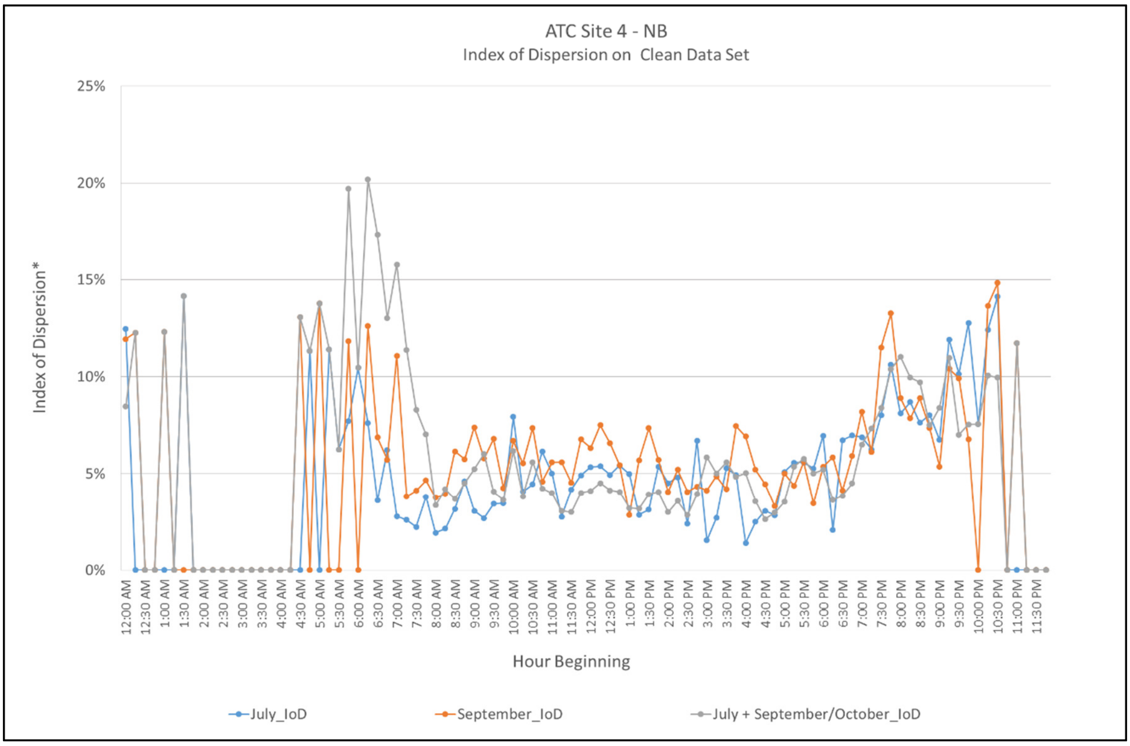


*IoD = 95%CI of Average 15 minute flows



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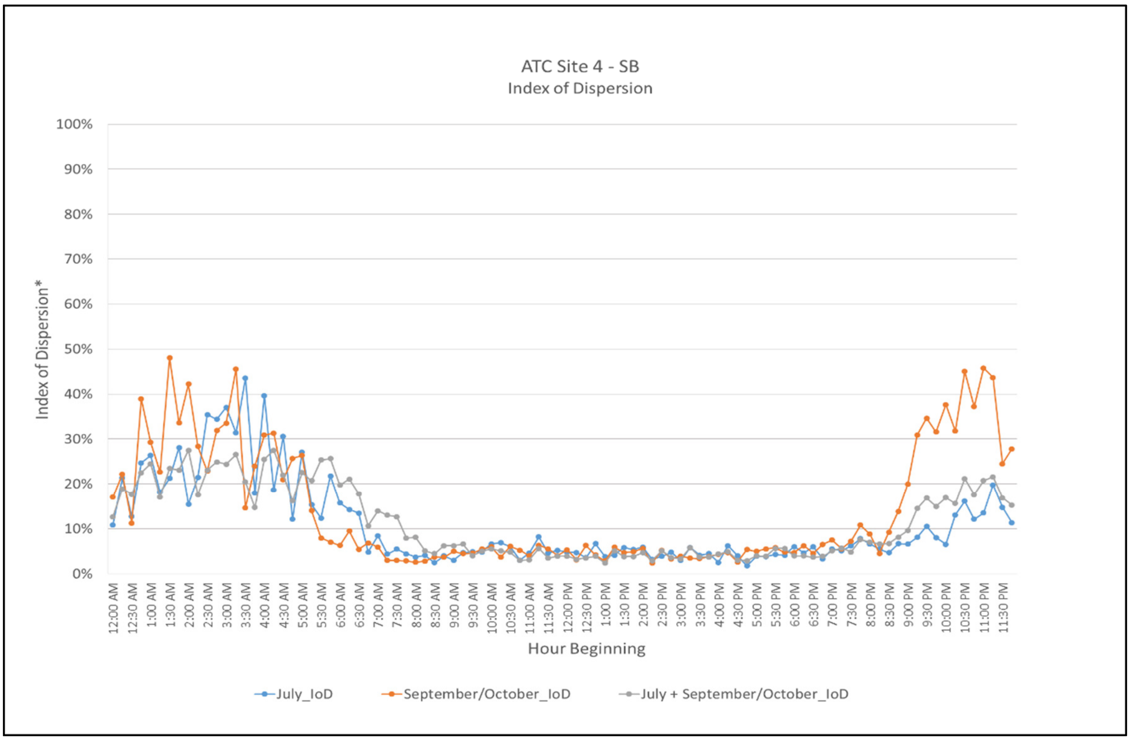
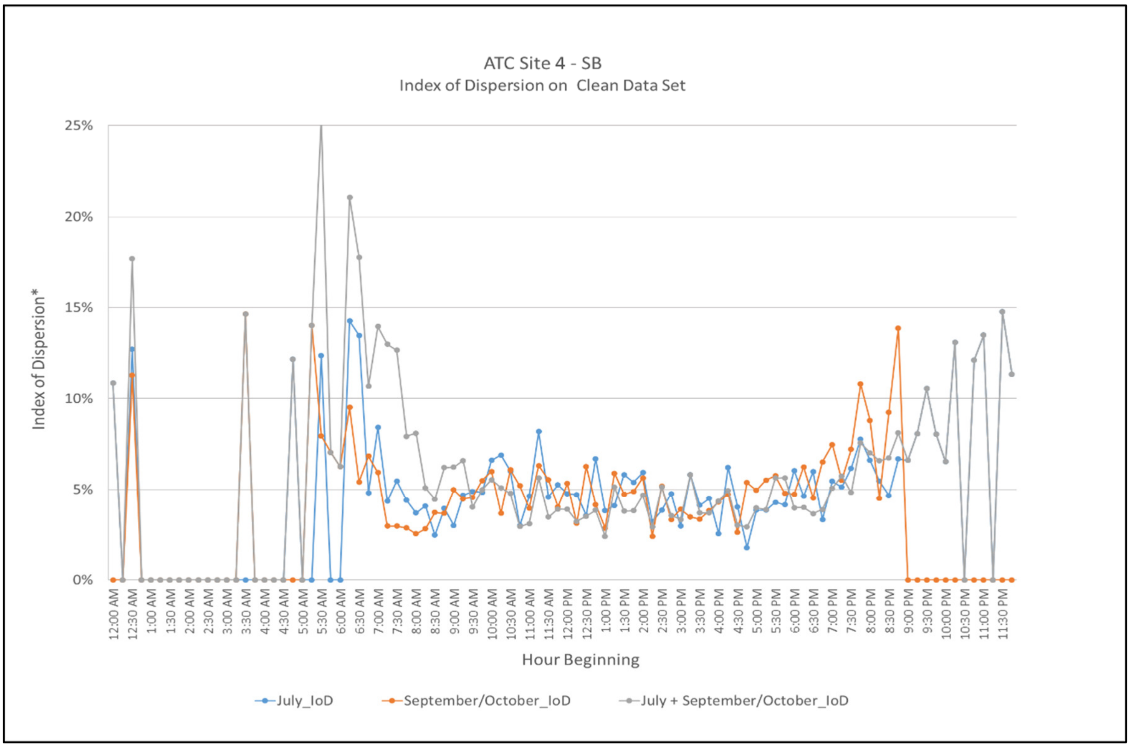


*IoD = 95%CI of Average 15 minute flows



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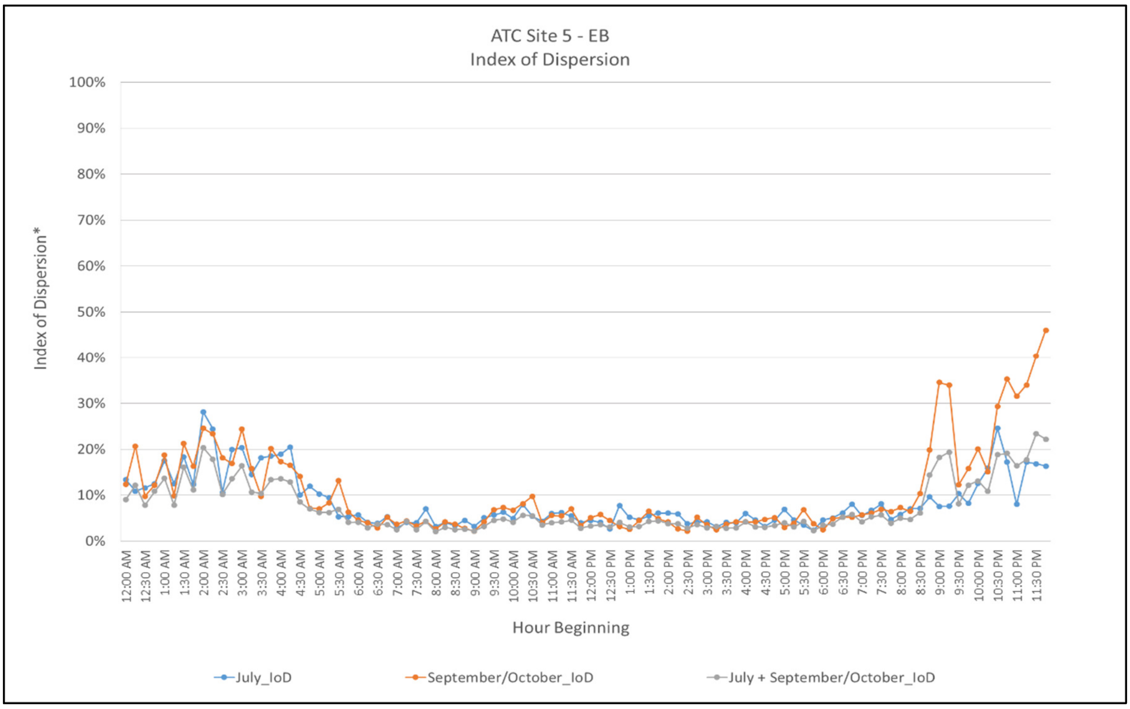
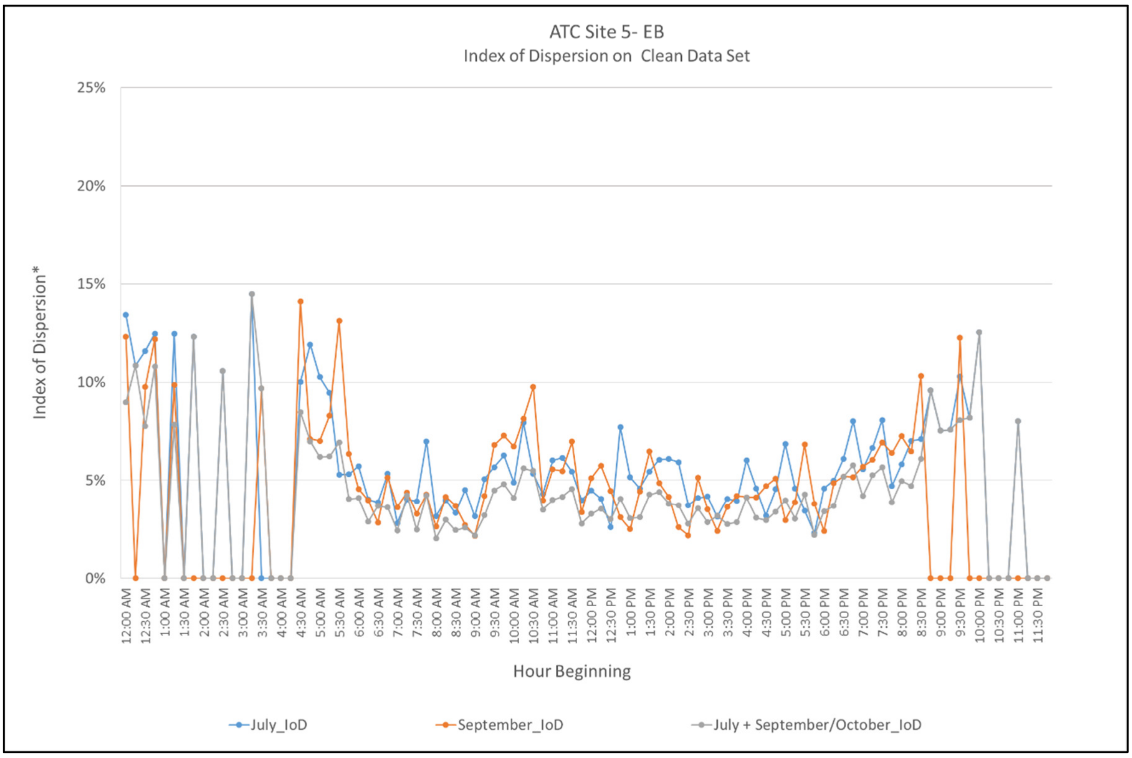
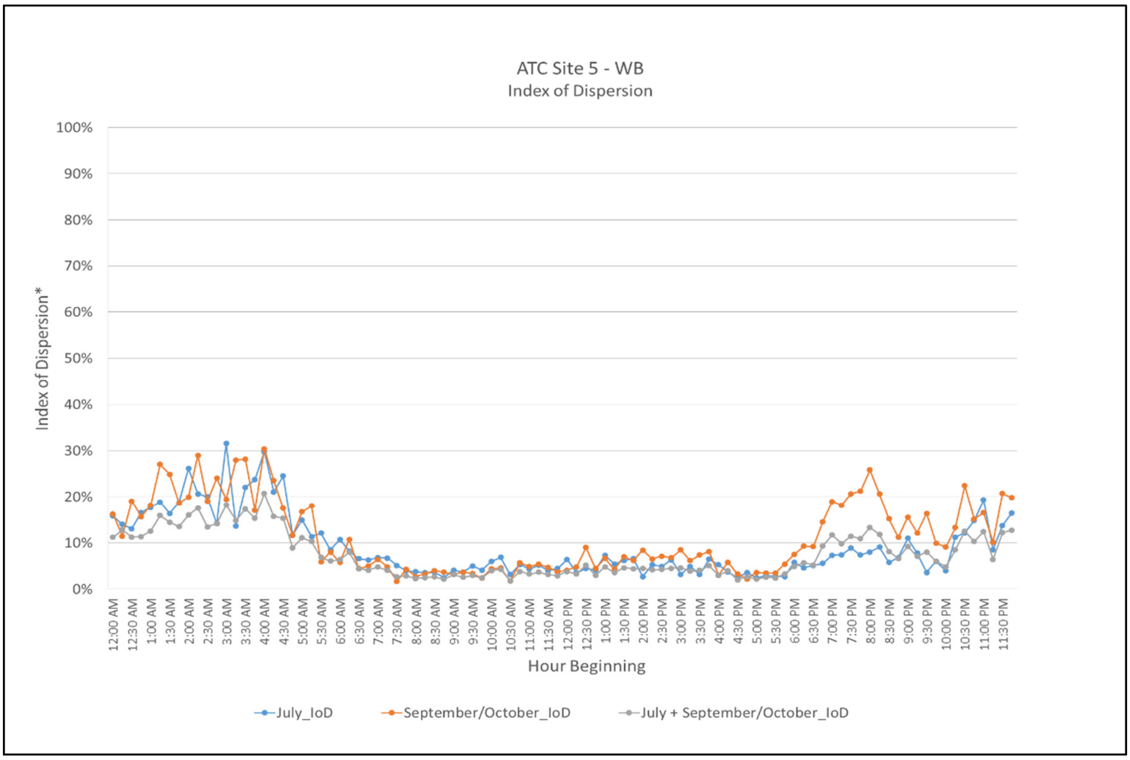


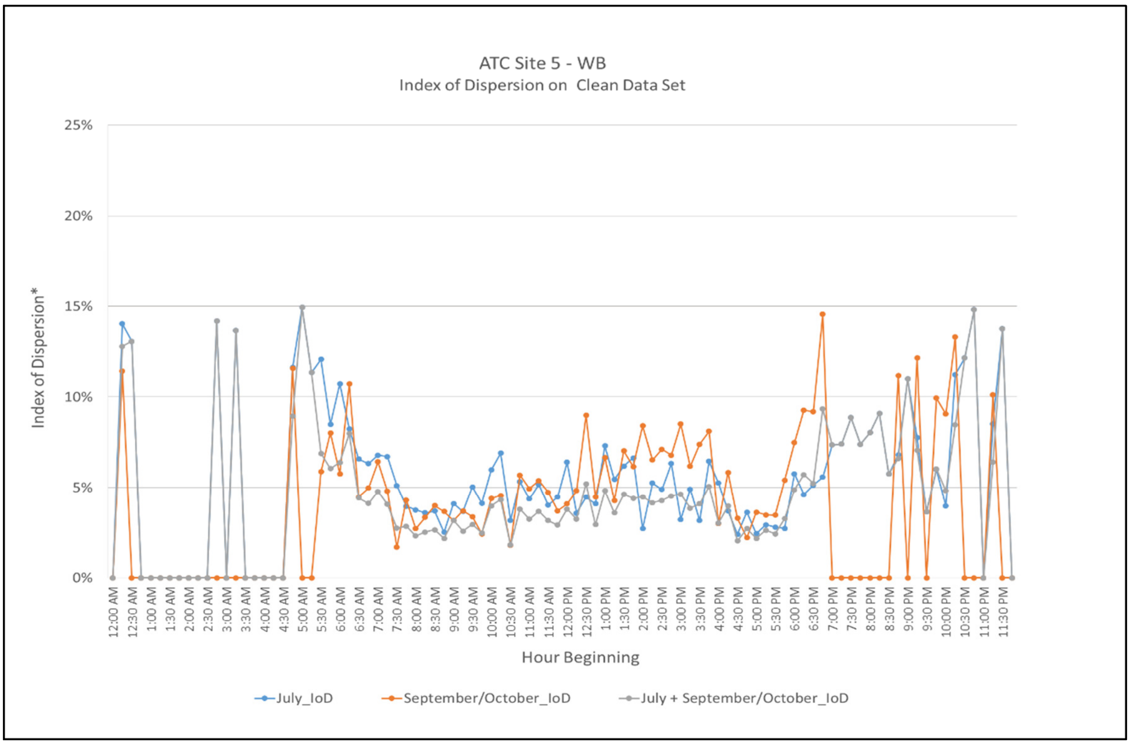
*IoD = 95%CI of Average 15 minute flows



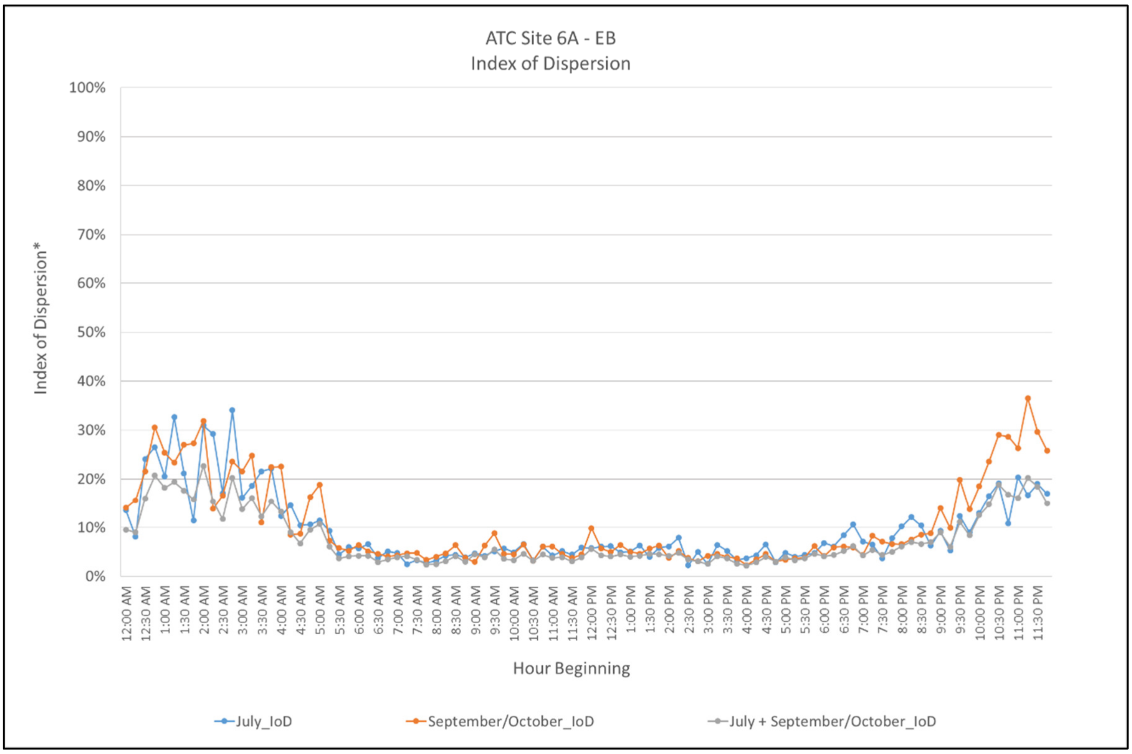
Zero value indicates that data points at that hour beginning were excluded based on the IoD test



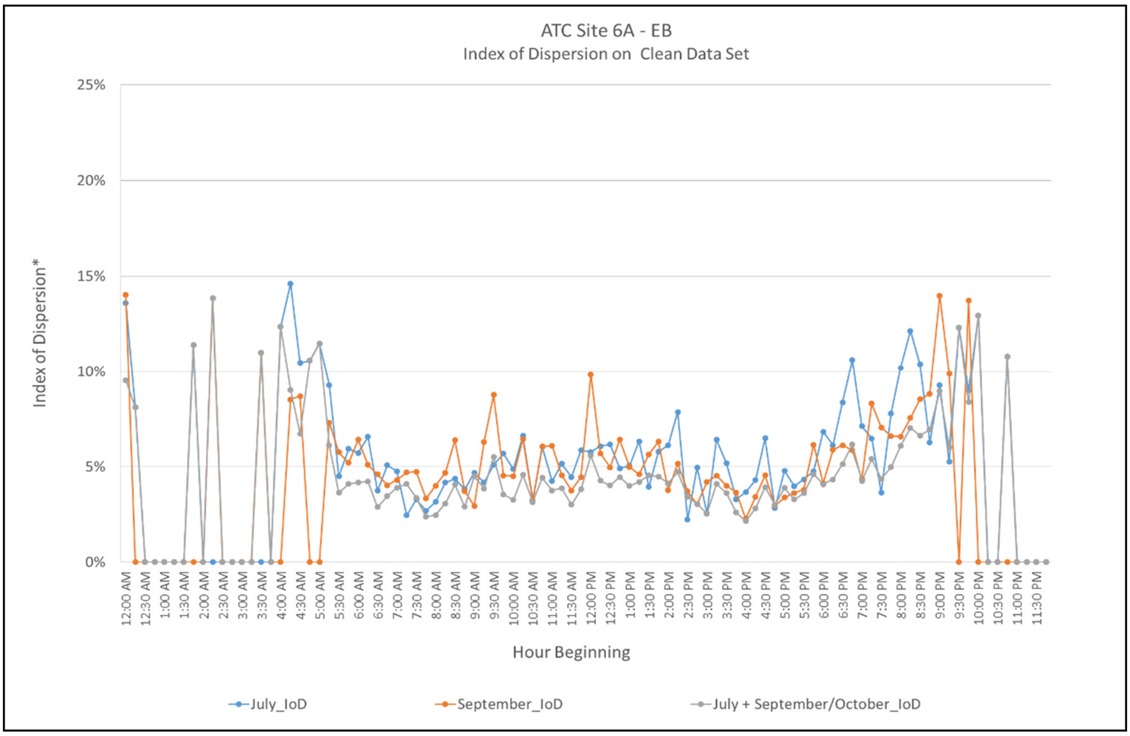
*IoD = 95%CI of Average 15 minute flows



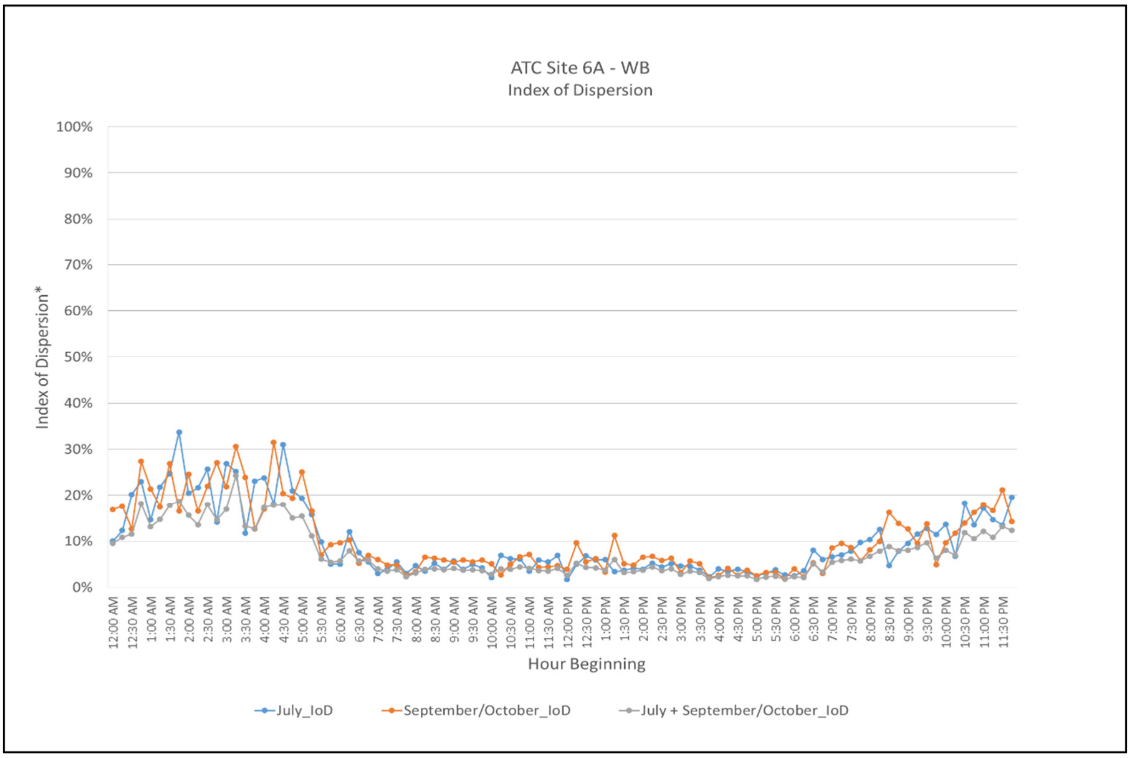
Zero value indicates that data points at that hour beginning were excluded based on the IoD test



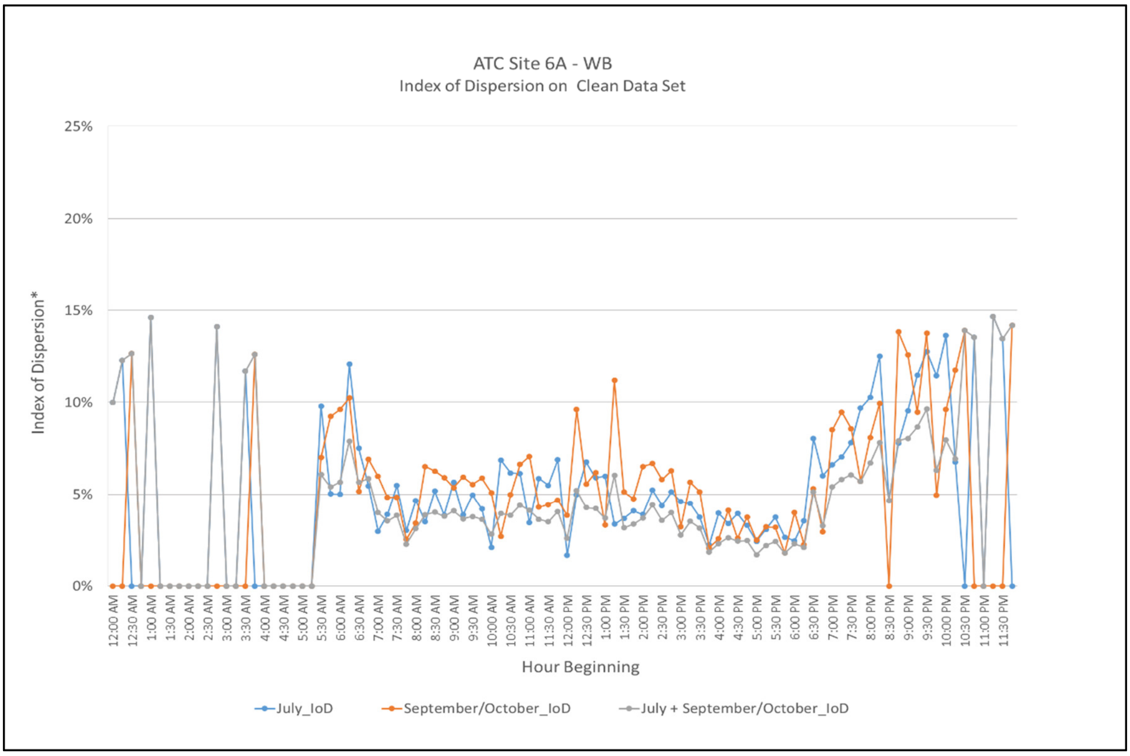
*IoD = 95%CI of Average 15 minute flows



Zero value indicates that data points at that hour beginning were excluded based on the IoD test

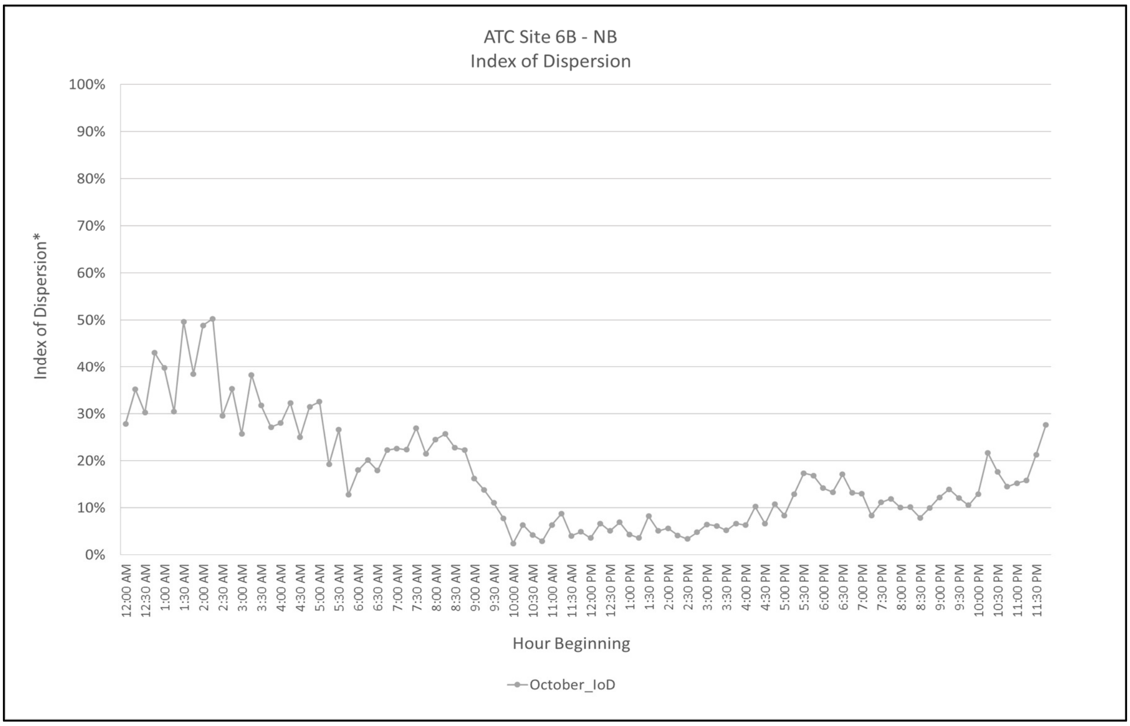


*IoD = 95%CI of Average 15 minute flows

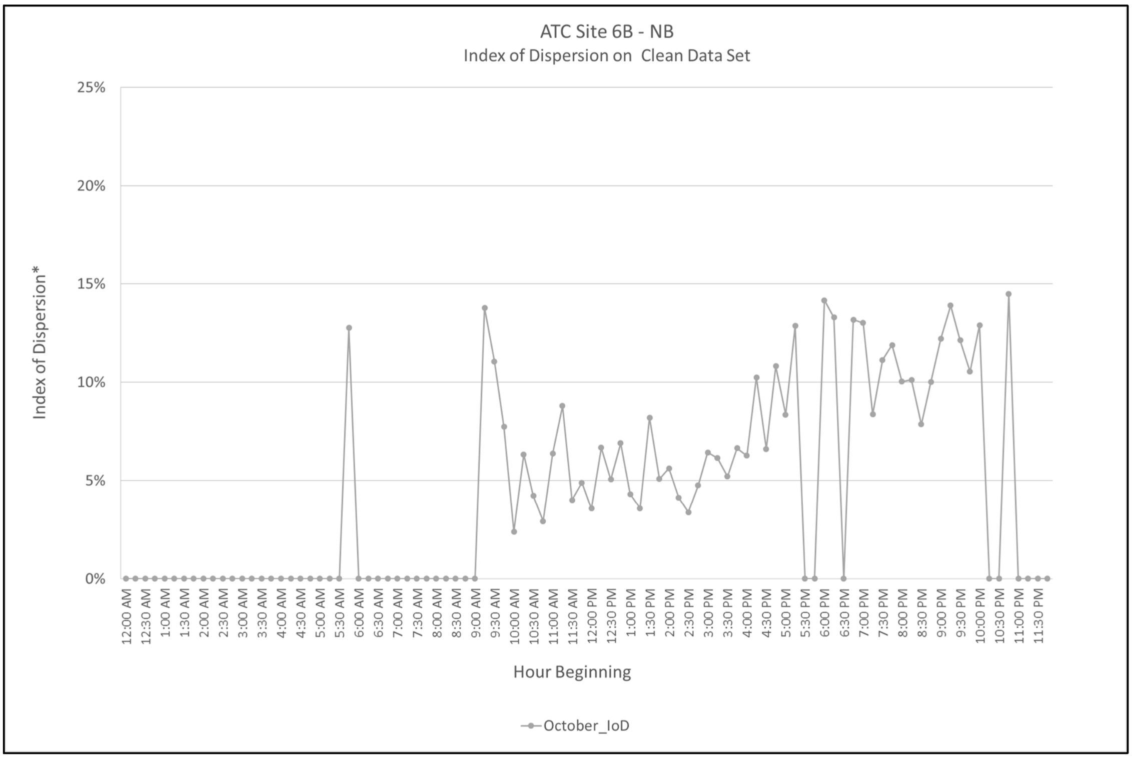


*IoD = 95%CI of Average 15 minute flows

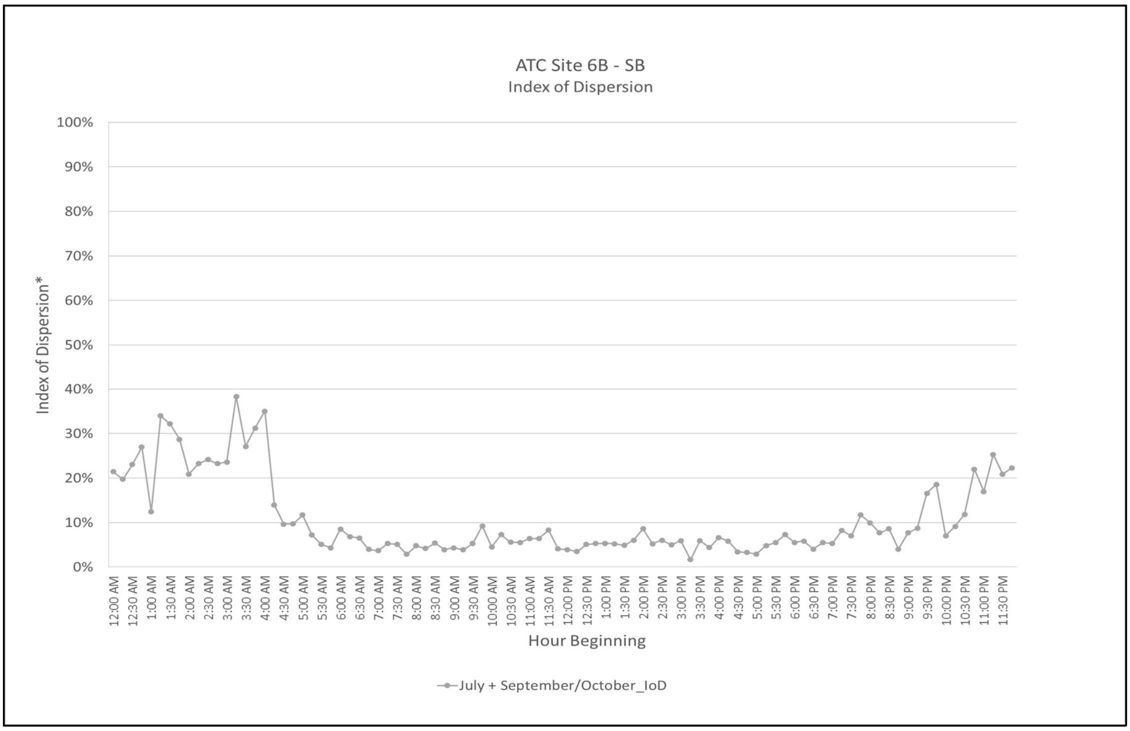
Zero value indicates that data points at that hour beginning were excluded based on the IoD test

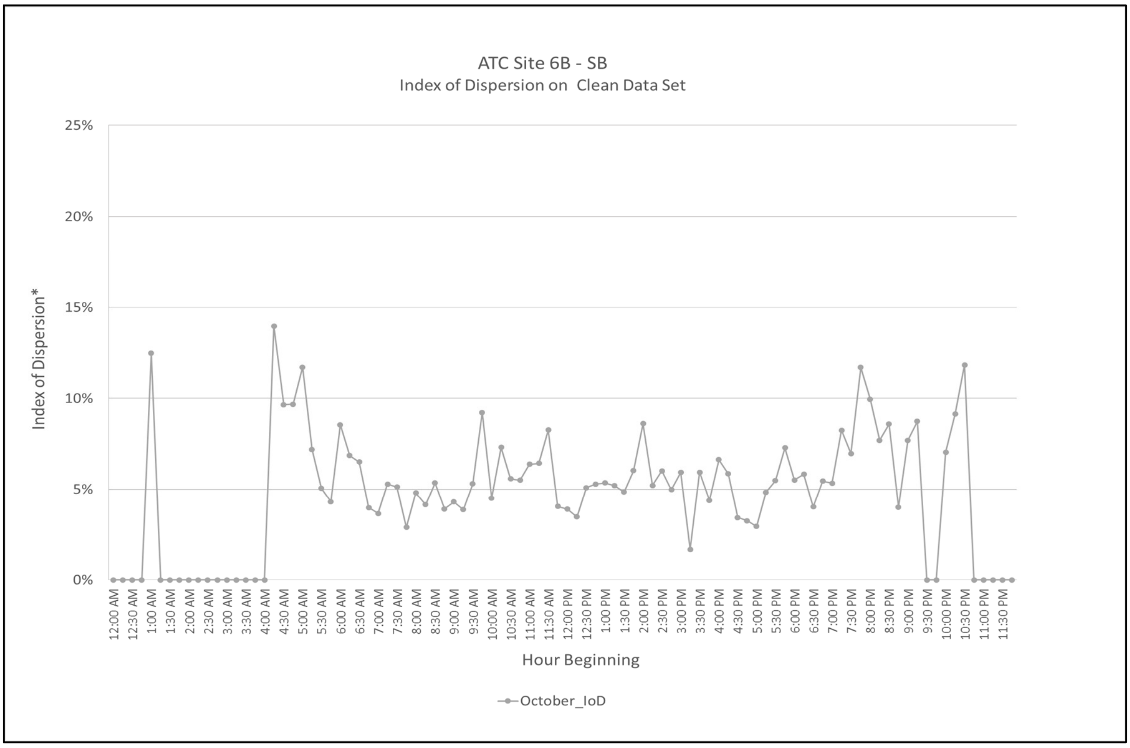


*IoD = 95%CI of Average 15 minute flows

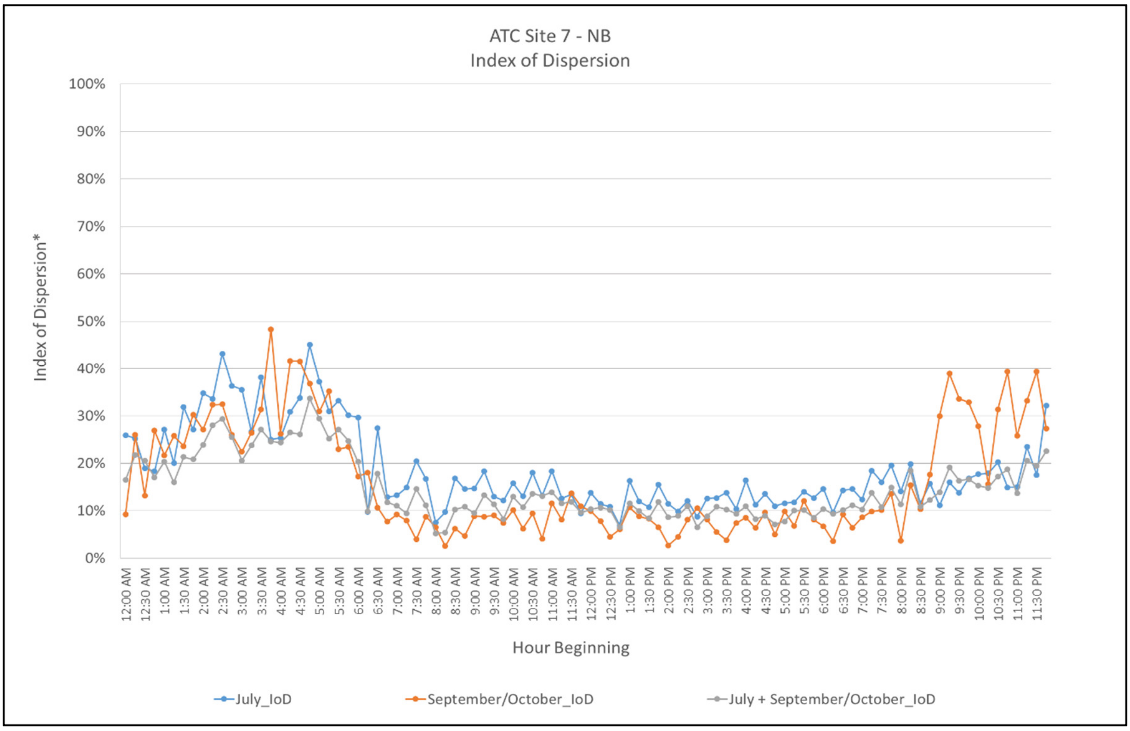


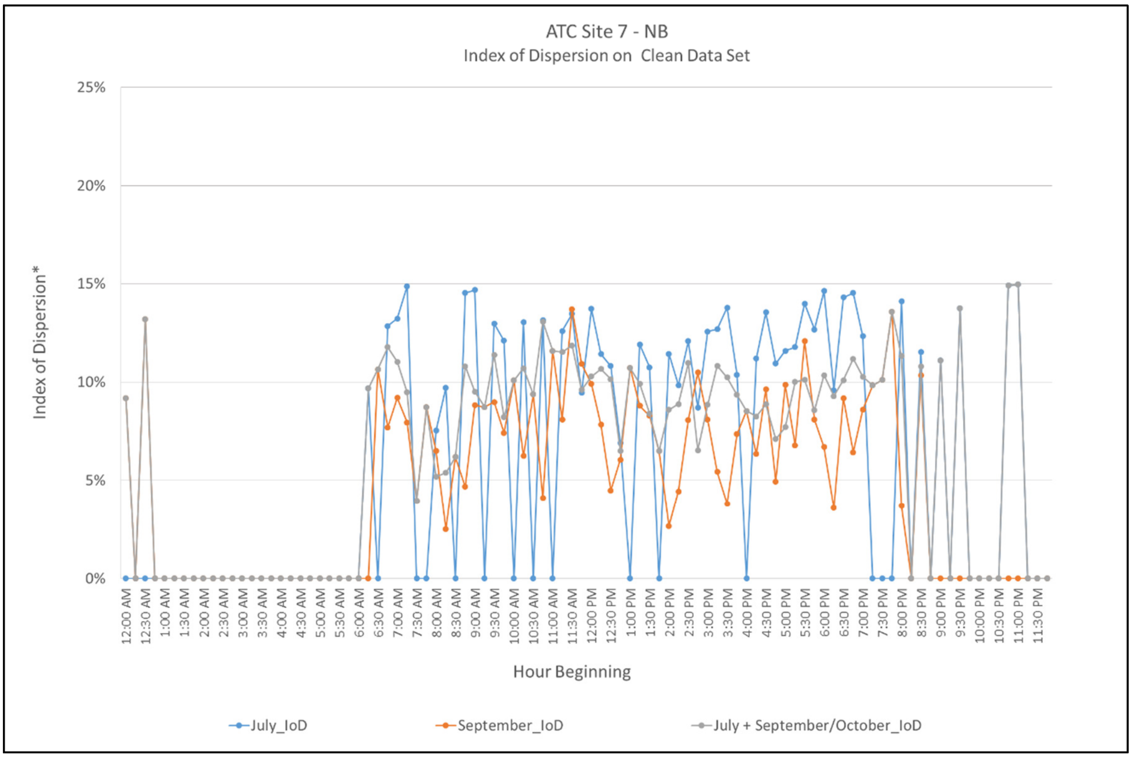
*IoD = 95%CI of Average 15 minute flows
Zero value indicates that data points at that hour beginning were excluded based on the IoD test



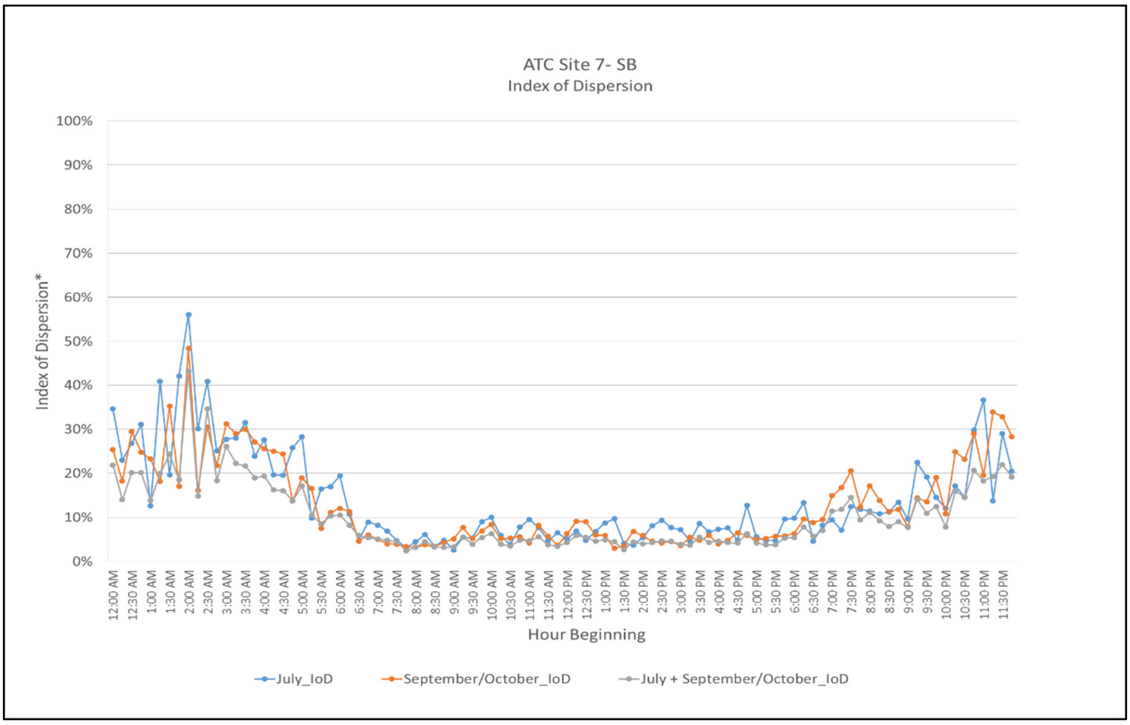


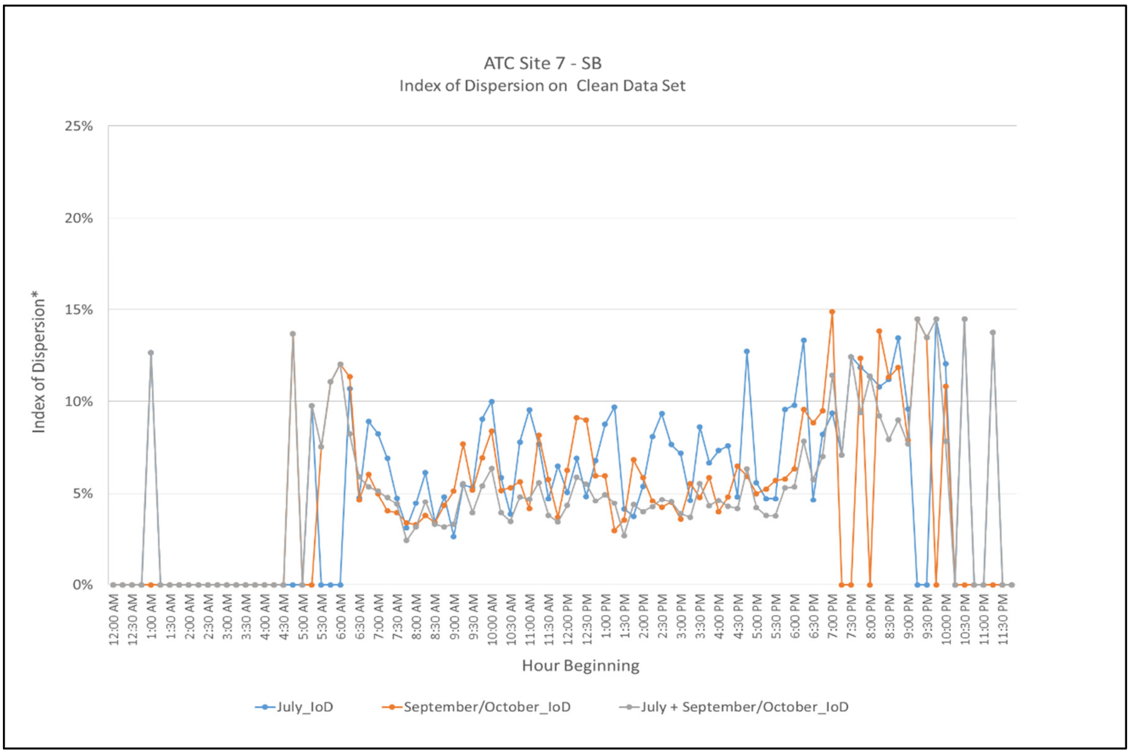
*IoD = 95%CI of Average 15 minute flows
Zero value indicates that data points at that hour beginning were excluded based on the IoD test





*IoD = 95%CI of Average 15 minute flows
Zero value indicates that data points at that hour beginning were excluded based on the IoD test





APPENDIX G

Outliers in 2015 ATC (Weekday) Data

APPENDIX G: Outliers in 2015 ATC Weekday Data

2015 ATC Site No.	Direction	AM			IP			PM		
		Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers
2015ATC_01	EB	136	8	6%	418	44	11%	228	0	0%
	WB	136	0	0%	418	44	11%	228	0	0%
2015ATC_02	EB	160	16	10%	440	0	0%	240	12	5%
	WB	160	16	10%	440	0	0%	240	24	10%
2015ATC_03	NB	160	8	5%	440	22	5%	240	12	5%
	SB	80	8	10%	220	22	10%	132	36	27%
2015ATC_04	NB	160	0	0%	440	22	5%	240	12	5%
	SB	160	0	0%	440	22	5%	240	0	0%
2015ATC_05	EB	160	0	0%	440	0	0%	240	0	0%
	WB	160	0	0%	440	22	5%	240	12	5%
2015ATC_6A	EB	160	8	5%	440	22	5%	240	12	5%
	WB	160	8	5%	440	0	0%	240	0	0%
2015ATC_6B	NB	80	8	10%	220	0	0%	120	0	0%
	SB	80	8	10%	220	0	0%	120	12	10%
2015ATC_07	NB	168	0	0%	462	44	10%	240	12	5%
	SB	168	8	5%	462	44	10%	240	12	5%

APPENDIX H

Outliers in 2016 ATC (Weekday) Data

APPENDIX H: Outliers in 2016 ATC Weekday Data

ATC Site No.	Direction	AM			IP			PM		
		Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers
1	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
2	NB	80	0	0%	220	0	0%	120	12	10%
	SB	80	8	10%	220	22	10%	120	0	0%
3	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
4	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	0	0%	220	44	20%	120	0	0%
5	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	12	10%
6	NB	80	0	0%	220	0	0%	120	12	10%
	SB	80	8	10%	220	0	0%	120	0	0%
7	NB	104	0	0%	172	0	0%	168	0	0%
	SB	104	0	0%	172	0	0%	168	0	0%
8	NB	80	8	10%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
9	NB	112	0	0%	301	0	0%	168	12	7%
	SB	112	8	7%	301	22	7%	168	12	7%
10	NB	112	8	7%	308	0	0%	168	0	0%
	SB	112	0	0%	308	0	0%	168	12	7%
11	NB	80	0	0%	219	19	9%	120	0	0%
	SB	80	0	0%	219	22	10%	120	0	0%
12	NB	80	0	0%	220	44	20%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
13	NB	80	0	0%	220	0	0%	120	12	10%
	SB	80	0	0%	220	0	0%	120	0	0%
14	NB	112	16	14%	298	22	7%	168	12	7%
	SB	112	0	0%	298	22	7%	168	12	7%
15	NB	80	0	0%	No Data			No Data		
	SB	80	0	0%	220	0	0%	120	0	0%
16	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
17	NB	88	0	0%	243	0	0%	144	0	0%

ATC Site No.	Direction	AM			IP			PM		
		Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers
	SB	88	0	0%	243	0	0%	144	0	0%
18	NB	80	0	0%	218	0	0%	120	0	0%
	SB	80	8	10%	218	0	0%	120	0	0%
19	NB	112	8	7%	308	22	7%	162	0	0%
	SB	112	0	0%	308	0	0%	162	12	7%
20	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
21	NB	90	0	0%	253	0	0%	140	12	9%
	SB	90	16	18%	253	22	9%	140	0	0%
22	NB	80	0	0%	220	0	0%	120	12	10%
	SB	80	8	10%	220	0	0%	120	0	0%
23	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	8	10%	220	22	10%	120	0	0%
24	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	8	10%	220	0	0%	120	12	10%
25	EB	112	8	7%	295	22	7%	156	12	8%
	WB	112	8	7%	295	22	7%	156	12	8%
26	EB	104	0	0%	283	22	8%	156	0	0%
	WB	104	0	0%	283	0	0%	156	0	0%
27	EB	80	8	10%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
28	EB	104	0	0%	286	0	0%	156	0	0%
	WB	104	8	8%	286	0	0%	156	0	0%
29	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	8	10%	220	0	0%	120	0	0%
31	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	8	10%	220	0	0%	120	0	0%
32	NB	80	8	10%	220	22	10%	120	12	10%
	SB	80	0	0%	220	0	0%	120	0	0%
33	EB	112	0	0%	308	0	0%	168	0	0%
	WB	112	0	0%	308	0	0%	168	0	0%
34	NB	80	8	10%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	12	10%
35	NB	80	0	0%	220	22	10%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%

ATC Site No.	Direction	AM			IP			PM		
		Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers
36	EB	80	0	0%	220	22	10%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
37	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
38	EB	79	0	0%	214	0	0%	120	0	0%
	WB	79	0	0%	214	0	0%	120	0	0%
39	EB	80	0	0%	220	0	0%	120	12	10%
	WB	80	0	0%	220	0	0%	120	0	0%
40	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
41	EB	104	0	0%	286	22	8%	156	0	0%
	WB	104	0	0%	286	0	0%	156	12	8%
42	EB	112	0	0%	282	0	0%	155	0	0%
	WB	112	0	0%	282	0	0%	155	12	8%
43	NB	80	8	10%	220	0	0%	120	0	0%
	SB	80	0	0%	220	22	10%	120	0	0%
44	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
45	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
46	EB	80	0	0%	220	22	10%	120	12	10%
	WB	80	0	0%	220	22	10%	120	0	0%
47	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	12	10%
48	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
49	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	8	10%	220	22	10%	120	0	0%
50	NB	80	8	10%	220	22	10%	120	0	0%
	SB	80	0	0%	220	22	10%	120	0	0%
51	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
52	EB	80	8	10%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
53	NB	80	0	0%	204	0	0%	120	0	0%

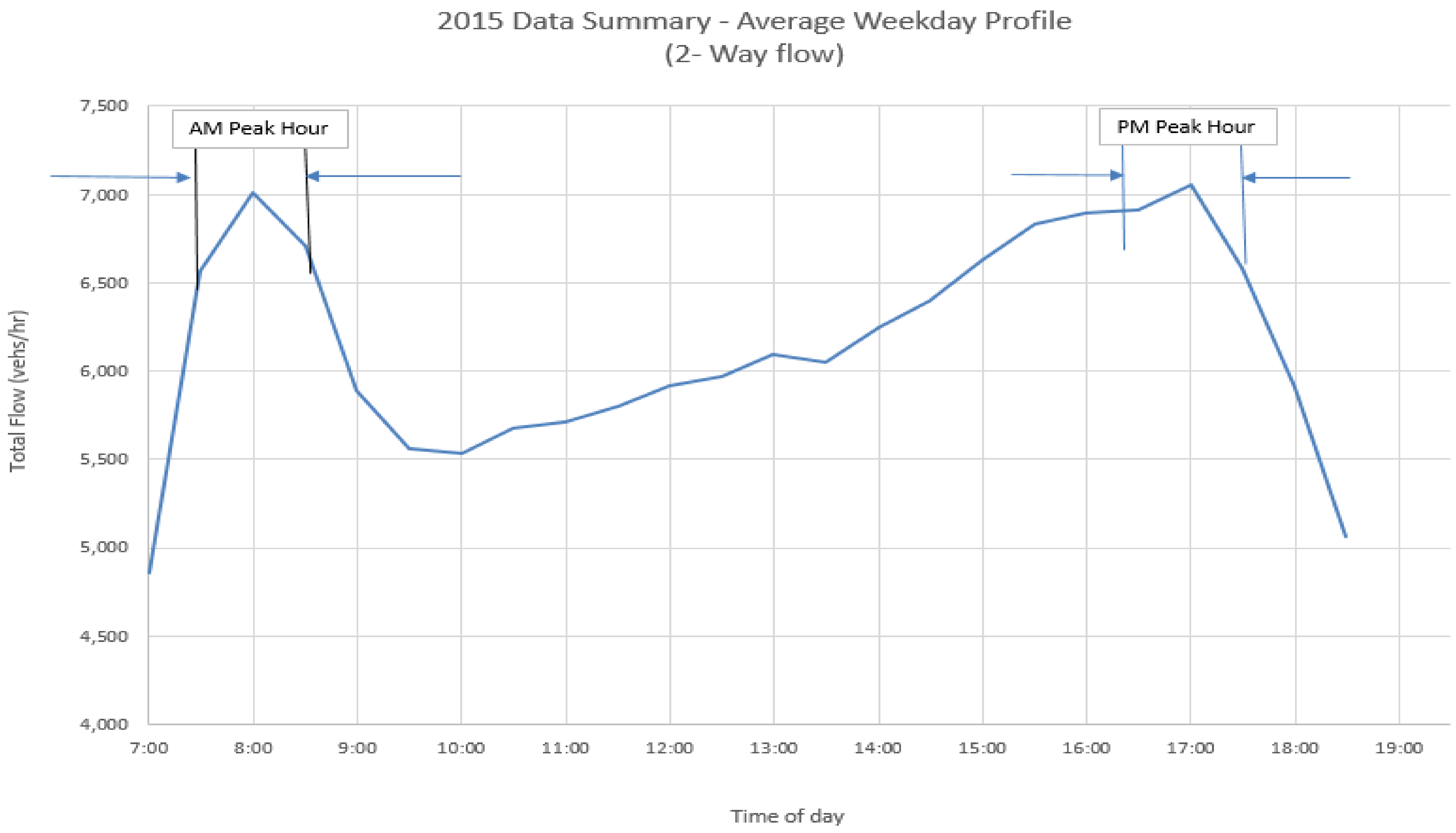
ATC Site No.	Direction	AM			IP			PM		
		Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers
	SB	80	8	10%	204	22	11%	120	0	0%
54	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	12	10%
55	NB	80	8	10%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
56	NB	80	0	0%	220	22	10%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
57	NB	80	8	10%	220	0	0%	120	0	0%
	SB	80	8	10%	220	0	0%	120	0	0%

APPENDIX I

2015 ATC Data: Weekday 2-Way Average Flow Summary

APPENDIX I: 2015 Weekday Average Traffic Flow (2-Way ATC)

Site_Ref	**07:00**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	**12 - hour flows (vehs)**
2015ATC_01	937	1127	1032	916	928	880	865	876	859	841	866	866	869	879	922	918	969	1046	1051	1037	1027	933	900	741	22,285
2015ATC_02	915	1072	1125	1042	910	875	882	894	888	911	942	921	943	948	970	985	1028	1066	1049	1049	1053	1025	968	827	23,288
2015ATC_03	256	558	681	690	576	530	540	568	591	601	598	598	618	612	640	642	643	684	658	666	697	671	483	417	14,218
2015ATC_04	509	784	868	847	715	657	640	634	637	650	679	677	680	685	693	760	770	777	763	772	780	729	674	599	16,979
2015ATC_05	560	810	871	867	765	722	710	721	709	725	739	772	776	762	780	801	826	846	904	962	1003	913	845	729	19,118
2015ATC_06A	913	1080	1113	997	908	858	859	869	886	902	891	909	936	937	964	995	1034	1048	1055	1033	1023	1009	967	812	22,998
2015ATC_06B	539	762	835	866	718	682	685	739	749	765	779	801	820	796	827	850	883	895	940	912	956	829	710	631	18,969
2015ATC_07	233	377	489	479	369	359	356	380	390	403	423	425	452	430	448	443	477	473	478	485	516	471	360	309	10,025
Total (for 2015 sites)	**4862**	**6570**	**7014**	**6704**	**5889**	**5563**	**5537**	**5681**	**5709**	**5798**	**5917**	**5969**	**6094**	**6049**	**6244**	**6394**	**6630**	**6835**	**6898**	**6916**	**7055**	**6580**	**5907**	**5065**	**147,880**


2015 Data Summary - Average Weekday Profile
(2- Way flow)
AM Peak Hour
PM Peak Hour
Total Flow (vehs/hr)
7,500
7,000
6,500
6,000
5,500
5,000
4,500
4,000
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
Time of day

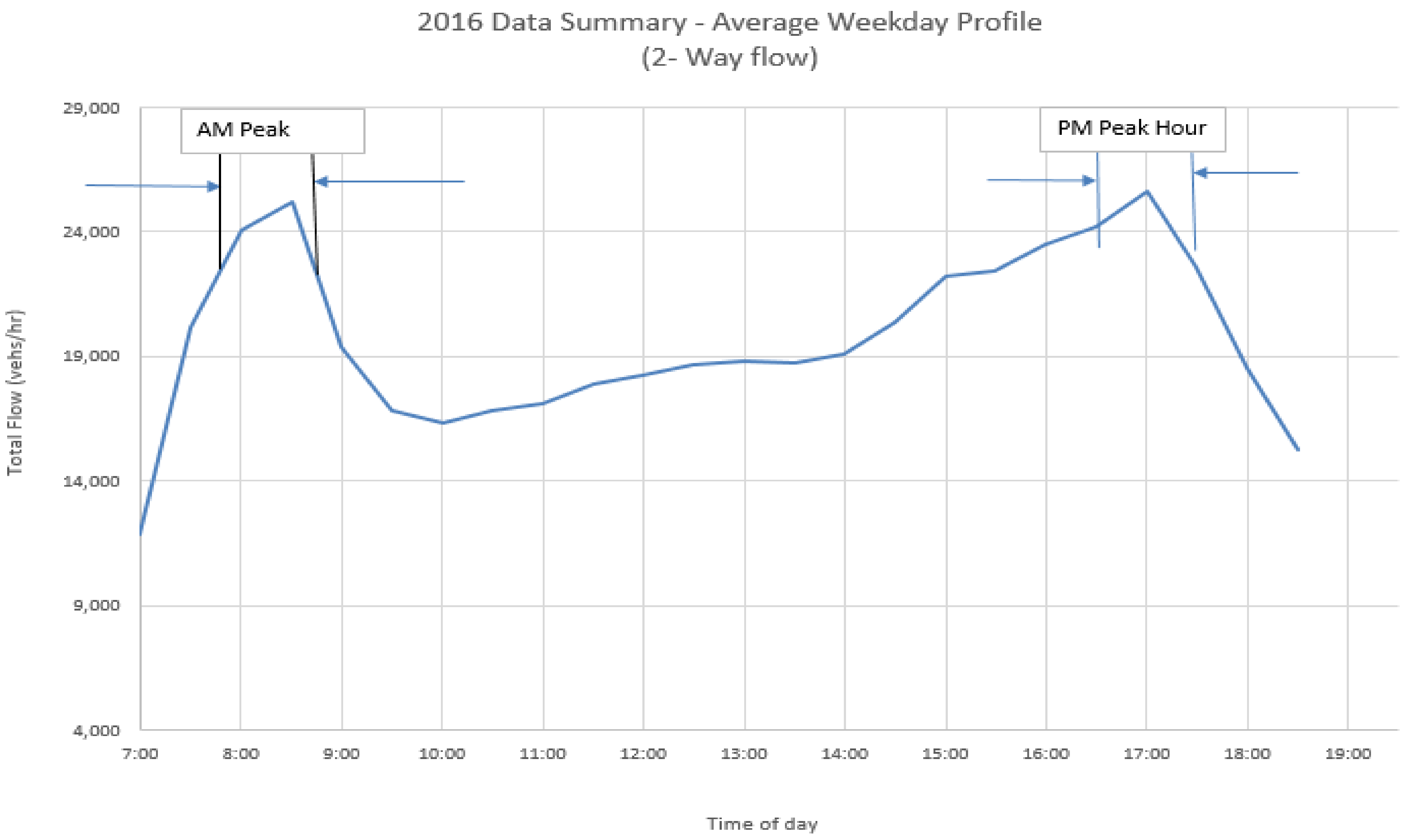
APPENDIX J

2016 ATC Data: Weekday 2-Way Average Flow Summary

APPENDIX J: 2016 Weekday Average Traffic Flow (2-Way ATC)

Site_Ref	07:00	07:30	08:00	08:30	09:00	09:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	12 - hour flows (vehs)
2016ATC_01	353	716	996	1117	782	616	620	652	657	681	706	701	738	746	754	772	840	851	915	919	1034	855	634	489	18144
2016ATC_02	300	546	675	729	608	525	547	569	569	596	598	614	637	633	630	662	742	749	679	678	693	610	529	465	14583
2016ATC_03	36	62	90	106	73	58	49	57	55	63	75	75	70	72	68	74	90	79	86	89	121	80	48	32	1708
2016ATC_04	104	151	155	132	76	61	48	45	55	59	57	60	55	57	59	68	89	91	110	140	162	126	84	63	2107
2016ATC_05	663	848	858	783	619	499	433	457	440	464	475	499	510	510	523	513	546	657	736	726	654	646	588	457	14104
2016ATC_06	231	453	561	604	426	343	332	353	358	380	375	393	398	415	417	438	454	466	491	500	559	465	340	268	10020
2016ATC_07	133	251	340	416	325	306	292	315	308	337	344	331	328	335	344	361	404	384	389	415	433	378	315	272	8056
2016ATC_08	104	241	349	435	326	292	301	318	319	341	347	339	332	337	349	350	404	408	386	421	484	449	360	302	8294
2016ATC_09	194	404	525	691	437	367	352	359	363	389	390	415	417	419	424	473	584	584	511	541	578	511	417	370	10715
2016ATC_10	197	357	482	613	477	430	437	455	476	496	510	521	536	523	529	556	590	599	567	619	633	564	482	439	12088
2016ATC_11	291	453	499	483	395	356	321	360	352	375	405	419	414	413	412	420	459	467	511	537	563	450	361	269	9985
2016ATC_12	108	150	163	146	78	56	50	46	54	60	58	58	57	61	56	69	94	95	115	139	160	128	87	64	2152
2016ATC_13	1	2	4	3	3	5	2	4	3	3	2	3	4	3	4	3	8	4	4	7	6	5	3	2	88
2016ATC_14	514	988	1089	1055	870	688	650	667	703	700	717	734	705	720	737	789	815	873	898	952	1017	911	706	571	19069
2016ATC_15	53	56	93	121	107	112	109	113	111	126	122	121	117	112	119	108	97	106	98	100	92	102	120	93	2508
2016ATC_16	107	203	327	387	327	314	285	288	300	306	310	317	319	314	321	349	340	359	377	397	428	402	305	245	7627
2016ATC_17	279	494	559	600	552	506	503	513	534	561	567	559	566	569	607	608	593	605	624	631	625	584	570	502	13311
2016ATC_18	139	303	425	464	319	272	258	261	285	293	301	307	317	310	323	363	377	387	392	404	423	377	325	282	7907
2016ATC_19	34	70	127	131	67	59	61	59	55	63	60	63	61	63	64	74	98	92	95	100	117	104	85	75	1877
2016ATC_20	25	27	48	65	40	35	31	31	34	38	36	32	31	36	31	41	41	48	50	47	56	53	41	41	958
2016ATC_21	52	152	164	193	177	137	128	128	129	122	128	131	140	133	127	125	128	124	130	156	177	118	54	40	3093
2016ATC_22	192	369	487	528	358	316	317	313	330	349	361	371	371	363	380	405	469	470	495	531	556	498	393	321	9543
2016ATC_23	174	368	488	546	376	338	333	348	351	383	389	389	399	385	407	426	484	495	520	549	568	515	406	350	9987
2016ATC_24	86	201	276	259	194	187	176	182	190	208	216	216	219	201	220	227	238	249	275	291	292	268	210	174	5255
2016ATC_25	59	124	157	246	143	141	141	142	148	138	130	129	133	137	139	176	221	164	179	182	181	172	165	123	3670
2016ATC_26	154	266	384	482	310	263	255	249	256	277	295	315	298	280	295	329	401	381	396	392	418	378	296	248	7618
2016ATC_27	181	387	540	681	466	369	339	358	362	388	393	402	402	377	412	451	528	529	549	536	566	512	452	376	10556
2016ATC_28	308	513	550	626	451	340	318	293	301	320	348	358	386	383	403	421	490	467	522	515	567	457	374	306	10017
2016ATC_29	372	656	859	820	637	587	560	563	572	580	557	627	585	595	594	699	740	715	779	737	784	694	602	519	15433
2016ATC_31	349	566	559	575	470	466	457	494	505	531	562	582	602	577	579	572	590	587	612	617	610	551	473	392	12878
2016ATC_32	283	439	512	504	378	324	270	292	304	309	296	297	334	322	310	325	351	370	460	526	593	455	360	265	8879
2016ATC_33	0	0	2	1	0	0	0	0	0	0	0	0	1	1	0	0	2	0	0	1	1	6	5	12	32
2016ATC_34	70	124	136	130	91	78	73	78	81	90	84	86	88	92	90	101	104	114	130	122	142	127	102	86	2419
2016ATC_35	201	262	278	271	168	129	108	113	121	123	132	147	139	135	127	136	189	195	220	272	306	247	187	134	4340
2016ATC_36	166	266	380	467	372	341	344	371	379	402	417	417	436	421	430	447	479	461	451	459	462	442	375	315	9500
2016ATC_37	326	623	748	676	574	498	480	487	477	504	513	553	542	553	560	638	690	692	743	771	876	755	640	553	14472
2016ATC_38	360	626	841	799	613	576	551	559	557	582	563	609	590	604	586	700	734	711	770	732	787	698	598	519	15265
2016ATC_39	171	285	299	370	258	196	184	174	185	187	198	205	223	214	219	249	309	269	300	284	308	244	196	154	5681
2016ATC_40	55	107	151	194	116	104	101	101	104	100	105	105	102	107	108	127	166	135	135	135	152	136	114	92	2852
2016ATC_41	47	87	118	175	149	144	143	149	147	165	155	156	159	156	160	166	193	180	176	165	168	155	132	104	3549
2016ATC_42	130	249	351	416	397	396	405	430	438	469	456	480	453	466	466	483	483	474	468	471	491	443	377	340	10032
2016ATC_43	242	372	407	331	211	140	138	124	135	137	156	159	161	149	167	189	246	255	298	333	392	299	203	135	5379

2016ATC_44	103	216	258	214	107	74	70	62	66	67	72	73	81	78	81	108	136	143	197	232	290	234	143	83	3188
2016ATC_45	2	3	7	4	5	7	5	6	5	7	6	5	6	8	9	7	7	7	6	8	7	5	4	3	139
2016ATC_46	66	110	145	118	72	60	58	55	53	57	62	63	68	58	69	71	91	85	113	120	142	116	77	51	1980
2016ATC_47	8	41	43	36	16	11	10	9	12	13	13	12	13	14	13	21	25	25	35	45	63	42	19	11	550
2016ATC_48	287	444	454	383	333	312	308	311	306	324	324	320	340	346	347	365	377	410	424	429	457	364	294	232	8491
2016ATC_49	407	663	677	566	503	451	457	477	473	463	494	461	487	502	507	548	572	594	628	631	660	626	534	413	12794
2016ATC_50	239	386	410	355	229	156	137	131	141	139	156	160	166	163	164	200	260	278	310	354	414	309	212	142	5611
2016ATC_51	203	343	392	414	332	294	284	295	298	310	316	335	329	313	345	370	399	416	423	449	475	443	371	298	8447
2016ATC_52	150	323	454	599	372	296	275	296	291	318	333	343	332	316	329	379	457	430	440	430	470	435	381	326	8775
2016ATC_53	794	1111	1157	1121	961	891	919	922	964	1015	1027	1023	1043	1035	1043	1068	1127	1159	1176	1189	1162	1145	1010	870	24932
2016ATC_54	544	779	872	886	730	607	600	620	625	644	715	678	706	703	713	721	745	776	846	917	971	846	699	581	17524
2016ATC_55	321	591	719	731	648	595	628	652	675	680	686	689	686	692	720	719	760	770	772	783	791	707	557	437	16009
2016ATC_56	494	767	797	759	680	627	603	614	607	620	618	651	635	667	675	750	728	749	807	784	788	694	626	573	16313
2016ATC_57	355	536	641	670	549	463	455	485	503	524	513	529	545	547	552	534	606	626	659	693	725	612	462	348	13132
Total (for 2016 Sites)	**11817**	**20130**	**24078**	**25227**	**19353**	**16814**	**16311**	**16805**	**17122**	**17876**	**18244**	**18637**	**18812**	**18741**	**19117**	**20344**	**22190**	**22409**	**23478**	**24203**	**25650**	**22548**	**18503**	**15227**	**473636**

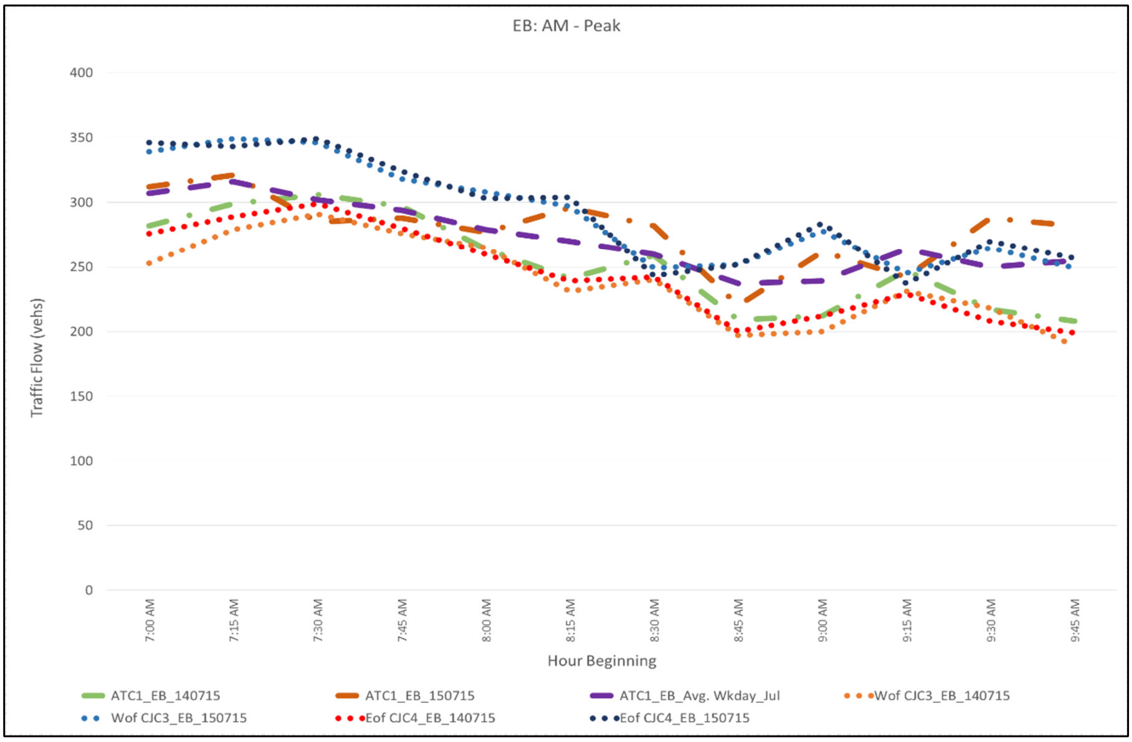

2016 Data Summary - Average Weekday Profile
(2- Way flow)
AM Peak
PM Peak Hour
Total Flow (vehs/hr)
29,000
24,000
19,000
14,000
9,000
4,000
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
Time of day

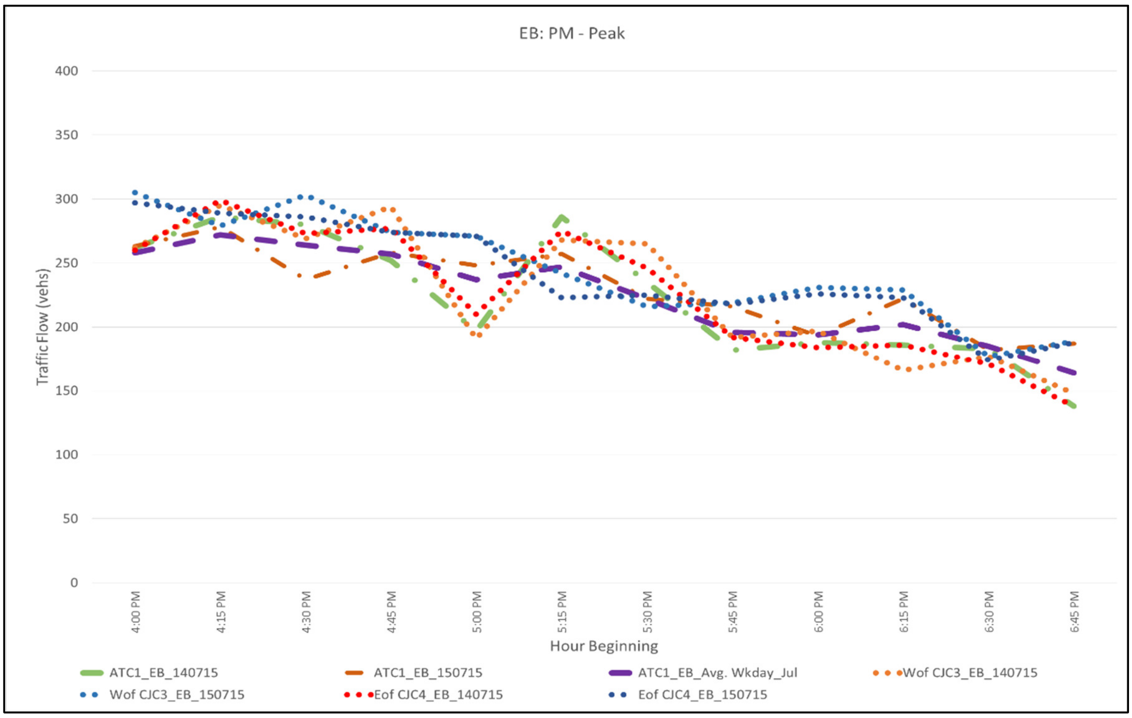
APPENDIX K

2015 Data Comparison: CJC vs ATC

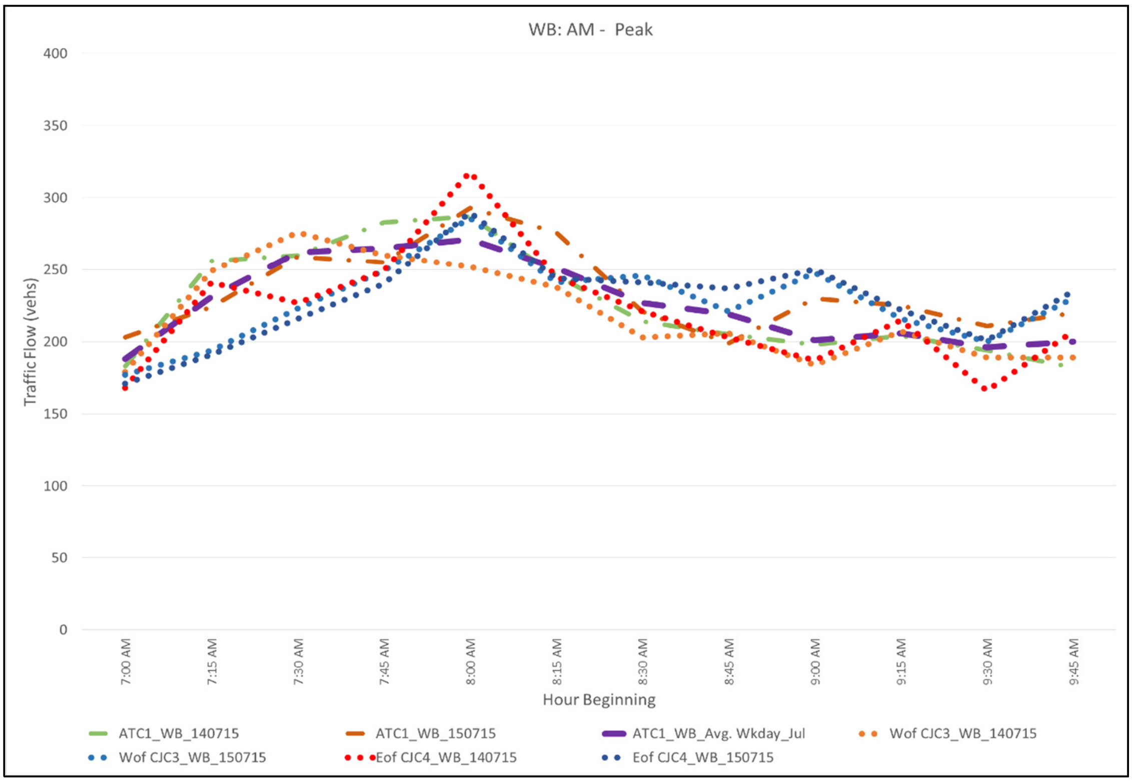
APPENDIX F: 2015 data - CJC (vs) ATC Comparisons

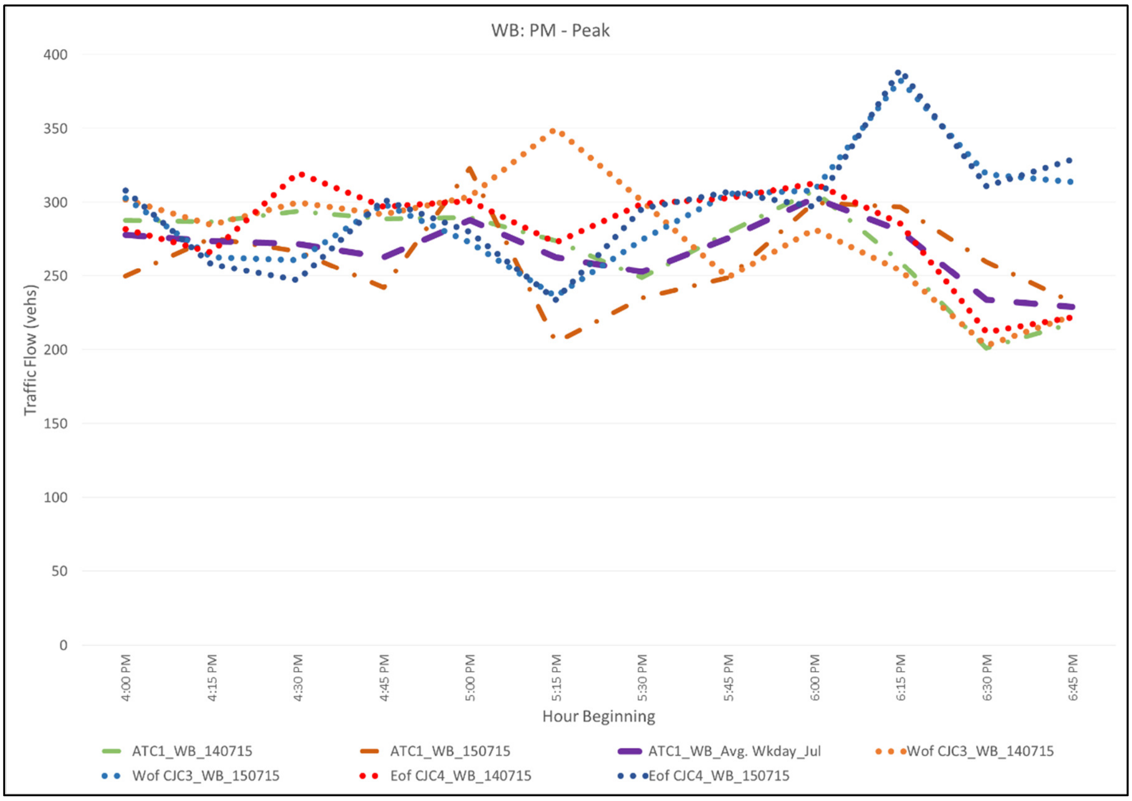
Comparison of CJC at Site 3 and Site 4 with ATC 1



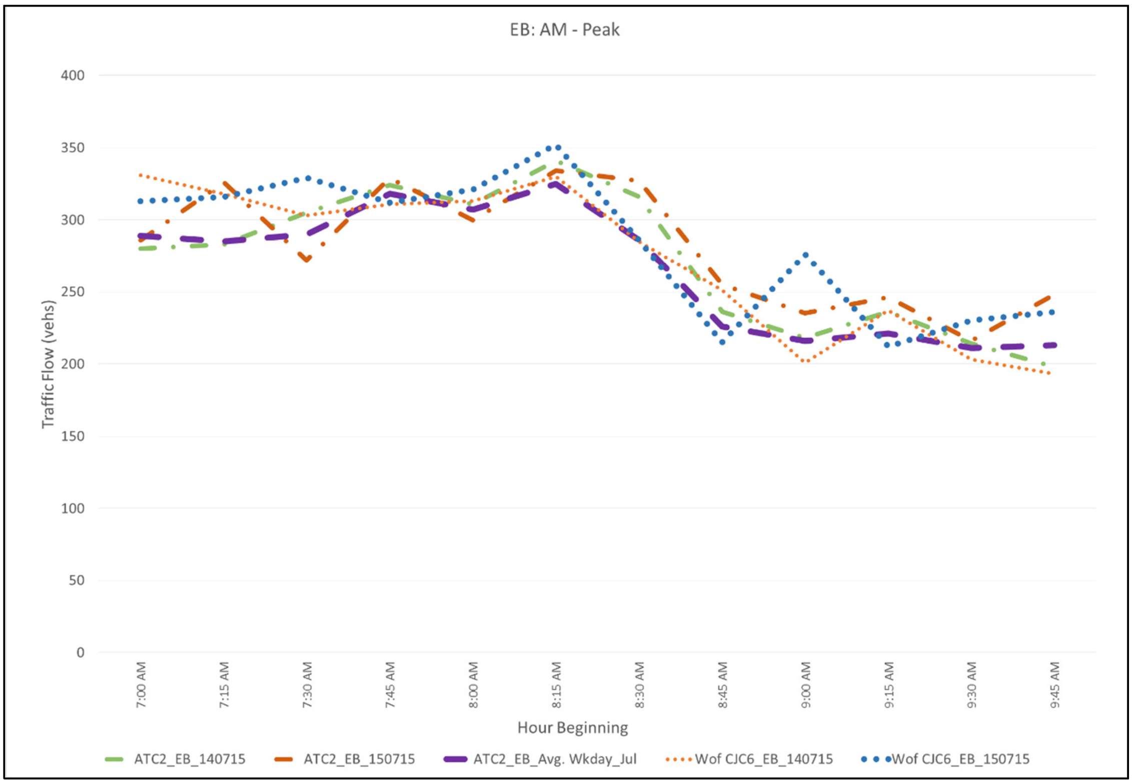


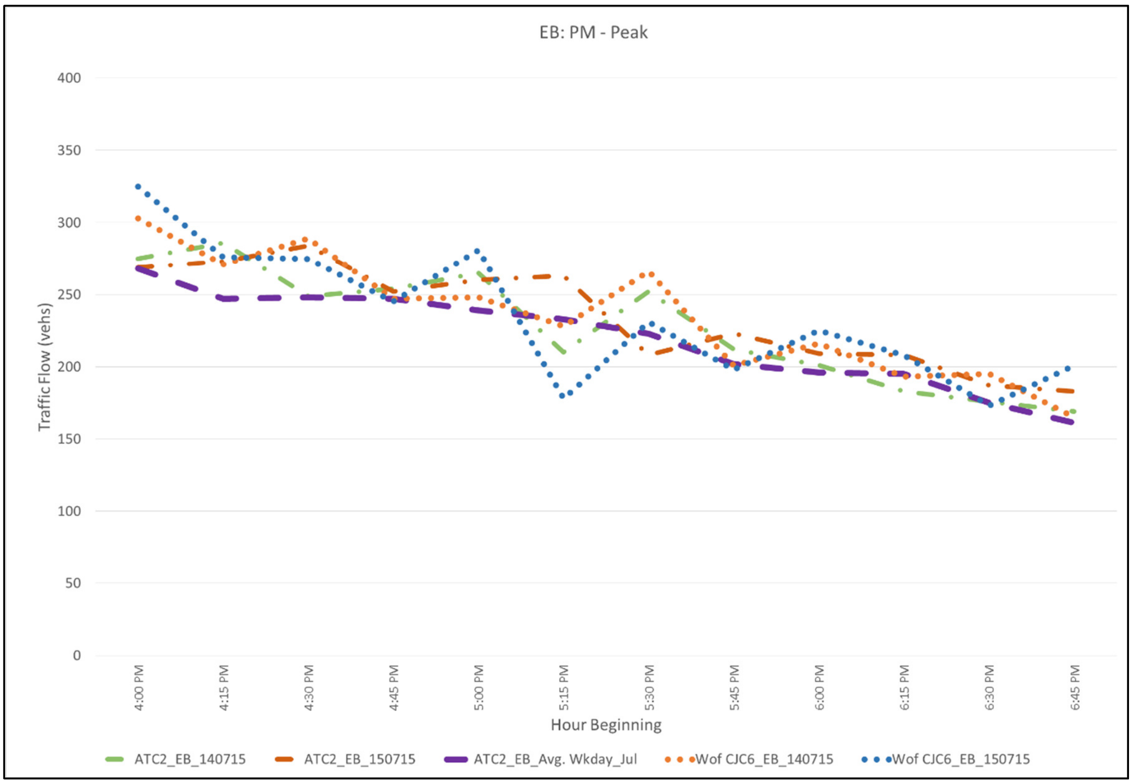
Comparison of CJC at Site 3 and Site 4 with ATC 1



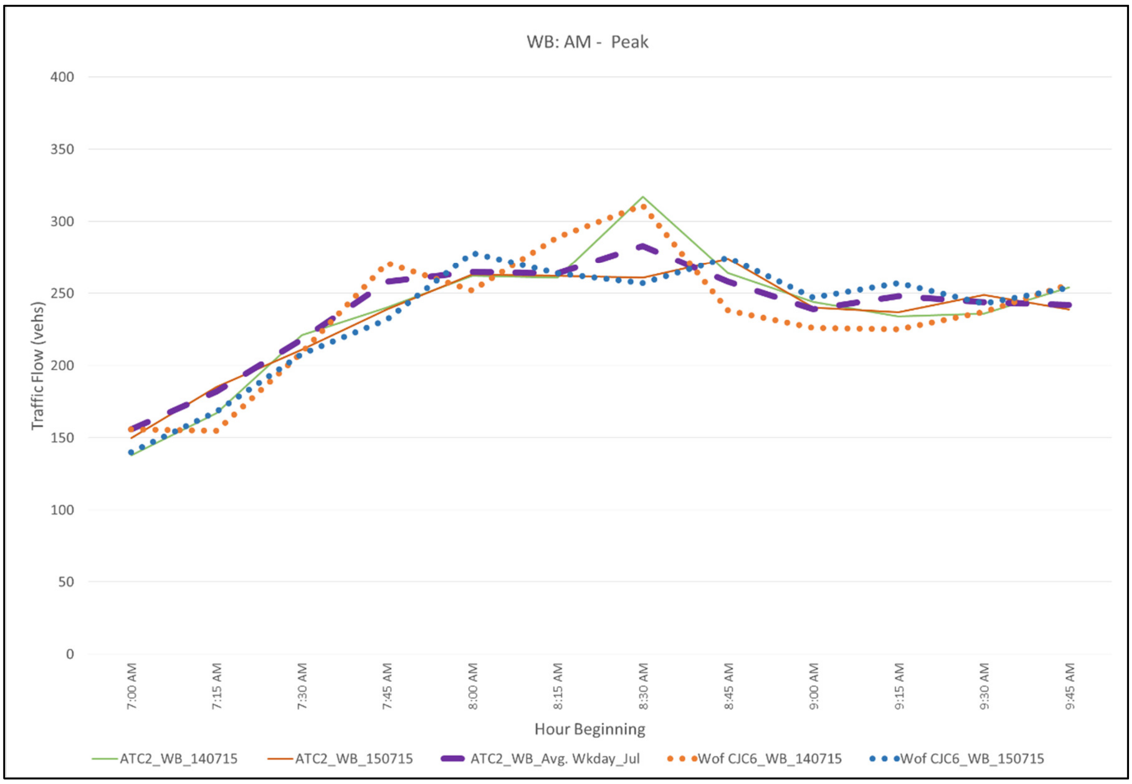


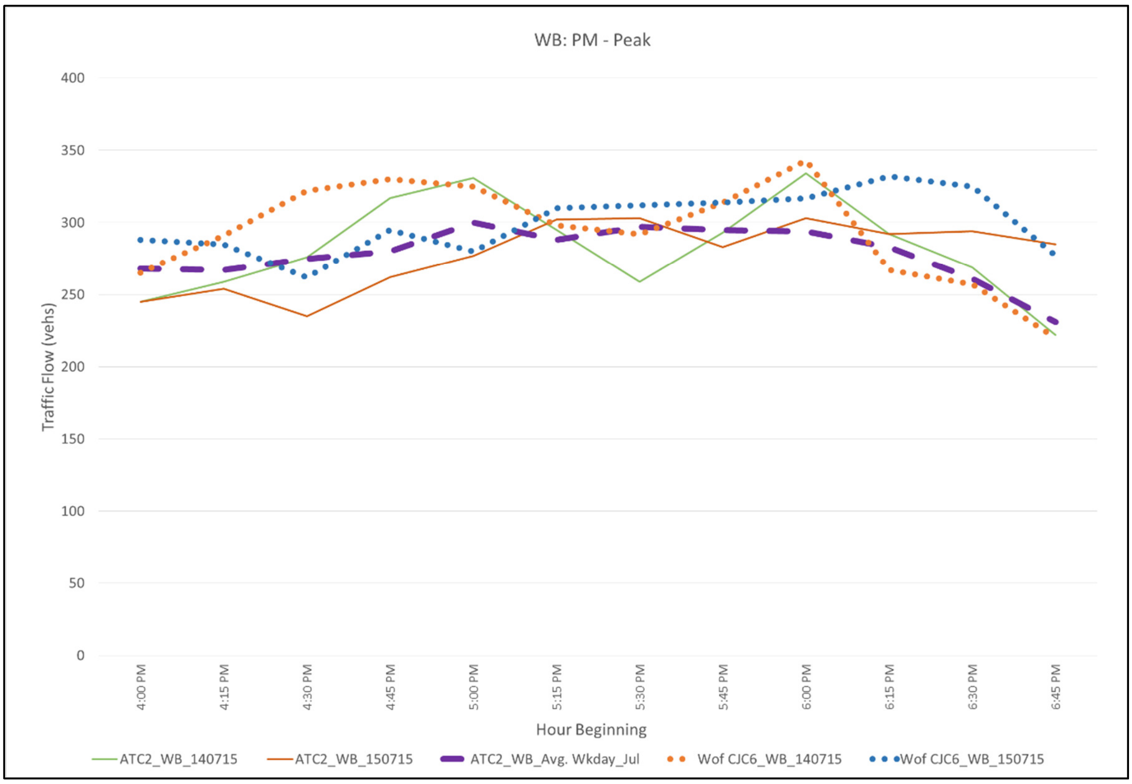
Comparison of CJC at Site 6 with ATC 2



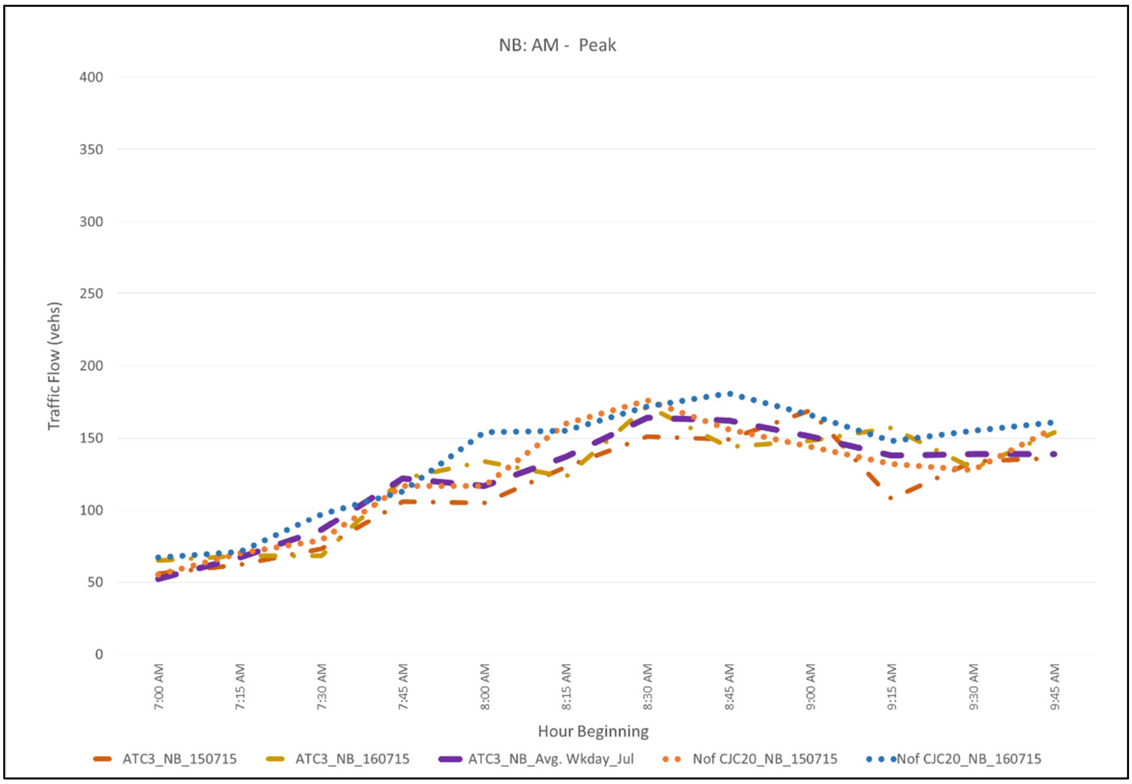


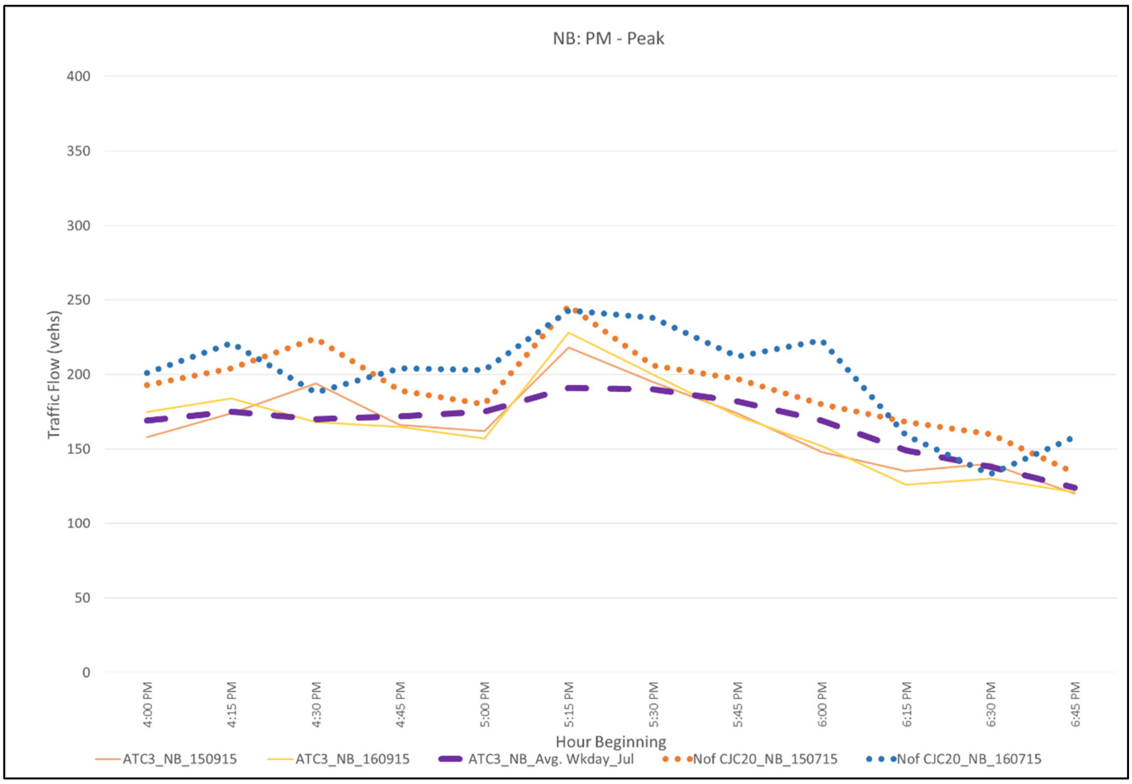
Comparison of CJC at Site 6 with ATC 2



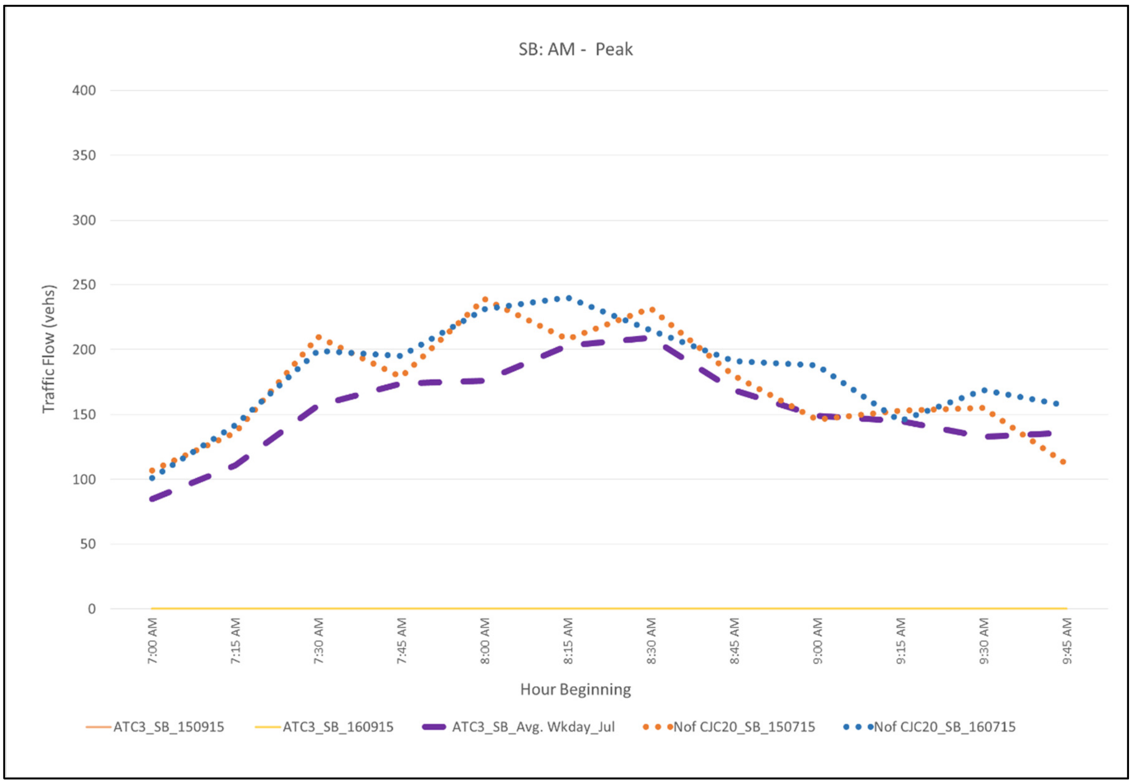


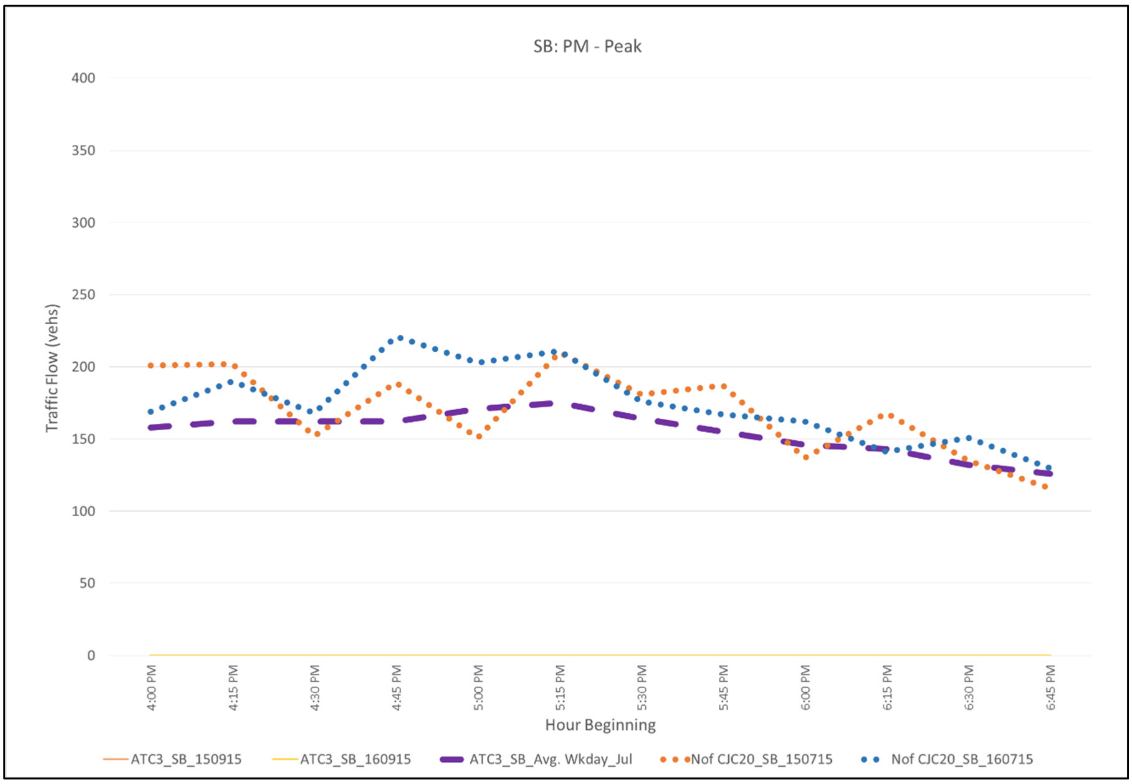
Comparison of CJC at Site 20 with ATC 3



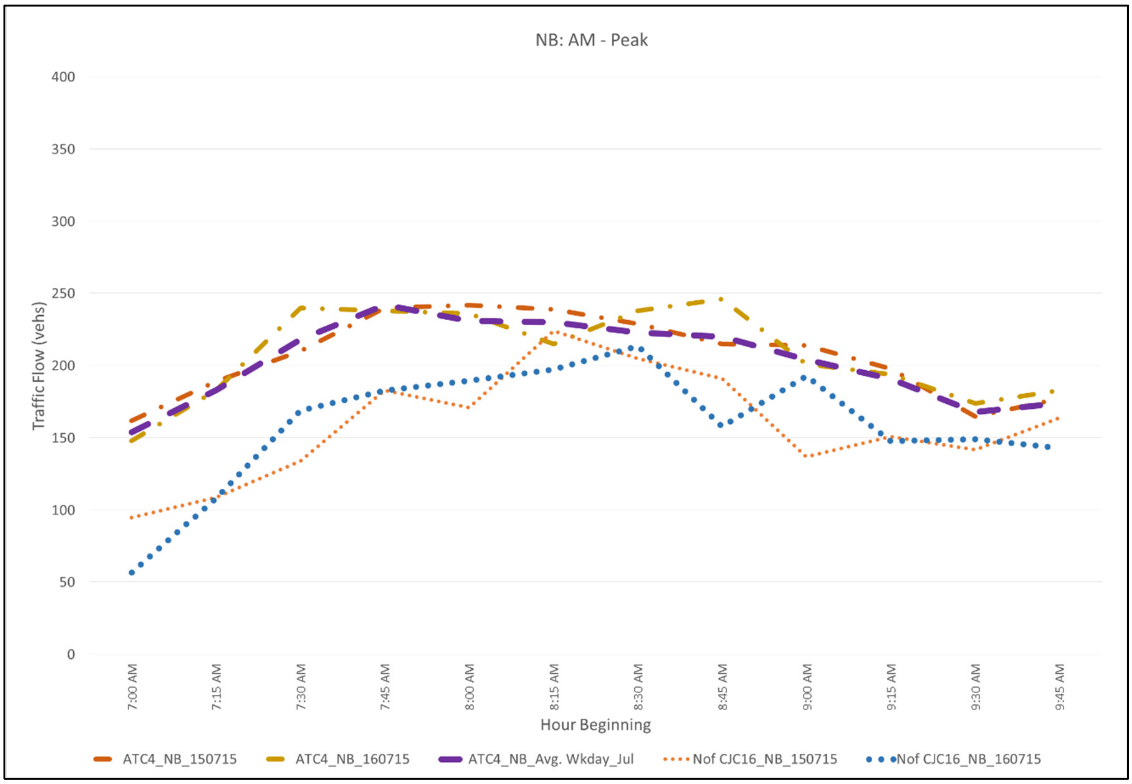


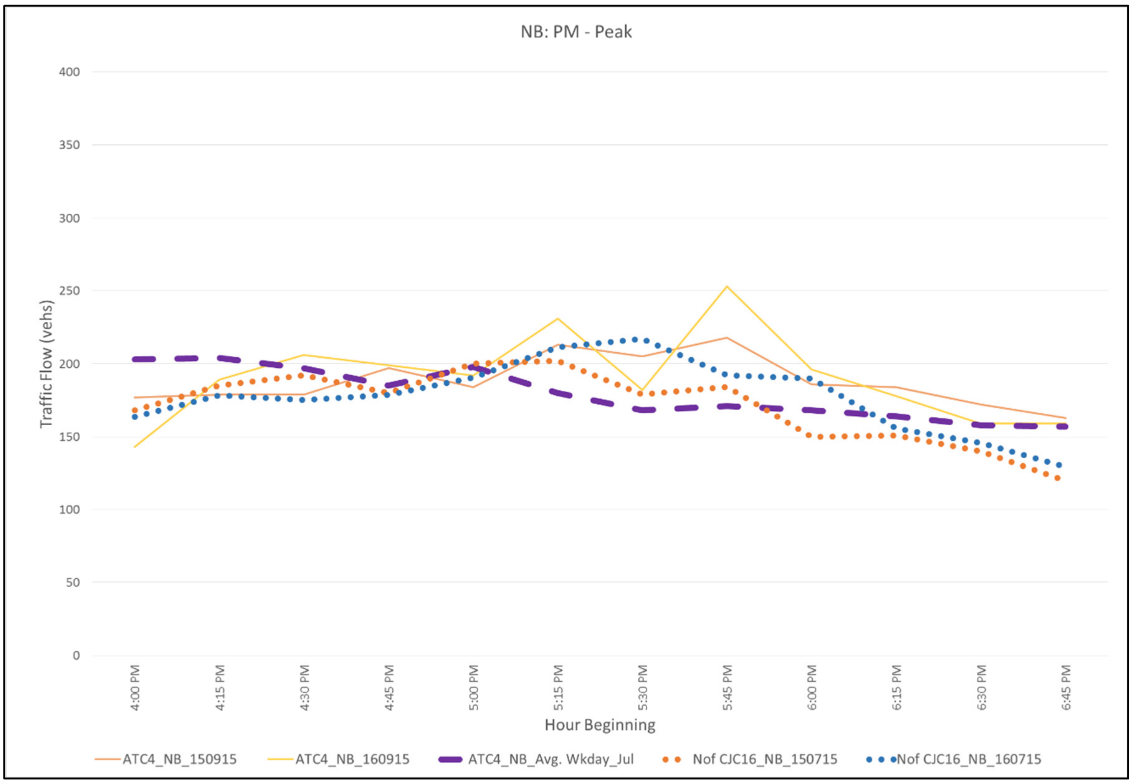
Comparison of CJC at Site 20 with ATC 3



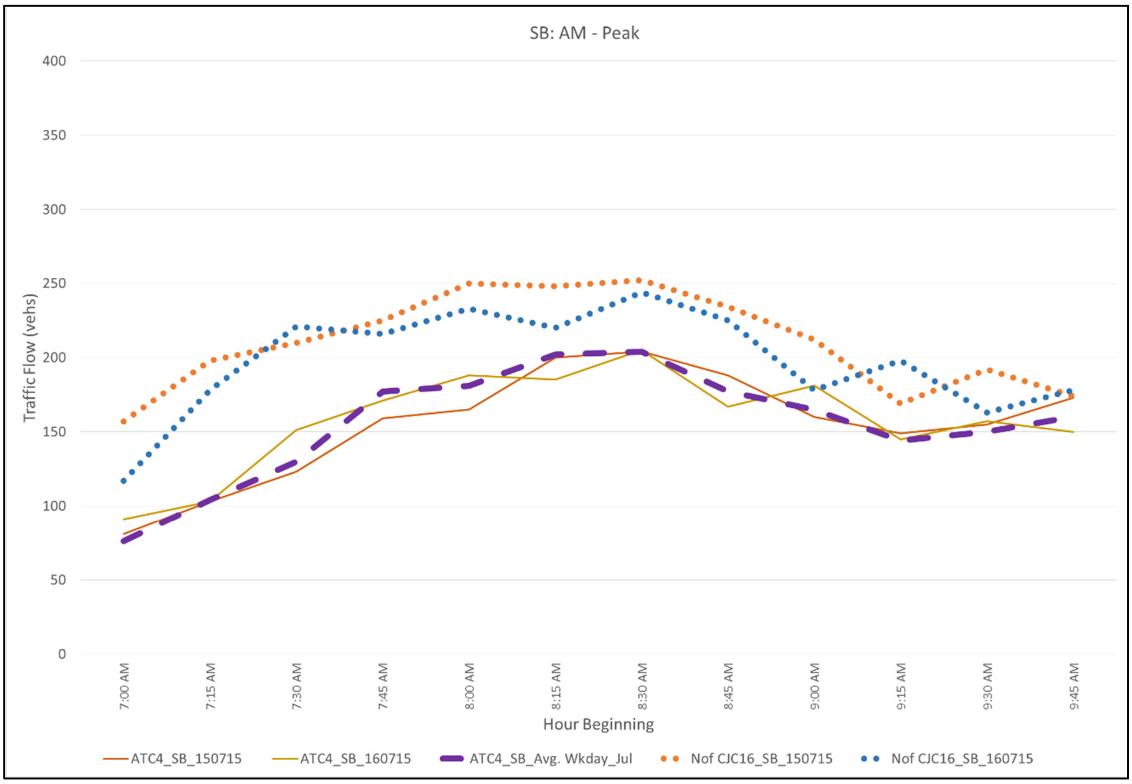


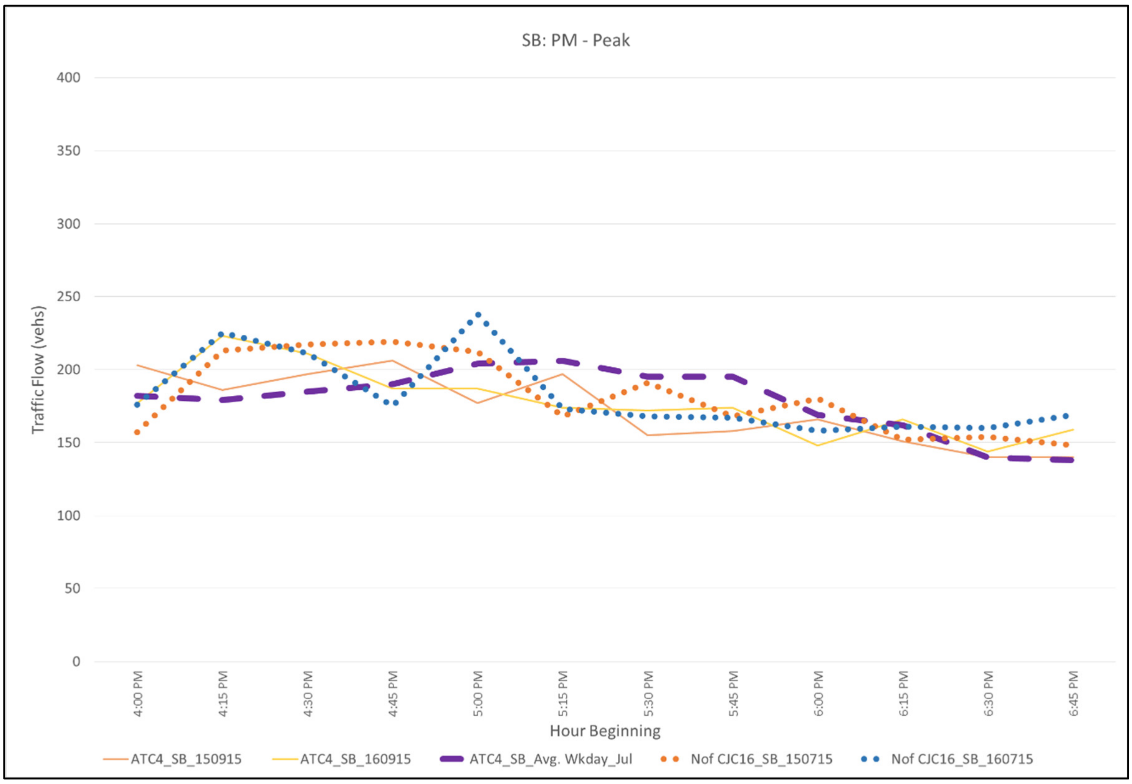
Comparison of CJC at Site 16 with ATC 4



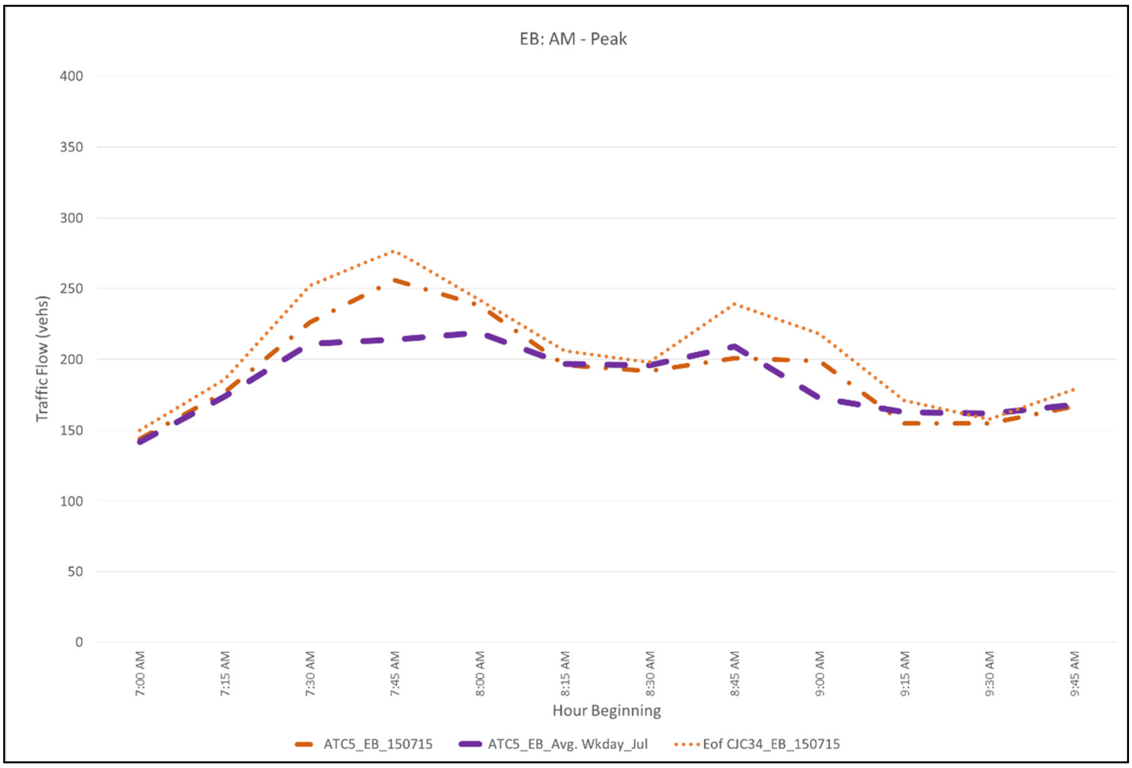


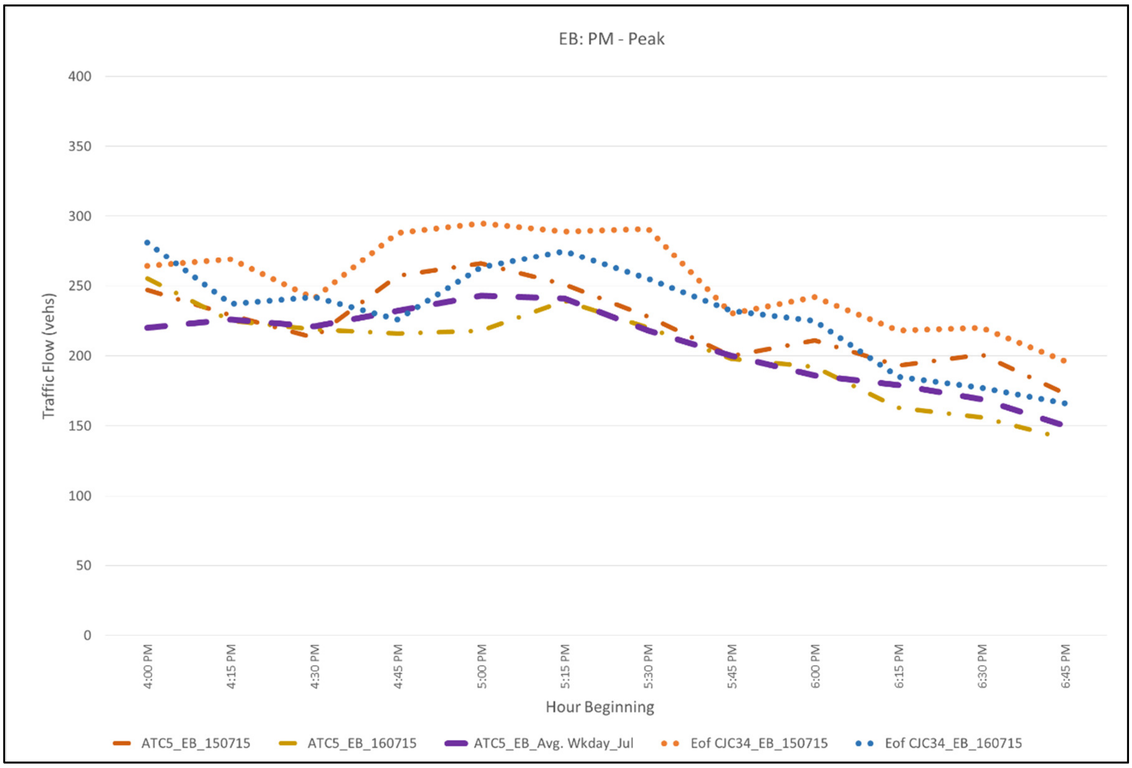
Comparison of CJC at Site 16 with ATC 4



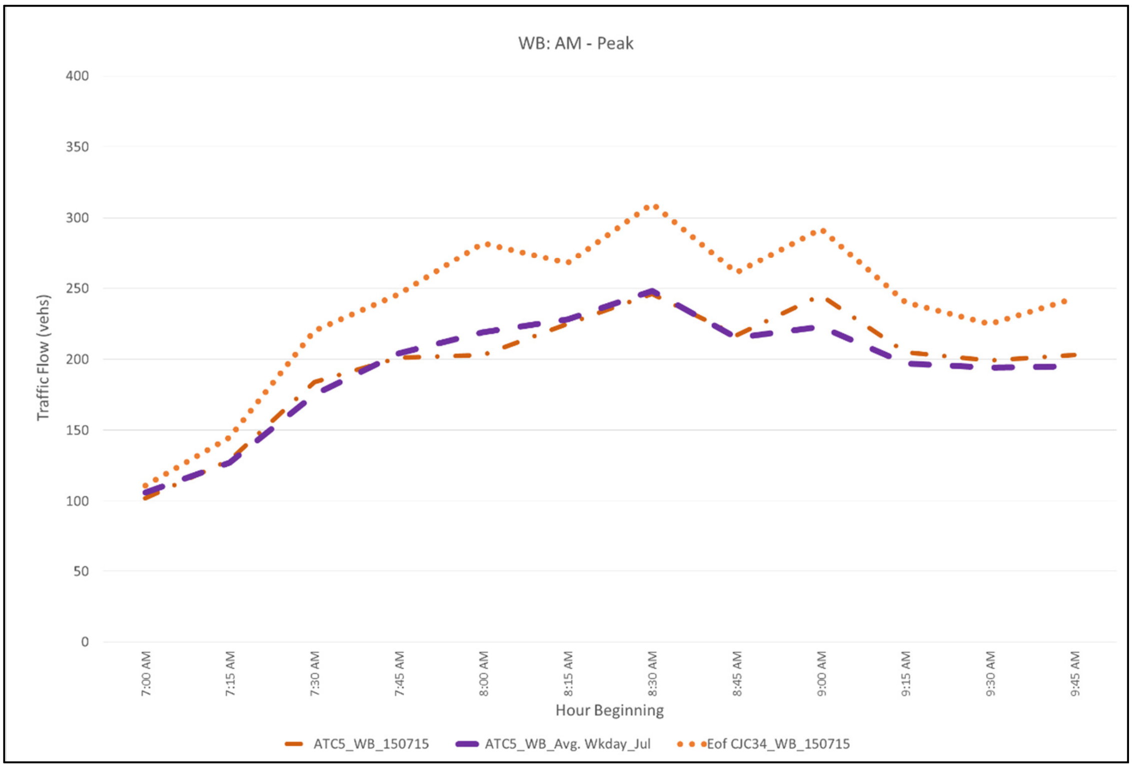


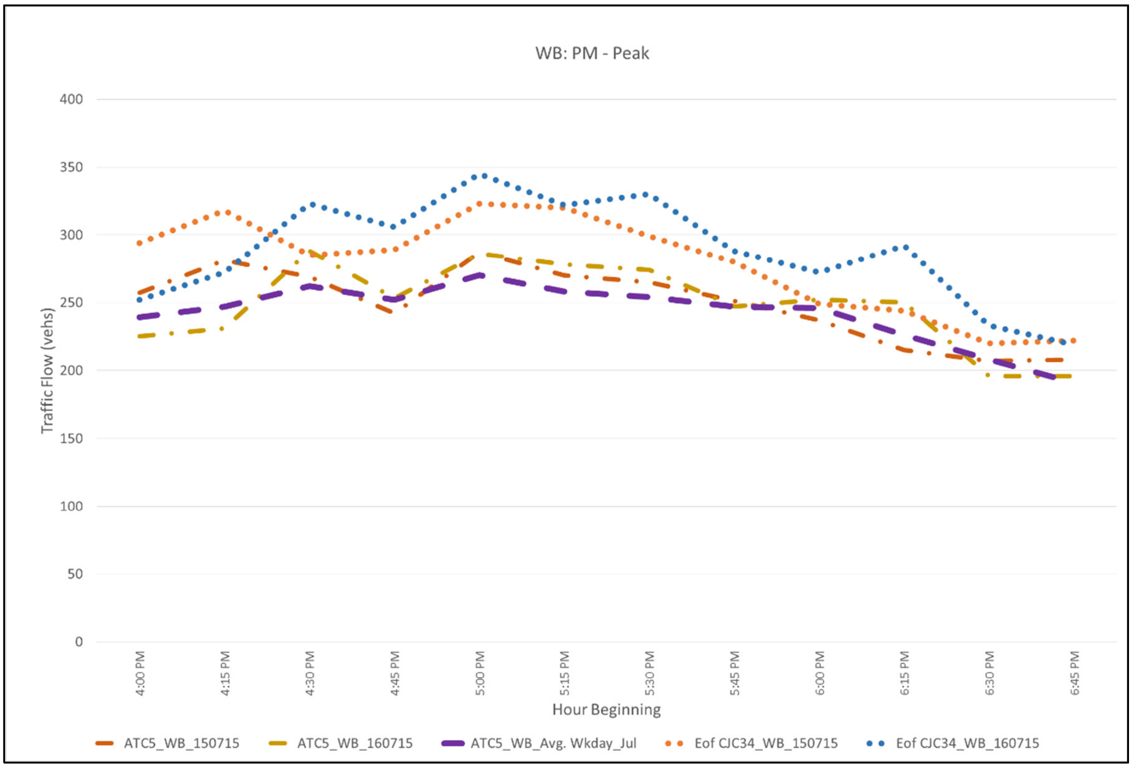
Comparison of CJC at Site 34 with ATC 5



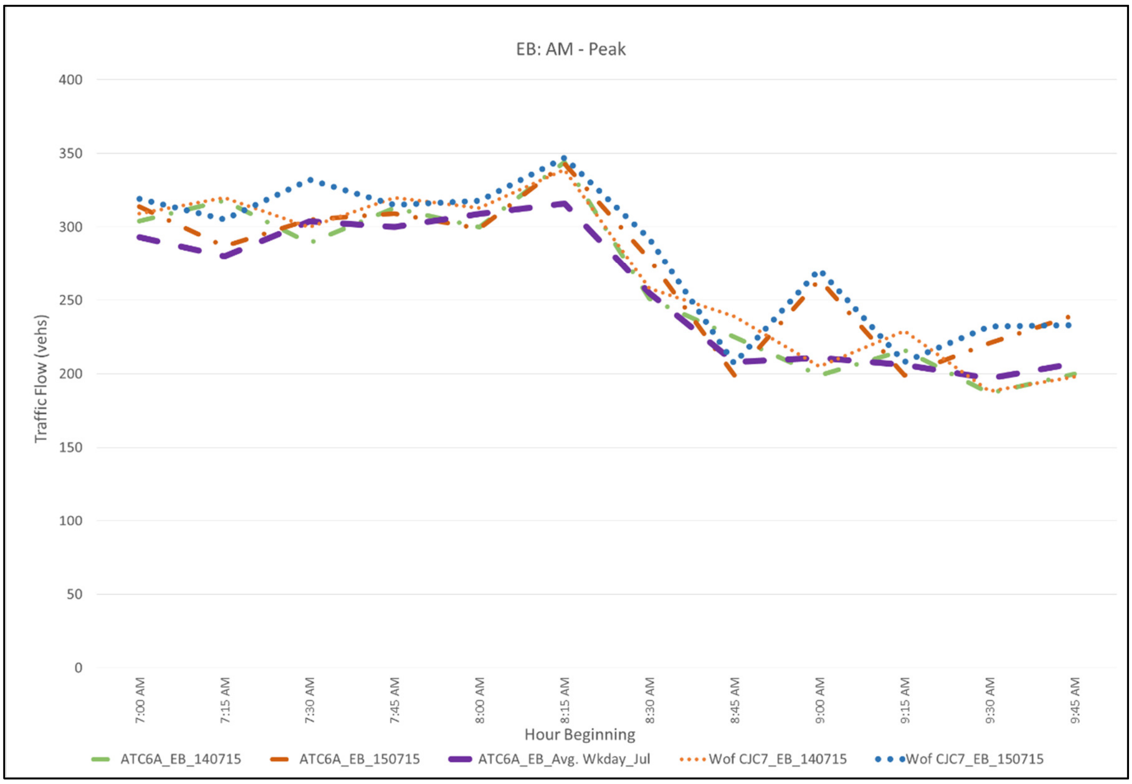


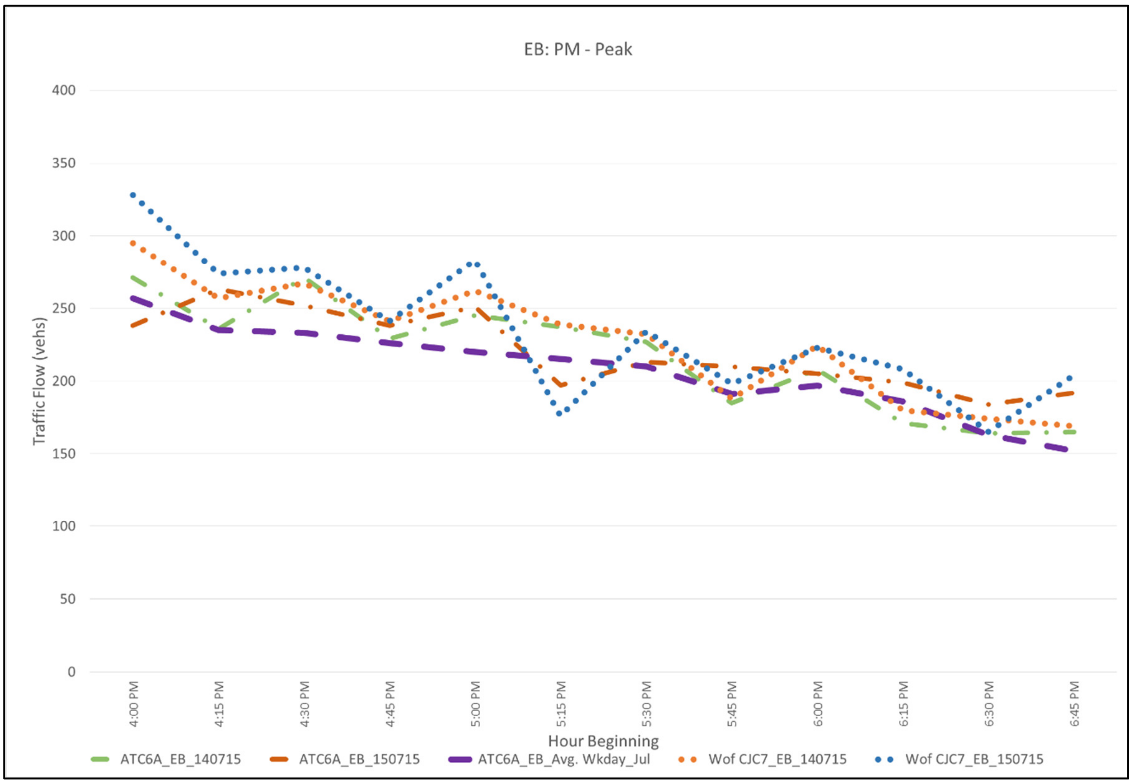
Comparison of CJC at Site 34 with ATC 5



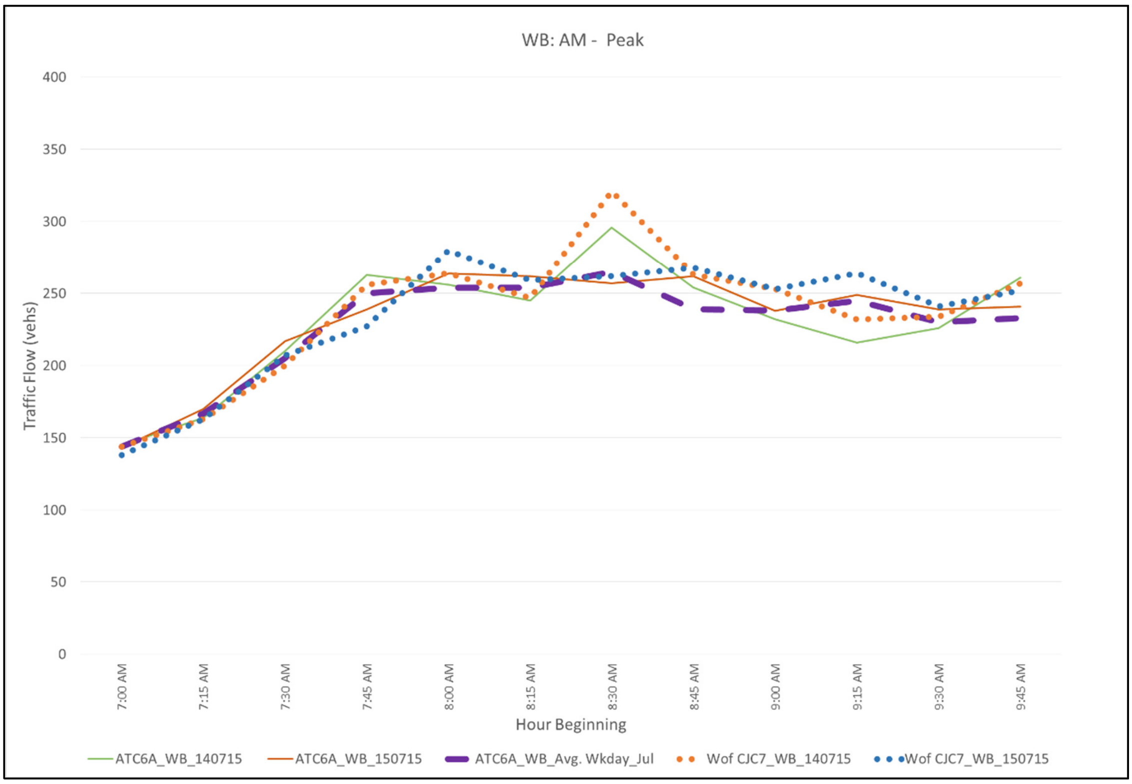


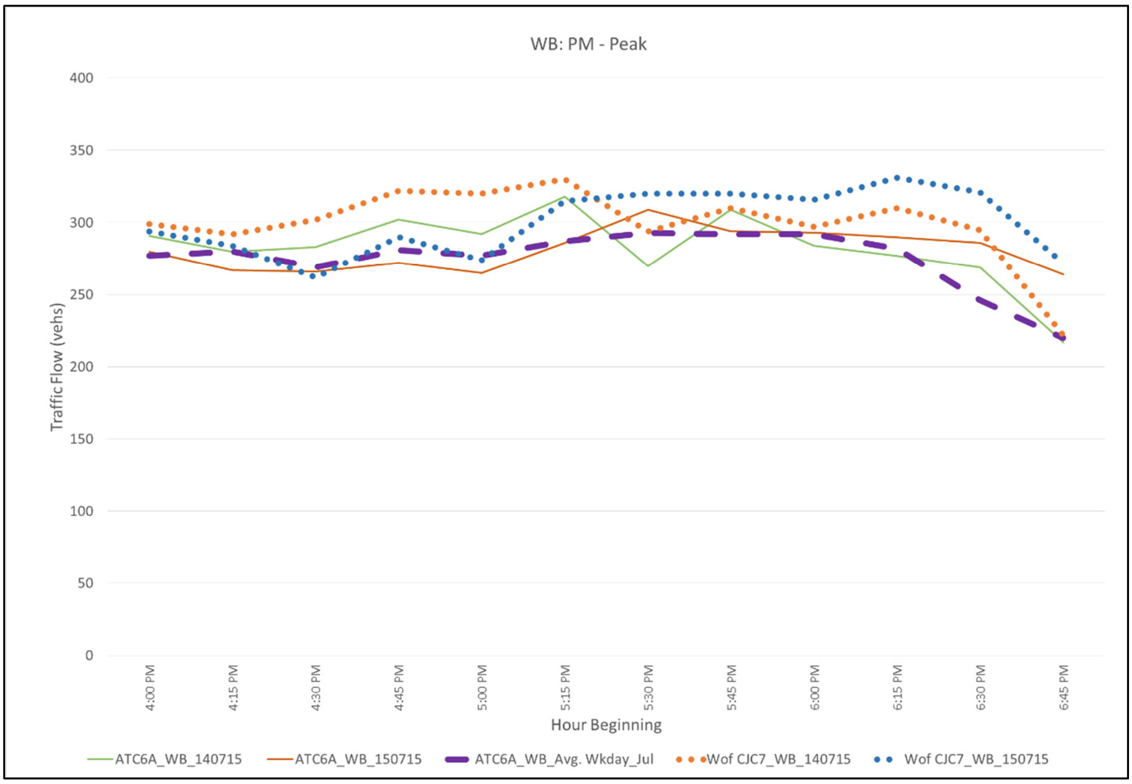
Comparison of CJC at Site 7 with ATC 6A



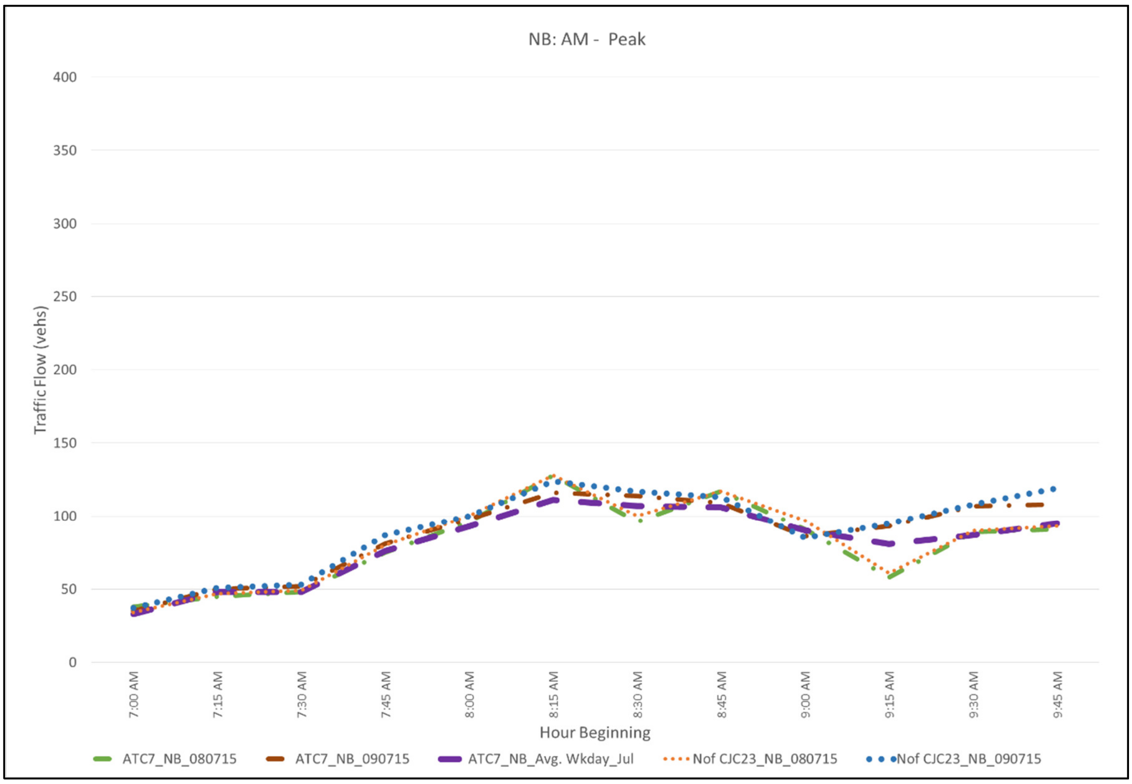


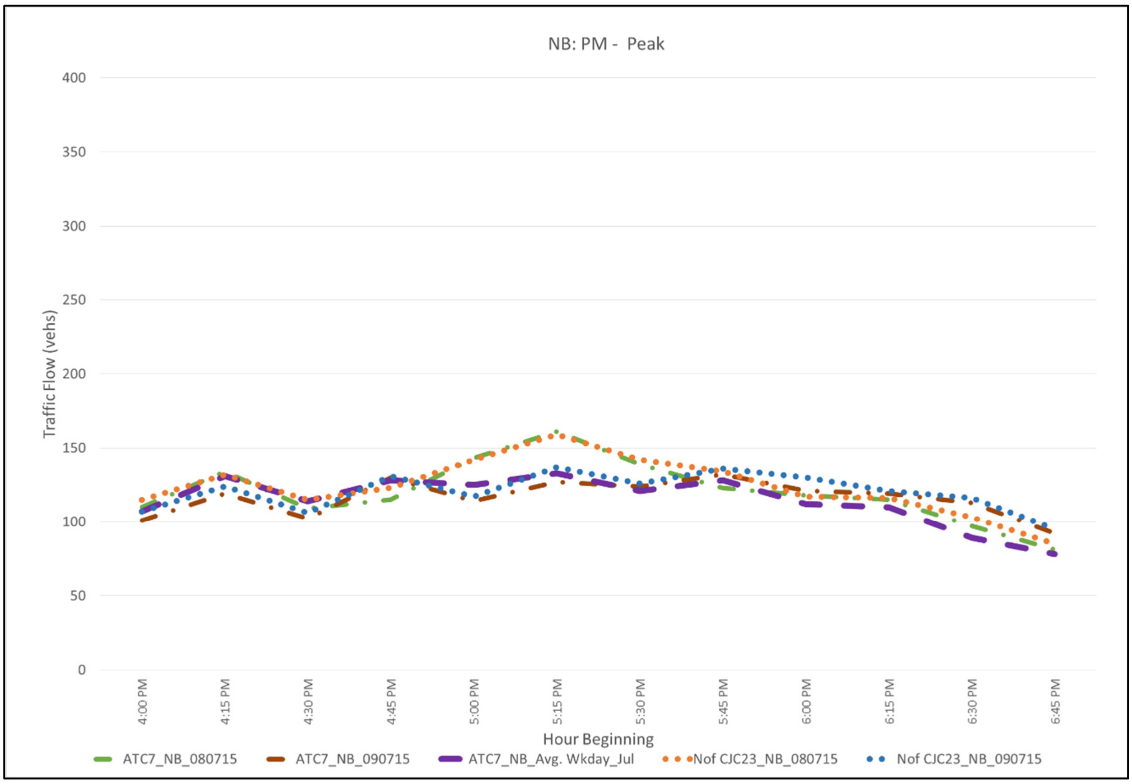
Comparison of CJC at Site 7 with ATC 6A



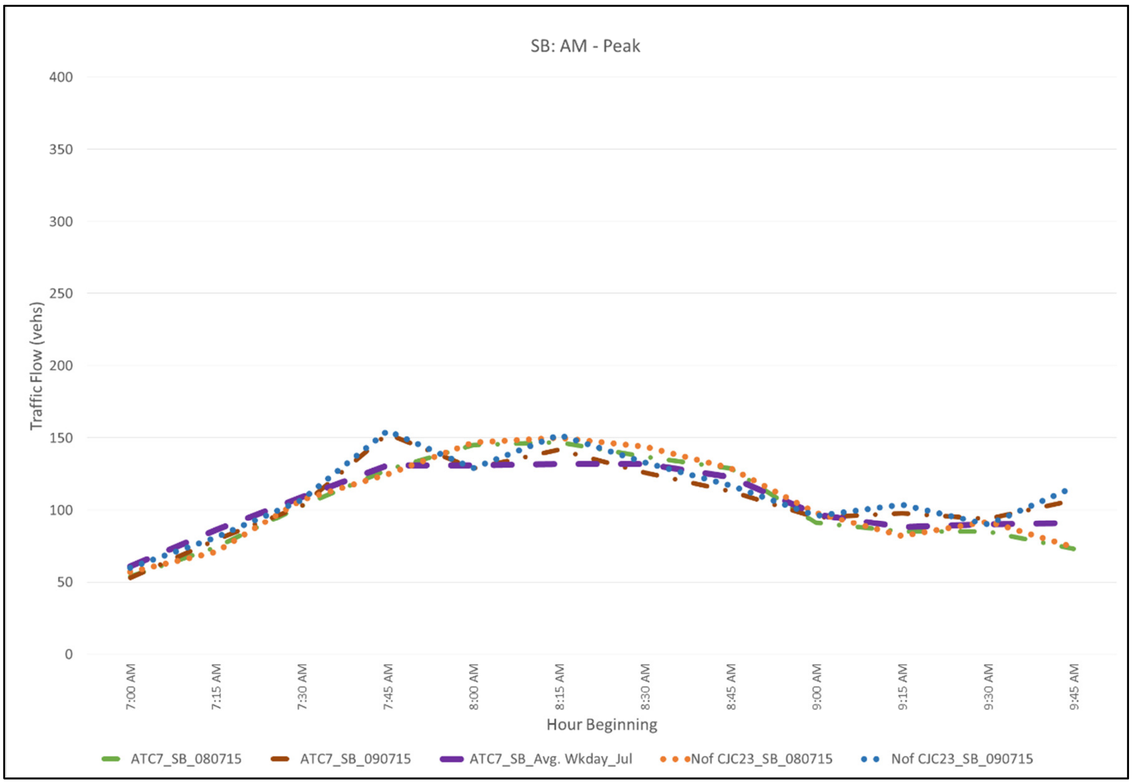


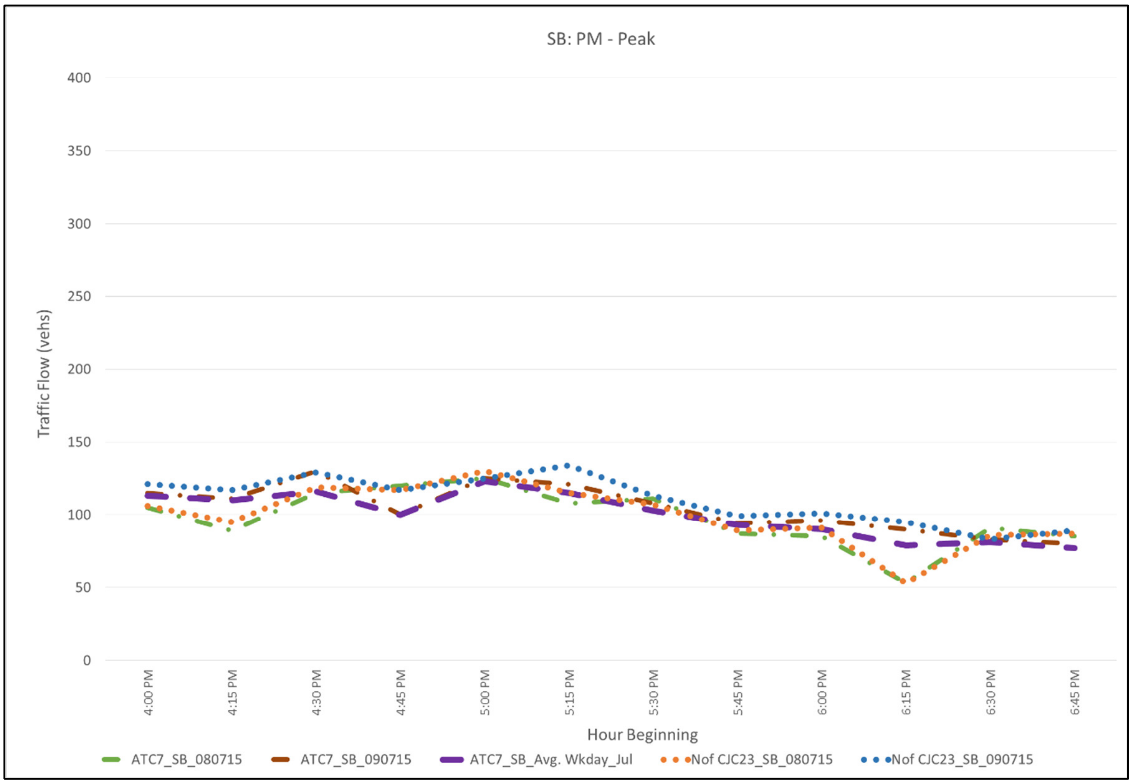
Comparison of CJC at Site 23 with ATC 7





Comparison of CJC at Site 23 with ATC 7



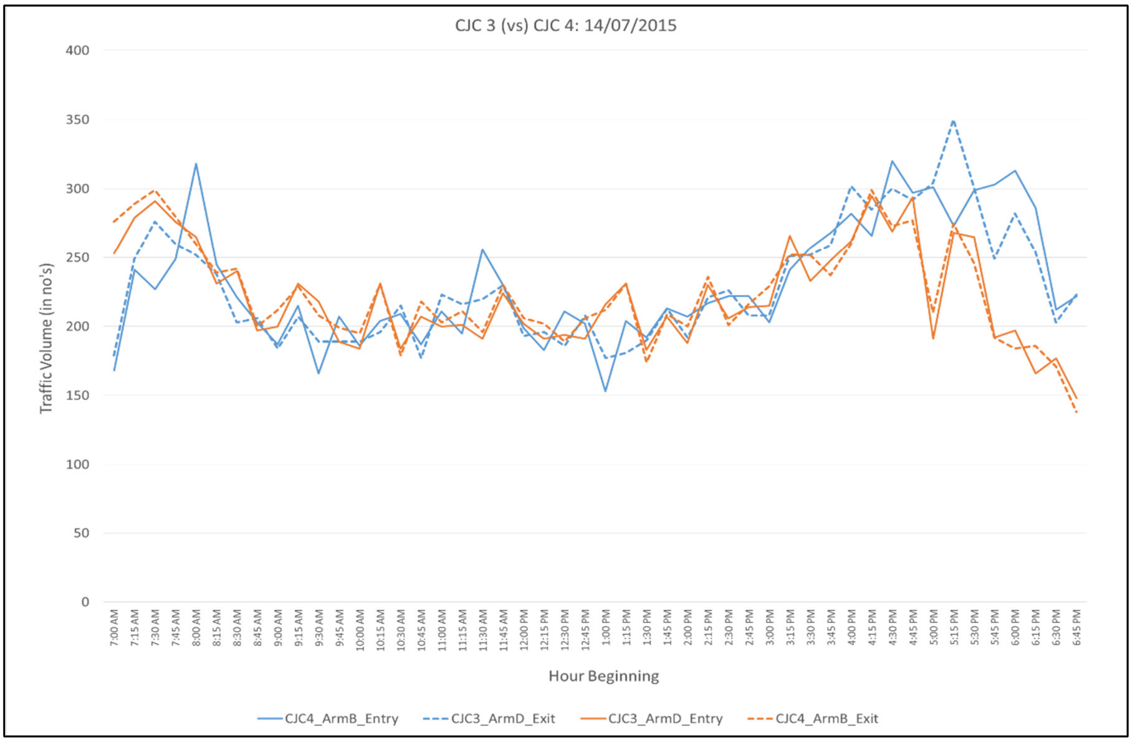


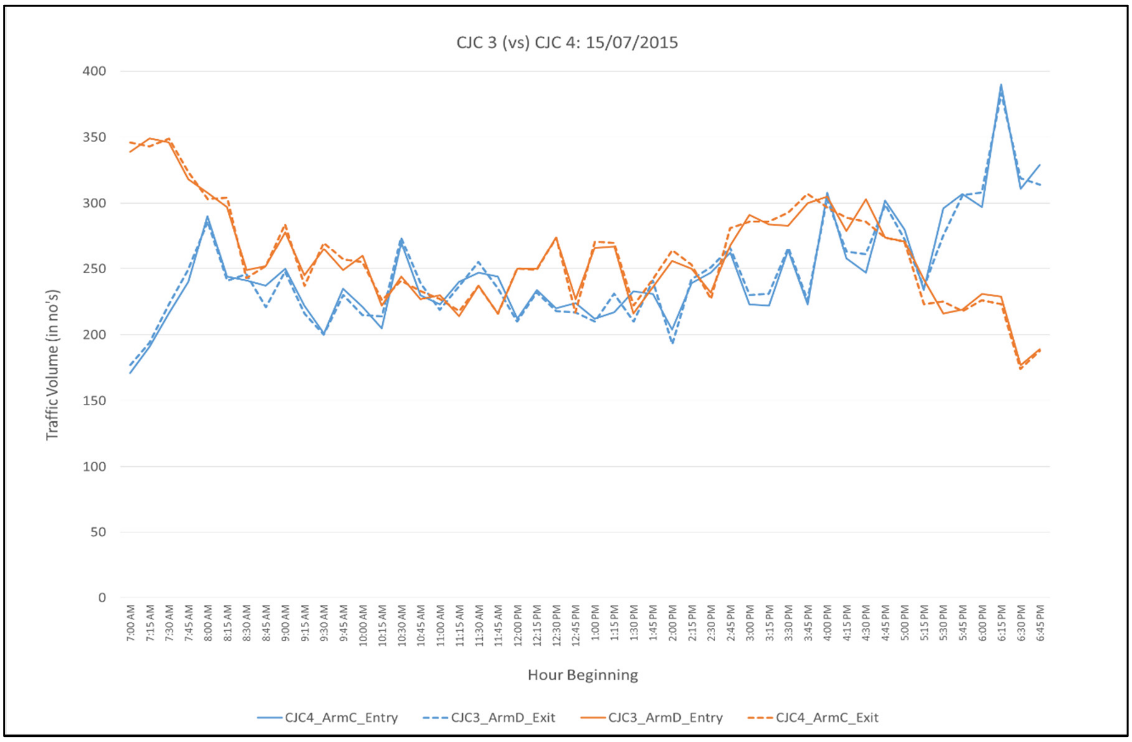
APPENDIX L

2015 Data: CJC vs CJC Comparison

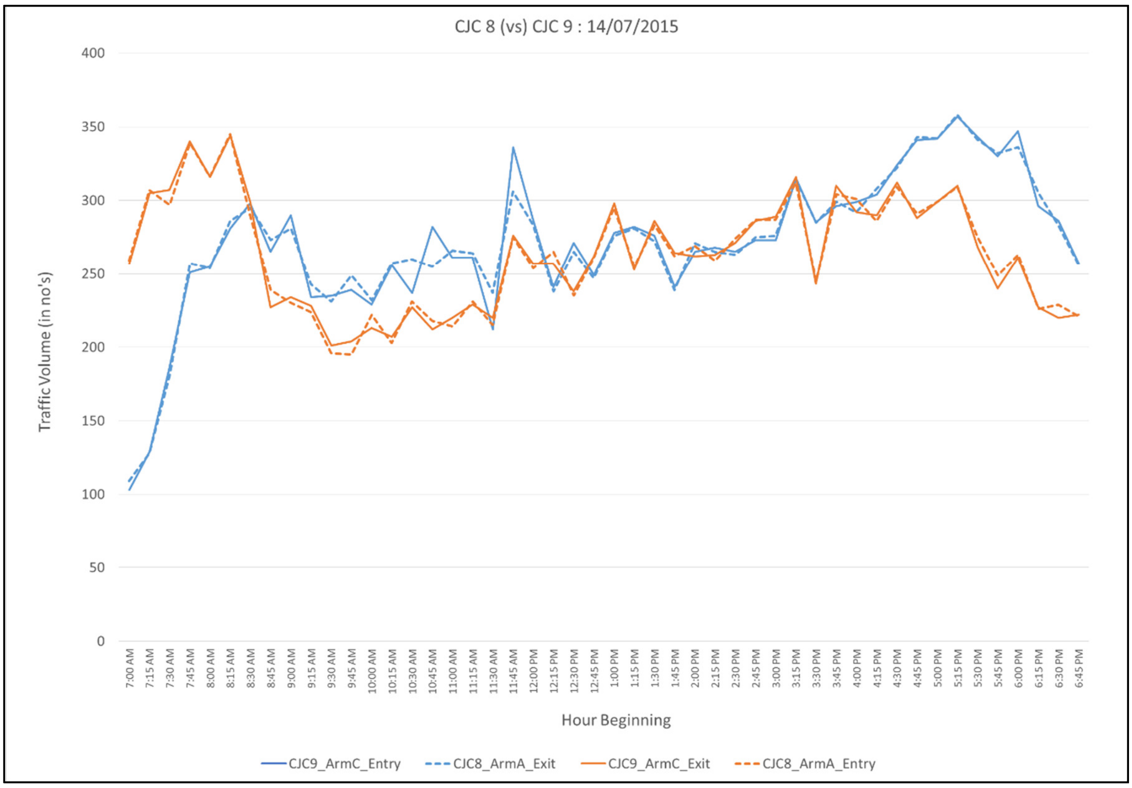
APPENDIX G: 2015 data - CJC vs CJC Comparisons

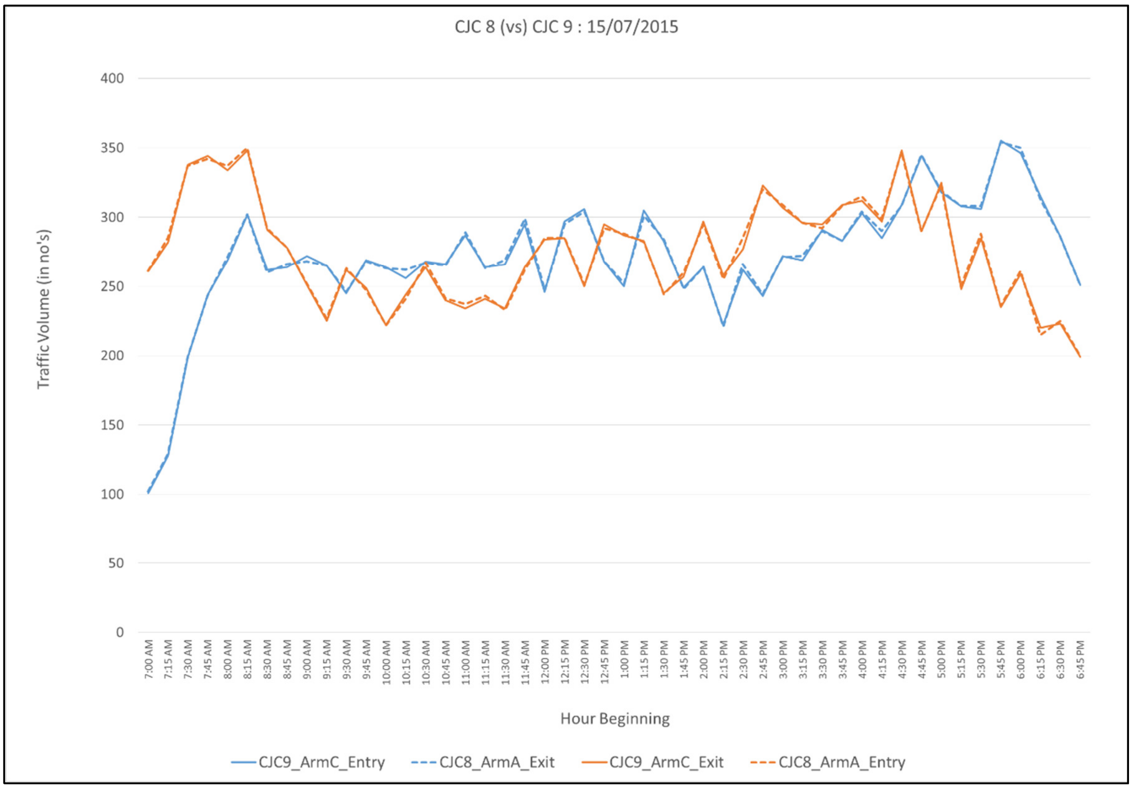
Area 1: Comparison of CJC 3 and CJC 4 on A585 Garstang New Road (EB-WB)



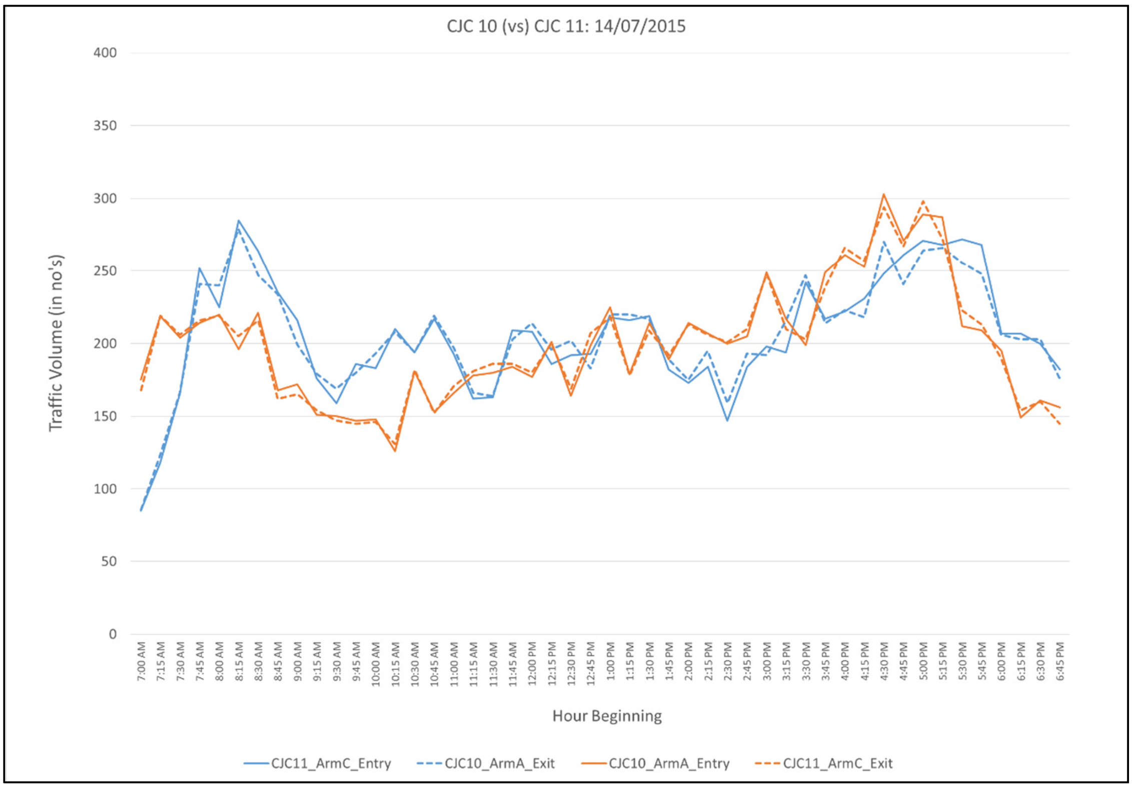


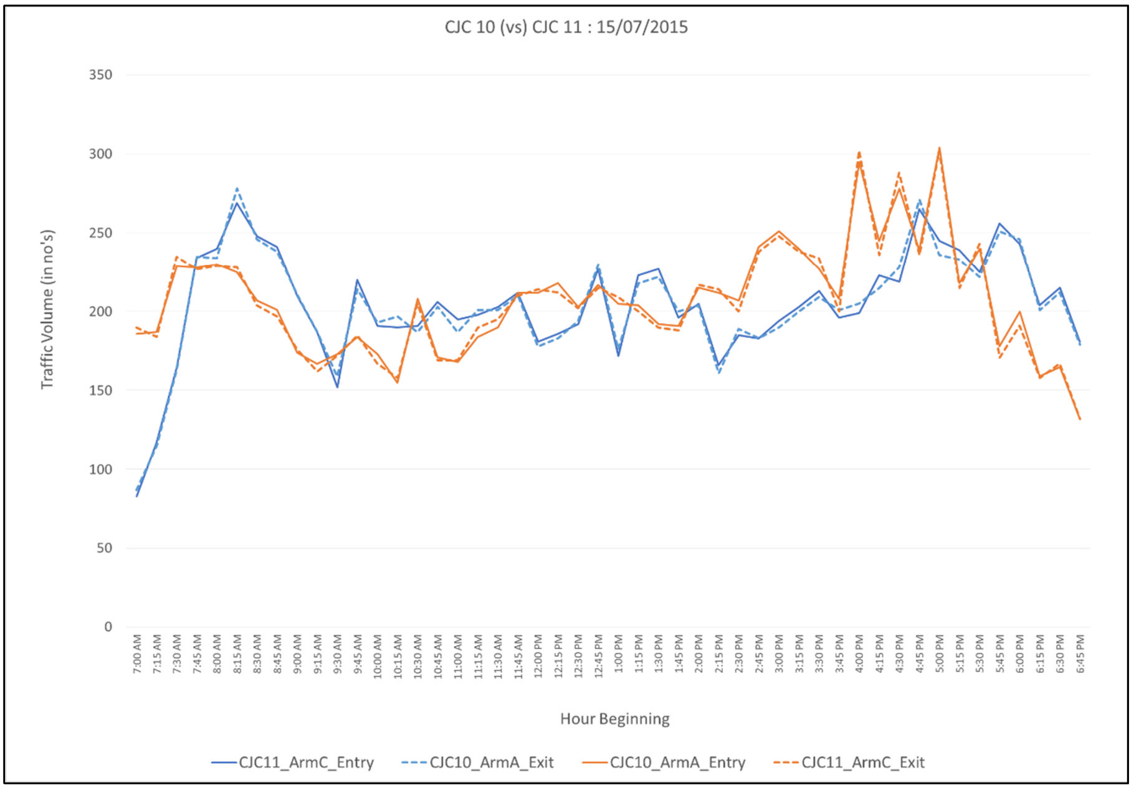
Area 1: Comparison of CJC 8 and CJC 9 on A585 Amounderness Way (NB-SB)



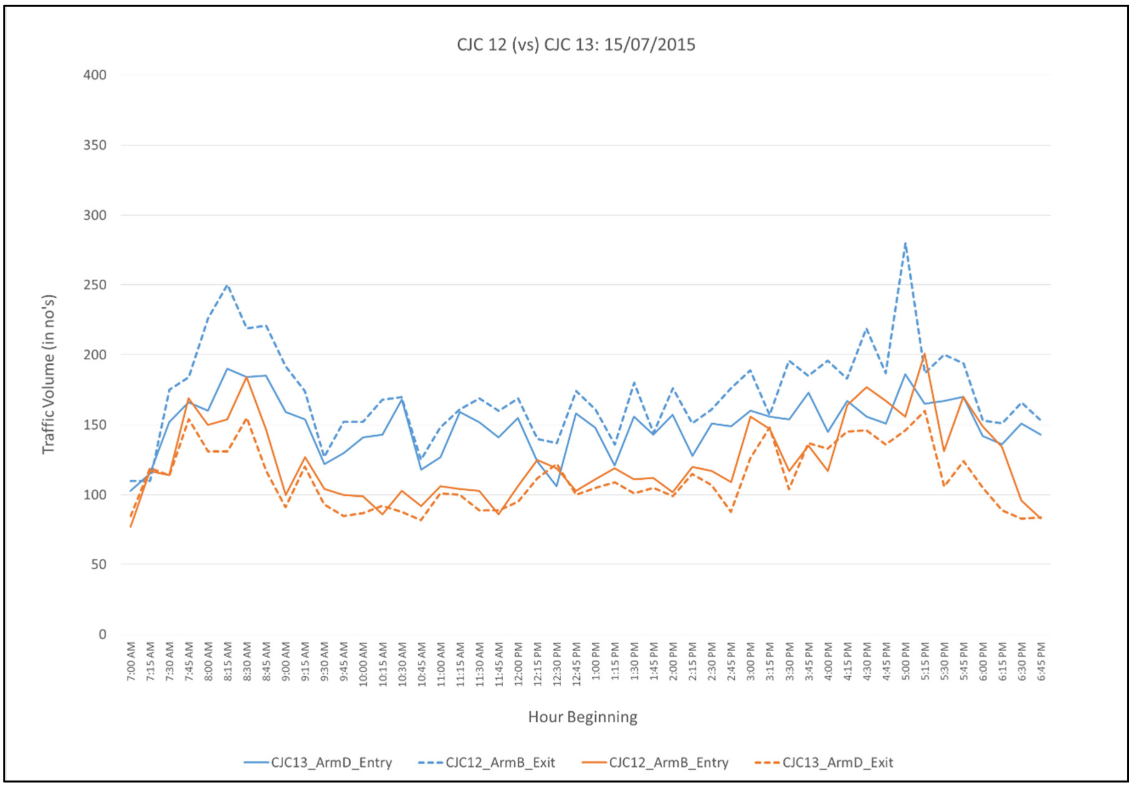


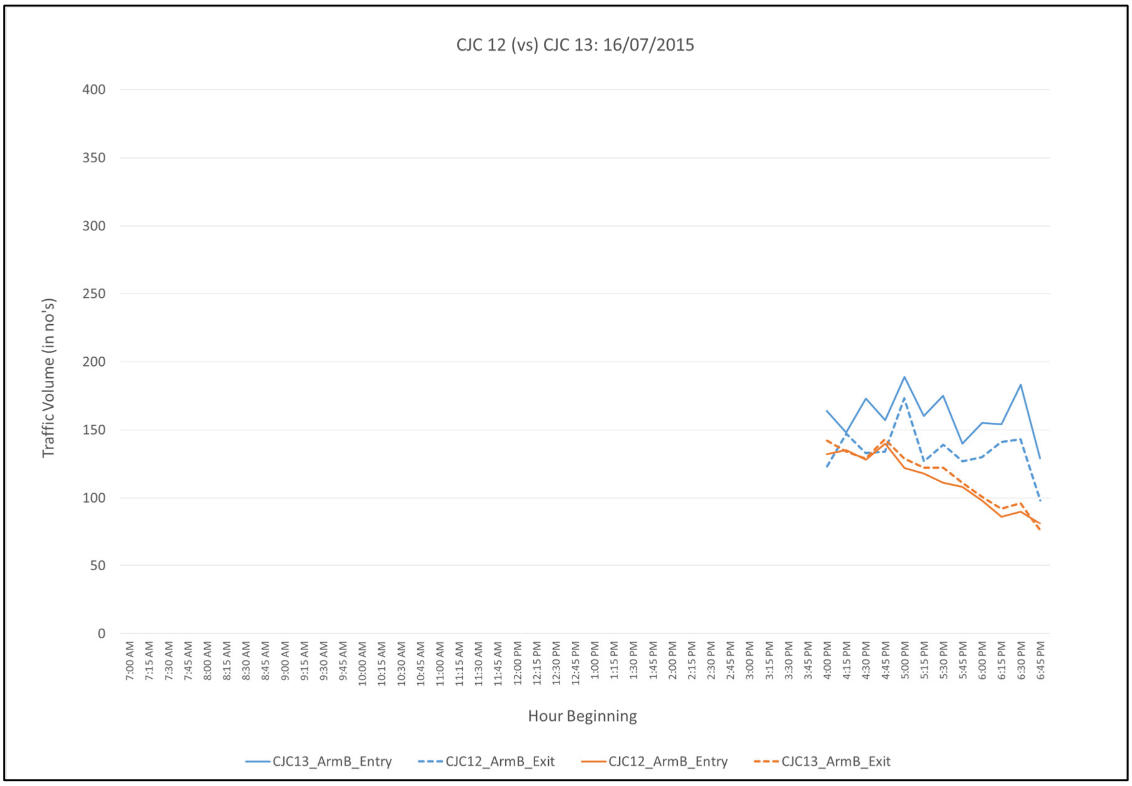
Area 1: Comparison of CJC 10 and CJC 11 on A585 Amounderness Way (NB-SB)



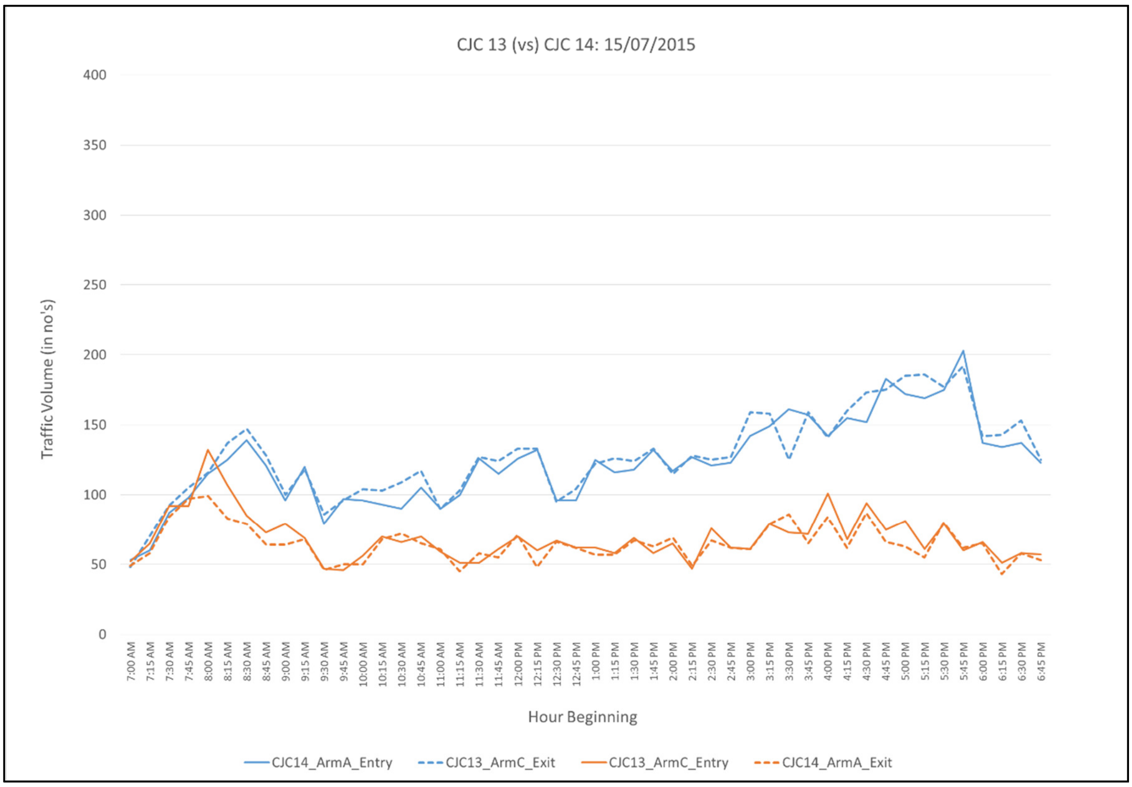


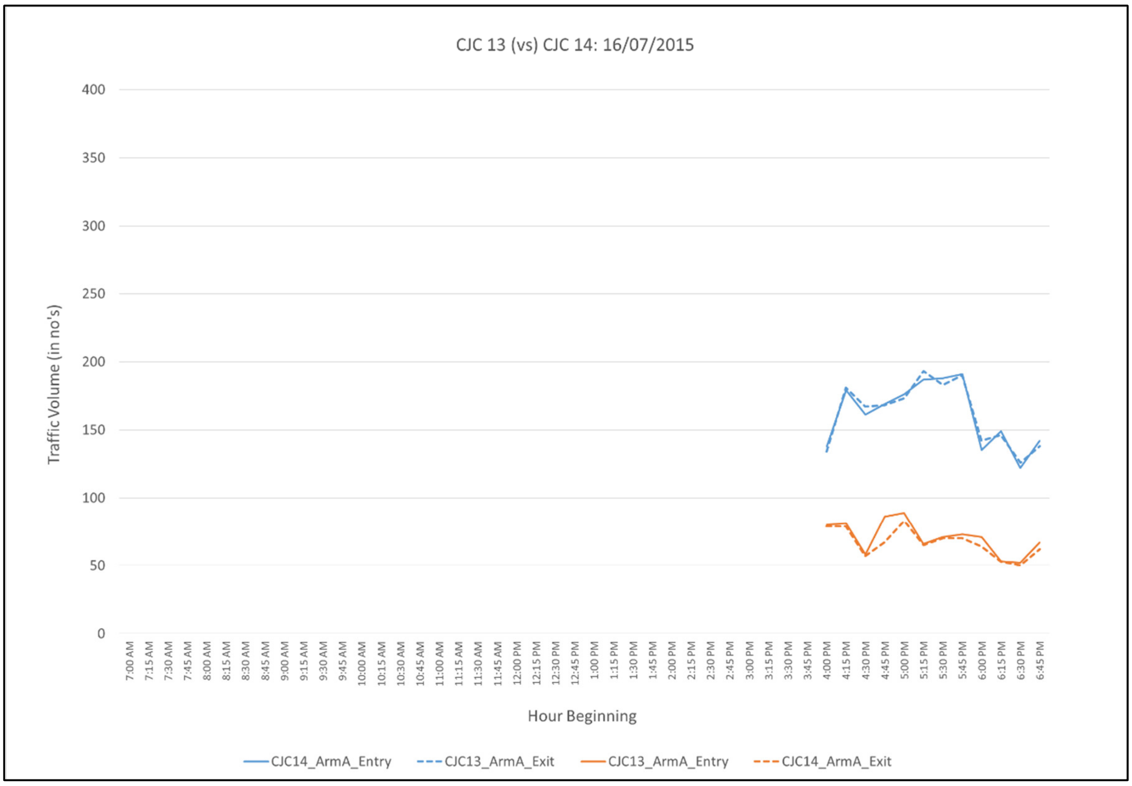
Area 2: Comparison of CJC 12 and CJC 13 on Garstang Road East (EB-WB)



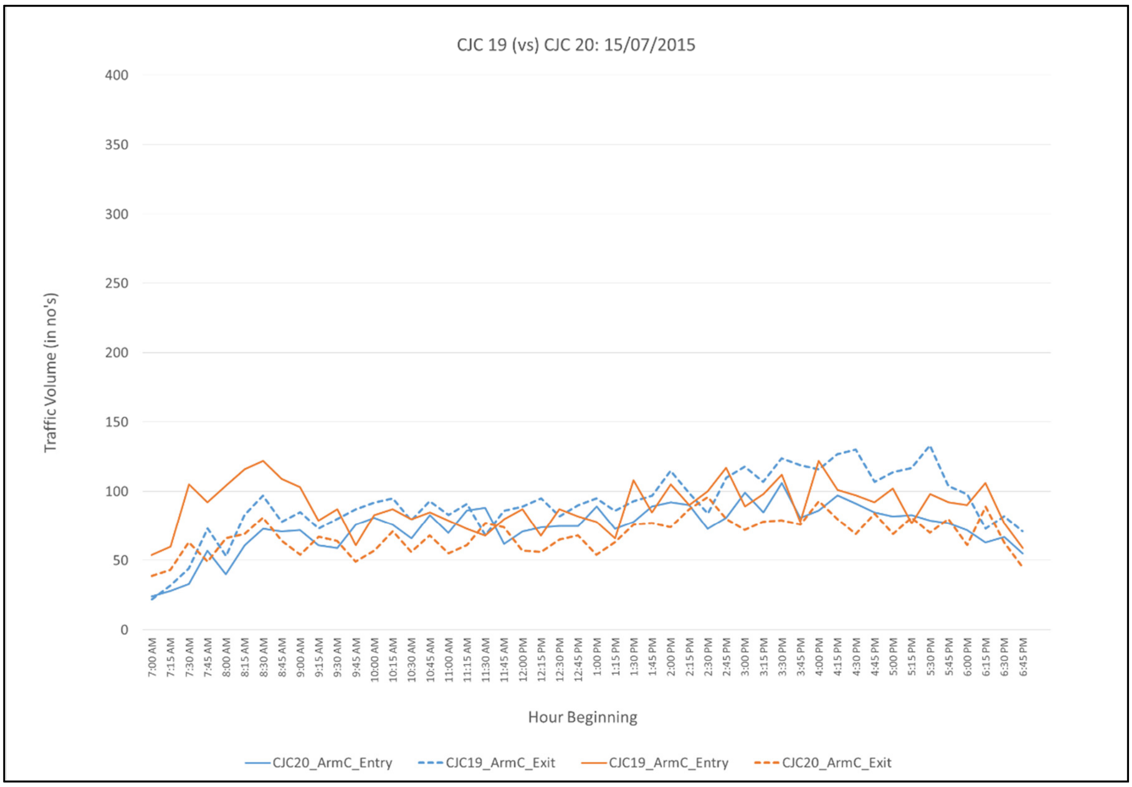


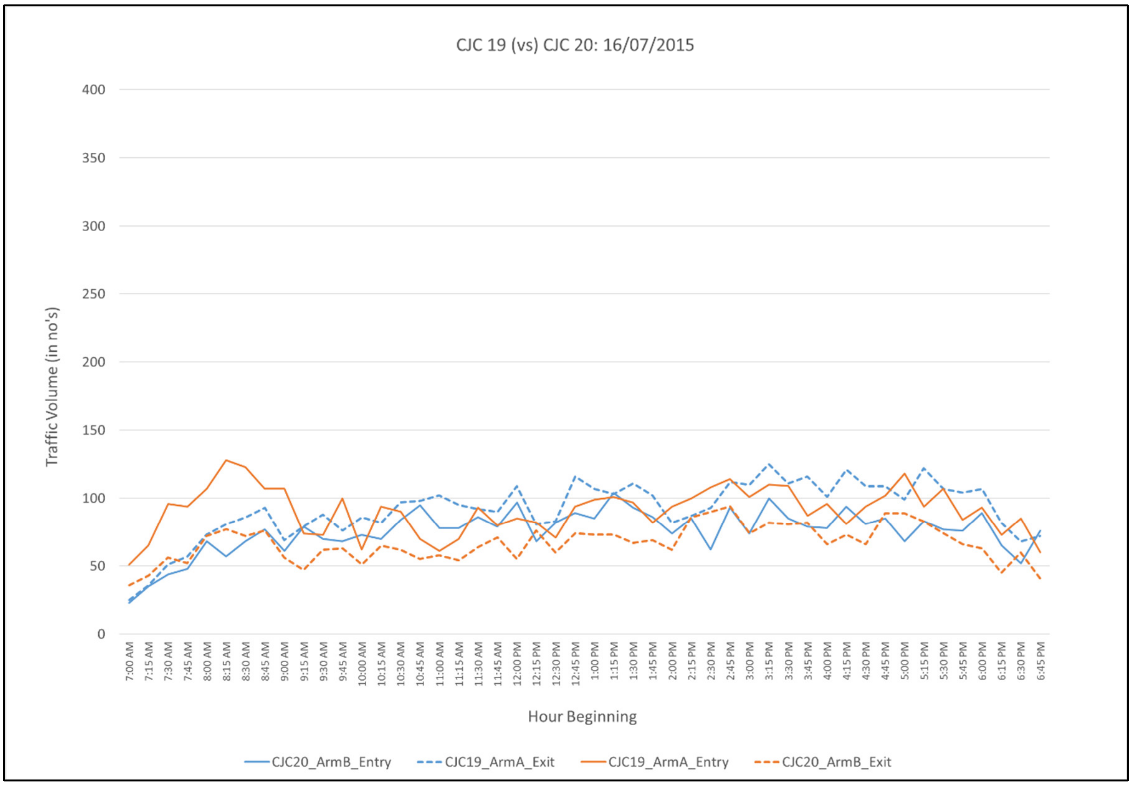
Area 2: Comparison of CJC 13 and CJC 14 on A583 Hardhorn Road (NB-SB)



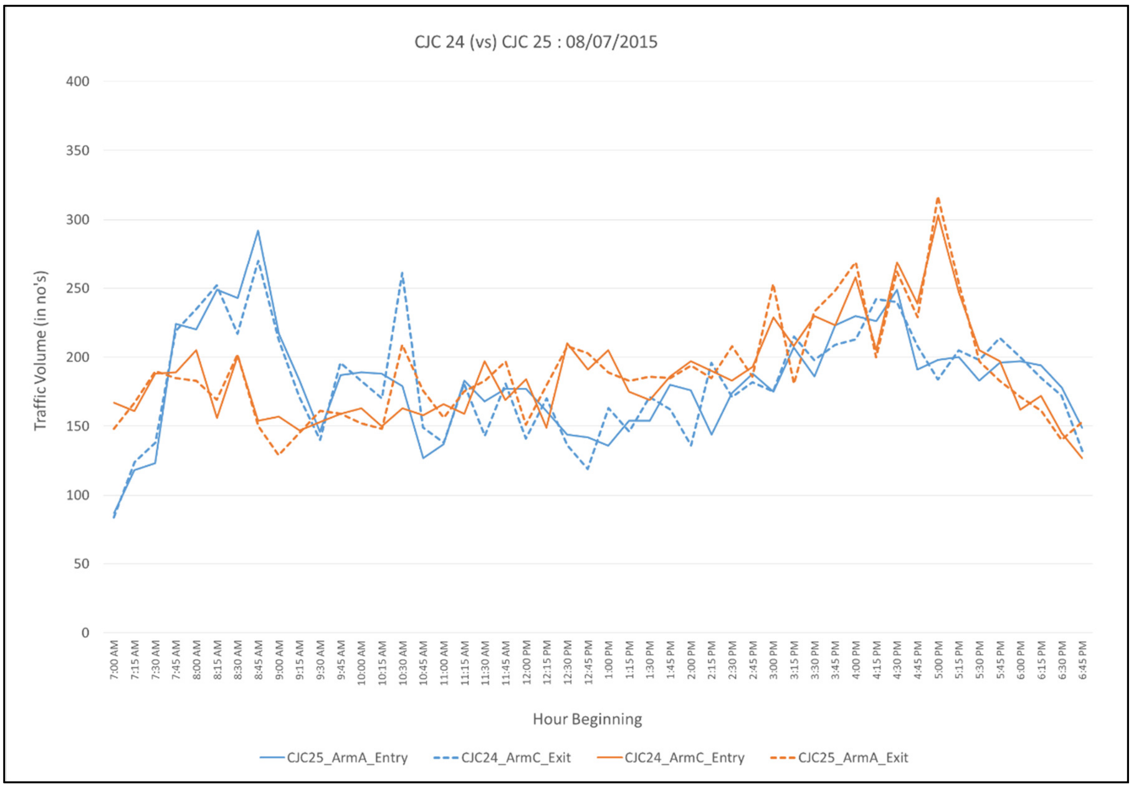


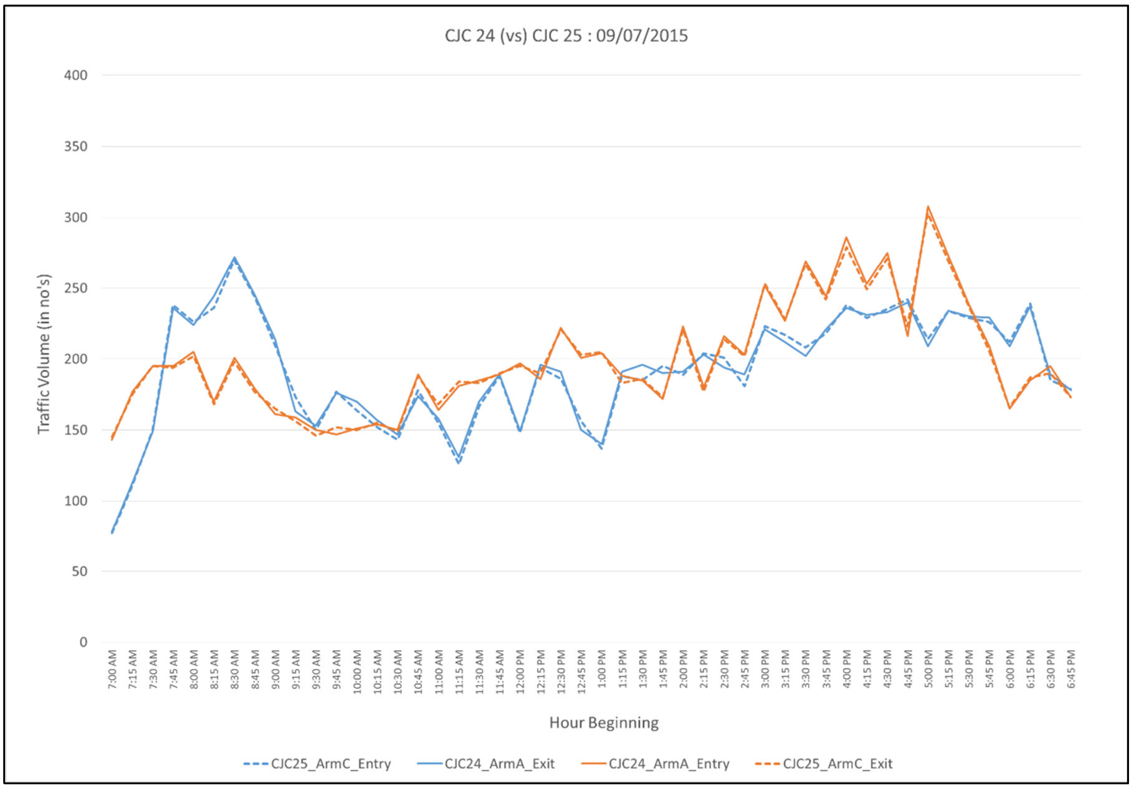
Area 2: Comparison of CJC 19 and CJC 20 on A587 Fleetwood Road (NB-SB)



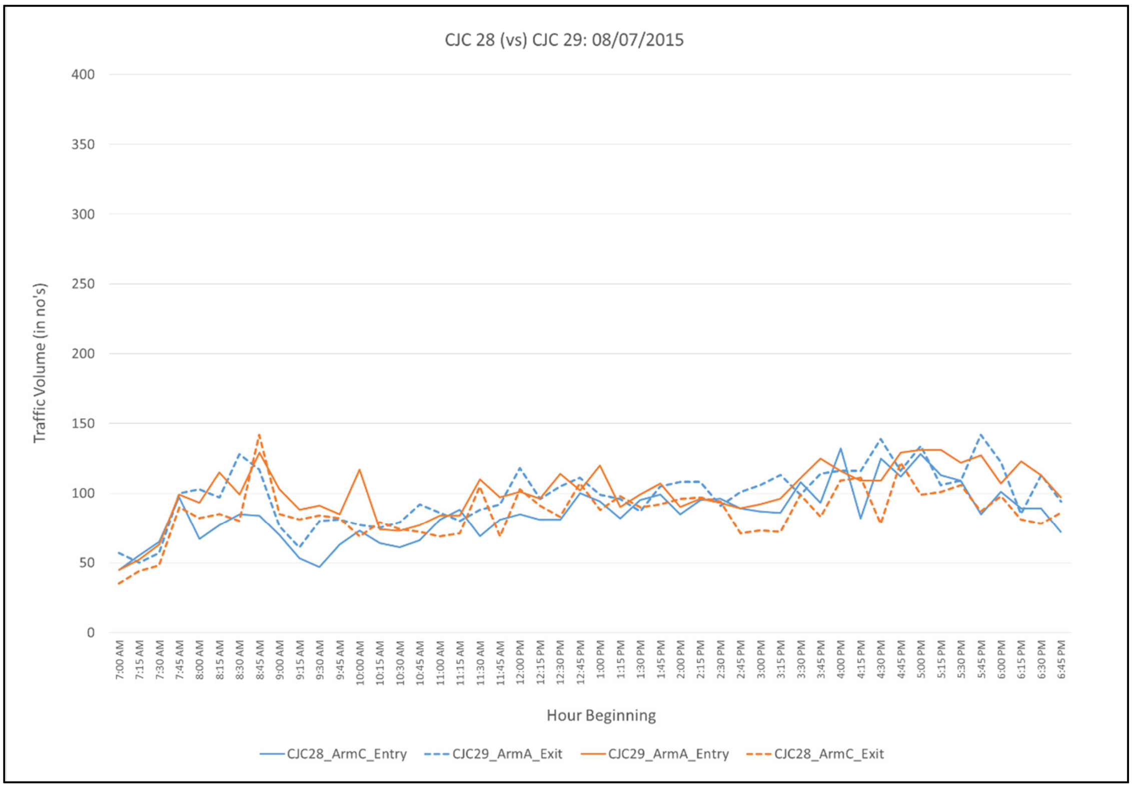


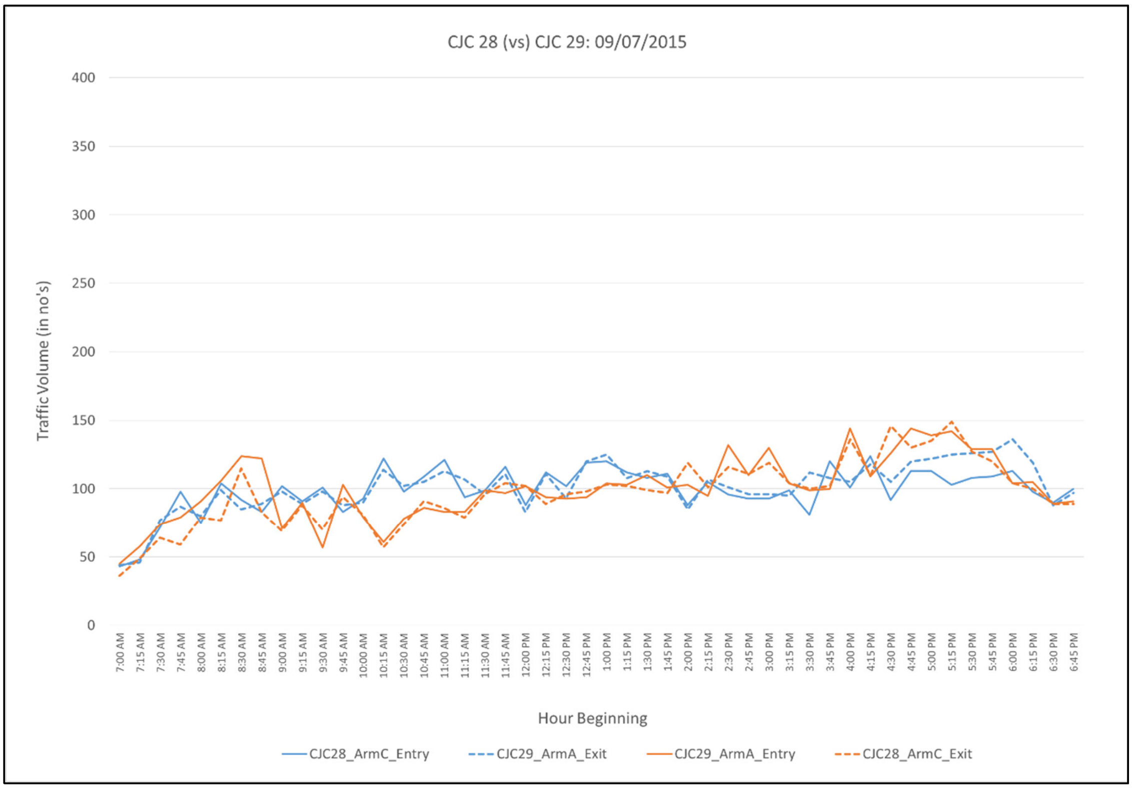
Area 3: Comparison of CJC 24 and CJC 25 on Amounderness Way (NB-SB)





Area 3: Comparison of CJC 28 and CJC 29 on B5268 Fleetwood Road N (NB-SB)

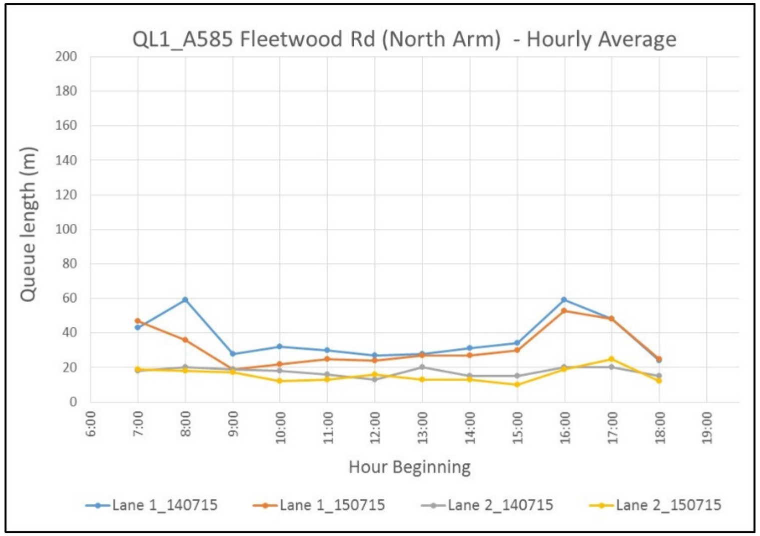


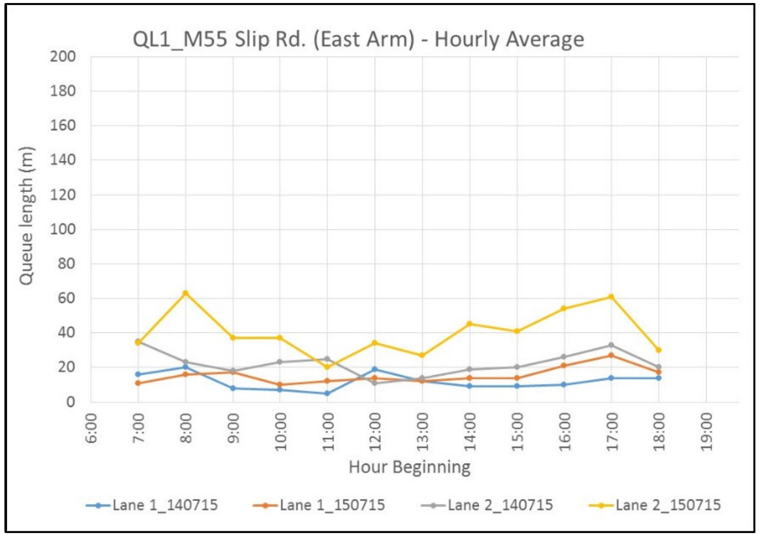


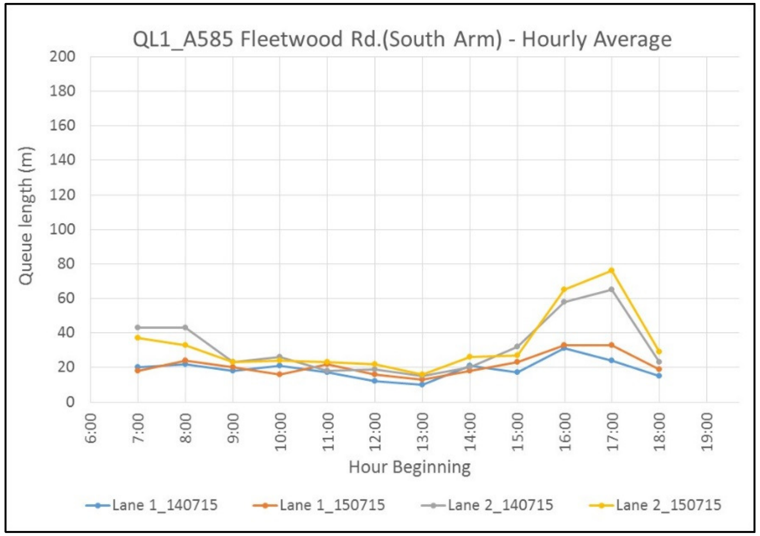
APPENDIX M

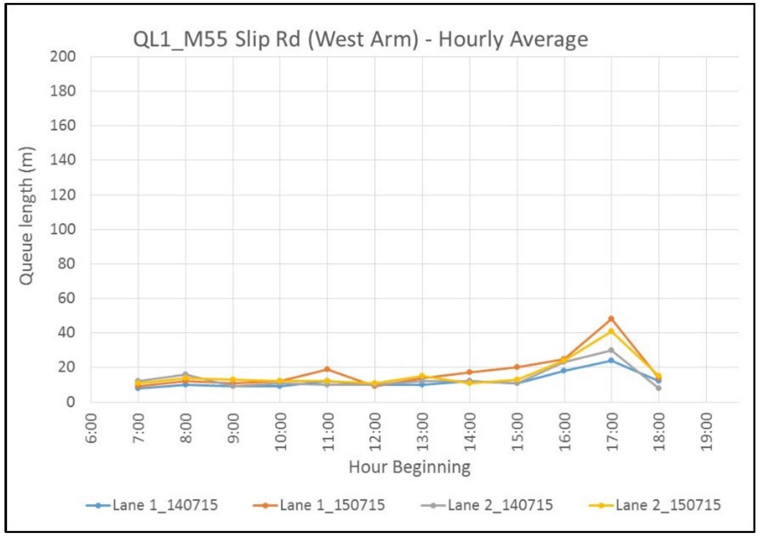
Hourly Average Maximum Queue Length on A585 Sites

QL1: A585 Fleetwood Rd/M55 Slip Rd

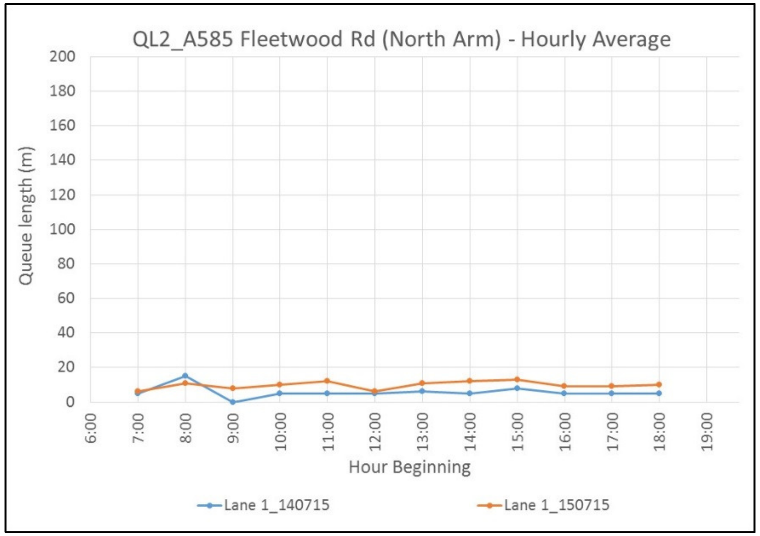


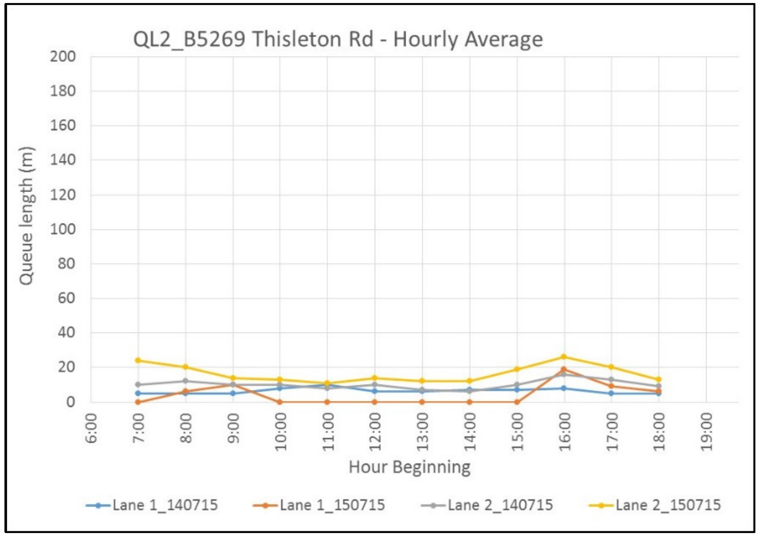


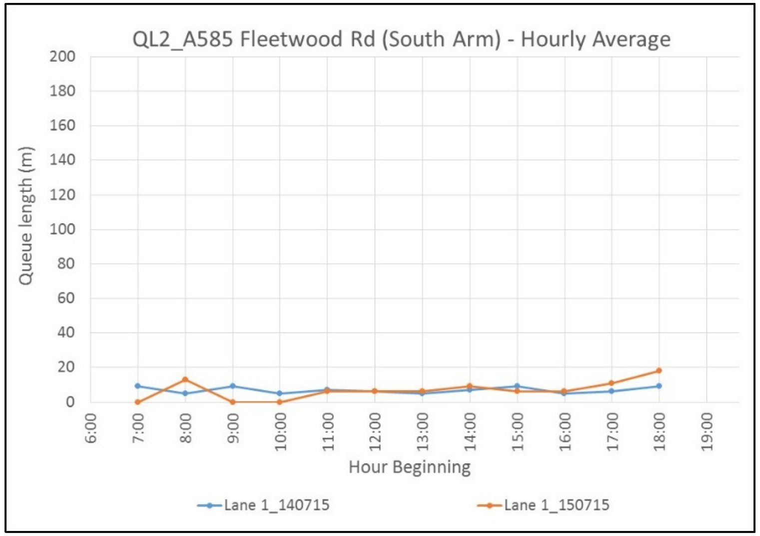


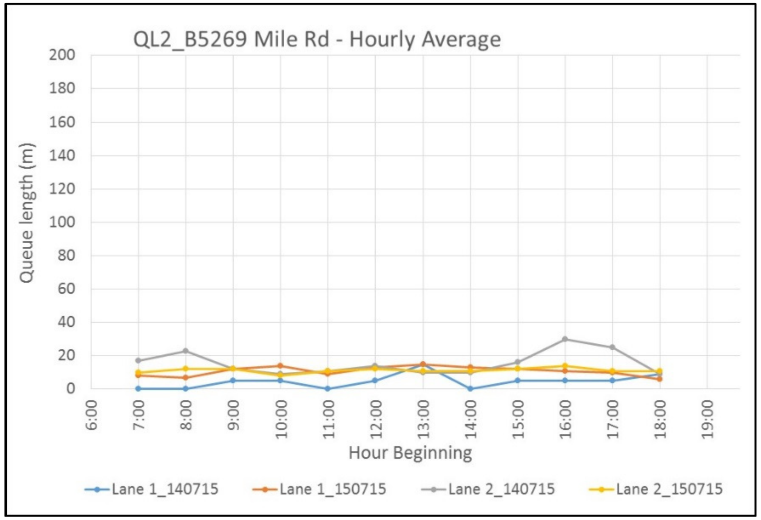


QL2: A585 Fleetwood Rd / B5269 Thistleton Rd/ B5269 Mile Rd

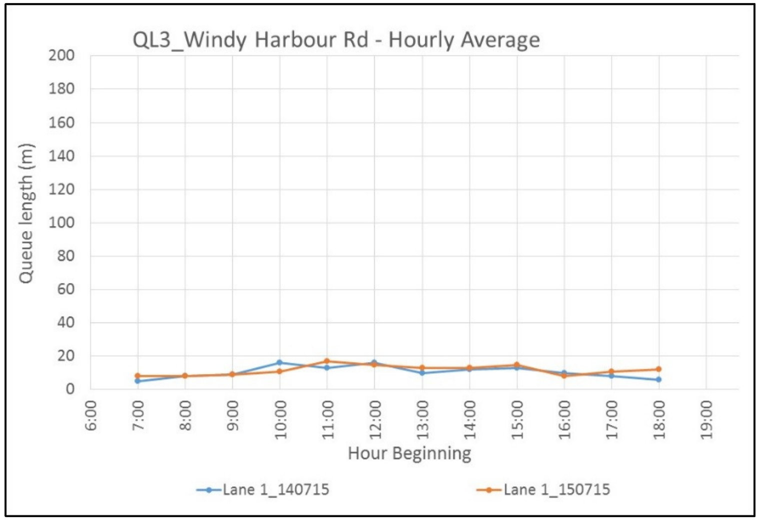


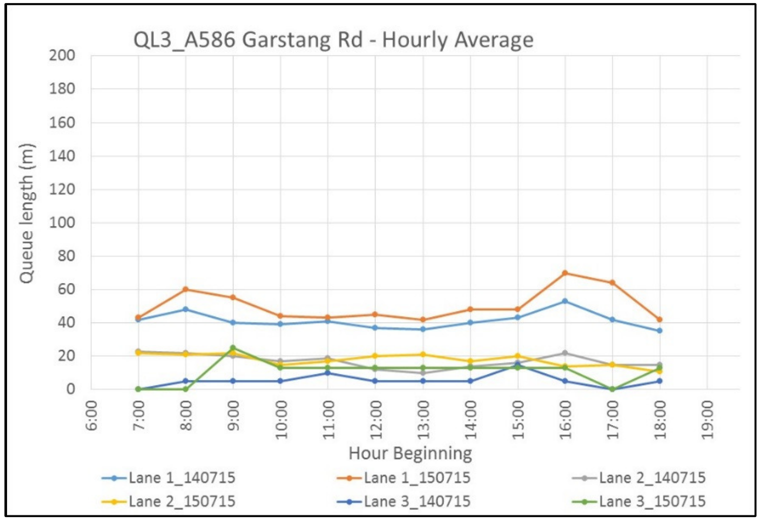


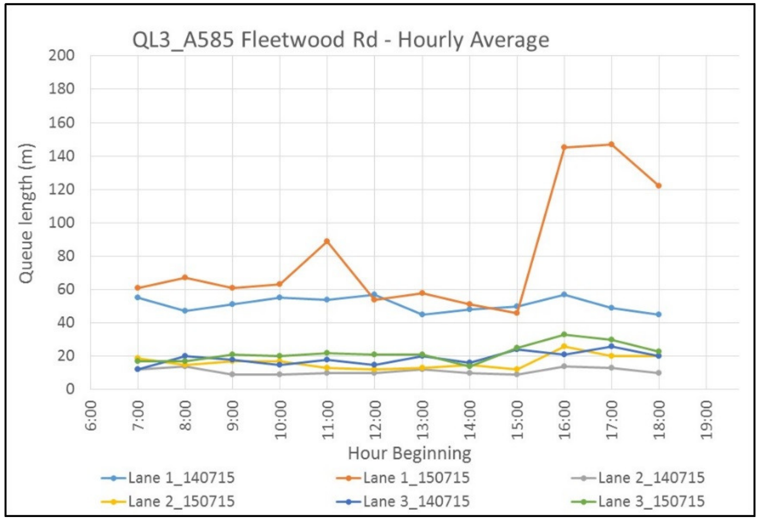


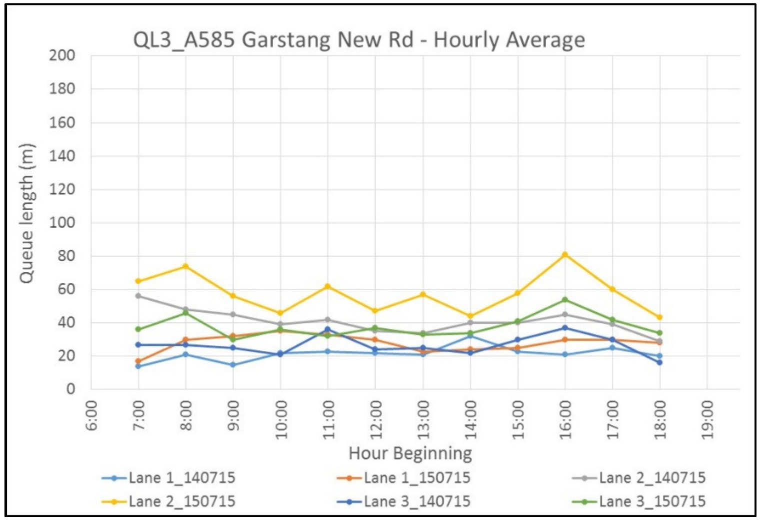


QL3: Windy Harbour Rd/A586 Garstang Rd/A585 Fleetwood Rd/ A585 Garstang New Rd

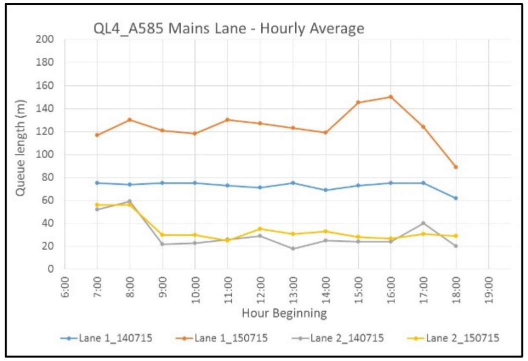


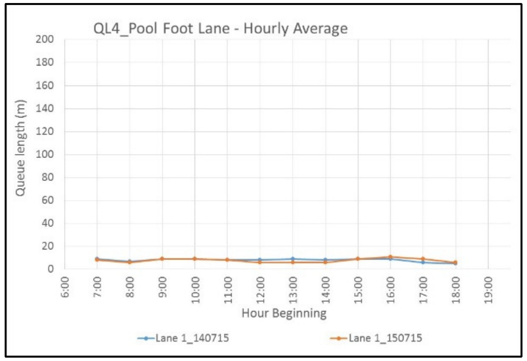


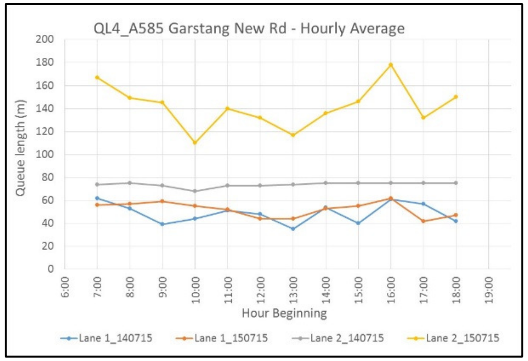


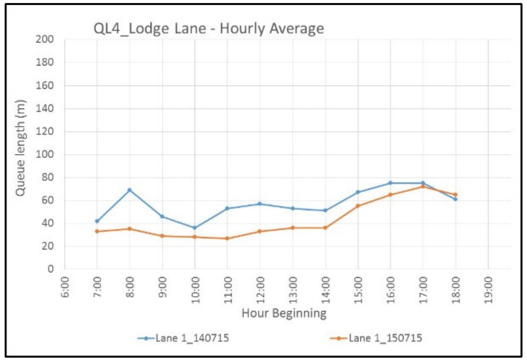


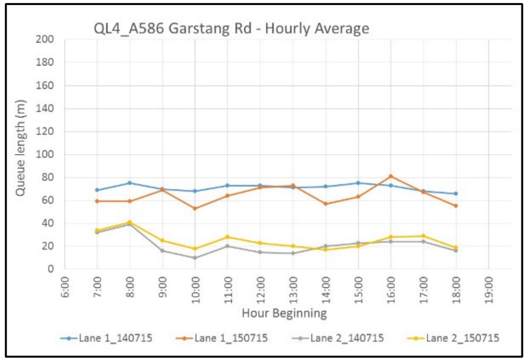
QL4: A585 Mains Lane/Pool Foot Lane/ A585 Garstang New Rd/ Lodge Lane/ A586 Garstang Rd



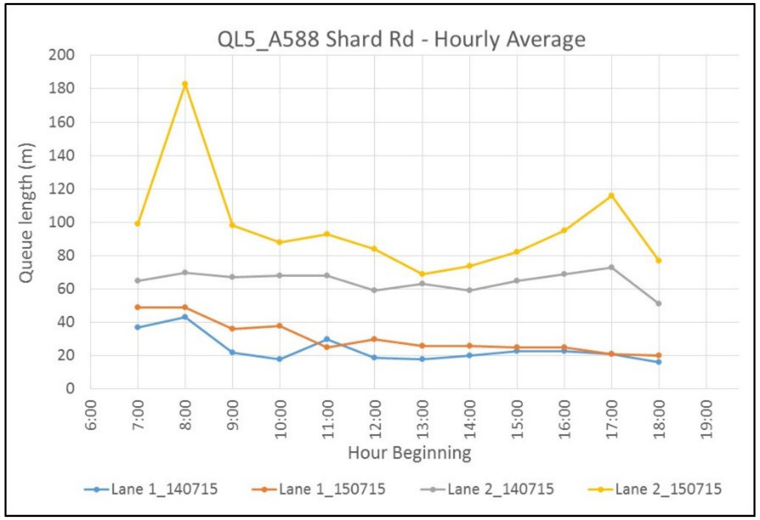


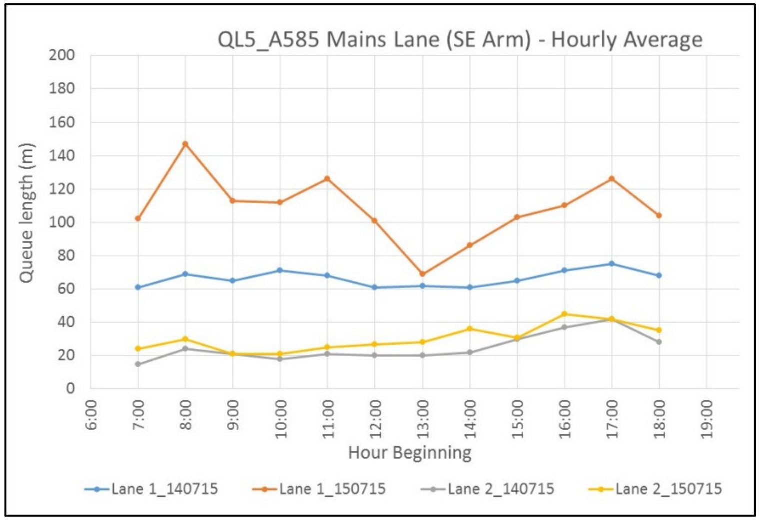


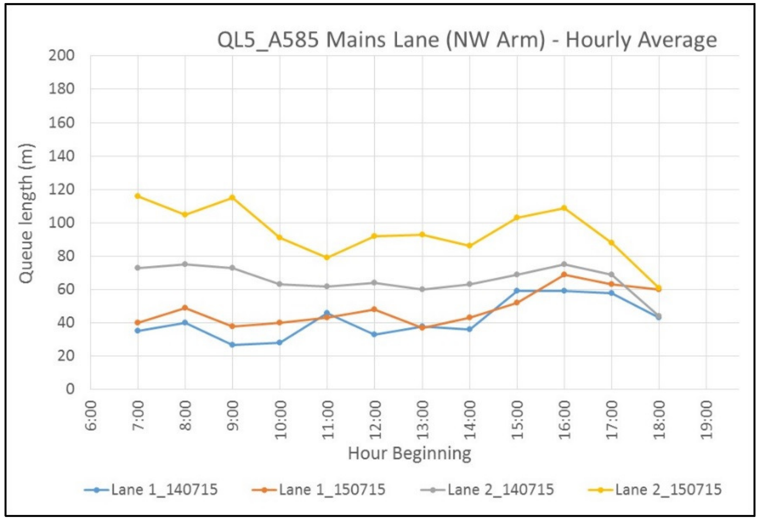




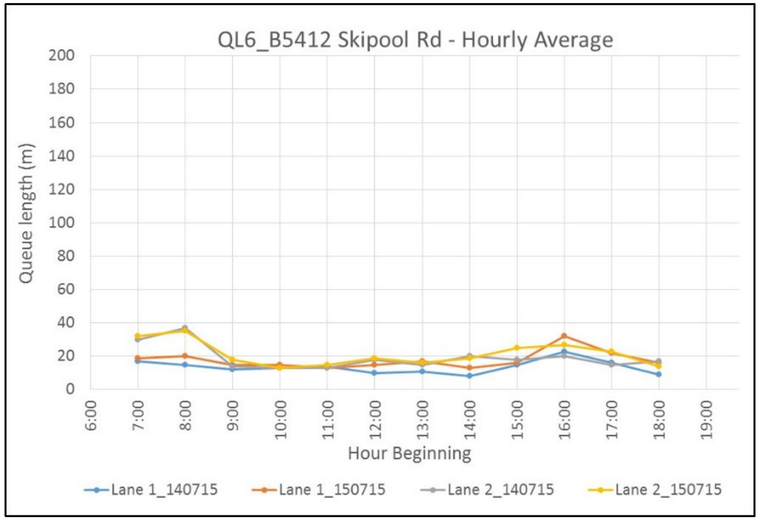
QL5: A588 Shard Rd/ A585 Mains Lane

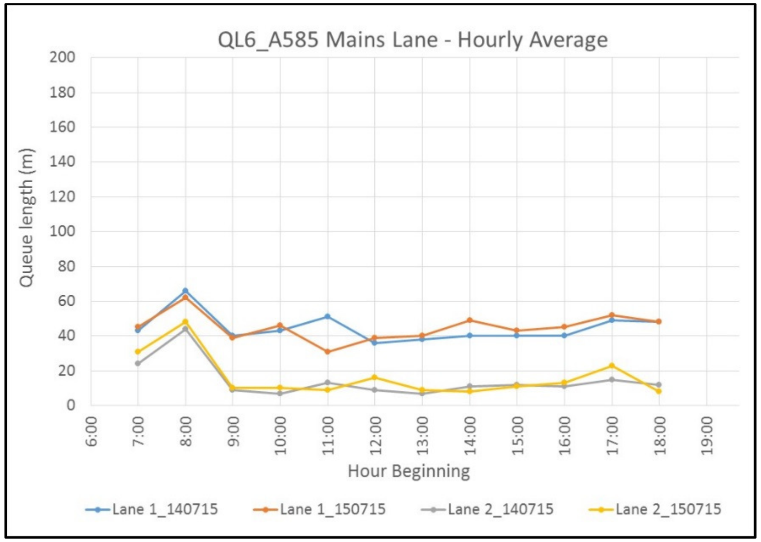


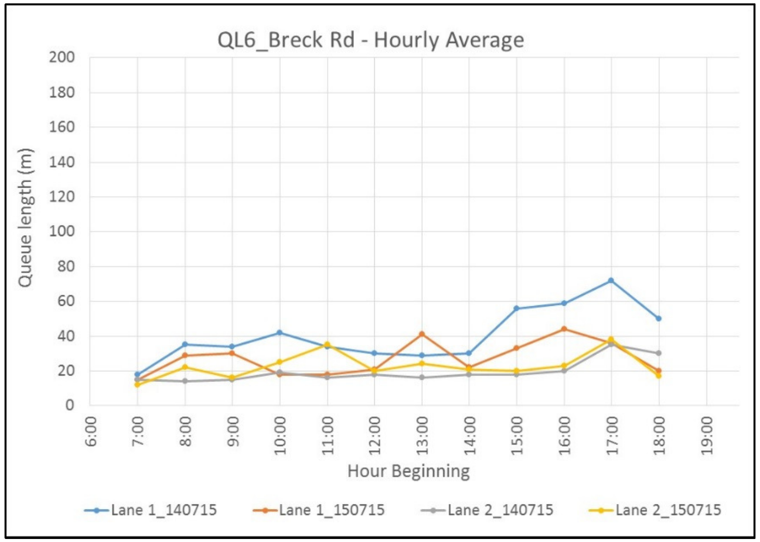


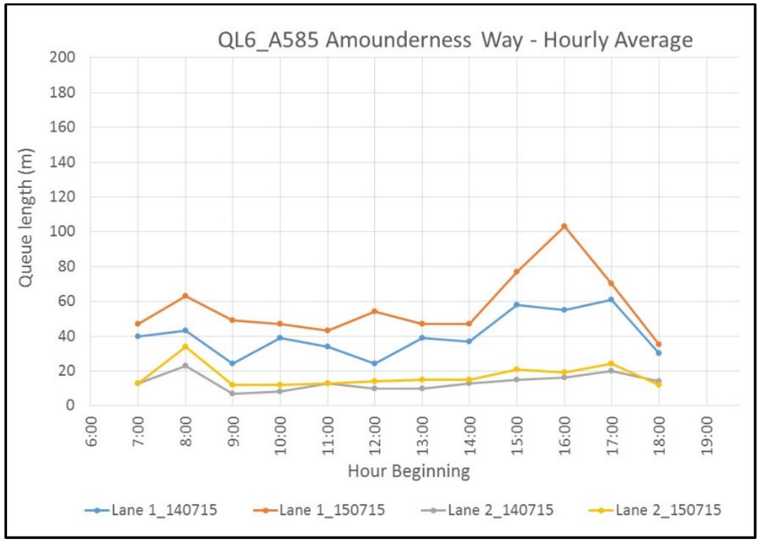


QL6: B5412 Skipool Rd/ A585 Mains Lane/ Breck Rd/ A585 Amounderness Way

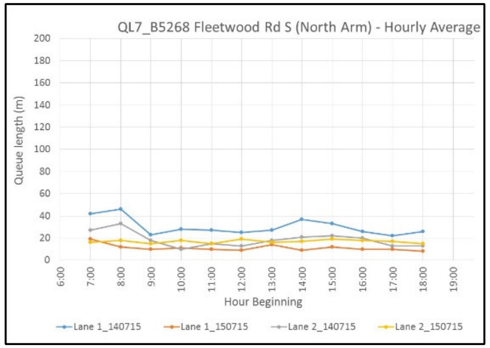


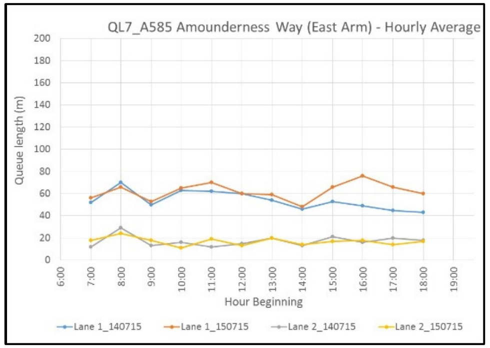


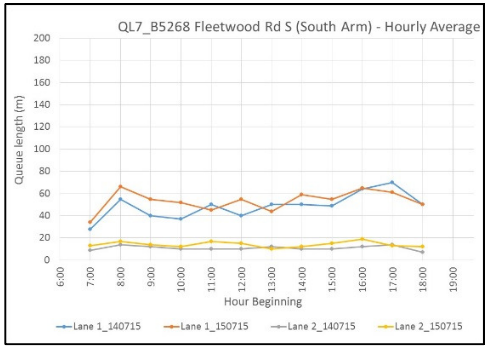


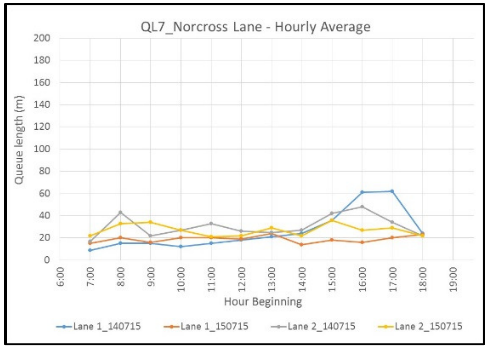


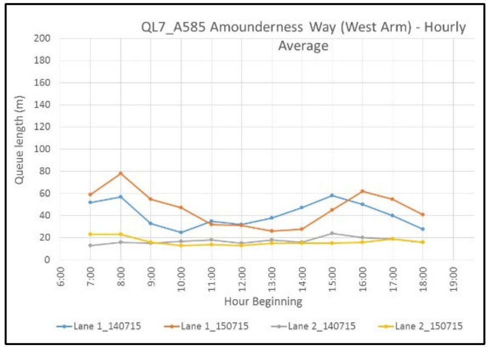
QL7: B5268 Fleetwood Rd S/ A585 Amounderness Way/Norcross Lane



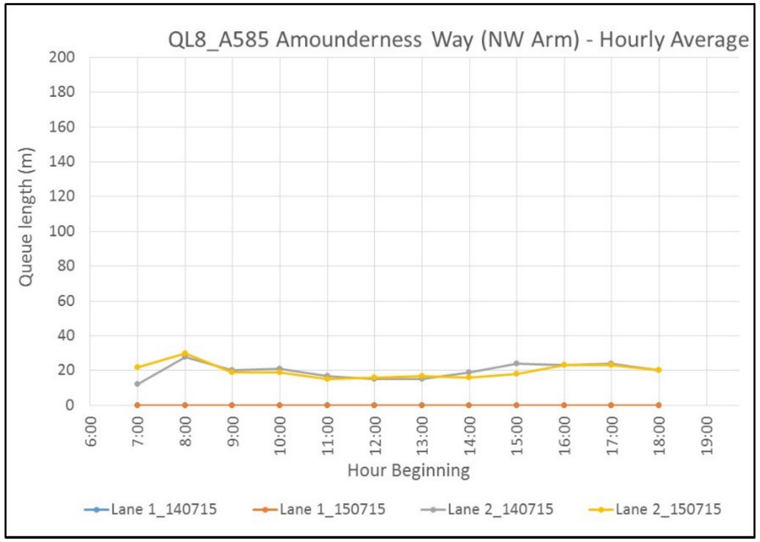


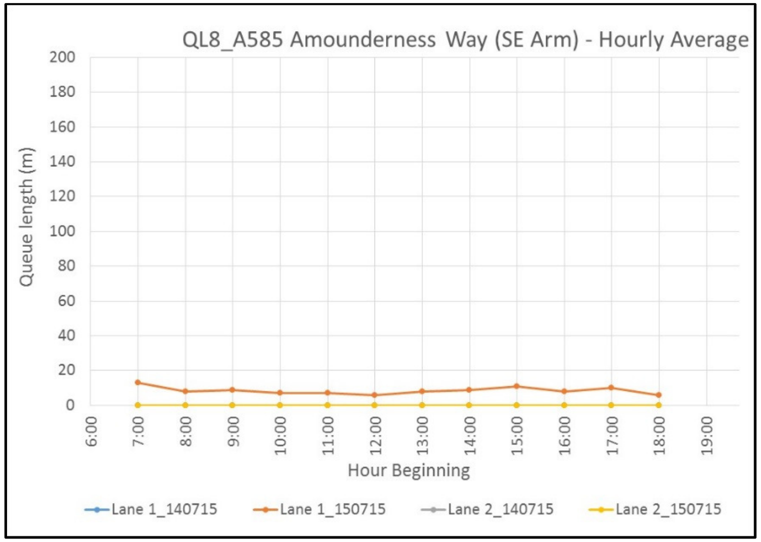


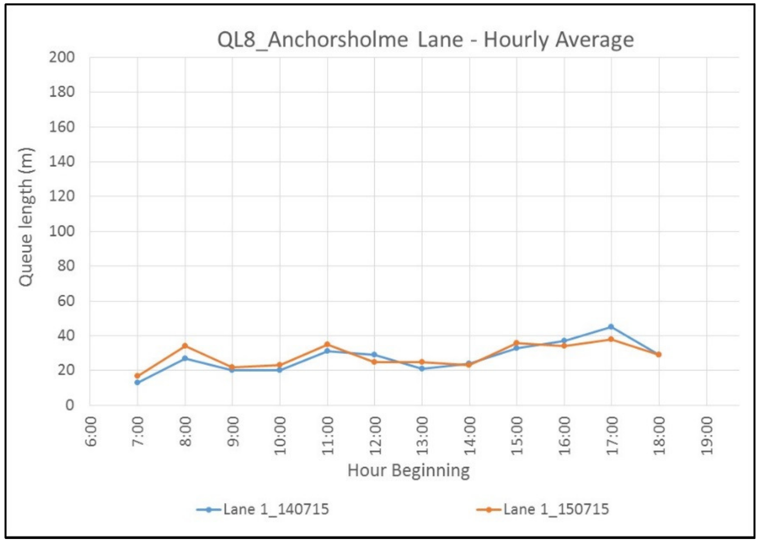




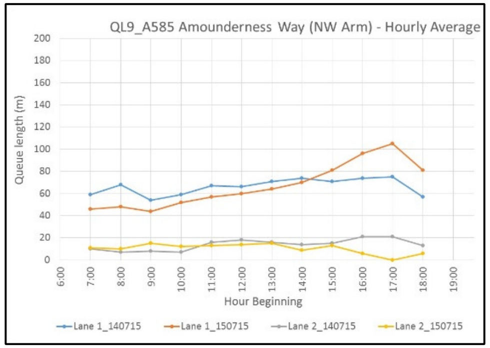
QL8: A585 Amounderness Way/Anchorsholme Lane

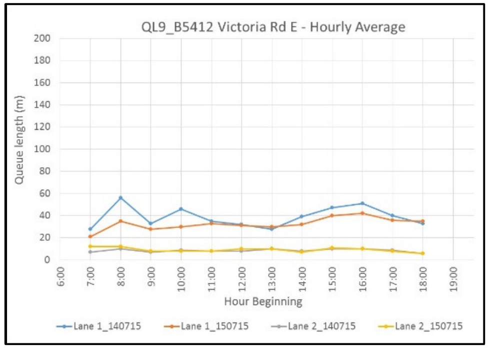


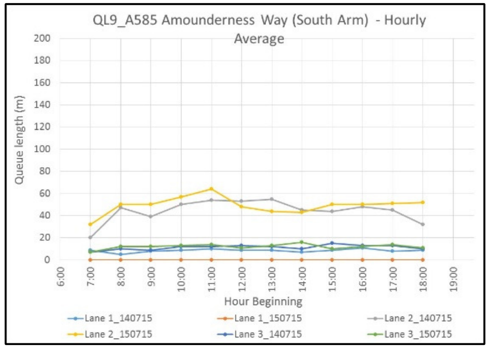


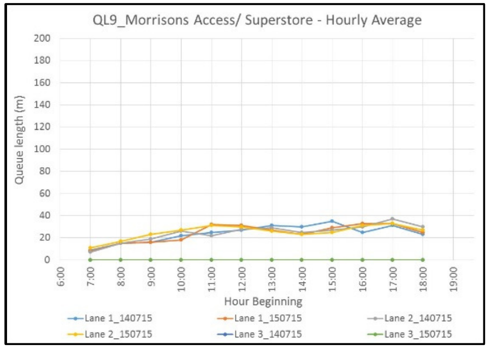


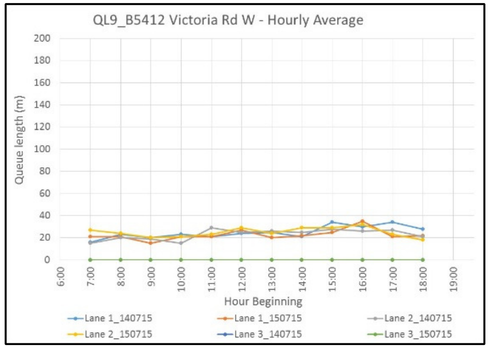
QL9: A585 Amounderness Way/ B5412 Victoria Rd E/ B5412 Victoria Rd W



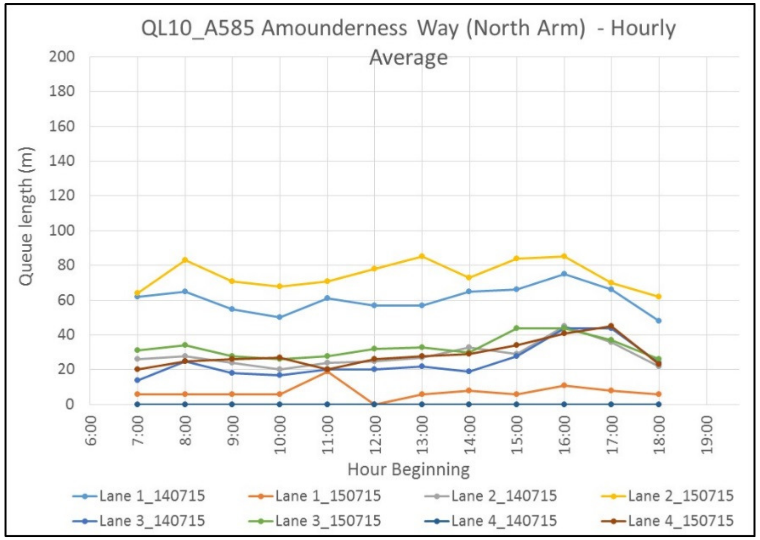


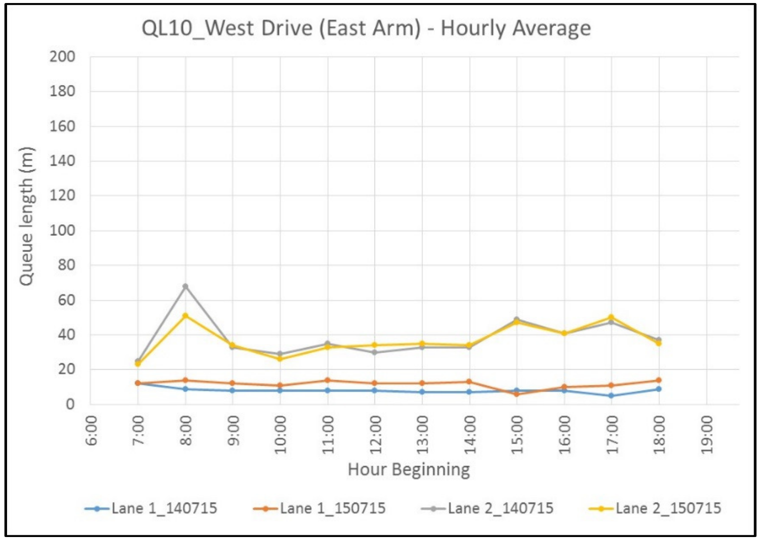


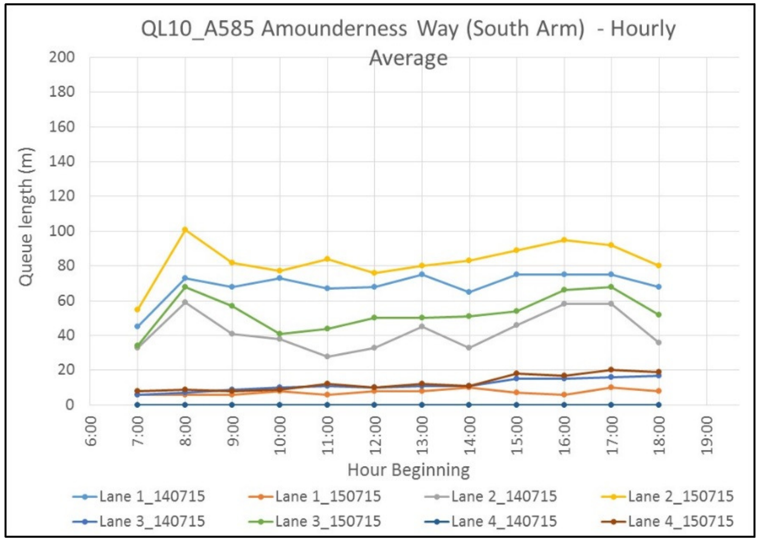


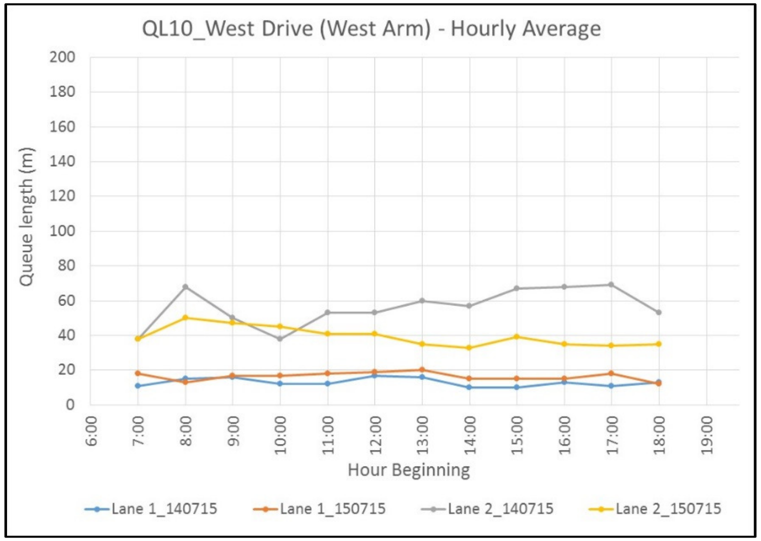


QL10: A585 Amounderness Way/ West Drive

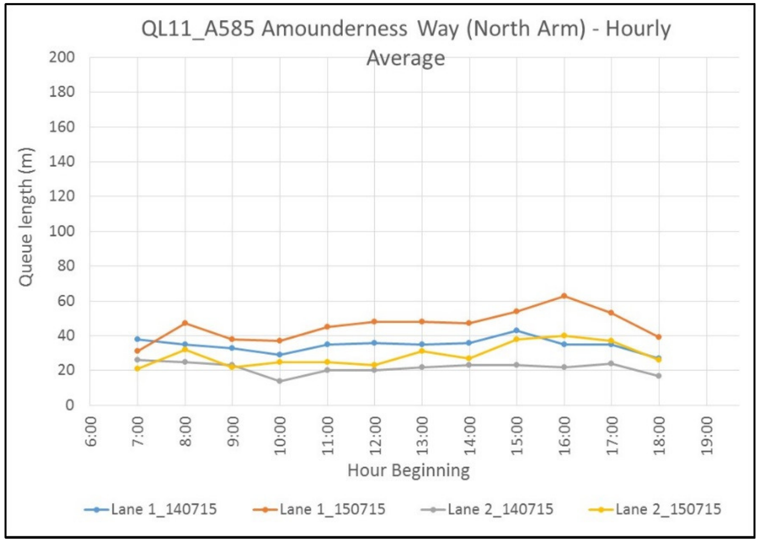


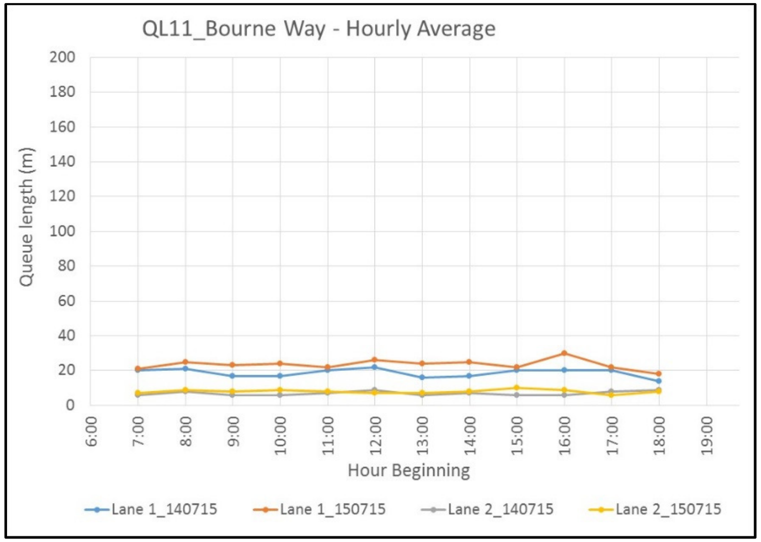


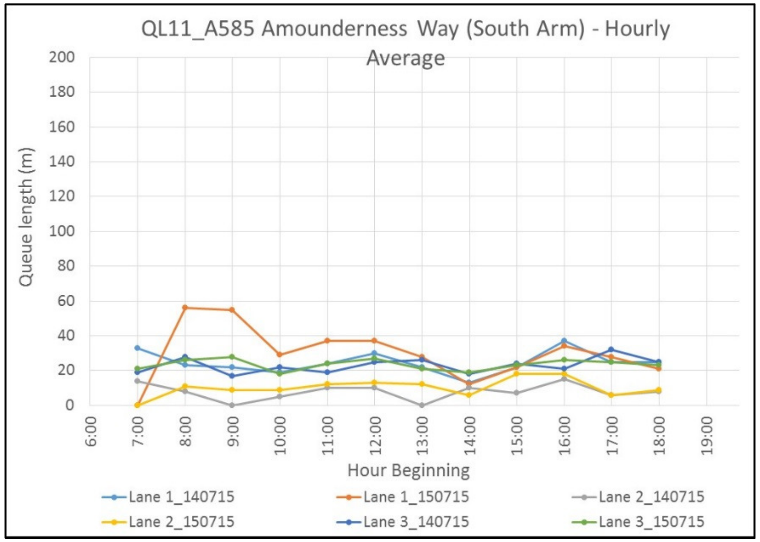




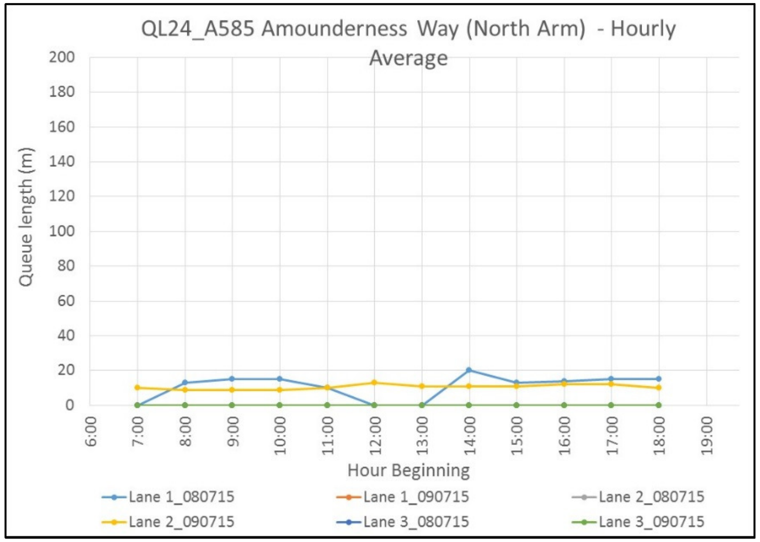
QL11: A585 Amounderness Way/ Bourne Way

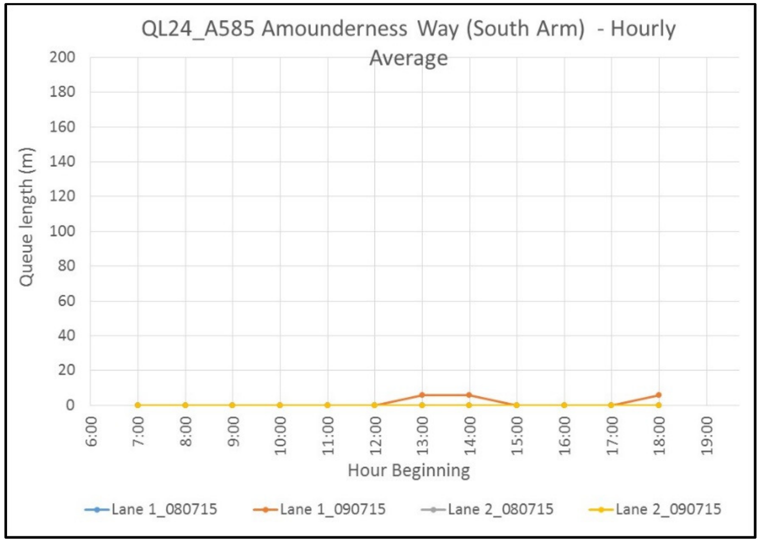


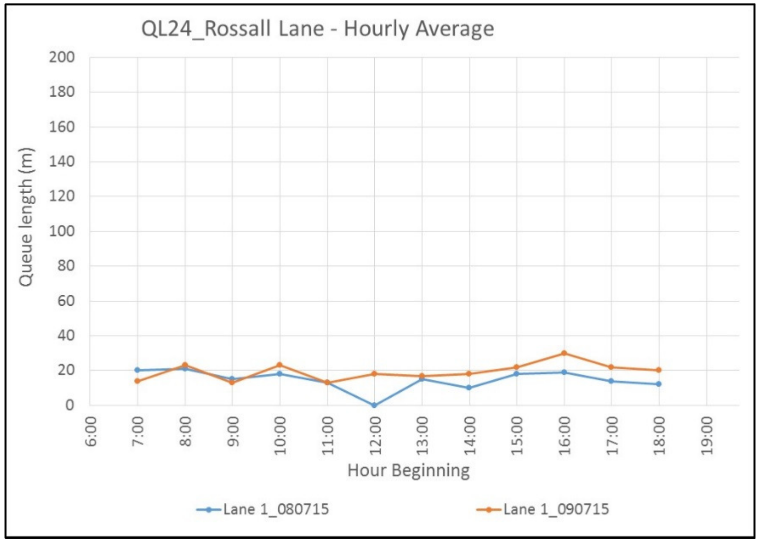




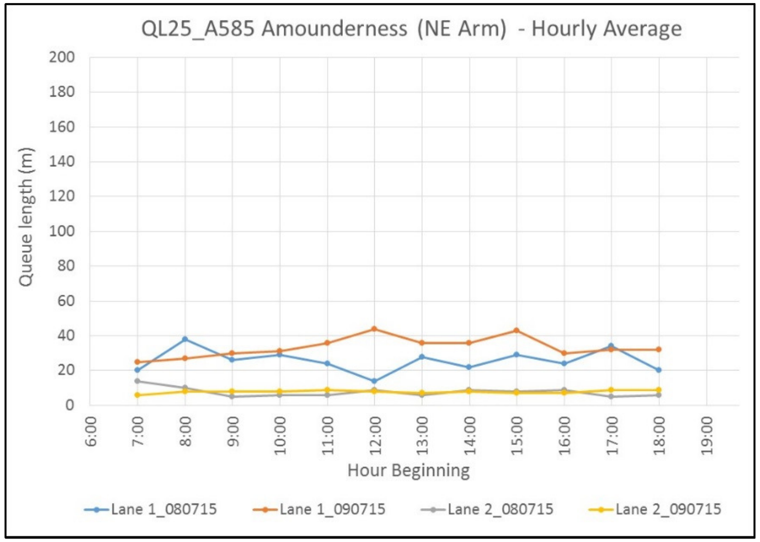
QL24: A585 Amounderness Way /Rosssall Lane

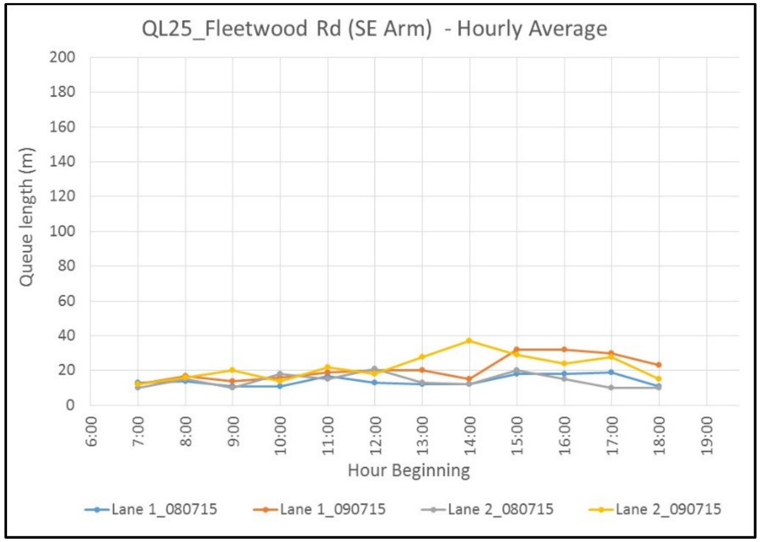


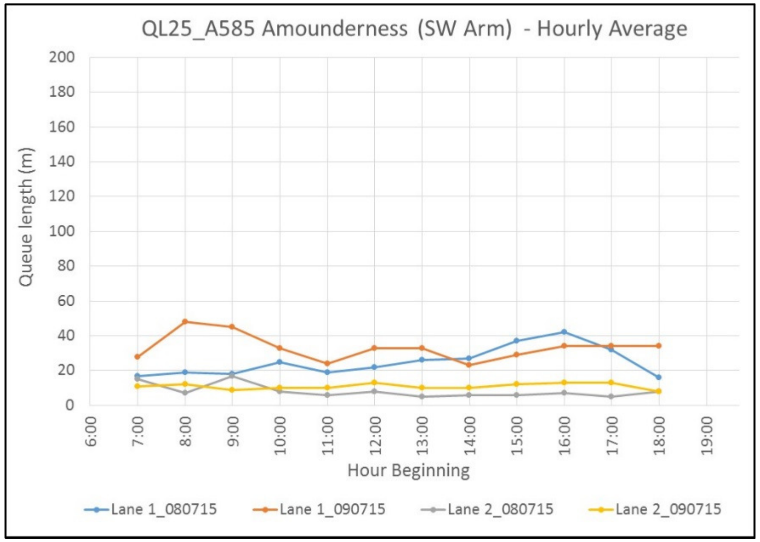


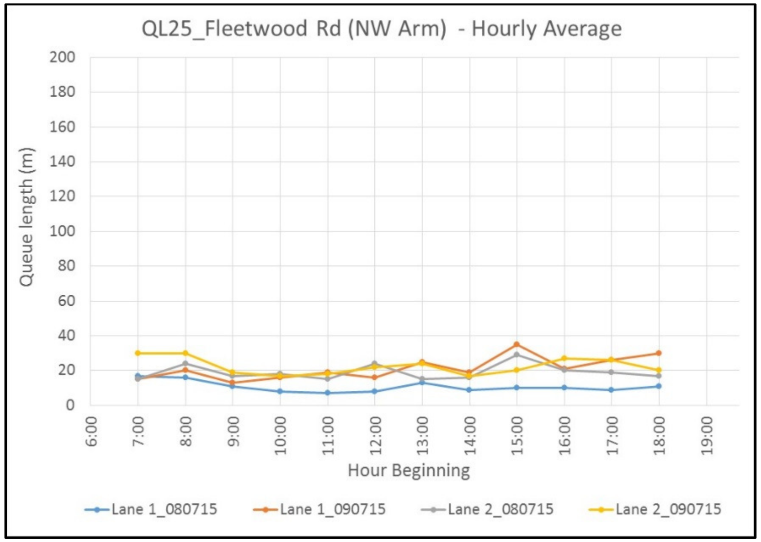


QL25: A585 Amounderness /Fleetwood Rd

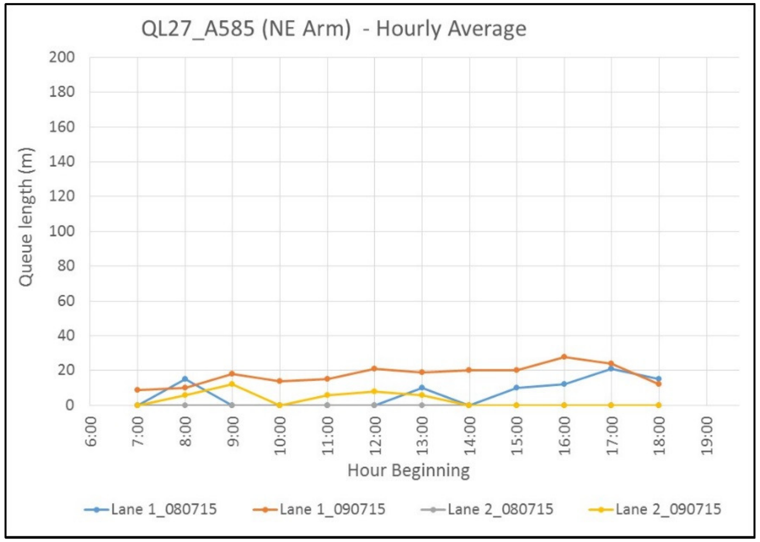


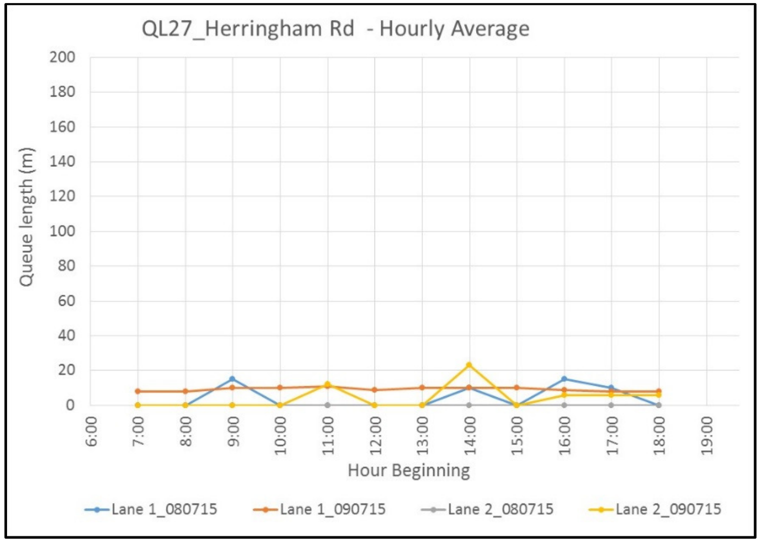


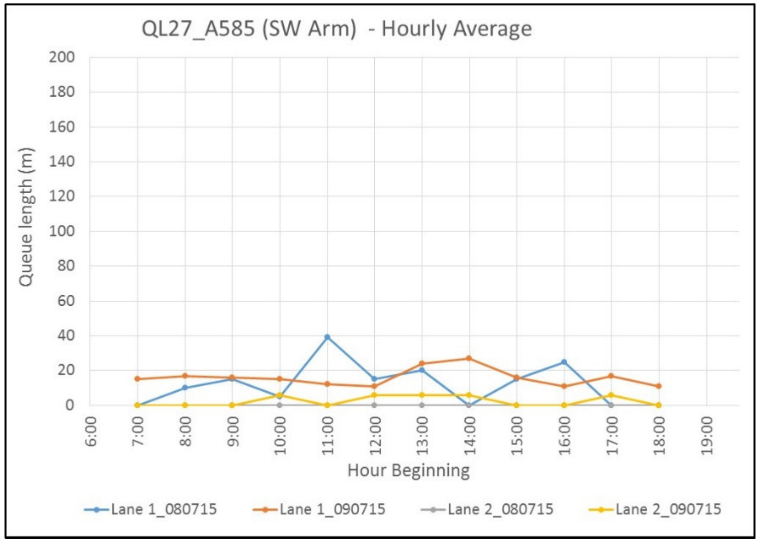


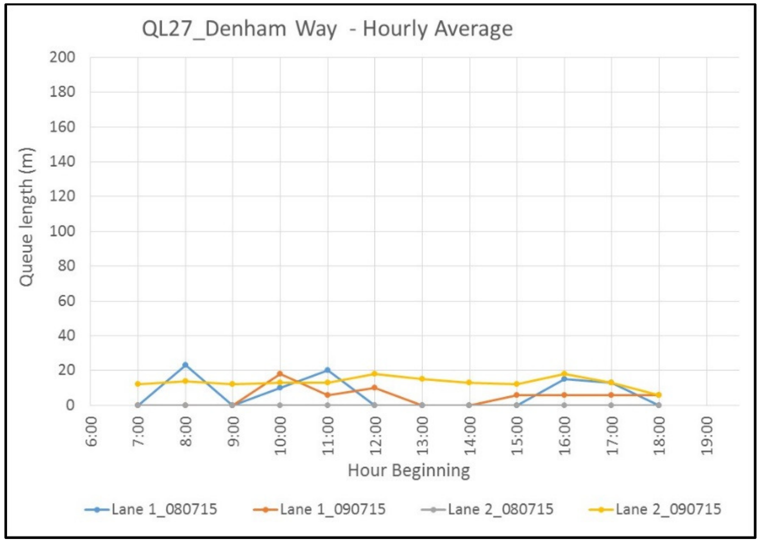


QL27: A585 /Herringham Rd /Denham Way





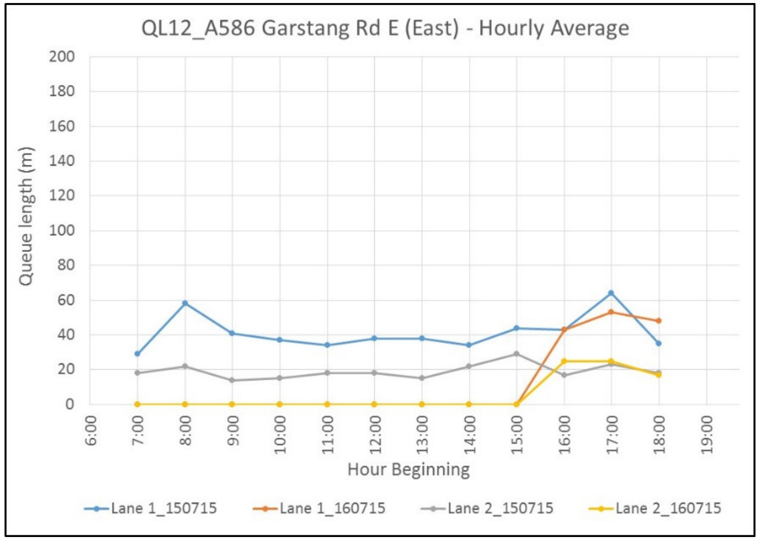


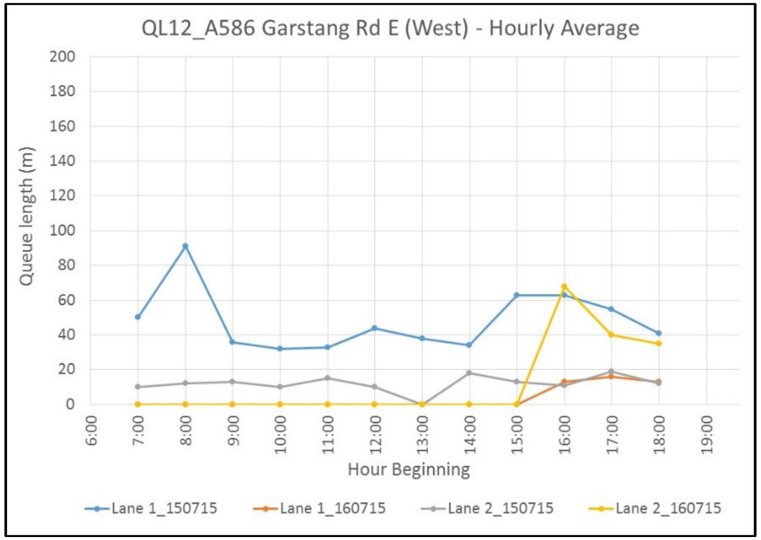


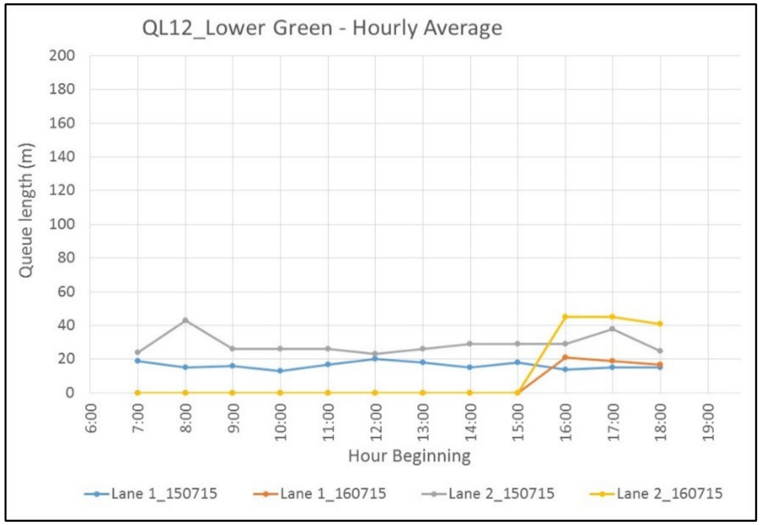
APPENDIX N

Hourly Average Maximum Queue Length on Remaining Sites

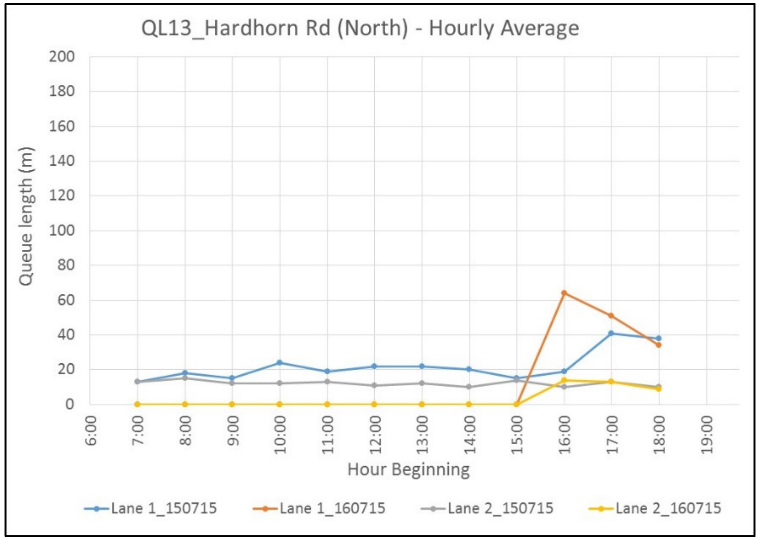
QL12: A586 Garstang Rd E / Lower Green

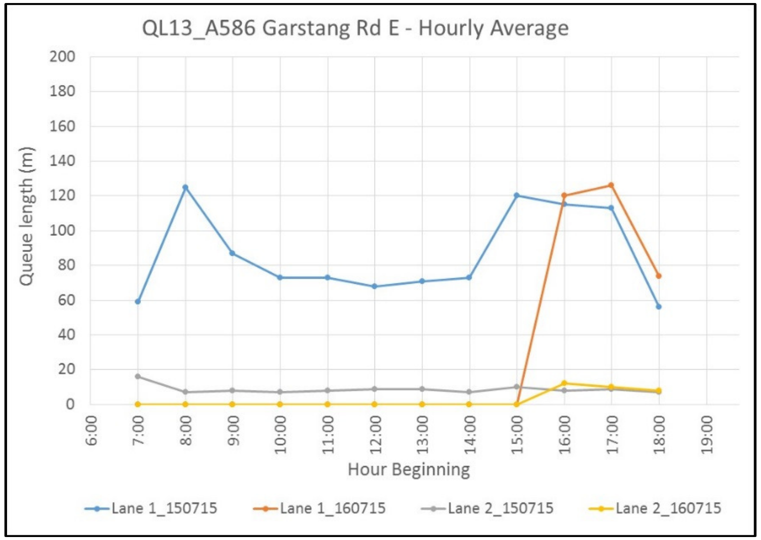


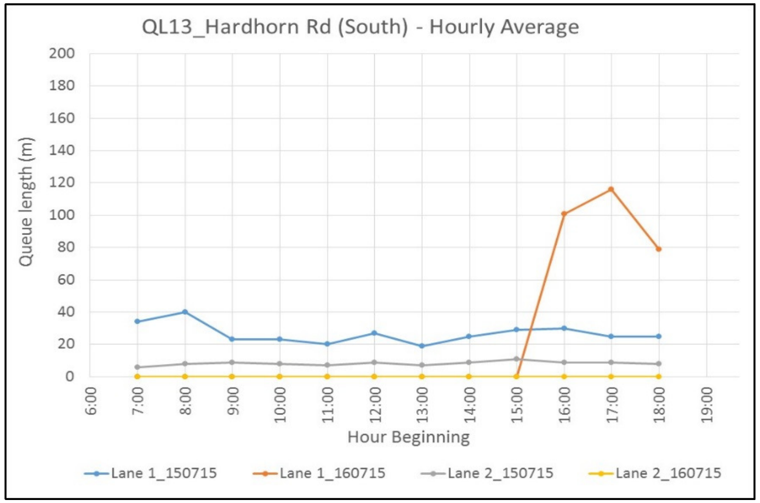


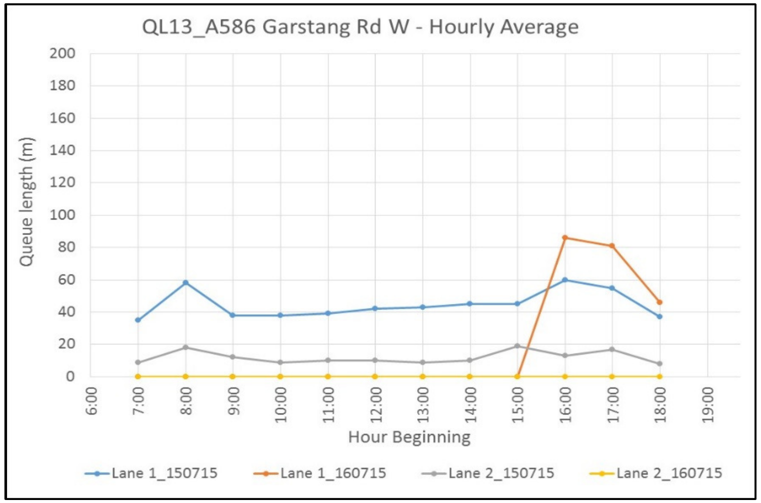


QL13: A586 Garstang Rd W / Hardhorn Rd / A586 Garstang Rd E

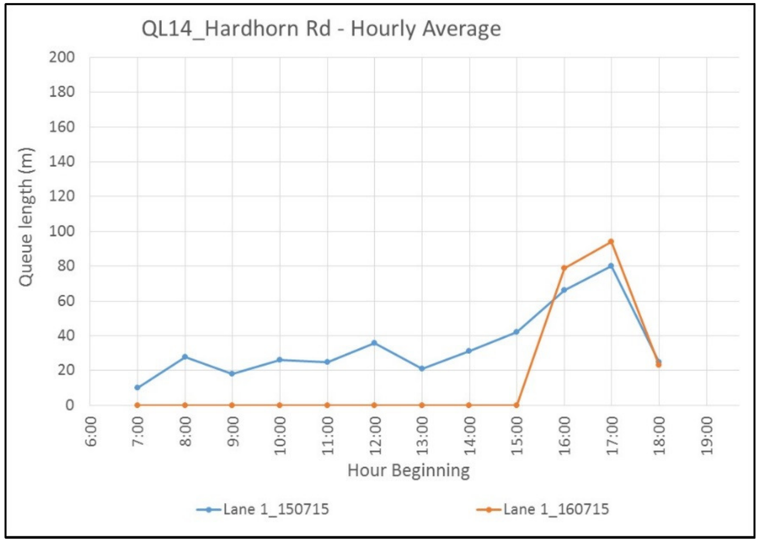


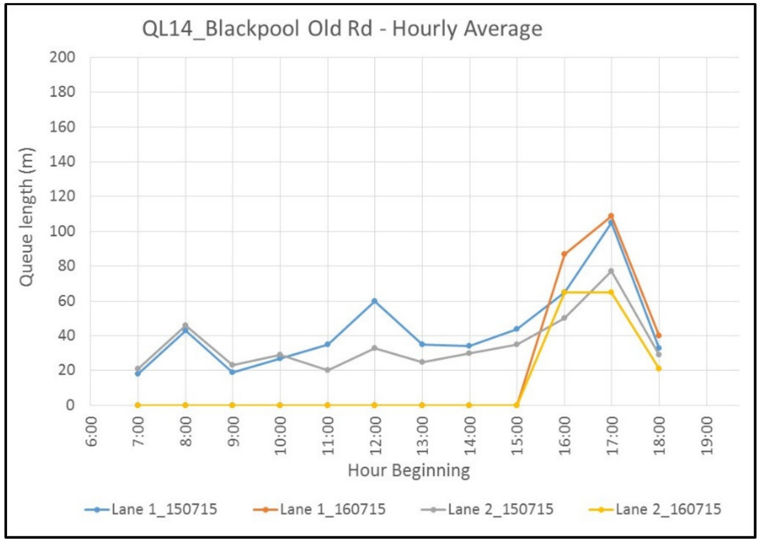




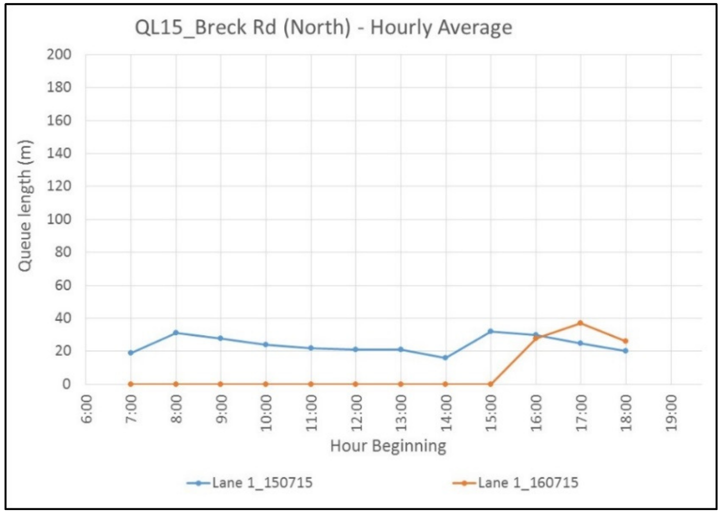


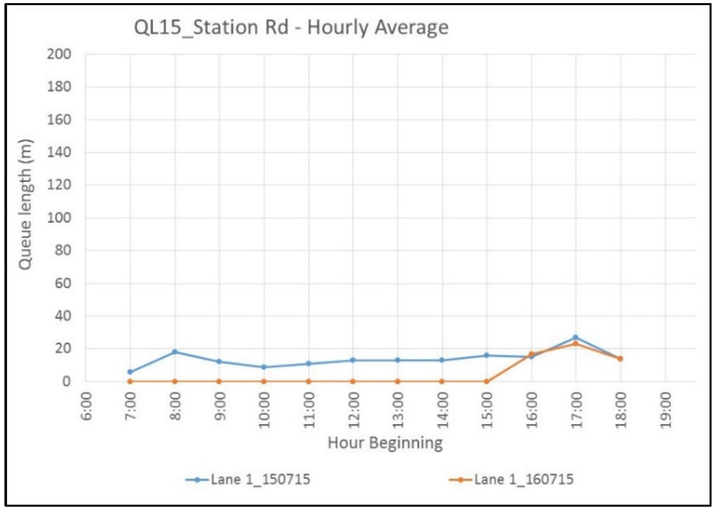
QL14: Hardhorn Rd / Blackpool Old Rd

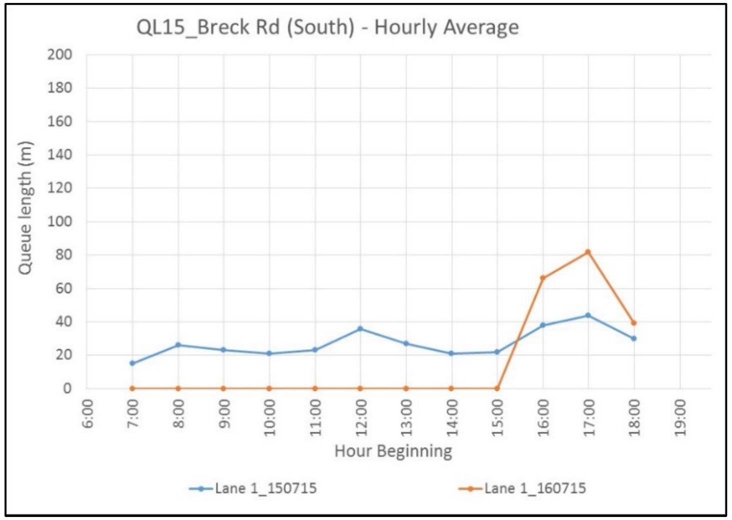


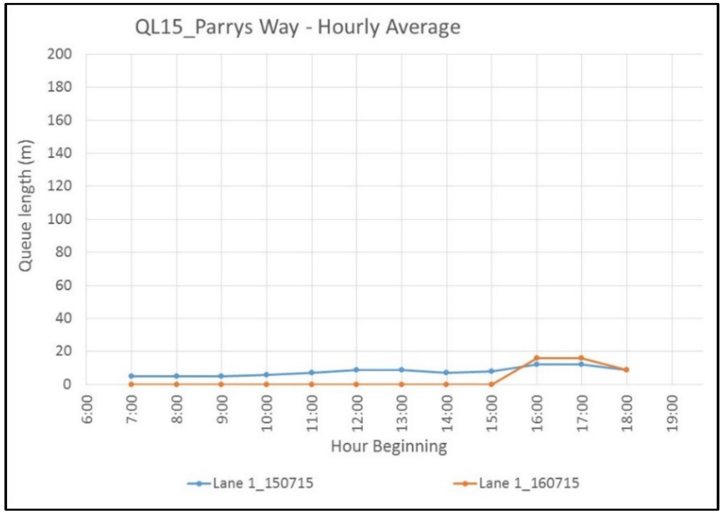


QL15: Breck Rd / Station Rd / Parrys Way

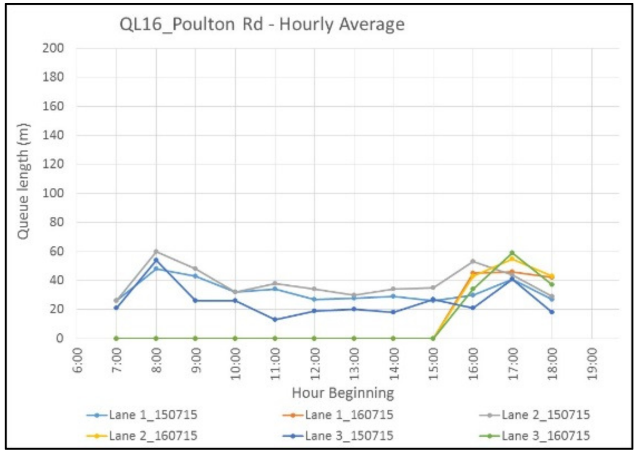


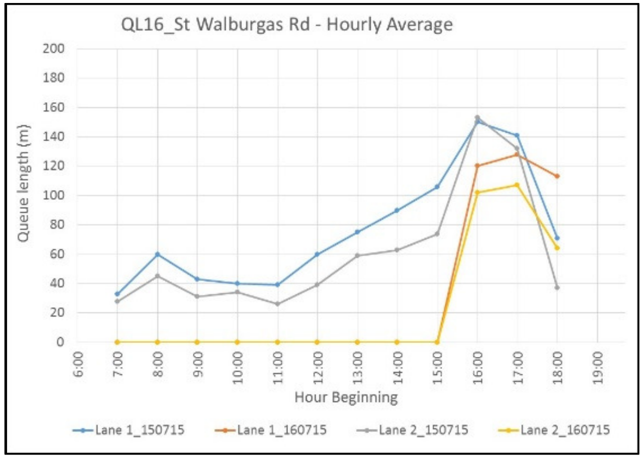


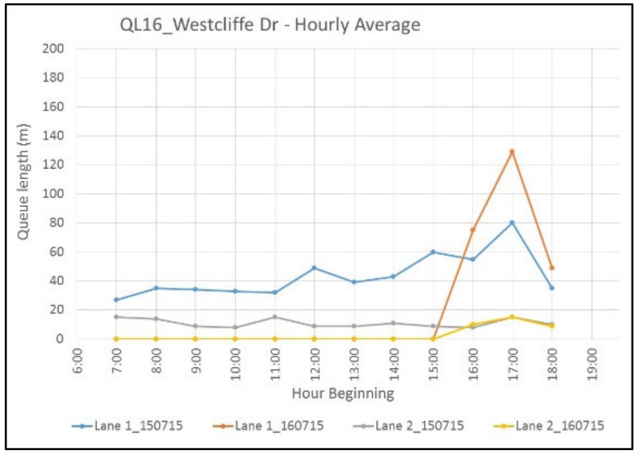


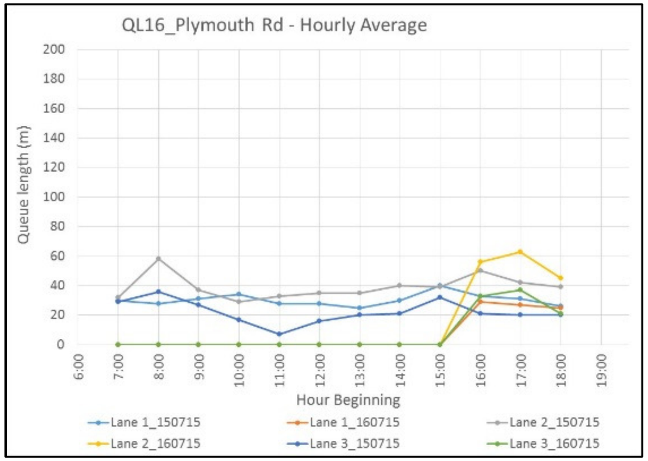


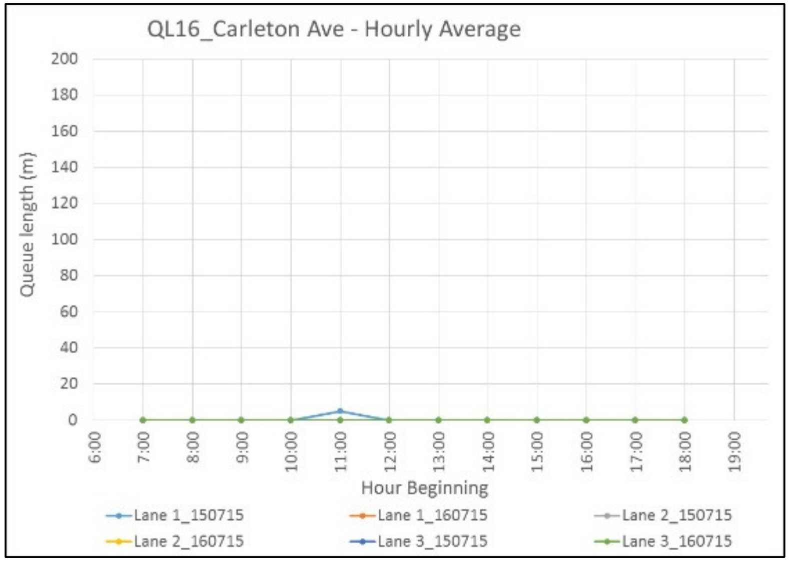
QL16: Poulton Rd / Plymouth Rd / St. Walburgas / Westcliffe Dr. / Carleton Ave



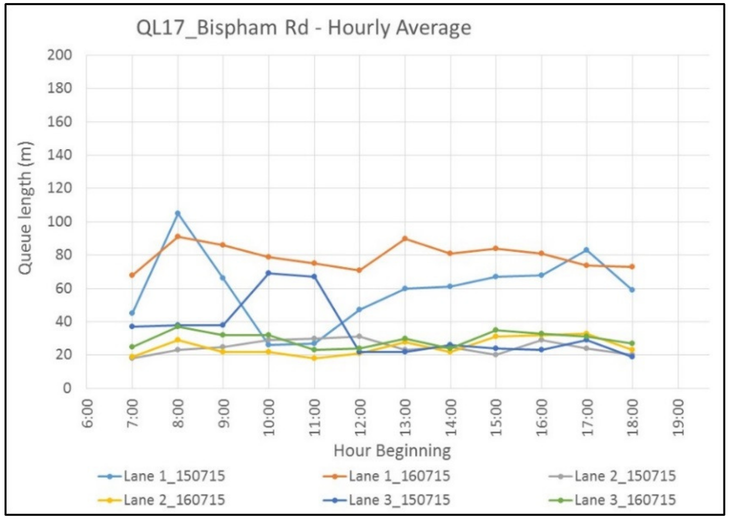


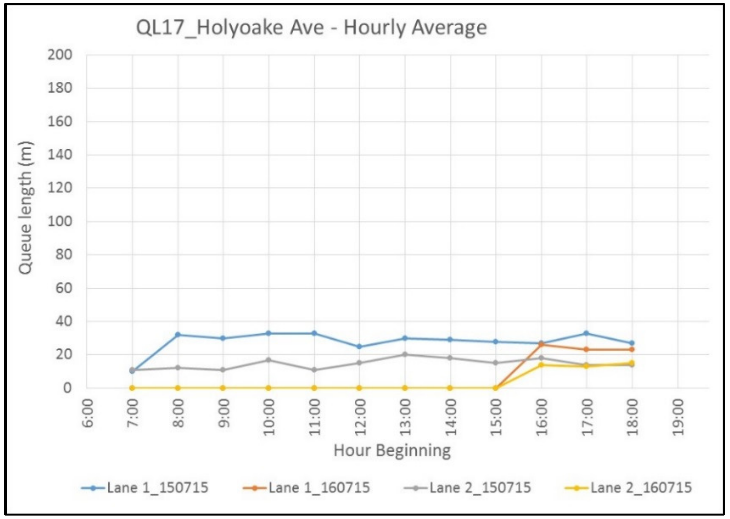


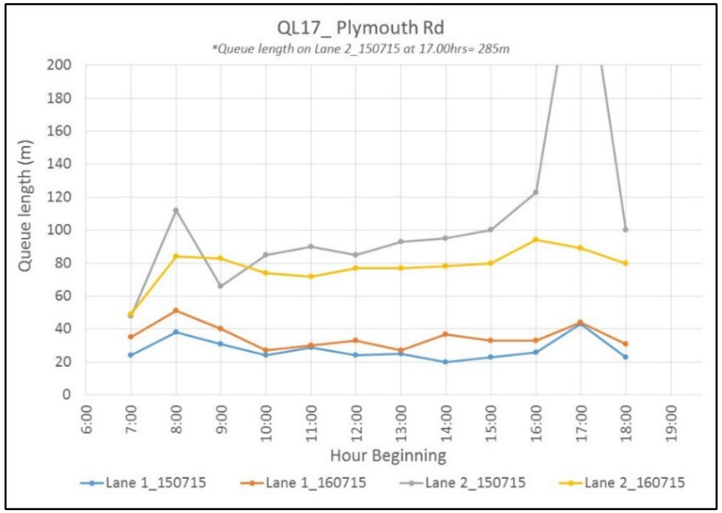


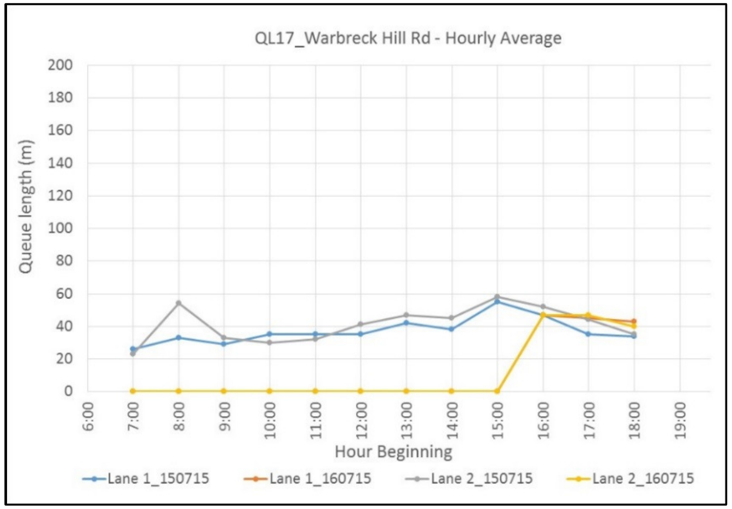

QL16_Carleton Ave - Hourly Average
Queue length (m)
0
20
40
60
80
100
120
140
160
180
200
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
Hour Beginning
Lane 1_150715
Lane 1_160715
Lane 2_150715
Lane 2_160715
Lane 3_150715
Lane 3_160715

QL17: Bispham Rd / Holyoake Ave / Plymouth Rd / Warbreck Hill Rd

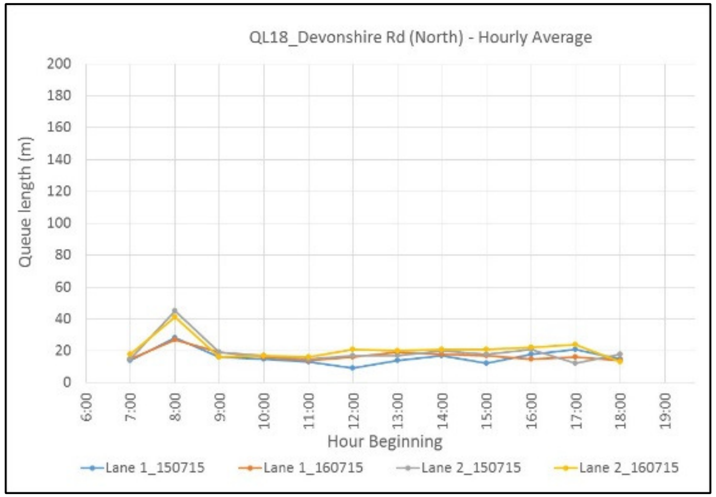


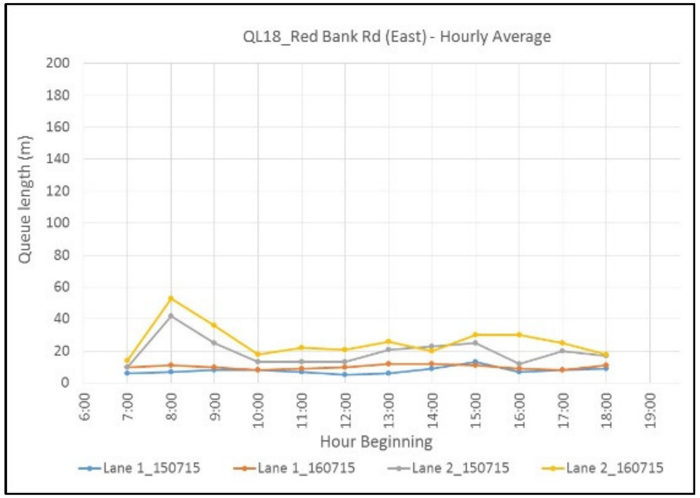


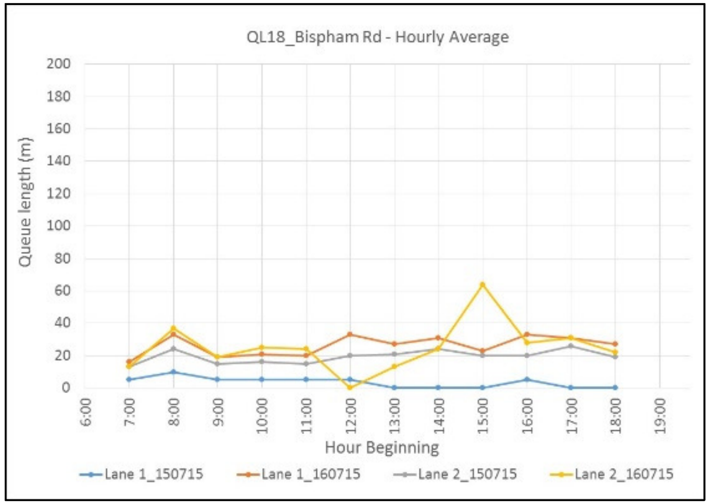


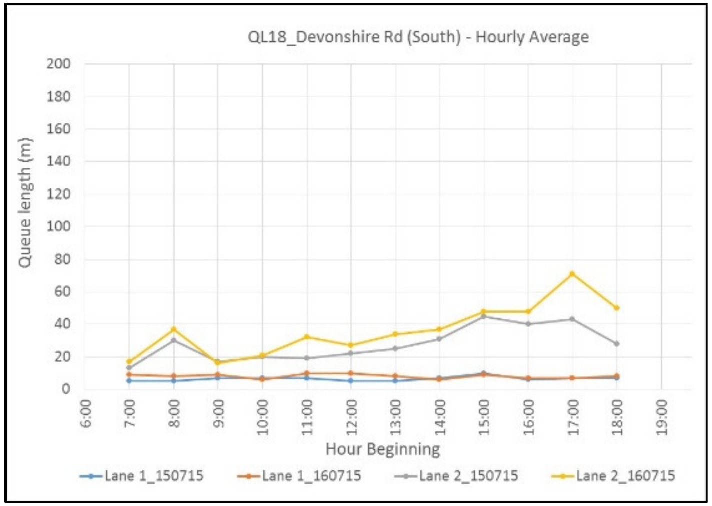


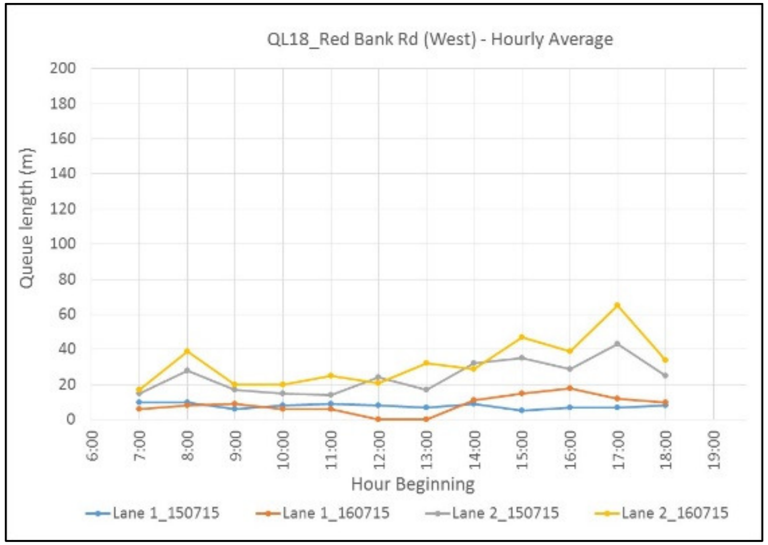
QL18: Red Bank Rd / Devonshire Rd



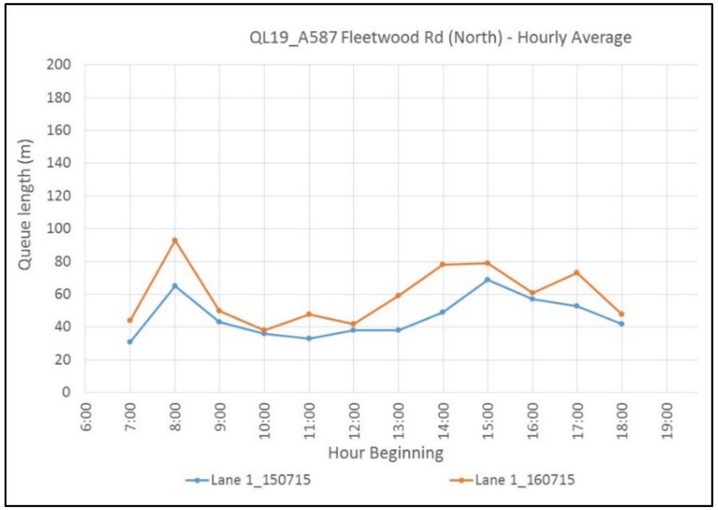


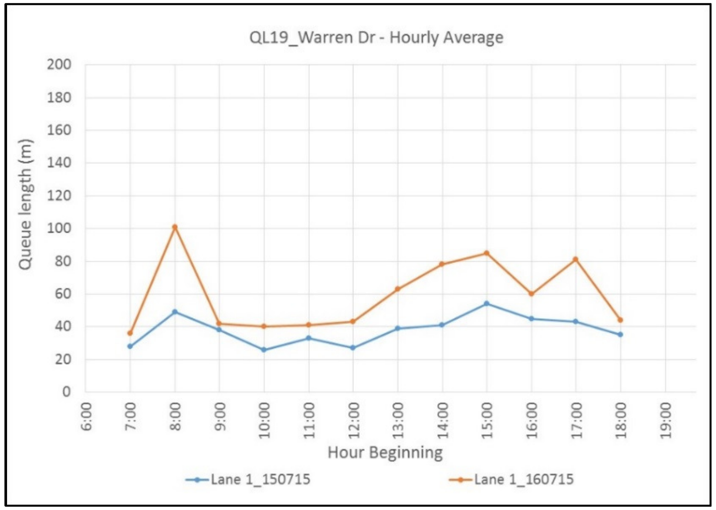


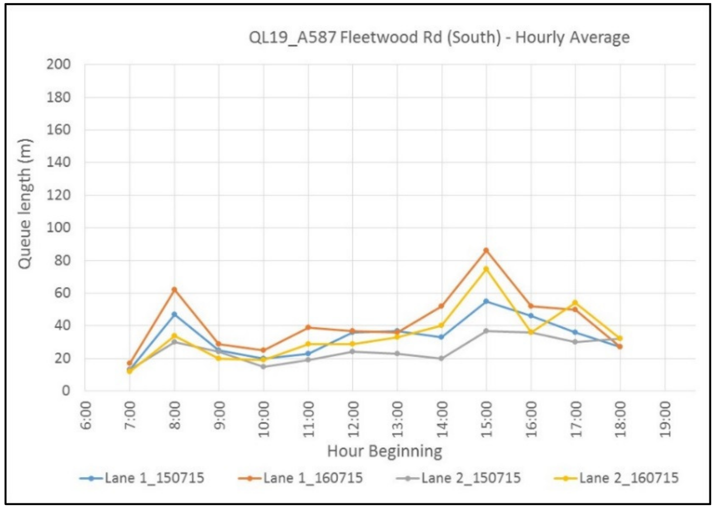


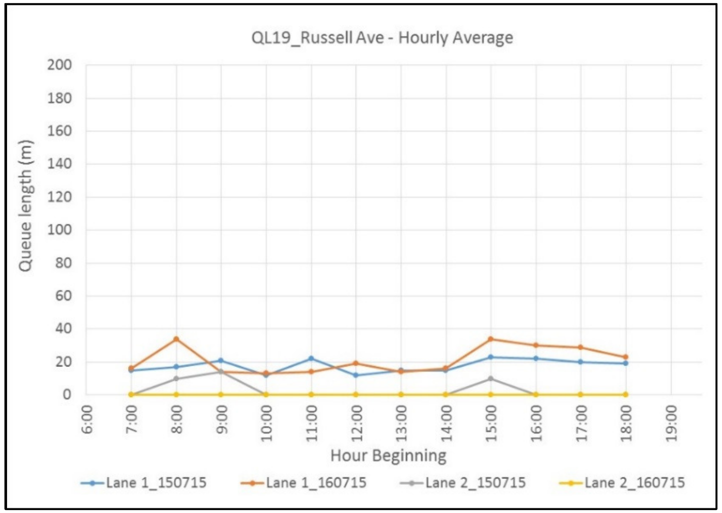

QL18_Red Bank Rd (West) - Hourly Average
Queue length (m)
200
180
160
140
120
100
80
60
40
20
0
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
Hour Beginning
Lane 1_150715
Lane 1_160715
Lane 2_150715
Lane 2_160715

QL19: A587 Fleetwood Rd / Warren Dr / Russell Ave

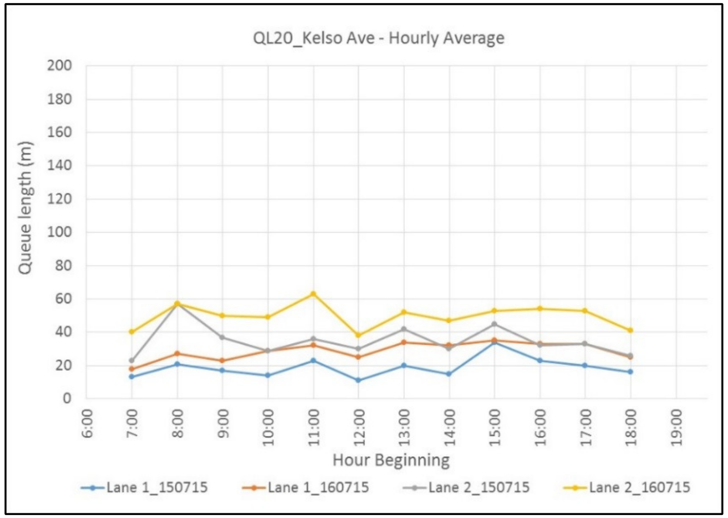


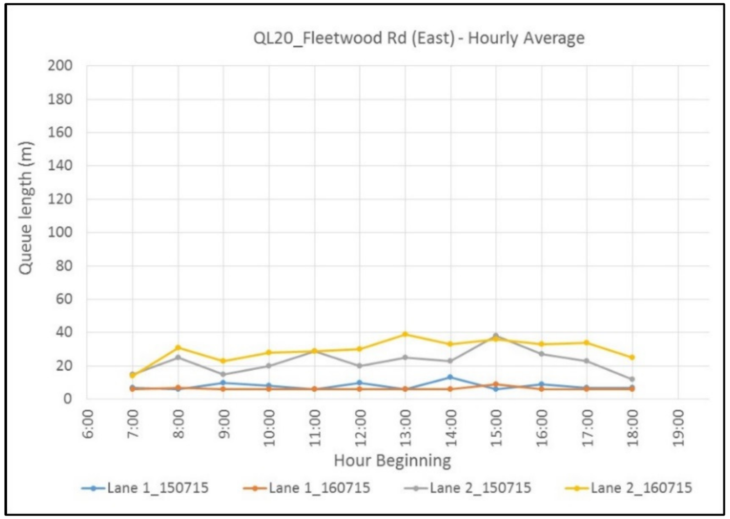


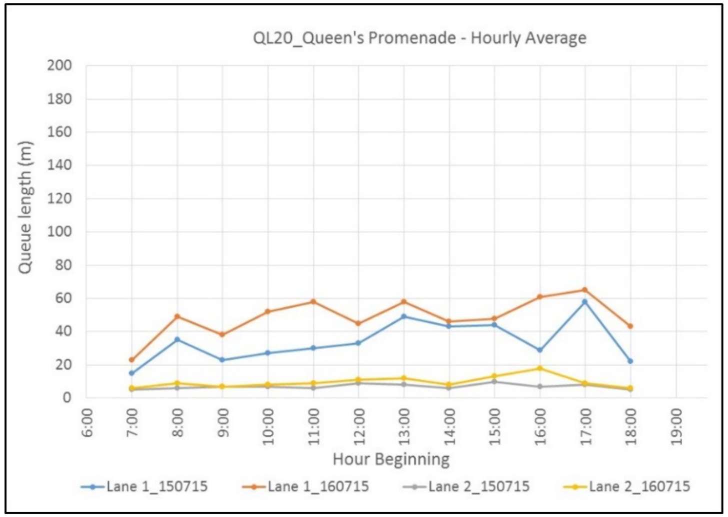




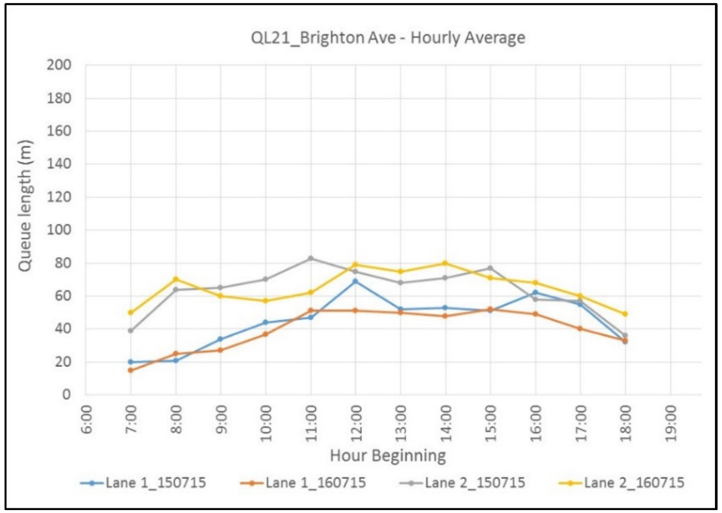
QL20: Kelso Ave / Fleetwood Rd / Queen's Promenade

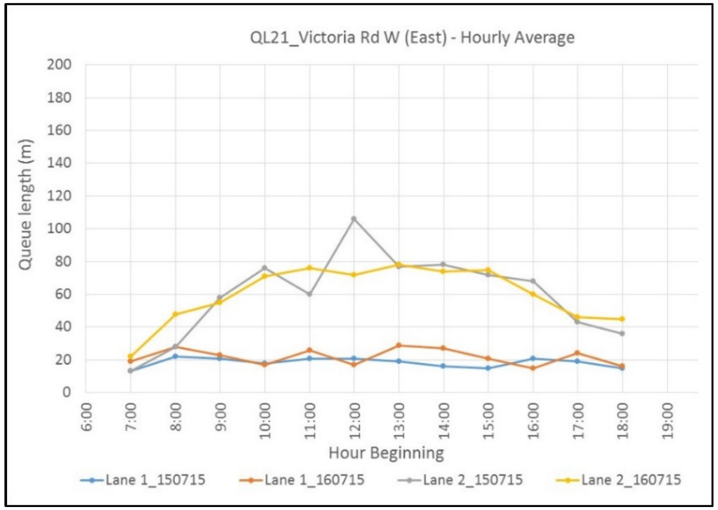


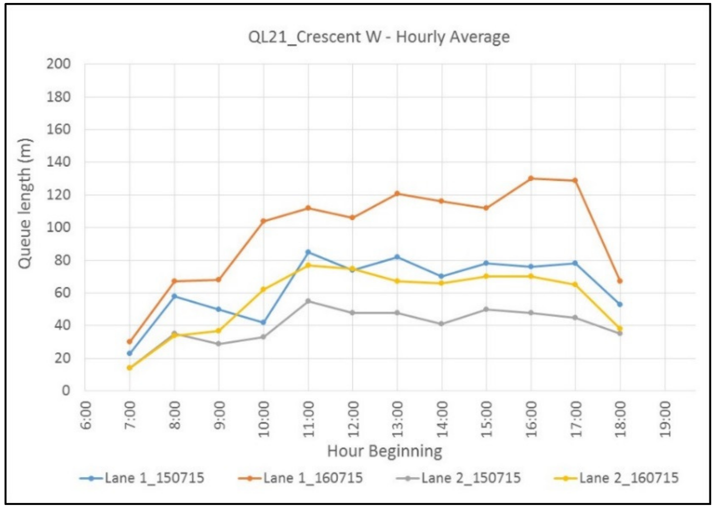




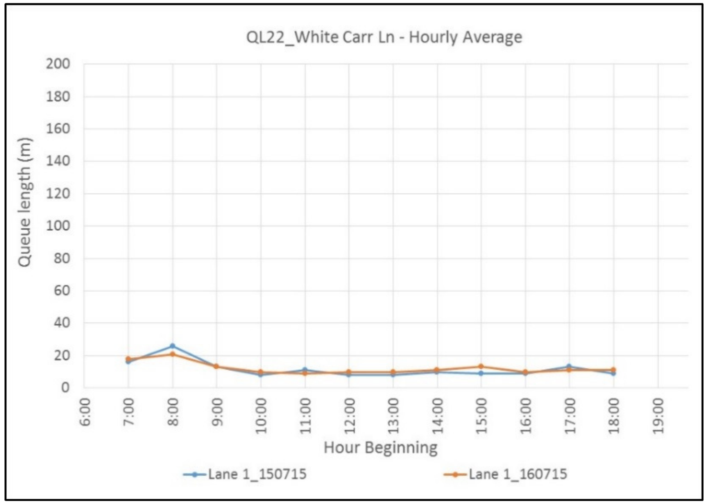
QL21: Rossall Rd / Brighton Ave / Victoria Rd W / Crescent W

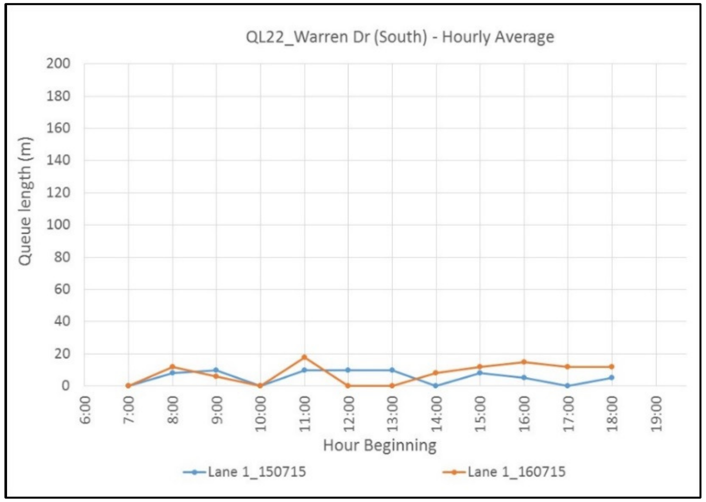


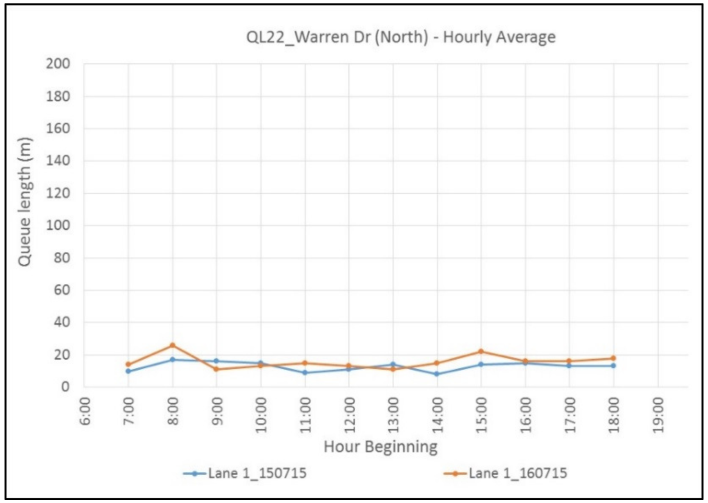




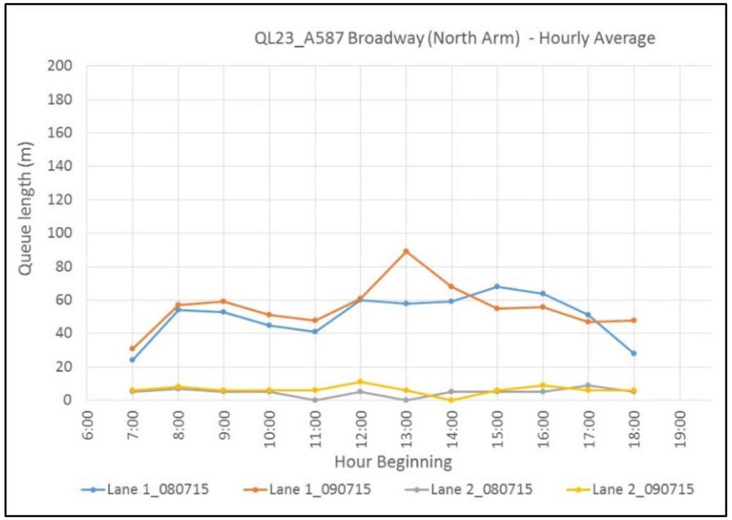
QL22: White Carr Ln / Warren Dr

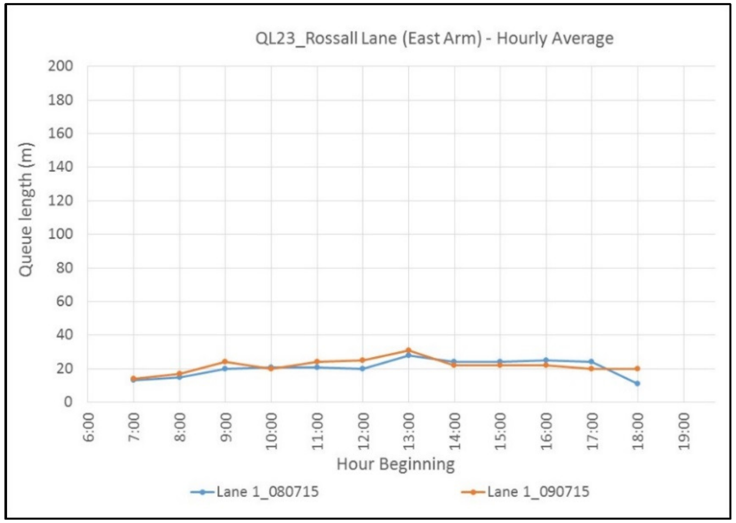


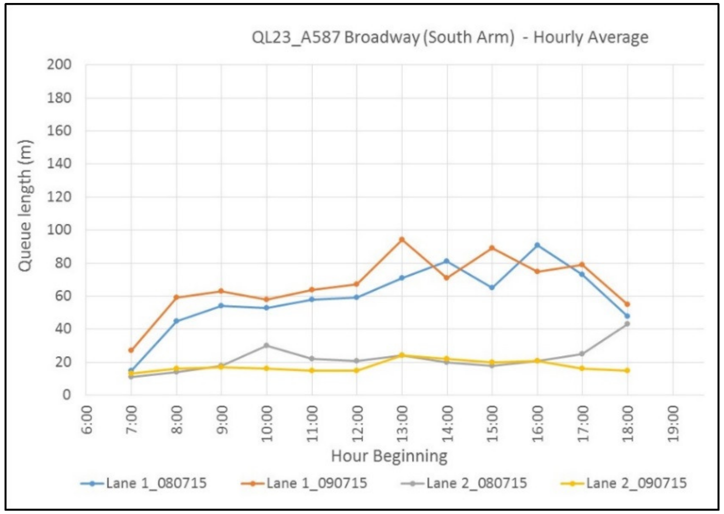


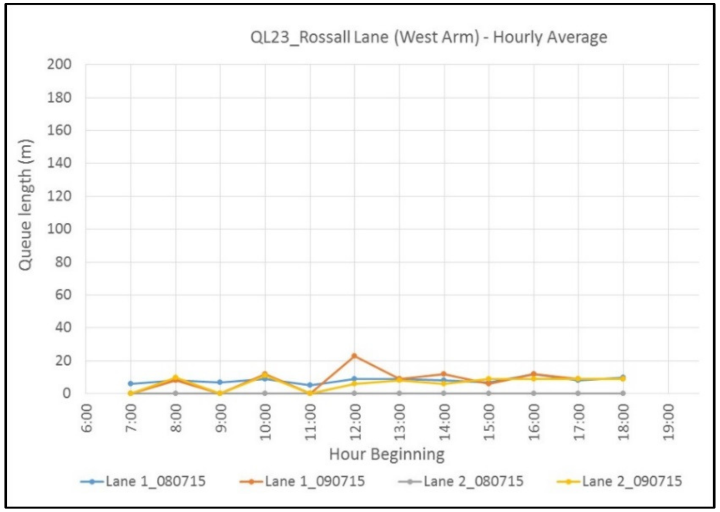


QL23: A587 Broadway /Rossall Lane

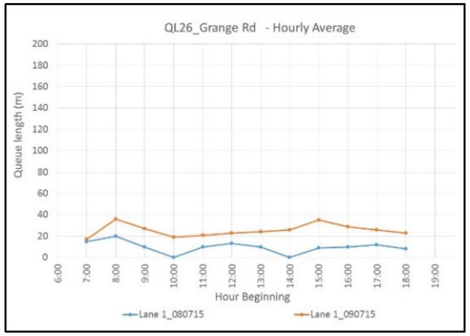


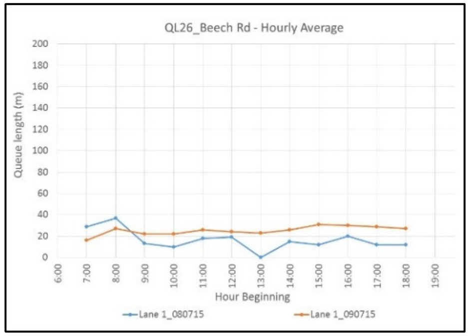


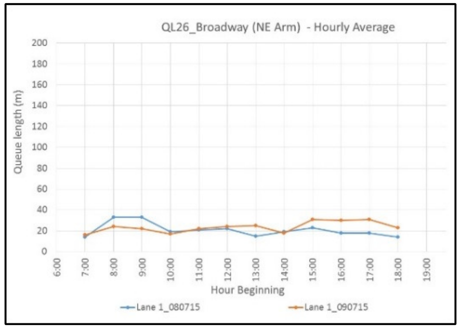


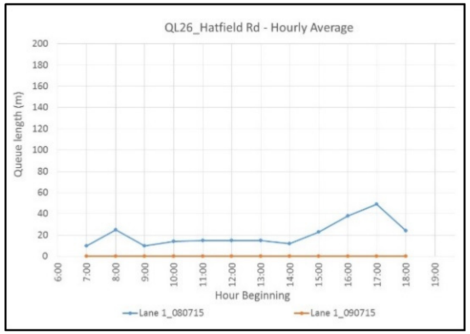


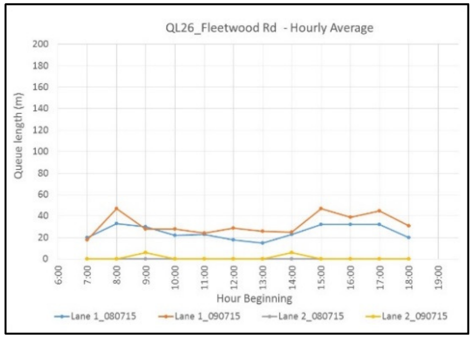
QL26: Grange Rd /Beech Rd /Broadway /Hatfield Ave /Fleetwood Rd /Chatsworth Ave

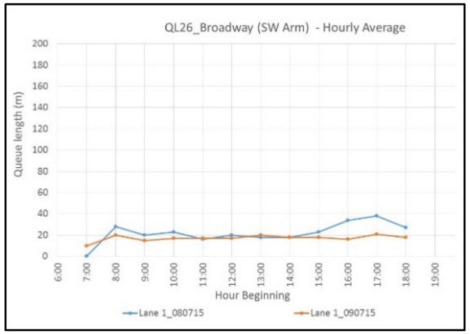


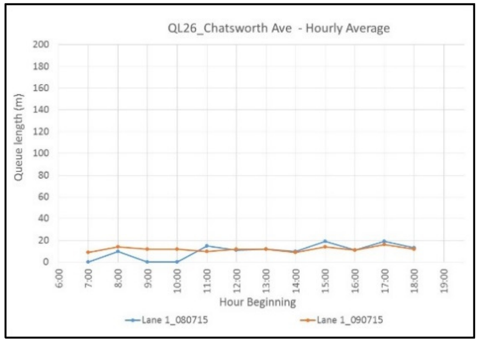




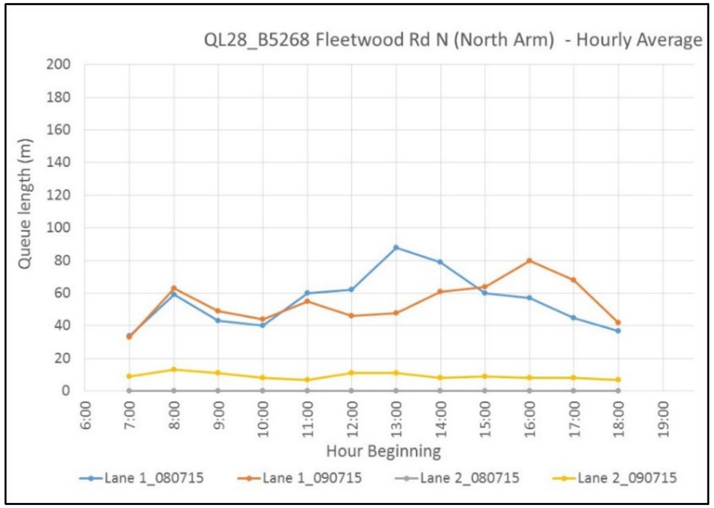


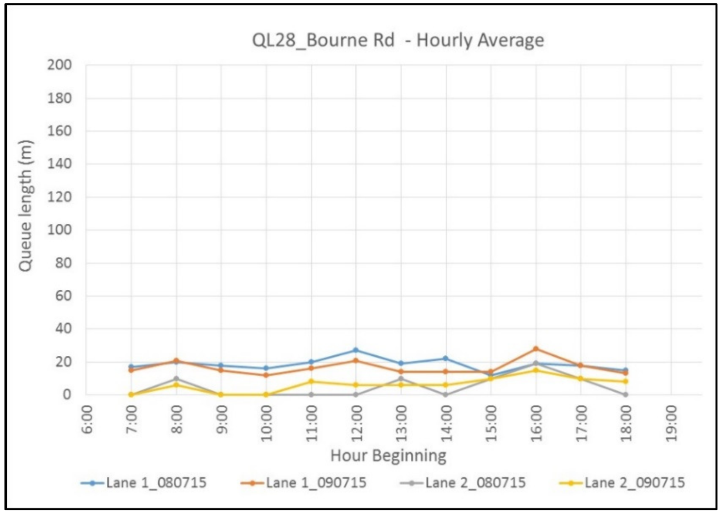


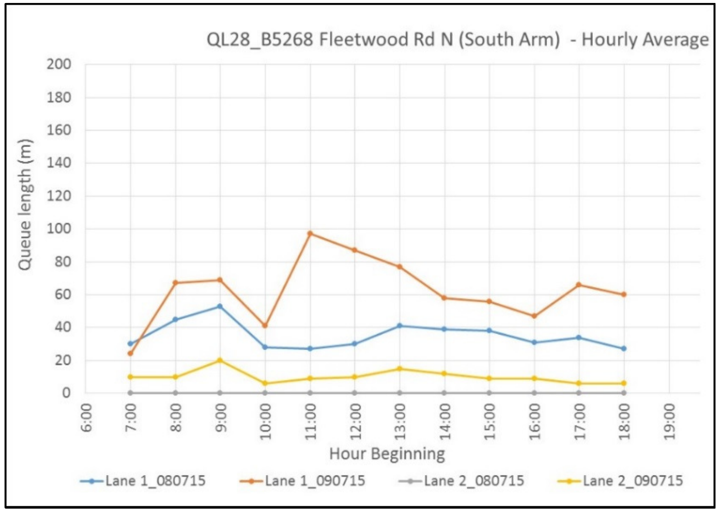


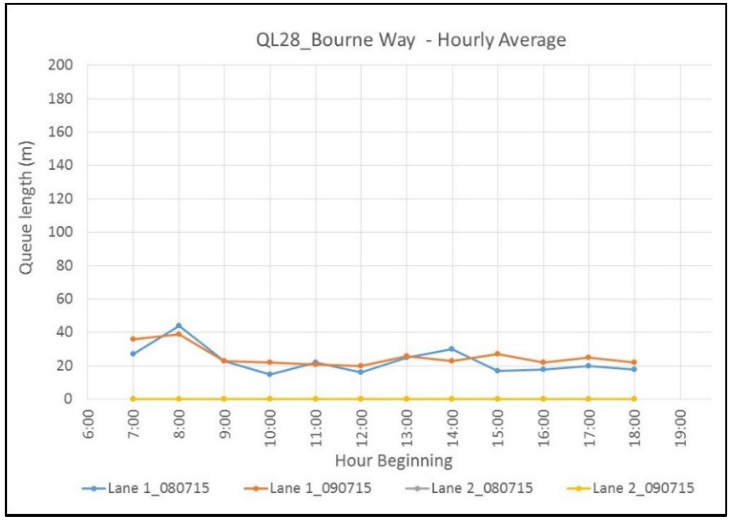


QL28: B5268 Fleetwood Rd N/ Bourne Rd /Bourne Way

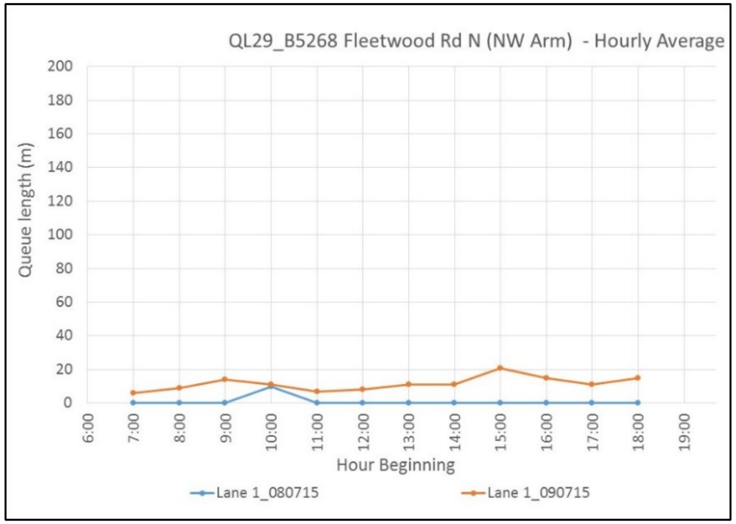


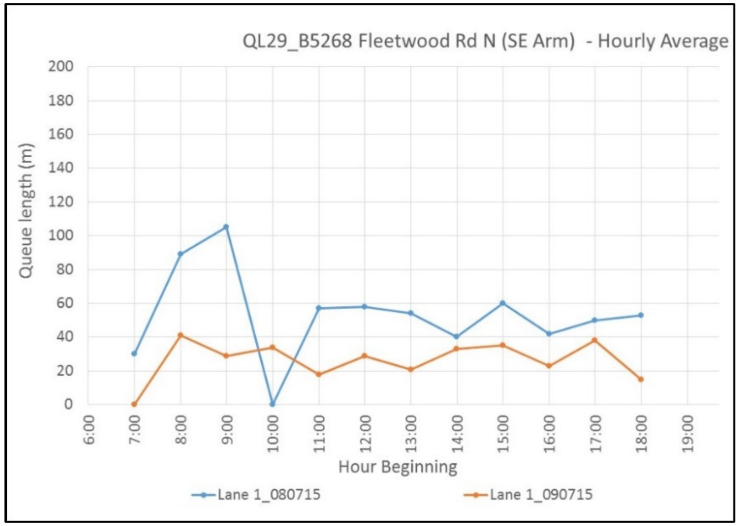


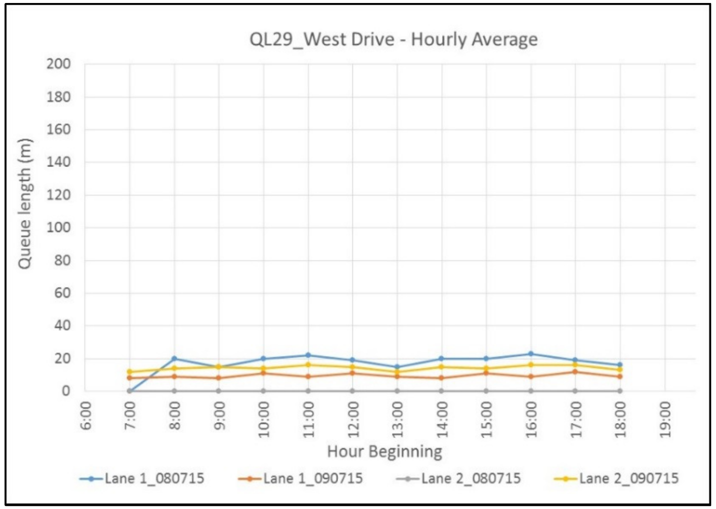




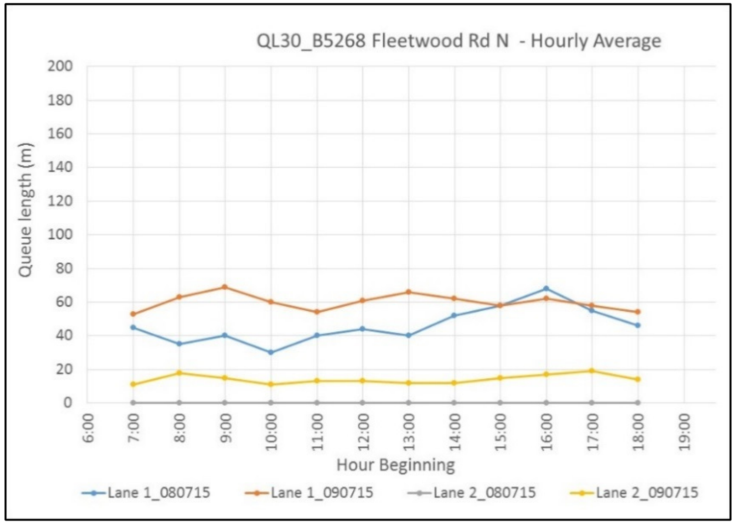
QL29: B5268 Fleetwood Rd N /West Drive

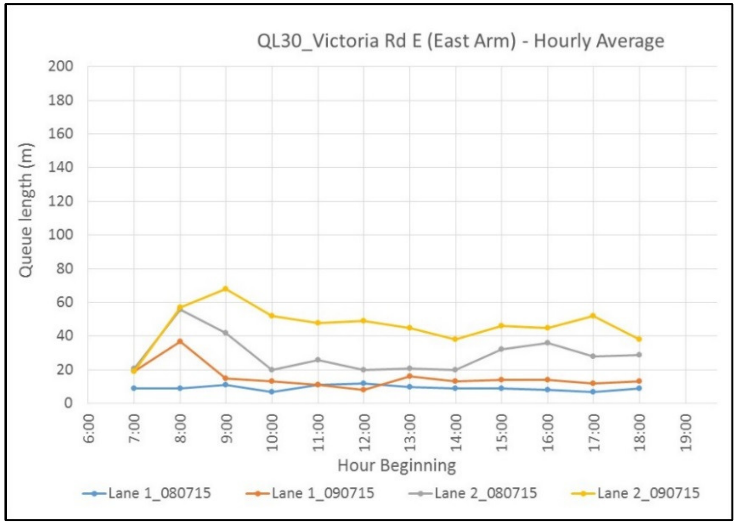


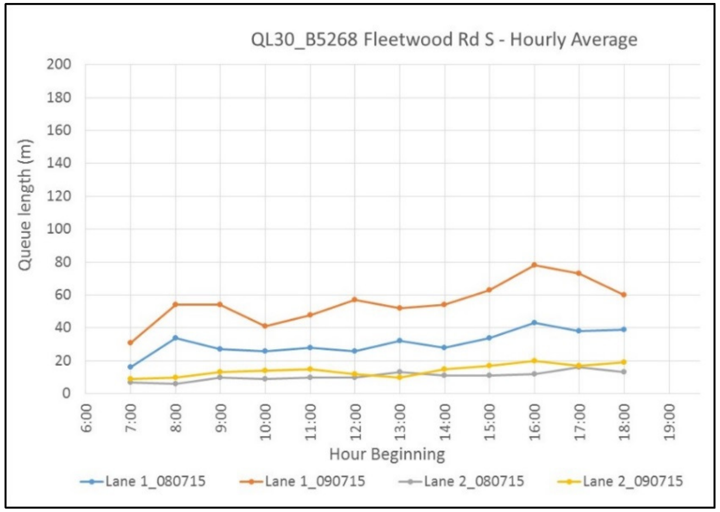


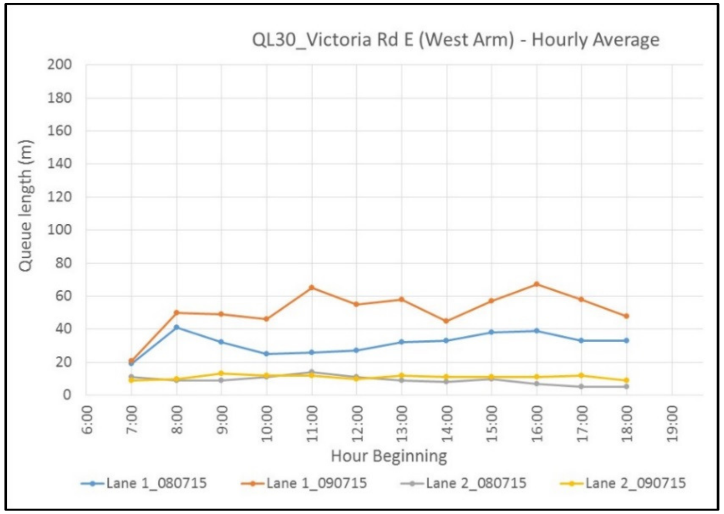


QL30: B5268 Fleetwood Rd N /Victoria Rd E /B5268 Fleetwood Rd S

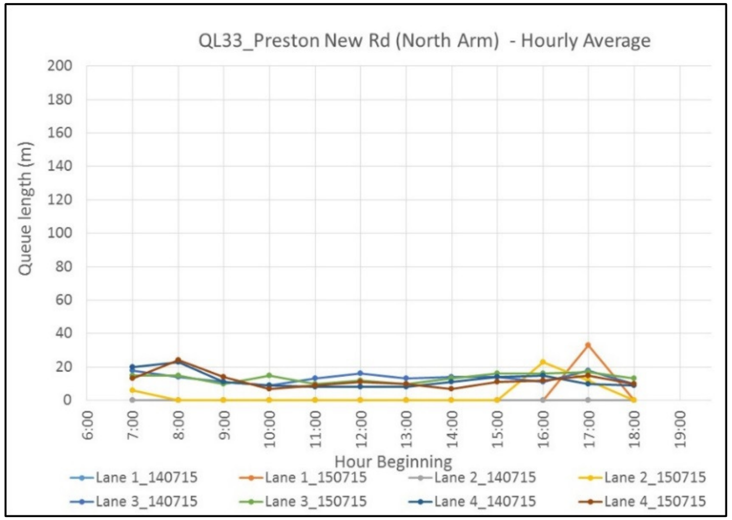


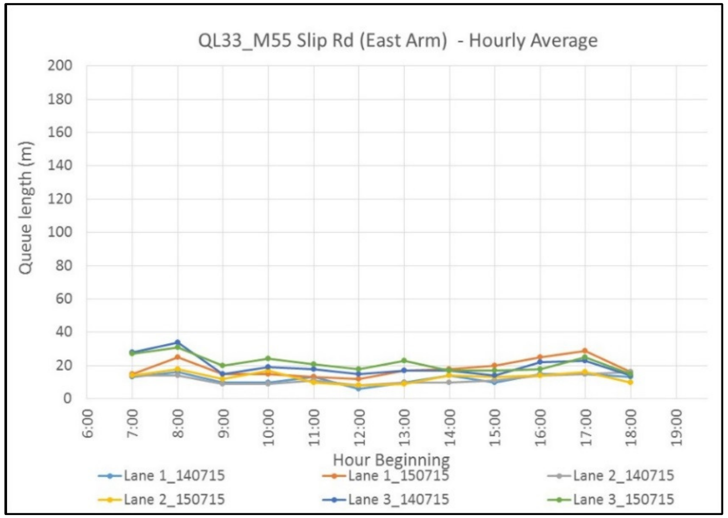


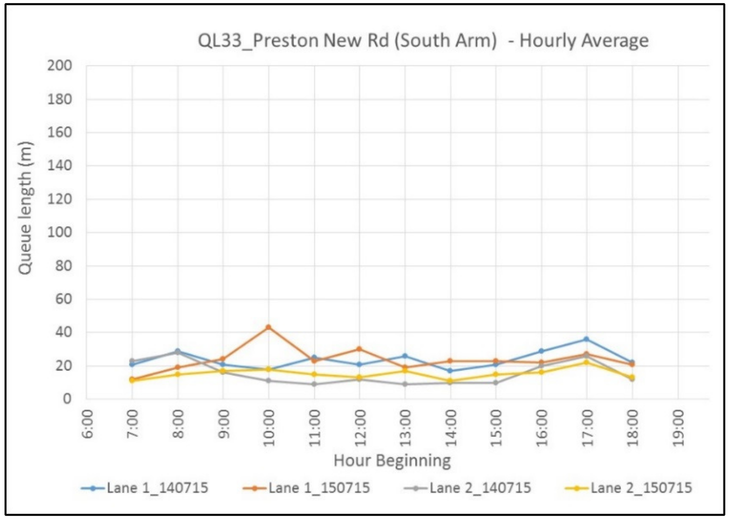


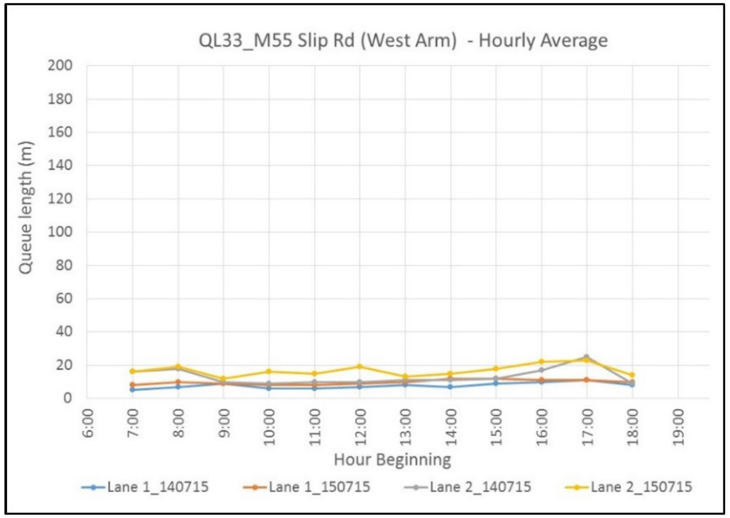


QL33: Preston New Rd/ M55 Slip Rd

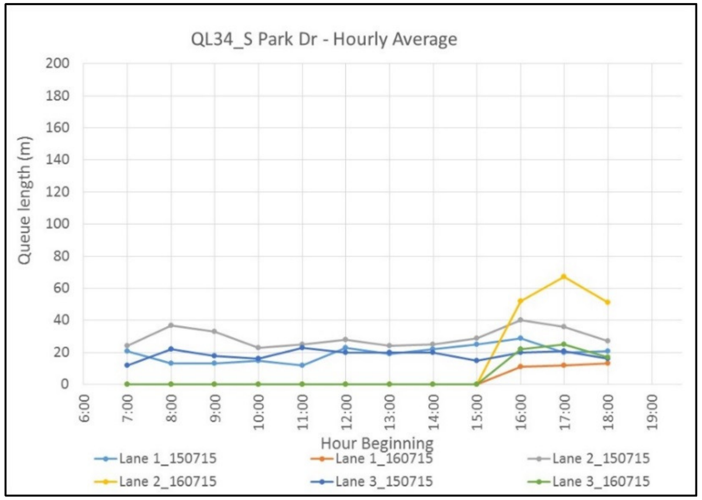


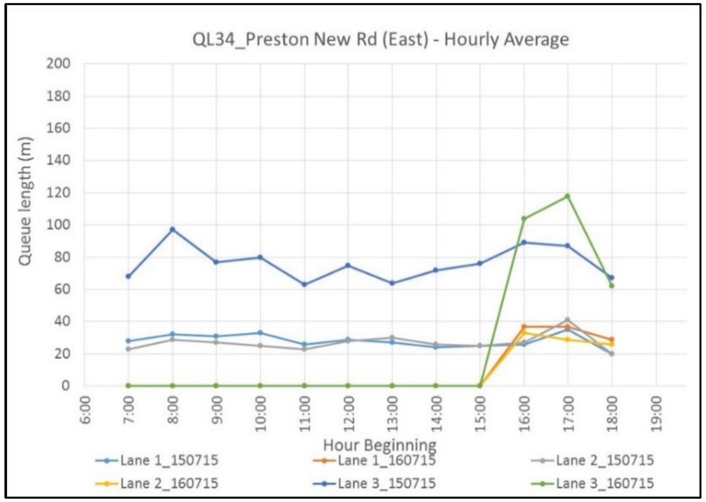


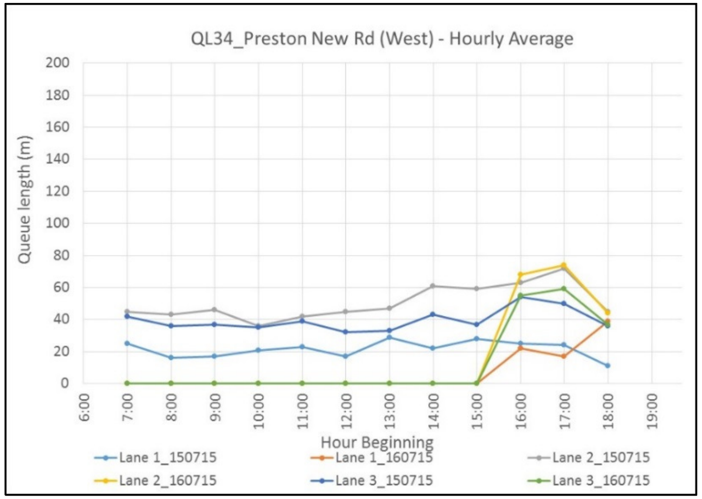




QL34: S Park Dr / Preston New Rd







APPENDIX O

Comparison of RSI Record Counts and Model Base Month and Year Traffic Counts

Table O-1 Numbers of RSI records in each dataset compared to model month and year traffic count

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
BCC 1	AM	Car	96	1554
		LGV	4	98
		HGV	3	51
	IP	Car	150	3055
		LGV	7	207
		HGV	1	87
	PM	Car	46	1448
		LGV	0	68
		HGV	0	41
BCC 2	AM	Car	58	1020
		LGV	5	39
		HGV	1	12
	IP	Car	115	1873
		LGV	4	76
		HGV	1	14
	PM	Car	45	1043
		LGV	1	25
		HGV	0	10
BCC 3	AM	Car	113	989
		LGV	9	26
		HGV	0	59
	IP	Car	172	1902
		LGV	6	50

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	0	93
	PM	Car	70	1114
		LGV	3	19
		HGV	1	58
BCC 4	AM	Car	122	853
		LGV	18	41
		HGV	2	1
	IP	Car	254	1451
		LGV	25	102
		HGV	2	1
	PM	Car	174	843
		LGV	12	28
		HGV	0	0
BCC 5	AM	Car	159	1921
		LGV	6	134
		HGV	0	18
	IP	Car	241	3347
		LGV	15	295
		HGV	5	28
	PM	Car	74	1783
		LGV	4	99
		HGV	0	4
BCC 6	AM	Car	321	1916
		LGV	21	70
		HGV	9	7
	IP	Car	496	3004
		LGV	55	147

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	11	2
	PM	Car	263	1755
		LGV	18	52
		HGV	1	1
BCC 7	AM	Car	168	1840
		LGV	8	170
		HGV	6	71
	IP	Car	236	3599
		LGV	13	345
		HGV	4	98
	PM	Car	136	2387
		LGV	1	133
		HGV	1	64
BCC 8	AM	Car	240	1167
		LGV	23	105
		HGV	3	2
	IP	Car	257	1954
		LGV	13	165
		HGV	3	0
	PM	Car	85	1477
		LGV	3	92
		HGV	2	0
BCC 9	AM	Car	186	1282
		LGV	52	164
		HGV	28	72
	IP	Car	570	2793
		LGV	92	299

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	31	129
	PM	Car	252	1779
		LGV	26	86
		HGV	5	49
BCC 10	AM	Car	259	1589
		LGV	18	90
		HGV	1	35
	IP	Car	388	3540
		LGV	63	252
		HGV	17	56
	PM	Car	200	1583
		LGV	2	68
		HGV	1	16
BCC 11	AM	Car	311	2206
		LGV	30	108
		HGV	5	14
	IP	Car	481	4001
		LGV	51	263
		HGV	5	24
	PM	Car	208	2339
		LGV	18	99
		HGV	0	4
BCC 12	AM	Car	279	2970
		LGV	37	187
		HGV	28	55
	IP	Car	478	5436
		LGV	58	379

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	44	92
	PM	Car	287	2855
		LGV	22	103
		HGV	4	20
BCC 15	AM	Car	320	2245
		LGV	40	264
		HGV	9	82
	IP	Car	562	3918
		LGV	66	528
		HGV	21	216
	PM	Car	306	2919
		LGV	17	278
		HGV	4	32
PWD 01 NB	AM	Car	288	1251
		LGV	12	145
		HGV	7	30
	IP	Car	357	2043
		LGV	20	200
		HGV	29	91
	PM	Car	261	1757
		LGV	14	154
		HGV	6	26
PWD 01 SB	AM	Car	229	1557
		LGV	5	124
		HGV	11	49
	IP	Car	364	2009
		LGV	14	239

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	9	95
	PM	Car	190	1597
		LGV	10	141
		HGV	16	16
PWD 11 WB	AM	Car	212	834
		LGV	15	74
		HGV	3	21
	IP	Car	483	1044
		LGV	43	119
		HGV	11	47
	PM	Car	209	562
		LGV	18	75
		HGV	9	10
PWD 13 NB	AM	Car	314	1784
		LGV	13	239
		HGV	10	52
	IP	Car	363	2368
		LGV	23	422
		HGV	10	104
	PM	Car	258	1845
		LGV	11	223
		HGV	10	33
PWD 27 SB	AM	Car	250	1673
		LGV	10	175
		HGV	5	97
	IP	Car	266	1869
		LGV	35	272

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	33	196
	PM	Car	278	1469
		LGV	7	103
		HGV	3	51
PWD 29 WB	AM	Car	173	794
		LGV	18	125
		HGV	7	47
	IP	Car	301	1288
		LGV	23	218
		HGV	8	107
	PM	Car	206	1088
		LGV	17	121
		HGV	5	19
PWD 29 EB	AM	Car	177	802
		LGV	4	79
		HGV	3	21
	IP	Car	391	1012
		LGV	13	134
		HGV	5	65
	PM	Car	188	749
		LGV	16	57
		HGV	8	13
PWD 2 EB	AM	Car	259	2920
		LGV	33	341
		HGV	22	110
	IP	Car	489	4088
		LGV	75	579

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	22	273
	PM	Car	246	3455
		LGV	27	242
		HGV	20	34
PWD 30 SB	AM	Car	216	1252
		LGV	8	118
		HGV	2	22
	IP	Car	330	2168
		LGV	20	220
		HGV	2	50
	PM	Car	128	1258
		LGV	7	90
		HGV	2	11
PWD 31 WB	AM	Car	207	2598
		LGV	32	422
		HGV	16	145
	IP	Car	410	3901
		LGV	101	746
		HGV	19	304
	PM	Car	256	2640
		LGV	30	357
		HGV	8	89
PWD 32 NB	AM	Car	161	1296
		LGV	35	215
		HGV	12	91
	IP	Car	446	2683
		LGV	38	424

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	12	161
	PM	Car	221	1610
		LGV	20	170
		HGV	5	49
PWD 33 EB	AM	Car	398	2463
		LGV	21	339
		HGV	16	267
	IP	Car	441	3936
		LGV	46	734
		HGV	16	598
	PM	Car	254	2500
		LGV	12	283
		HGV	11	117
PWD 33 WB	AM	Car	283	1830
		LGV	21	336
		HGV	14	231
	IP	Car	391	3211
		LGV	34	668
		HGV	15	534
	PM	Car	205	1931
		LGV	11	229
		HGV	16	134
PWD 34 NB	AM	Car	235	3331
		LGV	25	293
		HGV	16	122
	IP	Car	539	4385
		LGV	57	453

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	21	174
	PM	Car	258	2594
		LGV	21	177
		HGV	8	37
PWD 3 NB	AM	Car	213	2321
		LGV	22	243
		HGV	17	106
	IP	Car	465	3197
		LGV	51	431
		HGV	21	231
	PM	Car	268	2129
		LGV	25	235
		HGV	7	72
PWD 5 NB	AM	Car	131	2189
		LGV	23	377
		HGV	10	186
	IP	Car	374	3424
		LGV	62	530
		HGV	43	311
	PM	Car	211	2089
		LGV	26	249
		HGV	9	83
PWD 2 WB	AM	Car	223	3113
		LGV	16	333
		HGV	19	108
	IP	Car	459	4274
		LGV	46	588

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	14	256
	PM	Car	291	3267
		LGV	22	246
		HGV	5	47
PWD 3 SB	AM	Car	160	1591
		LGV	22	262
		HGV	16	83
	IP	Car	410	3259
		LGV	59	451
		HGV	16	158
	PM	Car	293	2945
		LGV	10	215
		HGV	8	48
PWD 35 WB	AM	Car	192	493
		LGV	12	46
		HGV	7	35
	IP	Car	487	727
		LGV	57	108
		HGV	16	47
	PM	Car	231	895
		LGV	20	73
		HGV	7	16
PWD 28 WB	AM	Car	97	342
		LGV	8	34
		HGV	5	13
	IP	Car	188	640
		LGV	14	88

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	11	25
	PM	Car	111	547
		LGV	5	56
		HGV	4	12
PWD 28 EB	AM	Car	148	693
		LGV	9	67
		HGV	18	8
	IP	Car	169	516
		LGV	15	66
		HGV	15	23
	PM	Car	111	354
		LGV	7	32
		HGV	6	6
PWD 10 SB	AM	Car	118	1337
		LGV	18	249
		HGV	8	122
	IP	Car	250	2054
		LGV	48	362
		HGV	22	218
	PM	Car	144	1476
		LGV	14	202
		HGV	5	44
PWD 9 SB	AM	Car	265	1786
		LGV	11	178
		HGV	3	47
	IP	Car	399	3249
		LGV	19	326

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	4	106
	PM	Car	173	1988
		LGV	6	172
		HGV	5	29
PWD 7 SB	AM	Car	169	1922
		LGV	9	200
		HGV	9	61
	IP	Car	387	3262
		LGV	51	373
		HGV	10	144
	PM	Car	213	1514
		LGV	13	104
		HGV	3	23
PWD 4 SB	AM	Car	167	991
		LGV	21	107
		HGV	9	27
	IP	Car	310	1747
		LGV	29	156
		HGV	6	65
	PM	Car	163	1089
		LGV	7	94
		HGV	4	9
PWD 4 NB	AM	Car	139	844
		LGV	18	90
		HGV	5	33
	IP	Car	297	1846
		LGV	27	200

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	15	52
	PM	Car	189	1515
		LGV	18	124
		HGV	7	14
ANSA 1	AM	Car	329	2638
		LGV	63	188
		HGV	22	235
	IP	Car	514	3536
		LGV	100	355
		HGV	59	529
	PM	Car	322	2154
		LGV	45	139
		HGV	13	135
ANSA 2	AM	Car	234	827
		LGV	19	98
		HGV	9	26
	IP	Car	410	1708
		LGV	63	181
		HGV	17	41
	PM	Car	233	1041
		LGV	45	51
		HGV	6	8
ANSA 3	AM	Car	248	1919
		LGV	55	119
		HGV	15	20
	IP	Car	419	2622
		LGV	74	230

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	32	36
	PM	Car	272	1351
		LGV	34	79
		HGV	4	2
ANSA 4	AM	Car	203	539
		LGV	21	50
		HGV	1	3
	IP	Car	268	954
		LGV	40	97
		HGV	5	0
	PM	Car	242	1094
		LGV	14	36
		HGV	1	0
ANSA 5	AM	Car	169	379
		LGV	12	32
		HGV	4	0
	IP	Car	218	456
		LGV	16	59
		HGV	9	0
	PM	Car	122	240
		LGV	4	19
		HGV	0	0

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Appendix C – Stage 2 Traffic Data Collection Report

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Working on behalf of Highways England

TRAFFIC DATA COLLECTION REPORT

A585 - Windy Harbour to Skippool

HE548643-ARC-GEN-A585-RP-TR-2022

02 AUGUST 2017

Incorporating

CONTACTS

NICK HENDERSON
Project Manager

dd +44 (0)1483 803153
[redacted]
e nicholas.henderson@arcadis.com

Arcadis.
The Surrey Research Park
10 Medawar Road
Guildford
GU2 7AR
United Kingdom

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Reviewer List

Name	Role
Marcus Chick	TAME
Richard Steinberger	Senior Transport Planning and Economics Advisor, TAME
David Hopkin	Highways England MP Project Manager

Approvals

Name	Signature	Title	Date of Issue	Version

TRAFFIC DATA COLLECTION REPORT

A585 - Windy Harbour to Skippool

Author	Mahesh S. / Alex Walton / Mark Hudson [redacted]
Checker	Amy Leather/ Saeed Ishtiaq [redacted]
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5.0	02/09/2017	Tom Rankin	Final – Issued for implementation

This report dated 02/09/2017 has been prepared for Highways England (the “Client”) in accordance with the terms and conditions of appointment dated 16 March 2016 (the “Appointment”) between the client and Arcadis Consulting (UK) Limited (“Arcadis”) for the purposes specified in the Appointment. For the avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

CONTENTS

1 INTRODUCTION

1.1 Purpose of the Traffic Data Collection Report

1.1.1 The aim of this Traffic Data Collection Report (TDCR) is to set out the traffic data to be used in the A585 Windy Harbour to Skippool project, taking into consideration the current stage in the Highways England Project Control Framework (PCF) process and any subsequent stages and statutory steps. The study area of the A585 scheme is shown in Figure 1-2.

1.1.2 The report collates, summarises and reviews existing data. Additional surveys undertaken, and associated data analysis, are described up to the point the data is to be used in the model building process. The outputs from the data collection process are summarised and relevant observations discussed.

1.2 Background

1.2.1 The A585 is the major transport link into the northern part of the Fylde/Wyre peninsula. It connects with the motorway network at Junction 3 of the M55. The route from Windy Harbour to Skippool, as shown in Figure 1-1, currently suffers from significant congestion during peak periods, leading to unreliable journey times and a poor safety record.

1.2.2 A junction improvement (‘pinch point scheme’) at the A585/A586 crossroads at Garstang New Road, Fleetwood Road and Windy Harbour was implemented in spring 2015. Further improvements to the A585 corridor west of A585/A586 Windy Harbour are in the process of consideration by Highways England with planning currently at PCF Stage 2.

1.2.3 Following an options sifting process and a Value Engineering Workshop held during PCF Stage 1, both online and offline solutions are being considered for the A585 between A585/A586 Windy Harbour and Skippool, including significant junction improvements in addition to single and dual carriageway options. Offline options include a bypass either to the north or the south of Little Singleton. Online options comprise the introduction of a gyratory (one-way) road system within Little Singleton, local widening and junction improvements including roundabouts and signals.

Figure 1-1 A585 – Windy Harbour to Skippool: Existing Road Layout

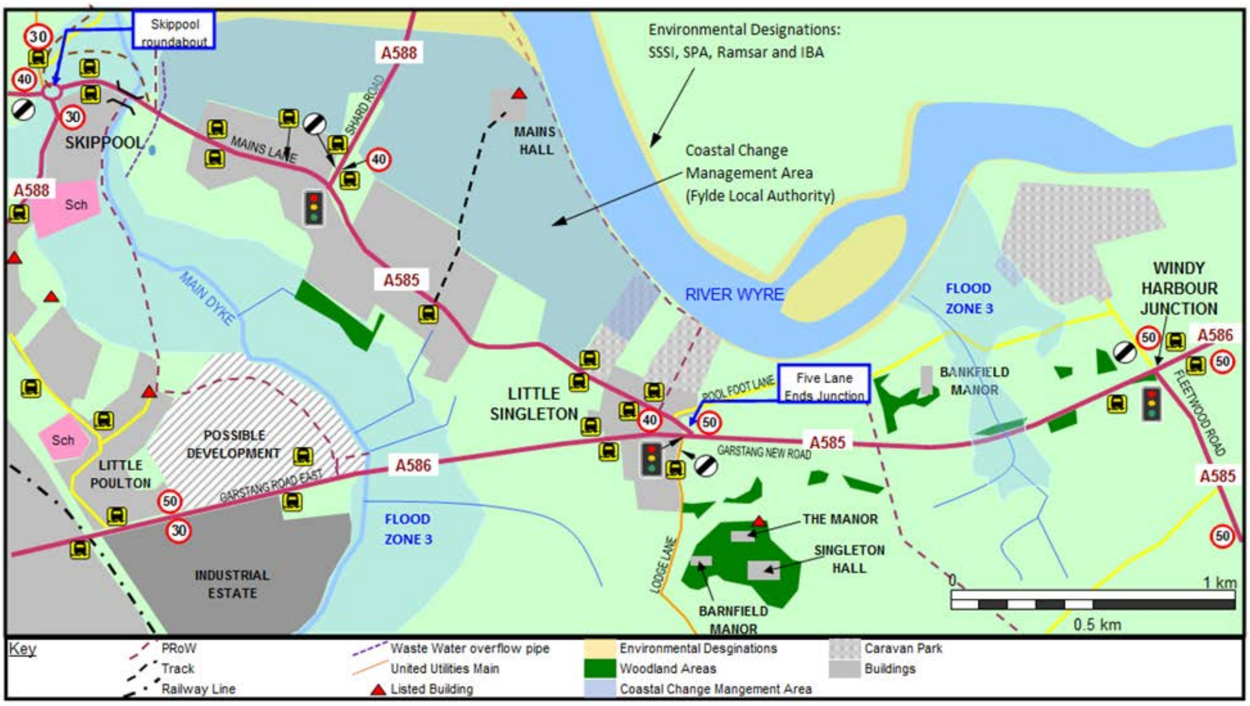

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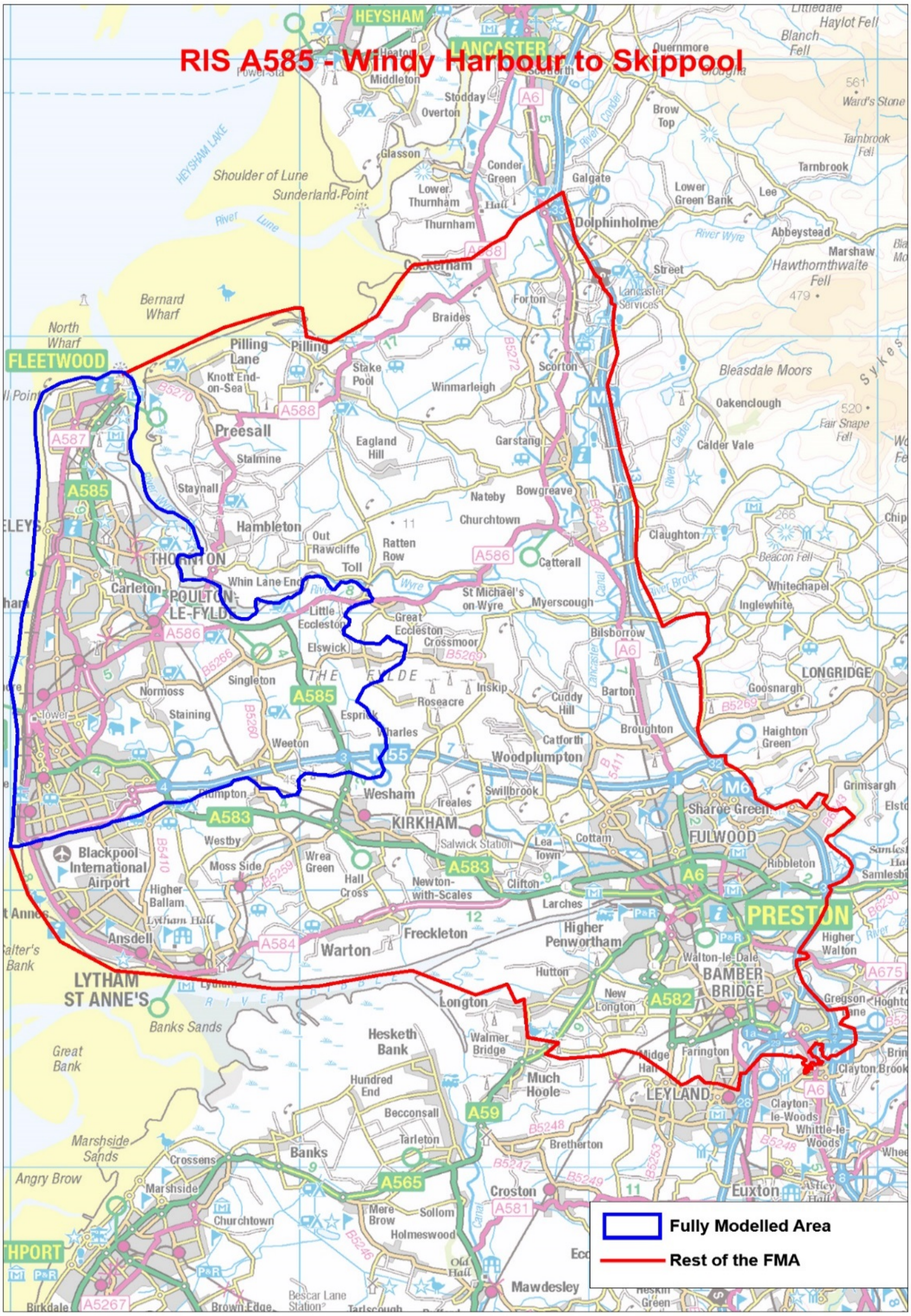
Figure 1-2 Fully Modelled Area



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1.3 Project Definition

1.3.1	Project Title:	RIS A585 – Windy Harbour to Skippool
1.3.2	A585 ID Number (PIN):	548643
1.3.3	Scheme Type:	Major Project – Improvement Scheme
1.3.4	PCF Stage:	Stage 2

2 NEED FOR TRAFFIC DATA

2.1 Scheme Objectives

2.1.1 The Options Assessment Report (OAR) produced by Highways England identified the following seven transport objectives for the A585 Windy Harbour to Skippool junction improvement options study:

- **Objective 1**: Reduce congestion on the existing A585 through Little Singleton, Shard and Skippool junctions
- **Objective 2**: Improve journey time reliability
- **Objective 3**: Reduce severance and improve access across the existing A585 between the Little Singleton and Skippool junctions
- **Objective 4**: Reduce/minimise the impact on the wider environment for air quality and noise
- **Objective 5**: Improve connectivity and community cohesion
- **Objective 6**: Reduce the obstacles to the economic growth potential in both Wyre and Fylde
- **Objective 7**: Compliment and realise the full benefits of the earlier Pinch Point scheme at Windy Harbour junction

2.1.2 Wider objectives as outlined in the Strategic Outline Business Case (SOBC) include supporting employment and residential/commercial development opportunities, delivering capacity enhancements to the Strategic Road Network (SRN) whilst supporting the use of sustainable modes and improving access to the Enterprise Zone at Warton.

2.2 Principal Data Requirements

2.2.1 The traffic data requirements in the development and appraisal of the A585 Windy Harbour to Skippool scheme in the context of the scheme design, PCF products, economic appraisal and environmental assessment are defined in the Appraisal Specification Report (HE548643-HYD-GEN-A585-RP-TR-2044-v3.0).

2.2.2 The principal requirements for traffic data are to:

- Support the development of a robust traffic model
- Support the development of forecasts which will be used for economic and environmental appraisal

2.2.3 The data required is defined by the modelling approach adopted, which for this scheme is a SATURN based traffic assignment model using demand matrices developed based on the methodology set out in the ASR. This involves the collection of a large set of the latest traffic data and Road Side Interview (RSI) data collected for previous studies, including the A585 Corridor & Thornton-Fleetwood Area Action Plan (A585 CTF) S-Paramics Model, Blackpool Transport Model and the Central Lancashire Highways and Traffic Model, and then processing it to the current year using matrix estimation.

2.2.4 The data summarised in this report will also be used to support the development of an up-to-date microsimulation model (in S-Paramics software) in order to carry out operational assessment of the proposed scheme options.

2.2.5 The base model will be developed in SATURN for the AM, Inter Peak (IP) and PM peak hours on an average weekday in June 2015. These time periods will be identified from the ATC data collected specifically for this study.

2.3 Use of Existing and New Survey Data

2.3.1 The PCF Stage 0 traffic modelling work for the A585 Windy Harbour to Skippool scheme was undertaken by Mouchel Ltd. in November 2014. The Stage 1 traffic modelling (using S-Paramics) was undertaken by Arcadis (commencing in September 2015). Most of the data used to build the A585 CTF S-Paramics model (for Stage 1 modelling) was based on RSIs carried out in 2008

2.3.2 Highways England guidance provided to Hyder on 9 June 2015 (‘*TAME Advice Note 1 v1.0*’ by Roger Himlin) states that, *“Traffic models can use data up to 10 years old, however the data should not be older than 10 years, by the time of public consultation”.* The majority of the RSI data used in the development of the Stage 0 A585 CTF S-Paramics model is less than 10 years old; therefore, the previous model matrices and metadata will be used as far as possible to assist matrix production for this study. However, to ensure robust results, these matrices will be updated using 2015 control data including traffic counts undertaken in 2015 and/or information taken from TEMPRO (Trip End Model Presentation Program) as appropriate.

2.3.3 As part of new data collection activities, traffic surveys were undertaken in July and September/October 2015 and February/March 2016. The data obtained from the traffic surveys will provide a significant proportion of the count data for the purposes of matrix expansion, re-basing, matrix estimation and model validation.

3 AVAILABILITY OF PREVIOUS TRAFFIC MODELS AND TRAFFIC DATA

3.1 Previously Developed Traffic Models

3.1.1 A review of previously developed traffic models within or in close proximity to the study area was undertaken to assess their suitability and availability. The following models were considered to be relevant to the A585 scheme:

- A585 Corridor - Thornton-Fleetwood (CTF) S-Paramics model
- Further recent S-Paramics modelling under this commission (PCF Stage 1)
- The Blackpool Transport Model (CUBE) (including matrices already used in the A585 CTF model)
- The Central Lancashire Highways & Traffic Model (CLHTM); including modelling undertaken for the Preston Western Distributor (PWD) scheme

3.1.2 A summary of these previously developed traffic models is provided in Table 3-1.

Table 3-1 Previously Developed Traffic Models

Traffic Model		Year Developed	Remarks
1	A585 CTF S-Paramics model	2010	Validated for flow, but not fully validated for JT (AM peak).
2	Further S-Paramics modelling under this commission (PCF Stage 1)	Originally in 2010, later adjusted to 2014 base using TEMPRO	Validated only for the study area. Limited spatial extent. Of sufficient quality only for operational assessment.
3	Blackpool Transport Model (CUBE)	2008	Model has not been maintained, no LMVR available.
4	CLHTM (PWD)	2014	Model lacks detail in the A585 scheme area.

3.1.3 Where appropriate, some of the data used in the development of the models described in Table 3-1 will be used to develop the SATURN model for the A585 Windy Harbour to Skippool scheme, as set out in Section 3.2.

3.2 Previously Collected Traffic Data

3.2.1 As part of the development of the traffic models set out in Section 3.1.1, the following data was obtained from previous A585 studies:

- Road Side Interview (RSI) data
- Automatic Traffic Count (ATC) data
- Manual Classified Link Count (CLC) data
- Manual Classified Junction Count (CJC) data

3.2.2 A summary of the traffic data obtained from previous studies is provided in Table 3-2.

Table 3-2 Summary of Previously Collected Traffic Data

Traffic Data		Year Collected	Remarks
1	Blackpool RSIs	Collected in 2008	Data is within the ten-year time horizon specified in TAME Advice Note 1 v1.0. Extensive coverage of the A585 study area.
2	A585 & Surroundings RSIs (ANSA)	Collected on 11th, 12th and 13th May 2010	
3	RSIs collected for the Preston Western Distributor Model	Collected on 22/04/2014	Data is relatively recent; however, all RSIs are outside the A585 study area.
4	Blackpool Council – Temporary ATCs	2012 to 2015	Data is relatively recent; with some coverage of the A585 study area.
5	Blackpool Council – Permanent ATCs	2012 to 2015	
6	Lancashire County Council – Permanent ATCs	2011 to 2015	Data is relatively recent; with some coverage of the A585 study area.
7	Lancashire County Council – Temporary ATCs	2011 to 2015	Data is relatively recent; with extensive coverage of the A585 study area.

3.2.3 This previously collected data was reviewed for its suitability for developing the SATURN model for the A585 Windy Harbour to Skippool scheme.

3.2.4 RSIs and traffic counts carried out in Blackpool in 2008 were used in the development of the A585 Corridor & Thornton-Fleetwood CTF S-Paramics model. Based on consideration of the CTF model's area of influence and the Blackpool RSIs, data from five additional RSI sites (as collected by ANSA in May 2010, and referred to as the 'A585 and surroundings' RSIs) were obtained. Some of the Blackpool RSI sites were not used in the S-Paramics model, but have also been used in the development of the SATURN model for the current A585 scheme.

3.2.5 Figure 3-1 shows the location of the Blackpool and the A585 and Surroundings RSI sites.

3.2.6 As part of the development of the CLHTM (PWD) model, RSI data was collected at a number of sites, which are shown in Figure 3-2. Although all of these sites are located outside the FMA of the proposed A585 SATURN model, the trips they intercepted may pass through the FMA and so will be used, as appropriate, in the building of observed matrices for the new model.

3.2.7 Table 3-3 shows the exact dates on which RSIs were collected at the above-mentioned sites.

Table 3-3 Dates of RSIs

RSI Source	Site #	Date of RSI
ANSA RSIs	A1	13-May-2010
	A2	11-May-2010
	A3	12-May-2010
	A4	12-May-2010
	A5	11-May-2010
Blackpool RSIs	B1	9-May-2008
	B2	9-May-2008
	B3	13-Jun-2008
	B4	23-May-2008
	B5	23-May-2008
	B6	23-May-2008
	B7	13-Jun-2008
	B8	16-May-2008

RSI Source	Site #	Date of RSI
	B9	16-May-2008
	B10	16-May-2008
	B11	6-Jun-2008
	B12	9-May-2008
	B15	6-Jun-2008
PWD RSIs	All Sites	22-Apr-2014

3.2.8 Some of the RSI data, those collected in 2008 and 2010, we received from the consultants who had developed the previously used A585 CTF model. Information was cleaned from model development technical reports, also supplied, about how the raw RSI records had been checked for reasonableness.

3.2.9 An analysis of the data that we received led to us to infer that the 2010 ANSA interview records supplied were not from the cleaned dataset that had been produced by the previous modelling consultants. As a consequence, a cleaning procedure was applied to these data, but only to the 2010 ANSA records since our analysis allowed us to conclude that the supplied 2008 and 2014 data did come from the cleaned datasets produced by the previous consultants.

3.2.10 A description of the analysis that was carried out on the supplied RSI data and a discussion of the way in which the 2010 ANSA records were cleaned is given in Chapter 4.

Figure 3-1 Blackpool and A585 & Surroundings RSI Site Locations

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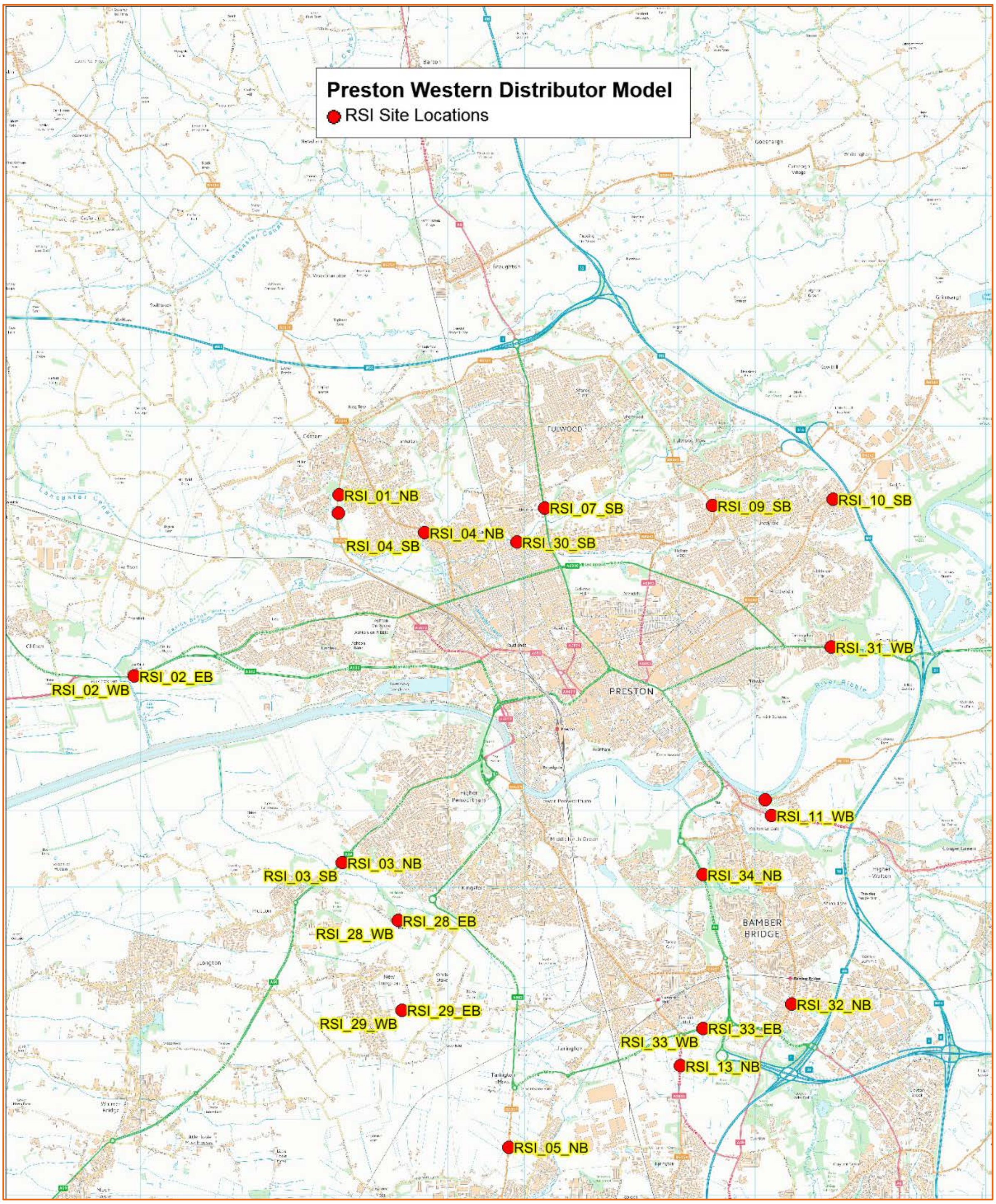
Figure 3-2 CLHTM PWD RSI Site Locations



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3.2.11 Blackpool Council has permanent Automatic Traffic Count (ATC) data counters placed at approximately 21 sites. In addition, the Council also maintains temporary ATC counters at several locations and has provided the most recent data at these locations. The Blackpool Council ATC data locations are illustrated in Figure 3-3.

3.2.12 Figure 3-4 and Figure 3-5 illustrate the Lancashire County Council (LCC) permanent and temporary ATC count locations. ATC data at some of these sites dates back to 2008, while some sites contain data as recent as August 2015**.**

Figure 3-3 Blackpool Council ATC Data Locations

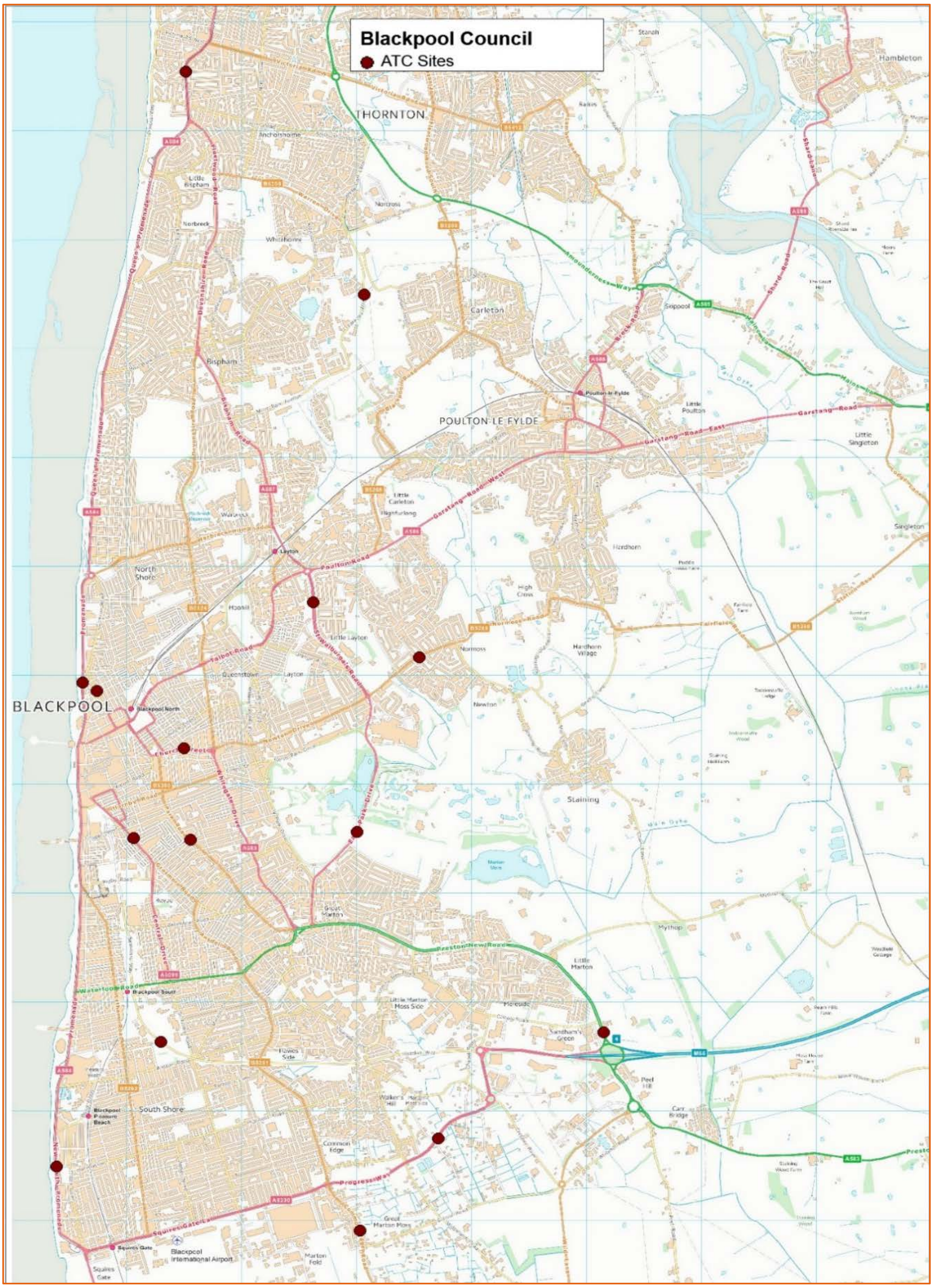

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Figure 3-4 Lancashire County Council Permanent ATC Site Locations

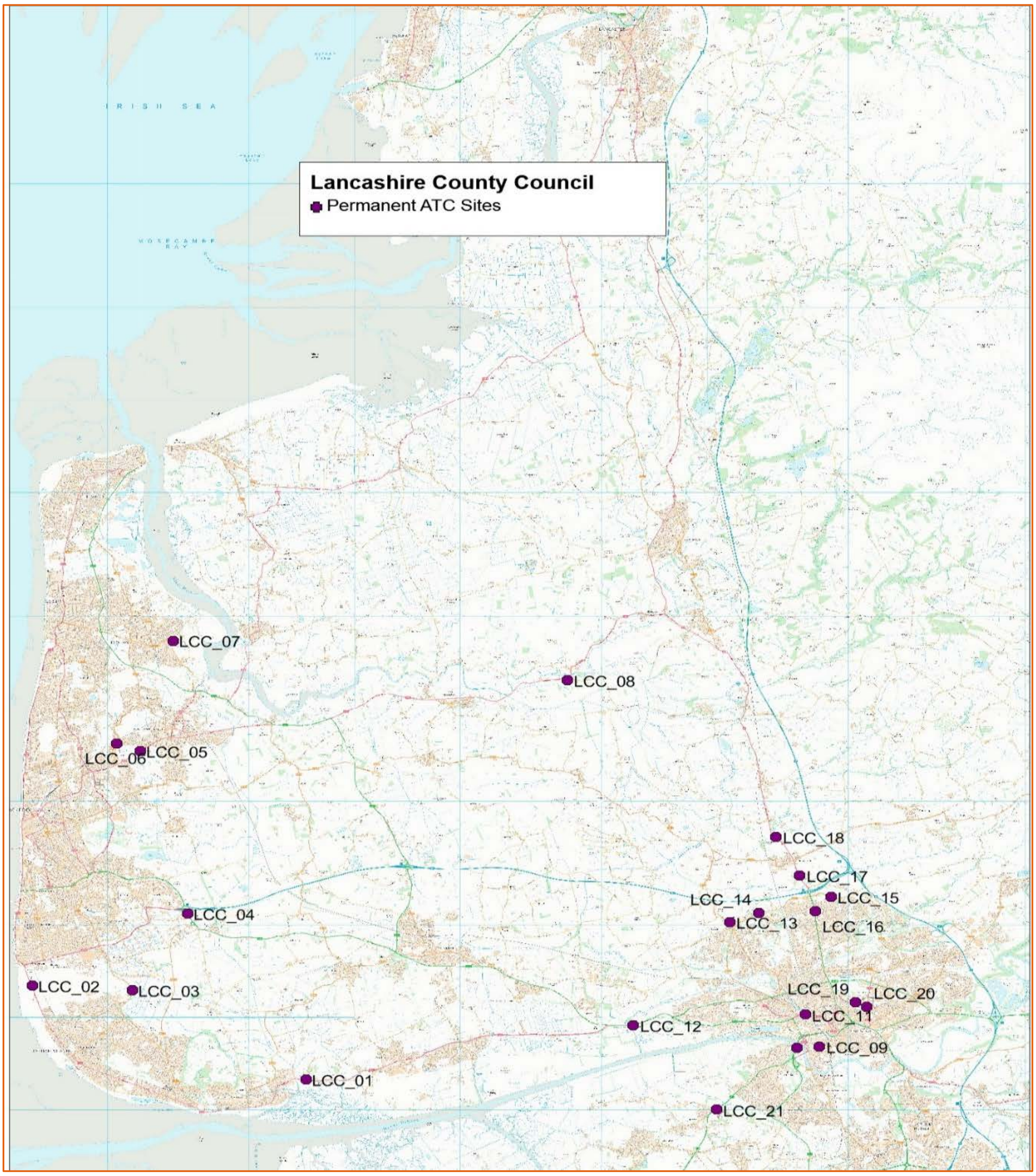

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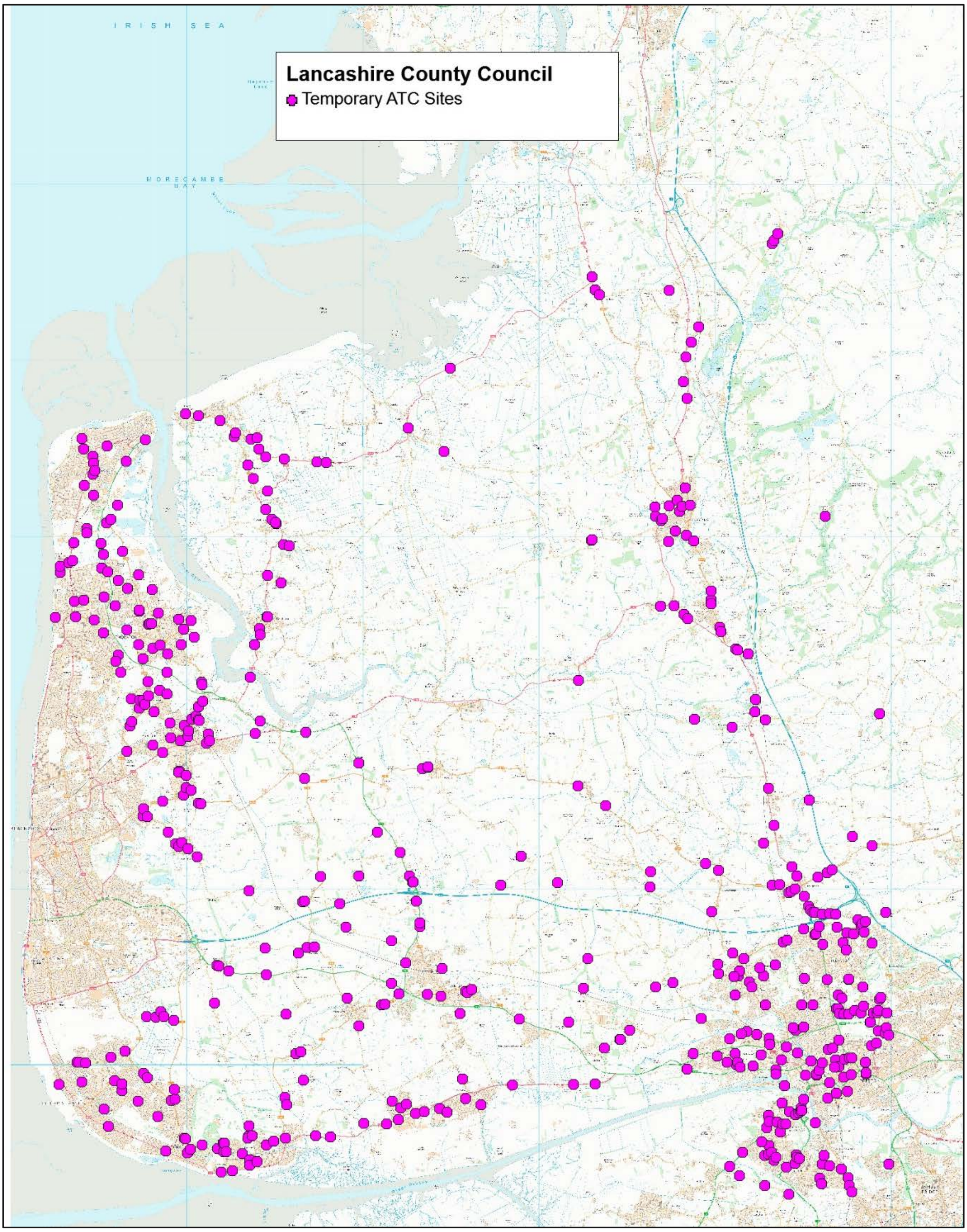
Figure 3-5 Lancashire County Council Temporary ATC Site Locations



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3.3 Summary

3.3.1 Table 3-4 provides a summary of the previously developed traffic models and previously collected traffic data discussed in this chapter. Where appropriate, these data sources have been used in the A585 model development process, as described in the final column of the table.

Table 3-4 Summary of Previous Traffic Models and Traffic Data

Previous Traffic Models		Year Developed	Use in A585 Model Development
1	A585 CTF S-Paramics Model	2010	S-Paramics model zone boundaries were reviewed whilst developing the A585 SATURN model zone boundaries.
2	Further S-Paramics modelling (PCF 1)	Originally in 2010, later adjusted to 2014 base using TEMPRO	
3	Blackpool Transport Model (CUBE)	2008	Signal timings were reviewed to determine if they could be used at any of the signalised junctions in the A585 SATURN model.
4	Central Lancashire Highways & Transport Masterplan (CLHTM) – Preston Western Distributor (PWD)	2014	Counts collected during 2014 at a number of Road Side Interview (RSI) sites in the vicinity of Preston were used as a contribution to the development of the base year matrices for the A585 SATURN model.
Previous Traffic Data		**Date Collected**	**Use in A585 Model Development**
1	Blackpool RSIs	Collected in 2008	Used to develop the base year matrices for the A585 SATURN model, after being uplifted to June 2015 traffic counts. The distributions of the trips recorded in these data sets were also used to generate distributions of generalised costs, which were used as inputs to the gravity model that was used in the synthesis of the prior matrix.
2	A585 & Surroundings RSIs (collected by ANSA)	Collected in 2010	
3	RSIs collected for CLHTM (PWD)	Collected in 2014	
4	Blackpool Council - Temporary ATCs	2012 to 2015 data	Used to derive factored counts for calibration/validation at screenlines and cordons.
5	Blackpool Council - Permanent ATCs	2012 to 2015 data	
6	Lancashire County Council – Permanent ATCs	2011 to 2015 data	
7	Lancashire County Council – Temporary ATCs	2011 to 2015 data	

3.3.2 However, it was still necessary to collect additional data at specific locations for calibration and validation purposes and to develop a robust traffic model in accordance with WebTAG requirements. Additional data was also needed to derive Yearly Growth Factors and Monthly Seasonality Factors at specific site locations. The traffic survey programme is discussed in Chapter 5.

4 RSI DATA COLLECTION AND CLEANING

4.1 Introduction

4.1.1 The development of the new SATURN model builds on work undertaken by former consultants in respect of the A585 Corridor – Thornton-Fleetwood (CTF) Action Area Plan, in which an S-Paramics microsimulation model was built. As the A585 CTF model and the new SATURN model share parts of their fully modelled areas, the observed trips that were used to inform the matrix building of the CTF model are relevant to the SATURN model.

4.1.2 As described in section 3.2, the observed trips used in the previous models were derived from roadside interview (RSI) records that were collected in different years. The previously built models that are of significance to the current modelling comprise the following:

- A585 CTF – S-Paramics microsimulation model
- Blackpool Cube Model
- Preston Western Distributor – SATURN assignment model

4.1.3 The A585 CTF model was developed in 2010 and the interviews used to inform its matrix building were taken from a set that were conducted in 2008, though not all of the RSIs in that set were used for that model. The full set of interviews is referred to in this document as ‘BCC 2008’, and it comprises records collected at 13 sites numbered 1-12 and 15.

4.1.4 Five additional RSIs were conducted in 2010 in order to complete a cordon that was identified by the CTF model’s commissioned consultants. The interviews at these five sites were carried out by Ansa Consultants Ltd, and so the records resulting from them are referred to in this document as ‘ANSA 2010’. The locations and designations of all these sites are illustrated in Figure 3-1.

4.1.5 The PWD SATURN model used trip information collected from interviews conducted in 2014 at 19 sites forming a cordon around Preston to the west of, and excluding, the M6. The interviews and their records are referred to in this document as ‘PWD 2014’ and their locations and designations are illustrated in Figure 3-2.

4.1.6 It is important to note that the BCC 2008 and ANSA 2010 interviews were conducted in one direction only at each site. These directions are included in Table 4-1 and Table 4-2, in the next sections. By contrast, most of the PWD interviews were conducted in both directions of travel through each site, as shown in Table 4-3.

4.2 Overview of the BCC 2008 RSI records

4.2.1 The roadside interviews conducted in 2008 were located at the sites prefixed with ‘BCC’ in Figure 3-1. Data were obtained for 13 sites, numbered from 1-12 and with an additional site numbered 15.

4.2.2 The dataset was obtained from the previously commissioned consultants who were responsible for building the A585 CTF S-Paramics model. Due to contractual issues, it was not possible to obtain from those consultants the prior matrices that had been developed from this BCC 2008 data (in conjunction with the ANSA 2010 data) and so it has been necessary to re-process the raw interview data.

4.2.3 Of the 13 sites for which trip data was collected, two were collected via postcard completion, while the remaining 11 were collected via roadside interviews. Table 4-1 summarises the information available about these datasets, showing the survey method, number of trip records received and a description of the interview/intercept location.

4.2.4 Each record has a number of attributes including origin purpose, destination purpose, origin postcode and destination postcode. Each interview was allocated to a time with a resolution of 30 minutes in the range 07:00 to 18:30, which indicates the start of the 30-minute long time slice containing the interview.

4.2.5 The origin and destination purposes were classified into 10 categories, including home, place of work, employer’s business, and education and shopping. With a separate purpose recorded for each trip’s origin and destination, it is possible to classify each recorded trip into standard home-based and non-home-based purposes. This information is needed in order to link the interview data with the SATURN assignment user classes during matrix building, and also to construct separate from-home, return-home and non-home-based observations that can be used to build trip matrices in production-attraction format for use in a variable demand model. Each record was also classified into a vehicle type, which is needed in order to apply the correct scaling factor to a record when expanding it to the relevant traffic count at the interview site.

Table 4-1 Summary of received BCC 2008 RSI records

Site No.	Description	Interview Direction	Date	Survey Method	No. of Records
1	Kelso Avenue north of Queens Promenade	South	09/05/2008	Postcard	307
2	Warren Drive east of A587 Fleetwood Rd	West	09/05/2008	Postcard	230
3	Red Bank Road east of A587 Devonshire Rd	West	13/06/2008	Interview	374
4	Moor Park Avenue east of A587 Bispham Rd	West	23/05/2008	Interview	609
5	A586 Poulton Rd east of A587 Bispham Rd	West	23/05/2008	Interview	504
6	Newton Drive east of A587 North Park Dr	West	23/05/2008	Interview	1206
7	A583 Preston New Road east of Preston Old Road	West	13/06/2008	Interview	574
8	Yeadon Way	North	16/05/2008	Interview	630
9	A5230 Progress Way east of Midgeland Rd	West	16/05/2008	Interview	1244
10	Common Edge Rd south of Squires Gate Lane	North	16/05/2008	Interview	950
11	A584 Clifton Drive south of Squires Gate Lane	North	06/06/2008	Interview	1115
12	A585 Amounderness Way south of Victoria Rd	South	09/05/2008	Interview	1238
15	A583 Preston New Rd south of M55 J4	North	06/06/2008	Interview	1356

4.2.6 The trip data extracted from roadside interviews invariably needs to be passed through some cleaning procedures in order to remove invalid records. Invalid records can be generated in a number of ways, and can result in miscoded or missing origins, destinations and trip purposes. The BCC 2008 dataset was cleaned by the previous consultants by considering logical cordon-to-cordon movements to filter the raw interview data and remove any illogical movements.

4.2.7 A copy of the A585 CTF Model Build Report (MBR)[1] was obtained and this contains tables showing the number of records in the BCC RSIs after cleaning had been carried out by the previous consultants,

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[1] 'A585 Corridor & Fleetwood – Thornton Area Action Plan: Transport Model Matrix Build Report', prepared by ANSA Consultants Limited for AmeyMouchel; October 2010.

and information about the number of records that were removed as a result. The number of records in the spreadsheets received for the individual RSI sites led us to conclude that the supplied data had already been cleaned.

4.3 Overview of the ANSA 2010 RSI records

4.3.1 The roadside interviews conducted in 2010 were located at the sites prefixed with ‘ANSA’ in Figure 3-1. As in the case of the BCC 2008 interview data, it was not possible to obtain the prior matrices that had been previously developed from this ANSA 2010 data (in conjunction with the BCC 2008 data), and so it has been necessary to re-process the raw interview data.

4.3.2 Data were collected at five sites, interviewing travellers in a single direction only at each one. Table 4-2 summarises the data received for these sites, showing the number of trip records received and a description of the interview/intercept location.

Table 4-2 Summary of received ANSA 2010 RSI records

Site No.	Description	Easting	Northing	Interview Direction	Date	No. of Records
1	A585 Fleetwood Road	341446	435145	South	13/05/2010	1742
2	Garstang Road	339453	439731	West	11/05/2010	1191
3	Shard Bridge	336875	441338	South	12/05/2010	1388
4	Singleton Road	338729	436108	North	12/05/2010	876
5	Thistleton Road	340580	437963	South	11/05/2010	654

4.3.3 Each record has a number of attributes including origin and destination purposes, origin and destination postcodes, as well as others that have not been used, such as gender and age group. As in the case of the BCC 2008 records, each interview was allocated to a time with a resolution of 30 minutes in the range 07:00 to 18:30, indicating the start of the time slice that contained the interview.

4.3.4 The origin and destination purposes were classified into 12 categories, including home, place of work, employer’s business, and education and shopping. Each record was classified into a vehicle type, which is needed in order to apply the correct scaling factor to a record when expanding it to the relevant traffic count at the interview’s site.

4.3.5 As in the case of the BCC 2008 interview records, the ANSA 2010 records were cleaned by the previous consultants to remove illogical movements. Arcadis received a total of 5,851 records over the five ANSA 2010 interview sites, but this number did not match the number of clean records given in the MBR. Therefore, it was concluded that the ANSA 2010 interview data that were received from the previous consultants were those that had not been passed through the cleaning process described in the MBR.

4.3.6 It did not prove possible to obtain the cleaned ANSA 2010 interview records, and so all of these RSI datasets required checking and cleaning for illogical/invalid movements before the observed trips could be used to build matrices for the SATURN model. This cleaning process is described in section 4.5.

4.4 Overview of the PWD 2014 RSI records

4.4.1 The roadside interviews conducted in 2014 were located at the sites shown in Figure 3-2. These data were collected to be used as inputs to the matrix building process for the Preston Western Distributor SATURN model. The RSIs form a cordon around Preston to the west of (and excluding) the M6.

4.4.2 Interviews were conducted at a total of 19 sites, with trips through all sites being intercepted in both directions. However, not all of the 38 possible combinations of site and direction were surveyed, and a total of 26 data files were obtained containing PWD 2014 RSI records, which are summarised in Table 4-3.

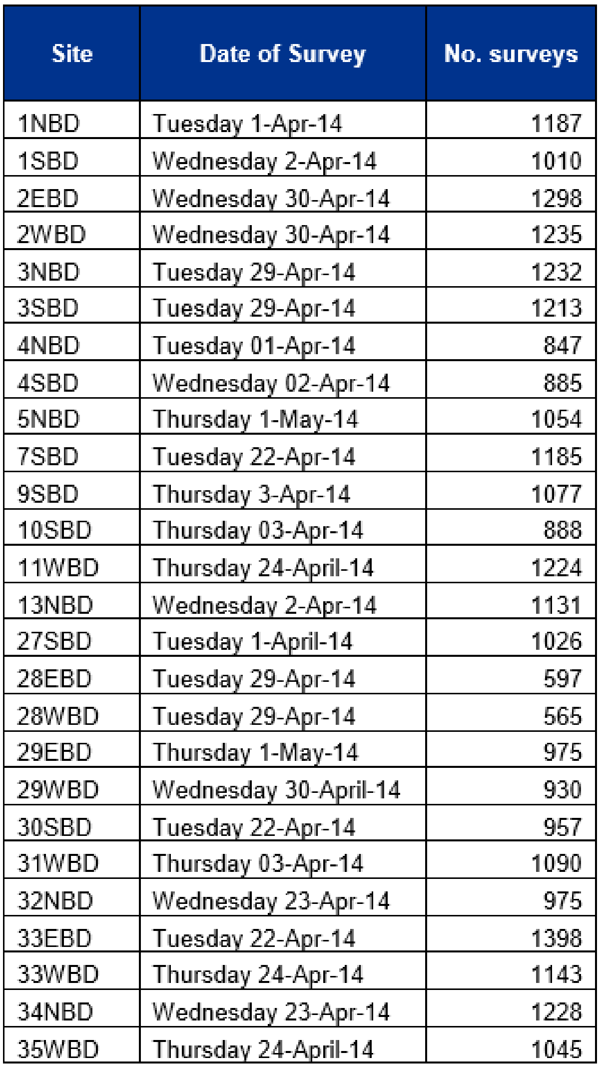
Table 4-3 Summary of received PWD 2014 RSI records

Site No. & Direction	Easting	Northing	No. of records
Site 1NBD	350577	432108	1051
Site 1SBD	350567	431878	879
Site 2EBD	347911	429752	1261
Site 2WBD	347911	429752	1130
Site 3NBD	350620	427323	1116
Site 3SBD	350620	427323	1040
Site 4NBD	351690	431622	753
Site 4SBD	351690	431622	735
Site 5NBD	352788	423622	921
Site 7SBD	353253	431942	899
Site 9SBD	355436	431974	982
Site 10SBD	357011	432053	638
Site 11WBD	356204	427935	1050
Site 13NBD	355020	424682	1064
Site 27SBD	341211	432774	895
Site 28EBD	351343	426571	525
Site 28WBD	351343	426571	464
Site 29EBD	351398	425406	829
Site 29WBD	351398	425406	783
Site 30SBD	352891	431497	799
Site 31WBD	356980	430129	984
Site 32NBD	356465	425480	785
Site 33EBD	355316	425168	1263
Site 33WBD	355316	425168	1017
Site 34NBD	355310	427166	1115
Site 35WBD	356127	428144	874

4.4.3 At each site, surveys were conducted over twelve hours from 07:00 to 19:00. As with the other surveys, the typical information collected from each traveller included the start and end locations of the trip, the journey purpose at each end of the trip, the vehicle type and the time of the survey. The survey time was, as for the 2008 and 2010 RSI datasets, allocated to a 30-minute time slice.

4.4.4 A copy of the PWD model LMVR was obtained, which contains a table listing the number of vehicles (over all types) surveyed at each site. This table is reproduced as Table 4-4, below.

Table 4-4 Copy of Table 7-2 from PWD model LMVR, showing the total number of vehicles surveyed at each PWD 2014 RSI site



Site	Date of Survey	No. surveys
1NBD	Tuesday 1-Apr-14	1187
1SBD	Wednesday 2-Apr-14	1010
2EBD	Wednesday 30-Apr-14	1298
2WBD	Wednesday 30-Apr-14	1235
3NBD	Tuesday 29-Apr-14	1232
3SBD	Tuesday 29-Apr-14	1213
4NBD	Tuesday 01-Apr-14	847
4SBD	Wednesday 02-Apr-14	885
5NBD	Thursday 1-May-14	1054
7SBD	Tuesday 22-Apr-14	1185
9SBD	Thursday 3-Apr-14	1077
10SBD	Thursday 03-Apr-14	888
11WBD	Thursday 24-April-14	1224
13NBD	Wednesday 2-Apr-14	1131
27SBD	Tuesday 1-April-14	1026
28EBD	Tuesday 29-Apr-14	597
28WBD	Tuesday 29-Apr-14	565
29EBD	Thursday 1-May-14	975
29WBD	Wednesday 30-April-14	930
30SBD	Tuesday 22-Apr-14	957
31WBD	Thursday 03-Apr-14	1090
32NBD	Wednesday 23-Apr-14	975
33EBD	Tuesday 22-Apr-14	1398
33WBD	Thursday 24-Apr-14	1143
34NBD	Wednesday 23-Apr-14	1228
35WBD	Thursday 24-April-14	1045

4.4.5 The PWD model's LMVR states that all interview records were checked, both in terms of the journeys' specified start and end locations, and the journey purpose. To check the start and end locations were valid, each survey record was used to plot a desire line representing the movement for the surveyed trip. The desire line was checked against the survey location and if it did not logically pass the site, the record was discarded. Some records were found that would represent a logical trip if the desire lines' direction were flipped – e.g. the desire line points northbound but the interview was conducted in the southbound direction. These records were either allocated to the interview in the opposite direction, if it existed, or were kept with the current interview with the record's origin and destination interchanged, if it did not.

4.4.6 It can be seen from a comparison of Table 4-3 and Table 4-4 that the number of vehicles surveyed is greater than the final number of records that was supplied for these RSIs, and so we can conclude that Arcadis was supplied with the PWD 2014 records after they had been cleaned to remove illogical movements and incomplete survey records.

4.5 Cleaning the supplied ANSA 2010 RSI records

4.5.1 As noted in sections 4.2 and 4.3, the BCC 2008 and ANSA 2010 data that were received from the A585 CTF model's consultants could not be assumed to be in their final cleaned state, after the removal of illogical trips, and so these datasets were analysed and cleaned, as necessary, by Arcadis prior to their use in the new A585 SATURN model.

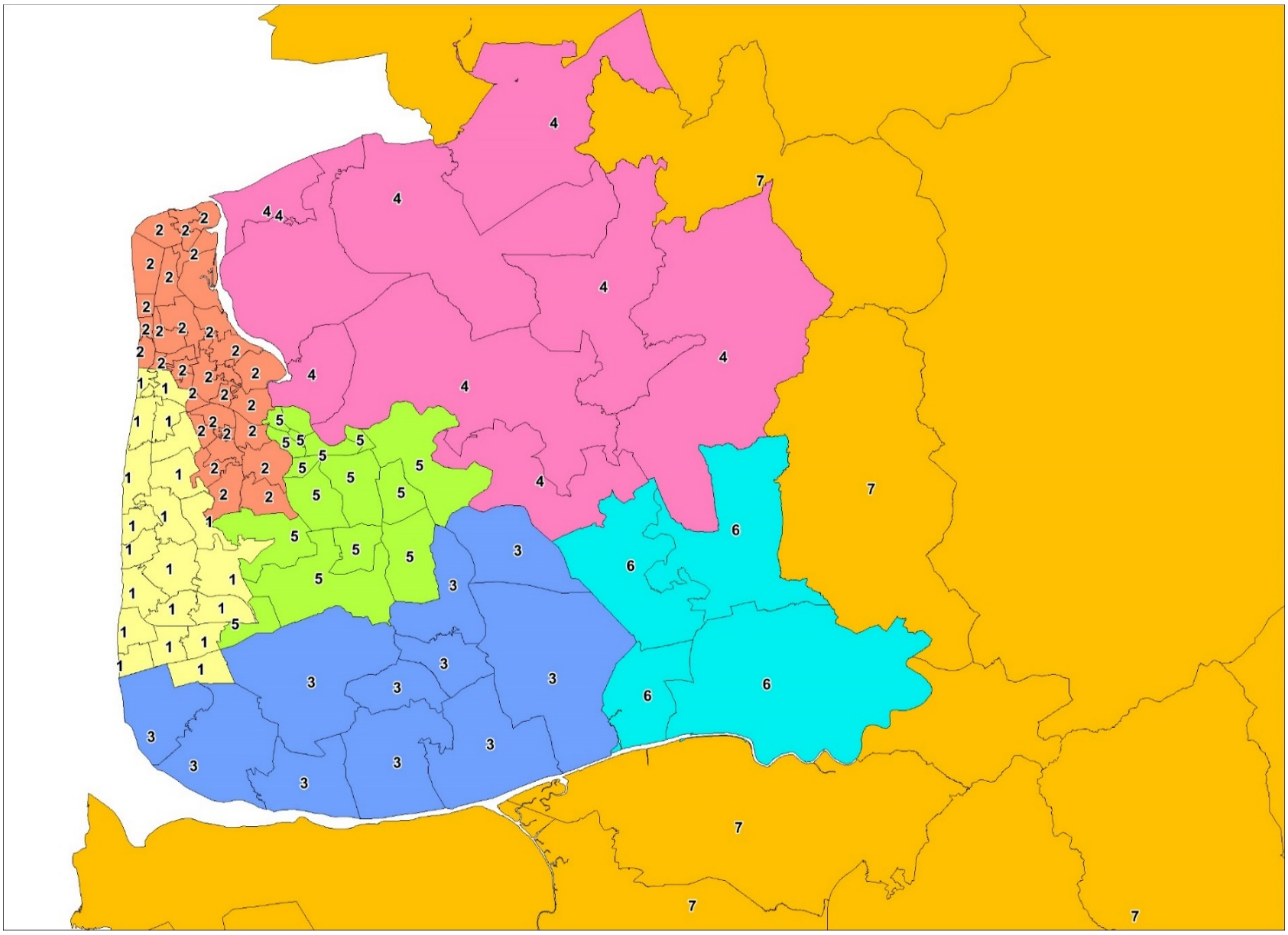
4.5.2 The cleaning process was essentially the same as that used to clean the PWD 2014 records – desire lines were constructed between the origin and destination of each record and these were compared to the location and direction of the interview in which they were included to see whether the journey was feasible.

4.5.3 It was not practical to check every record manually and so a spreadsheet-based procedure was devised, which considered the angle subtended at each interview site by a line drawn between the origin and destination points and used reasonable limits on the angle to assess a journey's feasibility.

4.5.4 Based on this angle, a number of rules were devised to assess whether the direction of travel between the trip's origin and destination via the RSI site was likely. As in the case of the PWD 2014 cleaning, carried out by other consultants, some movements were also examined to see whether they could be valid if their origin and destination were transposed.

4.5.5 After the automatic cleaning had been applied to the ANSA 2010 records, all of the remaining records were allocated to a system of 7 sectors to help identify inter-sectoral movements that did not seem reasonable. These sectors were chosen to reflect the important movements within the study area when considered together with the Windy Harbour to Skippool scheme. The sectoral system used for checking the RSI movements is shown in Figure 4-1. This sectoral system is also used in the comparison of the final car and goods vehicle prior matrices to the interview data, as reported in the LMVR.

Figure 4-1 The 7-sector system used to aggregate RSI records, to conduct final checks on movements after automated cleaning



4.5.6 Every record that, post automated cleaning, appeared to be unlikely when considered from the sectoral point of view was checked individually, using tools such as online route finders to assess the movement's reasonableness. A number of records were removed from the post-cleaning data for each ANSA site as a result of these final visual checks.

4.5.7 The final numbers of ANSA 2010 interview records that have been used in matrix building are given in Table 4-5.

Table 4-5 Final numbers of ANSA 2010 records after all rounds of cleaning

Site No.	Car Records	LGV Records	HGV Records	All Records
Site 1 SB	1158	208	94	1460
Site 2 WB	869	127	32	1028
Site 3 SB	935	163	51	1149
Site 4 NB	713	75	7	795
Site 5 SB	508	32	13	553

4.6 Summary of final expanded RSI data used in matrix building

4.6.1 The final sets of interview records that had passed the different rounds of cleaning were expanded to traffic counts by vehicle type at the relevant MCC and ATC locations. Factors were calculated separately to expand the records to a whole period and to the average assignment hours.

4.6.2 The different expansion factors were needed so that period-to-hour factors could be calculated for converting the outputs of the gravity model (used to synthesise car trips, as described in the LMVR) to assignment hours, and so that goods vehicle matrices could be built directly from the interview data.

4.6.3 After expansion of the recorded trips, the BCC 2008 and ANSA 2010 data – collected in a single interview direction – were transposed and converted into trips travelling through the interview sites in the unobserved direction. This transposition was applied to both the car and goods vehicle records.

4.6.4 Necessarily, the origins and destinations of all RSI records had been allocated to SATURN zones before any cleaning took place, and these zones were ultimately used to convert the cleaned data into partially observed matrices that could then be used as inputs to the SATURN trip matrix building processes. These are all discussed in detail in the LMVR.

4.6.5 Although the RSI datasets for 2008, 2010 and 2014 together contain several thousand records, most of the records provided by the PWD 2014 dataset (of which there are almost 24,000) consist of movements within the large model zones allocated to Preston and its environs. These records therefore do not necessarily contribute to a large number of different zonal movements in the partial matrices.

4.6.6 Table 4-6 summarises the number of non-zero cells in the final partial matrices, by time period and vehicle type, with the contributions from transposed trips separated out. The table shows the number of non-zero cells as an absolute count and as a percentage of all relevant cells in the matrix. Two counts/percentages are given: taken over the whole matrix, which has 190×190 = 36,100 cells, and taken over only movements within the FMA, which consists of zones numbered 1-94 and therefore covers 8,836 movements and cells.

Table 4-6 Summary of non-zero cell counts and proportions for the final partially observed matrices used in matrix building for the A585 SATURN model

Time Period	Vehicle Type	Non-zero cells (%) (original records)		Non-zero cells (%) (transposed records)		Total non-zero cells (%)	
		All Cells	I-I Only	All Cells	I-I Only	All Cells	I-I Only
AM	Car	2532 (7.0%)	1469 (16.6%)	1890 (5.2%)	1299 (14.7%)	4036 (11.2%)	2471 (28.0%)
	LGV	1544 (4.3%)	789 (8.9%)	1077 (3.0%)	669 (7.6%)	2442 (6.8%)	1326 (15.0%)
	HGV	678 (1.9%)	256 (2.9%)	370 (1.0%)	168 (1.9%)	1020 (2.8%)	409 (4.6%)
IP	Car	3631 (10.1%)	1956 (22.1%)	2720 (7.5%)	1746 (19.8%)	5593 (15.5%)	3165 (35.8%)
	LGV	1544 (4.3%)	789 (8.9%)	1077 (3.0%)	669 (7.6%)	2442 (6.8%)	1326 (15.0%)
	HGV	663 (1.8%)	245 (2.8%)	398 (1.1%)	191 (2.2%)	1031 (2.9%)	419 (4.7%)
PM	Car	2705 (7.5%)	1520 (17.2%)	1864 (5.2%)	1312 (14.8%)	4147 (11.5%)	2511 (28.4%)
	LGV	1544 (4.3%)	789 (8.9%)	1077 (3.0%)	669 (7.6%)	2442 (6.8%)	1326 (15%)
	HGV	659 (1.8%)	242 (2.7%)	384 (1.1%)	179 (2%)	1015 (2.8%)	406 (4.6%)

4.6.7 Table O-1 in Appendix O summarises the number of interview records by vehicle type, time period and site, in comparison with the computed traffic count at each site in the model's base month and year.

5 TRAFFIC SURVEY PROGRAMME

5.1 Introduction

5.1.1 In line with the data requirements outlined earlier and the modelling approach set out in the ASR, and to supplement the previously collected data that will be used in model development, Arcadis (formerly Hyder Consulting (UK) Ltd.) undertook a programme of traffic surveys during July and September/October 2015 and February/March 2016 as summarised in Table 5-1. Appendix A provides further details of the ATC survey programme.

Table 5-1 Overview of the Traffic Survey Programme

Survey Type	Contractor	No. of Sites	Direction	Duration	Survey Dates (2015)
Automatic Traffic Count (ATC)	Tracsis	8	1 & 2 - EB/WB 3 & 4 - NB/SB 5 & 6A - EB/WB 6B & 7 – NB/SB	2 weeks (24 hrs each day)	Sites 1, 3 & 7: 6-19 July & 11 September to October 1. Sites 2, 4 & 5: 6-19 July & 11-24 September. Site 6A: 6-19 July & 15-28 September. Site 6B: 6-19 October.
Classified Junction Count (CJC)	Tracsis	12	All turning movements	2 days per site (07:00-19:00 on each day)	Sites 1 to 11 & 13: 14 July
	CTS	20			Sites 1 to 11 & 33: 15 July Sites 23 to 30: 9 July
	ANSA	20			Sites 12 to 22 & 34: 15 July Sites 23 to 30: 8 July
	Modal TP	12			Sites 12 to 22 & 34: 16 July
Queue Length Survey	Tracsis	12	Queues on all lanes at each junction approach arm	2 days per site (07:00-19:00 on each day)	Sites 1 to 11 & 13: 14 July
	CTS	20			Sites 1 to 11 & 33: 15 July Sites 23 to 30: 9 July
	ANSA	20			Sites 12 to 22 & 34: 15 July Sites 23 to 30: 8 July
	Modal TP	12			Sites 12 to 22 & 34: 16 July
Survey Type	**Contractor**	**No. Sites**	**Direction**	**Duration**	**Survey Dates (2016)**
Automatic Traffic Count (ATC)	Tracsis	56	See Table 4-2 & Appendix A	2 weeks (24 hrs each day)	6-12 February 22 February to 3 March
Manual Classified Count (MCC)	CTS	9	See Table 4-4	1 day (07:00-19:00)	9 February

5.1.2 The specification of each survey type is provided in the following sections. A discussion on how each data type will be used in model development is included in subsequent sections.

5.2 Automatic Traffic Counts

5.2.1 ATC surveys were carried out to record the volume of traffic passing along a specified road, classified by vehicle size and direction. 24 hour counts were collected over 14 consecutive days at seven locations. The ATC data collected at each site included the following:

- Vehicle counts for each 15-minute period throughout the 14-day period (e.g. 07:30 to 07:45; 07:45 to 08:00 and so on)
- Separate counts for vehicles travelling in each direction
- ATC data was provided in twelve vehicle class bins, which can be aggregated into Cars, Light Goods Vehicles (LGVs) and Heavy Goods Vehicles (HGVs) as required

5.2.2 A list of 2015-ATC sites and 2016-ATC sites are provided in Table 5-2 and Table 5-3 maps of the site locations are shown in Figure 5-1 and Figure 5-2.

5.2.3 The ATC sites chosen to collect data for calibration and validation along screenlines and cordons were identified following a review of the proposed A585 scheme and the previously collected data.

5.2.4 ATC data was initially collected from 6 to 19 July 2015 by Tracsis (formerly Sky High Technology Ltd.). As a result of equipment malfunctions, a full dataset was only returned for four sites and, of the sites with missing data, three had no more than 3.5 days of data. Further ATC surveys were therefore carried out in September 2015 and the 2SD and IoD tests (as described in detail in Chapter 9) were carried out to remove any outliers.

5.2.5 Following a review of the gaps in count data, additional ATCs (for 56 locations) were collected in February and March 2016.

Table 5-2 2015 List of ATC Surveys

No.	Unique Site ID	Road Name	Easting, Northing	Survey Dates (2015)
1	2015ATC_01	A585 west of junction with A586 and Windy Harbour Road	338064, 439457	6-19 July 11 Sept – 1 Oct
2	2015ATC_02	A585 west of junction with B5412 and Breck Road (Skippool junction)	335274, 440576	6-19 July 11-24 September
3	2015ATC_03NB	A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), north of junction with Queen's Promenade	331524, 442183	6-19 July 11-24 September
4	2015ATC_03SB	A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), north of junction with Queen's Promenade	331524, 442183	6-19 July 11 Sept – 1 Oct
5	2015ATC_04	A587 Plymouth Rd, north of junction with A586 Poulton Rd and A586 Westcliffe Drive	332447, 438073	6-19 July 11-24 September
6	2015ATC_05	A583 Preston New Road, east of junction with A587 E Park Drive	332816, 434726	6-19 July 11-24 September
7	2015ATC_06A	A585 south of roundabout junction with Amounderness Way/Fleetwood Road/Norcross Lane	333812, 441367	6-19 July 15-28 September
8	2015ATC_06B	A585 north of junction with Amounderness Way/Rossall Lane B5409	332503, 445305	- 6-19 October
9	2015ATC_07	A587 Broadway, north of junction with Rossall Lane	331790, 445173	6-19 July 11 Sept – 1 Oct

Table 5-3 2016 List of ATC Surveys

No.	Unique Site ID	Road Name	Easting, Northing	Survey Dates (2016)
1	2016ATC_01	A584 Clifton Drive North	330716, 431420	6 -12 February 22 – 28 February
2	2016ATC_02	B5261 Common Edge Road	332821, 432195	6 -12 February 22 – 28 February
3	2016ATC_03	Cropper Road	334476, 432698	6 -12 February 22 – 28 February
4	2016ATC_04	B5260	338461, 433587	6 -12 February 22 – 28 February
5	2016ATC_05	A585	341606, 434444	6 -12 February 22 – 28 February
6	2016ATC_06	A584 South Promenade	330511, 433636	6 -12 February 22 – 28 February

No.	Unique Site ID	Road Name	Easting, Northing	Survey Dates (2016)
7	2016ATC_07	B5262	330962, 433639	6 -12 February 22 Feb – 03 Mar
8	2016ATC_08	St Anne's Road	331482, 433823	6 -12 February 22 – 28 February
9	2016ATC_09	B5261 Hawes Side Lane	332247, 433637	6 -12 February 22 Feb – 03 Mar
10	2016ATC_10	Vicarage Lane	333095, 433520	6 -12 February 22 Feb – 03 Mar
11	2016ATC_11	Ashworth Road	334100, 433631	6 -12 February 22 – 28 February
12	2016ATC_12	B5260	338528, 434340	6 -12 February 22 – 28 February
13	2016ATC_13	Bradshaw Lane	339941, 434831	6 -12 February 22 – 28 February
14	2016ATC_14	A584	330576, 436335	6 -12 February 22 Feb – 03 Mar
15	2016ATC_15	Market Street	330640, 436317	6 -12 February 22 – 28 February
16	2016ATC_16	A586	331025, 436533	6 -12 February 22 – 28 February
17	2016ATC_17	B5124	331678, 437008	6 -12 February 22 Feb – 03 Mar
18	2016ATC_18	Layton Road	332160, 437217	6 -12 February 22 – 28 February
19	2016ATC_19	Dinmore Avenue	333399, 438112	6 -12 February 22 Feb – 03 Mar
20	2016ATC_20	Holls Lane	335513, 439083	6 -12 February 22 – 28 February
21	2016ATC_21	Bracewell Avenue	336271, 439215	6 -12 February 22 Feb – 03 Mar
22	2016ATC_22	North Drive	332095, 441909	6 -12 February 22 – 28 February
23	2016ATC_23	North Drive	332175, 442541	6 -12 February 22 – 28 February
24	2016ATC_24	West Drive	332277, 443153	6 -12 February 22 – 28 February
25	2016ATC_25	Luton Road	332155, 442059	6 -12 February 22 Feb – 03 Mar
26	2016ATC_26	B5258 Warren Drive	332116, 441556	6 -12 February 22 Feb – 03 Mar
27	2016ATC_27	Ashfield Road	332371, 440590	6 -12 February 22 – 28 February
28	2016ATC_28	Moor Park Avenue	332727, 439735	6 -12 February 22 Feb – 03 Mar
29	2016ATC_29	A586 Poulton Road	333072, 438081	6 -12 February 22 – 28 February

No.	Unique Site ID	Road Name	Easting, Northing	Survey Dates (2016)
30	2016ATC_30	No data - site numbering retained for logging purposes		
31	2016ATC_31	Clifton Road (Cherry Tree Road)	333585, 434240	6 -12 February 22 – 28 February
32	2016ATC_32	Yeadon Way	331188, 433742	6 -12 February 22 Feb – 03 Mar
33	2016ATC_33	Anchorsholme Lane	333460, 441881	6 -12 February 22 – 28 February
34	2016ATC_34	B5269	340574, 438018	6 -12 February 22 – 28 February
35	2016ATC_35	B5260 Fox Lane Ends	339349, 432084	6 -12 February 22 – 28 February
36	2016ATC_36	Vicarage Lane	333142, 433606	6 -12 February 22 – 28 February
37	2016ATC_37	B5266 Newton Drive	333230, 436916	6 -12 February 22 – 28 February
38	2016ATC_38	A586 Poulton Road	332821, 438006	6 -12 February 22 – 28 February
39	2016ATC_39	Moor Park Avenue	332104, 439407	6 -12 February 22 – 28 February
40	2016ATC_40	Luton Road	331924, 442124	6 -12 February 22 Feb – 03 Mar
41	2016ATC_41	Anchorsholme Lane East	332086, 442357	6 -12 February 22 Feb – 03 Mar
42	2016ATC_42	B5412 Victoria Road West	332065, 442707	6 -12 February 22 – 28 February
43	2016ATC_43	B5260 Weeton Road	338466, 437329	6 -12 February 22 – 28 February
44	2016ATC_44	B5266 Station Road	336784, 437389	6 -12 February 22 – 28 February
45	2016ATC_45	Back Lane	340328, 436567	6 -12 February 22 – 28 February
46	2016ATC_46	B5269 Mile Road	339613, 438246	6 -12 February 22 – 28 February
47	2016ATC_47	Grange Road	339443, 439223	6 -12 February 22 – 28 February
48	2016ATC_48	A586	339545, 439783	6 -12 February 22 – 28 February
49	2016ATC_49	A588 Shard Road Arm	336851, 441268	6 -12 February 22 – 28 February
50	2016ATC_50	B5260 Singleton Road	338717, 436177	6 -12 February 22 – 28 February
51	2016ATC_51	B5258 Warren Drive Arm	331816, 441607	6 -12 February 22 – 28 February
52	2016ATC_52	Red Bank Road Arm	331680, 440042	6 -12 February 22 – 28 February

No.	Unique Site ID	Road Name	Easting, Northing	Survey Dates (2016)
53	2016ATC_53	A585 Amounderness Way Arm	332909, 442230	6 -12 February 22 – 28 February
54	2016ATC_54	A583 Preston New Road WB	333704, 434478	6 -12 February 22 – 28 February
55	2016ATC_55	A587 Kelso Avenue SB	331529, 442473	6 -12 February 22 – 28 February
56	2016ATC_56	A587 St. Walburga’s Road SB	332638, 437637	6 -12 February 22 – 28 February
57	2016ATC_57	A5230 Progress Way WB	333954, 432966	6 -12 February 22 – 28 February

Figure 5-1 2015 ATC Site Locations

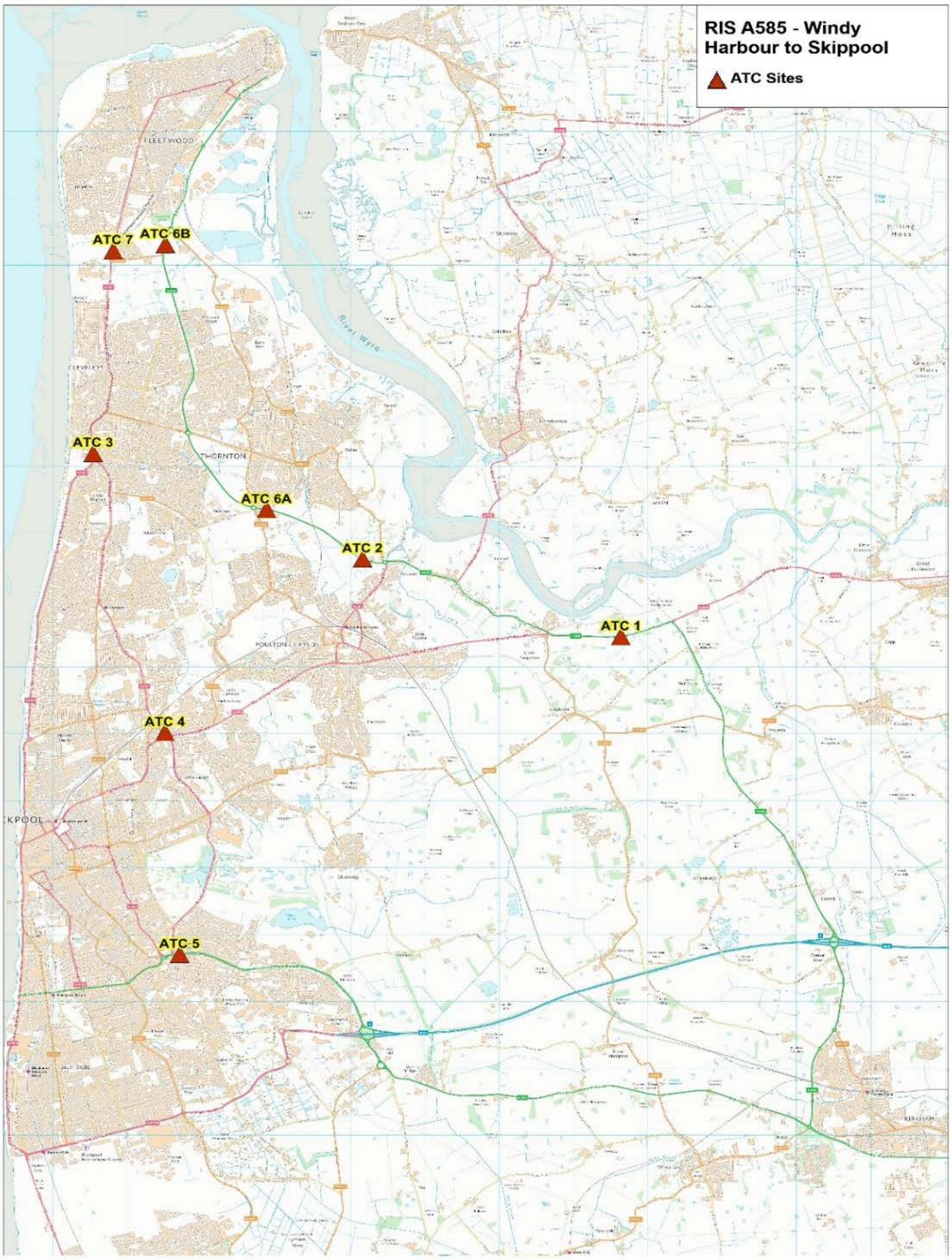


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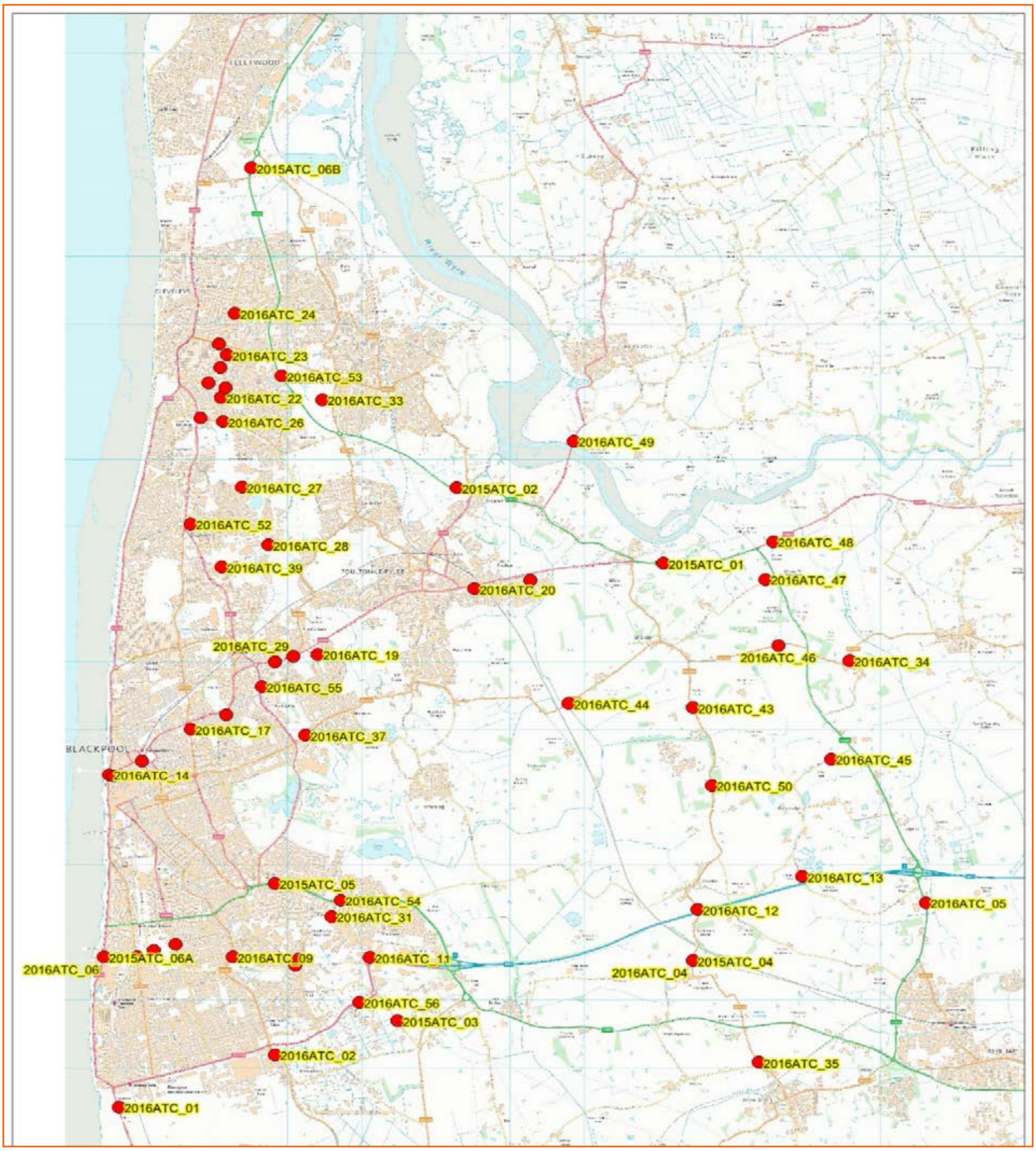
Figure 5-2 2016 ATC Site Locations



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5.3 Classified Junction Counts and Queue Length Surveys

5.3.1 Classified Junction Counts (CJCs) and Queue Length Surveys were conducted from 07:00-19:00 on 8 to 16 July 2015 at 32 junctions in the study area. The CJCs recorded the origin arm and destination arm for all vehicles (by class) passing through each junction. The Queue Length Surveys identified the average maximum length of the queue present at each junction during the survey time period.

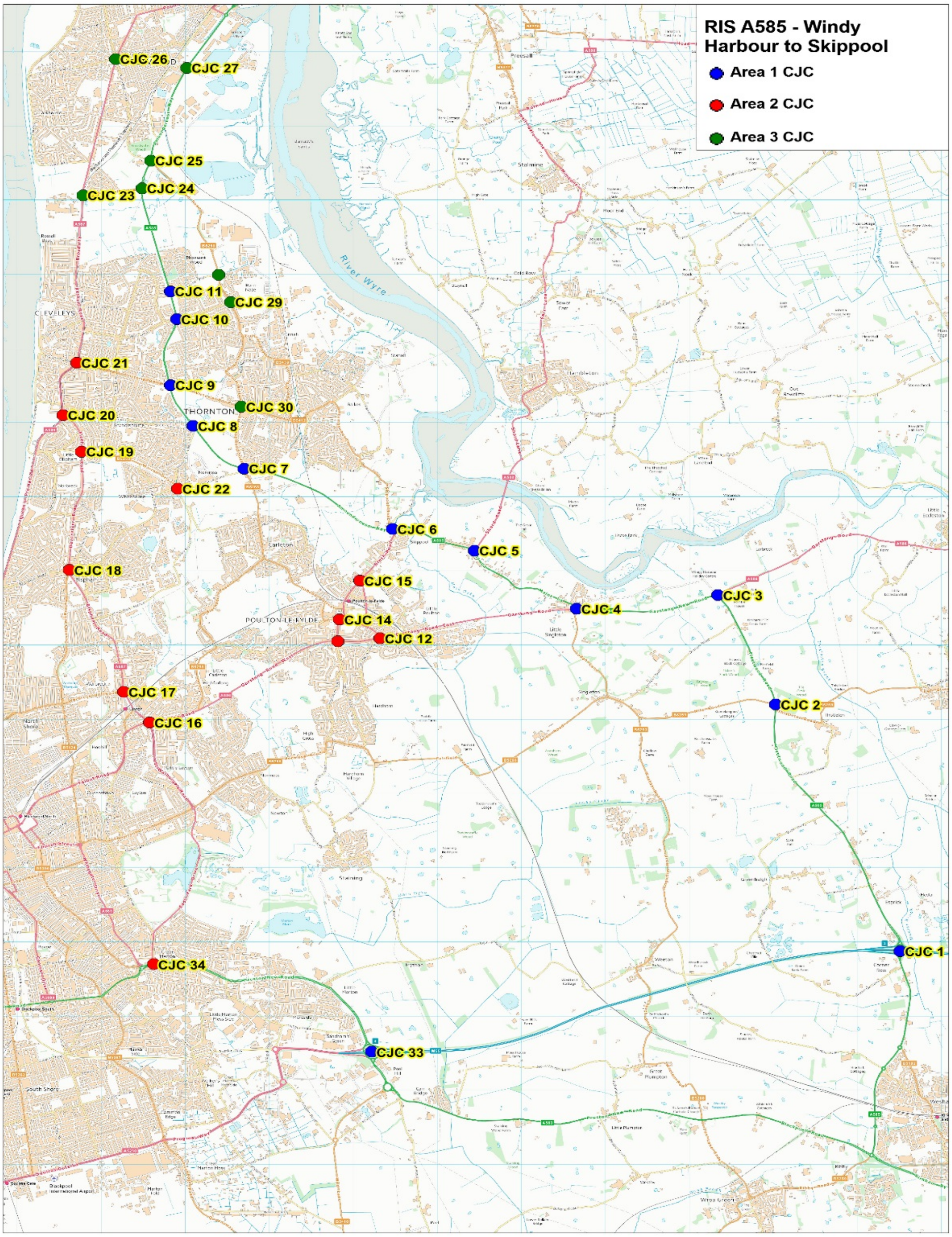
5.3.2 As recommended in WebTAG Unit M1.2 Section 3.3, ATCs were carried out in February/March 2016 for comparison purposes and to confirm the robustness of the CJC data, as described in Section 5.2.5.

5.3.3 The CJC locations were chosen based on a review of the scheme location, model study area and the location of screenlines and cordons. In each of the three data collection areas, counts were conducted for two consecutive days at each junction, as detailed in Table 5-4. The locations of the sites are illustrated in Figure 5-3.

Table 5-4 CJC Site List

No.	Area 1 – Junction Description	Survey Dates (2015)
1	M55 Junction 3 roundabout with A585	14 & 15 July
2	A585 Fleetwood Road/Mile Road/Thistleton Road staggered 4-arm priority junction	
3	A585 Garstang New Road/Windy Harbour Road/A585 Garstang Road/A585 Fleetwood Road traffic signals	
4	A585 Mains Lane/Pool Foot Lane/A585 Garstang New Road/Lodge Lane/A586 Garstang Road traffic signals	
5	A585 Mains Lane/A588 Shard Road traffic signals	
6	A585 Amounderness Way/Skippool Road/A585 Mains Lane/Breck Road roundabout	
7	A585 Amounderness Way/Fleetwood Road South/Norcross Lane roundabout	
8	A585 Amounderness Way/Anchorsholme Lane priority junction	
9	A585 Amounderness Way/Victoria Road East/Supermarket Access/Victoria Road West roundabout	
10	A585 Amounderness Way/West Drive traffic signals	
11	A585 Amounderness Way/Bourne Way priority junction	
33	M55 Junction 4 with A583 Preston New Road	
No.	**Area 2 – Junction Description**	
12	A586 Garstang Road East/Lower Green traffic signals	15 & 16 July
13	A586 Garstang Road West/Hardhorn Lane/A585 Garstang Road East traffic signals	
14	A583 Hardhorn Road/B5267 Blackpool Old Road/A583 Queen’s Square	
15	A588 Breck Road/Station Road/Parrys Way	
16	A587 Plymouth Road/A586 Poulton Road/A587 St Walburga’s Road/A586 Westcliffe Drive	
17	A587 Bispham Road/Holyoake Avenue/A587 Plymouth Road/Warbreck Hill Road	
18	A587 Bispham Rd/A587 Devonshire Road/B5124 Devonshire Road/Ingthorpe Avenue/Red Bank Road	
19	A587 Fleetwood Road/Russell Avenue/Warren Drive	
20	A587 Fleetwood Road/Queen’s Promenade/Kelso Avenue	
21	Crescent East/Crescent West/Rossall Road/Brighton Avenue/Victoria Road West	
22	Warren Drive/White Carr Lane	
34	A583 Preston New Road/A587 East Park Drive	
No.	**Area 3 – Junction Description**	
23	A587 Broadway/Rossall Lane	8 & 9 July
24	A585/Rossall Lane	
25	A585/Fleetwood Road	
26	A587 Broadway/Fleetwood Road/Beach Road/Chatsworth Avenue/Hatfield Avenue/Grange Road	
27	A585/Denham Way/Herring Arm Road	
28	B5268 Fleetwood Road North/Bourne Way/Bourne Road	
29	B5268 Fleetwood Road North/West Drive	
30	B5268 Fleetwood Road South/B5268 Fleetwood Road North/Victoria Road East	

Figure 5-3 CJC Site Locations



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5.3.4 CJC data was collected for a continuous twelve-hour period (from 07:00 to 19:00) on a mid-week day (Tuesday, Wednesday or Thursday), with the vehicles making each movement summed for each 15-minute period. All movements at any one junction were counted on the same day.

5.3.5 The vehicle classifications collected were summed as the following:

- Cycles, scooters, mopeds and motorbikes
- Cars and taxis
- Light Goods Vehicles (LGVs)

- OGV1 (all goods vehicles with two axles with twin tires, three axles (rigid))
- OGV2 (all goods vehicles with three axles (articulated), four axles or more (rigid or articulated))
- Buses and Coaches (including Public Service Vehicles (PSVs)).

5.3.6 Pedestrians, equestrians and mobility scooters were excluded from the classified counts. Pedal cycles using marked off-road cycle tracks and traffic signal facilities for crossing the road were also excluded.

5.3.7 Queue length surveys were carried out on two consecutive days for each junction arm at the same 32 junctions within the study area as the CJC survey locations. The data was collected at each junction for a continuous 12-hour period (from 07:00 to 19:00) on a mid-week day (Tuesday, Wednesday or Thursday). Queue lengths were measured via video recording as the maximum length of the vehicle queue present, at all types of junction, at intervals of five minutes.

5.4 Manual Classified Counts

5.4.1 Manual Classified Counts (MCCs) were conducted by CTS Data Collection Services on 9 February 2016 at nine locations, as shown in Table 5-5. In contrast with the CJCs described in section 5.3, the MCCs recorded link flows only, with no information gathered about turning movements.

Table 5-5 2016 MCC Sites

No.	Unique Site ID	Road Name	Easting, Northing	Survey Dates
1	2016MCC_01	B5260 Singleton Road	338730, 436111	9 February 2016
2	2016MCC_02	B5269 Thistleton Road Arm	340581, 437966	9 February 2016
3	2016MCC_03	Moor Park Avenue	331950, 439353	9 February 2016
4	2016MCC_04	B5266 Newton Drive	333165, 436855	9 February 2016
5	2016MCC_05	A583 Preston New Road	333649, 434472	9 February 2016
6	2016MCC_06	Yeadon Way	331143, 433793	9 February 2016
7	2016MCC_07	A5230 Squires Gate Lane	333453, 432539	9 February 2016
8	2016MCC_08	B5261 Common Edge Road	332800, 432220	9 February 2016
9	2016MCC_09	A584 Clifton Drive North	330648, 431646	9 February 2016

5.4.2 MCC Data was collected via high mast video units positioned at the locations set out in Table 5-5. All traffic movements were recorded in fifteen-minute intervals between the times of 07:00 to 19:00 on Tuesday 9 February 2016. The data was provided in a Microsoft Excel spreadsheet.

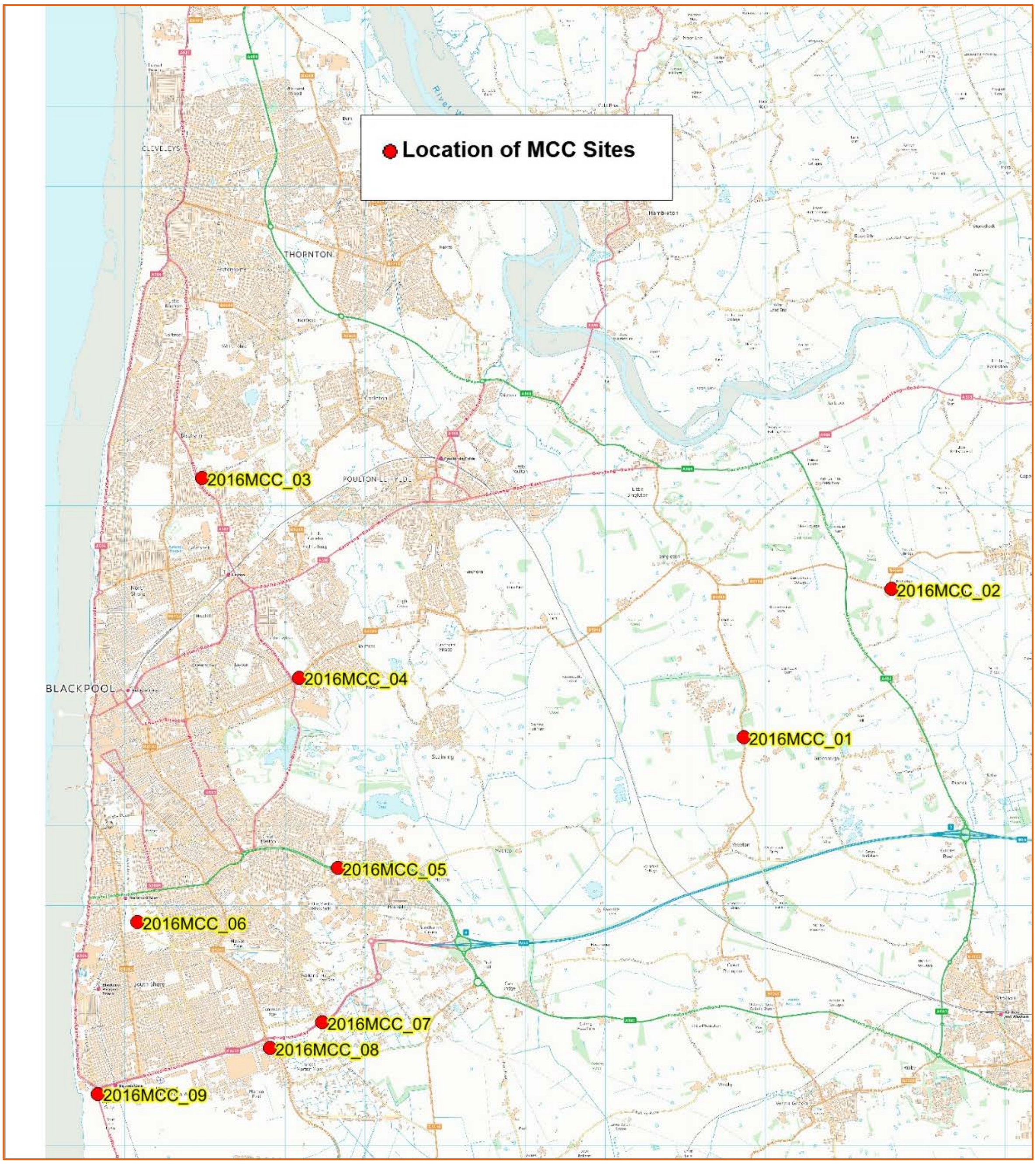
5.4.3 The count data was classified into the following categories:

- Pedal Cycles
- Motor Cycles
- Cars
- LGV
- OGV1
- OGV2
- PSV

5.4.4 Figure 5-4 shows the locations of the MCC sites surveyed in February 2016.

5.4.5 Towards the start of the model development programme, the need for the traffic counts detailed in this section became apparent. The client’s desire not to delay the programme by waiting to conduct the counts in a neutral month meant that the data was collected in February 2016. For use in the model, these counts were converted into the model’s base month and year by applying seasonality factors and adjustments for year-on-year growth.

Figure 5-4 2016 MCC Site Locations



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6 ATC DATA FROM TRIS DATABASE

6.1 Use of TRIS Data in Model Development

6.1.1 Traffic count information for the months of July 2015 and September 2015 is available on Highways England's TRIS data website (http://tris.highwaysengland.co.uk). The TRIS website includes traffic flow files generated monthly for each count site, with traffic data presented in 15-minute intervals for each day of the month.

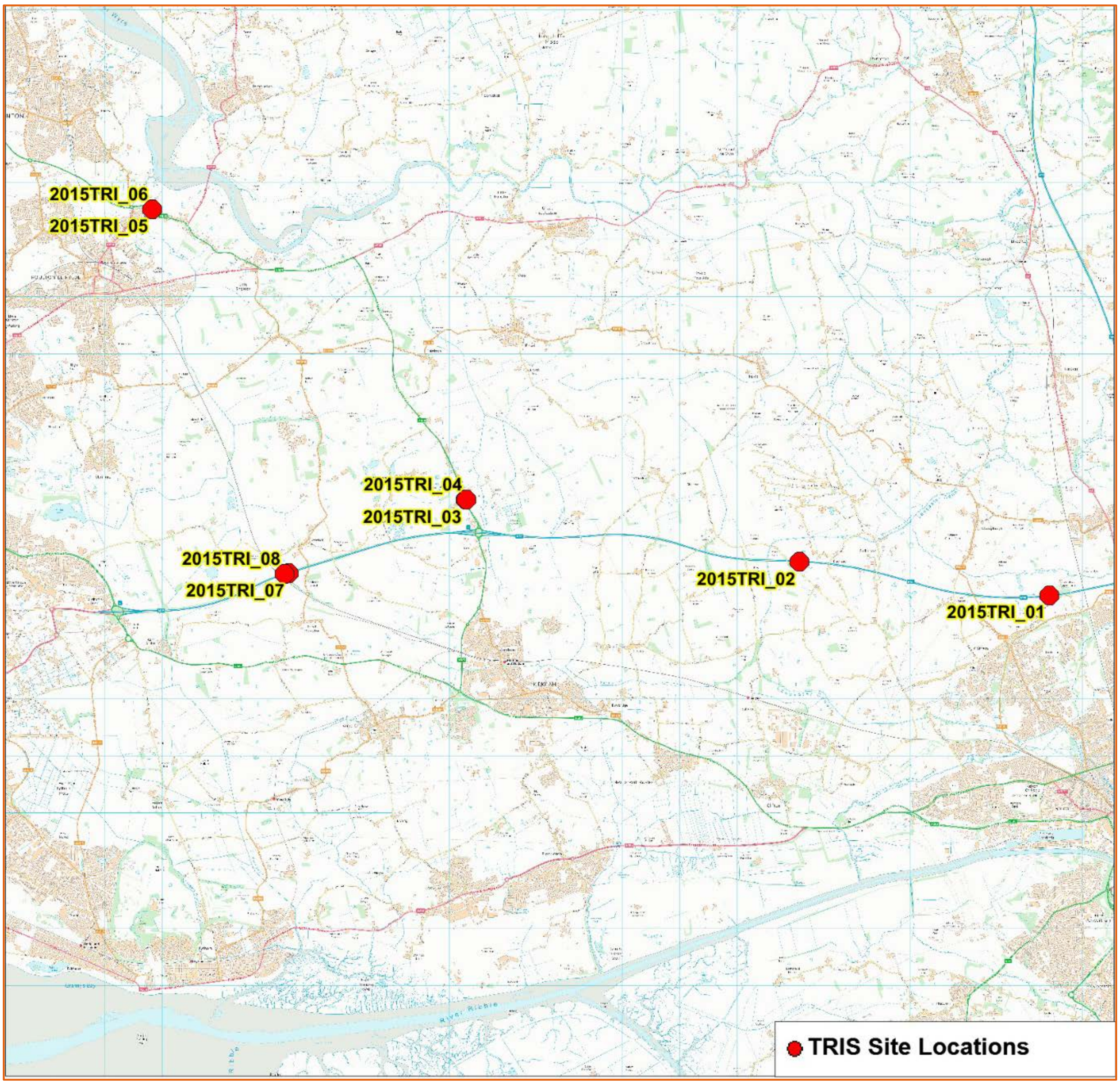
6.1.2 TRIS traffic count data (15-minute count totals) on selected locations in the project study area were downloaded and used in the development of the traffic model.

6.1.3 Table 6-1 and Figure 6-1 shows the list TRIS data sites along with co-ordinates used in model development.

Table 6-1 TRIS Data Sites Used in Model Development

No.	Site Reference ID	Location	Easting, Northing	Direction	Date for which Data was Used
1	2015TRIS_01	M55 eastbound between J3 and J1	E342723 N434810	EB	June 2015
2	2015TRIS_02	M55 westbound between J3 and J1	E347067 N434383	WB	June 2015
3	2015TRIS_03	A585 northbound between M55 and B5269	E341266 N435462	NB	June 2015
4	2015TRIS_04	A585 southbound between B5269 and M55	E341270 N435464	SB	June 2015
5	2015TRIS_05	NB, A585, A588-A588, EAST OF SKIPPOOL	E335808 N440523	NB	June 2015
6	2015TRIS_06	SB, A585, A588-A588, EAST OF SKIPPOOL	E335810 N440525	SB	June 2015
7	2015TRIS_07	M55 eastbound between J4 and J3	E338113 N434174	EB	June 2015
8	2015TRIS_08	M55 westbound between J3 and J4	E338184 N434177	WB	June 2015

Figure 6-1 TRIS Data Site Locations



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6.1.4 The data was used as observed counts at selected screenlines and cordons. It was also used for determining Yearly Growth Factors (YGFs) and Monthly Seasonality Factors (MSFs) at sites on Motorways and A roads.

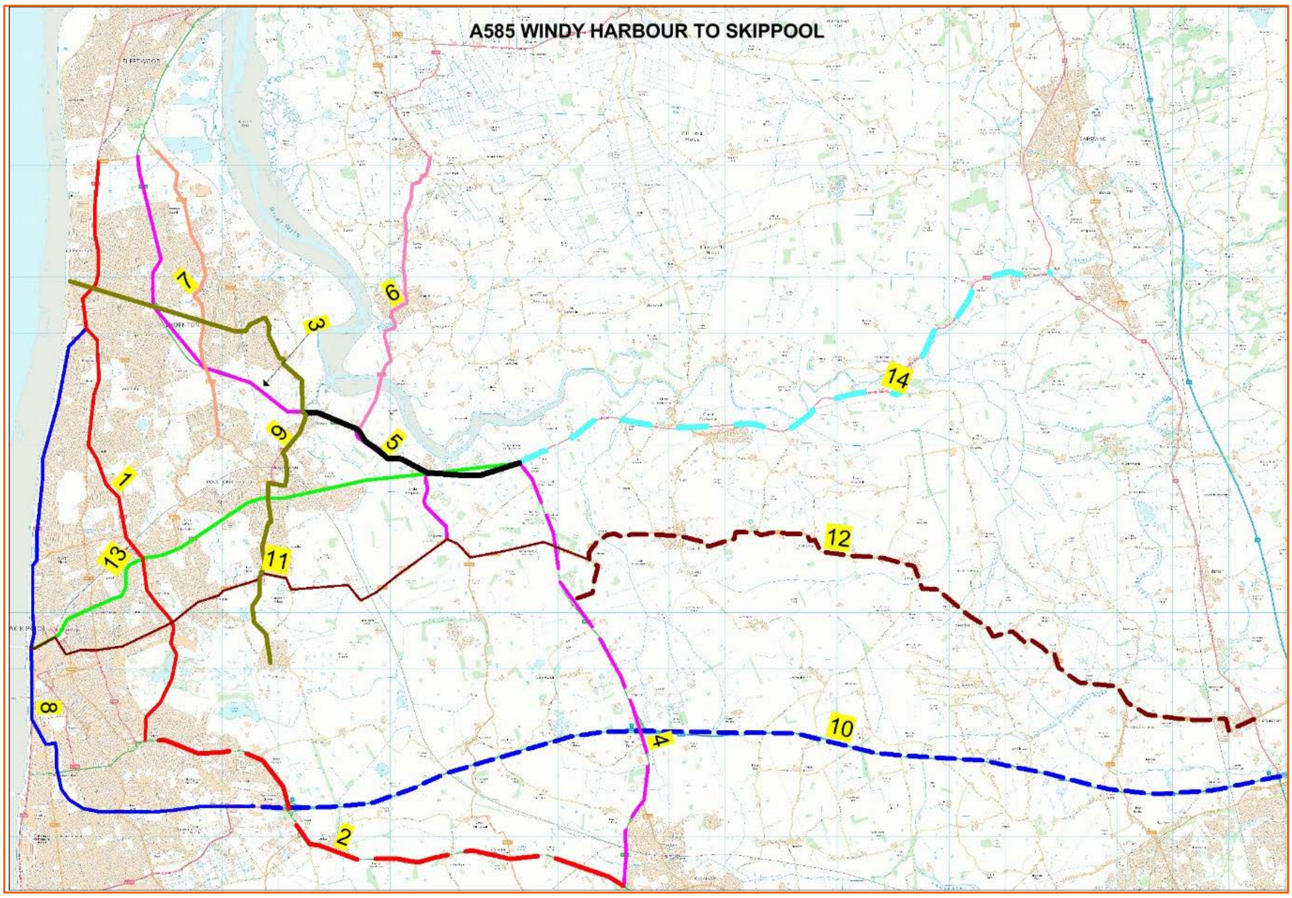
6.1.5 The weekday average traffic flows at TRIS sites (measured in half hour time intervals) are shown in Appendix B.

7 JOURNEY TIME DATA

7.1 Use of Journey Time Data in Model Development

7.1.1 Journey time data was obtained for 14 routes in the study area, as shown in Figure 7-1. Observed journey times were extracted for these routes from the Trafficmaster database. The observed journey times will be compared against the modelled journey times to determine whether the journey time validation results meet the criteria defined in paragraph 3.2.10 of WebTAG Unit M3.1.

Figure 7-1 Journey Time Routes



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7.1.2 The observed journey times on these routes, as derived from the Trafficmaster data, are shown in Table 7-1.

Table 7-1 Observed Journey Times on Routes

JT Route No.	Route Description	Length (km)	Observed JT (secs) Derived from Trafficmaster Data		
			AM Peak Hr	IP Peak Hr	PM Peak Hr
Route 1NB	A587 - S-Park Road to Russel Lane	11.30	1171	1170	1252
Route 1SB	A587 - Russel Lane to S-Park Road	11.28	1191	1165	1205
Route 2NB	A583 - Blackpool Road to Preston Road	10.16	723	715	730
Route 2SB	A583 - Preston Road to Blackpool Road	10.24	692	696	700
Route 3NB	A585 - Singleton (B5260) to Amounderness Way	10.13	775	743	940
Route 3SB	A585 - Amounderness Way to Singleton (B5260)	10.14	786	706	729
Route 4NB	A585 - Blackpool Road to Windy Harbour	8.28	523	524	528
Route 4SB	A585 - Windy Harbour to Blackpool Road	8.29	520	522	517
Route 5NB	A585 - Garstang Road to Skippool Junction	4.28	307	293	332
Route 5SB	A585 - Skippool Junction to Garstang Road	4.28	378	378	316
Route 6NB	A588 - Shard Road to Hall Road	6.83	463	470	463
Route 6SB	A588 - Hall Road to Shard Road	6.83	494	493	491
Route 7NB	B5260 - Carleton Road to Russel Lane	5.75	486	495	542
Route 7SB	B5260 - Russel Lane to Carleton Road	5.75	538	524	543
Route 8NB	M55 Junction 4 towards B5262 up to A584	11.85	1006	1071	1169
Route 8SB	A584 through B5262 up to M55 Junction 4	11.85	998	1066	1127
Route 9NB	Mill Lane towards A588 up to Victoria Road West	10.45	1123	1077	1155
Route 9SB	Victoria Road West towards A588 up to Mill Lane	10.90	1144	1132	1191
Route 10EB	M55 Junction 4 to M55 Junction 1	19.13	615	637	624
Route 10WB	M55 Junction 1 to M55 Junction 4	19.14	636	629	603
Route 11EB	Talbot Square Road (Blackpool) towards A586 up to Thistleton Road	11.52	949	945	983
Route 11WB	Thistleton Road through A586 up to Talbot Square (Blackpool)	11.49	966	985	1001
Route 12EB	B5269 - from Thistleton Road to Broughton Road	16.00	1272	1237	1246
Route 12WB	B5269 - Broughton Road to Thistleton Road	16.00	999	949	949
Route 13EB	Talbot Rd (Blackpool) through A586 to Windy Harbour Skippool Junction	9.92	210	190	197
Route 13WB	Windy Harbour Skippool Junction through A586 up to Talbot (Blackpool)	9.93	601	581	635
Route 14EB	A586 - Garstang Road to The Avenue A6	11.28	628	647	630
Route 14WB	The Avenue A6 to Garstang Road A586	11.28	634	654	647

7.1.3 Note that the lengths of routes 10EB and 10WB are outside the range recommended by WebTAG unit M3.1 (>3 km and <15 km). These routes have been defined as encompassing one motorway junction on each side of M55 junction 3, which is the point at which the M55 connects to the A585. As there is no M55 junction 2, the route runs between M55 junction 1 (with the A6) and M55 junction 4 (with the A583 Preston New Road).

8 ACCIDENT DATA OBTAINED FROM DfT

8.1 Accident Data Collection and Analysis

8.1.1 Accident data for the study area was obtained from the DfT for the last five years from 2011 to 2015. Table 8-1 shows the number of accidents by year and severity, with the accident severity trend illustrated in Figure 8-1.

8.1.2 It can be seen that there were a total of 94 accidents over the five-year period, ranging from a total of 15 to 23 accidents in any one year. Over the five-year period, the majority of accidents was classified as slight (94), with 8 accidents classified as severe and 2 fatal accidents. Figure 8-2 shows the location and severity of these accidents.

Table 8-1 Number of Accidents by Year and Severity (2011 – 2015)

Year	Severity			Total
	Fatal	Severe	Slight	
2011	1	2	14	17
2012	0	0	15	15
2013	1	2	20	23
2014	0	3	16	19
2015	0	1	19	20
TOTAL	**2**	**8**	**84**	**94**

Figure 8-1 Accident Severity Trend (2011 – 2015)

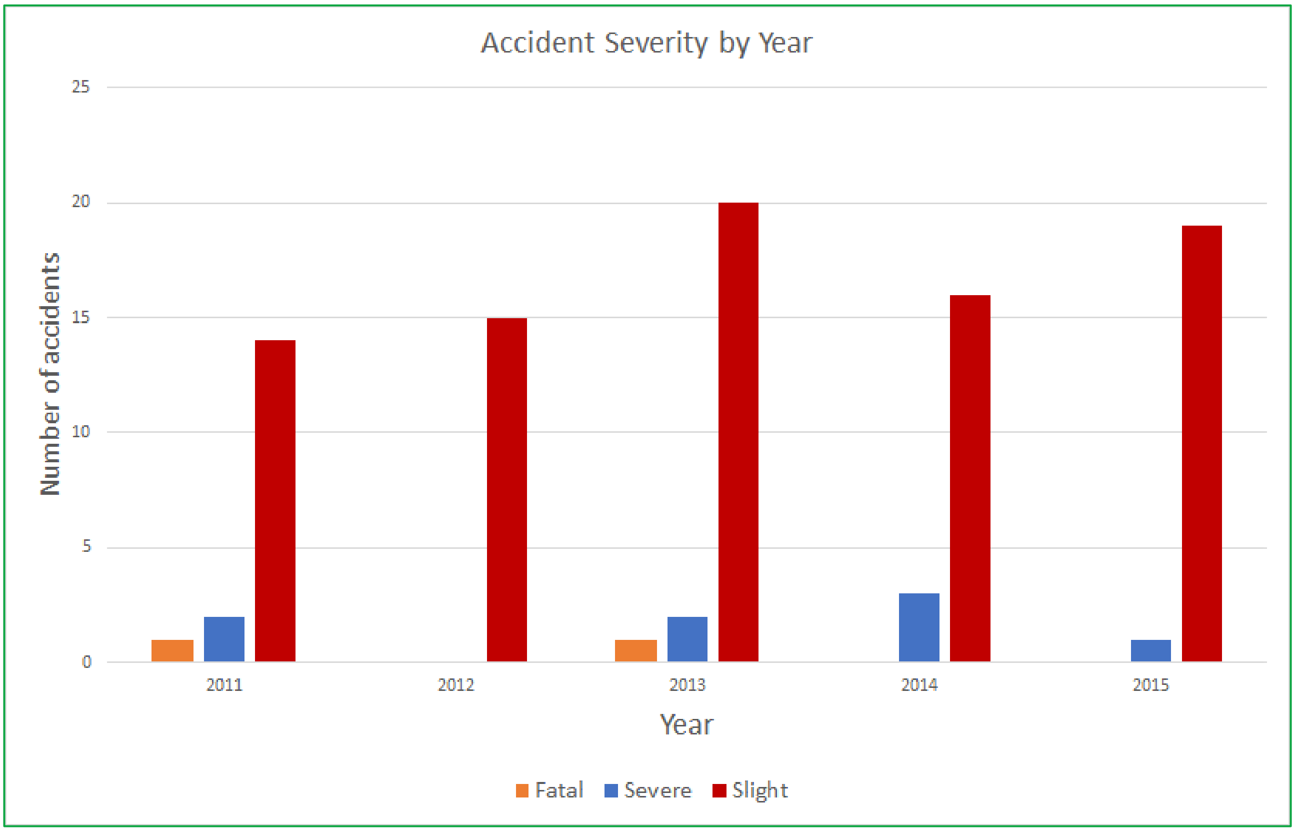
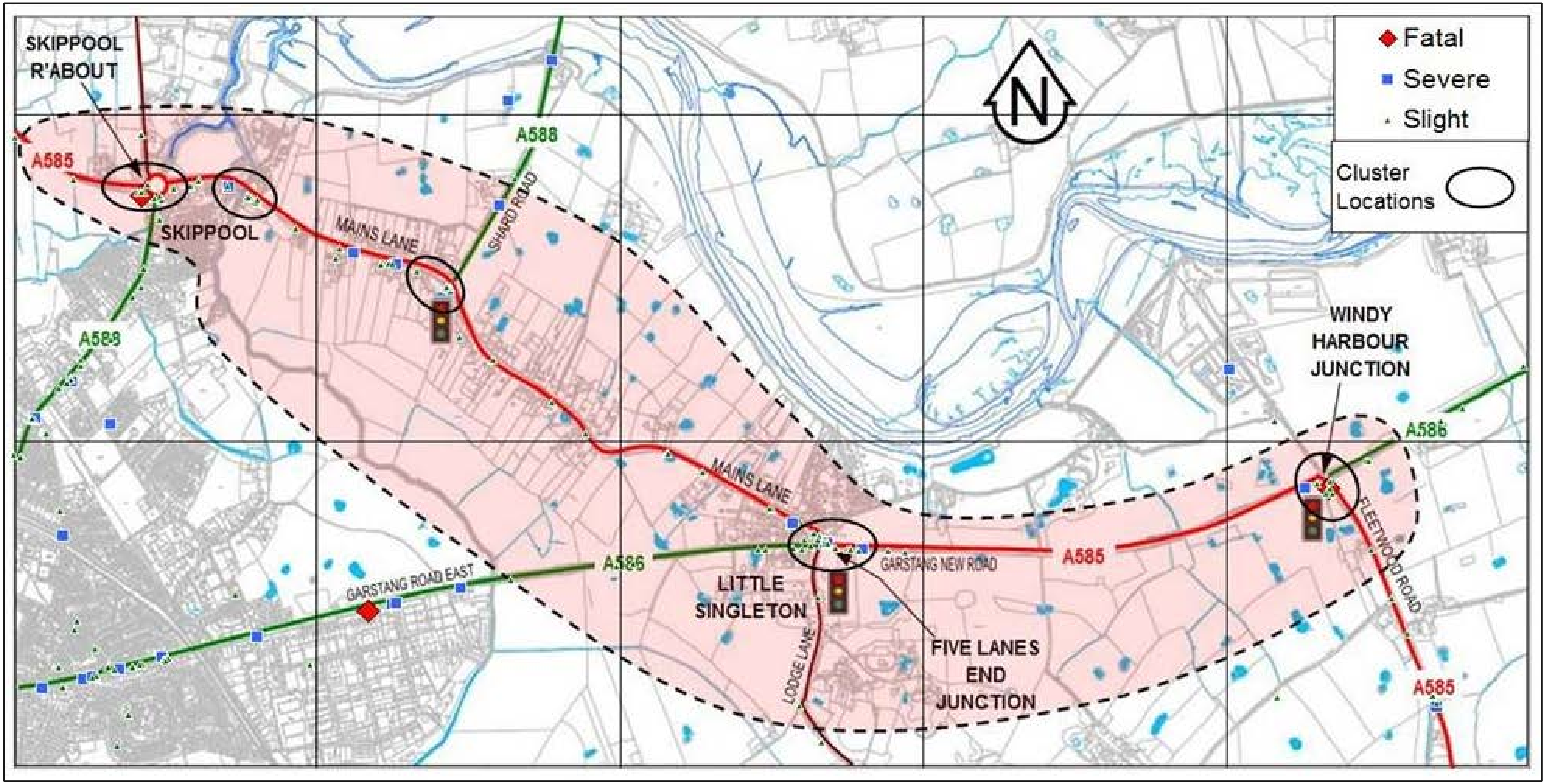


Figure 8-2 Accident Locations and Severity (2011 – 2015)



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9 AUTOMATIC TRAFFIC COUNT DATA ANALYSIS

9.1 ATC Data Checks and Cleaning

9.1.1 The first step in the analysis of the 2015 and 2016 ATC data was to check the datasets provided by the survey company to identify any missing data and report on the extent of any data loss. The checks carried out on the ATC data are detailed in Appendix A.

9.1.2 For the 2015 data, a full dataset was only returned for four sites. Therefore, additional counts were carried out in 2016 as described in Section 5.2.5. There were some reported data losses in some time periods for the 2016 data; however, the combined 2015 and 2016 datasets were considered to be sufficiently complete for use in model development.

9.1.3 A series of data checks were then carried out on the 2015 and 2016 ATC data. Firstly, all weekend and school holiday data (if any) was filtered out from the raw data. Two statistical tests were then performed for each ATC site to identify outliers (for vehicle totals) as follows:

- 2 Standard Deviation (2SD) test – the interval between the 'mean – 2SD' and 'mean +2SD'.
- Index of Dispersion (IoD) test – the Confidence Interval (CI) of the mean.

9.1.4 The above statistical tests were carried out based on guidance provided in Highways England's Technical Note on Traffic Model and Economics Review Data Requirements (dated 21/02/2014).

9.1.5 The 2SD test was applied at each ATC site to identify average peak hour traffic flows that lie within the SD CI. Based on the results of the 2SD test, the days on which the average peak hour flows lie outside the 2SD band were filtered out.

9.1.6 The IoD test was performed on the average peak hour traffic flows that remained after passing the 2SD test. To maintain consistency with previous Technical Notes, and in accordance with the guidance note provided by Highways England on Traffic Model and Economics Review Data Requirements (dated 21/02/2014), the IoD used was the CI of the mean.

9.1.7 All ATC data which failed the IoD test was excluded from model calibration and validation. However, the count data was retained to help with checking where, for example, other count data was unavailable or out of date.

9.1.8 As part of the data checking process, the underlying reasons for the exclusion of data according to the above tests was assessed. Where the (wide) variance of traffic flow data was assessed as being likely due to inherent and persistent variability (i.e. not due to atypical/transient events or incidents or due to equipment malfunction, etc.) then such data was incorporated and a relevant note appended in the database.

9.1.9 It is noted that in the matrix estimation process in SATURN, the most reliable counts (which arguably are the second set of 2015 counts and the 2016 counts) will comprise the sequentially later cards the '77777' dataset for use in the SATURN 'PIJA' analysis. Subject to the availability of alternative counts for calibration purposes, rather than completely excluding ATC data which marginally fails the IoD tests due to inherent traffic flow variability, such ATC data would be incorporated at the 'top' of the 77777 PIJA cards.

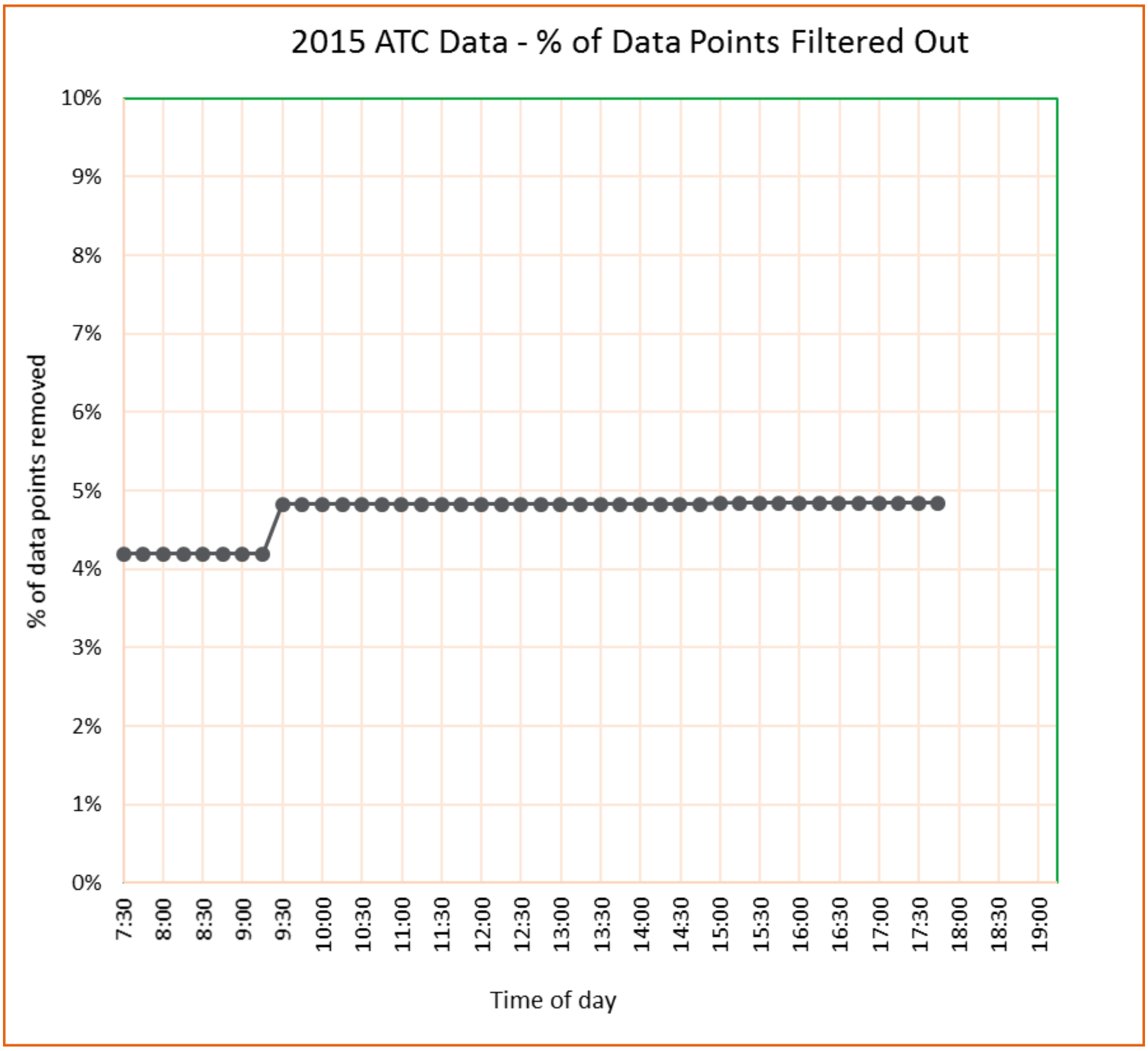
9.1.10 When deciding on the traffic counts to include, the volume of traffic was considered. The significance of the traffic count in the development of the model, and whether it is located on a key part of the network was considered when including or excluding counts.

9.1.11 The peak hour traffic flows (in the clean ATC dataset) as calculated for July 2015, September/October 2015 and February 2016 were multiplied by their appropriate Yearly Growth Factors (YGFs) and Monthly Seasonality Factors (MSFs) (as calculated from the traffic count database) to derive the peak hour traffic flows which were carried forward for model calibration and validation.

9.1.12 Appendix E shows the mean and 2SD plots for all ATC sites collected in July and September/October 2015 and the outliers in the 2015 ATC data points. ATC data which lies outside the LCL and UCL band(s) was filtered out from the spreadsheets. An example plot showing the IoD for ATC 1 – EB direction data is shown in Figure 9-1. Appendix F shows the IoD plots for the count data at all ATC sites. The percentage of 2015 ATC data points excluded during the AM, IP and PM peak hours is shown in Appendix G.

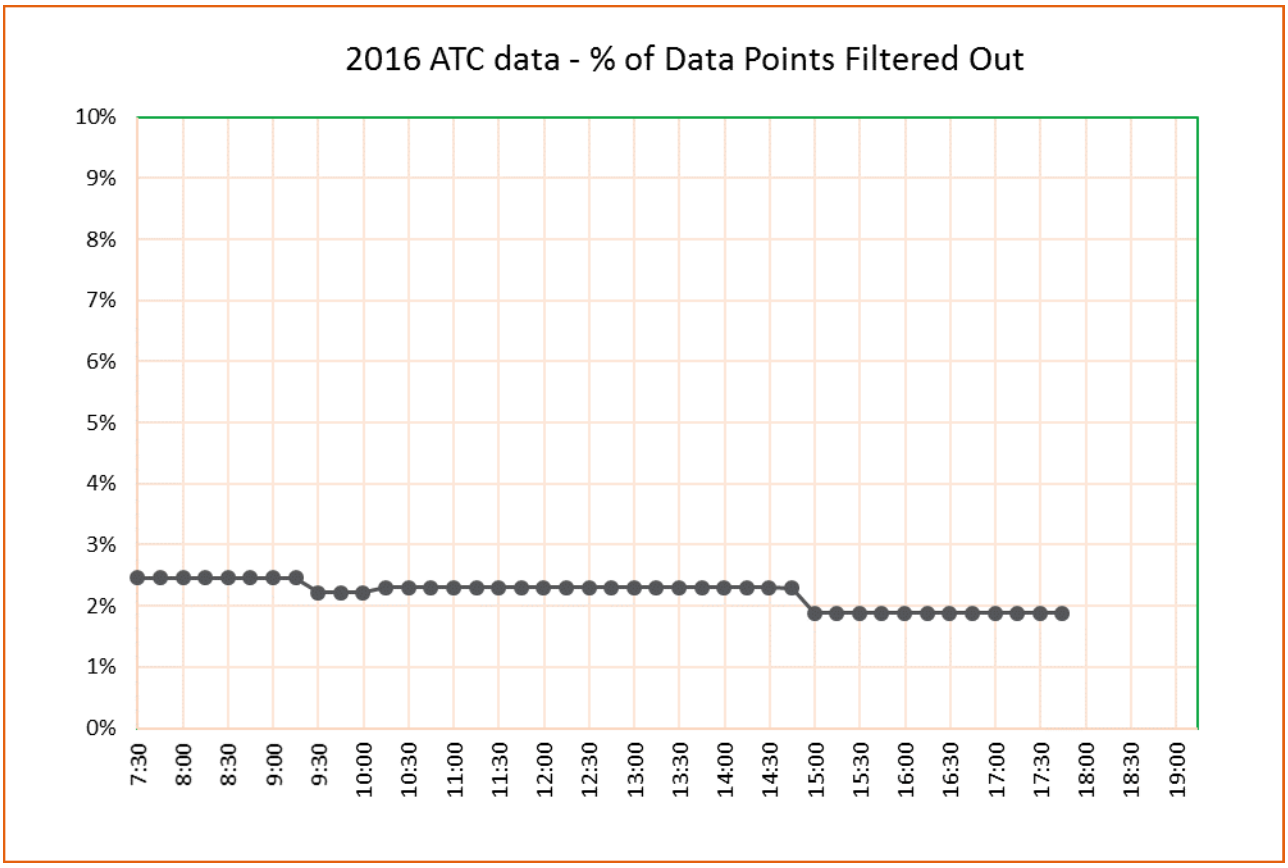
9.1.13 The number of points filtered out by 15-minute time interval (summed across all ATC sites) between 07:30 and 18:00 is shown in Figure 9-1. It can be seen that, at most, 5% of the data points are removed. This indicates that the surveyed 2015 ATC data represents a robust data set during the traffic modelling time window of 07:00 to 19:00.

Figure 9-1 2015 ATC Data – Percentage of Data Points Filtered Out



9.1.14 The percentage of 2016 ATC data points excluded during the AM, IP and PM peak hours is shown in Appendix H and plotted against the time of day in Figure 9-2. It can be seen that less than 3% of data points are removed from any time period; therefore, the 2016 dataset is considered to be sufficiently robust for model development.

Figure 9-2 2016 ATC Data – Percentage of Data Points Filtered Out

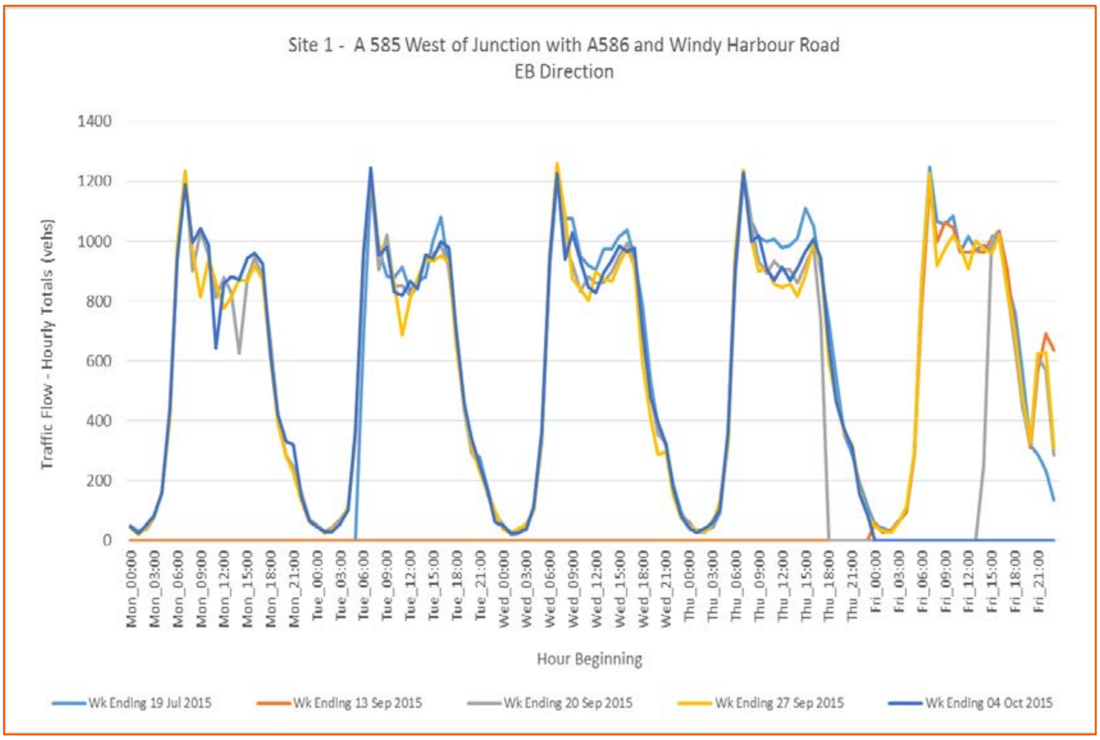


9.2 2015 ATC Weekday and Weekend Traffic Profiles

9.2.1 The 2015 ATC data (hourly flow in vehicles) was plotted for an average weekday and weekend, as shown in Appendix C. As expected, the weekends and weekdays display differing peak characteristics; the weekdays have a characteristic bi-modal profile with a sharp AM and more protracted PM peak and the weekends have a uni-modal profile with a protracted peak starting at approximately 10:00 and continuing until early afternoon. The traffic model being built for Stage 2 appraisal is a weekday peak hour model; therefore, the weekend data was excluded from further analysis.

9.2.2 After excluding weekend data, weekday ATC traffic profiles for each site in each direction were produced for each of the weeks starting in July and September/October 2015. The weekday profile for ATC Site 1 (eastbound) is shown in Figure 9-3 as an example.

Figure 9-3 ATC Site 1 (Eastbound) Weekday Profile



9.2.3 As shown in Figure 9-3, the weekday traffic flow profile at ATC Site 1 (eastbound) followed a similar recurring pattern throughout the weeks of July and September. With the exception of a few (non-recurring) time periods in the Monday and Tuesday profiles (most likely caused by traffic accidents), the traffic profiles indicate that the profile for September at Site 1 (eastbound) was not significantly different from that for July.

9.2.4 Appendix D shows the weekday traffic profiles for all ATC sites on a directional basis. A review of these weekday profiles indicates that, in general for a given weekday, the traffic for each of the months surveyed follows a very similar profile with very little variance, particularly in the peaks.

9.2.5 Some isolated data points and flow periods which deviated from the general profile are listed in Table 9-1. It is noted that some particular data points on the days listed in Table 9-1 were excluded from further analysis as described earlier in this chapter.

Table 9-1 Observed Deviant Traffic Periods

Site No.	Direction	Day of the Week	Week Ending
1	EB	Monday/Friday	20/09/2015 & 04/10/2015
		Tuesday	27/09/2015
	WB	Monday	20/09/2015 & 04/10/2015
2	EB	Tuesday	27/09/2015
	WB	Tuesday	27/09/2015
3	NB	Friday	13/09/2015 & 20/09/2015
	SB	Friday	13/09/2015
5	EB	Friday	13/09/2015 & 20/09/2015
	WB	Friday	13/09/2015 & 20/09/2015
6B	SB	Monday	25/10/2015
		Tuesday	11/10/2015

9.2.6 The 2015 two-way ATC flows (cleaned data) are shown in Appendix I; and the 2016 ATC data is shown in Appendix J.

9.3 Peak Hour Determination

9.3.1 In order to derive the peak hours in the Model Study Area, TRIS data (15-minute totals for July 2015) was downloaded from http://tris.highwaysengland.co.uk/detail/trafficflowdata and processed. There is a total of eight TRIS sites for which July 2015 fifteen-minute count data is available. These sites are described in Chapter 6.

9.3.2 The peak hour as determined at each of the TRIS sites is shown in Table 9-2.

Table 9-2 Peak Hour Based on TRIS Data

Peak Hour Time Period	Number of TRIS Sites Which Show this Peak Hour
07:00 – 08:00	2
07:15 – 08:15	2
07:30 – 08:30	2
08:30 – 09:30	1
14:15 – 15:15	1
16.00 – 17.00	2
16:15 – 17:15	3
16:45 – 17:45	2
17:00 – 18:00	1

9.3.3 Based on the results shown in Table 9-2, the TRIS data does not indicate a distinct one hour peak time period in either the morning or the evening. To help to identify the peak hours, ATC data collected in July/September 2015 and February/March 2016 was processed as described below.

9.3.4 Firstly, the clean 2015 ATC dataset was analysed. The 15-minute traffic counts were averaged across all days for each site in each direction. These average 15-minute counts were then summed across all sites in all directions to obtain the average traffic flow across the entire network during each 15-minute interval.

9.3.5 Rolling hourly counts were then calculated to identify the AM and PM peak hours for the study area. Table 9-3 shows the average 15-minute traffic flow (totals) for each site in each direction during the hours of 06:00 to 10:00 and the subsequent derivation of the AM peak hour.

Table 9-3 Derivation of AM Peak Hour Based on 2015 ATC Data

15-minute Start Period	15-minute Average Across All Sites	Rolling Hourly Totals (vehs)
06:00	64	376
06:15	77	462
06:30	105	558
06:45	130	654
07:00	150	738
07:15	174	805
07:30	200	852
07:45	214	868
08:00	217	851
08:15	221	821
08:30	216	775
08:45	197	731
09:00	187	707
09:15	175	688

15-minute Start Period	15-minute Average Across All Sites	Rolling Hourly Totals (vehs)
09:30	171	686
09:45	173	690
10:00	168	693

9.3.6 It should be noted that, due to the fact that there were some missing data points (for example ATC Site 6B – NB direction), the rolling average hourly totals were calculated across all sites, rather than the actual totals across all sites. The yellow highlighted cells in Table 9-3 indicate the 15-minute start periods at which the highest rolling hourly total occurs (a possible indication of the AM peak hour).

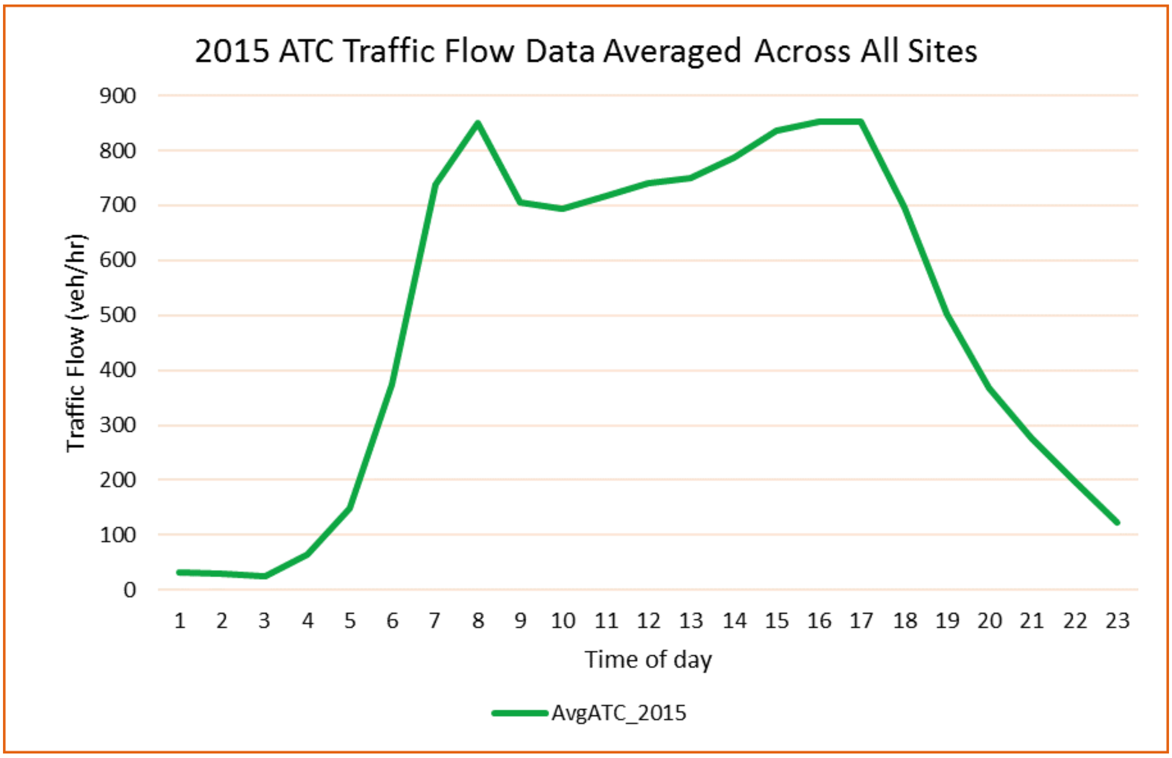
9.3.7 Table 9-4 shows the derivation of the PM peak hour based on the 2015 ATC data. Again, the yellow highlighted cells indicate the 15-minute start period at which the highest rolling hourly total occurs (a possible indication of the PM peak hour).

Table 9-4 Derivation of PM Peak Hour Based on 2015 ATC Data

15-minute Start Period	15-minute Average Across All Sites	Rolling Hourly Totals (vehs)
15:00	205	836
15:15	208	844
15:30	211	849
15:45	213	852
16:00	212	852
16:15	213	861
16:30	214	865
16:45	212	862
17:00	221	852
17:15	217	824
17:30	212	788
17:45	202	746
18:00	193	697
18:15	182	648
18:30	170	597
18:45	153	546
19:00	144	502

9.3.8 The average weekday profile based on the 2015 ATC data is shown in Figure 9-4.

Figure 9-4 Average Weekday Profile Based on 2015 ATC Data



9.3.9 The above plots and inferences based on the 2015 ATC data were presented to Highways England in TDCR Version 1.0 dated 03/12/2015 (HE548643-HYD-GEN-A585_RP-TR-1013-v1.0). Following discussions with Highways England, additional analysis was carried out on the 2015 ATC data to identify the peak hours based on fifteen-minute average flows. Table 9-5 shows the 15-minute average flows averaged across all 2015 ATC sites.

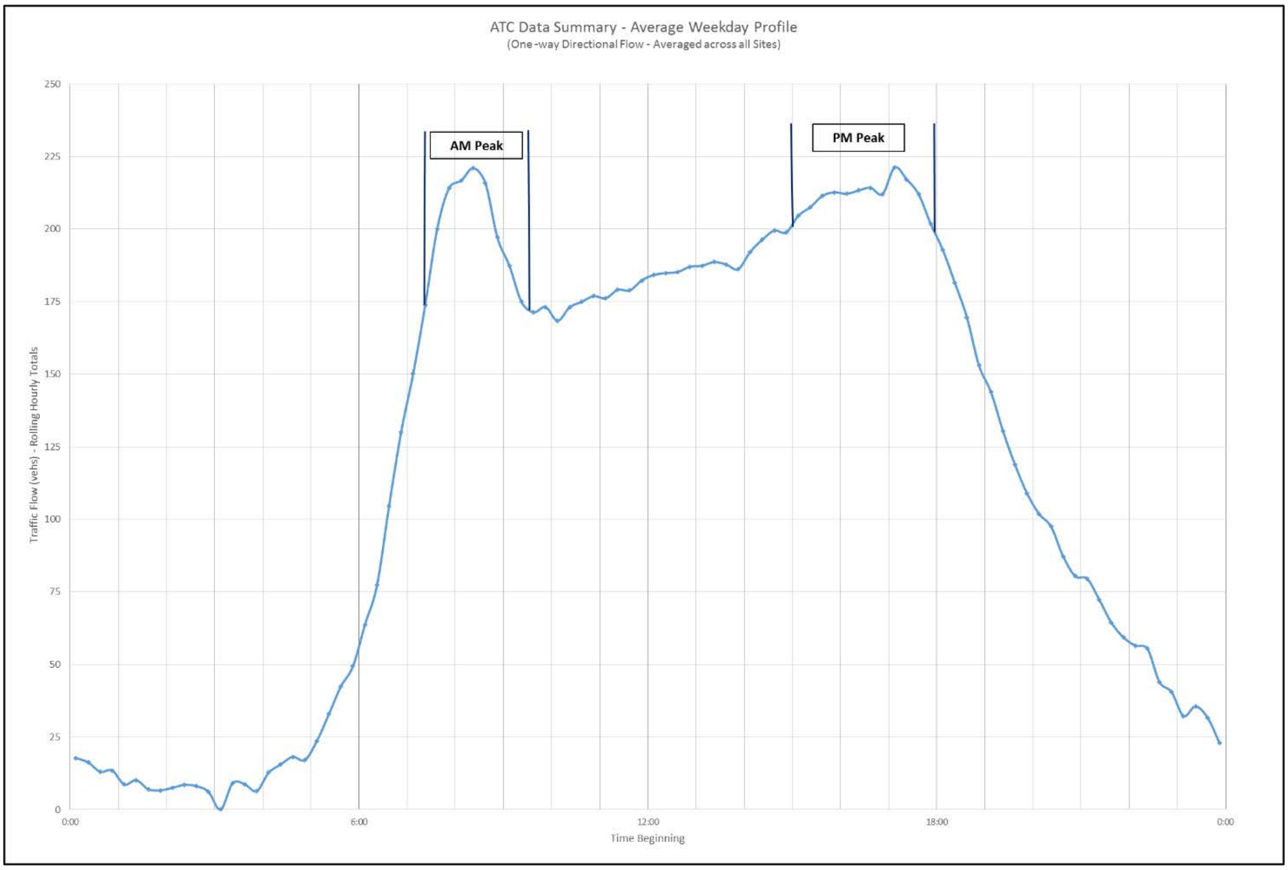
Table 9-5 Derivation of Peak Hour (15-minute Averages; 2015 ATC Data)

Time Period	15-minute Average	Rolling Hourly Totals	Fixed Hourly Totals
12:00	18	61	61
01:00	9	32	32
02:00	8	30	30
03:00	-	24	24
04:00	13	64	64
05:00	24	148	148
06:00	64	376	376
07:00	150	738	738
08:00	217	851	851
09:00	187	707	707
10:00	168	693	693
11:00	176	716	716
12:00	184	741	741
13:00	187	750	750
14:00	192	787	787
15:00	205	836	836
16:00	212	852	852
17:00	221	852	852

Time Period	15-minute Average	Rolling Hourly Totals	Fixed Hourly Totals
18:00	193	697	697
19:00	144	502	502
20:00	102	367	367
21:00	79	276	276
22:00	57	196	196
23:00	32	122	122

9.3.10 Figure 9-5 provides a plot showing the 15-minute average flows plotted by time of day.

Figure 9-5 2015 ATC Data: Average Weekday Profile



9.3.11 Following discussions with Highways England, the following were therefore identified as the peak hours for the traffic model:

- AM peak hour – average one hour between 07:30 and 09:30
- IP hour – average one hour between 09:30 and 15:00
- PM peak hour – average one hour between 15:00 and 18:00

9.3.12 A similar analysis to that performed on the 2015 ATC data was then performed on the 2-16 ATC data to check if there was any significant difference in the peak hours compared to those derived using the 2015 data.

9.3.13 Table 9-6 shows the average 15-minute vehicle totals during the hours of 06:00 to 10:00 as derived from the 2016 data, as well as the rolling hourly totals. The yellow highlighted cells provide an indication of the peak hour, based on the 15-minute starting periods with the highest rolling hourly totals.

Table 9-6 Derivation of AM Peak Hour Based on 2016 ATC Data

15-minute Starting Period	15-minute Average Across All Sites	Rolling Hourly Totals (vehs)
06:00	15	106
06:15	20	138
06:30	31	178
06:45	40	229
07:00	46	291
07:15	60	351
07:30	83	405
07:45	102	443
08:00	106	455
08:15	115	444
08:30	120	412
08:45	114	367
09:00	95	328
09:15	83	305
09:30	75	296
09:45	75	295
10:00	72	296

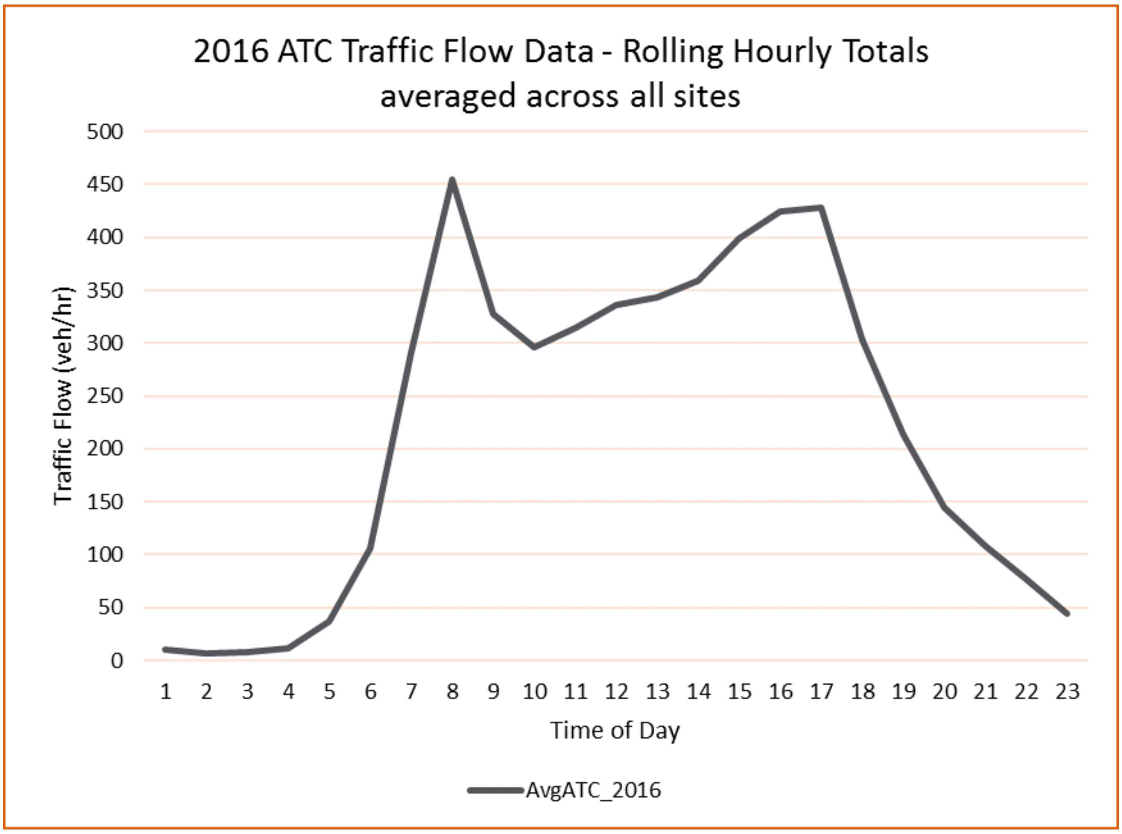
9.3.14 Table 9-7 presents the same data for the hours of 15:00 to 19:00.

Table 9-7 Derivation of PM Peak Hour Based on 2016 ATC Data

15-minute Starting Period	15-minute Average Across All Sites	Rolling Hourly Totals (vehs)
15:00	99	399
15:15	101	404
15:30	100	409
15:45	99	417
16:00	104	425
16:15	105	437
16:30	108	444
16:45	108	441
17:00	116	429
17:15	112	401
17:30	105	367
17:45	95	333
18:00	89	304
18:15	78	278
18:30	71	256
18:45	66	235
19:00	63	214

9.3.15 The average weekday profile based on the 2016 ATC data summary is shown in Figure 9-6.

Figure 9-6 Average Weekday Profile Based on 2016 ATC Data

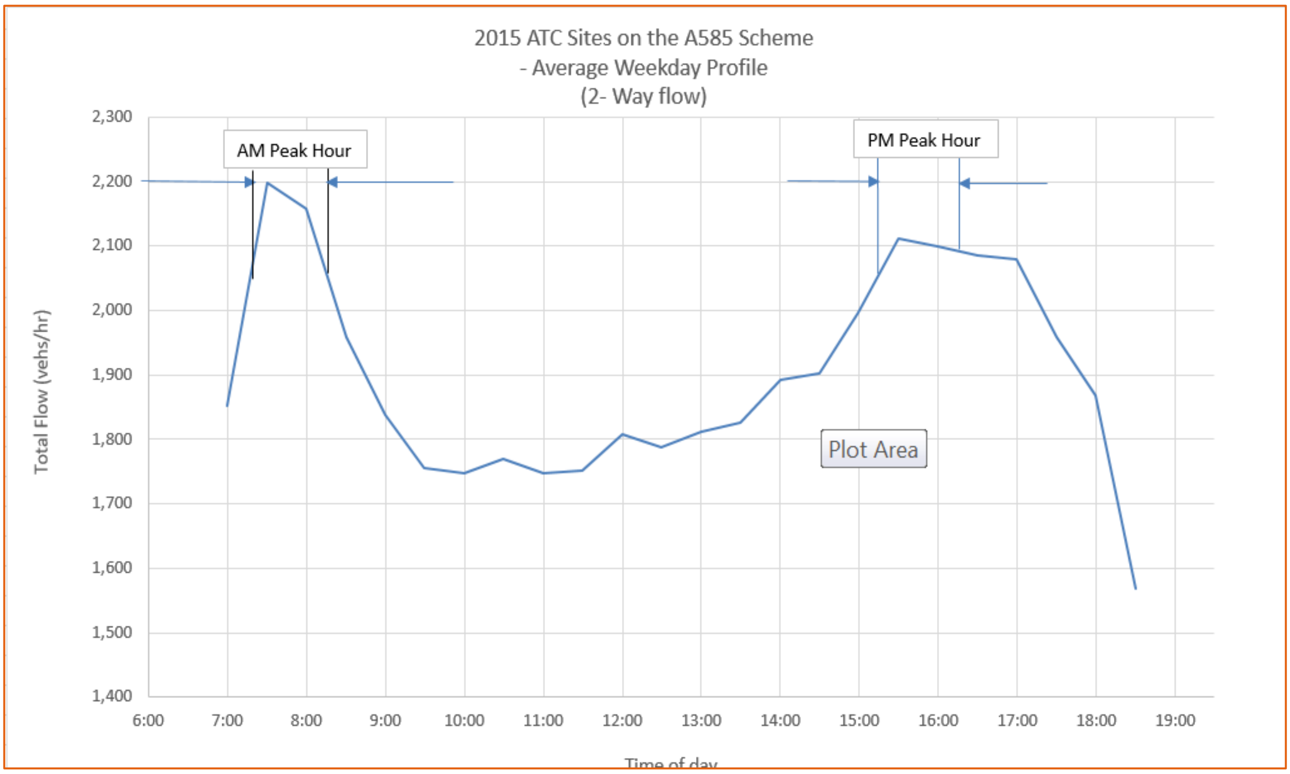


9.3.16 It can be seen that there is no significant difference between the AM and PM peak hours calculated for the 2015 and 2016 ATC data.

9.4 Peak Hour Derivation from A585 ATC Sites

9.4.1 In order to get a better understanding of the peak hours to be used in the study, the weekday ATC profile was plotted by time of the day for the two ATC sites along the A585 scheme; namely 2015ATC_01 and 2015ATC_02. This plot is shown in Figure 9-7.

Figure 9-7 Average Weekday Profile for A585 ATC Sites



9.4.2 As shown in Figure 9-7, the average weekday 2015 A585 ATC data suggests an AM peak hour of 07:30 to 08:30 and a PM peak hour of 15:15 to 16:15. These periods lie within the peak hours suggested by Highways England as listed in Chapter 9.3.14.

9.4.3 Therefore, the peak hours to be used in the model are confirmed as:

- AM peak - average hour between 07:30 and 09:30
- IP - average hour between 09:30 and 15:00
- PM peak - average hour between 15:00 and 18:00.

10 CLASSIFIED JUNCTION COUNT DATA ANALYSIS

10.1 Introduction and CJC Data Checks

10.1.1 Classified Junction Count (CJC) data was collected at 32 sites grouped into three areas, and in each area, counts were undertaken on two days in July 2015. A list of junctions where CJC data was collected is given in Table 5-4 and their locations are shown in Figure 5-3.

10.1.2 The data was collected at each junction by vehicle class for a continuous twelve-hour period (from 07:00 to 19:00) on a mid-week day (Tuesday, Wednesday or Thursday), with each movement summed by 15-minute period.

10.1.3 In order to process the CJC data, it was necessary to first identify any deficient data and exclude this data from the overall dataset to create a clean CJC data set. Three primary kinds of checks were therefore performed on the CJC data as follows:

- GEH check between CJCs (arm total entry flows) on two different days
- Comparison of CJCs (entry and exit flows) with nearby ATC data
- Comparison of CJCs (entry and exit flows) with nearby CJC data

10.1.4 The following sections describe these CJC checks in detail.

10.2 GEH Checks on CJC Data (Day 01 vs Day 02)

10.2.1 The GEH statistic is the form of a Chi-squared statistic that incorporates both relative and absolute errors and is calculated as follows:

$$GEH = \sqrt{\frac{(M - O)^2}{0.5 \times (M + O)}}$$

Where *M* is the modelled flow and *O* is the observed flow.

10.2.2 The GEH was calculated for the CJC data in order to compare the variation between the two surveyed days at each CJC site. The GEH statistic was computed for entry arm totals on each approach to each CJC site.

10.2.3 Table 10-1 shows the Area 1 CJC sites along with their respective arms and time periods when the GEH is greater than 5.

Table 10-1 Area 1 CJC Sites where GEH > 5

Area 1 – CJC Sites – Comparison of CJC Data on 14/07/2015 & 15/07/2015								
Site	**Arm Name**	**No. of Instances Where GEH>5**	**Time of Occurrence (Start of 15-minute Period)**					
CJC2	A585 Fleetwood Road (N arm)	1	18:15					
CJC2	A585 Fleetwood Road (S arm)	6	09:45	10:30	17:45	18:15	18:30	18:45
CJC3	A586 Garstang Road (E arm)	2	14:45	18:30				
CJC3	A585 Fleetwood Road (S arm)	2	17:15	18:15				
CJC3	A585 Garstang New Road (W arm)	4	09:00	10:00	12:30	17:00		
CJC4	A585 Garstang New Road (E arm)	3	18:15	18:30	18:45			
CJC4	Lodge Lane (S arm)	1	11:15					
CJC4	A585 Mains Lane	2	12:30	13:00				

Area 1 – CJC Sites – Comparison of CJC Data on 14/07/2015 & 15/07/2015								
Site	**Arm Name**	**No. of Instances Where GEH>5**	**Time of Occurrence (Start of 15-minute Period)**					
CJC5	A585 Main Lane (E)	2	18:30	18:45				
CJC5	A585 Garstang New Road (W)	1	12:30					
CJC6	A585 – E arm	1	08:30					
CJC9	B5412 Victoria Road East	1	07:45					
CJC33	A583 Preston New Road (N)	1	13:30					
CJC33	M55 (E and W arm)	2	09:00	10:45				
CJC33	A583 Preston New Road (S)	2	08:15	09:00				

10.2.4 Based on the GEH comparison shown in Table 10-1 it is clear that within Area 1, there are very few instances where the CJC counts vary significantly across the two days. The majority of the instances occur on the A585 Fleetwood Road south arm at CJC2.

10.2.5 Table 10-2 shows the Area 2 CJC sites along with their respective arms and time periods when the GEH is greater than 5.

Table 10-2 Area 2 CJC Sites Where GEH > 5

Area 2 – CJC Sites – Comparison of CJC data on 15/07/2015 & 16/07/2015					
Site	**Arm Name**	**No. of Instances Where GEH>5**	**Time of Occurrence (Start of 15-Minute Period)**		
CJC12	Garstang Road E EB	2	17:15	17:45	
CJC16	St Walburga's Rd NB	1	07:00		
CJC16	Westcliffe Drive	2	07:00	07:15	
CJC18	Devonshire Road	2	18:00	18:15	
CJC18	Devonshire Road SB	3	17:45	11:30	13:15
CJC18	Bispham Road NB	1	18:00		
CJC19	Russell Avenue EB	2	18:30	18:45	
CJC21	Victoria Road W WB	1	15:15		
CJC22	Warren Drive NB	2	17:15	17:30	
CJC22	Warren Drive EB	2	17:30		
CJC22	White Carr Lane SB	1	11:45	17:30	

10.2.6 Based on the Area 2 GEH comparison shown in Table 10-2 there are very few instances where the GEH is greater than 5, indicating that very few sites show a significant variation between the CJC counts collected on the two different survey days. Table 10-3 shows the Area 3 CJC sites along with their respective arms and time periods when the GEH is greater than 5.

Table 10-3 Area 3 CJC Sites Where GEH > 5

Area 3 – CJC Sites – Comparison of CJC Data on 08/07/2015 & 09/07/2015							
Site	**Arm Name**	**No. of Instances Where GEH>5**	**Time of Occurrence (Start of 15-Minute Period)**				
CJC24	Rossall Lane EB	2	10:30	11:00			
CJC26	Broadway NB	26	***				
CJC26	Chatsworth Avenue EB	9					
CJC26	Grange Road EB	36					
CJC26	Beech Road SB	3	11:45	16:15	17:00		
CJC26	Broadway SB	2	07:45	12:45			
CJC26	Hatfield Avenue WB	8	***				
CJC26	Fleetwood Road NB	4	12:45	13:15	13:30	16:45	
CJC27	Amounderness Way NB	1	13:15				
CJC29	Fleetwood Road N SB	4	09:15	11:45	12:45	13:00	18:15

*** In site 26 the number of instances are high in number and scattered throughout the day.

10.2.7 Based on the results shown in Table 10-3, with the exception of Site 26, Area 3 CJC sites have a limited number of occurrences where the GEH is greater than 5. CJC Site 26 data seems to have significant issues based on the GEH check and there are several time periods during the day when the GEH for this site is greater than 5. On further investigation, it was found that the raw data provided by the survey company had some arm name labelling inconsistencies. These were corrected based on a comparison of the data from both survey days.

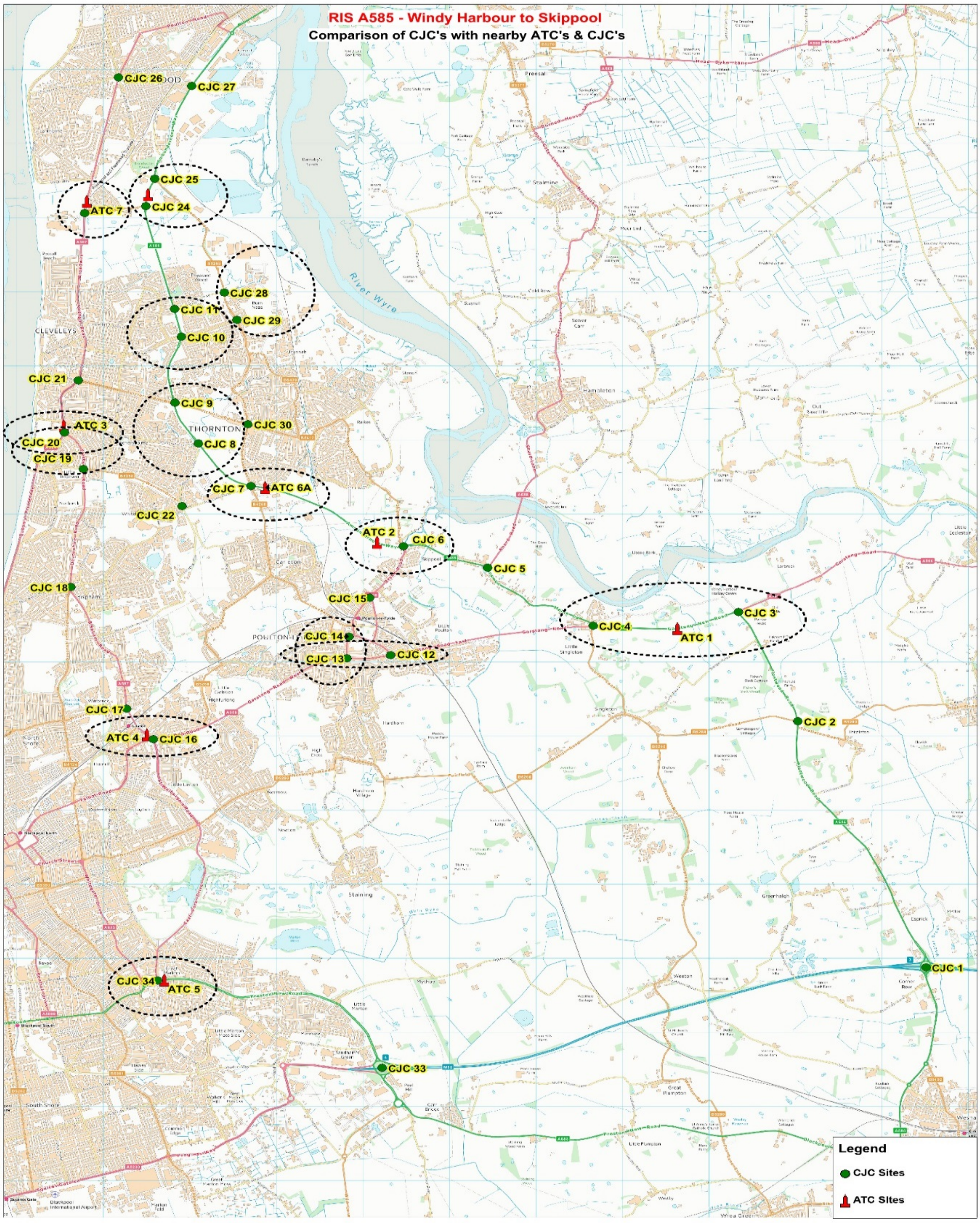
10.3 Comparison of CJCs with ATC Data

10.3.1 Further to the GEH checks, the CJC data at each site (entry and exit flow) was compared to nearby ATC data for each of the days that the CJC data was collected. Based on the location of the ATC and CJC sites, the following CJCs are identified along with the nearby ATCs with which the entry and exit flows have been compared.

- CJC at Site 3 and Site 4 is compared with ATC at Site 1
- CJC at Site 6 is compared with ATC at Site 2
- CJC at Site 7 is compared with ATC at Site 6A
- CJC at Site 16 is compared with ATC at Site 4
- CJC at Site 20 is compared with ATC at Site 3
- CJC at Site 23 is compared with ATC at Site 7
- CJC at Site 34 is compared with ATC at Site 5

10.3.2 Where ATC data was not available, existing CJC data was used to compare against the CJC data collected, as described in Section 10.4. Figure 10-1 shows the location of the CJC and ATC sites used for comparison. Importantly, these checks cover the key corridors in the study area, and provide reassurance that some of the most important traffic data to be used in the calibration and validation process is robust.

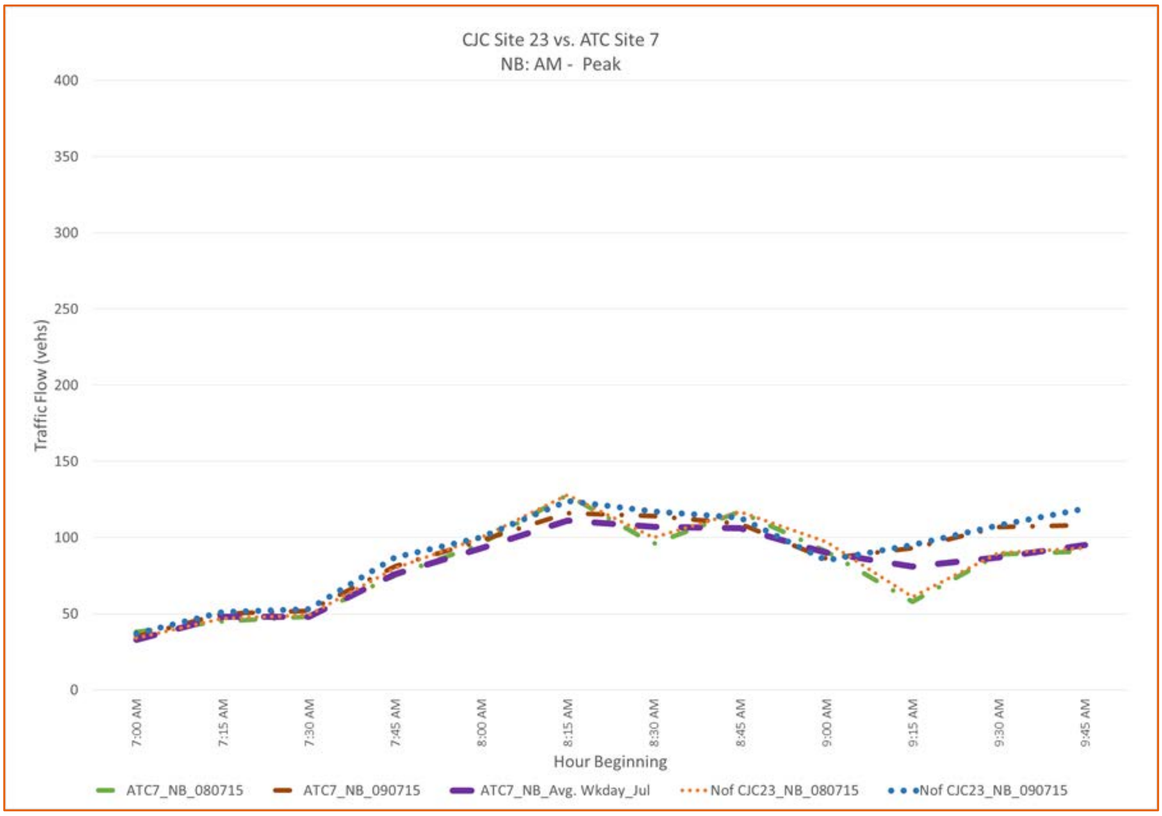
Figure 10-1 Comparison of CJCs with Nearby CJCs & ATCs



Source: OS data © Crown copyright 2015; Licence – Version 3 of Open Govt. Licence (OGL)

10.3.3 Figure 10-2 provides a plot comparing the northbound exit flow at CJC Site 23 versus the northbound entry flow at ATC Site 7 between 07:00 and 10:00 as an example.

Figure 10-2 CJC at Site 23 vs. ATC at Site 7 – NB AM Peak



10.3.4 It can be seen that the exit flows from CJC Site 23 match very closely with the entry flows at ATC Site 7 in the northbound direction on both CJC survey days. Appendix K provides plots which show the CJC versus ATC comparisons at all sites. A review of the plots in Appendix K indicates that in most cases, the general trend of entry and exit flows versus time of day from a junction count matches closely with the profile of the adjacent ATC. However, there are some instances for example at CJC Site 34 where the CJC and ATC profile follow a similar trend, but are slightly displaced.

10.3.5 GEH tests were also carried out to understand the variance between the CJC counts and relevant ATC counts.

10.3.6 Table 10-4 shows the instances where the CJC versus ATC comparison shows a GEH greater than 5.

Table 10-4 GEH Checks – CJC Data Versus Nearby ATC Data

Count Comparison	Remarks	EB/NB		WB/SB	
		14/07/2015	15/07/2015	14/07/2015	15/07/2015
ATC 1 (vs) CJC 3	Negligible traffic leakage	-	-	-	-
ATC 1 (vs) CJC 4	Negligible traffic leakage	-	-	-	2 (18:15, 18:45)
ATC 2 (vs) CJC 6	One local road leakage point	-	1 (17:15)	-	-
Count Comparison	**Remarks**	**15/07/2015**	**16/07/2015**	**15/07/2015**	**16/07/2015**
ATC 3 (vs) CJC 20	One local road leakage point	-	-	-	-
ATC 4 (vs) CJC 16	Traffic Leakage occurs between CJC 16 and ATC 4. Large driveway (Mowbray Drive) to an industrial area is present	5 (07:00, 07:15, 07:30, 09:00, 13:00)	4 (07:00, 07:15, 08:45, 10:00)	4 (07:00, 07:15, 07:30, 08:15)	3 (07:15, 07:30, 10:00)
ATC 5 (vs) CJC 34	Negligible traffic leakage	-	-	1 (08:00)	-
Count Comparison	**Remarks**	**14/07/2015**	**15/07/2015**	**14/07/2015**	**15/07/2015**
ATC 6A (vs) CJC 7	Negligible traffic leakage	-	1 (16:00)	-	-
Count Comparison	**Remarks**	**07/08/2015**	**07/09/2015**	**07/08/2015**	**07/09/2015**
ATC 7 (vs) CJC 23	Negligible traffic leakage	-	-	-	-

10.3.7 Based on the GEH checks reported in Table 10-4 and the plots provided in Appendix K, it is observed that at the majority of comparison locations, negligible traffic leakage occurs between the two counts as a result of there being only a small number of entry/egress points between the two locations.

10.3.8 There are very few occurrences where the entry and exit flows from a CJC vary significantly from the nearby ATC count. One notable exception is at CJC Site 4, where there are several occurrences in the AM peak hour. This could be a result of traffic exiting from CJC Site 16 and heading northbound and potentially turning right onto Mowbray Drive, thus resulting in flow imbalances between the CJC exit and the ATC count.

10.3.9 For those CJC sites which are not in the proximity of any ATC sites, further checks and comparisons were made between CJC data and nearby CJC data as reported in Section 10.4.

10.4 Comparison of CJCs with Nearby CJCs

10.4.1 It is noted that not all CJC sites are located near an ATC site. For those CJC sites which are not in the proximity of any ATC sites, further checks and comparisons were made between the CJC data and any other nearby CJC data to determine if any significant deficiencies exist in the CJC data.

10.4.2 The following CJC pairs were identified with which to compare entry and exit flows:

- CJC Site 3 and CJC Site 4
- CJC Site 8 and CJC Site 9
- CJC Site 10 and CJC Site 11

- CJC Site 12 and CJC Site 13
- CJC Site 12 and CJC Site 14
- CJC Site 19 and CJC Site 20
- CJC Site 24 and CJC Site 25
- CJC Site 28 and CJC Site 29

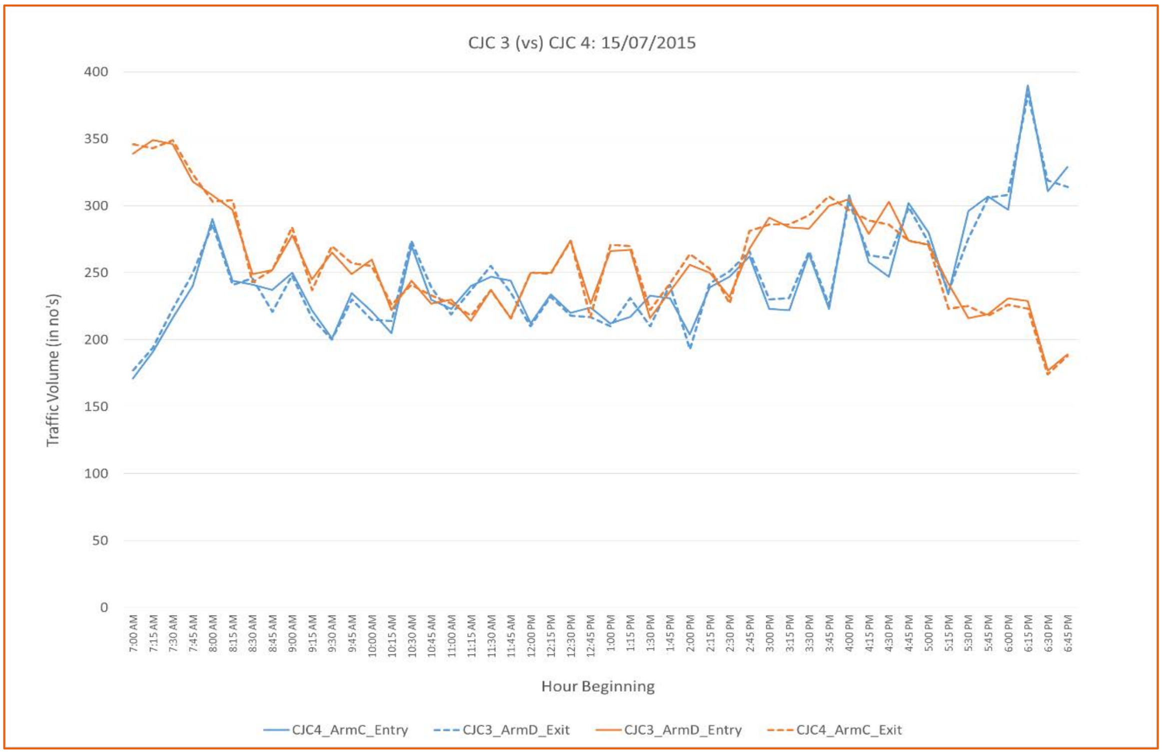
10.4.3 Table 10-5 shows the observations inferred from the comparison of CJC data with data obtained from nearby CJC sites. A broad level inspection of the CJC sites indicates the possibility of traffic leakage into residential areas between some CJC pairs.

Table 10-5 Comparison of CJC Site Data with Nearby CJCs

CJC Site	CJC Site	Remarks	Possible Explanations
3	4	Good match	
8	9	Good match	
10	11	Good match	
12	13	Some leakages observed	Traffic leakage into residential areas
13	14	Slight leakages observed	Traffic leakage into residential areas & market
19	20	Displaced plots on both days	Traffic leakage into residential areas
24	25	Good match	
28	29	Some leakages observed	Traffic leakage into residential areas

10.4.4 Figure 10-3 shows the comparison between CJC at Site 3 and CJC at Site 4 based on counts collected on 15th July 2015. A full set of plots showing the comparisons between other CJC site pairs is provided in Appendix L.

Figure 10-3 CJC at Site 3 vs. CJC at Site 4 – Comparison on 15/07/2015



10.4.5 As shown in Figure 10-3, the entry and exit flows between the CJCs at Sites 3 and 4 match very closely with each other. Given that Site 3 and Site 4 are key junctions in the immediate vicinity of the scheme improvement, the above plot indicates the robustness of the CJC data on 15 July 2015.

10.4.6 Based on all the CJC data checks and comparisons described in this chapter (i.e. GEH checks, CJC vs. ATC comparison and CJC vs. CJC comparison), a decision was taken regarding which CJC data points to use for further analysis and which CJC points to exclude. Table 10-6 shows the CJC data that will be taken forward for modelling purposes for CJC Area 1 along with any relevant remarks and observations on the datasets.

Table 10-6 Area 1 CJC Data to Use in Model Development

Area 1 CJCs – Data Collected on 14/07/2015 & 15/07/2015		
CJC Site No.	**Data to Use**	**Remarks**
1	Average of both days	No issues with the data
2	Use 15/07/2015 data	Data on 15/07/2016 matches much more closely to the adjacent ATC data
3	Use 15/07/2015 data	
4	Use 15/07/2015 data	Exclude 18:15 and 18:45pm data
5	Average of both days	Exclude 18:30 and 18:45 data
6	Average of both days	Exclude 16:00 and 17:15 data on 15/07/2015 Exclude PM peak EB entry on 15/07/2015
7	Average of both days	Exclude 16:00 data on 15/07/2015
8	Average of both days	No issues with the data
9	Average of both days	
10	Use 15/07/2015 data	CJC at Site 10 matches exactly with CJC at Site 11 on 15/07/2015
11	Use 15/07/2015 data	
33	Average of both days	No issues with the data

10.4.7 Table 10-7 shows the CJC data that will be taken forward for modelling for Area 2 CJC sites.

Table 10-7 Area 2 CJC Data to Use in Model Development

Area 2 CJCs – Data Collected on 15/07/2015 & 16/07/2015		
CJC Site No.	**Data to Use**	**Remarks**
12	Use 15/07/2015 data	Only PM peak data available on 16/07/2015
13	Use 15/07/2015 data	
14	Use 15/07/2015 data	
15	Use 15/07/2015 data	
16	Average of both days	No issues with the data
17	Average of both days	
18	For 17:45 to 18:45 use 15/07/2015 data Rest of day – average of both days	Some missing data points, but otherwise no issues
19	Average of both days	No issues with the data
20	Average of both days	
21	Average of both days	
22	For 16:00 to 19:00 use 15/07/2015 data Rest of day – average of both days	Some missing data points, but otherwise no issues
34	Use 15/07/2015 data	No AM peak data available on 16/07/2015

10.4.8 Table 10-8 shows the CJC data to take forward for modelling for Area 3 CJC sites.

Table 10-8 Area 3 CJC Data to Use in Model Development

Area 3 CJCs – Data Collected on 08/07/2015 & 09/07/2015		
CJC Site No.	**Data to Use**	**Remarks**
23	Average of both days	No issues with the data on any date
24	Use 09/07/2015 data	Entry and exit flows between these CJCs show very good flow conservation based on 09/07/2016 data
25	Use 09/07/2015 data	
26	Average of both days	No issues with the data on any date
27	Average of both days	No issues with the data on any date
28	Average of both days	No issues with the data on any date
29	Average of both days	No issues with the data on any date
30	Average of both days	No issues with the data on any date

10.5 Analysis of CJC Data

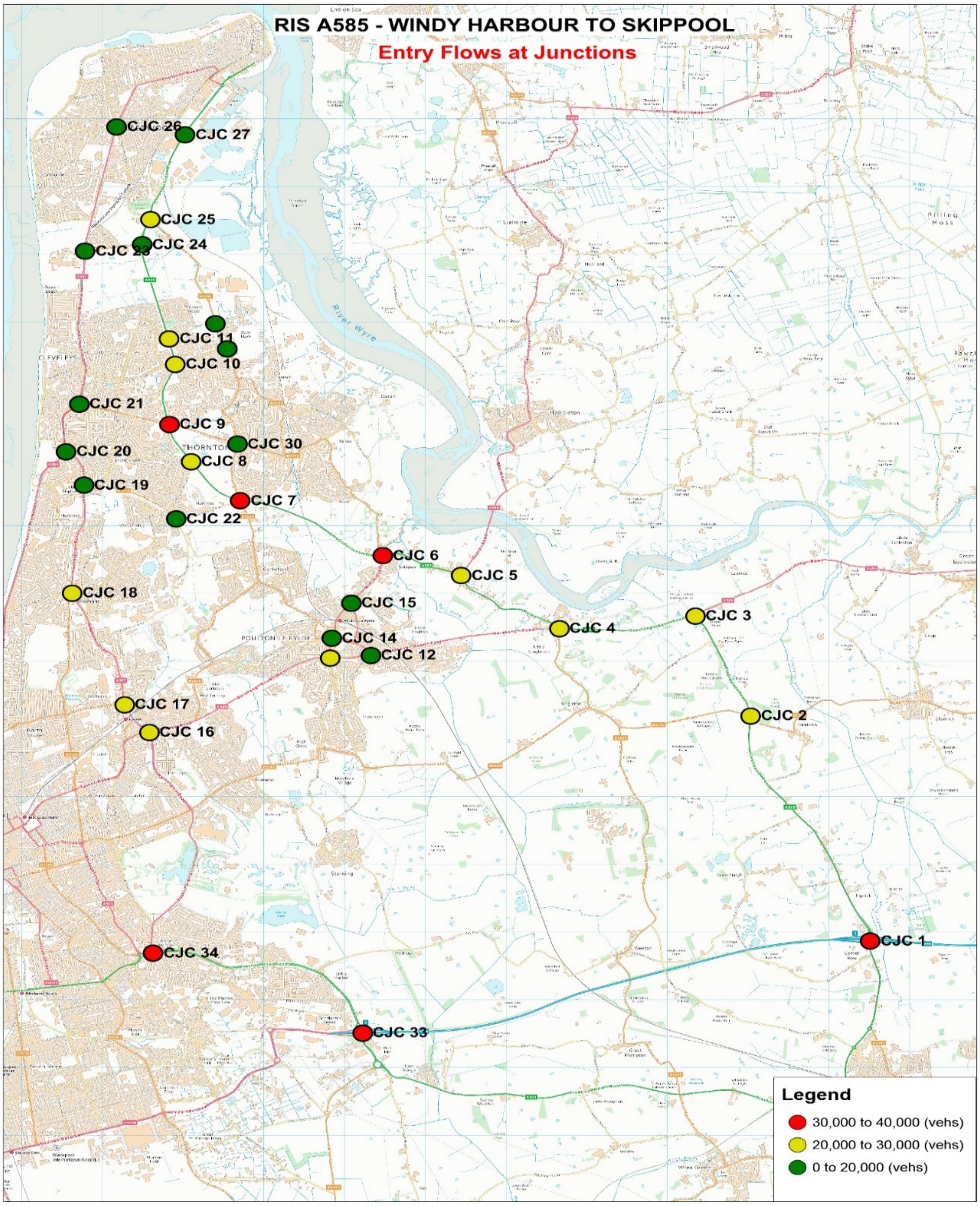
10.5.1 The entry flows were prepared from the CJC data set after removing any deficient points and infilling either based on an adjacent ATC or using another survey day. Table 10-9 shows the entry flows (totals) at all CJC sites for the 12-hour (07:00-19:00) period, which are illustrated in Figure 10-4.

Table 10-9 Total Entry Flows at CJC Sites

Site No.	Site Location	Total Entry Flows (Vehs) 07:00-19:00
1	M55 Junction 3 roundabout with A585	31,138
2	A585 Fleetwood Road/Mile Road/Thistleton Road staggered 4-arm priority junction	22,596
3	A585 Garstang New Road/Windy Harbour Road/A585 Garstang Road/A585 Fleetwood Road traffic signals	27,112
4	A585 Mains Lane/Pool Foot Lane/A585 Garstang New Road/Lodge Lane/A586 Garstang Road traffic signals	24,263
5	A585 Mains Lane/A588 Shard Road traffic signals	20,448
6	A585 Amounderness Way/Skippool Road/A585 Mains Lane/Breck Road roundabout	36,692
7	A585 Amounderness Way/Fleetwood Road South/Norcross Lane roundabout	39,533
8	A585 Amounderness Way/Anchorsholme Lane priority junction	27,286
9	A585 Amounderness Way/Victoria Road East/Supermarket Access/Victoria Road West roundabout	39,125
10	A585 Amounderness Way/West Drive traffic signals	26,175
11	A585 Amounderness Way/Bourne Way priority junction	20,188
12	A586 Garstang Road East/Lower Green traffic signals	17,884
13	A586 Garstang Road W/Hardhorn Lane/A585 Garstang Road East traffic signals	22,303
14	A583 Hardhorn Road/B5267 Blackpool Old Road/A583 Queen’s Square	12,797
15	A588 Breck Road/Station Road/Parrys Way	11,992
16	A587 Plymouth Road/A586 Poulton Road/A587 St Walburga’s Road/A586 Westcliffe Drive	29,415
17	A587 Bispham Road/Holyoake Avenue/A587 Plymouth Road/Warbreck Hill Road	27,065
18	A587 Bispham Rd/A587 Devonshire Road/B5124 Devonshire Road/Ingthorpe Avenue/Red Bank Road	25,581
19	A587 Fleetwood Road/Russell Avenue/Warren Drive	17,050
20	A587 Fleetwood Road/Queen’s Promenade/Kelso Avenue	17,125
21	Crescent East/Crescent West/Rossall Road/Brighton Avenue/Victoria Road West	18,665
22	Warren Drive/White Carr Lane	11,653
23	A587 Broadway/Rossall Lane	13,108
24	A585/Rossall Lane	19,781
25	A585/Fleetwood Road	27,330
26	A587 Broadway/Fleetwood Road/Beach Road/Chatsworth Avenue/Hatfield Avenue/Grange Road	19,445
27	A585/Denham Way/Herring Arm Road	16,948

Site No.	Site Location	Total Entry Flows (Vehs) 07:00-19:00
28	B5268 Fleetwood Road North/Bourne Way/Bourne Road	11,361
29	B5268 Fleetwood Road North/West Drive	11,358
30	B5268 Fleetwood Road South/B5268 Fleetwood Road North/Victoria Road East	18,731
33	M55 Junction 4 with A583 Preston New Road	35,099
34	A583 Preston New Road/A587 East Park Drive	32,313

Figure 10-4 Entry Flows at Junctions (07:00 to 19:00)



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11 QUEUE LENGTH SURVEY ANALYSIS

11.1 Introduction

11.1.1 Queue length surveys were carried out at 32 junctions within the study area on two consecutive days, as set out in Section 5.3.7 and as shown in Table 5-1.

11.1.2 The data was collected at each junction for a continuous 12-hour period (from 07:00 to 19:00) on a mid-week day (Tuesday, Wednesday or Thursday). The queue lengths were measured (by video recording) as the maximum length of the vehicle queue (number of vehicles) present at a signalised junction when the signal for that arm turned green. Queue lengths were recorded in five minute intervals.

11.1.3 Queue lengths were measured by the number of vehicles in the queue and the length of the queue was calculated in metres using the following measurement values: Car/LGV = 5m; OGV1 = 10m; and Bus/OGV2 = 15m.

11.1.4 This section sets out how the queue length data was processed and analysed.

11.2 Queue Length Data Processing

11.2.1 The queue length data collection sites and survey dates are shown in Table 11-1. At some sites, some of the queue length data was found to be missing; however, following a review it was determined that sufficient data was available at each site for model development.

Table 11-1 Queue Length Survey Data

Area	Site	Arm	Survey Dates
Area 1	2015CJC_01	A585 Fleetwood Road (North Arm)	14 & 15 July 2015
	2015CJC_01	M55 Slip Road (East Arm)	
	2015CJC_01	A585 Fleetwood Road (South Arm)	
	2015CJC_01	M55 Slip Road (West Arm)	
	2015CJC_02	A585 Fleetwood Road (North Arm)	
	2015CJC_02	B5269 Thistleton Road	
	2015CJC_02	A585 Fleetwood Road (South Arm)	
	2015CJC_02	B5269 Mile Road	
	2015CJC_03	Windy Harbour Road	
	2015CJC_03	A586 Garstang Road	
	2015CJC_03	A585 Fleetwood Road	
	2015CJC_03	A585 Garstang New Road	
	2015CJC_04	A585 Mains Lane	
	2015CJC_04	Pool Foot Lane	
	2015CJC_04	A585 Garstang New Road	
	2015CJC_04	Lodge Lane	
	2015CJC_04	A586 Garstang Road	
	2015CJC_05	A588 Shard Road	
	2015CJC_05	A585 Mains Lane (SE Arm)	
	2015CJC_05	A585 Mains Lane (NW Arm)	
	2015CJC_06	B5412 Skippool Road	
	2015CJC_06	A585 Mains Lane	
	2015CJC_06	Breck Road	
	2015CJC_06	A585 Amounderness Way	

Area	Site	Arm	Survey Dates
	2015CJC_07	B5268 Fleetwood Road South (North Arm)	
	2015CJC_07	A585 Amounderness Way (East Arm)	
	2015CJC_07	B5268 Fleetwood Road South (South Arm)	
	2015CJC_07	Norcross Lane	
	2015CJC_07	A585 Amounderness Way (West Arm)	
	2015CJC_08	A585 Amounderness Way (NW Arm)	
	2015CJC_08	A585 Amounderness Way (SE Arm)	
	2015CJC_08	Anchorsholme Lane	
	2015CJC_09	A585 Amounderness Way (NW Arm)	
	2015CJC_09	B5412 Victoria Road East	
	2015CJC_09	A585 Amounderness Way (South Arm)	
	2015CJC_09	Morrison’s Access/Superstore	
	2015CJC_09	B5412 Victoria Road West	
	2015CJC_10	A585 Amounderness Way (North Arm)	
	2015CJC_10	West Drive (East Arm)	
	2015CJC_10	A585 Amounderness Way (South Arm)	
	2015CJC_10	West Drive (West Arm)	
	2015CJC_11	A585 Amounderness Way (North Arm)	
	2015CJC_11	Bourne Way	
	2015CJC_11	A585 Amounderness Way (South Arm)	
	2015CJC_33	Preston New Road (North Arm)	
	2015CJC_33	M55 Slip Road (East Arm)	
	2015CJC_33	Preston New Road (South Arm)	
	2015CJC_33	M55 Slip Road (West Arm)	
Area 2	2015CJC_12	A586 Garstang Road East (East)	15 & 16 July 2015
	2015CJC_12	A586 Garstang Road East (West)	
	2015CJC_12	Lower Green	
	2015CJC_13	Hardhorn Road (North)	
	2015CJC_13	A586 Garstang Road East	
	2015CJC_13	Hardhorn Road (South)	
	2015CJC_13	A586 Garstang Road West	
	2015CJC_14	Hardhorn Road	
	2015CJC_14	Blackpool Old Road	
	2015CJC_15	Breck Road (North)	
	2015CJC_15	Station Road	
	2015CJC_15	Breck Road (South)	
	2015CJC_15	Parrys Way	
	2015CJC_16	Poulton Road	
	2015CJC_16	St Walburga’s Road	
	2015CJC_16	Westcliffe Drive	
	2015CJC_16	Plymouth Road	
	2015CJC_16	Carleton Avenue	

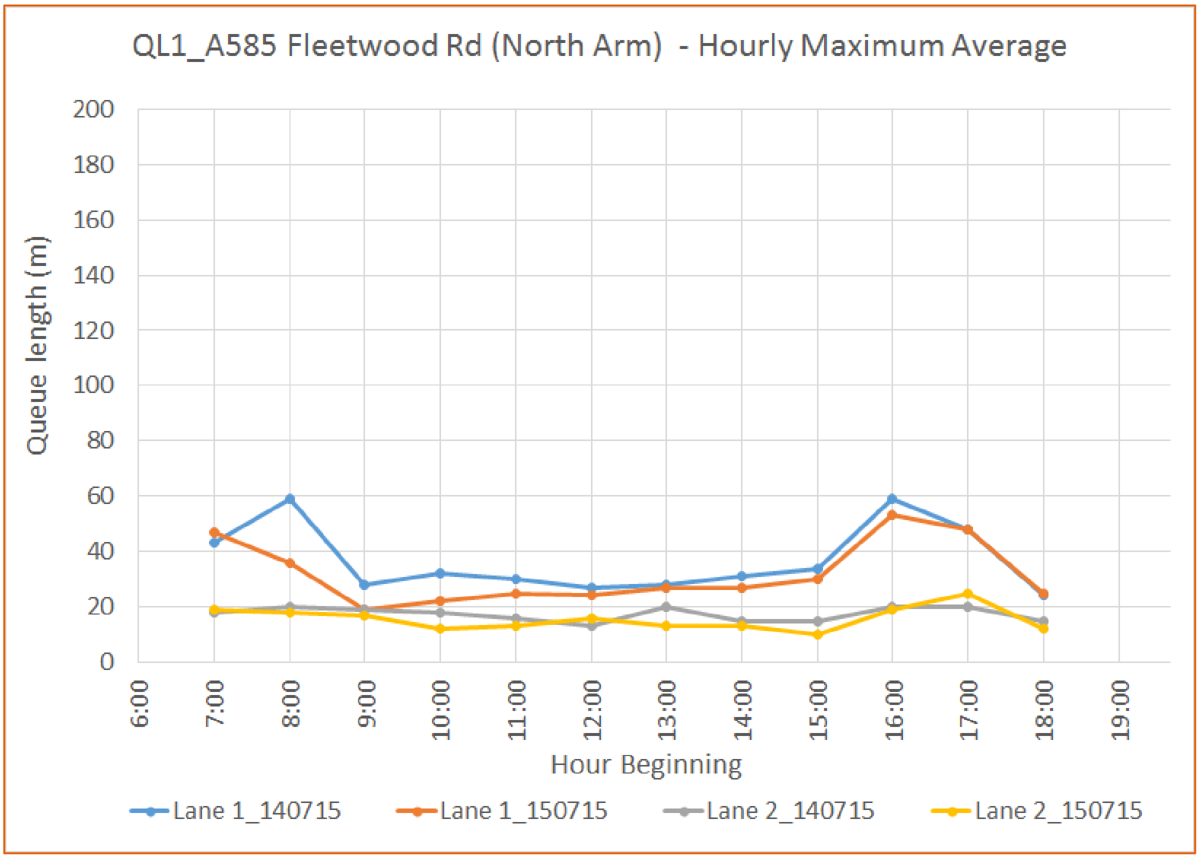
Area	Site	Arm	Survey Dates
	2015CJC_17	Bispham Road	
	2015CJC_17	Holyoake Avenue	
	2015CJC_17	Plymouth Road	
	2015CJC_17	Warbreck Hill Road	
	2015CJC_18	Devonshire Rd (North)	
	2015CJC_18	Red Bank Road (East)	
	2015CJC_18	Bispham Road	
	2015CJC_18	Devonshire Road (South)	
	2015CJC_18	Red Bank Road (West)	
	2015CJC_19	A587 Fleetwood Road (North)	
	2015CJC_19	Warren Drive	
	2015CJC_19	A587 Fleetwood Road (South)	
	2015CJC_19	Russell Avenue	
	2015CJC_20	Kelso Avenue	
	2015CJC_20	Fleetwood Road (East)	
	2015CJC_20	Queen's Promenade	
	2015CJC_21	Brighton Avenue	
	2015CJC_21	Victoria Road West (East)	
	2015CJC_21	Crescent West	
	2015CJC_22	White Carr Lane	
	2015CJC_22	Warren Drive (South)	
	2015CJC_22	Warren Drive (North)	
	2015CJC_34	S Park Drive	
	2015CJC_34	Preston New Road (East)	
	2015CJC_34	Preston New Road (West)	
Area 3	2015CJC_23	A587 Broadway (North Arm)	8 & 9 July 2015
	2015CJC_23	Rossall Lane (East Arm)	
	2015CJC_23	A587 Broadway (South Arm)	
	2015CJC_23	Rossall Lane (West Arm)	
	2015CJC_24	A585 Amounderness Way (North Arm)	
	2015CJC_24	A585 Amounderness Way (South Arm)	
	2015CJC_24	Rossall Lane	
	2015CJC_25	A585 Amounderness (NE Arm)	
	2015CJC_25	Fleetwood Road (SE Arm)	
	2015CJC_25	A585 Amounderness (SW Arm)	
	2015CJC_25	Fleetwood Road (NW Arm)	
	2015CJC_26	Grange Road	
	2015CJC_26	Beech Road	
	2015CJC_26	Broadway (NE Arm)	
	2015CJC_26	Hatfield Road	
	2015CJC_26	Fleetwood Road	
	2015CJC_26	Broadway (SW Arm)	
	2015CJC_26	Chatsworth Avenue	

Area	Site	Arm	Survey Dates
	2015CJC_27	A585 (NE Arm)	
	2015CJC_27	Herringham Road	
	2015CJC_27	A585 (SW Arm)	
	2015CJC_27	Denham Way	
	2015CJC_28	B5268 Fleetwood Road North (North Arm)	
	2015CJC_28	Bourne Road	
	2015CJC_28	B5268 Fleetwood Road North (South Arm)	
	2015CJC_28	Bourne Way	
	2015CJC_29	B5268 Fleetwood Road North (NW Arm)	
	2015CJC_29	B5268 Fleetwood Road North (SE Arm)	
	2015CJC_29	West Drive	
	2015CJC_30	B5268 Fleetwood Road North	
	2015CJC_30	Victoria Road East (East Arm)	
	2015CJC_30	B5268 Fleetwood Road South	
	2015CJC_30	Victoria Road East (West Arm)	

11.2.2 The average maximum queue lengths in metres for each hour were plotted for each lane on each arm at each junction for the respective survey dates

11.2.3 Figure 11-1 shows a typical queue profile plot, showing the average maximum queue length on the A585 Fleetwood Road North Arm for each hour from 07:00 to 19:00.

Figure 11-1 Hourly Average Maximum Queue Length



11.2.4 The other average maximum queue length plots for sites on the A585 are shown in Appendix M. The average maximum queue length plots for the remainder of the sites in the study area are shown in Appendix N.

11.2.5 The locations where significant queues were observed (arbitrarily defined as an hourly average of 75m or more) are shown in Table 11-2.

Table 11-2 Locations with Average Maximum Queue Lengths >75m

Area	Site	Arm	Lane	Date	AM	PM
1	QL1	A585 Fleetwood Road (South Arm)	2	15/07/15		17:00
	QL3	A585 Fleetwood Road	1	15/07/15		16:00-18:00
		A585 Garstang New Road	2	15/07/15		16:00
	QL4	A585 Mains Lane	1	14/07/15	07:00-10:00	16:00-17:00
		A585 Mains Lane	1	15/07/15	07:00-10:00	16:00-17:00
		A585 Garstang New Road	2	14/07/15	08:00	16:00 -18:00
		A585 Garstang New Road	2	15/07/15	07:00-10:00	16:00-18:00
		Lodge Lane	1	14/07/15		16:00-17:00
		A586 Garstang Road	1	14/07/15	08:00	
		A586 Garstang Road	1	15/07/15		16:00
	QL5	A588 Shard Road	2	15/07/15	07:00-9:00	17:00
		A585 Mains Lane (South East Arm)	1	15/07/15	07:00-10:00	16:00-18:00
		A585 Mains Lane (North West Arm)	2	15/07/15	07:00-10:00	16:00-17:00
	QL6	A585 Amounderness Way	1	15/07/15		16:00
	QL7	A585 Amounderness Way (East Arm)	1	15/07/15		16:00
		A585 Amounderness Way (West Arm)	1	15/07/15	08:00	
	QL9	A585 Amounderness Way (North West Arm)	1	14/07/15		17:00
		A585 Amounderness Way (North West Arm)	1	15/07/15		16:00-18:00
	QL10	A585 Amounderness Way (North Arm)	1	14/07/15		16:00
		A585 Amounderness Way (North Arm)	2	15/07/15	08:00	16:00
		A585 Amounderness Way (South Arm)	1	14/07/15		16:00-17:00
		A585 Amounderness Way (South Arm)	2	15/07/15	08:00-10:00	16:00-18:00
2	QL12	A586 Garstang Road East West	1	15/07/15	08:00	
	QL13	A586 Garstang Road East	1	15/07/15	08:00	16:00-17:00
		Hardhorn Road South	1	16/07/15		16:00-17:00
	QL14	Hardhorn Road	1	16/07/15		16:00-17:00
		Blackpool Old Road	1	15/07/15		17:00
		Blackpool Old Road	1	16/07/15		16:00-17:00
		Blackpool Old Road	2	15/07/15		17:00
	QL15	Breck Road South	1	16/07/15		17:00
	QL16	St Walburga’s Road	1	15/07/15		16:00-17:00
			1	16/07/15		16:00-18:00
			2	15/07/15		16:00-17:00
			2	16/07/15		16:00-17:00
		Westcliffe Drive	1	16/07/15		16:00-17:00
	QL17	Bispham Road	1	15/07/15	08:00	17:00
		Bispham Road	1	16/07/15	08:00-10:00	16:00
		Plymouth Road	2	15/07/15	08:00	16:00-18:00
		Plymouth Road	2	16/07/15	08:00-10:00	16:00-18:00
	QL19	A587 Fleetwood Road North	1	16/07/15	08:00	
		Warren Drive	1	16/07/15	08:00	17:00

Area	Site	Arm	Lane	Date	AM	PM
	QL21	Victoria Road West East	2	15/07/15	10:00	
		Crescent West	1	15/07/15		16:00-17:00
		Crescent West	1	16/07/15	10:00	16:00-17:00
	QL34	Preston New Road East	3	15/07/15	08:00	16:00-17:00
		Preston New Road East	3	16/07/15		16:00-17:00
3	QL23	A587 Broadway (South Arm)	1	08/7/15		16:00-17:00
		A587 Broadway (South Arm)	1	09/7/15		16:00-17:00
	QL28	B5268 Fleetwood Road North (North Arm)	1	09/7/15		16:00
	QL29	B5268 Fleetwood Road North (South East Arm)	1	08/7/15	09:00	
	QL30	B5268 Fleetwood Road South	1	09/7/15		16:00

11.2.6 The average maximum queue lengths will be used to validate the operational assessment (micro-simulation) model by comparing them against modelled queues at these junctions. The observed queue lengths may also be used for identifying blocking back characteristics during assignment and validation of the SATURN model.

12 GROWTH FACTORS AND SEASONALITY FACTORS

12.1 The Need to Derive Growth Factors

12.1.1 For traffic modelling purposes, it is necessary to convert any available traffic data (either from recent counts or any previously collected data) to the model base year, which in this case is June 2015. The conversion factors used for this are referred to as seasonality factors.

12.1.2 In order to derive seasonality factors for any traffic count, two kinds of factors need to be derived; namely Yearly Growth Factors (YGFs) and Monthly Seasonality Factors (MSFs). A detailed description of these factors and how they are proposed to be used was provided to Highways England in a Technical Note (HE548643-HYD-GEN-A585-TN-TR1034) submitted on 11th May 2016. This chapter summarises the methodology presented in Technical Note 34.

12.2 Yearly Growth Factors (YGFs)

12.2.1 YGFs provide an indication of how traffic volume patterns change (for the same month) across different years. For example, assuming we have the AADT (Annual Average Day Traffic) flows for 2011 and 2015, the YGF for Year 2011 can be calculated as follows:

$$\mathrm{YGF}_{2011} = \mathrm{AADT}_{2015} / \mathrm{AADT}_{2011}$$

12.2.2 YGFs were calculated for count sites located on motorways, A roads, B roads and C roads for 2008 to 2016, as shown in Table 12-1.

Table 12-1 Yearly Growth Factors by Road Type

Road Type	Year								
	2008	2009	2010	2011	2012	2013	2014	2015	2016*
Motorway	0.998	0.987	0.962	0.971	0.999	1.046	1.035	1	1.072
A - Road	0.966	0.963	1.007	1.011	1.017	0.973	0.985	1	0.992
B - Road	1.001	0.964	0.983	1.033	1.014	1.053	1.023	1	0.990
C - Road	0.875	0.979	0.900	-	0.940	0.935	0.965	1	0.991

* Represents a factor for converting February 2016 counts to June 2015

12.3 Monthly Seasonality Factors (MSFs)

12.3.1 Monthly Seasonality Factors (MSFs) provide an indication of how traffic volume patterns change during different months of a year. For example, the MSF for March is used to convert a traffic count in March (of a particular year) to June (of that same year). The MSF in this case has been calculated as follows:

$$\text{March } \mathrm{MSF}_{2015} = \text{AWT June}_{2015} / \text{AWT March}_{2015}$$

12.3.2 MSFs were calculated for count sites located on motorways, A roads, B roads and C roads. The MSFs for sites on C Roads for the months of March and July are not considered to be reliable as a result of insufficient data. Table 12-2 shows the MSFs calculated for the different road types.

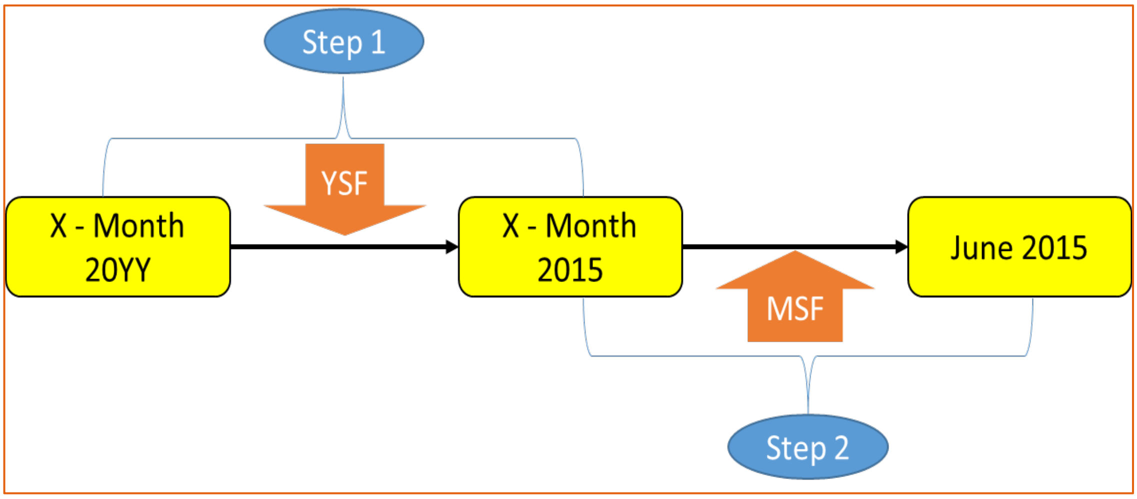
Table 12-2 Monthly Seasonality Factors by Road Type

Road Type	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Motorway	1.196	1.098	1.062	0.957	0.996	1	0.949	0.868	0.921	0.889	1.052	1.156
A - Road	1.219	1.103	1.111	1.059	1.030	1	0.976	0.976	0.970	1.000	0.999	1.057
B - Road	1.048	1.102	1.016	1.059	1.046	1	0.943	1.033	0.967	1.092	1.218	1.131
C - Road	1.091	1.123	NA	0.995	1.067	1	NA	1.046	0.947	0.938	1.056	1.398

12.4 Method to Convert Counts Using YGF and MSF

12.4.1 Following the derivation of YGFs and MSFs, the two-step procedure shown in Figure 12-1 was used to convert counts to the corresponding June 2015 count.

Figure 12-1 Count Conversion Process



I. Convert March$_{2011}$ count to March$_{2015}$ count.

II. Convert March$_{2015}$ count to June$_{2015}$ count.

13 DATA COLLATION AND ORGANISATION

13.1 Data Collation

13.1.1 The ATC counts from the surveys were all compiled into a single access database in Microsoft Excel, with the survey time periods (in 15-minute intervals) in rows and the survey days in columns. All data from the raw counts (including weekends) and blanks for missing data were taken into this master Excel file.

13.1.2 Similar to the ATC counts, CJC counts from all survey companies on each day and for each arm of each junction were collated into a single Excel spreadsheet.

13.2 Data Processing and Organisation

13.2.1 In order to process the ATC data, separate tabs were maintained to identify the ATC data points which were eliminated based on the 2SD test. The points passing this test were then linked to a new tab in the spreadsheet and then IoD tests were carried out on these data points to develop the clean ATC data set.

13.2.2 Appropriate graphs and plots showing statistical parameters such as the mean, maximum, minimum and standard deviation were plotted. The peak hour ATC data (based on the cleaned ATC data set) will be carried forward for traffic modelling for the AM peak hour (average hour between 07:30 and 09:30), the IP peak hour (average hour between 09:30 and 15:00) and the PM peak hour (average hour between 15:00 and 18:00).

13.2.3 The data collated in the master CJC sheet was used to prepare comparison plots between CJCs located at close proximity. Deficient CJC data points were taken note of and filtered out while preparing the final CJC counts for use at each junction. The turning movement traffic volumes will be carried forward for traffic modelling for the AM, PM and IP hours.

14 SUMMARY

14.1 Adequacy of Data Collected

14.1.1 Based on the extent of the study area, the location of screen lines and cordons and the suitability of previously available traffic models and data, several new traffic counts were commissioned in 2015 and 2016 as reported in this TDCR. The data has been subject to extensive review and analysis, and the resulting dataset is now considered sufficiently complete and robust for model development.

14.1.2 Statistical tests performed on the ATC data identified very few outliers (for exclusion) between the hours of 07:00 and 19:00. Comparisons and checks between the CJC and ATC data suggest that (with the exception of a few time periods), the entry and exit flows at CJC sites match closely (or within a reasonable deviation) with nearby ATC/CJC count data.

14.1.3 Based on the data reviewed, and discussions with Highways England, the peak hours for the traffic model were determined to be:

- AM peak hour – average one hour between 07:30 and 09:30
- IP hour – average one hour between 09:30 and 15:00
- PM peak hour – average one hour between 15:00 and 18:00

14.1.4 Table 14-1 summarises the data collected, which is determined to be sufficient for Stage 2 traffic modelling.

Table 14-1 Adequacy of Data Collected

Data Collected		Year & Month	No. of Sites Counted	Adequacy of the Data
1	ATC data	2015 Jul 2015 Sep 2016 Feb	7 sites 8 sites 56 sites	Sufficient for current Stage 2 modelling
2	CJC data	2015 Jul	32 sites	
3	MCC data	2016 Feb	9 sites	
4	Queue Length Surveys	2015 Jul	32 sites	

APPENDIX A

2015 and 2016 ATC General Checklist

2015 ATC Data Checks and Reported Data Losses

ATC No.	Site Description	Area	Reported Data Loss
1	ATC 1: (Area 1) A585, west of junction with A586 and Windy Harbour Road	1	**Jul Wk 1:** No data **July Wk 2:** 14/07 no data from 12am to 6am **Sep Wk 1:** Mon 14/9 14:30-14:45, Thu 17/9 17:45-00:00 **Sep Wk 2:** Fri 18/9 00:00-14:45 **Sep Wk 3:** Mon 28/9 11:30-11:45.
2	ATC 2: (Area 1) A585, west of junction with B5412 and Breck Road (Skippool junction)	1	Fri 18/9 15:00-15:15, Tue 22/9 11:00-11:15
3	ATC 3 - NB: (Area 2) A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), north of junction with Queen's Promenade	2	
	ATC 3 - SB: (Area 2) A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), north of junction with Queen's Promenade	2	**July Wk 1:** No data **July Wk 2:** No data on 13/09. On 14/09 no data from 12am to 2:15am **Sep Wk 1:** Sun 13/9 08:15-09:45, Mon 14/9 15:30 – midnight, Tue 15/09 to Thu 17/9 00:00 (3 days) **Sep Wk 2:** Fri 18/9 00:00-17:00.
4	ATC 4: (Area 2) A587 Plymouth Rd, north of junction with A586 Poulton Rd and A586 Westcliffe Drive	2	
5	ATC 5 - EB: (Area 2) A583 Preston New Road, east of junction with A587 E Park Drive	2	
6A	ATC 6A: (Area 3) A585, south of roundabout junction with Amounderness Way/Fleetwood Road/Norcross Lane	1	
6B	ATC6B: A585 - North of junction with Amounderness Way/ Rossall Lane B5409	3	Data collected only in October 2015
7	ATC 7: (Area 3) A587 Broadway, north of junction with Rossall Lane	3	**Jul Wk 2:** 16/09 No data from 10:15am to midnight 17/09 to 19/09 No data **Sep Wk 1:** Tue 15/9 11:00- midnight, Wed 16/9 and Thu 17/09 no data for entire day (2.5 days) **Sep Wk 2:** Fri 18/9 00:00-16:00 **Sep Wk 3:** Mon 28/9 12:30-12:45

2016 ATC Data Checks and Reported Data Losses

ATC Site No.	Site Description	Direction	Reported Data Loss
2016ATC_01	A584 Clifton Dr. N.	SB	Wk 2 - Data loss, Sat 27th Feb 14:45-15:45
		NB	
2016ATC_07	B5262	SB	Wk 1 - Data loss, Wed 10th 18:15 until Thurs 11th 13:30
		NB	
2016ATC_08	St Anne's Rd.	SB	Site was re-located for Wk 2 data. See Site Plan page.
		NB	
2016ATC_09	B5261 Hawes Side Ln.	SB	Wk 1 - Data loss, Sun 7th Feb 00:00-24:00. Wk 2 - Data loss, Mon 22nd Feb 11:15-12:15, Fri 26th Feb 11:45-12:30 and Sat 27th Feb 15:30-17:15. Wk 3 - Data loss, Wed 03 March IP 10:45 - 2pm
		NB	
2016ATC_10	Vicarage Ln.	SB	Wk 1 - Data loss, Sun 7th Feb 00:00-24:00.
		NB	
2016ATC_11	Ashworth Rd.	SB	Wk 1 - Data loss, Fri 12th 10:00-10:15.
		NB	
2016ATC_14	A584	SB	Wk 1 - Data loss; Sun 7th Feb 05:30-24:00, Mon 8th Feb 18:45-24:00, Tues 9th Feb 14:15-15:00 and Wed 10th Feb 13:30-13:45. Wk 3 - Data loss; Wed 2nd March 10:45 - 12:15.
		NB	
2016ATC_17	B5124	SB	Wk 1 - Data loss, Sat 6th Feb 00:00 - Wed 10th Feb 14:45.
		NB	
2016ATC_18	Layton Rd.	SB	Wk 2 - Data loss, Tues 23rd Feb 12:15-12:45.
		NB	
2016ATC_19	Dinmore Ave.	SB	Wk 1 - Data loss; Sat 6th Feb 12:30-13:30, Wed 10th Feb 19:00 - Thurs 11th Feb 06:00, Fri 12th 18:15-24:00. Wk 2 - Data loss, Mon 22nd Feb 16:30-18:45, Thurs 25th Feb 18:30-19:30.
		NB	
2016ATC_21	Bracewell Ave.	SB	Site moved after Wk 1. See site maps for details. Wk 2 - Data loss; Mon 22nd Feb 15:15-16:15, Tues 23rd Feb 08:15 - Wed 24th 11:45, Thur 25th 00:00 - 24:00. SB direction only - PM data missing on 24/02/2016 Wk 3 - Data loss; Wed 2nd March 09:15 - 10:00.
		NB	
2016ATC_25	Luton Rd.	WB	Wk 2 - Data loss, Fri 26th Feb 11:45 until Sat 27th Feb 12:00.
		EB	
2016ATC_26	B5258 Warren Dr.	WB	Wk 1 - Data loss; Tues 9th Feb 09:45-10:30 and Thurs 11th Feb 01:45 - Fri 12th Feb 02:15.
		EB	
2016ATC_28	Moor Park Ave.	WB	Wk 1 - Data loss, Mon 8th Feb 00:45 until Tues 9th Feb 01:45.
		EB	
2016ATC_37	A586 Poulton Rd.	WB	Site 38 – Wk 1, data loss, Thurs 11th Feb 09:15-11:00.
		EB	
2016ATC_41	Anchorsholme Ln. E	WB	Site 41 - Wk 1 Data loss, Sun 7th Feb 22:30 - Tues 9th Feb 02:45
		EB	
2016ATC_42	B5412 Victoria Rd. W.	WB	Wk 1 - Data loss; Sun 7th Feb 20:00-20:30, Mon 8th Feb 10:15-11:30, Wed 10th Feb 13:15-16:00, Thurs 11th Feb 14:45-15:45. Wk 2 - Data loss; Tues 23rd Feb 13:15-16:15, Wed 24th Feb 13:00-13:45, Sat 27th Feb 10:30-12:45. Wk 3 - Data loss; Wed 2nd March 17:45-19:30, Thur 3rd March 10:00 - 10:45
		EB	
2016ATC_53	A585 Amounderness Way Arm	SB	Wk2 - Data loss, Fri 26th Feb 11:00 until Sat 27th Feb 11:15.
		NB	
2016ATC_54	A583 Preston New Rd. WB	N/A	EB and WB directions for Site 54 included.
		WB	
2016ATC_55	A587 Kelso Ave. SB	N/A	NB and SB directions included here for Site 55.
		SB	
2016ATC_56	A587 St Walburgas Rd. SB	N/A	NB and SB directions for Site 56 included.
		SB	
2016ATC_57	A5230 Progress Way WB	N/A	EB and WB directions for Site 57 included.

A585 North West Priority Scheme: Windy Harbour to Skippool
ATC Locations

Data Tracker
Date: 27/10/2015

Survey Co: Tracsis (formerly Skyhigh)

				Jul-15														Sep-15																				Oct-15																				
ATC No	Description	Area		6	7	8	9	10	11	12	13	14	15	16	17	18	19	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Date Received	Any reported data loss
				Jul-Week 1							Jul-Week 2							Sep-Week 1							Sep-Week 2							Sep-Week 3											Oct-Week 1							Oct-Week 2								
1	ATC 1 EB: (Area 1) A585, west of junction with A586 and Windy Harbour Road	1		🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																			13/10/2015	Jul Wk1: No data July Wk2: 14/07 no data from 12am to 6am Sep Wk1: Mon 14/9 14:30-14:45, Thur 17/9 17:45-00:00 Sep Wk2: Fri 18/9 00:00-14:45 Sep Wk3: Mon 28/9 11:30-11:45.
	ATC 1 WB: (Area 1) A585, west of junction with A586 and Windy Harbour Road			🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																				
2	ATC 2 EB: A585, west of junction with B5412 and Breck Road (Skippool junction)	1		🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																										13/10/2015	Fri 18/9 15:00-15:15, Tue 22/9 11:00-11:15
	ATC 2 WB: A585, west of junction with B5412 and Breck Road (Skippool junction)			🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																											
3	ATC 3 - NB: A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), north of junction with Queen’s Promenade	2		🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																										13/10/2015	
	ATC 3 - SB: A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), north of junction with Queen’s Promenade	2		🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟨	🟨	🟥	🟥	🟥	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																			13/10/2015	July Wk1: No data July Wk2: No data on 13/09. On 14/09 no data from 12am to 2:15am Sep Wk1: Sun 13/9 08:15-09:45, Mon 14/9 15:30 - midnight Tue 15/09 to Thu 17/9 00:00 (3 days) Sep Wk2: Fri 18/9 00:00-17:00.
4	ATC 4 - NB: A587 Plymouth Rd, north of junction with A586 Poulton Rd and A586 Westcliffe Drive	2		🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																										13/10/2015	-
	ATC 4 - SB: A587 Plymouth Rd, north of junction with A586 Poulton Rd and A586 Westcliffe Drive			🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																											
5	ATC 5 - EB: A583 Preston New Road, east of junction with A587 E Park Drive	2		🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																										13/10/2015	
	ATC 5 - WB: A583 Preston New Road, east of junction with A587 E Park Drive			🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																											
6A	ATC 6A - EB: A585, south of roundabout junction with Amounderness Way/Fleetwood Road/Norcross Lane	1		🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																										
	ATC 6A - WB: A585, south of roundabout junction with Amounderness Way/Fleetwood Road/Norcross Lane			🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																										
6B	ATC6B - NB : A585 - North of junction with Amounderness Way/ Rossall Lane B5409	3																																									🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	26/10/2015	
	ATC6B - SB : A585 - North of junction with Amounderness Way/ Rossall Lane B5409																																										🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩		
7	ATC 7 - NB: A587 Broadway, north of junction with Rossall Lane	3		🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟨	🟥	🟥	🟥	🟩	🟩	🟩	🟩	🟨	🟥	🟥	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																			13/10/2015	Jul Wk2 : 16/09 No data from 10:15am to midnight 17/09 to 19/09 No data at all Sep Wk 1; Tue 15/9 11:00- midnight, Wed 16/9 and Thu 17/09 no data for entire day (2.5 days). Sep Wk 2; Fri 18/9 00:00-16:00 Sep Wk 3: Mon 28/9 12:30-12:45.
	ATC 7 - SB: A587 Broadway, north of junction with Rossall Lane			🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟨	🟥	🟥	🟥	🟩	🟩	🟩	🟩	🟨	🟥	🟥	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																				

Key

🟥 Missing for entire day
🟨 Missing during peak hours or for significant chunks of time during the day
🟩 No reported data loss

A585 Windy Harbour to Skippool
ATC Locations Feb 2016

Checker	MS/HJA
Data Tracker	
Date:	22-03-16

S.No	Type of Count (ATC/MCC)	Site #	Site Descriptions	East	North	Directio	Feb 2016															March 2016			Comments
							6	7	8	9	10	11	12	22	23	24	25	26	27	28	29	1	2	3	
							Sat	Sun	Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	
							Weekend		Weekday										Weekend		Weekday				
							Week 1							Week 2							Week 3				
1	ATC	ATC1	A584 Clifton Dr. N.	53.7745	-3.05276	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩					Wk2 - Data loss, Sat 27th Feb 14:45-15:45.
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩					
2	ATC	ATC2	B5261 Common Edge Rd.	53.7817	-3.021	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
3	ATC	ATC3	Cropper Rd.	53.7865	-2.996	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
4	ATC	ATC4	B5260	53.7949	-2.9357	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
5	ATC	ATC5	A585	53.803	-2.88812	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
6	ATC	ATC6	A584 South Promenade	53.7944	-3.05637	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
7	ATC	ATC7	B5262	53.7945	-3.04953	SB	🟩	🟩	🟩	🟩	🟧	🟥	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	Wk1 - Data loss, Wed 10th 18:15 until Thurs 11th 13:30.
						NB	🟩	🟩	🟩	🟩	🟧	🟥	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
8	ATC	ATC8	St Anne's Rd.	53.7962	-3.04167	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					Site was re-located for week 2 data. See Site Plan page.
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
9	ATC	ATC9	B5261 Hawes Side Ln.	53.7946	-3.03003	SB	🟩	🟥	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟧	🟧	🟩	🟩	🟩	🟩	🟩	Wk1 - Data loss, Sun 7th Feb 00:00-24:00.
						NB	🟩	🟥	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟧	🟧	🟩	🟩	🟩	🟩	🟩	Wk2 - Data loss, Mon 22nd Feb 11:15-12:15, Fri 26th Feb 11:45-12:30 and Sat 27th Feb 15:30-17:15.
10	ATC	ATC10	Vicarage Ln.	53.7937	-3.01714	SB	🟩	🟥	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	Wk1 - Data loss, Sun 7th Feb 00:00-24:00.
						NB	🟩	🟥	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
11	ATC	ATC11	Ashworth Rd.	53.7948	-3.0019	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩					Wk1 - Data loss, Fri 12th 10:00-10:15.
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
12	ATC	ATC12	B5260	53.8017	-2.93483	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
13	ATC	ATC13	Bradshaw Ln.	53.8063	-2.91347	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
14	ATC	ATC14	A584	53.8186	-3.056	SB	🟩	🟥	🟧	🟧	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩	Wk1 - Data loss; Sun 7th Feb 05:30-24:00, Mon 8th Feb 18:45-24:00, Tues 9th Feb 14:15-15:00 and Wed 10th Feb 13:30-13:45.
						NB	🟩	🟥	🟧	🟧	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩	
15	ATC	ATC15	Market St.	53.8185	-3.05502	N/A	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
16	ATC	ATC16	A586	53.8205	-3.04922	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
17	ATC	ATC17	B5124	53.8248	-3.03941	SB	🟥	🟥	🟥	🟥	🟥	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	Wk1 - Data loss, Sat 6th Feb 00:00 - Wed 10th Feb 14:45.
						NB	🟥	🟥	🟥	🟥	🟥	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
18	ATC	ATC18	Layton Rd.	53.8268	-3.03213	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩					Wk2 - Data loss, Tues 23rd Feb 12:15-12:45.
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩					
19	ATC	ATC19	Dinmore Ave.	53.835	-3.01351	SB	🟧	🟩	🟩	🟩	🟧	🟧	🟧	🟧	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	Wk1 - Data loss; Sat 6th Feb 12:30-13:30, Wed 10th Feb 19:00 - Thurs 11th Feb 06:00, Fri 12th 18:15-24:00.
						NB	🟧	🟩	🟩	🟩	🟧	🟧	🟧	🟧	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
20	ATC	ATC20	Holls Ln.	53.844	-2.9816	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
21	ATC	ATC21	Bracewell Ave.	53.8452	-2.97011	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟥	🟧	🟥	🟩	🟩	🟩	🟩	🟩	🟧	🟩	Site moved after wk 1. See site maps for details.
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟧	🟥	🟧	🟥	🟩	🟩	🟩	🟩	🟩	🟧	🟩	Wk2 - Data loss; Mon 22nd Feb 15:15-16:15, Tues 23rd Feb 08:15 - Wed 24th 11:45, Thur 25th 00:00
22	ATC	ATC22	North Dr.	53.8689	-3.03417	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
23	ATC	ATC23	North Dr.	53.8746	-3.03309	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
24	ATC	ATC24	West Dr.	53.8801	-3.03168	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
25	ATC	ATC25	Luton Rd.	53.8703	-3.03328	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟥	🟥	🟩	🟩	🟩	🟩	🟩	Wk2 - Data loss, Fri 26th Feb 11:45 until Sat 27th Feb 12:00.
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟥	🟥	🟩	🟩	🟩	🟩	🟩	
26	ATC	ATC26	B5258 Warren Dr.	53.8658	-3.03376	WB	🟩	🟩	🟩	🟧	🟩	🟥	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	Wk1 - Data loss; Tues 9th Feb 09:45-10:30 and Thurs 11th Feb 01:45 - Fri 12th Feb 02:15.
						EB	🟩	🟩	🟩	🟧	🟩	🟥	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
27	ATC	ATC27	Ashfield Rd.	53.8571	-3.02968	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
28	ATC	ATC28	Moor Park Ave.	53.8495	-3.02408	WB	🟩	🟩	🟥	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	Wk1 - Data loss, Mon 8th Feb 00:45 until Tues 9th Feb 01:45.
						EB	🟩	🟩	🟥	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
29	ATC	ATC29	A586 Poulton Rd.	53.8347	-3.01847	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
30	ATC	ATC31	Clifton Orad (Cherry Tree Rd.)	53.8002	-3.00985	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
31	ATC	ATC32	Yeadon Way	53.7954	-3.04613	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
32	ATC	ATC33	Anchorsholme Ln.	53.8689	-3.0134	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
33	ATC	ATC34	B5269	53.835	-2.90449	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
34	ATC	ATC35	B5260 Fox Ln. Ends	53.7815	-2.92192	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
35	ATC	ATC36	Vicarage Ln.	53.7944	-3.01644	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
36	ATC	ATC37	B5266 Newton Dr.	53.8242	-3.01582	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
37	ATC	ATC38	A586 Poulton Rd.	53.8339	-3.02227	WB	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					Site 38 - Wk1, data loss, Thurs 11th Feb 09:15-11:00.
						EB	🟩	🟩	🟩	🟩	🟩	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
38	ATC	ATC39	Moor Park Ave.	53.8464	-3.03347	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
39	ATC	ATC40	Luton Rd.	53.8708	-3.03681	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
40	ATC	ATC41	Anchorsholme Ln. E	53.873	-3.0344	WB	🟩	🟧	🟥	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	Site 41 - Wk 1 Data loss, Sun 7th Feb 22:30 - Tues 9th Feb 02:45
						EB	🟩	🟧	🟥	🟧	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	
41	ATC	ATC42	B5412 Victoria Rd. W.	53.8761	-3.03479	WB	🟩	🟧	🟧	🟩	🟧	🟧	🟩	🟩	🟧	🟧	🟩	🟩	🟧	🟩	🟩	🟩	🟧	🟧	Wk1 - Data loss; Sun 7th Feb 20:00-20:30, Mon 8th Feb 10:15-11:30, Wed 10th Feb 13:15-16:00, Thurs 11th Feb 14:45-15:45.
						EB	🟩	🟧	🟧	🟩	🟧	🟧	🟩	🟩	🟧	🟧	🟩	🟩	🟧	🟩	🟩	🟩	🟧	🟧	
42	ATC	ATC43	B5260 Weeton Rd.	53.8286	-2.93637	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
43	ATC	ATC44	B5266 Station Rd.	53.8289	-2.96194	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
44	ATC	ATC45	Back Ln.	53.8219	-2.90793	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
45	ATC	ATC46	B5269 Mile Rd.	53.8369	-2.91913	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
46	ATC	ATC47	Grange Rd.	53.8457	-2.9219	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
47	ATC	ATC48	A586	53.8507	-2.92047	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
48	ATC	ATC49	A588 Shard Rd. Arm	53.8638	-2.96172	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
49	ATC	ATC50	B5260 Singleton Rd.	53.8182	-2.93233	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
50	ATC	ATC51	B5258 Warren Dr. Arm	53.8662	-3.03834	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
51	ATC	ATC52	Red Bank Rd. Arm	53.8521	-3.04005	WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
						EB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
52	ATC	ATC53	A585 Amoundeness Way Arm	53.8719	-3.02186	SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟥	🟧	🟩					Wk2 - Data loss, Fri 26th Feb 11:00 until Sat 27th Feb 11:15.
						NB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟥	🟧	🟩					
53	ATC	ATC54	A583 Preston New Rd. WB	53.8024	-3.00809	N/A	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					EB and WB directions for Site 54 included.
						WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
54	ATC	ATC55	A587 Kelso Ave. SB	53.8739	-3.0429	N/A	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					NB and SB directions included here for Site 55.
						SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
55	ATC	ATC56	A587 St Walburgas Rd. SB	53.8306	-3.02497	N/A	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					NB and SB directions for Site 56 included.
						SB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					
56	ATC	ATC57	A5230 Progress Way WB	53.7888	-3.00398	N/A	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					EB and WB directions for Site 57 included.
						WB	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩					

Key		
	🟥	Missing for entire day or very large time periods during the day
	🟧	Missing during some hours during the day, sometimes isolated 15 minute periods, but sometimes during peak hours also
	🟩	No reported data loss
	🟨	Data loss occurs only on Weekend

APPENDIX B

Weekday Average Traffic Flows at TRIS Sites

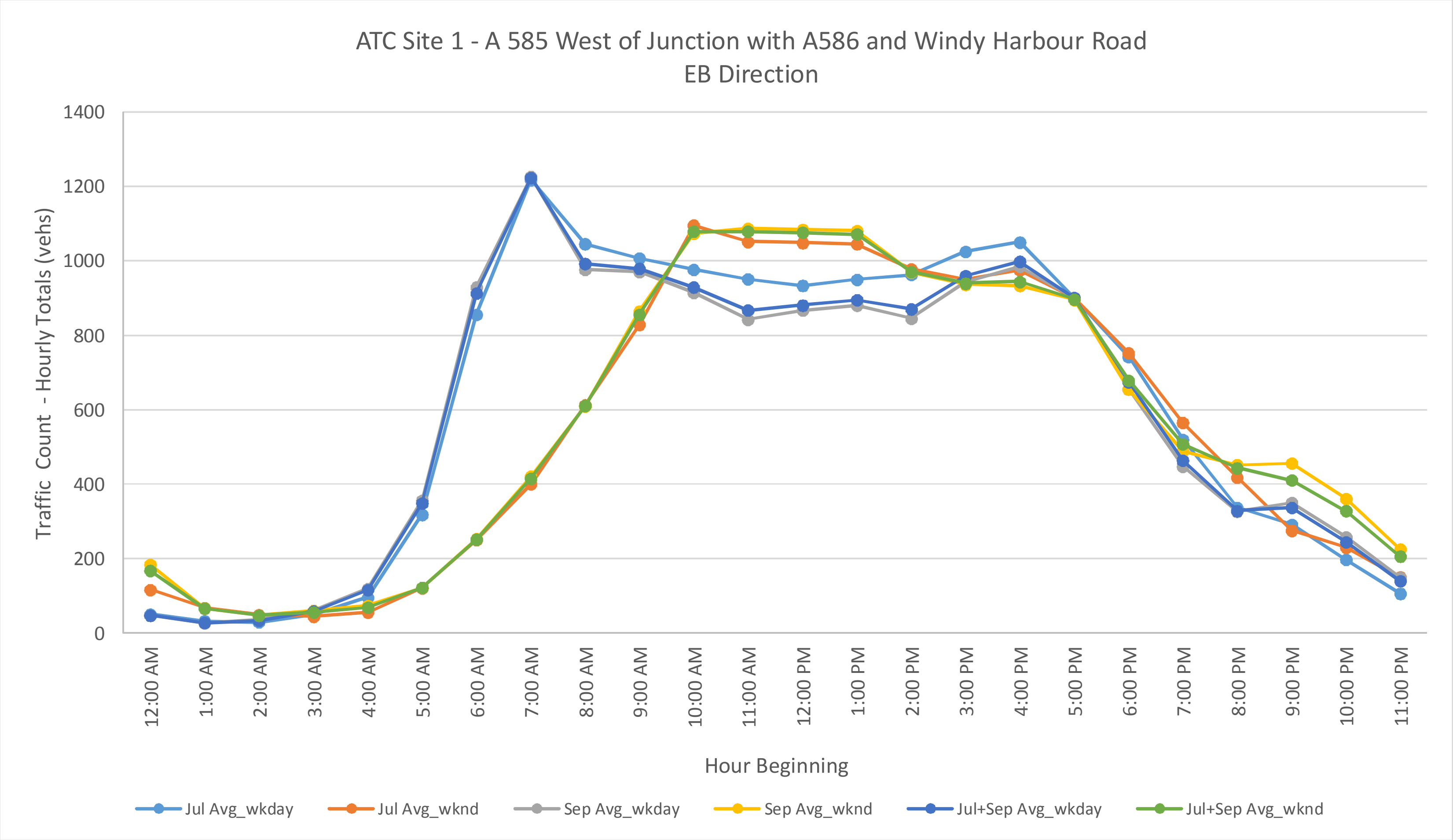
APPENDIX B: 2015 Weekday Average Traffic Flow at TRIS Sites

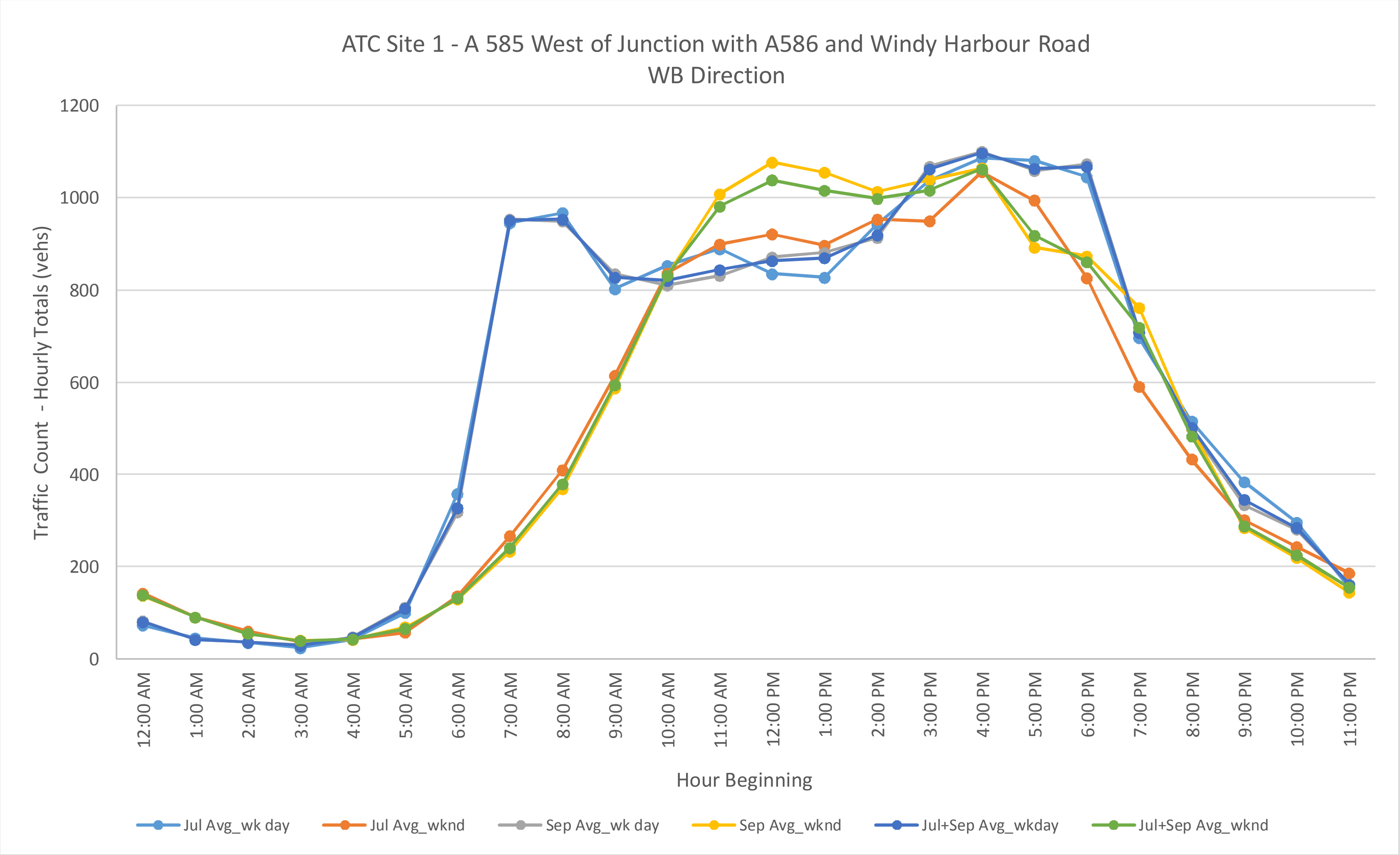
Site_Reference ID	07:00	07:30	08:00	08:30	09:00	09:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	12 -hour flows (vehs)
2015TRIS_01	1254	1481	1478	1241	1095	1027	994	970	931	902	900	905	920	942	972	1015	1106	1210	1432	1562	1596	1457	1085	794	27269
2015TRIS_02	495	1414	1527	1479	1176	1047	943	993	996	1000	976	950	942	952	928	961	957	1025	1153	1376	1463	1505	1333	1060	26651
2015TRIS_03	462	426	494	409	386	346	337	322	337	338	358	364	358	363	360	372	406	405	455	571	613	631	598	525	10236
2015TRIS_04	415	275	578	598	550	479	396	358	361	351	347	350	355	349	358	353	368	374	440	459	482	480	432	368	9876
2015TRIS_05	310	127	411	692	650	560	529	512	481	503	498	495	488	499	484	494	487	513	534	590	645	676	706	681	12565
2015TRIS_06	625	518	317	607	590	511	475	437	446	459	456	479	490	491	511	512	512	536	569	615	652	656	663	621	12748
2015TRIS_07	540	443	182	551	939	1053	988	766	685	667	709	705	704	661	617	592	597	666	637	650	677	774	887	915	16605
2015TRIS_08	885	769	612	326	846	883	784	667	652	626	626	601	592	570	597	570	639	604	669	699	759	878	1005	1030	16889
Total (for TRIS Sites)	**4986**	**5453**	**5599**	**5903**	**6232**	**5906**	**5446**	**5025**	**4889**	**4846**	**4870**	**4849**	**4849**	**4827**	**4827**	**4869**	**5072**	**5333**	**5889**	**6522**	**6887**	**7057**	**6709**	**5994**	**132839**

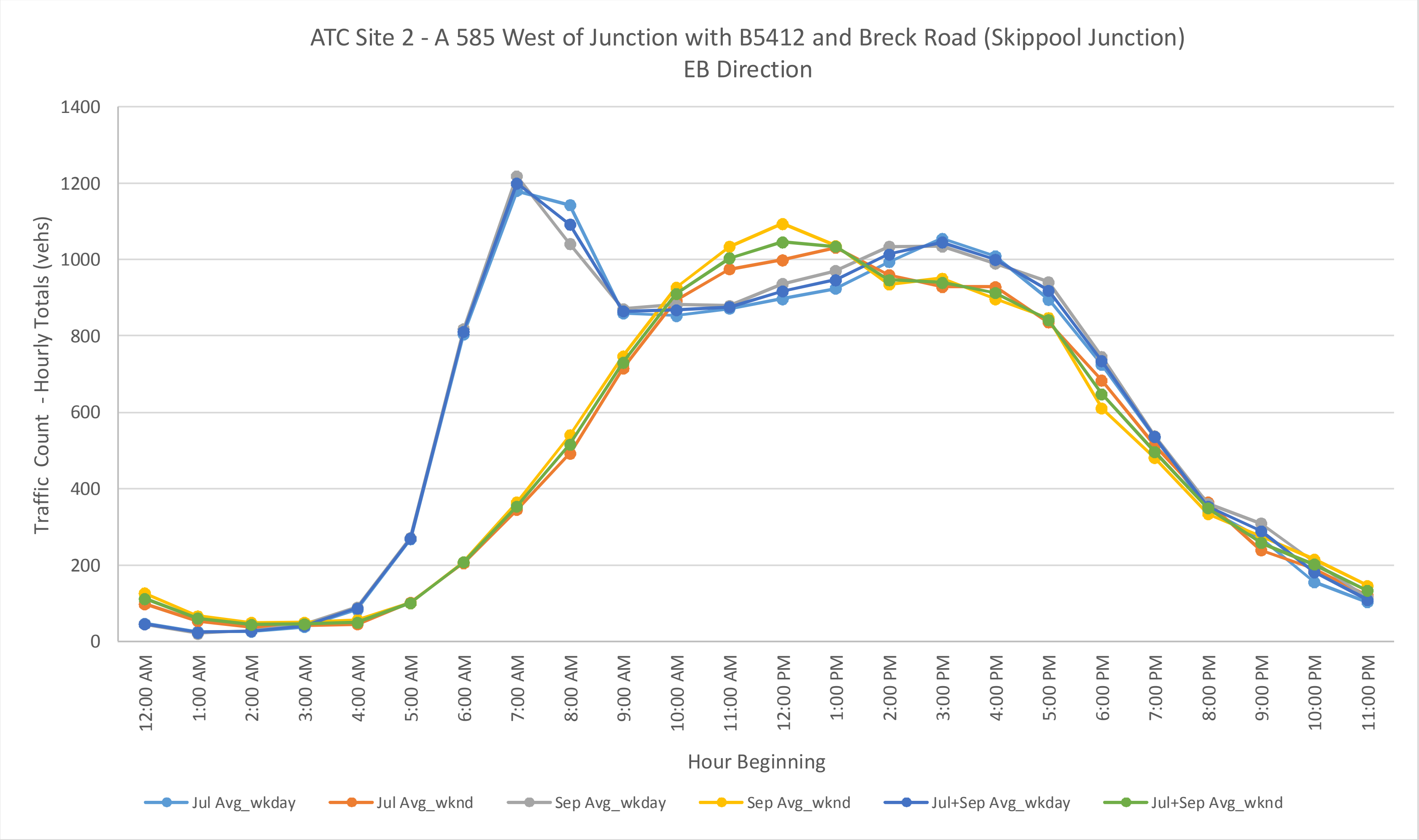
APPENDIX C

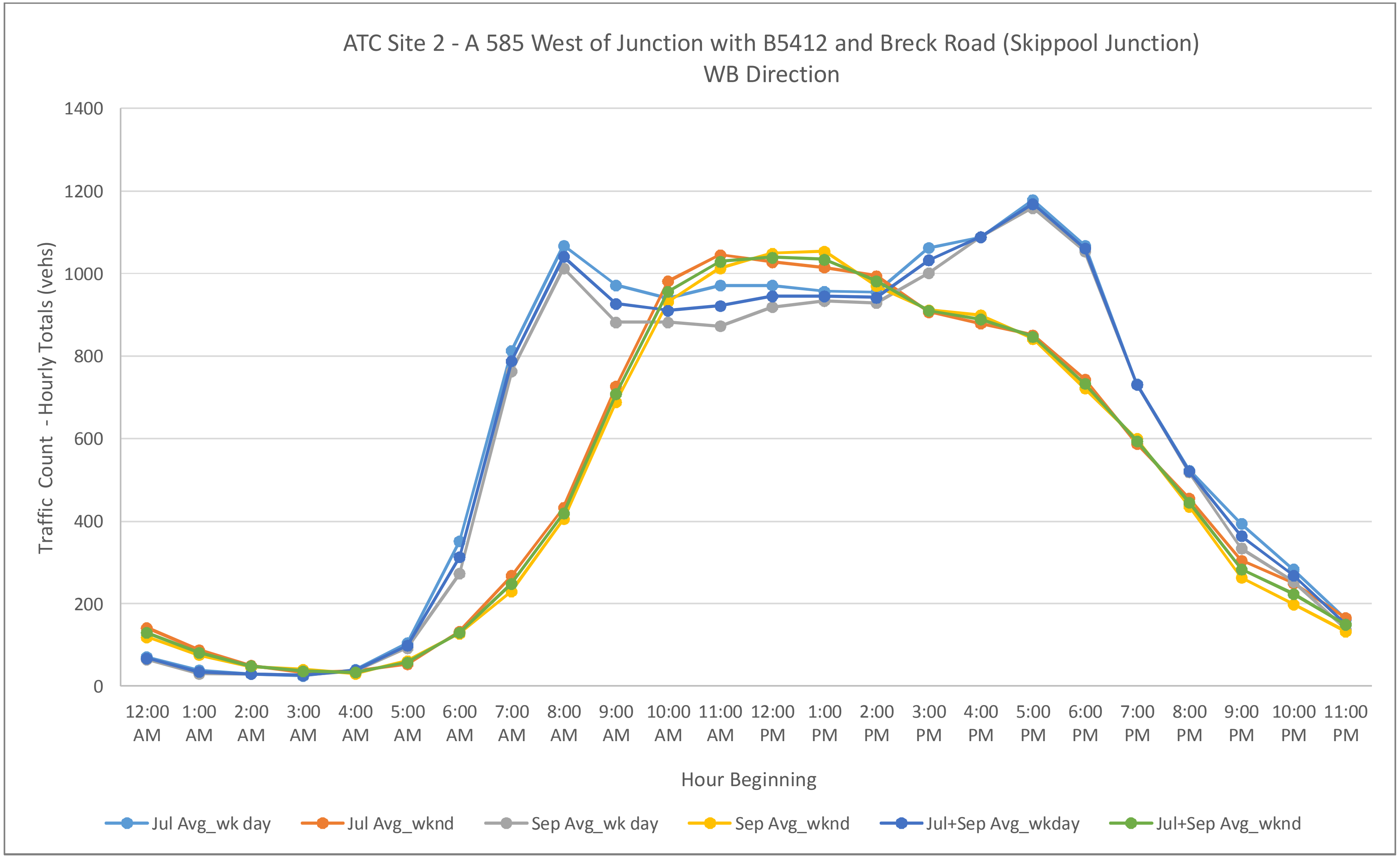
2015 ATC Weekday vs Weekend Profile

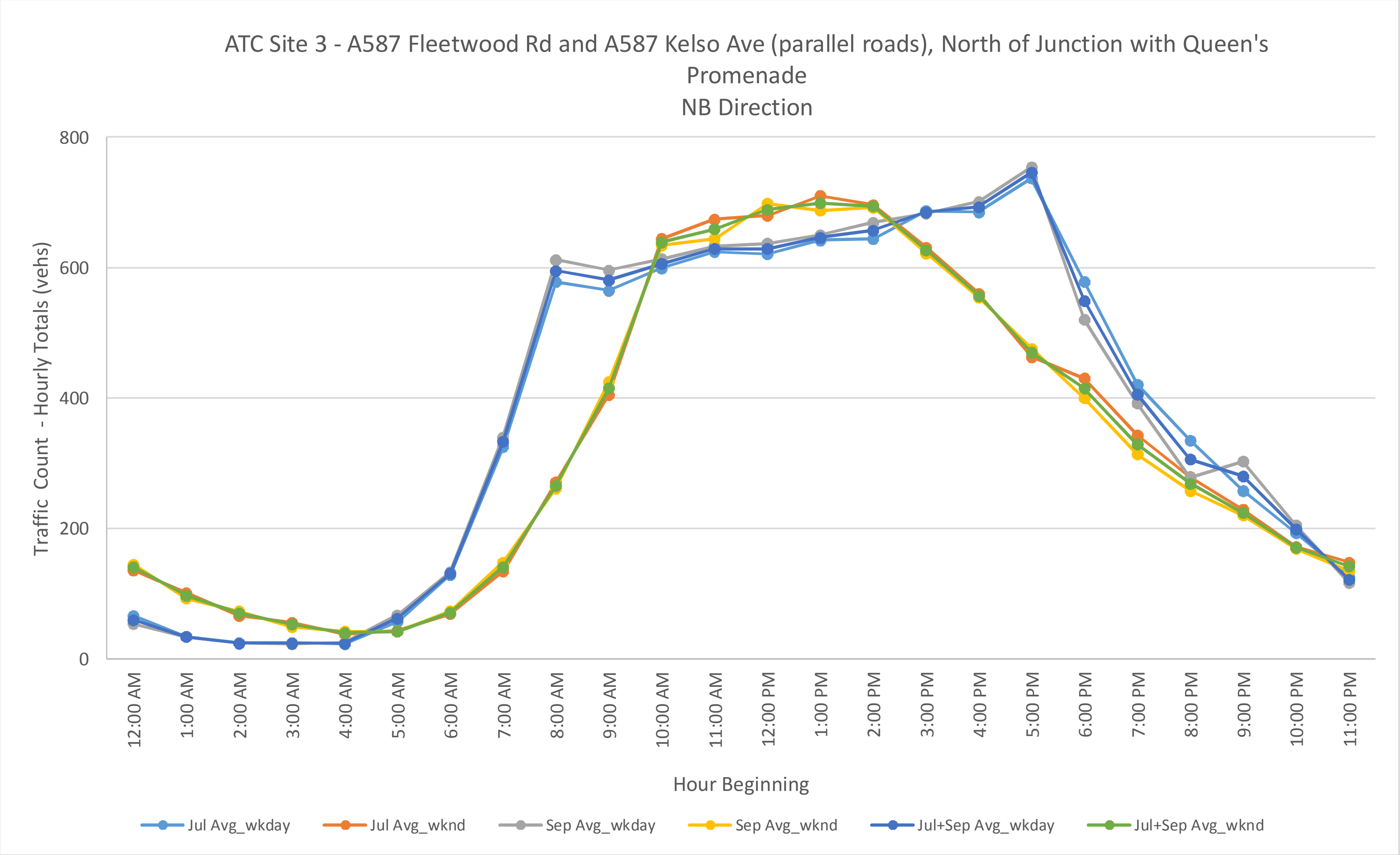
APPENDIX C: 2015 ATC Weekday (vs) Weekend Profiles

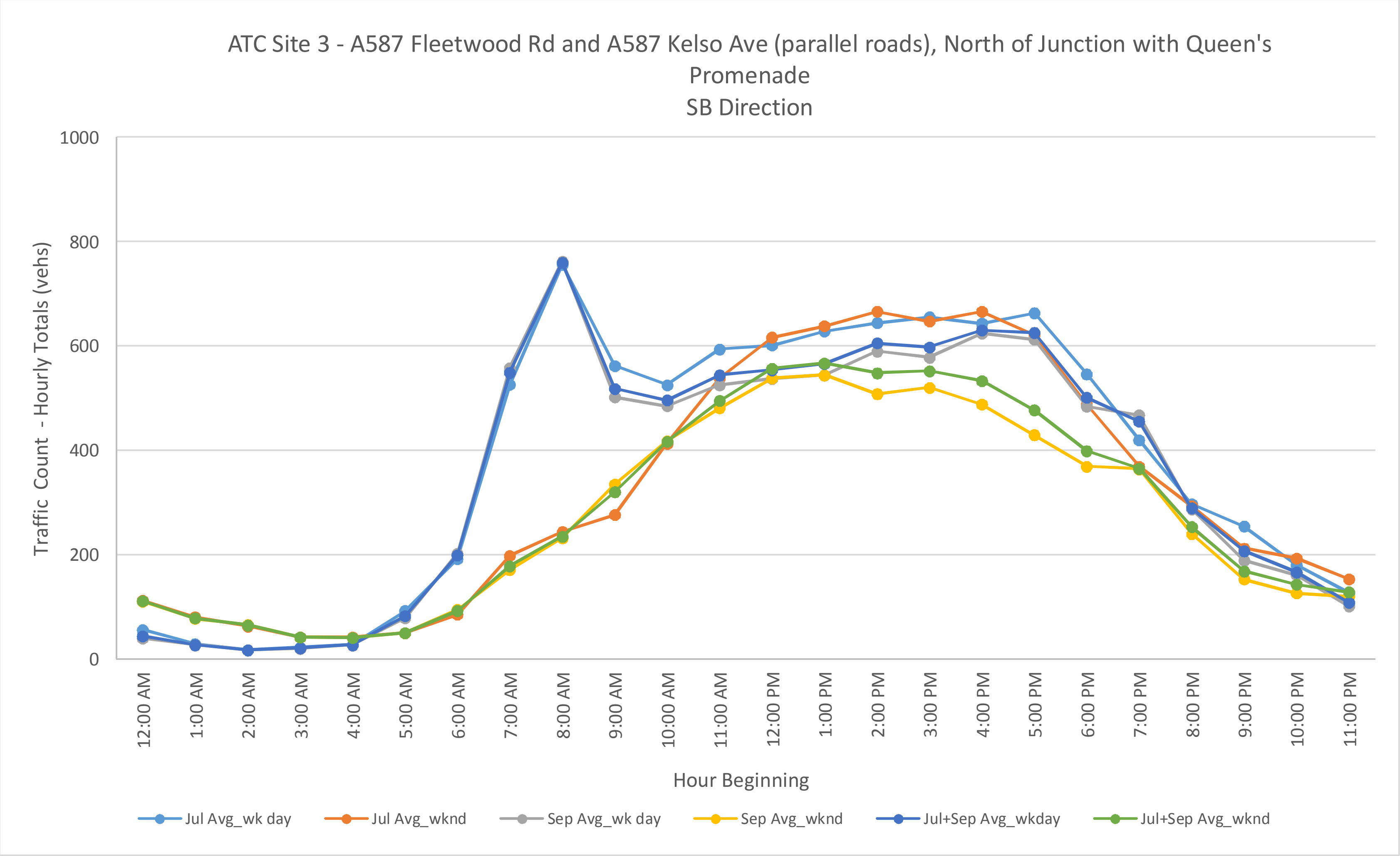


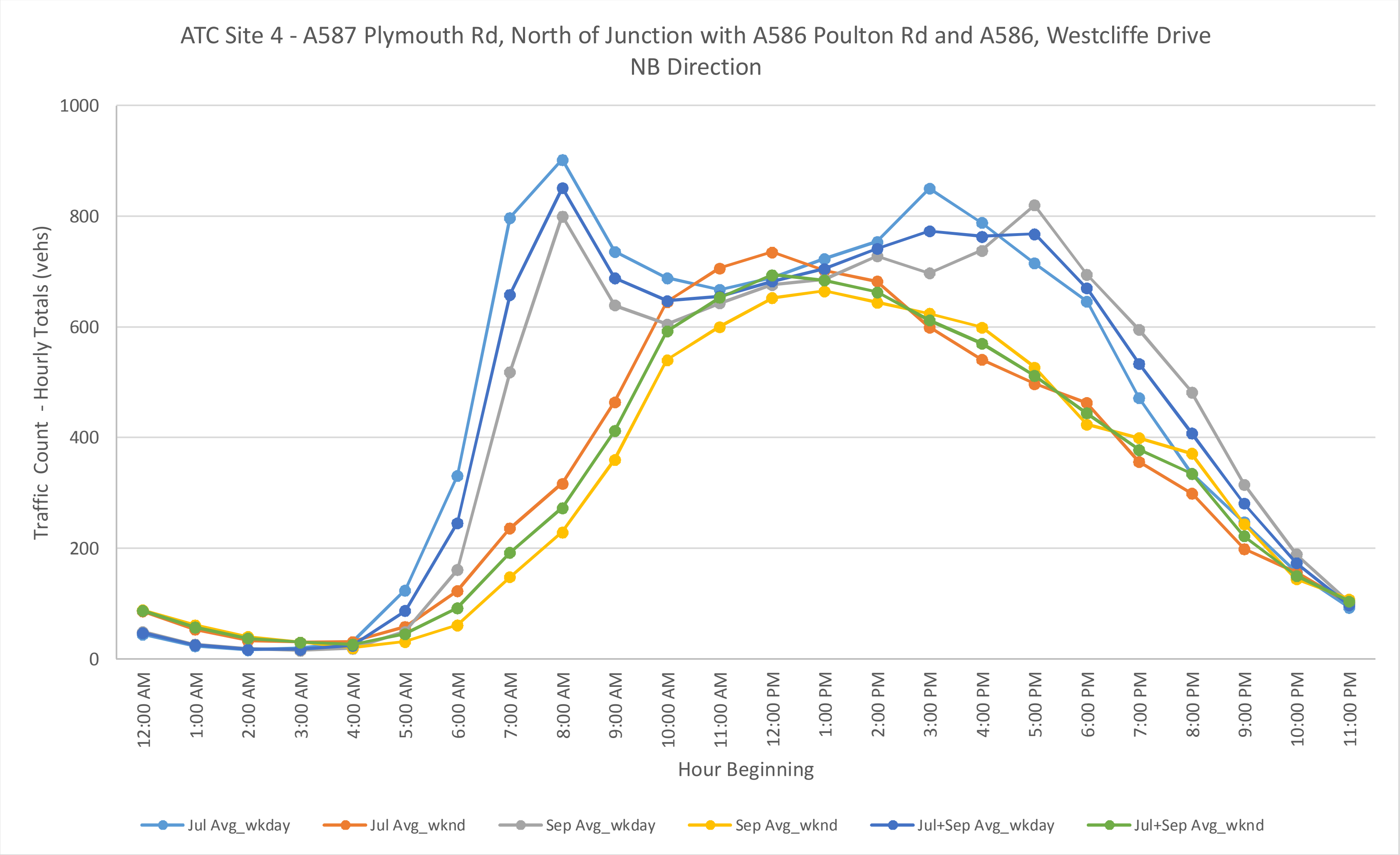

ATC Site 1 - A 585 West of Junction with A586 and Windy Harbour Road
WB Direction
Traffic Count - Hourly Totals (vehs)
1200
1000
800
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wk day
Jul Avg_wknd
Sep Avg_wk day
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

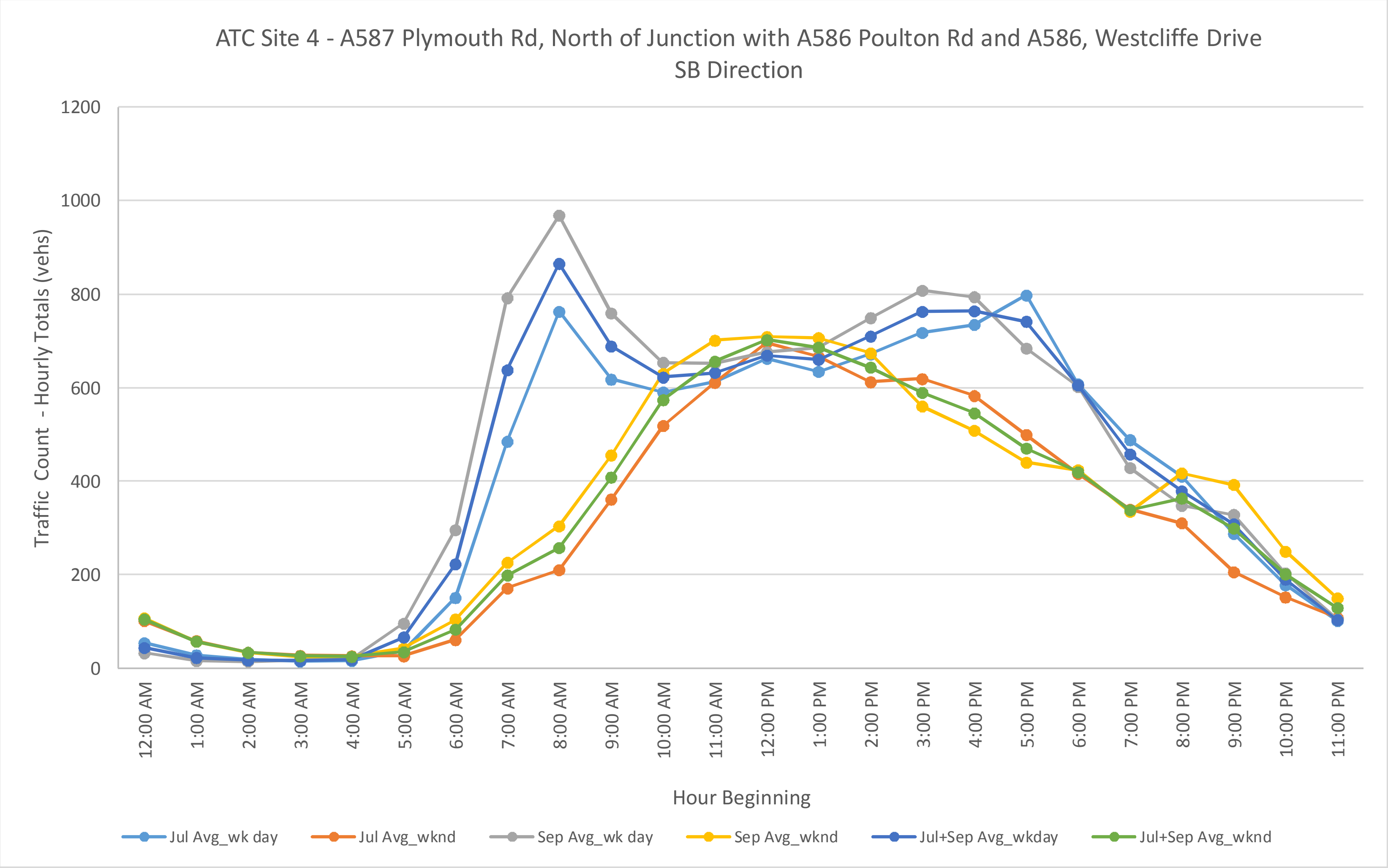

ATC Site 2 - A 585 West of Junction with B5412 and Breck Road (Skippool Junction)
EB Direction
Traffic Count - Hourly Totals (vehs)
0
200
400
600
800
1000
1200
1400
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wkday
Jul Avg_wknd
Sep Avg_wkday
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

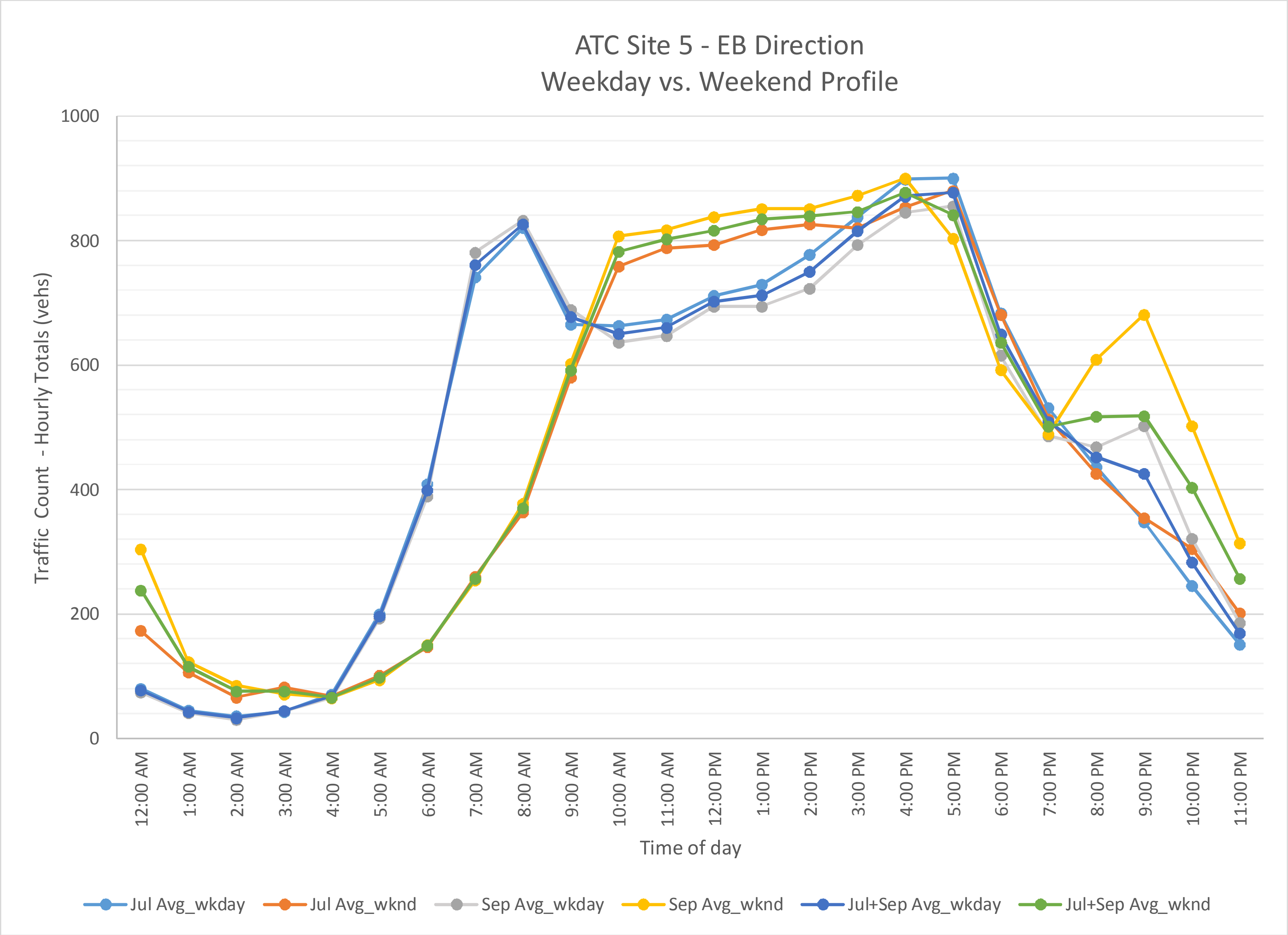

ATC Site 2 - A 585 West of Junction with B5412 and Breck Road (Skippool Junction)
WB Direction
Traffic Count - Hourly Totals (vehs)
1400
1200
1000
800
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wk day
Jul Avg_wknd
Sep Avg_wk day
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

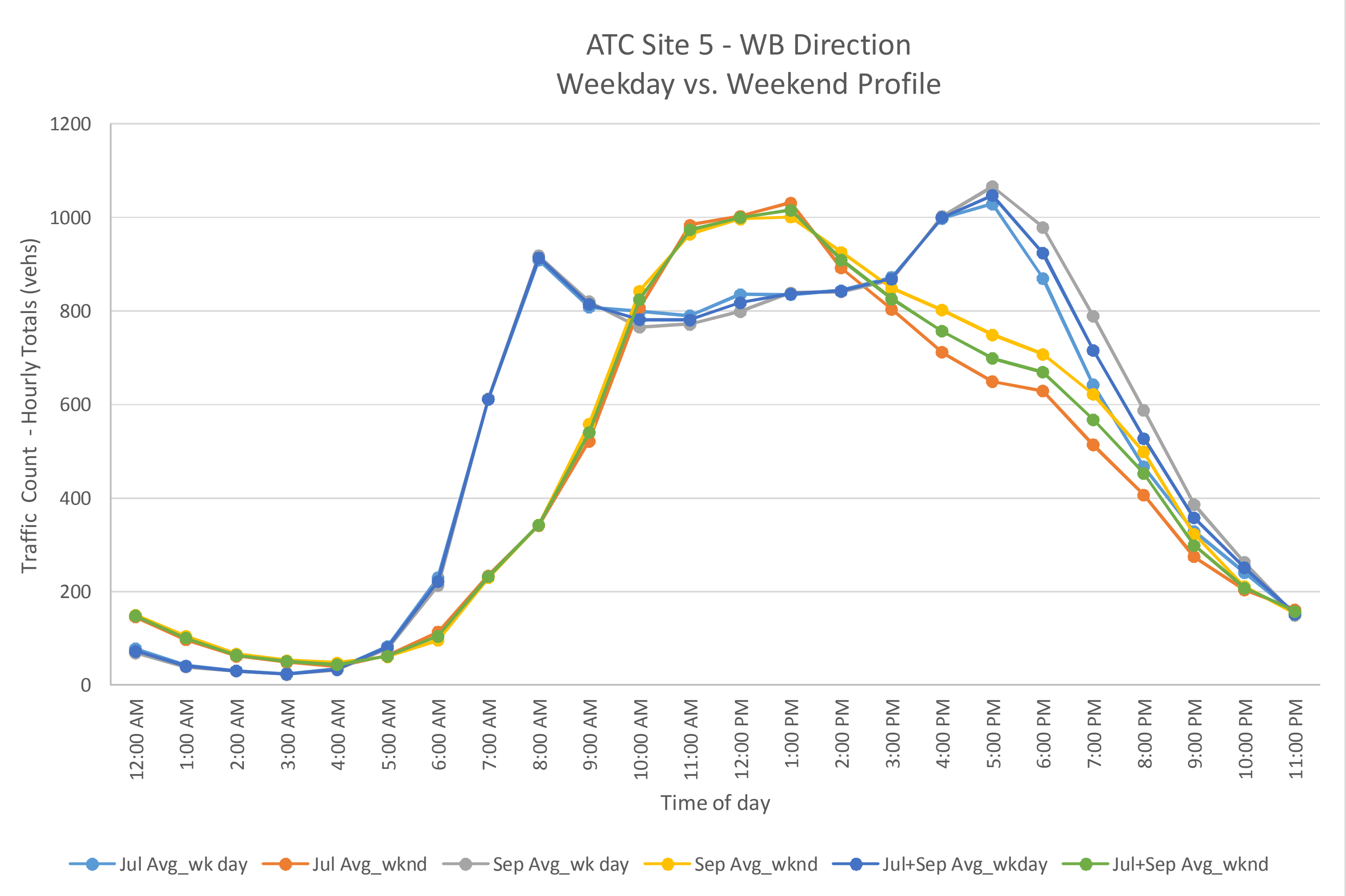

ATC Site 3 - A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), North of Junction with Queen's Promenade
NB Direction
Traffic Count - Hourly Totals (vehs)
0
200
400
600
800
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wkday
Jul Avg_wknd
Sep Avg_wkday
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

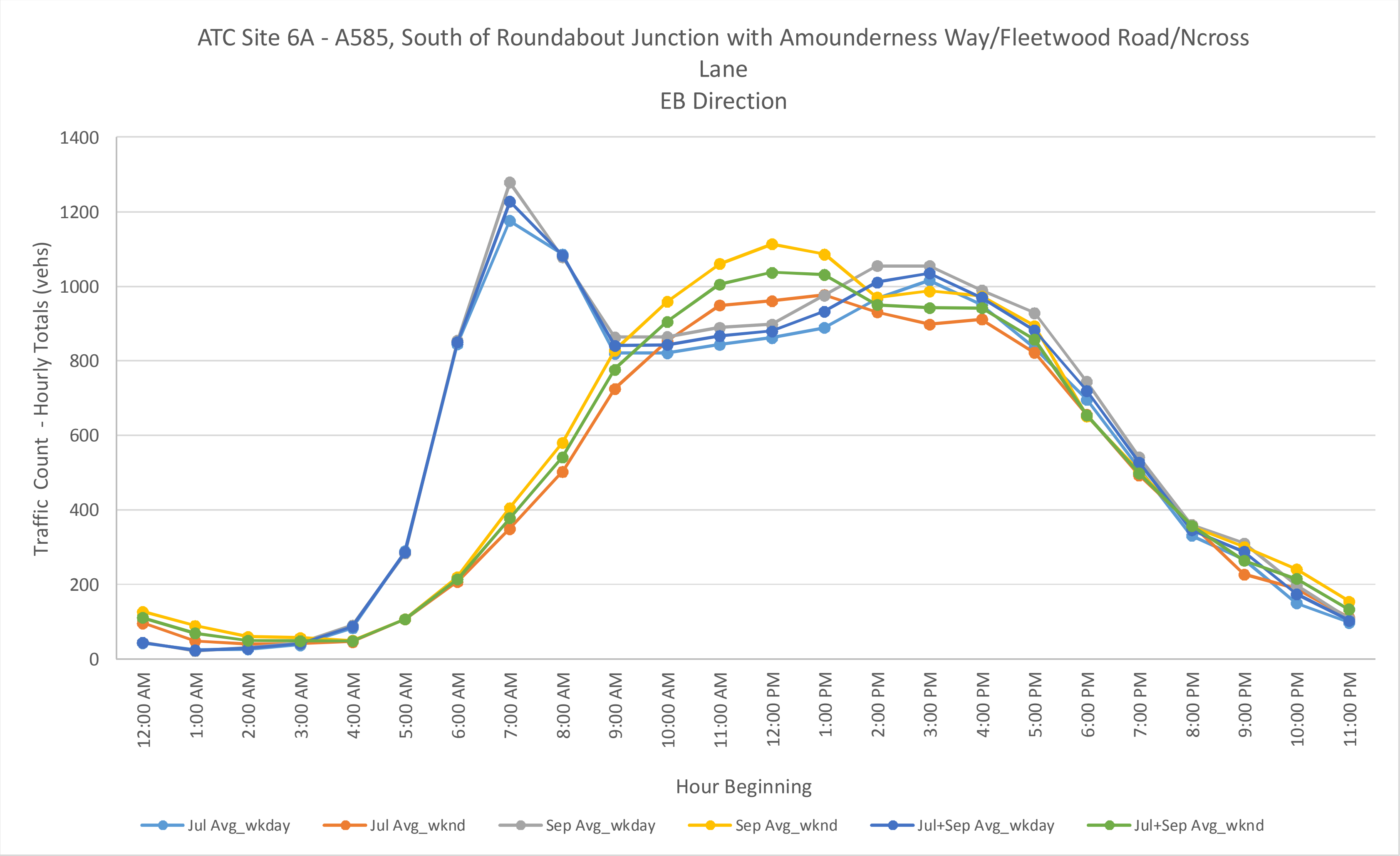

ATC Site 3 - A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), North of Junction with Queen's Promenade
SB Direction
Traffic Count - Hourly Totals (vehs)
0
200
400
600
800
1000
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wk day
Jul Avg_wknd
Sep Avg_wk day
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

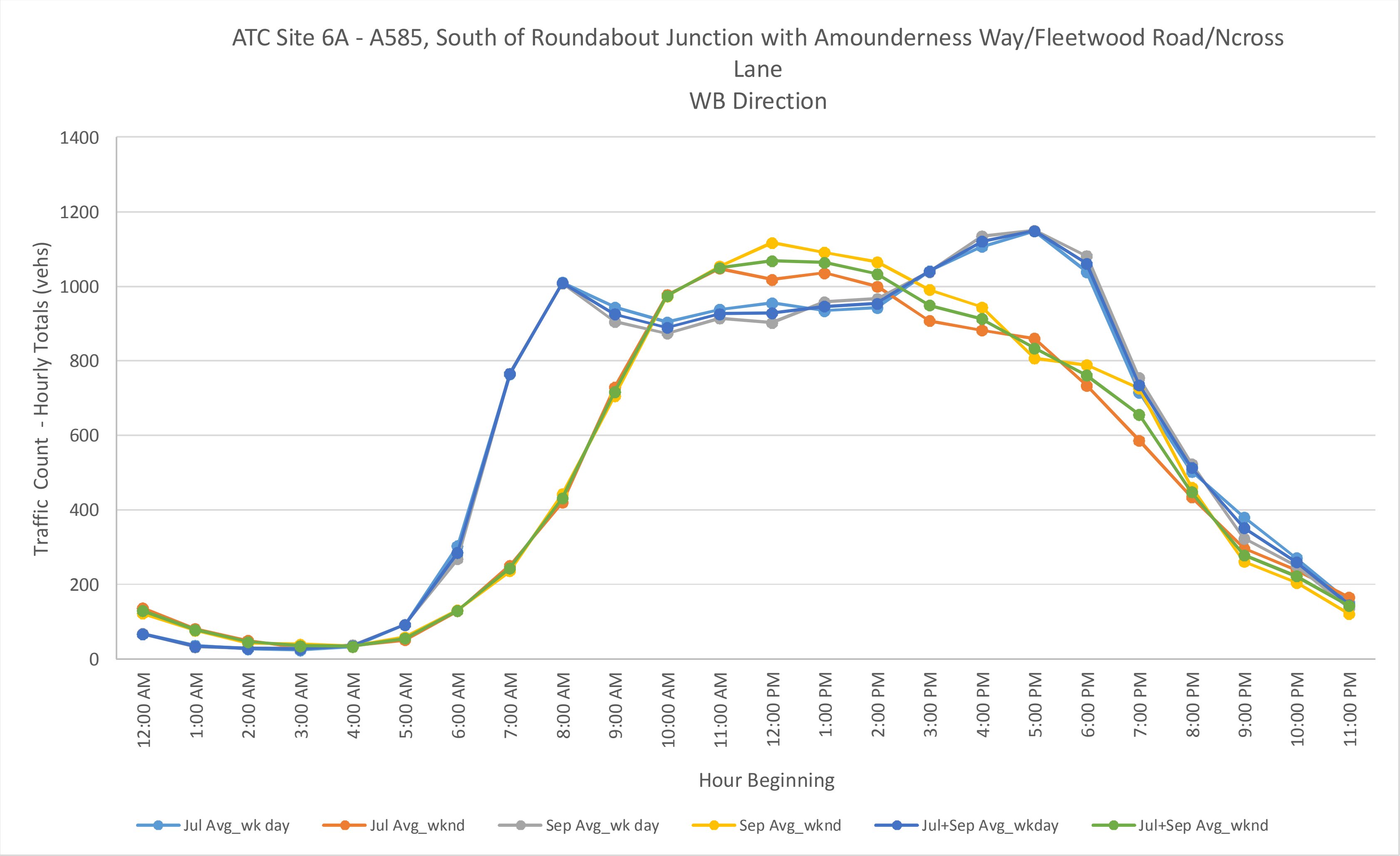

ATC Site 4 - A587 Plymouth Rd, North of Junction with A586 Poulton Rd and A586, Westcliffe Drive
NB Direction
Traffic Count - Hourly Totals (vehs)
0
200
400
600
800
1000
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wkday
Jul Avg_wknd
Sep Avg_wkday
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

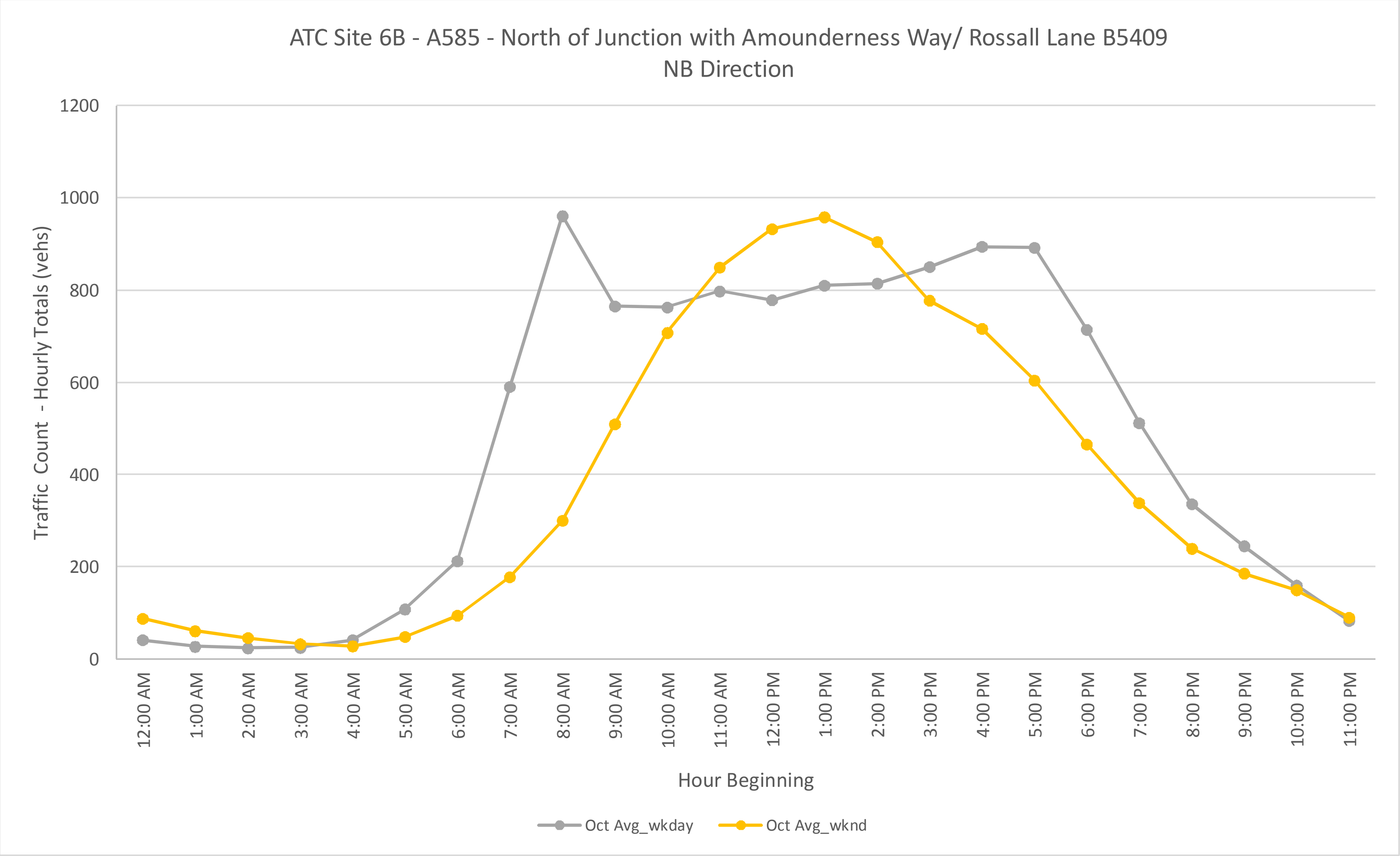

ATC Site 4 - A587 Plymouth Rd, North of Junction with A586 Poulton Rd and A586, Westcliffe Drive
SB Direction
Traffic Count - Hourly Totals (vehs)
1200
1000
800
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wk day
Jul Avg_wknd
Sep Avg_wk day
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

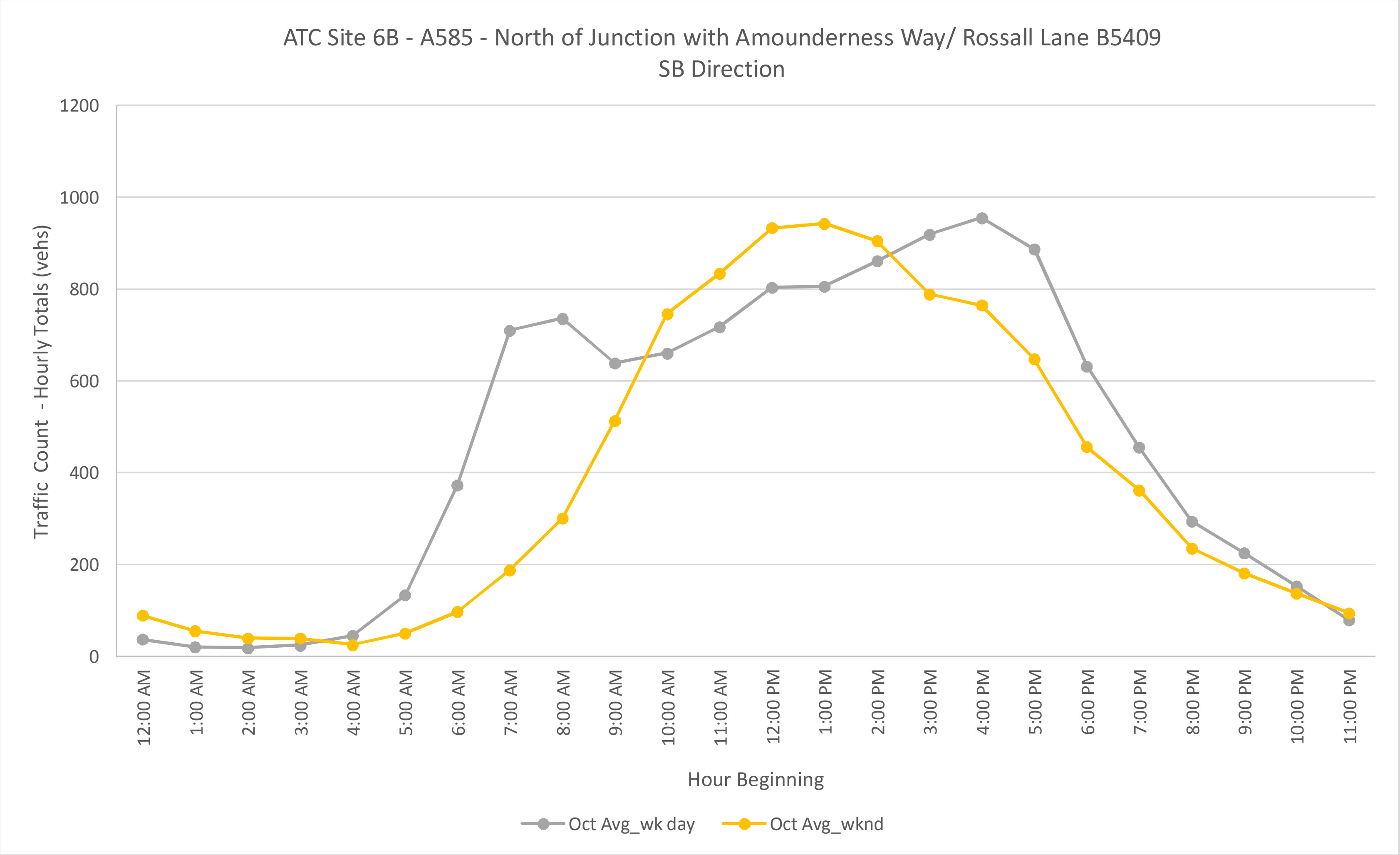

ATC Site 5 - EB Direction
Weekday vs. Weekend Profile
Traffic Count - Hourly Totals (vehs)
1000
800
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Time of day
Jul Avg_wkday
Jul Avg_wknd
Sep Avg_wkday
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

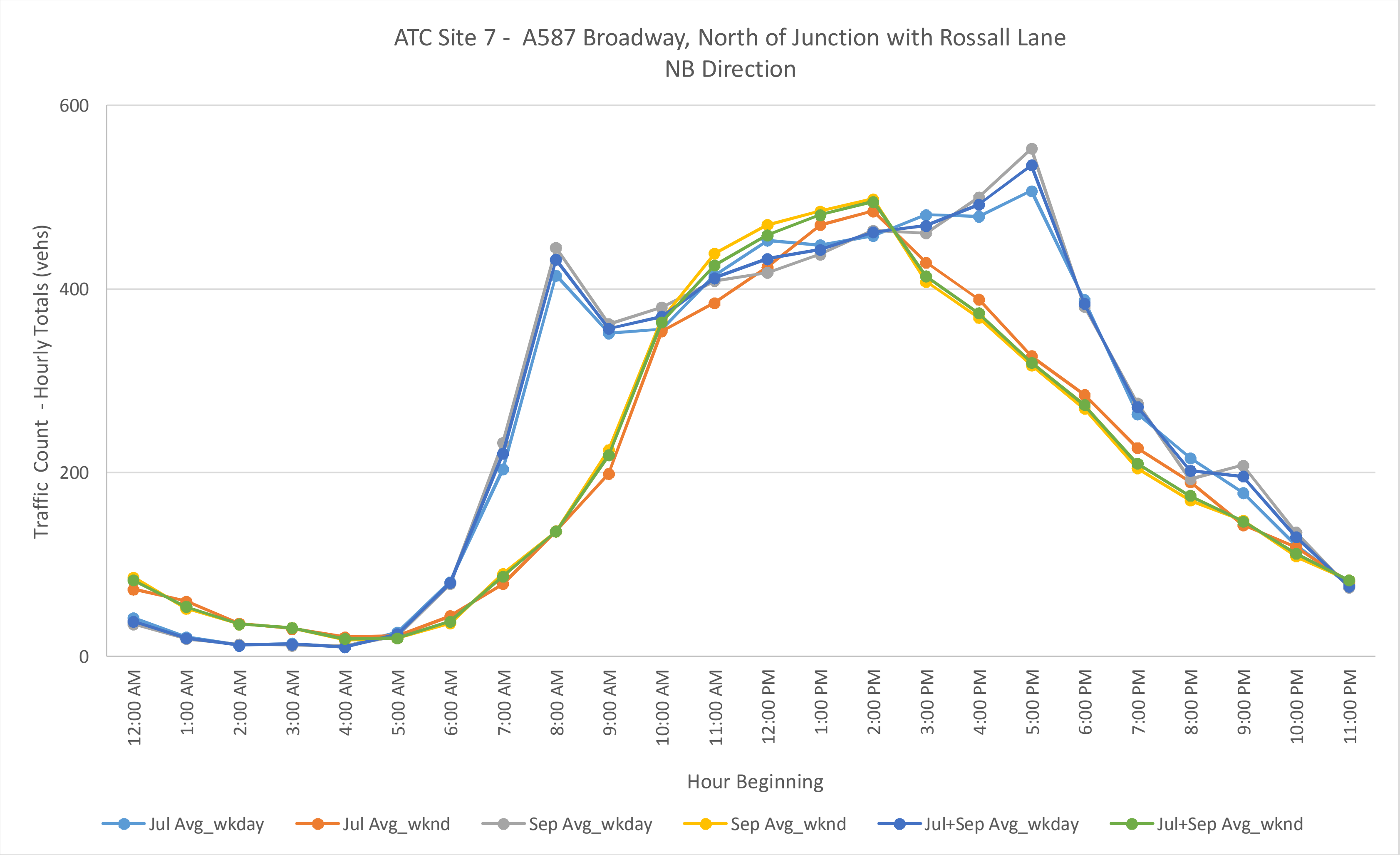

ATC Site 5 - WB Direction
Weekday vs. Weekend Profile
Traffic Count - Hourly Totals (vehs)
0
200
400
600
800
1000
1200
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Time of day
Jul Avg_wk day
Jul Avg_wknd
Sep Avg_wk day
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

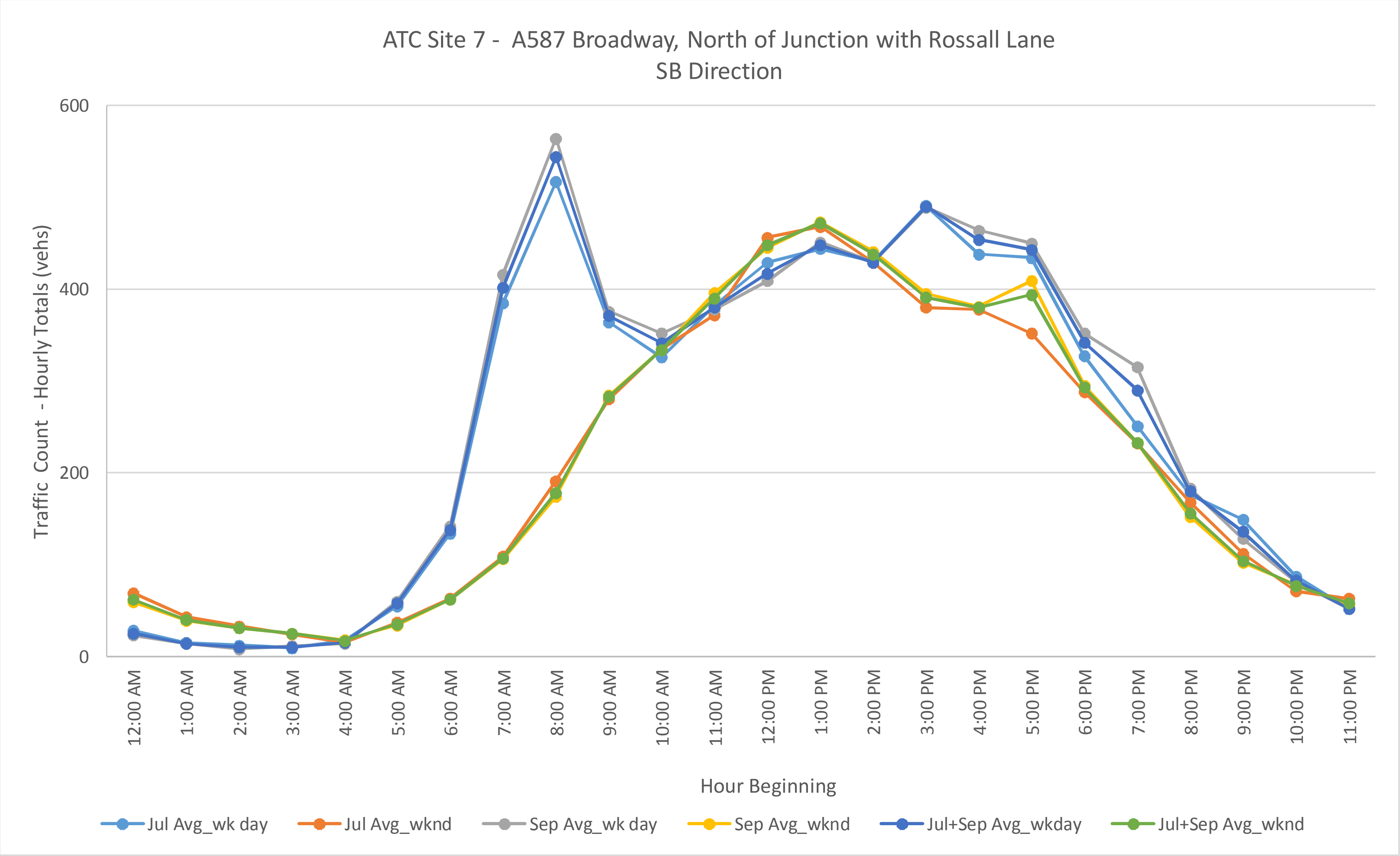

ATC Site 6A - A585, South of Roundabout Junction with Amounderness Way/Fleetwood Road/Ncross Lane
EB Direction
Traffic Count - Hourly Totals (vehs)
0
200
400
600
800
1000
1200
1400
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wkday
Jul Avg_wknd
Sep Avg_wkday
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd


ATC Site 6A - A585, South of Roundabout Junction with Amounderness Way/Fleetwood Road/Ncross Lane
WB Direction
Traffic Count - Hourly Totals (vehs)
1400
1200
1000
800
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wk day
Jul Avg_wknd
Sep Avg_wk day
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd


ATC Site 6B - A585 - North of Junction with Amounderness Way/ Rossall Lane B5409
NB Direction
Traffic Count - Hourly Totals (vehs)
1200
1000
800
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Oct Avg_wkday
Oct Avg_wknd


ATC Site 6B - A585 - North of Junction with Amounderness Way/ Rossall Lane B5409
SB Direction
Traffic Count - Hourly Totals (vehs)
1200
1000
800
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Oct Avg_wk day
Oct Avg_wknd

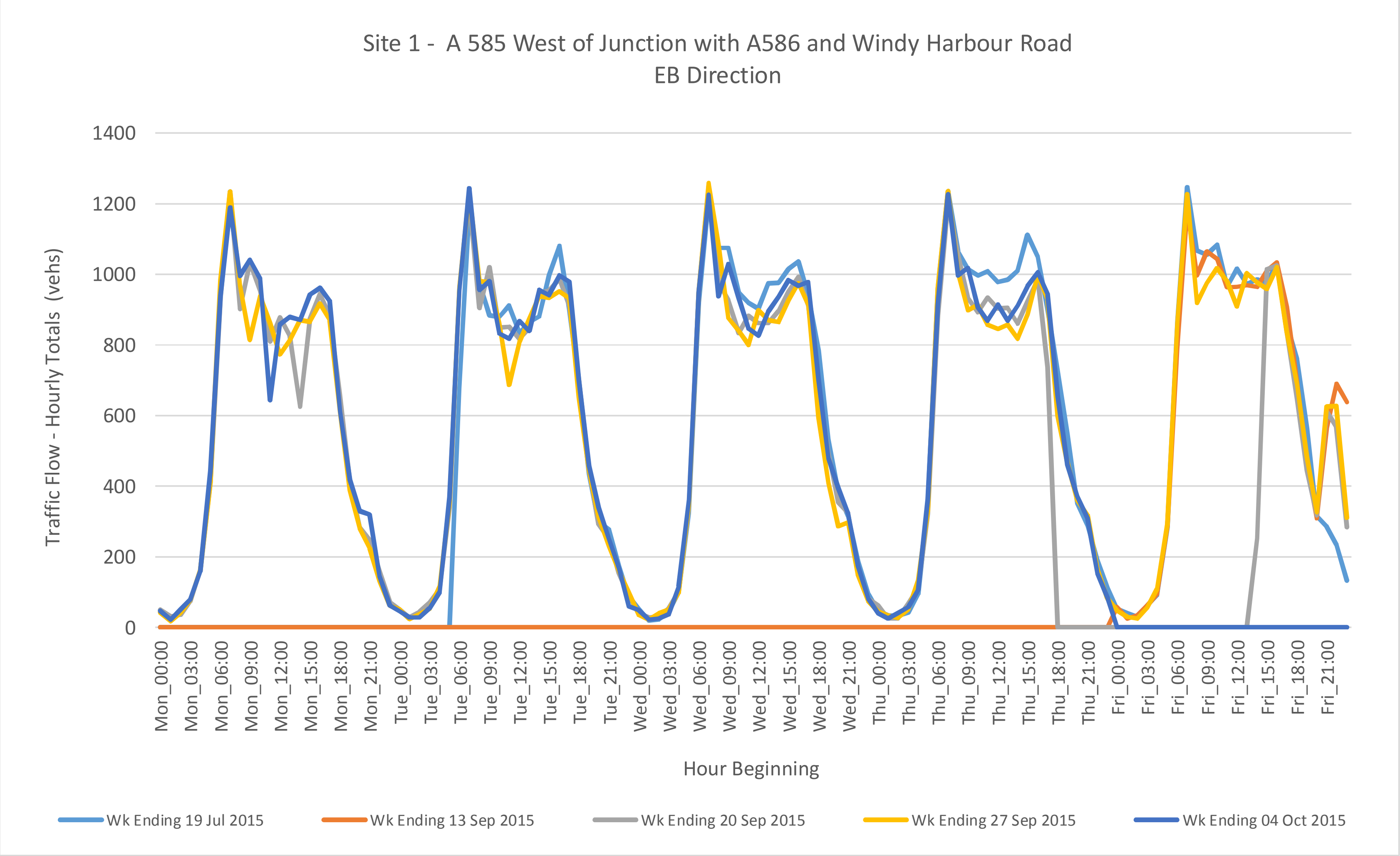

ATC Site 7 - A587 Broadway, North of Junction with Rossall Lane
NB Direction
Traffic Count - Hourly Totals (vehs)
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wkday
Jul Avg_wknd
Sep Avg_wkday
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

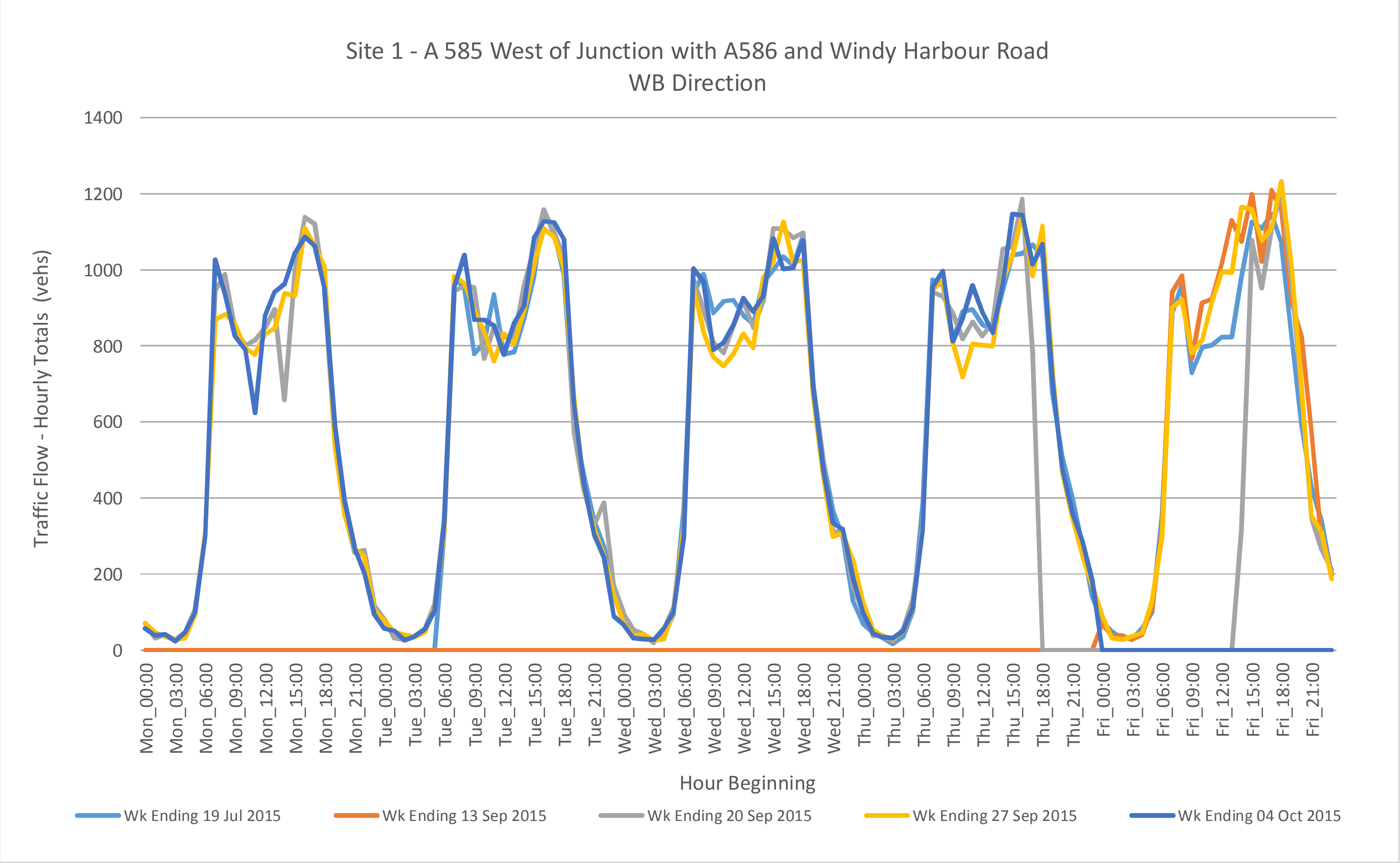

ATC Site 7 - A587 Broadway, North of Junction with Rossall Lane
SB Direction
Traffic Count - Hourly Totals (vehs)
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Hour Beginning
Jul Avg_wk day
Jul Avg_wknd
Sep Avg_wk day
Sep Avg_wknd
Jul+Sep Avg_wkday
Jul+Sep Avg_wknd

APPENDIX D

2015 Weekday ATC Profiles

APPENDIX D: 2015 Weekday ATC PROFILES




Site 1 - A 585 West of Junction with A586 and Windy Harbour Road
WB Direction
Traffic Flow - Hourly Totals (vehs)
1400
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
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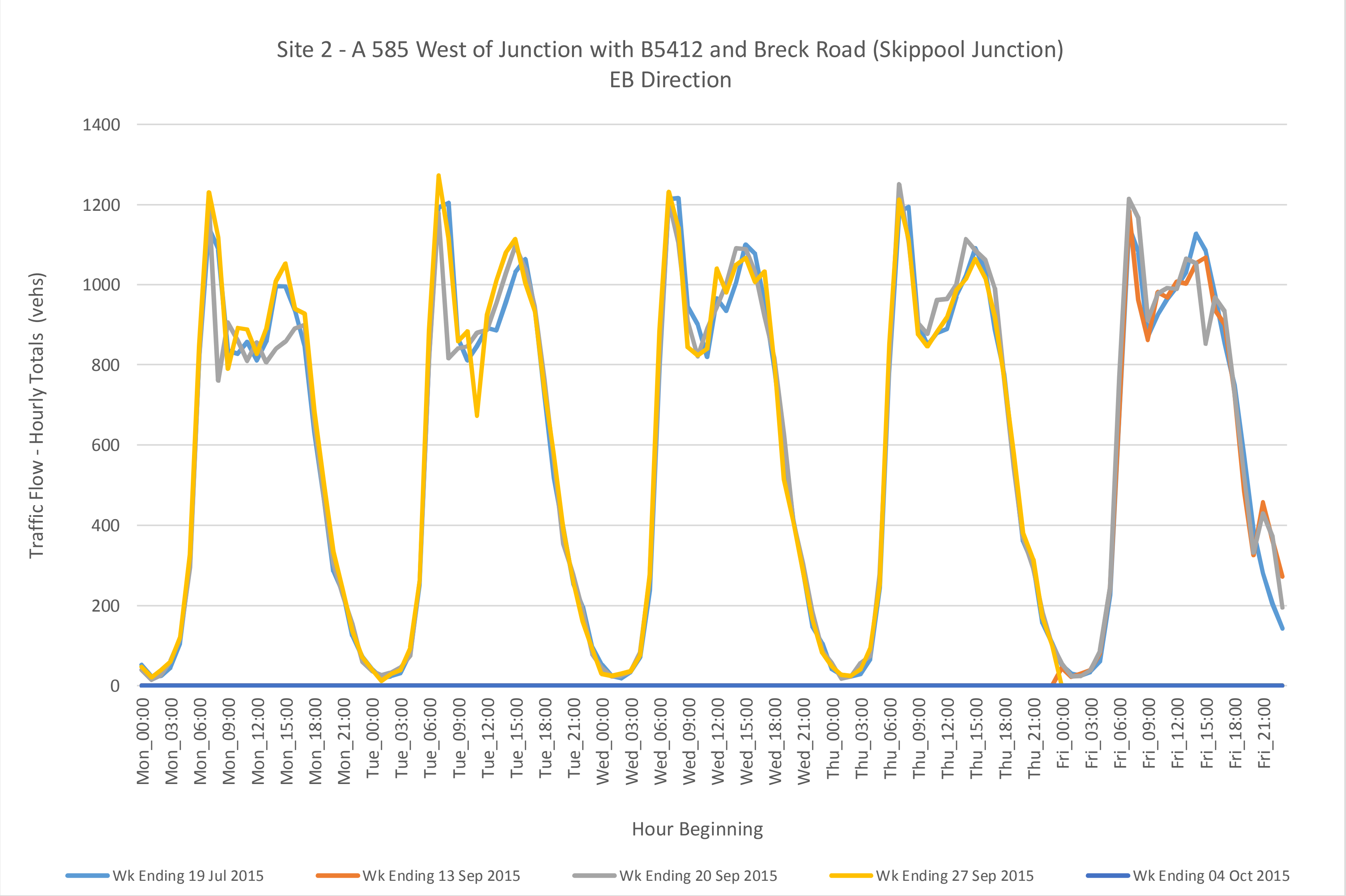
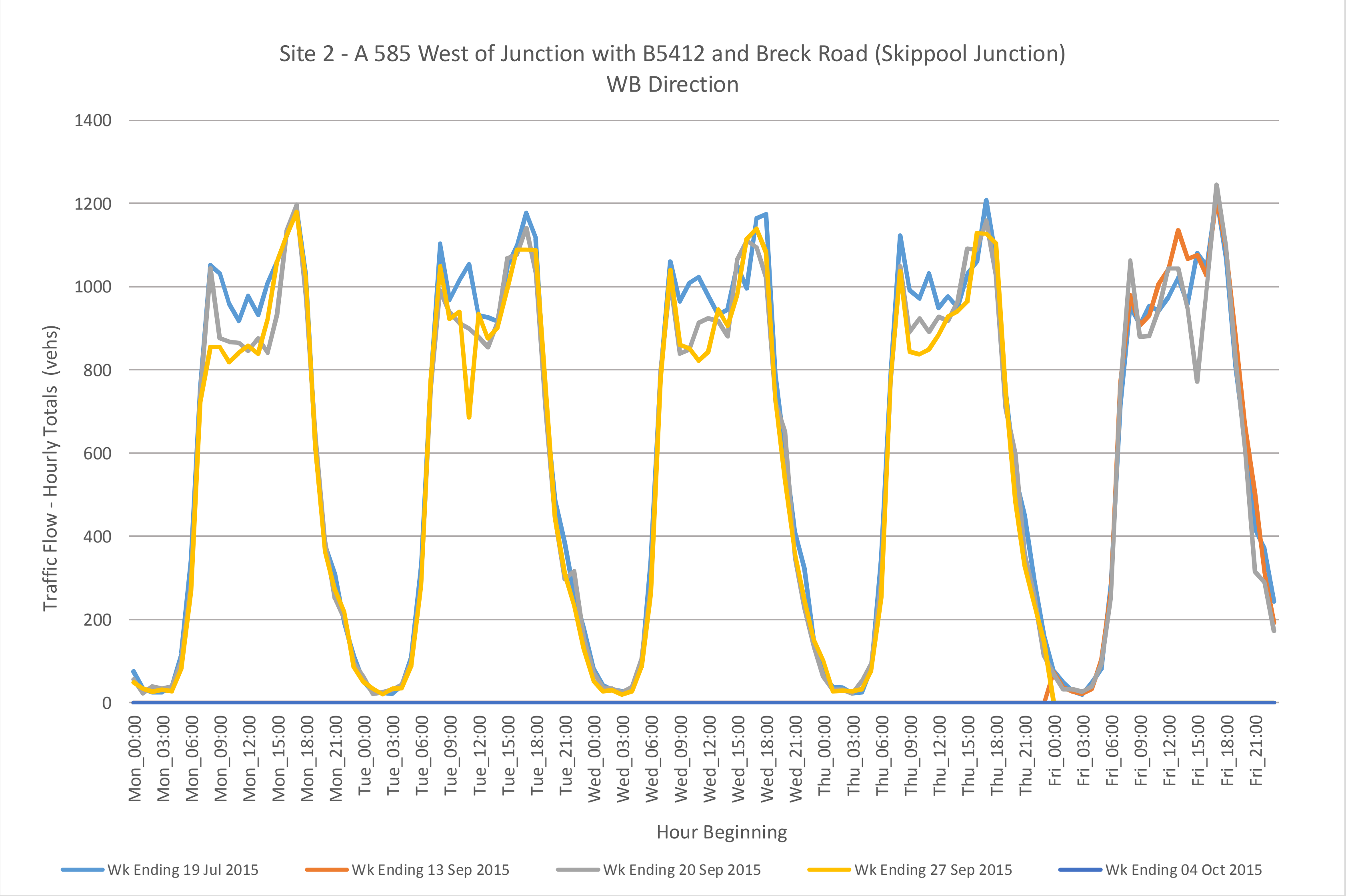
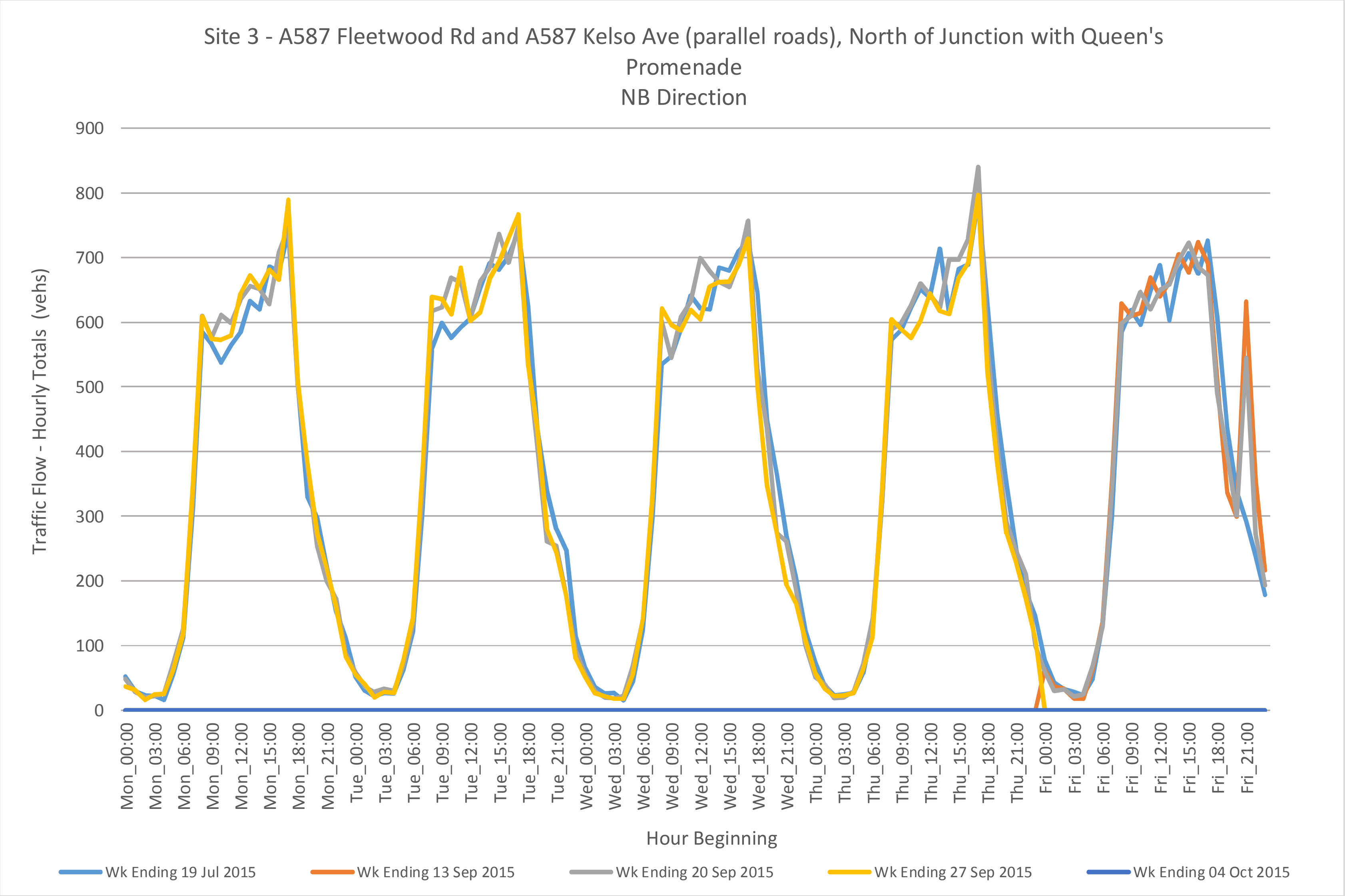
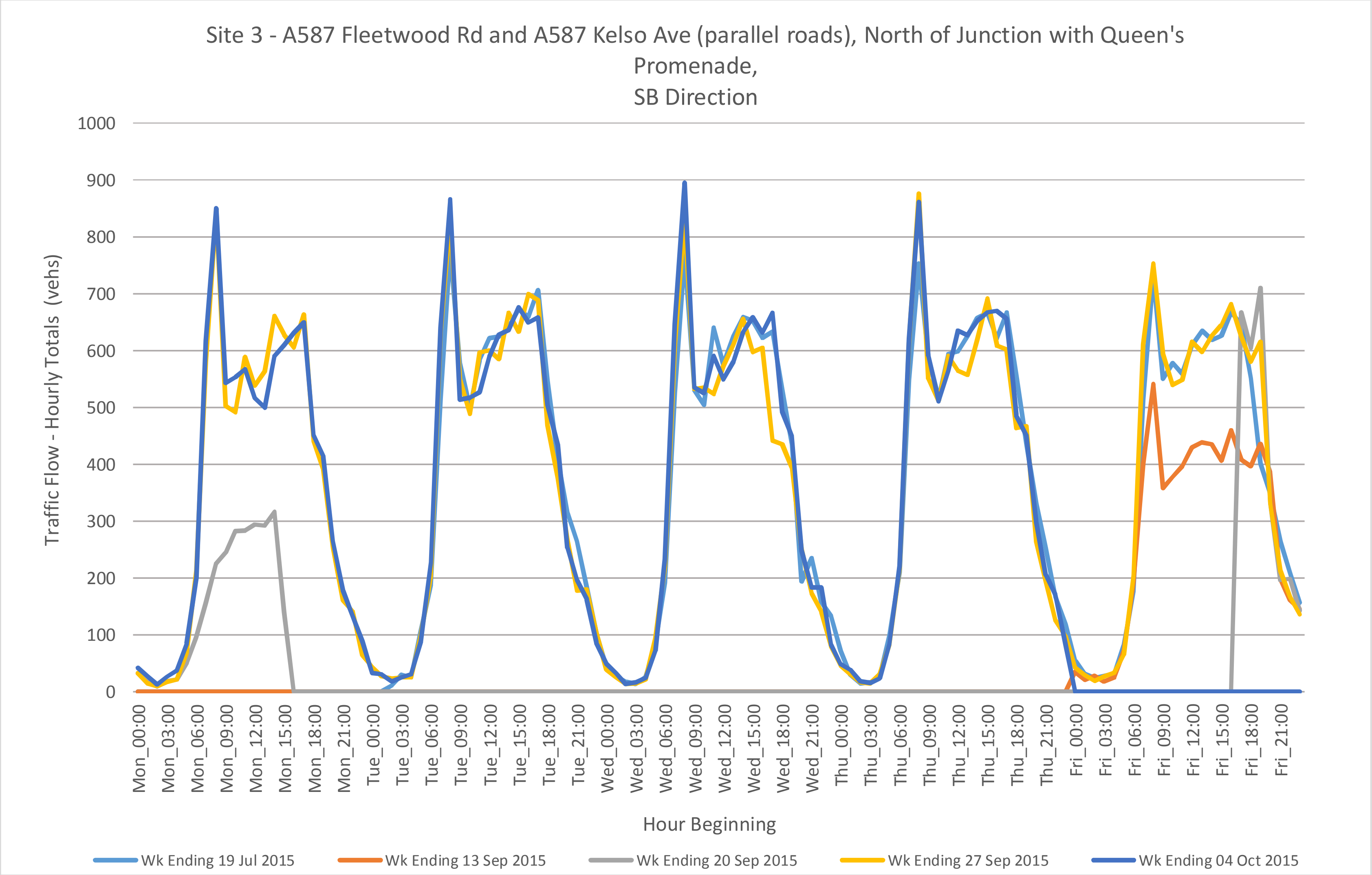
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 2 - A 585 West of Junction with B5412 and Breck Road (Skippool Junction)
EB Direction
Traffic Flow - Hourly Totals (vehs)
1400
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 2 - A 585 West of Junction with B5412 and Breck Road (Skippool Junction)
WB Direction
Traffic Flow - Hourly Totals (vehs)
0
200
400
600
800
1000
1200
1400
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 3 - A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), North of Junction with Queen's Promenade
NB Direction
Traffic Flow - Hourly Totals (vehs)
900
800
700
600
500
400
300
200
100
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 3 - A587 Fleetwood Rd and A587 Kelso Ave (parallel roads), North of Junction with Queen's Promenade,
SB Direction
Traffic Flow - Hourly Totals (vehs)
1000
900
800
700
600
500
400
300
200
100
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
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Thu_12:00
Thu_15:00
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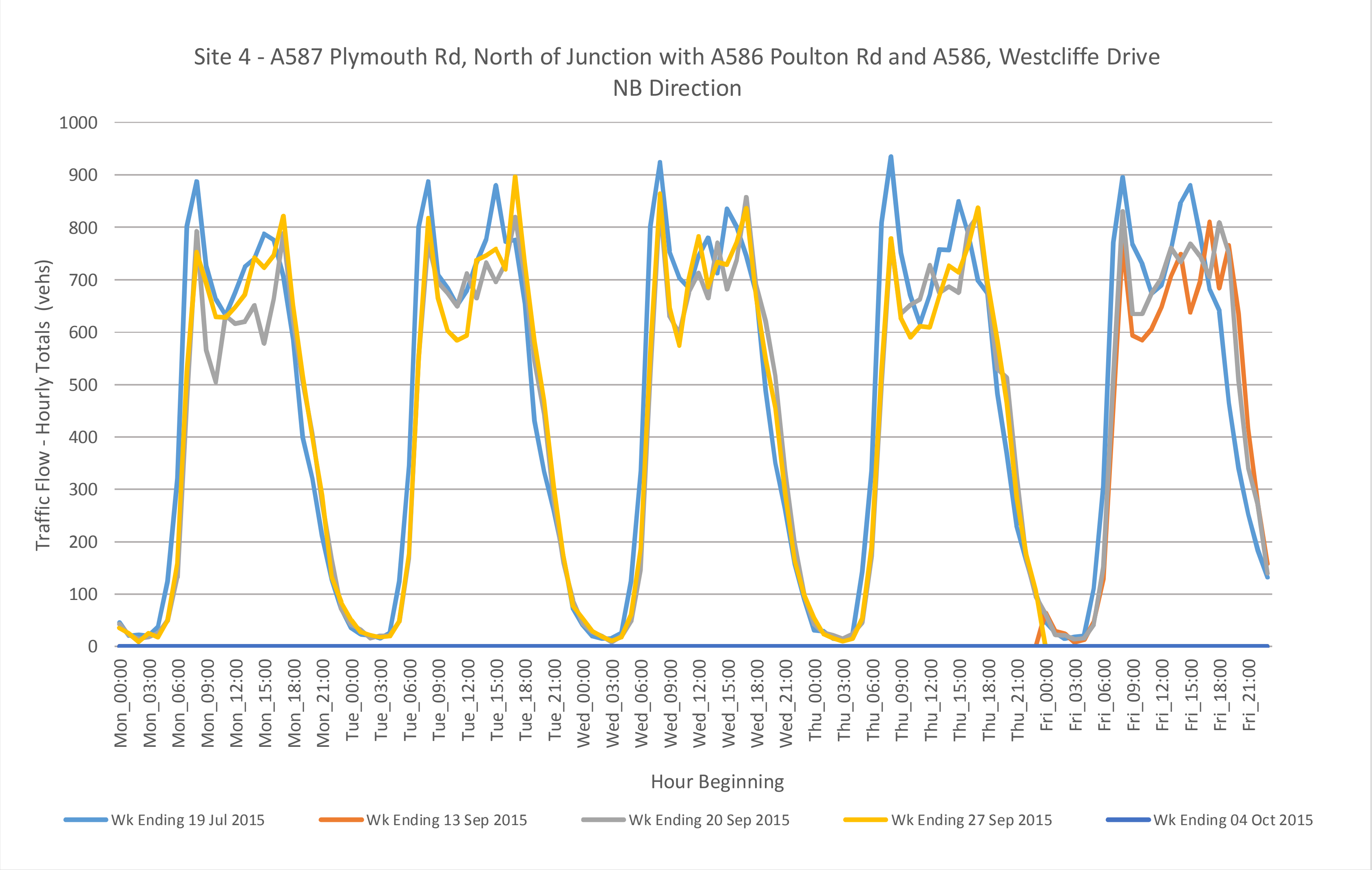
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 4 - A587 Plymouth Rd, North of Junction with A586 Poulton Rd and A586, Westcliffe Drive
NB Direction
Traffic Flow - Hourly Totals (vehs)
1000
900
800
700
600
500
400
300
200
100
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
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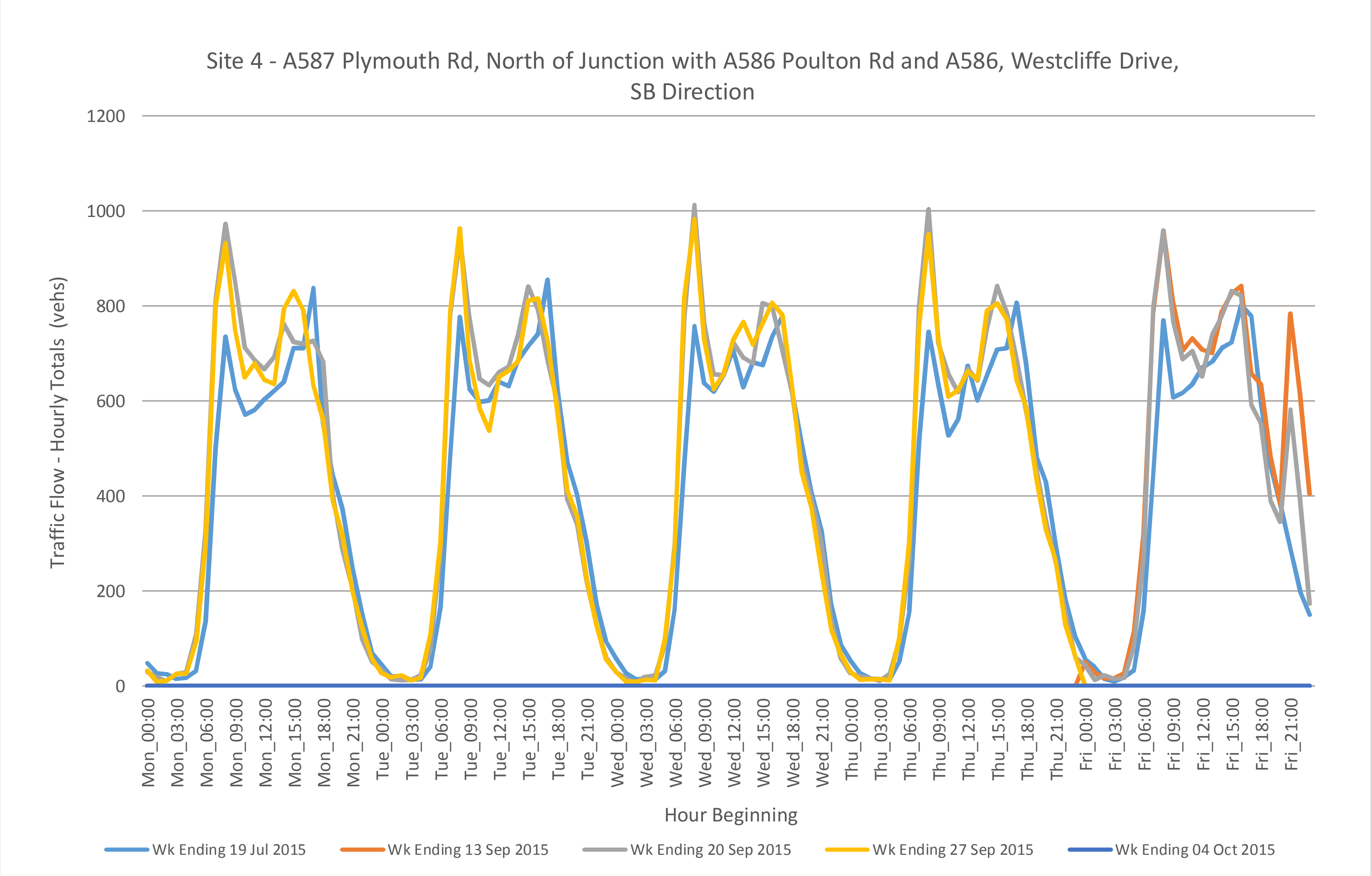
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 4 - A587 Plymouth Rd, North of Junction with A586 Poulton Rd and A586, Westcliffe Drive, SB Direction
Traffic Flow - Hourly Totals (vehs)
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
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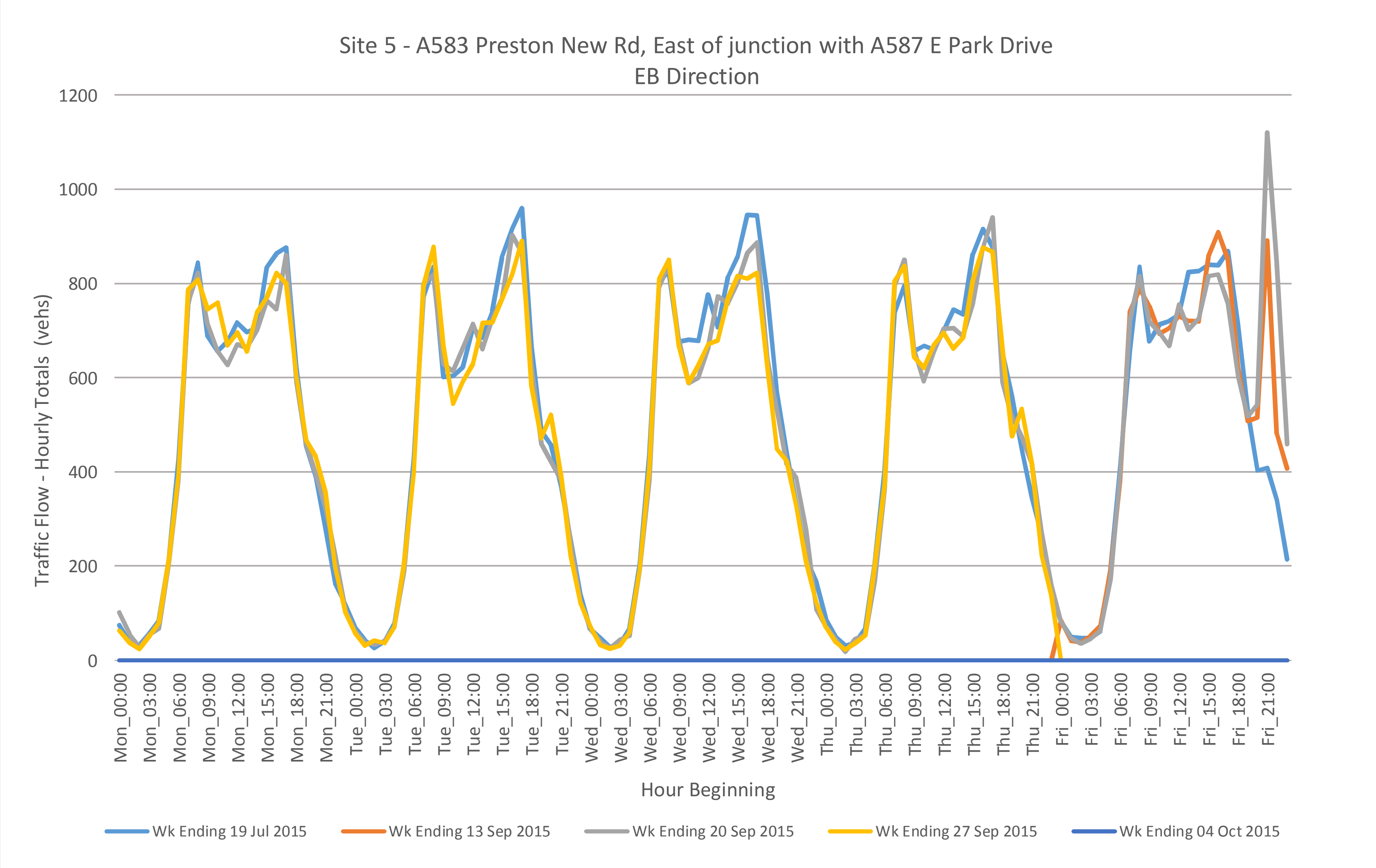
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 5 - A583 Preston New Rd, East of junction with A587 E Park Drive
EB Direction
Traffic Flow - Hourly Totals (vehs)
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
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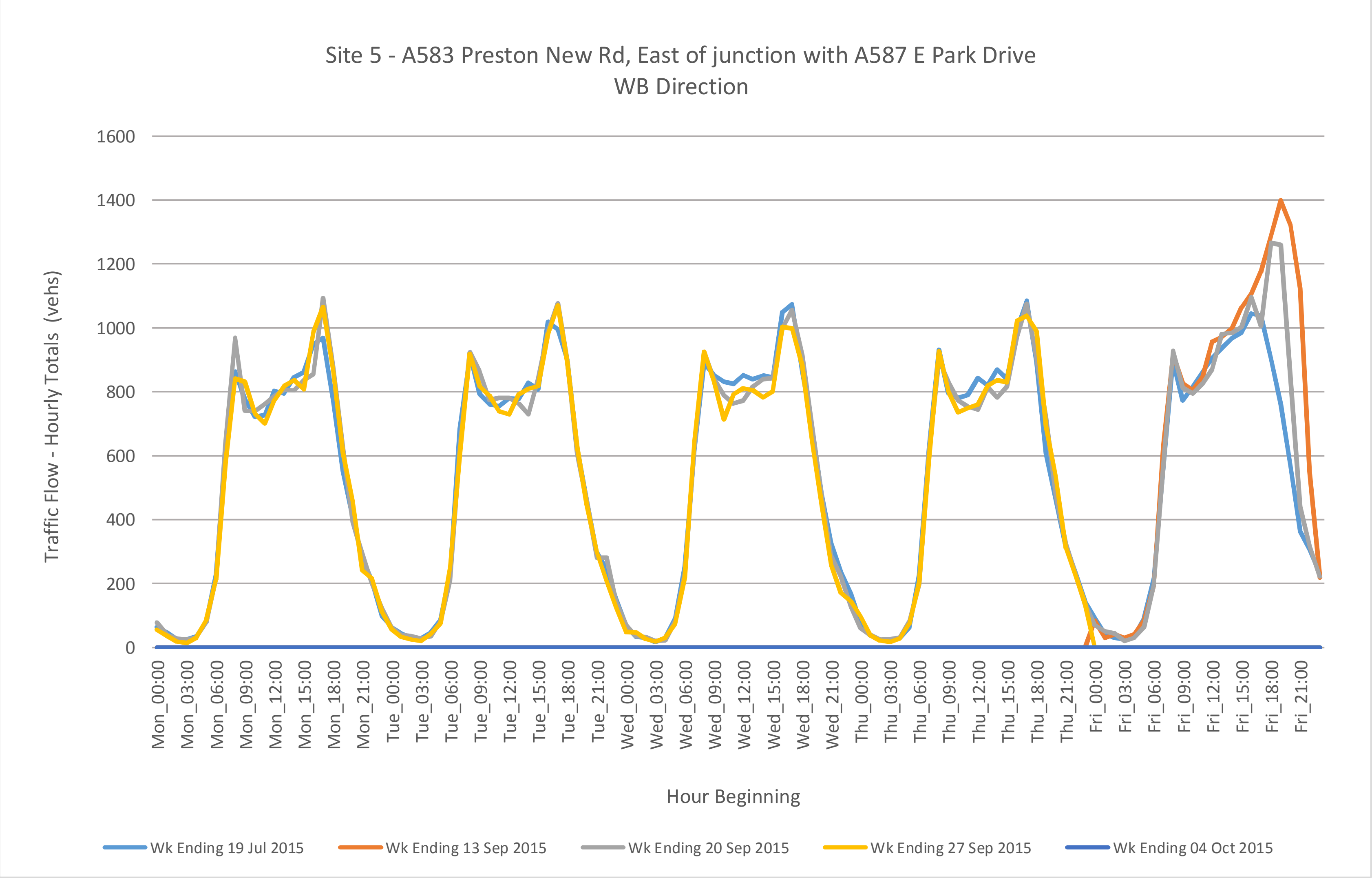
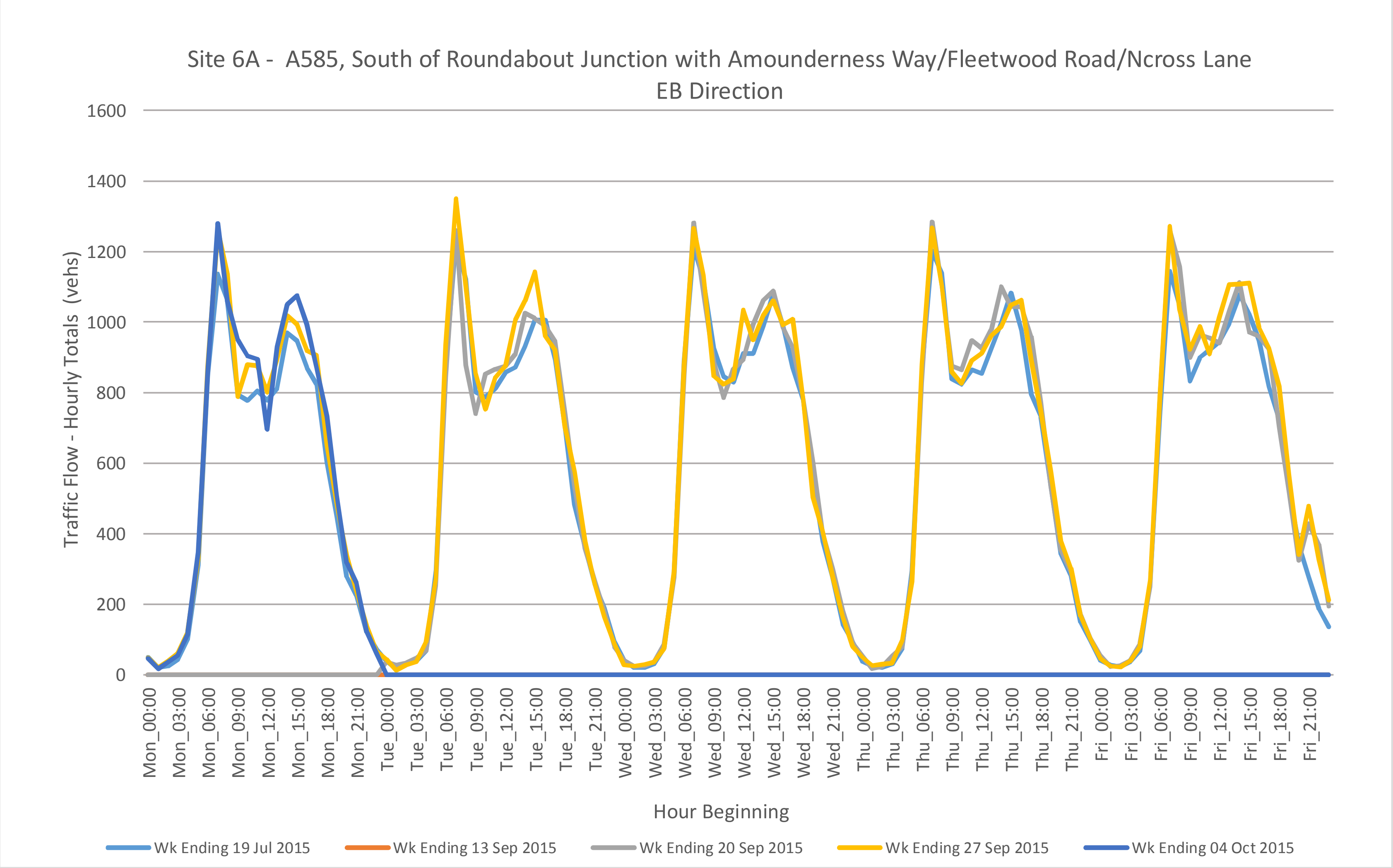
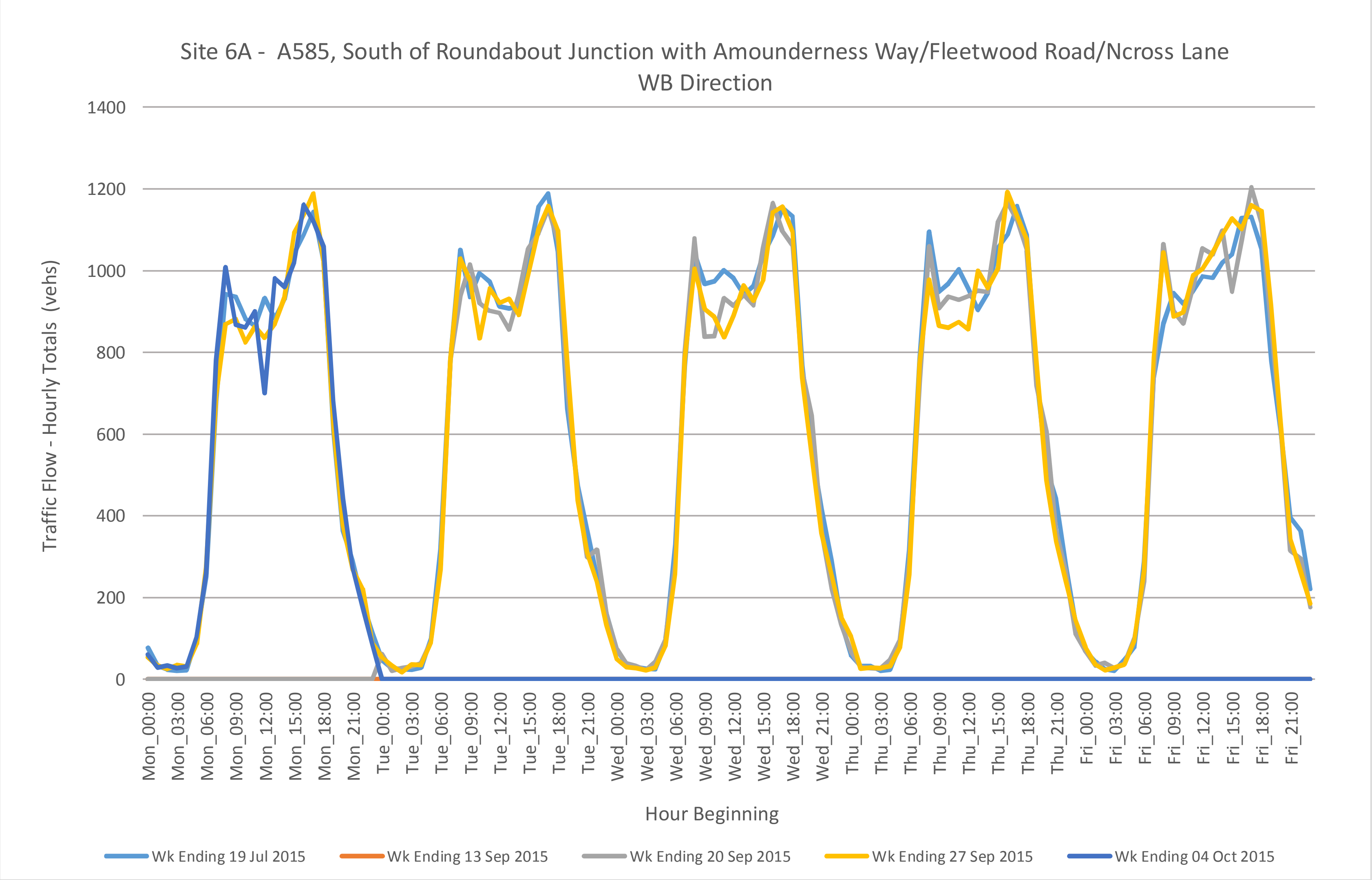
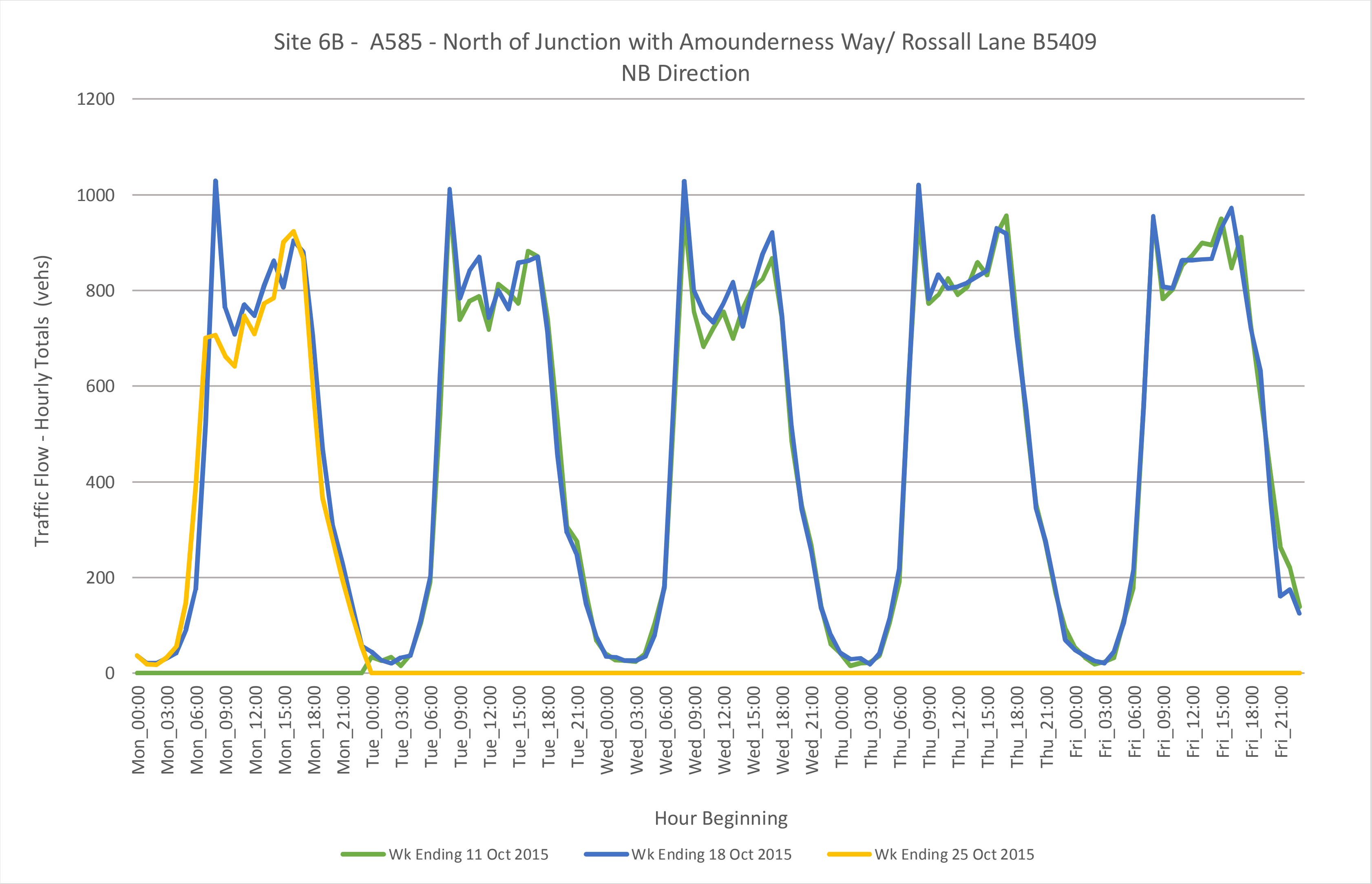
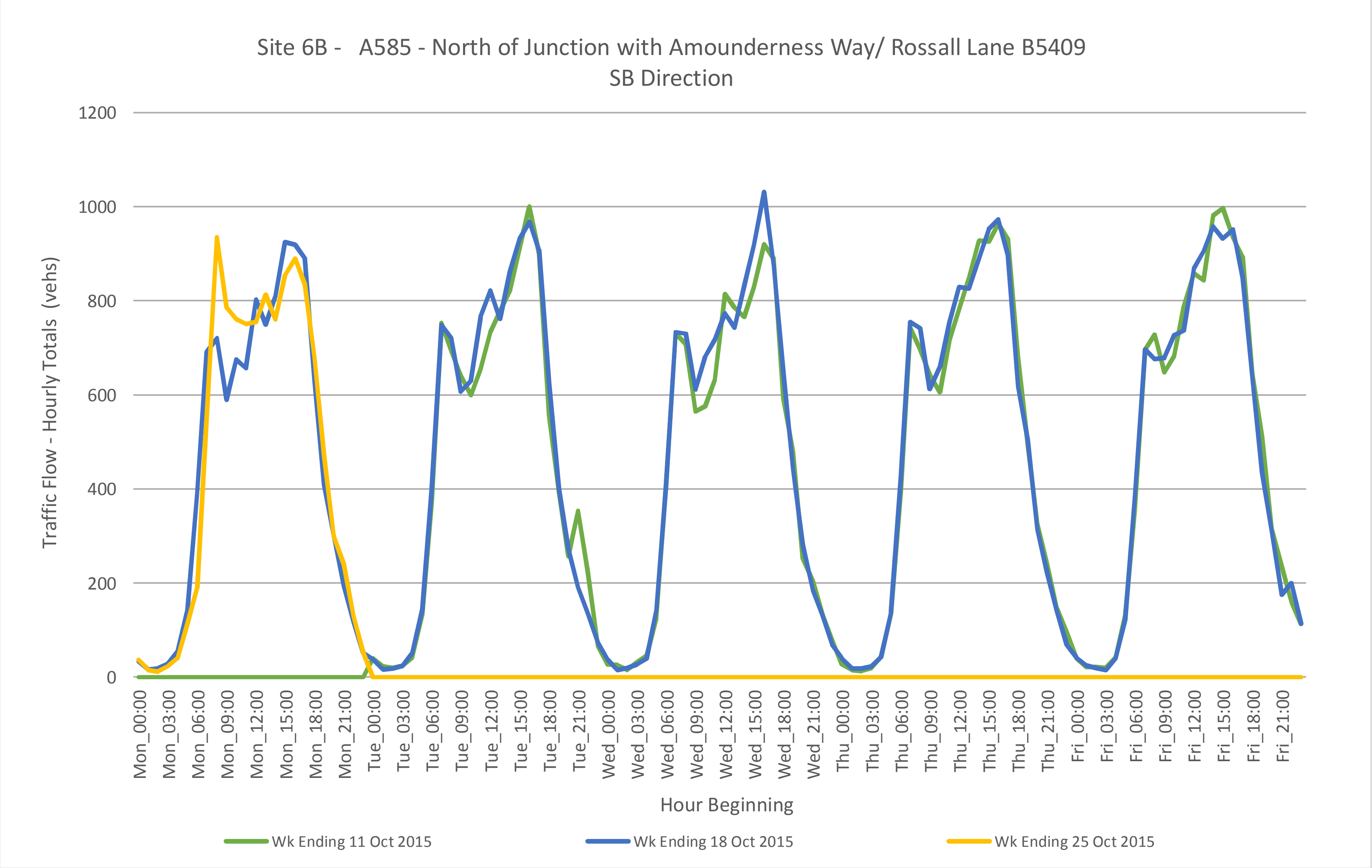
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015

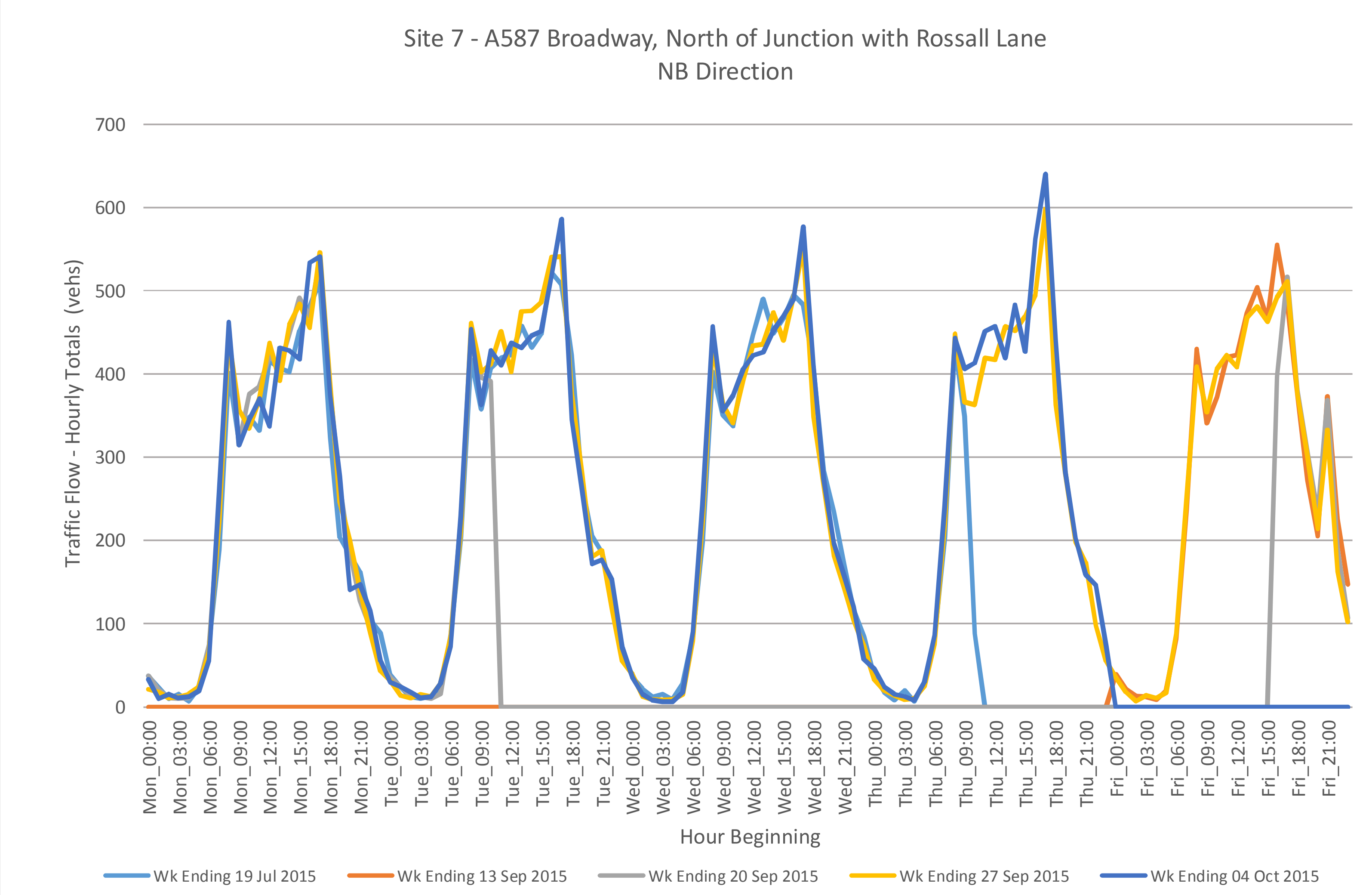

Site 5 - A583 Preston New Rd, East of junction with A587 E Park Drive
WB Direction
Traffic Flow - Hourly Totals (vehs)
0
200
400
600
800
1000
1200
1400
1600
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015

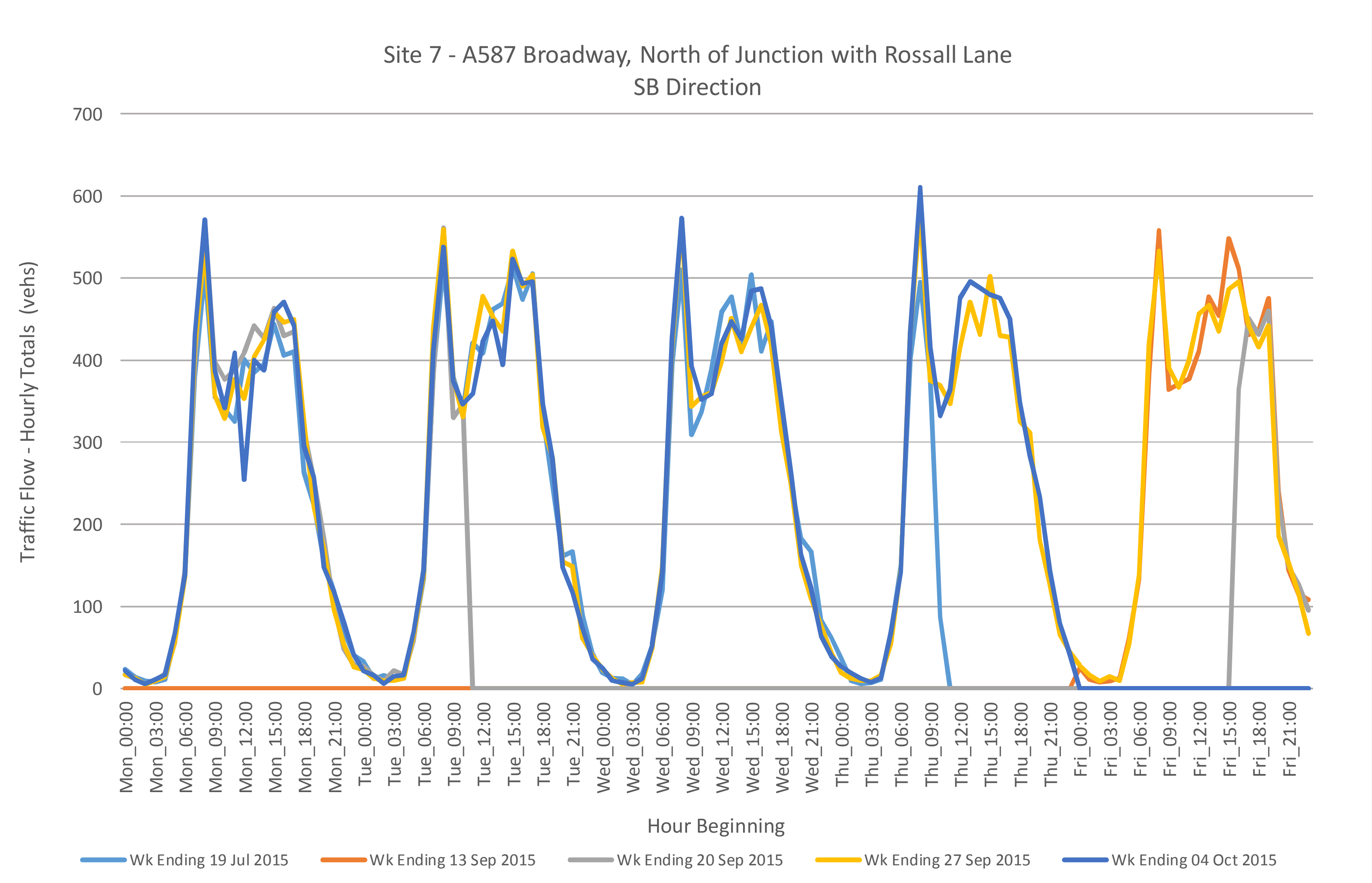

Site 6A - A585, South of Roundabout Junction with Amounderness Way/Fleetwood Road/Ncross Lane
EB Direction
Traffic Flow - Hourly Totals (vehs)
1600
1400
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 6A - A585, South of Roundabout Junction with Amounderness Way/Fleetwood Road/Ncross Lane
WB Direction
Traffic Flow - Hourly Totals (vehs)
0
200
400
600
800
1000
1200
1400
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015


Site 6B - A585 - North of Junction with Amounderness Way/ Rossall Lane B5409
NB Direction
Traffic Flow - Hourly Totals (vehs)
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 11 Oct 2015
Wk Ending 18 Oct 2015
Wk Ending 25 Oct 2015


Site 6B - A585 - North of Junction with Amounderness Way/ Rossall Lane B5409
SB Direction
Traffic Flow - Hourly Totals (vehs)
1200
1000
800
600
400
200
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 11 Oct 2015
Wk Ending 18 Oct 2015
Wk Ending 25 Oct 2015


Site 7 - A587 Broadway, North of Junction with Rossall Lane
NB Direction
700
600
500
400
300
200
100
0
Traffic Flow - Hourly Totals (vehs)
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015

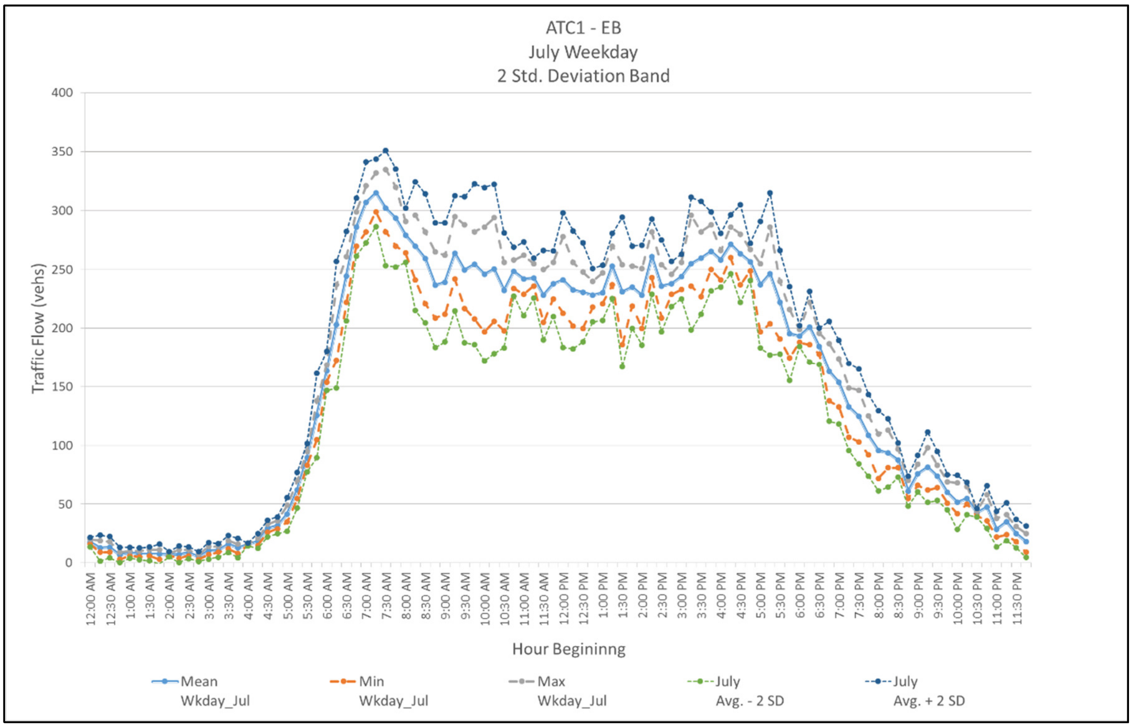

Site 7 - A587 Broadway, North of Junction with Rossall Lane
SB Direction
Traffic Flow - Hourly Totals (vehs)
700
600
500
400
300
200
100
0
Mon_00:00
Mon_03:00
Mon_06:00
Mon_09:00
Mon_12:00
Mon_15:00
Mon_18:00
Mon_21:00
Tue_00:00
Tue_03:00
Tue_06:00
Tue_09:00
Tue_12:00
Tue_15:00
Tue_18:00
Tue_21:00
Wed_00:00
Wed_03:00
Wed_06:00
Wed_09:00
Wed_12:00
Wed_15:00
Wed_18:00
Wed_21:00
Thu_00:00
Thu_03:00
Thu_06:00
Thu_09:00
Thu_12:00
Thu_15:00
Thu_18:00
Thu_21:00
Fri_00:00
Fri_03:00
Fri_06:00
Fri_09:00
Fri_12:00
Fri_15:00
Fri_18:00
Fri_21:00
Hour Beginning
Wk Ending 19 Jul 2015
Wk Ending 13 Sep 2015
Wk Ending 20 Sep 2015
Wk Ending 27 Sep 2015
Wk Ending 04 Oct 2015

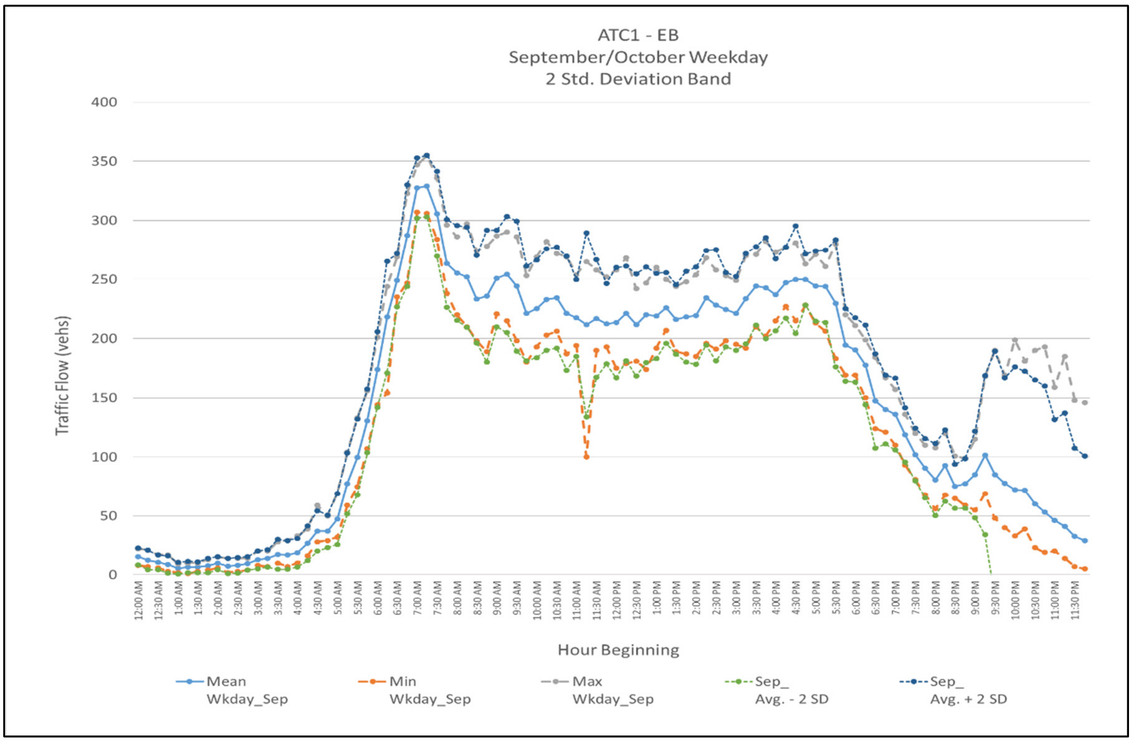
APPENDIX E

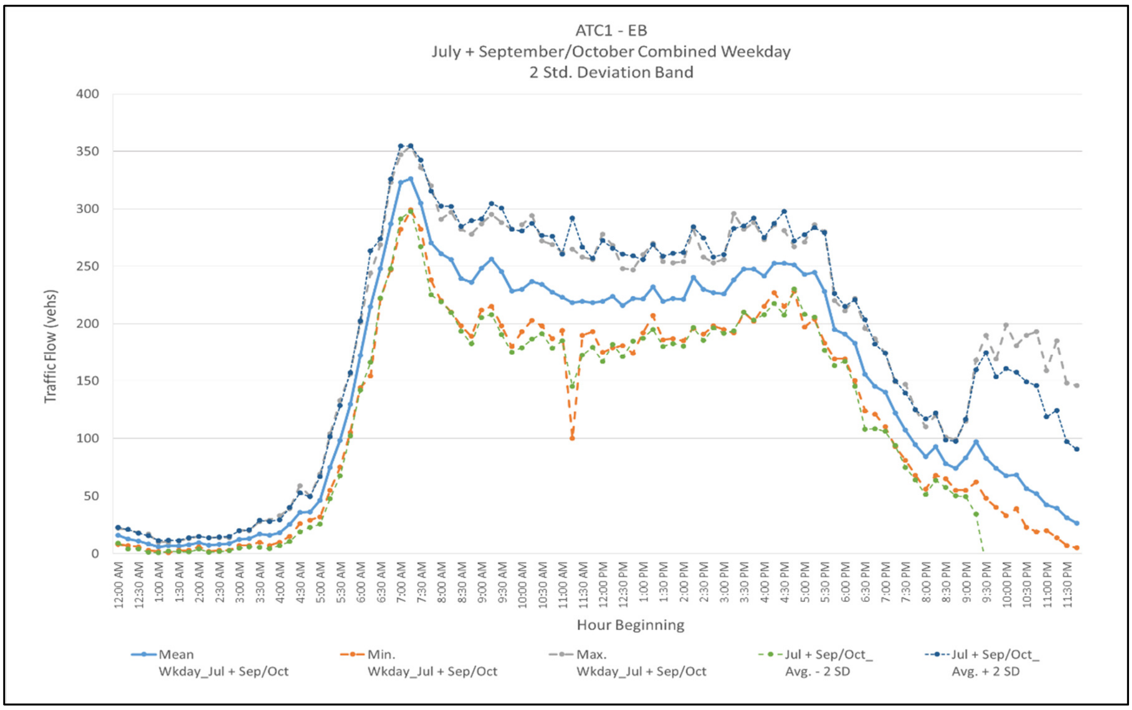
2015 ATC Data: Mean and 2SD Band Plots

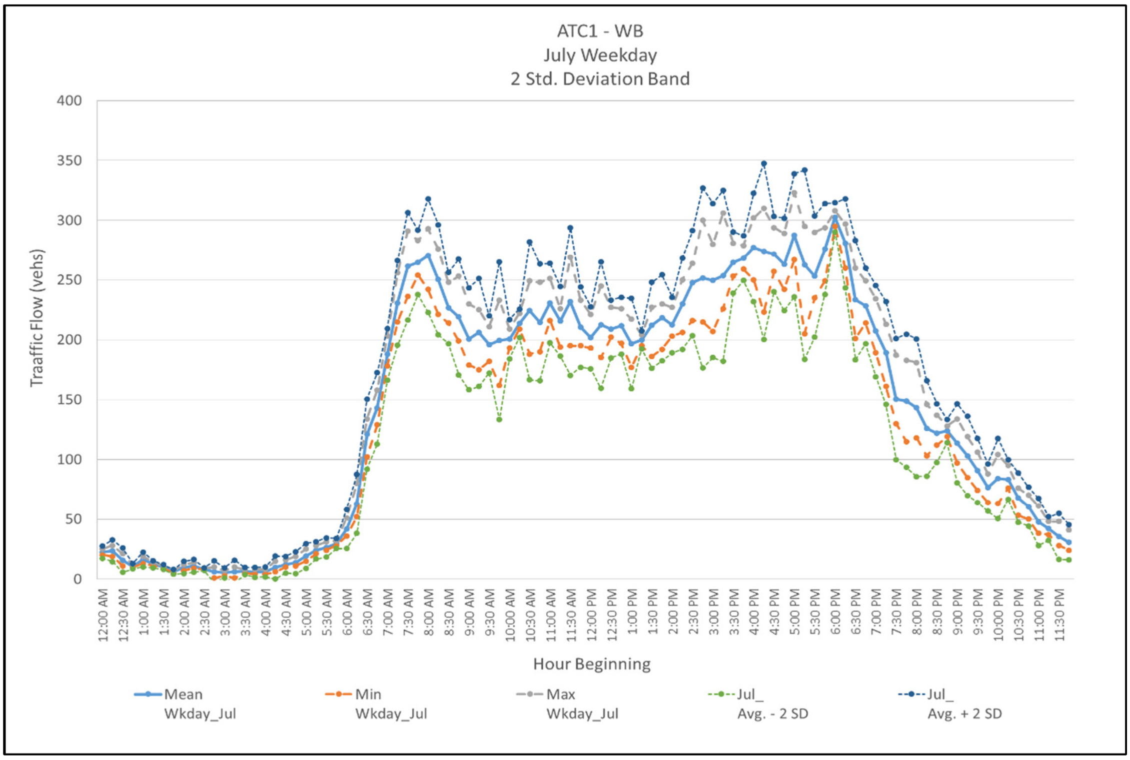
APPENDIX E: 2015 ATC data - TWO STD. DEVIATION TESTS

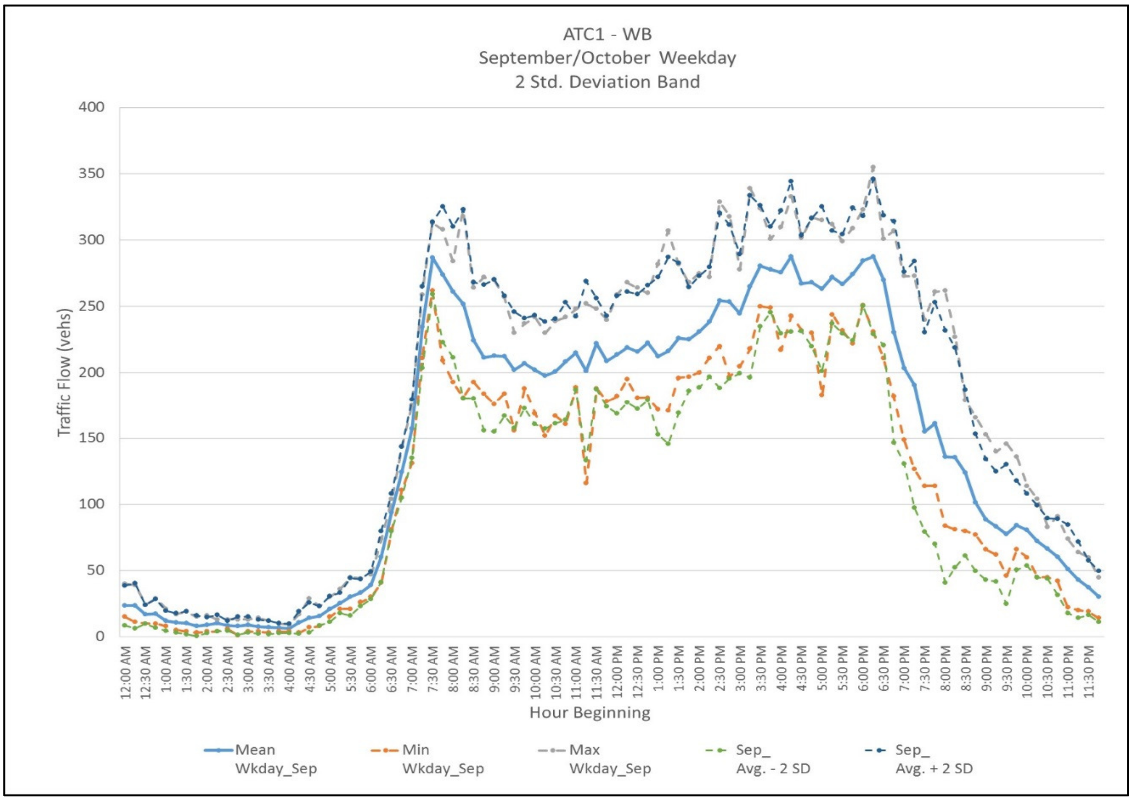
ATC 1

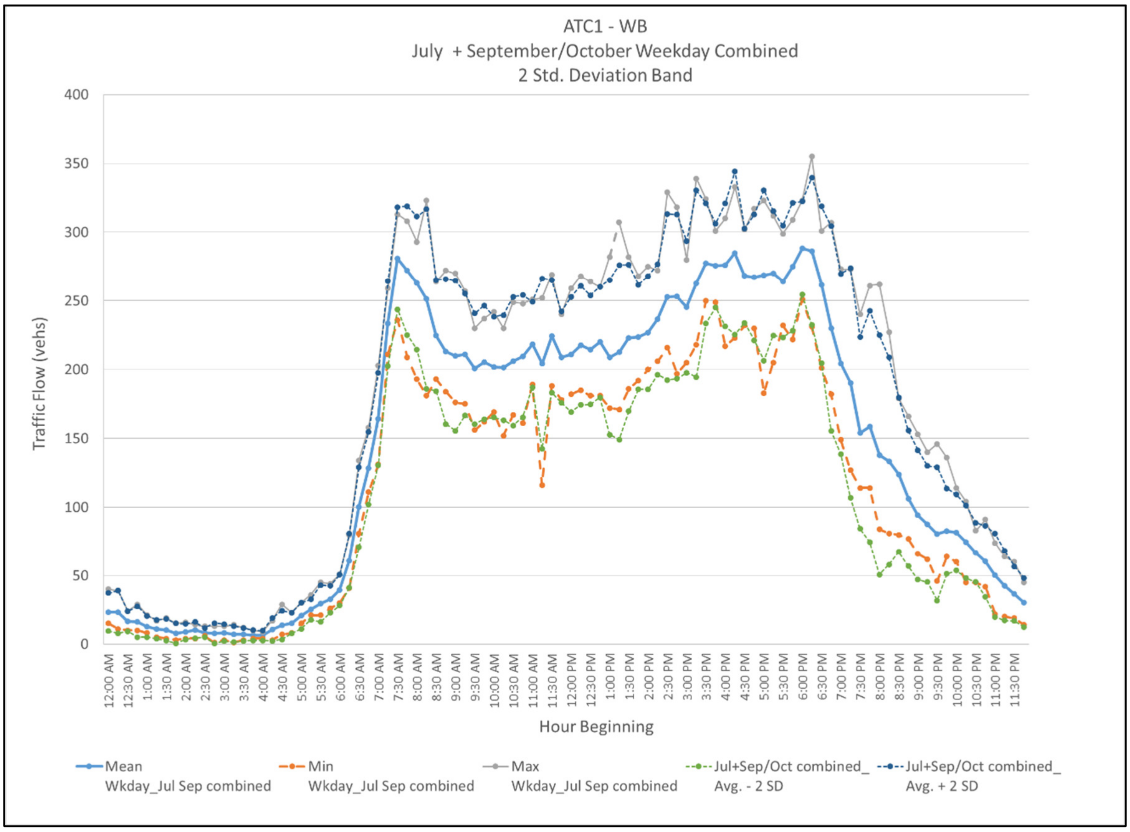




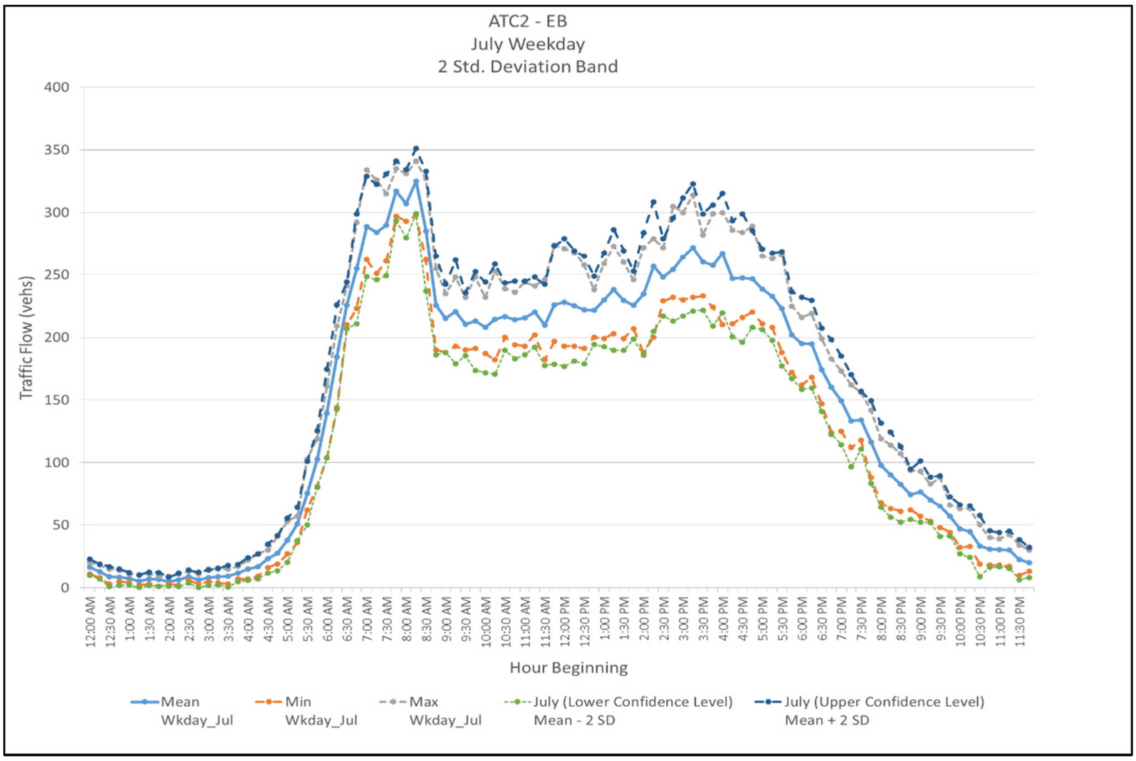

ATC1 - EB
July + September/October Combined Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul + Sep/Oct
Min. Wkday_Jul + Sep/Oct
Max. Wkday_Jul + Sep/Oct
Jul + Sep/Oct_ Avg. - 2 SD
Jul + Sep/Oct_ Avg. + 2 SD

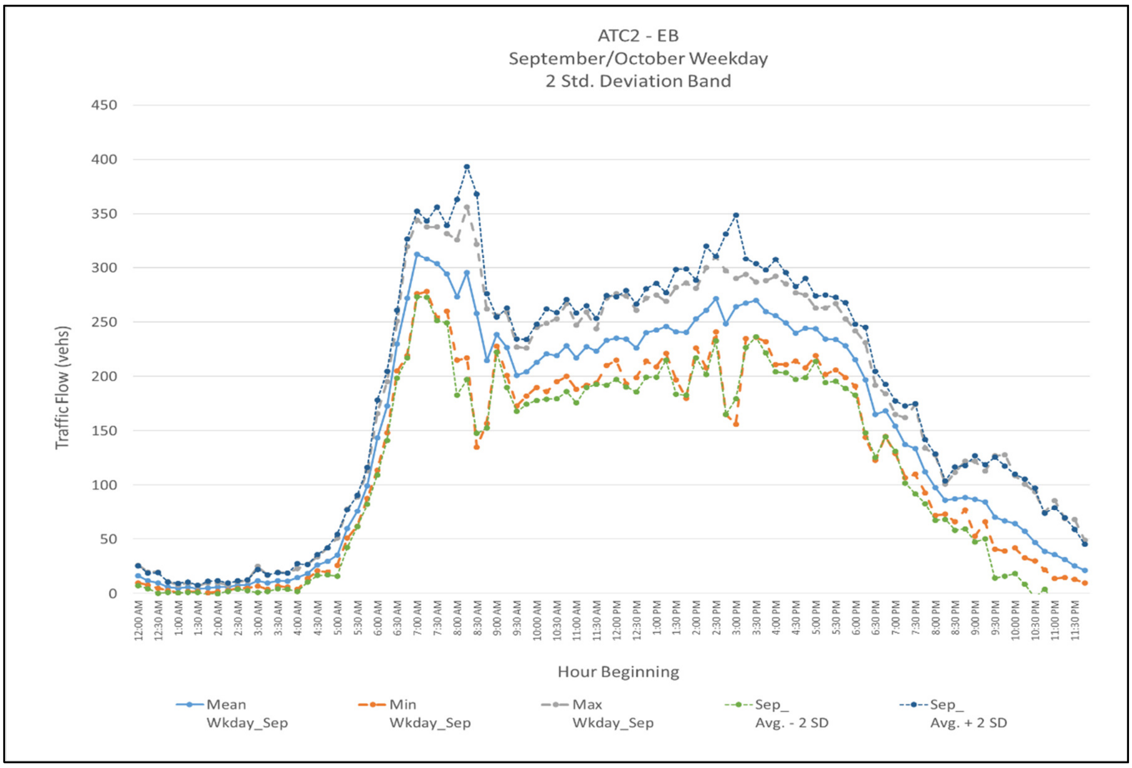

ATC1 - WB
July Weekday
2 Std. Deviation Band
Traaffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
Jul_ Avg. - 2 SD
Jul_ Avg. + 2 SD

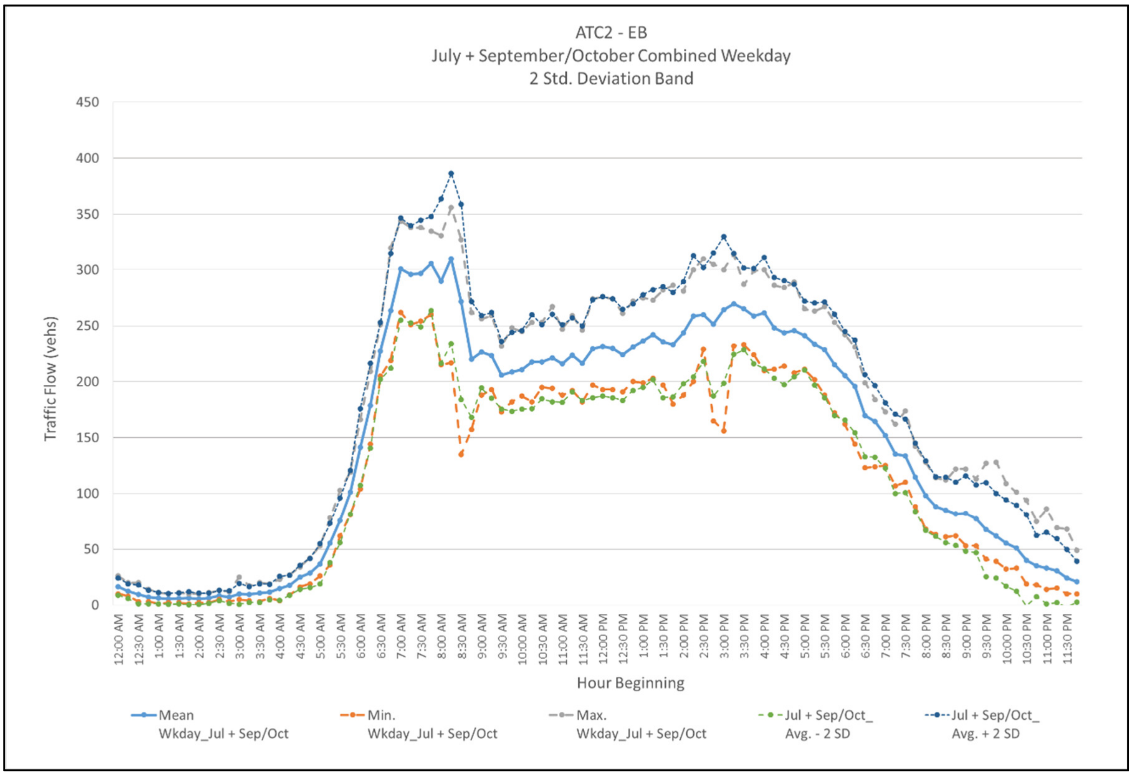

ATC1 - WB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD

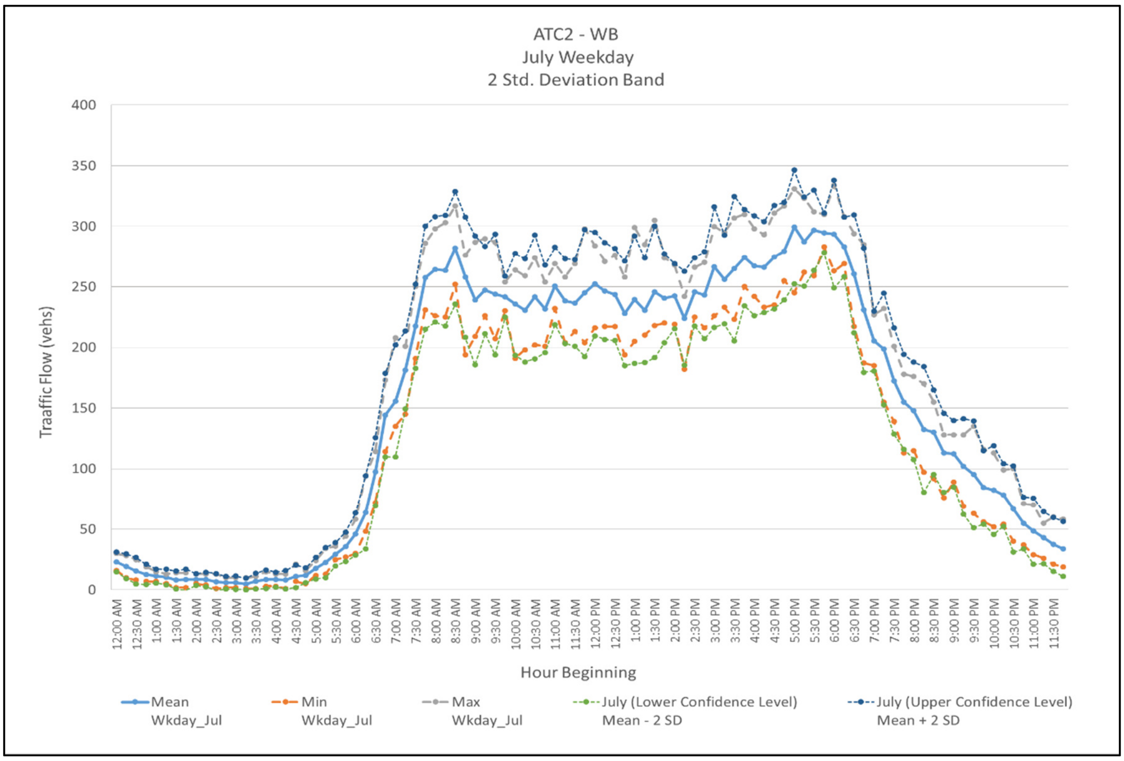

ATC1 - WB
July + September/October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
11:30 PM
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul+Sep/Oct combined_ Avg. - 2 SD
Jul+Sep/Oct combined_ Avg. + 2 SD

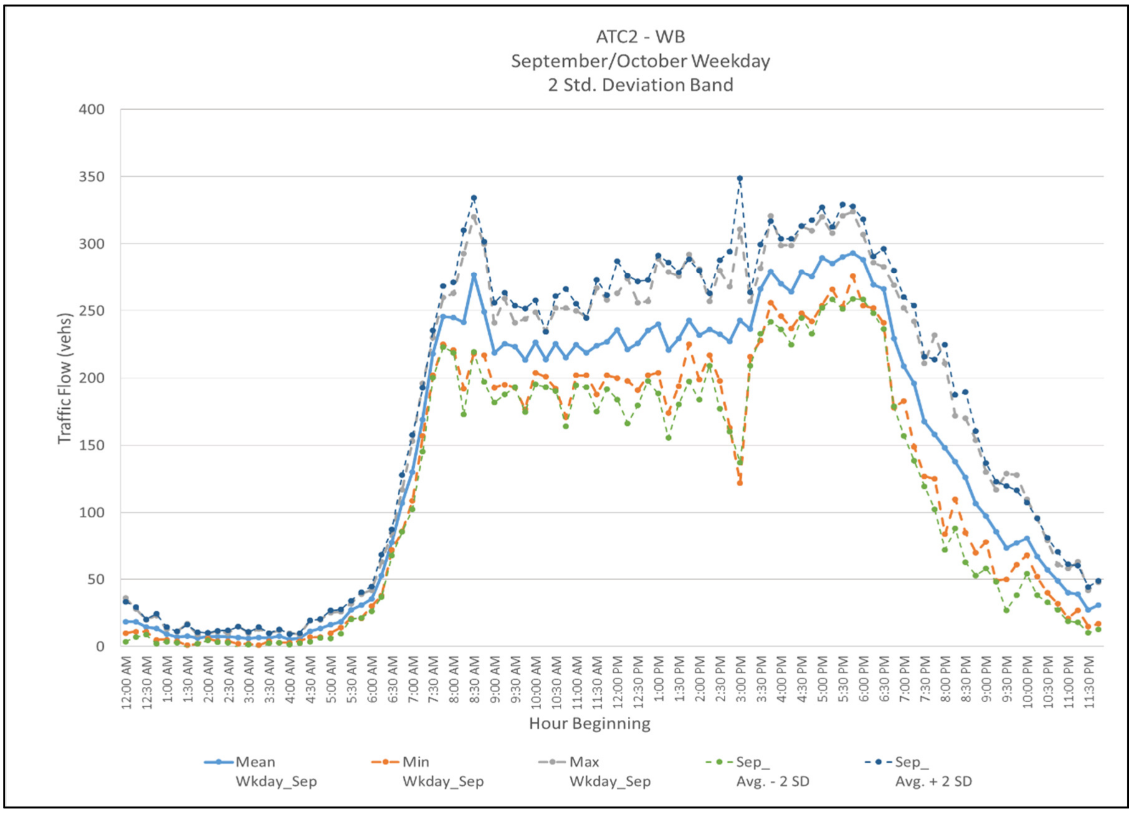
ATC 2

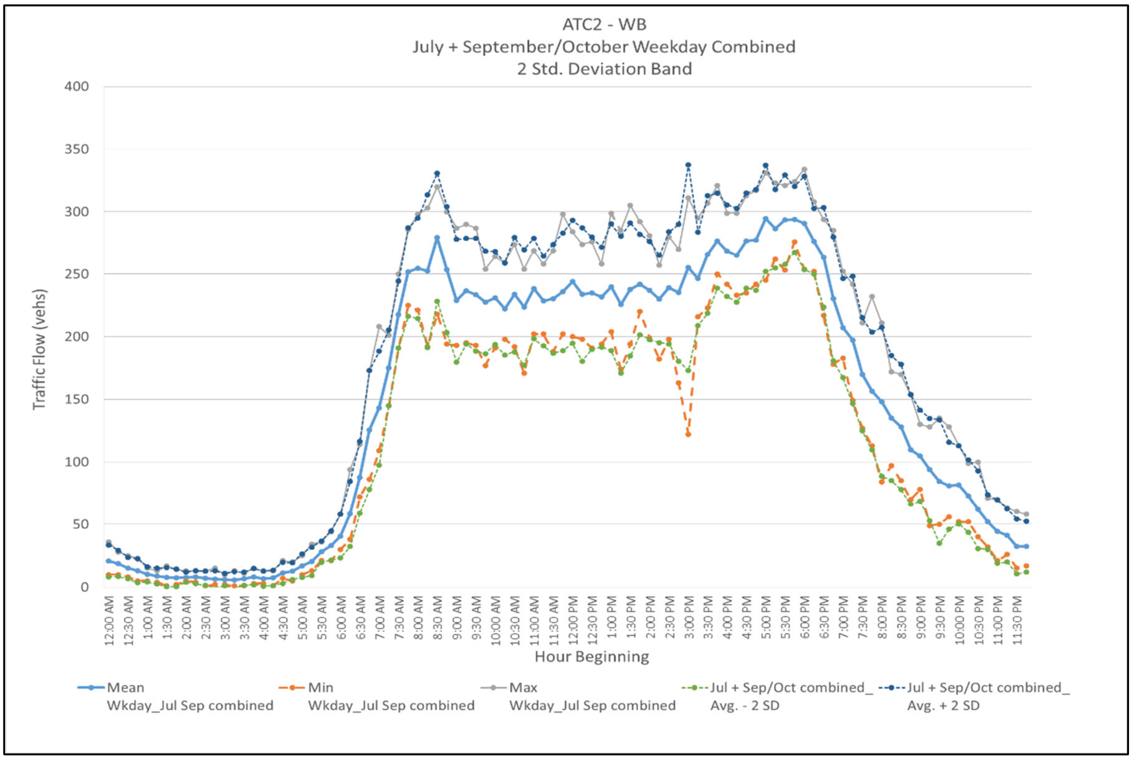

ATC2 - EB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July (Lower Confidence Level) Mean - 2 SD
July (Upper Confidence Level) Mean + 2 SD


ATC2 - EB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
450
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC2 - EB
July + September/October Combined Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
450
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul + Sep/Oct
Min. Wkday_Jul + Sep/Oct
Max. Wkday_Jul + Sep/Oct
Jul + Sep/Oct_ Avg. - 2 SD
Jul + Sep/Oct_ Avg. + 2 SD


ATC2 - WB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July (Lower Confidence Level) Mean - 2 SD
July (Upper Confidence Level) Mean + 2 SD


ATC2 - WB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
4:30 PM
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC2 - WB
July + September/October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
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11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
3:30 PM
4:00 PM
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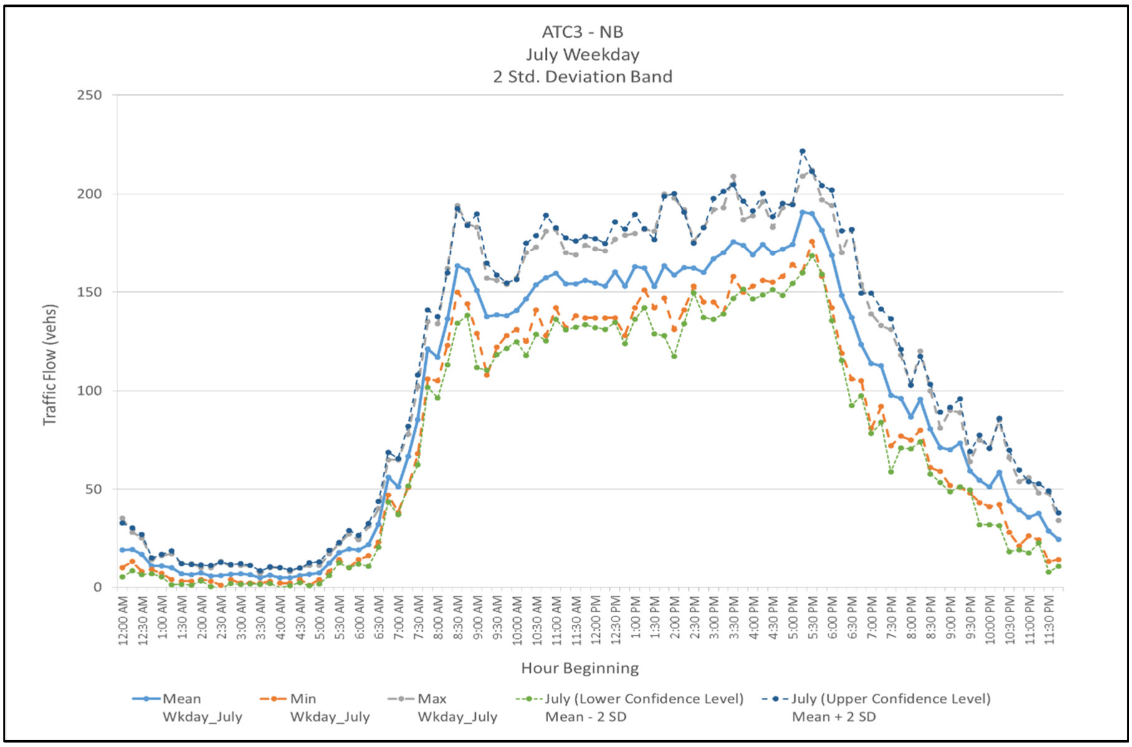
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul + Sep/Oct combined_ Avg. - 2 SD
Jul + Sep/Oct combined_ Avg. + 2 SD

ATC 3


ATC3 - NB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
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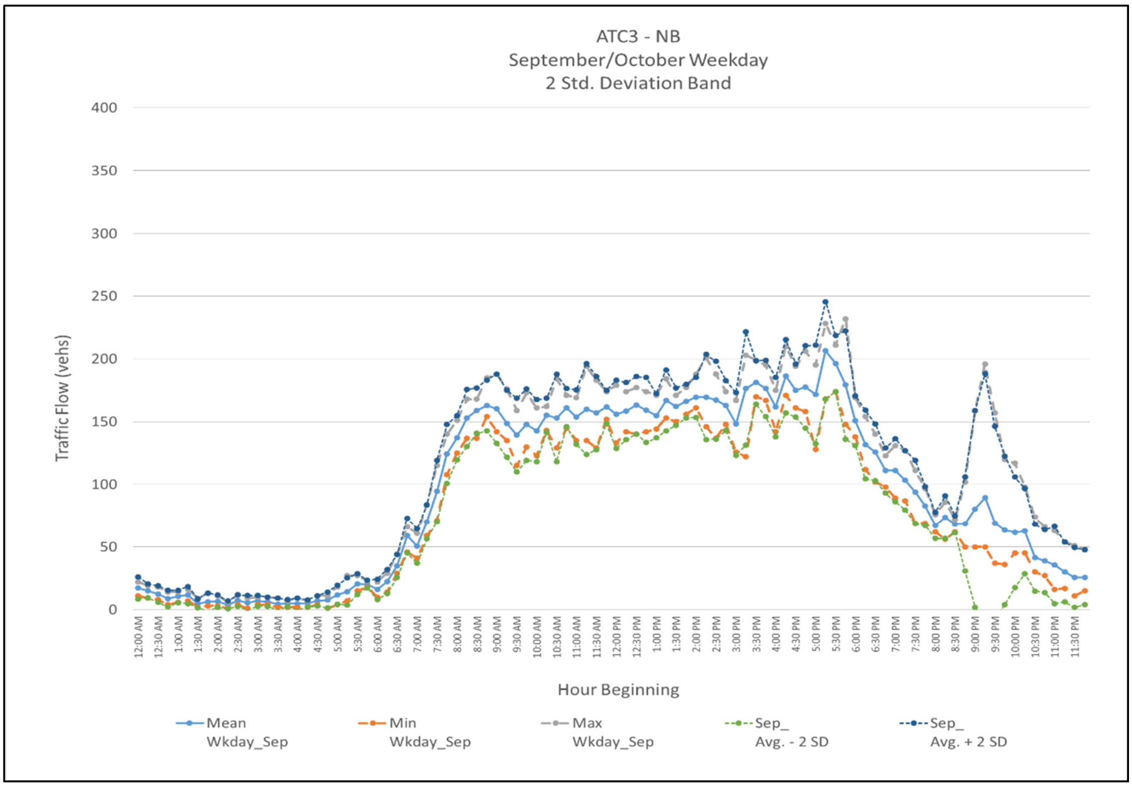
200
250
12:00 AM
11:30 PM
Hour Beginning
Mean Wkday_July
Min Wkday_July
Max Wkday_July
July (Lower Confidence Level) Mean - 2 SD
July (Upper Confidence Level) Mean + 2 SD


ATC3 - NB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
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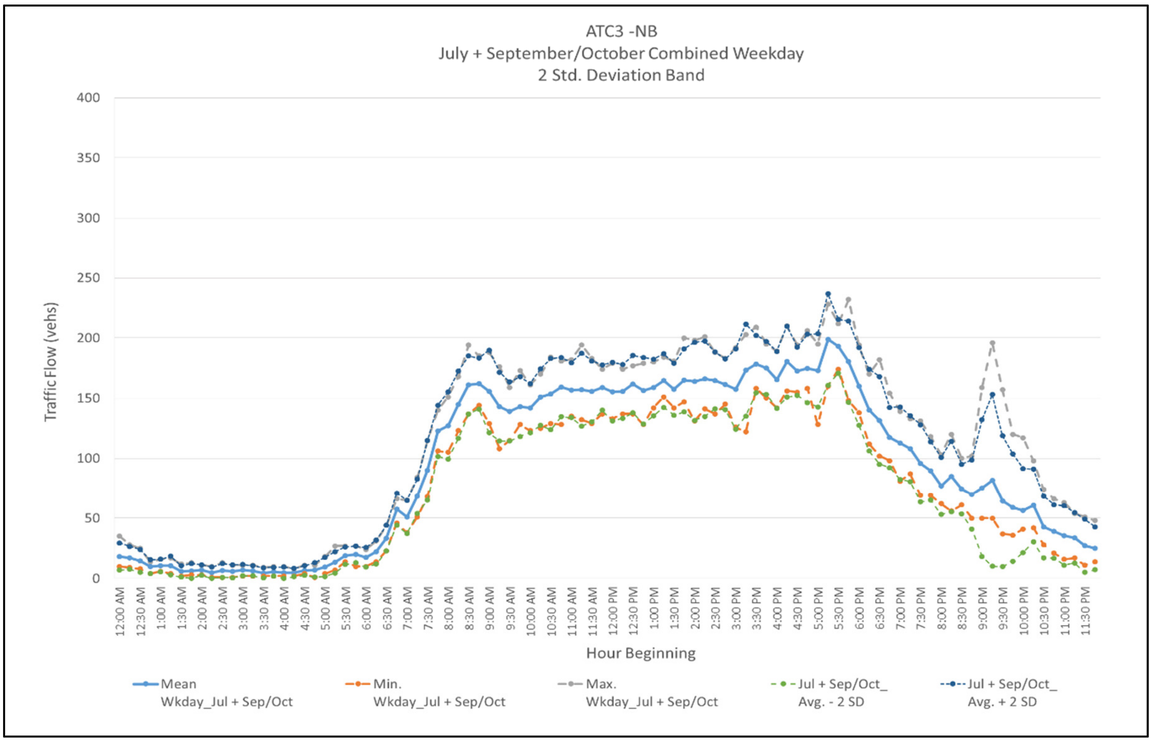
350
400
12:00 AM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC3 -NB
July + September/October Combined Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
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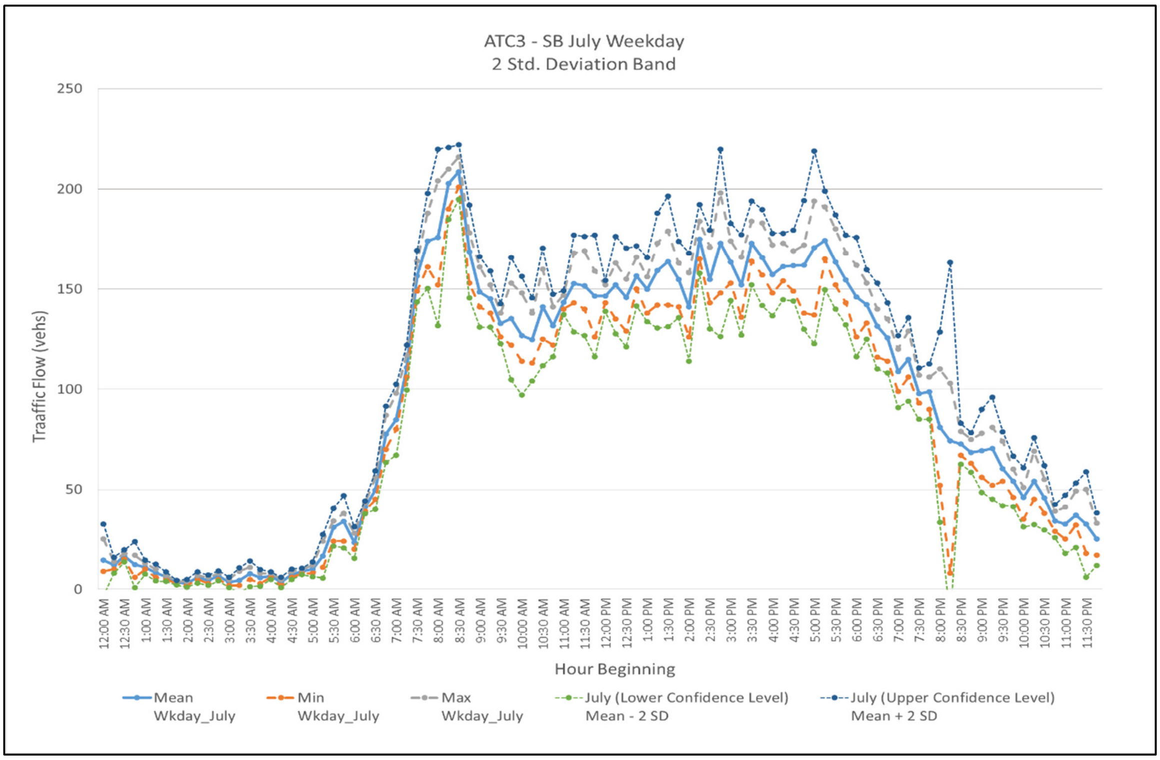
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul + Sep/Oct
Min. Wkday_Jul + Sep/Oct
Max. Wkday_Jul + Sep/Oct
Jul + Sep/Oct_ Avg. - 2 SD
Jul + Sep/Oct_ Avg. + 2 SD


ATC3 - SB July Weekday
2 Std. Deviation Band
Traaffic Flow (vehs)
250
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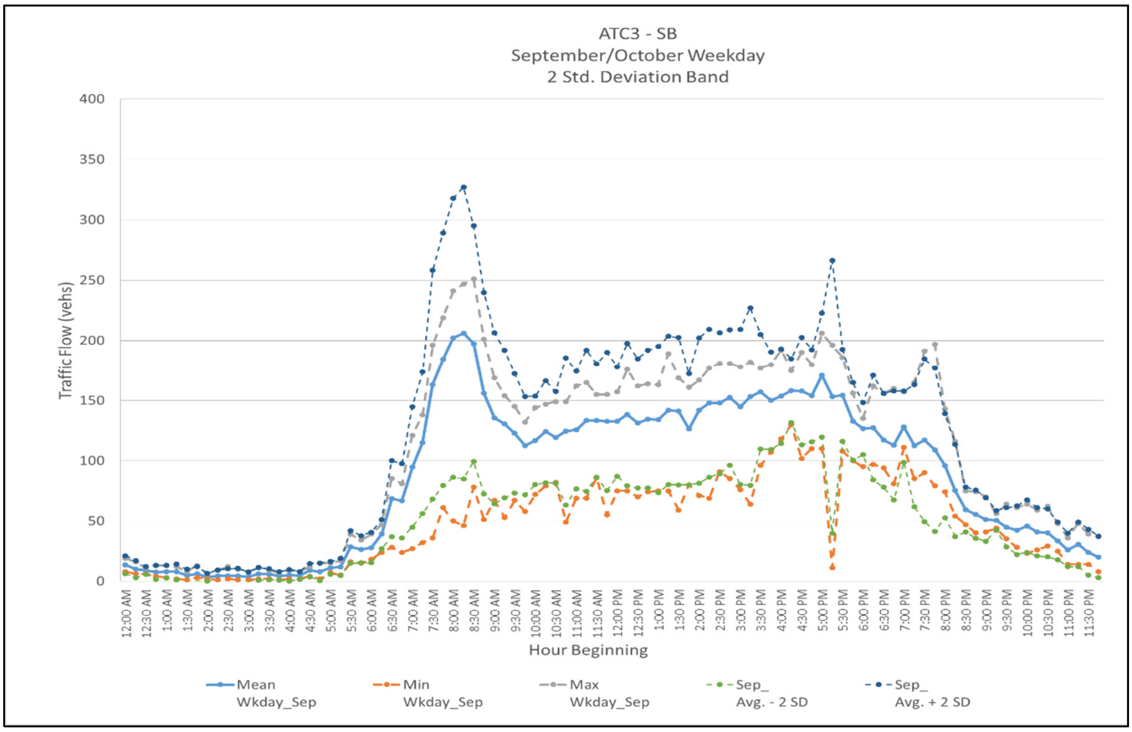
Hour Beginning
Mean Wkday_July
Min Wkday_July
Max Wkday_July
July (Lower Confidence Level) Mean - 2 SD
July (Upper Confidence Level) Mean + 2 SD


ATC3 - SB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
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Hour Beginning
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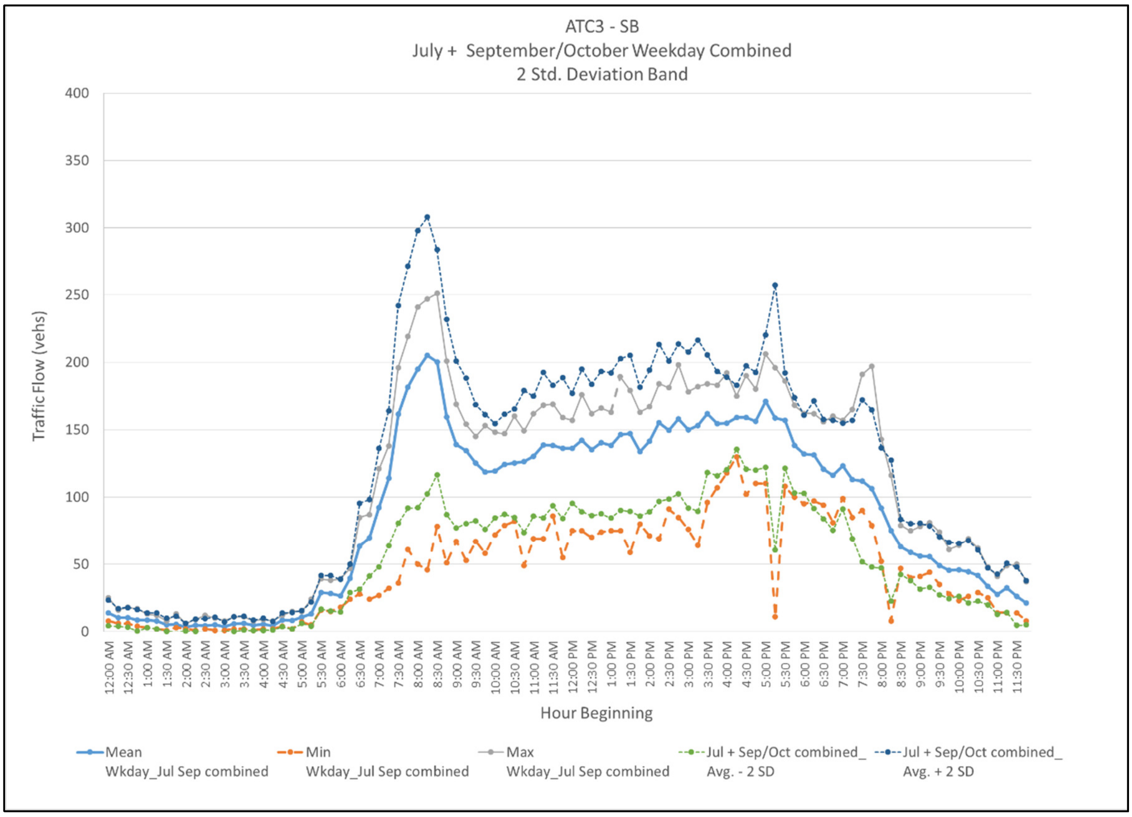
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC3 - SB
July + September/October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
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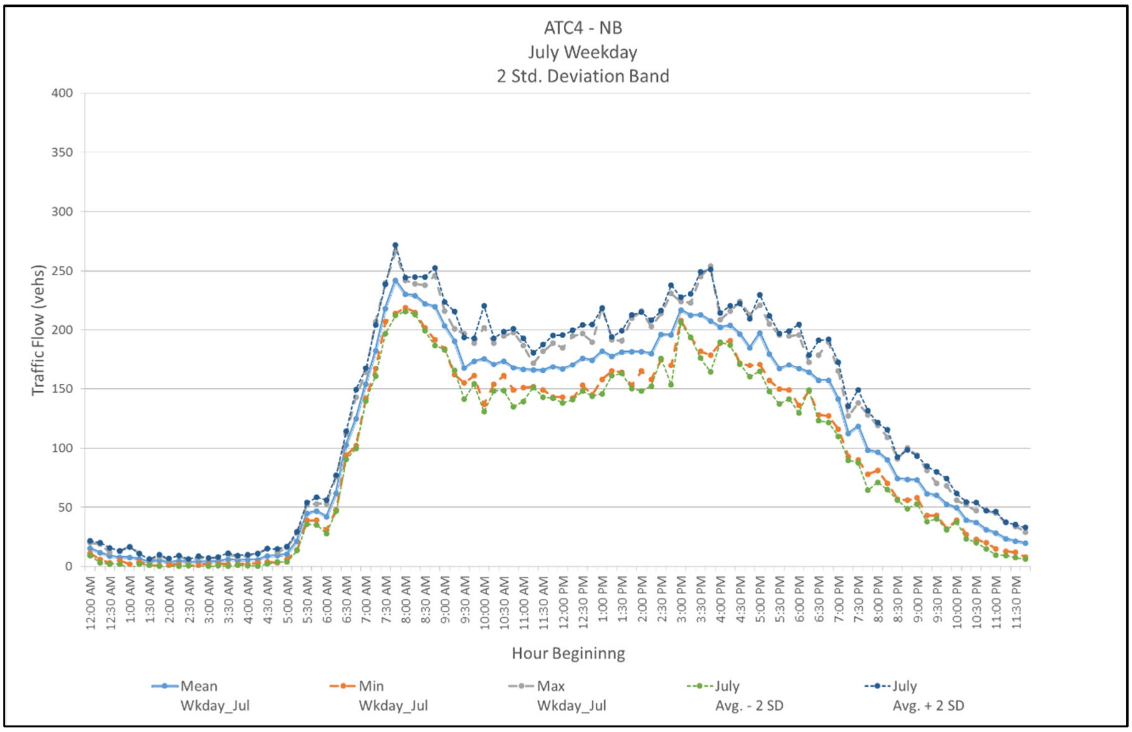
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul + Sep/Oct combined_ Avg. - 2 SD
Jul + Sep/Oct combined_ Avg. + 2 SD

ATC 4


ATC4 - NB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
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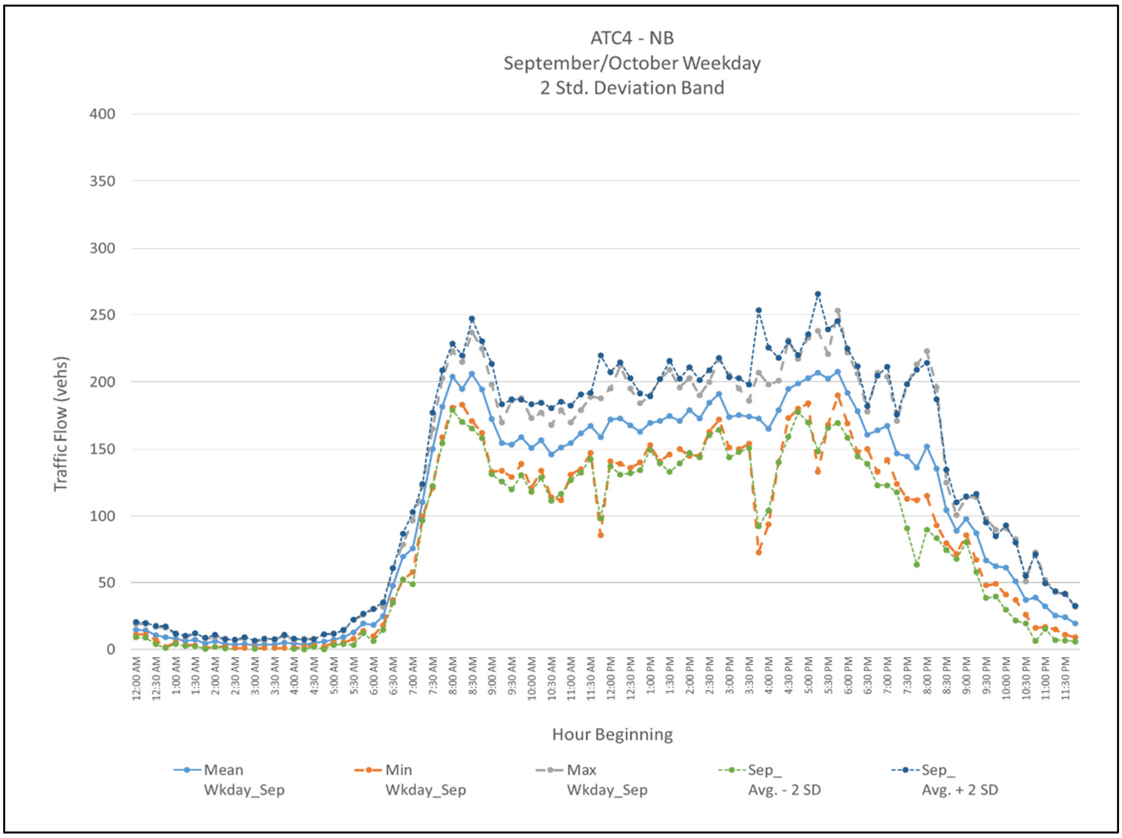
Hour Begininng
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July Avg. - 2 SD
July Avg. + 2 SD


ATC4 - NB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
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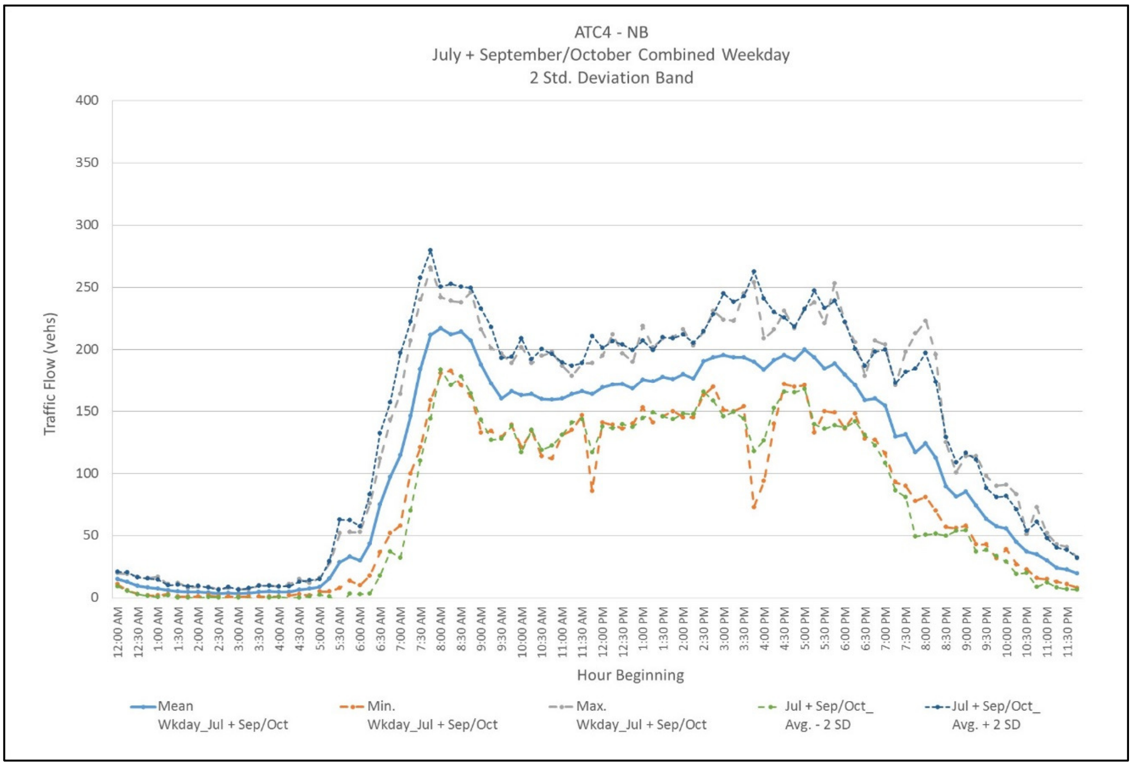
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC4 - NB
July + September/October Combined Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
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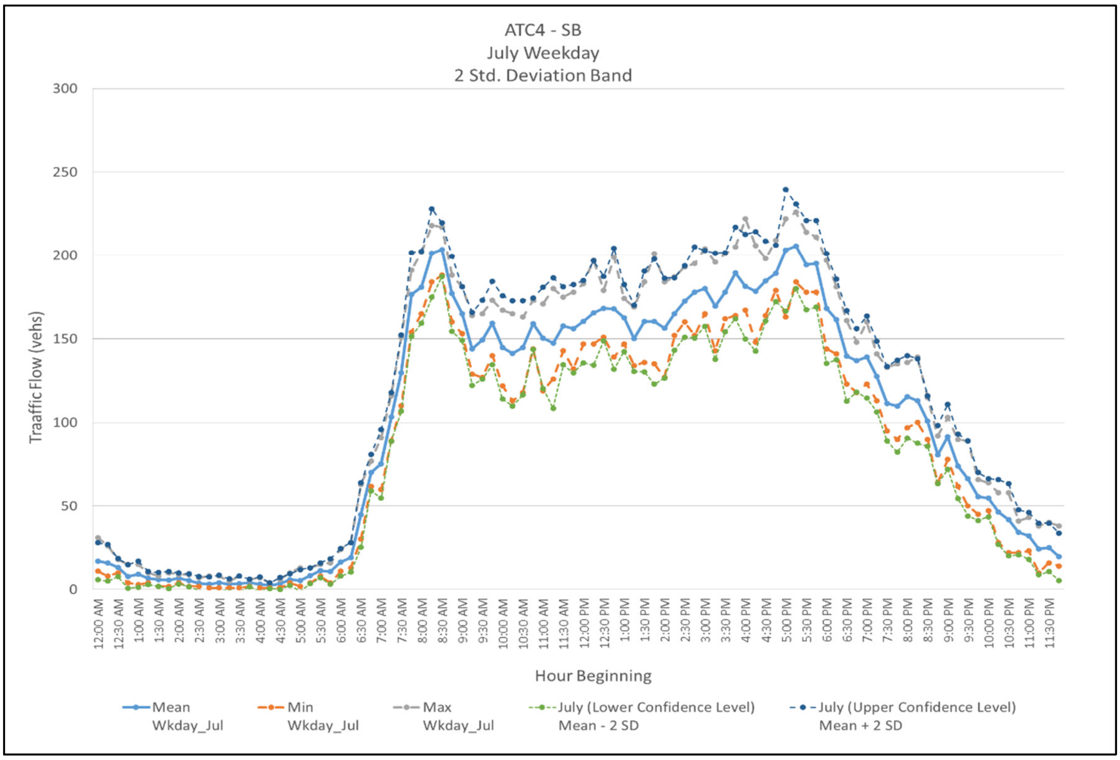
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul + Sep/Oct
Min. Wkday_Jul + Sep/Oct
Max. Wkday_Jul + Sep/Oct
Jul + Sep/Oct_ Avg. - 2 SD
Jul + Sep/Oct_ Avg. + 2 SD


ATC4 - SB
July Weekday
2 Std. Deviation Band
Traaffic Flow (vehs)
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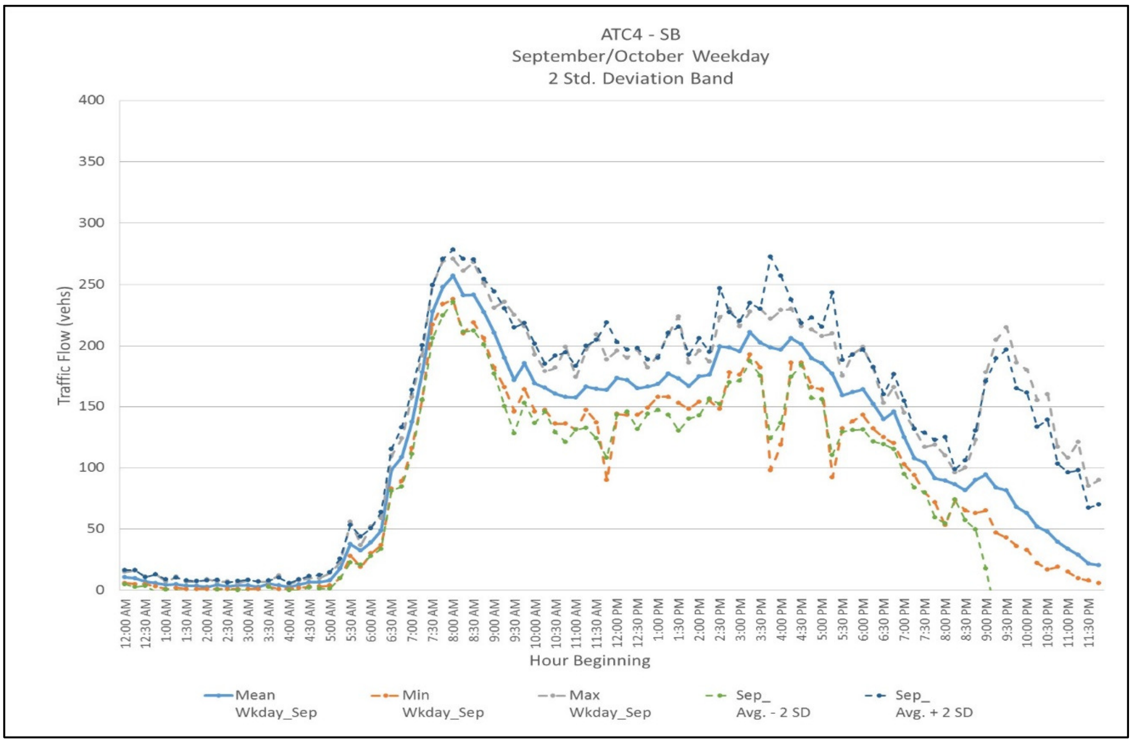
Hour Beginning
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July (Lower Confidence Level) Mean - 2 SD
July (Upper Confidence Level) Mean + 2 SD


ATC4 - SB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
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12:00 AM
12:30 AM
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10:30 PM
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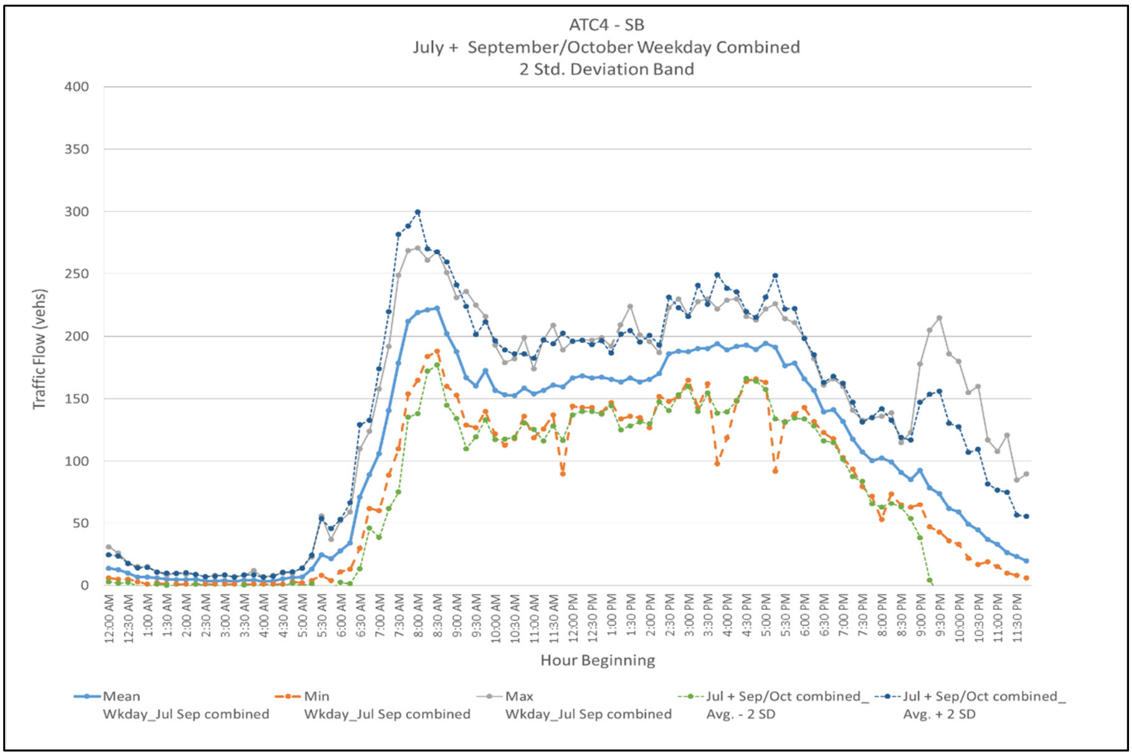
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC4 - SB
July + September/October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
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400
12:00 AM
12:30 AM
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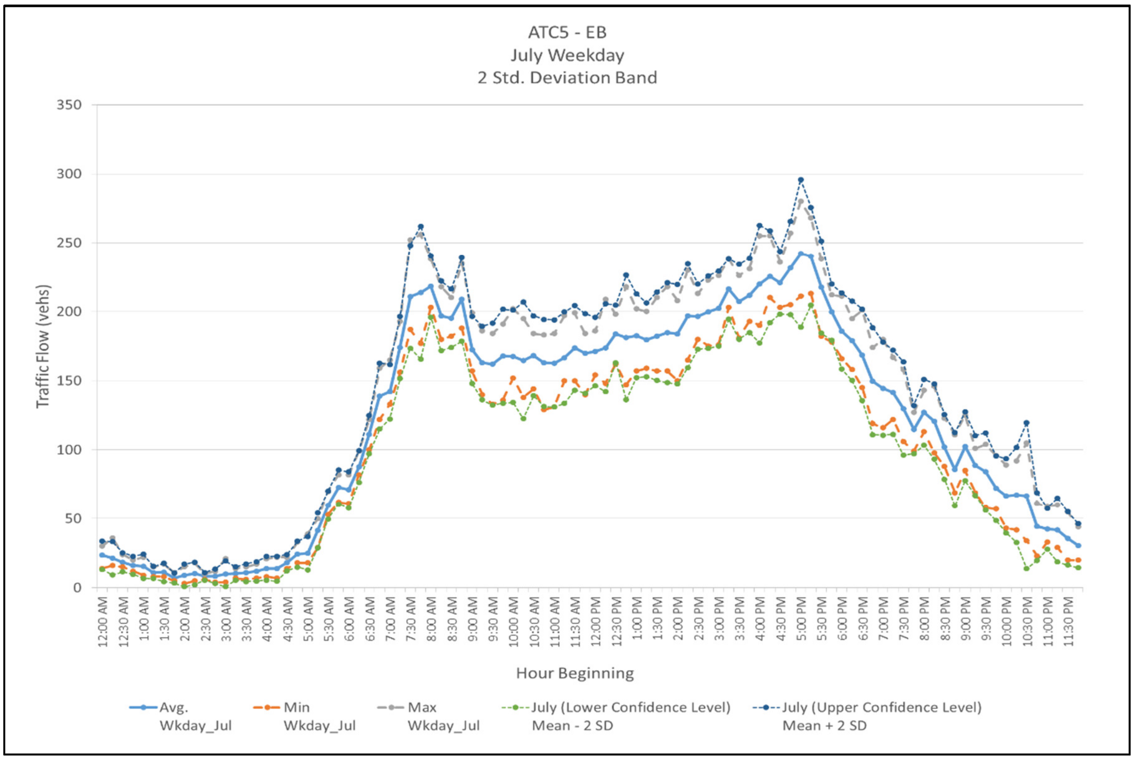
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul + Sep/Oct combined_ Avg. - 2 SD
Jul + Sep/Oct combined_ Avg. + 2 SD

ATC 5


ATC5 - EB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
350
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12:00 AM
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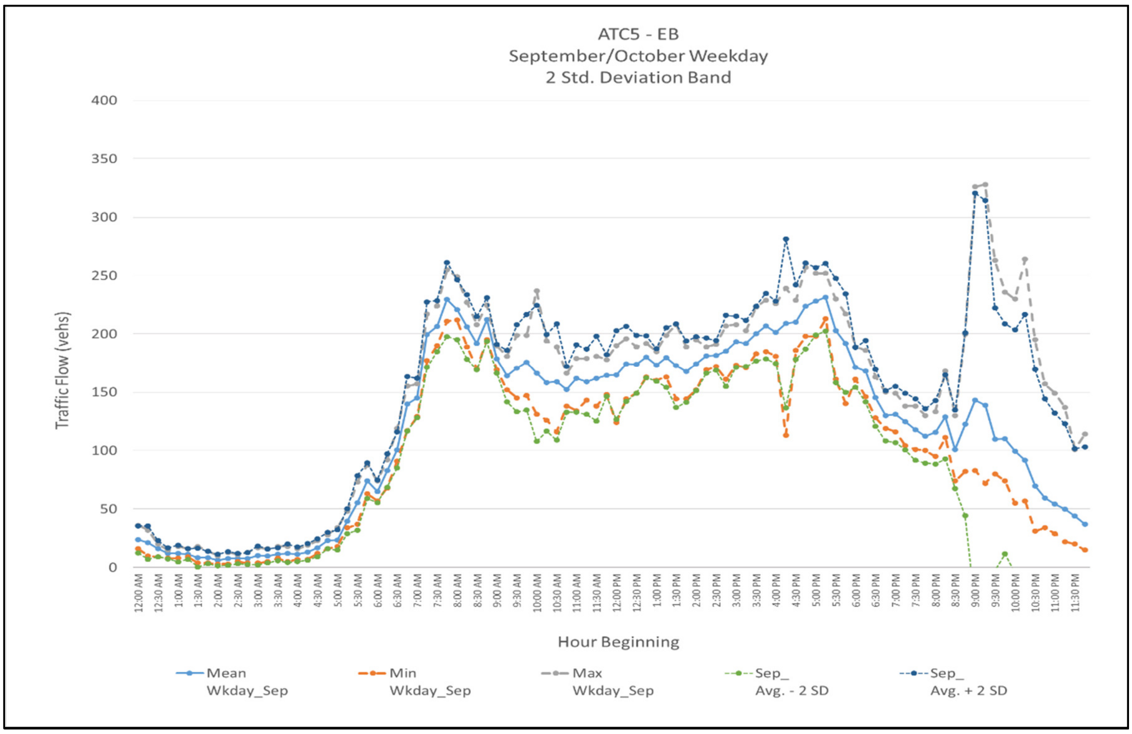
Hour Beginning
Avg. Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July (Lower Confidence Level) Mean - 2 SD
July (Upper Confidence Level) Mean + 2 SD


ATC5 - EB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
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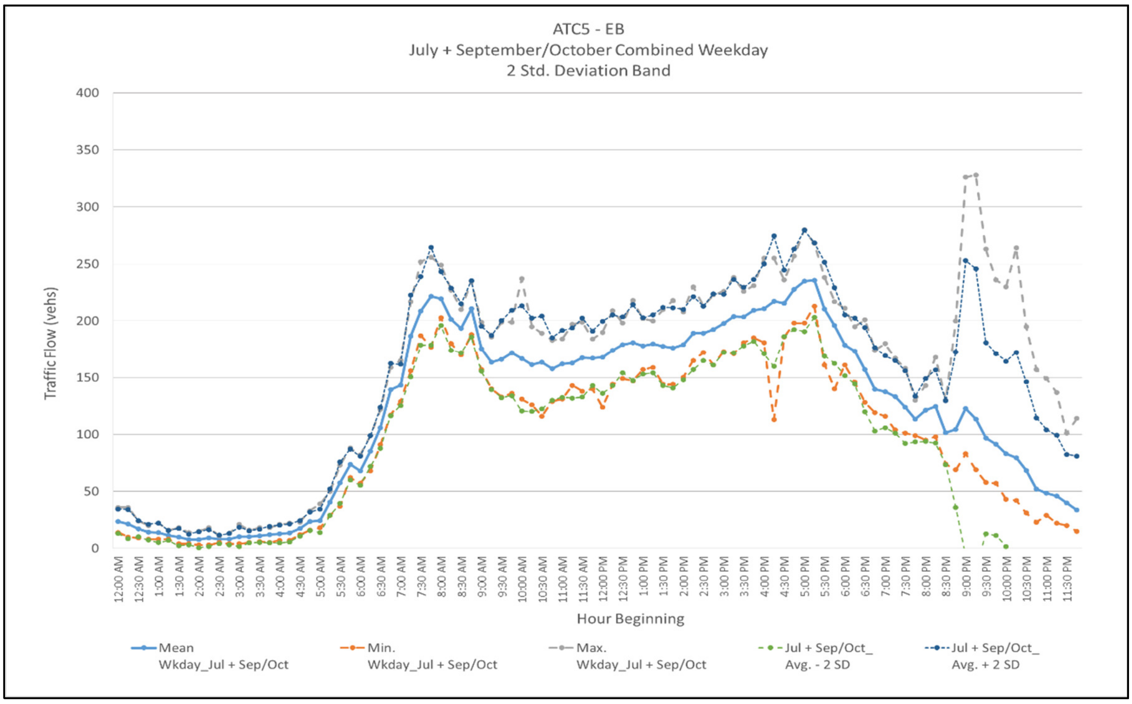
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC5 - EB
July + September/October Combined Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
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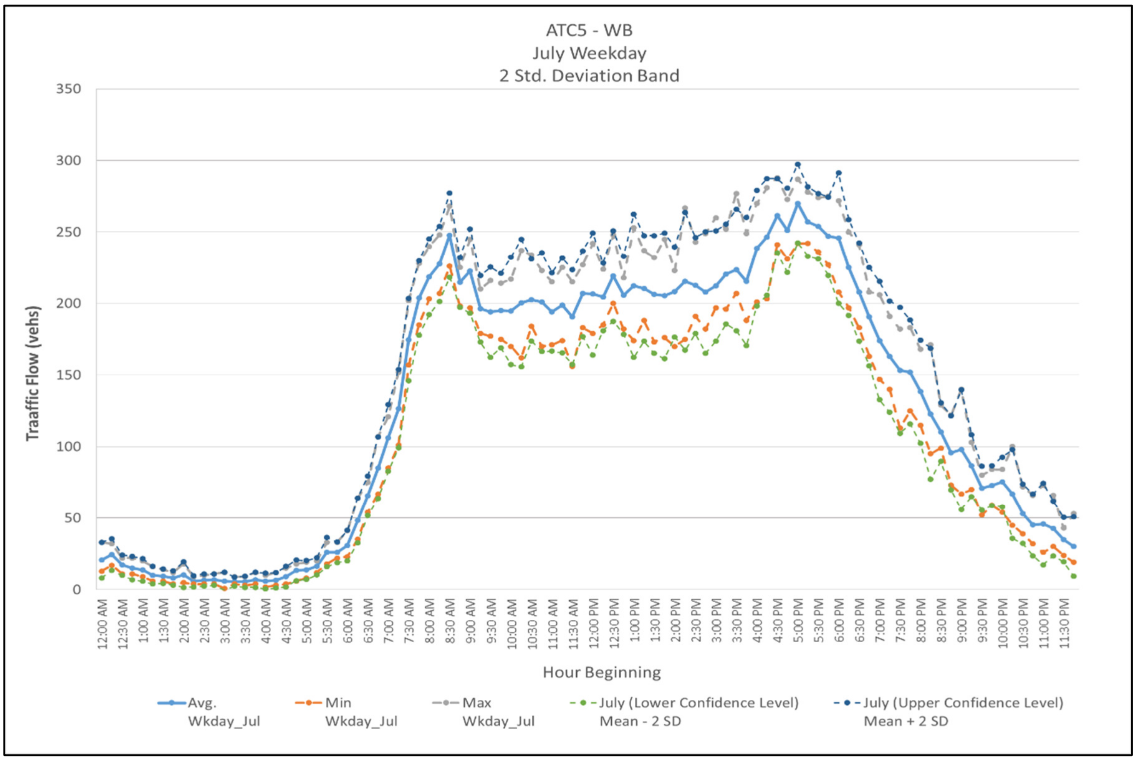
Hour Beginning
Mean Wkday_Jul + Sep/Oct
Min. Wkday_Jul + Sep/Oct
Max. Wkday_Jul + Sep/Oct
Jul + Sep/Oct_ Avg. - 2 SD
Jul + Sep/Oct_ Avg. + 2 SD


ATC5 - WB
July Weekday
2 Std. Deviation Band
Traaffic Flow (vehs)
350
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12:00 AM
12:30 AM
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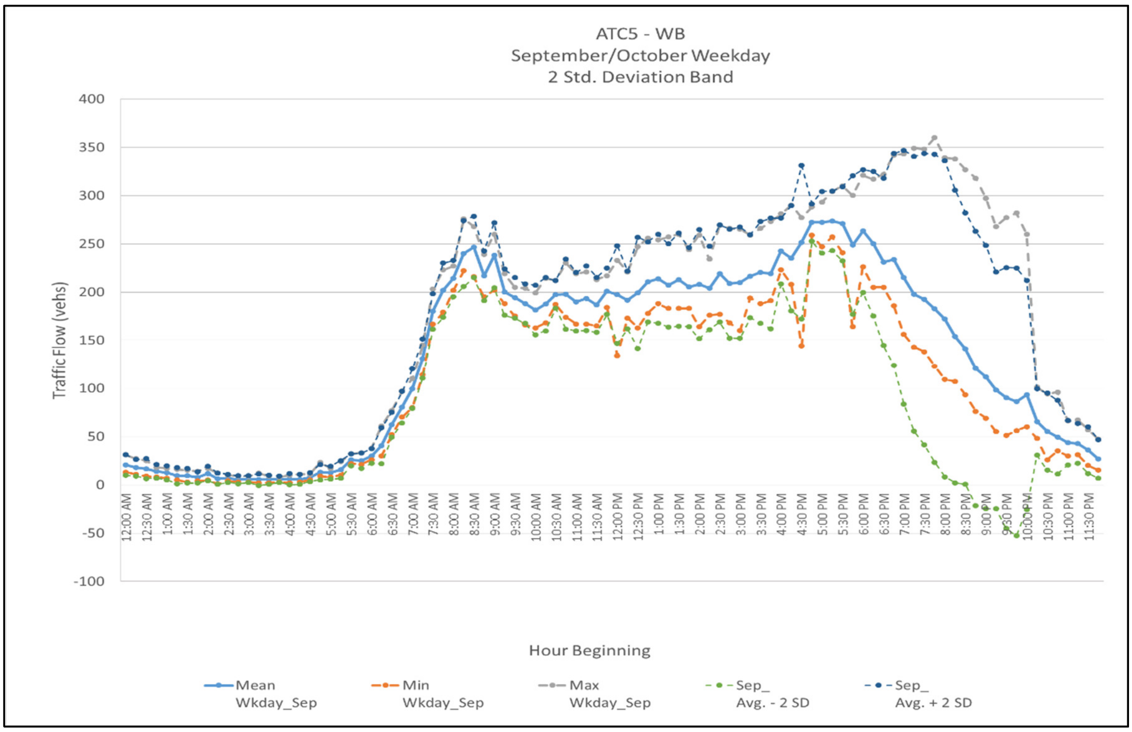
Hour Beginning
Avg. Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July (Lower Confidence Level) Mean - 2 SD
July (Upper Confidence Level) Mean + 2 SD


ATC5 - WB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
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-50
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12:00 AM
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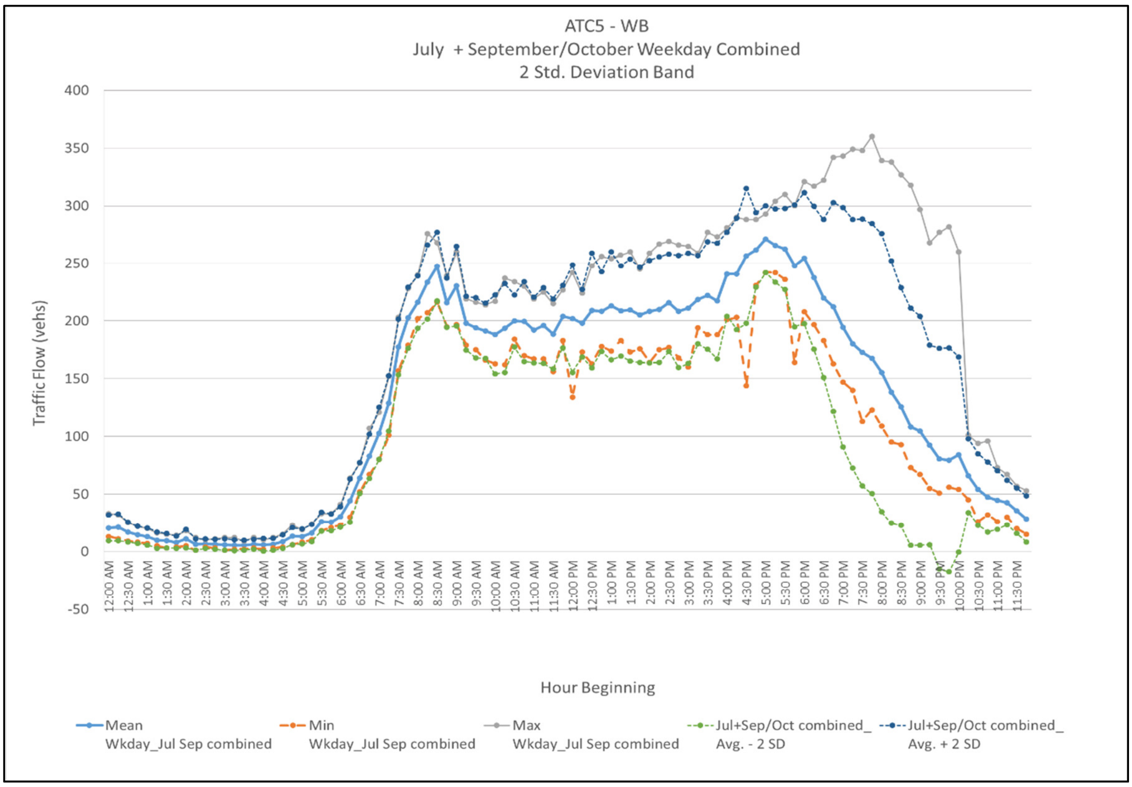
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC5 - WB
July + September/October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
400
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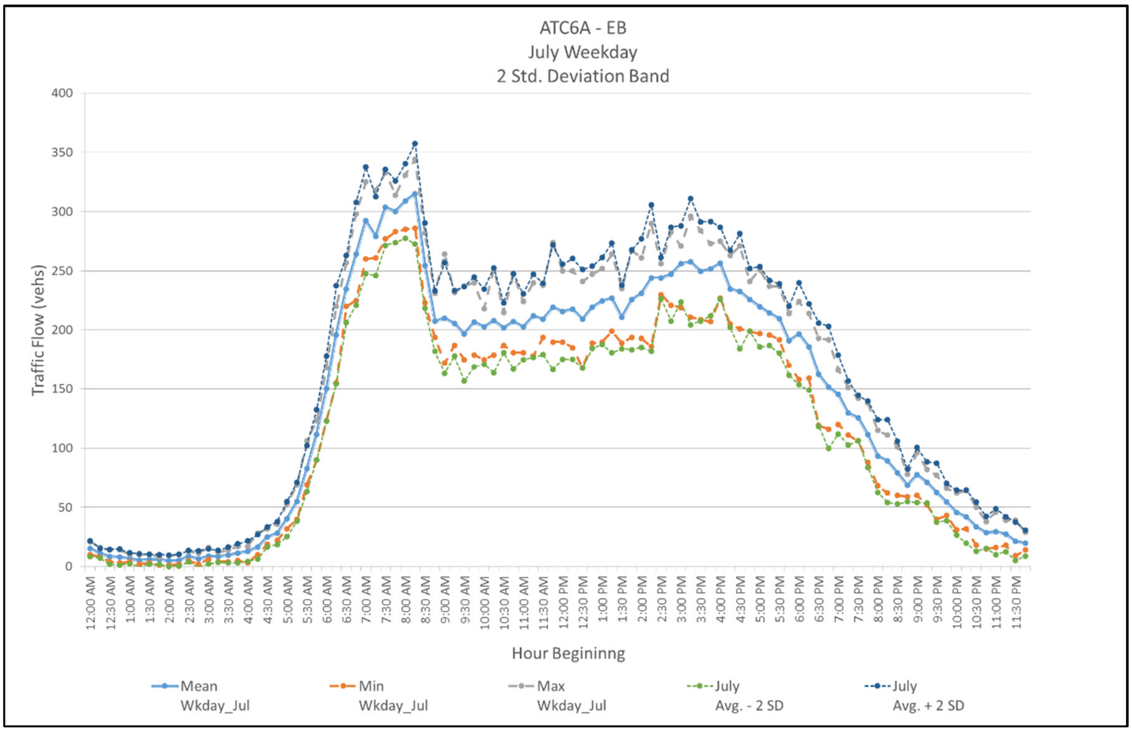
100
50
0
-50
12:00 AM
12:30 AM
1:00 AM
...
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul+Sep/Oct combined_ Avg. - 2 SD
Jul+Sep/Oct combined_ Avg. + 2 SD

ATC 6A


ATC6A - EB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
1:00 PM
1:30 PM
2:00 PM
2:30 PM
3:00 PM
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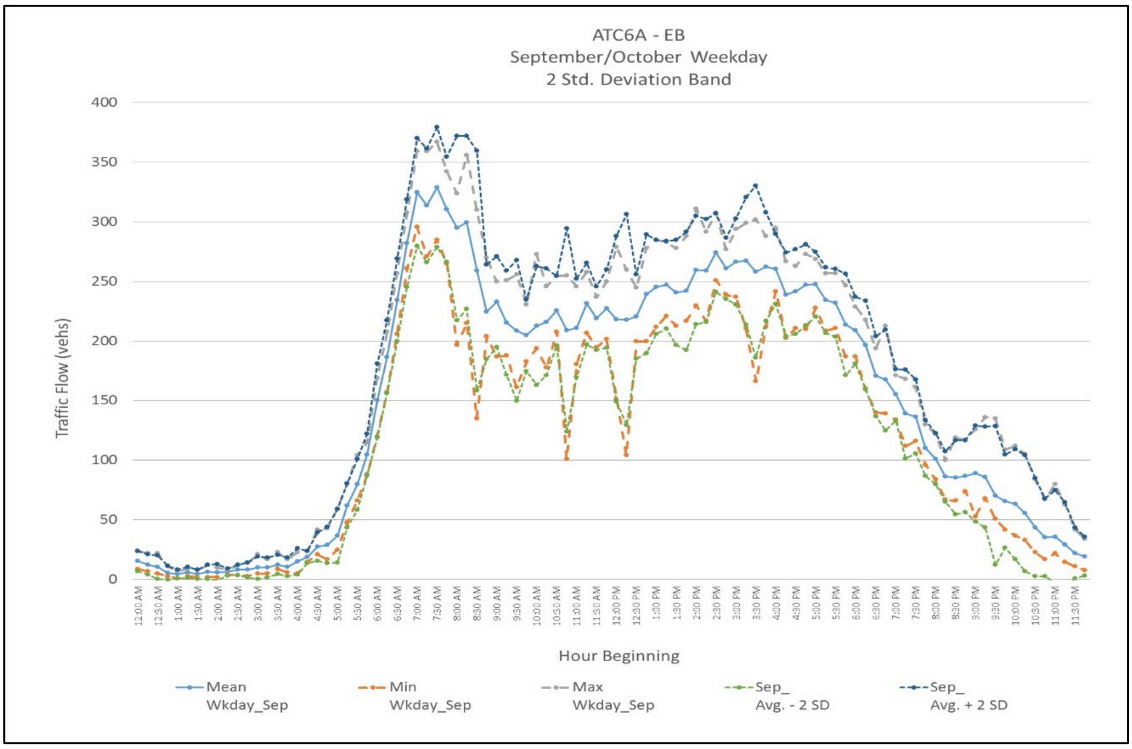
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Begininng
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July Avg. - 2 SD
July Avg. + 2 SD


ATC6A - EB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
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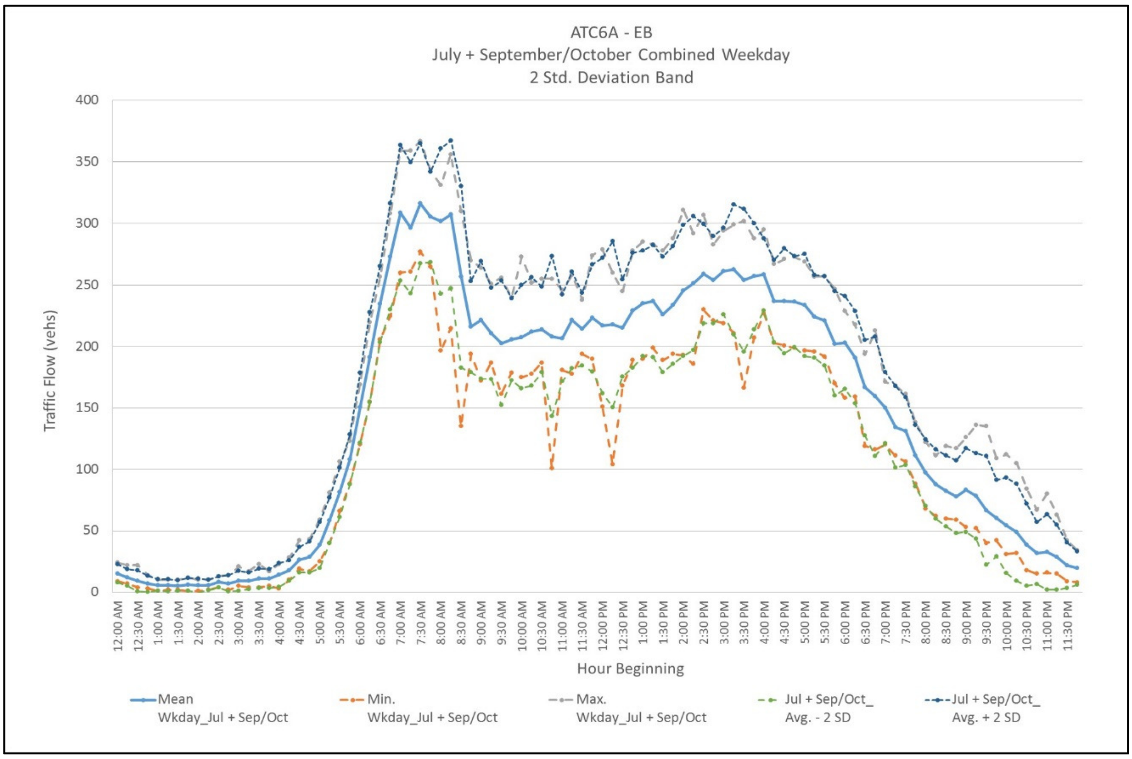
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC6A - EB
July + September/October Combined Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
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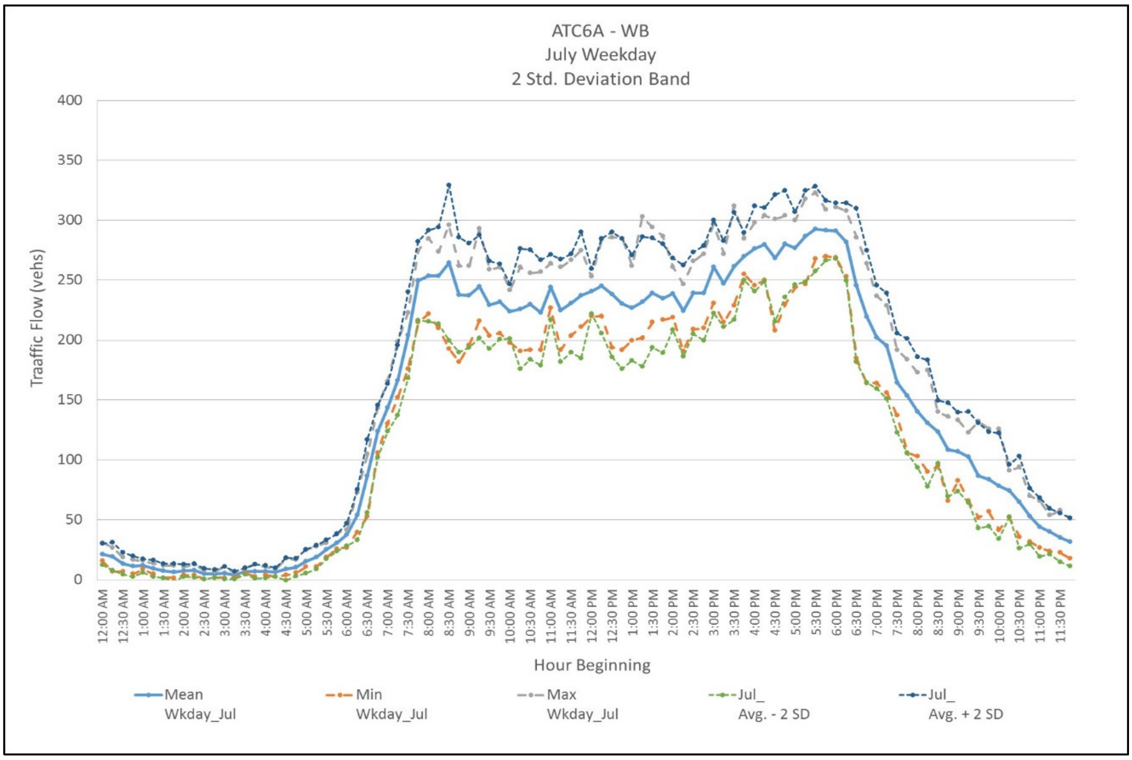
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul + Sep/Oct
Min. Wkday_Jul + Sep/Oct
Max. Wkday_Jul + Sep/Oct
Jul + Sep/Oct_ Avg. - 2 SD
Jul + Sep/Oct_ Avg. + 2 SD


ATC6A - WB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
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10:30 AM
11:00 AM
11:30 AM
12:00 PM
12:30 PM
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7:00 PM
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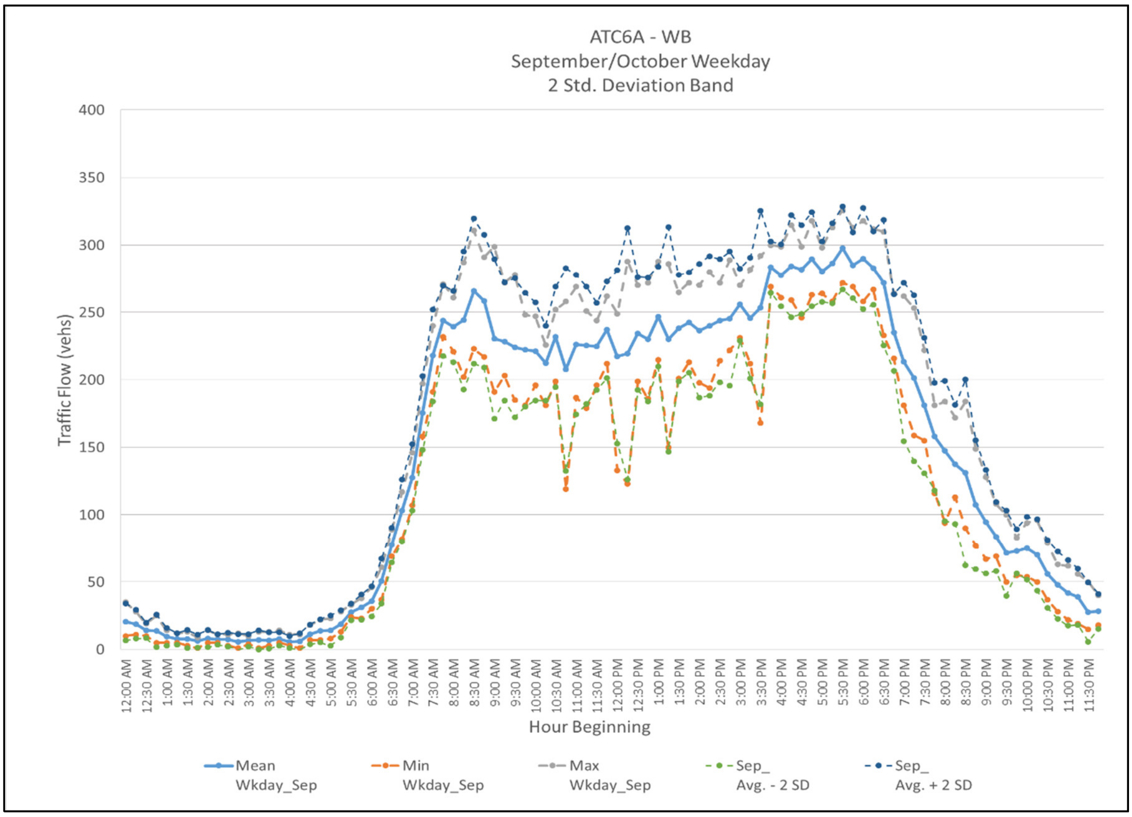
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
Jul_ Avg. - 2 SD
Jul_ Avg. + 2 SD


ATC6A - WB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
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11:30 AM
12:00 PM
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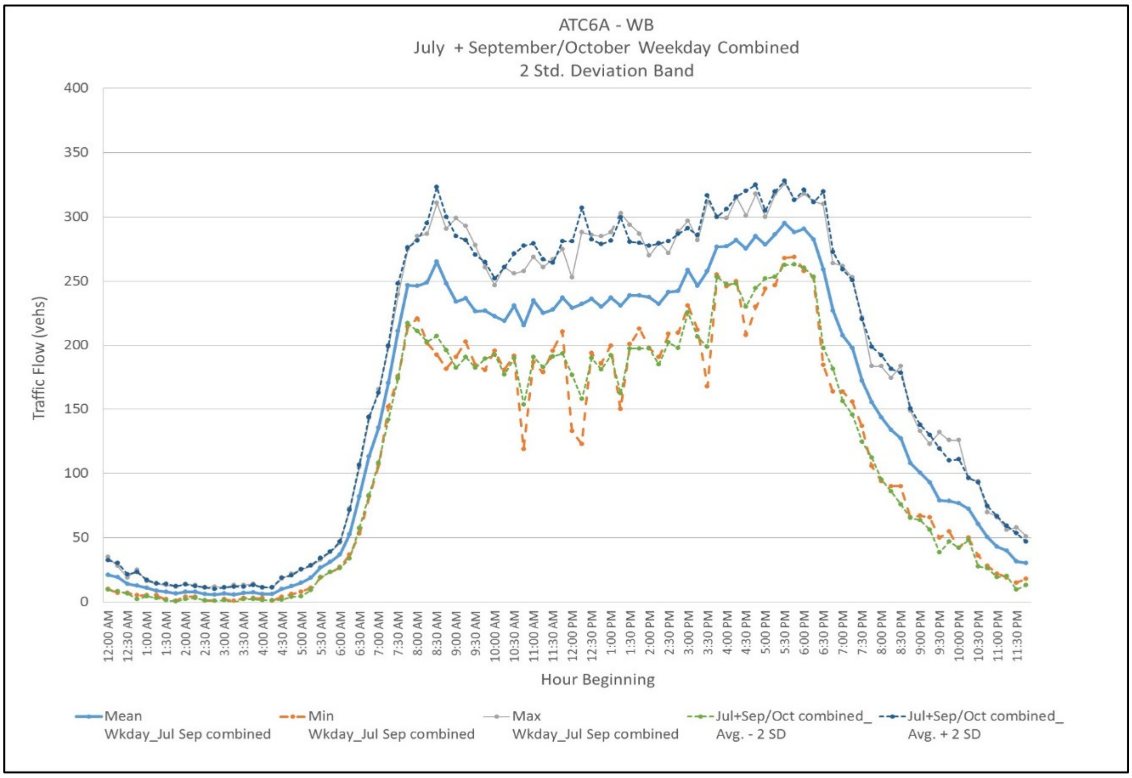
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC6A - WB
July + September/October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
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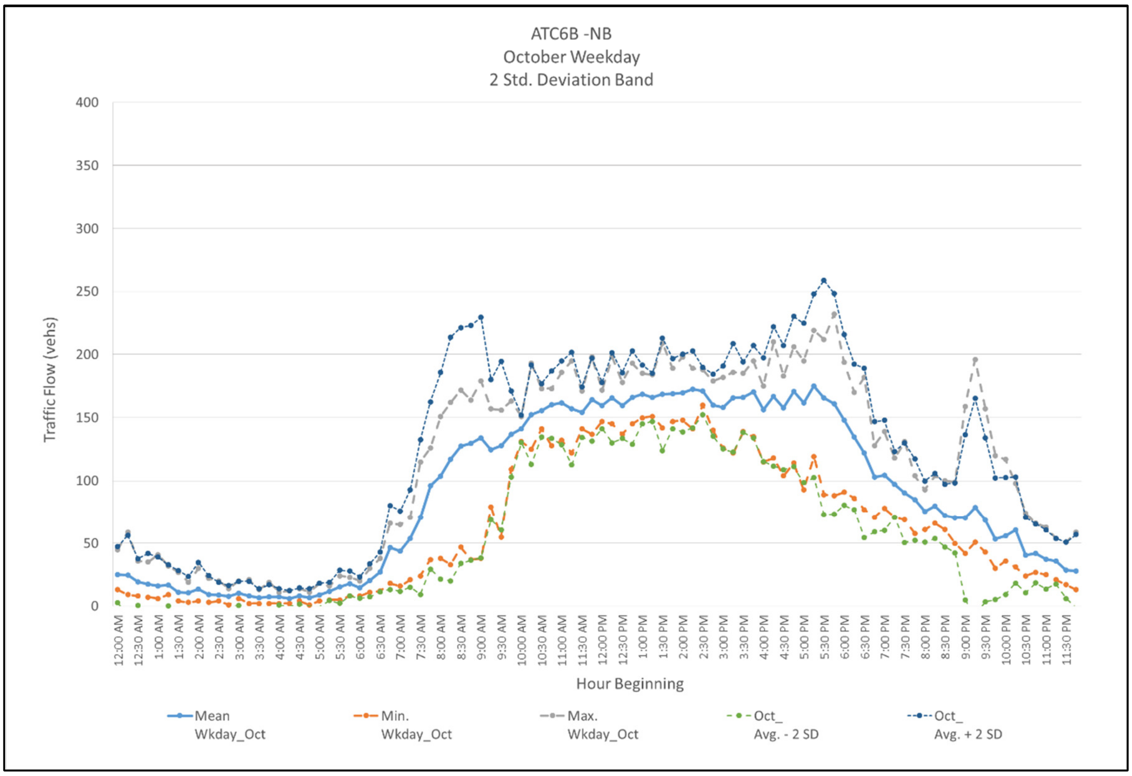
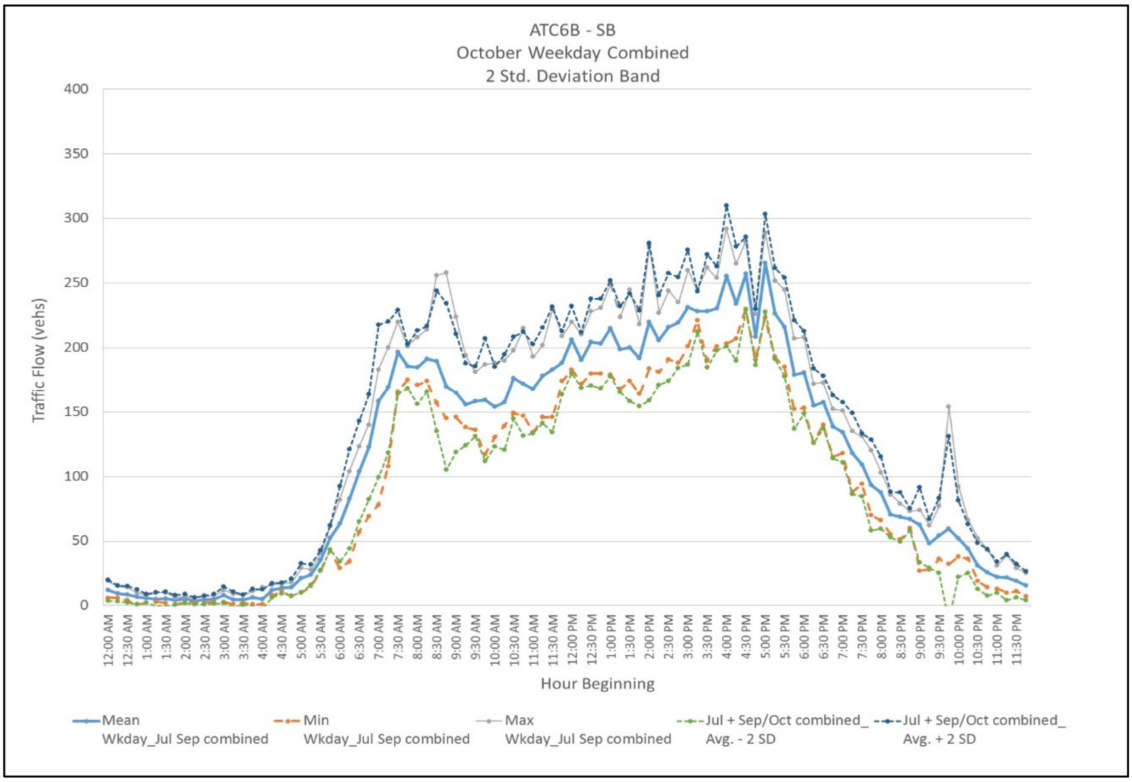
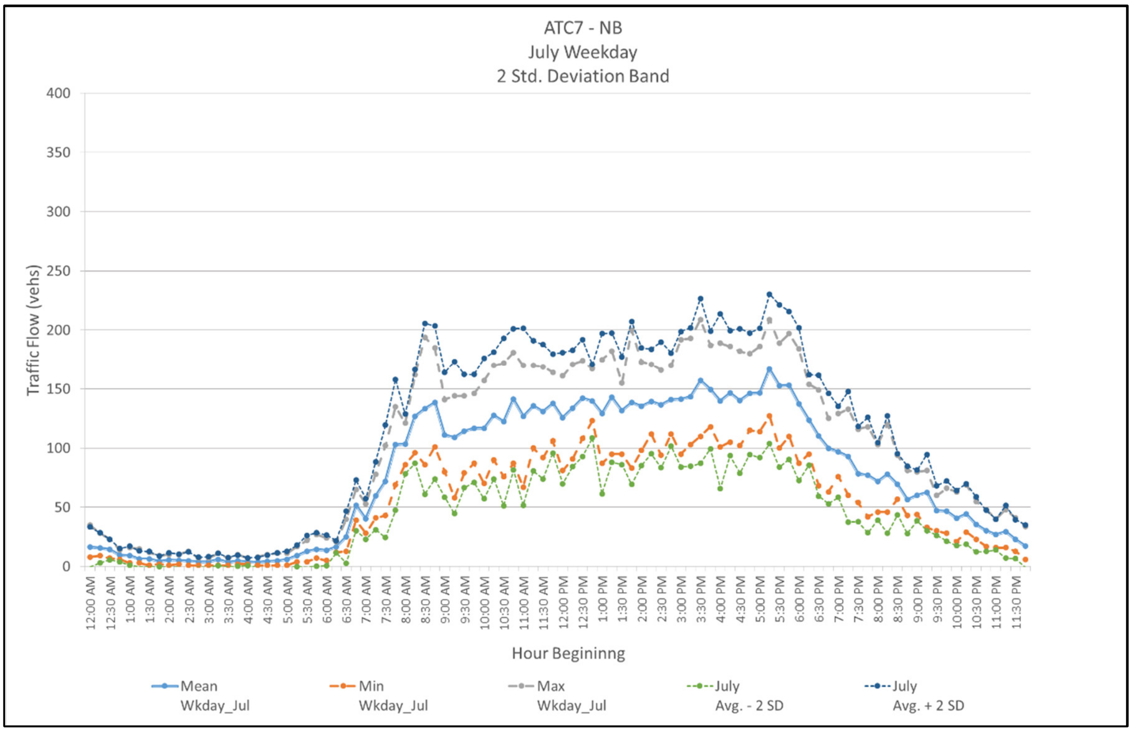
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul+Sep/Oct combined_ Avg. - 2 SD
Jul+Sep/Oct combined_ Avg. + 2 SD

ATC 6B


ATC6B -NB
October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
11:30 PM
Hour Beginning
Mean Wkday_Oct
Min. Wkday_Oct
Max. Wkday_Oct
Oct_ Avg. - 2 SD
Oct_ Avg. + 2 SD


ATC6B - SB
October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
11:30 PM
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul + Sep/Oct combined_ Avg. - 2 SD
Jul + Sep/Oct combined_ Avg. + 2 SD

ATC 7


ATC7 - NB
July Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
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1:30 PM
2:00 PM
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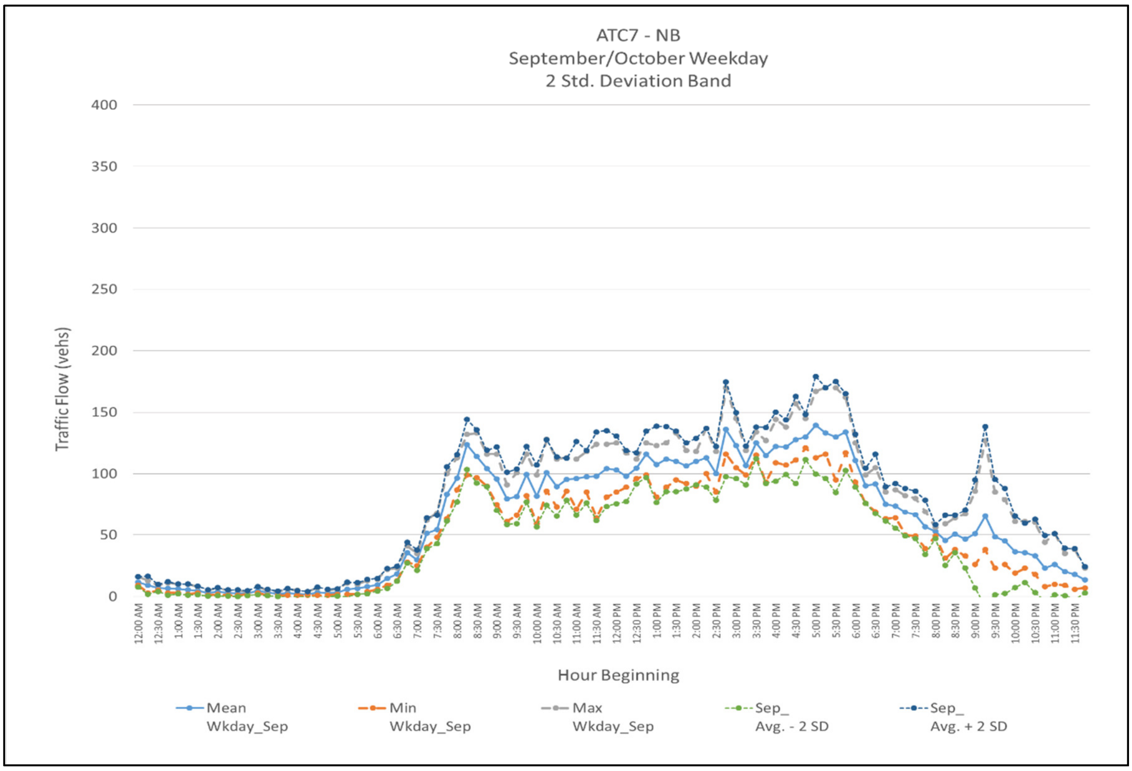
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Begininng
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
July Avg. - 2 SD
July Avg. + 2 SD


ATC7 - NB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
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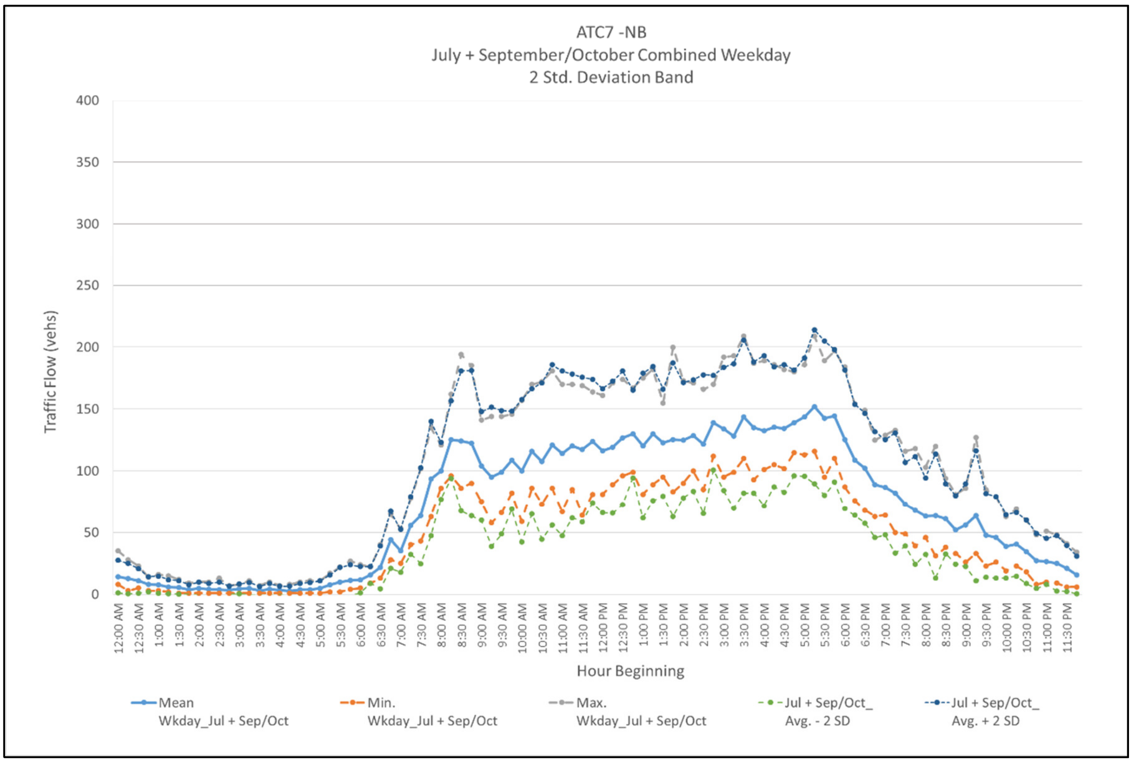
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC7 -NB
July + September/October Combined Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
0
50
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150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
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4:00 AM
4:30 AM
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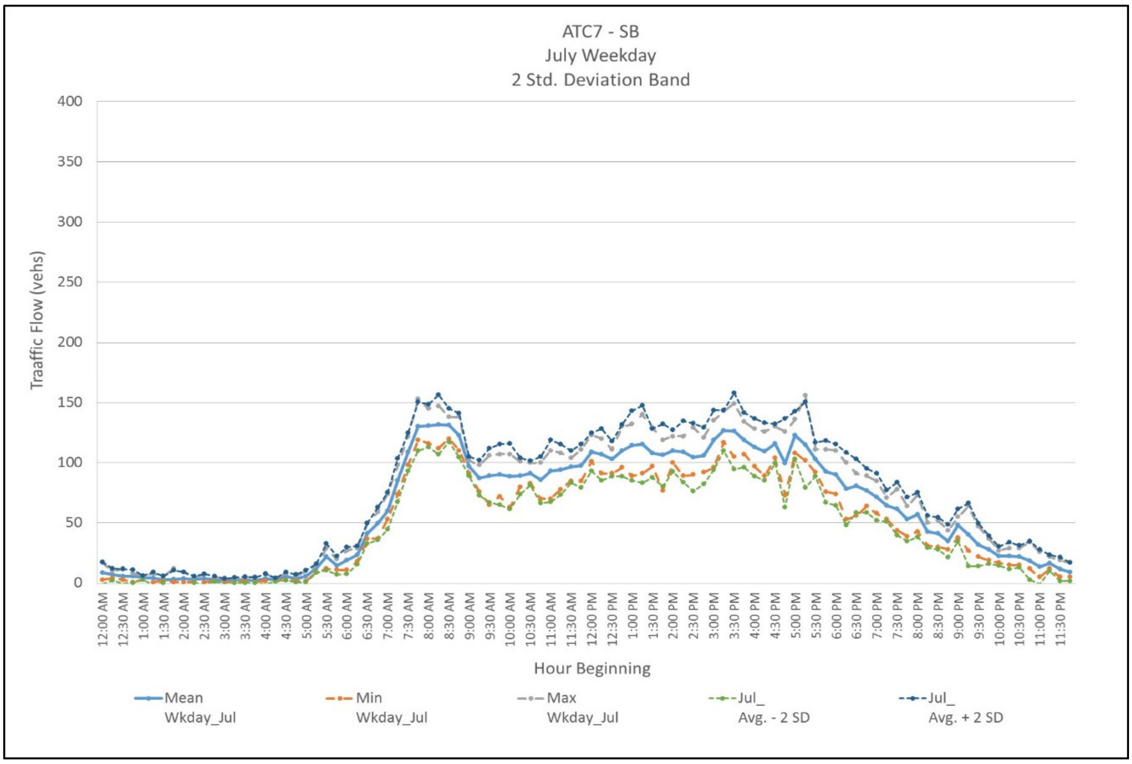
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul + Sep/Oct
Min. Wkday_Jul + Sep/Oct
Max. Wkday_Jul + Sep/Oct
Jul + Sep/Oct_ Avg. - 2 SD
Jul + Sep/Oct_ Avg. + 2 SD


ATC7 - SB
July Weekday
2 Std. Deviation Band
Traaffic Flow (vehs)
0
50
100
150
200
250
300
350
400
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
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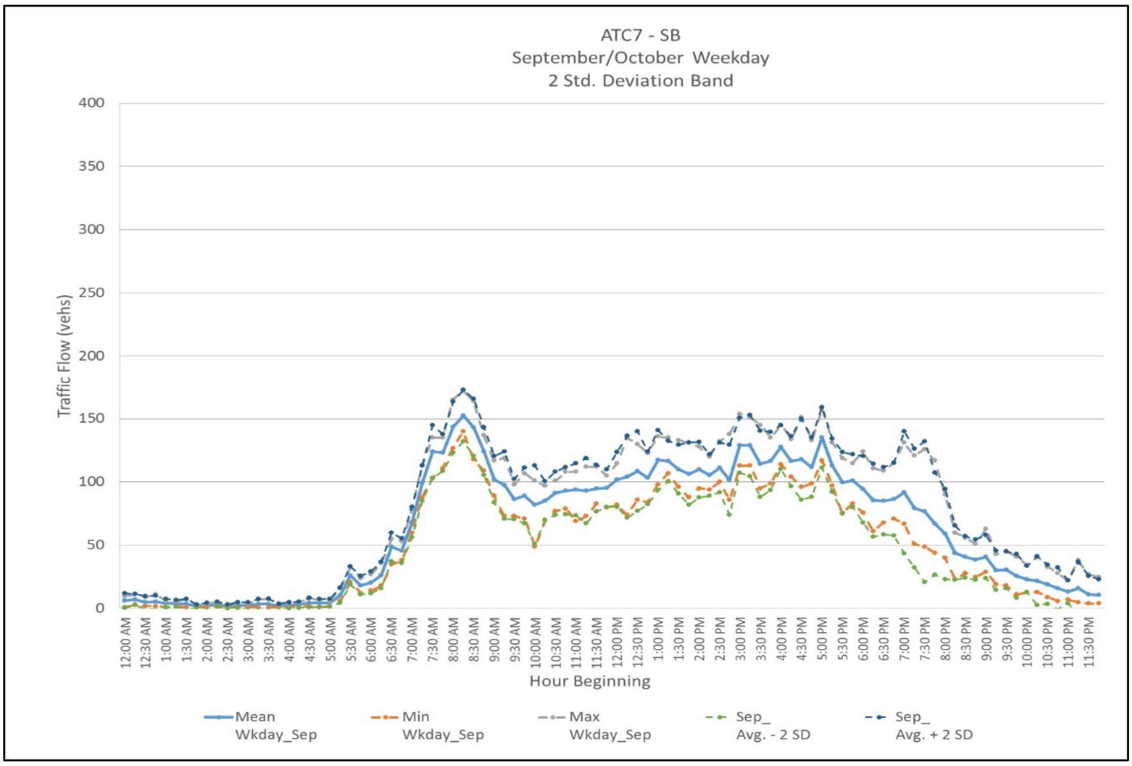
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul
Min Wkday_Jul
Max Wkday_Jul
Jul_ Avg. - 2 SD
Jul_ Avg. + 2 SD


ATC7 - SB
September/October Weekday
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
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5:00 AM
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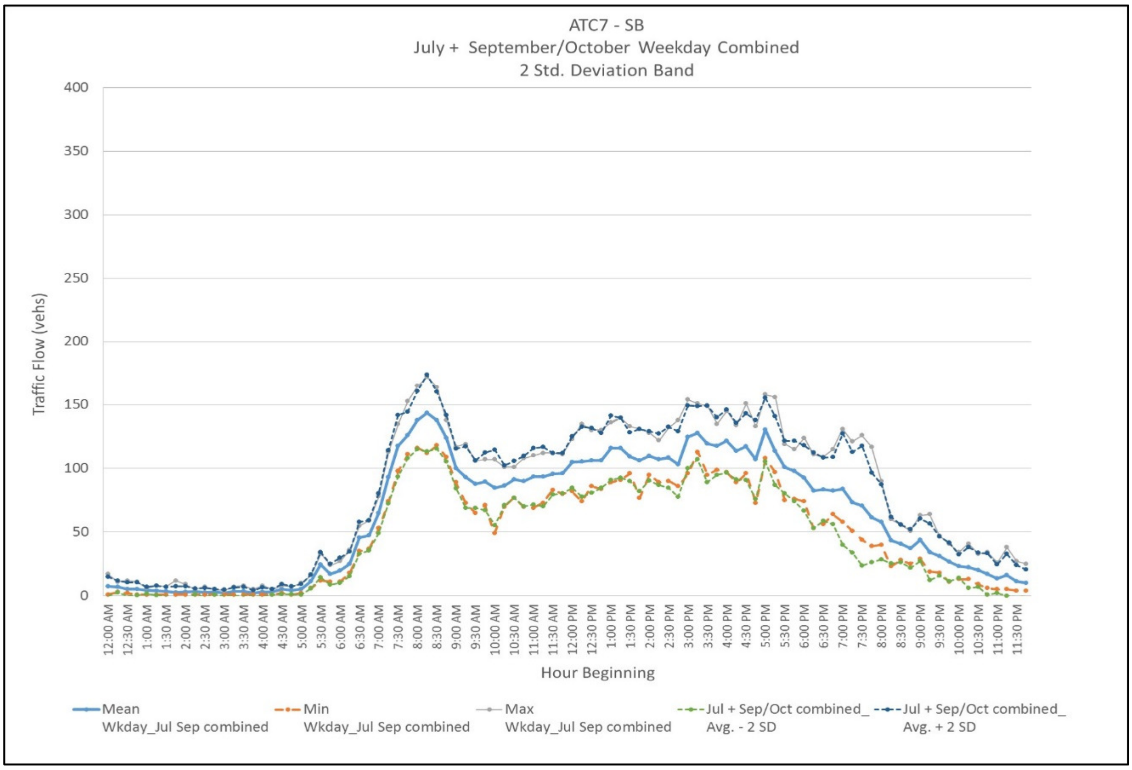
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Sep
Min Wkday_Sep
Max Wkday_Sep
Sep_ Avg. - 2 SD
Sep_ Avg. + 2 SD


ATC7 - SB
July + September/October Weekday Combined
2 Std. Deviation Band
Traffic Flow (vehs)
400
350
300
250
200
150
100
50
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
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4:30 AM
5:00 AM
5:30 AM
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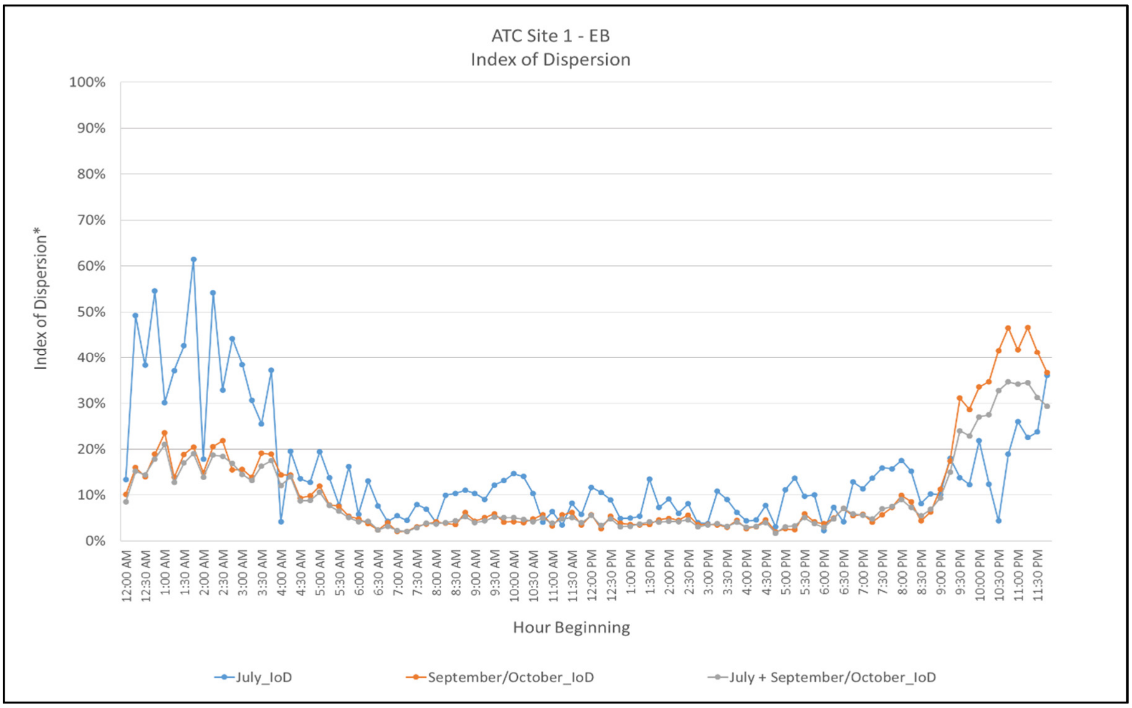
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Hour Beginning
Mean Wkday_Jul Sep combined
Min Wkday_Jul Sep combined
Max Wkday_Jul Sep combined
Jul + Sep/Oct combined_ Avg. - 2 SD
Jul + Sep/Oct combined_ Avg. + 2 SD

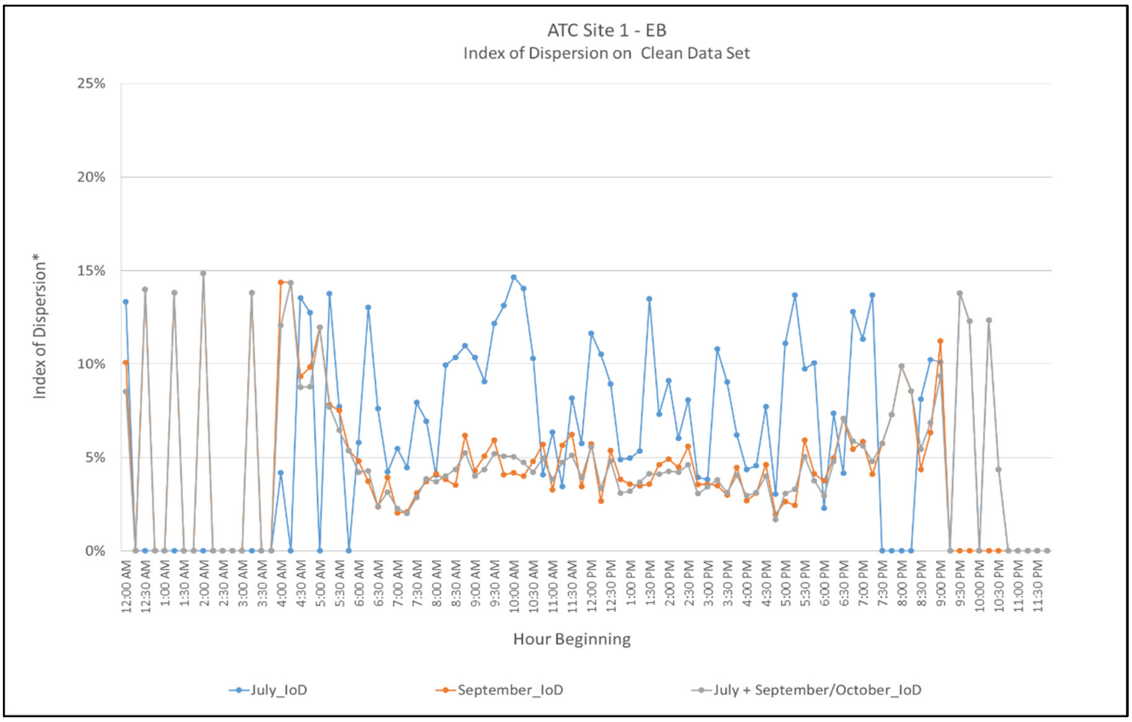
APPENDIX F

2015 ATC Data: Index of Dispersion Plots

APPENDIX F: 2015 ATC - INDEX OF DISPERSION PLOTS

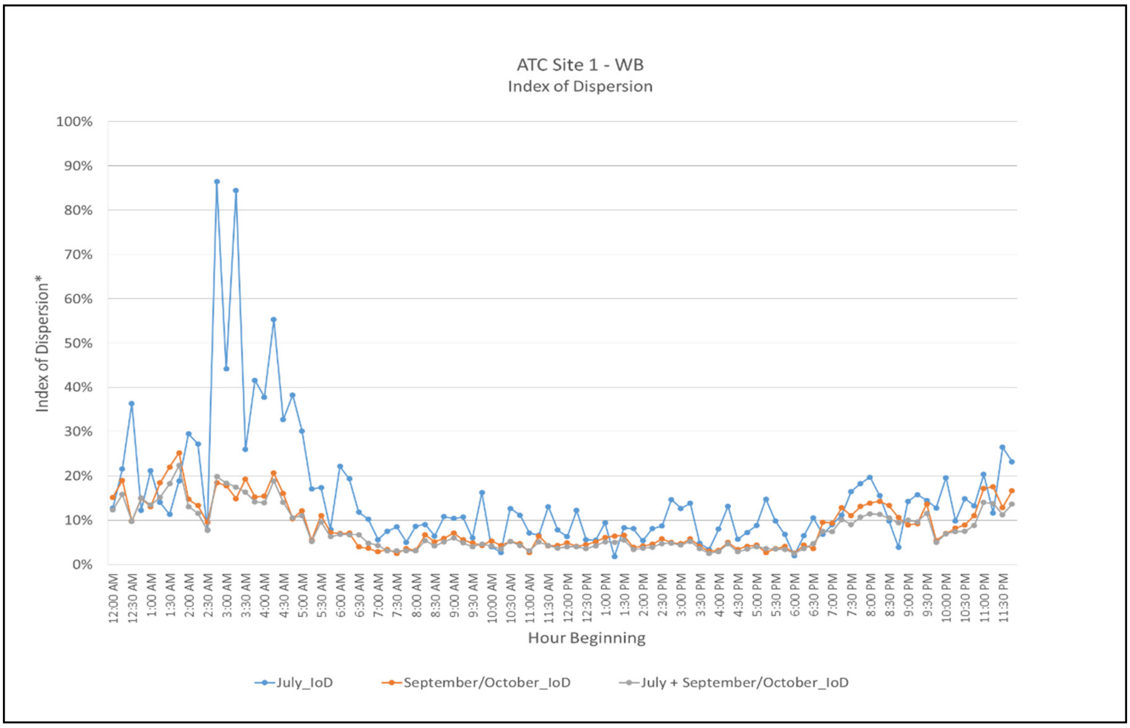


*IoD = 95%CI of Average 15 minute flows

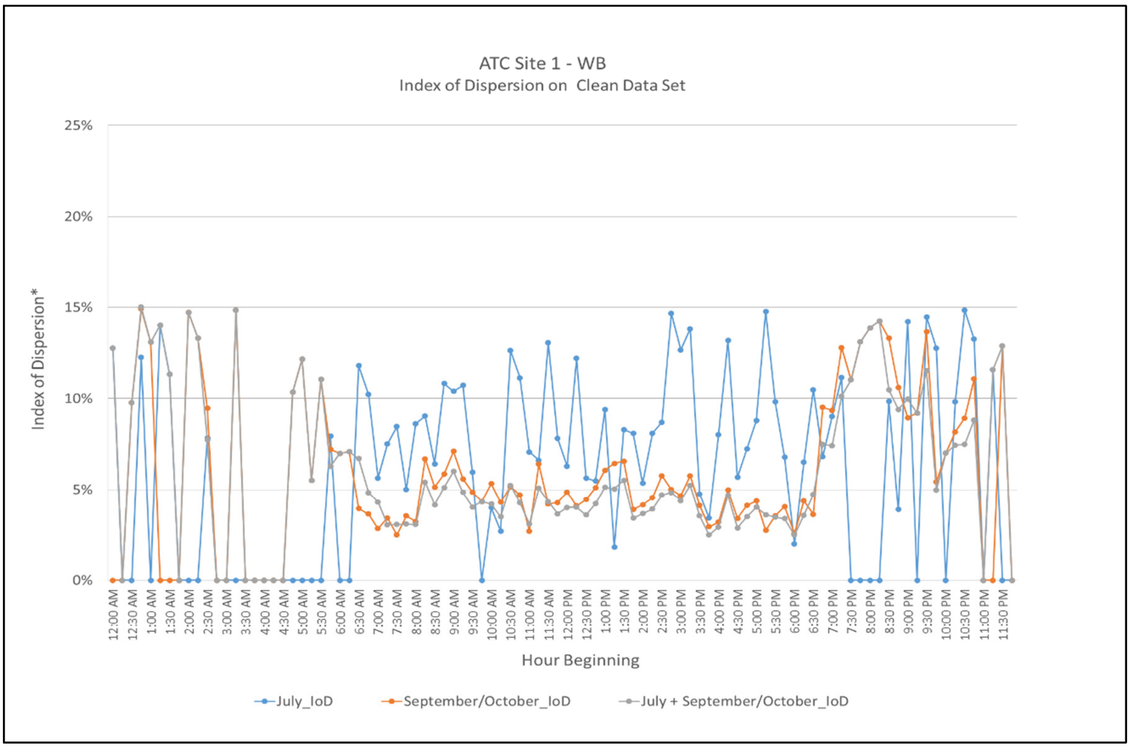


*IoD = 95%CI of Average 15 minute flows

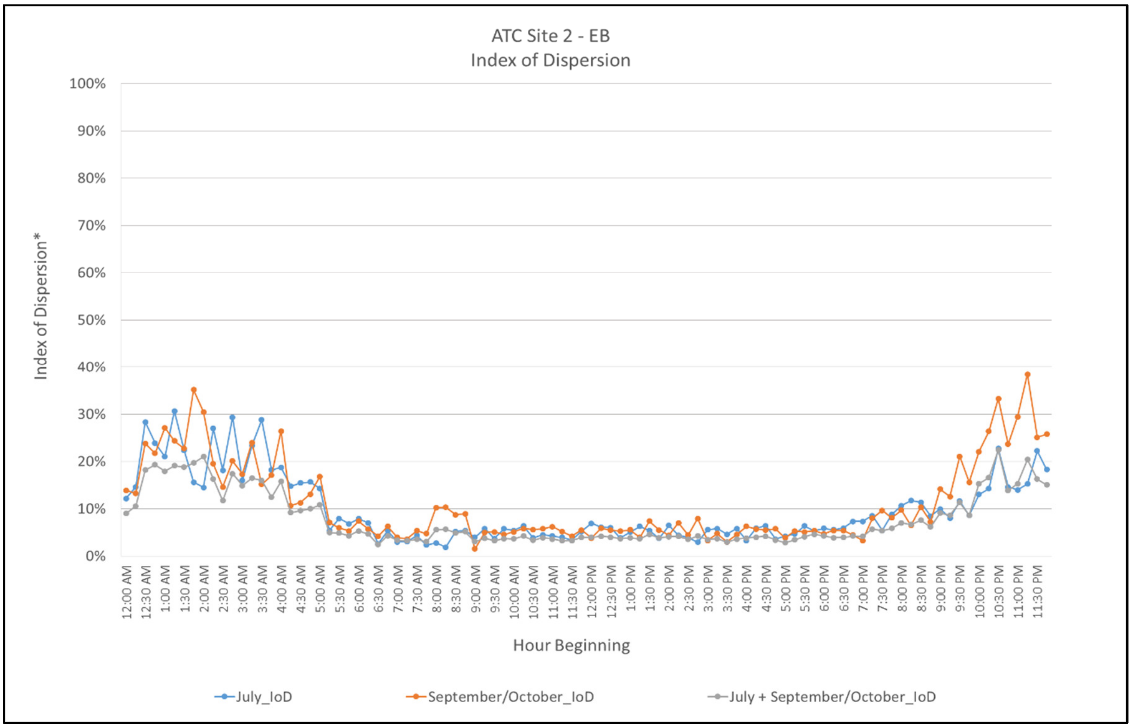
Zero value indicates that data points at that hour beginning were excluded based on the IoD test



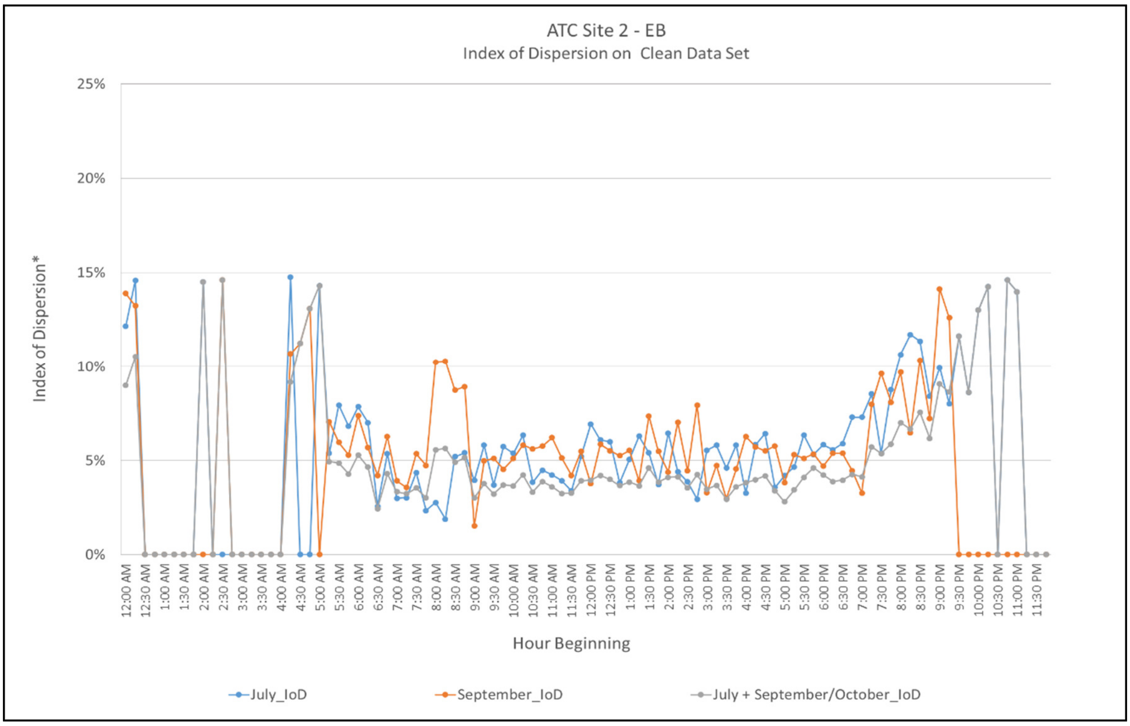
*IoD = 95%CI of Average 15 minute flows



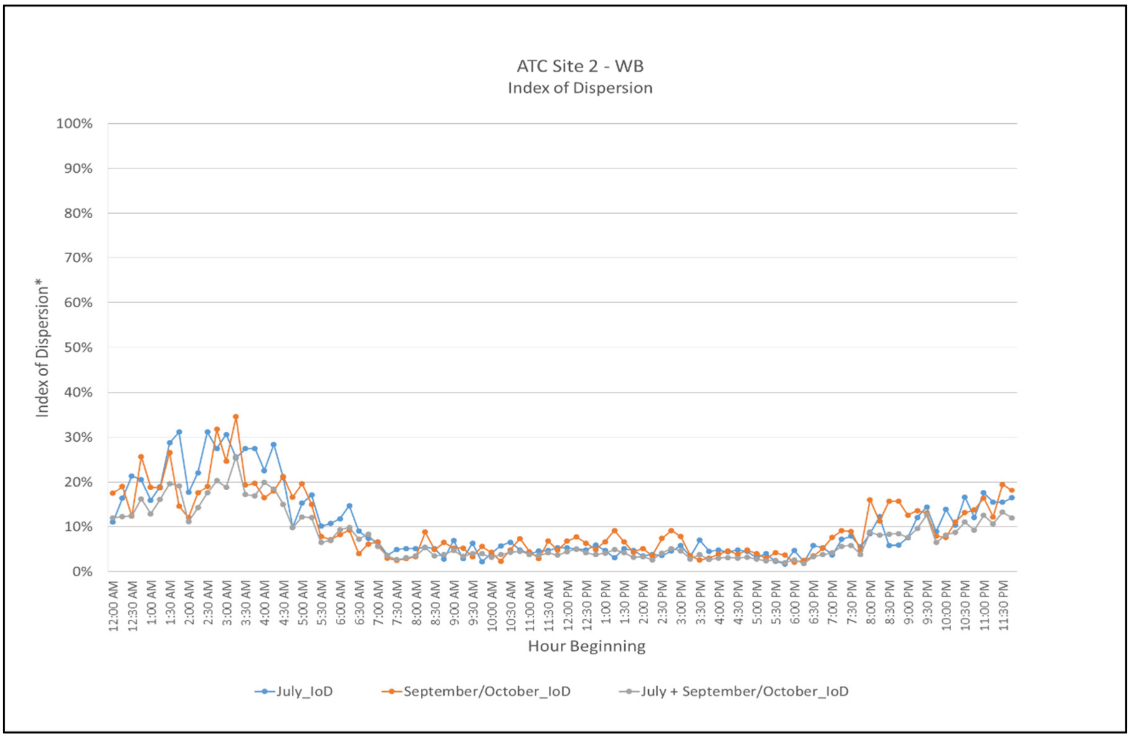
*IoD = 95%CI of Average 15 minute flows
Zero value indicates that data points at that hour beginning were excluded based on the IoD test

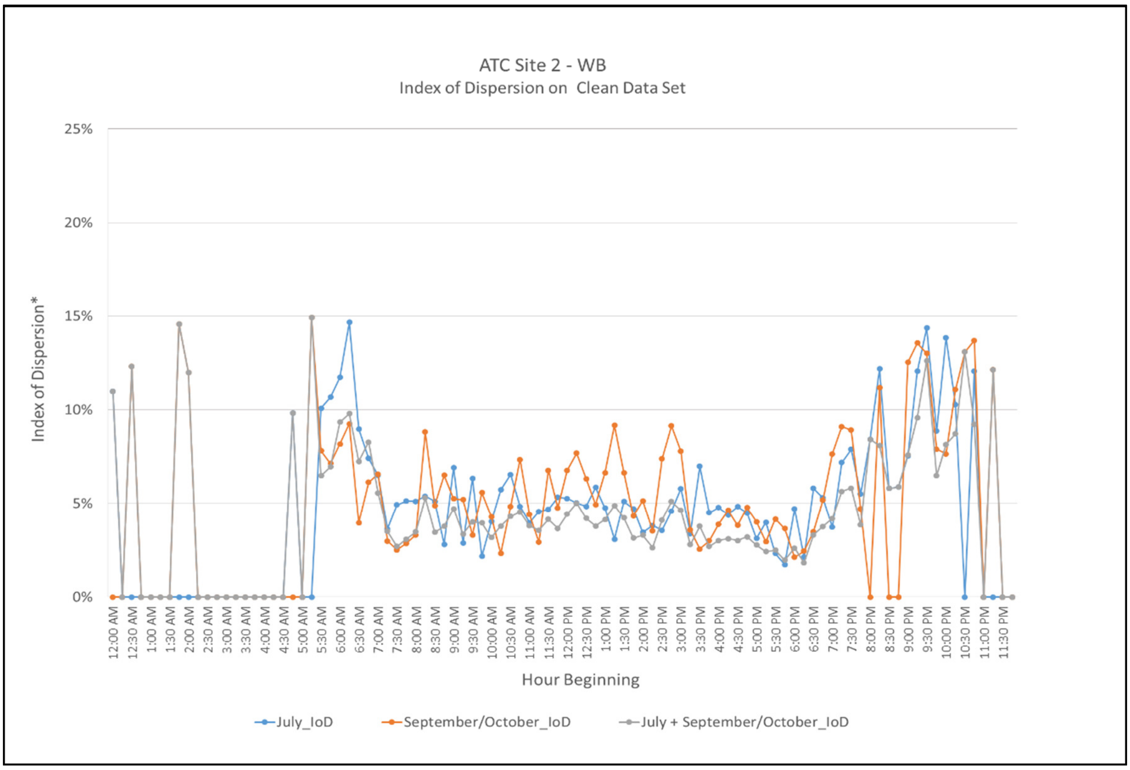


*IoD = 95%CI of Average 15 minute flows

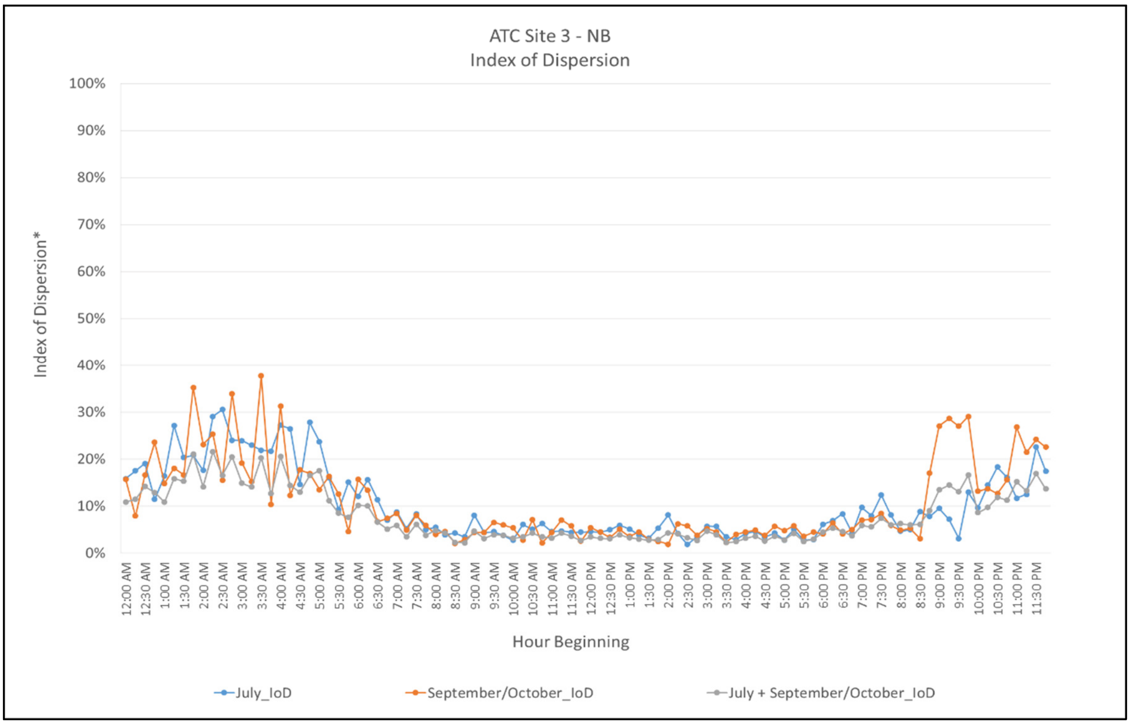


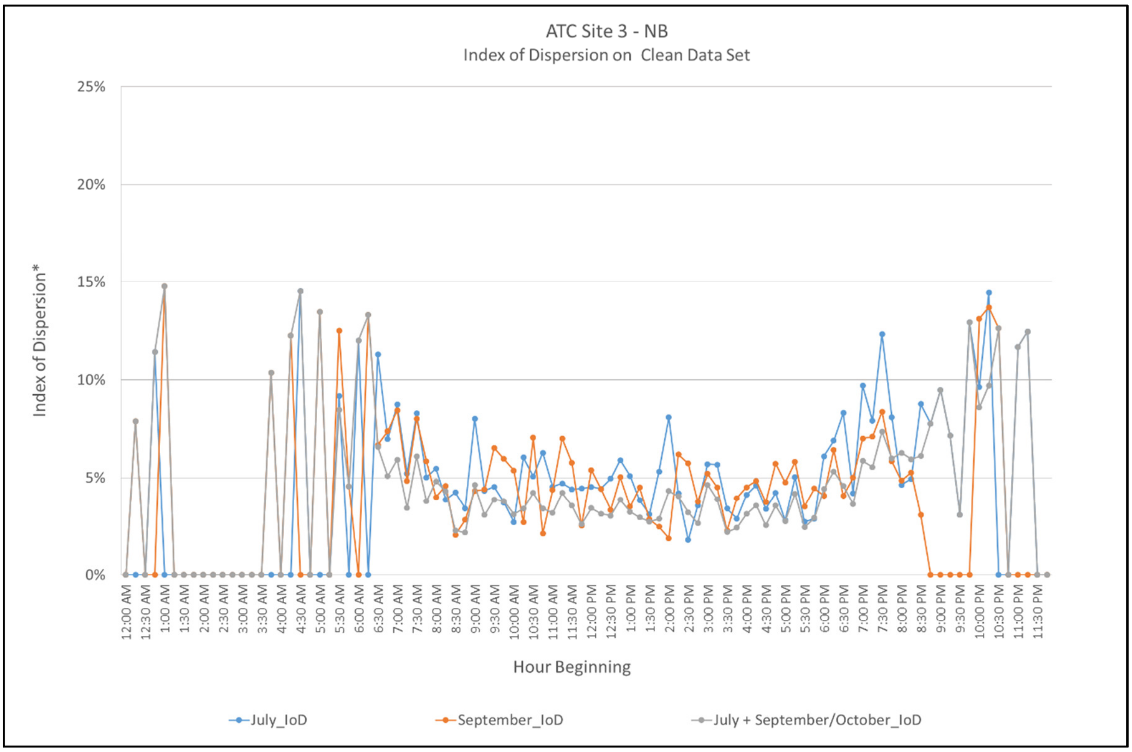
*IoD = 95%CI of Average 15 minute flows
Zero value indicates that data points at that hour beginning were excluded based on the IoD test



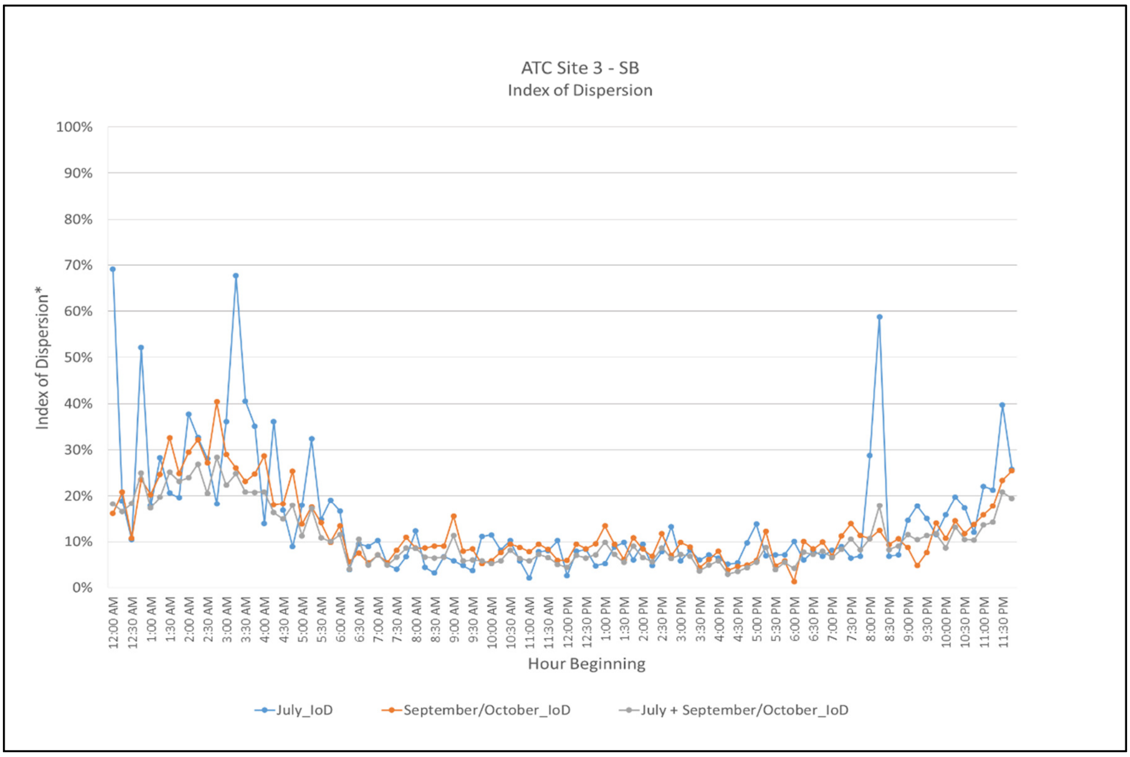


*IoD = 95%CI of Average 15 minute flows
Zero value indicates that data points at that hour beginning were excluded based on the IoD test

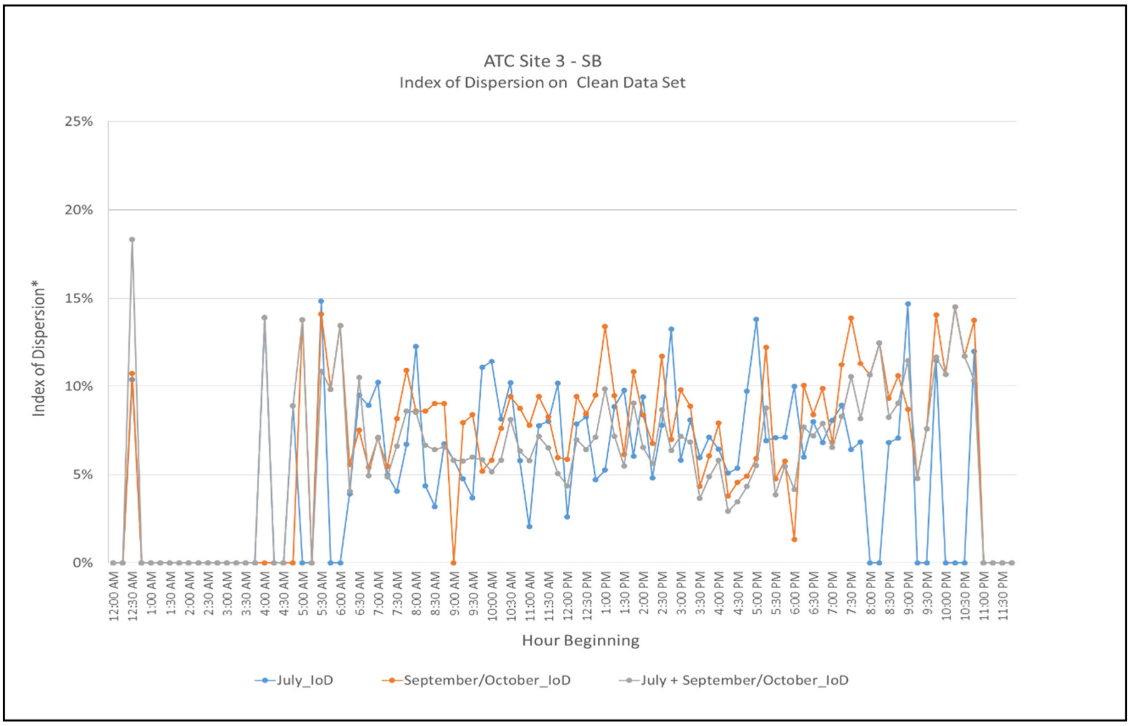




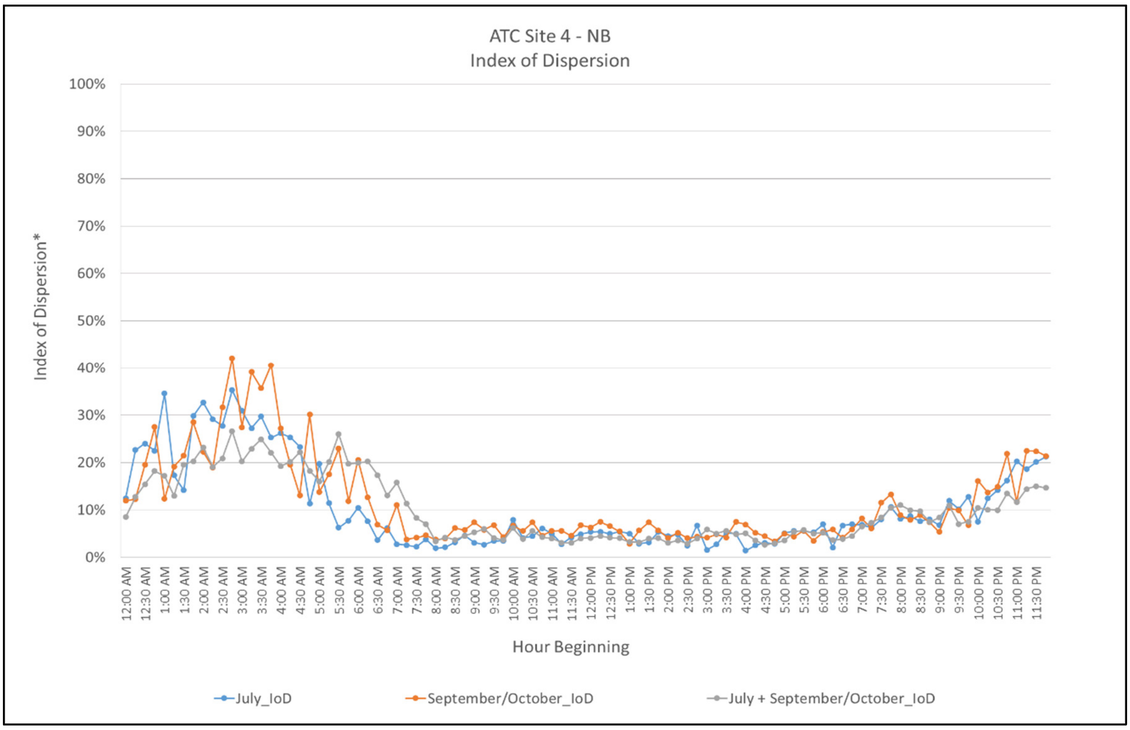
Zero value indicates that data points at that hour beginning were excluded based on the IoD test



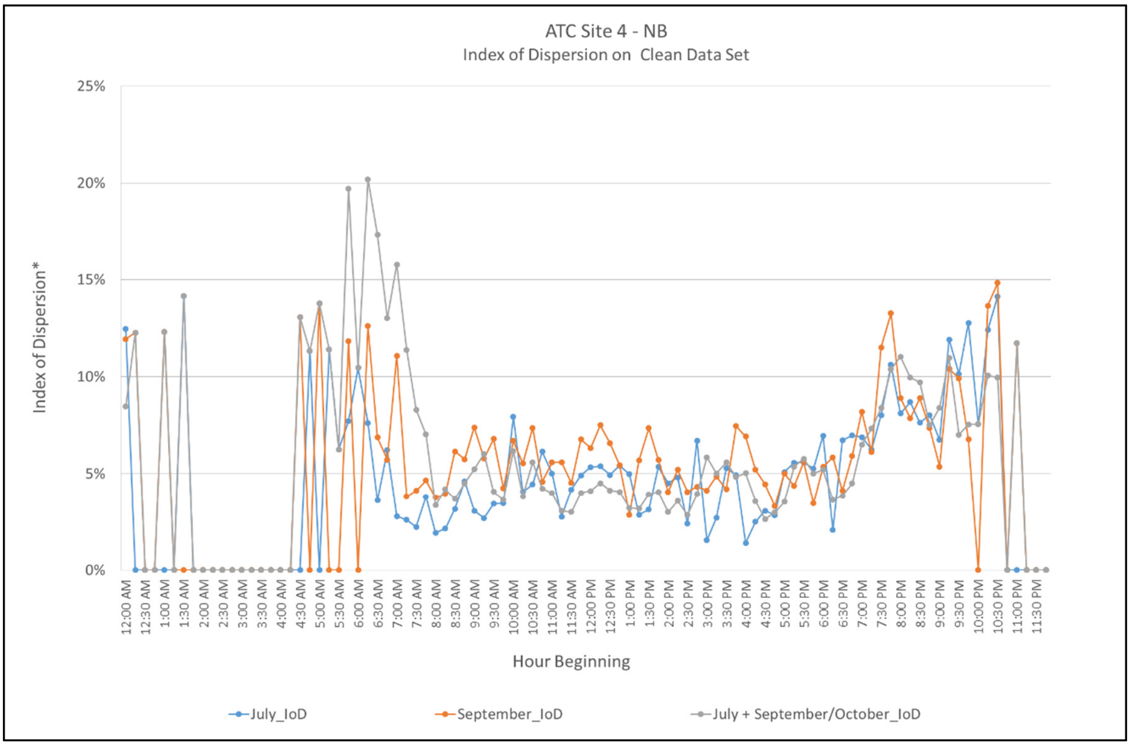
*IoD = 95%CI of Average 15 minute flows



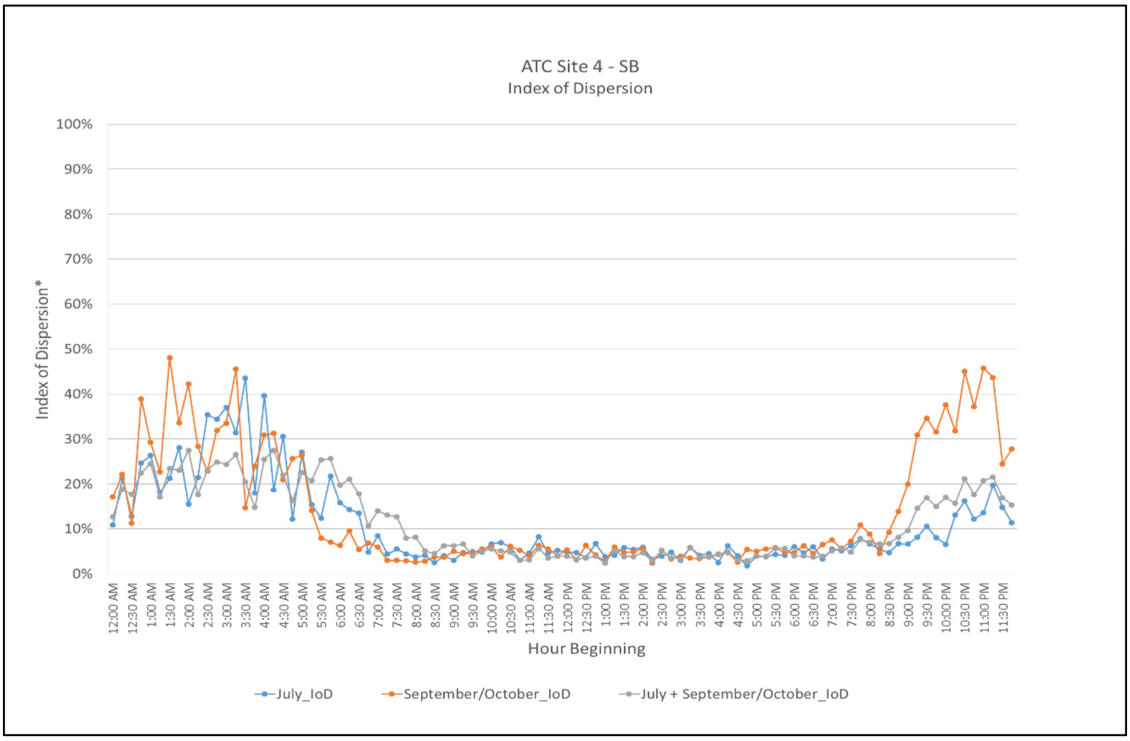
Zero value indicates that data points at that hour beginning were excluded based on the IoD test



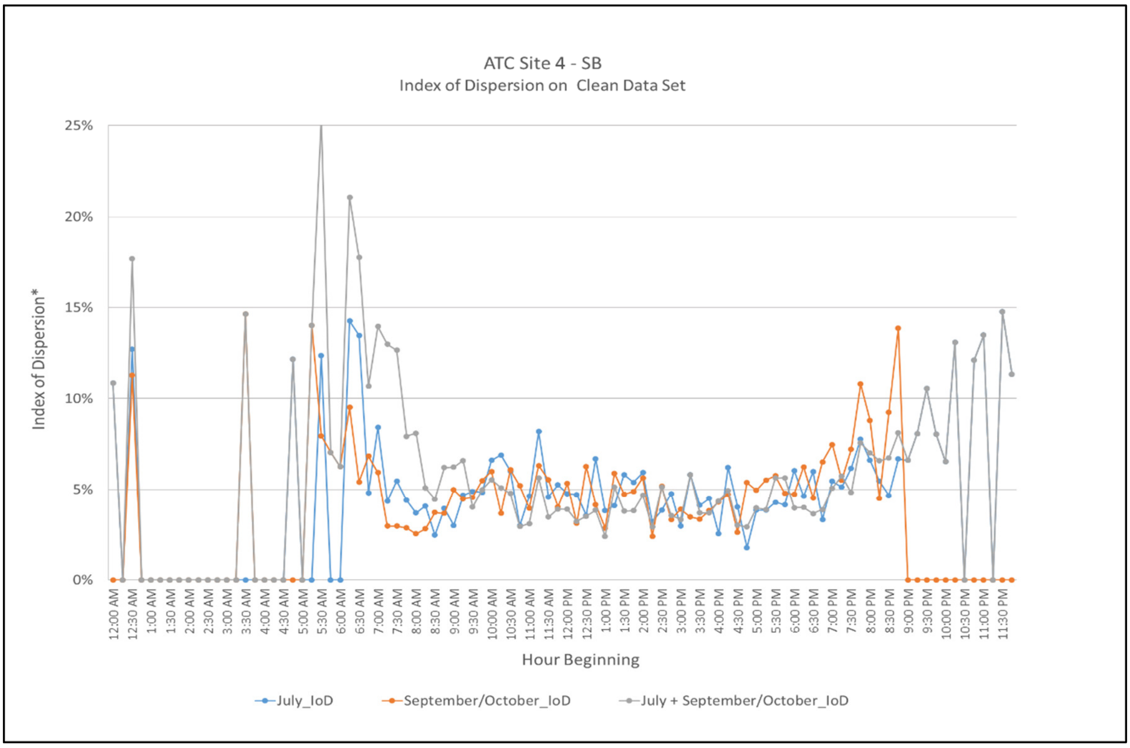
*IoD = 95%CI of Average 15 minute flows



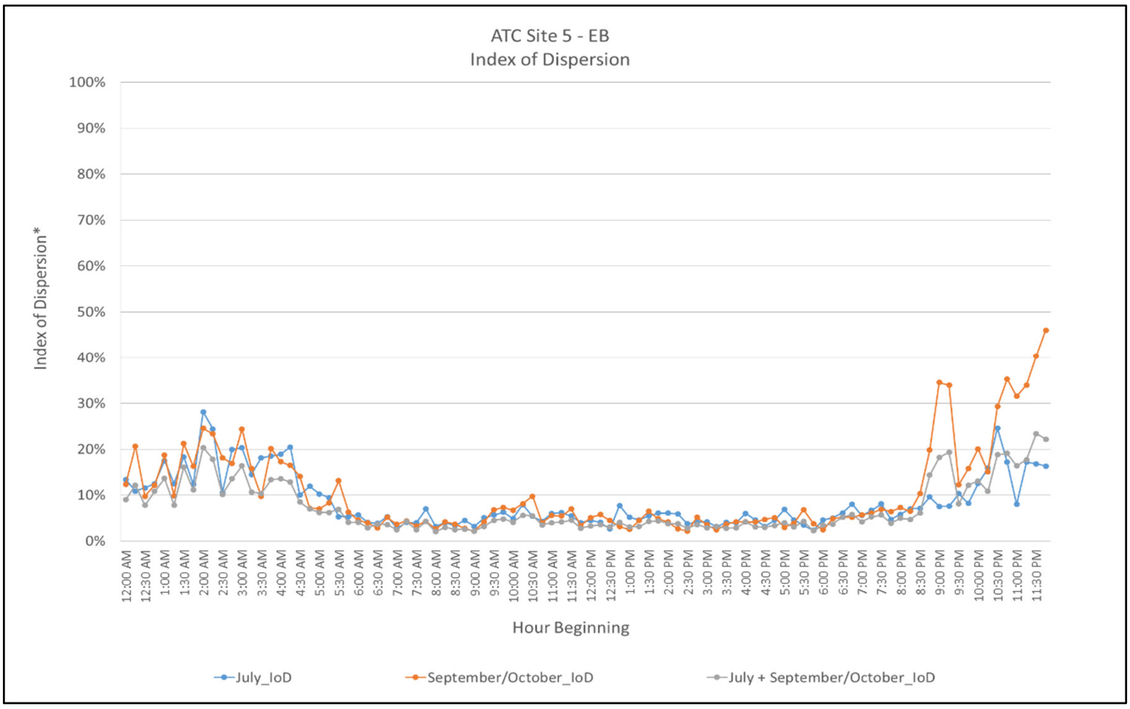
Zero value indicates that data points at that hour beginning were excluded based on the IoD test



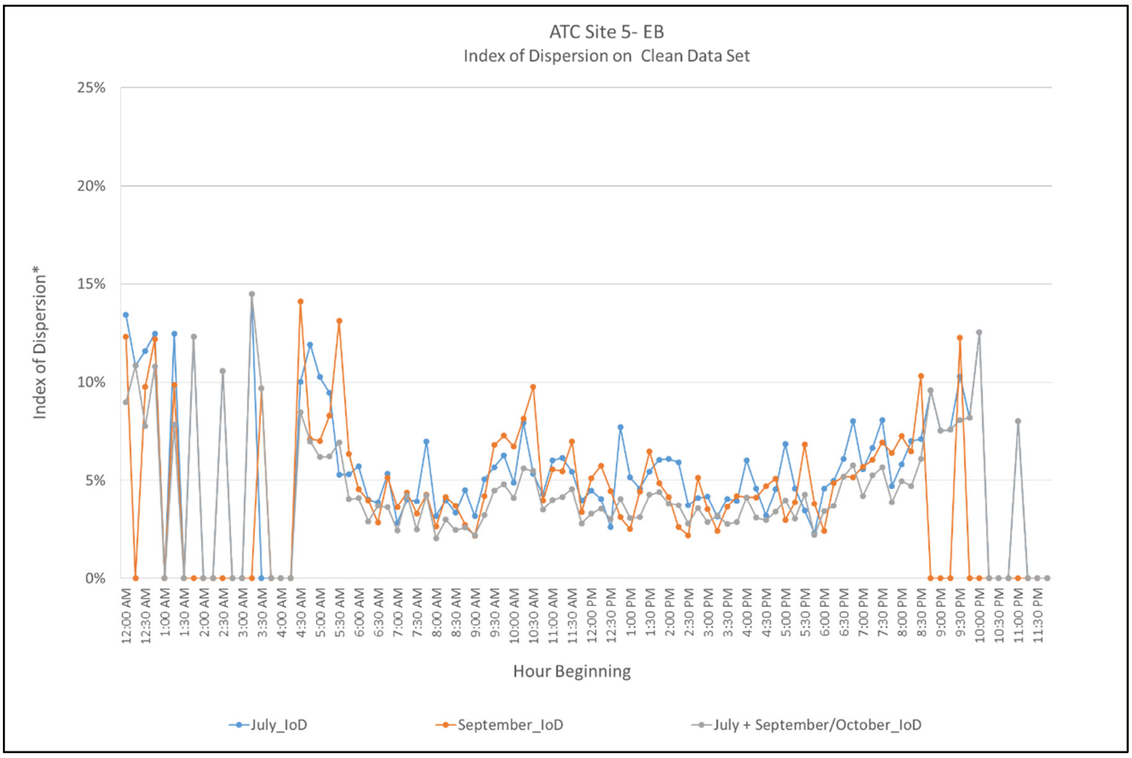
*IoD = 95%CI of Average 15 minute flows



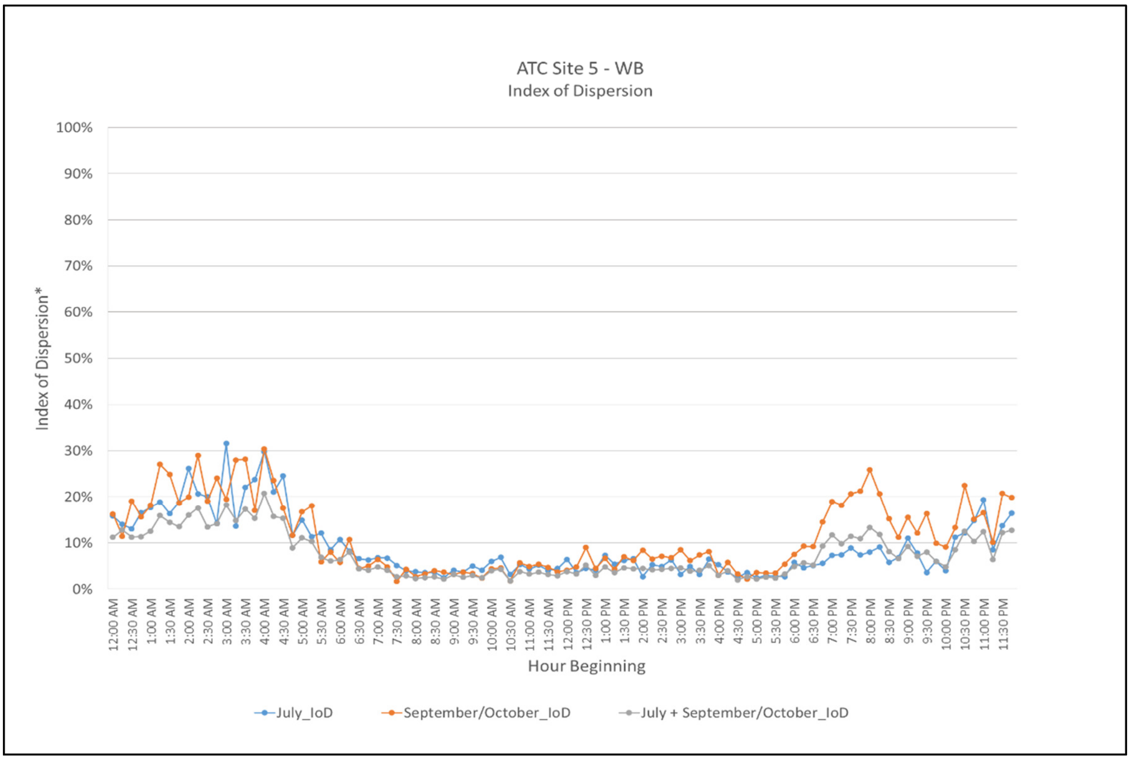
Zero value indicates that data points at that hour beginning were excluded based on the IoD test



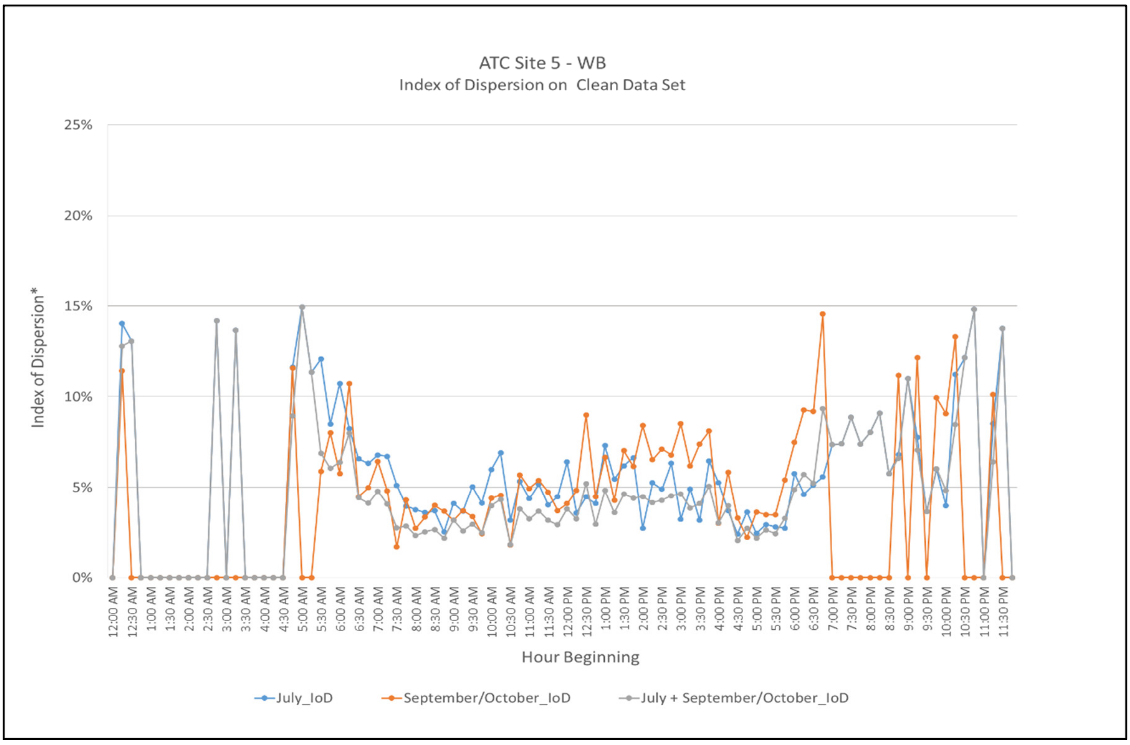
*IoD = 95%CI of Average 15 minute flows



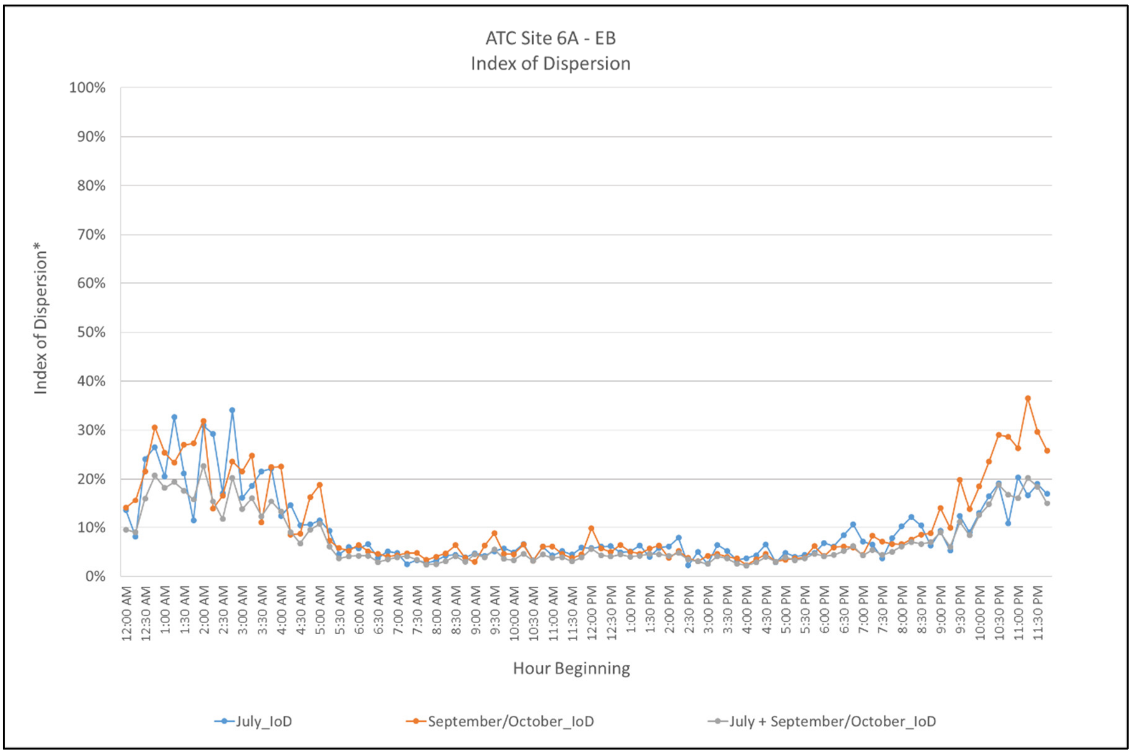
Zero value indicates that data points at that hour beginning were excluded based on the IoD test



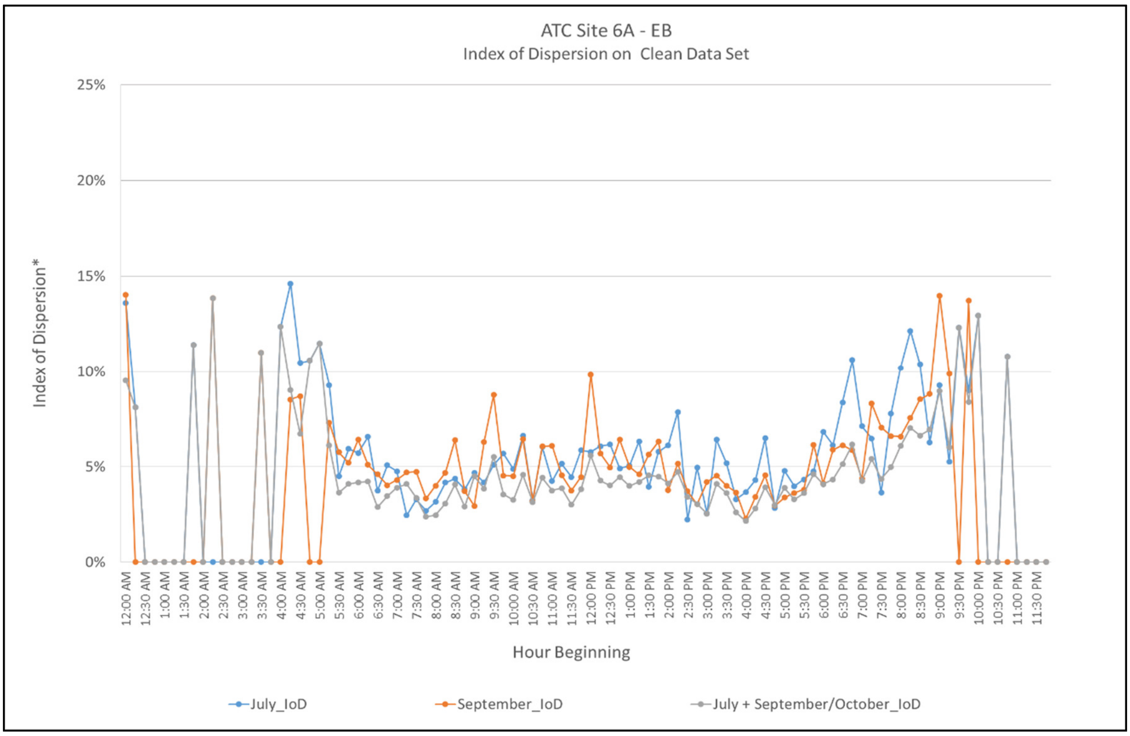
*IoD = 95%CI of Average 15 minute flows



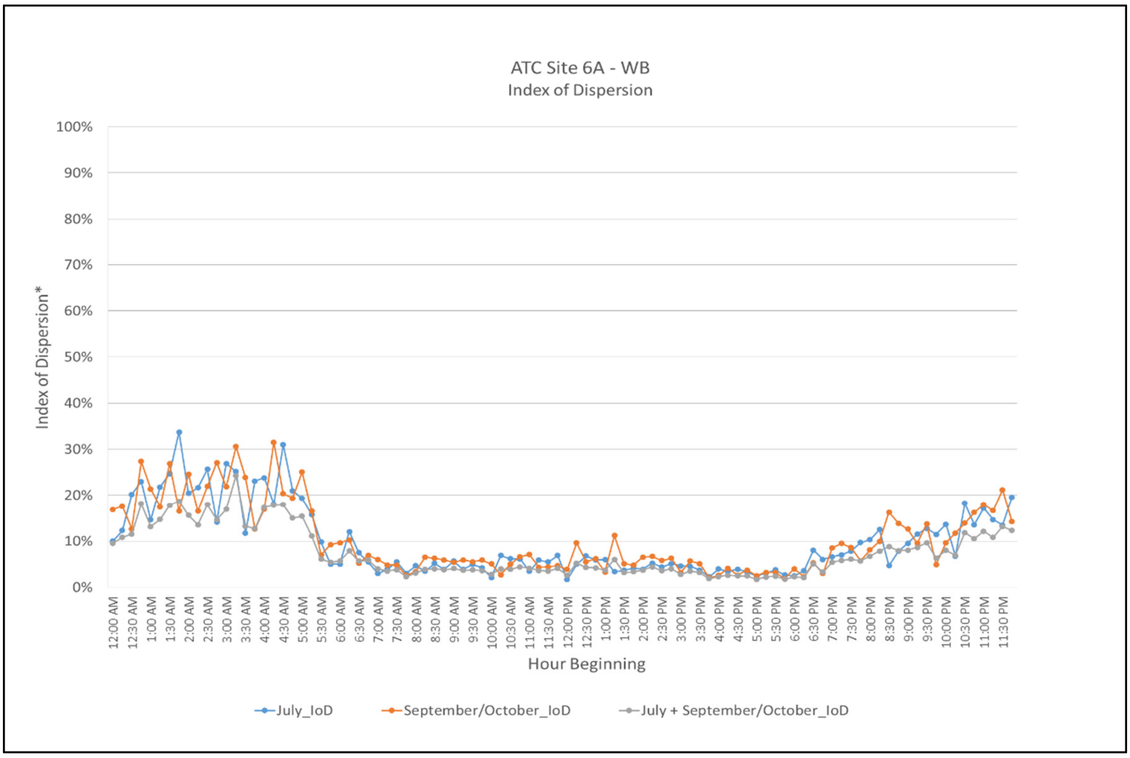
Zero value indicates that data points at that hour beginning were excluded based on the IoD test



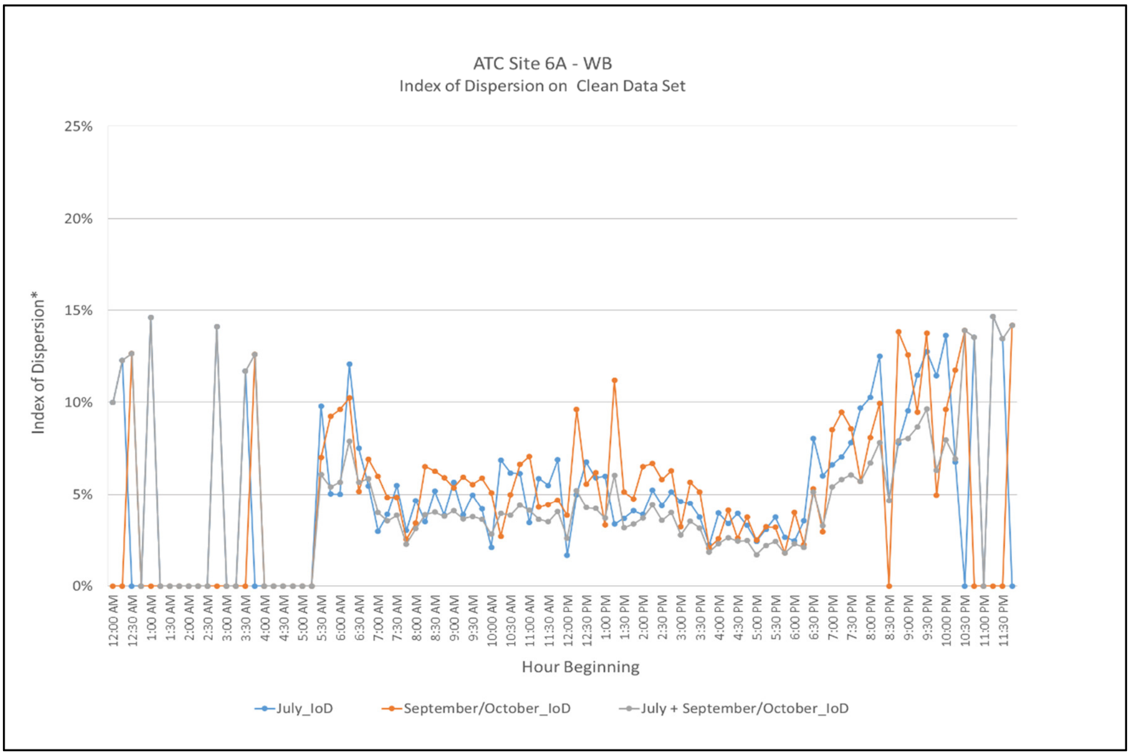
*IoD = 95%CI of Average 15 minute flows



Zero value indicates that data points at that hour beginning were excluded based on the IoD test

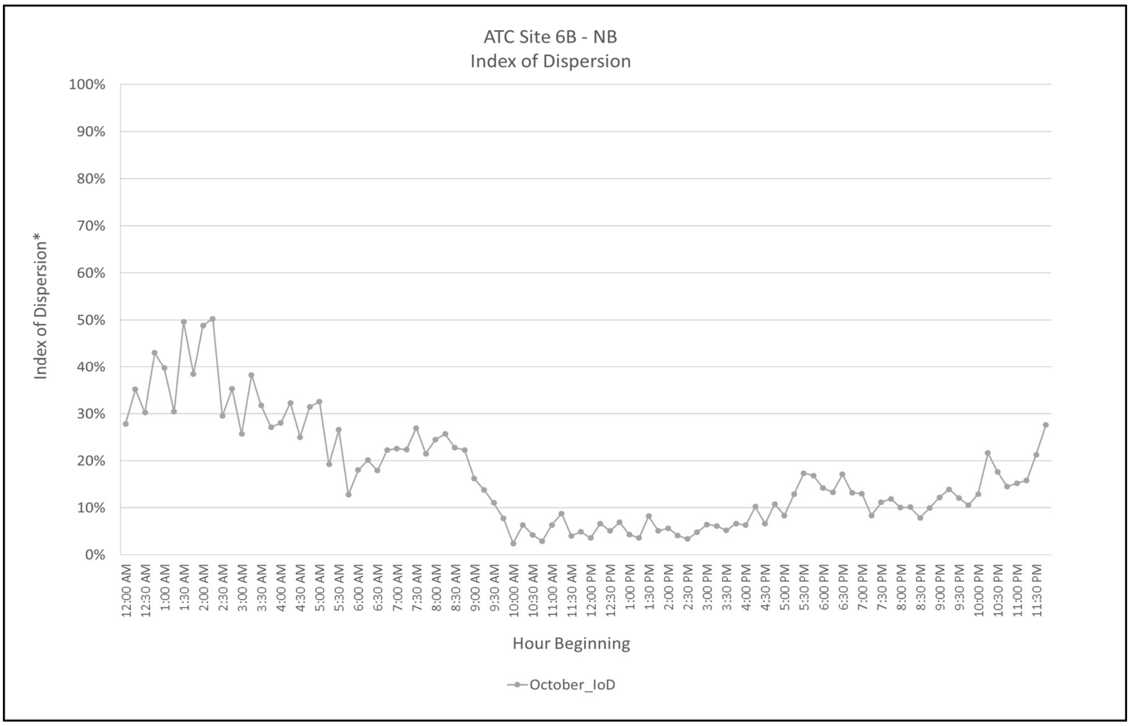


*IoD = 95%CI of Average 15 minute flows

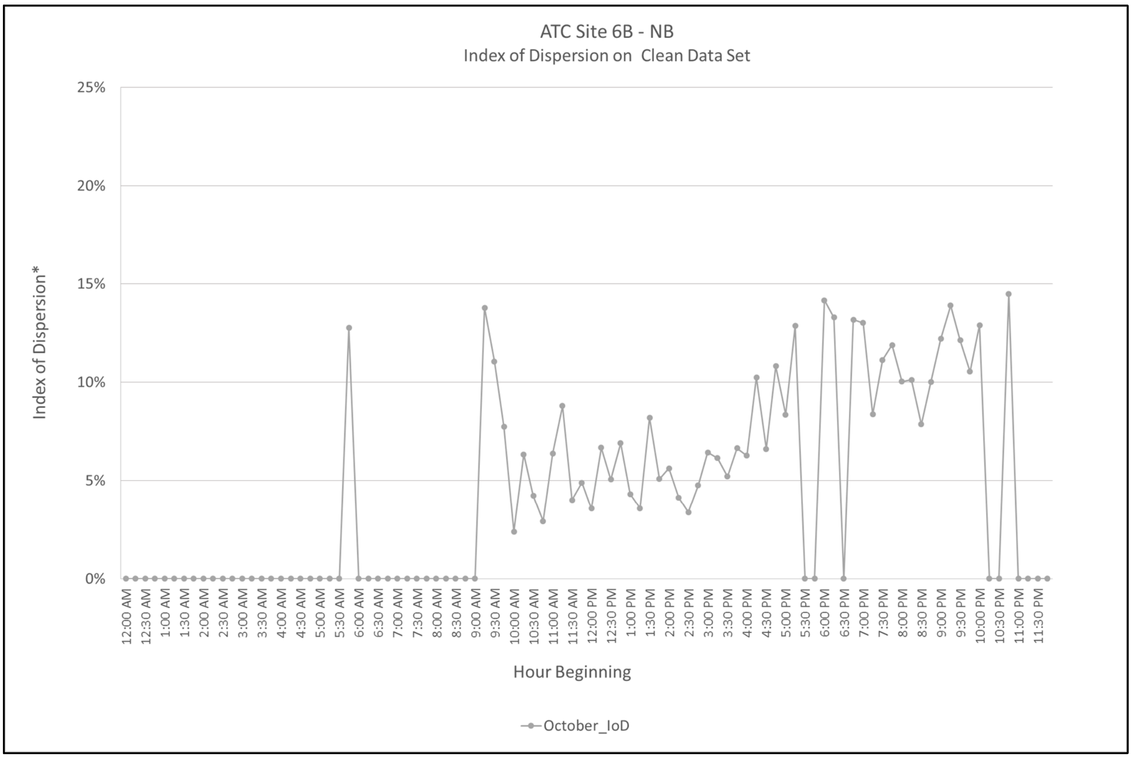


*IoD = 95%CI of Average 15 minute flows

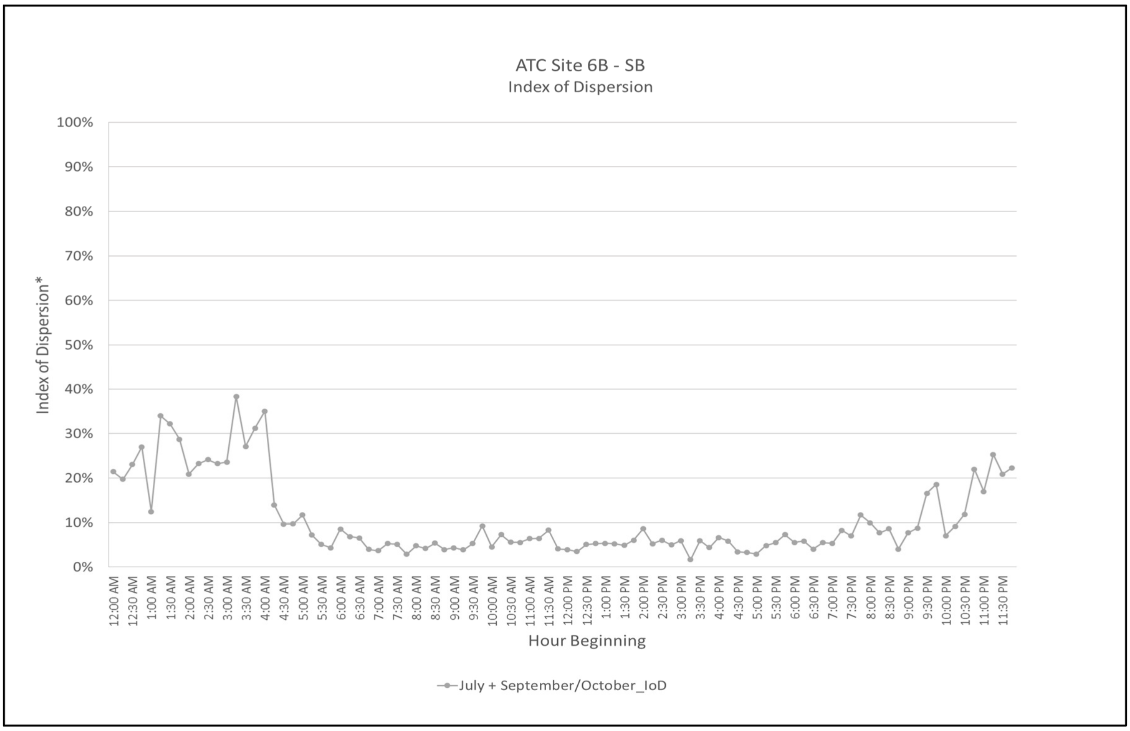
Zero value indicates that data points at that hour beginning were excluded based on the IoD test

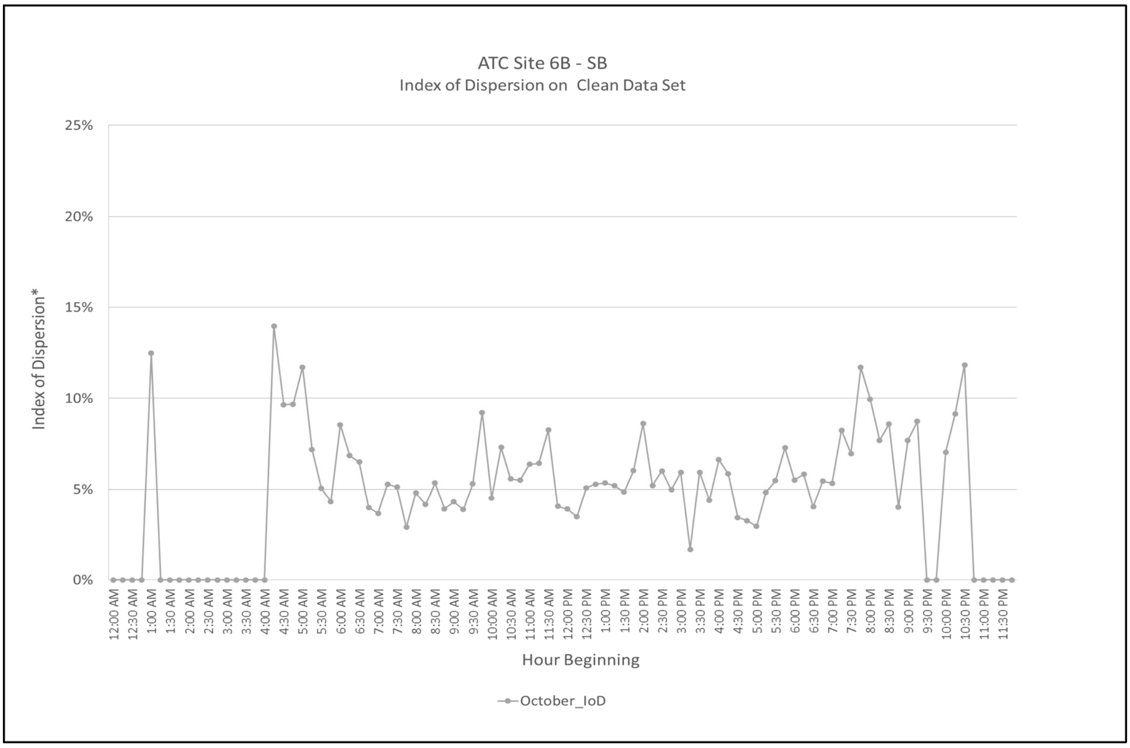


*IoD = 95%CI of Average 15 minute flows

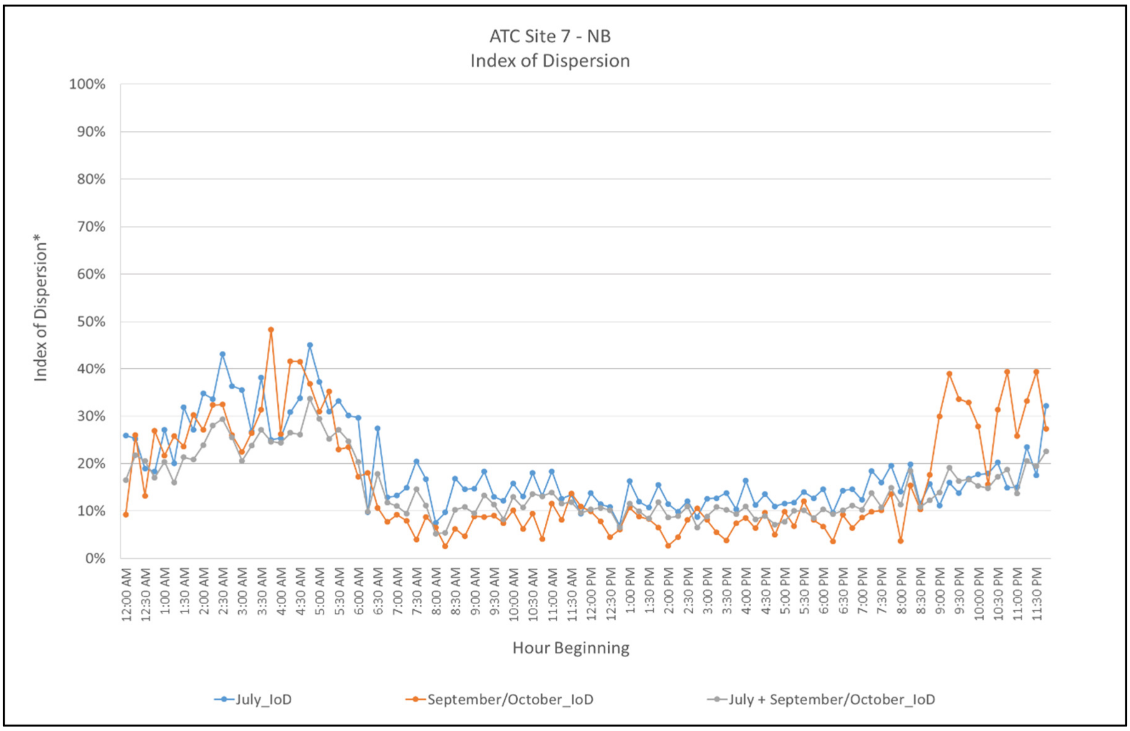


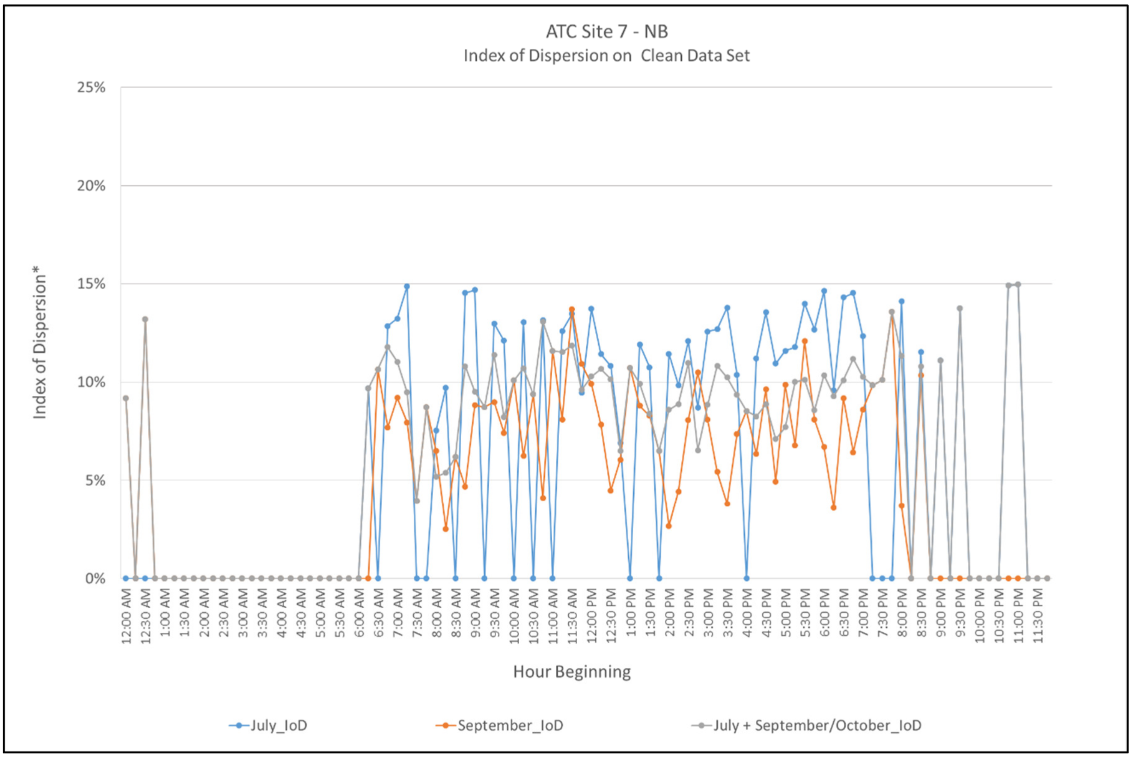
*IoD = 95%CI of Average 15 minute flows
Zero value indicates that data points at that hour beginning were excluded based on the IoD test



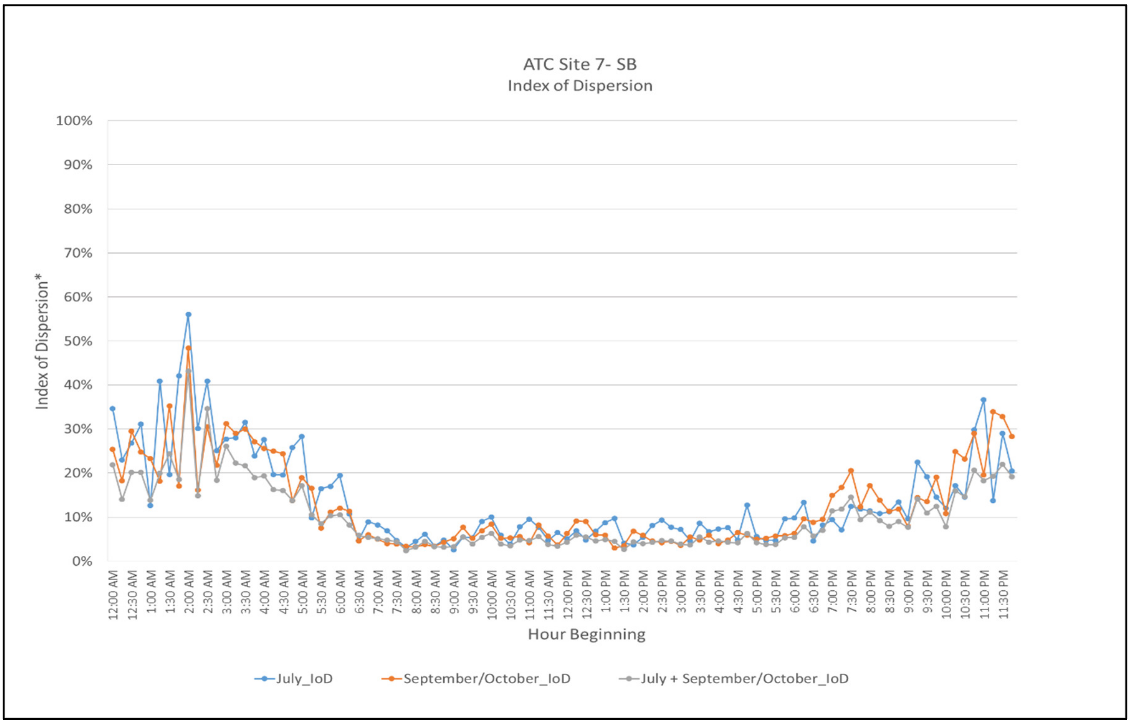


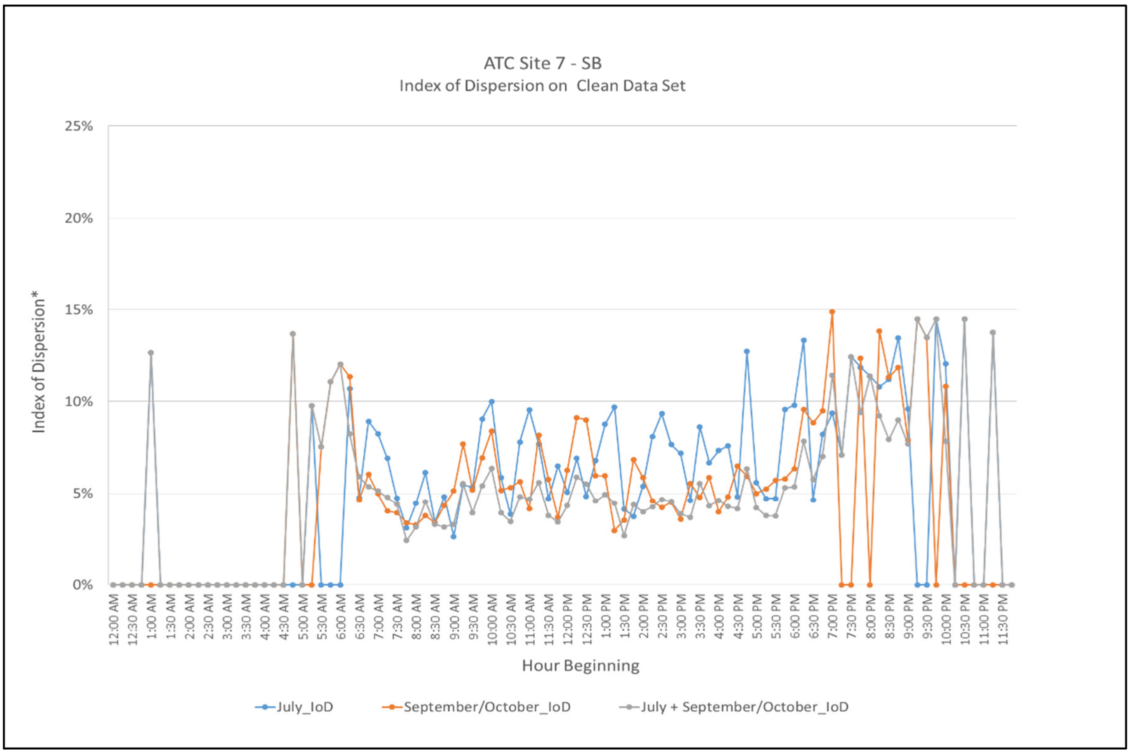
*IoD = 95%CI of Average 15 minute flows
Zero value indicates that data points at that hour beginning were excluded based on the IoD test





*IoD = 95%CI of Average 15 minute flows
Zero value indicates that data points at that hour beginning were excluded based on the IoD test





APPENDIX G

Outliers in 2015 ATC (Weekday) Data

APPENDIX G: Outliers in 2015 ATC Weekday Data

2015 ATC Site No.	Direction	AM			IP			PM		
		Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers
2015ATC _ 01	EB	136	8	6%	418	44	11%	228	0	0%
	WB	136	0	0%	418	44	11%	228	0	0%
2015ATC _ 02	EB	160	16	10%	440	0	0%	240	12	5%
	WB	160	16	10%	440	0	0%	240	24	10%
2015ATC _ 03	NB	160	8	5%	440	22	5%	240	12	5%
	SB	80	8	10%	220	22	10%	132	36	27%
2015ATC _ 04	NB	160	0	0%	440	22	5%	240	12	5%
	SB	160	0	0%	440	22	5%	240	0	0%
2015ATC _ 05	EB	160	0	0%	440	0	0%	240	0	0%
	WB	160	0	0%	440	22	5%	240	12	5%
2015ATC _ 6A	EB	160	8	5%	440	22	5%	240	12	5%
	WB	160	8	5%	440	0	0%	240	0	0%
2015ATC _ 6B	NB	80	8	10%	220	0	0%	120	0	0%
	SB	80	8	10%	220	0	0%	120	12	10%
2015ATC _ 07	NB	168	0	0%	462	44	10%	240	12	5%
	SB	168	8	5%	462	44	10%	240	12	5%

APPENDIX H

Outliers in 2016 ATC (Weekday) Data

APPENDIX H: Outliers in 2016 ATC Weekday Data

ATC Site No.	Direction	AM			IP			PM		
		Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers
1	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
2	NB	80	0	0%	220	0	0%	120	12	10%
	SB	80	8	10%	220	22	10%	120	0	0%
3	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
4	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	0	0%	220	44	20%	120	0	0%
5	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	12	10%
6	NB	80	0	0%	220	0	0%	120	12	10%
	SB	80	8	10%	220	0	0%	120	0	0%
7	NB	104	0	0%	172	0	0%	168	0	0%
	SB	104	0	0%	172	0	0%	168	0	0%
8	NB	80	8	10%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
9	NB	112	0	0%	301	0	0%	168	12	7%
	SB	112	8	7%	301	22	7%	168	12	7%
10	NB	112	8	7%	308	0	0%	168	0	0%
	SB	112	0	0%	308	0	0%	168	12	7%
11	NB	80	0	0%	219	19	9%	120	0	0%
	SB	80	0	0%	219	22	10%	120	0	0%
12	NB	80	0	0%	220	44	20%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
13	NB	80	0	0%	220	0	0%	120	12	10%
	SB	80	0	0%	220	0	0%	120	0	0%
14	NB	112	16	14%	298	22	7%	168	12	7%
	SB	112	0	0%	298	22	7%	168	12	7%
15	NB	80	0	0%	No Data			No Data		
	SB	80	0	0%	220	0	0%	120	0	0%
16	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
17	NB	88	0	0%	243	0	0%	144	0	0%

ATC Site No.	Direction	AM			IP			PM		
		Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers
	SB	88	0	0%	243	0	0%	144	0	0%
18	NB	80	0	0%	218	0	0%	120	0	0%
	SB	80	8	10%	218	0	0%	120	0	0%
19	NB	112	8	7%	308	22	7%	162	0	0%
	SB	112	0	0%	308	0	0%	162	12	7%
20	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
21	NB	90	0	0%	253	0	0%	140	12	9%
	SB	90	16	18%	253	22	9%	140	0	0%
22	NB	80	0	0%	220	0	0%	120	12	10%
	SB	80	8	10%	220	0	0%	120	0	0%
23	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	8	10%	220	22	10%	120	0	0%
24	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	8	10%	220	0	0%	120	12	10%
25	EB	112	8	7%	295	22	7%	156	12	8%
	WB	112	8	7%	295	22	7%	156	12	8%
26	EB	104	0	0%	283	22	8%	156	0	0%
	WB	104	0	0%	283	0	0%	156	0	0%
27	EB	80	8	10%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
28	EB	104	0	0%	286	0	0%	156	0	0%
	WB	104	8	8%	286	0	0%	156	0	0%
29	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	8	10%	220	0	0%	120	0	0%
31	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	8	10%	220	0	0%	120	0	0%
32	NB	80	8	10%	220	22	10%	120	12	10%
	SB	80	0	0%	220	0	0%	120	0	0%
33	EB	112	0	0%	308	0	0%	168	0	0%
	WB	112	0	0%	308	0	0%	168	0	0%
34	NB	80	8	10%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	12	10%
35	NB	80	0	0%	220	22	10%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%

ATC Site No.	Direction	AM			IP			PM		
		Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers
36	EB	80	0	0%	220	22	10%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
37	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
38	EB	79	0	0%	214	0	0%	120	0	0%
	WB	79	0	0%	214	0	0%	120	0	0%
39	EB	80	0	0%	220	0	0%	120	12	10%
	WB	80	0	0%	220	0	0%	120	0	0%
40	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
41	EB	104	0	0%	286	22	8%	156	0	0%
	WB	104	0	0%	286	0	0%	156	12	8%
42	EB	112	0	0%	282	0	0%	155	0	0%
	WB	112	0	0%	282	0	0%	155	12	8%
43	NB	80	8	10%	220	0	0%	120	0	0%
	SB	80	0	0%	220	22	10%	120	0	0%
44	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
45	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
46	EB	80	0	0%	220	22	10%	120	12	10%
	WB	80	0	0%	220	22	10%	120	0	0%
47	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	12	10%
48	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
49	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	8	10%	220	22	10%	120	0	0%
50	NB	80	8	10%	220	22	10%	120	0	0%
	SB	80	0	0%	220	22	10%	120	0	0%
51	NB	80	0	0%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
52	EB	80	8	10%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	0	0%
53	NB	80	0	0%	204	0	0%	120	0	0%

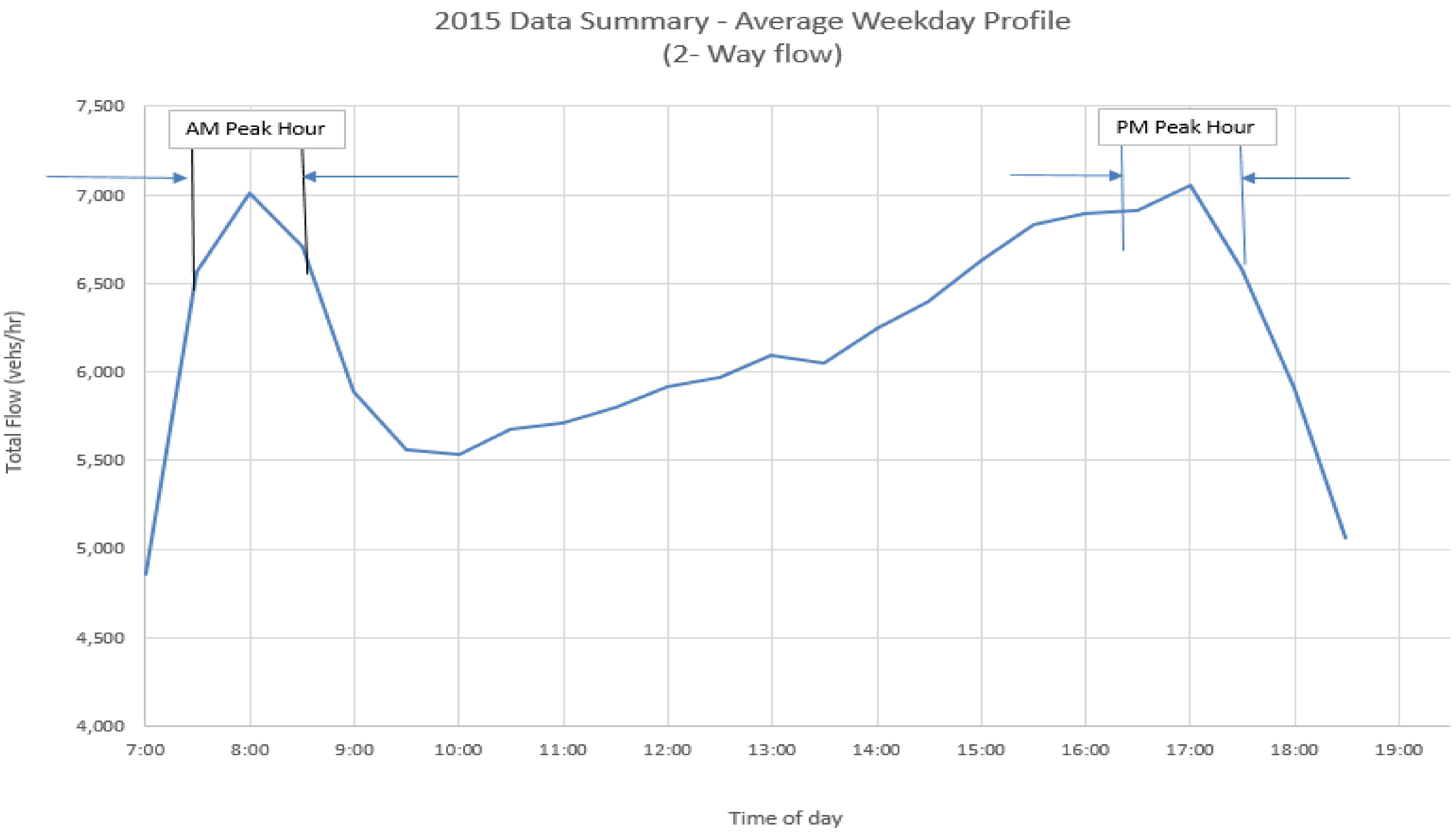
ATC Site No.	Direction	AM			IP			PM		
		Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers	Total No. of Data Pts.	No. of Outliers	% of Outliers
	SB	80	8	10%	204	22	11%	120	0	0%
54	EB	80	0	0%	220	0	0%	120	0	0%
	WB	80	0	0%	220	0	0%	120	12	10%
55	NB	80	8	10%	220	0	0%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
56	NB	80	0	0%	220	22	10%	120	0	0%
	SB	80	0	0%	220	0	0%	120	0	0%
57	NB	80	8	10%	220	0	0%	120	0	0%
	SB	80	8	10%	220	0	0%	120	0	0%

APPENDIX I

2015 ATC Data: Weekday 2-Way Average Flow Summary

APPENDIX I: 2015 Weekday Average Traffic Flow (2-Way ATC)

Site_Ref	**07:00**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	**12 - hour flows (vehs)**
2015ATC_01	937	1127	1032	916	928	880	865	876	859	841	866	866	869	879	922	918	969	1046	1051	1037	1027	933	900	741	22,285
2015ATC_02	915	1072	1125	1042	910	875	882	894	888	911	942	921	943	948	970	985	1028	1066	1049	1049	1053	1025	968	827	23,288
2015ATC_03	256	558	681	690	576	530	540	568	591	601	598	598	618	612	640	642	643	684	658	666	697	671	483	417	14,218
2015ATC_04	509	784	868	847	715	657	640	634	637	650	679	677	680	685	693	760	770	777	763	772	780	729	674	599	16,979
2015ATC_05	560	810	871	867	765	722	710	721	709	725	739	772	776	762	780	801	826	846	904	962	1003	913	845	729	19,118
2015ATC_06A	913	1080	1113	997	908	858	859	869	886	902	891	909	936	937	964	995	1034	1048	1055	1033	1023	1009	967	812	22,998
2015ATC_06B	539	762	835	866	718	682	685	739	749	765	779	801	820	796	827	850	883	895	940	912	956	829	710	631	18,969
2015ATC_07	233	377	489	479	369	359	356	380	390	403	423	425	452	430	448	443	477	473	478	485	516	471	360	309	10,025
Total (for 2015 sites)	**4862**	**6570**	**7014**	**6704**	**5889**	**5563**	**5537**	**5681**	**5709**	**5798**	**5917**	**5969**	**6094**	**6049**	**6244**	**6394**	**6630**	**6835**	**6898**	**6916**	**7055**	**6580**	**5907**	**5065**	**147,880**


2015 Data Summary - Average Weekday Profile
(2- Way flow)
AM Peak Hour
PM Peak Hour
Total Flow (vehs/hr)
7,500
7,000
6,500
6,000
5,500
5,000
4,500
4,000
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
Time of day

APPENDIX J

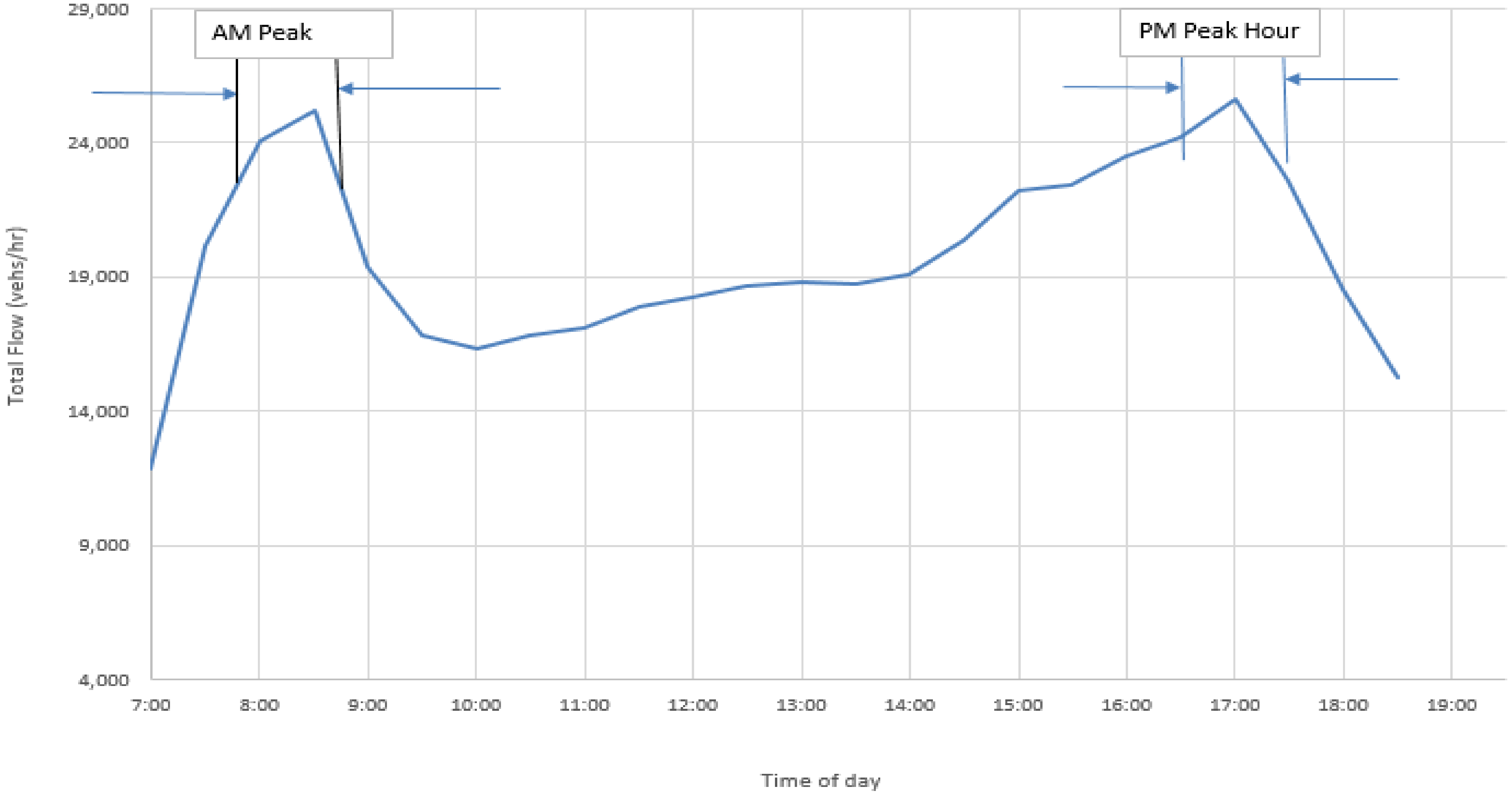
2016 ATC Data: Weekday 2-Way Average Flow Summary

APPENDIX J: 2016 Weekday Average Traffic Flow (2-Way ATC)

Site_Ref	07:00	07:30	08:00	08:30	09:00	09:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	12 - hour flows (vehs)
2016ATC_01	353	716	996	1117	782	616	620	652	657	681	706	701	738	746	754	772	840	851	915	919	1034	855	634	489	18144
2016ATC_02	300	546	675	729	608	525	547	569	569	596	598	614	637	633	630	662	742	749	679	678	693	610	529	465	14583
2016ATC_03	36	62	90	106	73	58	49	57	55	63	75	75	70	72	68	74	90	79	86	89	121	80	48	32	1708
2016ATC_04	104	151	155	132	76	61	48	45	55	59	57	60	55	57	59	68	89	91	110	140	162	126	84	63	2107
2016ATC_05	663	848	858	783	619	499	433	457	440	464	475	499	510	510	523	513	546	657	736	726	654	646	588	457	14104
2016ATC_06	231	453	561	604	426	343	332	353	358	380	375	393	398	415	417	438	454	466	491	500	559	465	340	268	10020
2016ATC_07	133	251	340	416	325	306	292	315	308	337	344	331	328	335	344	361	404	384	389	415	433	378	315	272	8056
2016ATC_08	104	241	349	435	326	292	301	318	319	341	347	339	332	337	349	350	404	408	386	421	484	449	360	302	8294
2016ATC_09	194	404	525	691	437	367	352	359	363	389	390	415	417	419	424	473	584	584	511	541	578	511	417	370	10715
2016ATC_10	197	357	482	613	477	430	437	455	476	496	510	521	536	523	529	556	590	599	567	619	633	564	482	439	12088
2016ATC_11	291	453	499	483	395	356	321	360	352	375	405	419	414	413	412	420	459	467	511	537	563	450	361	269	9985
2016ATC_12	108	150	163	146	78	56	50	46	54	60	58	58	57	61	56	69	94	95	115	139	160	128	87	64	2152
2016ATC_13	1	2	4	3	3	5	2	4	3	3	2	3	4	3	4	3	8	4	4	7	6	5	3	2	88
2016ATC_14	514	988	1089	1055	870	688	650	667	703	700	717	734	705	720	737	789	815	873	898	952	1017	911	706	571	19069
2016ATC_15	53	56	93	121	107	112	109	113	111	126	122	121	117	112	119	108	97	106	98	100	92	102	120	93	2508
2016ATC_16	107	203	327	387	327	314	285	288	300	306	310	317	319	314	321	349	340	359	377	397	428	402	305	245	7627
2016ATC_17	279	494	559	600	552	506	503	513	534	561	567	559	566	569	607	608	593	605	624	631	625	584	570	502	13311
2016ATC_18	139	303	425	464	319	272	258	261	285	293	301	307	317	310	323	363	377	387	392	404	423	377	325	282	7907
2016ATC_19	34	70	127	131	67	59	61	59	55	63	60	63	61	63	64	74	98	92	95	100	117	104	85	75	1877
2016ATC_20	25	27	48	65	40	35	31	31	34	38	36	32	31	36	31	41	41	48	50	47	56	53	41	41	958
2016ATC_21	52	152	164	193	177	137	128	128	129	122	128	131	140	133	127	125	128	124	130	156	177	118	54	40	3093
2016ATC_22	192	369	487	528	358	316	317	313	330	349	361	371	371	363	380	405	469	470	495	531	556	498	393	321	9543
2016ATC_23	174	368	488	546	376	338	333	348	351	383	389	389	399	385	407	426	484	495	520	549	568	515	406	350	9987
2016ATC_24	86	201	276	259	194	187	176	182	190	208	216	216	219	201	220	227	238	249	275	291	292	268	210	174	5255
2016ATC_25	59	124	157	246	143	141	141	142	148	138	130	129	133	137	139	176	221	164	179	182	181	172	165	123	3670
2016ATC_26	154	266	384	482	310	263	255	249	256	277	295	315	298	280	295	329	401	381	396	392	418	378	296	248	7618
2016ATC_27	181	387	540	681	466	369	339	358	362	388	393	402	402	377	412	451	528	529	549	536	566	512	452	376	10556
2016ATC_28	308	513	550	626	451	340	318	293	301	320	348	358	386	383	403	421	490	467	522	515	567	457	374	306	10017
2016ATC_29	372	656	859	820	637	587	560	563	572	580	557	627	585	595	594	699	740	715	779	737	784	694	602	519	15433
2016ATC_31	349	566	559	575	470	466	457	494	505	531	562	582	602	577	579	572	590	587	612	617	610	551	473	392	12878
2016ATC_32	283	439	512	504	378	324	270	292	304	309	296	297	334	322	310	325	351	370	460	526	593	455	360	265	8879
2016ATC_33	0	0	2	1	0	0	0	0	0	0	0	0	1	1	0	0	2	0	0	1	1	6	5	12	32
2016ATC_34	70	124	136	130	91	78	73	78	81	90	84	86	88	92	90	101	104	114	130	122	142	127	102	86	2419
2016ATC_35	201	262	278	271	168	129	108	113	121	123	132	147	139	135	127	136	189	195	220	272	306	247	187	134	4340
2016ATC_36	166	266	380	467	372	341	344	371	379	402	417	417	436	421	430	447	479	461	451	459	462	442	375	315	9500
2016ATC_37	326	623	748	676	574	498	480	487	477	504	513	553	542	553	560	638	690	692	743	771	876	755	640	553	14472
2016ATC_38	360	626	841	799	613	576	551	559	557	582	563	609	590	604	586	700	734	711	770	732	787	698	598	519	15265
2016ATC_39	171	285	299	370	258	196	184	174	185	187	198	205	223	214	219	249	309	269	300	284	308	244	196	154	5681
2016ATC_40	55	107	151	194	116	104	101	101	104	100	105	105	102	107	108	127	166	135	135	135	152	136	114	92	2852
2016ATC_41	47	87	118	175	149	144	143	149	147	165	155	156	159	156	160	166	193	180	176	165	168	155	132	104	3549
2016ATC_42	130	249	351	416	397	396	405	430	438	469	456	480	453	466	466	483	483	474	468	471	491	443	377	340	10032
2016ATC_43	242	372	407	331	211	140	138	124	135	137	156	159	161	149	167	189	246	255	298	333	392	299	203	135	5379

2016ATC_44	103	216	258	214	107	74	70	62	66	67	72	73	81	78	81	108	136	143	197	232	290	234	143	83	3188
2016ATC_45	2	3	7	4	5	7	5	6	5	7	6	5	6	8	9	7	7	7	6	8	7	5	4	3	139
2016ATC_46	66	110	145	118	72	60	58	55	53	57	62	63	68	58	69	71	91	85	113	120	142	116	77	51	1980
2016ATC_47	8	41	43	36	16	11	10	9	12	13	13	12	13	14	13	21	25	25	35	45	63	42	19	11	550
2016ATC_48	287	444	454	383	333	312	308	311	306	324	324	320	340	346	347	365	377	410	424	429	457	364	294	232	8491
2016ATC_49	407	663	677	566	503	451	457	477	473	463	494	461	487	502	507	548	572	594	628	631	660	626	534	413	12794
2016ATC_50	239	386	410	355	229	156	137	131	141	139	156	160	166	163	164	200	260	278	310	354	414	309	212	142	5611
2016ATC_51	203	343	392	414	332	294	284	295	298	310	316	335	329	313	345	370	399	416	423	449	475	443	371	298	8447
2016ATC_52	150	323	454	599	372	296	275	296	291	318	333	343	332	316	329	379	457	430	440	430	470	435	381	326	8775
2016ATC_53	794	1111	1157	1121	961	891	919	922	964	1015	1027	1023	1043	1035	1043	1068	1127	1159	1176	1189	1162	1145	1010	870	24932
2016ATC_54	544	779	872	886	730	607	600	620	625	644	715	678	706	703	713	721	745	776	846	917	971	846	699	581	17524
2016ATC_55	321	591	719	731	648	595	628	652	675	680	686	689	686	692	720	719	760	770	772	783	791	707	557	437	16009
2016ATC_56	494	767	797	759	680	627	603	614	607	620	618	651	635	667	675	750	728	749	807	784	788	694	626	573	16313
2016ATC_57	355	536	641	670	549	463	455	485	503	524	513	529	545	547	552	534	606	626	659	693	725	612	462	348	13132
Total (for 2016 Sites)	**11817**	**20130**	**24078**	**25227**	**19353**	**16814**	**16311**	**16805**	**17122**	**17876**	**18244**	**18637**	**18812**	**18741**	**19117**	**20344**	**22190**	**22409**	**23478**	**24203**	**25650**	**22548**	**18503**	**15227**	**473636**

2016 Data Summary - Average Weekday Profile
(2- Way flow)

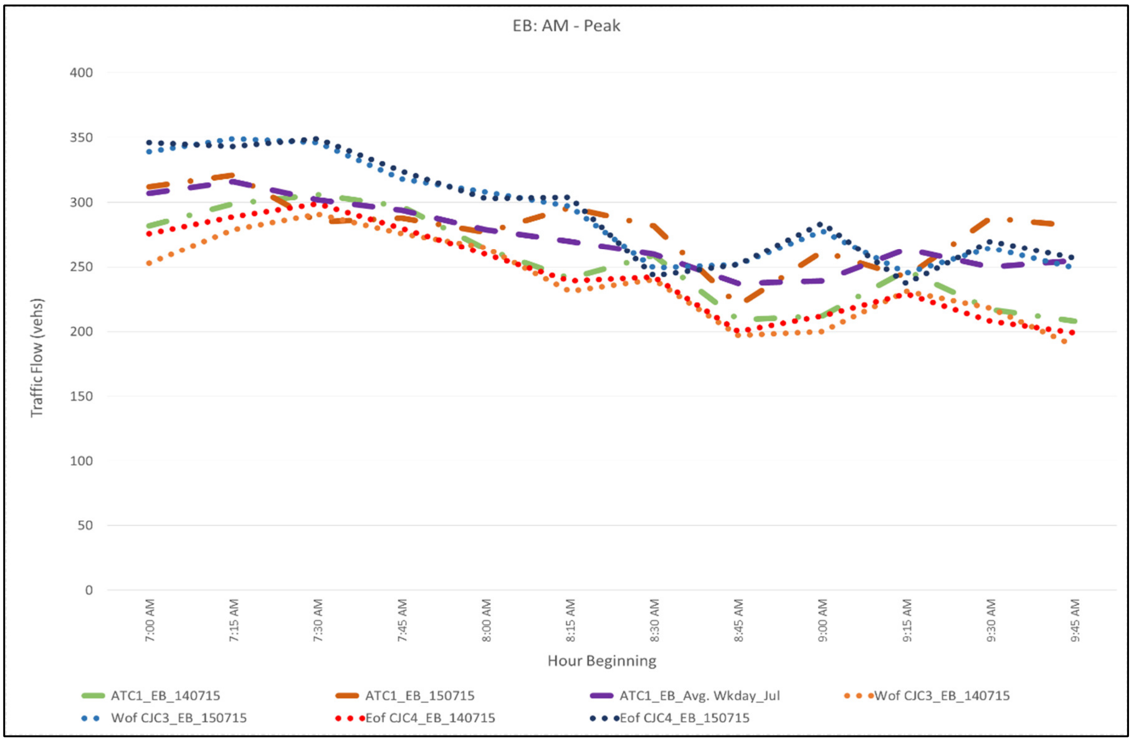


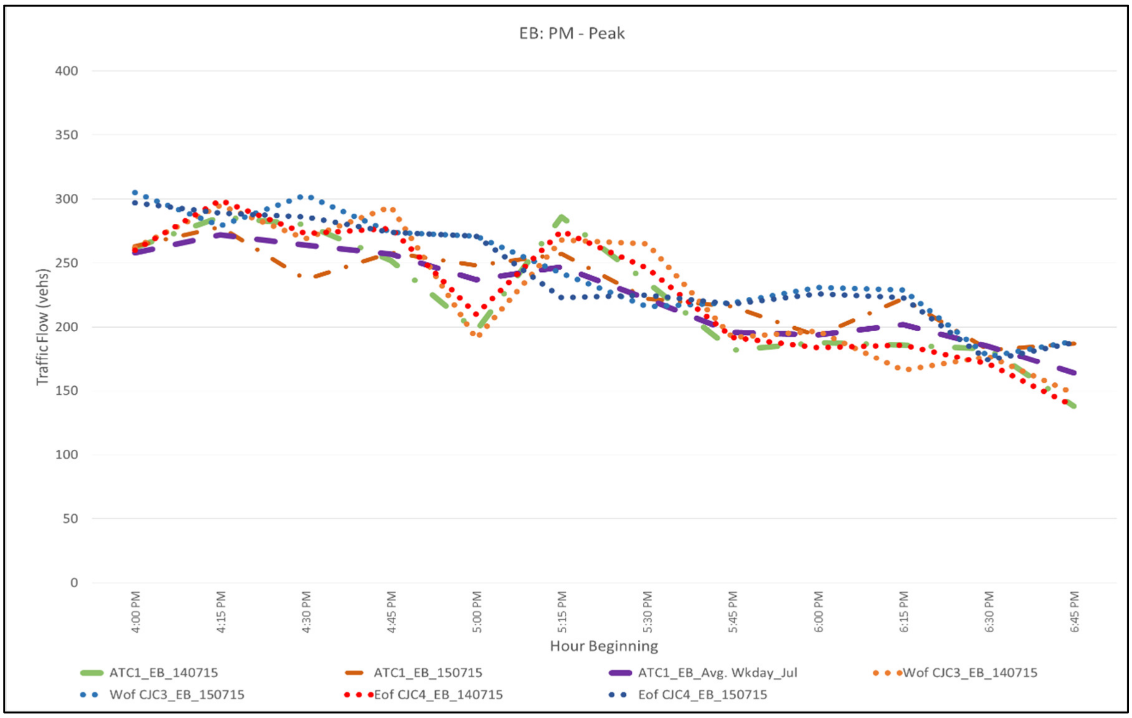
APPENDIX K

2015 Data Comparison: CJC vs ATC

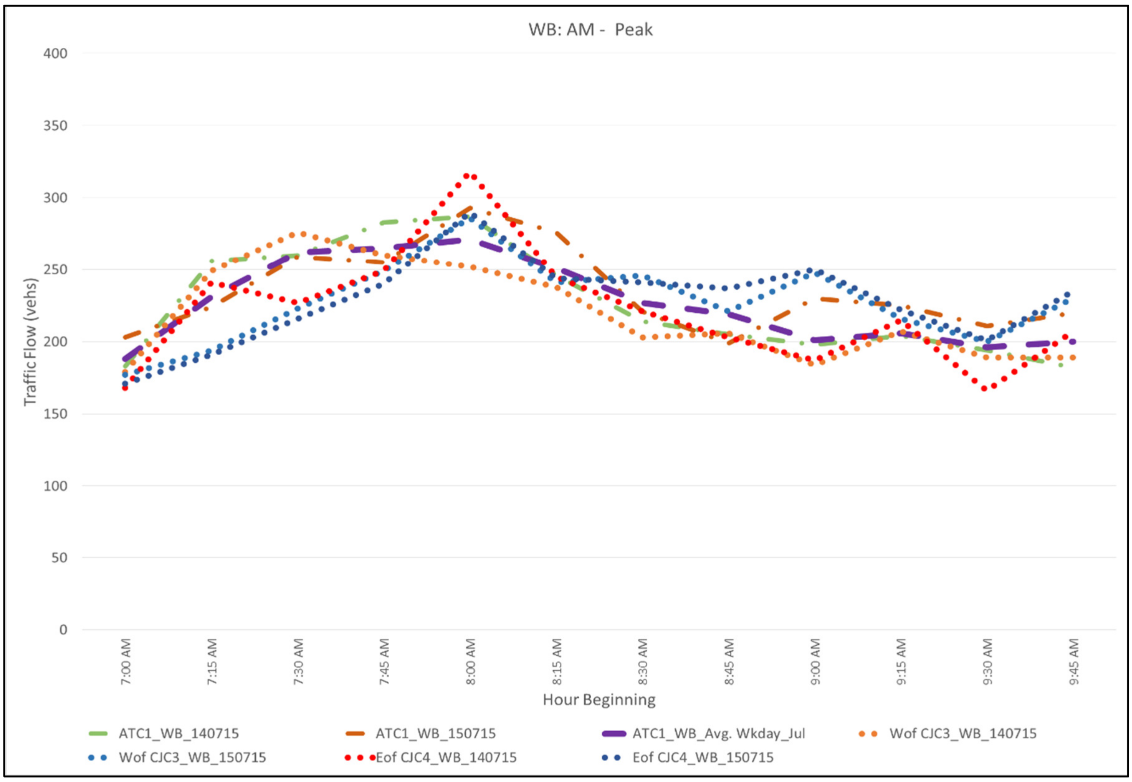
APPENDIX F: 2015 data - CJC (vs) ATC Comparisons

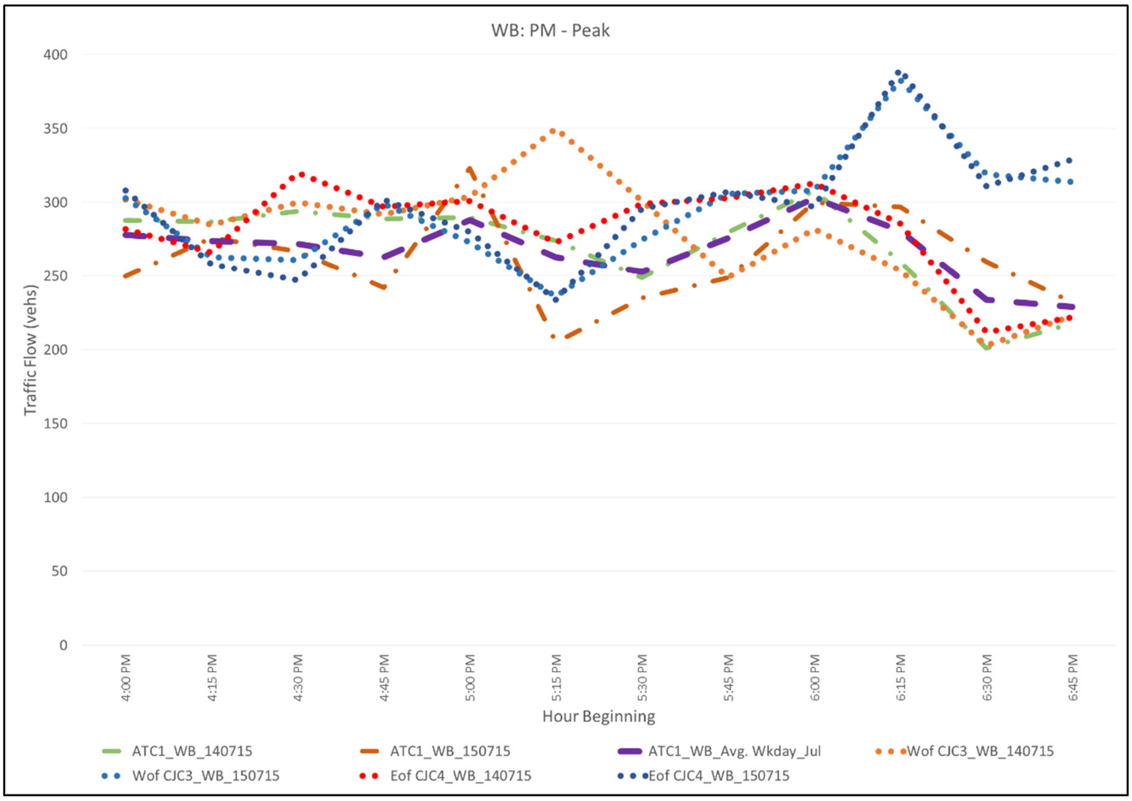
Comparison of CJC at Site 3 and Site 4 with ATC 1



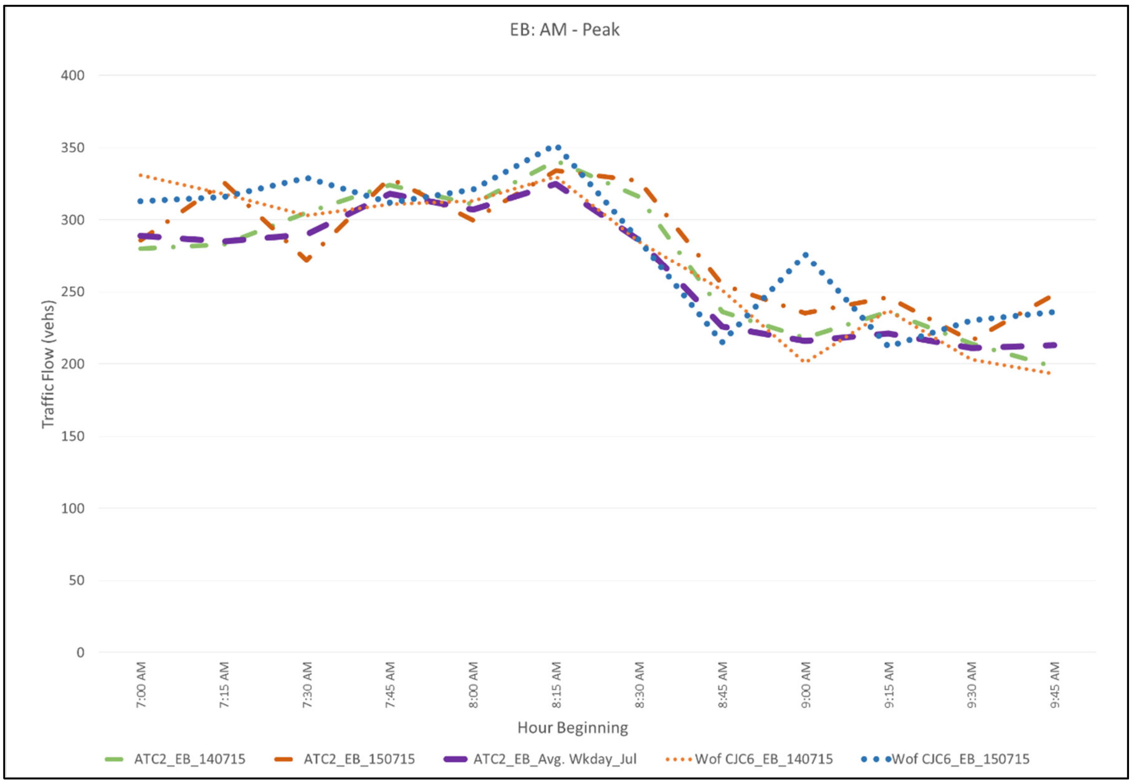


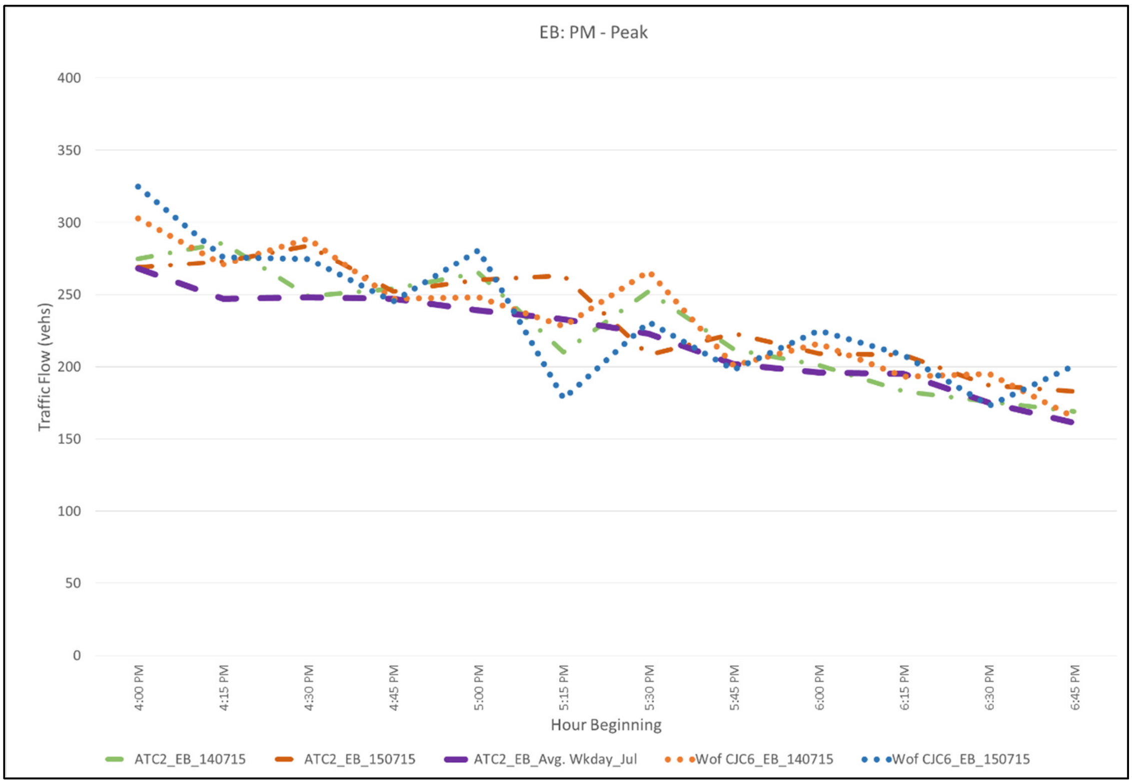
Comparison of CJC at Site 3 and Site 4 with ATC 1



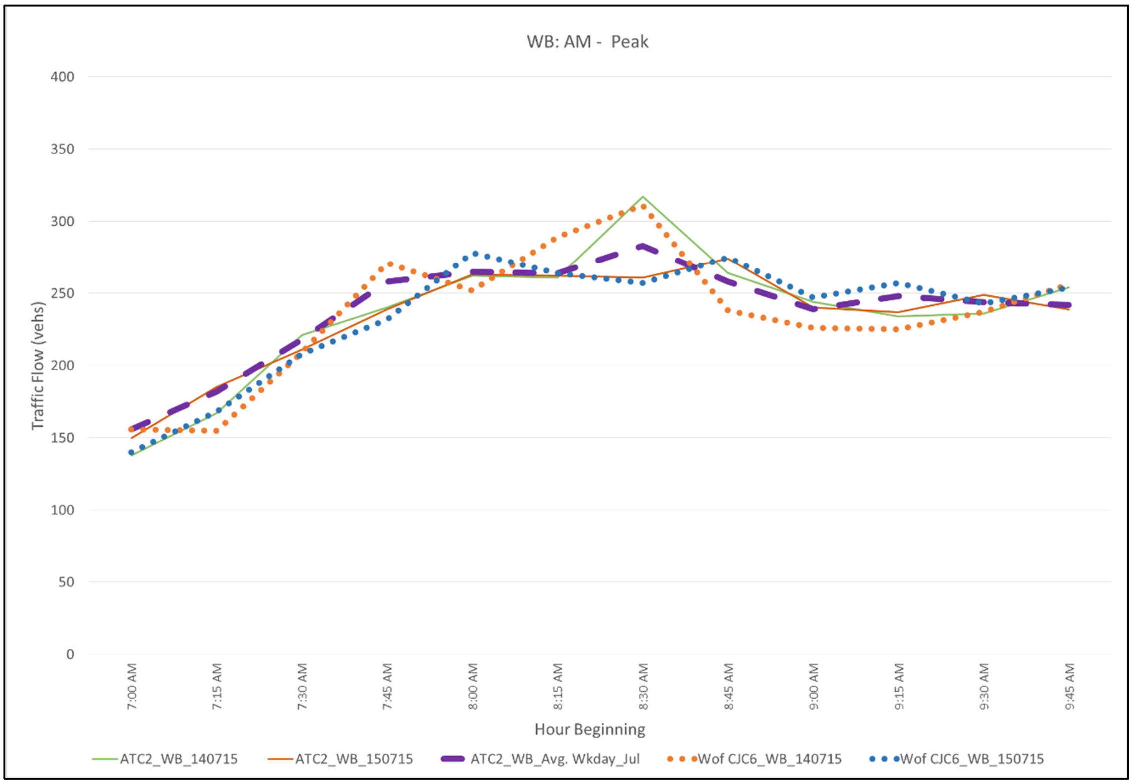


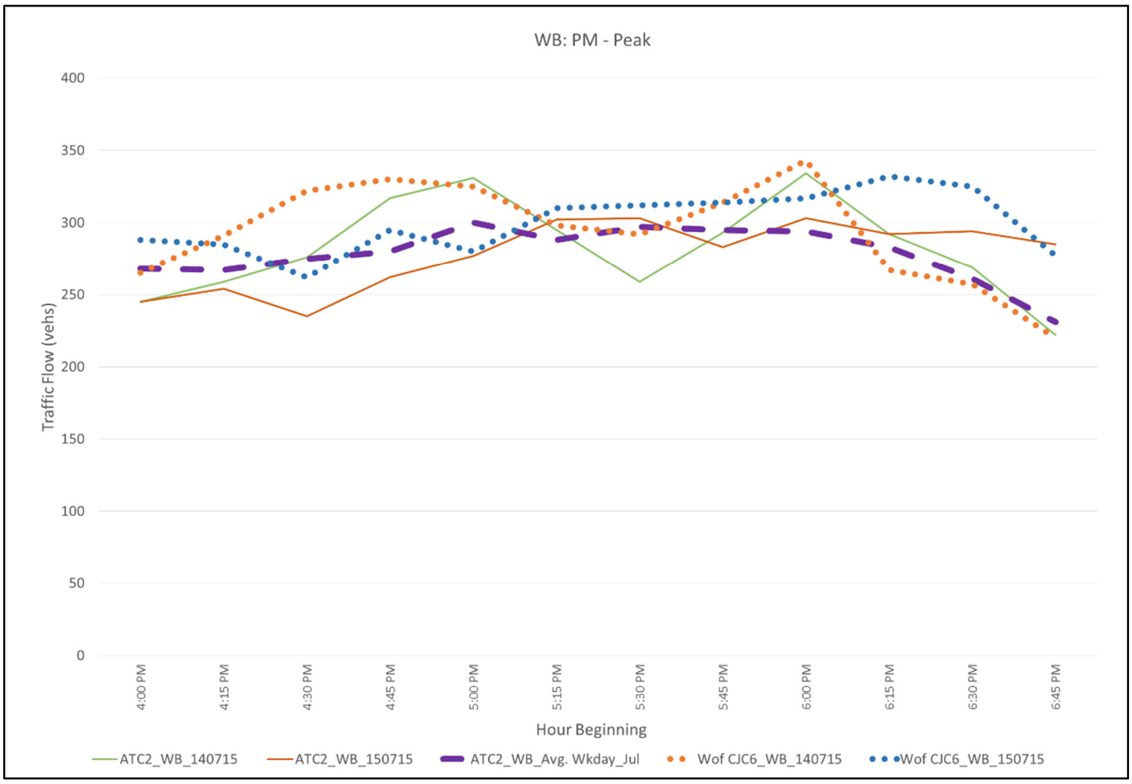
Comparison of CJC at Site 6 with ATC 2



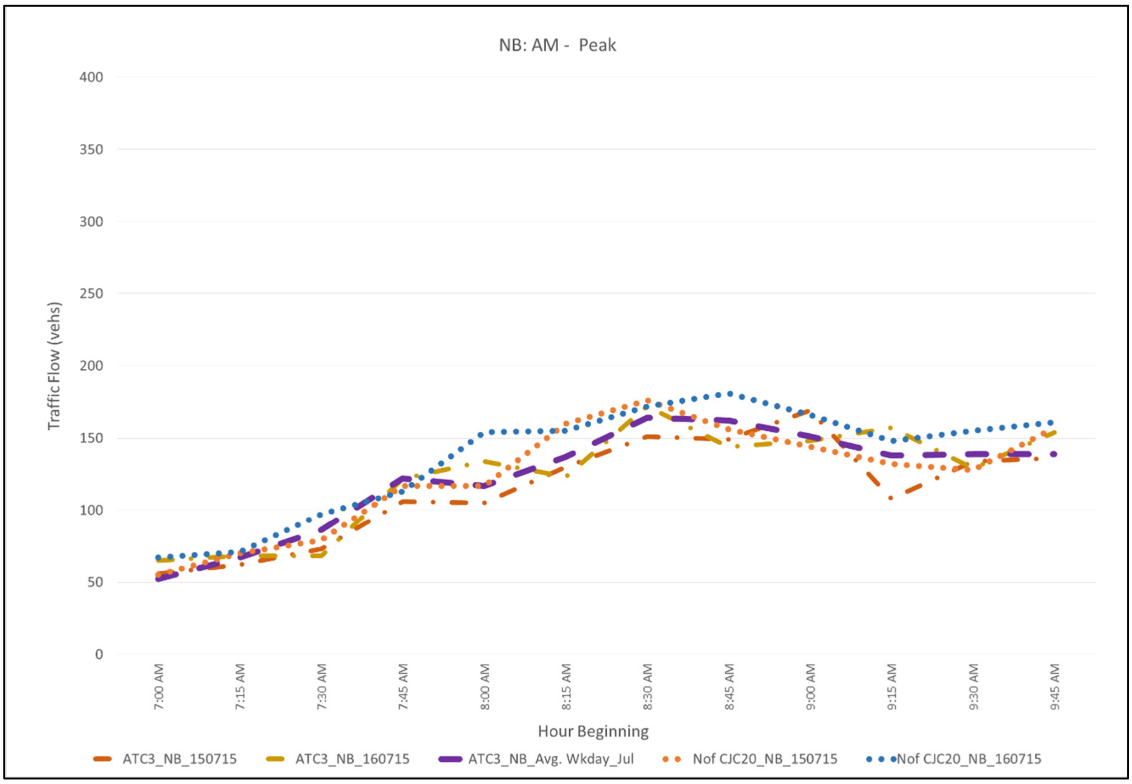


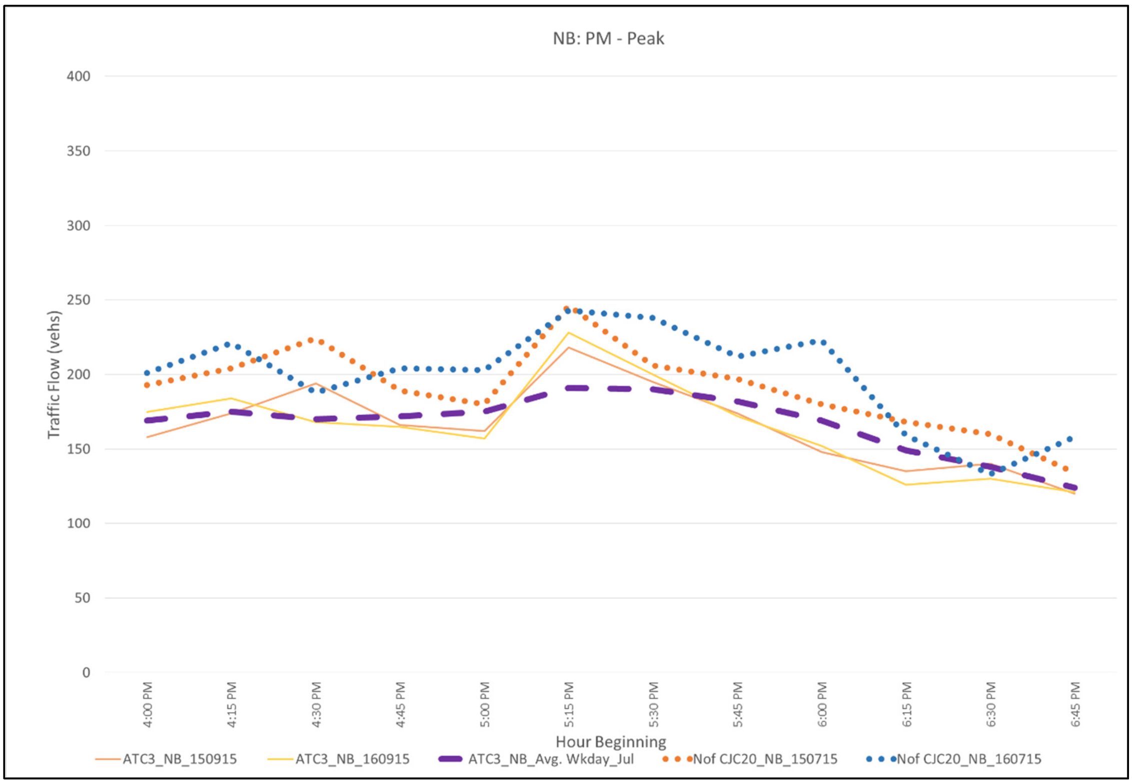
Comparison of CJC at Site 6 with ATC 2



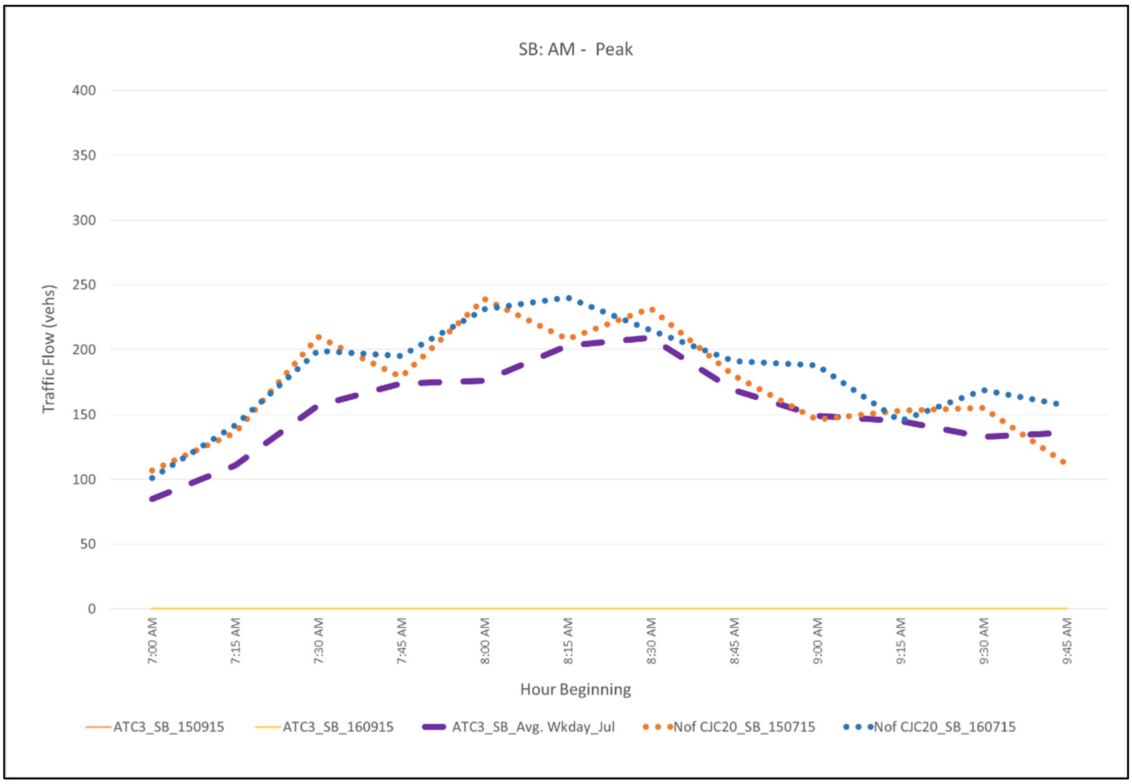


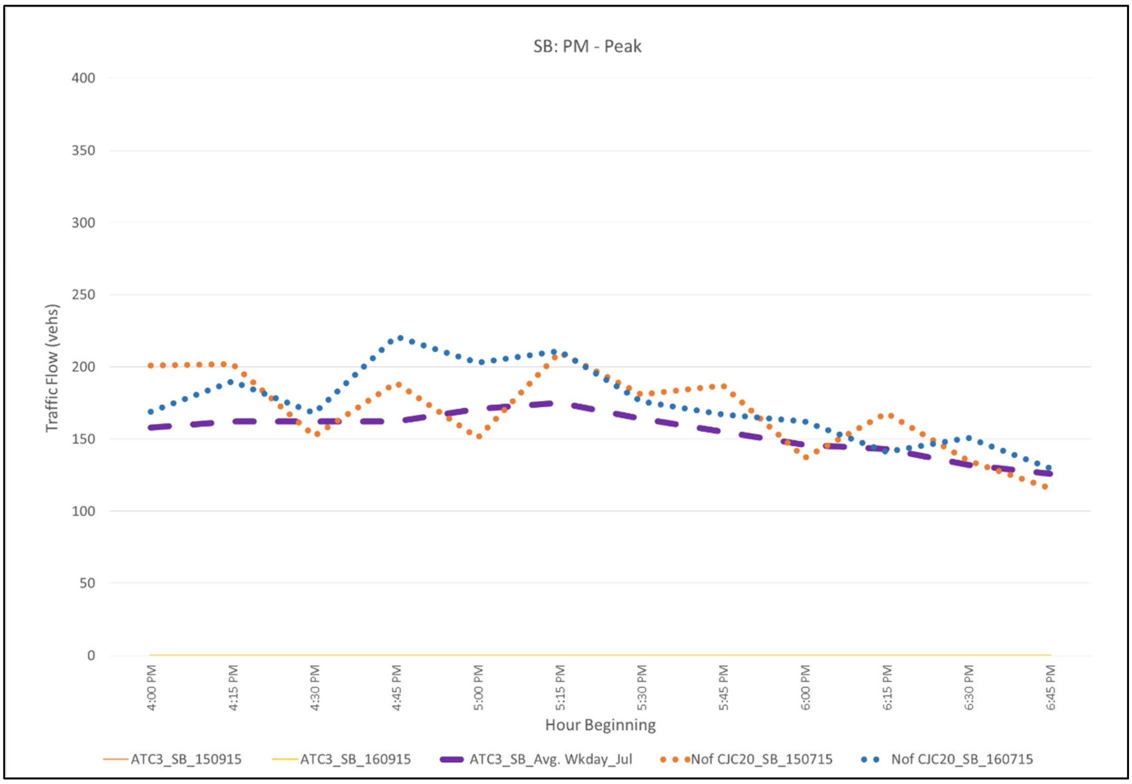
Comparison of CJC at Site 20 with ATC 3



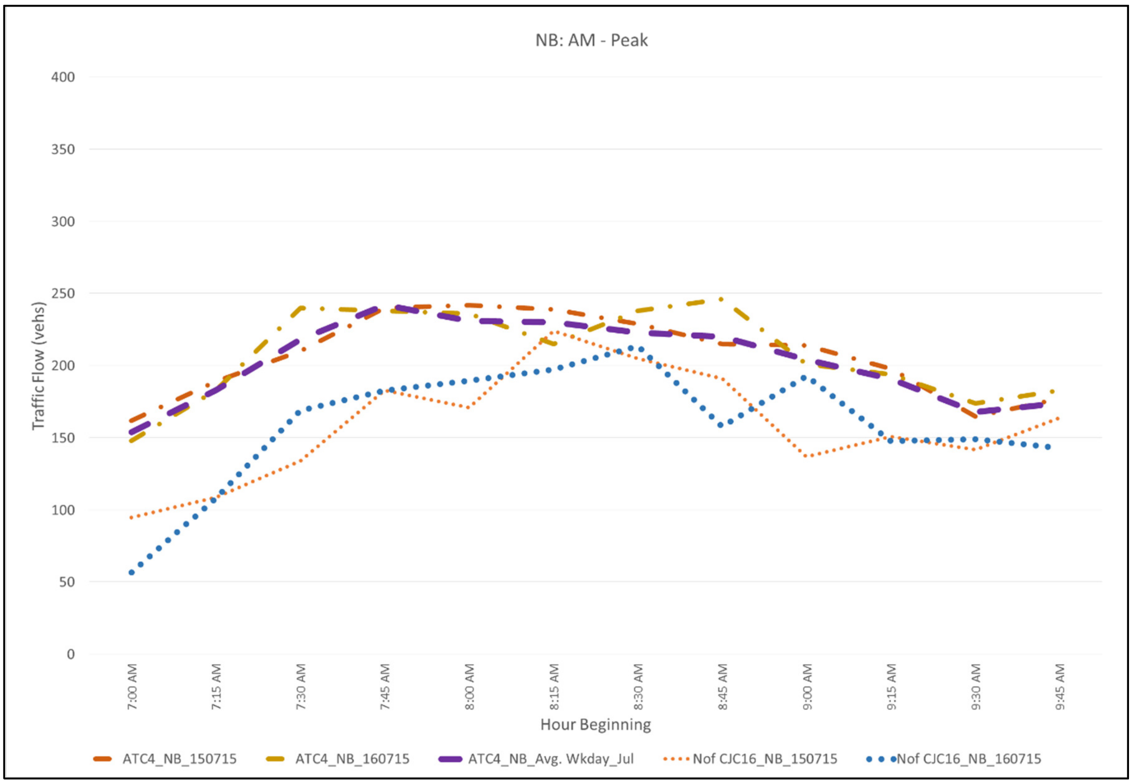


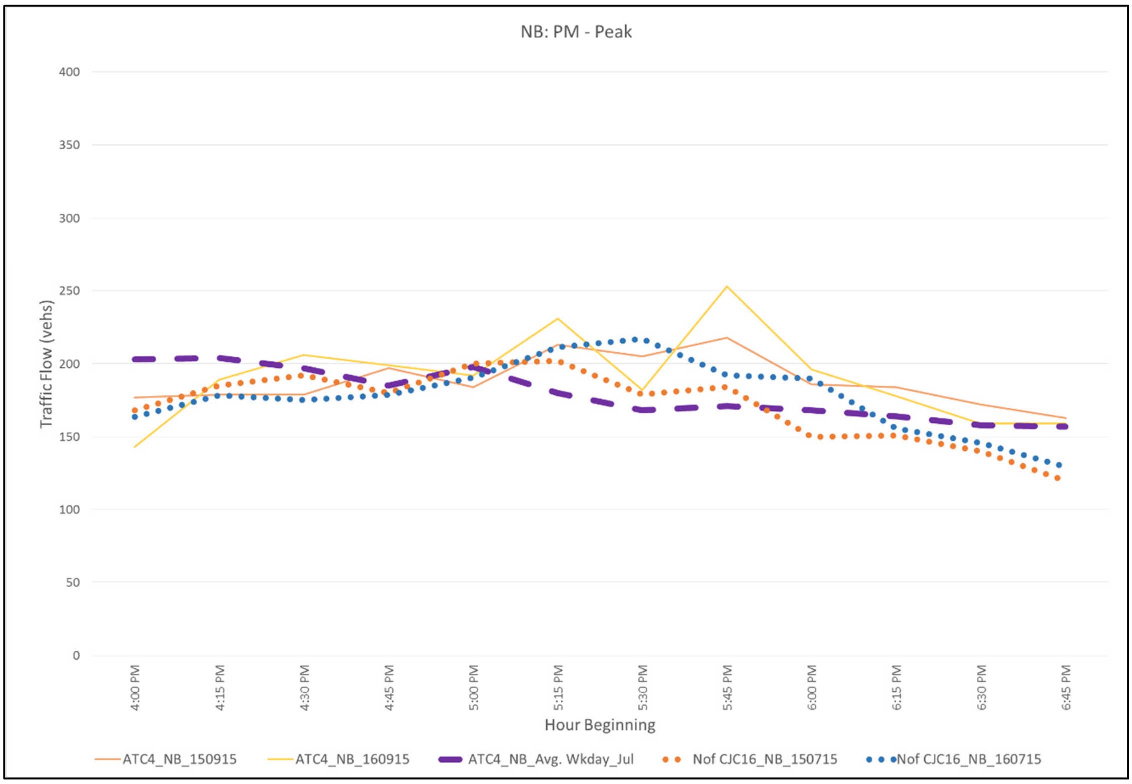
Comparison of CJC at Site 20 with ATC 3



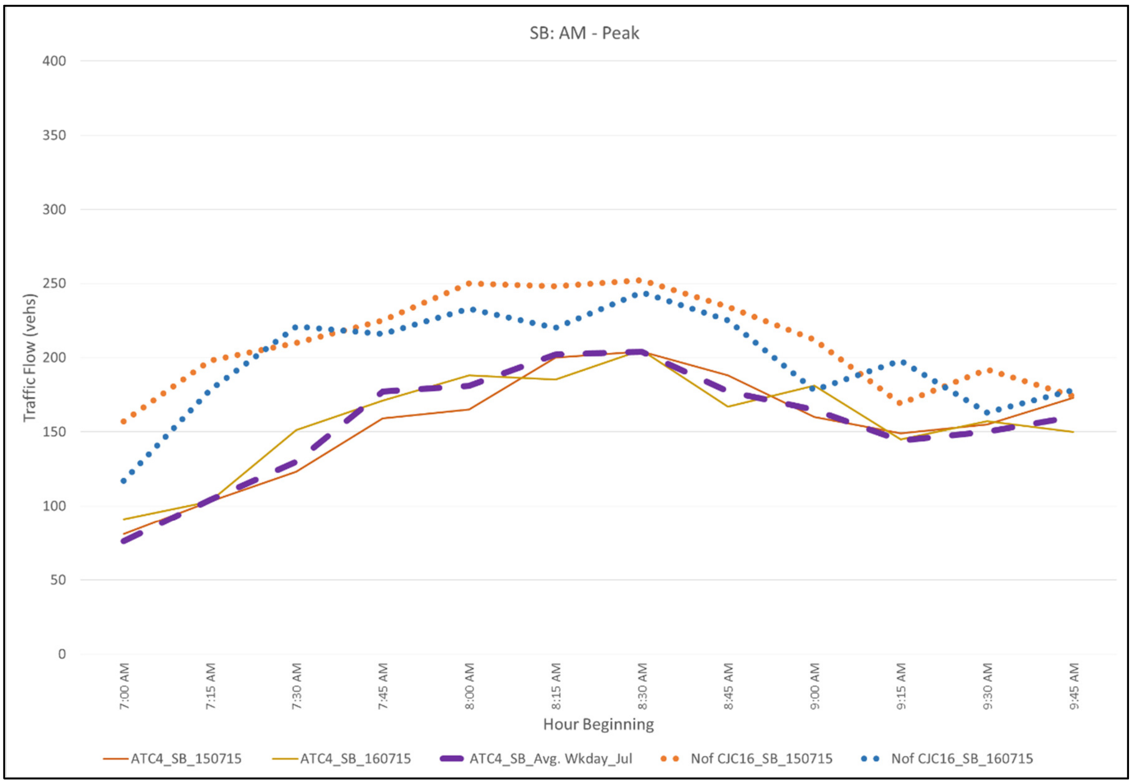


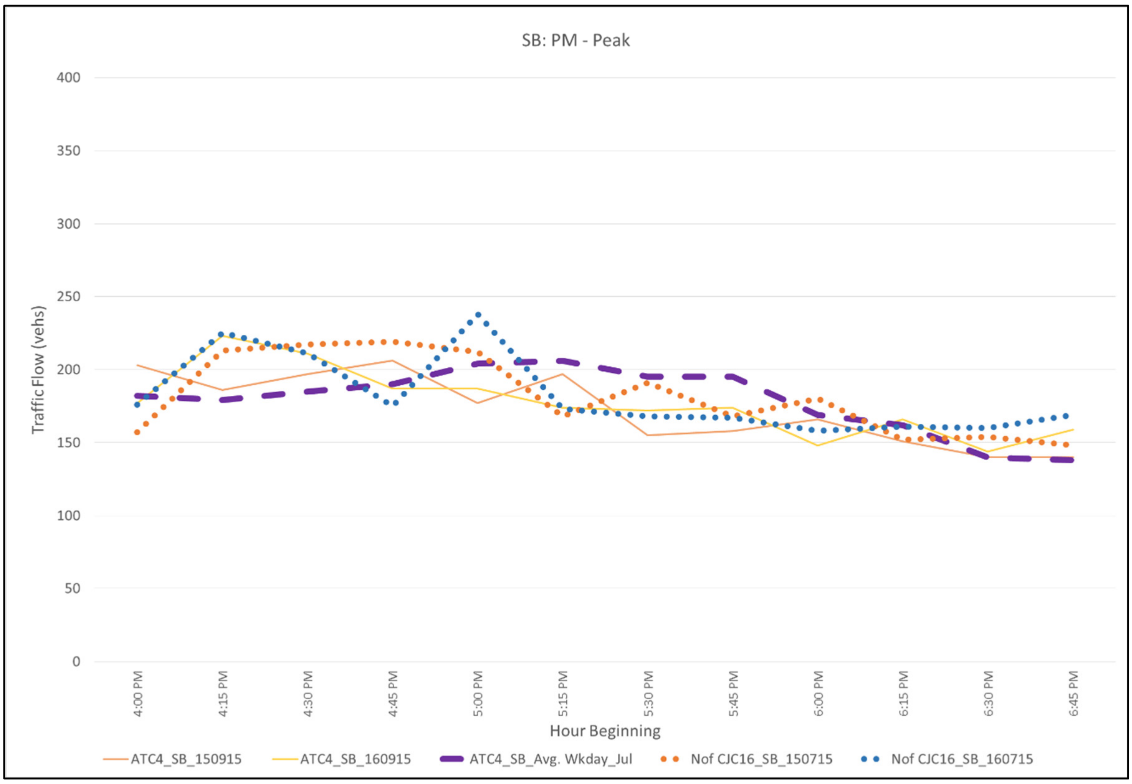
Comparison of CJC at Site 16 with ATC 4



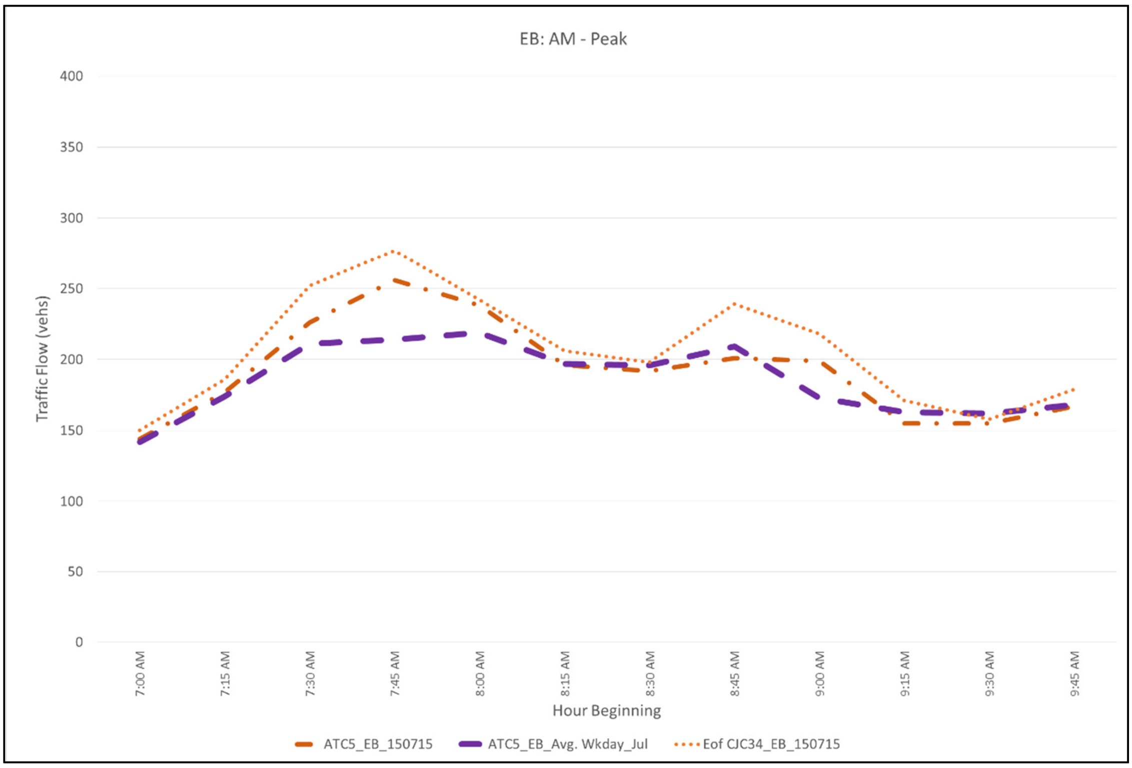


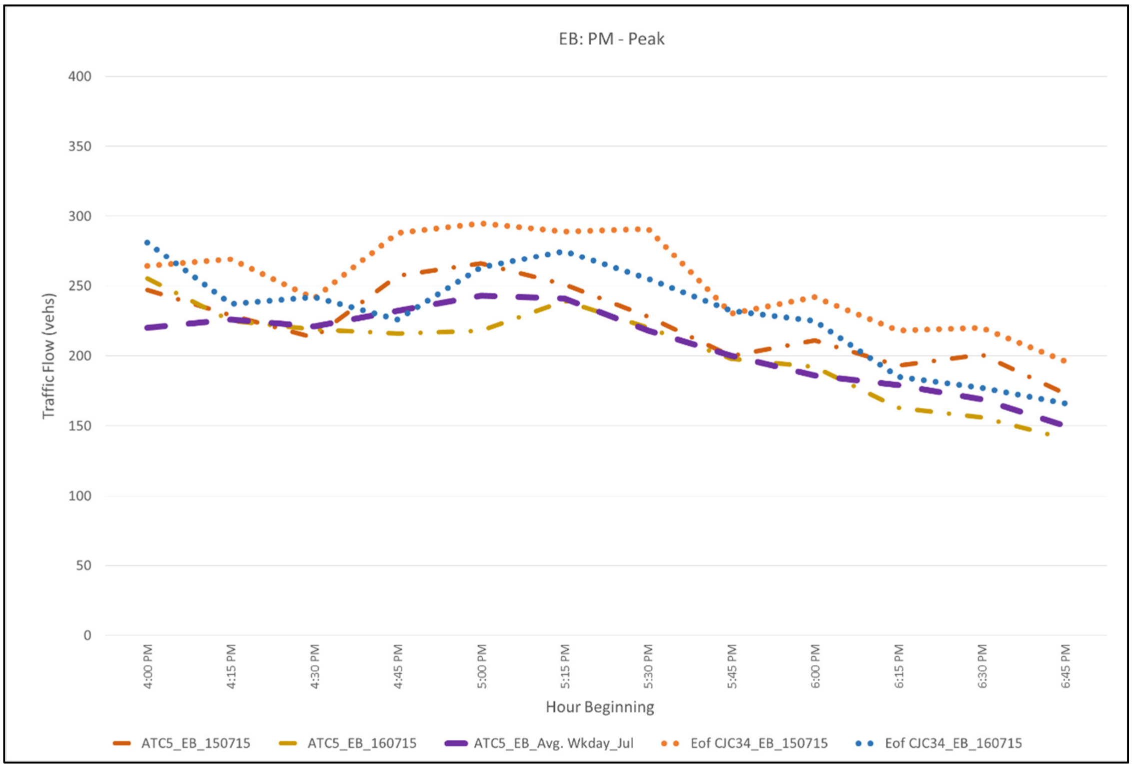
Comparison of CJC at Site 16 with ATC 4



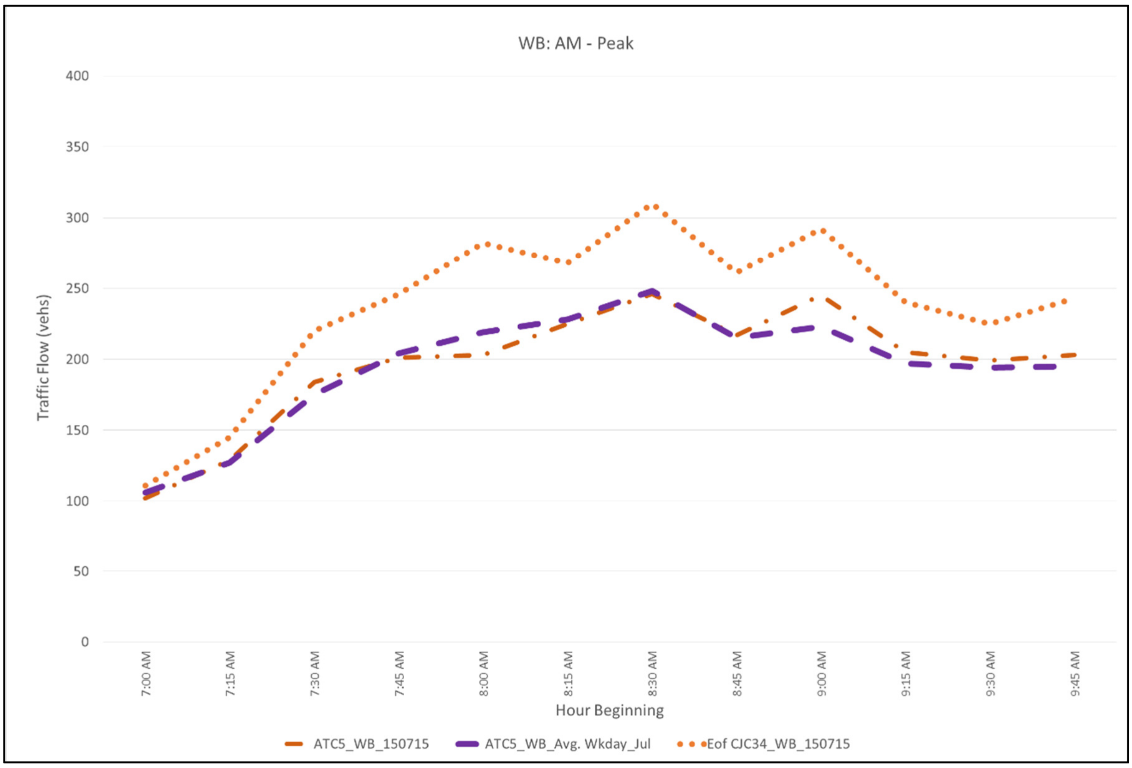


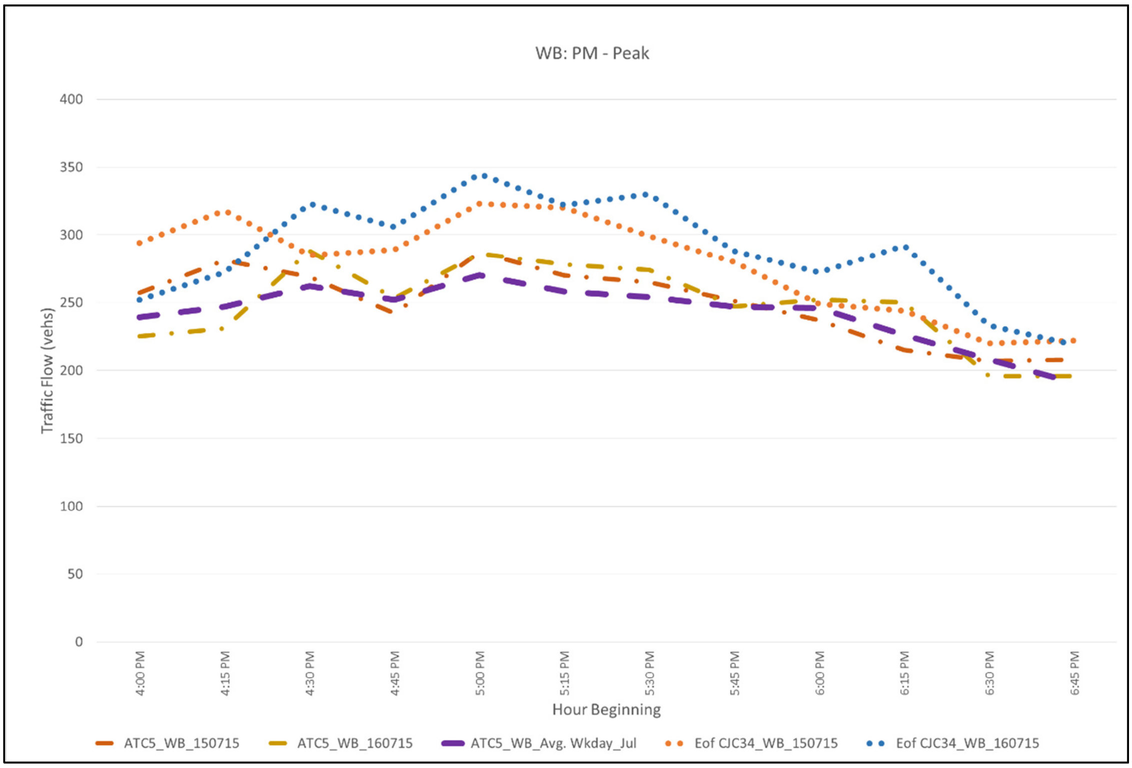
Comparison of CJC at Site 34 with ATC 5



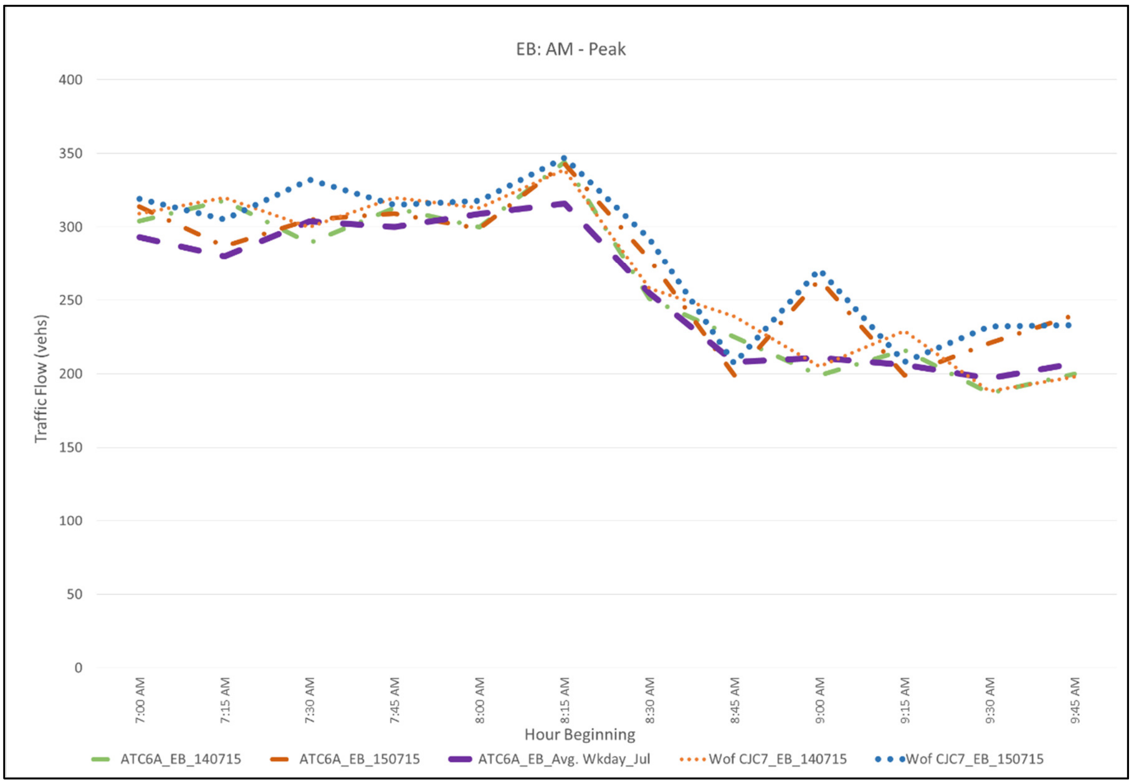


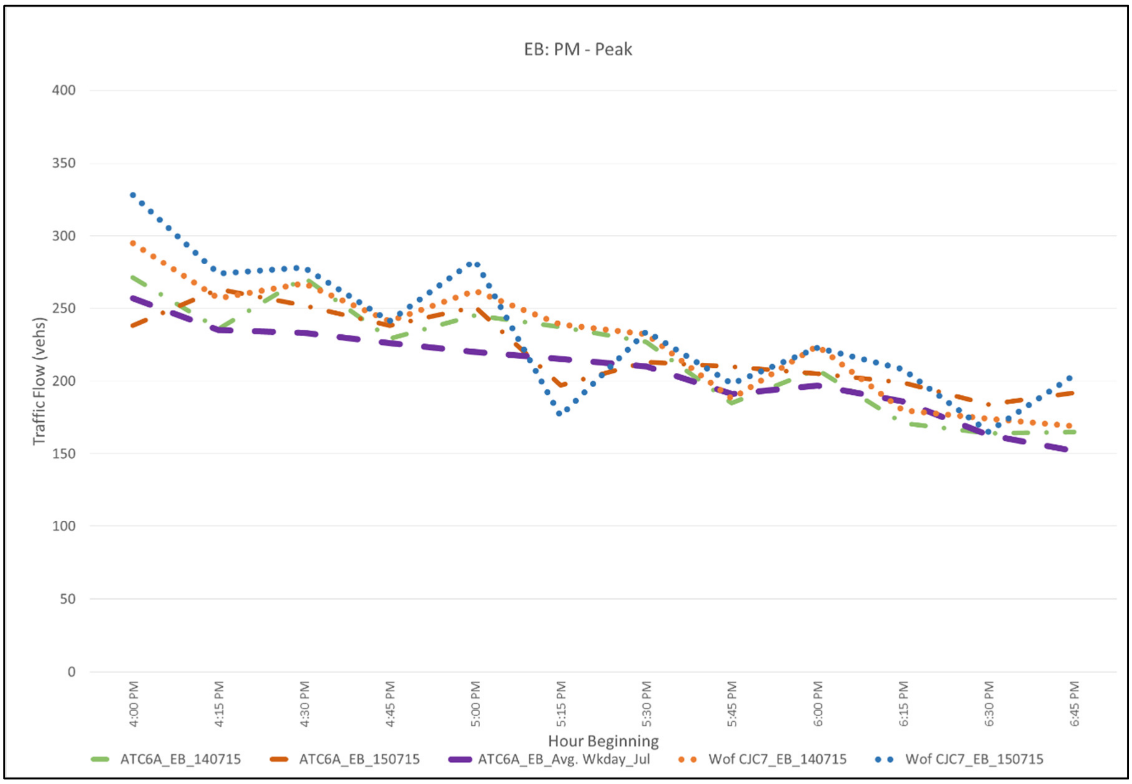
Comparison of CJC at Site 34 with ATC 5



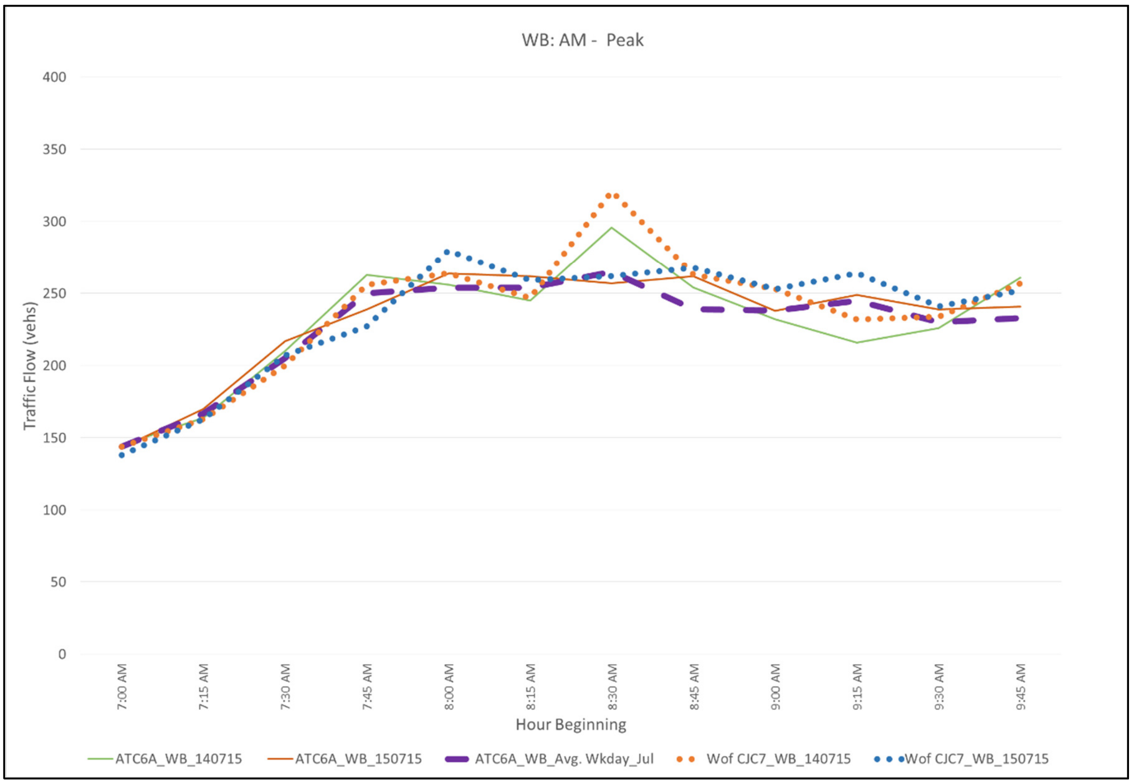


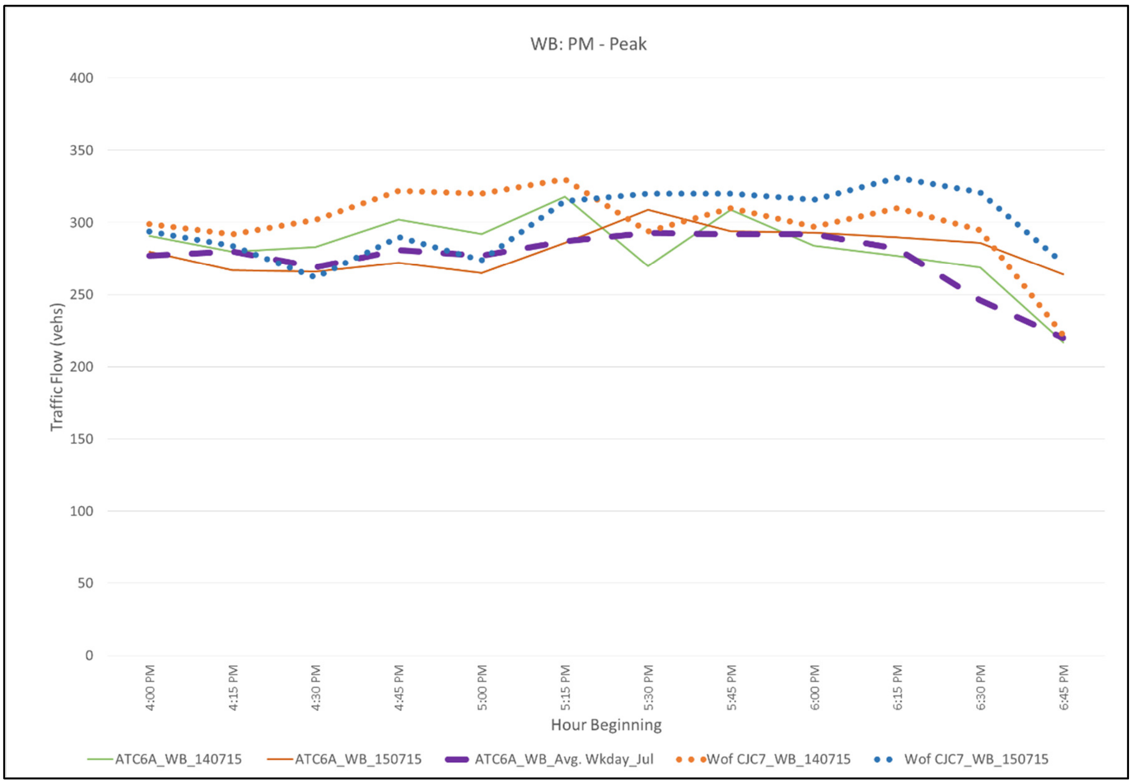
Comparison of CJC at Site 7 with ATC 6A



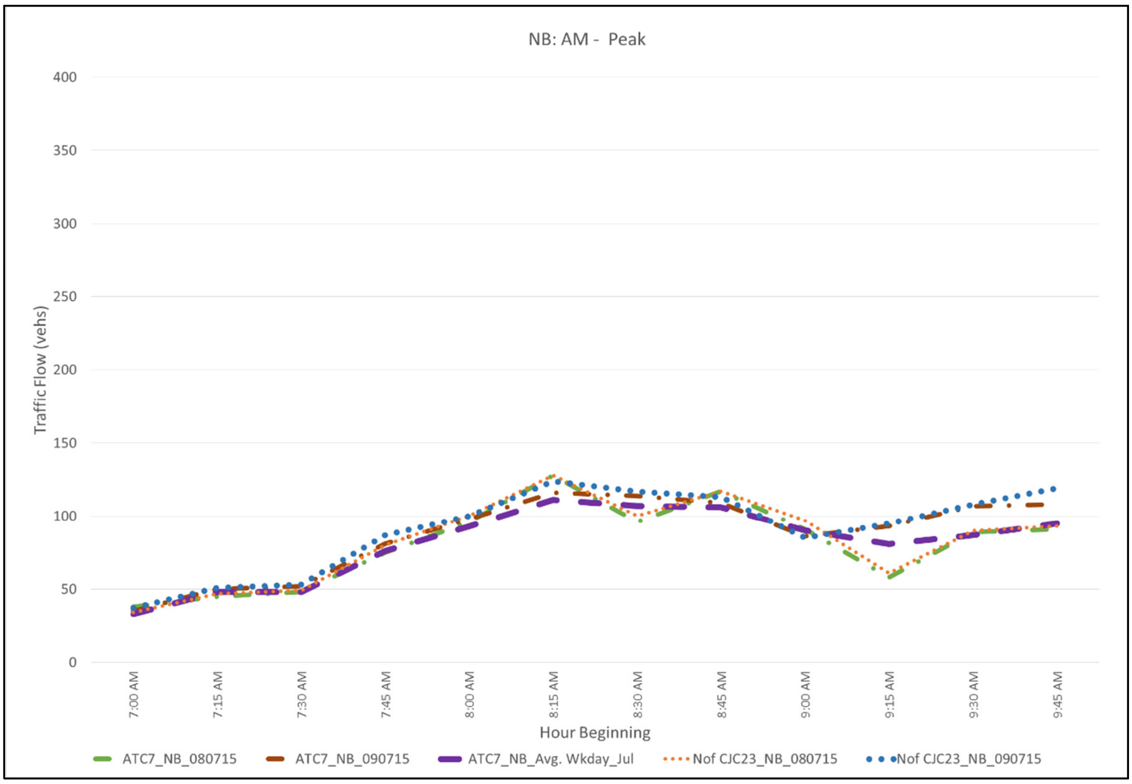


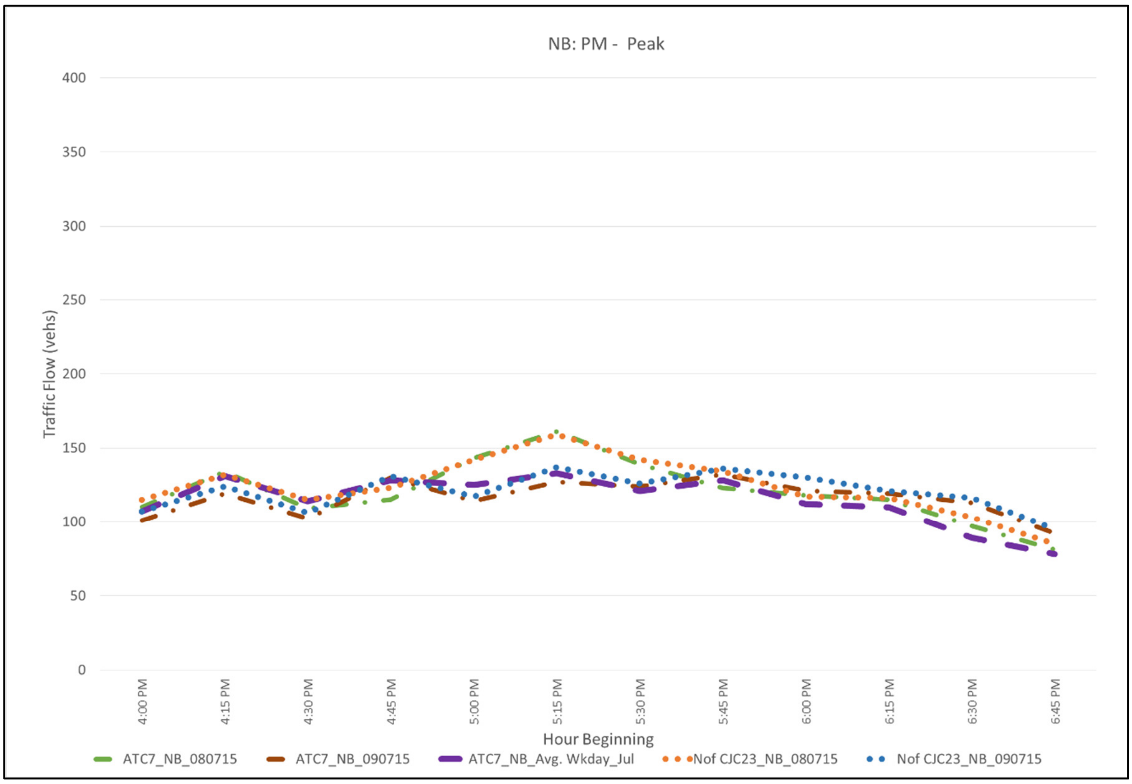
Comparison of CJC at Site 7 with ATC 6A



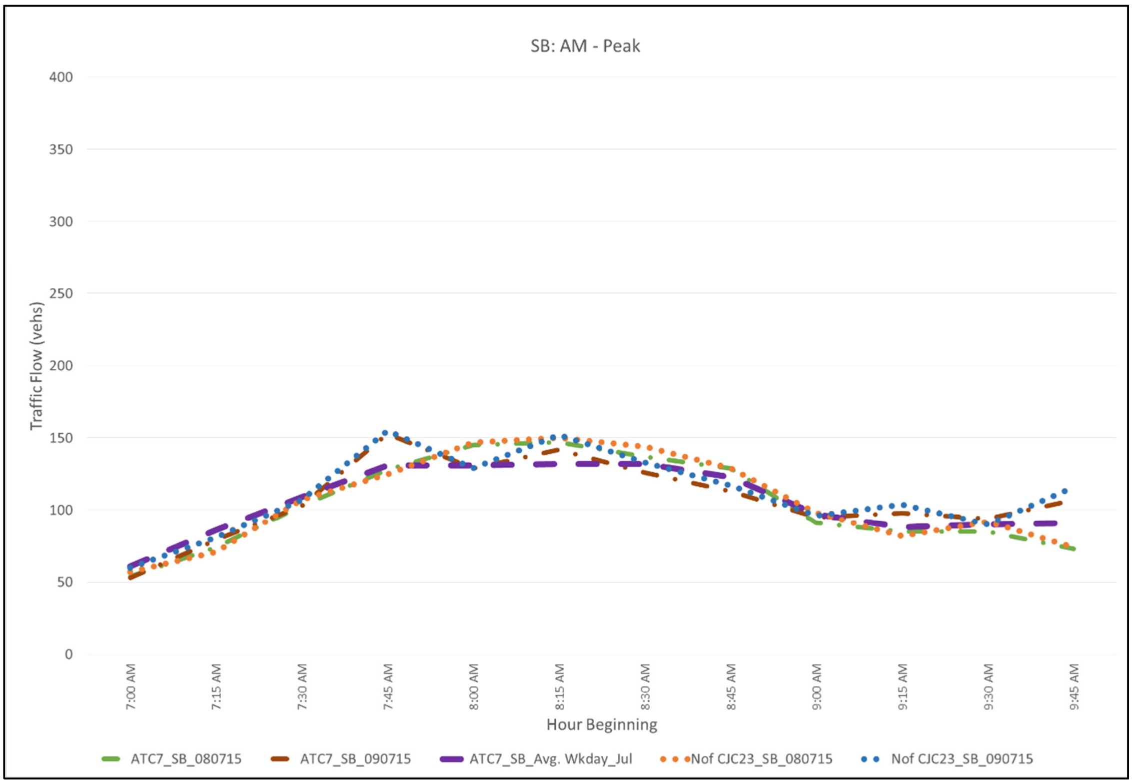


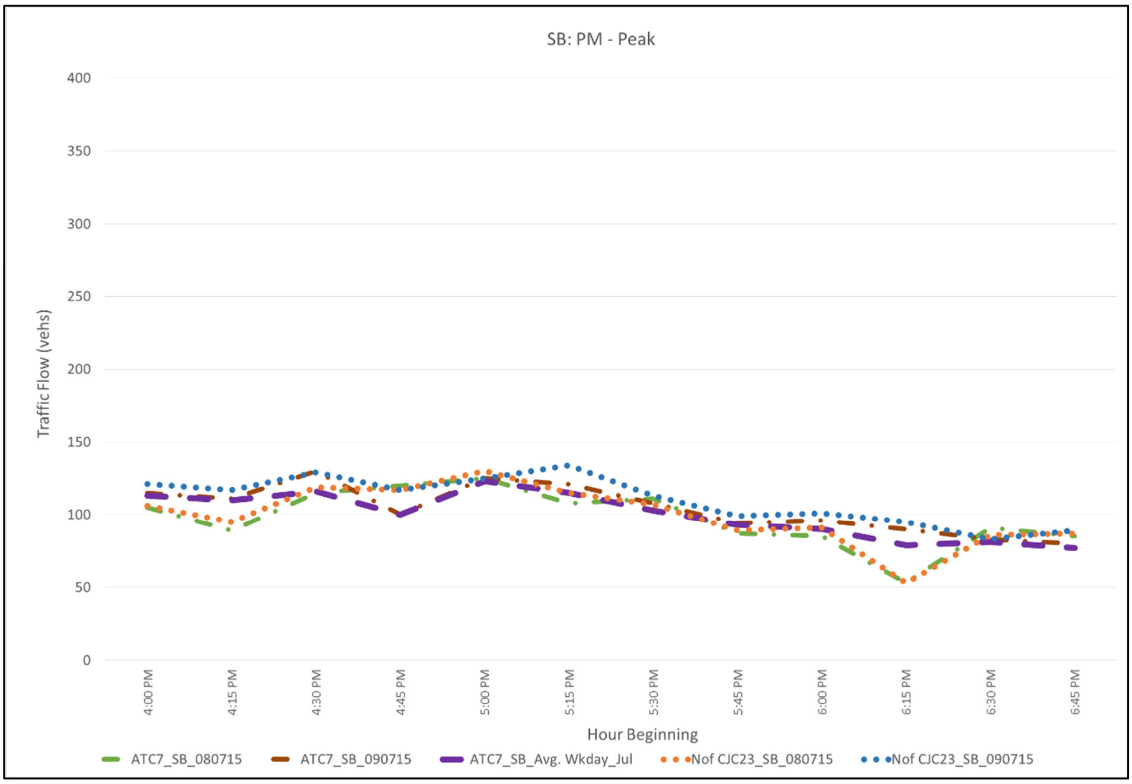
Comparison of CJC at Site 23 with ATC 7





Comparison of CJC at Site 23 with ATC 7



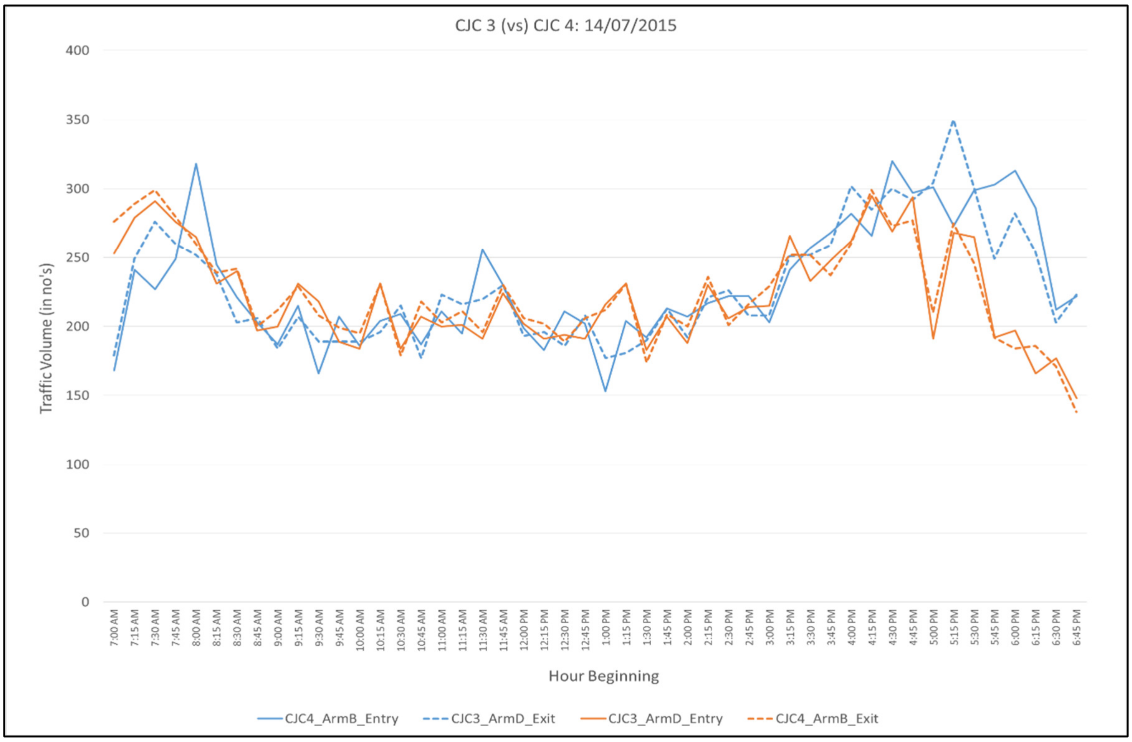


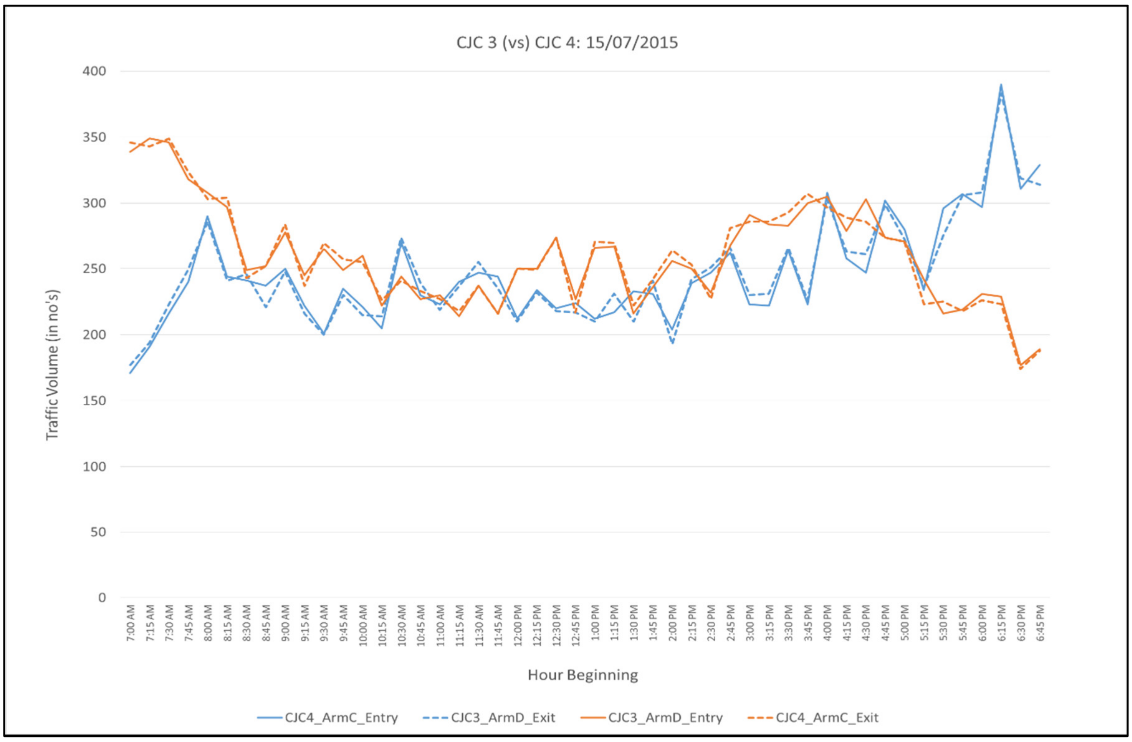
APPENDIX L

2015 Data: CJC vs CJC Comparison

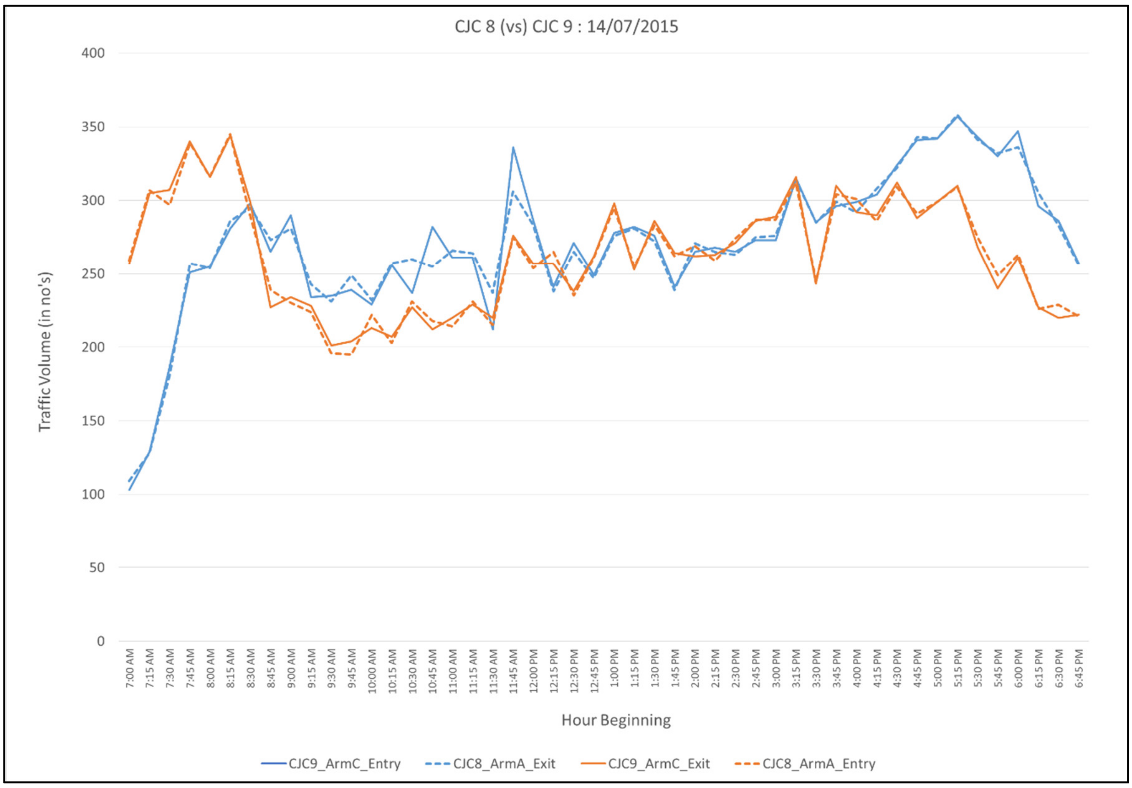
APPENDIX G: 2015 data - CJC vs CJC Comparisons

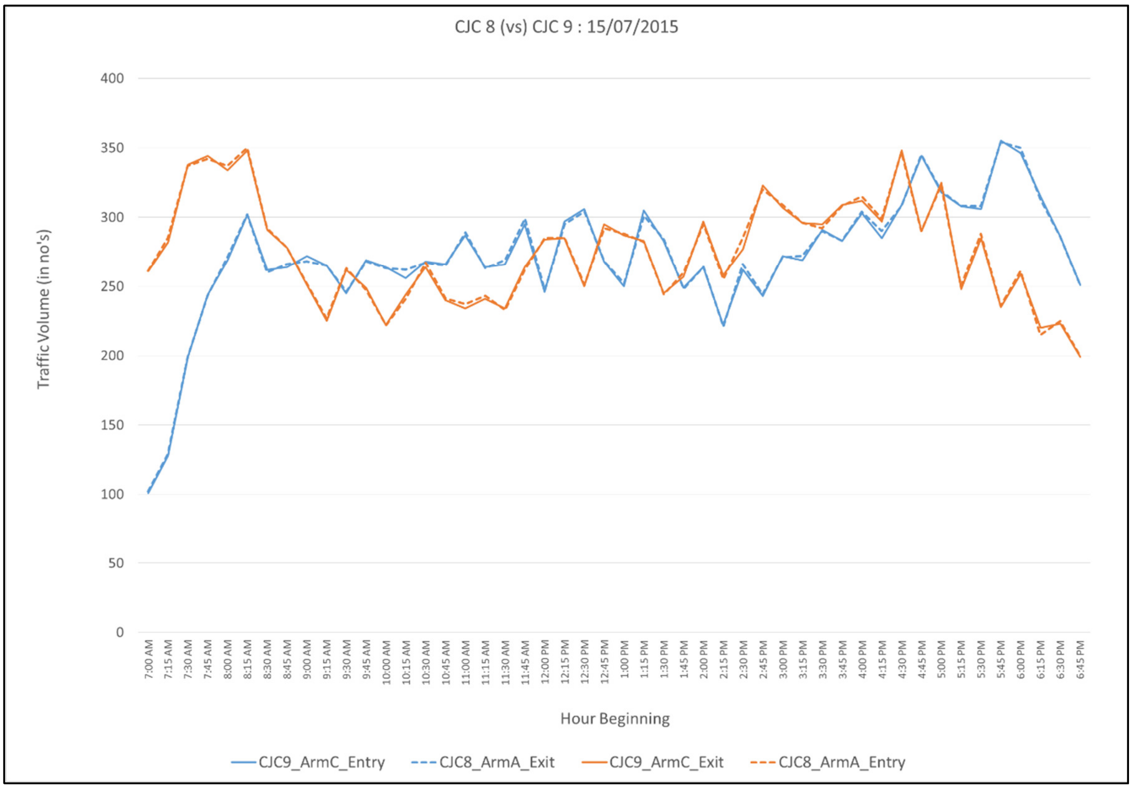
Area 1: Comparison of CJC 3 and CJC 4 on A585 Garstang New Road (EB-WB)



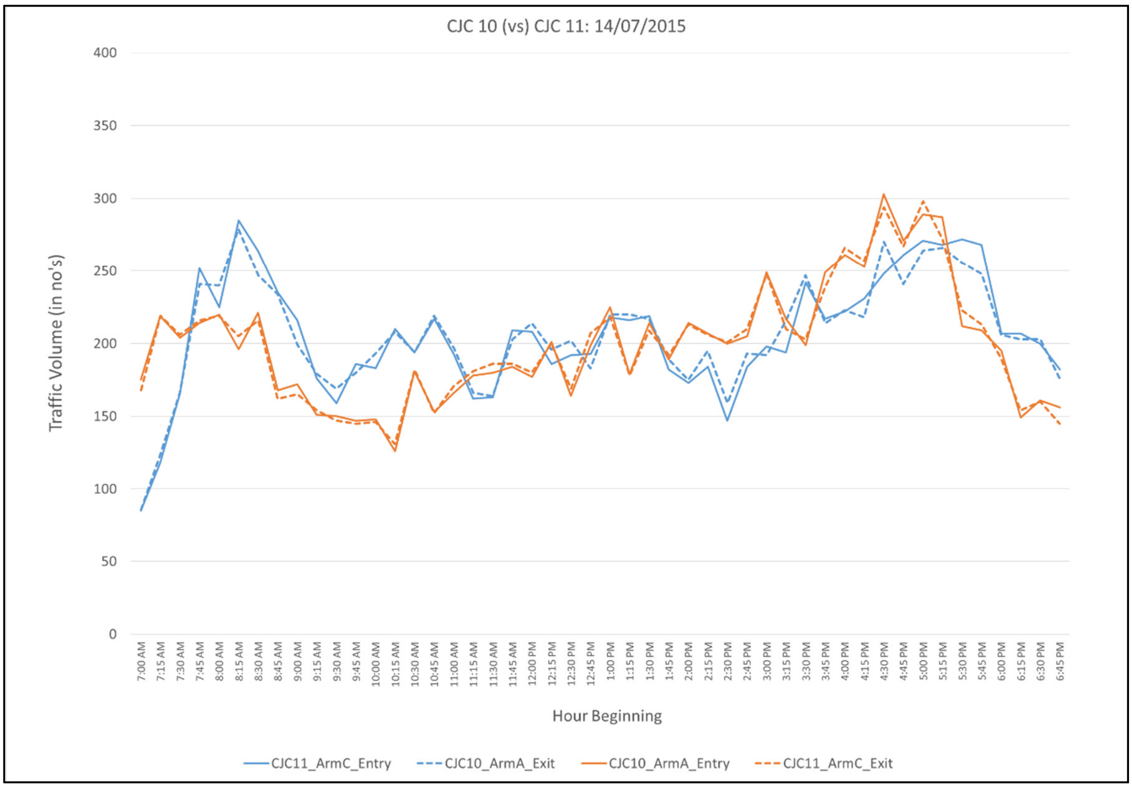


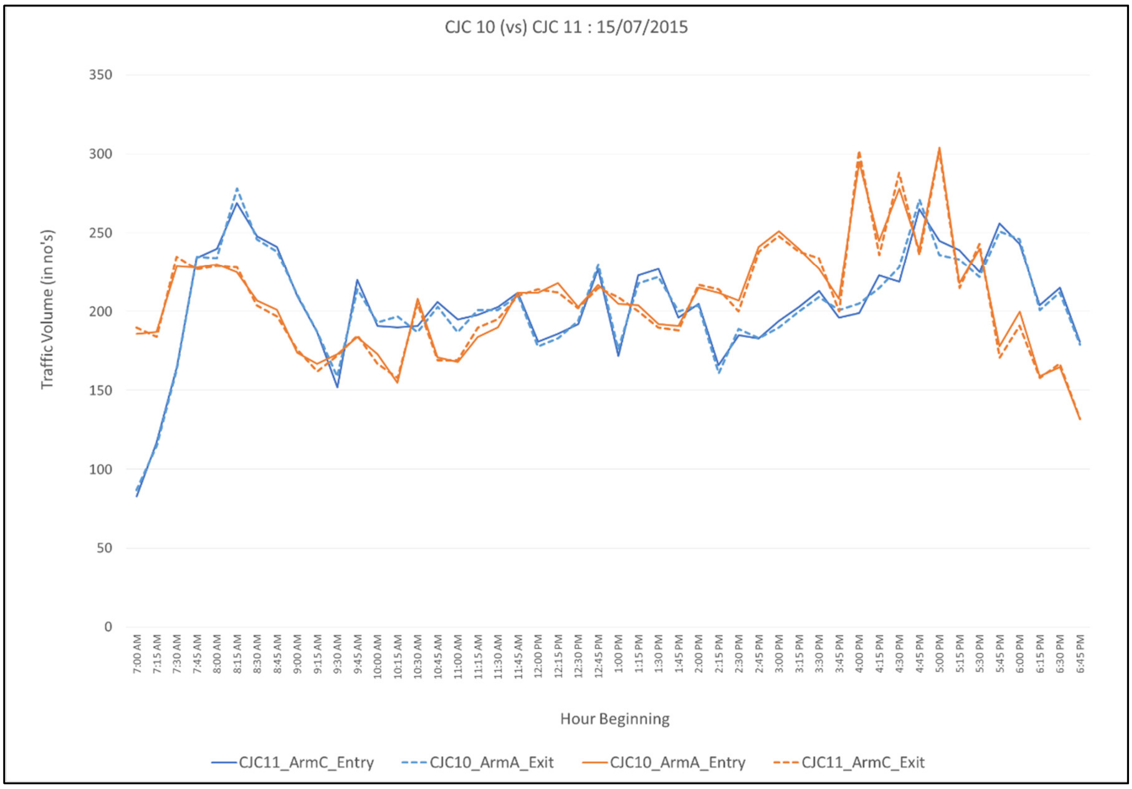
Area 1: Comparison of CJC 8 and CJC 9 on A585 Amounderness Way (NB-SB)



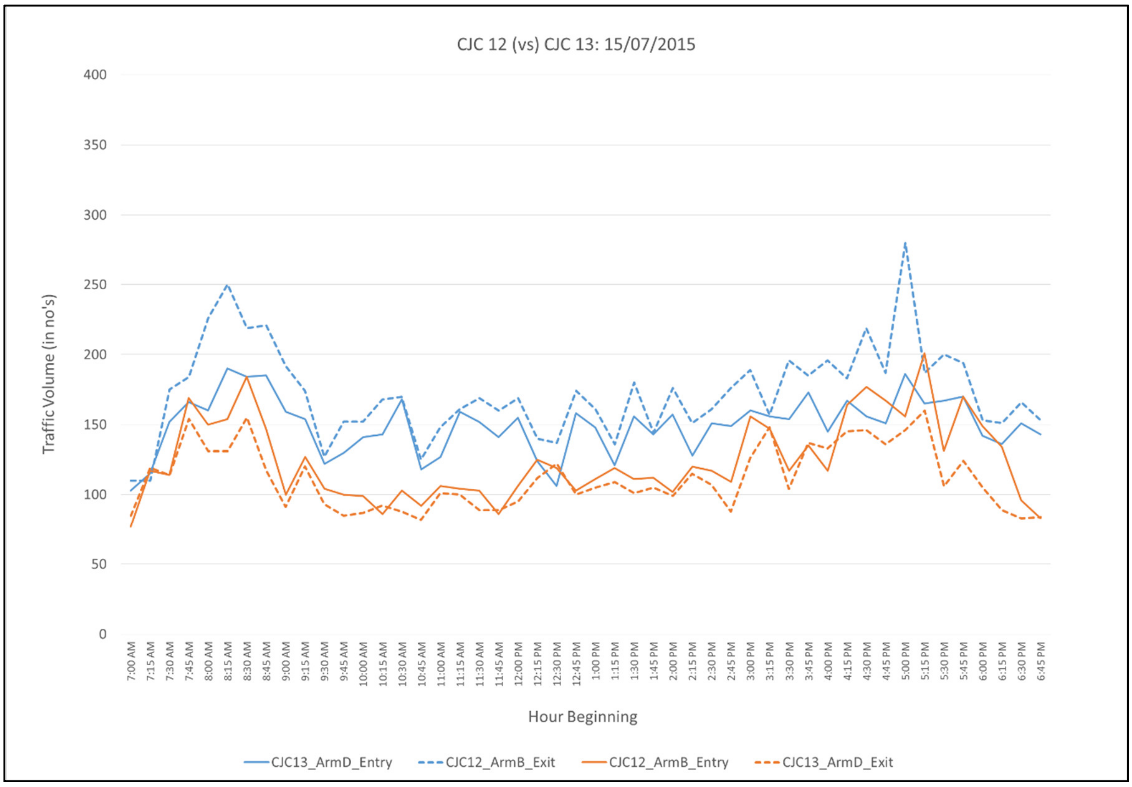


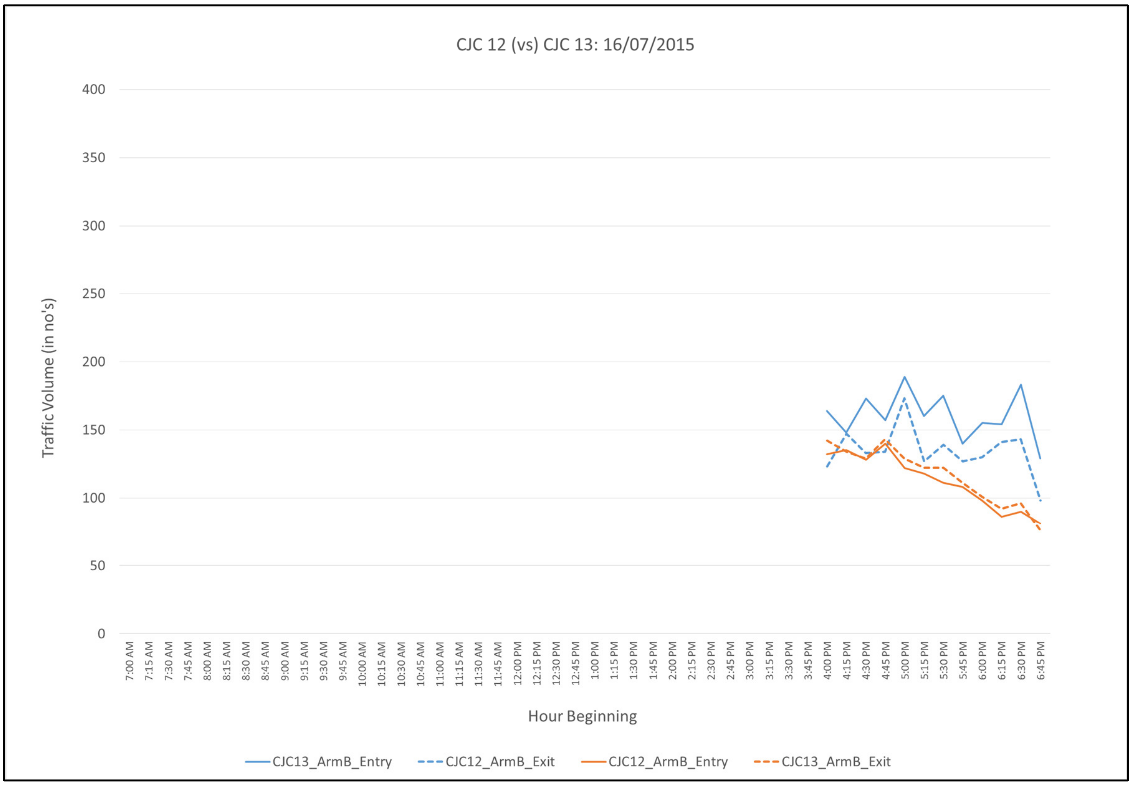
Area 1: Comparison of CJC 10 and CJC 11 on A585 Amounderness Way (NB-SB)



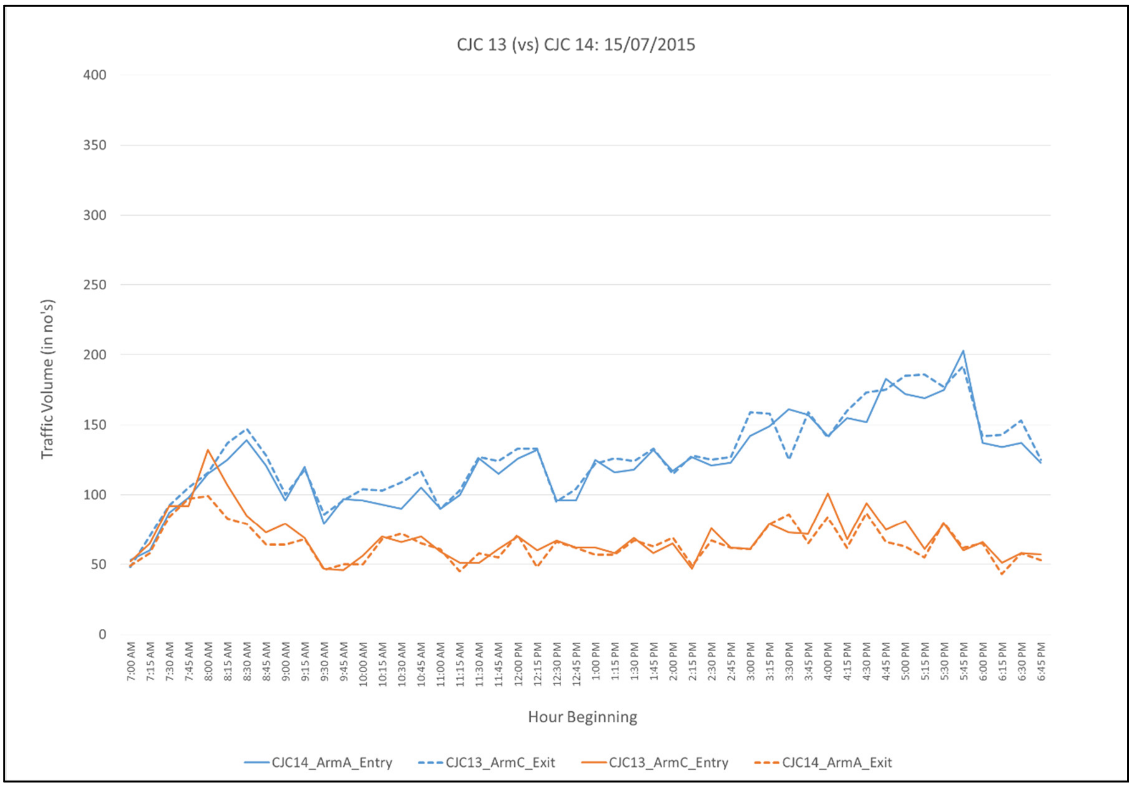


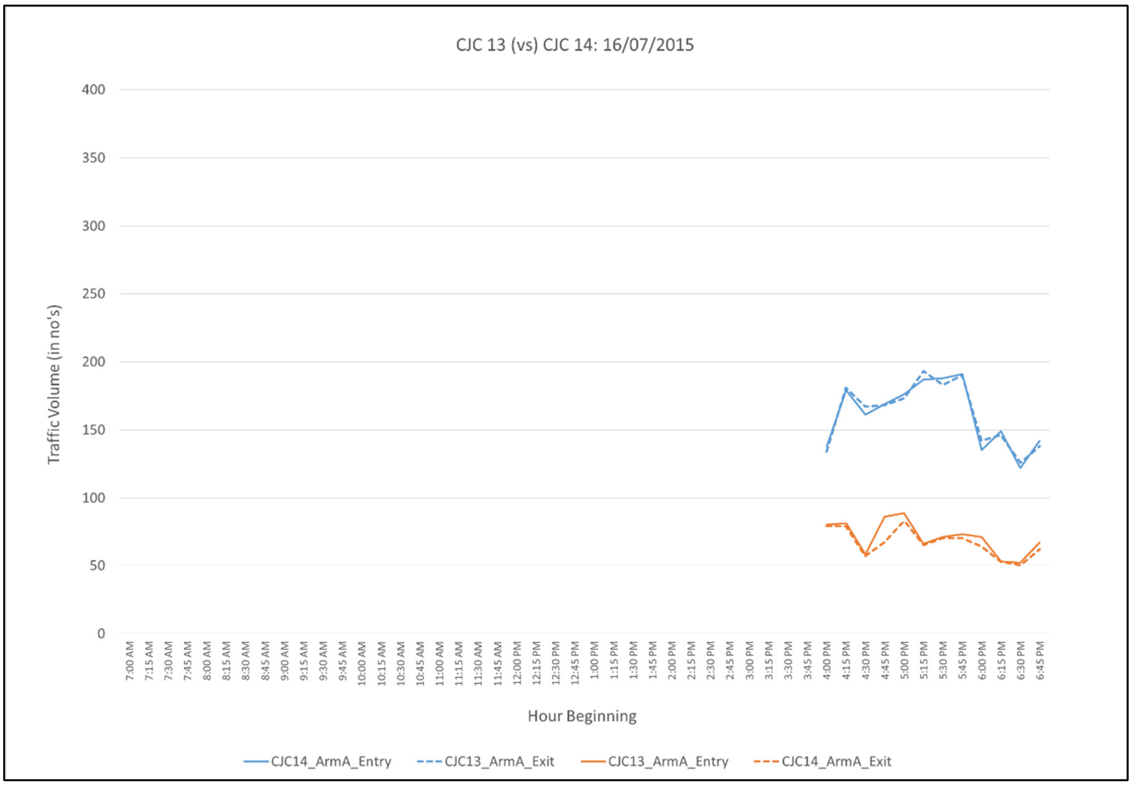
Area 2: Comparison of CJC 12 and CJC 13 on Garstang Road East (EB-WB)



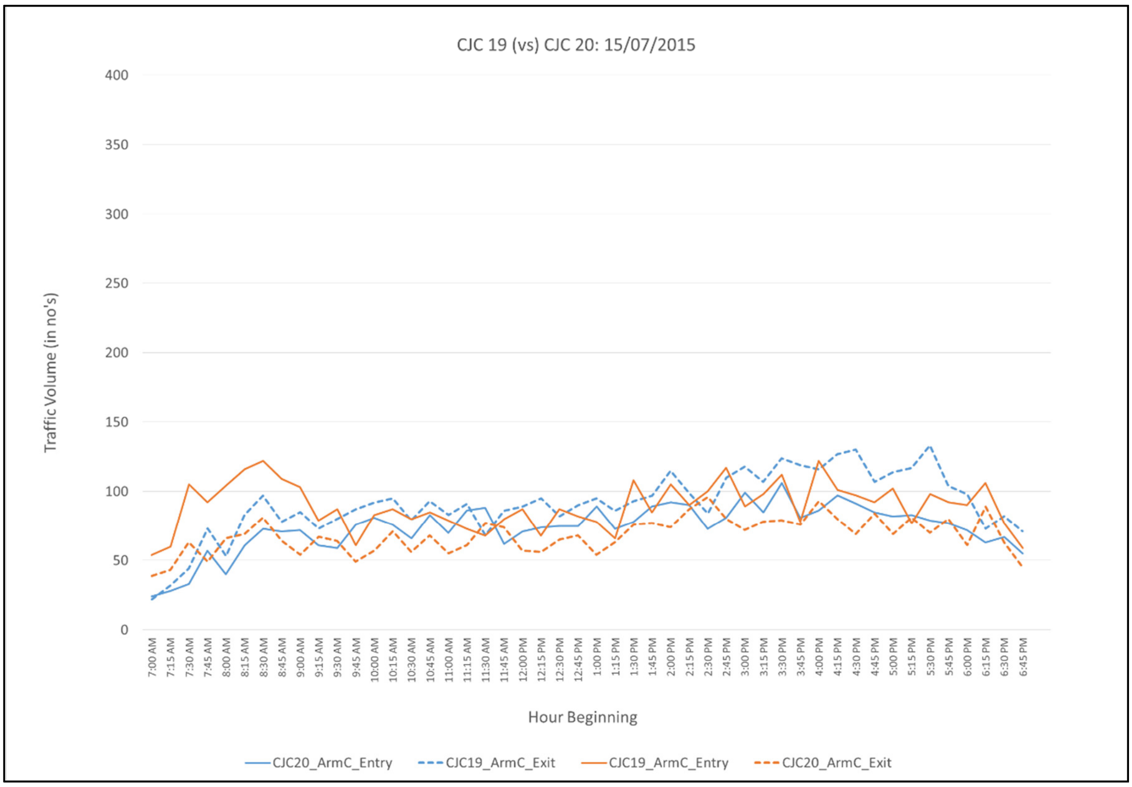


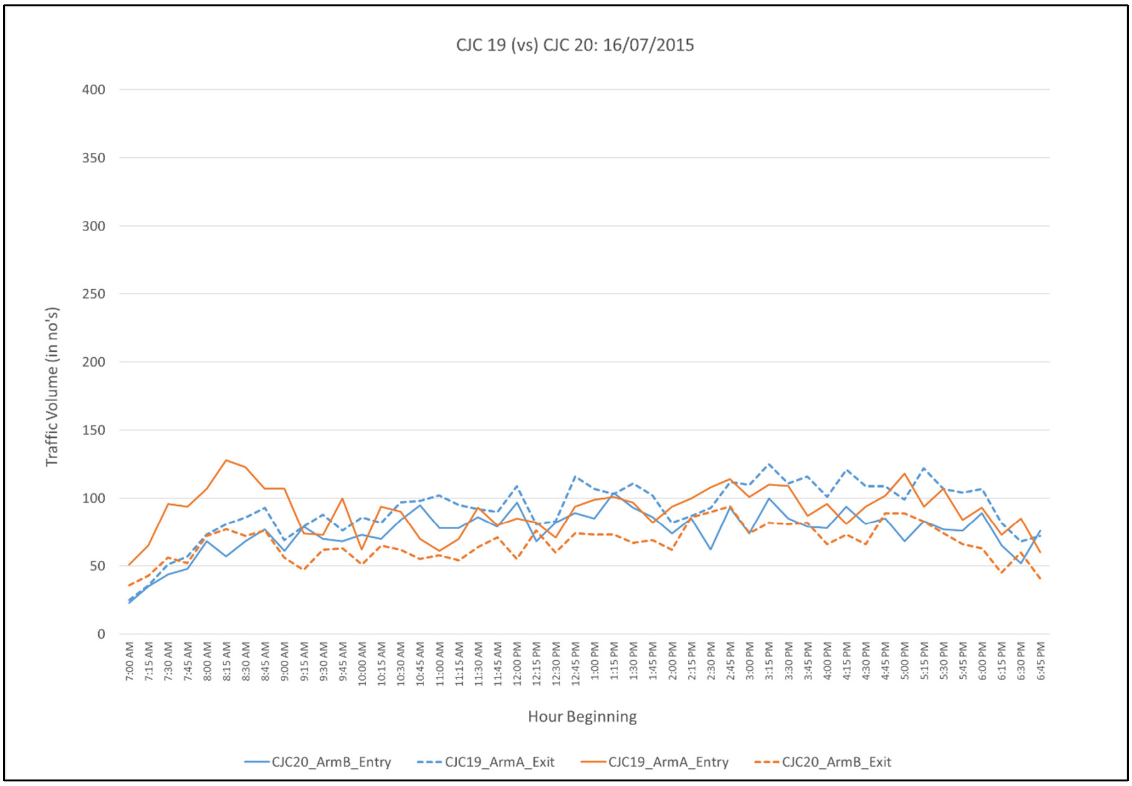
Area 2: Comparison of CJC 13 and CJC 14 on A583 Hardhorn Road (NB-SB)



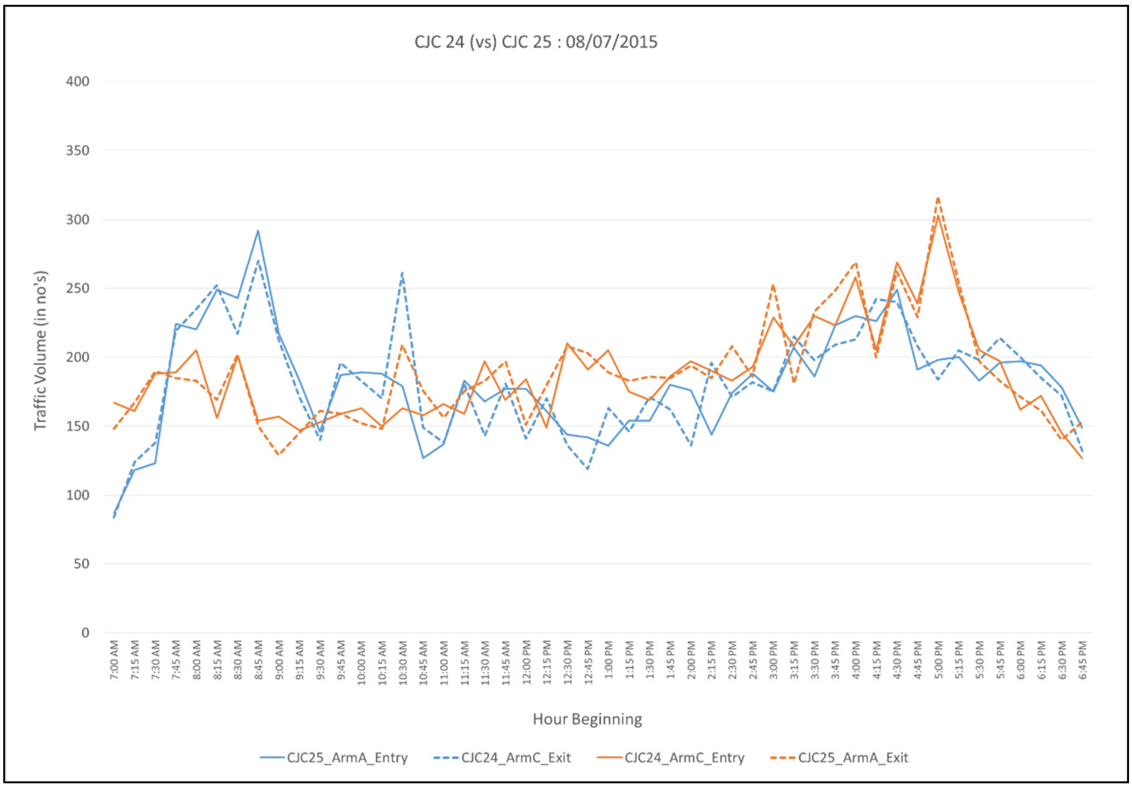


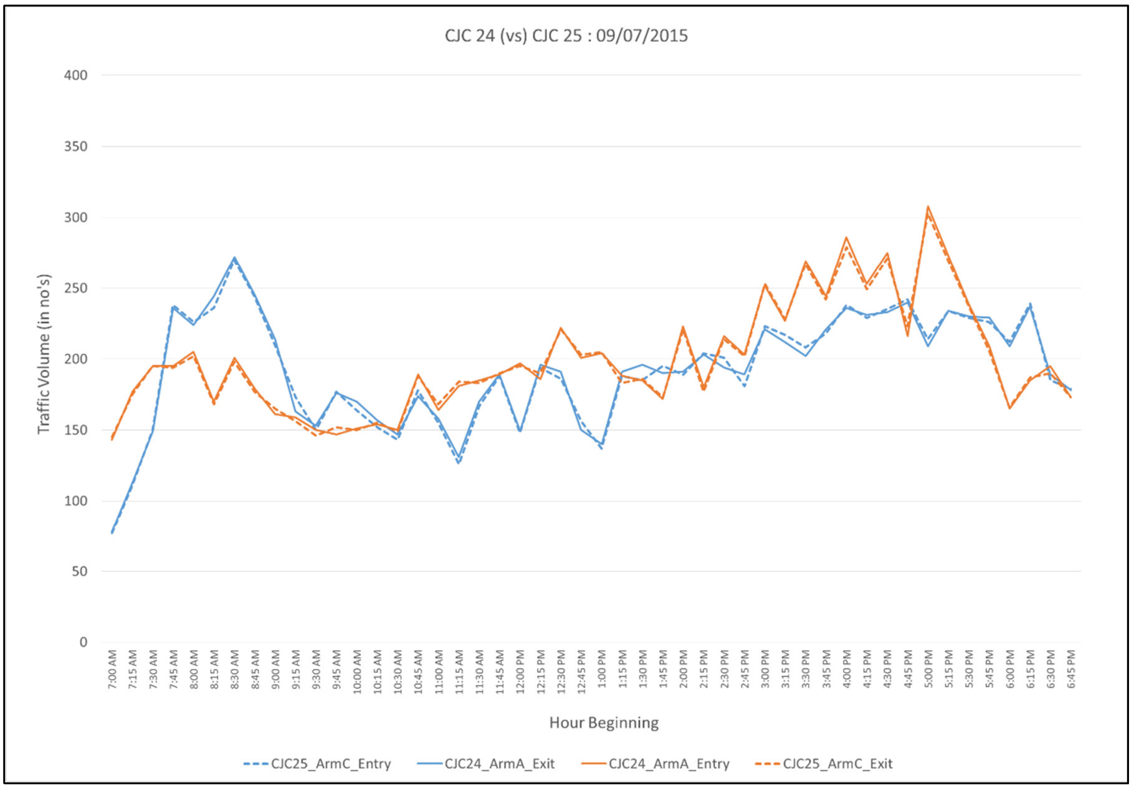
Area 2: Comparison of CJC 19 and CJC 20 on A587 Fleetwood Road (NB-SB)



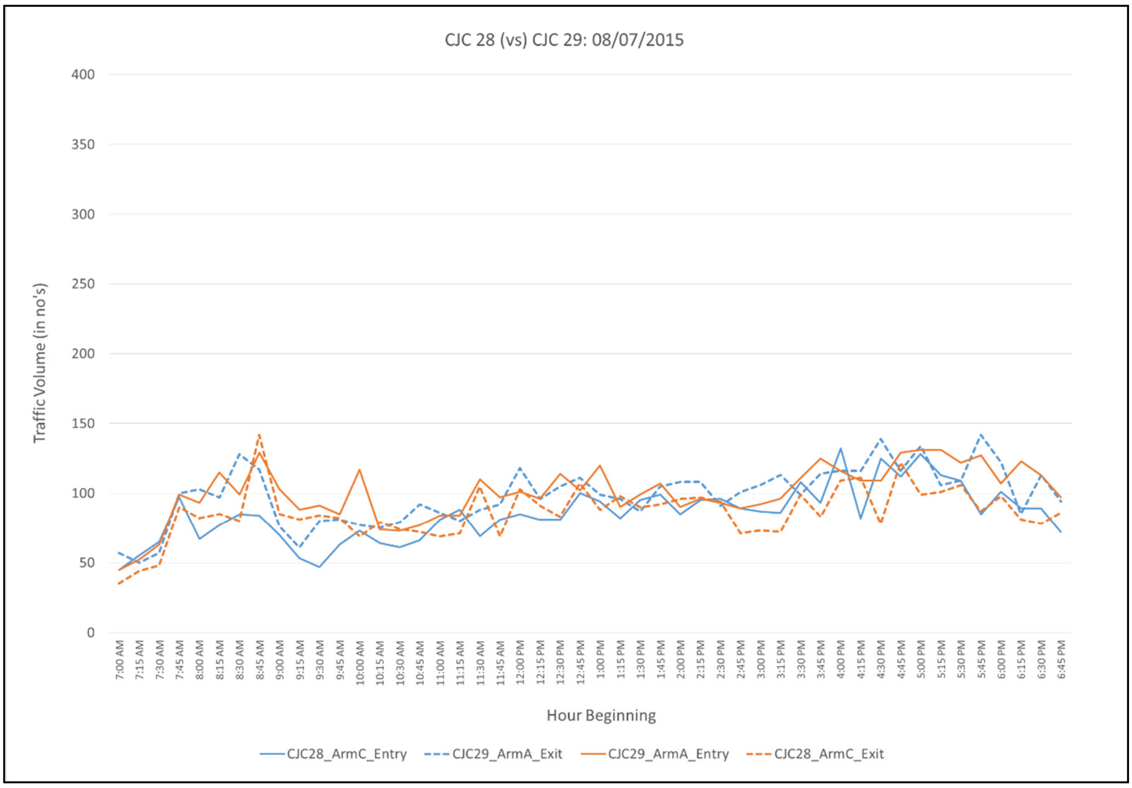


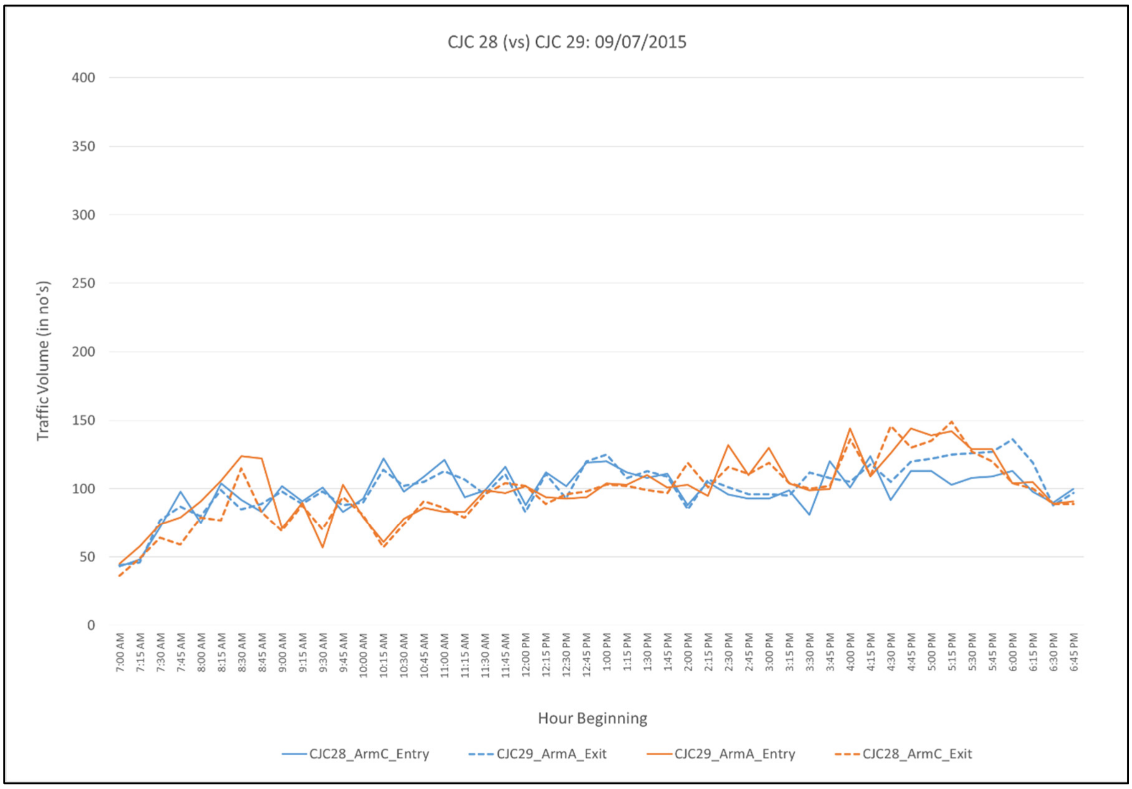
Area 3: Comparison of CJC 24 and CJC 25 on Amounderness Way (NB-SB)





Area 3: Comparison of CJC 28 and CJC 29 on B5268 Fleetwood Road N (NB-SB)

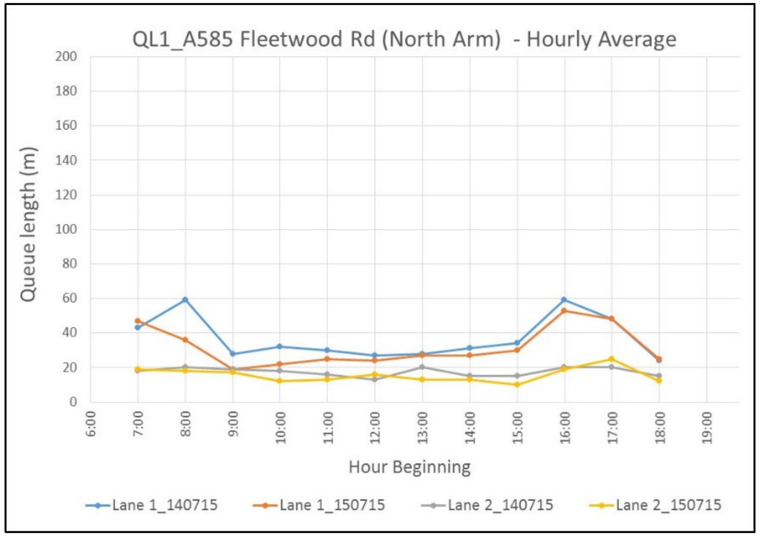


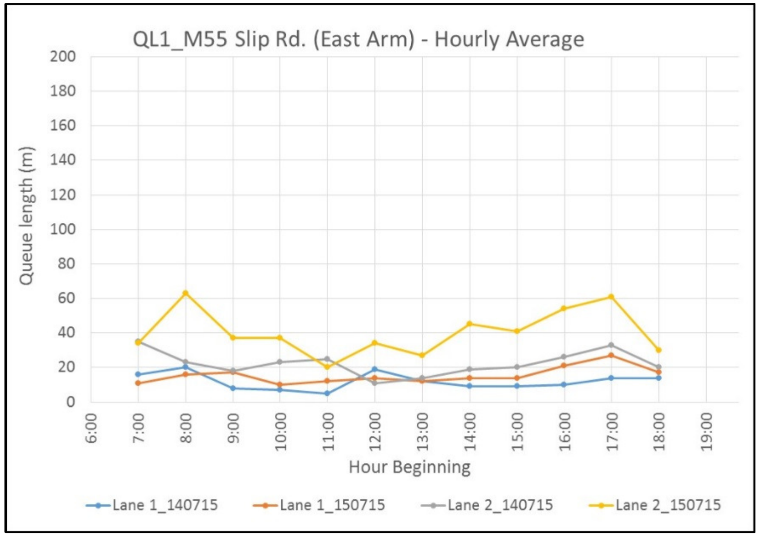


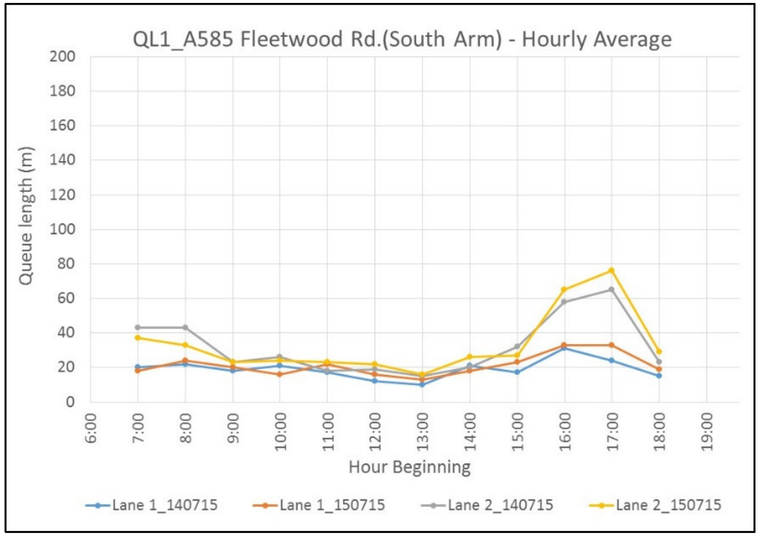
APPENDIX M

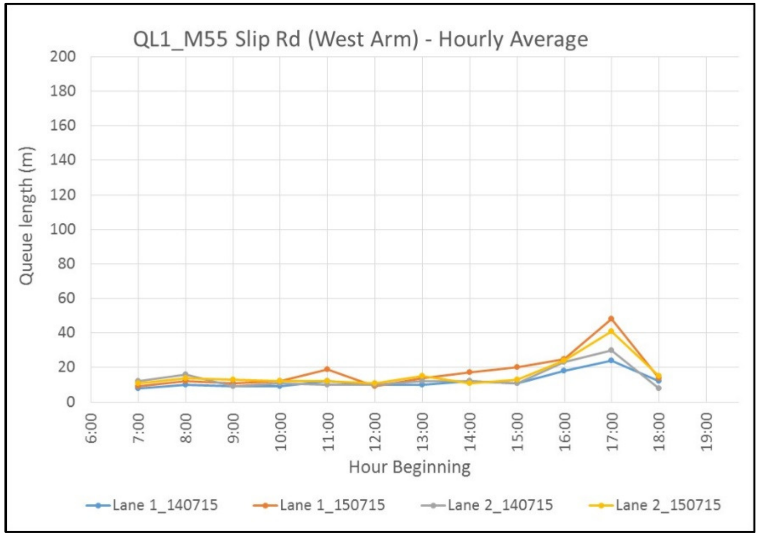
Hourly Average Maximum Queue Length on A585 Sites

QL1: A585 Fleetwood Rd/M55 Slip Rd

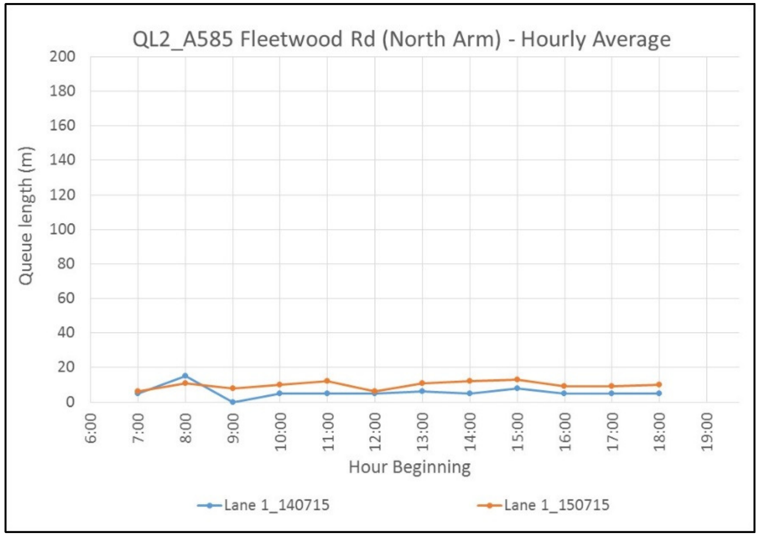


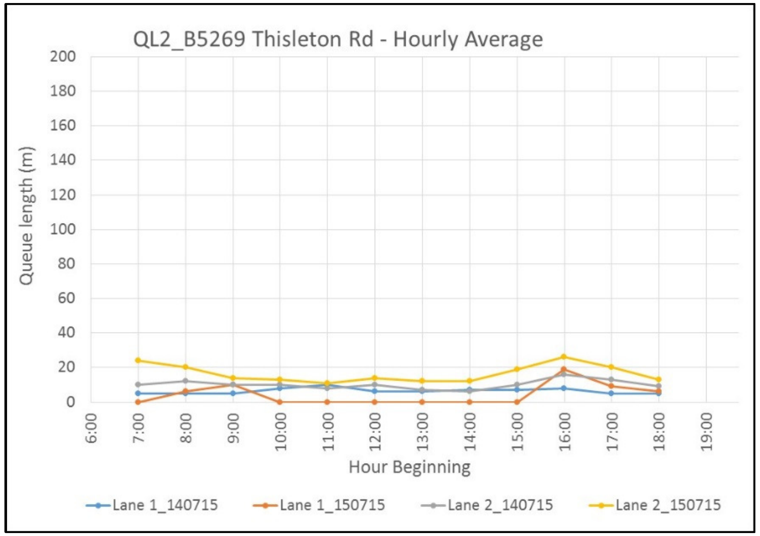


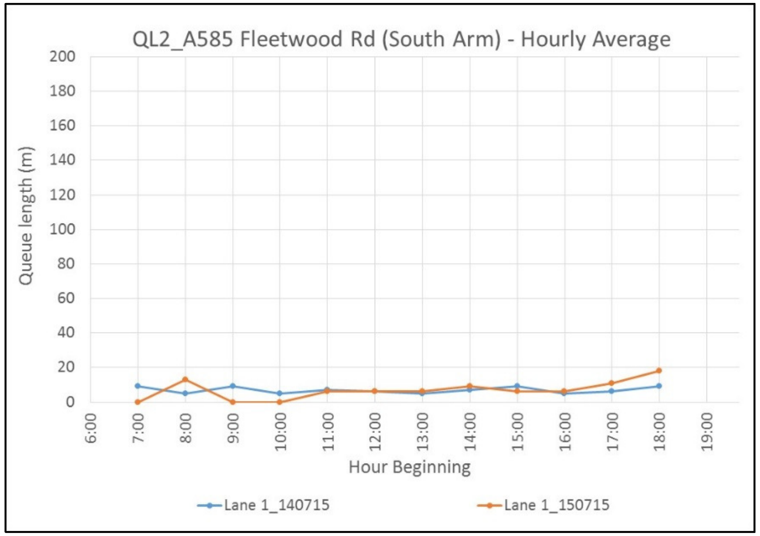


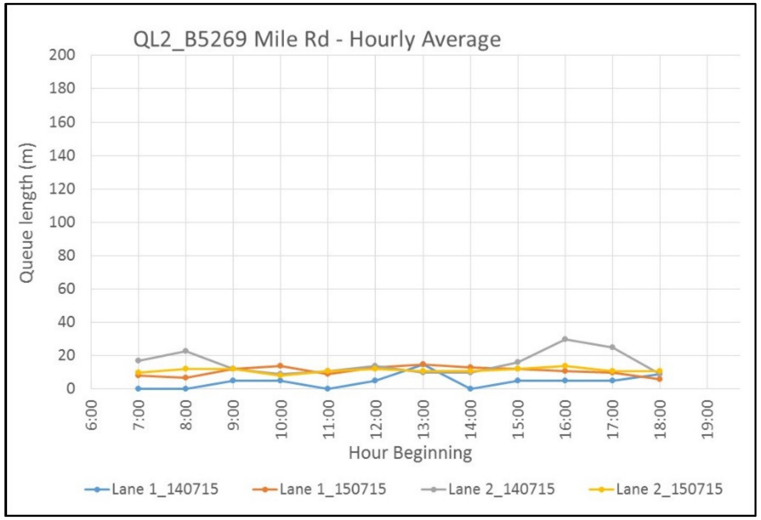


QL2: A585 Fleetwood Rd / B5269 Thistleton Rd/ B5269 Mile Rd

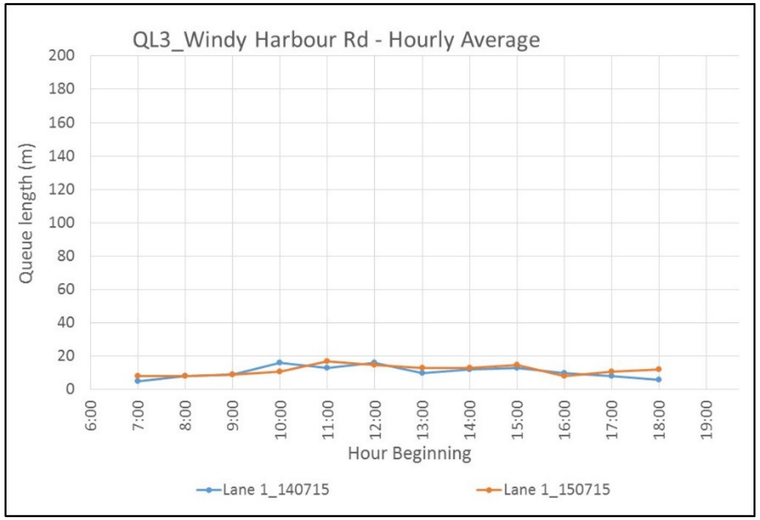


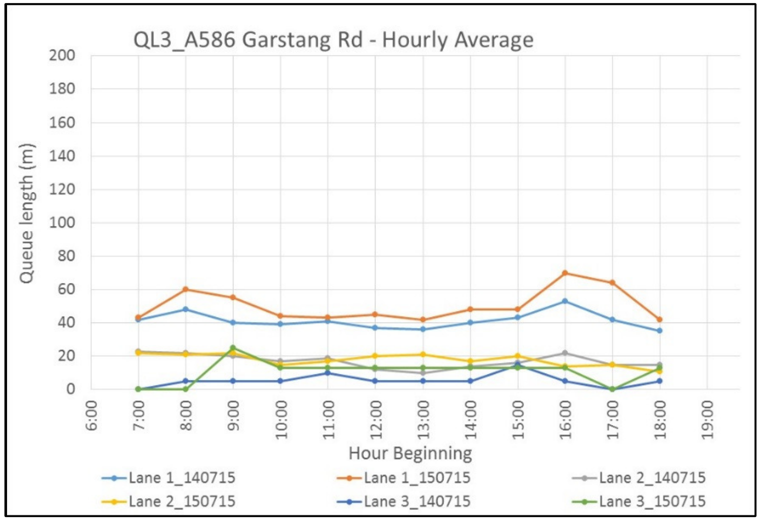


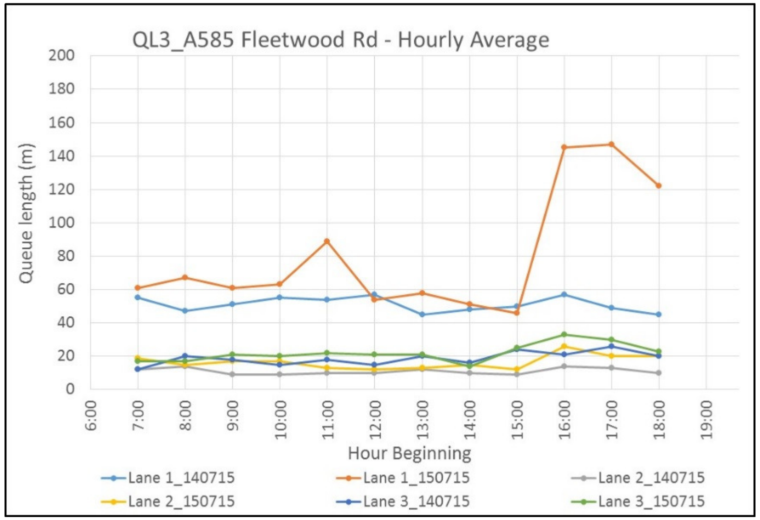


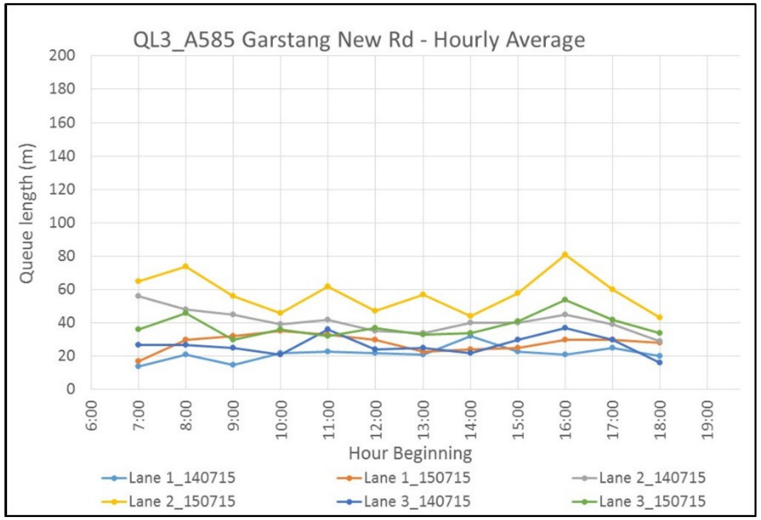


QL3: Windy Harbour Rd/A586 Garstang Rd/A585 Fleetwood Rd/ A585 Garstang New Rd

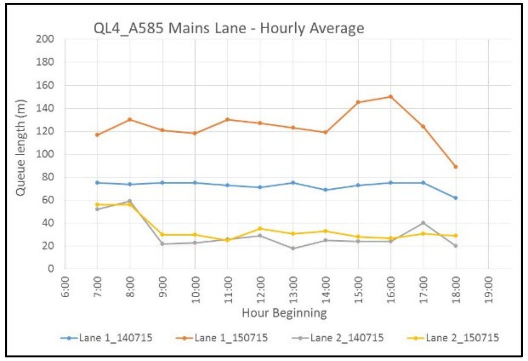


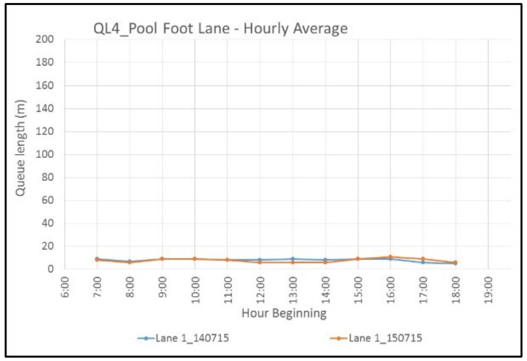


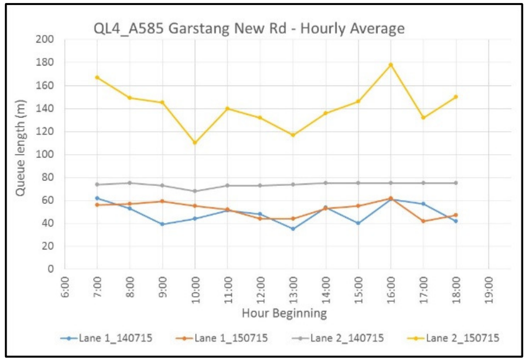


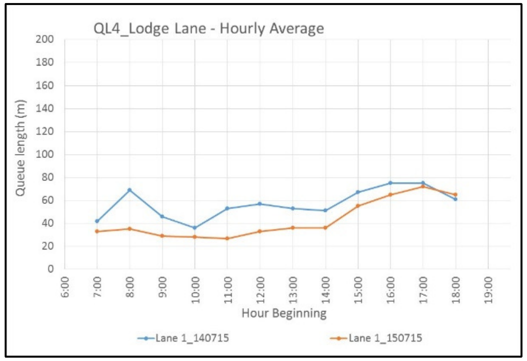


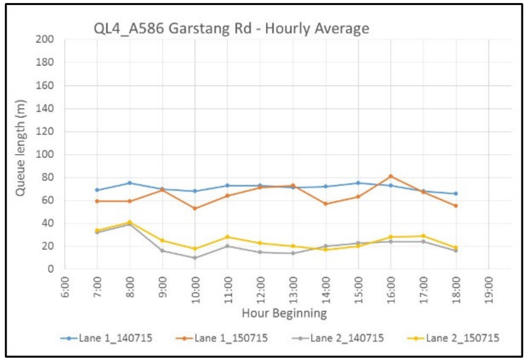
QL4: A585 Mains Lane/Pool Foot Lane/ A585 Garstang New Rd/ Lodge Lane/ A586 Garstang Rd



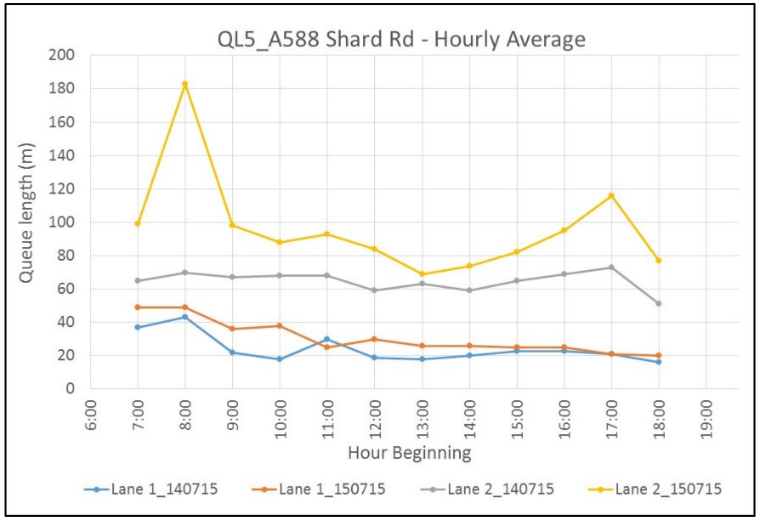


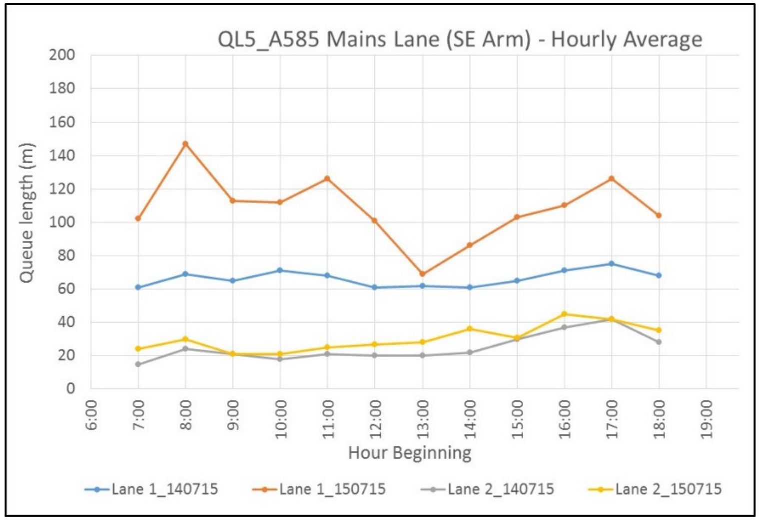


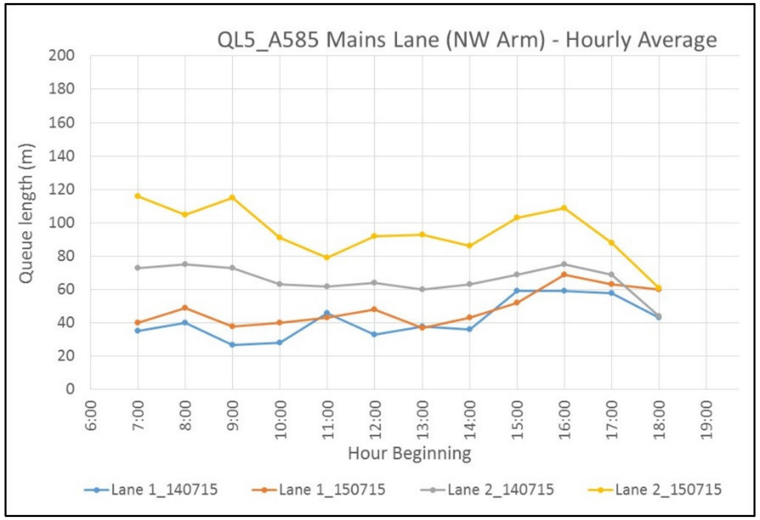




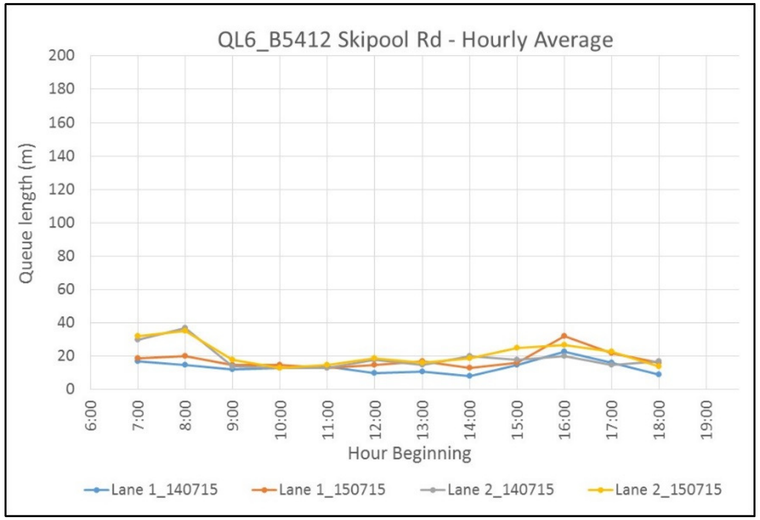
QL5: A588 Shard Rd/ A585 Mains Lane

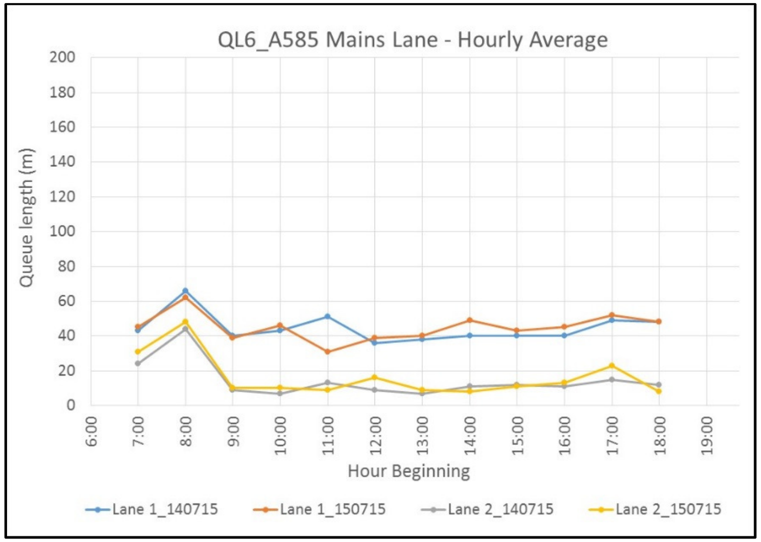


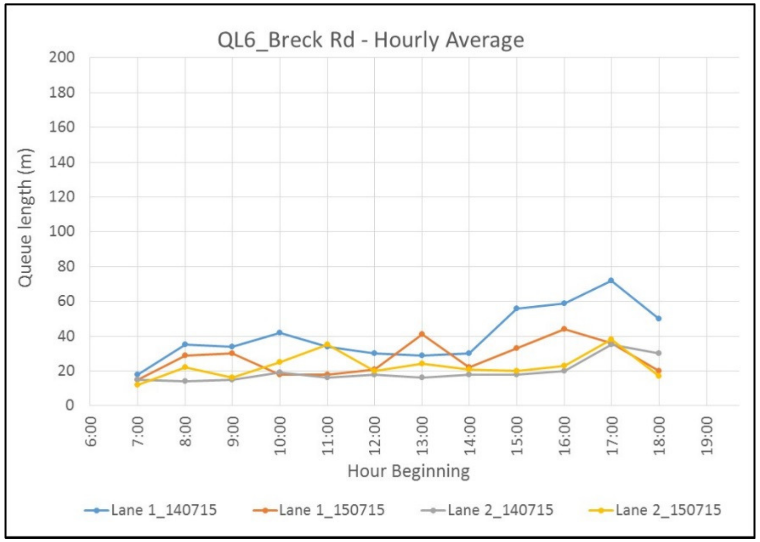


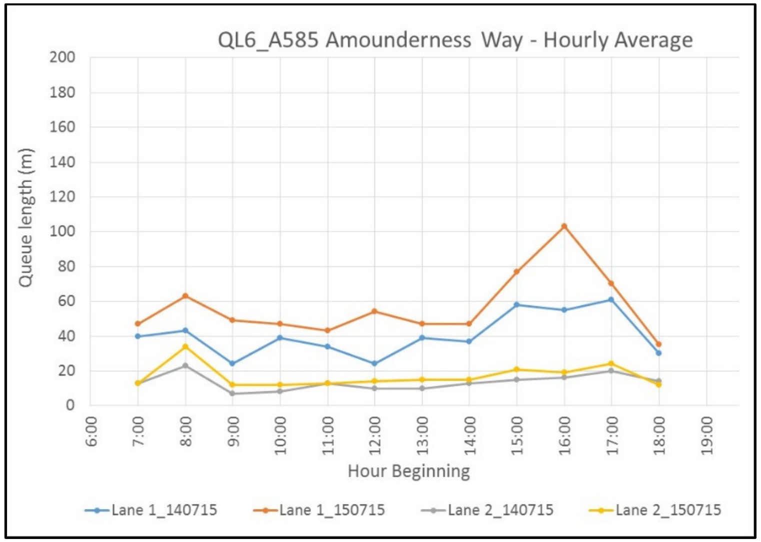


QL6: B5412 Skipool Rd/ A585 Mains Lane/ Breck Rd/ A585 Amounderness Way

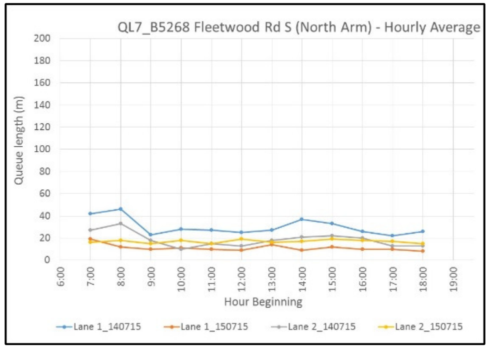


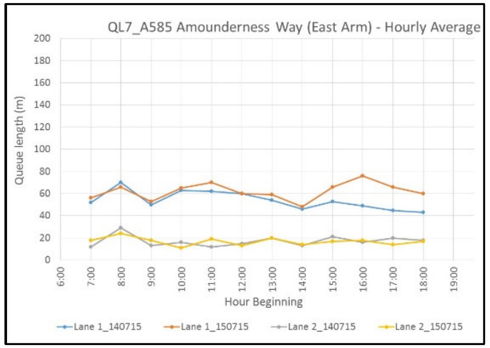


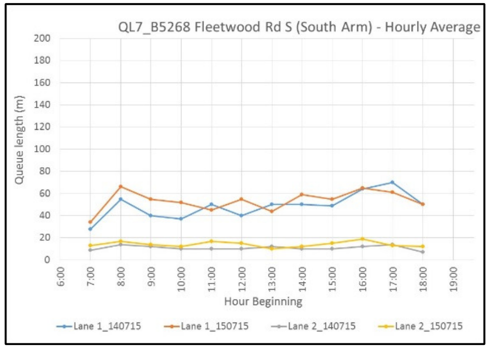


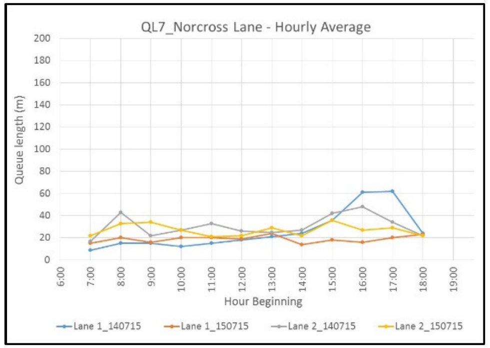


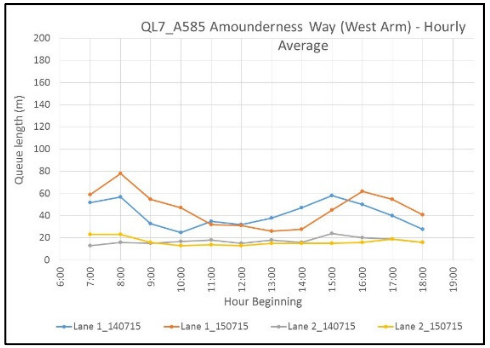
QL7: B5268 Fleetwood Rd S/ A585 Amounderness Way/Norcross Lane



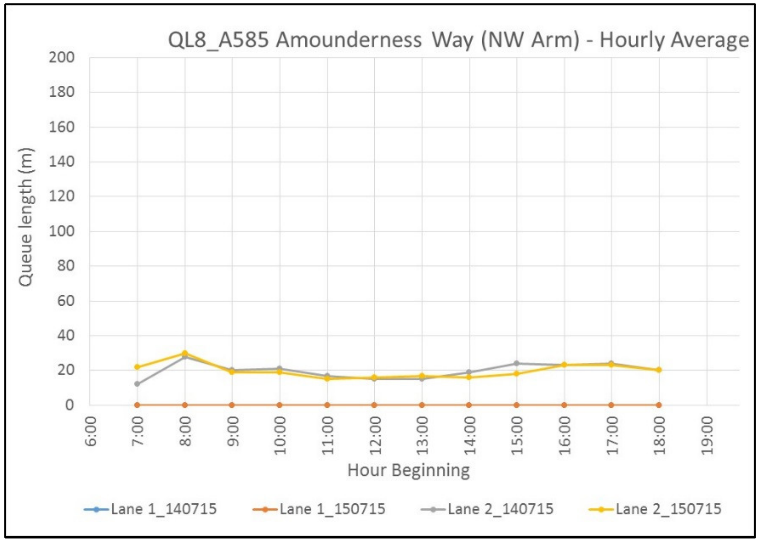


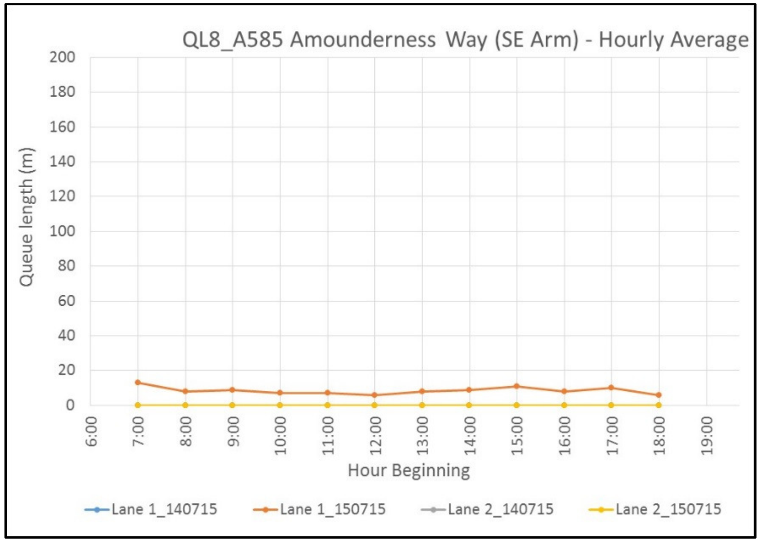


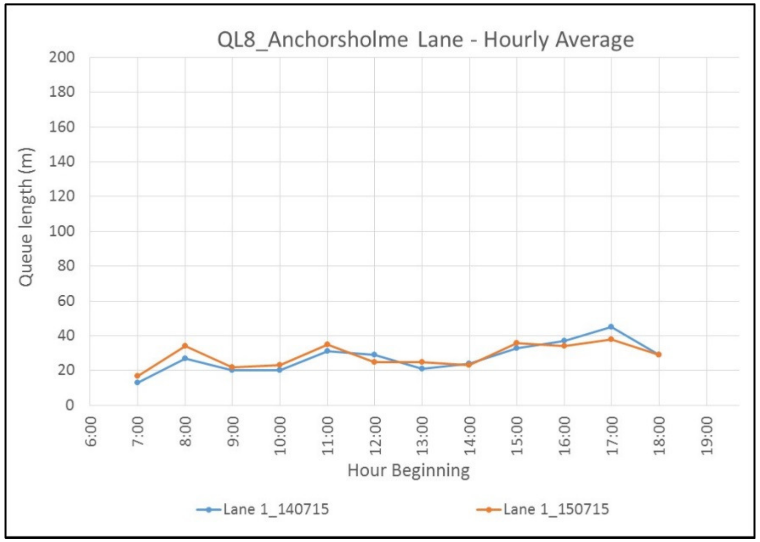




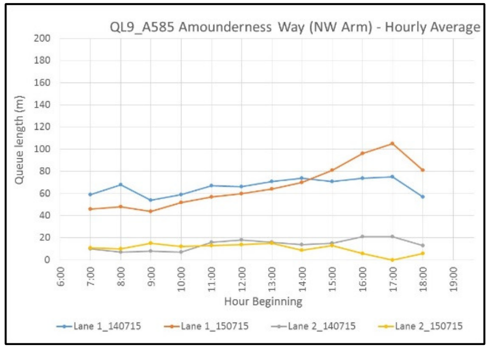
QL8: A585 Amounderness Way/Anchorsholme Lane

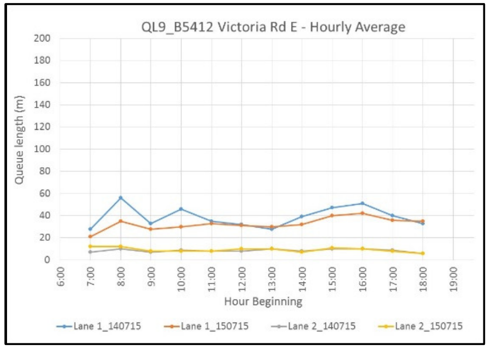


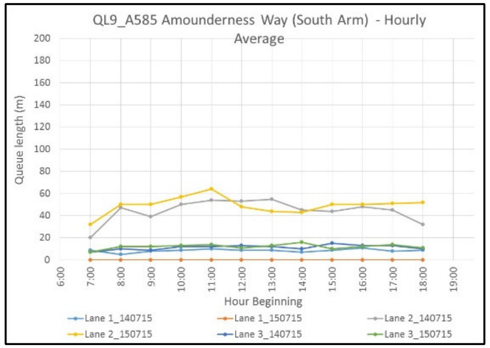


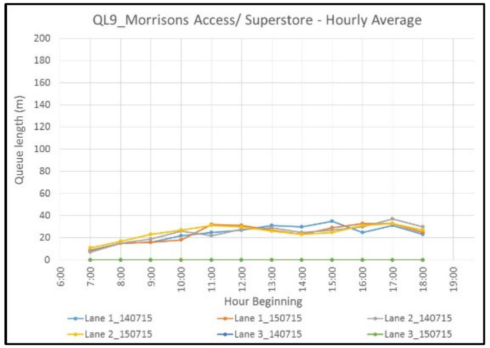


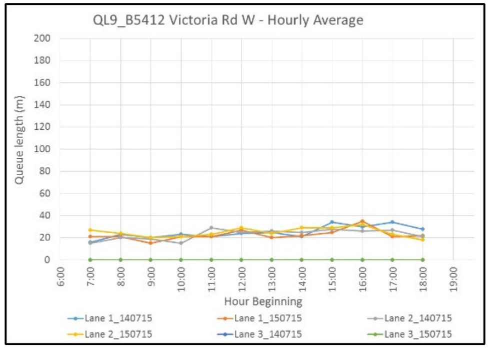
QL9: A585 Amounderness Way/ B5412 Victoria Rd E/ B5412 Victoria Rd W



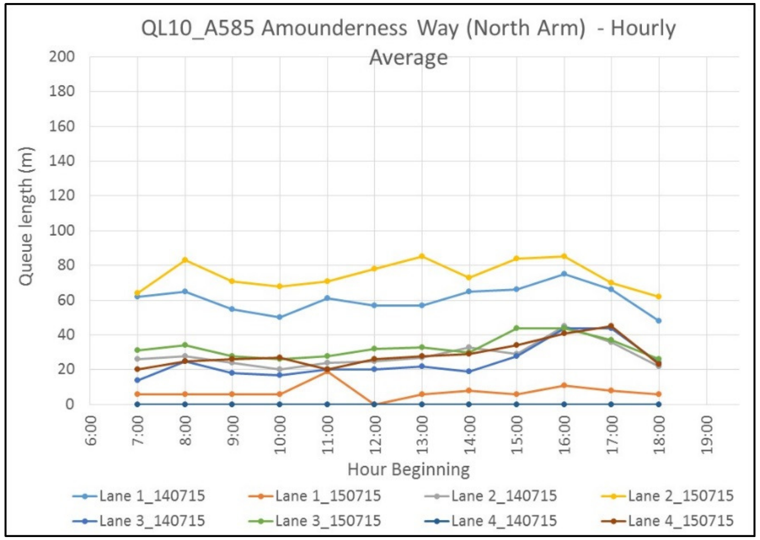


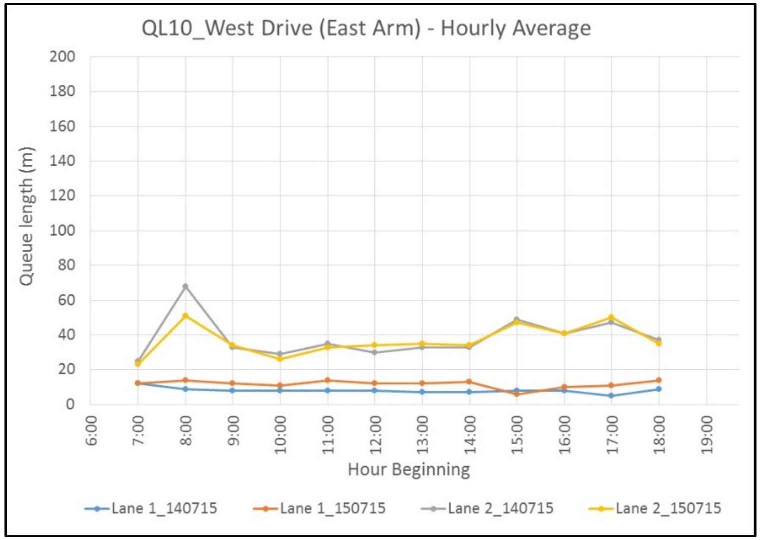


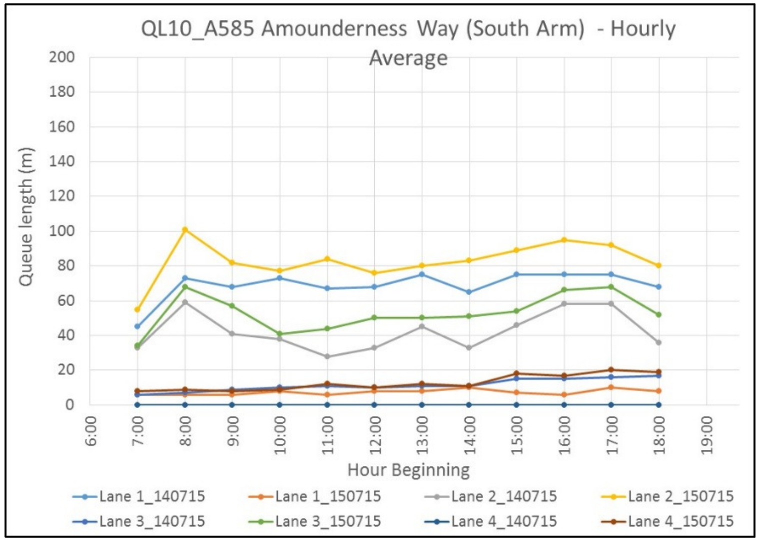


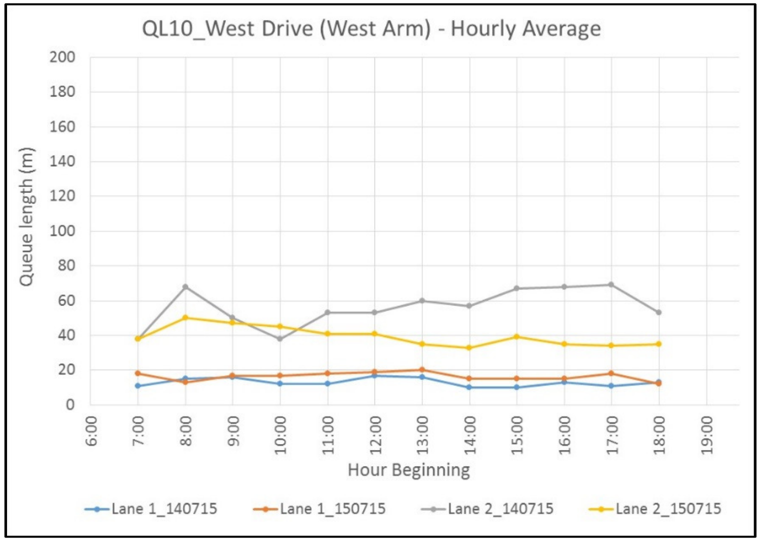


QL10: A585 Amounderness Way/ West Drive

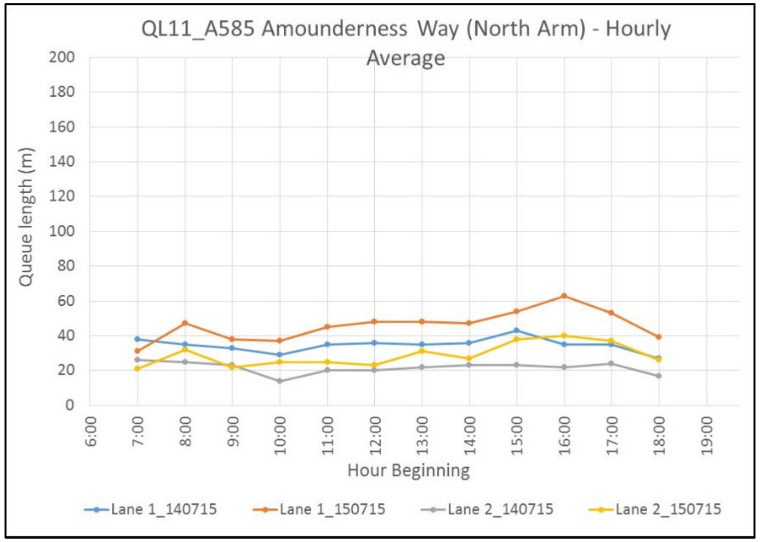


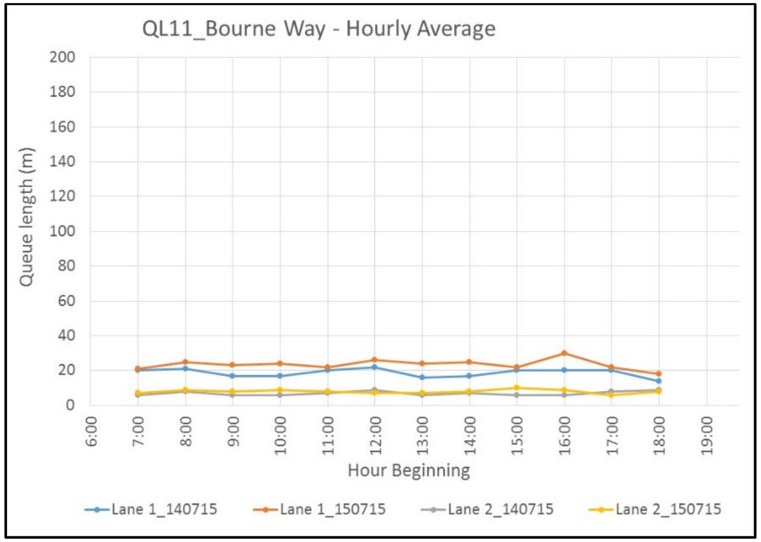


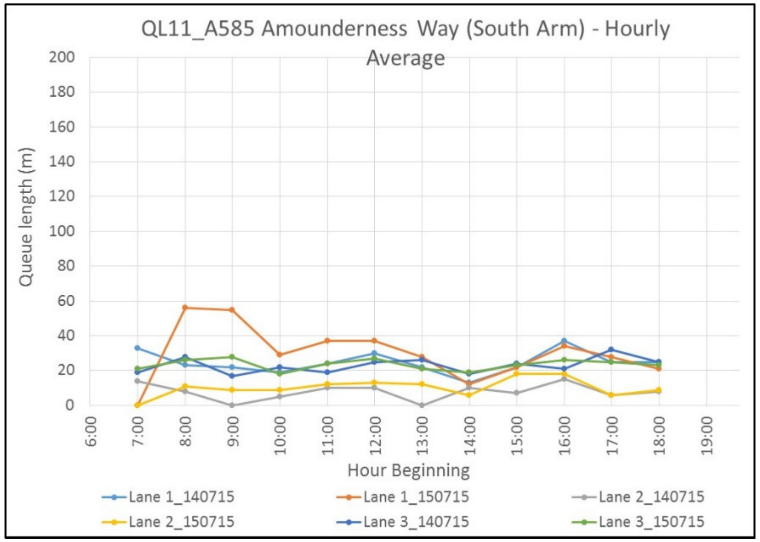




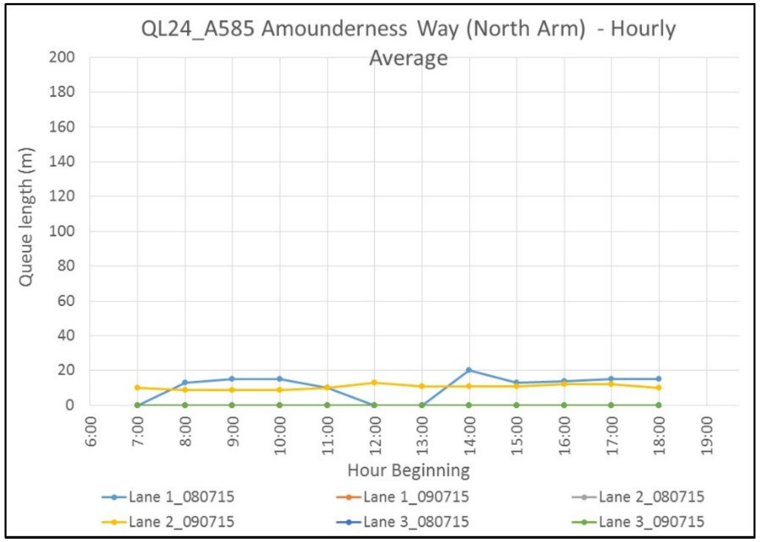
QL11: A585 Amounderness Way/ Bourne Way

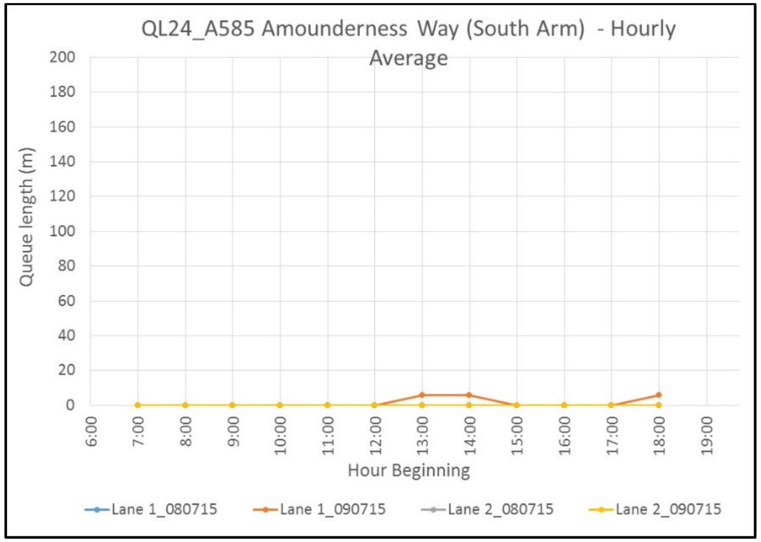


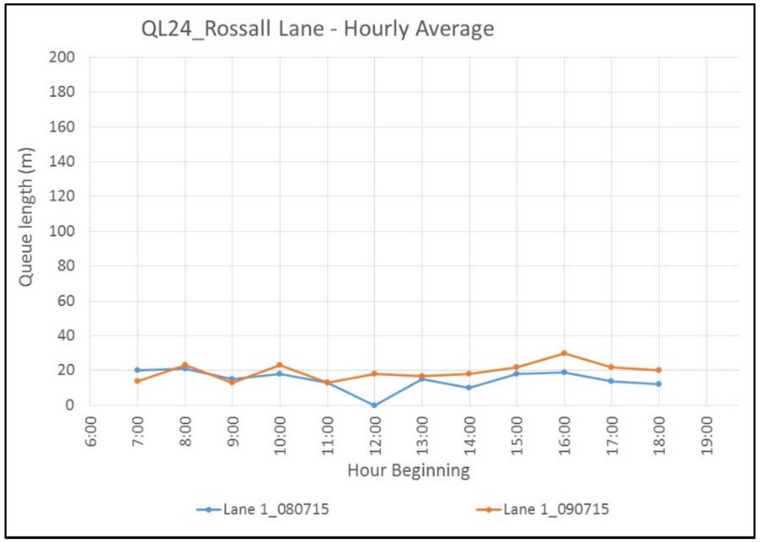




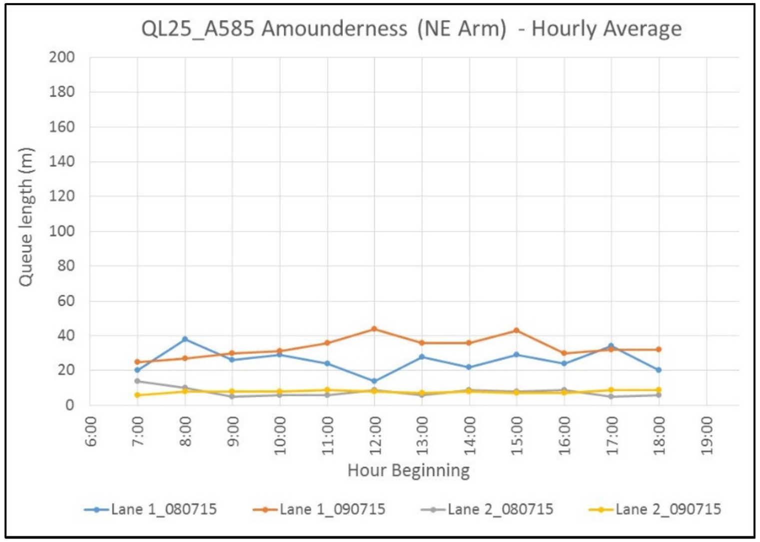
QL24: A585 Amounderness Way /Rosssall Lane

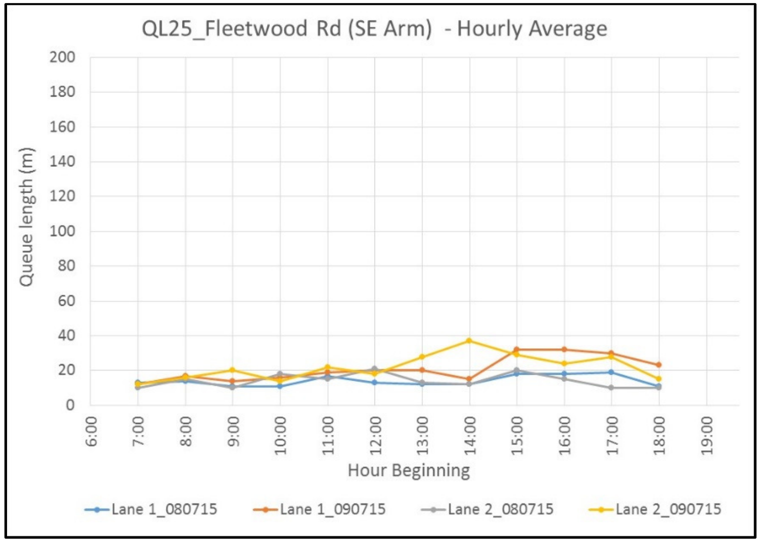


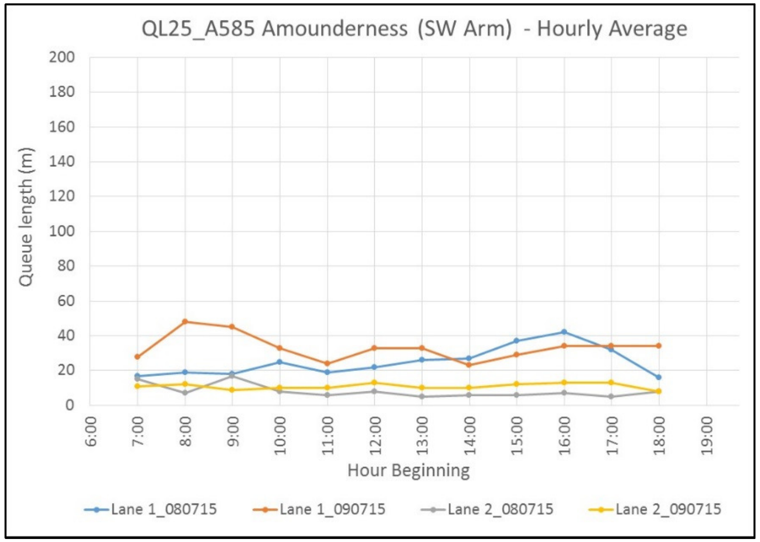


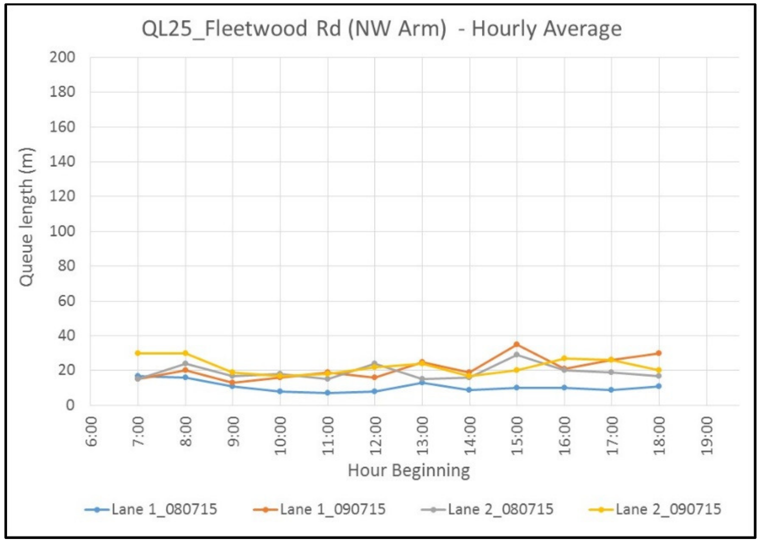


QL25: A585 Amounderness /Fleetwood Rd

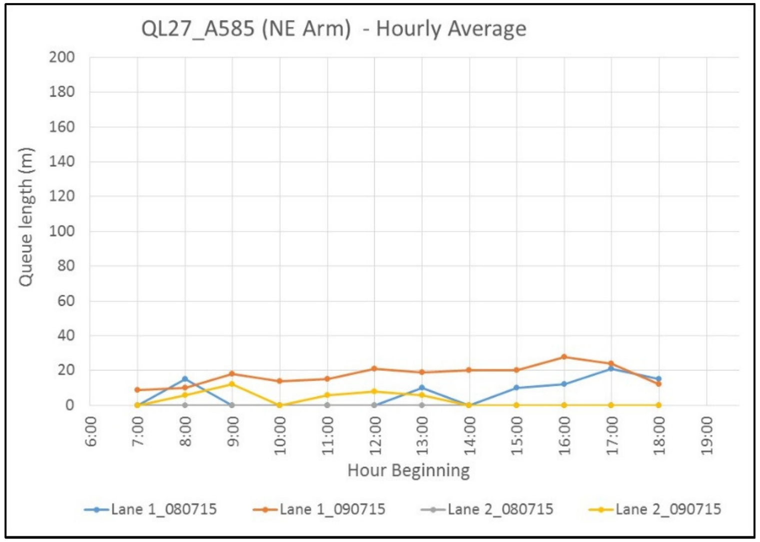


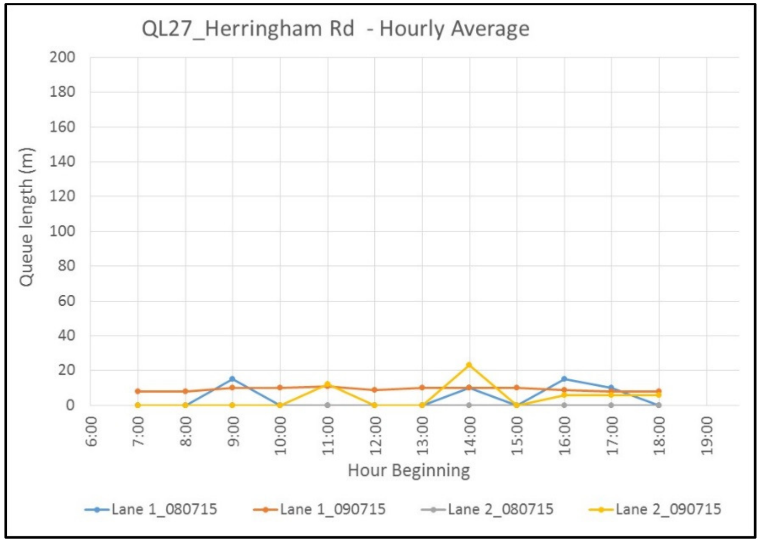


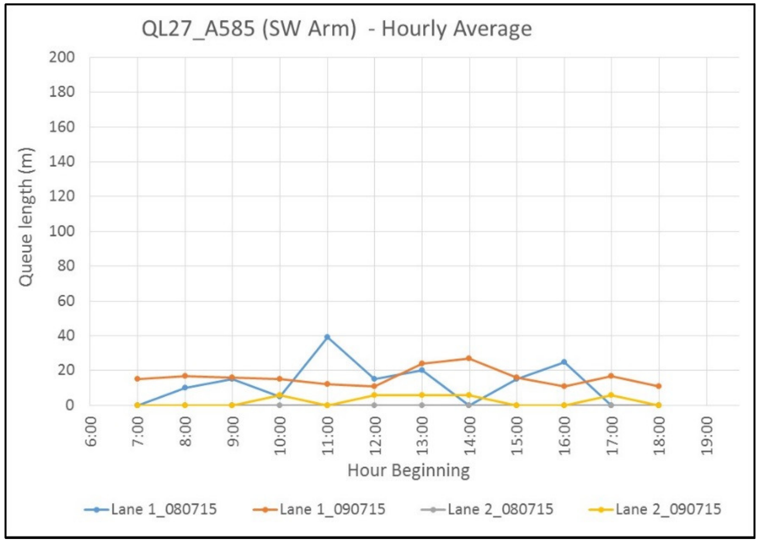


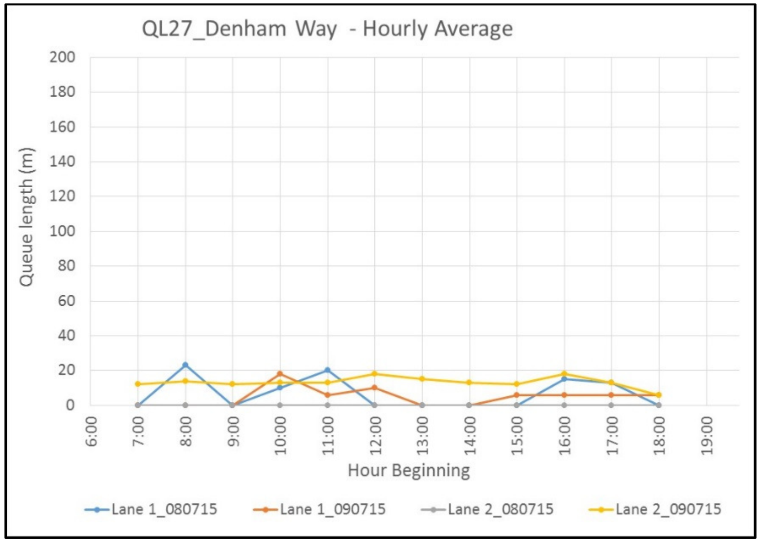


QL27: A585 /Herringham Rd /Denham Way





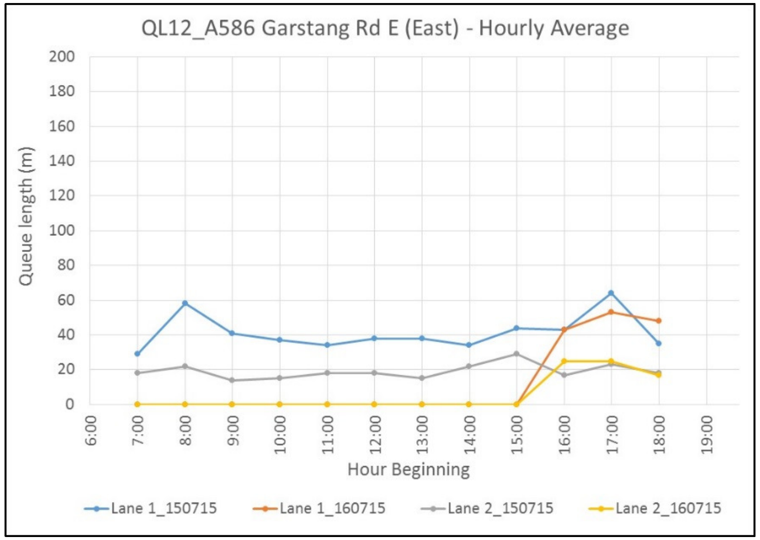


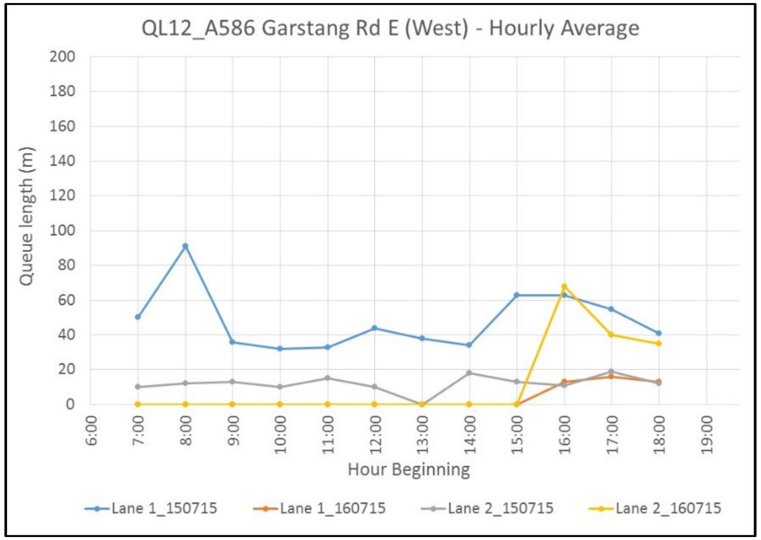


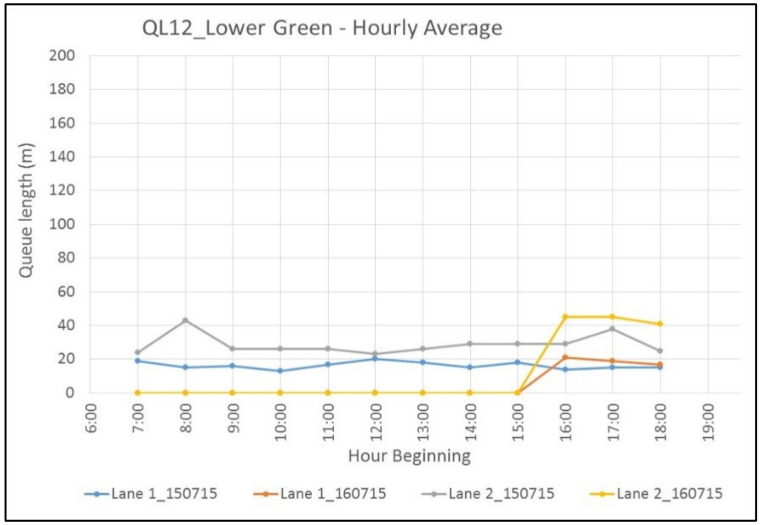
APPENDIX N

Hourly Average Maximum Queue Length on Remaining Sites

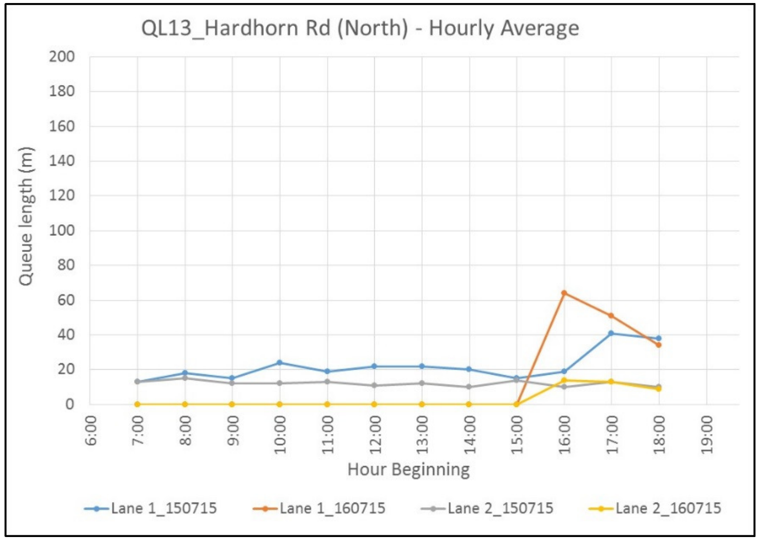
QL12: A586 Garstang Rd E / Lower Green

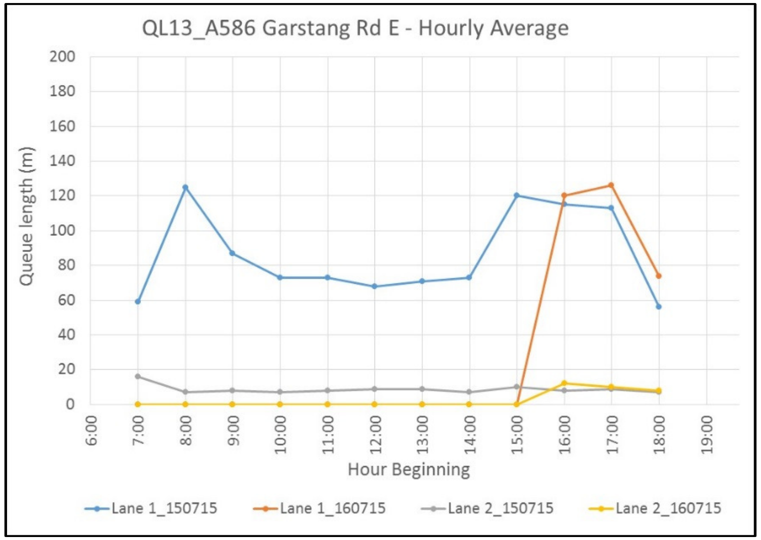


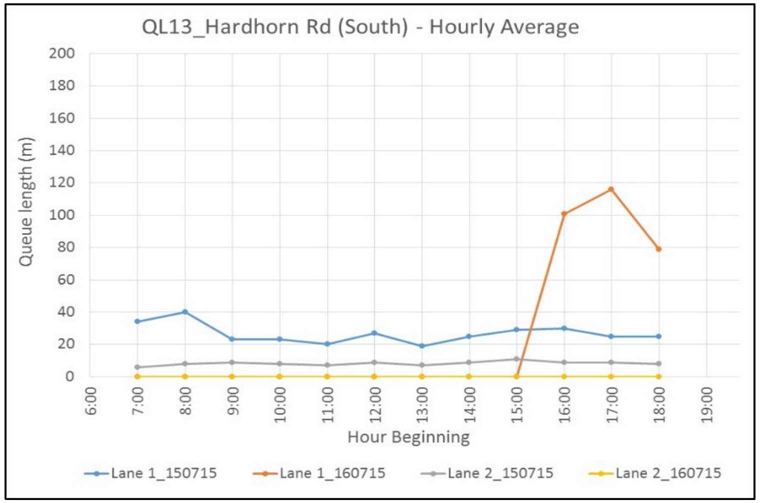


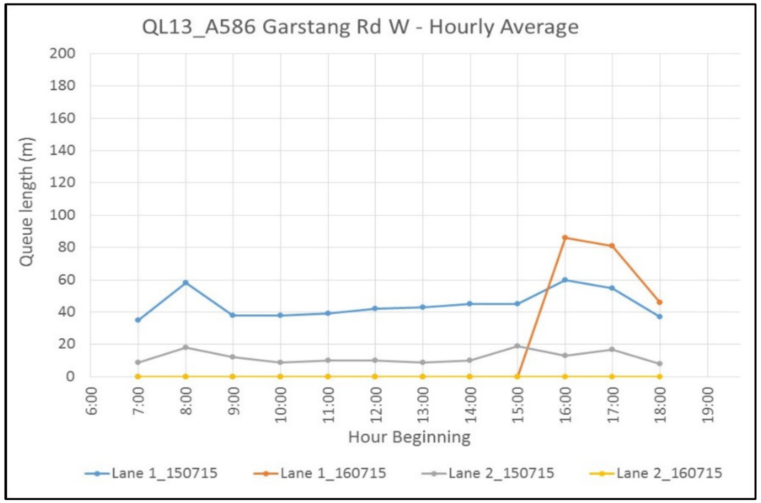


QL13: A586 Garstang Rd W / Hardhorn Rd / A586 Garstang Rd E

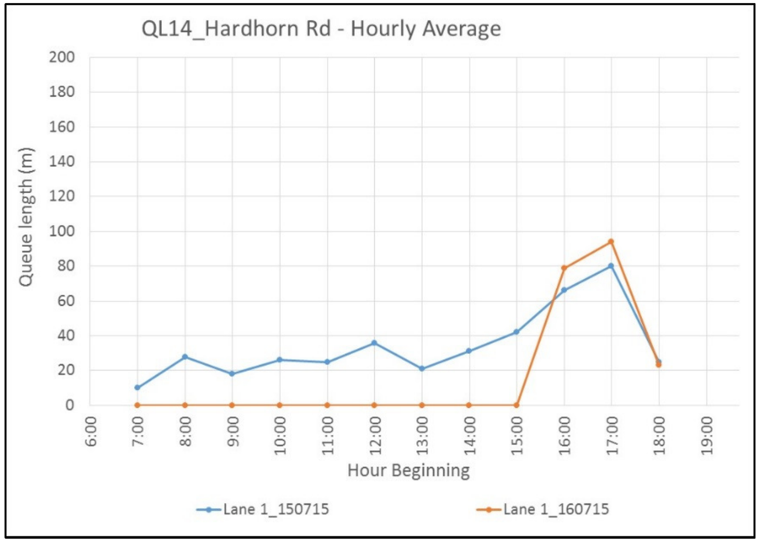

QL13_Hardhorn Rd (North) - Hourly Average

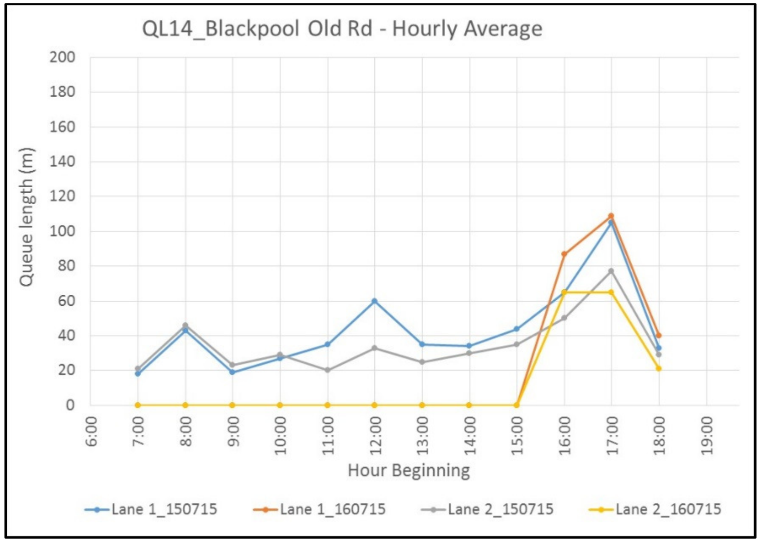

QL13_A586 Garstang Rd E - Hourly Average


QL13_Hardhorn Rd (South) - Hourly Average

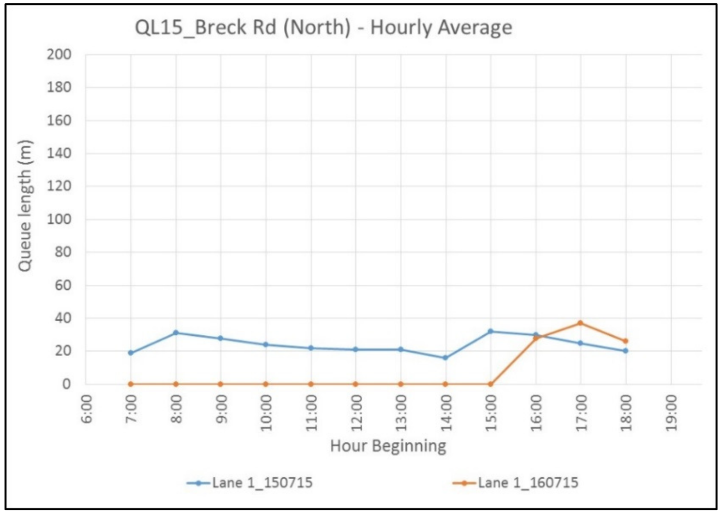

QL13_A586 Garstang Rd W - Hourly Average

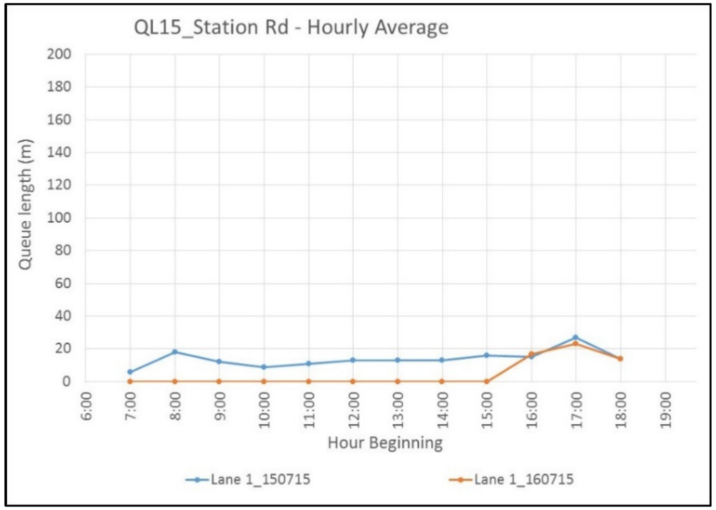
QL14: Hardhorn Rd / Blackpool Old Rd

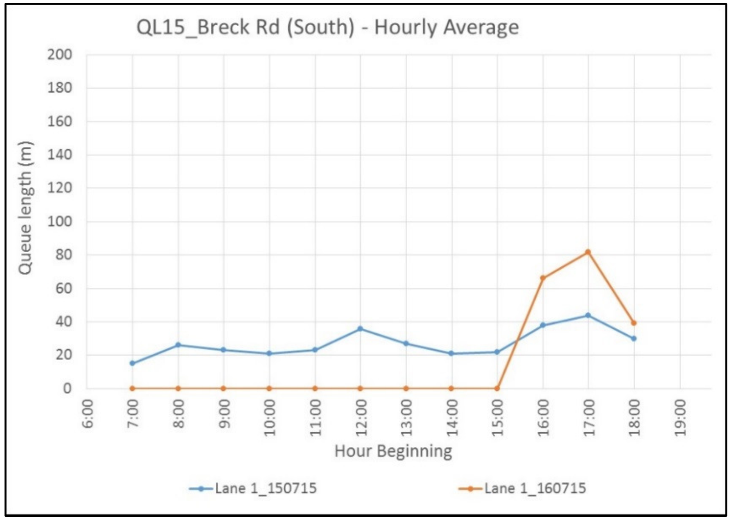


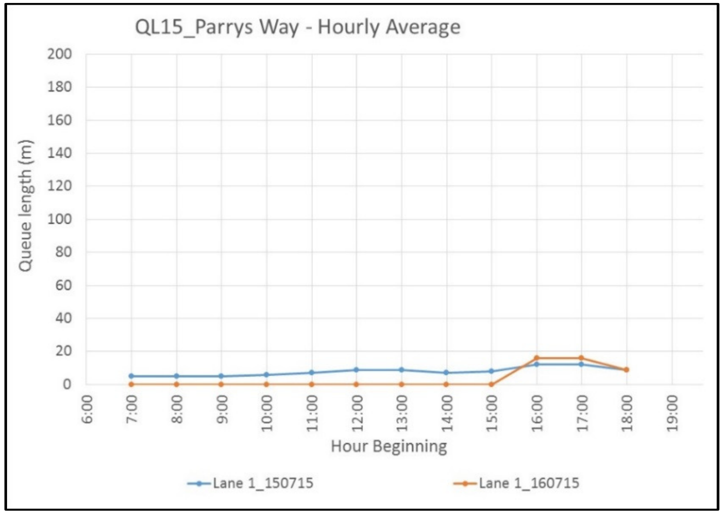


QL15: Breck Rd / Station Rd / Parrys Way

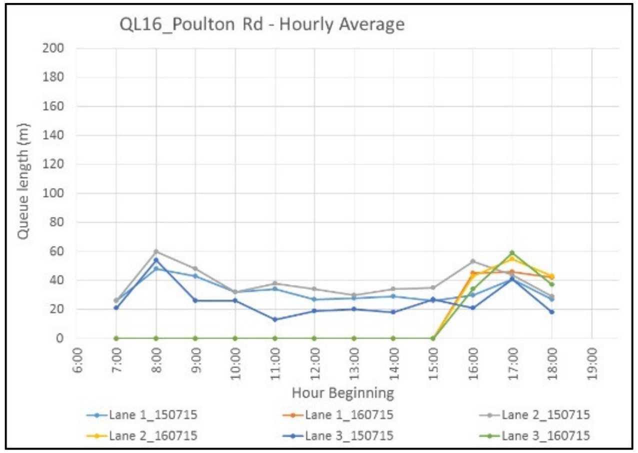


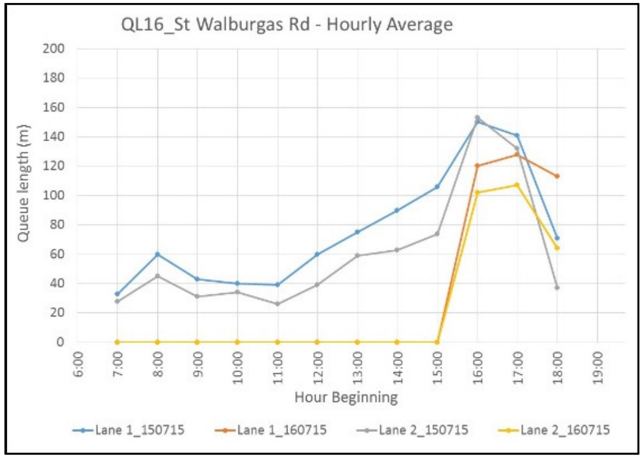


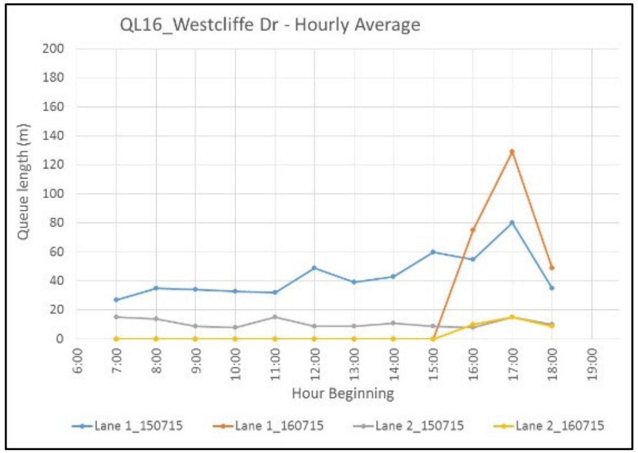


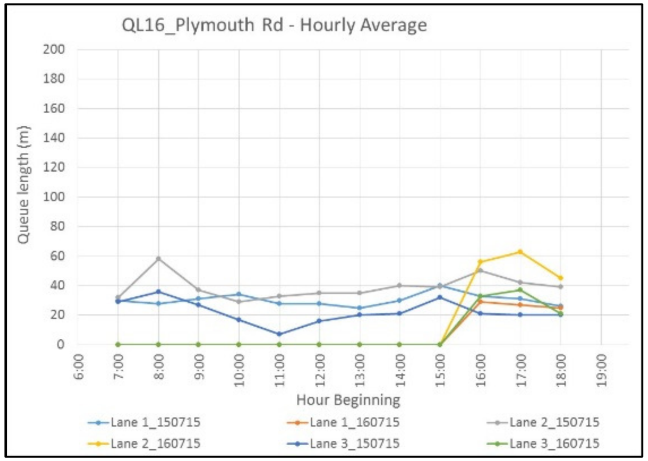


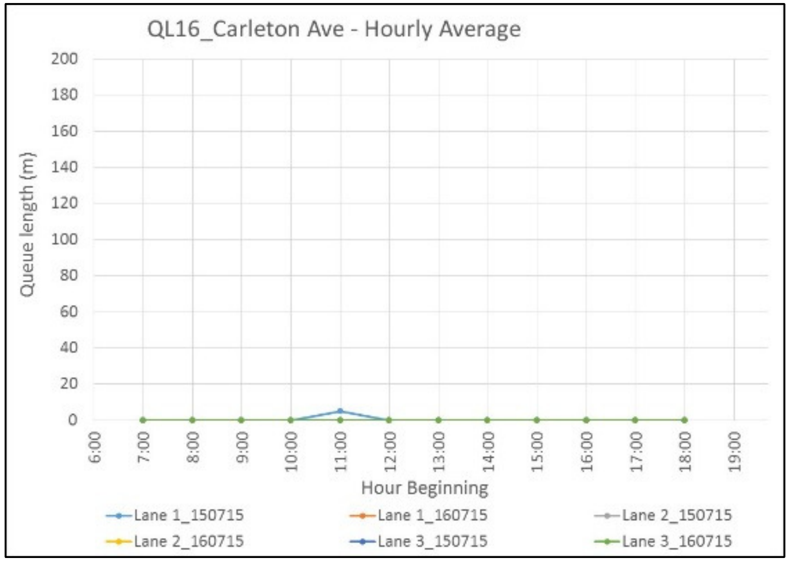
QL16: Poulton Rd / Plymouth Rd / St. Walburgas / Westcliffe Dr. / Carleton Ave



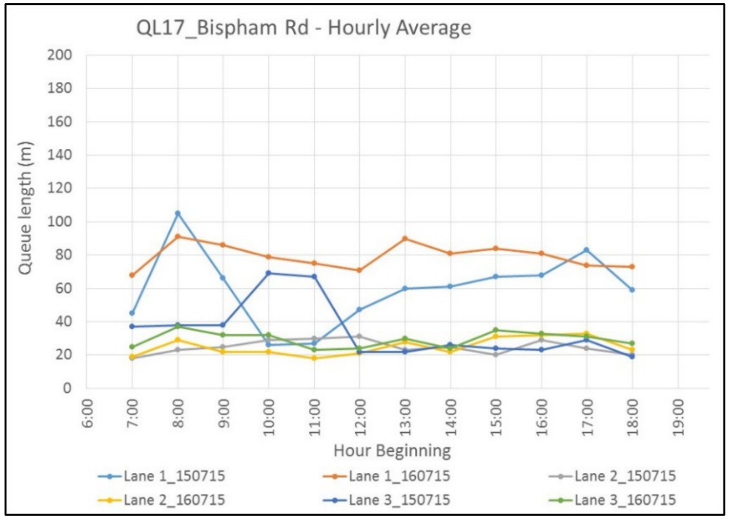


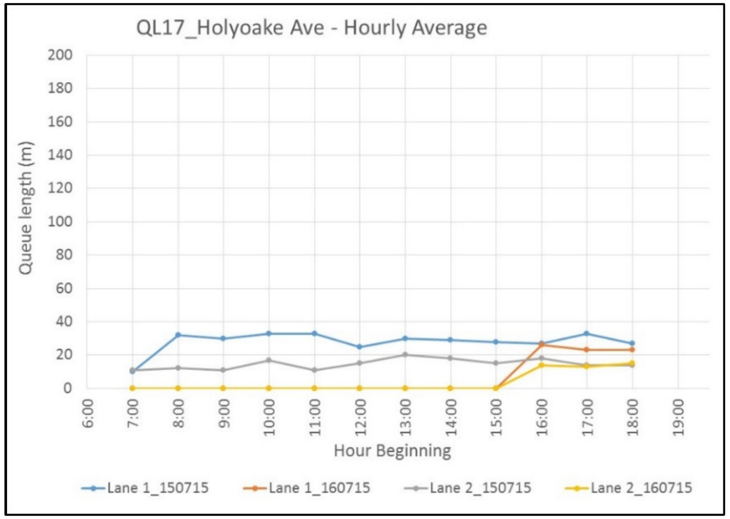


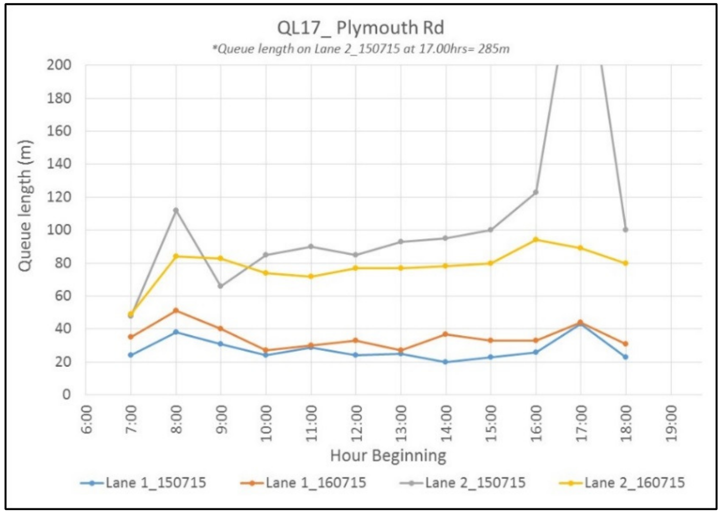


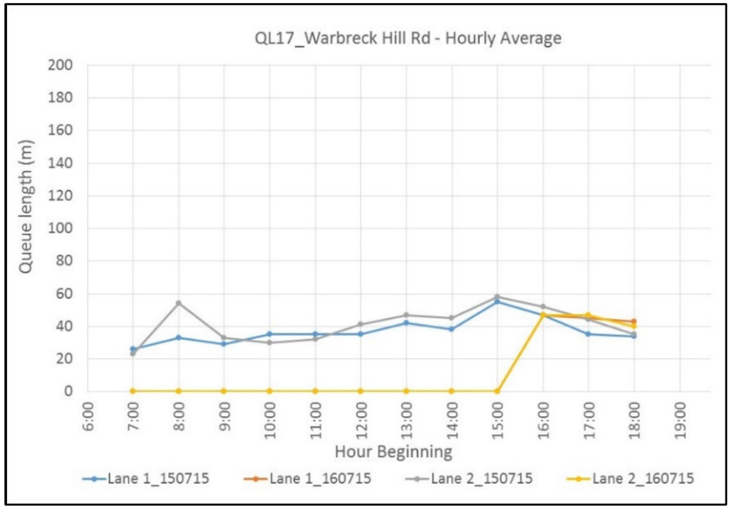

QL16_Carleton Ave - Hourly Average
Queue length (m)
200
180
160
140
120
100
80
60
40
20
0
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
Hour Beginning
Lane 1_150715
Lane 1_160715
Lane 2_150715
Lane 2_160715
Lane 3_150715
Lane 3_160715

QL17: Bispham Rd / Holyoake Ave / Plymouth Rd / Warbreck Hill Rd

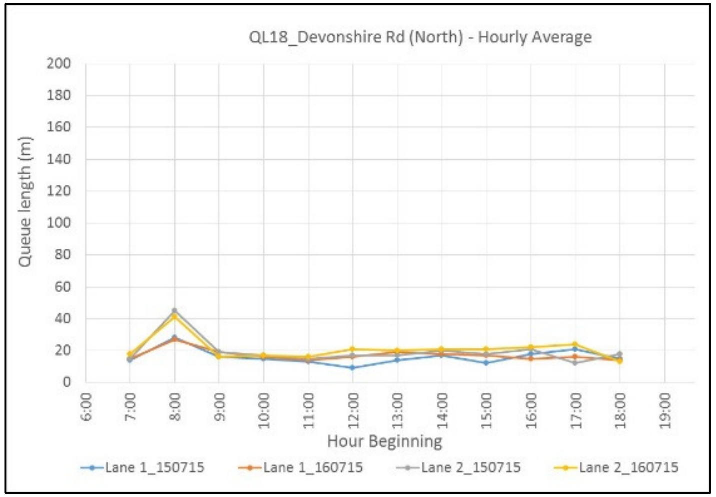


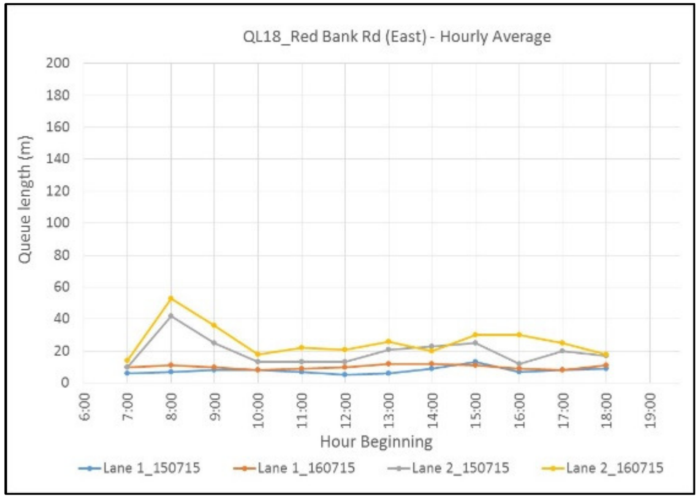


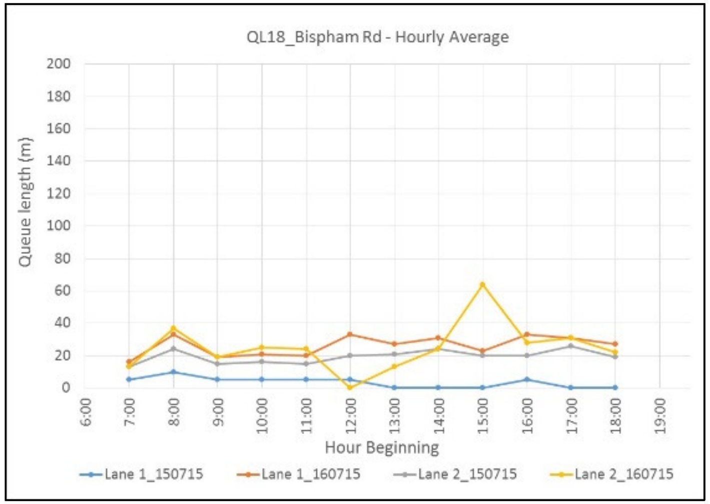


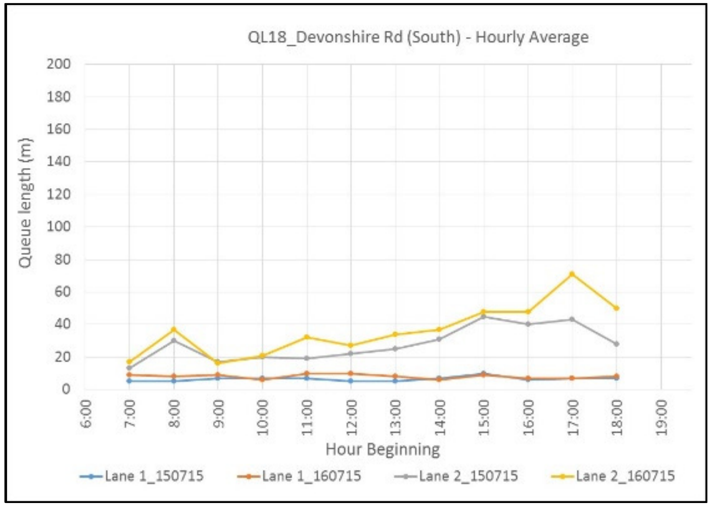


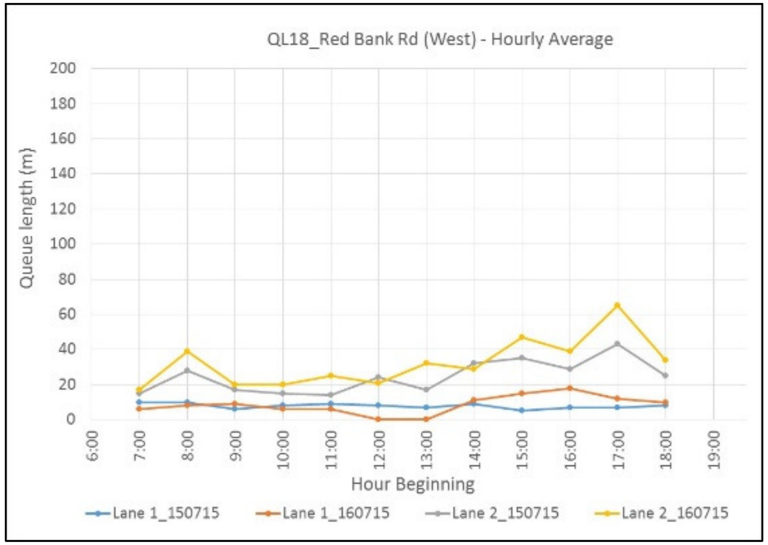
QL18: Red Bank Rd / Devonshire Rd



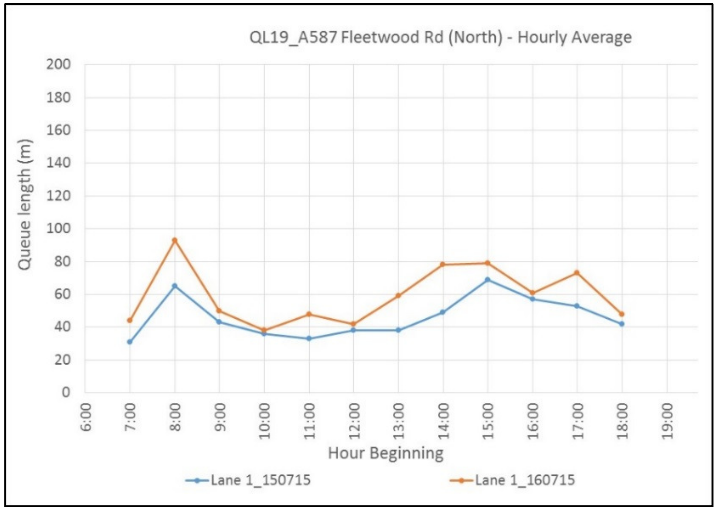


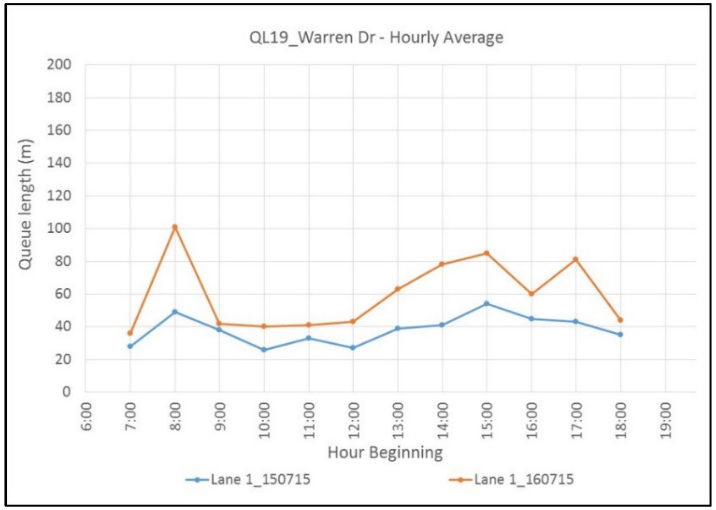


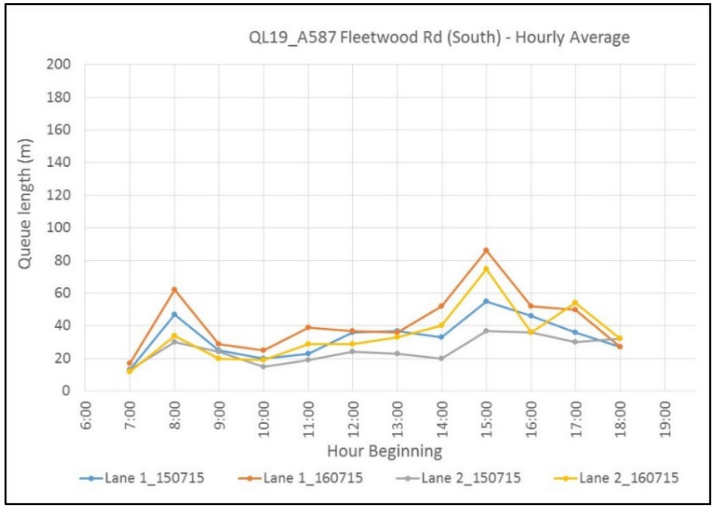


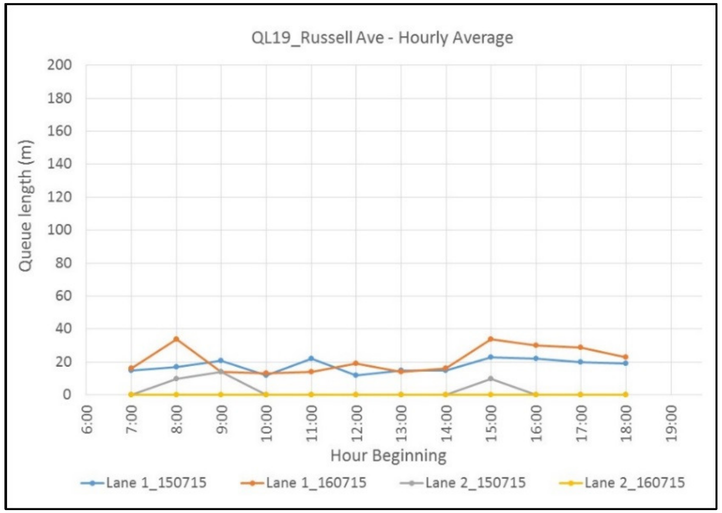

QL18_Red Bank Rd (West) - Hourly Average
Queue length (m)
200
180
160
140
120
100
80
60
40
20
0
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
Hour Beginning
Lane 1_150715
Lane 1_160715
Lane 2_150715
Lane 2_160715

QL19: A587 Fleetwood Rd / Warren Dr / Russell Ave

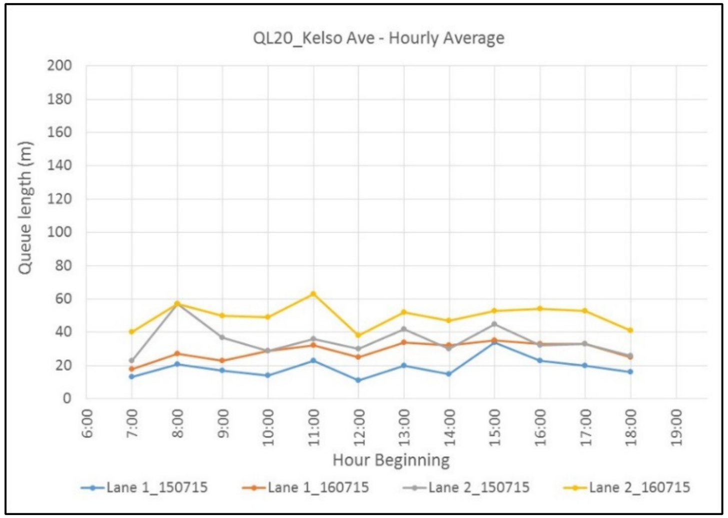


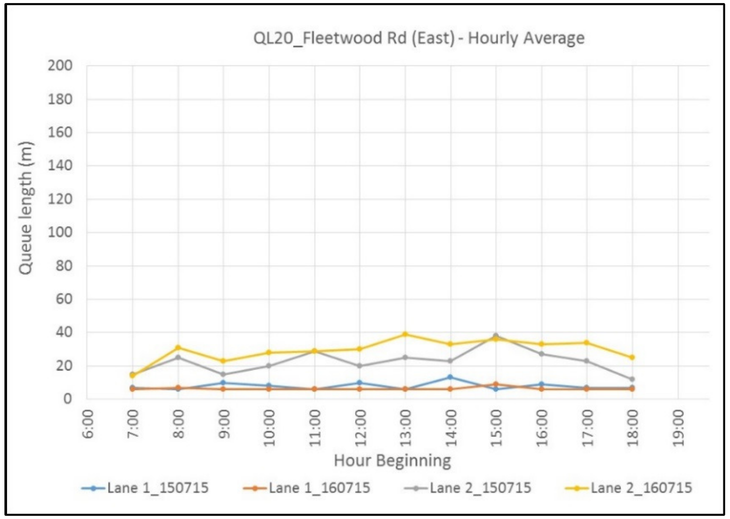


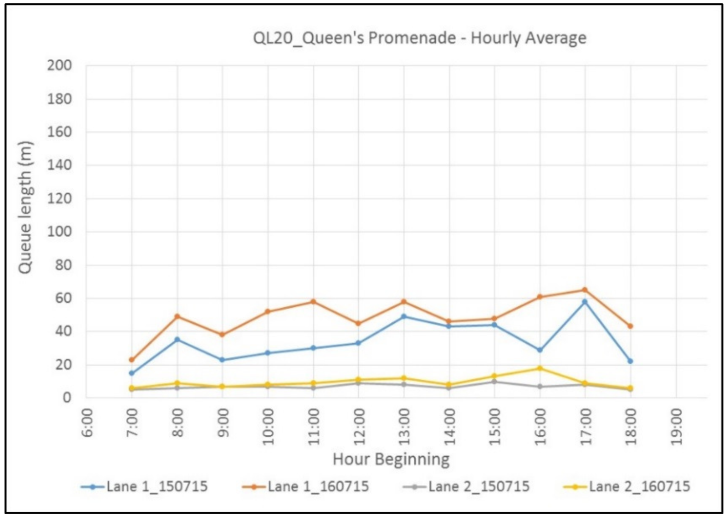




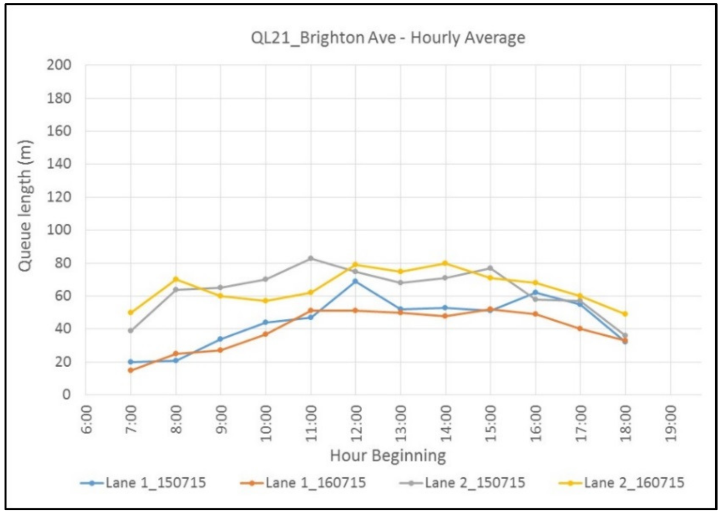
QL20: Kelso Ave / Fleetwood Rd / Queen's Promenade

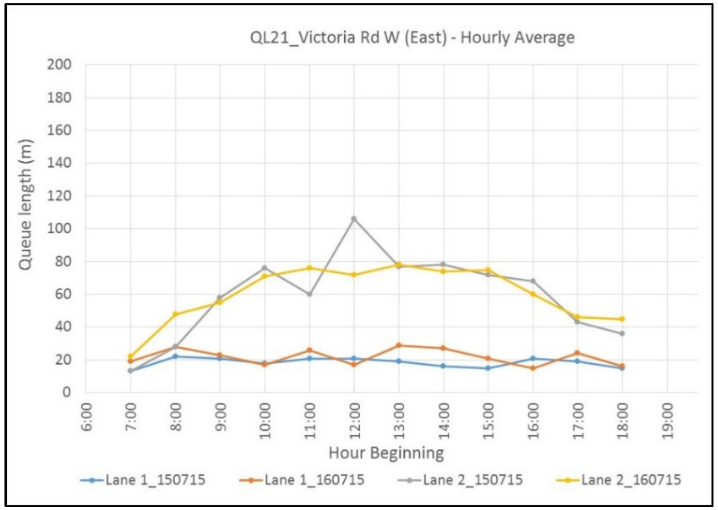


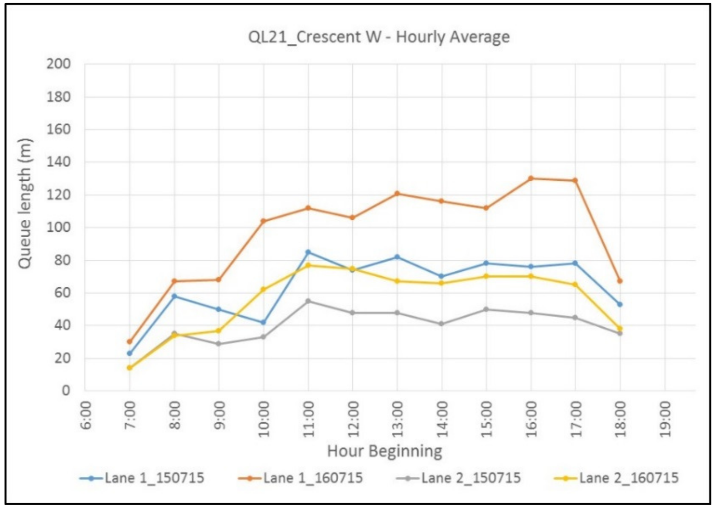




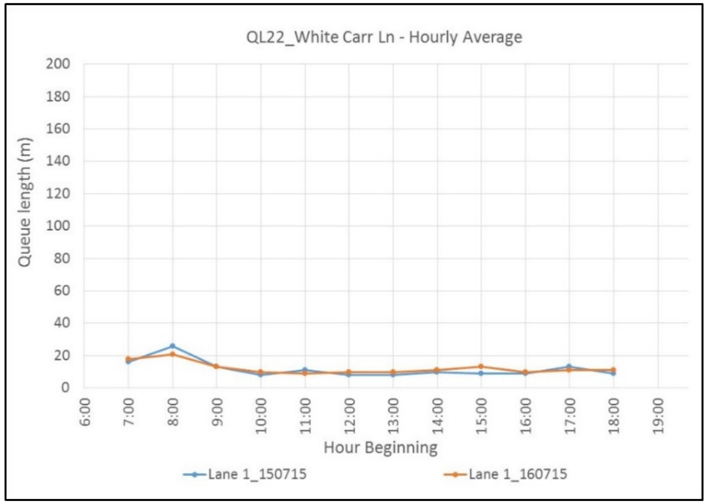
QL21: Rossall Rd / Brighton Ave / Victoria Rd W / Crescent W

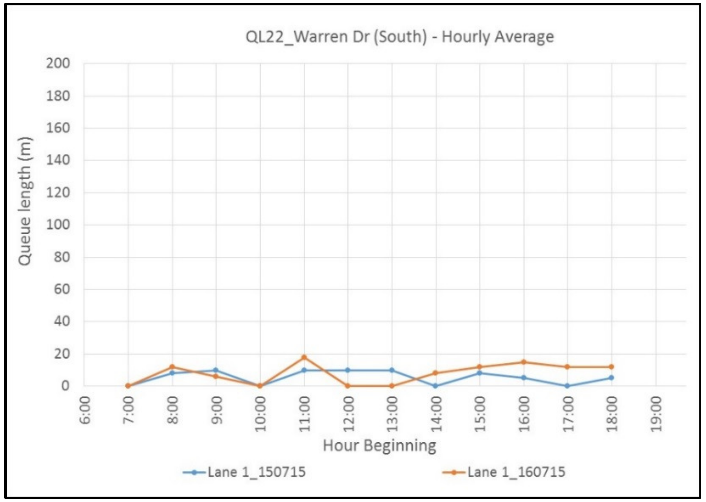


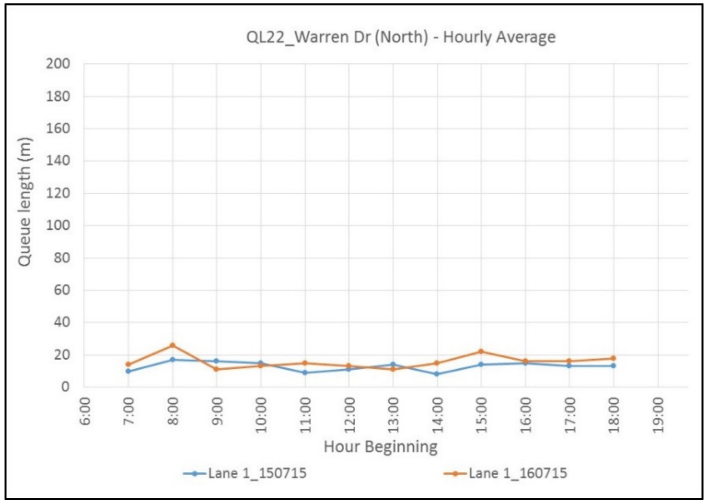




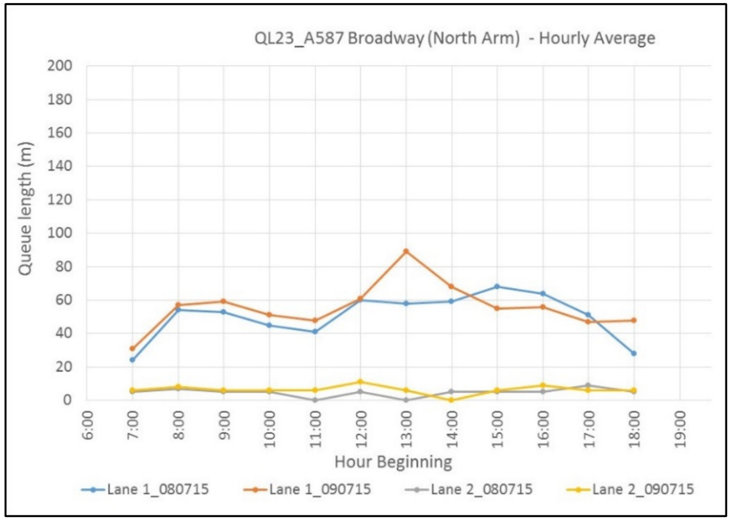
QL22: White Carr Ln / Warren Dr

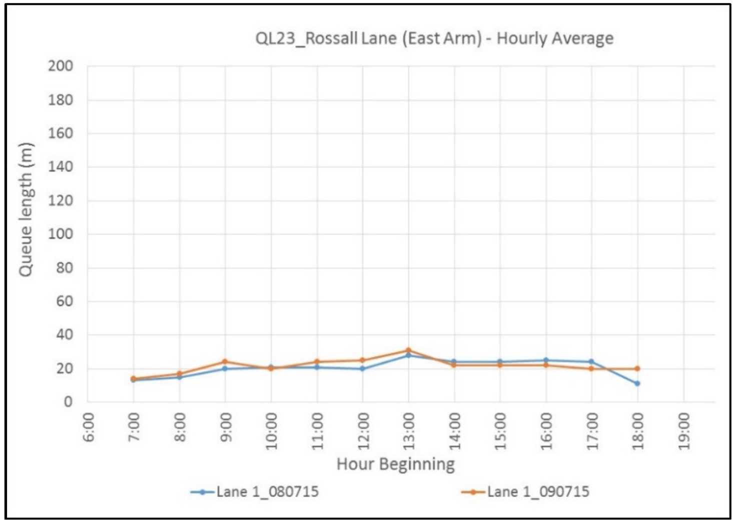


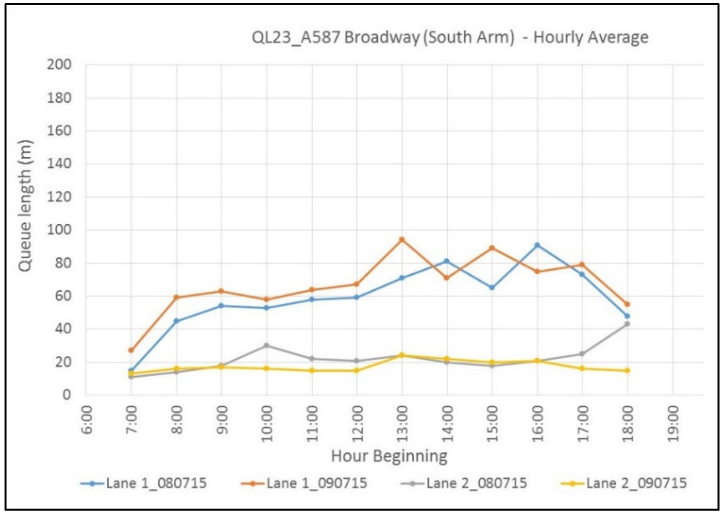


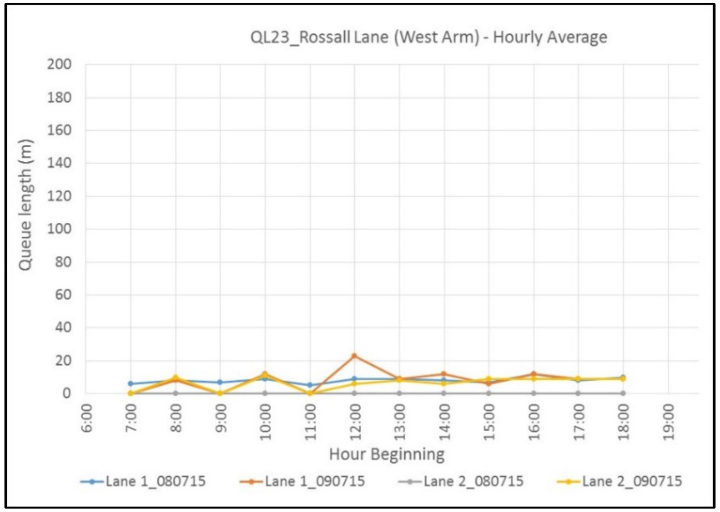


QL23: A587 Broadway /Rossall Lane

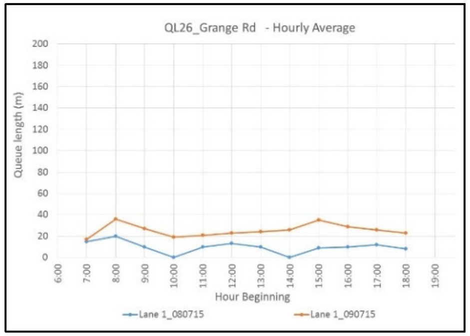


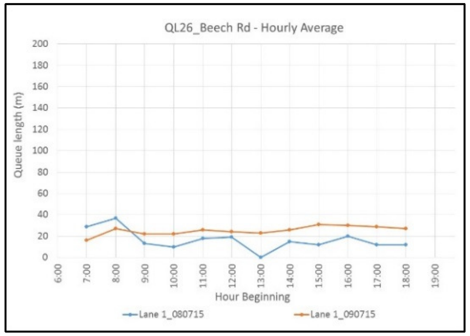


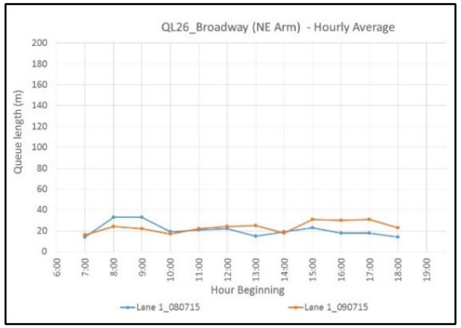


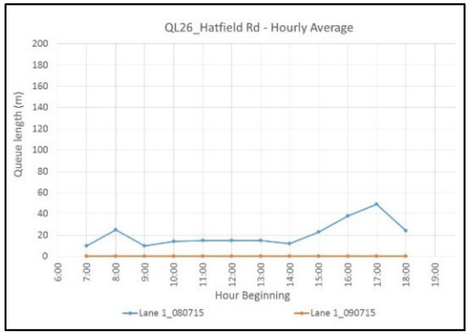


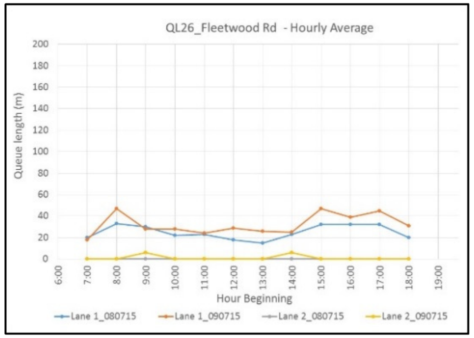
QL26: Grange Rd /Beech Rd /Broadway /Hatfield Ave /Fleetwood Rd /Chatsworth Ave

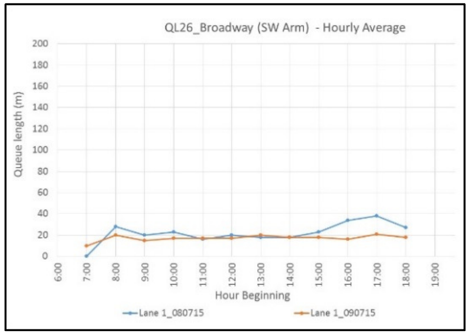


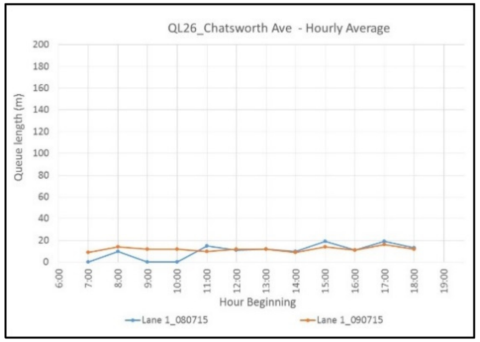




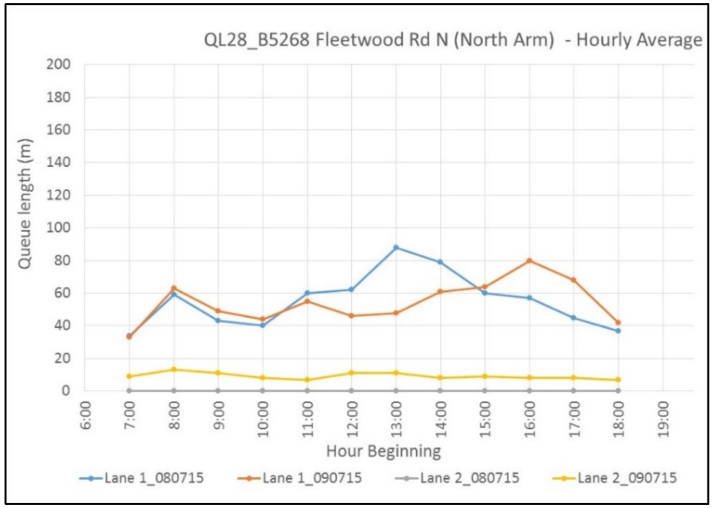


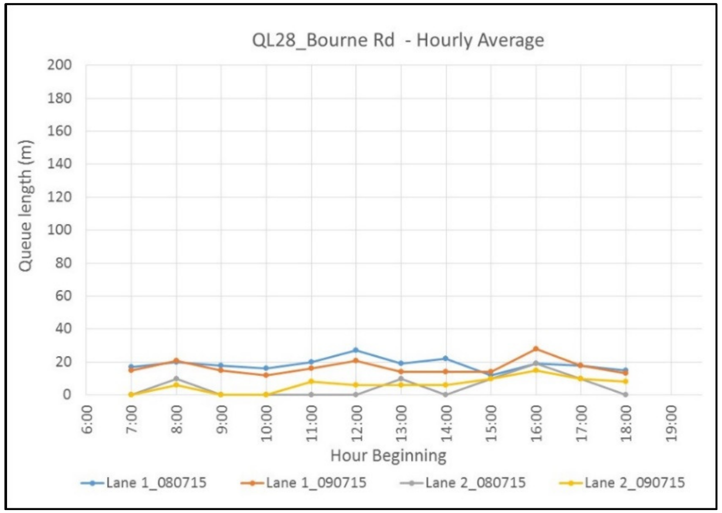


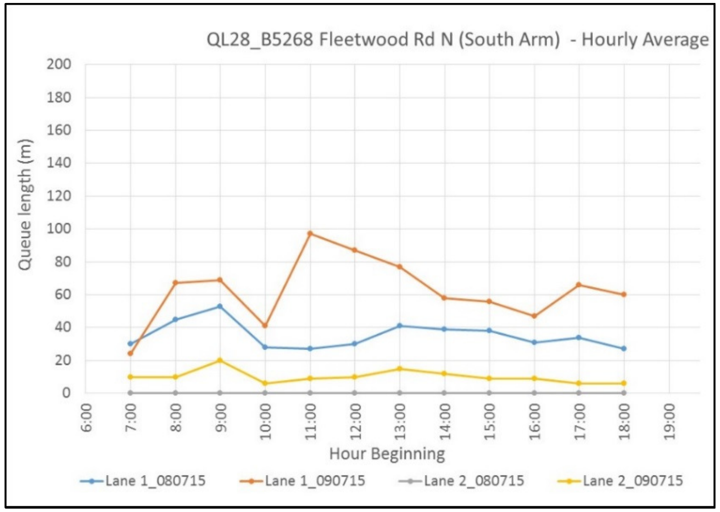


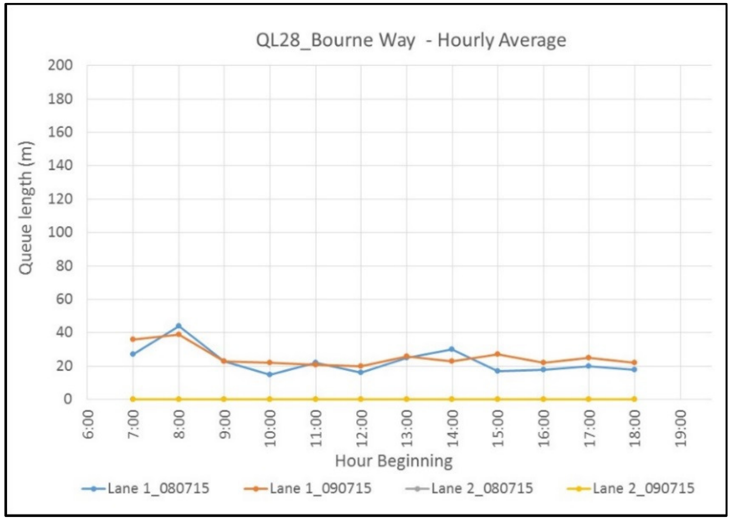


QL28: B5268 Fleetwood Rd N/ Bourne Rd /Bourne Way

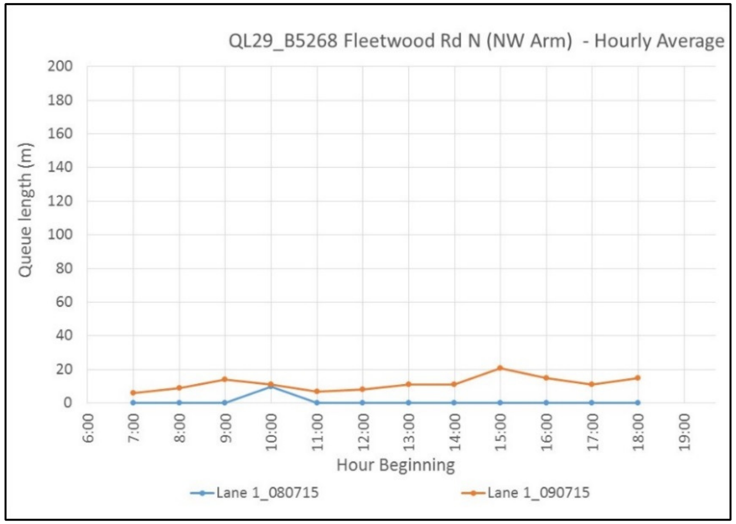


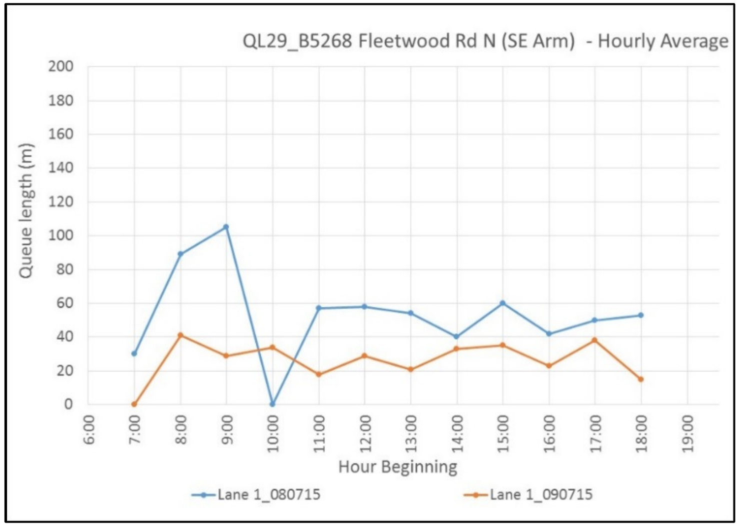


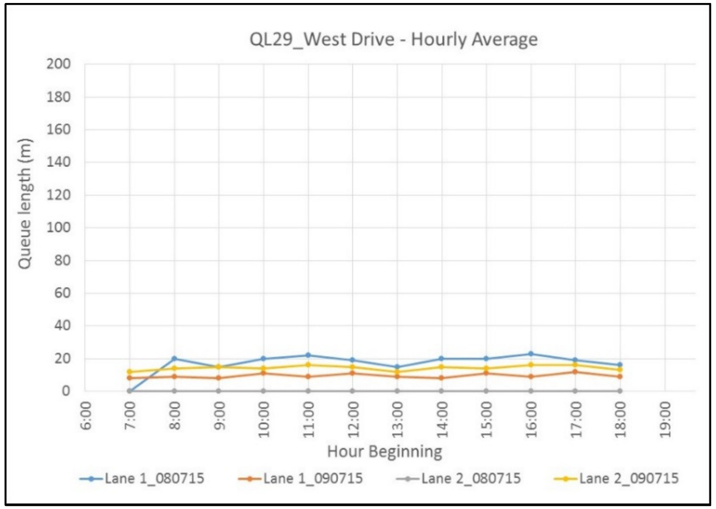




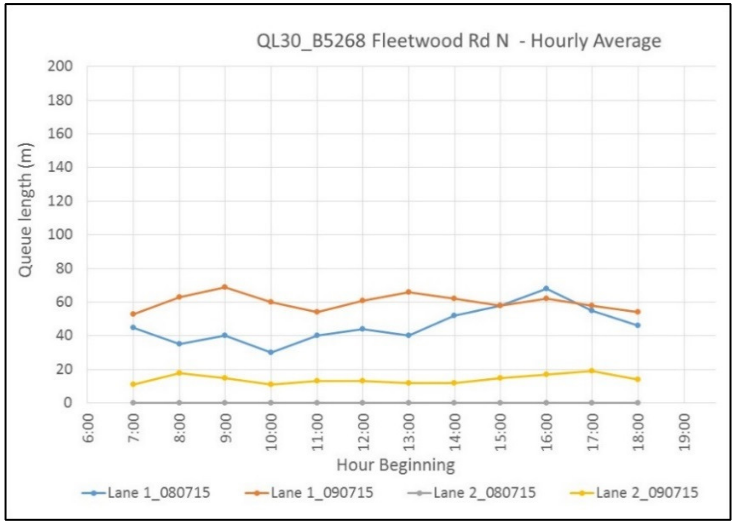
QL29: B5268 Fleetwood Rd N /West Drive

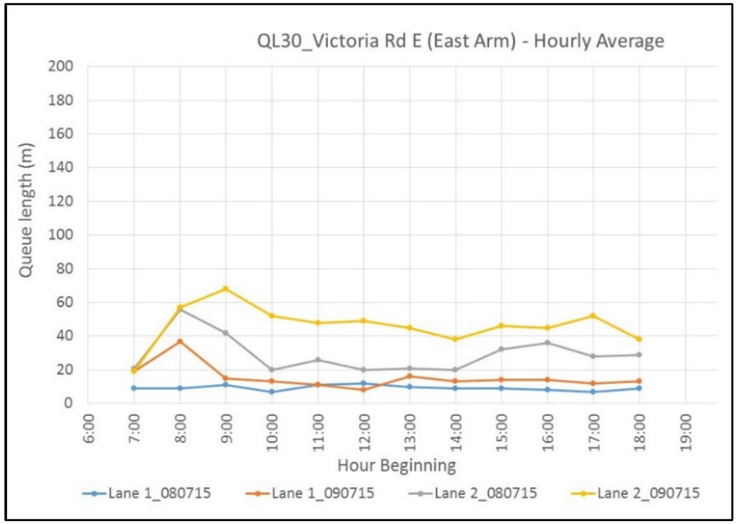


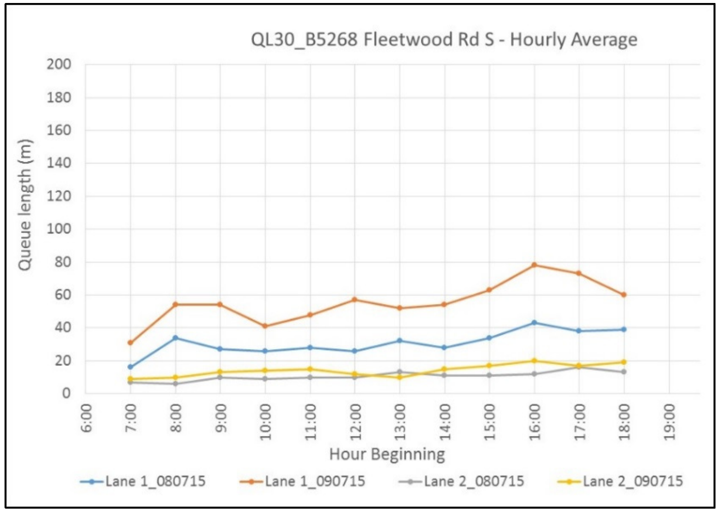


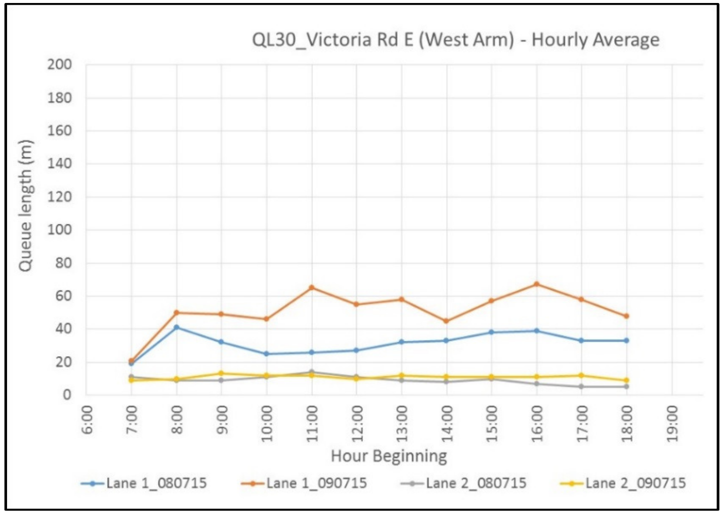


QL30: B5268 Fleetwood Rd N /Victoria Rd E /B5268 Fleetwood Rd S

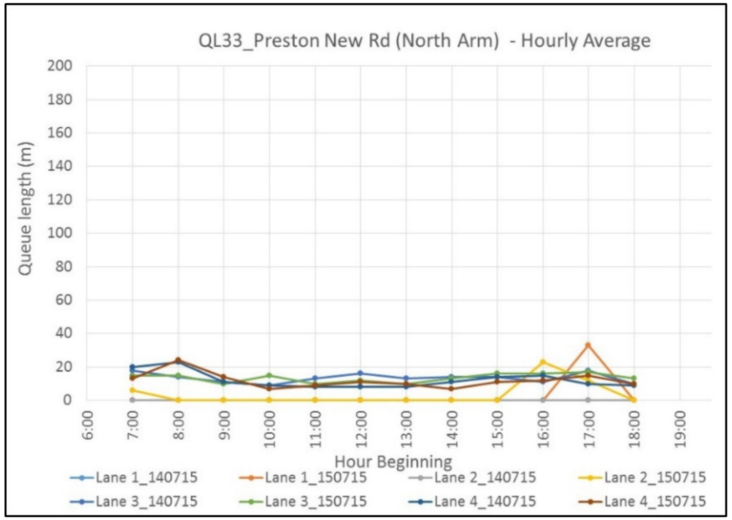


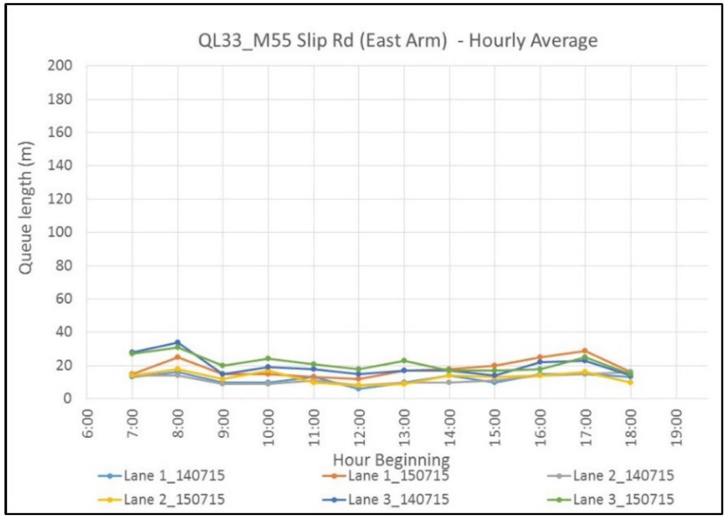


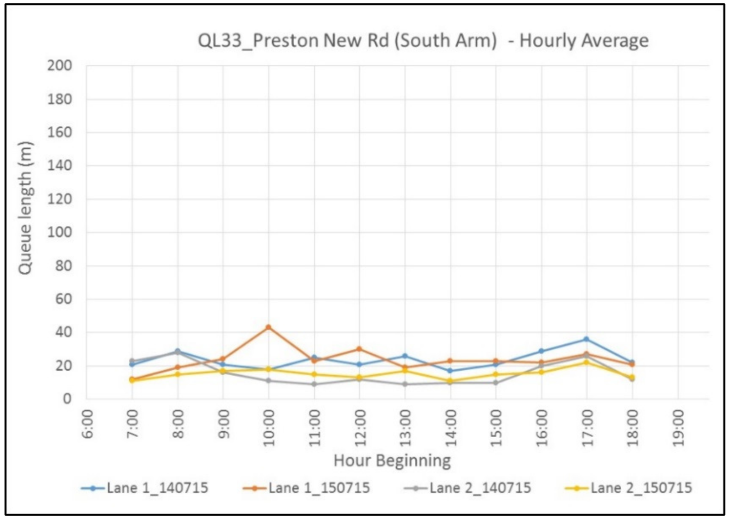


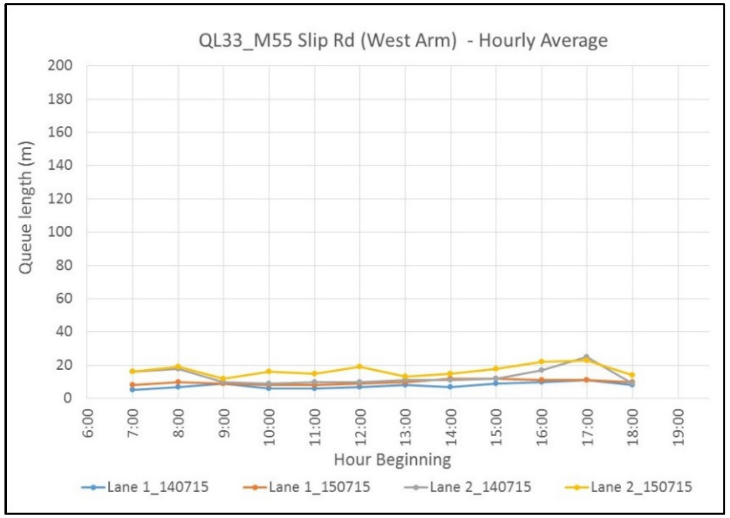


QL33: Preston New Rd/ M55 Slip Rd

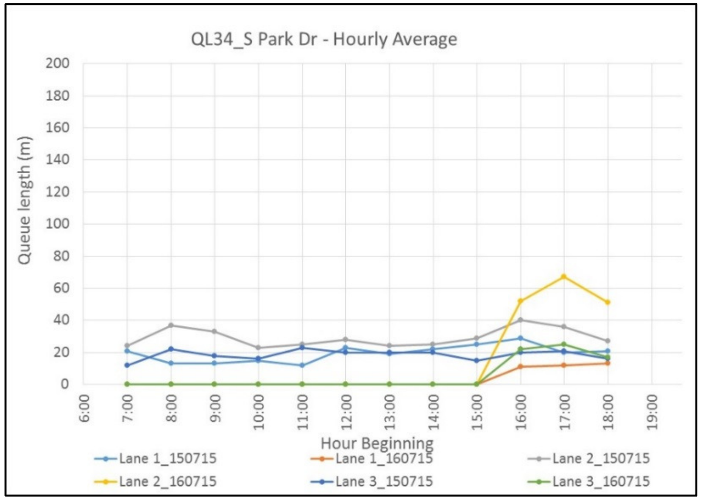


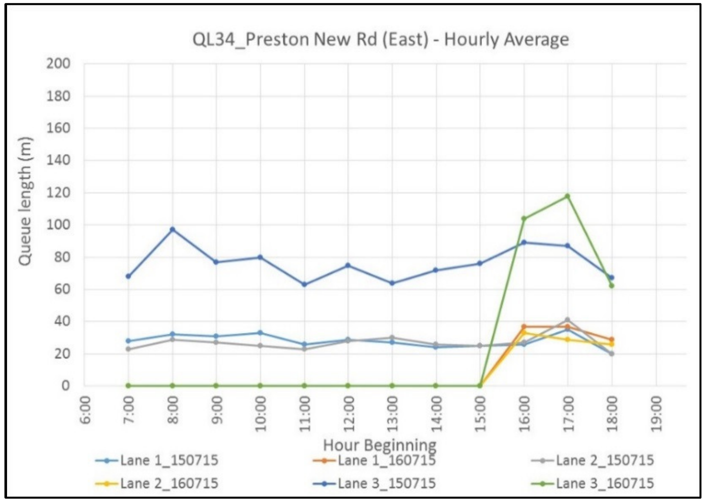


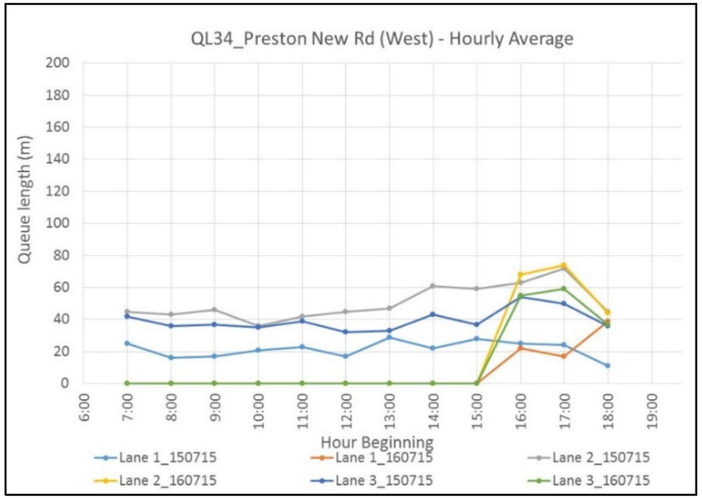




QL34: S Park Dr / Preston New Rd







APPENDIX O

Comparison of RSI Record Counts and Model Base Month and Year Traffic Counts

Table O-1 Numbers of RSI records in each dataset compared to model month and year traffic count

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
BCC 1	AM	Car	96	1554
		LGV	4	98
		HGV	3	51
	IP	Car	150	3055
		LGV	7	207
		HGV	1	87
	PM	Car	46	1448
		LGV	0	68
		HGV	0	41
BCC 2	AM	Car	58	1020
		LGV	5	39
		HGV	1	12
	IP	Car	115	1873
		LGV	4	76
		HGV	1	14
	PM	Car	45	1043
		LGV	1	25
		HGV	0	10
BCC 3	AM	Car	113	989
		LGV	9	26
		HGV	0	59
	IP	Car	172	1902
		LGV	6	50

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	0	93
	PM	Car	70	1114
		LGV	3	19
		HGV	1	58
BCC 4	AM	Car	122	853
		LGV	18	41
		HGV	2	1
	IP	Car	254	1451
		LGV	25	102
		HGV	2	1
	PM	Car	174	843
		LGV	12	28
		HGV	0	0
BCC 5	AM	Car	159	1921
		LGV	6	134
		HGV	0	18
	IP	Car	241	3347
		LGV	15	295
		HGV	5	28
	PM	Car	74	1783
		LGV	4	99
		HGV	0	4
BCC 6	AM	Car	321	1916
		LGV	21	70
		HGV	9	7
	IP	Car	496	3004
		LGV	55	147

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	11	2
	PM	Car	263	1755
		LGV	18	52
		HGV	1	1
BCC 7	AM	Car	168	1840
		LGV	8	170
		HGV	6	71
	IP	Car	236	3599
		LGV	13	345
		HGV	4	98
	PM	Car	136	2387
		LGV	1	133
		HGV	1	64
BCC 8	AM	Car	240	1167
		LGV	23	105
		HGV	3	2
	IP	Car	257	1954
		LGV	13	165
		HGV	3	0
	PM	Car	85	1477
		LGV	3	92
		HGV	2	0
BCC 9	AM	Car	186	1282
		LGV	52	164
		HGV	28	72
	IP	Car	570	2793
		LGV	92	299

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	31	129
	PM	Car	252	1779
		LGV	26	86
		HGV	5	49
BCC 10	AM	Car	259	1589
		LGV	18	90
		HGV	1	35
	IP	Car	388	3540
		LGV	63	252
		HGV	17	56
	PM	Car	200	1583
		LGV	2	68
		HGV	1	16
BCC 11	AM	Car	311	2206
		LGV	30	108
		HGV	5	14
	IP	Car	481	4001
		LGV	51	263
		HGV	5	24
	PM	Car	208	2339
		LGV	18	99
		HGV	0	4
BCC 12	AM	Car	279	2970
		LGV	37	187
		HGV	28	55
	IP	Car	478	5436
		LGV	58	379

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	44	92
	PM	Car	287	2855
		LGV	22	103
		HGV	4	20
BCC 15	AM	Car	320	2245
		LGV	40	264
		HGV	9	82
	IP	Car	562	3918
		LGV	66	528
		HGV	21	216
	PM	Car	306	2919
		LGV	17	278
		HGV	4	32
PWD 01 NB	AM	Car	288	1251
		LGV	12	145
		HGV	7	30
	IP	Car	357	2043
		LGV	20	200
		HGV	29	91
	PM	Car	261	1757
		LGV	14	154
		HGV	6	26
PWD 01 SB	AM	Car	229	1557
		LGV	5	124
		HGV	11	49
	IP	Car	364	2009
		LGV	14	239

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	9	95
	PM	Car	190	1597
		LGV	10	141
		HGV	16	16
PWD 11 WB	AM	Car	212	834
		LGV	15	74
		HGV	3	21
	IP	Car	483	1044
		LGV	43	119
		HGV	11	47
	PM	Car	209	562
		LGV	18	75
		HGV	9	10
PWD 13 NB	AM	Car	314	1784
		LGV	13	239
		HGV	10	52
	IP	Car	363	2368
		LGV	23	422
		HGV	10	104
	PM	Car	258	1845
		LGV	11	223
		HGV	10	33
PWD 27 SB	AM	Car	250	1673
		LGV	10	175
		HGV	5	97
	IP	Car	266	1869
		LGV	35	272

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	33	196
	PM	Car	278	1469
		LGV	7	103
		HGV	3	51
PWD 29 WB	AM	Car	173	794
		LGV	18	125
		HGV	7	47
	IP	Car	301	1288
		LGV	23	218
		HGV	8	107
	PM	Car	206	1088
		LGV	17	121
		HGV	5	19
PWD 29 EB	AM	Car	177	802
		LGV	4	79
		HGV	3	21
	IP	Car	391	1012
		LGV	13	134
		HGV	5	65
	PM	Car	188	749
		LGV	16	57
		HGV	8	13
PWD 2 EB	AM	Car	259	2920
		LGV	33	341
		HGV	22	110
	IP	Car	489	4088
		LGV	75	579

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	22	273
	PM	Car	246	3455
		LGV	27	242
		HGV	20	34
PWD 30 SB	AM	Car	216	1252
		LGV	8	118
		HGV	2	22
	IP	Car	330	2168
		LGV	20	220
		HGV	2	50
	PM	Car	128	1258
		LGV	7	90
		HGV	2	11
PWD 31 WB	AM	Car	207	2598
		LGV	32	422
		HGV	16	145
	IP	Car	410	3901
		LGV	101	746
		HGV	19	304
	PM	Car	256	2640
		LGV	30	357
		HGV	8	89
PWD 32 NB	AM	Car	161	1296
		LGV	35	215
		HGV	12	91
	IP	Car	446	2683
		LGV	38	424

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	12	161
	PM	Car	221	1610
		LGV	20	170
		HGV	5	49
PWD 33 EB	AM	Car	398	2463
		LGV	21	339
		HGV	16	267
	IP	Car	441	3936
		LGV	46	734
		HGV	16	598
	PM	Car	254	2500
		LGV	12	283
		HGV	11	117
PWD 33 WB	AM	Car	283	1830
		LGV	21	336
		HGV	14	231
	IP	Car	391	3211
		LGV	34	668
		HGV	15	534
	PM	Car	205	1931
		LGV	11	229
		HGV	16	134
PWD 34 NB	AM	Car	235	3331
		LGV	25	293
		HGV	16	122
	IP	Car	539	4385
		LGV	57	453

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	21	174
	PM	Car	258	2594
		LGV	21	177
		HGV	8	37
PWD 3 NB	AM	Car	213	2321
		LGV	22	243
		HGV	17	106
	IP	Car	465	3197
		LGV	51	431
		HGV	21	231
	PM	Car	268	2129
		LGV	25	235
		HGV	7	72
PWD 5 NB	AM	Car	131	2189
		LGV	23	377
		HGV	10	186
	IP	Car	374	3424
		LGV	62	530
		HGV	43	311
	PM	Car	211	2089
		LGV	26	249
		HGV	9	83
PWD 2 WB	AM	Car	223	3113
		LGV	16	333
		HGV	19	108
	IP	Car	459	4274
		LGV	46	588

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	14	256
	PM	Car	291	3267
		LGV	22	246
		HGV	5	47
PWD 3 SB	AM	Car	160	1591
		LGV	22	262
		HGV	16	83
	IP	Car	410	3259
		LGV	59	451
		HGV	16	158
	PM	Car	293	2945
		LGV	10	215
		HGV	8	48
PWD 35 WB	AM	Car	192	493
		LGV	12	46
		HGV	7	35
	IP	Car	487	727
		LGV	57	108
		HGV	16	47
	PM	Car	231	895
		LGV	20	73
		HGV	7	16
PWD 28 WB	AM	Car	97	342
		LGV	8	34
		HGV	5	13
	IP	Car	188	640
		LGV	14	88

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	11	25
	PM	Car	111	547
		LGV	5	56
		HGV	4	12
PWD 28 EB	AM	Car	148	693
		LGV	9	67
		HGV	18	8
	IP	Car	169	516
		LGV	15	66
		HGV	15	23
	PM	Car	111	354
		LGV	7	32
		HGV	6	6
PWD 10 SB	AM	Car	118	1337
		LGV	18	249
		HGV	8	122
	IP	Car	250	2054
		LGV	48	362
		HGV	22	218
	PM	Car	144	1476
		LGV	14	202
		HGV	5	44
PWD 9 SB	AM	Car	265	1786
		LGV	11	178
		HGV	3	47
	IP	Car	399	3249
		LGV	19	326

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	4	106
	PM	Car	173	1988
		LGV	6	172
		HGV	5	29
PWD 7 SB	AM	Car	169	1922
		LGV	9	200
		HGV	9	61
	IP	Car	387	3262
		LGV	51	373
		HGV	10	144
	PM	Car	213	1514
		LGV	13	104
		HGV	3	23
PWD 4 SB	AM	Car	167	991
		LGV	21	107
		HGV	9	27
	IP	Car	310	1747
		LGV	29	156
		HGV	6	65
	PM	Car	163	1089
		LGV	7	94
		HGV	4	9
PWD 4 NB	AM	Car	139	844
		LGV	18	90
		HGV	5	33
	IP	Car	297	1846
		LGV	27	200

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	15	52
	PM	Car	189	1515
		LGV	18	124
		HGV	7	14
ANSA 1	AM	Car	329	2638
		LGV	63	188
		HGV	22	235
	IP	Car	514	3536
		LGV	100	355
		HGV	59	529
	PM	Car	322	2154
		LGV	45	139
		HGV	13	135
ANSA 2	AM	Car	234	827
		LGV	19	98
		HGV	9	26
	IP	Car	410	1708
		LGV	63	181
		HGV	17	41
	PM	Car	233	1041
		LGV	45	51
		HGV	6	8
ANSA 3	AM	Car	248	1919
		LGV	55	119
		HGV	15	20
	IP	Car	419	2622
		LGV	74	230

Site	Time Period	Vehicle Type	RSI Record Count	Period Traffic Count
		HGV	32	36
	PM	Car	272	1351
		LGV	34	79
		HGV	4	2
ANSA 4	AM	Car	203	539
		LGV	21	50
		HGV	1	3
	IP	Car	268	954
		LGV	40	97
		HGV	5	0
	PM	Car	242	1094
		LGV	14	36
		HGV	1	0
ANSA 5	AM	Car	169	379
		LGV	12	32
		HGV	4	0
	IP	Car	218	456
		LGV	16	59
		HGV	9	0
	PM	Car	122	240
		LGV	4	19
		HGV	0	0

Appendix D – Stage 3 Transport Model Package

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A585 Windy Harbour to Skippool

Transport Model Package

HE548643-ARC-HGN-A585-RP-TR-3176

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Registered office Bridge House, 1 Walnut Tree Close, Guildford GU1 4LZ
Highways England Company Limited registered in England and Wales number 09346363

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Author	Jeanne WatrinAref AlipourAref Alipour
Owner	Nick HendersonNick Henderson
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Name	Role

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This report dated 22 AUGUST 2018 has been prepared for Highways England (the “Client”) in accordance with the terms and conditions of appointment dated 16 March 2016 (the “Appointment”) between the client and Arcadis Consulting (UK) Limited (“Arcadis”) for the purposes specified in the Appointment. For the avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

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1.1.1 The Stage 2 A585 Windy Harbour to Skippool base year traffic model (2015) was validated using the November 2016 v1.6 Transport Analysis Guidance (TAG) release of Values of Time (VoT) and Vehicle Operating Costs (VOC).

1.1.2 The Stage 3 traffic model VoT and VOC values have been updated with the July 2017 v1.8 TAG databook release. The purpose of this technical note, therefore, is to present the results of a sensitivity analysis undertaken on the changes to the VoT and VOC on the validated Stage 2 A585 Windy Harbour to Skippool base year model (2015). The validation details are provided in the PCF Stage 2 A585 Windy Harbour to Skippool Local Model Validation Report [HE548643-ARC-GEN-A585-RP-TR-2039-v6.0]. The PCF Stage 2 Local Model Validation Report (LMVR) identifies the model specification including the modelled time periods. The Stage 2 LMVR documents the development of the Stage 2 traffic model and data sources that have been considered for calibration and validation of the model to the present Stage 2 base year of 2015. The report then considers how the revised Stage 3 models perform in the base year of 2015, by comparing the model with observed data. Finally, the report describes the accuracy of the Stage 3 base year traffic model.

1.1.3 The Stage 3 A585 Windy Harbour to Skippool base year traffic model was tested three times to ensure the full capture of the VoT/VOC and SATURN version changes:

- B000 – Stage 2 handover Base Model (SATURN v.11.3.12U)
- B001 – Stage 2 handover Base Model using SATURN v.11.3.12W (SATURN update)
- B003 – Stage 2 handover model using SATURN v.11.3.12W and the July 2017 v1.8 TAG databook VoT and VOC values.

1.1.4 The testing of B000 and B001 provided a baseline to ensure that the upgrade to the newest version of SATURN (v.11.3.12W) would not affect the flow calibration and validation results. After showing that the flow calibration and validation results were not affected between B000 and B001, B003 was tested. In this latest version of the base model the newest version of SATURN as well as the updated VoT and VOC were introduced. The network speed used in the calculation of the VOC values was assumed to be 57 km/h for B003. This network speed assumption is unchanged from the Stage 2 base year traffic donor model and maintains consistency between the Stage 2 and Stage 3 traffic models.

1.1.5 An intermediate run of B002 was also undertaken to assess the impact of the TPG workbook default average network speed assumption of 54 km/h used in the calculation of the VOC values which would not be presented in this report as it differed from the average network speed assumption used in the calculation of the VOC values from the Stage 2 donor model.

2 Generalised Cost Formulation

2.1.1 As noted above, the generalised cost coefficients of the A585 Windy Harbour to Skippool Stage 2 base year (2015) traffic model, were based on TAG Unit A1.3, from a price base of 2010, reflecting the consultation values of time released in November 2016 v1.6 TAG databook release. The Stage 2 VOT /VOC values were prepared by applying the workbook supplied by Highways England Transport Planning Group (TPG) [VoT_and_VOC_from_TAG_Databook_v1.6_(Nov 2016 updates)_release130916.xls].

2.1.2 The generalised costs coefficients of the A585 Windy Harbour to Skippool Stage 3 base year traffic model (2015) were updated to reflect the July 2017 v1.8 TAG release of VOT/VOC values, from a price base of 2010. The VOT/VOC values were prepared by applying the TPG workbook [VoT_and_VOC_from_TAG_Databook_(July 2017) - release040817.xls]. These are presented in Table 2-1. The average network speed used in the calculation of the VOC values in both the Stage 2 and Stage 3 traffic models was 57 kph.

2.1.3 The TPG VoT/VOC workbook has now been updated to incorporate the October 2017 changes to the TAG Databook (v1.8.2 TAG release). The latest workbook now includes forecast fuel cost series for electric LGVs, updating Tables 10, 10b, 13 and 14 within the TAG tab. As this is only a minor change as agreed with TPG no modelling updates will be done just to incorporate these changes.

Table 2-1: Generalised Cost Coefficients - A585 Windy Harbour to Skippool

Category	Stage 2 Base Validated Model (2015)[σ]		B003 Sensitivity Test (2015)[∞]	
	VoT (pence/min)	VOC (pence/km)	VoT (pence/min)	VOC (pence/km)
AM Peak				
Car (Commute)	20.00	5.60	19.99	6.22
Car (EB)	29.82	12.01	29.81	12.53
Car (Others)	13.80	5.60	13.79	6.22
LGV	21.08	12.67	21.07	13.71
HGV*	42.80	42.76	42.78	44.19
Inter-Peak				
Car (Commute)	20.32	5.60	20.31	6.22
Car (EB)	30.56	12.01	30.54	12.53
Car (Others)	14.70	5.60	14.69	6.22
LGV	21.08	12.67	21.07	13.71
HGV*	42.80	42.76	42.78	44.19
PM Peak				
Car (Commute)	20.07	5.60	20.06	6.22
Car (EB)	30.25	12.01	30.24	12.53
Car (Others)	14.45	5.60	14.44	6.22
LGV	21.08	12.67	21.07	13.71
HGV*	42.80	42.76	42.78	44.19

[∞] Source – TPG workbook [VoT_and_VOC_from_TAG_Databook_v1.6_(Nov 2016 updates)_release130916.xls]
[σ] Source – TPG workbook [VoT_and_VOC_from_TAG_Databook_(July 2017) - release040817.xls]
*VOT factor adopted for HGVs = 2 as suggested in TAG Unit M3.1 paragraph 2.8.8

2.1.4 The change in generalised cost of travel would result in changes to route choice. The following section describes the sensitivity of the A585 Windy Harbour to Skippool base year traffic to the changes in the generalised cost of travel with respect to the stability of model convergence, changes in traffic flow and journey time validation and changes to the route choice within the traffic assignment.

3 Model Convergence

3.1.1 A measure of convergence in SATURN using Wardrop Equilibrium assignment method is obtained from the 'Delta' statistic (%GAP in SATURN), which can be defined as the difference between the time costs along chosen routes and the minimum time cost routes for the entire network using the equilibrium assignment.

3.1.2 Further assessment of the performance of the traffic assignment is done by evaluating the percentage of links which show less than 1% change in the assigned traffic flow between four successive iterations and also the percentage of junction delays changing less than 1%.

3.1.3 Table 3-1 summarises the most appropriate convergence measures as per TAG Unit 3.1 (Section 3.3.17) of proximity and stability and the values generally considered acceptable for use in establishing a base model.

Table 3-1: Summary – Convergence Criteria (TAG)

Measure of Convergence	Base Model Acceptable Values
Delta and %GAP	Less than 0.1% or at least stable with convergence fully documented and all other criteria met
Percentage of links with flow change (P) < 1%	Four consecutive iterations greater than 98%
Percentage of links with cost change (P2) < 1%	Four consecutive iterations greater than 98%
Percentage change in total user costs (V)	Four consecutive iterations less than 0.1% (SUE only)

3.1.4 The proximity indicator %GAP is the single most valuable indicator of overall model convergence. The values of %GAP in Table 3-2 passes the TAG unit M3.1 criteria of being less than 0.1%, which indicates that a high level of model convergence is achieved across all the three modelled time periods.

3.1.5 Further, the percentage of link flow and delay changes less than 1% in the final four successive iterations being greater than 98%, passes the stability criteria for all three modelled time periods.

Table 3-2: Model Convergence – Sensitivity Test

Model	Loops	% Link Flows <1% change*	% Delays <1% change*	GAP* (%)
B000				
AM	35	98.1	99.2	0.0057
		98.3	99.4	0.0100
		98.6	99.3	0.0075
		98.3	99.4	0.0080
IP	31	99.3	99.7	0.0025
		99.2	99.7	0.0026
		99.4	99.5	0.0025
		99.3	99.6	0.0033
PM	88	98.4	99.2	0.0045
		98.5	99.3	0.0053
		98.3	99.2	0.0051
		98.3	99.2	0.0061
B001				
AM	35	98.1	99.2	0.0057
		98.3	99.4	0.0100
		98.6	99.3	0.0075
		98.3	99.4	0.0080
IP	31	99.3	99.7	0.0025
		99.2	99.7	0.0026
		99.4	99.5	0.0025
		99.3	99.6	0.0033
PM	88	98.4	99.2	0.0045
		98.5	99.3	0.0053
		98.3	99.2	0.0051

Model	Loops	% Link Flows <1% change*	% Delays <1% change*	GAP* (%)
		98.3	99.2	0.0061
B003				
AM	34	98.6 98.2 98.1 98.3	99.4 99.3 99.2 99.1	0.0059 0.0058 0.0083 0.0079
IP	26	98.6 98.3 98.2 98.0	99.6 99.6 99.4 99.4	0.0035 0.0035 0.0044 0.0043
PM	88	98.4 98.6 98.4 98.1	99.3 99.4 99.5 99.2	0.0049 0.0039 0.0043 0.0044

*ascending by number of loops for the final four iterations

4 Flow Calibration/Validation

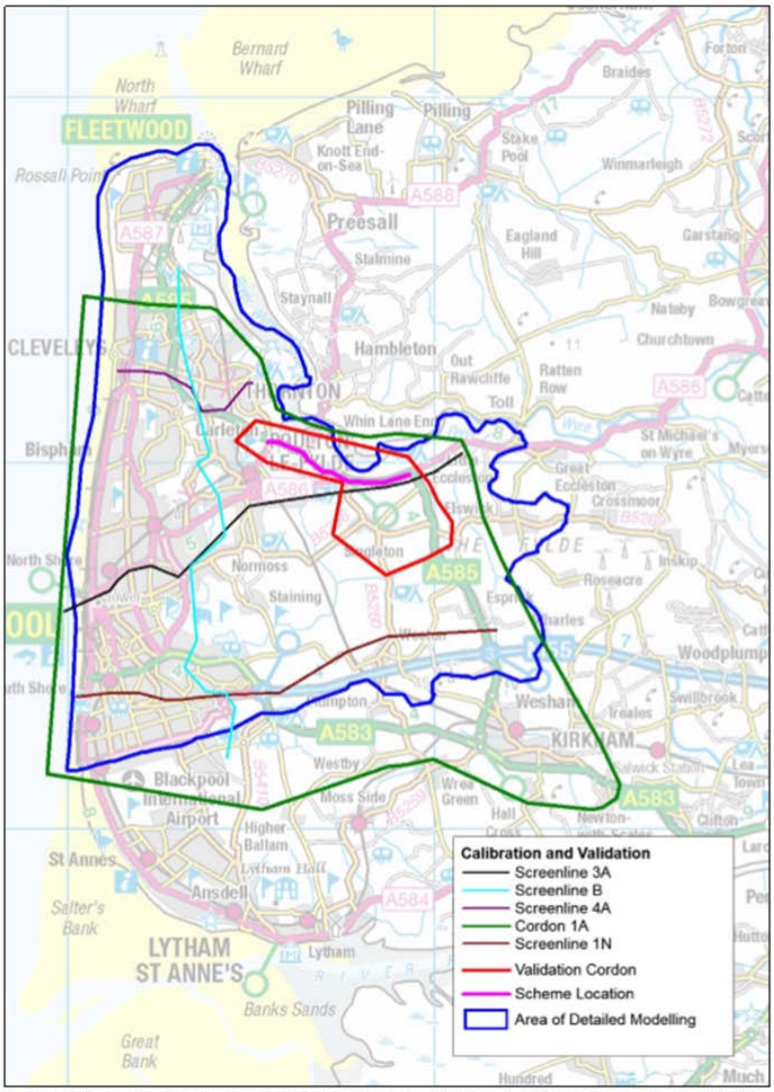
4.1 Introduction

4.1.1 Traffic flow and journey time validation exercise was carried out using the A585 Windy Harbour to Skippool base year network incorporating the July 2017 v1.8 TAG databook release.

4.1.2 As discussed in the introduction, the model was tested three times to ensure the full capture of the changes:

- B000 – Stage 2 donor model using SATURN v.11.3.12U
- B001 – Stage 2 donor model using SATURN v.11.3.12W
- B003 – Stage 2 donor model using SATURN v.11.3.12W and the July 2017 v1.8 VoT and VOC values.

4.1.3 A total of 150 links, 4 screenlines and one cordon were used as part of the sensitivity test to understand the level of model calibration as shown in Figure 4-1. Of the 150 links, 104 lie on screenlines and cordons and the remaining 46 links are additional calibration links separate to the screenlines and cordons. A summary of individual cordon/screenline validation statistics are provided in Appendix A.



Source: OS data © *Crown copyright 2015;* Licence – Version 3 of Open Govt. Licence (OGL)

Figure 4-1: A585 Windy Harbour to Skippool Screenlines and Cordon

4.1.4 The traffic model validation acceptability guidelines as outlined in TAG unit M3.1 are presented in Table

4-1 and Table 4-2 respectively.

Table 4-1: Screenline Flow Validation Criterion and Acceptability Guideline

Criteria	Acceptability Guideline
Differences between modelled flows and counts should be less than 5% of counts	All or nearly all screenlines

Source – TAG Unit M3.1, paragraph 3.2.5

Table 4-2: Link Flow/Turning Movement Validation Criteria and Acceptability Guidelines

Criteria	Description of Criteria	Acceptability Guideline
Flow Difference Criterion (1)	Individual flows within 100veh/h of counts for flows <700veh/h	> 85% of cases
	Individual flows within 15% of counts for flows from 700 to 2,700veh/h	> 85% of cases
	Individual flows within 400 veh/h of counts for flows > 2,700veh/h	> 85% of cases
GEH Criterion (2)	GEH < 5 for individual flows	> 85% of cases

Source – TAG Unit M3.1, paragraph 3.2.8

4.2 Assignment Calibration (Sensitivity Test)

4.2.1 As noted above, the link flow calibration exercise focused on 150 links, 104 of which lie on screenlines and cordons and the remaining 46 links are additional calibration links separate to the screenlines and cordons. The link flow calibration results were compared across B000, B001 and B003 and are presented in Table 4-3, Table 4-4 and Table 4-5. The complete link flow calibration results can be found in Appendix B.

Table 4-3: Summary of Flow Calibration - AM Peak

Count Type	Total	B000			B001			B003		
		Flow Criteria	GEH Criteria	TAG	Flow Criteria	GEH Criteria	TAG	Flow Criteria	GEH Criteria	TAG
Screenline Links	104	88	89	90	88	89	90	88	89	90
Other Links	46	44	43	44	44	43	44	44	43	44
Total Links	150	132	132	134	132	132	134	132	132	134
		88%	88%	89%	88%	88%	89%	88%	88%	89%
Turns	92	89	74	89	89	74	89	89	75	89
		97%	80%	97%	97%	80%	97%	97%	82%	97%
Total (Links and Turns)	242	221	206	223	221	206	223	221	207	223
		91%	85%	92%	91%	85%	92%	91%	86%	92%

Table 4-4: Summary of Flow Calibration - Inter-Peak

Count Type	Total	B000			B001			B003		
		Flow Criteria	GEH Criteria	TAG	Flow Criteria	GEH Criteria	TAG	Flow Criteria	GEH Criteria	TAG
Screenline Links	104	93	88	93	93	88	93	92	87	93
Other Links	46	46	45	46	46	45	46	46	45	46
Total Links	150	139	133	139	139	133	139	138	132	139
		93%	89%	93%	93%	89%	93%	92%	88%	93%
Turns	92	91	75	91	91	75	91	91	75	91
		99%	82%	99%	99%	82%	99%	99%	82%	99%
Total (Links and Turns)	242	230	208	230	230	208	230	229	207	230
		95%	86%	95%	95%	86%	95%	95%	86%	95%

Table 4-5: Summary of Flow Calibration - PM Peak

Count Type	Total	B000			B001			B003		
		Flow Criteria	GEH Criteria	TAG	Flow Criteria	GEH Criteria	TAG	Flow Criteria	GEH Criteria	TAG
Screenline Links	104	89	89	90	89	89	90	89	89	90
Other Links	46	45	44	45	45	44	45	45	44	45
Total Links	150	134	133	135	134	133	135	134	133	135
		89%	89%	90%	89%	89%	90%	89%	89%	90%
Turns	92	80	72	82	80	72	82	80	72	82
		87%	78%	89%	87%	78%	89%	87%	78%	89%
Total (Links and Turns)	242	214	205	217	214	205	217	214	205	217
		88%	85%	90%	88%	85%	90%	88%	85%	90%

4.2.2 Table 4-3, Table 4-4 and Table 4-5 illustrate that the level of fit between the observed and the modelled flows is good, with all the links and the majority of the turns meeting the TAG criterion. The results are summarised in detail:

AM Peak

- In the AM peak, all the links pass the DMRB traffic flow and GEH criteria as well as the TAG criteria for the three models, B000, B001 and B003. There are no improvements between the B000 model and B003.
- The turns pass the DMRB flow and TAG criteria but fails on the BMRB GEH criterion for all models, although there is a slight improvement in B003 compared to both B000 and B001.
- Since TAG suggests that meeting either the DMRB flow or GEH criterion is regarded as satisfactory, the results shown in Table 4-3 are deemed acceptable.

Inter-Peak

- In the Inter-Peak period, all the links pass the DMRB traffic flow and GEH criteria as well as the TAG criteria for the three models, B000, B001 and B003. The model with updated VoT and VOC show slightly worse for the DMRB flow criterion, as it decreased from 93% for both B000 and B001 to 92% for B003.
- The turns pass both the DMRB flow and TAG criteria but fail on the DMRB GEH criteria with 82%. As the turns meet the DMRB flow and TAG criteria, the results shown in Table 4-4 are deemed acceptable.

PM Peak

- As for the AM and Inter-Peak, the links pass the three criteria for all models. There are no improvements between B000 and B003.
- The turns also show a similar pattern as in the AM and Inter-Peak: the turns pass the DMRB flow and TAG criteria but fail on the DMRB GEH criterion, with no improvements between B000 and B003.
- The results shown in Table 4-5 are deemed acceptable in line with TAG.

4.2.3 It is observed that the results of the sensitivity test for the updated models (B001 and B003) are similar to the Stage 2 A585 Windy Harbour to Skippool base year donor model (B000) for all modelled time periods. Although, as noted above, the turns are not meeting the DMRB GEH criteria in the sensitivity test, they meet the DMRB Flow and TAG criteria, therefore are deemed acceptable as per the Stage 2 Base Year Model validation results.

4.3 Assignment Validation (Sensitivity Test)

4.3.1 A flow validation exercise was undertaken on the sensitivity test for all the existing models (i.e. B000, B001 and B003) for all time periods. The summary of the results is presented in Table 4-6, Table 4-7 and Table 4-8 while the complete validation results can be found in Appendix C.

Table 4-6: Summary of Flow Validation - AM Peak

Count Type	Total	B000			B001			B003		
		Flow Criteria	GEH Criteria	TAG	Flow Criteria	GEH Criteria	TAG	Flow Criteria	GEH Criteria	TAG
Screenline Links	20	15	14	15	15	14	15	15	14	15
Other Links	32	27	23	29	27	23	29	26	24	29
Total Links	52	42	37	44	42	37	44	41	38	44
		81%	71%	85%	81%	71%	85%	79%	73%	85%
Turns	20	19	18	20	19	18	20	18	18	20
		95%	90%	100%	95%	90%	100%	90%	90%	100%
Total (Links and Turns)	72	61	55	64	61	55	64	59	56	64
		85%	76%	89%	85%	76%	89%	82%	78%	89%

Table 4-7: Summary of Flow Validation - Inter-Peak

Count Type	Total	B000			B001			B003		
		Flow Criteria	GEH Criteria	TAG	Flow Criteria	GEH Criteria	TAG	Flow Criteria	GEH Criteria	TAG
Screenline Links	20	20	19	20	20	19	20	20	19	20
Other Links	32	30	25	30	30	25	30	30	25	30
Total Links	52	50	44	50	50	44	50	50	44	50
		96%	85%	96%	96%	85%	96%	96%	85%	96%
Turns	20	20	19	20	20	19	20	20	19	20
		100%	95%	100%	100%	95%	100%	100%	95%	100%
Total (Links and Turns)	72	70	63	70	70	63	70	70	63	70
		97%	88%	97%	97%	88%	97%	97%	88%	97%

Table 4-8: Summary of Flow Validation - PM Peak

Count Type	Total	B000			B001			B003		
		Flow Criteria	GEH Criteria	TAG	Flow Criteria	GEH Criteria	TAG	Flow Criteria	GEH Criteria	TAG
Screenline Links	20	17	16	17	17	16	17	17	16	17
Other Links	32	28	25	28	28	25	28	28	24	28
Total Links	52	45	41	45	45	41	45	45	40	45
		87%	79%	87%	87%	79%	87%	87%	77%	87%
Turns	20	18	16	19	18	16	19	18	16	19
		90%	80%	95%	90%	80%	95%	90%	80%	95%
Total (Links and Turns)	72	63	57	64	63	57	64	63	56	64
		88%	79%	89%	88%	79%	89%	88%	78%	89%

4.3.2 Table 4-6, Table 4-7 and Table 4-8 illustrate that the level of fit between the observed and the modelled flows is good, particularly in the Inter-Peak. All the links and turns meet the TAG criterion for all the models in all time periods. The results are summarised in detail below:

AM peak

- In the AM peak, all the links pass the TAG criterion with 85% for all three models, but fail the DMRB Flow and GEH criteria. The results for the DMRB flow criterion worsens by 2% in B003 compared to B000 and B001 while the DMRB GEH criterion improves by 2%.
- The turns pass all DMRB and TAG criteria.

- Although, the links DMRB flow and GEH criteria are not met and therefore the results do not meet the TAG acceptability criterion, the results are marginally outside the TAG guidance values and hence can be considered satisfactory.

Inter- peak

- The links and turns pass all the DMRB and TAG criteria for all the models in the Inter-Peak.
- There are no improvements between B000 and B003.
- The results shown in Table 4-7 are therefore deemed satisfactory.

PM peak

- The links and turns pass the TAG and DMRB Flow criteria but fail in the DMRB GEH criteria.
- Since TAG suggests that meeting either the DMRB flow or GEH criterion is regarded as satisfactory, the results shown in Table 4-8 are deemed acceptable.

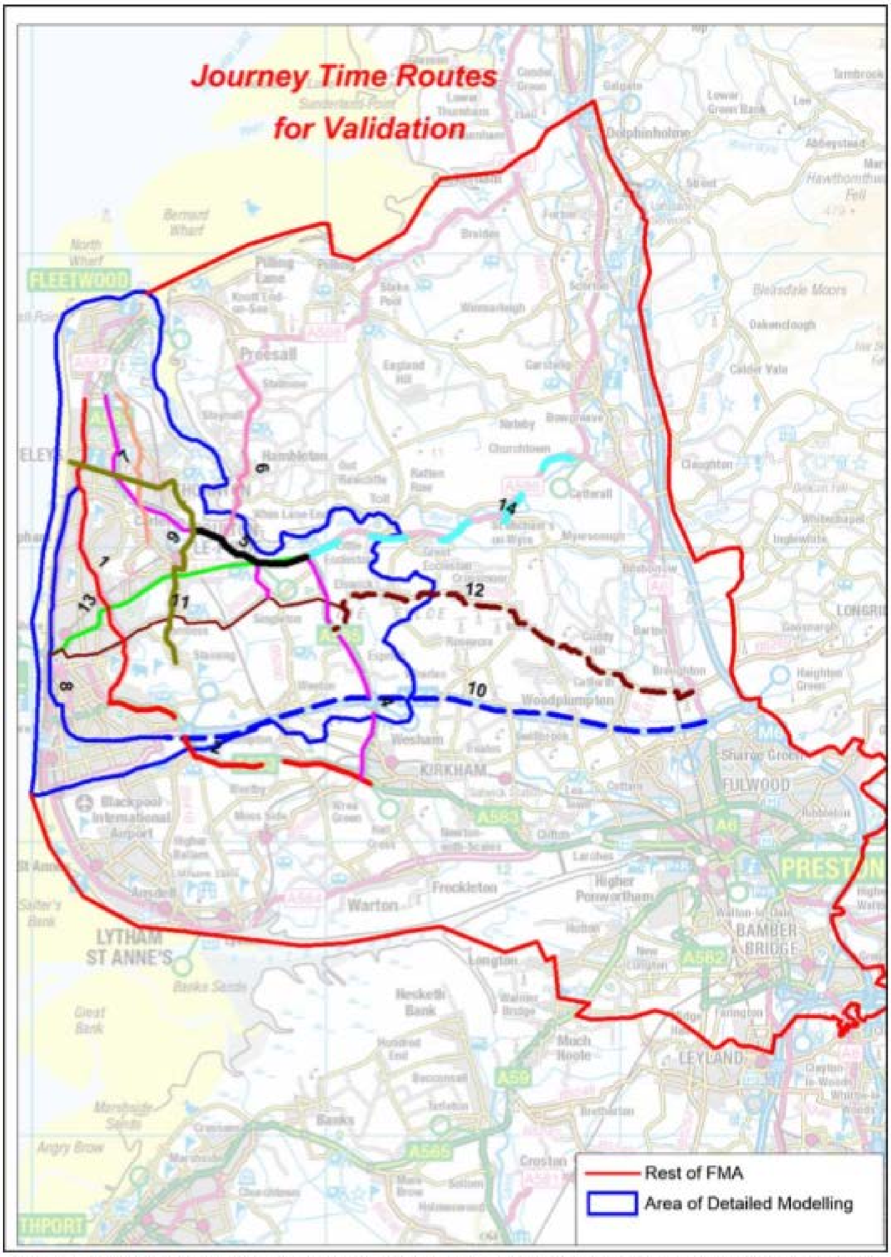
4.3.3 It is observed that the results of the sensitivity test for the updated models (B001 and B003) are similar to the A585 Windy Harbour to Skippool base year model (B000) for all modelled time periods. Although, as noted above, the links do not meet either of the DMRB criteria in the AM Peak, the results are marginally under the 85% required and are therefore deemed acceptable. The links and turns are not meeting the DMRB GEH criteria in the PM Peak in the sensitivity test but are meeting the DMRB Flow criteria and are therefore deemed acceptable.

5 Journey Time Validation

5.1 Introduction

5.1.1 Fourteen two-directional journey time routes were selected, as shown in Figure 5-1. The routes were selected to cover a wide geographical area, with specific consideration given to routes on which it is anticipated that traffic will be affected by the scheme.

5.1.2 Journey time data was extracted from the Traffic master database for the 28 combinations of route and direction. The Traffic master GPS link time for each route was extracted using the ITN layer.



Source: OS data © *Crown copyright 2015*; Licence – Version 3 of Open Govt. Licence (OGL)

Figure 5-1: Journey Time Routes

5.1.3 The details of each journey time route are presented in Table 5-1. The routes were selected in accordance with the criteria set out in TAG Unit M3.1 Paragraph 4.4.4; therefore, all are longer than 3 kilometres and, except for route 10, no longer than approximately 15 kilometres. No route has a journey time greater than 45 minutes.

Table 5-1: A585 Windy Harbour to Skippool Base Year Traffic Model - Journey Time Routes

Route No.	Route Name	Direction	Route Description	Length (km)
1	A587	NB	B5390 Park Road to Russell Avenue	11.30
		SB	Russell Avenue to B5390 Park Road	11.30
2	A583	NB	Blackpool Road to Preston Road	10.31
		SB	Preston Road to Blackpool Road	10.26
3	A585	EB	Singleton (B5260) to Amounderness Way	10.21
		WB	Amounderness Way to Singleton (B5260)	10.22
4	A585	EB	Blackpool Road to Windy Harbour	8.41
		WB	Windy Harbour to Blackpool Road	8.41
5	A585	NB	Garstang Road to Skippool Junction	4.32
		SB	Skippool Junction to Garstang Road	4.35
6	A588	NB	Shard Road to Hall Road	6.87
		SB	Hall Road to Shard Road	6.90
7	B5260	NB	Carleton Road to Russell Avenue	5.79
		SB	Russell Avenue to Carleton Road	5.79
8	M55	NB	M55 Junction 4 towards B5262 up to A584	11.78
		SB	A584 through B5262 up to M55 Junction 4	11.85
9	Mill Lane	NB	Mill Lane towards A588 up to Victoria Road West	10.49
		SB	Victoria Road West towards A588 up to Mill Lane	11.25
10	M55	EB	M55 Junction 4 to M55 Junction 1	19.31
		WB	M55 Junction 1 to M55 Junction 4	19.32
11	Talbot Square	EB	Talbot Square (Blackpool) towards A586 up to Thistleton Road	11.58
		WB	Thistleton Road through A586 up to Talbot Square (Blackpool)	11.54
12	B5269	EB	Thistleton Road to Broughton Road	15.43
		WB	Broughton Road to Thistleton Road	15.43
13	Talbot Road	EB	Talbot Road through A586 to Windy Harbour Skippool junction	9.97
		WB	Windy Harbour Skippool Junction through A586 to Talbot Road	10.02
14	A586	EB	Garstang Road to A6	11.32
		WB	A6 to Garstang Road	11.32

5.1.4 Routes 10 EB and WB exceed the maximum length of 15 km suggested by TAG unit M3.1. This route has been chosen because it runs between Junction 1 and Junction 4 of the M55. These are the junctions on each side of M55 Junction 3 (there is no M55 Junction 2), which is the point at which the motorway connects to the A585.

5.1.5 Table 5-2 presents the TAG criterion for journey time validation and the model acceptability guidelines.

Table 5-2: Journey Time Validation Criterion and Acceptability Guideline

Criteria	Acceptability Guideline
Modelled journey time along routes should be within 15% of surveyed times (or 1 minute if higher than 15%)	> 85% of all routes

Source – TAG Unit M3.1, paragraph 3.2.10

5.1.6 The modelled journey times were extracted for each modelled time period and compared with the corresponding observed journey time information. Table 5-3, Table 5-4 and Table 5-5 present the journey time validation results for each of the 28 journey time routes (by direction) across all three modelled time periods. The journey time plots can be found in Appendix D.

Table 5-3: Journey Time Validation Results - Sensitivity Test (AM Peak)

Route Name	B000 – Journey Time (secs)					B001 – Journey Time (secs)					B003 – Journey Time (secs)				
	Observed	Modelled	Diff (secs)	% Diff	Criteria	Observed	Modelled	Diff (secs)	% Diff	Criteria	Observed	Modelled	Diff (secs)	% Diff	Criteria
1 NB	1,171	1,261	-90	8%	Pass	1,171	1,261	-90	8%	Pass	1,171	1,264	-93	8%	Pass
1 SB	1,191	1,341	-150	13%	Pass	1,191	1,341	-150	13%	Pass	1,191	1,342	-151	13%	Pass
2 NB	723	711	12	-2%	Pass	723	711	12	-2%	Pass	723	714	9	-1%	Pass
2 SB	692	677	15	-2%	Pass	692	677	15	-2%	Pass	692	677	15	-2%	Pass
3 EB	775	829	-54	7%	Pass	775	829	-54	7%	Pass	775	827	-52	7%	Pass
3 WB	786	833	-47	6%	Pass	786	833	-47	6%	Pass	786	834	-48	6%	Pass
4 EB	523	533	-10	2%	Pass	523	533	-10	2%	Pass	523	530	-7	1%	Pass
4 WB	520	527	-7	1%	Pass	520	527	-7	1%	Pass	520	526	-6	1%	Pass
5 NB	307	337	-30	10%	Pass	307	337	-30	10%	Pass	307	337	-30	10%	Pass
5 SB	378	329	49	-13%	Pass	378	329	49	-13%	Pass	378	329	49	-13%	Pass
6 NB	463	448	15	-3%	Pass	463	448	15	-3%	Pass	463	449	14	-3%	Pass
6 SB	494	558	-64	13%	Pass	494	558	-64	13%	Pass	494	559	-65	13%	Pass
7 NB	486	477	9	-2%	Pass	486	477	9	-2%	Pass	486	477	9	-2%	Pass
7 SB	538	575	-37	7%	Pass	538	575	-37	7%	Pass	538	576	-38	7%	Pass
8 NB	1,006	1,063	-57	6%	Pass	1,006	1,063	-57	6%	Pass	1,006	1,064	-58	6%	Pass
8 SB	998	1,097	-99	10%	Pass	998	1,097	-99	10%	Pass	998	1,096	-98	10%	Pass
9 NB	1,123	1,110	13	-1%	Pass	1,123	1,110	13	-1%	Pass	1,123	1,111	12	-1%	Pass
9 SB	1,144	1,129	15	-1%	Pass	1,144	1,129	15	-1%	Pass	1,144	1,129	15	-1%	Pass
10 EB	615	645	-30	5%	Pass	615	645	-30	5%	Pass	615	644	-29	5%	Pass
10 WB	636	648	-12	2%	Pass	636	648	-12	2%	Pass	636	648	-12	2%	Pass
11 EB	949	1,070	-121	13%	Pass	949	1,070	-121	13%	Pass	949	1,074	-125	13%	Pass
11 WB	966	1,162	-196	20%	Fail	966	1,162	-196	20%	Fail	966	1,164	-198	21%	Fail
12 EB	1,272	1,172	100	-8%	Pass	1,272	1,172	100	-8%	Pass	1,272	1,173	99	-8%	Pass
12 WB	1,181	1,240	-59	5%	Pass	1,181	1,240	-59	5%	Pass	1,181	1,243	-62	5%	Pass
13 EB	970	1,223	-253	26%	Fail	970	1,223	-253	26%	Fail	970	1,226	-256	26%	Fail
13 WB	932	1,028	-96	10%	Pass	932	1,028	-96	10%	Pass	932	1,028	-96	10%	Pass
14 EB	628	582	46	-7%	Pass	628	582	46	-7%	Pass	628	582	46	-7%	Pass
14 WB	634	625	9	-1%	Pass	634	625	9	-1%	Pass	634	625	9	-1%	Pass
Number of Routes Passing Validation Criteria					26 / 28					26 / 28					26 / 28
Percentage of Routes Passing Validation Criteria					93%					93%					93%

Table 5-4: Journey Time Validation Results - Sensitivity Test (Inter-Peak)

Route Name	B000 – Journey Time (secs)					B001 – Journey Time (secs)					B003 – Journey Time (secs)				
	Observed	Modelled	Diff (secs)	% Diff	Criteria	Observed	Modelled	Diff (secs)	% Diff	Criteria	Observed	Modelled	Diff (secs)	% Diff	Criteria
1 NB	1,170	1,260	-90	8%	Pass	1,170	1,260	-90	8%	Pass	1,170	1,263	-93	8%	Pass
1 SB	1,165	1,308	-143	12%	Pass	1,165	1,308	-143	12%	Pass	1,165	1,311	-146	13%	Pass
2 NB	715	699	16	-2%	Pass	715	699	16	-2%	Pass	715	699	16	-2%	Pass
2 SB	696	644	52	-7%	Pass	696	644	52	-7%	Pass	696	644	52	-7%	Pass
3 EB	743	800	-57	8%	Pass	743	800	-57	8%	Pass	743	801	-58	8%	Pass
3 WB	706	820	-114	16%	Fail	706	820	-114	16%	Fail	706	819	-113	16%	Fail
4 EB	524	515	9	-2%	Pass	524	515	9	-2%	Pass	524	513	11	-2%	Pass
4 WB	522	492	30	-6%	Pass	522	492	30	-6%	Pass	522	492	30	-6%	Pass
5 NB	293	336	-43	15%	Pass	293	336	-43	15%	Pass	293	336	-43	15%	Pass
5 SB	301	320	-19	6%	Pass	301	320	-19	6%	Pass	301	320	-19	6%	Pass
6 NB	470	447	23	-5%	Pass	470	447	23	-5%	Pass	470	448	22	-5%	Pass
6 SB	493	474	19	-4%	Pass	493	474	19	-4%	Pass	493	474	19	-4%	Pass
7 NB	495	475	20	-4%	Pass	495	475	20	-4%	Pass	495	475	20	-4%	Pass
7 SB	524	566	-42	8%	Pass	524	566	-42	8%	Pass	524	566	-42	8%	Pass
8 NB	1,071	1,027	44	-4%	Pass	1,071	1,027	44	-4%	Pass	1,071	1,025	46	-4%	Pass
8 SB	1,066	1,024	42	-4%	Pass	1,066	1,024	42	-4%	Pass	1,066	1,023	43	-4%	Pass
9 NB	1,077	1,088	-11	1%	Pass	1,077	1,088	-11	1%	Pass	1,077	1,089	-12	1%	Pass
9 SB	1,132	1,093	39	-3%	Pass	1,132	1,093	39	-3%	Pass	1,132	1,093	39	-3%	Pass
10 EB	637	639	-2	0%	Pass	637	639	-2	0%	Pass	637	638	-1	0%	Pass
10 WB	629	638	-9	1%	Pass	629	638	-9	1%	Pass	629	638	-9	1%	Pass
11 EB	945	1,006	-61	6%	Pass	945	1,006	-61	6%	Pass	945	1,006	-61	6%	Pass
11 WB	985	1,069	-84	9%	Pass	985	1,069	-84	9%	Pass	985	1,069	-84	9%	Pass
12 EB	1,237	1,163	74	-6%	Pass	1,237	1,163	74	-6%	Pass	1,237	1,163	74	-6%	Pass
12 WB	1,136	1,162	-26	2%	Pass	1,136	1,162	-26	2%	Pass	1,136	1,162	-26	2%	Pass
13 EB	950	1,103	-153	16%	Fail	950	1,103	-153	16%	Fail	950	1,104	-154	16%	Fail
13 WB	919	964	-45	5%	Pass	919	964	-45	5%	Pass	919	964	-45	5%	Pass
14 EB	647	585	62	-10%	Pass	647	585	62	-10%	Pass	647	585	62	-10%	Pass
14 WB	654	632	22	-3%	Pass	654	632	22	-3%	Pass	654	631	23	-4%	Pass
Number of Routes Passing Validation Criteria					26 / 28					26 / 28					26 / 28
Percentage of Routes Passing Validation Criteria					93%					93%					93%

Table 5-5: Journey Time Validation Results - Sensitivity Test (PM Peak)

Route Name	B000 – Journey Time (secs)					B001 – Journey Time (secs)					B003 – Journey Time (secs)				
	Observed	Modelled	Diff (secs)	% Diff	Criteria	Observed	Modelled	Diff (secs)	% Diff	Criteria	Observed	Modelled	Diff (secs)	% Diff	Criteria
1 NB	1,252	1,363	-111	9%	Pass	1,252	1,363	-111	9%	Pass	1,252	1,380	-128	10%	Pass
1 SB	1,205	1,351	-146	12%	Pass	1,205	1,351	-146	12%	Pass	1,205	1,352	-147	12%	Pass
2 NB	730	722	8	-1%	Pass	730	722	8	-1%	Pass	730	723	7	-1%	Pass
2 SB	700	654	46	-7%	Pass	700	654	46	-7%	Pass	700	653	47	-7%	Pass
3 EB	940	849	91	-10%	Pass	940	849	91	-10%	Pass	940	848	92	-10%	Pass
3 WB	729	851	-122	17%	Fail	729	851	-122	17%	Fail	729	852	-123	17%	Fail
4 EB	528	557	-29	6%	Pass	528	557	-29	6%	Pass	528	555	-27	5%	Pass
4 WB	517	495	22	-4%	Pass	517	495	22	-4%	Pass	517	495	22	-4%	Pass
5 NB	332	350	-18	5%	Pass	332	350	-18	5%	Pass	332	349	-17	5%	Pass
5 SB	316	326	-10	3%	Pass	316	326	-10	3%	Pass	316	326	-10	3%	Pass
6 NB	463	492	-29	6%	Pass	463	492	-29	6%	Pass	463	492	-29	6%	Pass
6 SB	491	499	-8	2%	Pass	491	499	-8	2%	Pass	491	499	-8	2%	Pass
7 NB	542	486	56	-10%	Pass	542	486	56	-10%	Pass	542	487	55	-10%	Pass
7 SB	543	617	-74	14%	Pass	543	617	-74	14%	Pass	543	618	-75	14%	Pass
8 NB	1,169	1,136	33	-3%	Pass	1,169	1,136	33	-3%	Pass	1,169	1,134	35	-3%	Pass
8 SB	1,127	1,087	40	-4%	Pass	1,127	1,087	40	-4%	Pass	1,127	1,084	43	-4%	Pass
9 NB	1,155	1,125	30	-3%	Pass	1,155	1,125	30	-3%	Pass	1,155	1,125	30	-3%	Pass
9 SB	1,191	1,117	74	-6%	Pass	1,191	1,117	74	-6%	Pass	1,191	1,117	74	-6%	Pass
10 EB	624	646	-22	3%	Pass	624	646	-22	3%	Pass	624	646	-22	3%	Pass
10 WB	603	646	-43	7%	Pass	603	646	-43	7%	Pass	603	646	-43	7%	Pass
11 EB	983	1,040	-57	6%	Pass	983	1,040	-57	6%	Pass	983	1,041	-58	6%	Pass
11 WB	1,001	1,109	-108	11%	Pass	1,001	1,109	-108	11%	Pass	1,001	1,110	-109	11%	Pass
12 EB	1,246	1,169	77	-6%	Pass	1,246	1,169	77	-6%	Pass	1,246	1,169	77	-6%	Pass
12 WB	1,136	1,164	-28	2%	Pass	1,136	1,164	-28	2%	Pass	1,136	1,165	-29	3%	Pass
13 EB	999	1,142	-143	14%	Pass	999	1,142	-143	14%	Pass	999	1,145	-146	15%	Pass
13 WB	955	1,009	-54	6%	Pass	955	1,009	-54	6%	Pass	955	1,009	-54	6%	Pass
14 EB	630	604	26	-4%	Pass	630	604	26	-4%	Pass	630	604	26	-4%	Pass
14 WB	647	639	8	-1%	Pass	647	639	8	-1%	Pass	647	639	8	-1%	Pass
Number of Routes Passing Validation Criteria					27 / 28					27 / 28					27 / 28
Percentage of Routes Passing Validation Criteria					96%					96%					96%

5.1.7 It is seen that the 26 out of the 28 journey time routes in the AM and Inter-Peak, and 27 out of 28 routes in the PM Peak meet the TAG M3.1 acceptability criteria for the sensitivity test.

5.1.8 It can be concluded that the sensitivity test performs well, replicating the observed journey times to TAG Unit M3.1 standards.

5.2 Comparison with Stage 2 Validated Base Model (2015)

5.2.1 Table 5-6 presents a comparative summary of the journey time validation of the A585 Windy Harbour to Skippool Stage 2 base year validated traffic model (2015) and the generalised cost sensitivity test for B000, B001 and B003.

Table 5-6: Summary - Journey Time Validation

Journey Time Validation	No. of JT routes with observed to modelled difference within 15% (or 60 secs if higher)		
	AM	**IP**	**PM**
A585 Stage 2 base year validated traffic model (2015)	26 / 28	26 / 28	27 / 28
A585 Stage 2 Base Model Replication – B000	26 / 28	26 / 28	27 / 28
Stage 2 Base Model SATURN Version Sensitivity Test– B001	26 / 28	26 / 28	27 / 28
Stage 2 Base Model Generalised Cost Sensitivity Test – B003	26 / 28	26 / 28	27 / 28

5.2.2 It is seen that the journey time validation results of the sensitivity test are similar to the A585 Windy Harbour to Skippool Stage 2 base year model (2015) for all modelled time periods.

6 Routeing Stability Check

6.1.1 Analysis of the routes taken by vehicles as they travel through the network to specific destinations or along specific links provides a means of validating the network coding and route choice. As per TAG Unit M3.1 Paragraph 6.2.6, examination of the modelled routes should be done between selected origins and destinations which focus on important centres of population and employment or key intersections.

6.1.2 The “tree” building feature within SATURN was used to examine the following two routes for route stability taken from PCF Stage 2 Local Model Validation Report (LMVR)[1]:

- from Preston New Road (zone 10) to Pike Court (zone 70);
- from Waverley Avenue (zone 9) to Moorside Lane – B5269 (zone 86).

6.1.3 The results of the route stability “tree” building exercise for the two above routes can be found in Appendix E.

6.1.4 Appendix E presents the route choice for the above-mentioned zone pairs for the Stage 2 A585 base year validated traffic model (2015) and the sensitivity test. The route stability checks were undertaken for light vehicles (Cars and LGV’s) and HGV’s for all peak periods.

6.1.5 It is observed that the route choice of the model sensitivity test is the same as that of the Stage 2 A585 base year traffic model (2015) for all the three time periods; thereby, indicating that the change in the generalised cost parameters has not had a significant impact on route choice.

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[1] HE548643-ARC-GEN-A585-RP-TR-2039

7 Summary

7.1.1 The A585 Windy Harbour to Skippool Stage 2 base year traffic model (2015) was validated using the November 2016 v1.6 TAG release of Values of Time (VoT) and Vehicle Operating Costs (VOC). The Stage 3 base year traffic model was updated to use the July 2017 v1.8 TAG release. This technical note presented the results of a sensitivity analysis that was undertaken to test the effect on the validated Stage 2 base year model calibration and validation statistics due to changes to the VoT and VOC values. This Transport Model Package report should be read in conjunction with the Stage 2 LMVR [HE548643-ARC-GEN-A585-RP-TR-2039-v6.0], as this contains more detailed information on modelling assumptions.

7.1.2 The analysis shows that the sensitivity test (for all three versions of the Stage 3 models and all three modelled time periods):

- either meets, or is very close to, the acceptability DMRB guidelines at the link and turns level for both calibration and validation; there are instances of some links and turns not meeting the DMRB criteria in the sensitivity test, the percentage difference, in a majority of cases, between the modelled and the observed flow is seen to be marginally above the DMRB requirement of 5%, and thereby deemed to be acceptable;
- meets the acceptability guidelines for journey times across all modelled time periods; and
- shows similar journey time validation results as observed in the A585 Windy Harbour to Skippool Stage 2 base year traffic model (2015) for all modelled time periods.

7.1.3 The flow differences between B000 (Stage 2 donor model) and Stage 3 traffic model version B003 (new VoT/VOC and SATURN Version 11.3.12W) are very slight and are not likely to affect routing choices significantly.

7.1.4 In summary, the sensitivity test results indicate that the change in the Stage 3 generalised cost parameters and SATURN version has not had a significant impact either on the route choice or on the traffic assignment. The overall model validation results of the sensitivity test suggest that the model performs satisfactorily, within the area of detailed modelling, across all three time periods. Hence, the Stage 3 traffic model may be used in its application for assessing the current and future operations of the highway network and in forecasting the impact of changes to the highway network.

Appendix A – B003 Individual Screenline Cal/Val Summary

Table 0-1: B003 Run Individual Screenline Calibration Summary – AM Peak

Screenline/ Cordon	Direction	Observed	Modelled	Modelled - Observed	% Difference	GEH	Pass?	
							Flow	GEH
Cordon 1A	IN	8,441	8,220	-220	-2.6	2.4	✓	✓
	OUT	8,258	8,041	-217	-2.6	2.4	✓	✓
Screenline B	EB	6,020	5,823	-196	-3.3	2.6	✓	✓
	WB	6,305	5,926	-379	-6.0	4.9	×	✓
Screenline 3A	NB	3,750	3,678	-73	-1.9	1.2	✓	✓
	SB	4,535	4,548	13	0.3	0.2	✓	✓
Screenline 4A	SB	3,008	2,826	-182	-6.1	3.4	×	✓
	WB	3,332	3,393	61	1.8	1.1	✓	✓
Screenline 1N	NB	5,889	5,676	-213	-3.6	2.8	✓	✓
	SB	5,852	5,781	-71	-1.2	0.9	✓	✓
Number of screenlines complying with TAG acceptability criteria							**8/10**	**10/10**
% of screenlines complying with TAG acceptability criteria							**80%**	**100%**
% of individual links complying with TAG acceptability criteria							**86%**	**86%**

Table 0-2: B003 Run Individual Screenline Calibration Summary – Inter-Peak

Screenline / Cordon	Direction	Observed	Modelled	Modelled - Observed	% Difference	GEH	Pass?	
							Flow	**GEH**
Cordon 1A	IN	6,649	6,110	-539	-8.1	6.8	×	×
	OUT	6,544	6,423	-121	-1.8	1.5	✓	✓
Screenline B	EB	5,394	5,267	-127	-2.4	1.7	✓	✓
	WB	5,323	5,218	-105	-2.0	1.4	✓	✓
Screenline 3A	NB	3,616	3,500	-115	-3.2	1.9	✓	✓
	SB	3,250	3,325	76	2.3	1.3	✓	✓
Screenline 4A	SB	2,759	2,633	-125	-4.5	2.4	✓	✓
	WB	2,705	2,771	66	2.4	1.3	✓	✓
Screenline 1N	NB	4,625	4,301	-323	-7.0	4.8	×	✓
	SB	4,493	4,548	55	1.2	0.8	✓	✓

Number of screenlines complying with TAG acceptability criteria	**8/10**	**9/10**
% of screenlines complying with TAG acceptability criteria	**80%**	**90%**
% of individual links complying with TAG acceptability criteria	**88%**	**84%**

Table 0-3: B003 Run Individual Screenline Calibration Summary – PM Peak

Screenline / Cordon	Direction	Observed	Modelled	Modelled - Observed	% Difference	GEH	Pass?	
							Flow	**GEH**
Cordon 1A	IN	8,733	8,431	-302	-3.5	3.3	✓	✓
	OUT	8,688	8,404	-284	-3.3	3.1	✓	✓
Screenline B	EB	6,970	6,679	-291	-4.2	3.5	✓	✓
	WB	6,553	6,256	-297	-4.5	3.7	✓	✓
Screenline 3A	NB	4,694	4,514	-179	-3.8	2.6	✓	✓
	SB	3,895	4,010	116	3.0	1.8	✓	✓
Screenline 4A	SB	3,763	3,616	-147	-3.9	2.4	✓	✓
	WB	3,335	3,219	-116	-3.5	2.0	✓	✓
Screenline 1N	NB	6,448	6,088	-360	-5.6	4.5	×	✓
	SB	5,977	5,823	-154	-2.6	2.0	✓	✓
Number of screenlines complying with TAG acceptability criteria							**9/10**	**10/10**
% of screenlines complying with TAG acceptability criteria							**90%**	**100%**
% of individual links complying with TAG acceptability criteria							**89%**	**89%**

Appendix B – Assignment Calibration

7.1.5 Table 0-1 to Table 0-6 below present respectively the calibration links and turns results for the B003 version of the Stage 3 A585 Windy Harbour to Skippool traffic model for all model time periods.

Table 0-1: Calibration Links - B003 AM Peak

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A587-Broadway NB/BroadwaySB/Rosall lane/Sandy lane	SB	2015CJC_23	4430-4422	524	522	-2	-0.5	0.1	✓	✓	✓		Cordon1	
A585-Amoundernessway SB	SB	2015CJC-11	4482-4421	634	630	-4	-0.6	0.1	✓	✓	✓		Cordon1	
B5268 Fleetwood Rd from A585 Eros Roundabout to Thornton North (40mph)	SB	LCC_19	4454-4425	281	248	-33	-11.8	2.0	✓	✓	✓		Cordon1	
A588 Shard Road across river Wyre, A road	SB	2016ATC_49	1061-4320	769	769	0	0.1	0.0	✓	✓	✓	RSI	Cordon1	
A586 Garstang Road, A road, East of A585 Fleetwood Road	WB	2016ATC_48	1094-4513	343	343	0	0.0	0.0	✓	✓	✓		Cordon1	
B5269 Thisleton Road.	SB	2016ATC_34	4238-4210	158	161	3	1.7	0.2	✓	✓	✓	RSI	Cordon1	
M55 eastbound between J3 and J1	WB	2015TRI_02	1105-4092	2737	2652	-85	-3.1	1.6	✓	✓	✓	M55	Cordon1	
A 583 Blackpool Rd.W of New Hey Ln.	WB	LCC_08	1143-1119	481	506	25	5.2	1.1	✓	✓	✓		Cordon1	
B5259 Ribby Rd W of Brown Ln.	EB	LCC_06	1519-1077	339	335	-4	-1.1	0.2	✓	✓	✓		Cordon1	
B5260 Fox Ln. Ends	NB	2016ATC_35	1071-1068	191	203	12	6.2	0.8	✓	✓	✓		Cordon1	
B5410 U Lytham St Annes Way S of Moss Hall Ln.	NB	LCC_04	1041-1047	529	412	-117	-22.2	5.4	×	×	×		Cordon1	
B5261 Common Edge Road and Queens Way	NB	2015BUA_01	1036-1033	608	592	-16	-2.7	0.7	✓	✓	✓		Cordon1	
A584 Clifton Drive North	SB	2016ATC_01	1524-1021	848	848	0	0.0	0.0	✓	✓	✓		Cordon1	
A587-Broadway NB/BroadwaySB/Rosall lane/Sandy lane	NB	2015CJC_23	4422-4430	452	426	-25	-5.6	1.2	✓	✓	✓		Cordon1	
A585-Amoundernessway NB	NB	2015CJC-11	4421-4482	759	744	-14	-1.9	0.5	✓	✓	✓		Cordon1	
B5268 Fleetwood Rd from A585 Eros Roundabout to Thornton North (40mph)	NB	LCC_19	4425-4454	367	304	-62	-17.0	3.4	✓	✓	✓		Cordon1	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		WebTAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A588 Shard Road across river Wyre, A road	NB	2016ATC_49	4320-1061	419	437	18	4.2	0.9	✓	✓	✓		Cordon1	
A586 Garstang Road, A road, East of A585 Fleetwood Road	EB	2016ATC_48	4513-1094	447	278	-169	-37.7	8.9	✗	✗	✗		Cordon1	
B5269 Thisleton Road.	NB	2016ATC_34	4210-4238	80	94	14	17.1	1.5	✓	✓	✓		Cordon1	
M55 eastbound between J3 and J1	EB	2015TRI_01	4093-1104	2648	2535	-113	-4.3	2.2	✓	✓	✓	M55	Cordon1	
A 583 Blackpool Rd.W of New Hey Ln.	EB	LCC_08	1119-1143	637	656	19	3.0	0.7	✓	✓	✓		Cordon1	
B5259 Ribby Rd W of Brown Ln.	WB	LCC_06	1077-1519	472	470	-3	-0.5	0.1	✓	✓	✓		Cordon1	
B5260 Fox Ln. Ends	SB	2016ATC_35	1068-1071	291	277	-14	-4.8	0.8	✓	✓	✓		Cordon1	
B5410 U Lytham St Annes Way S of Moss Hall Ln.	SB	LCC_04	1047-1041	86	226	140	162.8	11.2	✗	✗	✗		Cordon1	
B5261 Common Edge Road and Queens Way	SB	2015BUA_01	1033-1036	665	659	-6	-0.9	0.2	✓	✓	✓		Cordon1	
A584 Clifton Drive North	NB	2016ATC_01	1021-1524	935	933	-2	-0.2	0.1	✓	✓	✓		Cordon1	
A585 Amounderness Way / Bourne Way priority junction	EB	2015CJC_11	4421-4424	130	102	-27	-21.2	2.6	✓	✓	✓		Scrl_B	
B5268 Fleetwood Rd N / West Drive	EB	2015CJC_29	4413-4414	123	120	-3	-2.7	0.3	✓	✓	✓		Scrl_B	
B5412 Victoria Road East	EB	LCC_20	4378-4376	361	253	-108	-29.8	6.1	✗	✗	✗		Scrl_B	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	EB	2015CJC_07	4360-4337	823	789	-34	-4.2	1.2	✓	✓	✓		Scrl_B	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	NB	2015CJC_07	4526-4337	436	602	166	38.0	7.3	✗	✗	✗		Scrl_B	
W of Deepdale Ave.	EB	LCC_22	4304-4301	400	276	-123	-30.9	6.7	✗	✗	✗		Scrl_B	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		WebTAG			
									Flow	GEH		M55/ RSI	CAL/ Val Links	A585 Links
B5268 Blackpool Road	EB	LCC_21	4265-4292	239	249	10	4.1	0.6	✓	✓	✓		Scrl_B	
Blackpool Old Rd	EB	LCC_23	4247-4261	153	150	-4	-2.4	0.3	✓	✓	✓		Scrl_B	
Garstang Road West of Mossbourne Rd.	EB	LCC_18	4219-4249	471	463	-8	-1.7	0.4	✓	✓	✓		Scrl_B	
B5266 Newton Dr	EB	2016ATC_37	4168-4181	516	527	10	2.0	0.5	✓	✓	✓		Scrl_B	
A5853 Preston New Road, A Road	EB	2016ATC_54	4084-4068	818	803	-16	-1.9	0.6	✓	✓	✓		Scrl_B	
Clifton Orad -Cheery Tree Road	EB	2016ATC_31	4038-4059	674	664	-11	-1.6	0.4	✓	✓	✓		Scrl_B	
Ashworth Road	NB	2016ATC_11	4037-4052	492	451	-41	-8.3	1.9	✓	✓	✓		Scrl_B	
Cropper Road	SB	2016ATC_03	4019-1039	102	128	26	25.2	2.4	✓	✓	✓		Scrl_B	
A585 Amounderness Way / Bourne Way priority junction	WB	2015CJC_11	4424-4421	176	154	-22	-12.5	1.7	✓	✓	✓		Scrl_B	
B5268 Fleetwood Rd N / West Drive	WB	2015CJC_29	4414-4413	141	100	-41	-29.4	3.8	✓	✓	✓		Scrl_B	
B5412 Victoria Road East	WB	LCC_20	4376-4378	458	241	-217	-47.4	11.6	✗	✗	✗		Scrl_B	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	WB	2015CJC_07	4337-4360	786	959	172	21.9	5.8	✗	✗	✗		Scrl_B	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	SB	2015CJC_07	4337-4526	586	703	117	19.9	4.6	✗	✓	✓		Scrl_B	
W of Deepdale Ave.	WB	LCC_22	4301-4304	315	131	-183	-58.3	12.3	✗	✗	✗		Scrl_B	
B5268 Blackpool Road	WB	LCC_21	4292-4265	312	289	-23	-7.3	1.3	✓	✓	✓		Scrl_B	
Blackpool Old Rd	WB	LCC_23	4261-4247	156	150	-6	-4.1	0.5	✓	✓	✓		Scrl_B	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		WebTAG			
									Flow	GEH		M55/ RSI	CAL/ Val Links	A585 Links
Garstang Road West of Mossbourne Rd.	WB	LCC_18	4249-4219	586	538	-48	-8.2	2.0	✓	✓	✓		Scrl_B	
B5266 Newton Dr	WB	2016ATC_37	4181-4168	771	774	3	0.4	0.1	✓	✓	✓		Scrl_B	
A5853 Preston New Road, A Road	WB	2016ATC_54	4068-4084	788	784	-3	-0.4	0.1	✓	✓	✓		Scrl_B	
Clifton Orad -Cheery Tree Road	WB	2016ATC_31	4059-4038	390	361	-29	-7.4	1.5	✓	✓	✓		Scrl_B	
Ashworth Road	SB	2016ATC_11	4052-4037	412	398	-15	-3.6	0.7	✓	✓	✓		Scrl_B	
Cropper Road	NB	2016ATC_03	1039-4019	60	39	-21	-35.5	3.0	✓	✓	✓		Scrl_B	
A586 Garstang Road, A road, East of A585 Fleetwood Road	NB	2016ATC_55	4532-4530	652	546	-106	-16.2	4.3	✗	✓	✓		Scrl_4A	
North Dr	NB	2016ATC_23	4373-4385	345	334	-11	-3.2	0.6	✓	✓	✓		Scrl_4A	
A585-Amounderness Way Arm (South arm)	SB	2016ATC_53	4360-4378	1138	1072	-65	-5.8	2.0	✓	✓	✓		Scrl_4A	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	NB	2015CJC_07	4337-4341	384	394	11	2.8	0.5	✓	✓	✓		Scrl_4A	
C381 School Rd. S of Wentworth Dr.	NB	LCC_16	4336-4364	76	69	-7	-8.6	0.8	✓	✓	✓		Scrl_4A	
B5412 Lambs Road	NB	LCC_17	4397-4371	414	410	-4	-1.0	0.2	✓	✓	✓		Scrl_4A	
A586 Garstang Road, A road, East of A585 Fleetwood Road	SB	2016ATC_55	4530-4532	660	691	31	4.7	1.2	✓	✓	✓		Scrl_4A	
North Dr	SB	2016ATC_23	4385-4373	532	530	-1	-0.2	0.1	✓	✓	✓		Scrl_4A	
A585-Amounderness Way Arm (South arm)	NB	2016ATC_53	4378-4360	1003	1081	79	7.8	2.4	✓	✓	✓	RSI	Scrl_4A	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	SB	2015CJC_07	4341-4337	622	605	-17	-2.7	0.7	✓	✓	✓		Scrl_4A	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55/ RSI	CAL/ Val Links	A585 Links
C381 School Rd. S of Wentworth Dr.	SB	LCC_16	4364-4336	46	45	-1	-2.2	0.1	✓	✓	✓		Scrl_4A	
B5412 Lambs Road	SB	LCC_17	4371-4397	469	440	-29	-6.2	1.4	✓	✓	✓		Scrl_4A	
A584 Promenade Road	NB	2016ATC_14	4124-4151	981	997	16	1.6	0.5	✓	✓	✓		Scrl_3A	
A586 CookSon Street	NB	2016ATC_16	4153-4156	352	318	-34	-9.6	1.9	✓	✓	✓		Scrl_3A	
B5124 Devonshire Road	NB	2016ATC_17	4162-4178	456	416	-40	-8.7	1.9	✓	✓	✓		Scrl_3A	
Layton Road and Collingwood Ave	NB	2016ATC_18	4536-4184	336	101	-235	-70.1	15.9	×	×	×		Scrl_3A	
A587 - BRd.Wy.	NB	2015ATC_07	4168-4176	361	593	232	64.4	10.6	×	×	×		Scrl_3A	
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	NB	2015CJC_13	4243-4253	432	413	-19	-4.4	0.9	✓	✓	✓		Scrl_3A	
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	NB	2015CJC_04	4228-4270	115	138	22	19.2	2.0	✓	✓	✓		Scrl_3A	
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	NB	2015CJC_03	4523-4280	718	703	-15	-2.1	0.6	✓	✓	✓		Scrl_3A	
A584 Promenade Road	SB	2016ATC_14	4151-4124	974	1013	39	4.1	1.3	✓	✓	✓		Scrl_3A	
A586 CookSon Street	SB	2016ATC_16	4156-4153	259	255	-4	-1.5	0.2	✓	✓	✓		Scrl_3A	
B5124 Devonshire Road	SB	2016ATC_17	4178-4162	626	626	-1	-0.1	0.0	✓	✓	✓		Scrl_3A	
Layton Road and Collingwood Ave	SB	2016ATC_18	4184-4536	406	212	-194	-47.7	11.0	×	×	×		Scrl_3A	
A587 - BRd.Wy.	SB	2015ATC_07	4176-4168	469	663	193	41.2	8.1	×	×	×		Scrl_3A	
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	SB	2015CJC_13	4253-4243	570	566	-4	-0.7	0.2	✓	✓	✓		Scrl_3A	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	SB	2015CJC_04	4270-4228	277	266	-11	-3.9	0.7	✓	✓	✓		Scrl_3A	
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	SB	2015CJC_03	4280-4523	954	947	-6	-0.7	0.2	✓	✓	✓		Scrl_3A	
A584 South Promenade	NB	2016ATC_06	4024-4057	518	515	-3	-0.6	0.1	✓	✓	✓		Scrl_1N	
B5262 Lytham Road	NB	2016ATC_07	4026-4049	365	340	-25	-6.8	1.3	✓	✓	✓		Scrl_1N	
Seasiders Way and Yeadon way	SB	2016ATC_32	4037-4081	493	501	8	1.7	0.4	✓	✓	✓		Scrl_1N	
St. Anne's Road	NB	2016ATC_08	4030-4051	359	344	-15	-4.2	0.8	✓	✓	✓		Scrl_1N	
B5261 Hawes Side lane	NB	2016ATC_09	4018-4044	563	540	-23	-4.1	1.0	✓	✓	✓		Scrl_1N	
Vicarage lane	NB	2016ATC_10	4027-4038	500	499	-1	-0.1	0.0	✓	✓	✓		Scrl_1N	
A583 Preston New Rd North of M55 J4	NB	2015BUA_05	4040-4048	1336	1292	-44	-3.3	1.2	✓	✓	✓		Scrl_1N	
Nr entrance to Mythop Hall	WB	LCC_26	4077-4086	202	111	-91	-45.1	7.3	✓	×	✓		Scrl_1N	
B5260 Singleton Road	NB	2016ATC_50	4104-4150	233	227	-7	-2.9	0.4	✓	✓	✓	RSI	Scrl_1N	
C302 Back Lane N of Bradshaw Ln.	NB	LCC_27	4108-4128	10	12	2	21.5	0.6	✓	✓	✓		Scrl_1N	
A585 Fleetwood Road, A road, North of M55 J3	NB	2015TRI_03	4110-4118	818	844	26	3.2	0.9	✓	✓	✓		Scrl_1N	
A584 South Promenade	SB	2016ATC_06	4057-4024	494	496	1	0.3	0.1	✓	✓	✓		Scrl_1N	
B5262 Lytham Road	SB	2016ATC_07	4049-4026	291	273	-18	-6.2	1.1	✓	✓	✓		Scrl_1N	
Seasiders Way and Yeadon way	NB	2016ATC_32	4081-4037	414	479	64	15.5	3.0	✓	✓	✓		Scrl_1N	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		WebTAG			
									Flow	GEH		M55/ RSI	CAL/ Val Links	A585 Links
St. Anne's Road	SB	2016ATC_08	4051-4030	304	281	-23	-7.6	1.3	✓	✓	✓		Scrl_1N	
B5261 Hawes Side lane	SB	2016ATC_09	4044-4018	447	443	-4	-1.0	0.2	✓	✓	✓		Scrl_1N	
Vicarage lane	SB	2016ATC_10	4038-4027	455	454	-1	-0.3	0.1	✓	✓	✓		Scrl_1N	
M55 Junction 3 roundabout with A585	SB	2015CJC_33	4048-4042	1328	1319	-9	-0.7	0.2	✓	✓	✓		Scrl_1N	
Nr entrance to Mythop Hall	EB	LCC_26	4086-4077	181	182	1	0.3	0.0	✓	✓	✓		Scrl_1N	
B5260 Singleton Road	SB	2016ATC_50	4150-4104	448	297	-152	-33.9	7.9	×	×	×		Scrl_1N	
C302 Back Lane N of Bradshaw Ln.	SB	LCC_27	4128-4108	17	18	1	4.2	0.2	✓	✓	✓		Scrl_1N	
A585 Fleetwood Road, A road, North of M55 J3	SB	2015TRI_04	4118-4110	1059	1143	84	8.0	2.5	✓	✓	✓	RSI	Scrl_1N	
A5230 Progress Way	EB	2016ATC_57	4008-4019	605	593	-12	-2.0	0.5	✓	✓	✓			
A587 St Walburga's Road	SB	2015BUA_16	4208-4176	932	889	-43	-4.6	1.4	✓	✓	✓			
Moor Park Ave	EB	2016ATC_39	4262-4278	274	278	4	1.5	0.2	✓	✓	✓			
Warren Drive / White Carr Lane	NB	2015CJC_22	4331-4332	119	146	27	22.8	2.4	✓	✓	✓			
B5258 Warren Dr	EB	2016ATC_26	4348-4347	375	332	-43	-11.4	2.3	✓	✓	✓			
B5258 Warren Dr	WB	2016ATC_26	4347-4348	337	216	-121	-35.8	7.3	×	×	×			
B5258 Warren Dr. Arm	WB	2016ATC_51	4348-4349	409	414	5	1.2	0.2	✓	✓	✓			
A587 Fleetwood Road / Queen’s Promenade / Kelso Avenue	SB	2015CJC_20	4363-4350	559	532	-27	-4.8	1.1	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55/ RSI	CAL/ Val Links	A585 Links
North Dr	NB	2016ATC_22	4352-4362	335	327	-7	-2.2	0.4	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	NB	2015CJC_30	4341-4367	301	290	-11	-3.7	0.6	✓	✓	✓			
Victoria Road West	EB	LCC_01	4385-4378	534	528	-6	-1.1	0.3	✓	✓	✓			
A585 / Rossall Lane	0	2015CJC_24	4435-4436	147	141	-6	-4.4	0.5	✓	✓	✓			
C293 Freckleton Rd. S. of Kirkham Bypass	SB	LCC_07	1119-1081	285	359	74	26.1	4.1	✓	✓	✓			
A586 Poulton Road, A Road	EB	2016ATC_38	4212-4219	627	544	-84	-13.3	3.5	✓	✓	✓			
B5261 Common Edge Road	NB	2016ATC_02	4005-1033	625	620	-5	-0.8	0.2	✓	✓	✓			
B5260 Church Road	SB	2016ATC_12	4074-4524	185	191	6	3.2	0.4	✓	✓	✓			
A5230 Progress Way	WB	2016ATC_57	4019-4008	575	570	-5	-0.9	0.2	✓	✓	✓			
Moor Park Ave	WB	2016ATC_39	4278-4262	328	344	16	4.8	0.9	✓	✓	✓			
Moor Park Ave.	WB	2016ATC_28	4283-4278	632	584	-48	-7.6	1.9	✓	✓	✓			
Moor Park Ave.	EB	2016ATC_28	4278-4283	424	387	-37	-8.7	1.8	✓	✓	✓			
Red Bank Rd. arm	WB	2016ATC_52	4297-4295	427	411	-16	-3.8	0.8	✓	✓	✓			
North Dr	SB	2016ATC_22	4362-4352	524	523	-1	-0.2	0.1	✓	✓	✓			
B5261 Common Edge Road	SB	2016ATC_02	1033-4005	639	621	-18	-2.9	0.7	✓	✓	✓			
B5260 Church Road	NB	2016ATC_12	4524-4074	77	109	31	40.5	3.3	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55/ RSI	CAL/ Val Links	A585 Links
Red Bank Rd. arm	EB	2016ATC_52	4295-4297	422	427	5	1.2	0.2	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	SB	2015CJC_30	4367-4341	401	397	-4	-0.9	0.2	✓	✓	✓			
A585 / Rossall Lane	NB	2015CJC_24	4482-4435	765	744	-21	-2.7	0.8	✓	✓	✓			
A585 / Rossall Lane	SB	2015CJC_24	4435-4482	651	630	-20	-3.1	0.8	✓	✓	✓			
B5260 Church Road and Weeton Road	NB	2016ATC_04	1068-4524	179	100	-79	-44.2	6.7	✓	×	✓			
Back Ln.	EB	2016ATC_45	4128-4163	4	8	4	88.8	1.5	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	NB	2015CJC_07	4495-4337	382	387	5	1.2	0.2	✓	✓	✓			
White Carr Lane	NB	LCC_13	4332-4358	117	127	10	8.1	0.9	✓	✓	✓			
B5260 Church Road and Weeton Road	SB	2016ATC_04	4524-1068	74	105	30	40.7	3.2	✓	✓	✓			
A585 / Rossall Lane	0	2015CJC_24	4436-4435	155	154	-1	-0.9	0.1	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	NB	2015CJC_29	4418-4425	315	311	-4	-1.3	0.2	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	SB	2015CJC_29	4425-4418	331	331	0	0.1	0.0	✓	✓	✓			
A587 St Walburga's Road	NB	2015BUA_16	4176-4208	638	626	-12	-1.9	0.5	✓	✓	✓			
A586 Poulton Road, A Road	WB	2016ATC_38	4219-4212	795	780	-15	-1.9	0.5	✓	✓	✓	RSI		
White Carr Lane	SB	LCC_13	4358-4332	271	295	24	8.9	1.4	✓	✓	✓			
B5258 Warren Dr. Arm	EB	2016ATC_51	4349-4348	321	322	1	0.3	0.1	✓	✓	✓			

Location	**Direction**	**Description**	**Saturn Link**	**Observed (vehs)**	**Modelled (vehs)**	**Diff**	**% Diff**	**GEH**	**Pass Criteria**		**Web TAG**			
									Flow	**GEH**		M55/ RSI	CAL/ Val Links	A585 Links
C293 Freckleton Rd. S. of Kirkham Bypass	NB	LCC_07	1081-1119	316	503	187	59.3	9.3	×	×	×			
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	EB	2015CJC_04	4505-4270	1003	996	-8	-0.8	0.2	✓	✓	✓			4505-4270
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	WB	2015CJC_04	4270-4505	761	737	-24	-3.2	0.9	✓	✓	✓			4270-4505
M55 Junction 4 with A583 Preston New Road	NB	2015CJC_01	4082-4088	661	638	-23	-4	0.91	✓	✓	✓			
M55 Junction 4 with A583 Preston New Road	SB	2015CJC_01	4088-4082	754	733	-21	-3	0.78	✓	✓	✓			
A587 Fleetwood Road / Queen's Promenade / Kelso Avenue	NB	2015CJC_20	4350-4363	354	346	-9	-2	0.47	✓	✓	✓			
Total (Minor Road Sites)			**150**	**73780**	**72151**	**-1630**	**-2.2%**	**6.0**	**132**	**132**				

Table 0-2: Calibration Turns – B003 AM Peak

Location	**Direction**	**Description**	**Saturn Link**	**Observed (vehs)**	**Modelled (vehs)**	**Diff**	**% Diff**	**GEH**	**Pass Criteria**		**Web TAG**			
									Flow	**GEH**		M55/ RSI	CAL/ Val Links	A585 Links
A587 Fleetwood Road / Russell Ave / Warren Drive	CB	2015CJC_19	4326-4349-4348	188	272	84	44.9	5.6	✓	×	✓			
A587 Fleetwood Road / Russell Ave / Warren Drive	BC	2015CJC_19	4348-4349-4326	254	386	132	52.1	7.4	×	×	×			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		WebTAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A587 Fleetwood Road / Russell Ave / Warren Drive	BA	2015CJC_19	4348-4349-4355	26	27	2	7.5	0.4	✓	✓	✓			
A587 Fleetwood Road / Russell Ave / Warren Drive	DB	2015CJC_19	4351-4349-4348	102	50	-52	-51.1	6.0	✓	×	✓			
A585 Amounderness Way / Bourne Way priority junction	BC	2015CJC_11	4424-4421-4413	158	148	-10	-6.6	0.8	✓	✓	✓			
A585 Amounderness Way / Bourne Way priority junction	BA	2015CJC_11	4424-4421-4482	18	7	-12	-64.0	3.3	✓	✓	✓			
A585 Amounderness Way / Bourne Way priority junction	AB	2015CJC_11	4482-4421-4424	8	9	1	7.6	0.2	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	BA	2015CJC_29	4407-4418-4425	268	263	-5	-1.8	0.3	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	CA	2015CJC_29	4414-4418-4425	47	47	0	-0.6	0.0	✓	✓	✓			
B5268 Fleetwood Rd N / Bourne Way / Bourne Rd	CD	2015CJC_28	4418-4425-4424	20	19	-1	-5.2	0.2	✓	✓	✓			
B5268 Fleetwood Rd N / Bourne Way / Bourne Rd	DA	2015CJC_28	4424-4425-4454	35	29	-7	-18.3	1.1	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	AB	2015CJC_29	4425-4418-4407	266	292	26	9.8	1.6	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
B5268 Fleetwood Rd N / West Drive	AC	2015CJC_29	4425-4418-4414	65	39	-26	-40.4	3.6	✓	✓	✓			
B5268 Fleetwood Rd N / Bourne Way / Bourne Rd	AD	2015CJC_28	4454-4425-4424	24	13	-11	-44.7	2.5	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	CD	2015CJC_13	4243-4253-4249	40	31	-9	-21.6	1.4	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	CA	2015CJC_13	4243-4253-4263	287	346	60	20.8	3.4	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	DC	2015CJC_13	4249-4253-4243	67	61	-5	-8.2	0.7	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	BC	2015CJC_13	4254-4253-4243	226	229	2	1.1	0.2	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	AC	2015CJC_13	4263-4253-4243	277	276	0	-0.2	0.0	✓	✓	✓			
M55 Junction 4 with A583 Preston New Road	DA	2015CJC_01	4099-4102-4110	60	51	-9	-15.0	1.2	✓	✓	✓			
M55 Junction 4 with A583 Preston New Road	AB	2015CJC_01	4110-4101-4095	719	741	22	3.0	0.8	✓	✓	✓			
M55 Junction 4 with A583 Preston New Road	BC	2015CJC_01	4092-4090-4088	448	424	-23	-5.2	1.1	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55/ RSI	CAL/ Val Links	A585 Links
M55 Junction 3 roundabout with A585	BC	2015CJC_33	4033-4029-1049	275	233	-41	-15.1	2.6	✓	✓	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	CD	2015CJC_33	1049-4028-4031	147	145	-3	-1.9	0.2	✓	✓	✓			
M55 Junction 4 with A583 Preston New Road	CD	2015CJC_01	4088-4091-4098	107	107	0	-0.3	0.0	✓	✓	✓			
A585 Amounderness Way / Bourne Way priority junction	CA	2015CJC_11	4413-4421-4482	740	738	-3	-0.4	0.1	✓	✓	✓			
A585 Amounderness Way / Bourne Way priority junction	AC	2015CJC_11	4482-4421-4413	626	621	-4	-0.7	0.2	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	DA	2015CJC_13	4249-4253-4263	134	307	173	129.3	11.7	✗	✗	✗			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	DB	2015CJC_13	4249-4253-4254	340	159	-181	-53.3	11.5	✗	✗	✗			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	AD	2015CJC_13	4263-4253-4249	34	33	-1	-3.4	0.2	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	BD	2015CJC_13	4254-4253-4249	399	386	-13	-3.2	0.6	✓	✓	✓			
B5268 Fleetwood Rd N / Bourne Way / Bourne Rd	AC	2015CJC_28	4454-4425-4418	207	195	-12	-5.6	0.8	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		WebTAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	**GEH**				
B5268 Fleetwood Rd N / Bourne Way / Bourne Rd	CA	2015CJC_28	4418-4425-4454	258	220	-38	-14.9	2.5	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	BC	2015CJC_29	4407-4418-4414	76	61	-15	-20.1	1.9	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	CB	2015CJC_29	4414-4418-4407	76	73	-3	-4.1	0.4	✓	✓	✓			
A583 Preston New Rd south of M55 J4	DA	2015CJC_33	4034-4040-4048	31	28	-3	-10.7	0.6	✓	✓	✓			
M55 Junction 3 roundabout with A585	AB	2015CJC_33	4042-4039-4035	527	544	17	3.2	0.7	✓	✓	✓			
Warren Drive / White Carr Lane	BA	2015CJC_22	4330-4331-4332	111	137	26	23.7	2.4	✓	✓	✓			
A587 Fleetwood Road / Queen’s Promenade / Kelso Avenue	AC	2015CJC_20	4534-4363-4350	537	532	-5	-1.0	0.2	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	AC	2015CJC_30	4382-4367-4341	280	248	-32	-11.5	2.0	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	BC	2015CJC_30	4366-4367-4341	89	86	-2	-2.6	0.3	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	BD	2015CJC_30	4366-4367-4376	212	211	-1	-0.5	0.1	✓	✓	✓			

Location	**Direction**	**Description**	**Saturn Link**	**Observed (vehs)**	**Modelled (vehs)**	**Diff**	**% Diff**	**GEH**	**Pass Criteria**		**Web TAG**	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	**GEH**				
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	CA	2015CJC_30	4341-4367-4382	219	182	-37	-16.9	2.6	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	CE	2015CJC_09	4360-4378-4385	142	195	53	37.6	4.1	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	CB	2015CJC_13	4243-4253-4254	105	36	-69	-66.0	8.3	✓	✗	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	EC	2015CJC_09	4385-4378-4360	259	335	76	29.1	4.4	✓	✓	✓			
Warren Drive / White Carr Lane	BC	2015CJC_22	4330-4331-4338	138	134	-4	-2.8	0.3	✓	✓	✓			
A587 Fleetwood Road / Queen's Promenade / Kelso Avenue	AB	2015CJC_20	4534-4363-4355	212	194	-18	-8.4	1.2	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	AB	2015CJC_30	4382-4367-4366	61	0	-61	-100.0	11.0	✓	✗	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	AD	2015CJC_30	4382-4367-4376	80	36	-44	-55.0	5.8	✓	✗	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	BA	2015CJC_30	4366-4367-4382	82	0	-82	-100.0	12.8	✓	✗	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	CD	2015CJC_30	4341-4367-4376	28	57	29	100.8	4.4	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55/ RSI	CAL/ Val Links	A585 Links
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	CB	2015CJC_30	4341-4367-4366	53	51	-3	-4.8	0.4	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	EA	2015CJC_09	4385-4378-4395	66	22	-44	-66.3	6.6	✓	✗	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	EB	2015CJC_09	4385-4378-4376	153	149	-5	-3.0	0.4	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	AC	2015CJC_09	4395-4378-4360	676	657	-19	-2.8	0.7	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	AE	2015CJC_09	4395-4378-4385	31	0	-31	-99.5	7.9	✓	✗	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	BE	2015CJC_09	4376-4378-4385	214	214	0	0.2	0.0	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	CA	2015CJC_09	4360-4378-4395	631	665	34	5.3	1.3	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	CB	2015CJC_09	4360-4378-4376	108	95	-13	-12.0	1.3	✓	✓	✓			
Warren Drive / White Carr Lane	CA	2015CJC_22	4338-4331-4332	8	9	1	10.3	0.3	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	DC	2015CJC_30	4376-4367-4341	33	63	31	93.6	4.4	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	CD	2015CJC_03	4523-4280-4509	638	683	45	7.0	1.7	✓	✓	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	BC	2015CJC_03	4513-4280-4523	116	114	-2	-1.6	0.2	✓	✓	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	DB	2015CJC_03	4509-4280-4513	256	261	5	1.8	0.3	✓	✓	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	DC	2015CJC_03	4509-4280-4523	831	833	2	0.2	0.1	✓	✓	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	CB	2015CJC_03	4523-4280-4513	76	17	-59	-77.9	8.7	✓	✗	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	BD	2015CJC_03	4513-4280-4509	227	229	2	0.8	0.1	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	BA	2015CJC_07	4311-4337-4341	142	83	-58	-41.1	5.5	✓	✗	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	BD	2015CJC_07	4311-4337-4526	252	252	0	0.1	0.0	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	BC	2015CJC_07	4311-4337-4495	54	9	-45	-83.8	8.1	✓	✗	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	AC	2015CJC_07	4341-4337-4495	194	193	-1	-0.4	0.1	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	AD	2015CJC_07	4341-4337-4526	256	318	62	24.4	3.7	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	EC	2015CJC_07	4360-4337-4495	134	112	-22	-16.6	2.0	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	CD	2015CJC_07	4495-4337-4526	35	34	-1	-2.4	0.1	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	CE	2015CJC_07	4495-4337-4360	209	234	26	12.3	1.7	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	CA	2015CJC_07	4495-4337-4341	92	97	5	5.5	0.5	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	DA	2015CJC_07	4526-4337-4341	141	205	65	46.0	4.9	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	DC	2015CJC_07	4526-4337-4495	35	13	-22	-63.1	4.5	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	AB	2015CJC_09	4395-4378-4376	41	0	-41	-100.0	9.0	✓	✗	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	BA	2015CJC_09	4376-4378-4395	48	11	-36	-76.2	6.7	✓	✗	✓			
A585 / Rossall Lane	CA	2015CJC_24	4436-4435-4443	155	154	-1	-0.9	0.1	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55/ RSI	CAL/ Val Links	A585 Links
A585 / Rossall Lane	AB	2015CJC_24	4443-4435-4482	651	630	-20	-3.1	0.8	✓	✓	✓			
A585 / Rossall Lane	AC	2015CJC_24	4443-4435-4436	58	44	-14	-23.6	1.9	✓	✓	✓			
A585 / Rossall Lane	BC	2015CJC_24	4482-4435-4436	89	97	7	8.0	0.7	✓	✓	✓			
A585 / Rossall Lane	BA	2015CJC_24	4482-4435-4443	676	648	-28	-4.1	1.1	✓	✓	✓			
A587 Fleetwood Road / Queen's Promenade / Kelso Avenue	BA	2015CJC_20	4355-4363-4534	209	225	17	7.9	1.1	✓	✓	✓			
A587 Fleetwood Road / Queen's Promenade / Kelso Avenue	CA	2015CJC_20	4350-4363-4534	325	346	20	6.2	1.1	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	DB	2015CJC_30	4376-4367-4366	166	106	-60	-36.0	5.1	✓	✗	✓			
Warren Drive / White Carr Lane	CB	2015CJC_22	4338-4331-4330	293	349	56	19.2	3.1	✓	✓	✓			
Warren Drive / White Carr Lane	AB	2015CJC_22	4332-4331-4330	274	291	17	6.1	1.0	✓	✓	✓			
Warren Drive / White Carr Lane	AC	2015CJC_22	4332-4331-4338	14	26	11	79.6	2.6	✓	✓	✓			
Total (Calibration Turns)			**92**	**18791**	**18530**	**-260**	**-1.4%**	**1.9**	**89**	**75**				

Table 0-3: Calibration Links - B003 Inter-Peak

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		WebTAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A587-Broadway NB/BroadwaySB/Rosall lane/Sandy lane	SB	2015CJC_23	4430-4422	522	517	-5	-0.9	0.2	✓	✓	✓		Cordon 1	
A585-Amoundernessway SB	SB	2015CJC-11	4482-4421	653	613	-39	-6.0	1.6	✓	✓	✓		Cordon 1	
B5268 Fleetwood Rd from A585 Eros Roundabout to Thornton North (40mph)	SB	LCC_19	4454-4425	320	284	-36	-11.3	2.1	✓	✓	✓		Cordon 1	
A588 Shard Road across river Wyre, A road	SB	2016ATC_49	1061-4320	484	494	10	2.1	0.5	✓	✓	✓	RSI	Cordon 1	
A586 Garstang Road, A road, East of A585 Fleetwood Road	WB	2016ATC_48	1094-4513	319	317	-1	-0.4	0.1	✓	✓	✓		Cordon 1	
B5269 Thisleton Road.	SB	2016ATC_34	4238-4210	83	84	1	1.1	0.1	✓	✓	✓	RSI	Cordon 1	
M55 eastbound between J3 and J1	WB	2015TRI_02	1105-4092	1933	1544	-389	-20.1	9.3	×	×	×	M55	Cordon 1	
A 583 Blackpool Rd.W of New Hey Ln.	WB	LCC_08	1143-1119	441	450	9	2.0	0.4	✓	✓	✓		Cordon 1	
B5259 Ribby Rd W of Brown Ln.	EB	LCC_06	1519-1077	302	213	-89	-29.4	5.5	✓	×	✓		Cordon 1	
B5260 Fox Ln. Ends	NB	2016ATC_35	1071-1068	133	131	-2	-1.6	0.2	✓	✓	✓		Cordon 1	
B5410 U Lytham St Annes Way S of Moss Hall Ln.	NB	LCC_04	1041-1047	213	217	4	1.9	0.3	✓	✓	✓		Cordon 1	
B5261 Common Edge Road and Queens Way	NB	2015BUA_01	1036-1033	560	560	0	0.0	0.0	✓	✓	✓		Cordon 1	
A584 Clifton Drive North	SB	2016ATC_01	1524-1021	687	686	-1	-0.2	0.1	✓	✓	✓		Cordon 1	
A587-Broadway NB/BroadwaySB/Rosall lane/Sandy lane	NB	2015CJC_23	4422-4430	563	529	-34	-6.0	1.4	✓	✓	✓		Cordon 1	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		WebTAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A585-Amoundernessway NB	NB	2015CJC-11	4421-4482	669	616	-53	-8.0	2.1	✓	✓	✓		Cordon 1	
B5268 Fleetwood Rd from A585 Eros Roundabout to Thornton North (40mph)	NB	LCC_19	4425-4454	329	279	-50	-15.3	2.9	✓	✓	✓		Cordon 1	
A588 Shard Road across river Wyre, A road	NB	2016ATC_49	4320-1061	471	478	7	1.5	0.3	✓	✓	✓		Cordon 1	
A586 Garstang Road, A road, East of A585 Fleetwood Road	EB	2016ATC_48	4513-1094	318	318	0	0.1	0.0	✓	✓	✓		Cordon 1	
B5269 Thisleton Road.	NB	2016ATC_34	4210-4238	84	92	8	9.8	0.9	✓	✓	✓		Cordon 1	
M55 eastbound between J3 and J1	EB	2015TRI_01	4093-1104	1906	1874	-32	-1.7	0.7	✓	✓	✓	M55	Cordon 1	
A 583 Blackpool Rd.W of New Hey Ln.	EB	LCC_08	1119-1143	425	423	-3	-0.6	0.1	✓	✓	✓		Cordon 1	
B5259 Ribby Rd W of Brown Ln.	WB	LCC_06	1077-1519	279	254	-25	-9.0	1.5	✓	✓	✓		Cordon 1	
B5260 Fox Ln. Ends	SB	2016ATC_35	1068-1071	123	124	1	0.9	0.1	✓	✓	✓		Cordon 1	
B5410 U Lytham St Annes Way S of Moss Hall Ln.	SB	LCC_04	1047-1041	88	172	84	95.1	7.3	✓	✗	✓		Cordon 1	
B5261 Common Edge Road and Queens Way	SB	2015BUA_01	1033-1036	605	576	-29	-4.8	1.2	✓	✓	✓		Cordon 1	
A584 Clifton Drive North	NB	2016ATC_01	1021-1524	684	689	5	0.7	0.2	✓	✓	✓		Cordon 1	
A585 Amounderness Way / Bourne Way priority junction	EB	2015CJC_11	4421-4424	119	86	-33	-27.8	3.3	✓	✓	✓		Scrl_B	
B5268 Fleetwood Rd N / West Drive	EB	2015CJC_29	4413-4414	140	103	-36	-26.1	3.3	✓	✓	✓		Scrl_B	
B5412 Victoria Road East	EB	LCC_20	4378-4376	424	317	-107	-25.2	5.6	✗	✗	✗		Scrl_B	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	EB	2015CJC_07	4360-4337	785	889	104	13.3	3.6	✓	✓	✓		Scrl_B	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	NB	2015CJC_07	4526-4337	352	351	-1	-0.4	0.1	✓	✓	✓		Scrl_B	
W of Deepdale Ave.	EB	LCC_22	4304-4301	275	231	-44	-16.1	2.8	✓	✓	✓		Scrl_B	
B5268 Blackpool Road	EB	LCC_21	4265-4292	246	265	18	7.4	1.1	✓	✓	✓		Scrl_B	
Blackpool Old Rd	EB	LCC_23	4247-4261	137	132	-6	-4.1	0.5	✓	✓	✓		Scrl_B	
Garstang Road West West of Mossbourne Rd.	EB	LCC_18	4219-4249	396	396	0	0.0	0.0	✓	✓	✓		Scrl_B	
B5266 Newton Dr	EB	2016ATC_37	4168-4181	529	534	5	1.0	0.2	✓	✓	✓		Scrl_B	
A5853 Preston New Road, A Road	EB	2016ATC_54	4084-4068	656	650	-5	-0.8	0.2	✓	✓	✓		Scrl_B	
Clifton Orad -Cheery Tree Road	EB	2016ATC_31	4038-4059	544	650	106	19.6	4.4	✗	✓	✓		Scrl_B	
Ashworth Road	NB	2016ATC_11	4037-4052	398	209	-189	-47.5	10.8	✗	✗	✗		Scrl_B	
Cropper Road	SB	2016ATC_03	4019-1039	74	171	96	129.4	8.7	✓	✗	✓		Scrl_B	
A585 Amounderness Way / Bourne Way priority junction	WB	2015CJC_11	4424-4421	128	103	-25	-19.5	2.3	✓	✓	✓		Scrl_B	
B5268 Fleetwood Rd N / West Drive	WB	2015CJC_29	4414-4413	113	61	-52	-46.2	5.6	✓	✗	✓		Scrl_B	
B5412 Victoria Road East	WB	LCC_20	4376-4378	388	283	-105	-27.1	5.7	✗	✗	✗		Scrl_B	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	WB	2015CJC_07	4337-4360	872	866	-6	-0.7	0.2	✓	✓	✓		Scrl_B	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		WebTAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	SB	2015CJC_07	4337-4526	357	396	39	11.0	2.0	✓	✓	✓		Scrl_B	
W of Deepdale Ave.	WB	LCC_22	4301-4304	248	207	-41	-16.6	2.7	✓	✓	✓		Scrl_B	
B5268 Blackpool Road	WB	LCC_21	4292-4265	237	239	2	0.8	0.1	✓	✓	✓		Scrl_B	
Blackpool Old Rd	WB	LCC_23	4261-4247	143	136	-8	-5.3	0.6	✓	✓	✓		Scrl_B	
Garstang Road West West of Mossbourne Rd.	WB	LCC_18	4249-4219	400	403	3	0.7	0.1	✓	✓	✓		Scrl_B	
B5266 Newton Dr	WB	2016ATC_37	4181-4168	513	516	4	0.7	0.2	✓	✓	✓		Scrl_B	
A5853 Preston New Road, A Road	WB	2016ATC_54	4068-4084	658	658	0	0.0	0.0	✓	✓	✓		Scrl_B	
Clifton Orad -Cheery Tree Road	WB	2016ATC_31	4059-4038	521	376	-144	-27.7	6.8	×	×	×		Scrl_B	
Ashworth Road	SB	2016ATC_11	4052-4037	362	636	274	75.5	12.3	×	×	×		Scrl_B	
Cropper Road	NB	2016ATC_03	1039-4019	54	60	6	10.2	0.7	✓	✓	✓		Scrl_B	
A586 Garstang Road, A road, East of A585 Fleetwood Road	NB	2016ATC_55	4532-4530	754	589	-165	-21.9	6.4	×	×	×		Scrl_4A	
North Dr	NB	2016ATC_23	4373-4385	353	347	-6	-1.7	0.3	✓	✓	✓		Scrl_4A	
A585-Amounderness Way Arm (South arm)	SB	2016ATC_53	4360-4378	944	1000	56	5.9	1.8	✓	✓	✓		Scrl_4A	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	NB	2015CJC_07	4337-4341	384	384	-1	-0.2	0.0	✓	✓	✓		Scrl_4A	
C381 School Rd. S of Wentworth Dr.	NB	LCC_16	4336-4364	58	51	-7	-12.0	0.9	✓	✓	✓		Scrl_4A	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		WebTAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
B5412 Lambs Road	NB	LCC_17	4397-4371	265	263	-2	-0.9	0.1	✓	✓	✓		Scrl_4A	
A586 Garstang Road, A road, East of A585 Fleetwood Road	SB	2016ATC_55	4530-4532	561	588	27	4.8	1.1	✓	✓	✓		Scrl_4A	
North Dr	SB	2016ATC_23	4385-4373	390	383	-7	-1.8	0.4	✓	✓	✓		Scrl_4A	
A585-Amounderness Way Arm (South arm)	NB	2016ATC_53	4378-4360	1007	1064	57	5.6	1.8	✓	✓	✓	RSI	Scrl_4A	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	SB	2015CJC_07	4341-4337	430	426	-4	-0.9	0.2	✓	✓	✓		Scrl_4A	
C381 School Rd. S of Wentworth Dr.	SB	LCC_16	4364-4336	56	53	-3	-4.5	0.3	✓	✓	✓		Scrl_4A	
B5412 Lambs Road	SB	LCC_17	4371-4397	261	257	-4	-1.6	0.3	✓	✓	✓		Scrl_4A	
A584 Promenade Road	NB	2016ATC_14	4124-4151	765	769	4	0.5	0.1	✓	✓	✓		Scrl_3A	
A586 CookSon Street	NB	2016ATC_16	4153-4156	428	404	-25	-5.8	1.2	✓	✓	✓		Scrl_3A	
B5124 Devonshire Road	NB	2016ATC_17	4162-4178	507	501	-6	-1.2	0.3	✓	✓	✓		Scrl_3A	
Layton Road and Collingwood Ave	NB	2016ATC_18	4536-4184	297	53	-243	-82.1	18.4	×	×	×		Scrl_3A	
A587 - BRd.Wy.	NB	2015ATC_07	4168-4176	408	593	185	45.4	8.3	×	×	×		Scrl_3A	
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	NB	2015CJC_13	4243-4253	416	406	-10	-2.4	0.5	✓	✓	✓		Scrl_3A	
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	NB	2015CJC_04	4228-4270	85	84	-1	-1.6	0.1	✓	✓	✓		Scrl_3A	
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	NB	2015CJC_03	4523-4280	710	691	-19	-2.7	0.7	✓	✓	✓		Scrl_3A	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		WebTAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	**GEH**				
A584 Promenade Road	SB	2016ATC_14	4151-4124	620	718	98	15.8	3.8	✓	✓	✓		Scrl_3A	
A586 CookSon Street	SB	2016ATC_16	4156-4153	185	173	-11	-6.2	0.8	✓	✓	✓		Scrl_3A	
B5124 Devonshire Road	SB	2016ATC_17	4178-4162	580	585	5	0.9	0.2	✓	✓	✓		Scrl_3A	
Layton Road and Collingwood Ave	SB	2016ATC_18	4184-4536	290	91	-199	-68.6	14.4	✗	✗	✗		Scrl_3A	
A587 - BRd.Wy.	SB	2015ATC_07	4176-4168	387	584	197	51.0	9.0	✗	✗	✗		Scrl_3A	
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	SB	2015CJC_13	4253-4243	379	368	-10	-2.8	0.5	✓	✓	✓		Scrl_3A	
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	SB	2015CJC_04	4270-4228	110	108	-2	-2.1	0.2	✓	✓	✓		Scrl_3A	
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	SB	2015CJC_03	4280-4523	700	698	-2	-0.3	0.1	✓	✓	✓		Scrl_3A	
A584 South Promenade	NB	2016ATC_06	4024-4057	363	364	1	0.3	0.1	✓	✓	✓		Scrl_1N	
B5262 Lytham Road	NB	2016ATC_07	4026-4049	324	316	-9	-2.7	0.5	✓	✓	✓		Scrl_1N	
Seasiders Way and Yeadon way	SB	2016ATC_32	4037-4081	353	350	-3	-0.9	0.2	✓	✓	✓		Scrl_1N	
St. Anne's Road	NB	2016ATC_08	4030-4051	326	308	-18	-5.5	1.0	✓	✓	✓		Scrl_1N	
B5261 Hawes Side lane	NB	2016ATC_09	4018-4044	419	426	7	1.7	0.3	✓	✓	✓		Scrl_1N	
Vicarage lane	NB	2016ATC_10	4027-4038	476	445	-32	-6.6	1.5	✓	✓	✓		Scrl_1N	
A583 Preston New Rd North of M55 J4	NB	2015BUA_05	4040-4048	964	958	-5	-0.6	0.2	✓	✓	✓		Scrl_1N	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
Nr entrance to Mythop Hall	WB	LCC_26	4077-4086	124	49	-74	-60.1	8.0	✓	×	✓		Scrl_1N	
B5260 Singleton Road	NB	2016ATC_50	4104-4150	153	119	-34	-22.1	2.9	✓	✓	✓	RSI	Scrl_1N	
C302 Back Lane N of Bradshaw Ln.	NB	LCC_27	4108-4128	13	10	-3	-21.8	0.8	✓	✓	✓		Scrl_1N	
A585 Fleetwood Road, A road, North of M55 J3	NB	2015TRI_03	4110-4118	711	746	35	5.0	1.3	✓	✓	✓		Scrl_1N	
A584 South Promenade	SB	2016ATC_06	4057-4024	392	393	1	0.2	0.0	✓	✓	✓		Scrl_1N	
B5262 Lytham Road	SB	2016ATC_07	4049-4026	323	319	-4	-1.2	0.2	✓	✓	✓		Scrl_1N	
Seasiders Way and Yeadon way	NB	2016ATC_32	4081-4037	258	311	53	20.5	3.1	✓	✓	✓		Scrl_1N	
St. Anne's Road	SB	2016ATC_08	4051-4030	322	298	-25	-7.6	1.4	✓	✓	✓		Scrl_1N	
B5261 Hawes Side lane	SB	2016ATC_09	4044-4018	365	353	-12	-3.2	0.6	✓	✓	✓		Scrl_1N	
Vicarage lane	SB	2016ATC_10	4038-4027	510	415	-95	-18.7	4.4	✓	✓	✓		Scrl_1N	
M55 Junction 3 roundabout with A585	SB	2015CJC_33	4048-4042	954	863	-90	-9.5	3.0	✓	✓	✓		Scrl_1N	
Nr entrance to Mythop Hall	EB	LCC_26	4086-4077	124	83	-40	-32.7	4.0	✓	✓	✓		Scrl_1N	
B5260 Singleton Road	SB	2016ATC_50	4150-4104	154	97	-58	-37.3	5.1	✓	×	✓		Scrl_1N	
C302 Back Lane N of Bradshaw Ln.	SB	LCC_27	4128-4108	13	8	-5	-40.0	1.6	✓	✓	✓		Scrl_1N	
A585 Fleetwood Road, A road, North of M55 J3	SB	2015TRI_04	4118-4110	716	772	56	7.9	2.1	✓	✓	✓	RSI	Scrl_1N	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A5230 Progress Way	EB	2016ATC_57	4008-4019	497	482	-15	-3.0	0.7	✓	✓	✓			
A587 St Walburga's Road	SB	2015BUA_16	4208-4176	715	704	-11	-1.5	0.4	✓	✓	✓			
Moor Park Ave	EB	2016ATC_39	4262-4278	156	159	3	2.1	0.3	✓	✓	✓			
Warren Drive / White Carr Lane	NB	2015CJC_22	4331-4332	117	118	1	1.3	0.1	✓	✓	✓			
B5258 Warren Dr	EB	2016ATC_26	4348-4347	279	240	-39	-14.1	2.4	✓	✓	✓			
B5258 Warren Dr	WB	2016ATC_26	4347-4348	282	245	-37	-13.3	2.3	✓	✓	✓			
B5258 Warren Dr. Arm	WB	2016ATC_51	4348-4349	319	318	-1	-0.3	0.1	✓	✓	✓			
A587 Fleetwood Road / Queen’s Promenade / Kelso Avenue	SB	2015CJC_20	4363-4350	415	401	-14	-3.3	0.7	✓	✓	✓			
North Dr	NB	2016ATC_22	4352-4362	338	330	-8	-2.3	0.4	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	NB	2015CJC_30	4341-4367	321	314	-7	-2.1	0.4	✓	✓	✓			
Victoria Road West	EB	LCC_01	4385-4378	683	626	-57	-8.3	2.2	✓	✓	✓			
A585 / Rossall Lane	0	2015CJC_24	4435-4436	161	164	3	1.6	0.2	✓	✓	✓			
C293 Freckleton Rd. S. of Kirkham Bypass	SB	LCC_07	1119-1081	204	299	95	46.4	6.0	✓	×	✓			
A586 Poulton Road, A Road	EB	2016ATC_38	4212-4219	558	535	-23	-4.1	1.0	✓	✓	✓			
B5261 Common Edge Road	NB	2016ATC_02	4005-1033	565	557	-9	-1.5	0.4	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		WebTAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
B5260 Church Road	SB	2016ATC_12	4074-4524	61	78	17	28.2	2.1	✓	✓	✓			
A5230 Progress Way	WB	2016ATC_57	4019-4008	517	512	-5	-1.0	0.2	✓	✓	✓			
Moor Park Ave	WB	2016ATC_39	4278-4262	248	187	-61	-24.5	4.1	✓	✓	✓			
Moor Park Ave.	WB	2016ATC_28	4283-4278	368	363	-5	-1.3	0.2	✓	✓	✓			
Moor Park Ave.	EB	2016ATC_28	4278-4283	326	329	3	0.9	0.2	✓	✓	✓			
Red Bank Rd. arm	WB	2016ATC_52	4297-4295	321	315	-6	-1.8	0.3	✓	✓	✓			
North Dr	SB	2016ATC_22	4362-4352	359	356	-3	-0.8	0.2	✓	✓	✓			
B5261 Common Edge Road	SB	2016ATC_02	1033-4005	617	608	-9	-1.5	0.4	✓	✓	✓			
B5260 Church Road	NB	2016ATC_12	4524-4074	52	70	18	35.4	2.3	✓	✓	✓			
Red Bank Rd. arm	EB	2016ATC_52	4295-4297	302	298	-4	-1.2	0.2	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	SB	2015CJC_30	4367-4341	369	357	-12	-3.2	0.6	✓	✓	✓			
A585 / Rossall Lane	NB	2015CJC_24	4482-4435	562	616	54	9.6	2.2	✓	✓	✓			
A585 / Rossall Lane	SB	2015CJC_24	4435-4482	601	613	12	2.1	0.5	✓	✓	✓			
B5260 Church Road and Weeton Road	NB	2016ATC_04	1068-4524	60	60	1	1.0	0.1	✓	✓	✓			
Back Ln.	EB	2016ATC_45	4128-4163	7	7	0	-5.3	0.1	✓	✓	✓			

Location	**Direction**	**Description**	**Saturn Link**	**Observed (vehs)**	**Modelled (vehs)**	**Diff**	**% Diff**	**GEH**	**Pass Criteria**		**WebTAG**	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	**GEH**				
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	NB	2015CJC_07	4495-4337	410	410	-1	-0.2	0.0	✓	✓	✓			
White Carr Lane	NB	LCC_13	4332-4358	117	125	8	6.5	0.7	✓	✓	✓			
B5260 Church Road and Weeton Road	SB	2016ATC_04	4524-1068	52	54	2	4.5	0.3	✓	✓	✓			
A585 / Rossall Lane	0	2015CJC_24	4436-4435	155	149	-6	-3.6	0.4	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	NB	2015CJC_29	4418-4425	356	339	-17	-4.7	0.9	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	SB	2015CJC_29	4425-4418	320	310	-10	-3.1	0.6	✓	✓	✓			
A587 St Walburga's Road	NB	2015BUA_16	4176-4208	612	594	-18	-2.9	0.7	✓	✓	✓			
A586 Poulton Road, A Road	WB	2016ATC_38	4219-4212	605	603	-2	-0.3	0.1	✓	✓	✓	RSI		
White Carr Lane	SB	LCC_13	4358-4332	121	145	24	19.8	2.1	✓	✓	✓			
B5258 Warren Dr. Arm	EB	2016ATC_51	4349-4348	306	303	-3	-0.9	0.2	✓	✓	✓			
C293 Freckleton Rd. S. of Kirkham Bypass	NB	LCC_07	1081-1119	238	310	72	30.3	4.4	✓	✓	✓			
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	EB	2015CJC_04	4505-4270	799	759	-40	-5.0	1.4	✓	✓	✓			4505 - 4270
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	WB	2015CJC_04	4270-4505	762	754	-8	-1.1	0.3	✓	✓	✓			4270 - 4505
M55 Junction 4 with A583 Preston New Road	NB	2015CJC_01	4082-4088	479	473	-7	-1	0.31	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
M55 Junction 4 with A583 Preston New Road	SB	2015CJC_01	4088-4082	466	443	-23	-5	1.08	✓	✓	✓			
A587 Fleetwood Road / Queen’s Promenade / Kelso Avenue	NB	2015CJC_20	4350-4363	396	401	5	1	0.27	✓	✓	✓			
Total (Minor Road Sites)			**150**	**60522**	**59125**	**-1397**	**-2.3%**	**5.7**	**138**	**132**				

Table 0-4: Calibration Turns - B003 Inter-Peak

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A587 Fleetwood Road / Russell Ave / Warren Drive	CB	2015CJC_19	4326-4349-4348	203	234	31	15.4	2.1	✓	✓	✓			
A587 Fleetwood Road / Russell Ave / Warren Drive	BC	2015CJC_19	4348-4349-4326	205	276	71	34.4	4.6	✓	✓	✓			
A587 Fleetwood Road / Russell Ave / Warren Drive	BA	2015CJC_19	4348-4349-4355	36	43	6	18.0	1.0	✓	✓	✓			
A587 Fleetwood Road / Russell Ave / Warren Drive	DB	2015CJC_19	4351-4349-4348	70	69	0	-0.6	0.1	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria					
									Flow	GEH	Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
A585 Amounderness Way / Bourne Way priority junction	BC	2015CJC_11	4424-4421-4413	112	93	-19	-17.1	1.9	✓	✓	✓			
A585 Amounderness Way / Bourne Way priority junction	BA	2015CJC_11	4424-4421-4482	16	10	-6	-39.3	1.7	✓	✓	✓			
A585 Amounderness Way / Bourne Way priority junction	AB	2015CJC_11	4482-4421-4424	16	16	-1	-3.6	0.1	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	BA	2015CJC_29	4407-4418-4425	305	292	-13	-4.2	0.7	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	CA	2015CJC_29	4414-4418-4425	50	47	-4	-7.5	0.5	✓	✓	✓			
B5268 Fleetwood Rd N / Bourne Way / Bourne	CD	2015CJC_28	4418-4425-4424	24	15	-8	-34.7	1.9	✓	✓	✓			
B5268 Fleetwood Rd N / Bourne Way / Bourne	DA	2015CJC_28	4424-4425-4454	32	35	3	9.2	0.5	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	AB	2015CJC_29	4425-4418-4407	276	304	27	9.9	1.6	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	AC	2015CJC_29	4425-4418-4414	44	7	-38	-84.9	7.4	✓	×	✓			
B5268 Fleetwood Rd N / Bourne Way / Bourne	AD	2015CJC_28	4454-4425-4424	36	18	-19	-51.2	3.6	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria					
									Flow	GEH	Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	CD	2015CJC_13	4243-4253-4249	41	36	-5	-12.8	0.8	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	CA	2015CJC_13	4243-4253-4263	285	367	81	28.4	4.5	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	DC	2015CJC_13	4249-4253-4243	44	39	-5	-11.6	0.8	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	BC	2015CJC_13	4254-4253-4243	172	167	-5	-3.1	0.4	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	AC	2015CJC_13	4263-4253-4243	163	163	-1	-0.4	0.1	✓	✓	✓			
M55 Junction 4 with A583 Preston New Road	DA	2015CJC_01	4099-4102-4110	80	73	-7	-8.5	0.8	✓	✓	✓			
M55 Junction 4 with A583 Preston New Road	AB	2015CJC_01	4110-4101-4095	499	503	4	0.8	0.2	✓	✓	✓			
M55 Junction 4 with A583 Preston New Road	BC	2015CJC_01	4092-4090-4088	215	196	-19	-8.8	1.3	✓	✓	✓			
M55 Junction 3 roundabout with A585	BC	2015CJC_33	4033-4029-1049	179	92	-87	-48.4	7.4	✓	×	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	CD	2015CJC_33	1049-4028-4031	119	113	-6	-5.2	0.6	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria					
									Flow	GEH	Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
M55 Junction 4 with A583 Preston New Road	CD	2015CJC_01	4088-4091-4098	65	62	-3	-4.4	0.4	✓	✓	✓			
A585 Amounderness Way / Bourne Way priority junction	CA	2015CJC_11	4413-4421-4482	653	606	-47	-7.2	1.9	✓	✓	✓			
A585 Amounderness Way / Bourne Way priority junction	AC	2015CJC_11	4482-4421-4413	636	597	-39	-6.1	1.6	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	DA	2015CJC_13	4249-4253-4263	120	144	24	20.3	2.1	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	DB	2015CJC_13	4249-4253-4254	254	215	-38	-15.0	2.5	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	AD	2015CJC_13	4263-4253-4249	30	29	-1	-4.1	0.2	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	BD	2015CJC_13	4254-4253-4249	339	323	-16	-4.8	0.9	✓	✓	✓			
B5268 Fleetwood Rd N / Bourne Way / Bourne Rd	AC	2015CJC_28	4454-4425-4418	261	239	-22	-8.4	1.4	✓	✓	✓			
B5268 Fleetwood Rd N / Bourne Way / Bourne Rd	CA	2015CJC_28	4418-4425-4454	295	216	-79	-26.7	4.9	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	BC	2015CJC_29	4407-4418-4414	69	54	-15	-21.5	1.9	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria					
									Flow	GEH	Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
B5268 Fleetwood Rd N / West Drive	CB	2015CJC_29	4414-4418-4407	89	56	-33	-36.6	3.8	✓	✓	✓			
A583 Preston New Rd south of M55 J4	DA	2015CJC_33	4034-4040-4048	40	31	-9	-23.3	1.6	✓	✓	✓			
M55 Junction 3 roundabout with A585	AB	2015CJC_33	4042-4039-4035	416	429	13	3.1	0.6	✓	✓	✓			
Warren Drive / White Carr Lane	BA	2015CJC_22	4330-4331-4332	106	107	1	1.2	0.1	✓	✓	✓			
A587 Fleetwood Road / Queen's Promenade / Kelso Avenue	AC	2015CJC_20	4534-4363-4350	400	401	1	0.3	0.1	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	AC	2015CJC_30	4382-4367-4341	259	194	-65	-25.1	4.3	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	BC	2015CJC_30	4366-4367-4341	66	63	-2	-3.3	0.3	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	BD	2015CJC_30	4366-4367-4376	169	166	-3	-1.5	0.2	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	CA	2015CJC_30	4341-4367-4382	227	147	-80	-35.2	5.9	✓	×	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	CE	2015CJC_09	4360-4378-4385	205	206	1	0.3	0.0	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria					
									Flow	GEH	Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	CB	2015CJC_13	4243-4253-4254	89	3	-86	-96.2	12.6	✓	✗	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	EC	2015CJC_09	4385-4378-4360	197	386	189	96.1	11.1	✗	✗	✗			
Warren Drive / White Carr Lane	BC	2015CJC_22	4330-4331-4338	153	154	2	1.1	0.1	✓	✓	✓			
A587 Fleetwood Road / Queen’s Promenade / Kelso Avenue	AB	2015CJC_20	4534-4363-4355	233	223	-9	-4.0	0.6	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	AB	2015CJC_30	4382-4367-4366	68	0	-68	-100.0	11.6	✓	✗	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	AD	2015CJC_30	4382-4367-4376	80	26	-54	-67.7	7.4	✓	✗	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	BA	2015CJC_30	4366-4367-4382	74	0	-74	-100.0	12.2	✓	✗	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	CD	2015CJC_30	4341-4367-4376	37	111	74	202.6	8.6	✓	✗	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	CB	2015CJC_30	4341-4367-4366	57	56	-1	-1.8	0.1	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	EA	2015CJC_09	4385-4378-4395	57	6	-51	-89.4	9.1	✓	✗	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria					
									Flow	GEH	Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	EB	2015CJC_09	4385-4378-4376	210	211	1	0.6	0.1	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	AC	2015CJC_09	4395-4378-4360	555	544	-11	-2.0	0.5	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	AE	2015CJC_09	4395-4378-4385	32	4	-28	-86.3	6.5	✓	×	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	BE	2015CJC_09	4376-4378-4385	210	210	0	-0.1	0.0	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	CA	2015CJC_09	4360-4378-4395	556	579	23	4.2	1.0	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	CB	2015CJC_09	4360-4378-4376	96	82	-14	-14.3	1.5	✓	✓	✓			
Warren Drive / White Carr Lane	CA	2015CJC_22	4338-4331-4332	11	11	0	1.9	0.1	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	DC	2015CJC_30	4376-4367-4341	45	100	55	123.8	6.5	✓	×	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	CD	2015CJC_03	4523-4280-4509	632	683	51	8.2	2.0	✓	✓	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	BC	2015CJC_03	4513-4280-4523	79	72	-7	-8.4	0.8	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	**Pass Criteria**					
									Flow	**GEH**	**Web TAG**	M55/ RSI	CAL/ Val Links	A585 Links
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	DB	2015CJC_03	4509-4280-4513	248	313	65	26.3	3.9	✓	✓	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	DC	2015CJC_03	4509-4280-4523	602	625	23	3.9	0.9	✓	✓	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	CB	2015CJC_03	4523-4280-4513	70	5	-65	-92.6	10.6	✓	×	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	BD	2015CJC_03	4513-4280-4509	238	245	7	2.9	0.4	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	BA	2015CJC_07	4311-4337-4341	144	122	-22	-15.3	1.9	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	BD	2015CJC_07	4311-4337-4526	174	167	-7	-4.0	0.5	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	BC	2015CJC_07	4311-4337-4495	50	30	-21	-41.0	3.3	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	AC	2015CJC_07	4341-4337-4495	174	174	0	0.2	0.0	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	AD	2015CJC_07	4341-4337-4526	123	160	37	30.3	3.1	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	EC	2015CJC_07	4360-4337-4495	190	188	-2	-1.0	0.1	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria					
									Flow	GEH	Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	CD	2015CJC_07	4495-4337-4526	32	31	-1	-2.3	0.1	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	CE	2015CJC_07	4495-4337-4360	238	238	0	0.1	0.0	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	CA	2015CJC_07	4495-4337-4341	98	110	12	12.5	1.2	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	DA	2015CJC_07	4526-4337-4341	130	134	4	3.2	0.4	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	DC	2015CJC_07	4526-4337-4495	21	21	0	-0.8	0.0	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	AB	2015CJC_09	4395-4378-4376	41	7	-34	-83.7	7.0	✓	✗	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	BA	2015CJC_09	4376-4378-4395	41	10	-30	-74.6	6.0	✓	✗	✓			
A585 / Rossall Lane	CA	2015CJC_24	4436-4435-4443	155	149	-6	-3.6	0.4	✓	✓	✓			
A585 / Rossall Lane	AB	2015CJC_24	4443-4435-4482	601	613	12	2.1	0.5	✓	✓	✓			
A585 / Rossall Lane	AC	2015CJC_24	4443-4435-4436	106	79	-28	-26.0	2.9	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria					
									Flow	GEH	Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
A585 / Rossall Lane	BC	2015CJC_24	4482-4435-4436	55	85	30	55.3	3.6	✓	✓	✓			
A585 / Rossall Lane	BA	2015CJC_24	4482-4435-4443	507	531	24	4.7	1.0	✓	✓	✓			
A587 Fleetwood Road / Queen's Promenade / Kelso Avenue	BA	2015CJC_20	4355-4363-4534	290	265	-25	-8.6	1.5	✓	✓	✓			
A587 Fleetwood Road / Queen's Promenade / Kelso Avenue	CA	2015CJC_20	4350-4363-4534	372	401	29	7.8	1.5	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	DB	2015CJC_30	4376-4367-4366	202	129	-73	-36.0	5.6	✓	✗	✓			
Warren Drive / White Carr Lane	CB	2015CJC_22	4338-4331-4330	182	243	61	33.5	4.2	✓	✓	✓			
Warren Drive / White Carr Lane	AB	2015CJC_22	4332-4331-4330	120	214	94	77.9	7.2	✓	✗	✓			
Warren Drive / White Carr Lane	AC	2015CJC_22	4332-4331-4338	7	13	6	95.3	2.0	✓	✓	✓			
Total (Calibration Turns)			**92**	**16597**	**16255**	**-342**	**-2.1%**	**2.7**	**91**	**75**				

Table 0-5: Calibration Links - B003 PM Peak

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/Val Links	A585 Links
									Flow	GEH				
A587-Broadway NB/BroadwaySB/Rosall lane/Sandy lane	SB	2015CJC_23	4430-4422	721	688	-33	-4.6	1.2	✓	✓	✓		Cordon1	
A585-Amoundernessway SB	SB	2015CJC-11	4482-4421	825	826	1	0.1	0.0	✓	✓	✓		Cordon1	
B5268 Fleetwood Rd from A585 Eros Roundabout to Thornton North (40mph)	SB	LCC_19	4454-4425	425	397	-27	-6.5	1.4	✓	✓	✓		Cordon1	
A588 Shard Road across river Wyre, A road	SB	2016ATC_49	1061-4320	509	511	2	0.5	0.1	✓	✓	✓	RSI	Cordon1	
A586 Garstang Road, A road, East of A585 Fleetwood Road	WB	2016ATC_48	1094-4513	395	401	6	1.5	0.3	✓	✓	✓		Cordon1	
B5269 Thisleton Road.	SB	2016ATC_34	4238-4210	96	51	-46	-47.5	5.3	✓	✗	✓	RSI	Cordon1	
M55 eastbound between J3 and J1	WB	2015TRI_02	1105-4092	2580	2554	-26	-1.0	0.5	✓	✓	✓	M55	Cordon1	
A 583 Blackpool Rd.W of New Hey Ln.	WB	LCC_08	1143-1119	734	739	5	0.7	0.2	✓	✓	✓		Cordon1	
B5259 Ribby Rd W of Brown Ln.	EB	LCC_06	1519-1077	482	312	-169	-35.2	8.5	✗	✗	✗		Cordon1	
B5260 Fox Ln. Ends	NB	2016ATC_35	1071-1068	287	244	-43	-14.9	2.6	✓	✓	✓		Cordon1	
B5410 U Lytham St Annes Way S of Moss Hall Ln.	NB	LCC_04	1041-1047	229	243	13	5.9	0.9	✓	✓	✓		Cordon1	
B5261 Common Edge Road and Queens Way	NB	2015BUA_01	1036-1033	585	558	-27	-4.6	1.1	✓	✓	✓		Cordon1	
A584 Clifton Drive North	SB	2016ATC_01	1524-1021	866	908	42	4.8	1.4	✓	✓	✓		Cordon1	
A587-Broadway NB/BroadwaySB/Rosall lane/Sandy lane	NB	2015CJC_23	4422-4430	767	725	-42	-5.5	1.5	✓	✓	✓		Cordon1	
A585-Amoundernessway NB	NB	2015CJC-11	4421-4482	732	725	-7	-0.9	0.3	✓	✓	✓		Cordon1	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/Val Links	A585 Links
									Flow	GEH				
B5268 Fleetwood Rd from A585 Eros Roundabout to Thornton North (40mph)	NB	LCC_19	4425-4454	376	335	-41	-10.9	2.2	✓	✓	✓		Cordon1	
A588 Shard Road across river Wyre, A road	NB	2016ATC_49	4320-1061	715	718	3	0.4	0.1	✓	✓	✓		Cordon1	
A586 Garstang Road, A road, East of A585 Fleetwood Road	EB	2016ATC_48	4513-1094	412	411	-1	-0.2	0.0	✓	✓	✓		Cordon1	
B5269 Thisleton Road.	NB	2016ATC_34	4210-4238	148	155	7	4.7	0.6	✓	✓	✓		Cordon1	
M55 eastbound between J3 and J1	EB	2015TRI_01	4093-1104	2785	2605	-180	-6.5	3.5	✓	✓	✓	M55	Cordon1	
A 583 Blackpool Rd.W of New Hey Ln.	EB	LCC_08	1119-1143	496	501	5	1.0	0.2	✓	✓	✓		Cordon1	
B5259 Ribby Rd W of Brown Ln.	WB	LCC_06	1077-1519	341	329	-12	-3.5	0.7	✓	✓	✓		Cordon1	
B5260 Fox Ln. Ends	SB	2016ATC_35	1068-1071	180	181	1	0.5	0.1	✓	✓	✓		Cordon1	
B5410 U Lytham St Annes Way S of Moss Hall Ln.	SB	LCC_04	1047-1041	186	176	-11	-5.8	0.8	✓	✓	✓		Cordon1	
B5261 Common Edge Road and Queens Way	SB	2015BUA_01	1033-1036	634	635	0	0.1	0.0	✓	✓	✓		Cordon1	
A584 Clifton Drive North	NB	2016ATC_01	1021-1524	916	910	-6	-0.7	0.2	✓	✓	✓		Cordon1	
A585 Amounderness Way / Bourne Way priority junction	EB	2015CJC_11	4421-4424	173	155	-17	-10.1	1.4	✓	✓	✓		Scrl_B	
B5268 Fleetwood Rd N / West Drive	EB	2015CJC_29	4413-4414	159	150	-10	-6.1	0.8	✓	✓	✓		Scrl_B	
B5412 Victoria Road East	EB	LCC_20	4378-4376	544	348	-196	-36.0	9.3	✗	✗	✗		Scrl_B	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	EB	2015CJC_07	4360-4337	857	953	95	11.1	3.2	✓	✓	✓		Scrl_B	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	NB	2015CJC_07	4526-4337	534	740	206	38.6	8.2	✗	✗	✗		Scrl_B	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/Val Links	A585 Links
									Flow	GEH				
W of Deepdale Ave.	EB	LCC_22	4304-4301	359	188	-171	-47.6	10.3	×	×	×		Scrl_B	
B5268 Blackpool Road	EB	LCC_21	4265-4292	389	372	-17	-4.4	0.9	✓	✓	✓		Scrl_B	
Blackpool Old Rd	EB	LCC_23	4247-4261	153	156	3	2.0	0.2	✓	✓	✓		Scrl_B	
Garstang Road West West of Mossbourne Rd.	EB	LCC_18	4219-4249	566	559	-7	-1.2	0.3	✓	✓	✓		Scrl_B	
B5266 Newton Dr	EB	2016ATC_37	4168-4181	868	861	-7	-0.8	0.2	✓	✓	✓		Scrl_B	
A5853 Preston New Road, A Road	EB	2016ATC_54	4084-4068	809	830	21	2.6	0.7	✓	✓	✓		Scrl_B	
Clifton Orad -Cheery Tree Road	EB	2016ATC_31	4038-4059	513	530	17	3.3	0.7	✓	✓	✓		Scrl_B	
Ashworth Road	NB	2016ATC_11	4037-4052	520	326	-194	-37.4	9.4	×	×	×		Scrl_B	
Cropper Road	SB	2016ATC_03	4019-1039	102	114	12	11.9	1.2	✓	✓	✓		Scrl_B	
A585 Amounderness Way / Bourne Way priority junction	WB	2015CJC_11	4424-4421	149	131	-19	-12.5	1.6	✓	✓	✓		Scrl_B	
B5268 Fleetwood Rd N / West Drive	WB	2015CJC_29	4414-4413	155	129	-26	-16.6	2.2	✓	✓	✓		Scrl_B	
B5412 Victoria Road East	WB	LCC_20	4376-4378	447	275	-172	-38.6	9.1	×	×	×		Scrl_B	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	WB	2015CJC_07	4337-4360	986	996	10	1.0	0.3	✓	✓	✓		Scrl_B	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	SB	2015CJC_07	4337-4526	464	645	180	38.8	7.7	×	×	×		Scrl_B	
W of Deepdale Ave.	WB	LCC_22	4301-4304	419	253	-166	-39.6	9.0	×	×	×		Scrl_B	
B5268 Blackpool Road	WB	LCC_21	4292-4265	231	224	-6	-2.8	0.4	✓	✓	✓		Scrl_B	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/Val Links	A585 Links
									Flow	GEH				
Blackpool Old Rd	WB	LCC_23	4261-4247	191	189	-2	-1.1	0.1	✓	✓	✓		Scrl_B	
Garstang Road West West of Mossbourne Rd.	WB	LCC_18	4249-4219	453	452	0	-0.1	0.0	✓	✓	✓		Scrl_B	
B5266 Newton Dr	WB	2016ATC_37	4181-4168	621	627	6	1.0	0.3	✓	✓	✓		Scrl_B	
A5853 Preston New Road, A Road	WB	2016ATC_54	4068-4084	869	868	0	0.0	0.0	✓	✓	✓		Scrl_B	
Clifton Orad -Cheery Tree Road	WB	2016ATC_31	4059-4038	652	621	-31	-4.8	1.2	✓	✓	✓		Scrl_B	
Ashworth Road	SB	2016ATC_11	4052-4037	463	440	-23	-5.1	1.1	✓	✓	✓		Scrl_B	
Cropper Road	NB	2016ATC_03	1039-4019	78	72	-6	-7.4	0.7	✓	✓	✓		Scrl_B	
A586 Garstang Road, A road, East of A585 Fleetwood Road	NB	2016ATC_55	4532-4530	883	661	-222	-25.1	8.0	✗	✗	✗		Scrl_4A	
North Dr	NB	2016ATC_23	4373-4385	543	545	2	0.5	0.1	✓	✓	✓		Scrl_4A	
A585-Amounderness Way Arm (South arm)	SB	2016ATC_53	4360-4378	1096	1169	73	6.7	2.2	✓	✓	✓		Scrl_4A	
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	NB	2015CJC_07	4337-4341	599	597	-2	-0.4	0.1	✓	✓	✓		Scrl_4A	
C381 School Rd. S of Wentworth Dr.	NB	LCC_16	4336-4364	67	94	27	40.5	3.0	✓	✓	✓		Scrl_4A	
B5412 Lambs Road	NB	LCC_17	4397-4371	576	550	-26	-4.4	1.1	✓	✓	✓		Scrl_4A	
A586 Garstang Road, A road, East of A585 Fleetwood Road	SB	2016ATC_55	4530-4532	629	635	6	1.0	0.3	✓	✓	✓		Scrl_4A	
North Dr	SB	2016ATC_23	4385-4373	484	477	-7	-1.4	0.3	✓	✓	✓		Scrl_4A	
A585-Amounderness Way Arm (South arm)	NB	2016ATC_53	4378-4360	1198	1159	-39	-3.2	1.1	✓	✓	✓	RSI	Scrl_4A	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55/ RSI	CAL/Val Links	A585 Links
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	SB	2015CJC_07	4341-4337	492	483	-10	-2.0	0.4	✓	✓	✓		Scrl_4A	
C381 School Rd. S of Wentworth Dr.	SB	LCC_16	4364-4336	78	80	2	2.7	0.2	✓	✓	✓		Scrl_4A	
B5412 Lambs Road	SB	LCC_17	4371-4397	454	385	-69	-15.3	3.4	✓	✓	✓		Scrl_4A	
A584 Promenade Road	NB	2016ATC_14	4124-4151	1006	1034	28	2.8	0.9	✓	✓	✓		Scrl_3A	
A586 CookSon Street	NB	2016ATC_16	4153-4156	538	510	-28	-5.2	1.2	✓	✓	✓		Scrl_3A	
B5124 Devonshire Road	NB	2016ATC_17	4162-4178	587	442	-145	-24.6	6.4	✗	✗	✗		Scrl_3A	
Layton Road and Collingwood Ave	NB	2016ATC_18	4536-4184	407	203	-204	-50.1	11.7	✗	✗	✗		Scrl_3A	
A587 - BRd.Wy.	NB	2015ATC_07	4168-4176	487	679	192	39.5	8.0	✗	✗	✗		Scrl_3A	
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	NB	2015CJC_13	4243-4253	619	599	-20	-3.3	0.8	✓	✓	✓		Scrl_3A	
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	NB	2015CJC_04	4228-4270	191	181	-10	-5.0	0.7	✓	✓	✓		Scrl_3A	
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	NB	2015CJC_03	4523-4280	859	866	7	0.8	0.2	✓	✓	✓		Scrl_3A	
A584 Promenade Road	SB	2016ATC_14	4151-4124	776	914	137	17.7	4.7	✗	✓	✓		Scrl_3A	
A586 CookSon Street	SB	2016ATC_16	4156-4153	217	210	-7	-3.2	0.5	✓	✓	✓		Scrl_3A	
B5124 Devonshire Road	SB	2016ATC_17	4178-4162	610	614	3	0.5	0.1	✓	✓	✓		Scrl_3A	
Layton Road and Collingwood Ave	SB	2016ATC_18	4184-4536	367	140	-227	-61.9	14.3	✗	✗	✗		Scrl_3A	

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/Val Links	A585 Links
									Flow	GEH				
A587 - BRd.Wy.	SB	2015ATC_07	4176-4168	447	682	235	52.7	9.9	✗	✗	✗		Scrl_3A	
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	SB	2015CJC_13	4253-4243	430	430	0	-0.1	0.0	✓	✓	✓		Scrl_3A	
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	SB	2015CJC_04	4270-4228	168	154	-13	-8.0	1.1	✓	✓	✓		Scrl_3A	
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	SB	2015CJC_03	4280-4523	879	867	-12	-1.4	0.4	✓	✓	✓		Scrl_3A	
A584 South Promenade	NB	2016ATC_06	4024-4057	466	485	19	4.1	0.9	✓	✓	✓		Scrl_1N	
B5262 Lytham Road	NB	2016ATC_07	4026-4049	363	318	-45	-12.5	2.5	✓	✓	✓		Scrl_1N	
Seasiders Way and Yeadon way	SB	2016ATC_32	4037-4081	519	536	17	3.2	0.7	✓	✓	✓		Scrl_1N	
St. Anne's Road	NB	2016ATC_08	4030-4051	416	432	15	3.7	0.7	✓	✓	✓		Scrl_1N	
B5261 Hawes Side lane	NB	2016ATC_09	4018-4044	556	574	18	3.3	0.8	✓	✓	✓		Scrl_1N	
Vicarage lane	NB	2016ATC_10	4027-4038	577	532	-44	-7.7	1.9	✓	✓	✓		Scrl_1N	
A583 Preston New Rd North of M55 J4	NB	2015BUA_05	4040-4048	1322	1304	-17	-1.3	0.5	✓	✓	✓		Scrl_1N	
Nr entrance to Mythop Hall	WB	LCC_26	4077-4086	206	153	-53	-25.6	3.9	✓	✓	✓		Scrl_1N	
B5260 Singleton Road	NB	2016ATC_50	4104-4150	397	340	-57	-14.4	3.0	✓	✓	✓	RSI	Scrl_1N	
C302 Back Lane N of Bradshaw Ln.	NB	LCC_27	4108-4128	16	17	1	8.8	0.3	✓	✓	✓		Scrl_1N	
A585 Fleetwood Road, A road, North of M55 J3	NB	2015TRI_03	4110-4118	1090	1070	-20	-1.8	0.6	✓	✓	✓		Scrl_1N	

Location	**Direction**	**Description**	**Saturn Link**	**Observed (vehs)**	**Modelled (vehs)**	**Diff**	**% Diff**	**GEH**	**Pass Criteria**		**Web TAG**	M55/ RSI	CAL/Val Links	A585 Links
									Flow	**GEH**				
A584 South Promenade	SB	2016ATC_06	4057-4024	499	498	-1	-0.2	0.1	✓	✓	✓		Scrl_1N	
B5262 Lytham Road	SB	2016ATC_07	4049-4026	427	403	-23	-5.5	1.2	✓	✓	✓		Scrl_1N	
Seasiders Way and Yeadon way	NB	2016ATC_32	4081-4037	393	425	31	8.0	1.6	✓	✓	✓		Scrl_1N	
St. Anne's Road	SB	2016ATC_08	4051-4030	418	390	-28	-6.6	1.4	✓	✓	✓		Scrl_1N	
B5261 Hawes Side lane	SB	2016ATC_09	4044-4018	529	492	-38	-7.1	1.7	✓	✓	✓		Scrl_1N	
Vicarage lane	SB	2016ATC_10	4038-4027	598	545	-52	-8.8	2.2	✓	✓	✓		Scrl_1N	
M55 Junction 3 roundabout with A585	SB	2015CJC_33	4048-4042	1313	1227	-86	-6.6	2.4	✓	✓	✓		Scrl_1N	
Nr entrance to Mythop Hall	EB	LCC_26	4086-4077	196	204	8	4.2	0.6	✓	✓	✓		Scrl_1N	
B5260 Singleton Road	SB	2016ATC_50	4150-4104	233	235	2	1.0	0.1	✓	✓	✓		Scrl_1N	
C302 Back Lane N of Bradshaw Ln.	SB	LCC_27	4128-4108	17	9	-8	-46.0	2.2	✓	✓	✓		Scrl_1N	
A585 Fleetwood Road, A road, North of M55 J3	SB	2015TRI_04	4118-4110	890	954	64	7.2	2.1	✓	✓	✓	RSI	Scrl_1N	
A5230 Progress Way	EB	2016ATC_57	4008-4019	604	562	-42	-6.9	1.7	✓	✓	✓			
A587 St Walburga's Road	SB	2015BUA_16	4208-4176	765	745	-21	-2.7	0.7	✓	✓	✓			
Moor Park Ave	EB	2016ATC_39	4262-4278	226	237	11	5.1	0.8	✓	✓	✓			
Warren Drive / White Carr Lane	NB	2015CJC_22	4331-4332	207	237	31	14.8	2.1	✓	✓	✓			
B5258 Warren Dr	EB	2016ATC_26	4348-4347	385	355	-30	-7.7	1.5	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55/ RSI	CAL/Val Links	A585 Links
B5258 Warren Dr	WB	2016ATC_26	4347-4348	393	402	9	2.4	0.5	✓	✓	✓			
B5258 Warren Dr. Arm	WB	2016ATC_51	4348-4349	381	387	6	1.6	0.3	✓	✓	✓			
A587 Fleetwood Road / Queen’s Promenade / Kelso Avenue	SB	2015CJC_20	4363-4350	467	447	-20	-4.3	0.9	✓	✓	✓			
North Dr	NB	2016ATC_22	4352-4362	567	586	18	3.2	0.8	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	NB	2015CJC_30	4341-4367	437	437	0	0.0	0.0	✓	✓	✓			
Victoria Road West	EB	LCC_01	4385-4378	799	755	-44	-5.5	1.6	✓	✓	✓			
A585 / Rossall Lane	0	2015CJC_24	4435-4436	223	250	27	11.9	1.7	✓	✓	✓			
C293 Freckleton Rd. S. of Kirkham Bypass	SB	LCC_07	1119-1081	290	526	236	81.6	11.7	×	×	×			
A586 Poulton Road, A Road	EB	2016ATC_38	4212-4219	790	753	-37	-4.6	1.3	✓	✓	✓			
B5261 Common Edge Road	NB	2016ATC_02	4005-1033	713	663	-50	-7.0	1.9	✓	✓	✓			
B5260 Church Road	SB	2016ATC_12	4074-4524	72	137	65	90.8	6.4	✓	×	✓			
A5230 Progress Way	WB	2016ATC_57	4019-4008	687	684	-3	-0.4	0.1	✓	✓	✓			
Moor Park Ave	WB	2016ATC_39	4278-4262	339	313	-27	-7.9	1.5	✓	✓	✓			
Moor Park Ave.	WB	2016ATC_28	4283-4278	469	473	4	0.8	0.2	✓	✓	✓			
Moor Park Ave.	EB	2016ATC_28	4278-4283	523	534	11	2.1	0.5	✓	✓	✓			
Red Bank Rd. arm	WB	2016ATC_52	4297-4295	430	412	-19	-4.3	0.9	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55/ RSI	CAL/Val Links	A585 Links
North Dr	SB	2016ATC_22	4362-4352	425	442	17	3.9	0.8	✓	✓	✓			
B5261 Common Edge Road	SB	2016ATC_02	1033-4005	650	627	-24	-3.6	0.9	✓	✓	✓			
B5260 Church Road	NB	2016ATC_12	4524-4074	165	171	6	3.7	0.5	✓	✓	✓			
Red Bank Rd. arm	EB	2016ATC_52	4295-4297	436	439	3	0.8	0.2	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	SB	2015CJC_30	4367-4341	378	380	2	0.5	0.1	✓	✓	✓			
A585 / Rossall Lane	NB	2015CJC_24	4482-4435	778	725	-54	-6.9	2.0	✓	✓	✓			
A585 / Rossall Lane	SB	2015CJC_24	4435-4482	858	826	-32	-3.7	1.1	✓	✓	✓			
B5260 Church Road and Weeton Road	NB	2016ATC_04	1068-4524	73	112	39	53.9	4.1	✓	✓	✓			
Back Ln.	EB	2016ATC_45	4128-4163	7	9	2	32.1	0.8	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	NB	2015CJC_07	4495-4337	529	500	-30	-5.6	1.3	✓	✓	✓			
White Carr Lane	NB	LCC_13	4332-4358	185	223	38	20.6	2.7	✓	✓	✓			
B5260 Church Road and Weeton Road	SB	2016ATC_04	4524-1068	161	122	-39	-24.2	3.3	✓	✓	✓			
A585 / Rossall Lane	0	2015CJC_24	4436-4435	178	186	8	4.5	0.6	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	NB	2015CJC_29	4418-4425	404	389	-15	-3.6	0.7	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	SB	2015CJC_29	4425-4418	425	425	1	0.2	0.0	✓	✓	✓			
A587 St Walburga's Road	NB	2015BUA_16	4176-4208	765	747	-18	-2.4	0.7	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/Val Links	A585 Links
									Flow	**GEH**				
A586 Poulton Road, A Road	WB	2016ATC_38	4219-4212	668	660	-9	-1.3	0.3	✓	✓	✓	RSI		
White Carr Lane	SB	LCC_13	4358-4332	153	194	41	26.4	3.1	✓	✓	✓			
B5258 Warren Dr. Arm	EB	2016ATC_51	4349-4348	469	508	39	8.4	1.8	✓	✓	✓			
C293 Freckleton Rd. S. of Kirkham Bypass	NB	LCC_07	1081-1119	328	363	35	10.5	1.9	✓	✓	✓			
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	EB	2015CJC_04	4505-4270	864	838	-26	-3.0	0.9	✓	✓	✓			4505-4270
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	WB	2015CJC_04	4270-4505	1000	984	-15	-1.5	0.5	✓	✓	✓			4270-4505
M55 Junction 4 with A583 Preston New Road	NB	2015CJC_01	4082-4088	735	721	-15	-2	0.54	✓	✓	✓			
M55 Junction 4 with A583 Preston New Road	SB	2015CJC_01	4088-4082	636	595	-41	-6	1.65	✓	✓	✓			
A587 Fleetwood Road / Queen's Promenade / Kelso Avenue	NB	2015CJC_20	4350-4363	503	477	-25	-5	1.15	✓	✓	✓			
Total (Minor Road Sites)			**150**	**78811**	**77100**	**-1710**	**-2.2%**	**6.1**	**134**	**133**				

Table 0-6: Calibration Turns - B003 PM Peak

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/RSI	CAL/Val Links	A585 Links
									Flow	GEH				
A587 Fleetwood Road / Russell Ave / Warren Drive	CB	2015CJC_19	4326-4349-4348	296	380	84	28.5	4.6	✓	✓	✓			
A587 Fleetwood Road / Russell Ave / Warren Drive	BC	2015CJC_19	4348-4349-4326	229	347	118	51.4	6.9	✗	✗	✗			
A587 Fleetwood Road / Russell Ave / Warren Drive	BA	2015CJC_19	4348-4349-4355	35	40	5	15.0	0.8	✓	✓	✓			
A587 Fleetwood Road / Russell Ave / Warren Drive	DB	2015CJC_19	4351-4349-4348	133	128	-5	-3.6	0.4	✓	✓	✓			
A585 Amounderness Way / Bourne Way priority junction	BC	2015CJC_11	4424-4421-4413	131	117	-14	-10.8	1.3	✓	✓	✓			
A585 Amounderness Way / Bourne Way priority junction	BA	2015CJC_11	4424-4421-4482	18	14	-5	-25.1	1.1	✓	✓	✓			
A585 Amounderness Way / Bourne Way priority junction	AB	2015CJC_11	4482-4421-4424	31	34	4	12.3	0.7	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	BA	2015CJC_29	4407-4418-4425	327	312	-15	-4.5	0.8	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	CA	2015CJC_29	4414-4418-4425	77	77	0	0.2	0.0	✓	✓	✓			
B5268 Fleetwood Rd N / Bourne Way / Bourne Rd	CD	2015CJC_28	4418-4425-4424	37	32	-5	-14.4	0.9	✓	✓	✓			

Location	**Direction**	**Description**	**Saturn Link**	**Observed (vehs)**	**Modelled (vehs)**	**Diff**	**% Diff**	**GEH**	**Pass Criteria**		**Web TAG**	M55/RSI	CAL/Val Links	A585 Links
									Flow	**GEH**				
B5268 Fleetwood Rd N / Bourne Way / Bourne Rd	DA	2015CJC_28	4424-4425-4454	32	24	-8	-26.1	1.6	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	AB	2015CJC_29	4425-4418-4407	378	403	25	6.6	1.3	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	AC	2015CJC_29	4425-4418-4414	47	22	-25	-52.7	4.2	✓	✓	✓			
B5268 Fleetwood Rd N / Bourne Way / Bourne Rd	AD	2015CJC_28	4454-4425-4424	41	25	-16	-39.3	2.8	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	CD	2015CJC_13	4243-4253-4249	58	37	-21	-36.4	3.1	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	CA	2015CJC_13	4243-4253-4263	445	550	106	23.8	4.7	×	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	DC	2015CJC_13	4249-4253-4243	64	30	-34	-53.3	5.0	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	BC	2015CJC_13	4254-4253-4243	186	218	32	17.2	2.3	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	AC	2015CJC_13	4263-4253-4243	181	182	2	1.0	0.1	✓	✓	✓			
M55 Junction 4 with A583 Preston New Road	DA	2015CJC_01	4099-4102-4110	135	123	-13	-9.3	1.1	✓	✓	✓			
M55 Junction 4 with A583 Preston New Road	AB	2015CJC_01	4110-4101-4095	643	648	5	0.8	0.2	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		WebTAG			
									Flow	GEH		M55/RSI	CAL/Val Links	A585 Links
M55 Junction 4 with A583 Preston New Road	BC	2015CJC_01	4092-4090-4088	338	320	-18	-5.2	1.0	✓	✓	✓			
M55 Junction 3 roundabout with A585	BC	2015CJC_33	4033-4029-1049	294	72	-222	-75.5	16.4	✗	✗	✗			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	CD	2015CJC_33	1049-4028-4031	154	142	-12	-7.5	1.0	✓	✓	✓			
M55 Junction 4 with A583 Preston New Road	CD	2015CJC_01	4088-4091-4098	67	60	-7	-10.8	0.9	✓	✓	✓			
A585 Amounderness Way / Bourne Way priority junction	CA	2015CJC_11	4413-4421-4482	713	711	-2	-0.3	0.1	✓	✓	✓			
A585 Amounderness Way / Bourne Way priority junction	AC	2015CJC_11	4482-4421-4413	794	791	-3	-0.4	0.1	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	DA	2015CJC_13	4249-4253-4263	159	191	32	20.0	2.4	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	DB	2015CJC_13	4249-4253-4254	338	312	-25	-7.5	1.4	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	AD	2015CJC_13	4263-4253-4249	40	40	0	-0.7	0.0	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	BD	2015CJC_13	4254-4253-4249	408	375	-33	-8.1	1.7	✓	✓	✓			
B5268 Fleetwood Rd N / Bourne Way / Bourne Rd	AC	2015CJC_28	4454-4425-4418	357	333	-24	-6.7	1.3	✓	✓	✓			

Location	**Direction**	**Description**	**Saturn Link**	**Observed (vehs)**	**Modelled (vehs)**	**Diff**	**% Diff**	**GEH**	**Pass Criteria**		**Web TAG**			
									Flow	**GEH**		M55/RSI	CAL/Val Links	A585 Links
B5268 Fleetwood Rd N / Bourne Way / Bourne Rd	CA	2015CJC_28	4418-4425-4454	290	236	-54	-18.8	3.4	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	BC	2015CJC_29	4407-4418-4414	107	107	-1	-0.7	0.1	✓	✓	✓			
B5268 Fleetwood Rd N / West Drive	CB	2015CJC_29	4414-4418-4407	82	72	-10	-12.0	1.1	✓	✓	✓			
A583 Preston New Rd south of M55 J4	DA	2015CJC_33	4034-4040-4048	75	76	1	1.9	0.2	✓	✓	✓			
M55 Junction 3 roundabout with A585	AB	2015CJC_33	4042-4039-4035	644	684	40	6.3	1.6	✓	✓	✓			
Warren Drive / White Carr Lane	BA	2015CJC_22	4330-4331-4332	186	218	32	17.4	2.3	✓	✓	✓			
A587 Fleetwood Road / Queen’s Promenade / Kelso Avenue	AC	2015CJC_20	4534-4363-4350	449	447	-2	-0.4	0.1	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	AC	2015CJC_30	4382-4367-4341	264	212	-52	-19.7	3.4	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	BC	2015CJC_30	4366-4367-4341	72	65	-7	-9.8	0.9	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	BD	2015CJC_30	4366-4367-4376	174	158	-17	-9.7	1.3	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	CA	2015CJC_30	4341-4367-4382	321	210	-111	-34.5	6.8	×	×	×			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/RSI	CAL/Val Links	A585 Links
									Flow	GEH				
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	CE	2015CJC_09	4360-4378-4385	188	173	-16	-8.4	1.2	✓	✓	✓			
A586 Garstang Road W / Hardhorn Lane / A585 Garstang Road E	CB	2015CJC_13	4243-4253-4254	118	12	-106	-90.0	13.2	×	×	×			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	EC	2015CJC_09	4385-4378-4360	237	420	183	77.4	10.1	×	×	×			
Warren Drive / White Carr Lane	BC	2015CJC_22	4330-4331-4338	274	279	5	1.9	0.3	✓	✓	✓			
A587 Fleetwood Road / Queen’s Promenade / Kelso Avenue	AB	2015CJC_20	4534-4363-4355	256	232	-25	-9.7	1.6	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	AB	2015CJC_30	4382-4367-4366	84	0	-84	-100.0	12.9	✓	×	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	AD	2015CJC_30	4382-4367-4376	86	20	-66	-76.3	9.0	✓	×	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	BA	2015CJC_30	4366-4367-4382	102	0	-102	-100.0	14.3	×	×	×			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	CD	2015CJC_30	4341-4367-4376	34	142	108	316.7	11.5	×	×	×			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	CB	2015CJC_30	4341-4367-4366	82	85	3	3.7	0.3	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	EA	2015CJC_09	4385-4378-4395	59	63	4	6.9	0.5	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/RSI	CAL/Val Links	A585 Links
									Flow	GEH				
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	EB	2015CJC_09	4385-4378-4376	277	255	-22	-8.0	1.4	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	AC	2015CJC_09	4395-4378-4360	643	643	0	0.1	0.0	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	AE	2015CJC_09	4395-4378-4385	57	0	-57	-100.0	10.7	✓	×	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	BE	2015CJC_09	4376-4378-4385	218	199	-20	-9.0	1.4	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	CA	2015CJC_09	4360-4378-4395	671	828	157	23.4	5.7	×	×	×			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	CB	2015CJC_09	4360-4378-4376	155	86	-68	-44.1	6.2	✓	×	✓			
Warren Drive / White Carr Lane	CA	2015CJC_22	4338-4331-4332	21	19	-2	-8.3	0.4	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	DC	2015CJC_30	4376-4367-4341	42	103	61	145.6	7.2	✓	×	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	CD	2015CJC_03	4523-4280-4509	711	821	110	15.5	4.0	×	✓	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	BC	2015CJC_03	4513-4280-4523	125	117	-8	-6.3	0.7	✓	✓	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	DB	2015CJC_03	4509-4280-4513	276	367	91	33.1	5.1	✓	×	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/RSI	CAL/Val Links	A585 Links
									Flow	GEH				
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	DC	2015CJC_03	4509-4280-4523	737	749	12	1.7	0.5	✓	✓	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	CB	2015CJC_03	4523-4280-4513	134	44	-90	-67.1	9.5	✓	×	✓			
A585 Garstang New Road / Windy Harbour Road / A585 Garstang Road / A585 Fleetwood Road	BD	2015CJC_03	4513-4280-4509	273	284	11	4.1	0.7	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	BA	2015CJC_07	4311-4337-4341	198	157	-41	-20.8	3.1	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	BD	2015CJC_07	4311-4337-4526	253	283	30	11.7	1.8	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	BC	2015CJC_07	4311-4337-4495	66	31	-36	-53.8	5.1	✓	×	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	AC	2015CJC_07	4341-4337-4495	205	199	-6	-3.1	0.5	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	AD	2015CJC_07	4341-4337-4526	142	233	91	64.1	6.6	✓	×	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	EC	2015CJC_07	4360-4337-4495	194	186	-9	-4.4	0.6	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	CD	2015CJC_07	4495-4337-4526	35	30	-5	-14.4	0.9	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	CE	2015CJC_07	4495-4337-4360	303	304	1	0.4	0.1	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/RSI	CAL/Val Links	A585 Links
									Flow	GEH				
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	CA	2015CJC_07	4495-4337-4341	144	144	0	0.0	0.0	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	DA	2015CJC_07	4526-4337-4341	241	255	14	5.8	0.9	✓	✓	✓			
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	DC	2015CJC_07	4526-4337-4495	35	36	1	3.0	0.2	✓	✓	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	AB	2015CJC_09	4395-4378-4376	50	0	-50	-100.0	10.0	✓	✗	✓			
A585 Amounderness Way / Victoria Road E / Supermarket Access / Victoria Road W roundabout	BA	2015CJC_09	4376-4378-4395	53	37	-16	-30.2	2.4	✓	✓	✓			
A585 / Rossall Lane	CA	2015CJC_24	4436-4435-4443	178	186	8	4.5	0.6	✓	✓	✓			
A585 / Rossall Lane	AB	2015CJC_24	4443-4435-4482	858	826	-32	-3.7	1.1	✓	✓	✓			
A585 / Rossall Lane	AC	2015CJC_24	4443-4435-4436	124	113	-11	-8.9	1.0	✓	✓	✓			
A585 / Rossall Lane	BC	2015CJC_24	4482-4435-4436	99	137	38	37.9	3.5	✓	✓	✓			
A585 / Rossall Lane	BA	2015CJC_24	4482-4435-4443	679	588	-91	-13.4	3.6	✓	✓	✓			
A587 Fleetwood Road / Queen's Promenade / Kelso Avenue	BA	2015CJC_20	4355-4363-4534	302	268	-34	-11.2	2.0	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/RSI	CAL/Val Links	A585 Links
									Flow	GEH				
A587 Fleetwood Road / Queen's Promenade / Kelso Avenue	CA	2015CJC_20	4350-4363-4534	465	477	13	2.7	0.6	✓	✓	✓			
B5268 Fleetwood Rd S / B5268 Fleetwood Rd N / Victoria Road E	DB	2015CJC_30	4376-4367-4366	248	200	-48	-19.5	3.2	✓	✓	✓			
Warren Drive / White Carr Lane	CB	2015CJC_22	4338-4331-4330	203	422	219	107.8	12.4	×	×	×			
Warren Drive / White Carr Lane	AB	2015CJC_22	4332-4331-4330	153	268	115	75.6	8.0	×	×	×			
Warren Drive / White Carr Lane	AC	2015CJC_22	4332-4331-4338	9	11	2	20.5	0.6	✓	✓	✓			
Total (Calibration Turns)			**92**	**20946**	**20907**	**-39**	**-0.2%**	**0.3**	**80**	**72**				

Appendix C – Assignment Validation

7.1.6 Table 0-1Table 0-1 to Table 0-6 below present respectively the validation links and turns for the B003 version of the A585 Windy Harbour to Skippool model for all peak times.

Table 0-1: Validation Links - B003 AM Peak

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A585 Fleetwood Road, A road	SB	2016ATC_ 05	4082-1085	820	738	-82	-10	2.92	✓	✓	✓			
A585 Fleetwood Road, A road	NB	2016ATC_ 05	1085-4082	708	639	-69	-10	2.68	✓	✓	✓			
Normoss Road	WB	LCC_24	4196-4186	437	545	109	25	4.90	✗	✓	✓			
Normoss Road	EB	LCC_24	4186-4196	295	336	41	14	2.32	✓	✓	✓			
B5269 Mile Rd.	WB	2016ATC_ 46	4223-4215	105	133	28	27	2.56	✓	✓	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	SB	2015CJC_02	4259-4223	961	947	-13	-1	0.43	✓	✓	✓			
B5269 Mile Rd.	EB	2016ATC_ 46	4215-4223	115	142	27	24	2.39	✓	✓	✓			
Grange Rd.	WB	2016ATC_ 47	4259-4225	39	0	-39	-100	8.79	✓	✗	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	NB	2015CJC_02	4223-4259	720	686	-34	-5	1.28	✓	✓	✓			
Grange Rd.	EB	2016ATC_ 47	4225-4259	31	17	-14	-46	2.89	✓	✓	✓			
Luton Rd.	EB	2016ATC_ 40	4368-4362	99	39	-60	-61	7.30	✓	✗	✓			
Luton Rd	WB	2016ATC_ 25	4359-4362	183	82	-101	-55	8.73	✗	✗	✗			
A587 Fleetwood Road	SB	2015ATC_ 03	4368-4534	670	726	56	8	2.12	✓	✓	✓			
Luton Rd	EB	2016ATC_ 25	4362-4359	148	71	-77	-51.9	7.3	✓	✗	✓			
A587 Fleetwood Road	NB	2015ATC_ 03	4534-4368	536	546	10	2	0.44	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
B5412 Victoria Rd. West	EB	2016ATC_ 42	4389-4385	315	389	74	23	3.94	✓	✓	✓			
West Dr	WB	2016ATC_ 24	4411-4401	277	199	-78	-28	5.06	✓	✗	✓			
West Dr	EB	2016ATC_ 24	4401-4411	182	202	19	11	1.40	✓	✓	✓			
E of Peel Rd.	WB	LCC_25	1068-1053	454	410	-45	-10	2.15	✓	✓	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	NB	2015CJC_02	4182-4218	778	820	43	5	1.50	✓	✓	✓		Cordon_2	
B5266 Station Rd.	EB	2016ATC_ 44	4193-4491	236	172	-64	-27	4.45	✓	✓	✓		Cordon_2	
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	WB	2015CJC_02	4210-4218	68	158	90	132	8.44	✓	✗	✓		Cordon_2	
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	SB	2015CJC_02	4218-4182	1026	1149	123	12	3.72	✓	✓	✓		Cordon_2	
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	EB	2015CJC_02	4218-4210	61	100	39	64	4.34	✓	✓	✓		Cordon_2	
B5266 Station Rd.	WB	2016ATC_ 44	4491-4193	158	178	20	13	1.53	✓	✓	✓		Cordon_2	
Bradshaw Ln	NB	2016ATC_ 13	4108-4076	4	6	2	43	0.78	✓	✓	✓			
Bradshaw Ln	SB	2016ATC_ 13	4076-4108	4	1	-3	-75	1.90	✓	✓	✓			
Bradshaw Ln. W of A585 Fleetwood Rd.	EB	LCC_30	4076-4082	23	6	-17	-75	4.56	✓	✓	✓			
Bradshaw Ln. W of A585 Fleetwood Rd.	WB	LCC_30	4082-4076	59	1	-58	-98	10.59	✓	✗	✓			
A583 Blackpool Rd. W of Ribby Rd.	WB	LCC_29	1077-1068	517	383	-134	-26	6.29	✗	✗	✗			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55/ RSI	CAL/ Val Links	A585 Links
A588 Breck Rd- N of Skippool Ave.	SB	LCC_02	4307-4289	766	634	-132	-17	4.98	✗	✓	✓			
A588 Breck Rd- N of Skippool Ave.	NB	LCC_02	4289-4307	469	577	108	23	4.70	✗	✓	✓			
A585 Mains Lane / A588 Shard Road	WB	2015CJC_05	4320-4305	707	770	63	9	2.32	✓	✓	✓		Cordon_2	
A585 Mains Lane / A588 Shard Road	EB	2015CJC_05	4310-4305	1082	1242	160	15	4.69	✓	✓	✓			4310-4305
A585 Mains Lane / A588 Shard Road	WB	2015CJC_05	4305-4310	1164	1264	99	9	2.85	✓	✓	✓			4305-4310
A585 Mains Lane / A588 Shard Road	EB	2015CJC_05	4305-4497	967	1028	61	6	1.94	✓	✓	✓			4305-4497
A585 Mains Lane / A588 Shard Road	WB	2015CJC_05	4497-4305	769	716	-53	-7	1.94	✓	✓	✓			4497-4305
A585 Mains Lane / A588 Shard Road	EB	2015CJC_05	4305-4320	428	438	10	2	0.48	✓	✓	✓		Cordon_2	
A588 - Breck Road	SB	2015CJC_06	4311-4307	860	704	-156	-18	5.57	✗	✗	✗		Cordon_2	
A588 - Breck Road	NB	2015CJC_06	4307-4311	531	630	99	19	4.09	✓	✓	✓		Cordon_2	
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	EB	2015CJC_06	4311-4511	1022	1242	220	22	6.55	✗	✗	✗			4311-4511
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	WB	2015CJC_06	4511-4311	1139	1265	125	11	3.61	✓	✓	✓			4511-4311

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A585 - Amounderness Wy.	EB	2015ATC_ 02	4337-4311	1056	1042	-13	-1	0.41	✓	✓	✓		Cordon_2	4337-4311
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	SB	2015CJC_06	4340-4311	439	483	44	10	2.05	✓	✓	✓		Cordon_2	
A585 - Amounderness Wy.	WB	2015ATC_ 02	4311-4337	960	1041	81	8	2.57	✓	✓	✓		Cordon_2	4311-4337
A586 Garstang Road, A road, East of A585 Fleetwood Road	WB	2016ATC_ 48	4513-4280	343	343	0	0	0.01	✓	✓	✓	RSI	Cordon_2	
B5260 Weeton Rd.	SB	2016ATC_ 43	4150-4215	207	102	-105	-51	8.43	×	×	×		Cordon_2	
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	EB	2015CJC_04	4501-4270	419	381	-38	-9	1.91	✓	✓	✓		Cordon_2	
A586 Garstang Road, A road, East of A585 Fleetwood Road	EB	2016ATC_ 48	4280-4513	447	278	-169	-38	8.87	×	×	×		Cordon_2	
B5260 Weeton Rd.	NB	2016ATC_ 43	4215-4150	444	232	-212	-48	11.50	×	×	×		Cordon_2	
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	WB	2015CJC_04	4270-4501	344	329	-15	-4	0.81	✓	✓	✓		Cordon_2	
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	NB	2015CJC_06	4311-4340	324	432	108	33	5.55	×	×	×		Cordon_2	
Total (Validation Links)			**52**	**24917**	**24995**	**79**	**0.3%**	**0.5**	**41**	**38**				

Table 0-2: Validation Counts - B003 AM Peak

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		WebTAG			
									Flow	GEH		M55/ RSI	CAL/ Val Links	A585 Links
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	WB	2015CJC_02	4210-4218-4223	70	77	6	9	0.72	✓	✓	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	EB	2015CJC_02	4223-4218-4210	46	18	-27	-60	4.81	✓	✓	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	SB	2015CJC_02	4223-4218-4182	1026	1068	42	4	1.29	✓	✓	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	NB	2015CJC_02	4182-4218-4223	768	739	-29	-4	1.06	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	CA	2015CJC_05	4310-4305-4320	332	393	61	18	3.22	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	AB	2015CJC_05	4320-4305-4497	216	179	-37	-17	2.67	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	AC	2015CJC_05	4320-4305-4310	491	592	100	20	4.32	×	✓	✓			
A585 Mains Lane / A588 Shard Road	BA	2015CJC_05	4497-4305-4320	96	44	-52	-54	6.18	✓	×	✓			
A585 Mains Lane / A588 Shard Road	CB	2015CJC_05	4310-4305-4497	750	849	99	13	3.49	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	BC	2015CJC_05	4497-4305-4310	673	672	-1	0	0.04	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55/ RSI	CAL/ Val Links	A585 Links
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	DC	2015CJC_06	4337-4311-4307	345	273	-72	-21	4.12	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	AB	2015CJC_06	4340-4311-4511	167	235	68	40	4.77	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	CD	2015CJC_06	4307-4311-4337	248	212	-35	-14	2.31	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	DB	2015CJC_06	4337-4311-4511	708	770	62	9	2.29	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	AC	2015CJC_06	4340-4311-4307	264	248	-16	-6	1.02	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	BC	2015CJC_06	4511-4311-4307	251	183	-68	-27	4.59	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	BD	2015CJC_06	4511-4311-4337	705	829	123	17	4.46	✗	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	CA	2015CJC_06	4307-4311-4340	137	180	43	31	3.40	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	CB	2015CJC_06	4307-4311-4511	147	238	90	62	6.52	✓	✗	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	BA	2015CJC_06	4511-4311-4340	183	252	69	38	4.69	✓	✓	✓			
Total (Validation Counts)			**20**	**7625**	**8051**	**426**	**5.6%**	**4.8**	**18**	**18**				

Table 0-3: Validation Links - B003 Inter-Peak

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55 /RSI	CAL/ Val Links	A585 Links
A585 Fleetwood Road, A road	SB	2016ATC_05	4082-1085	473	445	-28	-6	1.32	✓	✓	✓			
A585 Fleetwood Road, A road	NB	2016ATC_05	1085-4082	473	473	0	0	0.01	✓	✓	✓			
Normoss Road	WB	LCC_24	4196-4186	247	300	52	21	3.16	✓	✓	✓			
Normoss Road	EB	LCC_24	4186-4196	256	308	52	20	3.08	✓	✓	✓			
B5269 Mile Rd.	WB	2016ATC_46	4223-4215	60	31	-29	-48	4.31	✓	✓	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	SB	2015CJC_02	4259-4223	695	698	3	0	0.11	✓	✓	✓			
B5269 Mile Rd.	EB	2016ATC_46	4215-4223	60	55	-5	-8	0.66	✓	✓	✓			
Grange Rd.	WB	2016ATC_47	4259-4225	13	0	-13	-99	5.05	✓	×	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	NB	2015CJC_02	4223-4259	713	689	-23	-3	0.87	✓	✓	✓			
Grange Rd.	EB	2016ATC_47	4225-4259	14	2	-12	-87	4.36	✓	✓	✓			
Luton Rd.	EB	2016ATC_40	4368-4362	92	78	-15	-16	1.59	✓	✓	✓			
Luton Rd	WB	2016ATC_25	4359-4362	162	86	-76	-47	6.84	✓	×	✓			
A587 Fleetwood Road	SB	2015ATC_03	4368-4534	541	624	83	15	3.43	✓	✓	✓			
Luton Rd	EB	2016ATC_25	4362-4359	119	66	-53	-44.8	5.6	✓	×	✓			
A587 Fleetwood Road	NB	2015ATC_03	4534-4368	607	589	-18	-3	0.72	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55 /RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
B5412 Victoria Rd. West	EB	2016ATC_42	4389-4385	448	377	-71	-16	3.50	✓	✓	✓			
West Dr	WB	2016ATC_24	4411-4401	218	219	1	1	0.10	✓	✓	✓			
West Dr	EB	2016ATC_24	4401-4411	188	180	-8	-4	0.61	✓	✓	✓			
E of Peel Rd.	WB	LCC_25	1068-1053	410	428	18	4	0.87	✓	✓	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	NB	2015CJC_02	4182-4218	748	746	-2	0	0.07	✓	✓	✓		Cordon_2	
B5266 Station Rd.	EB	2016ATC_44	4193-4491	78	71	-7	-9	0.82	✓	✓	✓		Cordon_2	
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	WB	2015CJC_02	4210-4218	58	85	27	46	3.16	✓	✓	✓		Cordon_2	
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	SB	2015CJC_02	4218-4182	716	771	55	8	2.03	✓	✓	✓		Cordon_2	
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	EB	2015CJC_02	4218-4210	52	92	41	79	4.82	✓	✓	✓		Cordon_2	
B5266 Station Rd.	WB	2016ATC_44	4491-4193	70	51	-19	-27	2.43	✓	✓	✓		Cordon_2	
Bradshaw Ln	NB	2016ATC_13	4108-4076	4	2	-2	-61	1.47	✓	✓	✓			
Bradshaw Ln	SB	2016ATC_13	4076-4108	4	1	-3	-78	2.01	✓	✓	✓			
Bradshaw Ln. W of A585 Fleetwood Rd.	EB	LCC_30	4076-4082	28	2	-26	-94	6.88	✓	✗	✓			
Bradshaw Ln. W of A585 Fleetwood Rd.	WB	LCC_30	4082-4076	28	1	-27	-97	7.14	✓	✗	✓			
A583 Blackpool Rd. W of Ribby Rd.	WB	LCC_29	1077-1068	363	351	-12	-3	0.61	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55 /RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A588 Breck Rd- N of Skippool Ave.	SB	LCC_02	4307-4289	462	383	-79	-17	3.83	✓	✓	✓			
A588 Breck Rd- N of Skippool Ave.	NB	LCC_02	4289-4307	477	371	-106	-22	5.14	×	×	×			
A585 Mains Lane / A588 Shard Road	WB	2015CJC_05	4320-4305	514	494	-20	-4	0.89	✓	✓	✓		Cordon_2	
A585 Mains Lane / A588 Shard Road	EB	2015CJC_05	4310-4305	972	1033	61	6	1.92	✓	✓	✓			4310-4305
A585 Mains Lane / A588 Shard Road	WB	2015CJC_05	4305-4310	988	1033	45	5	1.43	✓	✓	✓			4305-4310
A585 Mains Lane / A588 Shard Road	EB	2015CJC_05	4305-4497	759	759	0	0	0.01	✓	✓	✓			4305-4497
A585 Mains Lane / A588 Shard Road	WB	2015CJC_05	4497-4305	739	744	6	1	0.21	✓	✓	✓			4497-4305
A585 Mains Lane / A588 Shard Road	EB	2015CJC_05	4305-4320	478	479	1	0	0.04	✓	✓	✓		Cordon_2	
A588 - Breck Road	SB	2015CJC_06	4311-4307	477	424	-53	-11	2.50	✓	✓	✓		Cordon_2	
A588 - Breck Road	NB	2015CJC_06	4307-4311	500	427	-73	-15	3.40	✓	✓	✓		Cordon_2	
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	EB	2015CJC_06	4311-4511	964	1034	70	7	2.22	✓	✓	✓			4311-4511
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	WB	2015CJC_06	4511-4311	959	1034	74	8	2.35	✓	✓	✓			4511-4311

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55 /RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A585 - Amounderness Wy.	EB	2015ATC_02	4337-4311	882	942	60	7	1.98	✓	✓	✓		Cordon_2	4337-4311
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	SB	2015CJC_06	4340-4311	239	284	45	19	2.77	✓	✓	✓		Cordon_2	
A585 - Amounderness Wy.	WB	2015ATC_02	4311-4337	900	925	25	3	0.83	✓	✓	✓		Cordon_2	4311-4337
A586 Garstang Road, A road, East of A585 Fleetwood Road	WB	2016ATC_48	4513-4280	319	317	-1	0	0.07	✓	✓	✓	RSI	Cordon_2	
B5260 Weeton Rd.	SB	2016ATC_43	4150-4215	149	80	-69	-46	6.43	✓	×	✓		Cordon_2	
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	EB	2015CJC_04	4501-4270	323	290	-32	-10	1.86	✓	✓	✓		Cordon_2	
A586 Garstang Road, A road, East of A585 Fleetwood Road	EB	2016ATC_48	4280-4513	318	318	0	0	0.02	✓	✓	✓		Cordon_2	
B5260 Weeton Rd.	NB	2016ATC_43	4215-4150	147	98	-50	-34	4.49	✓	✓	✓		Cordon_2	
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	WB	2015CJC_04	4270-4501	285	262	-22	-8	1.36	✓	✓	✓		Cordon_2	
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	NB	2015CJC_06	4311-4340	242	304	62	26	3.77	✓	✓	✓		Cordon_2	
Total (Validation Links)			**52**	**20031**	**19857**	**-174**	**-0.9%**	**1.2**	**51**	**45**				

Table 0-4: Validation Counts - B003 Inter-Peak

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55/ RSI	CAL/ Val Links	A585 Links
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	WB	2015CJC_02	4210-4218-4223	58	52	-7	-12	0.91	✓	✓	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	EB	2015CJC_02	4223-4218-4210	33	12	-21	-64	4.45	✓	✓	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	SB	2015CJC_02	4223-4218-4182	716	738	22	3	0.81	✓	✓	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	NB	2015CJC_02	4182-4218-4223	729	665	-64	-9	2.42	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	CA	2015CJC_05	4310-4305-4320	351	379	28	8	1.47	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	AB	2015CJC_05	4320-4305-4497	138	106	-33	-24	2.95	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	AC	2015CJC_05	4320-4305-4310	375	389	13	4	0.68	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	BA	2015CJC_05	4497-4305-4320	126	100	-26	-21	2.48	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	CB	2015CJC_05	4310-4305-4497	621	654	33	5	1.30	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	BC	2015CJC_05	4497-4305-4310	613	645	32	5	1.28	✓	✓	✓			

Location	**Direction**	**Description**	**Saturn Link**	**Observed (vehs)**	**Modelled (vehs)**	**Diff**	**% Diff**	**GEH**	**Pass Criteria**		**Web TAG**	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	**GEH**				
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	DC	2015CJC_06	4337-4311-4307	191	166	-25	-13	1.86	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	AB	2015CJC_06	4340-4311-4511	106	157	51	48	4.45	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	CD	2015CJC_06	4307-4311-4337	204	182	-22	-11	1.55	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	DB	2015CJC_06	4337-4311-4511	682	776	94	14	3.48	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	AC	2015CJC_06	4340-4311-4307	117	126	9	8	0.83	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	BC	2015CJC_06	4511-4311-4307	169	131	-38	-22	3.06	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	BD	2015CJC_06	4511-4311-4337	681	743	62	9	2.34	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	CA	2015CJC_06	4307-4311-4340	120	145	24	20	2.12	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	CB	2015CJC_06	4307-4311-4511	175	100	-75	-43	6.40	✓	×	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	BA	2015CJC_06	4511-4311-4340	110	159	49	45	4.25	✓	✓	✓			
Total (Validation Counts)			**20**	**6315**	**6424**	**109**	**1.7%**	**1.4**	**20**	**19**				

Table 0-5: Validation Links - B003 PM Peak

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55 /RSI	CAL/ Val Links	A585 Links
A585 Fleetwood Road, A road	SB	2016ATC_05	4082-1085	606	598	-8	-1	0.32	✓	✓	✓			
A585 Fleetwood Road, A road	NB	2016ATC_05	1085-4082	691	724	33	5	1.25	✓	✓	✓			
Normoss Road	WB	LCC_24	4196-4186	323	405	81	25	4.26	✓	✓	✓			
Normoss Road	EB	LCC_24	4186-4196	402	570	168	42	7.60	✗	✗	✗			
B5269 Mile Rd.	WB	2016ATC_46	4223-4215	130	120	-10	-8	0.88	✓	✓	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	SB	2015CJC_02	4259-4223	880	866	-14	-2	0.47	✓	✓	✓			
B5269 Mile Rd.	EB	2016ATC_46	4215-4223	90	82	-8	-9	0.90	✓	✓	✓			
Grange Rd.	WB	2016ATC_47	4259-4225	32	0	-32	-99	7.93	✓	✗	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	NB	2015CJC_02	4223-4259	867	824	-43	-5	1.49	✓	✓	✓			
Grange Rd.	EB	2016ATC_47	4225-4259	45	42	-3	-7	0.46	✓	✓	✓			
Luton Rd.	EB	2016ATC_40	4368-4362	125	75	-50	-40	5.03	✓	✗	✓			
Luton Rd	WB	2016ATC_25	4359-4362	198	195	-3	-2	0.23	✓	✓	✓			
A587 Fleetwood Road	SB	2015ATC_03	4368-4534	614	678	64	11	2.54	✓	✓	✓			
Luton Rd	EB	2016ATC_25	4362-4359	166	132	-34	-20.2	2.7	✓	✓	✓			
A587 Fleetwood Road	NB	2015ATC_03	4534-4368	679	661	-18	-3	0.70	✓	✓	✓			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55 /RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
B5412 Victoria Rd. West	EB	2016ATC_42	4389-4385	536	575	39	7	1.64	✓	✓	✓			
West Dr	WB	2016ATC_24	4411-4401	269	319	50	19	2.91	✓	✓	✓			
West Dr	EB	2016ATC_24	4401-4411	263	137	-126	-48	8.91	×	×	×			
E of Peel Rd.	WB	LCC_25	1068-1053	545	527	-19	-3	0.81	✓	✓	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	NB	2015CJC_02	4182-4218	998	1057	59	6	1.86	✓	✓	✓		Cordon_2	
B5266 Station Rd.	EB	2016ATC_44	4193-4491	129	173	44	34	3.55	✓	✓	✓		Cordon_2	
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	WB	2015CJC_02	4210-4218	75	50	-25	-33	3.15	✓	✓	✓		Cordon_2	
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	SB	2015CJC_02	4218-4182	904	957	53	6	1.73	✓	✓	✓		Cordon_2	
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	EB	2015CJC_02	4218-4210	94	155	61	65	5.47	✓	×	✓		Cordon_2	
B5266 Station Rd.	WB	2016ATC_44	4491-4193	275	152	-123	-45	8.42	×	×	×		Cordon_2	
Bradshaw Ln	NB	2016ATC_13	4108-4076	5	2	-3	-50	1.30	✓	✓	✓			
Bradshaw Ln	SB	2016ATC_13	4076-4108	7	4	-3	-48	1.46	✓	✓	✓			
Bradshaw Ln. W of A585 Fleetwood Rd.	EB	LCC_30	4076-4082	46	2	-44	-95	8.84	✓	×	✓			
Bradshaw Ln. W of A585 Fleetwood Rd.	WB	LCC_30	4082-4076	22	4	-18	-83	5.13	✓	×	✓			
A583 Blackpool Rd. W of Ribby Rd.	WB	LCC_29	1077-1068	538	380	-158	-29	7.38	×	×	×			

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG			
									Flow	GEH		M55 /RSI	CAL/ Val Links	A585 Links
A588 Breck Rd- N of Skippool Ave.	SB	LCC_02	4307-4289	513	466	-47	-9	2.12	✓	✓	✓			
A588 Breck Rd- N of Skippool Ave.	NB	LCC_02	4289-4307	719	645	-74	-10	2.83	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	WB	2015CJC_05	4320-4305	540	513	-28	-5	1.21	✓	✓	✓		Cordon_2	
A585 Mains Lane / A588 Shard Road	EB	2015CJC_05	4310-4305	1248	1363	115	9	3.17	✓	✓	✓			4310-4305
A585 Mains Lane / A588 Shard Road	WB	2015CJC_05	4305-4310	1233	1311	78	6	2.18	✓	✓	✓			4305-4310
A585 Mains Lane / A588 Shard Road	EB	2015CJC_05	4305-4497	865	838	-27	-3	0.93	✓	✓	✓			4305-4497
A585 Mains Lane / A588 Shard Road	WB	2015CJC_05	4497-4305	1017	992	-25	-2	0.79	✓	✓	✓			4497-4305
A585 Mains Lane / A588 Shard Road	EB	2015CJC_05	4305-4320	709	718	9	1	0.34	✓	✓	✓		Cordon_2	
A588 - Breck Road	SB	2015CJC_06	4311-4307	536	511	-25	-5	1.09	✓	✓	✓		Cordon_2	
A588 - Breck Road	NB	2015CJC_06	4307-4311	747	749	2	0	0.08	✓	✓	✓		Cordon_2	
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	EB	2015CJC_06	4311-4511	1175	1363	188	16	5.28	✗	✗	✗			4311-4511
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	WB	2015CJC_06	4511-4311	1201	1311	110	9	3.10	✓	✓	✓			4511-4311

Location	**Direction**	**Description**	**Saturn Link**	**Observed (vehs)**	**Modelled (vehs)**	**Diff**	**% Diff**	**GEH**	**Pass Criteria**		**Web TAG**	M55 /RSI	CAL/ Val Links	A585 Links
									Flow	**GEH**				
A585 - Amounderness Wy.	EB	2015ATC_02	4337-4311	955	1064	109	11	3.43	✓	✓	✓		Cordon_2	4337-4311
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	SB	2015CJC_06	4340-4311	366	456	90	25	4.43	✓	✓	✓		Cordon_2	
A585 - Amounderness Wy.	WB	2015ATC_02	4311-4337	1064	1077	14	1	0.41	✓	✓	✓		Cordon_2	4311-4337
A586 Garstang Road, A road, East of A585 Fleetwood Road	WB	2016ATC_48	4513-4280	395	401	6	2	0.30	✓	✓	✓	RSI	Cordon_2	
B5260 Weeton Rd.	SB	2016ATC_43	4150-4215	392	205	-187	-48	10.82	✗	✗	✗		Cordon_2	
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	EB	2015CJC_04	4501-4270	442	426	-16	-4	0.76	✓	✓	✓		Cordon_2	
A586 Garstang Road, A road, East of A585 Fleetwood Road	EB	2016ATC_48	4280-4513	412	411	-1	0	0.06	✓	✓	✓		Cordon_2	
B5260 Weeton Rd.	NB	2016ATC_43	4215-4150	204	165	-39	-19	2.89	✓	✓	✓		Cordon_2	
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road / Lodge Lane / A586 Garstang Road	WB	2015CJC_04	4270-4501	298	291	-6	-2	0.37	✓	✓	✓		Cordon_2	
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	NB	2015CJC_06	4311-4340	493	628	135	27	5.70	✗	✗	✗		Cordon_2	
Total (Validation Links)			**52**	**26079**	**26368**	**289**	**1.1%**	**1.8**	**45**	**40**				

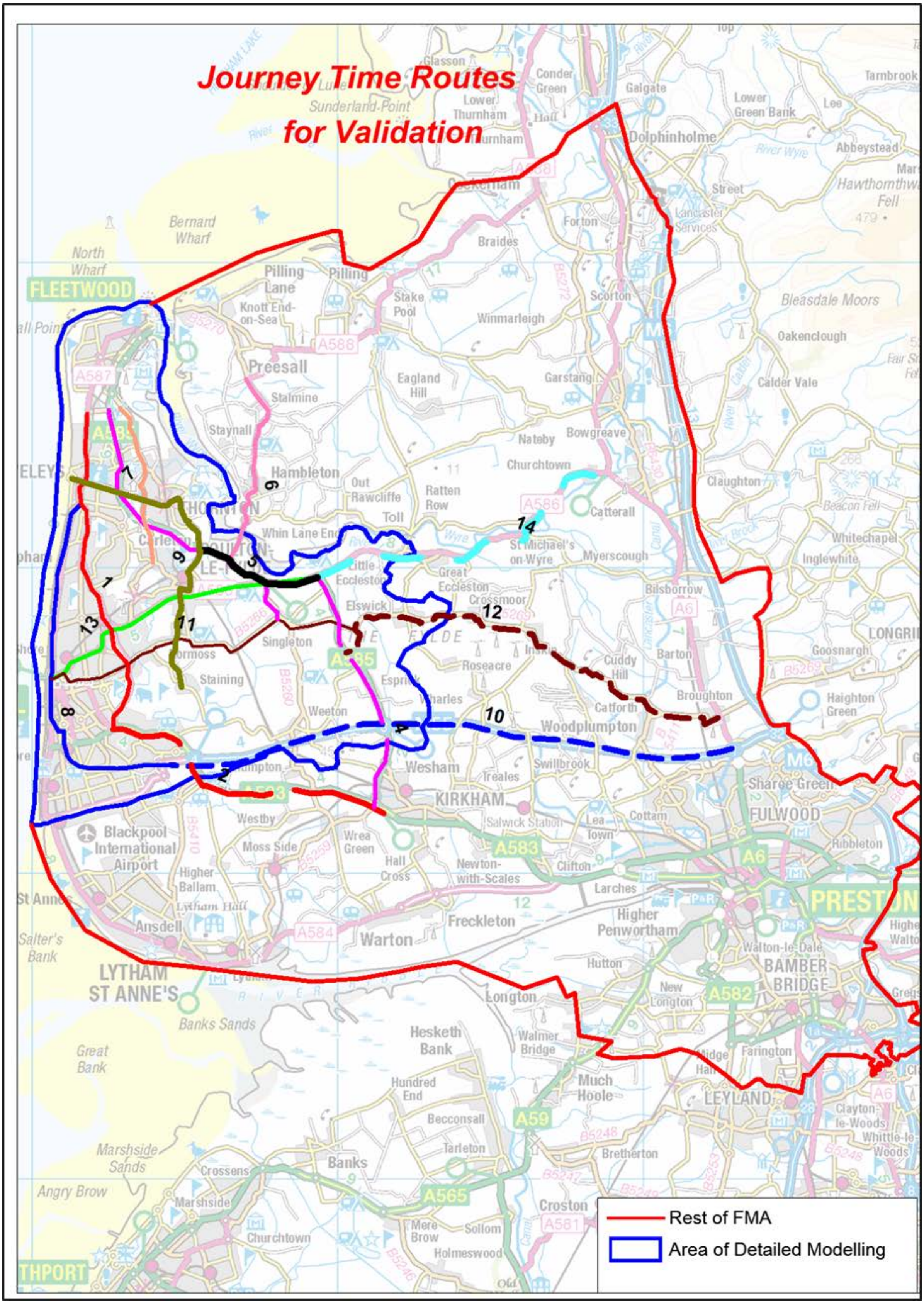
Table 0-6: Validation Counts - B003 PM Peak

Location	Direction	Description	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria		Web TAG	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	GEH				
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	WB	2015CJC_02	4210-4218-4223	75	24	-51	-68	7.24	✓	×	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	EB	2015CJC_02	4223-4218-4210	72	10	-62	-86	9.71	✓	×	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	SB	2015CJC_02	4223-4218-4182	904	931	27	3	0.88	✓	✓	✓			
A585 Fleetwood Road / Mile Road / Thistleton Road staggered 4-arm priority junction	NB	2015CJC_02	4182-4218-4223	976	912	-64	-7	2.07	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	CA	2015CJC_05	4310-4305-4320	510	614	104	20	4.37	×	✓	✓			
A585 Mains Lane / A588 Shard Road	AB	2015CJC_05	4320-4305-4497	127	89	-38	-30	3.67	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	AC	2015CJC_05	4320-4305-4310	414	423	9	2	0.44	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	BA	2015CJC_05	4497-4305-4320	198	104	-94	-47	7.64	✓	×	✓			
A585 Mains Lane / A588 Shard Road	CB	2015CJC_05	4310-4305-4497	738	749	11	2	0.41	✓	✓	✓			
A585 Mains Lane / A588 Shard Road	BC	2015CJC_05	4497-4305-4310	819	888	69	8	2.35	✓	✓	✓			

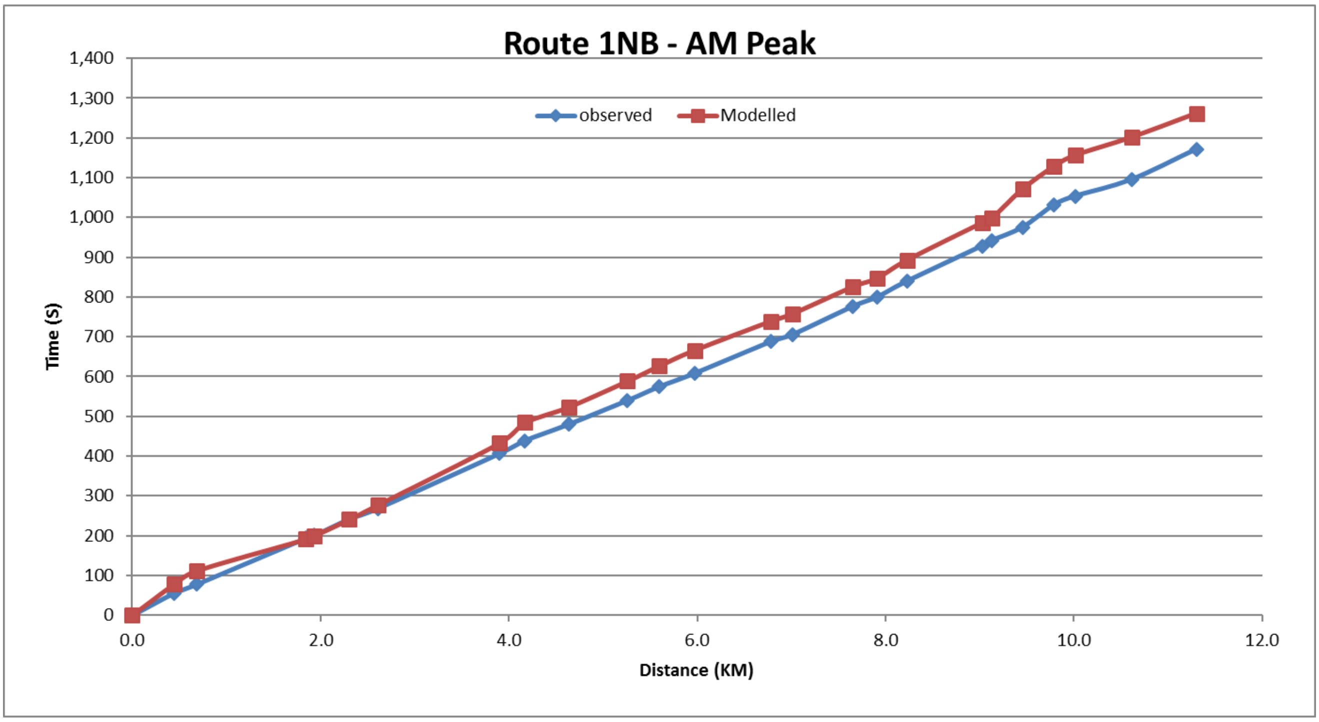
Location	**Direction**	**Description**	**Saturn Link**	**Observed (vehs)**	**Modelled (vehs)**	**Diff**	**% Diff**	**GEH**	**Pass Criteria**		**Web TAG**	M55/ RSI	CAL/ Val Links	A585 Links
									Flow	**GEH**				
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	DC	2015CJC_06	4337-4311-4307	210	157	-53	-25	3.89	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	AB	2015CJC_06	4340-4311-4511	191	227	36	19	2.49	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	CD	2015CJC_06	4307-4311-4337	264	217	-47	-18	3.05	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	DB	2015CJC_06	4337-4311-4511	731	907	176	24	6.14	×	×	×			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	AC	2015CJC_06	4340-4311-4307	161	228	68	42	4.84	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	BC	2015CJC_06	4511-4311-4307	165	126	-40	-24	3.30	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	BD	2015CJC_06	4511-4311-4337	787	861	74	9	2.57	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	CA	2015CJC_06	4307-4311-4340	230	303	73	32	4.49	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	CB	2015CJC_06	4307-4311-4511	253	229	-24	-9	1.53	✓	✓	✓			
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	BA	2015CJC_06	4511-4311-4340	249	325	76	30	4.47	✓	✓	✓			
Total (Validation Counts)			**20**	**8075**	**8324**	**249**	**3.1%**	**2.7**	**18**	**16**				

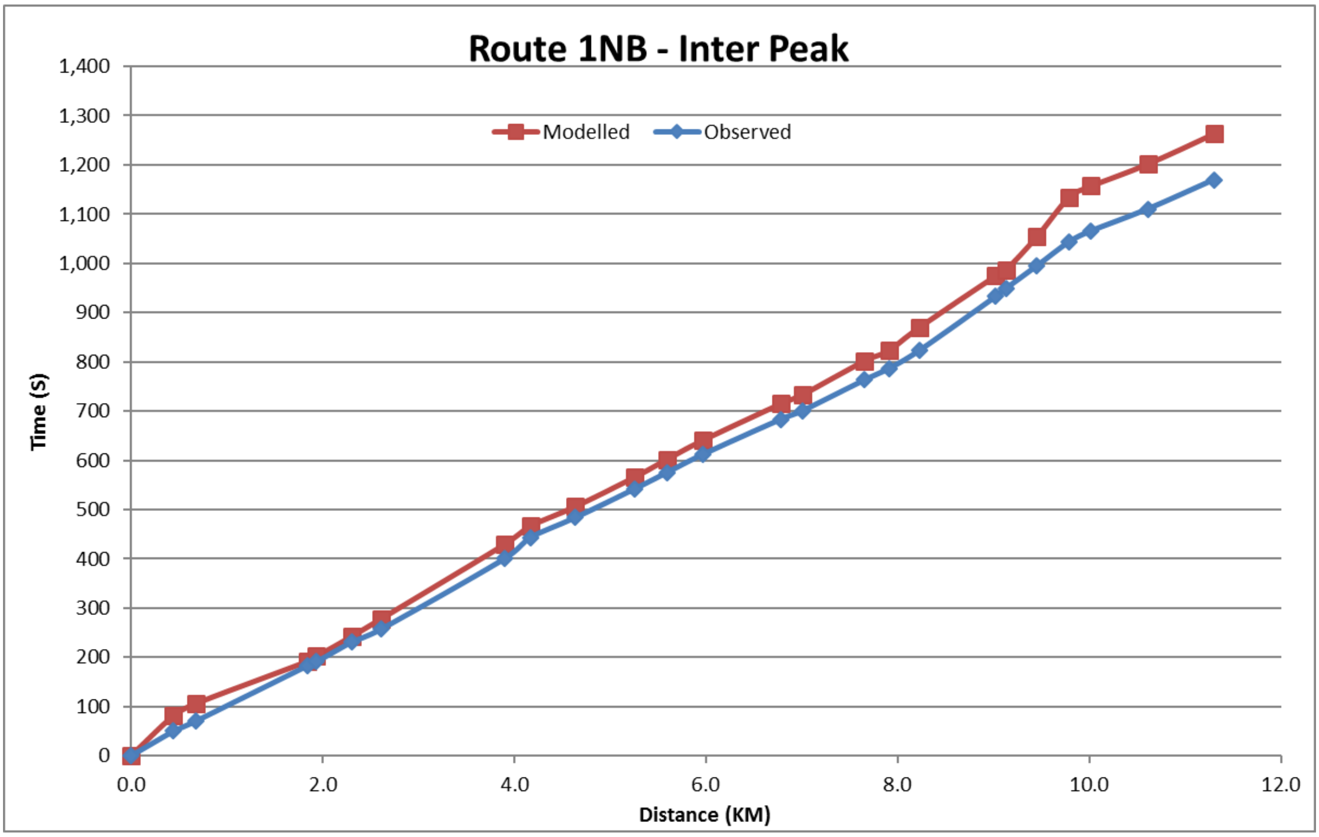
Appendix D – Journey Time plots

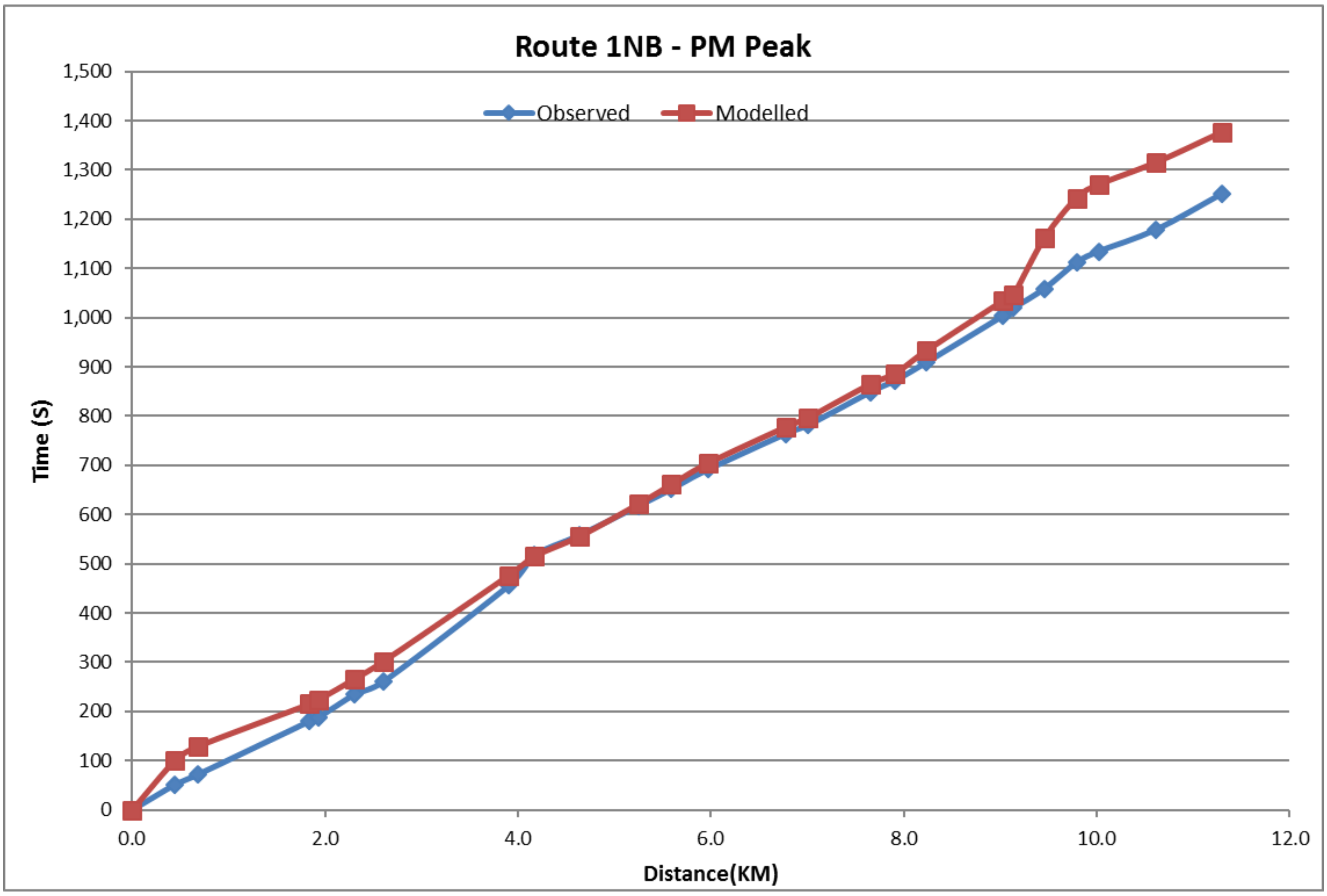
The graphs below show the journey time validations for the routes highlighted in the figure below.

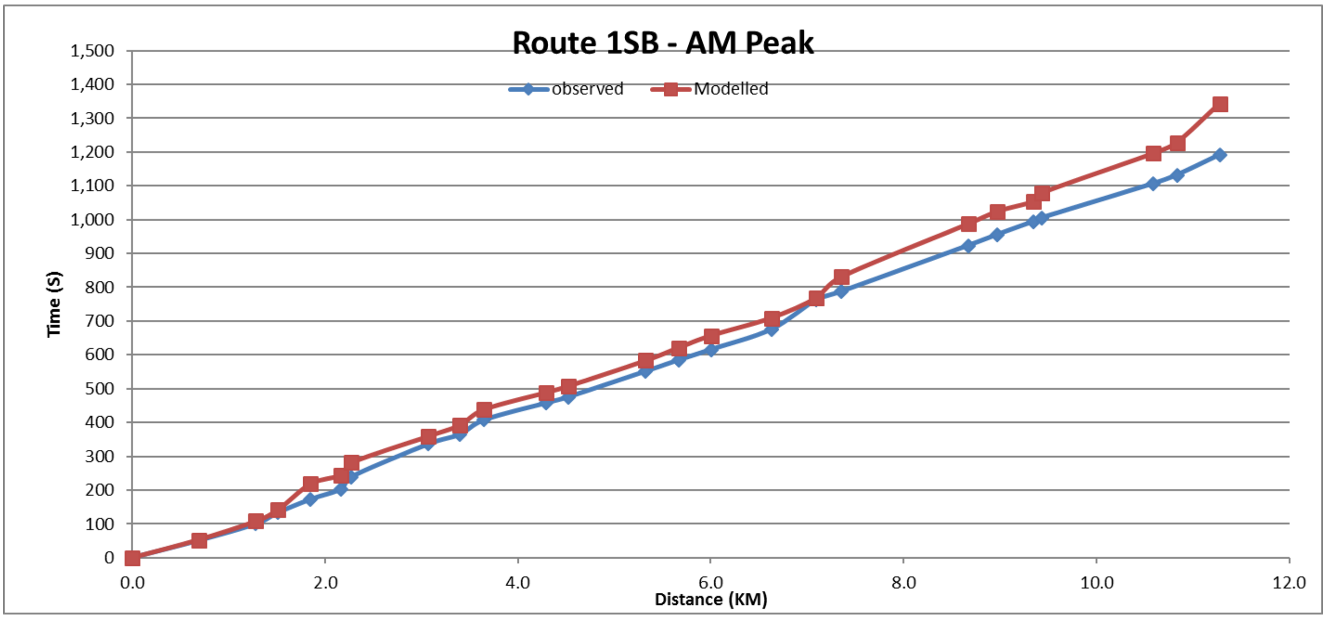


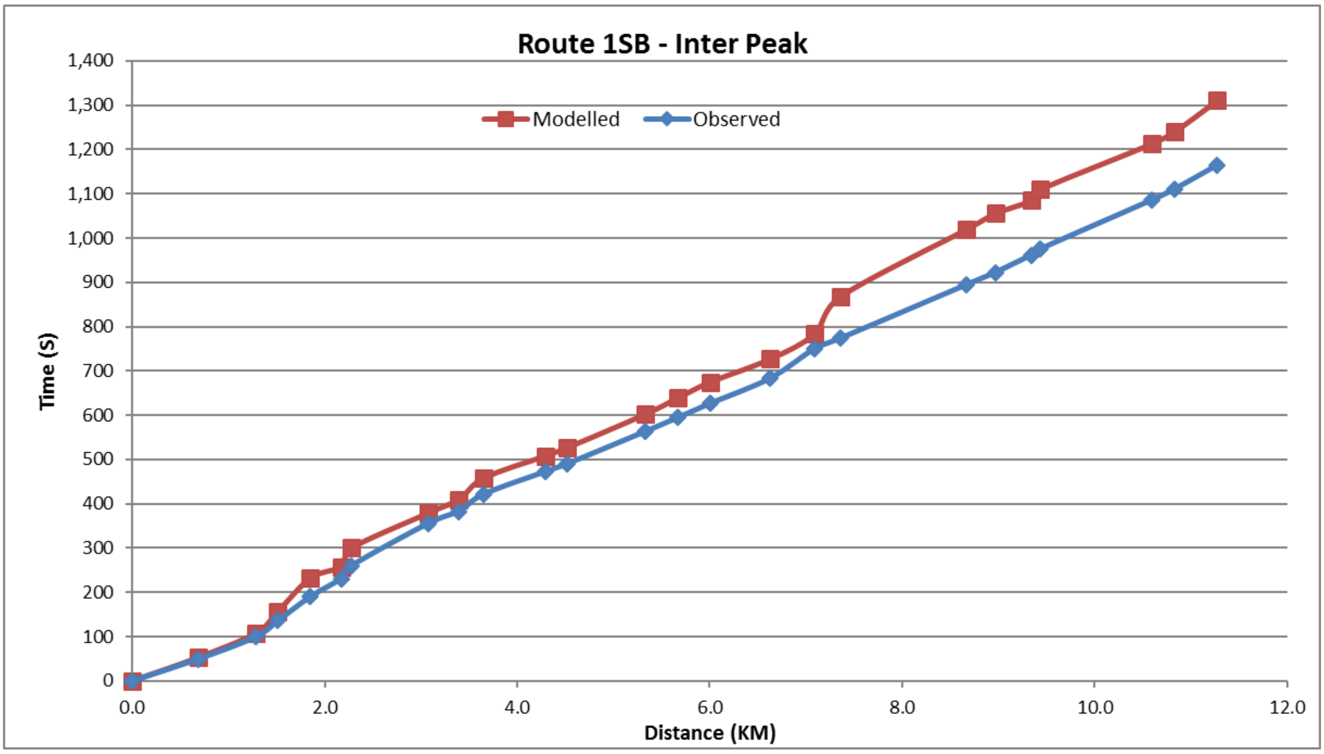
B003 – Journey Time Validation Plots

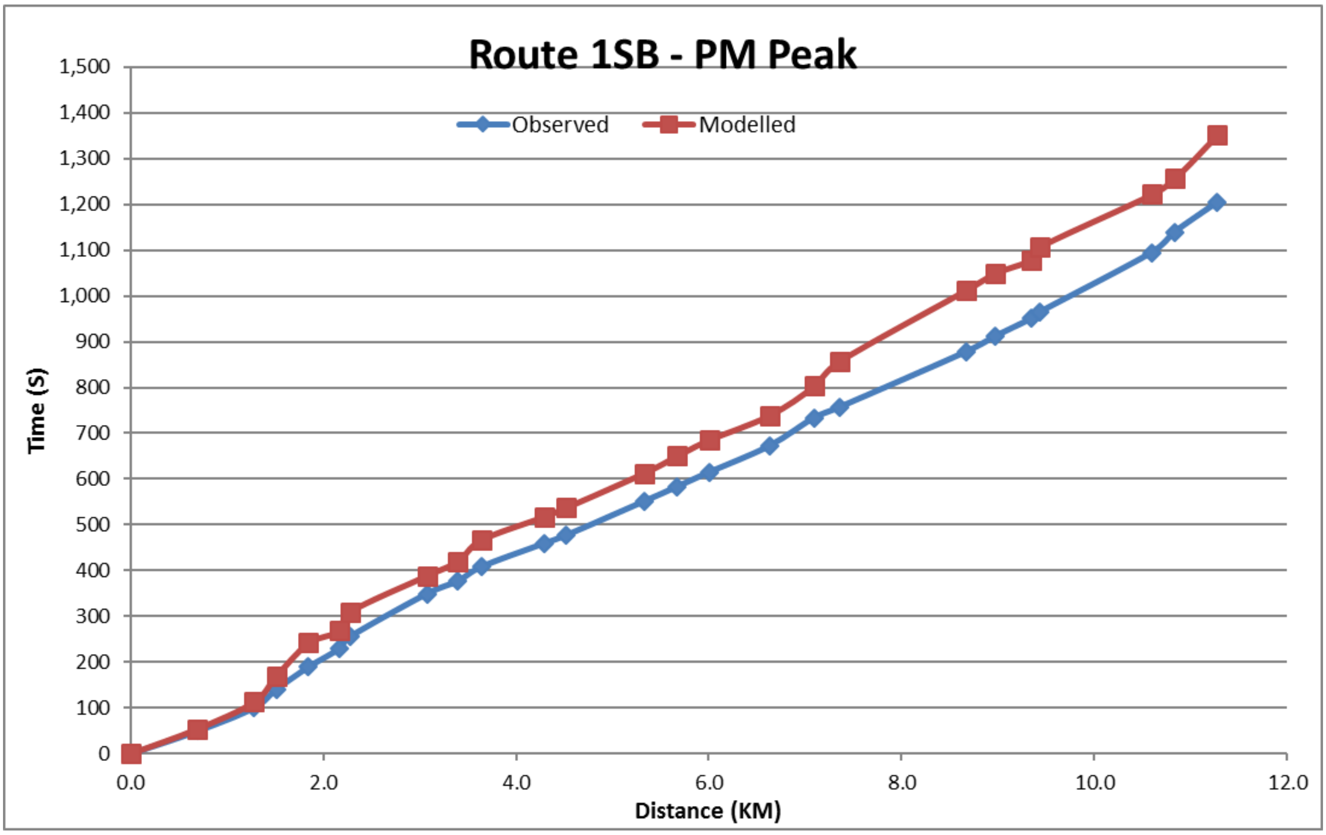


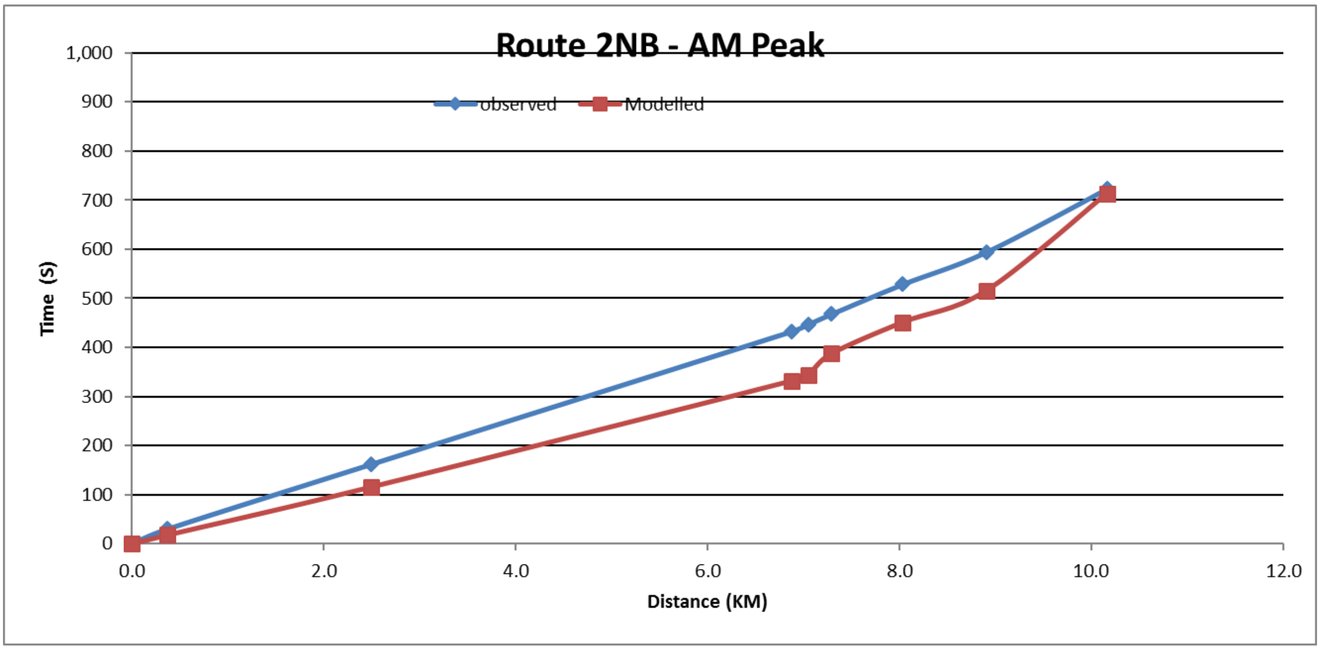


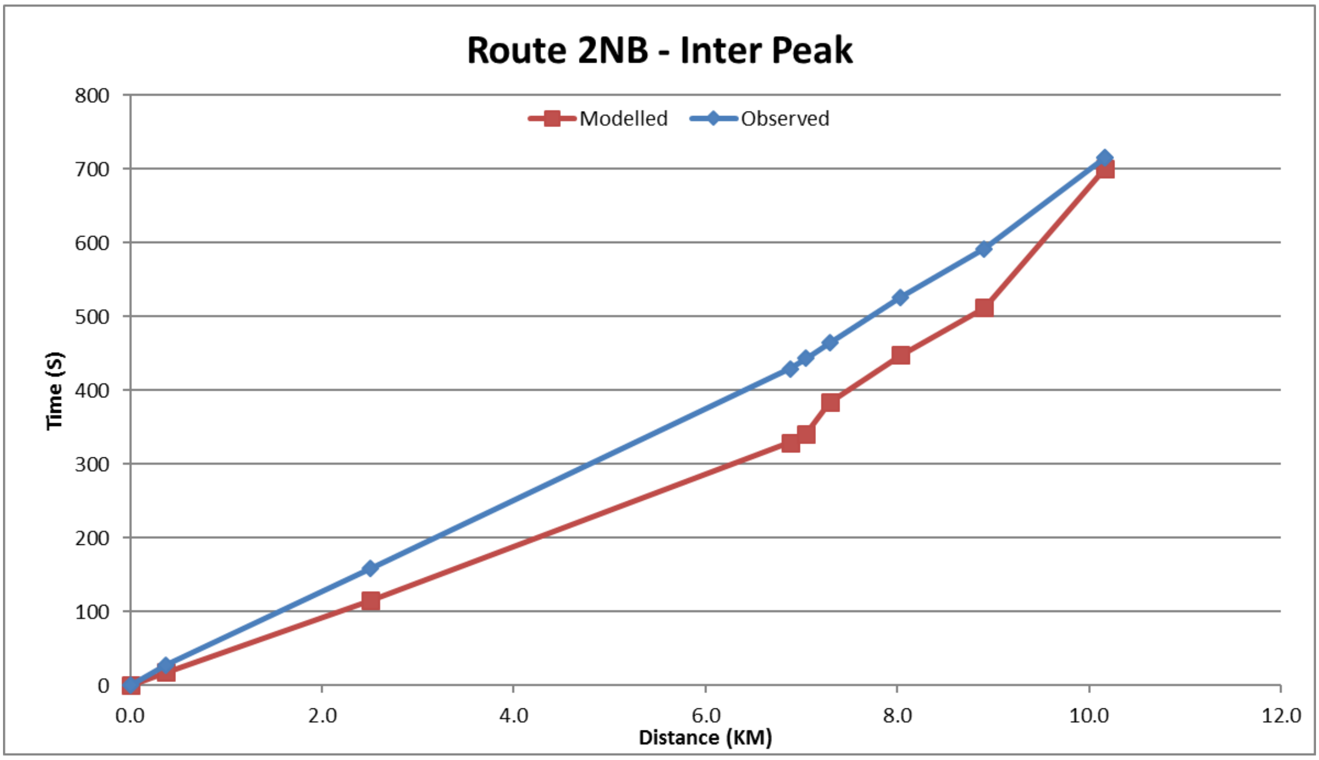

Route 1NB - PM Peak
Observed
Modelled
Time (S)
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance(KM)

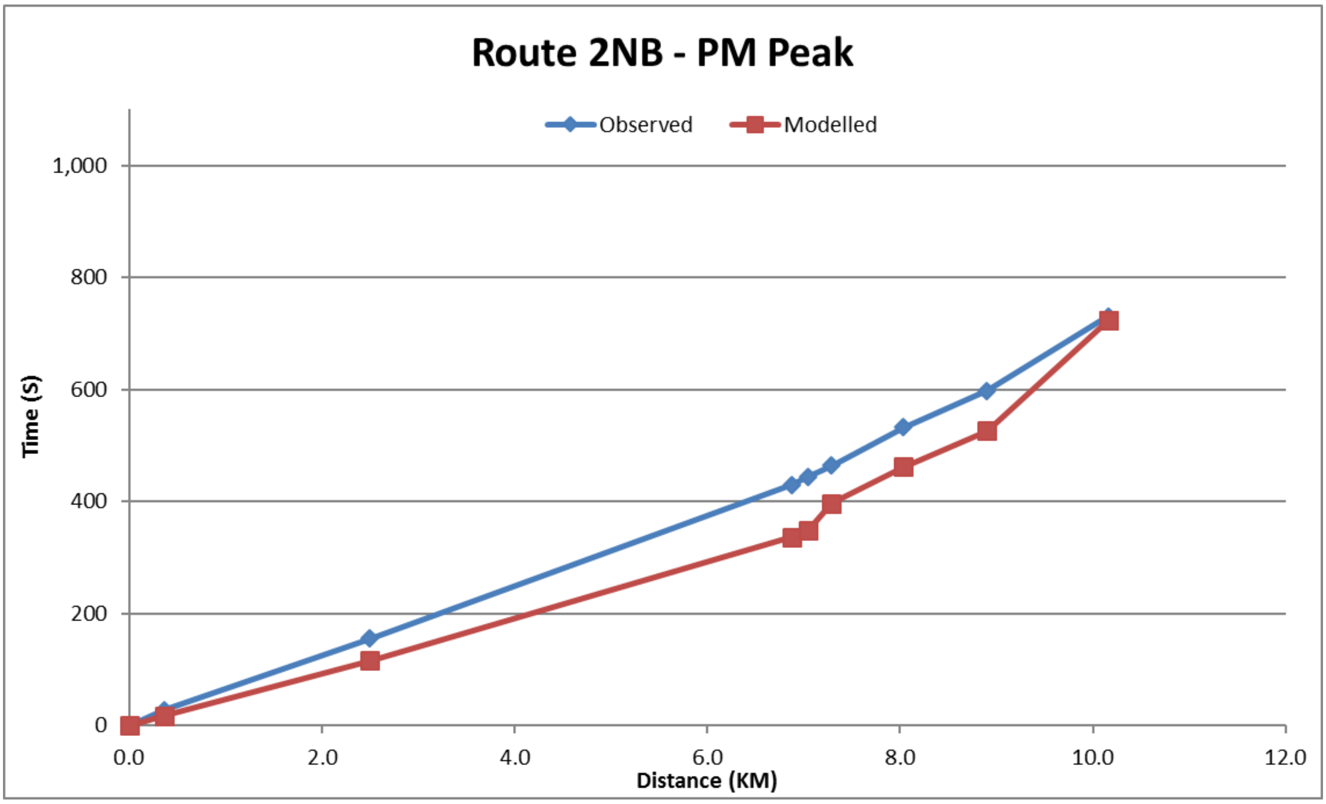

Route 1SB - AM Peak
observed
Modelled
Time (S)
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (KM)

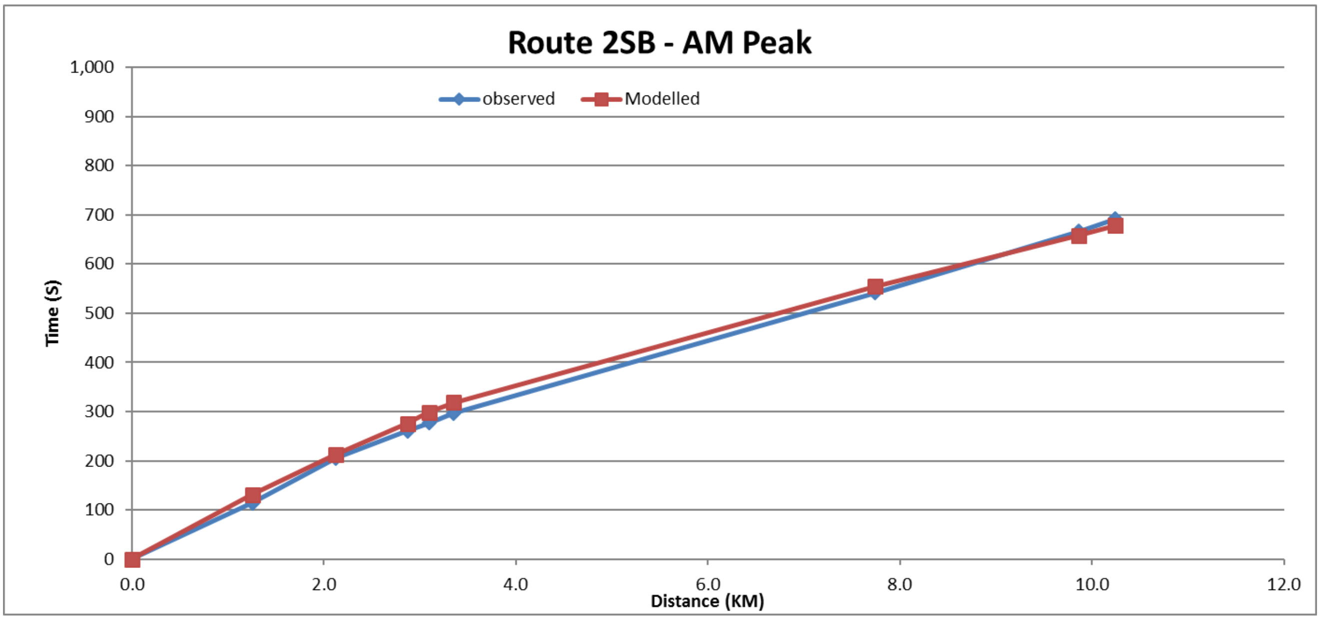

Route 1SB - Inter Peak
Modelled
Observed
Time (S)
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (KM)

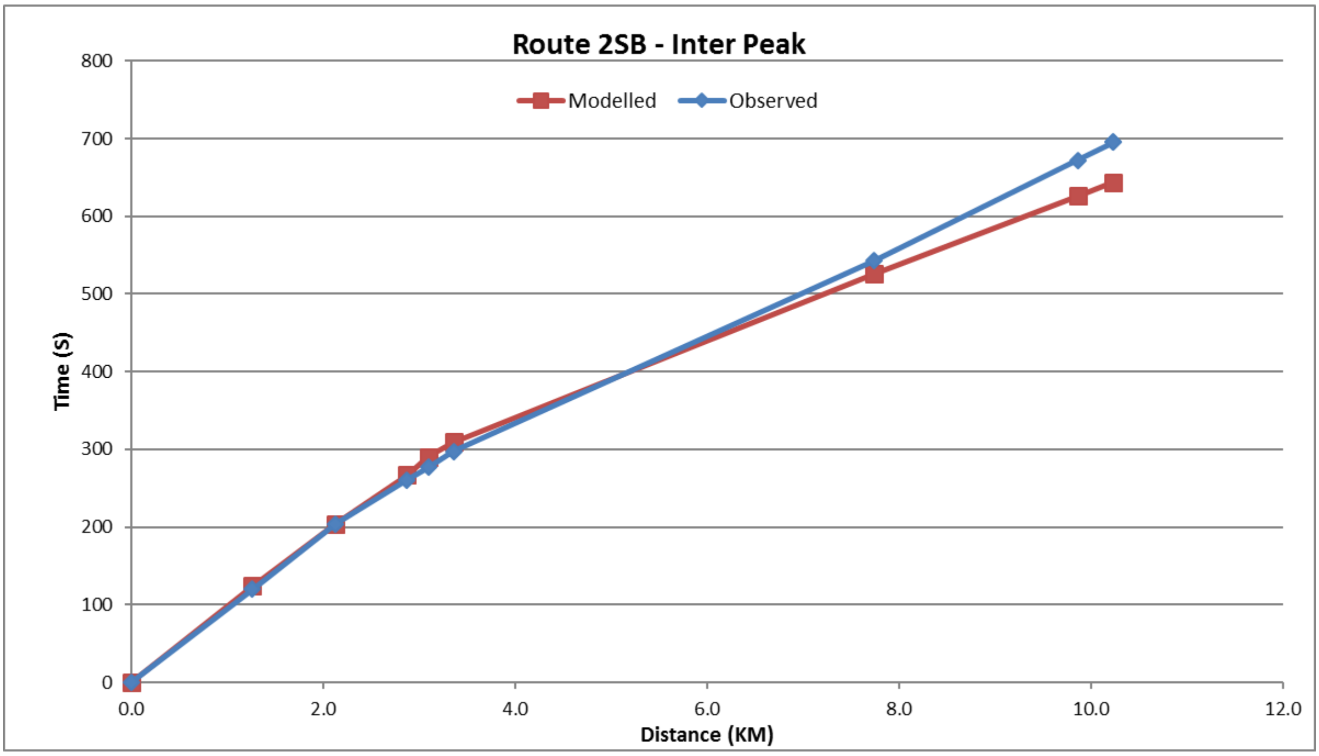

Route 1SB - PM Peak
Observed
Modelled
Time (S)
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (KM)

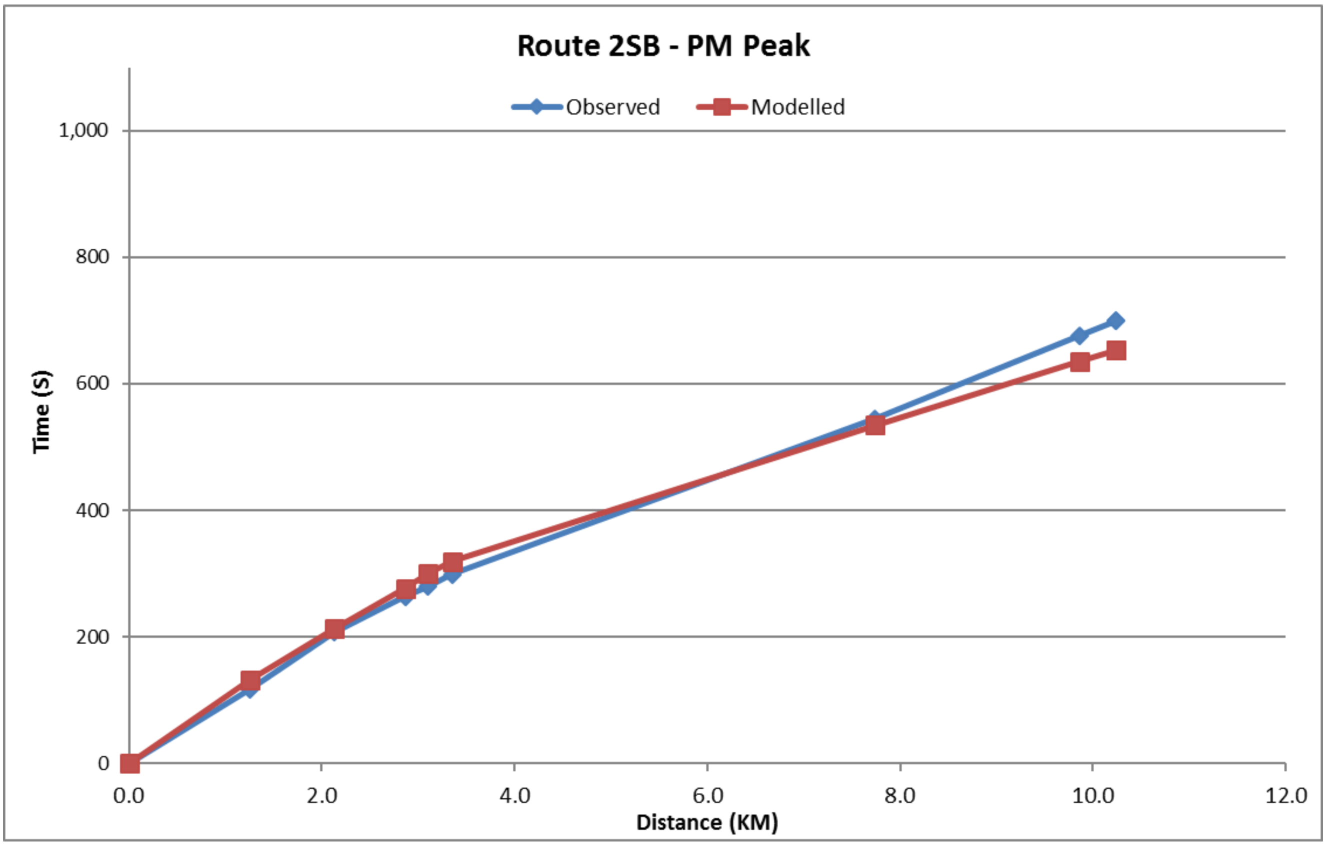

Route 2NB - AM Peak
observed
Modelled
Time (S)
1,000
900
800
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (KM)

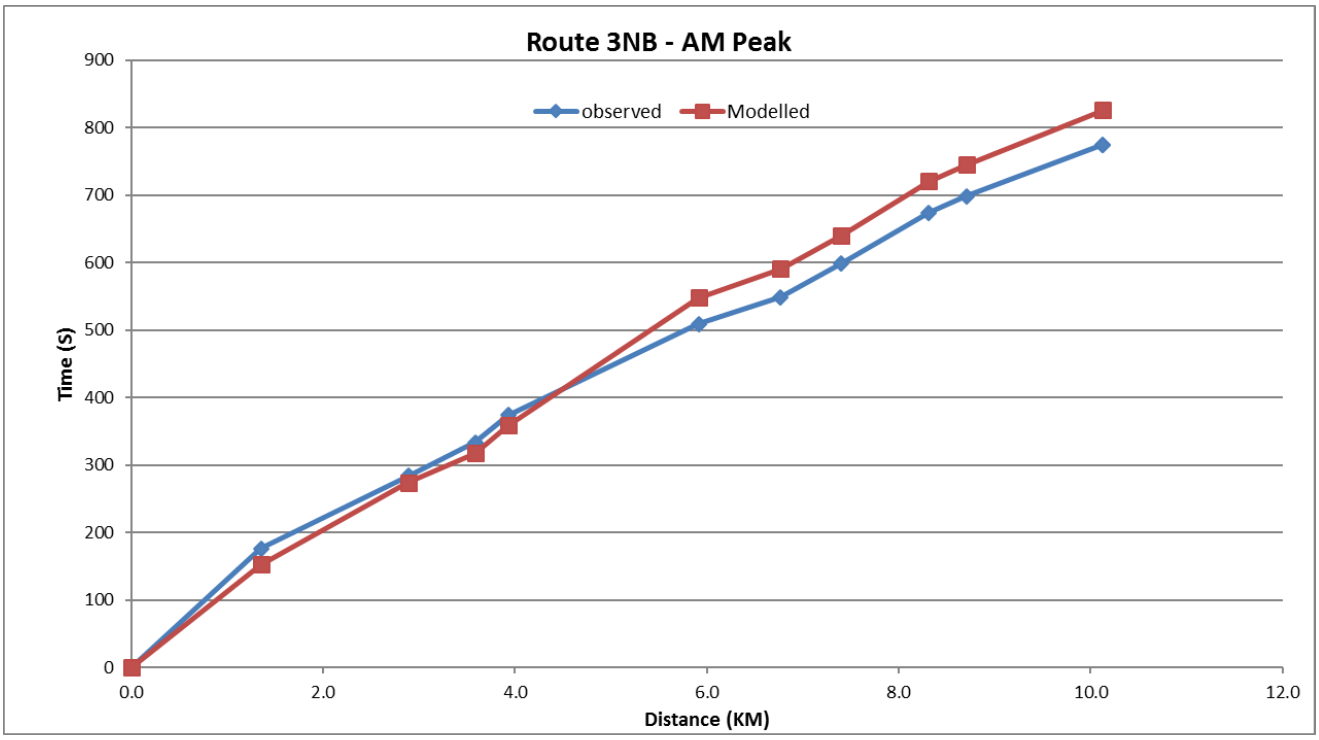

Route 2NB - Inter Peak
Modelled
Observed
Time (S)
800
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (KM)

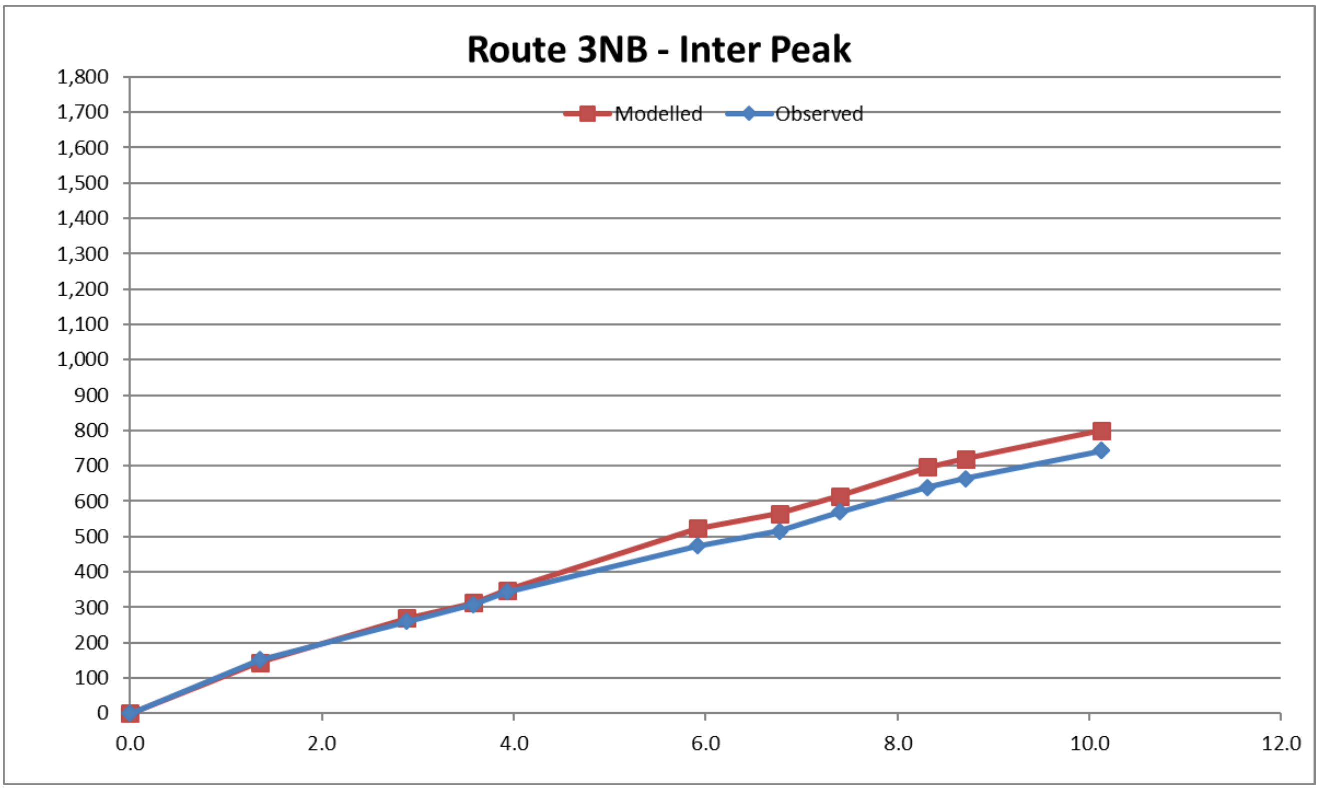

Route 2NB - PM Peak
Observed
Modelled
Time (S)
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (KM)

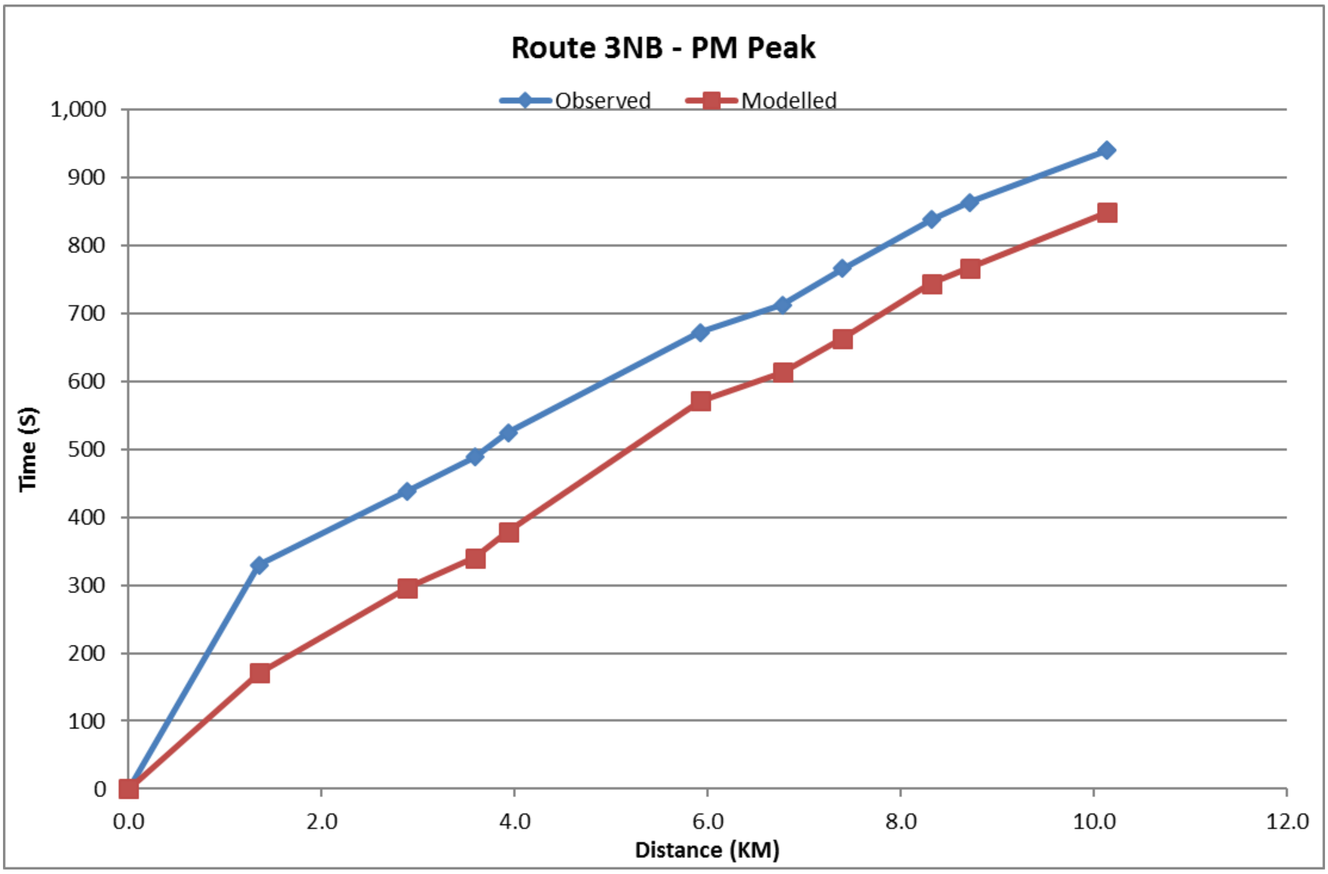

Route 2SB - AM Peak
observed
Modelled
Time (S)
1,000
900
800
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (KM)

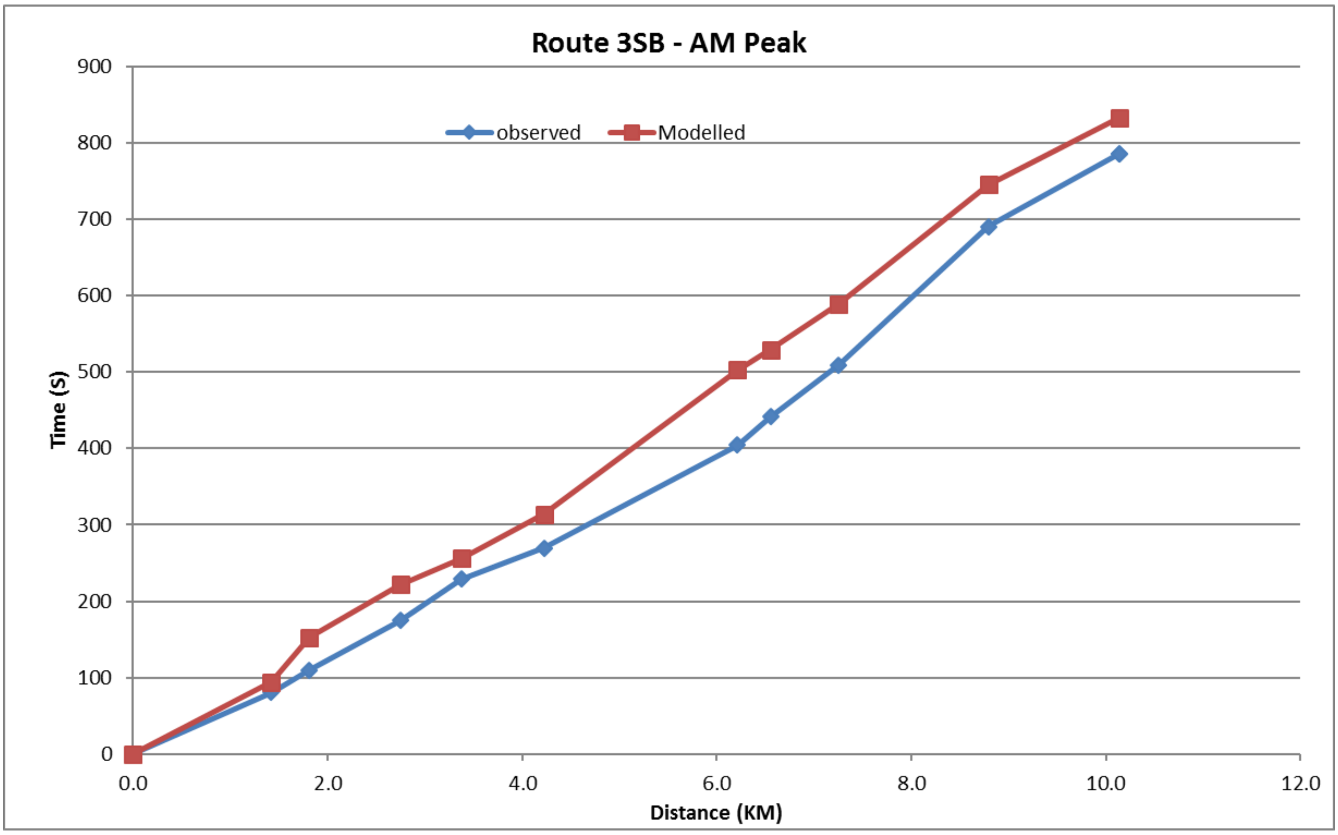

Route 2SB - Inter Peak
Modelled
Observed
Time (S)
800
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (KM)

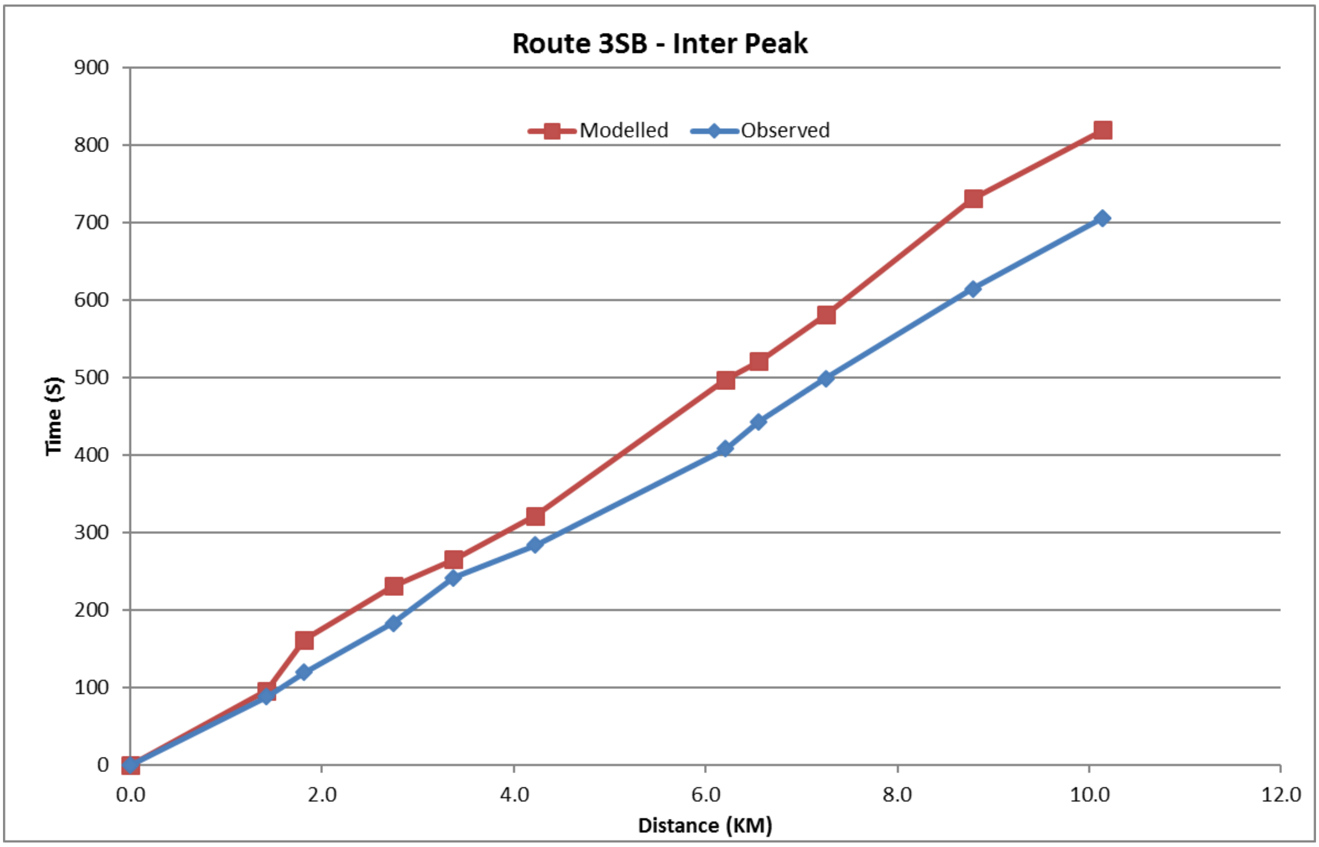

Route 2SB - PM Peak
Observed
Modelled
Time (S)
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (KM)

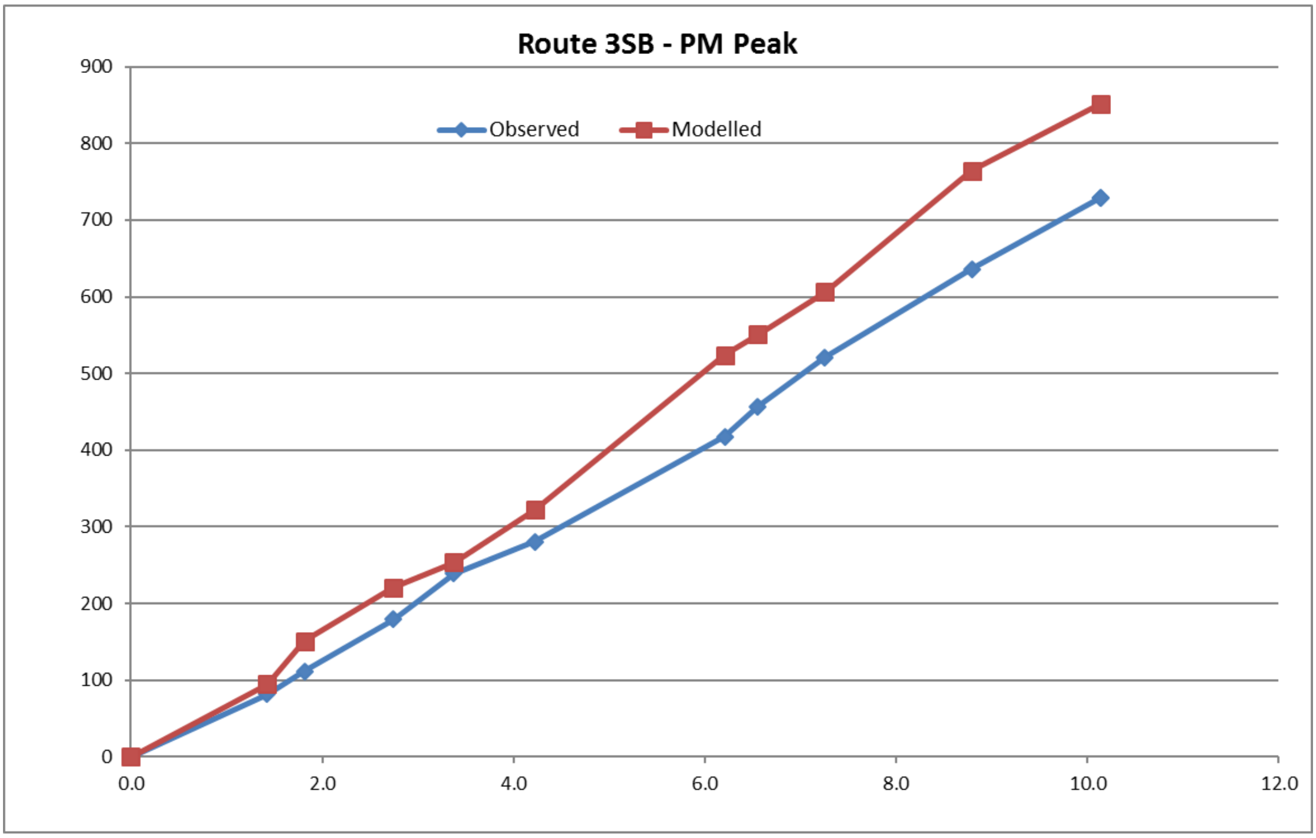

Route 3NB - AM Peak
observed
Modelled
Time (S)
900
800
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (KM)

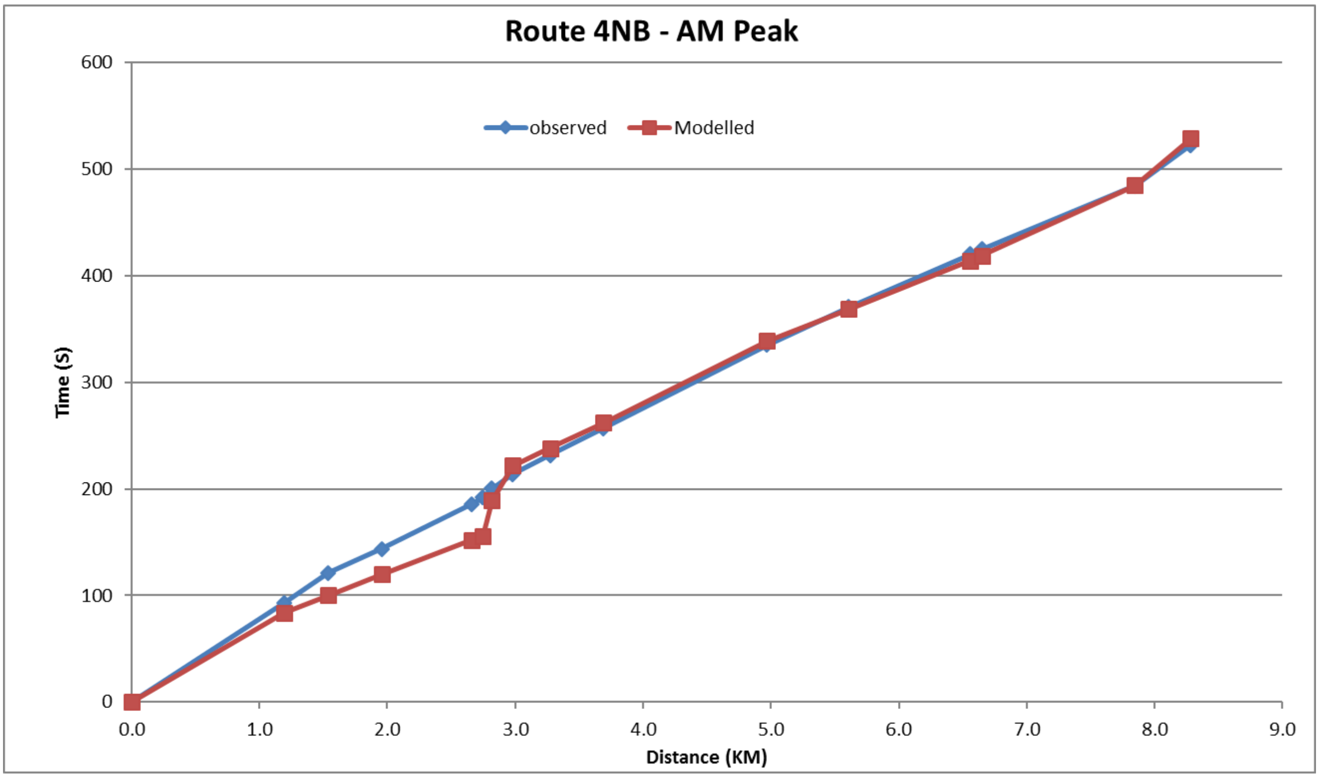

Route 3NB - Inter Peak
Modelled
Observed
1,800
1,700
1,600
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0

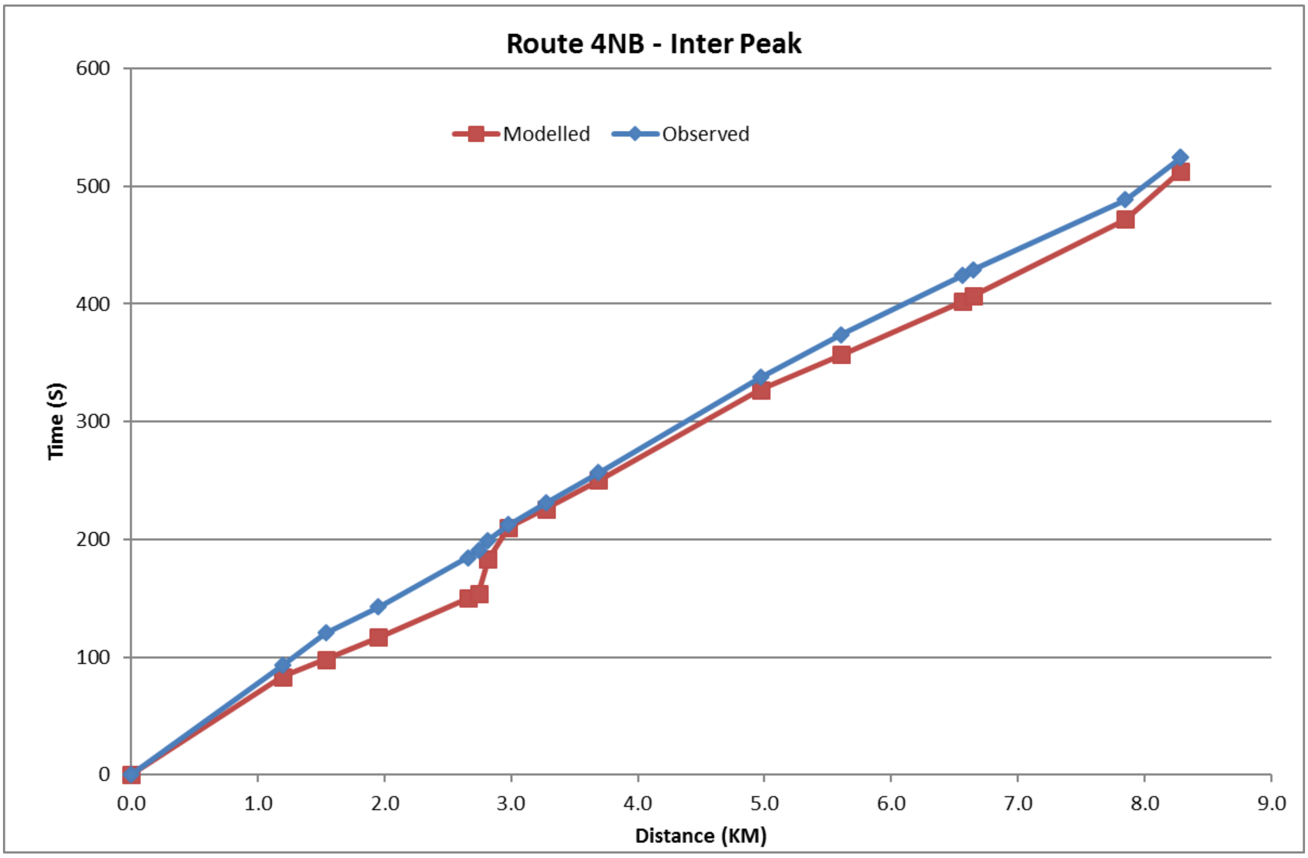

Route 3NB - PM Peak
Observed
Modelled
Time (S)
1,000
900
800
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (KM)

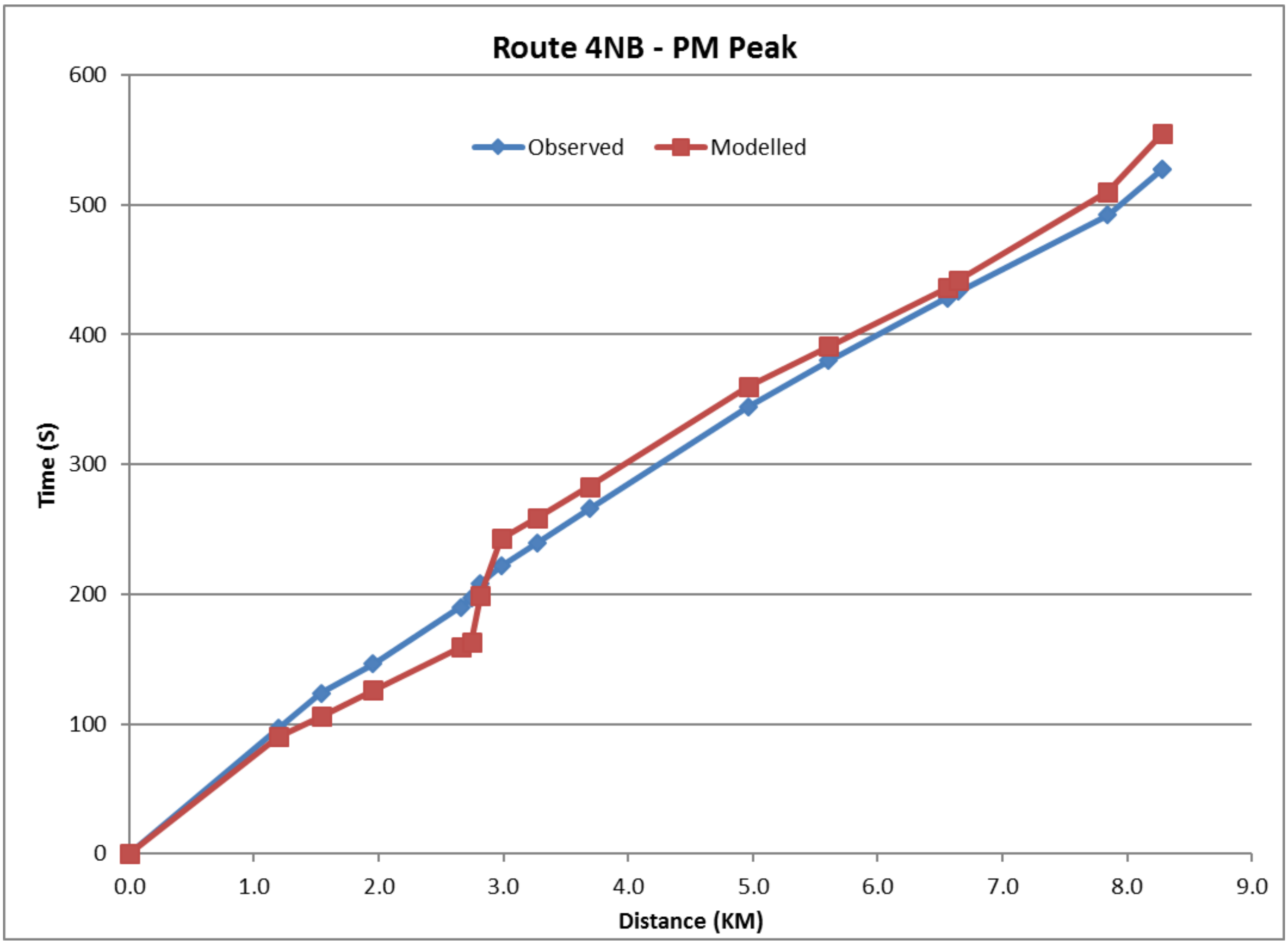

Route 3SB - AM Peak
observed
Modelled
Time (S)
900
800
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (KM)

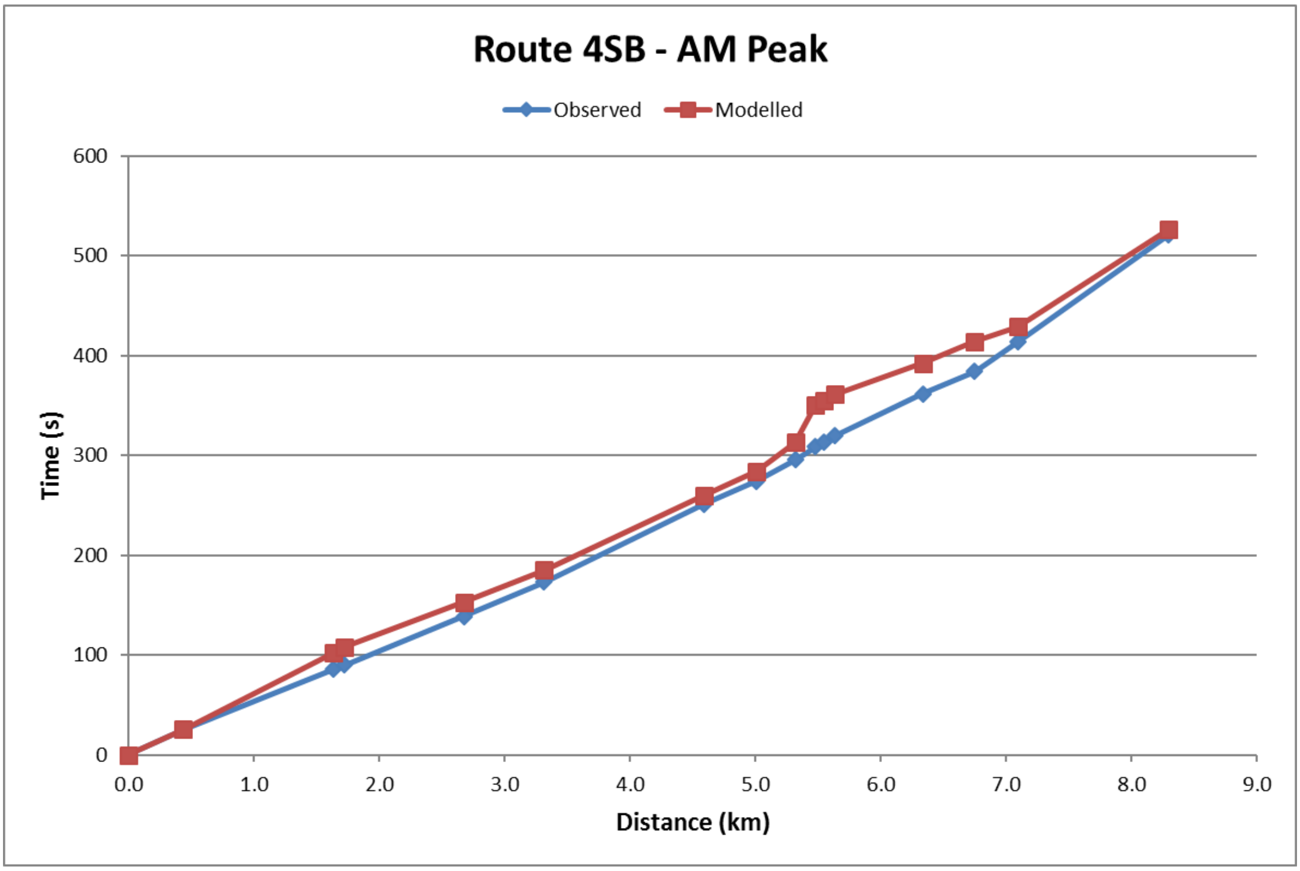

Route 3SB - Inter Peak
Modelled
Observed
Time (S)
900
800
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (KM)

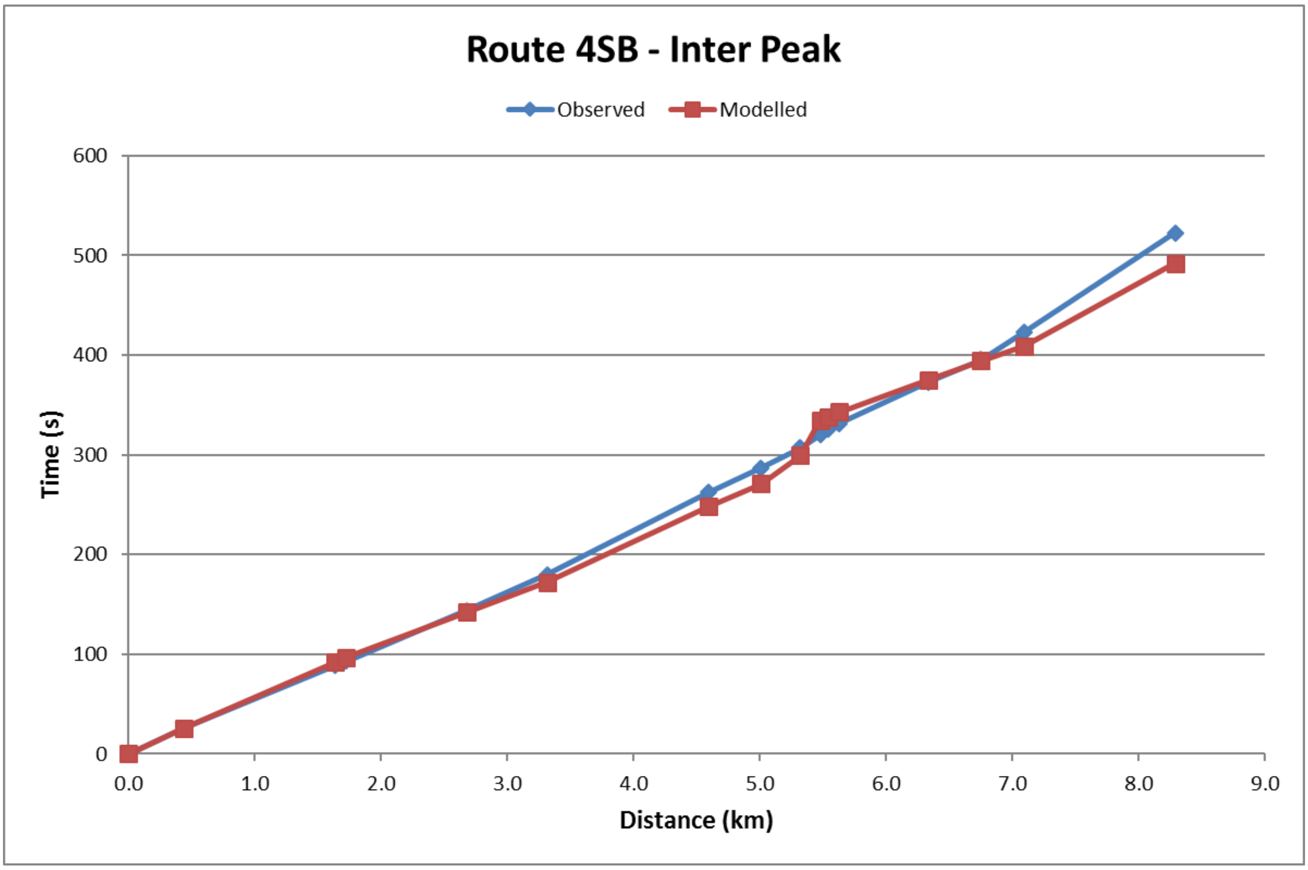

Route 3SB - PM Peak
Observed
Modelled
900
800
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0

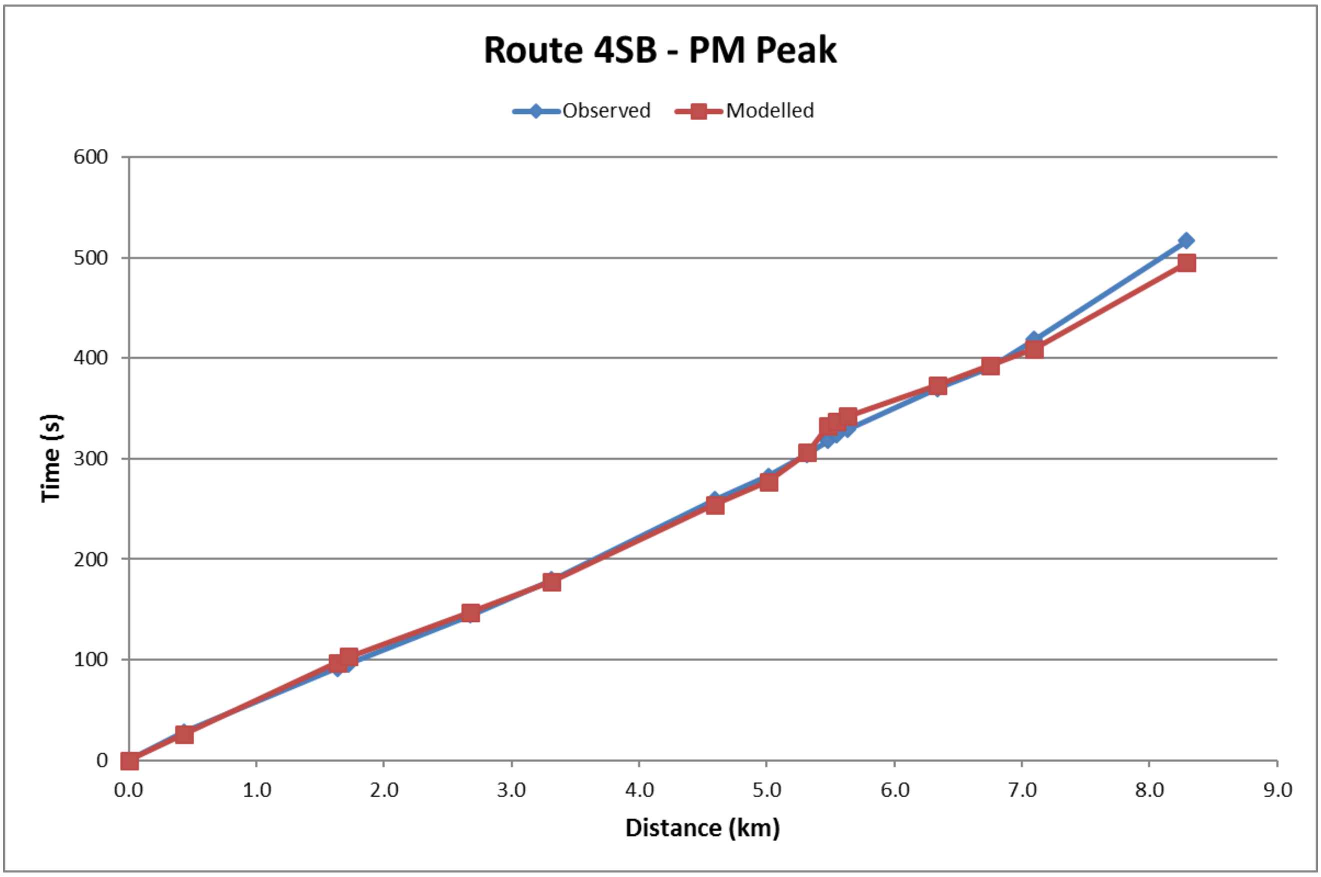

Route 4NB - AM Peak
observed
Modelled
Time (S)
0
100
200
300
400
500
600
Distance (KM)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0

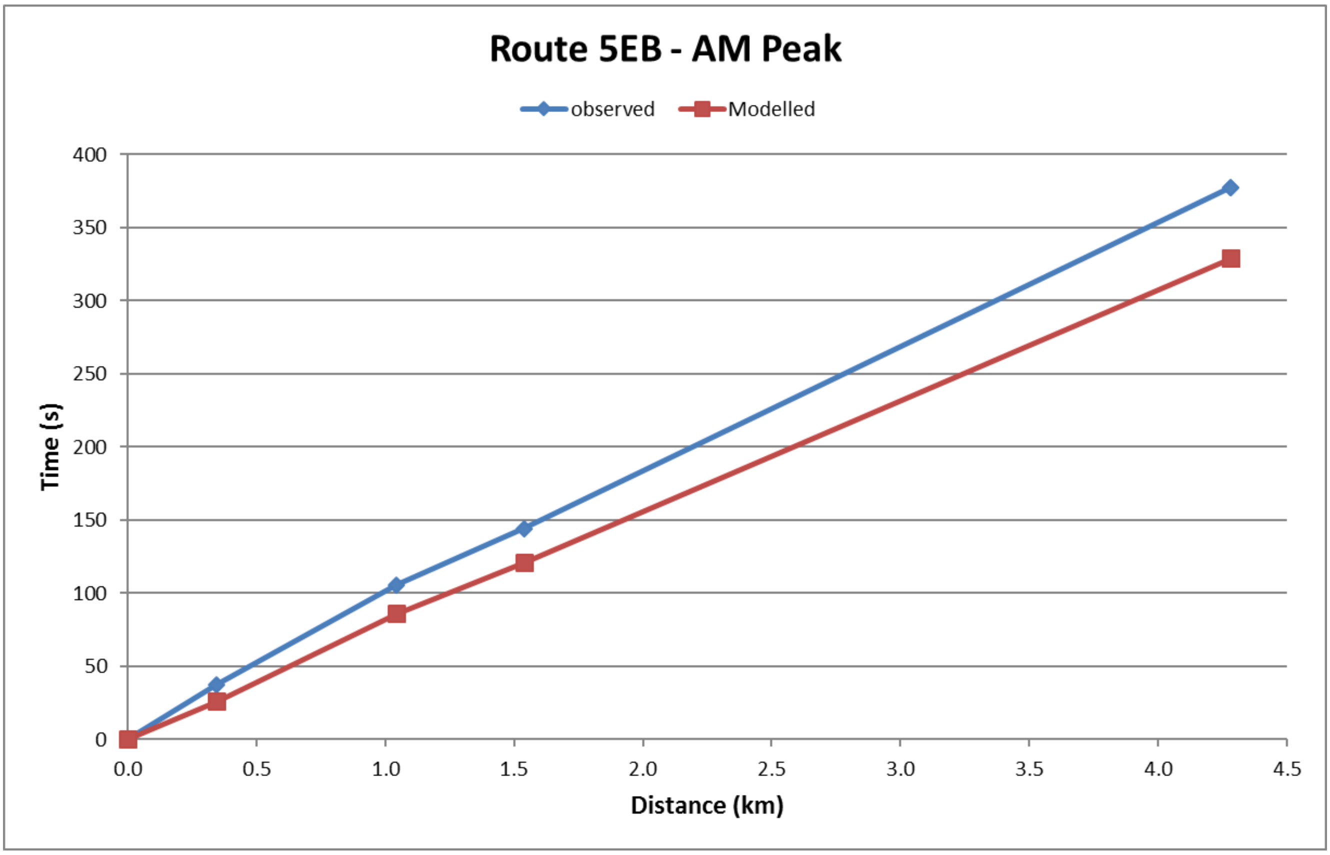

Route 4NB - Inter Peak
Modelled
Observed
Time (S)
0
100
200
300
400
500
600
Distance (KM)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0

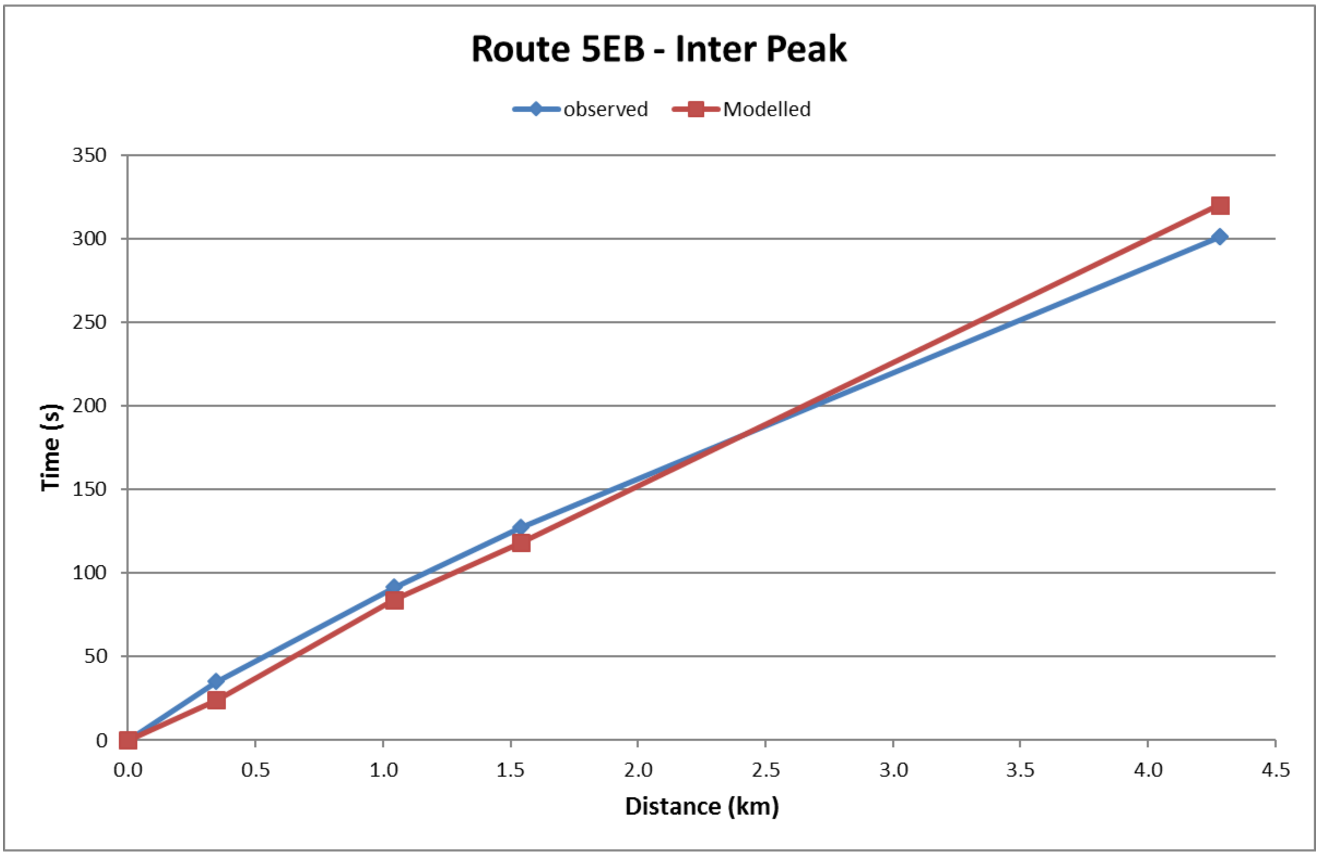

Route 4NB - PM Peak
Observed
Modelled
Time (S)
600
500
400
300
200
100
0
Distance (KM)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0

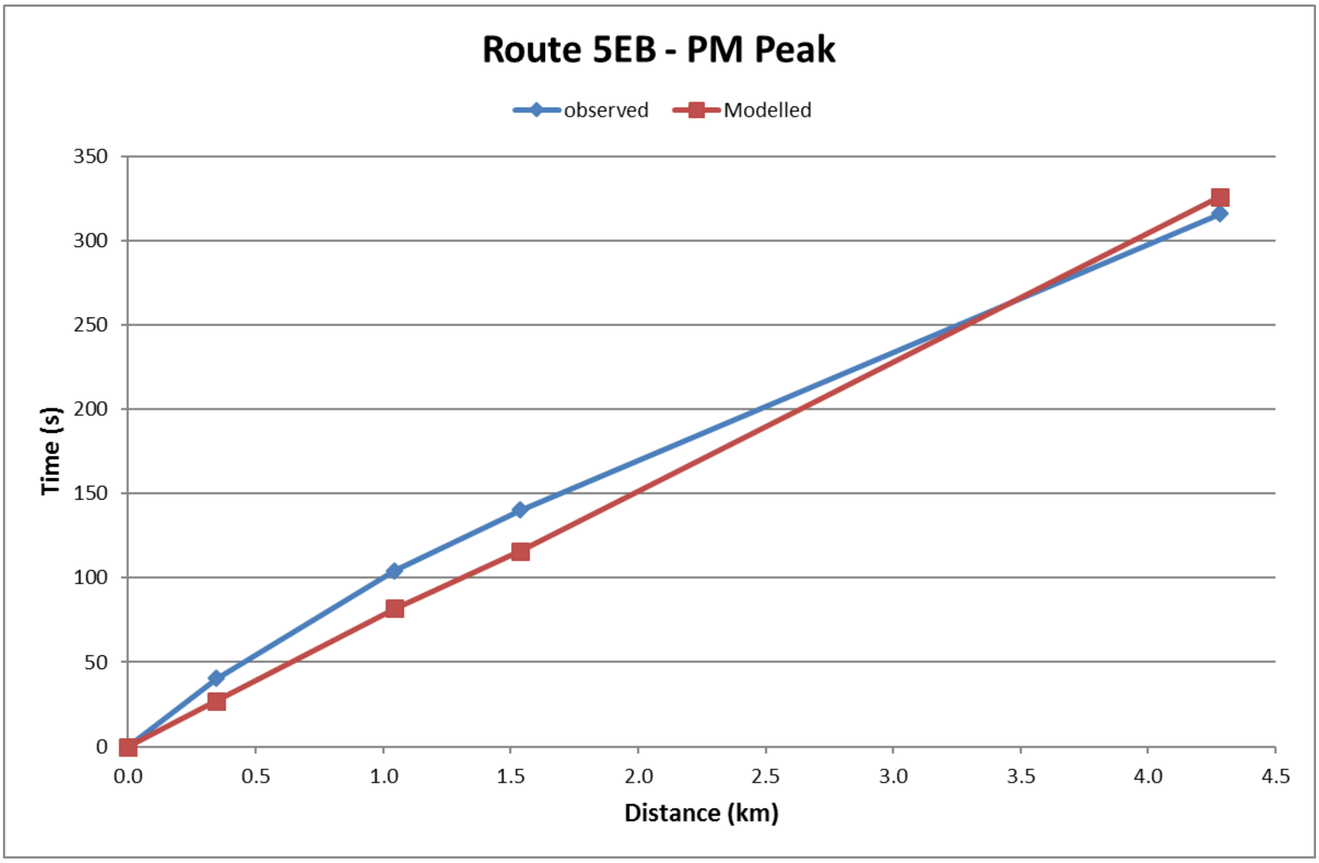

Route 4SB - AM Peak
Observed
Modelled
Time (s)
0
100
200
300
400
500
600
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
Distance (km)

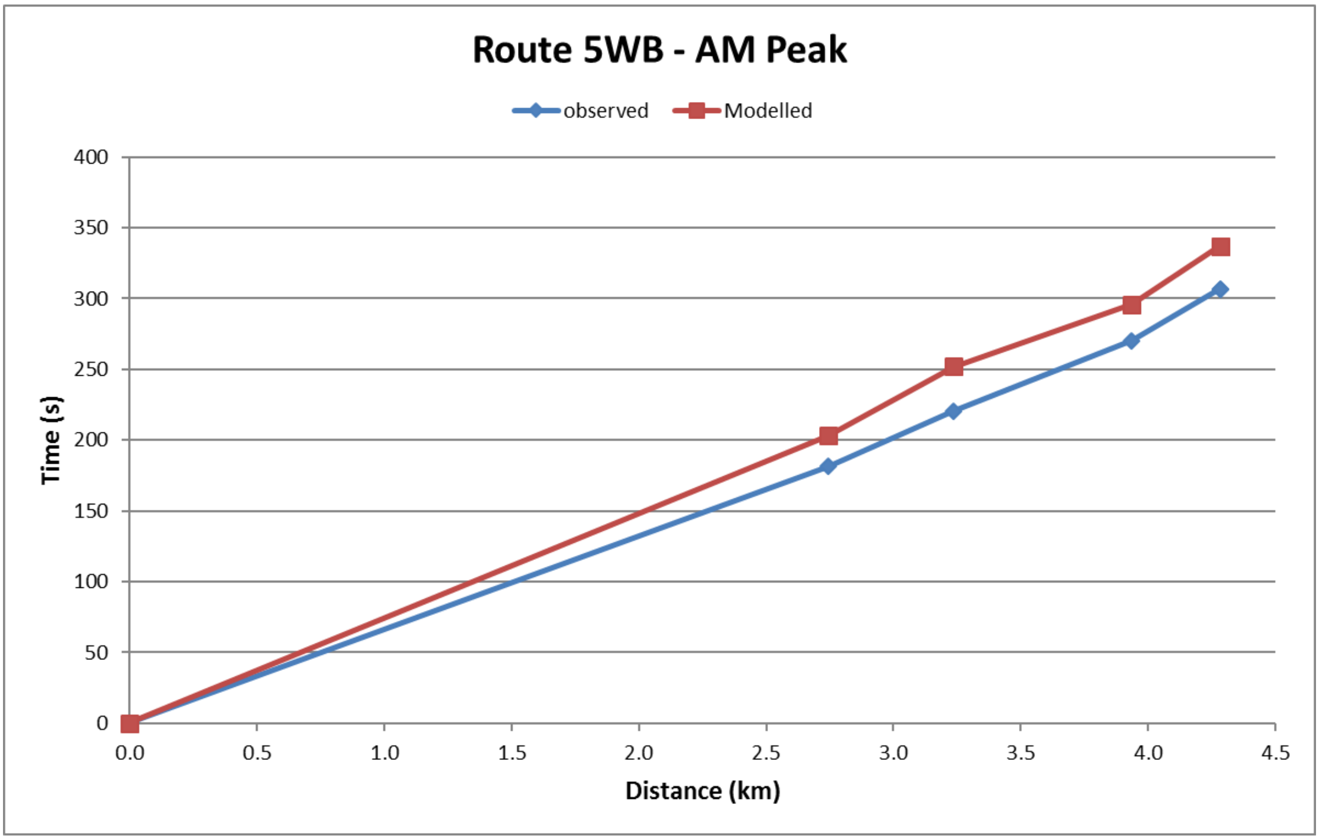

Route 4SB - Inter Peak
Observed
Modelled
Time (s)
0
100
200
300
400
500
600
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
Distance (km)

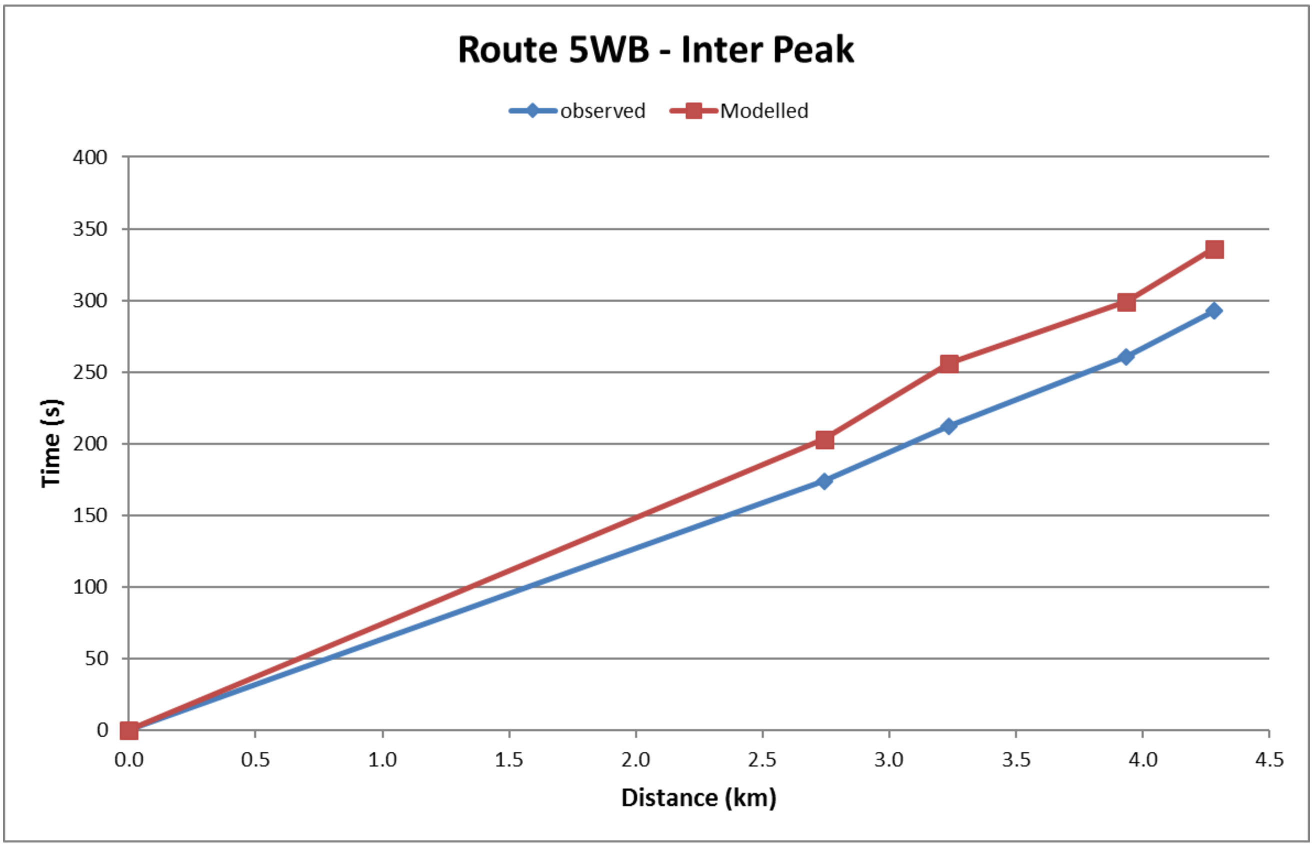

Route 4SB - PM Peak
Observed
Modelled
Time (s)
600
500
400
300
200
100
0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
Distance (km)

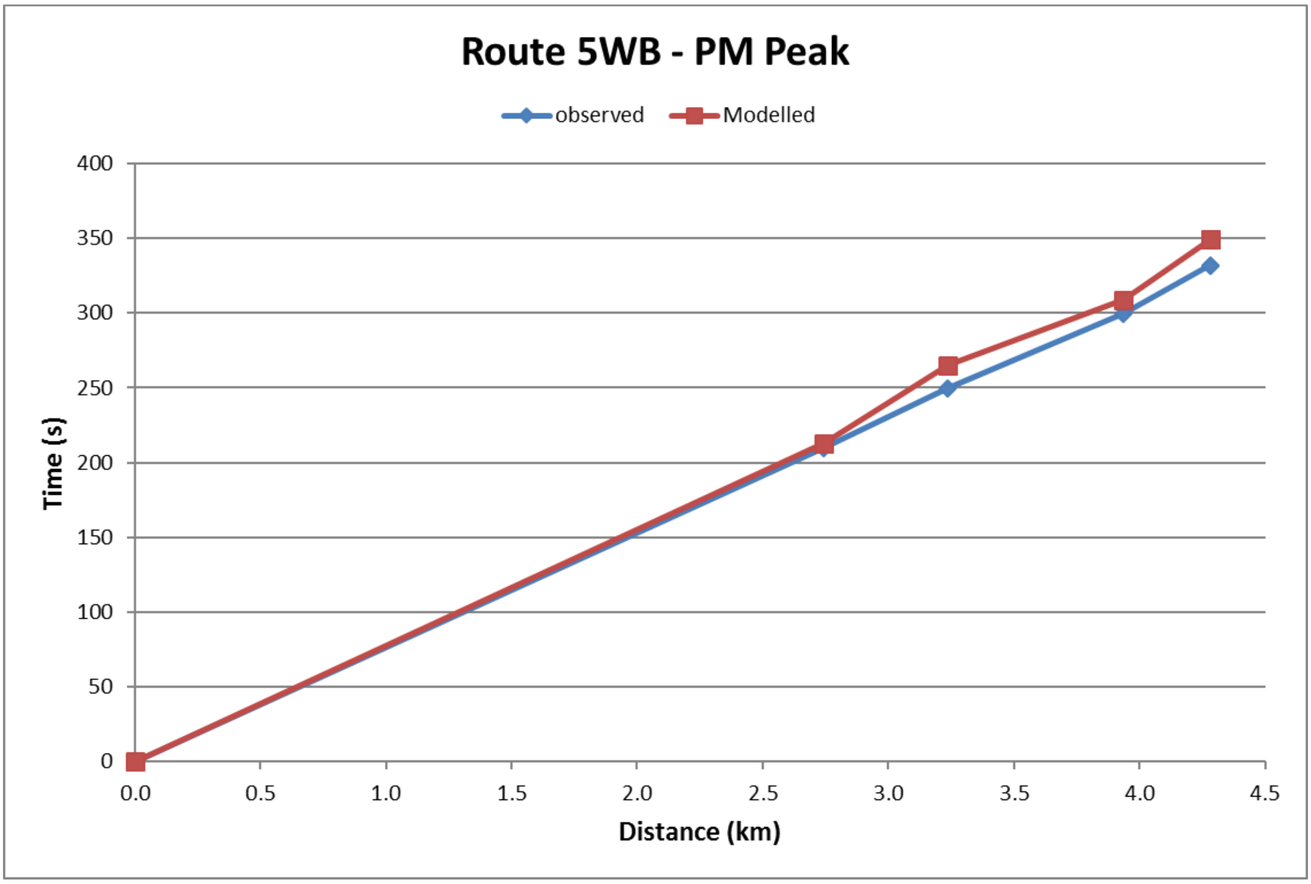

Route 5EB - AM Peak
observed
Modelled
Time (s)
400
350
300
250
200
150
100
50
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
Distance (km)

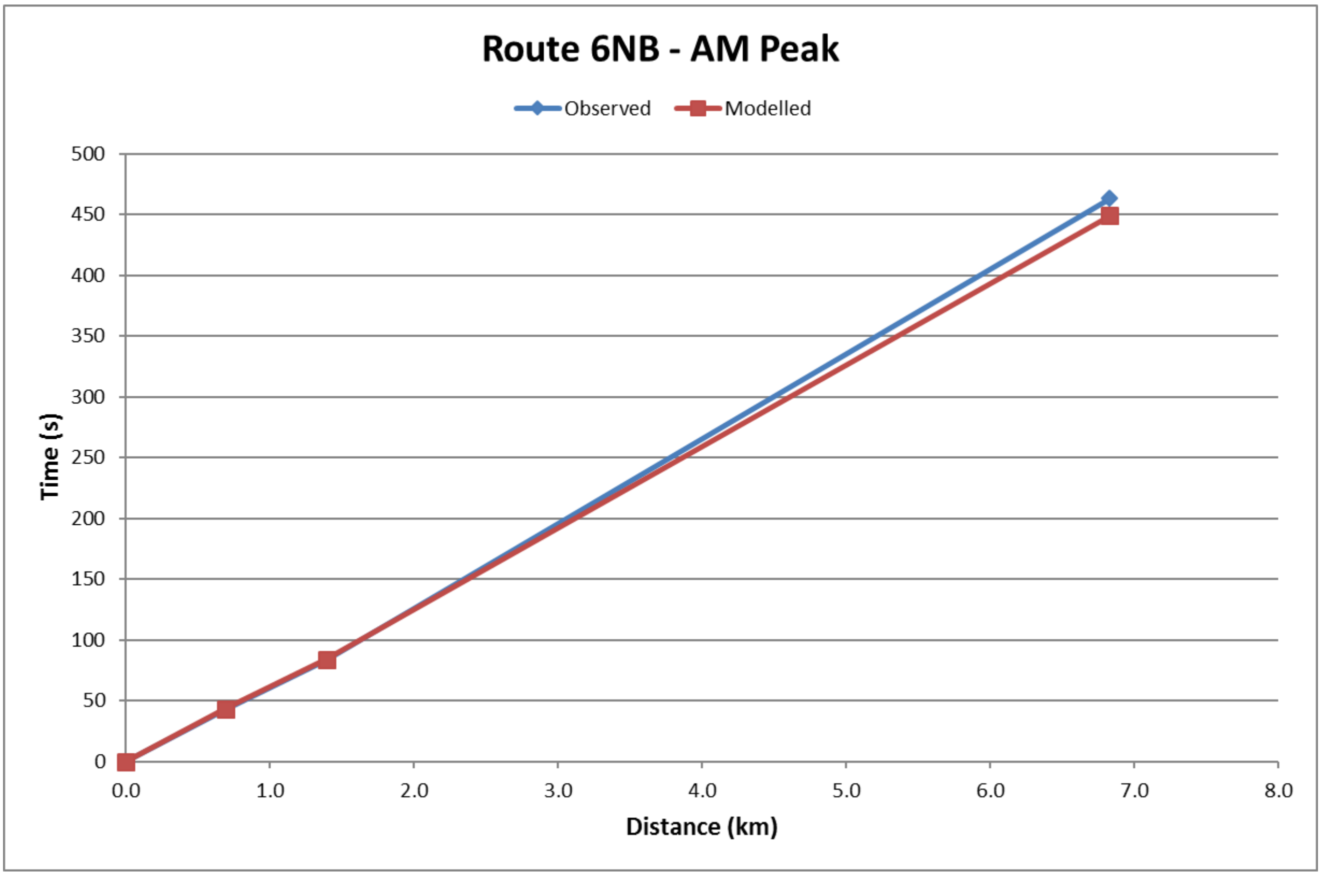

Route 5EB - Inter Peak
observed
Modelled
Time (s)
350
300
250
200
150
100
50
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
Distance (km)

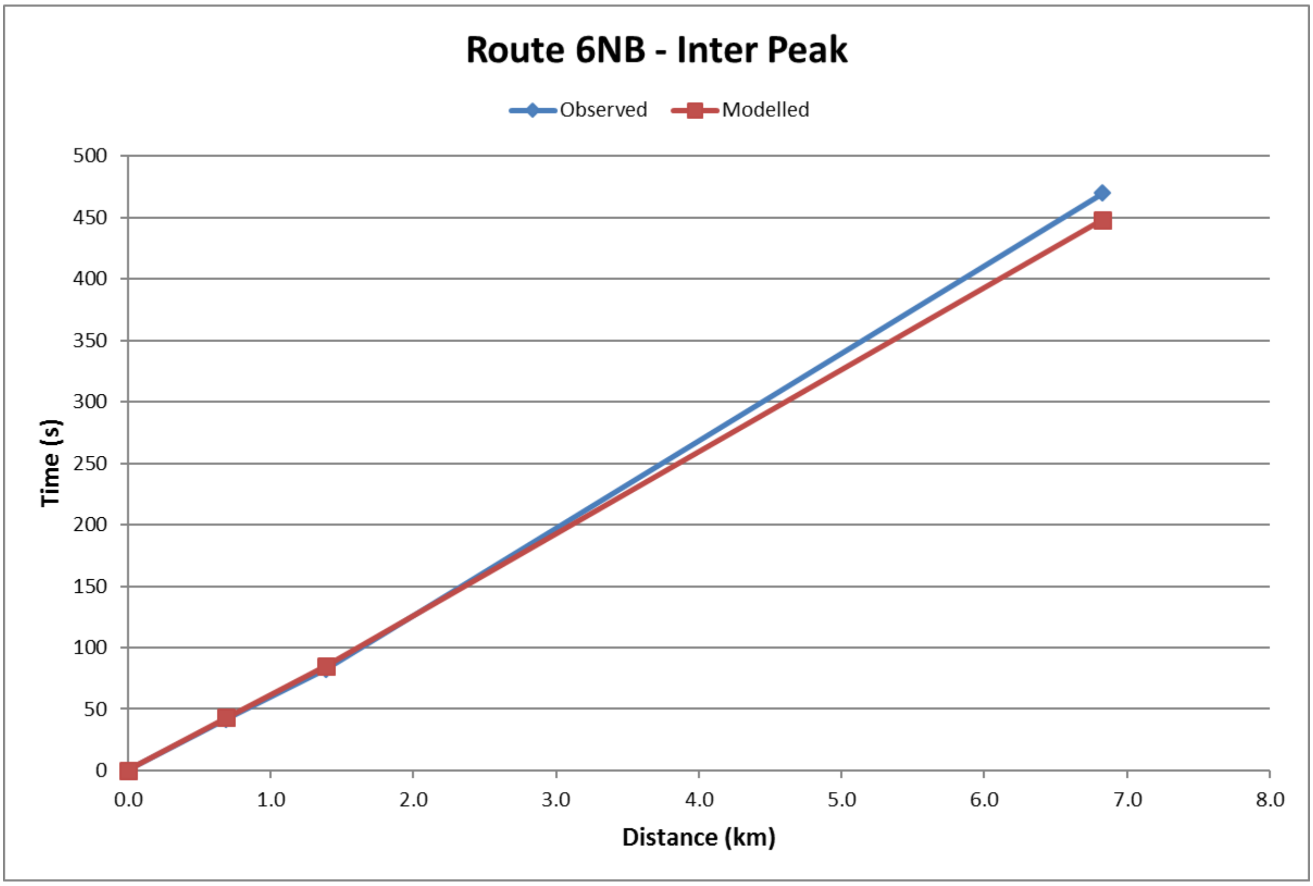

Route 5EB - PM Peak
observed
Modelled
Time (s)
350
300
250
200
150
100
50
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
Distance (km)

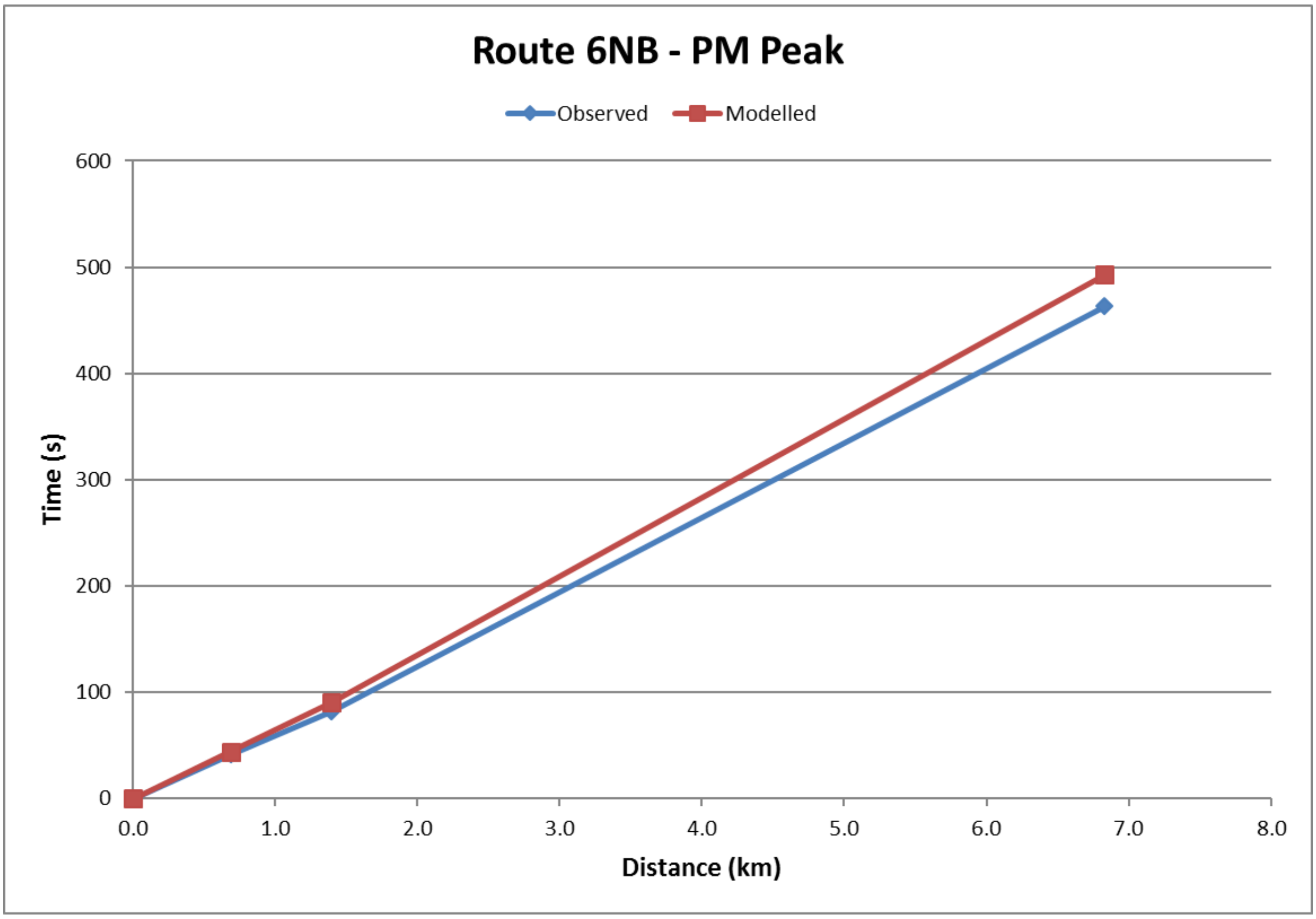

Route 5WB - AM Peak
observed
Modelled
Time (s)
400
350
300
250
200
150
100
50
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
Distance (km)


Route 5WB - Inter Peak
observed
Modelled
Time (s)
400
350
300
250
200
150
100
50
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
Distance (km)

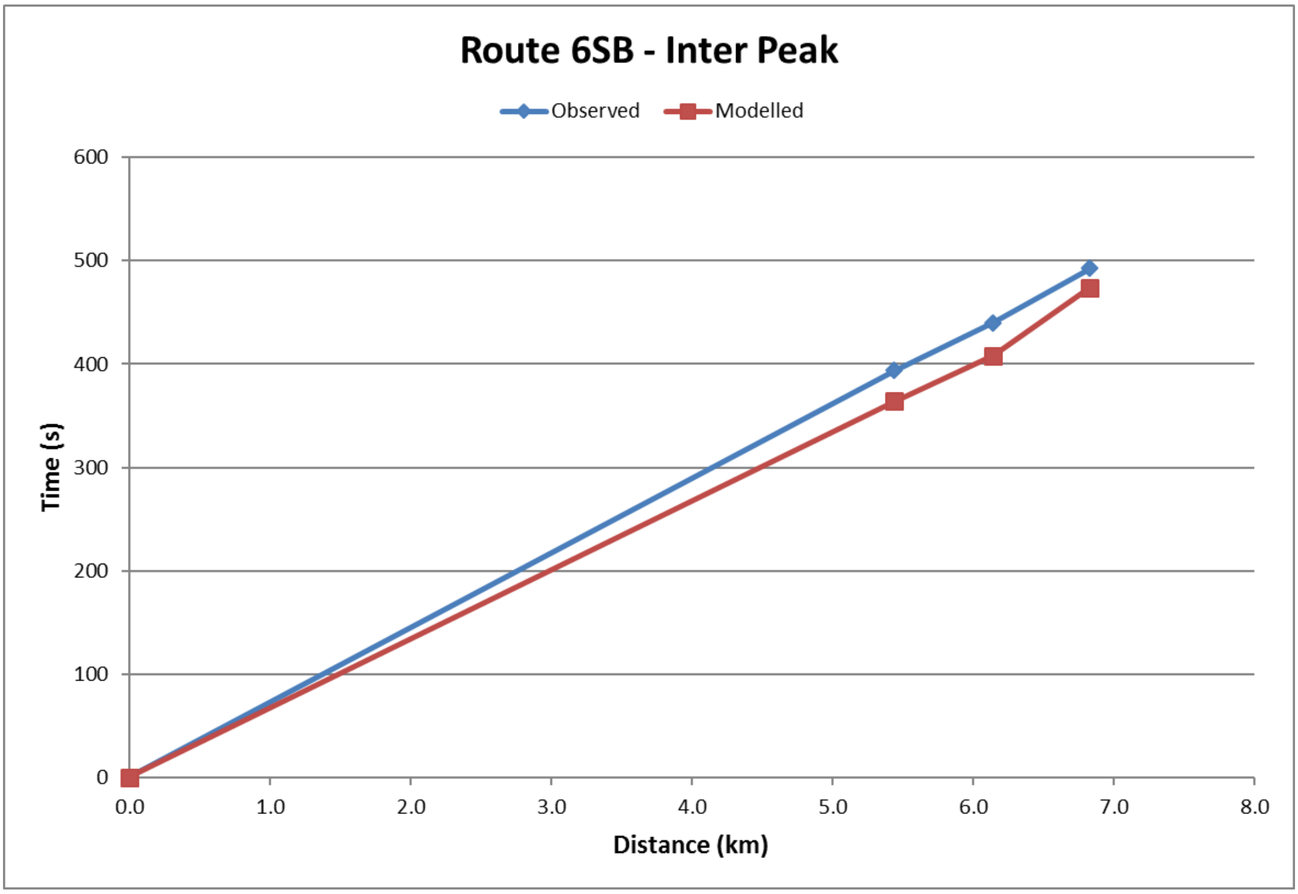

Route 5WB - PM Peak
observed
Modelled
Time (s)
400
350
300
250
200
150
100
50
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
Distance (km)

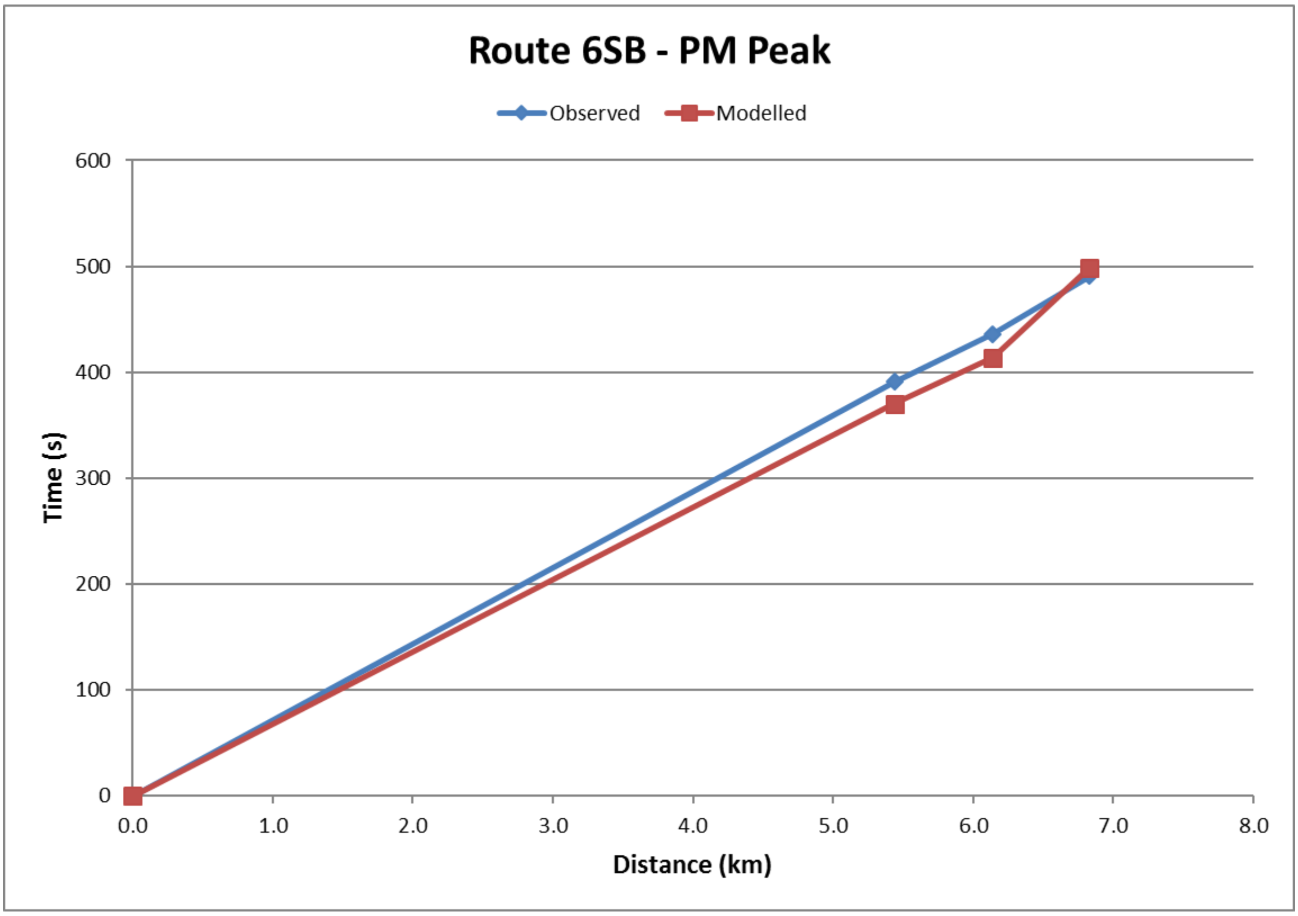

Route 6NB - AM Peak
Observed
Modelled
Time (s)
500
450
400
350
300
250
200
150
100
50
0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
Distance (km)

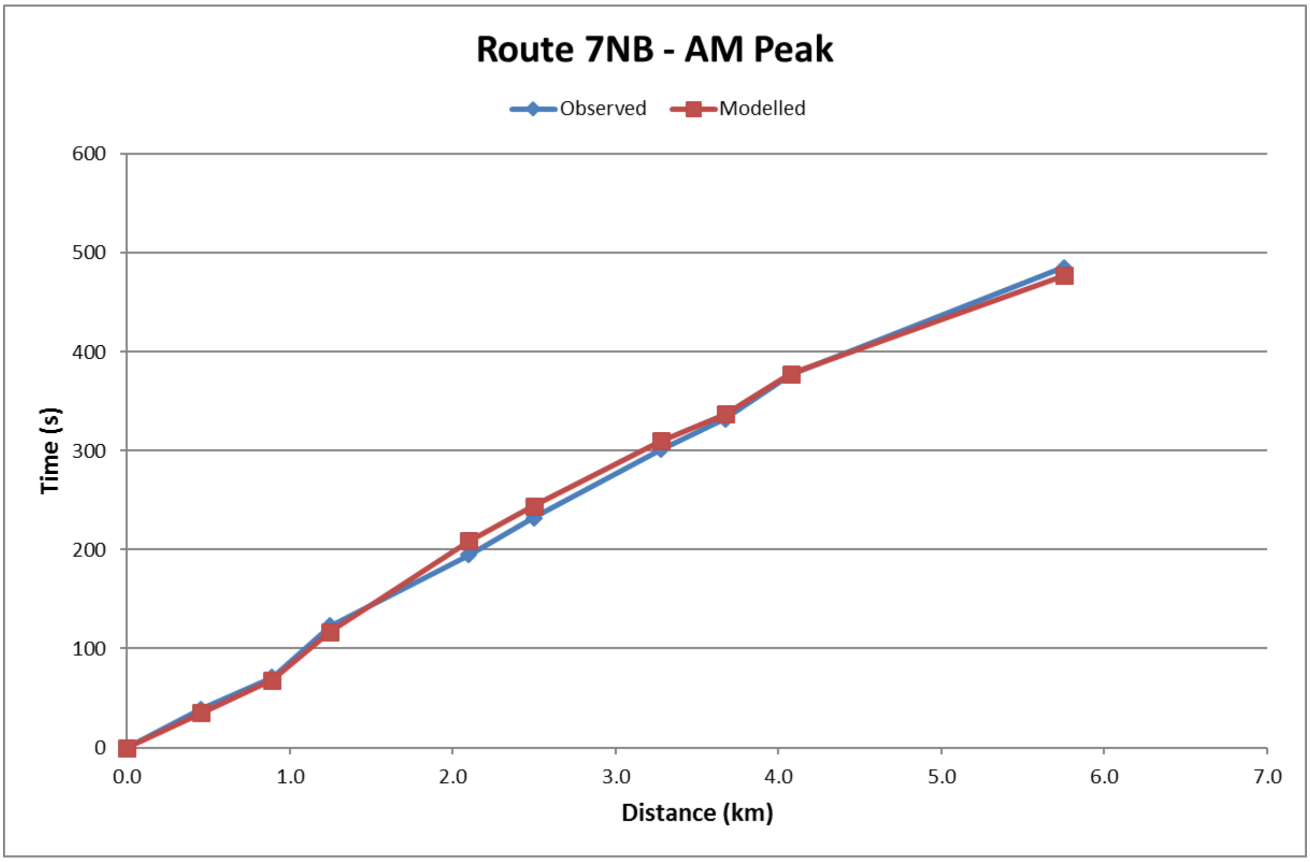

Route 6NB - Inter Peak
Observed
Modelled
Time (s)
500
450
400
350
300
250
200
150
100
50
0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
Distance (km)

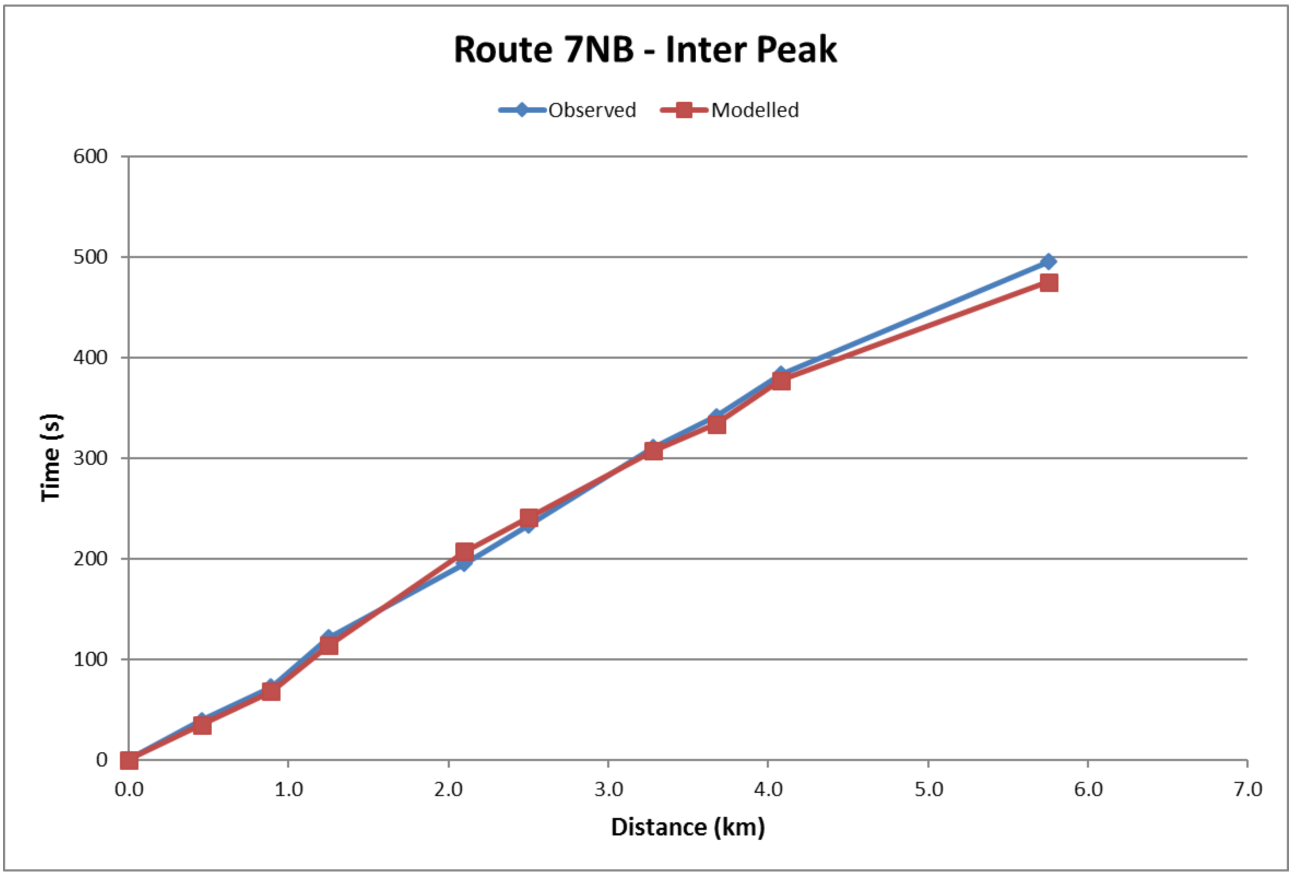

Route 6NB - PM Peak
Observed
Modelled
Time (s)
Distance (km)
0
100
200
300
400
500
600
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0

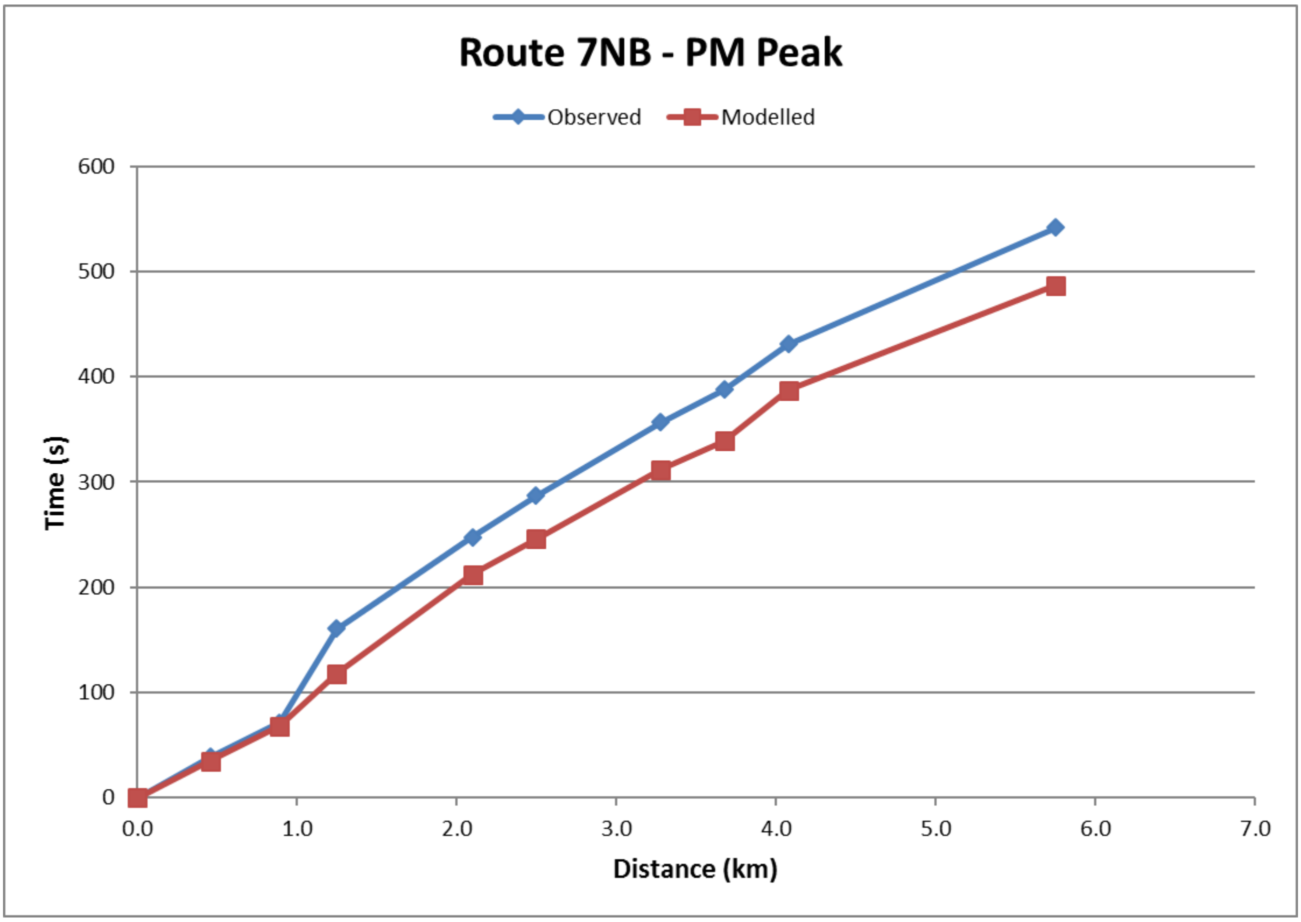

Route 6SB - AM Peak
Observed
Modelled
Time (s)
Distance (km)
0
100
200
300
400
500
600
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0

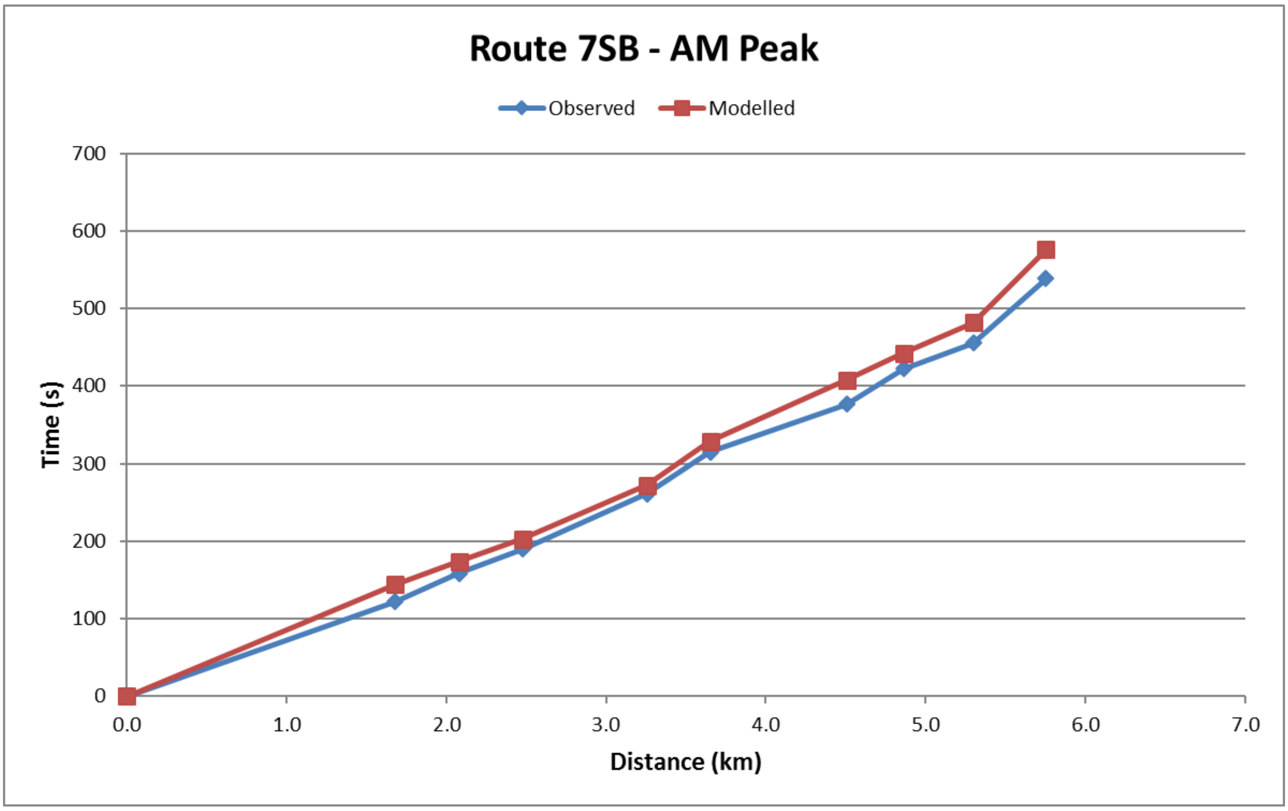

Route 6SB - Inter Peak
Observed
Modelled
Time (s)
600
500
400
300
200
100
0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
Distance (km)

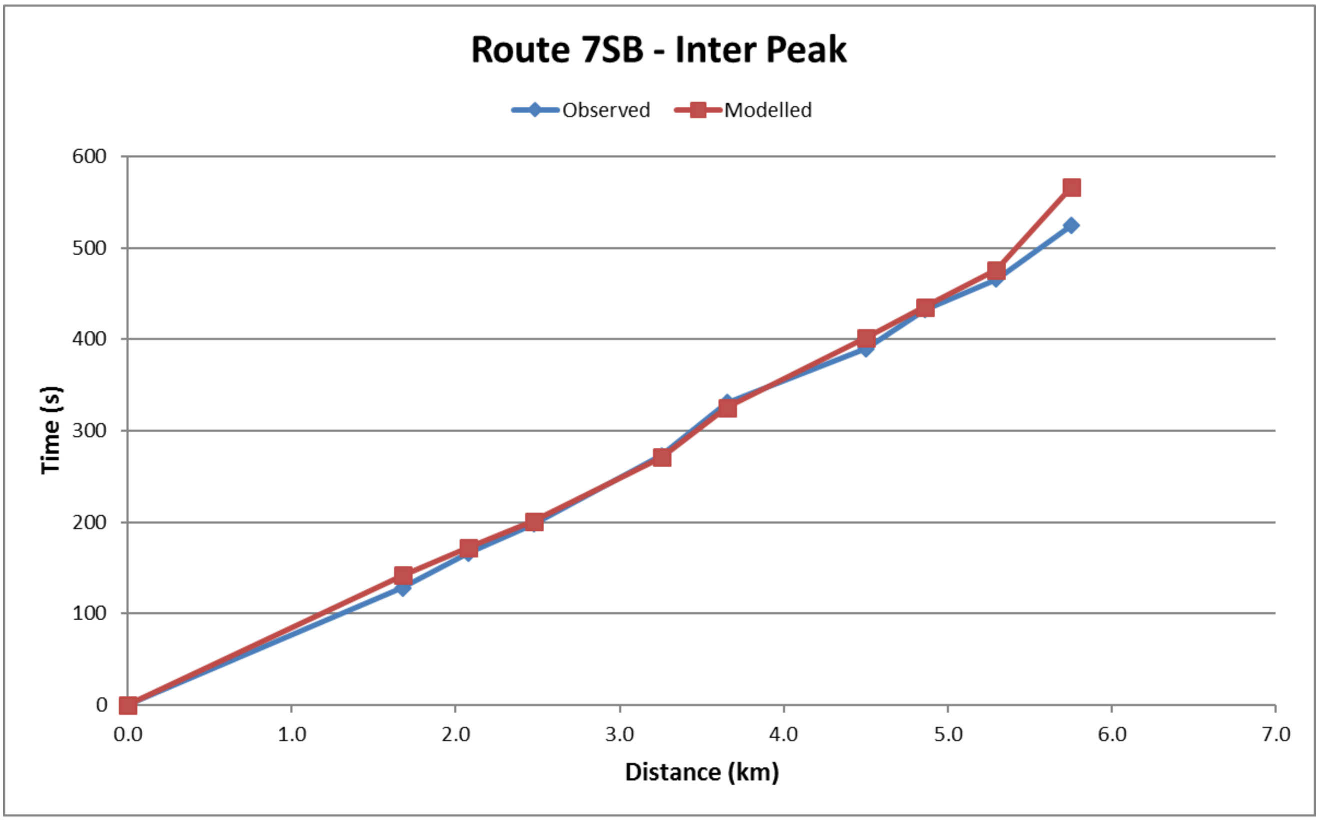

Route 6SB - PM Peak
Observed
Modelled
Time (s)
600
500
400
300
200
100
0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
Distance (km)

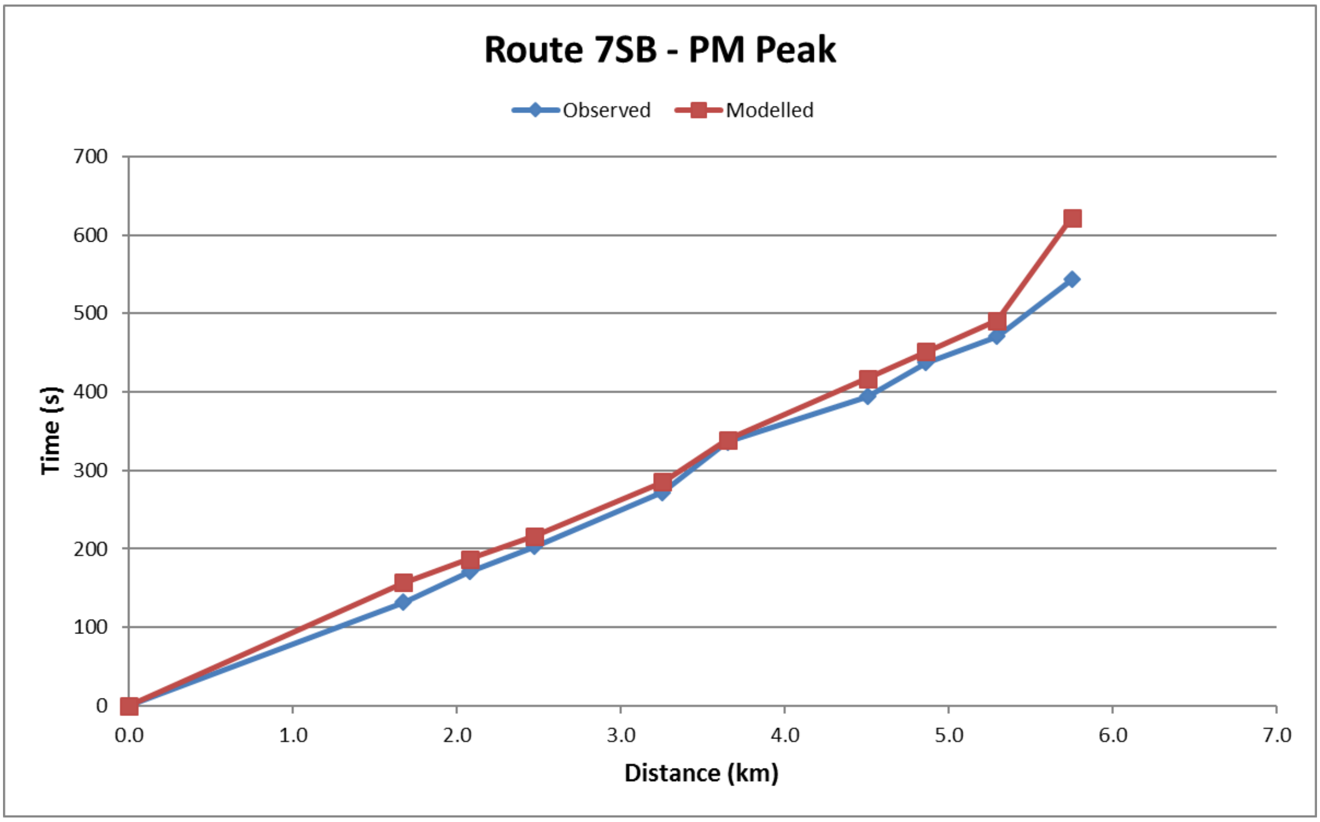

Route 7NB - AM Peak
Observed
Modelled
Time (s)
600
500
400
300
200
100
0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
Distance (km)

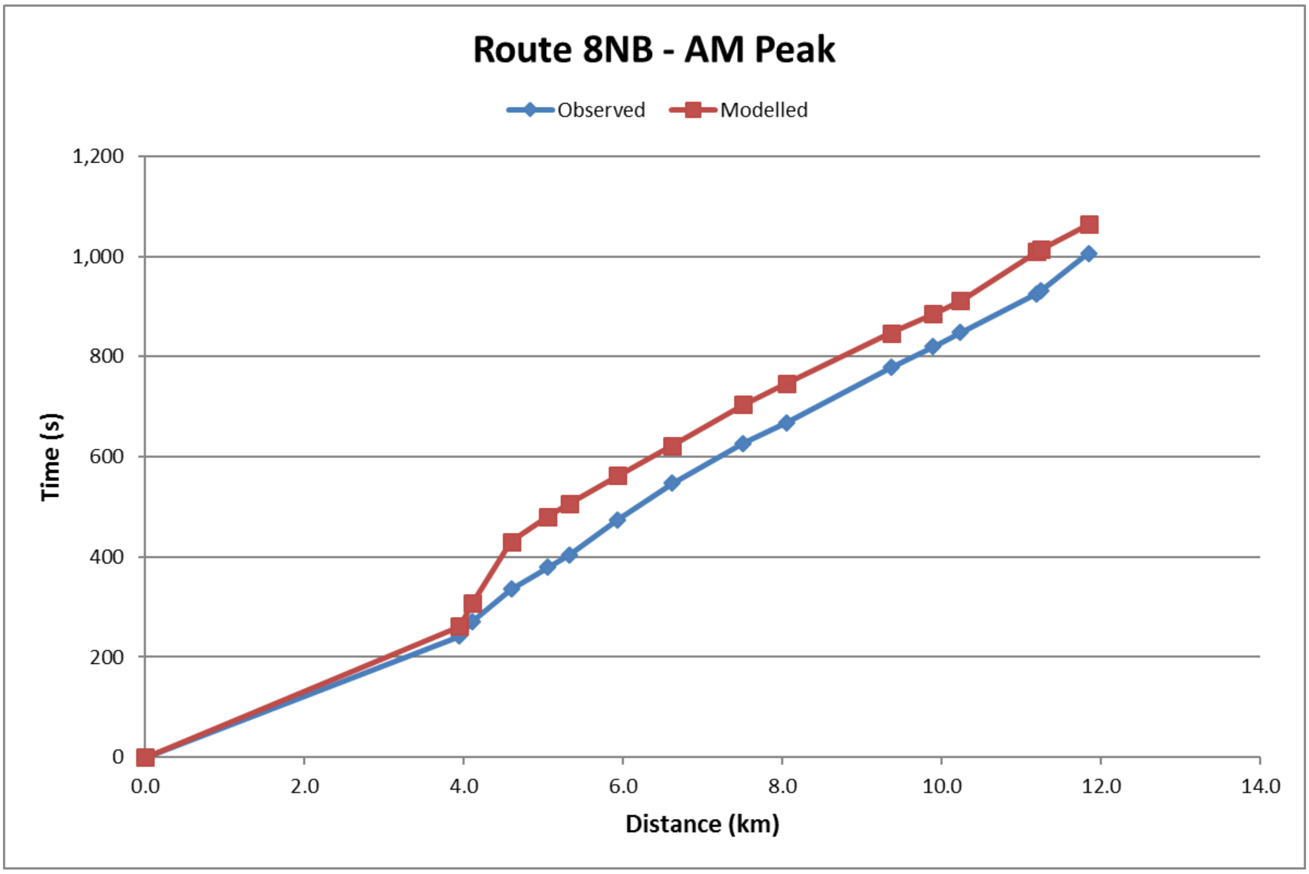

Route 7NB - Inter Peak
Observed
Modelled
Time (s)
600
500
400
300
200
100
0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
Distance (km)

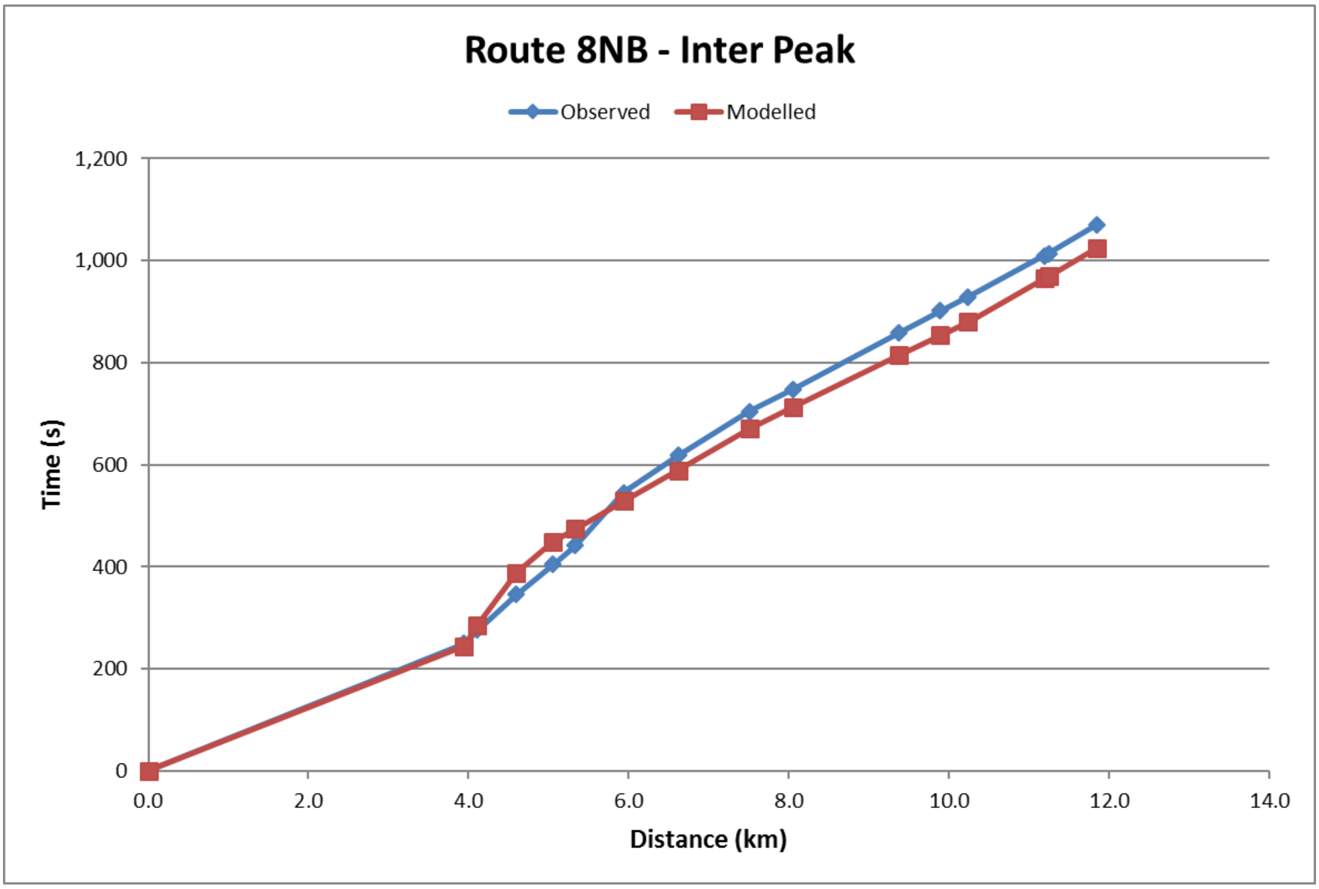

Route 7NB - PM Peak
Observed
Modelled
Time (s)
600
500
400
300
200
100
0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
Distance (km)

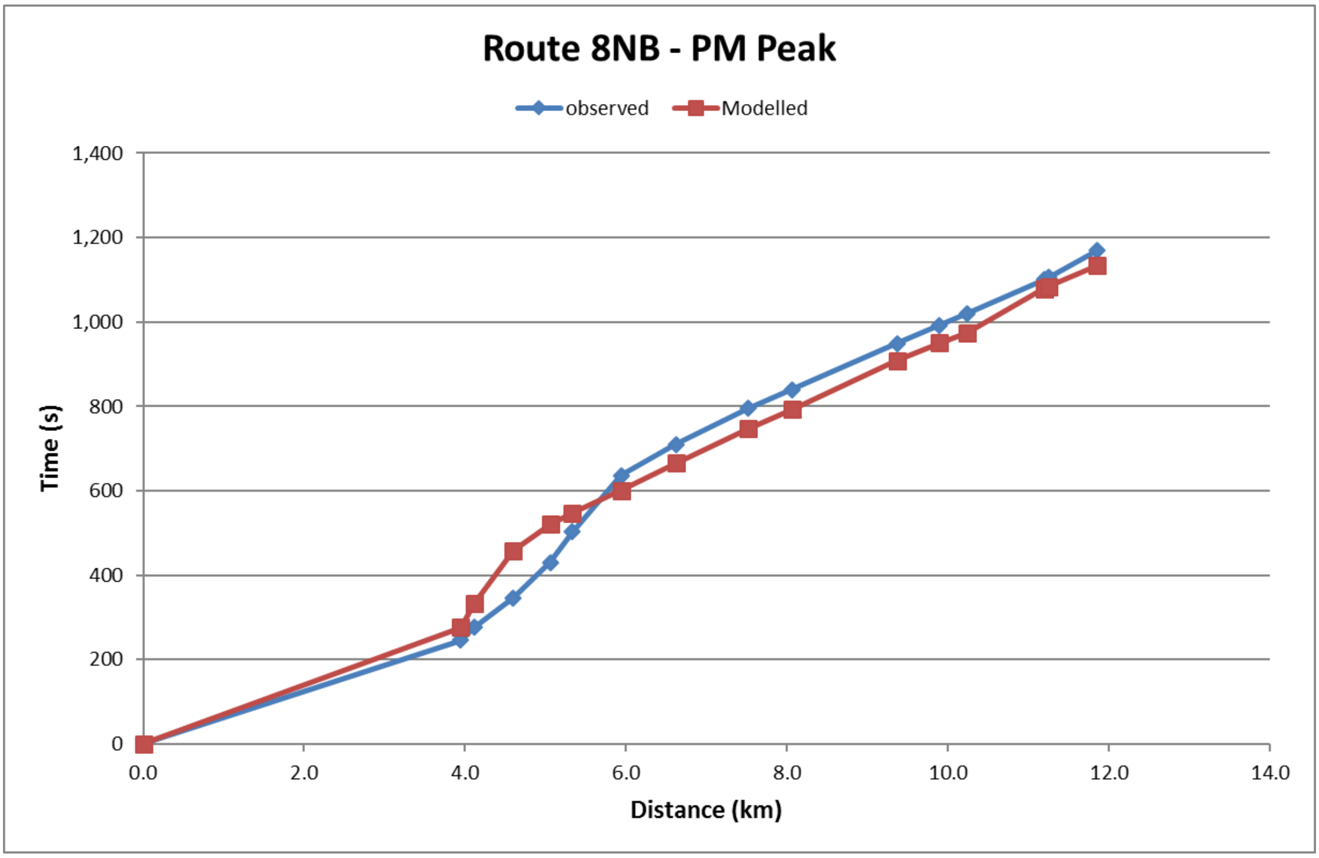

Route 7SB - AM Peak
Observed
Modelled
Time (s)
700
600
500
400
300
200
100
0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
Distance (km)

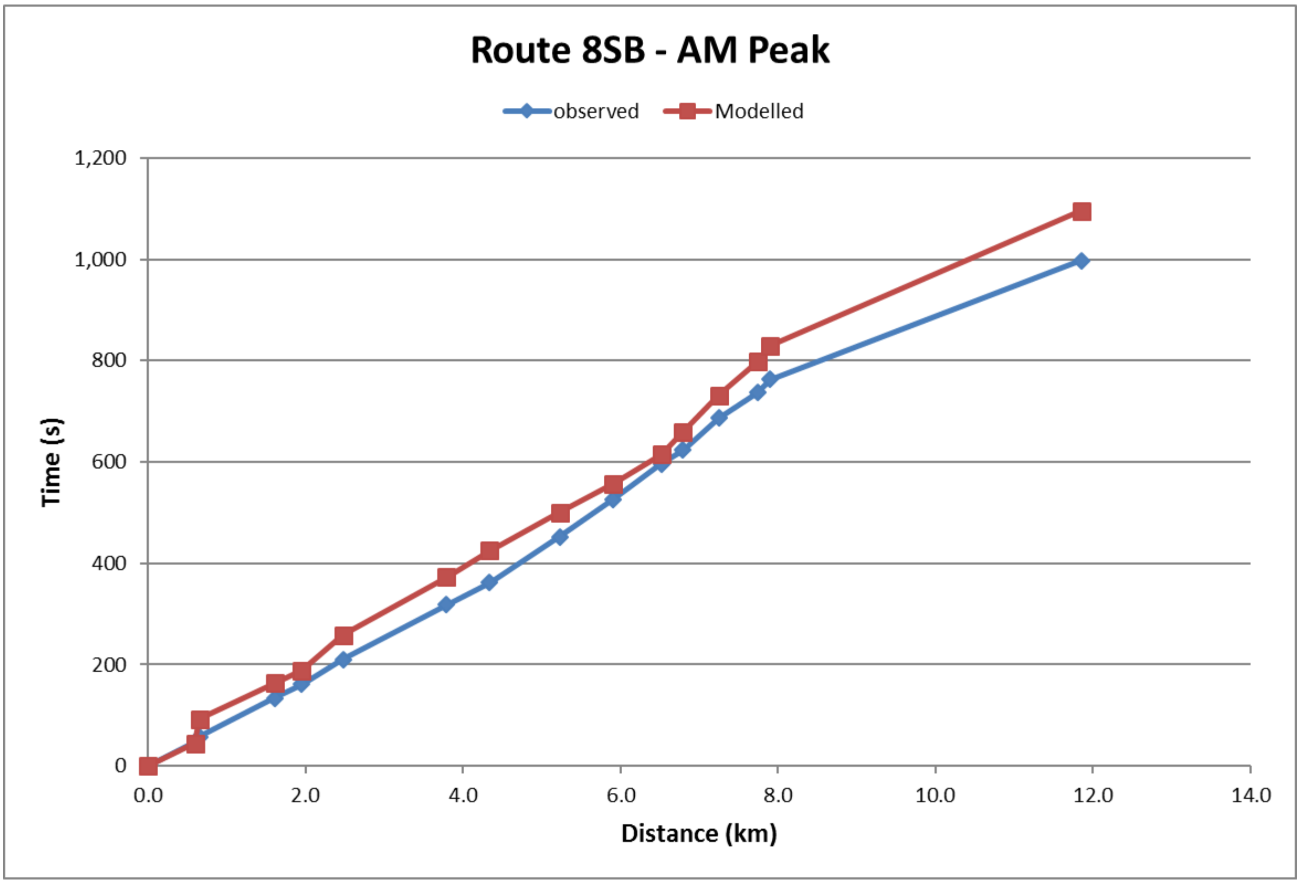

Route 7SB - Inter Peak
Observed
Modelled
Time (s)
600
500
400
300
200
100
0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
Distance (km)

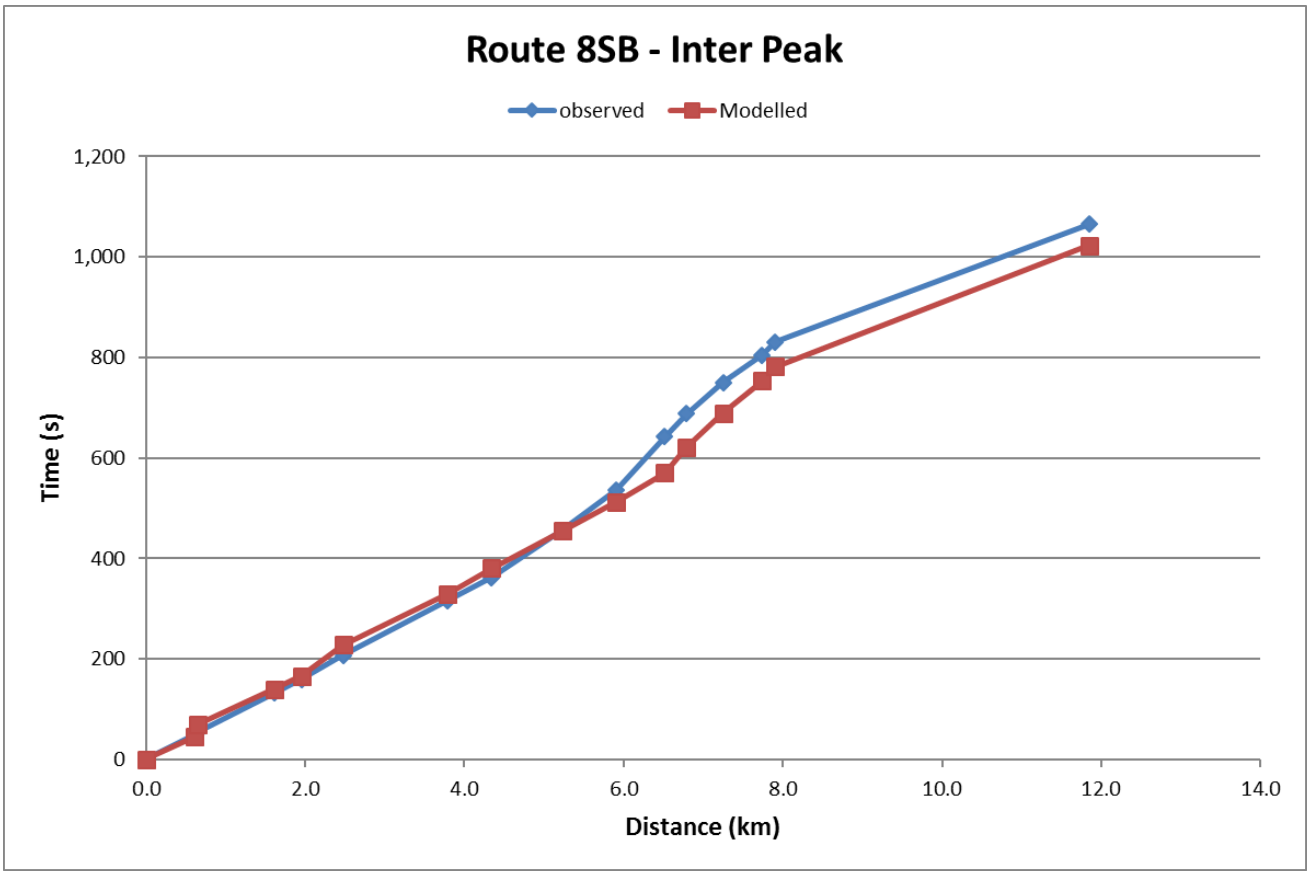

Route 7SB - PM Peak
Observed
Modelled
Time (s)
700
600
500
400
300
200
100
0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
Distance (km)

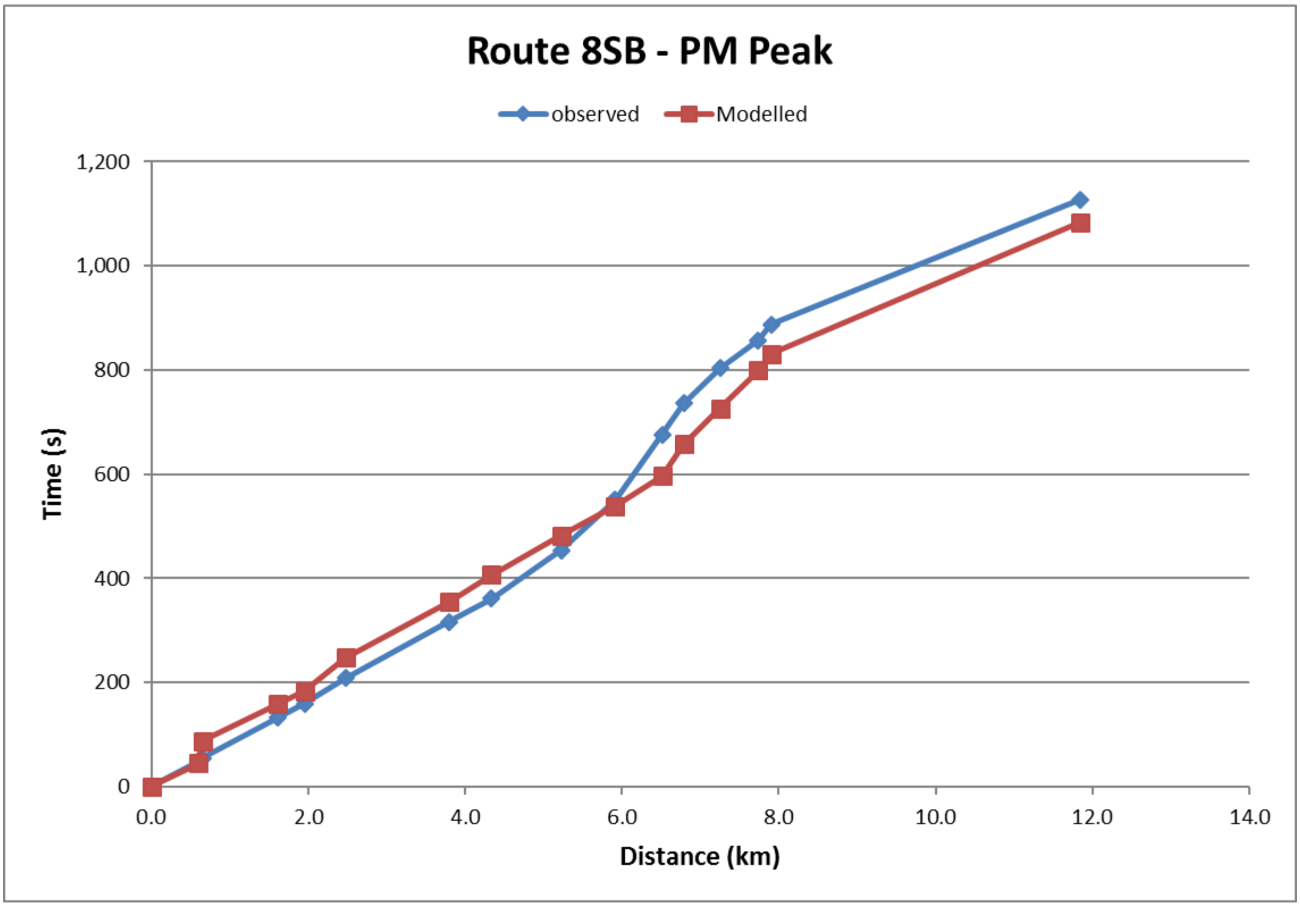

Route 8NB - AM Peak
Observed
Modelled
Time (s)
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Distance (km)

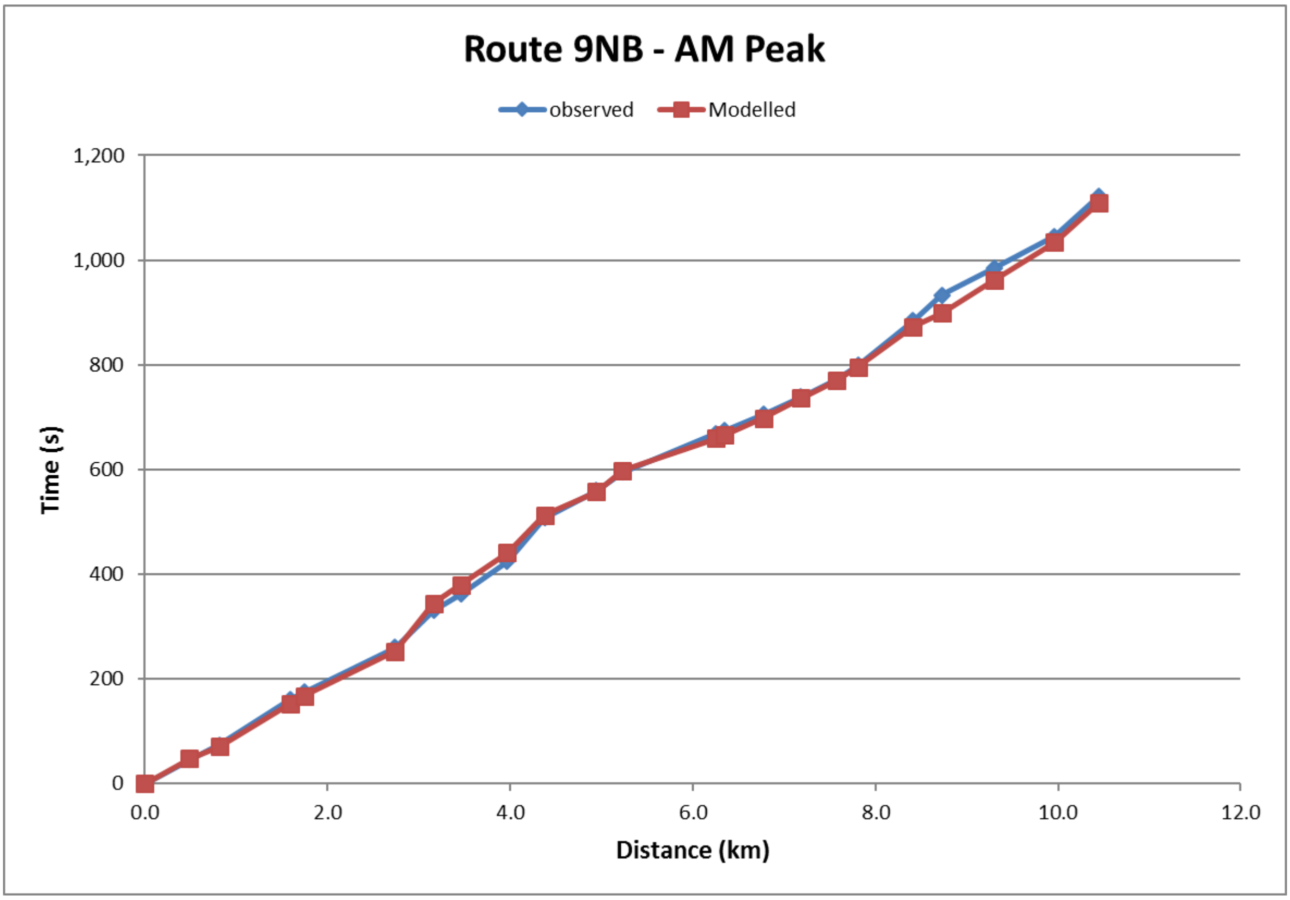

Route 8NB - Inter Peak
Observed
Modelled
Time (s)
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Distance (km)

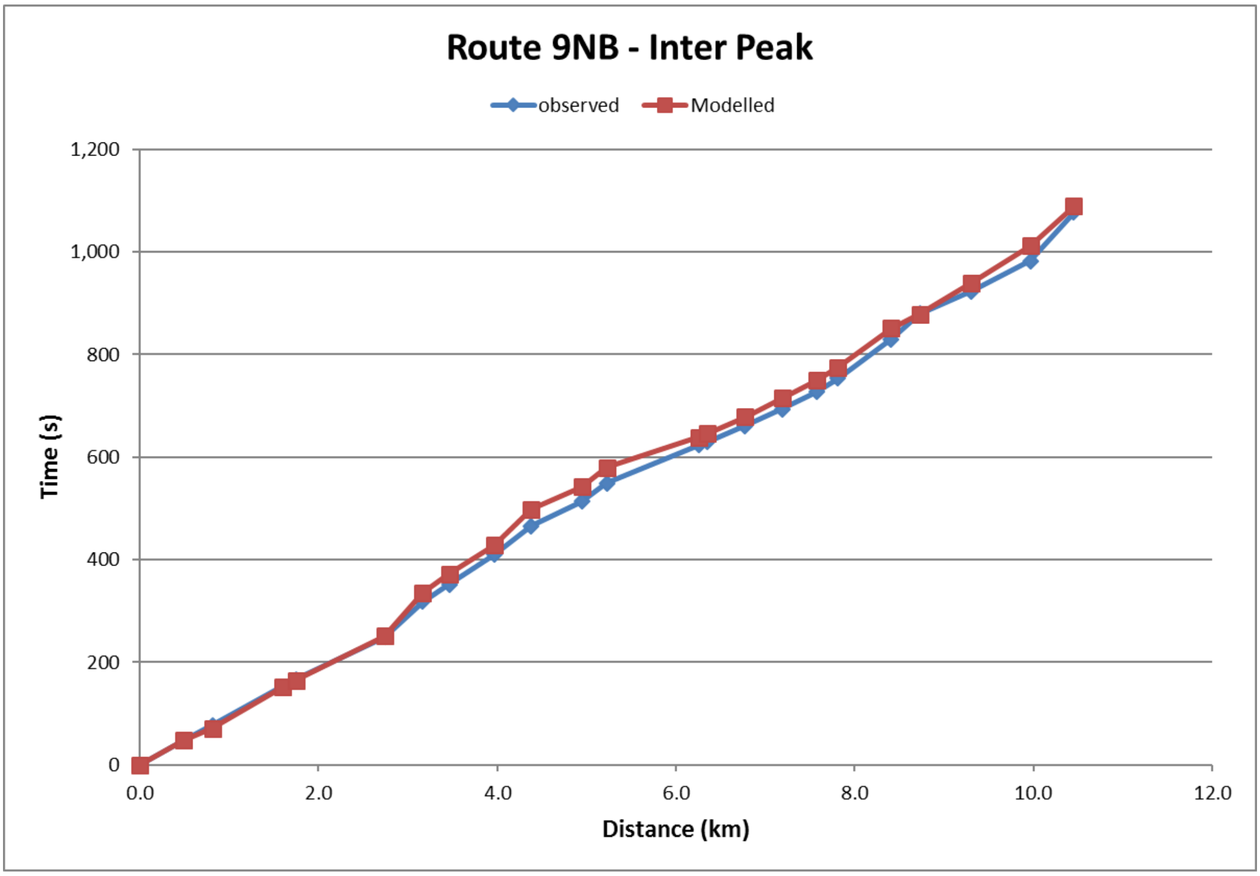

Route 8NB - PM Peak
observed
Modelled
Time (s)
1,400
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Distance (km)

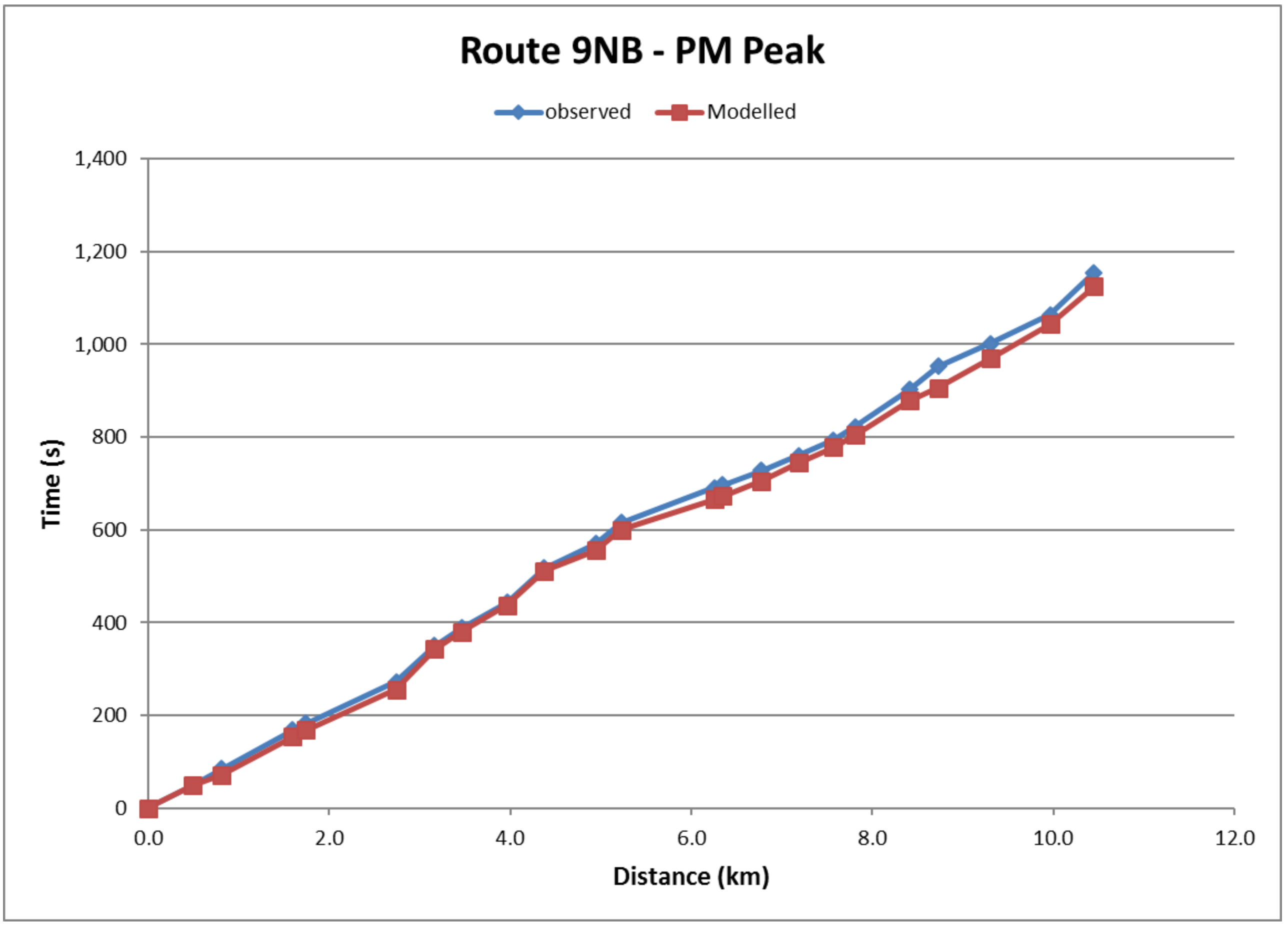

Route 8SB - AM Peak
observed
Modelled
Time (s)
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Distance (km)

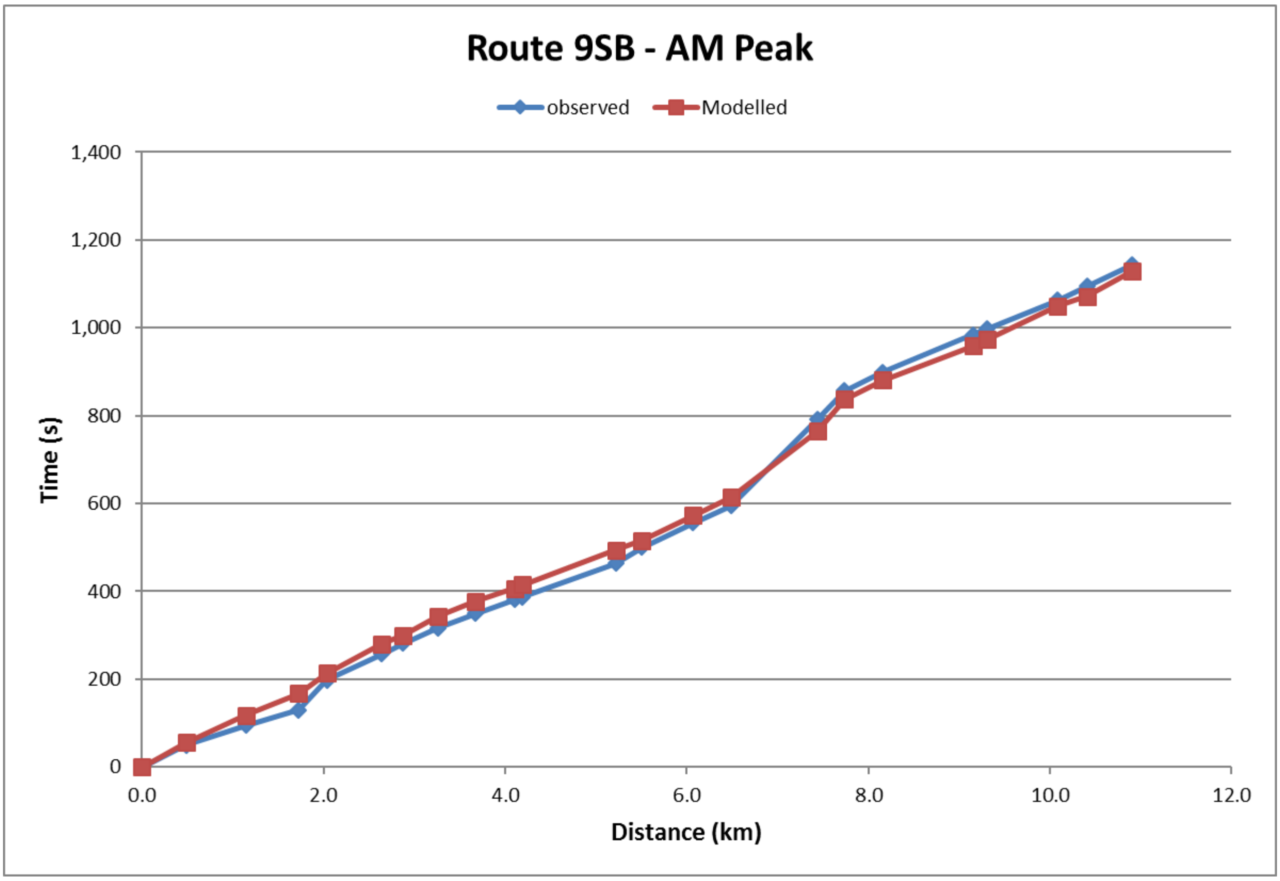

Route 8SB - Inter Peak
observed
Modelled
Time (s)
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Distance (km)

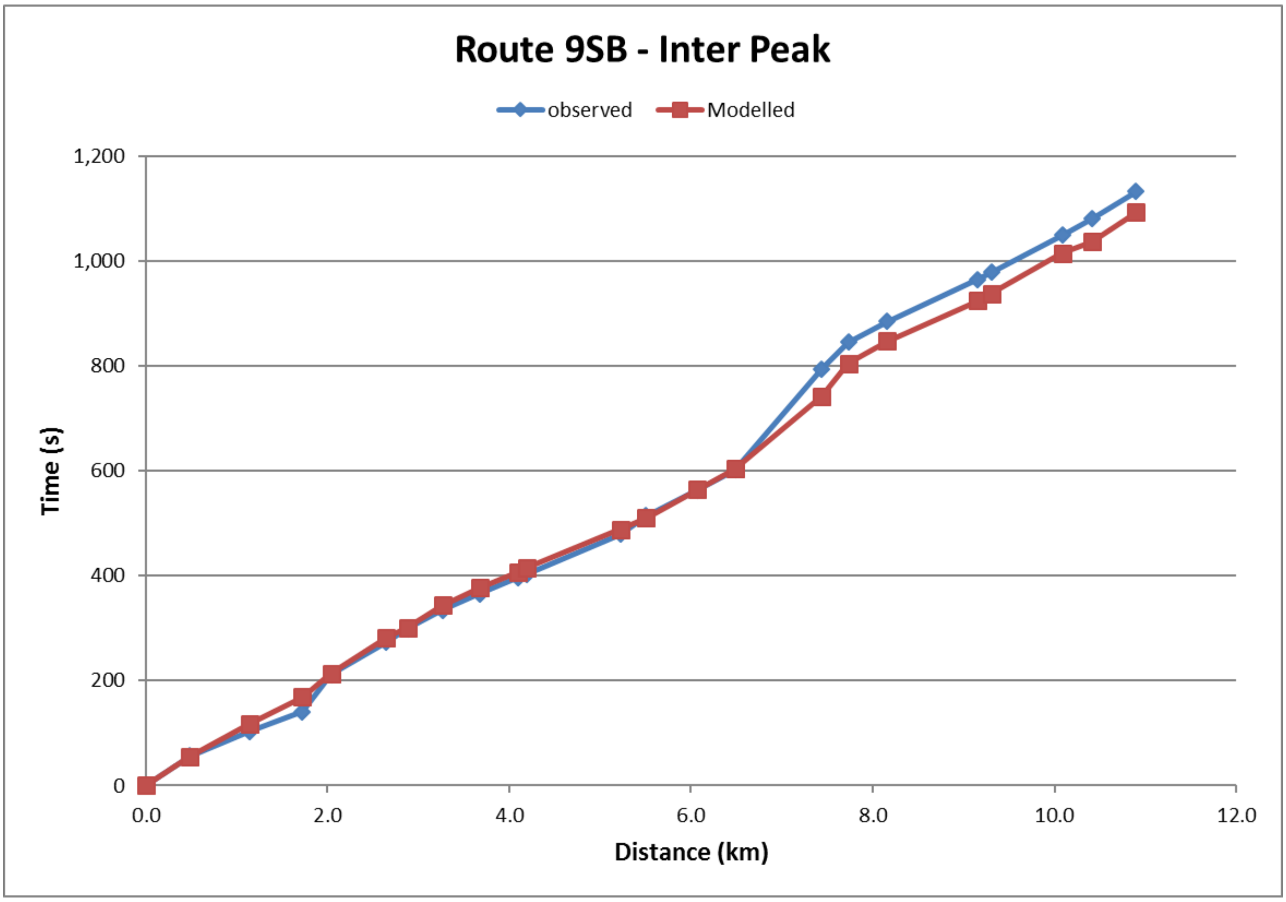

Route 8SB - PM Peak
observed
Modelled
1,200
1,000
800
600
400
200
0
Time (s)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Distance (km)

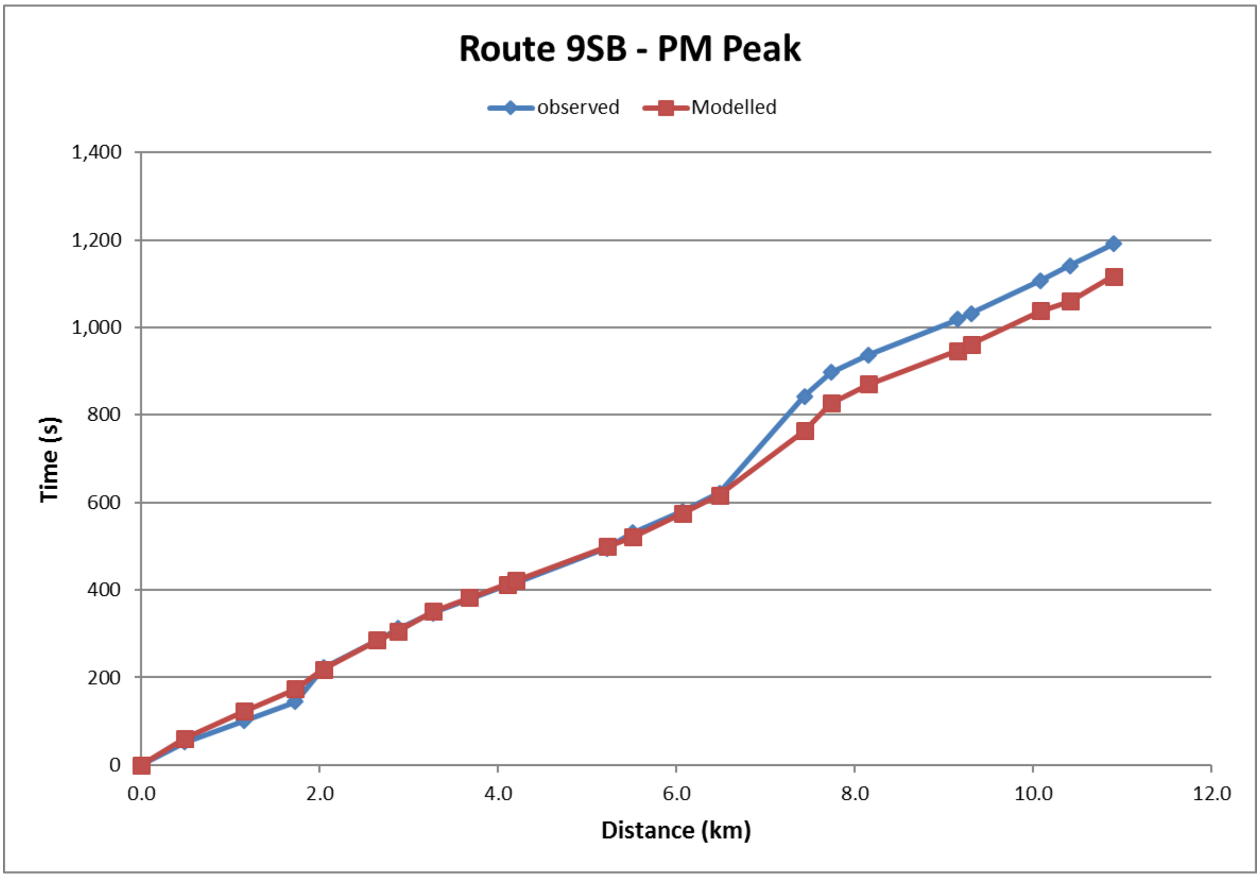

Route 9NB - AM Peak
observed
Modelled
1,200
1,000
800
600
400
200
0
Time (s)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)

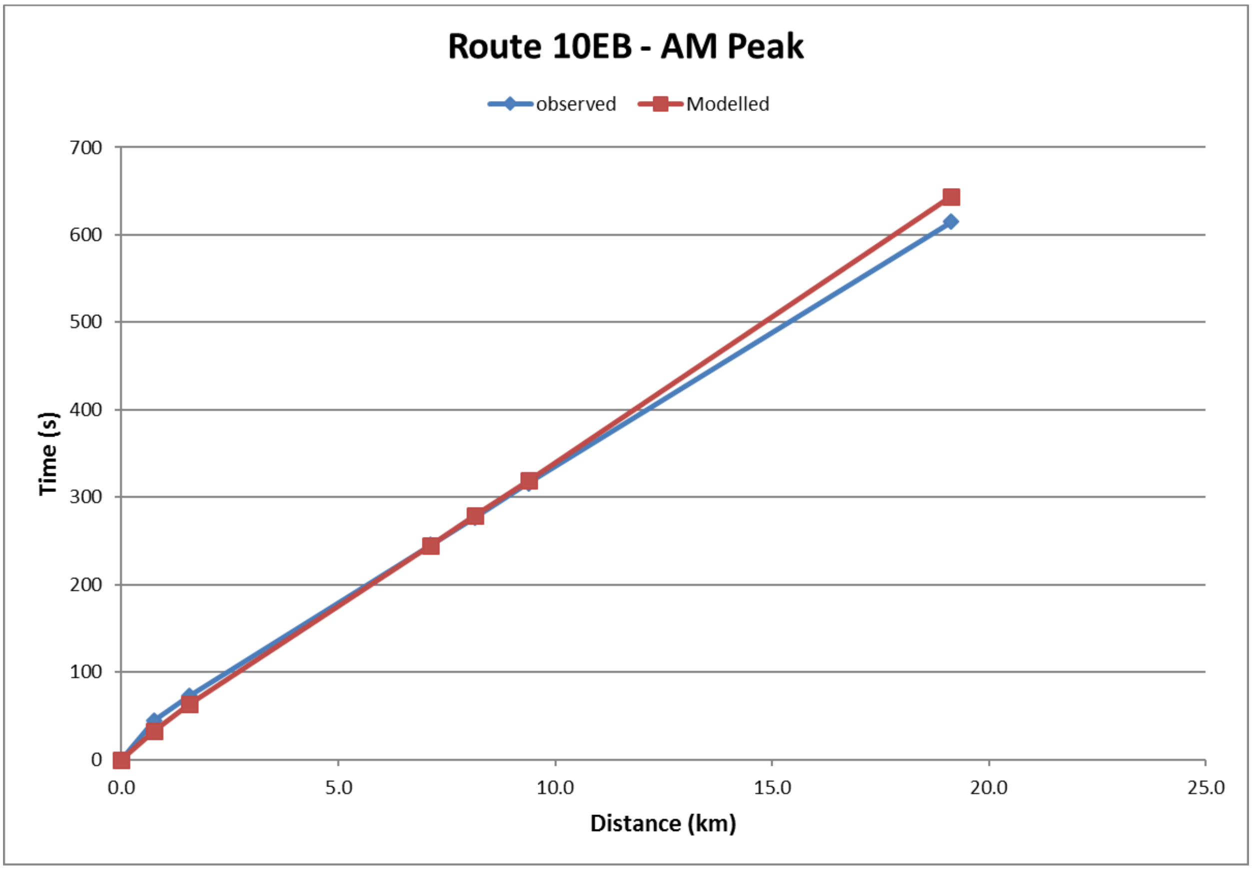

Route 9NB - Inter Peak
observed
Modelled
Time (s)
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)

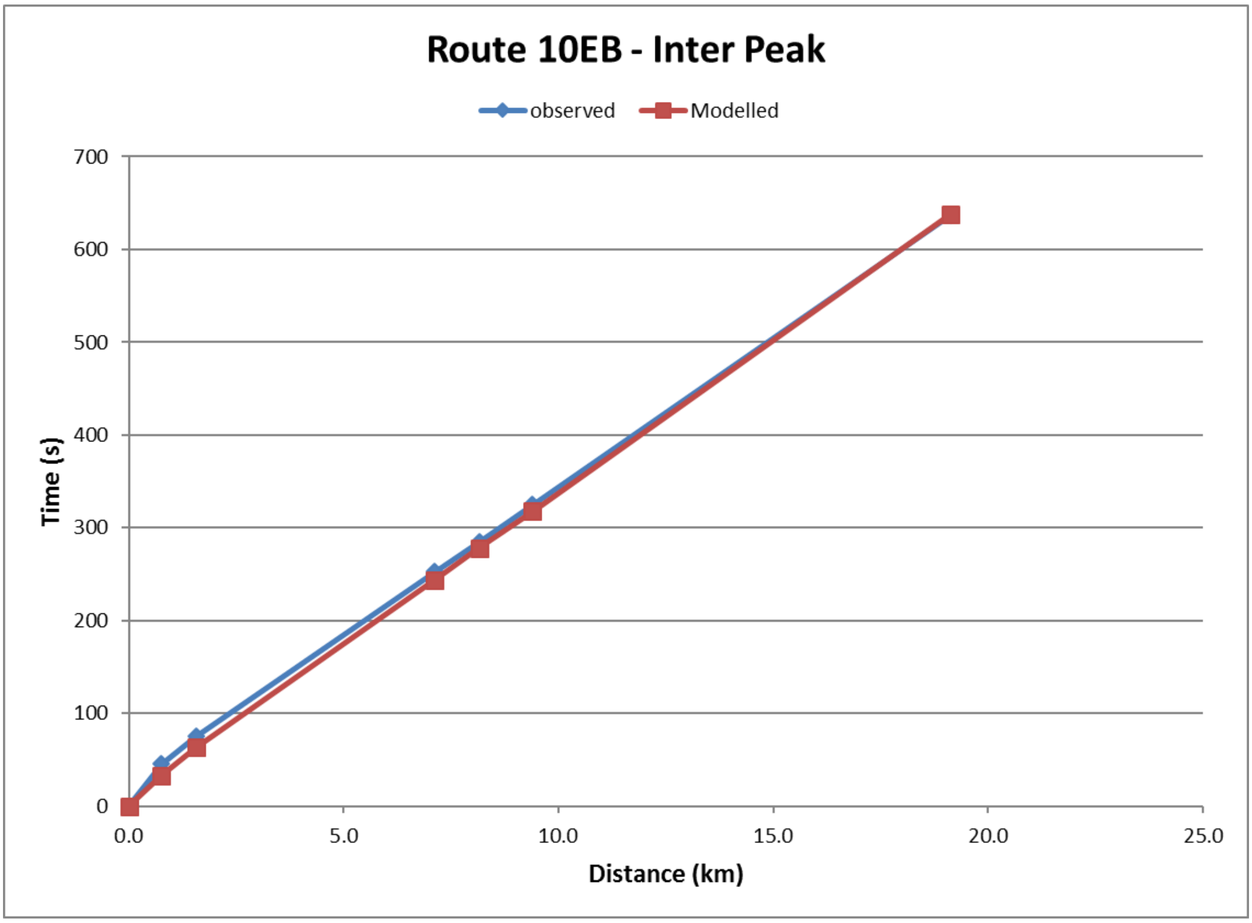

Route 9NB - PM Peak
observed
Modelled
Time (s)
1,400
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)

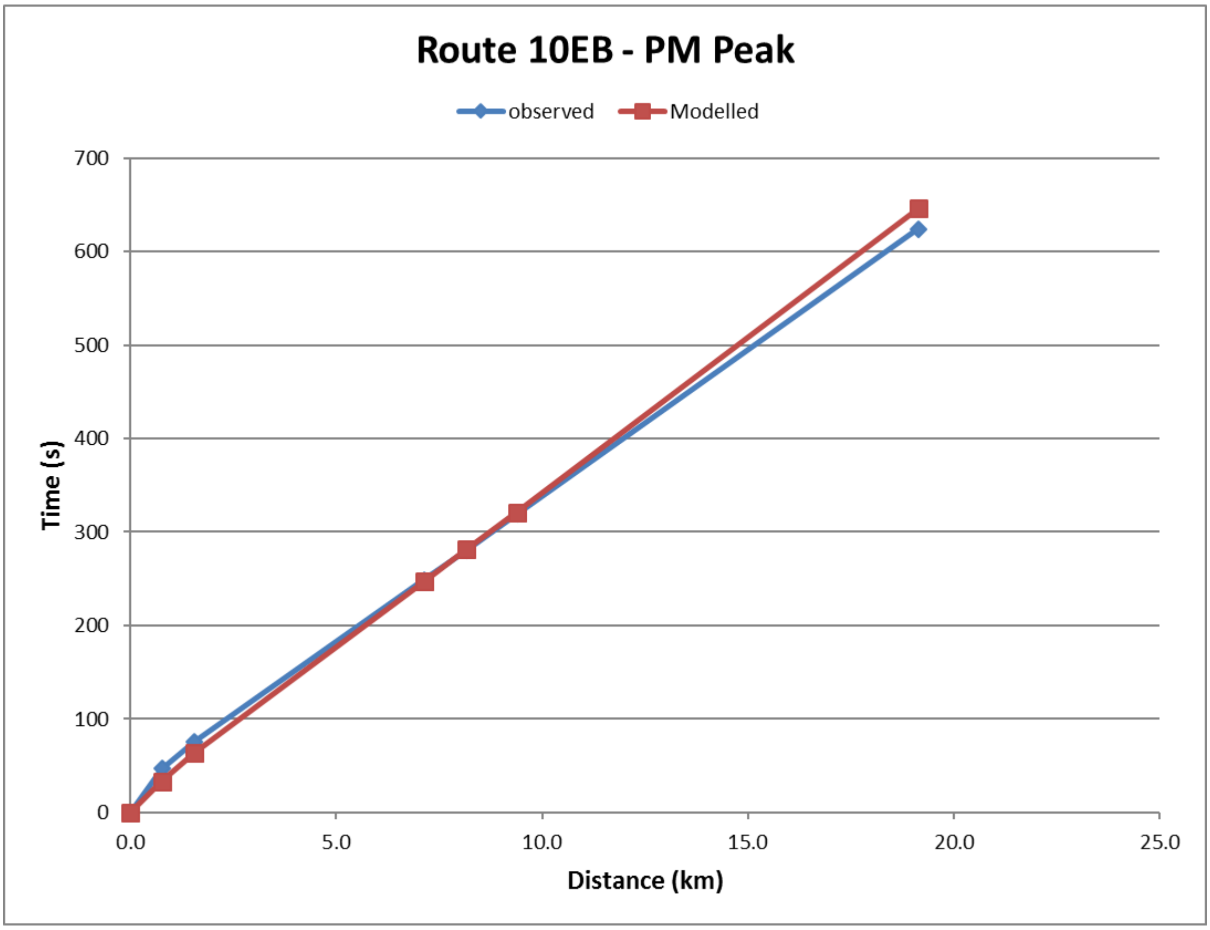

Route 9SB - AM Peak
observed
Modelled
Time (s)
0
200
400
600
800
1,000
1,200
1,400
Distance (km)
0.0
2.0
4.0
6.0
8.0
10.0
12.0

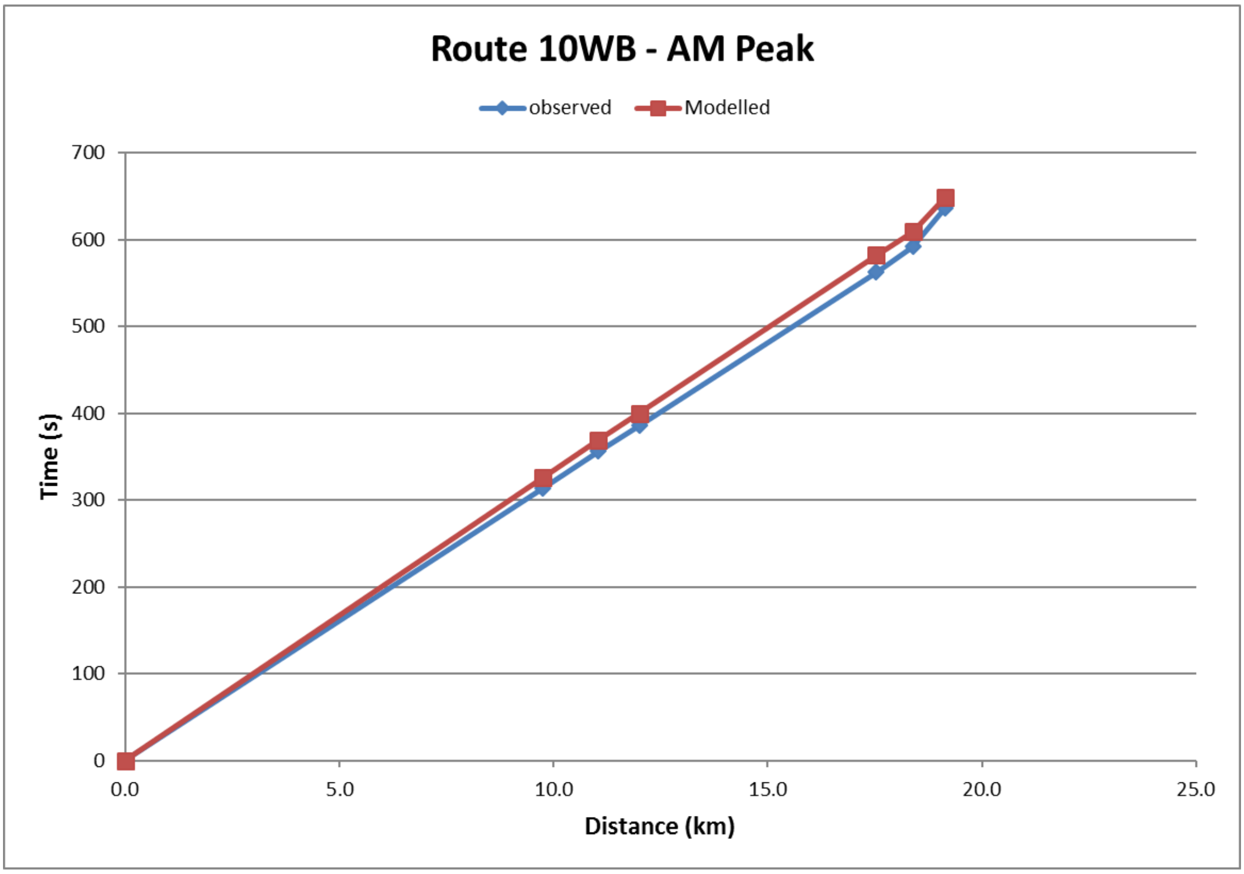

Route 9SB - Inter Peak
observed
Modelled
Time (s)
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)

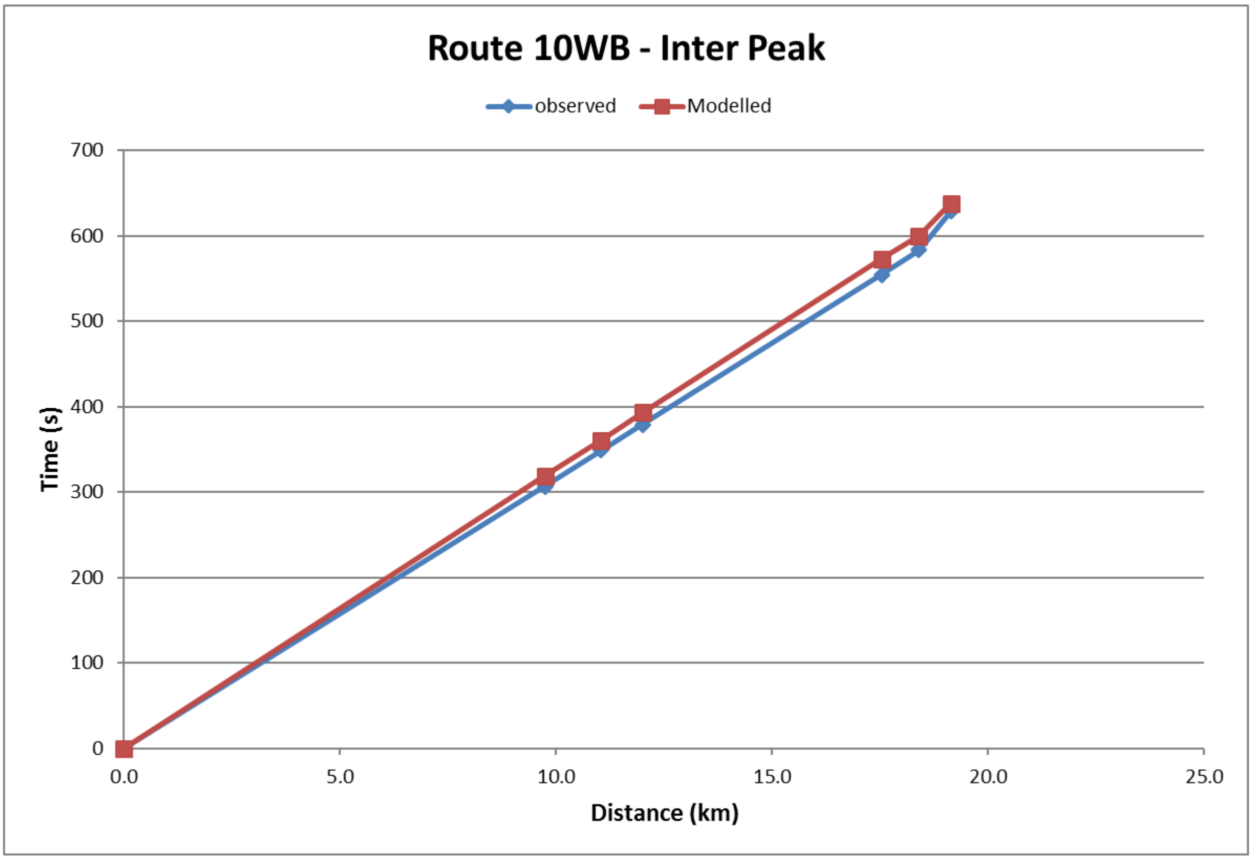

Route 9SB - PM Peak
observed
Modelled
Time (s)
1,400
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)

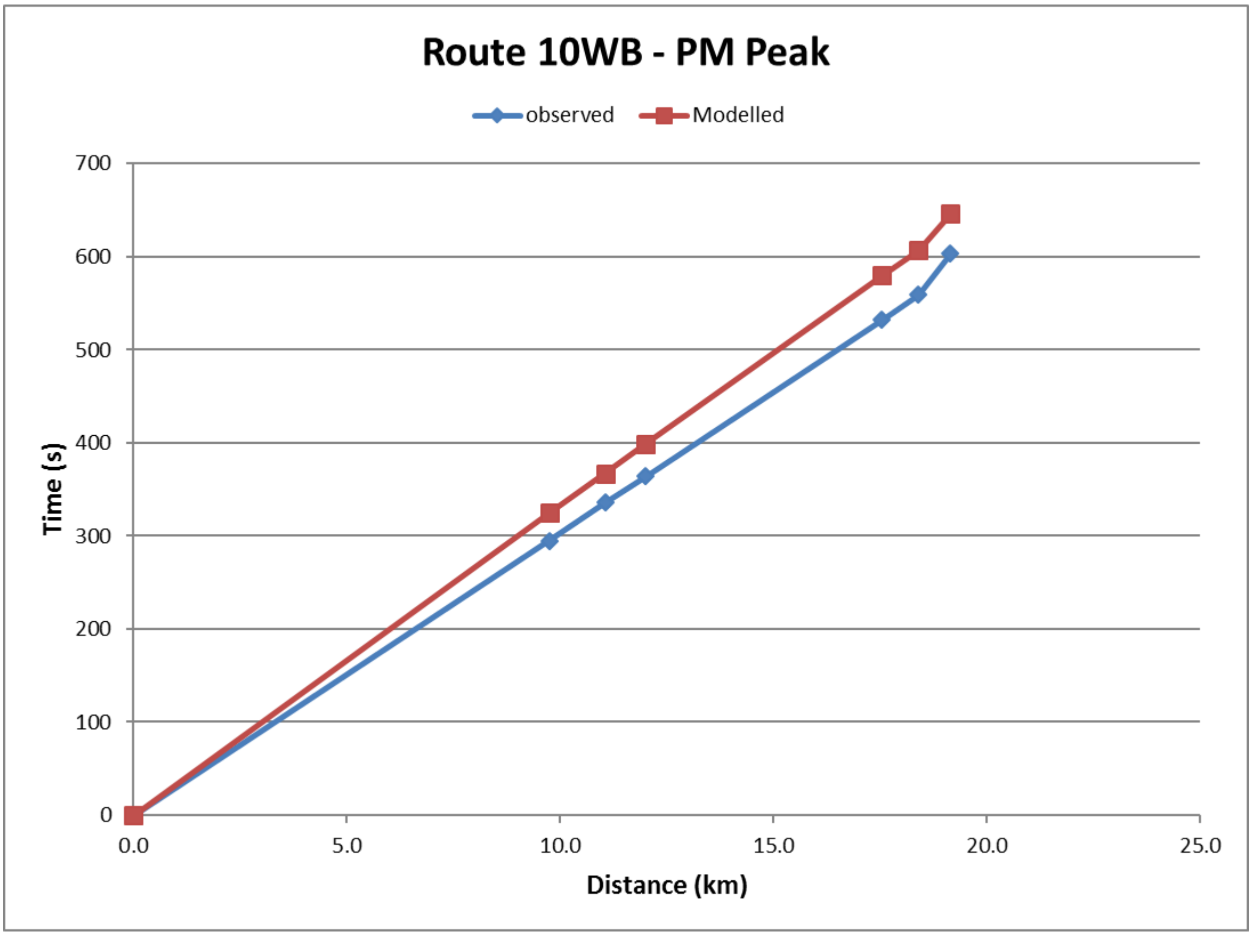

Route 10EB - AM Peak
observed
Modelled
Time (s)
700
600
500
400
300
200
100
0
0.0
5.0
10.0
15.0
20.0
25.0
Distance (km)

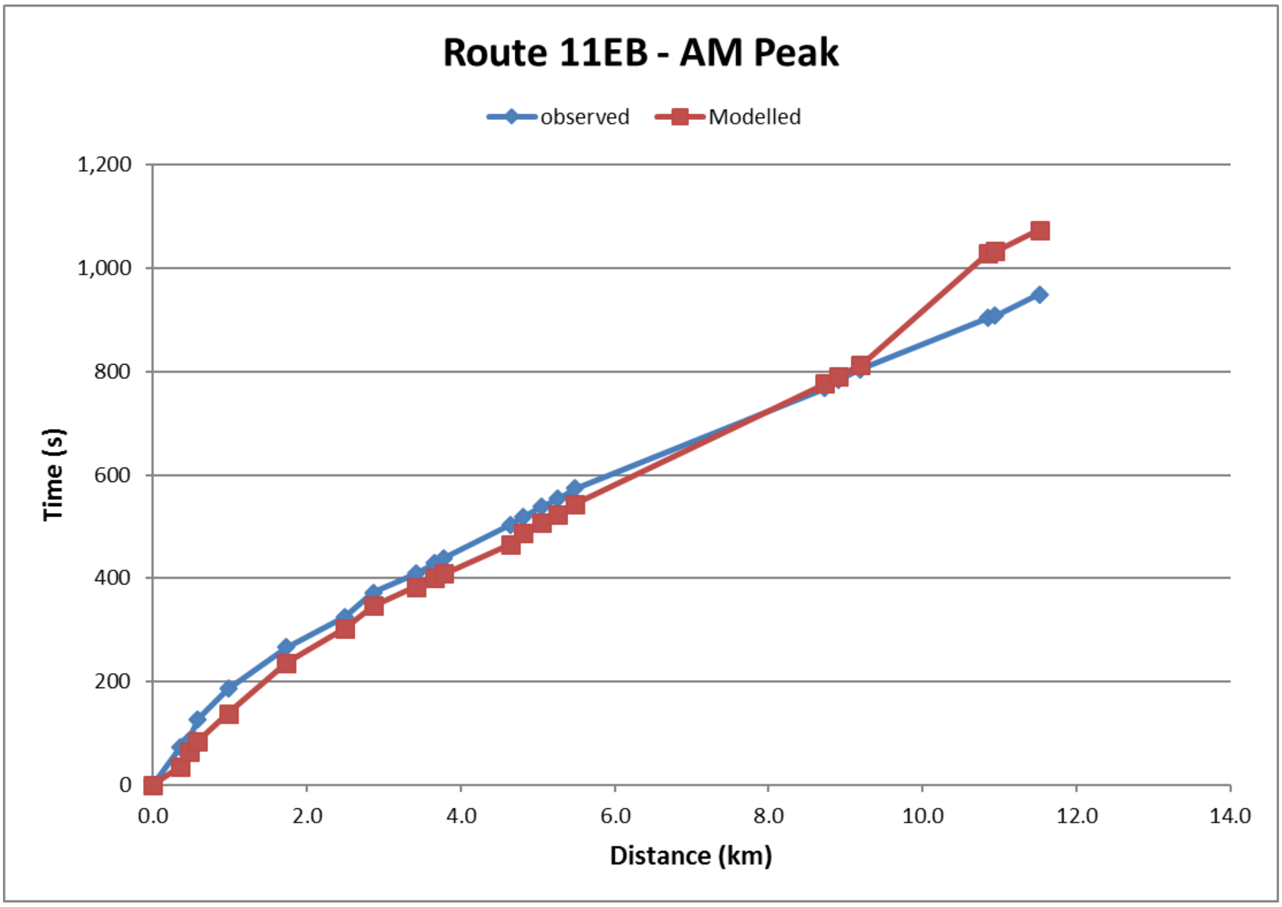

Route 10EB - Inter Peak
observed
Modelled
Time (s)
0
100
200
300
400
500
600
700
0.0
5.0
10.0
15.0
20.0
25.0
Distance (km)

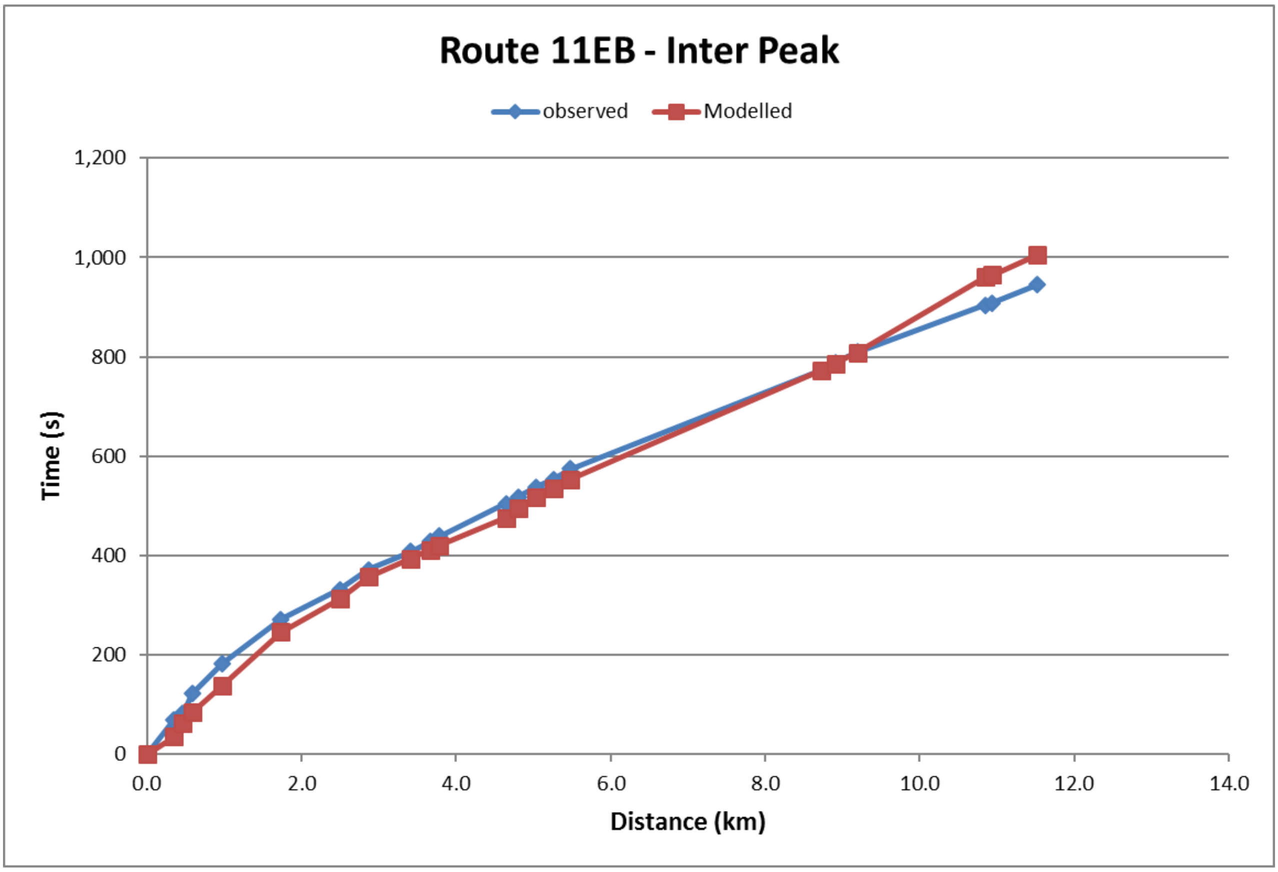

Route 10EB - PM Peak
observed
Modelled
Time (s)
700
600
500
400
300
200
100
0
0.0
5.0
10.0
15.0
20.0
25.0
Distance (km)

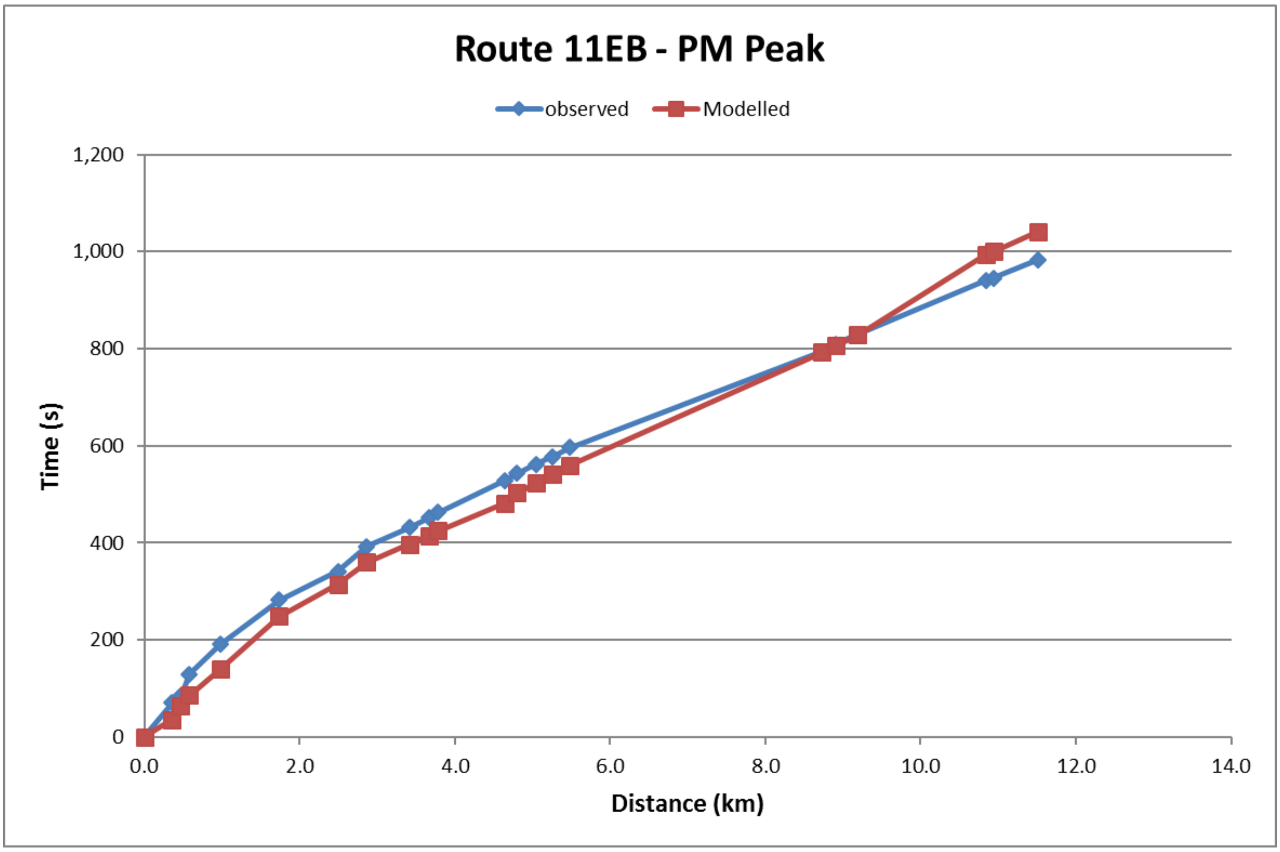

Route 10WB - AM Peak
observed
Modelled
700
600
500
400
300
200
100
0
Time (s)
0.0
5.0
10.0
15.0
20.0
25.0
Distance (km)

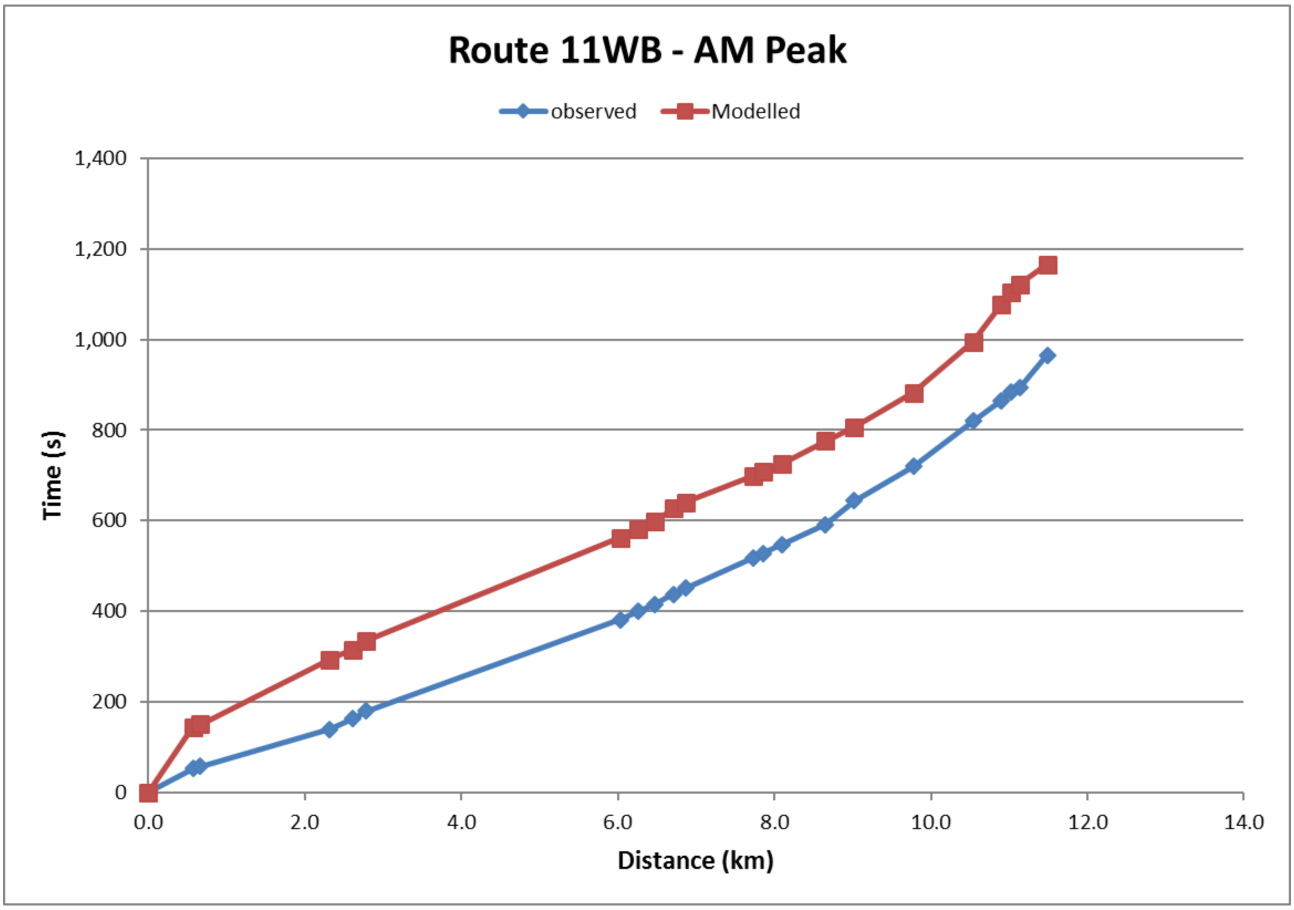

Route 10WB - Inter Peak
observed
Modelled
700
600
500
400
300
200
100
0
Time (s)
0.0
5.0
10.0
15.0
20.0
25.0
Distance (km)

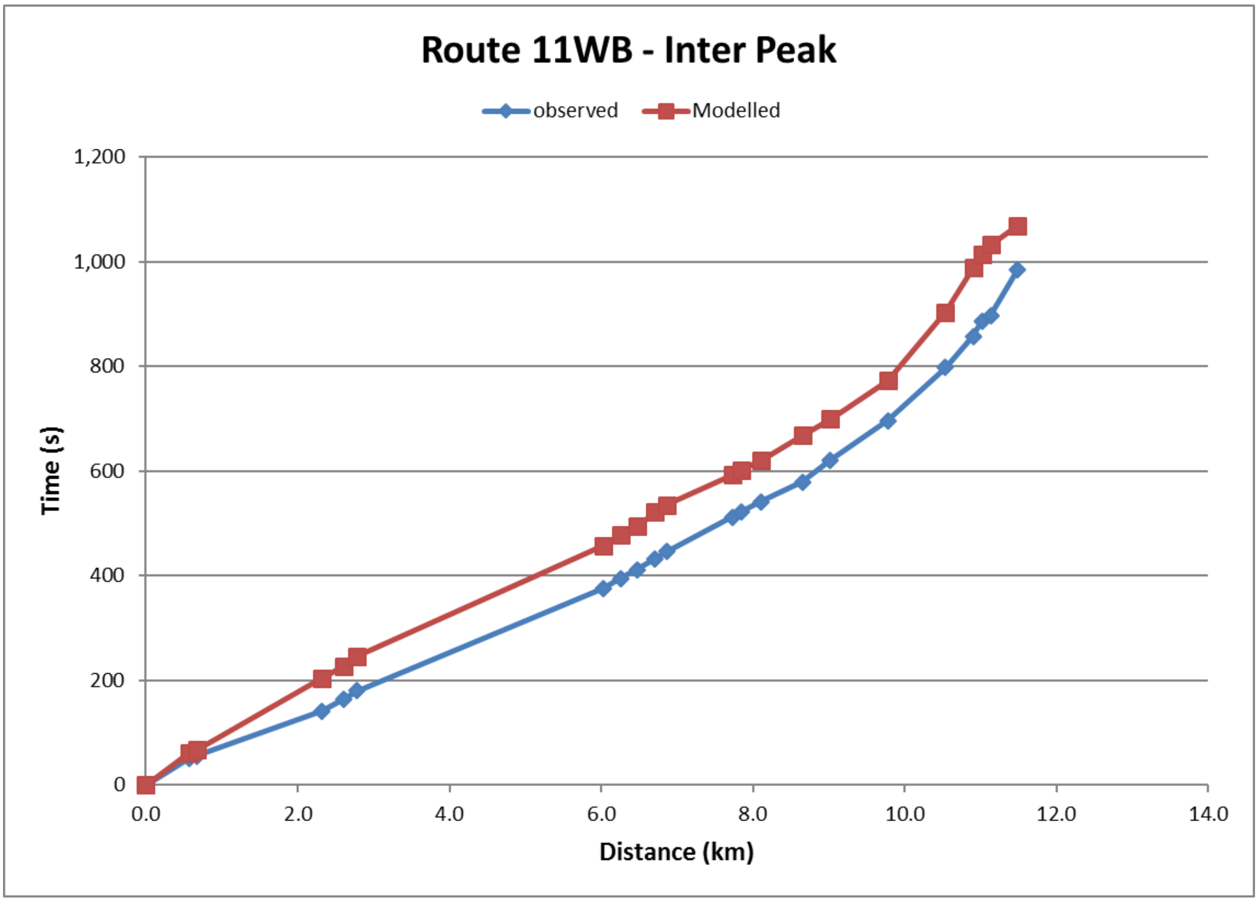

Route 10WB - PM Peak
observed
Modelled
Time (s)
700
600
500
400
300
200
100
0
0.0
5.0
10.0
15.0
20.0
25.0
Distance (km)

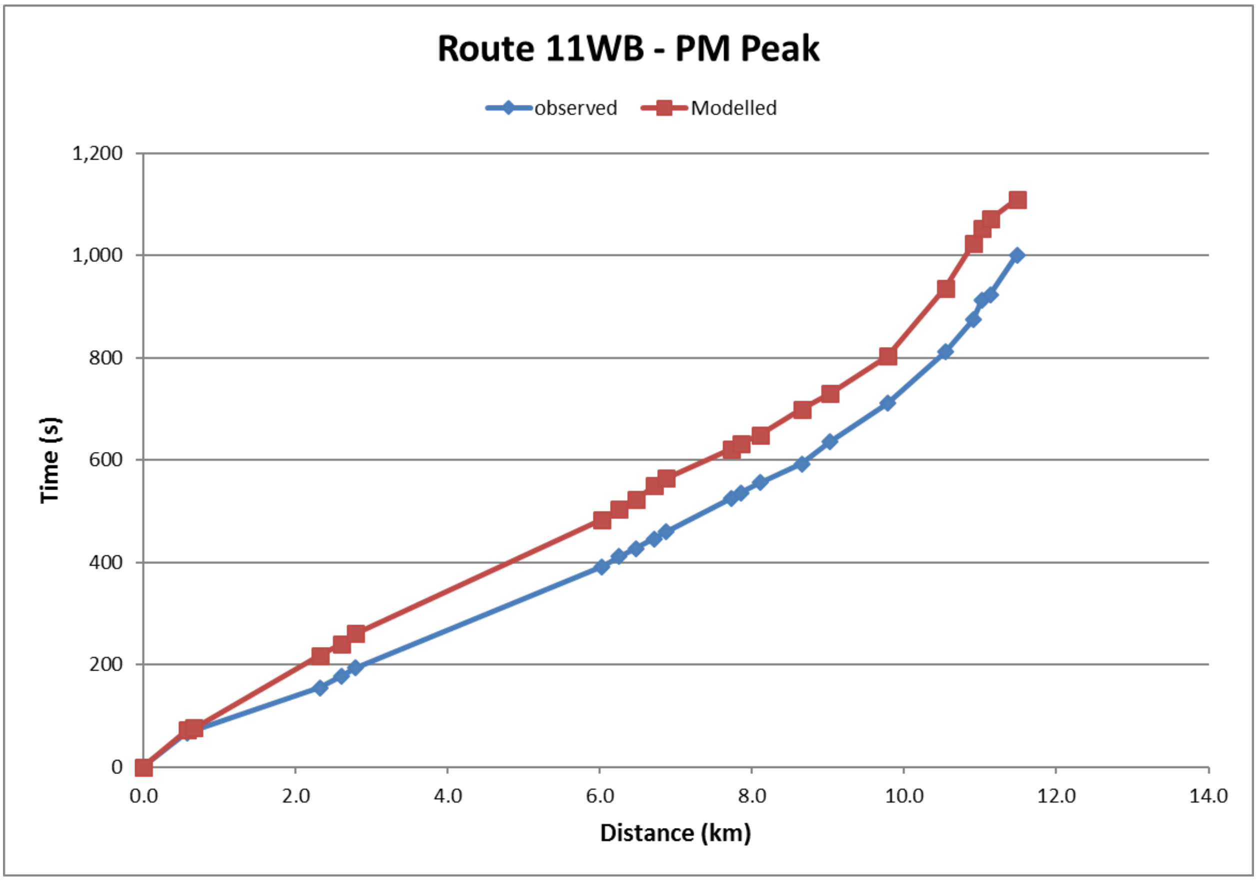

Route 11EB - AM Peak
observed
Modelled
Time (s)
0
200
400
600
800
1,000
1,200
Distance (km)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0

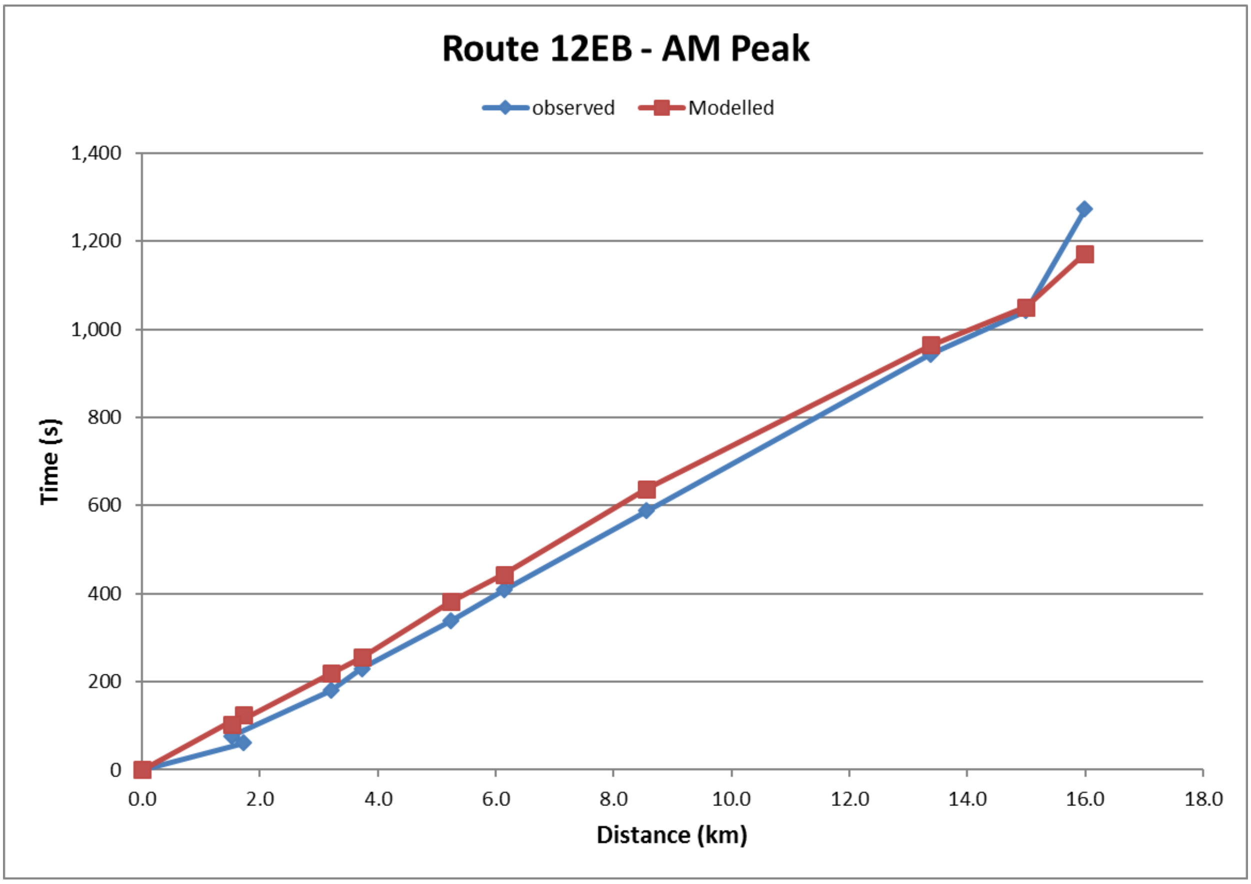

Route 11EB - Inter Peak
observed
Modelled
Time (s)
0
200
400
600
800
1,000
1,200
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Distance (km)

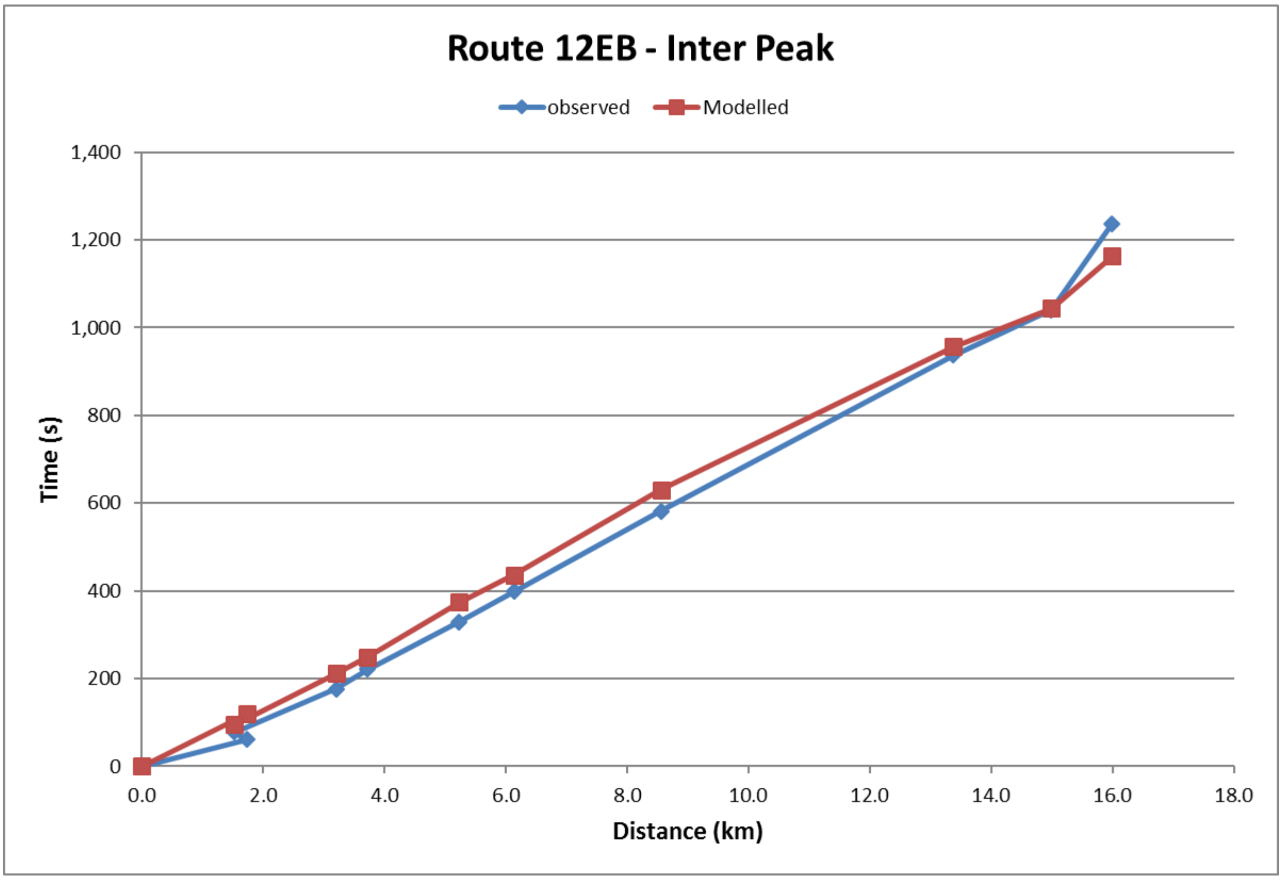

Route 11EB - PM Peak
observed
Modelled
Time (s)
0
200
400
600
800
1,000
1,200
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Distance (km)

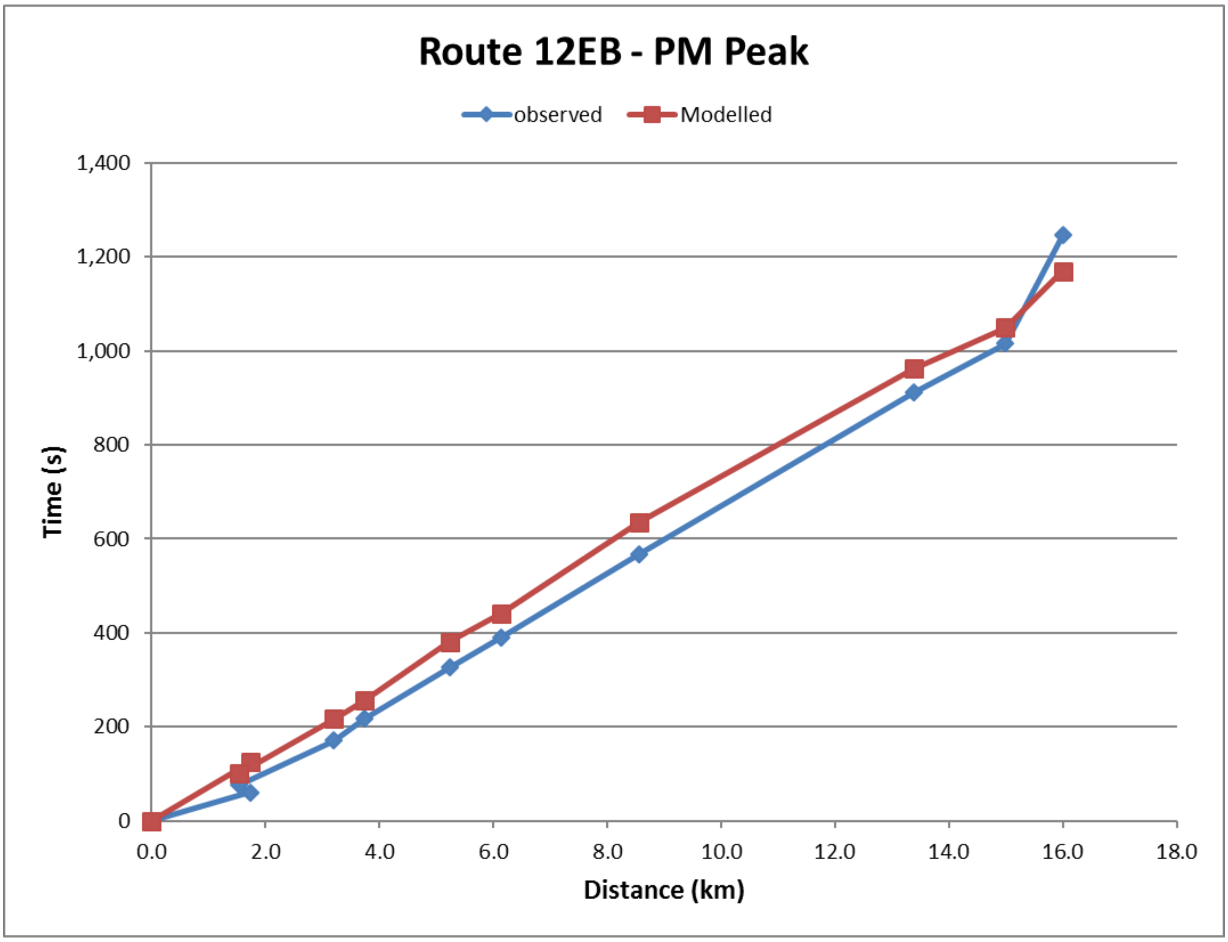

Route 11WB - AM Peak
observed
Modelled
Time (s)
1,400
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Distance (km)

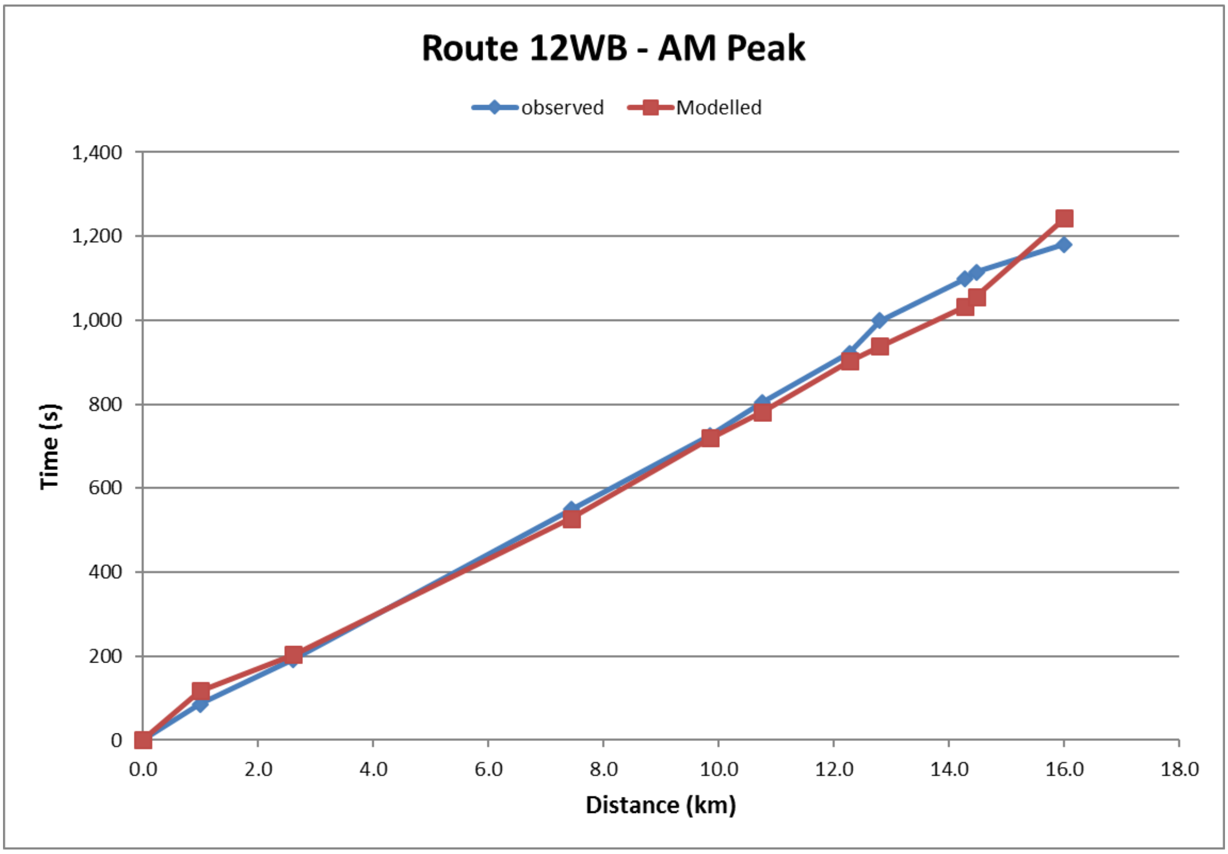

Route 11WB - Inter Peak
observed
Modelled
1,200
1,000
800
600
400
200
0
Time (s)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Distance (km)


Route 11WB - PM Peak
observed
Modelled
Time (s)
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Distance (km)

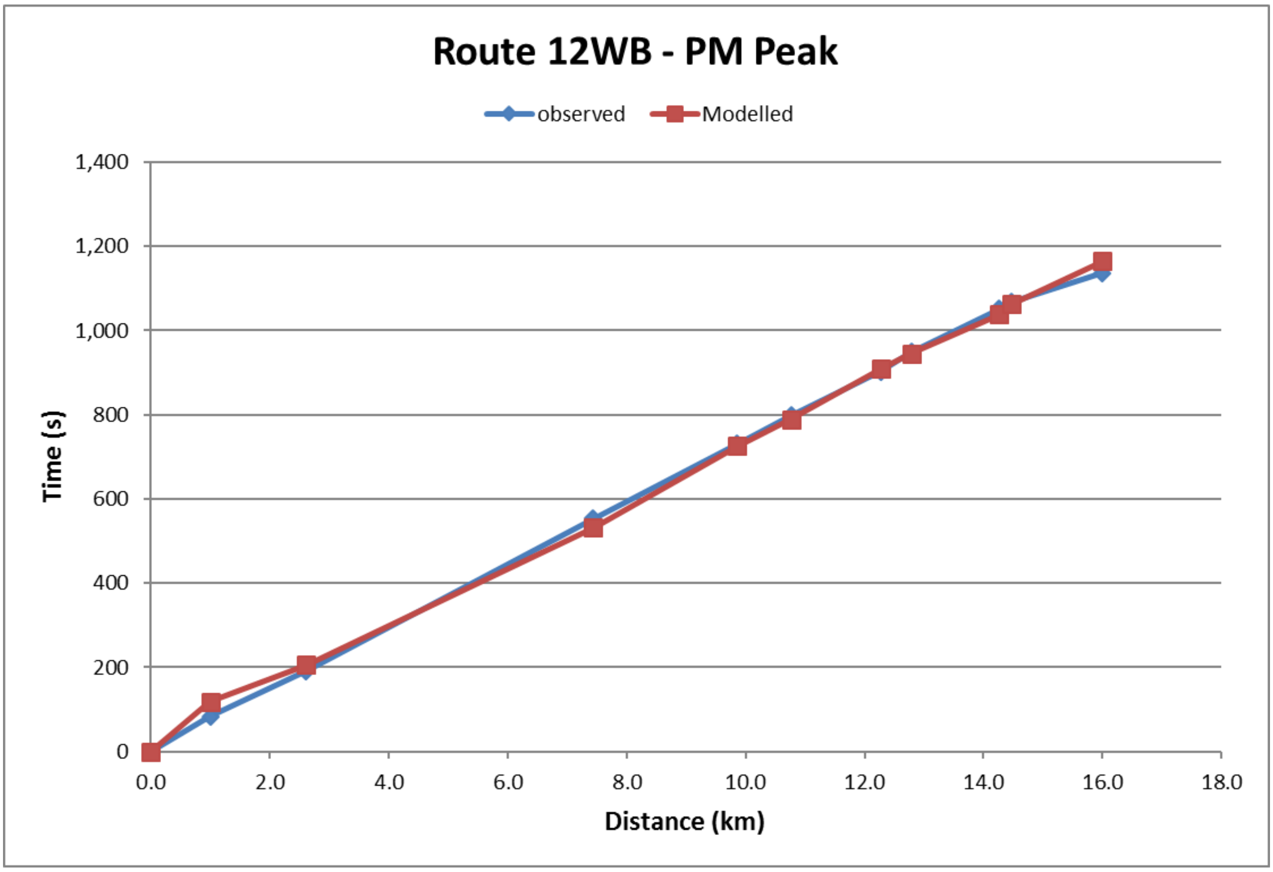

Route 12EB - AM Peak
observed
Modelled
Time (s)
1,400
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
Distance (km)

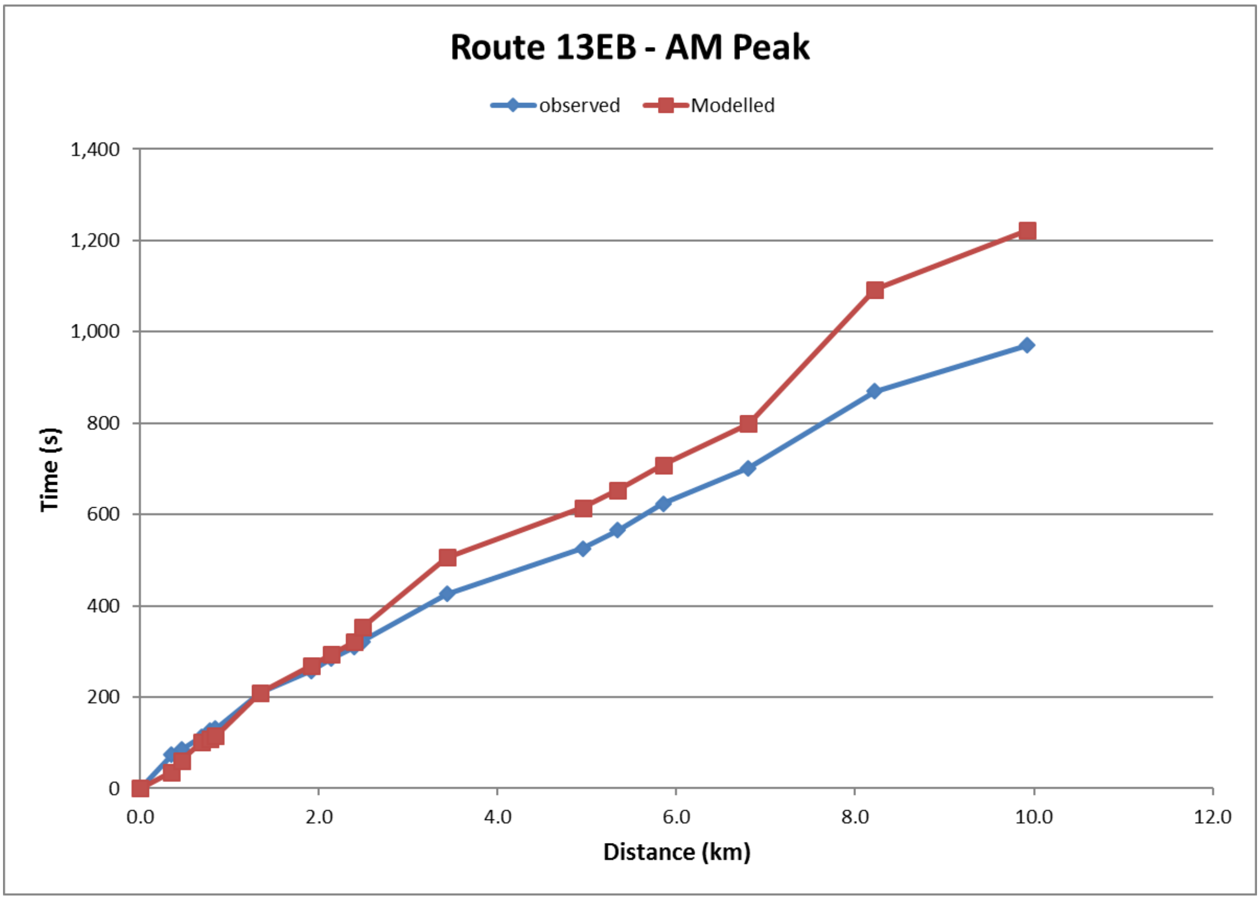

Route 12EB - Inter Peak
observed
Modelled
Time (s)
1,400
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
Distance (km)

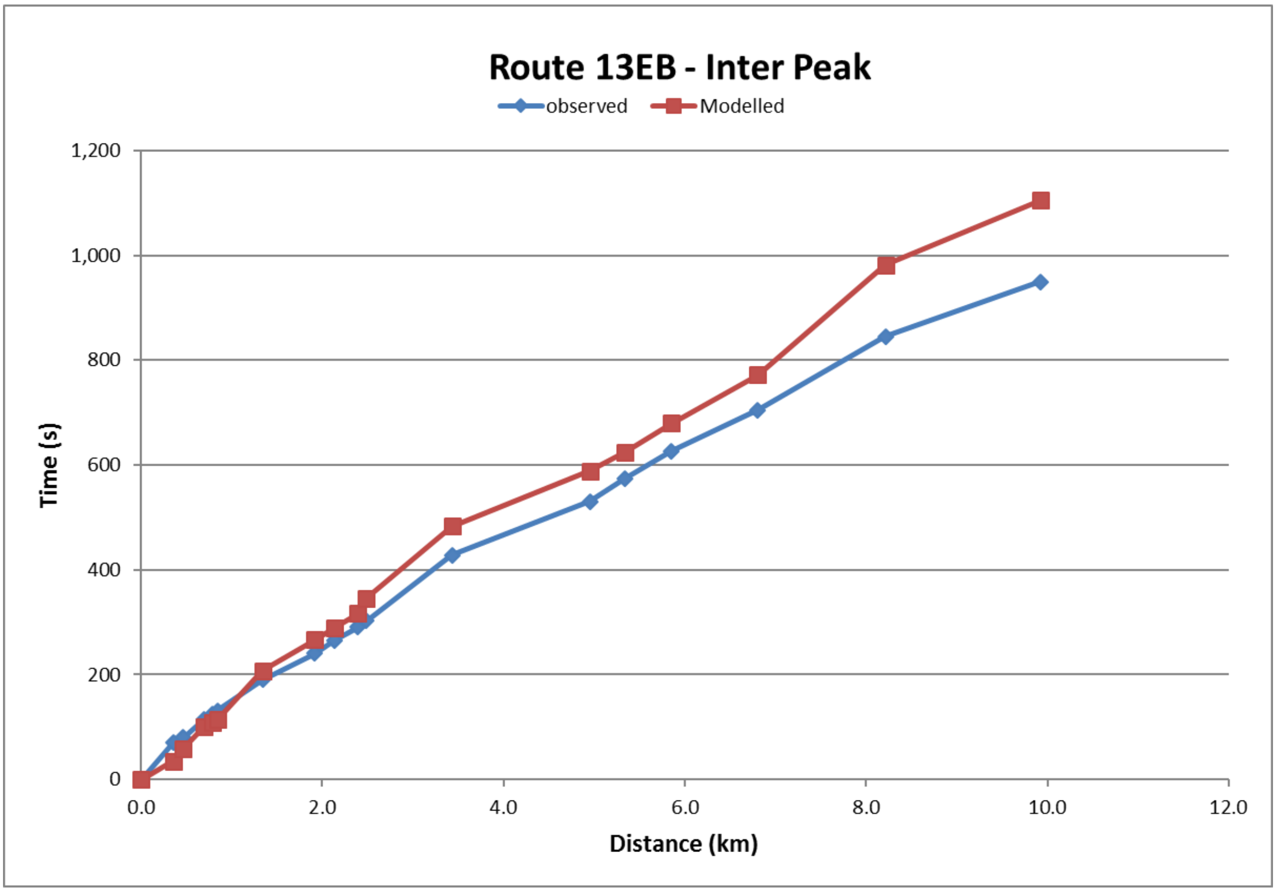

Route 12EB - PM Peak
observed
Modelled
Time (s)
0
200
400
600
800
1,000
1,200
1,400
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
Distance (km)

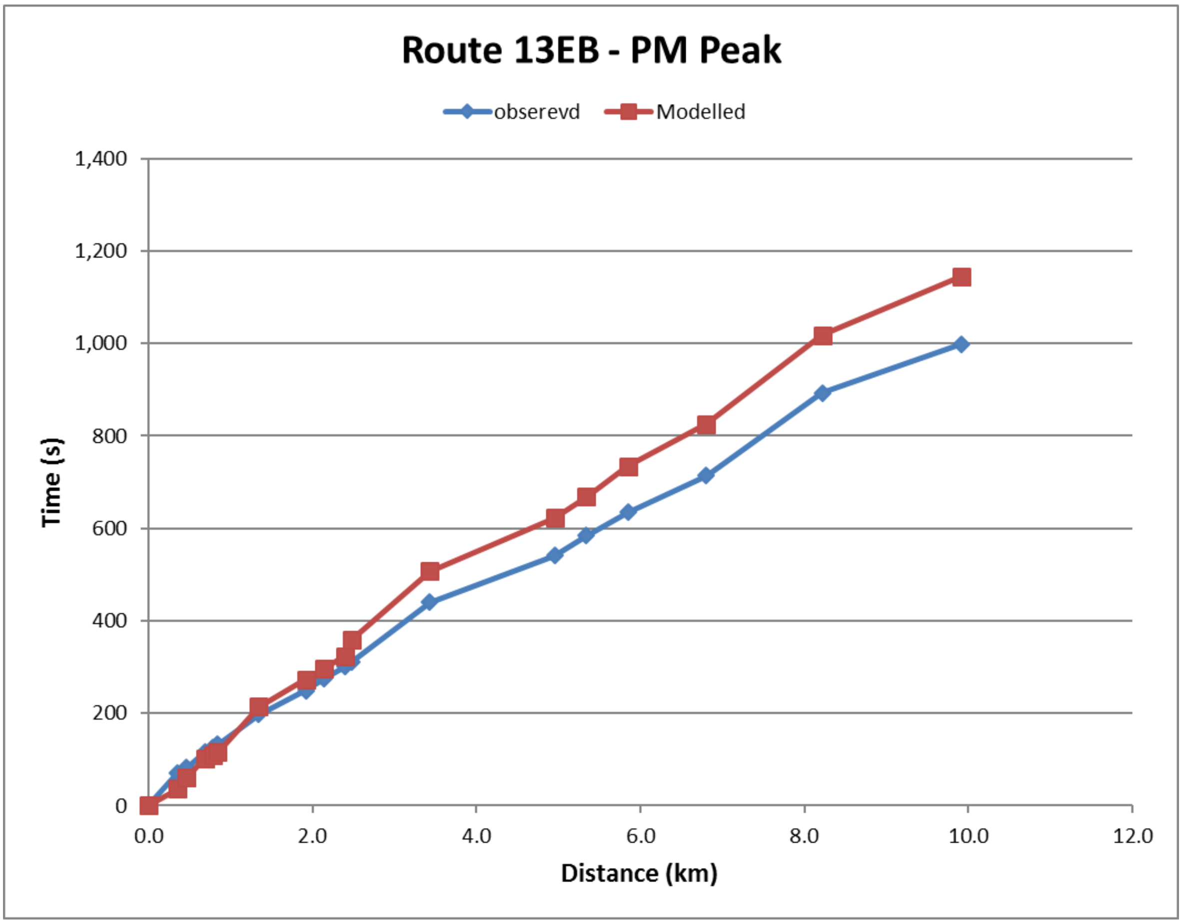

Route 12WB - AM Peak
observed
Modelled
Time (s)
1,400
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
Distance (km)

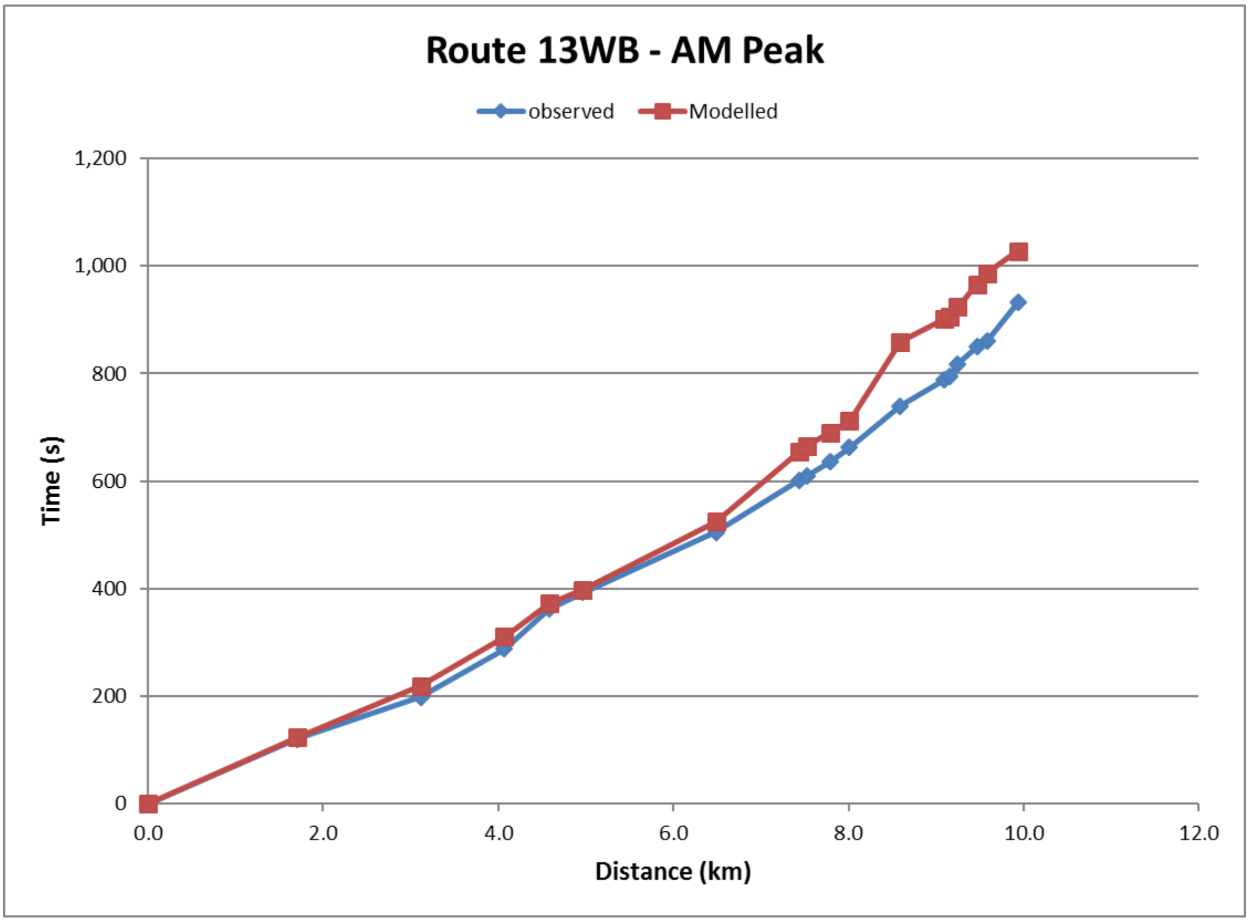

Route 12WB - Inter Peak
observed
Modelled
Time (s)
1,400
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
Distance (km)

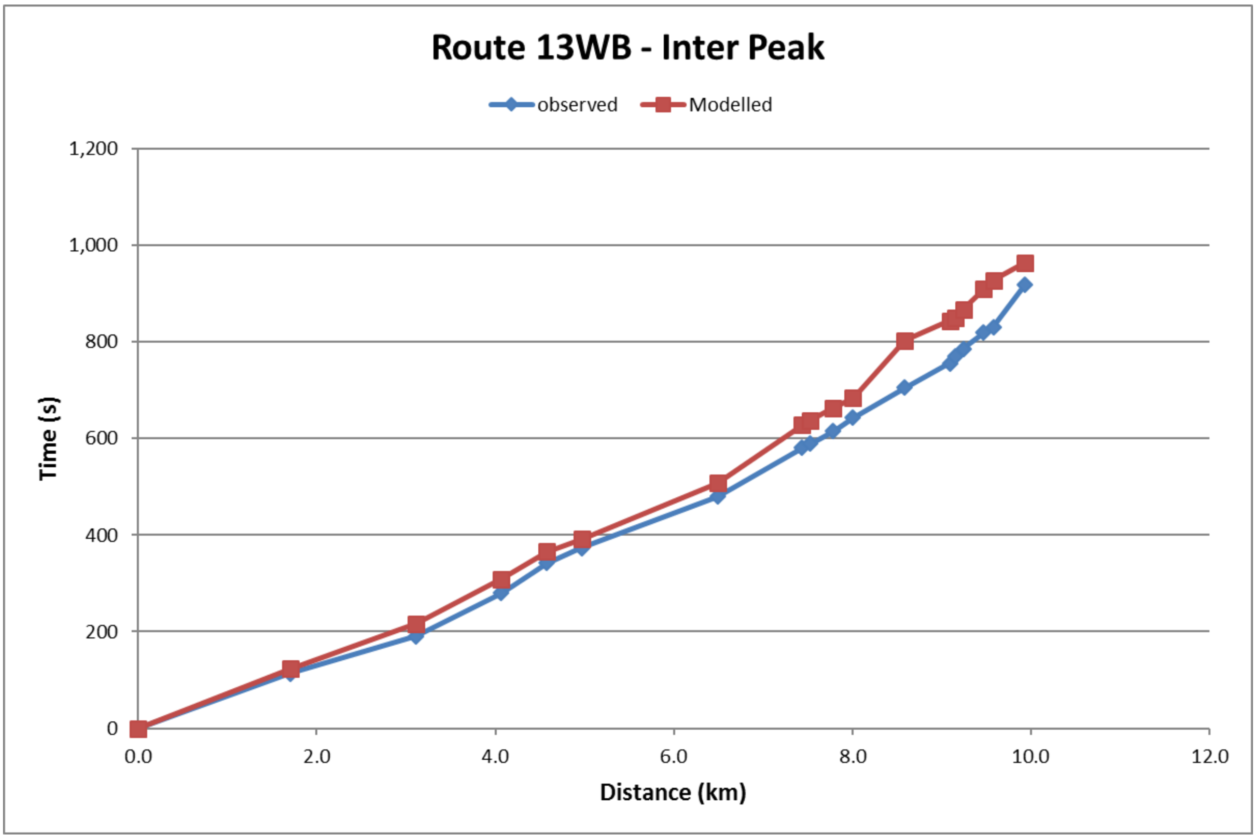

Route 12WB - PM Peak
observed
Modelled
1,400
1,200
1,000
800
600
400
200
0
Time (s)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
Distance (km)

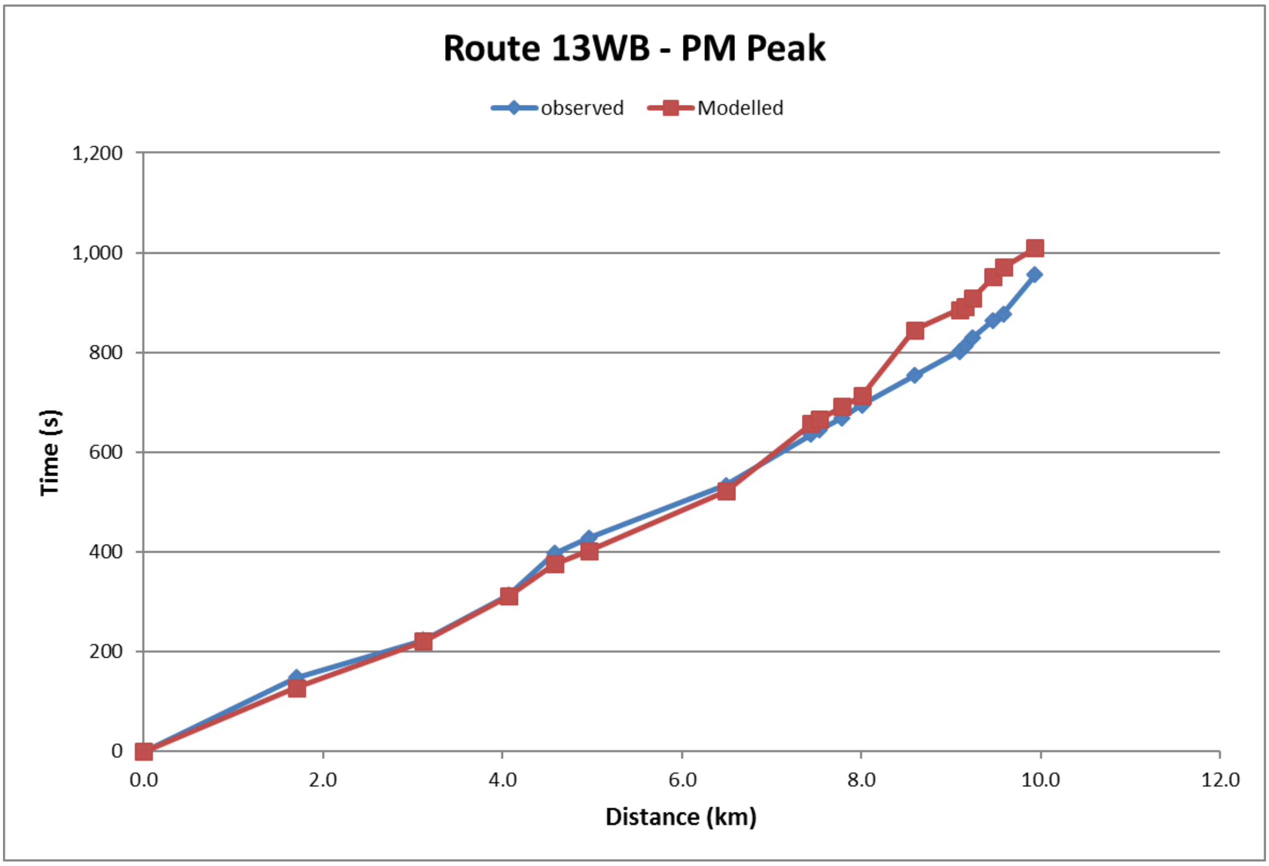

Route 13EB - AM Peak
observed
Modelled
1,400
1,200
1,000
800
600
400
200
0
Time (s)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)

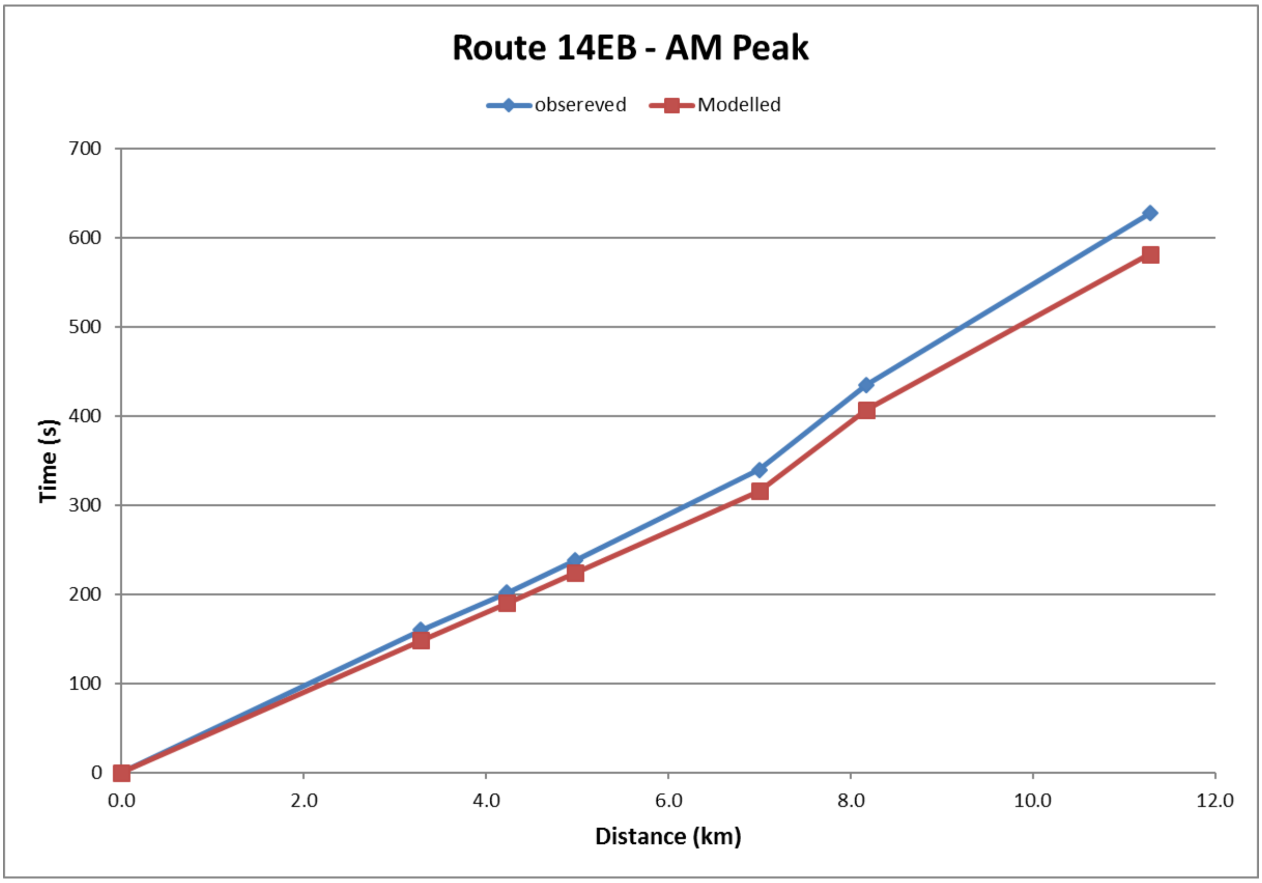

Route 13EB - Inter Peak
observed
Modelled
Time (s)
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)

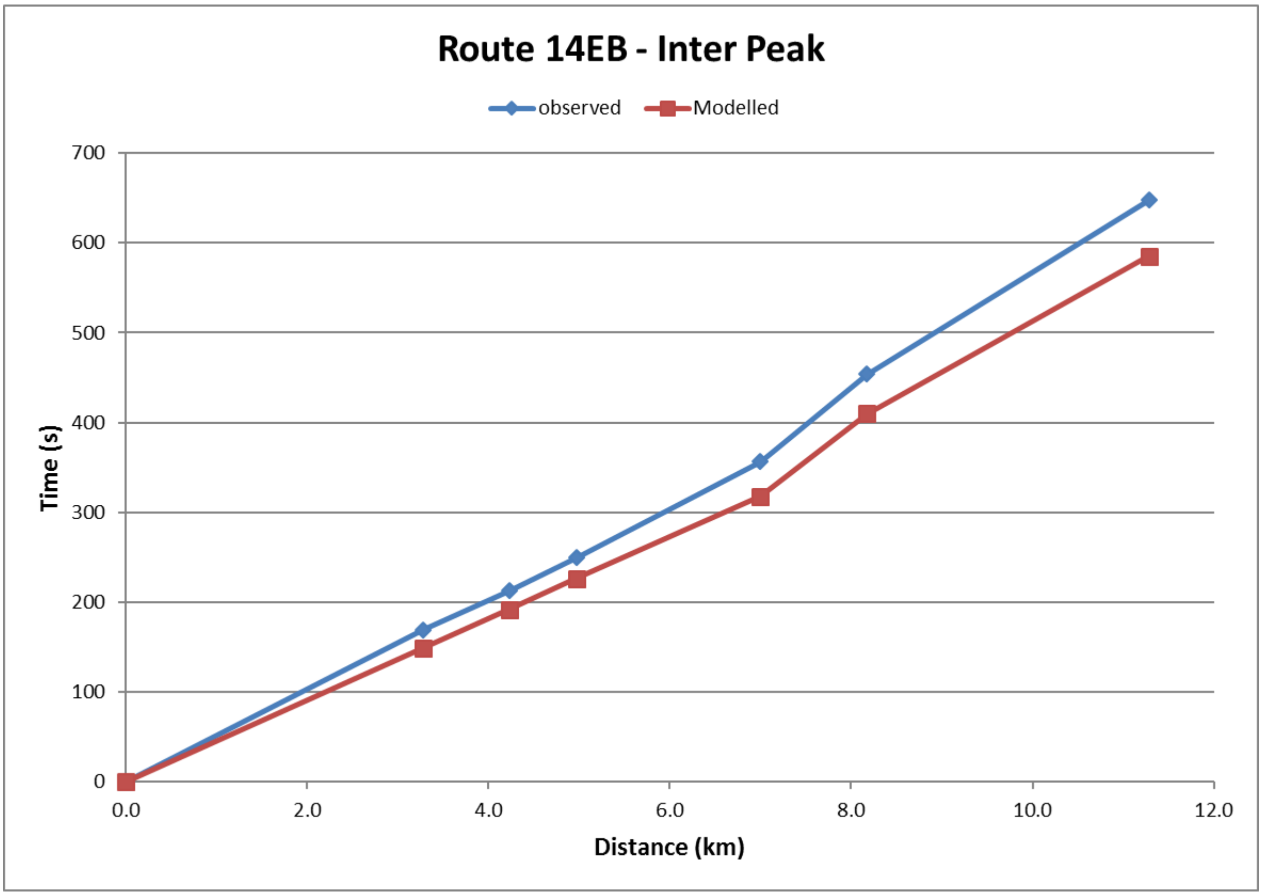

Route 13EB - PM Peak
obserevd
Modelled
Time (s)
1,400
1,200
1,000
800
600
400
200
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)

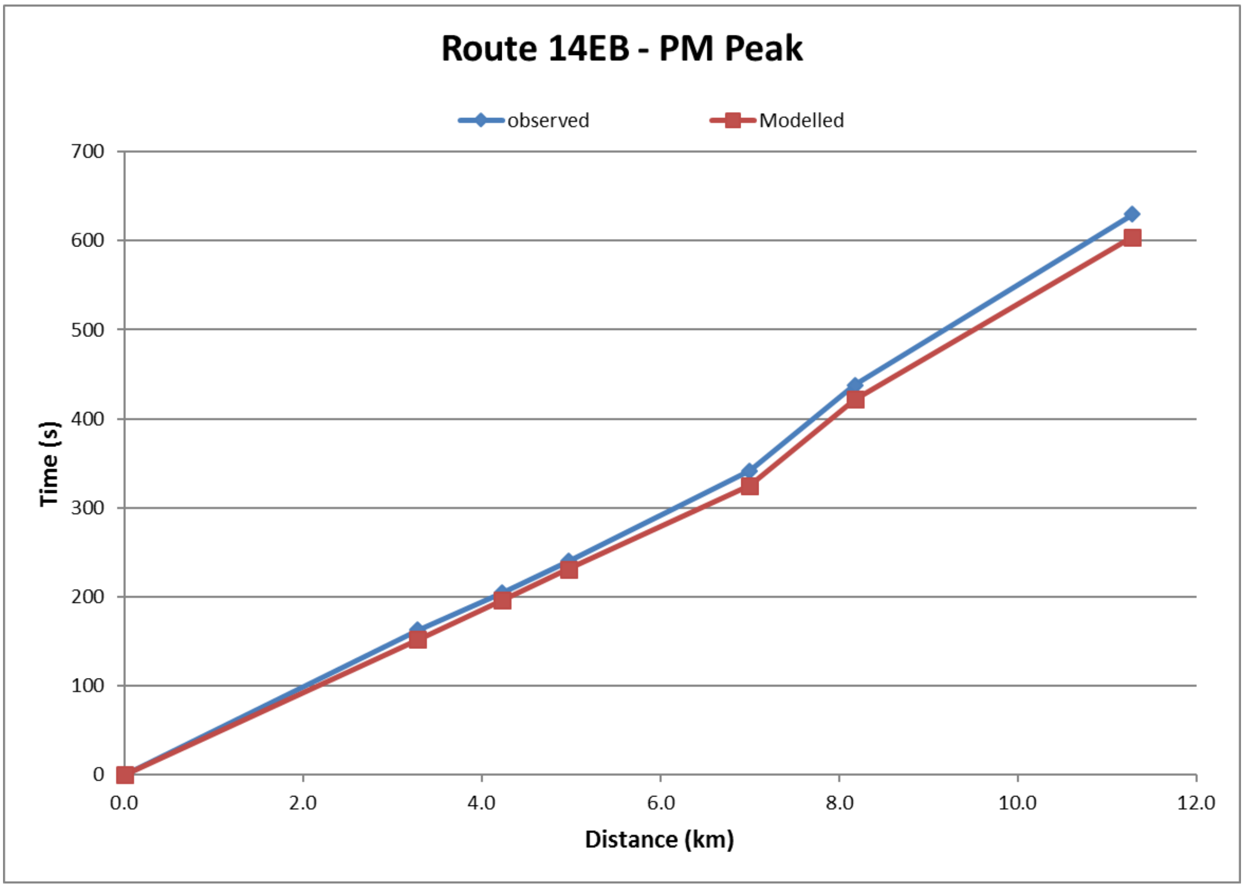

Route 13WB - AM Peak
observed
Modelled
1,200
1,000
800
600
400
200
0
Time (s)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)

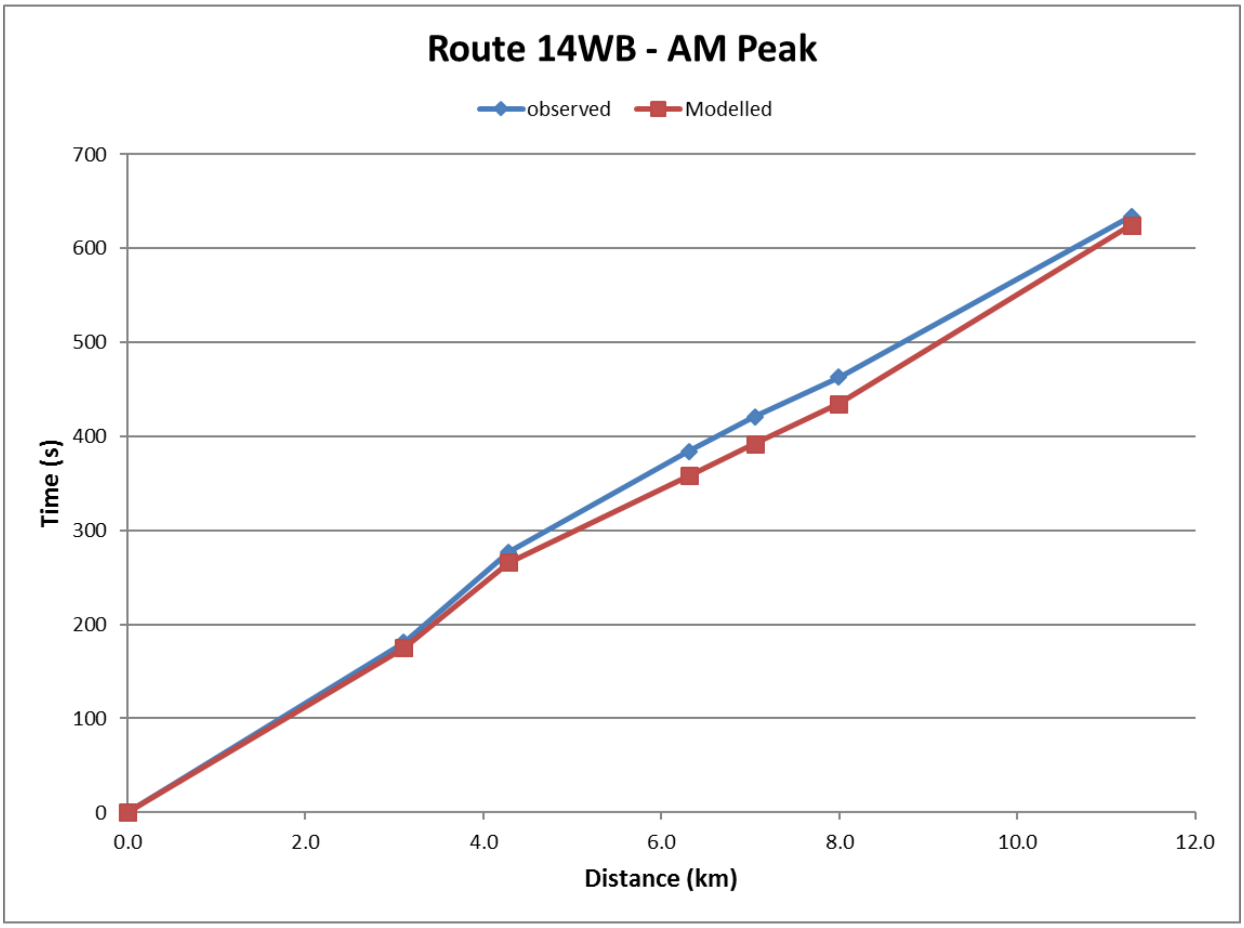

Route 13WB - Inter Peak
observed
Modelled
1,200
1,000
800
600
400
200
0
Time (s)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)


Route 13WB - PM Peak
observed
Modelled
1,200
1,000
800
600
400
200
0
Time (s)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)

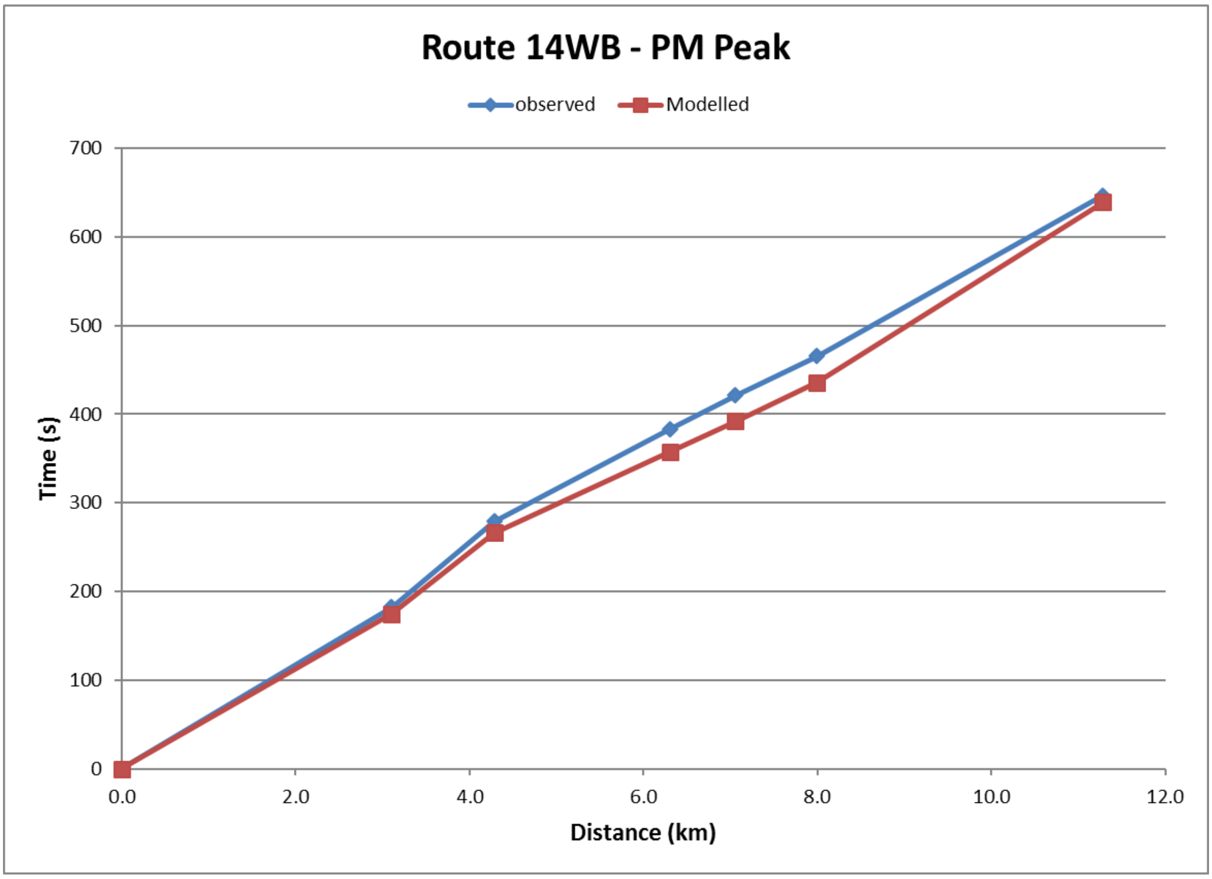

Route 14EB - AM Peak
obsereved
Modelled
700
600
500
400
300
200
100
0
Time (s)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)


Route 14EB - Inter Peak
observed
Modelled
Time (s)
0
100
200
300
400
500
600
700
Distance (km)
0.0
2.0
4.0
6.0
8.0
10.0
12.0


Route 14EB - PM Peak
observed
Modelled
Time (s)
0
100
200
300
400
500
600
700
Distance (km)
0.0
2.0
4.0
6.0
8.0
10.0
12.0


Route 14WB - AM Peak
observed
Modelled
Time (s)
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)

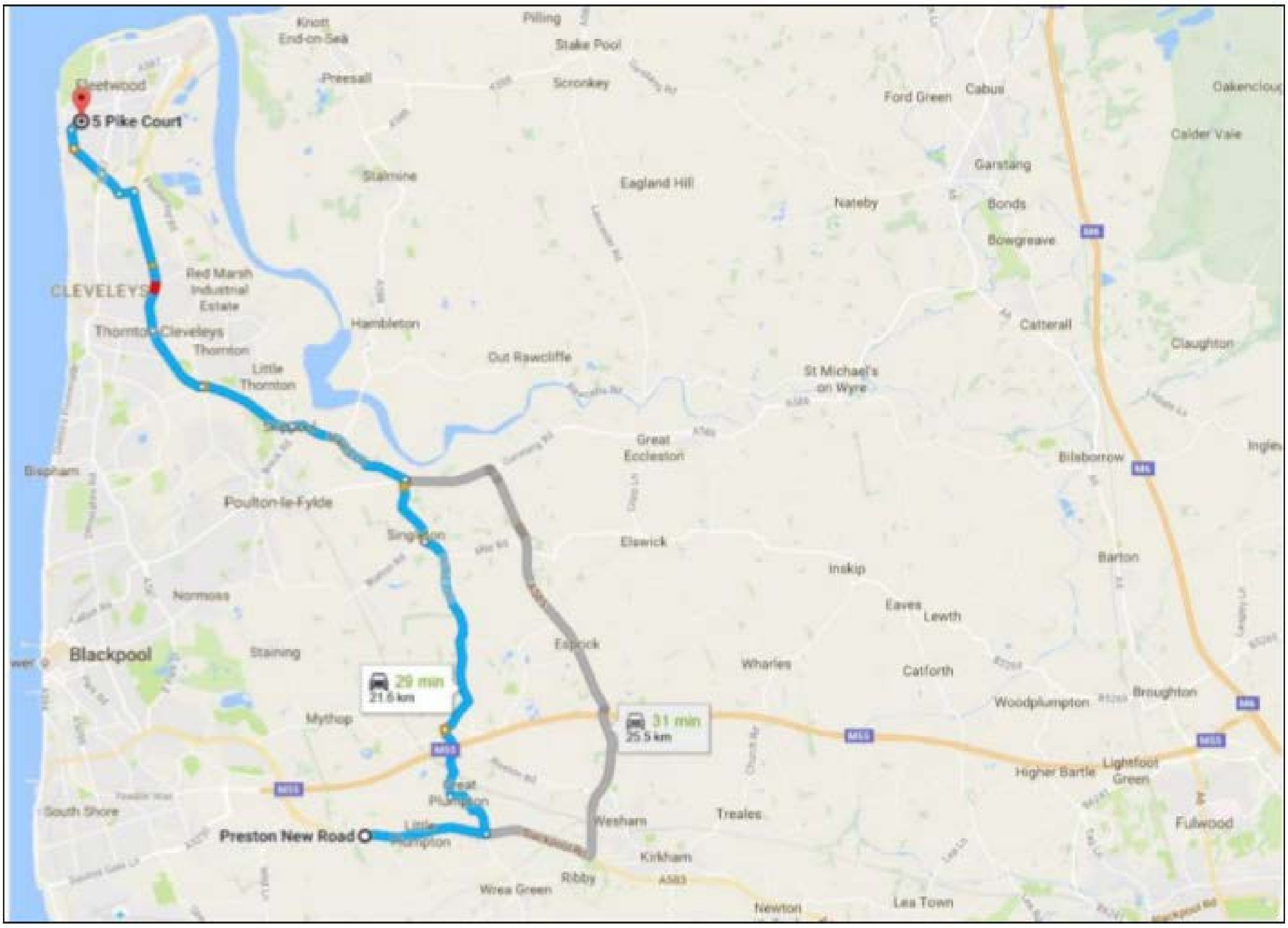

Route 14WB - Inter Peak
Observed
Modelled
Time (s)
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)


Route 14WB - PM Peak
observed
Modelled
Time (s)
700
600
500
400
300
200
100
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Distance (km)

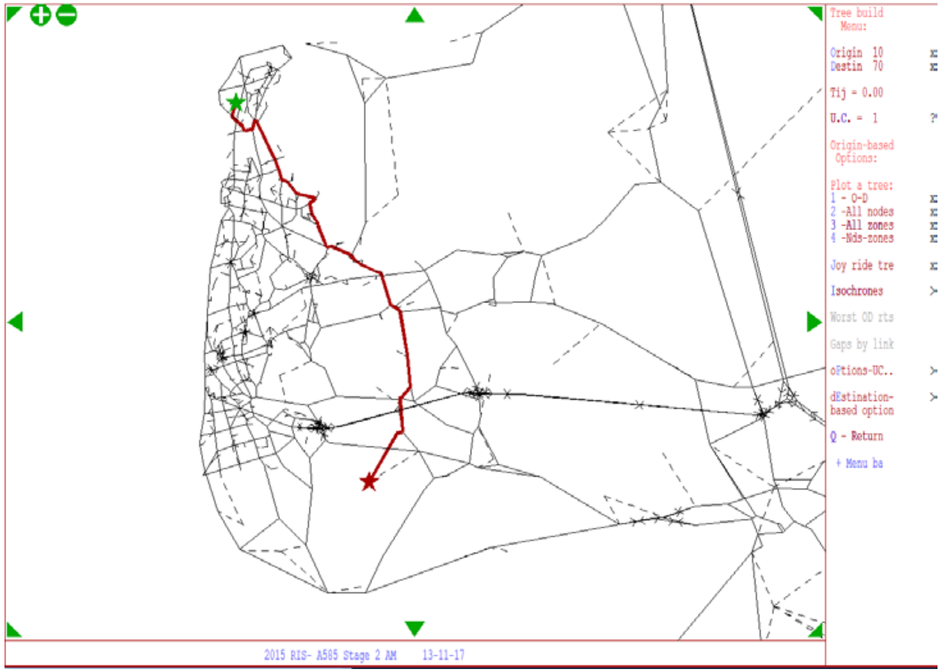
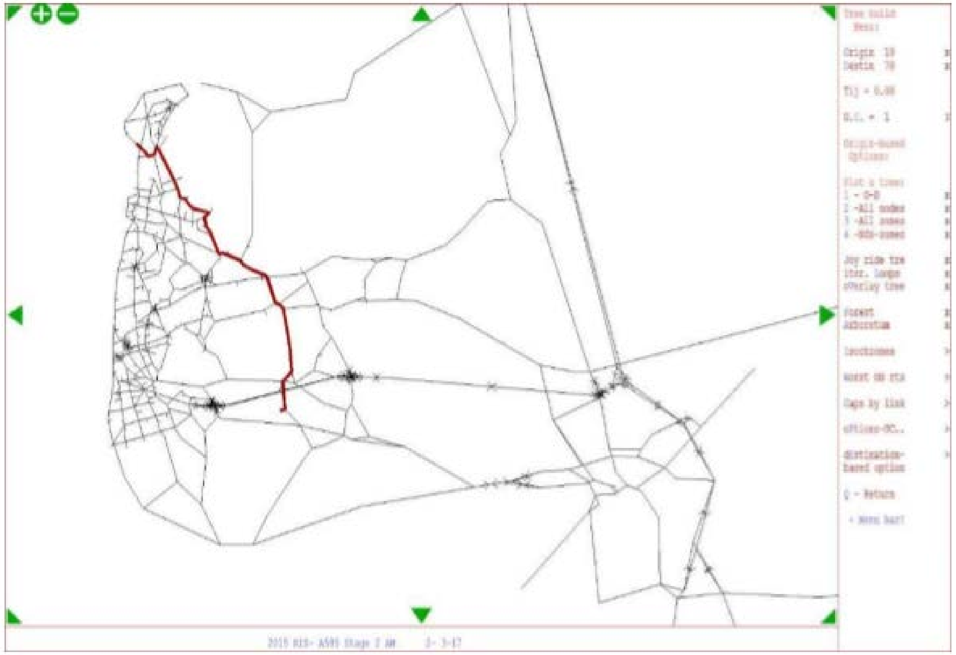
Appendix E – Routeing Stability Checks

Network Routeing Checks

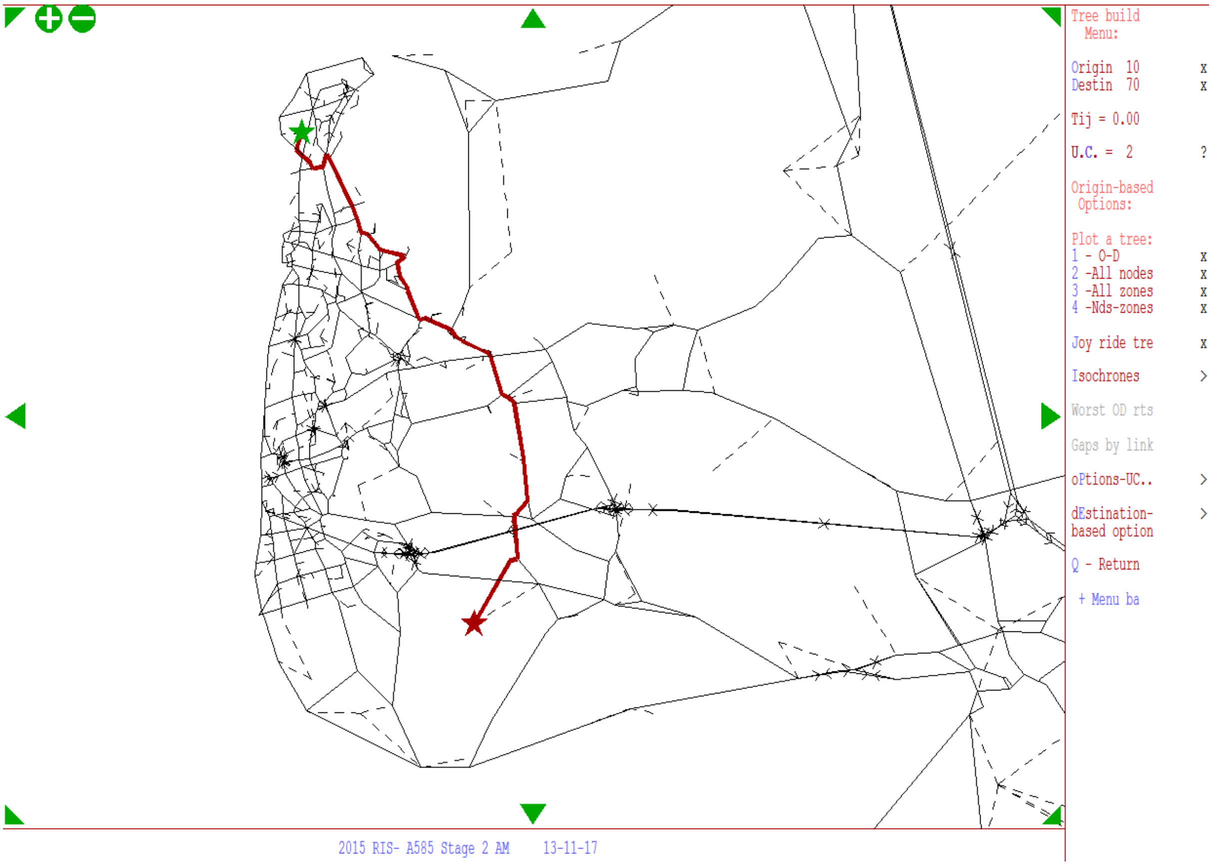
Route Between OD Pairs 10 and 70



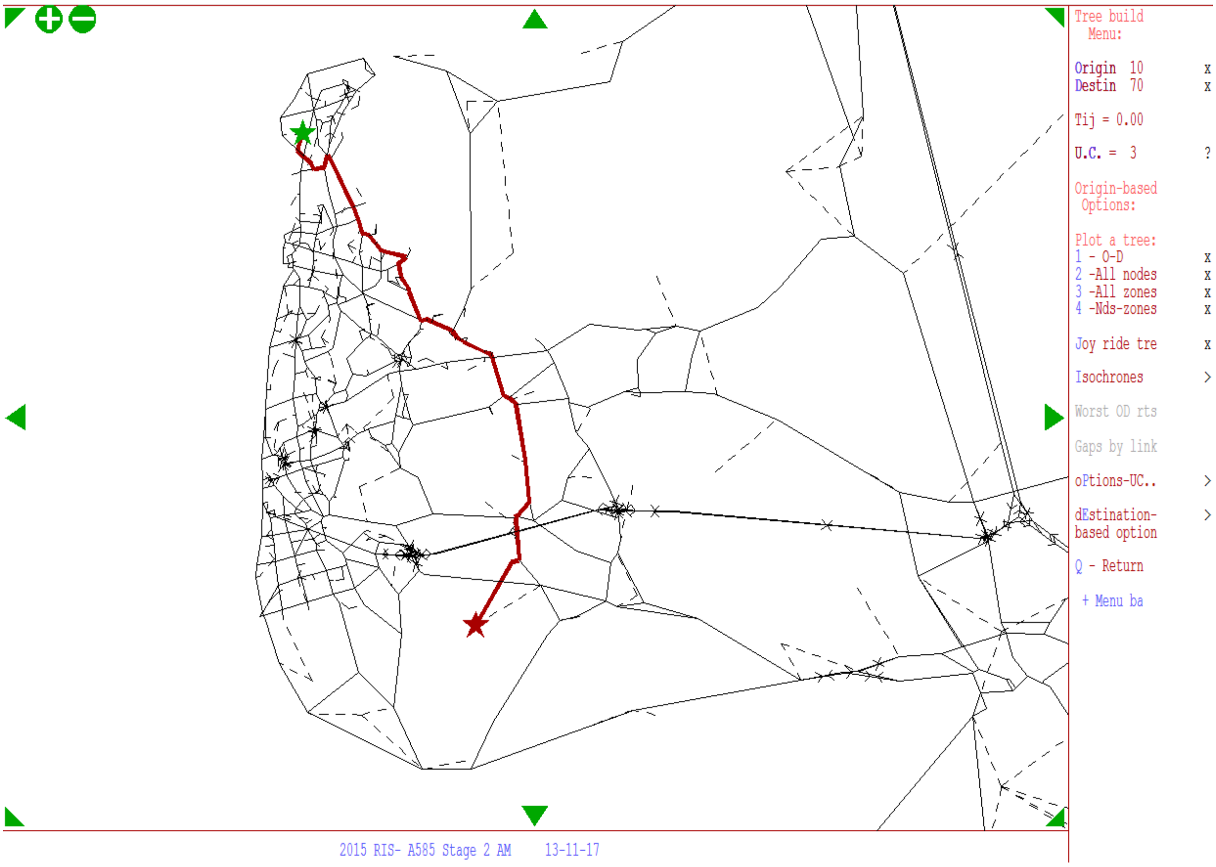
AM PEAK

Sensitivity Test	A585 Base Traffic Model
	

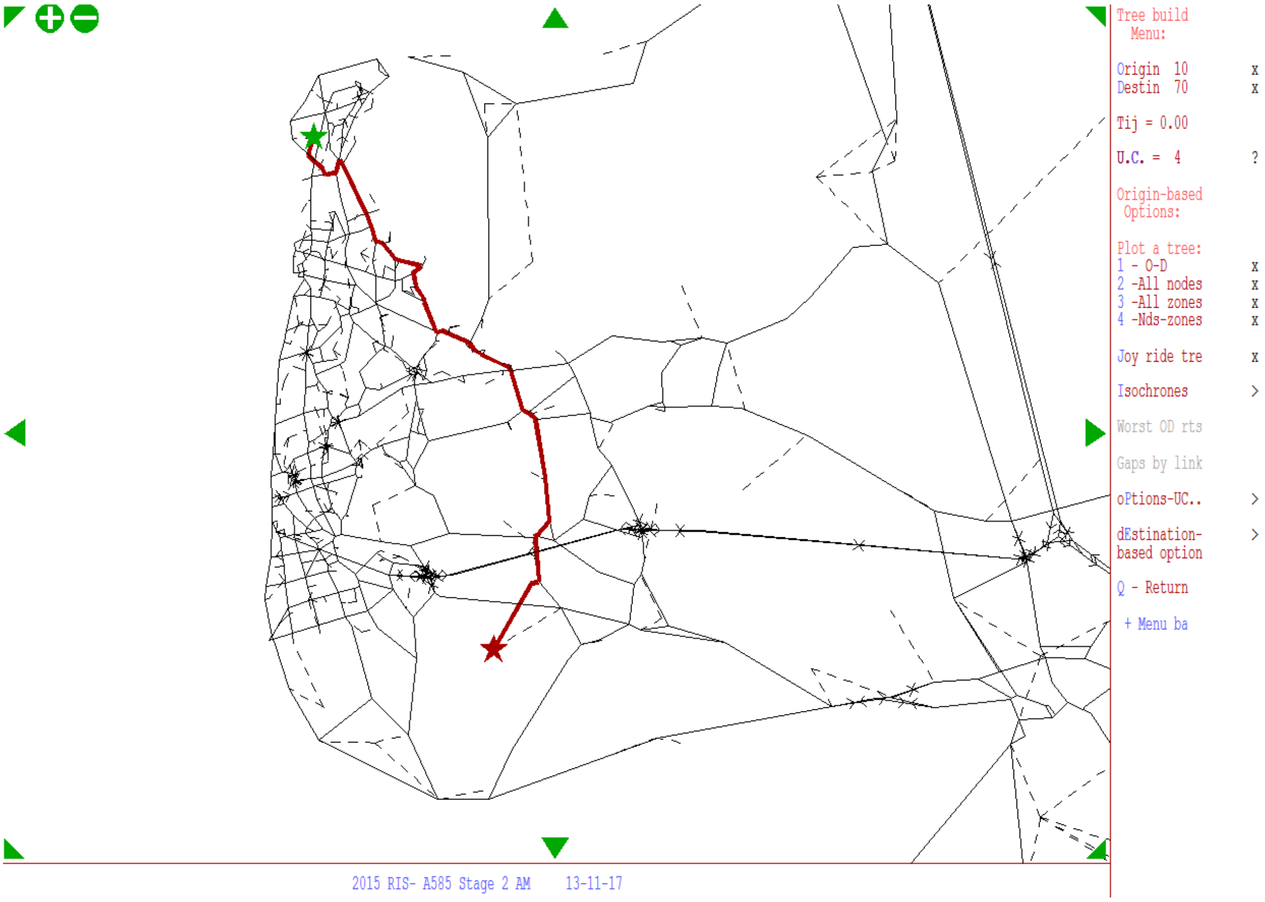
Sensitivity Test – AM (no Base Year Model comparison available)



Origin 10
Destin 70
Tij = 0.00
U.C. = 2



Origin 10
Destin 70
Tij = 0.00
U.C. = 3



Origin 10
Destin 70
Tij = 0.00
U.C. = 4

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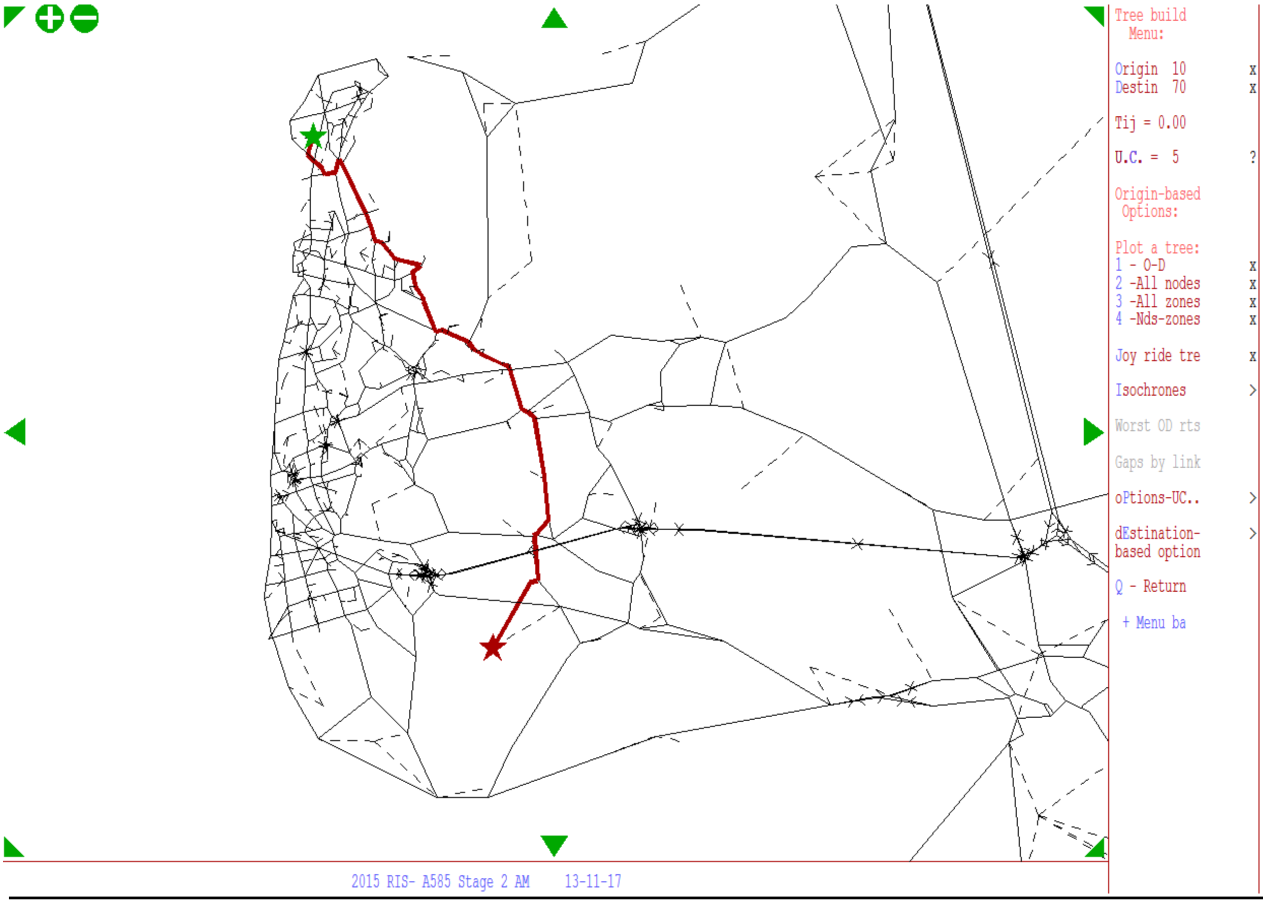

Origin 10
Destin 70
Tij = 0.00
U.C. = 5

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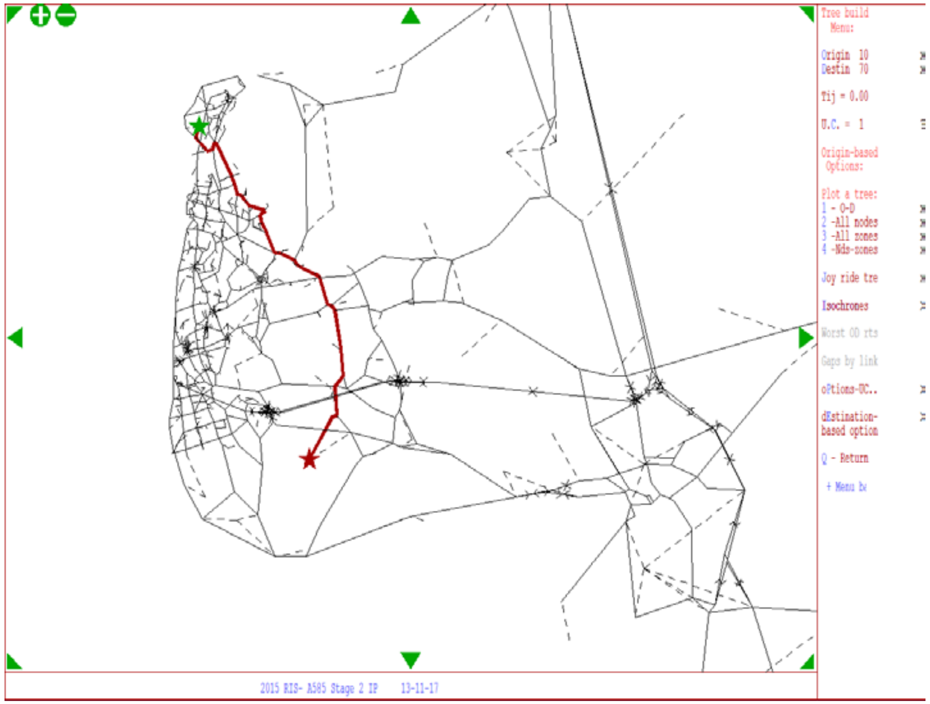
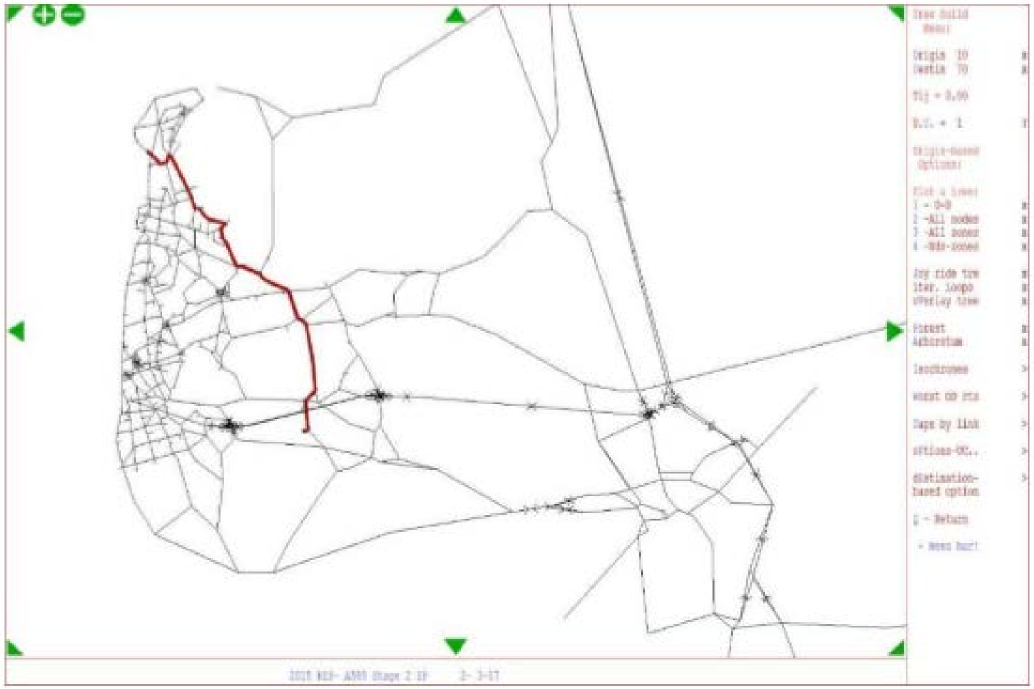
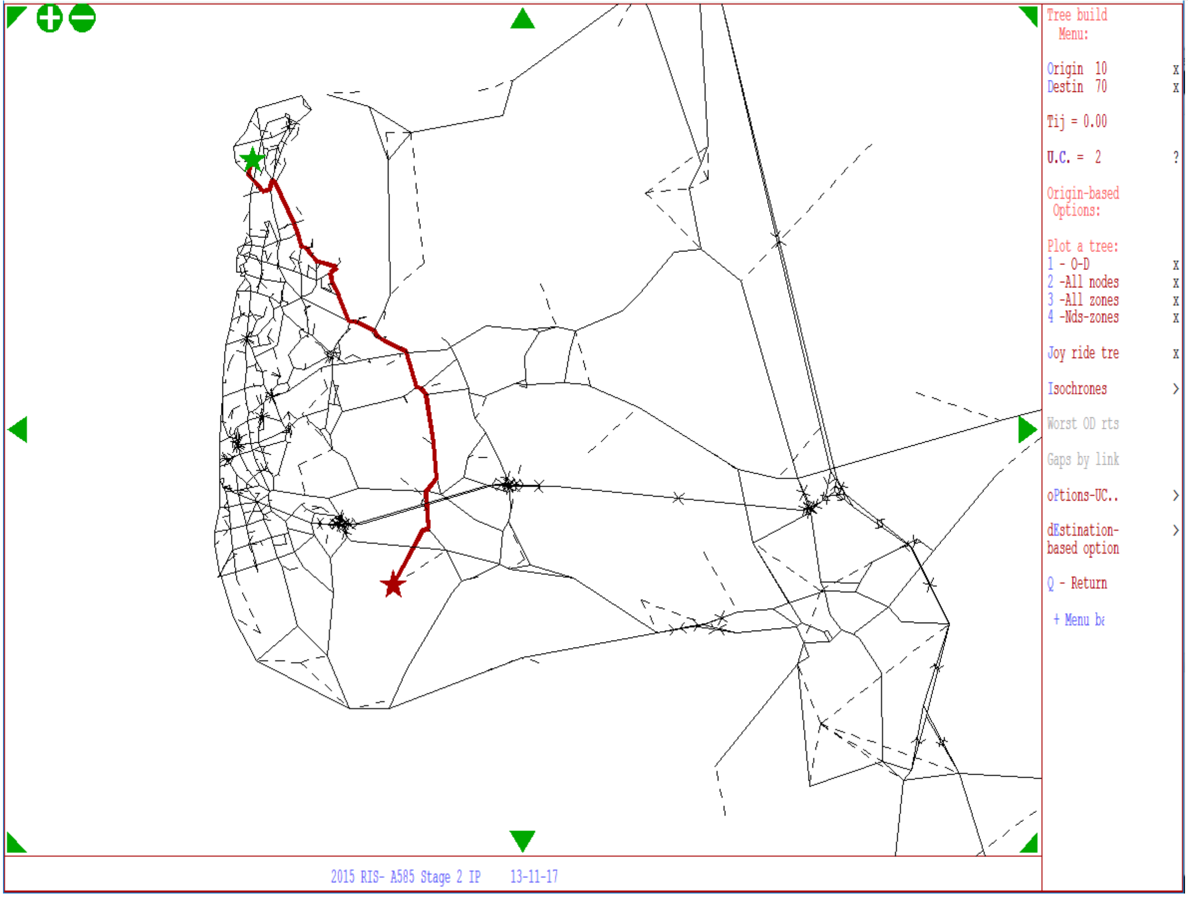
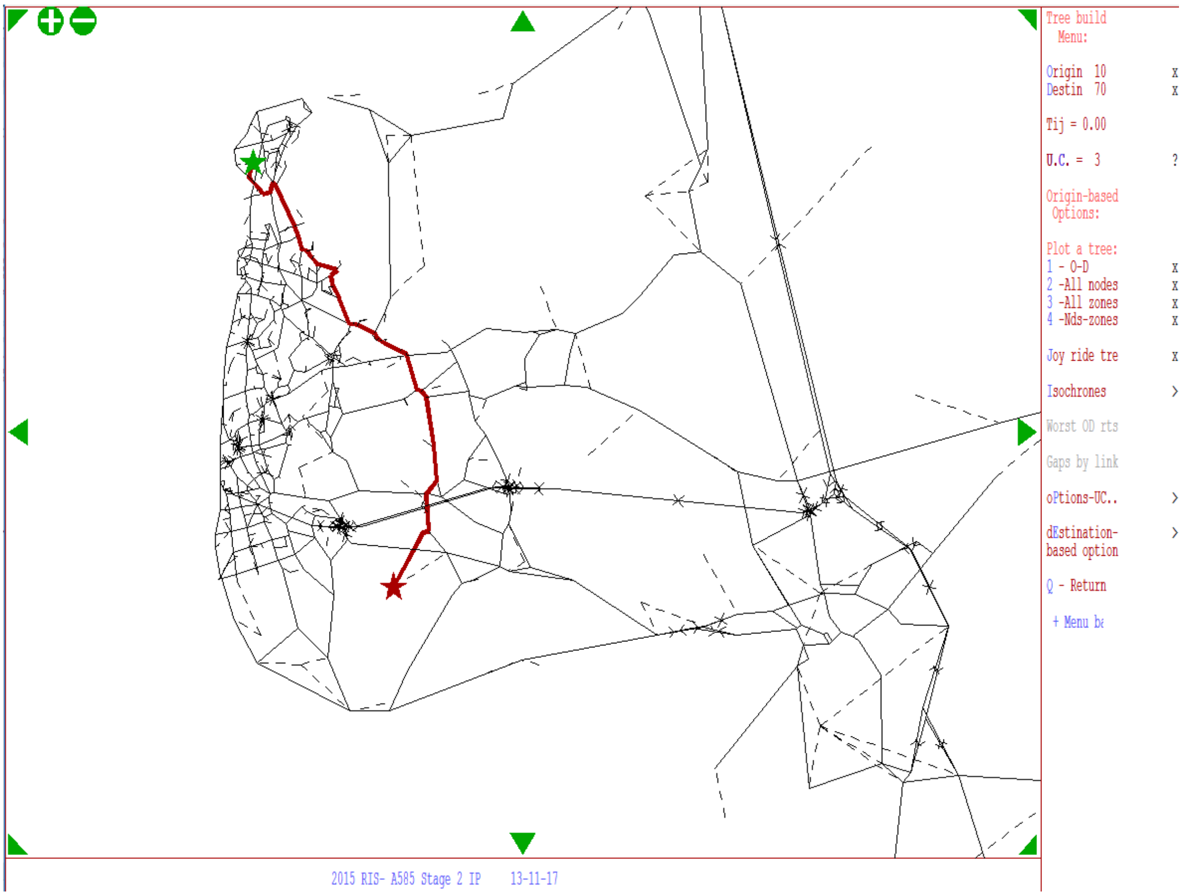
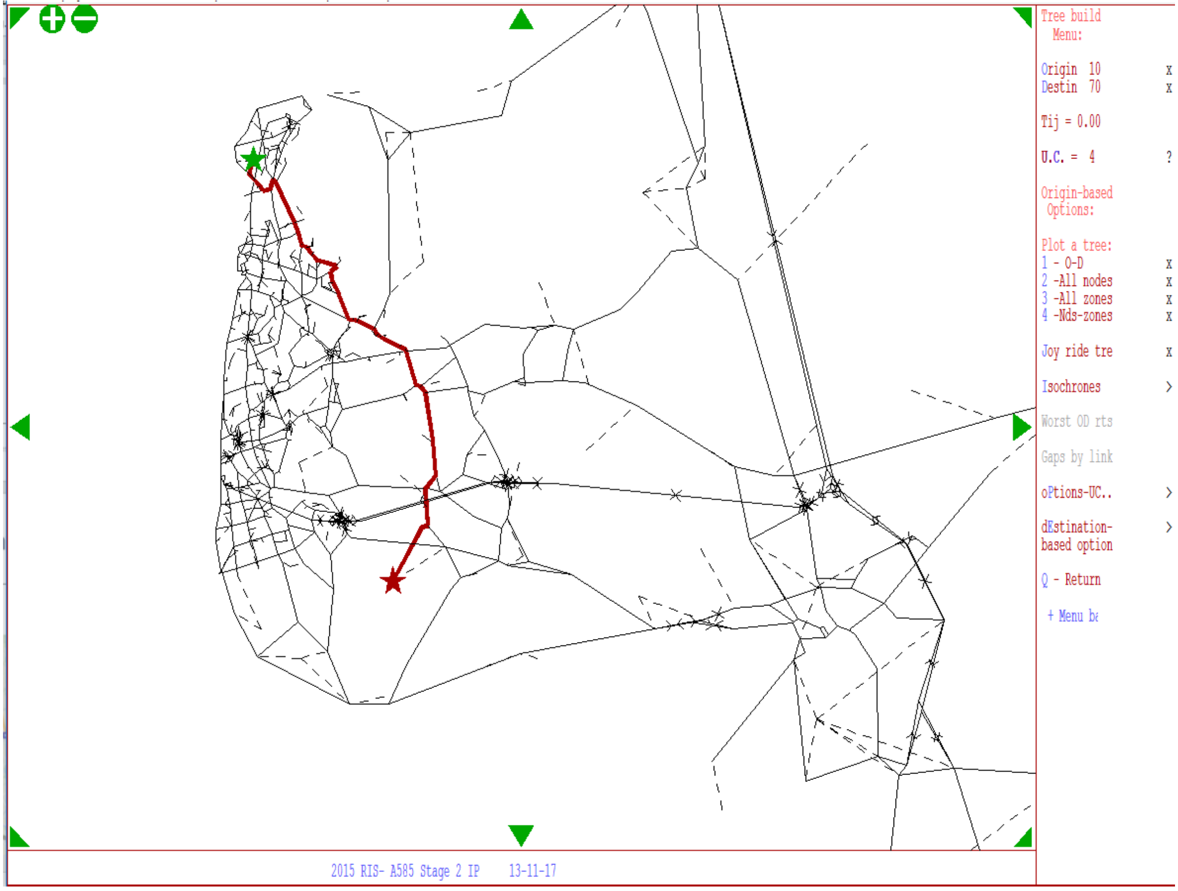
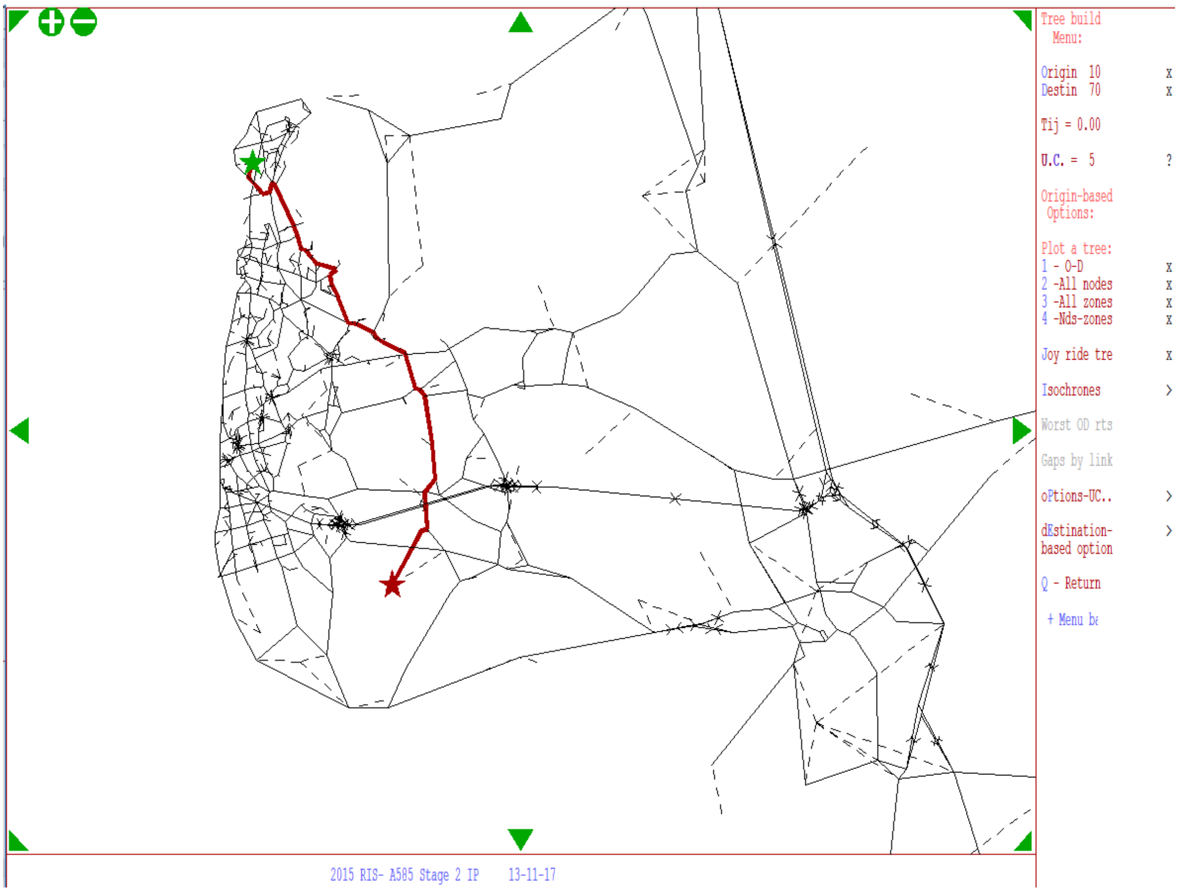
INTER – PEAK

Sensitivity Test	A585 Base Traffic Model
	

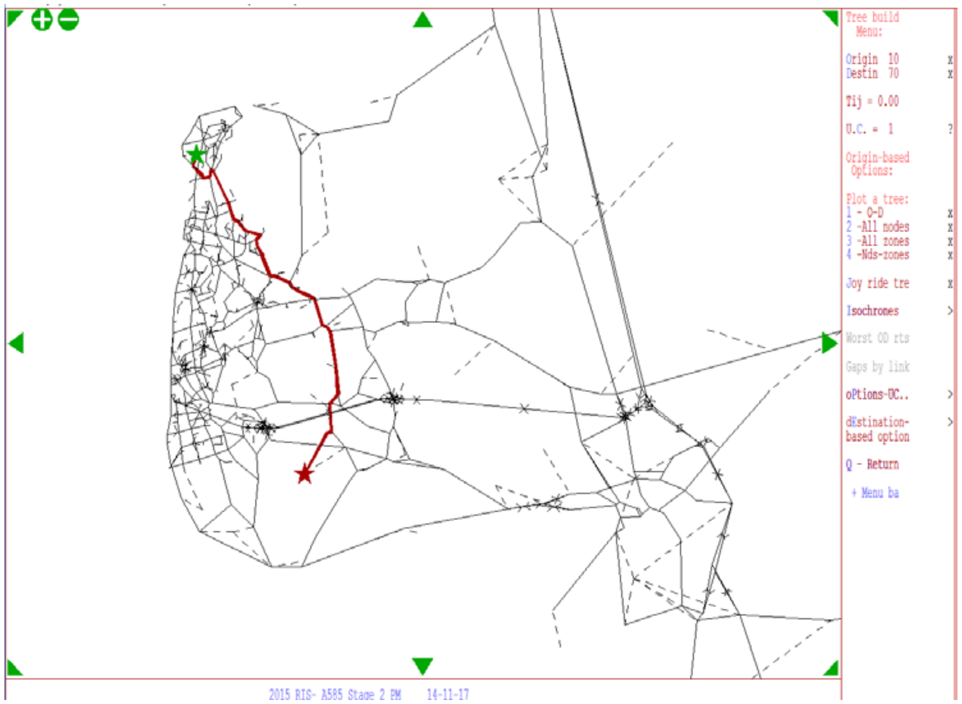
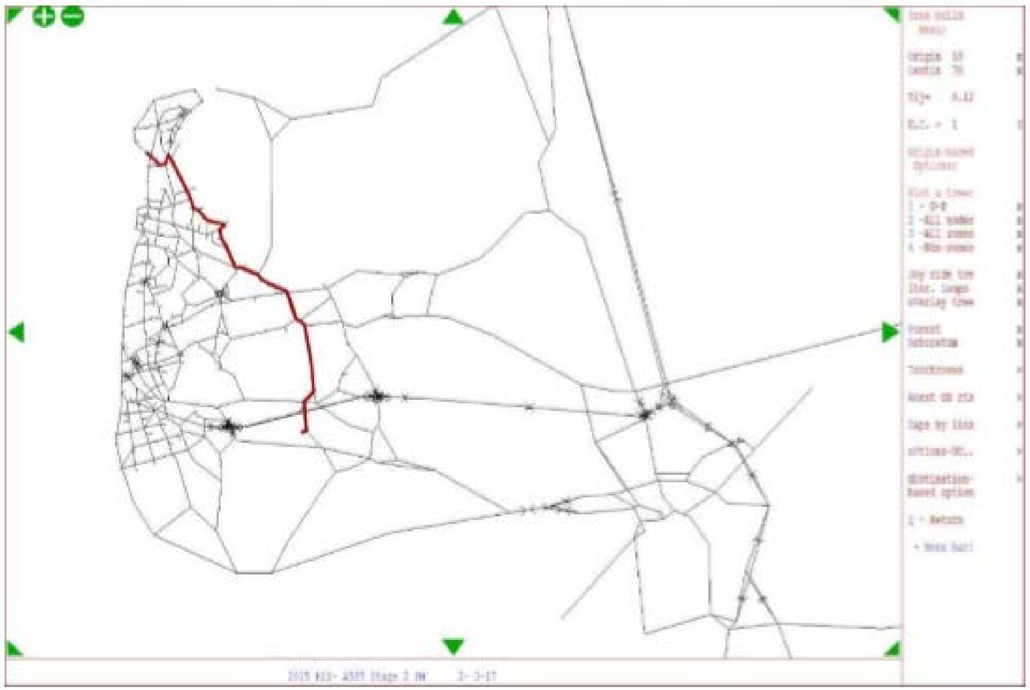

Origin 10
Destin 70
Tij = 0.00
U.C. = 2


Origin 10
Destin 70
Tij = 0.00
U.C. = 3

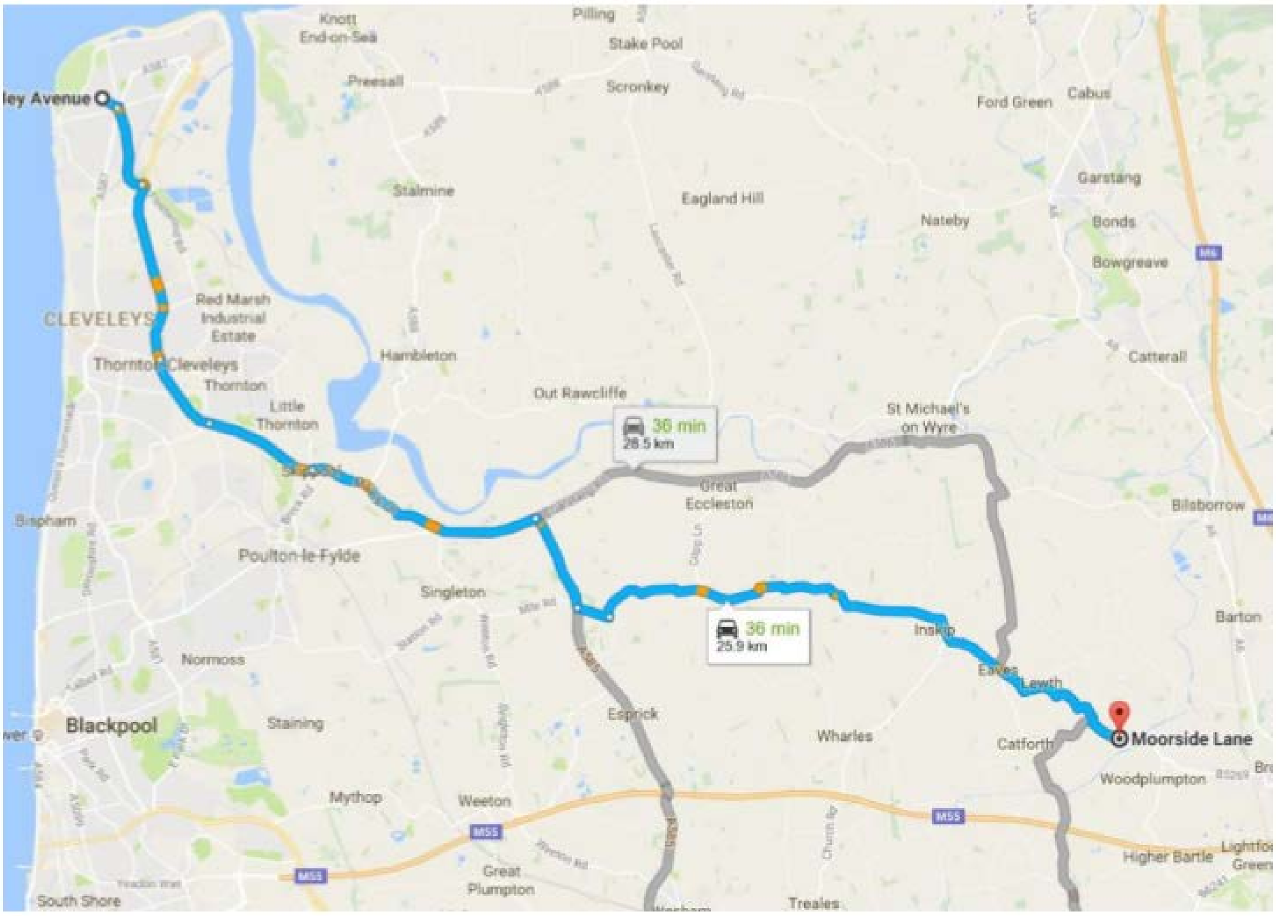

Tree build
Menu:
Origin 10 x
Destin 70 x
Tij = 0.00
U.C. = 4 ?
Origin-based
Options:
Plot a tree:
1 - O-D x
2 -All nodes x
3 -All zones x
4 -Nds-zones x
Joy ride tre x
Isochrones >
Worst OD rts
Gaps by link
oPtions-UC.. >
dEstination-
based option >
Q - Return
+ Menu ba
2015 RIS- A585 Stage 2 IP 13-11-17

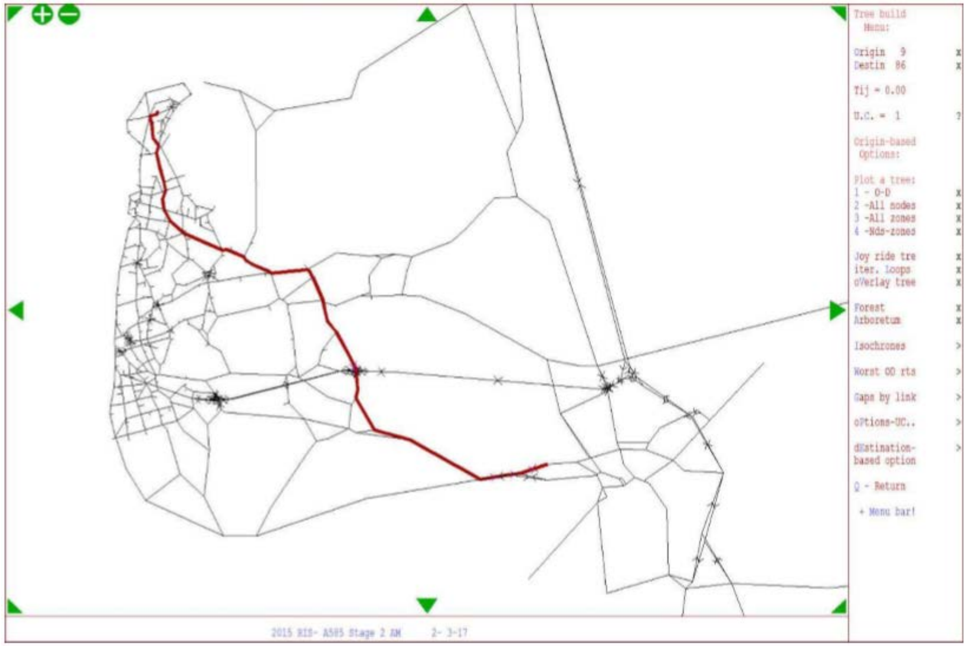
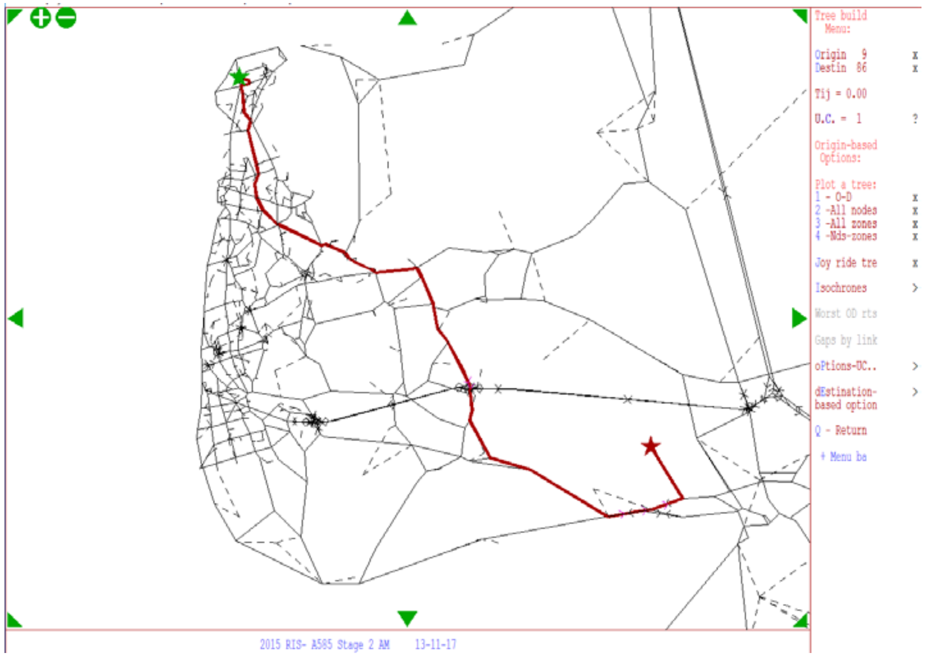

Tree build
Menu:
Origin 10 x
Destin 70 x
Tij = 0.00
U.C. = 5 ?
Origin-based
Options:
Plot a tree:
1 - O-D x
2 -All nodes x
3 -All zones x
4 -Nds-zones x
Joy ride tre x
Isochrones >
Worst OD rts
Gaps by link
oPtions-UC.. >
dEstination-
based option >
Q - Return
+ Menu ba
2015 RIS- A585 Stage 2 IP 13-11-17

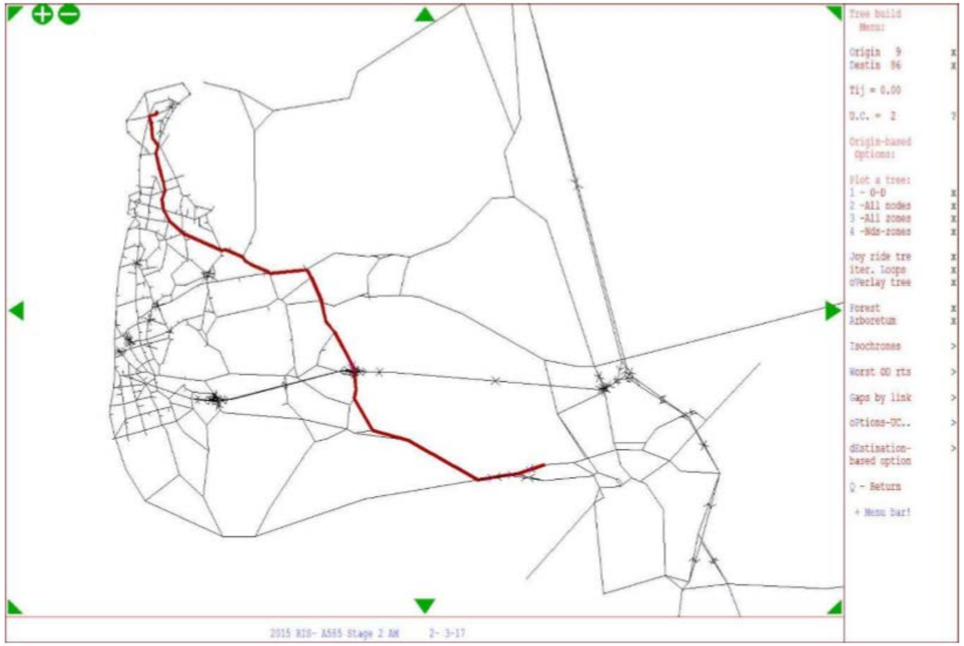
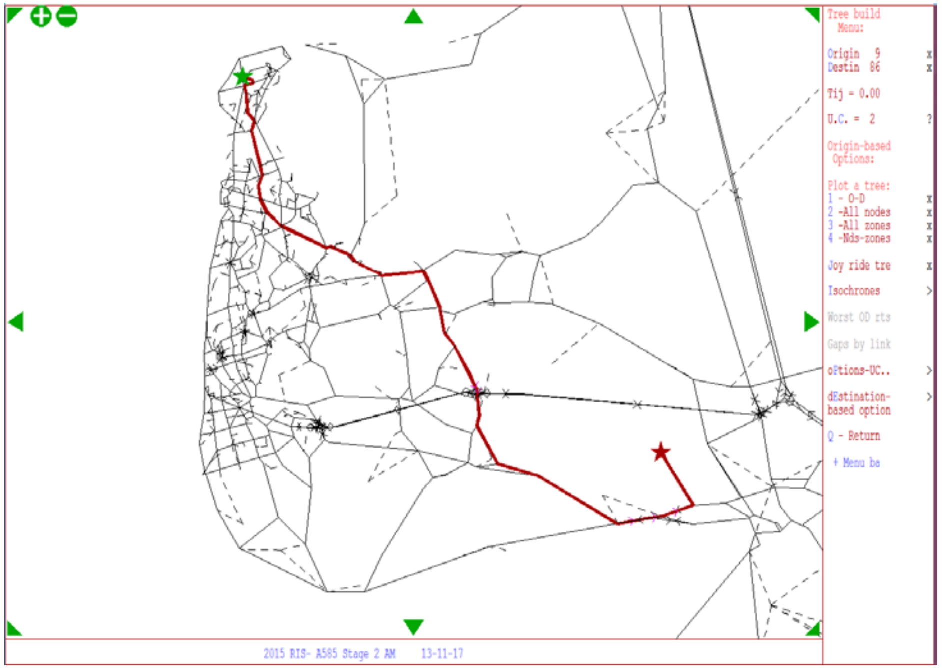
PM PEAK – B003

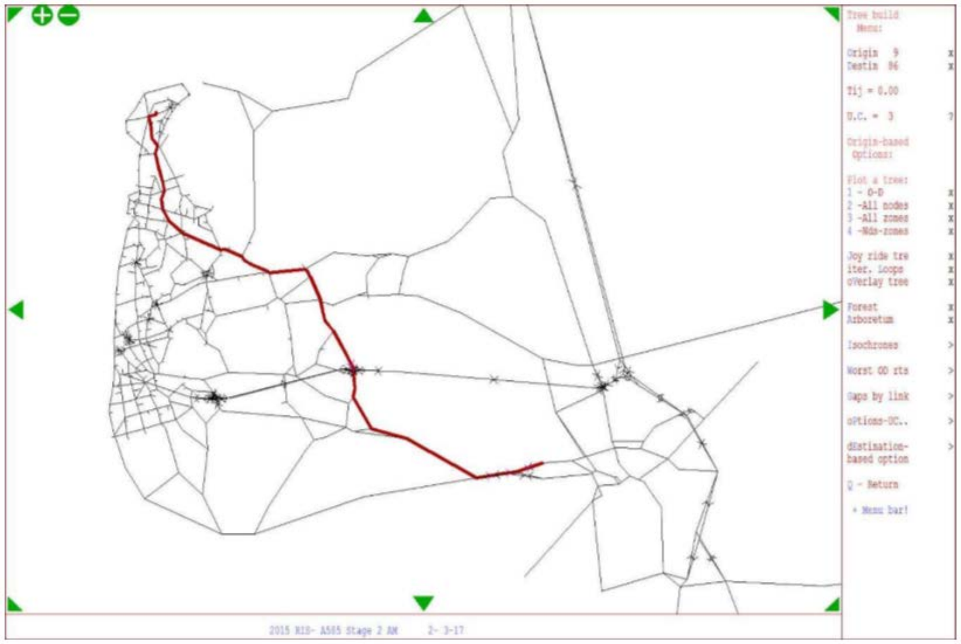
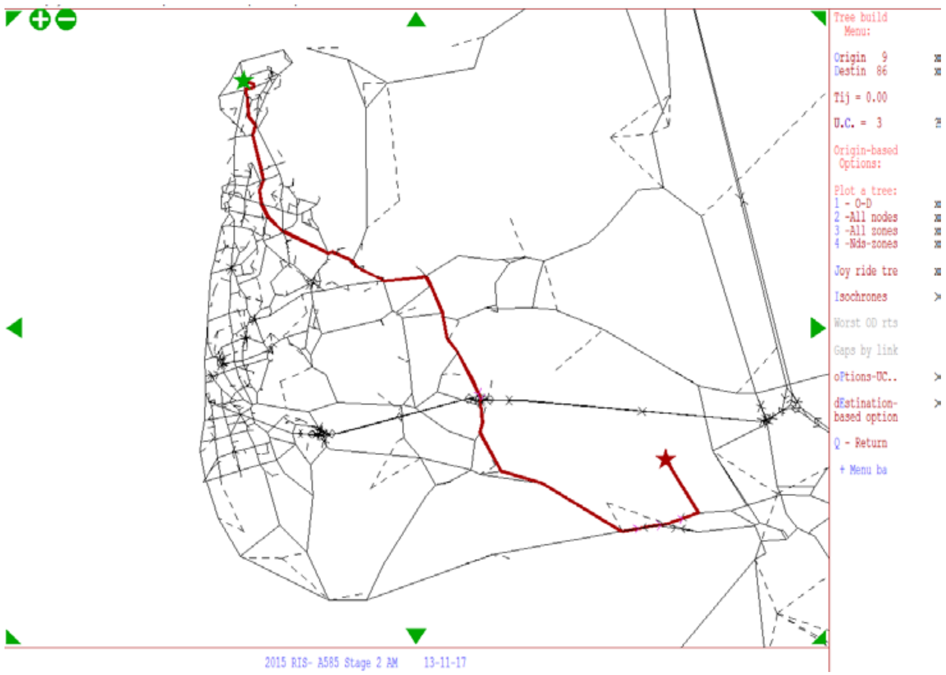
Sensitivity Test	A585 Base Traffic Model
	

Route Between OD Pairs 9 and 86



UC	Sensitivity Test	A585 Base Traffic Model
AM PEAK		
1	 Origin 9 Destin 86 Tij = 0.00 U.C. = 1 	 Origin 9 Destin 86 Tij = 0.00 U.C. = 1

UC	Sensitivity Test	A585 Base Traffic Model
2		

UC	Sensitivity Test	A585 Base Traffic Model
3		

Origin 9
Destin 86
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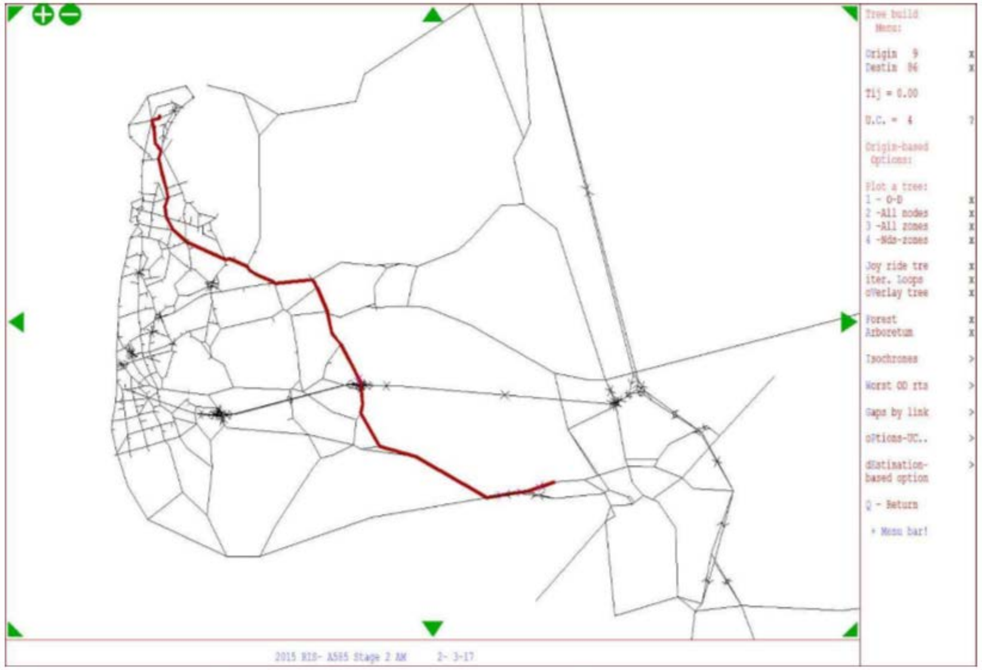

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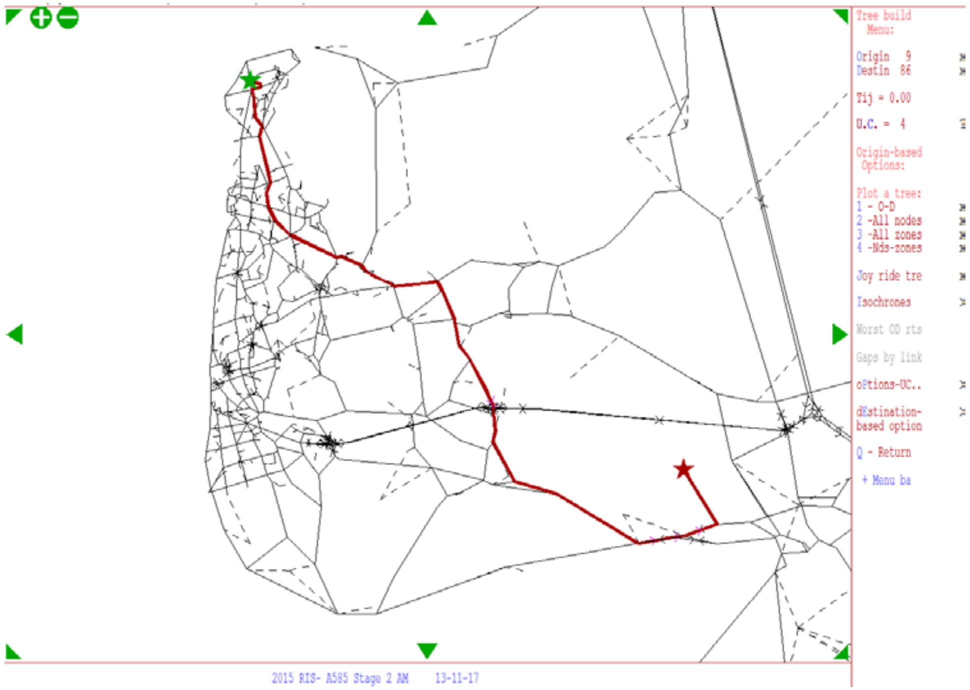

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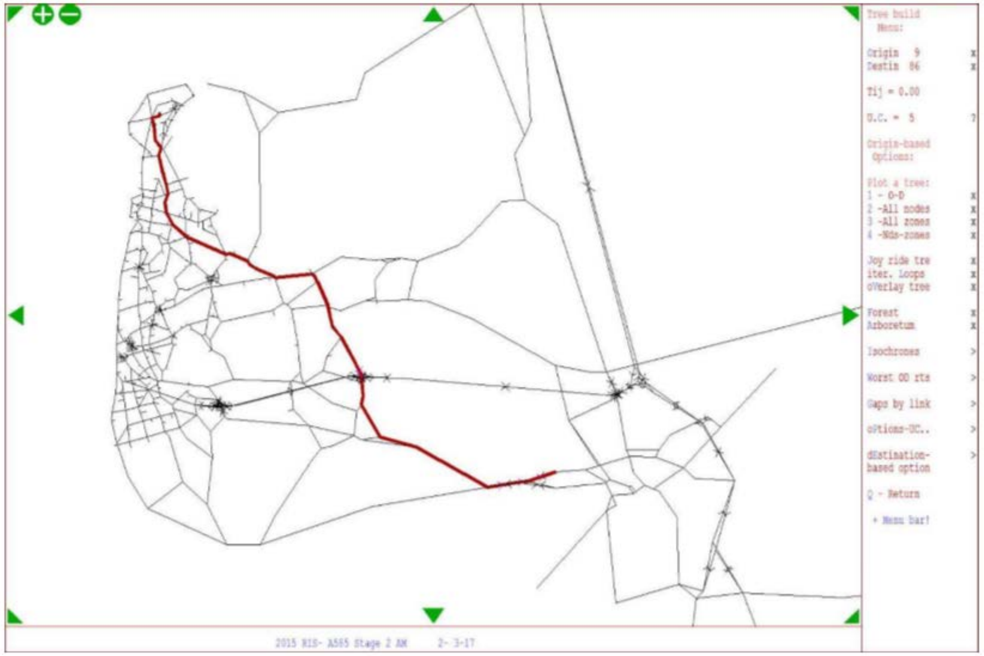
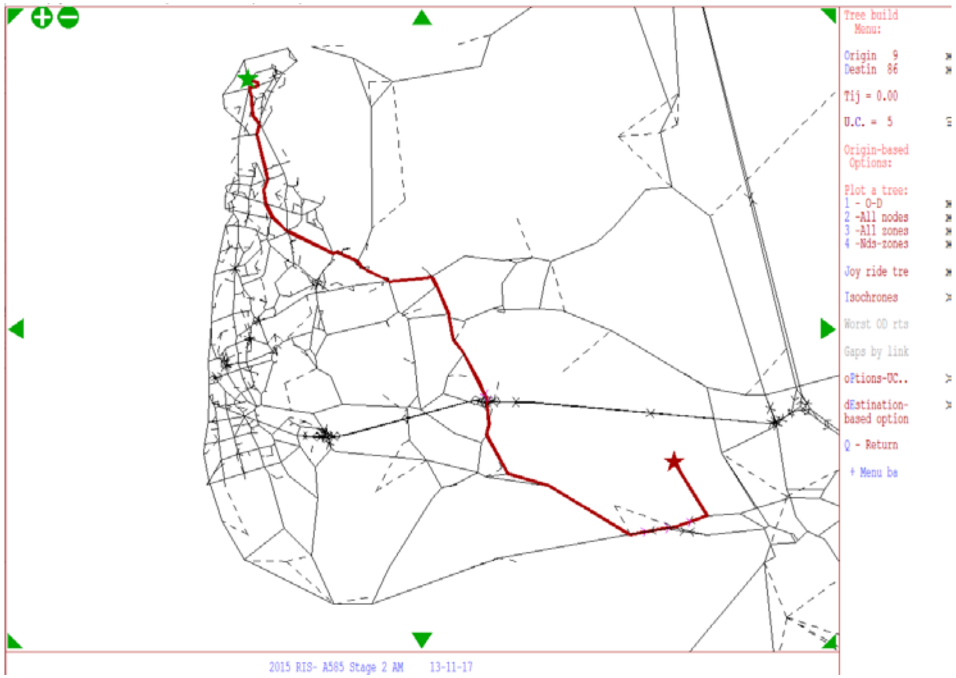
<tr><td>5</td><td>
</td><td>
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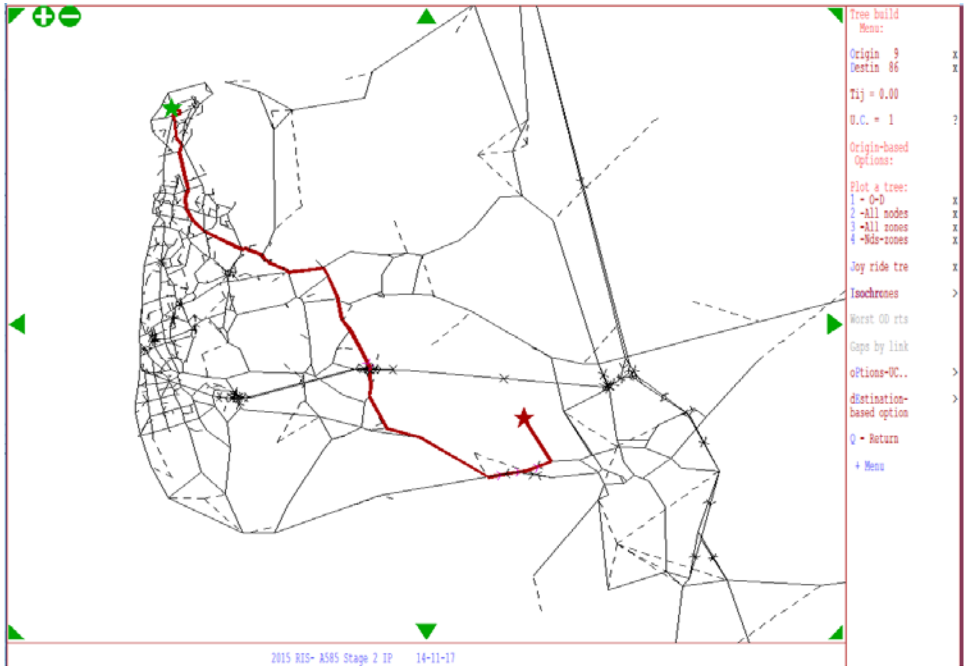
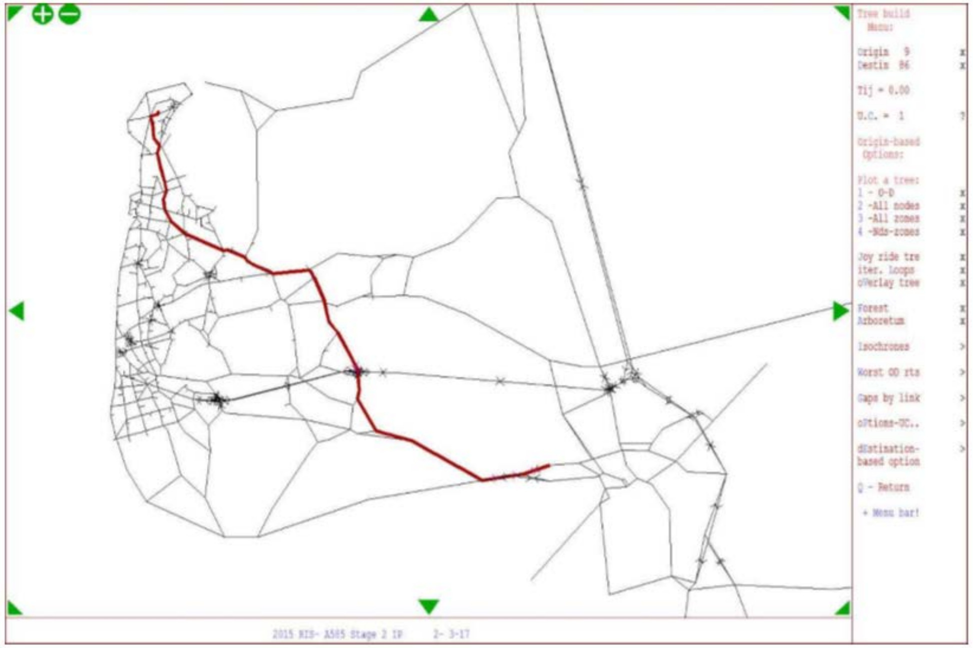
1		

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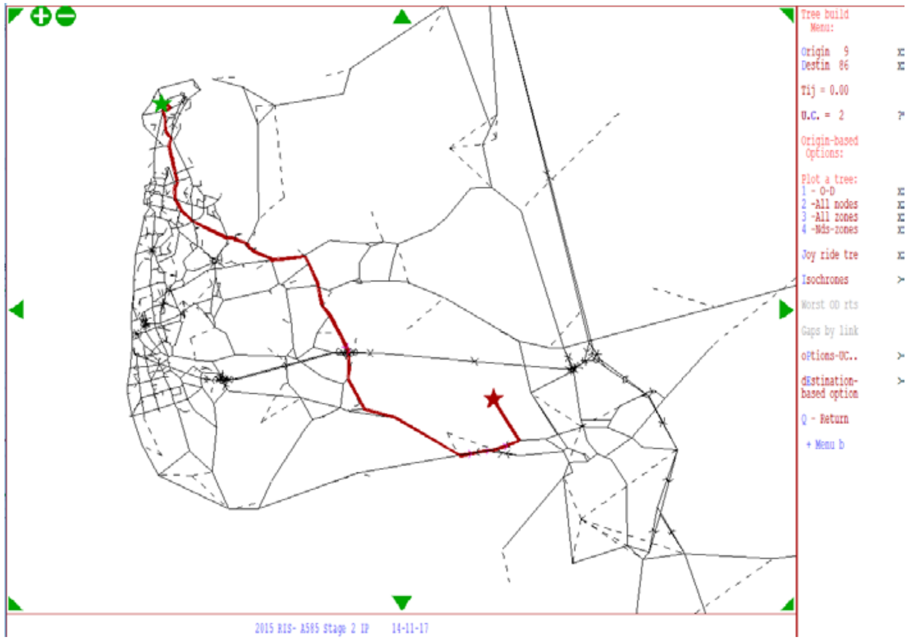
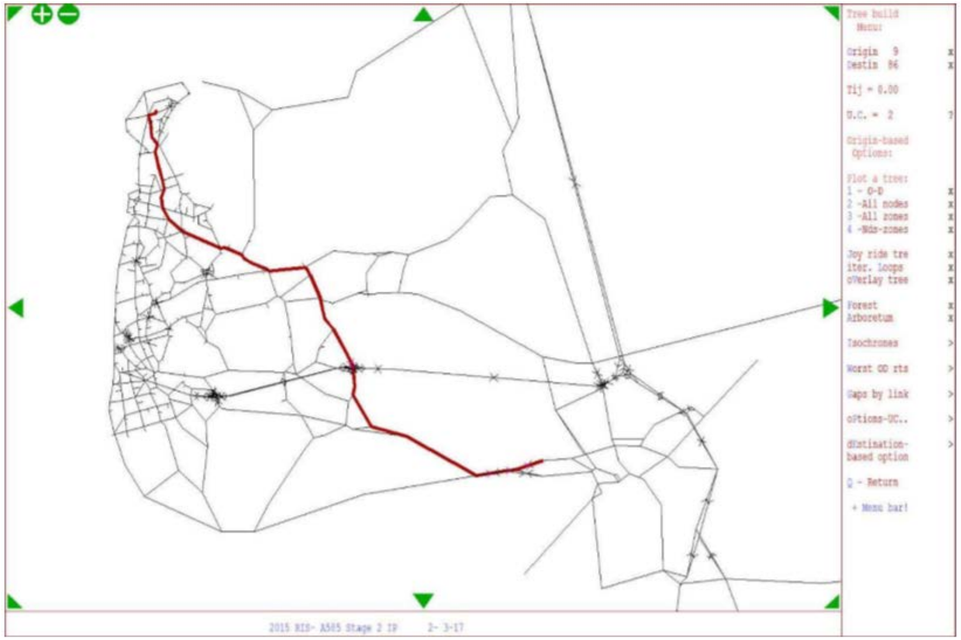
2		

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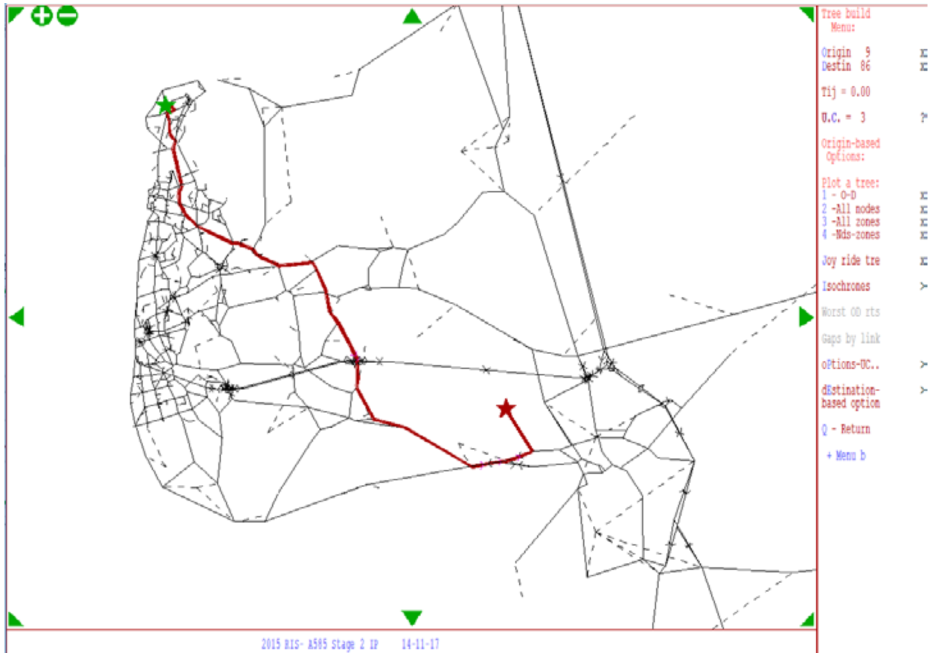
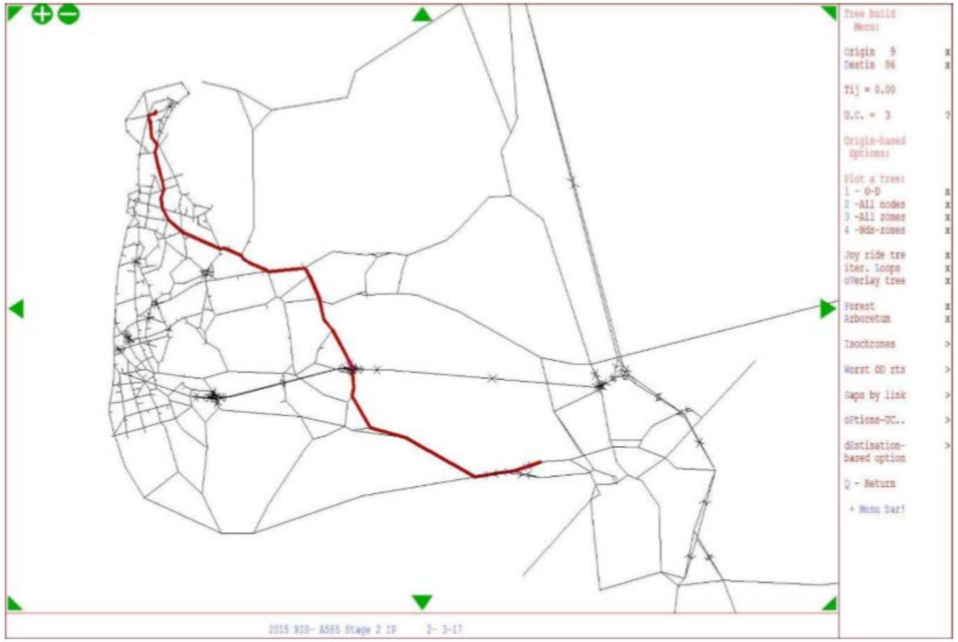
3		

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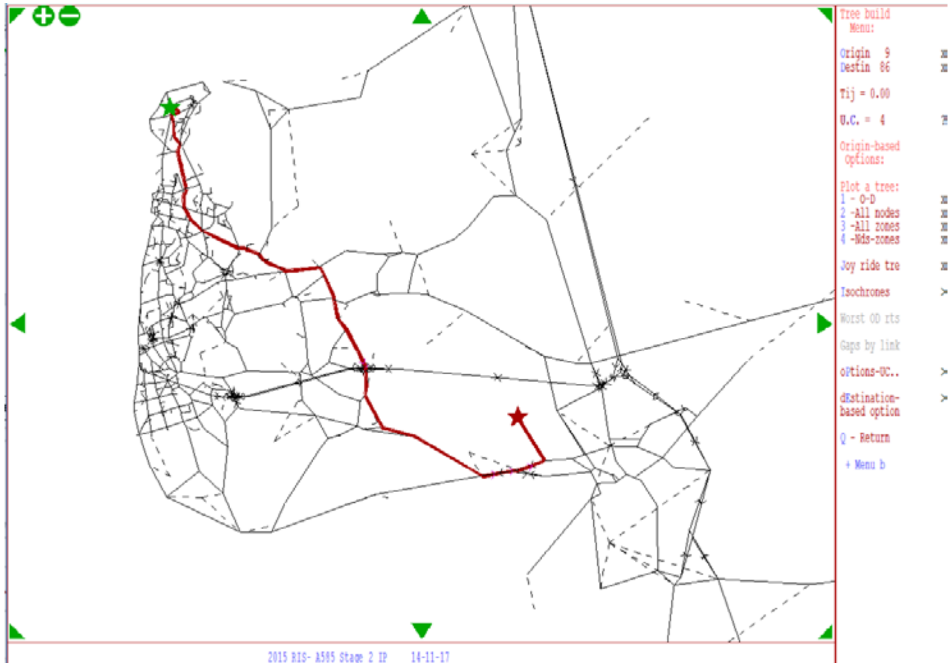
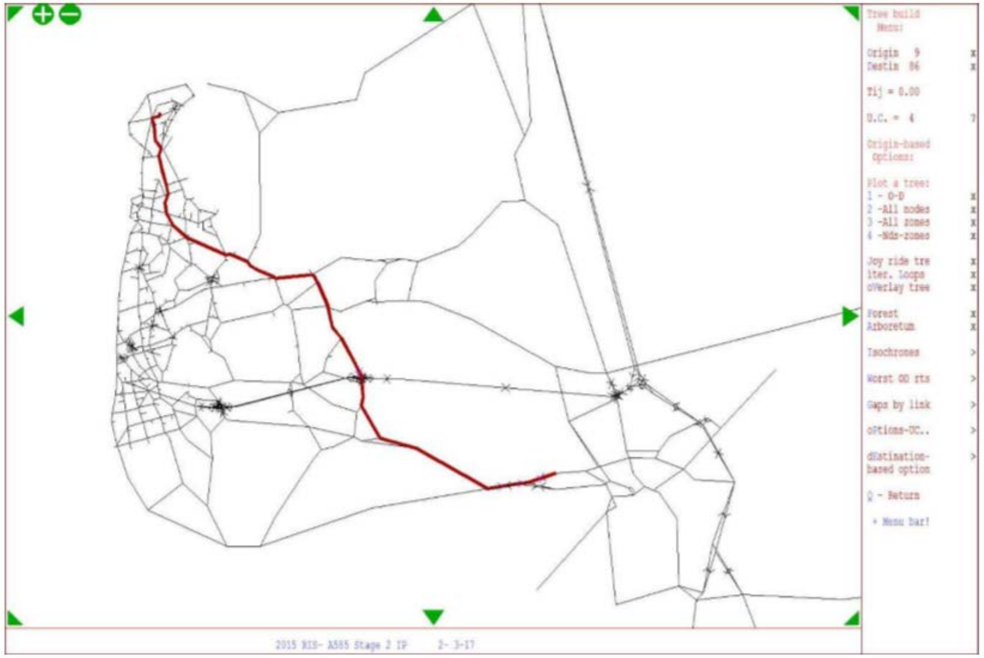
4		

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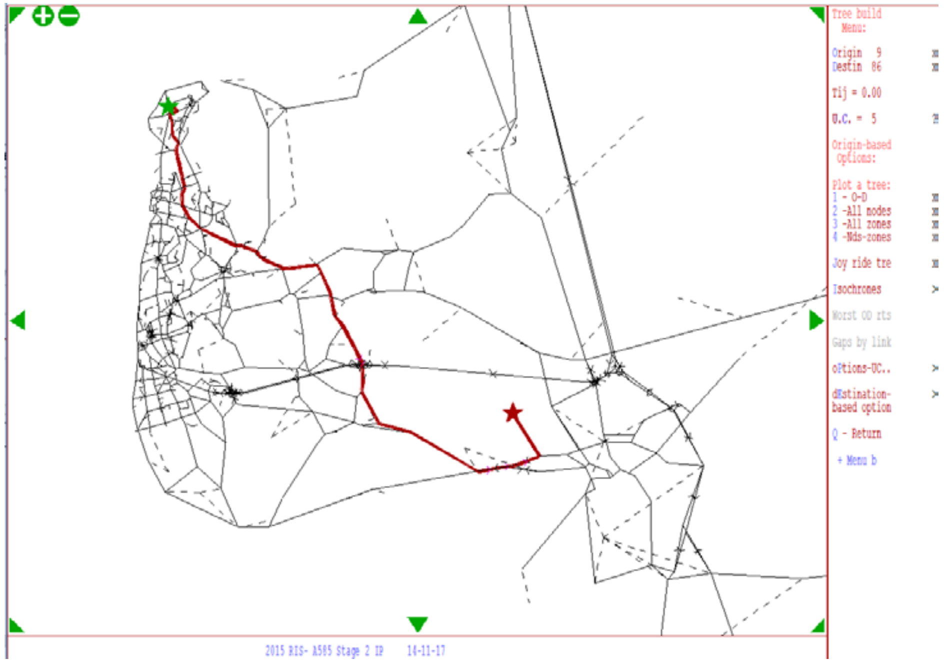
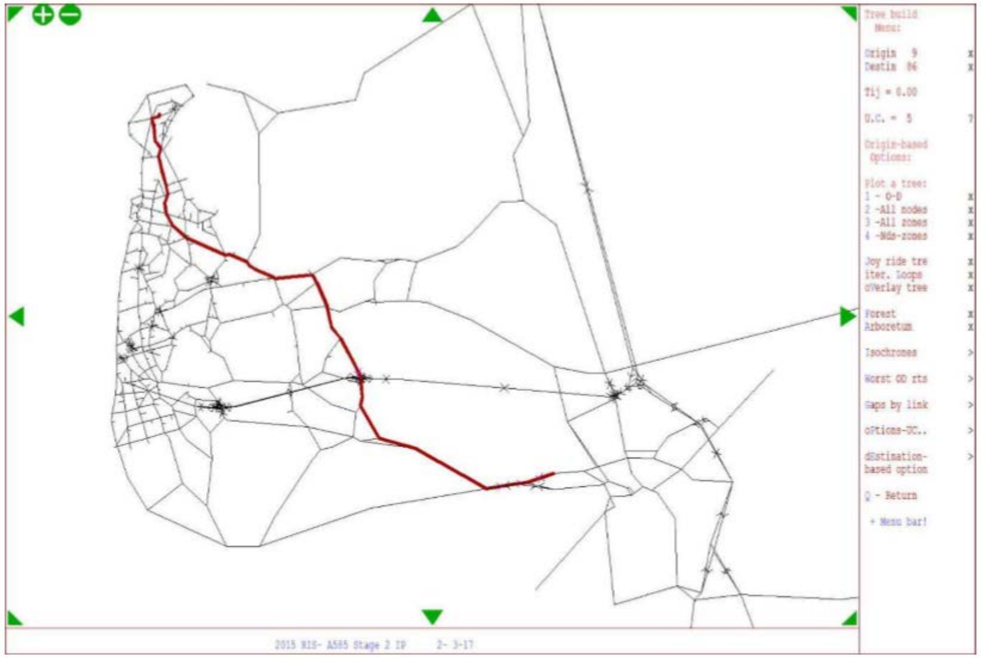
5	Origin 9 Destin 86 Tij = 0.00 U.C. = 5 	Origin 9 Destin 86 Tij = 0.00 U.C. = 5

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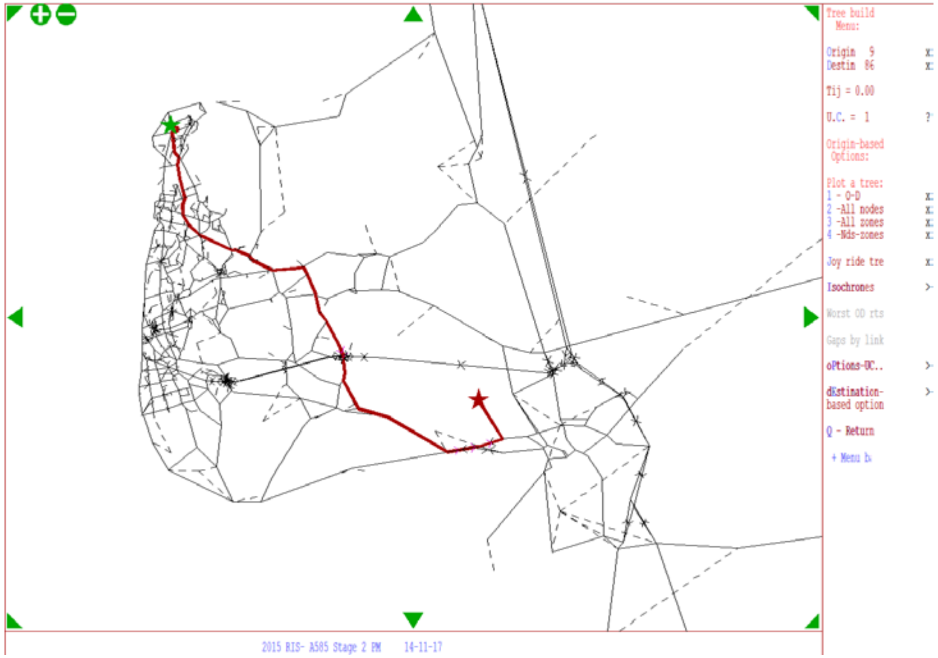
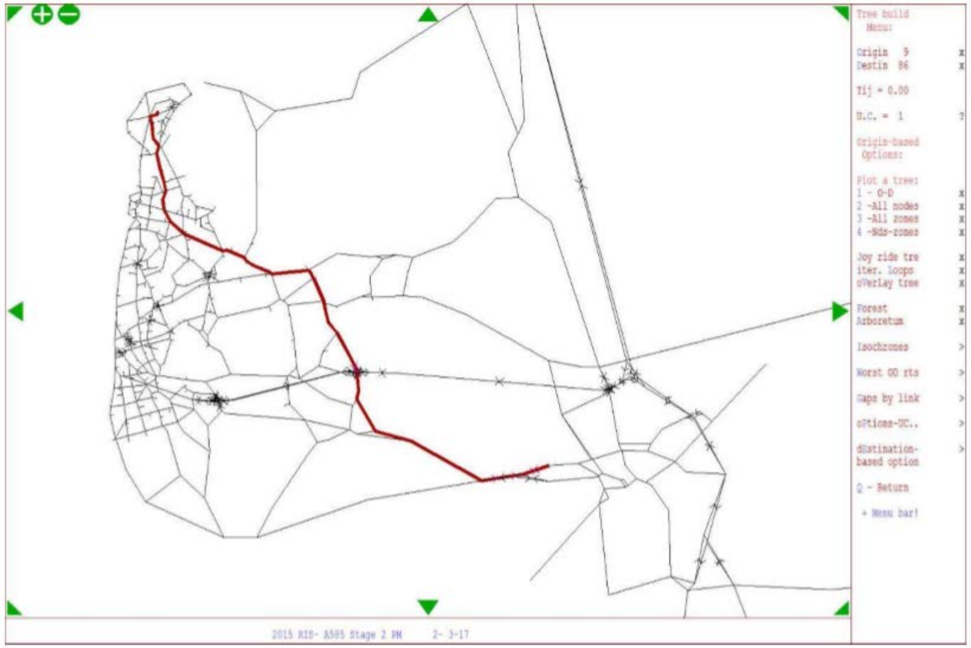
1	 Origin 9 Destin 86 Tij = 0.00 U.C. = 1 2015 RIS- A585 Stage 2 PM 14-11-17 	 Origin 9 Destin 86 Tij = 0.00 U.C. = 1 2015 RIS- A585 Stage 2 PM 2- 3-17

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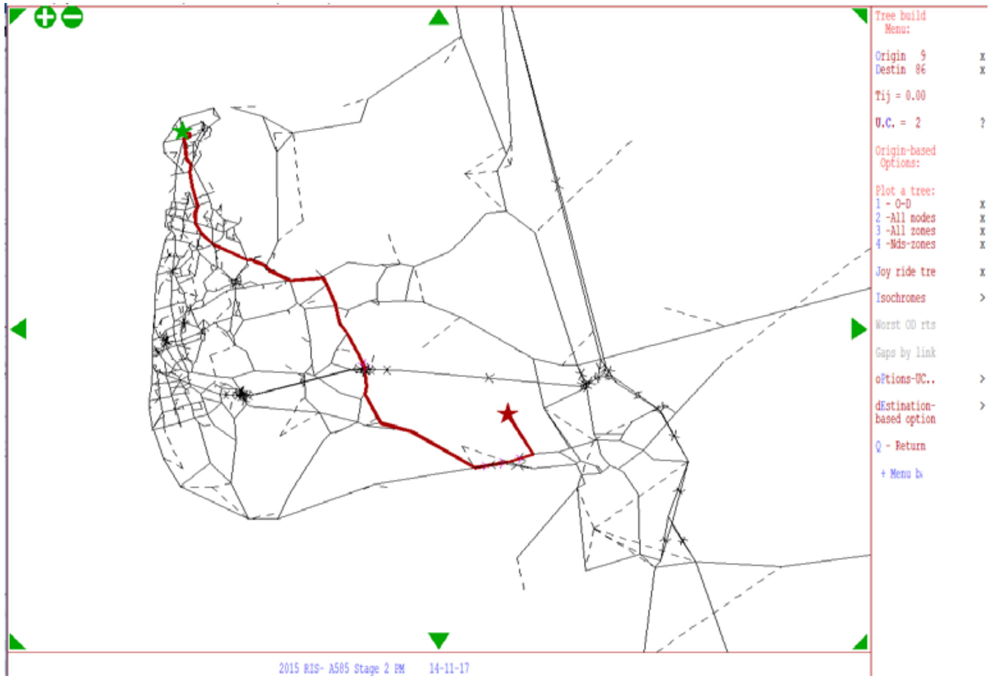
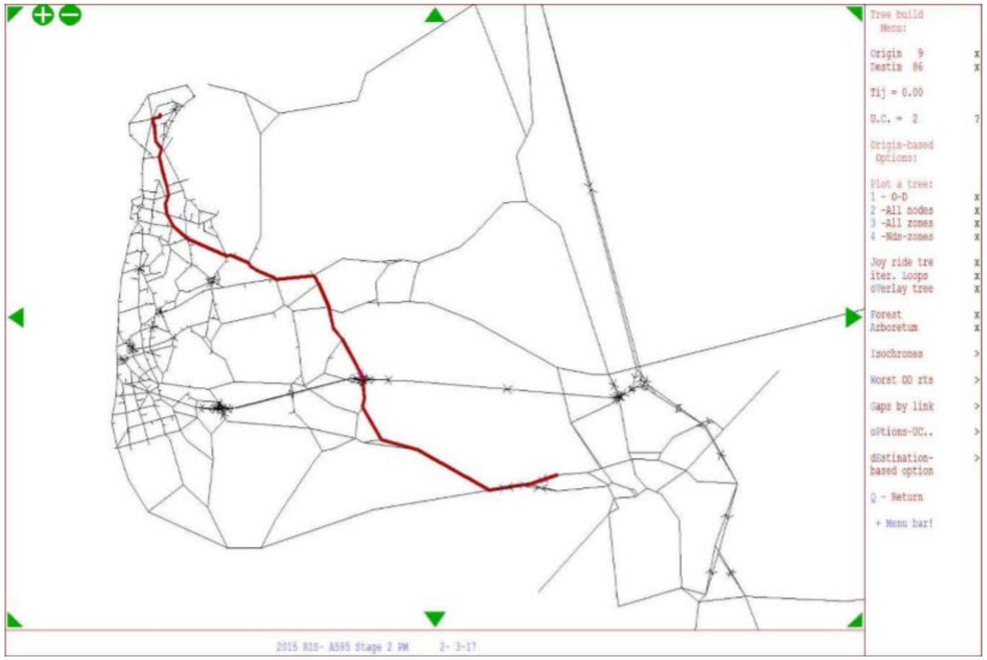
2		

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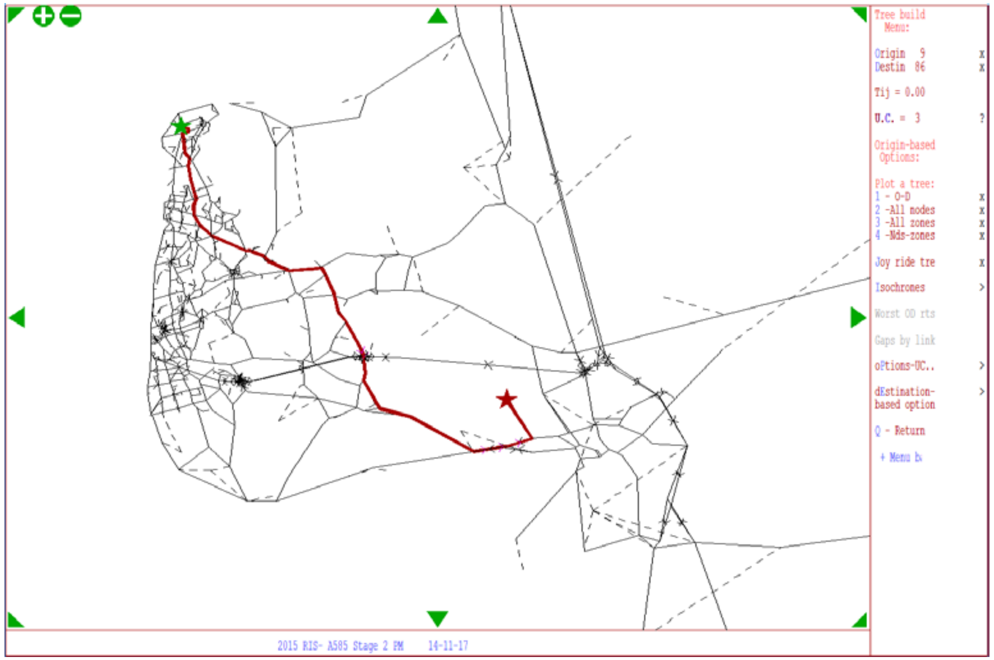
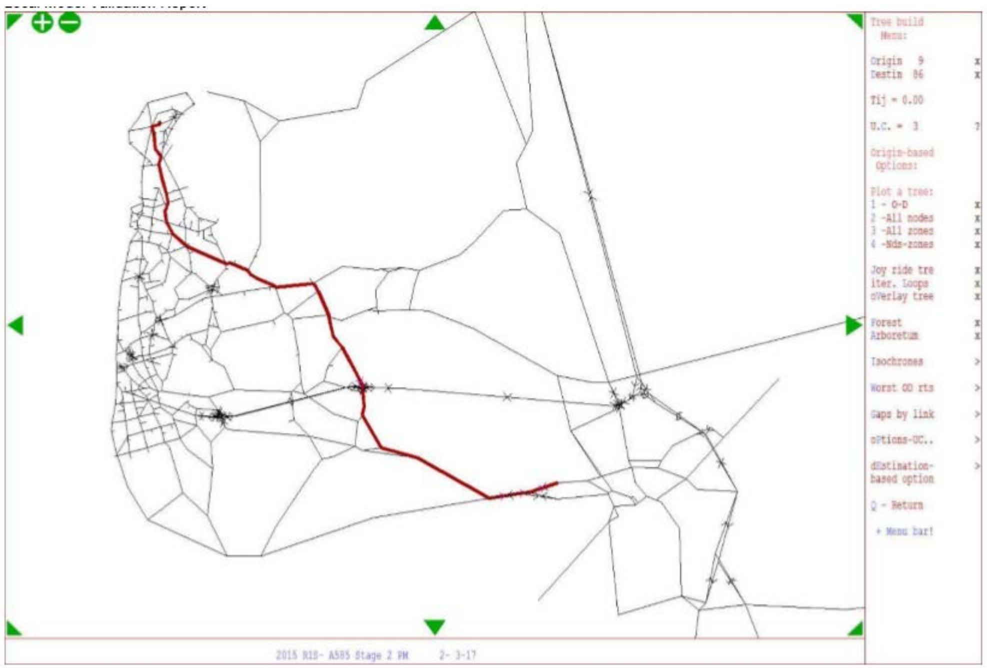
3		

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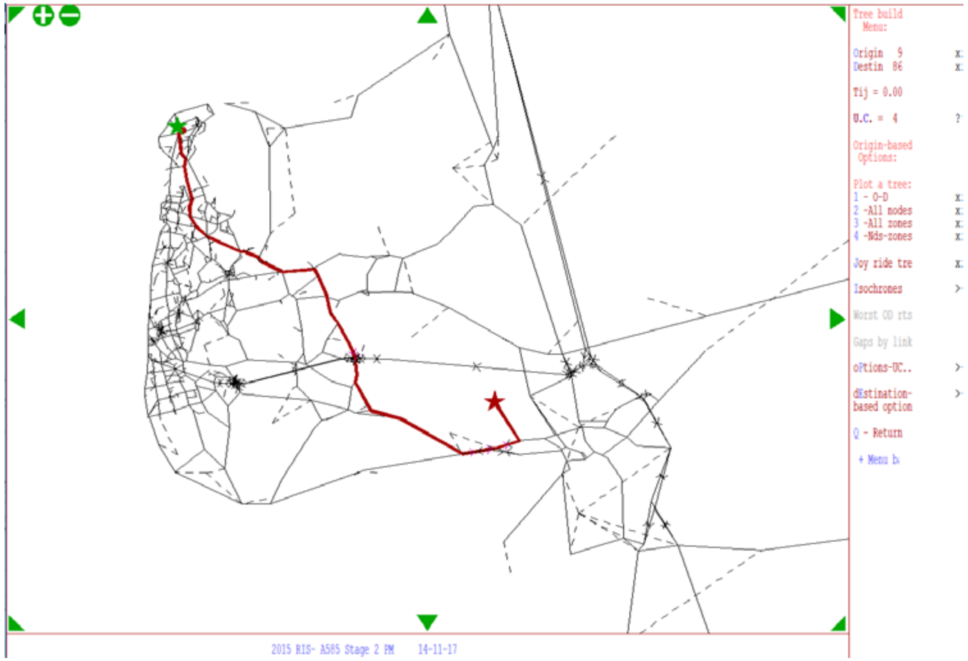
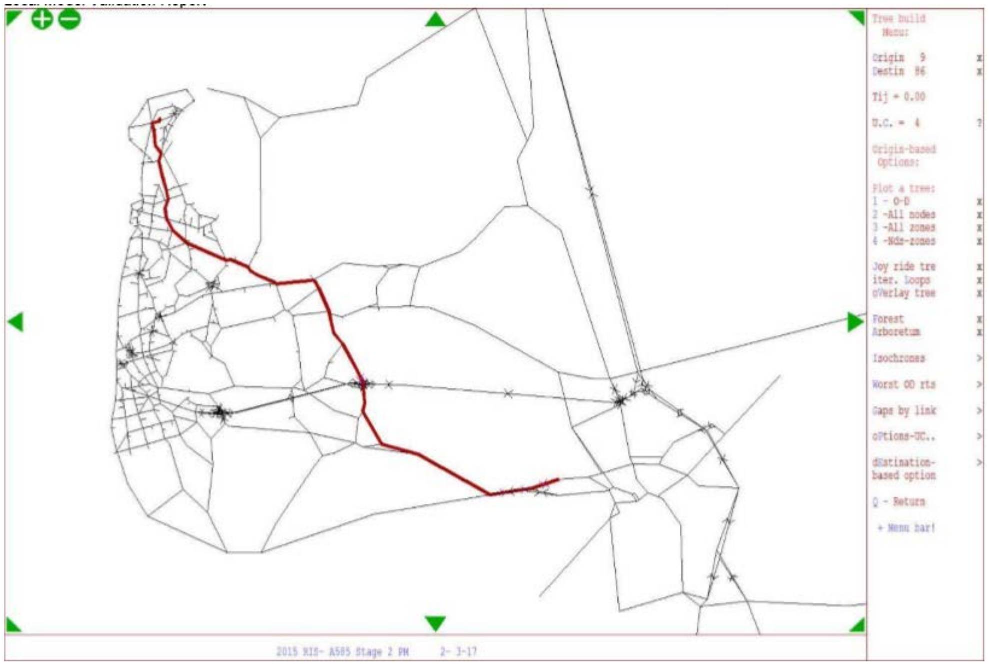
4		

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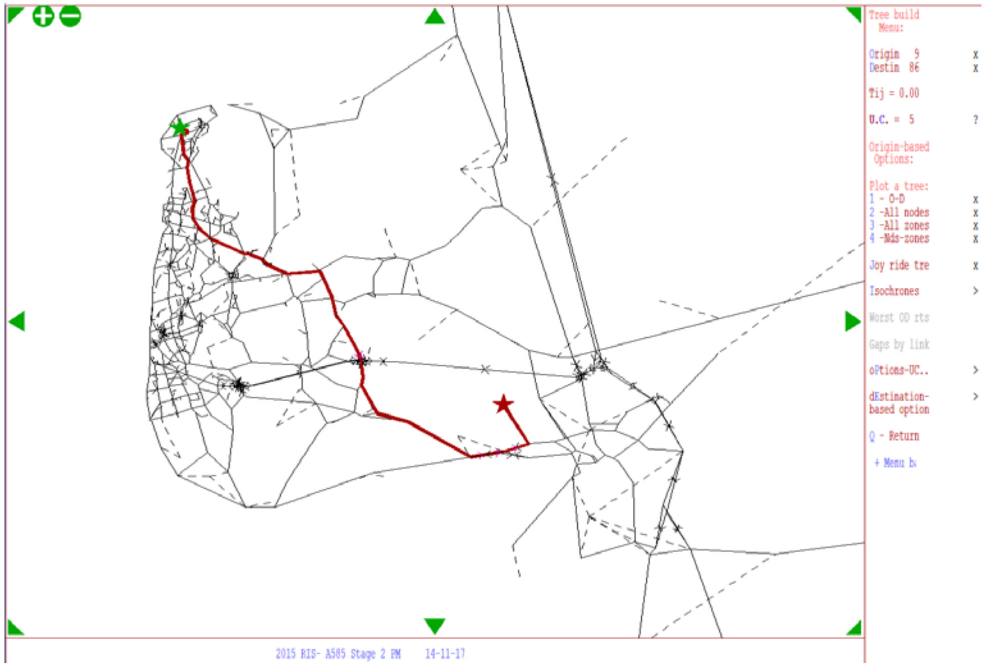
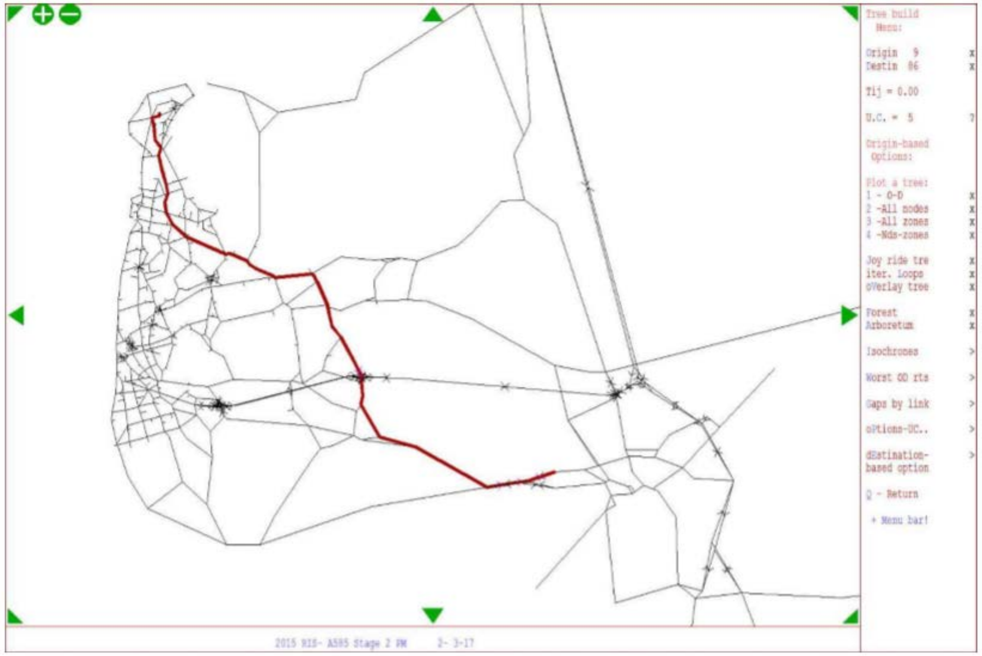
5		

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Technical Note 10

Project	**Stage 3 A585 Windy Harbour to Skippool**	Date	**22/12/2017**
Subject	**Variable Demand Modelling Realism Tests**	Ref	**HE548643-ARC-GEN-A585-TN-D-3010** **Version 1.0**
Author	Shirin Antony		

Table of Contents

Prepared by	Shirin Antony	Date	08/12/2017
Checked by	Clare-Louise Douglas	Date	22/12/2017
Approved by	Clare Bond	Date	

Revision Status	Amendments	Date
		Day Month Year

1 INTRODUCTION

1.1 Background

1.1.1 The A585 Windy Harbour to Skippool traffic model developed at PCF Stage 2 will be used for the Stage 3 assessment and therefore only minor modifications to update the PCF Stage 2 traffic model with the updated appraisal values of time and vehicle operating costs from the Department for Transport (DFT) data book have been undertaken.

1.1.2 The Stage 2 A585 Windy Harbour to Skippool base year traffic model (2015) was validated using the November 2016 TAG release of Values of Time (VoT) and Vehicle Operating Costs (VOC) [VoT_and_VOC_from_WebTAG_Databook_v1.6_ (Nov 2016 updates) _release130916.xlsx].

1.1.3 The TAG databook July 2017 v1.8 release [VoT_and_VOC_from_webTAG_Databook_(July 2017) - release040817.xlsx] as specified in the Stage 3 Appraisal Specification Report [HE548643-ARC-GEN-A585-RP-D-3038-V2.0] has been used in the development of the Stage 3 traffic model.

1.1.4 The Highways England TPG VoT/VOC spreadsheet has now been updated to incorporate the October 2017 changes to the TAG Databook (Release 1.8.2). The latest spreadsheet now includes forecast fuel cost series for electric LGVs, updating Tables 10, 10b, 13 and 14 within the TAG tab. As this is only a minor change as agreed with Highways England no modelling updates will be done just to incorporate these changes.

1.1.5 The technical note 'A585 Realism Tests Note v4.0' presented the results of the sensitivity test on the changes to the VoT and VOC undertaken on the Stage 2 A585 Windy Harbour to Skippool base year traffic model. The analysis showed that the 'sensitivity test' (for all the three modelled time periods) either met, or was very close to, the acceptability DMRB guidelines at the cordon and screenlines level and individual link level at the independent validation sites. It also met the acceptability guidelines for journey times across all modelled time periods.

1.1.6 The purpose of this technical note is to present the results of a sensitivity analysis undertaken on the A585 Windy Harbour to Skippool Variable Demand Model as a result of changes to the Values of Time (VoT) and Vehicle Operating Costs (VOC). This analysis was undertaken to ensure that the 'calibrated' (DIADEM-lambda) parameters of the Stage 2 A585 Windy Harbour to Skippool Variable Demand Modelling (VDM) provide a realistic response to changes in fuel costs and journey times (using the more recent VoT, VOC values) to test future transport interventions and forecasting future travel demand.

1.1.7 The variable demand model realism tests will be undertaken in line with the Department for Transport's Transport Analysis Guidance (TAG) Unit M2 Variable Demand Modelling, March 2017 guidance and using methods described in the VDM DIADEM software manual.

2 Demand Model Development

2.1 Model Development

2.1.1 DIADEM is an incremental logit demand model used to model variable demand and find the equilibrium between demand and supply. The incremental model works by adjusting an input reference demand matrix according to changes between forecast travel costs and input reference travel costs. This process iterates between demand calculations and assignments; equilibrium is not found exactly therefore convergence criteria are used to determine when the solution is close enough to equilibrium.

2.2 Modelling Software Used

2.2.1 The scheme is only to be modelled with a highway component, and this was undertaken in SATURN Version 11.3.12W. Therefore, the VDM is to be undertaken in DIADEM Version 5.0 software which provides an off-the-shelf solution to undertaking VDM in conjunction with a SATURN highway assignment model.

2.3 Segmentation

2.3.1 The segmentation was undertaken in accordance with TAG Unit M2 Variable Demand Modelling guidance with commute trips as home-based trips only and the employer's business and other purposes split into home based and non-home-based trips. The home-based trip purposes were modelled as 24-hour production-attraction trip matrices while the non-home-based trip purposes as average hour origin-destination trip matrices. The Light Goods Vehicles (LGV) and Heavy Goods Vehicles (HGV) matrices were modelled as fixed matrices, and do not respond to the VDM.

2.3.2 Table 2.1 shows the demand segmentation based upon the journey purposes and matrix form used for each, in the VDM.

Table 2.1: Demand Segmentation

ID	Purpose	Segment	Matrix Form
1	Car-Commute	Home Based	Production-attraction
2	Car-Employer's Business	Home Based	Production-attraction
3		Non-Home-Based	Origin-destination
4	Car-Other	Home Based	Production-attraction
5		Non-Home-Based	Origin-destination
6	LGV	N/A	Origin-destination Fixed demand – no VDM
7	HGV	N/A	Origin-destination Fixed demand – no VDM

2.4 VDM Parameters

2.4.1 TAG Unit M2 minimum values of parameters for the demand responses were selected following realism testing. The time period choice values are derived from the median mode choice parameters, as provided in TAG unit M2 Table 5.1. As the frequency response is a proxy for mode choice, a low value of 0.1 was used to enable a response to occur, but at a much lower level than a true mode choice. It is to be noted that the VDM parameters used are the same as that used for the Stage 2 base year realism testing. The demand model parameter values are shown in Table 2.2.

2.4.2 As there are no public transport costs available, no mode choice was included. However, as per TAG unit M2 (section 4.7.3), a trip frequency response (of car journeys) was used as a proxy for mode choice.

Table 2.2: Demand Model Parameters

Purpose	Segment	Frequency (Scaling)	Time Period (Scaling)	Distribution
Car-Commute	Home Based	0.1	0.68	-0.054 (Doubly Constrained)
Car-Employer's Business	Home Based	0.1	0.45	-0.038 (Production Constrained)
	Non-Home-Based	0.1	0.73	-0.069 (Origin Constrained)
Car-Other	Home Based	0.1	0.53	-0.074 (Production Constrained)
	Non-Home-Based	0.1	0.81	-0.073 (Origin Constrained)

3 Realism Testing

3.1 Methodology

3.1.1 Realism testing was undertaken to ensure the VDM parameters provide a realistic response to changes in travel costs.

3.1.2 The Stage 3 A585 Windy Harbour to Skippool 2015 base year SATURN model version B003 (with the adopted VoT and VOC - July 2017 v1.8 TAG databook release) was used for the realism testing in accordance with guidance in TAG Unit M2 Para 6.4.8 which advises that the elasticities should be calculated using the base year model. The method to carry out the realism test is described in the DIADEM manual. The guidance in the DIADEM manual provides a method to adjust the VDM parameters to ensure the changes in travel costs are suitably calibrated.

3.1.3 The cost changes were tested for cars relate to fuel and journey time changes. Travel demand is measured in vehicle kilometres for the fuel cost change and vehicle hours for the journey time cost change.

3.1.4 The realism test for car fuel costs involves artificially increasing the cost of fuel by 20% as suggested by TAG unit M2 Para 6.4.12, p 48, and then undertaking a VDM model run. The change in car kilometres before and after the fuel cost increase are used to calculate outturn fuel cost elasticity for the destination choice lambda. As stated in section 2.4.1, the demand model parameter values adopted were in line with Stage 2 base year realism testing.

3.1.5 TAG Unit M2 Para 6.4.14 indicates that ‘overall car trip elasticity to fuel cost’ is -0.3 within a range of -0.25 to -0.35 overall across all purposes and with a range from -0.1 to -0.4 with values closer to -0.1 for employer’s business trips and -0.4 for discretionary trips. Based on this, the outturn elasticity values are compared to the desired/target elasticity values from TAG unit M2 as shown in Table 3.3.

Table 3.3: Desired elasticity values

Car Purpose	Desired Elasticity
Work	-0.25
Employers Business	-0.10
Others	-0.40

3.2 Car Fuel Cost Realism Test

3.2.1 An increase of 20% fuel cost was adopted and the change in car-kilometres in the before and after fuel cost increase VDM assignment were used to calculate outturn fuel cost elasticity. The PPK base values and 20% increased values adopted are shown in Table 3.4. The non-fuel elasticity values were not increased in this process.

Table 3.4: VOC (PPK) values adopted for car fuel realism tests

User Class	AM		IP		PM	
	Base	20% Increase in Fuel Cost	Base	20% Increase in Fuel Cost	Base	20% Increase in Fuel Cost
Work	6.22	7.46	6.22	7.46	6.22	7.46
Employer business	12.53	13.57	12.53	13.57	12.53	13.57
Others	6.22	7.46	6.22	7.46	6.22	7.46
LGV	13.71	15.04	13.71	15.04	13.71	15.04
HGV	44.19	49.70	44.19	49.70	44.19	49.70

3.2.2 The outturn fuel cost elasticity was calculated using the following equation:

$$E = \frac{\log\left(\frac{T^1}{T^0}\right)}{\log\left(\frac{C^1}{C^0}\right)}$$

Where: E = Fuel Cost Elasticity (of demand);

T^0 = Vehicle kilometres before change;

C^0 = Fuel cost before change;

T^1 = Vehicle kilometres after change;

C^1 = Fuel Cost after change (after 20% increase);

Adjust distribution lambda using λ1 = λ0 * (ed / eo)

Where: λ1 = adjusted distribution lambda parameter;

λ0 = original distribution lambda parameter;

e_d = desired elasticity;

e_o = outturn elasticity (from original VDM assignments using original distribution lambda parameter).

3.3 Car Journey Time Realism Test

3.3.1 The car elasticity of vehicle-kilometres with respect to journey times were derived from the aforementioned car fuel cost elasticities, by multiplying each of them by their relevant ratios between car journey costs and fuel costs. The DIADEM manual recommends this approach on calculating the journey time elasticity. This is based on the premise that for a typical trip in a network there exists a relationship between the trip cost and journey time (or the PPM and PPK weightings); and hence, a relationship between elasticities of vehicle kilometres with respect to fuel cost and journey time. This is given as follows:

$$E^{time} = E^{fuel}\frac{aT}{bK}$$

where,

E^{time} is the elasticity of vehicle kilometres with respect to journey time;

E^{fuel} is the elasticity of vehicle kilometres with respect to fuel cost;

a is the cost per hour from the generalised cost function and b is the cost per km

4 Realism Test Results

4.1 Car Fuel Cost Realism Test

4.1.1 Car-kilometres were directly obtained from the SATURN assignment output and the results are summarised in Table 4.1.

Table 4.1: Lambda Parameters and Fuel Cost Outturn Elasticities (Network Based)

Car Purpose	AM Peak		Inter Peak		PM Peak		Off-Peak	
	Lambda	Outturn Elasticity	Lambda	Outturn Elasticity	Lambda	Outturn Elasticity	Lambda	Outturn Elasticity
Adopted Parameters within TAG unit M2 guidance								
Car - Commute	-0.054	-0.19	-0.054	-0.19	-0.054	-0.19	-0.054	-0.19
Car - EB-HB	-0.038	-0.13	-0.038	-0.12	-0.038	-0.09	-0.038	-0.12
Car - EB-NHB	-0.069	-0.17	-0.069	-0.26	-0.069	-0.09	-0.069	-0.26
Car O-HB	-0.074	-0.46	-0.074	-0.49	-0.074	-0.55	-0.074	-0.51
Car O-NHB	-0.073	-0.17	-0.073	-0.35	-0.073	-0.40	-0.073	-0.34

4.1.2 The lambda parameters for each time periods for the car fuel cost realism testing are shown in Table 4.2.

Table 4.2: VDM Parameters

Car Purpose	AM	IP	PM	OP
Car - Commute	-0.054	-0.054	-0.054	-0.054
Car - EB-HB	-0.038	-0.038	-0.038	-0.038
Car - EB-NHB	-0.069	-0.069	-0.069	-0.069
Car O-HB	-0.074	-0.074	-0.074	-0.074
Car O-NHB	-0.073	-0.073	-0.073	-0.073

4.1.3 A summary of car fuel cost elasticity values achieved for all modelled time periods for the lambda values are shown in Tables 4.3.

Table 4.3: Fuel Cost Elasticities by Demand Segment and Time Period

Purpose	AM	IP	PM	OP	ALL
Car - Commute	-0.19	-0.19	-0.19	-0.19	**-0.19**
Car - EB-HB	-0.13	-0.12	-0.09	-0.12	**-0.11**
Car - EB-NHB	-0.17	-0.26	-0.09	-0.26	**-0.19**
Car O-HB	-0.46	-0.49	-0.55	-0.51	**-0.51**
Car O-NHB	-0.17	-0.35	-0.40	-0.34	**-0.32**
All Purposes	**-0.26**	**-0.40**	**-0.37**	**-0.34**	**-0.34**

4.1.4 TAG unit M2 Para 6.4.15-17 recommended elasticity values are in the range of -0.1 to -0.4, with employer’s business close to - 0.1 and other purposes closer to -0.4. The annual average fuel cost elasticity (across all trip purposes) should lie within the range of -0.25 to -0.35.

4.1.5 The resultant elasticities for the updated VoT/VOC values show a similar trend as the Stage 2 base year elasticity values issued (ref: 20171116 104106 A585 Realism Tests Note v4.0.docx).

4.1.6 From table 4.3, it is clear that the relationship between demand segments is as expected, with Employer’s Business the least elastic, and the Other purpose the most elastic.

4.1.7 The elasticities for employer business and other trips are marginally higher than the recommended ranges of -0.1 and -0.4 respectively for AM, IP and OP and within the recommended range for PM. This suggests that these trip purposes would exhibit a slightly higher sensitivity to fuel cost increases.

4.1.8 It is observed that the Car Other-NHB trips are less elastic than the Car Other-HB trips. This pertains to the fact that the average trip lengths for Car Other-NHB is shorter than the Car Other-HB trip length resulting in the lower overall elasticity for Car Other-NHB compared to Car Other-HB.

4.1.9 The overall fuel cost elasticity (across all trip purposes) was -0.34 which lies within the TAG suggested range of -0.25 to -0.35.

4.2 Car Journey Time Realism Test

4.2.1 The journey time elasticities were calculated based on the of fuel cost elasticities for which the elasticities were within the recommended TAG ranges. The journey time elasticity values are shown in Tables 4.4.

Table 4.4: Car Journey Time Elasticities

Purpose	**AM**	**IP**	**PM**	**OP**	**All**
Car - Commute	-0.20	-0.20	-0.19	-0.18	-0.19
Car - EB-HB	-0.10	-0.10	-0.07	-0.08	-0.09
Car - EB-NHB	-0.13	-0.20	-0.08	-0.18	-0.15
Car O-HB	-0.35	-0.38	-0.43	-0.35	-0.39
Car O-NHB	-0.13	-0.27	-0.32	-0.24	-0.25
All Purposes	-0.23	-0.32	-0.32	-0.27	-0.28

4.2.2 Table 4.4 demonstrates that the car journey time elasticities are below the TAG unit M2 recommended threshold value of -2.0 and therefore provides evidence that the Stage 3 variable demand model meets the primary car fuel cost realism criteria.

5 Convergence Results

5.1.1 The fixed step length algorithm in DIADEM was used to control the variable demand model, which resulted in convergence results as shown in Table 5.1.

Table 5.1: Demand Model Convergence Table

Iteration	Absolute Gap	Relative gap
1	825402.34	6.92%
2	400718.52	3.46%
3	196052.45	1.72%
4	96613.636	0.85%
5	47884.116	0.42%
6	24376.271	0.22%
7	12994.727	0.12%
8	7951.2534	0.07%

5.1.2 TAG Unit M2 Para 6.3.8 states that the demand/supply gap should be less than 0.20% (preferably less than 0.1%). The demand-supply gap for the realism test results presented in table 5.1 shows a good level of convergence, achieved in 8 iterations.

6 Conclusions

6.1.1 The Stage 2 A585 Windy Harbour to Skippool base year traffic model (2015) was validated using the November 2016 TAG release of Values of Time (VoT) and Vehicle Operating Costs (VOC) [VoT_and_VOC_from_WebTAG_Databook_v1.6_(Nov 2016 updates)_release130916.xlsx].

6.1.2 The TAG databook July 2017 v1.8 release [VoT_and_VOC_from_webTAG_Databook_(July 2017) -release040817.xlsx] as specified in the Stage 3 Appraisal Specification Report [HE548643-ARC-GEN-A585-RP-D-3038-V2.0] has been used in the development of the Stage 3 traffic model.

6.1.3 This technical note presented the results of a fuel cost sensitivity analysis undertaken on the A585 Windy Harbour to Skippool VDM as a result of the changes to the Values of Time (VoT) and Vehicle Operating Costs (VOC). This analysis was undertaken to ensure that the ‘calibrated’ VDM parameters of the Stage 2 A585 Windy Harbour to Skippool variable demand model and using the adopted VoT and VOC values from the more recent release provide a realistic response to changes in fuel costs and journey times.

6.1.4 The variable demand model realism tests were undertaken in line with TAG Unit M2 Variable Demand Modelling, March 2017 guidance and using methods described in the DIADEM manual.

6.1.5 For commuting trips, the desired car fuel elasticity values were achieved for the lambda values within the TAG recommended limits, for all the time periods. The elasticities for employer business and other trips are marginally higher than the recommended ranges of -0.1 and -0.4 respectively for AM, IP and OP and within the recommended range for PM. This suggests that these trip purposes would exhibit a slightly higher sensitivity to fuel cost increases. Nevertheless, the overall fuel cost elasticity (across all trip purposes) was observed to be -0.34 that lies within the TAG suggested range of -0.25 to -0.35.

6.1.6 The Car Other-NHB trips are less elastic than the Car Other-HB trips due to the fact that the average trip lengths for Car Other-NHB was shorter than the Car Other-HB trip length resulting in the lower overall elasticity for Car Other-NHB compared to Car Other-HB.

6.1.7 The car journey time realism testing showed that the model elasticities were well below the TAG recommended threshold of -2.0 and were therefore deemed acceptable.

6.1.8 The realism sensitivity tests undertaken on the A585 Windy Harbour to Skippool variable demand model concludes that lambda parameter validated using the ‘November 2016 TAG (release’ of Values of Time (VoT) and Vehicle Operating Costs (VOC) adopted for the sensitivity test using the adopted version of TAG (release on VoT and VOC reflects the ‘July 2017 v1.8 TAG databook release’) values aligns with TAG unit M2 outturn elasticity values. The A585 Windy Harbour to Skippool VDM is thereby, considered fit to test future transport interventions and forecasting future travel demand.

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Appendix E – Stage 2 Local Model Validation Report

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Working on behalf of Highways England

LOCAL MODEL VALIDATION REPORT PCF STAGE 2

A585 Windy Harbour to Skippool

HE548643-ARC-GEN-A585-RP-TR-2039

08 SEPTEMBER 2017

Incorporating

CONTACTS

NICK HENDERSON
Project Manager

dd +44 (0)1483 803153
[redacted]
e Nick.Henderson@arcadis.com

Arcadis
The Surrey Research Park
10 Medawar Road
Guildford
GU2 7AR
United Kingdom

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Author	Amy Leather, Mahesh S., Mark Hudson
Owner	Nick Henderson
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Reviewer List

Name	Role
Marcus Chick	Senior Transport Planning and Economics Advisor, TPG

Approvals

Name	Signature	Title	Date of Issue	Version

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Local Model Validation Report

A585 Windy Harbour to Skippool

Author	Amy Leather, Mahesh S., Mark Hudson [redacted]
Checker	Saeed Ishtiaq [redacted]
Approver	Graham Foulkes [redacted]
Report No	HE548643-ARC-GEN-A585-RP-TR-2039
Date	SEPTEMBER 2017

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6.0	08/09/2017	CP,SA,SSA	Addressed comments in v5.0 from Richard Steinberg

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LIST OF ABBREVIATIONS AND ACRONYMS

AADT – Average Annual Daily Traffic

ADM – Area of Detailed Modelling

ASR – Appraisal Specification Report

BC – Blackpool Council

DfT – Department for Transport

DIADEM – Dynamic Integrated Assignment and Demand Modelling software

DMRB – Design Manual for Roads and Bridges

EB – East Bound

FMA – Fully Modelled Area

HATRIS – Highways Agency Traffic Information System

HBEB – Home Based Employer’s Business

HBO – Home Based Other

HBW – Home Based Work

HGV – Heavy Goods Vehicle

IP – Inter-Peak

ITN – Integrated Transport Network

JTDB – Journey Time Database

KPH – Kilometres Per Hour

LGV – Light Goods Vehicle

LMVR – Local Model Validation Report

ME – Matrix Estimation

MPH – Miles Per Hour

MSOA – Census 2011 Medium Level Super Output Area

MSF – Monthly Seasonality Factor

NB – North Bound

NHBEB – Non-Home Based Employer’s Business

NHBO – Non-Home Based Other

NHBW – Non-Home Based Work

OA – Census 2011 Output Area

OAR – Options Assessment Report

OD – Origin/Destination

OS – Ordnance Survey

PA – Production/Attraction

PCF – Project Control Framework

RSI – Road Side Interview

SATURN – Highway assignment software: ‘Simulation and Assignment of Traffic to Urban Road Networks’

SB – South Bound

SFC – Speed Flow Curve

SOBC – Strategic Outline Business Case

SRN – Strategic Road Network

TAME – Traffic Appraisal Modelling and Economics (Highways England)

TDCR – Traffic Data Collection Report

TEMPRO – Trip End Model Presentation Program

TFR – Traffic Forecasting Report

TfL – Transport for London

VOC – Vehicle Operating Cost

VoT – Value of Time

WB – West Bound

WebTAG – Web-based Transport Analysis Guidance

YGF – Yearly Growth Factor

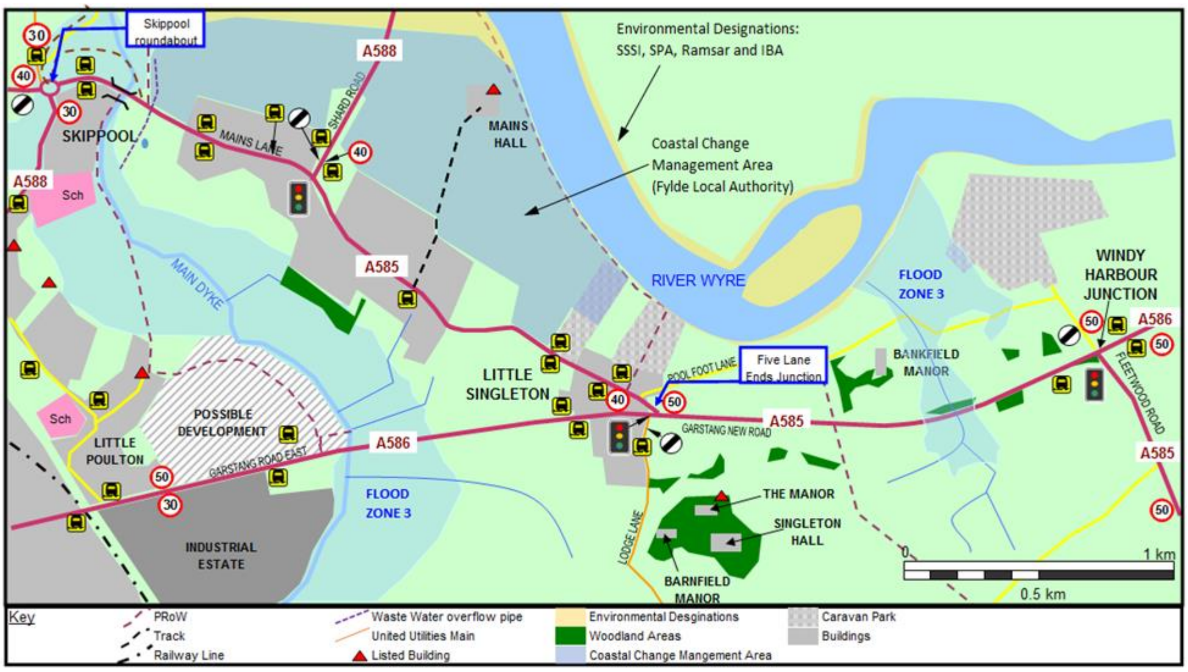
1 STUDY OVERVIEW

1.1 Background

1.1.1 The A585(T) is a single carriageway trunk road that provides the only viable access from the motorway network to Fleetwood, connecting the settlements of Windy Harbour, Skippool, Poulton-Le-Fylde and Thornton-Cleveleys along its route into the northern part of the Fylde/Wyre peninsula. It carries up to 28,000 vehicles per day (Annual Average Daily Traffic, AADT), along the sections of interest, causing significant issues of congestion, particularly in peak periods. The congestion leads to unreliable journey times and environmental and safety impacts in the villages of Little Singleton and Skippool and surrounding areas.

1.1.2 The existing road layout is shown in Figure 1-1. The congestion is particularly severe at the A585/A586 signalised junction (Little Singleton) and the signalised A585/A588 junction (Shard Road). A third signalised junction to the west (Windy Harbour) creates additional congestion, and the interaction of the three junctions exacerbates the issues.

Figure 1-1 A585 Windy Harbour to Skippool – Existing Road Layout



1.1.3 In spring 2015, a junction improvement (‘pinch point scheme’) was implemented at the A585/A586 crossroads at Garstang New Road, Fleetwood Road and Windy Harbour. The existing crossroads were realigned and widened to provide additional lanes through the junction and improvements to pedestrian and cycle facilities were made.

1.1.4 Highways England is now considering further improvements to the A585 corridor west of the A585/A586 junction. The A585 Windy Harbour to Skippool scheme is being delivered through Highways England’s Project Control Framework (PCF) for major projects, with planning currently at Stage 2 (Option Selection) of the seven stage PCF process.

1.1.5 Following an options sifting process and a Value Engineering Workshop held during PCF Stage 1, three options were taken forward for further consideration during Stage 2:

- A southern route offline dual carriageway with a bridge under Lodge Lane
- A northern route offline dual carriageway with a bridge under Lodge Lane
- An online scheme with a gyratory system at Little Singleton and upgrading of the junction at Shard Road to a roundabout

1.1.6 At the end of Stage 2, a preferred option will be selected to take forward to PCF Stage 3 (Preliminary Design).

1.2 Statement of scheme objectives

1.2.1 The Options Assessment Report (OAR) produced by Highways England identifies the following seven transport objectives for the A585 Windy Harbour to Skippool junction improvement:

- Objective 1: Reduce congestion on the existing A585 through Little Singleton, Shard and Skippool junctions
- Objective 2: Improve journey time reliability
- Objective 3: Reduce severance and improve access across the existing A585 between the Little Singleton and Skippool junctions
- Objective 4: Reduce/minimise the impact on the wider environment for air quality and noise
- Objective 5: Improve connectivity and community cohesion
- Objective 6: Reduce the obstacles to the economic growth potential in both Wyre and Fylde
- Objective 7: Complement and realise the full benefits of the earlier Pinch Point scheme at Windy Harbour junction

1.2.2 Wider objectives as outlined in the Strategic Outline Business Case (SOBC) developed for the A 585 improvement scheme include the delivery of capacity enhancements to the Strategic Road Network (SRN) and supporting employment and residential/commercial development opportunities, including the delivery of improved access to the Enterprise Zone at Warton.

1.3 Purpose & structure of this LMVR

1.3.1 This Local Model Validation Report (LMVR) describes the development of the base year model for the A585 improvement scheme during PCF Stage 2. The model is a SATURN-based traffic assignment model developed for the AM, Inter-Peak (IP) and PM peak periods on an average weekday in June 2015.

1.3.2 The model will be used to assess the three scheme options listed in Section 1.1.5. A microsimulation model will be developed in S-Paramics software to carry out an operational assessment of the three scheme options. A Variable Demand Model (VDM) is being developed in DIADEM (Dynamic Integrated Assignment and Demand Modelling) software to predict and quantify future changes in demand, as set out in Chapter 7 of this report.

1.3.3 The purpose of this LMVR is to demonstrate that the SATURN model accurately reproduces an existing, independently observed situation and to summarise the accuracy of the base from which traffic forecasts will be prepared.

1.3.4 The LMVR is the third in a series of PCF Products that document the options assessment work for the A585 improvement scheme that was undertaken during PCF Stage 2. It follows the Appraisal Specification Report[1] (ASR) and the Traffic Data Collection Report[2] (TDCR) and will be followed by the Traffic Forecasting Report (TFR) and the Economic Assessment Report (EAR).

1.3.5 The model has been developed in accordance with relevant guidance, primarily the Department for Transport's (DfT's) Web-based Transport Appraisal Guidance (WebTAG). Specific references to the guidance are provided in this LMVR to demonstrate compliance with the relevant requirements.

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[1] A585 Windy Harbour to Skippool Appraisal Specification Report March 2017 (Document Reference: HE548643-HYD-GEN-A585-RP-TR-2044 Version 10.0)

[2] A585 Windy Harbour to Skippool Traffic Data Collection Report August 2017 (Document Reference: HE548643-ARC-GEN-A585-RP-TR-2022 Version 5.0)

1.3.6 Following this introductory section, the LMVR is structured as follows:

- **Chapter 2: Model description / specification** – provides a description of the base year highway model developed for the A585 scheme.
- **Chapter 3: Summary of data collection** – summarises the traffic data collected to develop the base year highway model, and its fitness for purpose in model development.
- **Chapter 4: Highway model development** – describes the development of the highway model network and matrices and the assignment process.
- **Chapter 5: Highway model calibration** – describes the highway model network, matrix and assignment calibration processes and provides relevant calibration results.
- **Chapter 6: Highway model validation** – describes the highway model network, matrix and assignment validation processes and provides relevant validation results.
- **Chapter 7: Variable demand model** – describes the development of the Variable Demand Model used to assess the A585 scheme.
- **Chapter 8: Summary and conclusion** – summarises the information provided in the LMVR and provides conclusions regarding the robustness of the models to be used for forecasting.

2 MODEL DESCRIPTION / SPECIFICATION

2.1 Overview

2.1.1 This section provides a description of the base year traffic model developed for the A585 improvement scheme during PCF Stage 2, including information about its geographic coverage, the software used and the modelled time periods.

2.1.2 The following sections describe the traffic data collection processes, the ways in which data was used in the model development and the calibration and validation process used to assess the robustness of the model in terms of undertaking future forecasting and economic appraisal.

2.2 Model software

2.2.1 The A585 base year traffic model has been developed using the SATURN version 11.3.12U highway modelling suite.

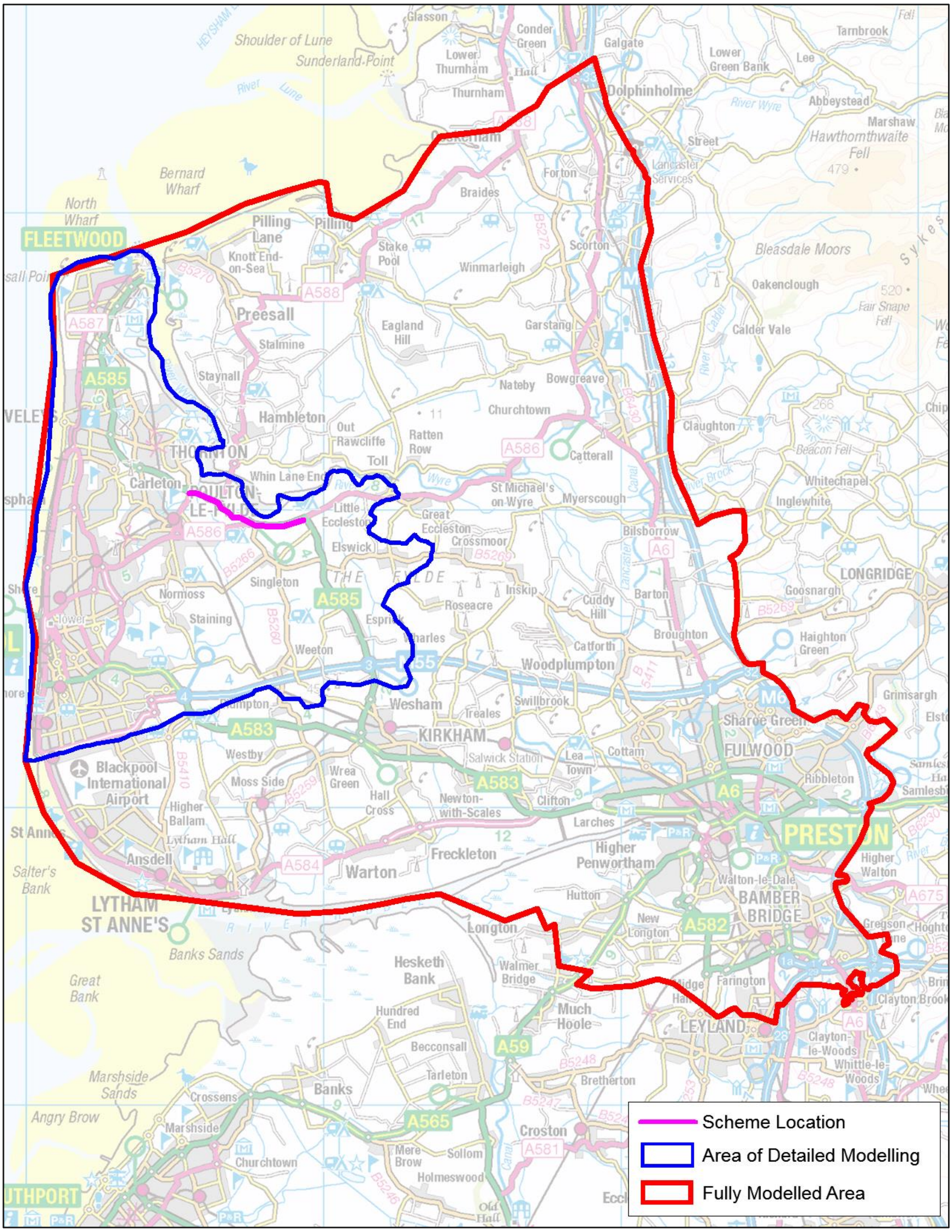
2.3 Geographic model coverage

2.3.1 The Fully Modelled Area (FMA) of the A585 base year traffic model was identified following discussions with Highways England's Traffic Appraisal Modelling and Economics Team (TAME). The FMA is the area over which the A585 improvement scheme is expected to have an influence. It is bounded by the edges of the Fylde Peninsula to the north, west and south, and by the M6 to the east. It is considered unlikely that the scheme would have any impacts to the east of the M6.

2.3.2 The Area of Detailed Modelling (ADM) includes the scheme and all alternative routes. The geographical setting of the A585 on a peninsula limits the number of viable alternative routes. More strategic route choices, such as routes on the M6 to Fleetwood, will be addressed by the FMA.

2.3.3 Figure 2-1 illustrates the geographic coverage of the model. Further information on the network development process is provided in Section 4.2.

Figure 2-1 Geographic Model Coverage



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2.4 Modelled time periods

2.4.1 The A585 base year SATURN model has been developed for the following time periods for an average weekday in June 2015, with the average hour being used within each time range:

- AM Peak Period: 07:30 – 9:30
- Inter-Peak Period: 09:30 – 15:00
- PM Peak Period: 15:00 – 18:00

2.4.2 The definitions of these time periods were discussed and agreed with Highways England in December 2015 based on analysis of the traffic data collected as reported in the TDCR[3].

2.4.3 At this stage, no weekday overnight or weekend modelling is proposed.

2.5 Demand modelling system

2.5.1 The A585 forecasting procedure requires a Variable Demand Model (VDM) which is being developed using the DfT's DIADEM 5.0 software, taking input data from the SATURN highway assignment model.

2.5.2 DIADEM provides the facility for setting up a hierarchical choice model structure that can include trip frequency, time of day, mode split and distribution models, as well as an interface to highway assignment. The DIADEM framework controls the iteration between demand and supply to ensure that the calculations reach an acceptable equilibrium.

2.5.3 The A585 VDM uses frequency, time period choice and trip distribution models. A frequency response is included to represent modal shift away from car since a specific mode choice model is not being used. Further details about the structure and behaviour of the VDM are provided in Chapter 7.

2.5.4 As set out in the Appraisal Specification Report (ASR)[4], no public transport modelling has been undertaken in relation to the proposed A585 improvement scheme. The reasons for this are set out in Section 4.2.44.

2.5.5 No land-use/transport interaction model has been developed for the proposed A585 improvement scheme.

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[3] A585 Windy Harbour to Skippool Traffic Data Collection Report August 2017 (Document Reference: HE548643-ARC-GEN-A585-RP-TR-2022 Version 5.0)

[4] A585 Windy Harbour to Skippool Appraisal Specification Report March 2017 (Document Reference: HE548643-HYD-GEN-A585-RP-TR-2044 Version 10.0)

3 SUMMARY OF DATA COLLECTION

3.1 Overview

3.1.1 In order to support the development of a robust traffic model, and to support the development of forecasts which will be used for economic and environmental appraisal, a large set of traffic data was collected.

3.1.2 The dataset comprised data that had been used in the development of the PCF Stage 1 A585 S-Paramics model and other previously developed traffic models, data collected by Local Authorities and new data collected for the development, calibration and validation of the A585 base year traffic model.

3.1.3 This chapter provides a summary of the main data sources used in model development, calibration and validation. Full details are provided in the A585 Stage 2 TDCR that was submitted to Highways England on 10 April 2017[5].

3.2 Data sources

Previous traffic models and traffic data

3.2.1 Table 3-1 provides a summary of the previously developed traffic models and previously collected traffic data used in the development of the A585 base year model. Full details of the previous traffic models and traffic data used in the development of the A585 traffic model are provided in Chapter 3 of the TDCR.

Table 3-1 Summary of Previous Traffic Models and Traffic Data

Previous Traffic Models		Year Developed	Use in A585 Model Development
1.	A585 Corridor & Thornton-Fleetwood Area Action Plan S-Paramics Model	2010	S-Paramics model zone boundaries were reviewed whilst developing the A585 SATURN model zone boundaries
2.	Further S-Paramics Modelling (PCF 1)	Originally in 2010, later adjusted to 2014 base using TEMPRO	
3.	Blackpool Transport Model (CUBE)	2008	Signal timings were reviewed to determine if they could be used at any of the signalised junctions in the A585 SATURN model.
4.	Central Lancashire Highways & Transport Masterplan (CLHTM) – Preston Western Distributor (PWD)	2014	Counts collected during 2014 at a number of Road Side Interview (RSI) sites in the vicinity of Preston were used as a contribution to the development of the base year matrices for the A585 SATURN model, as described in Section 4.3.
Previously Collected Traffic Data		**Year Collected**	**Use in A585 Model Development**
1.	Blackpool RSIs	2008	

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[5] A585 Windy Harbour to Skippool Traffic Data Collection Report April 2017 (Document Reference: HE548643-ARC-GEN-A585-RP-TR-2022 Version 5.0)

2.	A585 & Surroundings RSIs (collected by ANSA)	2010	Used to develop the base year matrices for the A585 SATURN model, after being uplifted to June 2015. The distributions of the trips recorded in these data sets were also used to generate distributions of generalised costs, which were used as inputs to the gravity model that was used in the synthesis of the prior matrix. This procedure is described in Section 4.3.
3.	RSIs collected for CLHTM (PWD)	2014	
4.	Blackpool Council – Temporary Automatic Traffic Counts (ATCs)	2012-2015	Used to derive factored counts for calibration/validation at screenlines and cordons
5.	Blackpool Council – Permanent ATCs	2012-2015	
6.	Lancashire County Council – Temporary ATCs	2011-2015	
7.	Lancashire County Council – Permanent ATCs	2011-2015	

3.2.2 Figure 3-1 shows the location of the Blackpool (2008), A585, and Surroundings (ANSA 2010) RSI site locations. Figure 3-2 shows the RSI sites at which interviews were carried out for the development of the PWD model (2014).

Figure 3-1 Blackpool and A585 & Surroundings (ANSA) RSI Site Locations

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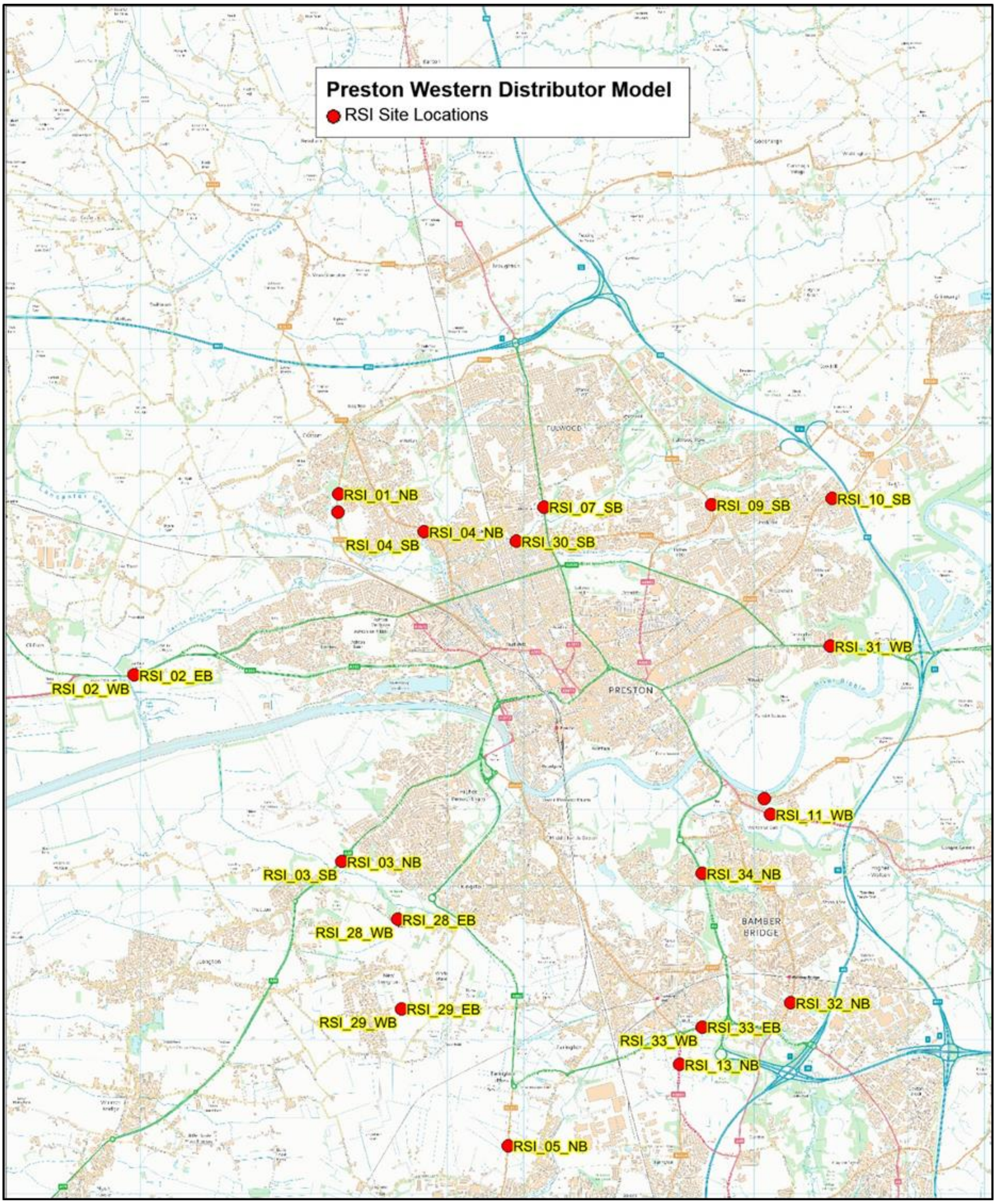
Figure 3-2 PWD RSI Site Locations



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3.2.3 It was necessary to collect additional data at specific locations for calibration and validation purposes and to derive Yearly Growth Factors (YGFs) and Monthly Seasonality Factors (MSFs) at specific site locations. The traffic survey programme is discussed in the next section.

Traffic survey programme

3.2.4 To supplement the previously collected data and information taken from previously developed traffic models, a programme of traffic surveys was carried out in September/October 2015 and

February/March 2016, as summarised in Table 3-2. Further details of the survey programme are provided in Chapter 4 of the TDCR.

Table 3-2 Summary of the Traffic Survey Programme

Survey Type	No. of Sites	Direction	Duration	Survey Dates	Use in Model Development
Automatic Traffic Counts (ATCs)	8	All directions at each survey site	2 weeks (24 hours per day)	July, September, October 2015	Matrix development Link calibration and validation along screenlines and cordons
	56	All directions at each survey site	2 weeks (24 hours per day)	February/March 2016	
Classified Junction Counts (CJCs)	64	All turning movements	2 days per site (07:00-19:00 on each day)	July 2015	Turn calibration and validation
Queue Length Surveys	64	Queues on all lanes at each junction approach arm	2 days per site (07:00-19:00 on each day)	July 2015	Network calibration and validation
Manual Classified Counts (MCCs)	9	All movements	1 day (07:00-19:00)	February 2016	Calibration and validation Vehicle classification factors

3.2.5 Figure 3-3 to Figure 3-6 shows the location of the ATC (2015 and 2016), CJC and MCC site locations.

Figure 3-3 2015 ATC Site Locations

Figure 3-4 2016 ATC Site Locations

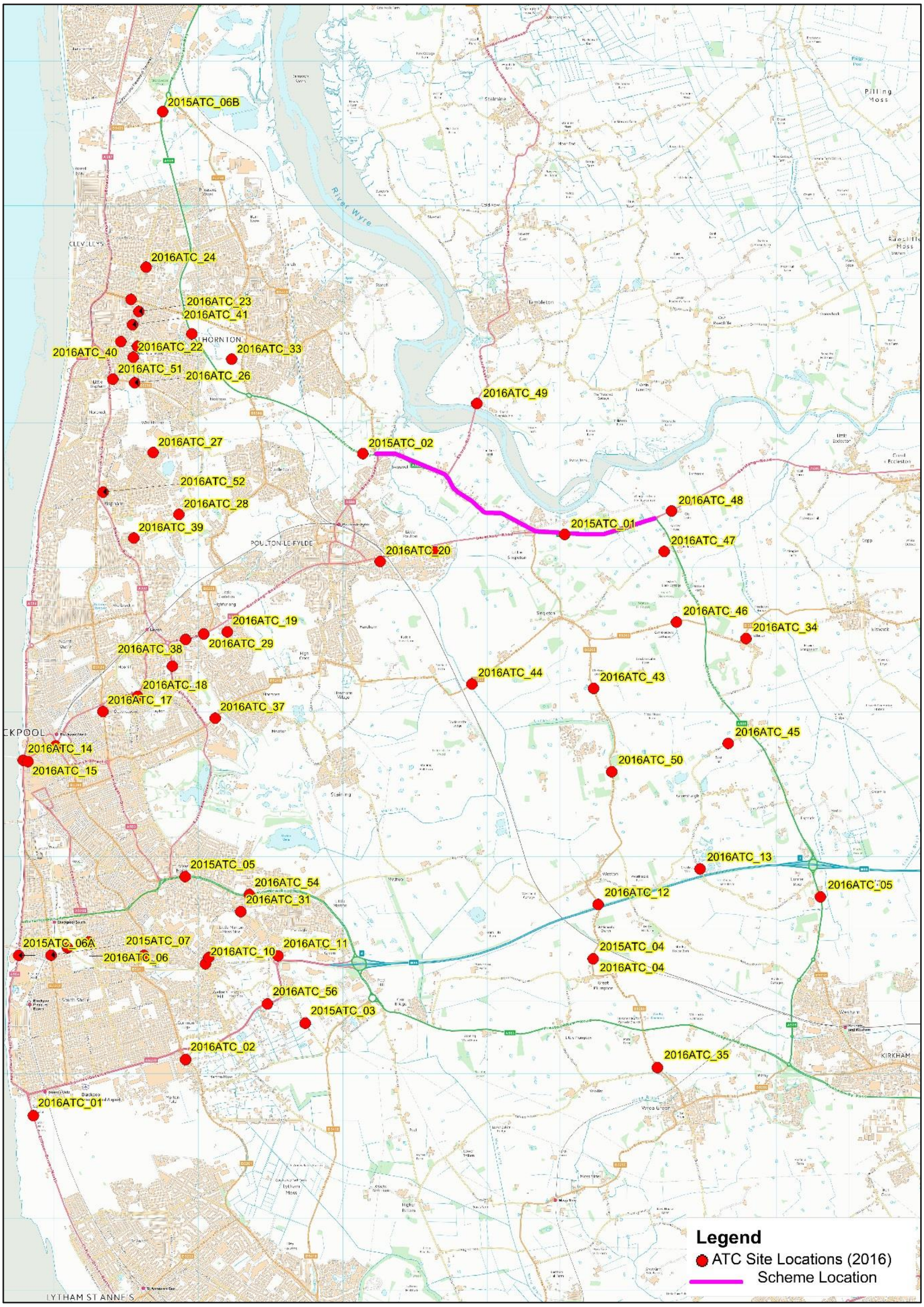


Figure 3-5 CJC Site Locations

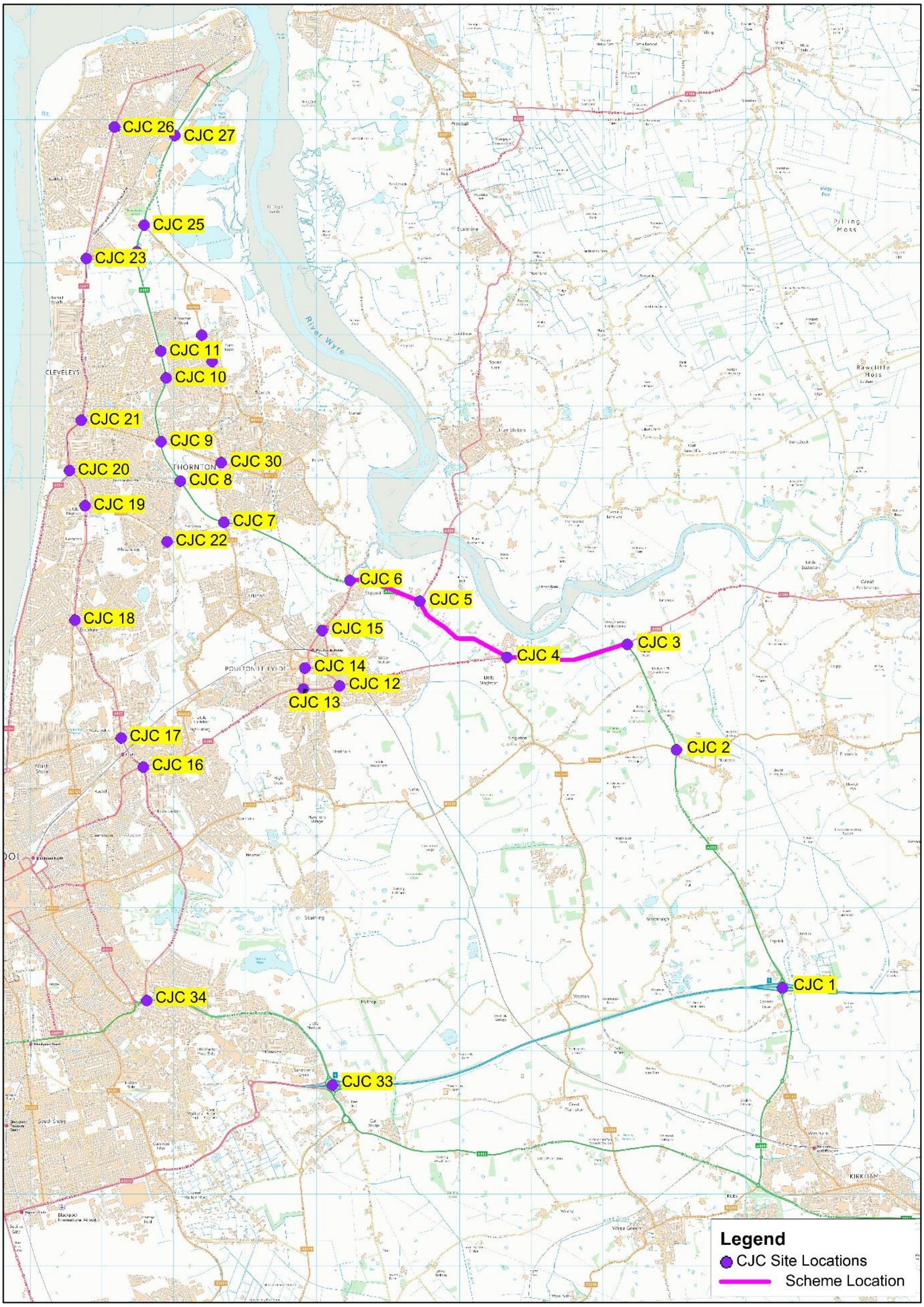


Figure 3-6 2016 MCC Site Locations

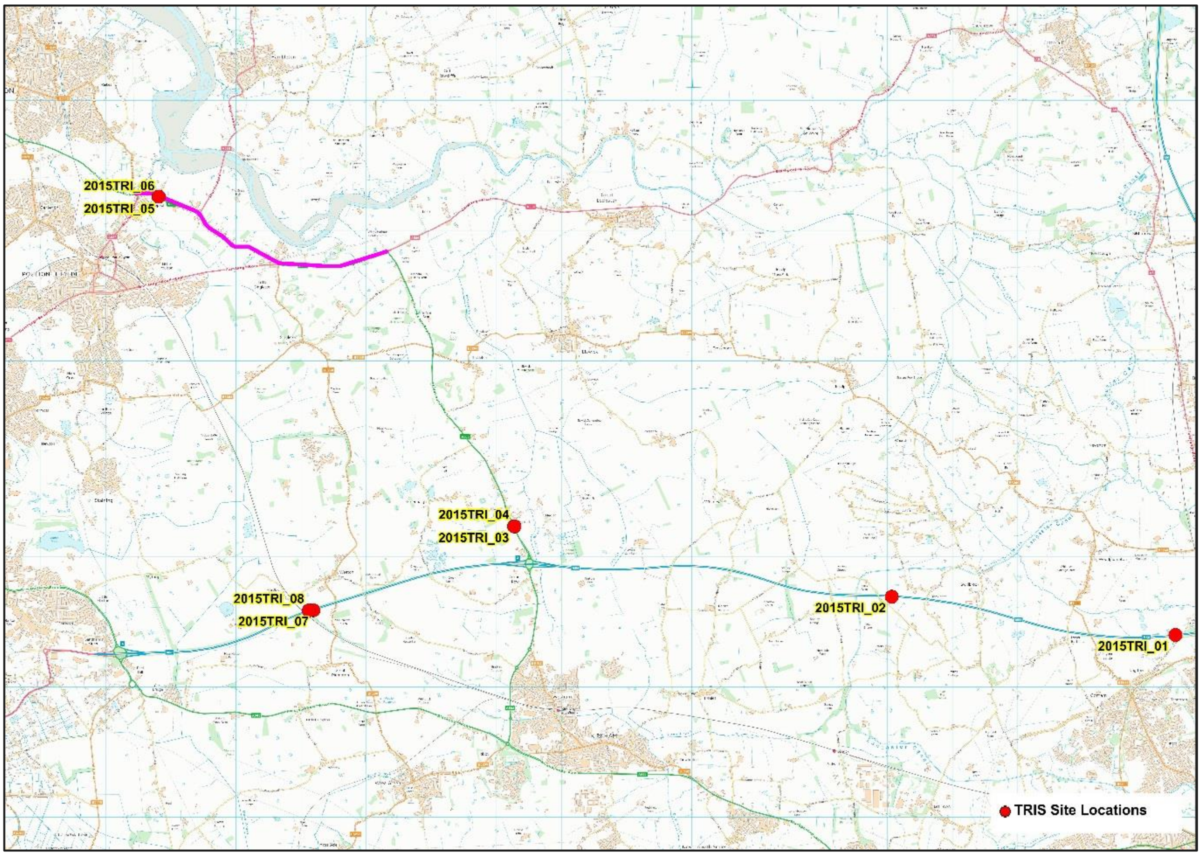
TRIS data

3.2.6 In addition to collecting bespoke traffic data to use in the development of the A585 model, existing traffic count information was extracted from Highways England's TRIS website (http://tris.highwaysengland.co.uk) for the months of July 2015 and September 2015. This data was extracted for eight locations in the study area, in fifteen minute intervals. Further details regarding the sites for which data was extracted is provided in Chapter 5 of the TDCR.

3.2.7 The TRIS data was used as observed counts at selected screenlines and cordons and it was also used to identify Yearly Growth Factors (YGFs) and Monthly Seasonality Factors (MSFs) for sites on motorways and 'A' class roads that were then used to convert the data collected to the model base month and year of June 2015.

3.2.8 Figure 3-7 shows the TRSI data site locations.

Figure 3-7 TRIS Data Site Locations



Journey time data

3.2.9 Data on observed journey times was extracted from the Trafficmaster database for 28 routes in the study area. This data was compared with modelled journey time data to identify whether the journey time validation results meet the relevant criteria.

3.2.10 Each journey time route was sub-divided into several sections for validation purposes, which were constructed from one or more SATURN network links. The observed journey time for each section was extracted from the Trafficmaster data and the sum over the whole route was compared with the modelled journey time summed over the same section and assessed against the WebTAG criteria for journey time validation. The results of the observed and modelled journey time comparisons are presented in Section 6.5.

3.3 Summary

3.3.1 This chapter presents a summary of the data collected and used in the development of the A585 base year traffic model. Previously developed traffic models and previously collected traffic data were examined to identify their appropriateness for A585 model development, and relevant information and data was used where appropriate. RSI data from 2008, 2010 and 2014 was used to develop the base year matrices, after being uplifted to June 2015 counts. The trips recorded in these datasets were also used to generate an initial set of generalised costs, which were used as inputs to the gravity model that synthesised the final prior matrices of car trips, which were later modified through matrix estimation.

3.3.2 A traffic survey programme was carried out in 2015/16, which included ATC, CJC and MCC data collection. The programme was developed in accordance with the extent of the study area and the location of screenlines and cordons. The ATC data was used in matrix development and link calibration and validation along screenlines and cordons. The CJC data was used for turn calibration and validation and the MCC data was used for calibration and validation purposes and also to derive vehicle classification factors. Queue length surveys were carried out for network calibration and validation.

3.3.3 TRIS data was used to provide observed counts at selected screenlines and cordons, as a comparison against the data collected. Statistical tests were used to identify any outliers, as reported in full in the TDCR. The TRIS data was also used to identify YGFs and MSFs for sites on motorways and ‘A’ class roads.

4 HIGHWAY MODEL DEVELOPMENT

4.1 Overview

4.1.1 This chapter describes the development of the base year highway assignment model, covering the procedures used to build networks and construct trip matrices. It also summarises the definitions and parameters used in the SATURN model.

4.2 Network development

4.2.1 This section provides an overview of the development of the SATURN model network for PCF Stage 2. Further details are provided in Technical Note 22: SATURN Model Network Development (Version 2), which was submitted to Highways England on 4 July 2016. It should be noted that further network development work has been undertaken since Technical Note 22 was issued, which is reflected in this chapter.

Network structure

4.2.2 The A585 traffic model consists of two key model areas: the Fully Modelled Area (FMA) and the External Area.

4.2.3 The FMA is the area over which the proposed scheme is expected to have an influence, focusing on the A585 to the north of the M55 and to the west of the M6, including the principal settlements of Fleetwood, Blackpool, Cleveleys, Poulton-Le-Fylde, Singleton and a number of smaller areas, as illustrated earlier in Figure 2-1.

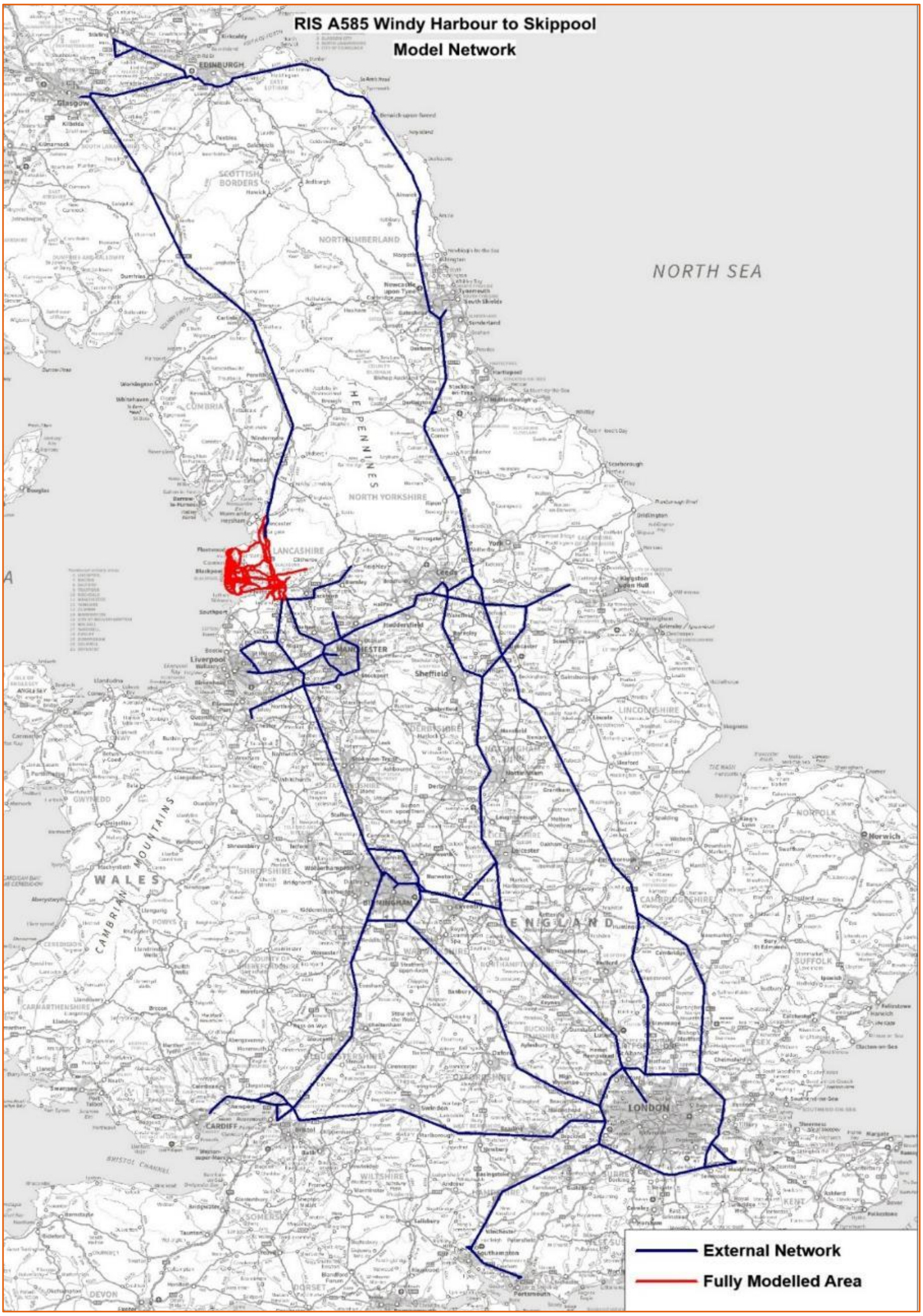
4.2.4 The FMA is further sub-divided into the Model Simulation Area or Area of Detailed Modelling (hereafter referred to as the ADM) and the Buffer Area.

4.2.5 The ADM is the area over which significant scheme impacts are expected. This area is characterised by small zones, very detailed networks and junction modelling, with all trip movements represented. The ADM of the A585 traffic model contains a total of 81 signalised junctions, 47 roundabouts and 241 priority junctions.

4.2.6 The Buffer Area is the area over which scheme impacts are expected to be relatively weak in magnitude. All trip movements are represented in the Buffer Area of the A585 base year model, but with larger zones and less network detail than for the ADM.

4.2.7 The External Area is the area outside the anticipated area of scheme influence, characterised in the A585 traffic model by large zones, skeleton networks and fixed speed modelling. The External Area represents a large proportion of the rest of Great Britain, as shown in Figure 4-1.

Figure 4-1 A585 Windy Harbour to Skippool – External Area (Road Network)



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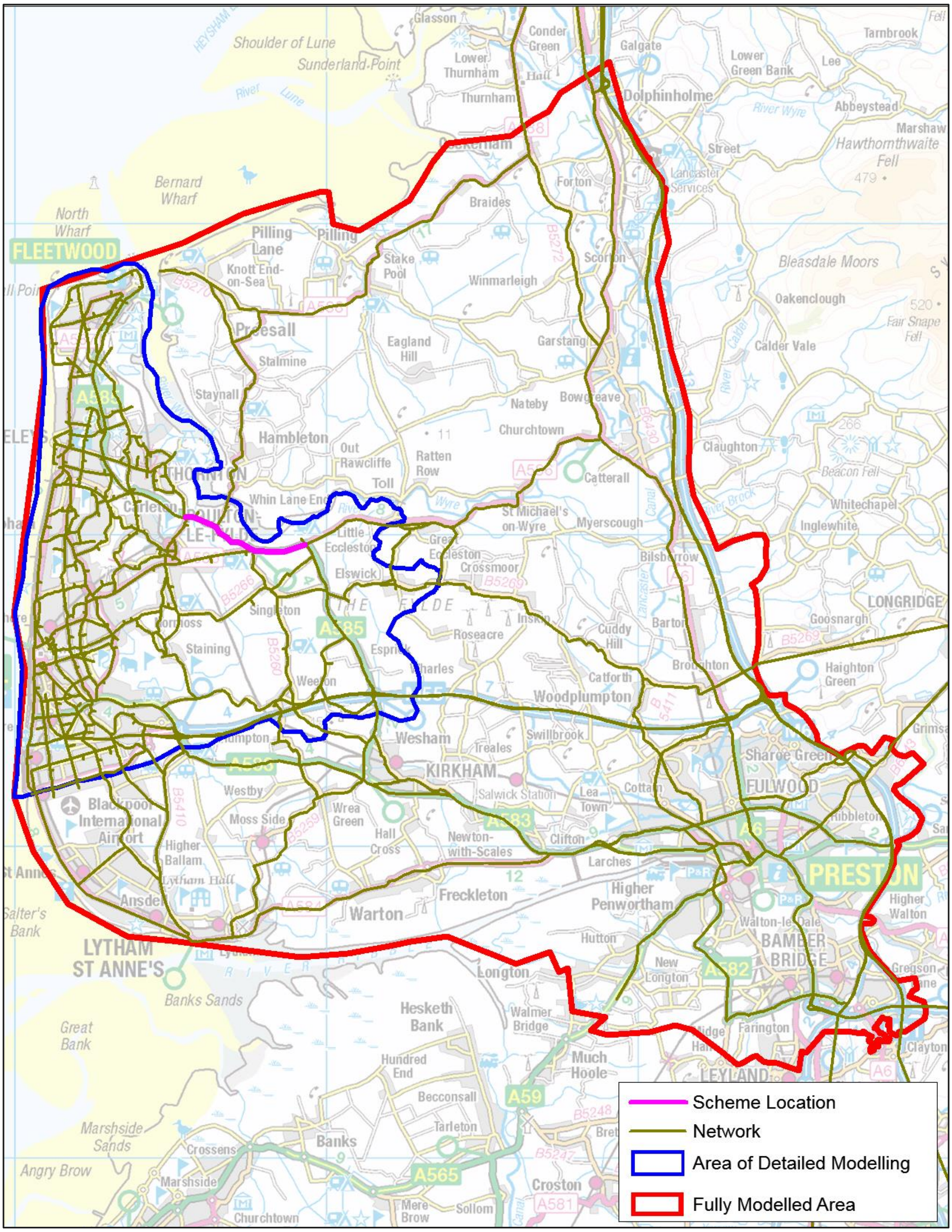
4.2.8 MapInfo GIS software was used as the primary tool in identifying the roads for inclusion in the model, building the model road network and updating network attributes. The model road network is illustrated in Figure 4-2.

Figure 4-2 A585 Model Road Network



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Network coding: zone structure

4.2.9 The SATURN model zone structure was designed in accordance with the guidance set out in WebTAG Unit M3.1 (Section 2.3).

4.2.10 The zone hierarchy for the A585 model is as follows:

- Local areas
- Output areas
- Wards
- Districts
- Counties
- Regions

4.2.11 The base year network contains 190 zones, of which 69 are in the ADM, 25 are in the rest of the FMA and the remaining 96 are in the External Area. Zones in the ADM are the smallest, becoming progressively larger for the rest of the FMA and larger again for the External Area. In some circumstances, special zones were created; for example, a zone was created to represent the Windy Harbour Caravan Park.

4.2.12 A zone list and description is provided in Appendix A. The model zone boundaries are illustrated in Figure 4-3 and Figure 4-4.

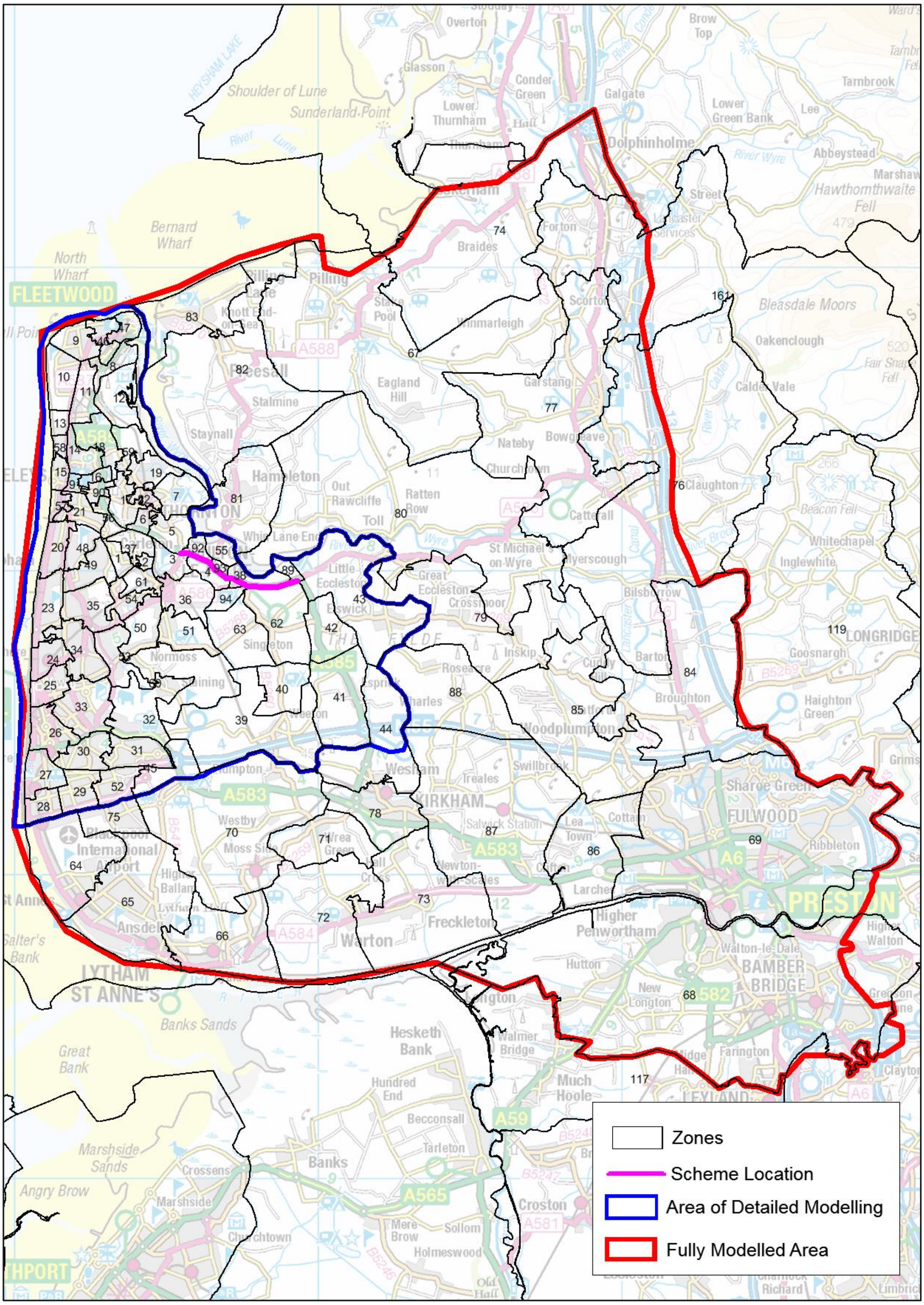
4.2.13 Once zone boundaries were finalised, centroid connectors were attached to each zone. These were positioned at the weighted centroid of all household and trip generating developments within the zone. For zones within the ADM, zone loading points are via the side roads along which traffic is most likely to access the network. In the rest of the FMA, only motorways and A-roads were included, and zone connectors were connected to the nearest node of the motorway or A-road. In the External Area, only motorways were included and zones were connected to the nearest loading point on the motorway.

4.2.14 For all zones, the distances coded from the zone centroid to the loading points were set to the actual travel distance from the zone centroid to the road network.

4.2.15 In some cases, local access roads were combined and represented as stubs/spigots to allow for access to and egress from zones.

4.2.16 All trips were therefore loaded at the most likely points at which traffic accesses the network. Once factored counts were assigned, checks were carried out on the locations of loading points to ensure that assignment patterns are realistic, as set out in Section 4.4.

Figure 4-3 Model Zone Structure



Source: OS data © *Crown copyright 2015;* Licence – Version 3 of Open Govt. Licence (OGL)

Figure 4-4 External Zone Boundaries

Network coding: link lengths

4.2.17 Link lengths were initially measured from base maps using MapInfo and reviewed following receipt of the Ordnance Survey Master Map Integrated Transport Network (ITN) layer. The network was reviewed and updated where needed to ensure that all links reflect the corresponding link lengths on the ITN layer.

4.2.18 The SATURN software generates warnings about links for which the crow-fly distance between a link's end points differs significantly[6] from the distance coded into the network, which was obtained from the ITN layer. All instances of these warnings were checked and all discrepancies in distance were found to be a result of the shape and curvature of the roads in question.

Network coding: speeds assigned

4.2.19 Within the ADM, the speed assigned to each link (Motorway, A and B class roads) was equal to the off-peak cruise speed assigned to the same link in the Trans-Pennine South Regional Transport Model (RTM), where such information was available. Where such information was not available for a particular link, the speed was assumed to be the same as the off-peak cruise speed as derived from the Trafficmaster data.

4.2.20 For all links in the External Area, the speeds were assumed to be equal to the break point speeds provided in Highways England's Technical Note on a Proposed Update to the Speed/Flow Curve Section of the SATURN Manual[7]. The validity of this approach was confirmed following a comparison of these speeds with actual speeds derived from HATRIS (Highways Agency Traffic Information System) and JTDB (Journey Time Database).

4.2.21 The cruise speeds were applied to all links within the ADM based on the link classification. For any given link, the same cruise speed was set in all modelled time periods.

Network coding: speed flow curves

4.2.22 A Speed Flow Curve (SFC) is a means of representing the delay on a link that results from the volume of traffic travelling along it, independently of the delays that result from individual junctions. SFCs are used within the model to reflect the constraints on demand in line with available network capacity. This is achieved by defining a SFC relationship which represents the way in which the speed of traffic along a link decreases as the traffic flow along it increases, with the characteristics of the road determining the nature of this relationship.

4.2.23 SFCs should not be used to represent 'junction' delay, and therefore should only be used on longer links. A general rule of thumb is that a SFC should only be applied where the majority of the delay along a link can be attributed to the link itself, rather than the junction at its downstream end. Where the majority of the delay is attributable to the junction at the end of the link, a fixed-speed should be coded on a link, with delays being generated by the junction coding.

4.2.24 The application of SFCs was kept to a minimum in the ADM of the A585 traffic model and they were predominantly used for strategic and non-urban routes such as the A585 across the study area, and considered for links of those kinds that also have lengths greater than 750 metres. SFCs were also applied to some local residential roads to avoid unrealistic rat-run routing.

4.2.25 SFCs were not used unless it was not possible to correctly match the observed and modelled link delay through junction performance alone. This was typically the case on long semi-urban and rural links and also on urban links, where the incidence of bus stops, parking and side roads reduce link capacities without affecting junction capacities. In such cases, SFCs were selectively used and applied.

4.2.26 The parameters used in the SFCs were based on values provided in the Highways England RTM Manual, which in turn are based on the DfT's COBA guidance. SFCs were defined according to the type of road, the number of lanes and the location (rural, sub-urban, urban and small town). The set of all SFCs used within the A585 base year model is listed in Table 4-1.

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[6] SATURN regards a significant difference as being greater than 10 metres or a difference of >10% or -5% relative to the crow-fly.

[7] Technical Note on a Proposed Update to the Speed Flow Curve in the SATURN Manual, provided by Highways England to Arcadis on 2 December 2015

Table 4-1 Speed Flow Curves – A585 Traffic Model

Settlement Type	SFC Title/Description	Index	Free Flow Speed (km/hr)	Capacity (km/hr)	HGV Speed (km/hr)
Rural	D4M	101	111	81	96
	D3M	102	111	81	96
	D2M	103	104	74	96
	D3AP	104	107	80	96
	D2AP	105	100	73	96
	S2 10m TD9/81	106	93	55	80
	S2 7.3m TD9/81	107	87	58	80
	S2 7.3m (Typical)	108	82	53	80
	1 Lane Slip	110	100	73	96
	S2 A Road 40mph	111	64	35	50
	S2 6.5m Poor	112	67	45	55
	S2 Other Road (slow)	113	54	35	45
	S2 Other Road (narrow carriageway)	114	82	53	68
	S2 Other Road (slow, narrow carriageway)	115	54	35	45
Suburban	Dual - Slight Development	201	75	35	64
	Dual - Typical Development	202	71	35	64
	Dual - Heavy Development	203	58	35	48
	Single - Slight Development	204	65	25	48
	Single - Typical Development	205	61	25	48
	Single - Heavy Development	206	58	25	48
Urban	Non-Central 50% Development	301	48	30	48

Settlement Type	SFC Title/Description	Index	Free Flow Speed (km/hr)	Capacity (km/hr)	HGV Speed (km/hr)
	Non-Central 80% Development	302	48	25	48
	Non-Central 90% Development	303	46	25	46
	Central INT =2	304	37	15	37
	Central INT = 4.5	305	33	15	33
	Central INT = 9	306	28	15	28
Small Town	35% Development	401	63	32	48
	60% Development	402	56	30	48
	90% Development	403	46	30	46

4.2.27 It should be noted that in areas outside the expected area of scheme influence, the network is less detailed and only includes key routes and maintains zone connectivity. Given the skeletal nature of the network in the External Area, routing is controlled by fixed model speeds, which were applied to all network links without any capacity restraint.

4.2.28 In the Rest of the Fully Modelled Area, capacity restraint was modelled through the use of link-based speed/flow relationships; therefore, SFCs were defined for all links.

4.2.29 At the calibration stage, trip demand and routing through these areas were reviewed to ensure that they were modelled correctly.

4.2.30 Gyratory links and urban links were not assigned a SFC index. Gyratory links are shorter links; therefore, the application of a SFC would affect delays at downstream junctions. One of the factors that determines the SFCs for urban links is the number of junctions that exist per kilometre. Junction delays are modelled very accurately in SATURN, and so the use of SFCs for urban links in the ADM is considered to be double counting the effects of delays at junctions.

Network coding: HGV speeds assigned

4.2.31 WebTAG Unit M3.1[8] advises that, in the majority of circumstances, separate speed/flow relationships for LGVs and HGVs should be used, in order to provide more accurate estimates of changes in Vehicle Operating Costs (VOC).

4.2.32 It is also recognised that HGVs are subject to different speed limits compared to cars and LGVs. The speed limits for HGVs travelling on single and dual carriageways were modified on 6 April 2015. For HGVs weighing more than 7.5 tonnes travelling on a single carriageway, the speed limit was increased from 40 mph to 50 mph. For HGVs weighing more than 7.5 tonnes travelling on a dual carriageway, the speed limit was increased from 50 mph to 60 mph.

4.2.33 It was not possible to model differential speeds in the A585 base year model with an acceptable level of accuracy, as SATURN does not offer the required functionality. Therefore, in order to represent the restricted maximum speed for HGVs on the highway network it was necessary to reduce the maximum (free flow) speed available to the HGVs in the model using the KLUNK and CLIMAX parameters within SATURN.

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[8] WebTAG Unit M3.1 Highway Assignment Modelling (Department for Transport, January 2014)

Network coding: stacking capacity

4.2.34 The calculation of stacking capacity is important, especially in the case of short modelled links where the number of lanes at the stop line differs from those on the mid-link segment of that link. This is because SATURN tends to overestimate the link capacity based on the number of lanes at the stop line.

4.2.35 The stacking capacity was calculated as follows:

Stacking Capacity = (Number of Complete Lanes * Link Length/Average Vehicle Length) + (Number of Flare Lanes * Length of Flare Lanes/Average Vehicle Length)

Network coding: turn saturation flows

4.2.36 Turn saturation flows were calculated for 32 key junctions with reference to their individual geometries and parameters, in accordance with the guidance set out in the following documents:

- Signalised junctions – TRL Research Report 67
- Roundabouts – TRL Research Report 35
- Opposed movements at priority junctions – TRL Research Report 36

4.2.37 A full list of these junctions and their calculated saturation flows is provided in Appendix B.

4.2.38 For the remaining signalised and priority junctions in the ADM, saturation flows were coded in accordance with template values as shown in Table 4-2[9]. Checks were carried out to ensure that these saturation flows were consistent with the saturation flows calculated for the 32 key junctions.

Table 4-2 Saturation Flow Template Values for Non-Key Junctions

Saturation Flows (pcus/hour/lane)						
Junction Type	Main Carriageway			Side Road (Give Way)		
	Left Turn	Straight Ahead	Right Turn	Left Turn	Straight Ahead	Right Turn
Priority	1850	1950	735	745	745	627
Signalised	1850	1950	1750	1850	1950	1750

4.2.39 For the remaining roundabout junctions, guideline values for saturation flows were taken from the Regional Traffic Model guidelines, as shown in Table 3-4 of Technical Note 22. Again, these were cross-checked against the values used for roundabout junctions for the 32 key junctions to ensure consistency.

4.2.40 Saturation flows on side roads were assumed to be equal to the minor road saturation flows at a priority junction, as set out in Table 4-2.

Junction simulation

4.2.41 All junctions within the ADM were coded in detail to enable the simulation of junction operation and delay. Information used for junction coding was primarily obtained from Google Earth Street view and supplemented with surveyed information where available. Existing / observed signal timings and staging diagrams were used where available. Turning priorities were allocated to turning movements at all nodes.

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[9] As outlined in Section 3.8.3 of Technical Note 22, in the interest of time and to avoid the need to calculate saturation flows at all junctions, standard saturation flows were used for signalised and priority junctions.

4.2.42 All roundabouts were coded with no U-turns, unless U-turns are specifically allowed. Large signalised / grade separated roundabouts were exploded to multiple nodes and coded separately.

Bus lanes and bus routes

4.2.43 Bus route and frequency information was obtained from Blackpool Council and Lancashire County Council for the bus services within the ADM. One bus lane was coded into the base year highway model network. The Blackpool tramway was also included in the model network, which was coded as a bus lane at locations where the tram shares the road with other vehicles. An allowance was made for tram stages at relevant signalised junctions through the inclusion of additional green time.

Public transport modelling

4.2.44 The proposed scheme focuses on highway improvements rather than any specific improvements to public transport. In addition, there is relatively low use of public transport in the study area. CJC data collected in July 2015 (as detailed in Table 3-2) indicates very low usage of public transport or non-motorised modes in the study area. Bus occupancy surveys carried out on 14 July 2016 confirmed this impression, showing that, for the 12-hour period between 07:00 and 19:00, bus vehicle counts were only 0.3% of car vehicle counts and the number of bus passengers was only 1.4% of the number of car passengers.

Network audit

4.2.45 Following completion of the initial network coding process, a network audit was carried out to ensure that speeds, distances, zone centroid connectors, node positions, link lengths and other network parameters are correctly modelled in the base year network.

4.2.46 The network for the SATURN model described in this section (Version 2.0) was submitted to Highways England on 18 April 2016. This version was then used to load and assign trips onto the network, using the input matrix described in Section 4.3 below.

Demand segmentation

4.2.47 The A585 highway assignment model represents highway demand in three vehicle classes: cars, LGVs and HGVs. The car vehicle type is further split by journey purpose into commuting, employer's business and other trips to allow for variations in perceived travel cost. Table 4-3 shows the five demand segments used in the A585 highway assignment model.

Table 4-3 A585 Model User Classes

Vehicle Type	Journey Purpose
Car	Commuting
Car	Employer's Business
Car	Other
LGV	-
HGV	-

4.3 Matrix development

4.3.1 This section provides details of the methodology used to construct the base year highway trip matrices for the A585 traffic model.

4.3.2 The approach used to develop the trip matrices differed according to the type of vehicle. For cars, observed data from the RSI data sets listed in section 3.2 was used to calculate trip cost distributions for the three journey purposes. After expansion to traffic counts, the data was used as one of the inputs to a gravity model which synthesised full trip matrices for each purpose in each time period. These matrices were scaled to the assignment hours, using factors derived from the RSI records, subjected to some large-scale manual adjustments to create reasonable priors, and adjusted with matrix estimation process to match traffic counts at a number of calibration locations distributed across the ADM.

4.3.3 No freight modelling was carried out for this model, due to a lack of the trip ends that are required in order to do so. Additionally, no gravity modelling was performed for LGVs or HGVs due to a lack of required data concerning trip ends. The prior matrices for both types of goods vehicle were therefore built from the available RSI records and matrix estimation processes were used to adjust them to a better match to the calibration traffic counts.

4.3.4 The different data sources used in the building of the base year trip matrices are:

- RSI records from several datasets;
- Classified traffic counts at a number of locations across the ADM;
- Trip ends by time period and journey purpose from TEMPRO 7.0;
- Resident Populations by Census 2011 Output Area;
- Generalised costs of travel, produced by assigning the partially observed matrices with the SATURN model;
- Estimates of intra-zonal travel as a proportion of all travel for external zones, derived from Census 2011 journey to work data.

4.3.5 The remainder of this section provides details of how the different data sources were used within the gravity modelling and/or matrix estimation process to lead to the final calibrated highway assignment trip matrices for the base year.

RSI records and traffic counts

4.3.6 As summarised in Section 3.2, RSI data that had been collected in 2008, 2010 and 2014 and used in the development of previous models of the A585 and its environs was made available for matrix development. Using information collected during the interviews, the records for car journeys were classified into commuting, business and other journey purposes, into from-home, return-home and non-home-based travel directions, and were allocated to SATURN zone origins and destinations. RSI data for LGVs and HGVs was also available. Each interview was allocated to, or originally recorded in, a 30-minute period between 07:00 and 19:00. This time banding allowed interviews to be allocated to the standard time periods used in TEMPRO and also to the time periods used in Saturn model, which are listed in Section 4.5.

4.3.7 The interviews conducted in 2008 and 2010 surveyed travellers passing through locations in a single direction only, whereas those conducted in 2014 surveyed both directions at each interview location.

4.3.8 Traffic counts were obtained for both travel directions through each site at which the RSIs were conducted, including those at which interviews were conducted in single direction. These counts were processed as described in the TDCR[10] to convert them into the model's month and year. Counts were classified into cars, LGVs and HGVs and for use in the matrix building they were aggregated into the same 30-minute periods as used in the RSI records, which enabled the calculation of average assignment hour trips.

4.3.9 The gravity model, used to create an initial synthetic matrix for car trips, operates at the level of a whole period's trips, using the definitions that are used in the TEMPRO software:

- AM Peak: 07:00-10:00
- IP: 10:00-16:00

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[10] HE548643-ARC-GEN-A585-RP-TR-2022

- PM Peak: 16:00-19:00

4.3.10 These definitions were used so that trip end data from TEMPRO could be used directly in the gravity model to act as constraints on the synthetic matrices.

4.3.11 For car trips, scaling factors were applied to each interview record collected in a given time period in order to expand the sample to the relevant traffic counts in the whole of that period and for the average hour in that period. The factors were calculated separately for each interview site and each vehicle type; however, they did not vary by journey purpose, as that information is not available in the traffic counts. Using the factors, the sum over the expanded records for a single site, vehicle type and either whole period or average hour across all journey purposes was then equal to the total count of those vehicles at the site in the same period or average hour.

4.3.12 For goods vehicles, however, a different approach was taken due to the sparseness of the data set in any single time period. In these cases, the whole RSI dataset collected over the 12-hour period from 0700 to 1900 was used, with separate scaling factors calculated to expand the same records, independently, to the average hour in each assignment period. Thus, the origins and destinations contributing to each goods vehicle prior matrix were the same in each time period, but the relative sizes of the trips between zones depended upon the specific average hour counts to which the records were expanded. Because no gravity modelling was performed for goods vehicles, as explained above, it was necessary to generate as full a prior matrix as possible from the available data.

4.3.13 As mentioned earlier, the RSI records for each site in 2008 and 2010 were collected in a single travel direction only. Thus, to maximise the amount of data usable with the gravity model and matrix estimation the observed movements were converted into trips in the opposite, unobserved direction by transposing the RSI records for those years only.

4.3.14 These estimates of unobserved trips were generated as follows:

- The origins and destinations of interview records for 2008 and 2010 were interchanged.
- Interviews collected in the AM period were shifted to the PM period, and vice versa. Interviews collected in the IP period were left in the IP after transposition.
- The transposed and time-shifted records were expanded to traffic counts in the opposite direction to their original counterparts, using both whole-period and average hour scaling factors, as with the data for the observed directions.
- After expansion, the trips within each purpose were scaled (keeping the total across purposes constant) so as to match the relative proportions from the original combined 2008 and 2010 datasets, in the time period to which the transposed records had been allocated.

4.3.15 The matrices, based on expanding the trips observed in the roadside interviews are referred to as ‘partial’ matrices as well as ‘observed matrices’ in this report.

4.3.16 For cars, the period-level partial matrices were used only as inputs to the gravity model for the construction of an estimate of the observed trip cost distribution. For goods vehicles, no gravity model was used and so the partial matrices themselves were used as the priors for input to matrix estimation, after they had been expanded to the assignment hours in each period rather than to a whole time period.

4.3.17 Table 4-4 shows the number of non-zero matrix cells obtained from the RSI data for goods vehicles in each time period, both with and without the contributions from the transposed records.

Table 4-4: Numbers of non-zero cells in goods vehicle matrices derived from RSI data, including and excluding the contribution of transposed records

	Non-Zero Matrix Cells (%)		
Time Period & Vehicle Type	RSI Records	Transposed Records	All Records
AM LGV	1544 (4.3%)	1077 (3.0%)	2442 (6.8%)
AM HGV	678 (1.9%)	370 (1.0%)	1020 (2.8%)
IP LGV	1544 (4.3%)	1077 (3.0%)	2442 (6.8%)
IP HGV	663 (1.8%)	398 (1.1%)	1031 (2.9%)
PM LGV	1544 (4.3%)	1077 (3.0%)	2442 (6.8%)
PM HGV	659 (1.8%)	384 (1.1%)	1015 (2.8%)

4.3.18 The number of non-zero cells in each time period's LGV RSI-based matrix is the same because, as explained earlier, the whole of each goods vehicle's interview dataset across the 12-hour collection period was used in the expansion to each time period. Since every interview site had a non-zero LGV flow through it in the peak hours for each period, all records were expanded and included in the final matrices. The same is not true of the HGV traffic counts, where there were zero flows recorded at different sites in the peak hours and these lead to the exclusion of different records (and hence different movements) in each period.

4.3.19 Factors used in the conversion of the gravity model's outputs from whole-period trips (e.g. AM 07:00-10:00) to assignment hour trips (e.g. average 07:30-09:30 in the AM Peak) were derived from the expanded RSI records using a simple 3-sector system due to the sparseness of the RSI data at a zonal level. The three sectors are based on the model's zonal detail as follows:

- Sector 1 = Zones 1-63, 89-94 (FMA)
- Sector 2 = Zones 64-88 (Rest of FMA)
- Sector 3 = Zones 100-312 (External)

4.3.20 These areas of the model are as illustrated in Figure 2-1.

4.3.21 Scaling factors for car all user classes as applied to the three peak periods are set out in Appendix C.

4.3.22 The factor from one period (for example the AM peak) to its assignment hour was calculated by dividing the expanded observed trip total for the applicable average assignment hour by the expanded observed trip total for the whole period, for each sectoral movement. For example, for the AM peak hour the expanded records between 07:30 and 09:30 were summed and divided by 2 to give the expanded average hour, and then divided by the total between 07:00 and 10:00 to give the required factor. For the IP and PM Peak periods, whose assignment hours overlap the boundaries between different TEMPRO time periods, the same approach was used as the scaling needed only to express the trips in an average hour relative to the total trips in the period used by the gravity model.

Generalised trip cost distributions

4.3.23 The gravity model requires trip cost distributions derived from the partial car trip matrices and generalised costs skimmed from the SATURN assignment output files. Cost skims obtained from the assignments of the partial observed matrices were used as a starting point for running the gravity model.

4.3.24 The cost distributions were built using bins with a width of 2 generalised minutes in the range from 0 to 200 generalised minutes. A separate distribution was used for each of the three car journey purposes and for each time period.

Trip ends

4.3.25 As described later in this section, the gravity model uses a log-normal form of the deterrence function that describes the way in which numbers of trips vary with the cost of travel. Therefore, the numbers of trips from and to each origin and destination must also be provided so that they may be distributed according to the influence of the deterrence function.

4.3.26 As shown in Table 4-3, the A585 SATURN model has five user classes, of which three are for car – commuting, business and other. The trip purposes used by the DfT's TEMPRO 7.0 software were aggregated into these user classes as shown in Table 4-5.

Table 4-5 TEMPRO 7.0 Trip End Categories used with each SATURN Car User Class

User Class	Trip Purpose
Car Commuting	Home Based Work
Car Employer's Business	Home Based Employer's Business Non-Home Based Employer's Business
Car Other	Non-Home Based Work Non-Home Based Education Non-Home Based Shopping Non-Home Based Personal Business Non-Home Based Recreational/Social Non-Home Based Holiday/Day Trip Home Based Education Home Based Shopping Home Based Personal Business Home Based Recreational/Social Home Based Visiting Friends/Relatives Home Based Holiday/Day Trip

4.3.27 For these user classes, total origin and destination trip ends were extracted from TEMPRO 7.0 at Medium Level Super Output Areas (MSOAs) and for each of the three time periods, as listed earlier.

4.3.28 The MSOA zones at which the TEMPRO 7.0 trip ends are available can be smaller or larger than the SATURN model's zones and their boundaries do not often correspond. Therefore, a method of allocating trip ends to the SATURN model zones was devised that made use of population data and simple area-based splits.

4.3.29 Populations for all Census 2011 output areas (OAs) were obtained and aggregated into MSOAs. This aggregation is exact since there is, by design, a perfect nesting of OAs into MSOAs. The individual OA populations and MSOA totals were used to obtain the proportions of each MSOA's total population that resides in its constituent OAs.

4.3.30 Next, GIS software was used to intersect OAs with the model's SATURN zones to obtain overlap proportions based on area.

4.3.31 Estimates of the trip ends associated with each SATURN zone were then obtained by splitting trip ends from MSOAs to OAs using the population shares, and then aggregating the trip ends from OAs into SATURN zones on the basis of the areas of intersection between them.

Intra-zonal trip proportions

4.3.32 As described in the next sub-section, which goes into detail about the gravity model's implementation, initial outputs of the gravity model led to larger numbers of trips from external zones than seemed reasonable on the basis of preliminary calibration/validation statistics.

4.3.33 The results suggested a need to reduce the inter-zonal trips from the external zones by allocating a certain proportion of all origins from those zones to intra-zonal movements and zeroing the diagonal elements of the synthetic matrix for those zones. The gravity model would then distribute a smaller number of trips from and to external zones.

4.3.34 By analysing Census 2011 journey-to-work data (obtained from the NOMIS website), estimates of the proportion of all commuting trips for the external zones that are made intra-zonally were obtained. In the absence of other data, these intra-zonal proportions were also applied to the business and other purposes in the gravity model.

Gravity model

4.3.35 The gravity model synthesises trips from zone *i* to zone *j* by journey purpose *p* using the following equation:

$$T_{ijp} = O_{ip}A_{ip}D_{jp}B_{jp}f\left(C_{ijp}\right)$$

where:

- T_{ijp} is the number of trips synthesised;
- O_{ip} is the number of trips travelling from zone i for journey purpose p, which is obtained from the set of origin trip ends based on TEMPRO 7.0 data;
- D_{jp} is the number of trips travelling to destination zone j for journey purpose p, which is obtained from the set of destination trip ends based on TEMPRO 7.0 data;
- A_{ip} is a balancing factor for each origin zone and purpose that ensures that the total number of trips from the zone is equal to the value from the input trip ends data;
- B_{jp} is a balancing factor for each destination zone and purpose that ensures that the total number of trips to the zone is equal to the value from the input trip ends data;
- $f(C_{ijp})$ is the deterrence equation as a function of the generalised cost of travelling from zone i to zone j for purpose p.

4.3.36 The form of the deterrence function used in the gravity model is the log-normal, which is defined by:

$$f(x) = \frac{1}{\sqrt{2\pi}\alpha x}\mathrm{e}^{-\frac{(\ln(x)^2-\beta)}{2\alpha^2}}$$

4.3.37 The log-normal function depends on two parameters, α and β, which control the specific shape of a single curve within the family of log-normal curves. This function is one that has been applied by Transport for London (TfL) to the development of trip matrices for the London sub-regional 'HAM' assignment models. When it is applied in the gravity model, the variable x represents a value of generalised cost and the appropriate values of parameters α and β are to be found.

4.3.38 A synthetic trip matrix for each purpose and time period was produced via a process in which the free parameters in the log-normal deterrence function (α and β) were iteratively modified until the trip cost distribution based on the gravity model's output was sufficiently close to the one derived from the relevant partial matrix.

4.3.39 In more detail, the procedure was as follows:

- Calculate the 'observed' trip cost distribution from input generalised costs and the partial matrix for the current time period and journey purpose. The distribution is based on a histogram of bins of width 2 generalised minutes from 0-200 generalised minutes, with the value of each bin being equal to the proportion of the total trips that have been allocated to that bin

- Using the generalised cost inputs for the current purposes and time period, and an initial choice of the α and β parameters, create a matrix of values from the log-normal function $f(x)$, defined earlier
- Using the trip ends for each SATURN zone for the current purpose and time period, apply the Furness matrix balancing process to the matrix created by the deterrence function until the row and column totals for each zone match the targets to within a defined tolerance
- Use the input generalised costs and the results of the matrix balancing procedure to obtain a 'synthetic' trip cost distribution using the same binning/proportioning approach as for the observed case.
- Calculate the value of the objective function that measures the closeness of the fit between the observed and synthetic trip cost distributions – this objective function is equal to the sum of the squared differences between the proportions of the trips (independently for observed and synthetic) that are in each bin
- Modify the α and β parameters according to the value of the objective function and go back to the step in which $f(x)$ is used to create a matrix that is then Furnessed
- Continue to adjust the parameters and recalculate the output cost distribution until the objective function has been minimised to a satisfactory level of convergence

4.3.40 Note that the partial matrices are, necessarily, based only on trips that were observed passing through the RSI sites. However, the trip ends used in the gravity modelling cover all trips, and so they include contributions from movements that will not pass through the study area. Because of this, it was deemed inappropriate to include all possible inter-zonal movements in the observed cost distributions used in the gravity model, and so the optimisation of parameters was carried out using distributions based on observed movements that had at least one end in the study area, covered by FMA and rest of FMA zones.

4.3.41 The use of Furnessing to obtain a synthetic trip matrix means that the value of the objective function depends in a complex way on the values of α and β parameters. Hence, the minimisation of the objective function with respect to those parameters was carried out with the Nelder-Mead downhill simplex algorithm, which was implemented in Excel VBA code.

4.3.42 Appendix O shows the input and output cost distributions obtained from the RSI data and the gravity model, for each car user journey and time period.

4.3.43 Table 4-6 shows the final α and β parameters that were obtained through the automated optimisation procedure.

Table 4-6: Final α and β values used in gravity modelling, by time period and purpose

		Parameters	
Time Period	Purpose	Alpha	Beta
AM	Business	0.744	2.611
	Commuting	0.568	2.923
	Other	0.681	2.560
IP	Business	0.826	2.352
	Commuting	0.708	2.521

		Parameters	
Time Period	Purpose	Alpha	Beta
	Other	0.723	2.529
PM	Business	0.825	2.225
	Commuting	0.606	2.866
	Other	0.737	2.617

4.3.44 The outputs of the gravity model are period-level synthetic trips which were converted to the average hours used in the SATURN assignments by application of the 3x3 scaling factors that were derived from the expanded RSI data, as described earlier.

Post-gravity model adjustments

4.3.45 Initial assignments using the outputs of the gravity model were found to lead to too many inbound and/or outbound trips along the M55 in the AM and PM Peak periods and insufficient trips within the study area zones in the inter-peak. These are likely to have been caused by factors such as:

- The use of data from different times, some of which are relatively old – such as RSI records being taken from different years for different parts of the ADM – and expanded to traffic counts that were factored to the base month and year;
- The paucity of the RSI datasets in terms of the coverage of the ADM and the number of observations;
- The inherent uncertainties present in the conversion of MSOA trip ends to SATURN zones and their use as constraints in the gravity model;
- The use of the expanded RSI data to derive period-to-average-hour factors to create the initial prior assignment matrices.

4.3.46 Therefore, the car prior trip matrices that were used as inputs to the matrix estimation process were modified by applying large-scale adjustments to the gravity model’s synthetic matrix outputs, using the same sectors as defined for the derivation of the period-to-hour scaling factors.

4.3.47 Trips coming into Sectors 1 and 2 from Sector 3 and vice versa were reduced and additional scaling was applied to trips from and to Preston which also contributed to the large flows on the M55. Select link analyses were used for the IP period to derive scaling to apply to movements within and between Sectors 1 and 2 to make up for a deficiency in the numbers of trips obtained when assigning that period’s synthetic matrix.

4.3.48 These broad adjustments were made iteratively together with assignment of the resulting priors to obtain matrices that led to as good a fit to calibration screenline and cordon totals as were obtainable before resorting to matrix estimation.

Matrix estimation

4.3.49 Assignment of the prior matrices led to statistics that did not meet the link and turn validation requirements set out in WebTAG Unit M3.1; therefore, matrix estimation was used to perform the necessary adjustments to the prior matrices in order to obtain a much closer degree of fit to the observed traffic counts.

4.3.50 The SATME2 software, which is part of the SATURN highway assignment suite of programs, was used to perform matrix estimation. SATME2 was set up to perform multi-user class estimation, so that the observed car, LGV and HGV counts were targeted separately rather than trying to match flows over all vehicle types only. Since traffic counts contain no information about journey purpose, SATME2 adjusts the sum of the three car user classes to meet the car target flows, and uses the input shares of the user classes to re-segment the estimated car trip totals back into 3 user classes for the final result

4.3.51 SATME2 takes an input produced by another SATURN program called SATPIJA, which is used to calculate route choice probabilities for all zone pairs whose trips contribute to the flows on links for which there are target vehicle flows. SATPIJA was provided with a list of link and turn counts that were used for calibrating the trip matrices. In order to meet the supplied target flows, SATME2 adjusts cells in the input trip matrix and these then cause changes in assigned link flows in accordance with the route choice probabilities.

4.3.52 The degree of variation that SATME2 can apply to matrix cells is controlled by the parameter XAMAX – scaling factors between 1/XAMAX and XAMAX are defined for each link on which a calibration count is defined, and the actual value used by SATME2 depends on the values of the cells in the prior matrix. SATME2 creates a new matrix by using a process which changes the fundamental shape (e.g. distribution of large and small cells) of the prior matrix as little as possible while meeting as many of the calibration counts as possible, within the limits imposed by XAMAX.

4.3.53 The matrix estimation performed on the prior matrices created by gravity modelling and post hoc large-scale factoring used XAMAX=3 for the car user classes and XAMAX=4 for both goods vehicle classes. The larger value of XAMAX for the goods vehicle classes was justified on the grounds that the goods vehicle priors were not derived from the gravity model and so they contain fewer non-zero cells for SATME2 to act upon, as shown earlier in Table 4-4, than the synthetic car matrices.

4.3.54 It should be noted that although SATME2 allows counts to be grouped together into sets that are each treated as having a single count constraint, this facility was used sparingly and only when it was found that ME2 was changing some links by too large an amount without satisfying the validation criteria.

4.4 Select link analysis

4.4.1 Select link analysis was carried out for cars on selected RSI count sites in the A585 scheme areas. Eight RSI sites were selected to form a cordon, and observed counts at these locations were compared to RSI observed matrix totals.

4.4.2 The RSI sites for which select link analysis was carried out are presented as inbound and outbound cordons in Table 4-7 and Table 4-8.

Table 4-7 Select Link Analysis – Inbound RSI Sites

RSI Site ID	Link ID	Direction
ANSA 2	4513-4280	WB
ANSA 3	1061-4320	SB
ANSA 4	4104-4150	NB
ANSA 5	4238-4210	SB
BC 12	4378-4360	SB

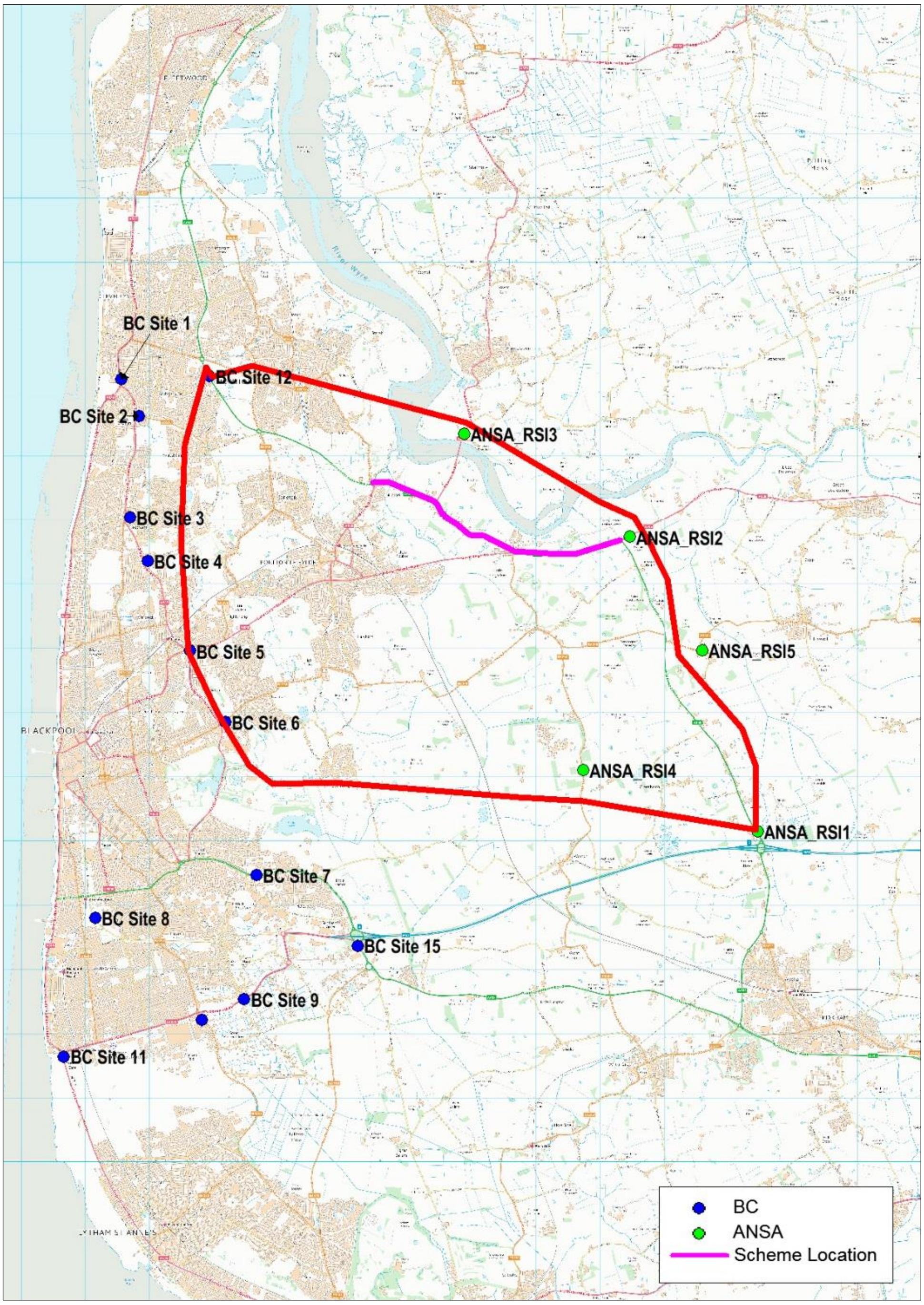
Table 4-8 Select Link Analysis – Outbound RSI Sites

RSI Site ID	Link ID	Direction
ANSA 1	4118-4110	SB
BC 5	4219-4212	WB
BC 6	4181-4168	WB

4.4.3 Using the SATURN outputs from assigning the prior matrix, link inbound and outbound matrix files for all car user classes were extracted and merged to form a single car user matrix. The matrix extraction was done for all user classes for all three time periods.

4.4.4 A system of 7 sectors was devised to compress the full zonal matrix to a smaller size for the analysis and display of select link matrices. The same procedure was applied to the RSI count-based matrices from the RSI count data. The cordon map used for select link analysis is presented in Figure 4-5.

Figure 4-5 RSI Count Sites Cordon Map for Select Link Analysis



Source: OS data © *Crown copyright 2015;* Licence – Version 3 of Open Govt. Licence (OGL)

4.4.5 The results of the select link analysis for the inbound and outbound RSI site cordons for car trips in the AM peak are presented in Table 4-9 and Table 4-10. The full set of results for all three model time periods are presented in Appendix D.

Table 4-9 Inbound RSI Count Matrix Compared to Prior Select Link Analysis Matrix (AM Peak - Cars)

RSI Site ID	Link ID	Direction	Obs. Count	RSI Obs. Matrix Total	Prior SLA Matrix Total	Difference (No.)	Difference (%)	GEH
ANSA 2	4513-4280	WB	292	292	610	-318	109%	15.0
ANSA 3	1061-4320	SB	719	719	731	-12	2%	0.4
ANSA 4	4104-4150	NB	215	215	77	137	-64%	11.4
ANSA 5	4238-4210	SB	147	147	98	48	-33%	4.3
BC 12	4378-4360	SB	1058	1058	824	234	-22%	7.6
				2430	**2341**	**89**	**-4%**	**1.8**

Table 4-10 Outbound RSI Count Matrix Compared to Prior Select Link Analysis Matrix (AM Peak - Cars)

RSI Site ID	Link ID	Direction	Obs. Count	RSI Obs. Matrix Total	Prior SLA Matrix Total	Difference (No.)	Difference (%)	GEH
ANSA 1	4118-4110	SB	920	920	934	-14	2%	0.5
BC 5	4219-4212	WB	739	738	586	152	-21%	5.9
BC 6	4181-4168	WB	739	739	662	76	-10%	2.9
				2396	**2182**	**214**	**-9%**	**4.5**

4.4.6 The differences between the RSI observed matrix totals and the prior select link analysis matrix totals in the AM peak are in some cases large, though the total flows over all links in a given direction are similar, with an overall percentage difference across all sites, in given directions, of 4% for inbound trips and 9% for outbound trips. Particularly large differences are observed at a number of RSI site locations, including ANSA 2 (109%), ANSA 4 (64%) and ANSA 5 (33%) for inbound trips and BC 5 (21%) and BC 6 (10%) for outbound trips.

4.5 Assignment process

Model time periods

4.5.1 Three time periods have been used in the A585 model to reflect variations in traffic at different times of the day, for an average weekday in June 2015. These three time slices comprise of the average hour with in the following three time periods:

- AM Peak: Average 07:30 – 09:30
- Inter-Peak: Average 09:30 – 15:00
- PM Peak: Average 15:00 – 18:00

Vehicle types, User classes and Trip Purposes

4.5.2 The highway assignment process calculates the routes that are predicted to be used by traffic as it moves around the network by modelling the user's response to costs and travel times. This response is quantified through the use of Values of Time (VoTs) and Vehicle Operating Costs (VOCs).

4.5.3 It is known from empirical data that people who travel for different purposes have different VoTs, and that different types of vehicles have different VOCs. Consequently, it is usual to divide trip matrices into different segments for different types of traveller, grouping together those that have common VoTs and VOCs. These different parameters can lead to different routes between origins and destinations being chosen by travellers as they balance the competing costs of time and fuel.

4.5.4 The A585 model represents highway demand with respect to five user classes as derived from three vehicle types (Car, Light Goods Vehicle (LGV) and Heavy Goods Vehicle (HGV)) and a number of different trip purposes, as detailed in Table 4-11.

Table 4-11 Vehicle Types, User Classes and Trip Purposes

Vehicle Types	User Classes	Trip Purposes
Car	Car Commuting	Home Based Work (HBW)
	Car Business	Home Based Employer's Business (HBEB) Non-Home Based Employer's Business (NHBEB)
	Car Other	Home Based Other (HBO) Non-Home Based Other (NHBO) Non-Home Based Work (NHBW)
LGV	LGV	-
HGV	HGV	-

Generalised costs

4.5.5 The basis for route choice within a highway assignment model is generalised cost, which is the sum of the monetary and non-monetary costs of making a journey, defined as follows:

Generalised cost = (time) + (vehicle operating cost per km x distance / value of time) + (road user charges / value of time)

4.5.6 The A585 base year model uses a multi-user class assignment with generalised costs that vary by user class. Coefficients for the generalised costs were calculated in accordance with the guidance set out in WebTAG Unit A1.3 User and Provider Impacts[11], reflecting the consultation values of time released in September 2016 and other values relating to the December 2015 WebTAG release.

4.5.7 Table 4-12 sets out the VoTs and VOCs (as updated to the 2015 model base year from a 2010 base price), together with the generalised cost coefficients used in the A585 base year assignment model. The value of time varies by purpose (either working or non-working time), vehicle type, and occupancy level. Similarly, operating costs and maintenance costs are vehicle dependent and vary by speed.

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[11] WebTAG Unit A1.3 User and Provider Impacts, DfT November 2014

Table 4-12 Generalised Cost Coefficients

Category	VoT (pence/min)	Fuel Cost (pence/km)	Non-Fuel Cost (pence/km)	Fuel + Non-Fuel Cost	Pence Per Minute (PPM)	Pence Per Kilometre (PPK)
AM Peak						
Car (Commute)	20.00	5.60	0.00	5.60	20.00	5.60
Car (Employer's Business)	29.82	4.67	7.34	12.01	29.82	12.01
Car (Other)	13.80	5.60	0.00	5.60	13.80	5.60
LGV	21.08	5.60	7.07	12.67	21.08	12.67
HGV*	42.80	26.10	16.66	42.76	42.80	42.76
Inter Peak						
Car (Commute)	20.32	5.60	0.00	5.60	20.32	5.60
Car (Employer's Business)	30.56	4.67	7.34	12.01	30.56	12.01
Car (Other)	14.70	5.60	0.00	5.60	14.70	5.60
LGV	21.08	5.60	7.07	12.67	21.08	12.67
HGV*	42.80	26.10	16.66	42.76	42.80	42.76
PM Peak						
Car (Commute)	20.07	5.60	0.00	5.75	20.07	5.60
Car (Employer's Business)	30.25	4.67	7.34	12.01	30.25	12.01
Car (Other)	14.45	5.60	0.00	5.60	14.45	5.60
LGV	21.08	5.60	7.07	12.67	21.08	12.67
HGV*	42.80	26.10	16.66	42.76	42.80	42.76

Source: December 2015 WebTAG release of VOT/VOC values (VOT reflects Nov 2016 values)
*PPM value adopted for HGVs = 2 * WebTAG Unit A1.3 values, based on discussions with Highways England and recommendations made in the DfT's VOT/VOC calculations[12]

Assignment convergence criteria

4.5.8 The stability of the assignment (also referred to as 'convergence') must be established prior to using the model as a basis for decision making. It is important that the A585 base year model provides stable, consistent, robust results that can be used as the basis for future forecasting.

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[12] WebTAG TAG Data book, Department for Transport (Spring 2016 V1.6 release)

4.5.9 In SATURN, the Delta statistic (%GAP) is used as a convergence indicator, based on Wardrop's First Principle of Traffic Equilibrium. The Delta statistic is defined as the difference between the costs along the chosen routes and the costs along the minimum cost routes, summed across the whole network and expressed as a percentage of the minimum costs.

4.5.10 Further assessment of the performance of the assignment was carried out by evaluating the percentage of links and junction delays which show less than 1% change in the assigned traffic flow between four successive iterations.

4.5.11 Table 4-13 summarises the most appropriate convergence measures of proximity and stability and the values generally considered acceptable for use in establishing a base model, as set out in WebTAG Unit M3.1 (Section 3.3).

Table 4-13 Summary of Convergence Criteria Used

Measure of Convergence	Type	Base Model Acceptable Values
Delta & %GAP	Proximity	Less than 0.1% or at least stable with convergence fully documented and all other criteria met
Percentage of links with flow change (P) < 1%	Stability	Four consecutive iterations greater than 98%
Percentage of links with cost change (P2) < 1%		Four consecutive iterations greater than 98%

Assignment parameters

4.5.12 Assignment parameters were defined in the model in accordance with the guidelines set out in the Regional Traffic Model (RTM) Network Coding Manual[13], in order to reduce instability and fluctuations and improve the overall convergence.

4.5.13 A list of relevant parameters that were considered when setting up the A585 SATURN model is summarised in Table 4-14, grouped into three categories: logical; integer and real parameters.

Table 4-14 Model Assignment Parameter Settings

Parameter	Description	Model Value
Logical Parameters		
AUTNUC, AUTOK and AUTONA	For improved model convergence and reduced model runs	TRUE
BB109	True, to use updated methods in SATURN to calculate blocking-back within the assignment	TRUE
CLIMAX	True, if modelling fixed maximum speeds for vehicle classes	TRUE for user class 5 (HGV) only
DUTCH	True, to use 5-digit node numbers within network	FALSE
FOZZY	True, to interpolate unconnected nodes in bus routes	TRUE

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[13] RTM Network Coding Manual Version 0.7 (2 November 2015)

Parameter	Description	Model Value
FREEXY	True, if supplementary node data in 55555 records are to be input in free format	TRUE
FUNNEL	True, if turns coded with merge priority marker are assumed to 'funnel' into a single exit lane with their 'major' turn	FALSE
M108	True, to implement revised rules for merge priority markers	TRUE
MULTIC	True, to allow assignment to use multi-core processing to reduce run times	TRUE
MONACO	True, if the number of right-turning PCUs that are required to sit at head of queue in order to block ahead traffic is set value of TAX +1	TRUE
SPIDER	True, to create an aggregated version of the network to reduce model run times	FALSE
UFC109	True, to provide higher accuracy of select link analyses and skims through the use of modified output files	TRUE
WRIGHT	True, to reduce the likelihood of serious network coding errors in the final model by upgrading certain warning messages to semi-fatal errors	TRUE
Integer Parameters		
IEPSG	Defines coordinate system	27700 (i.e. British Ordnance Survey National Grid)
ISTOP	Test for convergence of assignment/simulation loops ISTOP % of link flows must change by less than PCNEAR % in order to satisfy this flow stability convergence criterion	98
KLUNK	Allows different maximum speeds to be set on modelled default speed-flow curves by vehicle class	1
KONSTP	Allows for different assignment stopping criterion 0 = convergence based on ISTOP criteria 1 = convergence based on %Gap criteria 2 = convergence based on CPU time criteria 3 = convergence based on ISTOP with an upper limit on CPU time 4 = convergence based on %Gap with an upper limit on CPU time 5 = convergence based on both ISTOP and %Gap criteria or 6 = convergence based on either ISTOP or %Gap criteria	5
LTP and LRTP	Length of modelled time period in minutes	60

Parameter	Description	Model Value
MASL	Maximum number of assignment/simulation loops undertaken in an assignment to limit the model's maximum run time	150
NISTOP	Number of successive iterations the stopping criteria need to achieve for model to converge	4
NITA	Maximum number of assignment iterations within a single assignment/simulation loop	20
NITA_C	Number of loops saved within SATURN UFC file using UFC109	999
NITA_S	Ignored if UFC109 is TRUE	-
NITS	Maximum number of simulation iterations within a single assignment/simulation loop	20
NOMADS	Number of modelled user-classes defined in generalised cost cards	5
Real Parameters		
APRESV	Controls weight assigned to merging traffic in terms of lane choice by 'major' traffic for turn priority markers M	1.0
BBKING	Defines ratio of queue to stacking capacity at which blocking back begins to phase in	1.0
FISTOP	Wardrop assignment stopping parameter for monitoring fractional improvements in objective function	0.05
GAP	Determines required gap in oncoming traffic for right turners at priority junction or signals to make a turn	2.0
GAPM	Determines required gap for traffic to join main carriageway where merge turn priority marker is coded	1.0
GAPR	Gap value for a normal roundabout	2.0
GONZO	A multiplicative factor used to scale all elements of the input trip matrix.	1.0
PCNEAR	The percentage change below which a link 'passes' ISTOP convergence criteria	1.0
PMAX	Maximum value of power used in simulation flow-delay curves	5.0
QDMAX	Maximum delay in seconds that can be calculated at a Q-node	226.0
QVCMIN	Minimum volume-to-capacity ratio at which delays are applied to Q-nodes	0.75
RSTOP	Used in the test for convergence of assignment/simulation loops	98.0

Parameter	Description	Model Value
STPGAP	Required %GAP value by which model convergence should be monitored	0.1
TIJMIN	Value below which demand movements are ignored in assignment. Setting this to zero means that all non-zero cells are assigned.	0.0
UNCRTS	Sets stopping criteria for assignment stage on its own (should be less than STPGAP)	0.05

4.6 Summary

4.6.1 This chapter has described the development of the A585 base year traffic model in SATURN in terms of the development of the network, the development of the matrices and the assignment of the matrices onto the network.

4.6.2 The next chapter describes the calibration of the base year model.

5 HIGHWAY MODEL CALIBRATION

5.1 Overview

5.1.1 This section describes the calibration of the A585 base year highway model, setting out the checks and tests that were carried out to ensure that the model accurately represents the observed travel patterns in the study area, within specified acceptability criteria as set out in WebTAG Unit M3.1.

5.1.2 Calibration was carried out in three key stages as described in Sections 5.3 to 5.5:

- Network calibration
- Matrix calibration
- Assignment calibration

5.2 Calibration procedure

5.2.1 The calibration of a highway assignment model is the process used to ensure that the model adequately reproduces the actual travel patterns in the geographic area under consideration. The Design Manual for Roads and Bridges (DMRB) Volume 12 Section 1[14] describes the calibration process as *"the estimation of the parameters of a chosen model by fitting to observations".*

5.2.2 The development of a traffic model for the proposed A585 improvement scheme that accurately represents observed conditions helps to ensure that it is fit for purpose and does not lead to inherent bias in the decision-making process.

5.2.3 The A585 highway assignment model calibration procedure involved a number of tasks, each of which was designed to ensure that the model adequately reproduced the observed base year traffic flows and travel times in the study area. The key tasks were:

- Network calibration:
    - Network inventory checks to confirm that the model extent and coverage is sufficient and that nodes, links and junctions are coded correctly
    - Checking and, where required, adjustment of the highway network to ensure the realistic routing of traffic
    - Review of the model speed flow curves to ensure they represent the operating conditions of the local network
    - Review of modelled flows versus observed counts
    - Review of modelled journey times to ensure they are comparable with observed journey times
    - Checks on the stability of the assignment
- Matrix calibration:
    - Use of matrix estimation procedures (using the SATURN programme SATME2) to modify the input synthetic 'prior' matrices to produce trip matrices that lead to a better fit of the model's outputs to observed traffic flows across the study area
- Assignment calibration:
    - Link flow calibration on screenlines and cordons, by comparing modelled flows and traffic counts
    - Examining the model's behaviour against the relevant convergence criteria to ensure the model provides stable, reliable results

5.2.4 Each of these calibration elements described in more detail in the following sections.

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[14] Design Manual for Roads and Bridges (DMRB) Volume 12: Traffic Appraisal of Roads Schemes Section 1: The Application of Traffic Appraisal to Trunk Roads Schemes (November 1997)

5.3 Network calibration

5.3.1 The initial stages of calibration aimed to improve the overall quality of the assignment by removing general network coding errors causing excessive delays or inappropriate route choice.

5.3.2 The process of network calibration involved a number of checks to the model, as part of the network refinement process. It is to be noted that many of the checks had already been conducted as part of the network audit procedure, as described in Sections 4.2.9 to 4.2.46.

5.3.3 As part of the network calibration process, a number of additional checks were performed to ensure that:

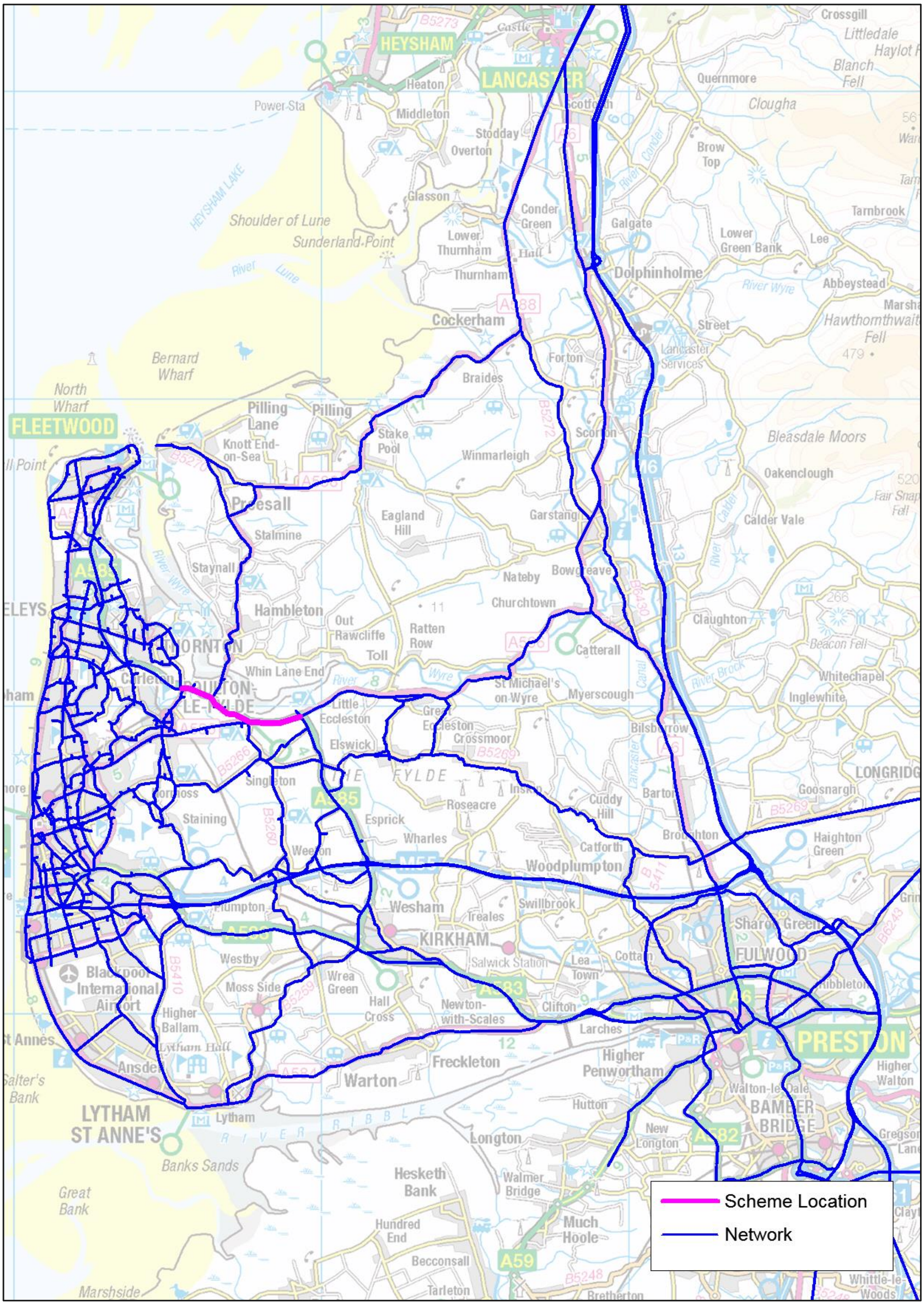
- Key junctions in the study area (and in the wider network) that can influence traffic in the vicinity of the scheme are coded correctly;
- Traffic routing in the ADM and on key strategic corridors is modelled accurately;
- The allocation of centroid connectors for internal zones causes trips to load onto the network at locations that are realistic.

Network inventory check: model extent and coverage

5.3.4 The model network extent and coverage must be sufficiently detailed in order to use the model in carrying out a robust assessment of the A585 scheme options. A representation of the SATURN model network was therefore overlaid on background mapping of the study area and the Ordnance Survey (OS) Integrated Transport Network (ITN) layer to highlight any key links missing from the model.

5.3.5 The plot shown in Figure 5-1 demonstrates that the SATURN simulation network covers all major motorways, A-roads and B-roads. As described in paragraph 4.2.15, local access roads were combined and represented as stubs/spigots to allow for access to and egress from the model zones.

Figure 5-1 Model Coverage – Simulation Network



Source: OS data © *Crown copyright 2015;* Licence – Version 3 of Open Govt. Licence (OGL)

Network audit on the unassigned network

5.3.6 A thorough audit of the network in the ADM was carried out, which included checks to ensure that speeds, distances, node positions, link lengths and other network parameters are correctly represented in the network, and correctly imported from GIS data sources into SATURN.

5.3.7 A total of 875 nodes in the ADM were audited for the following network/junction aspects:

- Junction type
- Number of approach arms
- Number of lanes
- Representation of one-way and two-way links
- Link lengths
- Free flow speeds and speed flow curves
- Lane allocation
- Turn saturation flows
- Stacking capacity
- Circulating capacity for roundabouts
- GAP values
- Priority markers
- TAX for signals
- Weight/access restrictions e.g. for HGVs
- Bus only lanes

5.3.8 All warnings and serious warnings in SATURN were checked to identify whether changes needed to be made. A summary of these warnings is provided in Table 5-1. Further detail is provided in Appendix E.

Table 5-1 SATURN Network Warning Log

No.	Type	Description	Frequency			**Comment**
			AM	IP	PM	
12	Warning	More than one give-way turn sharing a single lane at a priority junction. See Section 6.4.9.	176	176	176	All of these warnings occur at loading points which are coded with reduced saturation flows. It is expected that the loading links are one lane links used for all turn movements. No action taken.
32	Warning	Simulation link distances, times and/or speeds differ in reverse directions. Any difference at all in distances triggers a warning but times must differ by 10% or greater and/or speeds must differ by greater than 1.5 kph. The critical limits are also name list parameters under &PARAM with W32D	191	191	191	There is only one occurrence in the network where link lengths are different in different directions. This is due to the network structure. Difference in speeds are due to cruise speeds differing in different directions. Cruise Speeds

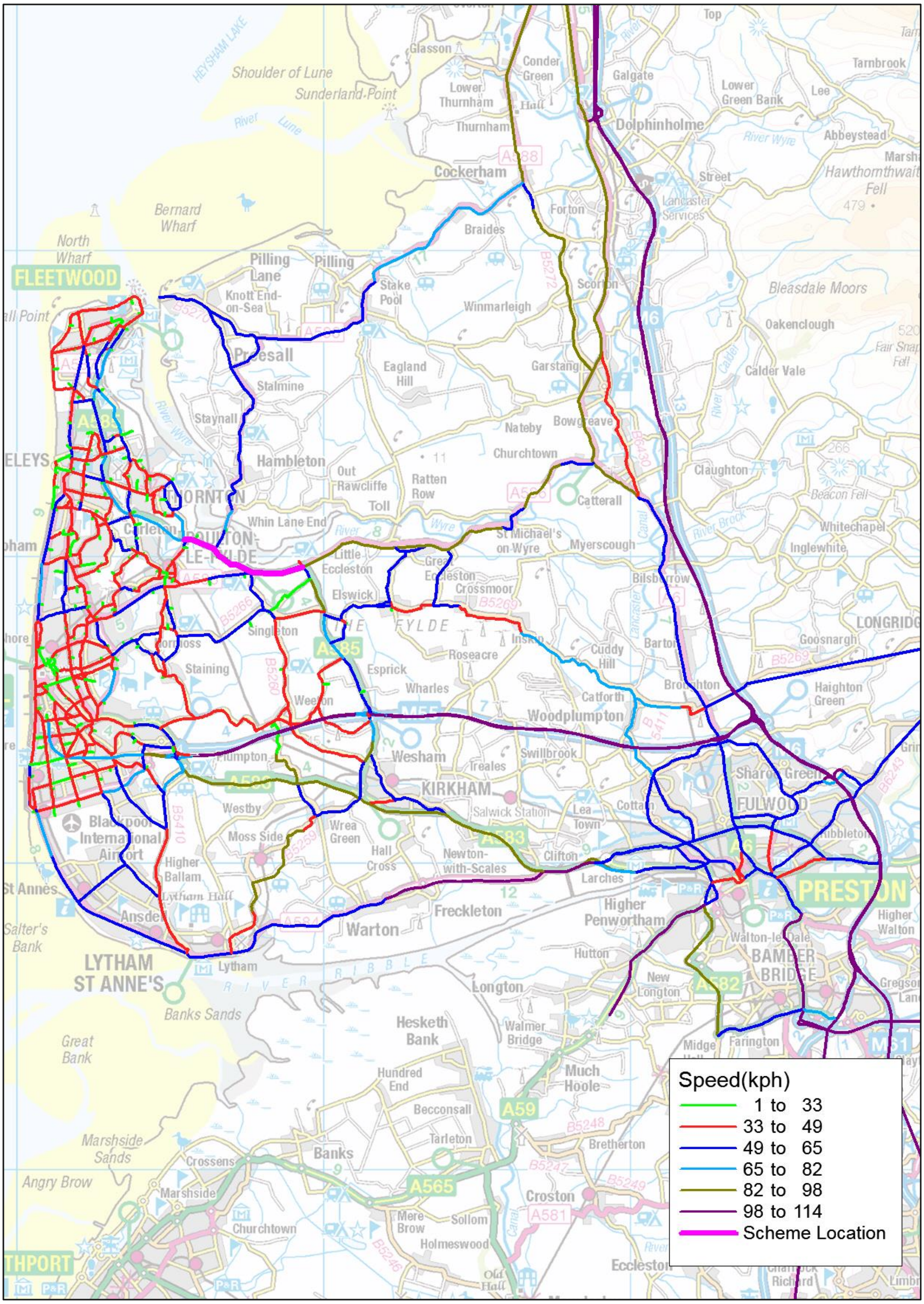
No.	Type	Description	Frequency AM	IP	PM	Comment
		= 0.0 by default for zero differences in distances, W32T = 0.10 (i.e., 10%) for relative times and W32KPH = 1.5 for speeds.				are taken from ITN and RTM. No action taken.
33	Warning	Suspicious link distance – the input value differs "significantly" from the crow-fly value. See Serious Warning 136 for "highly significant" differences. A significant difference is defined to be either greater than 10 metres or a relative difference of either more than plus 10% or minus 5% relative to the crow-fly. Note that differences between coded and crow-fly distances may also be displayed as link annotation data within P1X.	154	154	154	The distance taken for every link is from ITN. The difference is mainly due to the difference in shape and curvature of the model links compared to how they are coded in the ITN layer. No action taken.
92	Warning	A zone connected under 33333 would be better coded under 22222; this removes the possibility of U-turns. See Section 16.6.4 and 18.9.1. See also Serious Warning 174 below.	144	144	144	Coding the connector in the 22222 card would induce delay in the links. As the node delay is being simulated, there would then be a potential risk of double counting the delay. No action taken.
97	Warning	Opposing x-turns at signals hook; i.e., interfere. Since such turns can make convergence more difficult it is worth checking to see if any such occurrences should be converted to non-hooking. As a general rule in modern networks hooked turns at signals are very much the exception rather than the rule (although the defaults in SATURN may still indicate otherwise; see 15.7.1). See Section 6.4.2.6.	84	84	84	The signal staging for the signals is arranged to be hooked. These do not cause additional delays at signals; therefore, there is no potential effect of re-routing. No action taken.
98	Warning	The lane structure suggests that a minor turn might be given a clear exit priority modifier C. See Section 6.4.2.6	70	70	71	The node structure on ground is not suggestive of this issue. It may be due to co-ordinates.

No.	Type	Description	Frequency			Comment
			AM	IP	PM	
						No action taken.
135	Serious warning	More than one give-way turn sharing the single lane: major arm at a priority junction; see Section 6.4.9.	147	147	147	This warning occurs at loading links and these are coded with give way markers and reduced sat-flows. It is expected that loading links are single lanes which share the traffic from all turning movements. No action taken.
136	Serious warning	Suspicious link distance – the input value differs “highly significantly” from the crow-fly value. See Warning 33 for a “significant” difference. A highly significant difference is defined to be either greater than 50 meters or a relative difference of either more than plus 30% or minus 25%.	71	71	71	The distance taken for every link is from ITN. The difference is mainly because of the difference in shape and curvature of the model links compared to how they are coded in the ITN layer. No action taken.
137	Serious warning	The turn saturation flows per lane differ widely single arm at a signalized or priority junction; see Section 6.4.6.3.	232	232	232	The turn saturation flow varies because the B Node is a loading point from which the traffic loads to the network from a zone through a loading link. The saturation flow for the link is low. The turn saturation flows vary significantly at that node.
152	Serious warning	A single-lane arm at signals which includes an X-marked turn; see Section 6.4.	61	62	62	There is only a single lane without a flare at these signals and it is found that there are few turning vehicles that do not cause a significant delay.

5.3.9 Capacity indices representing specific SFCs were plotted as thematic maps and sense checked to ensure that the SFCs do not vary unjustifiably along a series of links.

5.3.10 Cruise speeds in the ADM and the RoFMA were plotted as thematic maps, as shown in Figure 5-2. These were checked for any discrepancies. It can be seen that motorway links are coded with higher speeds of between 98 and 114 kph. All stub connector links were coded as 30 kph. Based on posted speeds, majority of the urban links were coded with continuous speeds of 48 kph.

Figure 5-2 Cruise Speeds Used in the A585 SATURN Model



Source: OS data © *Crown copyright 2015;* Licence – Version 3 of Open Govt. Licence (OGL)

5.3.11 Journey time route distances from the SATURN model were compared against the observed journey time route distances, as obtained from driving distances provided in Google maps. It was found that the percentage deviation between the observed journey time route length and the modelled journey time route length is within 1% for the majority of routes, and within 3% for all routes, as shown in Table 5-2.

Table 5-2 Comparison of Modelled and Observed Journey Time Route Lengths

Route No.	Route	Direction	Observed Distance (km)	Modelled Distance (km)	Deviation (%)
1	A587	B5390 Park Road to Russell Avenue	11.30	11.30	0%
		Russell Avenue to B5390 Park Road	11.30	11.27	0%
2	A583	Blackpool Road to Preston Road	10.31	10.16	1%
		Preston Road to Blackpool Road	10.26	10.24	0%
3	A585	Singleton (B5260) to Amounderness Way	10.21	10.14	1%
		Amounderness Way to Singleton (B5260)	10.22	10.14	1%
4	A585	Blackpool Road to Windy Harbour	8.41	8.28	2%
		Windy Harbour to Blackpool Road	8.41	8.29	1%
5	A585	Garstang Road to Skippool Junction	4.32	4.30	1%
		Skippool Junction to Garstang Road	4.35	4.30	1%
6	A588	Shard Road to Hall Road	6.87	6.83	1%
		Hall Road to Shard Road	6.90	6.83	1%
7	B5260	Carleton Road to Russell Avenue	5.79	5.75	1%
		Russell Avenue to Carleton Road	5.79	5.75	1%
8	M55	M55 Junction 4 towards B5262 up to A584	11.78	11.85	-1%
		A584 through B5262 up to M55 Junction 4	11.85	11.85	0%

Route No.	Route	Direction	Observed Distance (km)	Modelled Distance (km)	Deviation (%)
9	Mill Lane	Towards A588 up to Victoria Road West	10.49	10.45	0%
		Victoria Road West towards A588	11.25	10.90	3%
10	M55	Junction 4 to Junction 1	19.31	19.13	1%
		Junction 1 to Junction 4	19.32	19.14	1%
11	Talbot Square	Talbot Square (Blackpool) towards A586 up to Thistleton Road	11.58	11.52	1%
		Thistleton Road through A586 up to Talbot Square (Blackpool)	11.54	11.49	1%
12	B5269	Thistleton Road to Broughton Road	15.43	15.38	0%
		Broughton Road to Thistleton Road	15.43	15.38	0%
13	Talbot Road	Talbot Road through A586 to Windy Harbour Skippool junction	9.97	9.94	0%
		Windy Harbour Skippool Junction through A586 to Talbot Road	10.02	9.95	1%
14	A586	Garstang Road to A6	11.32	11.28	0%
		A6 to Garstang Road	11.32	11.28	0%

5.3.12 The free flow speeds coded in the ADM were checked against posted speed limits as observed from satellite imagery where possible and updated as appropriate. It was verified that free flow speeds do not vary unjustifiably along a series of links.

5.3.13 All GAP values were checked to ensure that they lie within a suitable range (1-3 seconds).

5.3.14 The stacking capacity on the approach to junctions was compared with observed data from aerial photography and adjusted where necessary.

5.3.15 Where included, priority markers were cross-checked for each node using satellite imagery.

5.3.16 The location of facilities where HGVs are restricted was verified in accordance with the classified count data. For example, whilst checking the posted speeds on the network using Google Street view, some HGV access restrictions were observed and replicated in the model. Smithy lane and Wild lane have HGV access restrictions at each end of the nodes.

5.3.17 The location of bus-only lanes within the ADM was cross-checked with bus route maps obtained from Blackpool, Wyre and Fylde Councils.

Calibration checks on the assigned network

5.3.18 After performing the network audits described above and running an assignment, the following specific aspects of the network were reviewed:

- **Counts in excess of capacity** (i.e. where an observed count was noticeably higher than the coded network capacity) – the capacities were checked and amended as appropriate
- **Excessive junction delays** – unreasonably high node delays and the largest differences between the modelled link travel times and the observed travel times from Trafficmaster journey time data were checked and the link/junction coding amended as necessary. Where delays at signalised junctions were unreasonably high or blocking back of the upstream junction was observed, the signal timings coded in the model were checked against the observed timings and adjustments were made where necessary. Due to the adaptive nature of signal timings and lack of information on stage lags/delays, a deviation of signal phase timings in the form of optimisation of signal timings was adopted, where felt necessary
- **Low/high flows** – locations/links where the modelled flow was substantially different from that of an observed count show either 1) traffic restricted at an upstream junction; 2) where a competing route is more attractive; or 3) where delays within the model are not well represented. In order to reduce the delays along a route, the signal phases for the top ten worst performing junctions were optimised to reduce the junction delay, without changing the total cycle time
- **Unrealistic link speeds** - link attributes by time period and direction were checked for consistency by direction; including link lengths, cruise speeds, link type and SFCs. Where these differed by direction, the reasons were found to be justified. Cruise speeds were plotted as thematic maps and checked for outliers. Checks were also carried out to ensure that speeds do not vary unjustifiably along a series of links.
- **Poor reproduction of observed travel times** – a comparison of the modelled and observed journey time routes showed locations where the segments within the model may not be replicating the observed levels of delays. Observed and modelled times on each link were compared and the SFC and cruise speed values were adjusted to match the ITN speeds.

5.3.19 Table 5-3 summarises the calibration checks that were performed on the assigned network.

Table 5-3 Summary of Calibration Checks on the Assigned Network

Parameter	Check
Saturation Flows	Default values were locally adjusted where counts or journey time data indicate more vehicles passing through the junction than default values allow
Connectors	Flows on simulation connectors were checked to represent realistic loading on the network New connectors were added for some zones and in some cases existing connectors were removed to adjust trip patterns and account for new zones. For example, Zone 89 was created as a separate zone to represent the Windy Harbour Caravan Park.
GAP	Default values were locally adjusted where modelled delays on give way movements were different to observed
Stacking Capacity	Checks were carried out against aerial photography where delays at junctions were unreasonable and unjustifiable Stacking capacity was checked against the aerial photography for short modelled links created as a result of exploding a roundabout, set-backs at bus lanes etc.

Routing checks

5.3.20 Analysis of the routes taken by vehicles as they travel through the network to specific destinations or along specific links provides a means of validating the network coding and route choice. The 'tree' building feature within SATURN produces plots that can be used for this purpose.

5.3.21 In locations where the modelled flows at calibration count sites did not match the observed data, select link analysis was undertaken to check that this was not caused by unrealistic routing.

5.3.22 Similarly, traffic flow routing was examined to ensure that the number of vehicles using these routes is realistic. Occurrences of unrealistic routing were examined using journey time data to ensure that delays and journey times were being modelled correctly, in order that minor routes were not appearing unreasonably attractive. Further information on route network checks are provided in Appendix F.

5.3.23 WebTAG Unit M3.1 requires that examination of the modelled routes should be carried out between selected origins and destinations which focus on important centres of population and employment or key intersections. The number of Origin-Destination (OD) pairs to be examined also depends on the size of the model, with the rule of thumb being:

$$\text{Number of OD pairs} = (\text{Number of zones})^{1/4} \times (\text{Number of user classes})$$

5.3.24 In the case of the A585 SATURN model, this equation implies 18 or 19 OD pairs should be considered.

5.3.25 A sense check was carried out by comparing the model's assigned route for cars, LGVs and HGVs with that provided by Google Maps driving directions for 18 OD pairs. Appendix F shows all network travel route comparisons undertaken.

5.3.26 The modelled assigned route for cars and LGVs was found to be similar to that of the Google Maps driving directions. For heavy vehicles, a similar comparison may be inappropriate as the cost function varies considerably compared to that for cars. However, the routes used by HGVs in the model seem reasonable i.e. they are using the A585 rather than local roads.

5.3.27 In conclusion, the route analysis indicates that the routing used by vehicles throughout the network is sensible. The analysis presented in Sections 6.4 and 6.5.1, which describe the validation of flow on the links against the traffic count data and the comparison of modelled journey times along selected routes against observed data taken from Trafficmaster, further support this.

Checks on assignment stability

5.3.28 As calibration of the model progressed, the areas of the network found to be causing assignment instability were examined. These included:

- Locations of the worst converged nodes
- Links and junctions where delays and queues change considerably between assignment runs
- Locations having unreasonably high delays
- Locations with excessively high blocking back links.

5.3.29 The above were the focus of further checks to ensure that the coding of the surrounding network was correct and to improve the quality of the traffic assignment.

5.4 Matrix calibration

5.4.1 A combination of existing and newly collected data was used for matrix calibration purposes, as set out in Chapter 3. This included ATC, CJC and MCC data.

5.4.2 Matrix calibration was carried out by applying matrix estimation to prior matrices that had been created with a gravity model (for car trips) or solely by expanding RSI records to traffic counts, as described in section 4.3.

5.4.3 The impact of the calibration process was assessed by comparing the prior and post-estimation matrices at different levels of aggregation, together with an examination of changes to trip length distributions.

Matrix estimation monitoring

5.4.4 A comparison of the trip matrix before and after matrix estimation is used to assess the effectiveness of the matrix estimation process in producing an output that better matches a set of calibration link and turn vehicle flows. The post-estimation trip matrix should reflect more closely than the prior (i.e. pre-estimation) matrix the pattern of observed traffic on the network, and as such provide a better representation of travel patterns in the study area.

5.4.5 A comparison of the total number of trips in the A585 model matrix for each user class, before and after matrix estimation, is shown in Table 5-4. A comparison of prior and post ME2 trips at sector level is provided in Appendix J.

Table 5-4 Prior and Post Matrix Totals Comparison (Vehicles)

User Class	Prior Matrix Totals			Post Matrix Totals			% Difference (Post – Prior)/Prior		
	AM	IP	PM	AM	IP	PM	AM	IP	PM
Car (Commute)	15,884	4,511	13,194	16,453	4,434	13,538	4%	-2%	3%
Car (Business)	1,978	2,103	2,074	2,118	2,046	2,316	7%	-3%	12%
Car (Other)	13,332	22,237	17,808	14,348	22,213	19,207	8%	0%	8%
LGV	3,277	2,827	2,820	3,614	3,106	3,139	10%	10%	11%
HGV	1,221	1,243	821	1,294	1,258	867	6%	1%	6%

5.4.6 There are some large changes between the prior and post-ME matrix totals for LGVs and HGVs. These are a consequence of the need to use the expanded RSI data samples directly as prior matrices rather than a synthetic matrix from a gravity model (as in the case of the car matrices) and the sparseness of the sample when converted to matrix form (as shown in Table 4-4). Consequently, the initial match of the observed goods vehicle data to the full set of traffic counts was poor, and so matrix estimation was required to make large changes to zonal movements in order to achieve a closer match to the counts.

5.4.7 For cars, the changes to the matrix totals in all modelled time periods are not very large. The changes in car commute trips during the IP and car business trips during the PM peak are, however, above the WebTAG criteria of 5% (refer to Section 5.4.9).

5.4.8 WebTAG Unit M3.1 recommends that the changes brought about by the matrix estimation process should be monitored to ensure that the magnitude of these changes is reasonable. Table 5-5 outlines the criteria as set out in Unit M3.1.

Table 5-5 Significance Criteria of Matrix Estimation Changes

Measure	Significance Criteria
Matrix zonal cell values	▪ Slope within 0.98 and 1.02 ▪ Intercept near zero ▪ R^2 in excess of 0.95

Measure	Significance Criteria
Matrix zonal trip ends	▪ Slope within 0.99 and 1.01 ▪ Intercept near zero ▪ R^2 in excess of 0.98
Trip length distributions	▪ Means within 5% ▪ Standard deviation within 5%
Sector to sector level matrices	▪ Differences within 5%

Source: WebTAG Unit M3.1

5.4.9 The following sections assess the changes to the matrices brought about by matrix estimation against each of these four criteria.

Matrix zonal cell values

5.4.10 Figure 5-3 to Figure 5-5 summarise the changes brought about by matrix estimation for the AM, IP and PM peaks at the matrix O-D cell level. A summary of the results is provided in Table 5-6. Details for each of the five user classes are tabulated and included in Appendix G.

Figure 5-3 Matrix Zonal Cell Value Comparison – Prior vs. Post ME2 - AM Peak

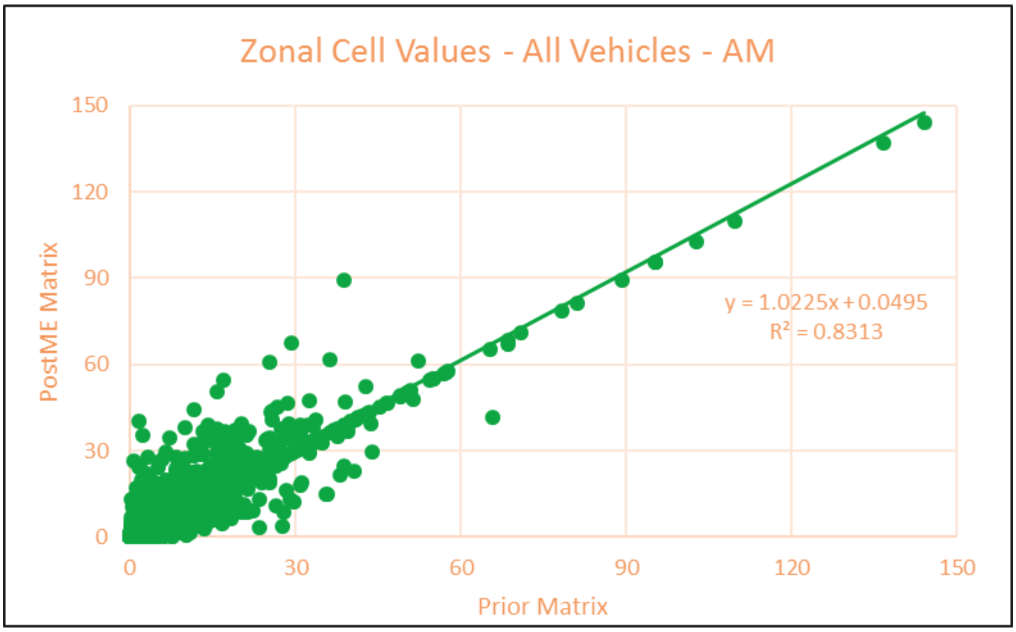


Figure 5-4 Matrix Zonal Cell Value Comparison – Prior vs. Post ME2 – IP

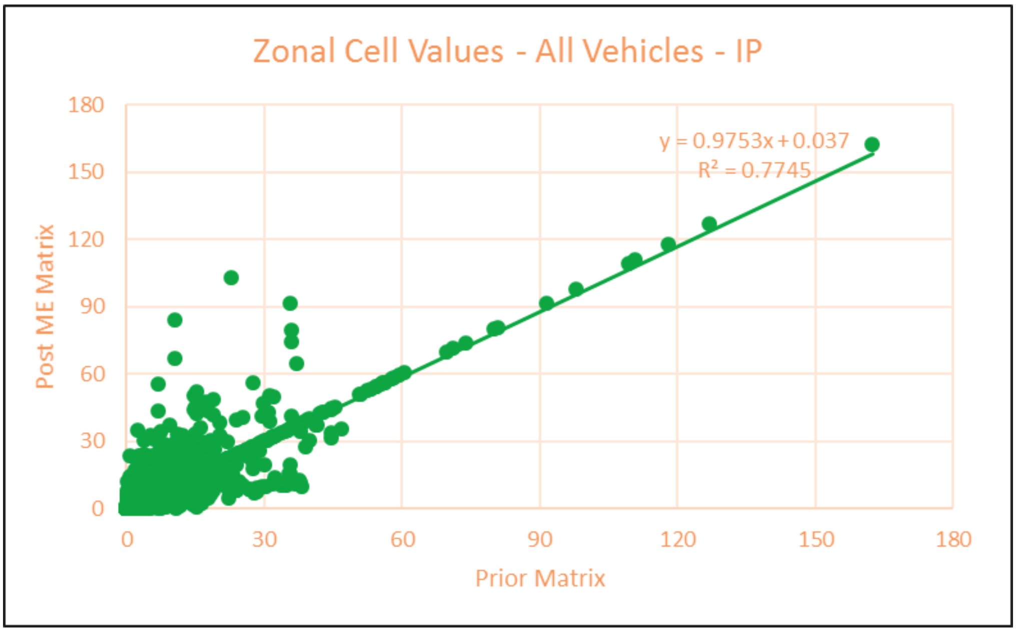


Figure 5-5 Matrix Zonal Cell Value Comparison – Prior vs. Post ME2 - PM Peak

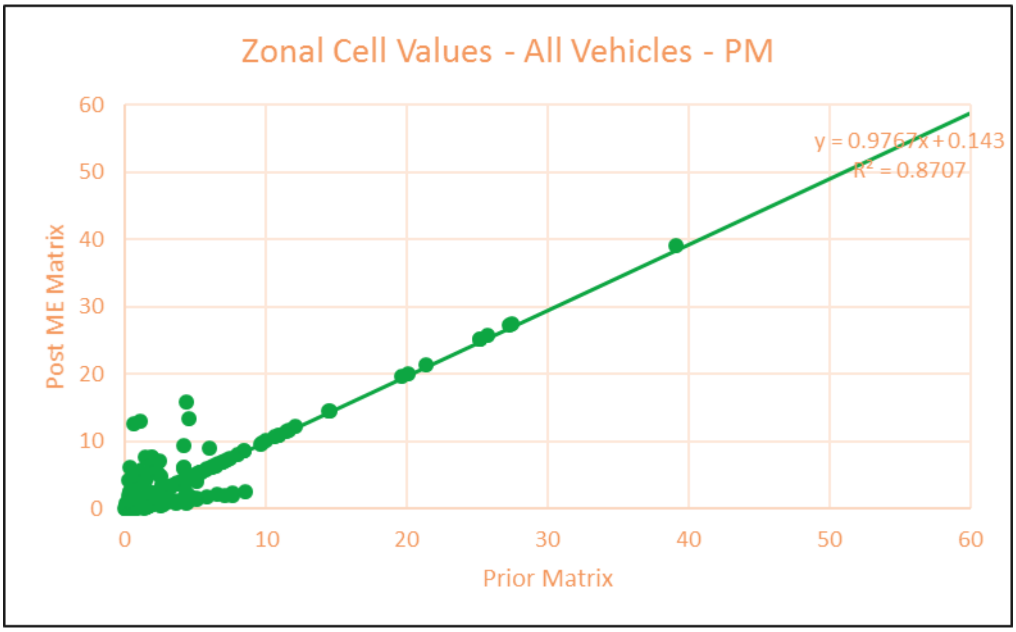


Table 5-6 Monitoring Zonal Cell Values – Prior vs. Post ME2

Measure	Criteria	AM	IP	PM
Slope	0.98 to 1.02	1.02	0.98	0.98
Intercept	Near to zero	0.05	0.04	0.13
R-square	> 0.95	0.83	0.77	0.87

Source: WebTAG Unit M3.1

5.4.11 Table 5-6 shows that matrix estimation had little effect on the trip matrices in terms of the zonal cell values. The coefficient of determination (R-square) criteria is not satisfied in all three peaks. This could be due to inaccuracies in the calculation of the zonal trip ends that were used in the gravity model, which involved converting between OA, MSOA and SATURN zones, and which may have led to the outliers seen in the IP and PM scatter plots. Intercept values are near to zero in all three peaks and all the slope values are near to 1 in all the three peaks.

Matrix zonal trip ends

5.4.12 The second measure of the impact of matrix estimation is to assess the impact of ME2 on the total number of trips to and from each model zone. Scatter plots of the trip end totals (origins and destinations) are presented for each of the three model time periods in Figure 5-6 to Figure 5-11.

Figure 5-6 Matrix Zonal Origin Trip End Comparison – AM Peak

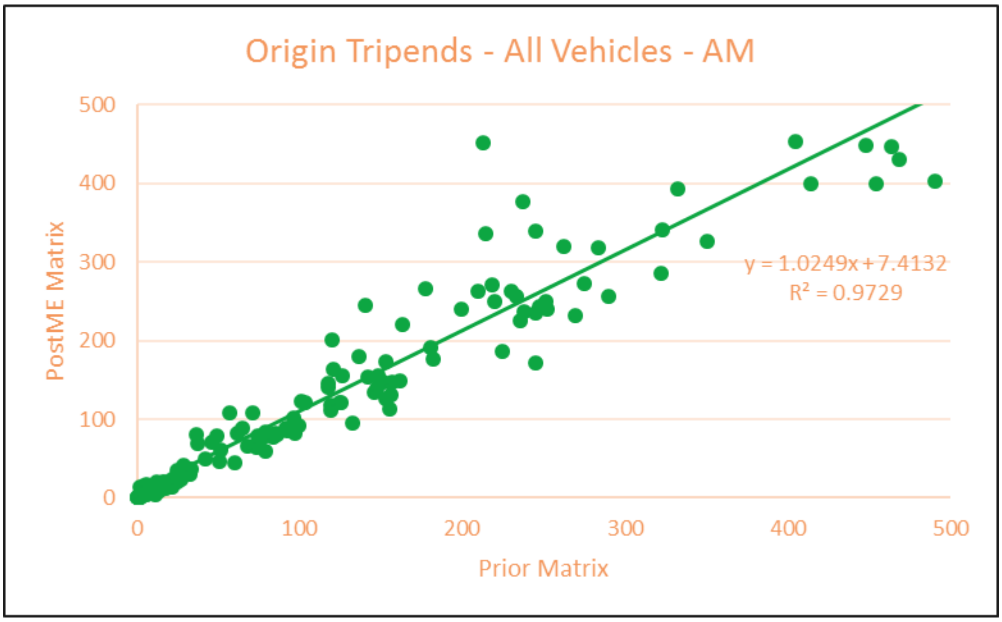


Figure 5-7 Matrix Zonal Destination Trip End Comparison – AM Peak

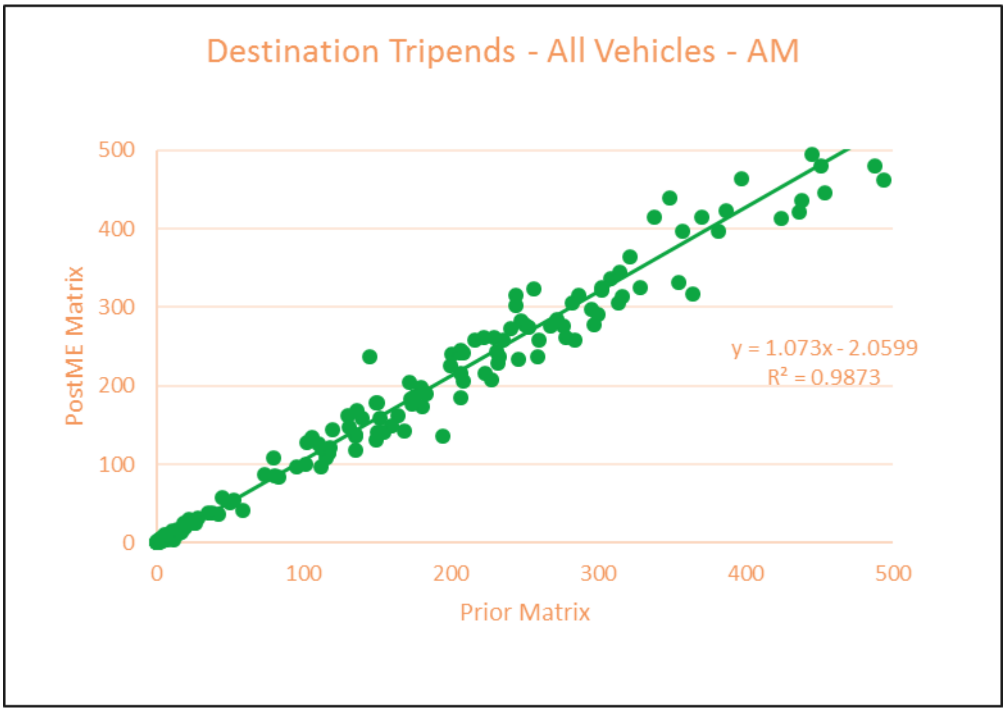


Figure 5-8 Matrix Zonal Origin Trip End Comparison – IP

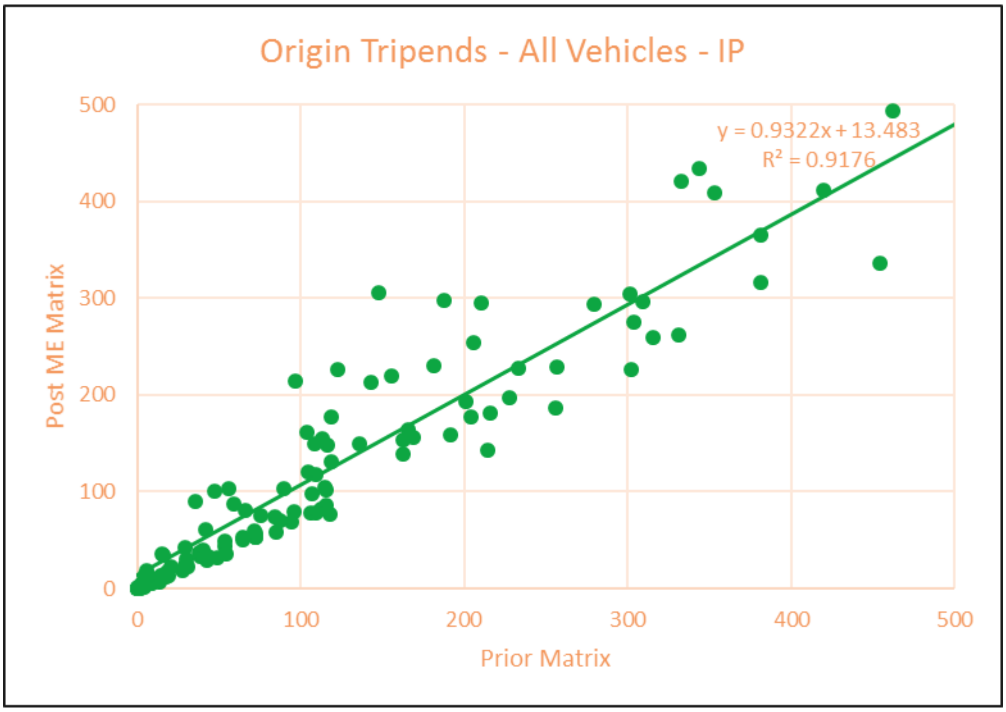


Figure 5-9 Matrix Zonal Destination Trip End Comparison – IP

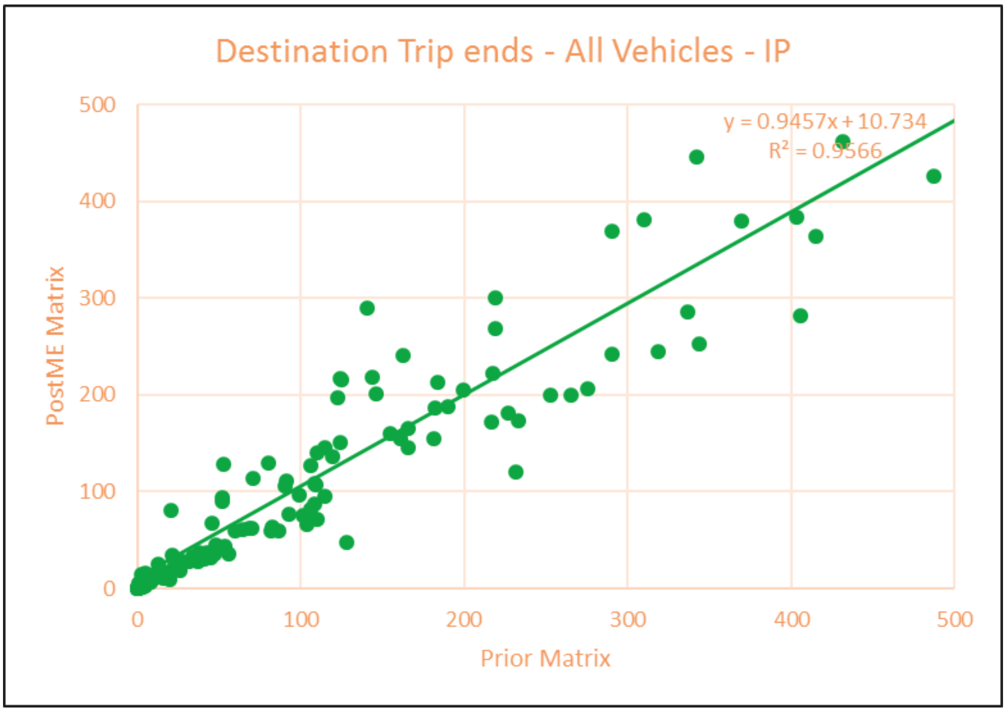


Figure 5-10 Matrix Zonal Origin Trip End Comparison – PM Peak

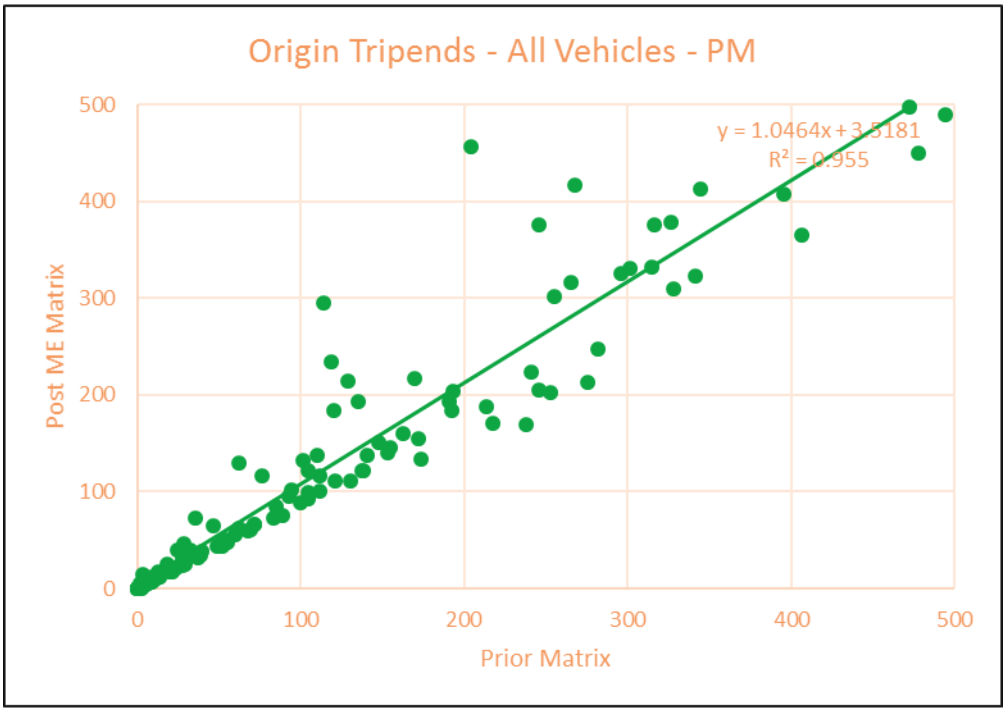
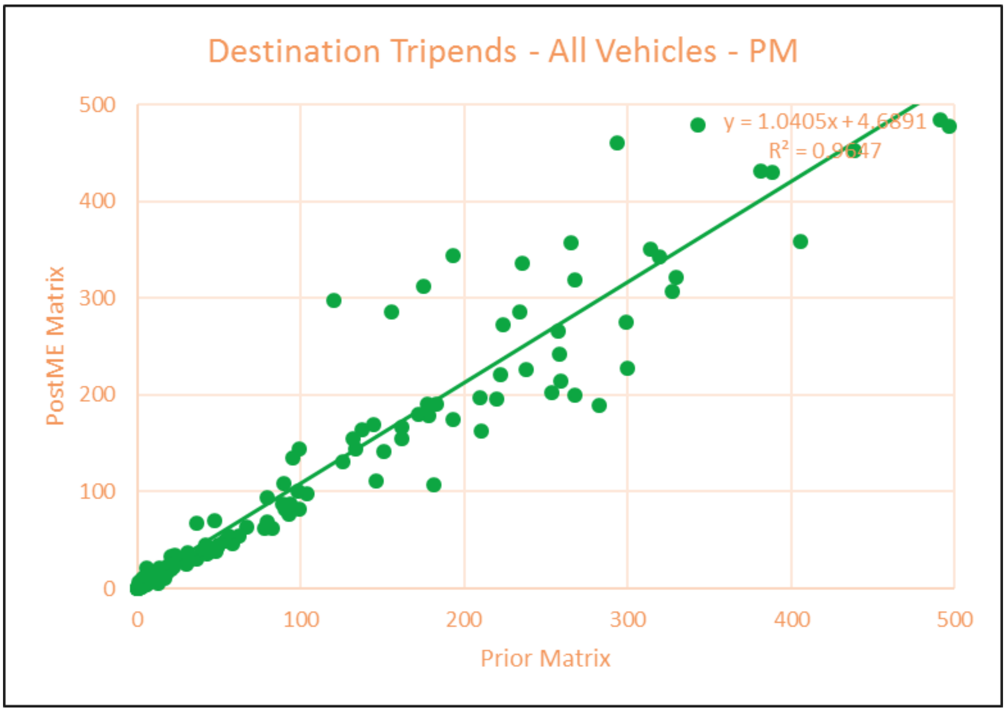


Figure 5-11 Matrix Zonal Destination Trip End Comparison – PM Peak



5.4.13 Table 5-7 provides a summary of the prior versus post ME2 zonal trip end analysis. A full user class breakdown is presented in Appendix H.

Table 5-7 Monitoring Zonal Trip Ends – Prior vs. Post ME2

Measure	Criterion	AM	IP	PM
Zonal Trip Ends (Origins)				
Slope	0.99 to 1.01	1.02	0.93	1.05
Intercept	Near to zero	7.41	13.48	3.61
R-square	> 0.98	0.97	0.92	0.95
Zonal Trip Ends (Destinations)				
Slope	0.99 to 1.01	1.07	0.95	1.04
Intercept	Near to zero	2.06	10.73	4.69
R-square	> 0.98	0.99	0.96	0.96

Source: WebTAG Unit M3.1

5.4.14 Table 5-7 shows that matrix estimation has overall had a minimal effect on the zonal origins and destinations between the prior and post-ME trip matrices. Though the regression line slopes do not satisfy the WebTAG criteria in any of the time periods, the deviations are not very large. Although there are some large variations between prior and Post-ME trip ends for some zones, there appears to be no overall bias either up or down.

5.4.15 Furthermore, there exists a strong correlation between the prior and post-ME matrices, as expressed by the R-squared statistic for the origin and the destination ends in AM and PM time periods.

Trip length distribution

5.4.16 The third method for assessing the impact of SATME2 on the prior trip matrices is to check whether the estimation process has significantly altered the trip length distribution of the prior matrices. Table 5-8 shows the change in the mean trip length for each user class before and after matrix estimation. Table 5-9 provides the mean trip length values of prior and post-ME matrices for all three time periods.

Table 5-8 Mean Trip Length Comparison – Prior vs. Post ME2

Time Period	Measure	Criteria	Car	LGV	HGV
AM	Mean	Within 5%	-4%	6%	10%
IP	Mean	Within 5%	20%	-9%	4%
PM	Mean	Within 5%	-14%	-3%	9%

Table 5-9 Mean Trip Length Values of Prior and Post ME Matrices

Mode	Criterion	Trip Length AM	Trip Length IP	Trip Length PM
Car	Prior Matrix	19.40	22.63	21.11
Car	Post-ME Matrix	18.53	18.19	18.23
LGV	Prior Matrix	34.57	34.24	34.24
LGV	Post-ME Matrix	32.51	30.99	33.24
HGV	Prior Matrix	59.61	59.22	59.69
HGV	Post-ME Matrix	65.46	61.65	64.99

5.4.17 The guidance stated in WebTAG Unit M3.1 requires mean trip lengths before and after matrix estimation to be within 5% of each other. Table 5-8 shows that this is achieved in some time periods for some user classes. There are however some user classes for which the trip length distribution before and after ME2 varies by more than 10%, including Carss in the IP and PM peaks and HGVs in the AM peak. The changes for goods vehicle trips are expected to be larger than car due to the small proportion of cells in the prior matrix that contain trips, and it can be seen that the largest changes brought about by matrix estimation are for HGVs, which can be seen from Table 4-4 to have a rather small number of observations for estimation to affect.

5.4.18 Figure 5-12 to Figure 5-14 show the trip length frequency distribution plots for car commute trips, LGV trips and HGV trips in the AM peak, before and after matrix estimation. The full set of trip length frequency distribution plots for all user classes in all three modelled time periods is presented in Appendix I.

Figure 5-12 Trip Length Distribution Comparison: AM Peak – Car Commute Trips

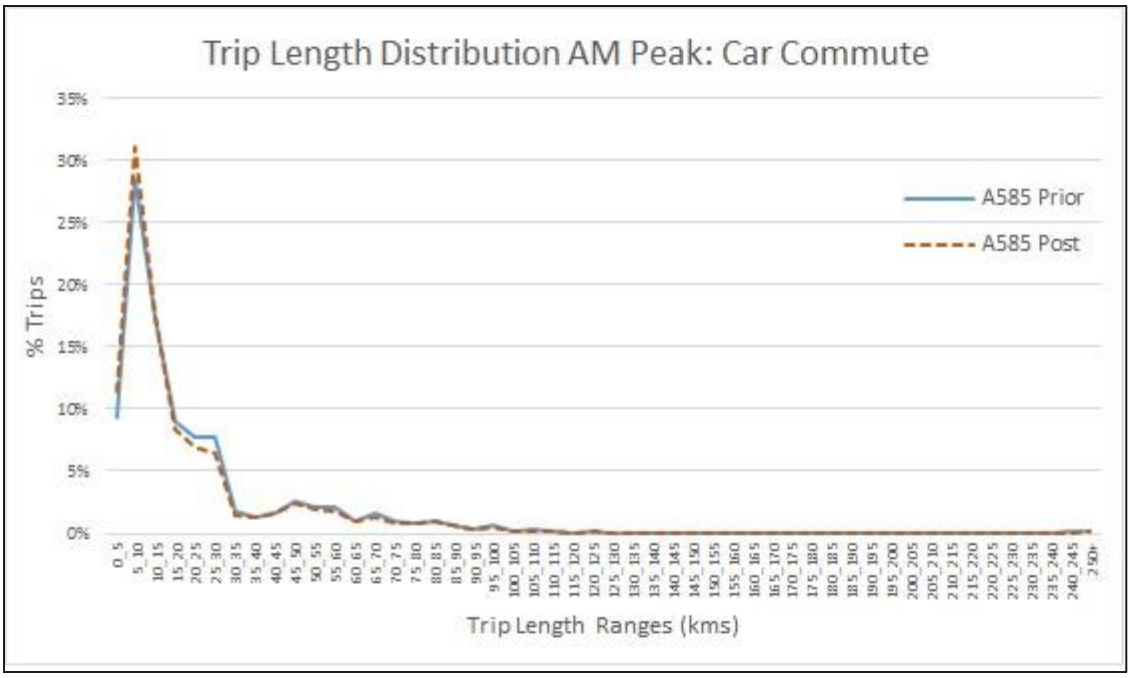


Figure 5-13 Trip Length Distribution Comparison: AM Peak – LGV Trips

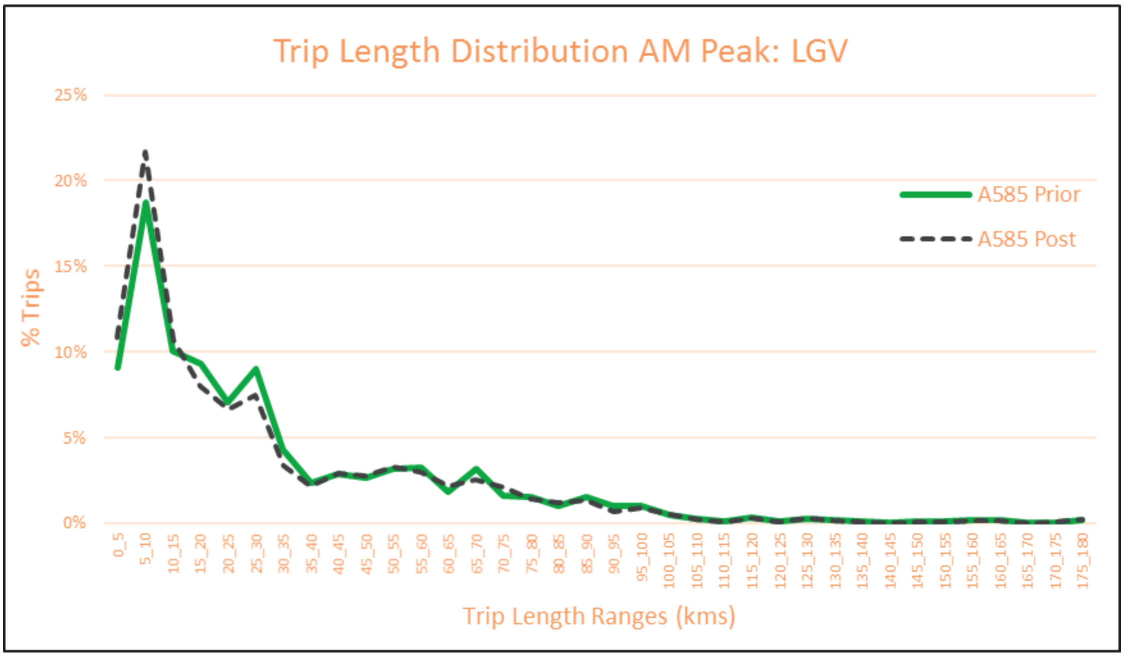
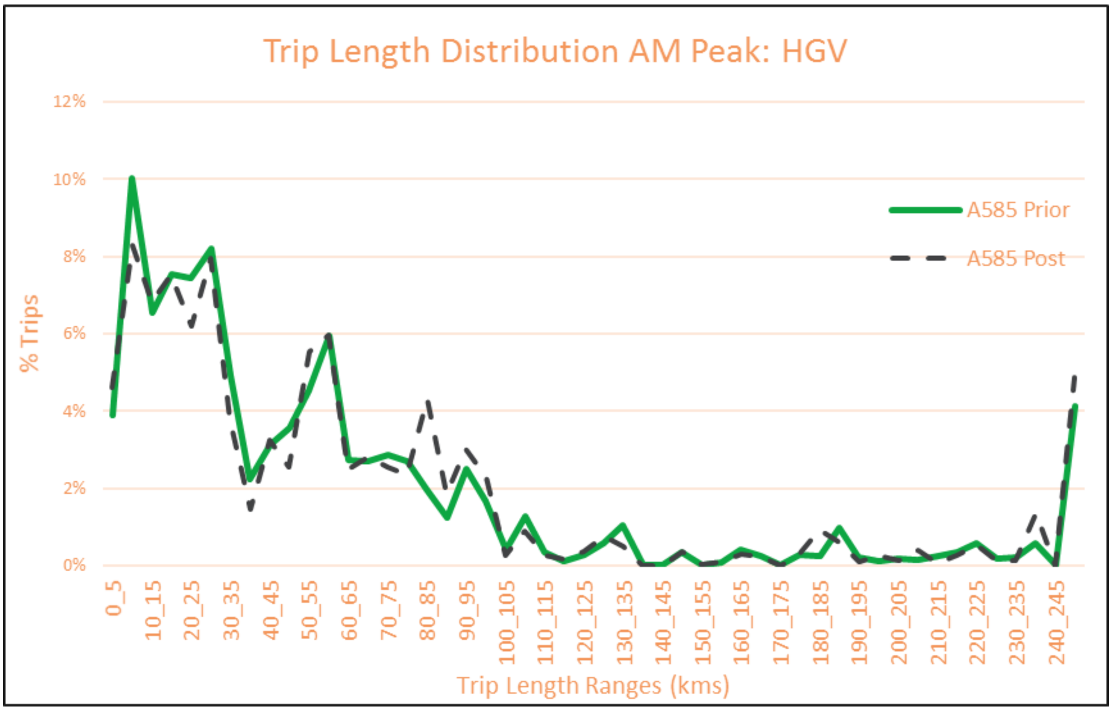


Figure 5-14 Trip Length Distribution Comparison: AM Peak – HGV Trips



5.4.19 Based on the trip length comparisons in Appendix I, it is concluded that the trip length distributions between the prior and post matrices for cars do not vary significantly across the three model time periods. However, the distributions for light and heavy goods vehicles do vary by large proportions in some distance bands. These variations are a consequence of the need to use the expanded RSI samples directly as prior matrices for goods vehicles rather than a synthetic matrix from a gravity model, and the ensuing sparseness of the sample when converted to matrix form.

5.4.20 From the above tests, it can be observed that the majority of the WebTAG-based comparisons of prior matrices with post-matrix estimation are within the stipulated limits with a few exceptions.

5.5 Assignment calibration

5.5.1 Assignment calibration was carried out separately for links and turns and for screen lines and cordons, as described in this selection.

Link and screenlines flow calibration

5.5.2 The link and screenlines flow calibration exercise focused on 150 links, four screenlines and one cordon as described in Section 5.4 and illustrated in Figure 5-15. Of the 150 links, 104 lie on screenlines and cordons and the remaining 46 links are additional calibration links separate to the screenlines and cordons.

5.5.3 The comparison of modelled link flows and turn flows to traffic counts followed the acceptability guidelines set out in WebTAG Unit M3.1 section 3, as presented in Table 5-10. WebTAG advises that flows that satisfy either of the two criteria can be regarded as satisfactory.

Table 5-10 Link and Turn Flow Calibration Criteria and Acceptability Guidelines

Criteria	Description of Criteria	Acceptability Guideline
Flow Difference Criterion (1)	Individual flows within 100 veh/hr of counts for flows less than 700 veh/hr	>85% of cases
	Individual flows within 15% of counts for flows from 700 to 2,700 veh/hr	
	Individual flows within 400 veh/hr of counts for flows more than 2,700 veh/h	
GEH Criterion (2)	GEH < 5 for individual flows	>85% of cases

Source: WebTAG Unit M3.1

5.5.4 Table 5-11 to Table 5-13 provide a summary of the flow calibration results in all three modelled time periods. The results are broken down into their performance against the flow difference criterion (1) and GEH Criterion (2). The WebTAG criterion (3) column indicates the total number of links that meet either the flow or GEH requirement and which can therefore be regarded as satisfactory.

Table 5-11 Link and Turn Calibration Summary – AM Peak

Count Type	**Total**	**Number/Percentage Passing WebTAG Calibration Criteria**					
		Post ME2			**Prior ME2**		
		Flow Criteria	**GEH Criteria**	**WebTAG Criteria**	**Flow Criteria**	**GEH Criteria**	**WebTAG Criteria**
Screenline Links	**104**	88	89	90	59	52	60
Other Links	**46**	44	43	44	22	18	22
Total Links	**150**	**132**	**132**	**134**	**81**	**70**	**82**
		88%	**88%**	**89%**	**54%**	**47%**	**55%**
Turns	**92**	89	74	89	62	37	63
		97%	**80%**	**97%**	**65%**	**46%**	**65%**

Table 5-12 Link and Turn Calibration Summary – Inter Peak

Count Type	Total	Number/Percentage Passing WebTAG Calibration Criteria					
		Post ME2			Prior ME2		
		Flow Criteria	GEH Criteria	WebTAG Criteria	Flow Criteria	GEH Criteria	WebTAG Criteria
Screenline Links	**104**	93	88	93	59	52	60
Other Links	**46**	46	45	46	22	18	22
Total Links	**150**	**139**	**133**	**139**	**81**	**71**	**86**
		93%	**89%**	**93%**	**54%**	**47%**	**57%**
Turns	**92**	91	75	91	63	32	63
		99%	**82%**	**99%**	**68%**	**35%**	**68%**

Table 5-13 Link and Turn Calibration Summary – PM Peak

Count Type	Total	Number/Percentage Passing WebTAG Calibration Criteria					
		Post ME2			Prior ME2		
		Flow Criteria	GEH Criteria	WebTAG Criteria	Flow Criteria	GEH Criteria	WebTAG Criteria
Screenline Links	**104**	89	89	90	49	47	53
Other Links	**46**	45	44	45	21	23	25
Total Links	**150**	**134**	**133**	**135**	**70**	**70**	**78**
		89%	**89%**	**90%**	**47%**	**47%**	**52%**
Turns	**92**	80	72	82	58	40	59
		87%	**78%**	**89%**	**63%**	**43%**	**64%**

5.5.5 In the AM peak, the post ME2 results for links and turns satisfy the WebTAG flow criterion, with 89% of links and 97% of turns passing the WebTAG criterion. Similarly, in the Inter Peak, 93% of links and 99% of turns pass the WebTAG criterion. In the PM peak 90% of links and 89% of turns, pass the WebTAG criterion. The modelled flows are therefore considered to be sufficiently calibrated in all three modelled time periods.

Screenline and cordon calibration

5.5.6 The screenlines and cordons used in calibration and validation are presented in Figure 5-15

5.5.7 The screenlines and cordons used in calibration are illustrated in Figure 5-16 and defined in Table 5-14.

Figure 5-15 Screenlines and Cordons

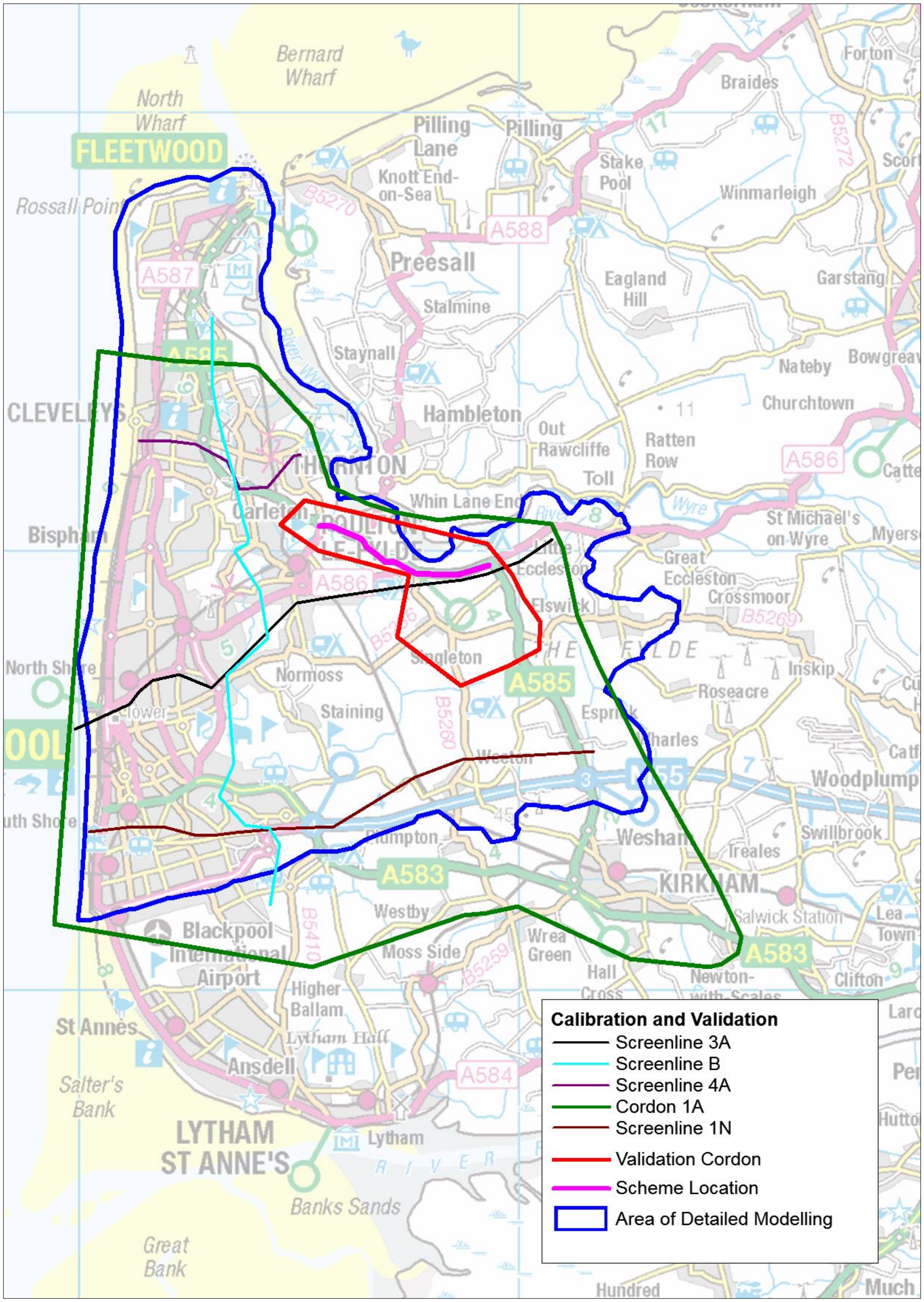


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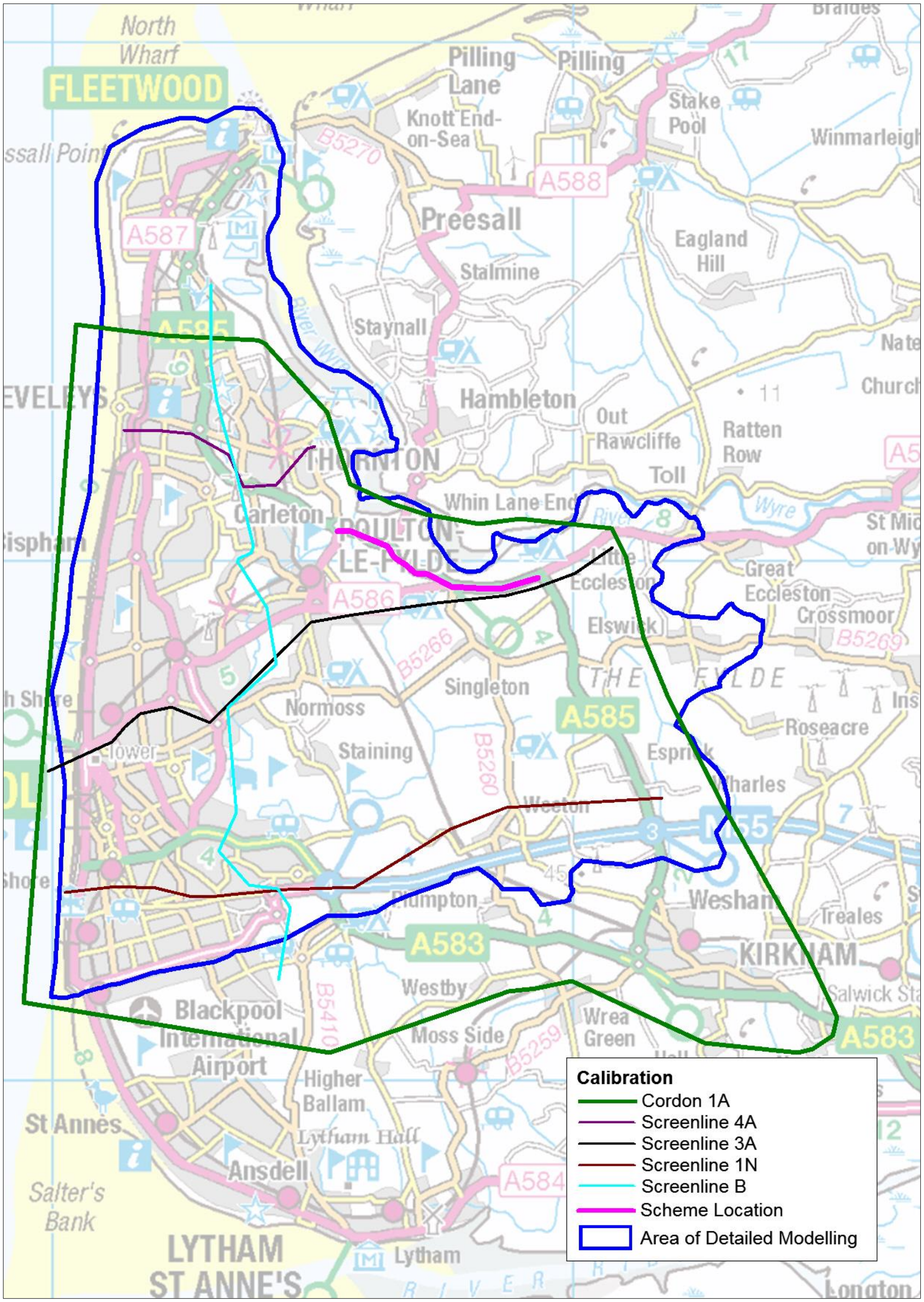
Figure 5-16 Calibration Screenlines and Cordon



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5.5.8 The screenline and cordon calibration followed the acceptability guidelines set out in WebTAG Unit M3.1 Section 3, as presented in Table 5-15.

Table 5-14 Screenlines and Cordons list used in Calibration

Description	Screenline or Cordon
Cordon at edge of fully modelled area (within A587)	Cordon 1A
North-South Screenline from B5268 Fleetwood Road to A583 Preston New Road	Screenline B
From Blackpool (A584 Promenade) to A585 (South of A585/Thistleton Rd Junction (Northbound)	Screenline 4A
East West Screenline parallel to B5412 Victoria Rd	Screenline 3A
North of M55/Yeadon Way from Blackpool (A584 Promenade) to M55 J1	Screenline 1N

Table 5-15 Screenline Flow Calibration Criterion and Acceptability Guideline

Criterion	Acceptability Guideline
Differences between modelled flows and counts should be less than 5% of counts	All or nearly all screenlines

5.5.9 The results of the screenline and cordon calibration are shown in Table 5-16 to Table 5-18 for the three modelled time periods.

5.5.10 The tables report the observed and modelled flow of total vehicles in both directions of travel across the screenline or cordon, together with percentage differences. At the bottom of each table, summary rows show the proportion of the screenlines/cordon that pass the total flow criterion (Table 5-15), together with information about the proportion of all links on the screenlines and cordon whose modelled flows satisfy the standard WebTAG flow criteria, as set out in Table 5-10.

Table 5-16 Individual Screenline Calibration Summary – AM Peak

Screenline / Cordon	Direction	Observed	Modelled	Modelled - Observed	% Difference	Pass?
Cordon 1A	IN	8,441	8,240	-200	-2.4	✓
	OUT	8,258	8,065	-193	-2.3	✓
Screenline B	EB	6,020	5,825	-194	-3.2	✓
	WB	6,305	5,929	-376	-6.0	×
Screenline 3A	NB	3,750	3,681	-69	-1.9	✓
	SB	4,535	4,548	13	0.3	✓
Screenline 4A	NB	3,008	2,827	-181	-6.0	×
	SB	3,332	3,395	64	1.9	✓
Screenline 1N	NB	5,889	5,689	-200	-3.4	✓
	SB	5,852	5,796	-56	-1.0	✓
Number of screenlines complying with WebTAG acceptability criteria						8/10
% of screenlines complying with WebTAG acceptability criteria						80%
% of individual screenline link flows complying with WebTAG acceptability criteria						85% (88 / 104)

Table 5-17 Individual Screenline Calibration Summary – Inter Peak

Screenline / Cordon	Direction	Observed	Modelled	Modelled - Observed	% Difference	Pass?
Cordon 1A	IN	6,649	6,126	-523	-7.9	×
	OUT	6,544	6,441	-103	-1.6	✓
Screenline B	EB	5,394	5,281	-113	-2.1	✓
	WB	5,323	5,231	-92	-1.7	✓
Screenline 3A	NB	3,616	3,485	-131	-3.6	✓
	SB	3,250	3,327	77	2.4	✓
Screenline 4A	NB	2,759	2,634	-125	-4.5	✓
	SB	2,705	2,771	66	2.4	✓
Screenline 1N	NB	4,625	4,307	-318	-6.9	×
	SB	4,493	4,568	75	1.7	✓
Number of screenlines complying with WebTAG acceptability criteria						8/10
% of screenlines complying with WebTAG acceptability criteria						80%
% of individual screenline link flows complying with WebTAG acceptability criteria						89% (93 / 104)

Table 5-18 Individual Screenline Calibration Summary – PM Peak

Screenline / Cordon	Direction	Observed	Modelled	Modelled - Observed	% Difference	Pass?
Cordon 1A	IN	8,733	8,453	-280	-3.2	✓
	OUT	8,688	8,423	-266	-3.1	✓
Screenline B	EB	6,970	6,695	-275	-3.9	✓
	WB	6,553	6,272	-281	-4.3	✓
Screenline 3A	NB	4,694	4,510	-183	-3.9	✓
	SB	3,895	4,017	122	3.1	✓
Screenline 4A	NB	3,763	3,626	-137	-3.6	✓
	SB	3,335	3,224	-111	-3.3	✓
Screenline 1N	NB	6,448	6,099	-350	-5.4	×
	SB	5,977	5,837	-140	-2.3	✓
Number of screenlines complying with WebTAG acceptability criteria						9/10
% of screenlines complying with WebTAG acceptability criteria						90%
% of individual screenline link flows complying with WebTAG acceptability criteria						86% (89 / 104)

5.5.11 The level of fit between the observed and modelled flows is good, with the majority of modelled flows on screenlines falling within 5% of the observed traffic flow, and a large proportion of links across all screenlines satisfying the standard link flow criterion.

5.5.12 In the AM peak:

- 80% of the screenlines and cordons pass the WebTAG flow criterion, where the modelled flows are within 5% of the observed flows
- Within the screenlines/cordon, 85% of the individual calibration links (88 out of 104) have modelled flows that satisfy the standard WebTAG criteria.
- The model is therefore considered to be sufficiently calibrated for the AM peak time period.

5.5.13 In the Inter-Peak:

- 80% of the screenlines and cordons pass the WebTAG flow criteria for total vehicles
- Within the screenlines/cordon, 89% of the individual calibration links (93 out of 104) have modelled flows that satisfy the standard WebTAG criteria.
- The model is therefore considered to be sufficiently calibrated for the inter-peak time period.

5.5.14 In the PM peak:

- 90% of the screenlines and cordons pass the WebTAG flow criterion for total vehicles
- Within the screenlines/cordon, 86% of the individual calibration links (89 out of 104) have modelled flows that satisfy the standard WebTAG criteria.
- The model is therefore considered to be sufficiently calibrated for the PM peak time period.

5.5.15 A detailed comparison of the observed and modelled flows for individual calibration links (forming a screenline) for each time period is presented in Appendix K.

5.5.16 Figure 5-16 to Figure 5-18 present the performance of the model across the study area, where each count site has been colour coded to indicate whether it passes the WebTAG criteria based on flow and GEH. The colours used are as follows:

- Green – site passes WebTAG criteria
- Red – site fails WebTAG criteria

5.5.17 It can be seen that there is generally a good geographic spread of acceptable model performance across the study area across all three modelled time periods.

Figure 5-17 AM Peak Calibration Links

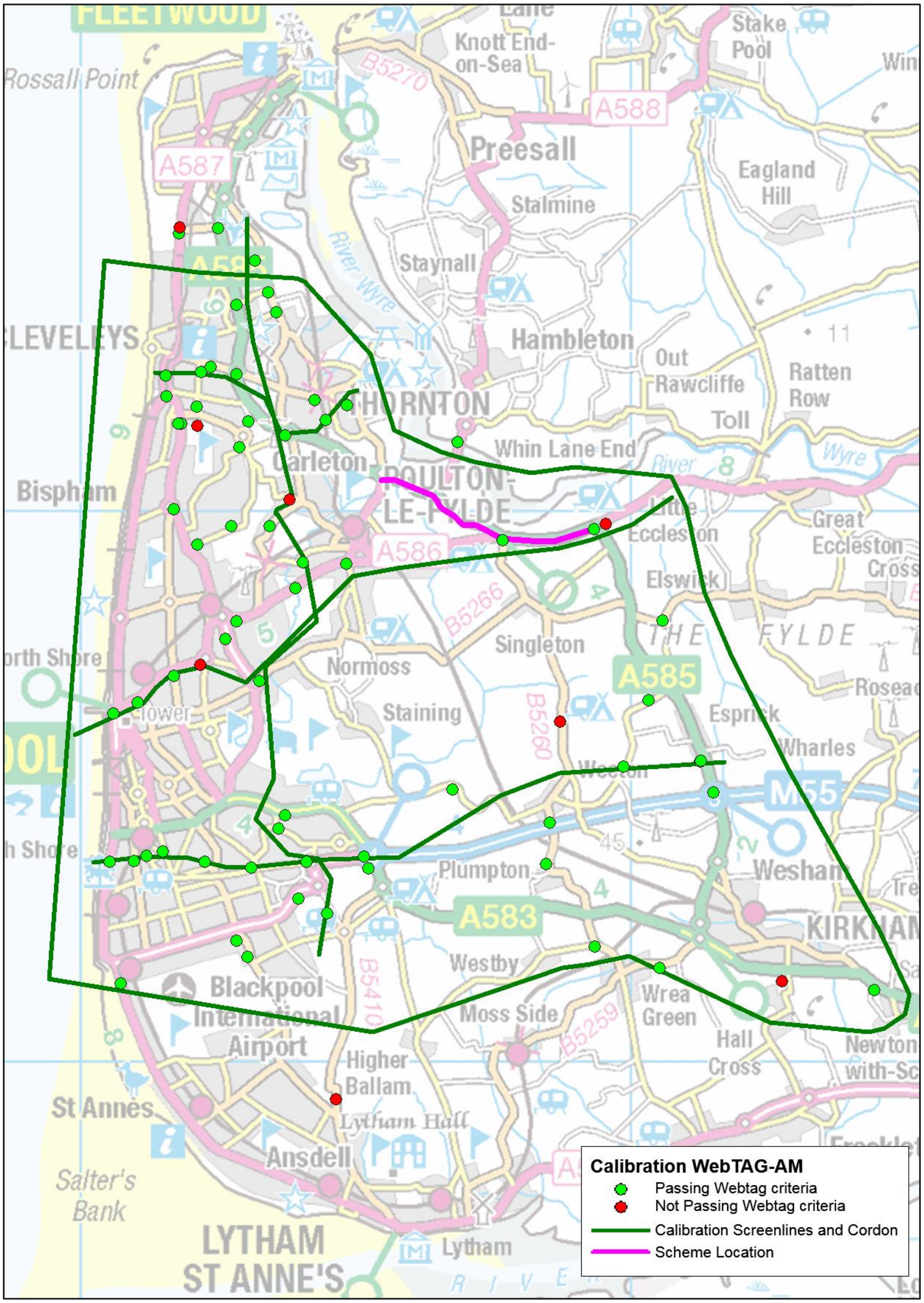

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Figure 5-18 IP Calibration Links

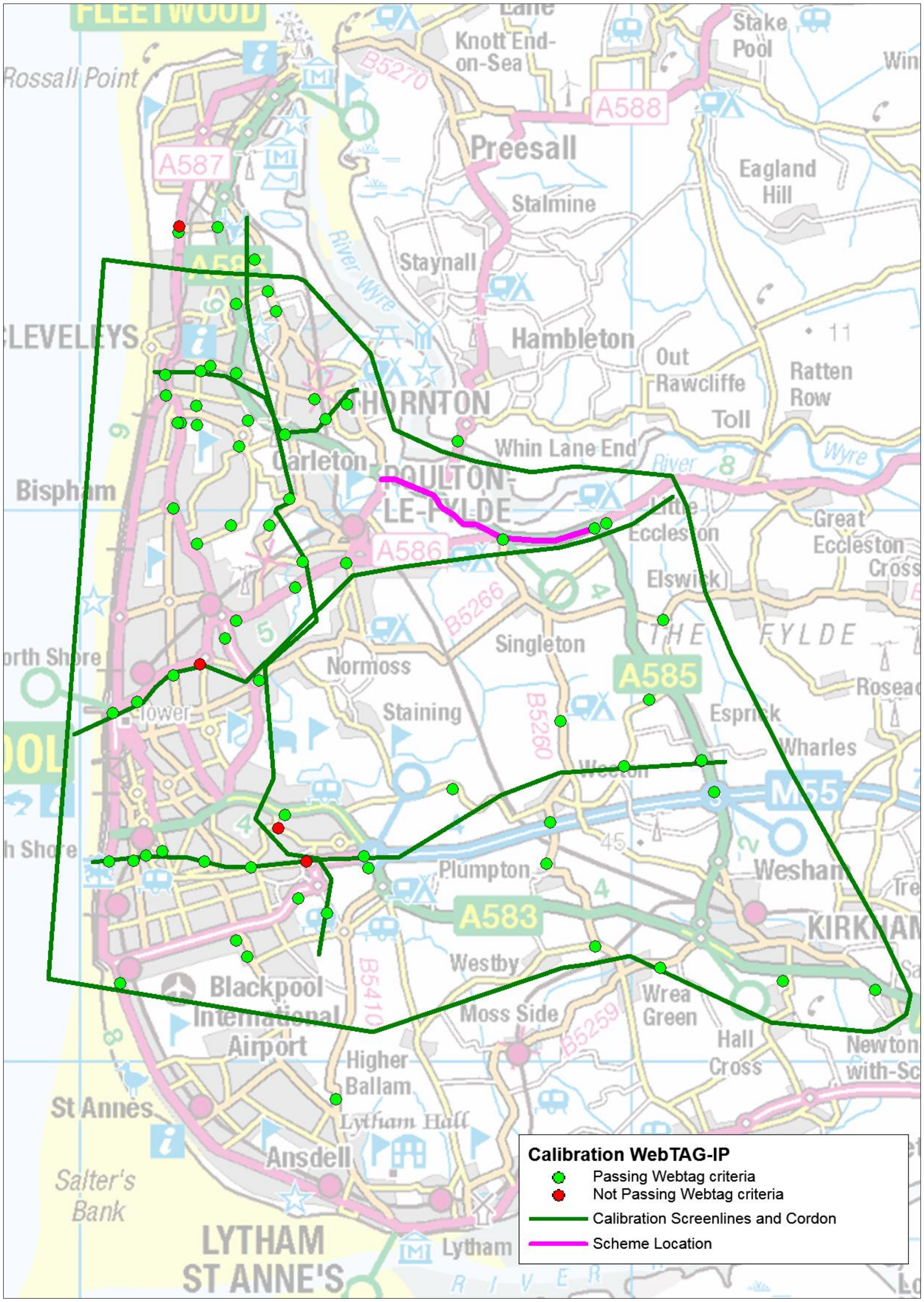

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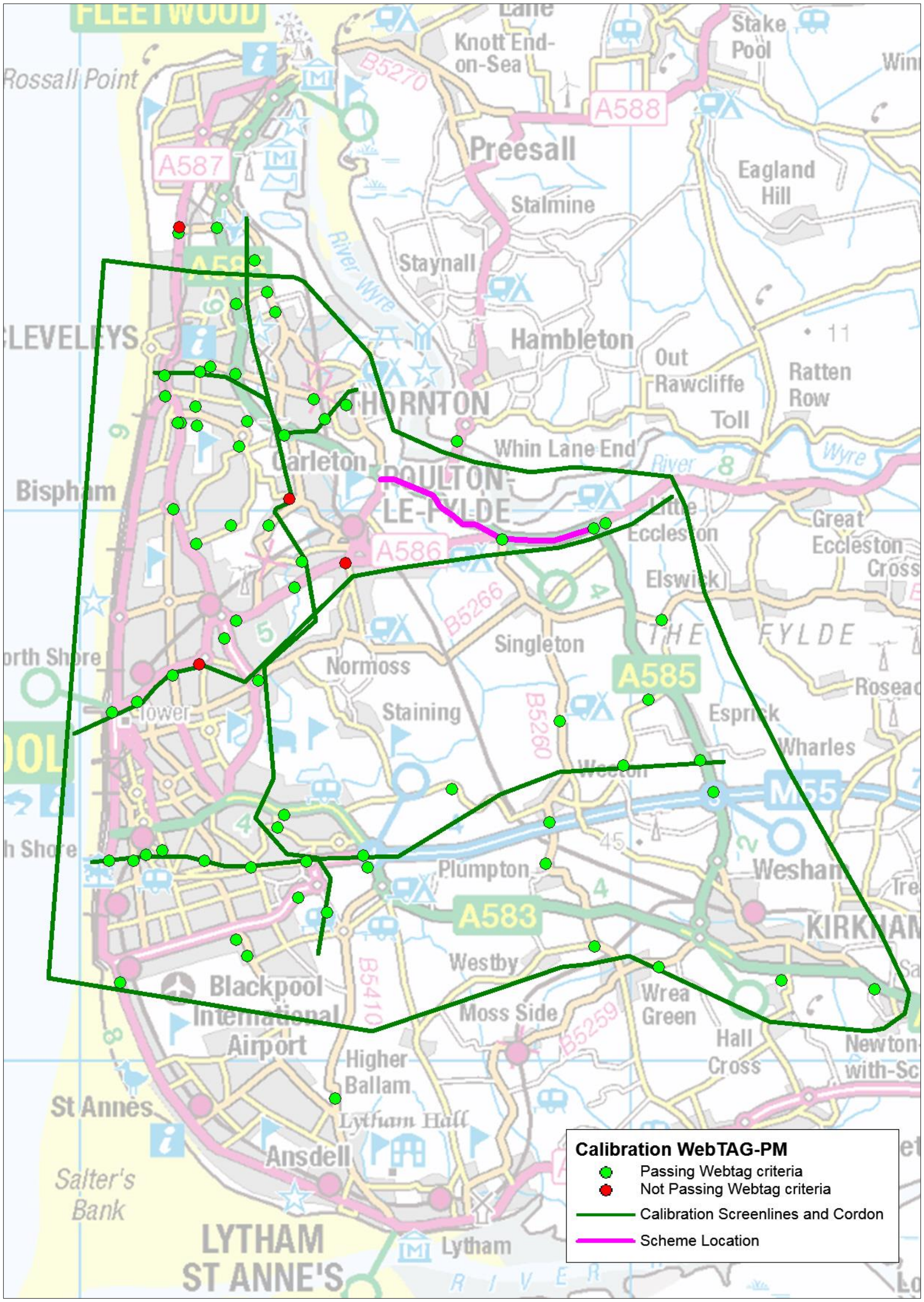
Figure 5-19 PM Peak Calibration Links



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5.6 Model convergence

5.6.1 The stability of the assignment must be examined in order to ensure that model results are sufficiently robust, stable and consistent to use as a basis for decision making. As described in Section 4.4, a measure of convergence is obtained from the Delta statistic (%GAP in SATURN), which is defined as the difference between the time costs along the chosen routes and the minimum cost routes for the entire network using the equilibrium assignment.

5.6.2 Further assessment of the performance of the traffic assignment was carried out by evaluating the percentage of links that show less than 1% change in the assigned traffic flow between four successive iterations and also the percentage of junction delays with less than 1% change.

5.6.3 Table 4-13 in Chapter 4 summarises the most appropriate convergence measures of proximity and stability as set out in WebTAG Unit M3.1 (Section 3.3.17) and the values that are generally considered to be acceptable for use in establishing a base year model.

5.6.4 Table 5-19 presents a summary of the model convergence results for the A585 base year model. It can be seen that the values of %GAP pass the criteria set out in Table 4-13 for all three modelled time periods, which indicates that a high degree of convergence has been achieved. The percentage of link flow and delay changes of less than 1% in the final four successive iterations is also greater than 98% across all three model time periods in accordance with the specified criteria. The full set of convergence results for each of the three modelled time periods is presented in Appendix N.

Table 5-19 Model Convergence Results

Model Peak Hour	Convergence Loops	% Link Flows <1%*	% Delays <1% Change*	GAP %
AM	35	98.3	99.4	0.0080
		98.6	99.3	0.0075
		98.3	99.4	0.0100
		98.1	99.2	0.0057
IP	32	99.3	99.6	0.0033
		99.4	99.5	0.0025
		99.2	99.7	0.0026
		99.3	99.7	0.0025
PM	88	98.3	99.2	0.0061
		98.3	99.2	0.0051
		98.5	99.3	0.0053
		98.4	99.2	0.0045

*Ascending by number of loops for final four iterations

5.7 Summary

5.7.1 The model calibration procedure involved a number of tasks, each of which was designed to ensure that the model adequately reproduces observed traffic flows and travel times within the study area.

5.7.2 The initial stages of calibration sought to improve the overall quality of the assignment by removing general network coding errors causing excessive delay or inappropriate route choice.

5.7.3 Network calibration checks were carried out on the unassigned network and included adjustments of link and junction operating parameters to represent the existing situation. In addition, network checks were carried out on the assigned network to ensure plausible and realistic routing of traffic.

5.7.4 Calibration checks also involved checks on the assigned stability i.e. the locations of the worst converged nodes and links as well as the junctions where delays and queues change considerably between assignment loops were examined.

5.7.5 Once the network reached a sufficient level of early calibration, matrix estimation was performed on the prior matrices to improve the level of traffic flow calibration across the calibration screen lines/cordons when compared to WebTAG criteria.

5.7.6 The matrix estimation process was monitored to ensure that the trip matrix converges to a stable solution, travel patterns at the sector level are reasonable and trip length distributions are reasonable.

5.7.7 Matrix estimation was monitored for changes to the matrix totals, zonal cell values, zonal trip ends, mean trip length and trip length distribution, as well as sectoral changes to the trip matrix. This was to ensure that the changes brought about by matrix estimation were not significant. All of the above-mentioned checks led to the inference that matrix estimation has had not significantly altered the prior matrices used for cars, although there are some larger variations seen for the goods vehicle matrices. These are believed to be a consequence of the sparseness of the data used for those vehicle types.

5.7.8 The link and turn flow calibration exercise focused on 150 links and 92 turns. The results in all three modelled time periods pass the relevant WebTAG criteria, where more than 85% of links and turns in each period pass either the stated flow or GEH criteria.

5.7.9 The link flow calibration exercise focused on four screenlines and one cordon. The results from the link flow calibration show the model is well calibrated and complies with the requirements of WebTAG.

5.7.10 The model calibration exercise confirmed that:

- A detailed network calibration process was adopted
- The modelled assignments and routings were realistic
- The effects of matrix estimation were minimal for cars
- Screenline and link flow calibration against observed traffic counts complies with relevant WebTAG requirements.

6 HIGHWAY MODEL VALIDATION

6.1 Overview

6.1.1 The validation of a highway assignment model is the process by which modelled data is compared to observed data that is independent from that used in model calibration. The requirement of data independency means that counts used in the matrix estimation should not be used for model validation.

6.1.2 The validation process for the A585 base year traffic model comprised the following:

- Network validation
- Matrix validation
- Assignment validation:
    - Link flow validation (32 links)
    - Turn flow validation (20 turns)
    - Cordon flow validation (1 cordon – two-directional)
    - Journey time validation (14 routes – two-directional)

6.1.3 The validation was based on checks of the following:

- Modelled and observed traffic flows on individual links and screenlines (total vehicles), as a check on the quality of trip matrices and the assignment
- Modelled and observed journey times along routes, as a check on the quality of the network and the assignment

6.1.4 An iterative process was used, whereby the validation of the model was assessed using comparisons of the modelled and observed data as discussed in this chapter. Adjustments made to the model to reduce the differences between the modelled and observed data, which were undertaken as part of the model calibration, are described in Chapter 5.

6.1.5 The validation was undertaken in accordance with relevant WebTAG criteria, as set out in Table 5-10 in Chapter 5.

6.2 Network validation

6.2.1 As stated in WebTAG Unit M3.1 (Section 6.3.1), it is not possible to validate a network in isolation, as the output traffic flows and travel times will not only reflect the errors in the network, but also those inherited from the input trip matrix. The accuracy of the trip assignment therefore depends on the network structure, the trip matrix and the realism of the modelled routes.

6.2.2 As detailed in Chapter 5 – Highway Model Calibration, a number of checks were carried out on the network coding as part of the network calibration process. These checks were carried out on both the unassigned network and the assigned network to ensure that the model network represents the existing traffic conditions.

6.2.3 There are no specific requirements for validating route choices within a modelled network. However, it is common practice to undertake a review of the routeing chosen by the model between key locations. WebTAG Unit M3.1 suggests that the number of routes (OD pairs) for which routing must be checked is approximately:

$$\text{Number of OD pairs} = (\text{Number of zones})^{1/4} \times \text{Number of user classes}$$

6.2.4 The analysis of routes across the network did not identify any errors in the underlying network coding. The OD pair from zone 10 to zone 70 is illustrated for all the three peaks in figures from Figure 6-1 to Figure 6-4. Further information is provided in Appendix F.

Figure 6-1 Google Car Path tree between OD Zone Pairs 10 and 70

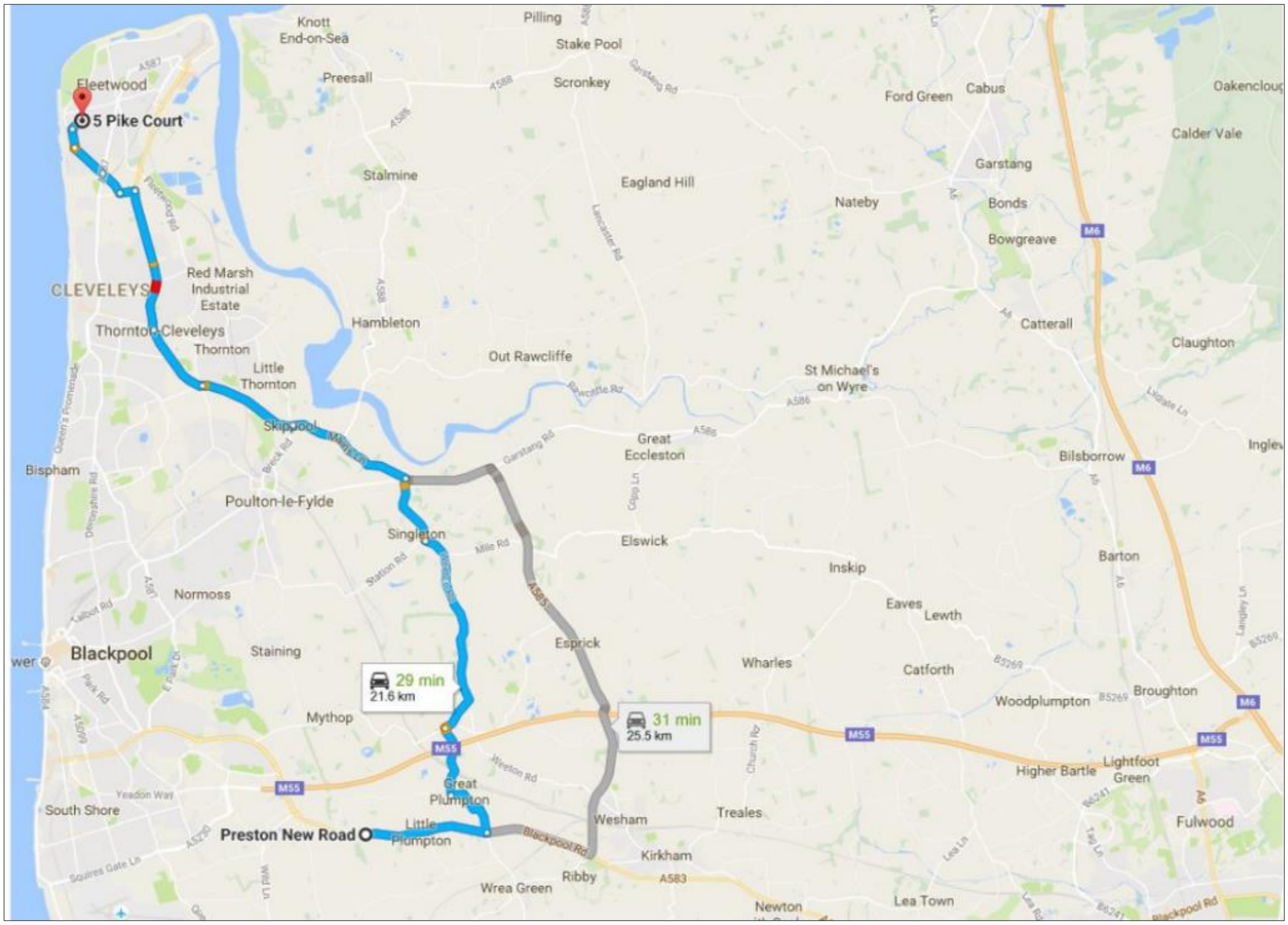

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Figure 6-2 AM Peak Car Path tree between OD Zone Pairs 10 and 70

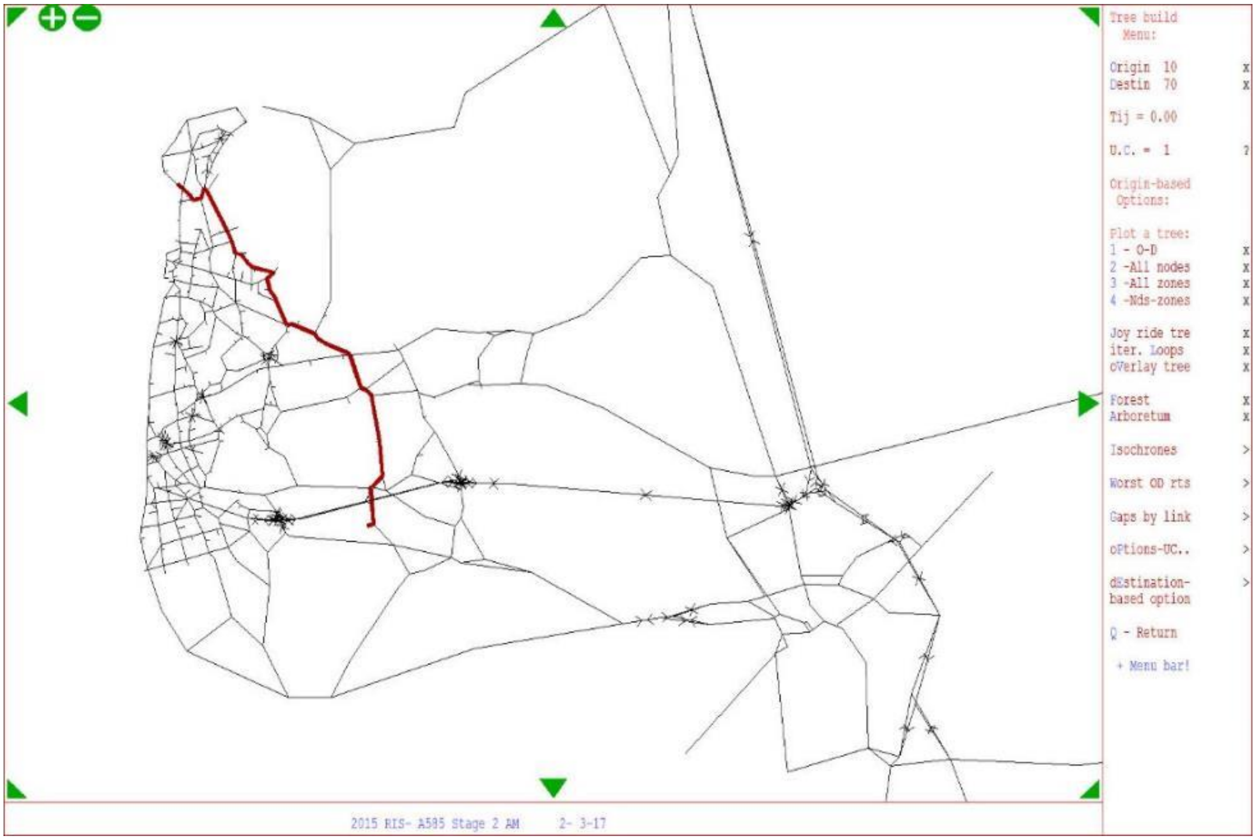
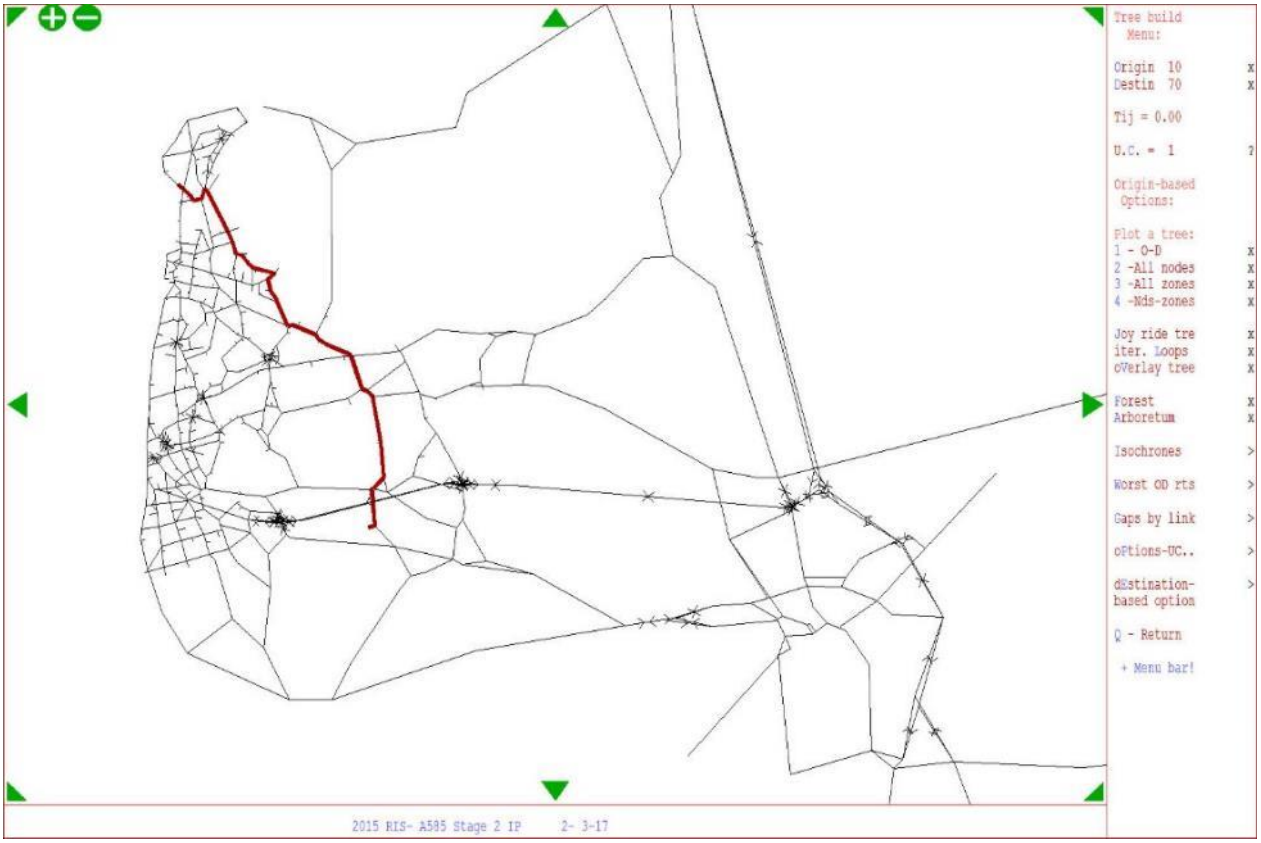
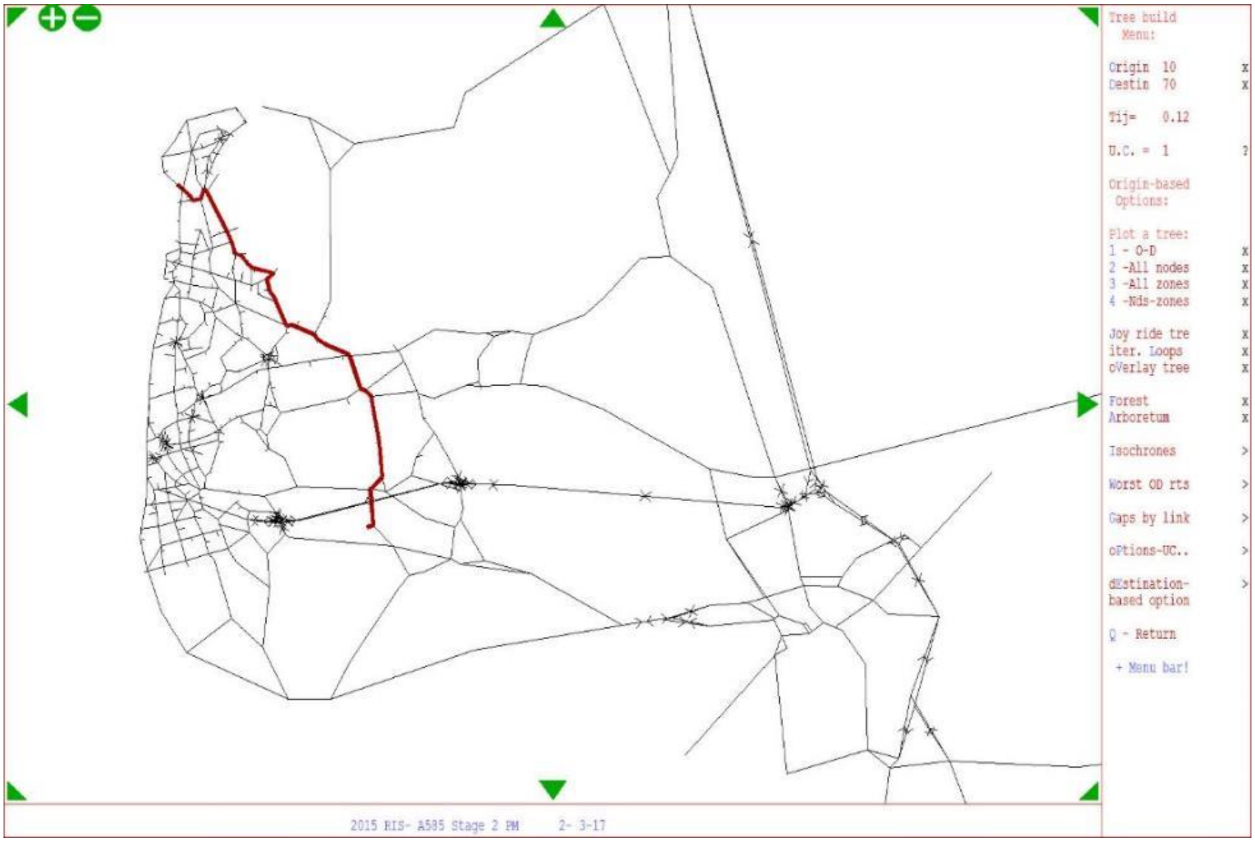


Figure 6-3 IP Car Path tree between OD Zone Pairs 10 and 70



Origin 10
Destin 70
Tij = 0.00
U.C. = 1

Figure 6-4 PM Peak Car Path tree between OD Zone Pairs 10 and 70



6.2.5 From route path analysis, it is observed that all the routes in all three peaks following the Google shortest path and the OD pairs are taking shortest paths in all three modelled time periods.

6.3 Matrix validation

6.3.1 The trip matrix and trip assignment calibration was undertaken in conjunction with the matrix estimation process previously described in Chapter 5 – Highway Model Calibration. Validation of the post-matrix estimation matrices focused on total vehicles in the ADM.

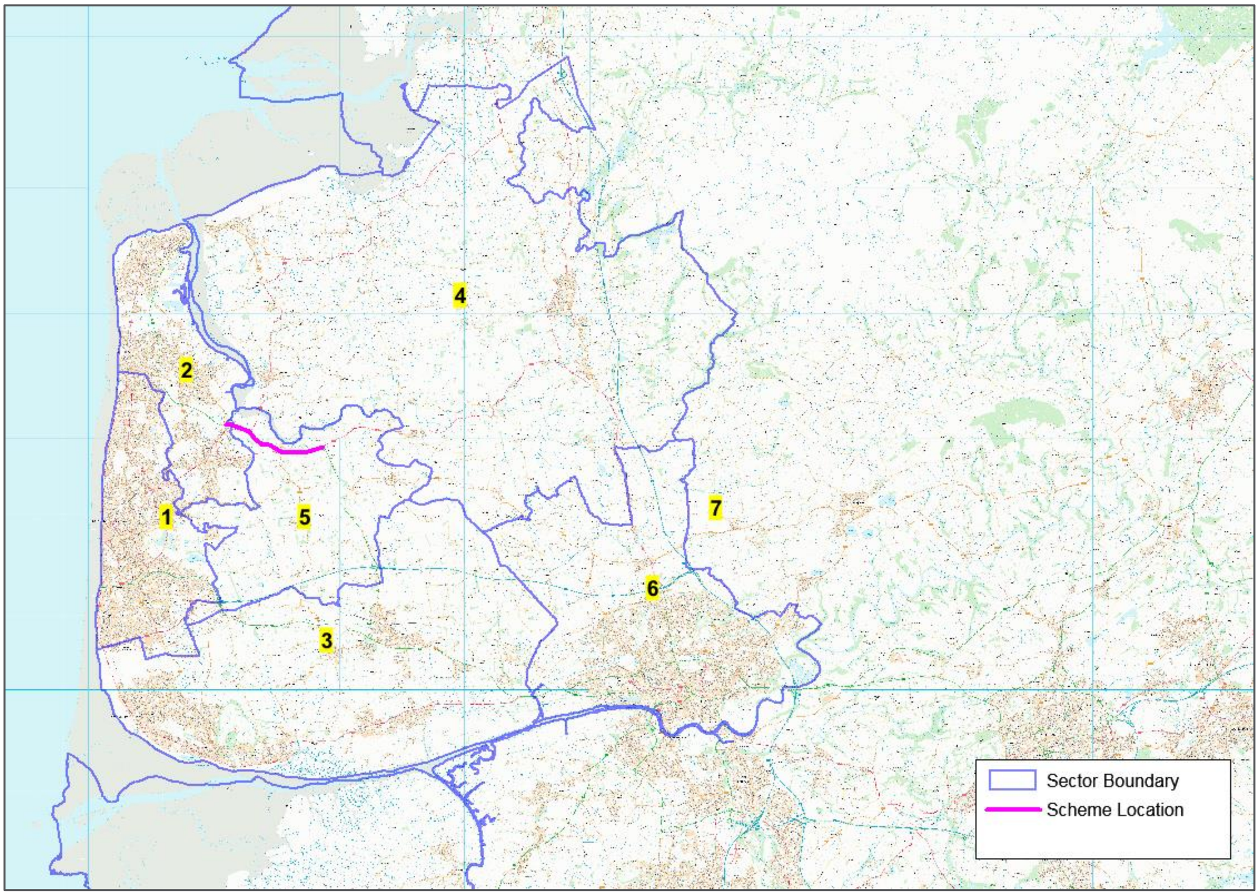
Monitoring sectoral changes

6.3.2 In order to assess the impact of the matrix estimation, a comparison of the sectoral changes prior and post SATME2 was carried out. For this analysis, the extent of matrix estimation was compared at a seven-sector level as shown in Figure 6-5.

6.3.3 The seven-sector system was developed based on the Local Authority level boundaries. This sector system was designed to be appropriate for the possible disaggregation of economic benefits. The sectors defined are:

- Sector 1 - Blackpool
- Sector 2 + Sector 4 - Wyre
- Sector 3 + Sector 5 - Fylde
- Sector 6 - Preston
- Sector 7 – External Area

Figure 6-5 Sector Boundaries for Comparison of Movements Prior and Post ME2



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6.3.4 Table 6-1 presents the number of sector-to-sector movements differing by more than 5% as a result of ME2. The percentage differences between each sector-to-sector movement's trips from the prior to post-ME2 matrices is presented in Appendix J.

Table 6-1 Monitoring Sectoral Changes – Prior vs. Post ME2

Time Period	Description	Car	Total
AM	Sector-to-sector movements changing by more than 5 %	-5.5%	-6.0%
IP	Sector-to-sector movements changing by more than 5 %	0.5%	-0.4%
PM	Sector-to-sector movements changing by more than 5 %	-6.0%	-6.4%

6.3.5 At the level of total trips over all vehicle types, the differences between the prior and post-ME matrices are generally small. In total, all-vehicle trip matrices in size as follows:

- AM Peak hour: 6.0%
- Inter Peak hour: 0.4%

- PM Peak hour: 6.4%

6.3.6 Table 6-2 to Table 6-4 show the percentage changes in sector-to-sector movements between the prior and the post matrices. The same comparison of results for cars for each of the three time periods is presented in Appendix J.

Table 6-2 Sector Level Prior and Post Matrices Comparison – Percentage Difference in Trips (All Vehicles, AM Peak)

Origin Sector	Matrix	Destination Sector							Total
		1	2	3	4	5	6	7	
	Prior	5,712	2,457	2,094	248	223	621	1,310	12,666
1	Post	6,661	2,579	2,450	241	405	519	1,147	14,001
	% Diff.	**-17%**	**-5%**	**-17%**	**3%**	**-82%**	**17%**	**12%**	**-11%**
	Prior	2,977	2,125	458	196	99	160	388	6,403
2	Post	3,465	2,387	508	251	152	180	457	7,400
	% Diff.	**-16%**	**-12%**	**-11%**	**-28%**	**-53%**	**-13%**	**-18%**	**-16%**
	Prior	2,186	408	1,268	75	86	760	1,041	5,825
3	Post	2,182	302	1,495	68	177	734	1,142	6,100
	% Diff.	**0%**	**26%**	**-18%**	**9%**	**-107%**	**3%**	**-10%**	**-5%**
	Prior	484	371	149	391	44	282	846	2,566
4	Post	313	379	127	386	39	265	790	2,299
	% Diff.	**35%**	**-2%**	**15%**	**1%**	**10%**	**6%**	**7%**	**10%**
	Prior	217	77	81	22	8	58	68	531
5	Post	354	91	105	28	13	59	82	732
	% Diff.	**-63%**	**-19%**	**-29%**	**-30%**	**-62%**	**-2%**	**-20%**	**-38%**
	Prior	633	174	761	180	51	250	178	2,227
6	Post	577	128	710	172	88	250	178	2,104
	% Diff.	**9%**	**26%**	**7%**	**4%**	**-75%**	**0%**	**0%**	**6%**
	Prior	1,426	517	1,277	701	78	617	860	5,475
7	Post	1,150	403	1,351	671	139	617	860	5,190
	% Diff.	**19%**	**22%**	**-6%**	**4%**	**-77%**	**0%**	**0%**	**5%**
	Prior	13,635	6,129	6,088	1,814	588	2,748	4,691	35,692
Total	Post	14,702	6,270	6,744	1,818	1,013	2,624	4,656	37,827
	% Diff.	**-8%**	**-2%**	**-11%**	**0%**	**-72%**	**5%**	**1%**	**-6%**

Table 6-3 Sector Level Prior and Post Matrices Comparison – Percentage Difference in Trips (All Vehicles, Inter Peak)

Origin Sector	Matrix	Destination Sector							Total
		1	2	3	4	5	6	7	
1	Prior	5,621	2,695	1,614	300	90	402	1,435	12,157
	Post	6,815	2,701	1,903	242	192	313	1,088	13,254
	% Diff.	**-21%**	**0%**	**-18%**	**19%**	**-113%**	**22%**	**24%**	**-9%**
2	Prior	2,572	1,935	262	226	25	119	499	5,639
	Post	2,576	2,456	295	254	57	94	404	6,135
	% Diff.	**0%**	**-27%**	**-13%**	**-12%**	**-123%**	**21%**	**19%**	**-9%**
3	Prior	1,721	299	906	90	29	709	1,536	5,290
	Post	1,902	230	1079	87	45	640	1,251	5,235
	% Diff.	**-11%**	**23%**	**-19%**	**3%**	**-55%**	**10%**	**19%**	**1%**
4	Prior	285	221	94	387	10	192	854	2,043
	Post	191	255	119	379	11	172	768	1,895
	% Diff.	**33%**	**-15%**	**-26%**	**2%**	**-11%**	**10%**	**10%**	**7%**
5	Prior	89	25	28	10	2	24	36	214
	Post	177	61	38	10	4	24	33	347
	% Diff.	**-98%**	**-141%**	**-35%**	**2%**	**-75%**	**-2%**	**7%**	**-62%**
6	Prior	396	140	652	179	17	221	158	1,764
	Post	229	89	581	161	10	221	158	1,449
	% Diff.	**42%**	**37%**	**11%**	**10%**	**39%**	**0%**	**0%**	**18%**
7	Prior	1,428	607	1,569	844	35	527	805	5,815
	Post	805	479	1,334	767	25	527	805	4,742
	% Diff.	**44%**	**21%**	**15%**	**9%**	**30%**	**0%**	**0%**	**18%**
Total	Prior	12,112	5,922	5,126	2,036	209	2194	5,323	32,921
	Post	12,695	6,270	5,349	1,900	344	1991	4,508	33,057
	% Diff.	**-5%**	**-6%**	**-4%**	**7%**	**-64%**	**9%**	**15%**	**-0.4%**

Table 6-4 Sector Level Prior and Post Matrices Comparison – Percentage Difference in Trips (All Vehicles, PM Peak)

Origin Sector	Matrix	Destination Sector							Total
		1	2	3	4	5	6	7	
1	Prior	6,921	3,792	1,798	428	171	575	1,898	15,582
	Post	8,109	3,913	2,286	417	353	495	1,589	17,162
	% Diff.	**-17%**	**-3%**	**-27%**	**3%**	**-107%**	**14%**	**16%**	**-10%**
2	Prior	3,022	2,839	338	296	59	143	577	7,275
	Post	3,011	3,534	291	345	81	112	506	7,879
	% Diff.	**0%**	**-24%**	**14%**	**-16%**	**-39%**	**22%**	**12%**	**-8%**
3	Prior	1,611	396	734	77	46	391	899	4,153
	Post	2,066	310	915	102	73	369	965	4,799
	% Diff.	**-28%**	**22%**	**-25%**	**-33%**	**-56%**	**6%**	**-7%**	**-16%**
4	Prior	388	349	102	333	21	186	794	2,173
	Post	252	315	112	325	18	170	736	1,928
	% Diff.	**35%**	**10%**	**-9%**	**2%**	**11%**	**9%**	**7%**	**11%**
5	Prior	128	51	43	15	5	28	53	322
	Post	298	95	65	19	4	30	80	590
	% Diff.	**-133%**	**-88%**	**-52%**	**-24%**	**6%**	**-5%**	**-51%**	**-83%**
6	Prior	575	163	499	170	29	221	152	1,809
	Post	505	119	484	158	43	221	152	1,682
	% Diff.	**12%**	**27%**	**3%**	**7%**	**-48%**	**0%**	**0%**	**7%**
7	Prior	1688	642	1079	672	60	530	730	5,402
	Post	1397	548	1093	633	94	530	730	5,026
	% Diff.	**17%**	**15%**	**-1%**	**6%**	**-57%**	**0%**	**0%**	**7%**
Total	Prior	14,332	8,232	4,593	1,991	390	2,074	5,103	36,717
	Post	15,637	8,836	5,245	1,999	667	1,925	4,758	39,067
	% Diff.	**-9%**	**-7%**	**-14%**	**0%**	**-71%**	**7%**	**7%**	**-6.4%**

6.3.7 The prior and post-matrices totals by sector level in AM peak are varying by 6%. The variance is less than 1% in the IP and 6% in the PM. For some inter-sector movements, there are some relatively large differences. This shows that the number of trips in the prior matrix was low. Therefore, the matrix estimation process had to uplift the number of trips in the post-ME2 matrix to a sufficient level.

6.4 Assignment validation

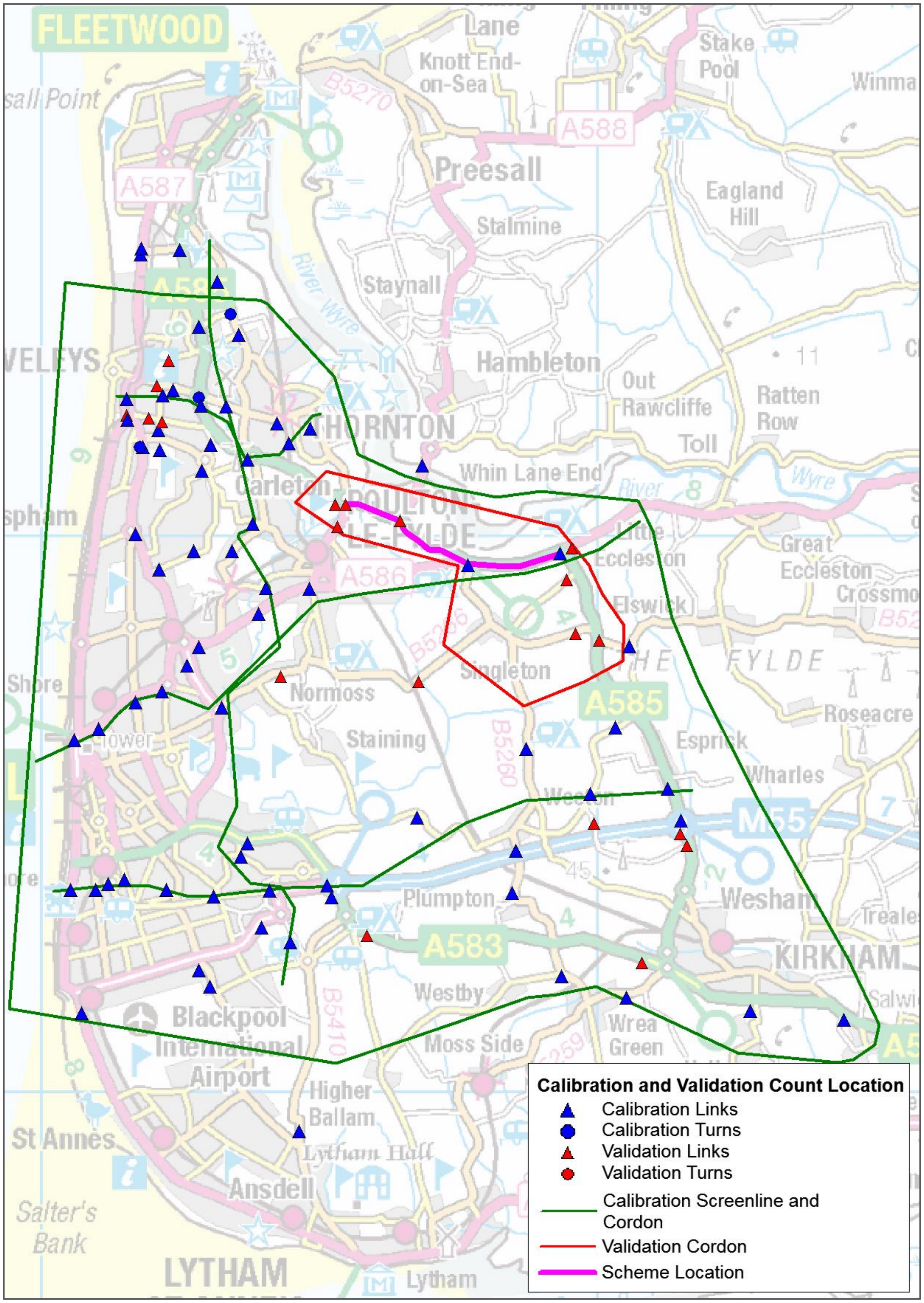
6.4.1 Assignment validation included the following:

- Link and turn flows validation
- Screenline and cordon flow validation
- Journey time validation.

6.4.2 A total of 314 link and turn counts were used for both model calibration and validation.

6.4.3 Figure 6 6 shows the locations of these counts. Each point in this figure can represent more than one link or turn count.

Figure 6-6 Calibration and Validation Count Sites



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Link and turn flow validation

6.4.4 The assignment validation was undertaken by comparing the total modelled traffic flows and observed traffic counts across the cordon links and other links for each modelled time period. The validation was carried out in accordance with the link flow and turning movement validation criteria set out in WebTAG Unit M3.1 Section 3, which is replicated in Table 5-10 in Chapter 5.

6.4.5 The validation summary results for the three modelled time periods are presented in Table 6-5 to Table 6-7. These tables show the percentage of cordon links and other links passing the flow criteria (1), GEH criteria (2) and WebTAG criteria (3) as per the guidelines set out in Table 5-10. A link is defined as passing the WebTAG criteria (3) if that link passes either the flow criteria (1) or the GEH criteria (2), in accordance with the WebTAG guidance in Unit M3.1.

6.4.6 The assignment validation was undertaken by comparing the total modelled traffic flows and observed traffic counts across each screenline and cordon for each modelled time period. The validation was carried out in accordance with the assessment criteria set out in WebTAG Unit M3.1, which states that 85% of the screenlines and individual links should meet acceptability guidelines for the model flow criteria and GEH criteria. Furthermore, the differences between modelled flows and traffic counts should be less than 5% of the traffic counts for all or nearly all cordon links and other links.

6.4.7 The validation summary results for the three modelled time periods are presented in Table 6-5 to Table 6-7. These tables show the percentage of cordon links and individual links passing the WebTAG validation criteria in each peak hour.

6.4.8 Table 6-11 provides a summary of all three time periods. Detailed results for each time period are presented in Table 6-8 to Table 6-10. Each table shows the percentage of cordon links and other links that pass WebTAG criteria, based on total vehicles.

Table 6-5 Validation Summary – AM Peak

Count Type	Total	Number/Percentage Passing WebTAG Validation Criteria					
		Post ME2			Prior ME2		
		Flow Criteria	GEH Criteria	WebTAG Criteria	Flow Criteria	GEH Criteria	WebTAG Criteria
Cordon Links	**20**	15 (75%)	14 (70%)	15 (75%)	11 (55%)	10 (50%)	12 (60%)
Other Links	**32**	27 (84%)	23 (72%)	29 (91%)	21 (66%)	14 (44%)	22 (69%)
Total Links	**52**	**42**	**37**	**44**	**32**	**24**	**34**
		81%	**71%**	**85%**	**62%**	**46%**	**65%**
Turns	**20**	**19**	**18**	**20**	**16**	**16**	**17**
		95%	**90%**	**100%**	**80%**	**80%**	**85%**

Table 6-6 Validation Summary – Inter Peak

Count Type	Total	Number/Percentage Passing WebTAG Validation Criteria					
		Post ME2			Prior ME2		
		Flow Criteria	GEH Criteria	WebTAG Criteria	Flow Criteria	GEH Criteria	WebTAG Criteria
Cordon Links	**20**	20 (100%)	19 (100%)	20 (100%)	14 (70%)	12 (60%)	14 (70%)
Other Links	**32**	30 (94%)	25 (78%)	30 (94%)	19 (59%)	13 (41%)	19 (59%)
Total Links	**52**	**50**	**44**	**50**	**33**	**25**	**33**
		96%	**85%**	**96%**	**63%**	**48%**	**63%**
Turns	**20**	**20**	**19**	**20**	**12**	**10**	**13**
		100%	**95%**	**100%**	**60%**	**50%**	**65%**

Table 6-7 Validation Summary – PM Peak

Count Type	Total	Number/Percentage Passing WebTAG Validation Criteria					
		Post ME2			Prior ME2		
		Flow Criteria	GEH Criteria	WebTAG Criteria	Flow Criteria	GEH Criteria	WebTAG Criteria
Cordon Links	**20**	17 (85%)	16 (85%)	17 (85%)	14 (85%)	13 (85%)	14 (85%)
Other Links	**32**	28 (88%)	25 (78%)	28 (88%)	22 (69%)	19 (59%)	24 (75%)
Total Links	**52**	**45**	**41**	**45**	**36**	**32**	**38**
		87%	**79%**	**87%**	**69%**	**62%**	**73%**
Turns	**20**	**18**	**16**	**19**	**18**	**14**	**18**
		90%	**80%**	**95%**	**90%**	**70%**	**90%**

6.4.9 One cordon was used to validate movements in the vicinity of the A585 Windy Harbour to Skippool scheme, as shown in Figure 6-7. This cordon is separate to that which was used for calibration purposes.

Figure 6-7: Cordon used for Model Validation

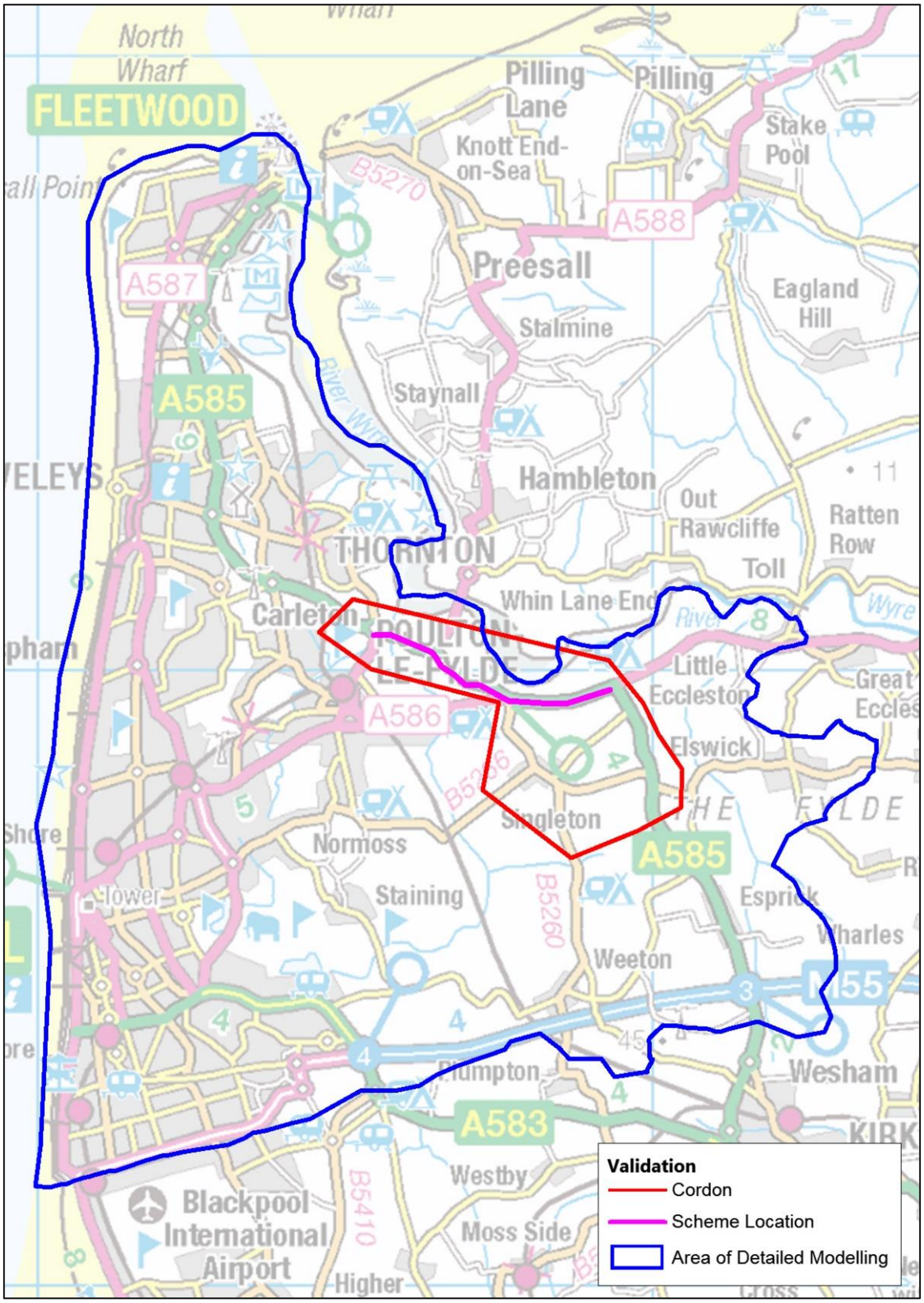

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Table 6-8 Model Validation: AM Peak

Cordon	Direction	Observed	Modelled	Modelled – Observed	% Difference	Pass?
Cordon 2	IN	4,784	4,904	120	2.5	✓
	OUT	5,052	4,884	-168	-3.3	✓
Number of cordons complying with WebTAG acceptability criteria						2/2
% of cordons complying with WebTAG acceptability criteria						100%
% of individual cordon links complying with WebTAG flow acceptability criteria						75% (15 / 20)

Table 6-9 Model Validation: Inter-Peak

Cordon	Direction	Observed	Modelled	Modelled – Observed	% Difference	Pass?
Cordon 2	IN	3,810	3,735	-75	-2.0	✓
	OUT	3,684	3,723	39	1.1	✓
Number of cordons complying with WebTAG acceptability criteria						2/2
% of cordons complying with WebTAG acceptability criteria						100%
% of individual cordon links complying with WebTAG flow acceptability criteria						100% (20 / 20)

Table 6-10 Model Validation: PM Peak

Cordon	Direction	Observed	Modelled	Modelled – Observed	% Difference	Pass?
Cordon 2	IN	4,853	5,076	223	4.6	✓
	OUT	5,229	5,048	-181	-3.5	✓
Number of cordons complying with WebTAG acceptability criteria						2/2
% of cordons complying with WebTAG acceptability criteria						100%
% of individual cordon links complying with WebTAG flow acceptability criteria						85% (17 / 20)

Table 6-11 Model Validation: Summary of All Three Time Periods

% of Cordons and Cordon Links passing WebTAG criteria based on Flow and GEH			
Time Period	Criteria	All Vehicles	
		Flow	GEH
AM	% of cordons	100%	n/a
	% of individual links	75%	70%
IP	% of cordons	100%	n/a
	% of individual links	100%	95%
PM	% of cordons	100%	n/a
	% of individual links	85%	80%

6.4.10 A detailed comparison of the modelled and observed flow for individual validation links (forming a cordon) for each vehicle class and for all model time periods is presented in Appendix L.

6.4.11 The validation results from the post-matrix estimation can be summarised as follows:

- In the AM Peak:
    - At the level of the whole cordon, both inbound and outbound validation links at the cordon boundary satisfy the WebTAG flow criterion.
    - It is observed that 75% of the individual links pass the flow validation criteria and 70% of the individual links pass the GEH criteria.
- In the Inter Peak:
    - At the level of the whole cordon, both inbound and outbound validation links at the cordon boundary satisfy the WebTAG flow criterion.
    - It is observed that 100% of the individual links pass the flow validation criteria and 95% of the individual links pass the GEH validation criteria
- In the PM Peak:
    - At the level of the whole cordon, both inbound and outbound validation links at the cordon boundary satisfy the WebTAG flow criterion.
    - It is observed that 85% of individual links satisfy the WebTAG flow and 80% of the individual links satisfy the GEH criteria for all individual vehicles and pass the acceptability criteria, they are considered satisfactory.

6.4.12 Figure 6-8 to Figure 6-10 present the performance of the model on validation links across the study area, where each count site has been colour-coded to indicate whether it passes the WebTAG criteria based on flow and GEH. The colours used are as follows:

- Green – site passes WebTAG criteria
- Red – site fails WebTAG criteria

Figure 6-8 AM Peak Validation Links

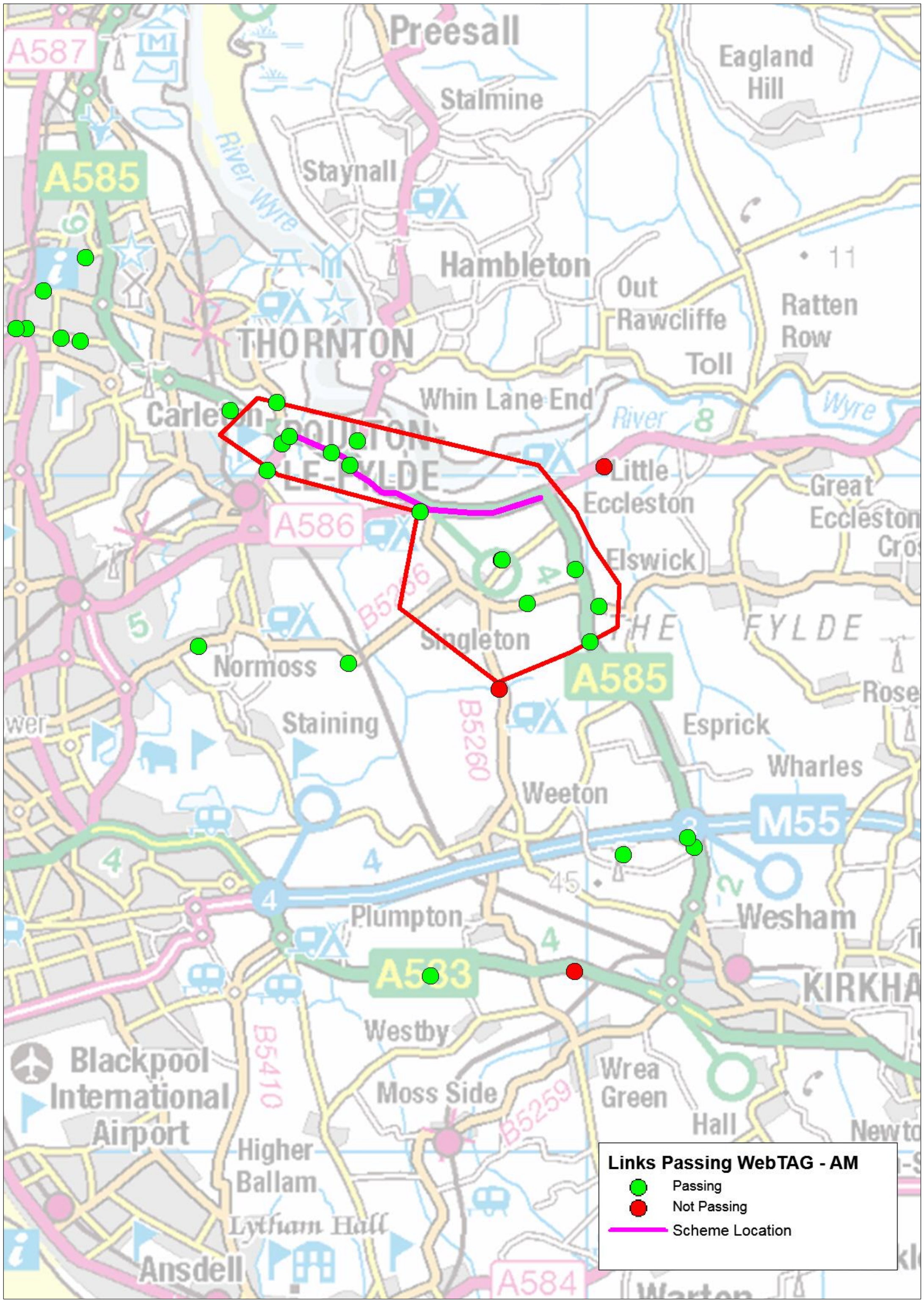

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Figure 6-9 IP Validation Links

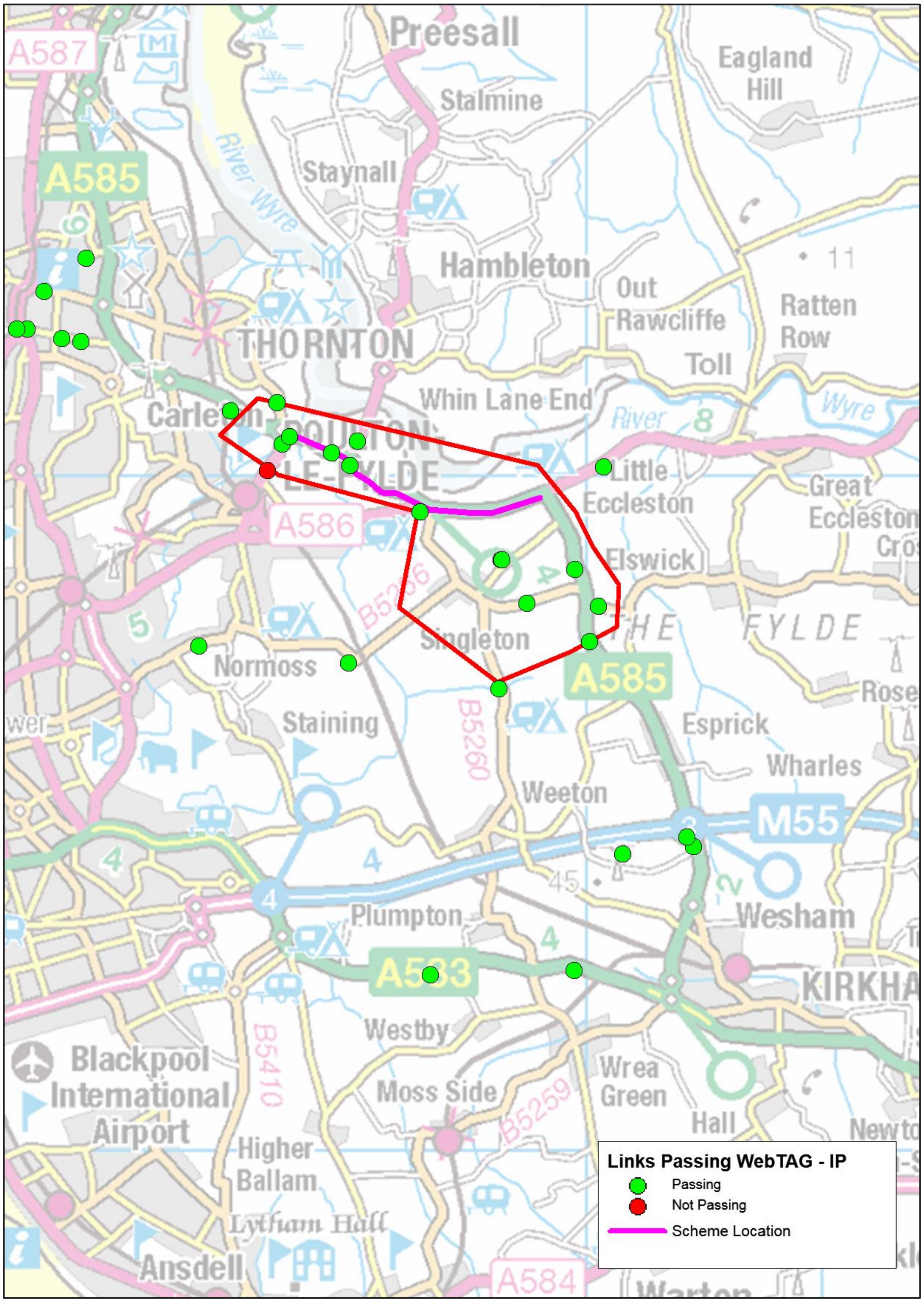

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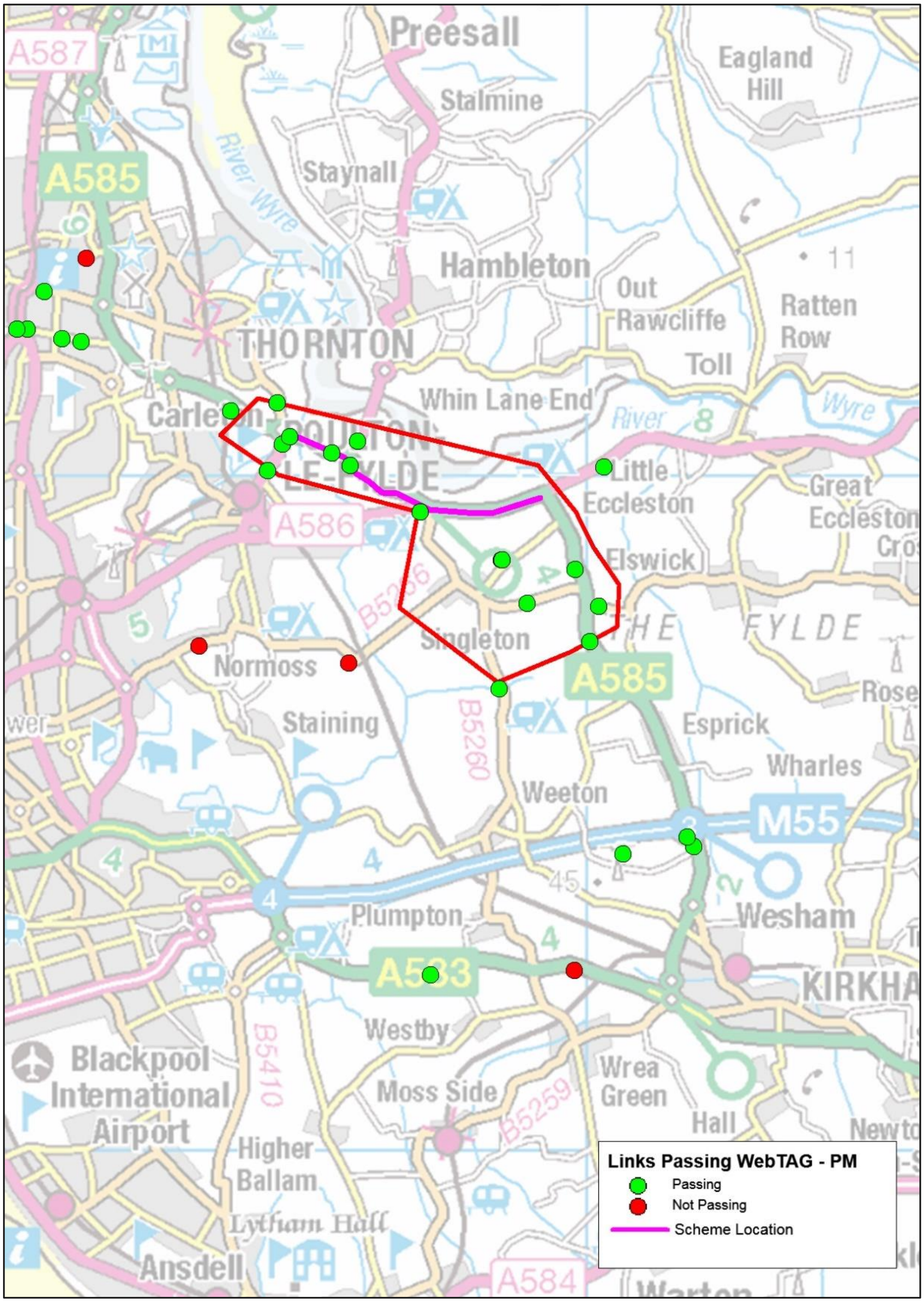
Figure 6-10 PM Peak Validation Links



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6.4.13 It can be seen that there is generally a good geographic spread of acceptable model performance across the study area for all three model time periods.

6.4.14 Table 6-12 presents a summary of flow difference at screenline and cordon level, it demonstrates improvement in the modelled flows due to matrix estimation from prior to post-matrices.

Table 6-12 Summary flow difference at screenline and Cordon level

Screenline / Cordon		Direction	Prior Matrix (%)			Post Matrix (%)		
			AM Peak	Inter Peak	PM Peak	AM Peak	Inter Peak	PM Peak
Calibration	Cordon 1A	IN	7	19	-1	-2.4	-7.9	-3.2
		OUT	-4	18	-2	-2.3	-1.6	-3.1
	Screenline B	EB	-12	-17	-10	-3.2	-2.1	-3.9
		WB	-5	-13	-6	-6.0	-1.7	-4.3
	Screenline 3A	NB	9	7	-0	-1.9	-3.6	-3.9
		SB	0	8	10	0.3	2.4	3.1
	Screenline 4A	SB	-3	5	2	-6.0	-4.5	-3.6
		WB	-7	3	-0	1.9	2.4	-3.3
	Screenline 1N	NB	-6	-3	-19	-3.4	-6.9	-5.4
		SB	-8	-8	-10	-1.0	1.7	-2.3
Validation	Cordon 2	IN	2.7	7.5	10.0	2.5	-2.0	4.6
		OUT	-3.2	10.8	1.1	-3.3	1.1	-3.5

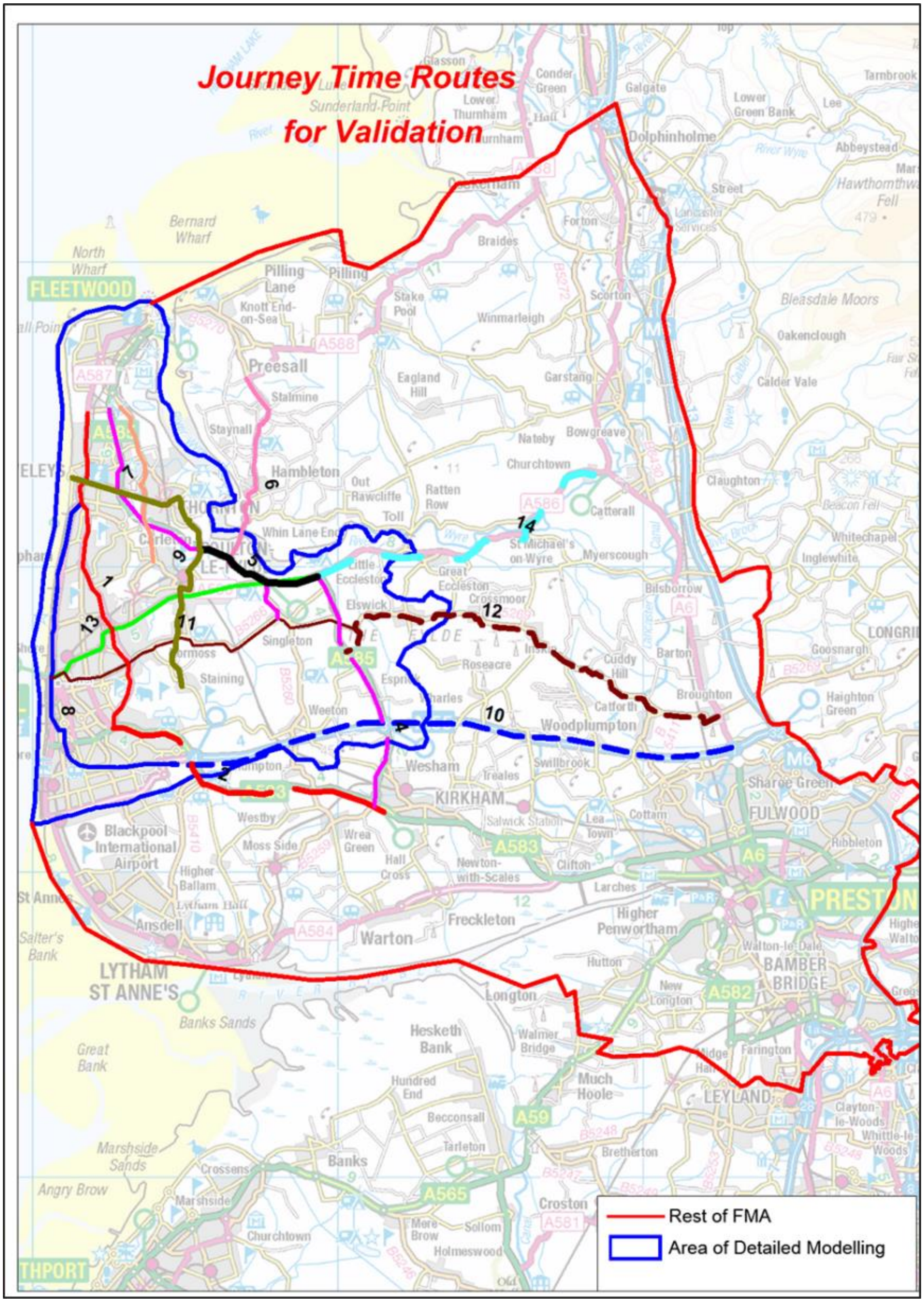
6.5 Journey time validation

6.5.1 Standard practice is for journey time validation to be performed at a route level. There is often a need to take an approach that is more detailed, and to check journey time validation at the link level or for segments of the route as well. This can be important when assessing noise and air quality impacts along the chosen routes.

6.5.2 Fourteen two-directional journey time routes were selected across the ADM, as shown in Figure 6-11. The routes were selected in order to cover a wide geographical area, with specific consideration given to routes on which it is anticipated that traffic will be affected by the scheme.

6.5.3 Journey time data was extracted from the Trafficmaster database for the 28 combinations of route and direction. The Trafficmaster GPS link time for each route was extracted using the ITN layer. An explanation of how the Trafficmaster data was processed is provided in Chapter 3.

Figure 6-11 Journey Time Routes



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6.5.4 The details of each journey time route are presented in Table 6-13. The routes were selected in accordance with the criteria set out in WebTAG Unit M3.1; therefore, all are longer than 3 kilometres and, except for route 10, no longer than approximately 15 kilometres. No route has a journey time greater than 45 minutes.

Table 6-13 Journey Time Route Description

Route No.	Route Name	Direction	Route Description	Length (km)
1	A587	NB	B5390 Park Road to Russell Avenue	11.30
		SB	Russell Avenue to B5390 Park Road	11.30
2	A583	NB	Blackpool Road to Preston Road	10.31
		SB	Preston Road to Blackpool Road	10.26
3	A585	EB	Singleton (B5260) to Amounderness Way	10.21
		WB	Amounderness Way to Singleton (B5260)	10.22
4	A585	EB	Blackpool Road to Windy Harbour	8.41
		WB	Windy Harbour to Blackpool Road	8.41
5	A585	NB	Garstang Road to Skippool Junction	4.32
		SB	Skippool Junction to Garstang Road	4.35
6	A588	NB	Shard Road to Hall Road	6.87
		SB	Hall Road to Shard Road	6.90
7	B5260	NB	Carleton Road to Russell Avenue	5.79
		SB	Russell Avenue to Carleton Road	5.79
8	M55	NB	M55 Junction 4 towards B5262 up to A584	11.78
		SB	A584 through B5262 up to M55 Junction 4	11.85

Route No.	Route Name	Direction	Route Description	Length (km)
9	Mill Lane	NB	Mill Lane towards A588 up to Victoria Road West	10.49
		SB	Victoria Road West towards A588 up to Mill Lane	11.25
10	M55	EB	M55 Junction 4 to M55 Junction 1	19.31
		WB	M55 Junction 1 to M55 Junction 4	19.32
11	Talbot Square	EB	Talbot Square (Blackpool) towards A586 up to Thistleton Road	11.58
		WB	Thistleton Road through A586 up to Talbot Square (Blackpool)	11.54
12	B5269	EB	Thistleton Road to Broughton Road	15.43
		WB	Broughton Road to Thistleton Road	15.43
13	Talbot Road	EB	Talbot Road through A586 to Windy Harbour Skippool junction	9.97
		WB	Windy Harbour Skippool Junction through A586 to Talbot Road	10.02
14	A586	EB	Garstang Road to A6	11.32
		WB	A6 to Garstang Road	11.32

6.5.5 Routes 10 EB and WB exceed the maximum length of 15 km suggested by WebTAG unit M3.1. This route has been chosen because it runs between Junction 1 and Junction 4 of the M55. These are the junctions on each side of M55 Junction 3 (there is no M55 Junction 2), which is the point at which the motorway connects to the A585.

6.5.6 Table 6-14 presents the journey time validation criteria and acceptability guidelines set out in WebTAG Unit M3.1.

Table 6-14 Journey Time Validation Criteria and Acceptability Guidelines

Criteria	Acceptability Guideline

Modelled journey time along routes should be within 15% of surveyed times (or 1 minute if higher than 15%)	>85% of all routes

6.5.7 The modelled journey times were extracted for each modelled time period and compared with the corresponding observed journey time information. Table 6-15 to Table 6-17 present the journey time validation results for each of the 28 journey time routes (by direction) across all three modelled time periods.

Table 6-15 Journey Time Validation Results – AM Peak

Route No.	Route Name	Direction	Journey Time (MM:SS)		Difference (MM:SS)	Difference (%)	Pass
			Observed	**Modelled**			
1	A587 Park Road to Russell Avenue	NB	19:52	21:02	-1:50	8%	✓
	A587 Russell Avenue to Park Road	SB	19:85	22:35	-2:50	13%	✓
2	A583 Blackpool Road to Preston Road	NB	12:05	11:85	0:20	-2%	✓
	A583 Preston Road to Blackpool Road	SB	11:53	11:28	0:25	-2%	✓
3	A585 Singleton (B5260) to Amounderness Way	EB	12:92	13:82	0:90	7%	✓
	A585 Amounderness Way to Singleton (B5260)	WB	13:10	13:88	0:78	6%	✓
4	A585 Blackpool Road to Windy Harbour	EB	08:72	08:88	-0:17	2%	✓
	A585 Windy Harbour to Blackpool Road	WB	8:67	8:78	-0:12	1%	✓
5	A585 Garstang Road to Skippool Junction	NB	5:12	5:62	-0:50	10%	✓

Route No.	Route Name	Direction	Journey Time (MM:SS)		Difference (MM:SS)	Difference (%)	Pass
			Observed	Modelled			
	A585 Skippool Junction to Garstang Road	SB	6:30	5:48	0:82	-13%	✓
6	A588 Shard Road to Hall Road	NB	7:72	7:47	0:25	-3%	✓
	A588 Hall Road to Shard Road	SB	8:23	9:30	-1:07	13%	✓
7	B5260 Carleton Road to Russell Avenue	NB	8:10	7:95	0:15	-2%	✓
	B5260 Russell Avenue to Carleton Road	SB	8:97	9:58	-0:62	7%	✓
8	M55 Junction 4 along B5262 up to A584	NB	16:77	17:72	-0:95	6%	✓
	M55 Junction 4 along A584 to B5262	SB	16:63	18:28	-1:65	10%	✓
9	Mill Lane towards A588 up to Victoria Road West	NB	18:72	18:50	0:22	-1%	✓
	Victoria Road West towards A588 up to Mill Lane	SB	19:07	18:82	0:25	-1%	✓
10	M55 Junction 4 to M55 Junction 1	EB	10:25	10:75	-0:50	5%	✓
	M55 Junction 1 to M55 Junction 4	WB	10:60	10:80	-0:20	2%	✓
11	Talbot Square Road (Blackpool) towards A586 up to Thistleton Road	EB	15:82	17:83	-2:02	13%	✓

Route No.	Route Name	Direction	Journey Time (MM:SS)		Difference (MM:SS)	Difference (%)	Pass
			Observed	Modelled			
	Thistleton Road through A586 up to Talbot Square (Blackpool)	WB	16:10	19:37	-3:27	20%	×
12	B5269 from Thistleton Road to Broughton Road	EB	21:20	19:53	1:67	-8%	✓
	B5269 from Broughton Road to Thistleton Road	WB	19:68	20:67	-0:98	5%	✓
13	Talbot Road (Blackpool) through A586 to Windy Harbour Skippool Junction	EB	16:17	20:38	-4:22	26%	×
	Windy Harbour Skippool Junction through A586 to Talbot Square (Blackpool)	WB	15:53	17:13	-1:60	10%	✓
14	A586 Garstang Road to A6	EB	10:47	9:70	0:77	-7%	✓
	A586 A6 to Garstang Road	WB	10:57	10:42	0:15	-1%	✓

Table 6-16 Journey Time Validation Results – Inter Peak

Route No.	Route Name	Direction	Journey Time (Seconds)		Difference (secs)	Difference (%)	Pass
			Observed	Modelled			
1	A587 Park Road to Russell Avenue	NB	19:50	21:00	-1:50	8%	✓
	A587 Russell Avenue to Park Road	SB	19:42	21:80	-2:38	12%	✓

Route No.	Route Name	Direction	Journey Time (Seconds)		Difference (secs)	Difference (%)	Pass
			Observed	Modelled			
2	A583 Blackpool Road to Preston Road	NB	11:92	11:65	0:27	-2%	✓
	A583 Preston Road to Blackpool Road	SB	11:60	10:73	0:87	-7%	✓
3	A585 Singleton (B5260) to Amounderness Way	EB	12:38	13:33	-0:95	8%	✓
	A585 Amounderness Way to Singleton (B5260)	WB	11:77	13:67	-1:90	16%	✗
4	A585 Blackpool Road to Windy Harbour	EB	8:73	8:58	0:15	-2%	✓
	A585 Windy Harbour to Blackpool Road	WB	8:70	8:20	0:50	-6%	✓
5	A585 Garstang Road to Skippool Junction	NB	4:88	5:60	-0:72	15%	✓
	A585 Skippool Junction to Garstang Road	SB	5:02	5:33	-0:32	6%	✓
6	A588 Shard Road to Hall Road	NB	7:83	7:45	0:38	-5%	✓
	A588 Hall Road to Shard Road	SB	8:22	7:90	0:32	-4%	✓
7	B5260 Carleton Road to Russell Avenue	NB	8:25	7:92	0:33	-4%	✓
	B5260 Russell Avenue to Carleton Road	SB	8:73	9:43	-0:70	8%	✓

Route No.	Route Name	Direction	Journey Time (Seconds)		Difference (secs)	Difference (%)	Pass
			Observed	Modelled			
8	M55 Junction 4 along B5262 up to A584	NB	17:85	17:12	0:73	-4%	✓
	M55 Junction 4 along A584 to B5262	SB	17:77	17:07	0:70	-4%	✓
9	Mill Lane towards A588 up to Victoria Road West	NB	17:95	18:13	-0:18	1%	✓
	Victoria Road West towards A588 up to Mill Lane	SB	18:87	18:22	0:65	-3%	✓
10	M55 Junction 4 to M55 Junction 1	EB	10:62	10:65	-0:03	0%	✓
	M55 Junction 1 to M55 Junction 4	WB	10:48	10:63	-0:15	1%	✓
11	Talbot Square Road (Blackpool) towards A586 up to Thistleton Road	EB	15:75	16:77	-1:02	6%	✓
	Thistleton Road through A586 up to Talbot Square (Blackpool)	WB	16:42	17:82	-1:40	9%	✓
12	B5269 from Thistleton Road to Broughton Road	EB	20:62	19:38	1:23	-6%	✓
	B5269 from Broughton Road to Thistleton Road	WB	18:93	19:37	-0:43	2%	✓
13	Talbot Road (Blackpool) through A586 to	EB	15:83	18:38	-2:55	16%	×

Route No.	Route Name	Direction	Journey Time (Seconds)		Difference (secs)	Difference (%)	Pass
			Observed	Modelled			
	Windy Harbour Skippool Junction						
	Windy Harbour Skippool Junction through A586 to Talbot Square (Blackpool)	WB	15:32	16:07	-0:75	5%	✓
14	A586 Garstang Road to A6	EB	10:78	9:75	1:03	-10%	✓
	A586 A6 to Garstang Road	WB	10:90	10:53	0:37	-3%	✓

Table 6-17 Journey Time Validation Results – PM Peak

Route No.	Route Name	Direction	Journey Time (Seconds)		Difference (secs)	Difference (%)	Pass
			Observed	Modelled			
1	A587 Park Road to Russell Avenue	NB	20:87	22:72	-1:85	9%	✓
	A587 Russell Avenue to Park Road	SB	20:08	22:52	-2:43	12%	✓
2	A583 Blackpool Road to Preston Road	NB	12:17	12:03	0:13	-1%	✓
	A583 Preston Road to Blackpool Road	SB	11:67	10:90	0:77	-7%	✓
3	A585 Singleton (B5260) to Amounderness Way	EB	15:67	14:15	1:52	-10%	✓
	A585 Amounderness Way to Singleton (B5260)	WB	12:15	14:18	-2:03	17%	×

Route No.	Route Name	Direction	Journey Time (Seconds)		Difference (secs)	Difference (%)	Pass
			Observed	Modelled			
4	A585 Blackpool Road to Windy Harbour	EB	8:80	9:28	-0:48	6%	✓
	A585 Windy Harbour to Blackpool Road	WB	8:62	8:25	0:37	-4%	✓
5	A585 Garstang Road to Skippool Junction	NB	5:53	5:83	-0:30	5%	✓
	A585 Skippool Junction to Garstang Road	SB	5:27	5:43	-0:17	3%	✓
6	A588 Shard Road to Hall Road	NB	7:72	8:20	-0:48	6%	✓
	A588 Hall Road to Shard Road	SB	8:18	8:32	-0:13	2%	✓
7	B5260 Carleton Road to Russell Avenue	NB	9:03	8:10	0:93	-10%	✓
	B5260 Russell Avenue to Carleton Road	SB	9:05	10:28	-1:23	14%	✓
8	M55 Junction 4 along B5262 up to A584	NB	19:48	18:93	0:55	-3%	✓
	M55 Junction 4 along A584 to B5262	SB	18:78	18:12	0:67	-4%	✓
9	Mill Lane towards A588 up to Victoria Road West	NB	19:25	18:75	0:50	-3%	✓
	Victoria Road West towards A588 up to Mill Lane	SB	19:85	18:62	1:23	-6%	✓

Route No.	Route Name	Direction	Journey Time (Seconds)		Difference (secs)	Difference (%)	Pass
			Observed	Modelled			
10	M55 Junction 4 to M55 Junction 1	EB	10:40	10:77	-0:37	3%	✓
	M55 Junction 1 to M55 Junction 4	WB	10:05	10:77	-0:72	7%	✓
11	Talbot Square Road (Blackpool) towards A586 up to Thistleton Road	EB	16:38	17:33	-0:95	6%	✓
	Thistleton Road through A586 up to Talbot Square (Blackpool)	WB	16:68	18:48	-1:80	11%	✓
12	B5269 from Thistleton Road to Broughton Road	EB	20:77	19:48	1:28	-6%	✓
	B5269 from Broughton Road to Thistleton Road	WB	18:93	19:40	-0:47	2%	✓
13	Talbot Road (Blackpool) through A586 to Windy Harbour Skippool Junction	EB	16:65	19:03	-2:38	14%	✓
	Windy Harbour Skippool Junction through A586 to Talbot Square (Blackpool)	WB	15:92	16:82	-0:90	6%	✓
14	A586 Garstang Road to A6	EB	10:50	10:07	0:43	-4%	✓
	A586 A6 to Garstang Road	WB	10:78	10:65	0:13	-1%	✓

6.5.8 In the AM and IP periods, 26 out of 28 (93%) journey time routes pass the WebTAG acceptability criteria. In the PM period, 27 out of 28 (96%) routes pass the WebTAG criteria.

6.5.9 Although no specific criterion exists for validating segments within a journey time route, a time-distance analysis of the journey time routes was carried out to assess the journey time performance of the model. The time-distance plots for all 28 journey time routes are presented in Appendix M. In summary, the model performs well in terms of replicating the observed journey times to the required standards set out in WebTAG Unit M3.1.

6.6 Stress testing

6.6.1 Paragraph 9.2.2 of WebTAG unit M3.1 states that stress testing the base year model is useful for identifying issues during model calibration. The suggested stress test consists of increasing the numbers of trips in the base matrices by 10% or 20% and then reassigning to judge the impacts of the increased demands.

6.6.2 As per this guidance, a stress test was conducted on the base model by increasing the number of trips by 20% in each user class and in each time period. No changes were made to the network or to any other model parameters.

6.6.3 The assignment with the increased traffic demand was reviewed, in particular to find locations in the network where there were significant new delays. Where increases in delay were significant and caused by network coding issues, adjustments were made to the network to resolve them. However, where increases in delay were a reasonable consequence of increasing traffic flows, no change was made.

6.6.4 The outcomes of the stress test were assessed by comparing the volume-to-capacity (V/C) ratios on links and delays at nodes, relative to the calibrated base model. Tables listing the nodes with the worst delays and the links with V/C ratios greater than 100% are given in Appendix P. These nodes and links are shown graphically in Figure 6-12 to Figure 6-17.

6.6.5 The tests indicate the network's ability to accommodate such levels of growth and the junctions/corridors/areas that are adversely affected as a result of the increased demand.

6.6.6 The node delay plots and the link V/C plots demonstrate that the model responds logically to the additional traffic demand.

6.6.7 The reasons for the lengthy delays at some nodes and V/C ratios >1 are listed in Appendix P. It can be seen in the table that the junctions/ links listed are either signalised junctions or stub nodes that are the zone loading points. An optimisation process would be done for the signalised junctions in the forecast models to align the signal timings to the increased demand. Similarly, the loading points would be revisited to help them cater the extra demand arising from development sites.

6.6.8 Also, the issues in the scheme area would be dealt with in the forecast models, with suggested network improvements.

6.6.9 The volume to capacity ratio of the stub links which connect the model zone to the local road network will be monitored during traffic forecasting by comparing demand flow to actual flow on the stub links to ensure that the capacity coding of the local connections does not materially affect the traffic modelling results.

Figure 6-12 Locations of nodes in AM Peak with delays > 60 seconds in the stress test

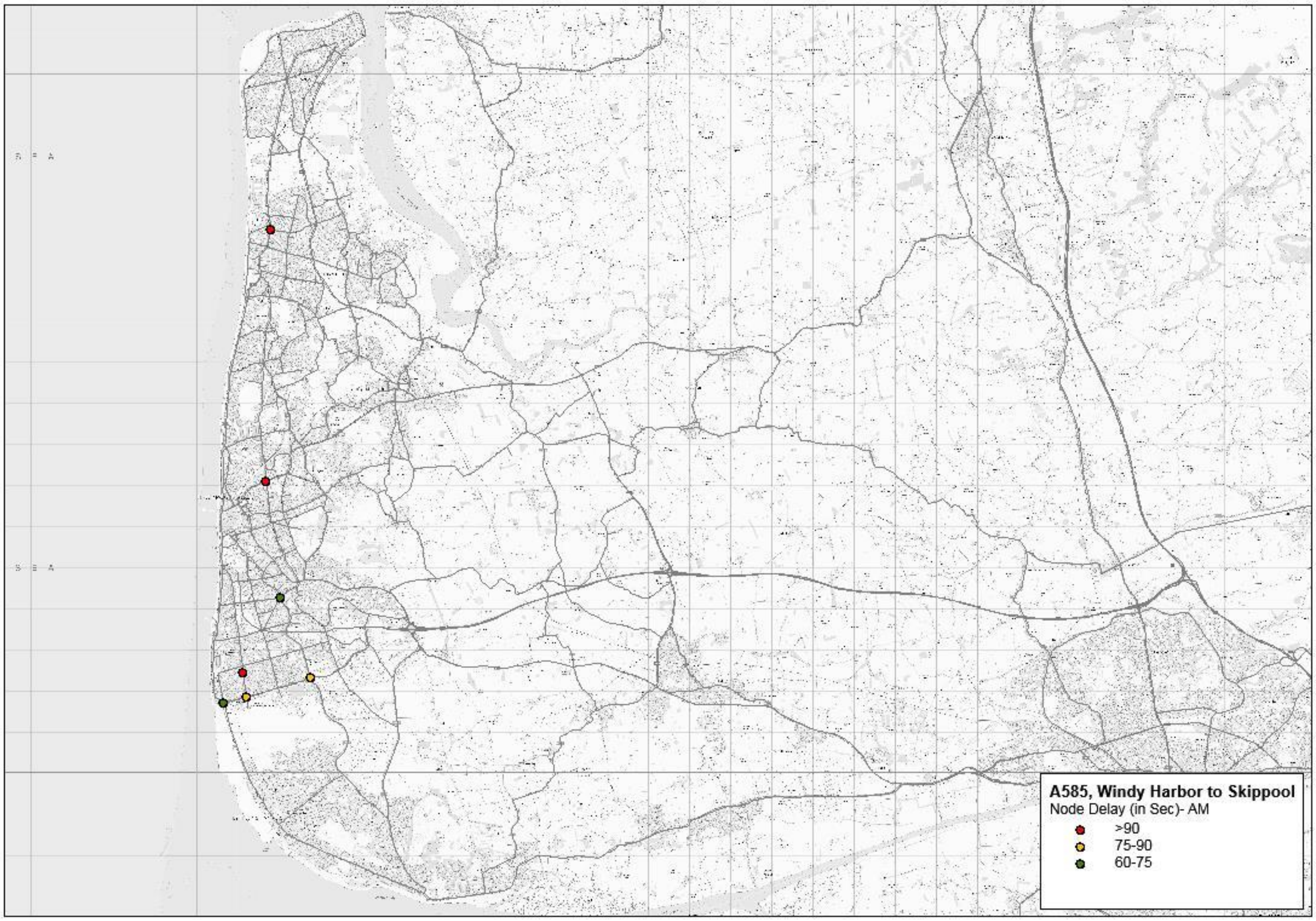


Figure 6-13 Locations of nodes in Inter Peak with delays > 60 seconds in the stress test

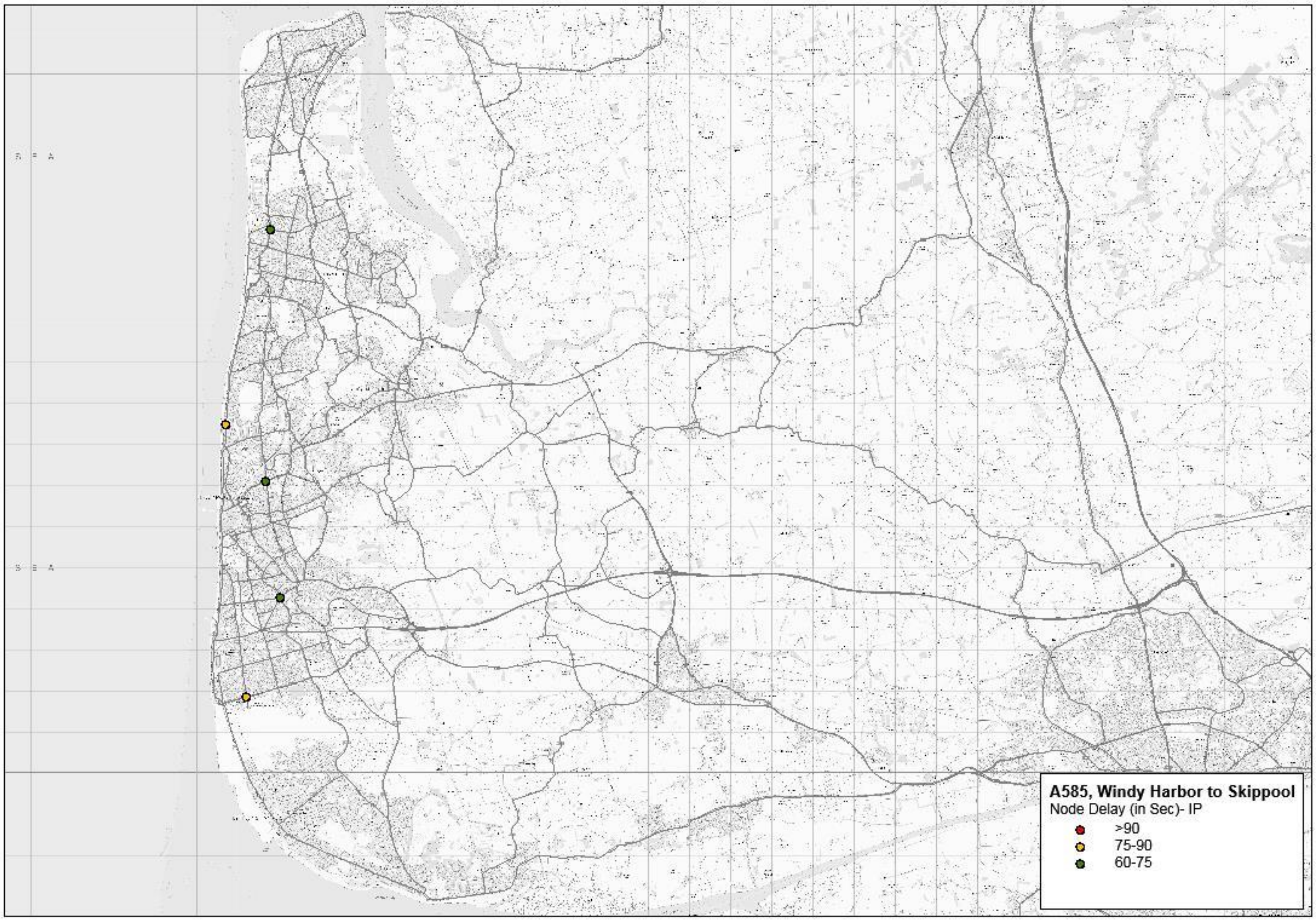


Figure 6-14 Locations of nodes in PM Peak with delays > 60 seconds in the stress test

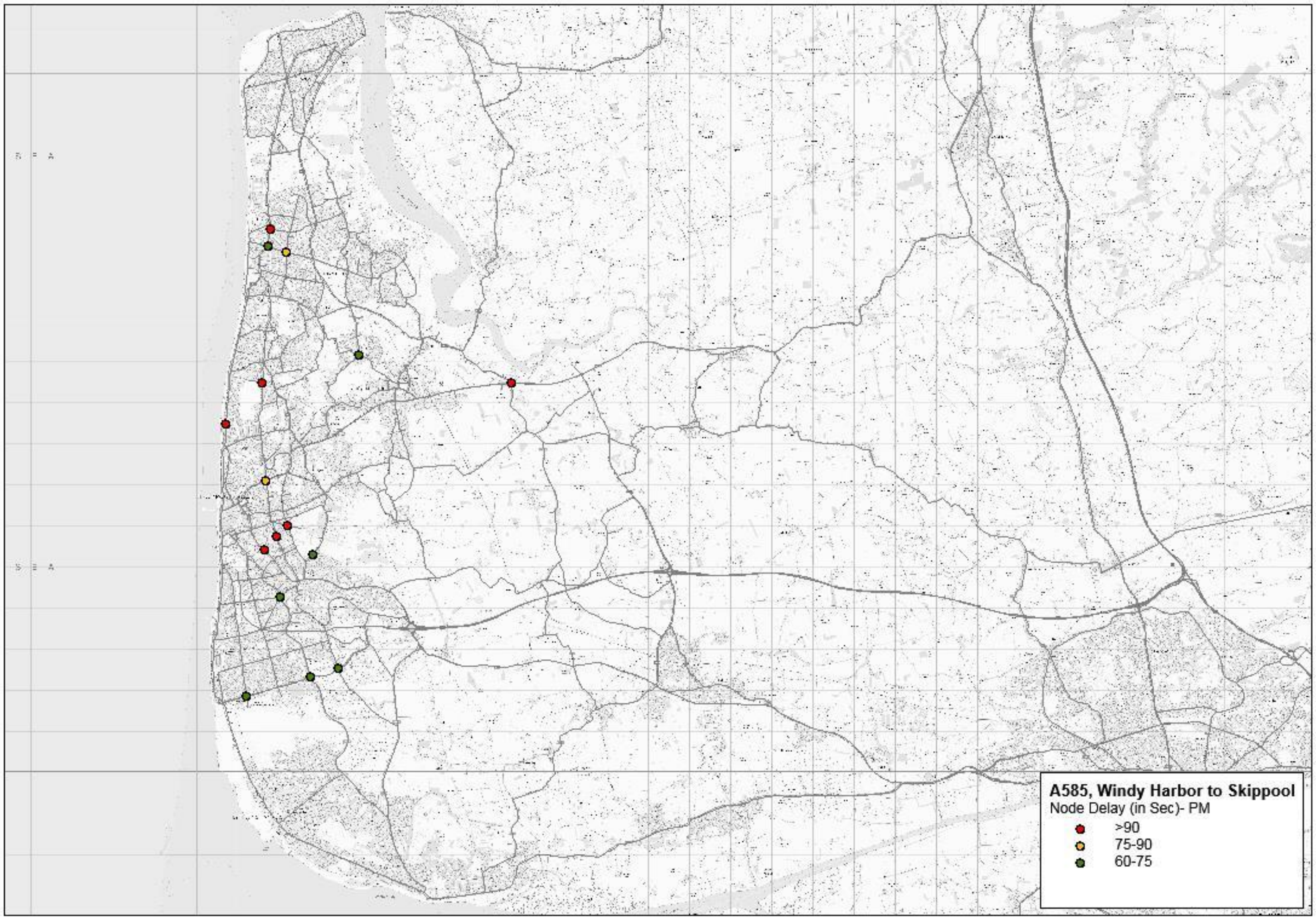


Figure 6-15 Locations of links in AM Peak with V/C > 100% in the stress test

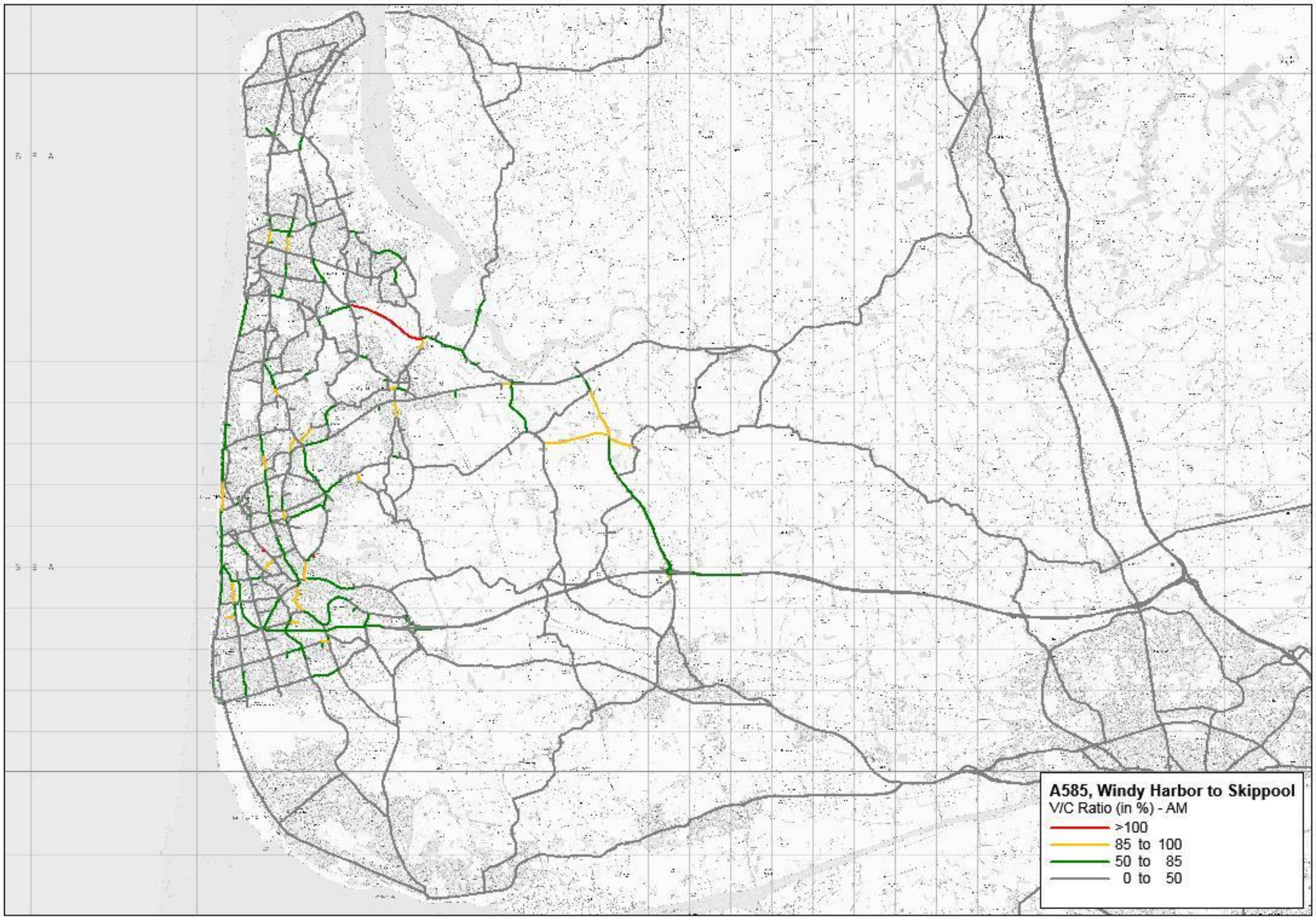


Figure 6-16 Locations of links in Inter Peak with V/C > 100% in the stress test

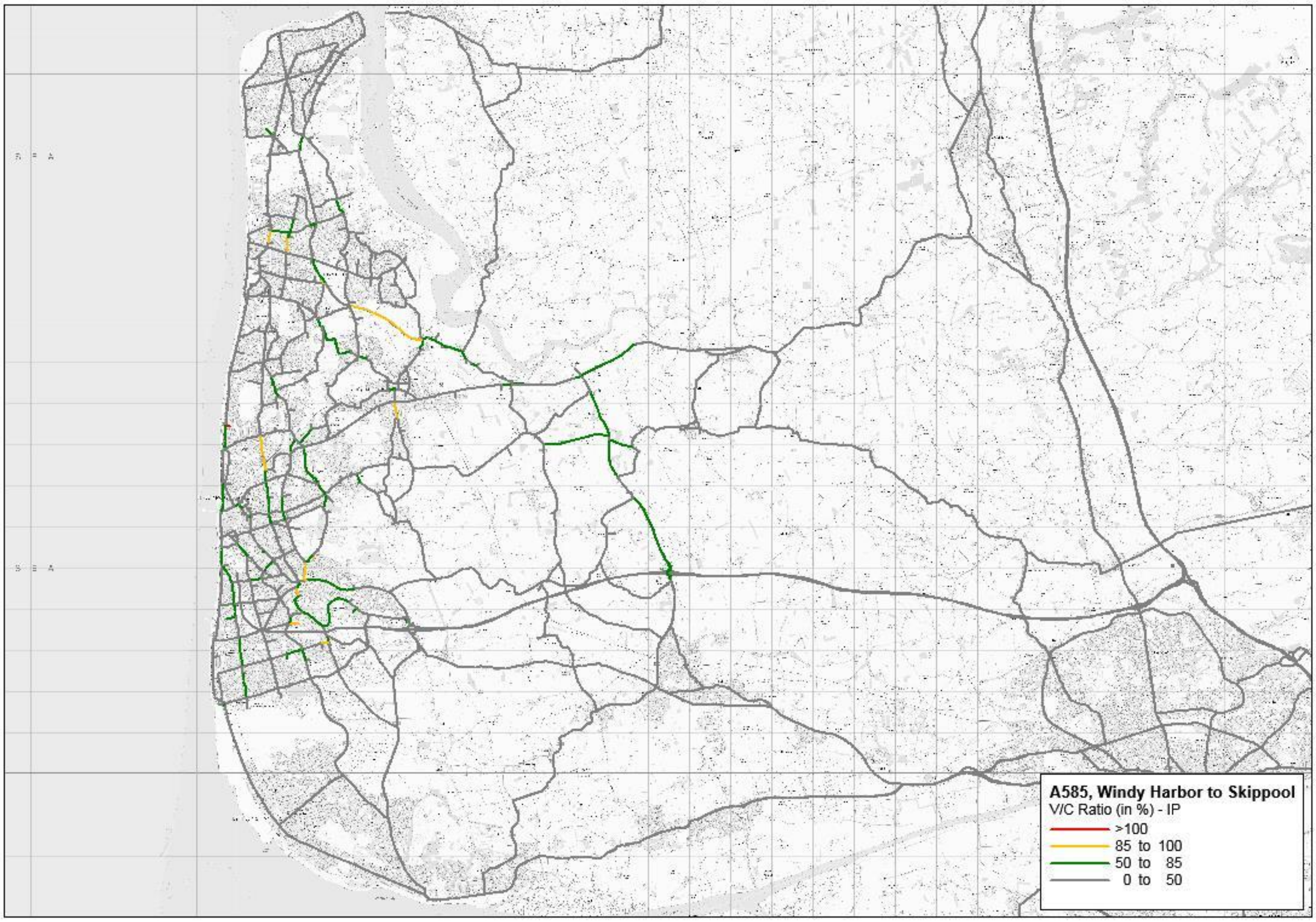
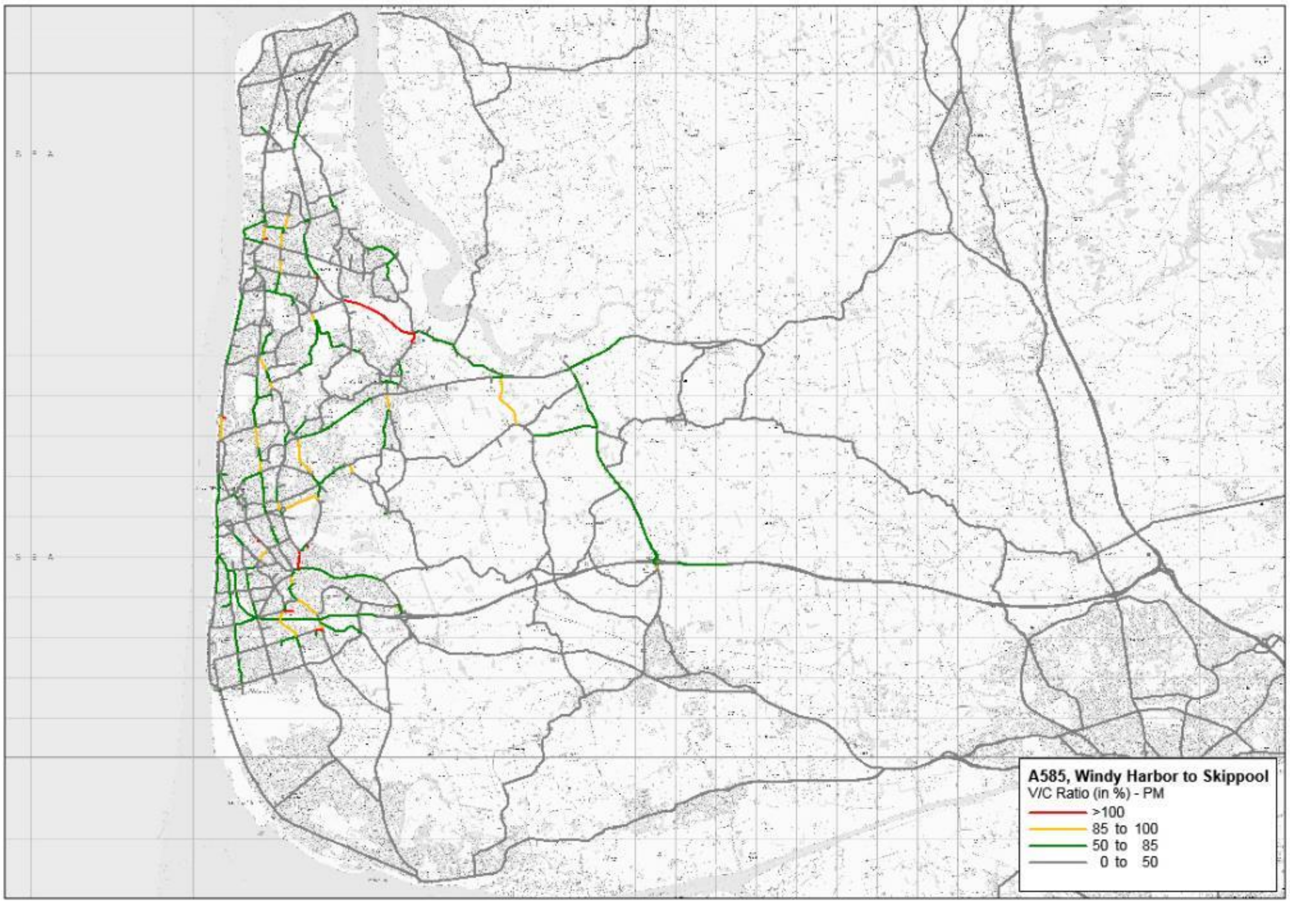


Figure 6-17 Locations of links in PM Peak with V/C > 100% in the stress test



6.7 Fitness for purpose

6.7.1 WebTAG Unit M3.1 states that the achievement of the validation acceptability guidelines does not necessarily mean that a model is fit for purpose and likewise a failure to meet the specified validation standards does not necessarily mean that model is not fit for purpose.

6.7.2 The overall model validation results suggest that the model performs well within the ADM across all three time periods based on total vehicles.

6.8 Summary

6.8.1 The A585 base year traffic model has been validated using the guidance and acceptability criteria recommended in WebTAG Unit M3.1.

6.8.2 Flows on individual links (within the ADM) which did not feature in matrix estimation were used in validation. In addition to flow validation, journey time validation was carried out on 28 routes.

6.8.3 The model has been built in accordance with best practice and has adopted processes that have ensured that the matrix has retained its integrity with the observed data and the matrix estimation has been applied in a controlled and limited way.

6.8.4 The analysis shows that, based on total vehicles, the A585 base year traffic model (for all three modelled time periods):

- Achieves the acceptability guidelines at the cordon level and individual link level at the independent validation sites

- Achieves the acceptability guidelines for journey times
- Is stable and achieves acceptable levels of convergence

6.8.5 The overall model validation results suggest that the model performs very well within the ADM across all three time periods based on total vehicles.

7 VARIABLE DEMAND MODEL

7.1 Overview

7.1.1 A change in transport conditions, such as the proposed improvements to the A585, will in principle have an impact on transport demand. Variable demand modelling seeks to predict and quantify those changes in demand, where travel choices are made based on the generalised costs of travel.

7.1.2 This chapter describes the development of the A585 Variable Demand Model (VDM), which will be used to predict future changes in demand as a result of the implementation of the Windy Harbour to Skippool scheme. The model has been developed in accordance with the guidance set out in WebTAG Unit M2 Variable Demand Modelling, and specific references are provided in the text as appropriate.

7.2 Model development

7.2.1 This section provides an overview of the development of the VDM for the A585 scheme, describing its structure, the values of the parameters that are used, and providing details of the results of realism tests, which are used to assess the suitability of the demand model's responses to cost changes.

7.2.2 Because of the relatively low level of public transport provision and mode share within the study area, VDM was undertaken on a highway-only basis.

7.2.3 In accordance with WebTAG guidance, the demand modelling was undertaken incrementally.

7.2.4 The variable demand modelling was carried out using the DfT's DIADEM 5 software, which provides an off-the-shelf solution to undertaking VDM tests in conjunction with a SATURN highway model.

Segmentation

7.2.5 The DIADEM model is set up with seven demand segments, of which five are used for car trips – which are passed through the demand model and are therefore responsive to costs – and two are fixed and represent goods vehicle trips.

7.2.6 Table 7-1 sets out the five cost-responsive demand segments, classifying them as home-based and non-home-based and showing how they are combined into the three car user classes used in SATURN. Commute is, by definition, home-based work and it is not sub-divided beyond this. The Employer's Business and Other categories are both split into Home-Based and Non Home-Based components.

Table 7-1 Classification of the cost-responsive demand segments used in the VDM

Purpose	Segment
Commute	Home-Based
Employer's Business	Home-Based
	Non-Home-Based
Other	Home-Based
	Non-Home-Based

Forms of trip matrices

7.2.7 Table 7-2 shows the forms of trip matrices that will be used in the model.

Table 7-2 Forms of Trip Matrices used in the VDM

Purpose	Segment	Matrix Form
Commute	Home-Based	Production – Attraction
Employer's Business	Home-Based	Production – Attraction
	Non-Home-Based	Origin – Destination
Other	Home-Based	Production – Attraction
	Non Home-Based	Origin – Destination
LGV	N/A	Fixed Demand
HGV	N/A	Fixed Demand

Time Periods

7.2.8 Although the scheme SATURN models have been built only for three time periods – AM, IP and PM – when DIADEM is used with PA modelling it is necessary for the PA trips to represent 24 hours of travel. The input data used by DIADEM to convert the PA trips into OD trips are therefore required to cover four time periods, which include the additional off-peak period (OP) that the SATURN models do not use.

7.2.9 Trip matrices in PA format were constructed from the validated OD matrices by splitting them into from-home, return-home and non-home-based contributions. This splitting was done using proportions that were derived from the detailed purpose information in the RSI datasets, using data aggregated into the three sectors defined in section 4.3.

7.2.10 The assignment hour from-home, return-home and non-home-based trips were expanded to each period using the factors derived from the traffic counts that were previously used to convert the synthetic trip outputs of the gravity model into assignment hours. The expanded trips were combined over time periods into 12-hour matrices, then the return-home trips were transposed and added to the from-home trips and the total divided by 2 to create estimates of the numbers of tours in the 12-hour period from 0700 to 1900, which are then in PA format. The NHB trip matrices by period are used separately as independent inputs to DIADEM in OD format.

7.2.11 DIADEM requires PA trips to be input for a whole day, and so an estimate of the number of trips being made in the off-peak period (1900 to 0700) was required. TEMPRO v7.2 was used to obtain the number of trip ends at a GB level in a full 24 hours relative to the 12-hour period 0700-1900, for each of the 5 car demand segments. These factors were applied to the 12-hour PA or OD matrices to obtain estimates of the whole day's trips, and the off-peak trips were then obtained by subtracting the 12-hour trips.

7.2.12 For goods vehicles, factors were derived from classified counts to expand the 12-hour data to 24 hours, and thus obtain an estimate for the number of off-peak LGV and HGV trips.

Choice model hierarchies

7.2.13 The hierarchy of demand responses is set out in Table 7-3 below. As no public transport costs are available, no mode choice is included. Therefore, a frequency response (of car journeys) is used as a proxy for mode choice.

Table 7-3: Response hierarchies used by the VDM

Purpose	Segment	Logit Model Hierarchy (From least to most sensitive)
Commute	Home Based	Frequency Time Period Choice Distribution: Doubly Constrained
Employer's Business	Home Based	Frequency Time Period Choice Distribution: Production Constrained
	Non-Home Based	Frequency Time Period Choice Distribution: Doubly Constrained
Other	Home Based	Frequency Time Period Choice Distribution: Production Constrained
	Non-Home Based	Frequency Time Period Choice Distribution: Doubly Constrained

VDM Parameters

7.2.14 WebTAG's minimum values of parameters for the demand responses were selected following realism testing. The time period choice values are derived from the median mode choice parameters, as advised by WebTAG. As the frequency response is a proxy for mode choice, a low value of 0.1 was used to enable a response to occur, but at a much lower level than a true mode choice. The parameters are shown in Table 7-4.

Table 7-4: Demand model parameters

Purpose	Segment	Frequency	Time Period	Distribution
Commute	Home Based	0.1	0.68	-0.054 (Doubly Constrained)
Employer's Business	Home Based	0.1	0.45	-0.038 (Production Constrained)

Purpose	Segment	Frequency	Time Period	Distribution
	Non-Home Based	0.1	0.73	-0.069 (Origin Constrained)
Other	Home Based	0.1	0.53	-0.074 (Production Constrained)
	Non-Home Based	0.1	0.81	-0.073 (Origin Constrained)

7.3 Realism testing

Tests Performed

7.3.1 In compliance with WebTAG, the elasticity of car demand (vehicle-kilometres) to a 20% increase in fuel cost has been derived using the VDM. An elasticity of car demand to travel time has been inferred from the fuel realism test based on the approach defined in the DIADEM manual.

Convergence

7.3.2 To ensure the results from the VDM are stable, the convergence of the model must be good. The Fixed Step Length algorithm in DIADEM was used to control the model, which resulted in convergence results as shown in Table 7-5. This shows a good level of convergence, achieved in 8 iterations. WebTAG defines a target relative gap of 0.2% or less.

Table 7-5: DIADEM Realism test convergence

Iteration	Absolute Gap	Relative Gap
1	767,496	6.57%
2	372,932	3.28%
3	182,873	1.63%
4	92,141	0.83%
5	46,061	0.41%
6	22,675	0.20%
7	12,020	0.11%
8	6,927	0.06%

Elasticity with respect to fuel cost

7.3.3 The Fuel Cost Elasticity is calculated by the following formula,

$$E = \frac{\log\left(\frac{T^1}{T^0}\right)}{\log\left(\frac{C^1}{C^0}\right)}$$

where T^0 and C^0 are the base model vehicle kilometres and fuel cost respectively and T^1 and C^1 are the forecast equivalent values, i.e. after the 20% increase.

7.3.4 A set of tests were undertaken using the WebTAG recommended median parameter values for Highway Distribution. For the set of values chosen as “best fit”, described above, the overall fuel cost elasticity was -0.33. WebTAG suggests a target range of between -0.25 and -0.35. Office of National Statistics Data[15] indicates, as shown in Table 7-6, that incomes in the area are lower than the national average which is consistent with the fuel cost elasticity being stronger than the national average.

Table 7-6: Gross disposable income per head for several local authorities relative to the whole UK (2014)

Local Authority	Income per head (£)	Index (UK=100)
UK	17,965	100
Blackburn with Darwen	12,096	67
Blackpool	13,954	78
Lancaster and Wyre	16,187	90
Mid Lancashire	15,954	89
East Lancashire	14,610	81
Chorley and West Lancashire	16,338	91

7.3.5 The breakdown of the elasticity across demand segments and time periods is shown in Table 7-7. From this table, it is clear that the relationship between demand segments is as is expected, with Employer’s Business the least elastic, and the Other purpose the most elastic. The off-peak Home Based Other elasticity is more negative than desired, which could be caused by the off-peak trip matrix being only an estimate derived from the 12-hour peak period.

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[15] https://www.ons.gov.uk/economy/regionalaccounts/grossdisposablehouseholdincome/datasets/regionalgrossdisposablehouseholdincomegdhi

Table 7-7: Fuel cost elasticities by demand segment and time period

	AM	IP	PM	OP	ALL
1: Commute	-0.17	-0.17	-0.17	-0.17	-0.17
2: HB EB	-0.12	-0.10	-0.07	-0.11	-0.10
3: NHB EB	-0.15	-0.21	-0.07	-0.24	-0.18
4: HB Other	-0.44	-0.48	-0.53	-0.49	-0.49
5: NHB Other	-0.17	-0.33	-0.39	-0.33	-0.32
All Purpose	-0.22	-0.26	-0.25	-0.27	-0.25

Elasticity with respect to journey time

7.3.6 Following the DIADEM guidance, the elasticity of vehicle kilometres with respect to journey time are estimated as follows:

$$E^{time} = E^{fuel} \frac{aT}{bK}$$

where: T is the total vehicle hours, K is the total vehicle kilometres, a is the cost per hour from the generalised cost function and b is the cost per kilometre.

7.3.7 Estimated on this basis, the overall journey time elasticity is -0.30. The full detail of each demand segment and time period is shown in Table 7-8. All values are smaller than the WebTAG limit of -2.0, and therefore provide evidence that the demand model meets the realism criteria.

Table 7-8: Journey time elasticities by demand segment and time period

Segment	AM	IP	PM	OP	ALL
1: Commute	-0.20	-0.18	-0.20	-0.16	-0.20
2: HB EB	-0.10	-0.08	-0.06	-0.08	-0.08
3: NHB EB	-0.12	-0.17	-0.06	-0.18	-0.15
4: HB Other	-0.38	-0.39	-0.45	-0.41	-0.41
5: NHB Other	-0.15	-0.27	-0.33	-0.28	-0.27
All Purpose	-0.19	-0.22	-0.22	-0.22	-0.22

7.4 Conclusions

7.4.1 This model meets the realism test criteria. There may be refinements made as the outputs are used in the forecasting stage.

8 SUMMARY AND CONCLUSION

Model development

8.1.1 The A585 Windy Harbour to Skippool base year traffic model was developed to assess the benefits of a proposed improvement scheme between the Windy Harbour and Skippool junctions on the A585 corridor. The model is a SATURN-based traffic assignment model

8.1.2 The study area covers Blackpool, Poulton-le-Fylde, and Fleetwood in detail. The model also extends across a wider area covering Wyre and Preston and to the external area to adequately represent the routing and travel choice of long distance trips.

8.1.3 The model represents a typical weekday in June 2015. The modelled time periods are the average hour in the AM (07:30 to 09:30), Inter Peak (09:30 to 15:00) and PM (15:00 to 18:00) peaks respectively.

8.1.4 The model includes five user classes, to represent car ‘commute’ trips, car ‘business’ trips and car ‘other’ trips, with commercial goods vehicle movements represented by LGVs and HGVs. Buses are assigned to fixed routes on the network to ensure that the model provides an accurate representation of the highway conditions.

8.1.5 The model zoning system covers the whole of Britain with 190 zones based on Census 2011 MSOAs. The zoning system follows the hierarchy region to county to district to ward to MSOA to local area level and is consistent with the requirements of WebTAG Unit M3.1.

Limitations

8.1.6 On this basis, it was agreed with Highways England that no public transport modelling or mode choice modelling would be undertaken.

8.1.7 No freight modelling has been undertaken for the proposed A585 improvement scheme, as no specific objectives have been developed in relation to the movement of freight traffic.

Model development

8.1.8 Within the ADM, zones were disaggregated, while in the External Area, several MSOAs have been combined to represent a larger zone. Zone connectors were reviewed in the model study area to facilitate appropriate local routing.

8.1.9 The model road network is a representation of the on-ground conditions and the existing ITN. A detailed node audit was conducted on all SATURN nodes within the study area using information from aerial photography, cruise speeds from Trafficmaster and information on bus services in the area.

8.1.10 The network parameters were based on technical discussions as outlined in Technical Note 22 on SATURN Model Network Development[16]. These parameters were also reviewed against the parameters used in the Regional Traffic Model (RTM) Network Coding Manual and continuously monitored during the calibration and validation stage.

8.1.11 A number of data sources were used to develop the trip matrices. These included previously collected RSI data from 2008, 2010 and 2014; traffic count data including ATCs, CJCs and MCCs collected during 2015 and 2016; journey time data from the Trafficmaster database, and additional traffic counts from the TRIS database.

8.1.12 The RSI data were expanded to traffic counts for the model’s base month and year at the interview locations and in the direction in which the intercepted trips were travelling.

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[16] Technical Note 22: SATURN Model Network Development (July 2016)

8.1.13 Prior matrices for use in matrix estimation were developed by using a gravity model that took as its main inputs a set of cost distributions, derived from RSI records expanded to traffic counts, and trip ends by journey purpose from TEMPRO 7.0. Synthetic prior matrices were produced for cars only. For goods vehicles (LGV and HGV), the expanded RSI datasets were used directly as the inputs to matrix estimation.

8.1.14 The assignment methodology, assignment parameters, and generalised costs align with the guidance and standards set out in WebTAG Unit M3.1, to ensure that the model is fit for the purpose of scheme assessment.

Calibration

8.1.15 The calibration procedure involved a number of tasks, each of which was designed to ensure that the model adequately reproduced observed traffic flows and travel times in the study area. This included network calibration, matrix calibration and assignment calibration.

8.1.16 Calibration checks on the unassigned network included checks on link and junction operating parameters and SFCs. Calibration checks on the assigned network involved checks to the traffic routing in the ADM and along key strategic corridors. Checks were also made on the assigned stability, with a focus on the locations of the worst converged nodes and links as well as junctions where delays and queues change considerably between assignment loops.

8.1.17 Once the A585 model network reached a sufficient level of early calibration, matrix estimation (SATME2) was performed on the prior matrices to improve the level of flow calibration across the calibration screenlines/cordons. Matrix estimation was monitored for changes to the matrix totals, zonal cell values, zonal trip ends, mean trip length and trip length distribution, as well as sectoral changes to the trip matrix.

8.1.18 Whilst the effect of matrix estimation did not significantly alter the prior matrix for cars, the effects were more pronounced for HGVs. Some inconsistencies in the RSI data that was used to develop the base year matrices were identified. In addition, the age and quality of the RSI data was identified as a major contributing factor to the quality of the prior matrices.

8.1.19 The link and turn flow calibration exercise focused on 138 links and 26 turns. The results in all three modelled time periods pass the relevant WebTAG criteria, where more than 85% of links and turns in each period pass either the stated flow or GEH criteria.

8.1.20 The screenline and cordon calibration focused on four screenlines and one cordon (in two directions). The results from the calibration show that the model is well calibrated and complies with the relevant WebTAG criteria for all three modelled time periods.

8.1.21 The base year model converges well within the WebTAG criteria with a stable flow of 98% and a %GAP below 0.03 across all model periods for both prior and post matrix estimation model runs, which is well below the standard of 0.1 as set out in WebTAG Unit M3.1.

Validation

8.1.22 The validation procedure included network validation, matrix validation and assignment validation.

8.1.23 A number of checks on the assigned and unassigned network had already been carried out as part of the model calibration. At the validation stage, a review of the routing chosen by the model along 18 routes was undertaken. This did not identify any errors in the underlying network coding.

8.1.24 In order to assess the impact of matrix estimation, a comparison of the sectoral changes prior and post SATME2 was carried out at a seven-sector level. At the level of total trips over all vehicle types, the differences between the prior and post matrices are generally small, with the largest difference observed in the Inter Peak (6.6%).

8.1.25 For some inter-sector movements, some relatively large differences were identified. The number of trips in the prior matrix was low; therefore, the matrix estimation process had to uplift the number of trips in the post ME2 matrix to a sufficient level.

8.1.26 Flow validation was undertaken separately for links and turns, and for screenlines and cordons. The validation was undertaken by comparing the total modelled traffic flows and observed traffic counts for each modelled time period. The validation was carried out in accordance with the link flow and turning movement validation criteria set out in WebTAG Unit M3.1 Section 3.

8.1.27 The link and turn flow calibration was carried out for 63 links and 12 turns. It was found that, in the AM peak, 92% of links and 100% of turns satisfy the WebTAG criterion. In the Inter Peak, 92% of links and 83% of turns satisfy the WebTAG criterion. In the PM peak, 79% of links and 67% of turns satisfy the WebTAG criterion.

8.1.28 One cordon was used for screenline and cordon flow validation. In the AM peak, it was found that inbound movements across the cordon validate well; however, outbound movements do not satisfy the relevant WebTAG criteria. The cordon links pass both the flow and GEH validation criteria. In the Inter Peak, both inbound and outbound movements do not satisfy the relevant criteria. However, 90% of the cordon links pass both flow and GEH criteria. In the PM peak, inbound and outbound movements do not validate well against the relevant criteria.

8.1.29 The model validates very well on the majority of the 28 journey time routes (14 routes each bi-directional). The number of routes passing the relevant WebTAG criteria are 26 out of 28 in the AM and PM peaks and 27 out of 28 in the Inter Peak.

8.2 Conclusion

8.2.1 We conclude that the SATURN model is sufficiently validated to such an extent that is fit for the purpose of forecasting traffic for scheme appraisal and for subsequent economic assessment.

APPENDIX A

Zone List and Description

Table A.1: List of A585 Scheme model zones

S.No	Modelling	SATURN	Zone Description	Level
1	MSA Zones	1	Wyre - Carleton West	Local
2	MSA Zones	2	Wyre - Carleton East	Local
3	MSA Zones	3	Wyre - Breck	Local
4	MSA Zones	4	Fylde - Singleton and Greenhalgh	Local
5	MSA Zones	5	Wyre - Staina South	Local
6	MSA Zones	6	Wyre - Marsh Mill	Local
7	MSA Zones	7	Wyre - Staina North	Local
8	MSA Zones	8	Wyre - Mount	Local
9	MSA Zones	9	Wyre - Warren	Local
10	MSA Zones	10	Wyre - Rossall	Local
11	MSA Zones	11	Wyre - Park	Local
12	MSA Zones	12	Wyre - Mount	Local
13	MSA Zones	13	Wyre - Rossall	Local
14	MSA Zones	14	Wyre - Cleveleys Park	Local
15	MSA Zones	15	Wyre - Jubilee	Local
16	MSA Zones	16	Wyre - Victoria & Norcross	Local
17	MSA Zones	17	Wyre - Marsh Mill	Local
18	MSA Zones	18	Wyre - Pheasant's Wood	Local
19	MSA Zones	19	Wyre - Bourne	Local
20	MSA Zones	20	Blackpool - Norbreck	Local
21	MSA Zones	21	Blackpool - Anchorsholme	Local
22	MSA Zones	22	Wyre - Stanah	Local
23	MSA Zones	23	Blackpool - Warbreck	Local
24	MSA Zones	24	Blackpool - Claremont	Local
25	MSA Zones	25	Blackpool - Talbot	Local
26	MSA Zones	26	Blackpool - Bloomfield	Local
27	MSA Zones	27	Blackpool - Waterloo	Local
28	MSA Zones	28	Blackpool - Squires Gate	Local
29	MSA Zones	29	Blackpool - Highfield	Local
30	MSA Zones	30	Blackpool - Hawes Side	Local
31	MSA Zones	31	Blackpool - Clifton	Local
32	MSA Zones	32	Blackpool - Marton	Local
33	MSA Zones	33	Blackpool - Tyldesley	Local
34	MSA Zones	34	Blackpool - Layton	Local
35	MSA Zones	35	Blackpool - Greenlands	Local
36	MSA Zones	36	Wyre - Hardhorn with High Cross	Local
37	MSA Zones	37	Wyre - Carleton	Local
38	MSA Zones	38	Fylde - Singleton and Greenhalgh	Local
39	MSA Zones	39	Fylde - Staining and Weeton	Local

S.No	Modelling	SATURN	Zone Description	Level
40	MSA Zones	40	Fylde - Staining and Weeton	Local
41	MSA Zones	41	Fylde - Singleton and Greenhalgh	Local
42	MSA Zones	42	Fylde - Singleton and Greenhalgh	Local
43	MSA Zones	43	Fylde - Elswick and Little Eccleston	Local
44	MSA Zones	44	Fylde - Medlar-with-Wesham	Local
45	MSA Zones	45	Fylde - Warton and Westby	Local
46	MSA Zones	46	Wyre - Pharos West	Local
47	MSA Zones	47	Wyre - Pharos East	Local
48	MSA Zones	48	Blackpool - Norbreck	Local
49	MSA Zones	49	Blackpool - Ingthorpe	Local
50	MSA Zones	50	Wyre - Hardhorn with High Cross	Local
51	MSA Zones	51	Wyre - Hardhorn with High Cross	Local
52	MSA Zones	52	Blackpool - Stanley	Local
53	MSA Zones	53	Blackpool - Park	Local
54	MSA Zones	54	Wyre - Tithebarn	Local
55	MSA Zones	55	Fylde - Singleton and Greenhalgh	Local
56	MSA Zones	56	Blackpool - Victoria & Norcross	Local
57	MSA Zones	57	Blackpool - Anchorsholme	Local
58	MSA Zones	58	Wyre - Jubilee	Local
59	MSA Zones	59	Wyre - Bourne	Local
60	MSA Zones	60	Fylde - Staining and Weeton	Local
61	MSA Zones	61	Wyre - Tithebarn	Local
62	MSA Zones	62	Fylde - Singleton South East	Local
63	MSA Zones	63	Fylde - Singleton South West	Local
64	Buffer Zone	64	Ward/OA - Ashton	Ward
65	Buffer Zone	65	Fylde - Heyhouses	Ward
66	Buffer Zone	66	Fylde - Clifton	Ward
67	Buffer Zone	67	Wyre - Pilling	Ward
68	Buffer Zone	68	South Ribble - New Longton & Hutton East	Ward
69	Buffer Zone	69	Preston (City)	Ward
70	Buffer Zone	70	Fylde - Warton and Westby	Ward
71	Buffer Zone	71	Fylde - Ribby-with-Wrea	Ward
72	Buffer Zone	72	Fylde - Warton and Westby	Ward
73	Buffer Zone	73	Fylde - Freckleton East	Ward
74	Buffer Zone	74	Lancaster - Ellel	Ward
75	Buffer Zone	75	Blackpool - Stanley	Ward
76	Buffer Zone	76	Wyre - Garstang	Ward
77	Buffer Zone	77	Wyre - Garstang	Ward
78	Buffer Zone	78	Fylde - Kirkham North	Ward
79	Buffer Zone	79	Wyre - Great Eccleston	Ward
80	Buffer Zone	80	Wyre - Great Eccleston	Ward
81	Buffer Zone	81	Wyre - Hambleton & Stalmine	Ward
82	Buffer Zone	82	Wyre - Preesall	Ward

S.No	Modelling	SATURN	Zone Description	Level
83	Buffer Zone	83	Wyre - Knot End on Sea	Ward
84	Buffer Zone	84	Preston - Preston Rural North	Ward
85	Buffer Zone	85	Preston - Preston Rural North West	Ward
86	Buffer Zone	86	Preston - Preston Rural West	Ward
87	Buffer Zone	87	Fylde - Newton and Treales	Ward
88	Buffer Zone	88	Fylde - Newton and Treales	Ward
89	MSA Zones	89	Fylde - Singleton North East	Local
90	MSA Zones	90	Wyre - Victoria & Norcross	Local
91	MSA Zones	91	Wyre - Victoria & Norcross	Local
92	MSA Zones	92	Fylde - Singleton North	Local
93	MSA Zones	93	Fylde - Singleton North	Local
94	MSA Zones	94	Fylde - Singleton North West	Local
95	External Area	100	Copeland	District
96	External Area	101	Carlisle	District
97	External Area	102	South Lakeland	District
98	External Area	103	Allerdale	District
99	External Area	104	Eden	District
100	External Area	105	Barrow-in-Furness	District
101	External Area	106	High Peak	District
102	External Area	107	South Derbyshire	District
103	External Area	108	Erewash	District
104	External Area	109	North East Derbyshire	District
105	External Area	110	Amber Valley	District
106	External Area	111	Bolsover	District
107	External Area	112	Derbyshire Dales	District
108	External Area	113	Chesterfield	District
109	External Area	114	West Lancashire	District
110	External Area	115	Lancaster	District
111	External Area	116	Chorley	District
112	External Area	117	South Ribble	District
113	External Area	118	Rossendale	District
114	External Area	119	Preston Rural North East	Ward
115	External Area	120	Pendle	District
116	External Area	121	Ribble Valley	District
117	External Area	122	Hyndburn	District
118	External Area	123	Burnley	District
119	External Area	124	Scarborough	District
120	External Area	125	Selby	District
121	External Area	126	Craven	District
122	External Area	127	Richmondshire	District
123	External Area	128	Harrogate	District
124	External Area	129	Ryedale	District
125	External Area	130	Hambleton	District

S.No	Modelling	SATURN	Zone Description	Level
126	External Area	131	Barnsley	District
127	External Area	132	Bolton	District
128	External Area	133	Bradford	District
129	External Area	134	Bury	District
130	External Area	135	Calderdale	District
131	External Area	136	Doncaster	District
132	External Area	137	Kirklees	District
133	External Area	138	Knowsley	District
134	External Area	139	Leeds	District
135	External Area	140	Liverpool	District
136	External Area	141	Manchester	District
137	External Area	142	Oldham	District
138	External Area	143	Rochdale	District
139	External Area	144	Rotherham	District
140	External Area	145	Salford	District
141	External Area	146	Sefton	District
142	External Area	147	Sheffield	District
143	External Area	148	Stockport	District
144	External Area	149	St. Helens	District
145	External Area	150	Tameside	District
146	External Area	151	Trafford	District
147	External Area	152	Wakefield	District
148	External Area	153	Wigan	District
149	External Area	154	Wirral	District
150	External Area	155	Blackburn with Darwen	District
151	External Area	156	Cheshire East	District
152	External Area	157	Cheshire West and Chester	District
153	External Area	158	Derby	District
154	External Area	159	Halton	District
155	External Area	160	Warrington	District
156	External Area	161	Wyre North East	Ward
157	External Area	200	East Riding of Yorkshire	County
158	External Area	201	Leicestershire	County
159	External Area	202	Lincolnshire	County
160	External Area	203	Northamptonshire	County
161	External Area	204	Rutland	County
162	External Area	205	Nottinghamshire	County
163	External Area	206	Shropshire	County
164	External Area	207	Staffordshire	County
165	External Area	208	Tyne & Wear	County
166	External Area	209	Warwickshire	County
167	External Area	210	West Midlands	County
168	External Area	211	Worcestershire	County

S.No	Modelling	SATURN	Zone Description	Level
169	External Area	212	Herefordshire	County
170	External Area	213	Durham	County
171	External Area	214	Powys	County
172	External Area	215	Gwynedd	County
173	External Area	216	Clwyd	County
174	External Area	217	Dyfed	County
175	External Area	218	Northumberland	County
176	External Area	219	Redcar and Cleveland	District
177	External Area	220	City of York	District
178	External Area	300	Eastern England	Region
179	External Area	301	London	Region
180	External Area	302	South East England	Region
181	External Area	303	Glamorgan & Gwent	County
182	External Area	304	South West England	Region
183	External Area	305	Central Scotland	Region
184	External Area	306	Glasgow	Region
185	External Area	307	Highlands and Islands	Region
186	External Area	308	North East Scotland	Region
187	External Area	309	South Scotland	Region
188	External Area	310	Mid Scotland and Fife	Region
189	External Area	311	Lothian	Region
190	External Area	312	West Scotland	Region

APPENDIX B

Calculated Saturation Flows

Table B.1: List of priority-opposed movements

	MOVEMENT			GEOMETRICS					Calc				CALC	
				lane	vis	vis	width	vis-r	vis-l		745		Saturation	Multiple Lanes
A node	B node	C node	Type	width	right	left	(a)	(b)	(c)	(H)	(K)	(K+H)	Flow	
4034	4040	4048	mLM	3.15	120	150	0.95	1.00	1	0	745	745	710	
4034	4040	4041	mRM	3.15	120	150	0.95	1.00	1	0	627	627	598	
4042	4041	4484	mRM	7.5	120	150	1.36	1.00	1	0	627	627	854	1708
4033	4029	1049	mLM	3.5	120	150	0.99	1.00	1	0	745	745	734	
4033	4029	4028	mRM	3.5	120	150	0.99	1.00	1	0	627	627	618	
1049	4028	4031	mLM	3.75	120	150	1.01	1.00	1	0	745	745	752	
1049	4028	4040	mRM	4.5	120	150	1.08	1.00	1	0	627	627	677	
4484	4039	4035	mLM	3.5	120	150	0.99	1.00	1	0	627	627	618	

Table B.2: List of priority-unopposed movements

MOVEMENT			GEOMETRICS							CALC	
Jn.			Lane	Slope	Lane	Turn	Radius	Lane	S0	Saturation	Multiple Lanes
A node	B Node	C node	no.		width	prop'n	mtr	factor		Flow	
4029	4028	4031	1	0	4.5	1	60	1	2205	2015	
4029	4028	4040	1	0	4.5	1	30	1	2205	1967	
4029	4028	4040	2	0	4.5	1	30	1	2205	1967	3933
4028	4040	4048	1	0	4.5	1	60	1	2205	2015	
4028	4040	4048	2	0	4.5	1	60	0	2205	2151	4166
4028	4040	4041	1	0	4.5	1	30	1	2205	1967	
4040	4041	4484	1	0	4.5	1	40	1	2205	1990	
4040	4041	4484	2	0	4.5	1	30	1	2205	1967	3957
4484	4029	1049	1	0	4.5	1	30	1	2205	1967	
4484	4029	4028	1	0	4.5	1	30	1	2205	1967	
4484	4029	4028	2	0	4.5	1	40	1	2205	1990	3957
4042	4039	4035	1	0	3.5	0	60	0	2105	2105	
4042	4039	4035	2	0	3.5	0	60	1	2105	1965	4070
4041	4484	4039	1	0	6.8	1	60	1	2435	2239	
4041	4484	4029	1	0	4	1	60	1	2155	1966	
4041	4484	4029	2	0	4	1	60	1	2155	1966	3932

Table B.3: List of Traffic Signals

Node Number			**4102**						
Entry Node Number	Turn	Slope	Lane Width	Turn Prop'n	Turn Radius	Lane Factor	Saturati on Flow	Saturati on Flow	Multiple Lanes
4099	1	0	3.04	1	50	1	2059	1863	
	2	0	3.04	0	0	1	2059	1919	
4091	1	0	4.04	0	0	1	2159	2019	
	2	0	4.04	1	30	1	2159	1923	
	2	**2**	**2.5**	**0**	**0**	**0**	**1921**	**1921**	**3844**
Node Number			**4090**						
Entry Node Number	Turn	Slope	Lane Width	Turn Prop'n	Turn Radius	Lane Factor	Saturati on Flow	Saturati on Flow	Multiple Lanes
4092	1	0	3.1	1	40	1	2065	1855	
	2	0	3.1	0	0	1	2065	1925	
4101	1	0	4.04	0	0	1	2159	2019	
	2	0	4.04	1	30	1	2159	1923	
Node Number			**4280**						
Entry Node Number	Turn	Slope	Lane Width	Turn Prop'n	Turn Radius	Lane Factor	Saturation Flow	Saturation Flow	Multiple Lanes
4259	1	0	3.6	1	40	1	2115	1904	
	1	0	3.6	1	40	0	2115	2039	3942
	2	0	4	0	0	0	2155	2155	
	3	0	4	1	50	0	2155	2092	
4270	1	0	3.6	1	40	1	2115	1904	
	2	0	3.6	0	0	1	2115	1975	
	3	0	3.6	1	40	0	2115	2039	
	3	0	3.6	1	40	0	2115	2039	4077
4286	1	0	3.6	1	25	1	2115	1863	
	2	0	3.6	0	0	1	2115	1975	
	3	0	3.6	1	30	1	2115	1881	
1094	1	0	3.6	1	25	1	2115	1863	
	2	0	3.6	0	0	1	2115	1975	
	2	0	3.6	0	0	0	2115	2115	4090
	3	0	3.6	1	30	0	2115	2014	

Node Number 4270

Entry Node Number	Turn	Slope	Lane Width	Turn Prop'n	Turn Radius	Lane Factor	Saturation Flow	Saturation Flow	Multiple Lanes
4305	1	0	3.25	1	15	1	2080	1764	
	2	0	3.25	0	0	1	2080	1940	
	3	0	3.25	1	30	0	2080	1981	
	4	0	3.25	1	25	0	2080	1962	
4277	1	0	3.00	1	20	1	2055	1781	
	2	0	3.00	0	0	1	2055	1915	
	3	0	3.00	1	40	1	2055	1846	
	4	0	3.00	1	15	1	2055	1741	
4280	1	0	3.0	1	25	1	2055	1807	
	2	0	3.0	0	0	1	2055	1915	
	3	0	3.0	0	0	0	2055	2055	
	4	0	3.0	1	20	0	2055	1912	
4228	1	0	3.25	1	15	1	2080	1764	
	2	0	3.25	1	40	1	2080	1870	
	3	0	3.25	0	0	1	2080	1940	
	4	0	3.25	1	30	1	2080	1848	
4260	1	0	3.75	1	20	1	2130	1851	
	2	0	3.75	1	40	1	2130	1918	
	3	0	3.75	0	0	1	2130	1990	
	4	0	3.75	1	20	0	2130	1981	

Node Number 4305

Entry Node Number	Turn	Slope	Lane Width	Turn Prop'n	Turn Radius	Lane Factor	Saturation Flow	Saturation Flow	Multiple Lanes
4310	1	0	3.5	1	20	1	2105	1828	
	2	0	3.5	0	0	0	2105	2105	
4320	1	0	3.25	1	20	1	2080	1805	
	2	0	3.25	1	25	0	2080	1962	
4270	1	0	3.5	0	0	1	2105	1965	
	2	0	3.5	1	20	0	2105	1958	

Node Number 4091

Entry Node Number	Turn	Slope	Lane Width	Turn Prop'n	Turn Radius	Lane Factor	Saturation Flow	Saturation Flow	Multiple Lanes
4088	1	0	3.4	1	50	1	2095	1898	
	2	0	3.4	0	0	1	2095	1955	

	2	0	3.28	0	0	1	2083	1943	3898
4090	1	0	4.04	1	30	1	2159	1923	
Node Number		**4101**							
Entry Node Number	Turn	Slope	Lane Width	Turn Prop'n	Turn Radius	Lane Factor	Saturation Flow	Saturation Flow	Multiple Lanes
4110	1	0	3.63	1	40	1	2118	1907	
	2	0	3.23	0	0	1	2078	1938	
4102	1	0	4.04	0	0	1	2159	2019	
	2	0	4.04	1	30	1	2159	1923	
	2	2	2.5	0	0	0	1921	1921	3844

Table B.4: List of Un-Signalized Roundabouts

JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4311	4340	0.27	6.26	1.04	1972	1.19		0.58	3374	1.1
	4310	0.27	6.26	0.98	1864	1.19		0.55	3374	1.1
	4307	0.21	6.80	0.98	2019	1.19		0.58	3498	1.0
	4337	0.16	6.79	1.00	2050	1.19		0.59	3495	1.0
				Circulation Capacity					3374	1.1
JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4466	4474	0.25	6.47	1.02	1993	1.37		0.67	2981	1.2
	4465	0.36	5.62	0.97	1650	1.37		0.59	2795	1.3
	4453	0.24	6.53	1.01	1989	1.37		0.66	2992	1.2
		0.32	5.94	1.00	1798	1.37		0.63	2868	1.3
JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4443	4445	0.37	7.05	0.97	2079	1.01		0.50	4160	0.9
	4454	0.18	6.68	0.98	1989	1.01		0.49	4067	0.9
	4435	0.53	5.42	0.99	1625	1.01		0.44	3698	1.0
	4481	0.59	5.53	1.01	1686	1.06		0.47	3576	1.0
			Circulation Capacity						3576	1.0

JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4378	4395	0.24	6.03	0.99	1812	1.09		0.50	3614	1.0
	4376	0.43	5.66	0.99	1703	1.09		0.49	3510	1.0
	4360	0.12	7.21	0.96	2096	1.09		0.54	3904	0.9
	4375	0.43	5.16	0.96	1494	1.09		0.45	3357	1.1
	4385	0.88	6.49	1.00	1972	1.09		0.53	3735	1.0
			Circulation Capacity						3357	1.1
JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4331	4338	0.00	3.00	0.97	878	1.46		0.47	1850	1.9
	4330	0.00	4.00	0.98	1192	1.46		0.54	2193	1.6
	4332	0.00	3.00	0.98	894	1.46		0.48	1850	1.9
		Circulation Capacity							1850	1.9
JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4337	4360	0.80	5.42	0.99	1619	1.06		0.46	3542	1.0
	4341	0.64	5.25	0.98	1564	1.19		0.50	3110	1.2
	4311	0.80	5.42	1.00	1641	1.09		0.48	3440	1.0
	4315	0.64	5.25	0.99	1581	1.19		0.51	3110	1.2
	4329	0.93	5.23	1.00	1578	1.09		0.47	3380	1.1
		Circulation Capacity							3110	1.2
JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4477	4469	0.00	4.00	0.93	1123	1.49		0.52	2150	1.7
	4458	0.00	4.00	0.97	1180	1.49		0.55	2150	1.7
	4480	0.00	4.00	0.99	1199	1.49		0.56	2150	1.7
				Circulation Capacity					2150	1.7
JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				

		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4458	4477	0.00	3.50	0.93	990	1.06		0.35	2803	1.3
	4467	-0.32	3.34	0.95	964	1.19		0.40	2432	1.5
	4459	0.00	3.50	0.93	987	1.09		0.36	2722	1.3
	4448	0.16	4.76	0.95	1371	1.19		0.46	2959	1.2
	4441	0.34	4.39	1.00	1330	1.09		0.43	3091	1.2
	4456	0.11	3.61	0.93	1021	1.09		0.37	2771	1.3
				Circulation Capacity					2432	1.5
JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4471	4478	0.53	3.97	0.98	1183	1.49		0.55	2141	1.7
	4466	0.00	3.50	0.95	1009	1.49		0.51	1992	1.8
	4468	0.43	3.14	0.95	906	1.49		0.49	1868	1.9
			Circulation Capacity						1868	1.9
JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4393	4400	0.32	3.12	0.93	883	1.48		0.47	1878	1.9
	4389	0.80	3.19	0.95	920	1.48		0.48	1904	1.9
	4388	0.80	3.19	0.97	935	1.48		0.49	1904	1.9
					Circulation Capacity				1878	1.9
JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4412	4417	0.00	4.00	0.93	1132	1.49		0.53	2150	1.7
	4404	0.17	3.56	0.93	1007	1.49		0.50	2012	1.8
	4400	0.00	3.00	0.93	849	1.49		0.47	1814	2.0
				Circulation Capacity					1814	2.0
JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4362	4373	0.00	3.50	0.97	1025	1.49		0.51	1992	1.8

	4359	0.00	3.50	0.97	1025	1.49		0.51	1992	1.8
	4352	0.32	3.22	0.97	943	1.49		0.50	1896	1.9
		0.19	3.81	0.97	1115	1.49		0.53	2092	1.7
				Circulation Capacity					1896	1.9
JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4348	4352	0.46	4.04	1.00	1224	1.49		0.57	2159	1.7
	4347	0.11	3.41	0.95	979	1.49		0.50	1956	1.8
	4349	0.00	3.50	0.84	887	1.49		0.45	1988	1.8
			Circulation Capacity						1956	1.8
JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4329	4330	0.16	4.88	0.98	1453	1.49		0.61	2390	1.5
	4337	0.16	3.76	0.95	1079	1.49		0.52	2076	1.7
	4325	0.11	4.82	0.82	1197	1.49		0.50	2376	1.5
				Circulation Capacity					2076	1.7
JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4262	4279	0.27	4.15	0.92	1157	1.49		0.53	2195	1.6
	4278	0.00	4.50	0.95	1297	1.49		0.57	2292	1.6
	4245	0.24	3.60	0.85	931	1.49		0.46	2026	1.8
	Circulation time =		Circulation Capacity						2026	1.8
JUNCTION					**CALCULATIONS**					
						SATURATION FLOWS				
		ENTRY CAPACITY			Entry			CIRC CAPACITY	Circulation	GAP
No	Entry	*(s)*	*(x2)*	*(k)*	*(QE)*	*(tD)*		*(fc)*	*(QC)*	*(g)*
4058	4078	0.57	4.67	0.98	1386	1.48		0.59	2353	1.5
	4060	0.48	4.77	0.95	1375	1.48		0.58	2378	1.5
	4049	0.32	3.61	1.00	1094	1.48		0.54	2043	1.8
				Circulation Capacity					2043	1.8

APPENDIX C

Peak Hour to Peak Period Factors

Table C.1: Peak Period to Hour factors for Car Prior Matrix Preparation

Commute AM			
Scaling Factor			
	1	2	3
1	0.378	0.376	0.367
2	0.379	0.376	0.368
3	0.365	0.380	0.331
Commute IP			
Scaling Factor			
	1	2	3
1	0.159	0.158	0.159
2	0.161	0.160	0.158
3	0.162	0.164	0.161
Commute PM			
Scaling Factor			
	1	2	3
1	0.353	0.357	0.360
2	0.346	0.341	0.345
3	0.336	0.330	0.325

Business AM			
Scaling Factor			
	1	2	3
1	0.381	0.378	0.370
2	0.369	0.367	0.366
3	0.359	0.355	0.345
Business IP			
Scaling Factor			
	1	2	3
1	0.158	0.158	0.159
2	0.160	0.160	0.158
3	0.161	0.164	0.161
Business PM			
Scaling Factor			
	1	2	3
1	0.358	0.350	0.353
2	0.344	0.331	0.331
3	0.338	0.327	0.329

Other AM			
Scaling Factor			
	1	2	3
1	0.378	0.378	0.365
2	0.378	0.373	0.370
3	0.367	0.363	0.346
Other IP			
Scaling Factor			
	1	2	3
1	0.159	0.157	0.159
2	0.161	0.160	0.158
3	0.161	0.163	0.160
Other PM			
Scaling Factor			
	1	2	3
1	0.356	0.354	0.355
2	0.348	0.331	0.329
3	0.335	0.327	0.327

Note that no goods vehicle period-to-hour scaling is needed because the LGV and HGV trips are taken directly from the expanded RSI records.

APPENDIX D

Select Link Analysis

Table D.1: RSI Matrix Comparison with Prior SLA Matrix for Car Trips (AM Peak Inbound)

Inbound									
RSI Matrix Vs Prior SLA Matrix (AM-Peak)									
RSI Site ID	Link ID	Direction	In/Out	Observed Count	RSI Observed Matrix Total	Prior SLA Matrix Total	Difference	%Difference	GEH
ANSA2	4513-4280	WB	Inbound	292	292	610	-318	109%	15.0
ANSA3	1061-4320	SB	Inbound	719	719	731	-12	2%	0.4
ANSA4	4104-4150	NB	Inbound	215	215	77	137	-64%	11.4
ANSA5	4238-4210	SB	Inbound	147	147	98	48	-33%	4.3
BC12	4378-4360	SB	Inbound	1058	1058	824	234	-22%	7.6
					2430	**2341**	**89**	**-4%**	**1.8**

Table D.2: RSI Matrix Comparison with Prior SLA Matrix for Car Trips (AM Peak Outbound)

Outbound									
RSI Matrix Vs Prior SLA Matrix (AM-Peak)									
RSI Site ID	Link ID	Direction	In/Out	Observed Count	RSI Observed Matrix Total	Prior SLA Matrix Total	Difference	%Difference	GEH
ANSA 1	4118-4110	SB	Outbound	920	920	934	-14	2%	0.5
BC5	4219-4212	WB	Outbound	738	738	586	152	-21%	5.9
BC6	4181-4168	WB	Outbound	739	739	662	76	-10%	2.9
					2396	**2182**	**214**	**-9%**	**4.5**

Table D.3: RSI Matrix Comparison with Prior SLA Matrix for Car Trips (IP Peak Inbound)

Inbound									
RSI Matrix Vs Prior SLA Matrix (IP-Peak)									
RSI Site ID	Link ID	Direction	In/Out	Observed Count	RSI Observed Matrix Total	Prior SLA Matrix Total	Difference	%Difference	GEH
ANSA2	4513-4280	WB	Inbound	277	277	317	-40	14%	2.3
ANSA3	1061-4320	SB	Inbound	437	437	497	-60	14%	2.8
ANSA4	4104-4150	NB	Inbound	135	135	53	82	-61%	8.5
ANSA5	4238-4210	SB	Inbound	75	75	75	-1	1%	0.1
BC12	4378-4360	SB	Inbound	868	868	720	147	-17%	5.2

1792	**1663**	**129**	**-7%**	**3.1**

Table D.4: RSI Matrix Comparison with Prior SLA Matrix for Car Trips (IP Peak Outbound)

Outbound

RSI Matrix Vs Prior SLA Matrix (IP-Peak)									
RSI Site ID	**Link ID**	**Direction**	**In/Out**	**Observed Count**	**RSI Observed Matrix Total**	**Prior SLA Matrix Total**	**Difference**	**%Difference**	**GEH**
ANSA1	4118-4110	SB	Outbound	571	571	805	-234	41%	8.9
BC5	4219-4212	WB	Outbound	548	548	473	75	-14%	3.3
BC6	4181-4168	WB	Outbound	488	488	378	110	-23%	5.3
					1608	**1657**	**-49**	**3%**	**1.2**

Table D.5: RSI Matrix Comparison with Prior SLA Matrix for Car Trips (PM Peak Inbound)

Inbound

RSI Matrix Vs Prior SLA Matrix (PM-Peak)									
RSI Site ID	**Link ID**	**Direction**	**In/Out**	**Observed Count**	**RSI Observed Matrix Total**	**Prior SLA Matrix Total**	**Difference**	**%Difference**	**GEH**
ANSA2	4513-4280	WB	Inbound	366	366	448	-82	22%	4.1
ANSA3	1061-4320	SB	Inbound	472	472	593	-121	26%	5.2
ANSA4	4104-4150	NB	Inbound	379	379	132	247	-65%	15.4
ANSA5	4238-4210	SB	Inbound	88	88	82	6	-7%	0.6
BC12	4378-4360	SB	Inbound	1034	1034	934	100	-10%	3.2
					2339	**2189**	**150**	**-6%**	**3.1**

Table D.6: RSI Matrix Comparison with Prior SLA Matrix for Car Trips (PM Peak Outbound)

Outbound

RSI Matrix Vs Prior SLA Matrix (Pm-Peak)									
RSI Site ID	**Link ID**	**Direction**	**In/Out**	**Observed Count**	**RSI Observed Matrix Total**	**Prior SLA Matrix Total**	**Difference**	**%Difference**	**GEH**
ANSA1	4118-4110	SB	Outbound	762	762	971	-209	27%	7.1
BC5	4219-4212	WB	Outbound	625	625	494	130	-21%	5.5
BC6	4181-4168	WB	Outbound	598	598	529	69	-12%	2.9
					1984	**1994**	**-10**	**0%**	**0.2**

Table D.7: RSI Matrix Comparison with Prior SLA Matrix for LGV Trips (AM Peak Inbound)

Inbound									
RSI Matrix Vs Prior SLA Matrix (AM-Peak)									
RSI Site ID	Link ID	Direction	In/Out	Observed Count	RSI Observed Matrix Total	Prior SLA Matrix Total	Difference	%Difference	GEH
ANSA2	4513-4280	WB	Inbound	33	33	46	-13	39%	2.1
ANSA3	1061-4320	SB	Inbound	41	41	68	-27	66%	3.7
ANSA4	4104-4150	NB	Inbound	17	17	16	1	-7%	0.3
ANSA5	4238-4210	SB	Inbound	13	12	8	4	-37%	1.4
BC12	4378-4360	SB	Inbound	56	57	97	-40	71%	4.6
					160	**234**	**-74**	**47%**	**5.3**

Table D.8: RSI Matrix Comparison with Prior SLA Matrix for LGV Trips (AM Peak Outbound)

Outbound									
RSI Matrix Vs Prior SLA Matrix (AM-Peak)									
RSI Site ID	Link ID	Direction	In/Out	Observed Count	RSI Observed Matrix Total	Prior SLA Matrix Total	Difference	%Difference	GEH
ANSA1	4118-4110	SB	Outbound	60	60	120	-61	102%	6.4
BC5	4219-4212	WB	Outbound	45	45	30	15	-32%	2.4
BC6	4181-4168	WB	Outbound	25	26	39	-13	51%	2.3
					130	**189**	**-59**	**45%**	**4.7**

Table D.9: RSI Matrix Comparison with Prior SLA Matrix for LGV Trips (IP Peak Inbound)

Inbound									
RSI Matrix Vs Prior SLA Matrix (IP-Peak)									
RSI Site ID	Link ID	Direction	In/Out	Observed Count	RSI Observed Matrix Total	Prior SLA Matrix Total	Difference	%Difference	GEH
ANSA2	4513-4280	WB	Inbound	31	31	30	1	-3%	0.2
ANSA3	1061-4320	SB	Inbound	39	39	64	-26	66%	3.6
ANSA4	4104-4150	NB	Inbound	17	16	12	4	-28%	1.2
ANSA5	4238-4210	SB	Inbound	9	9	19	-9	96%	2.4
BC12	4378-4360	SB	Inbound	63	64	84	-20	30%	2.3
					159	**208**	**-49**	**31%**	**3.6**

Table D.10: RSI Matrix Comparison with Prior SLA Matrix for LGV Trips (IP Peak Outbound)

Outbound

RSI Matrix Vs Prior SLA Matrix (IP-Peak)									
RSI Site ID	Link ID	Direction	In/Out	Observed Count	RSI Observed Matrix Total	Prior SLA Matrix Total	Difference	%Difference	GEH
ANSA1	4118-4110	SB	Outbound	56	56	113	-58	104%	6.3
BC5	4219-4212	WB	Outbound	50	50	41	9	-18%	1.3
BC6	4181-4168	WB	Outbound	24	25	43	-18	73%	3.1
					131	**198**	**-67**	**51%**	**5.2**

Table D.11: RSI Matrix Comparison with Prior SLA Matrix for LGV Trips (PM Peak Inbound)

Inbound

RSI Matrix Vs Prior SLA Matrix (PM-Peak)									
RSI Site ID	Link ID	Direction	In/Out	Observed Count	RSI Observed Matrix Total	Prior SLA Matrix Total	Difference	%Difference	GEH
ANSA2	4513-4280	WB	Inbound	22	22	23	-1	2%	0.1
ANSA3	1061-4320	SB	Inbound	33	33	57	-24	71%	3.5
ANSA4	4104-4150	NB	Inbound	16	16	15	1	-4%	0.2
ANSA5	4238-4210	SB	Inbound	9	9	17	-9	101%	2.4
BC12	4378-4360	SB	Inbound	47	47	86	-39	82%	4.7
					127	**198**	**-71**	**56%**	**5.6**

Table D.12: RSI Matrix Comparison with Prior SLA Matrix for LGV Trips (PM Peak Outbound)

Outbound

RSI Matrix Vs Prior SLA Matrix (Pm-Peak)									
RSI Site ID	Link ID	Direction	In/Out	Observed Count	RSI Observed Matrix Total	Prior SLA Matrix Total	Difference	%Difference	GEH
ANSA1	4118-4110	SB	Outbound	64	65	103	-38	59%	4.2
BC5	4219-4212	WB	Outbound	41	41	31	10	-24%	1.6
BC6	4181-4168	WB	Outbound	21	21	32	-11	54%	2.2
					127	**167**	**-40**	**31%**	**3.3**

Table D.13: RSI Matrix Comparison with Prior SLA Matrix for HGV Trips (AM Peak Inbound)

Inbound

RSI Matrix Vs Prior SLA Matrix (AM-Peak)									
RSI Site ID	**Link ID**	**Direction**	**In/Out**	**Observed Count**	**RSI Observed Matrix Total**	**Prior SLA Matrix Total**	**Difference**	**%Difference**	**GEH**
ANSA2	4513-4280	WB	Inbound	9	10	17	-8	83%	2.1
ANSA3	1061-4320	SB	Inbound	7	8	34	-27	353%	5.8
ANSA4	4104-4150	NB	Inbound	0	1	2	-2	349%	1.5
ANSA5	4238-4210	SB	Inbound	0	0	1	-1	0%	-
BC12	4378-4360	SB	Inbound	19	19	47	-28	148%	4.9
					37	**102**	**-65**	**179%**	**7.9**

Table D.14: RSI Matrix Comparison with Prior SLA Matrix for HGV Trips (AM Peak Outbound)

Outbound

RSI Matrix Vs Prior SLA Matrix (AM-Peak)									
RSI Site ID	**Link ID**	**Direction**	**In/Out**	**Observed Count**	**RSI Observed Matrix Total**	**Prior SLA Matrix Total**	**Difference**	**%Difference**	**GEH**
ANSA1	4118-4110	SB	Outbound	79	79	80	-1	1%	0.1
BC5	4219-4212	WB	Outbound	7	7	9	-2	25%	0.6
BC6	4181-4168	WB	Outbound	4	4	11	-7	213%	2.8
					89	**99**	**-10**	**11%**	**1.0**

Table D.15: RSI Matrix Comparison with Prior SLA Matrix for HGV Trips (IP Peak Inbound)

Inbound

RSI Matrix Vs Prior SLA Matrix (IP-Peak)									
RSI Site ID	**Link ID**	**Direction**	**In/Out**	**Observed Count**	**RSI Observed Matrix Total**	**Prior SLA Matrix Total**	**Difference**	**%Difference**	**GEH**
ANSA2	4513-4280	WB	Inbound	8	7	14	-7	92%	2.0
ANSA3	1061-4320	SB	Inbound	6	6	35	-29	483%	6.4
ANSA4	4104-4150	NB	Inbound	1	0	9	-9	0%	-
ANSA5	4238-4210	SB	Inbound	0	0	4	-4	0%	-
BC12	4378-4360	SB	Inbound	16	16	57	-41	261%	6.8
					29	**119**	**-90**	**312%**	**10.5**

Table D.16: RSI Matrix Comparison with Prior SLA Matrix for HGV Trips (IP Peak Outbound)

Outbound

RSI Matrix Vs Prior SLA Matrix (IP-Peak)									
RSI Site ID	Link ID	Direction	In/Out	Observed Count	RSI Observed Matrix Total	Prior SLA Matrix Total	Difference	%Difference	GEH
ANSA1	4118-4110	SB	Outbound	89	88	92	-4	4%	0.4
BC5	4219-4212	WB	Outbound	5	5	8	-3	57%	1.2
BC6	4181-4168	WB	Outbound	1	0	10	-9	5187%	4.3
					94	**110**	**-16**	**17%**	**1.6**

Table D.17: RSI Matrix Comparison with Prior SLA Matrix for HGV Trips (PM Peak Inbound)

Inbound

RSI Matrix Vs Prior SLA Matrix (PM-Peak)									
RSI Site ID	Link ID	Direction	In/Out	Observed Count	RSI Observed Matrix Total	Prior SLA Matrix Total	Difference	%Difference	GEH
ANSA2	4513-4280	WB	Inbound	5	4	8	-3	78%	1.4
ANSA3	1061-4320	SB	Inbound	3	3	21	-19	696%	5.4
ANSA4	4104-4150	NB	Inbound	0	0	6	-6	0%	-
ANSA5	4238-4210	SB	Inbound	0	0	3	-3	0%	-
BC12	4378-4360	SB	Inbound	10	10	39	-29	305%	6.0
					17	**77**	**-60**	**362%**	**8.8**

Table D.18: RSI Matrix Comparison with Prior SLA Matrix for HGV Trips (PM Peak Outbound)

Outbound

RSI Matrix Vs Prior SLA Matrix (Pm-Peak)									
RSI Site ID	Link ID	Direction	In/Out	Observed Count	RSI Observed Matrix Total	Prior SLA Matrix Total	Difference	%Difference	GEH
ANSA1	4118-4110	SB	Outbound	66	66	60	6	-9%	0.8
BC5	4219-4212	WB	Outbound	2	2	16	-14	844%	4.8
BC6	4181-4168	WB	Outbound	1	0	6	-6	1774%	3.3
					68	**82**	**-14**	**21%**	**1.6**

APPENDIX E

SATURN Model Warning Log

Table E.1: SATURN Model Detailed Warning Log

A585 SATURN Model Warnings Log - Run76 - Network version 38							
Error No.	**Error Description**	**Frequency**			**Type**	**Comment**	**Action**
		AM	**IP**	**PM**			
3	Some but not all turns coded as G – normally they should all be G	2	2	2	Warning	Most of these are loading links for Zonal trips. They are coded as per on ground structure.	No further action required
8	Turn marker X has appeared for two or more turns on the same link	1	1	1	Warning	The structure and signal phasing suggests that the second X Marker should be present.	No further action required
12	More than one give-way turn sharing a single lane at a priority junction. See Section 6.4.9.	176	176	176	Warning	All the warnings are at loading links and markers are given with reduced sat- flows and it is expected that the loading links are with one lane and shares the movement	No further action required
16	Rather long inter-green time for a stage	1	4	5	Warning	The long green time is because there is bicycle crossing at this signal	No further action required
23	The total upstream saturation entry flows seem to be inconsistent with the number of lanes at the downstream end.	22	22	22	Warning	The difference between the upstream and downstream saturation is due to the difference in number of lanes at the upstream Node stop lane the saturation flow at the upstream is controlled by the stacking capacity.	No further action required
24	Input link time/speed out of range set by the speed-flow record	6	6	6	Warning	The Cruise speed coded and difference with the free flow speed is the Capacity index differ by a minimal value.	No further action required
32	Simulation link distances, times and/or speeds differ in reverse directions. Any difference at all in distances triggers a warning but times must differ by 10% or greater and/or speeds must differ by greater than 1.5 kph. The critical limits are also name list parameters under &PARAM with W32D	191	191	191	Warning	There is only one difference due to the network with regard to distance (due to the network structure). Difference in speeds are due to cruise speeds being different in different directions. Cruise Speeds are taken from ITN and RTM.	No further action required

A585 SATURN Model Warnings Log - Run76 - Network version 38							
Error No.	Error Description	Frequency			Type	Comment	Action
		AM	IP	PM			
	= 0.0 by default for zero differences in distances, W32T = 0.10 (i.e., 10%) for relative times and W32KPH = 1.5 for speeds.						
33	Suspicious link distance – the input value differs "significantly" from the crow-fly value. See Serious Warning 136 for "highly significant" differences. A significant difference is defined to be either greater than 10 metres or a relative difference of either more than plus 10% or minus 5% relative to the crow-fly. Note that differences between coded and crow-fly distances may also be displayed as link annotation data within P1X.	154	154	154	Warning	The distance taken for every link is from ITN. The difference is mainly because of the links with curve and there many in our Network.	No further action required
43	A turn is coded as a right turn but is not the last. E.g., the turn in question enters from the south and exits to the east but there is also a one-way entry from the S-E between the two.	2	2	2	Warning	This signals staging and the Node structure is like that So the X markers are coded. This Node is a five arm junction.	No further action required
52	An external simulation node with 2 arms	1	1	1	Warning	The External Node coded connecting to two simulation Nodes.	No further action required
73	Bus routes with U-turns at non-simulation nodes	19	19	19	Warning	These are buffer nodes in general the bus routes are not expected to cause any problem in Simulation of our area of interest.	No further action required

A585 SATURN Model Warnings Log - Run76 - Network version 38							
Error No.	Error Description	Frequency			Type	Comment	Action
		AM	IP	PM			
79	An X-turn at signals is only in stages in which it is unopposed – hence it has nothing to give way to. (N.B. This may fail to detect the situation where there are two opposed (X) right turns in a single stage but which – through the choice of NOTUK and/or D Priority Modifiers – do not interfere because they do not hook; see 6.4.2.7.). See also Serious Warning 111 which is more general and includes, e.g., give-ways at priority junctions.	3	3	4	Warning	These warnings do not affect simulation. Saturn will give the priority to the movement with X, So this might not affect the Simulation of Nodes.	No further action required
84	An inter-green time is redundant – all turns continuously green	17	16	18	Warning	The signal staging has been set in this way to reduce the delay in the shared movement the turn associated with the same lane. This will reduce the impact of delay at this junction.	No further action required
91	Two turns have the same lanes at signals but do not always appear together in the same signal phases; hence one turn will potentially block the other. See also Serious Warning 130 which is the same basic situation but judged to be a bit more severe.	2	2	2	Warning	The signal staging is given like that as the flow in the sharing movement would be very less and there is no blocking back due to this movement.	No further action required
92	A zone connected under 33333 would be better coded under 22222; this removes the possibility of U-turns. See Section 16.6.4 and 18.9.1. See also Serious Warning 174 below.	144	144	144	Warning	Coding the connector in 22222 card would induce delay in the links. Anyways we are also simulating the Node delay. There is a potential risk of double counting the delay.	No further action required

A585 SATURN Model Warnings Log - Run76 - Network version 38							
Error No.	**Error Description**	**Frequency**			**Type**	**Comment**	**Action**
		AM	**IP**	**PM**			
97	Opposing x-turns at signals hook; i.e., interfere. Since such turns can make convergence more difficult it is worth checking to see if any such occurrences should be converted to non-hooking. As a general rule in modern networks hooked turns at signals are very much the exception rather than the rule (although the defaults in SATURN may still indicate otherwise; see 15.7.1). See Section 6.4.2.6.	84	84	84	Warning	The Signal staging for the signals are arranged to be hooked. Those are not causing more delays at signals. So there no potential effect of re-routing.	No further action required
98	The lane structure suggests that a minor turn might be given a clear exit priority modifier C. See Section 6.4.2.6	70	70	71	Warning	The Node structure on ground doesn't suggest. This might be due to co-ordinates.	No further action required
111	No opposing turns found for a turn with a priority marker at either a priority or signalised junction. See also Warning 79 which is specific to X-turns at signals and which is effectively a sub-set of 111.	4	4	5	Serious Warnings	These warnings do not affect simulation. Saturn will give the priority to the movement with X, So this might not affect the Simulation of Nodes.	No further action required
135	More than one give-way turn sharing the single lane: major arm at a priority junction; see Section 6.4.9.	147	147	147	Serious Warnings	All the warnings are at loading links and markers are given with reduced sat- flows and it is expected that the loading links are with one lane and shares the movement	No further action required
136	Suspicious link distance – the input value differs "highly significantly" from the crow-fly value. See Warning 33 for a "significant" difference. A highly significant difference is defined to be either greater than 50 metres or a relative difference of either more than plus 30% or minus 25%.	71	71	71	Serious Warnings	The distance taken for every link is from ITN. The difference is mainly because of the links with curve and there many in our Network.	No further action required

A585 SATURN Model Warnings Log - Run76 - Network version 38							
Error No.	**Error Description**	**Frequency**			**Type**	**Comment**	**Action**
		AM	**IP**	**PM**			
137	The turn saturation flows per lane differ widely single arm at a signalised or priority junction; see Section 6.4.6.3.	232	232	232	Serious Warnings	The turn Saturation flow is varying because the B Node is a loading point from which the traffic loads to the network from a zone through a loading link, the saturation flow for the link is low. The turn saturation flows are varying at that Node significantly.	No further action required
138	The maximum saturation flow per lane on one roundabout arm is more than 50% greater than the minimum saturation flow per lane on another. One would normally expect similar design standards on all arms at a roundabout.	1	1	1	Serious Warnings	This a peculiar roundabout in which the roundabout design is very much like oval and lane configuration and design is varying for every arm the Saturation flow coded is calculated RR67 guidelines.	No further action required
147	A positive inter-green separates two identical stages	0	1	1	Serious Warnings	There is a pedestrian phase which is added up to the signal.	
152	A single-lane arm at signals which includes an X-marked turn; see Section 6.4.	61	62	62	Serious Warnings	There is only a single lane without any flare at this signalised junction and it is found that there are very few X-turning vehicles and so they do not cause any significant delay at these nodes.	No further action required
154	An X-turn shares identical lanes with the turn inside it but that turn could use lanes further inside to avoid being blocked by the X-turn. E.g., a straight-ahead movement and an X-turn are both allocated to lane 2 only so it might be possible to avoid the potential conflict by allowing the straight movement to use lane 1 as well. N.B. If the X-turn has a flare the warning is ignored.	2	2	2	Serious Warnings	These junctions the X turn movement is very low and the signal staging will take care for the shared X turn at this Node.	No further action required
156	The exit link from a merge has Equal/More lanes than the sum of the two merging turns	2	2	2	Serious Warnings	At this Node there is a lane gain post Merge.	No further action required

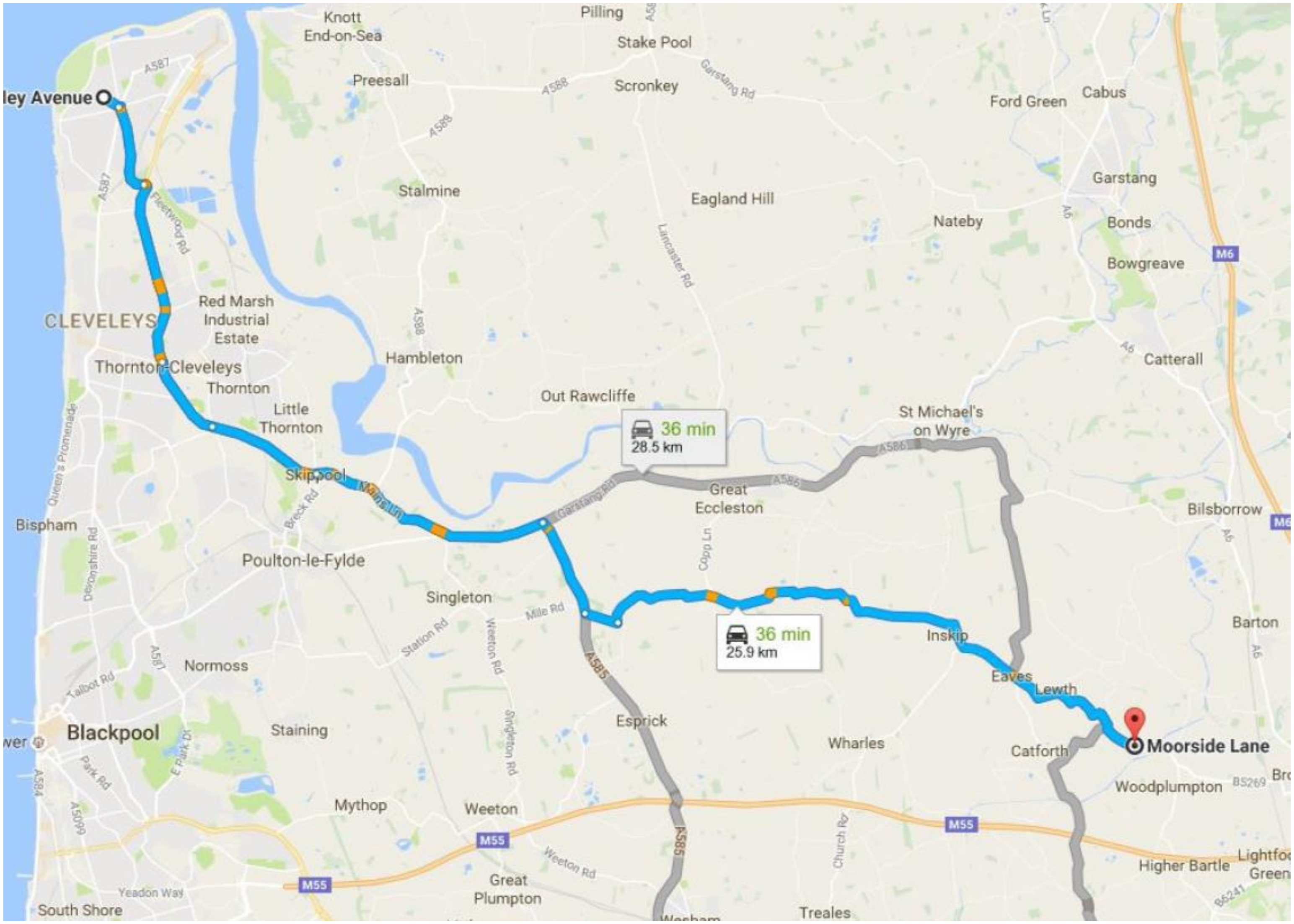
A585 SATURN Model Warnings Log - Run76 - Network version 38

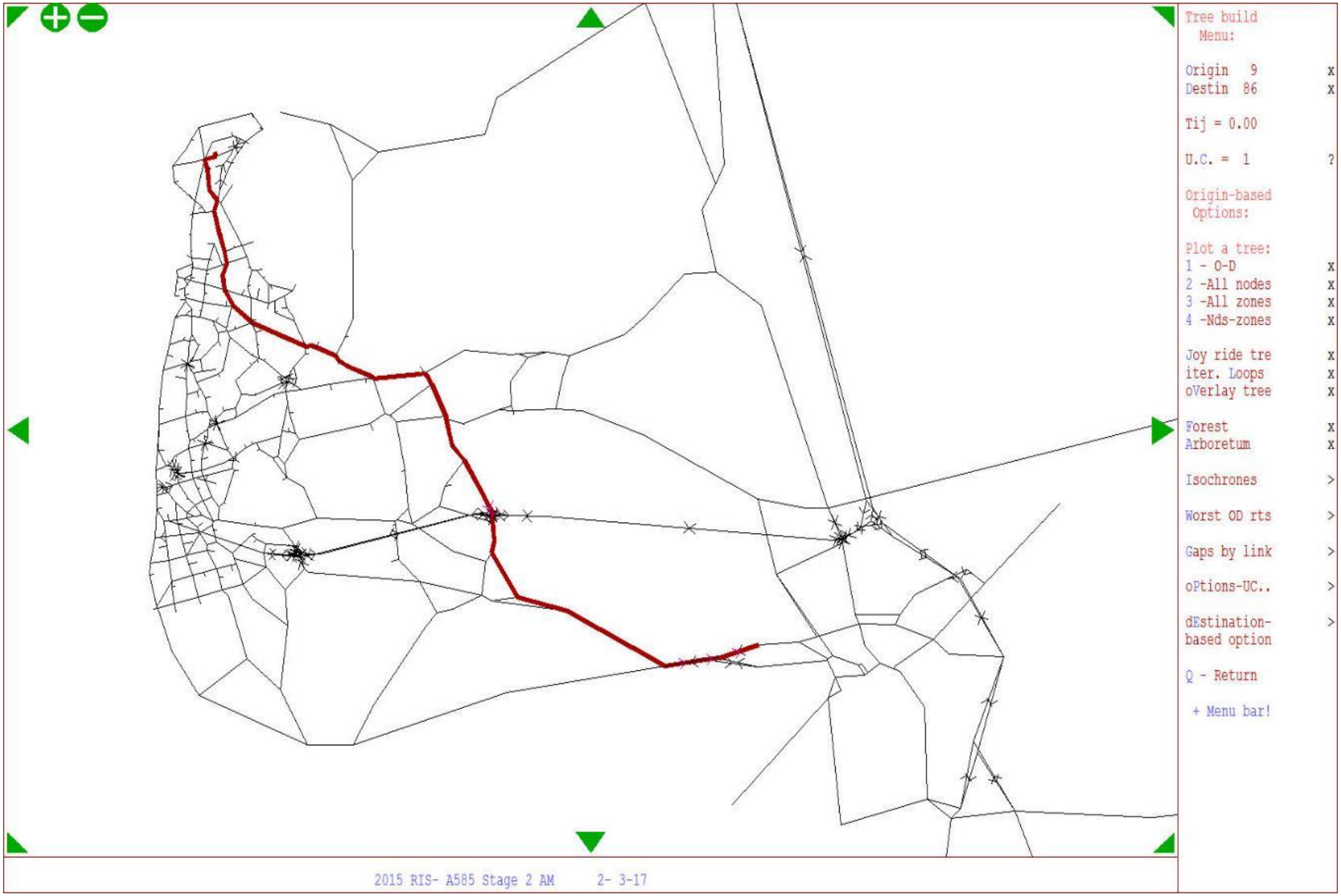
Error No.	Error Description	Frequency			Type	Comment	Action
		AM	IP	PM			
157	Mid-link capacity either >> or << stop-line saturation flows; the critical ratios are either 3 times or 1/3. See 6.4.12.1 and 8.4.4.	4	4	4	Serious Warnings	The SFC/mid link capacity taken are as per DMRB standard SFC and these particular links are in urban area with many seepages and outlets in the traffic. So this is justified to have a very low mid link capacity.	No further action required
178	Very strange stage sequencing for an X-turn at signals. E.g., an opposing turn continues at the end of the X-turn phase so that the (TAX) vehicles queued in the centre of the junction cannot clear.	13	12	13	Serious Warnings	The staging received is and post assignment the delay caused is minimal and indicates that all the vehicles are able to clear and there is no significant effect on the routeing.	No further action required
183	A simulation node has a LCY value of, say, 60 but all its neighbours have LCY = 70. See 15.15.3.	13	13	15	Serious Warnings	Signal staging and cycle length values are different because the traffic heading to this signal is very less and these Nodes are not causing any significant delays.	No further action required
186	Two stages are separated by an intergreen time of 0	2	2	0	Serious Warnings	The intergreens are zero in these stages as the movement continues in Next stage also.	No further action required
Non-Fatal Error	Too many U-Turns at external sim nodes for SATALL checks	1	1	1	Non-Fatal Error	Too many U turns are in Buffer area and the effect on area of interest minimal.	No further action required
Total <100 Series (Warnings) =		895	897	902			
Total 100<X<200 (Serious Warnings) =		552	553	555			
Total 200<X<300 (Semi-Fatal) =		0	0	0			
Total X>300 (Fatal) =		0	0	0			
Total Non- Fatal Error		1	1	1			
Total Errors		**1448**	**1451**	**1458**			

APPENDIX F

Network Routing Checks

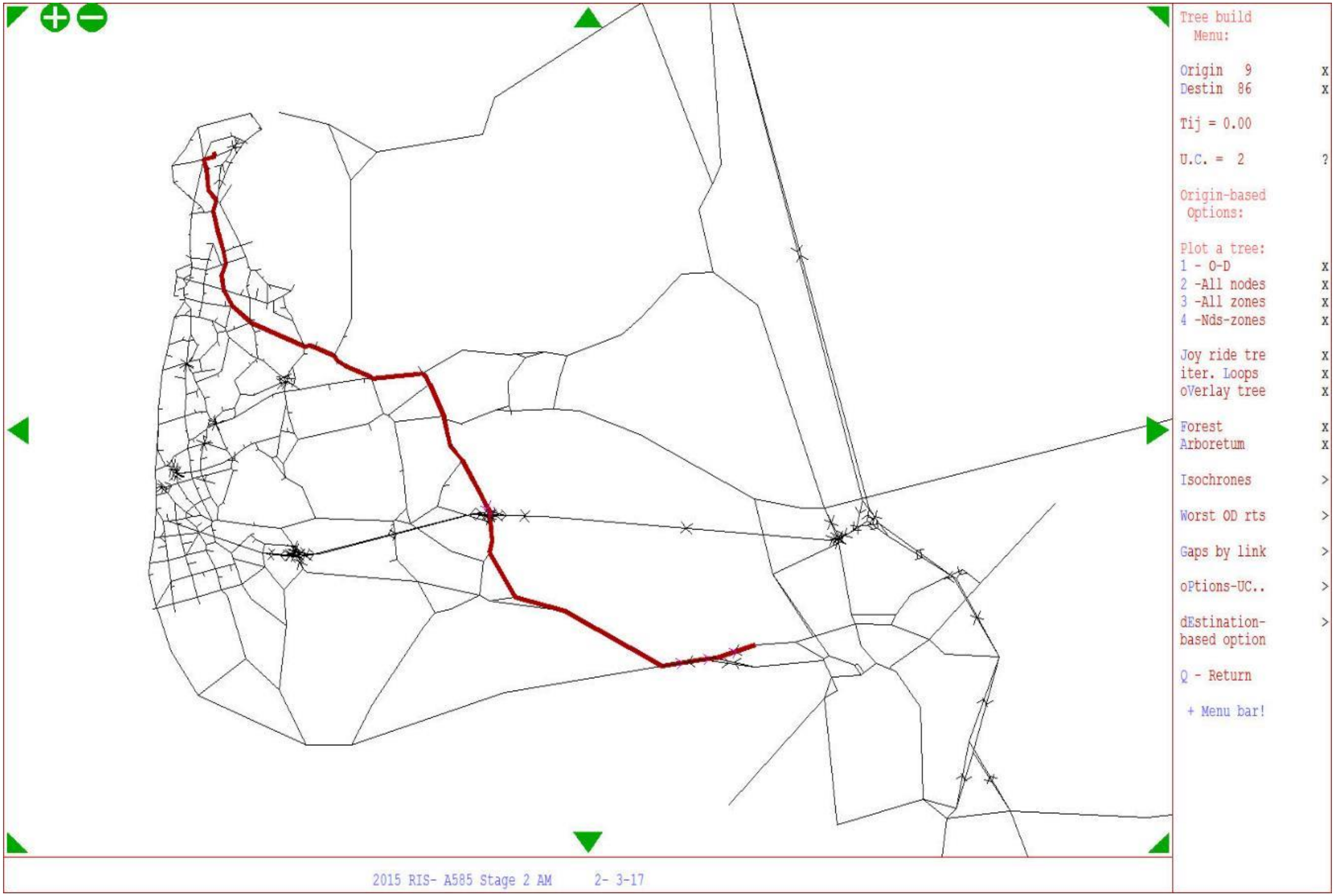
AM Networking Routing Checks


ley Avenue
Moorside Lane
36 min
28.5 km
36 min
25.9 km
CLEVELEYS
Thornton-Cleveleys
Skippool
Blackpool
Poulton-le-Fylde
Great Eccleston
Inskip
Garstang
Knott End-on-Sea
Preesall
Pilling
Stalmine
Hambleton
Singleton
Out Rawcliffe
St Michael's on Wyre
Eaves
Lewth
Catforth
Woodplumpton
Esprick
Wharles
Weeton
Great Plumpton
Mythop
Staining
Normoss
Bispham
M55
M6
A585
A586



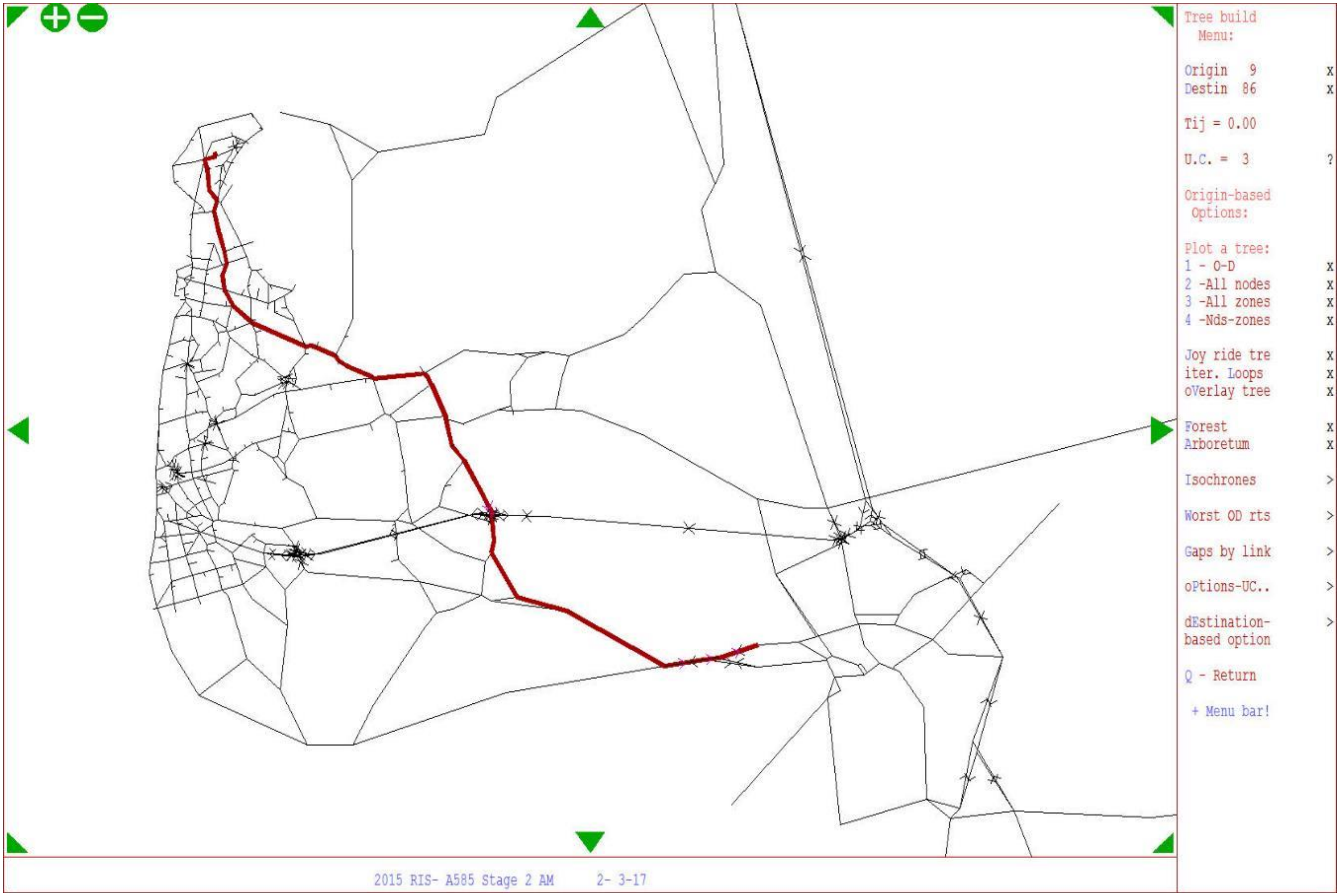
Origin 9
Destin 86
Tij = 0.00
U.C. = 1

2015 RIS- A585 Stage 2 AM 2- 3-17



Origin 9
Destin 86
Tij = 0.00
U.C. = 2

2015 RIS- A585 Stage 2 AM 2- 3-17

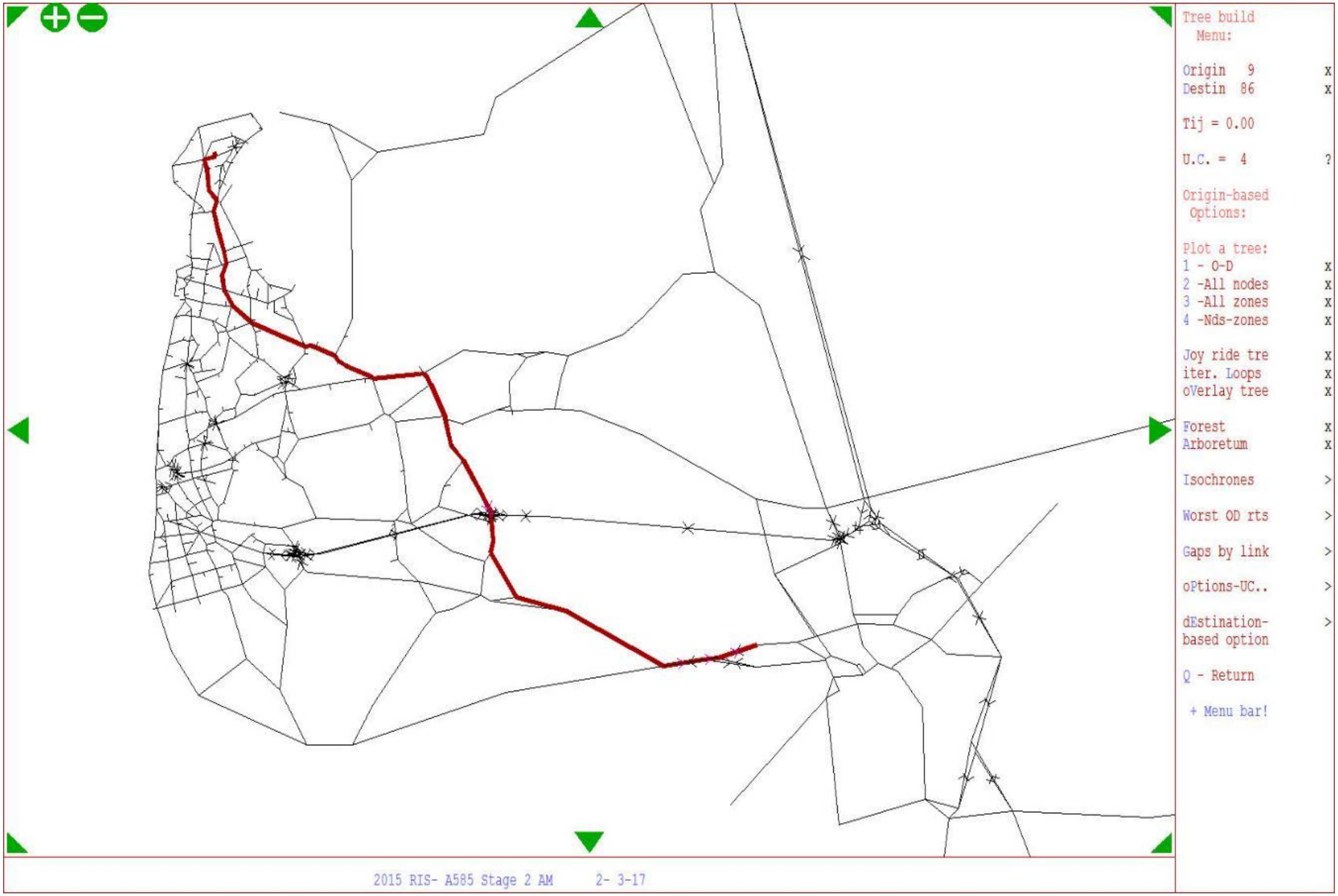


Origin 9
Destin 86

Tij = 0.00

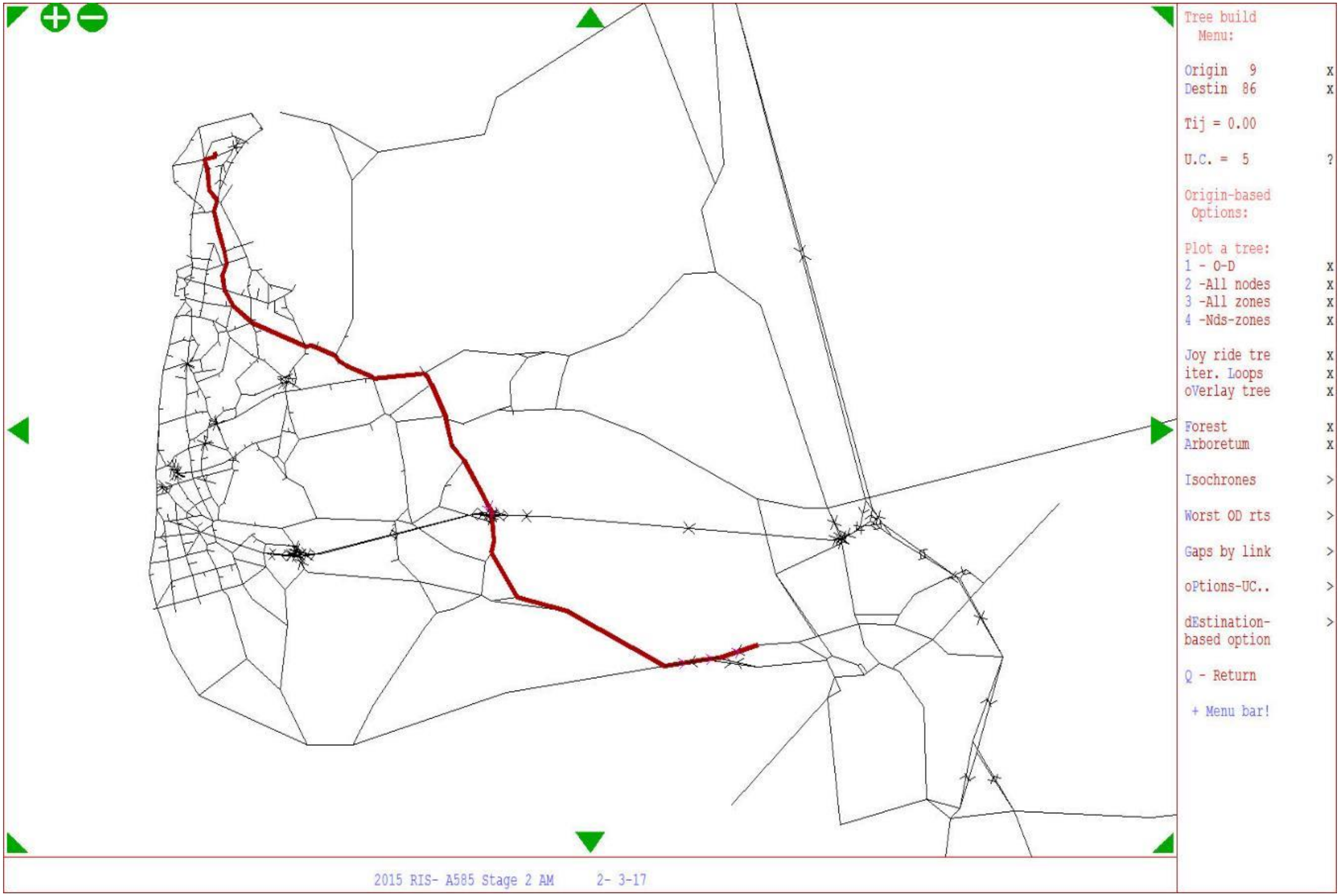
U.C. = 3

2015 RIS- A585 Stage 2 AM 2- 3-17

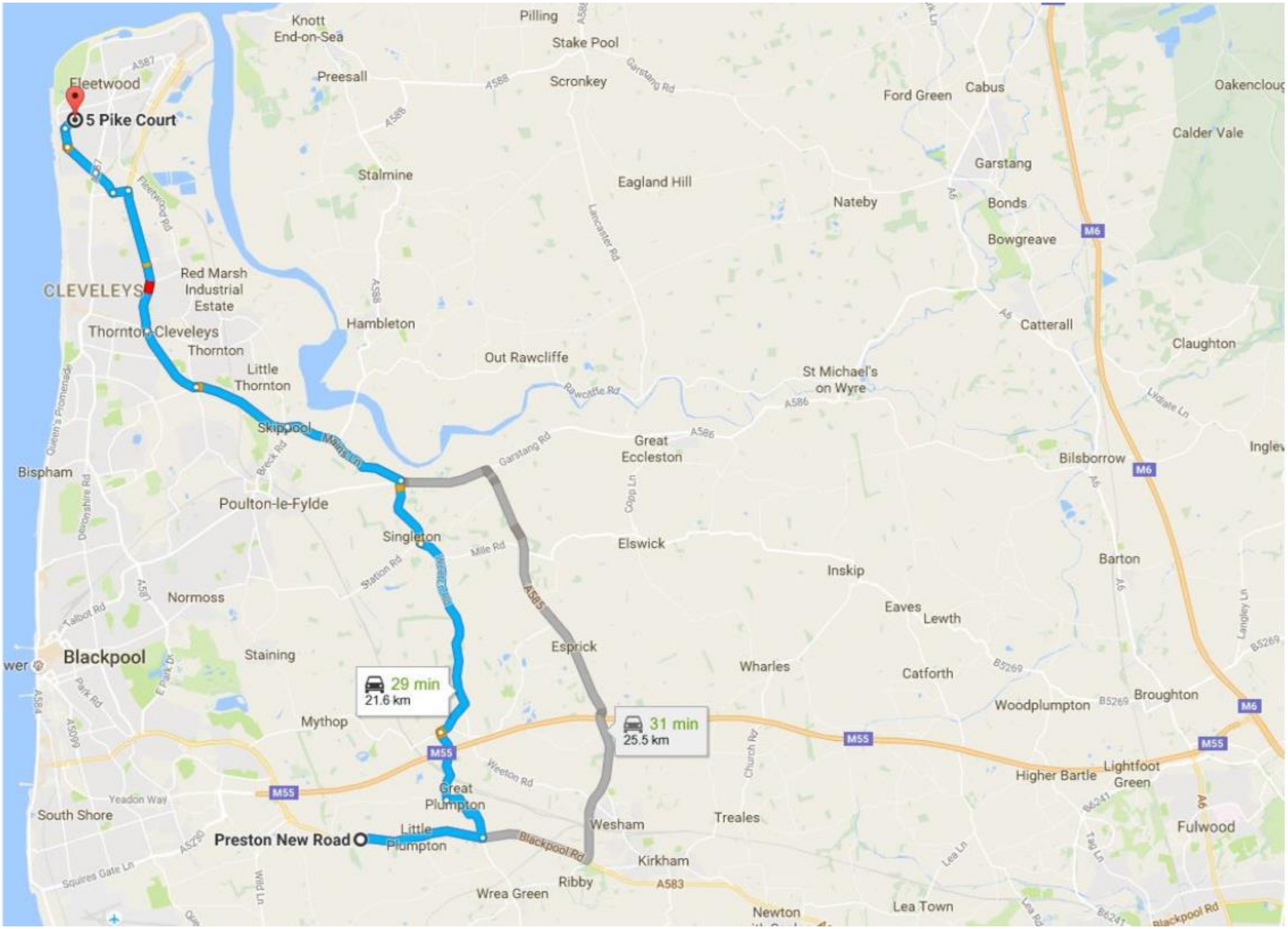


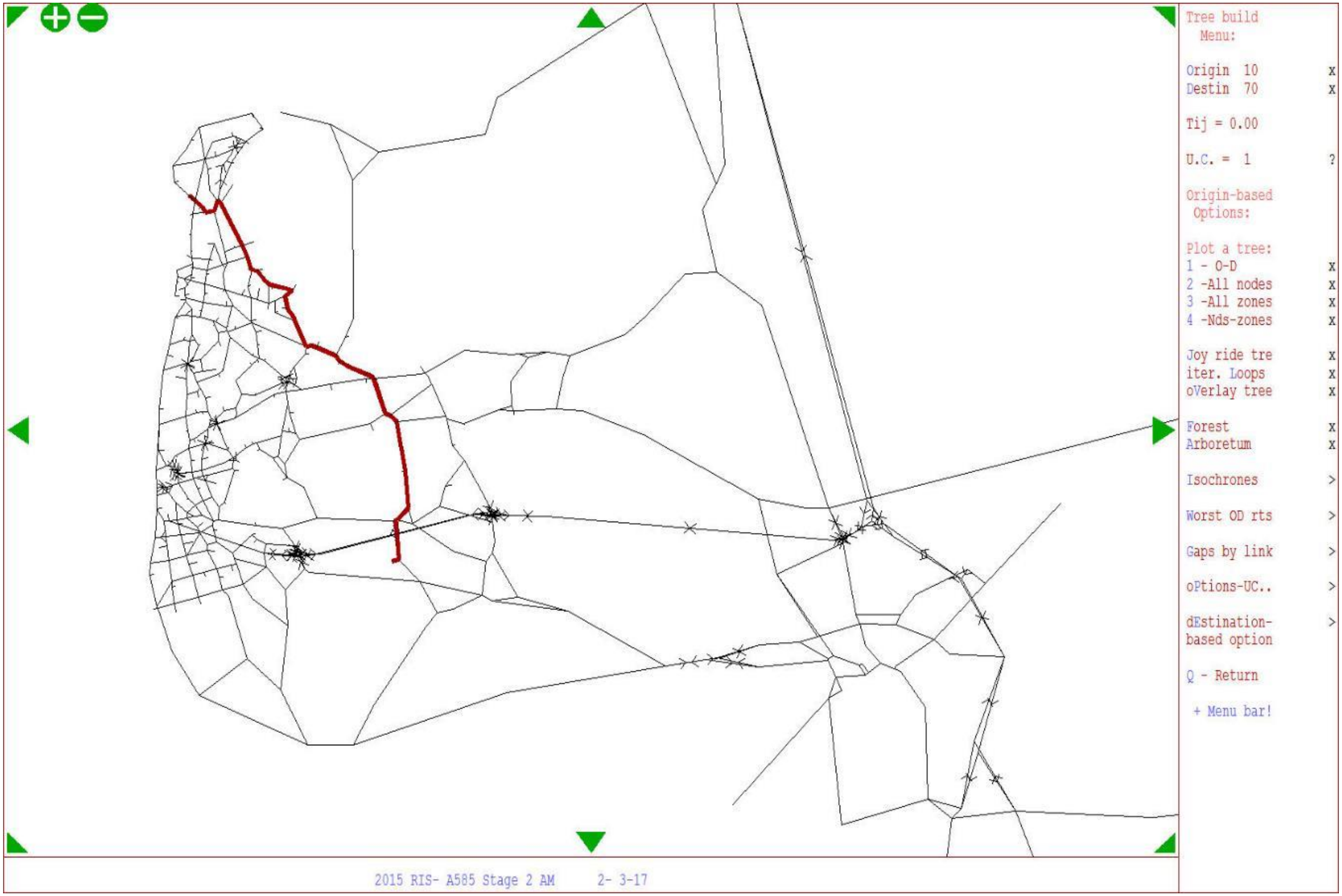
Origin 9
Destin 86
Tij = 0.00
U.C. = 4

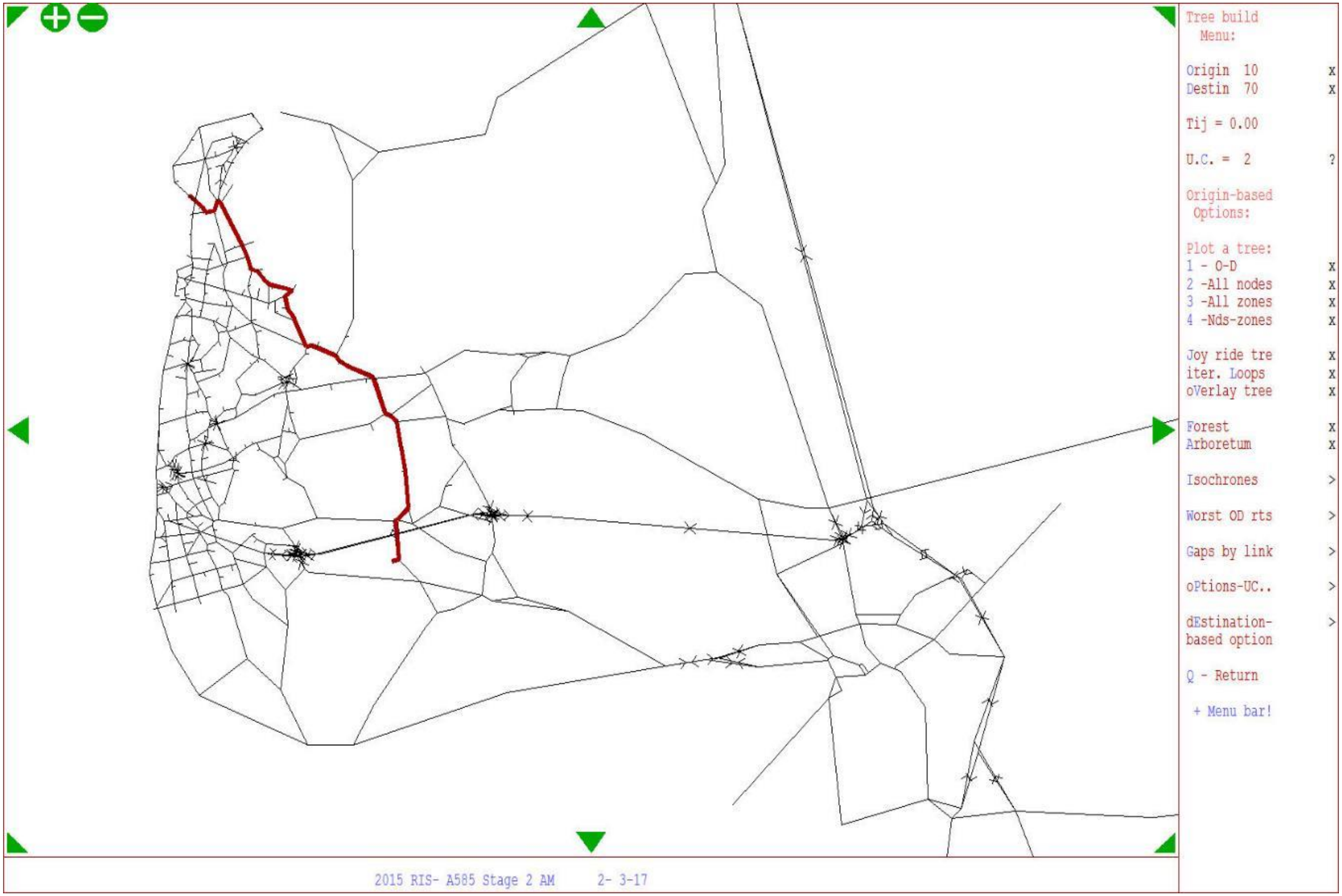
2015 RIS- A585 Stage 2 AM 2- 3-17



Origin 9
Destin 86
Tij = 0.00
U.C. = 5

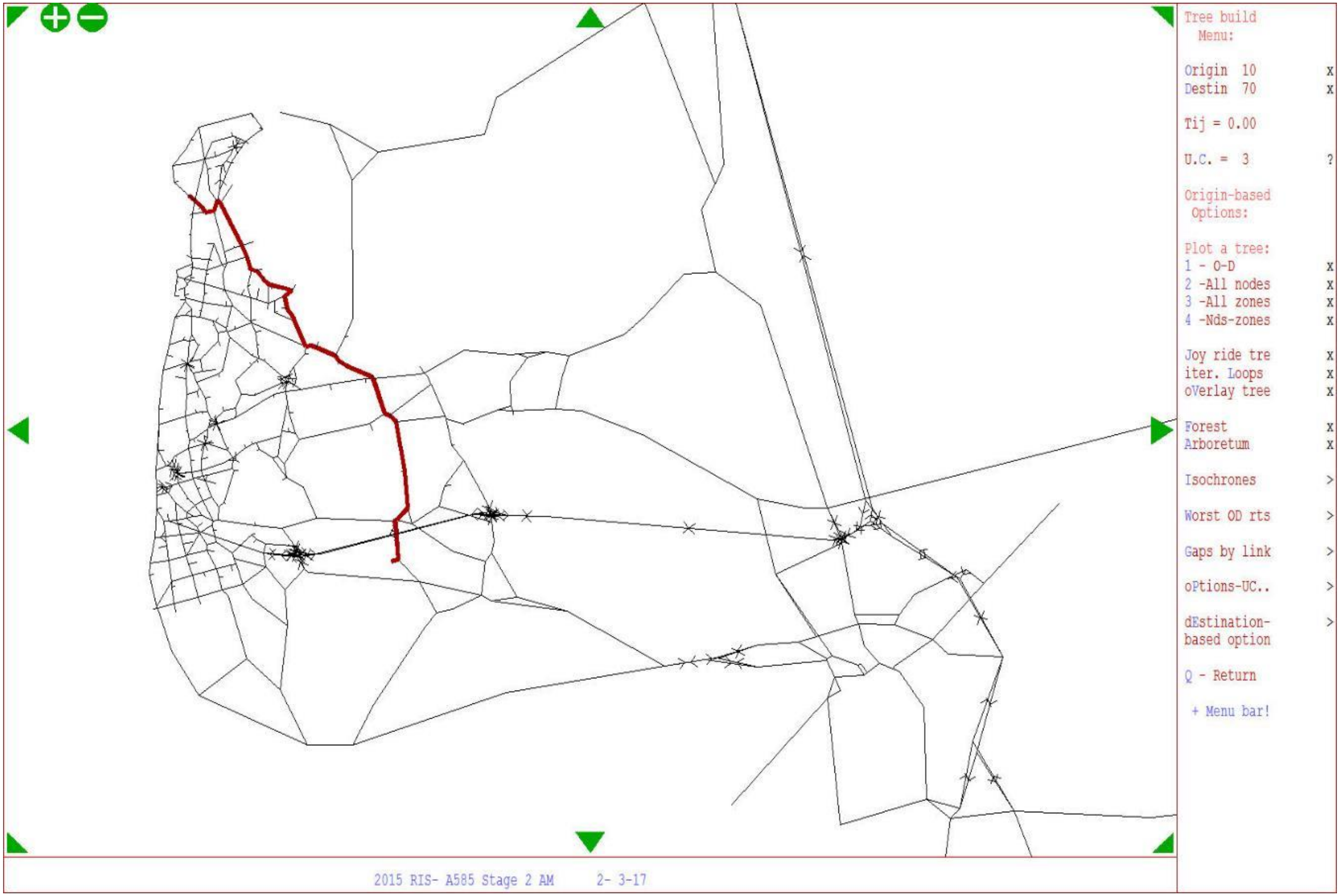

5 Pike Court
Preston New Road
29 min
21.6 km
31 min
25.5 km
Fleetwood
Cleveleys
Thornton-Cleveleys
Skippool
Poulton-le-Fylde
Singleton
Blackpool
Great Plumpton
Little Plumpton
Kirkham
Wesham
Esprick
Elswick
Great Eccleston
Out Rawcliffe
Hambleton
Preesall
Knott End-on-Sea
Stalmine
Pilling
Garstang
M55
M6
A585


Origin 10
Destin 70
Tij = 0.00
U.C. = 1



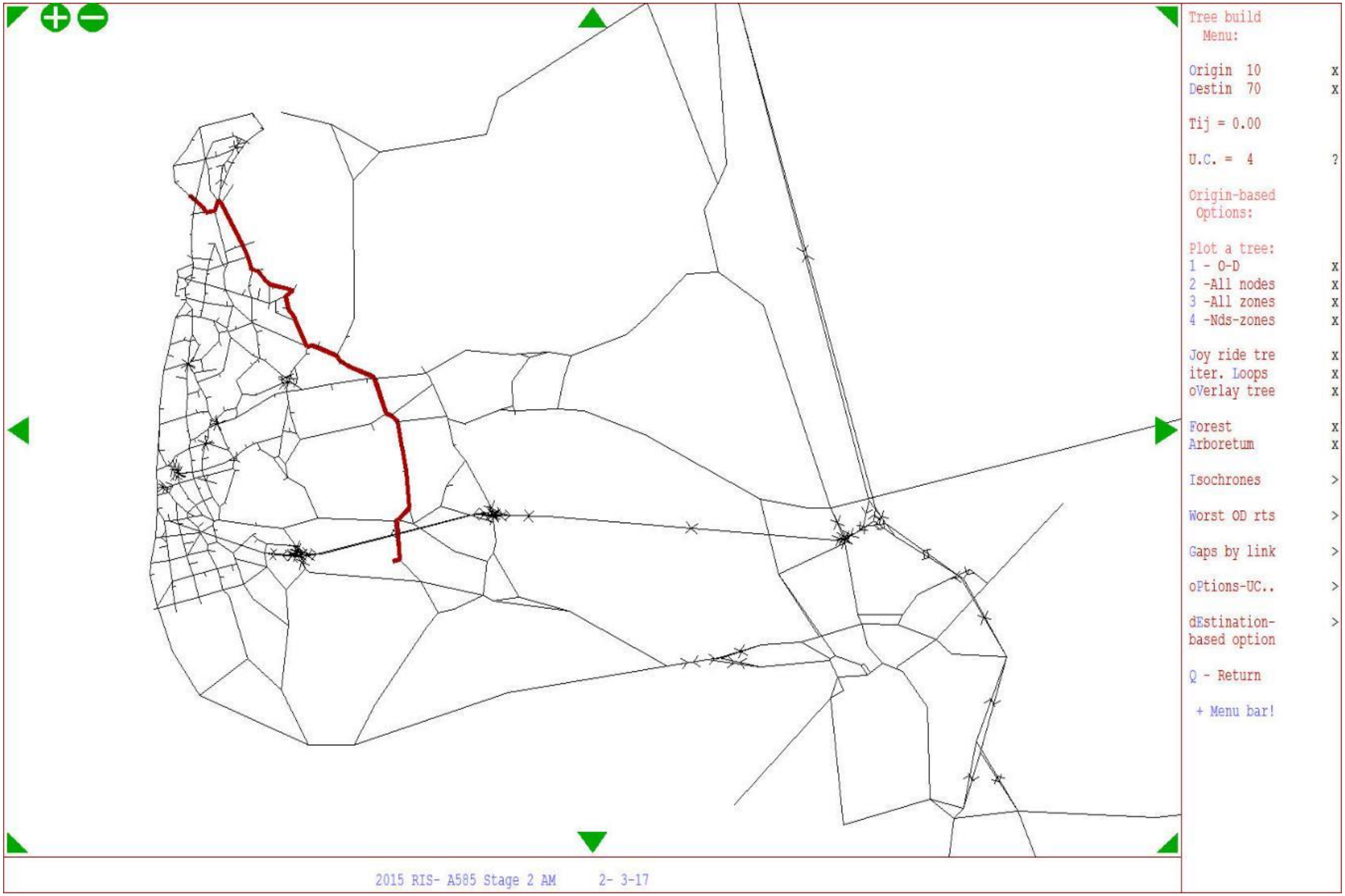
Origin 10
Destin 70
Tij = 0.00
U.C. = 2

2015 RIS- A585 Stage 2 AM 2- 3-17



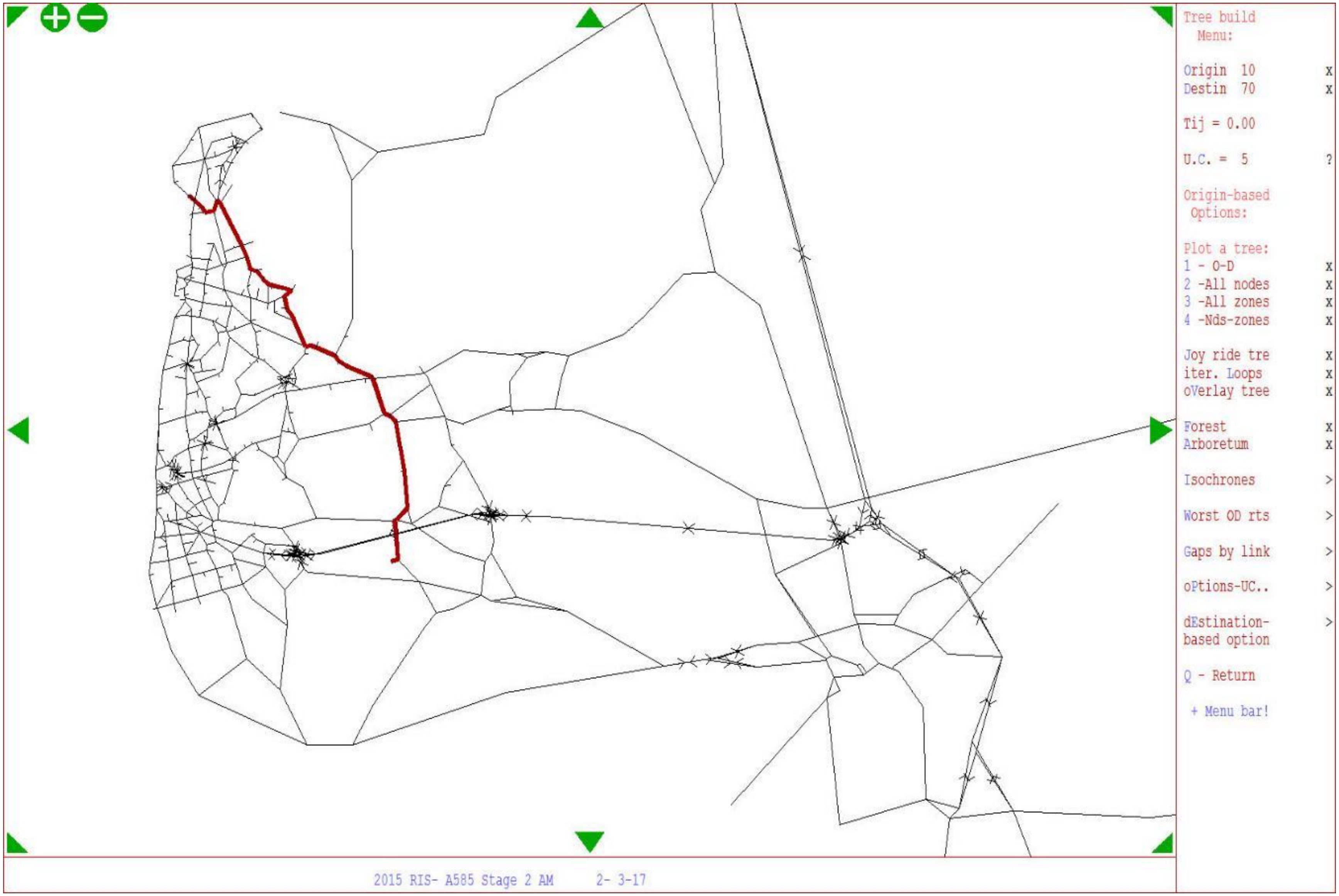
Origin 10
Destin 70
Tij = 0.00
U.C. = 3

2015 RIS- A585 Stage 2 AM 2- 3-17

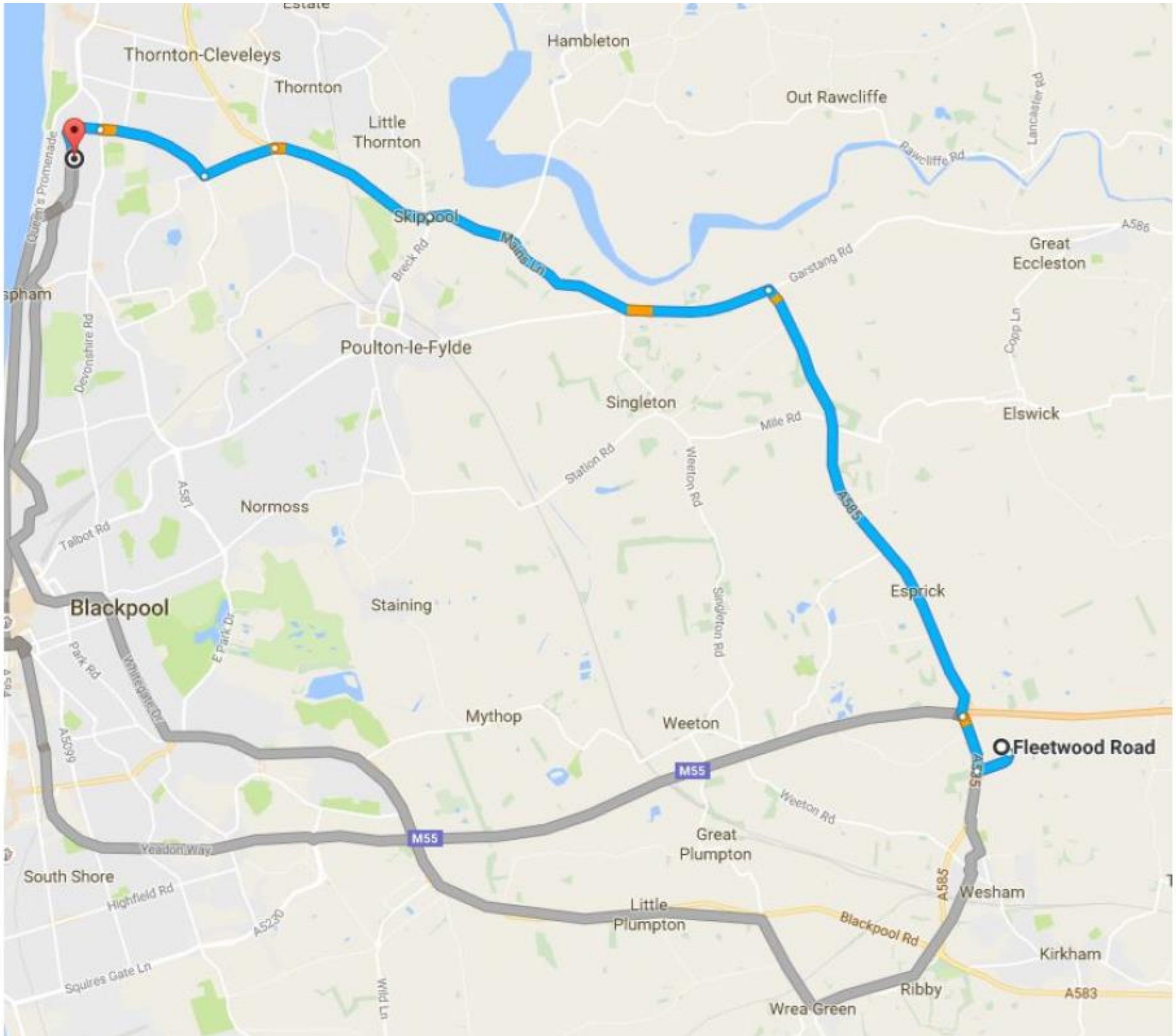


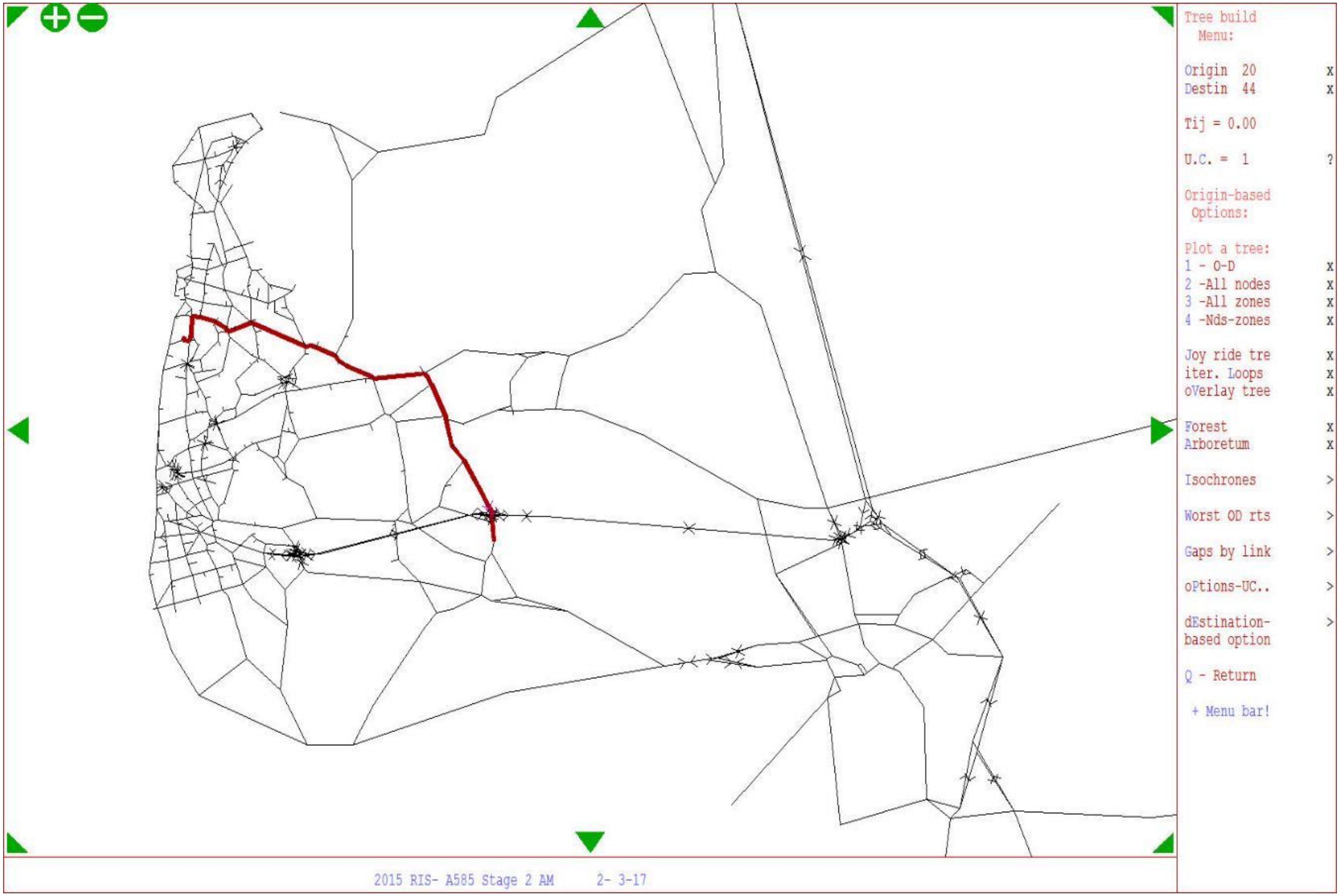
Origin 10
Destin 70
Tij = 0.00
U.C. = 4

2015 RIS- A585 Stage 2 AM 2- 3-17


Origin 10
Destin 70
Tij = 0.00
U.C. = 5

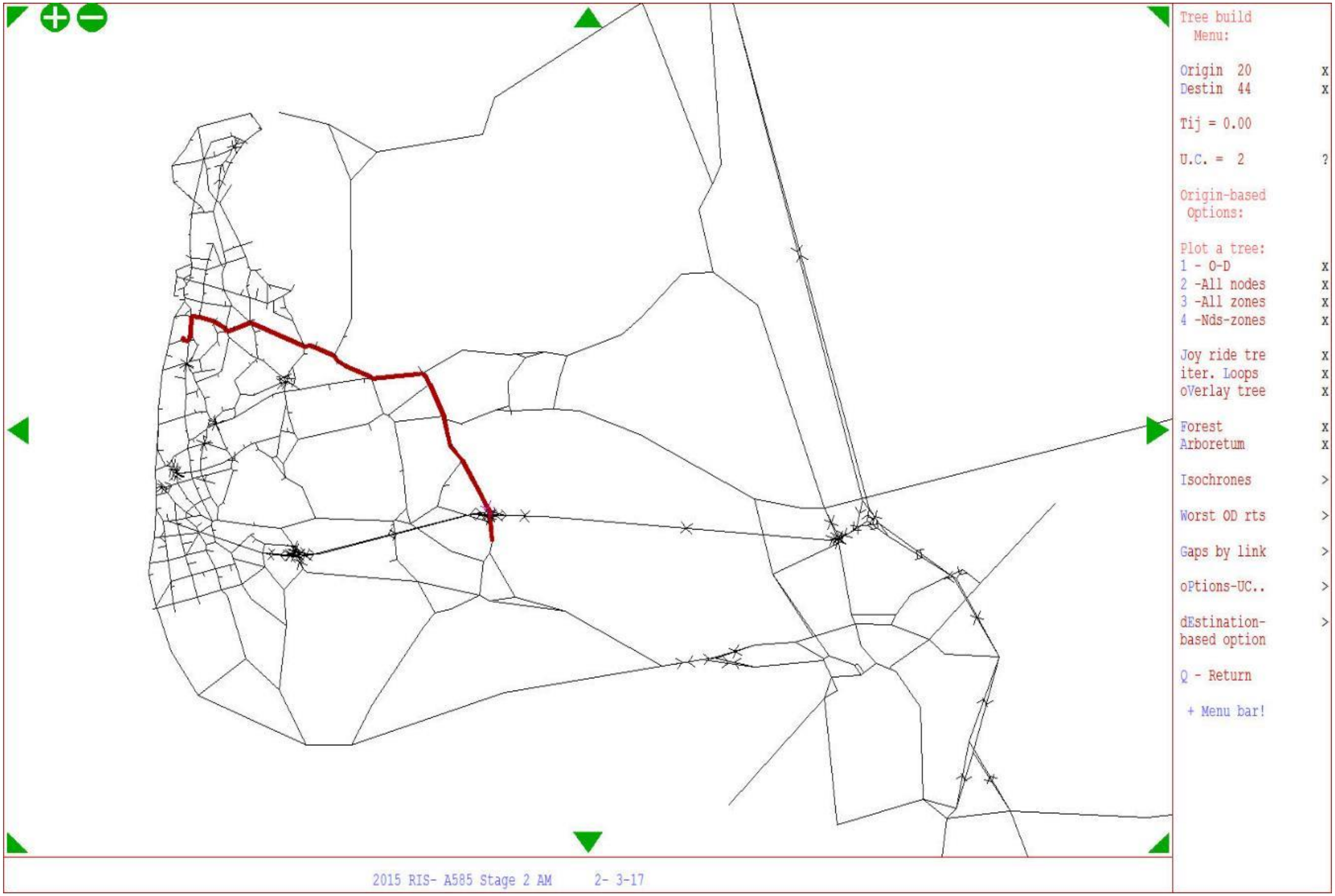
2015 RIS- A585 Stage 2 AM 2- 3-17


Thornton-Cleveleys
Thornton
Hambleton
Out Rawcliffe
Little Thornton
Queen's Promenade
Rawcliffe Rd
Lancaster Rd
Skippool
Breck Rd
Mains Ln
Garstang Rd
A586
Great Eccleston
Bispham
Devonshire Rd
Poulton-le-Fylde
Copp Ln
Singleton
Mile Rd
Elswick
Station Rd
Weeton Rd
A587
Normoss
A585
Talbot Rd
Esprick
Blackpool
Staining
Singleton Rd
E Park Dr
Park Rd
Whitegate Dr
A5099
Mythop
Weeton
Fleetwood Road
M55
A585
Weeton Rd
Yeadon Way
M55
Great Plumpton
South Shore
Highfield Rd
A5230
Little Plumpton
Blackpool Rd
A585
Wesham
Kirkham
Squires Gate Ln
Wild Ln
Ribby
Wrea Green
A583



Origin 20
Destin 44
Tij = 0.00
U.C. = 1

2015 RIS- A585 Stage 2 AM 2- 3-17



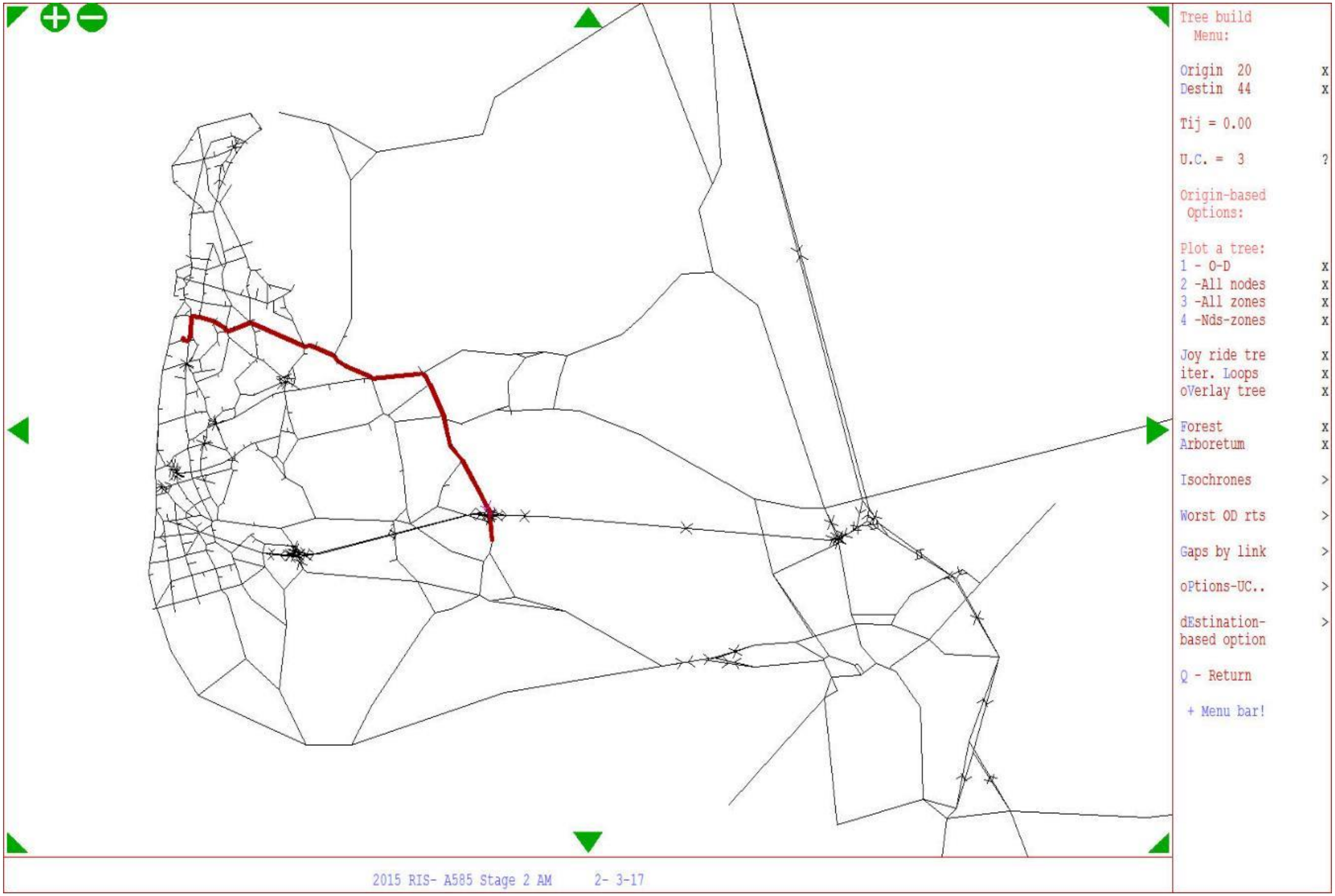
Tree build Menu:

Origin 20 x
Destin 44 x

Tij = 0.00

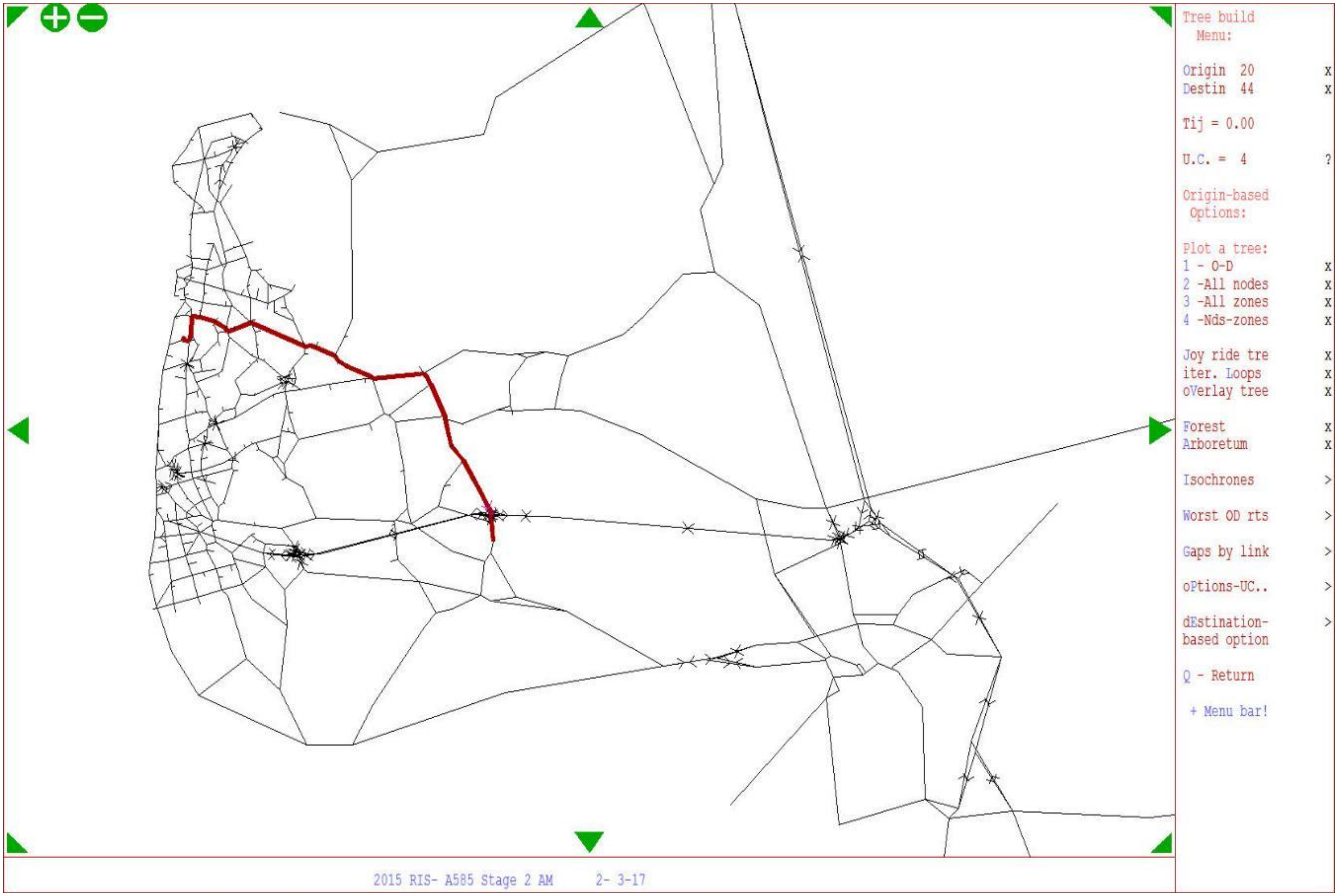
U.C. = 2 ?

2015 RIS- A585 Stage 2 AM 2- 3-17



Origin 20
Destin 44
Tij = 0.00
U.C. = 3

2015 RIS- A585 Stage 2 AM 2- 3-17

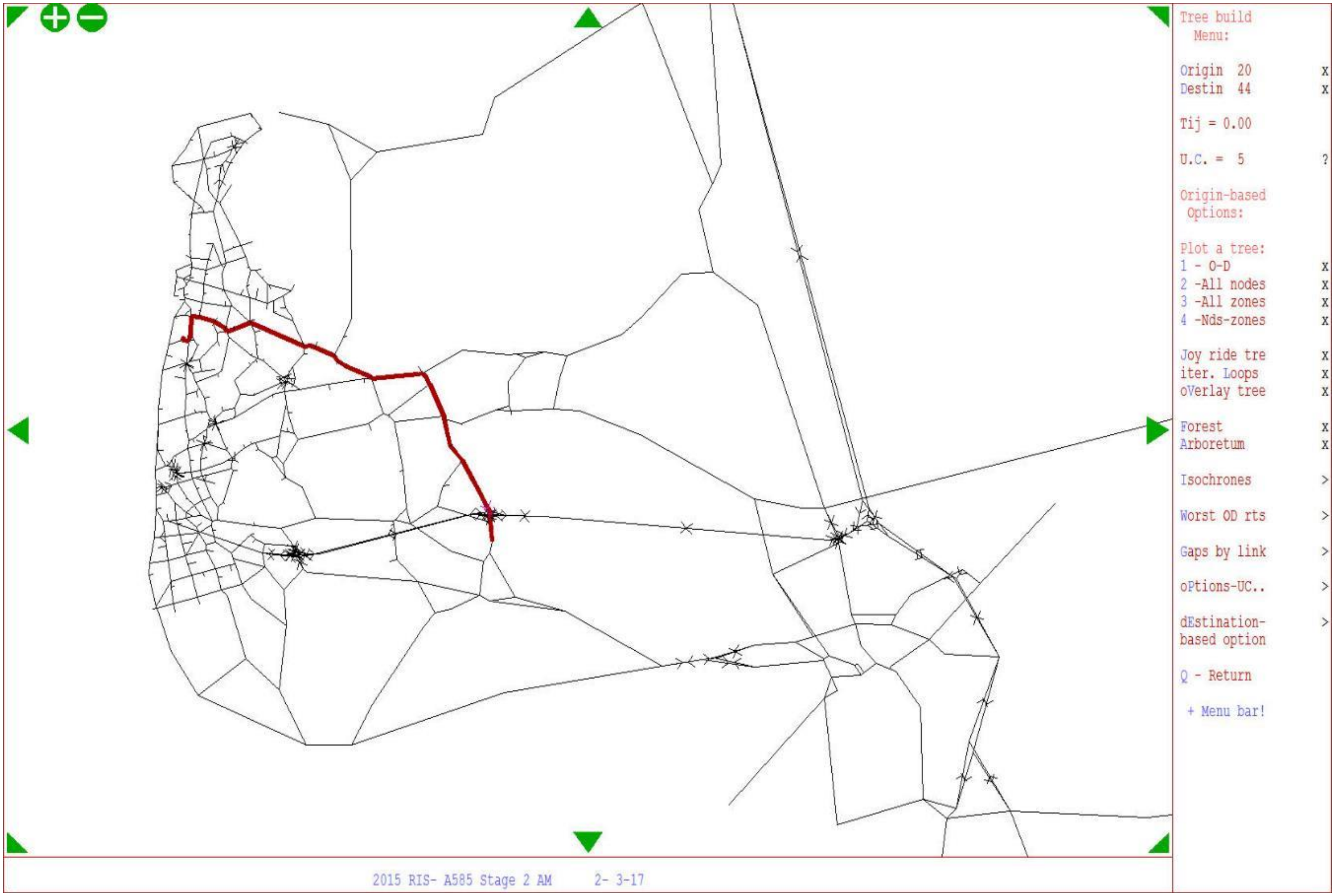


Origin 20
Destin 44

Tij = 0.00

U.C. = 4

2015 RIS- A585 Stage 2 AM 2- 3-17

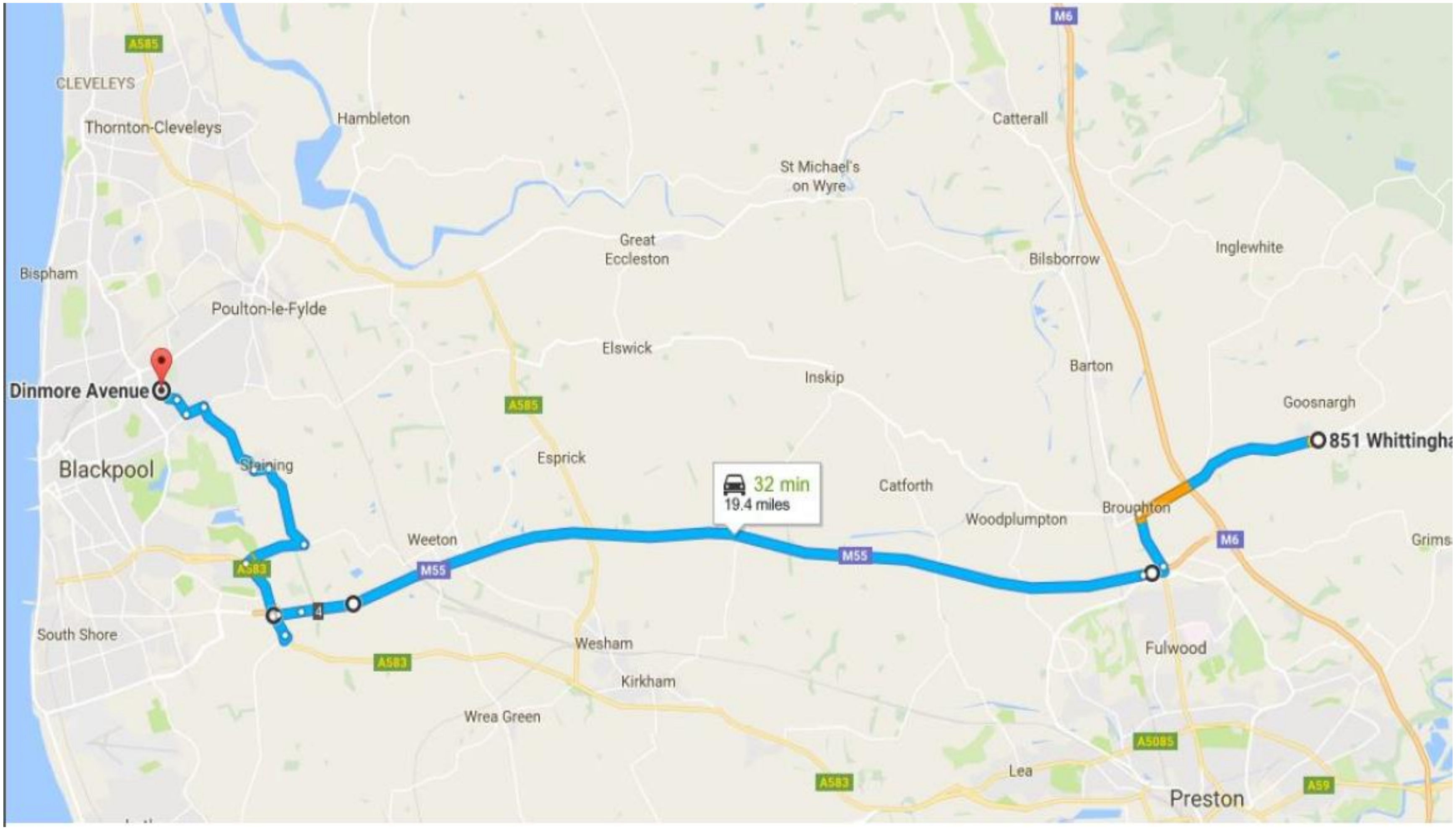


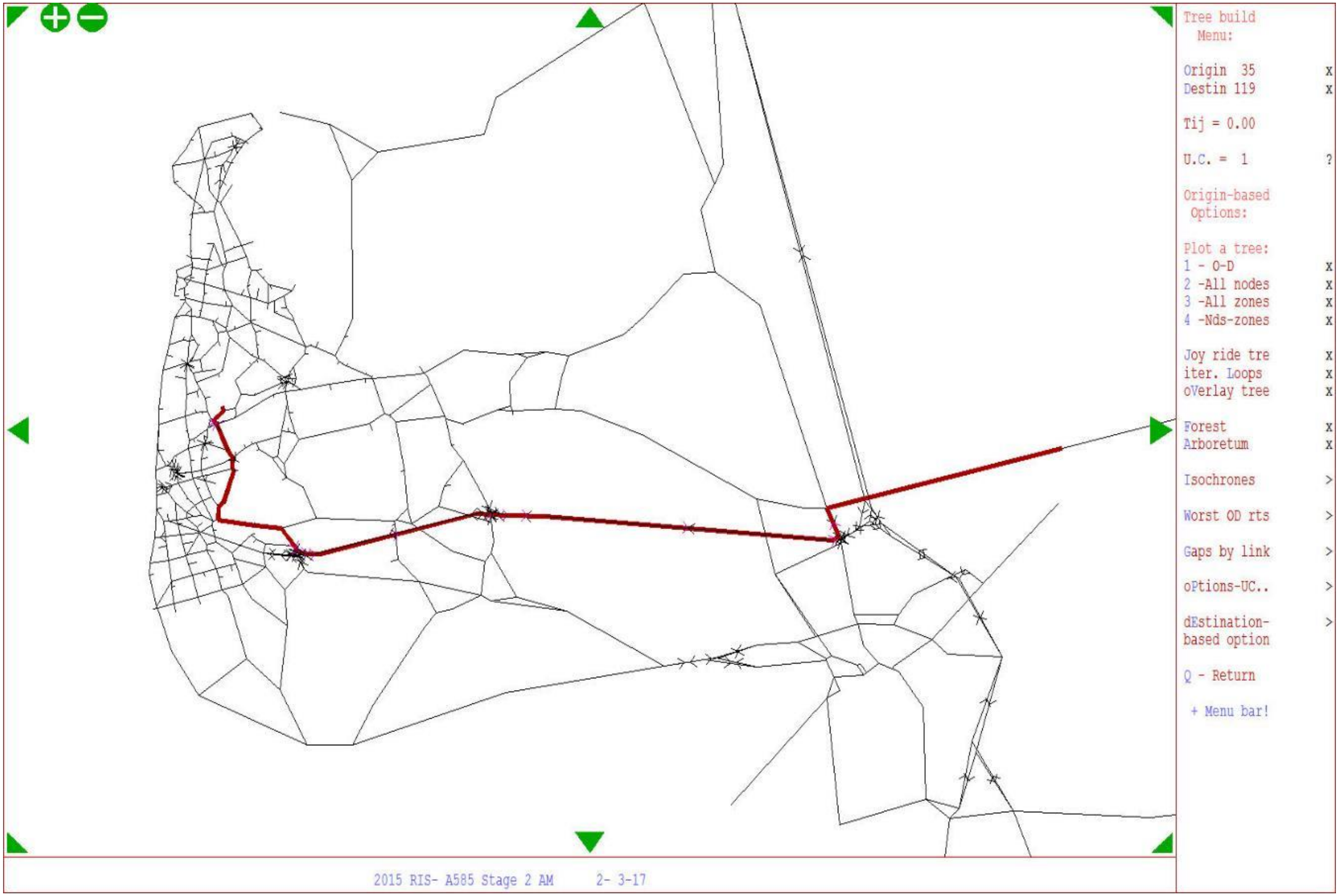
Origin 20
Destin 44

Tij = 0.00

U.C. = 5

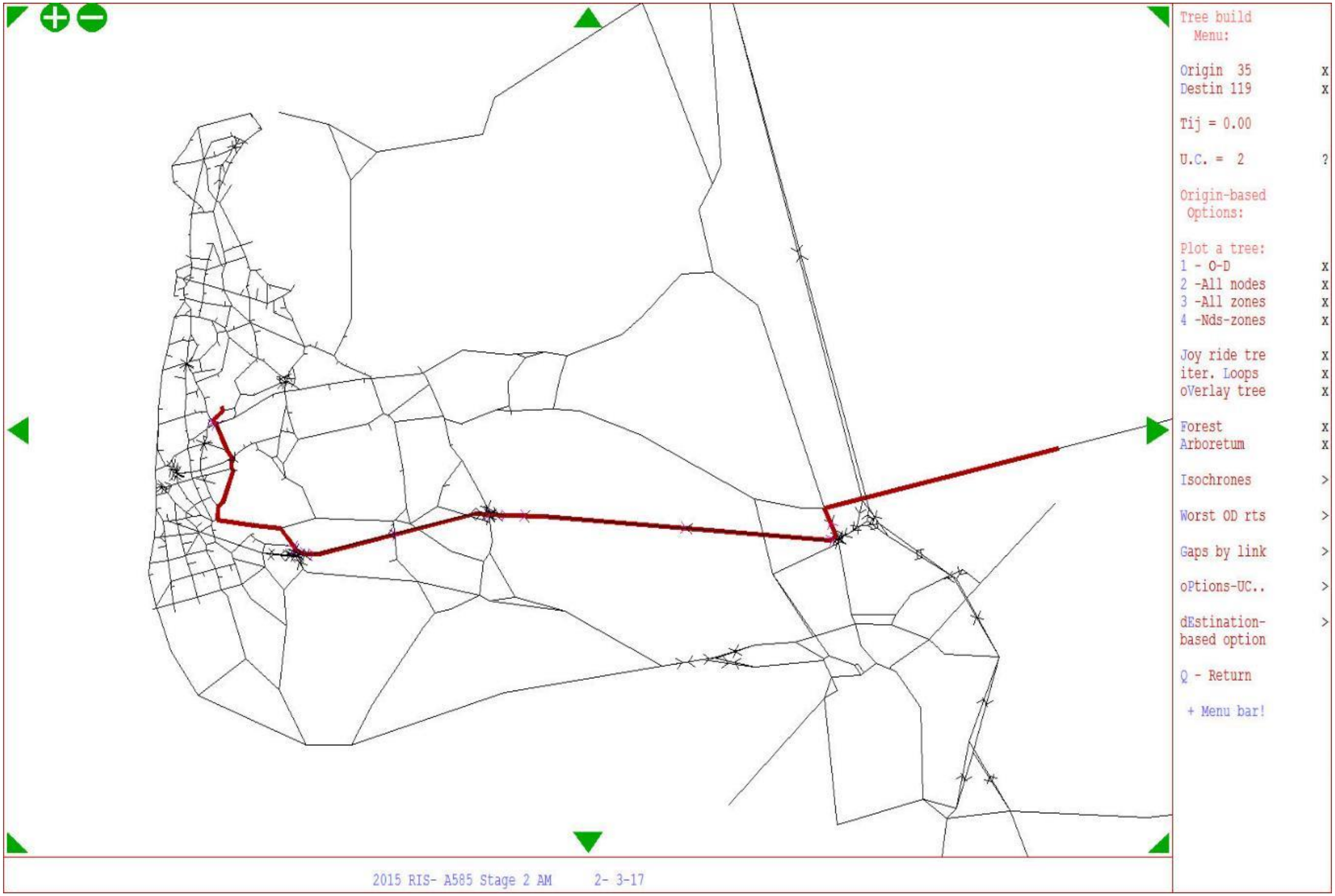
2015 RIS- A585 Stage 2 AM 2- 3-17


Dinmore Avenue
851 Whittingha
32 min
19.4 miles
A585
CLEVELEYS
Thornton-Cleveleys
Hambleton
Bispham
Poulton-le-Fylde
Blackpool
Staining
South Shore
A583
M55
Weeton
Great Eccleston
Elswick
Esprick
Wesham
Kirkham
Wrea Green
St Michael's on Wyre
Inskip
Catforth
Woodplumpton
Catterall
Bilsborrow
Barton
Broughton
Inglewhite
Goosnargh
M6
Fulwood
Lea
Preston
A5085
A59
Grims



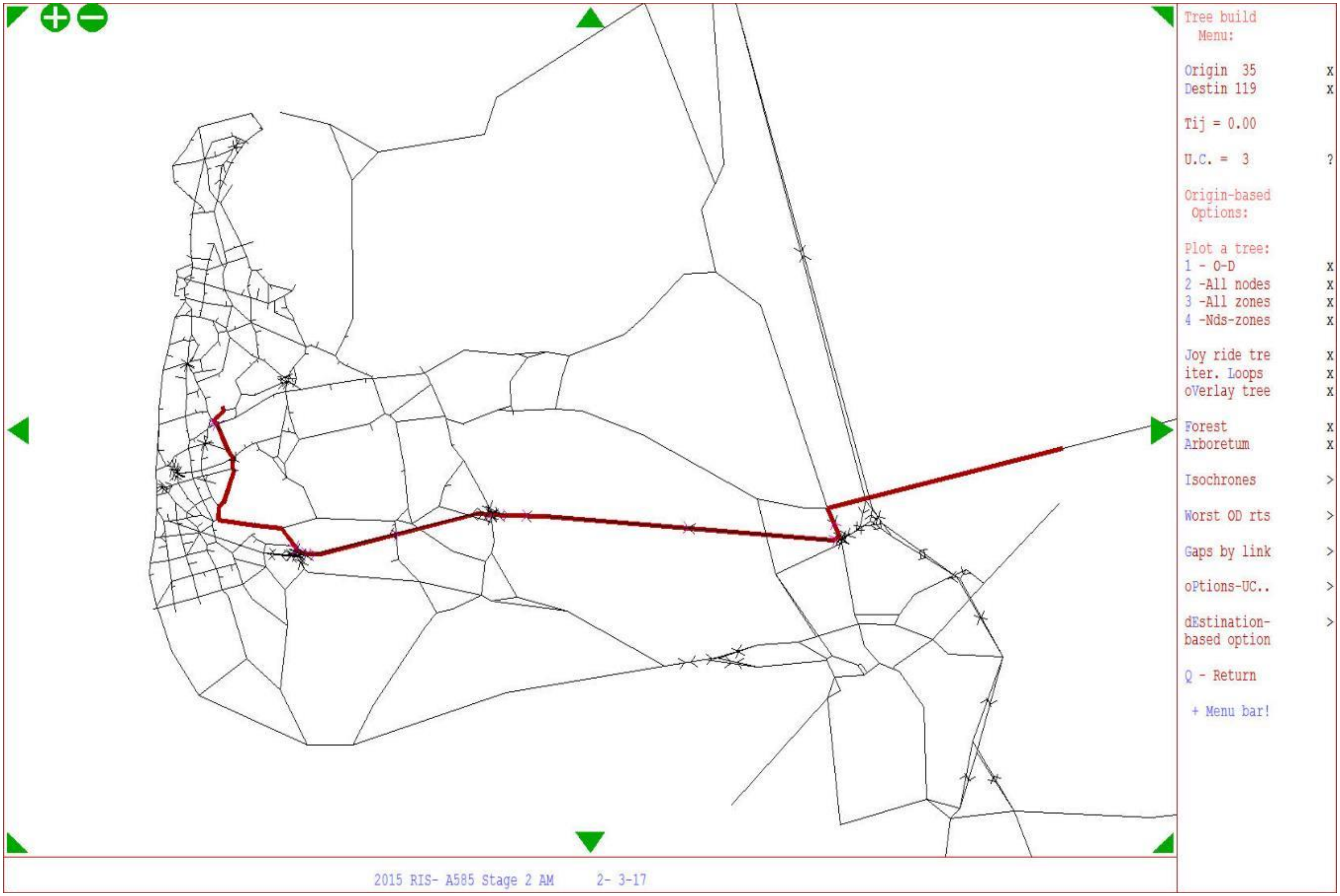
Origin 35
Destin 119
Tij = 0.00
U.C. = 1

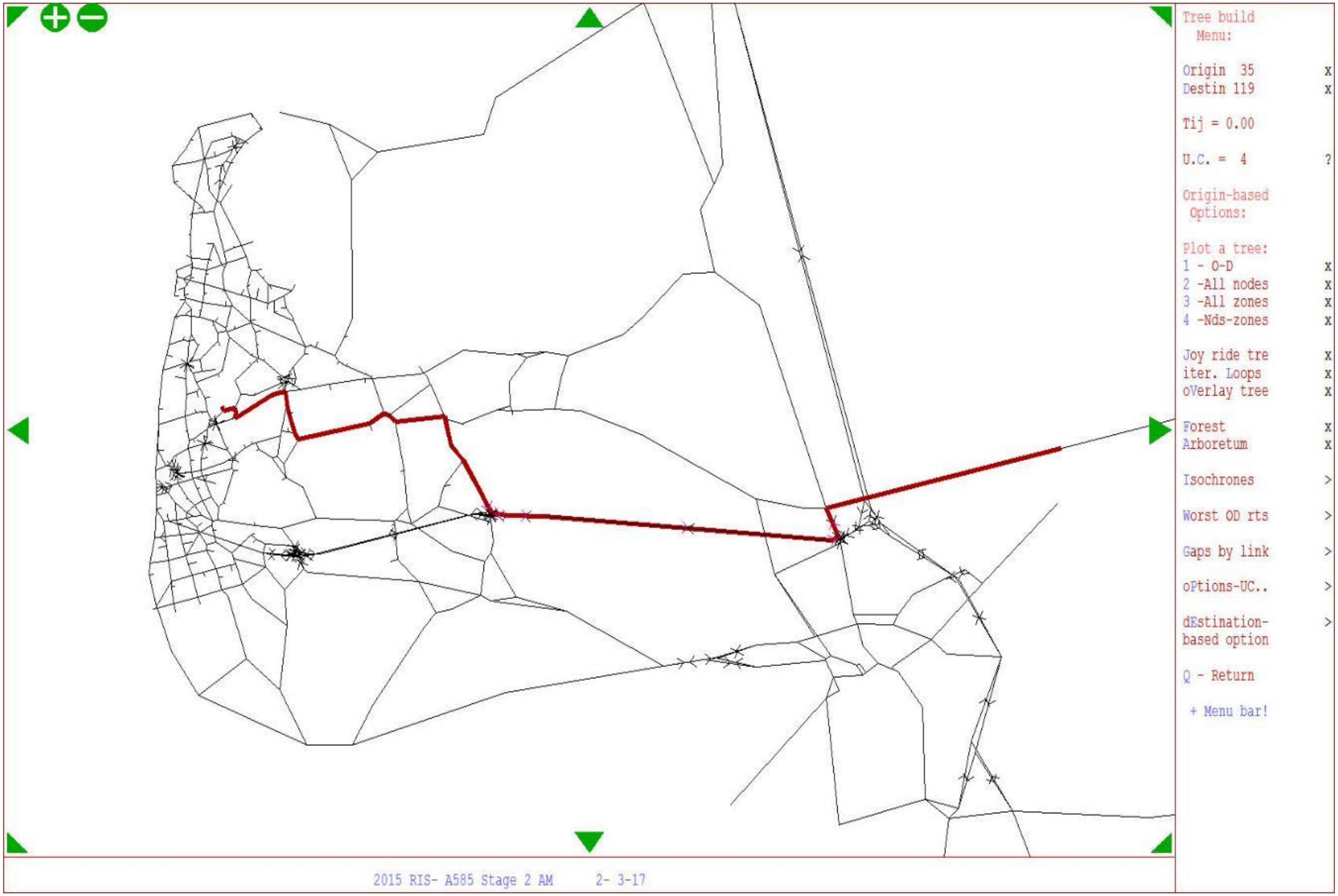
2015 RIS- A585 Stage 2 AM 2- 3-17



Origin 35
Destin 119
Tij = 0.00
U.C. = 2

2015 RIS- A585 Stage 2 AM 2- 3-17


Tree build
Menu:
Origin 35 x
Destin 119 x
Tij = 0.00
U.C. = 3 ?
Origin-based
Options:
Plot a tree:
1 - O-D x
2 -All nodes x
3 -All zones x
4 -Nds-zones x
Joy ride tre x
iter. Loops x
oVerlay tree x
Forest x
Arboretum x
Isochrones >
Worst OD rts >
Gaps by link >
oPtions-UC.. >
dEstination- >
based option
Q - Return
+ Menu bar!
2015 RIS- A585 Stage 2 AM 2- 3-17

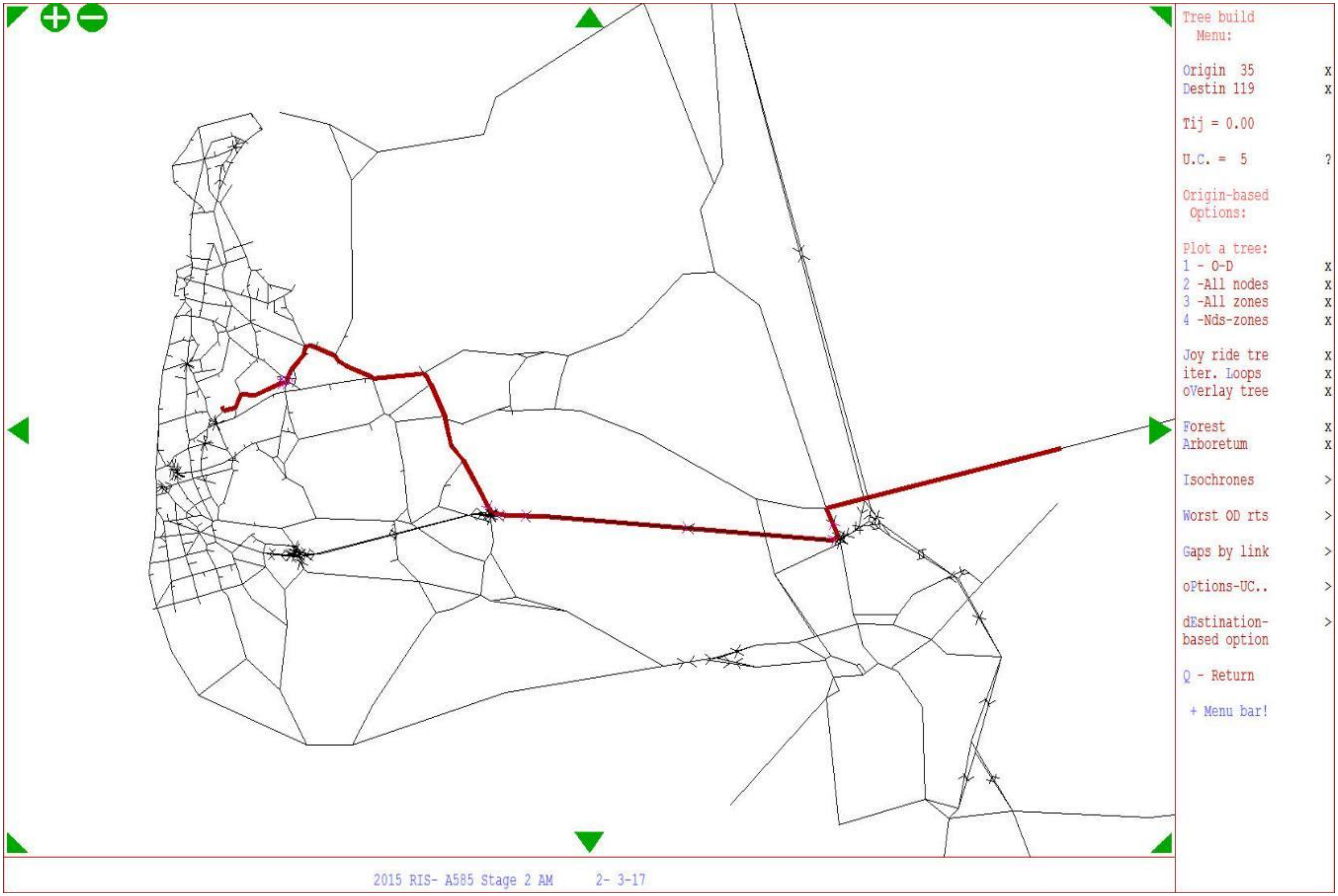


Origin 35 x
Destin 119 x

Tij = 0.00

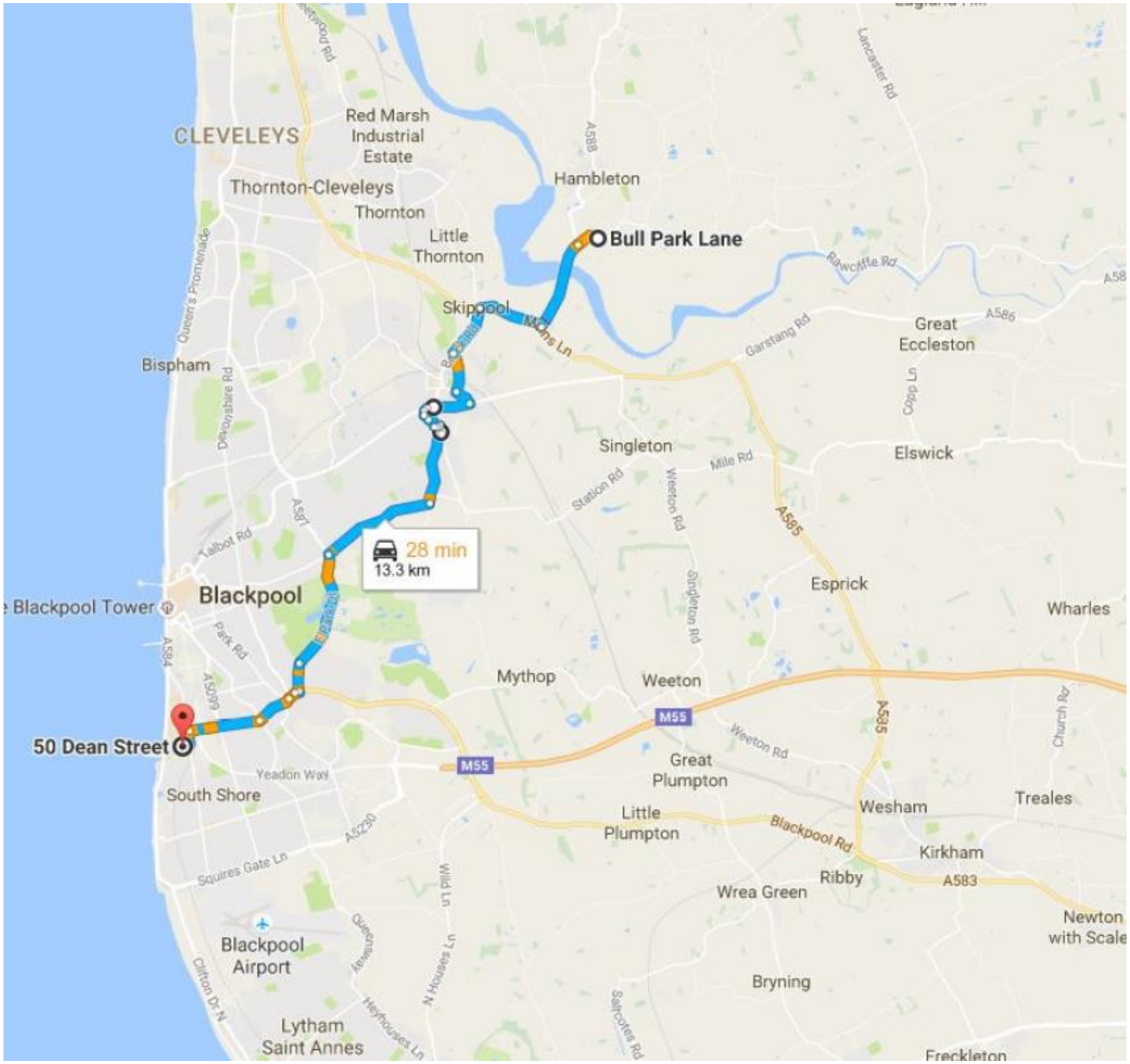
U.C. = 4 ?

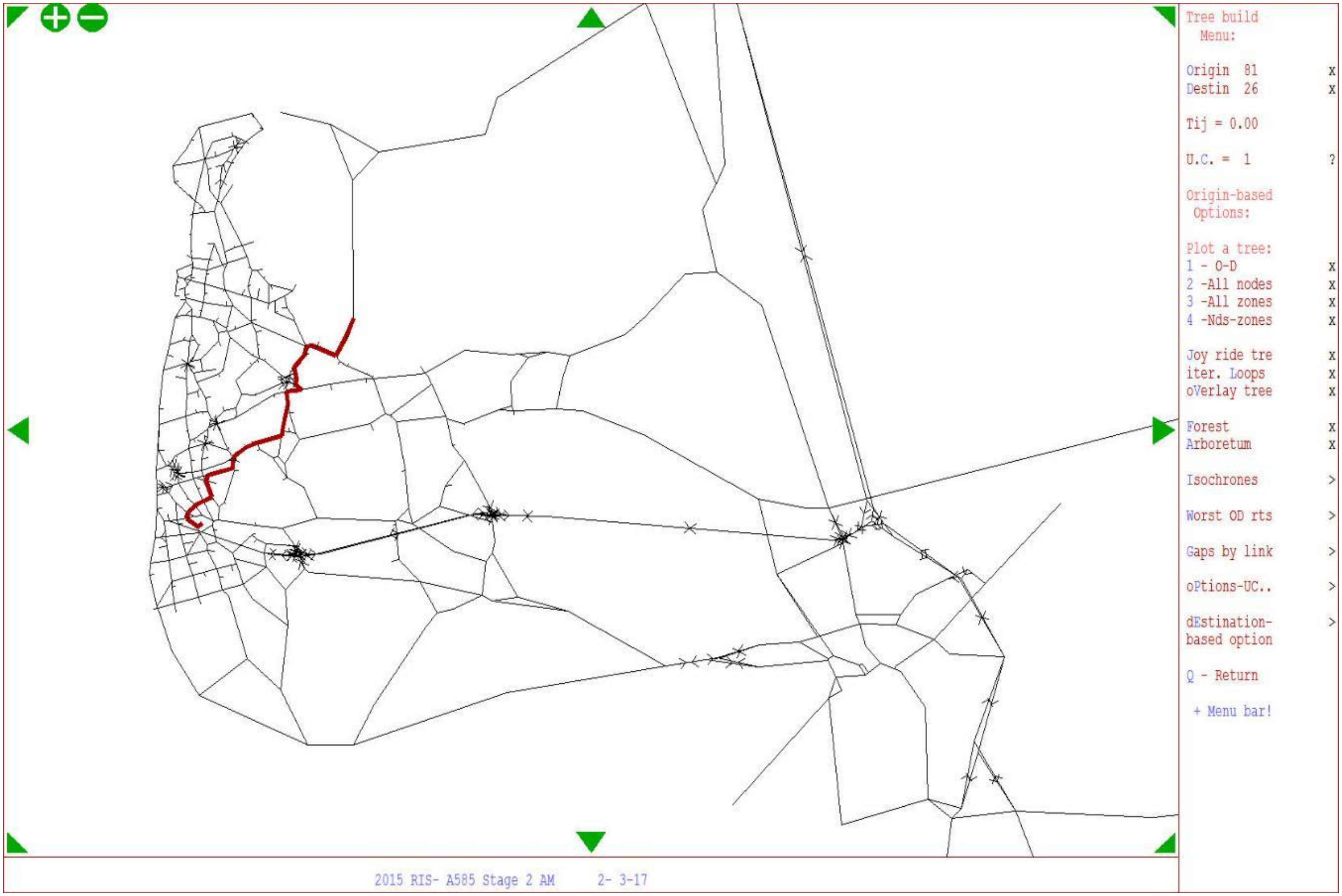
2015 RIS- A585 Stage 2 AM 2- 3-17



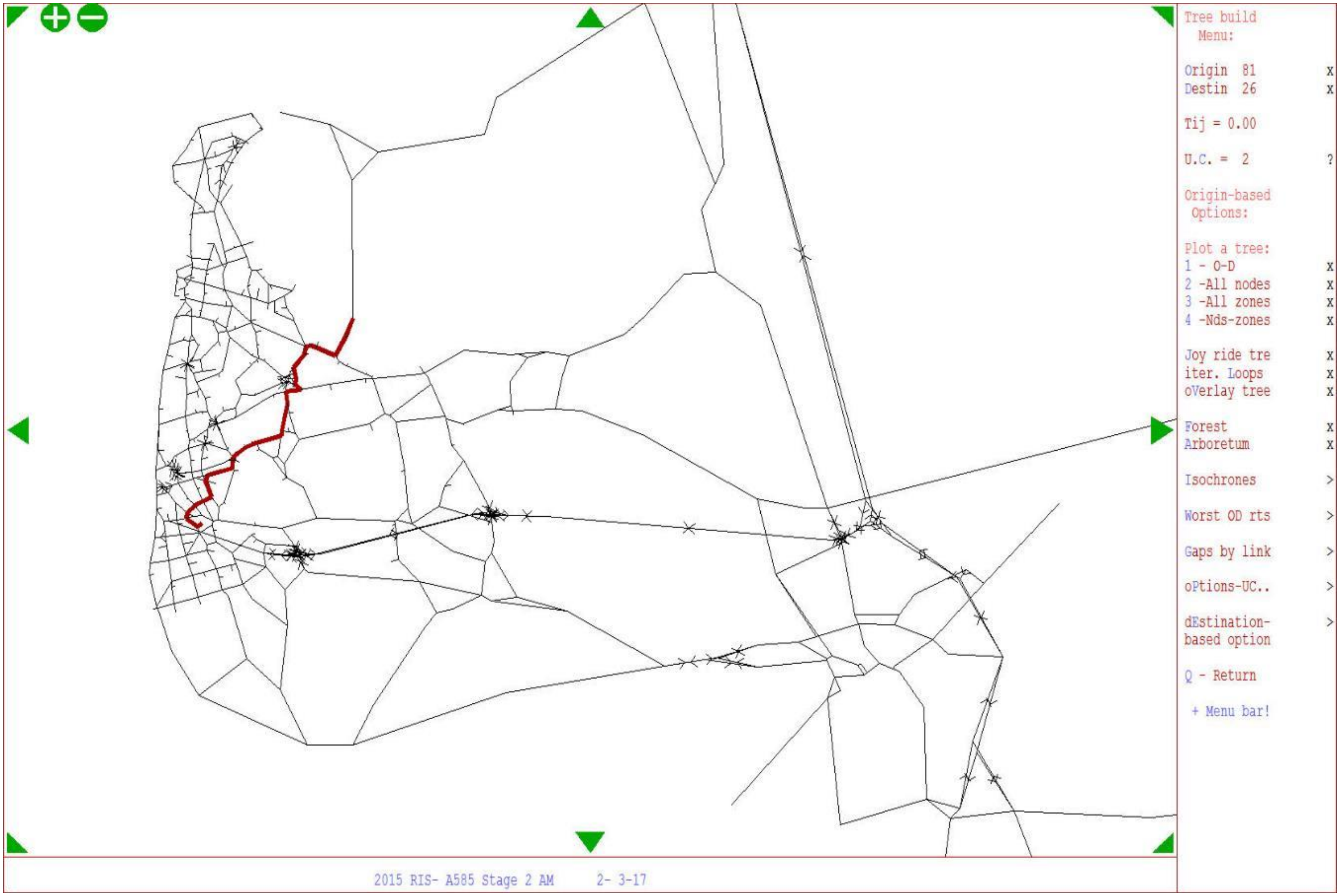
Origin 35
Destin 119
Tij = 0.00
U.C. = 5

2015 RIS- A585 Stage 2 AM 2- 3-17

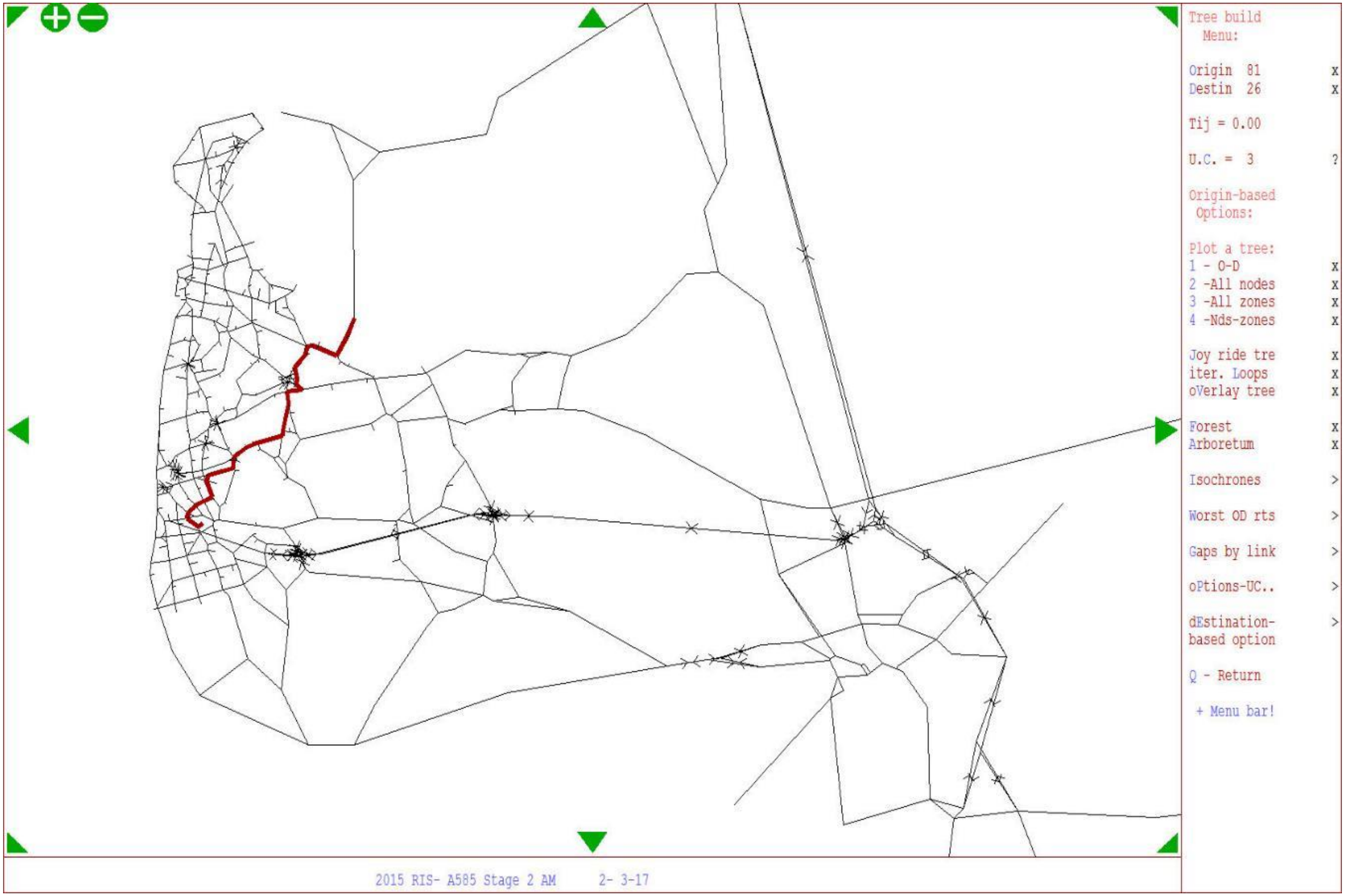

Bull Park Lane
50 Dean Street
28 min
13.3 km
CLEVELEYS
Red Marsh Industrial Estate
Thornton-Cleveleys
Thornton
Little Thornton
Hambleton
Skippool
Mains Ln
Bispham
Singleton
Great Eccleston
Elswick
Esprick
Wharles
Blackpool
Blackpool Tower
Mythop
Weeton
M55
Great Plumpton
Little Plumpton
Wesham
Treales
Kirkham
Ribby
Wrea Green
South Shore
Blackpool Airport
Lytham Saint Annes
Bryning
Newton with Scale
Freckleton
A585
A583
A586
A588
A587
A584
A5099
A5230
Blackpool Rd
Garstang Rd
Rawcliffe Rd
Lancaster Rd
Copp Ln
Mile Rd
Station Rd
Weeton Rd
Singleton Rd
Church Rd
Yeadon Way
Squires Gate Ln
Wild Ln
N Houses Ln
Saltcotes Rd
Queensway
Heyhouses Ln
Clifton Dr N
Talbot Rd
Park Rd
Devonshire Rd
Queen's Promenade



Origin 81
Destin 26
Tij = 0.00
U.C. = 1

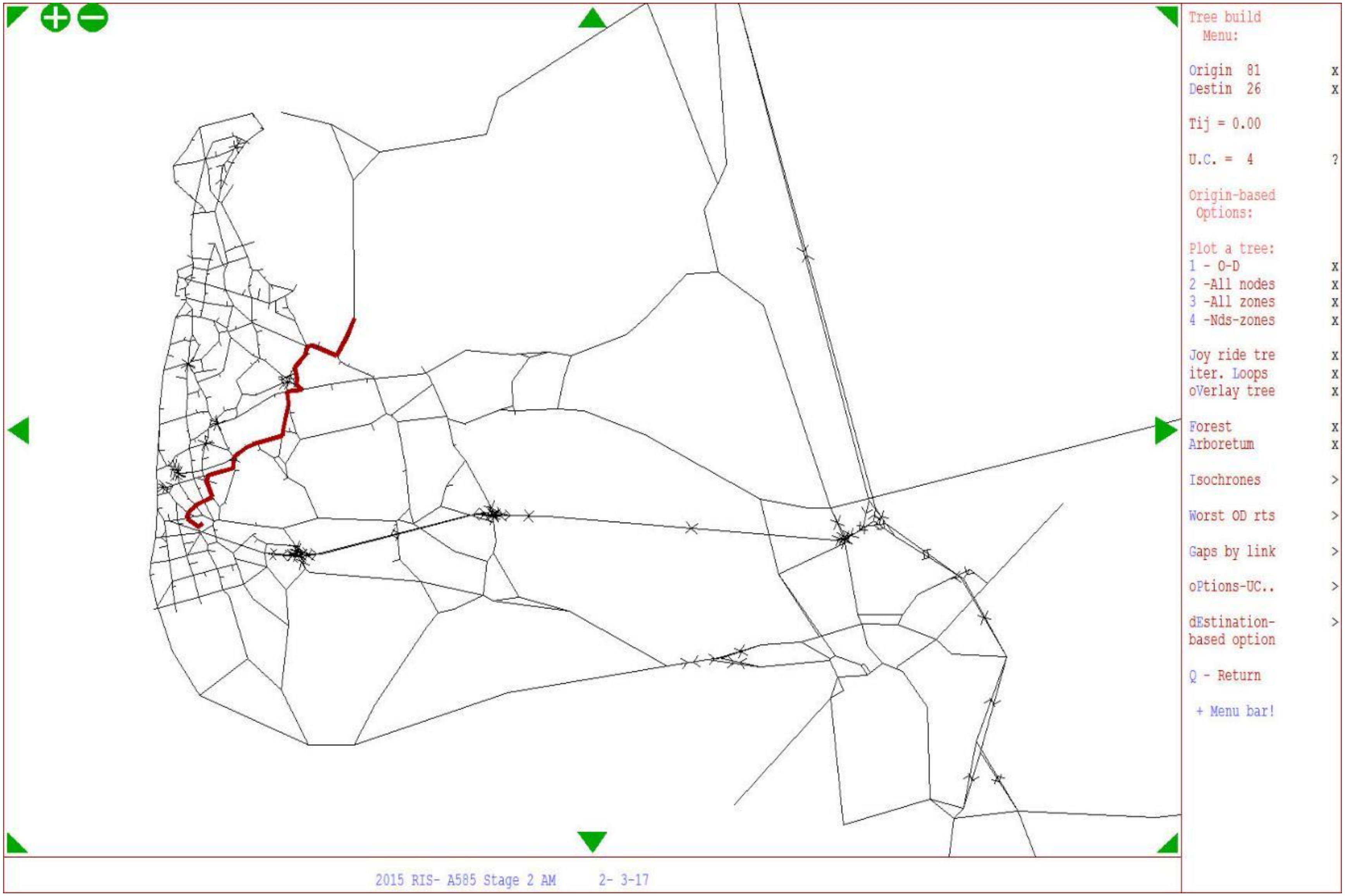

Origin 81
Destin 26
Tij = 0.00
U.C. = 2

2015 RIS- A585 Stage 2 AM 2- 3-17



Origin 81 x
Destin 26 x
Tij = 0.00
U.C. = 3 ?

2015 RIS- A585 Stage 2 AM 2- 3-17



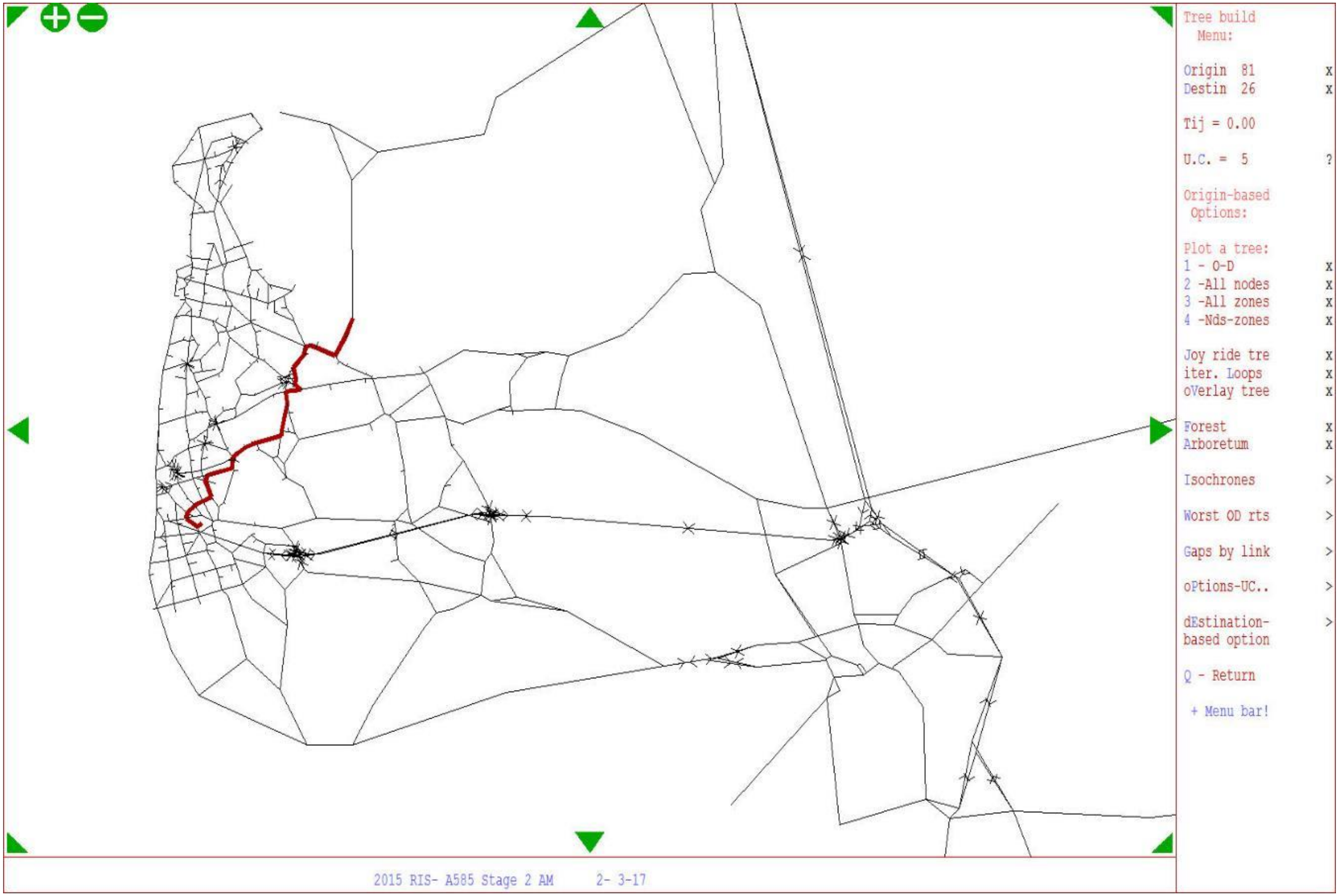
Origin 81 x
Destin 26 x

Tij = 0.00

U.C. = 4 ?

Origin-based Options:

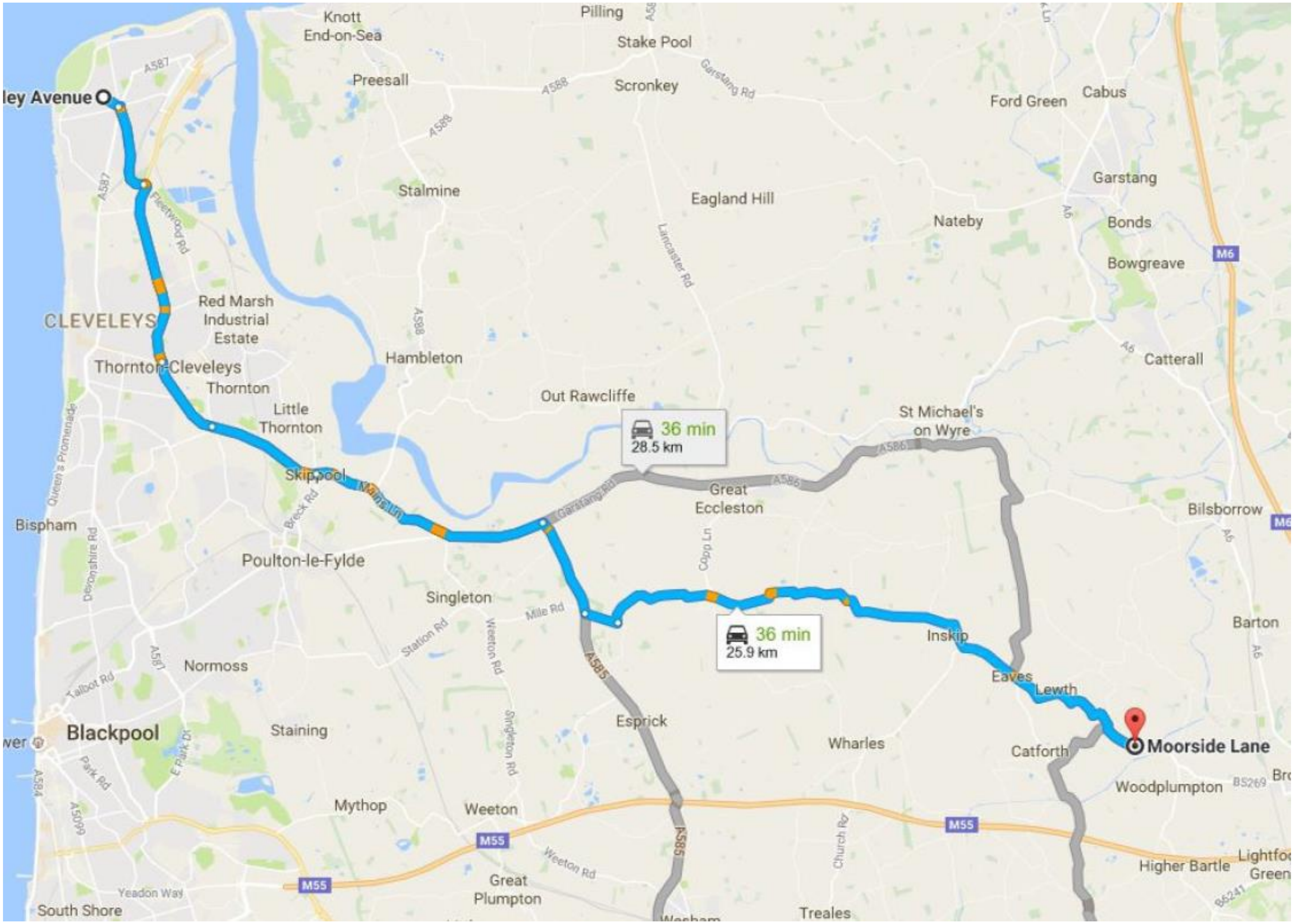
2015 RIS- A585 Stage 2 AM 2- 3-17

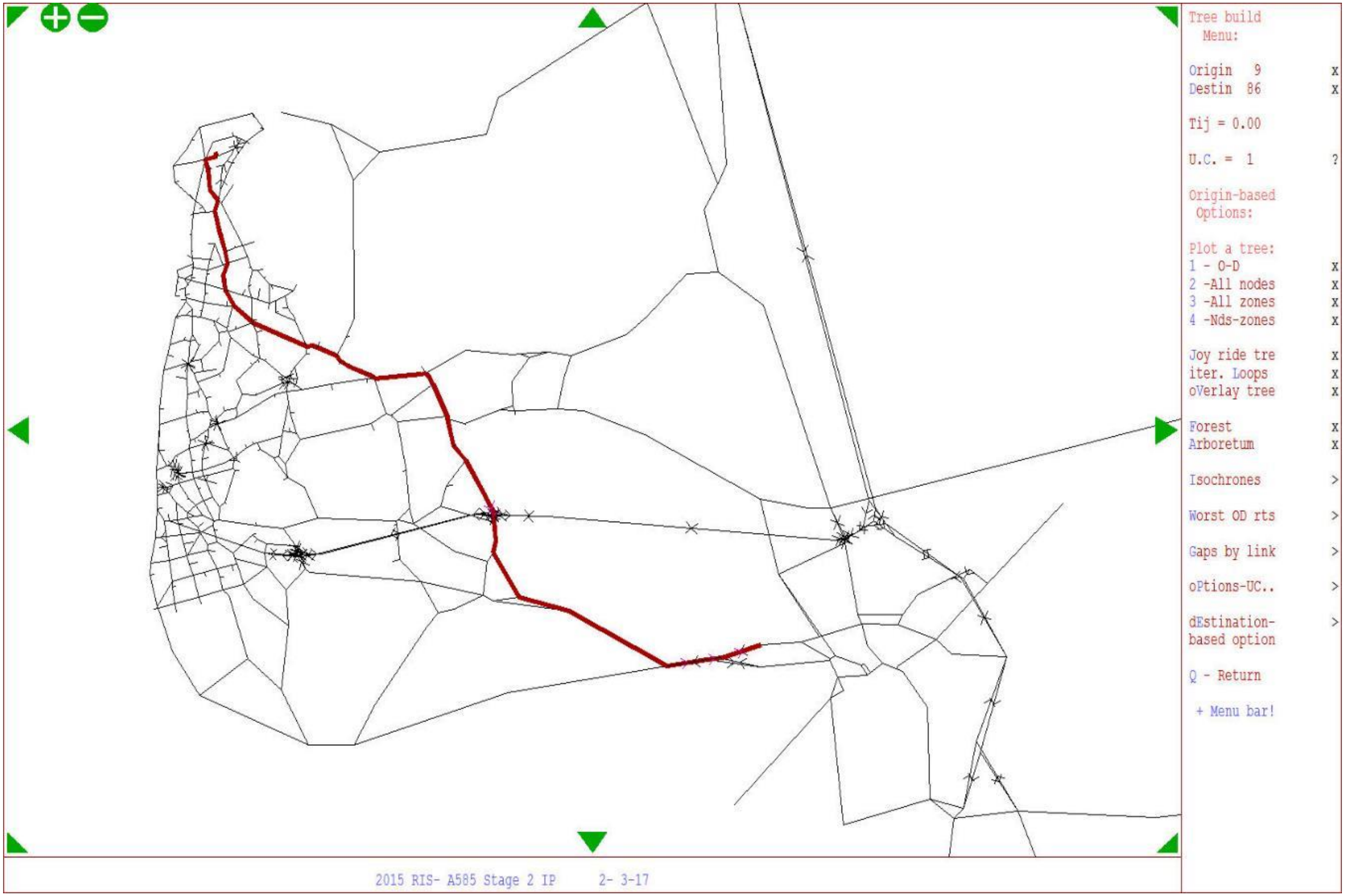


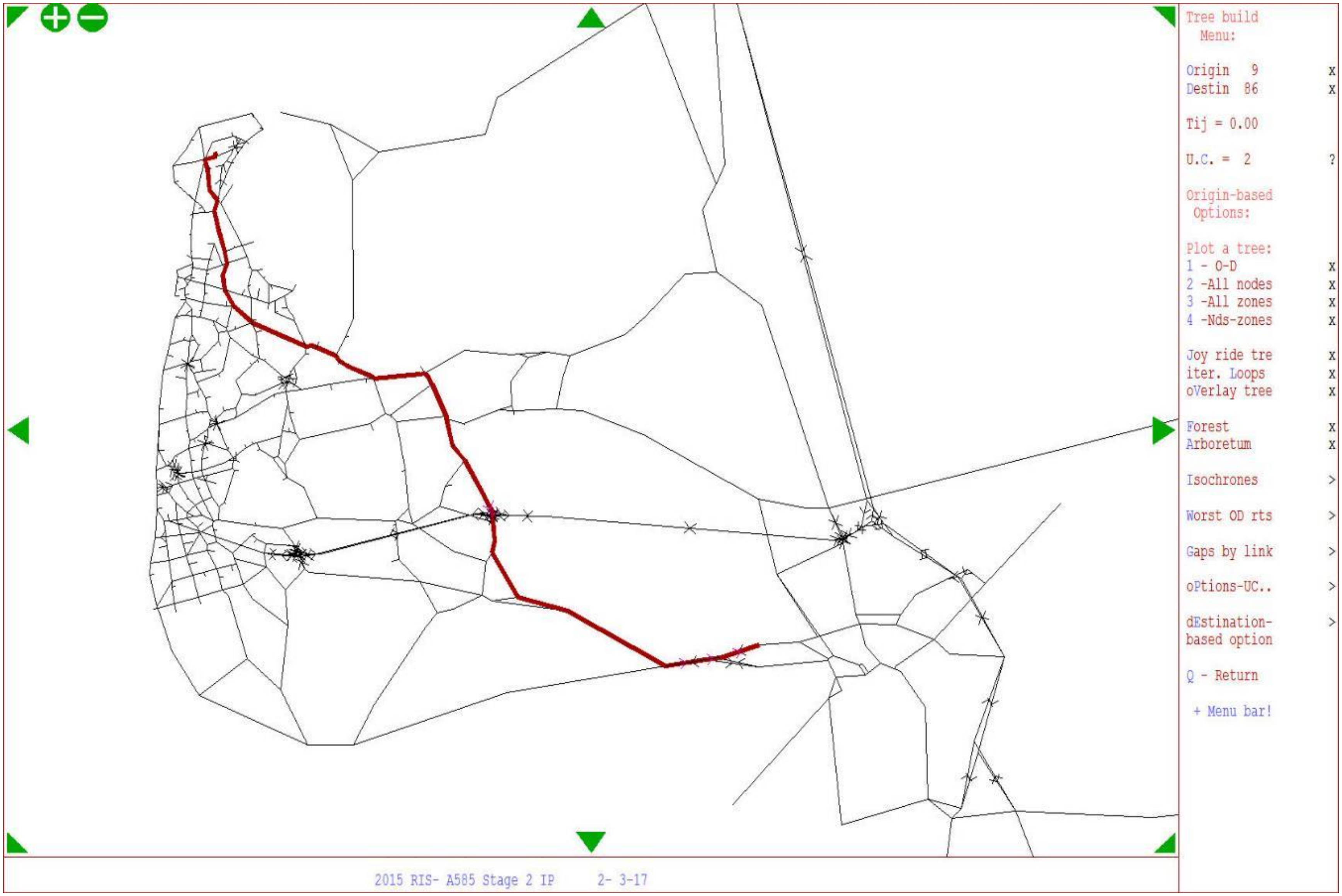
Origin 81
Destin 26
Tij = 0.00
U.C. = 5

2015 RIS- A585 Stage 2 AM 2- 3-17

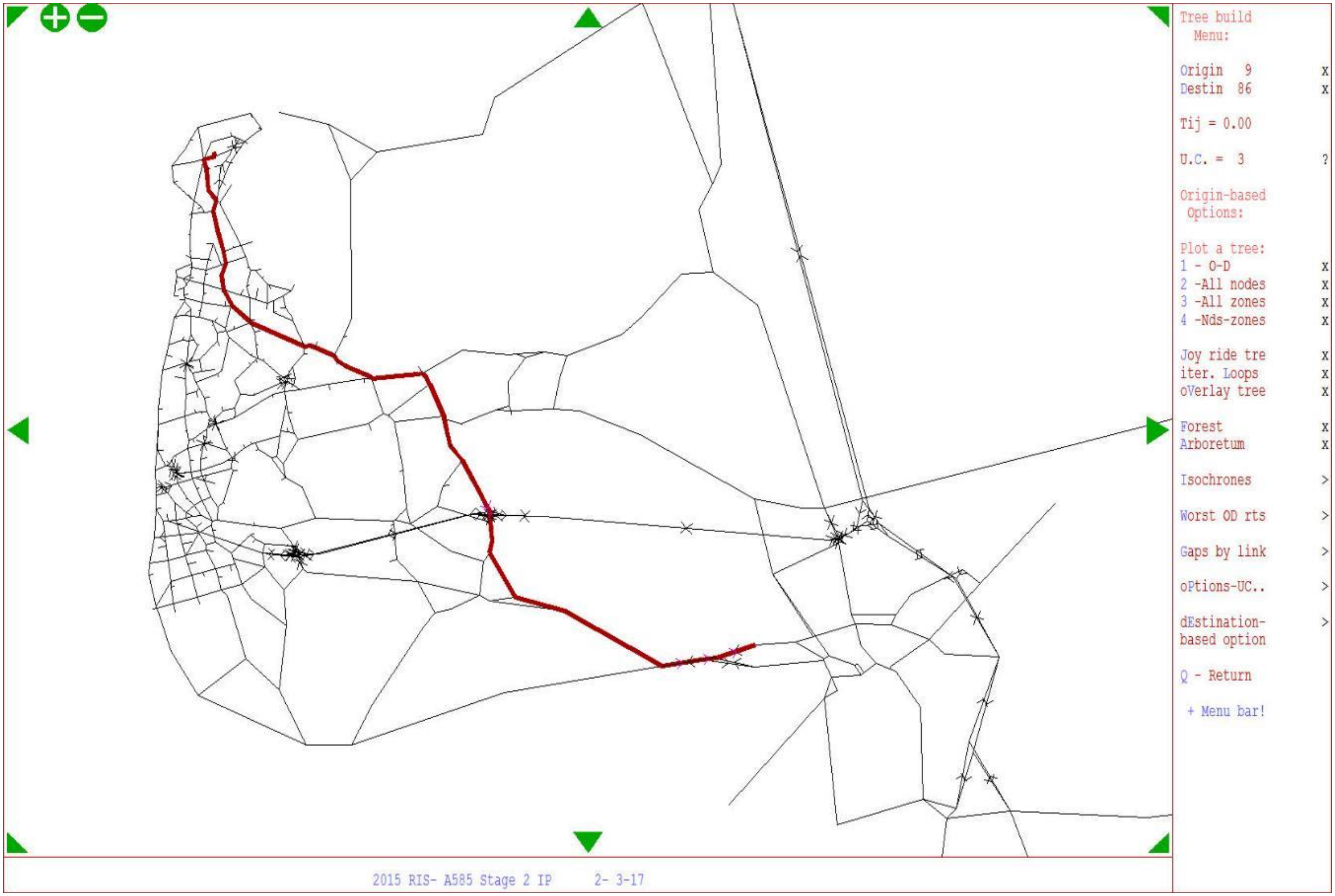
IP Networking Routing Checks


ley Avenue
Moorside Lane
36 min
28.5 km
36 min
25.9 km
CLEVELEYS
Thornton-Cleveleys
Skippool
Blackpool
Poulton-le-Fylde
Singleton
Great Eccleston
Inskip
Eaves
Lewth
Catforth
Woodplumpton
St Michael's on Wyre
Garstang
M55
M6
A585
A586

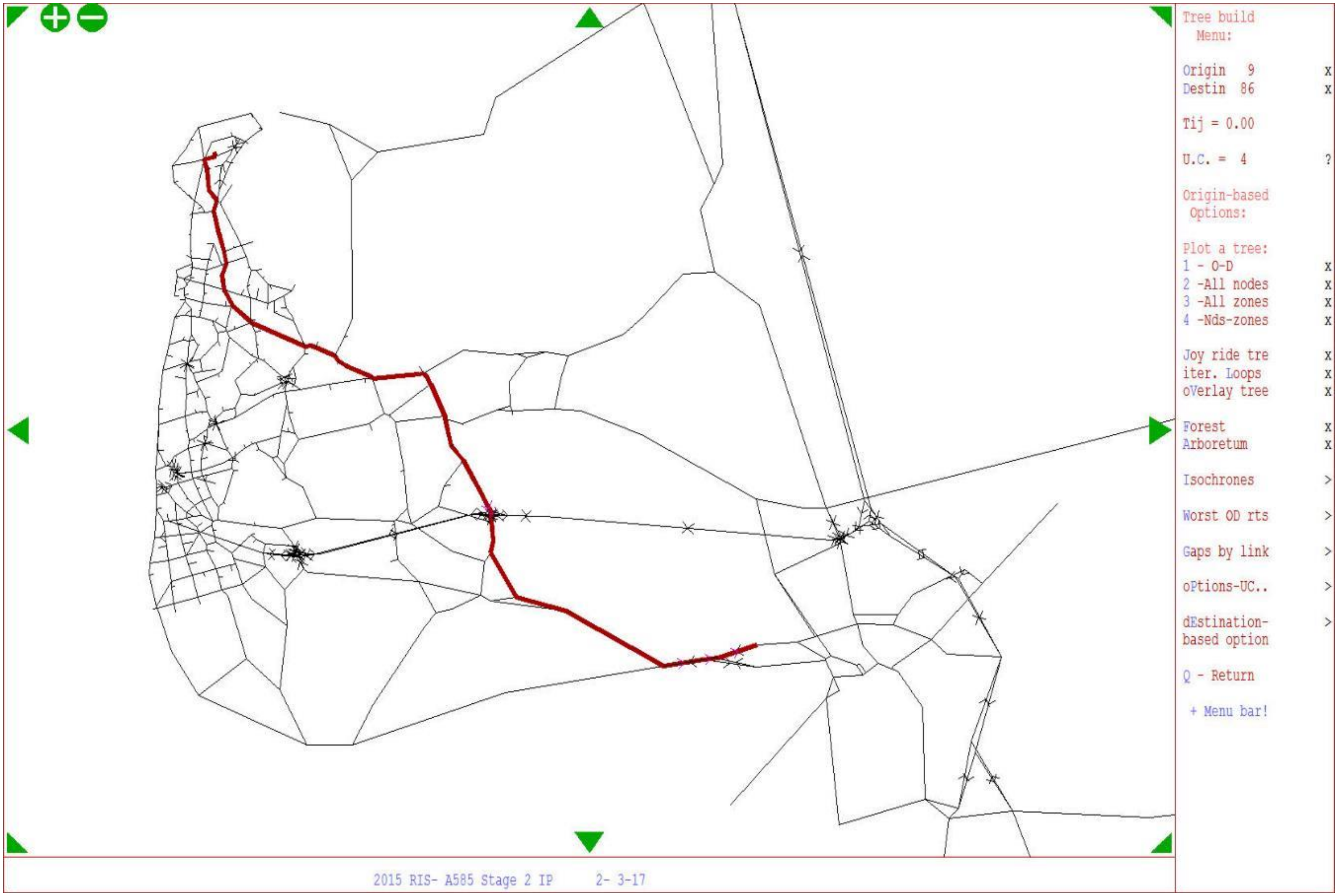

Origin 9
Destin 86
Tij = 0.00
U.C. = 1

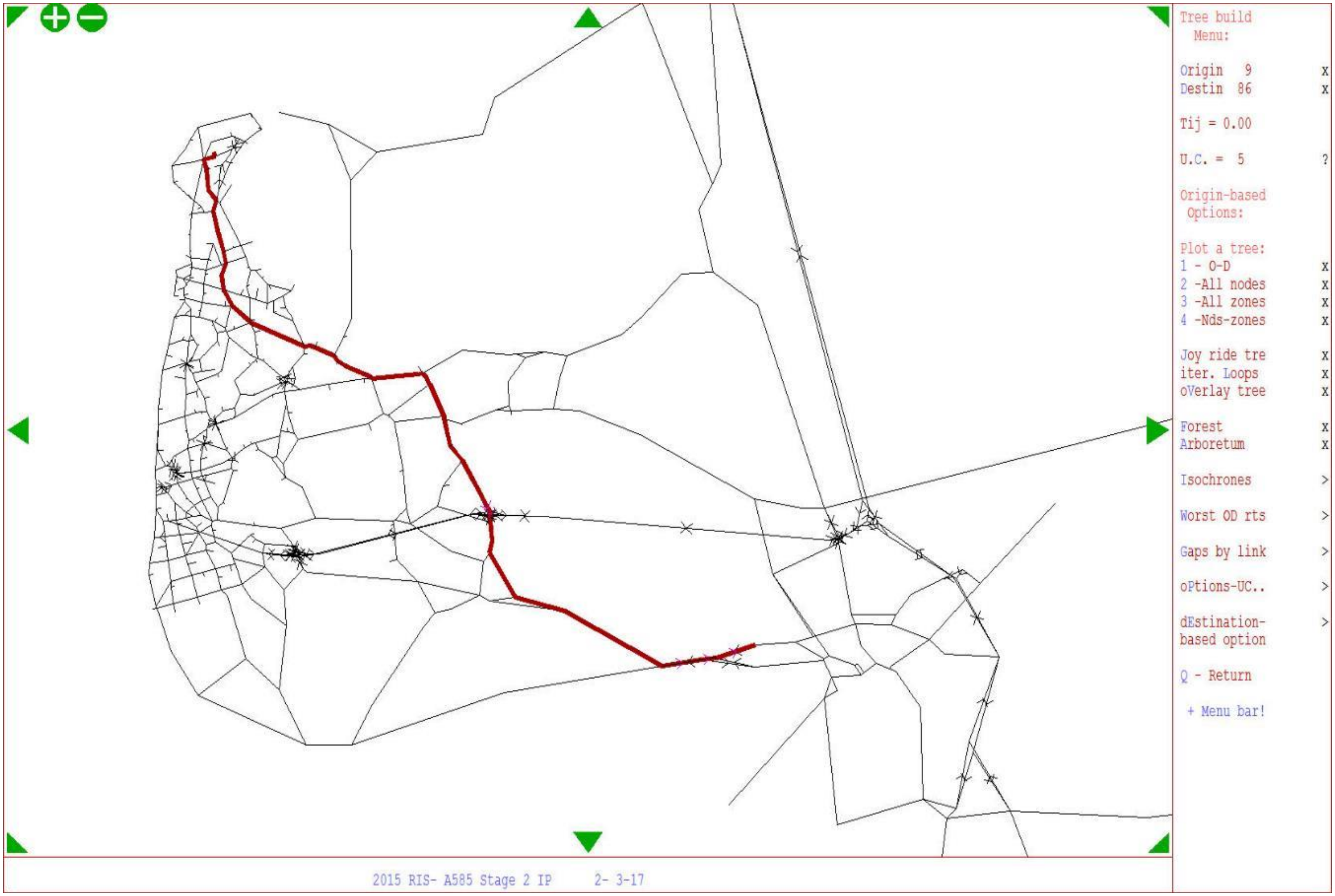

Origin 9
Destin 86
Tij = 0.00
U.C. = 2

2015 RIS- A585 Stage 2 IP 2- 3-17

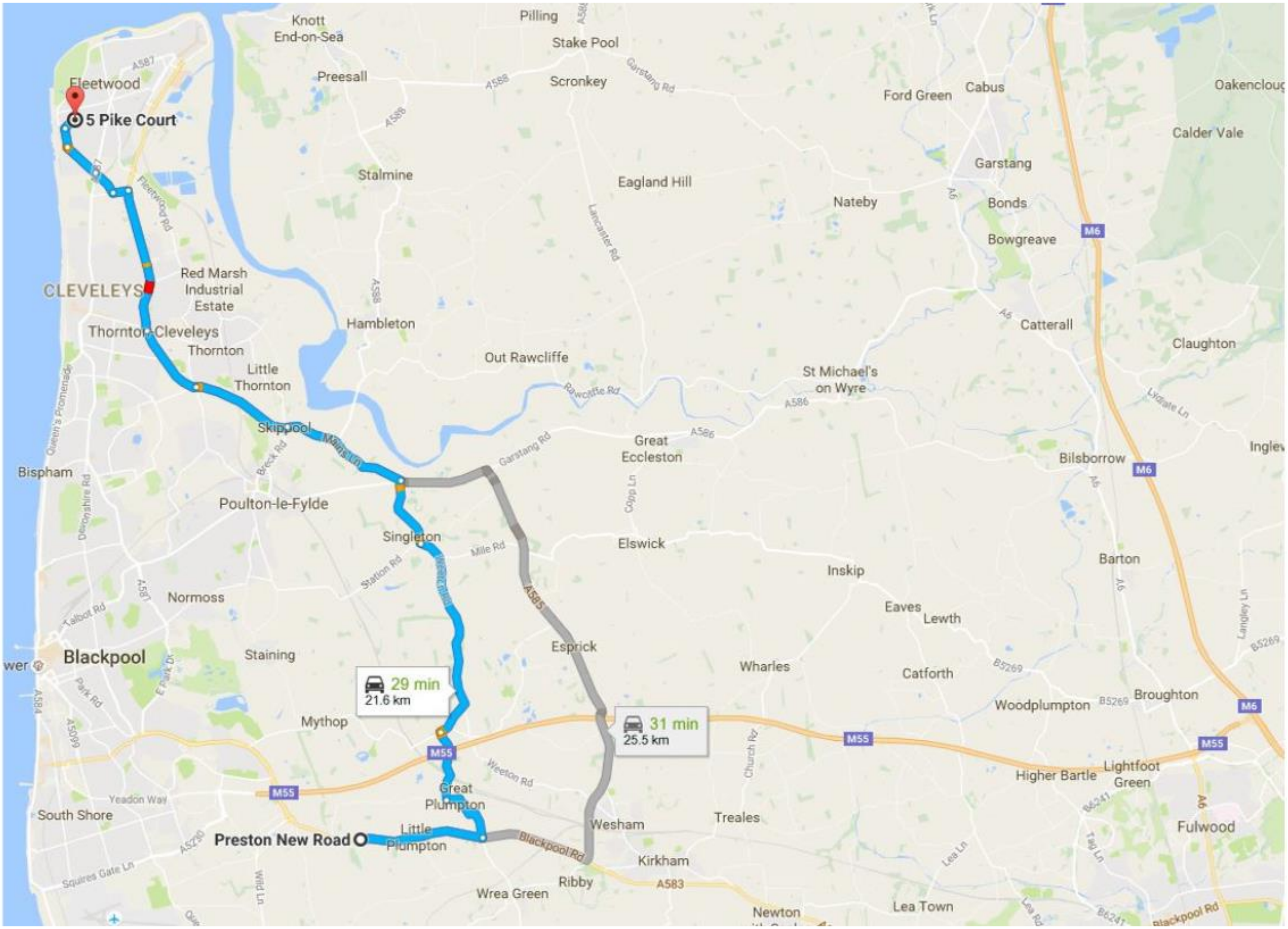


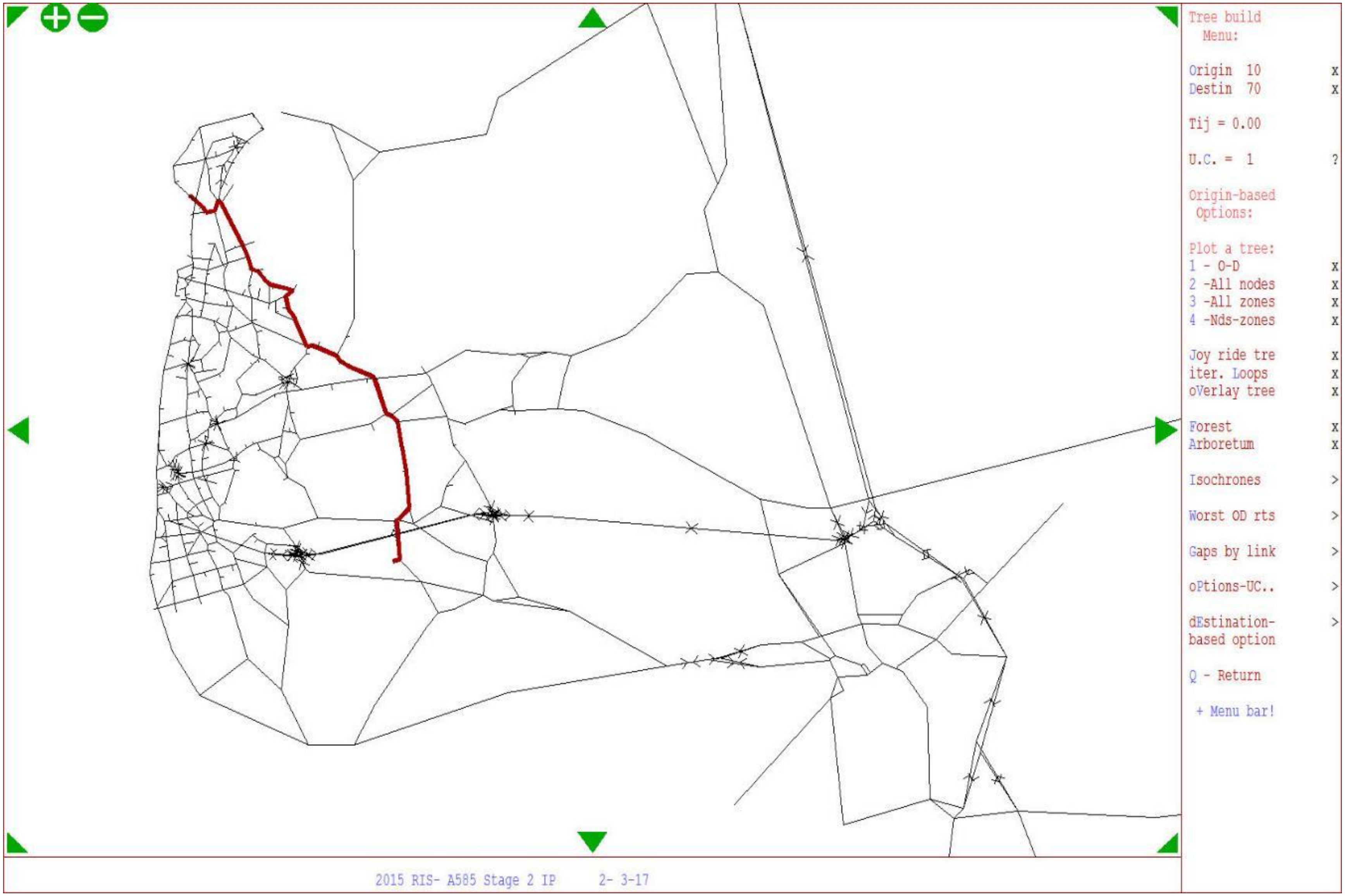
Origin 9
Destin 86
Tij = 0.00
U.C. = 3


Origin 9
Destin 86
Tij = 0.00
U.C. = 4



Origin 9
Destin 86
Tij = 0.00
U.C. = 5


5 Pike Court
Preston New Road
29 min
21.6 km
31 min
25.5 km
Fleetwood
Cleveleys
Thornton-Cleveleys
Skippool
Singleton
Great Plumpton
Little Plumpton
Blackpool
Poulton-le-Fylde
Wesham
Kirkham
Esprick
Elswick
M55
M6
A585

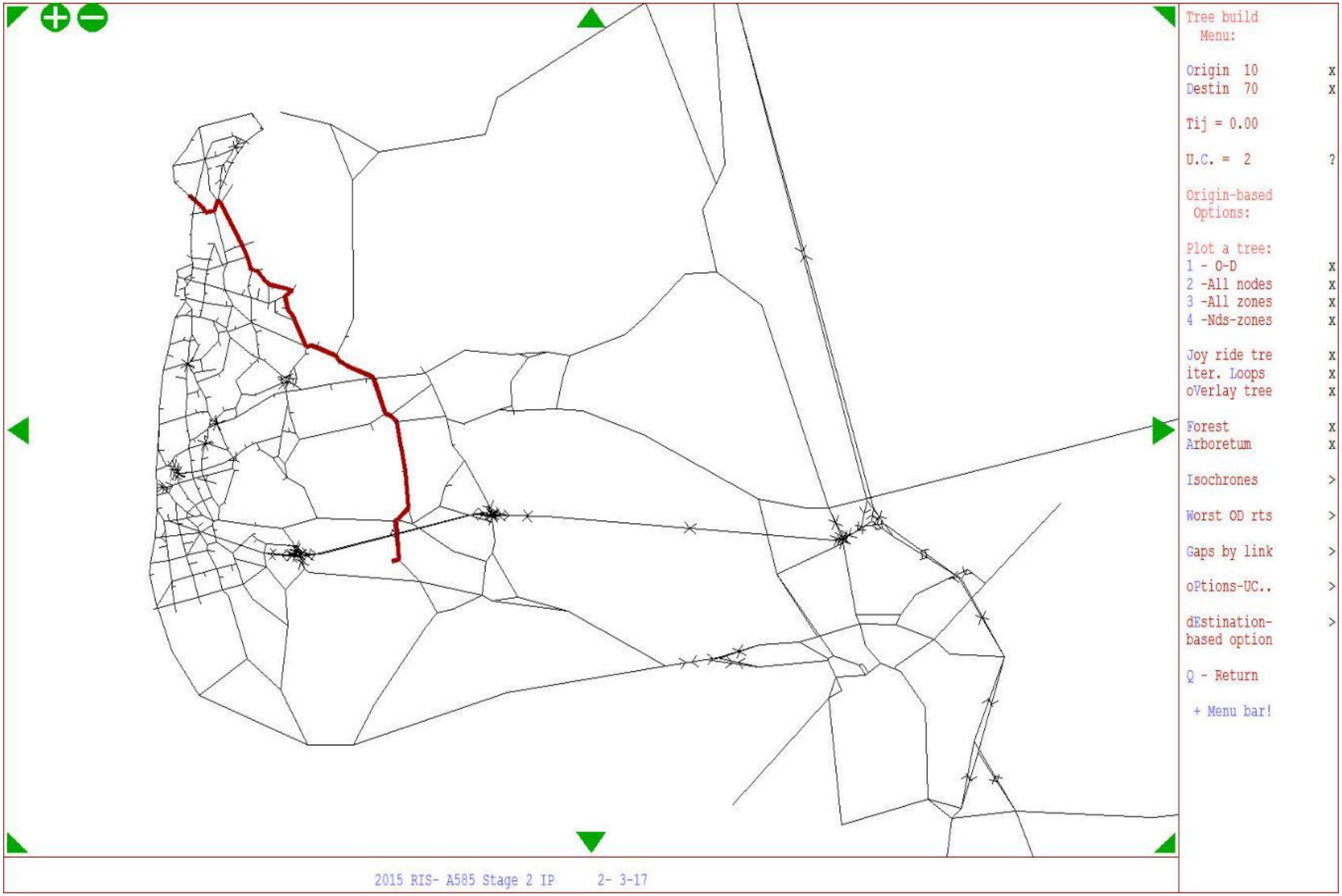


Origin 10 x
Destin 70 x

Tij = 0.00

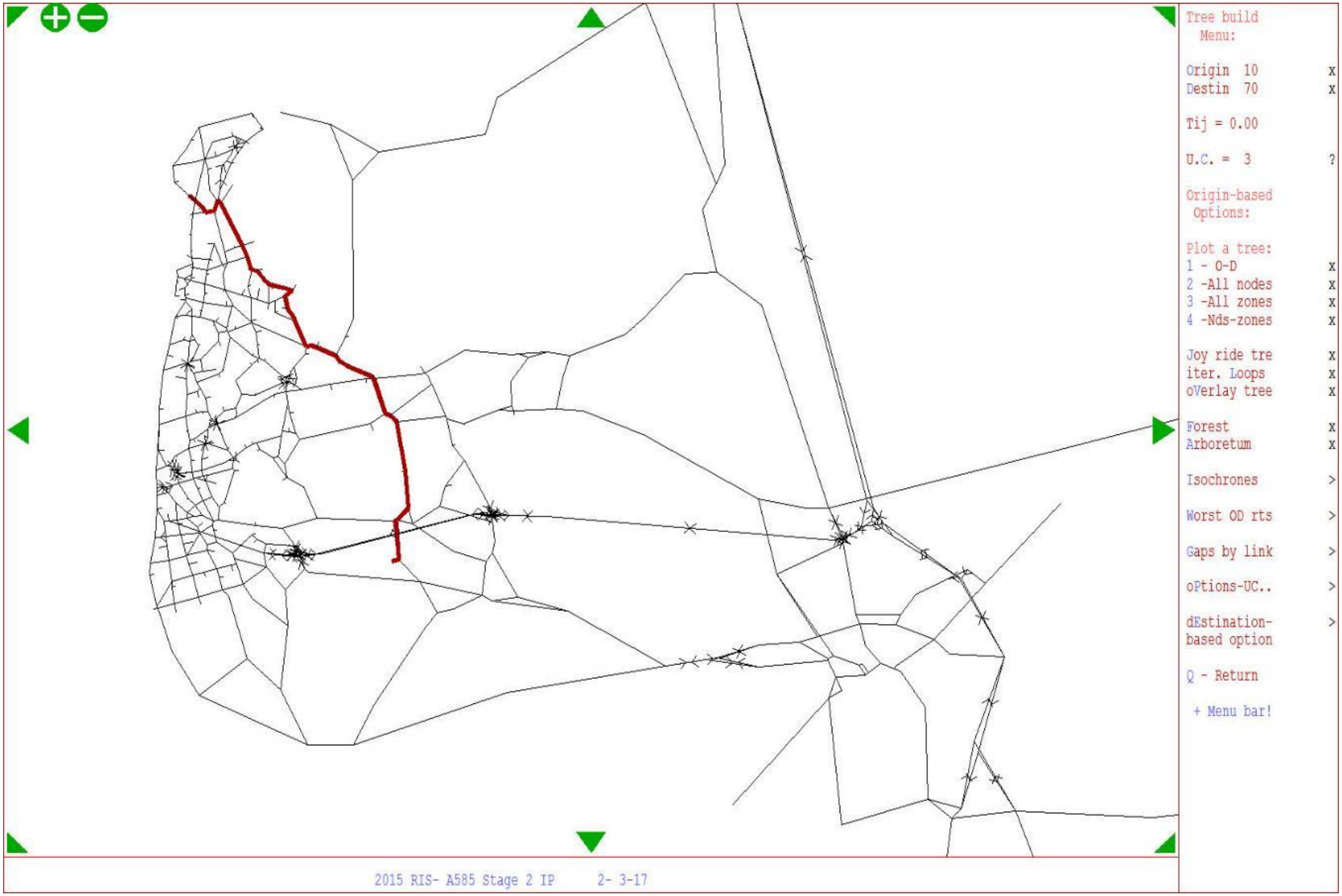
U.C. = 1 ?

2015 RIS- A585 Stage 2 IP 2- 3-17

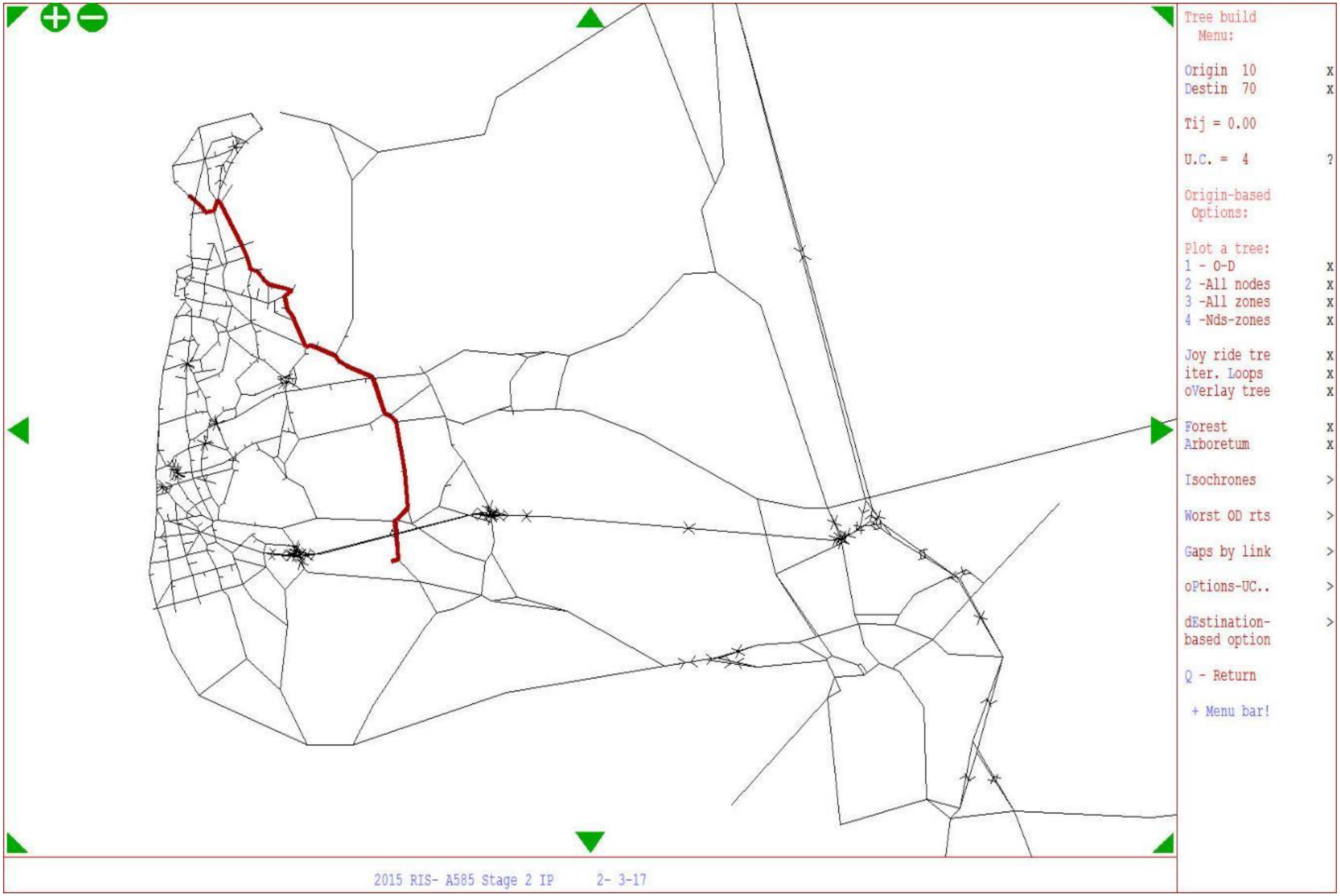


Origin 10
Destin 70
Tij = 0.00
U.C. = 2

2015 RIS- A585 Stage 2 IP 2- 3-17

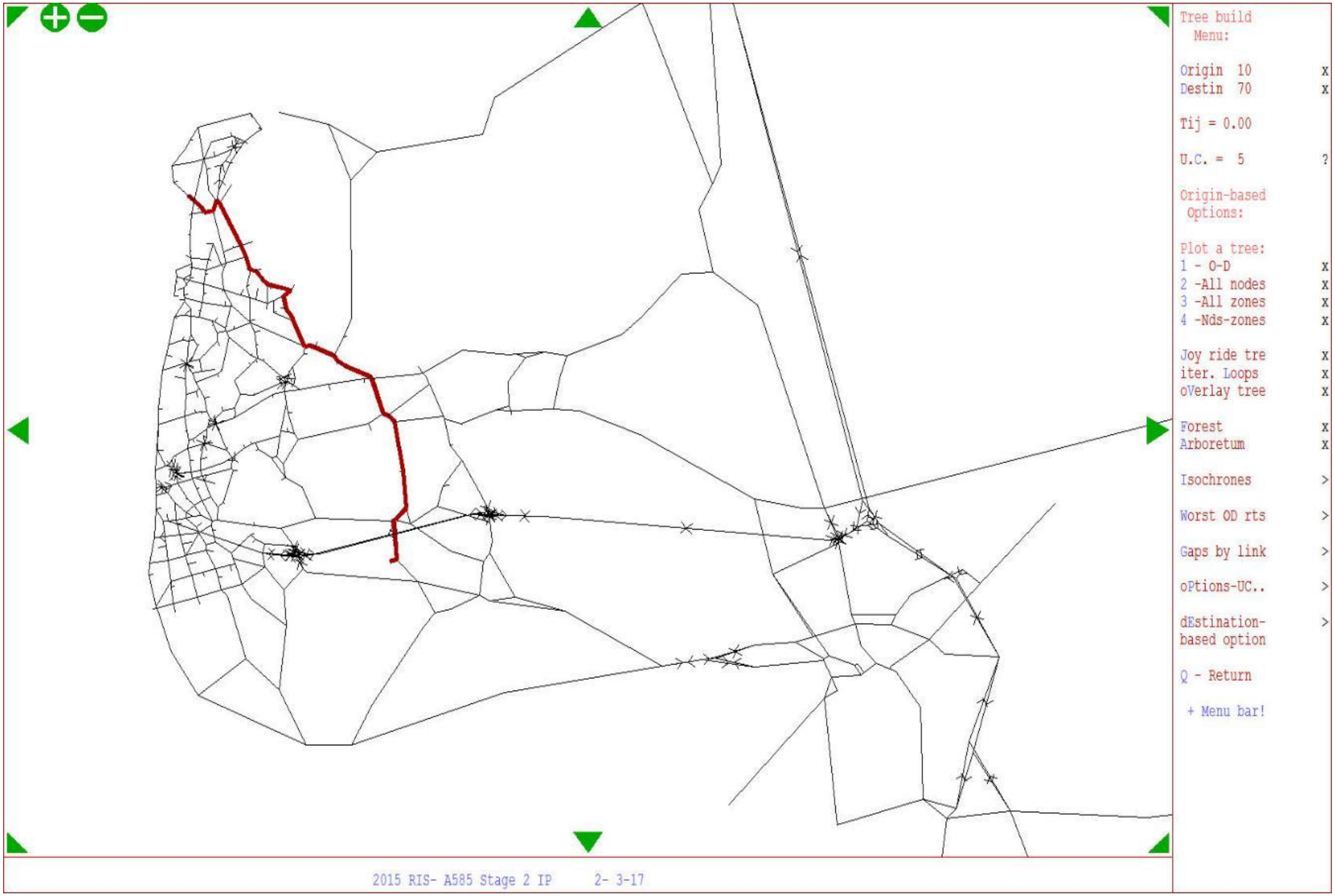


Origin 10
Destin 70
Tij = 0.00
U.C. = 3

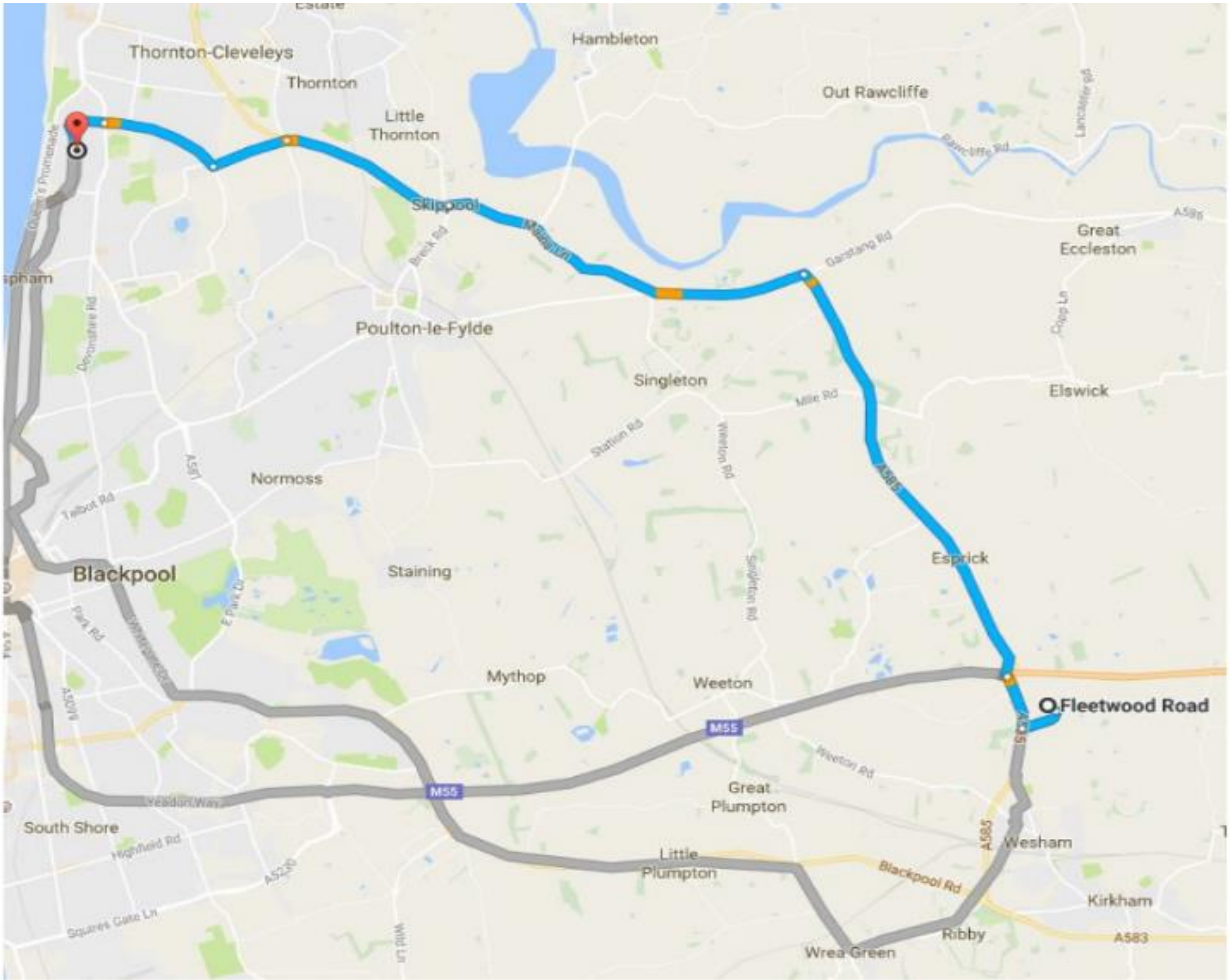


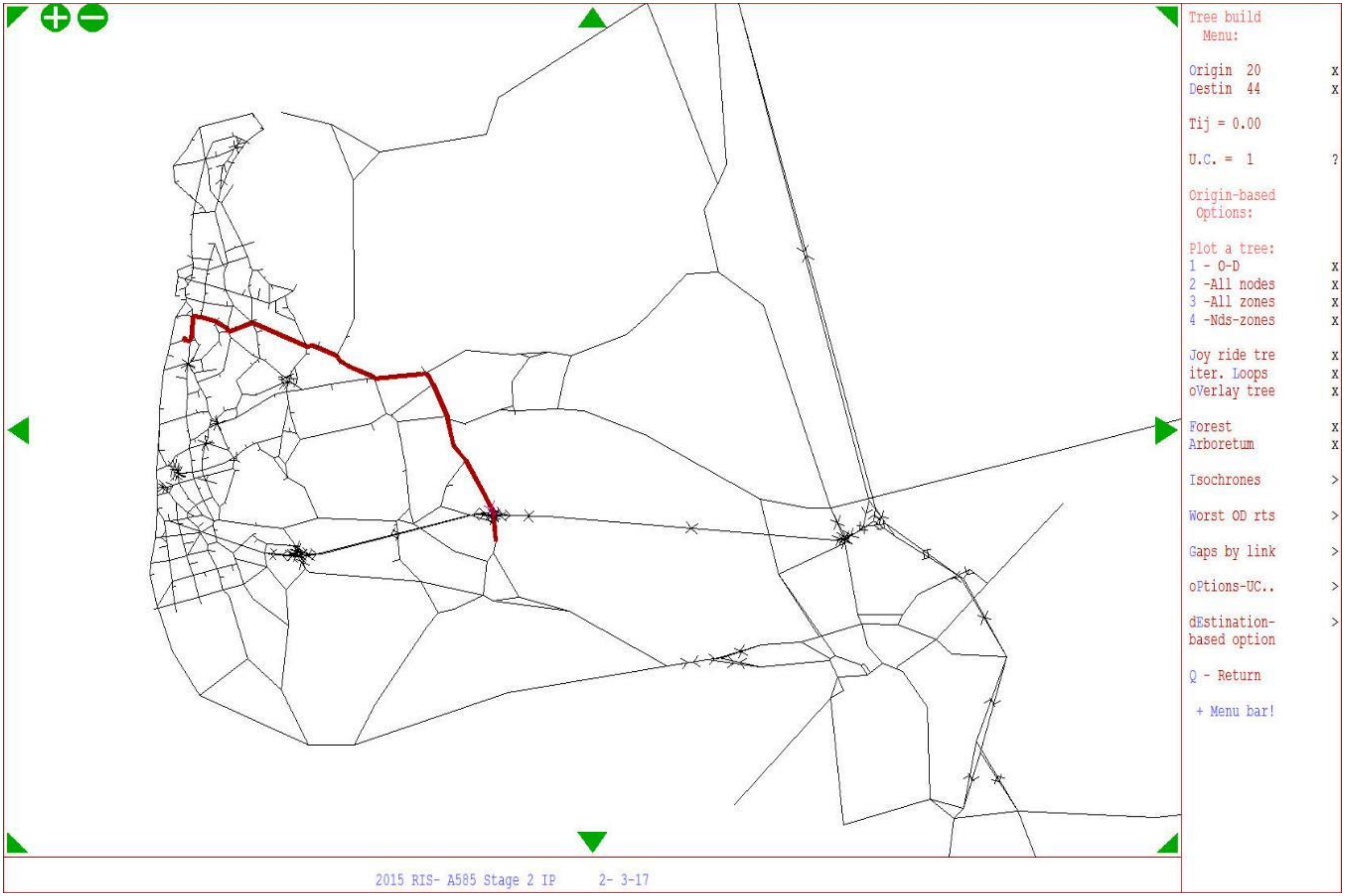
Origin 10
Destin 70
Tij = 0.00
U.C. = 4

2015 RIS- A585 Stage 2 IP 2- 3-17



Origin 10
Destin 70
Tij = 0.00
U.C. = 5


Thornton-Cleveleys
Thornton
Little Thornton
Hambleton
Out Rawcliffe
Skippool
Great Eccleston
Poulton-le-Fylde
Singleton
Elswick
Normoss
Blackpool
Staining
Esprick
Mythop
Weeton
Fleetwood Road
M55
Great Plumpton
Little Plumpton
South Shore
Wesham
Kirkham
Ribby
Wrea Green
A585
A583
Blackpool Rd

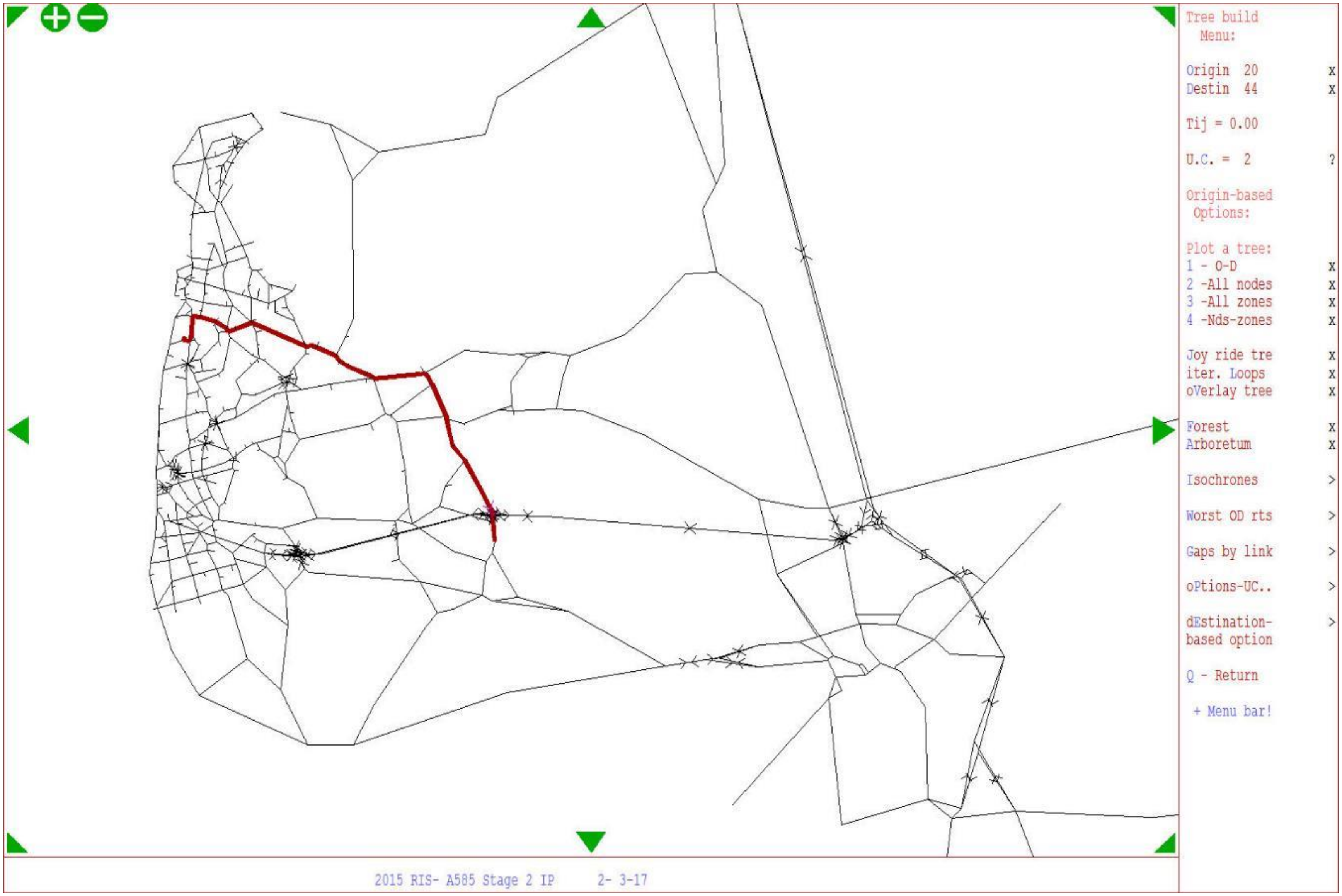


Origin 20
Destin 44

Tij = 0.00

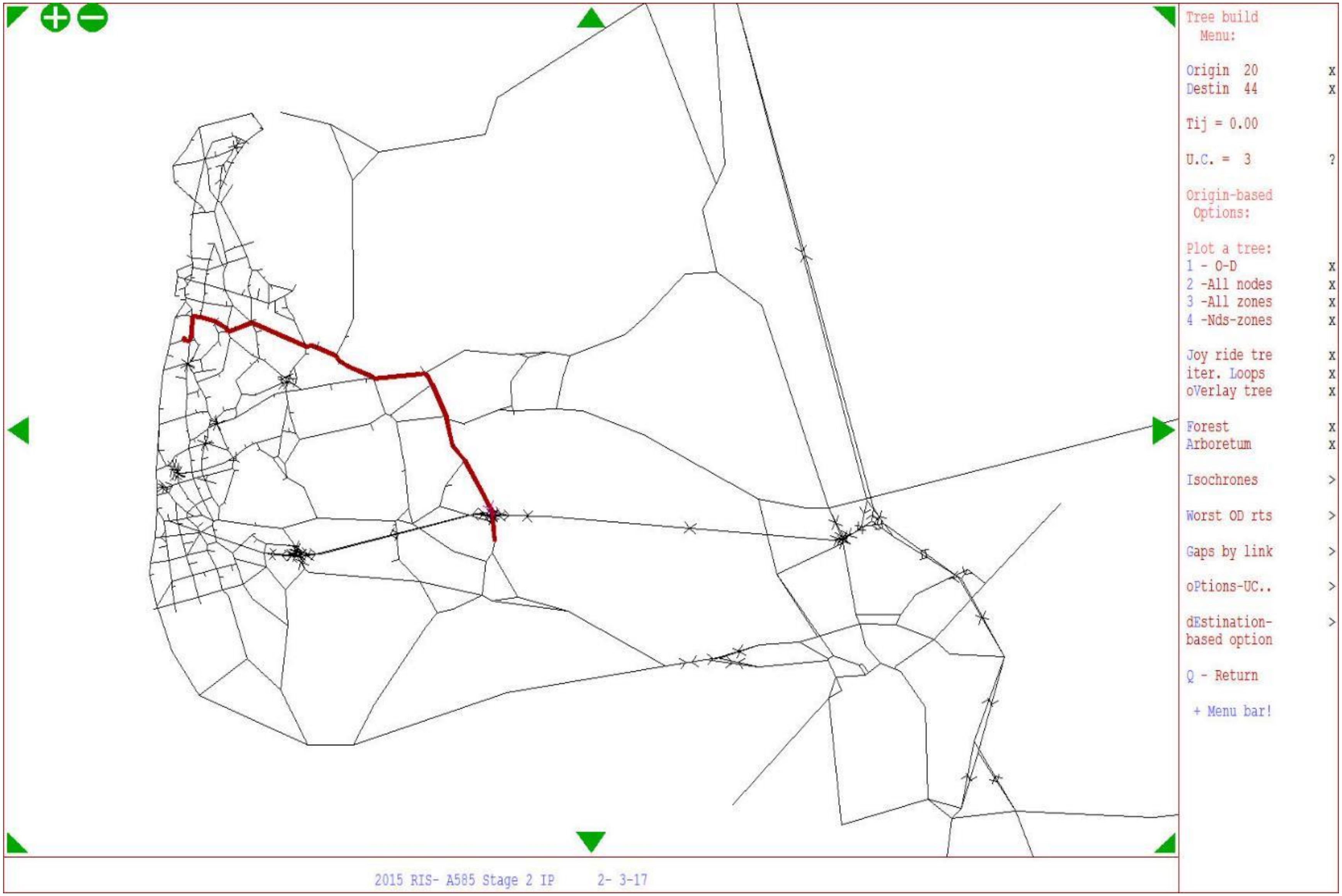
U.C. = 1

2015 RIS- A585 Stage 2 IP 2- 3-17



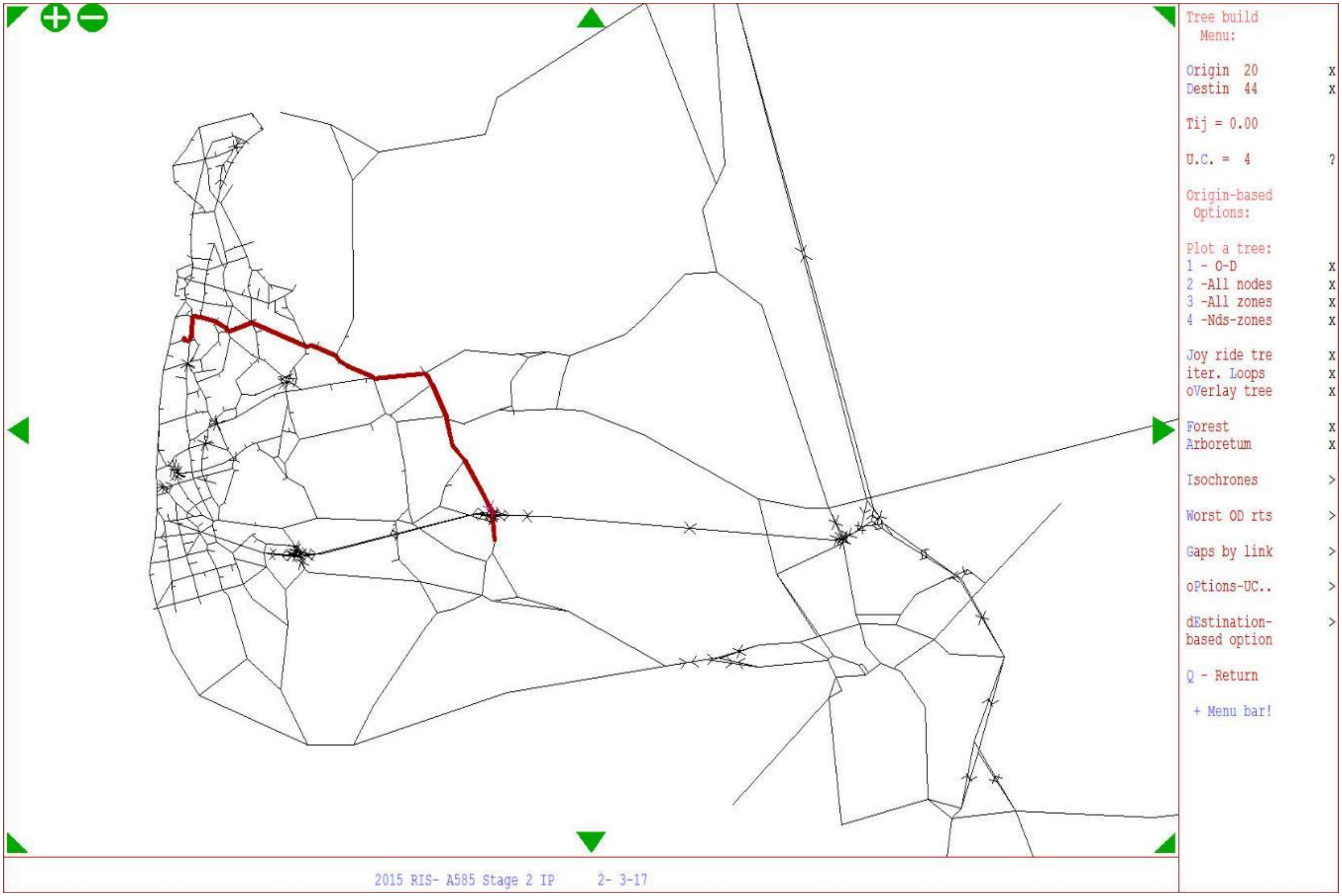
Origin 20
Destin 44
Tij = 0.00
U.C. = 2

2015 RIS- A585 Stage 2 IP 2- 3-17



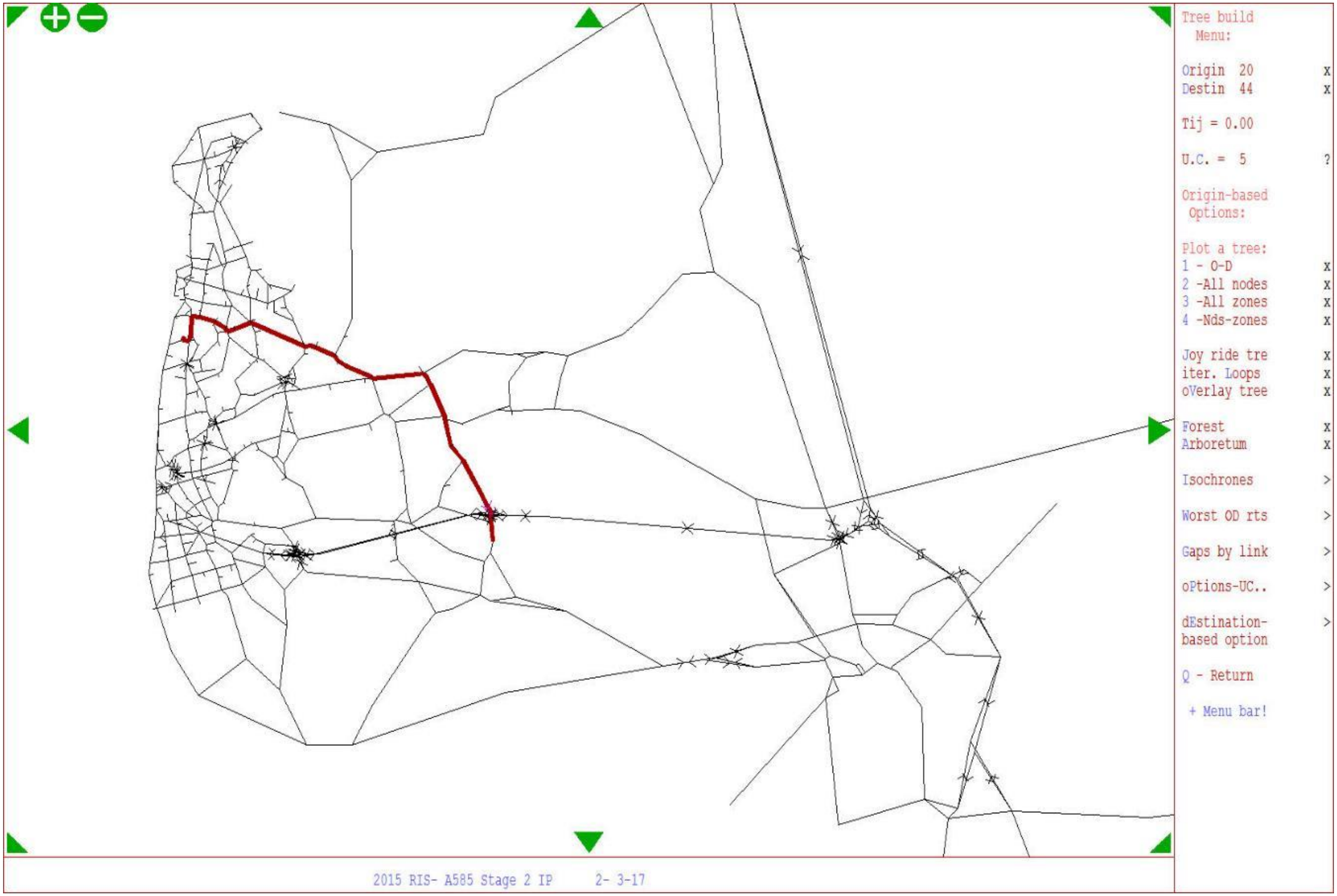
Origin 20
Destin 44
Tij = 0.00
U.C. = 3

2015 RIS- A585 Stage 2 IP 2- 3-17



Origin 20
Destin 44
Tij = 0.00
U.C. = 4

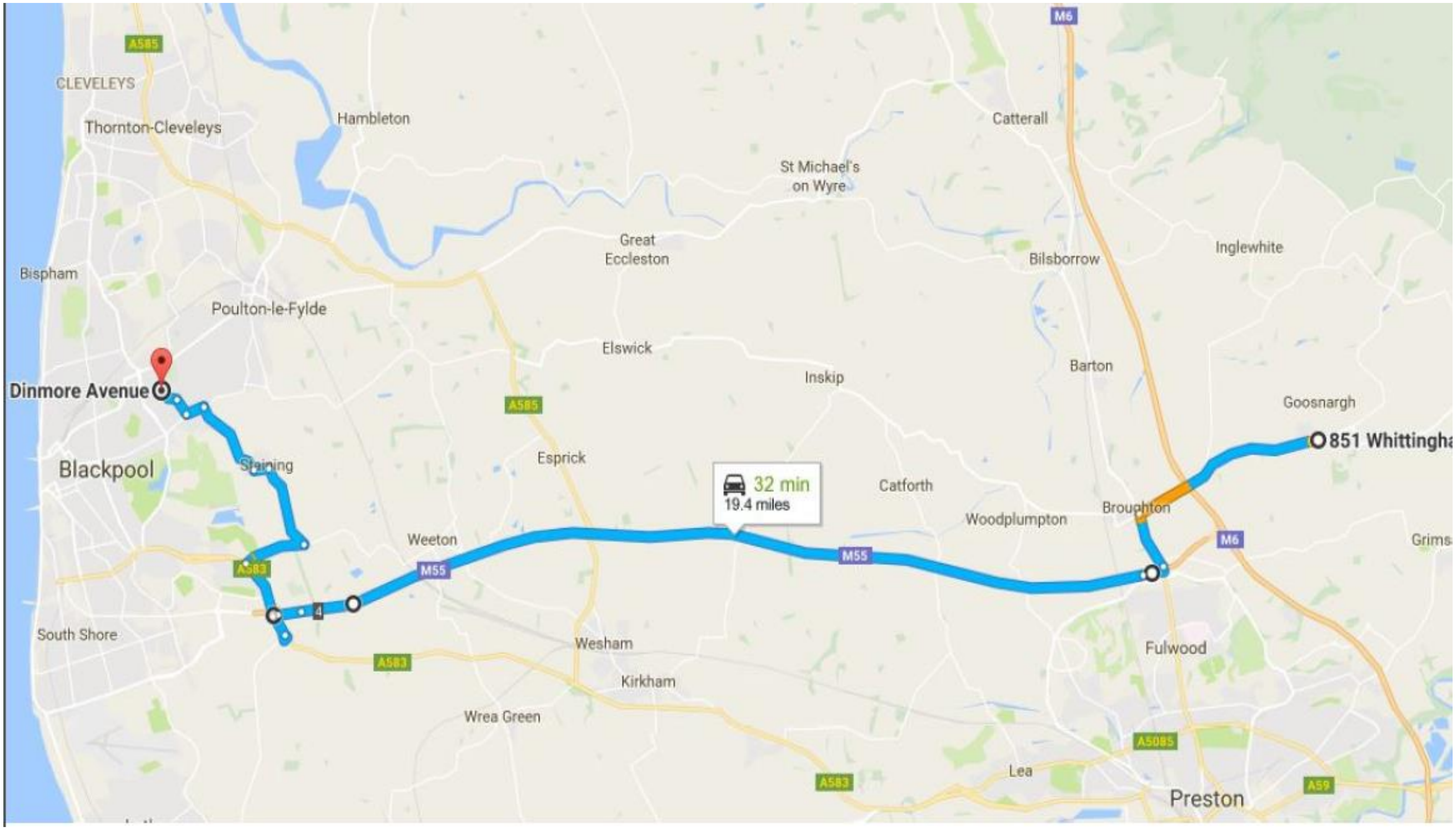
2015 RIS- A585 Stage 2 IP 2- 3-17

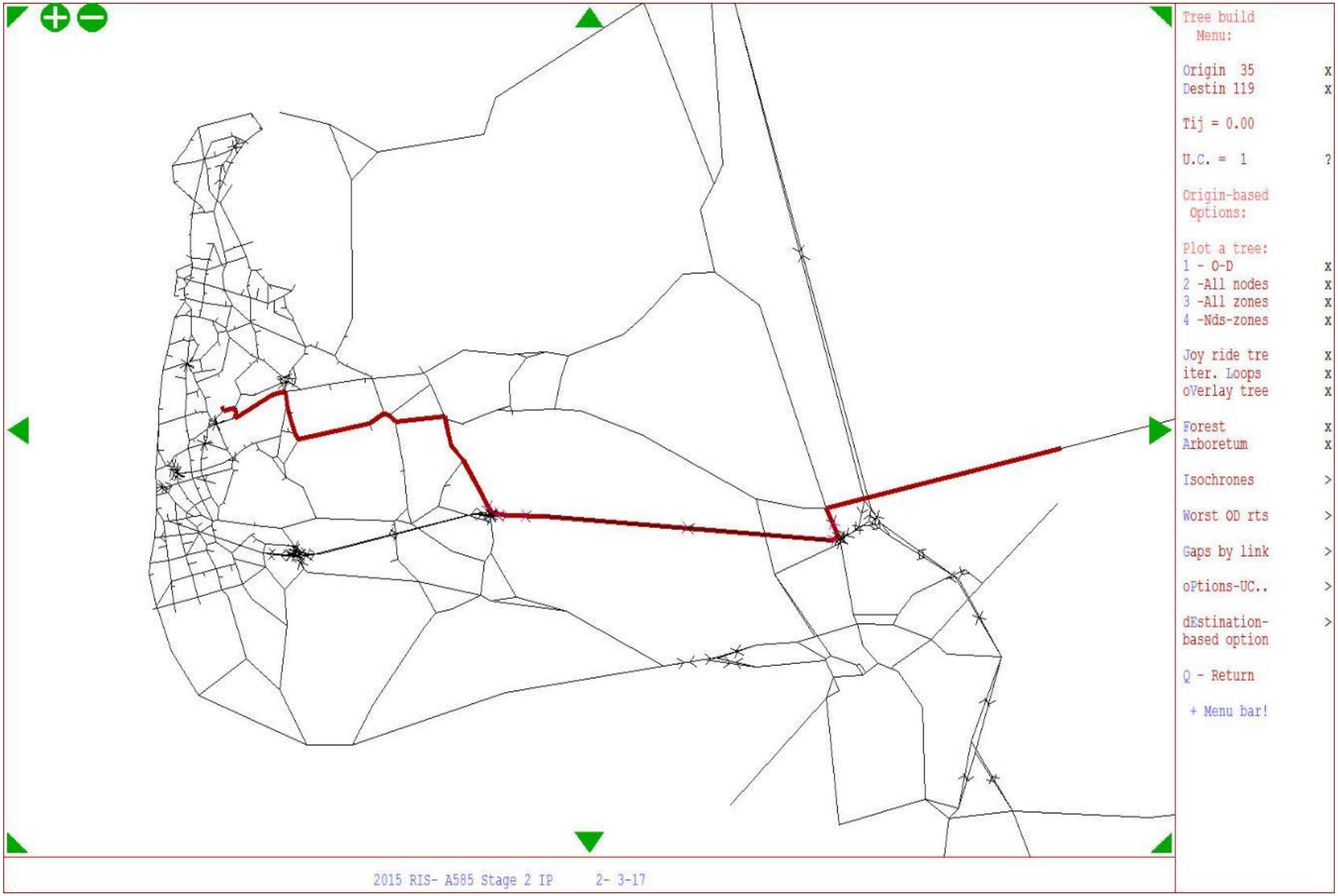


Tree build Menu:

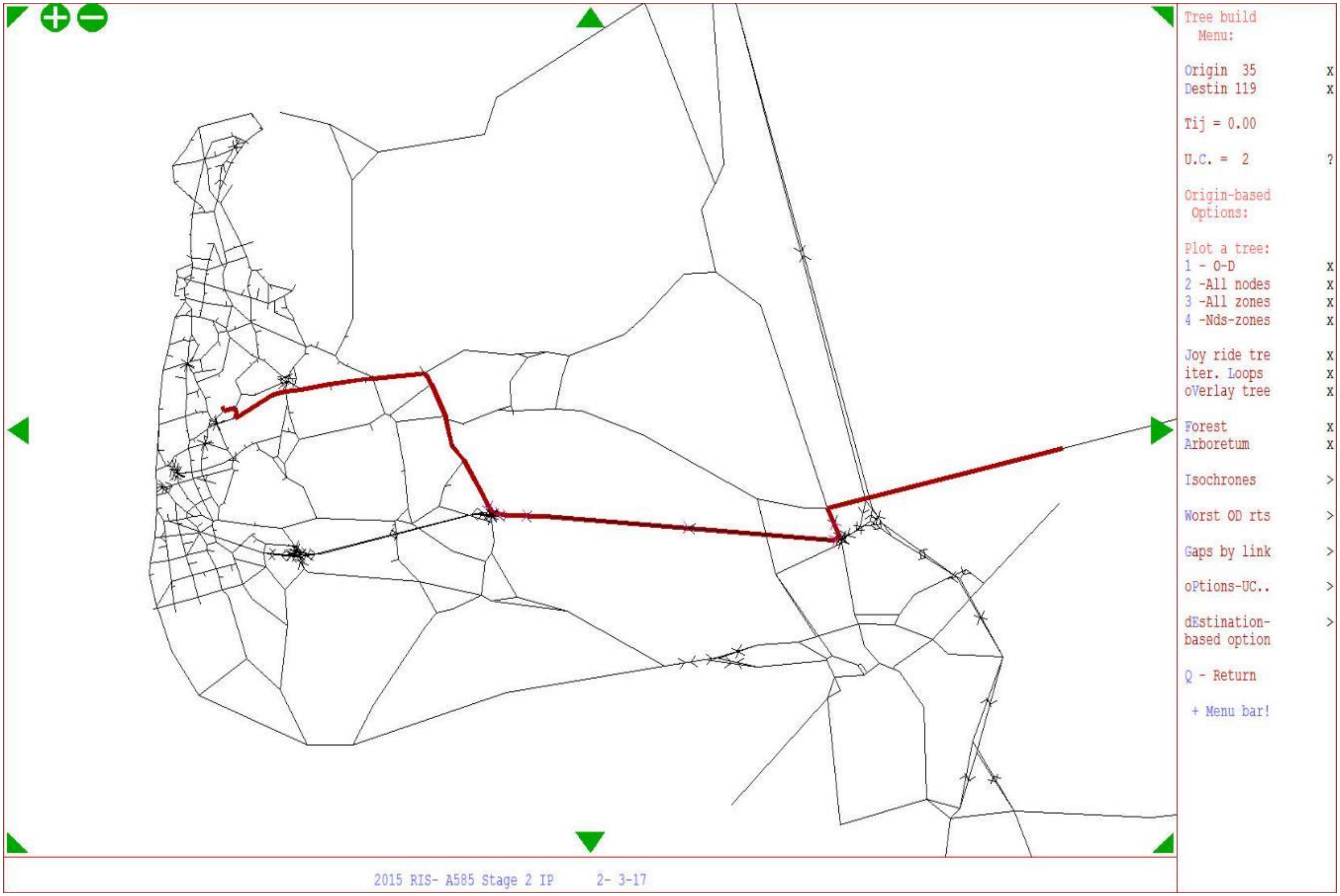
Origin 20
Destin 44
Tij = 0.00
U.C. = 5

2015 RIS- A585 Stage 2 IP 2- 3-17


A585
CLEVELEYS
Thornton-Cleveleys
Hambleton
Catterall
St Michael's on Wyre
Great Eccleston
Bilsborrow
Inglewhite
Bispham
Poulton-le-Fylde
Elswick
Barton
Inskip
Dinmore Avenue
A585
Goosnargh
851 Whittingha
Staining
Blackpool
Esprick
32 min
19.4 miles
Catforth
Woodplumpton
Broughton
Weeton
M55
M55
M6
M6
Grims
A583
South Shore
Wesham
Fulwood
A583
Kirkham
Wrea Green
A5085
Lea
A583
A59
Preston



Origin 35
Destin 119
Tij = 0.00
U.C. = 1

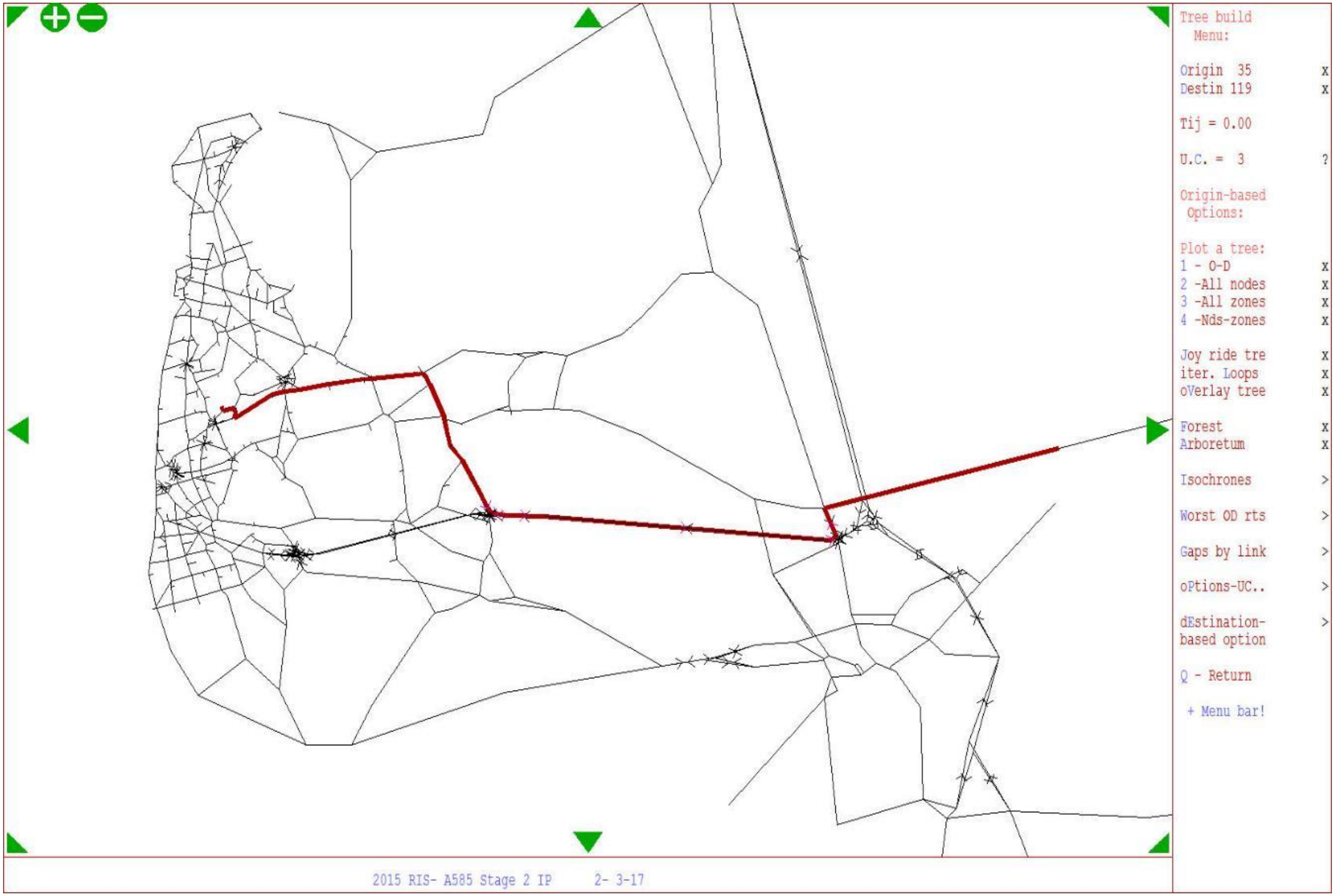


Origin 35
Destin 119

Tij = 0.00

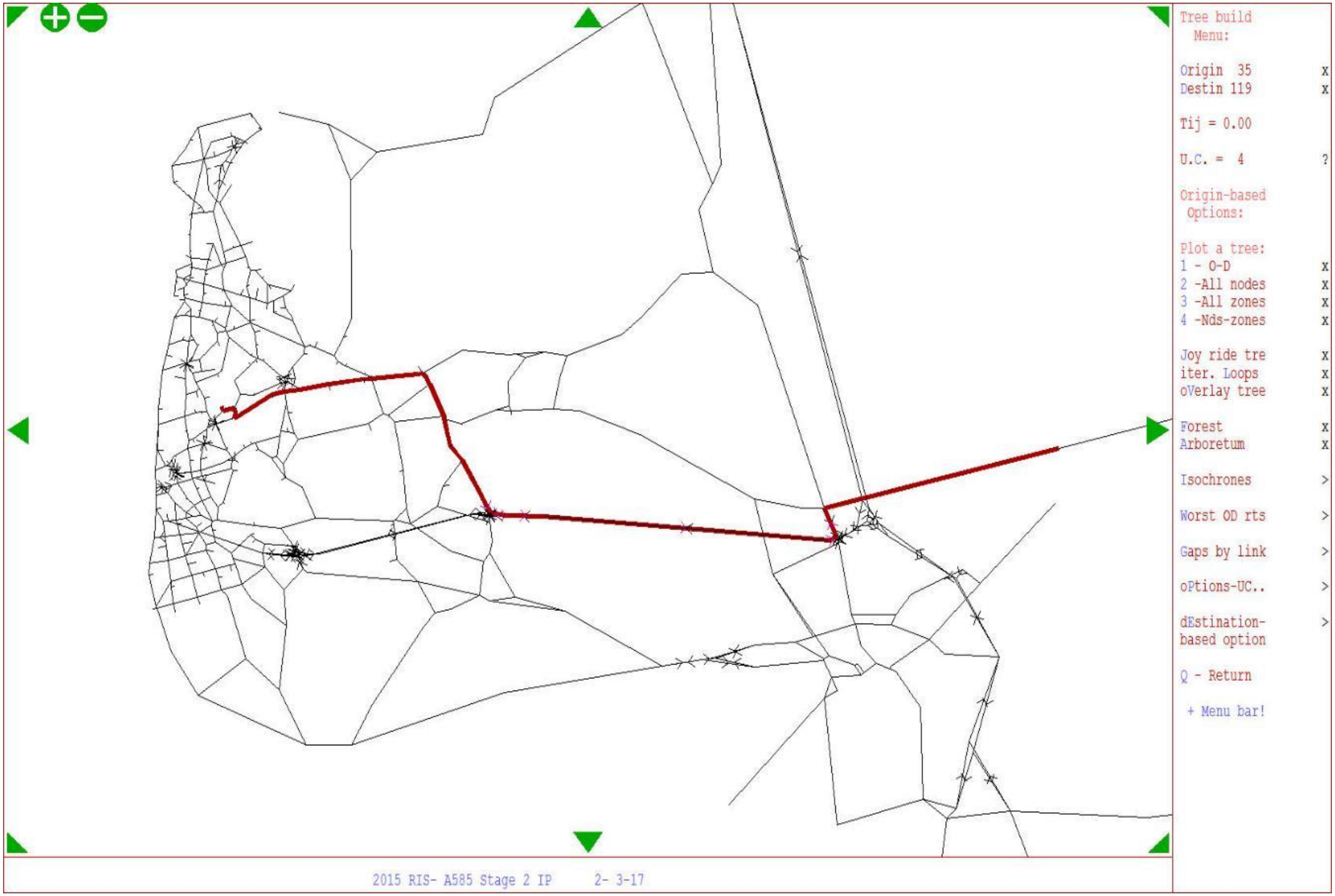
U.C. = 2

2015 RIS- A585 Stage 2 IP 2- 3-17

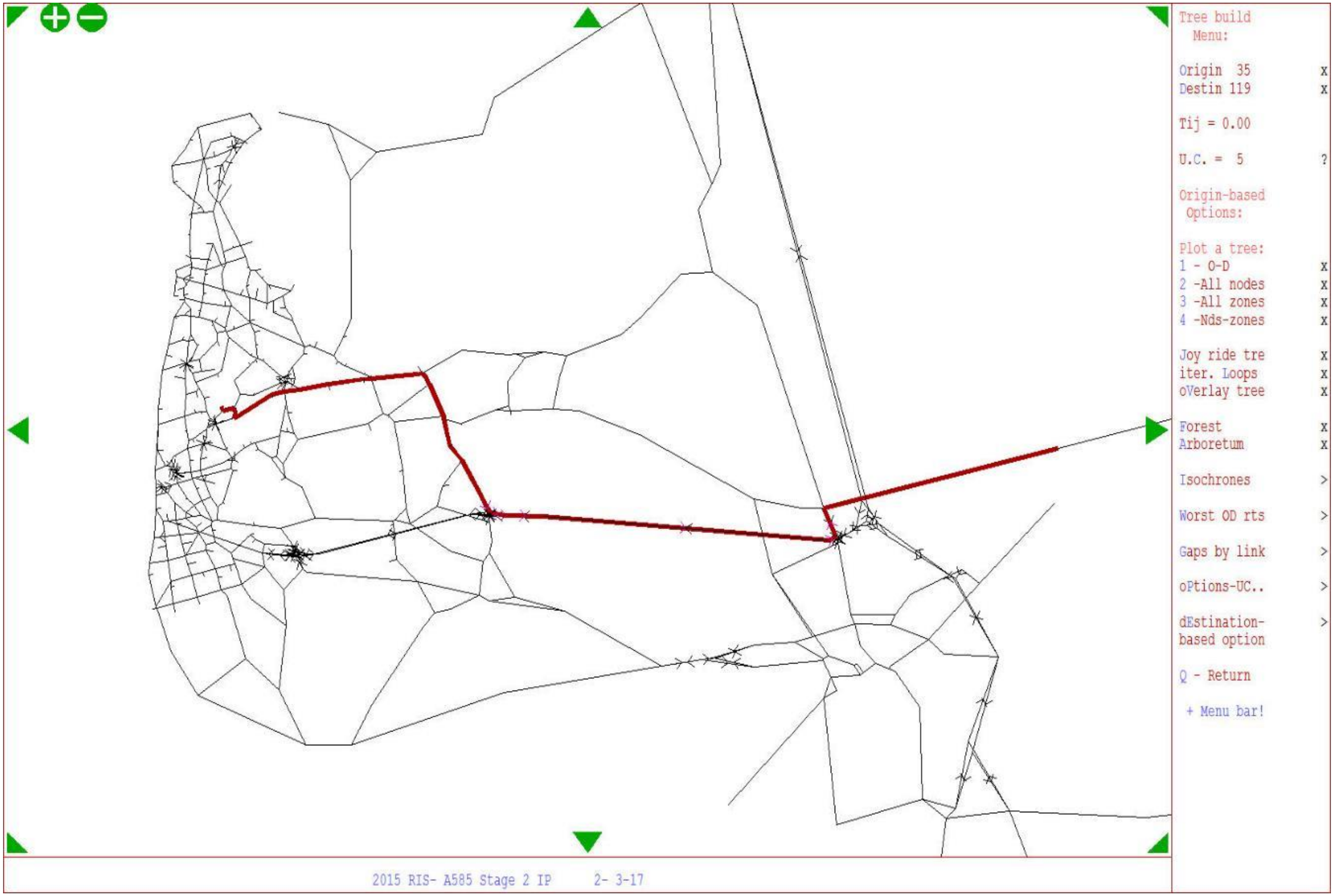


Origin 35
Destin 119
Tij = 0.00
U.C. = 3

2015 RIS- A585 Stage 2 IP 2- 3-17

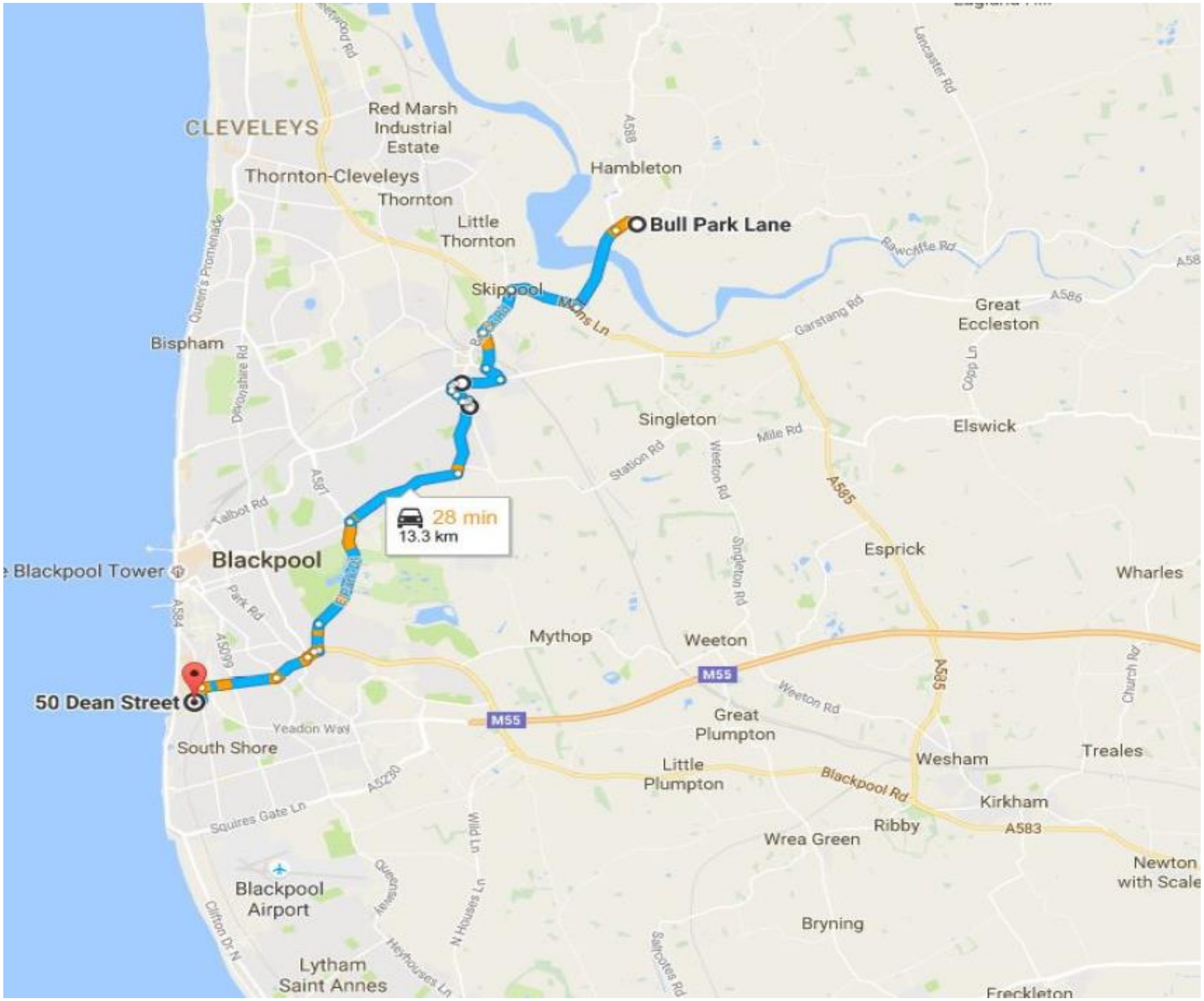


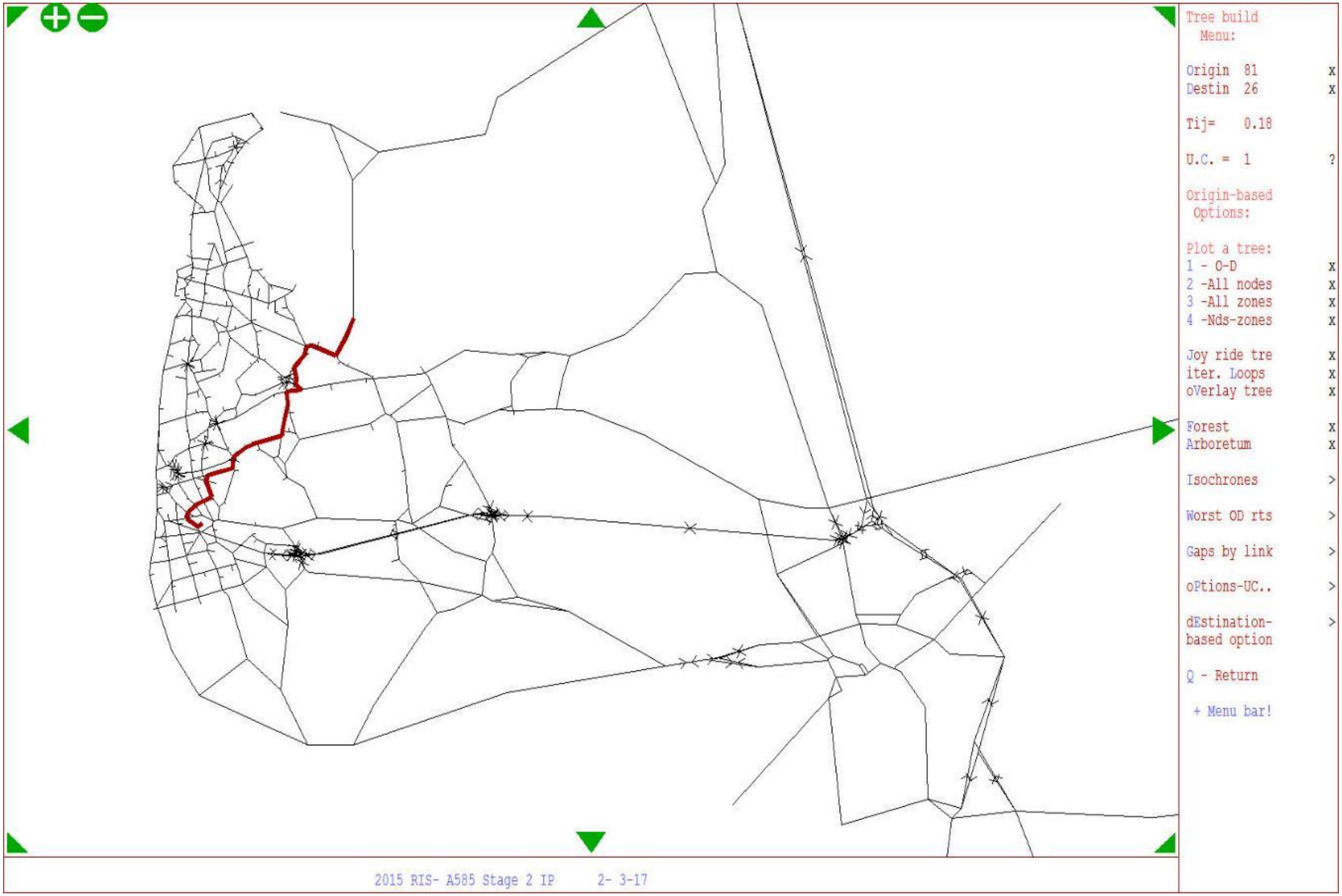
Origin 35
Destin 119
Tij = 0.00
U.C. = 4



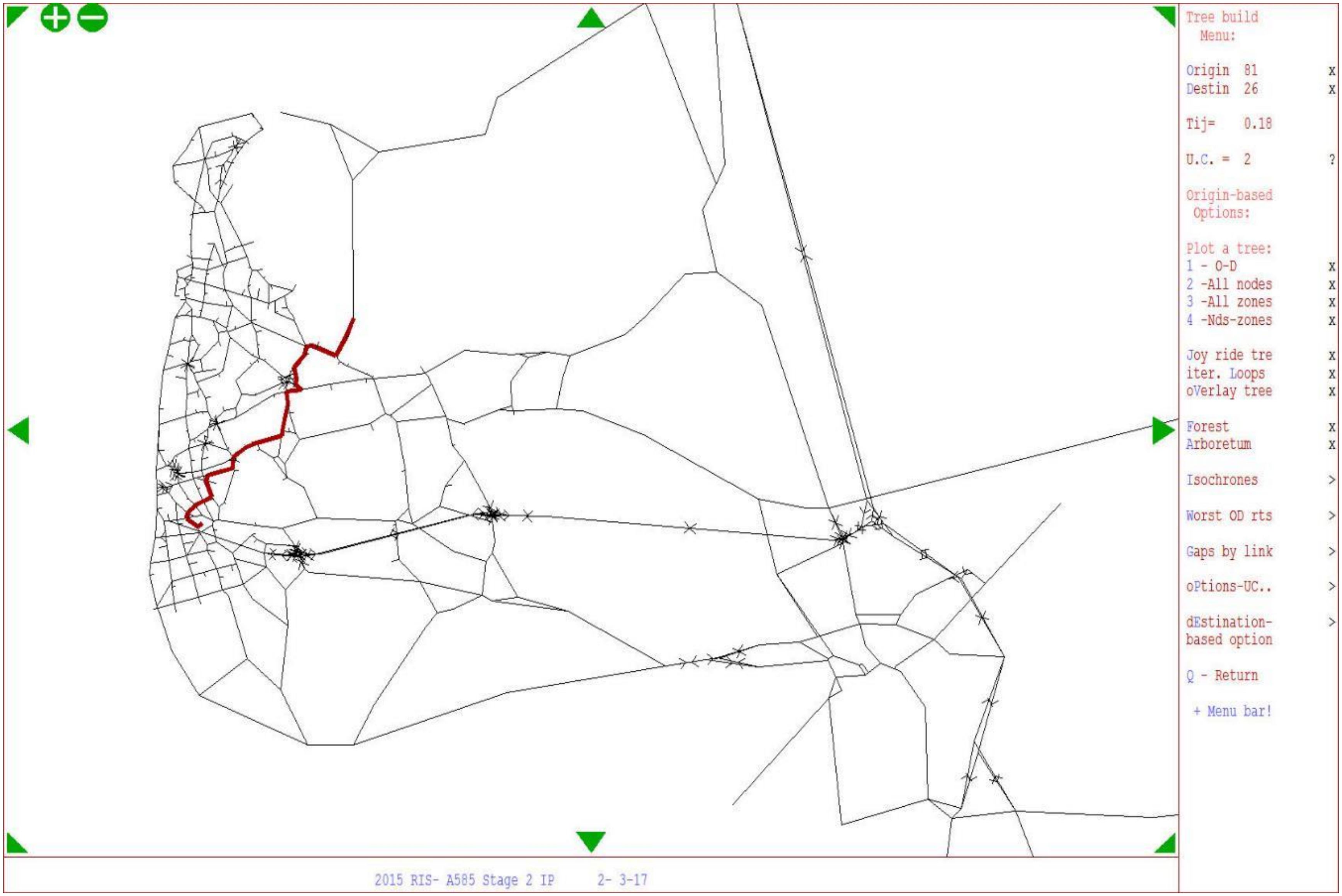
Origin 35
Destin 119
Tij = 0.00
U.C. = 5

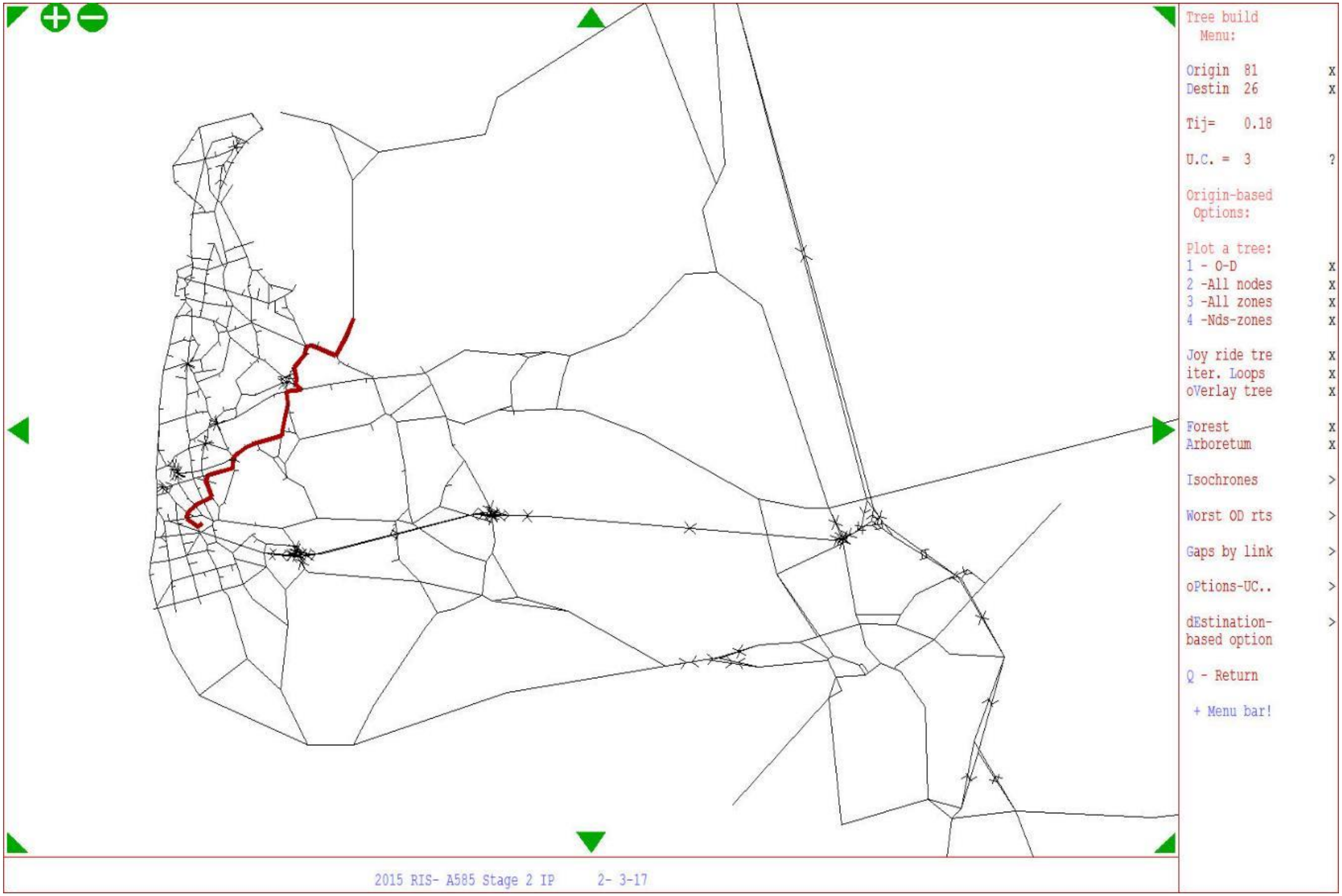
2015 RIS- A585 Stage 2 IP 2- 3-17


Bull Park Lane
50 Dean Street
28 min
13.3 km
CLEVELEYS
Red Marsh Industrial Estate
Thornton-Cleveleys
Thornton
Little Thornton
Hambleton
Skippool
Mains Ln
Bispham
Singleton
Great Eccleston
Elswick
Blackpool
Blackpool Tower
Esprick
Wharles
Mythop
Weeton
M55
Great Plumpton
Little Plumpton
Wesham
Treales
Kirkham
Ribby
Wrea Green
Newton with Scale
South Shore
Blackpool Airport
Bryning
Lytham Saint Annes
Freckleton
A585
A583
A586
A588
A587
A584
A5099
A5230
Garstang Rd
Blackpool Rd
Weeton Rd
Mile Rd
Station Rd
Talbot Rd
Park Rd
Yeadon Way
Squires Gate Ln
Wild Ln
N Houses Ln
Heyhouses Ln
Clifton Dr N
Queen's Promenade
Devonshire Rd
Lancaster Rd
Rawcliffe Rd
Copp Ln
Church Rd
Singleton Rd
Saltcotes Rd



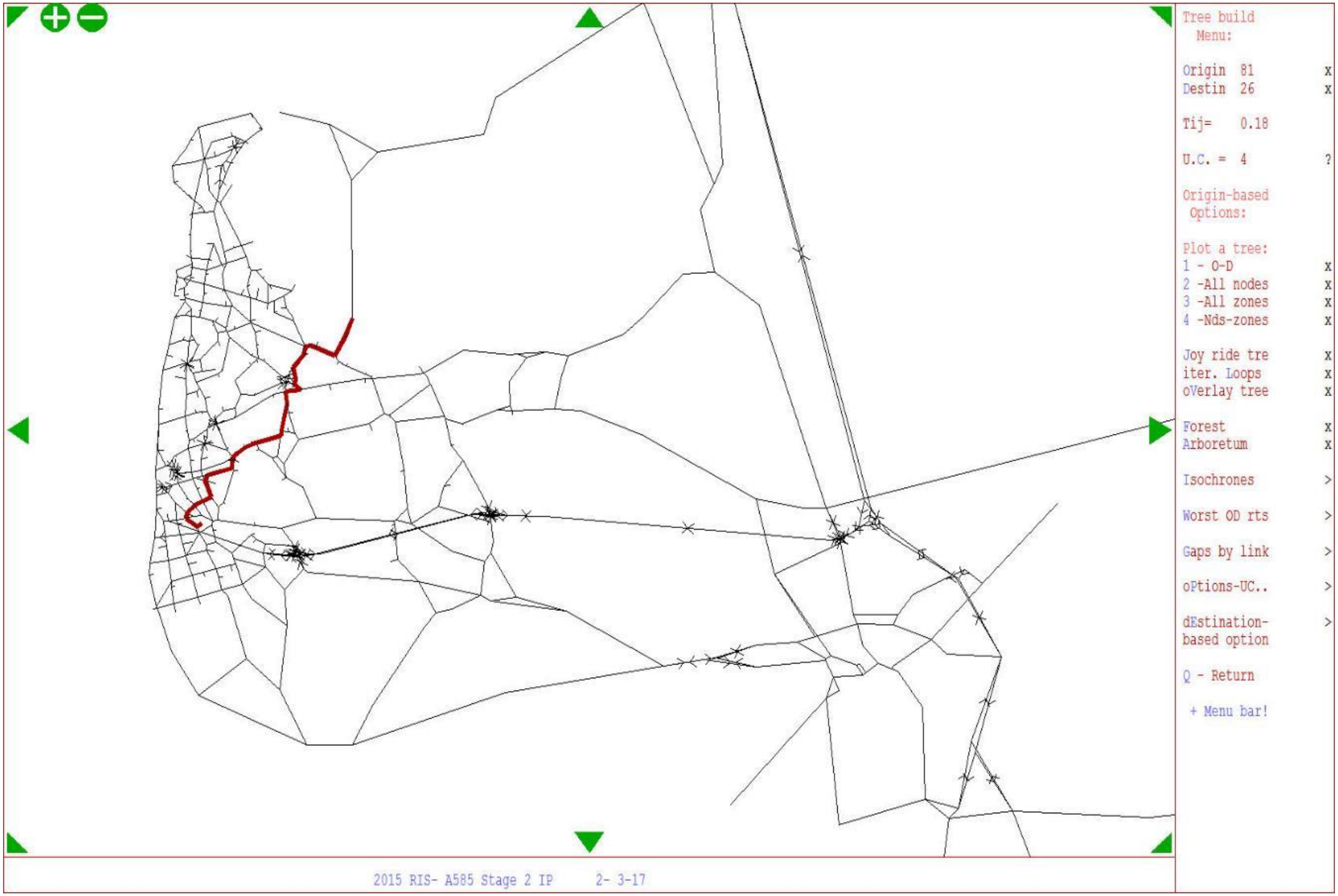
Origin 81
Destin 26
Tij= 0.18
U.C. = 1


Tree build
Menu:
Origin 81 x
Destin 26 x
Tij= 0.18
U.C. = 2 ?
Origin-based
Options:
Plot a tree:
1 - O-D x
2 -All nodes x
3 -All zones x
4 -Nds-zones x
Joy ride tre x
iter. Loops x
oVerlay tree x
Forest x
Arboretum x
Isochrones >
Worst OD rts >
Gaps by link >
oPtions-UC.. >
dEstination-based option >
Q - Return
+ Menu bar!
2015 RIS- A585 Stage 2 IP 2- 3-17



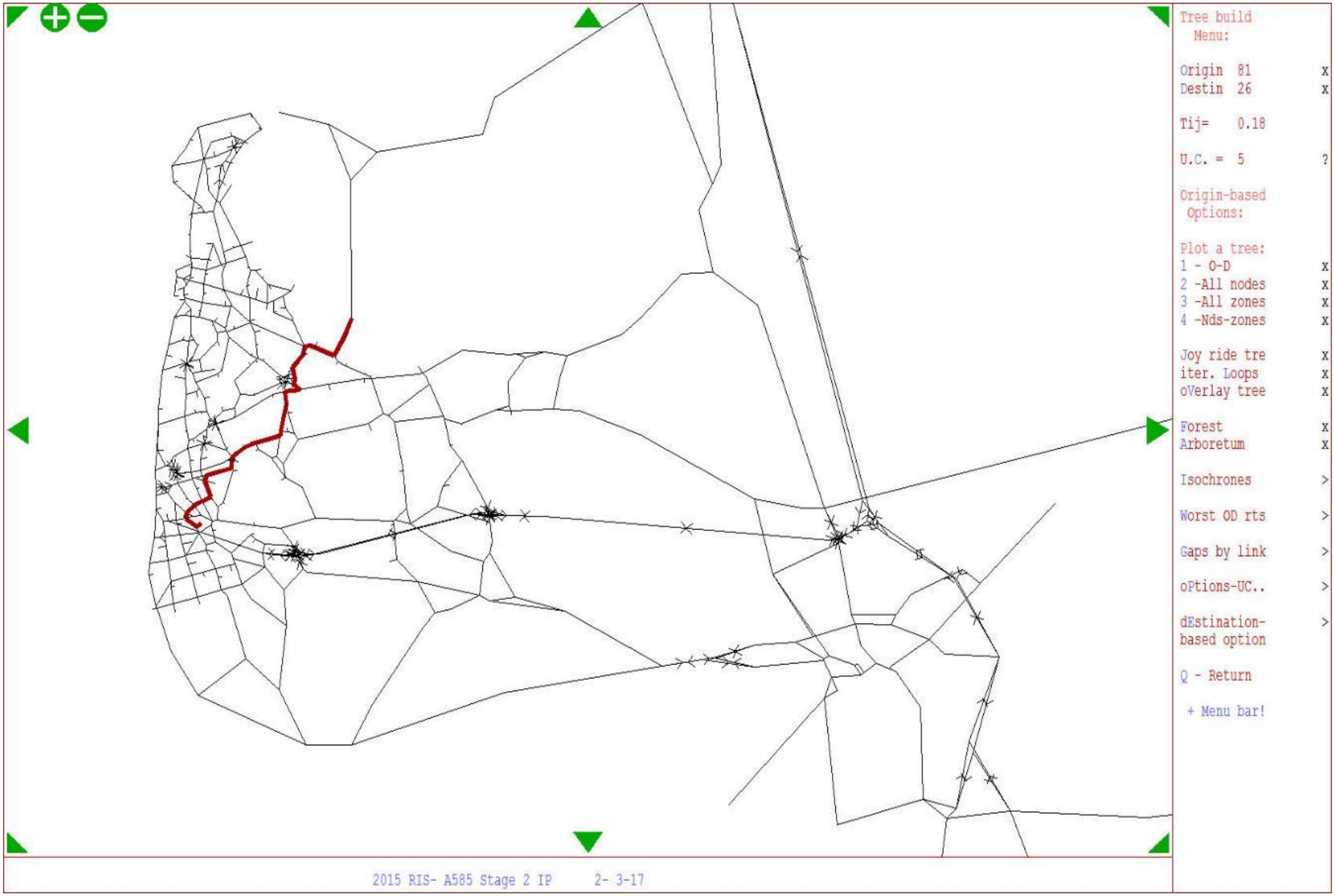
Origin 81
Destin 26
Tij= 0.18
U.C. = 3

2015 RIS- A585 Stage 2 IP 2- 3-17



Origin 81
Destin 26
Tij= 0.18
U.C. = 4

2015 RIS- A585 Stage 2 IP 2- 3-17

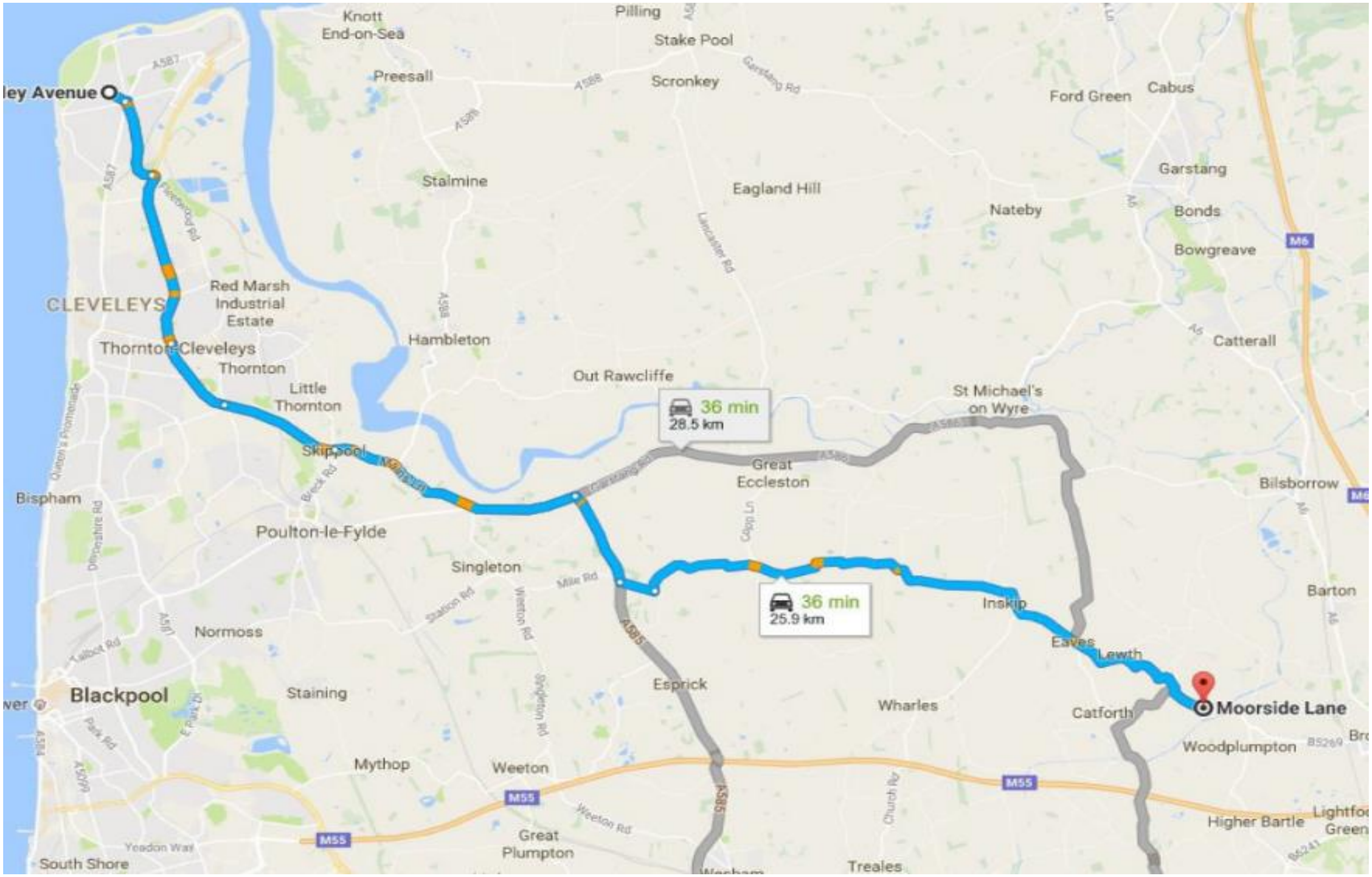


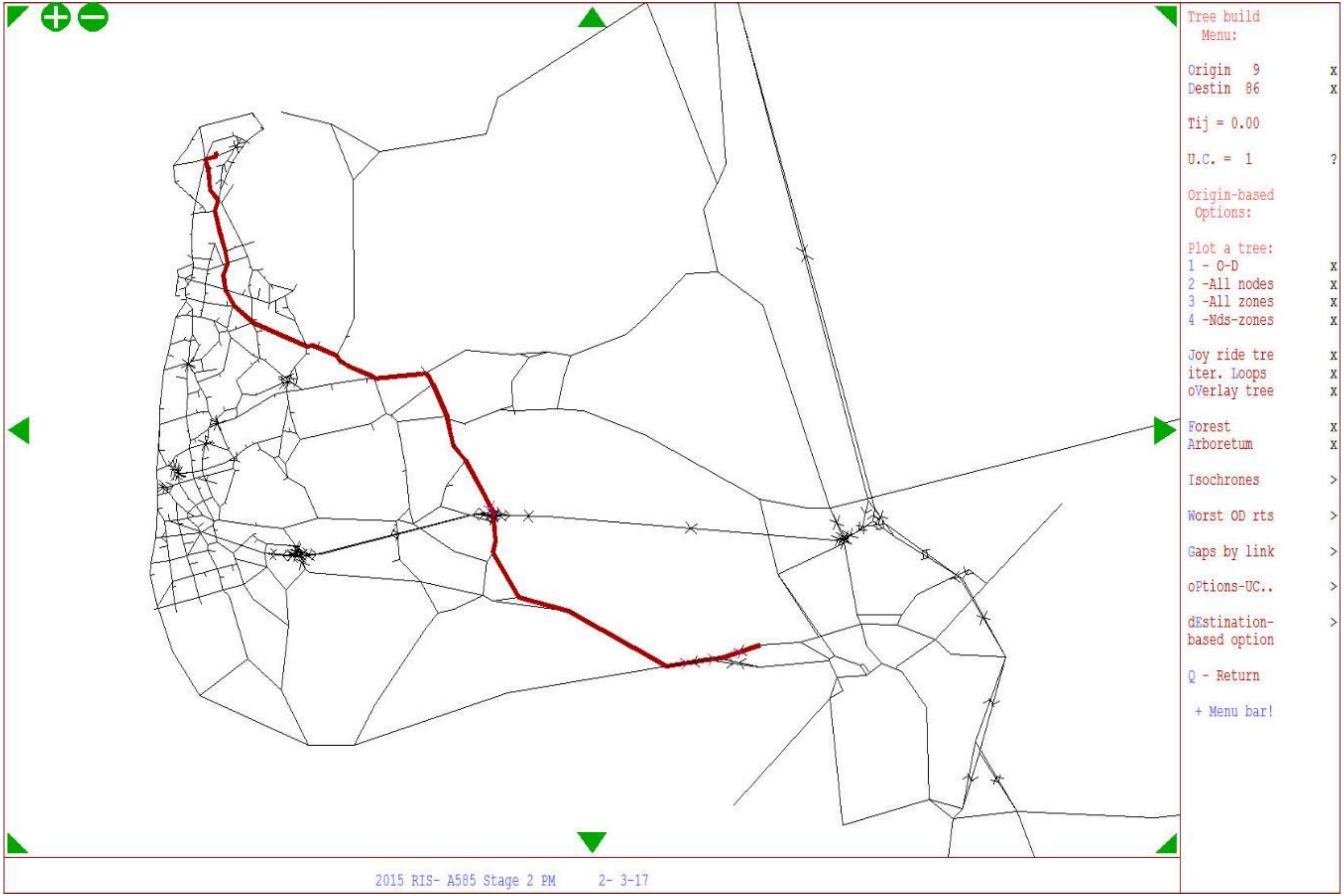
Tree build Menu:

Origin 81
Destin 26
Tij= 0.18
U.C. = 5

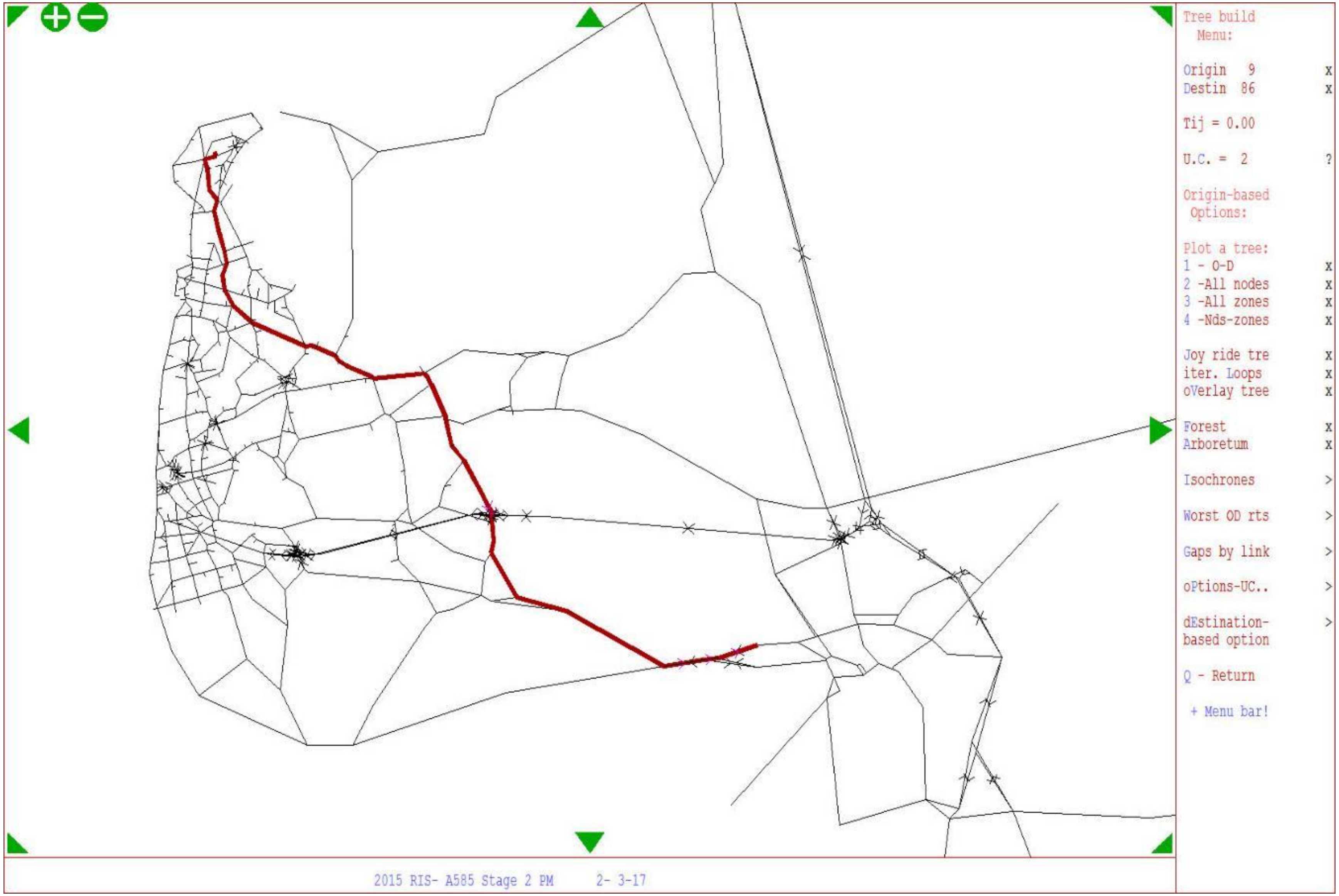
2015 RIS- A585 Stage 2 IP 2- 3-17

PM Networking Routing Checks



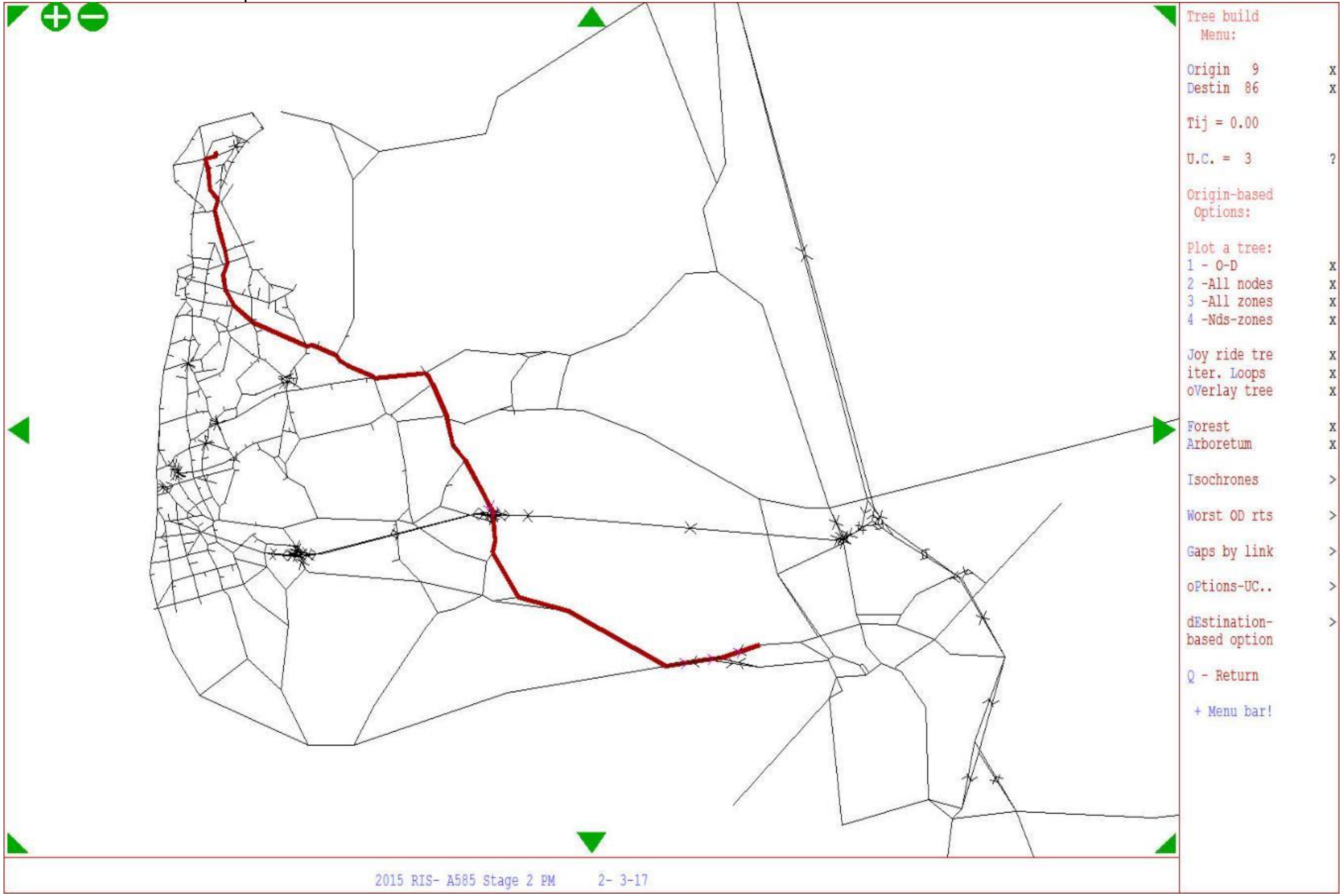


Origin 9
Destin 86
Tij = 0.00
U.C. = 1

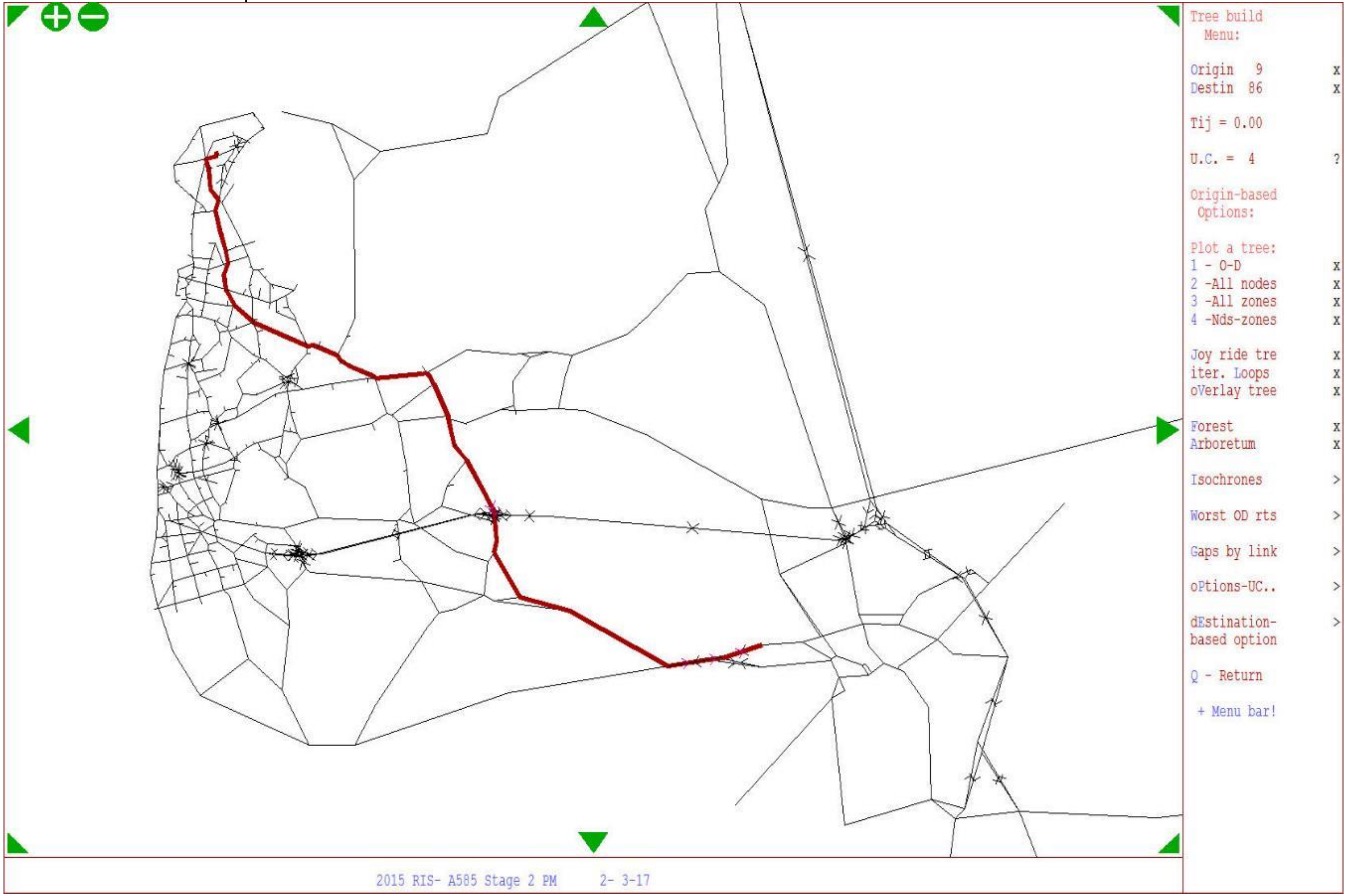


Origin 9
Destin 86
Tij = 0.00
U.C. = 2

2015 RIS- A585 Stage 2 PM 2- 3-17

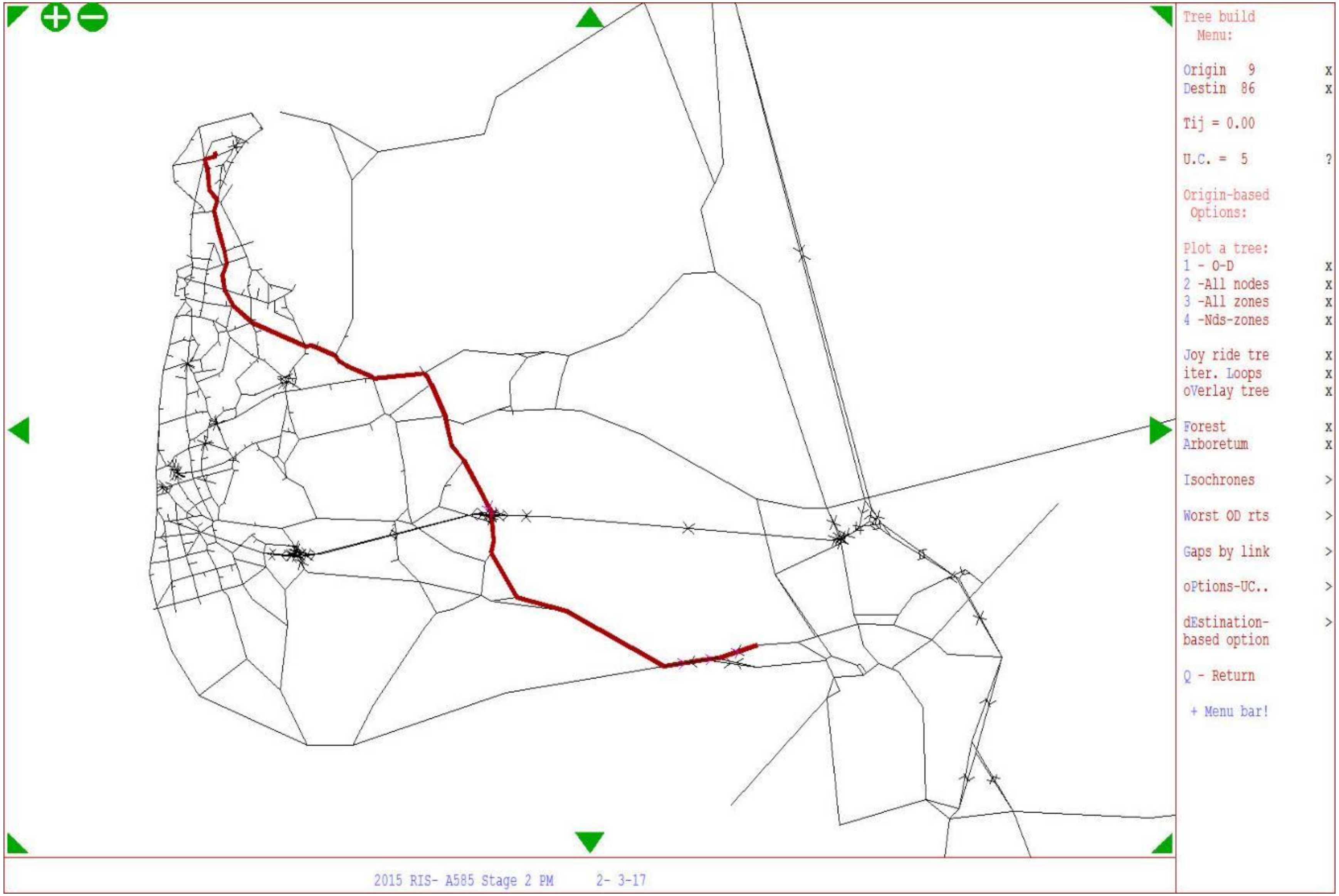


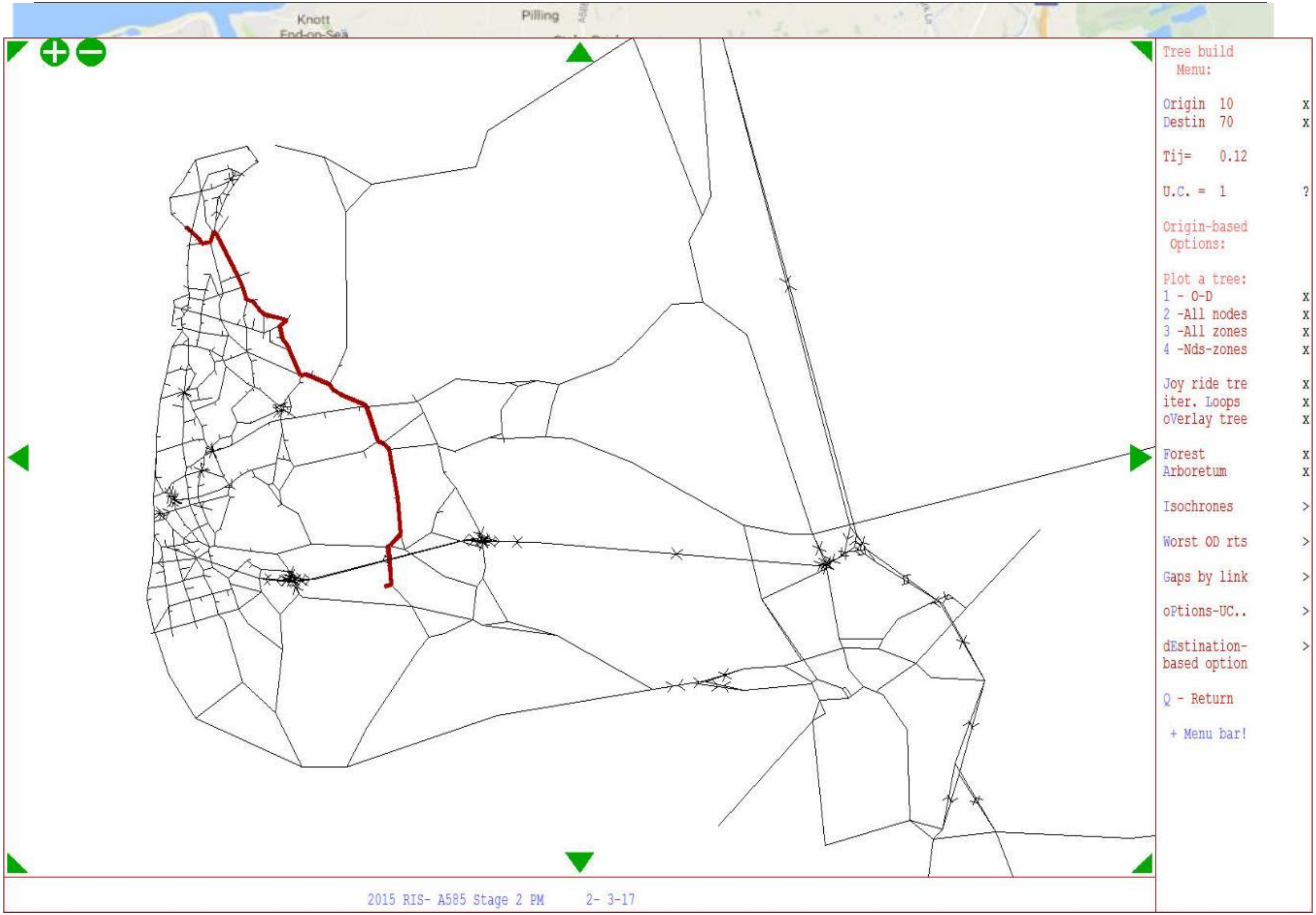
Origin 9
Destin 86
Tij = 0.00
U.C. = 3



Origin 9 x
Destin 86 x
Tij = 0.00
U.C. = 4 ?

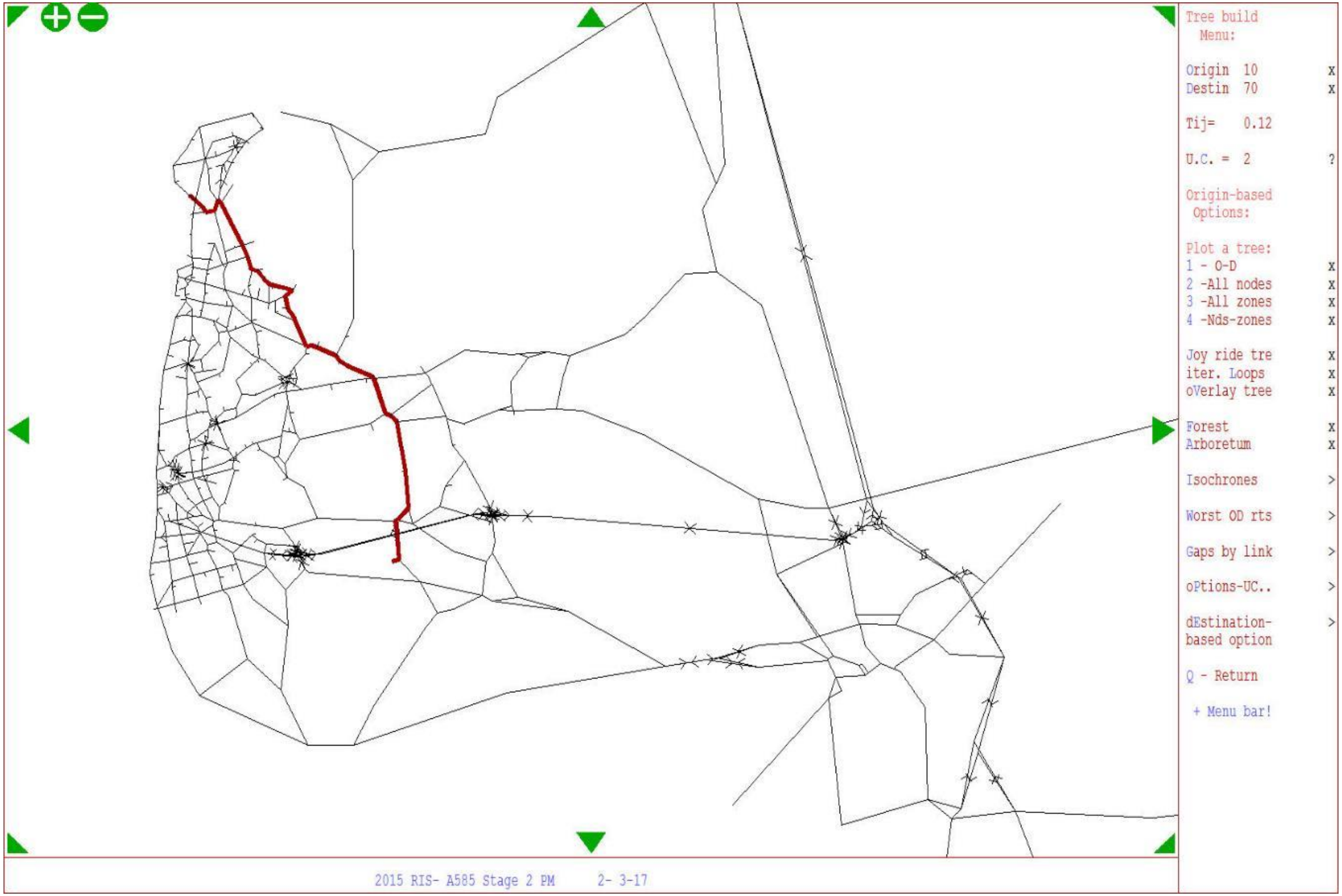
2015 RIS- A585 Stage 2 PM 2- 3-17


Tree build
Menu:
Origin 9 x
Destin 86 x
Tij = 0.00
U.C. = 5 ?
Origin-based
Options:
Plot a tree:
1 - O-D x
2 -All nodes x
3 -All zones x
4 -Nds-zones x
Joy ride tre x
iter. Loops x
oVerlay tree x
Forest x
Arboretum x
Isochrones >
Worst OD rts >
Gaps by link >
oPtions-UC.. >
dEstination-
based option >
Q - Return
+ Menu bar!
2015 RIS- A585 Stage 2 PM 2- 3-17



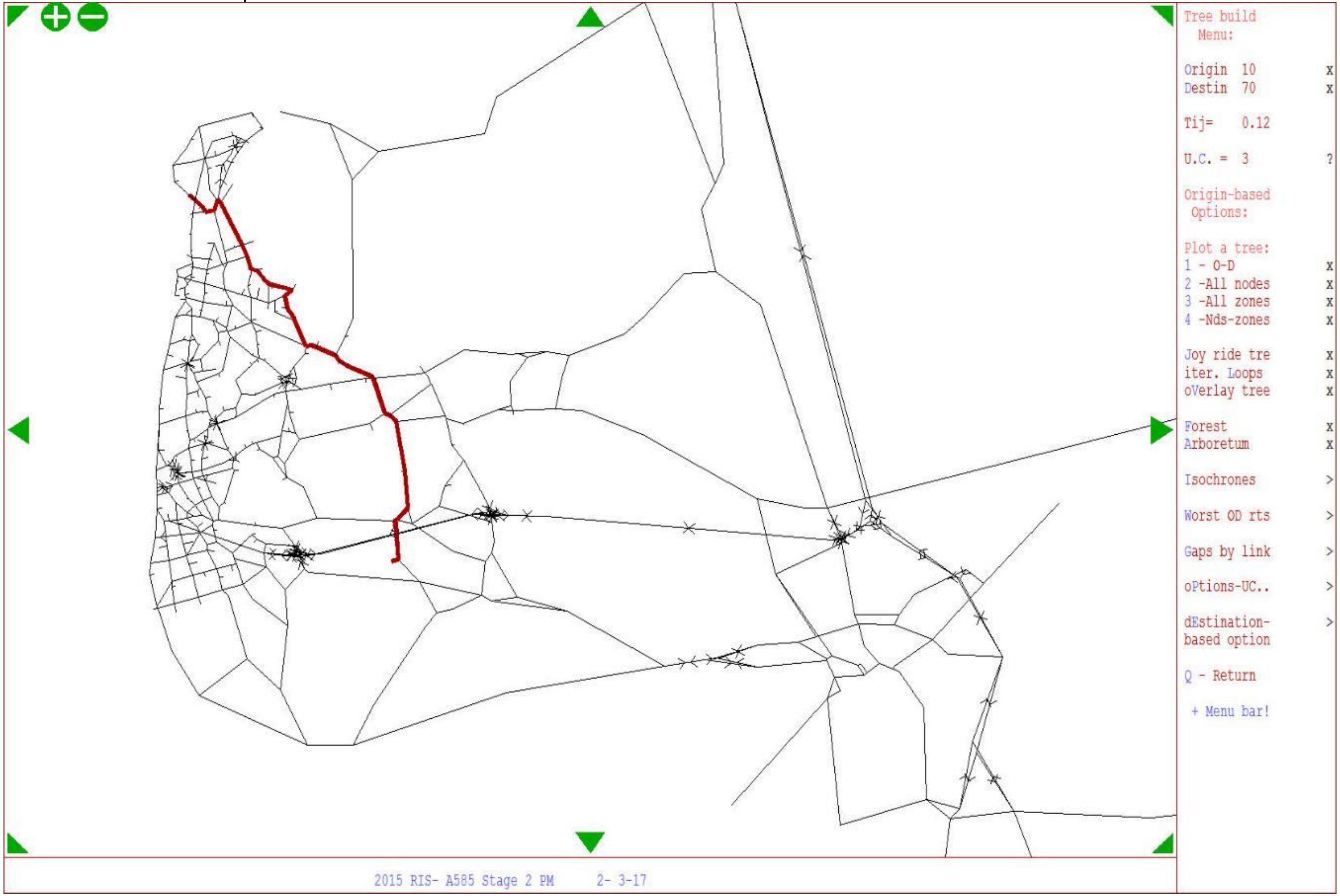
Origin 10
Destin 70
Tij= 0.12
U.C. = 1

2015 RIS- A585 Stage 2 PM 2- 3-17



Origin 10
Destin 70
Tij= 0.12
U.C. = 2

2015 RIS- A585 Stage 2 PM 2- 3-17

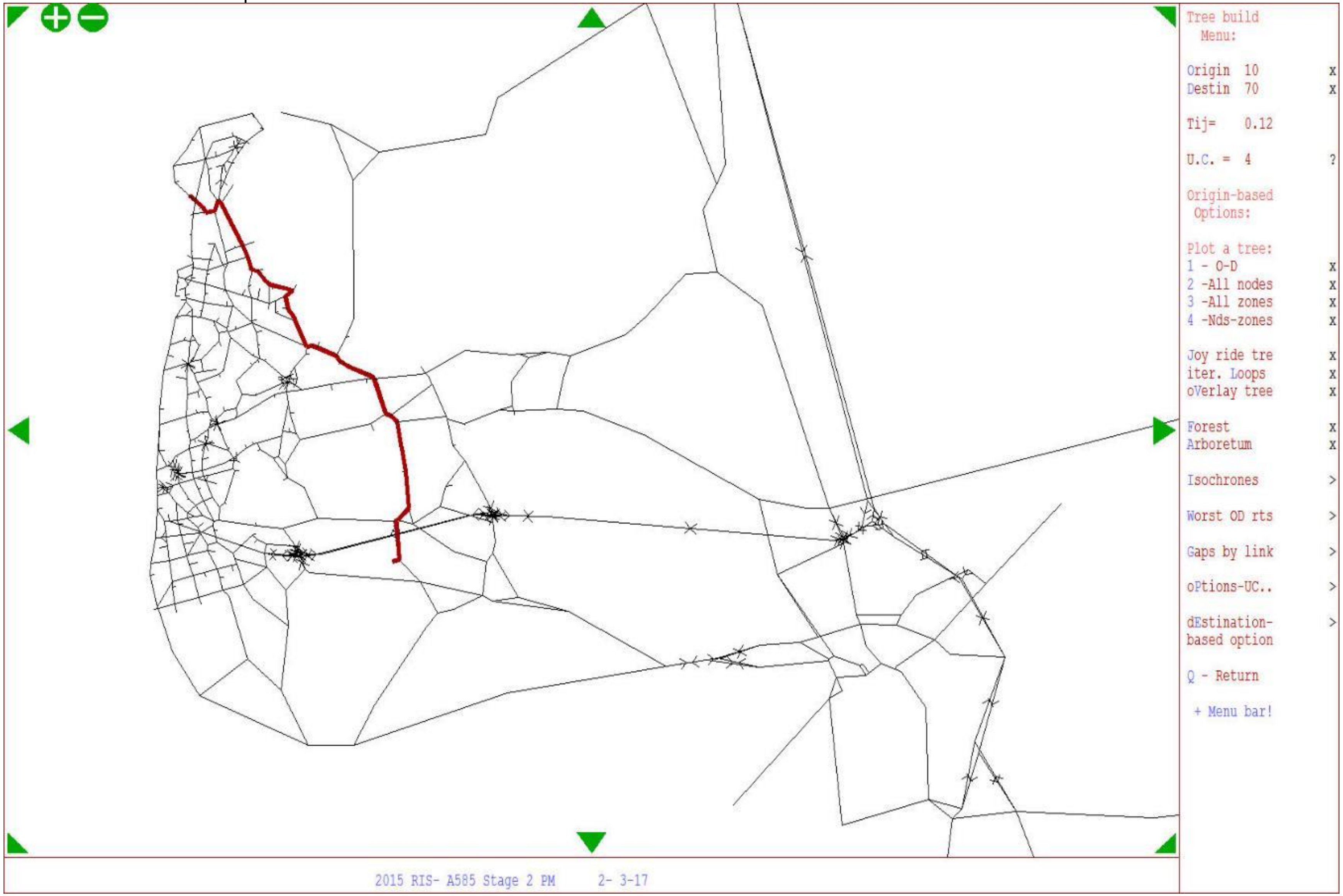


Origin 10
Destin 70

Tij= 0.12

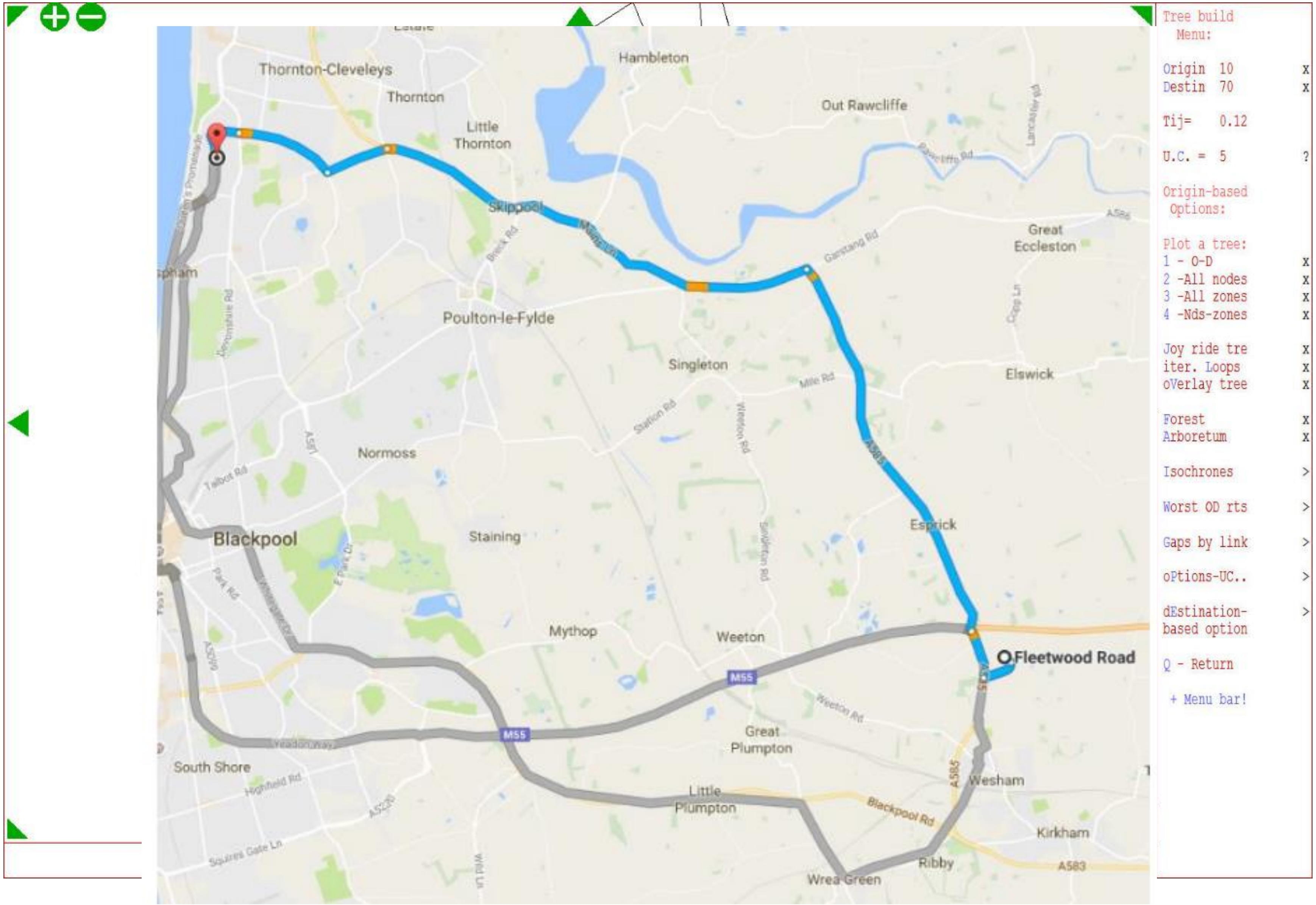
U.C. = 3

2015 RIS- A585 Stage 2 PM 2- 3-17



Origin 10
Destin 70
Tij= 0.12
U.C. = 4

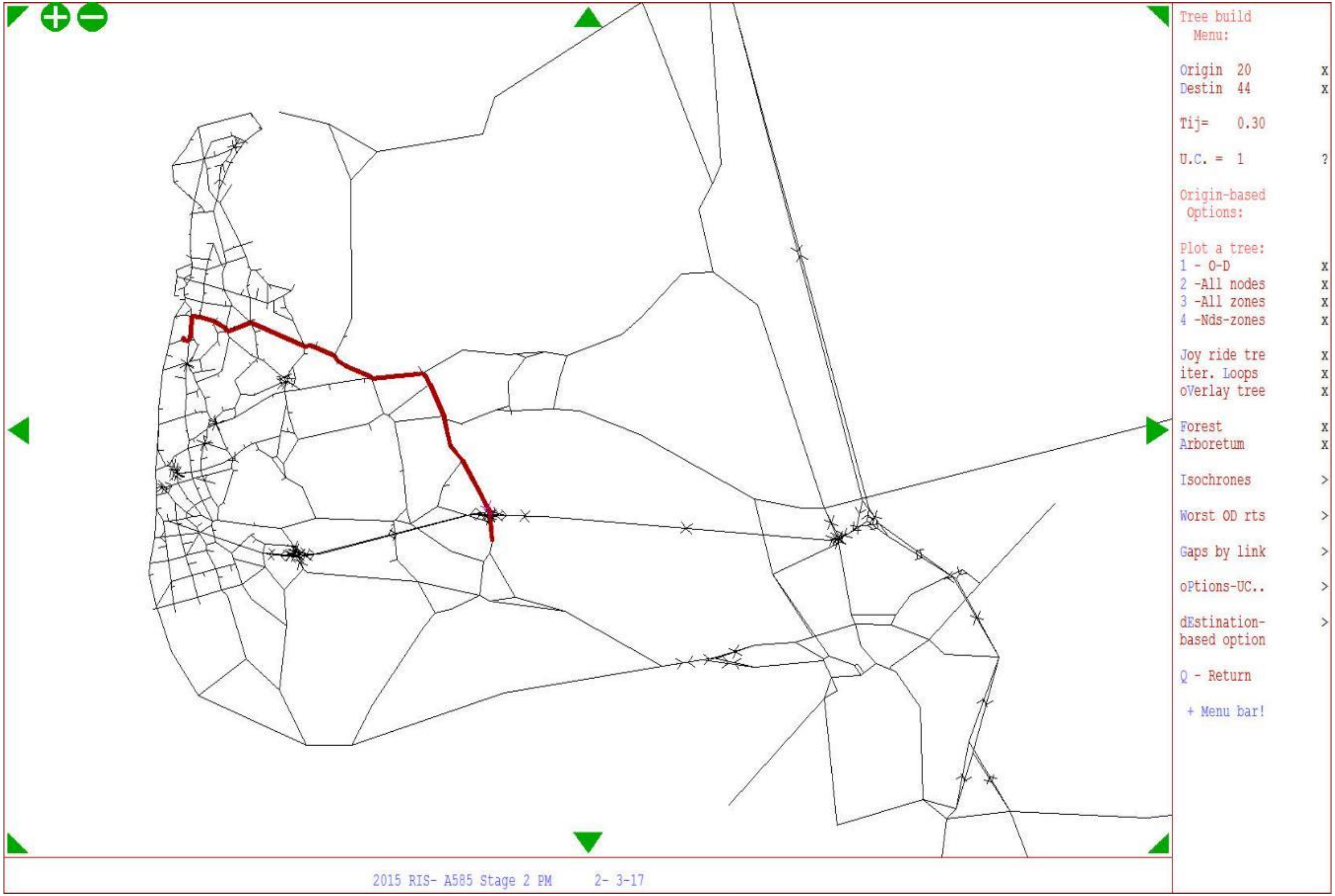
2015 RIS- A585 Stage 2 PM 2- 3-17

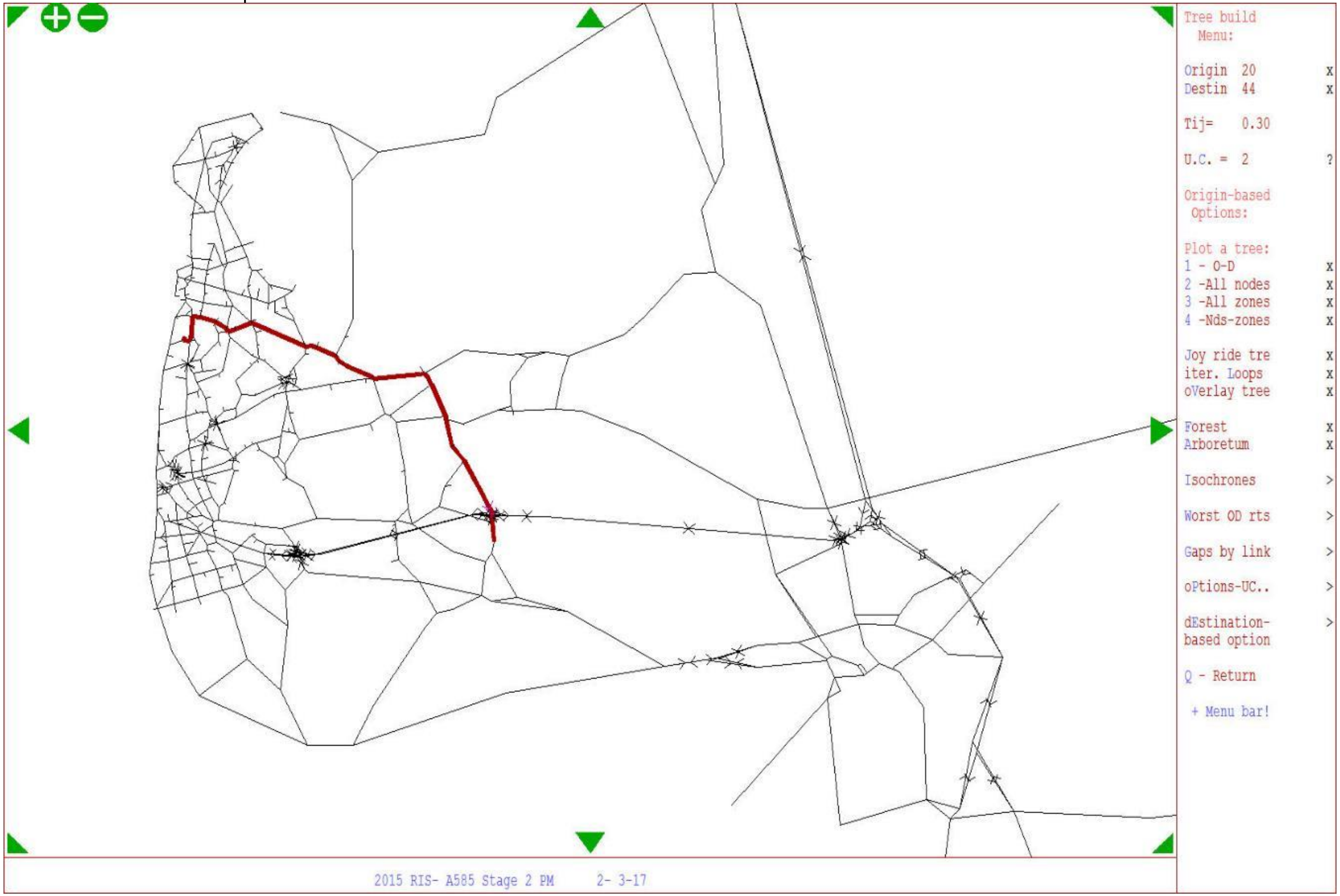


Origin 10
Destin 70

Tij= 0.12

U.C. = 5


Tree build
Menu:
Origin 20 x
Destin 44 x
Tij= 0.30
U.C. = 1 ?
Origin-based
Options:
Plot a tree:
1 - O-D x
2 -All nodes x
3 -All zones x
4 -Nds-zones x
Joy ride tre x
iter. Loops x
oVerlay tree x
Forest x
Arboretum x
Isochrones >
Worst OD rts >
Gaps by link >
oPtions-UC.. >
dEstination- >
based option
Q - Return
+ Menu bar!
2015 RIS- A585 Stage 2 PM 2- 3-17

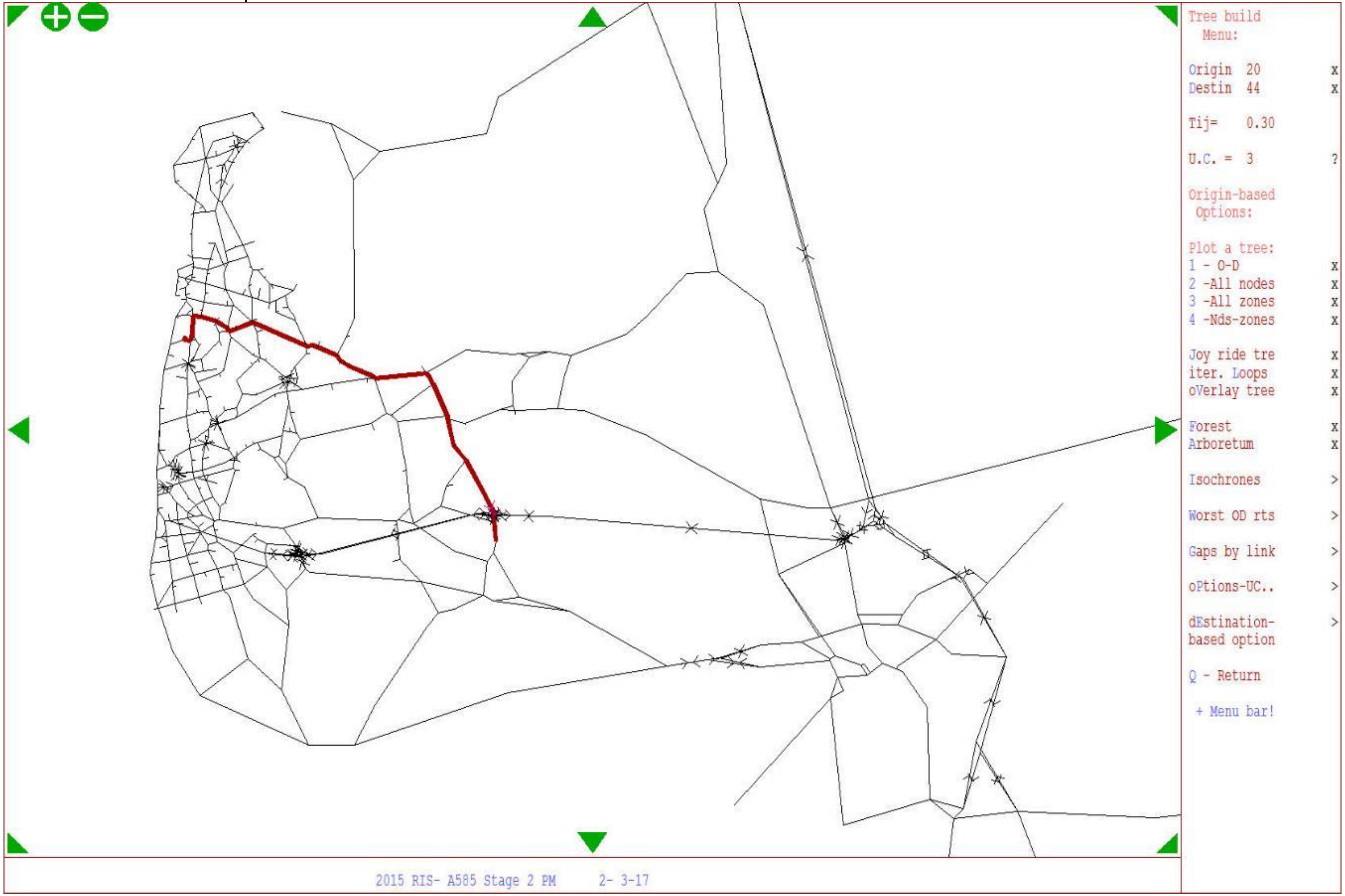


Origin 20
Destin 44

Tij= 0.30

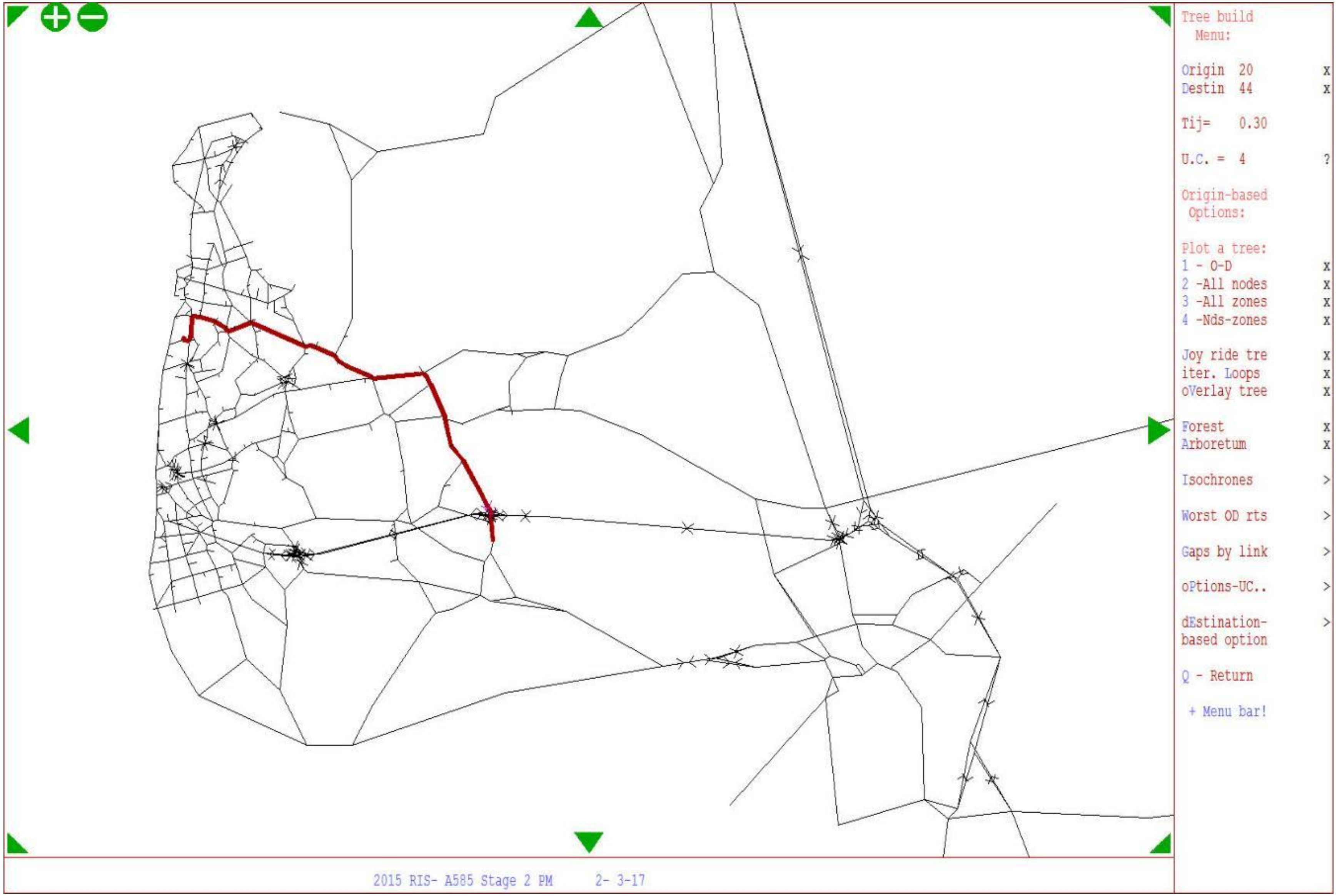
U.C. = 2

2015 RIS- A585 Stage 2 PM 2- 3-17



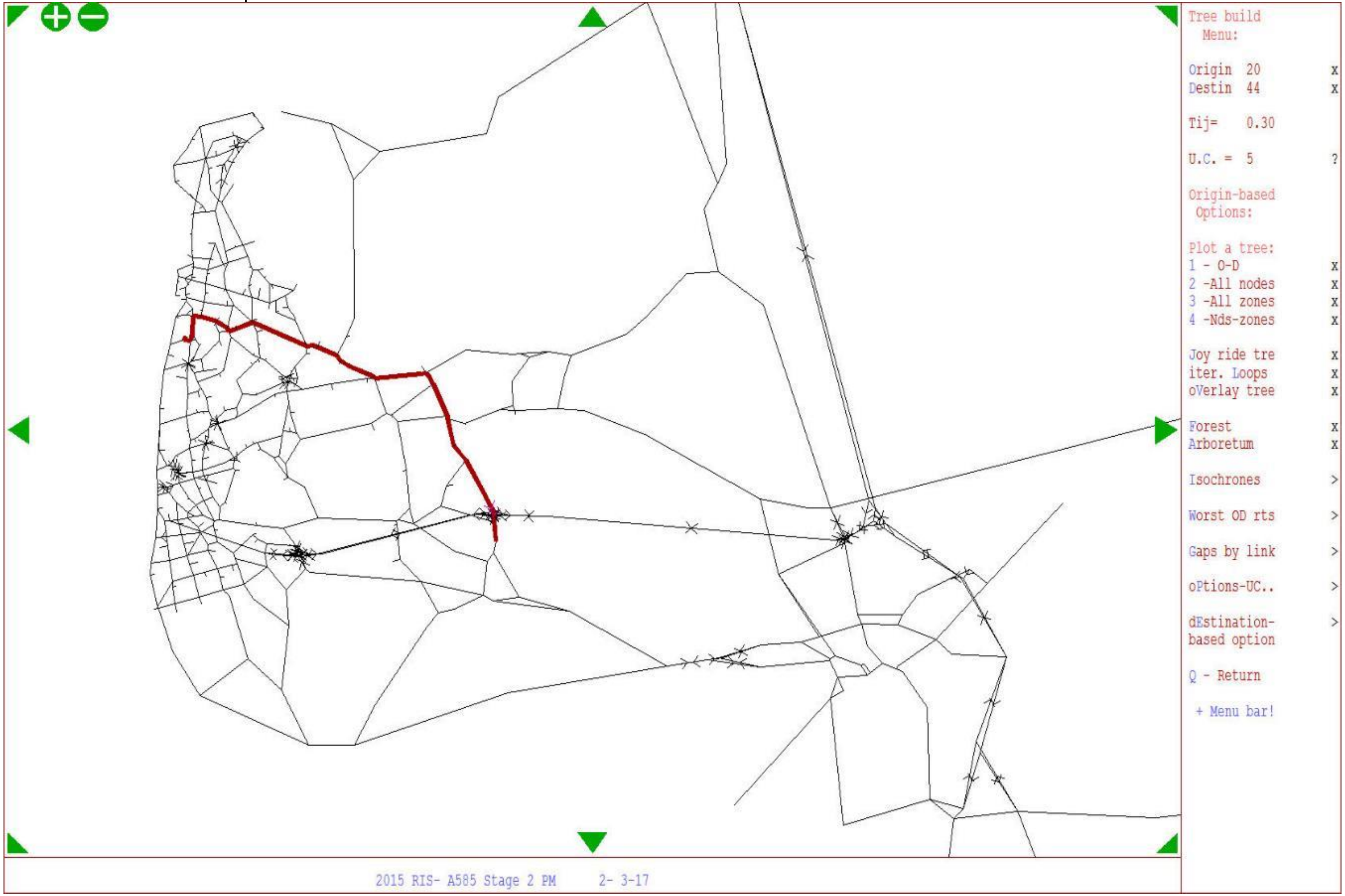
Origin 20
Destin 44
Tij= 0.30
U.C. = 3

2015 RIS- A585 Stage 2 PM 2- 3-17



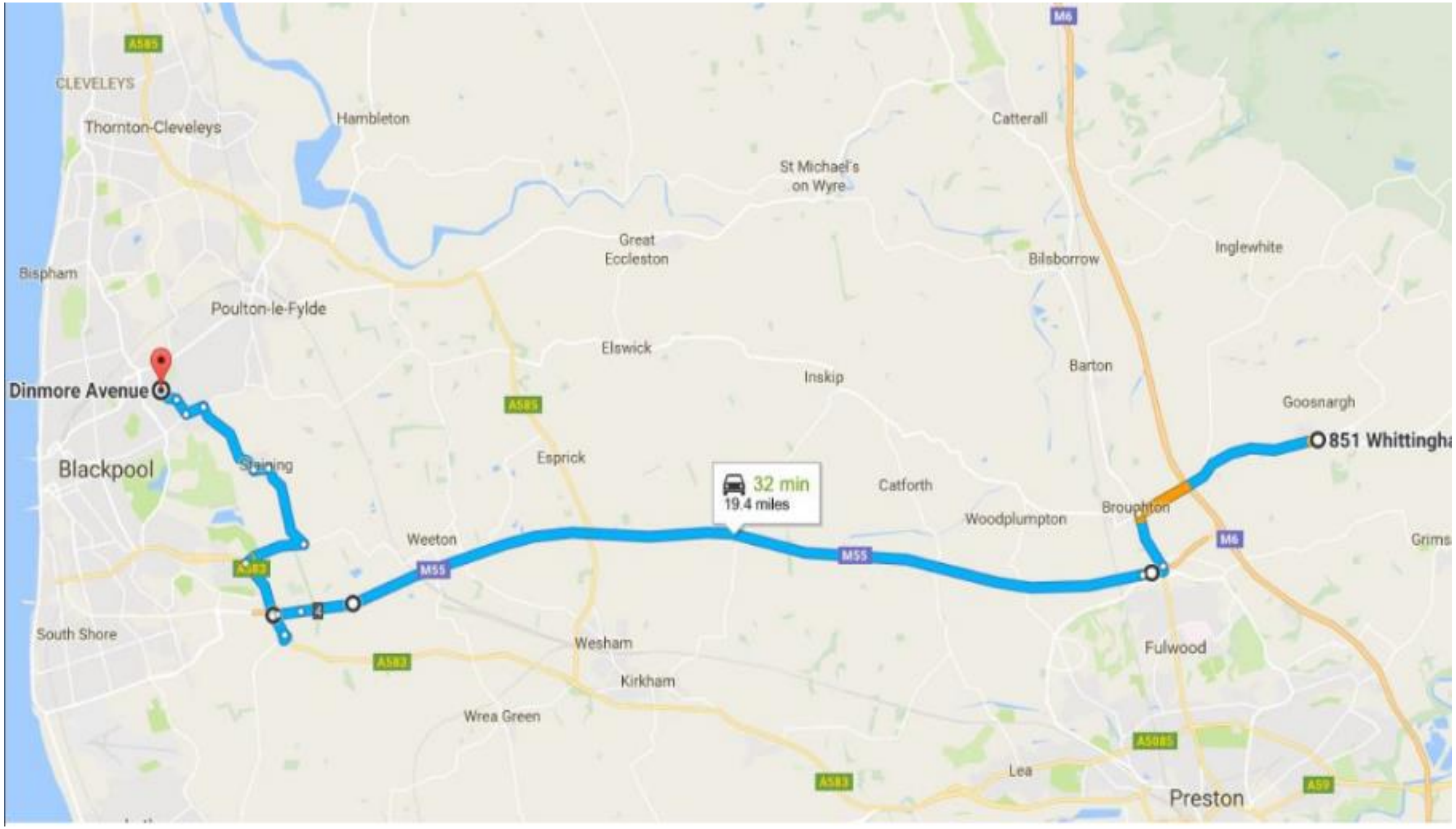
Origin 20
Destin 44
Tij= 0.30
U.C. = 4

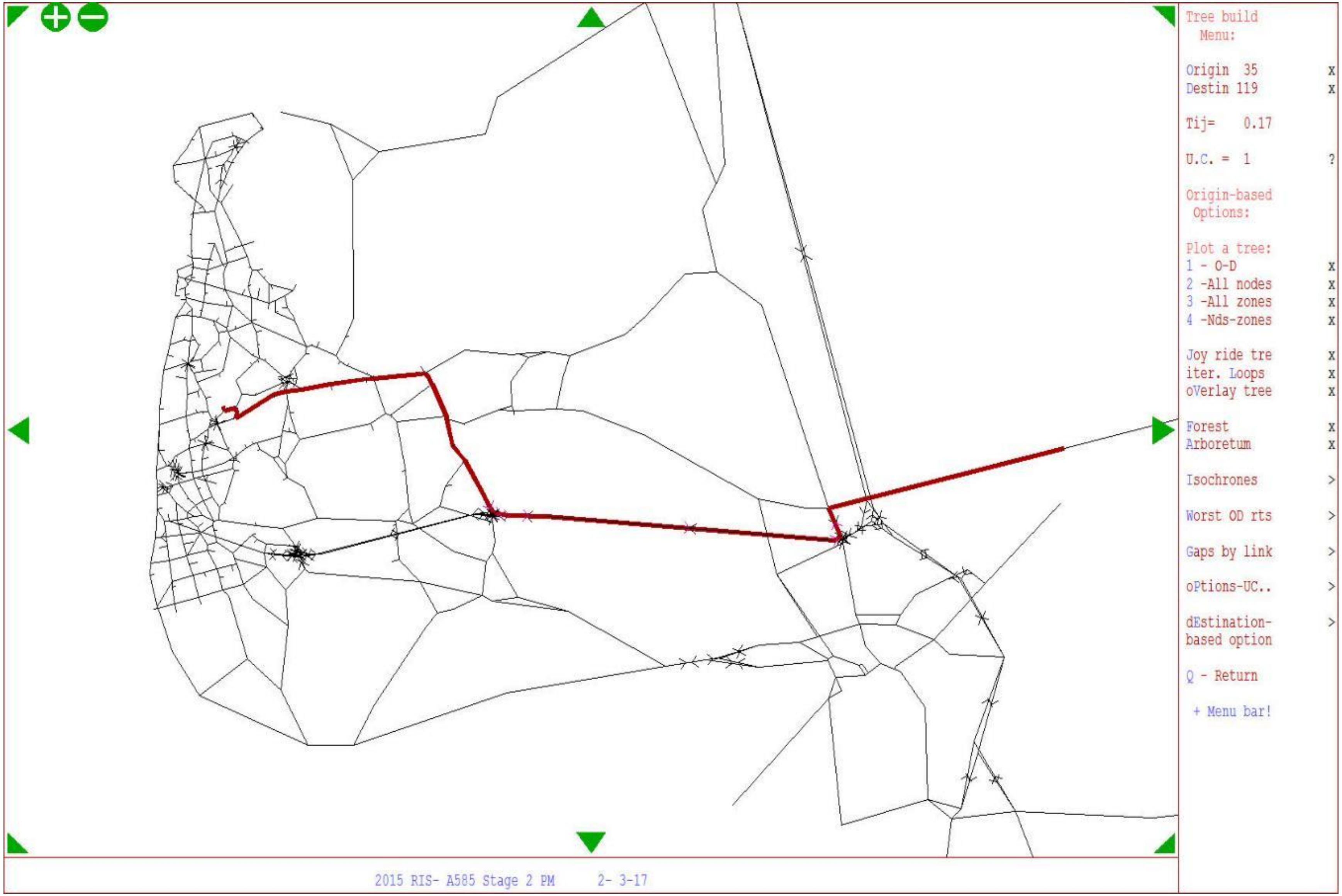
2015 RIS- A585 Stage 2 PM 2- 3-17



Origin 20
Destin 44
Tij= 0.30
U.C. = 5

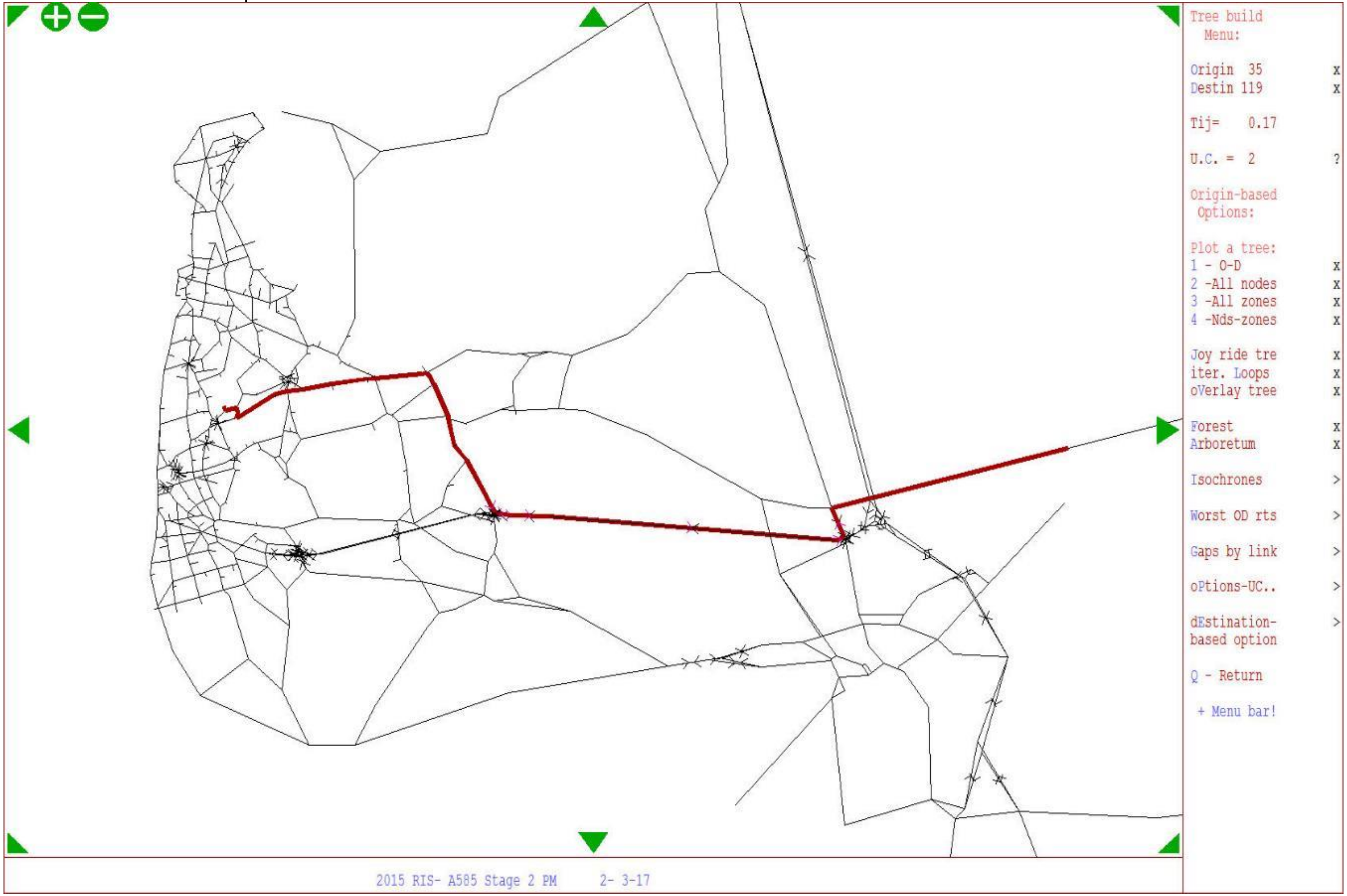
2015 RIS- A585 Stage 2 PM 2- 3-17


Dinmore Avenue
851 Whittingha
32 min
19.4 miles
CLEVELEYS
Thornton-Cleveleys
Hambleton
St Michael's on Wyre
Catterall
Great Eccleston
Bilsborrow
Inglewhite
Bispham
Poulton-le-Fylde
Elswick
Inskip
Barton
Goosnargh
Blackpool
Staining
Esprick
Catforth
Woodplumpton
Broughton
Weeton
Grims
South Shore
Wesham
Kirkham
Fulwood
Wrea Green
Lea
Preston
A585
A583
M55
M6
A5085
A59



Origin 35
Destin 119
Tij= 0.17
U.C. = 1

2015 RIS- A585 Stage 2 PM 2- 3-17

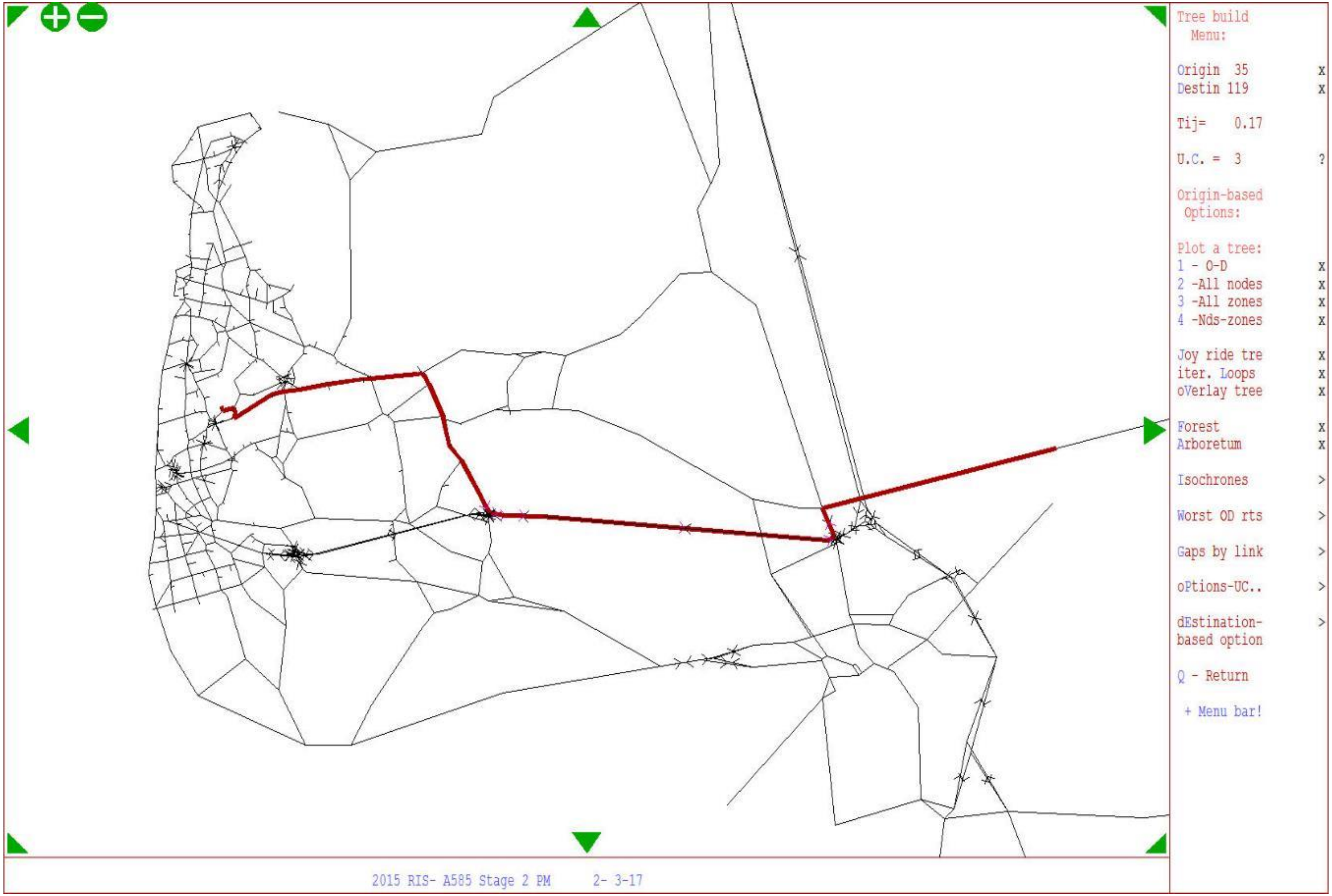


Origin 35
Destin 119

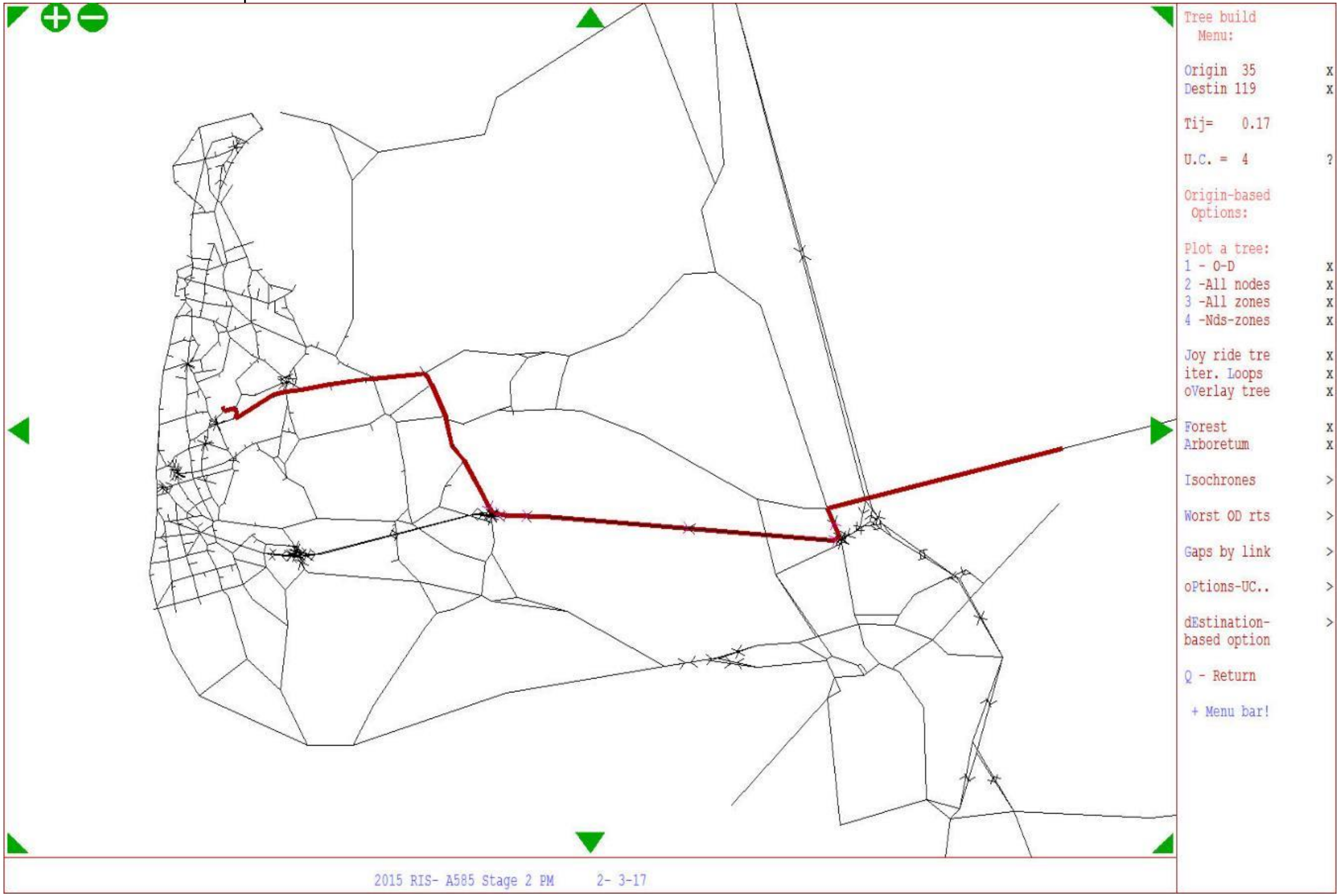
Tij= 0.17

U.C. = 2

2015 RIS- A585 Stage 2 PM 2- 3-17

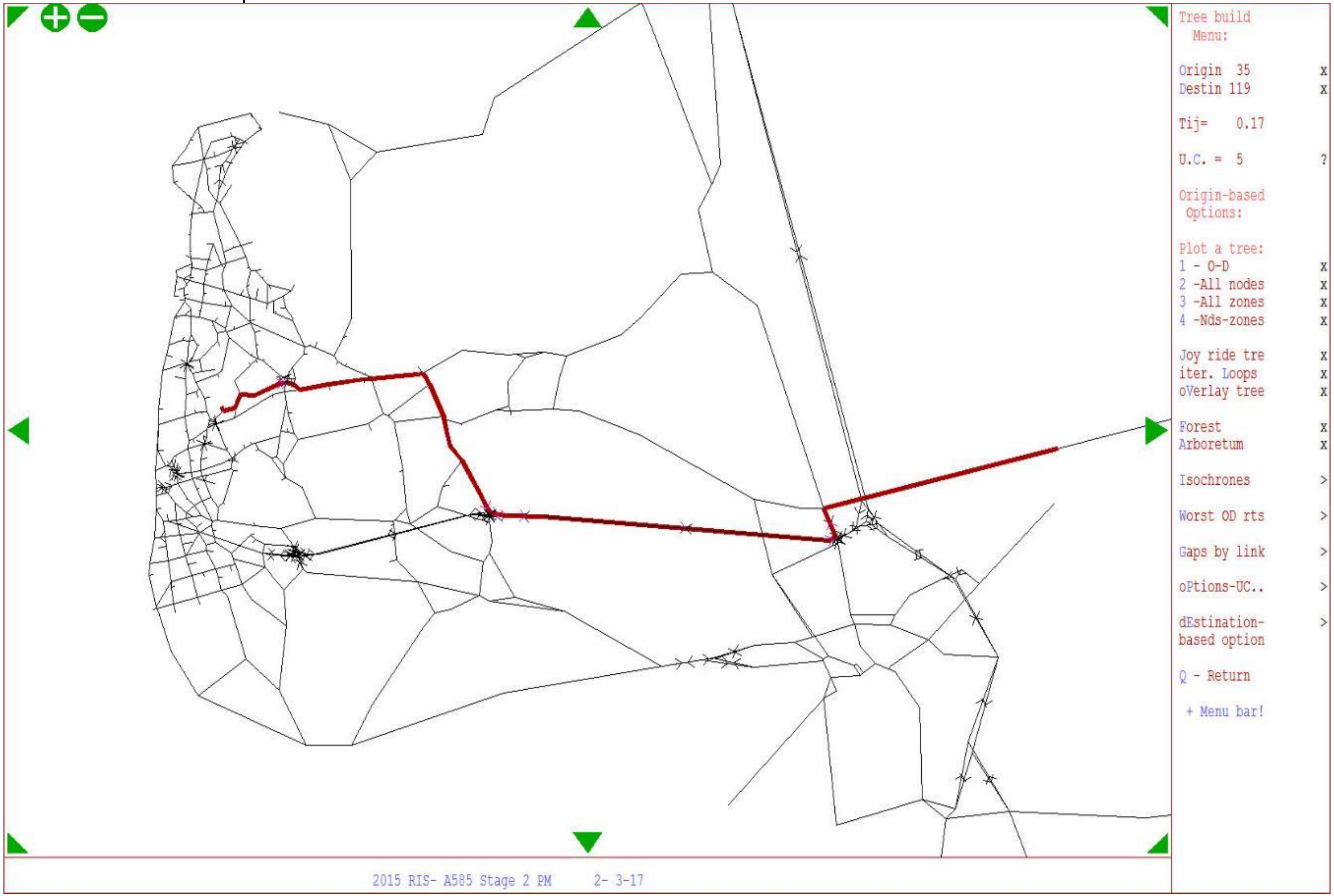


Tree build
Menu:
Origin 35 x
Destin 119 x
Tij= 0.17
U.C. = 3 ?
Origin-based
Options:
Plot a tree:
1 - O-D x
2 -All nodes x
3 -All zones x
4 -Nds-zones x
Joy ride tre x
iter. Loops x
oVerlay tree x
Forest x
Arboretum x
Isochrones >
Worst OD rts >
Gaps by link >
oPtions-UC.. >
dEstination- based option >
Q - Return
+ Menu bar!
2015 RIS- A585 Stage 2 PM 2- 3-17



Origin 35
Destin 119
Tij= 0.17
U.C. = 4

2015 RIS- A585 Stage 2 PM 2- 3-17



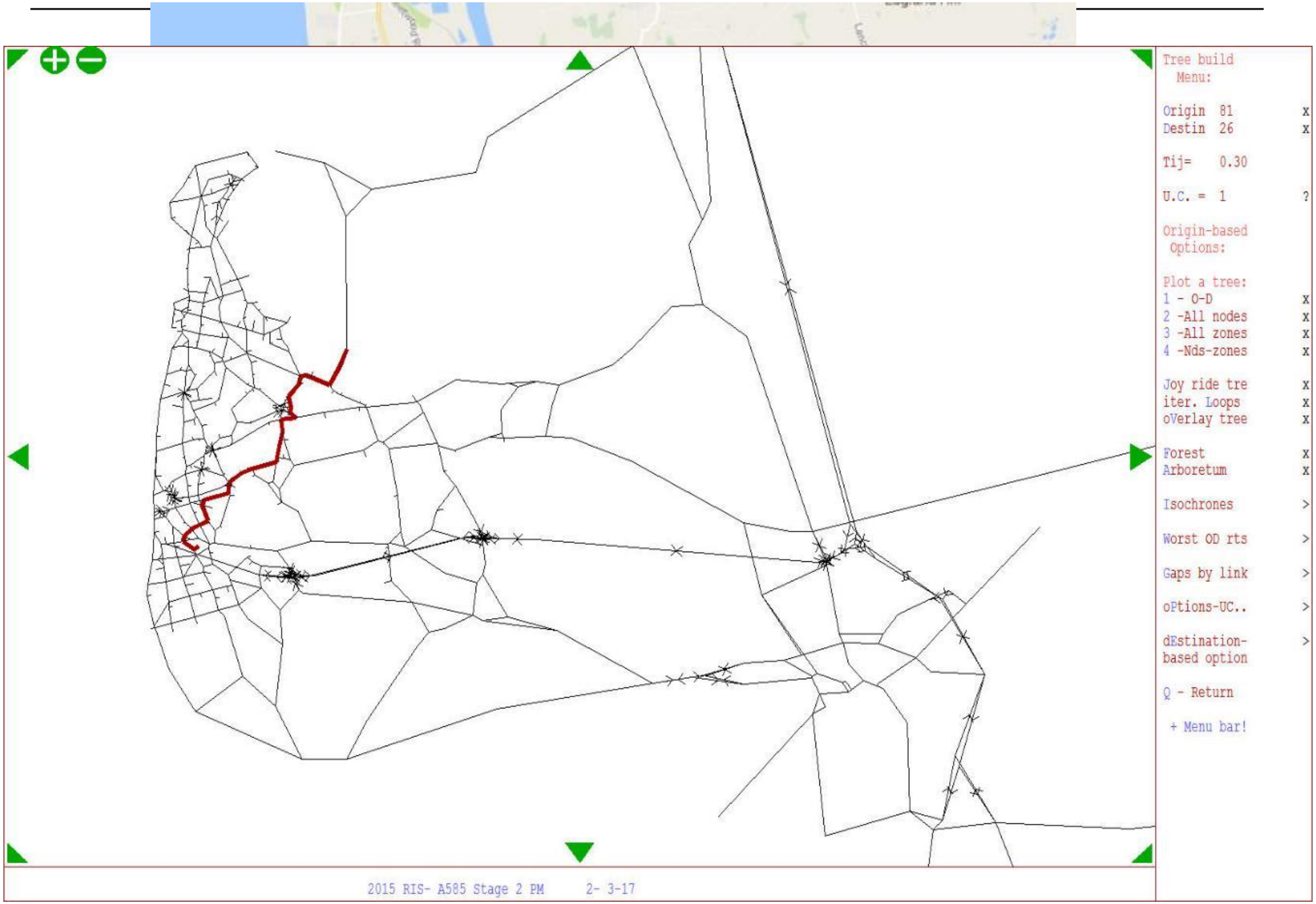
Tree build Menu:

Origin 35
Destin 119

Tij= 0.17

U.C. = 5

2015 RIS- A585 Stage 2 PM 2- 3-17

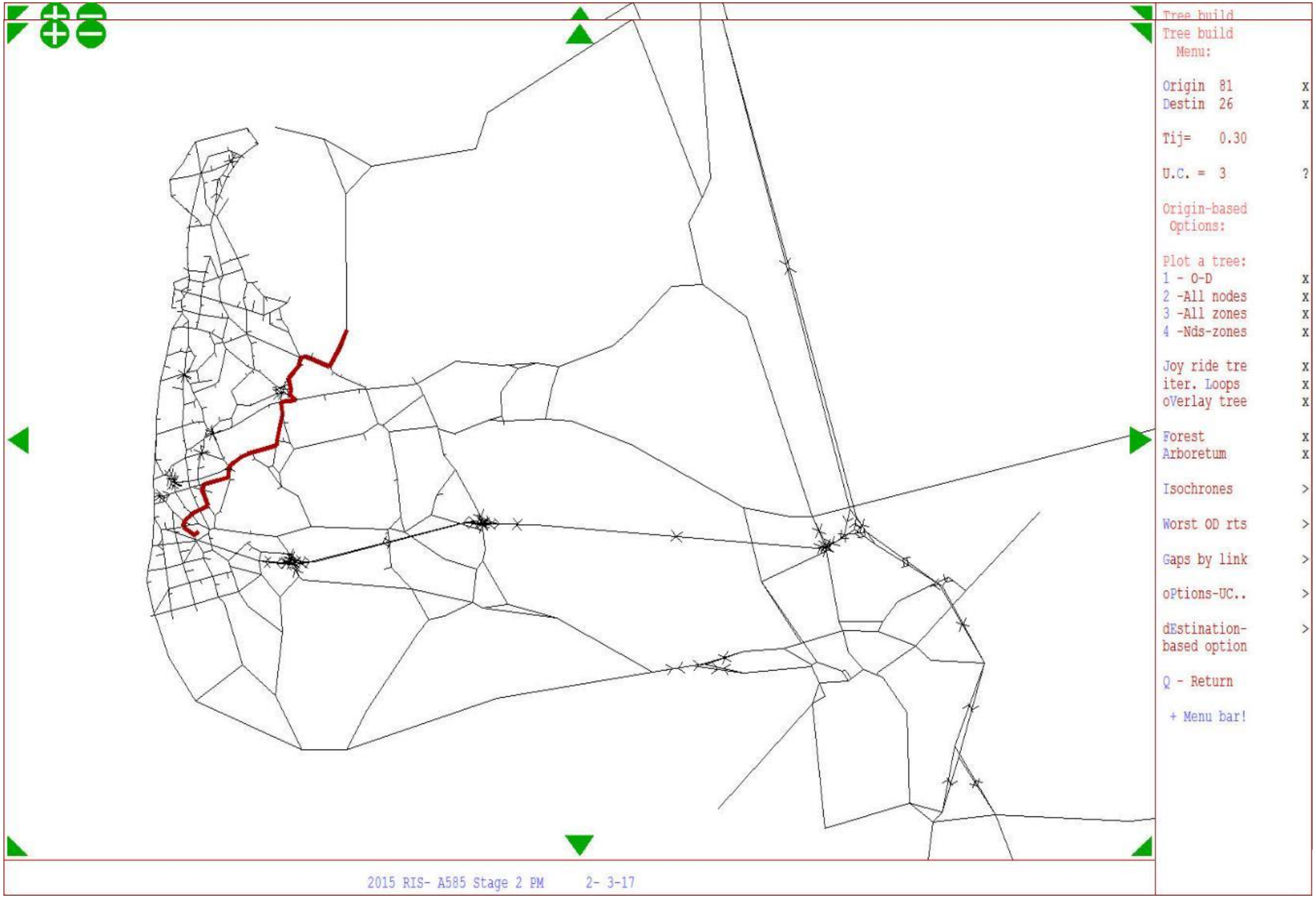


Origin 81
Destin 26

Tij= 0.30

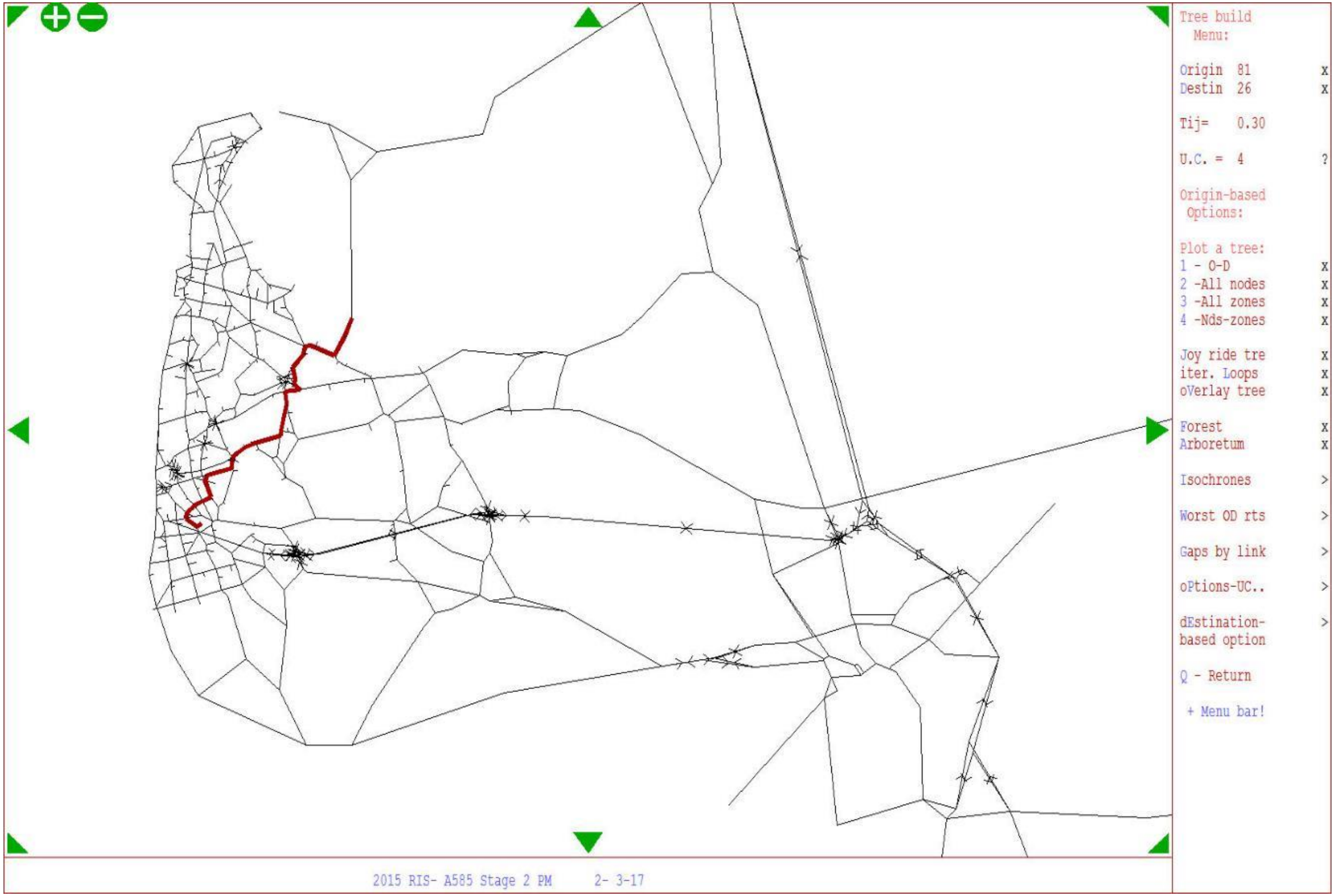
U.C. = 1

2015 RIS- A585 Stage 2 PM 2- 3-17



Origin 81
Destin 26
Tij= 0.30
U.C. = 3

2015 RIS- A585 Stage 2 PM 2- 3-17

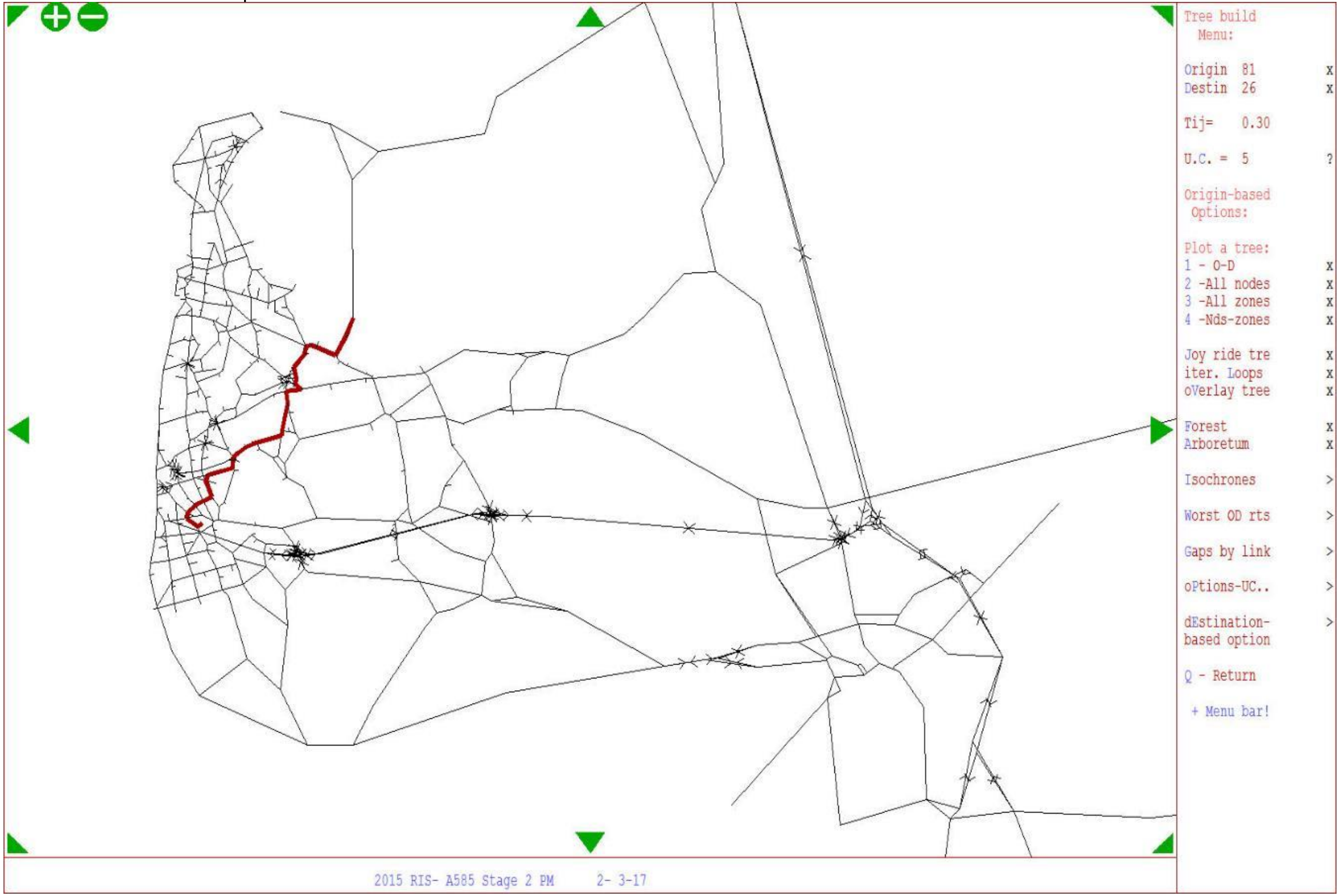


Origin 81 x
Destin 26 x

Tij= 0.30

U.C. = 4 ?

2015 RIS- A585 Stage 2 PM 2- 3-17



Origin 81
Destin 26
Tij= 0.30
U.C. = 5

APPENDIX G

Zonal Cell Value Comparison between Prior and Post Matrices

Matrix Zonal Cell Values

Figure G.1: Matrix Zonal Cell Value Comparison for Car-Commute (Prior vs Post ME2 - AM Peak)

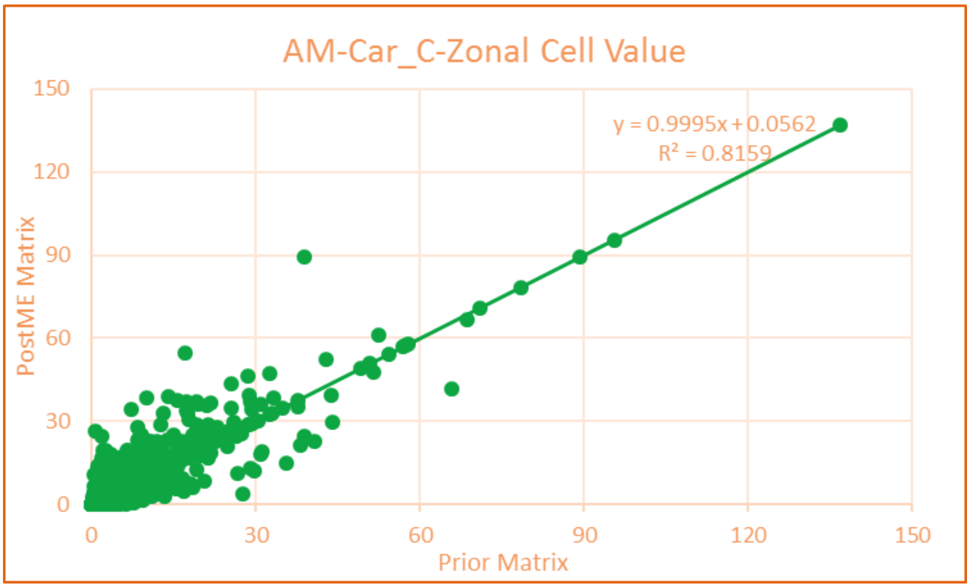


Figure G.2: Matrix Zonal Cell Value Comparison for Car-Business (Prior vs Post ME2 - AM Peak)

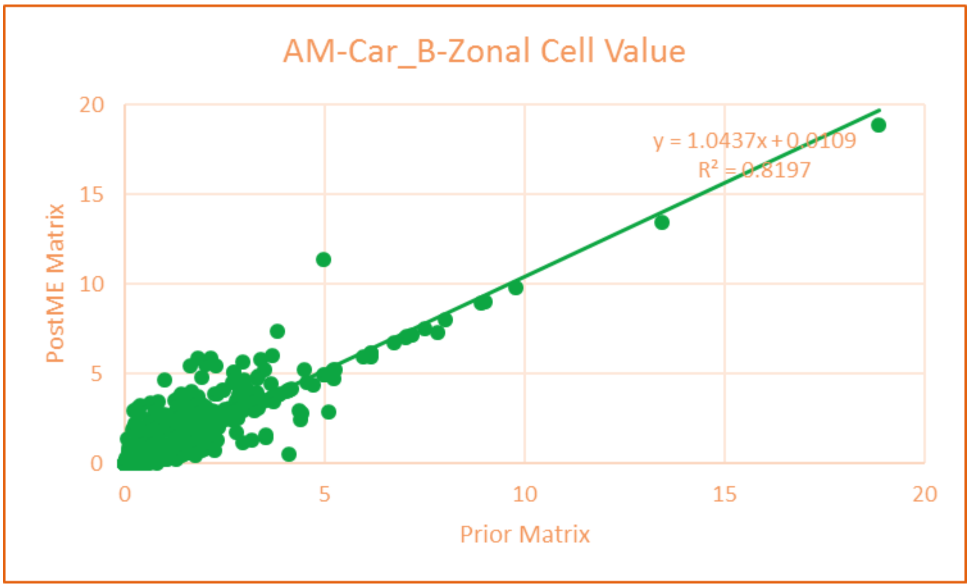


Figure G.3: Matrix Zonal Cell Value Comparison for Car-Other (Prior vs Post ME2 - AM Peak)

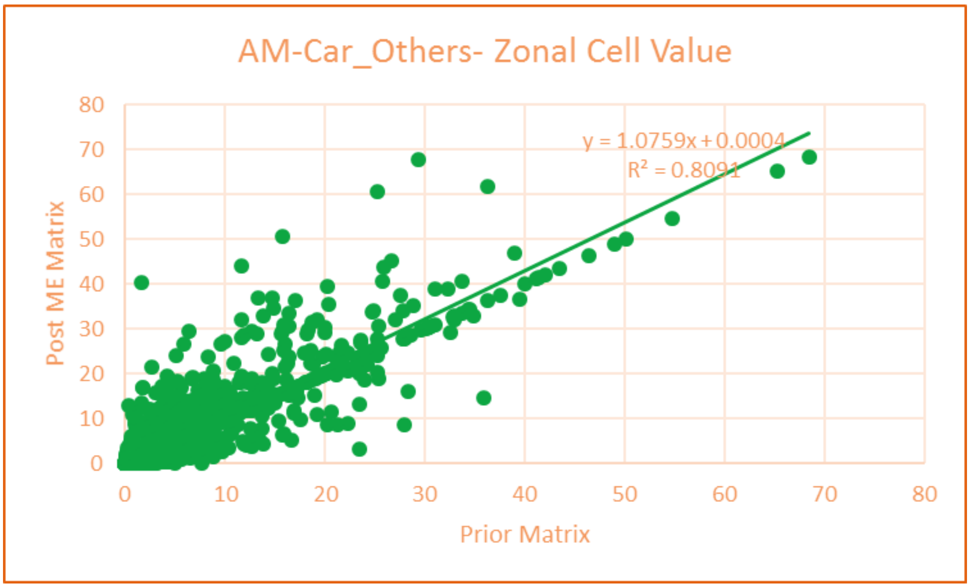


Figure G.4: Matrix Zonal Cell Value Comparison for LGV (Prior vs Post ME2 - AM Peak)

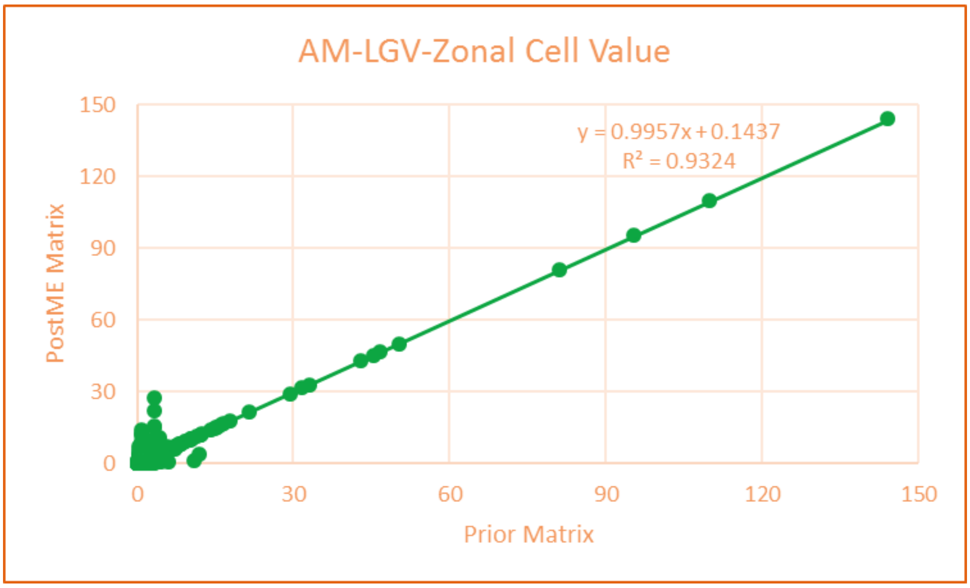


Figure G.5: Matrix Zonal Cell Value Comparison for HGV (Prior vs Post ME2 - AM Peak)

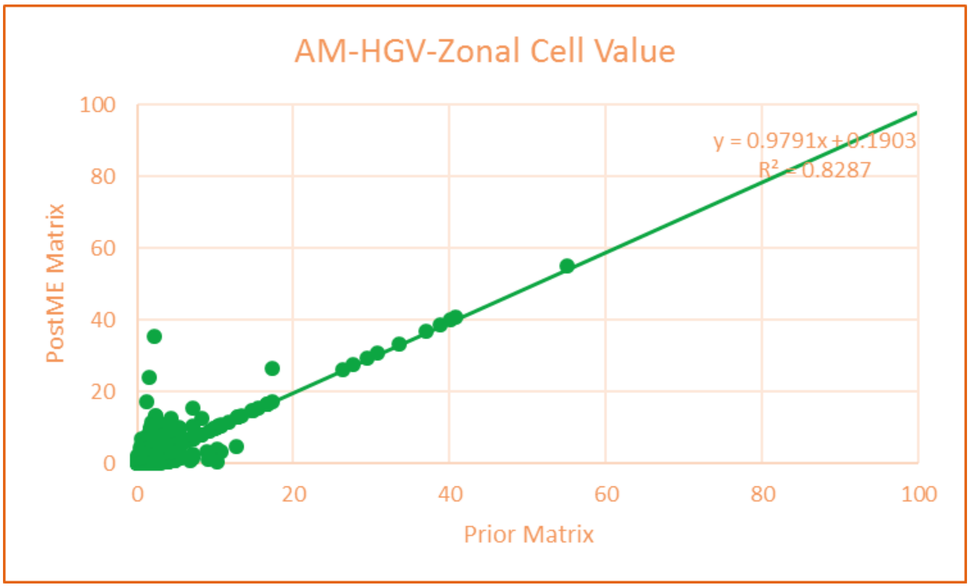


Figure G.6: Matrix Zonal Cell Value Comparison for Car-Commute (Prior vs Post ME2 – Inter Peak)

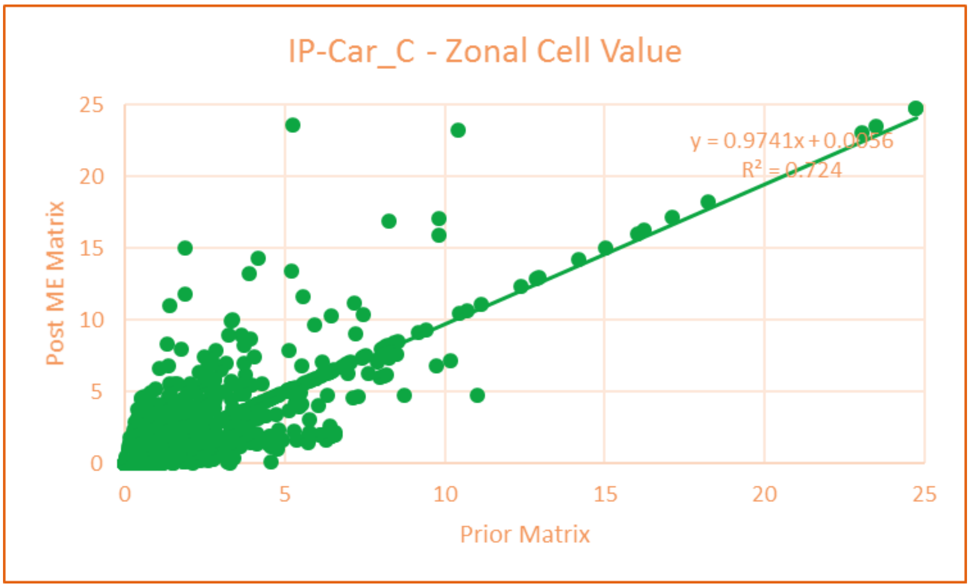


Figure G.7: Matrix Zonal Cell Value Comparison for Car-Business (Prior vs Post ME2 - Inter Peak)

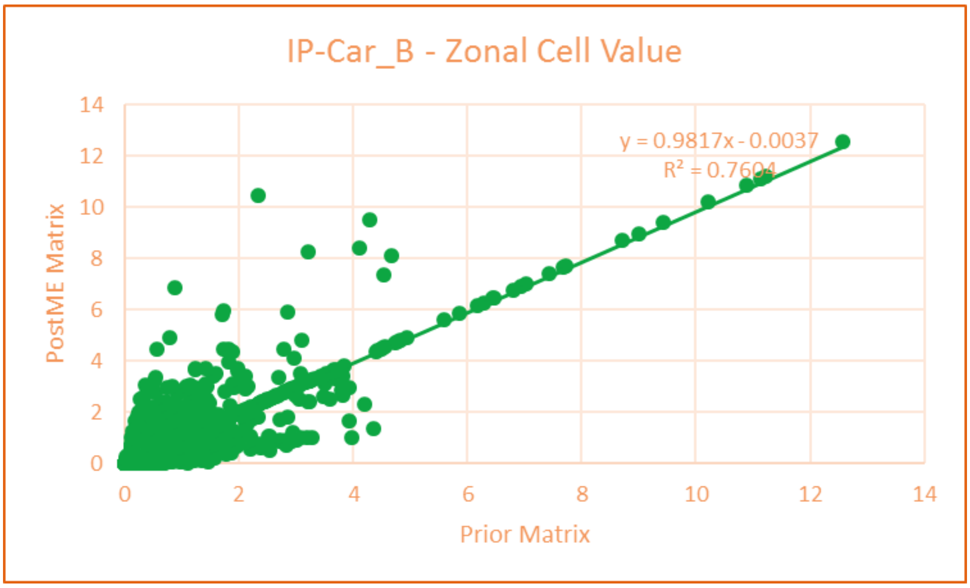


Figure G.8: Matrix Zonal Cell Value Comparison for Car-Other (Prior vs Post ME2 - Inter Peak)

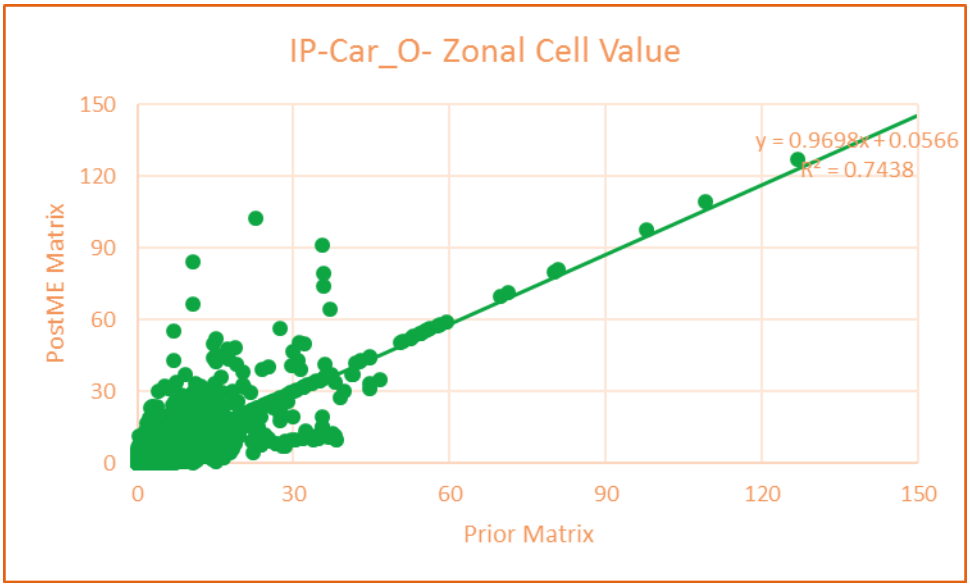


Figure G.9: Matrix Zonal Cell Value Comparison for LGV (Prior vs Post ME2 - Inter Peak)

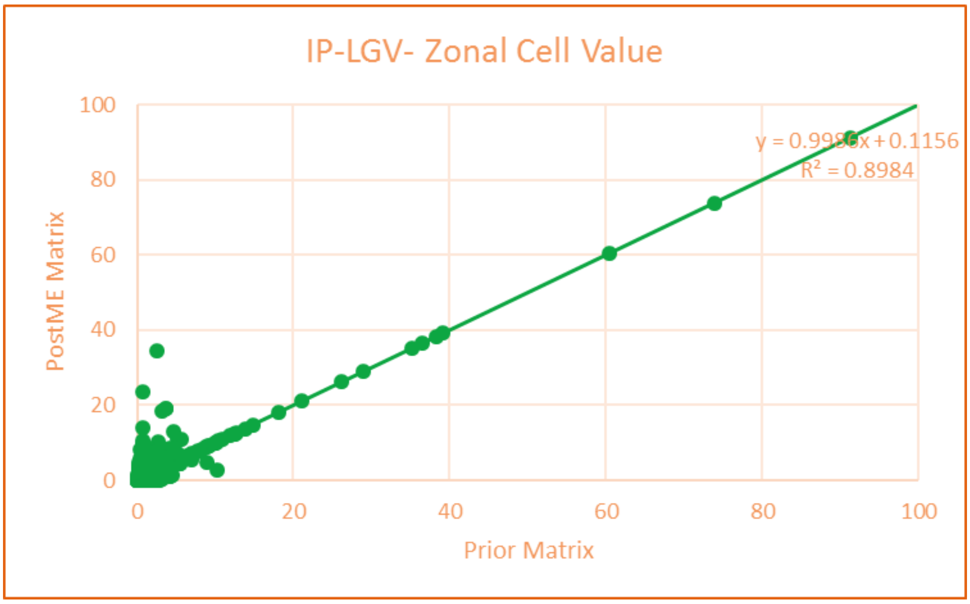


Figure G.10: Matrix Zonal Cell Value Comparison for HGV (Prior vs Post ME2 - Inter Peak)

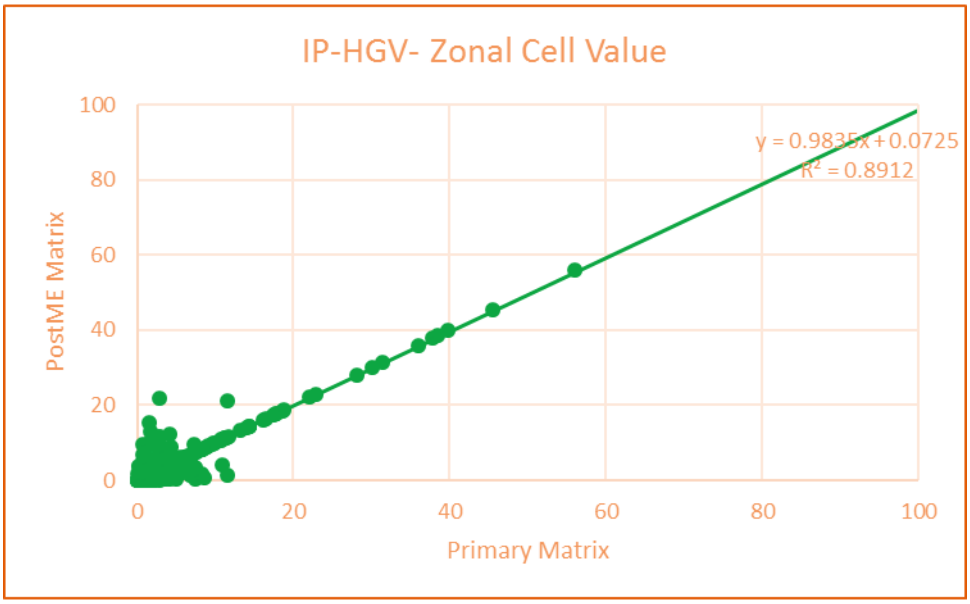


Figure G.11: Matrix Zonal Cell Value Comparison for Car-Commute (Prior vs Post ME2 - PM Peak)

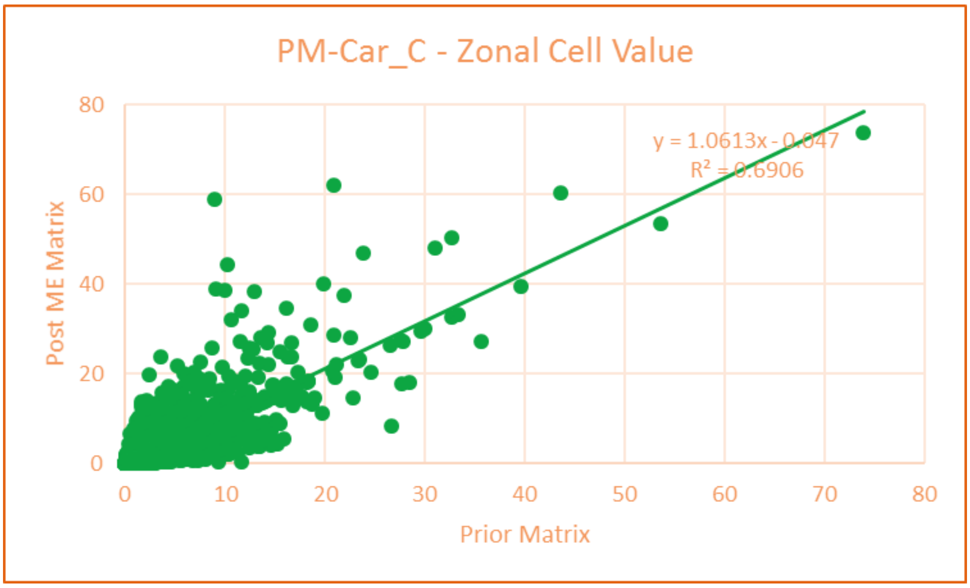


Figure G.12: Matrix Zonal Cell Value Comparison for Car-Business (Prior vs Post ME2 - PM Peak)

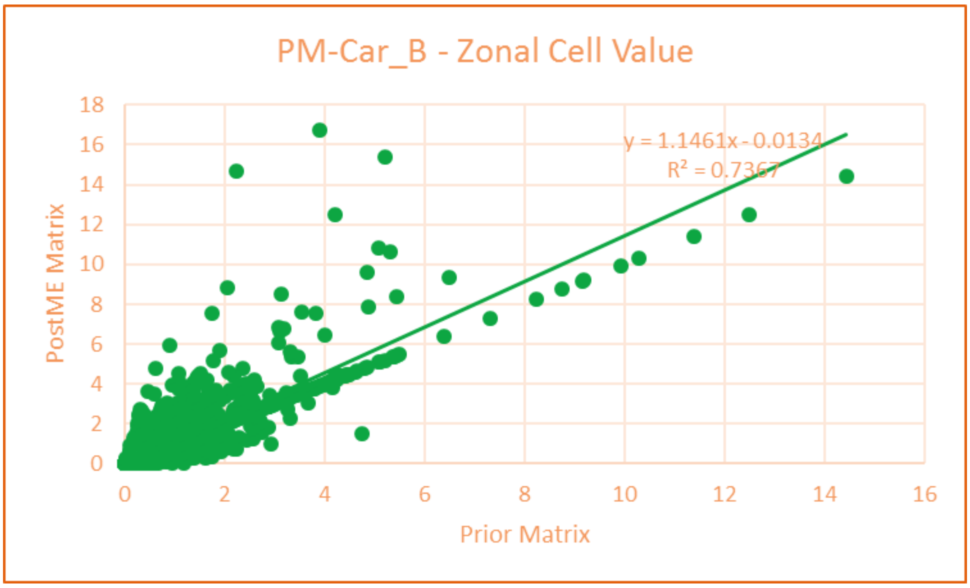


Figure G.13: Matrix Zonal Cell Value Comparison for Car-Other (Prior vs Post ME2 - PM Peak)

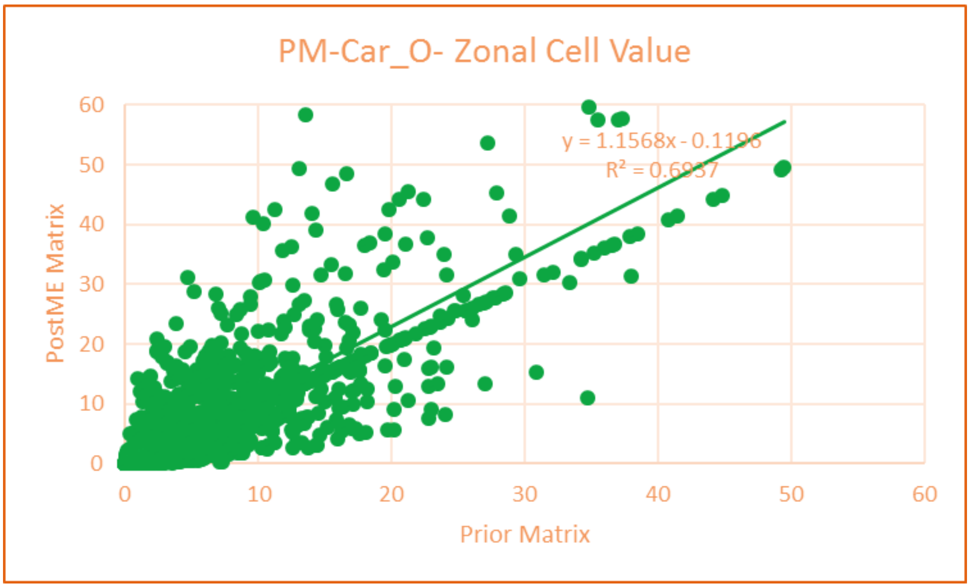


Figure G.14: Matrix Zonal Cell Value Comparison for LGV (Prior vs Post ME2 - PM Peak)

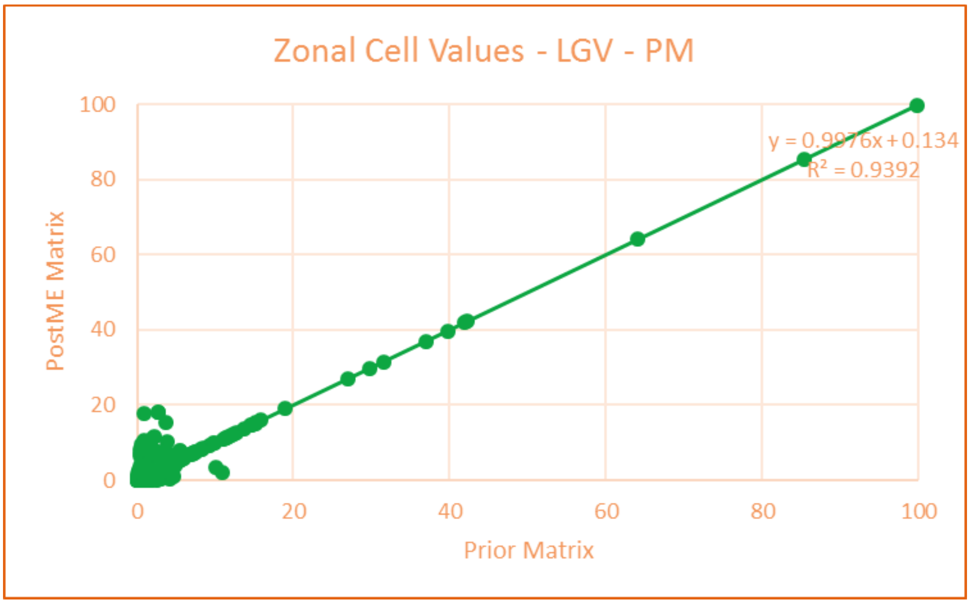
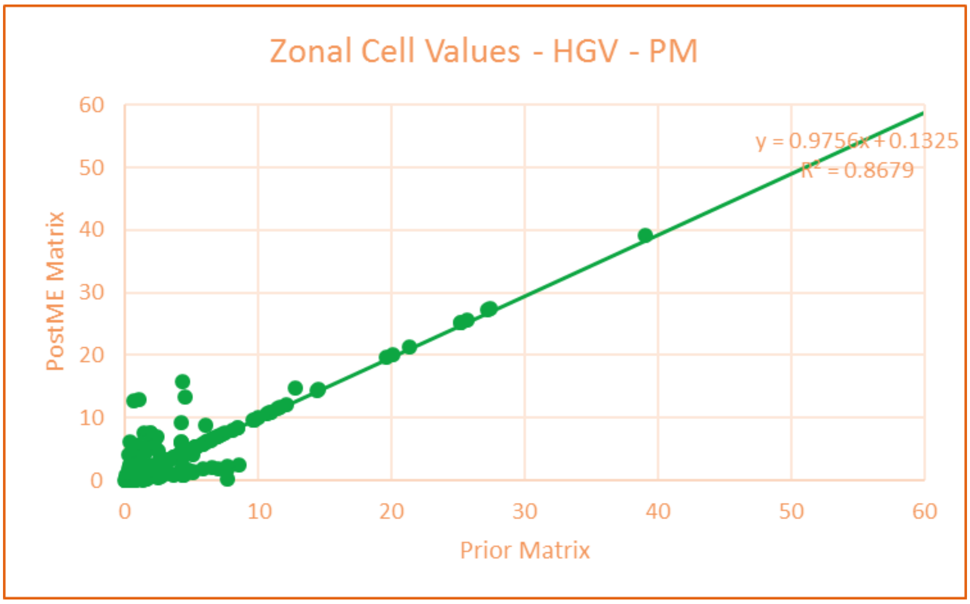


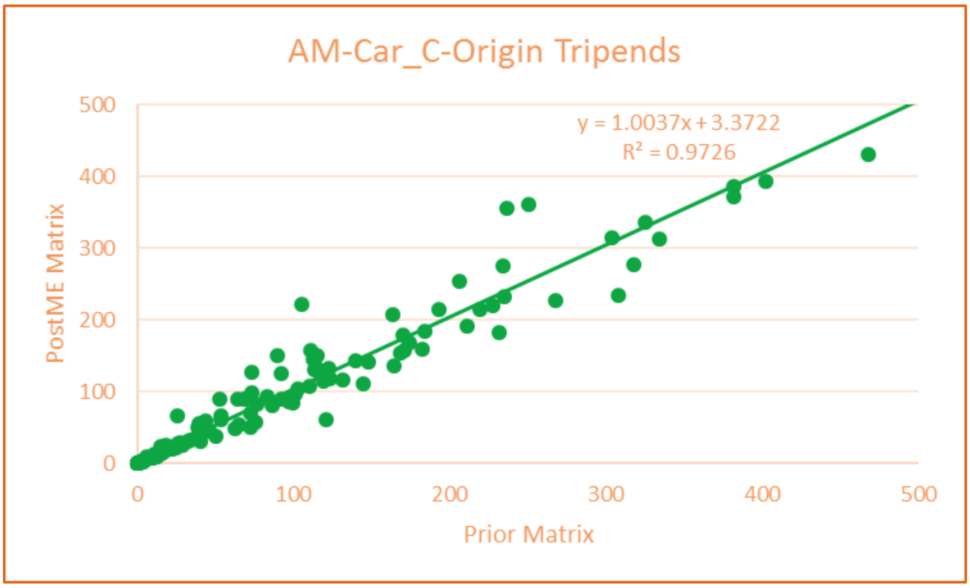
Figure G.15: Matrix Zonal Cell Value Comparison for HGV (Prior vs Post ME2 - PM Peak)



APPENDIX H

Zonal Trip End Comparison between Prior and Post Matrices

Figure H.1: Matrix zonal trip end comparison for Car-Commute (AM Peak)



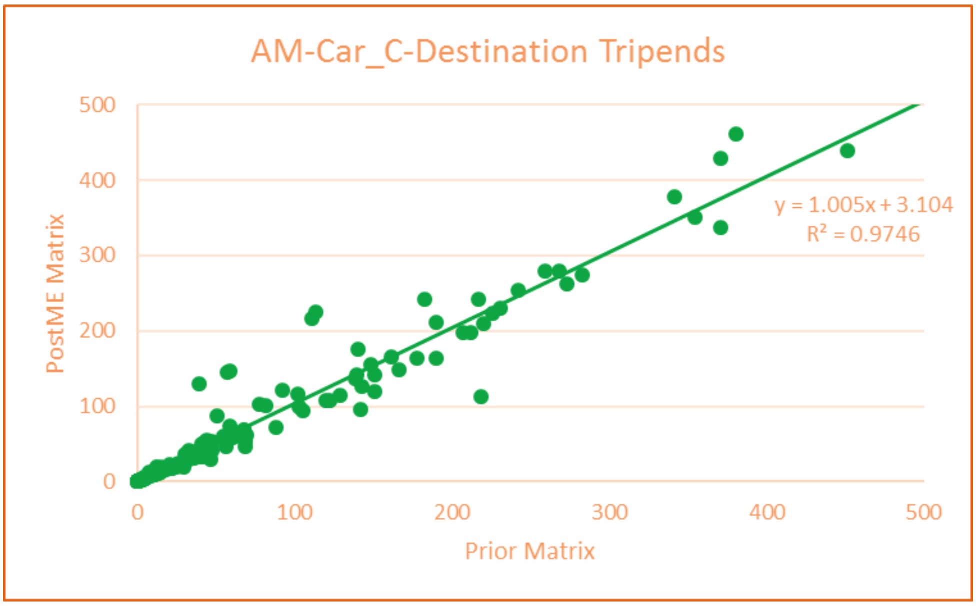
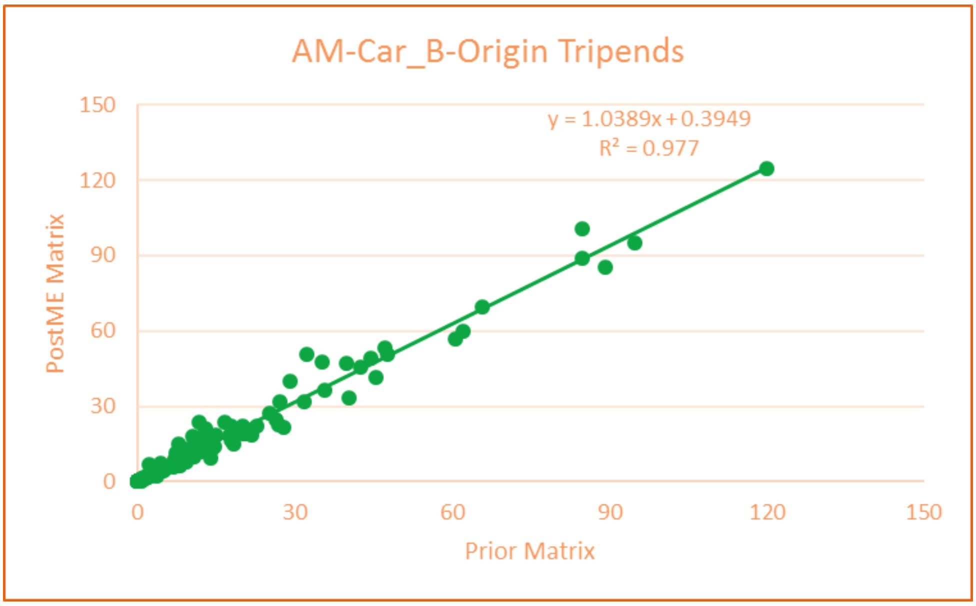


Figure H.2: Matrix zonal trip end comparison for Car-Business (AM Peak)



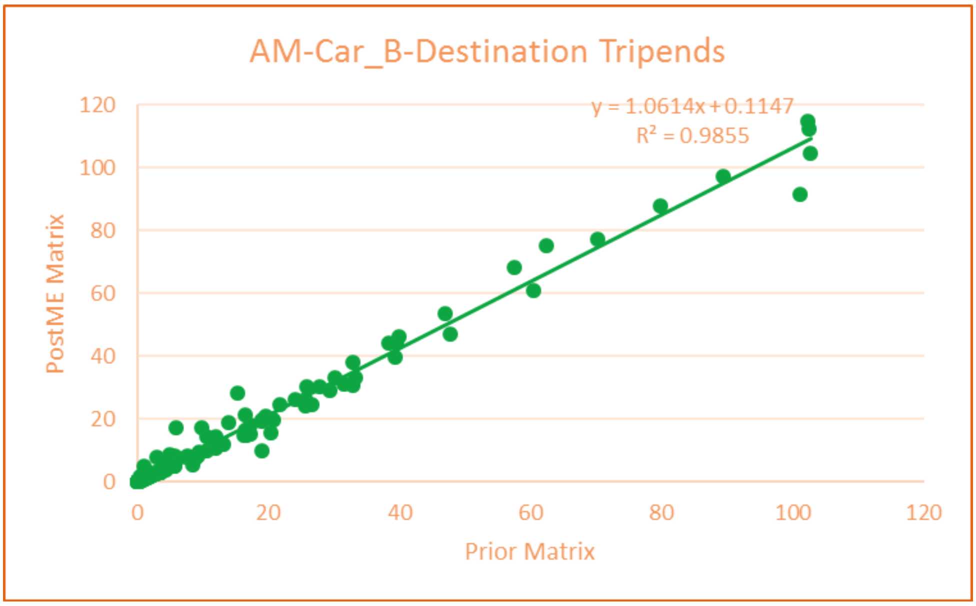
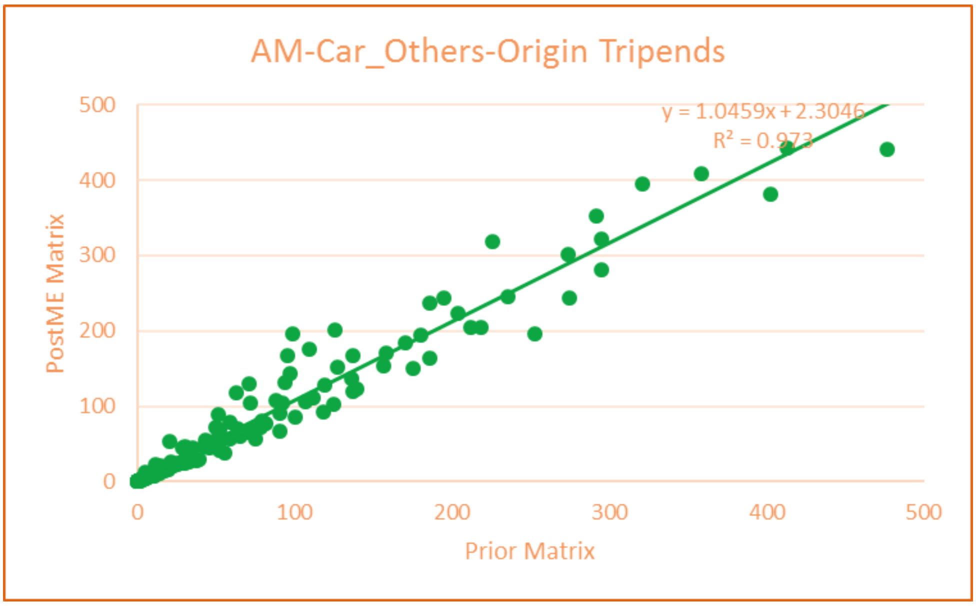


Figure H.3: Matrix zonal trip end comparison for Car-Other (AM Peak)



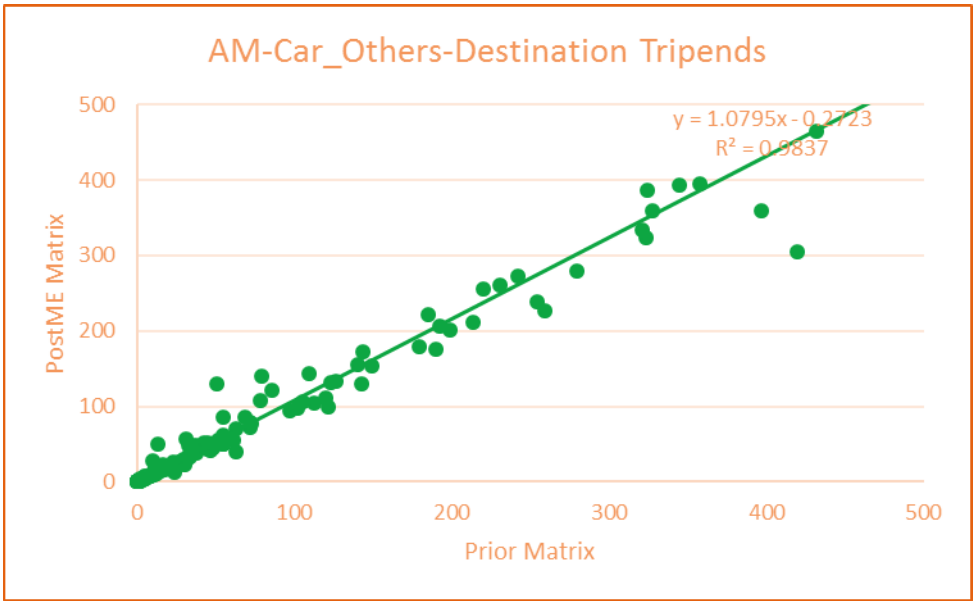
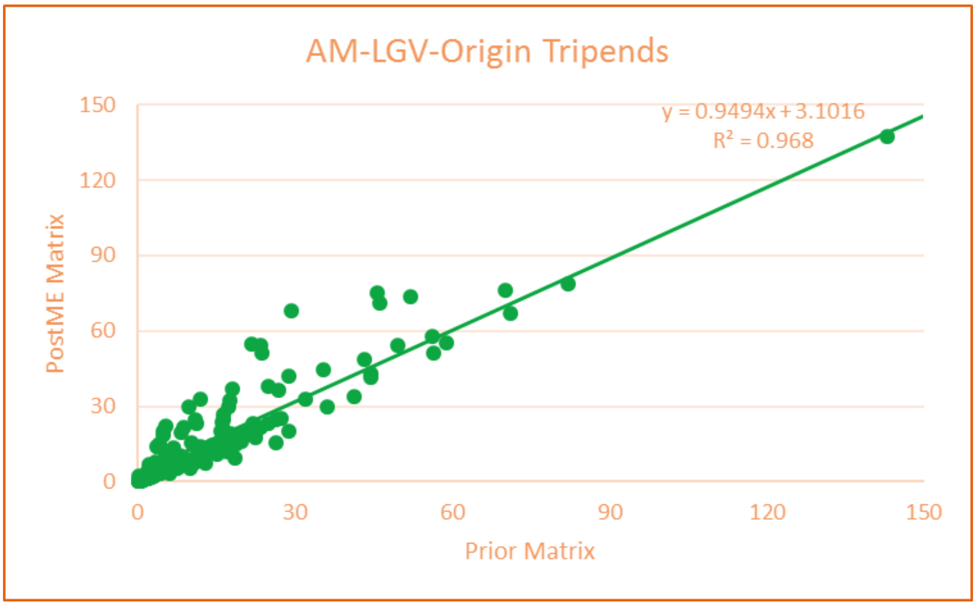


Figure H.4: Matrix zonal trip end comparison for LGV (AM Peak)



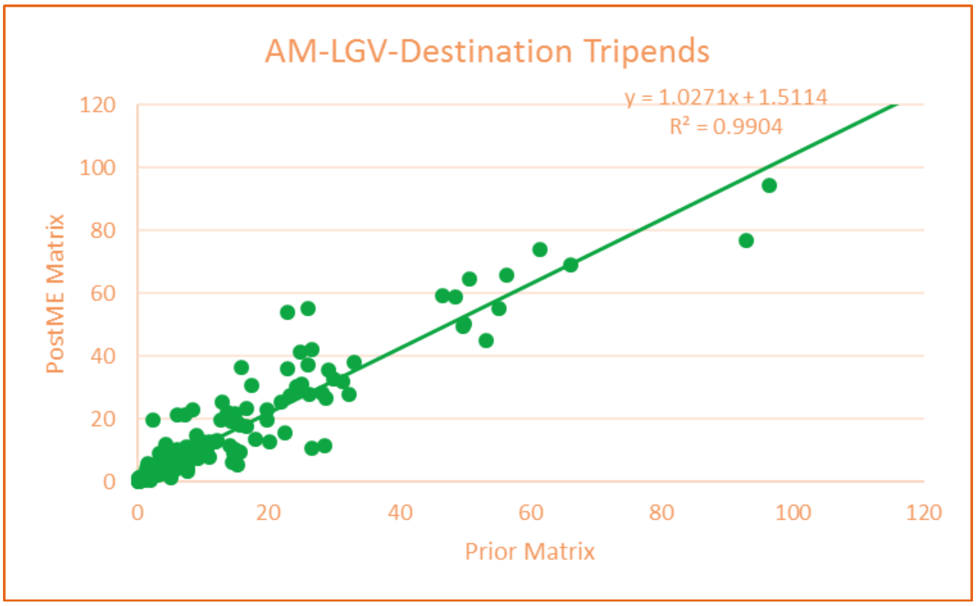
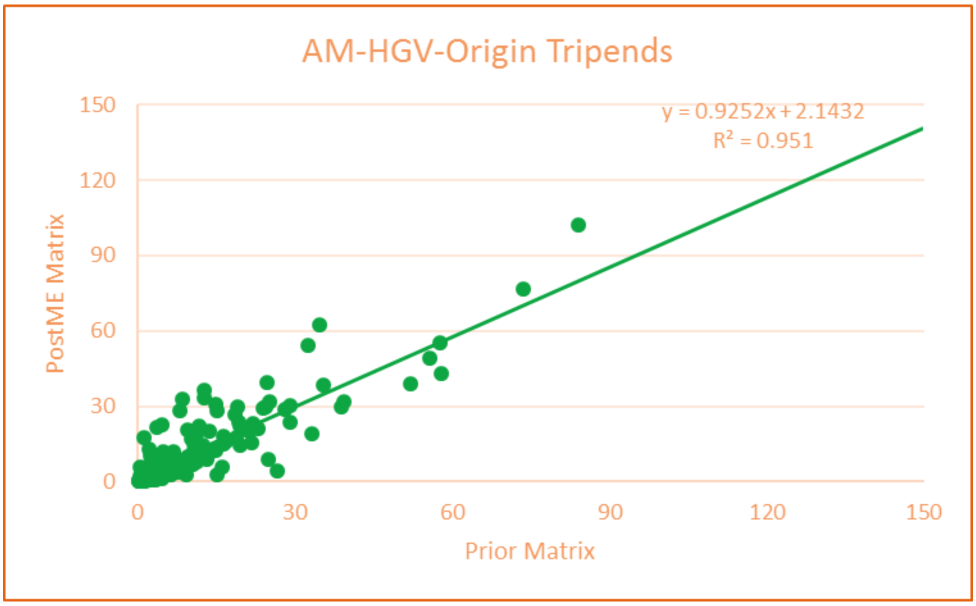


Figure H.5: Matrix zonal trip end comparison for HGV (AM Peak)



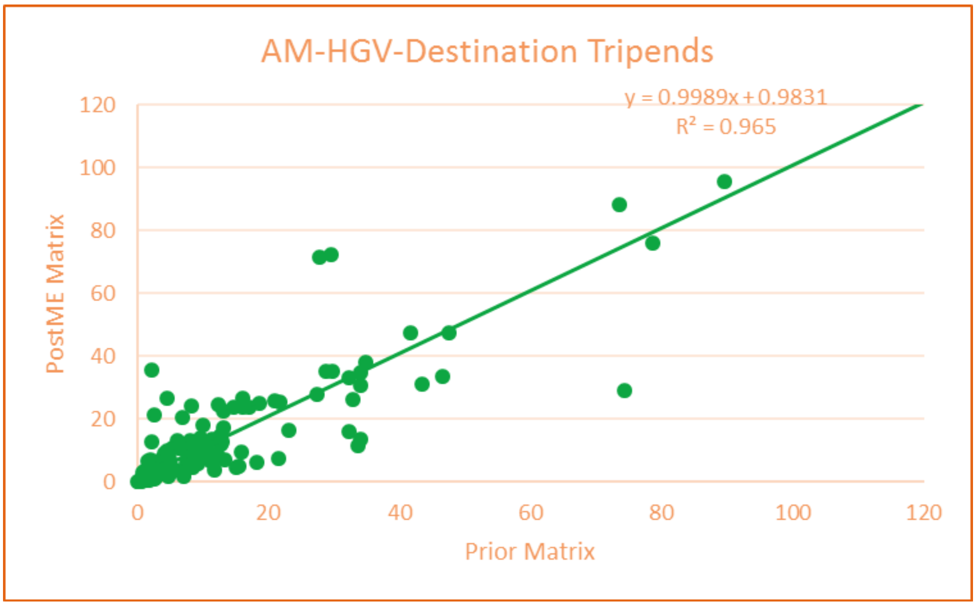
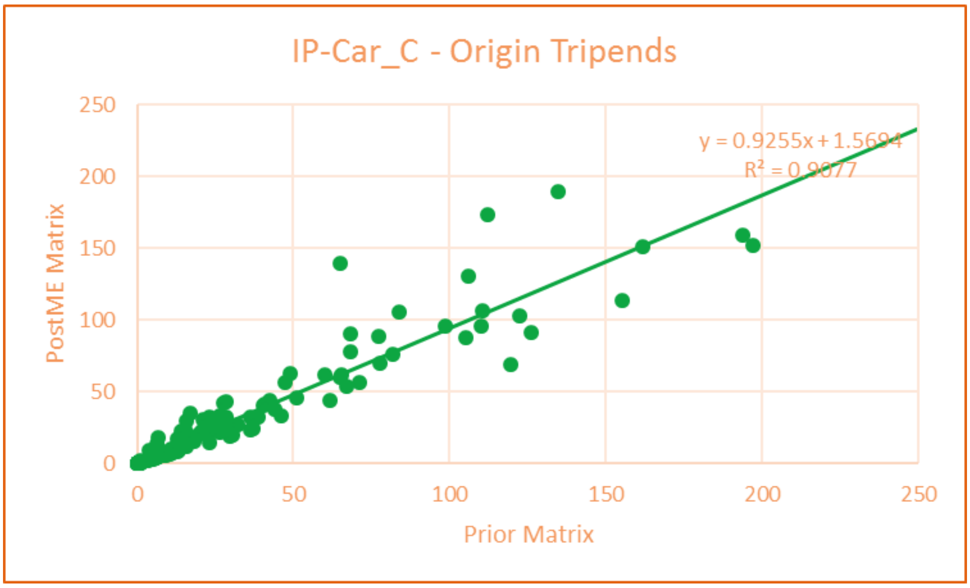


Figure H.6: Matrix zonal trip end comparison for Car- Commute (Inter Peak)



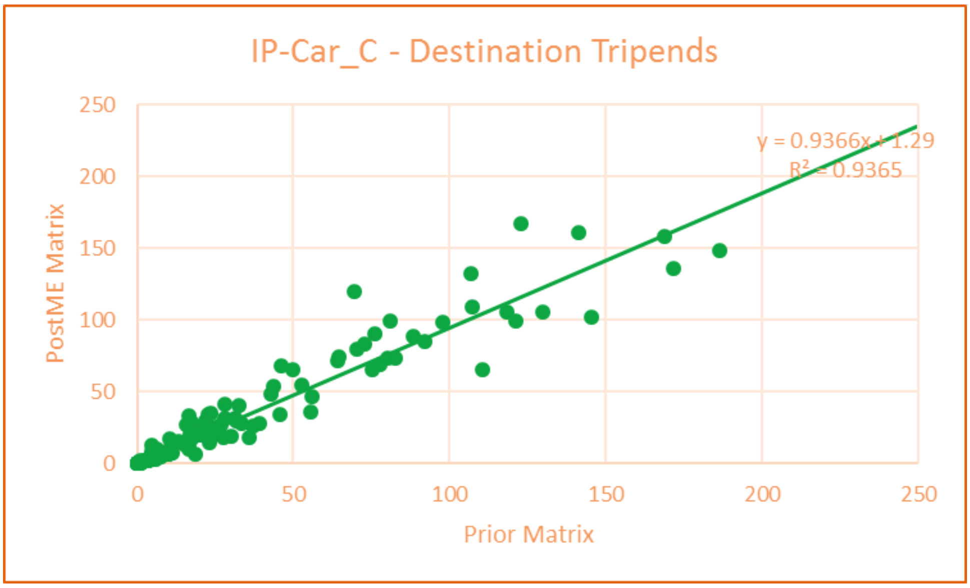
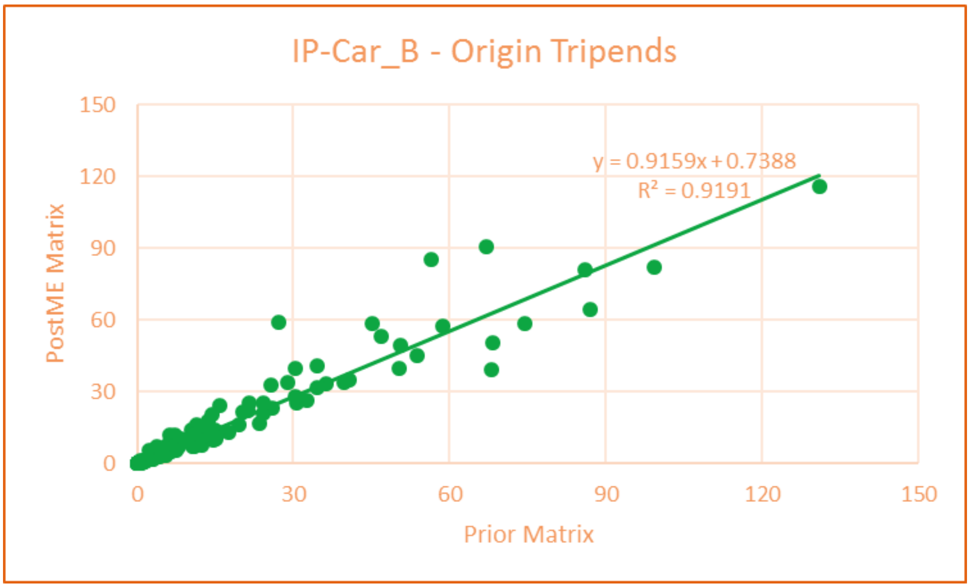


Figure H.7: Matrix zonal trip end comparison for Car- Business (Inter Peak)



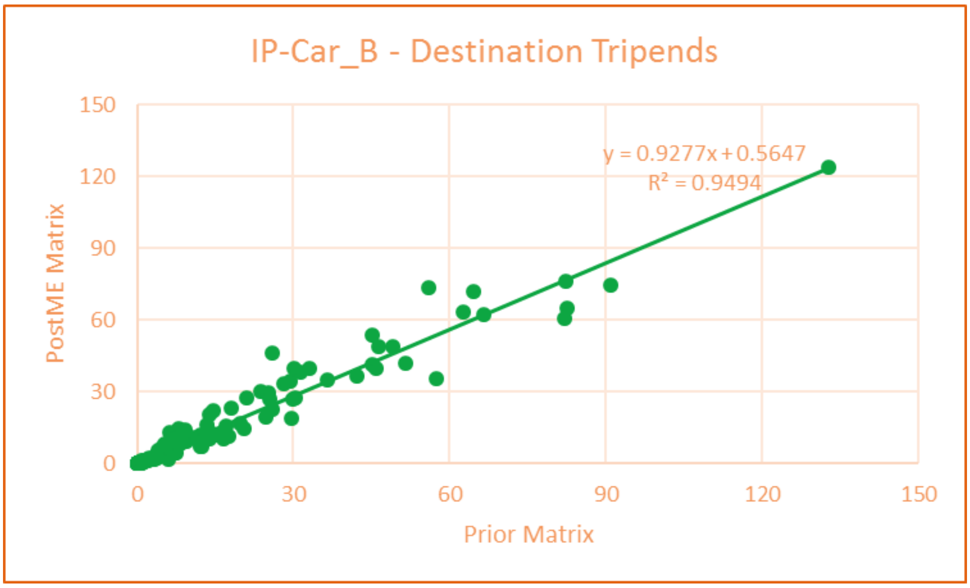


Figure H.8: Matrix zonal trip end comparison for Car- Other (Inter Peak)

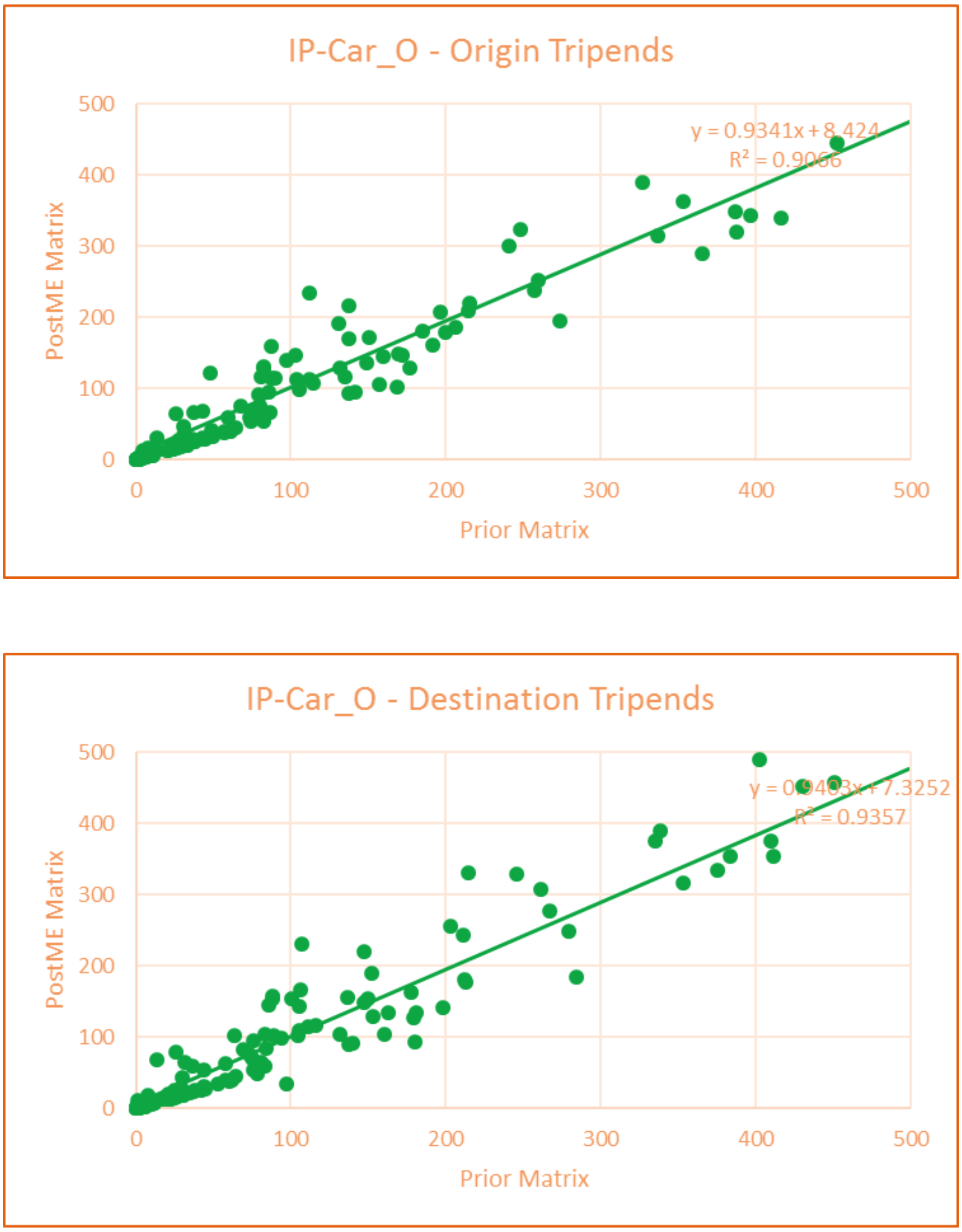
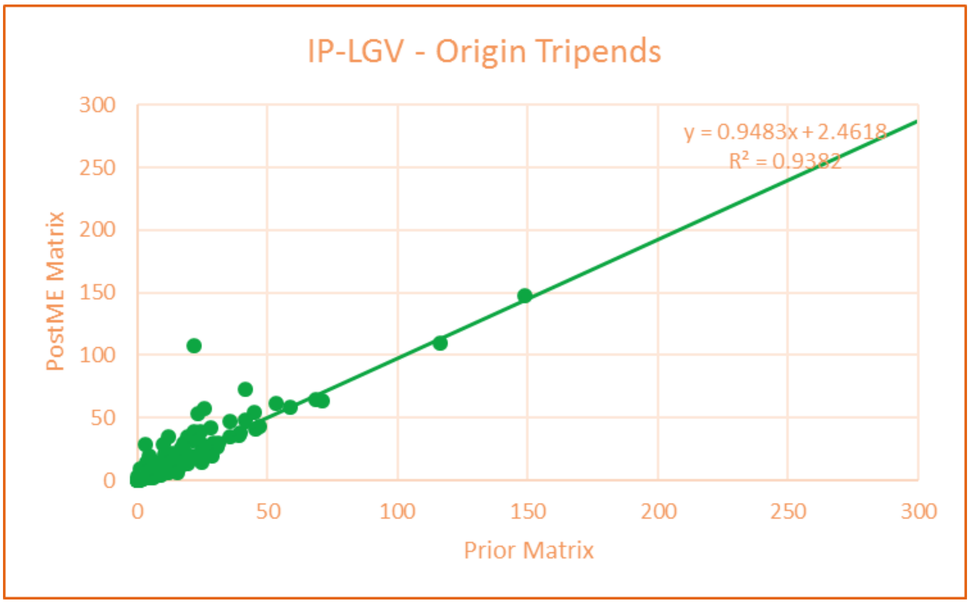


Figure H.9: Matrix zonal trip end comparison for LGV (Inter Peak)



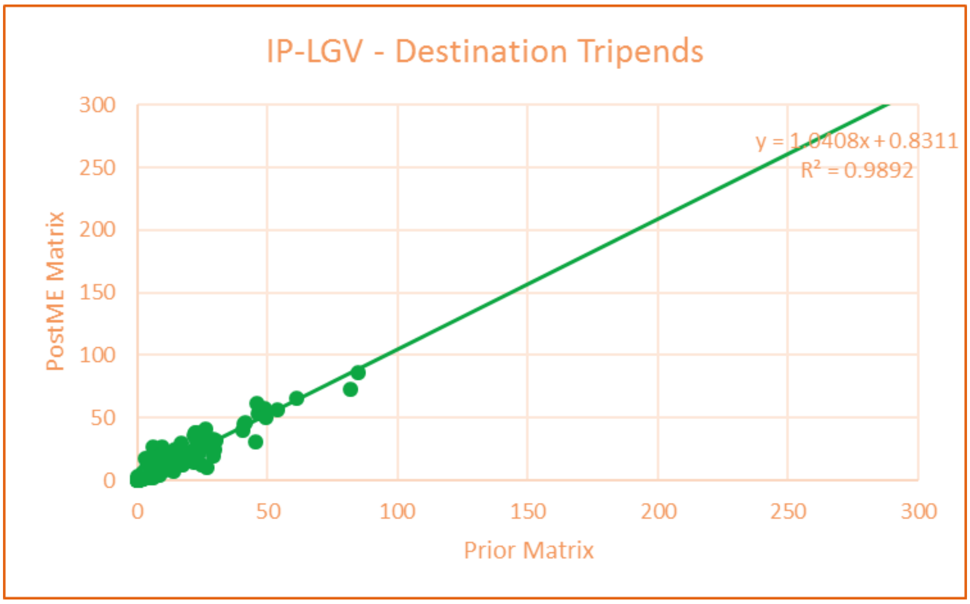
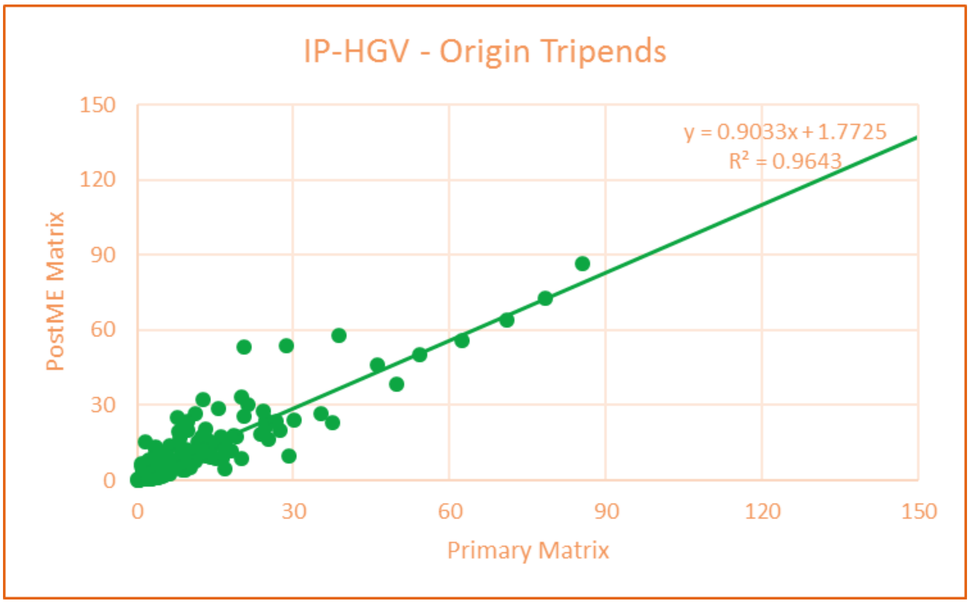


Figure H.10: Matrix zonal trip end comparison for HGV (Inter Peak)



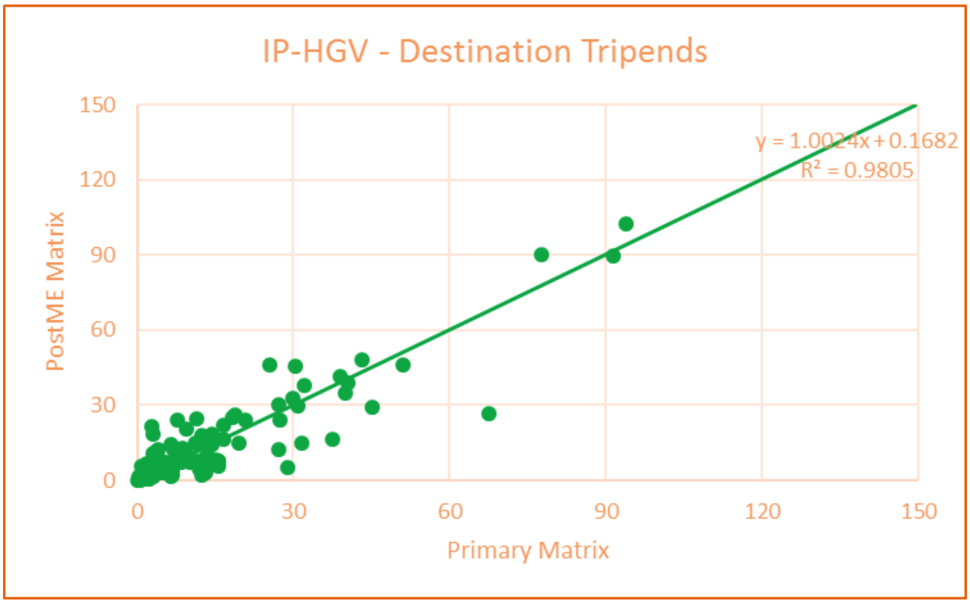
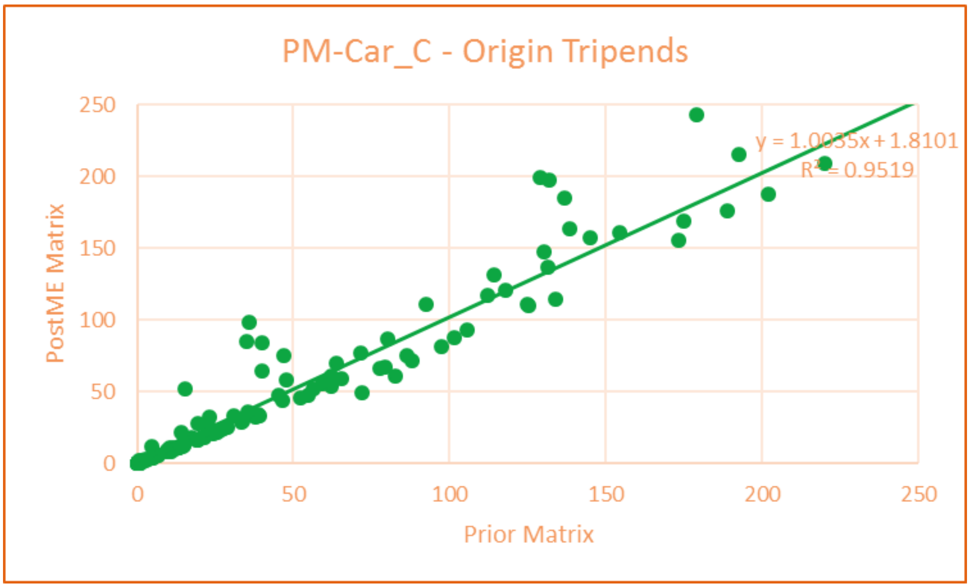


Figure H.11: Matrix zonal trip end comparison for Car-Commute (PM Peak)



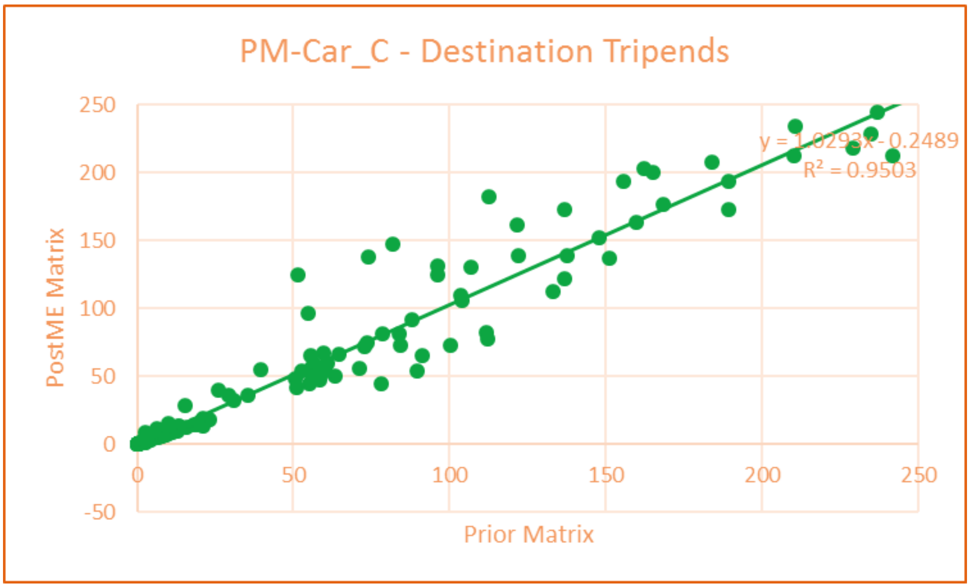
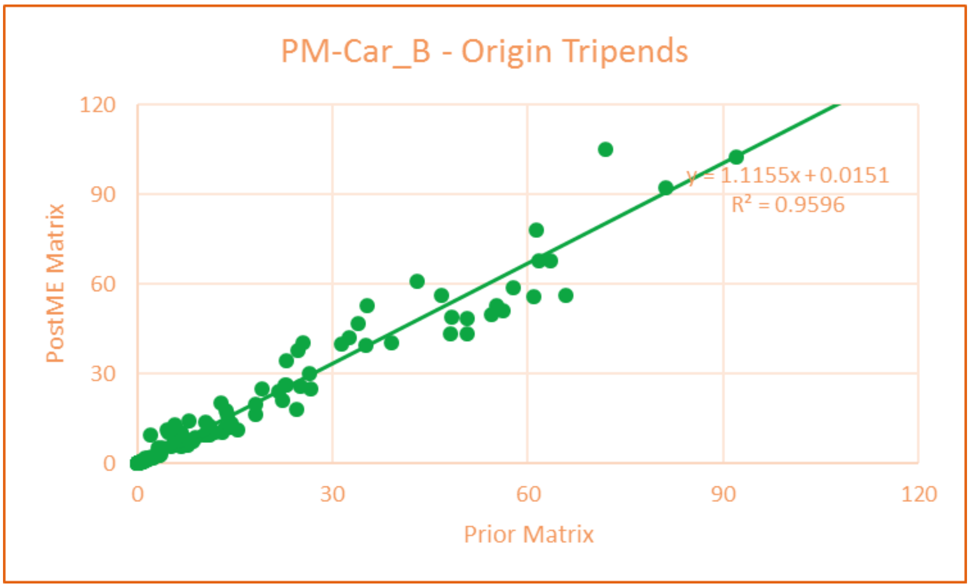


Figure H.12: Matrix zonal trip end comparison for Car-Business (PM Peak)



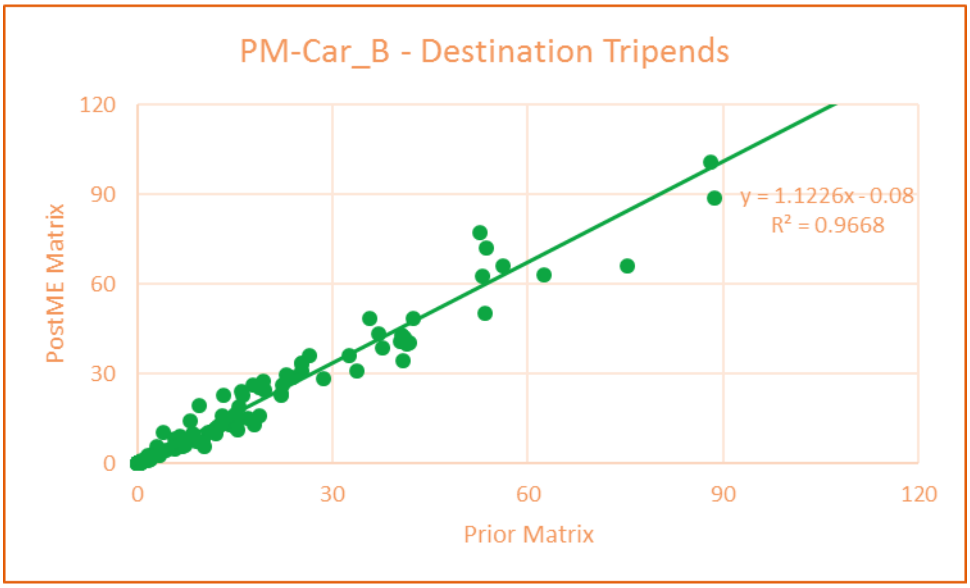
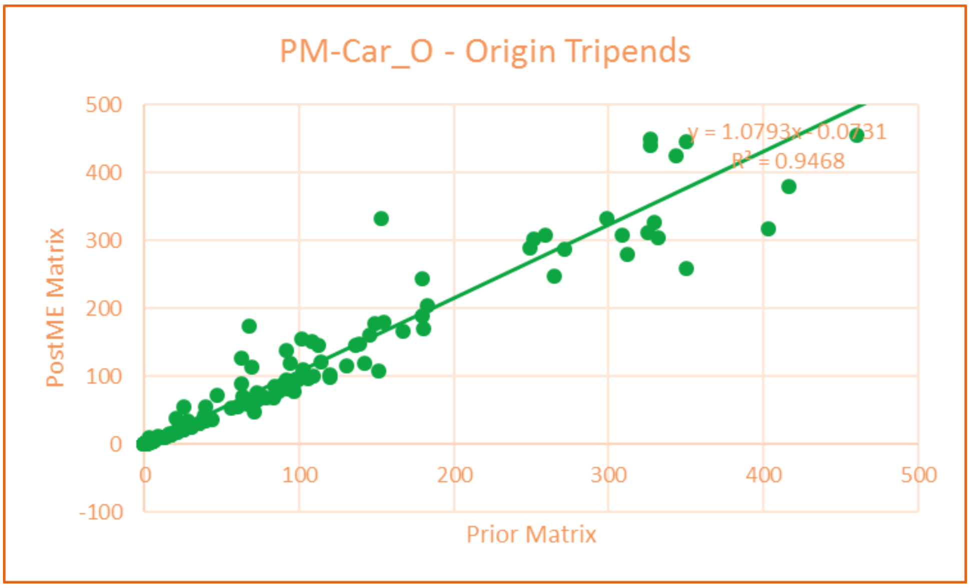


Figure H.13: Matrix zonal trip end comparison for Car-Other (PM Peak)



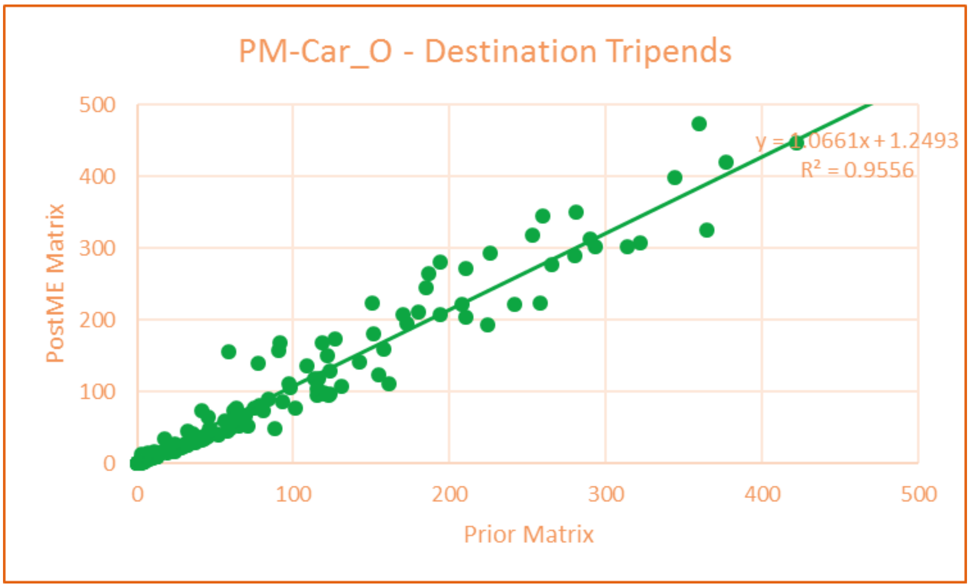
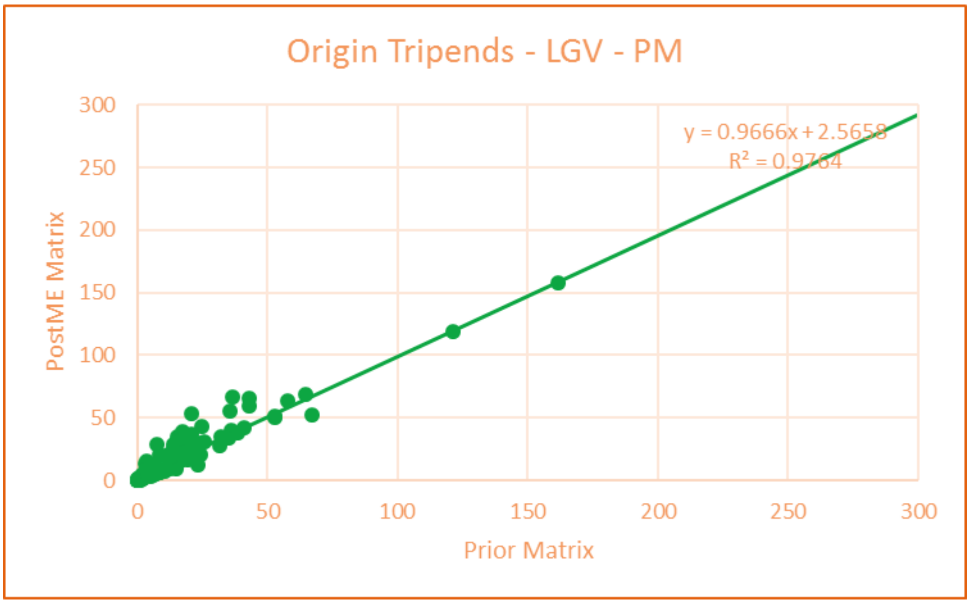


Figure H.14: Matrix zonal trip end comparison for LGV (PM Peak)



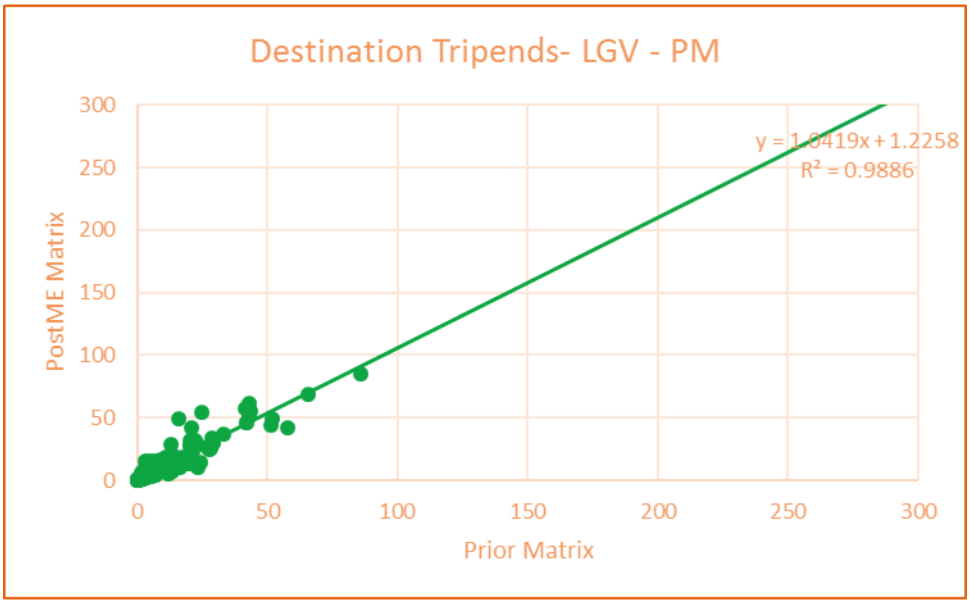
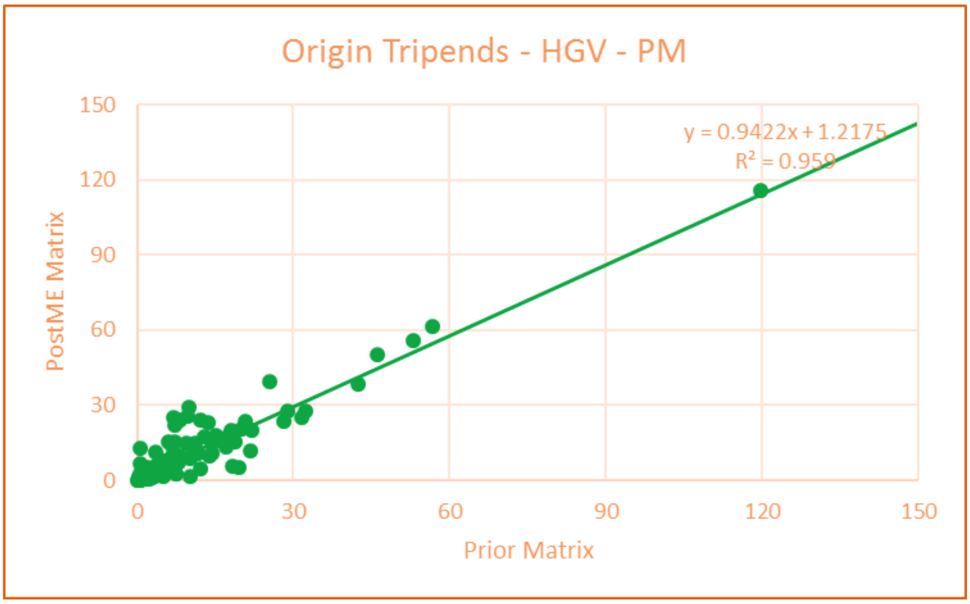
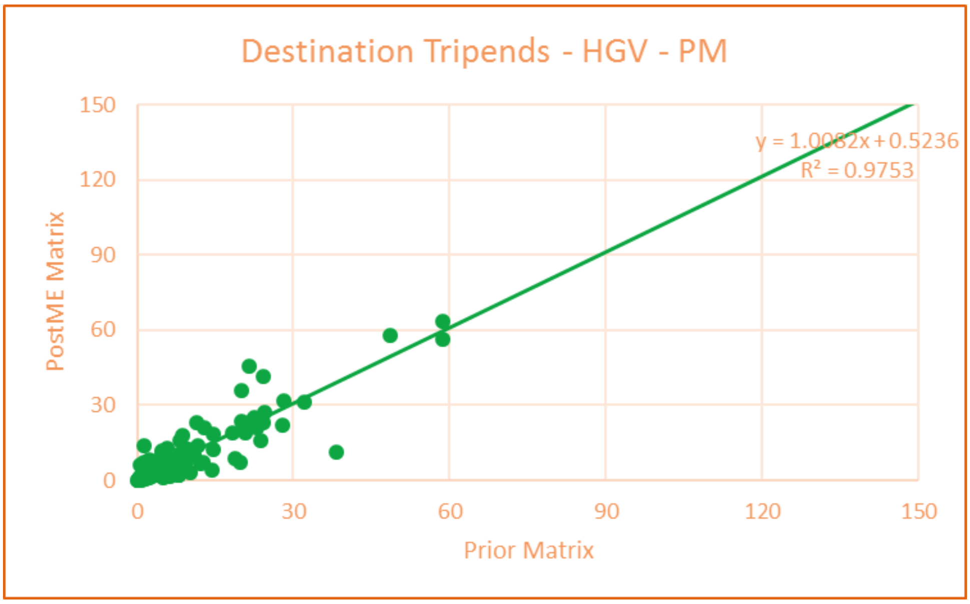


Figure H.15: Matrix zonal trip end comparison for HGV (PM Peak)





APPENDIX I

Trip Length Frequency Comparison between Prior and Post Matrices

Figure I.1: Trip Length Distribution for AM Peak-Car Commute

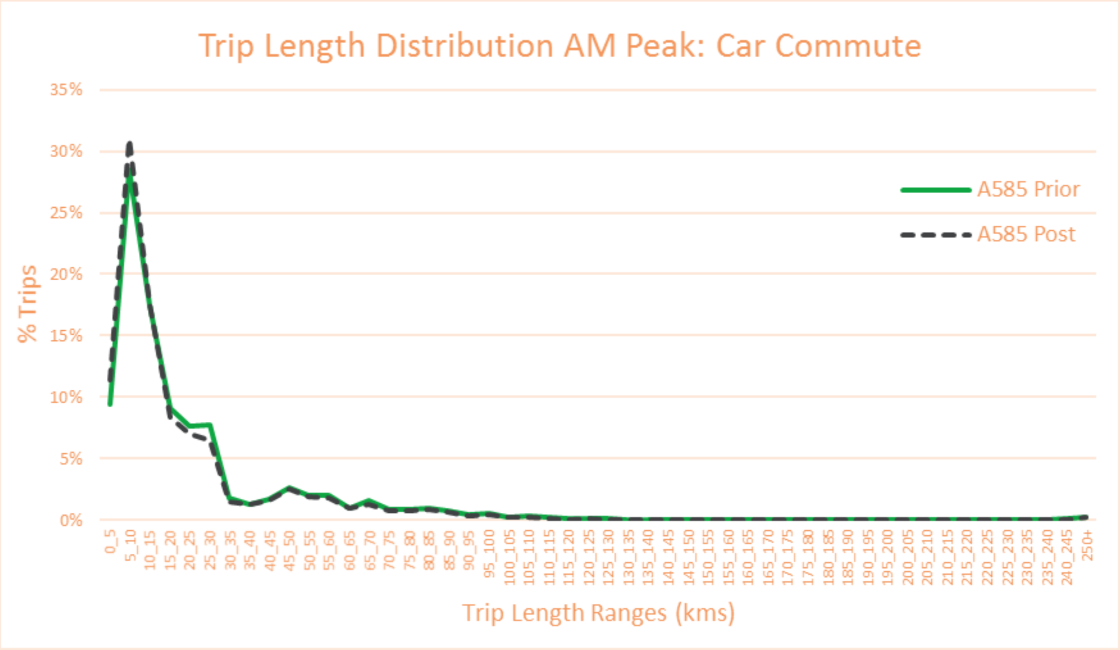


Figure I.2: Trip Length Distribution for AM Peak-Car Business

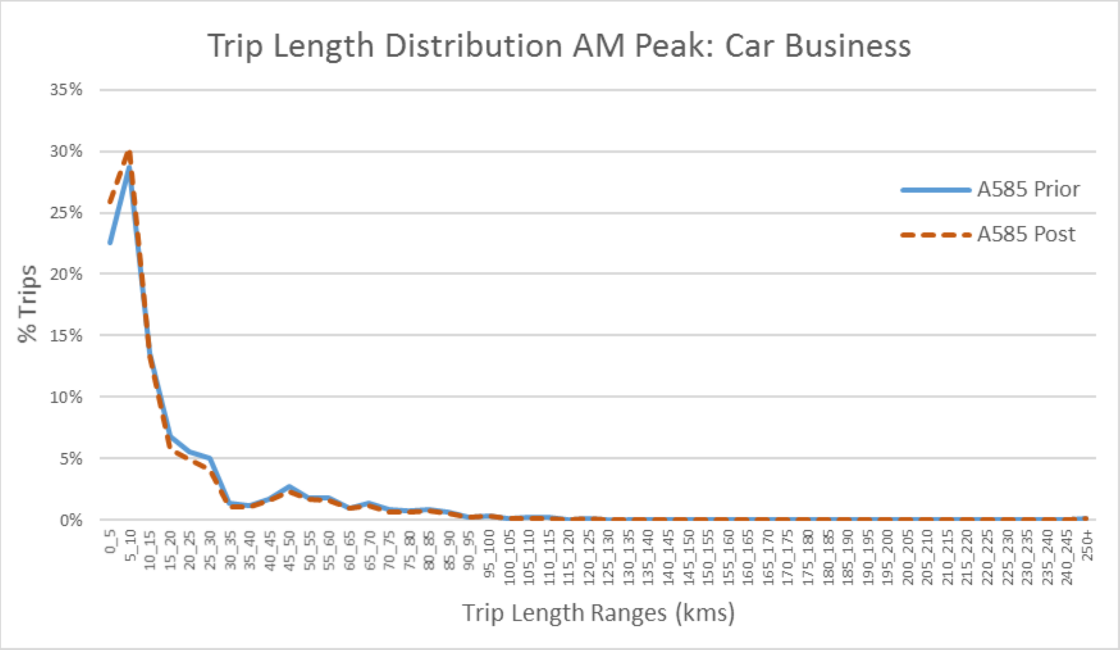


Figure I.3: Trip Length Distribution for AM Peak-Car Others

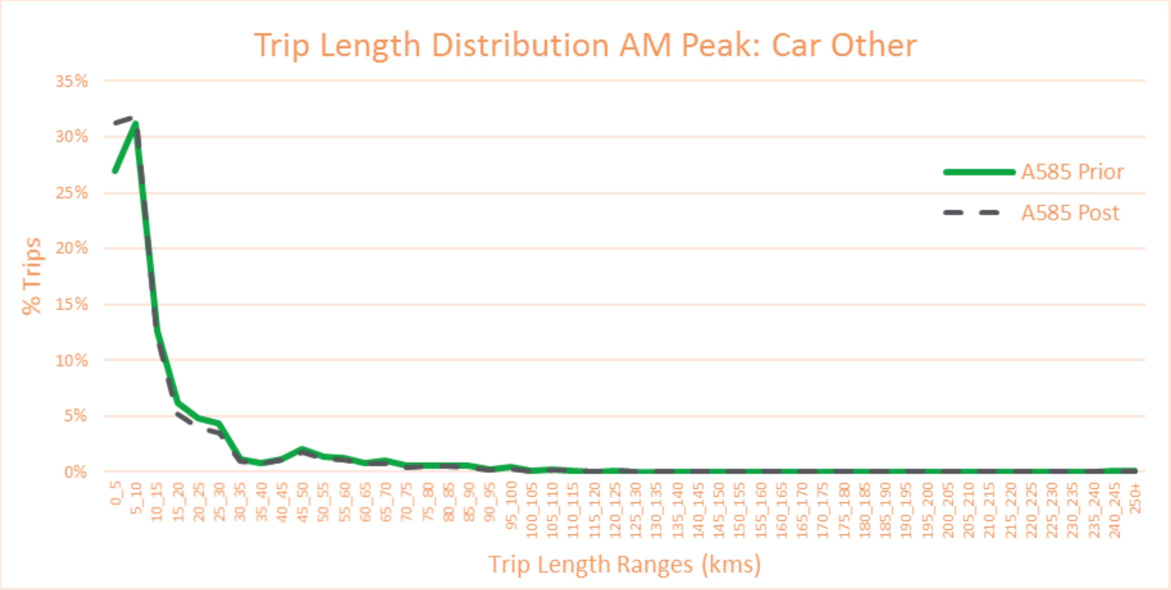


Figure I.4: Trip Length Distribution for AM Peak-Car All

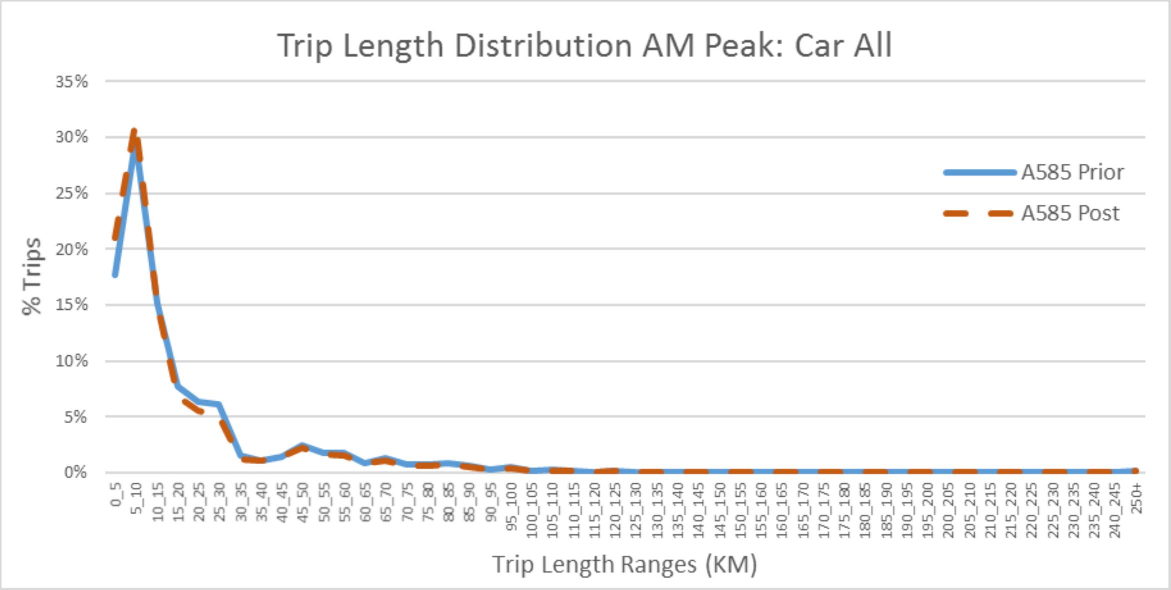


Figure I.5: Trip Length Distribution for AM Peak-LGV

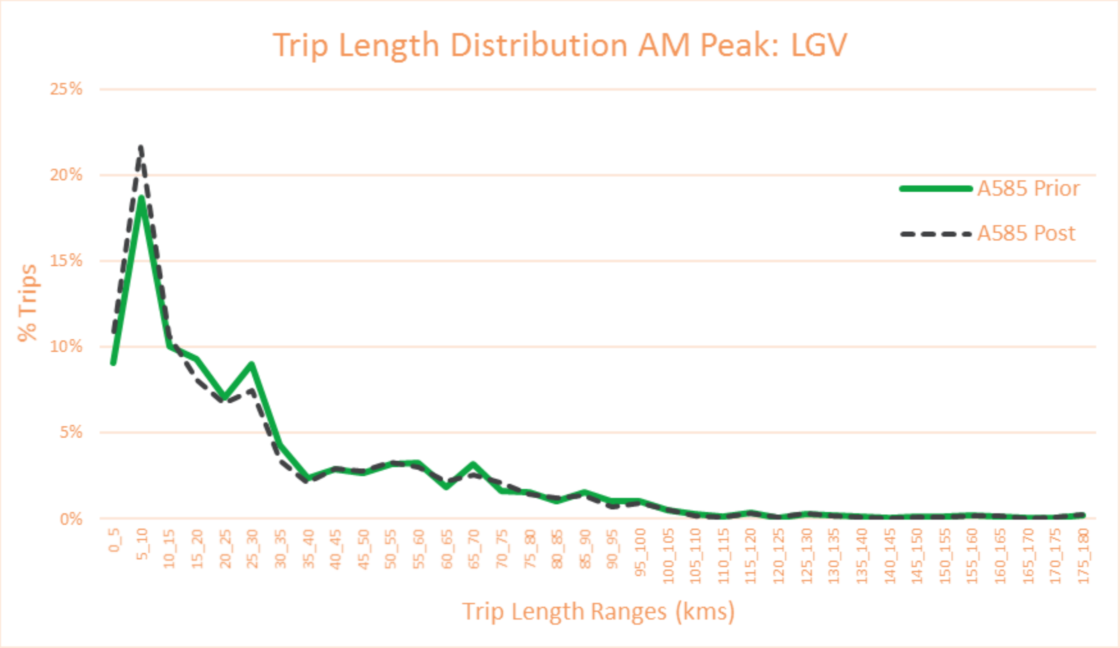


Figure I.6: Trip Length Distribution for AM Peak-HGV

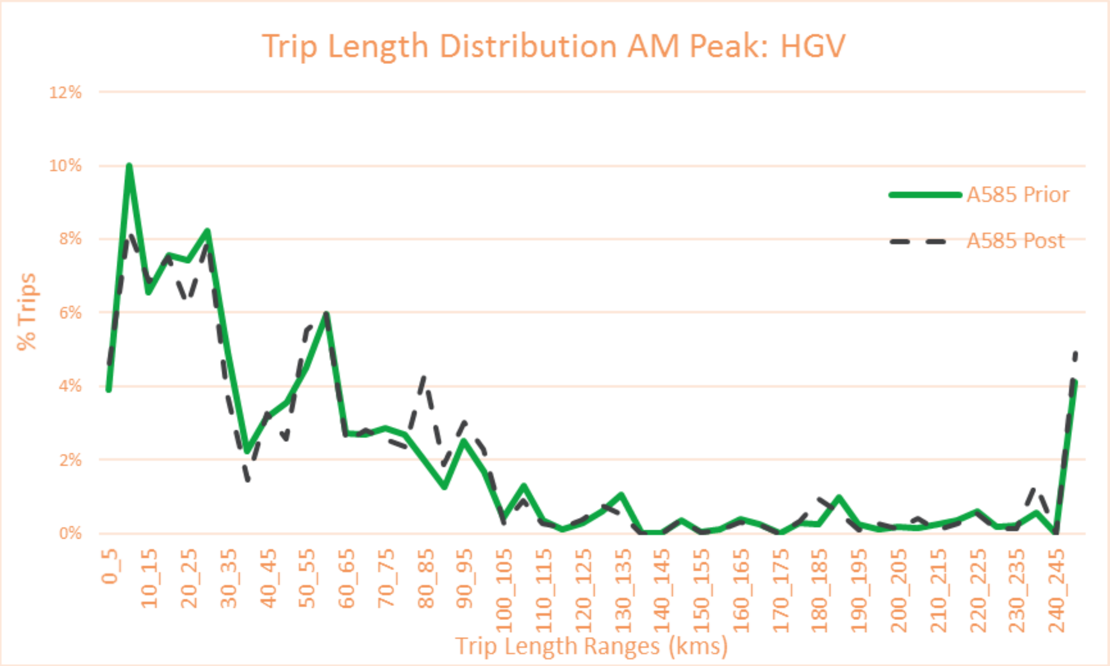


Figure I.7: Trip Length Distribution for Inter-Peak-Car Commute

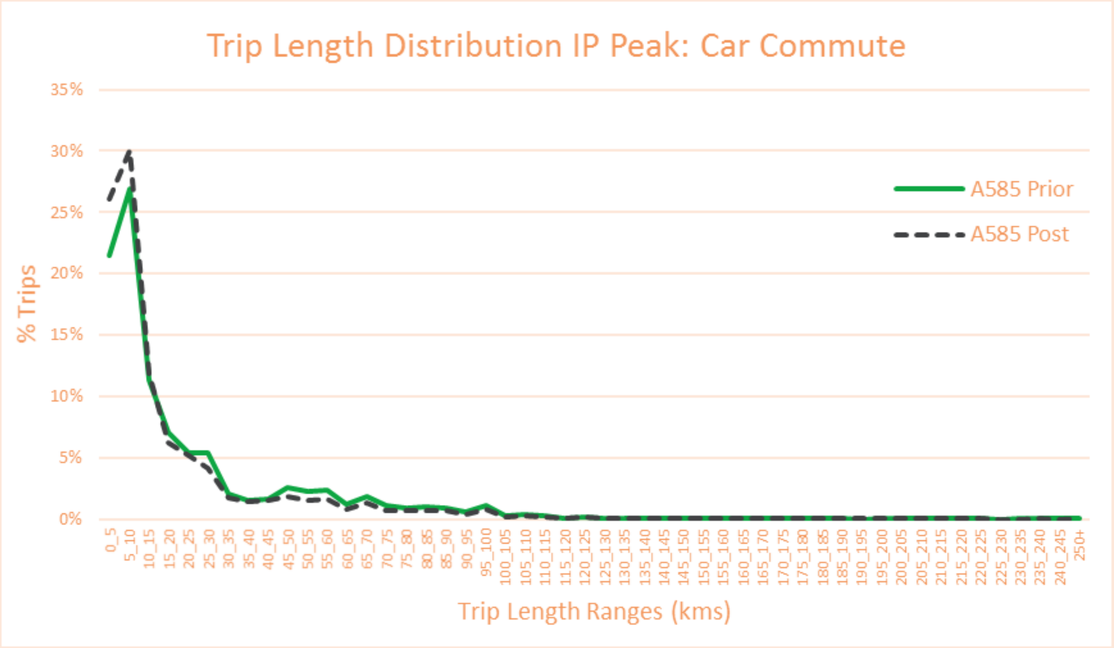


Figure I.8: Trip Length Distribution for Inter-Peak-Car Business

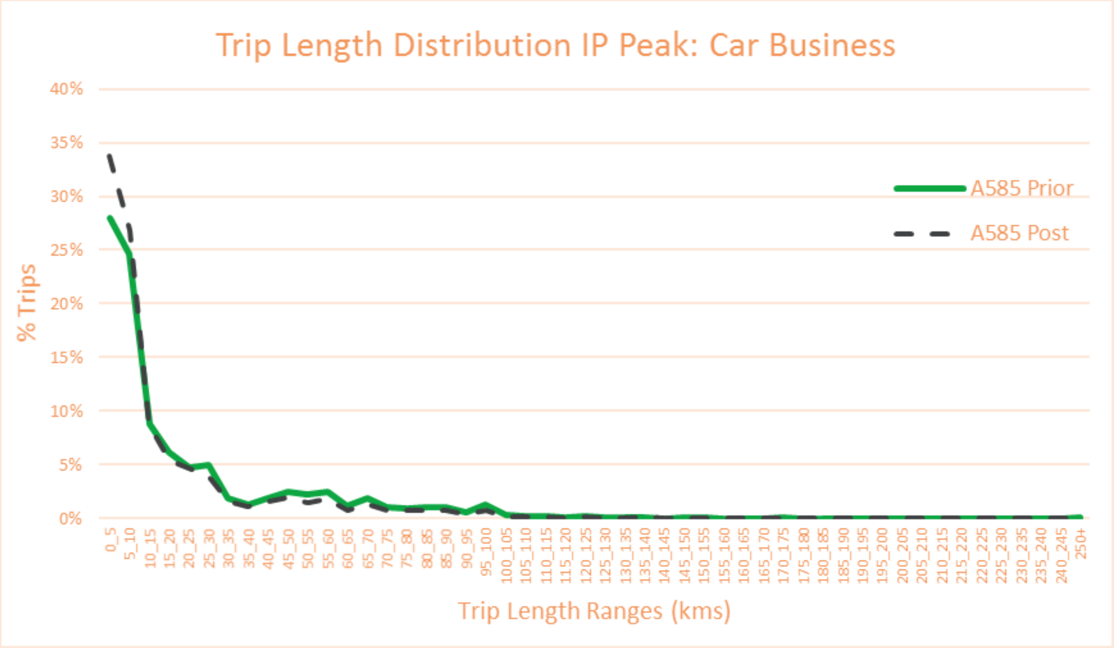


Figure I.9: Trip Length Distribution for Inter-Peak-Car Others

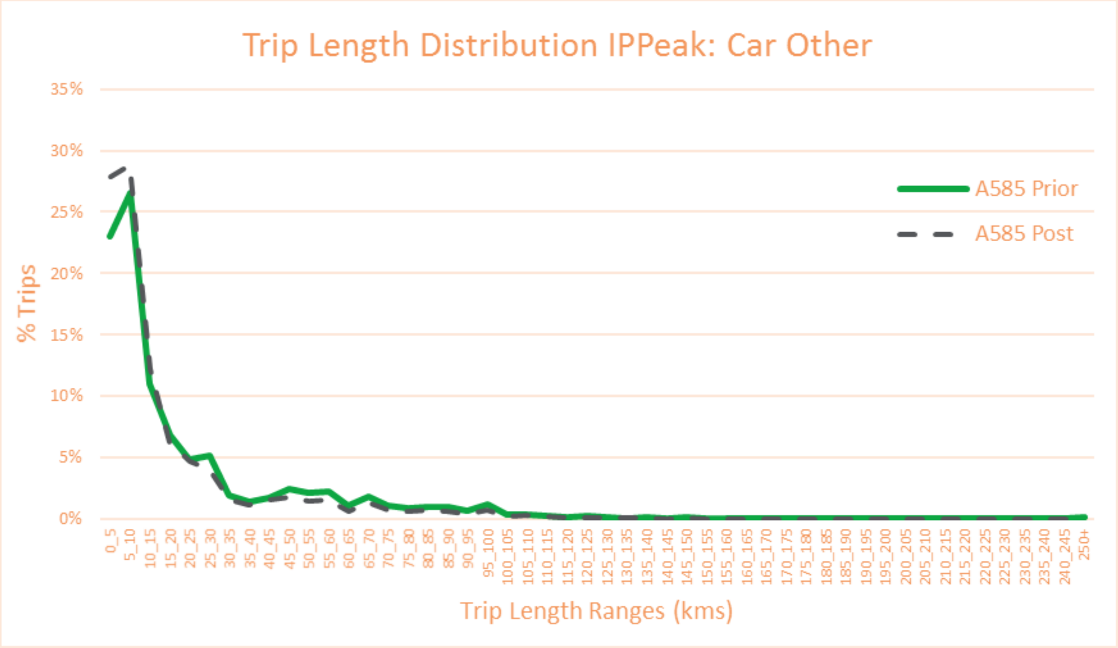


Figure I.10: Trip Length Distribution for Inter-Peak-Car All

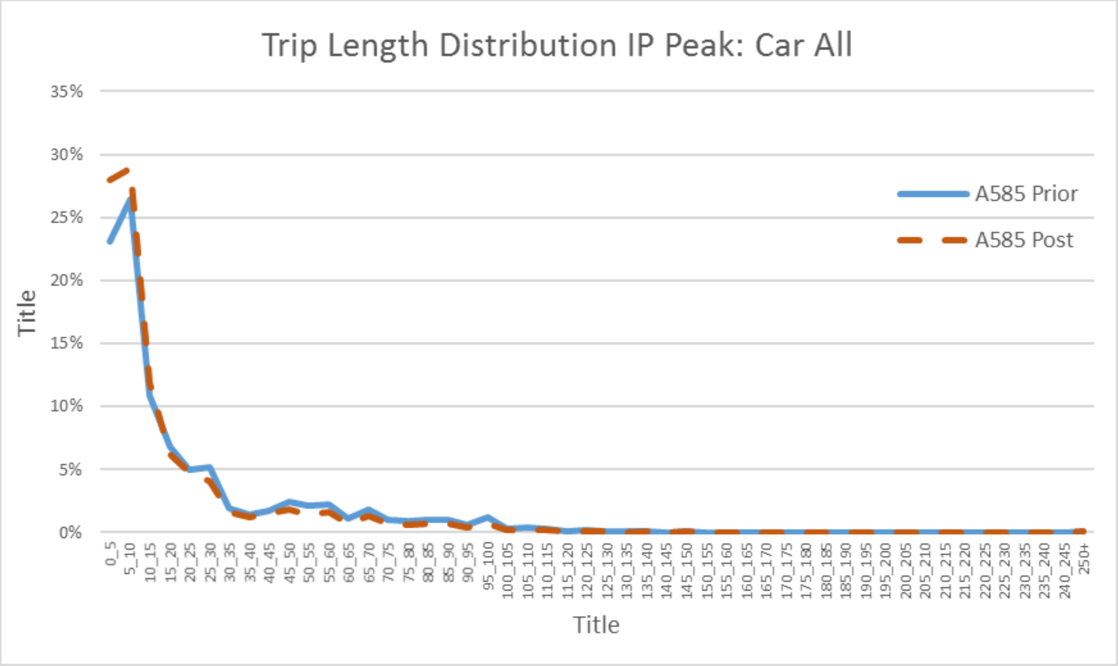


Figure I.11: Trip Length Distribution for IP Peak-LGV

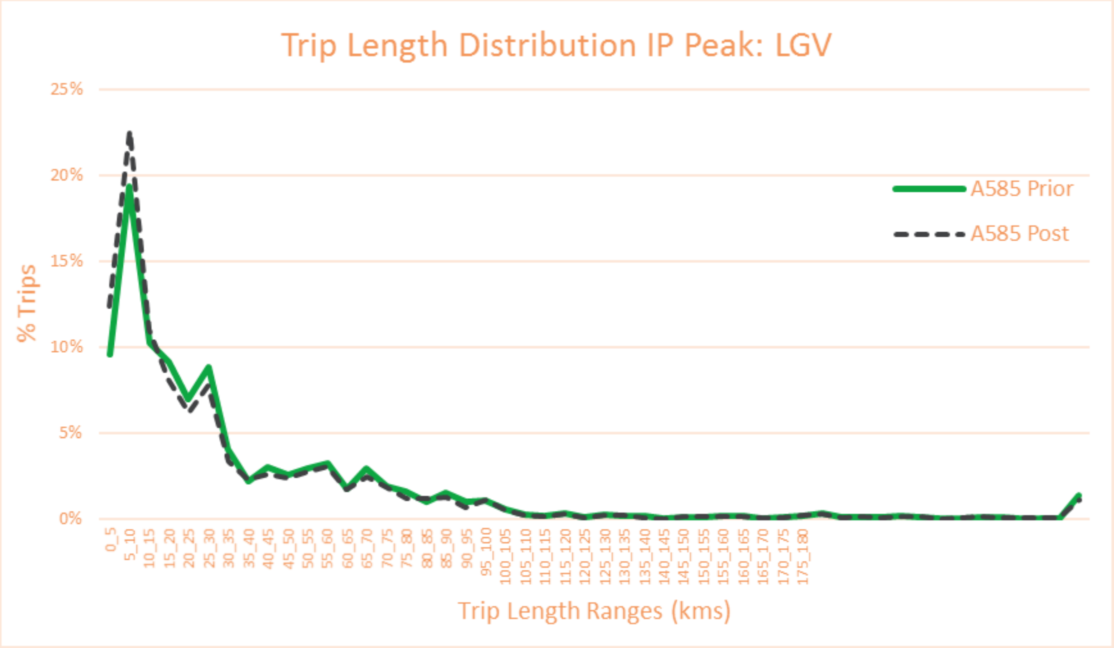


Figure I.12: Trip Length Distribution for Inter-Peak-HGV

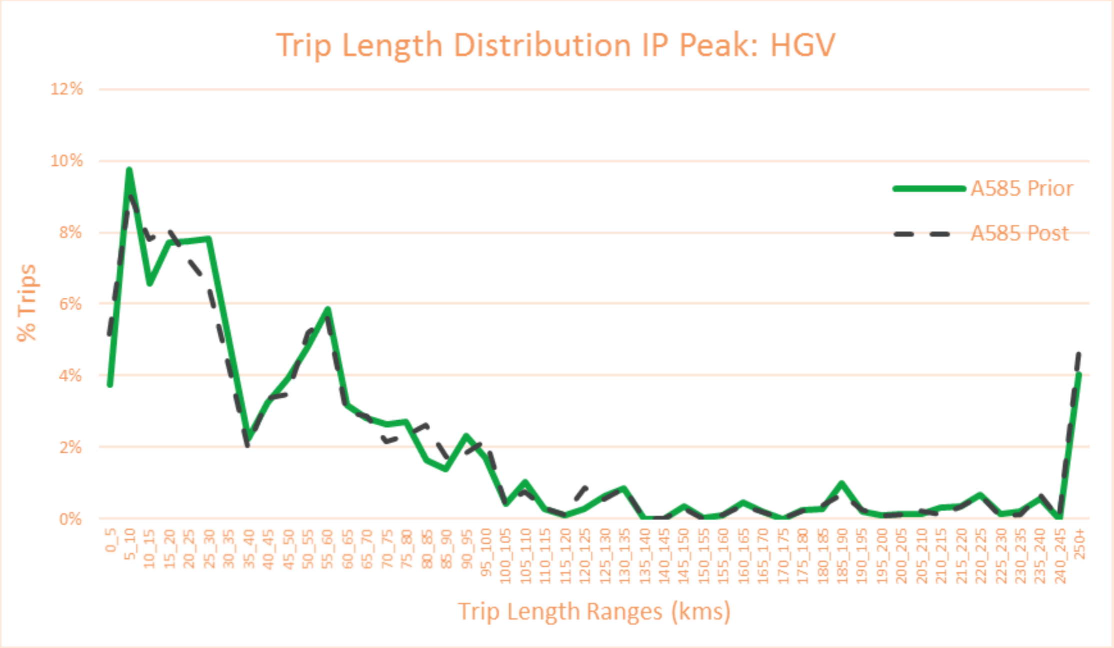


Figure I.13: Trip Length Distribution for PM Peak-Car Commute

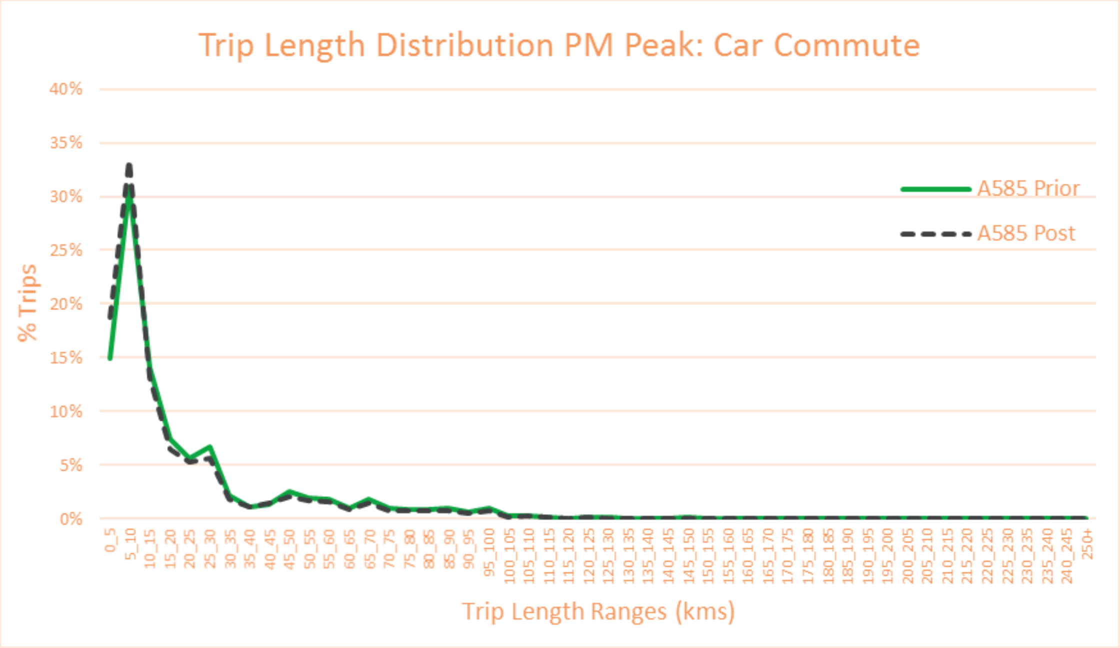


Figure I.14: Trip Length Distribution for PM Peak-Car Business

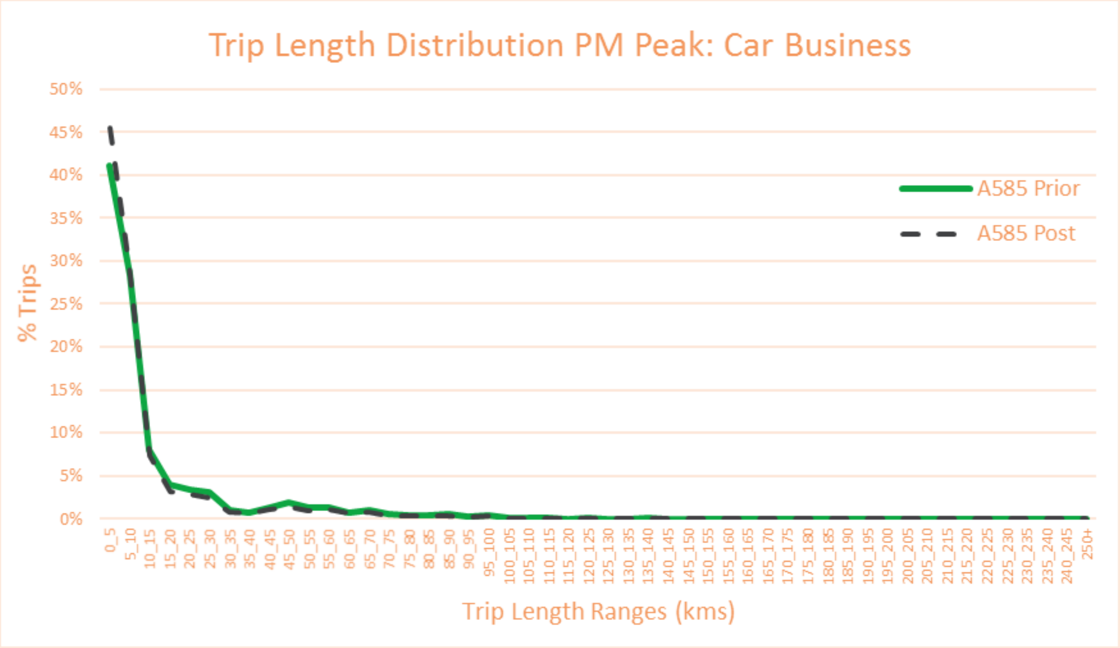


Figure I.15: Trip Length Distribution for PM Peak-Car Others

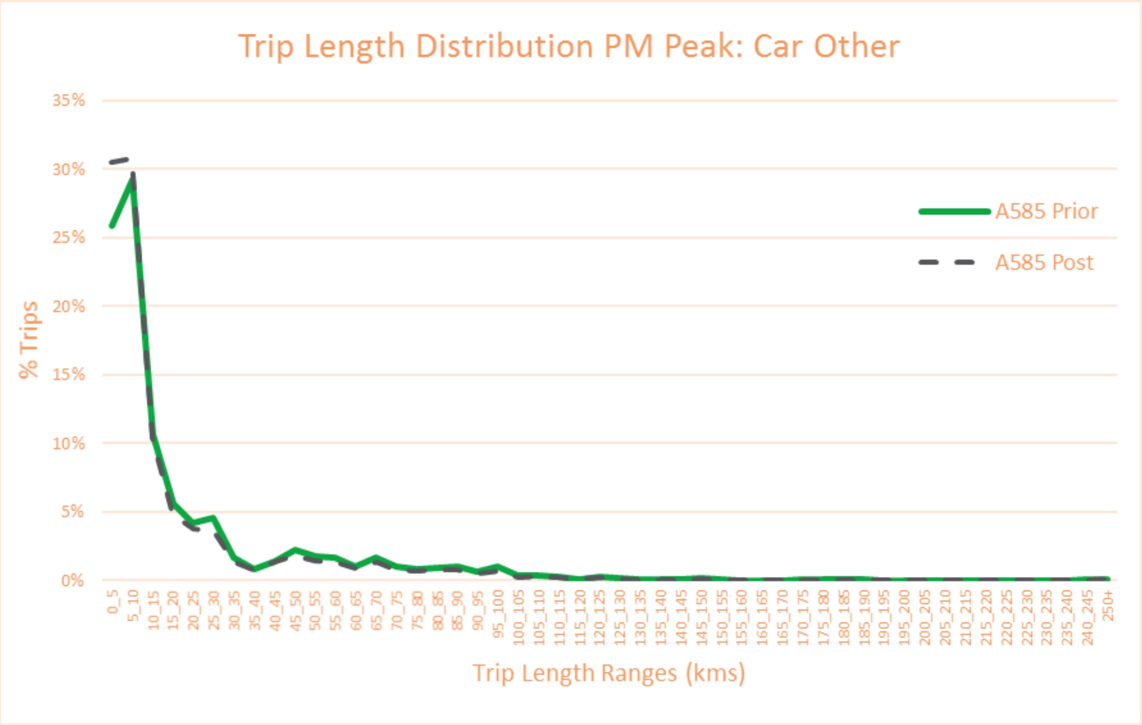


Figure I.16: Trip Length Distribution for PM Peak-Car All

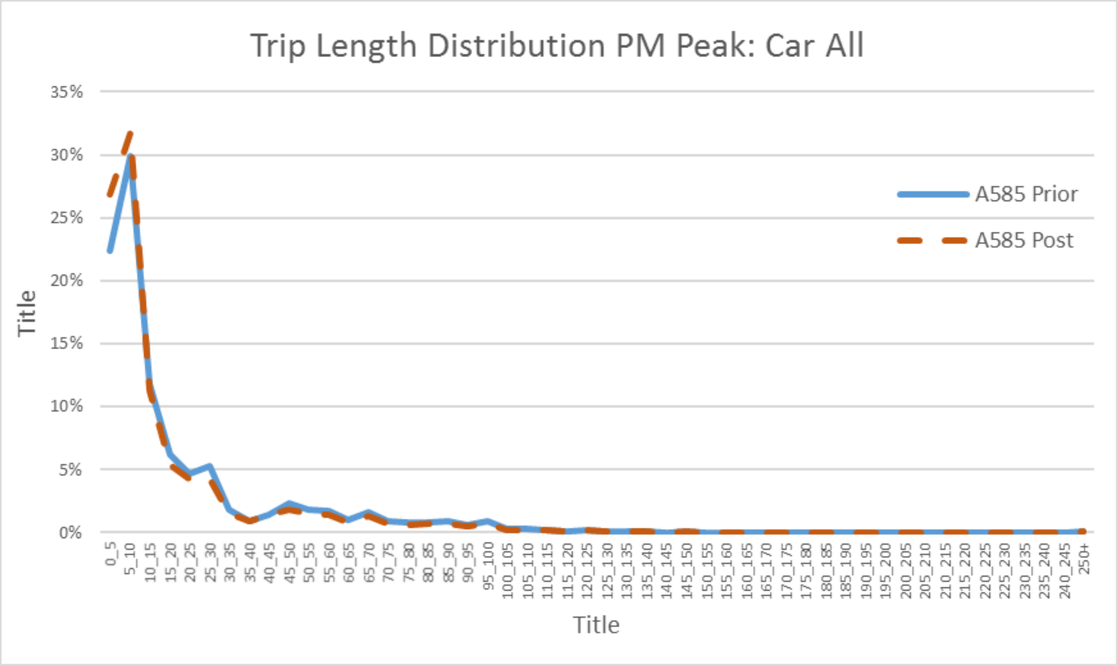


Figure I.17: Trip Length Distribution for PM Peak-LGV

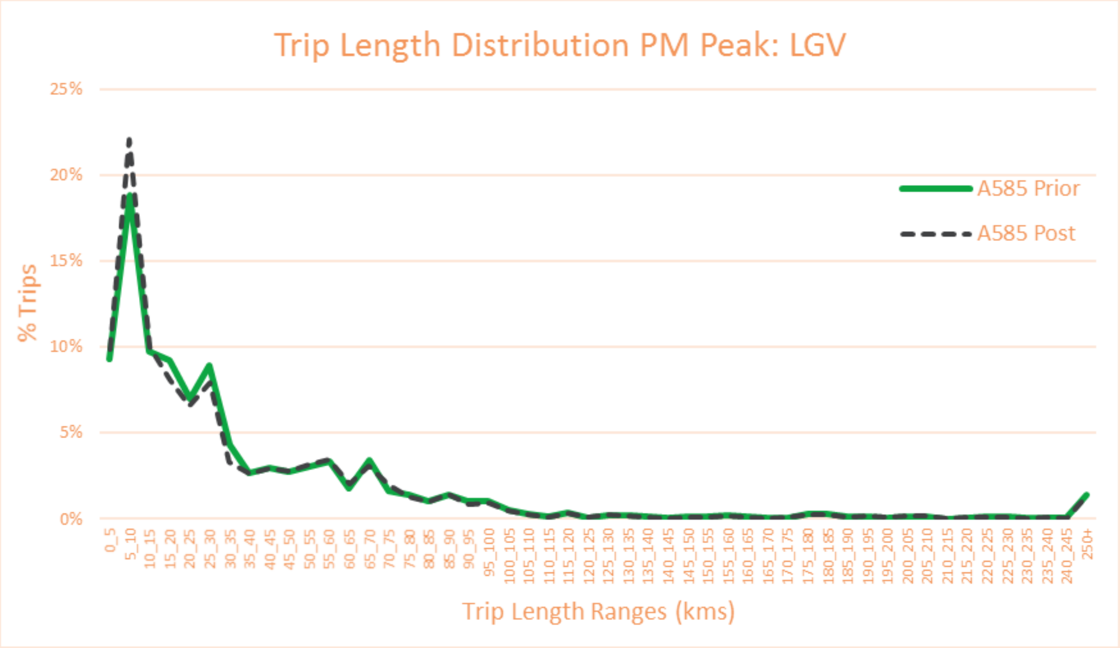
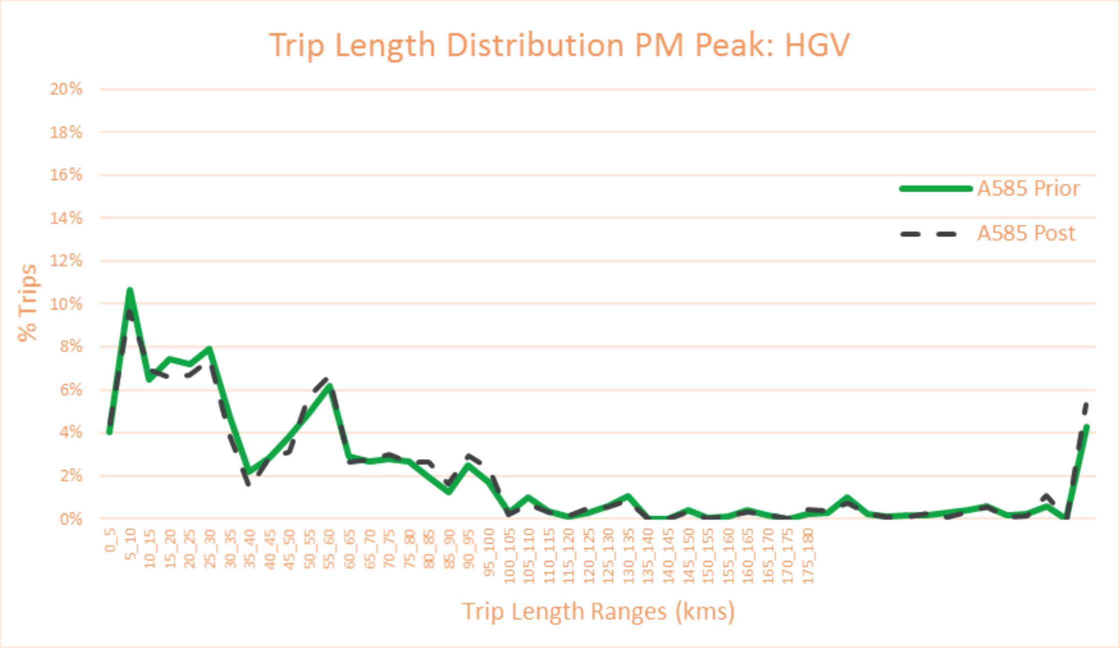


Figure I.18: Trip Length Distribution for PM Peak-HGV



APPENDIX J

Sectoral Movement Comparison between Prior and Post Matrices

Table J.1: Percentage Difference of Trips for Car (AM Peak)

Cars (vehs)									
Origin Sector	**Matrix**	**DESTINATION SECTOR**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
1	Prior	5612	2321	1980	213	191	561	1101	11978
	Post	6503	2400	2327	207	371	416	860	13083
	%Diff	**-16%**	**-3%**	**-18%**	**3%**	**-95%**	**26%**	**22%**	**-9%**
2	Prior	2837	2074	406	161	82	140	307	6009
	Post	3246	2270	433	216	121	146	354	6787
	%Diff	**-14%**	**-9%**	**-7%**	**-34%**	**-48%**	**-4%**	**-15%**	**-13%**
3	Prior	2073	360	1242	57	72	688	905	5396
	Post	2020	255	1464	58	166	670	949	5581
	%Diff	**3%**	**29%**	**-18%**	**-2%**	**-132%**	**3%**	**-5%**	**-3%**
4	Prior	450	335	127	384	39	252	796	2382
	Post	288	351	115	380	36	239	763	2172
	%Diff	**36%**	**-5%**	**9%**	**1%**	**9%**	**5%**	**4%**	**9%**
5	Prior	184	64	65	18	5	45	57	438
	Post	327	65	96	24	9	45	63	629
	%Diff	**-78%**	**-3%**	**-47%**	**-38%**	**-71%**	**1%**	**-12%**	**-44%**
6	Prior	589	136	685	166	45	0	0	1621
	Post	542	99	642	164	82	0	0	1529
	%Diff	**8%**	**27%**	**6%**	**1%**	**-82%**	**-**	**-**	**6%**
7	Prior	1224	337	1094	649	67	0	0	3371
	Post	982	271	1126	647	111	0	0	3137
	%Diff	**20%**	**20%**	**-3%**	**0%**	**-67%**	**-**	**-**	**7%**
Total	Prior	12970	5627	5598	1648	500	1687	3165	31194
	Post	13906	5711	6204	1697	896	1516	2989	32919
	%Diff	**-7%**	**-1%**	**-11%**	**-3%**	**-79%**	**10%**	**6%**	**-5.5%**

Table J.2: Percentage Difference of Trips for All Vehicles (AM Peak)

All Vehicles (vehs)									
Origin Sector	**Matrix**	**DESTINATION SECTOR**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
1	Prior	5712	2457	2094	248	223	621	1310	12666
	Post	6661	2579	2450	241	405	519	1147	14001
	%Diff	**-17%**	**-5%**	**-17%**	**3%**	**-82%**	**17%**	**12%**	**-11%**
2	Prior	2977	2125	458	196	99	160	388	6403
	Post	3465	2387	508	251	152	180	457	7400
	%Diff	**-16%**	**-12%**	**-11%**	**-28%**	**-53%**	**-13%**	**-18%**	**-16%**
3	Prior	2186	408	1268	75	86	760	1041	5825
	Post	2182	302	1495	68	177	734	1142	6100
	%Diff	**0%**	**26%**	**-18%**	**9%**	**-107%**	**3%**	**-10%**	**-5%**
4	Prior	484	371	149	391	44	282	846	2566
	Post	313	379	127	386	39	265	790	2299
	%Diff	**35%**	**-2%**	**15%**	**1%**	**10%**	**6%**	**7%**	**10%**
5	Prior	217	77	81	22	8	58	68	531
	Post	354	91	105	28	13	59	82	732
	%Diff	**-63%**	**-19%**	**-29%**	**-30%**	**-62%**	**-2%**	**-20%**	**-38%**
6	Prior	633	174	761	180	51	250	178	2227
	Post	577	128	710	172	88	250	178	2104
	%Diff	**9%**	**26%**	**7%**	**4%**	**-75%**	**0%**	**0%**	**6%**
7	Prior	1426	517	1277	701	78	617	860	5475
	Post	1150	403	1351	671	139	617	860	5190
	%Diff	**19%**	**22%**	**-6%**	**4%**	**-77%**	**0%**	**0%**	**5%**
Total	Prior	13635	6129	6088	1814	588	2748	4691	35692
	Post	14702	6270	6744	1818	1013	2624	4656	37827
	%Diff	**-8%**	**-2%**	**-11%**	**0%**	**-72%**	**5%**	**1%**	**-6.0%**

Table J.3: Percentage Difference of Trips for Car (Inter Peak)

Cars (vehs)									
Origin Sector	Matrix	DESTINATION SECTOR							
		1	2	3	4	5	6	7	Total
1	Prior	5522	2557	1506	265	59	346	1239	11494
	Post	6673	2524	1759	213	136	212	811	12327
	%Diff	**-21%**	**1%**	**-17%**	**20%**	**-131%**	**39%**	**35%**	**-7%**
2	Prior	2437	1897	214	190	12	98	410	5259
	Post	2400	2352	232	220	29	65	293	5590
	%Diff	**2%**	**-24%**	**-8%**	**-15%**	**-139%**	**34%**	**29%**	**-6%**
3	Prior	1604	253	884	73	16	664	1457	4951
	Post	1731	183	1045	79	30	604	1140	4813
	%Diff	**-8%**	**28%**	**-18%**	**-9%**	**-90%**	**9%**	**22%**	**3%**
4	Prior	253	186	74	380	6	164	806	1869
	Post	171	223	108	374	8	148	743	1775
	%Diff	**32%**	**-20%**	**-47%**	**2%**	**-24%**	**10%**	**8%**	**5%**
5	Prior	59	15	15	6	0	12	24	131
	Post	136	36	24	8	0	6	18	229
	%Diff	**-129%**	**-149%**	**-63%**	**-22%**	**-81%**	**50%**	**24%**	**-74%**
6	Prior	354	106	576	166	12	0	0	1215
	Post	207	69	517	153	7	0	0	953
	%Diff	**41%**	**35%**	**10%**	**8%**	**46%**	**-**	**-**	**22%**
7	Prior	1253	446	1406	801	26	0	0	3932
	Post	712	364	1166	746	18	0	0	3006
	%Diff	**43%**	**18%**	**17%**	**7%**	**31%**	**-**	**-**	**24%**
Total	Prior	11482	5460	4674	1882	131	1285	3937	28851
	Post	12030	5752	4851	1792	227	1035	3005	28693
	%Diff	**-5%**	**-5%**	**-4%**	**5%**	**-73%**	**19%**	**24%**	**0.5%**

Table J.4: Percentage Difference of Trips for All Vehicles (Inter Peak)

All Vehicles (vehs)									
Origin Sector	Matrix	DESTINATION SECTOR							
		1	2	3	4	5	6	7	Total
1	Prior	5621	2695	1614	300	90	402	1435	12157
	Post	6815	2701	1903	242	192	313	1088	13254
	%Diff	**-21%**	**0%**	**-18%**	**19%**	**-113%**	**22%**	**24%**	**-9%**
2	Prior	2572	1935	262	226	25	119	499	5639
	Post	2576	2456	295	254	57	94	404	6135
	%Diff	**0%**	**-27%**	**-13%**	**-12%**	**-123%**	**21%**	**19%**	**-9%**
3	Prior	1721	299	906	90	29	709	1536	5290
	Post	1902	230	1079	87	45	640	1251	5235
	%Diff	**-11%**	**23%**	**-19%**	**3%**	**-55%**	**10%**	**19%**	**1%**
4	Prior	285	221	94	387	10	192	854	2043
	Post	191	255	119	379	11	172	768	1895
	%Diff	**33%**	**-15%**	**-26%**	**2%**	**-11%**	**10%**	**10%**	**7%**
5	Prior	89	25	28	10	2	24	36	214
	Post	177	61	38	10	4	24	33	347
	%Diff	**-98%**	**-141%**	**-35%**	**2%**	**-75%**	**-2%**	**7%**	**-62%**
6	Prior	396	140	652	179	17	221	158	1764
	Post	229	89	581	161	10	221	158	1449
	%Diff	**42%**	**37%**	**11%**	**10%**	**39%**	**0%**	**0%**	**18%**
7	Prior	1428	607	1569	844	35	527	805	5815
	Post	805	479	1334	767	25	527	805	4742
	%Diff	**44%**	**21%**	**15%**	**9%**	**30%**	**0%**	**0%**	**18%**
Total	Prior	12112	5922	5126	2036	209	2194	5323	32921
	Post	12695	6270	5349	1900	344	1991	4508	33057
	%Diff	**-5%**	**-6%**	**-4%**	**7%**	**-64%**	**9%**	**15%**	**-0.4%**

Table J.5: Percentage Difference of Trips for Car (PM Peak)

Cars (vehs)									
Origin Sector	**Matrix**	**DESTINATION SECTOR**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
1	Prior	6836	3680	1719	397	145	530	1732	15039
	Post	8005	3732	2188	395	328	395	1333	16376
	%Diff	**-17%**	**-1%**	**-27%**	**1%**	**-125%**	**25%**	**23%**	**-9%**
2	Prior	2906	2803	300	267	45	127	511	6959
	Post	2861	3431	244	315	57	83	420	7410
	%Diff	**2%**	**-22%**	**19%**	**-18%**	**-25%**	**35%**	**18%**	**-6%**
3	Prior	1505	354	715	61	34	351	823	3842
	Post	1934	264	893	93	64	337	853	4437
	%Diff	**-29%**	**25%**	**-25%**	**-53%**	**-89%**	**4%**	**-4%**	**-16%**
4	Prior	363	323	84	327	18	161	755	2030
	Post	232	292	104	321	16	148	716	1828
	%Diff	**36%**	**10%**	**-23%**	**2%**	**9%**	**8%**	**5%**	**10%**
5	Prior	100	40	31	12	2	19	43	247
	Post	271	68	58	15	4	18	62	496
	%Diff	**-172%**	**-69%**	**-84%**	**-27%**	**-60%**	**2%**	**-45%**	**-101%**
6	Prior	534	137	433	158	25	0	0	1286
	Post	465	96	426	151	38	0	0	1177
	%Diff	**13%**	**30%**	**1%**	**4%**	**-54%**	**-**	**-**	**9%**
7	Prior	1528	524	938	633	51	0	0	3674
	Post	1243	460	945	612	76	0	0	3337
	%Diff	**19%**	**12%**	**-1%**	**3%**	**-50%**	**-**	**-**	**9%**
Total	Prior	13770	7861	4220	1854	320	1187	3863	33075
	Post	15011	8343	4858	1902	583	981	3384	35061
	%Diff	**-9%**	**-6%**	**-15%**	**-3%**	**-82%**	**17%**	**12%**	**-6.0%**

Table J.6: Percentage Difference of Trips for All Vehicles (PM Peak)

All Vehicles (vehs)									
Origin Sector	Matrix	DESTINATION SECTOR							
		1	2	3	4	5	6	7	Total
1	Prior	6921	3792	1798	428	171	575	1898	15582
	Post	8109	3913	2286	417	353	495	1589	17162
	%Diff	**-17%**	**-3%**	**-27%**	**3%**	**-107%**	**14%**	**16%**	**-10%**
2	Prior	3022	2839	338	296	59	143	577	7275
	Post	3011	3534	291	345	81	112	506	7879
	%Diff	**0%**	**-24%**	**14%**	**-16%**	**-39%**	**22%**	**12%**	**-8%**
3	Prior	1611	396	734	77	46	391	899	4153
	Post	2066	310	915	102	73	369	965	4799
	%Diff	**-28%**	**22%**	**-25%**	**-33%**	**-56%**	**6%**	**-7%**	**-16%**
4	Prior	388	349	102	333	21	186	794	2173
	Post	252	315	112	325	18	170	736	1928
	%Diff	**35%**	**10%**	**-9%**	**2%**	**11%**	**9%**	**7%**	**11%**
5	Prior	128	51	43	15	5	28	53	322
	Post	298	95	65	19	4	30	80	590
	%Diff	**-133%**	**-88%**	**-52%**	**-24%**	**6%**	**-5%**	**-51%**	**-83%**
6	Prior	575	163	499	170	29	221	152	1809
	Post	505	119	484	158	43	221	152	1682
	%Diff	**12%**	**27%**	**3%**	**7%**	**-48%**	**0%**	**0%**	**7%**
7	Prior	1688	642	1079	672	60	530	730	5402
	Post	1397	548	1093	633	94	530	730	5026
	%Diff	**17%**	**15%**	**-1%**	**6%**	**-57%**	**0%**	**0%**	**7%**
Total	Prior	14332	8232	4593	1991	390	2074	5103	36717
	Post	15637	8836	5245	1999	667	1925	4758	39067
	%Diff	**-9%**	**-7%**	**-14%**	**0%**	**-71%**	**7%**	**7%**	**-6.4%**

APPENDIX K

Link Flow Calibration

Table K.1: Outer Cordon (1A) Links for All Vehicles (AM Peak)

Cordon_1A- Cordon at edge of fully modelled area (within A587)									
Location	**Dir**	**Saturn Link**	**Observed (vehs)**	**Modelled (vehs)**	**Diff**	**% Diff**	**GEH**	**Pass Criteria**	
								Flow	**GEH**
A587 Broadway/Rossall Ln.	SB	4430-4422	524	521	-3	-0.7	0.2	✓	✓
A585 Amounderness Way	SB	4482-4421	634	633	-1	-0.1	0.0	✓	✓
B5268 Fleetwood Rd.	SB	4454-4425	281	246	-35	-12.4	2.2	✓	✓
A588 Shard. Rd.	SB	1061-4320	769	769	0	0.0	0.0	✓	✓
A586 Garstang Rd.	WB	1094-4513	343	345	3	0.8	0.1	✓	✓
B5269 Thistleton Rd.	SB	4238-4210	158	160	2	1.1	0.1	✓	✓
M55 westbound between J1 and J3	WB	1105-4092	2737	2671	-66	-2.4	1.3	✓	✓
A 583 Blackpool Rd.	WB	1143-1119	481	493	12	2.6	0.6	✓	✓
B5259 Ribby Rd.	EB	1519-1077	339	347	8	2.3	0.4	✓	✓
B5260 Fox Ln. Ends	NB	1071-1068	191	191	0	0.1	0.0	✓	✓
B5410 U Lytham St Anne’s Way.	NB	1041-1047	529	412	-117	-22.2	5.4	×	×
B5261 Common Edge Rd.	NB	1036-1033	608	600	-8	-1.3	0.3	✓	✓
A584 Clifton Drive North	SB	1524-1021	848	852	5	0.6	0.2	✓	✓
Total	IN	**13**	**8441**	**8240**	**-200**	**-2.4**	**2.2**	✓	✓
A587 Broadway/Rossall Ln.	NB	4422-4430	452	426	-25.73	-5.70	1.23	✓	✓
A585 Amounderness Way	NB	4421-4482	759	745	-14.09	-1.86	0.51	✓	✓
B5268 Fleetwood Rd.	NB	4425-4454	367	305	-62.00	-16.90	3.38	✓	✓
A588 Shard. Rd.	NB	4320-1061	419	432	13.01	3.10	0.63	✓	✓
A586 Garstang Rd.	EB	4513-1094	447	283	-164.03	-36.71	8.59	×	×
B5269 Thistleton Rd.	NB	4210-4238	80	93	12.90	16.04	1.38	✓	✓
M55 westbound between J1 and J3	EB	4093-1104	2648	2550	-97.89	-3.70	1.92	✓	✓
A 583 Blackpool Rd.	EB	1119-1143	637	657	20.34	3.19	0.80	✓	✓
B5259 Ribby Rd.	WB	1077-1519	472	470	-2.59	-0.55	0.12	✓	✓
B5260 Fox Ln. Ends	SB	1068-1071	291	277	-13.60	-4.67	0.81	✓	✓
B5410 U Lytham St Anne’s Way.	SB	1047-1041	86	226	140.18	163.00	11.22	×	×
B5261 Common Edge Rd.	SB	1033-1036	665	663	-2.27	-0.34	0.09	✓	✓
A584 Clifton Drive North	NB	1021-1524	935	938	2.85	0.30	0.09	✓	✓
Total	**OUT**	**13**	**8258**	**8065**	**-193**	**-2.3**	**2.1**	✓	✓

Table K.2 Calibration of Screenline (B) links for All Vehicles (AM Peak)

Screenline_B- North-South Screenline from B5268 Fleetwood Rd. to A583 Preston New Rd.									
Location	**Dir**	**Saturn Link**	**Observed (vehs)**	**Modelled (vehs)**	**Diff**	**% Diff**	**GEH**	**Pass Criteria**	
								Flow	**GEH**
B5268 Fleetwood Rd	SB	4454-4425	281	246	-35	-12.4	2.2	✓	✓
A585 Amounderness Way / Bourne Way priority junction	EB	4421-4424	130	102	-27	-21.2	2.6	✓	✓
B5268 Fleetwood Rd N / West Drive	EB	4413-4414	123	120	-3	-2.6	0.3	✓	✓
B5412 Victoria Road East	EB	4378-4376	361	249	-111	-30.9	6.4	×	×
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	EB	4360-4337	823	792	-31	-3.8	1.1	✓	✓
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	NB	4526-4337	436	605	169	38.7	7.4	×	×
W of Deepdale Ave.	EB	4304-4301	400	276	-124	-31.0	6.7	×	×
B5268 Blackpool Road	EB	4265-4292	239	247	8	3.5	0.5	✓	✓
Blackpool Old Rd	EB	4247-4261	153	146	-7	-4.8	0.6	✓	✓
Garstang Road West	EB	4219-4249	471	461	-9	-2.0	0.4	✓	✓
B5266 Newton Dr	EB	4168-4181	516	527	11	2.1	0.5	✓	✓
A5853 Preston New Road, A Road	EB	4084-4068	818	807	-11	-1.3	0.4	✓	✓
Clifton Road -Cheery Tree Road	EB	4038-4059	674	663	-11	-1.7	0.4	✓	✓
Ashworth Road	NB	4037-4052	492	457	-35	-7.1	1.6	✓	✓
Cropper Road	SB	4019-1039	102	125	23	22.5	2.2	✓	✓
Total	**EB**	**16**	**7209**	**7014**	**-194**	**-2.7**	**2.3**	**✓**	**✓**
B5268 Fleetwood Rd from A585 Eros Roundabout to Thornton North (40mph)	NB	4425-4454	367	305	-62	-16.9	3.4	✓	✓
A585 Amounderness Way / Bourne Way priority junction	WB	4424-4421	176	154	-22	-12.5	1.7	✓	×
B5268 Fleetwood Rd N / West Drive	WB	4414-4413	141	100	-41	-29.4	3.8	✓	✓
B5412 Victoria Road East	WB	4376-4378	458	238	-219	-47.9	11.8	✓	✓
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	WB	4337-4360	786	963	176	22.4	6.0	✓	✓
A585 Amounderness Way / Fleetwood Road S / Norcross Lane roundabout	SB	4337-4526	586	703	117	20.0	4.6	✓	✓
W of Deepdale Ave.	WB	4301-4304	315	131	-183	-58.3	12.3	×	×
B5268 Blackpool Road	WB	4292-4265	312	290	-22	-7.1	1.3	✓	✓
Blackpool Old Rd	WB	4261-4247	156	150	-7	-4.3	0.5	×	×
Garstang Road West of Mossbourne Rd.	WB	4249-4219	586	535	-51	-8.7	2.1	✓	✓
B5266 Newton Dr	WB	4181-4168	771	773	2	0.3	0.1	×	✓

Screenline_B- North-South Screenline from B5268 Fleetwood Rd. to A583 Preston New Rd.									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
A5853 Preston New Road, A Road	WB	4068-4084	788	784	-3	-0.4	0.1	✓	✓
Clifton Road - Cherry Tree Road	WB	4059-4038	390	363	-27	-7.0	1.4	✓	✓
Ashworth Road	SB	4052-4037	412	401	-11	-2.7	0.6	✗	✗
Cropper Road	NB	1039-4019	60	38	-21	-35.7	3.0	✓	✓
Total	**WB**	**16**	**7449**	**7073**	**-376**	**-5.0**	**4.4**	✗	✓

Table K.3 Calibration of Screenline (4A) Links for All Vehicles (AM Peak)

Screenline_4A- East West Screenline parallel to B5412 Victoria Rd									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
A586 Garstang Rd.	NB	4532-4530	652	547	-105	-16	4	✗	✓
North Dr	NB	4373-4385	345	329	-16	-5	1	✓	✓
A585-Amounderness Way	SB	4360-4378	1138	1072	-65	-6	2	✓	✓
A585 Amounderness Way(South)	NB	4337-4341	384	397	13	3	1	✓	✓
C381 School Rd.	NB	4336-4364	76	69	-7	-9	1	✓	✓
B5412 Lambs Rd.	NB	4397-4371	414	414	-0	-0	0	✓	✓
Total	**NB**	**6**	**3008**	**2827**	**-181**	**-6.0**	**3.4**	✗	✓
A586 Garstang Rd.	SB	4530-4532	660	690	30	5	1	✓	✓
North Dr	SB	4385-4373	532	529	-2	-0	0	✓	✓
A585-Amounderness Way Arm	NB	4378-4360	1003	1083	80	8	2	✓	✓
A585 Amounderness Way	SB	4341-4337	622	605	-18	-3	1	✓	✓
C381 School Rd.	SB	4364-4336	46	45	-1	-2	0	✓	✓
B5412 Lambs Rd.	SB	4371-4397	469	443	-26	-6	1	✓	✓
Total	**SB**	**6**	**3332**	**3395**	**64**	**1.9**	**1.1**	✓	✓

Table K.4 Calibration of Screenline (3A) Links for All Vehicles (AM Peak)

Screenline_3A- From Blackpool (A584 Promenade) to A585 (South of A585/Thistleton Rd Junction (Northbound)									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
A584 Promenade Rd.	NB	4124-4151	981	997	17	1.7	0.5	✓	✓
A586 Cookson Street	NB	4153-4156	352	320	-32	-9.0	1.7	✓	✓
B5124 Devonshire Rd.	NB	4162-4178	456	413	-43	-9.5	2.1	✓	✓
Layton Rd. and Collingwood Ave	NB	4536-4184	336	101	-235	-70.1	15.9	×	×
A587 - BRd.Wy.	NB	4168-4176	361	593	232	64.3	10.6	×	×
A586 Garstang Rd. W	NB	4243-4253	432	414	-19	-4.3	0.9	✓	✓
A585 Mains Lane	NB	4228-4270	115	127	12	10.4	1.1	✓	✓
A585 Garstang New Rd.	NB	4523-4280	718	717	-1	-0.2	0.1	✓	✓
Total	**NB**	**8**	**3750**	**3681**	**-69**	**-1.9**	**1.1**	✓	✓
A584 Promenade Rd.	SB	4151-4124	974	1022	49	5.0	1.5	✓	✓
A586 Cookson Street	SB	4156-4153	259	245	-14	-5.5	0.9	✓	✓
B5124 Devonshire Rd.	SB	4178-4162	626	625	-2	-0.3	0.1	✓	✓
Layton Rd. and Collingwood Ave	SB	4184-4536	406	209	-197	-48.4	11.2	×	×
A587 - BRd.Wy.	SB	4176-4168	469	664	195	41.5	8.2	×	×
A586 Garstang Rd. W	SB	4253-4243	570	567	-3	-0.5	0.1	✓	✓
A585 Mains Lane	SB	4270-4228	277	264	-12	-4.4	0.7	✓	✓
A585 Garstang New Rd.	SB	4280-4523	954	951	-3	-0.3	0.1	✓	✓
Total	**SB**	**8**	**4535**	**4548**	**13**	**0.3**	**0.2**	✓	✓

Table K.5 Calibration of Screenline (1N) links for All Vehicles (AM Peak)

Screenline_1N- North of M55/Yeadon Way from Blackpool (A584 Promenade) to M55 J1									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
A584 South Promenade	NB	4024-4057	518	524	6	1.2	0.3	✓	✓
B5262 Lytham Rd.	NB	4026-4049	365	338	-26	-7.2	1.4	✓	✓
Seasiders Way and Yeadon way	SB	4037-4081	493	504	11	2.2	0.5	✓	✓
St. Anne's Rd.	NB	4030-4051	359	340	-18	-5.1	1.0	✓	✓
B5261 Hawes Side Lane	NB	4018-4044	563	539	-25	-4.4	1.1	✓	✓
Vicarage lane	NB	4027-4038	500	500	-0	-0.1	0.0	✓	✓
Ashworth Rd.	NB	4037-4052	492	457	-35	-7.1	1.6	✓	✓
A583 Preston New Rd. North of M55 J4	NB	4040-4048	1336	1291	-44	-3.3	1.2	✓	✓
Nr entrance to Mythop Hall	WB	4077-4086	202	111	-91	-44.9	7.3	✓	×
B5260 Singleton Rd.	NB	4104-4150	233	214	-19	-8.3	1.3	✓	✓
C302 Back Lane N of Bradshaw Ln.	NB	4108-4128	10	12	2	16.6	0.5	✓	✓
A585 Fleetwood Rd.	NB	4110-4118	818	858	40	4.9	1.4	✓	✓
Total	**NB**	**12**	**5889**	**5689**	**-200**	**-3.4**	**2.6**	✓	✓
A584 South Promenade	SB	4057-4024	494	497	3	0.5	0.1	✓	✓
B5262 Lytham Rd.	SB	4049-4026	291	271	-20	-6.9	1.2	✓	✓
Seasiders Way and Yeadon way	NB	4081-4037	414	482	68	16.3	3.2	✓	✓
St. Anne's Rd.	SB	4051-4030	304	281	-23	-7.6	1.3	✓	✓
B5261 Hawes Side Lane	SB	4044-4018	447	445	-2	-0.5	0.1	✓	✓
Vicarage Lane	SB	4038-4027	455	454	-1	-0.3	0.1	✓	✓
Ashworth Rd.	SB	4052-4037	412	401	-11	-2.7	0.6	✓	✓
A583 Preston New Rd. North of M55 J4	SB	4048-4042	1328	1326	-2	-0.2	0.1	✓	✓
Nr entrance to Mythop Hall	EB	4086-4077	181	181	-0	-0.2	0.0	✓	✓
B5260 Singleton Rd.	SB	4150-4104	448	298	-151	-33.6	7.8	×	×
C302 Back Lane N of Bradshaw Ln.	SB	4128-4108	17	17	0	1.8	0.1	✓	✓
A585 Fleetwood Rd.	SB	4118-4110	1059	1143	84	8.0	2.5	✓	✓
Total	**SB**	**12**	**5852**	**5796**	**-56**	**-1.0**	**0.7**	✓	✓

Table K.6: Outer Cordon links (1A) for All Vehicles (Inter Peak)

Cordon_1A- Cordon at edge of fully modelled area (within A587)									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
A587 BRd.way	SB	4430-4422	522	509	-13	-2.5	0.6	✓	✓
A585 Amounderness Way	SB	4482-4421	653	617	-35	-5.4	1.4	✓	✓
B5268 Fleetwood Rd.	SB	4454-4425	320	288	-32	-9.9	1.8	✓	✓
A588 Shard. Rd.	SB	1061-4320	484	492	9	1.8	0.4	✓	✓
A586 Garstang Rd.	WB	1094-4513	319	319	0	0.0	0.0	✓	✓
B5269 Thistleton Rd.	SB	4238-4210	83	84	1	1.2	0.1	✓	✓
M55 westbound between J1 and J3	WB	1105-4092	1933	1552	-381	-19.7	9.1	✗	✗
A 583 Blackpool Rd.	WB	1143-1119	441	445	4	0.9	0.2	✓	✓
B5259 Ribby Rd.	EB	1519-1077	302	225	-77	-25.5	4.7	✓	✓
B5260 Fox Ln. Ends	NB	1071-1068	133	131	-2	-1.6	0.2	✓	✓
B5410 U Lytham St Anne's Way.	NB	1041-1047	213	217	4	1.9	0.3	✓	✓
B5261 Common Edge Rd.	NB	1036-1033	560	560	-0	-0.0	0.0	✓	✓
A584 Clifton Drive North	SB	1524-1021	687	687	0	0.0	0.0	✓	✓
Total	**IN**	**13**	**6649**	**6126**	**-523**	**-7.9**	**6.5**	✗	✗
A587 BRd.way	NB	4422-4430	563	528	-34.46	-6.13	1.48	✓	✓
A585 Amounderness Way	NB	4421-4482	669	617	-52.34	-7.82	2.06	✓	✓
B5268 Fleetwood Rd.	NB	4425-4454	329	279	-50.23	-15.28	2.88	✓	✓
A588 Shard. Rd.	NB	4320-1061	471	474	2.60	0.55	0.12	✓	✓
A586 Garstang Rd.	EB	4513-1094	318	317	-1.51	-0.47	0.08	✓	✓
B5269 Thistleton Rd.	NB	4210-4238	84	92	8.14	9.67	0.87	✓	✓
M55 westbound between J1 and J3	EB	4093-1104	1906	1891	-14.77	-0.77	0.34	✓	✓
A 583 Blackpool Rd.	EB	1119-1143	425	424	-1.54	-0.36	0.07	✓	✓
B5259 Ribby Rd.	WB	1077-1519	279	254	-24.98	-8.97	1.53	✓	✓
B5260 Fox Ln. Ends	SB	1068-1071	123	124	1.38	1.12	0.12	✓	✓
B5410 U Lytham St Anne's Way.	SB	1047-1041	88	169	80.70	91.70	7.12	✓	✗
B5261 Common Edge Rd.	SB	1033-1036	605	580	-24.79	-4.10	1.02	✓	✓
A584 Clifton Drive North	NB	1021-1524	684	693	8.68	1.27	0.33	✓	✓
Total	**OUT**	**13**	**6544**	**6441**	**-103**	**-1.6**	**1.3**	✓	✓

Table K.7 Calibration of Screenline (B) links for All Vehicles (Inter Peak)

Screenline_B- North-South Screenline from B5268 Fleetwood Rd. to A583 Preston New Rd.									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
B5268 Fleetwood Rd	SB	4454-4425	320	288	-32	-9.9	1.8	✓	✓
A585 Amounderness Way / Bourne Way priority junction	EB	4421-4424	119	86	-33	-27.8	3.3	✓	✓
B5268 Fleetwood Rd N / West Drive	EB	4413-4414	140	103	-36	-25.9	3.3	✓	✓
B5412 Victoria Road East	EB	4378-4376	424	317	-107	-25.2	5.6	✗	✗
A585 Amounderness Way	EB	4360-4337	785	891	106	13.6	3.7	✓	✓
A585 Amounderness Way	NB	4526-4337	352	350	-2	-0.5	0.1	✓	✓
W of Deepdale Ave.	EB	4304-4301	275	231	-44	-16.1	2.8	✓	✓
B5268 Blackpool Road	EB	4265-4292	246	267	21	8.5	1.3	✓	✓
Blackpool Old Rd	EB	4247-4261	137	132	-6	-4.1	0.5	✓	✓
Garstang Road West	EB	4219-4249	396	396	-0	-0.1	0.0	✓	✓
B5266 Newton Dr	EB	4168-4181	529	528	-1	-0.2	0.1	✓	✓
A5853 Preston New Road	EB	4084-4068	656	659	4	0.6	0.1	✓	✓
Clifton Road - Cherry Tree Road	EB	4038-4059	544	640	96	17.7	4.0	✓	✓
Ashworth Road	NB	4037-4052	398	223	-175	-44.1	10.0	✗	✗
Cropper Road	SB	4019-1039	74	170	96	128.4	8.6	✓	✗
Total	**EB**	**16**	**6381**	**6268**	**-113**	**-1.8**	**1.4**	✓	✓
B5268 Fleetwood Rd	NB	4425-4454	329	279	-50	-15.3	2.9	✓	✓
A585 Amounderness Way / Bourne Way priority junction	WB	4424-4421	128	103	-25	-19.2	2.3	✓	✓
B5268 Fleetwood Rd N / West Drive	WB	4414-4413	113	61	-53	-46.5	5.6	✓	✗
B5412 Victoria Road East	WB	4376-4378	388	283	-105	-27.1	5.7	✗	✗
A585 Amounderness Way	WB	4337-4360	872	866	-6	-0.7	0.2	✓	✓
A585 Amounderness Way	SB	4337-4526	357	402	45	12.5	2.3	✓	✓
W of Deepdale Ave.	WB	4301-4304	248	209	-39	-15.6	2.6	✓	✓
B5268 Blackpool Road	WB	4292-4265	237	239	1	0.5	0.1	✓	✓
Blackpool Old Rd	WB	4261-4247	143	136	-8	-5.3	0.6	✓	✓
Garstang Road West	WB	4249-4219	400	404	4	1.0	0.2	✓	✓
B5266 Newton Dr	WB	4181-4168	513	517	4	0.8	0.2	✓	✓
A5853 Preston New Road	WB	4068-4084	658	649	-9	-1.3	0.3	✓	✓
Clifton Road -Cherry Tree Road	WB	4059-4038	521	375	-146	-28.0	6.9	✗	✗
Ashworth Road	SB	4052-4037	362	650	287	79.3	12.8	✗	✗
Cropper Rd.	NB	1039-4019	54	60	6	10.2	0.7	✓	✓
Total	**WB**	**16**	**5958**	**5866**	**-92**	**-1.5**	**1.2**	✓	✓

Table K.8 Calibration of Screenline (4A) Links for All Vehicles (Inter Peak)

Screenline_4A- East West Screenline parallel to B5412 Victoria Rd									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
A586 Garstang Rd.	NB	4532-4530	754	588	-167	-22	6	×	×
North Dr	NB	4373-4385	353	349	-4	-1	0	✓	✓
A585-Amounderness Way	SB	4360-4378	944	1001	57	6	2	✓	✓
A585 Amounderness Way(South)	NB	4337-4341	384	383	-1	-0	0	✓	✓
C381 School Rd.	NB	4336-4364	58	51	-7	-12	1	✓	✓
B5412 Lambs Rd.	NB	4397-4371	265	263	-2	-1	0	✓	✓
Total	**NB**	**6**	**2759**	**2634**	**-125**	**-4.5**	**2.4**	✓	✓
A586 Garstang Rd.	SB	4530-4532	561	584	23	4	1	✓	✓
North Dr	SB	4385-4373	390	385	-5	-1	0	✓	✓
A585-Amounderness Way Arm	NB	4378-4360	1007	1062	55	5	2	✓	✓
A585 Amounderness Way	SB	4341-4337	430	431	1	0	0	✓	✓
C381 School Rd.	SB	4364-4336	56	53	-3	-5	0	✓	✓
B5412 Lambs Rd.	SB	4371-4397	261	256	-5	-2	0	✓	✓
Total	**SB**	**6**	**2705**	**2771**	**66**	**2.4**	**1.3**	✓	✓

Table K.9 Calibration of Screenline (3A) Links for All Vehicles (Inter Peak)

Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
Screenline_3A- From Blackpool (A584 Promenade) to A585 (South of A585/Thistleton Rd Junction (Northbound)									
								Flow	GEH
A584 Promenade Rd.	NB	4124-4151	765	769	4	0.6	0.2	✓	✓
A586 Cookson Street	NB	4153-4156	428	394	-34	-8.0	1.7	✓	✓
B5124 Devonshire Rd.	NB	4162-4178	507	500	-7	-1.3	0.3	✓	✓
Layton Rd. and Collingwood Ave	NB	4536-4184	297	53	-243	-82.1	18.4	×	×
A587 - BRd.Wy.	NB	4168-4176	408	592	185	45.3	8.3	×	×
A586 Garstang Rd. W	NB	4243-4253	416	401	-14	-3.4	0.7	✓	✓
A585 Mains Lane	NB	4228-4270	85	82	-3	-3.9	0.4	✓	✓
A585 Garstang New Rd.	NB	4523-4280	710	693	-18	-2.5	0.7	✓	✓
Total	**NB**	**8**	**3616**	**3485**	**-131**	**-3.6**	**2.2**	✓	✓
A584 Promenade Rd.	SB	4151-4124	620	719	100	16.1	3.9	✓	✓
A586 Cookson Street	SB	4156-4153	185	173	-11	-6.2	0.9	✓	✓
B5124 Devonshire Rd.	SB	4178-4162	580	585	5	0.9	0.2	✓	✓
Layton Rd. and Collingwood Ave	SB	4184-4536	290	91	-199	-68.5	14.4	×	×
A587 - BRd.Wy.	SB	4176-4168	387	583	197	50.9	8.9	×	×
A586 Garstang Rd. W	SB	4253-4243	379	371	-7	-1.9	0.4	✓	✓
A585 Mains Lane	SB	4270-4228	110	106	-4	-3.7	0.4	✓	✓
A585 Garstang New Rd.	SB	4280-4523	700	697	-3	-0.4	0.1	✓	✓
Total	**SB**	**8**	**3250**	**3327**	**77**	**2.4**	**1.3**	✓	✓

Table K.10 Calibration of Screenline (1N) Links for All Vehicles (Inter Peak)

Screenline_1N- North of M55/Yeadon Way from Blackpool (A584 Promenade) to M55 J1									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
A584 South Promenade	NB	4024-4057	363	364	1	0.3	0.1	✓	✓
B5262 Lytham Rd.	NB	4026-4049	324	307	-17	-5.3	1.0	✓	✓
Seasiders Way and Yeadon way	SB	4037-4081	353	359	6	1.7	0.3	✓	✓
St. Anne's Rd.	NB	4030-4051	326	309	-17	-5.3	1.0	✓	✓
B5261 Hawes Side lane	NB	4018-4044	419	426	7	1.7	0.3	✓	✓
Vicarage lane	NB	4027-4038	476	441	-35	-7.5	1.7	✓	✓
Ashworth Rd.	NB	4037-4052	398	223	-175	-44.1	10.0	×	×
A583 Preston New Rd. North of M55 J4	NB	4040-4048	964	952	-12	-1.3	0.4	✓	✓
Nr entrance to Mythop Hall	WB	4077-4086	124	49	-75	-60.5	8.1	✓	×
B5260 Singleton Rd.	NB	4104-4150	153	119	-34	-22.1	2.9	✓	✓
C302 Back Lane N of Bradshaw Ln.	NB	4108-4128	13	10	-3	-21.8	0.8	✓	✓
A585 Fleetwood Rd.	NB	4110-4118	711	748	37	5.2	1.4	✓	✓
Total	**NB**	**12**	**4625**	**4307**	**-318**	**-6.9**	**4.8**	×	✓
A584 South Promenade	SB	4057-4024	392	394	2	0.4	0.1	✓	✓
B5262 Lytham Rd.	SB	4049-4026	323	317	-6	-1.8	0.3	✓	✓
Seasiders Way and Yeadon way	NB	4081-4037	258	315	57	21.9	3.3	✓	✓
St. Anne's Rd.	SB	4051-4030	322	298	-25	-7.6	1.4	✓	✓
B5261 Hawes Side lane	SB	4044-4018	365	355	-10	-2.8	0.5	✓	✓
Vicarage lane	SB	4038-4027	510	414	-96	-18.8	4.5	✓	✓
Ashworth Rd.	SB	4052-4037	362	650	287	79.3	12.8	×	×
A583 Preston New Rd. North of M55 J4	SB	4048-4042	954	865	-88	-9.3	2.9	✓	✓
Nr entrance to Mythop Hall	EB	4086-4077	124	83	-40	-32.6	4.0	✓	✓
B5260 Singleton Rd.	SB	4150-4104	154	96	-58	-37.6	5.2	✓	×
C302 Back Lane N of Bradshaw Ln.	SB	4128-4108	13	7	-6	-43.5	1.8	✓	✓
A585 Fleetwood Rd.	SB	4118-4110	716	774	58	8.1	2.1	✓	✓
Total	**SB**	**12**	**4493**	**4568**	**75**	**1.7**	**1.1**	✓	✓

Table K.11: Outer Cordon Links (1A) for All Vehicles (PM Peak)

Cordon_1A- Cordon at edge of fully modelled area (within A587)									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
A587 BRd.way	SB	4430-4422	721	684	-37	-5.1	1.4	✓	✓
A585 Amounderness Way	SB	4482-4421	825	830	6	0.7	0.2	✓	✓
B5268 Fleetwood Rd.	SB	4454-4425	425	397	-28	-6.6	1.4	✓	✓
A588 Shard. Rd.	SB	1061-4320	509	511	2	0.5	0.1	✓	✓
A586 Garstang Rd.	WB	1094-4513	395	402	7	1.9	0.4	✓	✓
B5269 Thistleton Rd.	SB	4238-4210	96	48	-48	-50.1	5.7	✓	×
M55 westbound between J1 and J3	WB	1105-4092	2580	2573	-7	-0.3	0.1	✓	✓
A 583 Blackpool Rd.	WB	1143-1119	734	739	5	0.7	0.2	✓	✓
B5259 Ribby Rd.	EB	1519-1077	482	320	-162	-33.7	8.1	×	×
B5260 Fox Ln. Ends	NB	1071-1068	287	235	-51	-17.9	3.2	✓	✓
B5410 U Lytham St Anne’s Way.	NB	1041-1047	229	244	15	6.5	1.0	✓	✓
B5261 Common Edge Rd.	NB	1036-1033	585	560	-25	-4.3	1.0	✓	✓
A584 Clifton Drive North	SB	1524-1021	866	910	44	5.1	1.5	✓	✓
Total	**IN**	**13**	**8733**	**8453**	**-280**	**-3.2**	**3.0**	✓	✓
A587 BRd.way	NB	4422-4430	767	719	-48.05	-6.27	1.76	✓	✓
A585 Amounderness Way	NB	4421-4482	732	731	-0.96	-0.13	0.04	✓	✓
B5268 Fleetwood Rd.	NB	4425-4454	376	335	-40.91	-10.89	2.17	✓	✓
A588 Shard. Rd.	NB	4320-1061	715	716	1.00	0.14	0.04	✓	✓
A586 Garstang Rd.	EB	4513-1094	412	409	-2.68	-0.65	0.13	✓	✓
B5269 Thistleton Rd.	NB	4210-4238	148	156	7.95	5.38	0.65	✓	✓
M55 westbound between J1 and J3	EB	4093-1104	2785	2615	-170.19	-6.11	3.28	✓	✓
A 583 Blackpool Rd.	EB	1119-1143	496	495	-1.15	-0.23	0.05	✓	✓
B5259 Ribby Rd.	WB	1077-1519	341	334	-6.91	-2.03	0.38	✓	✓
B5260 Fox Ln. Ends	SB	1068-1071	180	181	1.17	0.65	0.09	✓	✓
B5410 U Lytham St Anne’s Way.	SB	1047-1041	186	188	1.73	0.93	0.13	✓	✓
B5261 Common Edge Rd.	SB	1033-1036	634	637	2.64	0.42	0.10	✓	✓
A584 Clifton Drive North	NB	1021-1524	916	907	-9.22	-1.01	0.31	✓	✓
Total	**OUT**	**13**	**8688**	**8423**	**-266**	**-3.1**	**2.9**	✓	✓

Table K.12 Calibration of Screenline (B) Links for All Vehicles (PM Peak)

Screenline_B- North-South Screenline from B5268 Fleetwood Rd. to A583 Preston New Rd.									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
B5268 Fleetwood Rd	SB	4454-4425	425	397	-28	-6.6	1.4	✓	✓
A585 Amounderness Way	EB	4421-4424	173	154	-18	-10.7	1.4	✓	✓
B5268 Fleetwood Rd N	EB	4413-4414	159	150	-10	-6.1	0.8	✓	✓
B5412 Victoria Road East	EB	4378-4376	544	348	-196	-36.0	9.3	×	×
A585 Amounderness Way	EB	4360-4337	857	959	102	11.9	3.4	✓	✓
A585 Amounderness Way	NB	4526-4337	534	747	213	39.8	8.4	×	×
W of Deepdale Ave.	EB	4304-4301	359	188	-172	-47.8	10.4	×	×
B5268 Blackpool Road	EB	4265-4292	389	374	-15	-3.9	0.8	✓	✓
Blackpool Old Rd	EB	4247-4261	153	154	1	1.0	0.1	✓	✓
Garstang Road West	EB	4219-4249	566	554	-12	-2.2	0.5	✓	✓
B5266 Newton Dr	EB	4168-4181	868	864	-3	-0.4	0.1	✓	✓
A5853 Preston New Road	EB	4084-4068	809	832	23	2.9	0.8	✓	✓
Clifton Road -Cherry Tree Road	EB	4038-4059	513	520	7	1.3	0.3	✓	✓
Ashworth Road	NB	4037-4052	520	339	-181	-34.9	8.7	×	×
Cropper Road	SB	4019-1039	102	116	14	14.2	1.4	✓	✓
Total	**EB**	**16**	**8229**	**7954**	**-275**	**-3.3**	**3.1**	✓	✓
B5268 Fleetwood Rd.	NB	4425-4454	376	335	-41	-10.9	2.2	✓	✓
B5268 Fleetwood Rd. N	WB	4424-4421	149	121	-28	-18.9	2.4	✓	✓
B5268 Fleetwood Rd. N	WB	4414-4413	155	125	-29	-19.0	2.5	✓	✓
B5268 Fleetwood Rd. S	WB	4376-4378	447	288	-160	-35.7	8.3	×	×
A585 Amounderness Way	WB	4337-4360	986	1018	32	3.3	1.0	✓	✓
A585 Amounderness Way	SB	4337-4526	464	640	175	37.8	7.5	×	×
W of Deepdale Ave.	WB	4301-4304	419	253	-166	-39.6	9.0	×	×
B5268 Blackpool Rd.	WB	4292-4265	231	224	-7	-2.9	0.4	✓	✓
Blackpool Old Rd.	WB	4261-4247	191	187	-4	-1.8	0.3	✓	✓
Garstang Rd. West	WB	4249-4219	453	454	1	0.3	0.1	✓	✓
B5266 Newton Dr	WB	4181-4168	621	627	6	1.0	0.2	✓	✓
A583 Preston New Rd. WB	WB	4068-4084	869	860	-9	-1.0	0.3	✓	✓
Clifton Road - Cherry Tree Rd.	WB	4059-4038	652	621	-31	-4.7	1.2	✓	✓
Ashworth Rd.	SB	4052-4037	463	447	-17	-3.6	0.8	✓	✓
Cropper Rd.	NB	1039-4019	78	72	-6	-7.7	0.7	✓	✓
Total	**WB**	**16**	**7834**	**7552**	**-281**	**-3.6**	**3.2**	✓	✓

Table K.13 Calibration of Screenline (4A) Links for All Vehicles (PM Peak)

Screenline_4A- East West Screenline parallel to B5412 Victoria Rd									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
A586 Garstang Rd.	NB	4532-4530	883	657	-226	-26	8	×	×
North Dr	NB	4373-4385	543	550	7	1	0	✓	✓
A585-Amounderness Way Arm (South arm)	SB	4360-4378	1096	1176	80	7	2	✓	✓
A585 Amounderness Way	NB	4337-4341	599	595	-4	-1	0	✓	✓
C381 School Rd.	NB	4336-4364	67	94	27	40	3	✓	✓
B5412 Lambs Rd.	NB	4397-4371	576	555	-21	-4	1	✓	✓
Total	**NB**	**6**	**3763**	**3626**	**-137**	**-3.6**	**2.3**	✓	✓
A586 Garstang Rd.	SB	4530-4532	629	637	8	1	0	✓	✓
North Dr	SB	4385-4373	484	477	-7	-1	0	✓	✓
A585-Amounderness Way Arm (South arm)	NB	4378-4360	1198	1161	-37	-3	1	✓	✓
A585 Amounderness Way	SB	4341-4337	492	484	-9	-2	0	✓	✓
C381 School Rd.	SB	4364-4336	78	80	2	3	0	✓	✓
B5412 Lambs Rd.	SB	4371-4397	454	385	-69	-15	3	✓	✓
Total	**SB**	**6**	**3335**	**3224**	**-111**	**-3.3**	**1.9**	✓	✓

Table K.14 Calibration of Screenline (3A) Links for All Vehicles (PM Peak)

Screenline_3A- From Blackpool (A584 Promenade) to A585 (South of A585/Thistleton Rd Junction (Northbound)									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
A584 Promenade Rd.	NB	4124-4151	1006	1034	28	2.8	0.9	✓	✓
A586 Cookson Street	NB	4153-4156	538	508	-30	-5.5	1.3	✓	✓
B5124 Devonshire Rd.	NB	4162-4178	587	440	-147	-25.0	6.5	×	×
Layton Rd. and Collingwood Ave	NB	4536-4184	407	202	-205	-50.4	11.8	×	×
A587 – B Rd.Wy.	NB	4168-4176	487	680	193	39.6	8.0	×	×
A586 Garstang Rd. W	NB	4243-4253	619	601	-18	-3.0	0.7	✓	✓
A585 Mains Lane	NB	4228-4270	191	175	-15	-8.1	1.1	✓	✓
A585 Garstang New Rd.	NB	4523-4280	859	870	11	1.3	0.4	✓	✓
Total	**NB**	**8**	**4694**	**4510**	**-183**	**-3.9**	**2.7**	✓	✓
A584 Promenade Rd.	SB	4151-4124	776	921	145	18.7	5.0	×	✓
A586 Cookson Street	SB	4156-4153	217	210	-7	-3.2	0.5	✓	✓
B5124 Devonshire Rd.	SB	4178-4162	610	614	3	0.5	0.1	✓	✓
Layton Rd. and Collingwood Ave	SB	4184-4536	367	140	-227	-62.0	14.3	×	×
A587 - BRd.Wy.	SB	4176-4168	447	685	238	53.2	10.0	×	×
A586 Garstang Rd. W	SB	4253-4243	430	430	-0	-0.1	0.0	✓	✓
A585 Mains Lane	SB	4270-4228	168	153	-15	-8.8	1.2	✓	✓
A585 Garstang New Rd.	SB	4280-4523	879	865	-14	-1.6	0.5	✓	✓
Total	**SB**	**8**	**3895**	**4017**	**122**	**3.1**	**1.9**	✓	✓

Table K.15 Calibration of Screenline (1N) links for All Vehicles (PM Peak)

Screenline_1N- North of M55/Yeadon Way from Blackpool (A584 Promenade) to M55 J1									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
A584 South Promenade	NB	4024-4057	466	490	24	5.2	1.1	✓	✓
B5262 Lytham Rd.	NB	4026-4049	363	313	-50	-13.7	2.7	✓	✓
Seasiders Way and Yeadon Way	SB	4037-4081	519	540	21	4.0	0.9	✓	✓
St. Anne's Rd.	NB	4030-4051	416	425	9	2.2	0.4	✓	✓
B5261 Hawes Side lane	NB	4018-4044	556	580	24	4.3	1.0	✓	✓
Vicarage Lane	NB	4027-4038	577	533	-43	-7.5	1.8	✓	✓
Ashworth Rd.	NB	4037-4052	520	339	-181	-34.9	8.7	×	×
A583 Preston New Rd. North of M55 J4	NB	4040-4048	1322	1303	-19	-1.4	0.5	✓	✓
N. entrance to Mythop Hall	WB	4077-4086	206	153	-53	-25.6	3.9	✓	✓
B5260 Singleton Rd.	NB	4104-4150	397	331	-66	-16.6	3.5	✓	✓
C302 Back Lane N of Bradshaw Ln.	NB	4108-4128	16	17	1	8.7	0.3	✓	✓
A585 Fleetwood Rd.	NB	4110-4118	1090	1073	-17	-1.6	0.5	✓	✓
Total	**NB**	**12**	**6448**	**6099**	**-350**	**-5.4**	**4.4**	×	✓
A584 South Promenade	SB	4057-4024	499	497	-2	-0.4	0.1	✓	✓
B5262 Lytham Rd.	SB	4049-4026	427	401	-25	-6.0	1.2	✓	✓
Seasiders Way and Yeadon way	NB	4081-4037	393	439	46	11.7	2.2	✓	✓
St. Anne's Rd.	SB	4051-4030	418	390	-28	-6.6	1.4	✓	✓
B5261 Hawes Side Lane	SB	4044-4018	529	496	-33	-6.3	1.5	✓	✓
Vicarage lane	SB	4038-4027	598	543	-55	-9.2	2.3	✓	✓
Ashworth Rd.	SB	4052-4037	463	447	-17	-3.6	0.8	✓	✓
A583 Preston New Rd. North of M55 J4	SB	4048-4042	1313	1235	-78	-6.0	2.2	✓	✓
Nr entrance to Mythop Hall	EB	4086-4077	196	197	1	0.8	0.1	✓	✓
B5260 Singleton Rd.	SB	4150-4104	233	236	3	1.1	0.2	✓	✓
C302 Back Lane N of Bradshaw Ln.	SB	4128-4108	17	9	-8	-47.8	2.3	✓	✓
A585 Fleetwood Rd.	SB	4118-4110	890	946	56	6.3	1.8	✓	✓
Total	**SB**	**12**	**5977**	**5837**	**-140**	**-2.3**	**1.8**	✓	✓

APPENDIX L

Link Flow Validation

Table L.1: Outer Cordon (2) Links for All Vehicles (AM Peak)

Cordon_2- East of Poulton, embracing A585 between Skippool Junction, Windy Harbour Junction and Singleton									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
A585 - Amounderness Wy.	EB	4337-4311	1056	1042	-13	-1	0	✓	✓
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	SB	4340-4311	439	487	47	11	2	✓	✓
A585 Mains Lane / A588 Shard Road	WB	4320-4305	707	770	63	9	2	✓	✓
A586 Garstang Road, A road, East of A585 Fleetwood Road	WB	4513-4280	343	345	3	1	0	✓	✓
A585 Fleetwood Road / Mile Road / Thistleton Road	WB	4210-4218	68	157	89	130	8	✓	×
A585 Fleetwood Road / Mile Road / Thistleton Road	NB	4182-4218	778	834	56	7	2	✓	✓
B5260 Weeton Rd.	SB	4150-4215	207	90	-117	-57	10	×	×
B5266 Station Rd.	EB	4193-4491	236	173	-63	-26.8	4.4	✓	✓
A588 - Breck Road	NB	4307-4311	531	628	97	18.2	4.0	✓	✓
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road	EB	4501-4270	419	379	-40	-9.6	2.0	✓	✓
Total	**IN**	**10**	**4784**	**4904**	**120**	**2.5**	**1.7**	✓	✓
A585 - Amounderness Wy.	WB	4311-4337	960	1044	84	9	3	✓	✓
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	NB	4311-4340	324	436	111	34	6	×	×
A585 Mains Lane / A588 Shard Road	EB	4305-4320	428	433	5	1	0	✓	✓
A586 Garstang Road, A road, East of A585 Fleetwood Road	EB	4280-4513	447	282	-164	-37	9	×	×
A585 Fleetwood Road / Mile Road / Thistleton Road	EB	4218-4210	61	99	38	62	4	✓	✓
A585 Fleetwood Road / Mile Road / Thistleton Road	SB	4218-4182	1026	1149	122	12	4	✓	✓
B5260 Weeton Rd.	NB	4215-4150	444	234	-210	-47	11	×	×
B5266 Station Rd.	WB	4491-4193	158	177	18	12	1	✓	✓
A588 - Breck Road	SB	4311-4307	860	703	-157	-18	6	×	×
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road	WB	4270-4501	344	328	-16	-5	1	✓	✓
Total	**OUT**	**10**	**5052**	**4884**	**-168**	**-3.3**	**2.4**	✓	✓

Table L.2: Outer Cordon (2) Links for All Vehicles (Inter Peak)

Cordon_2- East of Poulton, embracing A585 between Skippool Junction, Windy Harbour Junction and Singleton									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
A585 - Amounderness Wy.	EB	4337-4311	882	944	61	7	2	✓	✓
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	SB	4340-4311	239	283	44	18	3	✓	✓
A585 Mains Lane / A588 Shard Road	WB	4320-4305	514	493	-21	-4	1	✓	✓
A586 Garstang Road, A road, East of A585 Fleetwood Road	WB	4513-4280	319	319	0	0	0	✓	✓
A585 Fleetwood Road / Mile Road / Thistleton Road	WB	4210-4218	58	85	27	46	3	✓	✓
A585 Fleetwood Road / Mile Road / Thistleton Road	NB	4182-4218	748	747	-0	-0	0	✓	✓
B5260 Weeton Rd.	SB	4150-4215	149	81	-68	-46	6	✓	×
B5266 Station Rd.	EB	4193-4491	78	72	-6	-7.4	0.7	✓	✓
A588 - Breck Road	NB	4307-4311	500	424	-76	-15.2	3.5	✓	✓
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road	EB	4501-4270	323	287	-36	-11.1	2.1	✓	✓
Total	**IN**	**10**	**3810**	**3735**	**-75**	**-2.0**	**1.2**	✓	✓
A585 - Amounderness Wy.	WB	4311-4337	900	927	27	3	1	✓	✓
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	NB	4311-4340	242	304	62	26	4	✓	✓
A585 Mains Lane / A588 Shard Road	EB	4305-4320	478	474	-3	-1	0	✓	✓
A586 Garstang Road, A road, East of A585 Fleetwood Road	EB	4280-4513	318	317	-2	-0	0	✓	✓
A585 Fleetwood Road / Mile Road / Thistleton Road	EB	4218-4210	52	92	41	79	5	✓	✓
A585 Fleetwood Road / Mile Road / Thistleton Road	SB	4218-4182	716	772	56	8	2	✓	✓
B5260 Weeton Rd.	NB	4215-4150	147	98	-49	-34	4	✓	✓
B5266 Station Rd.	WB	4491-4193	70	51	-18	-26	2	✓	✓
A588 - Breck Road	SB	4311-4307	477	422	-55	-11	3	✓	✓
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road	WB	4270-4501	285	265	-20	-7	1	✓	✓
Total	**OUT**	**10**	**3684**	**3723**	**39**	**1.1**	**0.6**	✓	✓

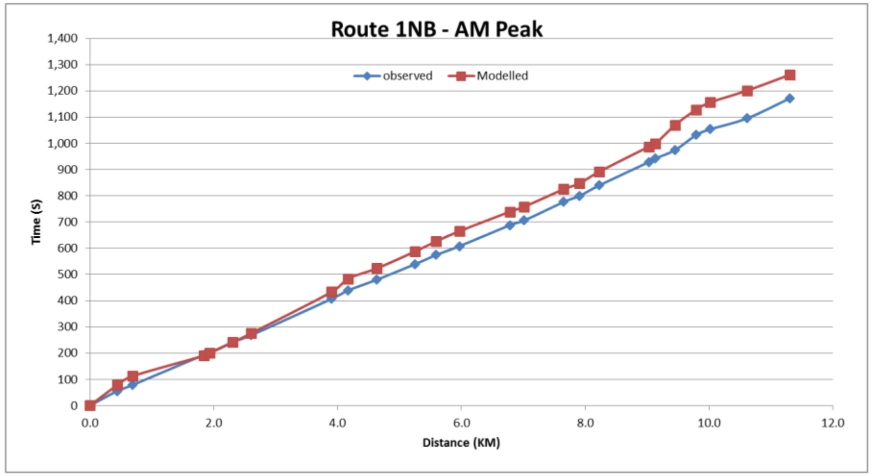
Table L.3: Outer Cordon (2) Links for All Vehicles (PM Peak)

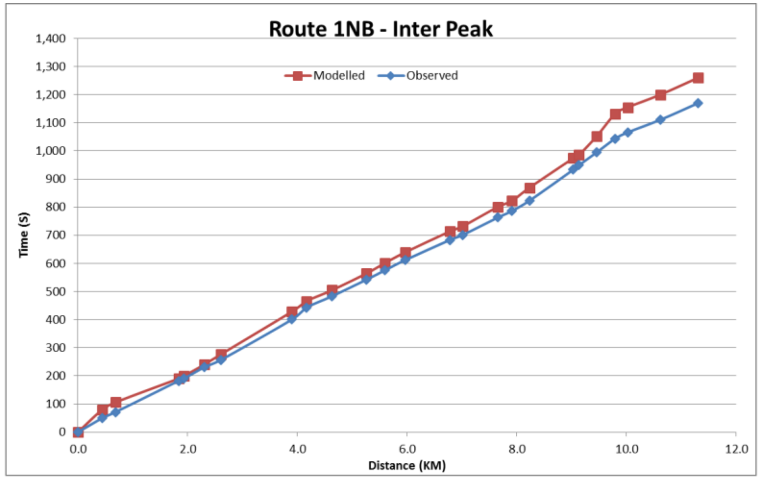
Cordon_2- East of Poulton, embracing A585 between Skippool Junction, Windy Harbour Junction and Singleton									
Location	Dir	Saturn Link	Observed (vehs)	Modelled (vehs)	Diff	% Diff	GEH	Pass Criteria	
								Flow	GEH
A585 - Amounderness Wy.	EB	4337-4311	955	1060	105	11	3	✓	✓
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	SB	4340-4311	366	456	90	25	4	✓	✓
A585 Mains Lane / A588 Shard Road	WB	4320-4305	540	513	-28	-5	1	✓	✓
A586 Garstang Road, A road, East of A585 Fleetwood Road	WB	4513-4280	395	402	7	2	0	✓	✓
A585 Fleetwood Road / Mile Road / Thistleton Road	WB	4210-4218	75	47	-27	-37	4	✓	✓
A585 Fleetwood Road / Mile Road / Thistleton Road	NB	4182-4218	998	1060	62	6	2	✓	✓
B5260 Weeton Rd.	SB	4150-4215	207	197	-10	-5	1	✓	✓
B5266 Station Rd.	EB	4193-4491	129	168	38	29.5	3.1	✓	✓
A588 - Breck Road	NB	4307-4311	747	749	3	0.3	0.1	✓	✓
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road	EB	4501-4270	442	424	-17	-3.9	0.8	✓	✓
Total	**IN**	**10**	**4853**	**5076**	**223**	**4.6**	**3.2**	✓	✓
A585 - Amounderness Wy.	WB	4311-4337	1064	1074	11	1	0	✓	✓
A585 Amounderness Way / Skippool Road / A585 Mains Lane / Breck Road roundabout	NB	4311-4340	493	633	140	28	6	×	×
A585 Mains Lane / A588 Shard Road	EB	4305-4320	709	716	7	1	0	✓	✓
A586 Garstang Road, A road, East of A585 Fleetwood Road	EB	4280-4513	412	409	-3	-1	0	✓	✓
A585 Fleetwood Road / Mile Road / Thistleton Road	EB	4218-4210	94	156	62	66	6	✓	×
A585 Fleetwood Road / Mile Road / Thistleton Road	SB	4218-4182	904	948	44	5	1	✓	✓
B5260 Weeton Rd.	NB	4215-4150	444	165	-279	-63	16	×	×
B5266 Station Rd.	WB	4491-4193	275	144	-131	-48	9	×	×
A588 - Breck Road	SB	4311-4307	536	512	-24	-5	1	✓	✓
A585 Mains Lane / Pool Foot Lane / A585 Garstang New Road	WB	4270-4501	298	291	-6	-2	0	✓	✓
Total	**OUT**	**10**	**5229**	**5048**	**-181**	**-3.5**	**2.5**	✓	✓

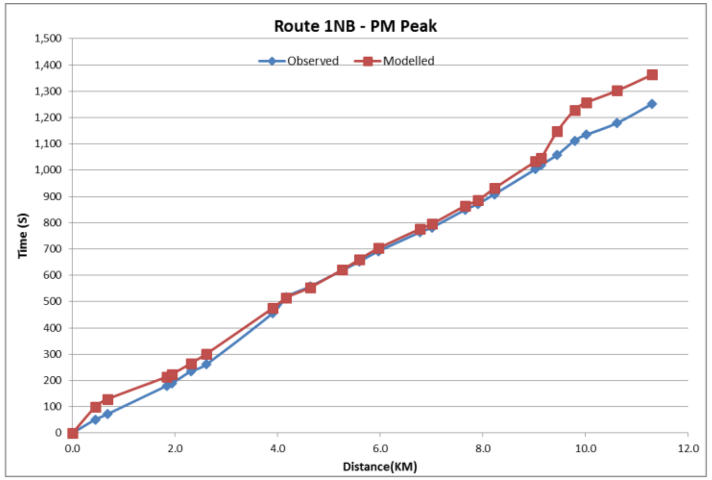
APPENDIX M

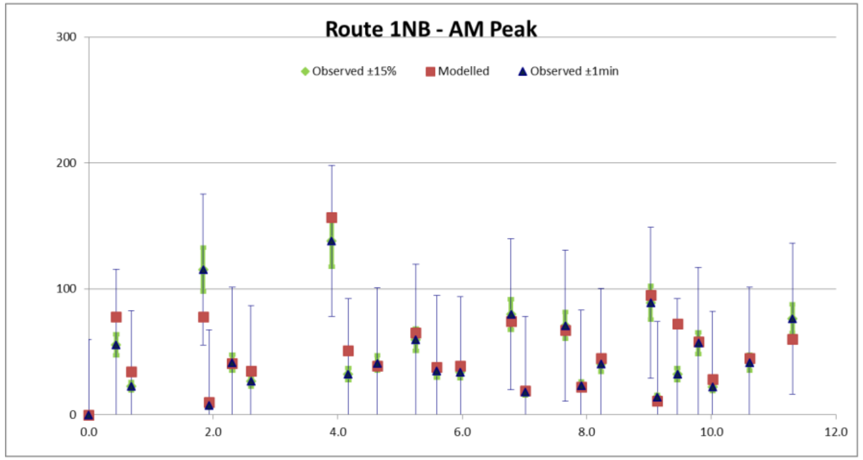
Time Distance Plots for Journey Time Routes

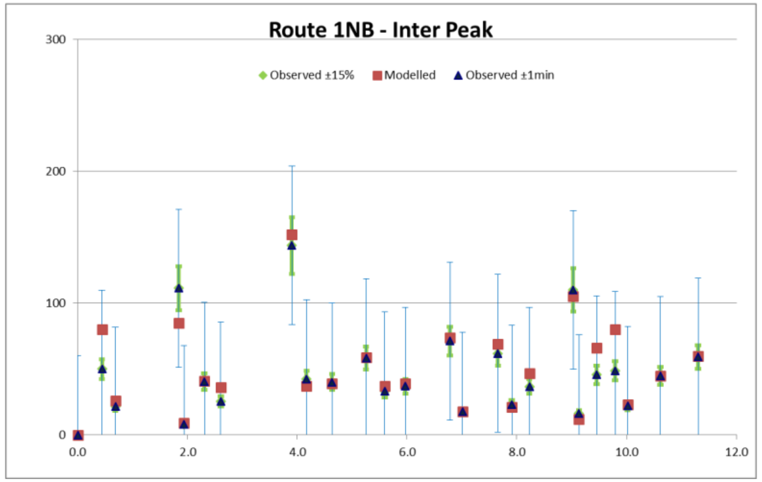
RIS A585 - JT Route
Time Distance Plots

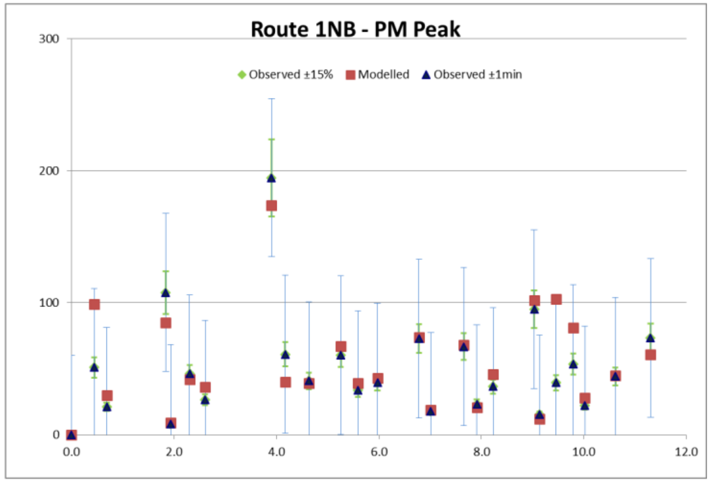






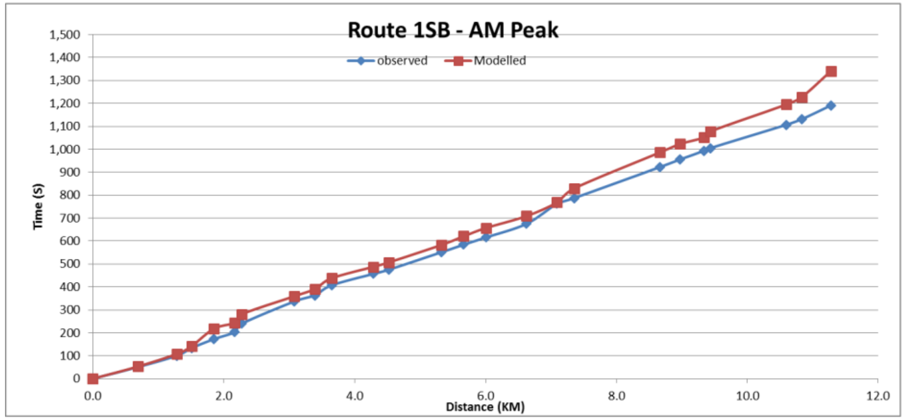


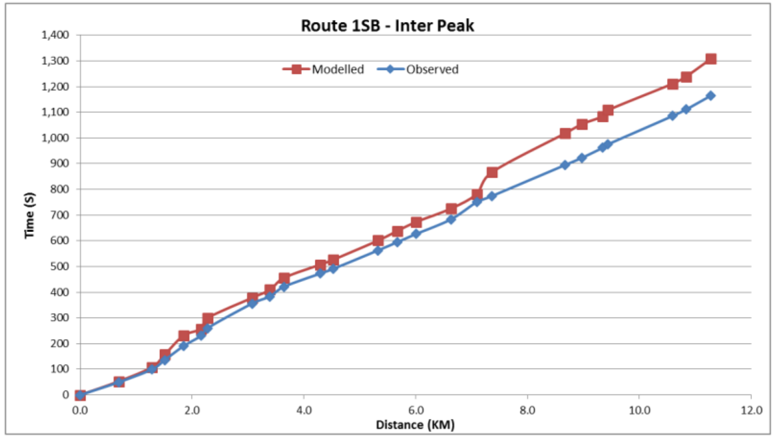


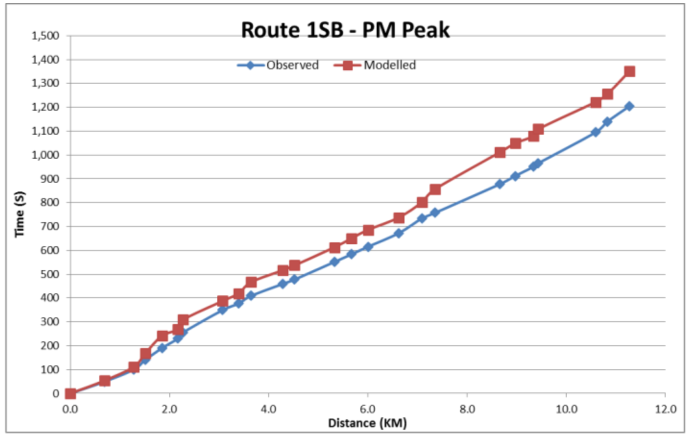


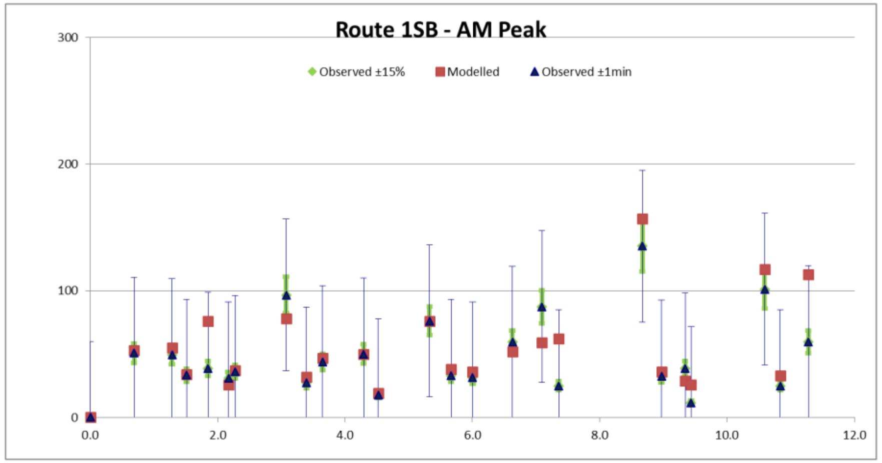
Route 1NB

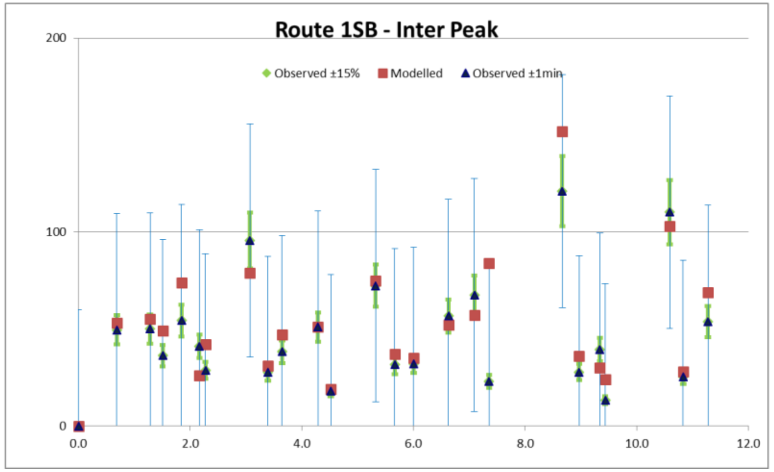
RIS A585 - JT Route
Time Distance Plots

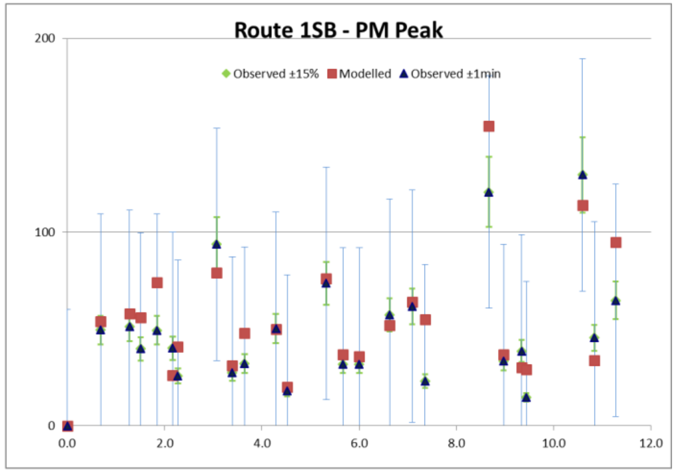






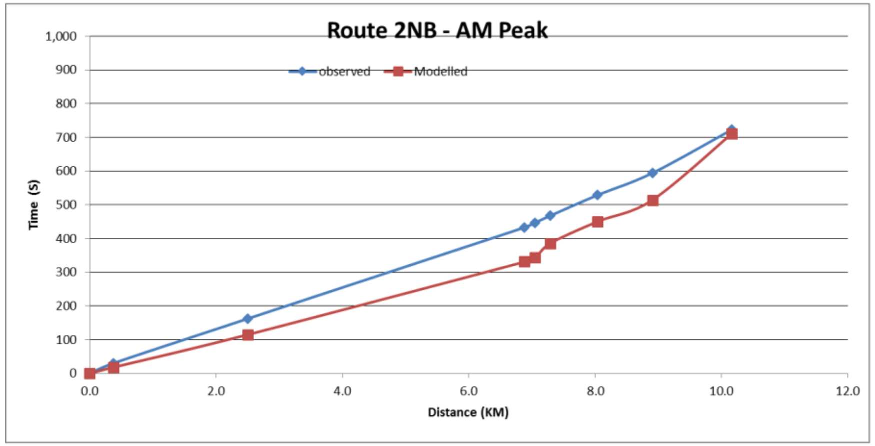


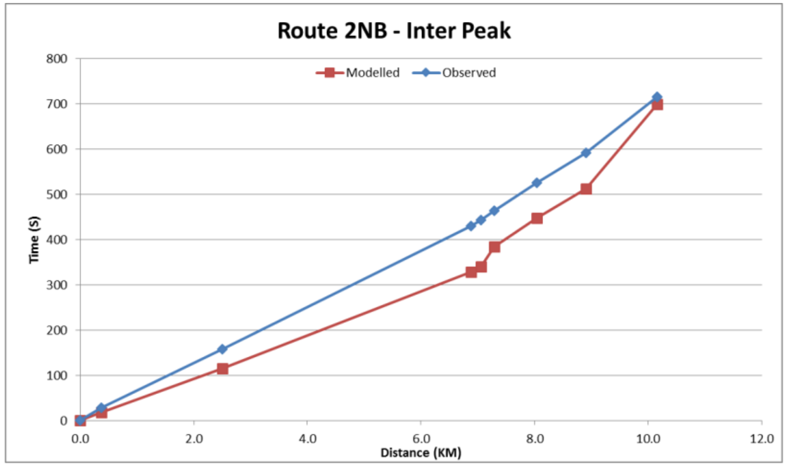


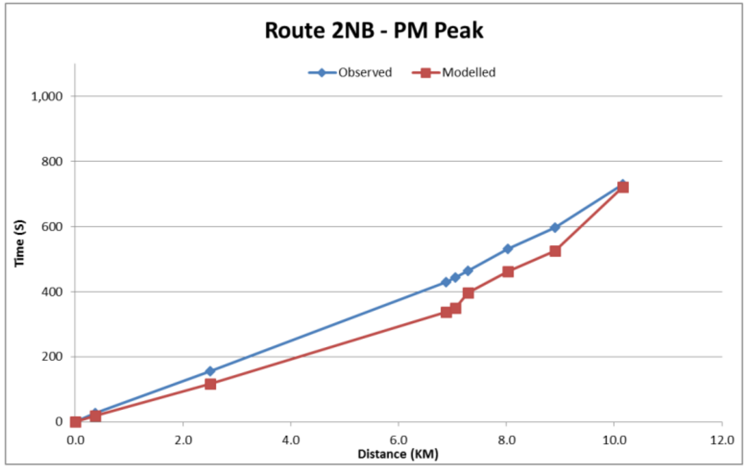


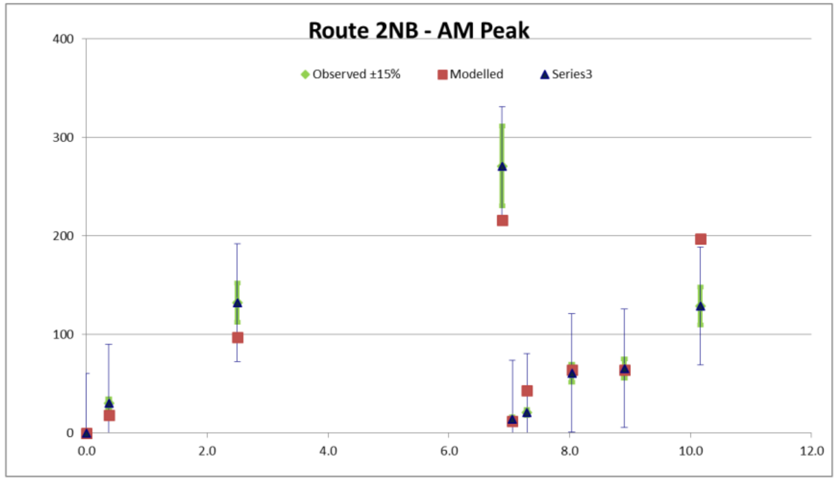
Route 1SB

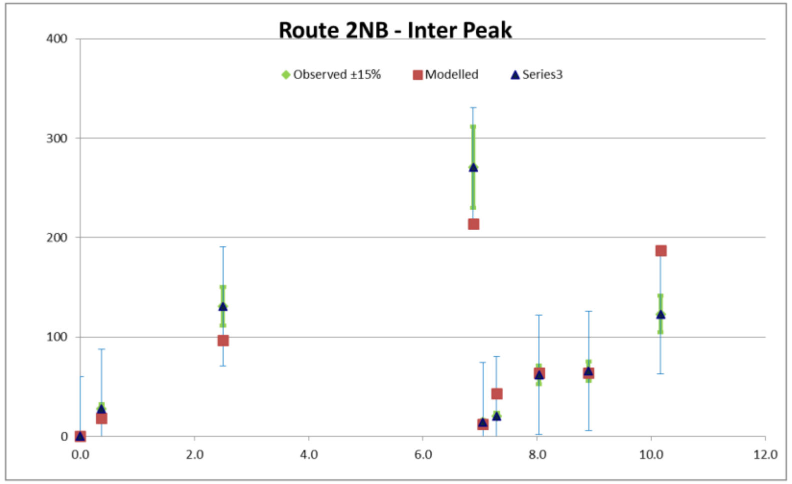
RIS A585 - JT Route
Time Distance Plots

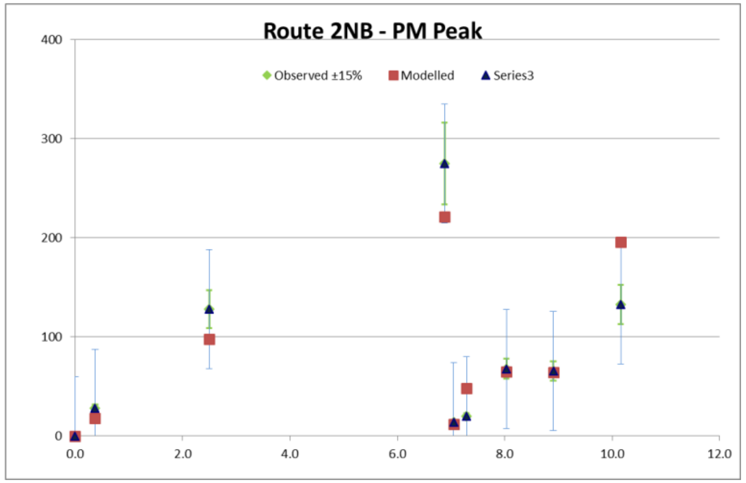






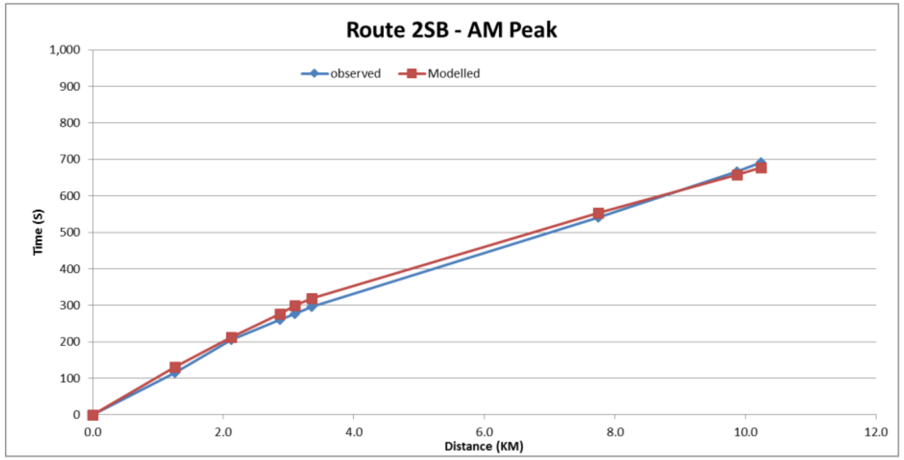


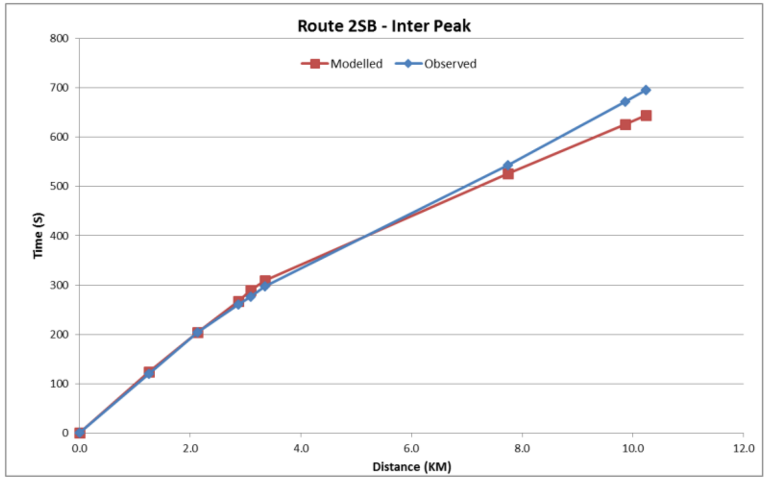


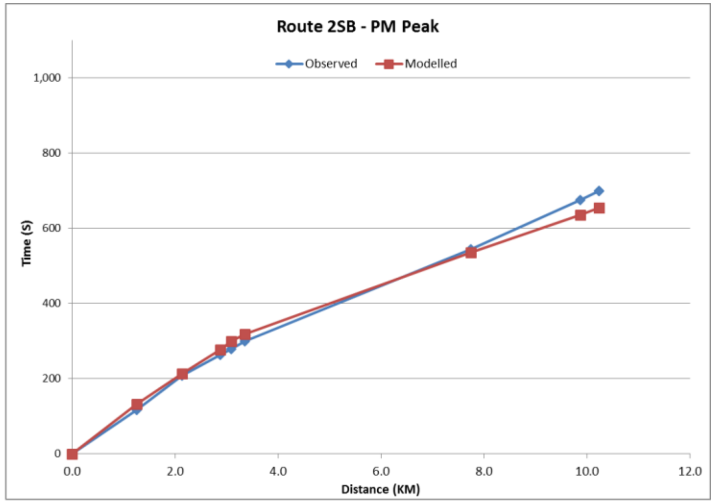


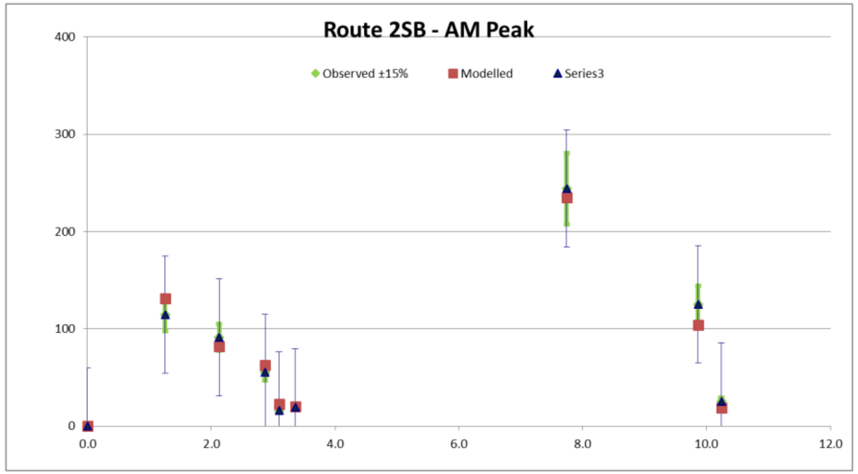
Route 2NB

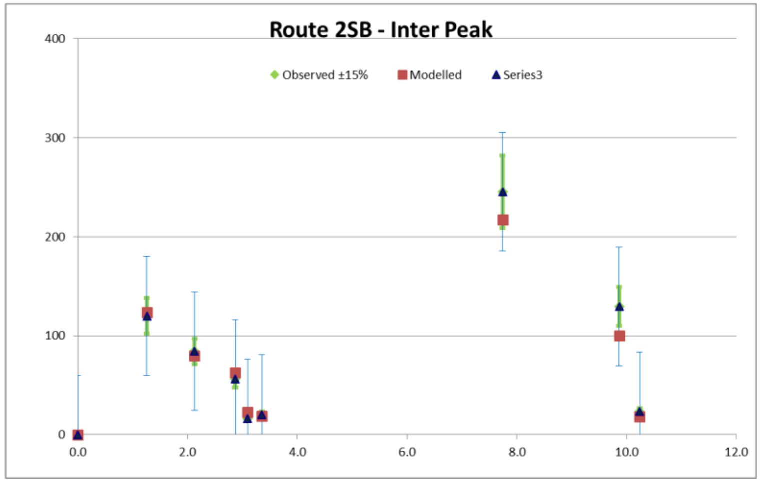
RIS A585 - JT Route
Time Distance Plots

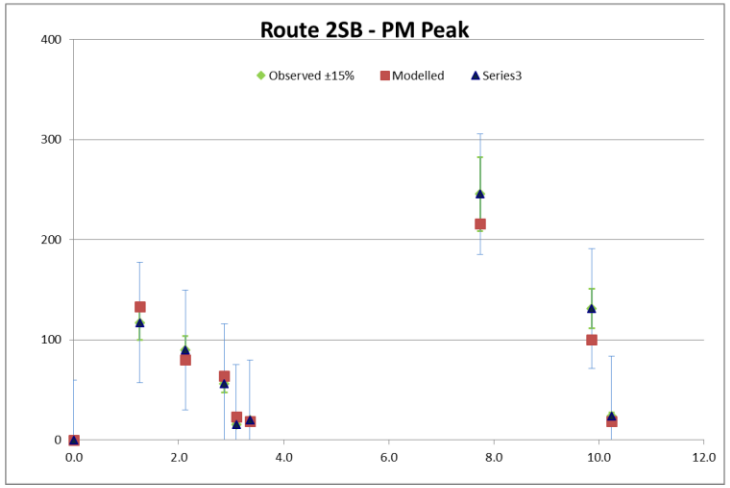






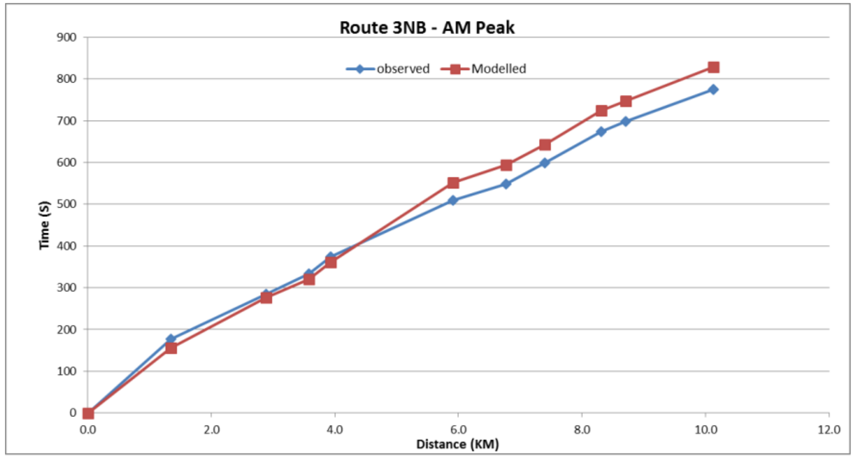


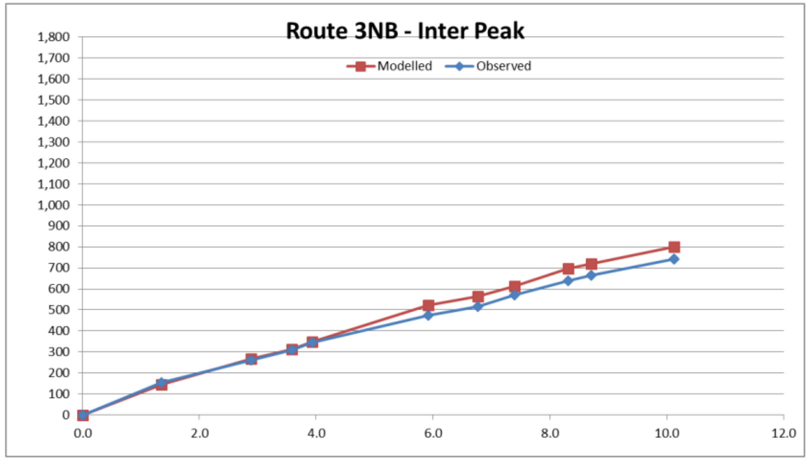


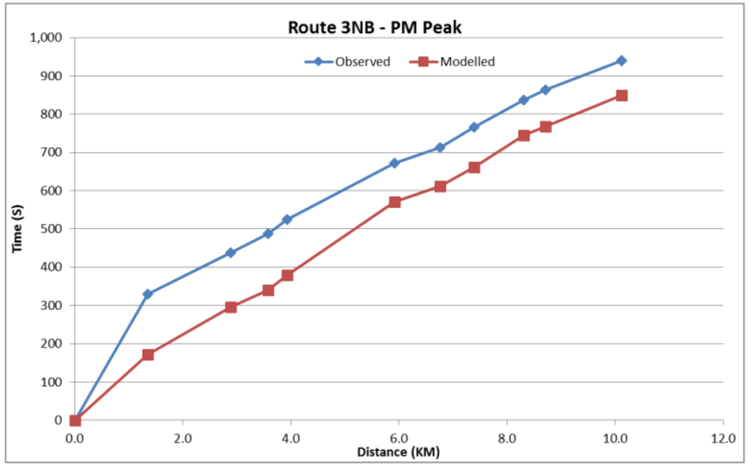


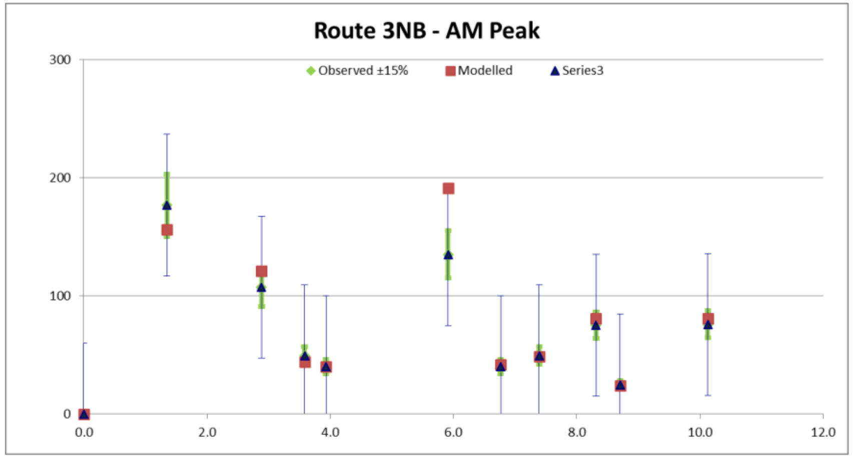
Route 2SB

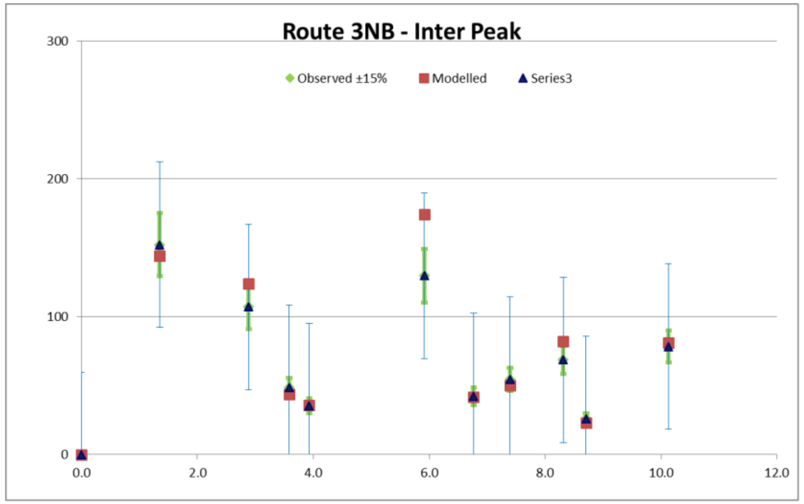
RIS A585 - JT Route
Time Distance Plots

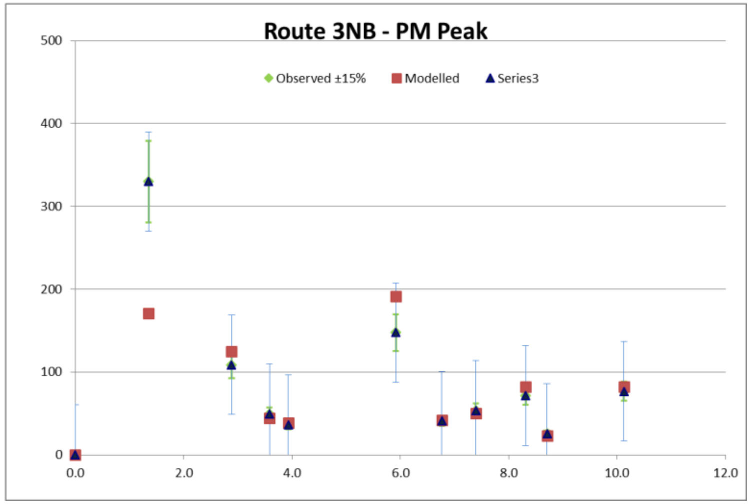






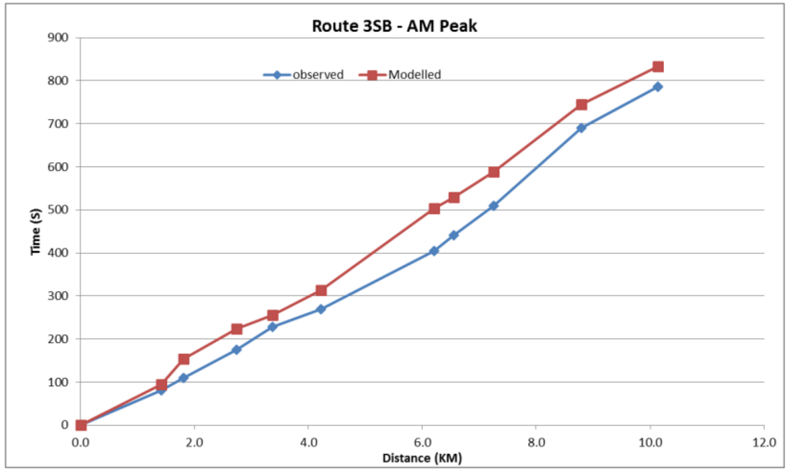


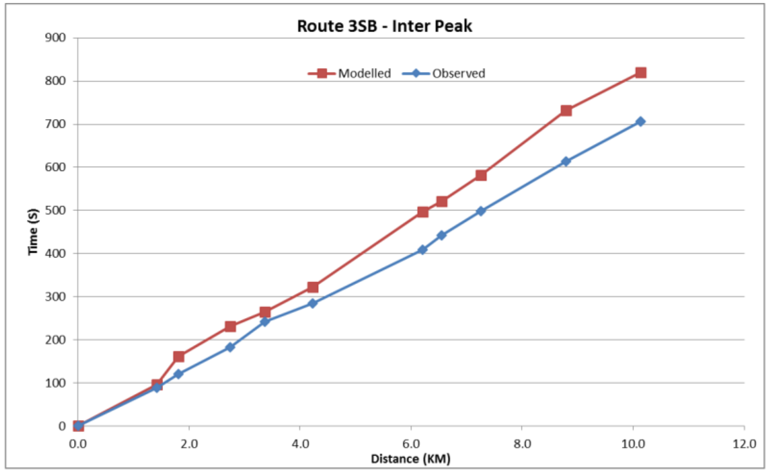


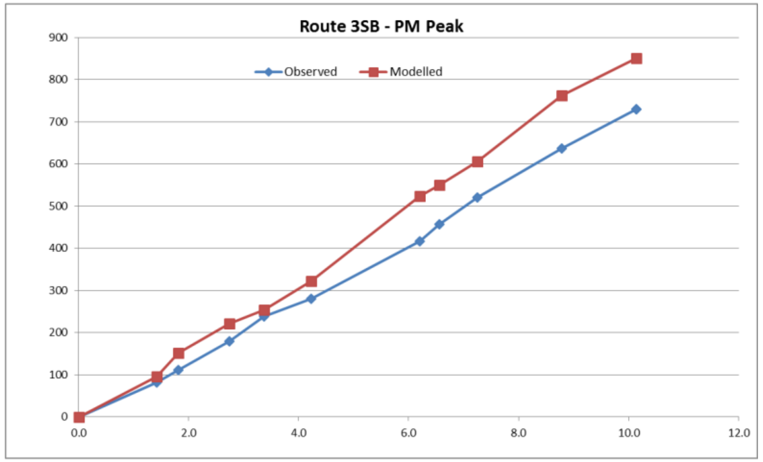


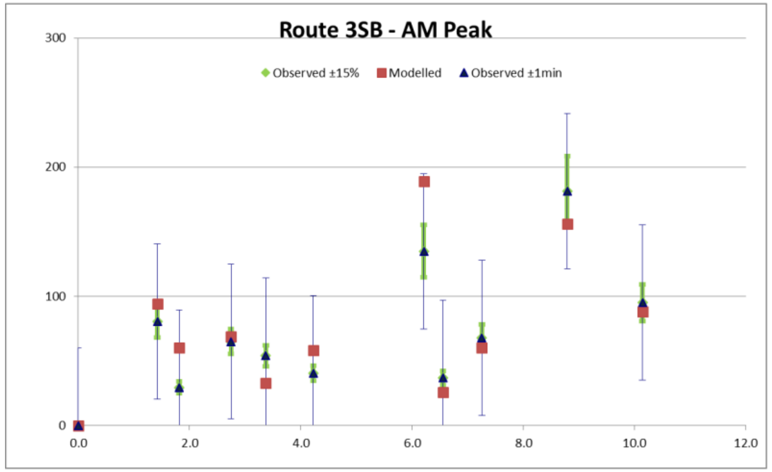
Route 3NB

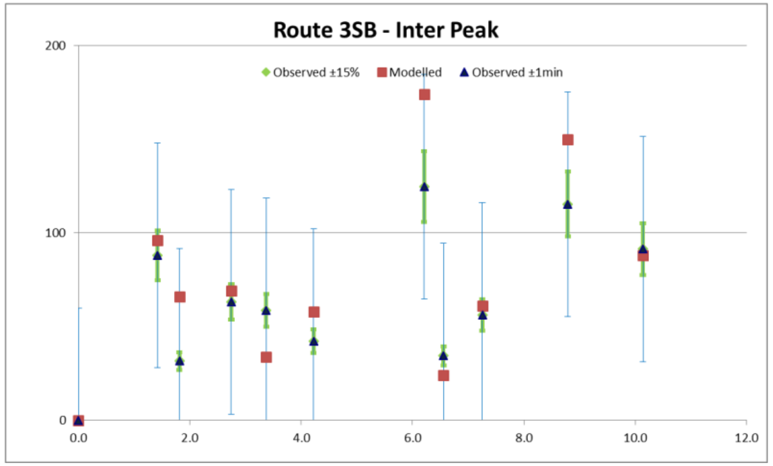
RIS A585 - JT Route
Time Distance Plots

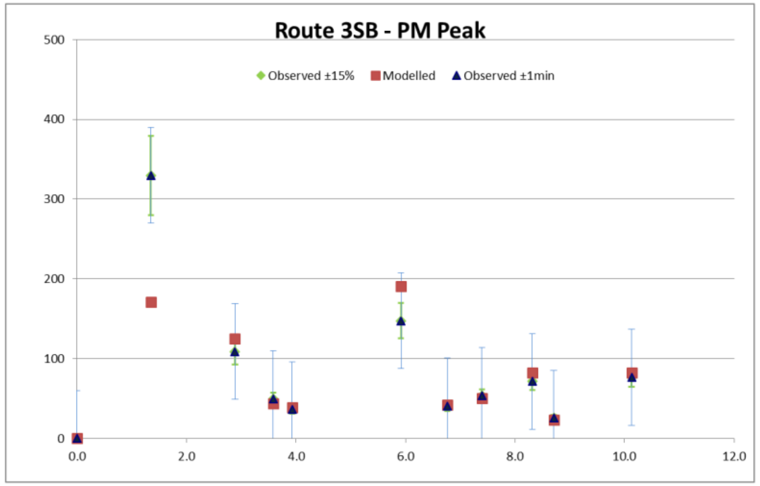






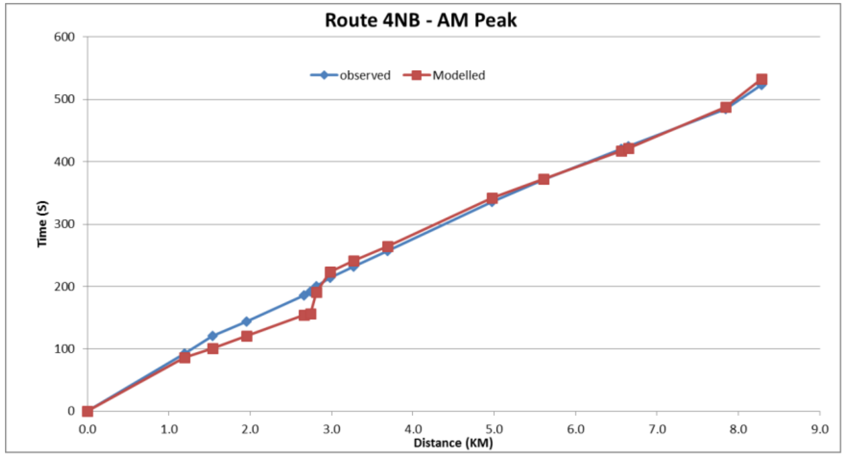


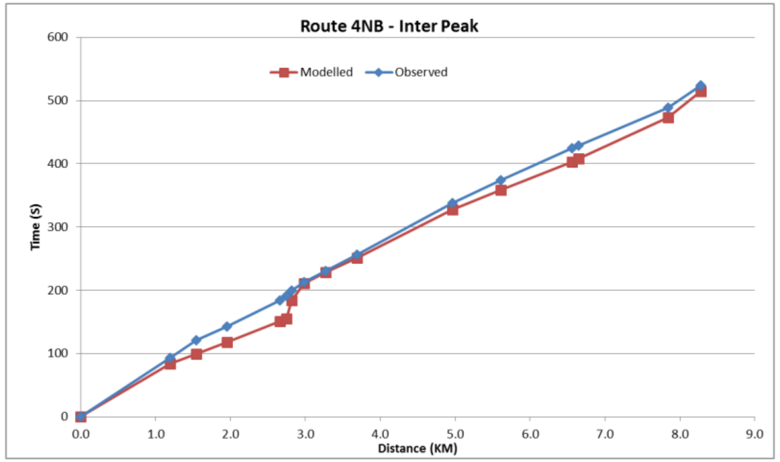


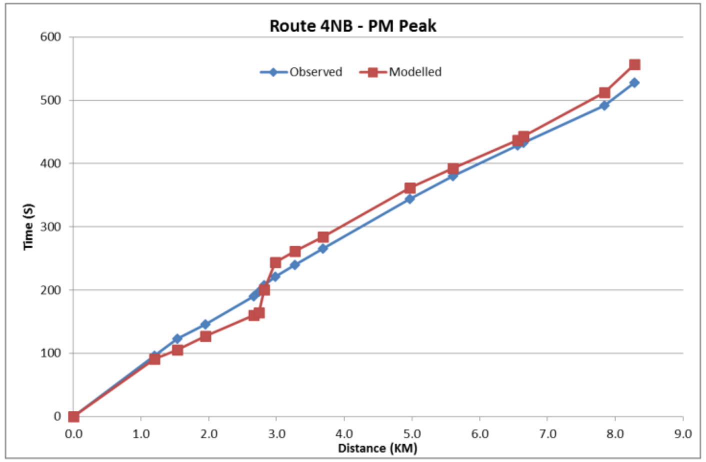


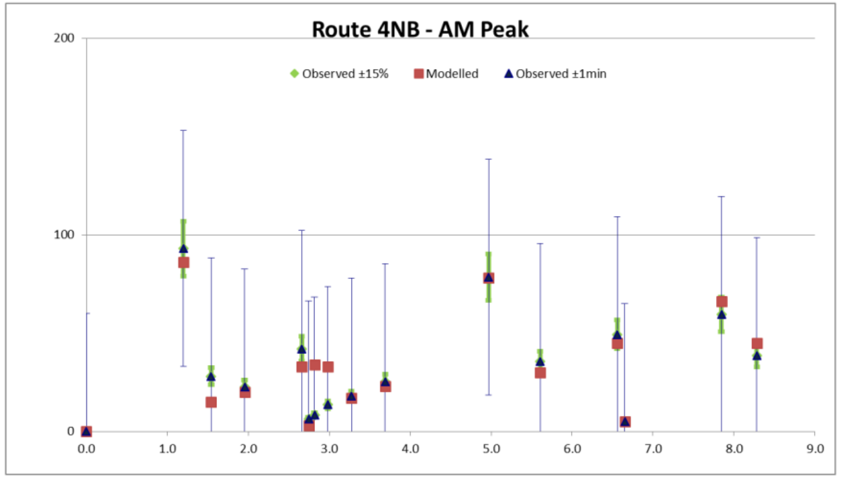
Route 3SB

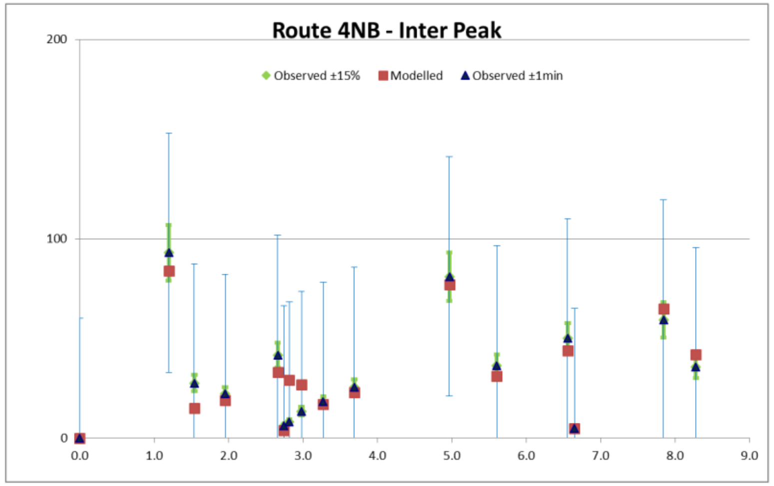
RIS A585 - JT Route
Time Distance Plots

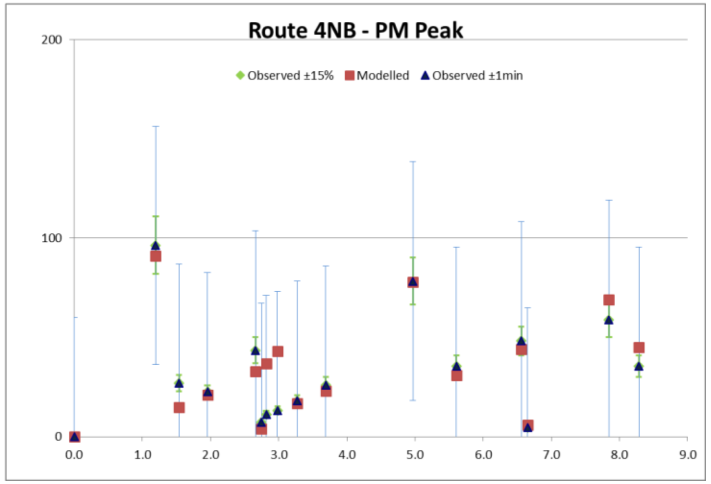






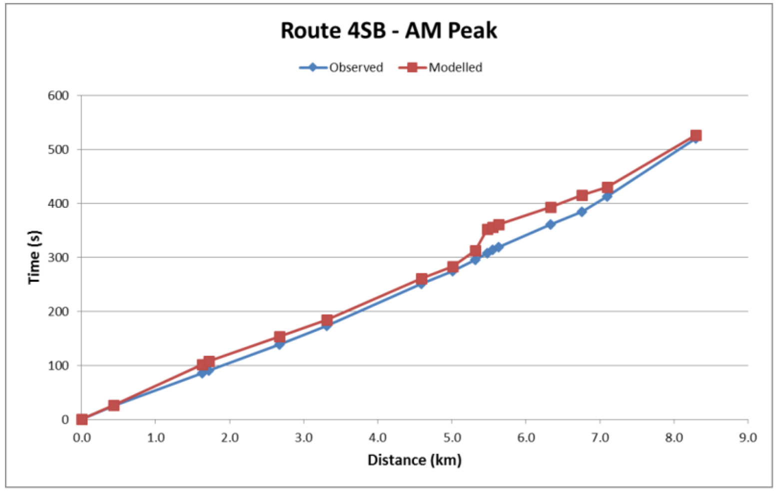


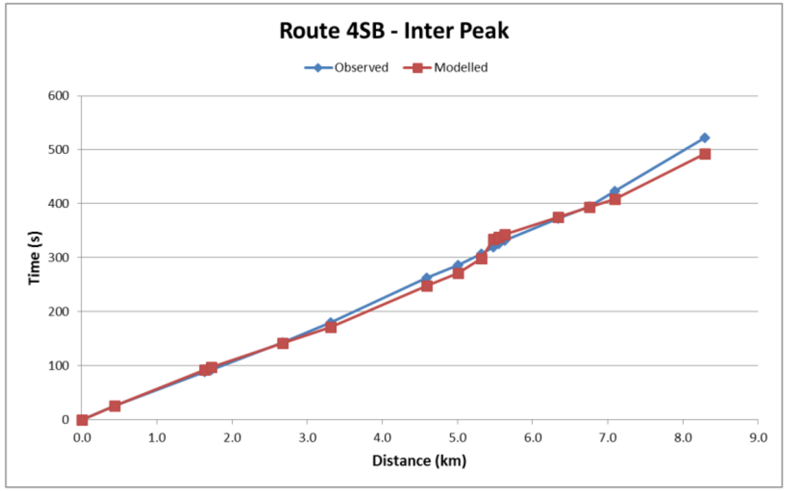


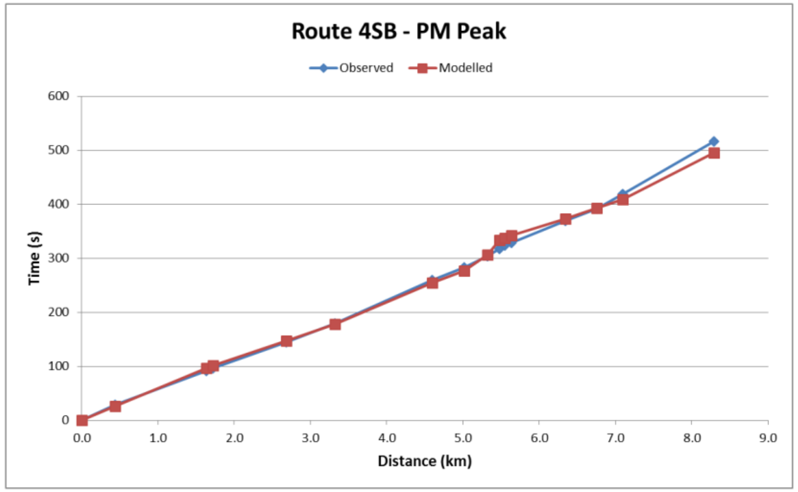


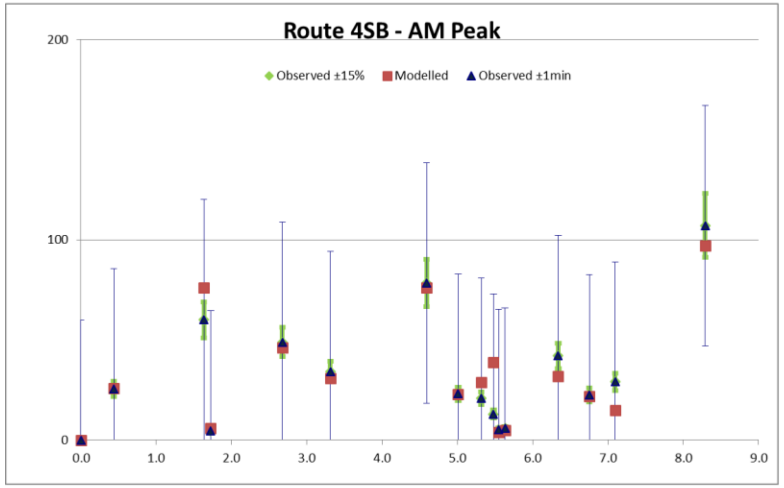
Route 4NB

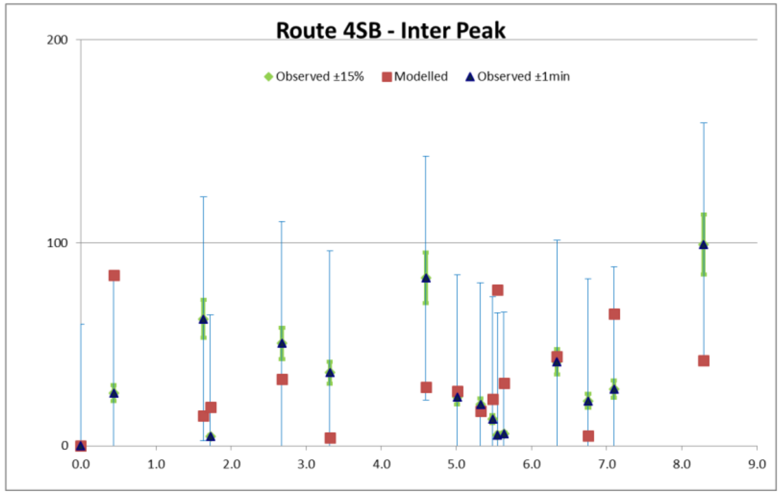
RIS A585 - JT Route
Time Distance Plots

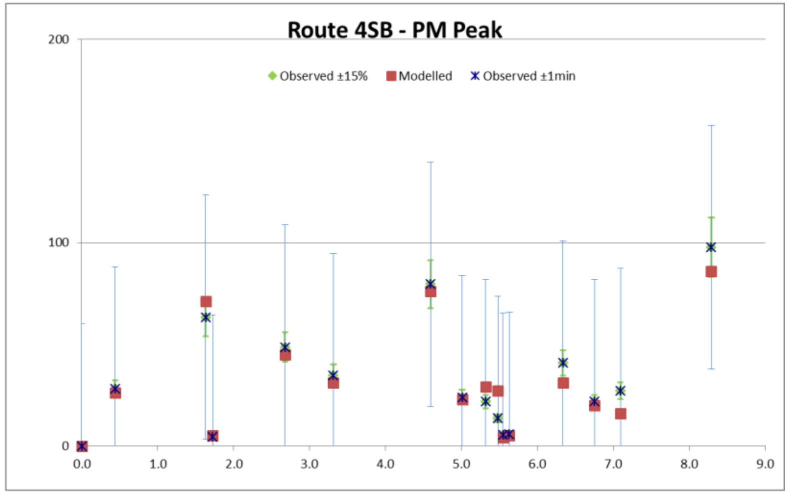

Route 4SB - AM Peak


Route 4SB - Inter Peak


Route 4SB - PM Peak

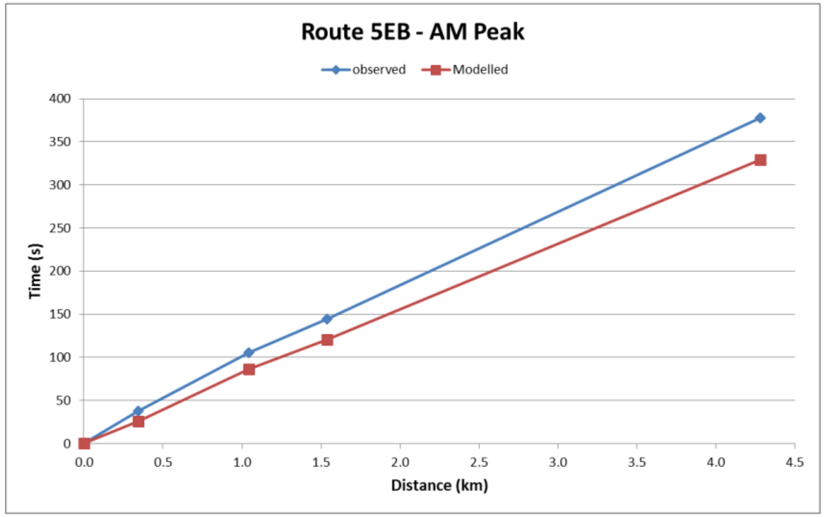

Route 4SB - AM Peak

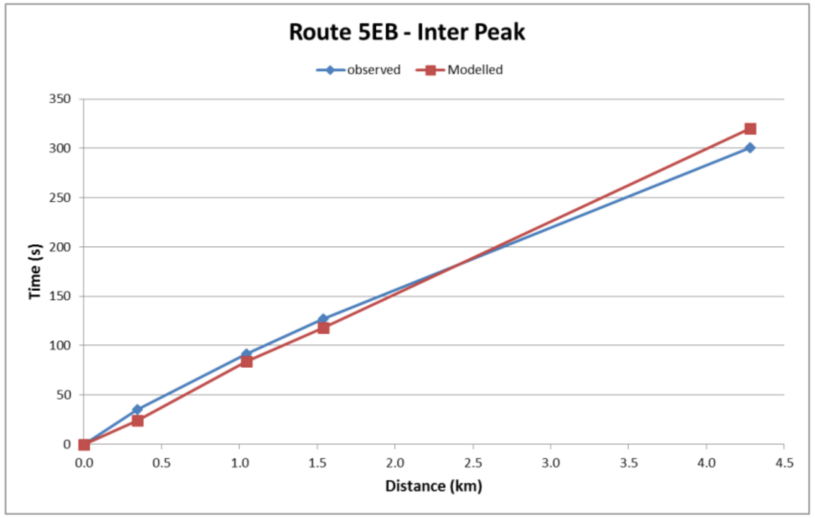

Route 4SB - Inter Peak

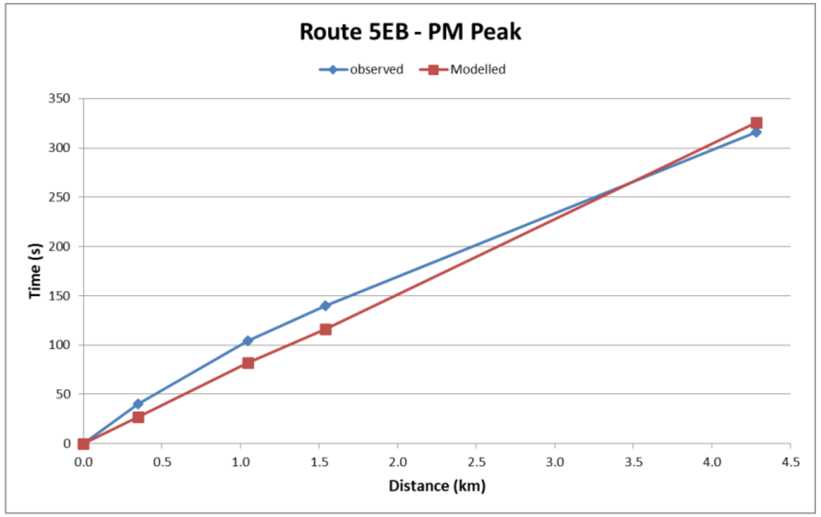

Route 4SB - PM Peak

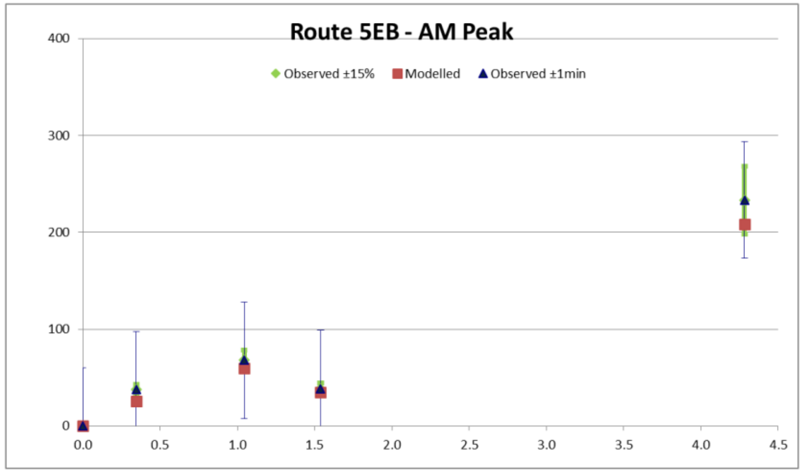
Route 4SB

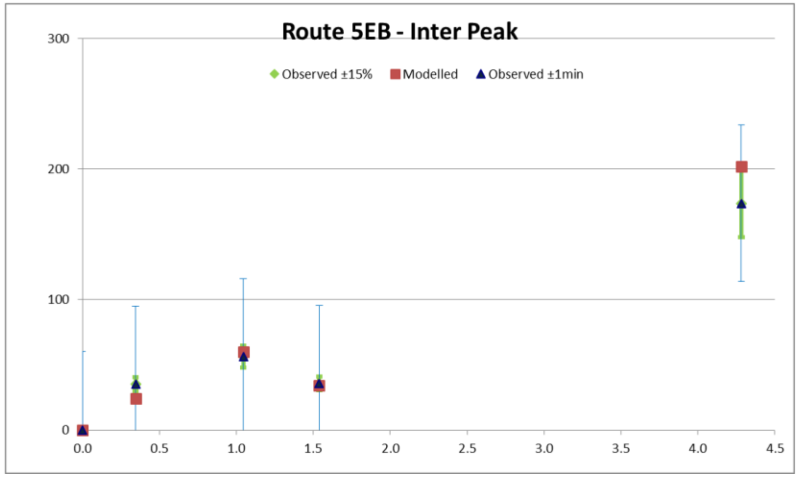
RIS A585 - JT Route
Time Distance Plots

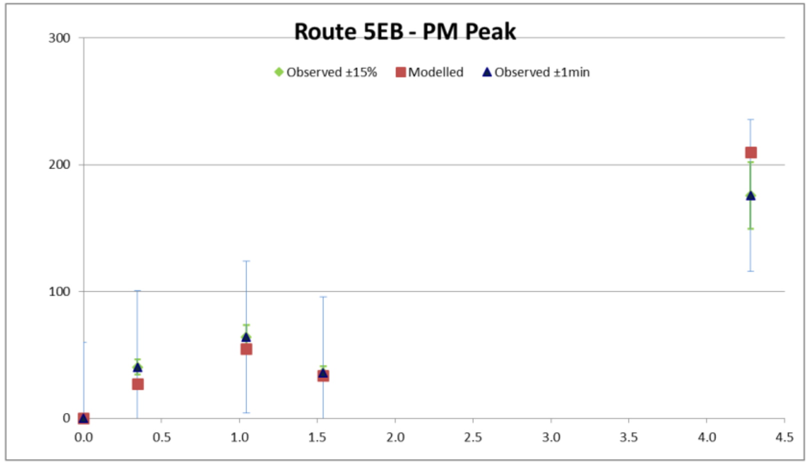






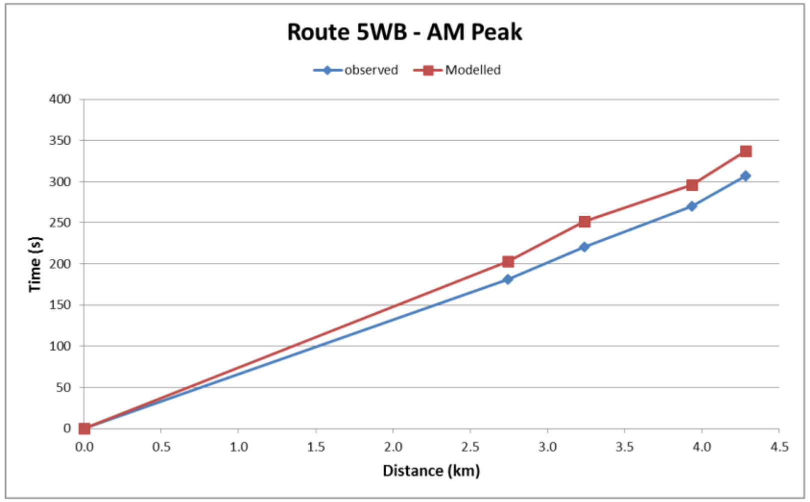


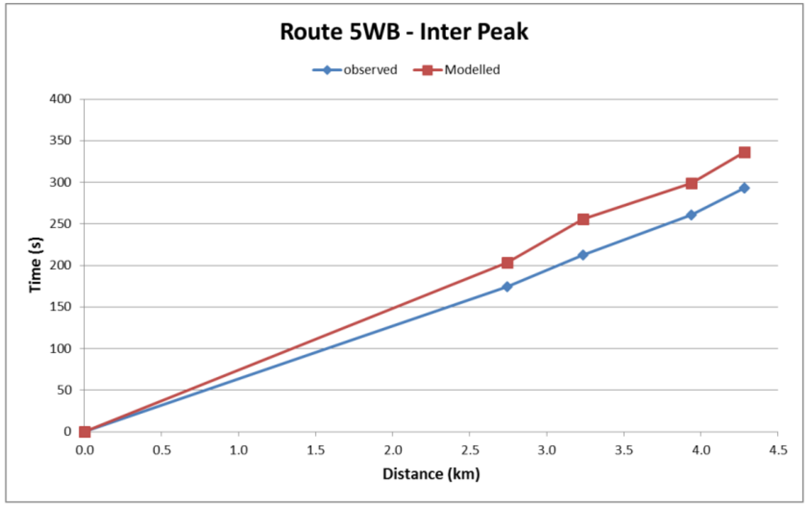


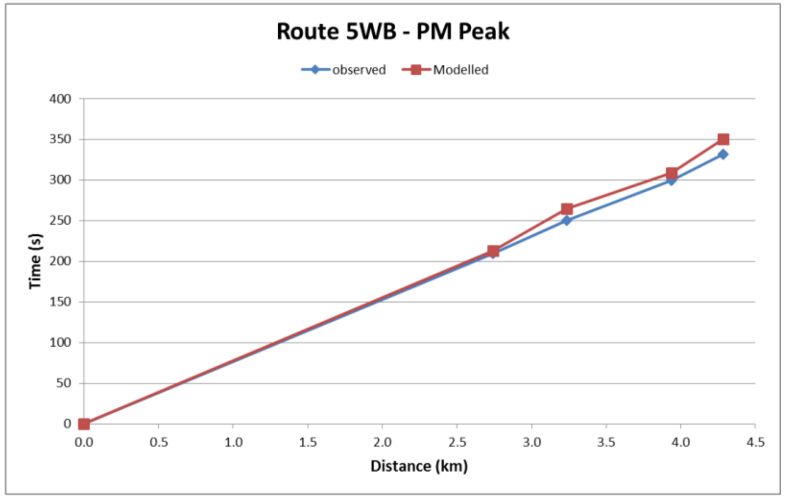


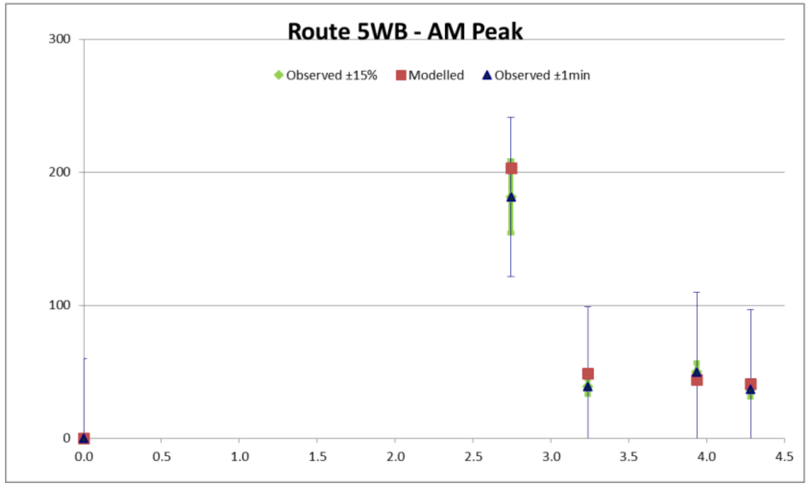
Route 5EB

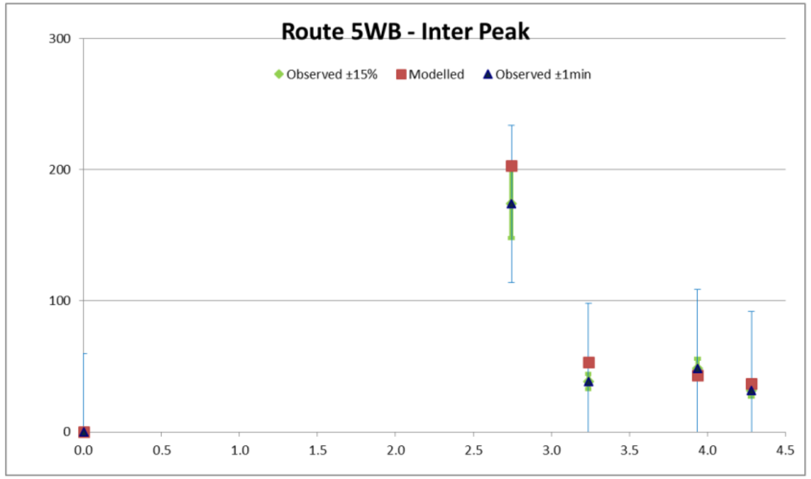
RIS A585 - JT Route
Time Distance Plots

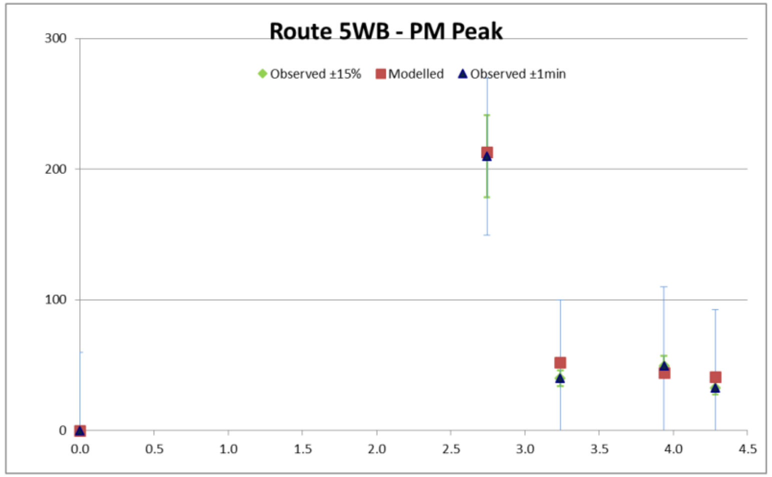






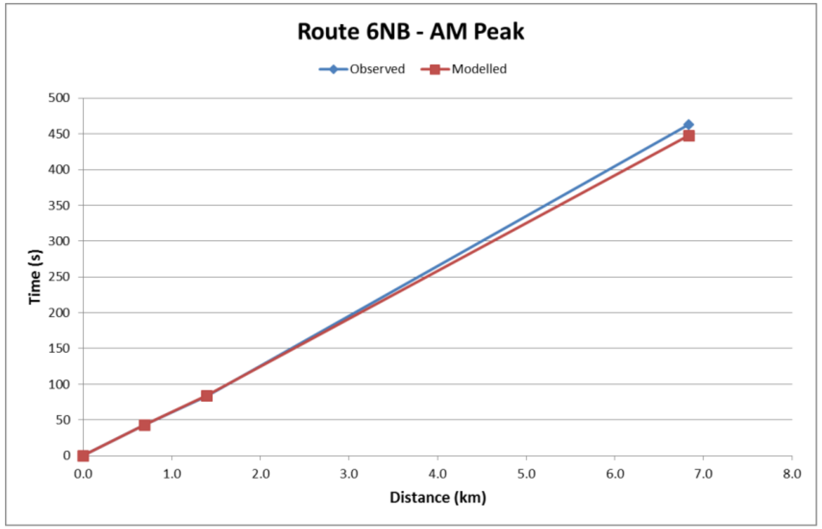


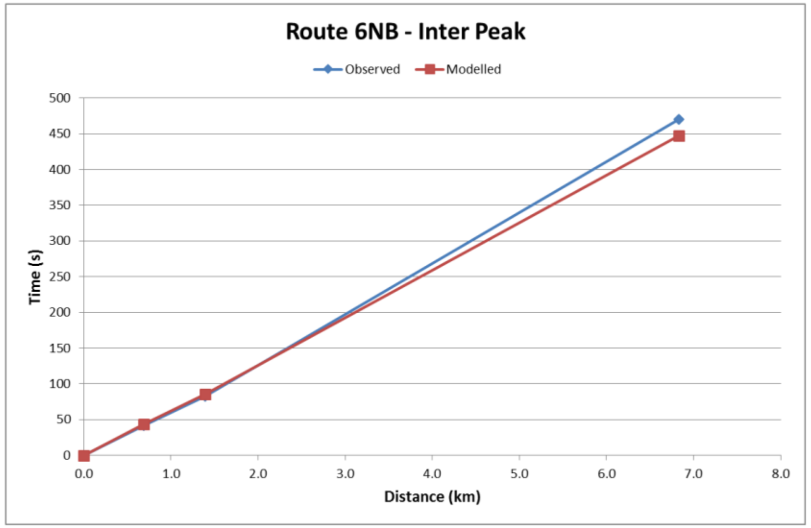


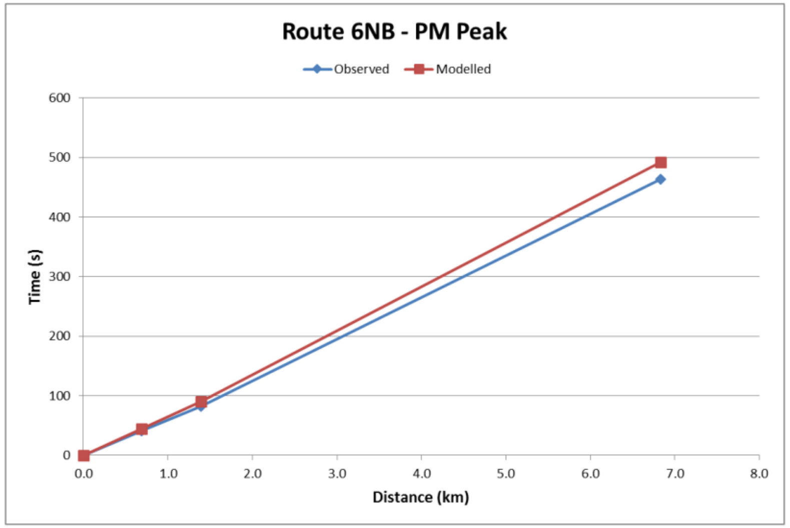


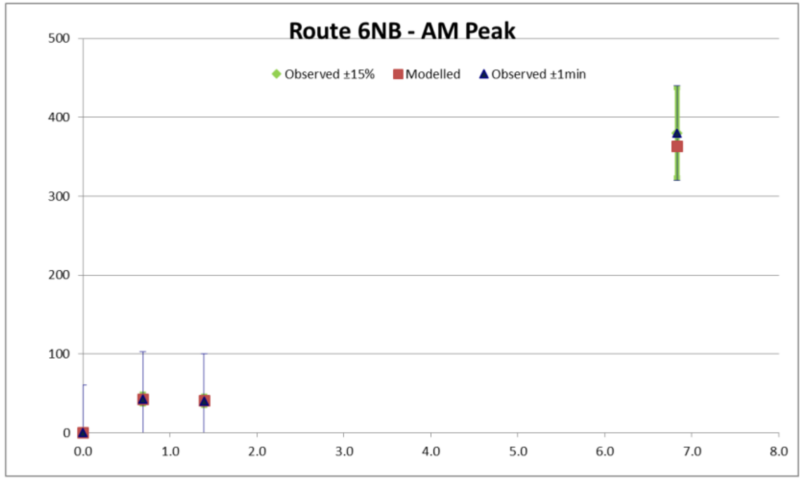
Route 5WB

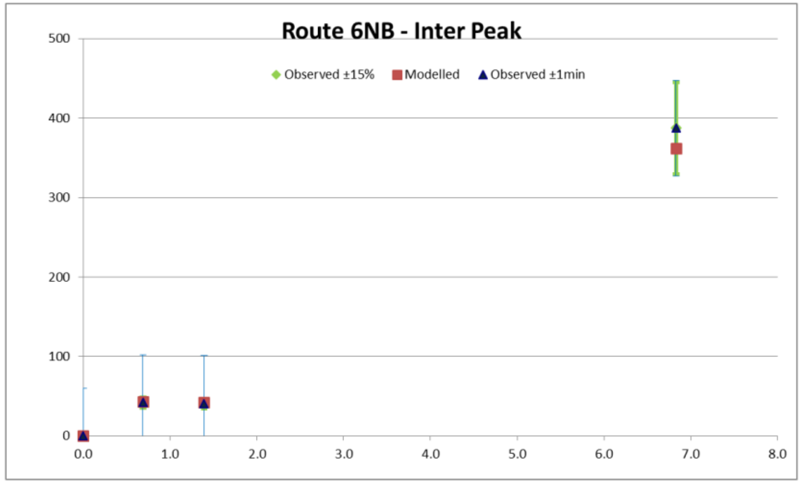
RIS A585 - JT Route
Time Distance Plots

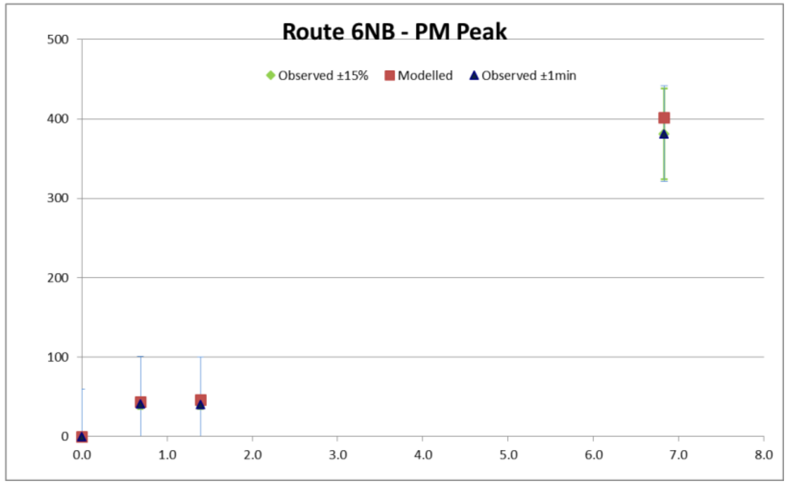






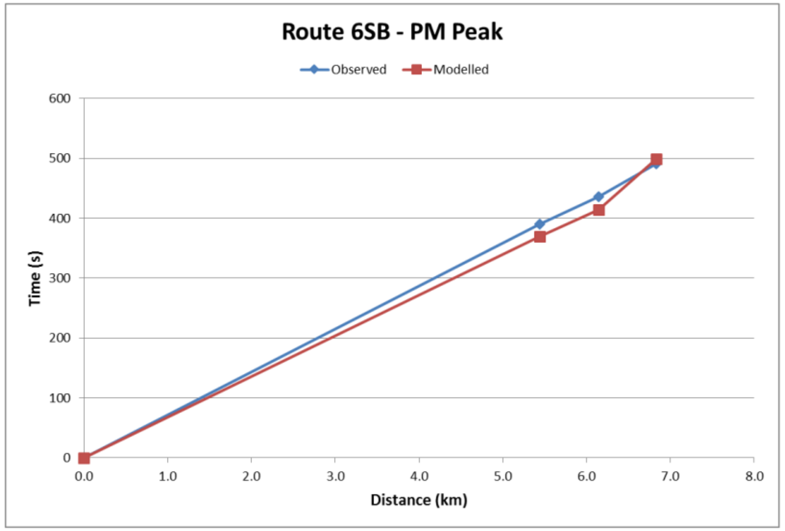


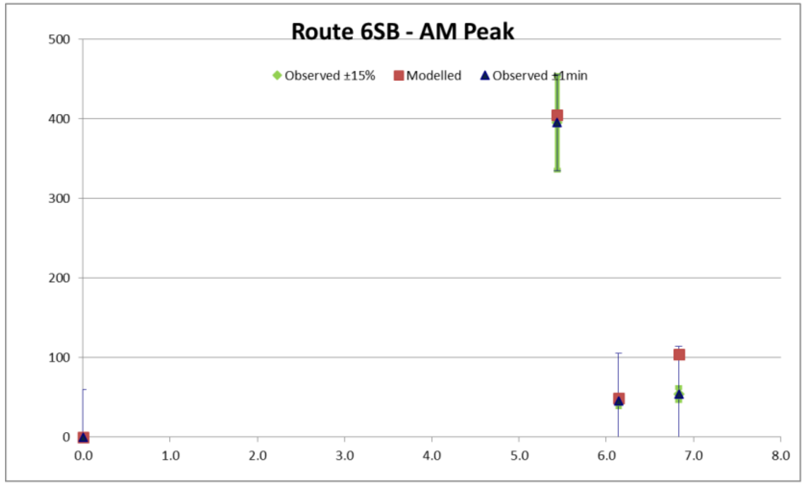


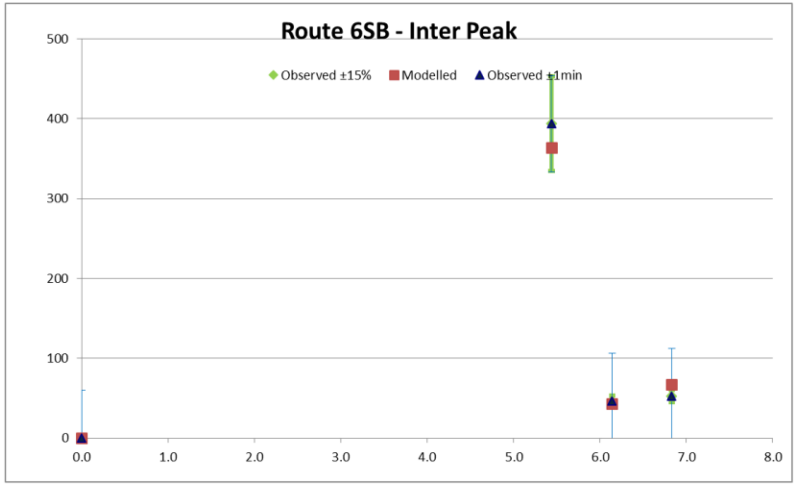


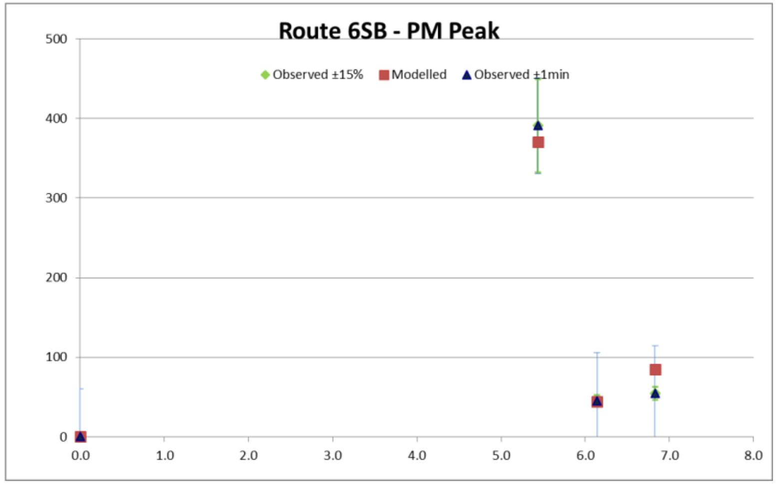
Route 6NB

RIS A585 - JT Route
Time Distance Plots



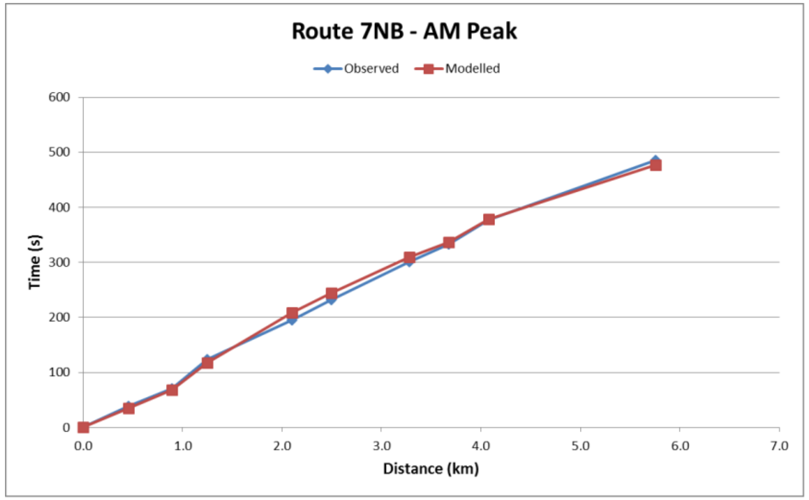


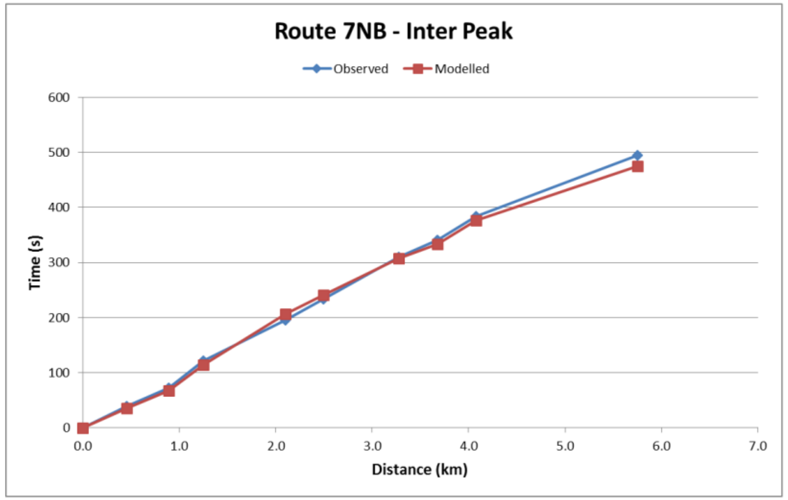


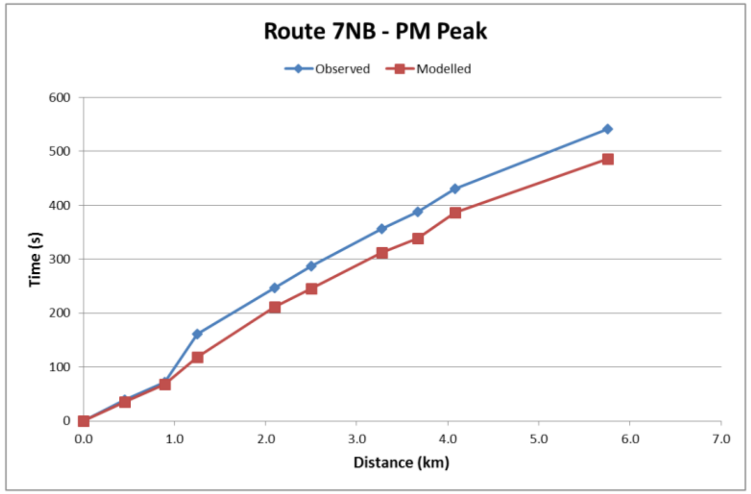


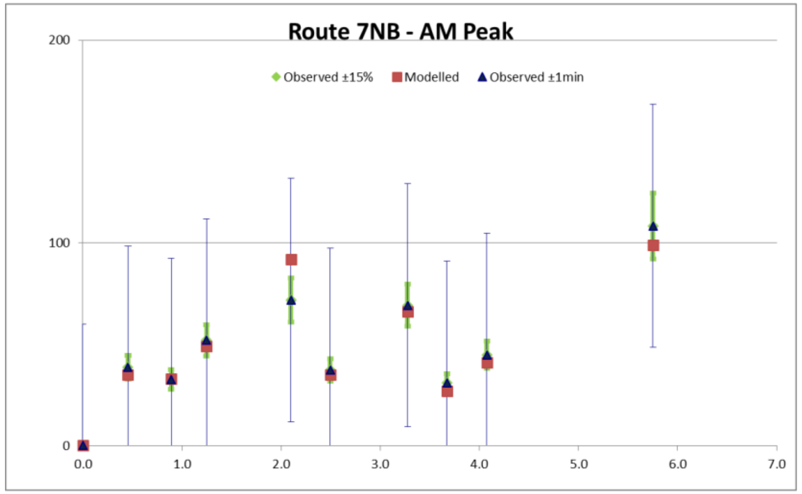
Route 6SB

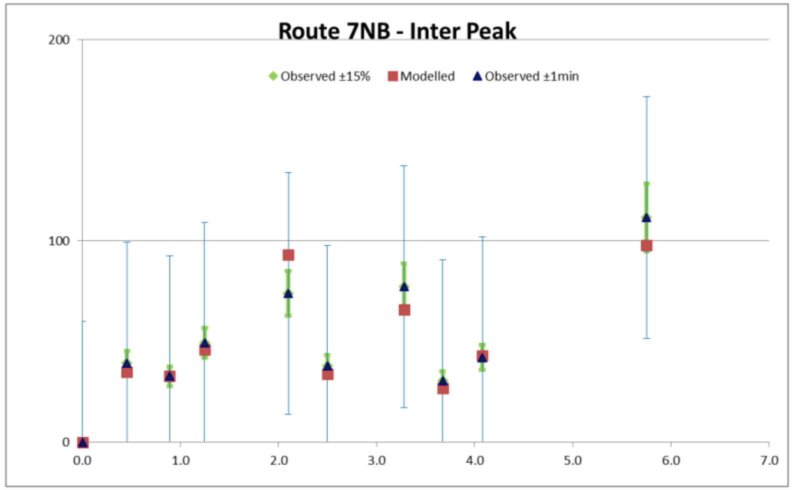
RIS A585 - JT Route
Time Distance Plots

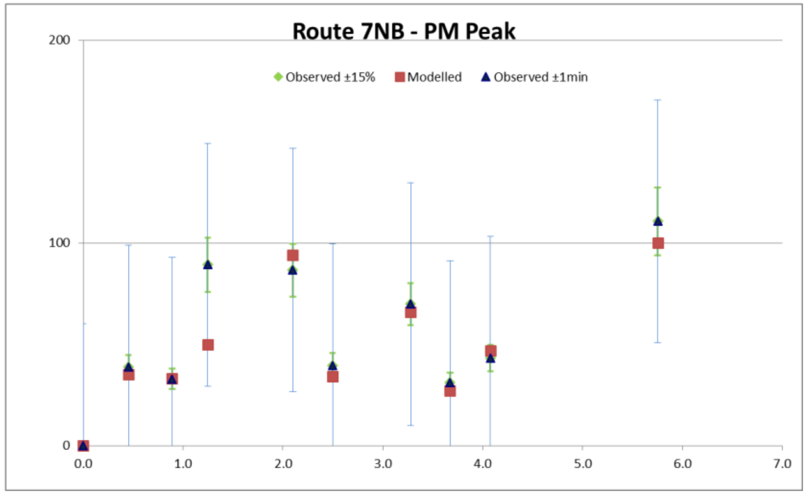






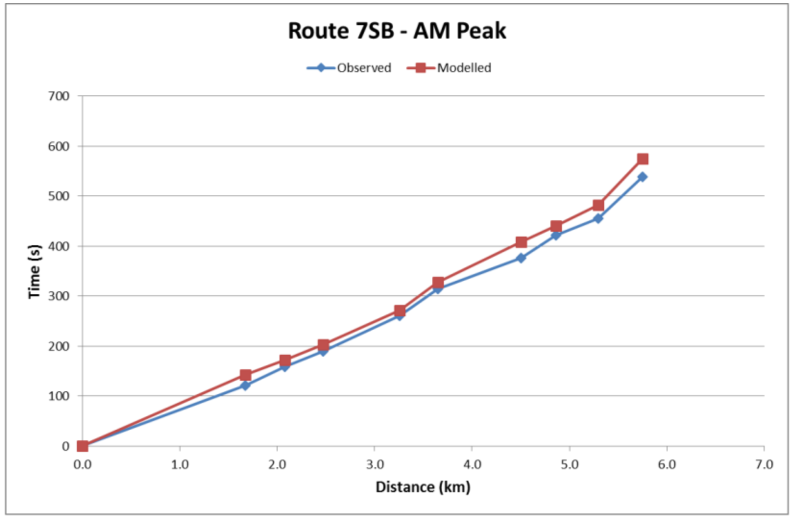


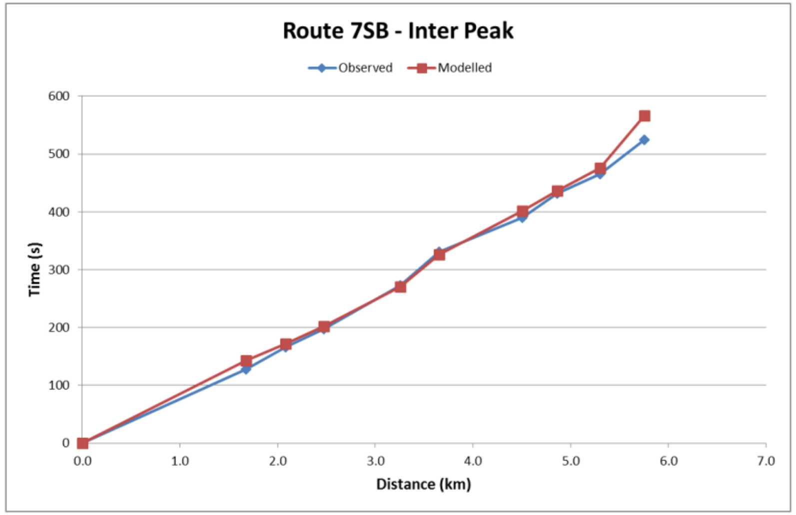


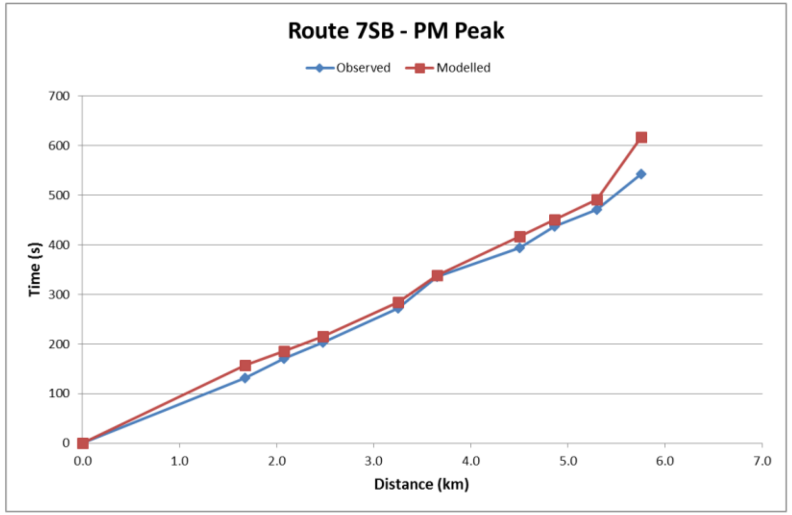


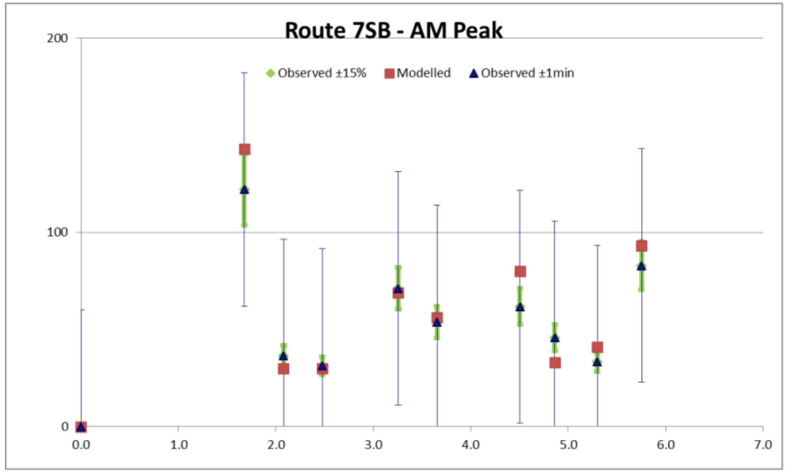
Route 7NB

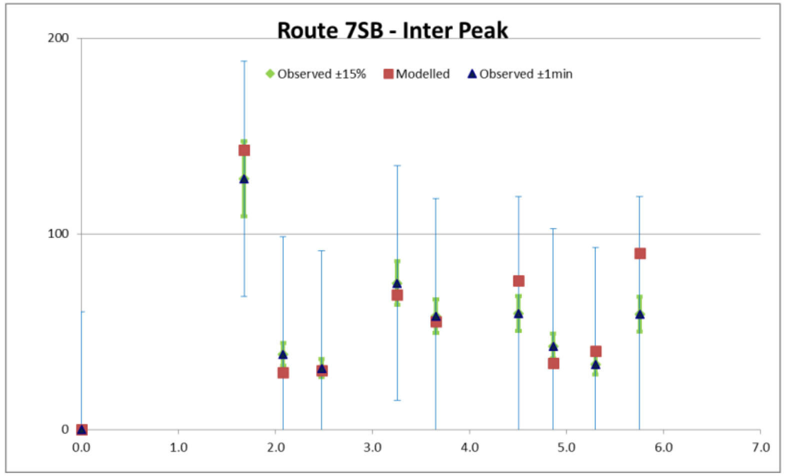
RIS A585 - JT Route
Time Distance Plots

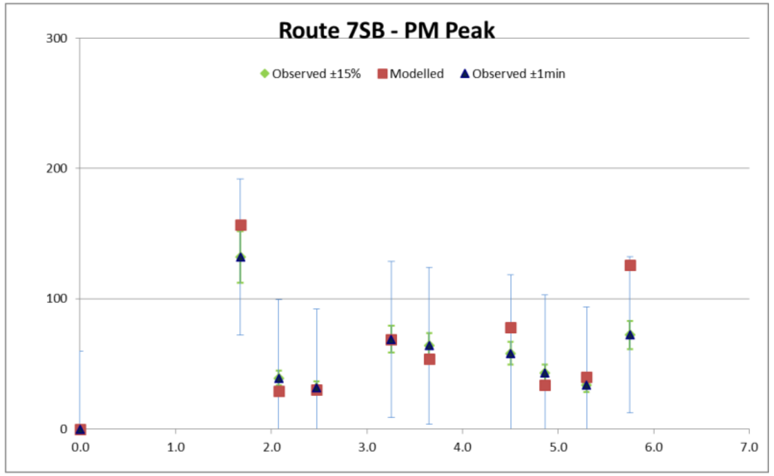






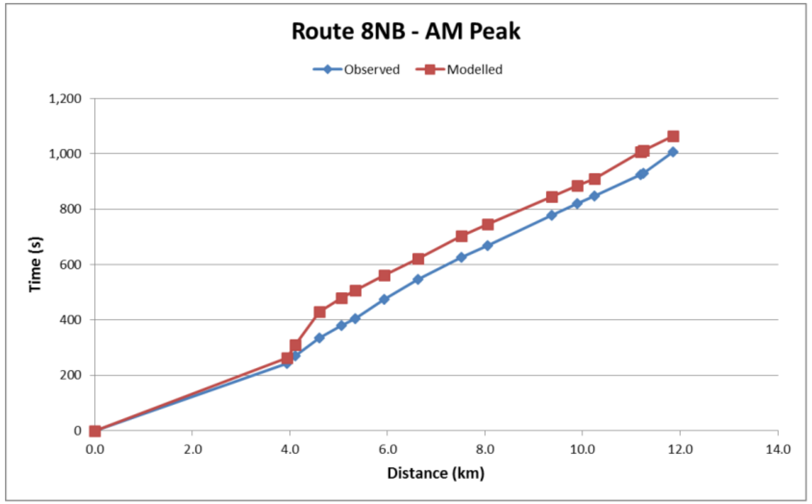


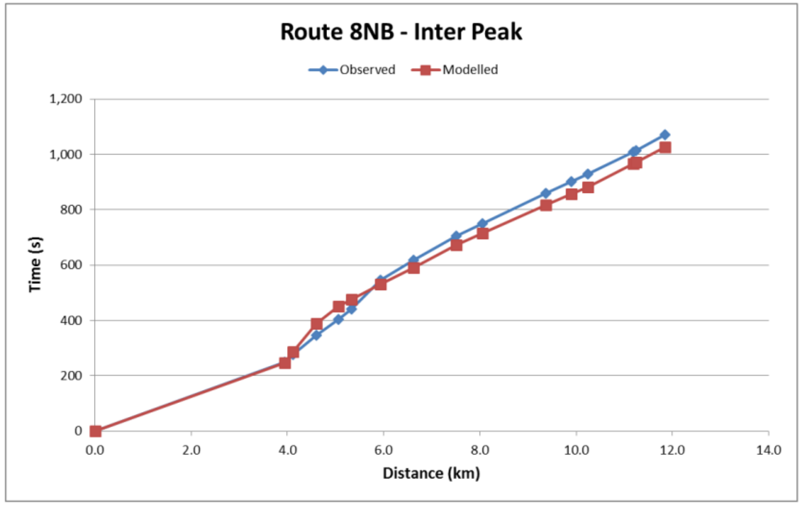


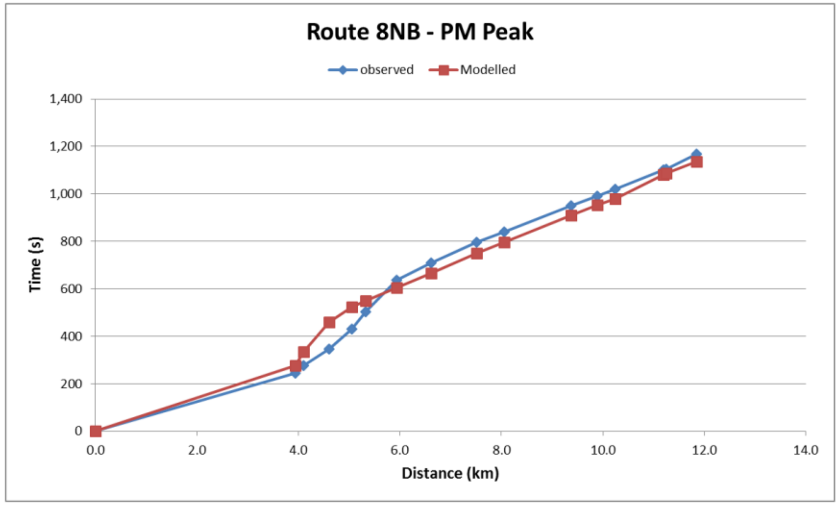


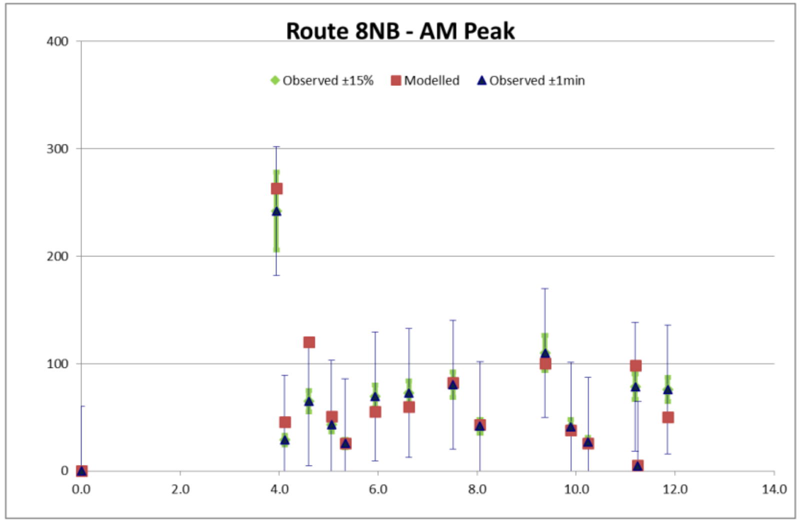
Route 7SB

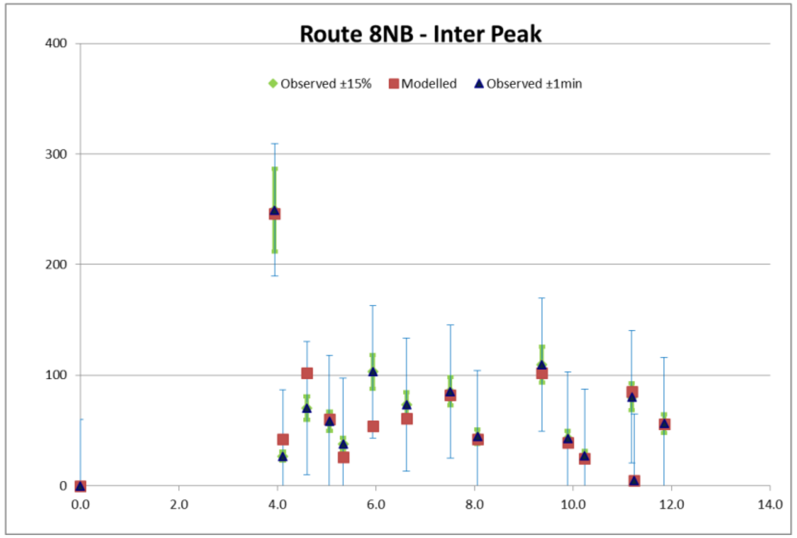
RIS A585 - JT Route
Time Distance Plots

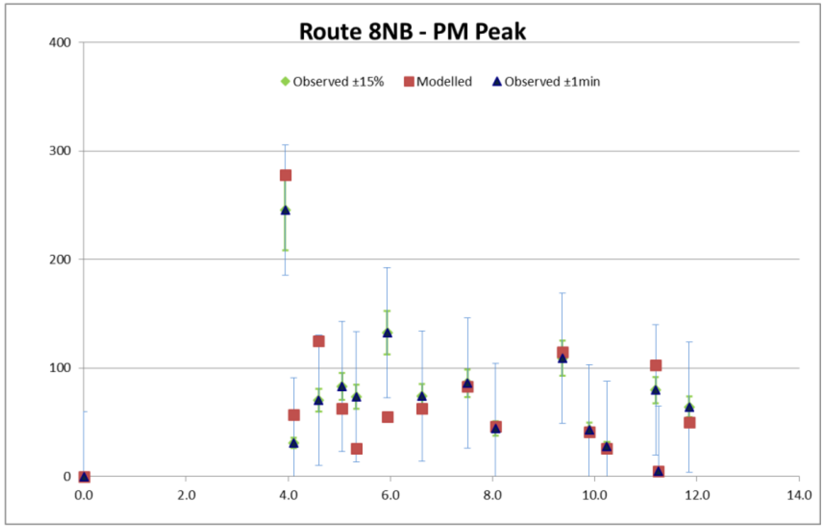






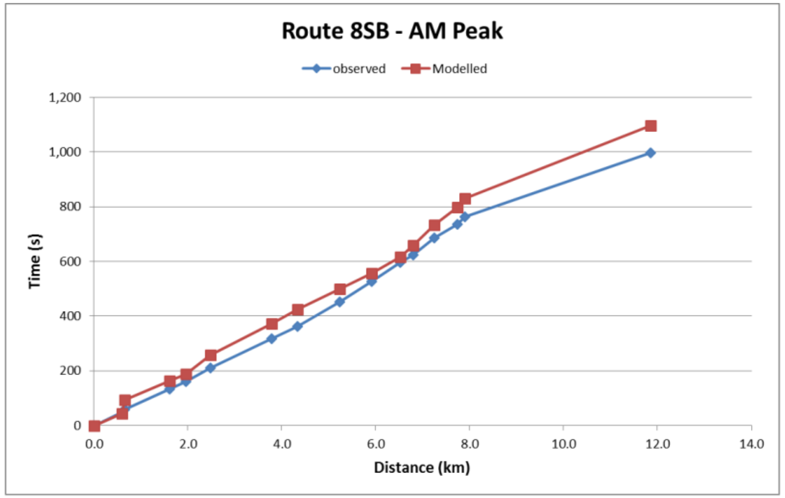


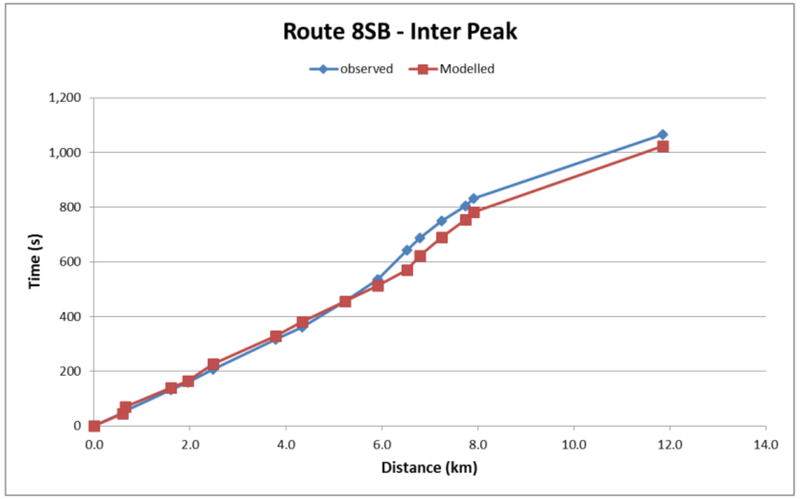


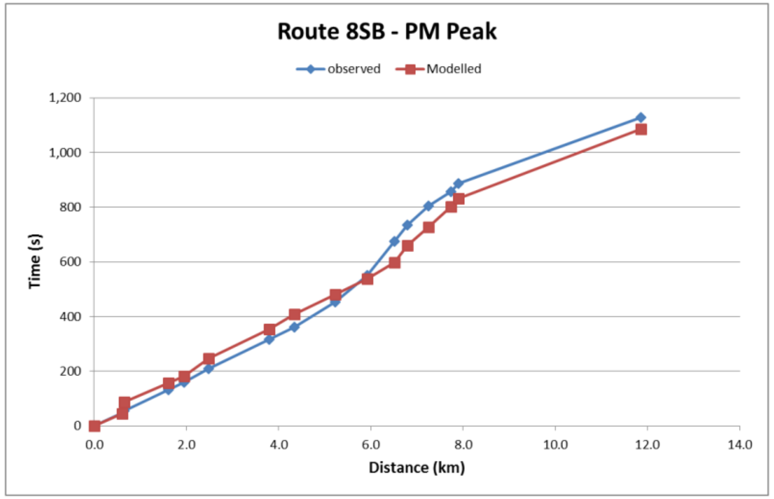


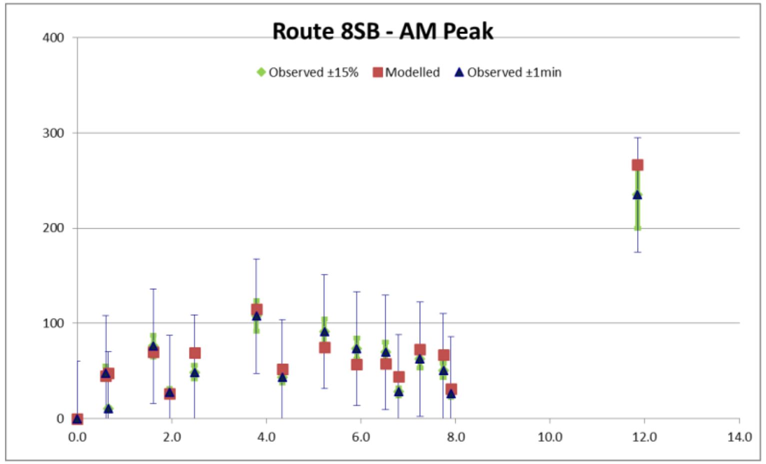
Route 8NB

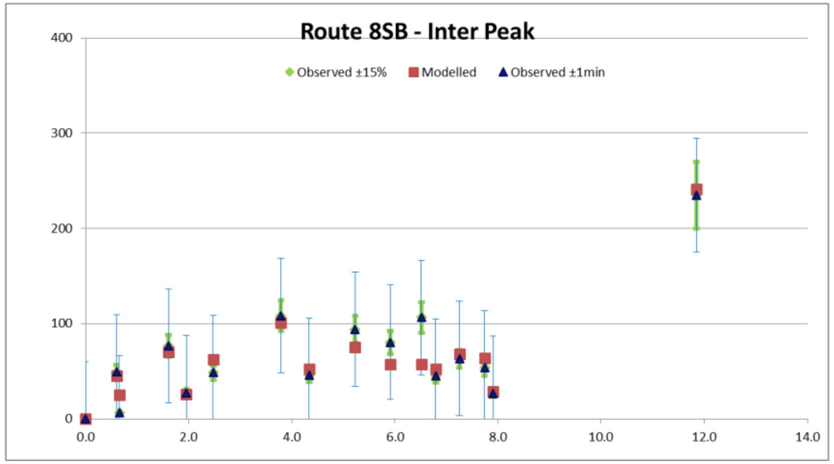
RIS A585 - JT Route
Time Distance Plots

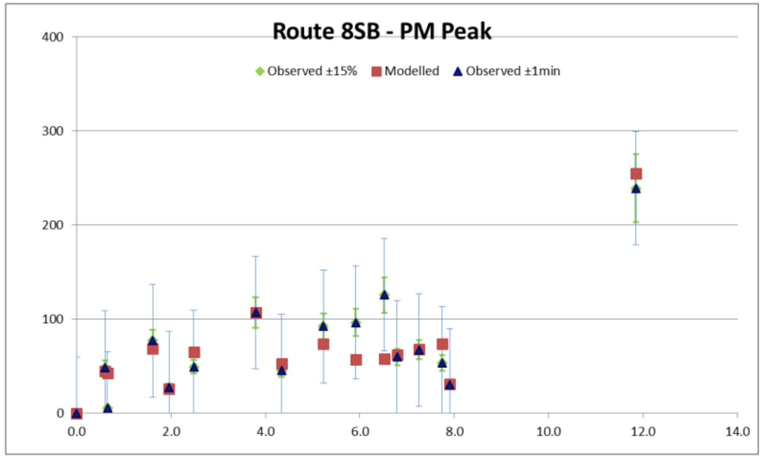






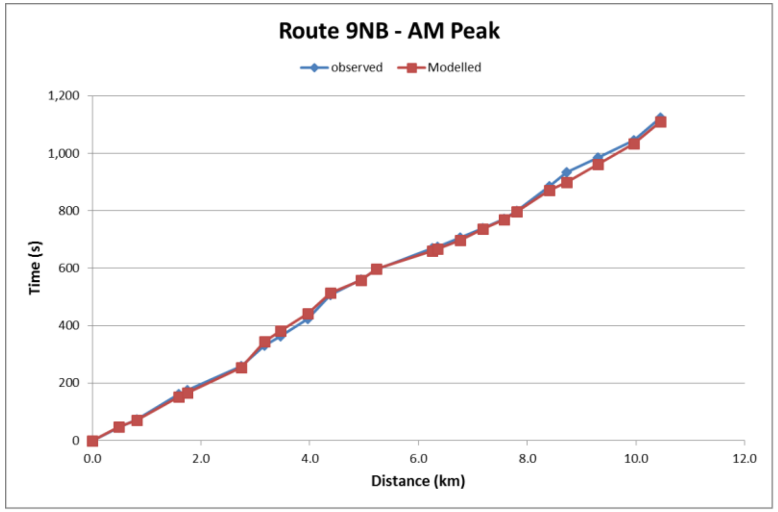


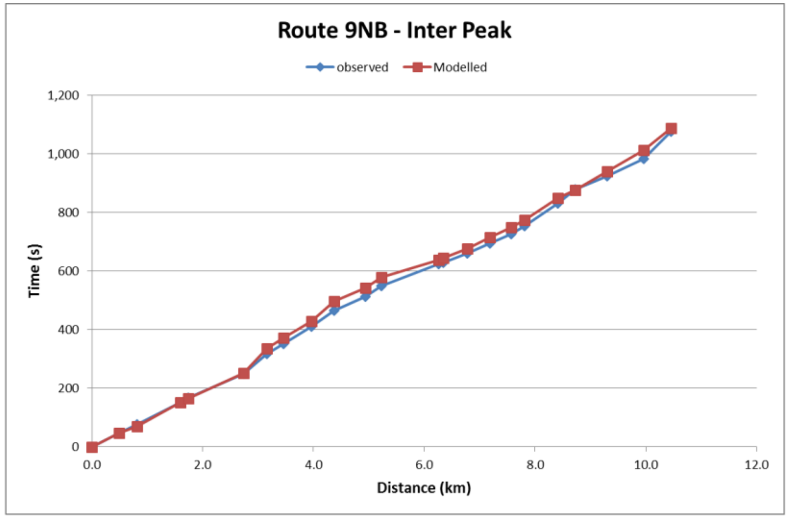


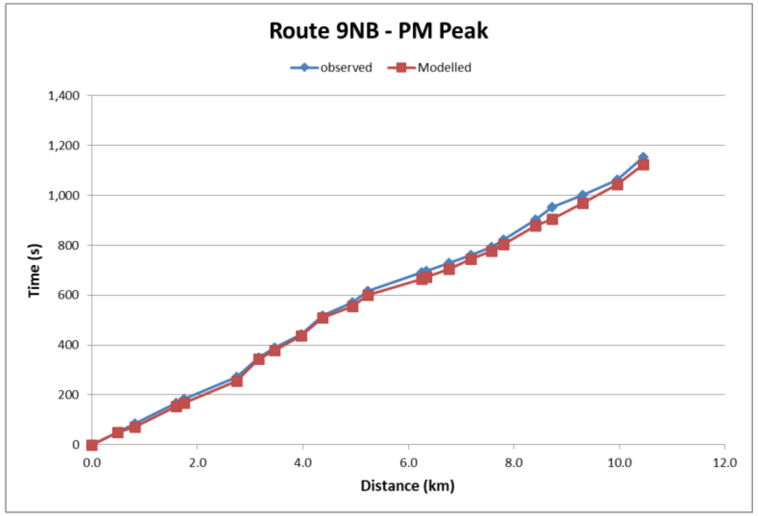


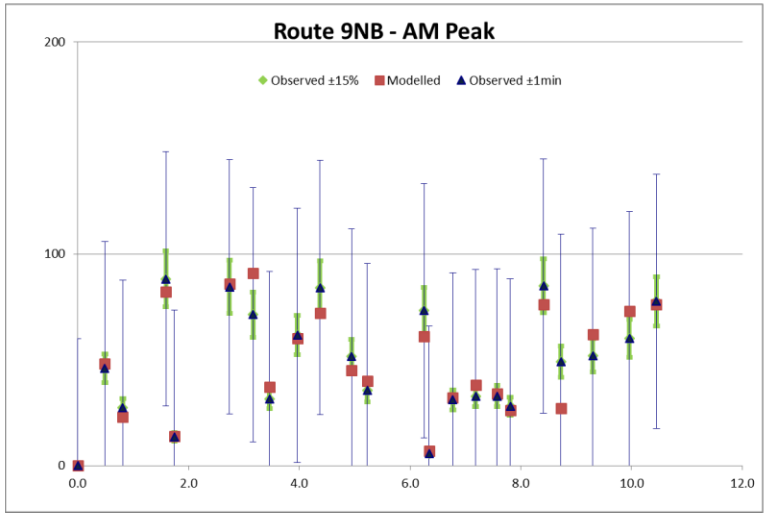
Route 8SB

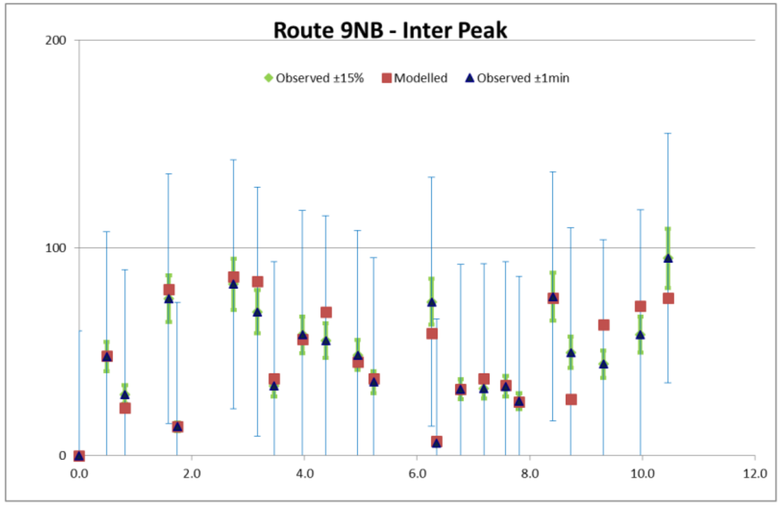
RIS A585 - JT Route
Time Distance Plots

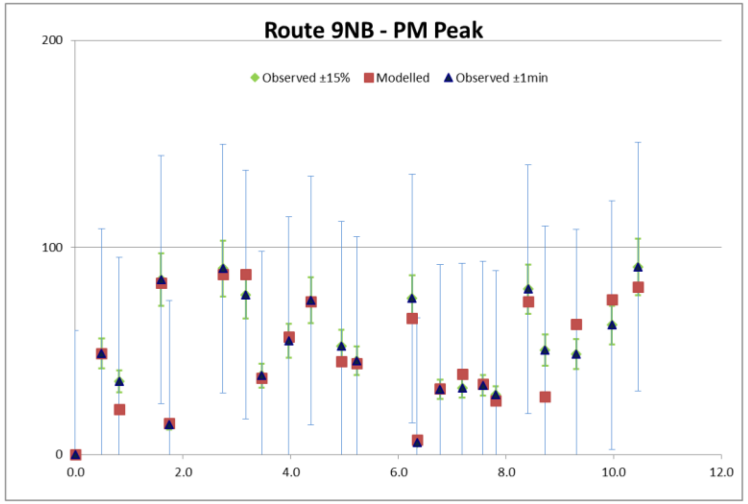






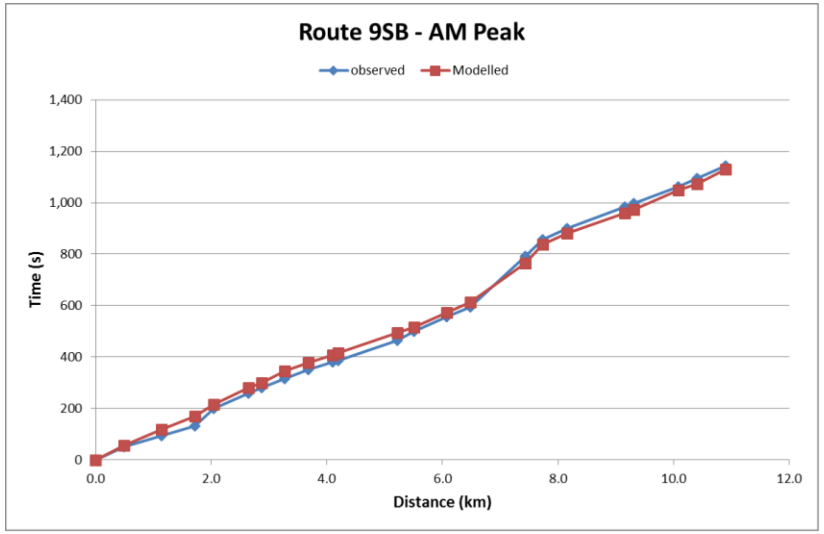


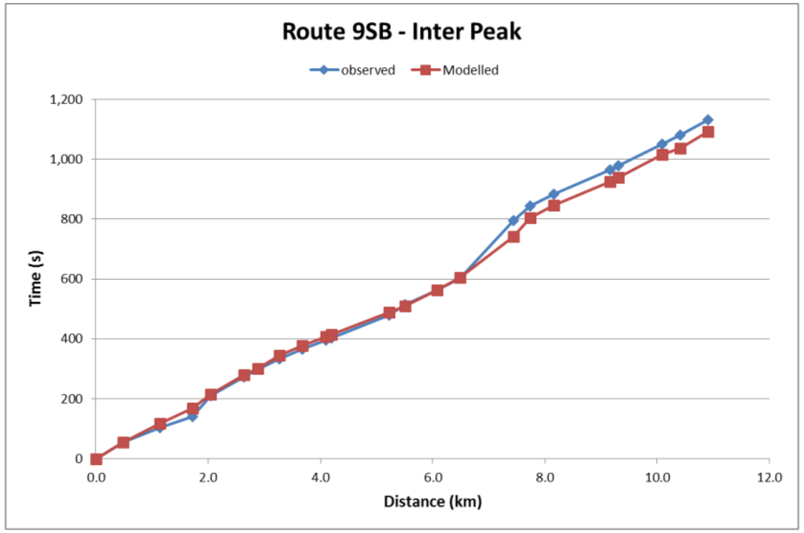


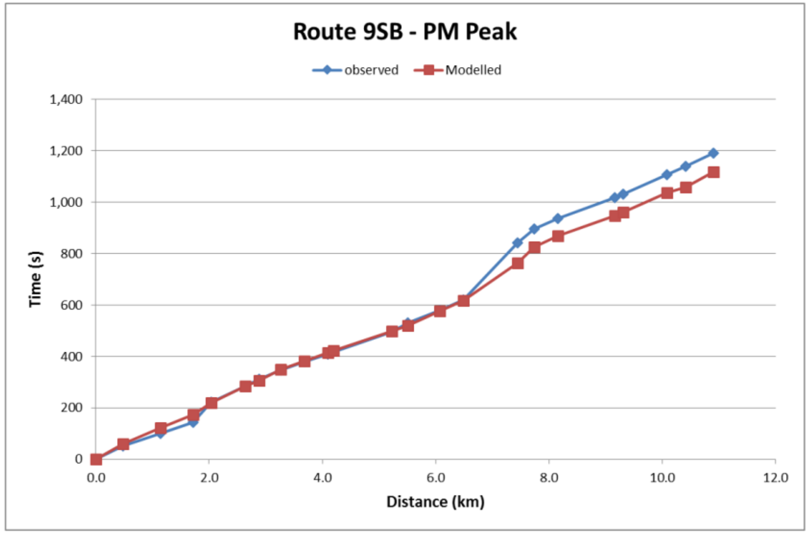


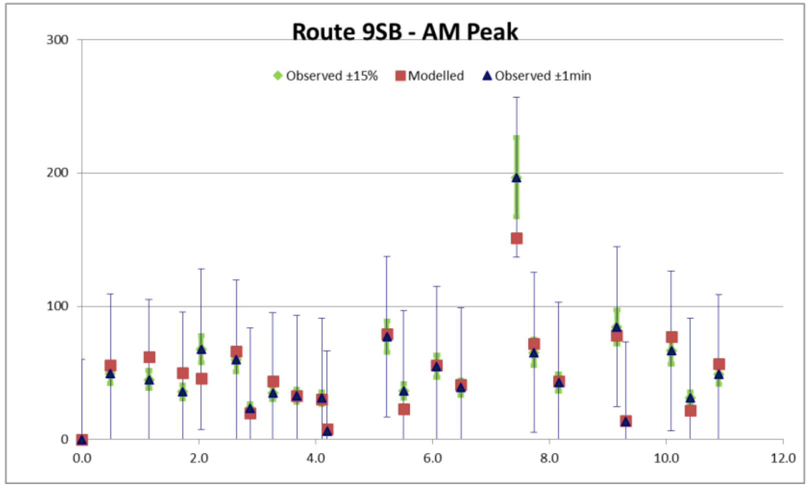
Route 9NB

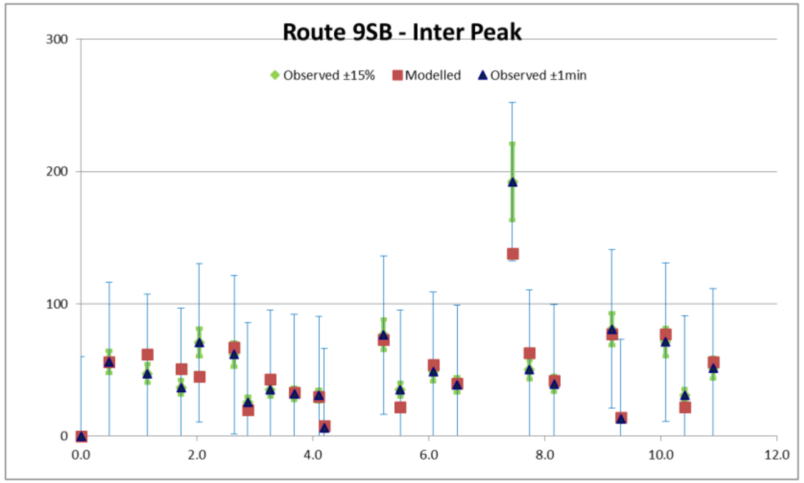
RIS A585 - JT Route
Time Distance Plots

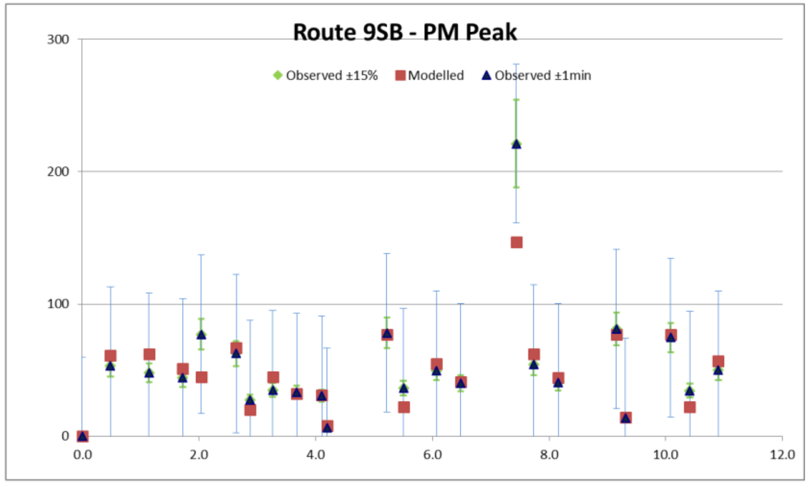

Route 9SB - AM Peak


Route 9SB - Inter Peak


Route 9SB - PM Peak

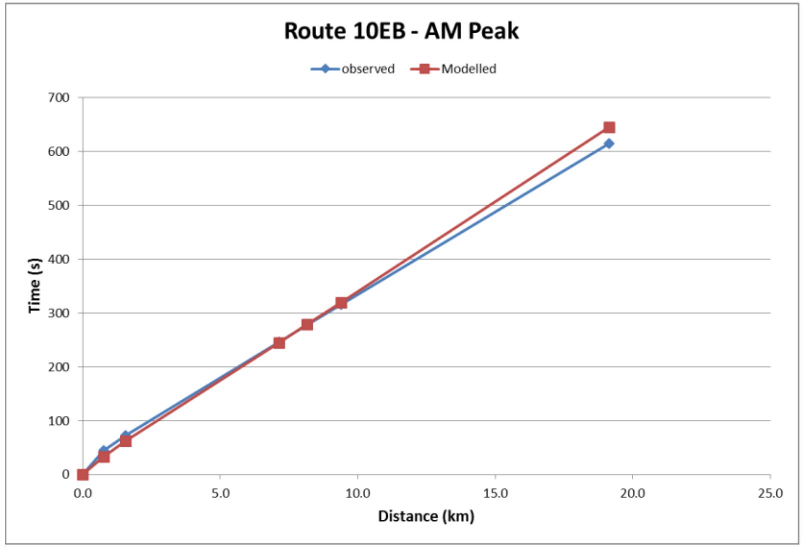

Route 9SB - AM Peak

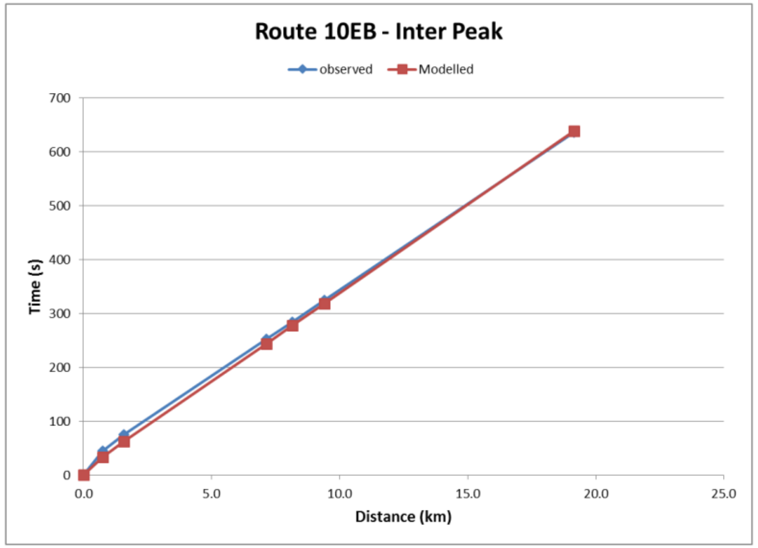

Route 9SB - Inter Peak

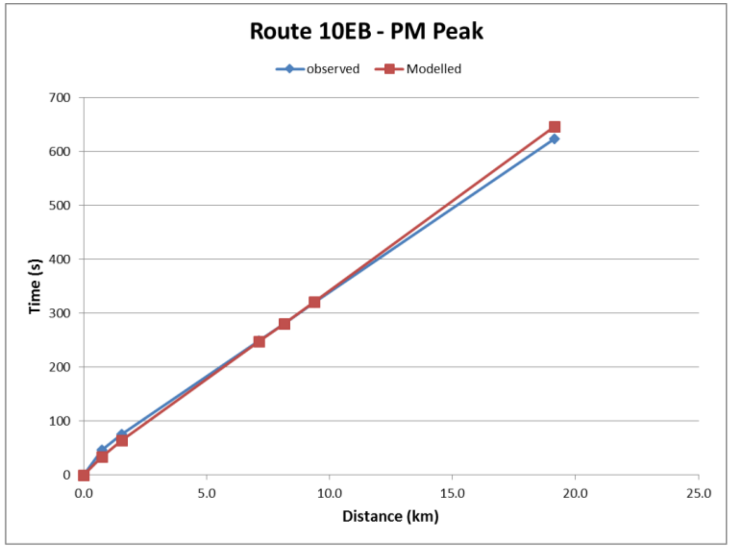

Route 9SB - PM Peak

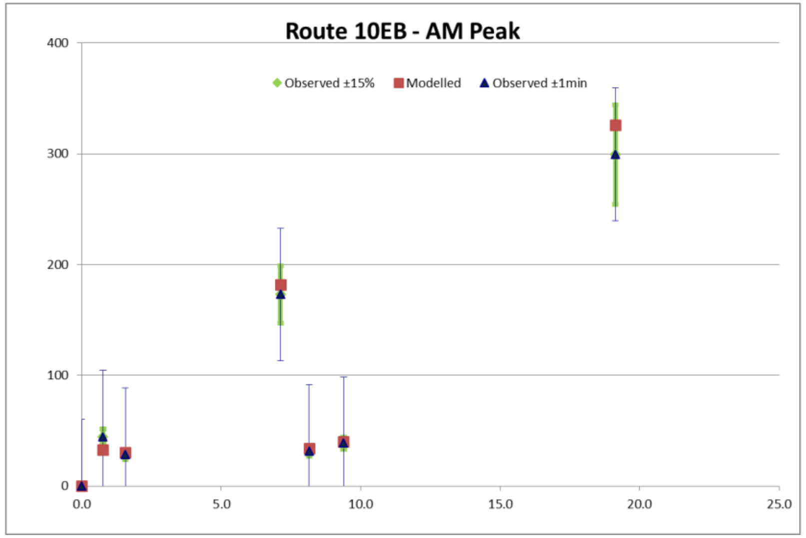
Route 9SB

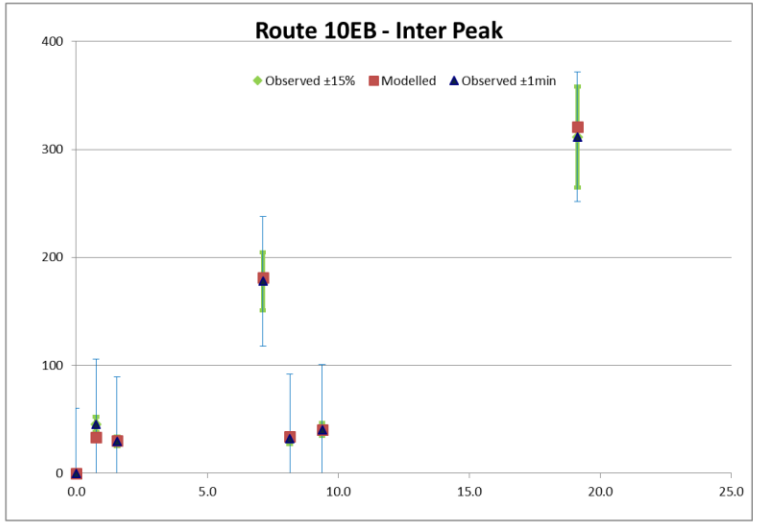
RIS A585 - JT Route
Time Distance Plots

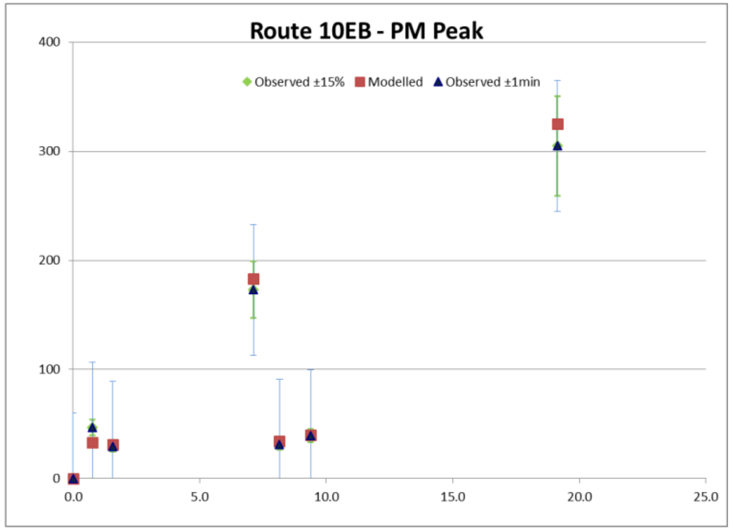






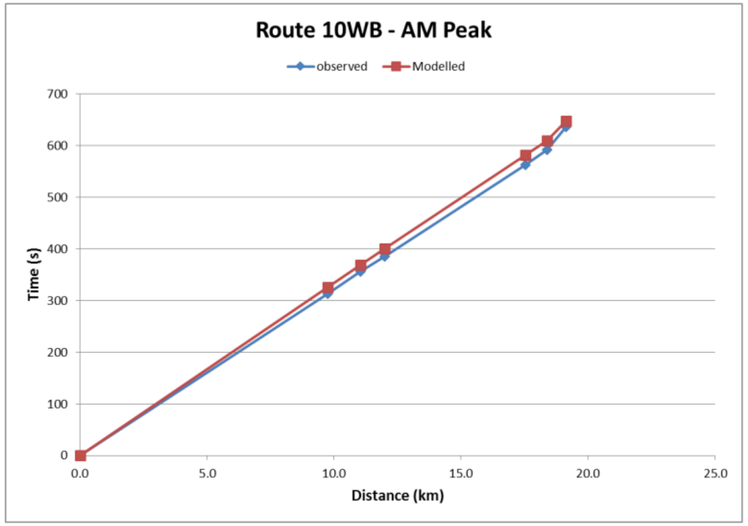


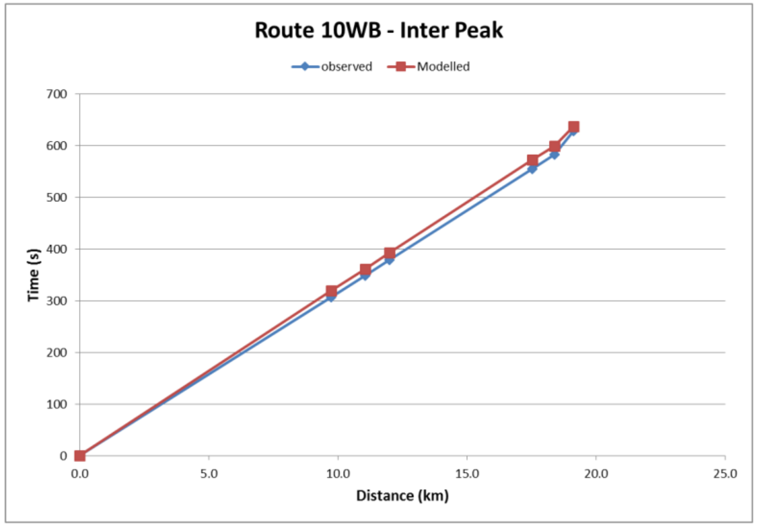


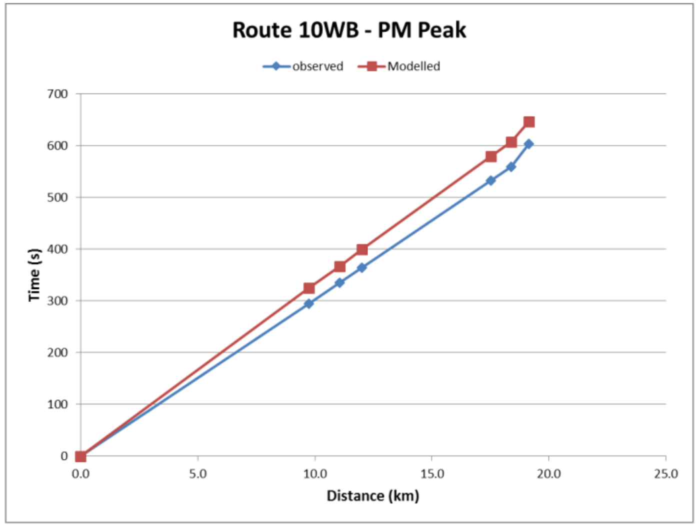


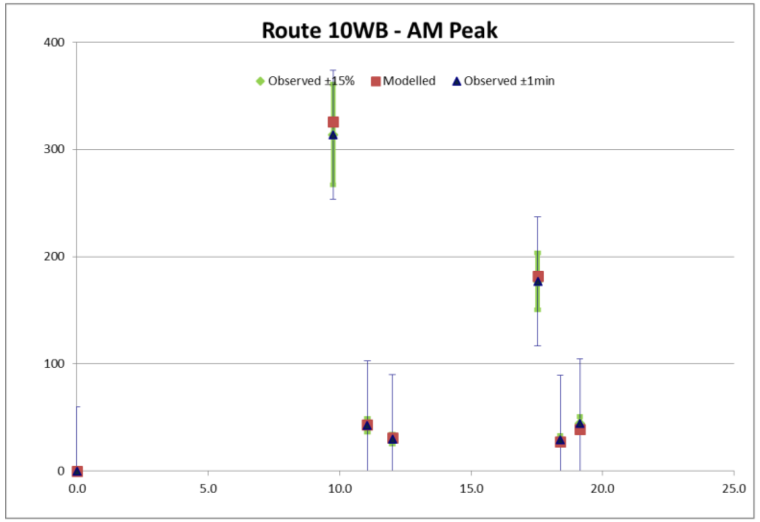
Route 10EB

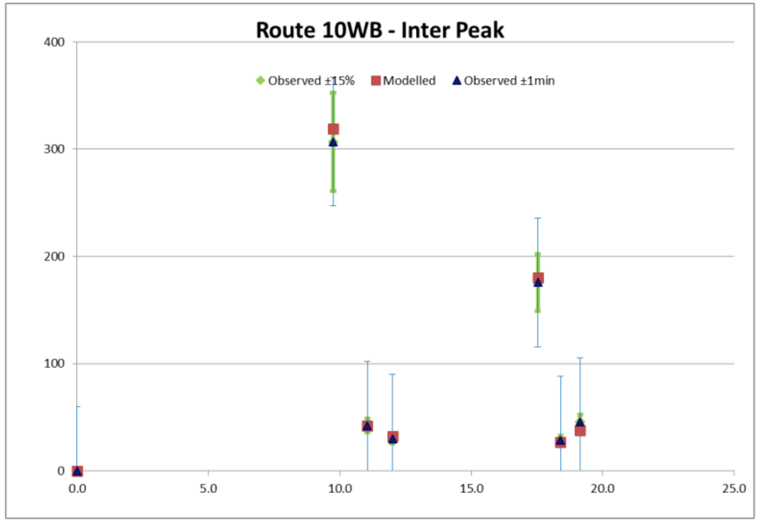
RIS A585 - JT Route
Time Distance Plots

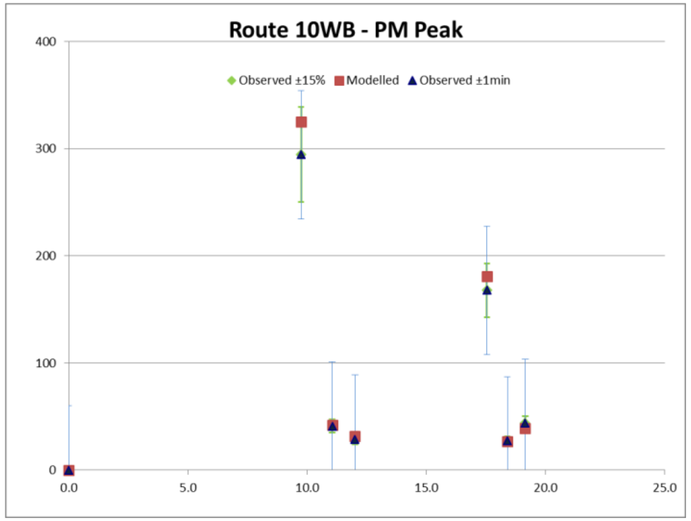






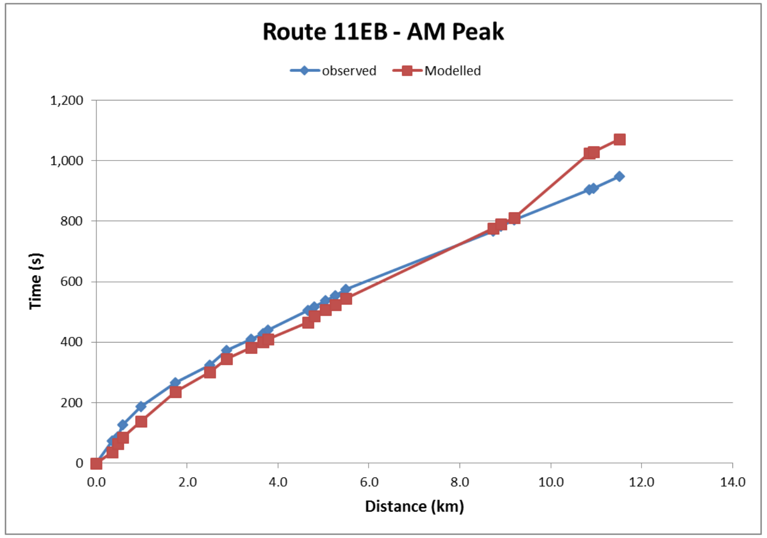


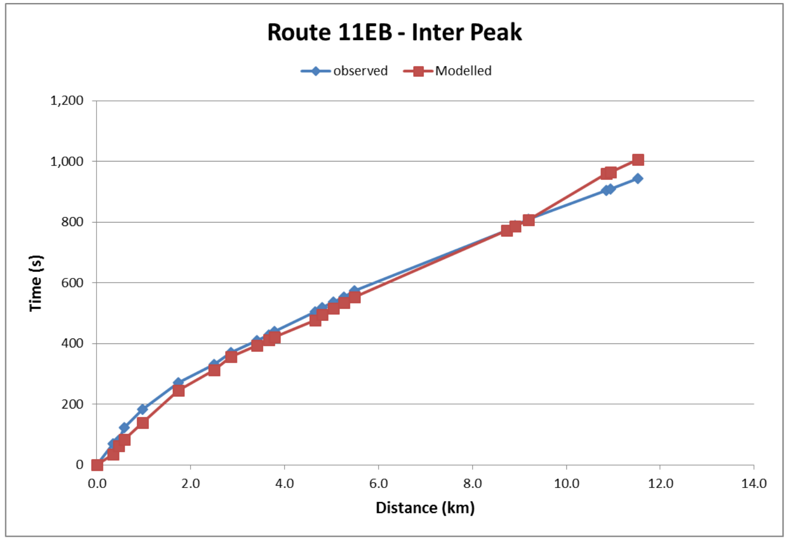


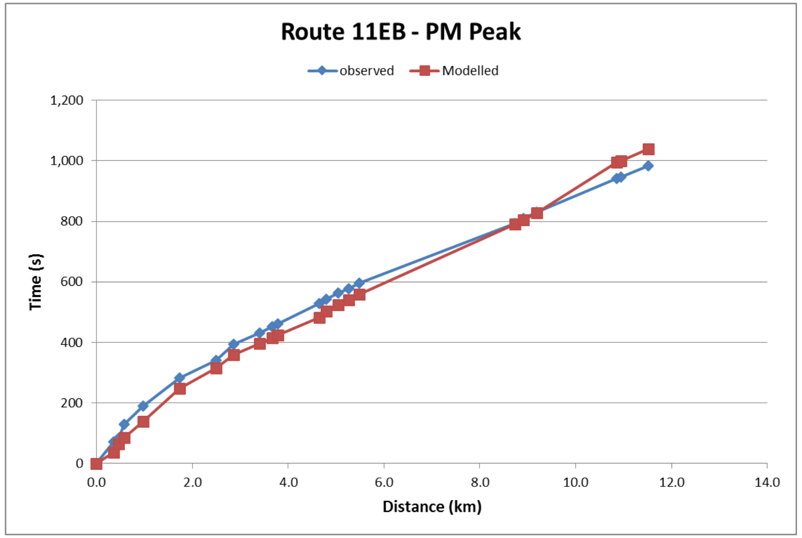


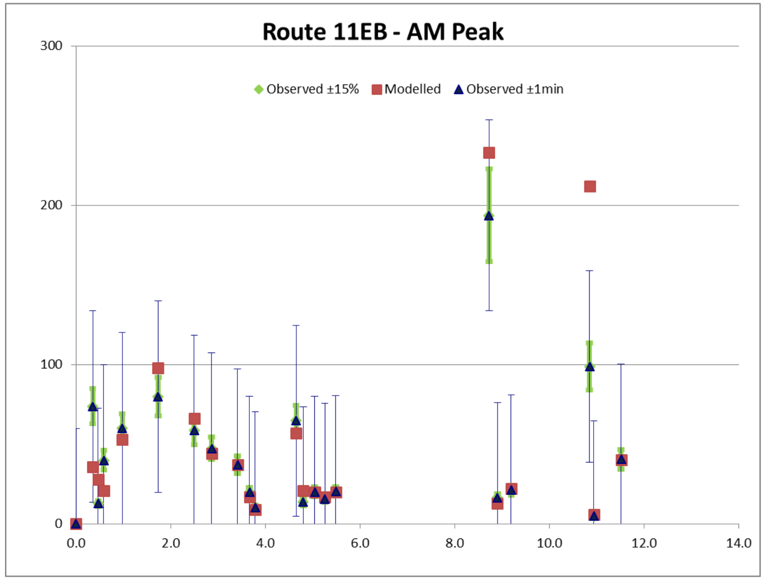
Route 10WB

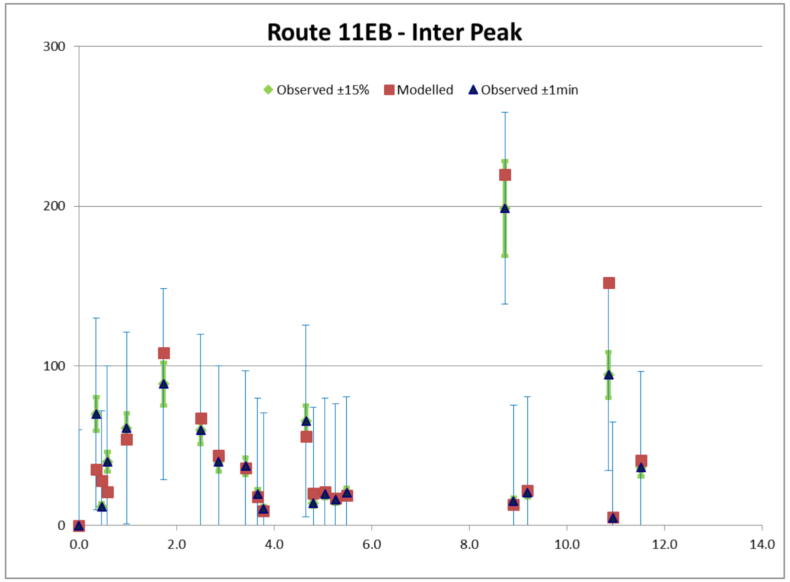
RIS A585 - JT Route
Time Distance Plots

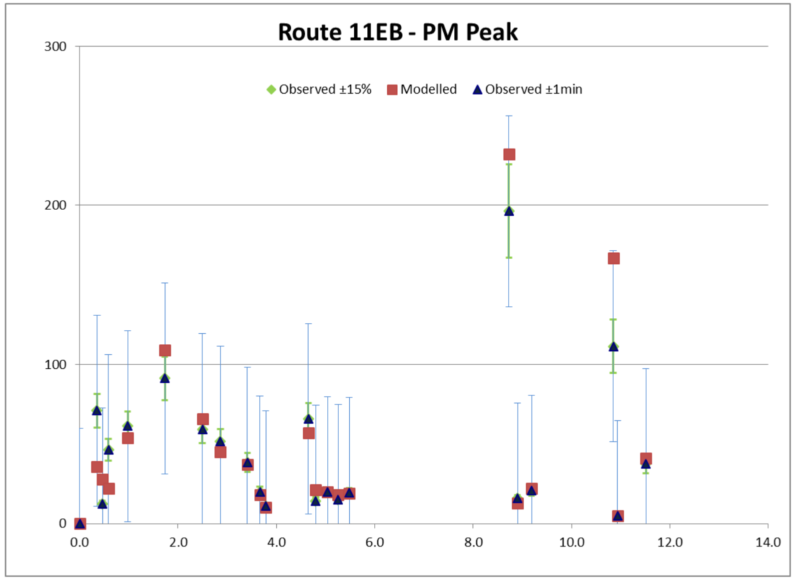






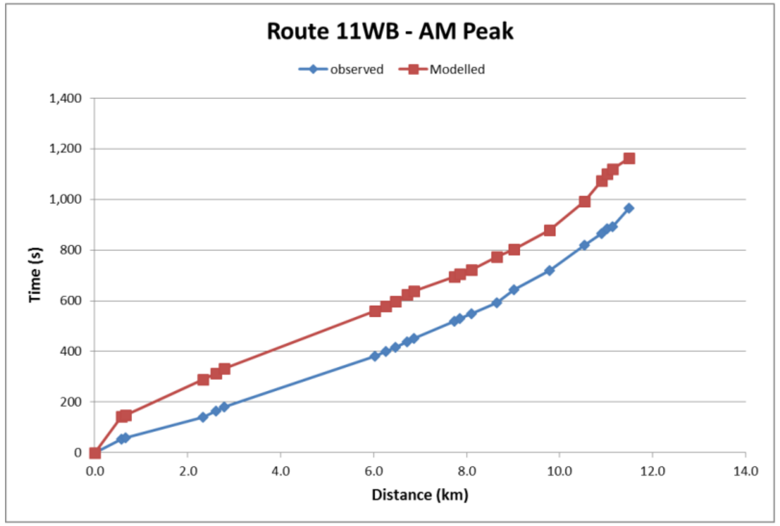


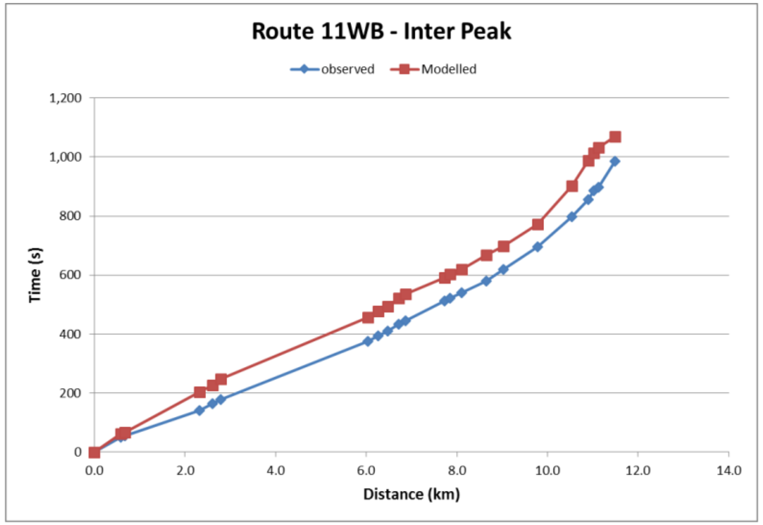


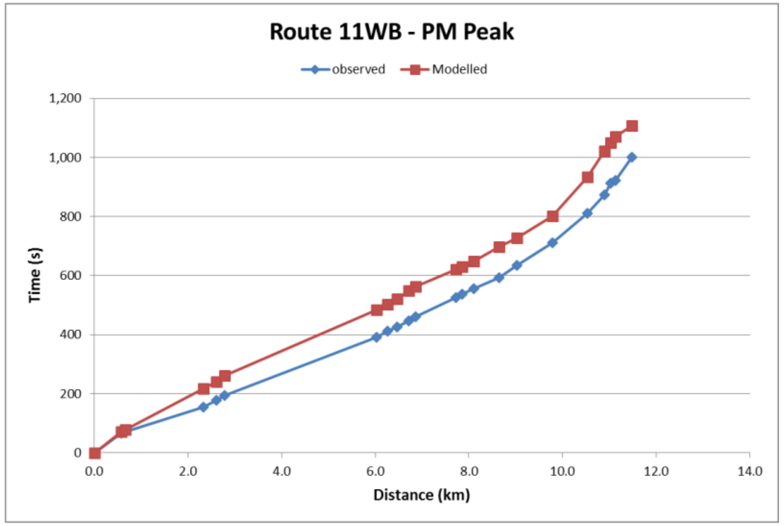


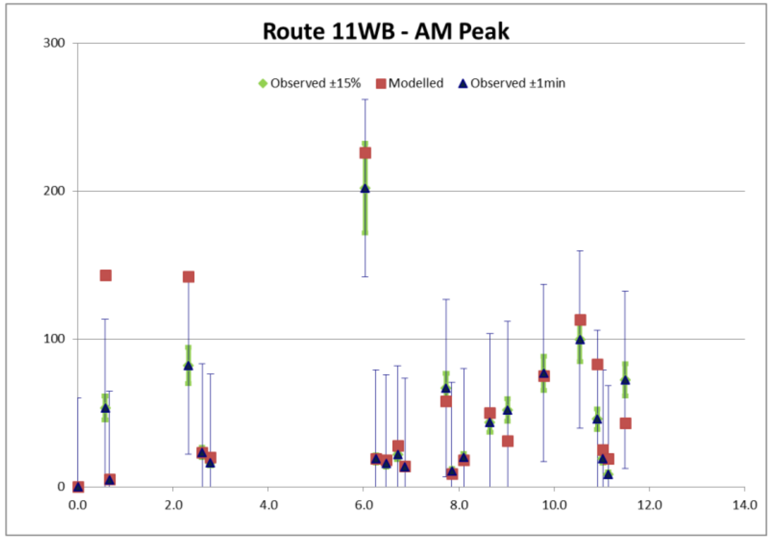
Route 11EB

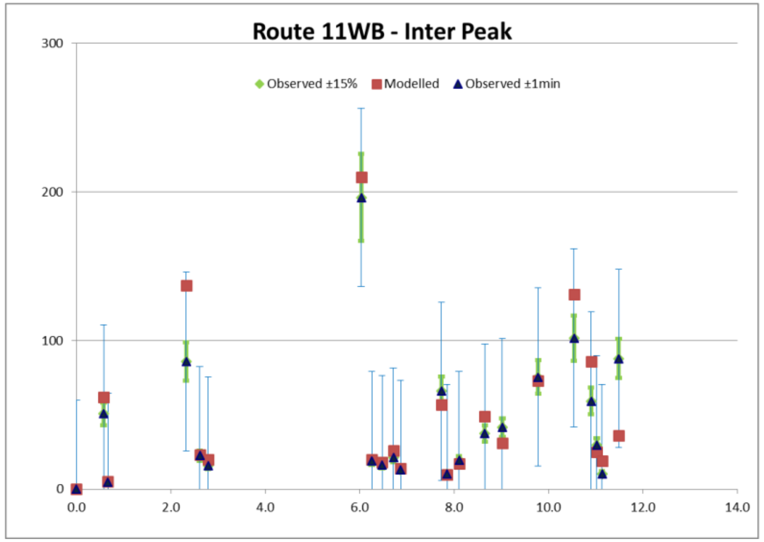
RIS A585 - JT Route
Time Distance Plots

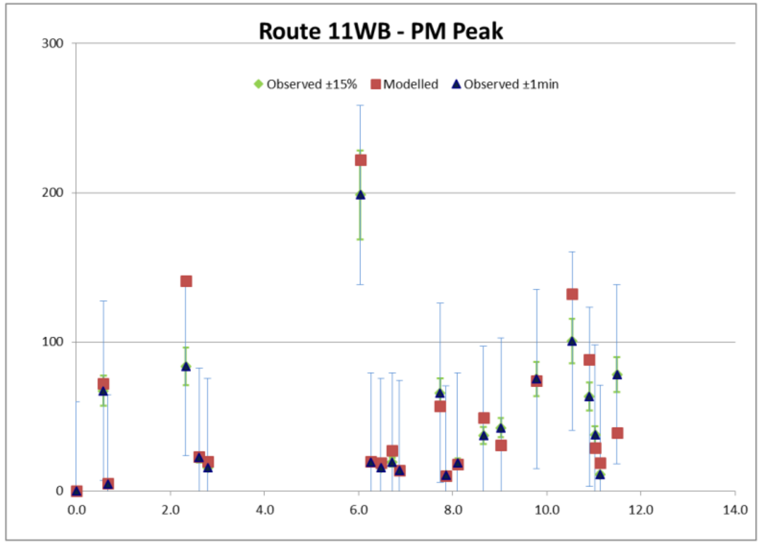






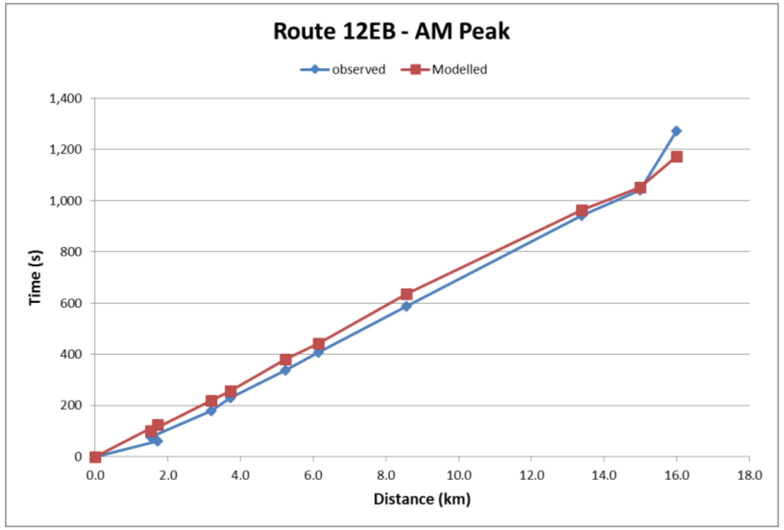


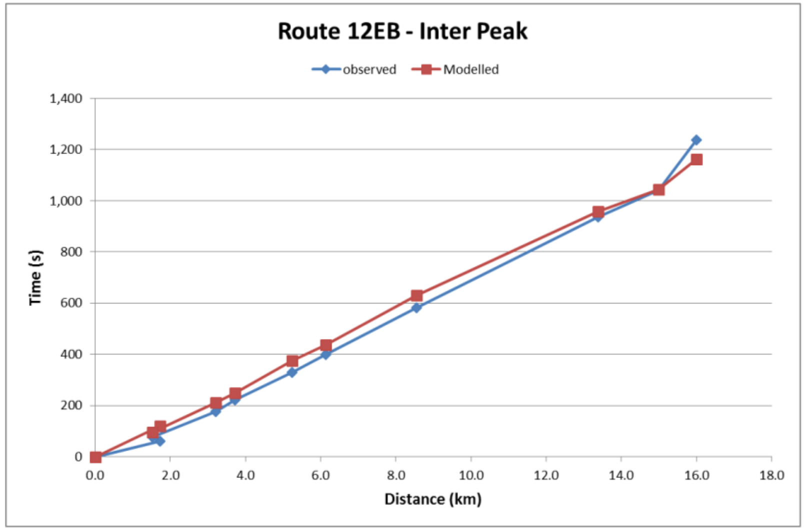


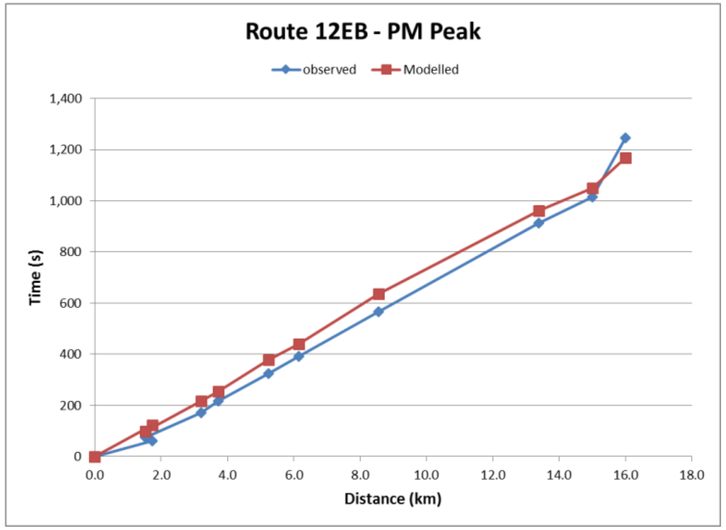


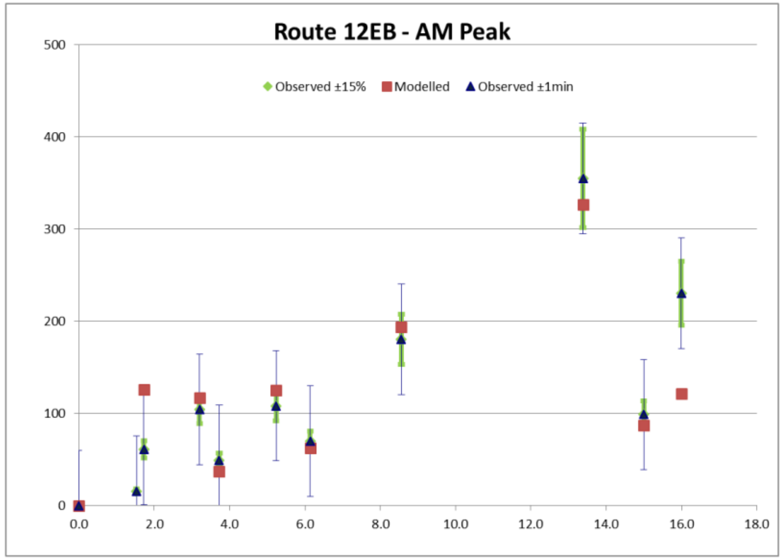
Route 11WB

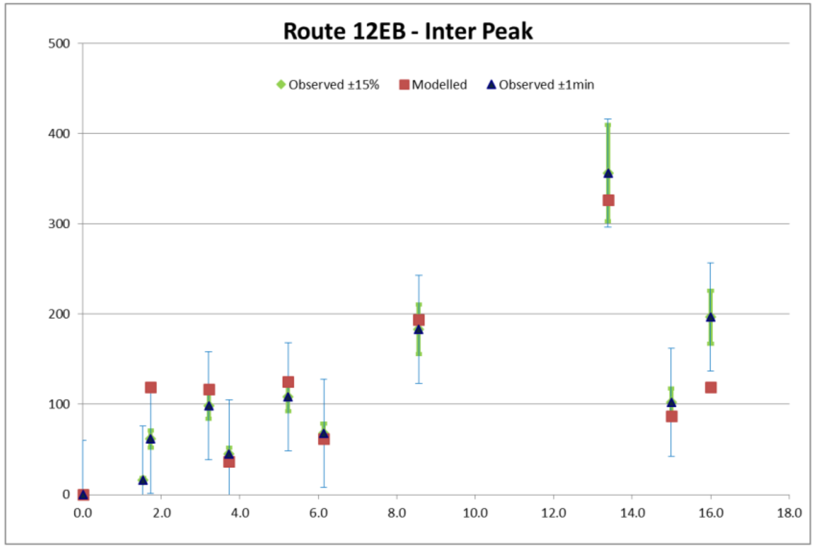
RIS A585 - JT Route
Time Distance Plots

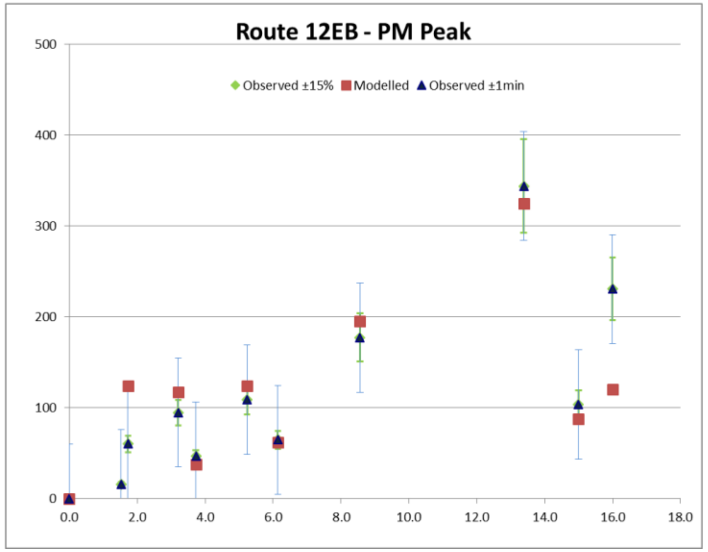






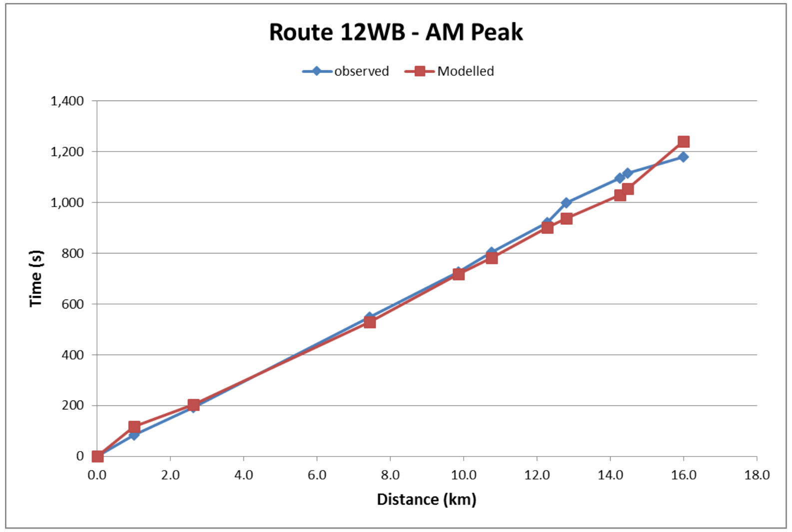


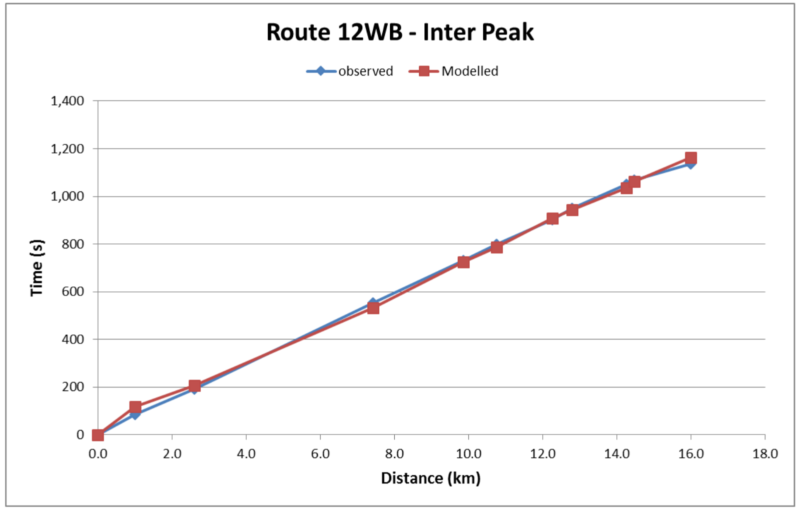


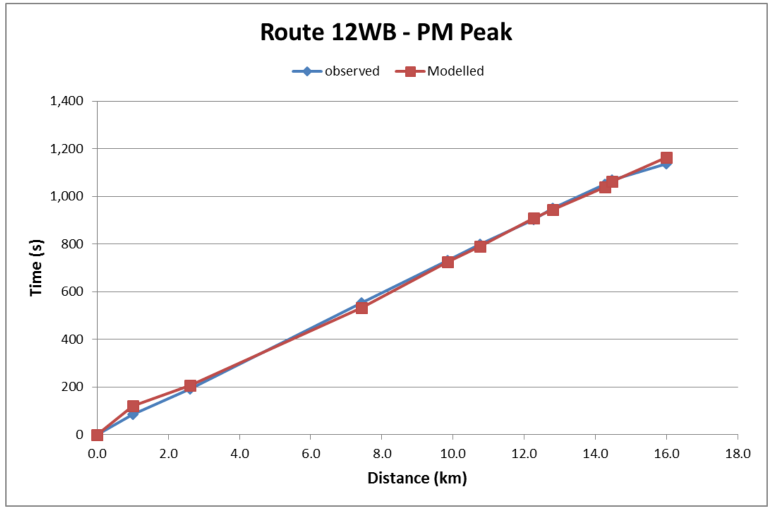


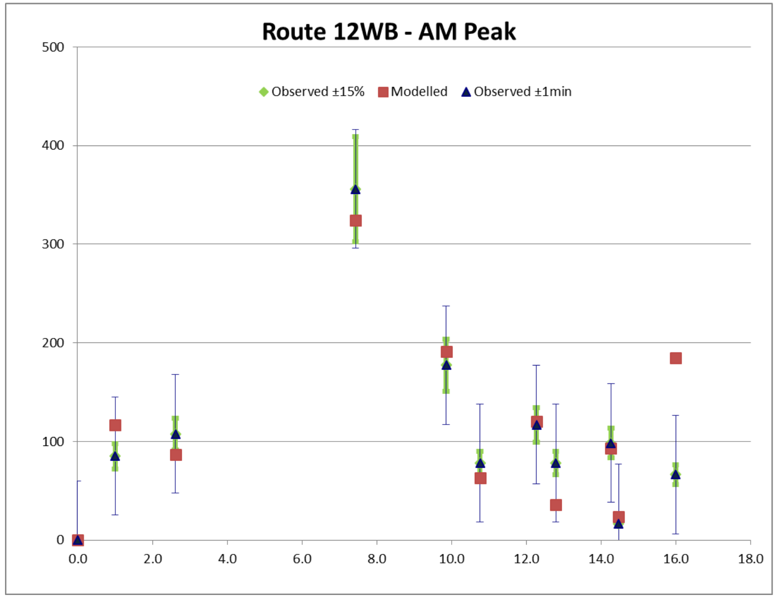
Route 12EB

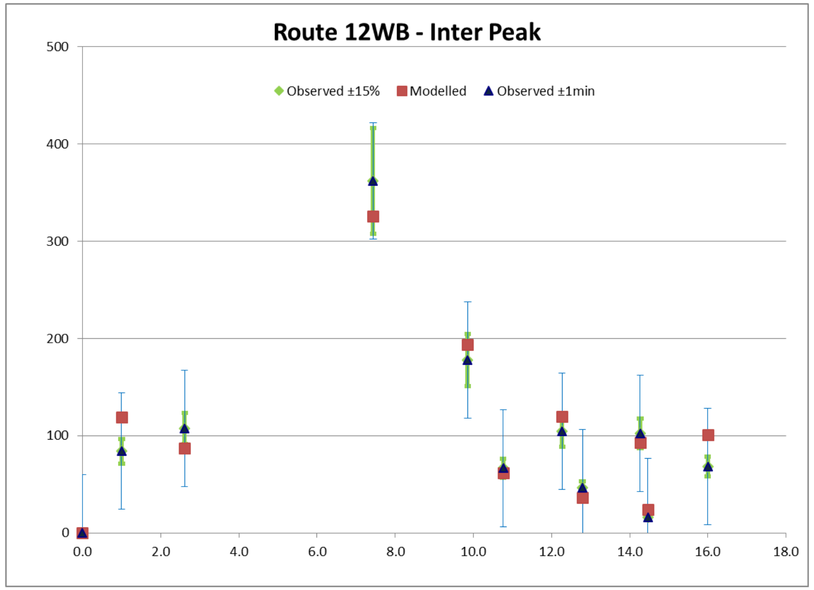
RIS A585 - JT Route
Time Distance Plots

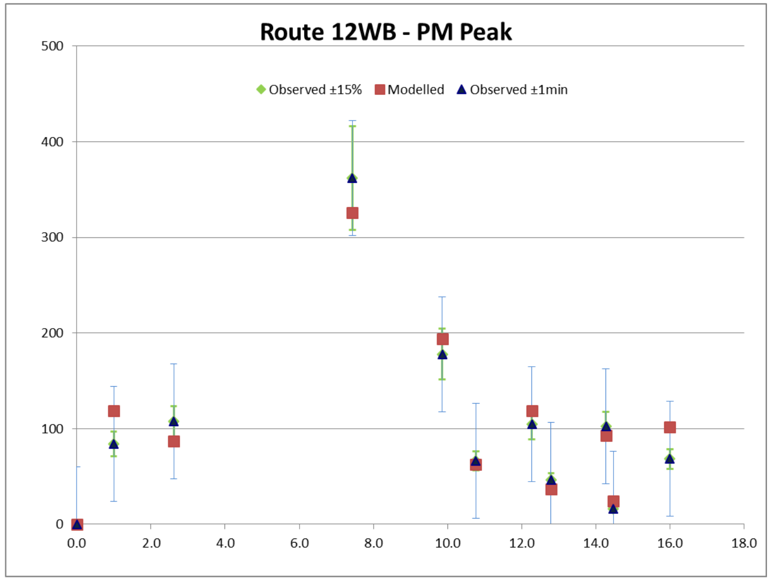






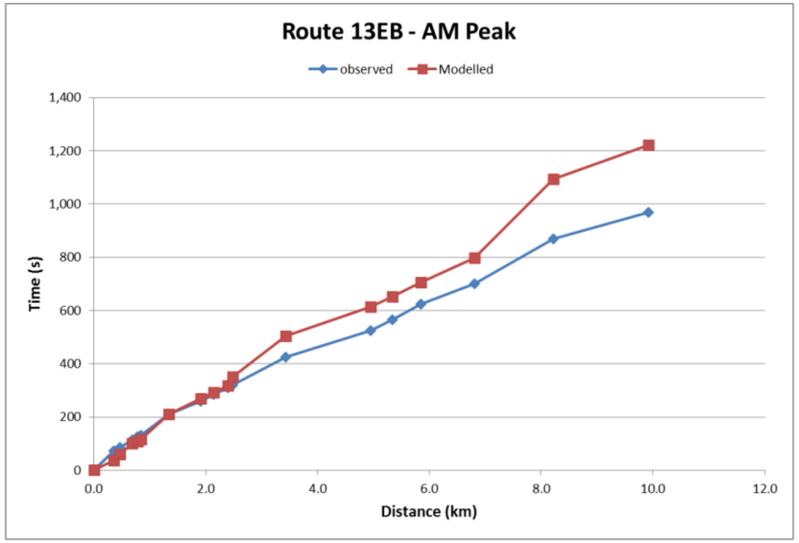


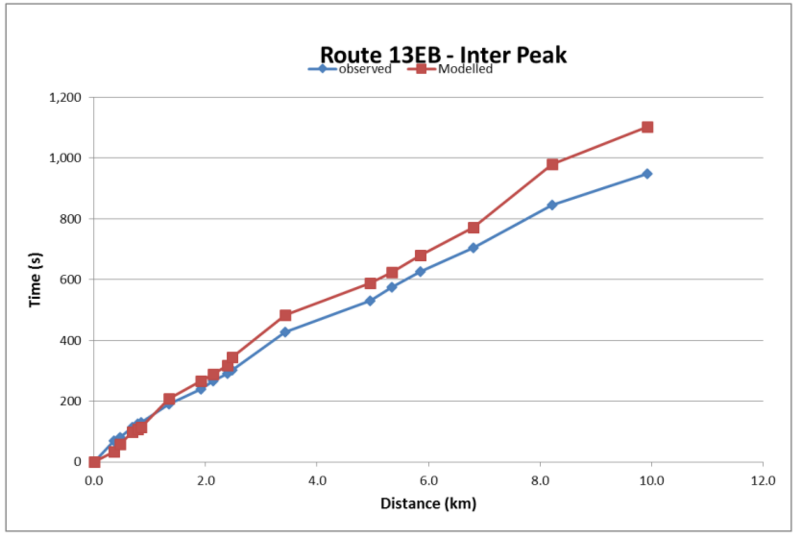


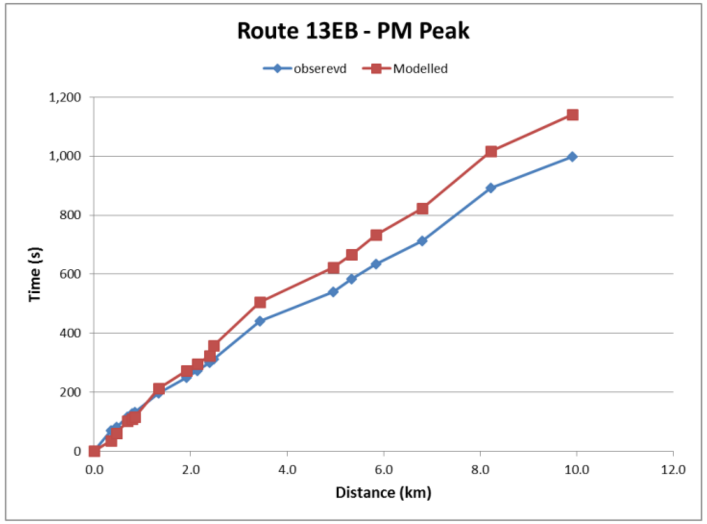


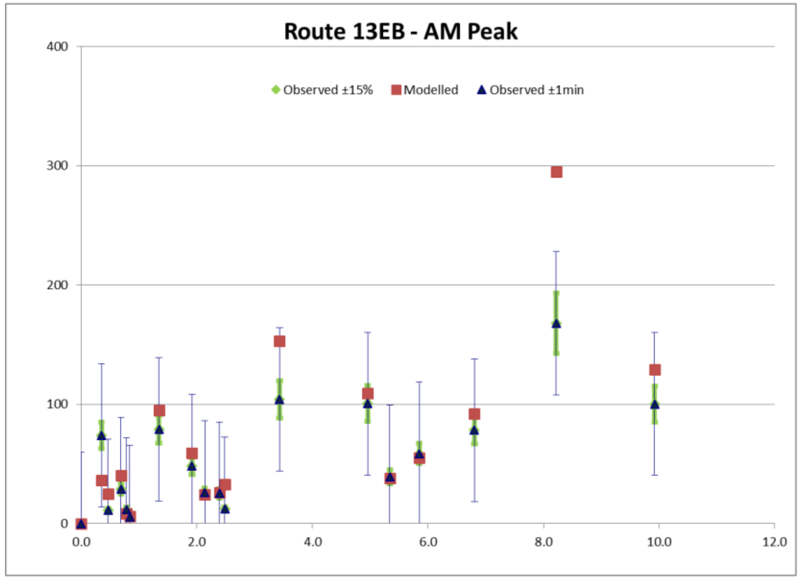
Route 12WB

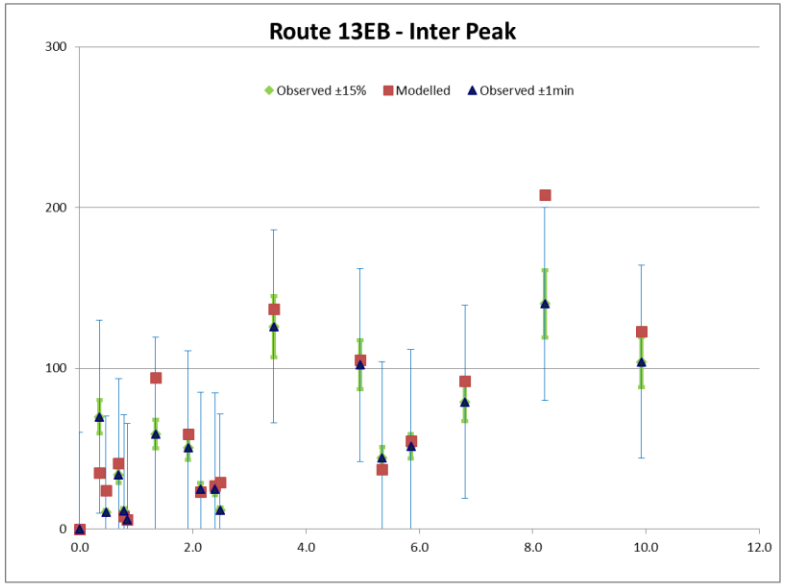
RIS A585 - JT Route
Time Distance Plots

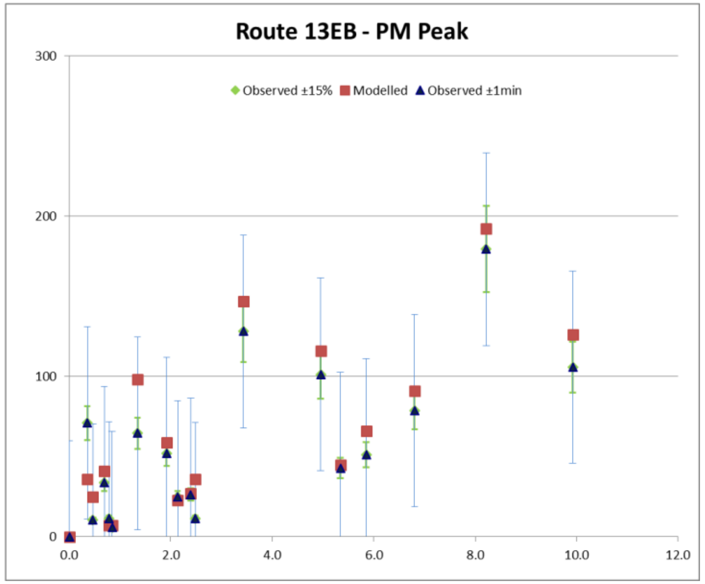






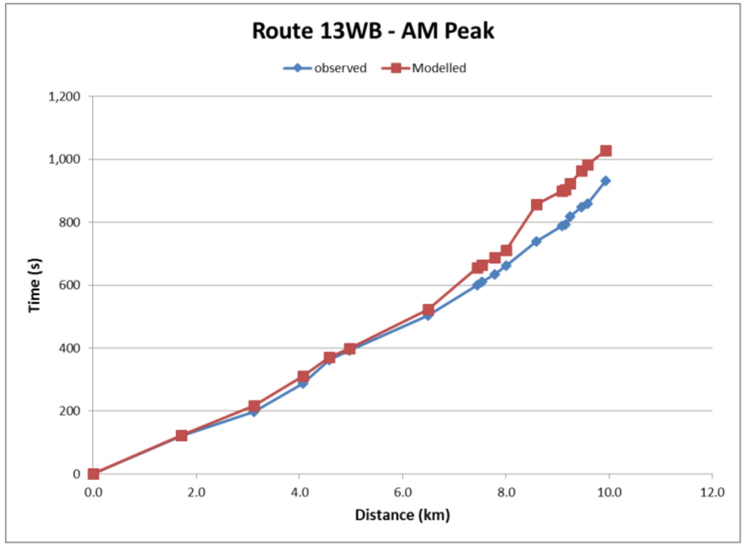


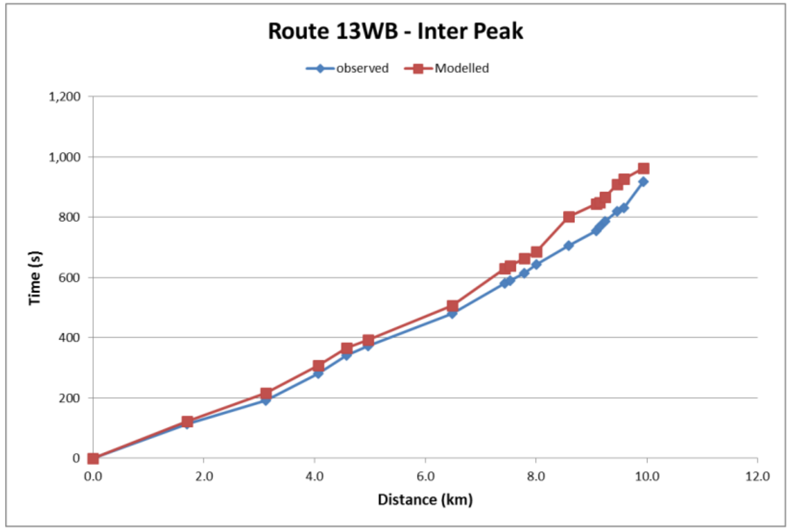


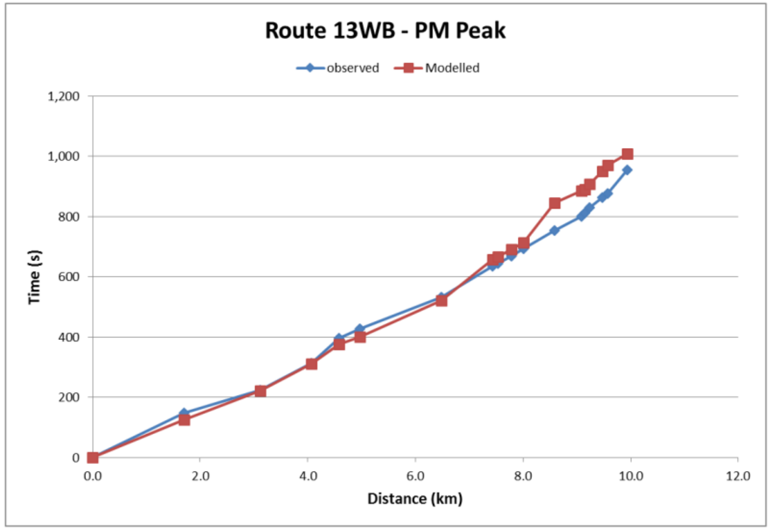


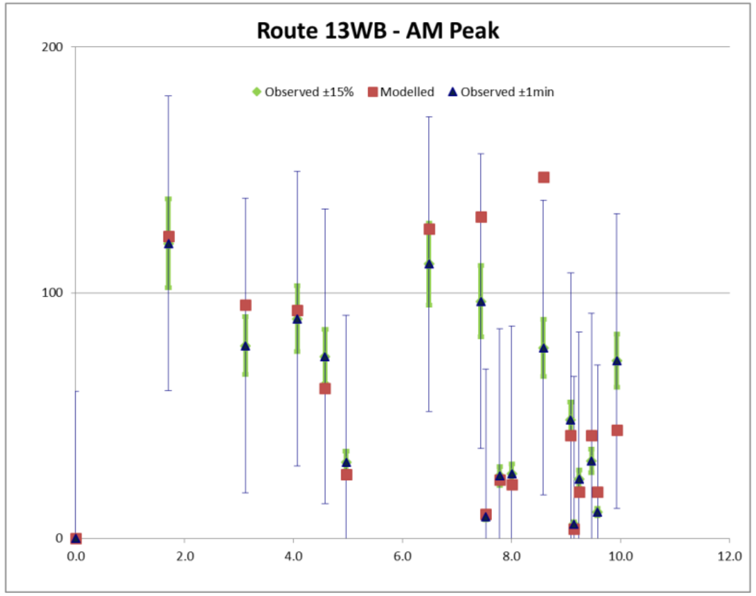
Route 13EB

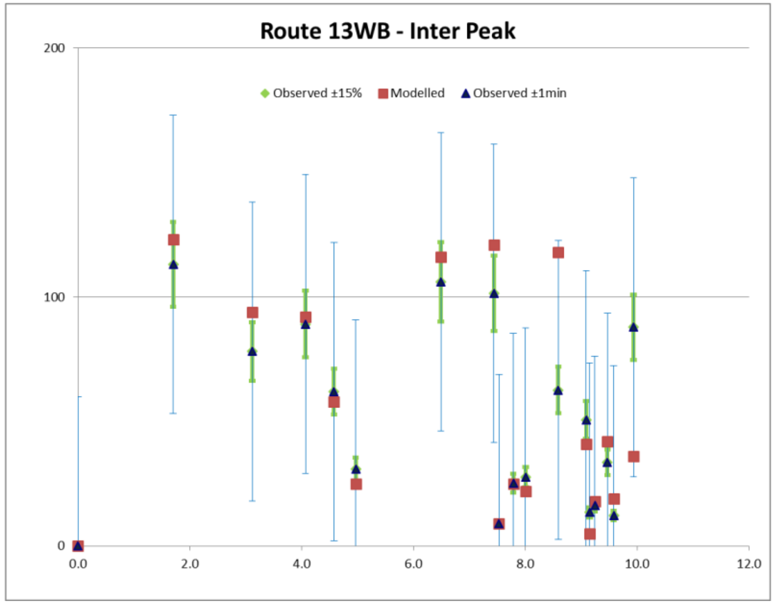
RIS A585 - JT Route
Time Distance Plots

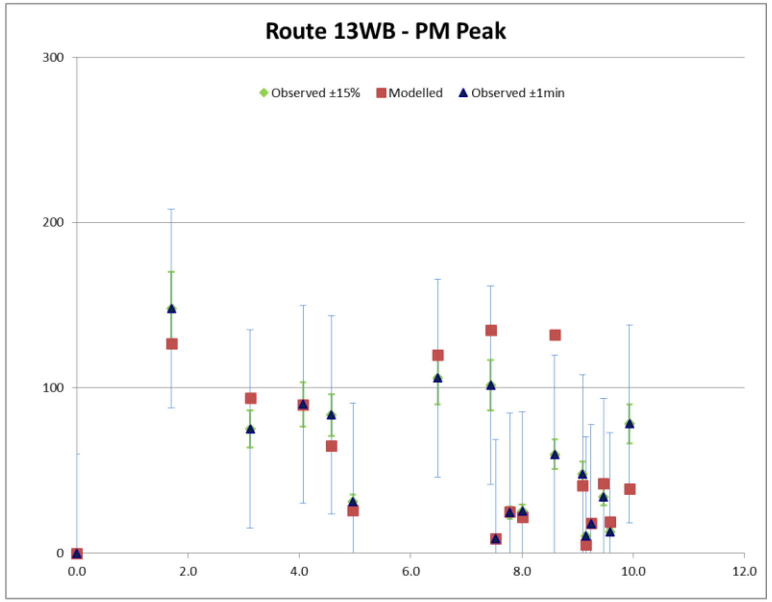






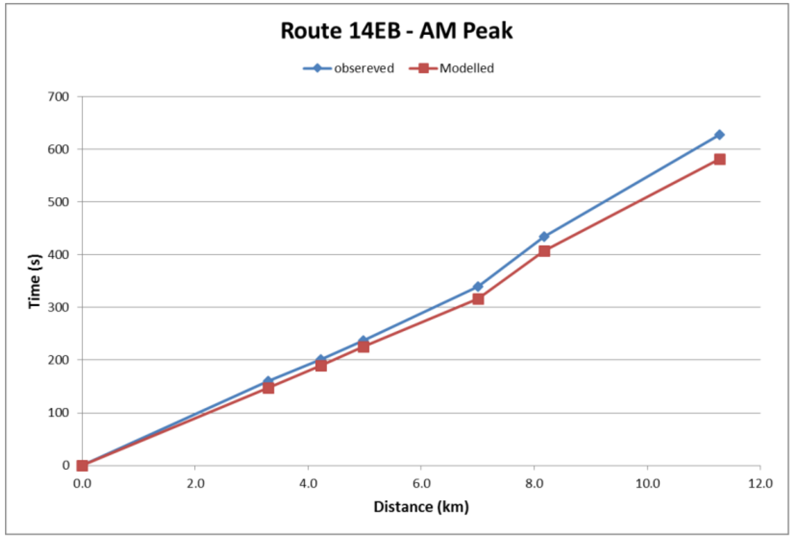


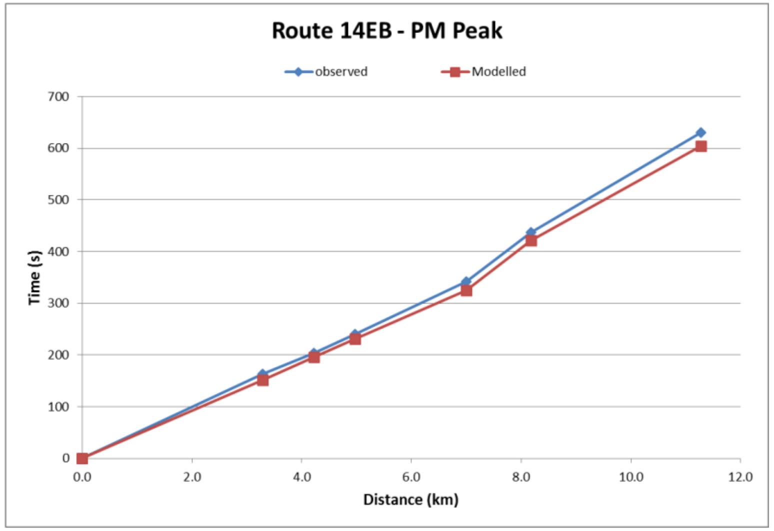


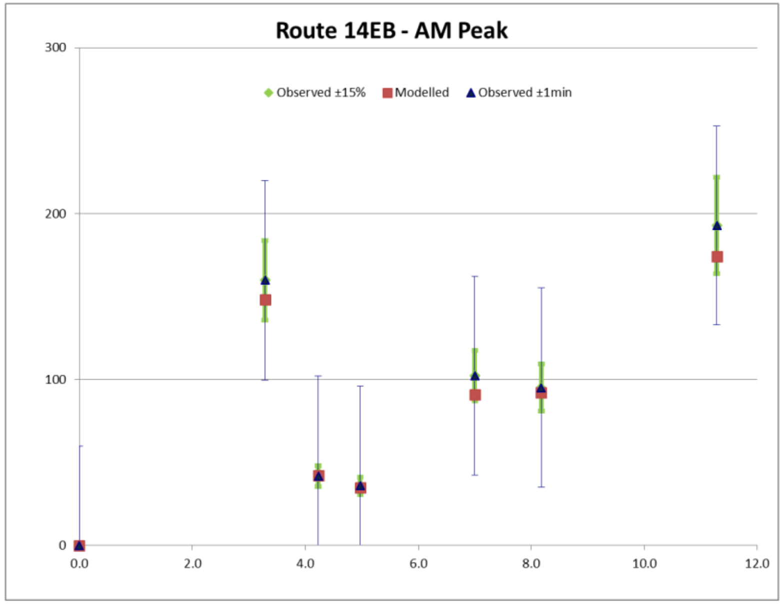


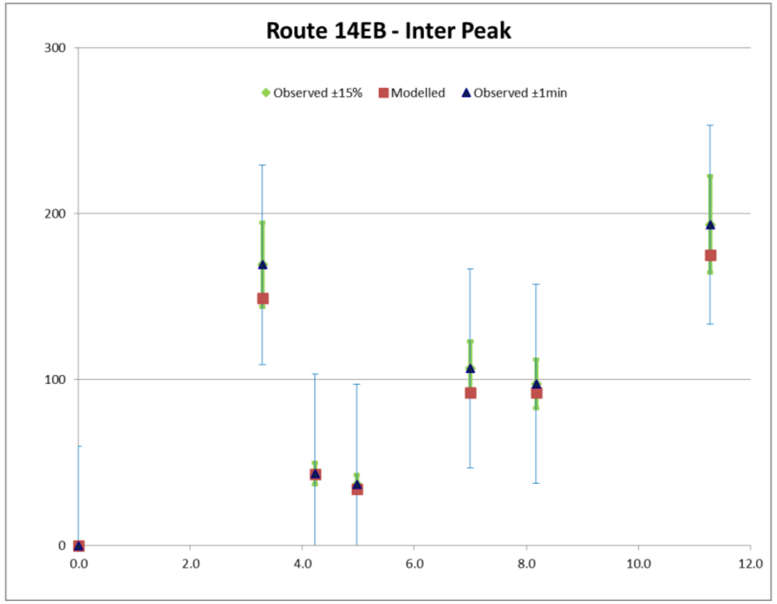
Route 13WB

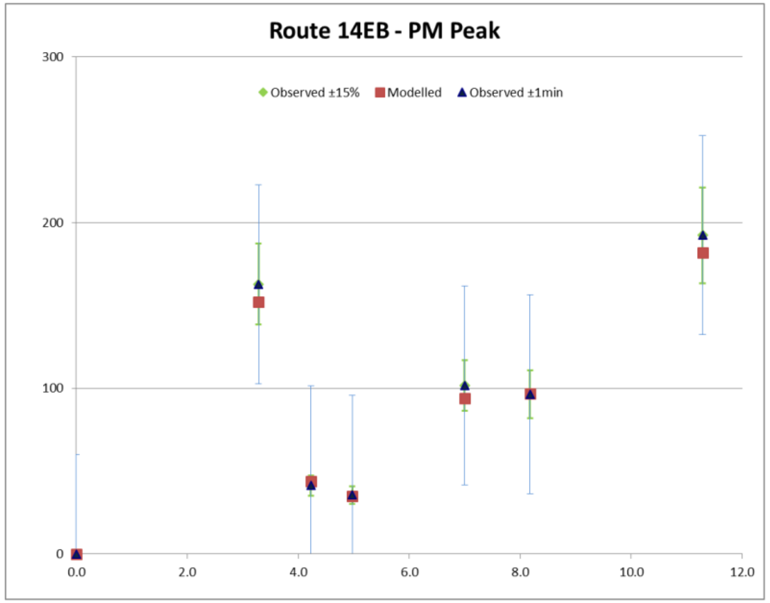
RIS A585 - JT Route
Time Distance Plots





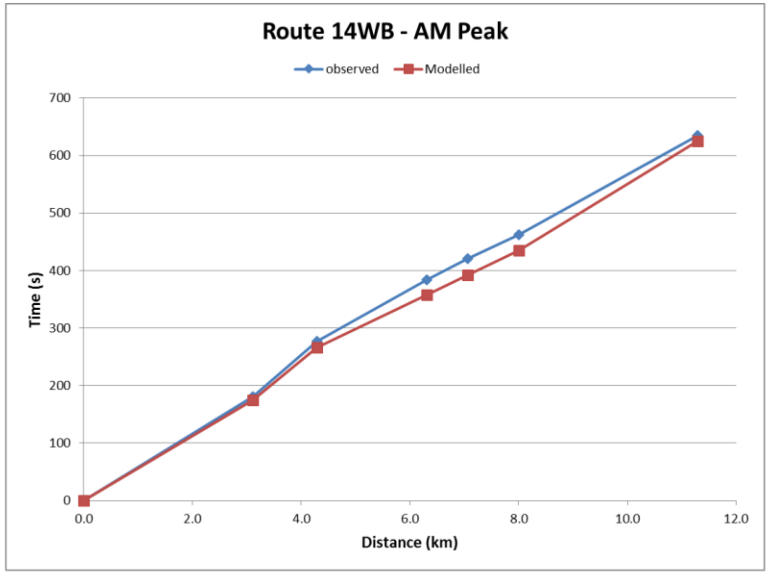


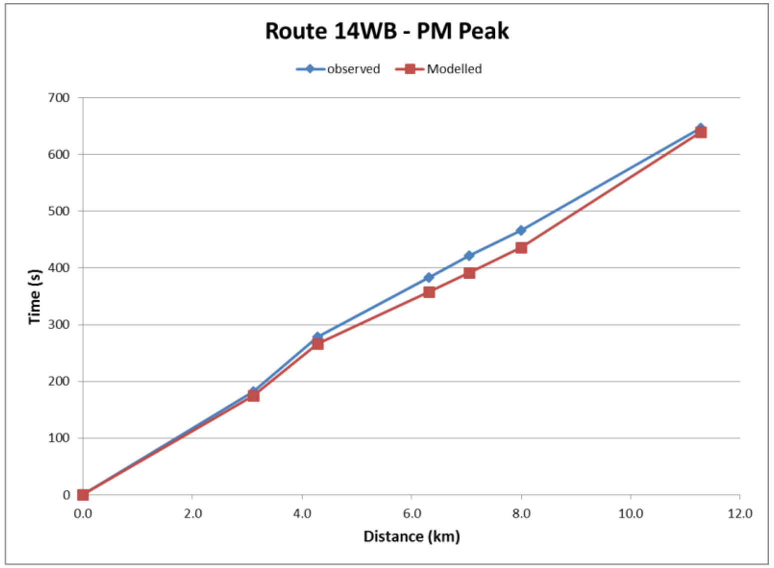


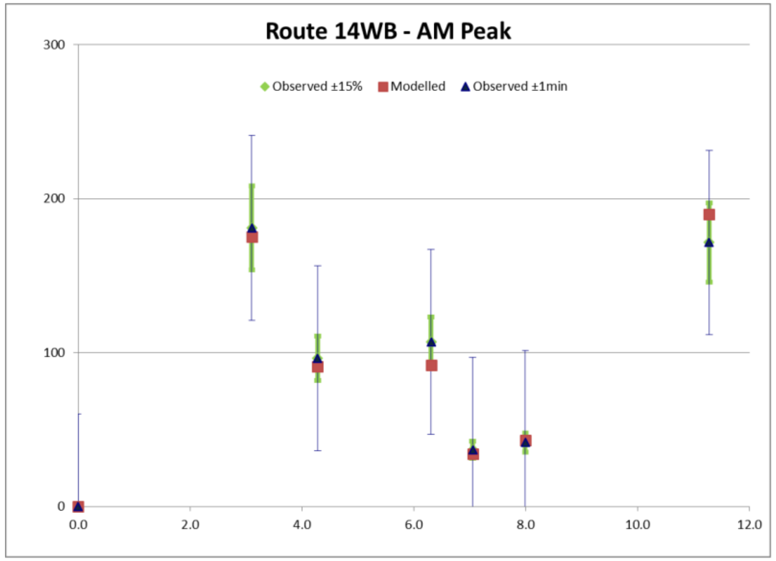


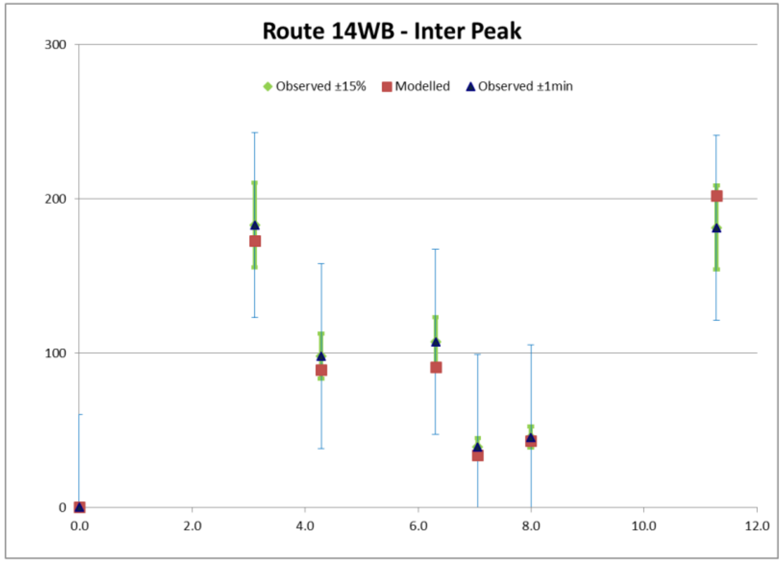
Route 14EB

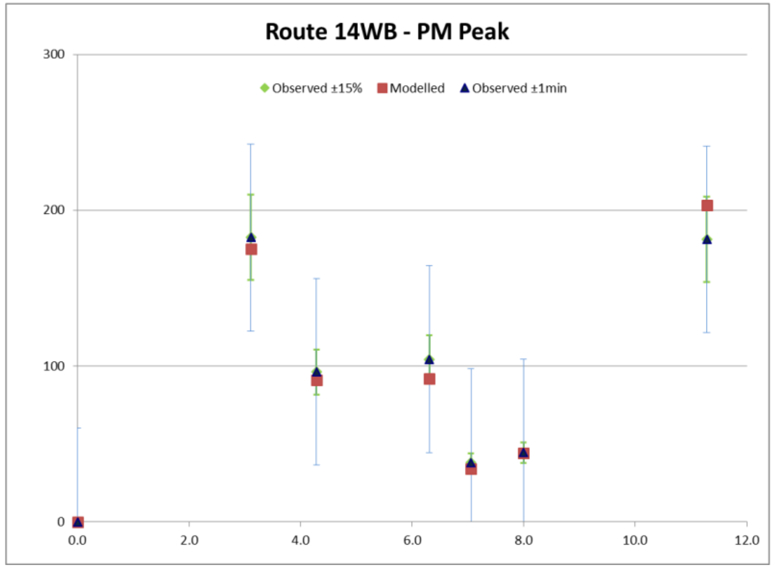
RIS A585 - JT Route
Time Distance Plots











Route 14WB

APPENDIX N

Model Convergence Results

Appendix N: Model Convergence Results

Assignment Simulation Iteration	AM Peak Model			Inter-Peak Model			PM Peak Model		
	% Flow	Delay (%)	% GAP	% Flow	Delay (%)	% GAP	% Flow	Delay (%)	% GAP
1		8.1	6.794		8.7	2.55		7	7.604
2	36.6	76.4	2.128	41.6	84.1	0.746	36.3	71.8	2.291
3	46.5	85.4	0.527	57.3	93.1	0.294	46.7	85.1	1.351
4	56.2	91.4	0.233	62.6	95.7	0.154	57.1	89.9	0.394
5	66.5	94.4	0.328	68.7	96.7	0.091	67.1	94	0.259
6	73.5	94.7	0.15	77.4	97.3	0.056	74.5	95.4	0.17
7	77.6	95.5	0.082	80.3	98	0.074	79.1	96.6	0.202
8	83.5	96.9	0.079	80.2	98.1	0.035	80.3	96.4	0.14
9	88.7	97.6	0.05	82.3	98.5	0.024	81.9	97.1	0.145
10	88.6	97.5	0.047	86.6	98.9	0.02	84.4	97.1	0.092
11	89.7	97.8	0.041	90.2	99.1	0.016	89.9	98.1	0.12
12	92	97.9	0.04	92.9	99.1	0.019	88.4	98.1	0.067
13	92.1	98.1	0.032	91.7	99.2	0.012	91.2	98	0.107
14	92.5	98.1	0.034	93.4	99.1	0.017	89.4	97.6	0.06
15	93.2	98.2	0.04	91	99.1	0.011	93	98	0.078
16	92	98	0.025	93	99.3	0.0099	90.9	97.9	0.054
17	93.4	98.3	0.022	96.2	99.4	0.008	93.7	98.4	0.071
18	95	98.3	0.024	95	99.5	0.0063	90.1	97.9	0.051
19	95.5	98.5	0.022	96.5	99.4	0.0071	93.1	98.1	0.063
20	95.3	98.4	0.019	96	99.4	0.0064	91.2	98.1	0.034
21	96.5	98.6	0.022	97.3	99.4	0.006	94.7	98.4	0.053
22	95.8	98.7	0.015	97.7	99.4	0.0056	90.5	98.2	0.034
23	96.6	98.6	0.016	97.4	99.3	0.0055	94.7	98.6	0.046
24	96.8	98.6	0.012	97.1	99.5	0.0043	92.7	98.3	0.027
25	96.5	98.7	0.013	97.7	99.5	0.0046	96.1	98.6	0.042
26	97.1	98.7	0.01	98.3	99.5	0.0038	92.1	98.4	0.026
27	97.1	98.9	0.01	97.9	99.4	0.0036	96.4	98.7	0.036
28	98	98.8	0.0089	99.3	99.6	0.0033	93.4	98.3	0.026
29	98.1	98.9	0.0078	99.4	99.5	0.0025	96.2	98.7	0.03
30	98.3	98.9	0.0096	99.2	99.7	0.0026	94.3	98.6	0.021
31	97.6	99.1	0.0069	99.3	99.7	0.0025	97.8	98.6	0.027
32	98.3	99.4	0.008				94.8	98.5	0.022
33	98.6	99.3	0.0075				97.2	98.9	0.026
34	98.3	99.4	0.01				95.5	98.5	0.018
35	98.1	99.2	0.0057				97.8	98.7	0.023

Assignment Simulation Iteration	AM Peak Model			Inter-Peak Model			PM Peak Model		
	% Flow	Delay (%)	% GAP	% Flow	Delay (%)	% GAP	% Flow	Delay (%)	% GAP
36							95.8	98.6	0.016
37							97.7	98.7	0.02
38							96	98.5	0.014
39							97.9	98.8	0.017
40							96.5	98.7	0.014
41							98.5	98.9	0.015
42							96.7	98.7	0.015
43							97.9	98.7	0.016
44							97.4	99	0.013
45							98.1	98.8	0.015
46							95.9	98.7	0.012
47							97.6	98.7	0.014
48							96.7	98.7	0.012
49							97.8	98.8	0.013
50							97.4	98.8	0.011
51							98.5	98.9	0.011
52							97.8	99	0.012
53							98.2	98.9	0.013
54							96.9	99	0.01
55							98.1	99	0.011
56							97.7	99.2	0.0096
57							98.2	98.9	0.011
58							96.7	98.9	0.0072
59							98.6	99.1	0.01
60							97.3	98.9	0.0092
61							98	99	0.013
62							97.1	98.9	0.0072
63							98	99	0.011
64							96.6	98.7	0.0069
65							98.4	98.8	0.0091
66							96.9	99	0.0068
67							97.8	98.9	0.0098
68							97.4	98.9	0.0069
69							98.5	98.9	0.0081
70							96.9	98.8	0.0062
71							98.3	98.9	0.0088
72							97.1	99	0.0056
73							98.7	99.1	0.0072
74							97.1	99	0.0072
75							98.3	98.9	0.0072

Assignment Simulation Iteration	AM Peak Model			Inter-Peak Model			PM Peak Model		
	% Flow	Delay (%)	% GAP	% Flow	Delay (%)	% GAP	% Flow	Delay (%)	% GAP
76							97.7	99.2	0.0062
77							98.3	99.2	0.0067
78							97.9	99.1	0.0067
79							98	99.1	0.0067
80							97.2	99	0.0071
81							97.5	99.1	0.0069
82							98	99	0.0062
83							98.1	99	0.0061
84							98	99.2	0.0064
85							98.3	99.2	0.0061
86							98.3	99.2	0.0051
87							98.5	99.3	0.0053
88							98.4	99.2	0.0045

APPENDIX O

Cost Distributions Obtained from the RSI data and Gravity Model

Figure O.1: Cost distribution of Gravity Model (AM Peak- Car Commute)

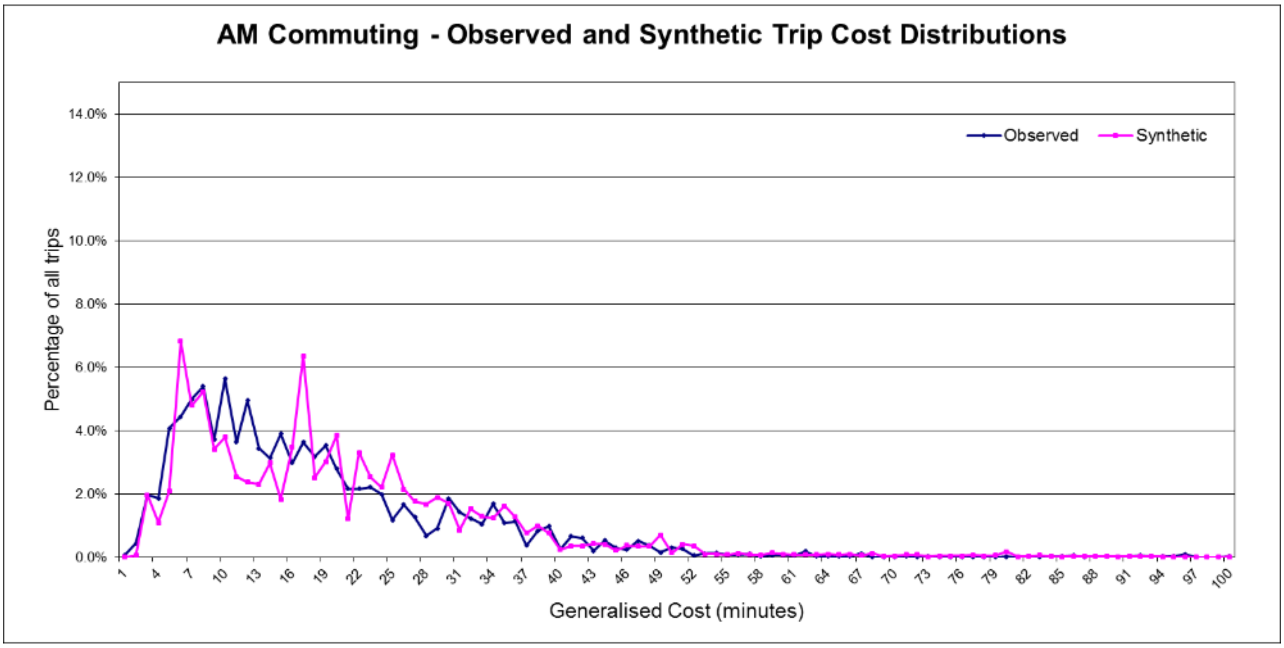


Figure O.2: Cost distribution of Gravity Model (AM Peak- Car Business)

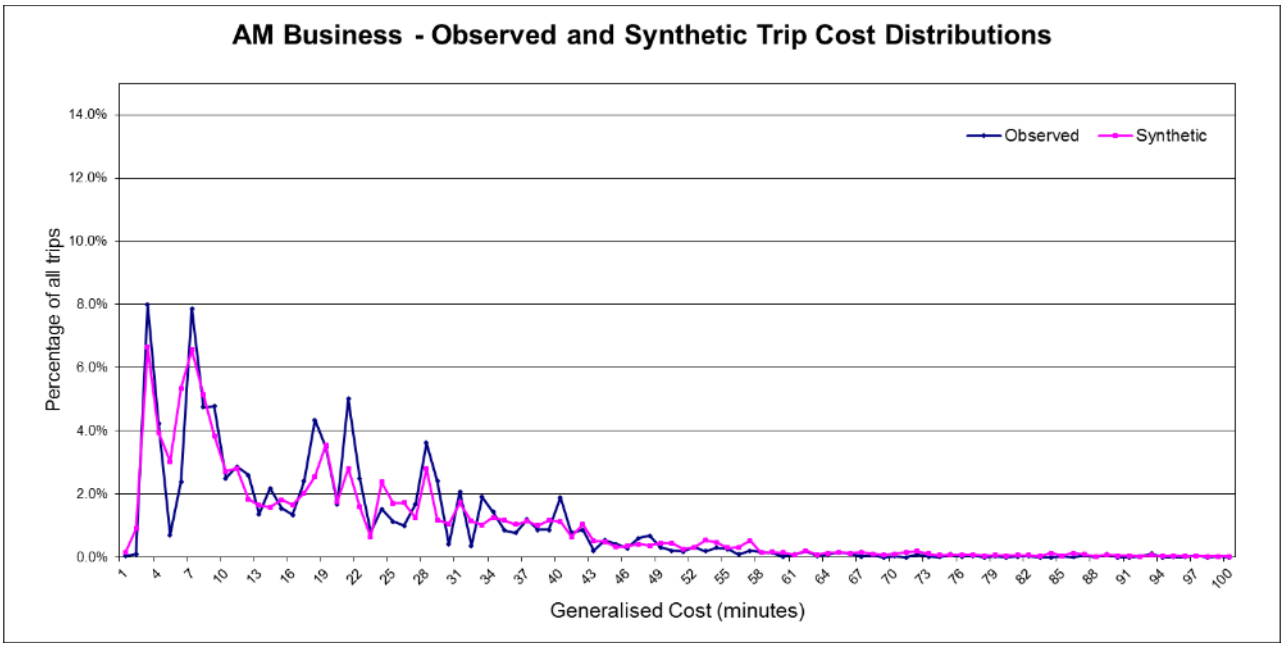


Figure O.3: Cost distribution of Gravity Model (AM Peak- Car Others)

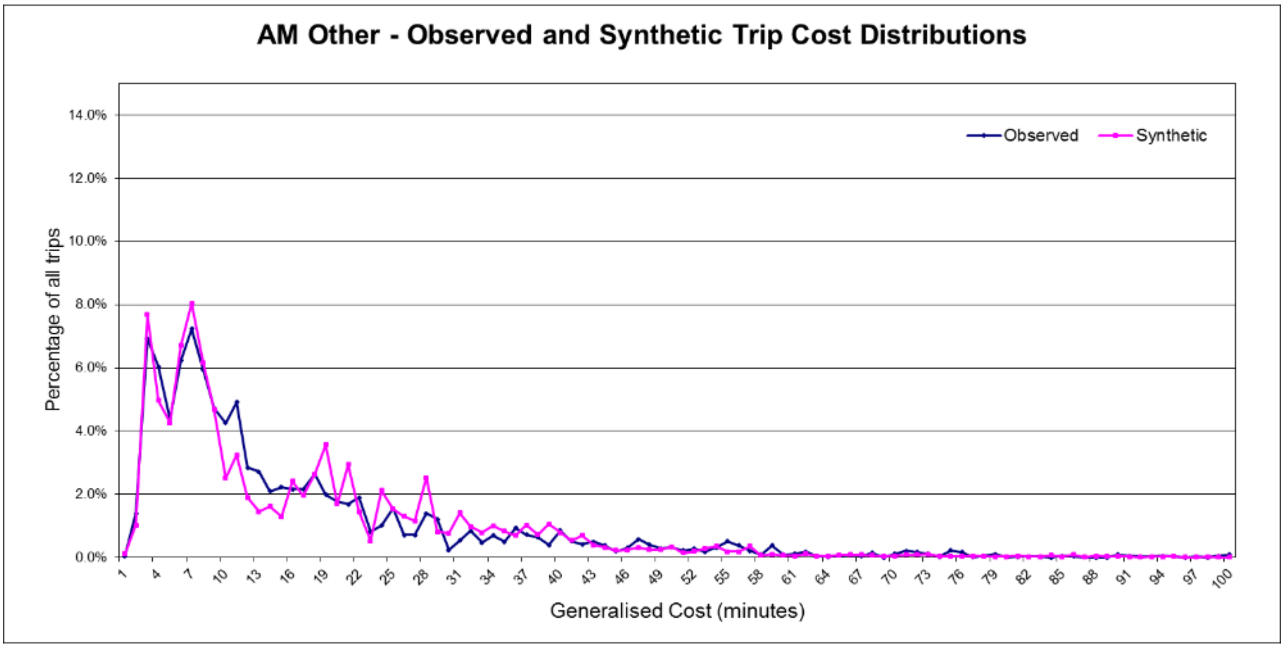


Figure O.4: Cost distribution of Gravity Model (IP- Car Commute)

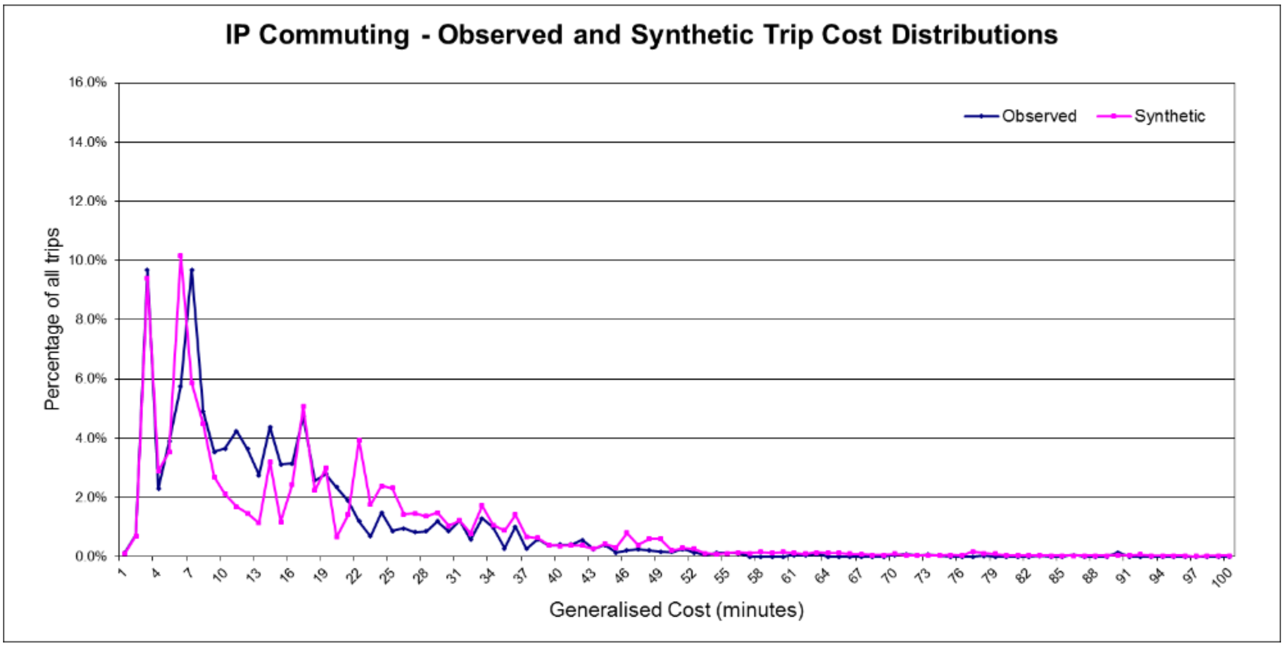


Figure O.5: Cost distribution of Gravity Model (IP- Car Business)

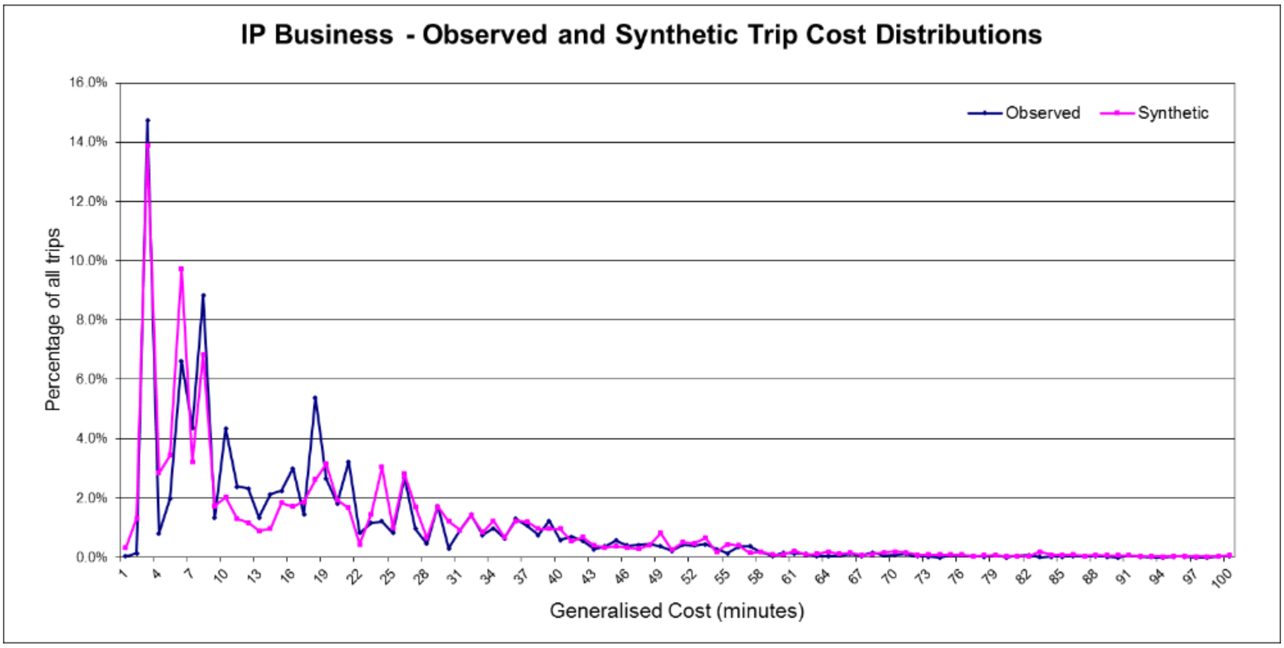


Figure O.6: Cost distribution of Gravity Model (IP- Car Others)

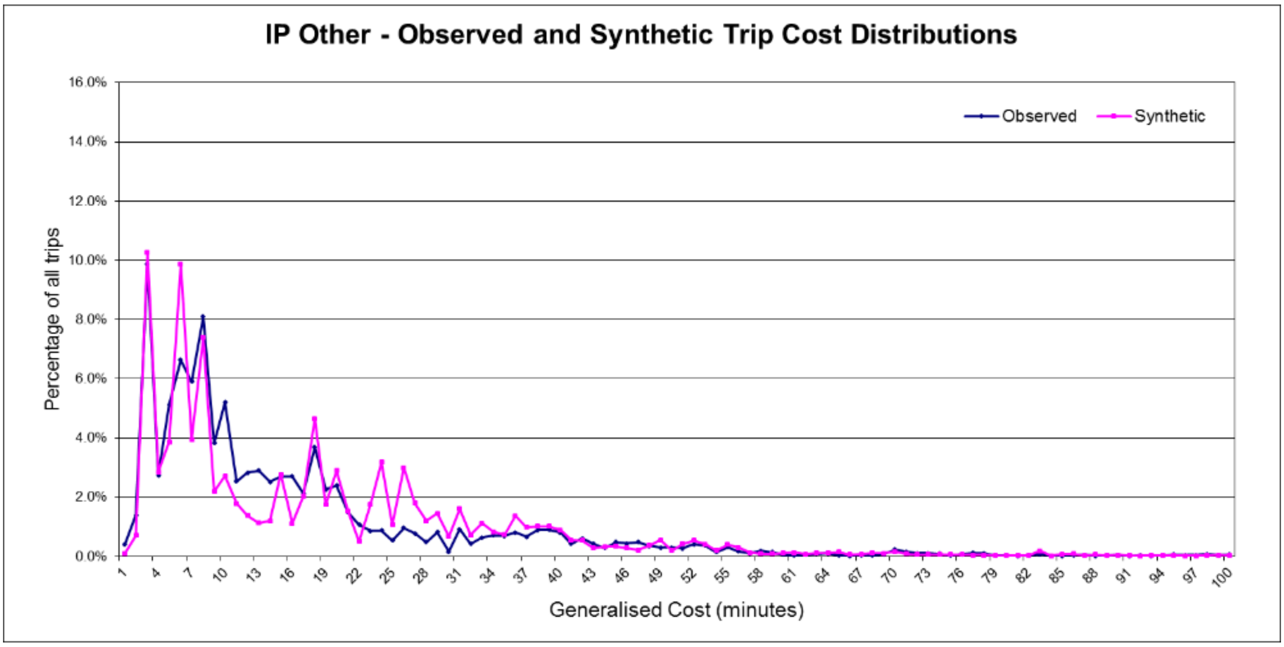


Figure O.7: Cost distribution of Gravity Model (PM Peak- Car Commute)

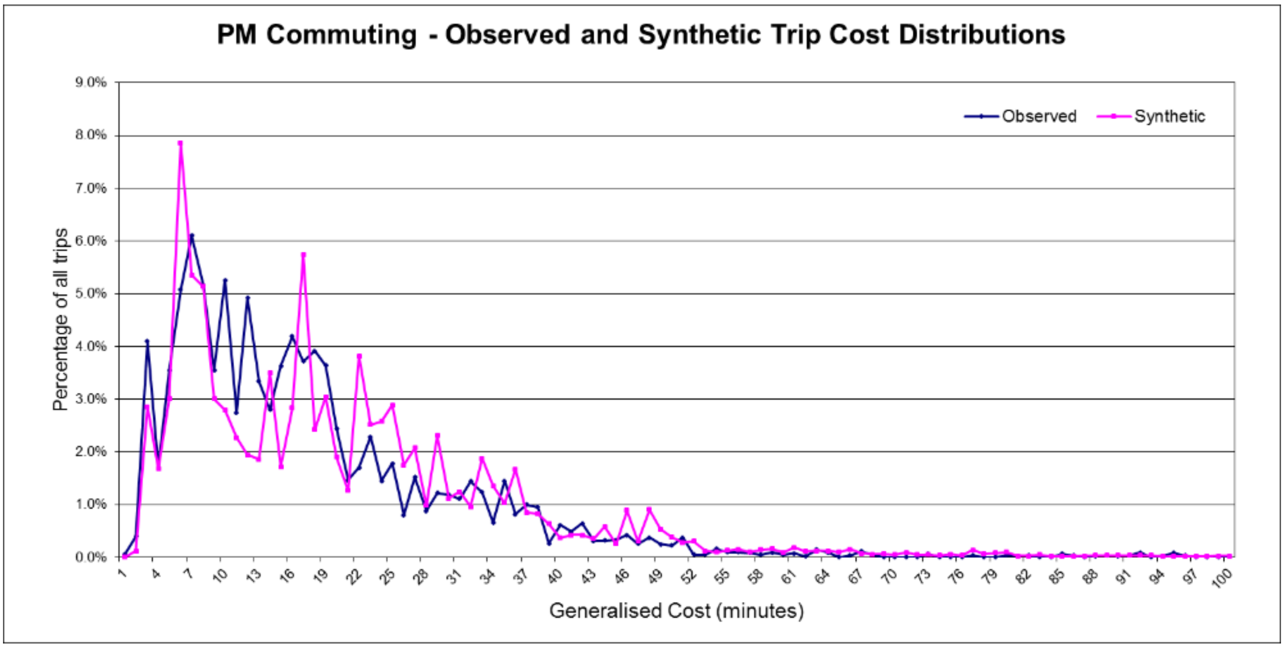


Figure O.8: Cost distribution of Gravity Model (PM Peak- Car Business)

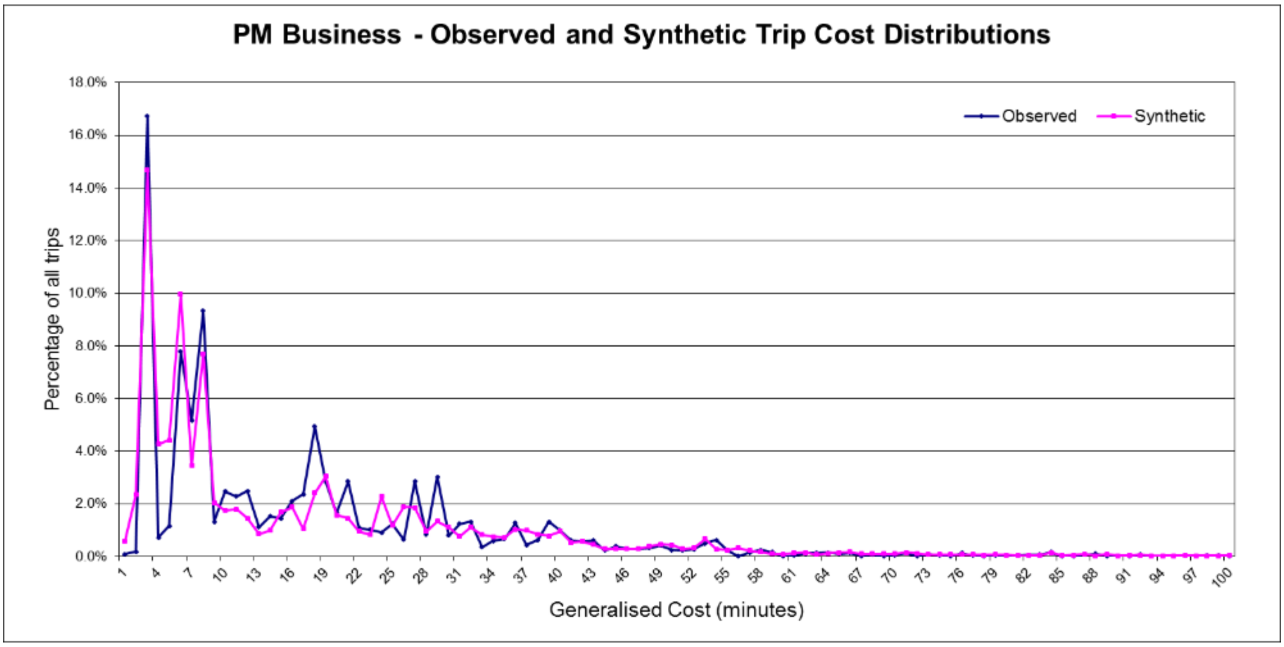
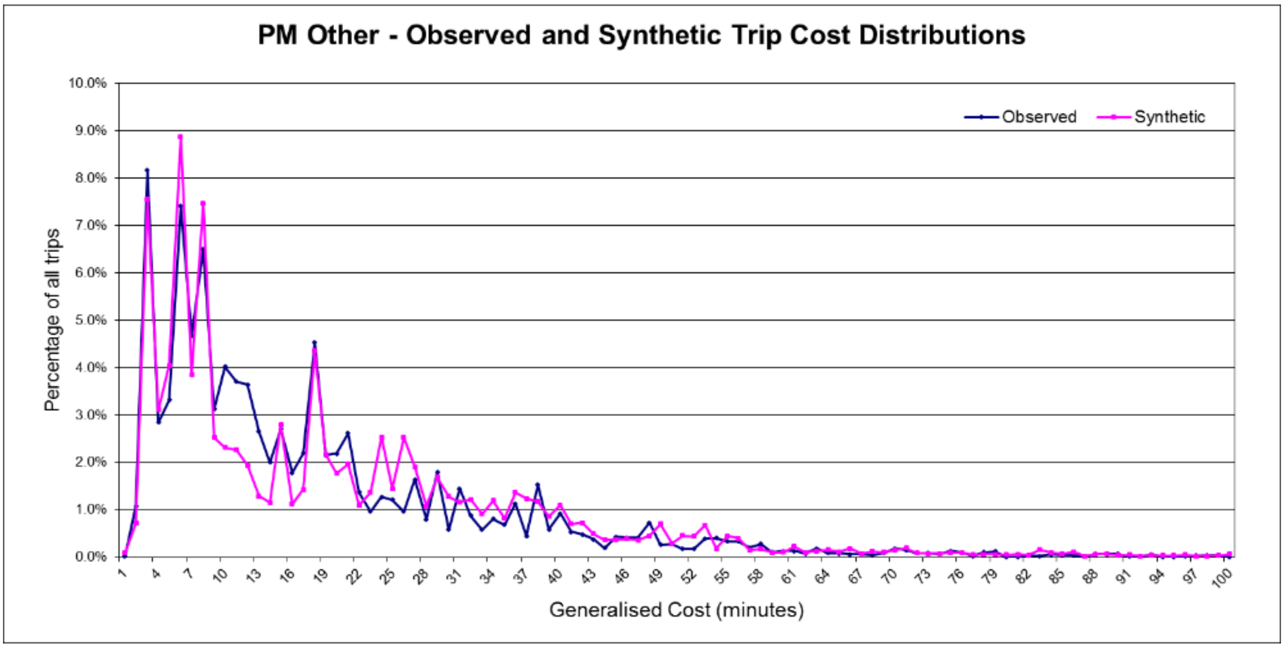


Figure O.9: Cost distribution of Gravity Model (PM Peak- Car Others)



APPENDIX P

Results of Base Year Model Stress Tests

Table P.1 AM Peak Node Delays Exceeding 60 Seconds in the Stress Test

Node	Junction Name	Base Delay (secs)	Stress Test Delay (secs)	Reason for Node Delay
4000	A5230 Squires Gate Lane/ St. Anne’s Road / Amy Johnson Way	62.42	77.86	Intergreen signal phasing time is very high
4002	A584 New South Promenade / Clifton Drive	32.57	69.37	Intergreen signal phasing time is very high
4005	A5230 Progress Way / Common Edge Road	68.7	77.55	Intergreen signal phasing time is very high
4006	Lytham Road / Scarsdale Avenue	41.56	313.71	Stub link capacities are much less than flow
4062	A5073 Waterloo Road / Ansdell Road / Hawes Side Lane / Marton Drive	64.51	71.90	Intergreen signal phasing time is very high
4084	A583 Preston New Road / South Park Drive	50.55	60.14	Intergreen signal phasing time is high
4178	A586 Talbot Road / Devonshire Road	93.47	111.02	Intergreen signal phasing time is high
4404	A587 Rossall Road / West Drive	70.63	92.54	Stub link is directly connected to signal

Table P.2 Inter Peak Node Delays Exceeding 60 Seconds in the Stress Test

Node	Junction Name	Base Delay (secs)	Stress Test Delay (secs)	Reason for Node Delay
4000	A5230 Squires Gate Lane/ St. Anne’s Road / Amy Johnson Way	65.46	78.48	Intergreen signal phasing time is very high
4062	A5073 Waterloo Road / Ansdell Road / Hawes Side Lane / Marton Drive	64.06	68.53	Intergreen signal phasing time is very high
4178	A586 Talbot Road / Devonshire Road	64.84	66.69	Intergreen signal phasing time is high
4241	A584 Queen’s Promenade / Knowle Avenue	6.52	76.79	Stub link capacities are much less than flow
4404	A587 Rossall Road / West Drive	44.32	65.71	Stub link is directly connected to signal

Table P.3 PM Peak Node Delays Exceeding 60 Seconds in the Stress Test

Node	Junction Name	Base Delay (secs)	Stress Test Delay (secs)	Reason for Node Delay
4000	A5230 Squires Gate Lane/ St. Anne's Road / Amy Johnson Way	40.6	69.65	Intergreen signal phasing time is very high
4005	A5230 Progress Way / Common Edge Road	66.75	66.99	Intergreen signal phasing time is very high
4008	A5230 Progress Way / -A5230 and Midgeland Road	57.19	66.8	Intergreen signal phasing time is very high
4062	A5073 Waterloo Road / Ansdell Road / Hawes Side Lane / Marton Drive	68.72	72.82	Intergreen signal phasing time is very high
4112	A587 East Park Drive / Weymouth Road	30.72	74.96	Stub link capacities are much less than flow
4115	Park Road / Westmorland Avenue	13.38	115.85	Stub link capacities are much less than flow
4122	A583 Whitegate Drive / Gorse Road	16.93	102.53	Stub link capacities are much less than flow
4131	Stanley Park entrance	14.02	154.98	Stub link capacities are much less than flow
4178	A586 Talbot Road / Devonshire Road	71.71	79.6	Intergreen signal phasing time is high
4241	A584 Queen's promenade / Knowle Avenue	8.79	218.59	Stub link capacities are much less than flow
4268	Devonshire Road / Northgate	15.5	139.04	Stub link capacities are much less than flow
4270	A585 / A586 Little Singleton Signalised Junction	45.39	93.67	Green signal phases are insufficient to clear the flow
4301	Fleetwood Road / Poulton Road / Blackpool Road / Bispham Road	52.94	66.64	Green signal phases are insufficient to clear the flow
4385	Victoria Road West –North Drive	53	76.98	Green signal phases are insufficient to clear the flow
4389	A587 Rossall Road / A587 Crescent East / Crescent West / Victoria Road West	35.2	68.69	Green signal phases are insufficient to clear the flow
4404	A587 Rossall Road / West Drive	85	102.69	Stub link is directly connected to signal

Table P.4 AM Peak Links with V/C > 100% in the Stress Test

Link	Road Name	Base V/C Ratio (%)	Stress Test V/C Ratio (%)	Reason for higher V/C Ratio on links
4001-4002	A5230 Squires Gate Lane	96.48	130.87	Intergreen signal phasing time is very high
4007-4006	Scarsdale Avenue	102.2	134.58	Stub link connected to priority junction (capacity < flow)
4020-4023	Highfield Road	90.06	100.77	Minor road link connected to priority junction (capacity < flow)
4043-4044	Burnside Avenue	68.72	100.57	Stub link connected to priority junction (capacity < flow)
4064-4063	Penrose Avenue	93.82	101.41	Stub link connected to priority junction (capacity < flow)
4107-4084	A587 South Park Drive	99.57	101.51	Minor road link connected to priority junction (capacity < flow)
4084-4107	A587 South Park Drive	96.68	100.6	link capacity less than arrival flow (capacity < flow)
4106-4112	Weymouth Road	100.15	101.53	Stub link connected to priority junction (capacity < flow)
4114-4115	Westmorland Avenue	100.28	102.47	Stub link connected to priority junction (capacity < flow)
4125-4122	Gorse Road	100.3	102.44	Stub link connected to priority junction (capacity < flow)
4210-4218	Thistleton Road	95.87	100.92	Minor road link connected to priority junction (capacity < flow)
4215-4223	Mile Road	91.98	100.4	Minor road link connected to priority junction (capacity < flow)
4337-4311	A585 Amounderness Way	89.93	102.08	link capacity less than arrival flow (capacity < flow)
4511-4311	A585 Mains Lane	86.18	100.62	link capacity less than arrival flow (capacity < flow)
4526-4329	Norcross Lane	84.13	100.03	Minor road link connected to round about (capacity < flow)
4408-4404	West Drive West	101.95	104.44	Green signal phases are insufficient to clear the link flow

Table P.5 Inter Peak Links with V/C > 100% in the Stress Test

Link	Road Name	Base V/C Ratio (%)	Stress Test V/C Ratio (%)	Reason for higher V/C Ratio on links
4020-4023	Highfield Road	83.28	100.19	Stub link connected to priority junction (capacity < flow)
4043-4044	Burnside Avenue	70.46	100.6	Stub link connected to priority junction (capacity < flow)
4064-4063	Penrose Avenue	96.2	101.88	Stub link connected to priority junction (capacity < flow)
4084-4107	A587 South Park Drive	97.09	100.35	link capacity less than arrival flow (capacity < flow)
4198-4201	Claremont Road	100.46	102.09	Stub link connected to priority junction (capacity < flow)
4240-4241	Knowle Avenue	71.34	109.16	Stub link connected to priority junction (capacity < flow)
4273-4268	Northgate Road	100.1	111.83	Stub link connected to priority junction (capacity < flow)

Table P.6 PM Peak Links with V/C > 100% in the Stress Test

Link	Road Name	V/C Ratio Base (%)	V/C Ratio 20%+ Base (%)	Reason for higher V/C Ratio on links
4007-4006	Scarsdale Avenue	84.55	100.84	Stub link connected to priority junction (capacity < flow)
4020-4023	Highfield Road	92.02	101.92	Stub link connected to priority junction (capacity < flow)
4043-4044	Burnside Avenue	73.05	103.89	Stub link connected to priority junction (capacity < flow)
4064-4063	Penrose Avenue	96.6	106.07	Stub link connected to priority junction (capacity < flow)
4084-4107	A587 South Park Drive	99.93	101.18	link capacity less than arrival flow (capacity < flow)
4106-4112	Weymouth Road	100.54	115.24	Stub link connected to Priority junction (capacity < flow)
4114-4115	Westmorland Avenue	95.71	115.55	Stub link connected to Priority junction capacity < flow)
4125-4122	Gorse Road	98.54	115.79	Stub link connected to Priority junction (capacity < flow)
4132-4131	Stanley Park Road	68.06	113.18	Stub link connected to Priority junction (capacity < flow)
4198-4201	Claremont Road	100.95	103.7	Stub link connected to Priority junction (capacity < flow)
4240-4241	Knowle Avenue	79.36	136.07	Stub link connected to priority junction (capacity < flow)
4309-4258	Princess Avenue	81.44	101.56	Stub link connected to priority junction (capacity < flow)
4273-4268	Northgate Road	100.47	138.7	Stub link connected to priority junction (capacity < flow)
4337-4311	A585 Amounderness Way	98.33	102.18	link capacity less than arrival flow (capacity < flow)
4307-4311	A588 Breck Road	83.46	102.84	link capacity less than arrival flow (capacity < flow)
4323-4322	Guildford Avenue	100.47	100.92	link capacity less than arrival flow (capacity < flow)
4495-4337	Fleetwood Road South	66.26	100.09	link capacity less than arrival flow (capacity < flow)

Link	Road Name	V/C Ratio Base (%)	V/C Ratio 20%+ Base (%)	Reason for higher V/C Ratio on links
4526-4337	Norcross Lane	87.77	104.85	link capacity less than arrival flow (capacity < flow)
4358-4360	Anchorsholme Lane	86.13	101.97	link capacity less than arrival flow (capacity < flow)
4373-4385	North Drive	99.39	104.83	Green signal phases are insufficient to clear the link flow
4530-4389	A587 Crescent West	77.81	100.06	link capacity less than arrival flow (capacity < flow)
4391-4392	York Avenue	69.6	101.89	Stub link connected to priority junction (capacity < flow)
4408-4404	West Drive West	102.08	103.71	link capacity less than arrival flow (capacity < flow)
4392-4404	A587 Rossall Road	98.01	100.07	link capacity less than arrival flow (capacity < flow)

Arcadis (UK) Limited

The Surrey Research Park
10 Medawar Road
Guildford
GU2 7AR
United Kingdom

T: +44 (0)1483 803 000

arcadis.com

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Appendix F – Stage 3 Transport Forecasting Package

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A585 Windy Harbour to Skippool

Stage 3 - Transport Forecasting Package

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19 SEPTEMBER 2018

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Name	Signature	Title	Date of Issue	Version

This report dated 19 SEPTEMBER 2018 has been prepared for Highways England (the "Client") in accordance with the terms and conditions of appointment dated 16 March 2016 (the "Appointment") between the client and Arcadis Consulting (UK) Limited ("Arcadis") for the purposes specified in the Appointment. For the avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

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1.1 Background

1.1.1 The A585(T) is a single carriageway trunk road, which provides the only viable access from the motorway network into Fleetwood and its urban areas. The A585 suffers from congestion, especially during the peak periods. This congestion is evident at the A585/A586 signalised junction (Little Singleton) and the A585/A588 signalised junction (Shard Road). There is a third signalised junction just to the east, known as Windy Harbour which, together with Little Singleton and Shard Road, creates further congestion and all three junctions interact thus exacerbating the problems. Figure 1-1 shows the location and the network in the vicinity of the trunk road.

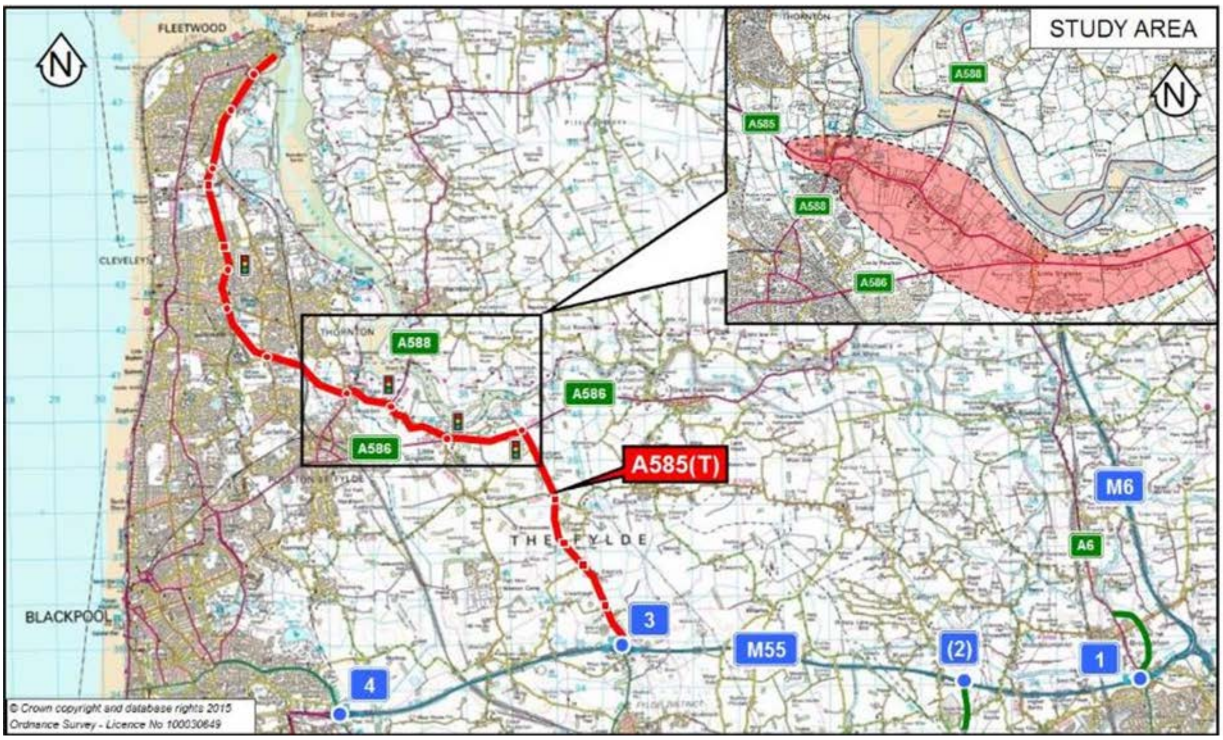


Figure 1-1: Location and network near the A585 Windy Harbour to Skippool scheme

1.1.2 The lack of rail infrastructure means that the Strategic Road Network (SRN) is the only real access option to / from Fleetwood. Bus companies are also discouraged from providing alternative sustainable travel options as the congestion impacts severely on their ability to deliver reliable timetables. Due to the lack of alternative routes and sustainable transport options, any incidents on this section of the A585 can also lead to significant delays, at any time of day, thereby exacerbating an already difficult situation.

1.1.3 Parts of the Fleetwood conurbation suffer from high unemployment and deprivation and this continued congestion will significantly limit the housing and employment growth aspirations and opportunities of the local planning authorities at both Wyre Council and Fylde Borough Council. Developers can be discouraged from investing due to the limited and congested access options.

1.2 Project Definition

1.2.1 Project Title: A585 Windy Harbour to Skippool Improvement

1.2.2 A585 ID Number (PIN): 548643

1.2.3 Scheme Type: The scheme proposal is an offline bypass of the section of the current A585, known as Mains Lane/Garstang New Road (between the junction with A586 at Windy Harbour and the junction with the A588 and B5412 at Skippool)

1.2.4 PCF Stage: Stage 3

1.3 Scheme Objectives

1.3.1 The overall project objectives as set out in the Client Scheme Requirements Version 3.2 are:

- To support economic growth in the area
- Improve safety along the route
- Improve journey time and reliability
- Reduction of severance for non-motorised users (NMUs) along the exiting Mains Lane.

1.3.2 The scheme's nine transport objectives as set out in the Client Scheme Requirements Version 3.2 are:

- Objective 1 – Deliver capacity enhancements to the SRN whilst supporting the use of sustainable modes
- Objective 2 - Reduce congestion on the existing A585 through Little Singleton, Shard and Skippool Junctions
- Objective 3 – Support employment and residential/commercial development and growth opportunities
- Objective 4 – Improve journey time reliability
- Objective 5 – Reduce severance for NMUs and improve access across the existing A585 between the Little Singleton and Skippool Junctions
- Objective 6 – Reduce/minimise the impact on the wider environment, particularly for air quality and noise
- Objective 7 – Improve connectivity and community cohesion
- Objective 8 – Support the removal of obstacles to economic growth potential in both Wyre and Fylde
- Objective 9 – Compliment and realise the full benefits of other Operations Directorate schemes in the region

1.4 Purpose of the Transport Forecasting Package

1.4.1 This Transport Forecasting Package captures the analytical material to produce the PCF Stage 3 traffic forecasts for the preferred route for the scheme announced on the 24 October 2017.

1.4.2 The traffic forecasts have been developed in accordance with the Department for Transport's (DfT) Web-based Transport Analysis Guidance (TAG).

1.4.3 Traffic forecasts have been prepared for the Core Scenario which underpins the operational and environmental assessment of the A585 Windy Harbour to Skippool scheme.

1.4.4 In addition, the traffic forecasts for the Core Scenario and the alternative growth scenarios, the Low and Optimistic Growth Scenarios will be used in the A585 Windy Harbour to Skippool Economic Assessment.

1.4.5 The initial Stage 3 scheme design was based on the Stage 2 scheme design. The Stage 3 Traffic Operational Report [HE548643-ARC-GEN-A585-RP-D-3065], which outlines the traffic operational appraisal undertaken in Stage 3, revealed some design issues with the proposed scheme junctions identified at Stage 2. The following recommendations for Stage 3 include:

1.4.6 Poulton junction – Long queues on the side roads (A586 Garstang Road) were observed in the Paramics model, due to the large volume of traffic through the junction, which was in roundabout form. This was causing significant delays to the side road. It was recommended that the design of the Poulton junction was re-visited and improved during Stage 3.

1.4.7 Skippool Bridge junction – Long queues were observed on the Mains Lane approach to the signalised Skippool Bridge junction. These queues were observed to block back across the Old Mains Lane side road and required a high green time allocation to clear them, decreasing the operational efficiency of the junction as a result. It was recommended that a longer multi-lane approach for traffic travelling westbound onto the bypass was included in Stage 3 designs.

1.4.8 Skippool junction – It was observed that straight ahead/right turning traffic on the Breck Road and Skippool Road approaches to the signalised Skippool junction was blocking left turning traffic from entering the segregated left turn lanes. This was causing delays and decreasing the operational efficiency of the junction. It was recommended that the multi-lane approaches on each arm were extended where possible to minimise the issue.

1.4.9 In addition to the above Stage 3 design changes the scheme design at the start of Stage 3 included a roundabout at Little Singleton. This was changed during Stage 3 to a revised signalised junction which includes a Q-turn facility for bus services.

1.4.10 The operational modelling assumes no scheme at the Norcross junction is in place in the design year for the A585 Windy Harbour to Skippool scheme. Inclusion of the A585 Norcross scheme would require a separate assessment to determine its impact.

1.4.11 Following the revisions to Stage 3 scheme design the traffic operational assessment has highlighted no significant issues with the revised Stage 3 Preliminary Design.

1.4.12 The updated scheme design drawings and the traffic forecasting results of the sensitivity test undertaken on the amended Stage 3 scheme design can be referred to in the Stage 3 Scheme Design Update Traffic Forecasting technical note [HE548643-ARC-HDG-A585-TN-TR-3023] in Appendix F.

1.5 Structure of the Package

1.5.1 The report is structured as follows:

- Chapter 1 – Introduction
- Chapter 2 – Key Components of the A585 Windy Harbour to Skippool Traffic Model
- Chapter 3 – Uncertainty Log and Forecast Years
- Chapter 4 – Reference Forecast Demand and Supply
- Chapter 5 – Equilibrium Demand Forecasts
- Chapter 6 – Assignment Results for Economic Assessment
- Chapter 7 – Assignment Results for Environmental Assessment
- Chapter 8 – Assignment Results for Operational Performance Assessment
- Chapter 9 – Glossary

2 Key Components of the A585 Windy Harbour to Skippool Traffic Model

2.1 Overview

2.1.1 This chapter presents a summary of the scheme's traffic model.

2.1.2 For further information on the work undertaken for previous PCF stages please refer to the Stage 3 Appraisal Specification Report HE548643-ARC-GEN-A585-RP-D-3038-V4.0.

2.1.3 The A585 Windy Harbour to Skippool traffic model is comprised of the following sub-components:

- A Simulation and Assignment of Traffic on Urban Road Network (SATURN) based highway network assignment model to replicate the base and forecast the future year travel demand and conditions on the highway network
- A Dynamic Integrated Assignment and Demand Modelling (DIADEM) based Variable Demand Model (VDM), to forecast user responses to changing travel conditions.

2.1.4 The A585 traffic model network extent in the scheme area is shown in Figure 2-1.

2.1.5 Further details on the A585 Windy Harbour to Skippool base year model development (2015) can be found in the Transport Model Package HE548643-ARC-HGN-A585-PCF-TR-3000-V2.0.

Figure 2-1: Traffic model extent in the scheme area

Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

2.2 Software

2.2.1 The following software was used in modelling the scheme:

- SATURN Version 11.3.12W and the July 2017 V1.8 TAG databook Values of Time (VoT) and Vehicle Operating Costs (VOC) – for assignment of the base and forecast traffic matrices onto the modelled highway network
- DIADEM Version 5.0 – for modelling the traffic redistribution effects in response to changes in travel cost using a variable demand approach
- TEMPro Version 7.2 and NTEM 7.2 datasets – for determining traffic growth factors, based on data from the National Transport Model

2.3 Modelled Time Periods

2.3.1 The A585 Windy Harbour to Skippool base year SATURN model has been developed for the following time periods for an average weekday in June 2015, with the average hour being used within each time range:

- AM Peak Period: 07:30 – 9:30
- Inter-Peak Period: 09:30 – 15:00
- PM Peak Period: 15:00 – 18:00

2.3.2 The definitions of these time periods were discussed and agreed with Highways England in December 2015.

2.4 Forecast Model Years

2.4.1 Traffic forecasts for the scheme have been prepared for three model years including the scheme opening year and design year and a horizon model year as follows:

- Scheme opening year (2022) – was 2021 in Stage 2
- Design year (2037) – was 2036 in Stage 2
- Horizon year: An additional model year, 2051

2.4.2 The change in scheme opening year and design year from Stage 2 is due to a change in construction start date and construction duration.

2.5 Vehicle Categories and User Classes

2.5.1 The A585 highway assignment model represents highway demand in three vehicle classes:

- Cars
- Light Goods Vehicles (LGVs)
- Heavy Goods Vehicles (HGVs).

2.5.2 The car vehicle type is further split by journey purpose into commuting, business and other trips to allow for variation in perceived travel cost.

2.5.3 Bus services were coded in the highway model to represent the road space occupied by public service vehicles within the study area. The addition of buses to the network helped to ensure that the highway model provides an accurate representation of highway conditions.

2.5.4 Walk, cycle and other non-motorised trips were not included in the model.

2.6 Generalised Cost

2.6.1 The route choice within the A585 Windy Harbour to Skippool model was modelled using the generalised cost of travel time, vehicle operating cost and tolling. The coefficients for the individual components of generalised costs were calculated using TAG Unit A1.3.

2.6.2 The model base year was 2015 with all monetary values calculated at a 2010 price base.

2.6.3 The value of time varies by trip purpose, vehicle type and occupancy level. Similarly, vehicle operating costs and maintenance costs are vehicle dependent and vary by speed.

2.6.4 Updated to 2015 (with a 2010 price base), the values of time in pence per minute (PPM) and vehicle operating costs in pence per kilometre (PPK) together with the generalised cost coefficients used in the base year A585 Windy Harbour to Skippool assignment model are given in Table 2-1. These are based on July 2017 v1.8 TAG release of VOT/VOC values.

2.6.5 The value of time given in the July 2017 v1.8 TAG release of VOT/VOC values for HGVs relates to the driver’s time and does not take account of the influence of the owner’s perception on the routing decisions of these vehicles. Therefore, TAG Unit M3.1 advises that values of time around twice the values stated in July 2017 v1.8 TAG release of VOT/VOC may be more appropriate for HGVs.

Table 2-1: Generalised cost coefficients

Category	Stage 3 A585 Base Model (2015)		2022		2037		2051	
	VoT (pence/ min)	VOC (pence /km)	VoT (pence/ min)	VOC (pence /km)	VoT (pence/ min)	VOC (pence /km)	VoT (pence/ min)	VOC (pence /km)
AM								
Car (Commute)	19.99	6.22	21.72	5.47	25.01	5.37	28.38	5.21
Car (EB)	29.81	12.53	32.39	11.91	37.29	11.85	42.32	11.72
Car (Others)	13.79	6.22	14.98	5.47	17.25	5.37	19.58	5.21
LGV	21.07	13.71	22.89	13.52	26.36	13.76	29.91	13.70
HGV*	42.78	44.19	46.48	44.80	53.51	48.85	60.74	49.76
IP								
Car (Commute)	20.31	6.22	22.07	5.47	25.41	5.37	28.84	5.21
Car (EB)	30.54	12.53	33.19	11.91	38.21	11.85	43.37	11.72
Car (Others)	14.69	6.22	15.96	5.47	18.38	5.37	20.86	5.21
LGV	21.07	13.71	22.89	13.52	26.36	13.76	29.91	13.70
HGV*	42.78	44.19	46.48	44.80	53.51	48.85	60.74	49.76
PM								
Car (Commute)	20.06	6.22	21.79	5.47	25.41	5.37	28.48	5.21
Car (EB)	30.24	12.53	32.85	11.91	38.21	11.85	42.93	11.72
Car (Others)	14.44	6.22	15.69	5.47	18.38	5.37	20.51	5.21
LGV	21.07	13.71	22.89	13.52	26.36	13.76	29.91	13.70

2.7 Assignment Approach

2.7.1 The A585 Windy Harbour to Skippool model has been developed using the SATURN suite of programs.

2.7.2 Model assignment of trips to the highway network was undertaken using the standard 'Wardrop User Equilibrium' approach, which seeks to minimise travel costs for all vehicles in the network.

2.7.3 The 'Wardrop User Equilibrium' is based on the following proposition: 'Traffic arranges itself on congested networks such that the cost of travel on all routes used between each origin-destination pair is equal to the minimum cost of travel and unused routes have equal or greater costs.'

2.7.4 SATURN uses the Frank-Wolfe Algorithm, which employs an iterative process, to reach user equilibrium.

2.7.5 The highway model assignment is based on generalised cost of travel, which is a function of both travel time and distance. Different user classes can be assigned, each with different perceptions of how time and distance contribute to travel cost.

2.7.6 Following an assignment, the simulation program re-calculates capacities, delays and queues, given the pattern of link and turn flows produced by the assignment. This generates new costs based on the current flows, which are returned to the assignment for the next iteration. This iterative process continues until the convergence criteria are met.

2.8 VDM and Highway Assignment Model Convergence

2.8.1 The stability of the highway assignment and the variable demand model (VDM) was examined to ensure that model results are sufficiently robust, stable and consistent to use as a basis for decision making.

2.8.2 A measure of convergence is obtained from the delta statistic (%GAP in SATURN), which is defined as the difference between the time costs along the chosen routes and the minimum cost routes for the entire network using the equilibrium assignment. Further assessment of the performance of the traffic assignment was carried out by evaluating the percentage of links that show less than 1% change in the assigned traffic flow between four successive iterations and the percentage of link delays with less than 1% change.

2.8.3 The VDM convergence criteria is based on TAG Unit M2 Variable Demand Modelling, Paragraph 6.3.8 p45, January 2014 as a convergence level (%GAP) value of less than 0.2.

2.8.4 The highway assignment model convergence criteria which is based on TAG Unit M3.1 Highway Assignment Modelling Paragraph 3.3.17 Table 4, p23, January 2014 is shown in Table 2-2.

Table 2-2: Highway assignment model convergence criteria

Measure of Convergence	Type	Acceptable Values
Delta & %GAP	Proximity	Less than 0.1% or at least stable with convergence fully documented and all other criteria met
Percentage of links with flow change (P) < 1%	Stability	Four consecutive iterations greater than 98%
Percentage of links with cost change (P2) < 1%		Four consecutive iterations greater than 98%

3 Uncertainty Log and Forecast Years

3.1 Background

3.1.1 The traffic model forecasting process commences with the development of the reference case demand matrices. The reference case is developed from the base year case by taking into account the growth in demand arising from changes in demographics and macro-economic factors between the 2015 base year and the model forecast years.

3.1.2 The growth in demand between the base year and the forecast years is derived from two sources:

- National long-term population, employment and transport forecasts published by the DfT in the National Trip End Model (NTEM) dataset (Version 7.2)
- Local planning data

3.1.3 This chapter provides details of how uncertainty in travel demand and supply has been addressed in the traffic forecast modelling process.

3.1.4 A description of uncertainty in forecasting is presented and the core, low growth and optimistic growth scenarios are described. The selection of the modelled forecast years is also explained.

3.2 Uncertainty in Forecasting

3.2.1 The Uncertainty Log for the A585 Windy Harbour to Skippool traffic model includes the area governed by the Blackpool Council, Wyre Council and Fylde Council as shown in Figure 3-1.

Figure 3-1: Scheme extent

3.2.2 According to TAG Unit M4 Forecasting and Uncertainty (Section 2.2.9), most sources of forecasting uncertainty can be classified into one of the following five categories:

- Model parameter errors: this is due to the simplification in the demand model responses or the adoption of standard model parameters.
- National uncertainty in travel demand: this is due to uncertainty in demographic projections and traveller behaviour and tastes.
- National uncertainty in travel cost: typically due to uncertainty in fuel prices or government policy.
- Local uncertainty (within the vicinity of the scheme) in travel demand: the most common cause being uncertainty surrounding whether proposed developments (for example housing, employment, schools, or retail) are built. Intense application of Smarter Choice measures within the vicinity of the scheme could also influence demand.
- Local uncertainty (within the vicinity of the scheme) in travel supply/cost: potential sources of uncertainty include whether other transport construction projects materialise. There can also be uncertainty over the implementation of new or existing transport schemes, such as their performance (for example public transport service provision) and their costs (for example, the levels of tolls and fares).

3.2.3 The A585 traffic model has been built in accordance with TAG Units M2, M3.1 and M3.2. As such, the uncertainty around the calibrated model parameters or the standard model parameters, e.g. values of time etc. has been reduced as far as possible in accordance with established guidance.

3.2.4 National uncertainty concerns national projections such as demographic data (population, households and employment), Gross Domestic Product (GDP) growth and fuel price trends. This is accounted for through the development of a set of alternative scenarios which are designed to examine the effects of low and high growth either side of the most likely scenario (known as the Core Scenario), to assess the effects of the uncertainty on the scheme appraisal.

3.2.5 Local sources of uncertainty typically relate to whether planned residential and commercial developments and transport network schemes go ahead in the vicinity of the scheme being built. This is accounted for through the development of an ‘uncertainty log’ which highlights the planned developments which will impact on transport supply and demand. Typically, the uncertainty log includes information on the location, timing, size and nature of proposed developments and transport infrastructure improvements. The role of the uncertainty log is to assess the certainty/likelihood of each of these factors to determine the low, core and high demand growth scenarios.

3.2.6 Sections 3.3 and 3.4 outline the production of the uncertainty log, the development of the Core Scenario and the development of the alternative low and optimistic growth scenarios.

3.3 Uncertainty Log and Identification of Core Scenario and Alternative Scenarios

3.3.1 The Uncertainty Log was developed in line with the guidance provided in TAG Unit M4 (Section 2).

3.3.2 The initial stage in the production of the uncertainty log was to review the Local Plans of the relevant local authority. A Local Plan identifies future residential and employment aspirations and are produced as part of the Local Development Framework process.

3.3.3 Information regarding the planning status of future developments in the study area was obtained from Blackpool Council and Fylde Council. Wyre Council was unable to provide the planning status and quantum of future developments within the Wyre Council area and suggested that Highways England prepare this information based on the Wyre Local Plan. Assumptions were therefore made by Highways England regarding the level of certainty, timing, quantum, land-use and trip rates of the developments included in the Stage 3 A585 Uncertainty Log in the Wyre Council Local Authority area.

3.3.4 The following three demand scenarios were appraised and are summarised in Table 3-1:

- Core Scenario incorporating NTEM background national growth and local development identified as Near Certain and More than Likely classification
- Low Growth scenario incorporating Low background national growth and local development identified as Near Certain and More than Likely classification
- Optimistic Growth scenario incorporating High background national growth and local development identified as Near Certain, More than Likely and Reasonably Foreseeable classification

Table 3-1: Demand Scenarios

Scenario	Supply	Demand	TEMPro Constraint
Core	Schemes that are: • Near Certain and • More Than Likely.	Developments that are: • Near Certain and • More Than Likely.	Standard TEMPro
Optimistic Growth	Schemes that are: • Near Certain • More Than Likely and • Reasonably Foreseeable.	Developments that are: • Near Certain • More Than Likely and • Reasonably Foreseeable.	High Growth TEMPro
Low Growth	Schemes that are: • Near Certain and • More Than Likely.	Developments that are: • Near Certain and • More Than Likely.	Low Growth TEMPro

3.3.5 The total number of proposed dwellings and employment from the uncertainty log for individual authorities are presented in Table 3-2.

Table 3-2: Uncertainty Log - Summary of Housing and Employment Developments

Council	Near Certain/More than Likely		Reasonably Foreseeable		Total	
	Dwellings	Employment (ha)	Dwellings	Employment (ha)	Dwellings	Employment (ha)
Fylde	6,537	16.71	442	24.28	6,979	40.99
Blackpool	1,252	7.31	-	8.10	1,252	15.41
Wyre	3,716	8.11	2,292	32.08	6,008	40.19
Total	11,505	32.14	2,734	64.46	14,239	96.59

3.4 Highway Infrastructure Schemes

3.4.1 In addition to proposed developments, the treatment of uncertainty in model forecasting should also include any proposed highway infrastructure schemes.

3.4.2 The definition of the ‘Without Scheme' network requires the identification of any committed or probable highway schemes within the study area that should be included in the traffic model.

3.4.3 The proposed network improvements which are likely to be in place by each forecast modelled year are included in both, ‘Without Scheme’ and ‘With Scheme’ forecast networks.

3.4.4 Following consultation with the Lancashire County Council, the highway schemes described in Table 3-3 have been included in the ‘Without Scheme’ forecast network:

Table 3-3: Uncertainty Log – Highway Schemes

Ref.	Local Authority	Scheme	Level of Certainty
1	Highways England	A585/A586 Windy Harbour junction improvement	Certain
2	Lancashire / Preston	M55 to A583 Preston Western Distributor (PWD)	More than Likely
3	Lancashire	M55 J1 capacity improvements (Broughton Roundabout)	More than Likely
4	Lancashire / Preston	East West Link Road (North West Preston) (linked to PWD)	More than Likely
5	Lancashire / Preston	M55 new J2 (part of PWD)	More than Likely
6	Lancashire / Preston	Cottam Link Road (part of PWD)	More than Likely
7	Lancashire / Preston	Cottam Parkway station	More than Likely
8	Fylde	Lytham Moss M55 to St Annes / Heyhouses Link Road	More than Likely

3.4.5 The A585/A586 Windy Harbour junction improvement was already in place by year 2015 and hence, was included in the A585 base year SATURN model.

3.4.6 The proposed scheme was added to the forecast year ‘Without Scheme’ networks to create the ‘With Scheme’ scenario for each forecast year.

4 Reference Forecast Demand and Supply

4.1 Introduction

4.1.1 The A585 Windy Harbour to Skippool forecasting approach is summarised below in Figure 4-1. The forecasting process commences with the development of the reference case by updating demand factors to each forecast year being appraised. The supply-side factors are then updated (i.e. network changes and cost assumptions) to derive the most likely 'Without Scheme' scenario against which the impact of the various schemes and policies that are to be introduced in the 'With Scheme' scenario can be tested.

4.1.2 The reference case matrices and the reference forecast are the starting point for the variable demand modelling process necessary to develop the Without Scheme and With Scheme forecasts.

4.1.3 This chapter describes the development of the reference case demand matrices for the core and alternative growth scenarios. The development of the forecast year highway networks and the generalised cost assumptions are also discussed in this chapter.

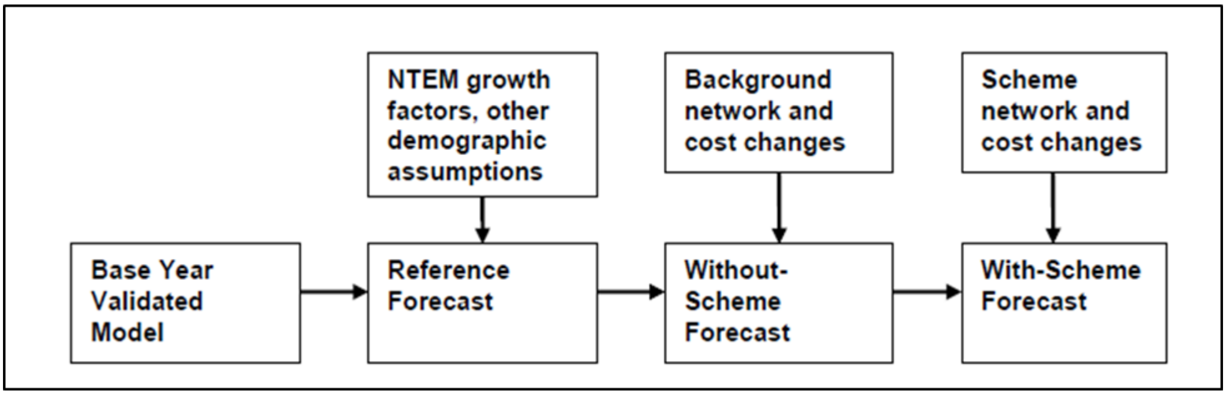


Figure 4-1: Forecasting Methodology - Future Year Matrix Development (Source: TAG Unit M4)

4.2 National Trip End Model

4.2.1 The NTEM dataset represents the DfT's standard assumptions about growth in travel demand, expressed in units of trip ends. It represents the central assumption of growth in travel demand between any two given years.

4.2.2 The NTEM provides a set of predictions for growth in travel demand at trip end level for a range of different modes: walk, bicycle, car drivers, car passengers, bus and train.

4.2.3 The NTEM model works by relating the number of trip origins and trip destinations in each area to a range of demographic and land use factors such as the number of households with cars in each area and the number of people employed in each area. NTEM trip ends are based on average rates over a wider area and mode share is derived from the 2011 National Travel Survey.

4.2.4 Trips are categorised as either home based (HB), where one of the trip ends is at the place of residence or non-home based (NHB) and are further split by trip purpose, mode and either time period or car availability. Spatially they are split into the NTEM zoning system, which covers the whole of Great Britain with at least one zone for each Local Authority / District area.

4.2.5 The NTEM dataset can be viewed using the TEMPro software (Trip End Model Presentation Program). Version 7.2 of TEMPro, issued in 2017, represents the current definitive version as defined by the DfT, and has been used to create the forecasts outlined in this report.

4.2.6 NTEM is able to produce datasets for different forecast years and for six different time periods:

- Weekday AM peak
- Weekday Interpeak
- Weekday PM peak
- Weekday Off peak
- Saturday (all day)
- Sunday (all day)
- Weekday (average) and
- Day (average)

4.2.7 NTEM was used to produce demand matrices for the car user classes in the three forecast years: 2022 2037 and 2051.

4.2.8 Correspondence was made between the A585 model zones and NTEM areas as referred in section 4.6. Within the core study area, model zones were allocated to the NTEM zones, while model zones located further out were allocated to local authority zones or regions as appropriate.

4.2.9 TEMPro was used to extract origin/destination growth factors of demand for the forecast years from NTEM for the relevant NTEM areas in the AM peak, Inter-Peak and PM peak time periods for the following user classes:

- Car – Commuter trips
- Car – Business trips
- Car – Other trips

4.3 National Transport Model

4.3.1 TAG Unit M4 (Section 7.3.18) states that the annual regional traffic forecasts from the NTM published by the DfT may be useful in forecasting freight growth.

4.3.2 The NTM forecasts provide traffic growth information by region, road type and area type (urban or rural).

4.3.3 Road Traffic Forecasts (RTF) 2015 (released in March 2015) present results from the NTM for traffic demand, congestion and emissions in England up to 2040. RTF are available for LGV, rigid and articulated vehicles.

4.3.4 The LGV growth rates were directly taken from RTF and the HGV growth rates were calculated from the total forecast vehicle miles travelled for rigid and articulated vehicles.

4.4 Reference Case Development

4.4.1 The reference case is developed from the base year case by considering the growth in demand arising from changes in demographics and macro-economic factors between the base year and forecast years.

4.4.2 TAG Unit M4 states that the forecast trip end growth should be consistent with TEMPro at the study area level, in order to allow consistency between different parts of the country when justifying transport proposals, as well as reducing the risk of optimism bias.

4.4.3 The growth in demand between the base year and the forecast years was derived using two datasets as mentioned in Section 4.2 and 4.3 for cars and light and heavy goods vehicles.

4.4.4 The trip end growth was constrained to growth forecasts at Lancashire County Level within the Lancashire sub-region. Growth rates were calculated at a county/authority level and at a regional level for the external areas depending on the correspondence of model zone structure with TEMPro.

4.4.5 The development of the reference case trip ends was undertaken in seven steps. This is explained in detail in paragraph 4.5 to 4.9.

1. Determine the growth in the forecast car trip ends projected by TEMPro between the base and the forecast years

2. Apply the TEMPro growth to the base year trip ends.

3. Determine the total number of trips generated for each model zone which includes local planning data based on the size of the development and the adopted trip rates for each development. This forecast trip data supersedes the TEMPro growth factors for zones which include local developments. Redistribute the forecast growth in trip ends by updating the TEMPro growth factors for the non-development zones only thereby taking into account the planning data provided by authorities of Wyre, Blackpool and Fylde.

4. Produce forecast year demand matrices by Furnessing the existing base demand matrices to match the forecast trip ends (including adjustments for existing brownfield/greenfield development sites)

5. Control the resulting demand matrices to the growth in TEMPro trip ends to ensure consistency with the national forecasts

6. Determine the growth in freight trip ends using RTF 2015 for the North-West Region

7. Apply the RTF growth on the LGV and HGV base matrices to derive the forecast

4.4.6 A flowchart showing the methodology for the future year matrix development process is provided in Figure 4-2.

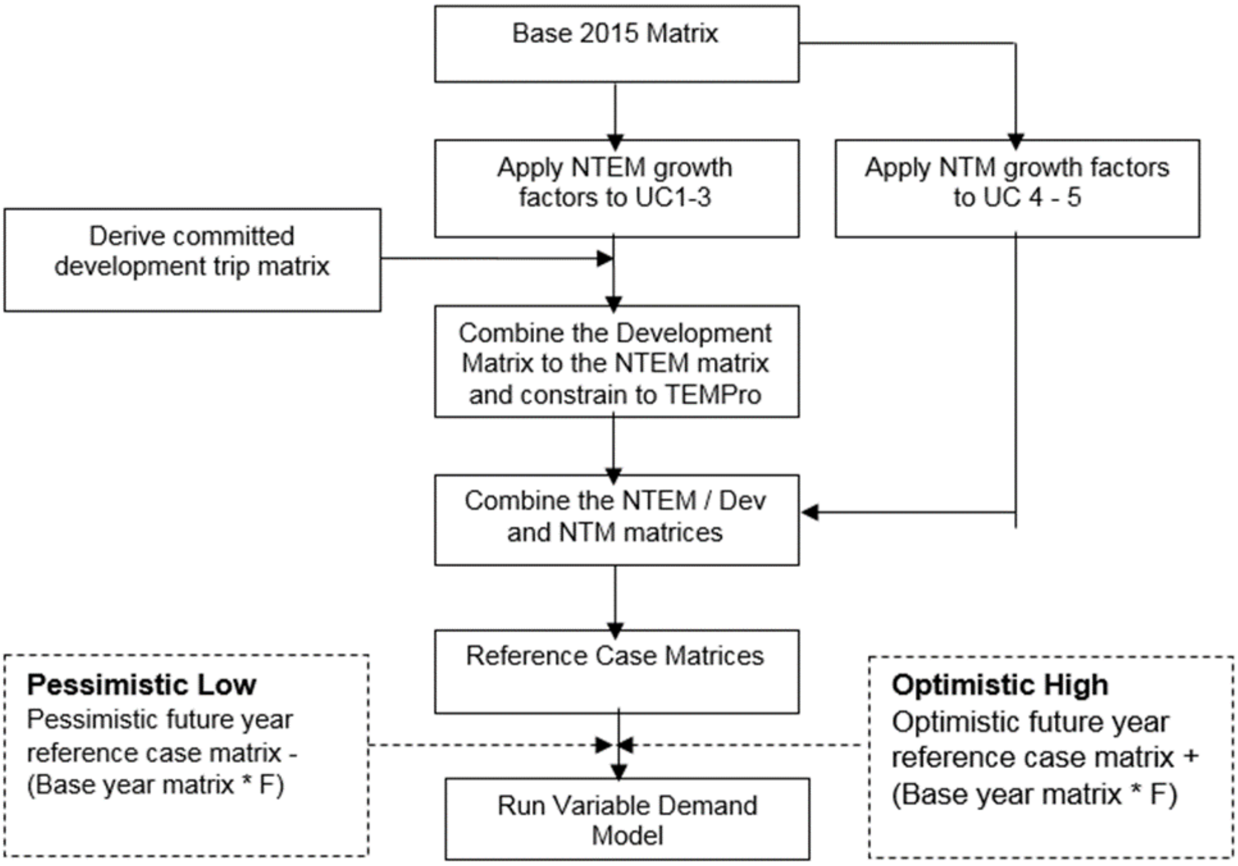


Figure 4-2: Flowchart of Future Matrix Development

4.5 Step 1 – TEMPro Growth Forecasts

4.5.1 The growth forecasts were calculated using TEMPro (version 7.2), which extracts data from the NTEM version 7.2 dataset published by the DfT.

4.5.2 A summary of the overall growth in car trip ends for the base year (2015) and the 2022, 2037 and 2051 forecast years is provided in Appendix A.

4.5.3 TEMPro growth forecasts were calculated for the TEMPro areas as shown in Table 4-1 (zones/authorities/counties/regions) for each of the three modelled time periods.

Table 4-1: TEMPro Areas Reference Case Growth

Sl No	Level	Area Description	Sl No	Level	Area Description	Sl No	Level	Area Description
1	Region	SCOTLAND	74	Authority	North East Derbyshire	147	E02005205	Fylde 003
2	Region	SE	75	Authority	North East Lincolnshire	148	E02005206	Fylde 004
3	Region	Lon	76	Authority	North Kesteven	149	E02005207	Fylde 005
4	Region	SW	77	Authority	North Lincolnshire	150	E02005208	Fylde 006
5	Region	East	78	Authority	North West Leicestershire	151	E02005209	Fylde 007
6	County	Herefordshire	79	Authority	St. Helens	152	E02005210	Fylde 008
7	County	Shropshire	80	Authority	Stockport	153	E02005211	Fylde 009
8	County	South East Wales	81	Authority	Swansea	154	E02005221	Lancaster 001
9	County	Northamptonshire	82	Authority	Tameside	155	E02005222	Lancaster 002
10	County	Northumberland	83	Authority	Trafford	156	E02005223	Lancaster 003
11	County	Staffordshire	84	Authority	Wakefield	157	E02005224	Lancaster 004
12	County	Tyne and Wear	85	Authority	Warrington	158	E02005225	Lancaster 005
13	County	Warwickshire	86	Authority	West Lancashire	159	E02005226	Lancaster 006
14	County	West Midlands	87	Authority	West Lindsey	160	E02005228	Lancaster 008
15	County	Durham	88	Authority	City of Edinburgh	161	E02005229	Lancaster 009
16	County	Nottinghamshire	89	Authority	Conwy	162	E02005230	Lancaster 010
17	County	Worcestershire	90	Authority	Copeland	163	E02005231	Lancaster 011
18	Authority	Allerdale	91	Authority	Craven	164	E02005233	Lancaster 013
19	Authority	Amber Valley	92	Authority	Denbighshire	165	E02005234	Lancaster 014
20	Authority	Barnsley	93	Authority	Derby	166	E02005235	Lancaster 015
21	Authority	Barrow-in-Furness	94	Authority	Derbyshire Dales	167	E02005236	Lancaster 016
22	Authority	Blaby	95	Authority	Doncaster	168	E02005237	Lancaster 017
23	Authority	Blackburn with Darwen	96	Authority	East Lindsey	169	E02005238	Lancaster 018
24	Authority	Gwynedd	97	Authority	East Riding of Yorkshire	170	E02005239	Lancaster 019
25	Authority	Halton	98	Authority	Eden	171	E02005253	Preston 001

Sl No	Level	Area Description	Sl No	Level	Area Description	Sl No	Level	Area Description
26	Authority	Hambleton	99	Authority	Erewash	172	E02005254	Preston 002
27	Authority	Harborough	100	Authority	Flintshire	173	E02005255	Preston 003
28	Authority	Harrogate	101	Authority	Oadby and Wigston	174	E02005256	Preston 004
29	Authority	Hartlepool	102	Authority	Oldham	175	E02005257	Preston 005
30	Authority	High Peak	103	Authority	Pembrokeshire	176	E02005258	Preston 006
31	Authority	Hinckley and Bosworth	104	Authority	Pendle	177	E02005259	Preston 007
32	Authority	Hyndburn	105	Authority	Powys	178	E02005260	Preston 008
33	Authority	Isle of Anglesey	106	Authority	Redcar and Cleveland	179	E02005261	Preston 009
34	Authority	Kingston upon Hull	107	Authority	Ribble Valley	180	E02005262	Preston 010
35	Authority	Kirklees	108	Authority	Wigan	181	E02005263	Preston 011
36	Authority	Knowsley	109	Authority	Wirral	182	E02005264	Preston 012
37	Authority	Richmondshire	110	Authority	Wrexham	183	E02005265	Preston 013
38	Authority	Rochdale	111	Authority	York	184	E02005266	Preston 014
39	Authority	Rossendale	112	E02002633	Blackpool 001	185	E02005267	Preston 015
40	Authority	Rotherham	113	E02002634	Blackpool 002	186	E02005268	Preston 016
41	Authority	Rutland	114	E02002635	Blackpool 003	187	E02005269	Preston 017
42	Authority	Ryedale	115	E02002636	Blackpool 004	188	E02005287	South Ribble 001
43	Authority	Salford	116	E02002637	Blackpool 005	189	E02005288	South Ribble 002
44	Authority	Scarborough	117	E02002638	Blackpool 006	190	E02005289	South Ribble 003
45	Authority	Sefton	118	E02002639	Blackpool 007	191	E02005290	South Ribble 004
46	Authority	Selby	119	E02002640	Blackpool 008	192	E02005291	South Ribble 005
47	Authority	Sheffield	120	E02002641	Blackpool 009	193	E02005292	South Ribble 006
48	Authority	South Derbyshire	121	E02002642	Blackpool 010	194	E02005293	South Ribble 007
49	Authority	South Holland	122	E02002643	Blackpool 011	195	E02005294	South Ribble 008
50	Authority	South Kesteven	123	E02002644	Blackpool 012	196	E02005295	South Ribble 009
51	Authority	South Lakeland	124	E02002645	Blackpool 013	197	E02005296	South Ribble 010
52	Authority	Bolsover	125	E02002646	Blackpool 014	198	E02005297	South Ribble 011
53	Authority	Bolton	126	E02002647	Blackpool 015	199	E02005298	South Ribble 012
54	Authority	Boston	127	E02002648	Blackpool 016	200	E02005299	South Ribble 013
55	Authority	Bradford	128	E02002649	Blackpool 017	201	E02005300	South Ribble 014
56	Authority	Burnley	129	E02002650	Blackpool 018	202	E02005301	South Ribble 015
57	Authority	Bury	130	E02002651	Blackpool 019	203	E02005302	South Ribble 016
58	Authority	Calderdale	131	E02005189	Chorley 001	204	E02005303	South Ribble 017
59	Authority	Carlisle	132	E02005190	Chorley 002	205	E02005319	Wyre 001
60	Authority	Carmarthenshire	133	E02005191	Chorley 003	206	E02005320	Wyre 002
61	Authority	Ceredigion	134	E02005192	Chorley 004	207	E02005321	Wyre 003
62	Authority	Charnwood	135	E02005193	Chorley 005	208	E02005322	Wyre 004
63	Authority	Cheshire East	136	E02005194	Chorley 006	209	E02005323	Wyre 005

Sl No	Level	Area Description	Sl No	Level	Area Description	Sl No	Level	Area Description
64	Authority	Cheshire West and Chester	137	E02005195	Chorley 007	210	E02005324	Wyre 006
65	Authority	Chesterfield	138	E02005196	Chorley 008	211	E02005325	Wyre 007
66	Authority	Leeds	139	E02005197	Chorley 009	212	E02005326	Wyre 008
67	Authority	Leicester	140	E02005198	Chorley 010	213	E02005327	Wyre 009
68	Authority	Lincoln	141	E02005199	Chorley 011	214	E02005328	Wyre 010
69	Authority	Liverpool	142	E02005200	Chorley 012	215	E02005329	Wyre 011
70	Authority	Manchester	143	E02005201	Chorley 013	216	E02005330	Wyre 012
71	Authority	Melton	144	E02005202	Chorley 014	217	E02005331	Wyre 013
72	Authority	Middlesbrough	145	E02005203	Fylde 001	218	E02005332	Wyre 014
73	Authority	Neath Port Talbot	146	E02005204	Fylde 002	219	E02006871	Lancaster 020

4.5.4 TEMPro trip ends are available by 15 trip purposes. The trip purposes were aggregated into the 3 user classes i.e. Car – Commute, Car- Employers' Business and Car- Others for the A585 Windy Harbour to Skippool traffic model as shown in Table 4-2.

Table 4-2: TEMPro Trip purpose correspondence

Commute	Business	Others
HB Work	HB Employers Business	HB Education
NHB Work	NHB Employers Business	HB Shopping
		HB Personal Business
		HB Recreation/Social
		HB Visiting Friends and Relatives
		HB Holiday/Day Trip
		NHB Education
		NHB Shopping
		NHB Personal Business
		NHB Recreation/Social
		NHB Holiday/Day Trip

4.6 Step 2 – Applying TEMPro Growth

4.6.1 The A585 model zones were aggregated to the 219 TEMPro zonal/authority/county/regional levels to enable the projected growth to be applied to the base year trip ends.

4.6.2 The TEMPro growth was applied to the base year trip ends at the TEMPro zone level using the following process:

- Extract the AM peak, Inter-peak and PM peak period trip ends from TEMPro for the 2015 base year
- Extract the equivalent trip ends from TEMPro for the 2022, 2037 and 2051 model forecast years
- Calculate the growth in modelled trip ends for the forecast years by trip purpose, by applying TEMPro growth factors to base trip ends at an TEMPro zonal/authority/county/regional level (as applicable):
- Forecast Model Trip ends = Base Model Trip ends * (TEMPro Forecast Trip ends / TEMPro Base Trip ends).

4.7 Step 3 – Use of Local Planning Data

4.7.1 The land use developments and transport schemes for the forecast years were obtained from local planning data for the Local Authority areas including Fylde Council, Wyre Council and Blackpool Council.

4.7.2 TAG Unit M4 (Section 4.1.3) advises that, in addition to a 'core' scenario, a range of sensitivity tests and/or alternative scenarios should be developed to account for future uncertainty in traffic forecasting, in order to allow the provision of a range of outcomes that consider the potential effects of uncertainty within the model. It was therefore appropriate to adjust the local growth assumptions related to demand in the different growth scenarios.

4.7.3 An uncertainty log of the developments with their planning status was prepared to highlight the uncertainties and factors likely to affect traffic, revenues and scheme delivery. The location and size of the planned developments, their land-use and their planning status is summarised in the uncertainty log provided in the workbook [HE548643-ARC-HGN-A585-TN-TR-3007-Stage 3_A585 Uncertainty Log_trips_v2.0] and summarised in Table 3-2.

4.7.4 The future growth scenarios modelled for the forecast years therefore comprise of a core scenario and two alternative growth scenarios, namely, low and optimistic growth scenarios depending on the status of the development proposals. The scenarios can be summarised as:

- The core scenario includes all local developments categorised as ‘near certain’ and ‘more than likely’ as outlined in TAG Unit M4 (Table A2).
- The optimistic growth scenario with the inclusion of the ‘reasonably foreseeable’ sources of growth that are not included in the core scenario and prepared by producing a range around the core scenario.
- The low growth scenario includes the same sources of local growth that are included in the core scenario and prepared by producing a range around the core scenario.

4.7.5 Each development was assigned a model zone (or zones) for which the trips generated were allocated.

4.7.6 The total number of trips generated for each model zone was calculated for all growth scenarios by forecast year using the size of development and the adopted trip rates for each development.

4.7.7 The development trips were then split into three car user classes and distributed using the base year trip purpose proportions for each model zone by time period.

4.8 Step 4 & 5 – Constraining to TEMPro Forecast Growth.

4.8.1 The trip ends for the forecast years were derived from two sources:

- a combination of an update to the NTEM derived growth factors for the non-development zones where local development data was not available (as the total demand must be controlled to NTEM at a suitable spatial level assessed to be the Lancashire County Level for the Stage 3 A585 traffic forecasts
- trip generation based on the local planning data for the zones which contained local developments. It was assumed that due to the size of the developments in relation to the traffic model zones that the trips generated from the local developments would be used instead of TEMPro for these zones. It was assumed that it would be double-counting to apply NTEM growth as well as include the trip generation derived from the developments.

4.8.2 The growth factor for each A585 model zones and the forecast trip ends were derived from TEMPro as described in Section 4.6. The total number of developments originating from and destined to the model zones were obtained as described in Section 4.7.

4.8.3 The trip ends derived from a combination of NTEM derived growth factors and the local planning data were controlled to the TEMPro-derived growth in trip ends to ensure consistency with the regional forecasts. This process has been described in detail below:

1 For model zones, where local development data was not available, the TEMPro growth factors were used to estimate the forecast trip ends as follows:

Forecast model trips = Base model trips * TEMPro Growth Factor for the model zone

2 For model zones, where development trips were available from local planning data, no TEMPro growth factors were applied (to avoid double-counting), instead the forecast origins and destinations are obtained as:

Forecast model trips = Base model trips + Development trips

3 However, wherever a TEMPro area contained a model zone having defined local development trips, a revised growth rate was calculated for the rest of the model zones within the TEMPro area. As noted above, this was done to control the overall demand to the TEMPro-derived growth in trip ends and ensure consistency with the regional forecasts

4 Revised Growth Factor = (TEMPro forecast trip ends – Development trips – Base trip ends for zones with development) / (Base trip ends for zones without development).

4.8.4 It was noticed that the quantum of development envisaged within some zones of authorities of Wyre, Blackpool and Fylde was quite high. This resulted in the generation of a development trips much higher than that predicted by the TEMPro forecasts for the entire local authority, thereby resulting in a negative background growth for the rest of the model zones within the authorities of Wyre, Blackpool and Fylde. This suggests that a few development zones within the authorities of Wyre, Blackpool and Fylde are expected to grow much more than the rest of the zones within these local authorities.

4.8.5 Hence, it was believed to be reasonable to consider a wider TEMPro area to constrain the overall demand to resolve the negative background growth for the zones within the authorities of Wyre, Blackpool and Fylde. As such, the revised growth factor was re-calculated at the Lancashire County level.

4.8.6 It is to be noted that TEMPro is DfT’s central assumption of growth in travel demand between any two given years. As noted above, TEMPro uses a range of demographic and land use factors, such as the number of households with cars in each area and the number of people employed in each area and works on the basis of ‘average trip rates’ over a wider area.

4.8.7 The forecast trip ends for the model zones thus derived include the development trips but do not exceed the TEMPro area forecast trip ends.

4.8.8 The distribution process was applied for each modelled time period and within each trip purpose, as TEMPro trip ends are extracted at this level.

4.8.9 Forecast reference case demand matrices were developed from the forecast model trip ends through a Furnessing process applied on the base year car demand matrices. A doubly constrained distribution was applied for each of the car user classes.

4.9 Step 6 & 7– Growth for Light and Heavy Goods Vehicles

4.9.1 Goods vehicle growth was updated using the latest NTM RTF forecasts: Ver 1.0, 2015, which were released in March 2015. Traffic, Congestion and Emissions by Region, Road Type & Vehicle Type Table 2 Scenario 1 for the North West area type was used.

4.9.2 This is in accordance with guidance provided in TAG Unit M4 (Section 7.3.18), which states “Usually, simpler methods, such as applying a single growth factor for the whole matrix will suffice”.

4.9.3 Table 4-3 shows the growth rates used to forecast Light Goods Vehicles (LGVs) and Heavy Goods Vehicles (HGVs) from the 2015 base Year to the forecast years respectively.

Table 4-3: Growth for LGVs and HGVs

Vehicle Type	2015 – 2022	2015 – 2037	2015 – 2051
LGVs	1.1921	1.5720	1.9337
HGVs	1.0506	1.1644	1.2864

4.10 Reference Case Matrix Totals – Core Scenario

4.10.1 The reference case matrix totals for the core scenario for all modelled time periods and forecast years are shown in Table 4-4

Table 4-4: Core Scenario Reference Case Matrix Totals

Year / Time Period	Matrix Totals (PCUs/hr)						
	UC1 Commute	UC2 EB	UC3 Others	UC4 LGV	UC5 HGV	TOTAL	GROWTH
AM							
2015	16,453	2,118	14,348	3,614	2,588	39,121	
2022	17,028	2,221	15,097	4,308	2,719	41,373	6%
2037	18,479	2,425	16,547	5,681	3,013	46,145	18%
2051	20,079	2,645	18,416	6,988	3,329	51,457	32%
IP							
2015	4,434	2,046	22,213	3,106	2,517	34,315	
2022	4,543	2,134	23,423	3,702	2,644	36,445	6%
2037	4,880	2,319	25,676	4,882	2,930	40,687	19%
2051	5,241	2,527	28,470	6,005	3,237	45,480	33%
PM							
2015	13,538	2,316	19,207	3,139	1,733	39,934	
2022	13,977	2,429	20,196	3,743	1,821	42,166	6%
2037	15,560	2,611	21,600	4,935	2,018	46,724	17%
2051	16,776	2,853	23,800	6,071	2,230	51,730	30%

4.11 Alternative Growth Scenario Development

4.11.1 The uncertainty of national trends such as GDP growth, fuel price trends and vehicle efficiency changes are not effectively reflected by the model. Therefore, it is best to test the impact of this uncertainty through the use of alternative growth scenarios.

Table 3-2 lists the local development considered within each forecast growth scenario Optimistic and Low Growth scenarios are subjected to full appraisal in accordance with TAG Unit M4 (Section 6.2). The matrix totals for the optimistic growth and low growth scenarios for all modelled time periods and forecast years are shown in Table 4-5 and

4.11.2 Table 4-6 respectively.

Table 4-5: Optimistic Growth Reference Case Matrix Totals

Year / Time Period	Matrix Totals (PCUs/hr)						
	UC1 Work	UC2 EB	UC3 Others	UC4 LGV	UC5 HGV	TOTAL	GROWTH
AM							
2015	16,453	2,118	14,348	3,614	2,588	39,121	
2022	18,116	2,364	16,046	4,547	2,890	43,963	12%
2037	20,408	2,673	18,231	6,104	3,317	50,733	30%
2051	22,548	2,965	20,569	7,530	3,717	57,329	47%
IP							
2015	4,434	2,046	22,213	3,106	2,517	34,315	
2022	4,836	2,267	24,890	3,908	2,810	38,711	13%
2037	5,401	2,561	28,281	5,246	3,225	44,715	30%
2051	5,904	2,836	31,805	6,471	3,615	50,631	48%
PM							
2015	13,538	2,316	19,207	3,139	1,733	39,934	
2022	14,877	2,580	21,469	3,950	1,936	44,811	12%
2037	17,148	2,890	23,851	5,303	2,221	51,413	29%
2051	18,810	3,201	26,681	6,542	2,490	57,722	45%

Table 4-6: Low Growth Reference Case Matrix Totals

Year / Time Period	Matrix Totals (PCUs/hr)						
	UC1 Work	UC2 EB	UC3 Others	UC4 LGV	UC5 HGV	TOTAL	GROWTH
	AM						
2015	16,453	2,118	14,348	3,614	2,588	39,121	
2022	15,940	2,081	14,148	4,069	2,548	38,786	-1%
2037	16,550	2,178	14,865	5,257	2,710	41,560	6%
2051	17,612	2,328	16,264	6,446	2,941	45,591	17%
	IP						
2015	4,434	2,046	22,213	3,106	2,517	34,315	
2022	4,250	1,999	21,954	3,497	2,477	34,177	0%
2037	4,360	2,081	23,072	4,518	2,635	36,666	7%
2051	4,576	2,221	25,139	5,540	2,860	40,335	18%
	PM						
2015	13,538	2,316	19,207	3,139	1,733	39,934	
2022	13,082	2,276	18,926	3,535	1,706	39,526	-1%
2037	13,973	2,340	19,348	4,567	1,815	42,044	5%
2051	14,746	2,507	20,920	5,600	1,970	45,743	15%

4.12 Forecast Network Development

Without Scheme Scenario

4.13.1 The specification of the Without Scheme scenario followed the guidance provided in TAG Unit M4 (Section 7.4). The transport schemes to be included within the Without Scheme scenario were developed using the highway schemes identified in the uncertainty log as described in Section 3.4.

4.13.2 The scheme's Traffic, Operational, Economic and Environment Assessment will exclude the A585 Norcross Junction and M55 Junction 3 schemes as the scheme designs were not available when the A585 Windy Harbour to Skippool model traffic forecasts were prepared.

With Scheme Scenario

4.13.3 The proposed A585 Windy Harbour to Skippool scheme was added to the forecast year Without Scheme networks to create the With Scheme scenario for each forecast year.

4.13.4 The With Scheme scenario was assessed for the Preferred Route as shown in Figure 4-3.

4.13.5 The A585 Windy Harbour to Skippool initial scheme design drawings showing the preferred route of the With Scheme Scenario is presented in Appendix B.

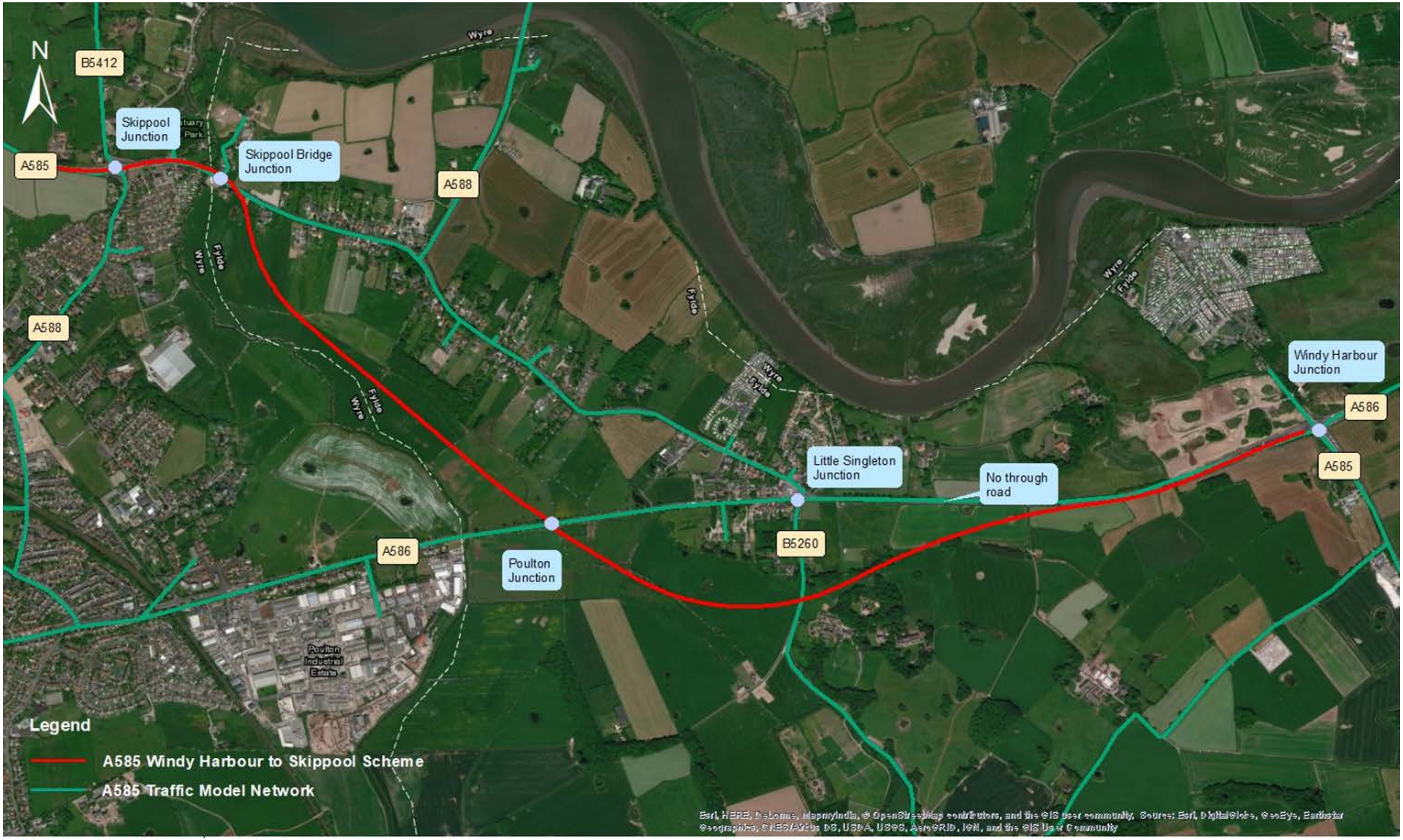


Figure 4-3: A585 Windy Harbour to Skippool Preferred Route

5 Equilibrium Demand Forecasts

5.1 Variable Demand Modelling

5.1.1 TAG unit M2 (Section 1.1.2) states that “any change to transport conditions will, in principle, cause a change in demand which can include road users making trips they did not make before the improvement, to change to a different mode, or to travel further to different destinations. The purpose of Variable Demand Modelling is to predict and quantify these changes.

5.1.2 To take into account these impacts, a variable demand model was developed to estimate the future year traffic demand.

5.1.3 TAG Unit M2 (Section 2.2) recommends that all assessments of government funded investments in highway/transport schemes need to consider the effects of variable demand, especially, if the capital cost is expected to be in excess of £5 million and that there would be congestion on the network in the forecast years in the absence of the scheme.

5.1.4 Realism testing was undertaken to ensure the VDM parameters provide a realistic response to changes in travel costs. Further detail on the realism testing undertaken for the A585 Windy Harbour to Skippool scheme can be referred to in HE548643-ARC-GEN-A585-TN-D-3010_Variable Demand Modelling Realism Tests_v1.0.

5.2 Variable Demand Model Methodology

5.2.1 The A585 Windy Harbour to Skippool VDM uses the DIADEM software (5.0) issued on behalf of the DfT for the purpose of producing the traffic forecasts for the A585 Windy Harbour to Skippool traffic model.

5.2.2 DIADEM is an incremental hierarchical logit model and works by adjusting an input reference demand matrix according to changes between forecast travel costs and input reference travel costs.

5.2.3 The VDM process consists of a series of iterations between DIADEM and SATURN (assignment model) during which demand matrices are assigned, skimmed cost matrices are extracted and, based on comparative travel costs, the demand matrices are updated.

5.2.4 DIADEM provides a means of achieving convergence between the assignment (supply) and demand models. It is to be noted that equilibrium between the demand and supply models is not found exactly and therefore, a TAG specified convergence criteria is used to determine when the solution is close enough to equilibrium.

5.2.5 There are four variable demand mechanisms in DIADEM, namely: trip frequency, mode choice, trip distribution and time of day choice.

5.2.6 The A585 VDM uses frequency, time period choice and trip distribution models. As there is no explicit main mode choice included in the VDM, a frequency response has been added to represent the possible shift of trips to or from car. No public transport modelling or land-use/transport interaction has been undertaken in relation to the proposed A585 scheme.

5.2.7 Although cost damping was introduced in DIADEM 5.0 to reduce the sensitivity of long distance trips to demand response, cost damping has not been used in the preparation of the A585 Windy Harbour to Skippool traffic forecasts.

5.3 Forecast Scenarios and Years

5.3.1 Three scenarios were considered, the Core Scenario, Low Growth scenario and Optimistic Growth scenario. The identification and development of the core and alternative growth scenarios has been discussed in greater detail in Sections 3.3 and 3.4 respectively.

5.3.2 Future year traffic flows are required for the design of the A585 Windy Harbour to Skippool scheme and also for environmental, operational and economic assessment purposes.

5.3.3 Two forecast years, the Year of Opening 2022 and the Design Year 2037 were considered for the scheme design, highway operational assessment and environmental assessment purposes.

5.3.4 Three forecast years, 2022, 2037 and 2051 were considered for the economic assessment of the scheme.

5.4 Core Scenario

Without Scheme Scenario

5.4.1 The Without Scheme represents elements that are either near certain or more than likely to be delivered. The Without Scheme scenario should represent a realistic view of what is likely to happen in the absence of any specific scheme proposals. It should focus on maintaining present transport facilities and implementing the more certain aspects of regional and local strategies.

5.4.2 The Without Scheme scenario was produced by running the A585 VDM using the reference demand, the changes to the generalised cost assumptions and the revised highway networks to achieve equilibrium of the demand and the travel costs.

With Scheme Scenario

5.4.3 The proposed scheme was assessed using the same reference case and generalised cost assumptions used to produce the Without Scheme scenario.

5.4.4 The With Scheme scenario was produced by running the A585 VDM using the reference demand, the changes to the generalised cost assumptions and the revised highway networks to achieve equilibrium of the demand and the travel costs.

VDM Response

5.4.5 The VDM response over time to the network supply and the local developments for the key sectors is shown for car origins and car destinations in the Without Scheme scenario by comparing the Post-VDM sector demand with Reference sector demand in Table 5-1 and Table 5-2. Freight matrices are not subject to adjustment by the VDM. Trips are reducing in the forecast years in response to increasing trip costs over time.

Table 5-1: Core Scenario Without Scheme VDM Response Trip Origins

Year	Sector ID	Sector	Cars AM Peak				Cars Inter Peak				Cars PM Peak			
			Trip Volumes		Comparison to Reference		Trip Volumes		Comparison to Reference		Trip Volumes		Comparison to Reference	
			Reference	DM VDM	Absolute	Percentage	Reference	DM VDM	Absolute	Percentage	Reference	DM VDM	Absolute	Percentage
2022	1	Wyre-1	1,343	1,354	10	1%	1,487	1,506	19	1%	1,885	1,910	25	1%
	2	Wyre-2	2,990	3,008	18	1%	2,681	2,685	5	0%	3,537	3,544	7	0%
	3	Blackpool - 1	3,088	3,101	13	0%	3,420	3,425	4	0%	4,368	4,378	9	0%
	4	Blackpool - 2	5,419	5,440	21	0%	5,134	5,154	20	0%	6,585	6,666	81	1%
	5	Blackpool - 3	4,569	4,568	0	0%	3,748	3,760	11	0%	5,246	5,252	5	0%
	6	Wyre-3	2,672	2,699	27	1%	1,749	1,748	-1	0%	2,313	2,312	-1	0%
	7	Fylde - 1	829	832	4	0%	477	474	-2	-1%	868	874	6	1%
	8	Fylde - 2	6,143	6,143	0	0%	5,347	5,414	67	1%	5,072	5,053	-19	0%
	9	Wyre-4	1,204	1,214	10	1%	826	816	-10	-1%	782	771	-11	-1%
	10	Wyre-5	1,382	1,376	-6	0%	1,222	1,202	-20	-2%	1,288	1,274	-14	-1%
	11	Preston	1,552	1,565	14	1%	961	962	1	0%	1,271	1,291	20	2%
		Total	31,189	31,300	111	0%	27,052	27,146	94	0%	33,217	33,325	108	0%
2037	1	Wyre-1	1,370	1,374	3	0%	1,565	1,591	26	2%	1,931	1,964	33	2%
	2	Wyre-2	3,113	3,116	3	0%	2,987	2,990	3	0%	3,818	3,817	-1	0%
	3	Blackpool - 1	3,090	3,093	3	0%	3,546	3,547	1	0%	4,402	4,376	-26	-1%
	4	Blackpool - 2	5,640	5,595	-46	-1%	5,362	5,395	33	1%	6,786	6,925	139	2%
	5	Blackpool - 3	4,795	4,708	-86	-2%	3,965	3,937	-27	-1%	5,458	5,515	57	1%
	6	Wyre-3	2,782	2,811	29	1%	1,914	1,905	-9	0%	2,484	2,473	-11	0%
	7	Fylde - 1	1,612	1,598	-15	-1%	1,020	993	-27	-3%	1,603	1,594	-9	-1%
	8	Fylde - 2	7,196	7,038	-158	-2%	5,927	5,956	29	0%	5,750	5,644	-106	-2%
	9	Wyre-4	1,240	1,245	5	0%	843	829	-14	-2%	792	773	-19	-2%
	10	Wyre-5	1,777	1,715	-62	-4%	1,511	1,476	-35	-2%	1,683	1,629	-54	-3%
	11	Preston	1,573	1,604	31	2%	1,002	973	-30	-3%	1,631	1,633	2	0%
		Total	34,190	33,897	-293	-1%	29,642	29,591	-51	0%	36,338	36,344	6	0%
2051	1	Wyre-1	1,617	1,598	-19	-1%	1,839	1,867	28	2%	2,226	2,257	30	1%
	2	Wyre-2	3,464	3,436	-28	-1%	3,320	3,309	-11	0%	4,221	4,175	-46	-1%
	3	Blackpool - 1	3,649	3,563	-85	-2%	4,183	4,102	-80	-2%	5,100	4,950	-150	-3%
	4	Blackpool - 2	6,415	6,204	-211	-3%	6,008	6,005	-2	0%	7,510	7,583	74	1%
	5	Blackpool - 3	5,265	5,068	-197	-4%	4,426	4,295	-130	-3%	5,982	6,103	121	2%
	6	Wyre-3	3,008	3,000	-8	0%	2,085	2,072	-13	-1%	2,661	2,609	-53	-2%
	7	Fylde - 1	1,682	1,654	-28	-2%	1,049	1,016	-34	-3%	1,657	1,616	-42	-3%
	8	Fylde - 2	7,447	6,982	-465	-6%	6,092	6,044	-47	-1%	5,880	5,692	-189	-3%
	9	Wyre-4	1,253	1,223	-29	-2%	847	829	-18	-2%	796	772	-24	-3%
	10	Wyre-5	1,779	1,652	-128	-7%	1,511	1,505	-6	0%	1,682	1,654	-28	-2%
	11	Preston	1,855	1,837	-18	-1%	1,183	1,069	-114	-10%	1,856	1,779	-77	-4%
		Total	37,433	36,217	-1,215	-3%	32,542	32,113	-429	-1%	39,570	39,188	-382	-1%

Table 5-2: Core Scenario Without Scheme VDM Response Trip Destinations

Year	Sector ID	Sector	Cars AM Peak				Cars Inter Peak				Cars PM Peak			
			Trip Volumes		Comparison to Reference		Trip Volumes		Comparison to Reference		Trip Volumes		Comparison to Reference	
			Reference	DM VDM	Absolute	Percentage	Reference	DM VDM	Absolute	Percentage	Reference	DM VDM	Absolute	Percentage
2022	1	Wyre-1	1,492	1,486	-7	0%	1,488	1,504	16	1%	1,600	1,599	-1	0%
	2	Wyre-2	2,681	2,654	-28	-1%	2,680	2,669	-11	0%	4,383	4,409	26	1%
	3	Blackpool - 1	2,949	2,926	-23	-1%	3,268	3,241	-26	-1%	3,863	3,870	7	0%
	4	Blackpool - 2	5,969	5,993	24	0%	5,262	5,264	1	0%	5,747	5,754	7	0%
	5	Blackpool - 3	5,095	5,089	-6	0%	3,513	3,468	-45	-1%	5,221	5,232	11	0%
	6	Wyre-3	1,887	1,887	-1	0%	1,915	1,923	8	0%	2,596	2,609	14	1%
	7	Fylde - 1	1,249	1,259	11	1%	471	466	-5	-1%	774	778	3	0%
	8	Fylde - 2	6,623	6,662	40	1%	5,392	5,416	25	0%	5,557	5,570	13	0%
	9	Wyre-4	602	585	-17	-3%	782	776	-6	-1%	953	960	6	1%
	10	Wyre-5	1,272	1,240	-32	-3%	1,214	1,190	-24	-2%	1,355	1,362	7	1%
	11	Preston	1,507	1,523	15	1%	1,053	1,068	15	1%	1,085	1,091	7	1%
		Total	31,326	31,304	-23	0%	27,038	26,985	-53	0%	33,133	33,233	100	0%
2037	1	Wyre-1	1,609	1,603	-6	0%	1,578	1,595	17	1%	1,623	1,607	-16	-1%
	2	Wyre-2	2,937	2,900	-37	-1%	2,997	2,959	-38	-1%	4,631	4,583	-48	-1%
	3	Blackpool - 1	3,103	3,053	-49	-2%	3,409	3,340	-69	-2%	3,879	3,828	-51	-1%
	4	Blackpool - 2	6,362	6,313	-49	-1%	5,500	5,430	-70	-1%	5,950	5,859	-91	-2%
	5	Blackpool - 3	5,366	5,244	-123	-2%	3,727	3,606	-122	-3%	5,493	5,433	-60	-1%
	6	Wyre-3	2,056	2,039	-17	-1%	2,080	2,056	-24	-1%	2,766	2,744	-22	-1%
	7	Fylde - 1	1,785	1,822	37	2%	1,005	957	-48	-5%	1,551	1,534	-17	-1%
	8	Fylde - 2	7,225	7,147	-78	-1%	5,984	5,963	-21	0%	6,640	6,545	-95	-1%
	9	Wyre-4	619	588	-31	-5%	797	781	-16	-2%	996	991	-5	0%
	10	Wyre-5	1,657	1,571	-86	-5%	1,443	1,388	-55	-4%	1,807	1,782	-25	-1%
	11	Preston	1,554	1,492	-62	-4%	1,103	1,079	-24	-2%	894	906	12	1%
		Total	34,273	33,773	-501	-1%	29,623	29,153	-470	-2%	36,230	35,812	-418	-1%
2051	1	Wyre-1	1,854	1,813	-41	-2%	1,852	1,855	3	0%	1,887	1,842	-45	-2%
	2	Wyre-2	3,259	3,156	-103	-3%	3,353	3,272	-82	-2%	5,160	4,989	-170	-3%
	3	Blackpool - 1	3,627	3,504	-122	-3%	4,025	3,902	-123	-3%	4,531	4,368	-164	-4%
	4	Blackpool - 2	7,177	6,992	-185	-3%	6,135	5,990	-144	-2%	6,569	6,297	-272	-4%
	5	Blackpool - 3	5,918	5,658	-260	-4%	4,149	3,945	-204	-5%	6,084	5,880	-204	-3%
	6	Wyre-3	2,186	2,123	-63	-3%	2,265	2,212	-54	-2%	2,982	2,900	-82	-3%
	7	Fylde - 1	1,881	1,904	23	1%	1,039	951	-89	-9%	1,612	1,565	-48	-3%
	8	Fylde - 2	7,537	7,363	-174	-2%	6,143	6,051	-93	-2%	6,753	6,551	-202	-3%
	9	Wyre-4	636	591	-45	-7%	803	775	-28	-4%	999	979	-21	-2%
	10	Wyre-5	1,653	1,564	-89	-5%	1,445	1,397	-48	-3%	1,808	1,724	-84	-5%
	11	Preston	1,801	1,593	-209	-12%	1,306	1,157	-149	-11%	1,032	1,001	-31	-3%
		Total	37,528	36,259	-1,269	-3%	32,515	31,507	-1,008	-3%	39,417	38,095	-1,322	-3%

Model Outputs

5.4.6 The outputs from the VDM assess the forecast growth in travel demand by the A585 VDM and the change in network performance over time.

5.4.7 Table 5-3 summarises the forecast growth in the modelled trip ends between the 2015 base year and the forecast years. The A585 Windy Harbour to Skippool demand model forecasts that the total number of trips made will increase by around 6-7% between 2015 and 2022, by around 18-20% by 2037 and by around 29-34% by 2051.

5.4.8 The forecast numbers are consistent with the projections from the TEMPro v7.2 dataset (as previously summarised in Section 4.5) with reference case forecast growth being around 6% by 2022, 17-19% by 2037 and 30-33% by 2051.

Table 5-3: Core Scenario Growth in Travel Demand – Post-VDM Matrix Totals

Year / Time Period	Matrix Totals (PCUs/hr)						
	UC1 Commute	UC2 EB	UC3 Others	UC4 LGV	UC5 HGV	TOTAL	GROWTH
AM							
2015	16,453	2,118	14,348	3,614	2,588	39,121	
2022	17,257	2,236	15,035	4,308	2,719	41,556	6%
2037	18,844	2,440	16,074	5,681	3,013	46,052	18%
2051	20,301	2,624	17,194	6,988	3,329	50,437	29%
IP							
2015	4,434	2,046	22,213	3,106	2,517	34,315	
2022	4,582	2,154	23,703	3,702	2,644	36,785	7%
2037	4,951	2,368	26,206	4,882	2,930	41,337	20%
2051	5,320	2,562	28,957	6,005	3,237	46,082	34%
PM							
2015	13,538	2,316	19,207	3,139	1,733	39,934	
2022	14,150	2,424	20,442	3,743	1,821	42,580	7%
2037	15,792	2,588	22,059	4,935	2,018	47,393	19%
2051	16,847	2,807	24,223	6,071	2,230	52,177	31%

Core Scenario VDM and Highway Assignment Model Convergence

5.4.9 The scheme's VDM convergence results are shown in Table 5-4 for the Core Scenario. All the forecasts achieve the TAG recommended convergence targets i.e. gap value of 0.2% or lower.

Table 5-4: Core Scenario VDM Convergence

Option	Year	Iterations	GAP
Without Scheme	2022	8	0.08%
	2037	10	0.08%
	2051	9	0.15%
With Scheme	2022	8	0.08%
	2037	10	0.07%
	2051	9	0.17%

5.4.10 The scheme's highway assignment model convergence results are presented in Table 5-5 for the Core Scenario. All the forecasts achieve the TAG recommended convergence targets i.e. gap value of 0.1% or lower.

Table 5-5: Core Scenario Highway Assignment Model Convergence

Time period	Year	Assignment Simulation Loops	% link Flows <1% Change	% Delays <1% change	% GAP
AM	2022	39	98.5	99	0.005
	2037	53	98.8	99.1	0.006
	2051	43	98.4	98.4	0.034
IP	2022	22	99	99.7	0.002
	2037	27	98.7	99.4	0.008
	2051	49	98	98.8	0.022
PM	2022	37	98.5	99.1	0.006
	2037	39	98.6	98.3	0.011
	2051	54	98.7	98.7	0.010

Network Statistics

5.4.11 Table 5-6 summarises the changes in travel conditions on the highway network between the 2015 base year and forecast years in the Without Scheme scenario.

5.4.12 Congestion levels are expected to increase by 2051 in the Without Scheme scenario. The increase in the levels of congestion mean that the average network speeds reduce by 4-12% by 2051.

Table 5-6: Core Scenario Network Statistics – Simulation Area (Without Scheme)

Network Performance Parameter	2015 Base Year	2022 Without Scheme	2037 Without Scheme	2051 Without Scheme	% change by 2022	% change by 2037	% change by 2051
AM							
Travel time (pcu-hrs)	5,408	5,674	6,407	7,350	5%	18%	36%
Travel Distance (pcu-kms)	210,784	226,821	251,085	275,244	8%	19%	31%
Average Speed (kph)	39	40	39	37	3%	1%	-4%
Over-Capacity Queues (pcu-hrs)	19	24	62	149	24%	225%	685%
Delays (pcu-hrs)	1,375	1,375	1,661	2,125	0%	21%	55%
IP							
Travel time (pcu-hrs)	4,248	4,549	5,324	6,626	7%	25%	56%
Travel Distance (pcu-kms)	167,989	187,904	216,710	245,769	12%	29%	46%
Average Speed (kph)	40	41	41	37	3%	2%	-7%
Over-Capacity Queues (pcu-hrs)	5	6	25	424	26%	408%	8380%
Delays (pcu-hrs)	1,001	987	1,251	1,997	-1%	25%	100%
PM							
Travel time (pcu-hrs)	5,779	6,121	7,021	8,836	6%	21%	53%
Travel Distance (pcu-kms)	220,840	239,802	266,744	294,736	9%	21%	33%
Average Speed (kph)	38	39	38	33	3%	0%	-12%
Over-Capacity Queues (pcu-hrs)	17	62	153	908	262%	799%	5239%
Delays (pcu-hrs)	1,520	1,552	1,967	3,213	2%	29%	111%

5.4.13 The impact of the A585 Windy Harbour to Skippool scheme, as summarised in Tables 5.5 to 5.7 can be assessed by comparing the network statistics to that of the Without Scheme scenario for the simulation area by comparisons of the network performance in terms of the travel distance, travel time, average network speed and total delays.

5.4.14 It is observed that the total travel times across the network with the A585 Windy Harbour to Skippool scheme in place, reduce by approximately 1% across all time periods when compared to the Without Scheme scenario.

5.4.15 Network wide delays too decrease by as much as 2% to 4% in the opening year and by 3% to 6% in the horizon year.

5.4.16 The average network speed is seen to be marginally improving in the with scheme scenario across all the forecast years.

Table 5-7: Core Scenario Network Statistics – Simulation Area (2022)

Network Performance Parameter	Without Scheme	With Scheme	%Diff
AM			
Travel time (pcu-hrs)	5674	5597	-77
Travel Distance (pcu-kms)	226821	228718	1897
Average Speed (kph)	40	41	1
Over-Capacity Queues (pcu-hrs)	24	29	6
Delays (pcu-hrs)	1375	1344	-31
IP			
Travel time (pcu-hrs)	4549	4495	-54
Travel Distance (pcu-kms)	187904	191005	3101
Average Speed (kph)	41	43	1
Over-Capacity Queues (pcu-hrs)	6	6	0
Delays (pcu-hrs)	987	958	-28
PM			
Travel time (pcu-hrs)	6121	6036	-85
Travel Distance (pcu-kms)	239802	243291	3489
Average Speed (kph)	39	40	1
Over-Capacity Queues (pcu-hrs)	62	35	-26
Delays (pcu-hrs)	1552	1488	-64

Table 5-8: Core Scenario Network Statistics – Simulation Area (2037)

Network Performance Parameter	Without Scheme	With Scheme	%Diff
AM			
Travel time (pcu-hrs)	6407	6329	-78
Travel Distance (pcu-kms)	251085	253053	1968
Average Speed (kph)	39	40	1
Over-Capacity Queues (pcu-hrs)	62	87	25
Delays (pcu-hrs)	1661	1635	-26
IP			
Travel time (pcu-hrs)	5324	5252	-72
Travel Distance (pcu-kms)	216710	220530	3820
Average Speed (kph)	41	42	1
Over-Capacity Queues (pcu-hrs)	25	22	-3
Delays (pcu-hrs)	1251	1200	-51
PM			
Travel time (pcu-hrs)	7021	6905	-116
Travel Distance (pcu-kms)	266744	270791	4047
Average Speed (kph)	38	39	1
Over-Capacity Queues (pcu-hrs)	153	107	-46
Delays (pcu-hrs)	1967	1870	-97

Table 5-9: Core Scenario Network Statistics – Simulation Area (2051)

Network Performance Parameter	Without Scheme	With Scheme	%Diff
AM			
Travel time (pcu-hrs)	7350	7249	-101
Travel Distance (pcu-kms)	275244	278986	3742
Average Speed (kph)	37	39	1
Over-Capacity Queues (pcu-hrs)	149	168	19
Delays (pcu-hrs)	2125	2055	-70
IP			
Travel time (pcu-hrs)	6626	6531	-95
Travel Distance (pcu-kms)	245769	250752	4983
Average Speed (kph)	37	38	1
Over-Capacity Queues (pcu-hrs)	424	375	-49
Delays (pcu-hrs)	1997	1912	-85
PM			
Travel time (pcu-hrs)	8836	8605	-231
Travel Distance (pcu-kms)	294736	299324	4589
Average Speed (kph)	33	35	1
Over-Capacity Queues (pcu-hrs)	908	813	-94
Delays (pcu-hrs)	3213	3000	-213

5.5 Alternative Growth Scenarios

5.5.1 Tag Unit M4 (Section 4 Defining High and Low Growth Alternative Scenarios) identifies that schemes should be tested to incorporate national economic uncertainties in GDP growth, fuel price trends and vehicle efficiencies. This is done by increasing or reducing the core scenario demand to create High and Low Growth scenarios respectively. In the case of the A585 scheme as the High Growth scenario also includes local development uncertainty, the High Growth scenario is labelled the Optimistic Growth scenario.

5.5.2 The methodology used to establish the Low and Optimistic growth scenarios is as follows:

5.5.3 Low Growth Scenario – apply the relevant national uncertainty to the core scenario demand.

5.5.4 Optimistic Growth Scenario – add in reasonably foreseeable development trips, as defined in the uncertainty log, to the core scenario demand, and then apply the relevant national uncertainty.

5.5.5 The methodology to develop the Low and Optimistic Growth scenarios is detailed in Chapter 4.

5.5.6 The alternative growth scenarios were assessed using the A585 Windy Harbour to Skippool VDM by using the same methodology as the core scenario.

5.5.7 The Without Scheme and With Scheme models were produced by running the A585 VDM using Optimistic and Low Growth reference demand matrices, changes to the generalised cost assumptions and revised highway networks to achieve equilibrium of the demand and travel costs.

5.6 Low Growth Scenario

Matrix Totals

5.6.1 The post-VDM matrix totals for the 2015 base year and the forecast years for the Low Growth scenario are shown in Table 5-10. The growth in the travel demand between the 2015 base year and the forecast years is also shown in Table 5.8.

5.6.2 It is observed that there is little or no growth in the travel demand from 2015 base year to the 2022 forecast year for the Low Growth scenario. This is because the national uncertainty in travel demand outweighs the central growth assumptions in travel demand between the two given years.

Table 5-10: Low Growth in Travel Demand – Post-VDM Matrix Totals

Year / Time Period	Matrix Totals (PCUs/hr)						
	UC1 Work	UC2 EB	UC3 Others	UC4 LGV	UC5 HGV	TOTAL	GROWTH
AM							
2015	16,453	2,118	14,348	3,614	2,588	39,121	
2022	16,196	2,100	14,145	4,069	2,548	39,057	0%
2037	16,958	2,204	14,539	5,257	2,710	41,668	7%
2051	18,020	2,340	15,322	6,446	2,941	45,068	15%
IP							
2015	4,434	2,046	22,213	3,106	2,517	34,315	
2022	4,288	2,019	22,236	3,497	2,477	34,517	1%
2037	4,425	2,126	23,607	4,518	2,635	37,311	9%
2051	4,656	2,296	25,845	5,540	2,860	41,196	20%
PM							
2015	13,538	2,316	19,207	3,139	1,733	39,934	
2022	13,253	2,274	19,222	3,535	1,706	39,990	0%
2037	14,242	2,324	19,895	4,567	1,815	42,844	7%
2051	14,987	2,478	21,897	5,600	1,970	46,931	18%

Low Growth Scenario VDM and Highway Assignment Model Convergence

5.6.3 The scheme's VDM convergence results are presented in Table 5-11 for the Low Growth scenario. All the forecasts achieve the TAG recommended convergence targets i.e. gap value of 0.2% or lower.

Table 5-11: Low Growth VDM Convergence

Option	Year	Iterations	GAP
Without Scheme	2022	8	0.08%
	2037	10	0.06%
	2051	9	0.16%
With Scheme	2022	8	0.08%
	2037	10	0.06%
	2051	14	0.11%

5.6.4 The scheme's highway assignment model convergence results for the Low Growth scenario are shown in Table 5.9. All the forecasts achieve the TAG recommended convergence targets i.e. gap value of 0.1% or lower.

Table 5-12: Low Growth Highway Assignment Model Convergence

Time period	Year	Assignment Simulation Loops	% link Flows <1% Change	% Delays <1% change	% GAP
AM	2022	39	98.5	99	0.005
	2037	33	98.6	99.4	0.007
	2051	50	98.7	99.2	0.010
IP	2022	26	98.2	99.7	0.001
	2037	19	98.9	99.7	0.003
	2051	28	98.9	99.5	0.006
PM	2022	31	98.3	99.6	0.005
	2037	30	98.6	99.6	0.008
	2051	62	98.8	99.1	0.010

Network Statistics

5.6.5 Table 5-13 presents the network statistics for the Low Growth scenario for the forecast years for the Without Scheme scenario.

Table 5-13: Low Growth Network Statistics – Simulation Area (Without Scheme)

Network Performance Parameter	2015 Base Year	2022 Without Scheme	2037 Without Scheme	2051 Without Scheme	% change by 2022	% change by 2037	% change by 2051
AM							
Travel time (pcu-hrs)	5,408	5,253	5,599	6,284	-3%	4%	16%
Travel Distance (pcu-kms)	210,784	213,489	226,489	249,299	1%	7%	18%
Average Speed (kph)	39	41	40	40	4%	4%	2%
Over-Capacity Queues (pcu-hrs)	19	2	14	43	-90%	-28%	125%
Delays (pcu-hrs)	1,375	1,218	1,329	1,587	-11%	-3%	15%
IP							
Travel time (pcu-hrs)	4,248	4,225	4,668	5,539	-1%	10%	30%
Travel Distance (pcu-kms)	167,989	175,817	195,513	226,587	5%	16%	35%
Average Speed (kph)	40	42	42	41	4%	5%	2%
Over-Capacity Queues (pcu-hrs)	5	1	6	64	-88%	28%	1174%
Delays (pcu-hrs)	1,001	893	1,008	1,345	-11%	1%	34%
PM							
Travel time (pcu-hrs)	5,779	5,626	6,078	7,537	-3%	5%	30%
Travel Distance (pcu-kms)	220,840	225,504	241,791	271,153	2%	9%	23%
Average Speed (kph)	38	40	40	36	6%	5%	-5%
Over-Capacity Queues (pcu-hrs)	17	12	52	506	-27%	208%	2874%
Delays (pcu-hrs)	1,520	1,340	1,524	2,424	-12%	0%	59%

5.6.6 The impact of the A585 Windy Harbour to Skippool scheme for the low growth scenario is summarised in Table 5-14. This is assessed by comparing the network statistics of the With Scheme scenario to that of the Without Scheme scenario for the simulation area.

5.6.7 It is observed that the total travel times across the network with the A585 Windy Harbour to Skippool scheme in place, reduce with the scheme in place in the horizon year.

5.6.8 It is also observed that average speeds increase by 2-4% with the scheme in place by the horizon year.

Table 5-14: Low Growth Network Statistics – Simulation Area

Network Performance Parameter	2022 Without Scheme	2022 With Scheme	% Diff	2037 Without Scheme	2037 With Scheme	% Diff	2051 Without Scheme	2051 With Scheme	% Diff
AM									
Travel time (pcu-hrs)	5,253	5,171	-2%	5,599	5,517	-1%	6,284	6,216	-1%
Travel Distance (pcu-kms)	213,489	215,432	1%	226,489	228,382	1%	249,299	251,564	1%
Average Speed (kph)	41	42	3%	40	41	2%	40	41	2%
Over-Capacity Queues (pcu-hrs)	2	2	-16%	14	19	38%	43	65	51%
Delays (pcu-hrs)	1,218	1,177	-3%	1,329	1,293	-3%	1,587	1,567	-1%
IP									
Travel time (pcu-hrs)	4,225	4,170	-1%	4,668	4,603	-1%	5,539	5,445	-2%
Travel Distance (pcu-kms)	175,817	178,824	2%	195,513	198,982	2%	226,587	230,550	2%
Average Speed (kph)	42	43	3%	42	43	3%	41	42	3%
Over-Capacity Queues (pcu-hrs)	1	1	-17%	6	6	-11%	64	46	-28%
Delays (pcu-hrs)	893	862	-3%	1,008	967	-4%	1,345	1,273	-5%
PM									
Travel time (pcu-hrs)	5,626	5,553	-1%	6,078	5,991	-1%	7,537	7,406	-2%
Travel Distance (pcu-kms)	225,504	228,750	1%	241,791	245,360	1%	271,153	275,291	2%
Average Speed (kph)	40	41	3%	40	41	3%	36	37	3%
Over-Capacity Queues (pcu-hrs)	12	7	-48%	52	26	-51%	506	484	-4%
Delays (pcu-hrs)	1,340	1,291	-4%	1,524	1,457	-4%	2,424	2,316	-4%

5.7 Optimistic Growth Scenario

Matrix Totals

5.7.1 The post-VDM matrix totals for the 2015 base year and the forecast years for the optimistic growth scenario are shown in Table 5-15. The growth in the travel demand between the 2015 base year and the forecast years is also shown in Table 5-15.

5.7.2 It is observed that that the total number of trips made will increase by around 13-14% between 2015 and 2022, by around 29-32% by 2037 and by around 44-49% by 2051.

Table 5-15: Optimistic Growth in Travel Demand – Post-VDM Matrix Totals

Year / Time Period	Matrix Totals (PCUs/hr)						
	UC1 Work	UC2 EB	UC3 Others	UC4 LGV	UC5 HGV	TOTAL	GROWTH
AM							
2015	16,453	2,118	14,348	3,614	2,588	39,121	
2022	18,436	2,369	15,921	4,547	2,890	44,163	13%
2037	20,953	2,671	17,609	6,104	3,317	50,654	29%
2051	22,956	2,932	19,129	7,530	3,717	56,264	44%
IP							
2015	4,434	2,046	22,213	3,106	2,517	34,315	
2022	4,911	2,289	25,167	3,908	2,810	39,086	14%
2037	5,532	2,610	28,722	5,246	3,225	45,336	32%
2051	6,054	2,899	32,189	6,471	3,615	51,228	49%
PM							
2015	13,538	2,316	19,207	3,139	1,733	39,934	
2022	15,103	2,571	21,642	3,950	1,936	45,202	13%
2037	17,473	2,861	24,277	5,303	2,221	52,137	31%
2051	19,010	3,147	26,907	6,542	2,490	58,095	45%

Optimistic Growth Scenario VDM and Highway Assignment Model Convergence

5.7.3 The scheme's VDM convergence results are shown Table 5-16 for the Optimistic Growth scenario. All the forecasts achieve the TAG recommended convergence targets i.e. gap value of 0.2% or lower.

Table 5-16: Optimistic VDM Convergence

Option	Year	Iterations	GAP
Without Scheme	2022	8	0.08%
	2037	10	0.07%
	2051	9	0.18%
With Scheme	2022	8	0.10%
	2037	10	0.07%
	2051	10	0.14%

5.7.4 The scheme's highway assignment model convergence results for the Optimistic Growth scenario are shown in Table 5-17. All the forecasts achieve the TAG recommended convergence targets i.e. relative gap value of 0.1% or below.

Table 5-17: Optimistic Growth Highway Assignment Model Convergence

Time period	Year	Assignment Simulation Loops	% link Flows <1% Change	% Delays <1% change	% GAP
AM	2022	35	98.8	99.2	0.007
	2037	62	98	98.5	0.007
	2051	55	96.6	97.4	0.030
IP	2022	23	98.7	99.5	0.006
	2037	28	98.9	99.2	0.008
	2051	55	96.6	97.4	0.030
PM	2022	53	98.8	99.1	0.005
	2037	48	98.2	97.9	0.009
	2051	58	95.6	96.6	0.024

Network Statistics

5.7.5 Table 5-18 presents the model network statistics for the Optimistic Growth scenario for the 2015 base year and forecast years for the Without Scheme scenario.

5.7.6 The increase in travel demand increases the levels of congestion with average speeds falling by as much as 8% by 2037 and 20% by 2051.

Table 5-18: Optimistic Growth Network Statistics – Simulation Area (Without Scheme)

Network Performance Parameter	2015 Base Year	2022 Without Scheme	2037 Without Scheme	2051 Without Scheme	% change by 2022	% change by 2037	% change by 2051
AM							
Travel time (pcu-hrs)	5,408	6,136	7,462	9,255	13%	38%	71%
Travel Distance (pcu-kms)	210,784	240,854	269,043	302,721	14%	28%	44%
Average Speed (kph)	39	39.3	36.1	32.7	1%	-7%	-16%
Over-Capacity Queues (pcu-hrs)	19	55.3	380.8	984.2	191%	1904%	5080%
Delays (pcu-hrs)	1,375	1,561	2,326	3,420	14%	69%	149%
IP							
Travel time (pcu-hrs)	4,248	4,914	5,874	7,580	16%	38%	78%
Travel Distance (pcu-kms)	167,989	199,697	231,828	266,124	19%	38%	58%
Average Speed (kph)	40	40.6	39.5	35.1	2%	-1%	-12%
Over-Capacity Queues (pcu-hrs)	5	26	83.8	603.8	420%	1576%	11976%
Delays (pcu-hrs)	1,001	1,121	1,485	2,517	12%	48%	151%
PM							
Travel time (pcu-hrs)	5,779	6,647	8,188	10,762	15%	42%	86%
Travel Distance (pcu-kms)	220,840	253,496	284,812	321,268	15%	29%	45%
Average Speed (kph)	38	38.1	34.8	29.9	0%	-8%	-21%
Over-Capacity Queues (pcu-hrs)	17	103.3	576.1	1,794	508%	3289%	10454%
Delays (pcu-hrs)	1,520	1,803	2,713	4,557	19%	78%	200%

5.7.7 The impact of the scheme, as summarised in Table 5-19 is seen with the total travel times across the network reducing by approximately 1-2% across all modelled time periods when compared to the Without Scheme scenario. Network wide delays also decrease by as much as 6% in the horizon year.

Table 5-19: Optimistic Growth Scenario Network Statistics – Simulation Area

Network Performance Parameter	2022 Without Scheme	2022 With Scheme	% Diff	2037 Without Scheme	2037 With Scheme	% Diff	2051 Without Scheme	2051 With Scheme	% Diff
AM									
Travel time (pcu-hrs)	6,136	6,051	-1%	7,462	7,316	-2%	9,255	9,177	-1%
Travel Distance (pcu-kms)	240,854	242,443	1%	269,043	270,801	1%	302,721	305,980	1%
Average Speed (kph)	39.3	40.1	2%	36.1	37	2%	32.7	33.3	2%
Over-Capacity Queues (pcu-hrs)	55.3	67.4	22%	380.8	389.7	2%	984.2	980.3	0%
Delays (pcu-hrs)	1,561	1,529	-2%	2,326	2,239	-4%	3,420	3,387	-1%
IP									
Travel time (pcu-hrs)	4,914	4,842	-1%	5,874	5,781	-2%	7,580	7,486	-1%
Travel Distance (pcu-kms)	199,697	202,878	2%	231,828	235,697	2%	266,124	271,194	2%
Average Speed (kph)	40.6	41.9	3%	39.5	40.8	3%	35.1	36.2	3%
Over-Capacity Queues (pcu-hrs)	26	20.4	-22%	83.8	65.9	-21%	603.8	572.4	-5%
Delays (pcu-hrs)	1,121	1,076	-4%	1,485	1,408	-5%	2,517	2,435	-3%
PM									
Travel time (pcu-hrs)	6,647	6,553	-1%	8,188	8,022	-2%	10,762	10,437	-3%
Travel Distance (pcu-kms)	253,496	257,293	1%	284,812	288,730	1%	321,268	326,207	2%
Average Speed (kph)	38.1	39.3	3%	34.8	36	3%	29.9	31.3	5%
Over-Capacity Queues (pcu-hrs)	103.3	70.8	-31%	576.1	519.3	-10%	1,794	1,617	-10%
Delays (pcu-hrs)	1,803	1,726	-4%	2,713	2,577	-5%	4,557	4,240	-7%

6 Assignment Results for Economic Assessment

6.1 Overview

6.1.1 This chapter describes the A585 traffic model forecast assignments (traffic model version VDM_04) undertaken for core growth and two alternative growth scenarios including low growth and optimistic growth required for economic assessment. This section also includes a description of changes in traffic flows, and journey times due to the scheme.

6.1.2 Traffic forecasts have been prepared for 3 future years, 2022, 2037 and 2051 covering three model time periods of the AM average hour, Inter-Peak average hour and PM average hour.

6.2 Core Scenario

6.3 Core Scenario Assignment Results

Area Wide Changes in Traffic Volume

6.3.1 The forecast changes in Core Scenario area wide traffic flows on the highway network between the 2015 base year and forecast years due to the scheme are shown in Figure 6-1 to Figure 6-9. Links highlighted green indicate an increase in traffic flow and links highlighted blue indicate a decrease in traffic flow. The plots show the change in pattern of the traffic and not traffic volume detail. The increase shown in green is approximately up to between 200-300 vehicles an hour on the A585 and A586. A schematic showing further details of the traffic flows of the improvement scheme is contained in Appendix C.

6.3.2 The figures show the growth in highway flows across all three time periods, particularly for the movements on the strategic A585 Windy Harbour to Skippool corridor.

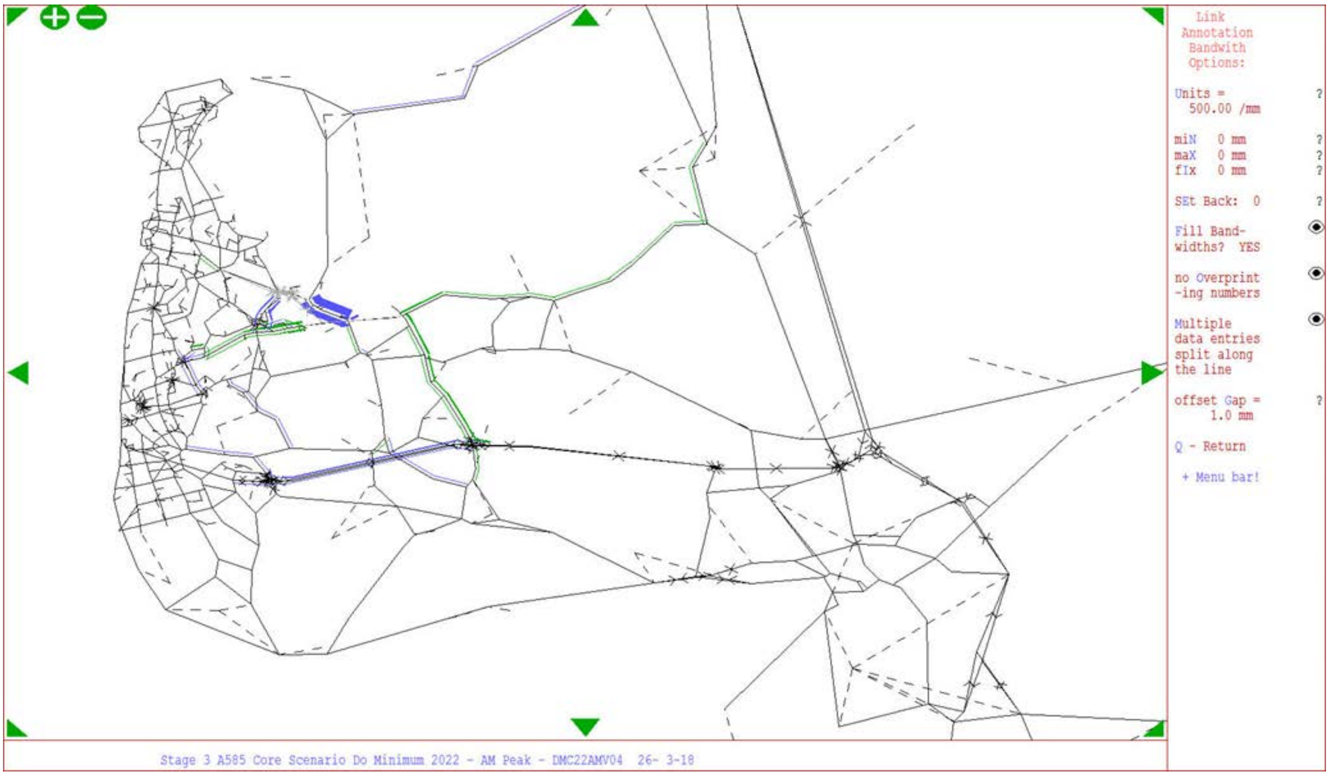
6.3.3 The largest changes in the highway flow across all modelled time periods occur on the strategic routes of A585 and the M55. The scheme benefits the long-distance traffic that use the strategic roads of A585 and M55 to travel from the authorities of Wyre and Blackpool to the rest of UK.

6.3.4 It can be seen that the traffic from Blackpool and Wyre using the local roads to reach the M55 in the Without Scheme, now heads towards the A585 in the With Scheme option.

6.3.5 A reduction of trips is observed on other roads, primarily the local roads within the Blackpool authority. In addition, it can be seen that vehicles that were using Shard Road (A588) now use the Garstang Road (A586) to head towards the north.

6.3.6 The high negative values seen in the P1X (SATURN traffic model) plots between the section from Windy Harbour to the Skippool improvement is as a result of the shift of traffic from the existing A585 to the scheme.

Figure 6-1: Core Scenario Changes in Traffic Flow (2022 With Scheme to Without Scheme - AM)



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Stage 3 A585 Core Scenario Do Minimum 2022 - AM Peak - DMC22AMV04 26- 3-18

Figure 6-2: Core Scenario Changes in Traffic Flow (2022 With Scheme to Without Scheme - IP)

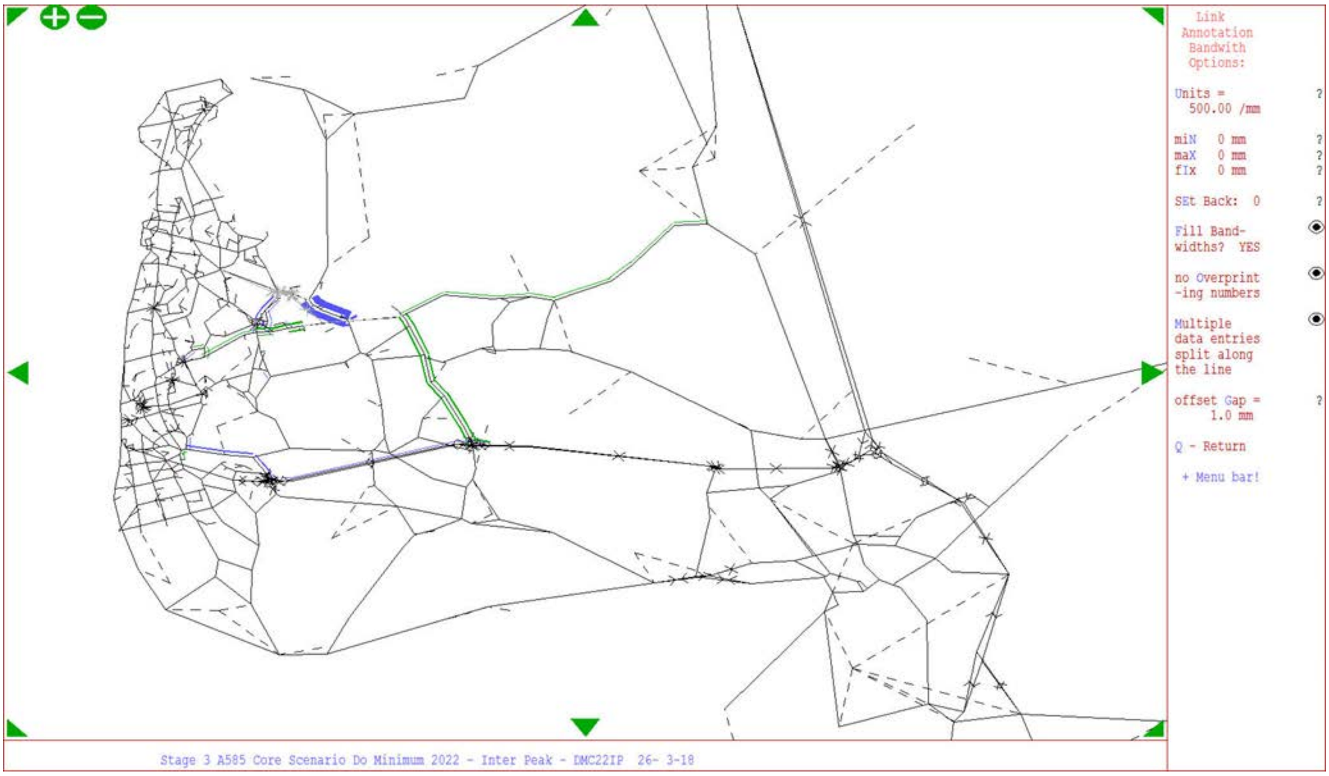

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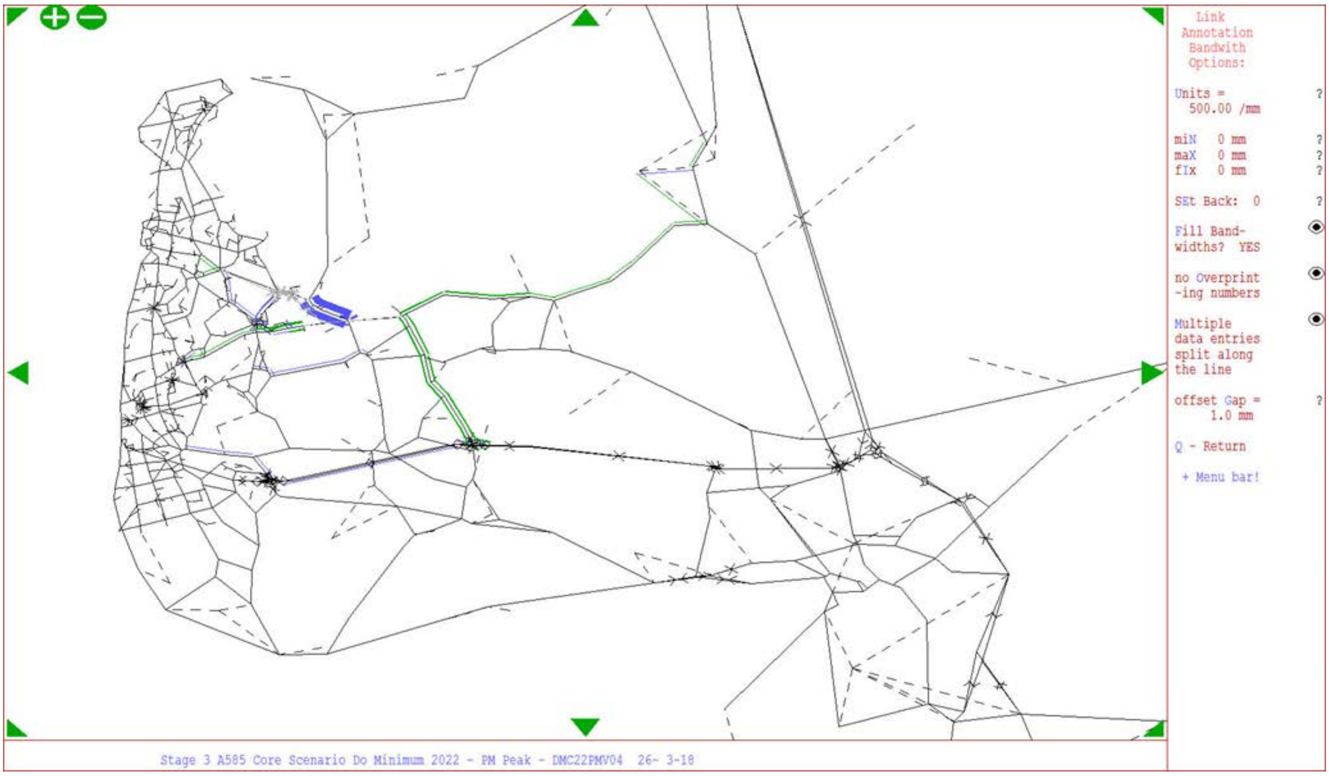
Figure 6-3: Core Scenario Changes in Traffic Flow (2022 With Scheme to Without Scheme - PM)



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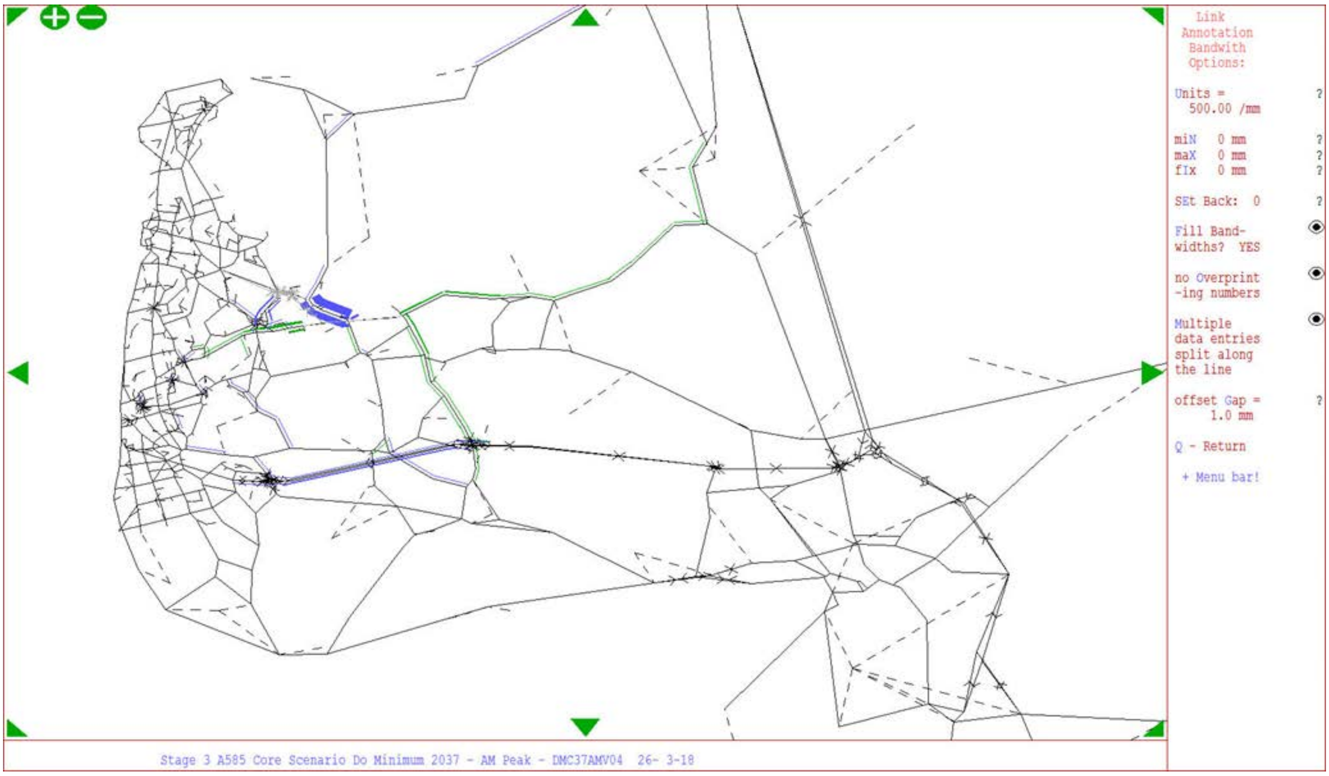
Stage 3 A585 Core Scenario Do Minimum 2022 - PM Peak - DMC22PMV04 26- 3-18

Figure 6-4: Core Scenario Changes in Traffic Flow (2037 With Scheme to Without Scheme - AM)



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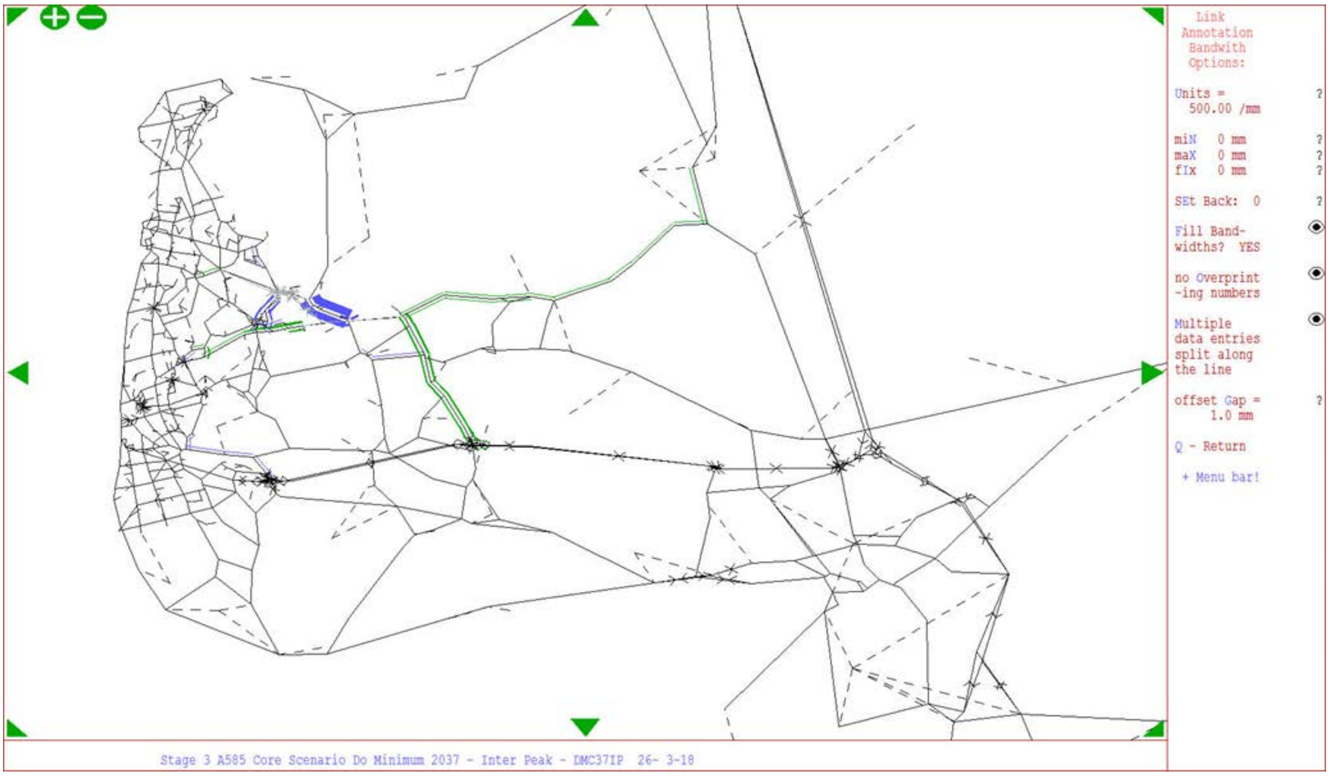
Stage 3 A585 Core Scenario Do Minimum 2037 - AM Peak - DMC37AMV04 26- 3-18

Figure 6-5: Core Scenario Changes in Traffic Flow (2037 With Scheme to Without Scheme - IP)



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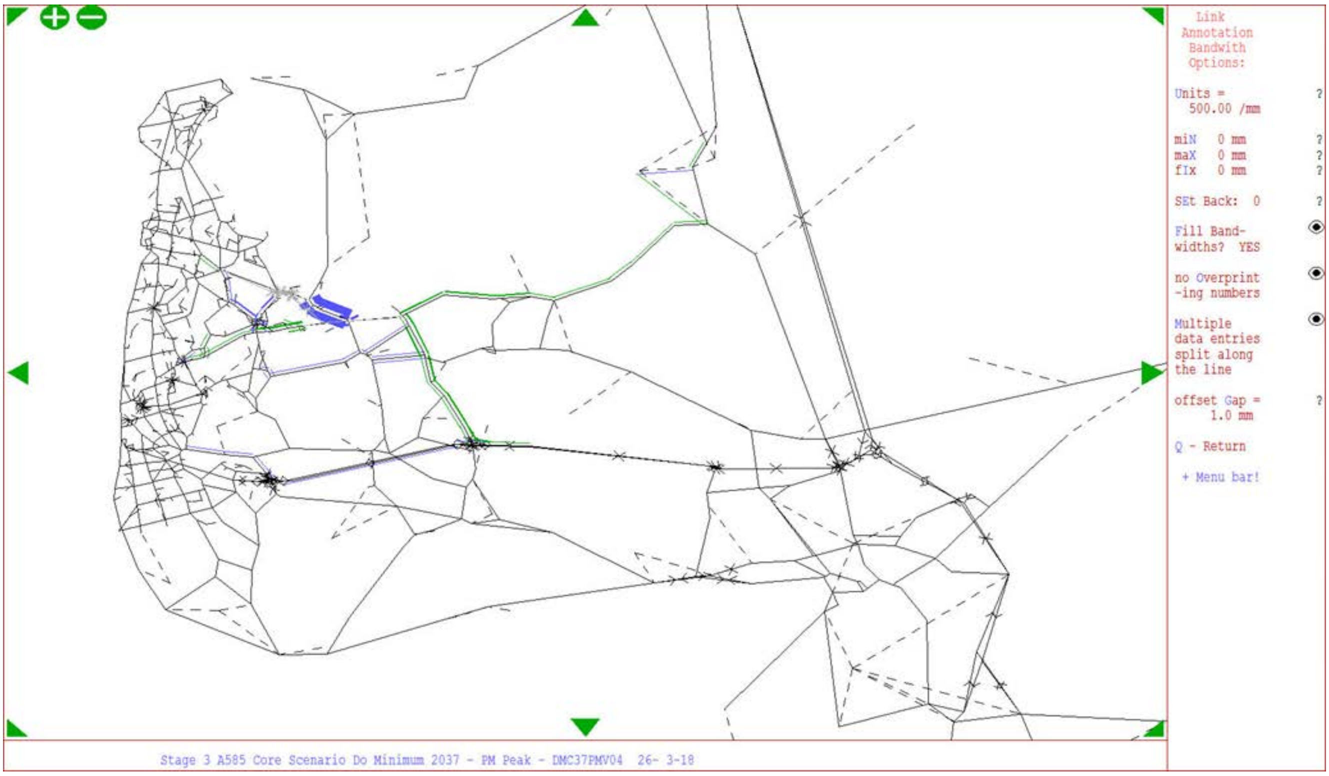
Stage 3 A585 Core Scenario Do Minimum 2037 - Inter Peak - DMC37IP 26- 3-18

Figure 6-6: Core Scenario Changes in Traffic Flow (2037 With Scheme to Without Scheme - PM)



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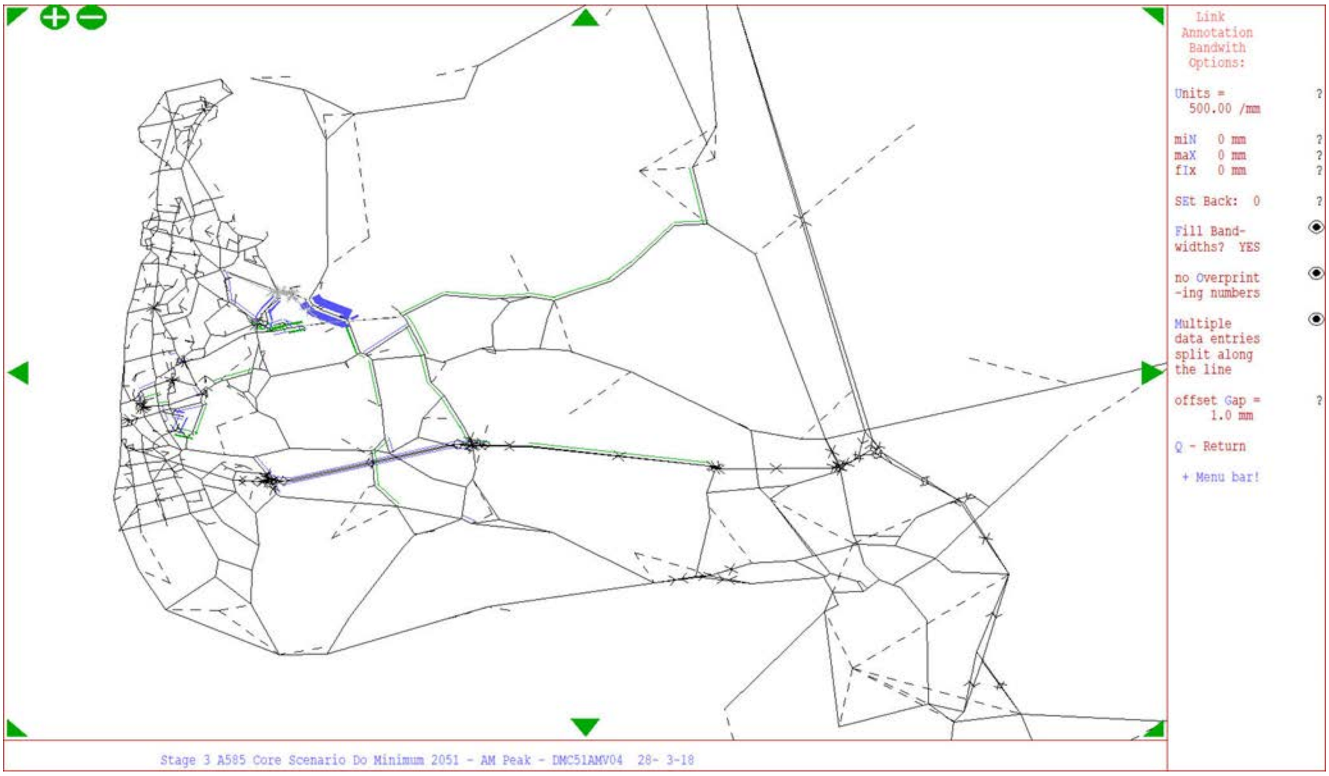
Stage 3 A585 Core Scenario Do Minimum 2037 - PM Peak - DMC37PMV04 26- 3-18

Figure 6-7: Core Scenario Changes in Traffic Flow (2051 With Scheme to Without Scheme)



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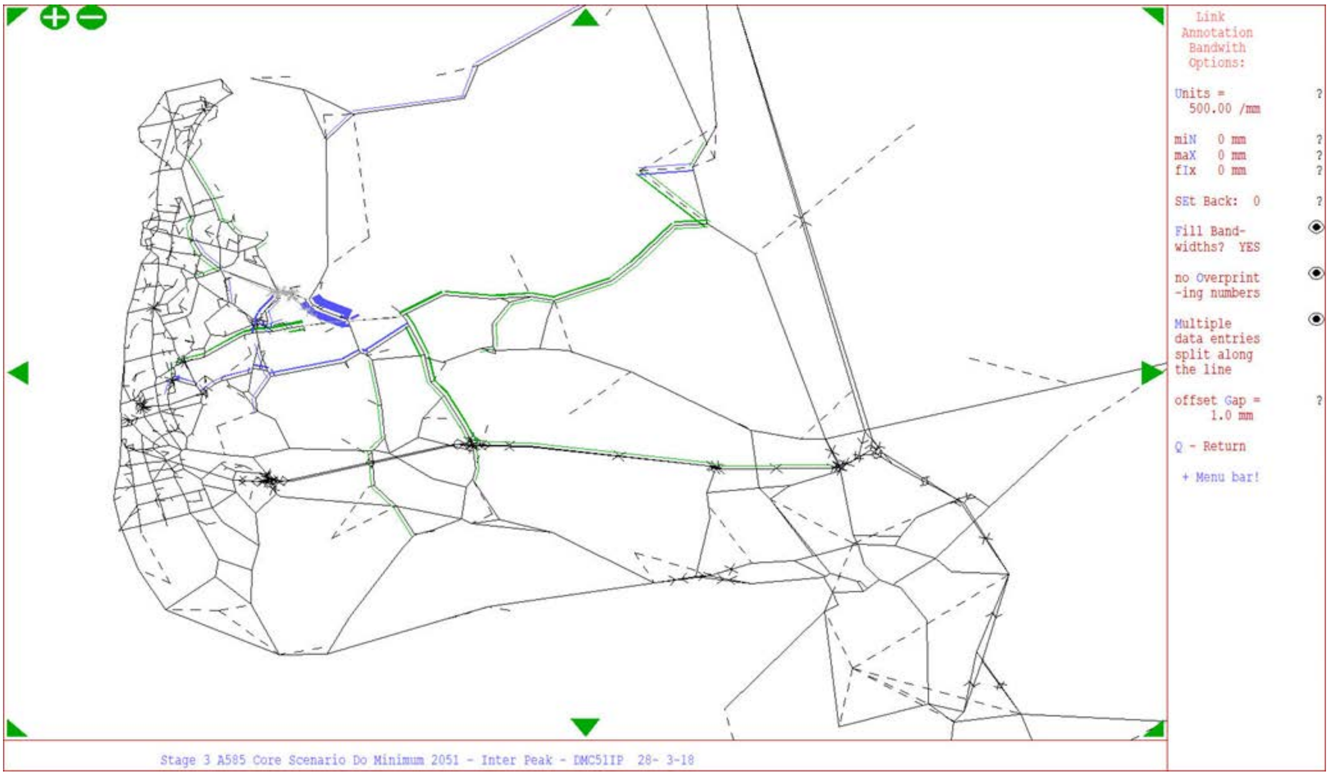
Stage 3 A585 Core Scenario Do Minimum 2051 - AM Peak - DMC51AMV04 28- 3-18

Figure 6-8: Core Scenario Changes in Traffic Flow (2051 With Scheme to Without Scheme - IP)



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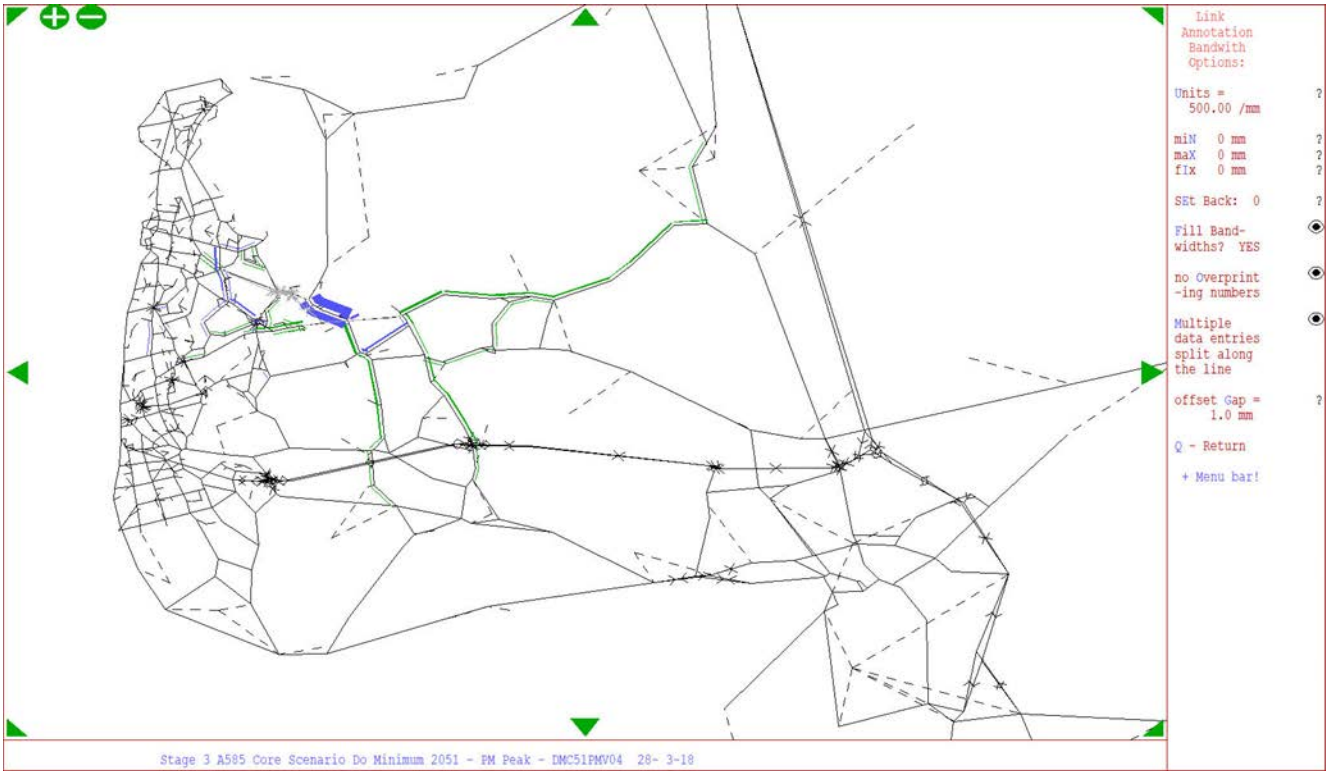
Stage 3 A585 Core Scenario Do Minimum 2051 - Inter Peak - DMC51IP 28- 3-18

Figure 6-9: Core Scenario Changes in Traffic Flow (2051 With Scheme to Without Scheme - PM)



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Stage 3 A585 Core Scenario Do Minimum 2051 - PM Peak - DMC51PMV04 28- 3-18

7 Core Scenario Traffic Flow Difference on the A585 (From Windy Harbour Junction to Skippool Junction)

7.1.1 A summary of the Core Scenario traffic flow on the A585 from Windy Harbour junction to Skippool junction for the Without Scheme and With Scheme scenario is presented in Table 7-1 to Table 6-3 for the forecast years. The traffic on the new scheme links in with the scheme case and is compared against the existing A585 links in the Without Scheme case.

7.1.2 It can be seen that the most heavily trafficked section of the A585 is between the Little Singleton junction and the Windy Harbour junction.

Table 7-1: Core Scenario Post-VDM Traffic Flows (in 2022) – Vehs/hr

Location	Without Scheme	With Scheme	% Diff
AM			
EB between Skippool Junction and Shard Road Junction	1302	1288	-1%
WB between Shard Road Junction and Skippool Junction	1329	1314	-1%
EB between Shard Road Junction and Little Singleton Junction	1184	1187	0%
WB between Little Singleton Junction and Shard Road Junction	779	856	10%
EB between Little Singleton Junction and Windy Harbour Junction	1189	1559	31%
WB between Windy Harbour Junction and Little Singleton Junction	1054	1166	11%
IP			
EB between Skippool Junction and Shard Road Junction	1182	1179	0%
WB between Shard Road Junction and Skippool Junction	1133	1134	0%
EB between Shard Road Junction and Little Singleton Junction	880	984	12%
WB between Little Singleton Junction and Shard Road Junction	808	941	16%
EB between Little Singleton Junction and Windy Harbour Junction	1066	1325	24%
WB between Windy Harbour Junction and Little Singleton Junction	1063	1245	17%
PM			
EB between Skippool Junction and Shard Road Junction	1535	1592	4%
WB between Shard Road Junction and Skippool Junction	1353	1462	8%
EB between Shard Road Junction and Little Singleton Junction	955	1134	19%
WB between Little Singleton Junction and Shard Road Junction	1029	1237	20%
EB between Little Singleton Junction and Windy Harbour Junction	1292	1617	25%
WB between Windy Harbour Junction and Little Singleton Junction	1237	1445	17%

Table 7-2: Core Scenario Post-VDM Traffic Flows (in 2037) – Vehs/hr

Location	Without Scheme	With Scheme	% Diff
AM			
EB between Skippool Junction and Shard Road Junction	1355	1375	2%
WB between Shard Road Junction and Skippool Junction	1488	1524	2%
EB between Shard Road Junction and Little Singleton Junction	1263	1248	-1%
WB between Little Singleton Junction and Shard Road Junction	939	1025	9%
EB between Little Singleton Junction and Windy Harbour Junction	1295	1654	28%
WB between Windy Harbour Junction and Little Singleton Junction	1257	1398	11%
IP			
EB between Skippool Junction and Shard Road Junction	1373	1416	3%
WB between Shard Road Junction and Skippool Junction	1269	1332	5%
EB between Shard Road Junction and Little Singleton Junction	1070	1216	14%
WB between Little Singleton Junction and Shard Road Junction	942	1104	17%
EB between Little Singleton Junction and Windy Harbour Junction	1268	1595	26%
WB between Windy Harbour Junction and Little Singleton Junction	1244	1426	15%
PM			
EB between Skippool Junction and Shard Road Junction	1698	1788	5%
WB between Shard Road Junction and Skippool Junction	1385	1562	13%
EB between Shard Road Junction and Little Singleton Junction	1121	1312	17%
WB between Little Singleton Junction and Shard Road Junction	1071	1354	26%
EB between Little Singleton Junction and Windy Harbour Junction	1446	1875	30%
WB between Windy Harbour Junction and Little Singleton Junction	1356	1562	15%

Table 7-3: Core Scenario Post-VDM Traffic Flows (in 2051) – Vehs/hr

Location	Without Scheme	With Scheme	% Diff
AM			
EB between Skippool Junction and Shard Road Junction	1341	1551	16%
WB between Shard Road Junction and Skippool Junction	1531	1642	7%
EB between Shard Road Junction and Little Singleton Junction	1206	1384	15%
WB between Little Singleton Junction and Shard Road Junction	972	1132	16%
EB between Little Singleton Junction and Windy Harbour Junction	1428	1733	21%
WB between Windy Harbour Junction and Little Singleton Junction	1359	1511	11%
IP			
EB between Skippool Junction and Shard Road Junction	1585	1663	5%
WB between Shard Road Junction and Skippool Junction	1321	1490	13%
EB between Shard Road Junction and Little Singleton Junction	1148	1408	23%
WB between Little Singleton Junction and Shard Road Junction	934	1228	31%
EB between Little Singleton Junction and Windy Harbour Junction	1381	1931	40%
WB between Windy Harbour Junction and Little Singleton Junction	1365	1584	16%
PM			
EB between Skippool Junction and Shard Road Junction	1877	1961	4%
WB between Shard Road Junction and Skippool Junction	1466	1627	11%
EB between Shard Road Junction and Little Singleton Junction	1257	1456	16%
WB between Little Singleton Junction and Shard Road Junction	1119	1363	22%
EB between Little Singleton Junction and Windy Harbour Junction	1644	2201	34%
WB between Windy Harbour Junction and Little Singleton Junction	1452	1566	8%

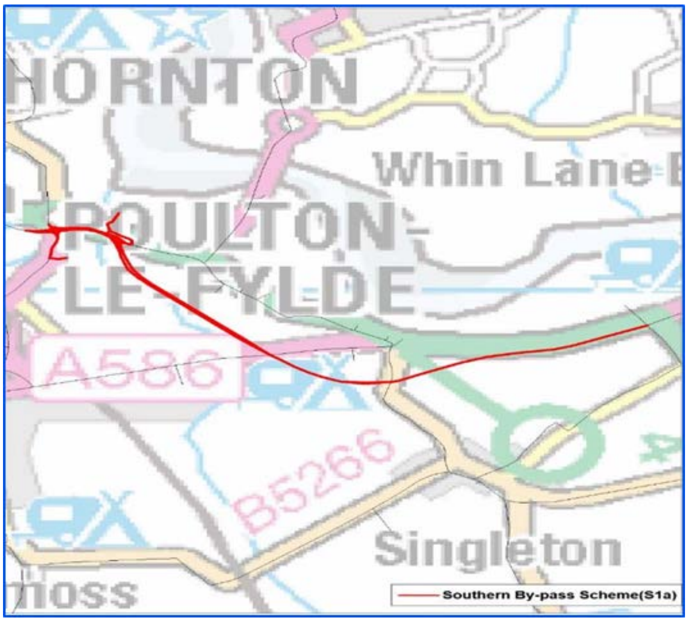
8 Core Scenario Journey Times

8.1.1 Information on Core Scenario travel times through the network was extracted for the Without Scheme (DM) and With Scheme (DS) scenario for the forecast years.

8.1.2 Figure 8-1 to Figure 8-2 present the journey time routes between the Windy Harbour junction and the Skippool junction. The journey time on the scheme (approximately 4.3 km) was analysed in order to ascertain the journey time saving that would result from the implementation of the scheme.

Figure 8-1: Journey Time Route along the A585 from Windy Harbour to Skippool junction - Without Scheme (DM)

Figure 8-2: Journey Time Route along the A585 from Windy Harbour to Skippool junction – With Scheme (DS)



8.1.3 The results of the Core Scenario journey time analysis on the A585 between Windy Harbour and the Skippool junction for the proposed scheme is presented in Table 8-1.

Table 8-1: Core Scenario Modelled Journey Time (in MM:SS)

Forecast Year	Route Direction	AM Peak			Inter Peak			PM Peak		
		DM	DS	Diff (savings)	DM	DS	Diff (savings)	DM	DS	Diff (savings)
2022	A585 EB	05:37	03:23	02:14	05:27	03:12	02:15	05:36	03:18	02:18
	A585 WB	05:43	03:07	02:36	05:43	03:02	02:41	07:11	03:07	04:04
2037	A585 EB	05:46	03:24	02:22	05:52	03:16	02:36	06:00	03:23	02:37
	A585 WB	06:03	03:07	02:56	06:12	03:03	03:09	08:04	03:10	04:54
2051	A585 EB	06:13	03:27	02:46	08:05	03:22	04:43	07:20	03:32	03:48
	A585 WB	06:53	03:09	03:44	07:58	03:07	04:51	07:59	03:06	04:53

8.1.4 In all modelled time periods the journey times along the A585 scheme area, seem to be reasonable with the Without Scheme being the slowest with a slight increase in journey time savings over the forecast period.

8.1.5 Within the proposed scheme, in the EB direction in the opening year, there is a journey time saving of around two minutes in the AM, IP and PM peaks. In the WB direction the journey time savings are in the range of 2 minutes for AM and IP and 4 minutes for the PM peak. These journey time savings are maintained in 2037 and 2051 with similar journey time savings observed between model years. The maximum time saving of around 4.5 minutes is observed in the westbound direction in the PM peak design year and horizon year.

8.2 Alternative Growth Scenarios: Low Growth and Optimistic Growth

8.2.1 Alternative growth scenarios were developed to assess the impact on the scheme due to local uncertainty in planning as well as national uncertainties concerning demographic, economic and behavioural trends.

8.2.2 As per TAG Unit M4 guidelines the optimistic growth scenario should consist of forecasts based on a proportion of the base year demand being added to the demand from the core scenario.

8.2.3 The Optimistic Growth Scenario includes some of the sources of growth that have less certainty and hence are not included in the Core Scenario. The local uncertainty for the Low Growth scenario is the same as the Core Scenario.

8.2.4 Additional details about the Low and Optimistic Growth scenarios are provided in section 3.7 of this report.

8.2.5 The alternative growth scenarios were assessed for the With Scheme option using the same methodology as for the Core Scenario.

8.2.6 The section below summarises the traffic forecasts for the alternative growth scenarios and an assessment of the likely future traffic patterns and journey times for the forecast years.

9 Low Growth Scenario

9.1 Low Growth Scenario Assignment Results

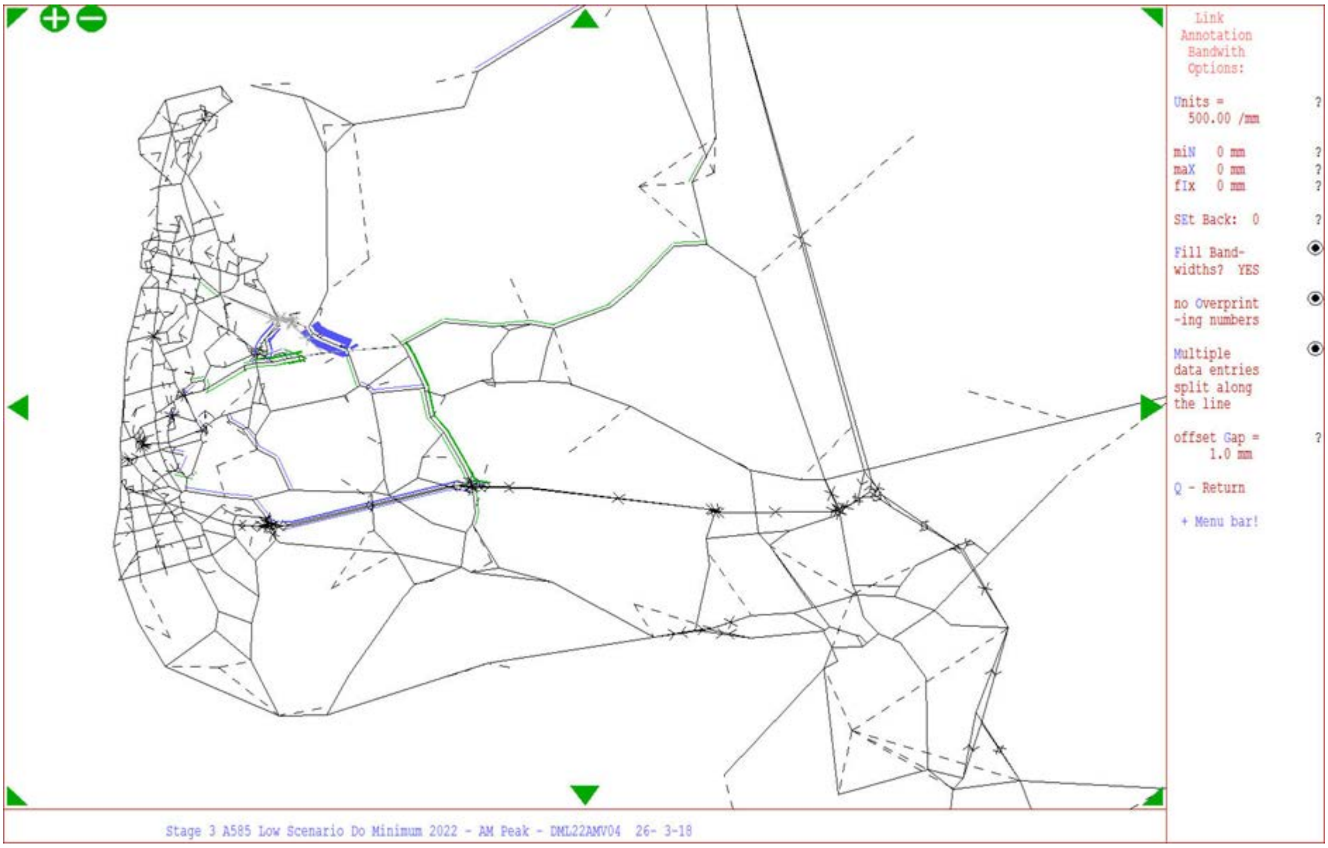
Area Wide Changes in Traffic Volume

9.1.1 The forecast changes in Low Growth scenario area wide model traffic flows on the highway network occurring with the introduction of the scheme in the forecast years are shown in Figure 6-12 to Figure 6-20. Links highlighted green indicate an increase in traffic flow and links highlighted blue indicate a decrease in traffic flow. A schematic showing more detail of the traffic flow of the scheme improvement is contained in Appendix D.

9.1.2 The change in the traffic flow pattern is seen to be generally similar to the Core Scenario.

9.1.3 The high negative values seen in the P1X (SATURN traffic model) plots between the section from Windy Harbour to Skippool junction is as a result of the shift of traffic from the old A585 to the scheme.

Figure 9-1: Low Growth Changes in Traffic Flow (2022 With Scheme to Without Scheme - AM)



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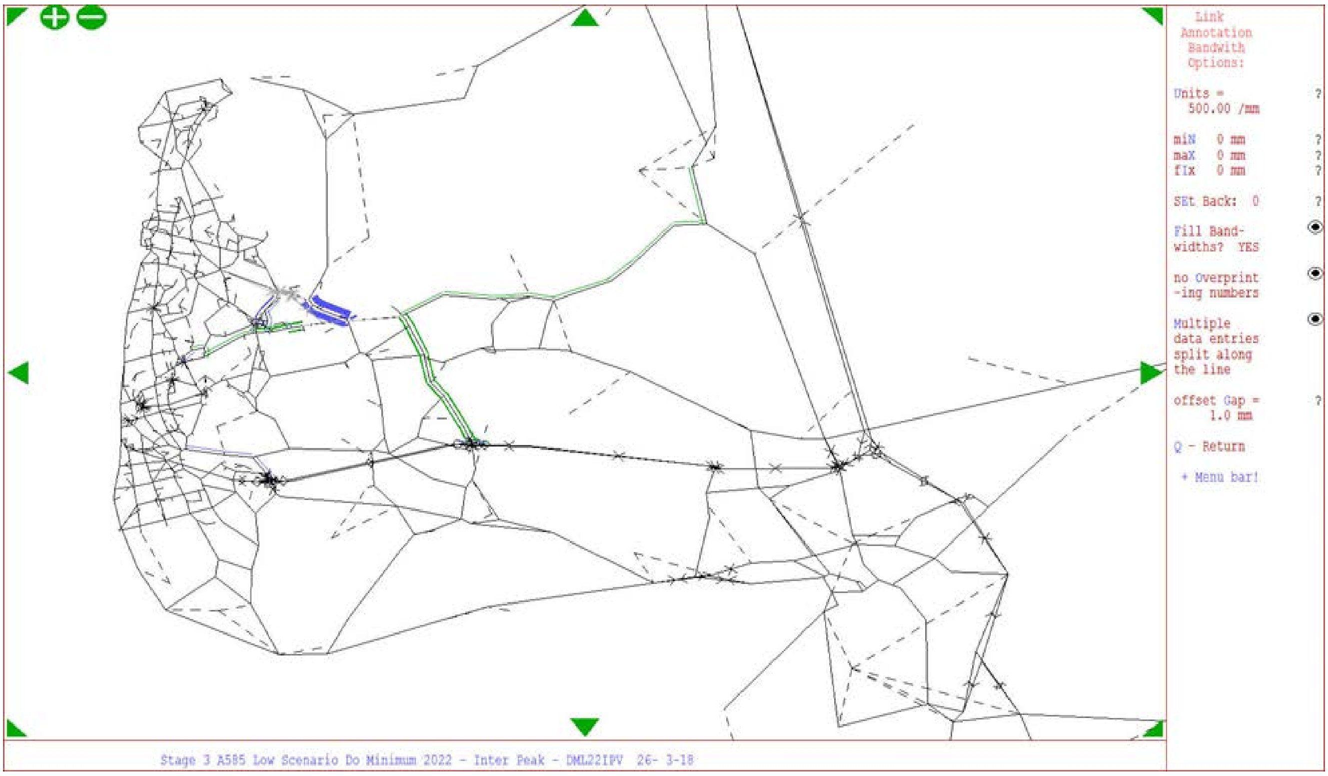
Stage 3 A585 Low Scenario Do Minimum 2022 - AM Peak - DML22AMV04 26- 3-18

Figure 9-2: Low Growth Changes in Traffic Flow (2022 With Scheme to Without Scheme - IP)



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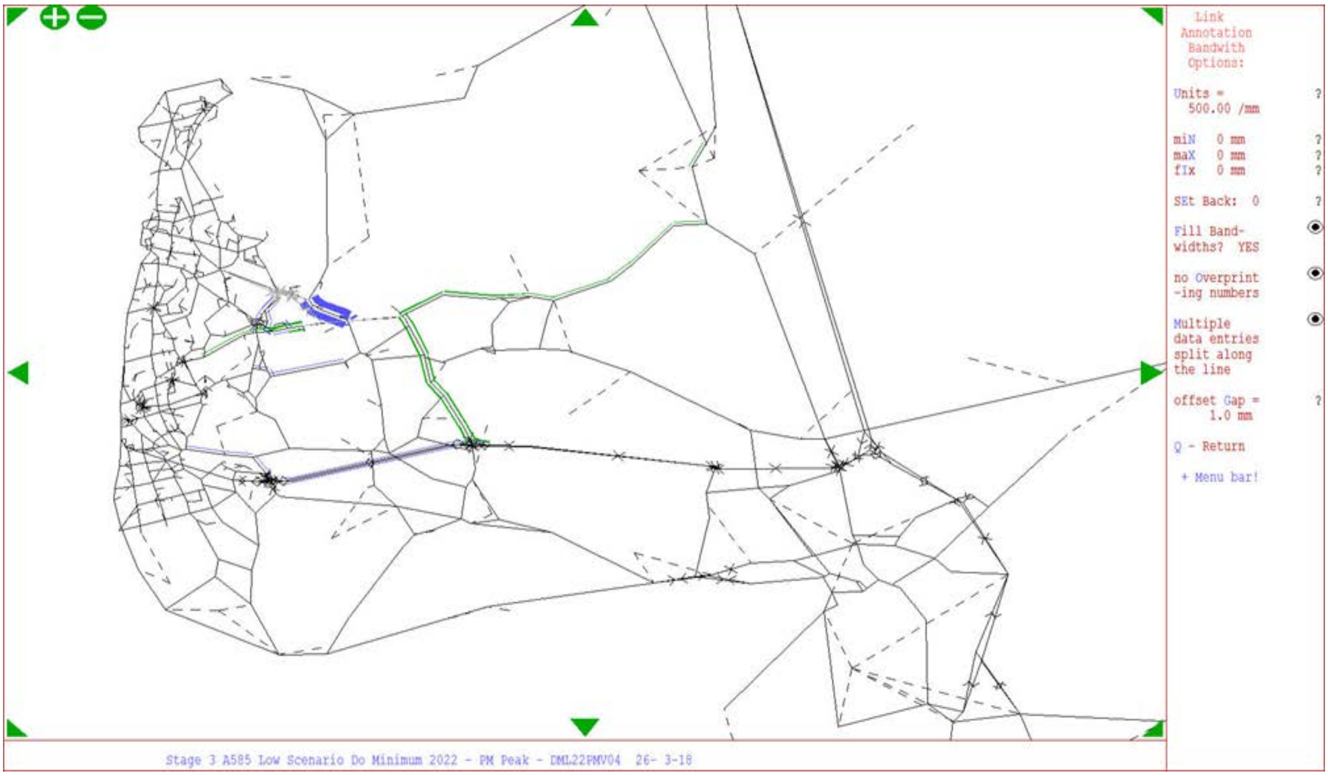
Stage 3 A585 Low Scenario Do Minimum 2022 - Inter Peak - DML22IPV 26- 3-18

Figure 9-3: Low Growth Changes in Traffic Flow (2022 With Scheme to Without Scheme - PM)



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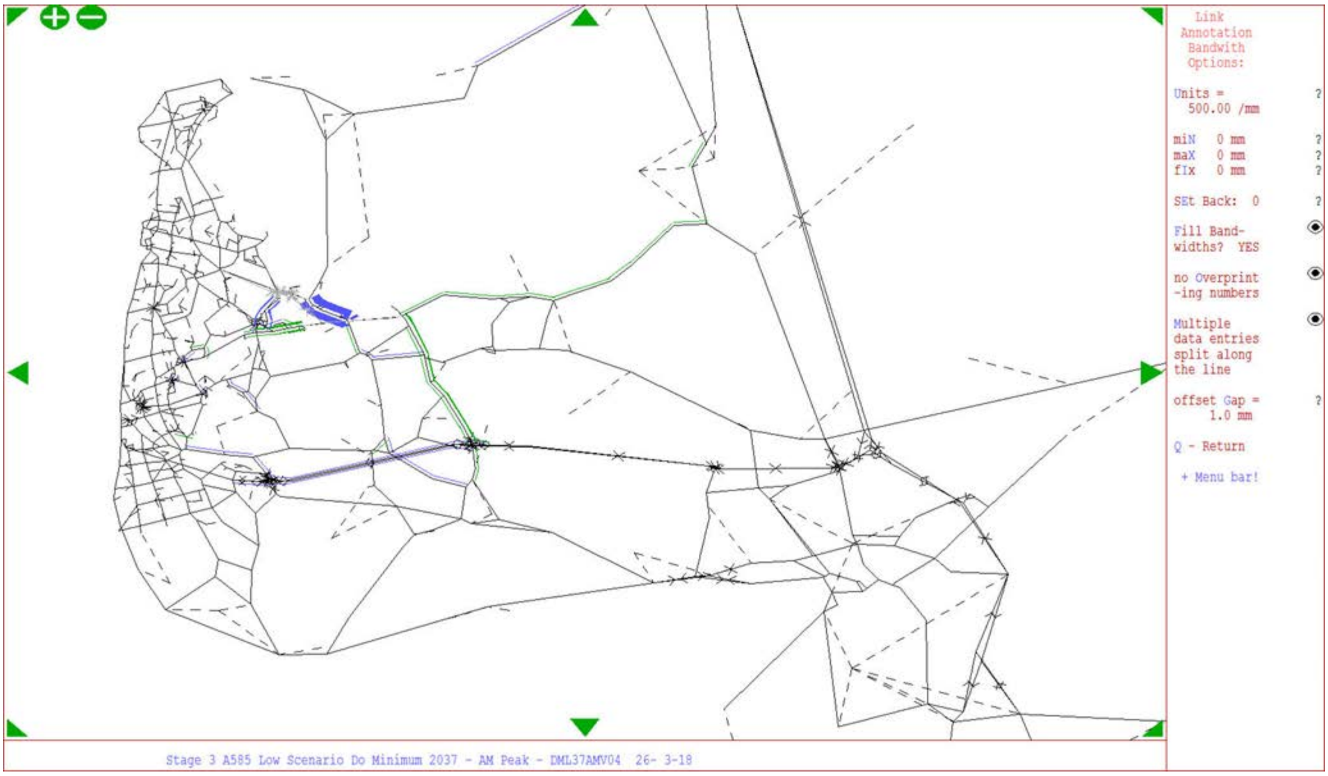
Stage 3 A585 Low Scenario Do Minimum 2022 - PM Peak - DML22PMV04 26- 3-18

Figure 9-4: Low Growth Changes in Traffic Flow (2037 With Scheme to Without Scheme - AM)



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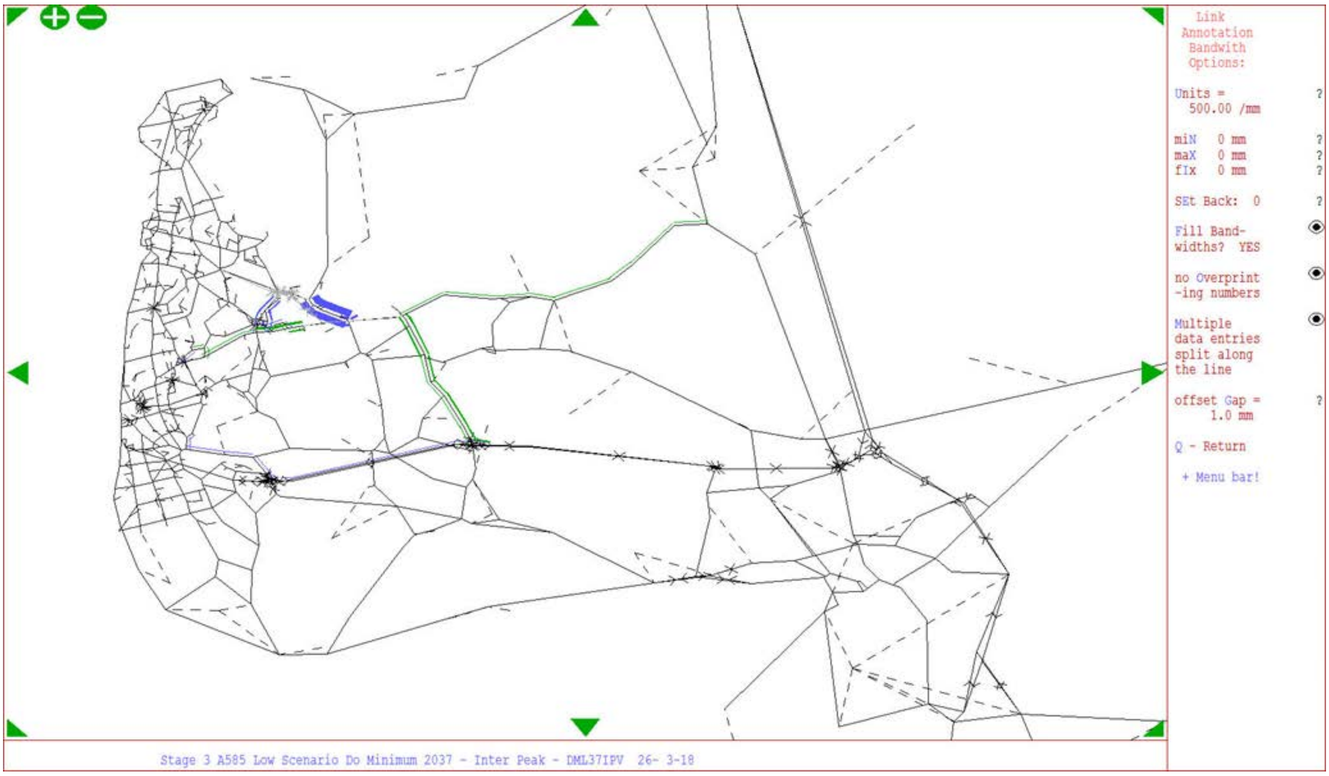
Stage 3 A585 Low Scenario Do Minimum 2037 - AM Peak - DML37AMV04 26- 3-18

Figure 9-5: Low Growth Changes in Traffic Flow (2037 With Scheme to Without Scheme - IP)



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Stage 3 A585 Low Scenario Do Minimum 2037 - Inter Peak - DML37IPV  26- 3-18
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Figure 9-6: Low Growth Changes in Traffic Flow (2037 With Scheme to Without Scheme - PM)

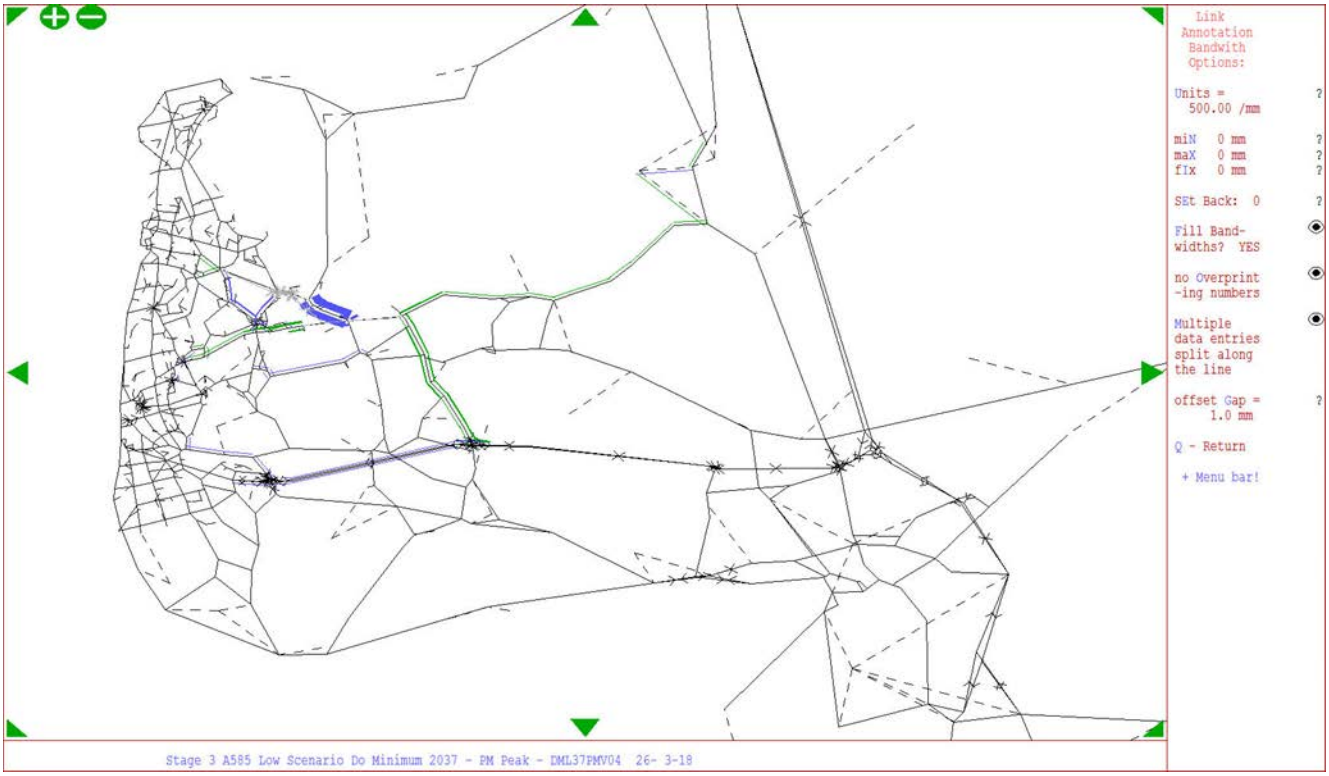

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Figure 9-7: Low Growth Changes in Traffic Flow (2051 With Scheme to Without Scheme - AM)

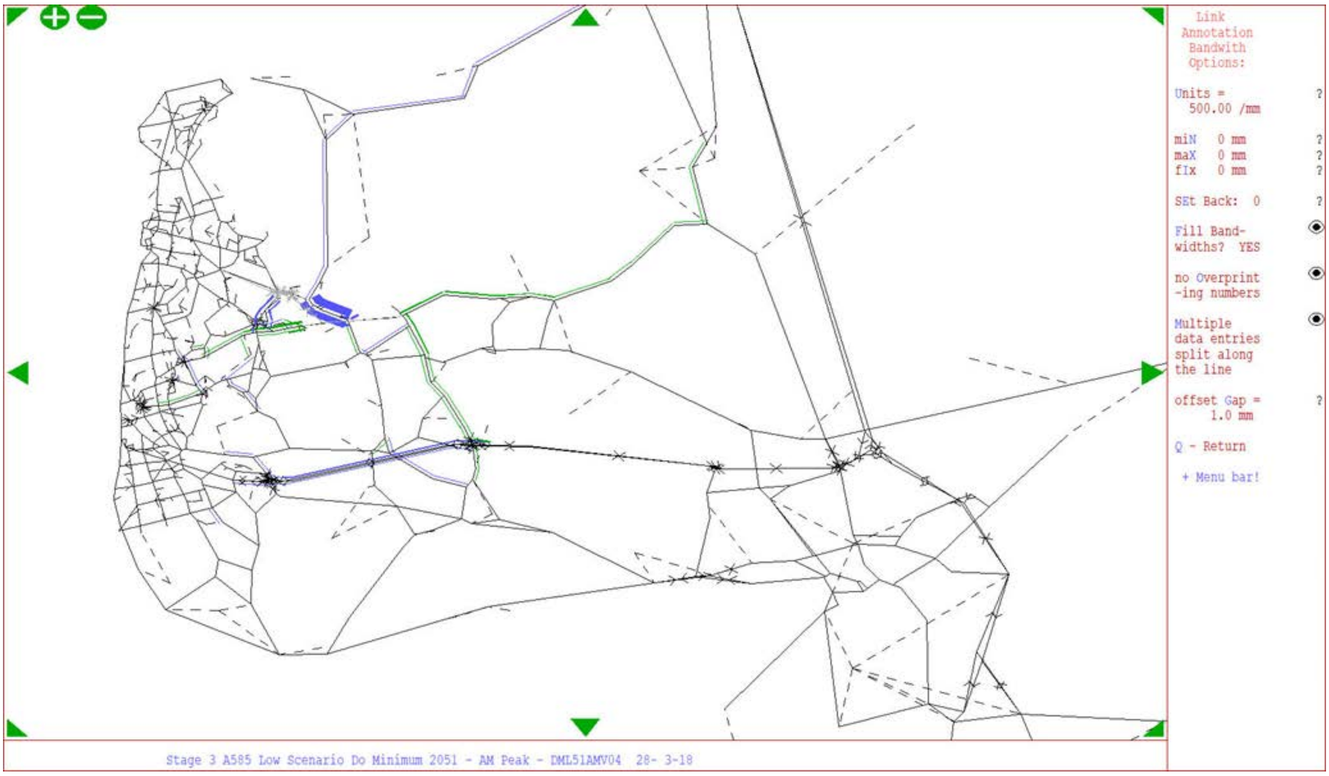


Figure 9-8: Low Growth Changes in Traffic Flow (2051 With Scheme to Without Scheme - IP)

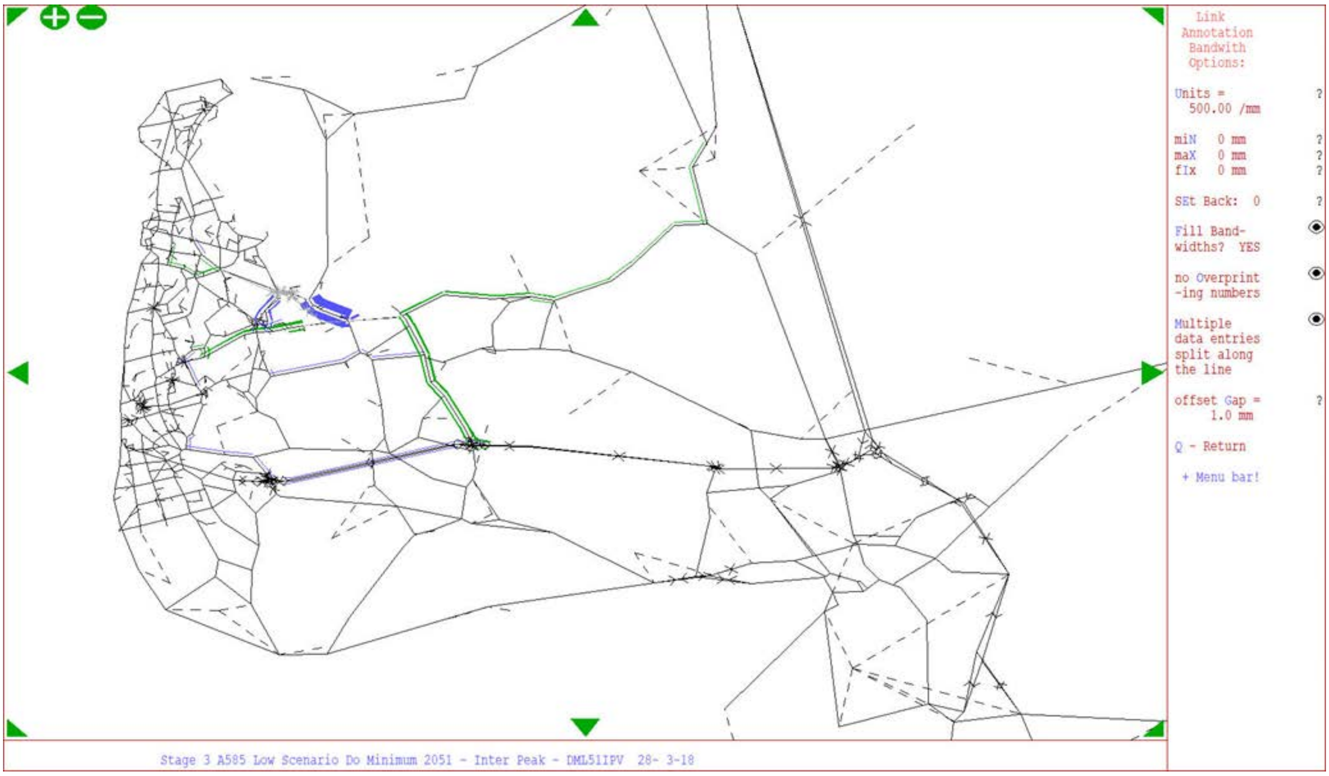
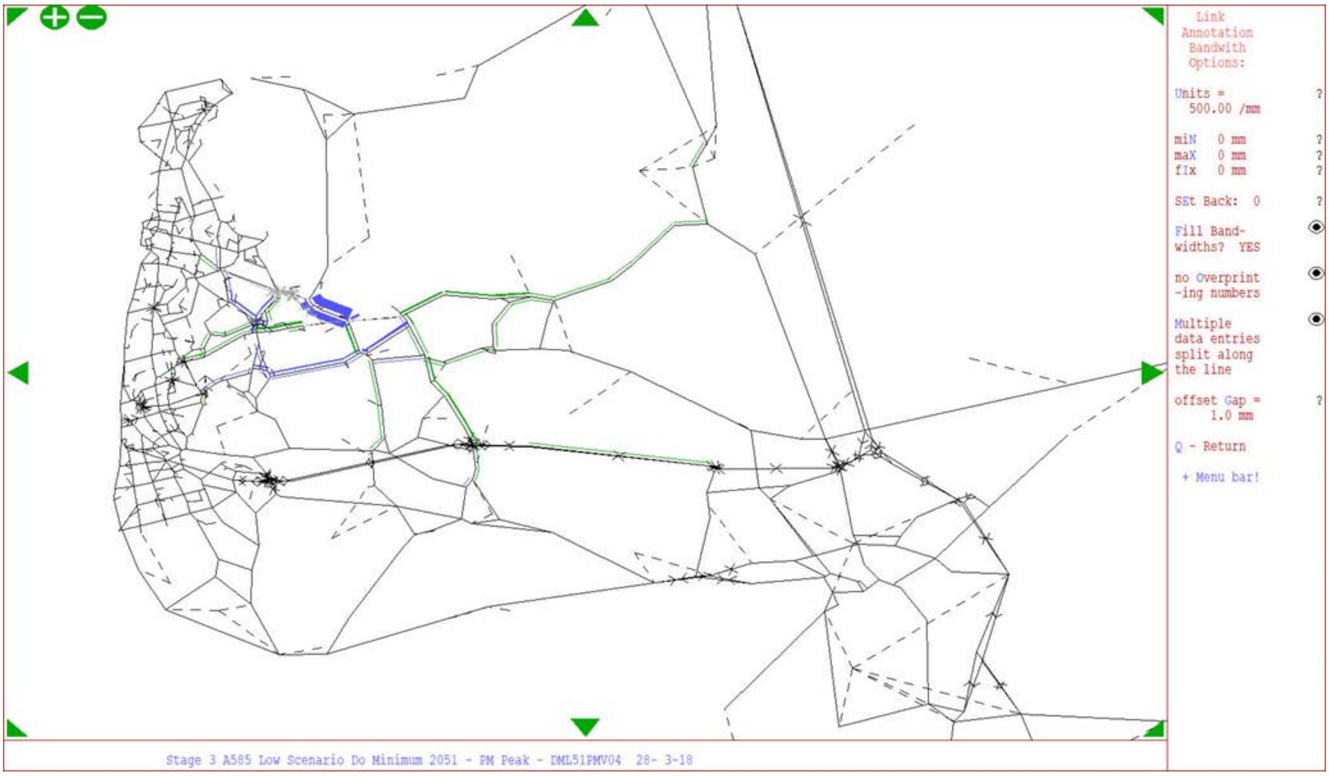


Figure 9-9: Low Growth Changes in Traffic Flow (2051 With Scheme to Without Scheme - PM)



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Stage 3 A585 Low Scenario Do Minimum 2051 - PM Peak - DML51PMV04 28- 3-18

9.2 Low Growth Scenario Traffic Flow Difference on the A585 (From Windy Harbour Junction to Skippool Junction)

9.2.1 A summary of the Low Growth scenario model traffic flow on the A585 from Windy Harbour to Skippool junction for the Without Scheme and With Scheme scenario for the forecast years is presented in Table 9-1.

Table 9-1: Low Growth Post-VDM Traffic Flows - Vehs/hr

Location	2022			2037			2051		
	Without Scheme	With Scheme	% Diff	Without Scheme	With Scheme	% Diff	Without Scheme	With Scheme	% Diff
AM									
EB between Skippool Junction and Shard Road Junction	1219	1202	-1%	1245	1246	0%	1374	1382	1%
WB between Shard Road Junction and Skippool Junction	1289	1263	-2%	1408	1407	0%	1469	1500	2%
EB between Shard Road Junction and Little Singleton Junction	1089	1142	5%	1129	1171	4%	1227	1243	1%
WB between Little Singleton Junction and Shard Road Junction	744	824	11%	871	966	11%	936	1042	11%
EB between Little Singleton Junction and Windy Harbour Junction	1135	1491	31%	1217	1573	29%	1272	1672	31%
WB between Windy Harbour Junction and Little Singleton Junction	1004	1114	11%	1167	1283	10%	1257	1392	11%
IP									
EB between Skippool Junction and Shard Road Junction	1128	1116	-1%	1243	1285	3%	1458	1532	5%
WB between Shard Road Junction and Skippool Junction	1068	1064	0%	1162	1221	5%	1261	1391	10%
EB between Shard Road Junction and Little Singleton Junction	836	931	11%	984	1110	13%	1142	1317	15%
WB between Little Singleton Junction and Shard Road Junction	761	881	16%	880	1050	19%	934	1163	25%
EB between Little Singleton Junction and Windy Harbour Junction	1035	1257	21%	1175	1462	24%	1366	1758	29%
WB between Windy Harbour Junction and Little Singleton Junction	1001	1170	17%	1161	1338	15%	1304	1500	15%
PM									
EB between Skippool Junction and Shard Road Junction	1480	1538	4%	1614	1711	6%	1849	1897	3%
WB between Shard Road Junction and Skippool Junction	1307	1373	5%	1315	1444	10%	1333	1522	14%
EB between Shard Road Junction and Little Singleton Junction	927	1098	18%	1067	1268	19%	1256	1413	13%
WB between Little Singleton Junction and Shard Road Junction	1011	1165	15%	1028	1261	23%	1029	1309	27%
EB between Little Singleton Junction and Windy Harbour Junction	1265	1555	23%	1403	1775	26%	1610	2143	33%
WB between Windy Harbour Junction and Little Singleton Junction	1184	1378	16%	1272	1488	17%	1354	1514	12%

9.3 Low Growth Scenario Journey Times

9.3.1 Information on Low Growth scenario travel times for the A585 Windy Harbour to Skippool scheme was extracted from the Without Scheme (DM) and With Scheme (DS) scenario.

9.3.2 The journey times between A585 Windy Harbour junction and Skippool junction on the A585, as in the Core Scenario were analysed in order to ascertain the journey time savings that would result from the introduction of the scheme.

9.3.3 The results of the journey time analysis are presented in Table 9-2.

Table 9-2: Low Growth Modelled Journey Time (in MM:SS)

Forecast Year	Route Direction	AM Peak			Inter Peak			PM Peak		
		DM	DS	Diff (savings)	DM	DS	Diff (savings)	DM	DS	Diff (savings)
2022	A585 EB	05:29	03:22	02:07	05:24	03:12	02:12	05:33	03:17	02:16
	A585 WB	05:39	03:05	02:34	05:39	03:02	02:37	06:10	03:06	03:04
2037	A585 EB	05:33	03:22	02:11	05:36	03:14	02:22	05:47	03:21	02:26
	A585 WB	05:49	03:05	02:44	05:50	03:02	02:48	07:11	03:07	04:04
2051	A585 EB	05:45	03:25	02:20	06:35	03:19	03:16	07:32	03:32	04:00
	A585 WB	06:03	03:12	02:51	07:03	03:04	03:59	08:08	03:08	05:00

9.3.4 As seen in the Core Scenario, the modelled journey times in the Low Growth scenario on the A585 would become quicker in both directions as a result of the scheme.

10 Optimistic Growth Scenario

10.1 Optimistic Growth Scenario Assignment Results

Area Wide Changes in Traffic Volume

10.1.1 The forecast changes in Optimistic Growth scenario area wide traffic flows on the highway network between the 2015 base year and forecast years is shown in Figure 10-1 to Figure 6-29. Links highlighted green indicate an increase in traffic flow and links highlighted blue indicate a decrease in traffic flow. A schematic showing more detail of the traffic flow of the scheme improvement is contained in Appendix E.

10.1.2 The figures show the growth in highway flows across all three time periods, particularly for the movements on the strategic A585 corridor. The change in the traffic flow shows a similar trend as the Core Scenario.

Figure 10-1: Optimistic Growth Changes in Traffic Flow (2022 With Scheme to Without Scheme - AM)

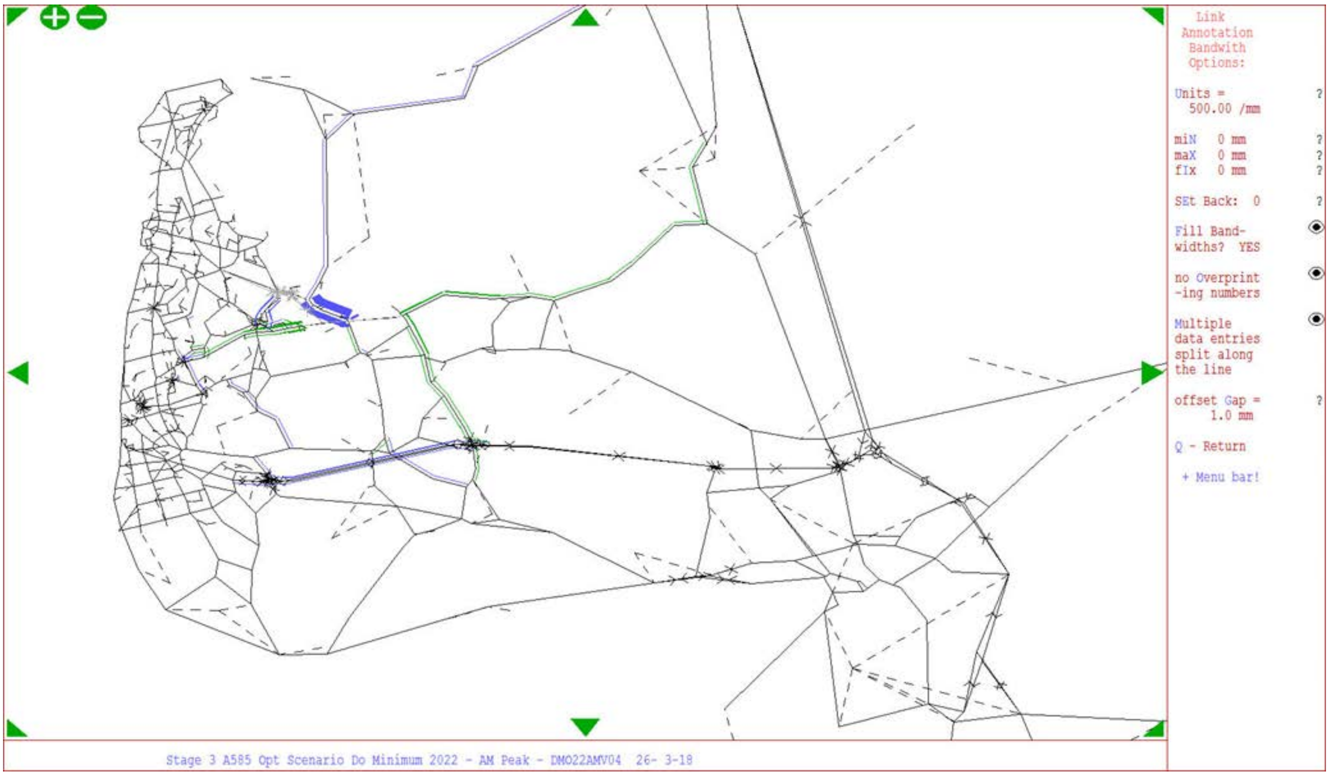


Figure 10-2: Optimistic Growth Changes in Traffic Flow (2022 With Scheme to Without Scheme - IP)

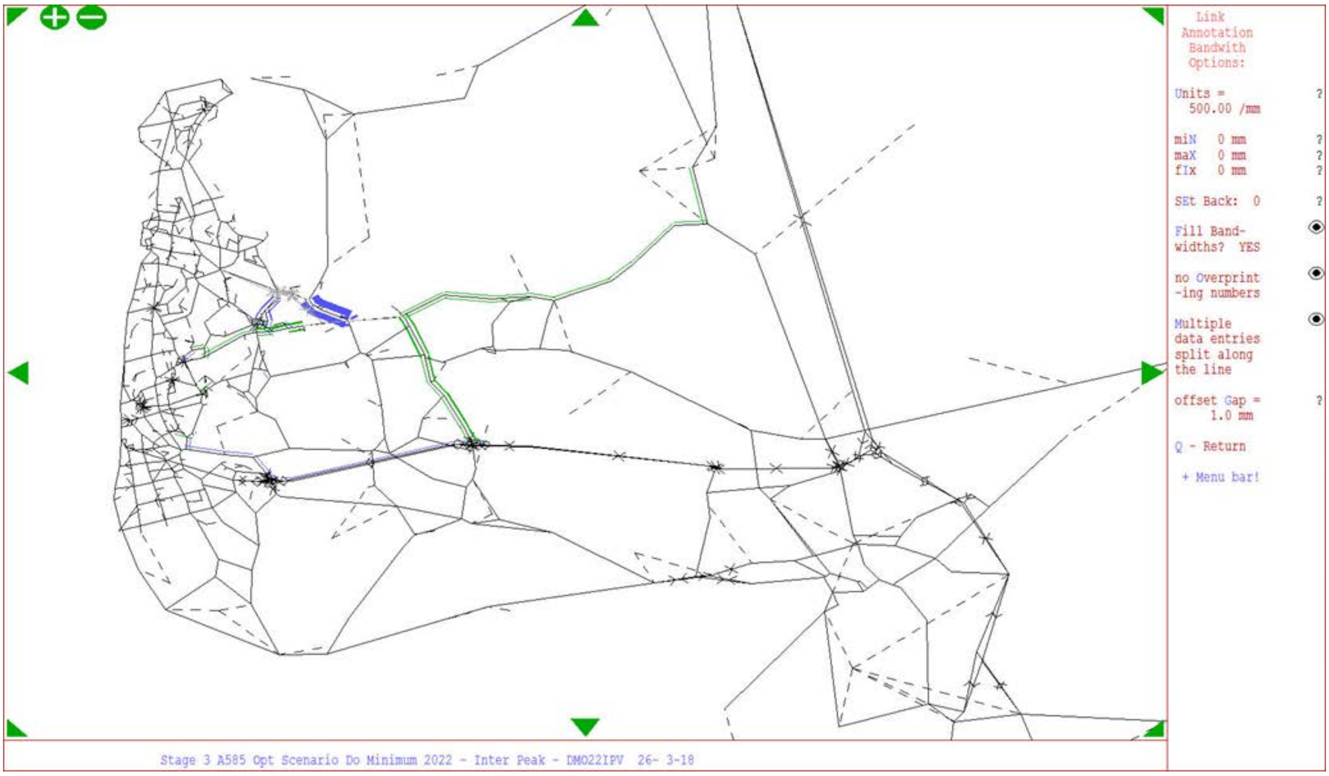
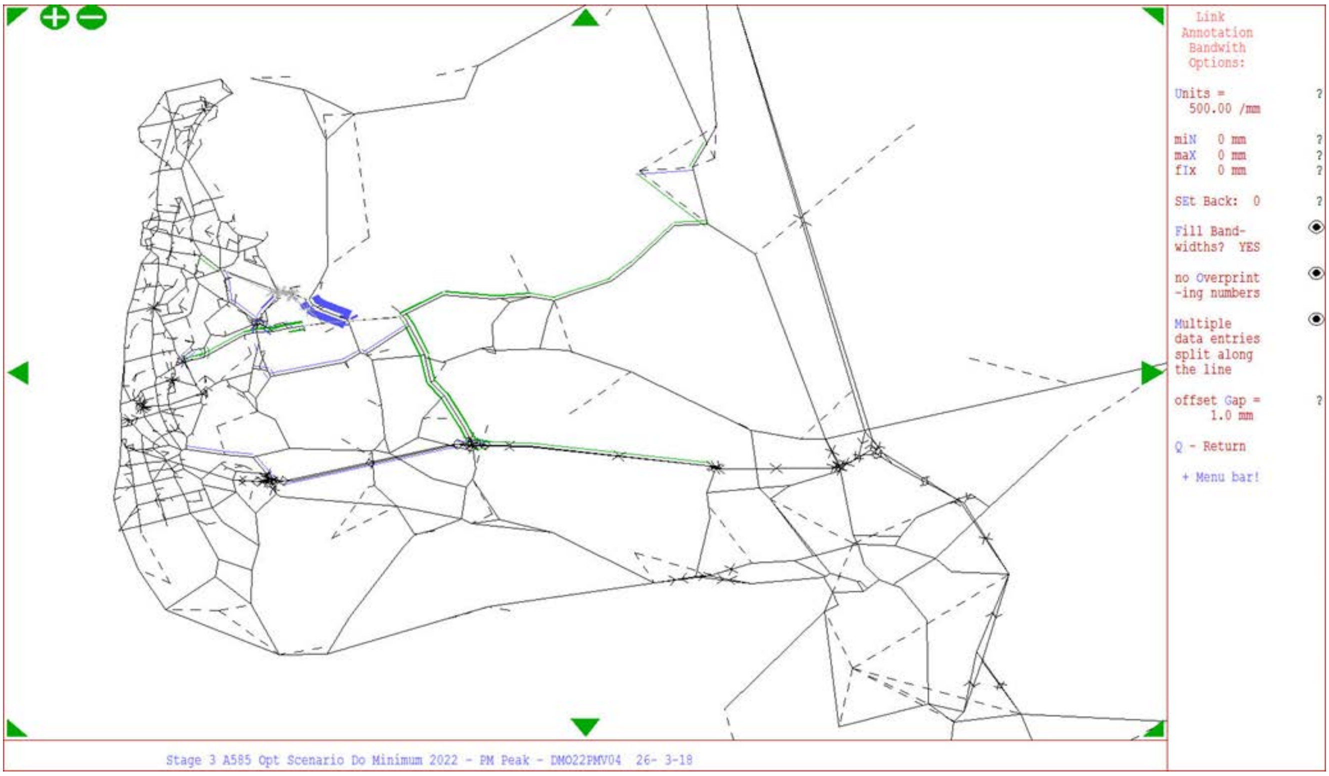


Figure 10-3: Optimistic Growth Changes in Traffic Flow (2022 With Scheme to Without Scheme - PM)



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Stage 3 A585 Opt Scenario Do Minimum 2022 - PM Peak - DMO22PMV04 26- 3-18

Figure 10-4: Optimistic Growth Changes in Traffic Flow (2037 With Scheme to Without Scheme - AM)

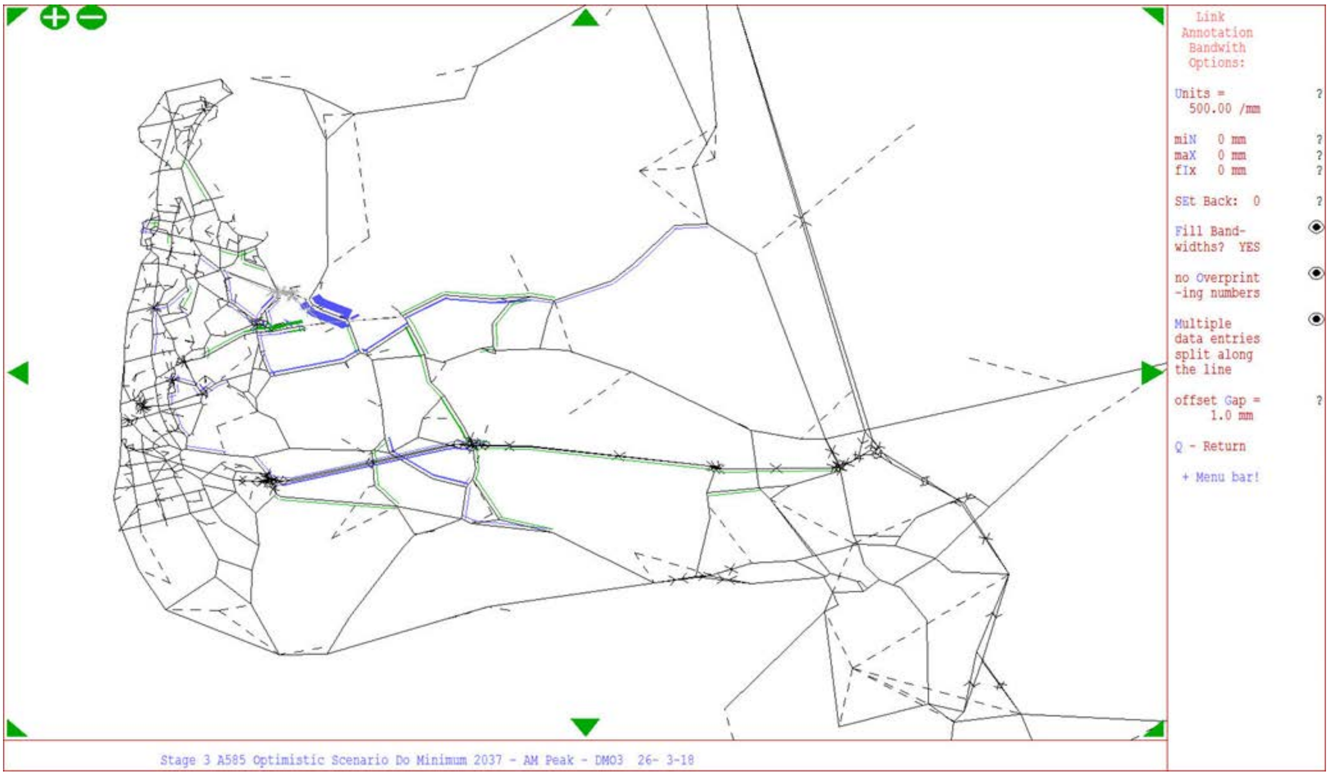

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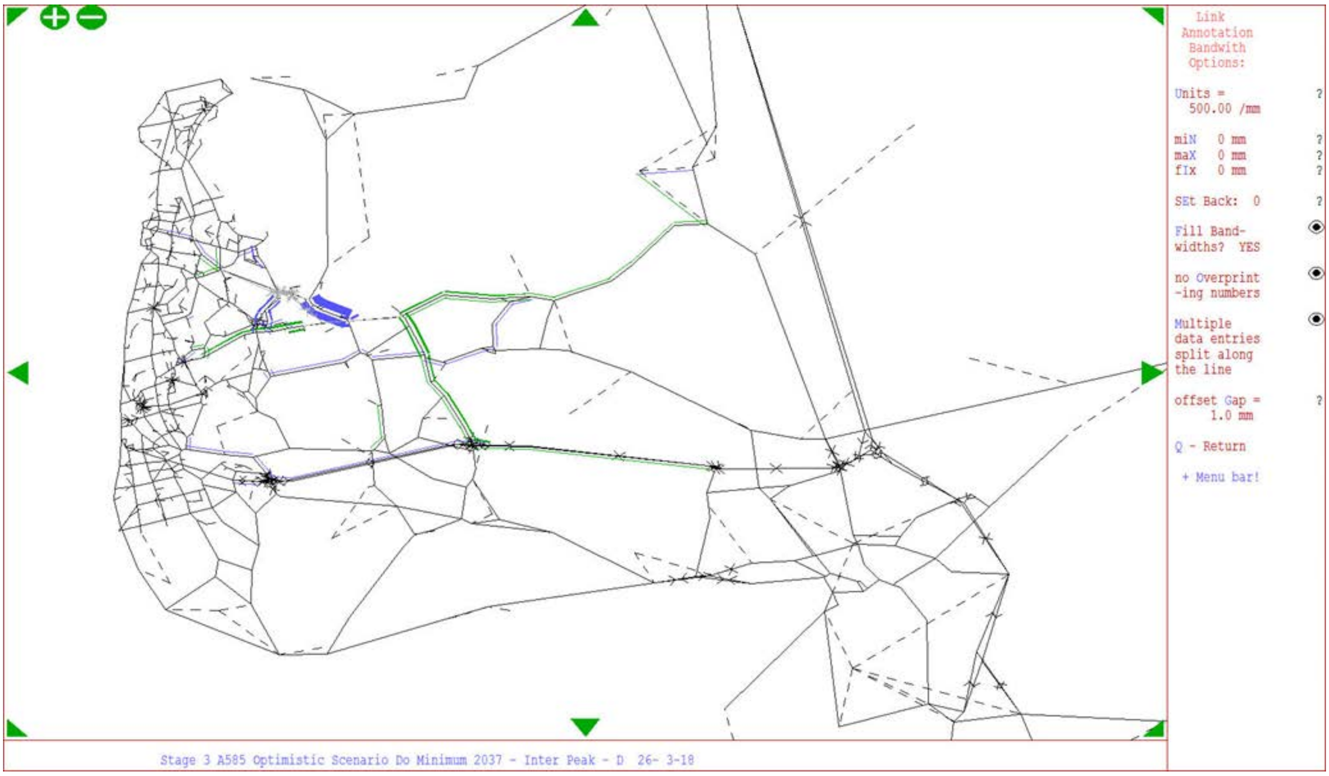
Figure 10-5: Optimistic Growth Changes in Traffic Flow (2037 With Scheme to Without Scheme -IP)



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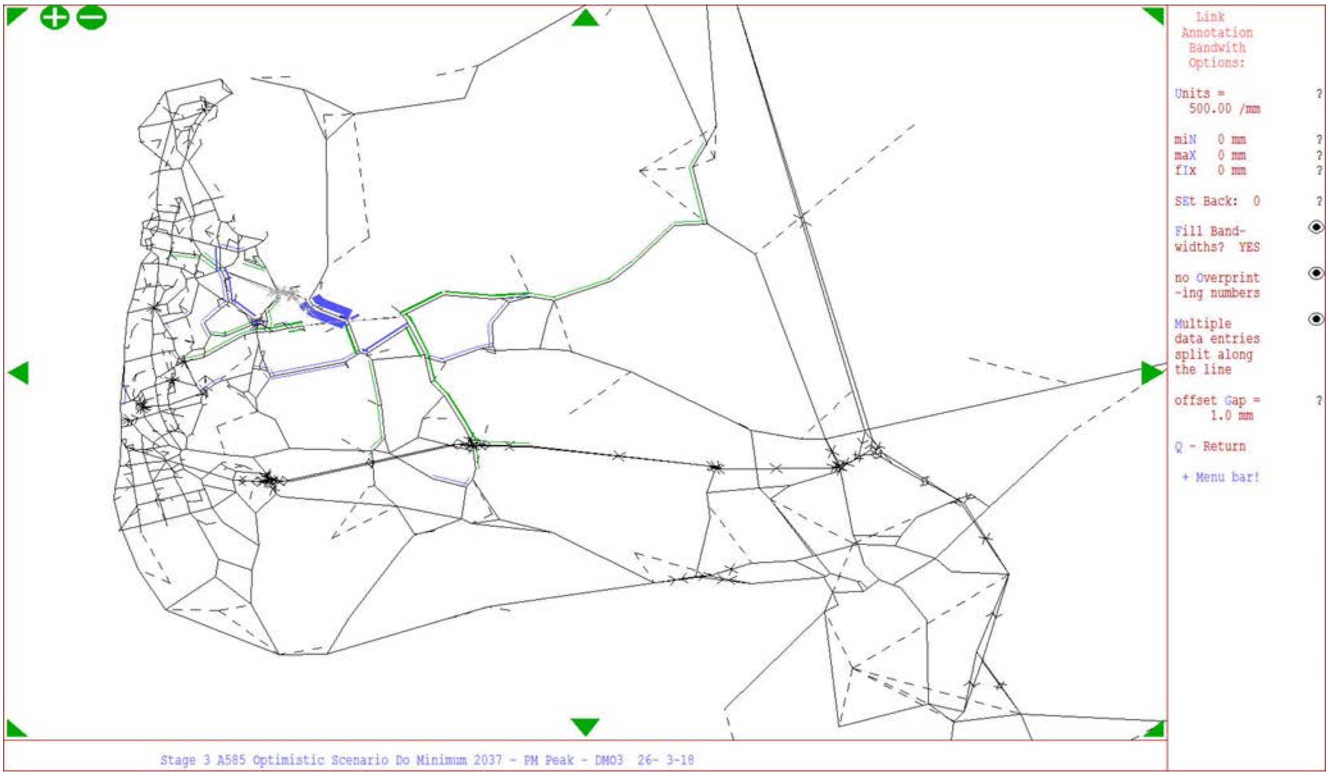
Stage 3 A585 Optimistic Scenario Do Minimum 2037 - Inter Peak - D 26- 3-18

Figure 10-6: Optimistic Growth Changes in Traffic Flow (2037 With Scheme to Without Scheme - PM)



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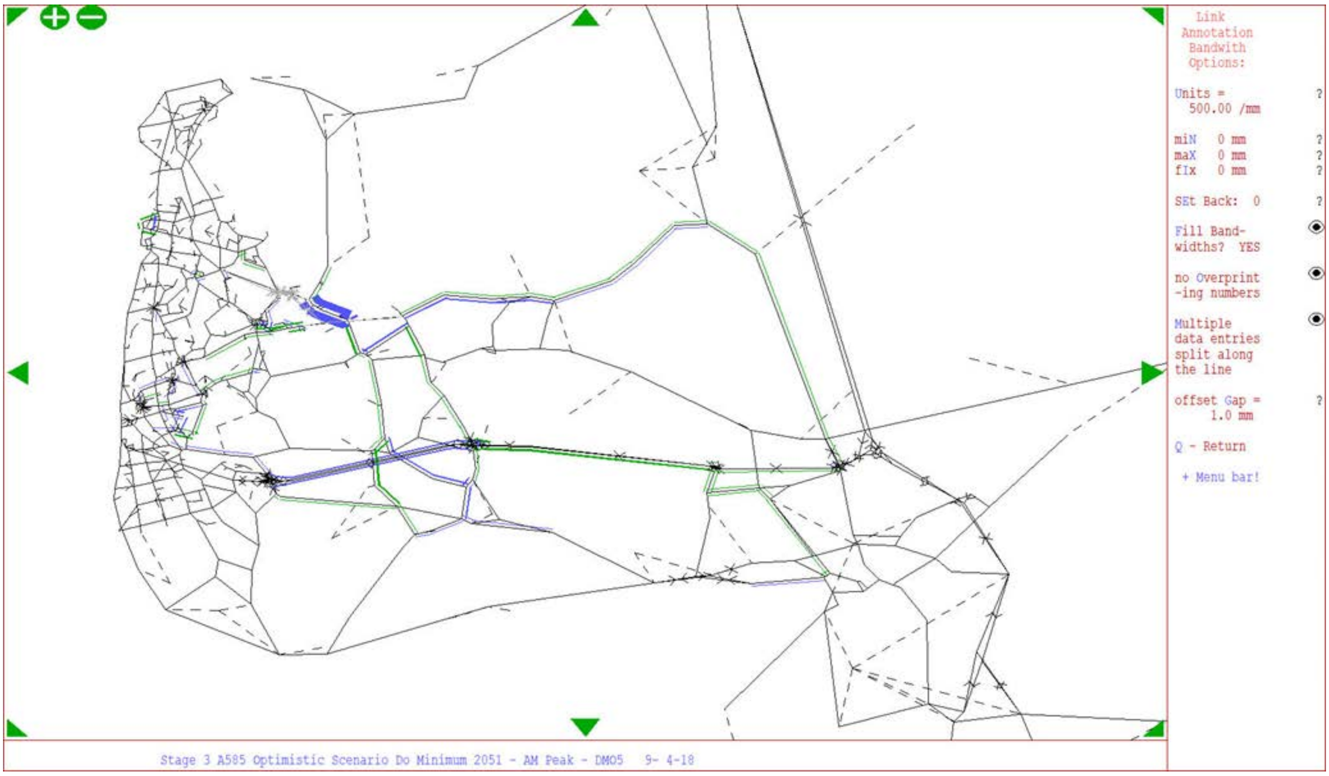
Stage 3 A585 Optimistic Scenario Do Minimum 2037 - PM Peak - DM03 26- 3-18

Figure 10-7: Optimistic Growth Changes in Traffic Flow (2051 With Scheme to Without Scheme - AM)



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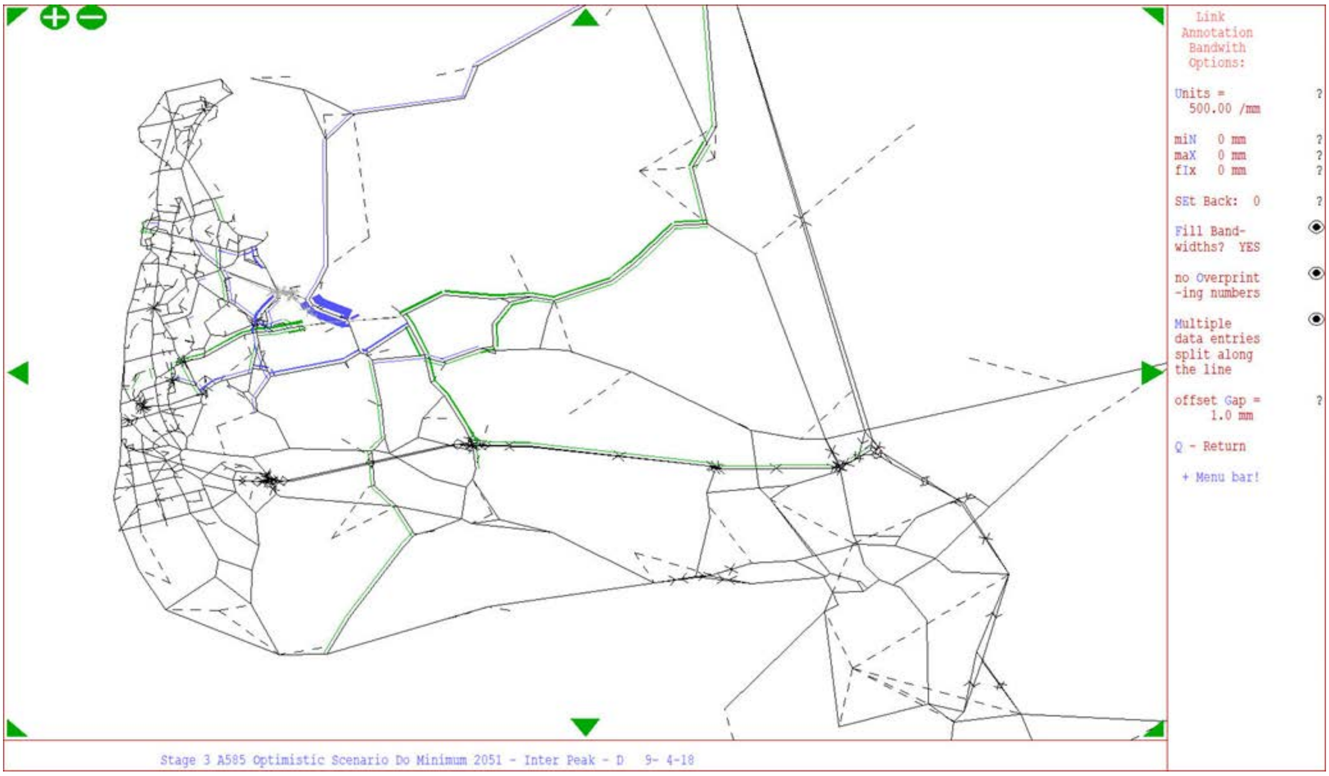
Stage 3 A585 Optimistic Scenario Do Minimum 2051 - AM Peak - DM05 9- 4-18

Figure 10-8: Optimistic Growth Changes in Traffic Flow (2051 With Scheme to Without Scheme - IP)



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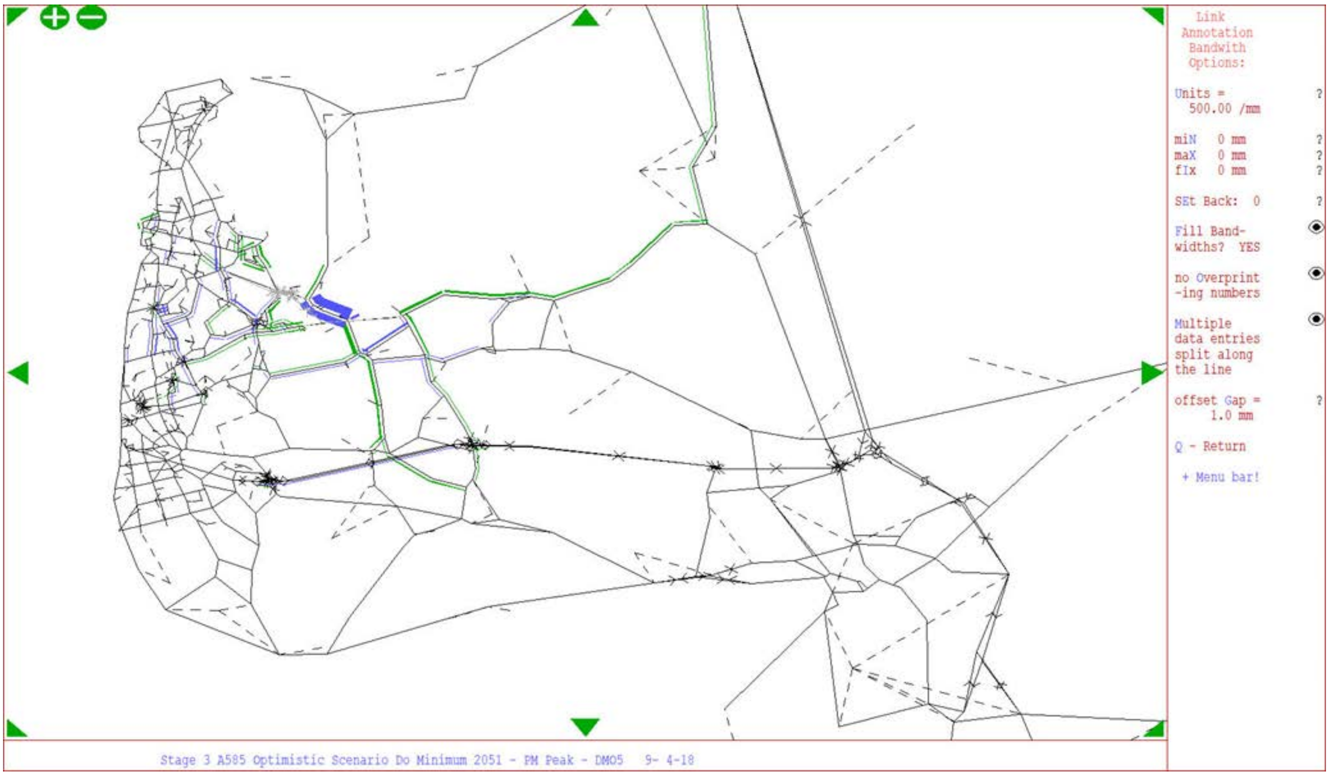
Stage 3 A585 Optimistic Scenario Do Minimum 2051 - Inter Peak - D 9- 4-18

Figure 10-9: Optimistic Growth Changes in Traffic Flow (2051 With Scheme to Without Scheme - PM)



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Stage 3 A585 Optimistic Scenario Do Minimum 2051 - PM Peak - DM05 9- 4-18

Optimistic Growth Scenario Traffic Flow Difference on the A585 (From Windy Harbour Junction to Skippool Junction)

10.1.3 A summary of Optimistic Growth scenario model traffic flow on the A585 from Windy Harbour to Skippool for the Without Scheme and With Scheme is presented in Table 10-1.

10.1.4 Traffic forecasts for the With Scheme scenario indicate there would be an increase in traffic levels, in the forecast years versus the corresponding Without Scheme scenario, compared with the Core Scenario.

Table 10-1: Optimistic Growth Post-VDM Traffic Flows - Vehs/hr

Location	2022			2037			2051		
	Without Scheme	With Scheme	% Diff	Without Scheme	With Scheme	% Diff	Without Scheme	With Scheme	% Diff
AM									
EB between Skippool Junction and Shard Road Junction	1363	1343	-2%	1323	1472	11%	1106	1441	30%
WB between Shard Road Junction and Skippool Junction	1397	1404	1%	1539	1693	10%	1584	1813	14%
EB between Shard Road Junction and Little Singleton Junction	1264	1226	-3%	1328	1324	0%	1104	1351	22%
WB between Little Singleton Junction and Shard Road Junction	841	915	9%	989	1127	14%	1042	1244	19%
EB between Little Singleton Junction and Windy Harbour Junction	1237	1600	29%	1319	1749	33%	1348	1766	31%
WB between Windy Harbour Junction and Little Singleton Junction	1145	1247	9%	1341	1450	8%	1531	1597	4%
IP									
EB between Skippool Junction and Shard Road Junction	1248	1239	-1%	1448	1509	4%	1652	1762	7%
WB between Shard Road Junction and Skippool Junction	1198	1198	0%	1301	1414	9%	1377	1512	10%
EB between Shard Road Junction and Little Singleton Junction	930	1030	11%	1129	1292	14%	1156	1498	30%
WB between Little Singleton Junction and Shard Road Junction	856	981	15%	948	1158	22%	958	1242	30%
EB between Little Singleton Junction and Windy Harbour Junction	1112	1389	25%	1328	1690	27%	1395	2030	46%
WB between Windy Harbour Junction and Little Singleton Junction	1126	1306	16%	1300	1502	16%	1421	1666	17%
PM									
EB between Skippool Junction and Shard Road Junction	1593	1665	4%	1778	1911	7%	1861	2014	8%
WB between Shard Road Junction and Skippool Junction	1382	1522	10%	1578	1664	5%	1496	1724	15%
EB between Shard Road Junction and Little Singleton Junction	995	1187	19%	1189	1453	22%	1279	1577	23%
WB between Little Singleton Junction and Shard Road Junction	1040	1281	23%	1250	1414	13%	1125	1453	29%
EB between Little Singleton Junction and Windy Harbour Junction	1328	1691	27%	1525	2050	34%	1654	2317	40%
WB between Windy Harbour Junction and Little Singleton Junction	1280	1492	17%	1486	1565	5%	1521	1606	6%

10.2 Optimistic Growth Scenario Journey Times

10.2.1 The results of the Optimistic Growth scenario journey time analysis between the A585 Windy Harbour junction and Skippool junction comparing the Without Scheme (DM) and With Scheme (DS) scenario for the forecast years are presented in Table 10-2.

Table 10-2: Optimistic Growth Modelled Journey Time (in MM:SS)

Forecast Year	Route Direction	AM Peak			Inter Peak			PM Peak		
		DM	DS	Diff (savings)	DM	DS	Diff (savings)	DM	DS	Diff (savings)
2022	A585 EB	05:46	03:24	02:22	05:31	03:14	02:17	05:41	03:19	02:22
	A585 WB	05:51	03:08	02:43	05:49	03:03	02:46	07:32	03:09	04:23
2037	A585 EB	05:40	03:23	02:17	06:13	03:17	02:56	06:19	03:25	02:54
	A585 WB	07:06	03:17	03:49	07:12	03:11	04:01	07:18	03:19	03:59
2051	A585 EB	05:38	03:24	02:14	08:44	03:25	05:19	07:03	03:36	03:27
	A585 WB	09:14	04:23	04:51	08:22	03:29	04:53	08:46	03:26	05:20

10.2.2 Compared with the Core Scenario, the modelled journey times in the Optimistic Growth scenario are higher in both directions.

10.2.3 The journey times along the A585 for the Optimistic Growth scenario seem to be reasonable (i.e. the Without Scheme being the slowest, with slight increases in journey time savings over the forecast period.

10.2.4 During the peak hours in the opening year, the average time saving as a result of the scheme is expected to be around 2 minutes in the eastbound and between 2-4 minutes in the westbound direction across all the time periods. By 2051, the time savings in the peak hours is expected to increase to between 2-5 minutes in the eastbound direction and between 4-5 minutes in the westbound direction.

10.3 Conclusion

10.3.1 The principal aim of these forecasts is to provide traffic data for appraising the economic, environmental and operational impact of the proposed A585 Windy Harbour to Skippool scheme.

10.3.2 It is observed that all forecast year models achieve the TAG recommended convergence targets, thereby indicating an adequate level of model convergence.

10.3.3 The impact of A585 Windy Harbour to Skippool scheme on the highway network is assessed by analysing the resulting changes in the travel conditions across the highway network with respect to changes in traffic flows and journey times and a reduction in delay for the scheme compared with the Without Scheme option.

10.3.4 The largest changes in the highway flow across all modelled time periods occur on the strategic routes of the A585 and the M55. The scheme benefits the long-distance traffic that uses the strategic roads of the A585 and M55 to travel between the authorities of Wyre, Fylde and Blackpool and the rest of the UK.

10.3.5 A reduction of trips is observed on other roads, primarily the local roads within the Blackpool authority. In addition, it can be seen that vehicles that were using Shard Road (A588) now use Garstang Road (A586) to head towards the north.

10.3.6 A summary of the traffic flow on the A585 from Windy Harbour junction to Skippool junction shows that the scheme can accommodate more traffic flow in both directions in the forecast years.

10.3.7 In all modelled time periods the journey times along the A585 scheme area, seems to be reasonable with the Without Scheme being the slowest with slight increases in journey time savings over the forecast period.

10.3.8 Travel time savings of between 2 and 4.5 minutes per journey are expected to be saved by road users due to the scheme.

11 Assignment Results for Environmental Assessment

11.1 Overview

11.1.1 The environmental assessment is used to inform the design process and aid in the development of appropriate mitigation measures. The assessment takes place concurrently with the development of the scheme design, and this iterative process seeks to reduce the severity of the impacts and increase the potential for successful mitigation measures to be fully incorporated into the scheme.

11.1.2 This section presents the inputs provided for an assessment of the potential impact on local and regional air quality associated with the proposed A585 Windy Harbour to Skippool scheme.

11.1.3 This section also details the inputs provided to predict the noise and vibration impacts of the proposed scheme.

11.1.4 Further details on the environmental assessment process, and the likely environmental effects resulting from the construction and/or operation of the scheme would be provided in the Environmental Assessment Report (EAR).

11.1.5 The EAR would present the details and findings of surveys and assessments undertaken to compile a comprehensive baseline to identify potential changes arising as a result of the proposed scheme, the level of impact and mitigation, where appropriate.

11.2 Introduction

11.2.1 Air quality and noise assessments require link-based traffic flows (total flows and number of HDVs) and speeds provided by a traffic model.

11.2.2 Traffic models have traditionally been developed with a focus on providing information to inform the scheme's economic assessment. Whilst the traffic flows have been used to inform environmental assessments and scheme design, the increased risks around air quality has presented challenges on the accuracy and suitability of traffic data required at the link level as opposed to more strategic flows.

11.2.3 Whilst there are validation criteria for modelled traffic flows at the link level, the criteria for journey times is based on discrete journeys through the model area and not at the individual link level.

11.2.4 A review of journey times undertaken by Highways England as part of scheme assessments has shown that the accuracy of journey times does not reflect speeds well on individual links. It is therefore, evident that it is not possible to describe the impacts of congested conditions within air quality and noise assessments.

11.2.5 Consequently, the development of the speed-band categories provides a pragmatic and robust approach to support air quality and noise assessments and is not unduly influenced by artificial precision.

11.2.6 A speed banding exercise has been carried out in accordance with IAN 185/15 - Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into speed-bands for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA207/07) and Volume 11, Section 3. Part 7 Noise (HD213/11).

11.3 Air Quality Assessment

Traffic Data Requirement (Air Quality)

11.3.1 Changes in local traffic flow characteristics resulting from the operation of the proposed scheme may potentially impact on air quality.

11.3.2 The quantity and composition of vehicle emissions is dependent on the type of fuel used, engine type, size and efficiency, vehicle speeds and the type of abatement equipment employed.

11.3.3 The main pollutants of health concern from road traffic exhaust releases are NO2 and fine particulates – normally assessed as the fraction of airborne particles of mean aerodynamic diameter less than ten micrometres (PM10). These two pollutants are usually considered within the environmental assessment.

11.3.4 DMRB HA 207/07 paragraph 3.5 requires that "The assessment should be carried out using traffic data for the "Do-Minimum" (Without Scheme) and "Do-Something" (With Scheme) scenarios, for the opening year and possibly for a further future year. The worst year in the first 15 years from opening needs to be assessed. The base case should also be assessed."

11.3.5 The A585 Windy Harbour to Skippool air quality assessment thus, considered the following scenarios:

- Baseline Year / Model Verification – 2015: considers measured pollutant levels and traffic characteristics in the study area
- Without Scheme Future Baseline – 2022: considers the predicted traffic flows in the Traffic Reliability Area (TRA), assuming that the proposed improvement does not take place
- With Scheme Opening Year - 2022: considers the predicted traffic flow in the year of opening assuming that the proposed scheme is constructed
- Without Scheme Future Baseline – 2037: considers the predicted traffic flows in the TRA, assuming that the proposed improvement does not take place
- With Scheme Design Year - 2037: 15 years after opening of the proposed scheme

11.3.6 Traffic data was available for each road link for the base (2015), opening year (2022) and design year (2037) in the following format:

- Annual Average Daily traffic flow (AADT)
- Percentage of Heavy Duty Vehicles (HDV)
- Speed (kph) – Modelled Speed

11.4 Annual Average Daily Traffic

11.4.1 The environmental assessment was undertaken using the Annual Average Daily Traffic (AADT).

11.4.2 To convert the modelled peak hour traffic flows into AADT traffic flows, conversion factors were derived using the observed traffic count data within the study area. Conversion factors were produced for light vehicles (LVs) which include cars and light goods vehicles and heavy vehicles (HVs) which include heavy goods vehicles and buses, using a combination of automatic traffic counts (ATC), classified counts from Lancashire County Council and Blackpool Council manual classified counts (MCC) and TRIS traffic counts.

11.4.3 Table 11-1 presents the factors used to convert the peak hour traffic flows into AADT traffic flows.

Table 11-1: AADT Conversion Factors

Factor	Vehicle Type	Conversion Factor (Median)	Sensitivity Testing			
			Mean	95% Confidence Value	Lower bound Limit	Upper Bound Limit
AM to AM Period	LVs	2.25	2.27	0.01	2.26	2.29
PM to PM Period	LVs	3.73	3.76	0.06	3.70	3.82
12hrAWT to 24hrAADT*	LVs	1.19	1.20	0.09	1.11	1.29
AM to AM Period	LVs	2.27	2.35	0.05	2.29	2.40
PM to PM Period	HVs	3.44	3.53	0.07	3.47	3.60
12hrAWT to 24hrAADT*	HVs	0.94	0.92	0.06	0.86	0.97

11.4.4 The AADT for light vehicles and heavy vehicles was calculated as follows:

- Light Vehicles - (AM peak × 2.25 + IP × 5.5 + PM × 3.73) × 1.19
- Heavy Vehicles (AM peak × 2.27 + IP × 5.5 + PM × 3.44) × 0.94

11.4.5 There were some manual adjustments undertaken to the output traffic model speed data to the off-peak and modelled time period speeds (which are a component of the 24 hr AADT speeds) in order to refine the speed data from the traffic model used in the environmental assessment at a few locations.

11.4.6 Further details on the air quality impacts arising as a result of the A585 Windy Harbour to Skippool scheme would be detailed out in the Environmental Assessment Report (EAR).

11.5 Noise Assessment

Traffic Data Requirement (Noise Assessment)

11.5.1 The data required for the noise assessment includes:

- 18hr Annual Average Weekday Traffic (AAWT) flows (06:00 to 00:00 hours).
- traffic composition expressed as the percentage of HGVs greater than 3,500kg (un-laden weight).
- the average speed of traffic in kilometres per hour (km/h).

11.5.2 As with the air quality assessment, the modelled speed of the traffic of the base and future year A585 Windy Harbour to Skippool traffic models was utilised for the noise assessment.

Annual Average Weekday Traffic

11.5.3 The noise assessment requires the use of 18hr Annual Average Weekday Traffic (AAWT) flows.

11.5.4 Conversion factors were produced for light vehicles (LVs) which include cars and light goods vehicles and heavy vehicles (HVs) which include heavy goods vehicles and buses, using a combination of Automated Traffic Counts (ATC), classified counts from Lancashire County Council and Blackpool Council manual classified counts (MCC) and TRIS traffic counts.

11.5.5 The factors used to convert the peak hour traffic flows into 18hr AAWT traffic flows are shown in Table 11-2.The following formula was used to produce 18hr AAWT flows from the SATURN model outputs.

- Light Vehicles - (AM peak × 2.25 + IP × 5.5 + PM × 3.73) × 1.21
- Heavy Vehicles - (AM peak × 2.27 + IP × 5.5 + PM × 3.44) × 0.93

11.5.6 Further details on the noise and vibration impacts arising as a result of the A585 Windy Harbour to Skippool scheme can be referred to in the Environmental Assessment Report (EAR

11.5.7 There was some manual adjustments undertaken to the output traffic model speed data to the off-peak and modelled time period speeds (which are a component of the 18 hr AAWT speeds) in order to refine the speed data from the traffic model used in the environmental assessment at a few locations.

Table 11-2: AAWT Conversion Factors

Factor	Vehicle Type	Conversion Factor (Median)	Sensitivity Testing			
			Mean	95% Confidence Value	Lower bound Limit	Upper Bound Limit
AM to AM Period	LVs	2.25	2.27	0.01	2.26	2.29
PM to PM Period	LVs	3.73	3.76	0.06	3.70	3.82
12hrAWT to 18hrAAWT*	LVs	1.21	1.22	0.07	1.14	1.29
12hrAWT to 24hrAAWT*	LVs	1.24	1.25	0.09	1.17	1.34
AM to AM Period	HVs	2.27	2.35	0.05	2.29	2.40
PM to PM Period	HVs	3.44	3.53	0.07	3.47	3.60
12hrAWT to 18hrAAWT*	HVs	0.93	0.94	0.08	0.86	1.02
12hrAWT to 24hrAAWT*	HVs	1.12	1.13	0.06	1.07	1.19

12 Assignment Results for Operational Performance Assessment

12.1 Overview

12.1.1 The Stage 3 A585 traffic model was used to produce forecasts for the economic and environmental assessment of the Stage 3 A585 Windy Harbour to Skippool scheme. Nevertheless, to ensure that proposed highway layouts are feasible in terms of network capacity and safe operation, more detailed traffic modelling analyses were undertaken using a microsimulation model that covers the A585 from the Norcross Junction to the M55 Junction 3 and included the surrounding urban areas of Poulton-le-Fylde and Singleton.

12.1.2 The Stage 3 Operational Modelling results can be referred to in more detail in the Traffic Operational Assessment Report [HE548643-ARC-GEN-A585-RP-D-3065].

13 Glossary

AADT	Average annual daily traffic
AAWT	Annual average weekday traffic
Affected Road Network	This comprises the area within which roads could be considered within the air quality model (selection of the roads within the model depends upon a number of criteria such as changes in Heavy Duty Vehicle flows).
AIES	Assessment of Implications on European Sites
AMCB	Analysis of monetary costs and benefits
ANPR	Automatic Number Plate Recognition
AONB	Area of Outstanding Natural Beauty: Statutory designation intended to conserve and enhance the ecology, natural heritage and landscape value of an area of countryside.
AQMA	Air Quality Management Area: an area, declared by a local authority, where air quality monitoring does not meet Defra’s national air quality objectives.
AQS	Air Quality Strategy
AQSO	Air Quality Strategy Objective: Objective set by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland to improve air quality in the UK in the medium term. Objectives are focused on the main air pollutants to protect health.
ARN	see Affected road network
ASR	Appraisal Specification Report
AST	Appraisal Summary Table; a summary of impacts of introducing new infrastructure, setting out impacts using a structured set or economic, social and environmental measures.
ATC	Automatic Traffic Count
BAP	Biodiversity Action Plan: National, local and sector-specific plans established under the UK Biodiversity Action Plan, with the intention of securing the conservation and sustainable use of biodiversity.
BCR	Benefit-Cost Ratio, the net benefit of a scheme divided by the net cost to Government. The ratio of present value of benefits (PVB) to present value of costs (PVC), an indication of value for money.
BNL	Basic Noise Level
BTO	British Trust for Ornithology: an organisation founded in 1932 for the study of birds in the British Isles.
CAD	Computer Aided Design
CAPEX	Capital expenditure; the cost of developing or providing non-consumable parts of the product or system.
Central case	Contains core forecasting assumptions
CFMP	Catchment Flood Management Plan: A strategic planning tool through which the Environment Agency works with other key decision-makers within a river catchment to identify and agree policies for sustainable flood risk management.
COBA	Cost Benefit Analysis computer program; DfT’s tool for estimating accident benefits. The COBA program compares the costs of providing road schemes with the benefits derived by road users.
COBALT	New ‘light touch’ version of COBA
Consumer users	Users of infrastructure on journeys for personal reasons such as shopping, education, or commuting to a place of work
CRTN	Department for Transport’s calculation of road traffic noise
CSR	Client Scheme Requirements
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs: the government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom of Great Britain and Northern Ireland.
DFBO	Design, Finance, Build, Operate
DfT	Department for Transport
DGV	Dangerous Goods Vehicles
DI	Distributional impact
Disbenefit	A disadvantage or loss resulting from something.

DMRB	Design Manual for Roads and Bridges: A series of 15 volumes produced by Highways England that provide standards, advice notes and other documents relating to the design, assessment and operation of trunk roads, including motorways in the UK and, with some amendments, the Republic of Ireland.
dwg	A binary file format used for storing two- and three- dimensional design data and metadata.
EA	Environment Agency: The Environment Agency was established under the Environment Act 1995 and is a Non-Departmental Public Body of Defra. The Environment Agency is the leading public body for protecting and improving the environment in England and Wales. The organisation is responsible for wide-ranging matters, including the management of all forms of flood risk, water resources, water quality, waste regulation, pollution control, inland fisheries, recreation, conservation and navigation of inland waterways.
EIA	Environmental Impact Assessment
EMME	Equilibre Multimodal, Multimodal Equilibrium; a complete travel demand modelling system for urban, regional and national transportation forecasting.
FBC	Full Business Case
FRA	Flood Risk Assessment
Frank-Wolfe algorithm	An iterative first-order optimisation algorithm for constrained convex optimisation.
Furness methodology	A traffic modelling methodology
FWI	Fatalities and Weighted Injuries: a statistical measurement of all non-fatal injuries added-up using a weighting factor to produce a total number of ‘fatality equivalents’.
FY	Full year
GBFM	Great Britain Freight Model
GEH	The GEH Statistic is a formula used in traffic engineering, traffic forecasting, and traffic modelling to compare two sets of traffic volumes
GDP	Gross Domestic Product
GIS	Geographic information system: an integrated collection of computer software and data used to view and manage information about geographic places, analyse spatial relationships, and model spatial processes.
GLAAS	Global Analysis and Assessment of Sanitation and Drinking-Water
GVA	Gross value added
HAGDMS	Highways England Geotechnical Data Management System
HAIL	Highways Agency Information Line – now Highways England Customer Contact Centre
HATRIS	Highways England Traffic Information System
HDV	Heavy duty vehicle
HEC	Highways England Commercial Services
HER	Historic Environment Records
HGV	Heavy goods vehicle
IMMI	Noise mapping software: IMMI covers a wide range of applications ranging from noise mapping to air pollution modelling. IMMI integrates both noise and air pollution in a single software package.
ITN	Ordnance Survey Integrated Transport Network
JT	Journey time
JTDB	Highways England’s Journey Time Database system , which holds information on journey times and traffic flows for links of the network
JTR	Journey time reliability
KPI	Key performance indicators
LA	Local authority
LGV	Light goods vehicle
LinSig	A software tool that allows traffic engineers to model traffic signals and their effect on traffic capacities and queuing.
LMVR	Local Model Validation Report
MAGIC	Multi-Agency Geographical Information for the Countryside
MMO	Marine Management Organisation: An executive non-departmental public body in the UK established under the Marine and Coastal Access Act 2009. The MMO exists to make a significant contribution to sustainable development in the marine area, and to promote the

	UK government’s vision for clean, healthy, safe, productive and biologically diverse oceans and seas.
MSOA	Middle Super Output Area
NIAs	Noise Important Areas
NMU	Non-motorised user, e.g. pedestrians, cyclists, equestrians.
NPSNN	National Policy Statement for National Networks: the NPSNN sets out the need for, and Government’s policies to deliver, development of nationally significant infrastructure projects on the national road and rail networks in England. It provides planning guidance for promoters of nationally significant infrastructure projects on the road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State.
NO2	Nitrogen dioxide
NPV	Net present value, a measure of the total impact of a scheme upon society, in monetary terms, expressed in 2010 prices
NTEM	Department for Transport National Trip End Model
O&M	Operations & Maintenance
OBC	Outline Business Case
OD	Origin-destination: origin-destination data (also known as flow data) includes the travel-to-work and migration patterns of individuals, cross-tabulated by variables of interest (for example occupation).
ONS	Office for National Statistics
OPEX	An operating expense or operating expenditure or operational expense or operational expenditure is an ongoing cost for running a product, business or system.
OS	Ordnance Survey
PA	Public Accounts
PCF	Highways England Project Control Framework process.
PCM	Defra’s Pollution Climate Mapping model
pcu	passenger car units. This is a metric to allow different vehicle types within traffic flows in a traffic model to be assessed in a consistent manner. Typical pcu factors are: 1 for a car or light goods vehicle; 2 for a bus of heavy goods vehicle; 0.4 for a motorcycle; and 0.2 for a pedal cycle.
PINS	Planning Inspectorate
PRoW	Public Right of Way: a right possessed by the public, to pass along routes over land at all times. Although the land may be owned by a private individual, the public may still gain access across that land along a specific route. The mode of transport allowed differs according to the type of public right of way which consist of footpaths, bridleways and open and restricted byways.
PV	Present Values
PVB	Present value of benefits, monetised benefits accruing to users (in terms of travel time, vehicle operating cost, and tolls to be paid), monetised impacts upon the environment, the monetised value of accidents, and monetised wider economic impacts.
PVC	Present value of costs, a measure of the monetary cost of a scheme, less revenues, discounted to and expressed in 2010 prices
QUADRO	Queues and Delays at Roadworks computer program; a Highways England sponsored computer program maintained and distributed by TRL Software; its primary use is in rural areas. It estimates the effects of roadworks in terms of time, vehicle operating and accident costs on the users of the road. Individual roadworks jobs can be combined to produce the total cost of maintaining the road over time.
Ramsar site	A wetland of international importance, designated under the Ramsar convention
RSI	Roadside interviews
RSPB	Royal Society for the Protection of Birds: A charitable organisation that works to promote conservation and protection of birds and the wider environment through public awareness campaigns, petitions and through the operation of nature reserves throughout the United Kingdom.
SAC	Special Area of Conservation: defined in the European Union's Habitats Directive (92/43/EEC), also known as the Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora. SACs are to protect the 220 habitats and approximately 1000 species listed in annex I and II of the directive which are considered to be of European interest following criteria given in the directive.
SATURN	Simulation and Assignment of Traffic to Urban Road Networks, Transport Model

SFRA	Strategic Flood Risk Assessment
SIA	Social impact assessment
SOBC	Strategic Outline Business Case: first stage of drawing together evidence pertaining to a transport scheme, focusing on the strategy or reasons why change may be required.
SPA	Special Protection Area: a designation under the European Union Directive on the Conservation of Wild Birds.
SRN	Strategic Road Network, the core road network, managed in England by Highways England.
SSSI	Site of Special Scientific Interest: a conservation designation denoting an area of particular ecological or geological importance.
SuDS	A sustainable urban drainage system designed to reduce the potential impact of new and existing developments with respect to surface water drainage discharges.
TAG	Transport Analysis Guidance: national guidance document produced by the Department for Transport.
TPG	The Traffic Appraisal, Modelling and Economics team within Highways England now referred to as the Transport Planning Group (TPG)
TEE	Economic Efficiency of the Transport system
tCO2e	Tonnes of carbon dioxide equivalent
TRA	Traffic Reliability Area
TRADS	Traffic Flow Data System (holds information on traffic flows at sites on the network) now referred to as TRIS
Trafficmaster	Trafficmaster, a division of Teletrac, owned by Danaher. Formerly known as Trafficmaster in the UK, Teletrac is one of the largest fleet companies in the UK and USA.
TUBA	Transport Users Benefit Appraisal (Department for Transport economic appraisal software tool)
USA	Updating and screening assessment
VDM	Variable demand model
V/C	Volume over Capacity (volume/capacity)
VFM	Value for Money
VOC	Vehicle Operating Costs
VOT	Values of Time
vph	Vehicles per hour
Wardrop's first principle	States: The journey times in all routes actually used are equal and less than those which would be experienced by a single vehicle on any unused route. Each user non-cooperatively seeks to minimise his cost of transportation. The traffic flows that satisfy this principle are usually referred to as "user equilibrium" (UE) flows, since each user chooses the route that is the best.
WEB	Wider economic benefit
TAG	Department for Transport's web-based multi-modal guidance on appraising transport projects and proposals.
WFD	Water Framework Directive: A European Community Directive (2000/60/EC) of the European Parliament and council designed to integrate the way water bodies are managed across Europe.
WI (wider impacts)	Wider Impacts, land use-related economic consequences of transport interventions, not directly related to impacts on users of the transport network, such as increased productivity.
Without Scheme/ With Scheme	Without Scheme: The scenario where government takes the minimum amount of action necessary and is used as a benchmark in the appraisal of options. With Scheme: An option that provides enhanced services by comparison to the benchmark Without Scheme scenario.

Appendix A – Growth Factors

Growth Factor for Cars 2022

		2022																	
		AM						IP						PM					
Area Description		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other	
Model Zone	Name	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
1	Wyre 012 (E02005330)	1.00	1.02	1.03	1.04	1.03	1.04	1.00	1.00	1.02	1.02	1.04	1.03	1.01	1.00	1.03	1.02	1.03	1.02
2	Wyre 013 (E02005331)	1.01	1.04	1.04	1.06	1.05	1.06	1.02	1.01	1.05	1.04	1.05	1.05	1.03	1.00	1.05	1.04	1.05	1.04
3	Wyre 013 (E02005331)	1.01	1.04	1.04	1.06	1.05	1.06	1.02	1.01	1.05	1.04	1.05	1.05	1.03	1.00	1.05	1.04	1.05	1.04
4	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
5	Wyre 012 (E02005330)	1.00	1.02	1.03	1.04	1.03	1.04	1.00	1.00	1.02	1.02	1.04	1.03	1.01	1.00	1.03	1.02	1.03	1.02
6	Wyre 012 (E02005330)	1.00	1.02	1.03	1.04	1.03	1.04	1.00	1.00	1.02	1.02	1.04	1.03	1.01	1.00	1.03	1.02	1.03	1.02
7	Wyre 012 (E02005330)	1.00	1.02	1.03	1.04	1.03	1.04	1.00	1.00	1.02	1.02	1.04	1.03	1.01	1.00	1.03	1.02	1.03	1.02
8	Wyre 005 (E02005323)	1.04	1.03	1.06	1.05	1.05	1.06	1.02	1.03	1.05	1.04	1.06	1.06	1.03	1.03	1.05	1.05	1.05	1.05
9		1.04	1.03	1.05	1.03	1.06	1.06	1.02	1.02	1.05	1.04	1.05	1.05	1.03	1.03	1.04	1.05	1.04	1.04
10	Wyre 003 (E02005321)	1.05	1.02	1.05	1.03	1.05	1.04	1.02	1.03	1.03	1.04	1.05	1.05	1.01	1.04	1.05	1.06	1.04	1.05
11	Wyre 005 (E02005323)	1.04	1.03	1.06	1.05	1.05	1.06	1.02	1.03	1.05	1.04	1.06	1.06	1.03	1.03	1.05	1.05	1.05	1.05
12	Wyre 005 (E02005323)	1.04	1.03	1.06	1.05	1.05	1.06	1.02	1.03	1.05	1.04	1.06	1.06	1.03	1.03	1.05	1.05	1.05	1.05
13	Wyre 003 (E02005321)	1.05	1.02	1.05	1.03	1.05	1.04	1.02	1.03	1.03	1.04	1.05	1.05	1.01	1.04	1.05	1.06	1.04	1.05
14		1.03	1.04	1.05	1.06	1.06	1.06	1.03	1.02	1.05	1.05	1.06	1.06	1.03	1.03	1.05	1.05	1.05	1.05
15	Wyre 008 (E02005326)	1.04	1.04	1.06	1.06	1.06	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.03	1.03	1.04	1.06	1.05	1.05
16	Wyre 010 (E02005328)	1.01	1.04	1.03	1.06	1.04	1.06	1.02	1.01	1.04	1.04	1.05	1.05	1.03	1.00	1.06	1.04	1.04	1.03
17	Wyre 011 (E02005329)	1.02	1.04	1.05	1.04	1.04	1.04	1.02	1.01	1.04	1.04	1.05	1.05	1.03	1.01	1.05	1.04	1.03	1.04
18		1.02	1.04	1.04	1.06	1.05	1.06	1.02	1.01	1.04	1.04	1.05	1.05	1.03	1.01	1.05	1.04	1.05	1.04
19	Wyre 011 (E02005329)	1.02	1.04	1.05	1.04	1.04	1.04	1.02	1.01	1.04	1.04	1.05	1.05	1.03	1.01	1.05	1.04	1.03	1.04
20		1.04	1.04	1.06	1.06	1.05	1.06	1.03	1.03	1.05	1.06	1.06	1.06	1.03	1.04	1.06	1.06	1.05	1.05
21		1.05	1.03	1.06	1.06	1.05	1.05	1.03	1.03	1.04	1.04	1.05	1.05	1.02	1.04	1.04	1.05	1.05	1.05
22		1.01	1.03	1.04	1.04	1.04	1.04	1.01	1.00	1.04	1.03	1.04	1.04	1.02	1.00	1.04	1.03	1.03	1.03
23		1.06	1.04	1.07	1.05	1.07	1.07	1.04	1.04	1.05	1.05	1.07	1.07	1.03	1.05	1.05	1.06	1.07	1.06
24		1.12	1.04	1.10	1.04	1.09	1.07	1.05	1.07	1.06	1.06	1.08	1.08	1.04	1.10	1.04	1.09	1.07	1.07
25		1.13	1.04	1.08	1.06	1.08	1.07	1.05	1.05	1.05	1.06	1.07	1.07	1.04	1.09	1.06	1.07	1.06	1.06
26		1.10	1.04	1.09	1.05	1.07	1.07	1.04	1.05	1.05	1.05	1.07	1.07	1.03	1.08	1.05	1.07	1.06	1.06
27		1.06	1.03	1.07	1.05	1.06	1.08	1.03	1.04	1.05	1.04	1.07	1.07	1.03	1.05	1.05	1.06	1.07	1.06
28		1.04	1.03	1.06	1.04	1.05	1.07	1.03	1.03	1.05	1.04	1.06	1.06	1.02	1.04	1.04	1.05	1.06	1.05
29		1.03	1.03	1.05	1.05	1.04	1.05	1.02	1.02	1.05	1.04	1.05	1.05	1.02	1.03	1.04	1.05	1.04	1.04
30		1.06	1.04	1.07	1.05	1.05	1.06	1.03	1.04	1.05	1.05	1.06	1.06	1.03	1.05	1.05	1.06	1.05	1.05
31	Blackpool 014 (E02002646)	1.06	1.04	1.06	1.06	1.06	1.06	1.04	1.04	1.05	1.05	1.06	1.06	1.03	1.05	1.05	1.06	1.05	1.05
32		1.02	1.04	1.04	1.05	1.04	1.06	1.02	1.02	1.04	1.04	1.05	1.05	1.03	1.03	1.05	1.05	1.05	1.04

		2022																	
		AM						IP						PM					
Area Description		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other	
Model Zone	Name	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
33		1.05	1.03	1.07	1.05	1.05	1.06	1.03	1.03	1.05	1.04	1.06	1.05	1.03	1.04	1.05	1.05	1.05	1.05
34		1.05	1.04	1.06	1.05	1.06	1.05	1.04	1.04	1.06	1.05	1.05	1.05	1.04	1.05	1.06	1.06	1.05	1.05
35	Blackpool 004 (E02002636)	1.04	1.04	1.05	1.05	1.04	1.04	1.02	1.02	1.04	1.04	1.04	1.04	1.03	1.03	1.04	1.05	1.04	1.04
36	Wyre 013 (E02005331)	1.01	1.04	1.04	1.06	1.05	1.06	1.02	1.01	1.05	1.04	1.05	1.05	1.03	1.00	1.05	1.04	1.05	1.04
37	Wyre 012 (E02005330)	1.00	1.02	1.03	1.04	1.03	1.04	1.00	1.00	1.02	1.02	1.04	1.03	1.01	1.00	1.03	1.02	1.03	1.02
38	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
39	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
40	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
41	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
42	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
43	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
44	Fylde 002 (E02005204)	1.00	1.03	1.03	1.04	1.04	1.05	1.00	1.00	1.04	1.03	1.05	1.05	1.02	0.99	1.04	1.02	1.04	1.04
45	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
46		1.05	1.04	1.06	1.05	1.06	1.06	1.03	1.04	1.06	1.05	1.06	1.06	1.03	1.05	1.05	1.06	1.05	1.05
47	Wyre 001 (E02005319)	1.07	1.04	1.07	1.05	1.07	1.07	1.04	1.04	1.06	1.06	1.06	1.06	1.04	1.05	1.05	1.06	1.05	1.05
48	Blackpool 002 (E02002634)	1.05	1.02	1.06	1.04	1.04	1.04	1.02	1.03	1.03	1.03	1.05	1.05	1.02	1.04	1.04	1.05	1.04	1.05
49		1.05	1.02	1.06	1.04	1.04	1.04	1.02	1.03	1.03	1.03	1.05	1.05	1.02	1.04	1.04	1.05	1.04	1.04
50	Wyre 014 (E02005332)	1.00	1.03	1.02	1.03	1.03	1.04	1.00	1.00	1.03	1.03	1.04	1.04	1.01	1.00	1.03	1.03	1.03	1.03
51	Wyre 014 (E02005332)	1.00	1.03	1.02	1.03	1.03	1.04	1.00	1.00	1.03	1.03	1.04	1.04	1.01	1.00	1.03	1.03	1.03	1.03
52	Blackpool 018 (E02002650)	1.06	1.04	1.07	1.05	1.06	1.06	1.03	1.04	1.05	1.05	1.06	1.06	1.03	1.05	1.05	1.06	1.05	1.05
53		1.09	1.05	1.09	1.07	1.07	1.05	1.05	1.04	1.06	1.06	1.06	1.06	1.04	1.05	1.05	1.06	1.06	1.06
54	Wyre 014 (E02005332)	1.00	1.03	1.02	1.03	1.03	1.04	1.00	1.00	1.03	1.03	1.04	1.04	1.01	1.00	1.03	1.03	1.03	1.03
55	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
56	Wyre 010 (E02005328)	1.01	1.04	1.03	1.06	1.04	1.06	1.02	1.01	1.04	1.04	1.05	1.05	1.03	1.00	1.06	1.04	1.04	1.03
57	Blackpool 001 (E02002633)	1.04	1.03	1.06	1.06	1.06	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.02	1.04	1.04	1.05	1.05	1.05
58	Wyre 008 (E02005326)	1.04	1.04	1.06	1.06	1.06	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.03	1.03	1.04	1.06	1.05	1.05
59	Wyre 011 (E02005329)	1.02	1.04	1.05	1.04	1.04	1.04	1.02	1.01	1.04	1.04	1.05	1.05	1.03	1.01	1.05	1.04	1.03	1.04
60	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02

		2022																	
		AM						IP						PM					
Area Description		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other	
Model Zone	Name	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
61	Wyre 013 (E02005331)	1.01	1.04	1.04	1.06	1.05	1.06	1.02	1.01	1.05	1.04	1.05	1.05	1.03	1.00	1.05	1.04	1.05	1.04
62	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
63	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
64		1.02	1.04	1.04	1.06	1.06	1.06	1.02	1.02	1.05	1.05	1.06	1.06	1.03	1.01	1.06	1.05	1.05	1.05
65		1.01	1.03	1.03	1.05	1.05	1.05	1.01	1.00	1.04	1.04	1.06	1.06	1.02	1.00	1.05	1.03	1.05	1.04
66		1.00	1.04	1.03	1.06	1.05	1.06	1.01	1.01	1.04	1.04	1.06	1.05	1.03	1.00	1.04	1.03	1.04	1.04
67	Wyre 009 (E02005327)	0.99	1.03	1.02	1.05	1.02	1.05	1.00	0.99	1.03	1.02	1.04	1.04	1.02	0.99	1.04	1.01	1.03	1.03
68		1.02	1.04	1.04	1.06	1.05	1.05	1.02	1.02	1.05	1.04	1.06	1.06	1.03	1.02	1.05	1.04	1.05	1.04
69		1.07	1.04	1.07	1.06	1.06	1.05	1.04	1.04	1.05	1.05	1.06	1.06	1.13	1.14	1.15	1.15	1.17	1.18
70	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
71	Fylde 002 (E02005204)	1.00	1.03	1.03	1.04	1.04	1.05	1.00	1.00	1.04	1.03	1.05	1.05	1.02	0.99	1.04	1.02	1.04	1.04
72	Fylde 007 (E02005209)	0.99	1.04	1.03	1.05	1.04	1.04	1.02	1.00	1.04	1.04	1.04	1.04	1.03	0.99	1.05	1.03	1.03	1.03
73		0.99	1.04	1.03	1.05	1.03	1.04	1.01	1.00	1.04	1.04	1.04	1.04	1.03	0.99	1.05	1.03	1.03	1.03
74	Lancaster 019 (E02005239)	1.04	0.99	1.04	1.00	0.99	1.01	0.99	1.00	1.00	1.00	1.00	1.01	0.98	1.02	1.00	1.02	1.00	1.00
75	Blackpool 018 (E02002650)	1.03	1.03	1.05	1.04	1.04	1.05	1.02	1.02	1.04	1.04	1.04	1.04	1.03	1.02	1.03	1.04	1.04	1.04
76	Wyre 006 (E02005324)	0.98	1.02	1.02	1.03	1.02	1.04	1.00	0.99	1.02	1.01	1.03	1.03	1.01	0.98	1.02	1.01	1.03	1.02
77	Wyre 007 (E02005325)	0.99	1.04	1.03	1.06	1.04	1.05	1.01	1.00	1.04	1.04	1.05	1.04	1.03	0.99	1.05	1.02	1.04	1.03
78		1.00	1.03	1.03	1.04	1.03	1.05	1.00	1.00	1.03	1.03	1.04	1.04	1.02	0.99	1.04	1.02	1.04	1.03
79	Wyre 009 (E02005327)	0.99	1.03	1.02	1.05	1.02	1.05	1.00	0.99	1.03	1.02	1.04	1.04	1.02	0.99	1.04	1.01	1.03	1.03
80	Wyre 009 (E02005327)	0.99	1.03	1.02	1.05	1.02	1.05	1.00	0.99	1.03	1.02	1.04	1.04	1.02	0.99	1.04	1.01	1.03	1.03
81	Wyre 004 (E02005322)	1.00	1.03	1.03	1.06	1.03	1.04	1.00	1.00	1.04	1.03	1.04	1.04	1.02	1.00	1.04	1.02	1.03	1.03
82	Wyre 004 (E02005322)	1.00	1.03	1.03	1.06	1.03	1.04	1.00	1.00	1.04	1.03	1.04	1.04	1.02	1.00	1.04	1.02	1.03	1.03
83	Wyre 004 (E02005322)	1.00	1.03	1.03	1.06	1.03	1.04	1.00	1.00	1.04	1.03	1.04	1.04	1.02	1.00	1.04	1.02	1.03	1.03
84	Preston 002 (E02005254)	1.03	1.03	1.05	1.04	1.05	1.05	1.03	1.03	1.05	1.04	1.06	1.06	1.10	1.10	1.13	1.14	1.16	1.16
85	Preston 002 (E02005254)	1.03	1.03	1.05	1.04	1.05	1.05	1.03	1.03	1.05	1.04	1.06	1.06	1.10	1.10	1.13	1.14	1.16	1.16
86		1.03	1.04	1.05	1.05	1.05	1.05	1.03	1.03	1.04	1.05	1.05	1.05	1.10	1.10	1.13	1.14	1.15	1.15
87	Fylde 003 (E02005205)	0.99	1.03	1.02	1.04	1.01	1.04	1.00	1.00	1.03	1.04	1.02	1.02	1.02	0.99	1.03	1.03	1.02	1.01
88	Fylde 003 (E02005205)	0.99	1.03	1.02	1.04	1.01	1.04	1.00	1.00	1.03	1.04	1.02	1.02	1.02	0.99	1.03	1.03	1.02	1.01
89	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
90	Wyre 010 (E02005328)	1.01	1.04	1.03	1.06	1.04	1.06	1.02	1.01	1.04	1.04	1.05	1.05	1.03	1.00	1.06	1.04	1.04	1.03

		2022																	
		AM						IP						PM					
Area Description		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other	
Model Zone	Name	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
91	Wyre 008 (E02005326)	1.04	1.04	1.06	1.06	1.06	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.03	1.03	1.04	1.06	1.05	1.05
92	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
93	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
94	Fylde 001 (E02005203)	0.98	1.03	1.01	1.05	1.03	1.05	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.98	1.04	1.02	1.03	1.02
100	Copeland	1.06	1.05	1.08	1.06	1.05	1.05	1.04	1.04	1.06	1.06	1.04	1.05	1.04	1.05	1.06	1.07	1.04	1.04
101	Carlisle	1.06	1.05	1.08	1.06	1.06	1.05	1.04	1.05	1.06	1.06	1.05	1.05	1.04	1.06	1.06	1.07	1.05	1.05
102	South Lakeland	1.01	1.05	1.04	1.06	1.04	1.05	1.02	1.02	1.05	1.05	1.05	1.05	1.07	1.06	1.11	1.11	1.12	1.12
103	Allerdale	1.03	1.04	1.05	1.06	1.04	1.05	1.03	1.02	1.05	1.05	1.04	1.04	1.03	1.02	1.05	1.05	1.04	1.04
104	Eden	1.02	1.04	1.04	1.05	1.04	1.04	1.02	1.02	1.04	1.04	1.05	1.05	1.03	1.01	1.05	1.04	1.04	1.04
105	Barrow-in-Furness	1.05	1.06	1.06	1.07	1.04	1.05	1.04	1.04	1.06	1.06	1.05	1.05	1.05	1.04	1.07	1.06	1.05	1.04
106	High Peak	1.02	1.03	1.05	1.05	1.07	1.07	1.02	1.02	1.04	1.04	1.07	1.07	1.03	1.02	1.05	1.04	1.06	1.06
107	South Derbyshire	1.09	1.03	1.09	1.05	1.11	1.08	1.06	1.06	1.06	1.06	1.11	1.11	1.03	1.08	1.05	1.09	1.09	1.11
108	Erewash	1.02	1.03	1.05	1.05	1.06	1.07	1.02	1.02	1.05	1.04	1.07	1.07	1.03	1.02	1.05	1.04	1.06	1.05
109	North East Derbyshire	1.05	1.04	1.07	1.06	1.08	1.07	1.03	1.04	1.06	1.06	1.08	1.08	1.04	1.04	1.06	1.06	1.07	1.07
110	Amber Valley	1.01	1.03	1.03	1.05	1.06	1.06	1.01	1.01	1.04	1.04	1.06	1.06	1.03	1.00	1.05	1.03	1.05	1.05
111	Bolsover	1.03	1.04	1.05	1.06	1.06	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.03	1.02	1.06	1.05	1.05	1.05
112	Derbyshire Dales	0.97	1.04	1.01	1.06	1.04	1.06	1.01	1.00	1.04	1.04	1.06	1.05	1.03	0.98	1.05	1.01	1.05	1.04
113	Chesterfield	1.03	1.04	1.05	1.06	1.06	1.07	1.03	1.02	1.05	1.05	1.07	1.07	1.04	1.02	1.06	1.05	1.06	1.05
114	West Lancashire	1.01	1.04	1.03	1.05	1.04	1.05	1.01	1.01	1.04	1.04	1.05	1.05	1.03	1.01	1.04	1.03	1.04	1.04
115		1.07	1.03	1.07	1.05	1.05	1.04	1.03	1.04	1.04	1.04	1.04	1.04	1.03	1.06	1.05	1.06	1.04	1.04
116		1.03	1.04	1.05	1.05	1.05	1.06	1.02	1.02	1.05	1.05	1.06	1.06	1.03	1.02	1.05	1.04	1.05	1.05
117		1.03	1.03	1.04	1.05	1.05	1.05	1.02	1.02	1.04	1.04	1.06	1.06	1.03	1.02	1.04	1.04	1.04	1.05
118	Rossendale	1.03	1.03	1.05	1.05	1.06	1.05	1.02	1.02	1.04	1.04	1.06	1.06	1.10	1.11	1.14	1.14	1.17	1.17
119	Preston 001 (E02005253)	1.03	1.04	1.05	1.07	1.05	1.05	1.03	1.03	1.05	1.05	1.05	1.05	1.10	1.10	1.14	1.14	1.15	1.15
120	Pendle	1.06	1.04	1.07	1.05	1.07	1.06	1.04	1.04	1.05	1.05	1.07	1.07	1.03	1.06	1.05	1.06	1.06	1.06
121	Ribble Valley	1.02	1.03	1.04	1.05	1.05	1.05	1.02	1.01	1.04	1.04	1.06	1.06	1.07	1.05	1.11	1.12	1.15	1.14
122	Hyndburn	1.04	1.03	1.05	1.05	1.05	1.05	1.02	1.02	1.04	1.04	1.06	1.06	1.03	1.03	1.05	1.05	1.05	1.05
123	Burnley	1.03	1.03	1.05	1.05	1.05	1.05	1.02	1.02	1.04	1.04	1.05	1.05	1.03	1.02	1.04	1.04	1.04	1.04
124	Scarborough	1.03	1.03	1.05	1.05	1.04	1.05	1.02	1.02	1.04	1.04	1.05	1.05	1.03	1.02	1.05	1.04	1.04	1.04
125	Selby	1.04	1.03	1.06	1.05	1.05	1.05	1.03	1.03	1.04	1.04	1.05	1.06	1.02	1.03	1.04	1.05	1.05	1.05
126	Craven	0.96	1.02	0.99	1.04	1.05	1.06	0.99	0.98	1.02	1.02	1.06	1.06	1.02	0.99	1.09	1.08	1.18	1.18
127	Richmondshire	1.01	1.03	1.04	1.04	1.04	1.05	1.01	1.01	1.04	1.03	1.04	1.04	1.02	1.01	1.04	1.03	1.04	1.04
128	Harrogate	1.02	1.03	1.04	1.05	1.05	1.05	1.02	1.02	1.04	1.04	1.05	1.05	1.02	1.01	1.04	1.04	1.04	1.04
129	Ryedale	1.00	1.02	1.03	1.04	1.03	1.04	1.01	1.00	1.03	1.03	1.04	1.04	1.02	1.00	1.03	1.03	1.04	1.04
130	Hambleton	0.99	1.03	1.02	1.05	1.03	1.04	1.01	1.00	1.03	1.03	1.04	1.04	1.02	0.99	1.04	1.02	1.03	1.03
131	Barnsley	1.06	1.05	1.08	1.07	1.07	1.06	1.04	1.05	1.06	1.06	1.07	1.07	1.04	1.05	1.06	1.07	1.07	1.07
132	Bolton	1.06	1.06	1.07	1.07	1.07	1.07	1.04	1.04	1.06	1.06	1.07	1.07	1.13	1.13	1.16	1.15	1.20	1.20
133	Bradford	1.03	1.02	1.05	1.04	1.07	1.06	1.02	1.02	1.03	1.03	1.07	1.07	1.02	1.03	1.04	1.04	1.06	1.06
134	Bury	1.04	1.05	1.06	1.07	1.05	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.05	1.04	1.06	1.05	1.06	1.06
135	Calderdale	1.02	1.02	1.04	1.04	1.07	1.07	1.02	1.02	1.03	1.03	1.08	1.08	1.02	1.02	1.04	1.04	1.06	1.06
136	Doncaster	1.05	1.06	1.07	1.08	1.07	1.07	1.05	1.04	1.07	1.07	1.07	1.07	1.06	1.04	1.07	1.07	1.07	1.06
137	Kirklees	1.01	1.02	1.04	1.04	1.06	1.06	1.01	1.01	1.03	1.03	1.07	1.07	1.02	1.01	1.03	1.03	1.05	1.05
138	Knowsley	1.06	1.05	1.08	1.07	1.08	1.07	1.04	1.05	1.06	1.06	1.08	1.08	1.04	1.06	1.06	1.07	1.07	1.07
139	Leeds	1.13	1.13	1.14	1.15	1.09	1.09	1.12	1.12	1.13	1.13	1.08	1.08	1.12	1.12	1.14	1.13	1.09	1.09
140	Liverpool	1.10	1.05	1.10	1.06	1.09	1.07	1.06	1.07	1.06	1.06	1.08	1.09	1.04	1.09	1.06	1.09	1.08	1.08

		2022																	
		AM						IP						PM					
Area Description		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other	
Model Zone	Name	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
141	Manchester	1.17	1.06	1.14	1.07	1.11	1.08	1.08	1.10	1.07	1.07	1.09	1.10	1.06	1.15	1.07	1.12	1.09	1.11
142	Oldham	1.07	1.06	1.08	1.07	1.07	1.06	1.05	1.05	1.06	1.06	1.07	1.07	1.05	1.06	1.06	1.07	1.06	1.07
143	Rochdale	1.06	1.06	1.07	1.07	1.07	1.07	1.04	1.04	1.06	1.06	1.07	1.07	1.05	1.05	1.06	1.06	1.07	1.07
144	Rotherham	1.04	1.06	1.06	1.07	1.06	1.06	1.04	1.04	1.06	1.06	1.06	1.06	1.05	1.03	1.07	1.06	1.06	1.06
145	Salford	1.14	1.06	1.13	1.07	1.10	1.07	1.07	1.09	1.07	1.07	1.09	1.09	1.06	1.12	1.07	1.11	1.09	1.10
146	Sefton	1.02	1.05	1.04	1.06	1.05	1.07	1.02	1.02	1.05	1.05	1.06	1.06	1.04	1.01	1.06	1.04	1.05	1.05
147	Sheffield	1.08	1.06	1.08	1.07	1.07	1.07	1.05	1.06	1.06	1.07	1.07	1.07	1.05	1.07	1.07	1.07	1.07	1.07
148	Stockport	1.03	1.06	1.05	1.07	1.05	1.06	1.03	1.03	1.06	1.06	1.06	1.06	1.05	1.02	1.06	1.05	1.06	1.05
149	St. Helens	1.04	1.06	1.06	1.07	1.05	1.06	1.03	1.03	1.06	1.06	1.06	1.06	1.05	1.03	1.06	1.05	1.06	1.05
150	Tameside	1.06	1.06	1.08	1.07	1.07	1.07	1.04	1.04	1.06	1.06	1.07	1.07	1.05	1.05	1.06	1.07	1.07	1.07
151	Trafford	1.05	1.06	1.07	1.07	1.07	1.07	1.04	1.04	1.06	1.06	1.07	1.07	1.05	1.04	1.06	1.06	1.06	1.06
152	Wakefield	1.16	1.15	1.17	1.16	1.10	1.10	1.14	1.14	1.15	1.15	1.09	1.09	1.14	1.15	1.15	1.16	1.11	1.11
153	Wigan	1.06	1.06	1.08	1.07	1.07	1.08	1.05	1.05	1.06	1.06	1.07	1.07	1.05	1.05	1.07	1.07	1.07	1.07
154	Wirral	1.03	1.05	1.05	1.07	1.06	1.07	1.03	1.03	1.05	1.05	1.06	1.06	1.04	1.02	1.06	1.05	1.05	1.05
155		1.06	1.04	1.06	1.05	1.06	1.06	1.03	1.04	1.05	1.05	1.06	1.06	1.03	1.05	1.05	1.05	1.05	1.06
156	Cheshire East	1.00	1.07	1.03	1.08	1.04	1.06	1.03	1.02	1.06	1.06	1.06	1.05	1.06	1.00	1.07	1.04	1.05	1.04
157	Cheshire West and Chester	1.02	1.06	1.05	1.07	1.06	1.06	1.03	1.03	1.06	1.06	1.06	1.06	1.05	1.02	1.06	1.05	1.06	1.05
158	Derby	1.05	1.04	1.07	1.05	1.07	1.07	1.03	1.04	1.05	1.05	1.07	1.07	1.03	1.05	1.05	1.06	1.06	1.06
159	Halton	1.06	1.06	1.07	1.07	1.07	1.07	1.05	1.05	1.06	1.06	1.08	1.08	1.05	1.05	1.07	1.07	1.07	1.07
160	Warrington	1.03	1.07	1.06	1.09	1.05	1.06	1.04	1.03	1.07	1.07	1.06	1.06	1.06	1.02	1.07	1.05	1.05	1.05
161	Wyre 006 (E02005324)	0.98	1.02	1.02	1.03	1.02	1.04	1.00	0.99	1.02	1.01	1.03	1.03	1.01	0.98	1.02	1.01	1.03	1.02
200		1.04	1.04	1.06	1.06	1.06	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.03	1.03	1.05	1.05	1.05	1.05
201		1.04	1.04	1.05	1.06	1.06	1.07	1.03	1.03	1.05	1.05	1.07	1.07	1.03	1.03	1.05	1.05	1.06	1.06
202		1.02	1.02	1.04	1.04	1.05	1.05	1.01	1.01	1.03	1.03	1.06	1.06	1.02	1.02	1.04	1.04	1.05	1.05
203	Northamptonshire	1.05	1.05	1.07	1.06	1.08	1.08	1.04	1.04	1.06	1.06	1.09	1.09	1.12	1.12	1.14	1.15	1.25	1.25
204	Rutland	0.96	1.03	1.01	1.05	1.03	1.04	0.99	0.98	1.03	1.03	1.05	1.05	1.02	0.96	1.04	1.01	1.04	1.04
205	Nottinghamshire	1.04	1.04	1.06	1.05	1.07	1.07	1.03	1.03	1.05	1.05	1.07	1.07	1.11	1.11	1.14	1.14	1.21	1.21
206	Shropshire	1.05	1.05	1.06	1.06	1.06	1.06	1.04	1.04	1.06	1.06	1.07	1.07	1.10	1.10	1.13	1.13	1.19	1.19
207	Staffordshire	1.02	1.03	1.04	1.05	1.06	1.06	1.02	1.02	1.04	1.04	1.07	1.07	1.09	1.08	1.13	1.12	1.18	1.18
208	Tyne and Wear	1.07	1.06	1.08	1.07	1.07	1.07	1.05	1.05	1.06	1.06	1.07	1.07	1.15	1.15	1.17	1.17	1.20	1.20
209	Warwickshire	1.02	1.03	1.04	1.05	1.09	1.09	1.02	1.02	1.04	1.04	1.10	1.10	1.09	1.08	1.13	1.13	1.25	1.25
210	West Midlands	1.06	1.05	1.07	1.06	1.07	1.07	1.04	1.04	1.06	1.06	1.08	1.08	1.13	1.14	1.15	1.15	1.23	1.23
211	Worcestershire	1.02	1.03	1.04	1.04	1.06	1.06	1.02	1.02	1.04	1.04	1.06	1.06	1.07	1.06	1.11	1.11	1.16	1.16
212	Herefordshire	1.02	1.02	1.04	1.04	1.06	1.06	1.02	1.01	1.03	1.03	1.06	1.06	1.09	1.10	1.12	1.12	1.18	1.18
213		1.08	1.07	1.09	1.09	1.06	1.06	1.06	1.06	1.08	1.08	1.06	1.06	1.06	1.07	1.08	1.08	1.06	1.06
214	Powys	0.99	1.02	1.02	1.03	1.03	1.04	1.00	1.00	1.02	1.02	1.04	1.04	1.01	0.99	1.03	1.02	1.03	1.03
215		1.04	1.03	1.05	1.05	1.03	1.04	1.03	1.03	1.04	1.04	1.03	1.03	1.03	1.03	1.05	1.05	1.04	1.04
216		1.02	1.02	1.04	1.04	1.06	1.06	1.01	1.01	1.03	1.03	1.06	1.06	1.01	1.01	1.04	1.04	1.05	1.05
217		1.03	1.03	1.04	1.04	1.05	1.05	1.02	1.02	1.04	1.04	1.06	1.06	1.02	1.02	1.04	1.04	1.05	1.05
218	Northumberland	1.03	1.06	1.06	1.07	1.07	1.08	1.04	1.03	1.06	1.06	1.08	1.08	1.10	1.09	1.15	1.15	1.19	1.19
219		1.06	1.06	1.07	1.08	1.05	1.05	1.05	1.04	1.07	1.07	1.05	1.05	1.05	1.05	1.07	1.07	1.05	1.05
220	York	1.08	1.03	1.08	1.05	1.06	1.05	1.04	1.05	1.05	1.05	1.06	1.06	1.03	1.07	1.05	1.07	1.05	1.06
300	East	1.04	1.04	1.06	1.06	1.09	1.09	1.03	1.03	1.06	1.06	1.10	1.10	1.04	1.04	1.06	1.06	1.08	1.08
301	Lon	1.09	1.07	1.10	1.09	1.10	1.10	1.07	1.07	1.09	1.08	1.10	1.11	1.07	1.08	1.08	1.09	1.10	1.10
302	SE	1.05	1.05	1.07	1.07	1.09	1.09	1.04	1.04	1.07	1.07	1.09	1.09	1.05	1.05	1.07	1.07	1.08	1.08
303		1.02	1.02	1.04	1.04	1.06	1.06	1.02	1.02	1.03	1.03	1.06	1.06	1.02	1.02	1.04	1.04	1.05	1.05
304	SW	1.04	1.04	1.06	1.06	1.07	1.07	1.03	1.03	1.05	1.05	1.07	1.07	1.04	1.04	1.06	1.06	1.06	1.06
305	SCOTLAND	1.05	1.05	1.06	1.06	1.06	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.04	1.04	1.05	1.05	1.06	1.06
306	SCOTLAND	1.05	1.05	1.06	1.06	1.06	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.04	1.04	1.05	1.05	1.06	1.06
307	SCOTLAND	1.05	1.05	1.06	1.06	1.06	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.04	1.04	1.05	1.05	1.06	1.06

		2022																	
		AM						IP						PM					
Area Description		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other	
Model Zone	Name	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
308	SCOTLAND	1.05	1.05	1.06	1.06	1.06	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.04	1.04	1.05	1.05	1.06	1.06
309	SCOTLAND	1.05	1.05	1.06	1.06	1.06	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.04	1.04	1.05	1.05	1.06	1.06
310	SCOTLAND	1.05	1.05	1.06	1.06	1.06	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.04	1.04	1.05	1.05	1.06	1.06
311	SCOTLAND	1.05	1.05	1.06	1.06	1.06	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.04	1.04	1.05	1.05	1.06	1.06
312	SCOTLAND	1.05	1.05	1.06	1.06	1.06	1.06	1.03	1.03	1.05	1.05	1.06	1.06	1.04	1.04	1.05	1.05	1.06	1.06

Growth Factor for Cars 2037

2037																	
AM						IP						PM					
Car Commuting		Car Employer Business Car Other		Car Other		Car Commuting		Car Employer Business Car Other		Car Other		Car Commuting		Car Employer Business Car Other		Car Other	
Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
1.03	1.10	1.07	1.13	1.10	1.13	1.04	1.03	1.10	1.09	1.12	1.11	1.07	1.02	1.11	1.07	1.10	1.09
1.06	1.13	1.11	1.16	1.13	1.16	1.09	1.07	1.13	1.13	1.15	1.15	1.11	1.05	1.14	1.11	1.14	1.12
1.06	1.13	1.11	1.16	1.13	1.16	1.09	1.07	1.13	1.13	1.15	1.15	1.11	1.05	1.14	1.11	1.14	1.12
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.03	1.10	1.07	1.13	1.10	1.13	1.04	1.03	1.10	1.09	1.12	1.11	1.07	1.02	1.11	1.07	1.10	1.09
1.03	1.10	1.07	1.13	1.10	1.13	1.04	1.03	1.10	1.09	1.12	1.11	1.07	1.02	1.11	1.07	1.10	1.09
1.03	1.10	1.07	1.13	1.10	1.13	1.04	1.03	1.10	1.09	1.12	1.11	1.07	1.02	1.11	1.07	1.10	1.09
1.14	1.13	1.16	1.15	1.16	1.16	1.10	1.11	1.14	1.14	1.16	1.16	1.11	1.12	1.14	1.15	1.15	1.15
1.14	1.12	1.16	1.12	1.17	1.16	1.10	1.10	1.15	1.14	1.16	1.16	1.10	1.11	1.14	1.15	1.14	1.14
1.18	1.11	1.17	1.11	1.17	1.13	1.11	1.12	1.12	1.14	1.16	1.16	1.09	1.15	1.12	1.16	1.14	1.16
1.14	1.13	1.16	1.15	1.16	1.16	1.10	1.11	1.14	1.14	1.16	1.16	1.11	1.12	1.14	1.15	1.15	1.15
1.14	1.13	1.16	1.15	1.16	1.16	1.10	1.11	1.14	1.14	1.16	1.16	1.11	1.12	1.14	1.15	1.15	1.15
1.18	1.11	1.17	1.11	1.17	1.13	1.11	1.12	1.12	1.14	1.16	1.16	1.09	1.15	1.12	1.16	1.14	1.16
1.12	1.13	1.15	1.16	1.17	1.17	1.10	1.11	1.14	1.14	1.17	1.17	1.12	1.11	1.14	1.15	1.15	1.15
1.15	1.13	1.17	1.16	1.18	1.18	1.11	1.12	1.15	1.15	1.18	1.18	1.12	1.13	1.14	1.16	1.16	1.16
1.06	1.14	1.10	1.17	1.12	1.15	1.08	1.07	1.13	1.13	1.14	1.14	1.11	1.05	1.15	1.10	1.12	1.11
1.08	1.13	1.12	1.14	1.13	1.14	1.08	1.07	1.13	1.13	1.15	1.14	1.10	1.06	1.14	1.12	1.12	1.12
1.09	1.13	1.13	1.16	1.14	1.16	1.09	1.08	1.13	1.13	1.15	1.15	1.11	1.08	1.14	1.12	1.14	1.13
1.08	1.13	1.12	1.14	1.13	1.14	1.08	1.07	1.13	1.13	1.15	1.14	1.10	1.06	1.14	1.12	1.12	1.12
1.14	1.13	1.16	1.17	1.16	1.17	1.11	1.12	1.16	1.15	1.16	1.16	1.10	1.13	1.15	1.17	1.15	1.14
1.15	1.12	1.16	1.15	1.16	1.15	1.11	1.12	1.14	1.13	1.16	1.16	1.10	1.13	1.12	1.16	1.14	1.15
1.06	1.12	1.10	1.14	1.12	1.13	1.07	1.05	1.12	1.11	1.13	1.13	1.10	1.04	1.13	1.09	1.11	1.11
1.19	1.13	1.19	1.16	1.18	1.18	1.13	1.13	1.16	1.15	1.17	1.17	1.12	1.15	1.14	1.18	1.17	1.17
1.34	1.14	1.28	1.14	1.23	1.19	1.17	1.21	1.17	1.17	1.20	1.20	1.13	1.30	1.15	1.26	1.18	1.20
1.34	1.14	1.22	1.16	1.21	1.19	1.15	1.16	1.15	1.15	1.19	1.19	1.13	1.26	1.15	1.20	1.17	1.17
1.28	1.13	1.23	1.15	1.20	1.18	1.15	1.17	1.15	1.15	1.18	1.18	1.12	1.23	1.15	1.20	1.17	1.17
1.18	1.13	1.19	1.14	1.18	1.19	1.12	1.14	1.15	1.14	1.18	1.17	1.11	1.17	1.14	1.17	1.17	1.16
1.14	1.12	1.16	1.14	1.15	1.18	1.10	1.11	1.14	1.13	1.17	1.16	1.10	1.12	1.13	1.15	1.16	1.15
1.11	1.12	1.14	1.15	1.13	1.15	1.09	1.09	1.14	1.13	1.14	1.14	1.10	1.10	1.13	1.14	1.13	1.13
1.18	1.13	1.19	1.15	1.17	1.17	1.13	1.13	1.15	1.15	1.16	1.16	1.11	1.16	1.14	1.17	1.15	1.15
1.19	1.14	1.18	1.15	1.17	1.17	1.12	1.13	1.14	1.14	1.17	1.17	1.12	1.16	1.15	1.17	1.15	1.15
1.09	1.13	1.12	1.15	1.13	1.16	1.09	1.10	1.13	1.13	1.15	1.15	1.11	1.11	1.14	1.15	1.14	1.13
1.16	1.13	1.18	1.15	1.16	1.16	1.12	1.12	1.15	1.14	1.16	1.16	1.11	1.14	1.14	1.17	1.15	1.14
1.16	1.13	1.17	1.15	1.16	1.16	1.12	1.14	1.16	1.15	1.16	1.16	1.13	1.16	1.15	1.18	1.15	1.14
1.13	1.13	1.14	1.14	1.13	1.13	1.10	1.10	1.13	1.13	1.13	1.14	1.11	1.11	1.13	1.14	1.12	1.13
1.06	1.13	1.11	1.16	1.13	1.16	1.09	1.07	1.13	1.13	1.15	1.15	1.11	1.05	1.14	1.11	1.14	1.12
1.03	1.10	1.07	1.13	1.10	1.13	1.04	1.03	1.10	1.09	1.12	1.11	1.07	1.02	1.11	1.07	1.10	1.09
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.04	1.12	1.09	1.14	1.12	1.15	1.05	1.04	1.11	1.11	1.14	1.14	1.10	1.03	1.13	1.08	1.13	1.12
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.17	1.14	1.18	1.15	1.19	1.17	1.12	1.13	1.15	1.15	1.18	1.17	1.12	1.15	1.15	1.17	1.15	1.16
1.21	1.14	1.20	1.16	1.20	1.18	1.13	1.14	1.16	1.15	1.18	1.18	1.12	1.17	1.15	1.18	1.16	1.16
1.16	1.12	1.16	1.14	1.14	1.13	1.10	1.11	1.13	1.12	1.14	1.15	1.10	1.13	1.12	1.15	1.13	1.15
1.15	1.12	1.15	1.14	1.14	1.13	1.10	1.11	1.13	1.12	1.14	1.15	1.11	1.13	1.13	1.15	1.13	1.14
1.04	1.11	1.07	1.14	1.10	1.13	1.04	1.03	1.11	1.10	1.12	1.12	1.07	1.03	1.11	1.07	1.10	1.10
1.04	1.11	1.07	1.14	1.10	1.13	1.04	1.03	1.11	1.10	1.12	1.12	1.07	1.03	1.11	1.07	1.10	1.10

2037																	
AM						IP						PM					
Car Commuting		Car Employer Business Car Other		Car Other		Car Commuting		Car Employer Business Car Other		Car Other		Car Commuting		Car Employer Business Car Other		Car Other	
Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
1.18	1.13	1.18	1.15	1.17	1.17	1.12	1.13	1.15	1.14	1.17	1.17	1.12	1.15	1.15	1.17	1.15	1.15
1.27	1.15	1.24	1.17	1.20	1.16	1.16	1.13	1.17	1.16	1.18	1.18	1.13	1.15	1.15	1.17	1.17	1.18
1.04	1.11	1.07	1.14	1.10	1.13	1.04	1.03	1.11	1.10	1.12	1.12	1.07	1.03	1.11	1.07	1.10	1.10
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.06	1.14	1.10	1.17	1.12	1.15	1.08	1.07	1.13	1.13	1.14	1.14	1.11	1.05	1.15	1.10	1.12	1.11
1.15	1.12	1.16	1.16	1.16	1.16	1.11	1.12	1.14	1.13	1.16	1.16	1.09	1.13	1.12	1.16	1.15	1.15
1.15	1.13	1.17	1.16	1.18	1.18	1.11	1.12	1.15	1.15	1.18	1.18	1.12	1.13	1.14	1.16	1.16	1.16
1.08	1.13	1.12	1.14	1.13	1.14	1.08	1.07	1.13	1.13	1.15	1.14	1.10	1.06	1.14	1.12	1.12	1.12
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.06	1.13	1.11	1.16	1.13	1.16	1.09	1.07	1.13	1.13	1.15	1.15	1.11	1.05	1.14	1.11	1.14	1.12
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.09	1.13	1.13	1.16	1.17	1.18	1.09	1.08	1.14	1.14	1.18	1.17	1.11	1.08	1.14	1.13	1.16	1.15
1.07	1.12	1.10	1.14	1.15	1.16	1.08	1.06	1.12	1.12	1.17	1.16	1.10	1.06	1.13	1.10	1.15	1.15
1.06	1.13	1.10	1.15	1.15	1.16	1.08	1.07	1.12	1.12	1.16	1.16	1.11	1.05	1.14	1.10	1.14	1.14
1.02	1.12	1.07	1.14	1.09	1.15	1.05	1.04	1.11	1.10	1.11	1.11	1.10	1.01	1.13	1.07	1.11	1.10
1.10	1.13	1.13	1.15	1.15	1.16	1.09	1.09	1.14	1.13	1.16	1.16	1.11	1.09	1.14	1.13	1.14	1.14
1.20	1.13	1.19	1.15	1.18	1.16	1.13	1.14	1.15	1.15	1.17	1.18	2.45	1.91	0.65	0.56	0.54	0.50
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.04	1.12	1.09	1.14	1.12	1.15	1.05	1.04	1.11	1.11	1.14	1.14	1.10	1.03	1.13	1.08	1.13	1.12
1.03	1.13	1.10	1.15	1.12	1.14	1.08	1.06	1.13	1.13	1.13	1.13	1.11	1.01	1.14	1.10	1.11	1.10
1.02	1.13	1.09	1.15	1.10	1.13	1.08	1.06	1.12	1.13	1.11	1.11	1.11	1.01	1.14	1.10	1.10	1.09
1.11	1.05	1.12	1.07	1.05	1.07	1.05	1.05	1.07	1.06	1.06	1.07	1.04	1.08	1.06	1.10	1.06	1.07
1.11	1.12	1.13	1.15	1.13	1.14	1.09	1.09	1.13	1.13	1.14	1.14	1.10	1.09	1.13	1.13	1.12	1.12
1.00	1.10	1.06	1.12	1.09	1.13	1.05	1.03	1.10	1.10	1.11	1.11	1.09	0.99	1.11	1.06	1.11	1.09
1.03	1.13	1.09	1.15	1.12	1.16	1.06	1.04	1.12	1.11	1.14	1.13	1.11	1.02	1.14	1.08	1.12	1.10
1.04	1.12	1.09	1.14	1.11	1.14	1.05	1.04	1.11	1.11	1.13	1.13	1.10	1.02	1.13	1.08	1.12	1.10
1.02	1.12	1.07	1.14	1.09	1.15	1.05	1.04	1.11	1.10	1.11	1.11	1.10	1.01	1.13	1.07	1.11	1.10
1.02	1.12	1.07	1.14	1.09	1.15	1.05	1.04	1.11	1.10	1.11	1.11	1.10	1.01	1.13	1.07	1.11	1.10
1.05	1.12	1.09	1.14	1.12	1.14	1.06	1.05	1.11	1.11	1.12	1.12	1.09	1.04	1.14	1.09	1.11	1.10
1.05	1.12	1.09	1.14	1.12	1.14	1.06	1.05	1.11	1.11	1.12	1.12	1.09	1.04	1.14	1.09	1.11	1.10
1.05	1.12	1.09	1.14	1.12	1.14	1.06	1.05	1.11	1.11	1.12	1.12	1.09	1.04	1.14	1.09	1.11	1.10
1.11	1.13	1.14	1.14	1.14	1.16	1.10	1.10	1.13	1.14	1.16	1.16	1.11	1.10	1.14	1.13	1.15	1.14
1.11	1.13	1.14	1.14	1.14	1.16	1.10	1.10	1.13	1.14	1.16	1.16	1.11	1.10	1.14	1.13	1.15	1.14
1.10	1.13	1.13	1.15	1.14	1.16	1.10	1.10	1.13	1.14	1.15	1.15	2.42	2.03	0.64	0.64	0.53	0.49
1.02	1.12	1.08	1.14	1.06	1.11	1.06	1.04	1.11	1.11	1.07	1.07	1.10	1.01	1.12	1.08	1.08	1.05
1.02	1.12	1.08	1.14	1.06	1.11	1.06	1.04	1.11	1.11	1.07	1.07	1.10	1.01	1.12	1.08	1.08	1.05
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.06	1.14	1.10	1.17	1.12	1.15	1.08	1.07	1.13	1.13	1.14	1.14	1.11	1.05	1.15	1.10	1.12	1.11
1.15	1.13	1.17	1.16	1.18	1.18	1.11	1.12	1.15	1.15	1.18	1.18	1.12	1.13	1.14	1.16	1.16	1.16
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.00	1.12	1.06	1.15	1.09	1.14	1.07	1.04	1.11	1.11	1.11	1.11	1.11	0.99	1.13	1.07	1.11	1.08
1.12	1.10	1.14	1.13	1.11	1.11	1.09	1.09	1.11	1.11	1.10	1.11	1.09	1.10	1.12	1.13	1.10	1.10
1.14	1.10	1.15	1.13	1.14	1.12	1.09	1.10	1.12	1.12	1.13	1.13	1.09	1.12	1.12	1.14	1.12	1.13
1.05	1.11	1.10	1.14	1.11	1.12	1.07	1.06	1.11	1.11	1.12	1.12	1.10	1.04	1.13	1.09	1.11	1.11
1.07	1.10	1.10	1.12	1.10	1.11	1.06	1.06	1.10	1.10	1.10	1.10	1.08	1.06	1.11	1.10	1.10	1.09
1.06	1.09	1.09	1.12	1.11	1.11	1.06	1.05	1.09	1.09	1.12	1.12	1.08	1.04	1.11	1.09	1.10	1.10
1.09	1.12	1.12	1.15	1.10	1.13	1.08	1.07	1.12	1.12	1.11	1.11	1.10	1.07	1.14	1.11	1.10	1.09
1.05	1.12	1.10	1.15	1.17	1.19	1.07	1.06	1.12	1.12	1.19	1.19	1.10	1.04	1.14	1.10	1.16	1.15
1.23	1.13	1.24	1.15	1.29	1.22	1.16	1.18	1.17	1.17	1.28	1.29	1.12	1.22	1.16	1.22	1.25	1.28
1.10	1.12	1.14	1.15	1.19	1.19	1.10	1.09	1.14	1.13	1.20	1.20	1.11	1.09	1.14	1.13	1.17	1.17

2037																	
AM						IP						PM					
Car Commuting		Car Employer Business Car Other		Car Other		Car Commuting		Car Employer Business Car Other		Car Other		Car Commuting		Car Employer Business Car Other		Car Other	
Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
1.19	1.14	1.21	1.16	1.25	1.21	1.14	1.15	1.17	1.16	1.24	1.24	1.12	1.17	1.16	1.20	1.22	1.23
1.06	1.12	1.10	1.15	1.17	1.19	1.08	1.06	1.13	1.12	1.19	1.19	1.10	1.05	1.14	1.10	1.16	1.15
1.10	1.13	1.14	1.16	1.18	1.19	1.10	1.09	1.14	1.14	1.19	1.19	1.11	1.09	1.15	1.13	1.17	1.16
0.98	1.12	1.05	1.15	1.13	1.18	1.05	1.03	1.11	1.11	1.17	1.16	1.11	0.98	1.13	1.06	1.14	1.12
1.10	1.13	1.14	1.16	1.18	1.20	1.10	1.09	1.14	1.14	1.20	1.20	1.12	1.08	1.15	1.13	1.17	1.16
1.05	1.14	1.10	1.15	1.11	1.14	1.08	1.06	1.12	1.12	1.13	1.13	1.11	1.04	1.14	1.10	1.12	1.11
1.18	1.10	1.18	1.12	1.14	1.12	1.11	1.12	1.12	1.12	1.13	1.13	1.09	1.15	1.12	1.16	1.12	1.13
1.12	1.13	1.15	1.15	1.16	1.16	1.10	1.10	1.14	1.14	1.17	1.17	1.11	1.10	1.14	1.14	1.15	1.15
1.11	1.12	1.13	1.15	1.15	1.15	1.10	1.09	1.13	1.13	1.16	1.16	1.11	1.09	1.14	1.13	1.14	1.14
1.14	1.13	1.16	1.15	1.17	1.16	1.10	1.11	1.14	1.14	1.17	1.17	1.11	1.12	1.14	1.15	1.15	1.16
1.11	1.13	1.14	1.16	1.14	1.16	1.10	1.10	1.14	1.14	1.15	1.15	1.12	1.10	1.14	1.14	1.14	1.14
1.21	1.13	1.21	1.15	1.20	1.17	1.14	1.16	1.15	1.15	1.19	1.19	1.12	1.19	1.15	1.19	1.18	1.19
1.04	1.12	1.08	1.14	1.13	1.15	1.07	1.05	1.11	1.12	1.15	1.14	1.11	1.03	1.13	1.09	1.13	1.12
1.13	1.13	1.15	1.15	1.15	1.15	1.10	1.10	1.13	1.13	1.16	1.16	1.11	1.11	1.14	1.14	1.14	1.14
1.11	1.13	1.14	1.15	1.14	1.15	1.09	1.09	1.13	1.13	1.15	1.15	1.11	1.09	1.14	1.13	1.13	1.13
1.11	1.10	1.13	1.12	1.12	1.14	1.08	1.08	1.11	1.11	1.13	1.13	1.08	1.09	1.12	1.12	1.12	1.11
1.13	1.09	1.15	1.12	1.17	1.14	1.09	1.10	1.12	1.11	1.16	1.17	1.08	1.12	1.12	1.14	1.14	1.16
0.94	1.10	1.01	1.13	1.14	1.18	1.02	0.99	1.09	1.08	1.18	1.18	1.09	0.94	1.11	1.02	1.15	1.13
1.03	1.09	1.08	1.11	1.11	1.13	1.05	1.03	1.09	1.09	1.12	1.12	1.07	1.02	1.10	1.07	1.11	1.10
1.05	1.09	1.09	1.12	1.13	1.13	1.06	1.05	1.10	1.10	1.14	1.14	1.08	1.04	1.11	1.09	1.12	1.12
1.04	1.08	1.08	1.11	1.10	1.13	1.05	1.04	1.09	1.09	1.12	1.12	1.07	1.03	1.10	1.07	1.11	1.10
1.00	1.09	1.05	1.11	1.10	1.13	1.04	1.02	1.08	1.08	1.12	1.12	1.07	0.99	1.10	1.05	1.10	1.09
1.17	1.15	1.19	1.17	1.21	1.20	1.13	1.13	1.16	1.16	1.22	1.22	1.14	1.15	1.17	1.17	1.20	1.20
1.17	1.16	1.18	1.17	1.19	1.20	1.13	1.13	1.16	1.15	1.20	1.20	1.14	1.15	1.16	1.16	1.19	1.19
1.15	1.12	1.16	1.14	1.21	1.21	1.11	1.11	1.13	1.13	1.23	1.23	1.11	1.13	1.13	1.15	1.20	1.21
1.13	1.15	1.15	1.16	1.17	1.18	1.11	1.11	1.14	1.14	1.19	1.19	1.13	1.11	1.15	1.14	1.17	1.17
1.12	1.12	1.15	1.14	1.22	1.21	1.10	1.10	1.13	1.13	1.24	1.24	1.11	1.11	1.13	1.14	1.20	1.21
1.13	1.16	1.16	1.19	1.19	1.20	1.12	1.12	1.16	1.16	1.20	1.20	1.15	1.11	1.17	1.15	1.19	1.18
1.10	1.11	1.13	1.14	1.19	1.20	1.09	1.08	1.12	1.12	1.22	1.22	1.10	1.09	1.13	1.12	1.19	1.18
1.15	1.16	1.17	1.18	1.18	1.17	1.13	1.12	1.16	1.16	1.18	1.18	1.14	1.13	1.16	1.16	1.16	1.17
1.25	1.25	1.27	1.27	1.24	1.25	1.22	1.22	1.25	1.25	1.25	1.25	1.23	1.24	1.26	1.26	1.25	1.25
1.31	1.16	1.28	1.18	1.24	1.19	1.19	1.21	1.17	1.18	1.21	1.22	1.15	1.28	1.17	1.25	1.20	1.22
1.43	1.16	1.35	1.17	1.29	1.21	1.22	1.26	1.18	1.19	1.26	1.27	1.16	1.38	1.17	1.30	1.25	1.29
1.17	1.15	1.18	1.17	1.18	1.18	1.13	1.13	1.15	1.15	1.20	1.20	1.13	1.15	1.15	1.16	1.18	1.18
1.14	1.15	1.16	1.17	1.17	1.19	1.12	1.11	1.15	1.15	1.19	1.18	1.13	1.12	1.16	1.15	1.17	1.17
1.11	1.16	1.14	1.18	1.16	1.18	1.11	1.10	1.15	1.15	1.19	1.19	1.14	1.10	1.17	1.14	1.17	1.17
1.32	1.16	1.29	1.17	1.26	1.20	1.19	1.22	1.18	1.18	1.24	1.25	1.15	1.29	1.17	1.26	1.23	1.25
1.08	1.15	1.12	1.17	1.13	1.17	1.09	1.08	1.14	1.14	1.15	1.14	1.13	1.06	1.16	1.11	1.14	1.12
1.21	1.16	1.21	1.18	1.21	1.20	1.15	1.16	1.17	1.17	1.22	1.22	1.15	1.18	1.17	1.19	1.20	1.21
1.09	1.15	1.12	1.17	1.15	1.18	1.10	1.09	1.14	1.14	1.18	1.18	1.13	1.08	1.15	1.12	1.16	1.15
1.10	1.15	1.13	1.17	1.15	1.17	1.10	1.09	1.14	1.14	1.17	1.16	1.13	1.08	1.15	1.12	1.15	1.14
1.17	1.15	1.19	1.17	1.21	1.20	1.13	1.13	1.16	1.16	1.22	1.21	1.13	1.15	1.16	1.17	1.19	1.20
1.16	1.15	1.17	1.17	1.20	1.19	1.13	1.12	1.15	1.15	1.21	1.21	1.14	1.14	1.16	1.16	1.19	1.19
1.26	1.27	1.28	1.28	1.26	1.26	1.23	1.23	1.26	1.26	1.26	1.26	1.24	1.24	1.27	1.27	1.26	1.26
1.14	1.15	1.16	1.17	1.20	1.20	1.12	1.12	1.15	1.15	1.20	1.20	1.13	1.13	1.16	1.15	1.18	1.18
1.11	1.15	1.14	1.18	1.15	1.17	1.11	1.10	1.15	1.15	1.16	1.16	1.13	1.10	1.16	1.14	1.15	1.14
1.18	1.13	1.18	1.15	1.18	1.16	1.12	1.13	1.14	1.14	1.18	1.18	1.12	1.16	1.15	1.17	1.16	1.17
1.01	1.16	1.07	1.18	1.13	1.17	1.08	1.05	1.14	1.14	1.16	1.16	1.14	1.01	1.16	1.08	1.15	1.13
1.08	1.16	1.12	1.18	1.15	1.16	1.10	1.09	1.15	1.14	1.16	1.16	1.14	1.07	1.16	1.12	1.15	1.14
1.17	1.13	1.18	1.15	1.20	1.20	1.12	1.13	1.14	1.15	1.21	1.21	1.12	1.15	1.15	1.17	1.19	1.19
1.12	1.15	1.15	1.17	1.18	1.19	1.11	1.11	1.15	1.15	1.20	1.19	1.13	1.11	1.16	1.14	1.17	1.17
1.07	1.16	1.12	1.18	1.15	1.18	1.10	1.09	1.15	1.15	1.18	1.17	1.14	1.06	1.16	1.12	1.16	1.14

2037																	
AM						IP						PM					
Car Commuting		Car Employer Business Car Other		Car Other		Car Commuting		Car Employer Business Car Other		Car Other		Car Commuting		Car Employer Business Car Other		Car Other	
Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
1.00	1.10	1.06	1.12	1.09	1.13	1.05	1.03	1.10	1.10	1.11	1.11	1.09	0.99	1.11	1.06	1.11	1.09
1.10	1.11	1.13	1.13	1.15	1.15	1.11	1.11	1.14	1.14	1.17	1.17	1.10	1.10	1.13	1.13	1.13	1.13
1.10	1.10	1.12	1.12	1.19	1.20	1.10	1.10	1.13	1.13	1.21	1.21	1.09	1.09	1.12	1.11	1.16	1.16
1.09	1.09	1.11	1.12	1.19	1.20	1.08	1.08	1.12	1.12	1.20	1.20	1.08	1.08	1.11	1.11	1.16	1.16
1.15	1.13	1.17	1.15	1.24	1.22	1.12	1.12	1.14	1.15	1.25	1.25	1.12	1.14	1.15	1.16	1.21	1.22
0.96	1.10	1.03	1.13	1.13	1.16	1.03	1.00	1.09	1.09	1.17	1.17	1.09	0.96	1.11	1.04	1.14	1.13
1.14	1.13	1.16	1.15	1.20	1.20	1.11	1.11	1.14	1.14	1.21	1.21	1.11	1.13	1.15	1.15	1.19	1.19
1.12	1.12	1.15	1.14	1.19	1.18	1.10	1.10	1.13	1.13	1.19	1.19	1.11	1.11	1.14	1.14	1.17	1.17
1.09	1.12	1.12	1.14	1.17	1.18	1.09	1.08	1.13	1.12	1.18	1.18	1.10	1.08	1.13	1.12	1.16	1.16
1.20	1.17	1.21	1.19	1.19	1.18	1.15	1.15	1.17	1.17	1.20	1.20	1.15	1.18	1.17	1.19	1.19	1.19
1.07	1.12	1.11	1.14	1.23	1.24	1.09	1.08	1.13	1.13	1.25	1.25	1.11	1.07	1.14	1.11	1.21	1.21
1.18	1.14	1.19	1.16	1.22	1.21	1.13	1.14	1.15	1.15	1.23	1.23	1.13	1.16	1.15	1.17	1.21	1.21
1.06	1.10	1.10	1.13	1.14	1.16	1.07	1.06	1.11	1.11	1.16	1.16	1.09	1.05	1.12	1.10	1.14	1.13
1.12	1.10	1.14	1.12	1.18	1.16	1.09	1.10	1.12	1.12	1.18	1.18	1.09	1.11	1.12	1.13	1.16	1.16
1.12	1.13	1.15	1.15	1.15	1.15	1.16	1.16	1.18	1.18	1.18	1.18	1.12	1.11	1.15	1.14	1.13	1.13
0.99	1.09	1.04	1.11	1.09	1.12	1.04	1.02	1.09	1.08	1.12	1.11	1.08	0.99	1.10	1.05	1.10	1.09
1.11	1.09	1.14	1.12	1.12	1.12	1.11	1.11	1.12	1.12	1.10	1.10	1.09	1.11	1.12	1.13	1.10	1.10
1.08	1.08	1.11	1.11	1.16	1.16	1.08	1.08	1.11	1.11	1.16	1.16	1.08	1.08	1.10	1.10	1.13	1.13
1.09	1.09	1.12	1.11	1.16	1.16	1.09	1.09	1.12	1.12	1.14	1.14	1.09	1.09	1.11	1.11	1.14	1.14
1.09	1.16	1.13	1.19	1.18	1.19	1.10	1.09	1.15	1.15	1.19	1.19	1.14	1.08	1.17	1.13	1.17	1.17
1.12	1.13	1.15	1.16	1.12	1.14	1.13	1.13	1.17	1.17	1.15	1.15	1.12	1.11	1.15	1.14	1.12	1.11
1.19	1.10	1.19	1.12	1.16	1.14	1.11	1.13	1.12	1.12	1.15	1.16	1.09	1.17	1.12	1.17	1.14	1.15
1.10	1.12	1.14	1.15	1.28	1.28	1.10	1.10	1.14	1.14	1.31	1.30	1.11	1.10	1.15	1.14	1.25	1.25
1.20	1.15	1.21	1.18	1.30	1.28	1.16	1.17	1.18	1.18	1.31	1.31	1.15	1.19	1.18	1.20	1.28	1.28
1.12	1.13	1.15	1.16	1.24	1.24	1.11	1.11	1.15	1.15	1.26	1.26	1.12	1.11	1.16	1.15	1.22	1.23
1.11	1.10	1.13	1.12	1.17	1.17	1.10	1.10	1.12	1.12	1.18	1.18	1.10	1.10	1.12	1.12	1.15	1.15
1.12	1.12	1.14	1.14	1.20	1.20	1.10	1.10	1.13	1.13	1.21	1.21	1.11	1.11	1.14	1.14	1.18	1.18
1.15	1.15	1.17	1.17	1.18	1.18	1.12	1.12	1.15	1.15	1.19	1.19	1.13	1.13	1.16	1.16	1.18	1.18
1.15	1.15	1.17	1.17	1.18	1.18	1.12	1.12	1.15	1.15	1.19	1.19	1.13	1.13	1.16	1.16	1.18	1.18
1.15	1.15	1.17	1.17	1.18	1.18	1.12	1.12	1.15	1.15	1.19	1.19	1.13	1.13	1.16	1.16	1.18	1.18
1.15	1.15	1.17	1.17	1.18	1.18	1.12	1.12	1.15	1.15	1.19	1.19	1.13	1.13	1.16	1.16	1.18	1.18
1.15	1.15	1.17	1.17	1.18	1.18	1.12	1.12	1.15	1.15	1.19	1.19	1.13	1.13	1.16	1.16	1.18	1.18
1.15	1.15	1.17	1.17	1.18	1.18	1.12	1.12	1.15	1.15	1.19	1.19	1.13	1.13	1.16	1.16	1.18	1.18
1.15	1.15	1.17	1.17	1.18	1.18	1.12	1.12	1.15	1.15	1.19	1.19	1.13	1.13	1.16	1.16	1.18	1.18
1.15	1.15	1.17	1.17	1.18	1.18	1.12	1.12	1.15	1.15	1.19	1.19	1.13	1.13	1.16	1.16	1.18	1.18

Growth Factors for cars 2051

2051																	
AM						IP						PM					
Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other	
Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
1.09	1.19	1.15	1.22	1.20	1.25	1.10	1.09	1.19	1.18	1.22	1.21	1.15	1.08	1.20	1.14	1.20	1.18
1.13	1.23	1.19	1.27	1.25	1.29	1.16	1.14	1.23	1.23	1.27	1.27	1.20	1.11	1.25	1.20	1.25	1.23
1.13	1.23	1.19	1.27	1.25	1.29	1.16	1.14	1.23	1.23	1.27	1.27	1.20	1.11	1.25	1.20	1.25	1.23
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.09	1.19	1.15	1.22	1.20	1.25	1.10	1.09	1.19	1.18	1.22	1.21	1.15	1.08	1.20	1.14	1.20	1.18
1.09	1.19	1.15	1.22	1.20	1.25	1.10	1.09	1.19	1.18	1.22	1.21	1.15	1.08	1.20	1.14	1.20	1.18
1.09	1.19	1.15	1.22	1.20	1.25	1.10	1.09	1.19	1.18	1.22	1.21	1.15	1.08	1.20	1.14	1.20	1.18
1.25	1.22	1.27	1.25	1.29	1.30	1.19	1.20	1.25	1.24	1.30	1.30	1.20	1.21	1.24	1.25	1.27	1.27
1.23	1.22	1.27	1.24	1.31	1.30	1.18	1.17	1.25	1.24	1.30	1.29	1.18	1.19	1.23	1.24	1.26	1.26
1.30	1.21	1.31	1.22	1.30	1.25	1.20	1.22	1.23	1.23	1.29	1.30	1.18	1.26	1.23	1.29	1.26	1.29
1.25	1.22	1.27	1.25	1.29	1.30	1.19	1.20	1.25	1.24	1.30	1.30	1.20	1.21	1.24	1.25	1.27	1.27
1.25	1.22	1.27	1.25	1.29	1.30	1.19	1.20	1.25	1.24	1.30	1.30	1.20	1.21	1.24	1.25	1.27	1.27
1.30	1.21	1.31	1.22	1.30	1.25	1.20	1.22	1.23	1.23	1.29	1.30	1.18	1.26	1.23	1.29	1.26	1.29
1.21	1.23	1.25	1.27	1.29	1.31	1.19	1.19	1.24	1.25	1.30	1.29	1.20	1.20	1.25	1.26	1.27	1.26
1.26	1.23	1.29	1.27	1.32	1.32	1.20	1.21	1.26	1.25	1.31	1.30	1.20	1.23	1.25	1.28	1.28	1.28
1.14	1.23	1.19	1.27	1.23	1.28	1.16	1.13	1.22	1.22	1.25	1.25	1.20	1.12	1.24	1.19	1.23	1.21
1.15	1.22	1.21	1.25	1.25	1.26	1.15	1.14	1.23	1.23	1.27	1.26	1.19	1.13	1.24	1.21	1.23	1.23
1.18	1.23	1.22	1.26	1.26	1.29	1.17	1.15	1.23	1.23	1.27	1.27	1.20	1.15	1.24	1.21	1.25	1.24
1.15	1.22	1.21	1.25	1.25	1.26	1.15	1.14	1.23	1.23	1.27	1.26	1.19	1.13	1.24	1.21	1.23	1.23
1.25	1.23	1.28	1.26	1.29	1.30	1.19	1.20	1.27	1.25	1.28	1.28	1.18	1.22	1.24	1.28	1.27	1.26
1.26	1.22	1.28	1.25	1.29	1.28	1.20	1.21	1.25	1.24	1.28	1.28	1.18	1.23	1.23	1.27	1.26	1.27
1.13	1.21	1.18	1.24	1.23	1.26	1.13	1.11	1.21	1.21	1.24	1.24	1.18	1.10	1.23	1.17	1.21	1.21
1.30	1.23	1.31	1.26	1.32	1.32	1.22	1.22	1.27	1.26	1.31	1.31	1.20	1.25	1.25	1.30	1.29	1.29
1.51	1.24	1.43	1.26	1.40	1.34	1.28	1.33	1.29	1.28	1.36	1.35	1.22	1.45	1.26	1.41	1.32	1.34
1.52	1.24	1.36	1.27	1.37	1.34	1.24	1.26	1.26	1.26	1.34	1.33	1.22	1.41	1.26	1.32	1.30	1.30
1.43	1.23	1.37	1.26	1.36	1.33	1.24	1.27	1.26	1.26	1.33	1.33	1.21	1.36	1.25	1.33	1.30	1.31
1.30	1.23	1.30	1.25	1.32	1.34	1.21	1.23	1.26	1.25	1.32	1.31	1.20	1.27	1.24	1.29	1.30	1.29
1.23	1.22	1.26	1.23	1.29	1.32	1.19	1.19	1.25	1.23	1.30	1.29	1.19	1.21	1.24	1.25	1.28	1.27
1.20	1.22	1.24	1.24	1.26	1.27	1.17	1.17	1.24	1.23	1.26	1.26	1.19	1.19	1.24	1.24	1.24	1.23
1.30	1.23	1.31	1.25	1.31	1.31	1.21	1.23	1.27	1.25	1.30	1.30	1.20	1.26	1.25	1.28	1.27	1.27
1.31	1.23	1.29	1.27	1.31	1.31	1.21	1.21	1.25	1.24	1.30	1.30	1.21	1.25	1.26	1.27	1.28	1.27
1.17	1.23	1.22	1.26	1.25	1.29	1.17	1.18	1.23	1.23	1.27	1.27	1.20	1.19	1.24	1.24	1.25	1.24
1.26	1.22	1.29	1.25	1.30	1.30	1.20	1.20	1.26	1.25	1.29	1.29	1.19	1.23	1.25	1.27	1.27	1.26
1.26	1.23	1.28	1.26	1.30	1.29	1.21	1.23	1.26	1.26	1.29	1.29	1.21	1.26	1.26	1.29	1.27	1.27
1.23	1.23	1.25	1.25	1.26	1.26	1.19	1.18	1.23	1.23	1.26	1.27	1.20	1.19	1.24	1.23	1.24	1.24
1.13	1.23	1.19	1.27	1.25	1.29	1.16	1.14	1.23	1.23	1.27	1.27	1.20	1.11	1.25	1.20	1.25	1.23
1.09	1.19	1.15	1.22	1.20	1.25	1.10	1.09	1.19	1.18	1.22	1.21	1.15	1.08	1.20	1.14	1.20	1.18
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.11	1.21	1.17	1.25	1.24	1.27	1.12	1.10	1.21	1.21	1.26	1.26	1.18	1.09	1.23	1.17	1.24	1.22
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.29	1.24	1.30	1.26	1.33	1.31	1.20	1.22	1.26	1.26	1.32	1.31	1.20	1.25	1.25	1.29	1.28	1.28
1.33	1.24	1.32	1.26	1.35	1.32	1.22	1.23	1.27	1.26	1.33	1.32	1.21	1.29	1.25	1.31	1.29	1.30
1.26	1.21	1.27	1.24	1.28	1.26	1.19	1.20	1.23	1.23	1.27	1.28	1.19	1.23	1.24	1.26	1.25	1.27
1.25	1.22	1.26	1.24	1.27	1.26	1.19	1.19	1.23	1.23	1.27	1.28	1.19	1.22	1.24	1.26	1.25	1.26
1.10	1.20	1.15	1.24	1.21	1.25	1.10	1.09	1.19	1.19	1.22	1.22	1.14	1.09	1.21	1.16	1.20	1.19

2051																	
AM						IP						PM					
Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other	
Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
1.10	1.20	1.15	1.24	1.21	1.25	1.10	1.09	1.19	1.19	1.22	1.22	1.14	1.09	1.21	1.16	1.20	1.19
1.29	1.23	1.30	1.26	1.31	1.31	1.21	1.22	1.25	1.25	1.30	1.30	1.20	1.25	1.25	1.28	1.28	1.28
1.42	1.25	1.39	1.28	1.37	1.30	1.26	1.22	1.29	1.26	1.33	1.33	1.22	1.24	1.26	1.28	1.30	1.33
1.10	1.20	1.15	1.24	1.21	1.25	1.10	1.09	1.19	1.19	1.22	1.22	1.14	1.09	1.21	1.16	1.20	1.19
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.14	1.23	1.19	1.27	1.23	1.28	1.16	1.13	1.22	1.22	1.25	1.25	1.20	1.12	1.24	1.19	1.23	1.21
1.26	1.22	1.29	1.25	1.29	1.29	1.20	1.21	1.26	1.25	1.28	1.28	1.18	1.23	1.22	1.27	1.27	1.27
1.26	1.23	1.29	1.27	1.32	1.32	1.20	1.21	1.26	1.25	1.31	1.30	1.20	1.23	1.25	1.28	1.28	1.28
1.15	1.22	1.21	1.25	1.25	1.26	1.15	1.14	1.23	1.23	1.27	1.26	1.19	1.13	1.24	1.21	1.23	1.23
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.13	1.23	1.19	1.27	1.25	1.29	1.16	1.14	1.23	1.23	1.27	1.27	1.20	1.11	1.25	1.20	1.25	1.23
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.19	1.23	1.23	1.26	1.30	1.31	1.17	1.16	1.24	1.24	1.31	1.30	1.20	1.16	1.25	1.23	1.27	1.27
1.16	1.22	1.20	1.26	1.28	1.29	1.16	1.14	1.22	1.22	1.29	1.29	1.19	1.14	1.24	1.19	1.26	1.26
1.14	1.23	1.20	1.26	1.27	1.29	1.16	1.14	1.23	1.22	1.29	1.28	1.20	1.12	1.24	1.20	1.26	1.25
1.08	1.22	1.15	1.24	1.19	1.28	1.12	1.10	1.20	1.20	1.22	1.22	1.19	1.07	1.23	1.15	1.22	1.20
1.20	1.23	1.23	1.26	1.28	1.29	1.18	1.17	1.24	1.23	1.29	1.29	1.20	1.17	1.25	1.23	1.26	1.26
1.33	1.23	1.32	1.26	1.33	1.30	1.22	1.23	1.25	1.25	1.32	1.32	2.65	2.10	0.71	0.62	0.60	0.55
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.11	1.21	1.17	1.25	1.24	1.27	1.12	1.10	1.21	1.21	1.26	1.26	1.18	1.09	1.23	1.17	1.24	1.22
1.09	1.23	1.19	1.26	1.22	1.25	1.16	1.13	1.22	1.23	1.22	1.23	1.20	1.07	1.24	1.19	1.21	1.20
1.08	1.23	1.18	1.26	1.20	1.24	1.15	1.13	1.22	1.23	1.21	1.21	1.20	1.06	1.24	1.19	1.20	1.18
1.18	1.14	1.21	1.17	1.14	1.18	1.11	1.12	1.16	1.15	1.16	1.17	1.12	1.14	1.16	1.18	1.16	1.15
1.19	1.22	1.23	1.25	1.25	1.27	1.17	1.16	1.23	1.23	1.25	1.26	1.19	1.17	1.23	1.22	1.23	1.22
1.05	1.20	1.15	1.23	1.20	1.26	1.12	1.09	1.19	1.19	1.23	1.23	1.18	1.04	1.21	1.13	1.22	1.19
1.08	1.22	1.17	1.25	1.22	1.28	1.13	1.10	1.21	1.21	1.24	1.24	1.19	1.07	1.24	1.16	1.23	1.20
1.10	1.21	1.16	1.25	1.22	1.27	1.12	1.10	1.21	1.21	1.24	1.24	1.18	1.08	1.23	1.16	1.23	1.20
1.08	1.22	1.15	1.24	1.19	1.28	1.12	1.10	1.20	1.20	1.22	1.22	1.19	1.07	1.23	1.15	1.22	1.20
1.08	1.22	1.15	1.24	1.19	1.28	1.12	1.10	1.20	1.20	1.22	1.22	1.19	1.07	1.23	1.15	1.22	1.20
1.11	1.21	1.18	1.25	1.21	1.25	1.12	1.11	1.20	1.20	1.22	1.22	1.17	1.10	1.22	1.17	1.21	1.19
1.11	1.21	1.18	1.25	1.21	1.25	1.12	1.11	1.20	1.20	1.22	1.22	1.17	1.10	1.22	1.17	1.21	1.19
1.11	1.21	1.18	1.25	1.21	1.25	1.12	1.11	1.20	1.20	1.22	1.22	1.17	1.10	1.22	1.17	1.21	1.19
1.21	1.23	1.25	1.25	1.28	1.31	1.20	1.19	1.24	1.24	1.29	1.29	1.21	1.20	1.24	1.24	1.28	1.27
1.21	1.23	1.25	1.25	1.28	1.31	1.20	1.19	1.24	1.24	1.29	1.29	1.21	1.20	1.24	1.24	1.28	1.27
1.18	1.23	1.23	1.26	1.27	1.30	1.18	1.18	1.23	1.24	1.28	1.28	2.62	2.19	0.70	0.70	0.59	0.54
1.05	1.21	1.14	1.24	1.14	1.22	1.11	1.09	1.20	1.20	1.16	1.16	1.18	1.04	1.22	1.15	1.16	1.12
1.05	1.21	1.14	1.24	1.14	1.22	1.11	1.09	1.20	1.20	1.16	1.16	1.18	1.04	1.22	1.15	1.16	1.12
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.14	1.23	1.19	1.27	1.23	1.28	1.16	1.13	1.22	1.22	1.25	1.25	1.20	1.12	1.24	1.19	1.23	1.21
1.26	1.23	1.29	1.27	1.32	1.32	1.20	1.21	1.26	1.25	1.31	1.30	1.20	1.23	1.25	1.28	1.28	1.28
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.05	1.22	1.14	1.25	1.18	1.26	1.14	1.10	1.20	1.20	1.21	1.22	1.19	1.03	1.23	1.14	1.20	1.17
1.21	1.20	1.24	1.23	1.21	1.21	1.16	1.16	1.21	1.21	1.20	1.20	1.17	1.17	1.22	1.23	1.20	1.19
1.25	1.20	1.27	1.23	1.25	1.23	1.18	1.19	1.21	1.22	1.24	1.24	1.18	1.22	1.22	1.25	1.22	1.23
1.14	1.21	1.20	1.25	1.22	1.24	1.15	1.13	1.21	1.21	1.22	1.22	1.18	1.12	1.23	1.19	1.21	1.21
1.14	1.19	1.19	1.22	1.19	1.21	1.13	1.13	1.19	1.19	1.19	1.19	1.16	1.12	1.21	1.18	1.19	1.18
1.15	1.19	1.20	1.22	1.21	1.22	1.14	1.13	1.19	1.19	1.22	1.22	1.16	1.13	1.21	1.19	1.20	1.21
1.15	1.22	1.20	1.25	1.19	1.23	1.15	1.13	1.21	1.21	1.20	1.20	1.19	1.12	1.23	1.20	1.20	1.18
1.11	1.21	1.18	1.25	1.28	1.31	1.14	1.12	1.21	1.21	1.30	1.30	1.18	1.10	1.23	1.18	1.27	1.25

2051																	
AM						IP						PM					
Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other	
Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
1.34	1.22	1.36	1.26	1.44	1.35	1.25	1.28	1.27	1.27	1.42	1.43	1.21	1.32	1.26	1.33	1.38	1.42
1.20	1.22	1.24	1.25	1.32	1.32	1.18	1.17	1.24	1.23	1.33	1.33	1.19	1.18	1.24	1.23	1.29	1.29
1.29	1.23	1.32	1.27	1.38	1.34	1.22	1.23	1.27	1.27	1.37	1.37	1.21	1.27	1.26	1.30	1.34	1.35
1.14	1.21	1.19	1.25	1.28	1.31	1.15	1.14	1.22	1.22	1.30	1.30	1.19	1.12	1.24	1.19	1.27	1.26
1.18	1.23	1.24	1.26	1.30	1.31	1.17	1.17	1.24	1.24	1.31	1.31	1.20	1.16	1.25	1.23	1.28	1.27
1.04	1.22	1.12	1.25	1.23	1.30	1.12	1.09	1.20	1.20	1.27	1.27	1.19	1.03	1.23	1.13	1.25	1.22
1.18	1.23	1.23	1.27	1.30	1.32	1.17	1.16	1.24	1.24	1.32	1.32	1.20	1.16	1.25	1.23	1.29	1.27
1.13	1.24	1.19	1.27	1.22	1.27	1.15	1.14	1.23	1.22	1.24	1.24	1.21	1.11	1.25	1.19	1.23	1.21
1.29	1.20	1.30	1.23	1.27	1.23	1.19	1.21	1.22	1.22	1.25	1.25	1.17	1.25	1.22	1.27	1.23	1.25
1.21	1.23	1.25	1.26	1.29	1.30	1.18	1.18	1.24	1.24	1.30	1.30	1.20	1.19	1.25	1.24	1.27	1.27
1.21	1.22	1.24	1.26	1.28	1.28	1.18	1.17	1.23	1.23	1.29	1.29	1.19	1.18	1.24	1.23	1.26	1.27
1.23	1.23	1.27	1.26	1.31	1.29	1.18	1.19	1.24	1.24	1.31	1.31	1.19	1.21	1.25	1.25	1.28	1.28
1.21	1.24	1.25	1.26	1.26	1.30	1.19	1.20	1.25	1.25	1.28	1.28	1.21	1.20	1.25	1.24	1.27	1.26
1.35	1.23	1.35	1.26	1.37	1.32	1.24	1.26	1.26	1.26	1.34	1.35	1.21	1.31	1.26	1.32	1.32	1.34
1.11	1.22	1.17	1.25	1.24	1.28	1.14	1.12	1.21	1.21	1.26	1.26	1.19	1.09	1.23	1.17	1.24	1.23
1.22	1.22	1.26	1.26	1.29	1.29	1.17	1.17	1.23	1.24	1.29	1.29	1.19	1.19	1.24	1.24	1.26	1.26
1.19	1.22	1.24	1.25	1.27	1.28	1.16	1.16	1.23	1.23	1.27	1.27	1.19	1.16	1.24	1.22	1.25	1.24
1.20	1.18	1.23	1.22	1.22	1.24	1.15	1.15	1.20	1.20	1.22	1.22	1.16	1.17	1.21	1.21	1.21	1.20
1.23	1.18	1.26	1.22	1.28	1.24	1.18	1.18	1.21	1.21	1.27	1.27	1.16	1.21	1.21	1.24	1.25	1.27
0.98	1.20	1.08	1.24	1.24	1.31	1.09	1.05	1.17	1.17	1.30	1.29	1.17	0.98	1.21	1.09	1.26	1.23
1.10	1.17	1.16	1.21	1.19	1.22	1.11	1.09	1.17	1.17	1.20	1.20	1.15	1.08	1.19	1.15	1.19	1.18
1.13	1.18	1.18	1.21	1.23	1.23	1.13	1.12	1.18	1.18	1.24	1.23	1.15	1.11	1.20	1.17	1.21	1.21
1.10	1.17	1.16	1.20	1.19	1.22	1.11	1.10	1.17	1.17	1.20	1.20	1.14	1.09	1.19	1.15	1.19	1.18
1.05	1.17	1.12	1.21	1.18	1.22	1.10	1.08	1.17	1.17	1.20	1.20	1.15	1.04	1.19	1.13	1.18	1.17
1.27	1.26	1.31	1.29	1.36	1.34	1.22	1.23	1.27	1.27	1.36	1.36	1.23	1.25	1.27	1.29	1.33	1.34
1.27	1.26	1.30	1.28	1.33	1.33	1.22	1.22	1.26	1.26	1.34	1.34	1.23	1.24	1.26	1.27	1.32	1.32
1.25	1.21	1.28	1.25	1.36	1.35	1.20	1.20	1.23	1.23	1.39	1.39	1.20	1.23	1.24	1.26	1.34	1.35
1.22	1.25	1.25	1.27	1.29	1.31	1.19	1.18	1.24	1.24	1.32	1.32	1.22	1.19	1.25	1.23	1.29	1.29
1.23	1.21	1.26	1.25	1.38	1.36	1.19	1.19	1.23	1.23	1.39	1.40	1.20	1.21	1.24	1.25	1.34	1.35
1.22	1.27	1.26	1.30	1.32	1.34	1.20	1.19	1.27	1.26	1.33	1.33	1.24	1.19	1.28	1.25	1.31	1.30
1.19	1.21	1.23	1.25	1.33	1.34	1.17	1.16	1.22	1.22	1.37	1.37	1.19	1.17	1.23	1.22	1.32	1.32
1.25	1.27	1.29	1.30	1.31	1.30	1.21	1.21	1.26	1.26	1.31	1.31	1.24	1.22	1.28	1.27	1.29	1.29
1.39	1.38	1.41	1.40	1.40	1.40	1.33	1.33	1.37	1.37	1.41	1.41	1.35	1.36	1.38	1.39	1.40	1.40
1.51	1.28	1.46	1.30	1.43	1.34	1.31	1.35	1.29	1.30	1.38	1.38	1.26	1.45	1.29	1.41	1.36	1.39
1.68	1.27	1.55	1.29	1.51	1.36	1.35	1.42	1.30	1.31	1.45	1.46	1.26	1.60	1.28	1.48	1.42	1.49
1.25	1.25	1.28	1.27	1.31	1.31	1.20	1.20	1.25	1.24	1.32	1.32	1.22	1.22	1.25	1.25	1.30	1.29
1.23	1.25	1.26	1.28	1.30	1.32	1.20	1.19	1.25	1.24	1.32	1.32	1.22	1.20	1.26	1.24	1.29	1.29
1.19	1.26	1.24	1.29	1.29	1.31	1.19	1.18	1.25	1.25	1.32	1.32	1.23	1.17	1.27	1.23	1.29	1.28
1.49	1.27	1.45	1.29	1.43	1.35	1.29	1.33	1.29	1.29	1.40	1.41	1.25	1.44	1.27	1.40	1.38	1.42
1.14	1.26	1.20	1.29	1.23	1.29	1.16	1.14	1.24	1.24	1.26	1.25	1.22	1.12	1.26	1.20	1.24	1.22
1.33	1.27	1.34	1.30	1.36	1.34	1.25	1.26	1.27	1.28	1.36	1.36	1.25	1.30	1.28	1.31	1.34	1.35
1.14	1.25	1.19	1.28	1.25	1.31	1.16	1.14	1.23	1.23	1.29	1.29	1.22	1.13	1.25	1.19	1.27	1.25
1.16	1.25	1.21	1.28	1.25	1.30	1.16	1.14	1.23	1.23	1.28	1.28	1.21	1.13	1.25	1.20	1.26	1.24
1.29	1.26	1.31	1.28	1.36	1.34	1.22	1.23	1.26	1.26	1.36	1.36	1.23	1.26	1.26	1.28	1.33	1.34
1.26	1.26	1.28	1.28	1.33	1.33	1.21	1.21	1.25	1.25	1.34	1.34	1.23	1.23	1.26	1.26	1.31	1.32
1.38	1.40	1.41	1.42	1.41	1.42	1.33	1.33	1.39	1.39	1.42	1.41	1.36	1.34	1.40	1.39	1.41	1.40
1.25	1.26	1.28	1.28	1.34	1.34	1.20	1.20	1.26	1.25	1.34	1.34	1.22	1.22	1.26	1.26	1.31	1.31
1.20	1.27	1.24	1.29	1.26	1.30	1.19	1.18	1.26	1.25	1.28	1.27	1.23	1.17	1.27	1.23	1.26	1.25
1.30	1.23	1.31	1.26	1.33	1.30	1.21	1.22	1.25	1.25	1.32	1.32	1.21	1.26	1.25	1.28	1.29	1.30
1.05	1.26	1.13	1.29	1.21	1.29	1.14	1.10	1.22	1.22	1.26	1.26	1.23	1.04	1.26	1.14	1.24	1.21
1.17	1.27	1.22	1.30	1.27	1.29	1.18	1.17	1.25	1.25	1.29	1.29	1.23	1.15	1.27	1.22	1.27	1.26

2051																	
AM						IP						PM					
Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other		Car Commuting		Car Employer Business		Car Other	
Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
1.27	1.22	1.29	1.26	1.33	1.33	1.20	1.21	1.24	1.24	1.34	1.34	1.20	1.24	1.25	1.27	1.31	1.31
1.23	1.25	1.26	1.28	1.33	1.32	1.19	1.19	1.25	1.25	1.34	1.34	1.22	1.20	1.26	1.25	1.30	1.30
1.12	1.27	1.19	1.29	1.25	1.30	1.17	1.14	1.24	1.24	1.28	1.28	1.23	1.10	1.26	1.19	1.26	1.23
1.05	1.20	1.15	1.23	1.20	1.26	1.12	1.09	1.19	1.19	1.23	1.23	1.18	1.04	1.21	1.13	1.22	1.19
1.24	1.24	1.27	1.27	1.29	1.29	1.20	1.20	1.25	1.25	1.29	1.29	1.21	1.21	1.26	1.26	1.27	1.27
1.20	1.22	1.23	1.24	1.32	1.33	1.18	1.17	1.23	1.23	1.34	1.34	1.19	1.18	1.23	1.22	1.30	1.29
1.19	1.19	1.23	1.23	1.30	1.31	1.16	1.16	1.21	1.21	1.32	1.32	1.17	1.17	1.22	1.22	1.28	1.28
1.25	1.22	1.27	1.25	1.37	1.35	1.20	1.20	1.24	1.24	1.38	1.38	1.20	1.23	1.24	1.26	1.33	1.34
1.01	1.19	1.10	1.23	1.23	1.28	1.09	1.06	1.17	1.18	1.27	1.27	1.16	1.00	1.20	1.11	1.24	1.22
1.24	1.22	1.27	1.26	1.34	1.33	1.20	1.20	1.24	1.24	1.34	1.34	1.20	1.22	1.25	1.26	1.31	1.31
1.22	1.21	1.25	1.25	1.31	1.31	1.18	1.18	1.23	1.23	1.32	1.32	1.19	1.20	1.24	1.24	1.29	1.29
1.18	1.21	1.22	1.24	1.29	1.30	1.16	1.16	1.22	1.22	1.30	1.30	1.19	1.16	1.23	1.21	1.27	1.27
1.33	1.28	1.34	1.31	1.35	1.33	1.24	1.25	1.28	1.29	1.35	1.35	1.25	1.29	1.29	1.32	1.33	1.34
1.16	1.21	1.21	1.25	1.37	1.39	1.16	1.16	1.22	1.22	1.40	1.40	1.19	1.15	1.24	1.21	1.34	1.34
1.29	1.24	1.30	1.27	1.36	1.34	1.22	1.23	1.25	1.25	1.37	1.37	1.22	1.26	1.26	1.28	1.33	1.34
1.13	1.19	1.18	1.22	1.24	1.27	1.13	1.12	1.19	1.19	1.27	1.26	1.17	1.11	1.21	1.17	1.24	1.23
1.23	1.18	1.25	1.21	1.30	1.27	1.17	1.18	1.20	1.20	1.29	1.29	1.16	1.20	1.21	1.23	1.26	1.28
1.35	1.29	1.35	1.32	1.34	1.31	1.26	1.27	1.30	1.30	1.32	1.32	1.26	1.31	1.31	1.33	1.31	1.32
1.04	1.18	1.10	1.20	1.13	1.18	1.09	1.07	1.16	1.16	1.16	1.16	1.15	1.03	1.19	1.11	1.16	1.14
1.22	1.18	1.24	1.21	1.15	1.15	1.17	1.18	1.19	1.19	1.14	1.14	1.16	1.20	1.20	1.22	1.15	1.16
1.18	1.18	1.21	1.21	1.21	1.21	1.15	1.15	1.19	1.19	1.22	1.22	1.16	1.16	1.20	1.20	1.21	1.21
1.18	1.19	1.21	1.22	1.20	1.20	1.17	1.16	1.20	1.20	1.20	1.20	1.17	1.16	1.21	1.21	1.20	1.20
1.18	1.28	1.25	1.31	1.31	1.34	1.19	1.18	1.27	1.26	1.33	1.33	1.24	1.16	1.29	1.24	1.31	1.30
1.26	1.28	1.29	1.31	1.27	1.29	1.22	1.22	1.28	1.28	1.27	1.27	1.24	1.23	1.29	1.28	1.27	1.26
1.30	1.18	1.30	1.22	1.27	1.24	1.19	1.21	1.21	1.21	1.25	1.26	1.17	1.26	1.21	1.27	1.24	1.25
1.18	1.21	1.24	1.26	1.42	1.43	1.17	1.17	1.24	1.24	1.45	1.45	1.20	1.17	1.25	1.23	1.38	1.38
1.31	1.24	1.33	1.28	1.45	1.43	1.26	1.26	1.29	1.28	1.45	1.45	1.24	1.30	1.28	1.31	1.41	1.41
1.21	1.23	1.25	1.26	1.36	1.37	1.19	1.19	1.25	1.25	1.38	1.38	1.21	1.19	1.25	1.24	1.33	1.33
1.22	1.20	1.24	1.23	1.25	1.25	1.18	1.18	1.21	1.22	1.26	1.26	1.18	1.19	1.22	1.23	1.24	1.25
1.21	1.21	1.24	1.24	1.32	1.32	1.18	1.18	1.22	1.22	1.32	1.32	1.19	1.19	1.23	1.23	1.29	1.29
1.26	1.26	1.28	1.28	1.28	1.28	1.20	1.20	1.26	1.26	1.29	1.29	1.22	1.22	1.27	1.27	1.28	1.28
1.26	1.26	1.28	1.28	1.28	1.28	1.20	1.20	1.26	1.26	1.29	1.29	1.22	1.22	1.27	1.27	1.28	1.28
1.26	1.26	1.28	1.28	1.28	1.28	1.20	1.20	1.26	1.26	1.29	1.29	1.22	1.22	1.27	1.27	1.28	1.28
1.26	1.26	1.28	1.28	1.28	1.28	1.20	1.20	1.26	1.26	1.29	1.29	1.22	1.22	1.27	1.27	1.28	1.28
1.26	1.26	1.28	1.28	1.28	1.28	1.20	1.20	1.26	1.26	1.29	1.29	1.22	1.22	1.27	1.27	1.28	1.28
1.26	1.26	1.28	1.28	1.28	1.28	1.20	1.20	1.26	1.26	1.29	1.29	1.22	1.22	1.27	1.27	1.28	1.28
1.26	1.26	1.28	1.28	1.28	1.28	1.20	1.20	1.26	1.26	1.29	1.29	1.22	1.22	1.27	1.27	1.28	1.28
1.26	1.26	1.28	1.28	1.28	1.28	1.20	1.20	1.26	1.26	1.29	1.29	1.22	1.22	1.27	1.27	1.28	1.28

Appendix B – Initial Scheme Design Drawings

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

100mm on Original

Notes

LEGEND:

VRS
KERB DRAINAGE
KERB

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN

PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN

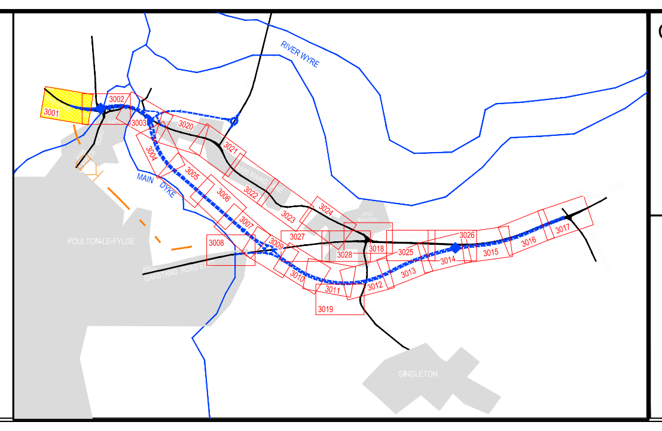
PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN

EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED



Client

highways england

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title
OPTION 1B GENERAL ARRANGEMENT SHEET 1 OF 19

Status: S3 - PRELIMINARY DESIGN
Revision: P1
Scale: 1:500@A1
Date - 09 FEB 18
Drawn By: L.FREITAS
Checked By: T.CHAUDRY
Approved By: N.HENDERSON
Project No.: UA009921
HE PIN: HE548643
Originator: ARC
Original Size: A1
Drawing number | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S1_ML_001-DR-D-3001

Print Date: 2018-02-09 17:17:09

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

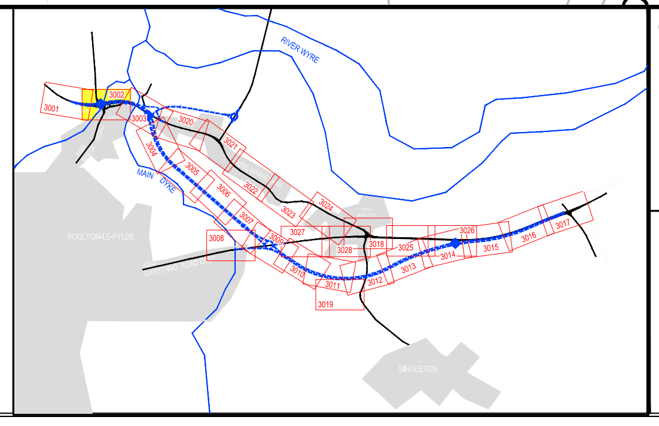
Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

Notes

LEGEND

VRS
KERB DRAINAGE — KD
KERB

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED



Client

highways england

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Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title
OPTION 1B GENERAL ARRANGEMENT SHEET 2 OF 19

	Status S3 - PRELIMINARY DESIGN	Revision	P1
Scale	1:500@A1	Date -	09 FEB 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDRY		
Approved By	N.HENDERSON		
Project No. UA009921	HE PIN HE548643	Originator ARC	Original Size A1

Drawing number Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S1_ML_002-DR-D-3002

100mm on Original

Print Date: 2018-02-09 17:17:22

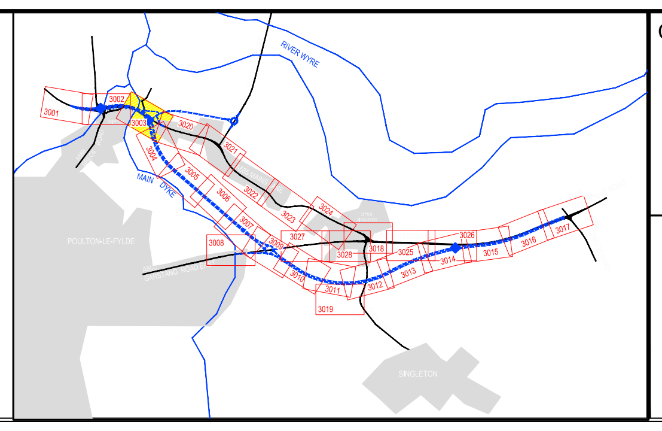
File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

Notes

VRS	—— · —— · —— · ——
KERB DRAINAGE	—— - - — KD ——
KERB	——

⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
◒	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
◎	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
◕	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
🟥	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◉	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
○	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◑	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED



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N1 9AB

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The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title
OPTION 1B GENERAL ARRANGEMENT SHEET 3 OF 19

Status	S3 - PRELIMINARY DESIGN	Revision P1
Scale	1:500@A1	Date - 09 FEB 18
Drawn By	L.FREITAS	
Checked By	T.CHAUDRY	
Approved By	N.HENDERSON	
Project No. UA009921	HE PIN HE548643 | Originator ARC	Original Size A1

Drawing number Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S2_ML_003-DR-D-3003

100mm on Original

Print Date: 2018-02-09 17:17:36

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

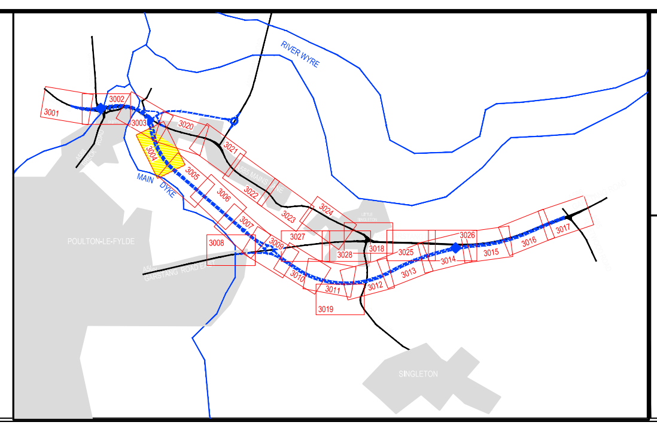
Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

Notes

LEGEND:

VRS	— · — · — · —
KERB DRAINAGE	— - - — KD —
KERB	—

- PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
- PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
- PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
- PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
- PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
- PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
- EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
- EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
- EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
- EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED



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Project
A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title

OPTION 1B GENERAL ARRANGEMENT
SHEET 4 OF 19

Status	S3 - PRELIMINARY DESIGN	Revision	P1
Scale	1:500@A1	Date -	09 FEB 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDRY		
Approved By	N.HENDERSON		
Project No. UA009921	HE PIN HE548643 | Originator ARC	Original Size	A1
Drawing number	Volume | Location | Type | Role | Number		
	HE548643-ARC-GEN-S3_ML_001-DR-D-3004		

100mm on Original

Print Date: 2018-02-09 17:17:48

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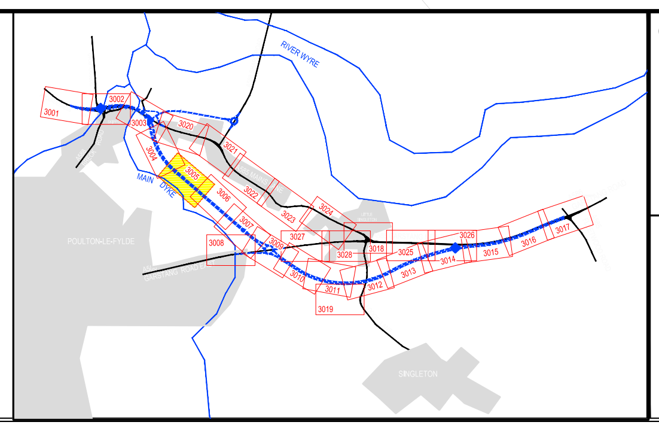
Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

Notes

LEGEND

VRS
KERB DRAINAGE KD
KERB

●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
●	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
○	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
●	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
●	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
●	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
○	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
●	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED



Client

highways england

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title
OPTION 1B GENERAL ARRANGEMENT SHEET 5 OF 19

	Status S3 - PRELIMINARY DESIGN	Revision	P1
Scale	1:500@A1	Date -	09 FEB 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDRY		
Approved By	N.HENDERSON		
Project No. UA009921	HE PIN HE548643	Originator ARC	Original Size A1

Drawing number Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S3_ML_002-DR-D-3005

100mm on Original

Print Date: 2018-02-09 17:18:00

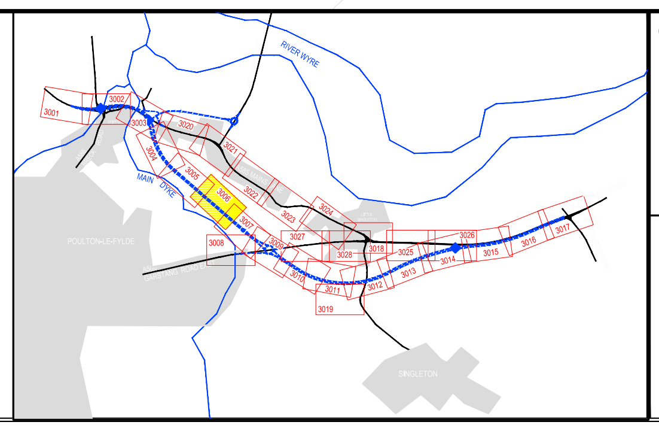
File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH
Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd

Notes

VRS	— · — · — · —
KERB DRAINAGE	— - - — KD —
KERB	—

⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
◒	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
◎	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
◕	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
●	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◉	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
○	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◐	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED



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Coordinating office:
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Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title
OPTION 1B GENERAL ARRANGEMENT SHEET 6 OF 19

	Status S3 - PRELIMINARY DESIGN	Revision P1	
Scale	1:500@A1	Date - 09 FEB 18	
Drawn By	L.FREITAS		
Checked By	T.CHAUDRY		
Approved By	N.HENDERSON		
Project No. UA009921	HE PIN HE548643	Originator ARC	Original Size A1

Drawing number Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S3_ML_003-DR-D-3006

100mm on Original

Print Date: 2018-02-09 17:18:12

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

Notes

VRS	— · — · — · —
KERB DRAINAGE	— - - — KD —
KERB	—

●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
●	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
○	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
●	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
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●	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
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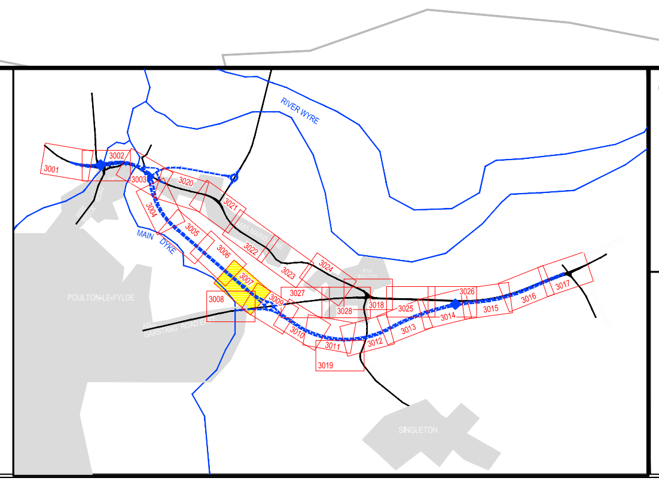

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N1 9AB

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10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title
OPTION 1B GENERAL ARRANGEMENT SHEET 7 OF 19

	Status S3 - PRELIMINARY DESIGN	Revision P1	
Scale	1:500@A1	Date -	09 FEB 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDRY		
Approved By	N.HENDERSON		
Project No. UA009921	HE PIN HE548643	Originator ARC	Original Size A1

Drawing number | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S3_ML_004-DR-D-3007

100mm on Original

Print Date: 2018-02-09 17:18:25

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

Notes

VRS	—— · —— · ——
KERB DRAINAGE	—— - - — KD ——
KERB	———

- PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
- PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
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- PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
- PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
- PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
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- EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
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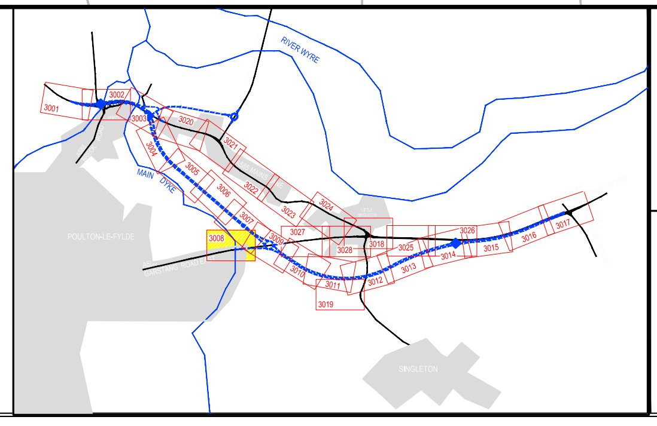

Client

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N1 9AB

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10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title
OPTION 1B GENERAL ARRANGEMENT SHEET 8 OF 19

	Status S3 - PRELIMINARY DESIGN	Revision P1	
Scale	1:500@A1	Date -	09 FEB 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDRY		
Approved By	N.HENDERSON		
Project No. UA009921	HE PIN HE548643	Originator ARC	Original Size A1

Drawing number Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S4_ML_001-DR-D-3008

100mm on Original

Print Date: 2018-02-09 17:18:37

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

POULTON JUNCTION

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

100mm on Original

Notes

LEGEND:

VRS
KERB DRAINAGE
KERB

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN

PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN

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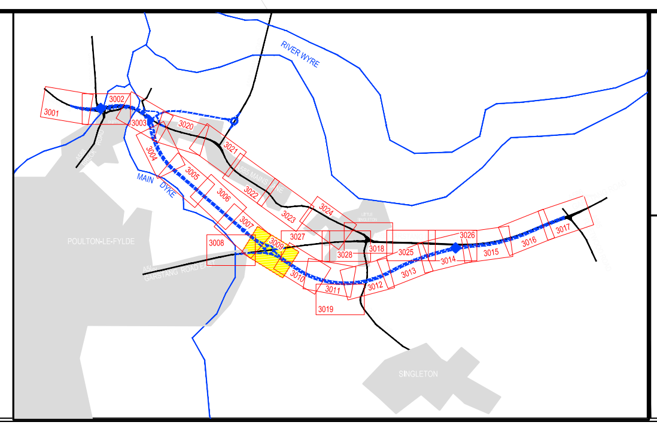

Client

highways england

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Registered office:
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N1 9AB

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The Surrey Research Park
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Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title
OPTION 1B GENERAL ARRANGEMENT
SHEET 9 OF 19

Status: S3 - PRELIMINARY DESIGN
Revision: P1
Scale: 1:500@A1
Date - 09 FEB 18
Drawn By: L.FREITAS
Checked By: T.CHAUDRY
Approved By: N.HENDERSON
Project No.: UA009921
HE PIN: HE548643
Originator: ARC
Original Size: A1
Drawing number (Volume | Location | Type | Role | Number): HE548643-ARC-GEN-S4_ML_002-DR-D-3009

Print Date: 2018-02-09 17:18:49

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

Notes

VRS ——·——·——·——

KERB DRAINAGE —— - - —— KD ——

KERB ——————

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN

PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN

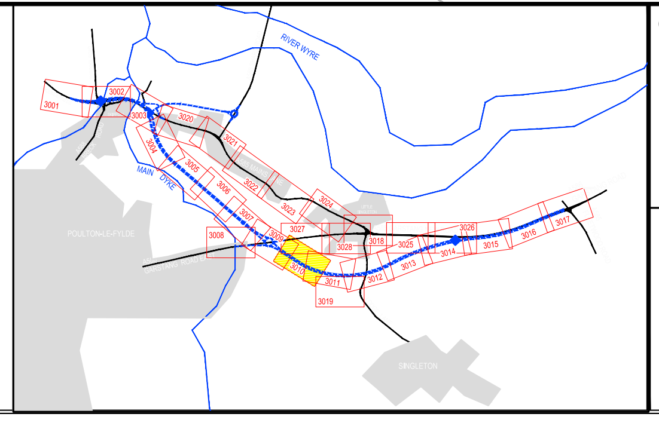
PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN

EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED



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Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title
OPTION 1B GENERAL ARRANGEMENT
SHEET 10 OF 19

Status: S3 - PRELIMINARY DESIGN
Revision: P1
Scale: 1:500@A1
Date - 09 FEB 18
Drawn By: L.FREITAS
Checked By: T.CHAUDRY
Approved By: N.HENDERSON
Project No.: UA009921
HE PIN: HE548643
Originator: ARC
Original Size: A1
Drawing number | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S5_ML_001-DR-D-3010

100mm on Original

Print Date: 2018-02-09 17:19:01

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

100mm on Original

Notes

LEGEND:

VRS	—— · —— · —— · ——
KERB DRAINAGE	—— - - —— KD ——
KERB	————

⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
◒	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
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●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
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◉	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
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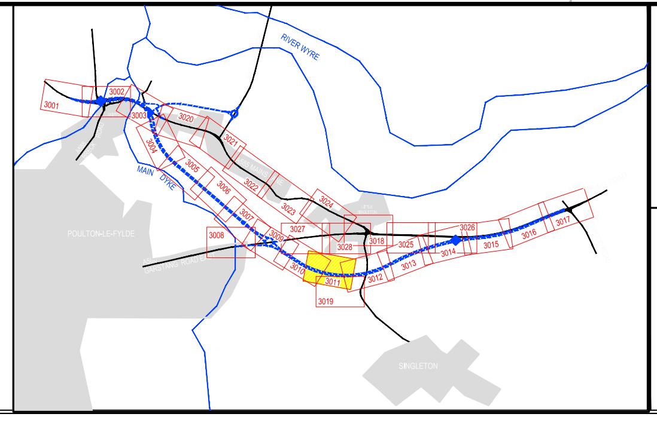

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Project

A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title

OPTION 1B GENERAL ARRANGEMENT
SHEET 11 OF 19

	Status S3 - PRELIMINARY DESIGN	Revision	P1
Scale	1:500@A1	Date -	09 FEB 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDRY		
Approved By	N.HENDERSON		
Project No. UA009921	HE PIN HE548643	I Originator ARC	Original Size A1

Drawing number Volume I Location I Type I Role I Number
HE548643-ARC-GEN-S5_ML_002-DR-D-3011

Print Date: 2018-02-09 17:19:14

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

Notes

VRS	— · — · — · —
KERB DRAINAGE	— - - — KD —
KERB	——

⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
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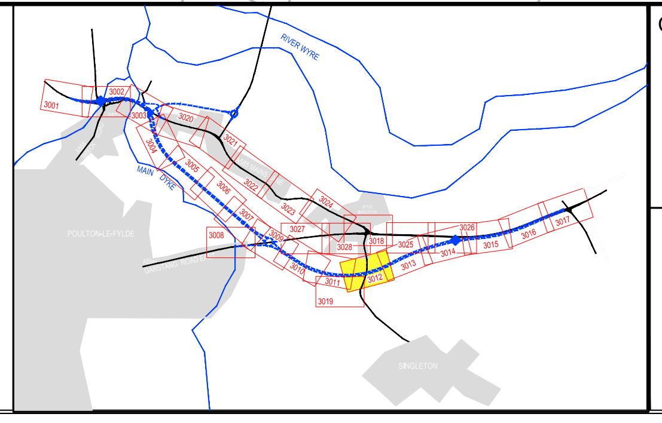

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

100mm on Original

Client

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Coordinating office:
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Project

A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title

OPTION 1B GENERAL ARRANGEMENT SHEET 12 OF 19

	Status S3 - PRELIMINARY DESIGN	Revision	P1
Scale	1:500@A1	Date -	09 FEB 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDRY		
Approved By	N.HENDERSON		
Project No. UA009921	HE PIN HE548643 | Originator ARC	Original Size	A1

Drawing number Volume | Location | Type | Role | Number

HE548643-ARC-GEN-S5_ML_003-DR-D-3012

Print Date: 2018-02-09 17:19:26 File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

Notes

VRS	— · — · — · —
KERB DRAINAGE	— - - — KD —
KERB	——

- PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
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- PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
- PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
- EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
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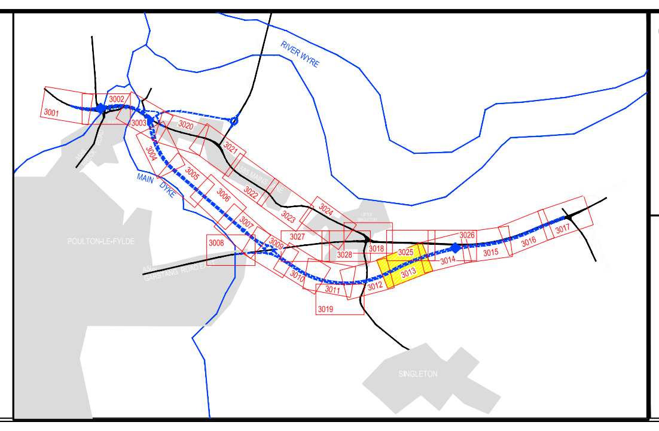
- EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
- EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED



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highways england

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title
OPTION 1B GENERAL ARRANGEMENT
SHEET 13 OF 19

Status: S3 - PRELIMINARY DESIGN
Revision: P1
Scale: 1:500@A1
Date - 09 FEB 18
Drawn By: L.FREITAS
Checked By: T.CHAUDRY
Approved By: N.HENDERSON

Project No.	HE PIN	Originator	Original Size
UA009921	HE548643	ARC	A1

Drawing number (Volume | Location | Type | Role | Number)
HE548643-ARC-GEN-S5_ML_004-DR-D-3013

100mm on Original

Print Date: 2018-02-09 17:19:38

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

Notes

VRS	— · — · — · —
KERB DRAINAGE	— - - — KD —
KERB	—

●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
●	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
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●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
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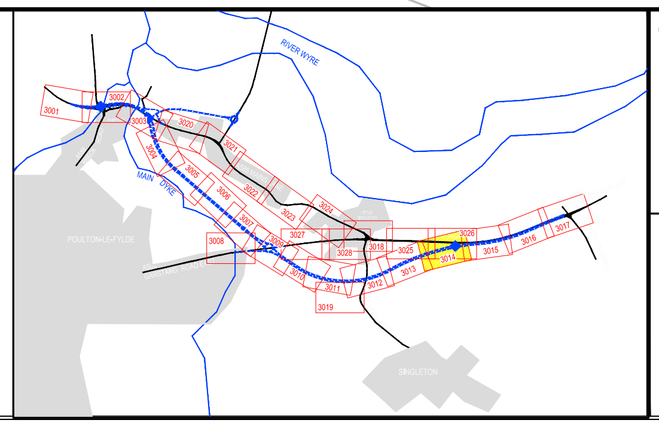
○	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
●	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED



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Project

A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title

OPTION 1B GENERAL ARRANGEMENT
SHEET 14 OF 19

	Status S3 - PRELIMINARY DESIGN	Revision	P1
Scale	1:500@A1	Date -	09 FEB 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDRY		
Approved By	N.HENDERSON		
Project No. UA009921	HE PIN HE548643 | Originator ARC	Original Size	A1

Drawing number Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S5_ML_005-DR-D-3014

100mm on Original

Print Date: 2018-02-09 17:19:50

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

Notes

LEGEND:

VRS

KERB DRAINAGE

KERB

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN

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PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN

PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN

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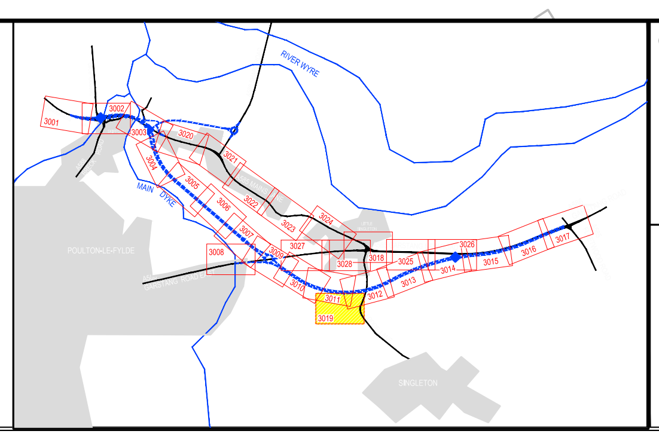
EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED



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highways england

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London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title

OPTION 1B GENERAL ARRANGEMENT SHEET 19 OF 19

	Status S3 - PRELIMINARY DESIGN	Revision	P1
Scale	1:500@A1	Date -	09 FEB 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDRY		
Approved By	N.HENDERSON		
Project No. UA009921	HE PIN HE548643 | Originator ARC	Original Size	A1

Drawing number Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S5_ML_006-DR-D-3019

100mm on Original

Print Date: 2018-02-09 17:20:02

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

Notes

LEGEND:

VRS	— · — · — · —
KERB DRAINAGE	— - - — KD —
KERB	——

⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
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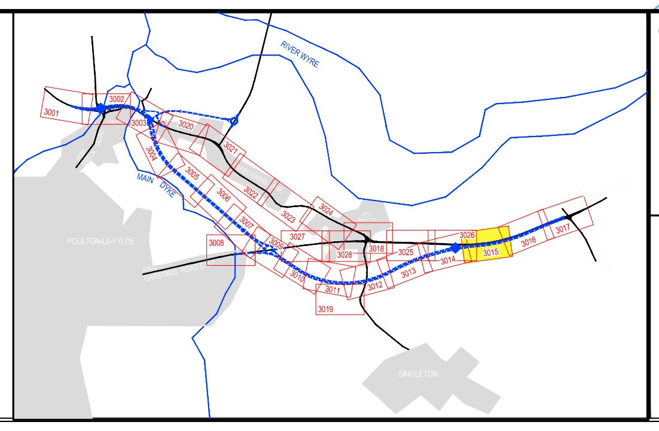

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N1 9AB

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The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project

A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title

OPTION 1B GENERAL ARRANGEMENT
SHEET 15 OF 19

	Status S3 - PRELIMINARY DESIGN	Revision	P1
Scale	1:500@A1	Date -	09 FEB 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDRY		
Approved By	N.HENDERSON		
Project No. UA009921	HE PIN HE548643	Originator ARC	Original Size A1

Drawing number Volume I Location I Type I Role I Number
HE548643-ARC-GEN-S6_ML_001-DR-D-3015

100mm on Original

Print Date: 2018-02-09 17:20:14

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

Notes

LEGEND

VRS
KERB DRAINAGE
KERB

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN

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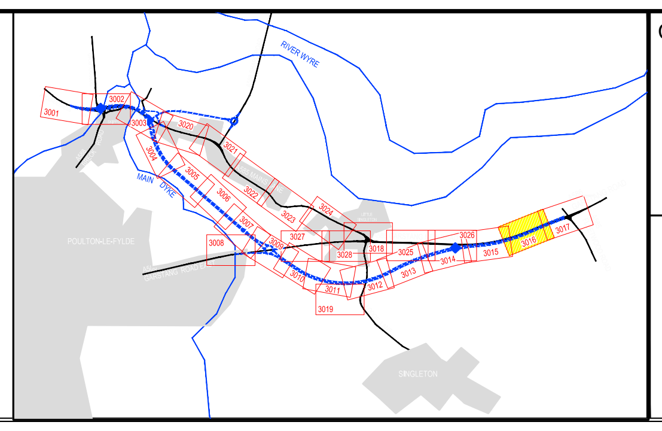

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highways england

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London
N1 9AB

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The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title
OPTION 1B GENERAL ARRANGEMENT SHEET 16 OF 19

Status: S3 - PRELIMINARY DESIGN
Revision: P1
Scale: 1:500@A1
Date - 09 FEB 18
Drawn By: L.FREITAS
Checked By: T.CHAUDRY
Approved By: N.HENDERSON
Project No.: UA009921
HE PIN: HE548643
Originator: ARC
Original Size: A1
Drawing number | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S6_ML_002-DR-D-3016

100mm on Original

Print Date: 2018-02-09 17:20:26

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

Notes

LEGEND:

VRS	— · — · — · —
KERB DRAINAGE	— - - — KD —
KERB	——

⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
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☢	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
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☢	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
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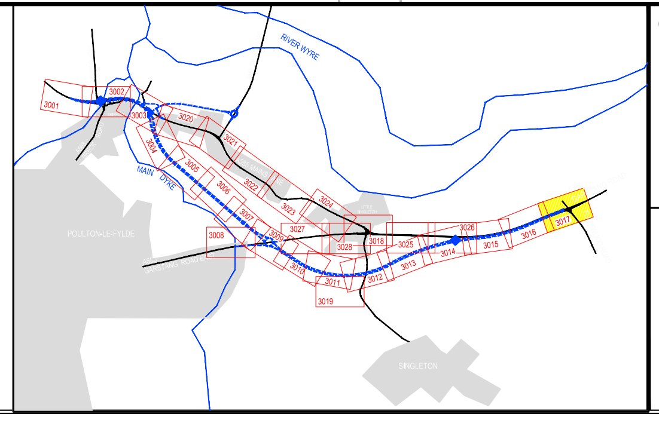
◔	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED



Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

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Guildford GU2 7AR
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Project
A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title
OPTION 1B GENERAL ARRANGEMENT
SHEET 17 OF 19

	Status S3 - PRELIMINARY DESIGN	Revision P1	
Scale	1:500@A1	Date - 09 FEB 18	
Drawn By	L.FREITAS		
Checked By	T.CHAUDRY		
Approved By	N.HENDERSON		
Project No. UA009921	HE PIN HE548643	Originator ARC	Original Size A1

Drawing number | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S6_ML_003-DR-D-3017

100mm on Original

Print Date: 2018-02-09 17:20:38

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

100mm on Original

Notes

LEGEND:

VRS
KERB DRAINAGE
KERB

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN

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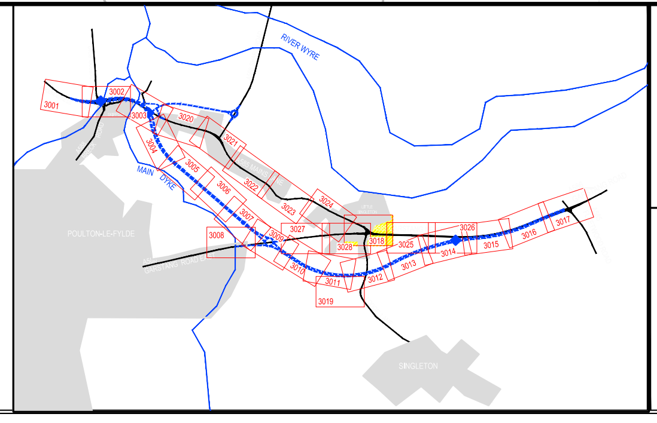

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Project

A585 WINDY HARBOUR TO SKIPPOOL
STAGE - 3 PRELIMINARY DESIGN

Drawing title

OPTION 1B GENERAL ARRANGEMENT
SHEET 18 OF 19

Status
S3 - PRELIMINARY DESIGN

Revision
P1

Scale 1:500@A1
Date - 09 FEB 18
Drawn By L.FREITAS
Checked By T.CHAUDRY
Approved By N.HENDERSON

Project No. UA009921
HE PIN HE548643
Originator ARC
Original Size A1

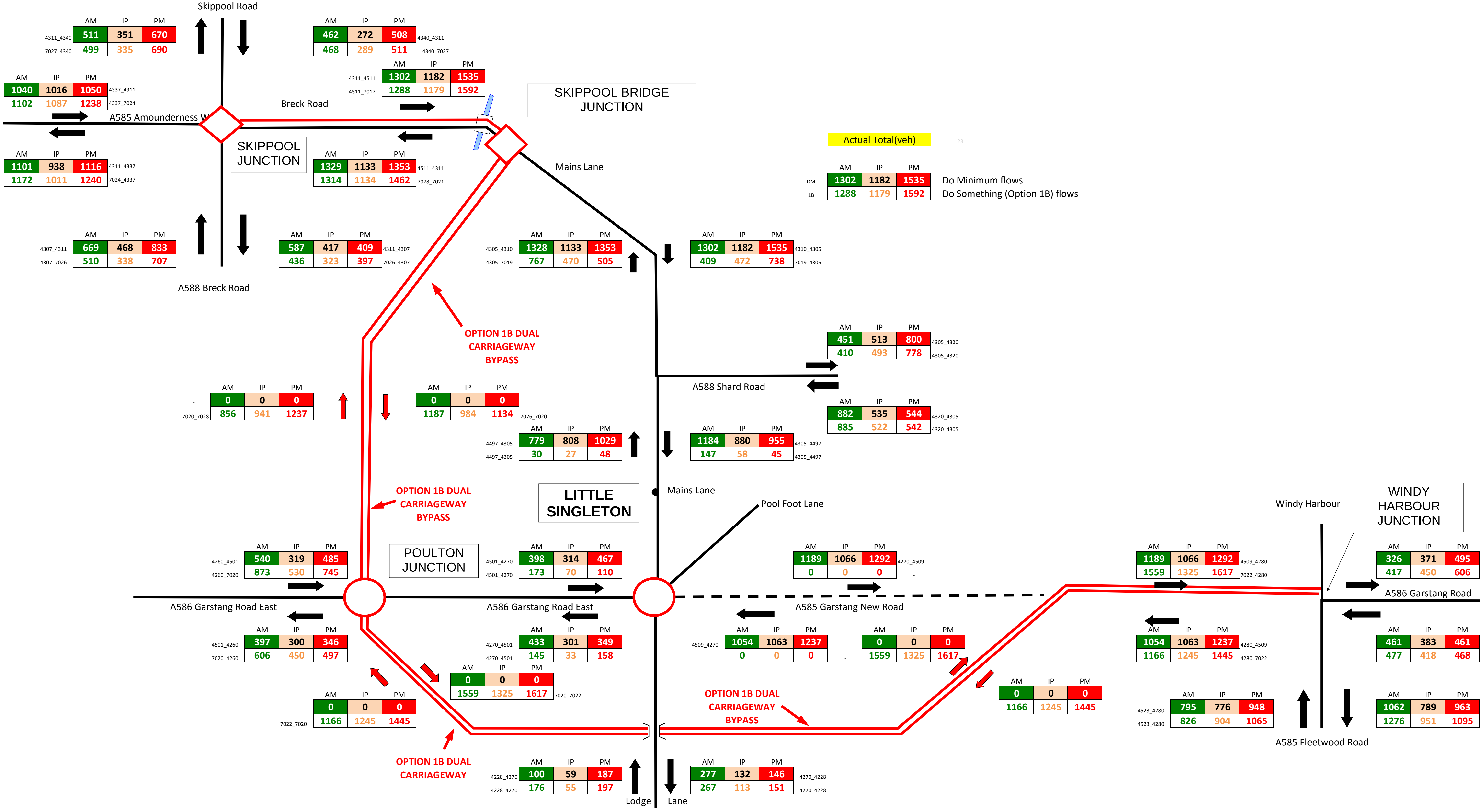
Drawing number | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S7_JN_001-DR-D-3018

Print Date: 2018-02-09 17:20:51

File Path: C:\Users\LFA78189\appdata\local\temp\AcPublish_18712\HE548643-ARC-GEN-S1_ML001_DR-D-3001-3018-Option-1B.dwg

Appendix C – Core Scenario Scheme Effect

Figure C-1 2022 Scheme Effect Core Growth Scenario Option 1B Southern Bypass



Actual Total(veh)

	AM	IP	PM	
DM	1302	1182	1535	Do Minimum flows
1B	1288	1179	1592	Do Something (Option 1B) flows

	AM	IP	PM
4311_4340	511	351	670
7027_4340	499	335	690

AM	IP	PM	
462	272	508	4340_4311
468	289	511	4340_7027

	AM	IP	PM
4311_4511	1302	1182	1535
4511_7017	1288	1179	1592

AM	IP	PM	
1040	1016	1050	4337_4311
1102	1087	1238	4337_7024

AM	IP	PM	
1101	938	1116	4311_4337
1172	1011	1240	7024_4337

AM	IP	PM	
1329	1133	1353	4511_4311
1314	1134	1462	7078_7021

	AM	IP	PM
4307_4311	669	468	833
4307_7026	510	338	707

AM	IP	PM	
587	417	409	4311_4307
436	323	397	7026_4307

	AM	IP	PM
4305_4310	1328	1133	1353
4305_7019	767	470	505

AM	IP	PM	
1302	1182	1535	4310_4305
409	472	738	7019_4305

AM	IP	PM	
451	513	800	4305_4320
410	493	778	4305_4320

AM	IP	PM	
882	535	544	4320_4305
885	522	542	4320_4305

	AM	IP	PM
-	0	0	0
7020_7028	856	941	1237

AM	IP	PM	
0	0	0	
1187	984	1134	7076_7020

	AM	IP	PM
4497_4305	779	808	1029
4497_4305	30	27	48

AM	IP	PM	
1184	880	955	4305_4497
147	58	45	4305_4497

	AM	IP	PM
4260_4501	540	319	485
4260_7020	873	530	745

	AM	IP	PM
4501_4270	398	314	467
4501_4270	173	70	110

AM	IP	PM	
1189	1066	1292	4270_4509
0	0	0	-

AM	IP	PM	
1189	1066	1292	4509_4280
1559	1325	1617	7022_4280

AM	IP	PM
326	371	495
417	450	606

	AM	IP	PM
4501_4260	397	300	346
7020_4260	606	450	497

	AM	IP	PM
4270_4501	433	301	349
4270_4501	145	33	158

AM	IP	PM	
0	0	0	
1559	1325	1617	7020_7022

	AM	IP	PM
-	0	0	0
7022_7020	1166	1245	1445

	AM	IP	PM
4509_4270	1054	1063	1237
	0	0	0

	AM	IP	PM
-	0	0	0
	1559	1325	1617

AM	IP	PM
0	0	0
1166	1245	1445

AM	IP	PM	
1054	1063	1237	4280_4509
1166	1245	1445	4280_7022

AM	IP	PM
461	383	461
477	418	468

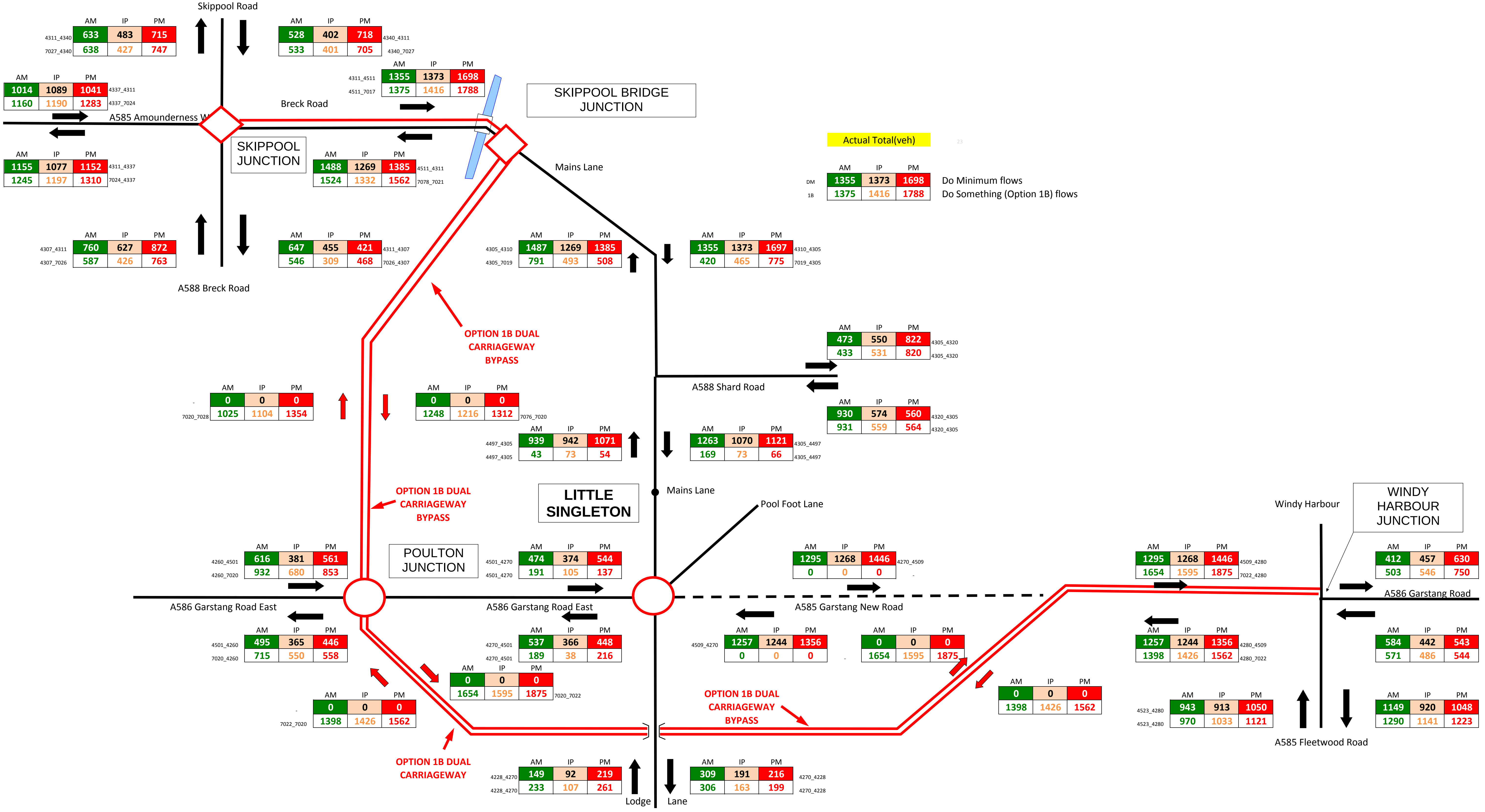
	AM	IP	PM
4523_4280	795	776	948
4523_4280	826	904	1065

AM	IP	PM
1062	789	963
1276	951	1095

	AM	IP	PM
4228_4270	100	59	187
4228_4270	176	55	197

AM	IP	PM	
277	132	146	4270_4228
267	113	151	4270_4228

Figure C-2 2037 Scheme Effect Core Growth Scenario Option 1B Southern Bypass



Actual Total(veh)

	AM	IP	PM	
DM	1355	1373	1698	Do Minimum flows
1B	1375	1416	1788	Do Something (Option 1B) flows

	AM	IP	PM
4311_4340	633	483	715
7027_4340	638	427	747

AM	IP	PM	
528	402	718	4340_4311
533	401	705	4340_7027

	AM	IP	PM
4311_4511	1355	1373	1698
4511_7017	1375	1416	1788

AM	IP	PM	
1014	1089	1041	4337_4311
1160	1190	1283	4337_7024

AM	IP	PM	
1155	1077	1152	4311_4337
1245	1197	1310	7024_4337

AM	IP	PM	
1488	1269	1385	4511_4311
1524	1332	1562	7078_7021

	AM	IP	PM
4307_4311	760	627	872
4307_7026	587	426	763

AM	IP	PM	
647	455	421	4311_4307
546	309	468	7026_4307

	AM	IP	PM
4305_4310	1487	1269	1385
4305_7019	791	493	508

AM	IP	PM	
1355	1373	1697	4310_4305
420	465	775	7019_4305

AM	IP	PM	
473	550	822	4305_4320
433	531	820	4305_4320

AM	IP	PM	
930	574	560	4320_4305
931	559	564	4320_4305

	AM	IP	PM
-	0	0	0
7020_7028	1025	1104	1354

AM	IP	PM	
0	0	0	
1248	1216	1312	7076_7020

	AM	IP	PM
4497_4305	939	942	1071
4497_4305	43	73	54

AM	IP	PM	
1263	1070	1121	4305_4497
169	73	66	4305_4497

	AM	IP	PM
4260_4501	616	381	561
4260_7020	932	680	853

	AM	IP	PM
4501_4270	474	374	544
4501_4270	191	105	137

AM	IP	PM	
1295	1268	1446	4270_4509
0	0	0	-

AM	IP	PM	
1295	1268	1446	4509_4280
1654	1595	1875	7022_4280

AM	IP	PM
412	457	630
503	546	750

	AM	IP	PM
4501_4260	495	365	446
7020_4260	715	550	558

	AM	IP	PM
4270_4501	537	366	448
4270_4501	189	38	216

AM	IP	PM	
0	0	0	
1654	1595	1875	7020_7022

	AM	IP	PM
-	0	0	0
7022_7020	1398	1426	1562

	AM	IP	PM
4509_4270	1257	1244	1356
	0	0	0

	AM	IP	PM
	0	0	0
-	1654	1595	1875

AM	IP	PM	
1257	1244	1356	4280_4509
1398	1426	1562	4280_7022

AM	IP	PM
584	442	543
571	486	544

AM	IP	PM
0	0	0
1398	1426	1562

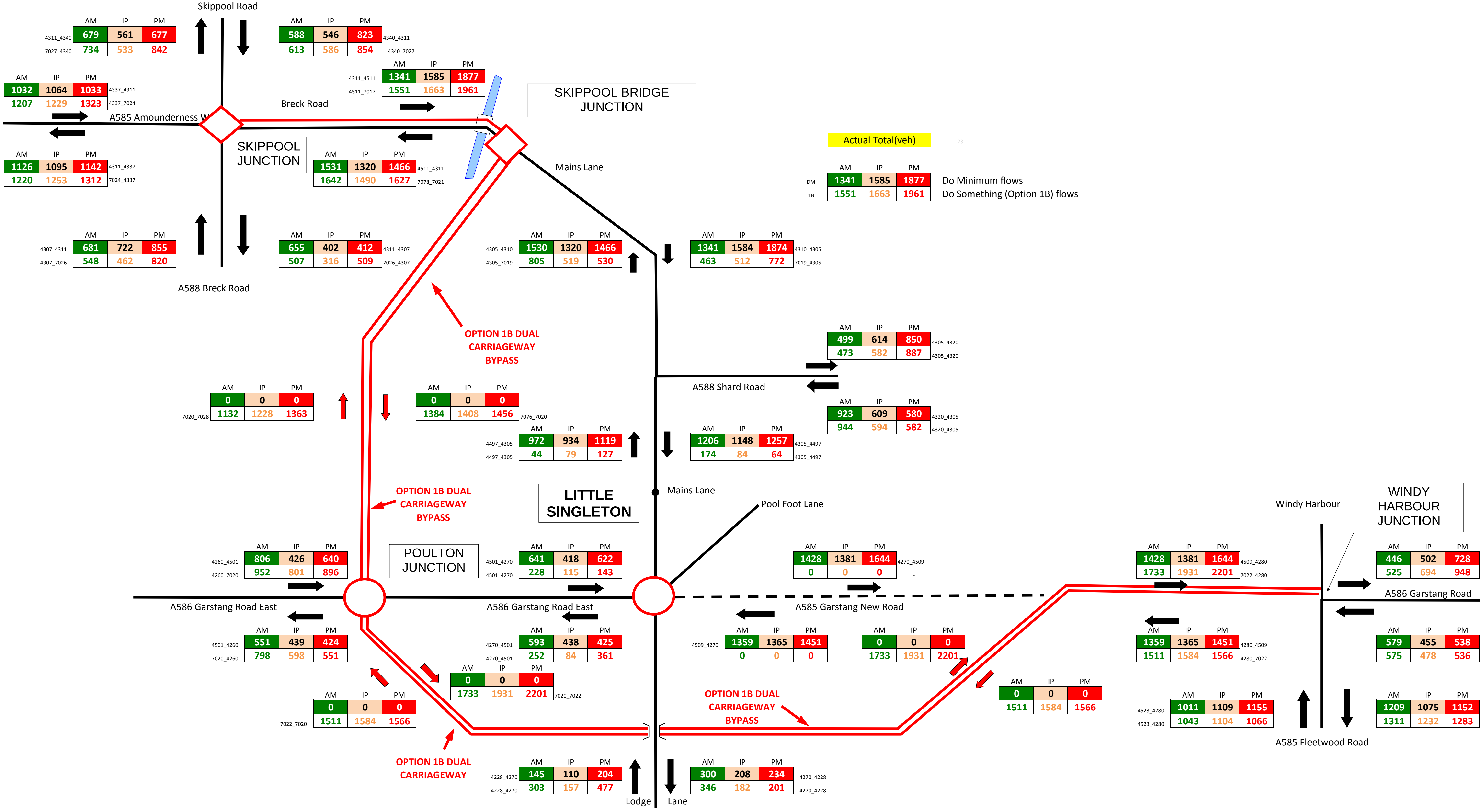
	AM	IP	PM
4523_4280	943	913	1050
4523_4280	970	1033	1121

AM	IP	PM
1149	920	1048
1290	1141	1223

	AM	IP	PM
4228_4270	149	92	219
4228_4270	233	107	261

AM	IP	PM	
309	191	216	4270_4228
306	163	199	4270_4228

Figure C-3 2051 Scheme Effect Core Growth Scenario Option 1B Southern Bypass



Actual Total(veh)

	AM	IP	PM	
DM	1341	1585	1877	Do Minimum flows
1B	1551	1663	1961	Do Something (Option 1B) flows

	AM	IP	PM
4311_4340	679	561	677
7027_4340	734	533	842

	AM	IP	PM
4340_4311	588	546	823
4340_7027	613	586	854

	AM	IP	PM
4311_4511	1341	1585	1877
4511_7017	1551	1663	1961

	AM	IP	PM
4337_4311	1032	1064	1033
4337_7024	1207	1229	1323

	AM	IP	PM
4311_4337	1126	1095	1142
7024_4337	1220	1253	1312

	AM	IP	PM
4511_4311	1531	1320	1466
7078_7021	1642	1490	1627

	AM	IP	PM
4307_4311	681	722	855
4307_7026	548	462	820

	AM	IP	PM
4311_4307	655	402	412
7026_4307	507	316	509

	AM	IP	PM
4305_4310	1530	1320	1466
4305_7019	805	519	530

	AM	IP	PM
4310_4305	1341	1584	1874
7019_4305	463	512	772

	AM	IP	PM
4305_4320	499	614	850
4305_4320	473	582	887

	AM	IP	PM
4320_4305	923	609	580
4320_4305	944	594	582

	AM	IP	PM
-	0	0	0
7020_7028	1132	1228	1363

	AM	IP	PM
	0	0	0
7076_7020	1384	1408	1456

	AM	IP	PM
4497_4305	972	934	1119
4497_4305	44	79	127

	AM	IP	PM
4305_4497	1206	1148	1257
4305_4497	174	84	64

	AM	IP	PM
4260_4501	806	426	640
4260_7020	952	801	896

	AM	IP	PM
4501_4270	641	418	622
4501_4270	228	115	143

	AM	IP	PM
4270_4509	1428	1381	1644
-	0	0	0

	AM	IP	PM
4509_4280	1428	1381	1644
7022_4280	1733	1931	2201

	AM	IP	PM
	446	502	728
	525	694	948

	AM	IP	PM
4501_4260	551	439	424
7020_4260	798	598	551

	AM	IP	PM
4270_4501	593	438	425
4270_4501	252	84	361

	AM	IP	PM
	0	0	0
7020_7022	1733	1931	2201

	AM	IP	PM
4509_4270	1359	1365	1451
	0	0	0

	AM	IP	PM
	0	0	0
-	1733	1931	2201

	AM	IP	PM
4280_4509	1359	1365	1451
4280_7022	1511	1584	1566

	AM	IP	PM
	579	455	538
	575	478	536

	AM	IP	PM
-	0	0	0
7022_7020	1511	1584	1566

	AM	IP	PM
	0	0	0
	1511	1584	1566

	AM	IP	PM
4523_4280	1011	1109	1155
4523_4280	1043	1104	1066

	AM	IP	PM
	1209	1075	1152
	1311	1232	1283

	AM	IP	PM
4228_4270	145	110	204
4228_4270	303	157	477

	AM	IP	PM
4270_4228	300	208	234
4270_4228	346	182	201

Appendix D – Low Growth Scenario Scheme Effect

Figure D-1 2022 Scheme Effect Low Growth Scenario Option 1B Southern Bypass

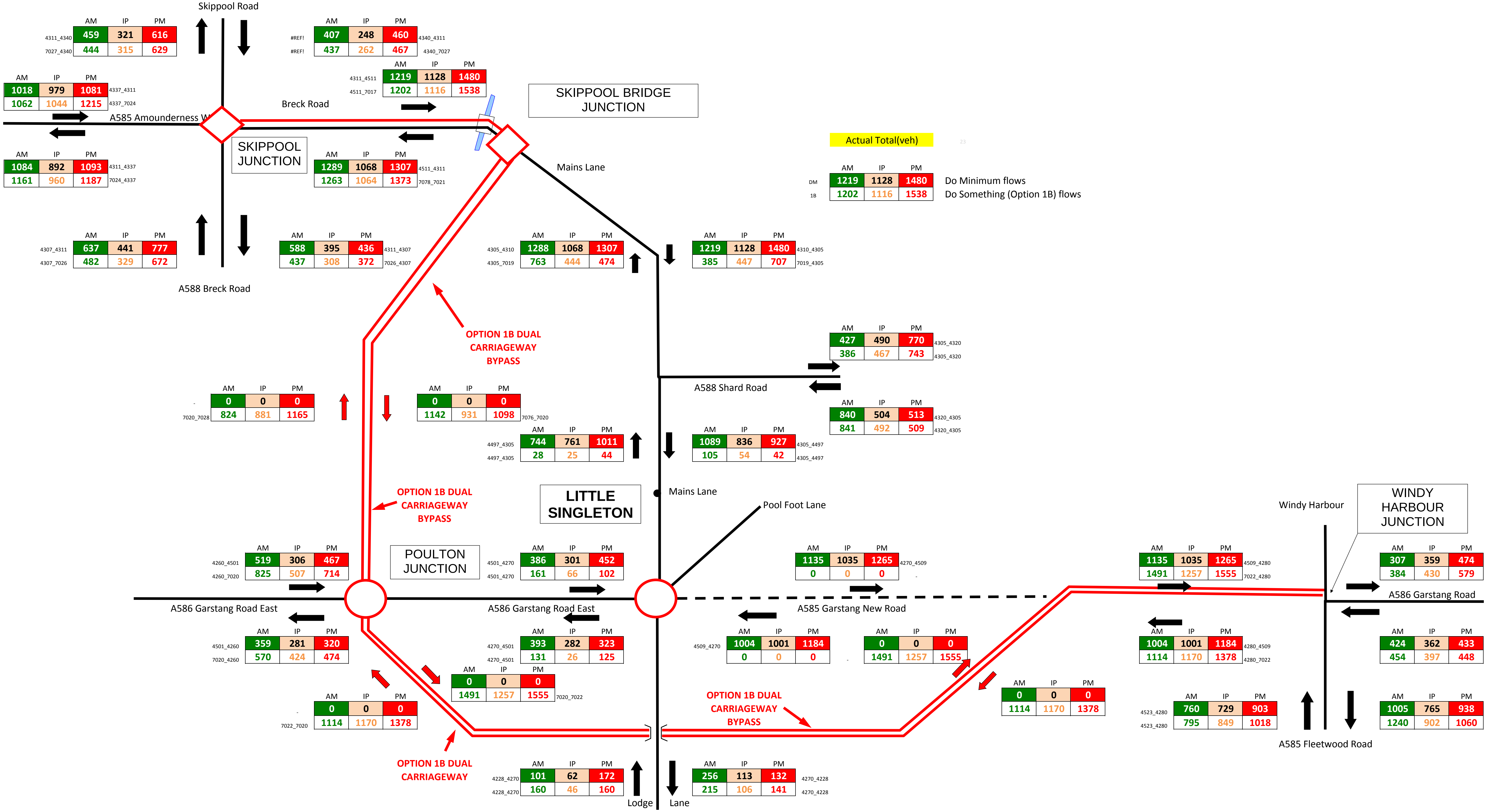


Figure D-3 2051 Scheme Effect Low Growth Scenario Option 1B Southern Bypass

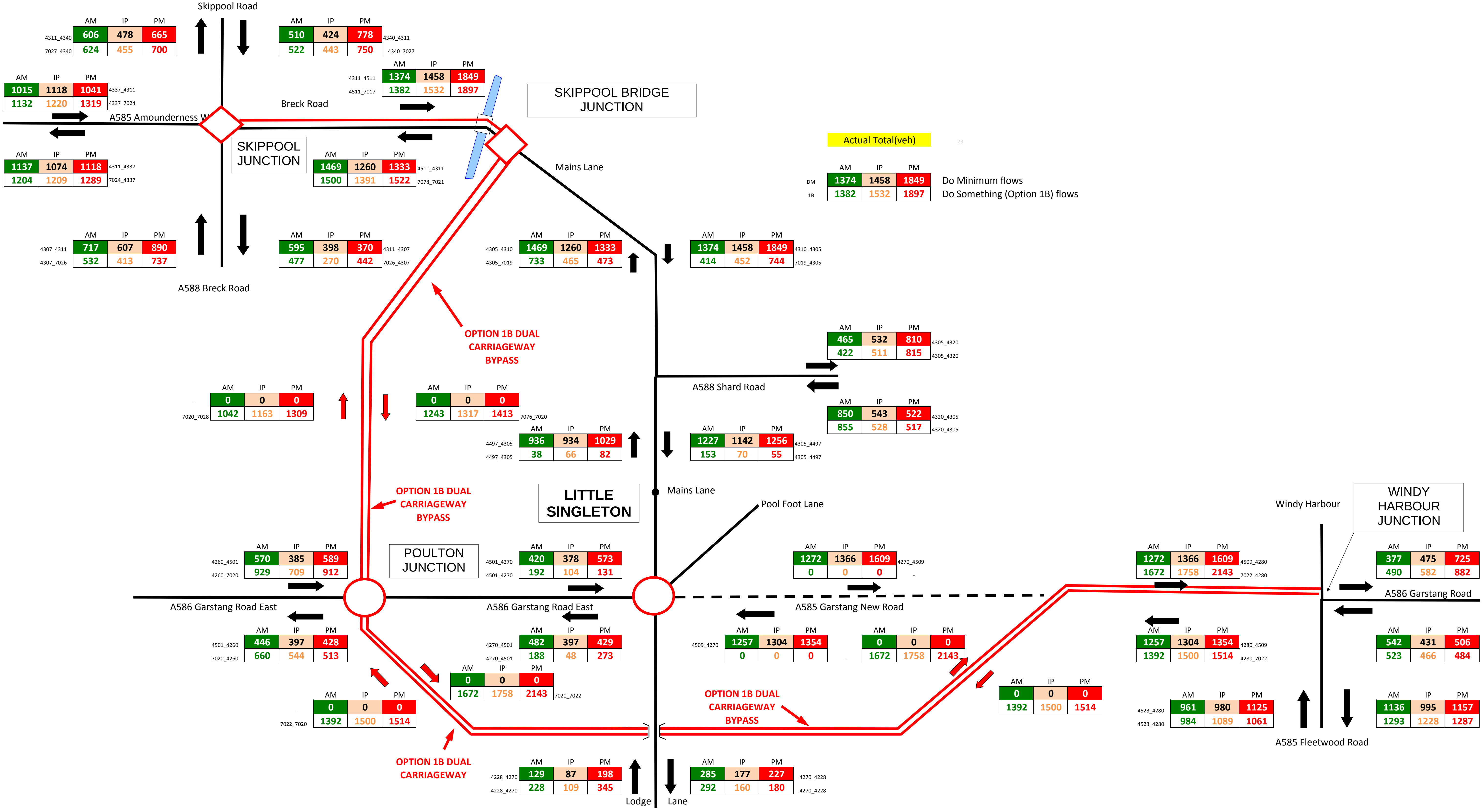
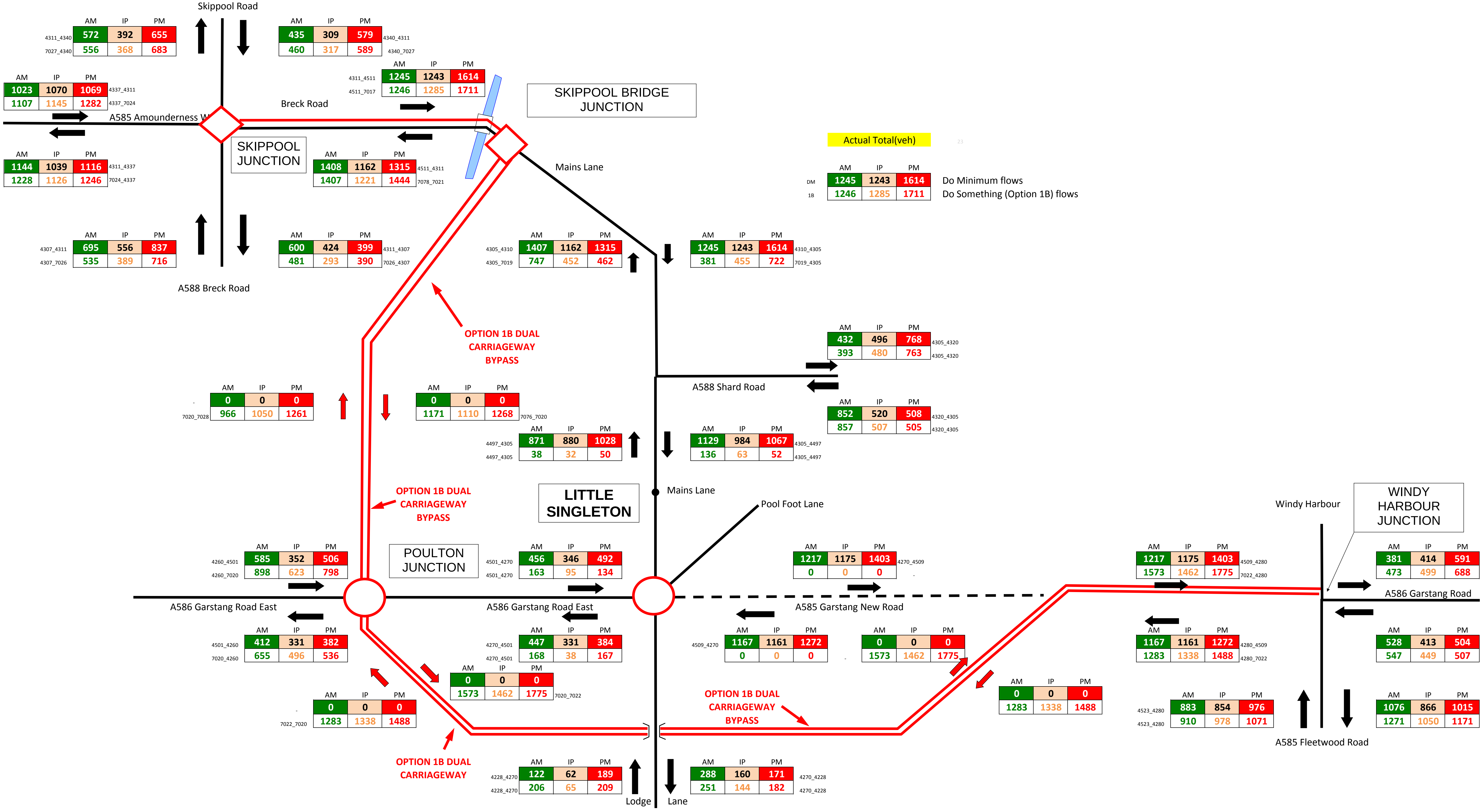


Figure D-2 2037 Scheme Effect Low Growth Scenario Option 1B Southern Bypass



Appendix E – Optimistic Growth Scenario Scheme Effect

Figure E-1 2022 Scheme Effect Optimistic Growth Scenario Option 1B Southern Bypass

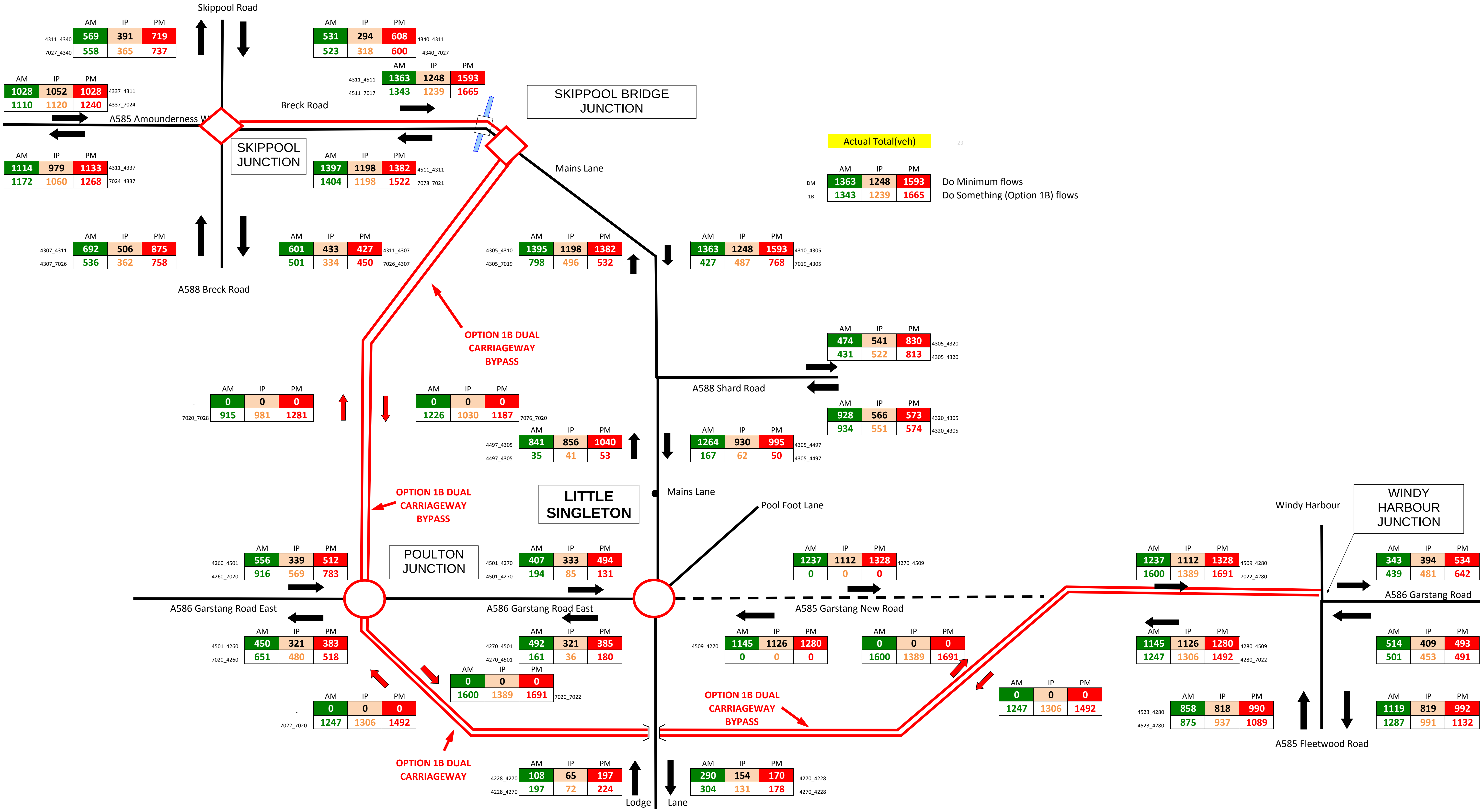


Figure E-2 2037 Scheme Effect Optimistic Growth Scenario Option 1B Southern Bypass

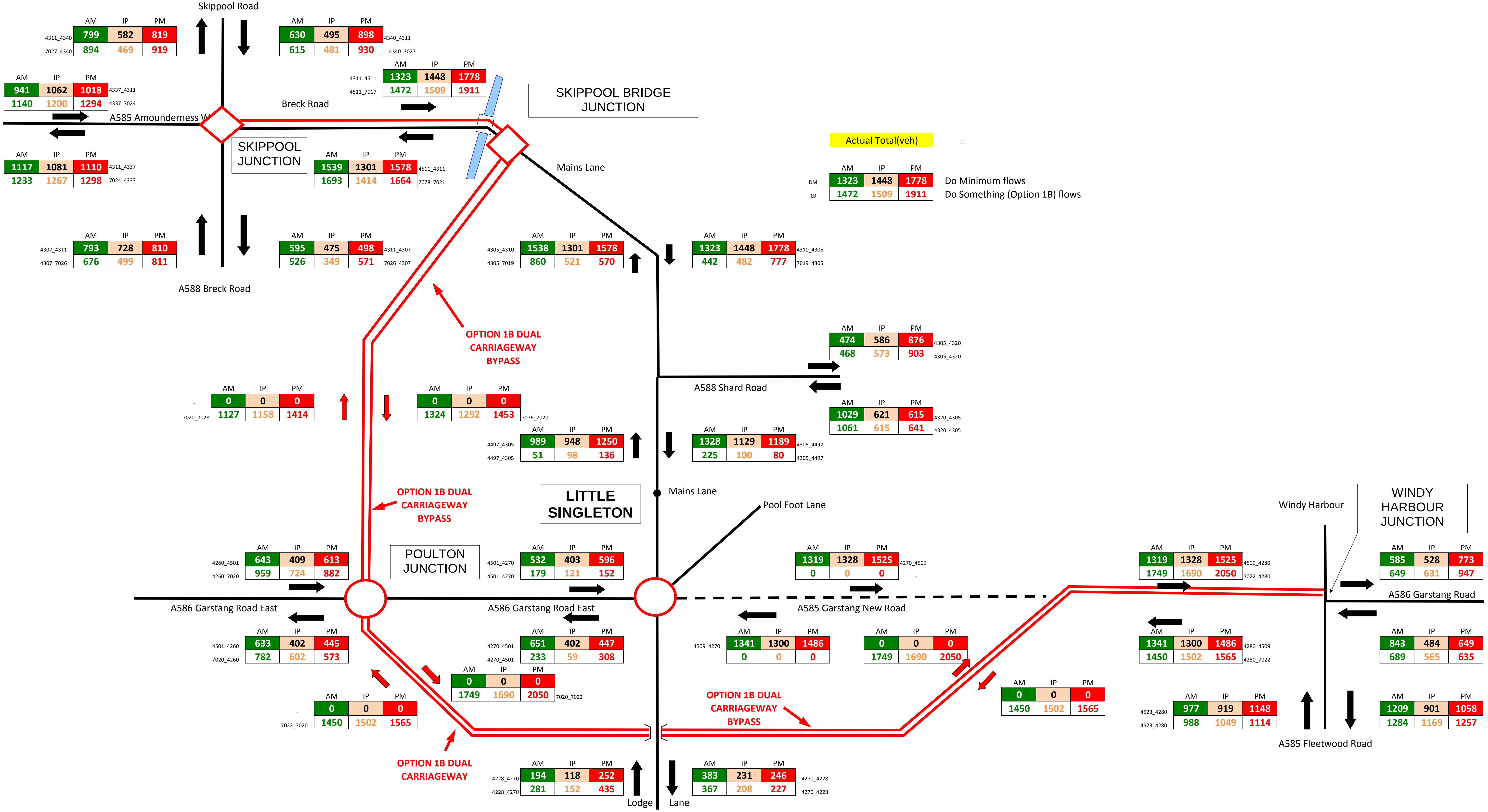
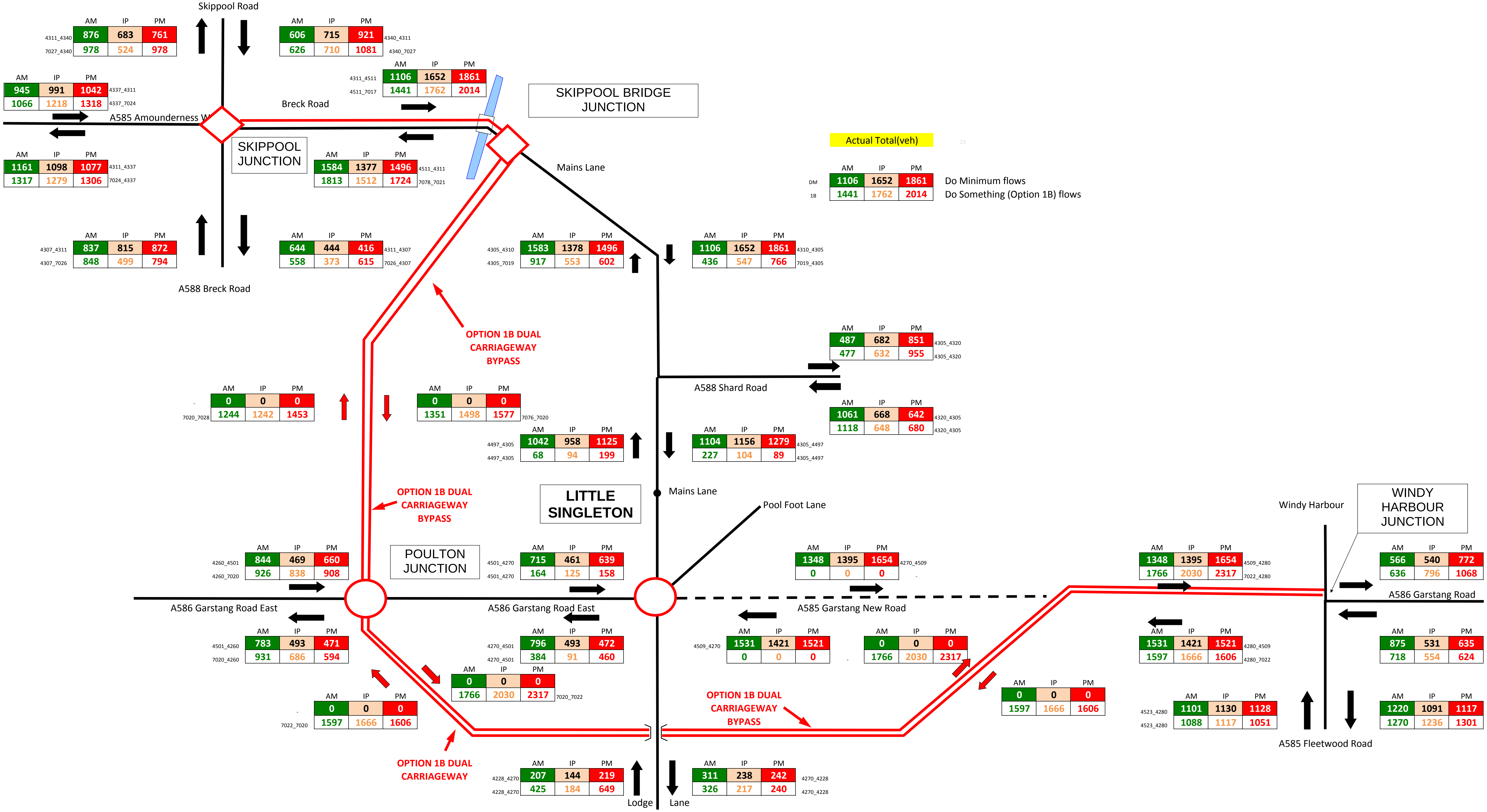


Figure E-3 2051 Scheme Effect Optimistic Growth Scenario Option 1B Southern Bypass



Actual Total(veh)

	AM	IP	PM	
DM	1106	1652	1861	Do Minimum flows
1B	1441	1762	2014	Do Something (Option 1B) flows

	AM	IP	PM
4311_4340	876	683	761
7027_4340	978	524	978

AM	IP	PM	
606	715	921	4340_4311
626	710	1081	4340_7027

	AM	IP	PM
4311_4511	1106	1652	1861
4511_7017	1441	1762	2014

AM	IP	PM	
945	991	1042	4337_4311
1066	1218	1318	4337_7024

AM	IP	PM	
1161	1098	1077	4311_4337
1317	1279	1306	7024_4337

AM	IP	PM	
1584	1377	1496	4511_4311
1813	1512	1724	7078_7021

	AM	IP	PM
4307_4311	837	815	872
4307_7026	848	499	794

AM	IP	PM	
644	444	416	4311_4307
558	373	615	7026_4307

	AM	IP	PM
4305_4310	1583	1378	1496
4305_7019	917	553	602

AM	IP	PM	
1106	1652	1861	4310_4305
436	547	766	7019_4305

AM	IP	PM	
487	682	851	4305_4320
477	632	955	4305_4320

AM	IP	PM	
1061	668	642	4320_4305
1118	648	680	4320_4305

	AM	IP	PM
-	0	0	0
7020_7028	1244	1242	1453

AM	IP	PM	
0	0	0	
1351	1498	1577	7076_7020

	AM	IP	PM
4497_4305	1042	958	1125
4497_4305	68	94	199

AM	IP	PM	
1104	1156	1279	4305_4497
227	104	89	4305_4497

	AM	IP	PM
4260_4501	844	469	660
4260_7020	926	838	908

	AM	IP	PM
4501_4270	715	461	639
4501_4270	164	125	158

AM	IP	PM	
1348	1395	1654	4270_4509
0	0	0	-

AM	IP	PM	
1348	1395	1654	4509_4280
1766	2030	2317	7022_4280

AM	IP	PM
566	540	772
636	796	1068

	AM	IP	PM
4501_4260	783	493	471
7020_4260	931	686	594

	AM	IP	PM
4270_4501	796	493	472
4270_4501	384	91	460

AM	IP	PM	
0	0	0	
1766	2030	2317	7020_7022

	AM	IP	PM
-	0	0	0
7022_7020	1597	1666	1606

	AM	IP	PM
4509_4270	1531	1421	1521
	0	0	0

	AM	IP	PM
	0	0	0
-	1766	2030	2317

AM	IP	PM
0	0	0
1597	1666	1606

AM	IP	PM	
1531	1421	1521	4280_4509
1597	1666	1606	4280_7022

AM	IP	PM
875	531	635
718	554	624

	AM	IP	PM
4523_4280	1101	1130	1128
4523_4280	1088	1117	1051

AM	IP	PM
1220	1091	1117
1270	1236	1301

	AM	IP	PM
4228_4270	207	144	219
4228_4270	425	184	649

AM	IP	PM	
311	238	242	4270_4228
326	217	240	4270_4228

Appendix F – Stage 3 Scheme Design Update Sensitivity Test

working on behalf of

Technical Note 23

Project	**A585 Windy Harbour to Skippool**	Date	30 AUGUST 2018
Subject	**Stage 3 Scheme Design Update Traffic Forecasting**	Ref	**HE548643-ARC-HDG-A585-TN-TR-3023** **Version 2.0**

Author Aref Alipour

Table of Contents

Prepared by	Aref Alipour	Date	29/08/2018
Checked by	Clare-Louise Douglas	Date	29/08/2018
Approved by	Colin Ferguson	Date	29/08/2018

Revision Status	Amendments	Date
1.0	Initial draft for comment	02/08/2018
2.0	Second issue for acceptance	30/08/2018

1 Introduction

1.1 Overview

1.1.1 The 4.5km section of the A585 between Windy Harbour junction and Skippool junction is a bottle-neck, affecting people's journeys between the M55 and the northern part of the Fylde peninsula as well as contributing to severance across the A585 between the Little Singleton and Skippool junctions.

1.1.2 In October 2017 Highways England announced Option 1, a southern bypass to the south of the current route for improving the A585 between Windy Harbour and Skippool as the preferred route for the scheme.

1.2 Purpose of this Technical Note

1.2.1 The purpose of this Technical Note is to set out the scheme's revised Stage 3 traffic forecasting results following an update to the Stage 3 scheme design.

1.2.2 The initial Stage 3 scheme design was based on the Stage 2 scheme design. The Stage 3 Traffic Operational Report [HE548643-ARC-GEN-A585-RP-D-3065], which outlines the traffic operational appraisal undertaken in Stage 3, revealed some design issues with the proposed scheme junctions identified at Stage 2. The following recommendations for Stage 3 include:

- Poulton junction – Long queues on the side roads (A586 Garstang Road) were observed in the Paramics model, due to the large volume of traffic through the junction, which was in roundabout form. This was causing significant delays to the side road. It was recommended that the design of the Poulton junction was re-visited and improved during Stage 3.
- Skippool Bridge junction – Long queues were observed on the Mains Lane approach to the signalised Skippool Bridge junction. These queues were observed to block back across the Old Mains Lane side road and required a high green time allocation to clear them, decreasing the operational efficiency of the junction as a result. It was recommended that a longer multi-lane approach for traffic travelling westbound onto the bypass was included in Stage 3 designs.
- Skippool junction – It was observed that straight ahead/right turning traffic on the Breck Road and Skippool Road approaches to the signalised Skippool junction was blocking left turning traffic from entering the segregated left turn lanes. This was causing delays and decreasing the operational efficiency of the junction. It was recommended that the multi-lane approaches on each arm were extended where possible to minimise the issue.

1.2.3 In addition to the above Stage 3 design changes the scheme design at the start of Stage 3 included a roundabout at Little Singleton. This was changed during Stage 3 to a revised signalised junction which includes a Q-turn facility for bus services.

1.2.4 The operational modelling assumes no scheme at the Norcross junction is in place in the design year for the A585 Windy Harbour to Skippool scheme. Inclusion of the A585 Norcross scheme would require a separate assessment to determine its impact.

1.2.5 Following the revisions to Stage 3 scheme design the traffic operational assessment has highlighted no significant issues with the revised Stage 3 Preliminary Design.

1.2.6 The updated Stage 3 A585 Windy Harbour to Skippool Preliminary Scheme Design drawings can be referred to in Appendix A.

2 Forecast Network Development

2.1 Without Scheme Scenario

2.1.1 The specification of the Without Scheme scenario followed the guidance provided in TAG Unit M4 (Section 7.4). The Without Scheme Scenario forecast network supply assumptions remain unchanged from the initial Stage 3 scheme forecasts as reported in the Stage 3 Transport Forecasting Package [HE548643-ARC-TTM-A585-RP-ZM-3144].

2.2 With Scheme Scenario

2.2.1 The proposed updated Stage 3 A585 Windy Harbour to Skippool scheme was added to the forecast year Without Scheme networks to create the With Scheme scenario for each forecast year.

2.2.2 The Stage 3 A585 Windy Harbour to Skippool updated scheme drawings showing the preferred route of the With Scheme Scenario is presented in Appendix A.

3 Model Convergence

3.1 Variable Demand Model Convergence

3.1.1 The scheme's Variable Demand Model (VDM) convergence results are presented in Table 3-1 for the Core Scenario. All the forecasts achieve the TAG recommended convergence targets i.e. gap value of 0.2% or lower.

Table 3-1: Core Scenario VDM Convergence

Option	Year	Iterations	GAP
Without Scheme	2022	8	0.08%
	2037	10	0.08%
	2051	9	0.15%
With Scheme	2022	8	0.08%
	2037	10	0.07%
	2051	12	0.12%

3.1.2 The scheme's VDM convergence results are presented in Table 3-2 for the Optimistic Growth Scenario. All the forecasts achieve the TAG recommended convergence targets i.e. gap value of 0.2% or lower.

Table 3-2: Optimistic Growth Scenario VDM Convergence

Option	Year	Iterations	GAP
Without Scheme	2022	8	0.08%
	2037	10	0.07%
	2051	9	0.18%
With Scheme	2022	8	0.10%
	2037	10	0.07%
	2051	10	0.15%

3.2 Highway Assignment Model Convergence

3.2.1 The scheme's highway assignment model convergence results are presented in Table 3-3 and for the Core Scenario. All the forecasts achieve the TAG recommended convergence targets i.e. gap value of 0.1% or lower.

Table 3-3: Core Scenario Without Scheme Highway Assignment Model Convergence

Time period	Year	Assignment Simulation Loops	% link Flows <1% Change	% Delays <1% change	% GAP
AM	2022	39	98.5	99.0	0.005
	2037	53	98.8	99.1	0.006
	2051	43	98.4	98.4	0.034
IP	2022	22	99.0	99.7	0.002
	2037	27	98.7	99.4	0.008
	2051	49	98.0	98.8	0.022
PM	2022	37	98.5	99.1	0.006
	2037	39	98.6	98.3	0.011
	2051	54	98.7	98.7	0.010

Table 3-4: Core Scenario With Scheme Highway Assignment Model Convergence

Time period	Year	Assignment Simulation Loops	% link Flows <1% Change	% Delays <1% change	% GAP
AM	2022	33	98.6	98.9	0.005
	2037	57	98.3	98.9	0.010
	2051	43	98.4	98.3	0.019
IP	2022	29	98.7	99.8	0.002
	2037	27	98.8	99.5	0.008
	2051	44	98.8	99.1	0.007
PM	2022	38	98.9	99.5	0.005
	2037	44	98.6	98.7	0.013
	2051	55	98.8	98.5	0.009

3.2.2 The scheme’s highway assignment convergence results are presented in Table 3-5 and Table 3-6 for the Optimistic Growth Scenario. All the forecasts achieve the TAG recommended convergence targets i.e. gap value of 0.1% or lower.

Table 3-5: Optimistic Growth Scenario Without Scheme VDM Convergence

Time period	Year	Assignment Simulation Loops	% link Flows <1% Change	% Delays <1% change	% GAP
AM	2022	35	98.8	99.2	0.007
	2037	66	99.2	99.0	0.017
	2051	55	96.6	97.4	0.030
IP	2022	23	98.7	99.5	0.006
	2037	28	98.4	99.0	0.015
	2051	32	96.1	97.6	0.041
PM	2022	53	98.8	99.1	0.005
	2037	55	98.3	97.8	0.010
	2051	58	95.6	96.6	0.024

Table 3-6: Optimistic Growth Scenario With Scheme VDM Convergence

Time period	Year	Assignment Simulation Loops	% link Flows <1% Change	% Delays <1% change	% GAP
AM	2022	43	98.8	99.0	0.007
	2037	56	99.1	98.6	0.015
	2051	67	96.6	98.2	0.025
IP	2022	30	99.1	99.6	0.004
	2037	37	98.8	99.0	0.006
	2051	32	95.6	97.3	0.033
PM	2022	41	98.3	98.8	0.007
	2037	53	99.0	98.8	0.005
	2051	50	96.2	96.3	0.040

4 Traffic Forecasting Results

4.1 Overview

4.1.1 Equilibrium demand traffic forecasts (traffic model version VDM_06) for the Core Scenario and Optimistic Growth Scenario for the revised Stage 3 scheme design were prepared using a traffic model developed using SATURN Version 11.3.12W and the July 2017 V1.8 TAG Databook Values of Time (VoT) and Vehicle Operating Costs (VOC) for assignment of the forecast matrices onto the modelled highway network and DIADEM Version 5.0 for modelling the traffic redistribution effects in response to changes in travel cost using a variable demand approach. For further information regarding the preparation of the traffic forecasts for the scheme assessment please refer to the Stage 3 Transport Forecasting Package HE548643-ARC-TTM-A585-RP-ZM-3144.

4.2 Core Scenario Assignment Results

4.2.1 A summary of the Core Scenario traffic flow on the A585 from Windy Harbour junction to Skippool junction for the Without Scheme and With Scheme scenario is presented in Table 4-1 to Table 4-3 for the forecast years. The traffic on the new scheme links in with the scheme case and is compared against the existing A585 links in the Without Scheme case. A schematic showing further details of the traffic flows of the improvement scheme is contained in Appendix B. It can be seen that the most heavily trafficked section of the scheme is between the Little Singleton junction and the Windy Harbour junction. A reduction in flow is observed compared to the without scheme scenario between Skippool junction and Skippool Bridge junction representing the route choice road users have to access the Poulton Industrial estate via the scheme or via Breck Road. In addition as Mains Lane will continue to carry some residual traffic in the With Scheme Scenario there is a reduction in flow on the scheme between the Skippool Bridge junction and the Poulton junction compared to the A585 between Shard Road junction and Little Singleton junction in the Without Scheme scenario.

Table 4-1: Core Scenario Post-VDM Traffic Flows (in 2022) – Vehs/hr

Location	Without Scheme	With Scheme	% Diff
AM			
EB between Skippool Junction and Shard Road Junction	1302	1212	-7%
WB between Shard Road Junction and Skippool Junction	1329	1367	3%
EB between Shard Road Junction and Little Singleton Junction	1184	1005	-15%
WB between Little Singleton Junction and Shard Road Junction	779	857	10%
EB between Little Singleton Junction and Windy Harbour Junction	1189	1524	28%
WB between Windy Harbour Junction and Little Singleton Junction	1054	1137	8%
IP			
EB between Skippool Junction and Shard Road Junction	1182	1149	-3%
WB between Shard Road Junction and Skippool Junction	1133	1132	0%
EB between Shard Road Junction and Little Singleton Junction	880	887	1%
WB between Little Singleton Junction and Shard Road Junction	808	892	10%
EB between Little Singleton Junction and Windy Harbour Junction	1066	1289	21%
WB between Windy Harbour Junction and Little Singleton Junction	1063	1183	11%
PM			
EB between Skippool Junction and Shard Road Junction	1535	1584	3%
WB between Shard Road Junction and Skippool Junction	1353	1431	6%
EB between Shard Road Junction and Little Singleton Junction	955	1049	10%
WB between Little Singleton Junction and Shard Road Junction	1029	1197	16%
EB between Little Singleton Junction and Windy Harbour Junction	1292	1593	23%
WB between Windy Harbour Junction and Little Singleton Junction	1237	1419	15%

Table 4-2: Core Scenario Post-VDM Traffic Flows (in 2037) – Vehs/hr

Location	Without Scheme	With Scheme	% Diff
AM			
EB between Skippool Junction and Shard Road Junction	1355	1283	-5%
WB between Shard Road Junction and Skippool Junction	1488	1654	11%
EB between Shard Road Junction and Little Singleton Junction	1263	1034	-18%
WB between Little Singleton Junction and Shard Road Junction	939	1094	17%
EB between Little Singleton Junction and Windy Harbour Junction	1295	1654	28%
WB between Windy Harbour Junction and Little Singleton Junction	1257	1391	11%
IP			
EB between Skippool Junction and Shard Road Junction	1373	1364	-1%
WB between Shard Road Junction and Skippool Junction	1269	1386	9%
EB between Shard Road Junction and Little Singleton Junction	1070	1061	-1%
WB between Little Singleton Junction and Shard Road Junction	942	1115	18%
EB between Little Singleton Junction and Windy Harbour Junction	1268	1583	25%
WB between Windy Harbour Junction and Little Singleton Junction	1244	1409	13%
PM			
EB between Skippool Junction and Shard Road Junction	1698	1871	10%
WB between Shard Road Junction and Skippool Junction	1385	1560	13%
EB between Shard Road Junction and Little Singleton Junction	1121	1257	12%
WB between Little Singleton Junction and Shard Road Junction	1071	1287	20%
EB between Little Singleton Junction and Windy Harbour Junction	1446	1843	27%
WB between Windy Harbour Junction and Little Singleton Junction	1356	1574	16%

Table 4-3: Core Scenario Post-VDM Traffic Flows (in 2051) – Vehs/hr

Location	Without Scheme	With Scheme	% Diff
AM			
EB between Skippool Junction and Shard Road Junction	1341	1399	4%
WB between Shard Road Junction and Skippool Junction	1531	1617	6%
EB between Shard Road Junction and Little Singleton Junction	1206	1111	-8%
WB between Little Singleton Junction and Shard Road Junction	972	1093	12%
EB between Little Singleton Junction and Windy Harbour Junction	1428	1729	21%
WB between Windy Harbour Junction and Little Singleton Junction	1359	1524	12%
IP			
EB between Skippool Junction and Shard Road Junction	1585	1623	2%
WB between Shard Road Junction and Skippool Junction	1320	1468	11%
EB between Shard Road Junction and Little Singleton Junction	1148	1252	9%
WB between Little Singleton Junction and Shard Road Junction	934	1186	27%
EB between Little Singleton Junction and Windy Harbour Junction	1381	1903	38%
WB between Windy Harbour Junction and Little Singleton Junction	1365	1589	16%
PM			
EB between Skippool Junction and Shard Road Junction	1877	1930	3%
WB between Shard Road Junction and Skippool Junction	1466	1614	10%
EB between Shard Road Junction and Little Singleton Junction	1257	1293	3%
WB between Little Singleton Junction and Shard Road Junction	1119	1309	17%
EB between Little Singleton Junction and Windy Harbour Junction	1644	2153	31%
WB between Windy Harbour Junction and Little Singleton Junction	1451	1551	7%

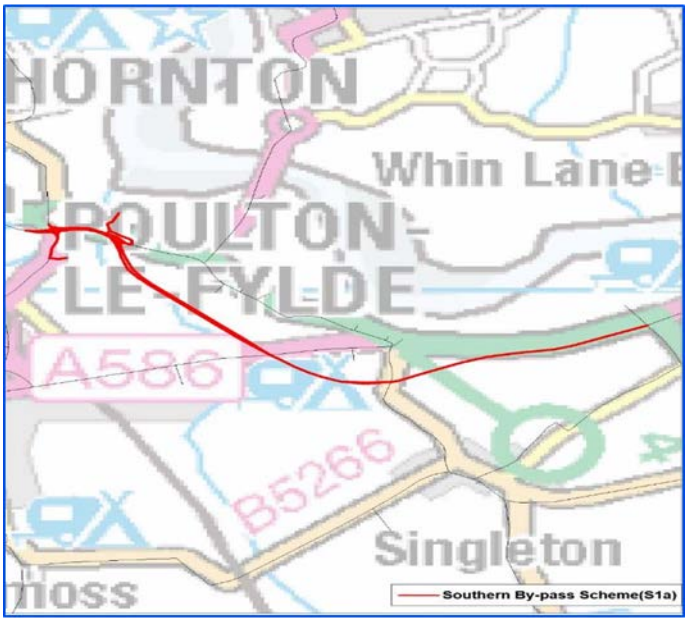
4.3 Core Scenario Journey Time Analysis

4.3.1 Information on Core Scenario travel times through the network was extracted for the Without Scheme (DM) and With Scheme (DS) scenario for the forecast years.

4.3.2 Figure 4-1 to Figure 4-2 present the journey time routes between the Windy Harbour junction and the Skippool junction. The journey time on the scheme (approximately 4.3 km) was analysed in order to ascertain the journey time saving that would result from the implementation of the scheme.

Figure 4-1: Journey Time Route along the A585 from Windy Harbour to Skippool junction - Without Scheme (DM)

Figure 4-2: Journey Time Route along the A585 from Windy Harbour to Skippool junction – With Scheme (DS)



4.3.3 The results of the Core Scenario journey time analysis on the A585 between Windy Harbour and the Skippool junction for the proposed scheme is presented in Table 4-4.

Table 4-4: Core Scenario Journey Time Savings

Forecast Year	Route Direction	AM Peak			Inter Peak			PM Peak		
		DM	DS	Diff (savings)	DM	DS	Diff (savings)	DM	DS	Diff (savings)
2022	A585 EB	05:37	03:41	01:56	05:27	03:37	01:40	05:36	03:47	01:49
	A585 WB	05:43	03:29	02:14	05:43	03:28	02:02	07:11	03:41	03:30
2037	A585 EB	05:46	03:31	02:15	05:52	03:23	02:29	06:00	03:33	02:27
	A585 WB	06:03	03:20	02:43	06:12	03:16	02:56	08:04	03:25	04:39
2051	A585 EB	06:13	03:40	02:33	08:05	03:33	04:32	07:19	03:49	03:30
	A585 WB	06:53	03:29	03:24	07:58	03:16	04:42	07:59	03:24	04:35

4.3.4 In all modelled time periods the journey times along the A585 scheme area, seem to be reasonable i.e. the Without Scheme being the slowest with a slight increase in journey time savings over the forecast period.

4.3.5 Within the proposed scheme, in the EB direction in the opening year, there is a journey time saving of around two minutes in the AM, IP and PM peaks. In the WB direction the journey time savings are in the range of 2 minutes for AM and IP and between 3-4 minutes for the PM peak. These journey time savings are maintained in 2037 and 2051 with similar journey time savings observed between model years. The maximum time saving of around 4.5 minutes is observed in the westbound direction in the PM peak design year and horizon year.

4.4 Optimistic Growth Scenario Assignment Results

4.4.1 A summary of the Optimistic Scenario traffic flow on the A585 from Windy Harbour junction to Skippool junction for the Without Scheme and With Scheme scenario is presented in Table 4-5 to Table 4-7 for the forecast years. The traffic on the new scheme links in with the scheme case and is compared against the existing A585 links in the Without Scheme case. A schematic showing further details of the traffic flows of the improvement scheme is contained in Appendix C.

4.4.2 There is a slight reduction in flow between future years on the initial two sections of the scheme eastbound in the morning peak between Skippool junction and Poulton junction. This is due to congestion arising from the over saturated A585 Norcross junction resulting in the re-routing of traffic away from the scheme.

4.4.3 As was the case with the Core Scenario it can be seen that the most heavily trafficked section of the scheme is between the Poulton junction and the Windy Harbour junction. A reduction in flow is observed compared to the without scheme scenario between Skippool junction and Skippool Bridge junction representing the route choice road users have to access the Poulton Industrial estate via the scheme or via Breck Road. In addition as Mains Lane will continue to carry some residual traffic in the With Scheme Scenario there is a reduction in flow on the scheme between the Skippool Bridge junction and the Poulton junction compared to the A585 between Shard Road junction and Little Singleton junction in the Without Scheme scenario.

Table 4-5: Optimistic Growth Scenario Post-VDM Traffic Flows (in 2022) – Vehs/hr

Location	Without Scheme	With Scheme	% Diff
AM			
EB between Skippool Junction and Shard Road Junction	1363	1267	-7%
WB between Shard Road Junction and Skippool Junction	1397	1427	2%
EB between Shard Road Junction and Little Singleton Junction	1264	1034	-18%
WB between Little Singleton Junction and Shard Road Junction	841	892	6%
EB between Little Singleton Junction and Windy Harbour Junction	1237	1581	28%
WB between Windy Harbour Junction and Little Singleton Junction	1145	1245	9%
IP			
EB between Skippool Junction and Shard Road Junction	1248	1221	-2%
WB between Shard Road Junction and Skippool Junction	1198	1184	-1%
EB between Shard Road Junction and Little Singleton Junction	930	936	1%
WB between Little Singleton Junction and Shard Road Junction	856	918	7%
EB between Little Singleton Junction and Windy Harbour Junction	1112	1367	23%
WB between Windy Harbour Junction and Little Singleton Junction	1126	1257	12%
PM			
EB between Skippool Junction and Shard Road Junction	1593	1642	3%
WB between Shard Road Junction and Skippool Junction	1382	1540	11%
EB between Shard Road Junction and Little Singleton Junction	995	1045	5%
WB between Little Singleton Junction and Shard Road Junction	1040	1250	20%
EB between Little Singleton Junction and Windy Harbour Junction	1328	1704	28%
WB between Windy Harbour Junction and Little Singleton Junction	1280	1511	18%

Table 4-6: Optimistic Growth Scenario Post-VDM Traffic Flows (in 2037) – Vehs/hr

Location	Without Scheme	With Scheme	% Diff
AM			
EB between Skippool Junction and Shard Road Junction	1323	1318	0%
WB between Shard Road Junction and Skippool Junction	1539	1701	11%
EB between Shard Road Junction and Little Singleton Junction	1328	1023	-23%
WB between Little Singleton Junction and Shard Road Junction	989	1096	11%
EB between Little Singleton Junction and Windy Harbour Junction	1319	1699	29%
WB between Windy Harbour Junction and Little Singleton Junction	1341	1543	15%
IP			
EB between Skippool Junction and Shard Road Junction	1448	1442	0%
WB between Shard Road Junction and Skippool Junction	1301	1401	8%
EB between Shard Road Junction and Little Singleton Junction	1129	1109	-2%
WB between Little Singleton Junction and Shard Road Junction	948	1120	18%
EB between Little Singleton Junction and Windy Harbour Junction	1328	1669	26%
WB between Windy Harbour Junction and Little Singleton Junction	1300	1506	16%
PM			
EB between Skippool Junction and Shard Road Junction	1778	1867	5%
WB between Shard Road Junction and Skippool Junction	1578	1661	5%
EB between Shard Road Junction and Little Singleton Junction	1189	1259	6%
WB between Little Singleton Junction and Shard Road Junction	1250	1320	6%
EB between Little Singleton Junction and Windy Harbour Junction	1525	2015	32%
WB between Windy Harbour Junction and Little Singleton Junction	1486	1627	9%

Table 4-7: Optimistic Growth Scenario Post-VDM Traffic Flows (in 2051) – Vehs/hr

Location	Without Scheme	With Scheme	% Diff
AM			
EB between Skippool Junction and Shard Road Junction	1106	1235	12%
WB between Shard Road Junction and Skippool Junction	1584	1743	10%
EB between Shard Road Junction and Little Singleton Junction	1104	994	-10%
WB between Little Singleton Junction and Shard Road Junction	1042	1124	8%
EB between Little Singleton Junction and Windy Harbour Junction	1348	1731	28%
WB between Windy Harbour Junction and Little Singleton Junction	1531	1638	7%
IP			
EB between Skippool Junction and Shard Road Junction	1652	1699	3%
WB between Shard Road Junction and Skippool Junction	1377	1508	9%
EB between Shard Road Junction and Little Singleton Junction	1156	1311	13%
WB between Little Singleton Junction and Shard Road Junction	958	1210	26%
EB between Little Singleton Junction and Windy Harbour Junction	1395	2011	44%
WB between Windy Harbour Junction and Little Singleton Junction	1421	1659	17%
PM			
EB between Skippool Junction and Shard Road Junction	1861	1946	5%
WB between Shard Road Junction and Skippool Junction	1496	1703	14%
EB between Shard Road Junction and Little Singleton Junction	1279	1347	5%
WB between Little Singleton Junction and Shard Road Junction	1125	1402	25%
EB between Little Singleton Junction and Windy Harbour Junction	1654	2278	38%
WB between Windy Harbour Junction and Little Singleton Junction	1521	1678	10%

4.5 Optimistic Growth Scenario Journey Time Analysis

4.5.1 The results of the Optimistic Growth scenario journey time analysis between the A585 Windy Harbour junction and Skippool junction comparing the Without Scheme (DM) and With Scheme (DS) scenario for the forecast years are presented in Table 4-8.

Table 4-8: Optimistic Growth Scenario Journey Time Savings

Forecast Year	Route Direction	AM Peak			Inter Peak			PM Peak		
		DM	DS	Diff (savings)	DM	DS	Diff (savings)	DM	DS	Diff (savings)
2022	A585 EB	05:46	03:35	02:11	05:31	03:33	01:58	05:41	03:26	02:15
	A585 WB	05:51	03:28	02:23	05:49	03:22	02:27	07:32	03:26	04:06
2037	A585 EB	05:42	03:29	02:13	06:13	03:24	02:49	06:16	03:35	02:41
	A585 WB	07:05	03:29	03:36	07:12	03:21	03:51	07:18	03:35	03:43
2051	A585 EB	05:38	03:35	02:03	08:44	03:38	05:06	07:03	04:00	03:03
	A585 WB	09:14	05:05	04:09	08:22	03:43	04:39	08:46	03:49	04:57

4.5.2 Compared with the Core Scenario, the modelled journey times in the Optimistic Growth scenario are higher in both directions.

4.5.3 The journey times along the A585 for the Optimistic Growth scenario seem to be reasonable (i.e. the Without Scheme being the slowest, with slight increase in journey time over the forecast period).

5 Assignment Results for Environmental Assessment

5.1.1 The environmental assessment is used to inform the design process and aid in the development of appropriate mitigation measures. The assessment takes place concurrently with the development of the scheme design, and this iterative process seeks to reduce the severity of the impacts and increase the potential for successful mitigation measures to be fully incorporated into the scheme.

5.1.2 Further details on the environmental assessment process, and the likely environmental effects resulting from the construction and/or operation of the scheme would be provided in the Environmental Assessment Report (EAR).

5.1.3 The EAR would present the details and findings of surveys and assessments undertaken to compile a comprehensive baseline to identify potential changes arising as a result of the proposed scheme, the level of impact and mitigation, where appropriate.

5.1.4 For further information regarding the preparation of the traffic forecasts for the environmental assessment please refer to the Stage 3 Transport Forecasting Package HE548643-ARC-TTM-A585-RP-ZM-3144.

5.1.5 As was the case for the initial scheme design there was some manual adjustments undertaken to the output traffic model speed data to the off-peak and modelled time period speeds (which are a component of the 18 hr AAWT speeds) in order to refine the speed data from the traffic model used in the environmental assessment at a few locations.

5.1.6 A manual adjustment was undertaken to a proportion of the traffic flow from the Garstang Road and Holts Lane forecast developments to/from zone 36. This was because the use of one of the zone 36 centroid connectors loading on to Higher Green in Poulton le Fylde was not representative of all of the typical route choice associated with the forecast development traffic in the zone.

6 Assignment Results for Operational Assessment

6.1.1 To ensure that proposed highway layouts are feasible in terms of network capacity and safe operation, further traffic modelling analyses were undertaken using a microsimulation model that covers the A585 from the Norcross Junction to the M55 Junction 3 and included the surrounding urban areas of Poulton-le-Fylde and Singleton.

6.1.2 For further information regarding the preparation of the traffic forecasts for the operational assessment please refer to the Stage 3 Transport Forecasting Package HE548643-ARC-TTM-A585-RP-ZM-3144.

7 Conclusion

7.1.1 The principal aim of these forecasts is to provide traffic data for appraising the economic, environmental and operational impact of the proposed revised Stage 3 A585 Windy Harbour to Skippool scheme.

7.1.2 It is observed that all forecast year models achieve the TAG recommended convergence targets, thereby indicating an adequate level of model convergence.

7.1.3 The impact of A585 Windy Harbour to Skippool scheme on the highway network is assessed by analysing the resulting changes in the travel conditions across the highway network with respect to changes in traffic flows and journey times and a reduction in delay for the scheme compared with the Without Scheme option.

7.1.4 A summary of the traffic flow on the A585 from Windy Harbour junction to Skippool junction shows that the scheme can accommodate more traffic flow in both directions in the forecast years.

7.1.5 In all modelled time periods the journey times along the A585 scheme area, seems to be reasonable i.e. the Without Scheme being the slowest with slight increases in journey time savings over the forecast period.

7.1.6 Travel time savings of between 2 and 4.5 minutes per journey are expected to be saved by road users due to the scheme.

Appendix A Stage 3 Updated Scheme Drawings

Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P01	S3	09/02/18	FIRST ISSUE DESIGN FIX 1	PA	TC	NH

NOTES

Client

highways england

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL
IMPROVEMENT SCHEME

Drawing title

MAINLINE
KEY PLAN

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	NTS	Date	13 JUL 2018
Drawn By	P.ABSALOM		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-SZ_ZZ_000-DR-D-3000

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P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

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NOTES

LEGEND:

VRS	— · — · —
	— - - — KD —
KERB	—
FOOTWAY	▇

⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
◒	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
◎	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
●	PUSH BUTTON TRAFFIC SIGNAL POST
●→	PRIMARY TRAFFIC SIGNAL POST
◕	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
●	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◉	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
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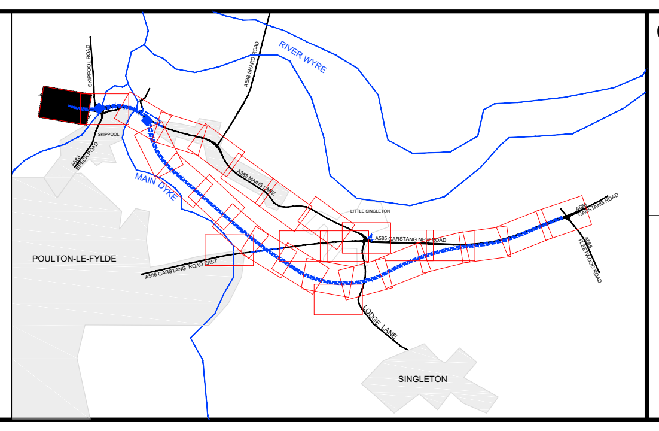
◑	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
●⇒	SECONDARY TRAFFIC SIGNAL POST



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ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project

A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title

GENERAL ARRANGEMENT SHEET 1 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number

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P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

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PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
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EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
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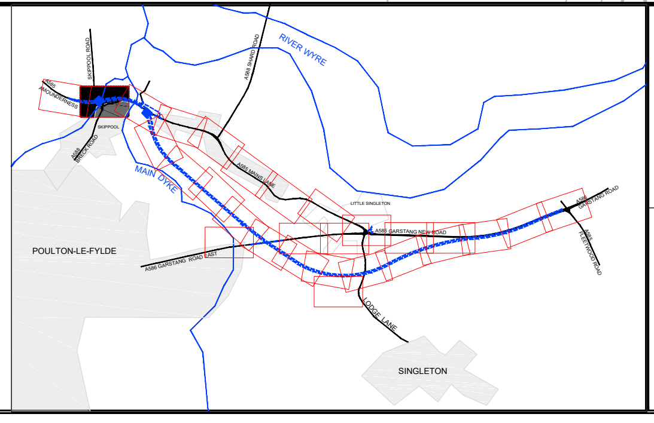

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Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT SHEET 2 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S1_ML_002-DR-D-3002

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Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

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NOTES

LEGEND:

VRS	— · — · —
KERB DRAINAGE	— - - — KD —
KERB	—
FOOTWAY	▇

⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
◒	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
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⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
●	PUSH BUTTON TRAFFIC SIGNAL POST
●→	PRIMARY TRAFFIC SIGNAL POST
◕	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
●	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◉	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
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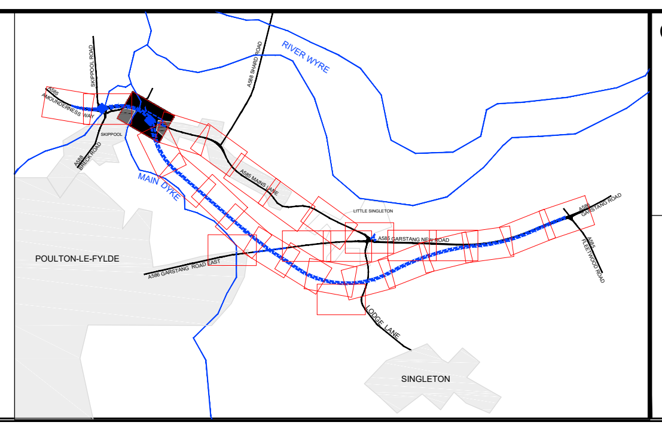
●→	SECONDARY TRAFFIC SIGNAL POST



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SHEET 3 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S2_ML_003-DR-D-3003

Print Date: 2018-07-20 16:11:30

File Path: C:\Sharepoint\ARCADIS\UA009921 - A585 Windy Harbour to Skippool - PCF Stage 3 - Dig_Eng_Gen\WIP - Drawings\HE548643-ARC-GEN-S1_ML001_DR-D-3000-3020-Option-1B GAs.dwg

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Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

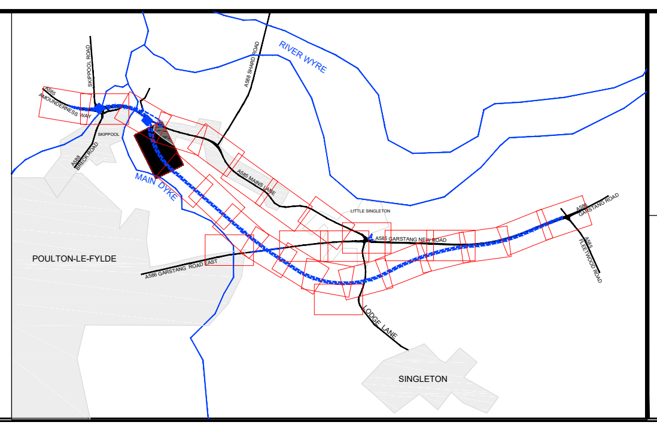
NOTES

LEGEND:

VRS
KD
KERB
FOOTWAY

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
PUSH BUTTON TRAFFIC SIGNAL POST
PRIMARY TRAFFIC SIGNAL POST

PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
SECONDARY TRAFFIC SIGNAL POST



Client

highways england

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT SHEET 4 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S3_ML_001-DR-D-3004

100mm on Original

Print Date: 2018-07-20 16:11:47

File Path: C:\Sharepoint\ARCADIS\UA009921 - A585 Windy Harbour to Skippool - PCF Stage 3 - Dig_Eng_Gen\WIP - Drawings\HE548643-ARC-GEN-S1_ML001_DR-D-3000-3020-Option-1B GAs.dwg

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Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

NOTES

LEGEND:

VRS
KD
KERB
FOOTWAY

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN

PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN

PUSH BUTTON TRAFFIC SIGNAL POST

PRIMARY TRAFFIC SIGNAL POST

PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN

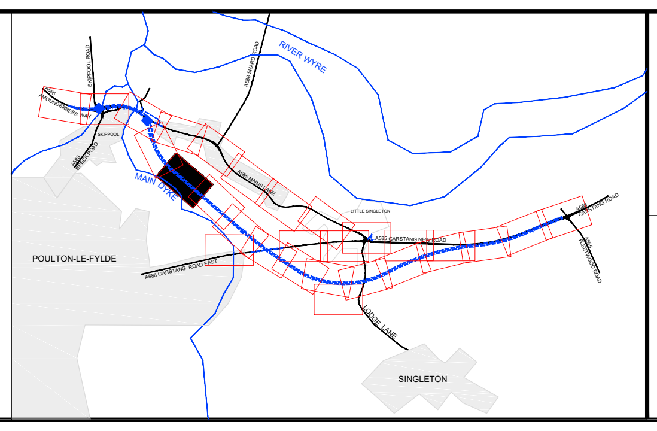
EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

SECONDARY TRAFFIC SIGNAL POST



Client

highways england

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT
SHEET 5 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S3_ML_002-DR-D-3005

100mm on Original

Print Date: 2018-07-20 16:12:04

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Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

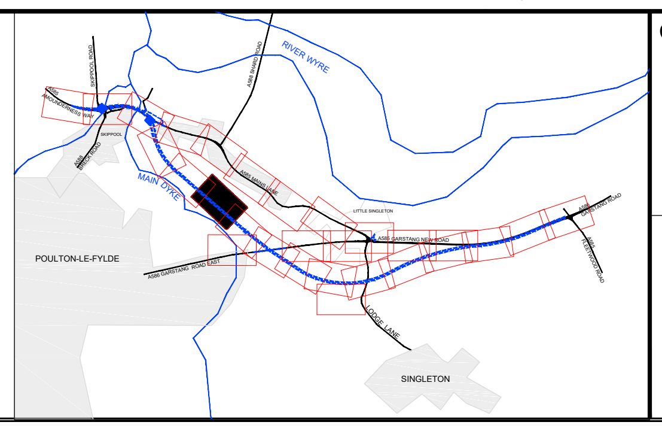
100mm on Original

NOTES

LEGEND:

VRS	— · — · —
	— - - KD —
KERB	—
FOOTWAY	▇

⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
◒	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
◎	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
◉	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
●	PUSH BUTTON TRAFFIC SIGNAL POST
●→	PRIMARY TRAFFIC SIGNAL POST
◕	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
◉	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◉	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
○	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◔	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
●→	SECONDARY TRAFFIC SIGNAL POST



Client

highways england

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT SHEET 6 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number | HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S3_ML_003-DR-D-3006

Print Date: 2018-07-20 16:12:23

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Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

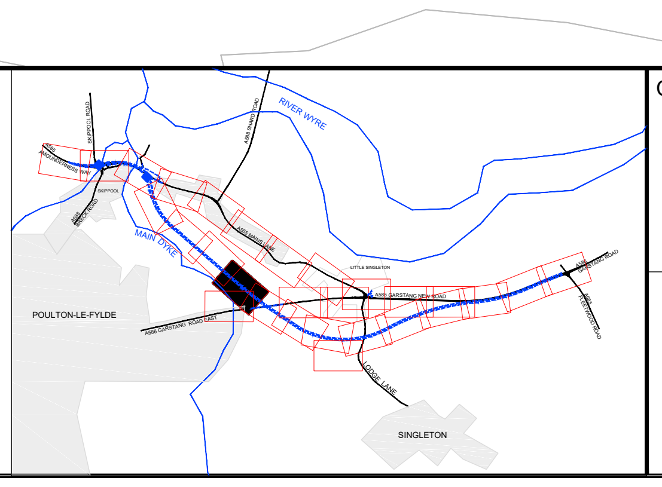
100mm on Original

NOTES

LEGEND:

VRS
KD
KERB
FOOTWAY

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
● PUSH BUTTON TRAFFIC SIGNAL POST
PRIMARY TRAFFIC SIGNAL POST
PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
SECONDARY TRAFFIC SIGNAL POST



Client

highways england

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT
SHEET 7 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S3_ML_004-DR-D-3007

Print Date: 2018-07-20 16:12:39

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Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

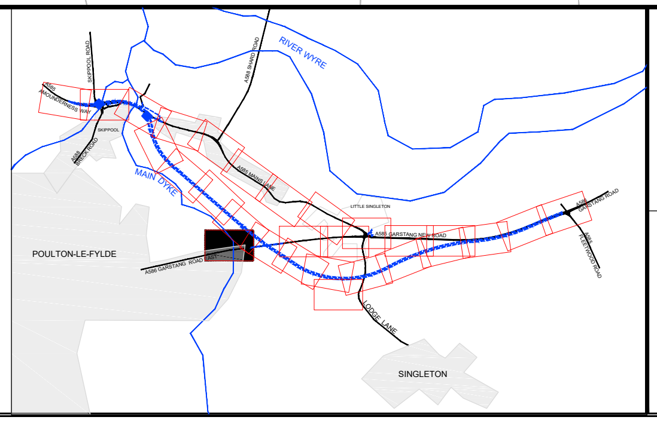
100mm on Original

NOTES

LEGEND:

VRS
KD
KERB
FOOTWAY

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
PUSH BUTTON TRAFFIC SIGNAL POST
PRIMARY TRAFFIC SIGNAL POST
PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
SECONDARY TRAFFIC SIGNAL POST



Client

highways england

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT SHEET 8 OF 20

Status: S3 - PRELIMINARY DESIGN
Revision: P2
Scale: 1:500@A1
Date: 13 JUL 18
Drawn By: L.FREITAS
Checked By: T.CHAUDHRY
Approved By: N.HENDERSON
Original Size: A1

Drawing number: HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S4_ML_001-DR-D-3008

Print Date: 2018-07-20 16:12:59

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Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

100mm on Original

NOTES

LEGEND:

VRS
KD
KERB
FOOTWAY

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN

PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN

● PUSH BUTTON TRAFFIC SIGNAL POST

PRIMARY TRAFFIC SIGNAL POST

PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN

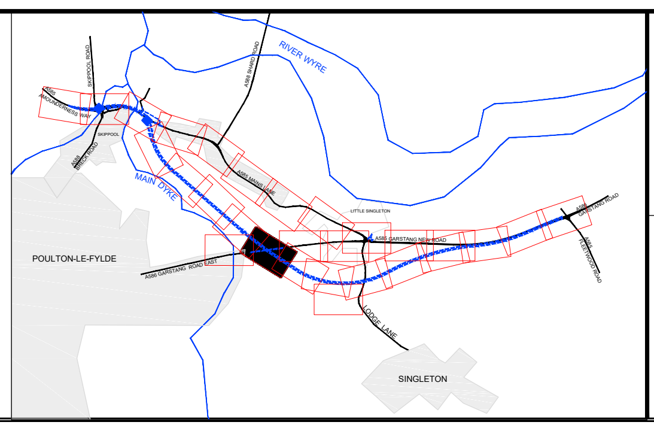
EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

SECONDARY TRAFFIC SIGNAL POST



Client

highways england

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Registered office:
Arcadis House
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London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT SHEET 9 OF 20

Status: S3 - PRELIMINARY DESIGN
Revision: P2
Scale: 1:500@A1
Date: 13 JUL 18
Drawn By: L.FREITAS
Checked By: T.CHAUDHRY
Approved By: N.HENDERSON
Original Size: A1
Drawing number: HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S4_ML_002-DR-D-3009

Print Date: 2018-07-20 16:13:20

File Path: C:\Sharepoint\ARCADIS\UA009921 - A585 Windy Harbour to Skippool - PCF Stage 3 - Dig_Eng_Gen\WIP - Drawings\HE548643-ARC-GEN-S1_ML001_DR-D-3000-3020-Option-1B GAs.dwg

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Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

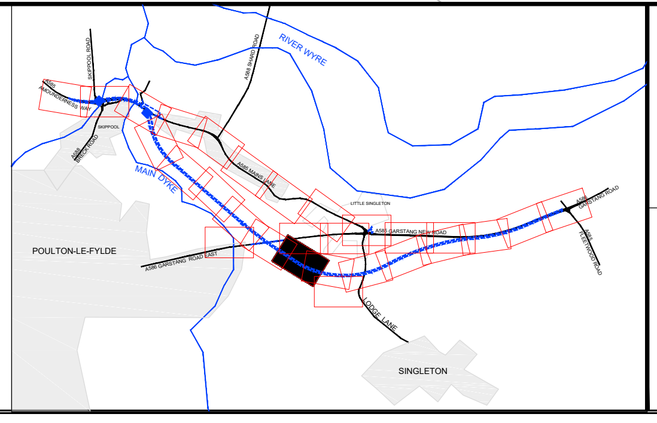
100mm on Original

NOTES

LEGEND:

VRS	— · — · —
	— - - — KD —
KERB	—
FOOTWAY	▆

⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
◒	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
○	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
●	PUSH BUTTON TRAFFIC SIGNAL POST
●→	PRIMARY TRAFFIC SIGNAL POST
◑	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
●	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◉	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
○	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◔	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
●⇥	SECONDARY TRAFFIC SIGNAL POST



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Coordinating office:
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10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT SHEET 10 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S5_ML_001-DR-D-3010

Print Date: 2018-07-20 16:13:39

File Path: C:\Sharepoint\ARCADIS\UA009921 - A585 Windy Harbour to Skippool - PCF Stage 3 - Dig_Eng_Gen\WIP - Drawings\HE548643-ARC-GEN-S1_ML001_DR-D-3000-3020-Option-1B GAs.dwg

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P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

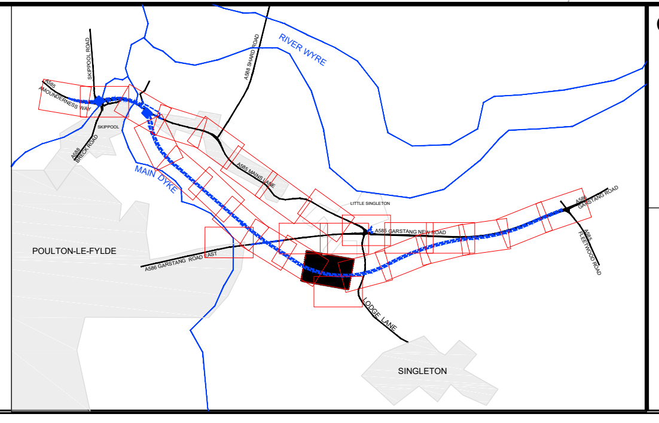
100mm on Original

NOTES

LEGEND:

VRS	— ᶻ — ᶻ — ᶻ —
	— - - — KD —
KERB	—
FOOTWAY	▇

⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
◒	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
◎	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
●	PUSH BUTTON TRAFFIC SIGNAL POST
●→	PRIMARY TRAFFIC SIGNAL POST
◕	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
●	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
●	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
○	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◑	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
●⇒	SECONDARY TRAFFIC SIGNAL POST



Client

highways england

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT SHEET 11 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S5_ML_002-DR-D-3011

Print Date: 2018-07-20 16:13:59

File Path: C:\Sharepoint\ARCADIS\UA009921 - A585 Windy Harbour to Skippool - PCF Stage 3 - Dig_Eng_Gen\WIP - Drawings\HE548643-ARC-GEN-S1_ML001_DR-D-3000-3020-Option-1B GAs.dwg

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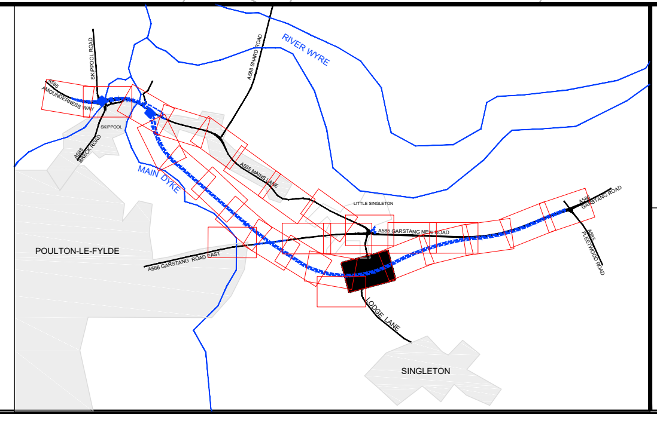
Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

NOTES

LEGEND:

VRS	— · — · —
KD	— - - — KD —
KERB	—
FOOTWAY	▆

⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
◒	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
◎	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
●	PUSH BUTTON TRAFFIC SIGNAL POST
●→	PRIMARY TRAFFIC SIGNAL POST
◐	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
●	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◉	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
○	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◐	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
●→	SECONDARY TRAFFIC SIGNAL POST



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N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT SHEET 12 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S5_ML_003-DR-D-3012

100mm on Original

Print Date: 2018-07-20 16:14:19

File Path: C:\Sharepoint\ARCADIS\UA009921 - A585 Windy Harbour to Skippool - PCF Stage 3 - Dig_Eng_Gen\WIP - Drawings\HE548643-ARC-GEN-S1_ML001_DR-D-3000-3020-Option-1B GAs.dwg

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Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

100mm on Original

NOTES

LEGEND:

VRS	— · — · —
KD	— - - — KD —
KERB	—
FOOTWAY	■

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN

PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN

● PUSH BUTTON TRAFFIC SIGNAL POST

PRIMARY TRAFFIC SIGNAL POST

PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN

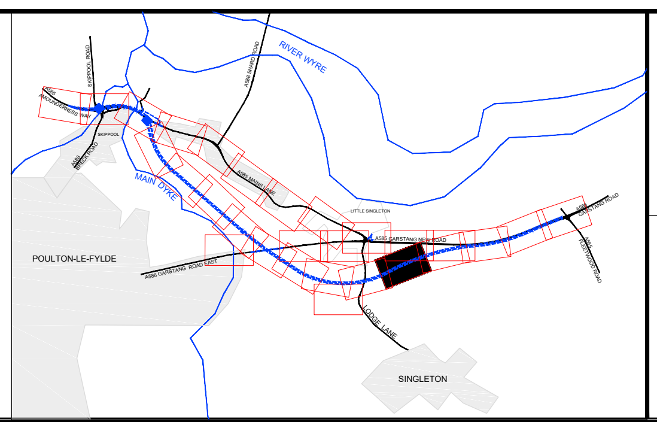
EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

SECONDARY TRAFFIC SIGNAL POST



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highways england

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
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London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT
SHEET 13 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S5_ML_004-DR-D-3013

Print Date: 2018-07-20 16:14:39

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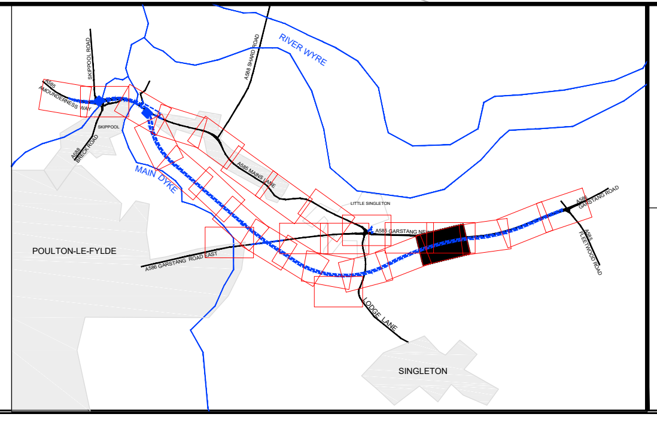
Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

100mm on Original

NOTES

LEGEND:

VRS	— — —
KD	— - - — KD —
KERB	—
FOOTWAY	▬
⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
◒	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
○	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
●	PUSH BUTTON TRAFFIC SIGNAL POST
●→	PRIMARY TRAFFIC SIGNAL POST
◕	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
●	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
●	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
○	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◑	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
●⇒	SECONDARY TRAFFIC SIGNAL POST



Client

highways england

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT SHEET 14 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S5_ML_005-DR-D-3014

Print Date: 2018-07-20 16:14:59

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Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

100mm on Original

NOTES

LEGEND:

VRS	
KD	
KERB	
FOOTWAY	▇

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN

PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN

● PUSH BUTTON TRAFFIC SIGNAL POST

●→ PRIMARY TRAFFIC SIGNAL POST

PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN

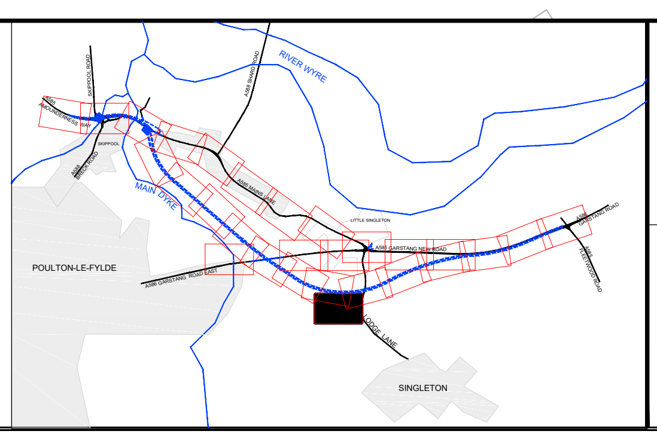
EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

●→ SECONDARY TRAFFIC SIGNAL POST



Client

highways england

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT
SHEET 19 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number | HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S5_ML_006-DR-D-3019

Print Date: 2018-07-20 16:15:16

File Path: C:\Sharepoint\ARCADIS\UA009921 - A585 Windy Harbour to Skippool - PCF Stage 3 - Dig_Eng_Gen\WIP - Drawings\HE548643-ARC-GEN-S1_ML001_DR-D-3000-3020-Option-1B GAs.dwg

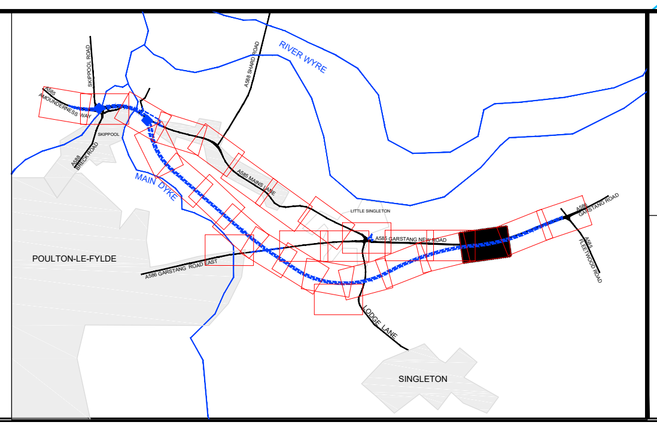
Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

NOTES

LEGEND:

VRS	— · — · —
	— - - — KD —
KERB	—
FOOTWAY	▨

⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
◒	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
○	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
●	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
●	PUSH BUTTON TRAFFIC SIGNAL POST
●→	PRIMARY TRAFFIC SIGNAL POST
◕	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
●	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◉	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
○	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◑	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
●⇒	SECONDARY TRAFFIC SIGNAL POST



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Coordinating office:
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Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT
SHEET 15 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S6_ML_001-DR-D-3015

100mm on Original

Print Date: 2018-07-20 16:15:32

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Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

100mm on Original

NOTES

LEGEND:

VRS
KD
KERB
FOOTWAY

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN

PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN

PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN

PUSH BUTTON TRAFFIC SIGNAL POST

PRIMARY TRAFFIC SIGNAL POST

PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN

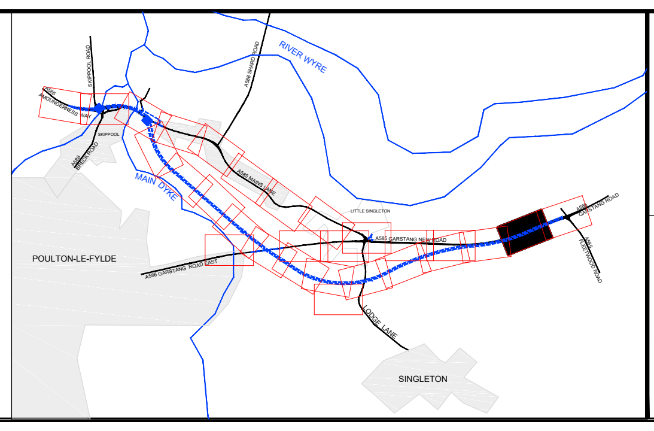
EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED

SECONDARY TRAFFIC SIGNAL POST



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Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT SHEET 16 OF 20

Status	S3 - PRELIMINARY DESIGN
Revision	P2
Scale	1:500@A1
Date	13 JUL 18
Drawn By	L.FREITAS
Checked By	T.CHAUDHRY
Approved By	N.HENDERSON
Original Size	A1
Drawing number (HE PIN | Originator | Volume | Location | Type | Role | Number)	HE548643-ARC-GEN-S6_ML_002-DR-D-3016

Print Date: 2018-07-20 16:15:49

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Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

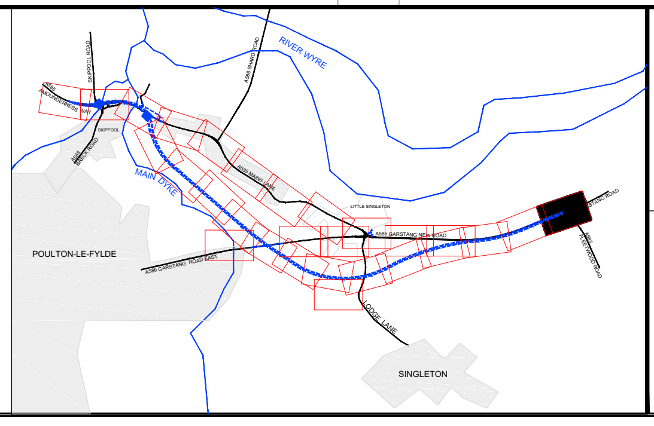
100mm on Original

NOTES

LEGEND:

VRS	— · — · —
KD	— - - — KD —
KERB	—
FOOTWAY	▨

⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
◒	PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
◎	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
⊛	PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
⊗	PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
●	PUSH BUTTON TRAFFIC SIGNAL POST
●→	PRIMARY TRAFFIC SIGNAL POST
◕	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
⊛	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
◉	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
○	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
⊖	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
●⇒	SECONDARY TRAFFIC SIGNAL POST



Client

highways england

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT SHEET 17 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S6_ML_003-DR-D-3017

Print Date: 2018-07-20 16:16:09

File Path: C:\Sharepoint\ARCADIS\UA009921 - A585 Windy Harbour to Skippool - PCF Stage 3 - Dig_Eng_Gen\WIP - Drawings\HE548643-ARC-GEN-S1_ML001_DR-D-3000-3020-Option-1B GAs.dwg

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Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

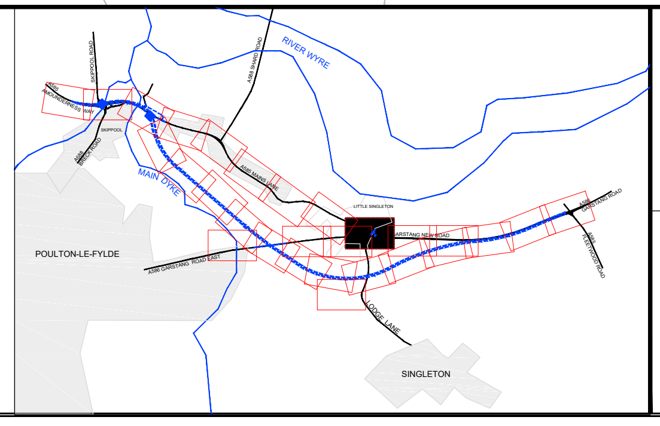
100mm on Original

NOTES

LEGEND:

VRS
KD
KERB
FOOTWAY

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN	PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.	EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN	EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN	EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
● PUSH BUTTON TRAFFIC SIGNAL POST	SECONDARY TRAFFIC SIGNAL POST
PRIMARY TRAFFIC SIGNAL POST	



Client

highways england

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34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT
SHEET 18 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S7_JN_001-DR-D-3018

Print Date: 2018-07-20 16:16:27

File Path: C:\Sharepoint\ARCADIS\UA009921 - A585 Windy Harbour to Skippool - PCF Stage 3 - Dig_Eng_Gen\WIP - Drawings\HE548643-ARC-GEN-S1_ML001_DR-D-3000-3020-Option-1B GAs.dwg

Rev	Status	Date	Description	Drawn	Chck'd	Apprv'd
P2	S3	13/07/18	PRELIMINARY DESIGN ISSUE	TC	PT	NH
P1	S3	09/02/18	FIRST ISSUE DESIGN FIX-1	LF	TC	NH

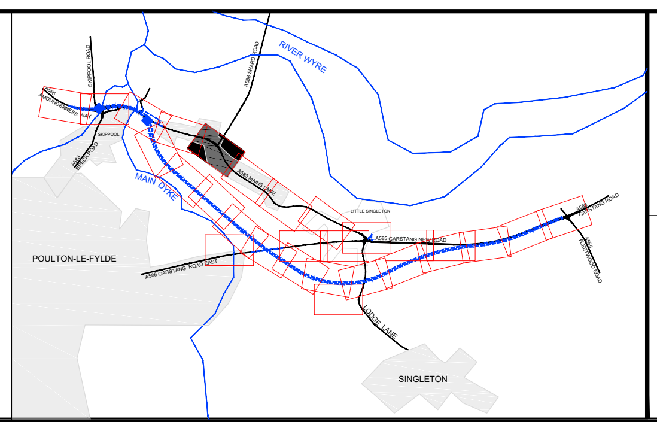
100mm on Original

NOTES

LEGEND:

VRS
KD
KERB
FOOTWAY

PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R3 60-120 DS NW 28KLM LED LANTERN
PROPOSED 5 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS MINI LUMA 1B R1 DS NW 12-30 2.6KLM LED LANTERN
PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R5 60-120 DS NW 20KLM LED LANTERN.
PROPOSED 12 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R6 60-120 DS NW 30KLM LED LANTERN
PROPOSED 12 METRE STEEL COLUMN WITH 1.0M PROJECTION BRACKET, PHILIPS LUMA 2 R4 60-120 DS NW 30KLM LED LANTERN
PUSH BUTTON TRAFFIC SIGNAL POST
PRIMARY TRAFFIC SIGNAL POST
PROPOSED 10 METRE STEEL COLUMN WITH 1.0 METRE PROJECTION BRACKET, PHILIPS LUMA 2 R2 60-120 DS NW 18KLM LED LANTERN
EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
EXISTING 10 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
EXISTING 12 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
EXISTING 8 METRE STEEL COLUMN WITH 1.25 METRE PROJECTION BRACKET, SIDE ENTRY LANTERN TO BE RETAINED
SECONDARY TRAFFIC SIGNAL POST



Client

highways england

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Arcadis House
34 York Way
London
N1 9AB

Coordinating office:
The Surrey Research Park
10 Medawar Road
Guildford GU2 7AR
Tel: 44 (0)1483 803 000

Project
A585 WINDY HARBOUR TO SKIPPOOL IMPROVEMENT SCHEME

Drawing title
GENERAL ARRANGEMENT SHEET 20 OF 20

Status	S3 - PRELIMINARY DESIGN	Revision	P2
Scale	1:500@A1	Date	13 JUL 18
Drawn By	L.FREITAS		
Checked By	T.CHAUDHRY		
Approved By	N.HENDERSON		
		Original Size	A1

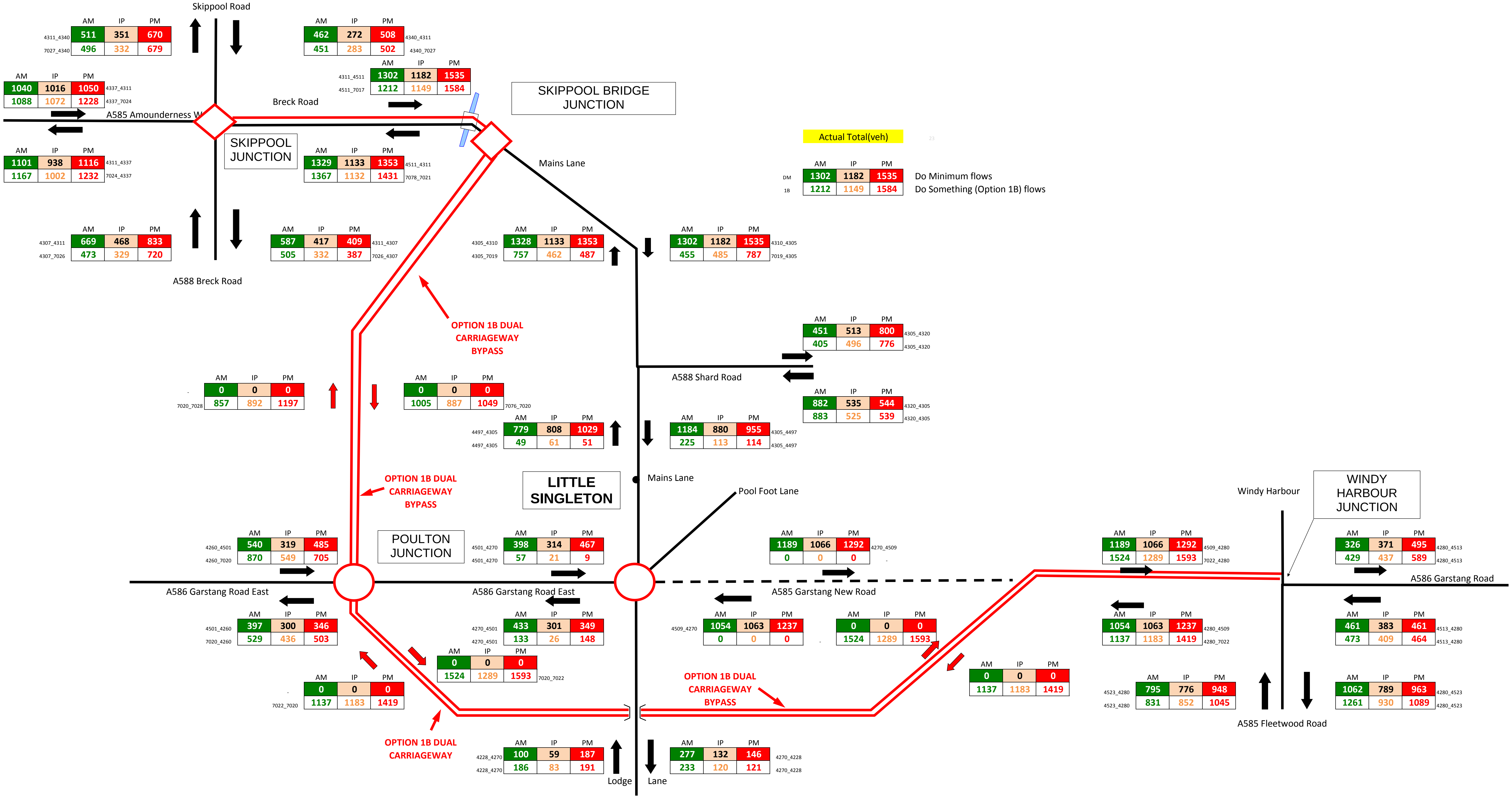
Drawing number HE PIN | Originator | Volume | Location | Type | Role | Number
HE548643-ARC-GEN-S8_DT_002-DR-D-3020

Print Date: 2018-07-20 16:16:44

File Path: C:\Sharepoint\ARCADIS\UA009921 - A585 Windy Harbour to Skippool - PCF Stage 3 - Dig_Eng_Gen\WIP - Drawings\HE548643-ARC-GEN-S1_ML001_DR-D-3000-3020-Option-1B GAs.dwg

Appendix B Core Scenario Scheme Effect

Scheme Effect Core Scenario 2022



Actual Total(veh)

	AM	IP	PM	
DM	1302	1182	1535	Do Minimum flows
1B	1212	1149	1584	Do Something (Option 1B) flows

	AM	IP	PM
4311_4340	511	351	670
7027_4340	496	332	679

	AM	IP	PM
4340_4311	462	272	508
4340_7027	451	283	502

	AM	IP	PM
4337_4311	1040	1016	1050
4337_7024	1088	1072	1228

	AM	IP	PM
4311_4511	1302	1182	1535
4511_7017	1212	1149	1584

	AM	IP	PM
4311_4337	1101	938	1116
7024_4337	1167	1002	1232

	AM	IP	PM
4511_4311	1329	1133	1353
7078_7021	1367	1132	1431

	AM	IP	PM
4307_4311	669	468	833
4307_7026	473	329	720

	AM	IP	PM
4311_4307	587	417	409
7026_4307	505	332	387

	AM	IP	PM
4305_4310	1328	1133	1353
4305_7019	757	462	487

	AM	IP	PM
4310_4305	1302	1182	1535
7019_4305	455	485	787

	AM	IP	PM
4305_4320	451	513	800
4305_4320	405	496	776

	AM	IP	PM
4320_4305	882	535	544
4320_4305	883	525	539

	AM	IP	PM
-	0	0	0
7020_7028	857	892	1197

	AM	IP	PM
	0	0	0
7076_7020	1005	887	1049

	AM	IP	PM
4497_4305	779	808	1029
4497_4305	49	61	51

	AM	IP	PM
4305_4497	1184	880	955
4305_4497	225	113	114

	AM	IP	PM
4260_4501	540	319	485
4260_7020	870	549	705

	AM	IP	PM
4501_4270	398	314	467
4501_4270	57	21	9

	AM	IP	PM
4270_4509	1189	1066	1292
-	0	0	0

	AM	IP	PM
4509_4280	1189	1066	1292
7022_4280	1524	1289	1593

	AM	IP	PM
4280_4513	326	371	495
4280_4513	429	437	589

	AM	IP	PM
4501_4260	397	300	346
7020_4260	529	436	503

	AM	IP	PM
4270_4501	433	301	349
4270_4501	133	26	148

	AM	IP	PM
	0	0	0
7020_7022	1524	1289	1593

	AM	IP	PM
-	0	0	0
7022_7020	1137	1183	1419

	AM	IP	PM
4509_4270	1054	1063	1237
-	0	0	0

	AM	IP	PM
	0	0	0
-	1524	1289	1593

AM	IP	PM
0	0	0
1137	1183	1419

	AM	IP	PM
4280_4509	1054	1063	1237
4280_7022	1137	1183	1419

	AM	IP	PM
4513_4280	461	383	461
4513_4280	473	409	464

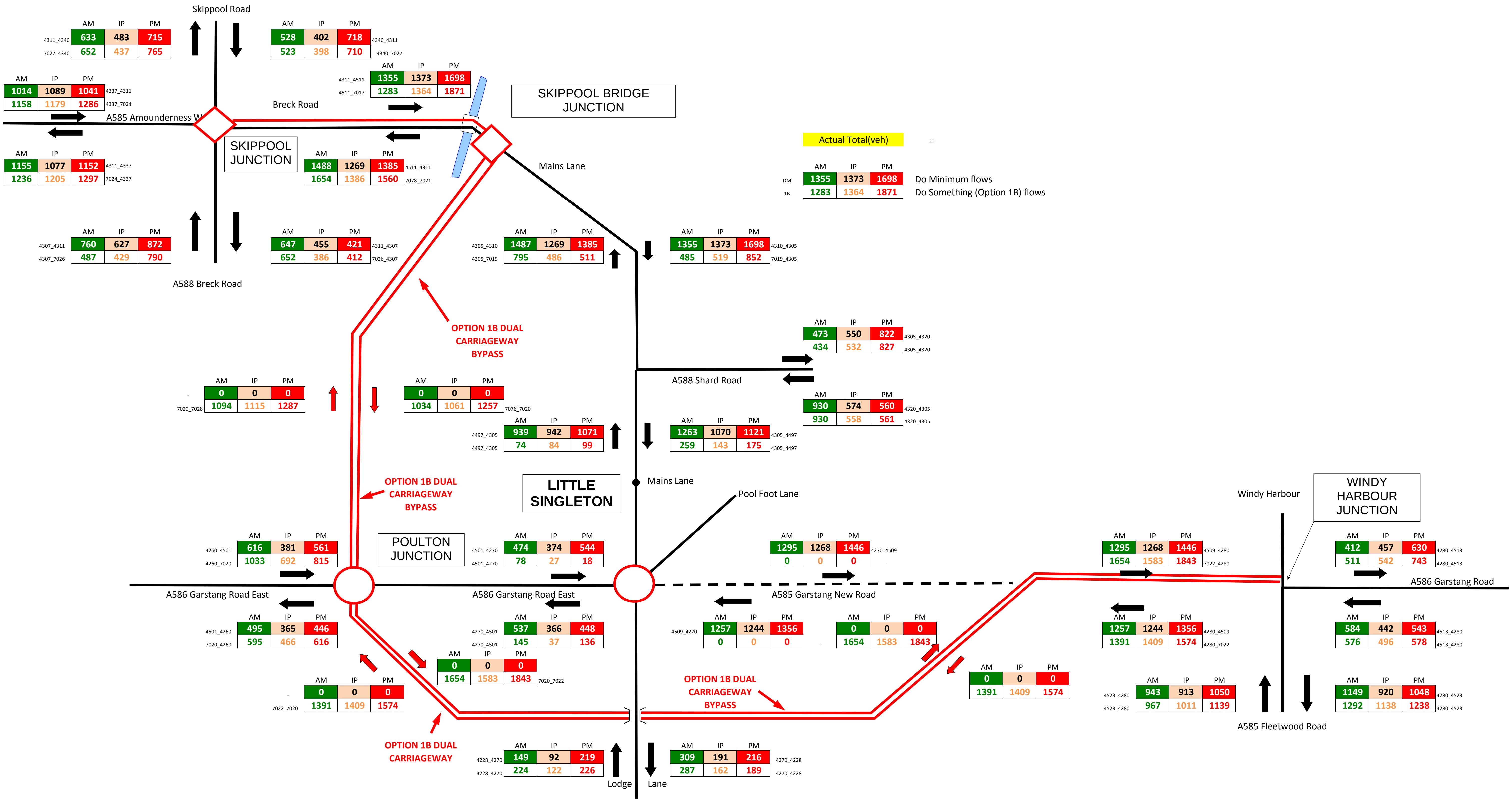
	AM	IP	PM
4523_4280	795	776	948
4523_4280	831	852	1045

	AM	IP	PM
4280_4523	1062	789	963
4280_4523	1261	930	1089

	AM	IP	PM
4228_4270	100	59	187
4228_4270	186	83	191

	AM	IP	PM
4270_4228	277	132	146
4270_4228	233	120	121

Scheme Effect Core Scenario 2037



Actual Total(veh)

	AM	IP	PM	
DM	1355	1373	1698	Do Minimum flows
1B	1283	1364	1871	Do Something (Option 1B) flows

	AM	IP	PM
4311_4340	633	483	715
7027_4340	652	437	765

AM	IP	PM	
528	402	718	4340_4311
523	398	710	4340_7027

	AM	IP	PM
4311_4511	1355	1373	1698
4511_7017	1283	1364	1871

AM	IP	PM	
1014	1089	1041	4337_4311
1158	1179	1286	4337_7024

AM	IP	PM	
1155	1077	1152	4311_4337
1236	1205	1297	7024_4337

AM	IP	PM	
1488	1269	1385	4511_4311
1654	1386	1560	7078_7021

	AM	IP	PM
4307_4311	760	627	872
4307_7026	487	429	790

AM	IP	PM	
647	455	421	4311_4307
652	386	412	7026_4307

	AM	IP	PM
4305_4310	1487	1269	1385
4305_7019	795	486	511

AM	IP	PM	
1355	1373	1698	4310_4305
485	519	852	7019_4305

AM	IP	PM	
473	550	822	4305_4320
434	532	827	4305_4320

	AM	IP	PM
-	0	0	0
7020_7028	1094	1115	1287

AM	IP	PM	
0	0	0	
1034	1061	1257	7076_7020

AM	IP	PM	
930	574	560	4320_4305
930	558	561	4320_4305

	AM	IP	PM
4497_4305	939	942	1071
4497_4305	74	84	99

AM	IP	PM	
1263	1070	1121	4305_4497
259	143	175	4305_4497

	AM	IP	PM
4260_4501	616	381	561
4260_7020	1033	692	815

	AM	IP	PM
4501_4270	474	374	544
4501_4270	78	27	18

AM	IP	PM	
1295	1268	1446	4270_4509
0	0	0	-

AM	IP	PM	
1295	1268	1446	4509_4280
1654	1583	1843	7022_4280

AM	IP	PM	
412	457	630	4280_4513
511	542	743	4280_4513

	AM	IP	PM
4501_4260	495	365	446
7020_4260	595	466	616

	AM	IP	PM
4270_4501	537	366	448
4270_4501	145	37	136

	AM	IP	PM
4509_4270	1257	1244	1356
-	0	0	0

AM	IP	PM
0	0	0
1654	1583	1843

AM	IP	PM	
1257	1244	1356	4280_4509
1391	1409	1574	4280_7022

AM	IP	PM	
584	442	543	4513_4280
576	496	578	4513_4280

AM	IP	PM	
0	0	0	
1654	1583	1843	7020_7022

AM	IP	PM
0	0	0
1391	1409	1574

	AM	IP	PM
-	0	0	0
7022_7020	1391	1409	1574

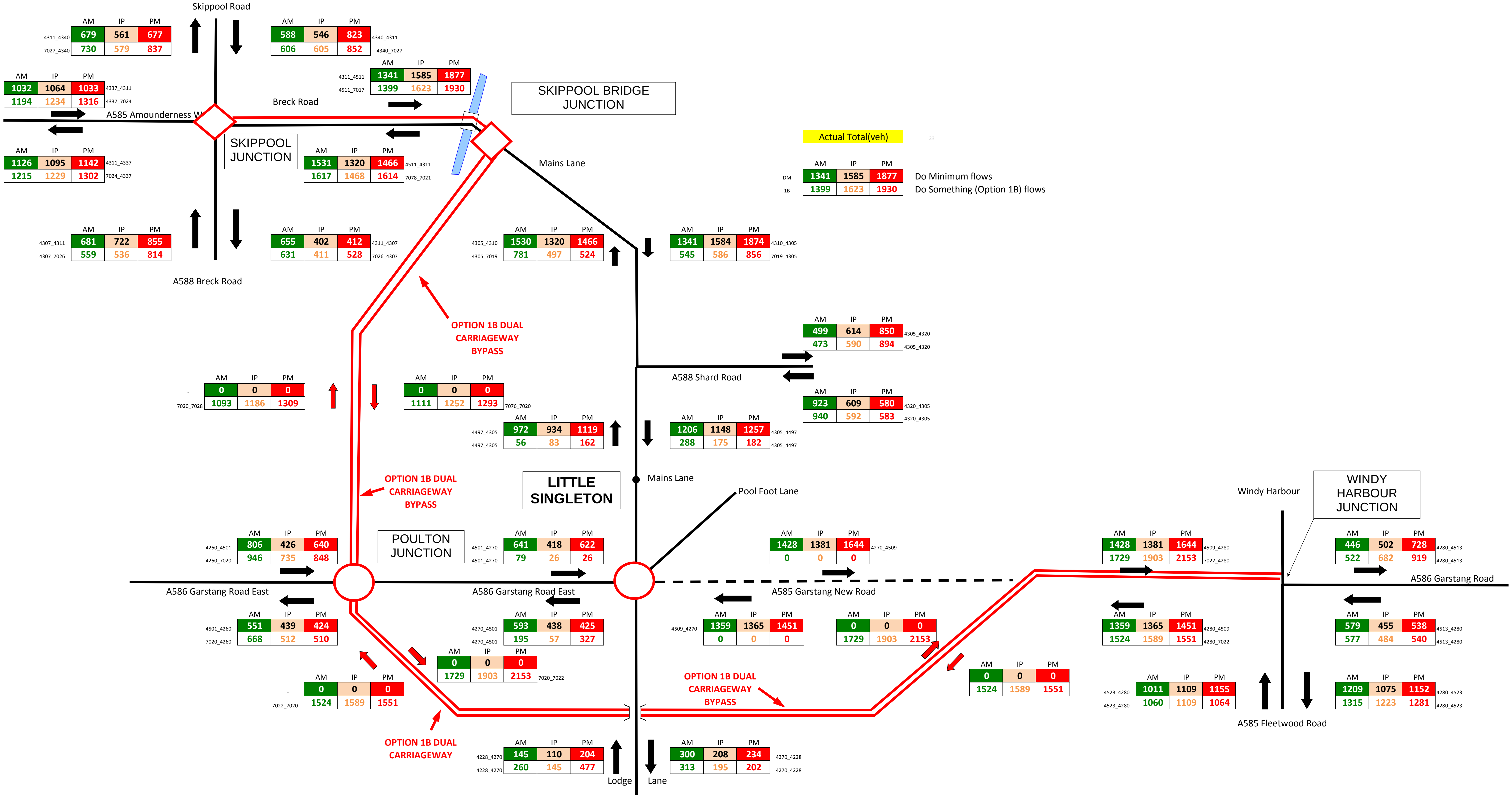
	AM	IP	PM
4523_4280	943	913	1050
4523_4280	967	1011	1139

AM	IP	PM	
1149	920	1048	4280_4523
1292	1138	1238	4280_4523

	AM	IP	PM
4228_4270	149	92	219
4228_4270	224	122	226

AM	IP	PM	
309	191	216	4270_4228
287	162	189	4270_4228

Scheme Effect Core Scenario 2051



	AM	IP	PM	
DM	1341	1585	1877	Do Minimum flows
1B	1399	1623	1930	Do Something (Option 1B) flows

	AM	IP	PM
4311_4340	679	561	677
7027_4340	730	579	837

	AM	IP	PM
4340_4311	588	546	823
4340_7027	606	605	852

	AM	IP	PM
4311_4511	1341	1585	1877
4511_7017	1399	1623	1930

	AM	IP	PM
4337_4311	1032	1064	1033
4337_7024	1194	1234	1316

	AM	IP	PM
4311_4337	1126	1095	1142
7024_4337	1215	1229	1302

	AM	IP	PM
4511_4311	1531	1320	1466
7078_7021	1617	1468	1614

	AM	IP	PM
4307_4311	681	722	855
4307_7026	559	536	814

	AM	IP	PM
4311_4307	655	402	412
7026_4307	631	411	528

	AM	IP	PM
4305_4310	1530	1320	1466
4305_7019	781	497	524

	AM	IP	PM
4310_4305	1341	1584	1874
7019_4305	545	586	856

	AM	IP	PM
4305_4320	499	614	850
4305_4320	473	590	894

	AM	IP	PM
4320_4305	923	609	580
4320_4305	940	592	583

	AM	IP	PM
-	0	0	0
7020_7028	1093	1186	1309

	AM	IP	PM
	0	0	0
7076_7020	1111	1252	1293

	AM	IP	PM
4497_4305	972	934	1119
4497_4305	56	83	162

	AM	IP	PM
4305_4497	1206	1148	1257
4305_4497	288	175	182

	AM	IP	PM
4260_4501	806	426	640
4260_7020	946	735	848

	AM	IP	PM
4501_4270	641	418	622
4501_4270	79	26	26

	AM	IP	PM
4270_4509	1428	1381	1644
-	0	0	0

	AM	IP	PM
4509_4280	1428	1381	1644
7022_4280	1729	1903	2153

	AM	IP	PM
4280_4513	446	502	728
4280_4513	522	682	919

	AM	IP	PM
4501_4260	551	439	424
7020_4260	668	512	510

	AM	IP	PM
4270_4501	593	438	425
4270_4501	195	57	327

	AM	IP	PM
4509_4270	1359	1365	1451
	0	0	0

	AM	IP	PM
	0	0	0
-	1729	1903	2153

	AM	IP	PM
4280_4509	1359	1365	1451
4280_7022	1524	1589	1551

	AM	IP	PM
4513_4280	579	455	538
4513_4280	577	484	540

	AM	IP	PM
	0	0	0
7020_7022	1729	1903	2153

	AM	IP	PM
-	0	0	0
7022_7020	1524	1589	1551

AM	IP	PM
0	0	0
1524	1589	1551

	AM	IP	PM
4523_4280	1011	1109	1155
4523_4280	1060	1109	1064

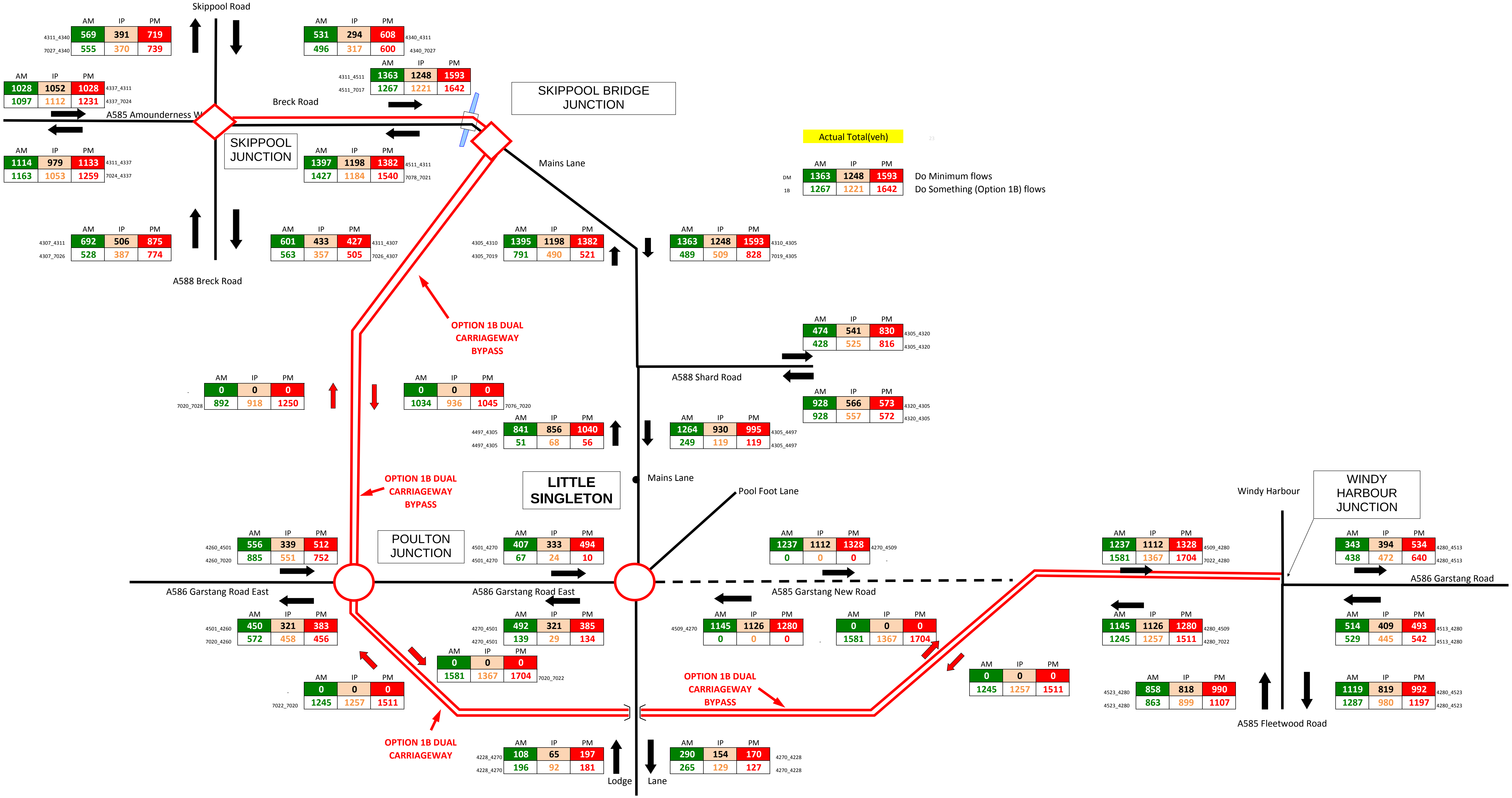
	AM	IP	PM
4280_4523	1209	1075	1152
4280_4523	1315	1223	1281

	AM	IP	PM
4228_4270	145	110	204
4228_4270	260	145	477

	AM	IP	PM
4270_4228	300	208	234
4270_4228	313	195	202

Appendix C Optimistic Growth Scenario Scheme Effect

Scheme Effect Optimistic Growth Scenario 2022



	AM	IP	PM
Actual Total(veh)			
DM	1363	1248	1593
1B	1267	1221	1642

Do Minimum flows
Do Something (Option 1B) flows

	AM	IP	PM
4311_4340	569	391	719
7027_4340	555	370	739

	AM	IP	PM
4340_4311	531	294	608
4340_7027	496	317	600

	AM	IP	PM
4311_4511	1363	1248	1593
4511_7017	1267	1221	1642

	AM	IP	PM
4337_4311	1028	1052	1028
4337_7024	1097	1112	1231

	AM	IP	PM
4311_4337	1114	979	1133
7024_4337	1163	1053	1259

	AM	IP	PM
4511_4311	1397	1198	1382
7078_7021	1427	1184	1540

	AM	IP	PM
4307_4311	692	506	875
4307_7026	528	387	774

	AM	IP	PM
4311_4307	601	433	427
7026_4307	563	357	505

	AM	IP	PM
4305_4310	1395	1198	1382
4305_7019	791	490	521

	AM	IP	PM
4310_4305	1363	1248	1593
7019_4305	489	509	828

	AM	IP	PM
4305_4320	474	541	830
4305_4320	428	525	816

	AM	IP	PM
4320_4305	928	566	573
4320_4305	928	557	572

	AM	IP	PM
-	0	0	0
7020_7028	892	918	1250

	AM	IP	PM
	0	0	0
7076_7020	1034	936	1045

	AM	IP	PM
4497_4305	841	856	1040
4497_4305	51	68	56

	AM	IP	PM
4305_4497	1264	930	995
4305_4497	249	119	119

	AM	IP	PM
4260_4501	556	339	512
4260_7020	885	551	752

	AM	IP	PM
4501_4270	407	333	494
4501_4270	67	24	10

	AM	IP	PM
4270_4509	1237	1112	1328
-	0	0	0

	AM	IP	PM
4509_4280	1237	1112	1328
7022_4280	1581	1367	1704

	AM	IP	PM
4280_4513	343	394	534
4280_4513	438	472	640

	AM	IP	PM
4501_4260	450	321	383
7020_4260	572	458	456

	AM	IP	PM
4270_4501	492	321	385
4270_4501	139	29	134

	AM	IP	PM
	0	0	0
7020_7022	1581	1367	1704

	AM	IP	PM
-	0	0	0
7022_7020	1245	1257	1511

	AM	IP	PM
4509_4270	1145	1126	1280
	0	0	0

	AM	IP	PM
	0	0	0
-	1581	1367	1704

	AM	IP	PM
	0	0	0
	1245	1257	1511

	AM	IP	PM
4280_4509	1145	1126	1280
4280_7022	1245	1257	1511

	AM	IP	PM
4513_4280	514	409	493
4513_4280	529	445	542

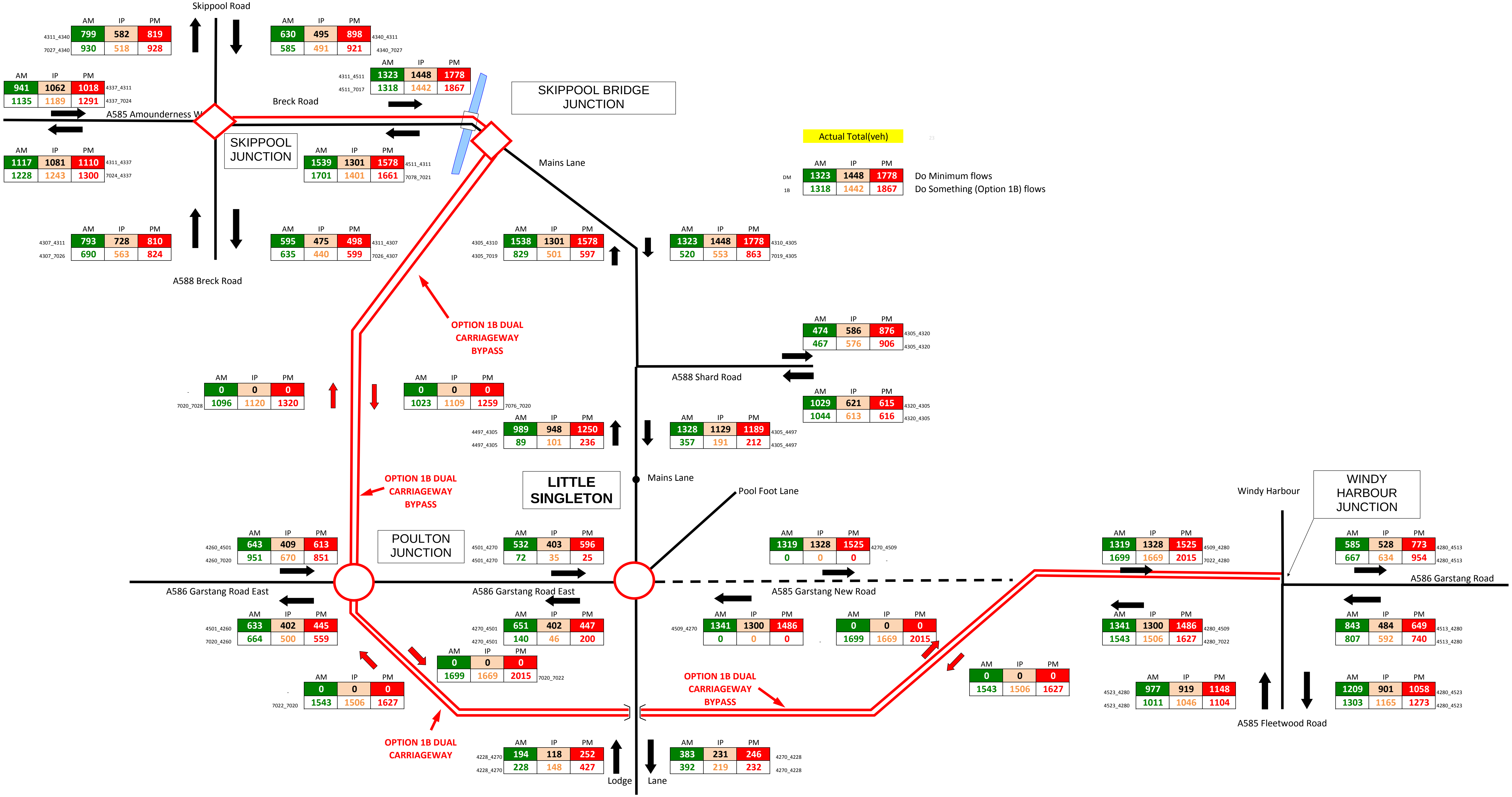
	AM	IP	PM
4523_4280	858	818	990
4523_4280	863	899	1107

	AM	IP	PM
4280_4523	1119	819	992
4280_4523	1287	980	1197

	AM	IP	PM
4228_4270	108	65	197
4228_4270	196	92	181

	AM	IP	PM
4270_4228	290	154	170
4270_4228	265	129	127

Scheme Effect Optimistic Growth Scenario 2037

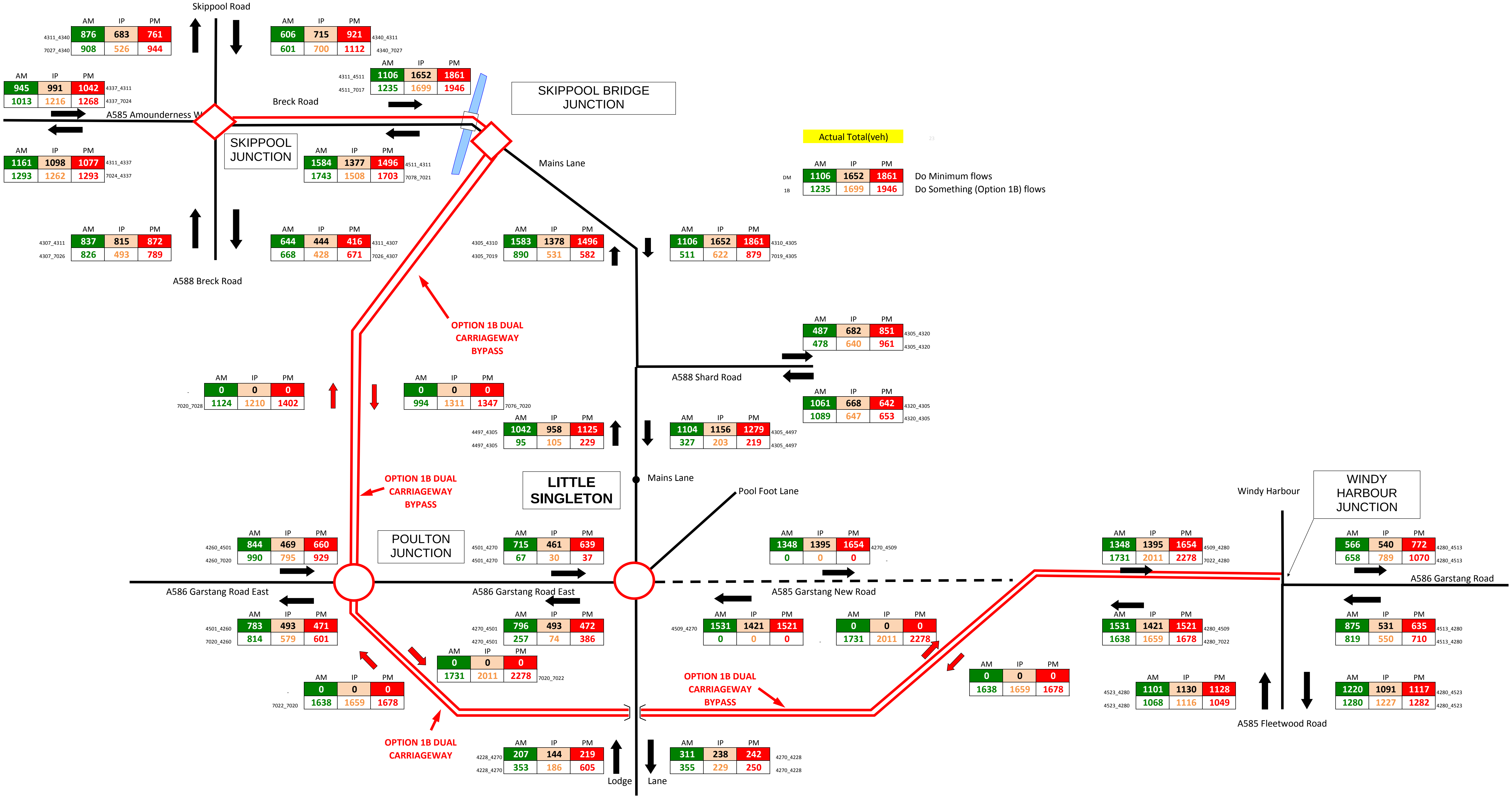


Actual Total(veh)

	AM	IP	PM	
DM	1323	1448	1778	Do Minimum flows
1B	1318	1442	1867	Do Something (Option 1B) flows

Link	AM	IP	PM
4311_4340	799	582	819
7027_4340	930	518	928
4340_4311	630	495	898
4340_7027	585	491	921
4311_4511	1323	1448	1778
4511_7017	1318	1442	1867
4337_4311	941	1062	1018
4337_7024	1135	1189	1291
4311_4337	1117	1081	1110
7024_4337	1228	1243	1300
4511_4311	1539	1301	1578
7078_7021	1701	1401	1661
4307_4311	793	728	810
4307_7026	690	563	824
4311_4307	595	475	498
7026_4307	635	440	599
4305_4310	1538	1301	1578
4305_7019	829	501	597
4310_4305	1323	1448	1778
7019_4305	520	553	863
4305_4320	474	586	876
4305_4320	467	576	906
4320_4305	1029	621	615
4320_4305	1044	613	616
	0	0	0
7020_7028	1096	1120	1320
	0	0	0
7076_7020	1023	1109	1259
4497_4305	989	948	1250
4497_4305	89	101	236
4305_4497	1328	1129	1189
4305_4497	357	191	212
4260_4501	643	409	613
4260_7020	951	670	851
4501_4270	532	403	596
4501_4270	72	35	25
4270_4509	1319	1328	1525
	0	0	0
4509_4280	1319	1328	1525
7022_4280	1699	1669	2015
4280_4513	585	528	773
4280_4513	667	634	954
4501_4260	633	402	445
7020_4260	664	500	559
4270_4501	651	402	447
4270_4501	140	46	200
4509_4270	1341	1300	1486
	0	0	0
	0	0	0
	1699	1669	2015
4280_4509	1341	1300	1486
4280_7022	1543	1506	1627
4513_4280	843	484	649
4513_4280	807	592	740
	0	0	0
7020_7022	1699	1669	2015
	0	0	0
7022_7020	1543	1506	1627
	0	0	0
	1543	1506	1627
4523_4280	977	919	1148
4523_4280	1011	1046	1104
4280_4523	1209	901	1058
4280_4523	1303	1165	1273
4228_4270	194	118	252
4228_4270	228	148	427
4270_4228	383	231	246
4270_4228	392	219	232

Scheme Effect Optimistic Growth Scenario 2051



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Appendix G – Stage 3 Economic Appraisal Package

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A585 Windy Harbour to Skippool Improvement Scheme

Stage 3 - Economic Appraisal Package

HE548643-ARC-TTM-A585-RP-ZM-3145
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Registered office Bridge House, 1 Walnut Tree Close, Guildford GU1 4LZ
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This report dated 11 November 2018 has been prepared for Highways England (the “Client”) in accordance with the terms and conditions of appointment dated 16 March 2016 (the “Appointment”) between the client and Arcadis Consulting (UK) Limited (“Arcadis”) for the purposes specified in the Appointment. For the avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

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1 Executive Summary

1.1 Introduction

1.1.1 The purpose of this Economic Appraisal Package is to set out the results of the economic assessment of the A585 Windy Harbour to Skippool Improvement Scheme. The A585(T) is located in the Lancashire County Council Local Authority and connects the settlements of Singleton, Skippool, Poulton-Le-Fylde, Thornton-Cleveleys and Hambleton along its route from the M55 junction 3 north-west of Preston into the northern part of the Fylde peninsula. The A585 Windy Harbour to Skippool Improvement Scheme ("the Scheme") is a 4.85km (3 miles) long dual 2-lane carriageway bypass from Windy Harbour Junction to the Skippool Junction.

1.1.2 The Scheme is being delivered through Highways England's Project Control Framework (PCF) for major projects, with planning currently in the Development Phase, Stage 3 Preliminary Design, of the seven stage PCF process.

1.1.3 The Scheme has been assessed and evaluated in accordance with The Department for Transport (DfT) Transport Analysis Guidance (TAG) Units A1, A2, A3 and A4 Economic, Environmental and Social Impact Appraisal which recommends that options should be appraised using cost-benefit analysis in accordance with the Green Book [HMT, 2003). This is achieved through, wherever feasible, attributing monetary values to the impacts of the proposal. Cost-benefit analysis quantifies in monetary terms as many of the costs and benefits of a proposal as feasible, including items for which the market does not provide a satisfactory measure of economic value.

1.1.4 The impacts of the Scheme are recorded in the Appraisal Summary Table (AST) The AST provides a summary of the economic, environmental, social and public accounts costs and benefits. Estimates of costs and benefits to transport users and providers from the Analysis of Monetised Costs and Benefits Table have been included in the AST which therefore includes costs and benefits for which the evidence on monetary values is considered most robust and are categorised into impacts that:

- Are typically monetised and reported in the Transport Economic Efficiency (TEE), Public Accounts (PA) and Analysis of Monetised Costs and Benefits (AMCB) tables;
- Can be monetised but their monetary values are not reported in the AST as the underlying evidence base is considered less robust; and
- It is currently infeasible to monetise so qualitative or quantitative analysis should be reported in the AST.

1.1.5 The economic appraisal period is informed by TAG Unit A1.1, paragraph 2.1.1, page 2, which stipulates a 60-year appraisal for projects that are deemed to have an 'indefinite life'. This includes major infrastructure schemes such as highways and bridges.

1.1.6 The Public Accounts relate to the costs faced by Government (either local or central) to implement the Scheme. They include the following:

- Investment costs
- Operating costs
- Revenue (for example, through induction of tolls)
- Developer and other contributions, if any
- Grant/subsidy payments, if any
- Indirect tax revenues to the government e.g. through fuel duty that results from the Scheme

1.1.7 The overall Analysis of Monetised Costs and Benefits (AMCB) include benefits due to savings in accidents (number and severity), greenhouse gases emissions, air quality and noise levels as a result of the Scheme. These would be negative if they were to increase.

1.1.8 The following elements make up the cost-benefit analysis of the Scheme:

- Scheme costs can be defined as the total amount of money spent in construction and maintaining the Scheme. These include the following:

  - Preparation costs (planning and designing costs), land acquisition costs, construction costs and supervision costs
  - Maintenance costs.
- The Scheme benefits are broadly made up of the following:
  - Road user benefits – due to savings in travel time and vehicles operating costs as a result of the Scheme
  - Safety benefits – due to changes in the number and/or severity of accidents as a result of the Scheme
  - Construction and maintenance (dis)benefits – due to changes in travel time and vehicle operating costs during the Scheme construction and maintenance
  - Environmental benefits – due to changes in greenhouse gases emissions, air quality and noise levels as a result of the Scheme
  - Indirect tax revenue – due to change in the amount of fuel purchased and the associated impact to revenue from fuel duty as a result of the Scheme
  - Journey time reliability benefits – due to changes in the journey time variability in the network as a result of the Scheme
  - Social distribution benefits as a result of the Scheme
  - Wider Impacts as a result of the Scheme

1.1.9 The Stage 3 introductory Scheme design (“the introductory Scheme” transport model version VDM_04) was based on the Stage 2 Scheme design. The Stage 3 Traffic Operational Report [HE548643-ARC-GEN-A585-RP-D-3065], which outlines the traffic operational appraisal undertaken in Stage 3, revealed some design issues with the proposed Scheme junctions identified at Stage 2. Following the revisions to Stage 3 Scheme design the traffic operational assessment has highlighted no significant issues with the updated Stage 3 Preliminary Design.

1.1.10 The economic appraisal results of the sensitivity test undertaken on the updated Stage 3 Scheme design (“the updated Scheme” transport model version VDM_06) can be referred to in the Stage 3 Scheme Design Update Economic Appraisal technical note [HE548643-ARC-HDG-A585-TN-TR-3024] in Appendix E.

1.2 Economic Appraisal Process and Results

Assessment of Scheme Costs

1.2.1 The costs of the Scheme based on Scheme cost estimates covering preparation costs, supervision costs, land costs and construction expenditure were produced on behalf of the Highways England Commercial team, who are responsible for cost estimation within Highways England.

1.2.2 Scheme costs have been expressed as market prices, inflated to outturn costs using projected construction related inflation, rebased to 2010 calendar year profiles for economic calculations, using the GDP-deflator series as published in the TAG Databook July 2017 V1.8 and discounted to the present value year of 2010.The discounted costs and indirect tax revenues are combined to provide a Present Year Value of Costs (PVC) and referred to as the Public Accounts (PA) impact.

1.2.3 The change in indirect taxation revenues, principally VAT and fuel duty, is related to changes in traffic levels and have been assessed as part of the process.

1.2.4 The Scheme Broad Transport Budget including the Scheme investment cost and maintenance cost is £108,895,457 in 2010 prices and discounted to 2010.

Assessment of Scheme Benefits

1.2.5 Equilibrium demand traffic forecasts were prepared using a transport model developed using SATURN Version 11.3.12W and the July 2017 V1.8 TAG Databook Values of Time (VoT) and Vehicle Operating Costs (VOC) for assignment of the forecast matrices onto the modelled highway network and DIADEM Version 5.0 for modelling the traffic redistribution effects in response to changes in travel cost using a variable demand approach. For further information regarding the preparation of the traffic forecasts for the Scheme assessment please refer to the Stage 3 Transport Forecasting Package HE548643-ARC-

TTM-A585-RP-ZM-3144.

1.2.6 TUBA (Transport User Benefit Appraisal) software version 1.9.9 was used to was used to estimate the direct user and provider benefits in terms of travel time savings and vehicle operating cost savings using the traffic forecasts output from the Scheme's transport model.

1.2.7 The appraisal of road user dis-benefits as a result of the delays incurred during the construction of the Scheme was carried out using Queues and Delays at Roadworks (QUADRO) version 4 release 15.

1.2.8 Accident savings resulting from the Scheme were assessed using the DfT's Cost and Benefit to Accidents – Light Touch (COBALT) program (Version 2013.2).

1.2.9 COBALT assessments were undertaken using local Personal Injury Accident (PIA) data from 2011-2016 for the A585. Default accident were used for the rest of the study area.

1.2.10 The extent of the COBALT study area was selected using criteria of a change in +/- 5% in AADT traffic flow (relative difference between the Without and With Scheme traffic flow from Optimistic Growth scenario in 2051).

1.2.11 The (dis)benefits to the transport user arising from the regular major maintenance work of the A585 were assessed using QUADRO software (Version 4, Release 15).

1.2.12 Local hourly traffic flow profiles on the A585 were used in the QUADRO analysis.

1.2.13 An assessment of the journey time reliability (or travel time variability) on urban roads was undertaken utilising the method described in TAG Unit A1.3, User and Provider Impacts. This will form part of the adjusted Benefit-Cost Ratio (BCR).

1.2.14 An assessment of the Wider Impacts such as agglomeration and labour supply impacts were undertaken based on data on trip patterns and travel times and costs from the Scheme transport model. This will form part of the adjusted benefit-cost ratio (BCR).

1.2.15 The effects of the Scheme on the following indicators have been monetised in line with TAG Unit A3 – Environmental Impact Appraisal:

- Greenhouse Gases
- Local Air Quality
- Noise

1.2.16 Distributional Impact Appraisal (DIA) refers to the assessment of the impact of the Scheme on vulnerable and disadvantage sectors of society and have been assessed following TAG Unit A4.2 and Highways England's TAME guidance.

Appraisal Results

1.2.17 All benefits and costs were calculated in monetary terms and expressed as present values in 2010 prices, as required by the DfT.

1.2.18 The economic assessment brings the user benefits and Scheme costs together with the accident and environmental impacts, where these can be quantified in an Analysis of Monetary Costs and Benefits which generates the measures of economic worth, the Net Present value (NPV) and the Initial Benefit-Cost Ratio (BCR) of the Scheme.

1.2.19 The AMCB table includes costs and benefits for which the evidence on monetisation is considered most robust. There are other significant Scheme benefits, including Wider Impacts, Reliability and Weekend User Benefits where the evidence on monetisation is less well developed and therefore the analysis presented in the AMCB table does not provide a full measure of value for money and should not be used as the sole basis for decisions. Further appraisal of monetised estimates of Reliability, Wider Impacts and weekend user benefits was analysed to allow the calculation of the Adjusted BCR to contribute to the Scheme evidence base.

1.2.20 Two BCRs, an initial BCR (which excludes journey time reliability and wider impacts and weekend benefits) and an adjusted BCR (which includes journey time reliability and wider impacts and weekend benefits) have been presented for the Scheme.

Conclusions and Recommendations

1.2.21 The initial Core Scenario Stage 3 introductory Scheme BCR is 1.34. Adding in Weekend benefits, Journey Time Reliability and Wider Impacts to provide an Adjusted BCR, increases the Core Scenario Stage 3 introductory Scheme BCR to 2.17.

1.2.22 The initial Core Scenario Stage 3 updated Scheme BCR is 1.26 (as reported in Appendix E). Adding in Weekend benefits, Journey Time Reliability and Wider Impacts to provide an Adjusted BCR, increases the Core Scenario Stage 3 updated Scheme BCR to 2.02.

1.2.23 The accident cost savings shows that the Scheme provides better accident measures and saves accidents. An overall Scheme objective, to improve safety along the route, will be achieved, as the Scheme if implemented is shown to reduce the number of accidents and casualties.

1.2.24 The Scheme reduces severance for non-motorised users. The reduced traffic flow on the de-trunked section due to the Scheme has the potential to improve the local environment along the de-trunked section and should encourage walking and cycling.

1.2.25 The Scheme improves road user journey time and reliability and the Scheme’s Wider Economic Impacts due to the improved journey times and reliability for business road users supports economic growth in the area.

1.2.26 On this basis the A585 Windy Harbour to Skippool Improvement Scheme Economic Assessment has shown that the overall objectives of the Scheme to improve safety along the route, reduce severance for non-motorised users, support economic growth and improve journey time reliability have been met and it is therefore worthwhile in economic terms to proceed with the Scheme.

1.3 Non-standard Procedures or Economic Parameters

1.3.1 There were no non-standard procedures or economic parameters utilised in the economic appraisal of the Scheme.

2 Scheme Costs

2.1 Introduction

2.1.1 The preparation of Scheme costs for the economic appraisal of the Scheme has been carried out following the principles set out in TAG Unit A1.2 Scheme costs.

2.1.2 Costs are estimate under two broad headings – investment costs and maintenance costs. Investment costs are those that will be incurred in the preparation and construction of the Scheme, including land acquisition costs. Maintenance costs are those that are required for the maintenance of the Scheme.

2.1.3 The Scheme cost estimate is based on 2016 Quarter 1 prices and included in Appendix A.

2.1.4 The extent of the Scheme from Windy Harbour Junction to Skippool Junction is shown in Figure 2-1 and can be referred to in detail in Appendix A.

2.2 Investment Cost

2.2.1 The outturn investment costs for the Scheme are adjusted as follows for appraisal purposes:

- Costs are deflated to 2010 price base using the GDP deflators from the TAG Databook to the inflation index of the year currently being used

2.2.2 The investment costs of the Scheme after adjustment is presented in Table 2-1. All historic costs are removed.

Table 2-1: Investment Cost Estimate (2010 prices)

Category	Cost (in 2010 prices)
Preparation	£8,626,529
Supervision	£1,948,624
Land	£19,352,454
Construction	£96,103,724
Total	£126,031,332

2.2.3 The distribution of the costs by year of anticipated expenditure, is shown in Table 2-2. The percentage splits of costs between years, is also shown as these are used in the input file for TUBA along with the total costs in each category.

Table 2-2: Cost Expenditure Profile (2010 prices)

Year	Preparation	Supervision	Construction	Land	Total
2018	£2,968,597	£0	£0	£3,132,855	£6,101,452
2019	£5,516,587	£0	£0	£0	£5,516,587
2020	£141,345	£638,900	£29,352,162	£16,219,599	£46,352,006
2021	£0	£1,245,233	£59,341,498	£0	£60,586,731
2022	£0	£64,491	£7,410,064	£0	£7,474,556
Total	**£8,626,529**	**£1,948,625**	**£96,103,724**	**£19,352,455**	**£126,031,332**

2.2.4 Conversion to market prices, by adding the average rate of indirect taxation in the economy (19%) and discounting to the present value year of 2010 is then undertaken in accordance with the guidance set out in TAG Unit A1.2, paragraph A.6.2, page 19.

2.2.5 The detailed breakdown of construction costs (in 2010 prices and discounted to 2010) as used in the economic assessment is shown in Table 2-3 .

Table 2-3: Construction Cost Estimate (2010 prices and discounted to 2010)

Category	Cost (in 2010 prices)
Preparation	£7,618,713
Supervision	£1,604,744
Land	£78,965,855
Construction	£16,514,232
Total	**£104,703,544**

2.3 Maintenance Cost

2.3.1 In addition to the investment costs, it is necessary for the economic assessment to take account of the cost of maintaining the Scheme with the current maintenance cost of the existing route.

2.3.2 Maintenance schedules were derived for both the Without and With Scheme Scenarios over the 60 year appraisal period.

2.3.3 Maintenance costs were provided for 2010 market price discounted to 2010.

2.3.4 The maintenance costs for the Without and With Scheme Scenarios are presented in Table 2-4.

Table 2-4: Maintenance Costs (2010 prices and discounted to 2010)

Description	Without Scheme	With Scheme	Change
2010 Market price discounted to 2010	£7,515,542	£11,707,456	£4,191,913

Figure 2-1: A585 Windy Harbour to Skippool Improvement Scheme extent

3 Transport User Benefits

3.1 Economic Parameters

3.1.1 The assessment of transport user benefits and costs were conducted using the DfT's TUBA version 1.9.9 program. This version was used to ensure consistency with the generalised cost coefficients i.e. values of time and vehicle operating costs of the forecast transport model. The generalised cost coefficients are based on TAG Data Book July 2017 v1.8 release.

3.1.2 TUBA provides a complete set of default economic parameters in its standard economics file. This contains values of time, vehicle operating cost data, tax rates, economic growth rates and a range of other economic parameter values. The standard economics file can be found in Appendix B.

3.1.3 TUBA version 1.9.9 reports the economic values in 2010 prices and discounted to the present value of 2010.

3.2 Scheme Parameters

3.2.1 The Scheme parameters are largely determined by the parameters used in the Scheme's forecast transport model as follows:

- Current Year – 2018
- Scheme Opening Year – 2022
- Design Year – 2037
- Final Forecast Year – 2051
- Horizon Year – 2081 (60 years from Scheme opening year)

3.2.2 For the economic appraisal, no traffic growth was assumed after 2051 i.e. the final forecast year.

3.3 Time Slices

3.3.1 TUBA works based on five standard definition time periods as follows:

- AM Peak (weekday 07:00 to 10:00)
- PM Peak (weekday 16:00 to 19:00)
- Inter Peak (weekday 10:00 to 16:00)
- Off-peak (weekday 19:00 to 07:00) and
- Weekend

3.3.2 TUBA analysis for the Scheme's transport model comprises of three weekday time periods;

- Average AM hour (07:30 to 09:30)
- Average Inter-peak hour (09:30 to 15:00)
- Average PM hour (15:00 to 18:00).

3.3.3 The weekday Off-Peak (OP) and Weekend (WE) transport models were developed from the weekday inter-peak models for 2022, 2037 and 2051 forecast years. The weekday off-peak and weekend inter-peak demand was calculated from the weekday inter-peak demand using conversion factors calculated from NTEM and TRIS data. The weekday OP and weekend demand was then assigned to the inter-peak network to create the weekday OP and weekend transport models. It is to be noted that the off-peak and weekend transport models were not calibrated in line with a proportionate approach to the Stage 3 transport modelling.

3.3.4 The weekday Off-Peak and Weekend forecast transport model time periods are described as follows:

- Average Weekday Off-Peak hour (18:00 to 07:30)
- Average Weekend Inter-Peak hour (10:00 to 16:00)

3.3.5 The weekday OP average hour demand was created from the weekday inter-peak demand by applying conversion factors by vehicle class. The conversion factors for the car user classes including Car-Commute, Car-Business and Car-Other were calculated from NTEM data by dividing the OP average hour trip-end values (19:00 - 07:00 trip-ends divided by 12) by the inter-peak average hour trip-end values (10:00 - 16:00 trip-ends divided by 6) for each year 2022, 2037 and 2051. For the goods vehicle classes LGV and HGV, conversion factors were calculated using ATC and TRIS data by dividing the observed average hour OP flows (18:00 - 07:30) by the observed average hour inter-peak flows (09:30 - 15:00), using the median value of the factors calculated for all the data sites.

3.3.6 The weekend inter-peak average hour demand was also created from the weekday inter-peak demand by applying conversion factors by vehicle class. NTEM data (for car trips) was obtained for the Saturday and Sunday 48-hour period and was representative of an average weekend hour. Appropriate conversion factors are calculated from the TRIS weekend data (for LGV and HGV) to convert the whole day weekend trips (24 hours) to weekend inter-peak trips (10:00-16:00).

3.3.7 For weekend inter-peak demand, the Car-Commute, Car-Business and Car-Others conversion factors were calculated from NTEM data by dividing weekend average inter peak hour trip-end values (10:00-16:00 trip-ends divided by 6) by weekday inter-peak average hour trip-end values (10:00-16:00 trip-ends divided by 6) for each forecast years 2022, 2037 and 2051. For user classes LGV and HGV, factors were calculated using TRIS data by dividing the observed weekend inter-peak flows (10:00-16:00) by observed weekday inter-peak flows (09:30-15:00) and using the median value of the factors calculated for all the data sites.

3.4 Annualisation Factors

3.4.1 The modelled time period benefits calculated by TUBA are converted into an estimate of annual benefits using annualisation factors. Annualisation factors are used to convert the travel time benefits per time slice to the annual user benefits. The benefits in each time slice are multiplied by an annualisation factor and then summed up over all time slices to give annual benefits.

3.4.2 The annualisation factor is therefore a representation of the number of time slices in a calendar year and is calculated as follows:

h*d

where h = the number of time slices in the time period

d = the number of days in a year containing the time periods

3.4.3 The Scheme's transport model represents an 'average' peak hour model with the AM peak representing an average hour between 07:30 hrs - 09:30 hours, the inter-peak representing an average hour between 09:30 hours - 15:00 hours and the PM peak representing an average hour between 15:00 hrs -18:00 hours. The Off-peak model developed represents an average hour between 18:00 hrs - 07:30 hrs. The annualisation factors were thus, calculated as 2 * 253 = 506 (AM period), 5.5 * 253 = 1392 (Inter-Peak period) and 3 * 253 = 759 (PM period), 13.5 * 253 = 3415 (Off-Peak period) and 6 * 104 = 624 (Weekend Inter-peak period).

3.4.4 The annualisation factors derived for the Scheme's transport model were as follows:

- AM Peak (0730 hrs. to 0930 hrs.): 506
- Inter Peak (0930 hrs. to 1500 hrs.): 1392
- PM Peak (1500 hrs. to 1800 hrs.): 759
- Off-Peak (1800 hrs. to 0730 hrs.): 3415
- Weekend (1000 hrs. to 1600 hrs.): 624

3.4.5 The economic assessment tables including the TEE, PA and AMCB tables have been presented in two sets, initial and adjusted:

1. Initial transport user benefits – includes weekday AM, IP, PM and OP time periods
2. Adjusted transport user benefits – includes weekend transport user benefits along with weekday transport user benefits, to provide a greater re-assurance around the overall transport user benefits.

3.5 User Classes

3.5.1 The Scheme's transport model was developed for five user classes. These were split into seven user classes within TUBA to take account of varying values of time for difference purposes and vehicles operating costs by vehicle type corresponding to the standard TUBA vehicle types / sub-modes. Light Good Vehicles (LGVs) were split into personal and freight trip purposes in the ratio of 12:88, as per TAG Data Book Table A1.3.4 – Proportion of Trips made in Work and Non-Work time. Similarly, Heavy Goods Vehicles (HGVs) are equally proportioned into OGV1 and OGV2 as suggested by the TAG Data Book Table A1.3.4.

3.5.2 Trip matrices obtained from SATURN are in passenger car units (PCUs) and are converted into vehicular units for use in TUBA. A PCU equivalent factor of 2.0 was applied to HGVs as advised in TAG Unit M3.1 (Appendix D.7.2).

3.5.3 The TUBA user classes are presented in Table 3-1, along with the TUBA trip purpose splits. The trip purpose proportions are combined with the PCU to vehicle conversion factors to derive the matrix proportions for each user class.

Table 3-1: Trip Purpose Proportion Splits

User Class	Model User Class	TUBA User Class	Proportion Split	PCU to Vehicle	Vehicle Matrix Proportion
1	Car-Commuting	Car-Commuting	1.00	1.00	1.00
2	Car-Business	Car-Business	1.00	1.00	1.00
3	Car-Other	Car-Other	1.00	1.00	1.00
4	LGV	LGV Personal – Other	0.12	1.00	0.12
5	LGV	LGV Freight – Business	0.88	1.00	0.88
6	HGV	OGV 1 – Business	0.50	0.50	0.25
7	HGV	OGV 2 – Business	0.50	0.50	0.25

3.6 Scenarios

3.6.1 Within the TUBA program, each modelled option is termed as a scenario and these were classified as either Without Scheme or With Scheme.

3.6.2 The Without Scheme scenario comprised of the existing road network with the committed road improvements within the Scheme's transport model simulation and buffer network extent.

3.6.3 The With Scheme scenario comprised of the Without Scheme scenario with the addition of the proposed Scheme.

3.6.4 The TUBA assessment was carried out for the Core Scenario and alternative Low and Optimistic Growth scenarios.

3.7 Trip Matrices, Distance, Time and Reference Distance

3.7.1 Data input into TUBA comprises of the trip matrices, travel times, travel distances and reference distance matrices (base year demand weighted distance matrices).

3.7.2 These matrices were prepared for all five time periods (AM, IP, PM, OP and Weekend), five user classes, three forecast years (2022, 2037 and 2051) and two scenarios (Without Scheme and With Scheme).

3.7.3 The SATURN software uses metres and seconds as units of distance and time respectively. However, TAG Unit A1.1 and TAG Data Book (and therefore TUBA) uses kilometres and hours as units. Therefore, a factor of 0.001 was used in the TUBA input file to convert distances from meters to kilometres and a factor of 0.00028 (=1/3600) to convert time from seconds to hours.

3.8 Vehicle Operating Costs

3.8.1 Vehicle operating costs (fuel and non-fuel) were produced as part of the assessment of Transport Economic Efficiency benefits and costs using TUBA.

3.8.2 Fuel costs vary by vehicle type; hence fuel costs are calculated based on variables including fuel consumption, average speed and fuel type.

3.8.3 Fuel costs also vary over time caused by improvements in vehicle efficiency and changes in the costs for fuel and for cars and the proportion of traffic using petrol or diesel engines.

3.8.4 An improvement in the operating speed with the introduction of the Scheme would generally result in fuel cost savings for cars and OGVs as the fuel consumption rate decreases with increasing speed approximately 80 kph. In the case of LGVs, however, the fuel consumption rates steadily increase from 50 kph which may result in negative fuel cost savings with the introduction of the Scheme which would particularly affect LGVs in the inter-peak period.

3.8.5 Non-fuel vehicle operating costs elements include oil, tyres, maintenance, depreciation and vehicles capital saving and depends upon vehicle type and fuel type for business and consumer trips.

3.8.6 Vehicle operating costs and fuel costs are contained in the standard TUBA economics input file.

3.9 TUBA Runs

3.9.1 The TUBA process computes the transport user benefits comparing the model attributes i.e. travel times and vehicle operating costs etc. of the With Scheme scenario with those of the Without Scheme scenario.

3.9.2 The input file for TUBA consists of 3 sets of matrices for both modelled scenarios for each forecast year, time period and user class as follows:

- Trip matrices
- Time matrices
- Distance matrices

3.9.3 An additional pre-requisite of TUBA 1.9.9 involves defining a reference distance matrix i.e. demand weighted base year distance matrix.

3.9.4 The TUBA Scheme file was created containing details of the modelled user classes to be included, the annualization factors to be applied, and the matrices to be used in TUBA. In addition, a sector file was also prepared to map and assess the transport user benefits to sectors.

3.9.5 A standard TUBA economics file (DfT provided TUBA program default file), containing values of time, vehicle operating costs, tax rates and economic growth rates was also used as an input to the TUBA program.

3.9.6 Each TUBA run as initiated using a batch file setting out the input files required and specifying the name for the corresponding output file.

TUBA Warning and Logic Checks

3.9.7 TUBA undertakes a check on the inputs provided and identifies any large cost or matrix changes between the Without Scheme and With Scheme scenarios. The top 50 warnings of each TUBA type were outputs and a sample of these were reviewed for each option.

3.9.8 Other sense checks were also carried out in terms of mapping the user benefits to sectors to check the pattern of these benefits. This pattern appeared plausible with no inconsistent results.

Sector Benefits

3.9.9 A 17-sector system was devised to understand the pattern of time savings and an analysis of the benefits for each sector was carried out to calculate the average transport used benefits per person resident in each sector as a result of the Scheme.

3.10 Introductory Scheme Transport User Benefits – Core Scenario

Scheme Benefits

3.10.1 Traffic forecasts were prepared using the Scheme's core scenario transport model and were used in the assessment of user benefits using TUBA.

3.10.2 TUBA estimates the monetised impacts which will be generated with the Scheme in place. These benefits will change over time as traffic growth takes place and the value attributed to those benefits is converted to present values through the process known as discounting.

3.10.3 All the TUBA user benefits are in 2010 prices and discounted to 2010. In the interest of proportionate reporting the initial transport user benefits including the weekday AM, IP, PM and OP time periods are tabulated. The weekend user benefits are shown in Figure 3-1.

3.10.4 Table 3-2 shows the resultant initial core scenario transport user benefits generated by the introductory Scheme using the AM, IP, PM and OP time periods in terms of travel time and vehicle operating costs. User benefits added to the indirect tax revenues gives the total benefits.

Table 3-2: Introductory Scheme Initial Core Scenario Transport User Benefits (2010 prices and discounted to 2010)

Description	Benefit
Travel Time	£164.81m
Vehicle Operating Cost	-£38.58m
User Charges	£0
Total User Benefits	**£126.23m**
Indirect Tax Revenue	£27.56m
Total Benefits	**£153.79m**

3.10.5 Over the 60 year appraisal period, the Scheme will generate total benefits of £153.79m (in 2010 prices and discounted to 2010). There are no tolls and public transport in the Scheme's transport model, hence the user charges amount to £0.

Transport User Benefits by Journey Purpose

3.10.6 Table 3-3 shows the introductory Scheme transport user benefits and charges segregated by journey purpose and vehicle class of the transport system.

Table 3-3: Introductory Scheme Initial Core Scenario Transport User Benefits by Journey Purpose and Vehicle Class (2010 prices and discounted to 2010 in £m)

User Class	Time Benefit	Fuel VOC benefit	Non-Fuel Benefit	User Charges	Total User Benefits	% of user Benefits
Car-Commuting	£38.28	£0.43	-£5.14	£0	£33.57	27%
Car-Business	£5.29	£0.03	£0.23	£0	£5.55	4%
Car-Other	£65.05	£0.34	-£31.42	£0	£33.97	27%
LGV Personal-Other	£2.33	-£0.41	-£0.12	£0	£1.79	1%
LGV Freight-Business	£37.58	-£3.41	-£0.15	£0	£34.01	27%
OGV1-Business	£8.14	-£1.13	£0.71	£0	£7.72	6%
OGV2-Business	£8.14	£0.10	£1.37	£0	£9.61	8%
Total	**£164.81**	**-£4.05**	**-£34.53**	**£0**	**£126.23**	**100%**

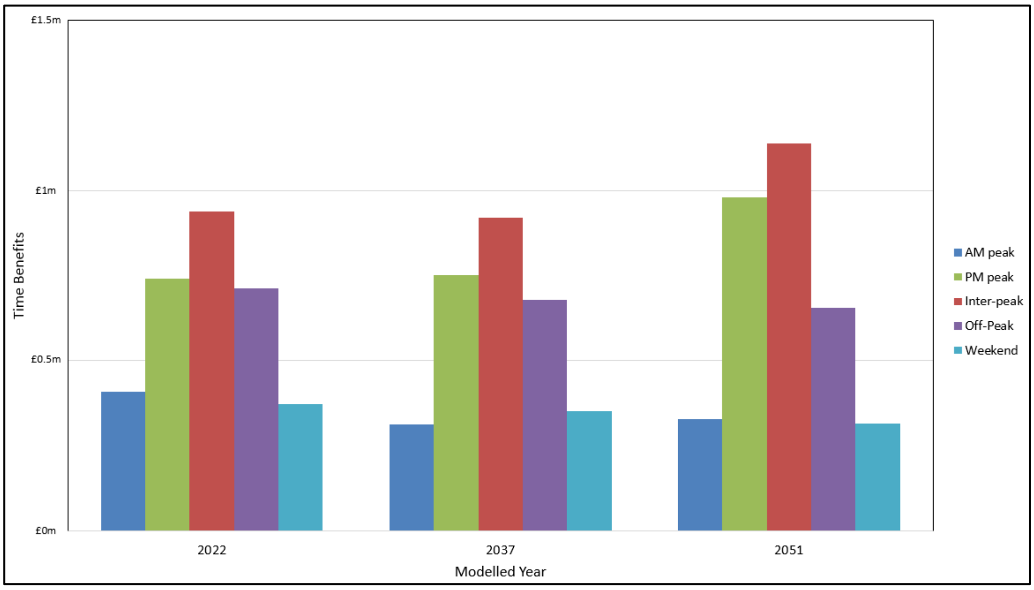
3.10.7 The car-commuting and car-other purpose users account for nearly 54% of the total transport user benefits due to the introductory Scheme. This is followed by the business users (car and goods vehicles user classes) which account for £56.89m (45%) of the total transport user benefits in 2010 prices and discounted to 2010.

Transport User Benefits by Time Period

3.10.8 Figure 3-1 shows the introductory Scheme user benefits profile for AM peak, Inter-peak, PM peak and Off-peak for forecast years 2022, 2037 and 2051.

3.10.9 The results show that the there is a slight decrease in travel time benefits for the morning peak period, off-peak period and weekend inter-period over forecast years, while the evening peak period and inter-peak period shows fairly similar benefits over the forecast years 2022 and 2037 while the benefits increase in 2051.

Figure 3-1: Introductory Scheme Core Scenario Transport User Benefit Profile by Time Period (2010 prices and discounted to 2010)



3.10.10 Table 3-4 shows the introductory Scheme transport user benefits by time period as a result of the Scheme.

Table 3-4: Introductory Scheme Core Scenario Transport User Benefits by Time Period (2010 prices and discounted to 2010)

Benefit Type	AM Peak	Inter-Peak	PM Peak	OP	WE	Total Initial	Total Adjusted
Travel Time	£18.7m	£59.0m	£49.7m	£37.4m	£18.6m	**£164.8m**	**£183.4m**
VOCs	-£.2m	-£.8m	£.4m	-£3.5m	-£.2m	**-£4.1m**	**-£4.3m**
Non-Fuel VOC	-£2.1m	-£15.5m	-£9.1m	-£7.9m	-£8.0m	**-£34.5m**	**-£42.5m**
Total	**£16.4m**	**£42.7m**	**£41.0m**	**£26.1m**	**£10.4m**	**£126.2m**	**£136.6m**
% Benefits (Without Weekend)	13%	34%	32%	21%	-	**100%**	**-**
% Benefits (With Weekend)	12%	31%	30%	19%	8%		100%
Hours per week	10 (2×5)	27.5 (5.5×5)	15 (3×5)	15 (3×5)	12 (6×2)		
Benefits per hour/week (sum over 60 years)	**£1.6m**	**£1.6m**	**£2.7m**	**£1.7m**	**£0.9m**		

3.10.11 The highest user benefits are realised during inter-peak period (34% of total travel time benefits) followed by evening peak period (32% of total travel time benefits). The off-peak and morning peak periods contribute 21% and 13% of total travel time benefits respectively.

3.10.12 However, when taking into account the weekend time period, the inter-peak and evening peak period accounts for around 30% of total travel time benefits followed by the off-peak and morning peak period benefits with 19% and 12% of total travel time benefits respectively.

3.10.13 Comparing the travel time benefits per hour/weekday shows that the evening peak period accounts for the highest benefits due to the overall greater travel time savings in the evening period followed by the inter-peak, morning and off-peak which all account for similar per hour/week travel time benefits.

Geographical Distribution of Transport User Benefits

3.10.14 Analysis of the transport user benefits on a geographical basis was carried out to understand the benefits to residents within large geographical areas (or sectors) as a result of constructing the Scheme.

3.10.15 The Scheme's transport model contains 190 zones between which trips are assigned on the road network. Although, the TUBA program has sufficient capacity to read this data from the matrices, it is only able to analyse benefits, geographically, between a much smaller number of zones, which in this context are known as 'sectors'.

3.10.16 The TUBA program was run with 17 sectors defined for the appraisal of the Scheme as shown in Table 3-5. The 17 sectors are presented geographically in Figure 3-2 and Figure 3-3 showing that the sectoral system becomes progressively coarser with increasing distance from the Scheme.

Table 3-5: Geographical Distribution of User Benefits – TUBA Sector System

Sector ID	Sector
1	Wyre-1
2	Wyre-2
3	Blackpool - 1
4	Blackpool - 2
5	Blackpool - 3
6	Wyre-3
7	Fylde - 1
8	Fylde - 2
9	Wyre-4
10	Wyre-5
11	Preston
12	Liverpool & Greater Manchester
13	South-West
14	South-East
15	Leeds & East
16	North-East
17	North-West & Scotland

Removal/Masking of Irrelevant User Benefits

3.10.17 Model noise can result in benefits being spuriously calculated by the TUBA program for sectors which are either far away from the Scheme area or for sectors which have been modelled with sparse network detail. These benefits were excluded (masked) from overall transport user benefits.

3.10.18 The user benefits excluded from the Scheme's economic appraisal are shown in Table 3-6. The shaded cells (in grey) are the sectoral movements for which the user benefits are considered to be irrelevant to the Scheme and hence, have been masked/excluded.

3.10.19 The rest of the sectoral movements are considered to be benefitting from the Scheme and hence, have been retained for the calculation of the transport user benefits and dis-benefits.

Table 3-6: Sectoral Masking

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	▨	▨	▨														
2	▨	▨	▨														
3	▨	▨	▨	▨													
4			▨	▨	▨							▨	▨	▨			
5				▨	▨			▨			▨	▨	▨	▨			
6																	
7																	
8					▨			▨			▨	▨	▨	▨			
9									▨							▨	▨
10										▨						▨	▨
11					▨			▨			▨	▨	▨	▨	▨	▨	▨
12				▨	▨			▨			▨	▨	▨	▨	▨	▨	▨
13				▨	▨			▨			▨	▨	▨	▨	▨	▨	▨
14				▨	▨			▨			▨	▨	▨	▨	▨	▨	▨
15											▨	▨	▨	▨	▨	▨	▨
16									▨	▨	▨	▨	▨	▨	▨	▨	▨
17									▨	▨	▨	▨	▨	▨	▨	▨	▨

Figure 3-2: TUBA Sectors – United Kingdom

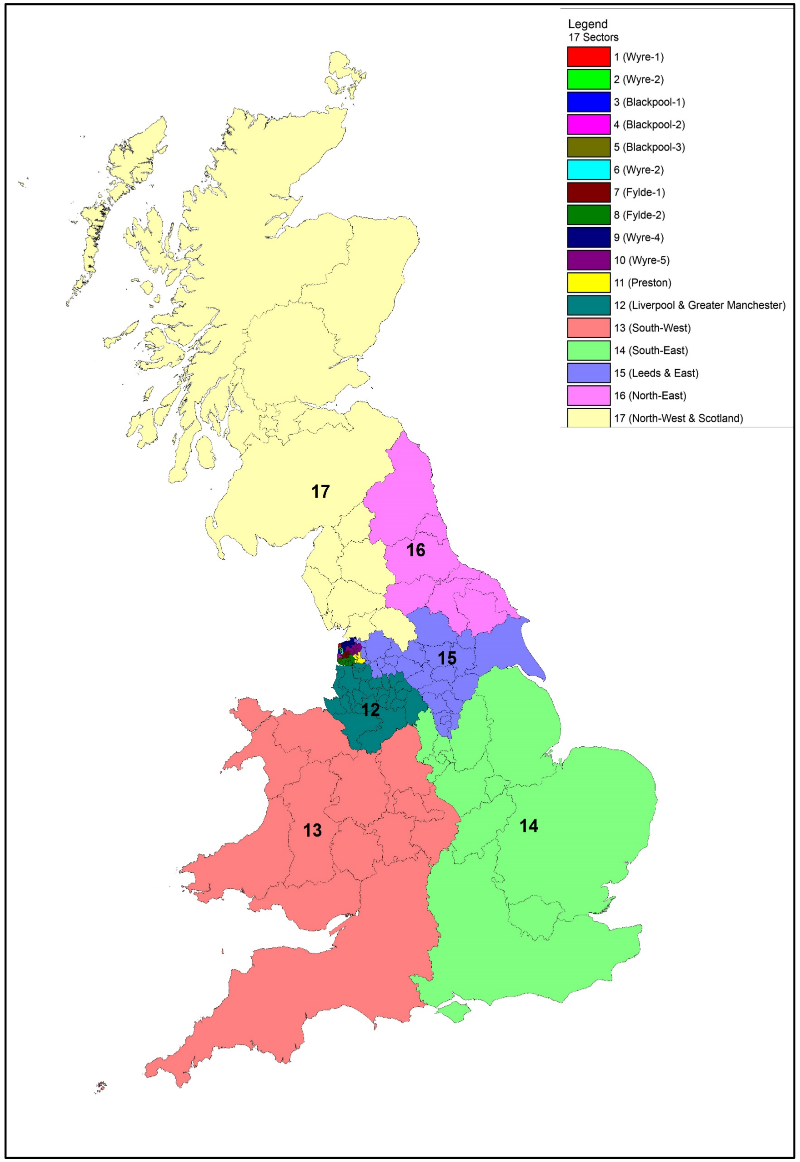
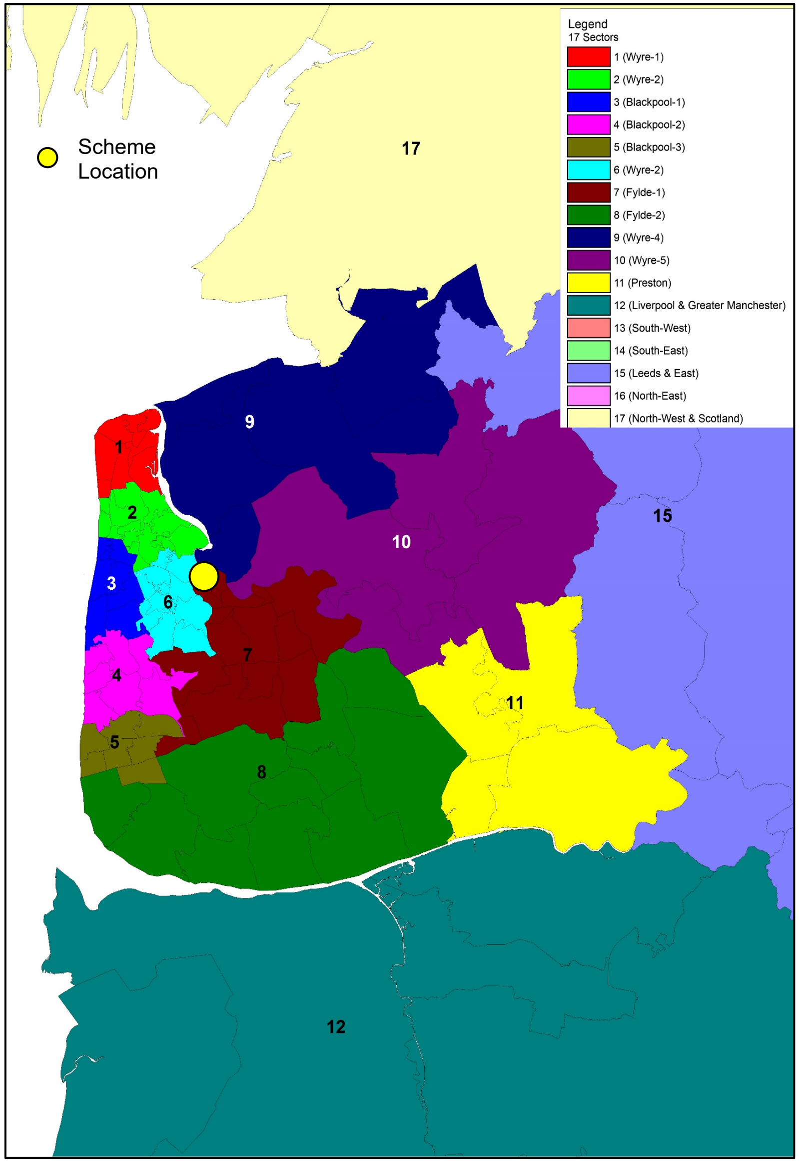


Figure 3-3 : TUBA Sectors



Transport User Benefits - Sectoral

3.10.20 The introductory Scheme initial core scenario weekday user time benefits from each sector to sector were extracted from the TUBA output file and shown in Table 3-7.

Table 3-7: Introductory Scheme Initial Core Scenario Sectoral Transport User Benefits (2010 prices and discounted to 2010, £m)

Sector ID	Sector Name	Benefits by Origin	Benefits by Destination	Average Benefits	% of Total User Benefits
1	Wyre-1	9.81	13.85	11.83	9%
2	Wyre-2	12.40	23.59	18.00	14%
3	Blackpool - 1	10.80	8.75	9.77	8%
4	Blackpool - 2	9.68	5.82	7.75	6%
5	Blackpool - 3	1.87	3.04	2.46	2%
6	Wyre-3	11.65	7.35	9.50	8%
7	Fylde - 1	6.03	4.80	5.42	4%
8	Fylde - 2	13.68	10.69	12.19	10%
9	Wyre-4	2.75	6.67	4.71	4%
10	Wyre-5	10.80	16.83	13.82	11%
11	Preston	8.01	6.82	7.41	6%
12	Liverpool & Greater Manchester	17.65	9.56	13.61	11%
13	South-West	0.35	-0.50	-0.08	0%
14	South-East	0.90	0.00	0.45	0%
15	Leeds & East	5.70	5.27	5.48	4%
16	North-East	0.06	0.05	0.05	0%
17	North-West & Scotland	4.10	3.64	3.87	3%
Total				**126.23**	

3.10.21 It is seen that the major transport user benefits account from Wyre-2 (14%) followed by Wyre-5 (11%), Liverpool & Greater Manchester (11%). All the sectors within the Fully Modelled Area seems to be benefitting from the Scheme while the rest of the sectors in the buffer area account for significantly lesser benefits from the Scheme.

3.10.22 An analysis of the introductory Scheme initial core scenario inter-sectoral transport user benefits is shown in Table 3-8. It is seen that the major transport user benefits account for transport movement from Liverpool & Greater Manchester (Sector 12) to Wyre-2 (Sector 2) followed by Liverpool & Greater Manchester (Sector 12) to Wyre-1 (Sector 1). This is deemed acceptable as the transport movement from Liverpool & Greater Manchester to Wyre-2 and Wyre-1 will be through the Scheme.

3.10.23 Transport user movement from Blackpool-2 (Sector 4) to Wyre-5 (Sector 10) and from Fylde-2 (Sector 8) to Wyre-2 (Sector 2) also show significant travel time benefits. This pertains to the fact that these sectoral movements occur via the Scheme.

3.10.24 The overall geographical distribution of user transport benefits due to the Scheme seems sensible.

Table 3-8: Introductory Scheme Initial Core Scenario Sector-to-Sector Transport User Time Benefits, £m

Sectors	No.	Wyre-1	Wyre-2	Blackpool - 1	Blackpool - 2	Blackpool - 3	Wyre - 3	Fylde - 1	Fylde - 2	Wyre - 4	Wyre - 5	Preston	Liverpool & Greater Manchester	South-West	South-East	Leeds & East	North-East	North-West & Scotland	Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Wyre-1	**1**	0.00	0.00	0.00	-0.04	0.06	0.00	0.68	2.14	0.32	1.55	1.84	4.63	0.61	0.30	1.80	0.04	1.75	**15.69**
Wyre-2	**2**	0.00	0.00	0.00	0.34	0.49	-0.06	1.34	4.13	0.83	2.97	1.86	4.74	0.41	0.22	1.38	0.04	2.23	**20.91**
Blackpool - 1	**3**	0.00	0.00	0.00	0.00	0.65	0.07	0.61	1.67	0.64	2.52	1.53	4.29	0.28	0.21	0.94	0.02	2.29	**15.70**
Blackpool - 2	**4**	-0.01	-0.27	0.00	0.00	0.00	-0.73	1.11	1.61	0.26	6.07	0.57	0.00	0.00	0.00	0.46	0.01	4.79	**13.89**
Blackpool - 3	**5**	0.04	0.08	0.36	0.00	0.00	-0.15	0.12	0.00	0.23	0.23	0.00	0.00	0.00	0.00	0.39	0.01	0.41	**1.72**
Wyre-3	**6**	0.11	0.23	-0.14	-0.73	0.34	0.05	0.52	1.59	0.85	3.06	1.85	3.26	0.45	0.18	1.17	0.03	1.39	**14.22**
Fylde - 1	**7**	1.02	2.01	0.89	0.80	0.25	0.71	-0.03	-0.02	0.37	0.03	-0.12	-0.08	-0.01	-0.01	-0.03	-0.02	0.01	**5.76**
Fylde - 2	**8**	1.87	5.62	1.80	0.79	0.00	1.73	0.02	0.00	2.54	-0.38	0.00	0.00	0.00	0.00	0.42	0.01	0.30	**14.71**
Wyre-4	**9**	0.00	-0.05	0.10	1.93	0.37	1.13	0.24	0.67	0.00	0.13	-0.08	-0.26	-0.04	0.00	-0.09	0.00	0.00	**4.03**
Wyre-5	**10**	1.77	4.24	1.46	1.18	-0.33	1.59	-0.18	-1.20	0.17	0.00	0.08	0.12	0.02	0.01	0.03	0.00	0.00	**8.95**
Preston	**11**	1.94	3.79	1.20	0.29	0.00	1.07	-0.02	0.00	0.36	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**8.67**
Liverpool & Greater Manchester	**12**	6.82	9.43	3.50	0.00	0.00	3.04	-0.01	0.00	1.29	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**24.13**
South-West	**13**	0.42	0.40	0.12	0.00	0.00	0.14	0.00	0.00	0.08	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**1.17**
South-East	**14**	0.29	1.05	0.07	0.00	0.00	0.05	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**1.58**
Leeds & East	**15**	1.92	2.39	0.66	0.21	0.14	0.61	0.01	0.08	0.35	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**6.39**
North-East	**16**	0.05	0.04	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.10**
North-West & Scotland	**17**	1.86	1.99	1.17	1.23	0.11	0.74	0.01	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**7.19**
Total		**18.10**	**30.96**	**11.19**	**6.01**	**2.08**	**10.00**	**4.43**	**10.76**	**8.39**	**16.26**	**7.53**	**16.70**	**1.72**	**0.90**	**6.49**	**0.12**	**13.16**	**164.81**

3.11 Introductory Scheme Alternative Scenario Results – Low and Optimistic Growth Scenarios

3.11.1 In addition to the introductory Scheme core scenario forecasts, sensitivity tests were carried out for the low and optimistic growth scenarios. The introductory Scheme initial transport user benefits of the economic assessment for the alternative growth scenario forecasts using the weekday AM, IP, PM and OP time periods are summarised in Table 3-9.

Table 3-9: Introductory Scheme Initial Core and Alternative Growth Scenarios Transport User Benefits (2010 prices and discounted to 2010)

Description	Core	Low	Optimistic
Travel Time	£164.81m	£139.25m	£182.09m
Vehicle Operating Costs	-£38.58m	-£34.24m	-£38.97m
User Charges	£0	£0	£0
Total User Benefits	**£126.23m**	**£105.01m**	**£143.12m**
Indirect tax revenue	£27.56m	£24.21m	£28.10m
Total Benefits	**£153.79m**	**£129.22m**	**£171.22m**

3.11.2 The results show that in the low growth scenario, the introductory Scheme generates transport user benefits of approximately £129.22 million. However, in the introductory Scheme optimistic growth scenario, the Scheme benefit is expected to increase to approximately £171.22 million.

3.11.3 It is also shown that the introductory Scheme user benefits in the low growth scenario are less than the introductory Scheme core scenario while the user benefits in the introductory Scheme optimistic growth scenario are higher than the introductory Scheme core scenario. As there are no tolls in the Scheme's transport model, user charges amount to £0.

3.11.4 Table 3-10 and Table 3-11 present the resultant introductory Scheme initial transport user benefits generated by journey purpose and vehicle class for the introductory Scheme low growth and optimistic growth scenarios respectively.

Table 3-10: Introductory Scheme Initial Low Growth Scenario Transport User Benefits by Journey Purpose and Vehicle Class (2010 prices and discounted to 2010 in £m)

User Class	Time Benefit	Fuel VOC benefit	Non-Fuel Benefit	User Charges	Total User Benefits	% of user Benefits
Car-Commuting	£31.03	£0.29	-£4.41	£0	£26.91	26%
Car-Business	£4.48	£0.01	£0.18	£0	£4.67	5%
Car-Other	£54.66	£0.02	-£27.13	£0	£27.56	26%
LGV Personal-Other	£2.04	-£0.39	-£0.12	£0	£1.53	1%
LGV Freight-Business	£32.96	-£3.31	-£0.17	£0	£29.48	28%
OGV1-Business	£7.04	-£1.06	£0.62	£0	£6.61	6%
OGV2-Business	£7.04	£0.01	£1.20	£0	£8.25	8%
Total	**£139.26**	**-£4.43**	**-£29.81**	**£0**	**£105.01**	**100%**

Table 3-11: Introductory Scheme Initial Optimistic Growth Scenario Transport User Benefits by Journey Purpose and Vehicle Class (2010 prices and discounted to 2010 in £m)

User Class	Time Benefit	Fuel VOC benefit	Non-Fuel Benefit	User Charges	Total User Benefits	% of user Benefits
Car-Commuting	£42.77	£0.38	-£5.24	£0	£37.90	26%
Car-Business	£5.94	£0.04	£0.26	£0	£6.24	5%
Car-Other	£71.06	£0.74	-£32.33	£0	£39.47	28%
LGV Personal-Other	£2.58	-£0.43	-£0.14	£0	£2.01	1%
LGV Freight-Business	£41.62	-£3.59	-£0.18	£0	£37.86	26%
OGV1-Business	£9.07	-£1.15	£0.82	£0	£8.74	6%
OGV2-Business	£9.07	£0.26	£1.58	£0	£10.90	8%
Total	**£182.09**	**-£3.74**	**-£35.23**	**£0**	**£143.12**	**100%**

3.11.5 The car-commuting and car-other purpose users in the low growth scenario account for 52% of the total transport user benefits due to the introductory Scheme. This is followed by the business users (car and goods vehicles user classes) which account for £49m (47%) of the total transport user benefits in 2010 prices and discounted to 2010 in the low growth scenario.

3.11.6 The car-commuting and car-other purpose users in the optimistic growth scenario account for 54% of the total transport user benefits due to the introductory Scheme. This is followed by the business users (car and goods vehicles user classes) which account for nearly £64m (45%) of the total transport user benefits in 2010 prices and discounted to 2010 in the optimistic growth scenario.

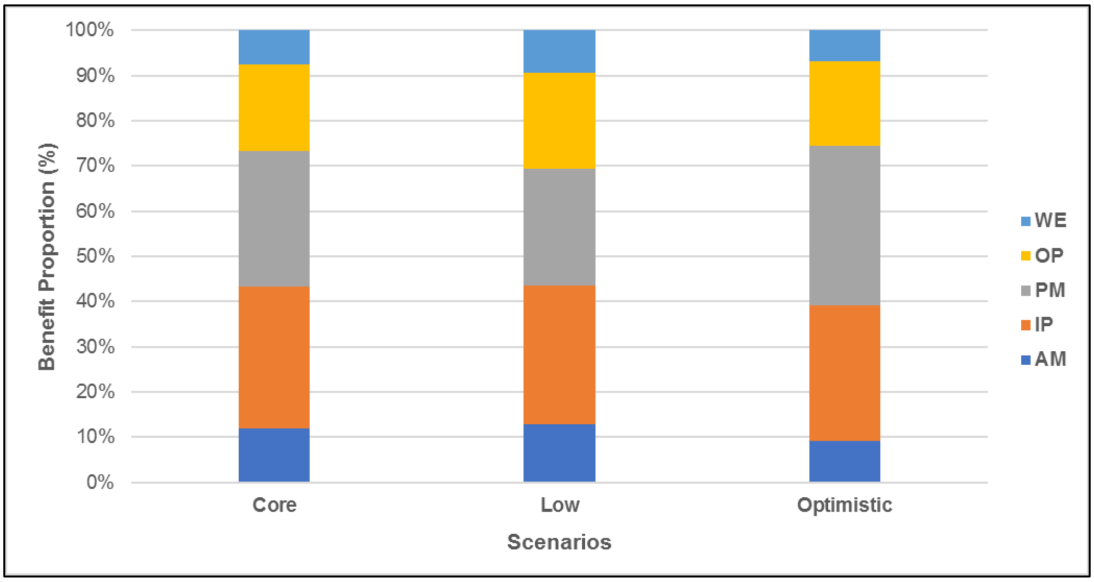
3.11.7 The pattern of transport user benefits by journey purpose and vehicle class for the alternative scenarios is aligned with the core scenario.

3.11.8 Table 3-12 and Figure 3-4 presents the proportion of the introductory Scheme user benefits being generated in each time period for all the growth scenarios.

Table 3-12: Introductory Scheme Proportion of user benefits by time period for all growth scenarios

Time Period	Forecast Scenario			Proportion of Benefits (Without Weekend)			Proportion of Benefits (With Weekend)		
	Core	Low	Optimistic	Core	Low	Optimistic	Core	Low	Optimistic
AM	£16.4m	£14.9m	£14.0m	13%	14%	10%	12%	13%	9%
IP	£42.7m	£35.7m	£46.1m	34%	34%	32%	31%	31%	30%
PM	£41.0m	£30.0m	£54.5m	32%	29%	38%	30%	26%	35%
OP	£26.1m	£24.5m	£28.5m	21%	23%	20%	19%	21%	19%
WE	£10.4m	£10.8m	£10.5m	-	-	-	8%	9%	7%
Total (Without Weekend)	**£126.2m**	**£105.0m**	**£143.1m**	**100%**	**100%**	**100%**	**-**	**-**	**-**
Total (With Weekend)	**£136.6m**	**£115.8m**	**£153.6m**	**-**	**-**	**-**	**100%**	**100%**	**100%**

Figure 3-4: Introductory Scheme Proportion of User Benefits by Time Period for all scenarios



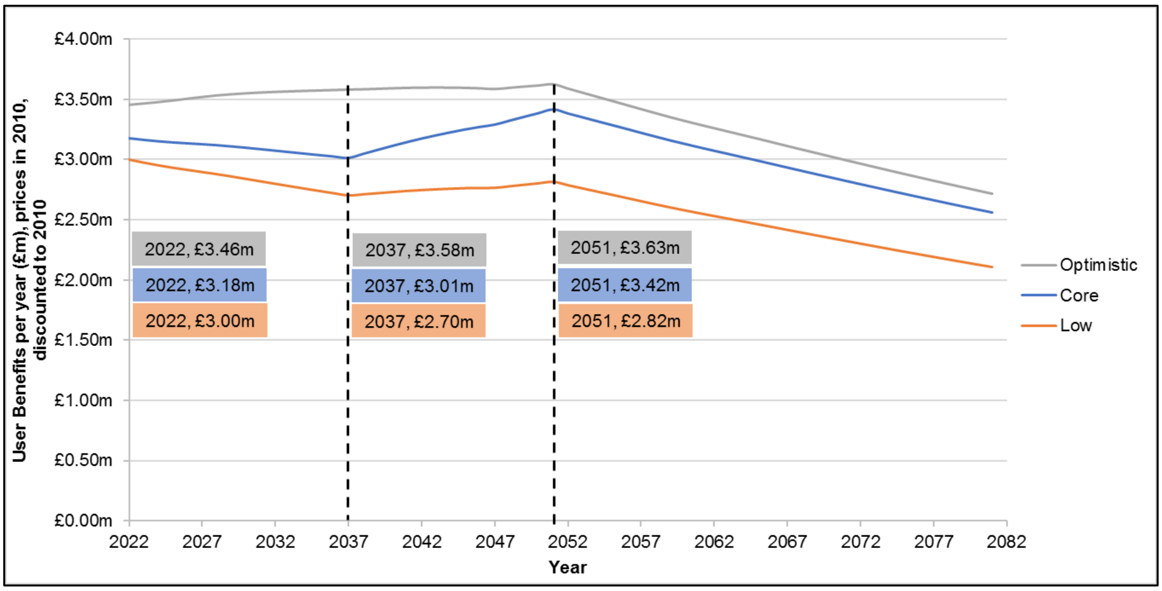
3.11.9 It is shown that on average, the inter-peak and evening time period contributes around 33% of weekday introductory Scheme user benefits across all three forecast scenarios. This is followed by off-peak and morning peak period benefits with 21% and 12% respectively.

3.11.10 However, when taking into account the weekend time period the inter-peak and evening peak period accounts for around 30% of total introductory Scheme travel time benefits followed by off-peak and morning peak period benefits with 20% and 11% respectively.

3.11.11 All three forecast scenario shows fairly similar introductory Scheme user benefits profile by time period with inter-peak and evening peak contributing highest followed by off-peak, morning peak and weekend time periods.

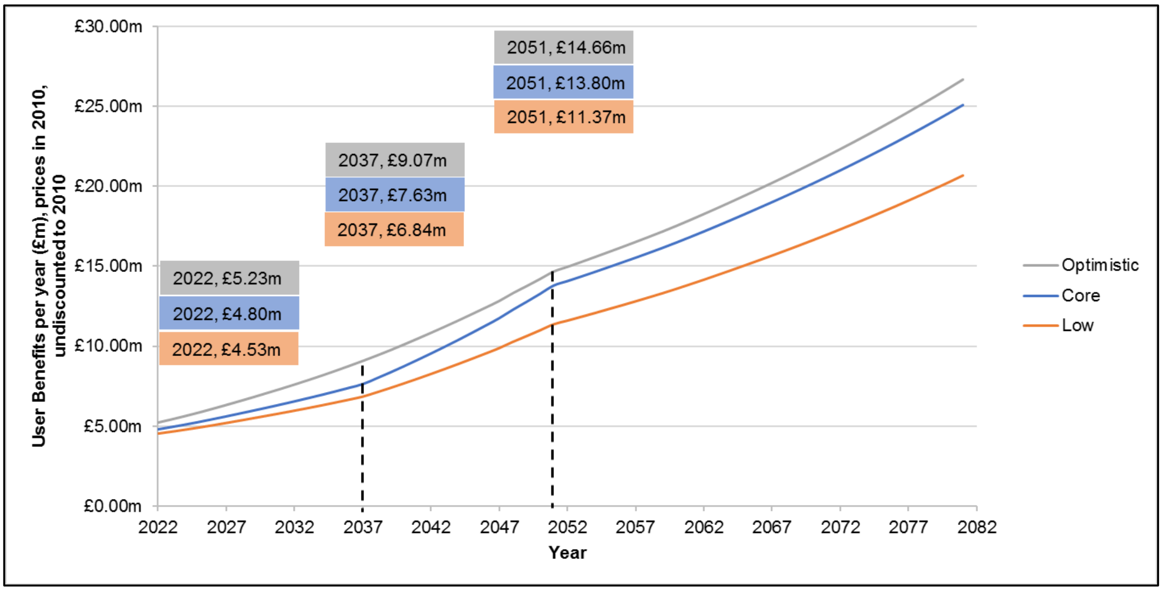
3.11.12 Figure 3-5 and Figure 3-6 presents the introductory Scheme user benefits of the Scheme throughout the 60 year period of the assessment for the core and alternative growth scenarios with discounted and undiscounted values respectively.

Figure 3-5: Introductory Scheme Yearly Profile of User Benefits (2010 prices and discounted to 2010)



3.11.13 Figure 3-5 shows that the optimistic growth scenario introductory Scheme user benefits profile is above the core scenario benefits profile while the low growth scenario benefits profile is below the core scenario benefits profile. It is shown there is a slight reduction in benefits in 2037 with respect to 2022 for the introductory Scheme core and low growth scenarios while the benefits profile for the optimistic growth scenario seem to increase over the forecast years. After the final forecast year 2051, with a constant traffic growth assumed for the rest of the appraisal years, the impact of discounting is seen to be evident for all three growth scenarios resulting in a consistent drop in benefits.

Figure 3-6: Introductory Scheme Yearly Profile of User Benefits (2010 prices and un-discounted to 2010)



3.11.14 Figure 3-6 shows the undiscounted introductory Scheme user benefits profile. The trend of the three growth scenarios remain similar to the discounted values, with the optimistic growth scenario benefits profile above the core scenario benefits profile while the low growth benefits profile is below the core scenario benefits profile. Also, as the values are undiscounted, it is seen that the introductory Scheme user benefits increase overtime until the horizon year for all three forecast scenarios.

4 Monetised Safety Assessment: Accident Cost Savings

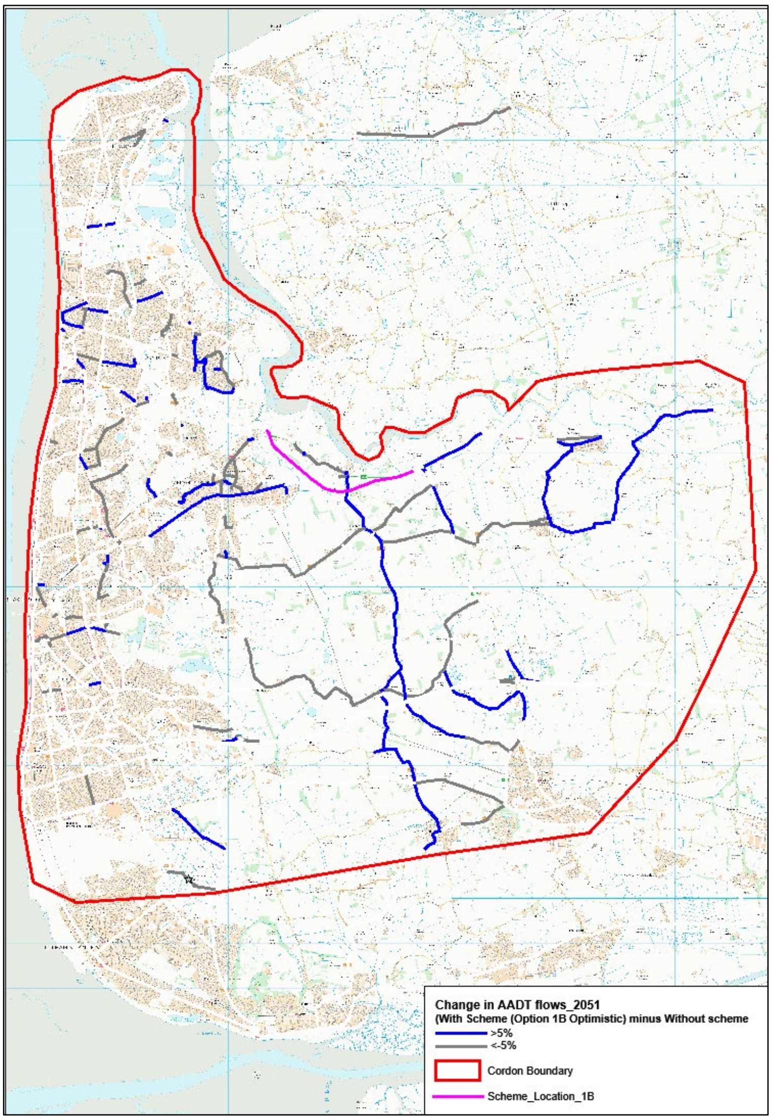
4.1.1 The safety impacts of the Scheme were assessed quantitatively and monetised and incorporated into the overall economic assessment for the Scheme. Accident saving benefits have been calculated using the Cost and Benefit to Accidents – Light Touch (COBALT) program (Version 2013.2), a spreadsheet application developed by the DfT to undertake the analysis of the impacts on accidents as part of the economic appraisal of road Schemes.

4.1.2 COBALT compares accidents by severity and associated costs across the network in the Without Scheme scenario with those in the With Scheme scenario, using details of link and junction characteristics and forecast traffic volumes. Accident rates and costs used in COBALT are consistent with those defined in the Design Manual for Roads and Bridges (DMRB) Volume 8. The resulting safety benefits calculated by COBALT were then added to the overall benefits to derive the Scheme BCR.

4.2 Selection of COBALT road network

4.2.1 The accident appraisal of the Scheme is undertaken on the traffic impact area. The impact area was taken to be the area within which traffic flow changes are significant. A criterion change of +/- 5% in AADT flows between the With Scheme and Without Scheme was utilised based on the 2051 optimistic growth scenario. The optimistic growth scenario was adopted to obtain the maximum network coverage for the COBALT network as shown in Figure 4-1.

Figure 4-1: Selecting the COBALT Network

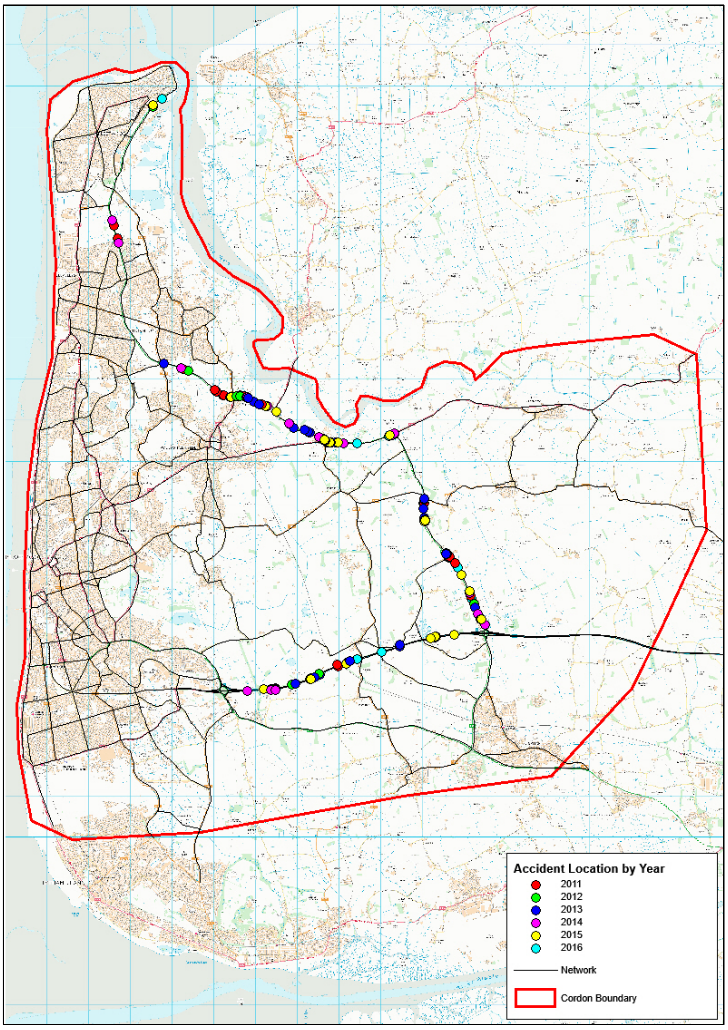


4.3 Accident Rates

4.3.1 COBALT calculates the number of accidents over the 60 year period from either default (national average) or observed (local) accident rates.

4.3.2 Observed accident rates were calculated for COBALT from Personal Injury Accident (PIA) data for the latest available complete six-year period (2011-2016). This data was obtained from the Road Safety Data website, published by the DfT Accident locations along the A585 between 2011 and 2016 are shown in Figure 4-2.

Figure 4-2: Accident locations by Year (2011-2016)



4.3.3 Local accident rates were calculated using the following steps:

i. Geocoded database of road accidents on the A585 developed

ii. COBALT road types allocated to relevant SATURN links

iii. AADT 24-hour (2way) traffic flows was calculated for the SATURN link using TRIS count data

iv. Annual million vehicle kilometres were estimated (traffic flow * link length * 365 * 10^-6)

v. Average number of accidents in the study area by link type was calculated

vi. Local accident rates were calculated by road type (accidents by link type per year / million veh km) and these were applied to a combined link and junction COBALT analysis.

4.3.4 The local accident rates were evaluated between 2011-2016 using the observed flow data (AADT) from WebTRIS.

4.3.5 The local accidents rates were calculated along A585 and M55 as these were the only traffic count sites (WebTRIS) available in the study area.

4.4 COBALT Inputs

4.4.1 COBALT requires the following input parameters:

- Current year (2018)
- Base Year (2015)
- Scheme Opening Year (2022)
- Model Forecast Years (2022, 2037, 2051)
- Link Classification – specifying link name, road type, length (in km), speed (in mph) for each link considered in the COBALT network
- AADT traffic flow on each COBALT link for base year and forecast years
- Observed / local accident rates

4.4.2 Road types were specified as per the classification given in the COBALT manual. Table 4-1 presents the road sections along A585 categorised by COBALT road type.

Table 4-1: Scheme COBALT Road Type

Road Type	Speed(kmph)	Road Section
Modern S2	>40	1 to 7
D3 Motorway	50/60/70	8

4.4.3 Speed limits (in mph) are required on all links within the COBALT network. All links with a speed limit of 20mph were coded as 30mph roads as per COBALT guidance.

4.4.4 AADT flows for each modelled link for both Without and With Scheme for all forecast years were assessed.

4.4.5 Table 4-2 summarises local accident rate used for COBALT analysis compared to the default accident rate each road type and speed limit category.

Table 4-2: Accident Rates

Road Type	Speed (mph)	Default Accident Rate	Local Accident Rate
D2M	50/60/70	0.08	-
D3M	50/60/70	0.067	0.099
D4M	50/60/70	0.079	-
Modern S2 Roads	30/40	0.532	-
Modern S2 Roads	>40	0.244	0.384
Modern D2 Roads	30/40	0.553	-
Modern D2 Roads	>40	0.107	-

4.5 Introductory Scheme Safety Assessment Results

4.5.1 COBALT results were classified into three categories:

i. Economic assessment

ii. Accident savings

iii. Casualty reduction

4.5.2 The results pertain to the total costs of accidents on the study network over the appraisal period (discounted to and in the 2010 price base) for the Without Scheme and With Scheme forecasts, and the total economic benefit of the Scheme. The benefit is the With Scheme cost subtracted from the Without Scheme cost.

4.5.3 The casualty results relate to the difference in number of fatal, serious and slight casualties between the Without and With Scheme.

4.5.4 A summary of the economic results of the introductory Scheme accident assessment for the core, low and optimistic scenarios is presented in Table 4-3. The accidents costs from QUADRO assessment during maintenance is also presented in the table to evaluate overall accident benefits. However, a detailed description of the QUADRO assessment is presented in Chapter 6.

4.5.5 The accident benefits are calculated as a difference between accident costs of the Without Scheme and With Scheme scenarios. Hence, an overall positive value indicates that there are accident benefits (or savings) and a negative value indicates accident disbenefits.

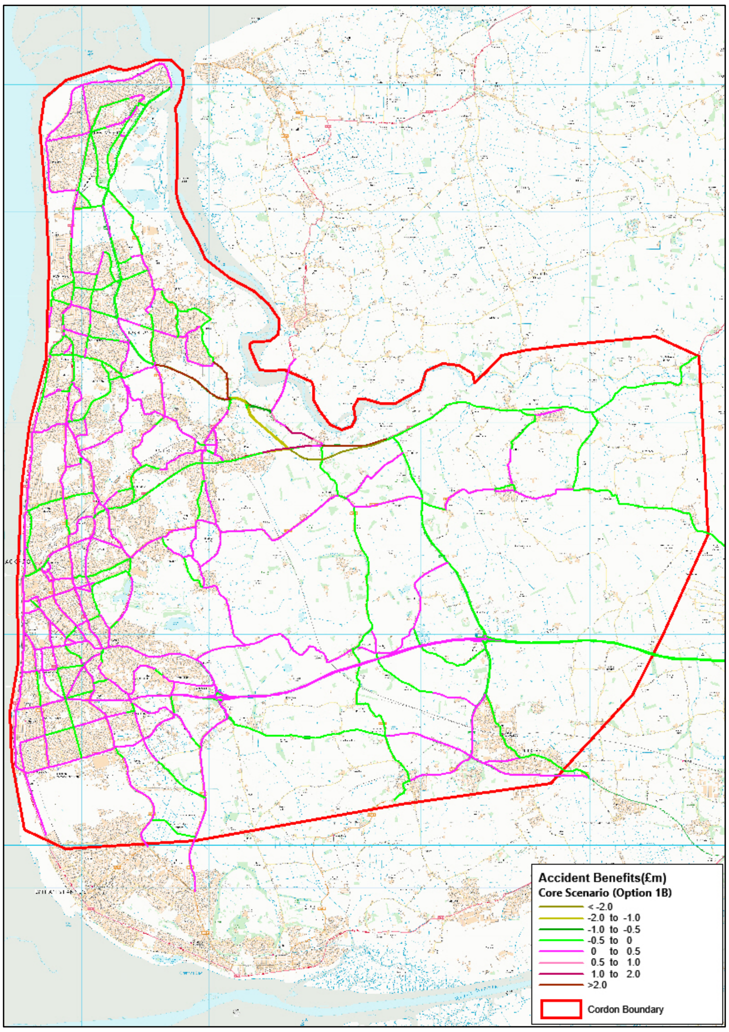
Table 4-3: Introductory Scheme Accident Benefits (2010 prices and discounted to 2010)

Scenario	Accident Costs (£m)		Accident Benefits saved by Scheme (£m)	QUADRO Accident Costs (£m)		Total Accident Benefits Saved by the Scheme (£m)
	Without Scheme	With Scheme		Without Scheme	With Scheme	
Core	£726.264	£716.157	£10.106	0.0049	0.0001	£10.111
Low Growth	£664.856	£653.789	£11.067	0.0049	0.0001	£11.071
Optimistic Growth	£791.930	£780.454	£11.476	0.0049	0.0001	£11.480

4.5.6 The introductory Scheme accident costs for the low growth scenario is lower than core and the optimistic growth scenario is higher than the core scenario. It can be observed that the accident savings for the low growth scenario is the highest as the flows are comparatively lower in this scenario and the difference between the Without and With Scheme gives the introductory Scheme low growth accident benefit savings of £11.07m. The accident benefits for the introductory Scheme core scenario is observed to be £10.11m and £11.48m for the optimistic growth scenario.

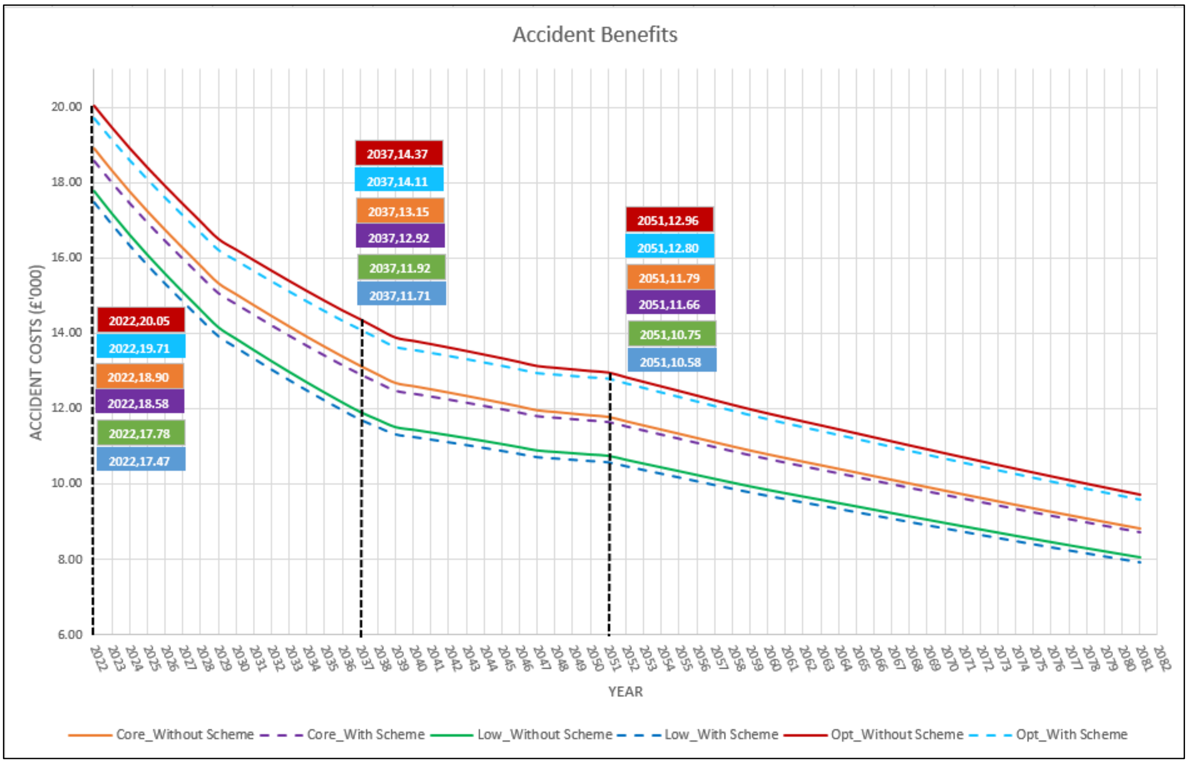
4.5.7 Figure 4-3 shows the introductory Scheme network wide accident benefits for the core scenario over the appraisal period resulting from the Scheme.

Figure 4-3: Introductory Scheme Accident Benefits – Core Scenario



4.5.8 The variation in introductory Scheme accident costs for the Without Scheme and With Scheme scenarios for the core, low and optimistic growth scenarios over the appraisal period is presented in Figure 4-4.

Figure 4-4: Introductory Scheme Variation in Accident Costs over the Appraisal Period- All Growth Scenarios



4.5.9 The introductory Scheme accident costs are observed to be the lowest in the low growth scenario and the highest in optimistic growth scenario. The increase in the accident costs is expectedly, attributed to the increased volume of traffic in the optimistic growth scenario.

4.5.10 The introductory Scheme leads to an overall reduction in accidents, thereby providing accident savings over all modelled years. The improvement of the A585 due to the introductory Scheme leads to an increase in the overall vehicle-kilometres travelled. The increase in vehicle-kilometres occurs on roads with a lower accident rate i.e. the improved Scheme section, whilst a decrease in vehicle-kilometres is observed on local roads with a higher accident rate i.e. the rest of the network.

Introductory Scheme Accident Savings

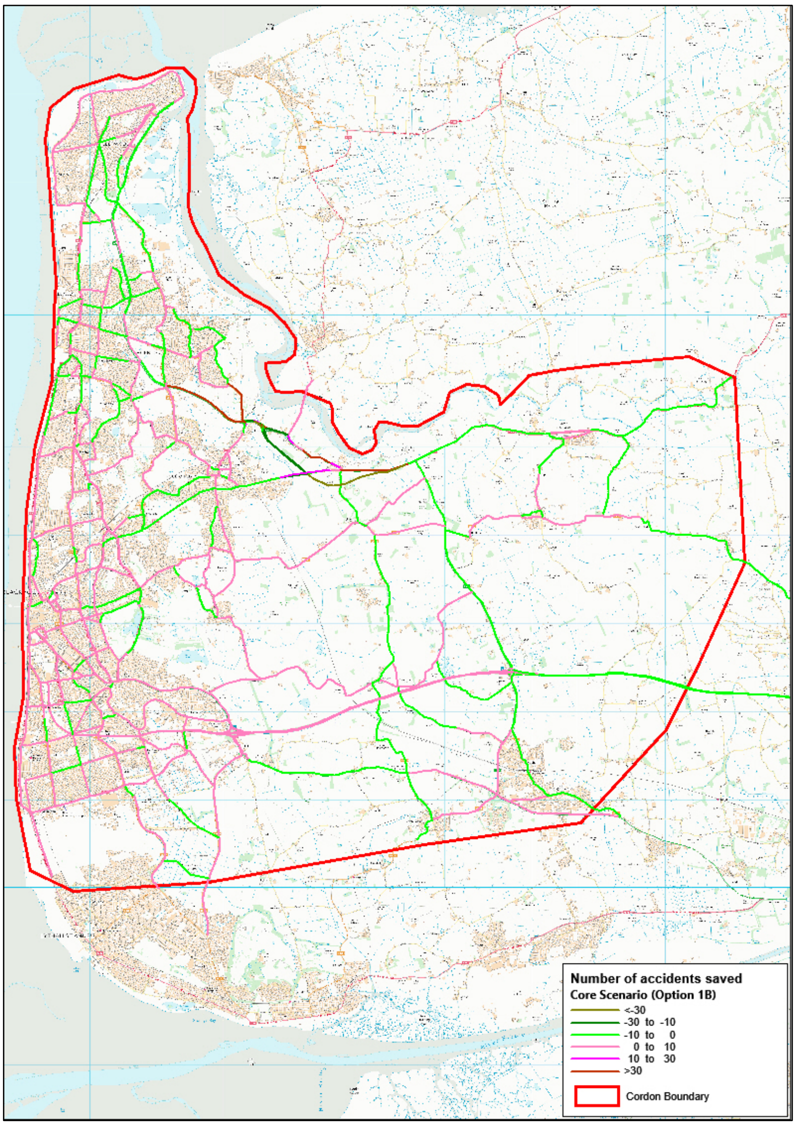
4.5.11 The number of accidents saved by the introductory Scheme for the core, low and optimistic growth scenarios is presented in Table 4-4. The accidents saved as a result of the introductory Scheme are calculated as the difference between the number of accidents in the Without Scheme and the With Scheme Scenarios.

Table 4-4: Introductory Scheme Accident Savings

Scenario	Total Accidents		Accidents Saved
	Without Scheme	With Scheme	
Core	15,641	15,613	28
Low Growth	14,289	14,228	61
Optimistic Growth	17,087	17,030	57

4.5.12 Figure 4-5 presents the change in the number of accidents due to the introductory Scheme for the Core Scenario.

Figure 4-5: Introductory Scheme Accident Savings - Core Scenario



4.5.13 The assessment of accident benefits is summarised below:

- There is an overall reduction in accident costs due to the introductory Scheme thereby providing accident savings over all modelled years. The Scheme leads to an increase in the overall vehicle-kilometres travelled (as vehicles undertake more and longer journeys utilising the improved strategic road network).
- The total accident costs are observed to decrease over time.

Introductory Scheme Casualties

4.5.14 The change in the number of casualties between the With Scheme and the Without Scheme scenarios is shown in Table 4-5.

Table 4-5: Introductory Scheme Summary of Casualties

Scenario	Number of Casualties						Casualties Saved		
	Without Scheme			With Scheme					
	Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight
Core	171	2079	19254	163	2039	19186	8	40	68
Low Growth	157	1899	17608	149	1856	17500	8	43	108
Optimistic Growth	187	2276	21005	178	2232	20904	8	45	101

4.5.15 It is observed that there is reduction in all types of casualties i.e. fatal, serious and slight injuries over the appraisal period with the introductory Scheme in place. The fatal injuries casualties saved by the introductory Scheme, is similar for the core, low and the optimistic scenarios. The highest reduction in casualties is seen in the low growth scenario, followed by the optimistic growth and core scenarios.

4.5.16 In summary, the Stage 3 Introductory A585 Windy Harbour to Skippool Improvement Scheme achieves one of its key overall objectives of improving safety along the route by reducing the number of accidents.

4.5.17 The monetary benefits due to the introductory Scheme accident savings for the core, low and optimistic growth scenarios has been applied in the Analysis of Monetised Costs and Benefits (AMCB), summarised in Section 8.

5 Introductory Scheme Construction Delay Assessment

5.1 Introduction

5.1.1 Traffic management during construction tends to result in changes to journey times and vehicle operating costs. Construction work also has an impact on accidents. These impacts need to be appraised within the economic assessment of a scheme.

5.1.2 Generally, the presence of roadworks results in increased travel costs and hence, the benefits due to construction works are normally negative.

5.1.3 Part of the Scheme will be constructed along the existing alignment and hence traffic will inevitably get delayed at certain times during the various construction phases. Delays to traffic can, however, be kept to a minimum by using effective traffic management measures.

5.1.4 Queues and Delays at Roadworks (QUADRO) V4R15 is used to compute the cost of construction works in terms of time delay, vehicle operating costs and accident costs, as well as incorporating the costs of the roadworks themselves for the Core Scenario. User dis-benefits are assessed based on queues developing at the roadwork or additional time taken to travel via an alternative route.

5.1.5 Following a review of the Traffic Management Plans and programmes provided by BAM Morgan Sindall Joint Venture (bmJV), an assessment of the delay to road users due to the construction of the Scheme using QUADRO was carried out.

5.2 Construction Programme

5.2.1 The Scheme has a part of its construction online, from Skippool junction to Skippool Bridge junction.

Skippool Junction

5.2.2 This section of the works requires a new 4-way signalised junction to be built on the footprint of the existing roundabout. The construction is carried out in three phases at this section.

5.2.3 The temporary Traffic Management (TM) during Phase 1 assumes that on the north, east and west approaches to the roundabout, the traffic is restricted to a single lane in each direction to maximize the available working area and allow the new traffic islands to be built. The southern approach remains unaltered. As part of the Phase 1 works, in addition to the main carriageway being built on its new alignment, many of the splitter islands are built or partially built to allow these to be utilised as part of the Phase 2 TM.

5.2.4 During Phase 2 the southern half of the junction will be built. Phase 2 TM will be introduced over the course of a week with both lanes of the main A585 traffic switched to using the newly built eastbound carriageway. The existing traffic island on the Breck Road southbound approach will be removed. As part of the traffic switch, the traffic approaching from the south now restricted to single lanes at the roundabout approach. This phase allows the reconstruction of the westbound carriageway and the access in front of the houses to the east of the existing roundabout.

5.2.5 Phase 3 of the construction involves the installation of the permanent white lining and the full traffic signal system for the junction. A QUADRO model was not developed for Phase 3 as there is no traffic management measure specification and it was therefore assumed that there will be no delay to road users due to either the installation of the permanent white lining or the installation of the full traffic signal control system.

Skippool Bridge

5.2.6 For the majority of the works at this junction the intention would be to maintain the traffic on the existing alignment in Phase 1 (North phase) and construct as much of the new junction off-line as possible.

5.2.7 Works would start with the construction of the new retaining wall to the north of the junction and the new section of ‘Old Mains Lane’. With this completed and open to local traffic as an access the section of new eastbound carriageway would be built. The programme allows a 40-day period after the earthworks have been completed for any diversion works to move utilities so that they can pass over the northern section of the new bridge before the existing structure is demolished. The work on the southern side of the existing alignment is not as critical as the northern and a resource link has been included to allow the earthwork on the south side to progress while the utility diversions take place on the north.

5.2.8 Phase 2 (South Phase) TM is implemented when the traffic is switched to the northern half of the bridge and this allows the new splitter islands at the junction to be completed as well as the completion of the westbound carriageway up towards the new deck. There would be no requirement for temporary traffic signals during Phase 2 and the new permanent signals would be erected as the islands are completed. The traffic signals would only be made operational when the bypass is opened.

Poulton Junction

5.2.9 This section of the works requires a new 4-way gyratory with A586 Garstang Road, providing an online connection with the existing carriageway.

5.2.10 The Initial phase 1 is required to provide a safe means of access to the site and for plant vehicles to travel West and East within the works boundary. For that, a new Traffic Light controlled plant crossing and Junction is required for staff, labour and delivery vehicles to access the main compound area located just to the north of Poulton Junction. Work areas to the West and East will be available to carry out new Bypass construction. Advanced signing and traffic calming on approach to temporary junction will be required to inform advancing vehicles that a plant crossing is close and there is a high likelihood that slow-moving vehicles will be crossing or turning near the junction and a reduced speed limit of 30 mph will be enforced to slow traffic in this high-risk area.

5.2.11 In Phase 2, a relatively simple diversion of the A586 will be made to the south which enables a work site to the North for 60 – 70 % of the new junction to be completed. Works traffic will still need to access the site to the East and West so a traffic light-controlled crossing / access will be maintained. Also, an advanced signing and traffic calming on approach to temporary junction will be required to inform road users that a plant crossing is close and slow-moving vehicles will be crossing or turning near the junction. The enforcement of a reduced speed limit of 30mph will continue in this phase also.

5.2.12 The final phase 3 would be to complete the southern section of the junction so traffic would be routed through the new signal junction layout. The temporary traffic Light controlled crossing of A586 Garstang Road will no longer be required and will be removed and would utilise the permanent traffic signals for any works traffic along the bypass route.

Lodge Lane Bridge

5.2.13 The new Lodge Lane overbridge is designed to be built on the same line as the existing road in 3 phases without the need for any existing road closures.

5.2.14 To enable the works to commence, Traffic Management will require a full chicane type diversion to control and route existing traffic through the works passing the new bridge site on the West. For general traffic safety, temporary lighting would probably be required on the diversion. The access road leading to Singleton Hall will be retained throughout this phase while the construction of the new access road on the south side of the bypass is constructed and a reduced speed limit of 30 mph will also be enforced.

5.2.15 Phase 2 is a similar phase as phase 1 but the new connection to the Singleton Hall access road can be made and existing road removed. The new bridge will be built top – down to avoid the temporary works involved with deep excavations. There will be a period when a traffic light controlled crossing can be used for plant and machinery movements, but this facility will be lost when works start on the new bridge deck. A reduced speed limit of 30 mph will continue to be enforced in this phase too.

5.2.16 In the final phase the diverted traffic will be re-routed back on the mainline and over the completed Bridge. All TM restrictions will be removed, and the works will proceed beneath the overbridge. Side road access will be made through the new connection to Singleton Hall access road.

Grange Footbridge to Windy Harbour Junction

5.2.17 The new Grange Footbridge will be provided over the new road at chainage 3900 to maintain pedestrian and cyclist connectivity. The construction takes place in 3 phases without any existing road closures but reduction in speed limit from 50mph to 40 mph for phases 1 and 3 and 30 mph for the Phase 2.

5.2.18 Phase 1 Traffic Management will consist of narrow lanes on the existing A586 moving traffic to the North to enable the widening works to be constructed on the South. Access to the works will be from the Westbound direction of the existing A586 via signed access and egress points. A segregated public footpath across site will be maintained and manned at work times giving priority to the public. The Grange Footbridge will require very little TM (maybe some widening of the existing access) as it will be constructed within the site boundaries and can be delivered from the Poulton Junction end if needed

5.2.19 The second phase has the existing A586 diverted in narrow lanes onto the new Westbound Carriageway. The Public footpath still crosses the work site for a small section on the North which will be manned, and access priority given to the public. Pedestrians can then use the new Grange footbridge to gain access over the diverted road. The work area is made available to the North for the new bypass widening works.

5.2.20 The remainder of the construction of the Scheme from A585 Skippool Bridge to Windy Harbour Junction is offline and therefore will not cause any user dis-benefits during construction. The traffic management diagrams for all phases are included in Appendix C.

5.2.21 Table 5-1 shows the duration of various construction phases of the A585 Windy Harbour to Skippool Improvement Scheme. Details on the construction and the traffic management arrangements for each construction phase have been provided in Section 5.2.

Table 5-1: Construction Phase Duration

Construction Phase	Location	Duration of Construction	Programmed Start
Phase 1	Skippool Junction	4 months	July 2020
Phase 2	Skippool Junction	4 months	December 2020
Phase 1	Skippool Bridge Junction	5 months	June 2020
Phase 2	Skippool Bridge Junction	6 months	January 2021
Phase 1	Poulton Junction	7 months	May 2021
Phase 2	Poulton Junction	2 months	December 2021
Phase 3	Poulton Junction	1 month	February 2022
Phase 1	Lodge Lane Bridge	2 months	July 2020
Phase 2	Lodge Lane Bridge	10 months	September 2020
Phase 3	Lodge Lane Bridge	4 months	July 2021
Phase 1	Grange Footbridge	7 months	April 2021
Phase 2	Grange Footbridge	4.5 months	November 2021
Phase 3	Grange Footbridge	1 month	March 2022

5.3 Introductory Scheme Construction Delay Assessment Results

5.3.1 Total construction benefits for the construction phases of the Scheme were calculated by summing up the (proportioned) benefits for each construction phase. Table 5-2 presents the proportionate benefits incurred for each construction phase and the overall benefits during the construction of the Scheme.

Table 5-2: Introductory Scheme Core Scenario Benefits during Construction Phases (2010 prices and discounted to 2010)

Phase	Description	Transport User Benefits	Fuel Carbon Emission	Indirect Tax Revenue (ITR)	Present Value of Benefits (PVB)
Phase1	Skippool Junction	-£549,544	£356	£27,532	-£521,656
Phase2	Skippool Junction	-£557,844	£356	£27,960	-£529,528
Phase 1	Skippool Bridge Junction North phase	-£715,632	£514	£35,513	-£679,605
Phase 1	Skippool Bridge Junction South phase	-£728,384	£547	£36,182	-£691,655
Phase 1,2& 3	Poulton Junction	-£16,679	-£1	£196	-£16,484
Phase 1&2	Lodge Lane Bridge	-£7,966	£0	£113	-£7,853
Phase 1	Garstang to Windy Harbour	-£491,315	£11	£23,494	-£467,810
Phase 2	Garstang to Windy Harbour	-£273,517	£5	£12,885	-£260,627
Phase 3	Garstang to Windy Harbour	-£16,415	£1	£894	-£15,520
Total		**-£3,357,296**	**£1,789**	**£164,769**	**-£3,190,738**

5.3.2 The overall transport (dis)benefits (including indirect tax revenue and greenhouse gases benefits) during construction of the introductory Scheme is approximately -£3.19 million (2010 prices and discounted to 2010).

6 Maintenance Delay Assessment

6.1 Introduction

6.1.1 In addition to assessing the delay to road users during construction, it is necessary for the economic assessment to take account of the cost of maintaining the new section of the Scheme during the 60 year appraisal period. It is currently expected that the bypassed section of the existing A585 between Little Singleton and Grange junction would be detrunked and its maintenance responsibility would be transferred to the local highway authority and therefore those maintenance costs are not included.

6.2 Maintenance Activities

6.2.1 A maintenance schedule was devised for both the Without and With Scheme and includes a recurring cycle of resurfacing/overlay/ reconstruction, together with major maintenance of structures.

6.2.2 The maintenance schedules include a recurring cycle of resurfacing (40mm) and inlay (100mm and 150mm +) applicable to different sections of the Scheme. For the maintenance works, mostly overnight closures from 7pm to 7am were applied along with 24-hour closures on weekends in some cases. The maintenance profile for the With Scheme and Without Scheme is included in Appendix D including the type of closure, duration and temporary speed on site.

6.2.3 Table 6-1 presents the maintenance programme for the Without Scheme and With Scheme scenarios. It is assumed that the maintenance will be required beginning 2022 and 2028 for the Without Scheme and With Scheme scenario respectively.

Table 6-1: Maintenance Program for Without Scheme and With Scheme scenarios

Scenario	40 mm “MINOR” Intervention	100 mm “MAJOR” Intervention	150 mm+ “MAJOR” Intervention
Without Scheme	2022, 2036, 2049, 2062, 2074	2042, 2068	2029, 2055, 2080
With Scheme	2028, 2041, 2054, 2067, 2079	2035, 2061	2048, 2073

6.3 Methodology

6.3.1 The (dis)benefits to the transport user arising because of the regular maintenance work of the proposed Scheme was assessed using the Highways England Transport Planning Group’s Queues and Delays at Roadworks (QUADRO) software (version 4 release 15).

6.3.2 QUADRO is used to compute the total cost of major maintenance works in terms of time delay, vehicle operating costs and accident costs, as well as incorporating the costs of the works themselves. User costs are assessed based on queues developing at roadworks or additional time taken to travel via an alternative route. QUADRO can be used to appraise an individual maintenance task that is being planned in the future or maintenance strategies over the whole life of an existing or new road.

6.3.3 A QUADRO assessment was carried out for each of the A585 sections in both directions for the Without Scheme and With Scheme scenarios.

6.3.4 QUADRO makes use of the traffic flow profiles on the Scheme links and diversion routes (including link flows), available capacity, details of the traffic management and speed flow curves for the diversion route. Diversionary routes are often formed of several links with varying traffic capacities and speed limits. Using this information QUADRO calculates output traffic flow profiles, likely diverted traffic, delays, average network speed and the cost of these delays.

6.3.5 Assumptions were made about the strategic and local diversion routes during maintenance, as required for use in QUADRO. Local hourly traffic flow profiles on the A585 were also required for the QUADRO analysis. Traffic profiles, along with the HGV percentage profiles were therefore, specified for the Scheme and the diversion routes.

6.3.6 It is to be noted that traffic profiles from Highways England’s Traffic Flow Data System (TRIS) for the following four-day types were used:

- Monday to Thursday
- Friday

- Saturday
- Sunday

6.3.7 For each maintenance phase and job described, delays and dis-benefits were calculated by QUADRO by day type and direction. These delays and dis-benefits were calculated as a combination of:

- main route traffic flows and their profile
- diversion route traffic flows and their profile
- HGV profile for both main route and diversion route
- flow diversion
- speed limits for both main route and diversion route
- link capacities for both main route and diversion route
- speed restriction during maintenance
- road closures and
- duration of closure

6.4 Assessment Results

6.4.1 Table 6-2 presents the benefits (both direction combined) incurred by transport users during the maintenance of the Without Scheme scenario.

Table 6-2: Maintenance Benefits – Without Scheme (2010 prices and discounted to 2010)

Section	Transport User Benefits	Fuel Carbon Emission	Indirect Tax Revenue	Present Value of Benefits (PVB)
Skippool Junction to Old Mains Road	-£1,026	£0	£0	-£1,026
Old Mains Road to Shard Road	-£31,694	-£4,813	£2,560	-£33,947
Shard Road to Little Singleton Junction	-£66,988	-£7,531	£6,307	-£68,212
Little Singleton Junction to Windy Harbour Junction	-£1,627,882	£406	£14,059	-£1,613,417
Total	**-£1,727,590**	**-£11,938**	**£22,926**	**-£1,716,602**

6.4.2 Table 6-3 presents the benefits (both directions combined) incurred by transport users during the maintenance of the With Scheme scenario.

Table 6-3: Maintenance Benefits – With Scheme (2010 prices and discounted to 2010)

Section	Transport User Benefits	Fuel Carbon Emission	Indirect Tax Revenue	Present Value of Benefits (PVB)
Skippool to Skippool Bridge Junction	-£48,639	£156	£790	-£47,693
Skippool Bridge to Poulton Junction	-£30,268	£25	£317	-£29,926
Poulton Junction to Grange	-£137,689	£169	£2,314	-£135,206
Grange to Windy Harbour Junction	-£122,581	£130	£2,213	-£120,238
Total	**-£339,177**	**£480**	**£5,634**	**-£333,063**

6.4.3 The With Scheme maintenance benefits when subtracted from the Without Scheme benefits provides the net impact on maintenance arising from the Scheme.

6.4.4 It is to be noted that the accident costs from the QUADRO assessment has been included as part of accident savings from the COBALT assessment in Table 4-3.

6.4.5 Table 6-4 summarises the maintenance benefits for the Scheme.

Table 6-4: Summary of maintenance benefits (2010 prices and discounted to 2010)

S.No.	Description	Without Scheme	With Scheme	Net Impact
1	User Impact	-£1,727,590	-£339,177	£1,388,413
2	Fuel carbon emission	-£11,938	£480	£12,418
3	Indirect Tax Revenue	£22,926	£5,634	-£17,292
4	**Maintenance PVB = (1+2+3)**	**-£1,716,602**	**-£333,063**	**£1,383,539**

6.4.6 The Scheme provides a net present value of maintenance benefits (PVB) of £1.38 million over a 60 year appraisal period (2010 prices and discounted to 2010).

6.4.7 The output from the assessment of the impact of the maintenance works using QUADRO was then incorporated into the overall results of the economic assessment.

7 Greenhouse Gases, Air Quality and Noise Assessment

7.1 Introduction

7.1.1 The effects of the Scheme on the following indicators have been monetised in line with TAG Unit A3 - Environmental Impact Appraisal:

- Greenhouse Gases - The emission factor toolkit (EFT) version 8 was used to generate the carbon emissions for the opening year 2022 and the design year 2037 both with and without the Scheme. The total emissions were then input into the TAG greenhouse gases worksheets to generate the monetarised values. Emissions from EFT can only be generated up to the year 2030 and therefore the 2030 emissions are used to represent the design year and the remaining years of the 60 year appraisal period. This is likely to overestimate the impact on carbon emissions as there would be a greater number of Ultra Low Emissions Vehicles (ULEV) beyond 2030 than is assumed in the assessment.
- Local Air Quality - The local air quality monetarisation has been generated by calculating emissions of NOx and concentrations of PM10 for inclusion in the local air quality worksheets. Calculations were undertaken for the opening year and design year both with and without the Scheme.
- Noise - The daytime and night-time predicted road traffic noise levels have been converted to an L_{Aeq} value in accordance with TAG Unit A3 and used to populate the TAG noise workbook (Dec 2017 version) spreadsheet to produce a monetarised value for the Scheme.

7.1.2 The Environmental Statement [HE548643-ARC-EGN-A585-RP-LE-3088] contains further detail in relation to the methodology and assessment results of the local air quality, noise and greenhouse gases assessments.

8 Economic Appraisal Summary Tables

8.1 Introduction

8.1.1 The appraisal process involves several stages.

8.1.2 The first stage is the development of the Transport Economic Efficiency (TEE) tables considering the effects on users and based primarily on the outputs of the transport model consisting of monetised travel time benefits, vehicle operating cost savings and benefits during construction and maintenance. When added to the noise, local air quality, greenhouse gases emission (dis)benefits and accident benefits, these give the initial Present Value of Benefits (PVB) in 2010 prices.

8.1.3 The second stage considers the effects of the Scheme on public accounts. The Public Accounts (PA) tables are made up of the costs incurred by Government as a result of the Scheme, including investment and operating costs. Revenues to the Government are also included (as negative costs) which are made up of changes in tax revenues because of the Scheme. Changes in tax revenues are directly linked to changes in fuel expenditure, which is a function of speed and distance of travel. The Present Value of Costs (PVC) is the net total from the Public Accounts (PA) table.

8.1.4 Stage 3 brings the user benefits and Scheme costs together with the accident and greenhouse gases impacts, where they can be quantified in the Analysis of Monetary Costs and Benefits (AMCB) tables. The Analysis of Monetised Costs and Benefits (AMCB) compares the PVB and the PVC to generate the measures of economic worth, the NPV and the Scheme's Initial BCR. The NPV is calculated by subtracting the present value of costs (PVC) from the total present value of benefits (PVB). The BCR is calculated by dividing the PVB by the PVC.

8.1.5 A positive NPV and BCR greater than unity indicate that the benefits due to the Scheme outweigh its costs and so it is positive in economic terms.

8.1.6 Further analysis including the appraisal of weekend benefits, Wider Impacts and Journey Time Reliability allow the calculation of the Adjusted BCR.

8.2 The Transport Economic Efficiency Table

8.2.1 The purpose of the Transport Economic Efficiency table (TEE) is to summarise and present the transport user benefits. TAG Unit A1.1 Cost-Benefit Analysis, paragraph 3.3.1, page 10, states that user travel time, vehicle operating cost and user charge impacts should be included in the TEE table, as should user impacts during construction and maintenance (which should include both travel time and vehicle operating cost impacts).

8.2.2 The TEE table presents the net user benefits disaggregated by group, by mode of transport and by impact. All estimates of monetary benefits and costs are expressed in 2010 prices and discounted to 2010.

8.2.3 The transport economic efficiency (TEE) results for the introductory Scheme have been presented in two sets. The transport user benefits are initially presented for the AM, IP, PM and OP. The second set includes an assessment of the weekend benefits. The introductory Scheme TEE tables for the core scenario and the two alternative scenarios are presented in Table 8-1 to Table 8-6.

8.2.4 The initial introductory Scheme core scenario transport user benefits is estimated to be around £125m, with approximately £56m of this being attributed to business users. The total introductory Scheme core scenario benefits including weekend benefits is estimated to be £135m.

8.2.5 The transport user benefits for the introductory Scheme optimistic growth scenario are estimated to be around £141m whilst the transport user benefits for the introductory Scheme low growth scenario are estimated to be around £103m.

8.2.6 The introductory Scheme transport user benefits including weekend benefits for the optimistic growth scenario are estimated to be around £152m whilst the transport user benefits for the introductory Scheme low growth scenario are estimated to be around £114m.

Table 8-1: Introductory Scheme Core Scenario TEE Table

Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£38,282,323		£38,282,323					
Vehicle operating costs	-£4,708,740		-£4,708,740					
User charges	£0		£0					
During Construction & Maintenance	-£274,317		-£274,317					
NET NON-BUSINESS BENEFITS: COMMUTING	£33,299,266	*(1a)*	£33,299,266					
Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£67,376,713		£67,376,713					
Vehicle operating costs	-£31,613,957		-£31,613,957					
User charges	£0		£0					
During Construction & Maintenance	-£1,098,491		-£1,098,491					
NET NON-BUSINESS BENEFITS: OTHER	£34,664,265	*(1b)*	£34,664,265					
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£59,149,848		£16,281,730	£42,868,118				
Vehicle operating costs	-£2,256,407		£1,049,581	-£3,305,988				
User charges	£0		£0	£0				
During Construction & Maintenance	-£581,868		-£301,043	-£280,825				
Subtotal	£56,311,573	*(2)*	£17,030,268	£39,281,305				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue								
Operating costs								
Investment costs								
Grant/subsidy								
Subtotal		*(3)*						
Other business impacts								
Developer contributions		*(4)*						
NET BUSINESS IMPACT	£56,311,573	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	£124,275,104	*(6) = (1a) + (1b) + (5)*						

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Table 8-2: Introductory Scheme Core Scenario TEE Table (Including Weekend)

Non-business: Commuting	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	£39,777,337		£39,777,337			
Vehicle operating costs	-£4,966,865		-£4,966,865			
User charges	£0		£0			
During Construction & Maintenance	-£274,317		-£274,317			
NET NON-BUSINESS BENEFITS: COMMUTING	£34,536,155	*(1a)*	£34,536,155			

Non-business: Other	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	£81,832,965		£81,832,965			
Vehicle operating costs	-£39,388,776		-£39,388,776			
User charges	£0		£0			
During Construction & Maintenance	-£1,098,491		-£1,098,491			
NET NON-BUSINESS BENEFITS: OTHER	£41,345,698	*(1b)*	£41,345,698			

Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£61,812,751		£16,546,696	£45,266,055				
Vehicle operating costs	-£2,426,760		£1,063,092	-£3,489,852				
User charges	£0		£0	£0				
During Construction & Maintenance	-£581,868		-£301,043	-£280,825				
Subtotal	£58,804,123	*(2)*	£17,308,745	£41,495,378				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue								
Operating costs								
Investment costs								
Grant/subsidy								
Subtotal		*(3)*						
Other business impacts								
Developer contributions		*(4)*						
NET BUSINESS IMPACT	£58,804,123	*(5) = (2) + (3) + (4)*						

TOTAL		
Present Value of Transport Economic Efficiency Benefits (TEE)	£134,685,976	*(6) = (1a) + (1b) + (5)*

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Table 8-3: Introductory Scheme Low Growth Scenario TEE Table

Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£31,029,533		£31,029,533					
Vehicle operating costs	-£4,116,886		-£4,116,886					
User charges	£0		£0					
During Construction & Maintenance	-£274,317		-£274,317					
NET NON-BUSINESS BENEFITS: COMMUTING	£26,638,330	*(1a)*	£26,638,330					
Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£56,701,736		£56,701,736					
Vehicle operating costs	-£27,611,700		-£27,611,700					
User charges	£0		£0					
During Construction & Maintenance	-£1,098,491		-£1,098,491					
NET NON-BUSINESS BENEFITS: OTHER	£27,991,545	*(1b)*	£27,991,545					
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£51,527,674		£14,087,386	£37,440,288				
Vehicle operating costs	-£2,517,039		£778,739	-£3,295,778				
User charges	£0		£0	£0				
During Construction & Maintenance	-£581,868		-£301,043	-£280,825				
Subtotal	£48,428,767	*(2)*	£14,565,082	£33,863,685				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue								
Operating costs								
Investment costs								
Grant/subsidy								
Subtotal		*(3)*						
Other business impacts								
Developer contributions		*(4)*						
NET BUSINESS IMPACT	£48,428,767	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	£103,058,642	*(6) = (1a) + (1b) + (5)*						

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.

All entries are discounted present values, in 2010 prices and values

Table 8-4: Introductory Scheme Low Growth Scenario TEE Table (Including Weekend)

Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£3,24,57,925		£32,457,925					
Vehicle operating costs	-£43,38,809		-£4,338,809					
User charges	£0		£0					
During Construction & Maintenance	-£274,317		-£274,317					
NET NON-BUSINESS BENEFITS: COMMUTING	£27,844,799	*(1a)*	£27,844,799					
Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£7,07,07,872		£70,707,872					
Vehicle operating costs	-£3,43,80,883		-£34,380,883					
User charges	£0		£0					
During Construction & Maintenance	-£1,098,491		-£1,098,491					
NET NON-BUSINESS BENEFITS: OTHER	£35,228,498	*(1b)*	£35,228,498					
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£54,080,449		£14,335,122	£39,745,327				
Vehicle operating costs	-£2,696,861		£792,333	-£3,489,194				
User charges	£0		£0	£0				
During Construction & Maintenance	-£581,868		-£301,043	-£280,825				
Subtotal	£50,801,720	*(2)*	£14,826,412	£35,975,308				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue								
Operating costs								
Investment costs								
Grant/subsidy								
Subtotal		*(3)*						
Other business impacts								
Developer contributions		*(4)*						
NET BUSINESS IMPACT	£50,801,720	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	£113,875,017	*(6) = (1a) + (1b) + (5)*						

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.

All entries are discounted present values, in 2010 prices and values

Table 8-5: Introductory Scheme Optimistic Growth Scenario TEE Table

Non-business: Commuting	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	£4,27,65,530		£42,765,530			
Vehicle operating costs	-£48,60,867		-£4,860,867			
User charges	£0		£0			
During Construction & Maintenance	-£274,317		-£274,317			
NET NON-BUSINESS BENEFITS: COMMUTING	£37,630,346	*(1a)*	£37,630,346			

Non-business: Other	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	£7,36,31,241		£73,631,241			
Vehicle operating costs	-£32,153,035		-£32,153,035			
User charges	£0		£0			
During Construction & Maintenance	-£1,098,491		-£1,098,491			
NET NON-BUSINESS BENEFITS: OTHER	£40,379,715	*(1b)*	£40,379,715			

Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£65,696,017		£18,131,980	£47,564,037				
Vehicle operating costs	-£1,956,327		£1,509,329	-£3,465,656				
User charges	£0		£0	£0				
During Construction & Maintenance	-£581,868		-£301,043	-£280,825				
Subtotal	£63,157,822	*(2)*	£19,340,266	£43,817,556				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue								
Operating costs								
Investment costs								
Grant/subsidy								
Subtotal		*(3)*						
Other business impacts								
Developer contributions		*(4)*						
NET BUSINESS IMPACT	£63,157,822	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	£141,167,883	*(6) = (1a) + (1b) + (5)*						

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Table 8-6: Introductory Scheme Optimistic Growth Scenario TEE Table (Including Weekend)

Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£4,43,34,096		£44,334,096					
Vehicle operating costs	-£51,66,919		-£5,166,919					
User charges	£0		£0					
During Construction & Maintenance	-£274,317		-£274,317					
NET NON-BUSINESS BENEFITS: COMMUTING	£38,892,860	*(1a)*	£38,892,860					
Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£8,82,98,667		£88,298,667					
Vehicle operating costs	-£40,147,420		-£40,147,420					
User charges	£0		£0					
During Construction & Maintenance	-£1,098,491		-£1,098,491					
NET NON-BUSINESS BENEFITS: OTHER	£47,052,756	*(1b)*	£47,052,756					
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£68,500,589		£18,423,112	£50,077,477				
Vehicle operating costs	-£2,146,993		£1,514,577	-£3,661,570				
User charges	£0		£0	£0				
During Construction & Maintenance	-£581,868		-£301,043	-£280,825				
Subtotal	£65,771,728	*(2)*	£19,636,646	£46,135,082				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue								
Operating costs								
Investment costs								
Grant/subsidy								
Subtotal		*(3)*						
Other business impacts								
Developer contributions		*(4)*						
NET BUSINESS IMPACT	£65,771,728	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	£151,717,344	*(6) = (1a) + (1b) + (5)*						

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

8.3 The Public Accounts Table

8.3.1 TAG Unit A1.1, paragraph 2.5.4, page 5, guidance on the Public Accounts (PA) assessment states that the Present Value of Costs (PVC) should only include impacts on the ‘Broad Transport Budget’ i.e. the costs and revenues which directly affect the public budget available for transport. All other impacts, including operating costs and revenues for private sector transport providers and impacts on wider government finances, should be included in the Present Value of Benefits (PVB). Changes in indirect tax revenue should be reported in the ‘Indirect tax revenues’ row of the PA table, with increases in indirect tax revenue reported as negative values.

8.3.2 The Public Accounts (PA) tables for the Scheme have been presented in two sets. The Public Accounts tables are initially presented for the AM, IP, PM and OP. The second set includes an assessment of the weekend benefits. The introductory Scheme PA tables for the core scenario and the two alternative scenarios are presented in Table 8-7 to Table 8-12. The Broad Transport Budget for the A585 Windy Harbour to Skippool Improvement Scheme is £108m.

Table 8-7: Introductory Scheme Core Scenario PA Table

	ALL MODES TOTAL		ROAD INFRASTRUCTURE	BUS and COACH	RAIL	OTHER
Local Government Funding						
Revenue						
Operating Costs						
Investment Costs						
Developer and Other Contributions						
Grant/Subsidy Payments						
NET IMPACT		*(7)*				
Central Government Funding: Transport						
Revenue	£0					
Operating costs						
Investment Costs	£104,703,544		£104,703,544			
Developer and Other Contributions						
Maintenance Cost	£4,191,913		£4,191,913			
Grant/Subsidy Payments						
NET IMPACT	£108,895,457	*(8)*	£108,895,457			
Central Government Funding: Non-Transport						
Indirect Tax Revenues	-£27,711,241	*(9)*	-£27,711,241			
TOTALS						
Broad Transport Budget	£108,895,457	*(10) = (7) + (8)*				
Wider Public Finances	-£27,711,241	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and ‘Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Table 8-8: Introductory Scheme Core Scenario PA Table (Including Weekend)

	ALL MODES TOTAL		ROAD INFRASTRUCTURE	BUS and COACH	RAIL	OTHER
Local Government Funding						
Revenue						
Operating Costs						
Investment Costs						
Developer and Other Contributions						
Grant/Subsidy Payments						
NET IMPACT		*(7)*				
Central Government Funding: Transport						
Revenue	£0					
Operating costs						
Investment Costs	£104,703,544		£104,703,544			
Developer and Other Contributions						
Maintenance Cost	£4,191,913		£4,191,913			
Grant/Subsidy Payments						
NET IMPACT	£108,895,457	*(8)*	£108,895,457			
Central Government Funding: Non-Transport						
Indirect Tax Revenues	-£33,378,114	*(9)*	-£33,378,114			
TOTALS						
Broad Transport Budget	£108,895,457	*(10) = (7) + (8)*				
Wider Public Finances	-£33,378,114	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and ‘Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Table 8-9: Introductory Scheme Low Growth Scenario PA Table

	ALL MODES		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue						
Operating Costs						
Investment Costs						
Developer and Other Contributions						
Grant/Subsidy Payments						
NET IMPACT		*(7)*				
Central Government Funding: Transport						
Revenue	£0					
Operating costs						
Investment Costs	£104,703,544		£104,703,544			
Developer and Other Contributions						
Maintenance Cost	£4,191,913		£4,191,913			
Grant/Subsidy Payments						
NET IMPACT	£108,895,457	*(8)*	£108,895,457			
Central Government Funding: Non-Transport						
Indirect Tax Revenues	-£24,355,226	*(9)*	-£24,355,226			
TOTALS						
Broad Transport Budget	£108,895,457	*(10) = (7) + (8)*				
Wider Public Finances	-£24,355,226	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and ‘Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Table 8-10: Introductory Scheme Low Growth Scenario PA Table (Including Weekend)

Local Government Funding	**ALL MODES TOTAL**		**ROAD INFRASTRUCTURE**	**BUS and COACH**	**RAIL**	**OTHER**
Revenue						
Operating Costs						
Investment Costs						
Developer and Other Contributions						
Grant/Subsidy Payments						
NET IMPACT		*(7)*				
Central Government Funding: Transport						
Revenue	£0					
Operating costs						
Investment Costs	£104,703,544		£104,703,544			
Developer and Other Contributions						
Maintenance Cost	£4,191,913		£4,191,913			
Grant/Subsidy Payments						
NET IMPACT	£108,895,457	*(8)*	£108,895,457			
Central Government Funding: Non-Transport						
Indirect Tax Revenues	-£29,228,247	*(9)*	-£29,228,247			
TOTALS						
Broad Transport Budget	£108,895,457	*(10) = (7) + (8)*				
Wider Public Finances	-£29,228,247	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and ‘Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Table 8-11: Introductory Scheme Optimistic Growth Scenario PA Table

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	TOTAL		INFRASTRUCTURE			
Revenue						
Operating Costs						
Investment Costs						
Developer and Other Contributions						
Grant/Subsidy Payments						
NET IMPACT		*(7)*				
Central Government Funding: Transport						
Revenue	£0					
Operating costs						
Investment Costs	£104,703,544		£104,703,544			
Developer and Other Contributions						
Maintenance Cost	£4,191,913		£4,191,913			
Grant/Subsidy Payments						
NET IMPACT	£108,895,457	*(8)*	£108,895,457			
Central Government Funding: Non-Transport						
Indirect Tax Revenues	-£28,246,556	*(9)*	-£28,246,556			
TOTALS						
Broad Transport Budget	£108,895,457	*(10) = (7) + (8)*				
Wider Public Finances	-£28,246,556	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and ‘Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Table 8-12: Introductory Scheme Optimistic Growth Scenario PA Table (Including Weekend)

	ALL MODES **TOTAL**		**ROAD** **INFRASTRUCTURE**	**BUS and COACH**	**RAIL**	**OTHER**
Local Government Funding						
Revenue						
Operating Costs						
Investment Costs						
Developer and Other Contributions						
Grant/Subsidy Payments						
NET IMPACT		*(7)*				
Central Government Funding: Transport						
Revenue	£0					
Operating costs						
Investment Costs	£104,703,544		£104,703,544			
Developer and Other Contributions						
Maintenance Cost	£4,191,913		£4,191,913			
Grant/Subsidy Payments						
NET IMPACT	£108,895,457	*(8)*	£108,895,457			
Central Government Funding: Non-Transport						
Indirect Tax Revenues	-£34,170,285	*(9)*	-£34,170,285			
TOTALS						
Broad Transport Budget	£108,895,457	*(10) = (7) + (8)*				
Wider Public Finances	-£34,170,285	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

8.4 The Analysis of Monetised Costs and Benefits

8.4.1 An Analysis of Monetised Costs and Benefits (AMCB) for the Scheme was undertaken to summarise the monetised impacts of the Scheme. The AMCB brings the user benefits and Scheme costs together with the accident and greenhouse gases impacts, where they can be quantified to generate the measures of economic worth, including the Scheme’s Initial Benefit-Cost Ratio (BCR) and the Net Present Value (NPV). The BCR indicates how much benefit is obtained for each unit of cost, with a BCR greater than 1 indicating that the benefits outweigh the costs. The AMCB table combines information from the TEE and PA tables with monetised estimates of other impacts (such as accidents and greenhouse gases).

8.4.2 The final AMCB table should include monetised estimates of noise, air quality, greenhouse gases, journey quality, physical activity and accident impacts, where appropriate, based on guidance in TAG Unit A3 – Environmental Impact Appraisal and TAG Unit A4.1 – Social Impact Appraisal. Monetised estimates of other impacts, such as journey time reliability or Wider Impacts, should not be included in the AMCB table.

8.4.3 The AMCB tables for the Scheme have been presented in two sets. The AMCB tables are initially presented for the AM, IP, PM and OP. The second set includes an assessment of the weekend benefits. The introductory Scheme AMCB tables for the Core Scenario and the two alternative scenarios are shown in Table 8-13 to Table 8-18.

Table 8-13: **Introductory Scheme Core Scenario AMCB Table**

Noise	£1,315,041	*(12)*
Local Air Quality	£256,629	*(13)*
Greenhouse Gases	-£17,889,985	*(14)*
Journey Ambience		*(15)*
Accidents	£10,111,039	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£33,299,266	*(1a)*
Economic Efficiency: Consumer Users (Other)	£34,664,265	*(1b)*
Economic Efficiency: Business Users and Providers	£56,311,573	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£27,711,241	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Present Value of Benefits (see notes) (PVB)	£145,779,069	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)*
Broad Transport Budget	£108,895,457	*(10)*
Present Value of Costs (see notes) (PVC)	£108,895,457	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£36,883,612	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	**1.34**	BCR=PVB/PVC
	2022 to 2081	

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions. All entries are discounted to present values in 2010 prices and values.

Table 8-14: Introductory Scheme Core Scenario AMCB Table (Including Weekend)

Noise	£1,315,041	*(12)*
Local Air Quality	£256,629	*(13)*
Greenhouse Gases	-£17,889,985	*(14)*
Journey Ambience		*(15)*
Accidents	£10,111,039	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£34,536,155	*(1a)*
Economic Efficiency: Consumer Users (Other)	£41,345,698	*(1b)*
Economic Efficiency: Business Users and Providers	£58,804,123	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£33,378,114	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Present Value of Benefits $^{\text{(see notes)}}$ (PVB)	£161,856,814	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)*
Broad Transport Budget	£108,895,457	*(10)*
Present Value of Costs $^{\text{(see notes)}}$ (PVC)	£108,895,457	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£52,961,357	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	**1.49**	BCR=PVB/PVC
	2022 to 2081	

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions. All entries are discounted to present values in 2010 prices and values.

Table 8-15: Introductory Scheme Low Growth Scenario AMCB Table

Noise	£1,315,041	*(12)*
Local Air Quality	£256,629	*(13)*
Greenhouse Gases	-£17,889,985	*(14)*
Journey Ambience		*(15)*
Accidents	£11,071,939	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£26,638,330	*(1a)*
Economic Efficiency: Consumer Users (Other)	£27,991,545	*(1b)*
Economic Efficiency: Business Users and Providers	£48,428,767	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£24,355,226	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Present Value of Benefits (see notes) (PVB)	£122,167,492	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)*
Broad Transport Budget	£108,895,457	*(10)*
Present Value of Costs (see notes) (PVC)	£108,895,457	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£13,272,035	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	**1.12**	BCR=PVB/PVC
	2022 to 2081	

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions. All entries are discounted to present values in 2010 prices and values.

Table 8-16: Introductory Scheme Low Growth Scenario AMCB Table (Including Weekend)

Noise	£1,315,041	*(12)*
Local Air Quality	£256,629	*(13)*
Greenhouse Gases	-£17,889,985	*(14)*
Journey Ambience		*(15)*
Accidents	£11,071,939	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£27,844,799	*(1a)*
Economic Efficiency: Consumer Users (Other)	£35,228,498	*(1b)*
Economic Efficiency: Business Users and Providers	£50,801,720	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£29,228,247	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Present Value of Benefits $^{\text{(see notes)}}$ (PVB)	£137,856,888	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)*
Broad Transport Budget	£108,895,457	*(10)*
Present Value of Costs $^{\text{(see notes)}}$ (PVC)	£108,895,457	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£28,961,431	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	**1.27**	BCR=PVB/PVC
	2022 to 2081	

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions. All entries are discounted to present values in 2010 prices and values.

Table 8-17: Introductory Scheme Optimistic Growth Scenario AMCB Table

Noise	£1,315,041	*(12)*
Local Air Quality	£256,629	*(13)*
Greenhouse Gases	-£17,889,985	*(14)*
Journey Ambience		*(15)*
Accidents	£11,480,839	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£37,630,346	*(1a)*
Economic Efficiency: Consumer Users (Other)	£40,379,715	*(1b)*
Economic Efficiency: Business Users and Providers	£63,157,822	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£28,246,556	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Present Value of Benefits (see notes) (PVB)	£164,576,963	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)*
Broad Transport Budget	£108,895,457	*(10)*
Present Value of Costs (see notes) (PVC)	£108,895,457	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£55,681,506	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	**1.51**	BCR=PVB/PVC
	2022 to 2081	

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions. All entries are discounted to present values in 2010 prices and values.

Table 8-18: Introductory Scheme Optimistic Growth Scenario AMCB Table (Including Weekend)

Noise	£1,315,041	*(12)*
Local Air Quality	£256,629	*(13)*
Greenhouse Gases	-£17,889,985	*(14)*
Journey Ambience		*(15)*
Accidents	£11,480,839	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£38,892,860	*(1a)*
Economic Efficiency: Consumer Users (Other)	£47,052,756	*(1b)*
Economic Efficiency: Business Users and Providers	£65,771,728	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£34,170,285	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Present Value of Benefits (see notes) (PVB)	£181,050,153	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)*
Broad Transport Budget	£108,895,457	*(10)*
Present Value of Costs (see notes) (PVC)	£108,895,457	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£72,154,696	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	**1.66**	BCR=PVB/PVC
	2022 to 2081	

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions. All entries are discounted to present values in 2010 prices and values.

9 Journey Time Reliability

9.1 Methodology

9.1.1 The standard methodology proposed for the calculation of user benefits does not consider the benefits that users may derive from the improved confidence in the reliability of journey times for trips that they make frequently.

9.1.2 Journey time reliability (JTR) refers to the variation in journey times that individuals are unable to predict. JTR assessment therefore, seeks to place a user benefit value on the reduction in the variability of journey times.

9.1.3 Different methods to estimate reliability impacts have been developed for public transport and private vehicle trips on inter urban motorways and dual carriageways, urban roads, and other roads. A standard MyRIAD journey time reliability assessment is done for motorway schemes while TAG Unit A1.3 outlines two methods for the calculation and valuation of changes in JTR on ‘urban roads’ and ‘other roads’.

9.1.4 The methodology to be undertaken is dependent on the designation of the road and whether it is classified as an urban or rural to be agreed with Highways England.

9.1.5 Should the road be classified as rural the result would be qualitative and therefore can only be reported upon in the Appraisal Summary Table. If the route is classed as urban, then the result would be quantitative and could be included as an indicative estimate of the impacts. Therefore, as advised by TAG A1.3 the reliability benefits will not be included in the Analysis of Monetised Costs and Benefits (AMCB) table but would instead be included in an adjusted BCR.

9.1.6 A majority of the Scheme is classified as a rural bypass, however on the basis that the proposed scheme is a dual carriageway (D2AP) and has a semi-urban section between Skippool and Skippool Bridge junctions, as a result it was proposed that a quantitative assessment would be undertaken. This approach was supported by Highways England Transport Planning Group.

9.1.7 For urban roads the guidance recommends the use of the standard deviation of travel time as a measure of reliability. The standard deviation is a measure of how travel times are distributed around the average, with an increasing standard deviation associated with an increasing variability.

9.1.8 The standard deviation would be calculated using the following formula.

$$\Delta\sigma_{ij} = 0.0018(t_{ij2}^{2.02} - t_{ij1}^{2.02})d_{ij}^{-1.41}$$

where,

Δσij is the change in standard deviation of journey time from i to j (seconds)

tij1 and tij2 are the journey times, before and after the changes, from i to j (seconds)

dij is the journey distance from i to j (km)

9.1.9 The reliability ratio enables changes in variability of journey time to be expressed in monetary terms. It is defined as follows:

Reliability Ratio = Value of SD of travel time/ Value of travel time

9.1.10 The recommended value, as per TAG guidelines, for the reliability ratio for all journey purposes by car is 0.4. This suggests that one minute of standard deviation has the same values as 0.4 minutes of average travel time.

9.1.11 A reliability ratio of 0.6 is proposed to be used for LGVs and HGVs in the reliability calculations, as advised by TAG.

9.1.12 The following TAG journey time reliability benefit formula will be used to estimate the JTR benefits.

$$Benefit = -\frac{1}{2}\sum_{ij}\Delta\sigma_{ij} * \left(T_{ij}^{0} + T_{ij}^{1}\right) * VOR$$

where,

VOR is the value of reliability, obtained by multiplying the value of time (VOT) by the reliability ratio

Tij0 and Tij1 are number of trips before and after the change

Process

9.1.13 The process used to calculate the JTR benefits for each modelled year will be as follows:

- Select Link trip matrices forecasted to use either the existing A585 or the Scheme for each modelled year will be produced for both the Without and With Scheme scenarios
- The travel times and distances associated with each of the movement will then be identified from the appropriate matrices and the change in standard deviation (σij) for each movement calculated
- The reliability benefits for each modelled year and time period would then be determined by the rule of half formula as specified in paragraph 2.1.9 using the sum of the A585 Without Scheme and With Scheme select link trip matrices (in vehicles/ hour) and the change in standard deviation
- Annualisation factors would be applied to convert the time period benefits to annual reliability benefits
- Appropriate Value of Reliability (VOR) values would be then applied by vehicle and trip purpose type to obtain the annualised journey time reliability benefits
- The JTR benefits will be calculated for each forecast year (2021 and 2036) and time periods (AM, IP, PM). It is assumed that for every year after 2036 the same benefits as in 2036 are experienced and standard discounting factors will be applied to discount to 2010 prices.

9.1.14 It is to be noted that the off-peak and weekend JTR benefits will also be calculated by multiplying the respective annualisation factors to inter-peak JTR benefits.

9.1.15 The indirect tax correction factor of 1.19 will be used to convert value of time used for Employee business, LGV and HGV to market price.

9.1.16 Total reliability benefits will be obtained by aggregating the discounted JTR benefits for all modelled time periods and user classes for the Core Scenario.

9.2 Introductory Scheme Journey Time Reliability Results

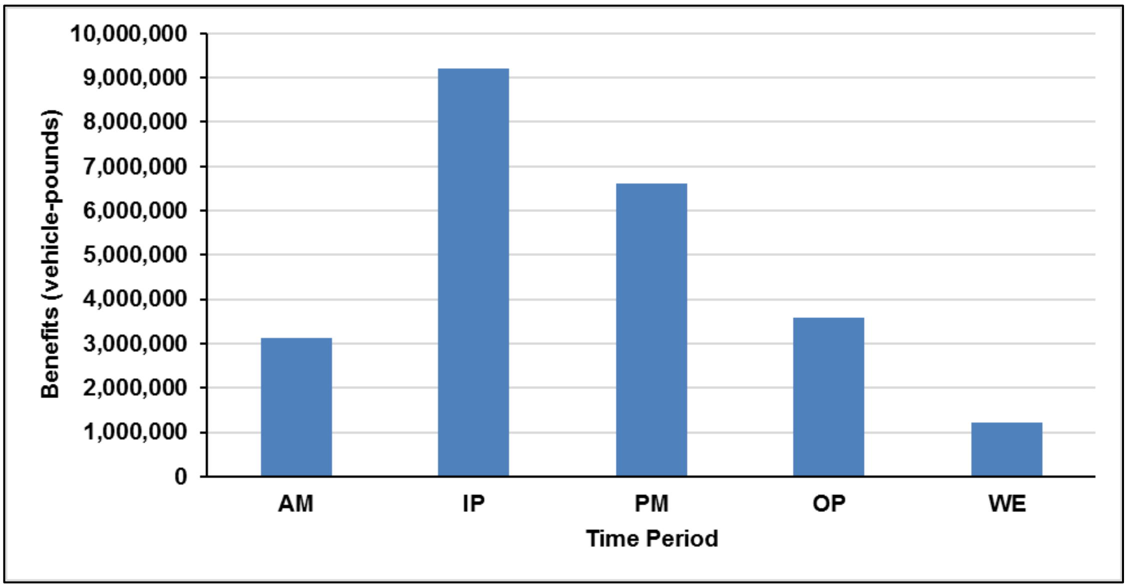
9.2.1 Table 9-1 presents the introductory Scheme Core Scenario appraisal of the valuation of journey time variability by trip purpose over a 60 year appraisal period for the modelled time periods (AM, IP, PM, OP and WE).

Table 9-1: Introductory Scheme Core Scenario Journey Time Variability Economic Assessment by Trip Purpose (£) – Modelled Time Periods (2010 prices and discounted to 2010)

Car-Commuting	Car-Business	Car-Other	LGV	HGV	Total
3,539,136	732,229	6,421,606	4,995,750	8,061,654	23,750,375

9.2.2 The total introductory Scheme annualised journey time reliability benefits for each modelled time period is shown in Figure 9.1. Annualisation factors were used to convert the reliability benefits per time slice to the annual user benefits.

Figure 9-1: Introductory Scheme Core Scenario Annualised Journey Time Reliability Benefits (By Time Period)



9.2.3 It is seen from Figure 9-1 that all time periods show an increase in journey time reliability benefits, indicating that the journey time reliability improves with the introductory Scheme in place.

9.2.4 The highest introductory Scheme JTR benefits are seen in the Inter-Peak period, whilst the lowest JTR benefits are seen in the week-end peak period.

9.2.5 The introductory Scheme Core Scenario present value of benefits (PVB), considering journey time reliability benefits incurring to all modelled time periods was seen to be £23.8m (in 2010 prices).

10 Wider Impacts

10.1 Methodology

10.1.1 Economic theory indicated that under hypothetical conditions of perfect competition a fully specified appraisal of a transport scheme would accurately estimate all benefits.

10.1.2 In practice, however, most markets are not perfectly competitive and as a consequence, direct user impacts may be complemented by wider economic impacts. For instance, the journey time savings achieved by the Scheme will increase the accessibility between areas of economic activity in the study area and improve access to jobs. This will generate wider economic impacts that are additional to the transport user benefits captured in the traditional economic appraisal.

10.1.3 The wider economic impacts relate to quantifiable indirect benefits which are additional to direct economic effects and enable the calculation of an adjusted Net Present Value and Benefit-Cost Ratio for the Scheme, accounting for the indirect economic effects. These indirect economic impacts can be large and can therefore be an important part of the overall appraisal of a transport Scheme.

10.1.4 A framework for the calculation of impacts has been established by the Department for Transport and is formalised in TAG Unit A2.1 Wider Impacts P2.2 page 2. Under the guidance wider impacts relate to three effects:

- Agglomeration effects – the term agglomeration refers to the concentration of economic activity over an area. Transport can act to increase the accessibility of an area to a greater number of firms and workers thereby impacting on the level of agglomeration. Increased agglomeration is empirically associated with higher productivity and can therefore result in higher GDP.
- Output Change in imperfectly competitive markets – under conditions of imperfect markets, lower production costs (due to reduced transport costs) can result in an increase in output which will be of value to consumers. The welfare gain to consumers will be higher than the initial value of the reduction in transport costs.
- Labour Market impacts – where transport interventions reduce the costs of commuting, they effectively act to reduce barriers to employment and improve access to employment opportunities. Wider impacts can occur where a transport scheme results in a transfer of employment from low to high productive jobs, or by increasing the overall level of employment in the economy.

10.1.5 In most circumstances, agglomeration effects and output changes account for the majority of wider impacts of transport improvements. DfT TAG suggests that the impact on the location of employment should be calculated only when a Land Use Transport Interaction (LUTI) model is used to forecast the employment and residential location consequences of the scheme that is being appraised. Therefore, whilst the Scheme is expected to play an important role in improving access to employment and labour and does not use a LUTI model, the Wider Impacts analysis primarily focuses on agglomeration effects and output changes in market and labour supply.

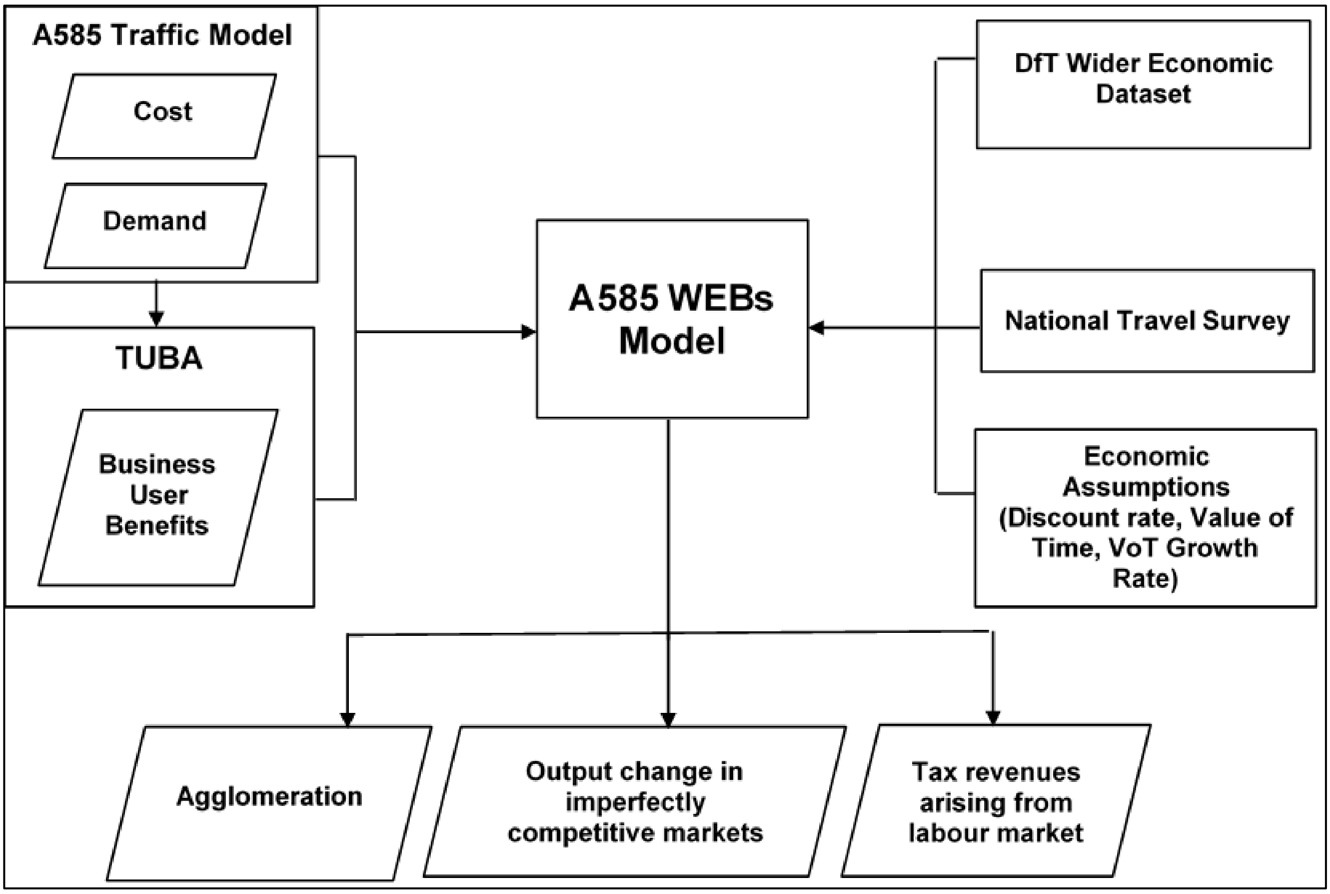
10.1.6 With respect to average generalised costs, the PT mode share has not been included in the calculation as its impact is small and there is a negligible upward bias in the results. Table 10-1 shows the distribution of business trips originating in the North West. The National Travel Survey was used to derive the mode shares. PT mode share is only 5.3% of total business trips and therefore will not be considered further in this assessment.

Table 10-1: Distribution of Business Trips Originating In The North West

Mode\trip time (min)	0-15	15-30	30-60	60-120	120+	No. of Trips
Walk	105	207	130	15	3	460
Bicycle	32	52	22	2	0	108
Car/Van	3,910	4,925	4,179	1,844	892	15,750
Other Private	80	124	110	56	15	385
Public Transport	40	145	283	207	258	933
Total	**4,167**	**5,453**	**4,724**	**2,124**	**1,168**	**17,636**

10.1.7 **Figure** shows how the wider impacts appraised relate to the other modelling and appraisal activities.

Figure 10-1: Scheme Wider Impacts Model



10.2 Agglomeration Benefits

10.2.1 As per TAG Unit A2.1, Section 2.2, agglomeration refers to the concentration of economic activity over an area.

10.2.2 Where a transport Scheme facilitates a reduction in journey times, it will alter the accessibility of firms in an area to other firms and workers. This will increase the concentration of economic activity resulting in additional impacts on productivity due to better knowledge and technology spill overs from business proximity, and the existence of deeper labour markets.

10.2.3 It is important to note that agglomeration impacts are not directly correlated with journey time benefits. Agglomeration benefits reflect the potential for businesses to interact with one another, rather than reflecting the actual pattern of trip making. Where new journey opportunities arise from a new road network, agglomeration may be supported even if trip making between these places is relatively small.

10.2.4 The approach used for estimating agglomeration benefits is set out in TAG Unit A2.1 Wider Impacts and involves three steps.

Step 1: Calculation of Average Generalised Cost

- The first step in estimating agglomeration benefits involves the calculation of average generalised cost for all origin-destination pairs and Business and Commuting journey purposes. The generalised cost of a journey is an aggregated cost that encompasses both the monetised time element and the financial costs associated with the trip such as fares and vehicle operating costs.
- The costs are calculated using a demand weighted average using the Without Scheme and With Scheme demand weights respectively. This is consistent with DfT guidance. While generalised costs are calculated for each of the time periods modelled, these were aggregated to a 24-hour weighted average generalised cost.
- The generalised costs should also be demand weighted by transport mode: private and public transport. As set out in the Appraisal Specification Report (Document Reference: HE548643-ARC-

GEN-A585-RP-D-3038 Version 4.0), no public transport modelling has been undertaken in relation to the proposed Scheme. The proposed Scheme focuses on highway improvements rather than any specific improvements to public transport. In addition, there is relatively low use of public transport in the study area. Traffic data collected indicates very low usage of public transport or non-motorised modes in the study area. Bus occupancy surveys carried out for the 12-hour period between 07:00 and 19:00, confirmed that the bus vehicle counts were only 0.3% of car vehicle counts and the number of bus passengers was only 1.4% of the number of car passengers. Hence, only private transport mode has been considered for the analysis.

$$g_{i,j}^{S,m,f} = \frac{\sum_{p} g_{i,j}^{S,m,p,f} T_{i,j}^{S,m,p,f}}{\sum_{p} T_{i,j}^{S,m,p,f}}$$

Where:

$g_{i,j}^{S,m,f}$ are the average generalised costs of travel (weighted average by journey purpose), between area *i* and *j*, for each mode *m* in the scenario *S*. This will vary depending on the forecast year f, to the extent that costs vary in the modelling of transport (TEE) user impacts.

S represents the scenario: indicating the calculations should be done for the both the alternative (A) and the base (B) case.

m is transport mode: private and public transport. This will not vary depending on the forecast year.

$g_{i,j}^{S,m,p,f}$ is the generalised cost of trips from transport zone *i* to transport zone *j*, scenario *S*, mode *m* and purpose *p*. it needs to be aggregated to LAD level. This will vary depending on the forecast year, to the extent that costs vary in the modelling transport (TEE) user impacts.

p is the purpose of travel. It includes business, commuting and, in the sensitivity case, freight trips. This will not vary depending on the forecast year.

$T_{i,j}^{S,m,p,f}$ is the number of trips from transport zone *i* and to transport zone *j* in the scenario *S* by mode *m* and purpose *p*. It needs to be aggregated to LAD level. This will vary depending on the forecast year *f*, to the extent the variable varies in the modelling of transport (TEE) user impacts.

Step 2: Calculating Effective density

- The effective density measures the accessibility of a zone to jobs in the destination area.
- The effective density therefore depends on the employment levels of all sectors in the destination area, the average generalised costs required to access these (as calculated in Step 1) and a decay parameter for each sector reflecting the differential effects of generalised costs for different sectors.
- The effective densities will be calculated using weighted average 24-hour generalised costs (excluding freight) for each mode of transport. This calculation is done for both Without Scheme and With Scheme options.

$$d_i^{S,k,f} = \sum_{j,m} \frac{E_j^{S,f}}{\left(g_{i,j}^{S,m,f}\right)^{\alpha^k}}$$

Where:

$E_j^{S,f}$ is total employment for all *k* sectors in area *j* in the scenario *S* – in the central WIs analysis where land-uses are held fixed, employment will be the same in the alternative (A) and the base (B) case scenarios. This will vary depending on the forecast year *f*.

$g_{i,j}^{S,m,f}$ is the average generalised cost of travel from area *i* to area *j* in the scenario *S* for mode *m*. This will vary depending on the forecast year f, to the extent that costs vary in the modelling of transport (TEE) user impacts.

m is transport mode: private and public transport. This will not vary depending on the forecast year.

α^k is a distance decay parameter for each group of sectors *k*. The decay parameter will not vary depending on the forecast year.

Step 3: Agglomeration Impacts

- This step involves combining the outputs from Steps 1 and 2 to compute the change in the productivity derived from the proportional change in the effective density.
- This change is calculated using the elasticity of productivity with respect to the change in effective density for the business sector. These elasticities are used in the productivity change calculation for each zone.
- Additional productivity is then multiplied by the GDP per worker and the employment of each zone, the product of which forms the agglomeration benefit.

$$WI1_i^{k,f} = \left[\left(\frac{d_i^{A,k,f}}{d_i^{B,k,f}}\right)^{\rho^k} - 1\right] GDPW_i^{B,k,f} E_i^{B,k,f}$$

$$WI1^f = \sum_{i,k} WI1_i^{k,f}$$

Where:

$WI1_i^{k,f}$ are the sectoral agglomeration impacts for each area *i* and sector *k*. they will vary depending on the forecast year *f*.

i *Wi1* is estimated for each origin area *i,* where *i* is the Local Authority District (LAD). Where the modelled transport zones are smaller than LAD areas, it will be necessary to aggregate average generalised costs for each zone to LAD level, in order to estimate $d_i^{A,k,f}, d_i^{B,k,f}$ for LAD area *i.*

k is the industrial sector. Sectoral employment and GDP data may therefore need to be aggregated to this level from a more detailed level of data.

f is the forecast year in question.

$d_i^{A,k,f}, d_i^{B,k,f}$ are the effective densities of origin area *i* sector *k* in the alternative case (A) and the base case (B) respectively, to be calculated. This will vary depending on the forecast year *f.*

ρ^k is the elasticity of productivity with respect of effective density for sector *k.* this will not vary depending on the forecast year *f.*

$GDPW_i^{B,k,f}$ is the GDP per worker of Local Authority District area *i* and sector *k* in the base case (B). This will vary depending on the forecast year.

$E_i^{B,k,f}$ is total employment in sector *k,* origin area *i* in the base scenario (B). This will vary depending on the forecast year *f.*

$WI1^f$ are the total agglomeration impacts for all sectors *k* and areas *i*, to be calculated for a specific forecast year.

- Employment data and other economic parameters will be obtained from the wider impacts data set provided TAG Unit A2.1. Similarly, changes in productivity will be calculated using the agglomeration elasticities provided in TAG Unit A2.1.

10.3 Change in Output in Imperfectly Competitive Markets

10.3.1 A reduction in the costs of transport allows businesses to operate more efficiently and improves their output. This allows for additional benefits to be captured as part of the wider impacts appraisal. The additional benefit is a result of an imperfectly competitive market where businesses tend to set prices greater than their marginal cost of production, and as a consequence the additional output is valued more highly by consumers than the cost of producing this output.

10.3.2 The change in output in imperfectly competitive markets will be calculated based on a proportion of the Business User Benefits (BUB) as calculated in Transport Users Benefit Appraisal (TUBA).

10.3.3 TAG Unit A2.1 recommends this proportion to be set at 10% of the change in business costs as an additional welfare benefit.

$$WI3^f = \iota BUB^f$$

$$WI3^f = 0.1BUB^f$$

Where:

$WI3^f$ are the impacts of increased or decreased output in imperfectly competitive markets, to be calculated. $WI3^f$ will vary depending on the forecast year *f.*

ι is the imperfect competition up-rate factor, currently estimated to be equal to 10% (0.1)[18]. The up-rate factor will not vary depending on the forecast year.

BUB^f are total user impacts to business journeys (time, money costs, reliability gains/losses etc). BUB will vary depending on the forecast year to the extent that the modelled transport (TEE) user impacts vary by year.

10.4 Assessing Tax Revenues arising from changes to the labour supply

10.4.1 The decisions about whether to take a job are assumed to be based on the combination of wages and commuting costs. As the costs of commuting change, these decisions can change and, so, the supply of labour may increase or decrease.

10.4.2 The reductions in journey time or cost will increase the returns from the combination of working and commuting and are likely to result in greater labour supply. The benefits to the individual are assumed to be captured in user benefits. However, the changes in tax revenue that result from the labour market impacts are not included in these benefits and need to be calculated separately.

10.4.3 The labour supply impacts are calculated in following three steps, as advised by TAG Unit A2.1.

- The first step involves estimating the change in the generalised cost for workers commuting from each origin (home) zone to each destination (employment) zone as a result of the Scheme. The change in generalised cost is then annualised. This change in annual commuting costs can be considered as a change in the perceived annual return from working. The change in annual commuting cost is divided by the earnings of the workers working in the destination zone to give the perceived relative change in net earnings. It is assumed that all savings are passed on to the workers. The parameter $Ʈ_1$, the average tax rate on earning, is required to convert gross earnings into net earnings.

  $$G_{i,j}^{S,c,f} = \frac{\sum_m \left(g_{i,j}^{S,m,c,f} + g_{j,i}^{S,m,c,f} \right) T_{i,j}^{B,m,c,f}}{\sum_m T_{i,j}^{B,m,c,f}}$$

  Where:

  $G_{i,j}^{S,c,f}$ is the round trip commuting generalised cost for scenario *S*. These costs will vary depending on the forecast year *f* and they will be in money terms.

  $g_{i,j}^{S,m,c,f}$ is the average generalised cost of travel from zone *i* to zone *j* in scenario *S* by mode *m* for the commuting purpose *c* in the forecast year *f.* The measure of cost must be for the same period as the wage terms m_j^f and y_j^f . It will be in money terms and travel time will be converted by multiplying by the money value of commuting time. Average generalised cost will vary depending on the forecast year, to the extent that the costs vary in the modelling of transport (TEE) user impacts.

  $T_{i,j}^{B,m,c,f}$ is the number of commuting trips from zone *i* to zone *j* in the scenario (B) by mode *m.* This will vary depending on the forecast year *f,* to the extent that it varies in the modelling of transport (TEE) user impacts.

- The second step involves estimating the change in labour force participation. The perceived relative change in net earnings is multiplied by the elasticity to a relative change in wages (ε^{LS}) to give the changes in labour supply by zone pair. The change in labour force participation is then multiplied by the median wage of the marginal worker (η) entering employment in the destination zone. This process is repeated and added for all origin zones.

- The final step involves calculating the total productivity change from the increased or decreased labour supply, for each year and then multiplying output by the tax take on labour supply.

  $$GP1^f = -\varepsilon^{LS} \frac{\eta}{(1-\tau_1)} \sum_i \left(\sum_j W_{i,j}^{S,f} \left(G_{i,j}^{A,c,f} - G_{i,j}^{B,c,f} \right) \right)$$

Where:

$GP1^{f}$ is the impact of the GDP from more/less people working, to be calculated. $GP1^{f}$ will vary depending on the forecast year *f* and it is at the transport model zone level.

ε^{LS} is the elasticity of labour supply with respect to effective wages (net of taxes and other transport costs). This will not vary depending on the forecast year.

$W_{i,j}^{S,f}$ is the number of workers living in transport model zone *i* and working in transport model zone *j* for scenarios *S*. For the central case, i.e. where a LUTI model is not being used, the number of workers for all scenarios will simply be the number of workers living in zone *i* and working in zone *j* in the alternative case (A), as taken from the transport model. If a LUTI model is available a sensitivity test may be undertaken where a LUTI model can be used to estimate workers living in zone *i* and working in zone *j* in the alternative case (A). Where a LUTI model is used, the estimates should be reported as a sensitivity test. The number of workers will vary with forecast year *f.*

$G_{i,j}^{A,c,f}, G_{i,j}^{B,c,f}$ are the round-trip commuting average generalised costs of travel between zone *i* and *j* in the alternative case (A) and the base case (B) respectively, calculated as shown in above equation; all the modelled zones *j* should be considered in the calculation, including the intra-zonal pairs (*i=j). These will vary depending on the forecast year, to the extent that they vary in the modelling of transport (TEE) user impacts.*

c is commuting only purpose. It does not include business or freight. This will not vary depending on the forecast year.

τ_1 is the average tax rate on earnings required to convert the gross earnings y_j^f into net earnings, with which the change in commuting costs can appropriately be compared. It is currently estimated to be equal to 30%. This will not vary depending on the forecast year.

y_j^f are gross mean workplace-based earnings in zone *j;* must be for the same time period as m_j^f and it will vary depending on the forecast year *f.* m_j^f must be for the same time period (e.g. per week or per year) as y_j^f .

η is the parameter that captures the lower productivity (compared to average) of workers on the margin of the labour force. Currently it is calculated as the fraction of 0.69 of the average wage, but it could take a different functional form or vary by zone. This will not vary depending on the forecast year.

10.4.4 The wider impact dataset is the core economic dataset and is used for all estimates of wider impacts to ensure consistency of estimates across schemes. The parameters used in assessing the labour supply impacts, as available in Section 5.1.3 of TAG Unit A2.1 are shown in Table 10-2.

Table 10-2: Labour supply impact parameters

Parameter	Description	Value
τ_1	Average tax rate	0.3
η	Pay of marginal worker compared to average worker	0.69
ε^{LS}	Elasticity of labour supply with respective to effective wages	0.1

10.5 Introductory Scheme Wider Impacts Results

10.5.1 The wider impacts of the Scheme can be categorised as:

- Agglomeration Benefits
- Output change in imperfectly competitive markets
- Labour supply impacts

10.5.2 In most circumstances, agglomeration effects and output changes account for the majority of wider impacts of transport improvements. Therefore, whilst the Scheme is expected to play an important role in improving access to employment and labour, this report focuses on agglomeration effects and output changes.

10.5.3 The wider impacts model is based on a study area of Preston, Blackpool, Wyre and Fylde which is an area compatible with the masked area used to prepare the Transport Economic Efficiency user benefits reported in Section 3.10.17. Therefore, sectors which are either far away from the Scheme area or sectors which have been modelled with sparse network detail have been excluded from the wider impacts model. Figure 10-2 shows the location of the Local Authority Districts (LADs) included in the wider impacts model.

Figure 10-2: Location of Local Authority Districts included in the Wider Impacts Model

10.5.4 The effects of average generalised costs made by intrazonal trips within Preston, Blackpool and Wyre Local Authority areas were included during the calculation process of agglomeration impacts.

10.5.5 The 2022, 2037 and 2051 forecast transport models were used to prepare the wider impacts model. The average generalised costs were produced at zonal level and thereafter converted to sector level. The 190 zones of the model were then converted into 7 different sectors; Rest of the UK, Liverpool & Greater Manchester, Leeds and East, Fylde, Wyre, Preston and Blackpool. The effects of UK, Liverpool & Greater Manchester, Leeds and East were masked out as they lie outside the study area. Since the employment rate and other economic parameters used to calculate Agglomeration Impacts were at LAD level taken directly from TAG Unit A2.1, the other 4 sectors were not broken down into smaller regions and calculated at LAD level.

10.5.6 The above may result in an over estimation of economic impacts. However, there is no method (defined within DfT TAG) to break the sectors into smaller zones.

Agglomeration Impacts

10.5.7 Agglomeration impacts arise because of the enhanced productivity that firms derive from being close to one another and from being located in large labour markets. Greater productivity in agglomeration arises from the fact that firms have access to larger product, input and labour markets.

10.5.8 The agglomeration benefits are based on the change in an area's effective density, a measure of the mass of economic activity which depends on the number of jobs available in surrounding areas and the generalised cost to reach them.

10.5.9 Zones which require use of the A585 to access the high concentration of jobs in Preston, Blackpool, Wyre and Fylde, have the highest change in effective density as a result of this Scheme. The calculation also depends on baseline GDP per worker and employment levels, so it is not surprising that overall agglomeration impacts are highest in zones within the mentioned Local Authority Districts.

10.5.10 Table 10-3: Introductory Scheme Agglomeration Impacts (2010 prices and not discounted to 2010, £)shows the introductory Scheme agglomeration benefits predicted by the Scheme transport model for the forecast years.

Table 10-3: Introductory Scheme Agglomeration Impacts

(2010 prices and not discounted to 2010, £)

LAD	2022	2037	2051
Fylde	396,197	1,299,949	1,824,416
Wyre	622,706	692,255	976,416
Preston	1,570,477	1,909,892	2,717,116
Blackpool	216,442	318,390	447,493
Total	**2,805,822**	**4,220,485**	**5,965,442**

10.5.11 The total introductory Scheme agglomeration benefits are predicted to be £2.8m in 2022 and £4.22m in 2037 and £5.96m in 2051(2010 prices and not discounted to 2010).

Output Changes in Imperfectly Competitive Markets

10.5.12 A reduction in the costs of transport allows businesses to operate more efficiently and improves their output. This allows for additional benefits to be captured as part of the wider impacts appraisal. The additional benefit is a result of an imperfectly competitive market where businesses tend to set prices greater than their marginal cost of production, and as a consequence the additional output is valued more highly by consumers than the cost of producing this output.

10.5.13 The change in output in imperfectly competitive markets has been calculated based on a proportion of the business user benefits (BUB) as calculated in Transport Users Benefit Appraisal (TUBA).

10.5.14 TAG guidance recommends this proportion to be set at 10% of the change in business costs as an additional welfare benefit. Consequently, this is calculated on the basis of a 10% uprate factor applied to the savings to business travel.

10.5.15 Table 10-4 presents the introductory Scheme business user benefits and the output change in imperfectly competitive markets for the 60 year appraisal period.

10.5.16 It is observed that the total introductory Scheme additional benefits arising due to this is c£2.5m (in 2010 prices and discounted to 2010), assuming that benefits were being incurred across all time periods.

Table 10-4: Introductory Scheme Output Change in Imperfectly Competitive Markets (2010 prices and discounted to 2010, £)

Business User Benefits	Benefits of All Time Periods
Fylde	6,829,260
Wyre	10,462,393
Preston	3,634,526
Blackpool	4,894,279
Total Region	25,820,458
WI2 (10% of Business User Benefits)	
Fylde	682,926
Wyre	1,046,239
Preston	363,453
Blackpool	489,428
Total Region	2,582,046

Labour Supply Impacts

10.5.17 Journey time savings reduce the costs associated with working, thereby, increasing effective wages and bringing in more people into the labour force. This additional labour supply produces additional economic output. Although the welfare benefits from labour market impacts are partially captured in the commuter user benefits calculated in the economic appraisal, the tax implications are not. Therefore, the additional economic output is multiplied by the relevant rate of taxation to calculate the wider impact.

10.5.18 The total benefits arising from the 60 year appraisal period due to the introductory Scheme is £1.4m as shown in Table 10-5.

Table 10-5: Introductory Scheme Core Scenario Labour Supply Impact on GDP (2010 prices and not discounted to 2010, £)

LAD	Fylde			Wyre			Preston			Blackpool		
Year	2022	2037	2051	2022	2037	2051	2022	2037	2051	2022	2037	2051
Labour Supply Impact	30,595	44,566	72,424	51,851	50,841	59,296	13,386	20,883	28,737	18,763	31,686	85,278

Summary of Results

10.5.19 The scale and breakdown of the wider economic impacts of the Scheme by type due to the introductory Scheme are set out in Table 10-6.

10.5.20 The introductory Scheme is expected to generate c£26m of wider impacts in Fylde, £16 m in Wyre, £42m in Preston and £7 m in Blackpool (in 2010 prices and discounted to 2010), producing a total of £93.6m over the full 60 year appraisal period across all time periods. If it was considered that the benefits from Preston overestimates the total Wider Impacts, this LAD could be excluded. Excluding Preston, the total Core Scenario Wider Impacts for the introductory Scheme is £51m.

Table 10-6: Introductory Scheme Core Scenario Wider Economic Impacts (PVB 2010 prices and discounted to 2010, £) – Net Present Value (60 year Appraisal Period)

Description	Fylde	Wyre	Preston	Blackpool	Total	Total (excl. Preston)
Agglomeration	25,378,867	15,427,985	42,096,987	6,764,087	89,667,925	47,570,939
Output in Imperfectly Competitive market	682,926	1,046,239	363,453	489,428	2,582,046	2,218,593
Labour supply impact	413,353	421,097	173,850	406,156	1,414,456	1,240,606
Total Wider Impacts	**26,475,146**	**16,895,321**	**42,634,289**	**7,659,671**	**93,664,427**	**51,030,138**

11 Distributional Impact Appraisal

11.1 Methodology

11.1.1 The purpose of Distributional Impact (DI) analysis is to attempt to identify those who would gain or lose from a transport intervention with particular emphasis on the potential impact upon equality through identifying the effects upon those who are disadvantaged compared to the majority of the population. This means that it is now necessary to attempt to disaggregate the benefits and dis-benefits of schemes between different socio-economic groups affected by the scheme. It is no longer acceptable to consider solely the effects upon society as a whole.

11.1.2 The requirement for a DI analysis only applies to the following eight Scheme impacts. Some of these will always be relevant to highway schemes, some will sometimes be relevant, and some will hardly ever be relevant.

- User benefits (journey times and vehicle operating costs)
- Noise
- Air quality
- Accidents
- Security
- Severance
- Accessibility
- Personal affordability

11.1.3 The effect of these impacts is assessed on the extent to which they affect the following eight social groups:

- Income distribution (income groups)
- Children
- Young males
- Older people
- Disabled
- Black and minority ethnic groups
- Those without access to a car
- Carers

11.1.4 These groups have been identified as vulnerable in TAG Unit A4.2, Section 5, page 24. For example, young males are more likely to be involved in car accidents than other groups. Some impacts are assessed only for specific groups (e.g. user benefits are only related to income distribution, and not other groups such as children and young people). A full assessment matrix is shown in Table 11-1.

Table 11-1: Scope of Socio-Demographic Analyses for Distributional Impacts

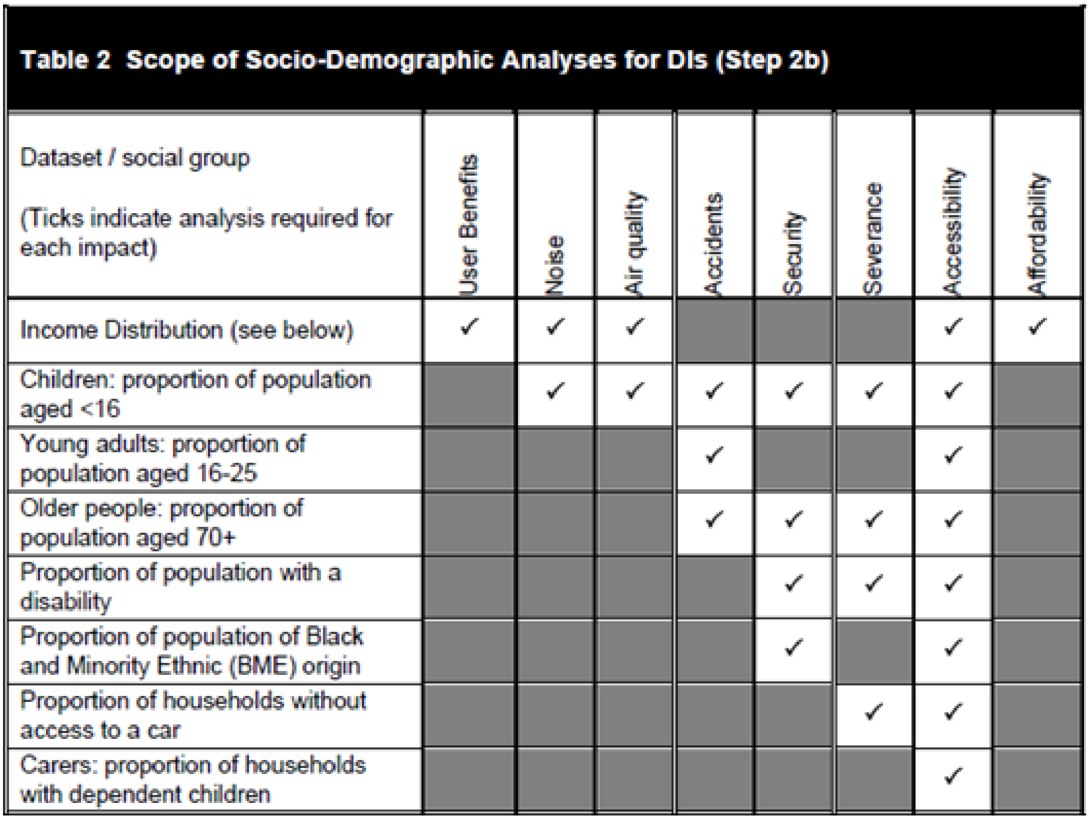


Table 2 Scope of Socio-Demographic Analyses for DIs (Step 2b)

Dataset / social group (Ticks indicate analysis required for each impact)	User Benefits	Noise	Air quality	Accidents	Security	Severance	Accessibility	Affordability
Income Distribution (see below)	✓	✓	✓				✓	✓
Children: proportion of population aged <16		✓	✓	✓	✓	✓	✓	
Young adults: proportion of population aged 16-25				✓			✓	
Older people: proportion of population aged 70+				✓	✓	✓	✓	
Proportion of population with a disability					✓	✓	✓	
Proportion of population of Black and Minority Ethnic (BME) origin					✓		✓	
Proportion of households without access to a car						✓	✓	
Carers: proportion of households with dependent children							✓	

11.1.5 The complete process for undertaking a distributional impact analysis follows the following steps:

- Step 1: Screening Process
- Step 2: Assessment
  - Step 2a: Confirmation of areas impacted by the intervention
  - Step 2b: Identification of social groups in the impact area
  - Step 2c: Identification of amenities in impact area
- Step 3: Appraisal of Impacts
  - Step 3a: Core analysis of impacts
  - Step 3b: Full appraisal of SDIs and input into AST

11.1.6 If screening indicates that a full analysis is required for any of the eight impacts, steps 2 and 3 of the distributional impact analysis process are followed. Otherwise, it is sufficient to report, with reasons, that a distributional impact analysis is not required.

11.2 Assessment Screening

11.2.1 The assessment screening involves the identification of which of the eight indicators the Scheme has an effect on. This step requires knowledge of the Scheme and its likely effects and is not undertaken at a detailed level. The outcomes may always be revised later during the detailed assessment. It is carried out to provide pointers to the impacts which are likely to require examination in more detail during the later steps.

11.2.2 The initial assessment has been carried out as per the TAG guidance and the results are outlined in Table 11-2 below. This table outlines both the assessment criteria and outcomes for the Scheme.

Table 11-2: Initial Screening

Indicator	(a) Appraisal output criteria	(b) Potential impact	(c) Qualitative Comments	(d) Proceed to appraisal
User benefits	The TUBA user benefit analysis software or an equivalent process has been used in the appraisal; and/or the value of user benefits Transport Economic Efficiency (TEE) table is non-zero.	Yes	The Scheme will have an impact upon users from a change in travel times and/or vehicle operating costs.	Yes
Noise	Any change in alignment of transport corridor or any links with significant changes (>25% or <-20%) in vehicle flow, speed or %HDV content. Also note comment in TAG Unit A3.	Yes	A Noise assessment was undertaken as a result of changes in traffic flow due to the Scheme.	Yes
Air quality	Any change in alignment of transport corridor or any links with significant changes in vehicle flow, speed or %HDV content: • Change in 24 hour AADT of 1000 vehicles or more • Change in 24 hour AADT of HDV of 200 HDV vehicles or more • Change in daily average speed of 10kph or more • Change in peak hour speed of 20kph or more • Change in road alignment of 5m or more	Yes	An Air Quality assessment was undertaken as a result of changes in traffic flow due to the Scheme.	Yes
Accidents	Any change in alignment of transport corridor (or road layout) that may have positive or negative safety impacts, or any links with significant changes in vehicle flow, speed, %HGV content or any significant change (>10%) in the number of pedestrians, cyclists or motorcyclists using road network.	Yes	The Scheme does improve traffic flow which results in >10% changes in traffic flow on certain links. This is confirmed through CoBALT analysis.	Yes
Security	Any change in public transport waiting/interchange facilities including pedestrian access expected to affect user perceptions of personal security.	No	No	No
Severance	Introduction or removal of barriers to pedestrian movement, either through changes to road crossing provision, or through introduction of new public transport or road corridors. Any areas with significant changes (>10%) in vehicle flow, speed, %HGV content.	Yes	The Scheme improves pedestrian access, however it is unlikely to cause any significant change to traffic flow.	No
Accessibility	Changes in routings or timings of current public transport services, any changes to public transport provision, including routing, frequencies, waiting facilities (bus stops / rail stations) and rolling stock, or any indirect impacts on accessibility to services (e.g. demolition & re-location of a school).	No	The Scheme does involve change to the transport network, however it is unlike to cause any significant change to the public transport system.	No

Indicator	(a) Appraisal output criteria	(b) Potential impact	(c) Qualitative Comments	(d) Proceed to appraisal
Affordability	In cases where the following charges would occur; Parking charges (including where changes in the allocation of free or reduced fee spaces may occur); Car fuel and non-fuel operating costs (where, for example, rerouting or changes in journey speeds and congestion occur resulting in changes in costs); Road user charges (including discounts and exemptions for different groups of travellers); Public transport fare changes (where, for example premium fares are set on new or existing modes or where multi-modal discounted travel tickets become available due to new ticketing technologies); or Public transport concession availability (where, for example concession arrangements vary as a result of a move in service provision from bus to light rail or heavy rail, where such concession entitlement is not maintained by the local authority).	Yes	There will be changes in fuel and non-fuel vehicle operating costs as a result of reduced congestion and journey times.	Yes

11.2.3 The initial assessment shows that only the User Benefits, Accidents and Affordability indicators need to be further assessed as part of the Distributional Impact analysis. The majority will not be influenced by the proposed Scheme.

11.2.4 The appraisal of the distributional impacts primarily revolves around the TUBA and COBALT outputs and applying them to the relevant assessment areas. For the analysis, the Lower Super Output Area (LSOA) was used to provide information across the assessment area.

11.2.5 The assessment of the User Benefits and Affordability indicators are derived from the TUBA results from the full SATURN Model assessment as opposed to the Cordon model in order to better differentiate the benefits to the relevant LSOA and income bands.

11.3 Appraisal of Impacts

Severance

11.3.1 The Scheme was not assessed quantitatively for severance as the changes will not result in significant changes to traffic flow however qualitatively the Scheme is beneficial as it reduces severance for walkers, cyclists and horse riders and improves access across the existing A585 between the Little Singleton and Skippool junctions. Previously there were no controlled crossing points along the A585 between Skippool and Little Singleton junctions. Signalised pedestrian crossings have been introduced at Skippool, Shard Road and Little Singleton junctions. In addition, the footpaths will be improved and a combined footway and cycleway will be implemented. The routes for pedestrians and cyclists will follow the existing road network rather than the bypass as this provides direct links between communities along routes with lower traffic flows. The reduced traffic flow on the de-trunked section due to the Scheme has the potential to improve the local environment along the de-trunked section and should encourage walking and cycling.

11.3.2 Further information regarding the reduced severance of walkers, cyclists and horse riders due to the Scheme can be referred to in The Environmental Statement Chapter 2 (TR010035/APP/6.2) and Figure 2-3 De-Trunking Proposals [HE548643-ARC-EGN-A585-RP-LE-3072].

Distributional Impacts of User Benefits and Affordability

11.3.3 The User Benefits and Affordability benefits have been applied to the LSOAs to assess the results using the associated Indices of Deprivation as required by TAG. As these indicators make use of the full model which covers the entire country, the population split is equal between all income quintiles.

11.3.4 In order to better reflect the benefits based on population, the benefits are calculated different depending on the peak in which they are generated. The AM and PM peaks take the benefits by Origin and Destination respectively in order to take benefits based on population locations as it is assumed that people with be leaving their homes in the morning peak and returning in the evening peak. The Inter peak and Off peak benefits are the average of the Origin and Destination benefits as it is not possible to determine the primary direction of travel.

11.3.5 The analysis of the User Benefits and Affordability has been carried out and the assessment results for the Introductory Scheme are presented in Table 11-3.

Table 11-3: Introductory Scheme User Benefits and Affordability Assessment Results

Indicator	Output	IMD Income Domains				
		Most deprived <-			-> Least deprived	
		0% - 20%	20% - 40%	40% - 60%	60-% - 80%	80% - 100%
User Benefits	Total Benefits (£)	£17,579,085	£14,559,670	£34,100,605	£42,084,877	£17,905,544
	Benefits %	13.93%	11.53%	27.01%	33.34%	14.18%
	Grading	✓	✓	✓✓✓	✓✓✓	✓
Affordability	Total Benefits (£)	-£5,113,575	-£5,096,542	-£11,935,215	-£10,626,069	-£5,807,703
	Benefits %	13.25%	13.21%	30.94%	27.54%	15.05%
	Grading	x	x	x x x	x x x	x x

11.3.6 The introductory Scheme User Benefits derived from the TUBA results are positive across all quintiles for the Scheme. The spread of benefits is reasonably consistent with the lower two quintiles and highest quintile each receiving slightly less than 15% of the total benefits. The third and fourth quintiles receive a slightly higher proportion of the benefits at around 27% and 33% respectively.

11.3.7 The Affordability benefits are the benefits associated with Vehicle Operating Costs. These form part of the total user benefits but are analysed separately for the Affordability impacts. The introductory Scheme affordability is shown to be negative across all quintiles, with the proportion split very similar to the overall User Benefits.

11.3.8 While the Affordability benefits are negative, they are a part of the overall user benefits, and therefore, the overall Distributional Impacts arising from the Scheme is positive. While the middle and upper income domains receive a higher proportion of the benefits as a result of the introductory Scheme, all income domains experience a positive impact as a result of the introductory Scheme.

Introductory Scheme Distributional Impacts of Accidents

11.3.9 The accident analysis consisted of identifying the links which experience a greater than 10% change in traffic flow between the Without Scheme and With Scheme scenarios in both the opening and forecast years.

11.3.10 The assessment of accidents requires the identification on any links with greater than 50 casualties occurring within a five-year period. As COBALT only outputs accident numbers, a conservative assumption has been made to assess any links with greater than 50 accidents in the Without Scheme Scenario within a five year period as calculated by COBALT.

11.3.11 The assessment of the CoBALT outputs identified six links with greater than 50 accidents within a five-year period. These are shown in Table 11-4 along with the flow change for each link over the assessment period.

Table 11-4: Introductory Scheme Identified Links with over 50 accidents in a 5 year period

SATURN Link ID	Accidents/ 5 year period	Scheme Flow Change
1104_7005	67.0	1.1%
7004_1104	61.4	1.0%
4036_4099	59.6	-1.8%
4037_4081	64.1	-3.0%
4081_4037	53.6	-1.8%
4097_4033	60.6	-2.2%

11.3.12 TAG Unit A4.2 states that if an identified link has a flow change of +/-5%, then any Distributional Impact on vulnerable social groups or road network users would be Neutral. Therefore, the Distributional Impact of the Scheme on Accidents is Neutral across all user groups.

Introductory Scheme Distributional Impacts of Noise

11.3.13 The appraisal of Distributional Impacts (DI) of noise has been undertaken in accordance with the methodology contained within TAG Unit A4.2 Distributional Impact Appraisal (DfT, December 2015).

11.3.14 The DI analysis for noise impacts requires the identification of the number of properties within each income quintile which experience an increase, decrease or no change in road traffic noise level.

11.3.15 This requires assigning each residential noise sensitive receptor within the study area to its relevant Lower Super Output Area (LSOA) and then through the use of the Index of Deprivation (IoD) the analysis of noise impacts experienced by households with different levels of income is undertaken.

11.3.16 The results of the number of properties that experience an increase, no change or decrease in road traffic level were used to populate the introductory Scheme noise impact DI analysis table as presented in Table 11-5, in accordance with TAG Unit A4.2.

Table 11-5: Introductory Scheme Distributional Impacts of Noise

Item	IoD Income Domain					Total
	0-20%	20-40%	40-60%	60-80%	80-100%	
Population in each group with increased noise [A]	0	100	94	0	710	904
Population in each group with decreased noise [B]	0	0	238	0	22	260
Population in each group with no change in noise [C]	0	566	349	0	343	1,258
Net no of Winners / Losers in each group [D] = [B] – [A]	0	-100	144	0	688	
Total number of Winners / Losers across all groups [E] = ∑[D]						732
Net winners/losers in each area as percentage of total [F] = [D] / [E]	0%	-14%	20%	0%	94%	100%
Share of total population in the impact area	0%	27%	28%	0%	44%	100%
Assessment	**Neutral**	**Slight Adverse**	**Slight Beneficial**	**Neutral**	**Large Adverse**	

11.3.17 From the data presented in Table 11-5 the following can be concluded:

- There are no residential dwellings within the most deprived quintile, therefore it is appropriate to give a score of **Neutral.**
- The second most deprived quintile has a 27% share of the total population and 14% of the net losers. The impacts are adverse, and the population impacted is smaller than the proportion of the group in the total population. It is therefore appropriate to give a score of **Slight Adverse.**
- The third most deprived quintile has a 28% share of the total population and 20% of the net winners. The proportion of net winners is smaller than the proportion of the population, and it is therefore appropriate to give a score of **Slight Beneficial.**
- There are no residential dwellings within the fourth most deprived quintile, therefore it is appropriate to give a score of **Neutral.**
- The fifth most deprived quintile has a 44% share of the total population and 94% of the net losers. The impacts are adverse, and the population impacted is far greater than the proportion of the group in the total population. It is therefore appropriate to give a score of **Large Adverse.**

11.3.18 As required by TAG Unit A4.2 in paragraph 3.4.4 and 3.4.5 the predicted change in road traffic noise level for schools and nursing homes has been examined with the following conclusions:

- Identified schools
    - Brookfield School - Neutral
    - Breck Primary School - Neutral
    - Happy Days Nursery - Neutral
    - Carr Head Primary School - Neutral
    - St Johns Catholic Primary School - Neutral
- Nursing Homes
    - Alexandra Nursing Home – Slight Adverse
    - Primrose Bank Rest Home - Neutral
    - The Moorland Nursing Home - Neutral

11.3.19 Changes in road traffic level at schools and nursing homes within the study area would be mostly negligible with a minor adverse impact (less than 1dB) predicted at Alexandra Nursing Home. It can be concluded that children and the elderly are unlikely to be disproportionately affected by changes in road traffic noise within the study area.

Introductory Scheme Distributional Impacts of Air Quality

11.3.20 The Distributional Impact (DI) analysis for the air quality indicators requires the identification of the number of properties in each income quintile which experience an increase, decrease or no change in air quality. This requires assigning each affected link the number of properties associated with the Lower Super Output Area (LSOA) through which it passes.

11.3.21 The TAG air quality assessment was undertaken as part of the Environmental Statement (ES) which shows the number of properties experiencing an increase, decrease or no change in PM10 and NO2 as a result of the Scheme in the opening year.

11.3.22 The links that made up the air quality study area were plotted on GIS along with the LSOA boundaries and their associated income quintile. The results of the TAG assessment were used to determine whether there was an improvement, deterioration or no change as a result of the Scheme in both PM10 and NO2. Where there was a difference in changes between NO2 and PM10 (e.g. an improvement in NO2 but a worsening in PM10) as a worst case the receptors were counted as experiencing a worsening in air quality.

11.3.23 The results of the number of properties that experience an improvement/no change/deterioration in air quality were used to populate the air quality introductory Scheme DI analysis as presented in Table 11-6, in accordance with TAG Unit A4.2 (DfT, December 2015).

11.3.24 The assessment score is dependent on the overall impact (beneficial/adverse) as a proportion of the total population. Table 11-6 illustrates that three quintiles have a beneficial impact with two having an adverse impact. Overall the Scheme has a beneficial impact particularly for the most deprived groups.

11.3.25 There are a number of schools within 200m, of links impacted on by the Scheme. The schools are shown below and include and the associated change in pollutant concentrations assessed at each of the links:

- Collegiate High School - No Change
- St Johns Catholic Primary School - Improvement
- Singleton Church of England Voluntary Aided Primary School - No Change
- Kirkland and Catterall Saint Helens Church of England School - Deterioration
- St Michael's-on-Wyre Church of England Primary School - Deterioration

11.3.26 It can be concluded that children are unlikely to be disproportionately affected by changes in air quality as a result of the Scheme given the number of schools affected. The Scheme makes air quality worse at two, compared to no change or an improvement in air quality at the others. It should be noted that there is unlikely to be any exceedances of air quality strategy objectives at any of these schools when the Scheme opens.

Table 11-6: Introductory Scheme Distributional Impacts of Air Quality

	Regional Income Quintile					
	Most Deprived			Least Deprived		
	1 (0-20%)	2 (20-40%)	3 (40-60%)	4 (60-80%)	5 (80-100%)	TOTAL
Properties with Improvement in AQ [A]	1992	631	1518	1268	155	5564
Properties with No change in AQ [B]	424	0	277	218	333	1252
Properties with Worse AQ [C]	613	483	1275	1494	746	4611
No. of Net winners/losers [D] = [A] - [C]	1379	148	243	-226	-591	
Total number of winners/losers across all groups [E] =∑[D]						**953**
Net winners/losers as % of Total [F] =[D]/[E]	144.7	15.5	25.5	-23.7	-62.0	100.0
Share of total population of study area	27	10	27	26	11	100.0
Assessment Score	**Large Beneficial**	**Slight Beneficial**	**Moderate Beneficial**	**Moderate Adverse**	**Large Adverse**	

12 Introductory Scheme Overall Appraisal Summary

12.1 Economic Appraisal Process and Results

12.1.1 The PCF Stage 3 Scheme economic assessment was undertaken to facilitate the quantification and monetisation of the Scheme costs and benefits of the proposed Scheme. The economic assessment brings the user benefits and Scheme costs together with the accident and environmental impacts, where these can be quantified in an Analysis of Monetary Costs and Benefits which generates the measures of economic worth, the Net Present value (NPV) and the Initial Benefit-Cost Ratio (BCR) of the Scheme.

12.1.2 As outlined in TAG Unit Section 3.4 the AMCB table includes costs and benefits for which the evidence on monetisation is considered most robust. There are other significant Scheme benefits, including Wider Impacts, Reliability and Weekend User Benefits where the evidence on monetisation is less well developed and therefore the analysis presented in the AMCB table does not provide a full measure of value for money and should not be used as the sole basis for decisions. Further appraisal of monetised estimates of Reliability, Wider Impacts and weekend user benefits was analysed to allow the calculation of the Adjusted BCR to contribute to the Scheme evidence base.

12.1.3 Traffic forecasts were prepared to illustrate the sensitivity of transport user benefits to the core scenario as well as local and national uncertainties in traffic growth. As such, in addition to the Core Scenario, two additional growth scenarios, the Low Growth Scenario and Optimistic Growth Scenario were assessed.

12.1.4 Combining the Scheme cost estimated at £108.9m in 2010 prices discounted to 2010 and the user benefits/dis-benefits, provides an overall economic appraisal of the Introductory Scheme. The Introductory Scheme BCR for all the growth scenarios are presented in Table 12-1 which includes an Initial BCR appraised using the AM, IP, PM and OP time periods and an adjusted BCR which includes an appraisal of the AM, IP, PM, OP and Weekend time periods and an appraisal of Journey Time Reliability and Wider Impacts.

Figure 12-1: Introductory Scheme Appraisal Results (2010 prices and discounted to 2010)

Description	Metric	Core Scenario	Low Growth Scenario	Optimistic Growth Scenario
Excluding Journey Time Reliability Benefits and Wider Impacts	TUBA Benefits	£153,793,544	£129,221,067	£171,221,638
	Accident Benefits	£10,111,039	£11,071,939	£11,480,839
	Construction & Maintenance Appraisal	-£1,807,199	-£1,807,199	-£1,807,199
	AQ, GHG and Noise	-£16,318,315	-£16,318,315	-£16,318,315
	Present value of Benefits (**PVB**)	£145,779,069	£122,167,492	£164,576,963
	Present value of Cost (**PVC**)	£108,895,457	£108,895,457	£108,895,457
	Net Present Value (**NPV**)	£36,883,612	£13,272,035	£55,681,506
	Initial Benefit-Cost Ratio (BCR)	**1.34**	**1.12**	**1.51**
Including Journey Time Reliability Benefits and Wider Impacts	TUBA Benefits (including Weekend)	£169,871,289	£144,910,463	£187,694,828
	Accident Benefits	£10,111,039	£11,071,939	£11,480,839
	Construction & Maintenance Appraisal	-£1,807,199	-£1,807,199	-£1,807,199
	AQ, GHG and Noise	-£16,318,315	-£16,318,315	-£16,318,315
	Journey Time Reliability Benefits	£23,750,375	£23,750,375	£23,750,375
	Wider Impacts	£51,030,138	£51,030,138	£51,030,138
	Present value of Benefits (**PVB**)	£236,637,327	£212,637,401	£255,830,666
	Present value of Cost (**PVC**)	£108,895,457	£108,895,457	£108,895,457
	Net Present Value (**NPV**)	£127,741,870	£103,741,944	£146,935,209
	Adjusted Benefit-Cost Ratio (BCR)	**2.17**	**1.95**	**2.35**
Journey Time Reliability as % of PVB		10.0%	11.2%	9.3%
Wider Impacts as % of PVB		21.6%	24.0%	19.9%

Introductory Scheme Source and Magnitude of Benefits

12.1.5 The introductory Scheme transport user benefits for the initial BCR assessment are calculated at £153.8m and £169.9m for the adjusted BCR assessment. The PVB of the introductory Scheme Core Scenario are calculated at £145.78m and £236.63m for the adjusted BCR assessment.

12.1.6 The safety assessment shows that 28 accidents are forecast to be saved due to the introductory Scheme Core Scenario resulting in an overall benefit of £10.1m. An overall Scheme objective, to improve safety along the route, will be achieved, as the Scheme if implemented is shown to reduce the number of accidents and casualties.

12.1.7 User and Provider benefits (travel time savings, and vehicle operating cost savings and construction delays) account for the majority of the direct economic benefits of the Scheme. These benefits derive largely from travel time savings

12.1.8 Under Low and Optimistic Growth economic conditions the PVB of the introductory Scheme when compared to the Core Scenario is reduced/increased from £145.78m to £122.17m and £164.58m respectively. The PVB of the Low Growth and Optimistic Growth Scenarios for the adjusted introductory Scheme BCR assessment when compared to the Core Scenario is reduced/increased from £236.64m to £212.64m and 255.83m respectively.

12.1.9 The proportion of the Journey Time Reliability benefits of the adjusted introductory Scheme Core Scenario PVB is around 10%. The proportion of the Wider Impacts of the adjusted introductory Scheme Core Scenario PVB is around 21%.

Introductory Scheme Benefit-Cost Ratios

12.1.10 The initial introductory Scheme Core Scenario BCR is 1.34. Adding in Weekend benefits, Journey Time Reliability and Wider Impacts to provide an adjusted introductory Scheme BCR increases the BCR to 2.17.

12.1.11 When taking into account Low Growth National Uncertainty the initial introductory Scheme Low Growth Scenario BCR is 1.12. Adding in Weekend benefits, Journey Time Reliability and Wider Impacts to provide an adjusted introductory Scheme Low Growth Scenario BCR increases the BCR to 1.95.

12.1.12 When taking into account Optimistic Local Growth and High Growth National Uncertainty the initial introductory Scheme Optimistic Growth Scenario BCR is 1.51. Adding in Weekend benefits, Journey Time Reliability and Wider Impacts to provide an adjusted introductory Scheme Optimistic Growth Scenario BCR increases the BCR to 2.35.

12.2 Introductory Scheme Conclusions and Recommendations

12.2.1 The purpose of economic assessment is to help support decision making for major investment by summarising the impact on the Economic Case of the transport intervention.

12.2.2 The Scheme has been assessed and evaluated in accordance with The Department for Transport (DfT) Transport Analysis Guidance (TAG) Units A1, A2, A3 and A4 Economic, Environmental and Social Impact Appraisal which recommends that options should be appraised using cost-benefit analysis in accordance with the Green Book [HMT, 2003). This is achieved through, wherever feasible, attributing monetary values to the impacts of the proposal. Cost-benefit analysis quantifies in monetary terms as many of the costs and benefits of a proposal as feasible, including items for which the market does not provide a satisfactory measure of economic value.

12.2.3 The accident cost savings shows that the Scheme provides better accident measures and reduces accidents. An overall Scheme objective, to improve safety along the route, will be achieved, as the Scheme if implemented is shown to reduce the number of accidents and casualties.

12.2.4 The Scheme reduces severance for non-motorised users. The reduced traffic flow on the de-trunked section due to the Scheme has the potential to improve the local environment along the de-trunked section and should encourage walking and cycling.

12.2.5 The introductory Scheme Core Scenario initial BCR is 1.34. Adding in Weekend benefits, Journey Time Reliability and Wider Impacts to provide an Adjusted BCR, increases the introductory Scheme Core Scenario BCR to 2.17.

12.2.6 The Scheme continues to provide user benefits when taking into account both Local and National economic uncertainty.

12.2.7 The Scheme improves road user journey time and reliability and the Scheme's Wider Economic Impacts due to the improved journey times and reliability for business road users supports economic growth in the area.

12.2.8 The A585 Windy Harbour to Skippool Improvement Scheme Economic Assessment has shown that the overall objectives of the Scheme to improve safety along the route, reduce severance for non-motorised users, support economic growth and improve journey time reliability have been met and it is therefore worthwhile in economic terms to proceed with the Scheme.

13 Scheme Appraisal Summary Table

13.1.1 Guidance on the purpose and preparation of a scheme's Appraisal Summary Table (AST) is provided in TAG Unit A1.1, Section 3.4.7-3.4.12. The purpose of the AST is to provide a summary of a scheme's economic, environmental, social and public accounts costs and benefits as shown in Table 13-1. Estimates of costs and benefits to transport users and providers from the Analysis of Monetised Costs and Benefits Table are to be included in the AST which therefore includes costs and benefits for which the evidence on monetary values is considered most robust and are categorised into impacts that:

- Are typically monetised and reported in the Transport Economic Efficiency (TEE), Public Accounts (PA) and Analysis of Monetised Costs and Benefits (AMCB) tables;
- Can be monetised but their monetary values are not reported in the AST as the underlying evidence base is considered less robust; and
- It is currently infeasible to monetise so qualitative or quantitative analysis should be reported in the AST.

13.1.2 The Stage 3 A585 Windy Harbour to Skippool Improvement Scheme AST [HE548643-ARC-GEN-A585-SH-LE-3015] prepared in accordance with TAG Unit A1.1 is provided in Table 13-2. The updated Scheme user and provider costs and benefits have been summarised in the AST based on outputs from the Stage 3 updated Scheme transport model version VDM_06.

Table 13-1: TAG Unit A1.1 Table 1 Appraisal Summary Table Impacts

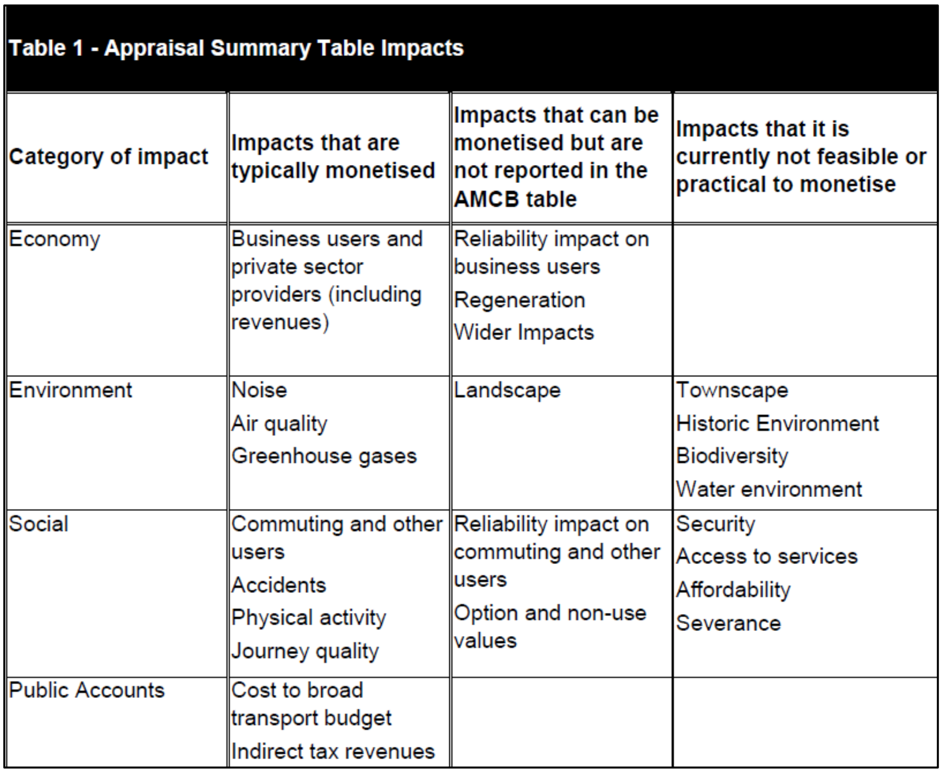


Table 1 - Appraisal Summary Table Impacts

Category of impact	**Impacts that are typically monetised**	**Impacts that can be monetised but are not reported in the AMCB table**	**Impacts that it is currently not feasible or practical to monetise**
Economy	Business users and private sector providers (including revenues)	Reliability impact on business users Regeneration Wider Impacts	
Environment	Noise Air quality Greenhouse gases	Landscape	Townscape Historic Environment Biodiversity Water environment
Social	Commuting and other users Accidents Physical activity Journey quality	Reliability impact on commuting and other users Option and non-use values	Security Access to services Affordability Severance
Public Accounts	Cost to broad transport budget Indirect tax revenues		

Table 13-2: Stage 3 A585 Windy Harbour to Skippool Improvement Scheme Appraisal Summary Table

Appraisal Summary Table	**Date produced:**	22nd October 2018	**Contact:**	
Name of scheme:	A585 Windy Harbour to Skippool Improvement Scheme - Stage 3		**Name**	David Hopkin
Description of scheme:	4.85km Scheme with alterations to Skippool Roundabout, with a short section of online road improvement up to the new Skippool Bridge junction, at which the route would swing southwards as an offline dual 2-lane all-purpose bypass travelling southeast-wards towards the A586 at the new Poulton Junction with the bypass then continuing eastwards to the existing Windy Harbour Junction.		**Organisation**	Highways England
			Role	Project Manager

	Impacts	**Summary of key impacts**	**Assessment**			
			Quantitative	**Qualitative**	**Monetary £(NPV)**	**Distributional 7-pt scale/ vulnerable grp**
Economy	Business users & transport providers	Business users benefit from the provision of the Scheme through reduced travel time (including reductions in congestion) amounting to £55.03m PV. The vehicle operating cost Scheme impact amounts to a dis-benefit to business users of £2.07m PV. There is also a disbenefit of £0.58m to business users during construction and maintenance giving an overall net benefit of £52.37m PV.	Value of journey time changes (£): £55.03 Net journey time changes (£) 0 to 2min: 21.02 2 to 5min: 33.84 > 5min: 0.17	N/A	£52.37m	n/a (TAG A4.2, Section 2.1.4 DI to be assessed for non-business journeys only)
	Reliability impact on Business users	Journey Time Reliability is expected to improve for business users due to the Scheme in all time periods.	£13.08m	Beneficial	£13.08m	
	Regeneration	Not assessed.	N/A	N/A	N/A	
	Wider Impacts	The Scheme is expected to have effects in areas other than transport. Agglomeration effects account for the majority of the Wider Impacts and it is expected the Scheme will play an important role in improving access to employment and labour.	£46.52m	Large Beneficial	£46.52m	
Environmental	Noise	Noise levels would increase at dwellings facing the new bypass and along Garstang New Road. Noise mitigation has been included. Noise levels would decrease at dwellings facing on to Mains Lane. There is one property predicted to qualify for noise insulation and impacts at all schools and nursing homes within the study area have been mitigated to a minimum.	Increased daytime noise in forecast year: 428 Reduced daytime noise in forecast year: 294 Increased night time noise in forecast year: 44 Reduced night time noise in forecast year: 72	N/A	£0.66m	Neutral to slight adverse for the most deprived. Neutral to large adverse for least deprived.
	Air Quality	Overall results predict both improvements and a deterioration in air quality at the receptors modelled. Predicted NO2 and PM10 concentrations are below the annual mean Air Quality Strategy (AQS) objective of 40µg/m³ at all receptors, with the highest modelled NO2 concentration of 29.6µg/m³ in the opening year. Regional emissions of PM10 are predicted to reduce by 0.6 tonnes/year in the opening year. Regional emissions of NOx are predicted to increase by 3.7 tonnes/year in the opening year. For both NO2 and PM10, those in the most deprived income quintile may experience net benefits. The evaluation of the modelling results indicates there are no exceedances of AQS objective criteria as a result of the Scheme and therefore the Scheme does not have a significant impact on air quality. In terms of compliance with the EU directive, the Scheme is Low Risk.	11,290 properties are located within 200m of the road network. 5,534 experience an improvement in air quality, 726 would experience no change, and 5,030 would experience a worsening in pollutant concentrations.	N/A	£0.24m	Slight adverse to large beneficial for most deprived. Moderate adverse to large adverse for least deprived.
	Greenhouse gases	Carbon dioxide emissions increase as a result of the Scheme by 348,979 tonnes.	Change in non-traded carbon over 60y (CO2e): 348,979 Change in traded carbon over 60y (CO2e): 0	CO2 emissions increase	-£15.73m	
	Landscape	The landscape features and character in the vicinity of the Scheme are typical of the Lancashire County Council local landscape area '15d Fylde'. The Scheme would have a major change on the designed landscape of Singleton Hall and Park and a moderate change on the tranquillity and rural features resulting in urban encroachment into the rural urban edge landscape of the Main Dyke.	N/A	Large Adverse	N/A	
	Townscape	The townscape features in the vicinity of the Scheme are typical of the trunk road and main road network of the Fylde. The removal of existing trunk road traffic from A585 Mains Lane and the A586 to an offline bypass would result in a slight beneficial change.	N/A	Moderate Adverse to Slight Beneficial	N/A	
	Historic Environment	The Scheme will result in the loss of 37 non-designated heritage assets of local significance. There will also be significant alteration of the context of a Grade II listed building (the Ice House at Singleton Hall), as well as a slight adverse effect to the Singleton Conservation Area, however, appropriate mitigation has been specified which has reduced the overall effect.	N/A	Slight Adverse	N/A	

	Biodiversity	The Scheme would not result in any direct impacts on the Morecambe Bay and Duddon Estuary SPA or Morecambe Bay Ramsar site. Direct loss of agricultural land that lies within foraging range of the majority of bird species for which the SPA / Ramsar Site is designated will be lost, however, this has been demonstrated to not be "functionally linked". Data, based on a desk study and two years of targeted field survey, suggests that significant effects are not likely on any species / habitats once suitable mitigation has been included, as a result of the Scheme.	N/A	Neutral	N/A	
	Water Environment	There is potential for some localised and short-term detriment to the water quality and flow conveyance attributes of some watercourses, namely the Main Dyke, Pool Foot Creek and unnamed drains crossed by the Scheme, but overall the significance of these effects and effects in the long-term, are insignificant. The exception is a long-term benefit in terms of a reduction in flood risk from the Main Dyke due to the Scheme providing an open span crossing, replacing an existing twin culvert arrangement of the existing Skippool Bridge under the A585.	N/A	Slight Beneficial to Neutral	N/A	
Social	Commuting and Other users	Transport users benefit from the provision of the Scheme through reduced travel time amounting to £98.22m PV. There is an increase in vehicle operating costs, primarily due to the increase in vehicle kilometres with a disbenefit of £33.97m PV. There is a disbenefit of £1.37m to transport users during construction and maintenance giving an overall net benefit of £62.88m PV.	**Value of journey time changes(£)** £98.22m **Net journey time changes (£)** 0 to 2min / 2 to 5min / > 5min 40.70 / 56.85 / 0.68	N/A	£62.88m	Slight beneficial to large beneficial for all.
	Reliability impact on Commuting and Other users	All time periods show an improvement in journey time reliability due to the Scheme.	£9.24m	Beneficial	£9.24m	
	Physical activity	Reduction in severance along the existing roads bypassed by the Scheme and particular provision for non-motorised users along those roads should encourage walking and cycling but speeds are unlikely to change.	N/A	Slight Beneficial	N/A	
	Journey quality	The Scheme is expected to improve journey quality for road users by reducing traveller stress as the Scheme provides journey time savings and is expected to reduce accidents.	N/A	Beneficial	N/A	
	Accidents	It is expected that there would be a decrease of around 30 accidents across the study area due to the Scheme over the 60 year appraisal period.	£10.40m	Beneficial	£10.40m	Adverse for all except large beneficial for middle income quartile.
	Security	The Scheme is not expected to change the level of security of road users or public transport users and as the Scheme involve upgrades to an existing route, there will be minimal changes to the security of the area.	N/A	N/A	N/A	N/A
	Access to services	The Scheme does involve some changes to the road network, however it is not expected to cause any significant changes to the public transport system that would impact the access to services.	N/A	N/A	N/A	N/A
	Affordability	The affordability impact was associated with vehicle operating costs and forms part of the user benefits but was assessed separately for affordability impacts. Vehicle Operating costs appear to increase due to the Scheme resulting in an adverse impact.	N/A	Adverse	VOC = -£33.97m	Slight adverse for most deprived. Large to moderate adverse for least deprived.
	Severance	The Scheme reduces severance for walkers, cyclists and horse riders and improves access across the existing A585 between the Little Singleton and Skippool junctions. Previously there were no controlled crossing points along the A585 between Skippool and Little Singleton junctions. Signalised pedestrian crossings have been introduced at Skippool, Shard Road and Little Singleton junctions. In addition the footpaths will be improved and a combined footway and cycleway will be implemented. The routes for pedestrians and cyclists will follow the existing road network rather than the bypass as this provides direct links between communities along routes with lower traffic flows.	N/A	Beneficial	N/A	N/A
	Option and non-use values	This is not applicable to the Scheme.	N/A	N/A	N/A	N/A
Public Accounts	Cost to Broad Transport Budget	The Cost to the Broad Transport Budget for the Scheme amounts to £108.90m PV. It includes investment costs of £104.70m and maintenance costs of £4.20m.	£108.90m	N/A	£108.90m	
	Indirect Tax Revenues	There is an increase in indirect tax revenues to Government of £26.05m	-£26.05m	N/A	-£26.05m	

APPENDIX A – Scheme Cost

ECONOMICS INFORMATION FOR THE WHOLE PACKAGE

PROJECT NAME:	**A585 Windy Harbour to Skippool Improvement Scheme**
PROJECT STAGE:	**3. Development - Preliminary Design**
PROJECT SCOPE:	
0	

IF YOU HAVE ANY QUESTIONS REGARDING THE INFORMATION
CommercialServicesDivision@highwaysengland.co.uk

REBASED 2010 CALENDAR YEAR PROFILES FOR ECONOMIC CALCULATIONS - ALL COSTS ARE IN THE FACTOR COST UNIT OF ACCOUNT

The expenditure profiles are based upon cost estimates for each financial year prepared in Q1 2016 prices and then inflated to outturn costs using HE projected construction related inflation. These costs have then been rebased to 2010 calendar year profiles for economic calculations, using the GDP-deflator series as published in the WebTAG Databook.

The costs exclude all recoverable VAT. All historic costs have been removed - previous years and an approximate of this years spend that occurs in the past.

	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total (Excl Hist)
PREPARATION EXPENDITURE PROFILE	£0	£0	£0	£0	£2,968,597	£5,516,587	£141,345	£0	£0	£8,626,529
SUPERVISION EXPENDITURE PROFILE	£0	£0	£0	£0	£0	£0	£638,900	£1,245,233	£64,491	£1,948,625
WORKS EXPENDITURE PROFILE	£0	£0	£0	£0	£0	£0	£29,352,162	£59,341,498	£7,410,064	£96,103,724
LANDS EXPENDITURE PROFILE	£0	£0	£0	£0	£3,132,855	£0	£16,219,599	£0	£0	£19,352,455
TOTAL EXPENDITURE FORECAST	**£0**	**£0**	**£0**	**£0**	**£6,101,452**	**£5,516,587**	**£46,352,006**	**£60,586,731**	**£7,474,556**	**£126,031,332**

PREPARATION EXPENDITURE PROFILE	0%	0%	0%	0%	34%	64%	2%	0%	0%	100%
SUPERVISION EXPENDITURE PROFILE	0%	0%	0%	0%	0%	0%	33%	64%	3%	100%
WORKS EXPENDITURE PROFILE	0%	0%	0%	0%	0%	0%	31%	62%	8%	100%
LANDS EXPENDITURE PROFILE	0%	0%	0%	0%	16%	0%	84%	0%	0%	100%
TOTAL EXPENDITURE FORECAST (ALL COSTS INCLUDED)	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**4.8%**	**4.4%**	**36.8%**	**48.1%**	**5.9%**	**100.0%**

Discounting cost calculations for the A585 Skippool to Windy Harbour Improvement Scheme **£104,703,544**

Year	PREPARATION EXPENDITURE PROFILE	SUPERVISION EXPENDITURE PROFILE	WORKS EXPENDITURE PROFILE	LANDS EXPENDITURE PROFILE	TOTAL EXPENDITURE FORECAST (ALL COSTS INCLUDED)	Discounting factor	Market price	Total cost	PREPARATION EXPENDITURE PROFILE	SUPERVISION EXPENDITURE PROFILE	WORKS EXPENDITURE PROFILE	LANDS EXPENDITURE PROFILE
2010	£0	£0	£0	£0	£0	1.0000	1.190	£0				
2011	£0	£0	£0	£0	£0	0.9662	1.190	£0				
2012	£0	£0	£0	£0	£0	0.9335	1.190	£0				
2013	£0	£0	£0	£0	£0	0.9019	1.190	£0				
2014	£0	£0	£0	£0	£0	0.8714	1.190	£0	£ -	£ -	£ -	£ -
2015	£0	£0	£0	£0	£0	0.8420	1.190	£0	£ -	£ -	£ -	£ -
2016	£0	£0	£0	£0	£0	0.8135	1.190	£0	£ -	£ -	£ -	£ -
2017	£0	£0	£0	£0	£0	0.7860	1.190	£0	£ -	£ -	£ -	£ -
2018	£2,968,597	£0	£0	£3,132,855	£6,101,452	0.7594	1.190	£5,513,881	£ 2,682,720.33	£ -	£ -	£ 2,831,160.64
2019	£5,516,587	£0	£0	£0	£5,516,587	0.7337	1.190	£4,816,752	£ 4,816,751.91	£ -	£ -	£ -
2020	£141,345	£638,900	£29,352,162	£16,219,599	£46,352,006	0.7089	1.190	£39,103,173	£ 119,240.71	£ 538,984.53	£ 24,761,876.66	£13,683,070.98
2021	£0	£1,245,233	£59,341,498	£0	£60,586,731	0.6849	1.190	£49,383,360	£ -	£1,014,971.42	£ 48,368,388.46	£ -
2022	£0	£64,491	£7,410,064	£0	£7,474,556	0.6618	1.190	£5,886,378	£ -	£ 50,788.40	£ 5,835,589.73	£ -
Total (Excl Hist)	**£8,626,529**	**£1,948,625**	**£96,103,724**	**£19,352,455**	**£126,031,332**			**£104,703,543.77**	7,618,713	1,604,744	78,965,855	16,514,232

Cost Category	
Preparation	£7,618,713
Supervision	£1,604,744
Land	£78,965,855
Construction	£16,514,232
Total	£104,703,544

APPENDIX B – TUBA Standard Economics File

```
*****************************************************************************************************************
Economics v1.9.9 file details (WebTAG Data Book v1.8.1 July 2017)
* Source: www.gov.uk/government/publications/webtag-tag-data-book-july-2017
TUBA ECONOMIC PARAMETERS FILE (22/08/2017) Version 1.9.9 Final Release
*****************************************************************************************************************
PARAMETERS
TUBA_version    1.9.9       the current version of TUBA
base_year       2010        defines base year for economic parameters
pres_val_year   2010        present value year for discounting
GDP_base        100.00      value of GDP in base year

** Source: TAG Data Book - Table A 1.3.1
av_ind_tax      19.0        %average final indirect tax rate

** TAG reference: TAG Data Book, Table A 3.4 (for non-traded), hidden worksheet 'GHG' (for traded)
nt_carbdxvalues   26.07  78.22  52.15  base year non-traded carbon dioxide values in £/tonne(low high central)
t_carbdxvalues    12.13  12.13  12.13  base year traded carbon dioxide values in £/tonne(low high central)
*****************************************************************************************************************
MODES
*No.   Description
 1     Road
 2     Bus
 3     Rail

VEHICLE_TYPE/SUBMODE
*No.   Mode  New_mode  P&R  Type  Description
 1     1     N         N    per   Car
 2     1     N         N    per   LGV Personal
 3     1     N         N    fre   LGV Freight
 4     1     N         N    fre   OGV1
 5     1     N         N    fre   OGV2
 6     2     N         N    per   Bus
 7     3     N         N    per   Light Rail
 8     3     N         N    per   Heavy rail

PERSON_TYPE
*No.   Type(D/P)   Description
 1     D           Driver
 2     P           Passenger

PURPOSE
*No.   Type(B/C/O) Description
 1     B           Business
 2     C           Commuting
 3     O           Other

FUEL_TYPE
*No.   Sector   Name    (sector: 1=untraded, sector 2=traded sector)
 1       1      Petrol
 2       1      Diesel
 3       2      Electric

TIME_PERIODS
*No.   Description   Comments
 1     AM peak       (7-10 weekdays)
 2     PM peak       (4-7 weekdays)
 3     Inter-peak    (10-4 weekdays)
 4     Off-peak      (7-7 weekdays)
 5     Weekend       (weekend)

BREAKPOINTS
*Description  Breakpoint1   Breakpoint2   Breakpoint3...
```

```
Distance        1.0      5.0      10.0      25.0      50.0      100.0      200.0
TimeSaving       -5.0     -2.0      0.0       2.0       5.0

CHARGES
*No.   Sector        Description
 1   pri          PT fares (private operators)
 2   loc          PT fares (LA operated)
 3   loc          LA tolls
 4   cen          National tolls
 5   pri          Private tolls
 6   loc          LA on-street parking
 7   loc          LA off-street parking
 8   pri          Private parking

DISCOUNT_RATE
** Source: TAG Data Book - Table A 1.1.1
** %change p.a.
*Start_yr    End_yr    Rate
  1          30    3.50
 31           75     3.00
 76           80     2.50

VALUE_OF_TIME_ALLOCATION
** Source: TAG Data Book - Table A 1.3.1
** Default VOT Method to be used: Method 1 for Car & Rail (Business) and Method 3 for All Other Modes-Purpose combinations
*Vtype/submode  Person_type  Purpose_type  VOT_Method
  1         1          1          1
  1         2          1          1
  8         2          1          1

VALUE_OF_TIME_METHOD1
** Source: TAG Data Book - Table A 1.3.1
** pence per hour (in 2010 base year values and prices)
*Vtype/submode Person_type Purpose_type U   Xmid        k
     1     1     1     2480.37     66.53     67.02
     1     1     2       0.00     0.00     0.00
     1     1     3       0.00     0.00     0.00
     1     2     1     2480.37     66.53     67.02
     1     2     2       0.00     0.00     0.00
     1     2     3       0.00     0.00     0.00
     2     1     1       0.00     0.00     0.00
     2     1     2       0.00     0.00     0.00
     2     1     3       0.00     0.00     0.00
     2     2     1       0.00     0.00     0.00
     2     2     2       0.00     0.00     0.00
     2     2     3       0.00     0.00     0.00
     3     1     1       0.00     0.00     0.00
     3     1     2       0.00     0.00     0.00
     3     1     3       0.00     0.00     0.00
     3     2     1       0.00     0.00     0.00
     3     2     2       0.00     0.00     0.00
     3     2     3       0.00     0.00     0.00
     4     1     1       0.00     0.00     0.00
     4     1     2       0.00     0.00     0.00
     4     1     3       0.00     0.00     0.00
     4     2     1       0.00     0.00     0.00
     4     2     2       0.00     0.00     0.00
     4     2     3       0.00     0.00     0.00
     5     1     1       0.00     0.00     0.00
     5     1     2       0.00     0.00     0.00
     5     1     3       0.00     0.00     0.00
     5     2     1       0.00     0.00     0.00
     5     2     2       0.00     0.00     0.00
     5     2     3       0.00     0.00     0.00
     6     1     1       0.00     0.00     0.00
```

```
     6    1    2      0.00      0.00      0.00
     6    1    3      0.00      0.00      0.00
     6    2    1      0.00      0.00      0.00
     6    2    2      0.00      0.00      0.00
     6    2    3      0.00      0.00      0.00
     7    1    1      0.00      0.00      0.00
     7    1    2      0.00      0.00      0.00
     7    1    3      0.00      0.00      0.00
     7    2    1      0.00      0.00      0.00
     7    2    2      0.00      0.00      0.00
     7    2    3      0.00      0.00      0.00
     8    1    1      0.00      0.00      0.00
     8    1    2      0.00      0.00      0.00
     8    1    3      0.00      0.00      0.00
     8    2    1   3646.86    107.04     63.95
     8    2    2      0.00      0.00      0.00
     8    2    3      0.00      0.00      0.00

VALUE_OF_TIME_METHOD2
** Source: TAG Data Book - Table A 1.3.1
** pence per hour (in 2010 base year values and prices)
** Distance Band 1 (D1) = 0-50 km, Distance Band 2 (D2) = 50-100km, Distance Band 3 (D3) = 100-200km, Distance Band 4 (D4) =
+200km
*Vtype/submode Person_type Purpose D1        D2        D3        D4
     1    1    1    842.34   1361.82   1848.85   2376.83
     1    1    2      0.00      0.00      0.00      0.00
     1    1    3      0.00      0.00      0.00      0.00
     1    2    1    842.34   1361.82   1848.85   2376.83
     1    2    2      0.00      0.00      0.00      0.00
     1    2    3      0.00      0.00      0.00      0.00
     2    1    1      0.00      0.00      0.00      0.00
     2    1    2      0.00      0.00      0.00      0.00
     2    1    3      0.00      0.00      0.00      0.00
     2    2    1      0.00      0.00      0.00      0.00
     2    2    2      0.00      0.00      0.00      0.00
     2    2    3      0.00      0.00      0.00      0.00
     3    1    1      0.00      0.00      0.00      0.00
     3    1    2      0.00      0.00      0.00      0.00
     3    1    3      0.00      0.00      0.00      0.00
     3    2    1      0.00      0.00      0.00      0.00
     3    2    2      0.00      0.00      0.00      0.00
     3    2    3      0.00      0.00      0.00      0.00
     4    1    1      0.00      0.00      0.00      0.00
     4    1    2      0.00      0.00      0.00      0.00
     4    1    3      0.00      0.00      0.00      0.00
     4    2    1      0.00      0.00      0.00      0.00
     4    2    2      0.00      0.00      0.00      0.00
     4    2    3      0.00      0.00      0.00      0.00
     5    1    1      0.00      0.00      0.00      0.00
     5    1    2      0.00      0.00      0.00      0.00
     5    1    3      0.00      0.00      0.00      0.00
     5    2    1      0.00      0.00      0.00      0.00
     5    2    2      0.00      0.00      0.00      0.00
     5    2    3      0.00      0.00      0.00      0.00
     6    1    1      0.00      0.00      0.00      0.00
     6    1    2      0.00      0.00      0.00      0.00
     6    1    3      0.00      0.00      0.00      0.00
     6    2    1      0.00      0.00      0.00      0.00
     6    2    2      0.00      0.00      0.00      0.00
     6    2    3      0.00      0.00      0.00      0.00
     7    1    1      0.00      0.00      0.00      0.00
     7    1    2      0.00      0.00      0.00      0.00
     7    1    3      0.00      0.00      0.00      0.00
     7    2    1      0.00      0.00      0.00      0.00
     7    2    2      0.00      0.00      0.00      0.00
```

```
     7    2    3     0.00     0.00     0.00     0.00
     8    1    1     0.00     0.00     0.00     0.00
     8    1    2     0.00     0.00     0.00     0.00
     8    1    3     0.00     0.00     0.00     0.00
     8    2    1   842.34  1361.82  2371.85  3421.63
     8    2    2     0.00     0.00     0.00     0.00
     8    2    3     0.00     0.00     0.00     0.00

VALUE_OF_TIME_METHOD3
** Source TAG Data Book - Table A 1.3.1
** pence per hour (in 2010 base year values and prices)
*Vtype/submode Person_type purpose_type VOT
     1    1    1  1486.44
     1    1    2   995.30
     1    1    3   454.28
     1    2    1  1486.44
     1    2    2   995.30
     1    2    3   454.28
     2    1    1  1023.53
     2    1    2   995.30
     2    1    3   454.28
     2    2    1  1023.53
     2    2    2   995.30
     2    2    3   454.28
     3    1    1  1023.53
     3    1    2     0.00
     3    1    3     0.00
     3    2    1  1023.53
     3    2    2     0.00
     3    2    3     0.00
     4    1    1  1205.96
     4    1    2     0.00
     4    1    3     0.00
     4    2    1  1205.96
     4    2    2     0.00
     4    2    3     0.00
     5    1    1  1205.96
     5    1    2     0.00
     5    1    3     0.00
     5    2    1  1205.96
     5    2    2     0.00
     5    2    3     0.00
     6    1    1  1232.02
     6    1    2     0.00
     6    1    3     0.00
     6    2    1   842.34
     6    2    2   995.30
     6    2    3   454.28
     7    1    1     0.00
     7    1    2     0.00
     7    1    3     0.00
     7    2    1   842.34
     7    2    2   995.30
     7    2    3   454.28
     8    1    1     0.00
     8    1    2     0.00
     8    1    3     0.00
     8    2    1  2451.90
     8    2    2   995.30
     8    2    3   454.28

VALUE_OF_TIME_GROWTH
** Source: TAG Data Book - Table A 1.3.2
** %change per annum from 2010 base year
*Start_yr   End_yr    VOT_Gr_purpose1  VOT_Gr_purpose2  VOT_Gr_purpose3
```

2011	2011	0.666	0.666	0.666
2012	2012	0.645	0.645	0.645
2013	2013	1.274	1.274	1.274
2014	2014	2.287	2.287	2.287
2015	2015	1.389	1.389	1.389
2016	2016	0.971	0.971	0.971
2017	2017	1.300	1.300	1.300
2018	2018	0.853	0.853	0.853
2019	2019	1.072	1.072	1.072
2020	2020	1.239	1.239	1.239
2021	2021	1.367	1.367	1.367
2022	2022	1.551	1.551	1.551
2023	2023	1.604	1.604	1.604
2024	2024	1.666	1.666	1.666
2025	2025	1.765	1.765	1.765
2026	2026	1.841	1.841	1.841
2027	2027	1.868	1.868	1.868
2028	2028	1.864	1.864	1.864
2029	2029	1.816	1.816	1.816
2030	2030	1.792	1.792	1.792
2031	2031	1.788	1.788	1.788
2032	2032	1.790	1.790	1.790
2033	2033	1.797	1.797	1.797
2034	2034	1.815	1.815	1.815
2035	2035	1.837	1.837	1.837
2036	2036	1.859	1.859	1.859
2037	2037	1.895	1.895	1.895
2038	2038	1.971	1.971	1.971
2039	2039	2.019	2.019	2.019
2040	2040	2.058	2.058	2.058
2041	2041	2.056	2.056	2.056
2042	2042	2.039	2.039	2.039
2043	2043	2.016	2.016	2.016
2044	2044	2.002	2.002	2.002
2045	2045	1.993	1.993	1.993
2046	2046	1.948	1.948	1.948
2047	2047	1.921	1.921	1.921
2048	2048	1.908	1.908	1.908
2049	2049	1.906	1.906	1.906
2050	2050	1.917	1.917	1.917
2051	2051	1.931	1.931	1.931
2052	2052	1.988	1.988	1.988
2053	2053	2.015	2.015	2.015
2054	2054	2.017	2.017	2.017
2055	2055	2.012	2.012	2.012
2056	2056	1.988	1.988	1.988
2057	2057	1.974	1.974	1.974
2058	2058	1.976	1.976	1.976
2059	2059	1.988	1.988	1.988
2060	2060	2.036	2.036	2.036
2061	2061	2.059	2.059	2.059
2062	2062	2.072	2.072	2.072
2063	2063	2.075	2.075	2.075
2064	2064	2.064	2.064	2.064
2065	2065	2.052	2.052	2.052
2066	2066	2.029	2.029	2.029
2067	2067	2.020	2.020	2.020
2068	2068	2.016	2.016	2.016
2069	2069	2.013	2.013	2.013
2070	2070	2.009	2.009	2.009
2071	2071	2.006	2.006	2.006
2072	2072	2.003	2.003	2.003
2073	2073	2.000	2.000	2.000
2074	2074	1.998	1.998	1.998
2075	2075	1.997	1.997	1.997

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2076        2076        1.996        1.996        1.996
2077        2077        1.996        1.996        1.996
2078        2078        1.996        1.996        1.996
2079        2079        1.997        1.997        1.997
2080        2080        1.998        1.998        1.998
2081        2081        1.999        1.999        1.999
2082        2082        2.001        2.001        2.001
2083        2083        2.002        2.002        2.002
2084        2084        2.004        2.004        2.004
2085        2085        2.005        2.005        2.005
2086        2086        2.006        2.006        2.006
2087        2087        2.007        2.007        2.007
2088        2088        2.008        2.008        2.008
2089        2089        2.009        2.009        2.009
2090        2090        2.009        2.009        2.009
2091        2091        2.009        2.009        2.009
2092        2092        2.008        2.008        2.008
2093        2093        2.008        2.008        2.008
2094        2094        2.008        2.008        2.008
2095        2095        2.007        2.007        2.007
2096        2096        2.007        2.007        2.007
2097        2097        2.007        2.007        2.007
2098        2098        2.007        2.007        2.007
2099        2099        2.006        2.006        2.006
2100        2100        2.007        2.007        2.007

AV_IND_TAX_CHANGES
** %change per annum from 2010 base year
*Start_yr   End_yr   Growth
2011        2050     0.00

CHARGE_TAX_RATES
** %base year tax rates
*Charge   Final   Intermediate
 1         0.0     0.0
 2         0.0     0.0
 3         0.0     0.0
 4         0.0     0.0
 5        17.5     0.0
 6         0.0     0.0
 7        17.5     0.0
 8        17.5     0.0

CHARGE_TAX_RATES_CHANGES
** %change per annum from 2010 base year
*Start_yr   End_yr   Charge   Final    Intermediate
2011        2011     1        0.000    0.000
2011        2011     2        0.000    0.000
2011        2011     3        0.000    0.000
2011        2011     4        0.000    0.000
2011        2011     5        14.286   0.000
2011        2011     6        0.000    0.000
2011        2011     7        14.286   0.000
2011        2011     8        14.286   0.000
2012        2100     1        0.000    0.000
2012        2100     2        0.000    0.000
2012        2100     3        0.000    0.000
2012        2100     4        0.000    0.000
2012        2100     5        0.000    0.000
2012        2100     6        0.000    0.000
2012        2100     7        0.000    0.000
2012        2100     8        0.000    0.000

FUEL_COST
** Source: TAG Data Book - Table A 1.3.7
```

```
** Source: TAG Data Book - Table A 3.3 (CO2e values)
** (In 2010 base year values and prices)
*Type   Resource(p/unit)  Duty(p/unit)    VAT(%) CO2_grammes/unit (unit=litre for fuel types 1 & 2; unit=KWH for electric)
 1       42.57        57.19         17.50       2230.00
 2       44.31        57.19         17.50       2562.00
 3       11.42         0.00          5.00       374.00

FUEL_COST_CHANGES
** Source: TAG Data Book -Table A 1.3.7 (Derived) & Table A 3.3 CO2 (Derived)
** %change per annum from 2010 base year
*Start_yr    End_yr    Fuel_type  Resource       Duty       VAT    CO2_Den_Change
2011        2011       1      22.293       -0.241       14.286       -0.844
2012        2012       1       2.158       -1.935       0.000       -0.024
2013        2013       1      -3.565       -1.870       0.000       -0.438
2014        2014       1     -11.692       -1.619       0.000       -0.537
2015        2015       1     -28.441       -0.549       0.000        0.000
2016        2016       1      -6.933       -1.703       0.000        0.000
2017        2017       1     -11.056       -0.593       0.000       -1.352
2018        2018       1       4.716        1.143       0.000       -1.370
2019        2019       1       2.960        1.784       0.000       -1.389
2020        2020       1       3.976        1.438       0.000       -1.408
2021        2021       1       3.878        1.229       0.000        0.000
2022        2022       1       2.718        1.150       0.000        0.000
2023        2023       1       3.750        0.939       0.000        0.000
2024        2024       1       3.530        0.779       0.000        0.000
2025        2025       1       3.319        0.684       0.000        0.000
2026        2026       1       2.142        0.684       0.000        0.000
2027        2027       1       3.145        0.684       0.000        0.000
2028        2028       1       3.049        0.684       0.000        0.000
2029        2029       1       1.973        0.684       0.000        0.000
2030        2030       1       2.902        0.684       0.000        0.000
2031        2031       1       0.000        0.684       0.000        0.000
2032        2032       1       0.000        0.684       0.000        0.000
2033        2033       1       0.000        0.684       0.000        0.000
2034        2034       1       0.000        0.684       0.000        0.000
2035        2035       1       0.000        0.684       0.000        0.000
2036        2036       1       0.000        0.684       0.000        0.000
2037        2037       1       0.000        0.684       0.000        0.000
2038        2038       1       0.000        0.684       0.000        0.000
2039        2039       1       0.000        0.684       0.000        0.000
2040        2040       1       0.000        0.684       0.000        0.000
2041        2041       1       0.000        0.684       0.000        0.000
2042        2042       1       0.000        0.684       0.000        0.000
2043        2043       1       0.000        0.684       0.000        0.000
2044        2044       1       0.000        0.684       0.000        0.000
2045        2045       1       0.000        0.684       0.000        0.000
2046        2046       1       0.000        0.684       0.000        0.000
2047        2047       1       0.000        0.684       0.000        0.000
2048        2048       1       0.000        0.684       0.000        0.000
2049        2049       1       0.000        0.684       0.000        0.000
2050        2050       1       0.000        0.684       0.000        0.000
2051        2051       1       0.000        0.684       0.000        0.000
2052        2052       1       0.000        0.684       0.000        0.000
2053        2053       1       0.000        0.684       0.000        0.000
2054        2054       1       0.000        0.684       0.000        0.000
2055        2055       1       0.000        0.684       0.000        0.000
2056        2056       1       0.000        0.684       0.000        0.000
2057        2057       1       0.000        0.684       0.000        0.000
2058        2058       1       0.000        0.684       0.000        0.000
2059        2059       1       0.000        0.684       0.000        0.000
2060        2060       1       0.000        0.684       0.000        0.000
2061        2061       1       0.000        0.684       0.000        0.000
2062        2062       1       0.000        0.684       0.000        0.000
2063        2063       1       0.000        0.684       0.000        0.000
2064        2064       1       0.000        0.684       0.000        0.000
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2065	2065	1	0.000	0.684	0.000	0.000
2066	2066	1	0.000	0.684	0.000	0.000
2067	2067	1	0.000	0.684	0.000	0.000
2068	2068	1	0.000	0.684	0.000	0.000
2069	2069	1	0.000	0.684	0.000	0.000
2070	2070	1	0.000	0.684	0.000	0.000
2071	2071	1	0.000	0.684	0.000	0.000
2072	2072	1	0.000	0.684	0.000	0.000
2073	2073	1	0.000	0.684	0.000	0.000
2074	2074	1	0.000	0.684	0.000	0.000
2075	2075	1	0.000	0.684	0.000	0.000
2076	2076	1	0.000	0.684	0.000	0.000
2077	2077	1	0.000	0.684	0.000	0.000
2078	2078	1	0.000	0.684	0.000	0.000
2079	2079	1	0.000	0.684	0.000	0.000
2080	2080	1	0.000	0.684	0.000	0.000
2081	2081	1	0.000	0.684	0.000	0.000
2082	2082	1	0.000	0.684	0.000	0.000
2083	2083	1	0.000	0.684	0.000	0.000
2084	2084	1	0.000	0.684	0.000	0.000
2085	2085	1	0.000	0.684	0.000	0.000
2086	2086	1	0.000	0.684	0.000	0.000
2087	2087	1	0.000	0.684	0.000	0.000
2088	2088	1	0.000	0.684	0.000	0.000
2089	2089	1	0.000	0.684	0.000	0.000
2090	2090	1	0.000	0.684	0.000	0.000
2091	2091	1	0.000	0.684	0.000	0.000
2092	2092	1	0.000	0.684	0.000	0.000
2093	2093	1	0.000	0.684	0.000	0.000
2094	2094	1	0.000	0.684	0.000	0.000
2095	2095	1	0.000	0.684	0.000	0.000
2096	2096	1	0.000	0.684	0.000	0.000
2097	2097	1	0.000	0.684	0.000	0.000
2098	2098	1	0.000	0.684	0.000	0.000
2099	2099	1	0.000	0.684	0.000	0.000
2100	2100	1	0.000	0.684	0.000	0.000

2011	2011	2	26.989	-0.241	14.286	0.188
2012	2012	2	3.367	-1.935	0.000	1.643
2013	2013	2	-3.802	-1.870	0.000	-0.435
2014	2014	2	-11.264	-1.619	0.000	0.153
2015	2015	2	-29.426	-0.549	0.000	0.004
2016	2016	2	-12.040	-1.703	0.000	0.003
2017	2017	2	-7.259	-0.593	0.000	-1.744
2018	2018	2	5.039	1.143	0.000	-1.775
2019	2019	2	3.157	1.784	0.000	-1.807
2020	2020	2	4.256	1.438	0.000	-1.841
2021	2021	2	4.136	1.229	0.000	0.000
2022	2022	2	2.878	1.150	0.000	0.000
2023	2023	2	3.978	0.939	0.000	0.000
2024	2024	2	3.742	0.779	0.000	0.000
2025	2025	2	3.516	0.684	0.000	0.000
2026	2026	2	2.265	0.684	0.000	0.000
2027	2027	2	3.322	0.684	0.000	0.000
2028	2028	2	3.215	0.684	0.000	0.000
2029	2029	2	2.076	0.684	0.000	0.000
2030	2030	2	3.051	0.684	0.000	0.000
2031	2031	2	0.000	0.684	0.000	0.000
2032	2032	2	0.000	0.684	0.000	0.000
2033	2033	2	0.000	0.684	0.000	0.000
2034	2034	2	0.000	0.684	0.000	0.000
2035	2035	2	0.000	0.684	0.000	0.000
2036	2036	2	0.000	0.684	0.000	0.000
2037	2037	2	0.000	0.684	0.000	0.000
2038	2038	2	0.000	0.684	0.000	0.000

2039	2039	2	0.000	0.684	0.000	0.000
2040	2040	2	0.000	0.684	0.000	0.000
2041	2041	2	0.000	0.684	0.000	0.000
2042	2042	2	0.000	0.684	0.000	0.000
2043	2043	2	0.000	0.684	0.000	0.000
2044	2044	2	0.000	0.684	0.000	0.000
2045	2045	2	0.000	0.684	0.000	0.000
2046	2046	2	0.000	0.684	0.000	0.000
2047	2047	2	0.000	0.684	0.000	0.000
2048	2048	2	0.000	0.684	0.000	0.000
2049	2049	2	0.000	0.684	0.000	0.000
2050	2050	2	0.000	0.684	0.000	0.000
2051	2051	2	0.000	0.684	0.000	0.000
2052	2052	2	0.000	0.684	0.000	0.000
2053	2053	2	0.000	0.684	0.000	0.000
2054	2054	2	0.000	0.684	0.000	0.000
2055	2055	2	0.000	0.684	0.000	0.000
2056	2056	2	0.000	0.684	0.000	0.000
2057	2057	2	0.000	0.684	0.000	0.000
2058	2058	2	0.000	0.684	0.000	0.000
2059	2059	2	0.000	0.684	0.000	0.000
2060	2060	2	0.000	0.684	0.000	0.000
2061	2061	2	0.000	0.684	0.000	0.000
2062	2062	2	0.000	0.684	0.000	0.000
2063	2063	2	0.000	0.684	0.000	0.000
2064	2064	2	0.000	0.684	0.000	0.000
2065	2065	2	0.000	0.684	0.000	0.000
2066	2066	2	0.000	0.684	0.000	0.000
2067	2067	2	0.000	0.684	0.000	0.000
2068	2068	2	0.000	0.684	0.000	0.000
2069	2069	2	0.000	0.684	0.000	0.000
2070	2070	2	0.000	0.684	0.000	0.000
2071	2071	2	0.000	0.684	0.000	0.000
2072	2072	2	0.000	0.684	0.000	0.000
2073	2073	2	0.000	0.684	0.000	0.000
2074	2074	2	0.000	0.684	0.000	0.000
2075	2075	2	0.000	0.684	0.000	0.000
2076	2076	2	0.000	0.684	0.000	0.000
2077	2077	2	0.000	0.684	0.000	0.000
2078	2078	2	0.000	0.684	0.000	0.000
2079	2079	2	0.000	0.684	0.000	0.000
2080	2080	2	0.000	0.684	0.000	0.000
2081	2081	2	0.000	0.684	0.000	0.000
2082	2082	2	0.000	0.684	0.000	0.000
2083	2083	2	0.000	0.684	0.000	0.000
2084	2084	2	0.000	0.684	0.000	0.000
2085	2085	2	0.000	0.684	0.000	0.000
2086	2086	2	0.000	0.684	0.000	0.000
2087	2087	2	0.000	0.684	0.000	0.000
2088	2088	2	0.000	0.684	0.000	0.000
2089	2089	2	0.000	0.684	0.000	0.000
2090	2090	2	0.000	0.684	0.000	0.000
2091	2091	2	0.000	0.684	0.000	0.000
2092	2092	2	0.000	0.684	0.000	0.000
2093	2093	2	0.000	0.684	0.000	0.000
2094	2094	2	0.000	0.684	0.000	0.000
2095	2095	2	0.000	0.684	0.000	0.000
2096	2096	2	0.000	0.684	0.000	0.000
2097	2097	2	0.000	0.684	0.000	0.000
2098	2098	2	0.000	0.684	0.000	0.000
2099	2099	2	0.000	0.684	0.000	0.000
2100	2100	2	0.000	0.684	0.000	0.000
2011	2011	3	5.190	0.000	0.000	-1.443
2012	2012	3	3.977	0.000	0.000	-1.874

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2013    2013    3    5.460    0.000    0.000    -2.436
2014    2014    3    3.759    0.000    0.000    -1.853
2015    2015    3    -0.702   0.000    0.000    -2.804
2016    2016    3    -1.396   0.000    0.000    -2.748
2017    2017    3    3.439    0.000    0.000    -2.982
2018    2018    3    3.325    0.000    0.000    -3.240
2019    2019    3    0.959    0.000    0.000    -3.528
2020    2020    3    2.094    0.000    0.000    -3.860
2021    2021    3    2.545    0.000    0.000    -4.236
2022    2022    3    -1.685   0.000    0.000    -4.662
2023    2023    3    1.822    0.000    0.000    -5.155
2024    2024    3    4.563    0.000    0.000    -5.735
2025    2025    3    6.692    0.000    0.000    -6.416
2026    2026    3    1.356    0.000    0.000    -7.228
2027    2027    3    -3.721   0.000    0.000    -8.212
2028    2028    3    5.038    0.000    0.000    -9.444
2029    2029    3    -2.569   0.000    0.000    -10.995
2030    2030    3    -3.587   0.000    0.000    -13.023
2031    2031    3    0.000    0.000    0.000    -8.688
2032    2032    3    0.000    0.000    0.000    -8.680
2033    2033    3    0.000    0.000    0.000    -8.692
2034    2034    3    0.000    0.000    0.000    -8.680
2035    2035    3    0.000    0.000    0.000    -8.685
2036    2036    3    0.000    0.000    0.000    -8.686
2037    2037    3    0.000    0.000    0.000    -8.689
2038    2038    3    0.000    0.000    0.000    -8.686
2039    2039    3    0.000    0.000    0.000    -8.684
2040    2040    3    0.000    0.000    0.000    -8.690
2041    2041    3    0.000    0.000    0.000    -4.720
2042    2042    3    0.000    0.000    0.000    -4.954
2043    2043    3    0.000    0.000    0.000    -5.212
2044    2044    3    0.000    0.000    0.000    -5.476
2045    2045    3    0.000    0.000    0.000    -5.817
2046    2046    3    0.000    0.000    0.000    -6.177
2047    2047    3    0.000    0.000    0.000    -6.583
2048    2048    3    0.000    0.000    0.000    -7.047
2049    2049    3    0.000    0.000    0.000    -7.581
2050    2050    3    0.000    0.000    0.000    -8.203
2051    2100    3    0.000    0.000    0.000    0.000

CARBDX_VALUE_CHANGES
** Source: TAG Data Book - Table A 3.4 (Non-traded) and hidden worksheet 'GHG' (Traded), Derived
*Start_yr   End_yr  Rel(%)_NT_Lw  Abs(t)_NT_Lw  Rel(%)_Tr_Lw  Abs(t)_Tr_Lw  Rel(%)_NT_Hi  Abs(t)_NT_Hi  Rel(%)_Tr_Hi
Abs(t)_Tr_Hi  Rel(%)_NT_Ce  Abs(t)_NT_Ce  Rel(%)_Tr_Ce  Abs(t)_Tr_Ce
2011  2011    1.500    0.000    -10.027    0.000    1.500    0.000    -10.027    0.000    1.500    0.000    -10.027
0.000
2012  2012    1.500    0.000    -49.367    0.000    1.500    0.000    -49.367    0.000    1.500    0.000    -49.367
0.000
2013  2013    1.500    0.000    -39.079    0.000    1.500    0.000    -39.079    0.000    1.500    0.000    -39.079
0.000
2014  2014    1.500    0.000    21.112    0.000    1.500    0.000    21.112    0.000    1.500    0.000    21.112    0.000
2015  2015    1.500    0.000    -99.998    0.000    1.500    0.000    15.048    0.000    1.500    0.000    15.048    0.000
2016  2016    1.500    0.000    0.000    0.000    1.500    0.000    -18.735    0.000    1.500    0.000    -18.735    0.000
2017  2017    1.500    0.000    0.000    0.000    1.500    0.000    0.739    0.000    1.500    0.000    0.739    0.000
2018  2018    1.500    0.000    0.000    0.000    1.500    0.000    9.311    0.000    1.500    0.000    0.887    0.000
2019  2019    1.500    0.000    0.000    0.000    1.500    0.000    56.600    0.000    1.500    0.000    3.800    0.000
2020  2020    1.500    0.000    0.000    0.000    1.500    0.000    26.621    0.000    1.500    0.000    3.800    0.000
2021  2021    1.667    0.000 3524655.829    0.000    1.667    0.000    117.015    0.000    1.667    0.000    158.848
0.000
2022  2022    1.639    0.000    100.000    0.000    1.639    0.000    53.920    0.000    1.639    0.000    61.367
0.000
2023  2023    1.613    0.000    50.000    0.000    1.613    0.000    35.031    0.000    1.613    0.000    38.030    0.000
2024  2024    1.587    0.000    33.333    0.000    1.587    0.000    25.943    0.000    1.587    0.000    27.552    0.000
2025  2025    1.563    0.000    25.000    0.000    1.563    0.000    20.599    0.000    1.563    0.000    21.600    0.000
2026  2026    1.538    0.000    20.000    0.000    1.538    0.000    17.081    0.000    1.538    0.000    17.763    0.000
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2027	2027	1.515	0.000	16.667	0.000	1.515	0.000	14.589	0.000	1.515	0.000	15.084	0.000
2028	2028	1.493	0.000	14.286	0.000	1.493	0.000	12.731	0.000	1.493	0.000	13.107	0.000
2029	2029	1.471	0.000	12.500	0.000	1.471	0.000	11.294	0.000	1.471	0.000	11.588	0.000
2030	2030	1.449	0.000	11.111	0.000	1.449	0.000	10.148	0.000	1.449	0.000	10.385	0.000
2031	2031	9.286	0.000	9.286	0.000	9.286	0.000	9.286	0.000	9.286	0.000	9.286	0.000
2032	2032	8.497	0.000	8.497	0.000	8.497	0.000	8.497	0.000	8.497	0.000	8.497	0.000
2033	2033	7.831	0.000	7.831	0.000	7.831	0.000	7.831	0.000	7.831	0.000	7.831	0.000
2034	2034	7.263	0.000	7.263	0.000	7.263	0.000	7.263	0.000	7.263	0.000	7.263	0.000
2035	2035	6.771	0.000	6.771	0.000	6.771	0.000	6.771	0.000	6.771	0.000	6.771	0.000
2036	2036	6.341	0.000	6.341	0.000	6.341	0.000	6.341	0.000	6.341	0.000	6.341	0.000
2037	2037	5.963	0.000	5.963	0.000	5.963	0.000	5.963	0.000	5.963	0.000	5.963	0.000
2038	2038	5.628	0.000	5.628	0.000	5.628	0.000	5.628	0.000	5.628	0.000	5.628	0.000
2039	2039	5.328	0.000	5.328	0.000	5.328	0.000	5.328	0.000	5.328	0.000	5.328	0.000
2040	2040	5.058	0.000	5.058	0.000	5.058	0.000	5.058	0.000	5.058	0.000	5.058	0.000
2041	2041	4.815	0.000	4.815	0.000	4.815	0.000	4.815	0.000	4.815	0.000	4.815	0.000
2042	2042	4.594	0.000	4.594	0.000	4.594	0.000	4.594	0.000	4.594	0.000	4.594	0.000
2043	2043	4.392	0.000	4.392	0.000	4.392	0.000	4.392	0.000	4.392	0.000	4.392	0.000
2044	2044	4.207	0.000	4.207	0.000	4.207	0.000	4.207	0.000	4.207	0.000	4.207	0.000
2045	2045	4.037	0.000	4.037	0.000	4.037	0.000	4.037	0.000	4.037	0.000	4.037	0.000
2046	2046	3.881	0.000	3.881	0.000	3.881	0.000	3.881	0.000	3.881	0.000	3.881	0.000
2047	2047	3.736	0.000	3.736	0.000	3.736	0.000	3.736	0.000	3.736	0.000	3.736	0.000
2048	2048	3.601	0.000	3.601	0.000	3.601	0.000	3.601	0.000	3.601	0.000	3.601	0.000
2049	2049	3.476	0.000	3.476	0.000	3.476	0.000	3.476	0.000	3.476	0.000	3.476	0.000
2050	2050	3.359	0.000	3.359	0.000	3.359	0.000	3.359	0.000	3.359	0.000	3.359	0.000
2051	2051	2.501	0.000	2.501	0.000	3.882	0.000	3.882	0.000	3.536	0.000	3.536	0.000
2052	2052	2.265	0.000	2.265	0.000	3.652	0.000	3.652	0.000	3.309	0.000	3.309	0.000
2053	2053	2.165	0.000	2.165	0.000	3.560	0.000	3.560	0.000	3.218	0.000	3.218	0.000
2054	2054	2.056	0.000	2.056	0.000	3.460	0.000	3.460	0.000	3.119	0.000	3.119	0.000
2055	2055	1.856	0.000	1.856	0.000	3.267	0.000	3.267	0.000	2.928	0.000	2.928	0.000
2056	2056	1.779	0.000	1.779	0.000	3.199	0.000	3.199	0.000	2.862	0.000	2.862	0.000
2057	2057	1.589	0.000	1.589	0.000	3.017	0.000	3.017	0.000	2.681	0.000	2.681	0.000
2058	2058	1.446	0.000	1.446	0.000	2.883	0.000	2.883	0.000	2.549	0.000	2.549	0.000
2059	2059	1.330	0.000	1.330	0.000	2.777	0.000	2.777	0.000	2.444	0.000	2.444	0.000
2060	2060	1.201	0.000	1.201	0.000	2.657	0.000	2.657	0.000	2.326	0.000	2.326	0.000
2061	2061	0.673	0.000	0.673	0.000	2.132	0.000	2.132	0.000	1.804	0.000	1.804	0.000
2062	2062	0.618	0.000	0.618	0.000	2.088	0.000	2.088	0.000	1.761	0.000	1.761	0.000
2063	2063	0.401	0.000	0.401	0.000	1.881	0.000	1.881	0.000	1.555	0.000	1.555	0.000
2064	2064	0.283	0.000	0.283	0.000	1.774	0.000	1.774	0.000	1.449	0.000	1.449	0.000
2065	2065	0.079	0.000	0.079	0.000	1.579	0.000	1.579	0.000	1.257	0.000	1.257	0.000
2066	2066	0.033	0.000	0.033	0.000	1.545	0.000	1.545	0.000	1.224	0.000	1.224	0.000
2067	2067	-0.193	0.000	-0.193	0.000	1.329	0.000	1.329	0.000	1.009	0.000	1.009	0.000
2068	2068	-0.302	0.000	-0.302	0.000	1.232	0.000	1.232	0.000	0.914	0.000	0.914	0.000
2069	2069	-0.461	0.000	-0.461	0.000	1.085	0.000	1.085	0.000	0.768	0.000	0.768	0.000
2070	2070	-0.585	0.000	-0.585	0.000	0.973	0.000	0.973	0.000	0.657	0.000	0.657	0.000
2071	2071	-0.609	0.000	-0.609	0.000	0.963	0.000	0.963	0.000	0.649	0.000	0.649	0.000
2072	2072	-0.738	0.000	-0.738	0.000	0.847	0.000	0.847	0.000	0.534	0.000	0.534	0.000
2073	2073	-0.837	0.000	-0.837	0.000	0.763	0.000	0.763	0.000	0.451	0.000	0.451	0.000
2074	2074	-1.033	0.000	-1.033	0.000	0.580	0.000	0.580	0.000	0.269	0.000	0.269	0.000
2075	2075	-1.037	0.000	-1.037	0.000	0.592	0.000	0.592	0.000	0.282	0.000	0.282	0.000
2076	2076	-1.310	0.000	-1.310	0.000	0.332	0.000	0.332	0.000	0.024	0.000	0.024	0.000
2077	2077	-1.316	0.000	-1.316	0.000	0.343	0.000	0.343	0.000	0.036	0.000	0.036	0.000
2078	2078	-1.493	0.000	-1.493	0.000	0.181	0.000	0.181	0.000	-0.125	0.000	-0.125	0.000
2079	2079	-1.571	0.000	-1.571	0.000	0.120	0.000	0.120	0.000	-0.185	0.000	-0.185	0.000
2080	2080	-1.769	0.000	-1.769	0.000	-0.063	0.000	-0.063	0.000	-0.365	0.000	-0.365	0.000
2081	2081	-1.478	0.000	-1.478	0.000	0.252	0.000	0.252	0.000	-0.051	0.000	-0.051	0.000
2082	2082	-1.672	0.000	-1.672	0.000	0.075	0.000	0.075	0.000	-0.226	0.000	-0.226	0.000
2083	2083	-1.769	0.000	-1.769	0.000	-0.002	0.000	-0.002	0.000	-0.303	0.000	-0.303	0.000
2084	2084	-1.854	0.000	-1.854	0.000	-0.068	0.000	-0.068	0.000	-0.367	0.000	-0.367	0.000
2085	2085	-1.834	0.000	-1.834	0.000	-0.026	0.000	-0.026	0.000	-0.324	0.000	-0.324	0.000
2086	2086	-2.050	0.000	-2.050	0.000	-0.222	0.000	-0.222	0.000	-0.519	0.000	-0.519	0.000
2087	2087	-2.154	0.000	-2.154	0.000	-0.305	0.000	-0.305	0.000	-0.601	0.000	-0.601	0.000
2088	2088	-2.198	0.000	-2.198	0.000	-0.326	0.000	-0.326	0.000	-0.621	0.000	-0.621	0.000
2089	2089	-2.321	0.000	-2.321	0.000	-0.426	0.000	-0.426	0.000	-0.720	0.000	-0.720	0.000
2090	2090	-2.359	0.000	-2.359	0.000	-0.439	0.000	-0.439	0.000	-0.732	0.000	-0.732	0.000
2091	2091	-2.279	0.000	-2.279	0.000	-0.331	0.000	-0.331	0.000	-0.623	0.000	-0.623	0.000

```
2092  2092   -2.328   0.000   -2.328   0.000   -0.353   0.000   -0.353   0.000   -0.644   0.000   -0.644   0.000
2093  2093   -2.521   0.000   -2.521   0.000   -0.520   0.000   -0.520   0.000   -0.810   0.000   -0.810   0.000
2094  2094   -2.577   0.000   -2.577   0.000   -0.548   0.000   -0.548   0.000   -0.837   0.000   -0.837   0.000
2095  2095   -2.649   0.000   -2.649   0.000   -0.591   0.000   -0.591   0.000   -0.879   0.000   -0.879   0.000
2096  2096   -2.712   0.000   -2.712   0.000   -0.623   0.000   -0.623   0.000   -0.910   0.000   -0.910   0.000
2097  2097   -2.715   0.000   -2.715   0.000   -0.593   0.000   -0.593   0.000   -0.880   0.000   -0.880   0.000
2098  2098   -2.915   0.000   -2.915   0.000   -0.763   0.000   -0.763   0.000   -1.048   0.000   -1.048   0.000
2099  2099   -2.865   0.000   -2.865   0.000   -0.676   0.000   -0.676   0.000   -0.960   0.000   -0.960   0.000
2100  2100   -3.011   0.000   -3.011   0.000   -0.788   0.000   -0.788   0.000   -1.071   0.000   -1.071   0.000

FLEET
** Source: TAG Data Book - Table A 1.3.9
** For 2010 base year proportions
*Veh_type  %Petrol    %Diesel    %Electric
 1     59.9925    40.0026     0.0049
 2      3.6784    96.3156     0.0060
 3      3.6784    96.3156     0.0060
 4      0.0000   100.0000     0.0000
 5      0.0000   100.0000     0.0000
 6      0.0000   100.0000     0.0000
 7      0.0000   100.0000     0.0000
 8      0.0000   100.0000     0.0000

FLEET_CHANGES
** Source: TAG Data Book - Table A 1.3.9 (derived)
** %change per annum from 2010 base year
*Start_yr   End_yr   Veh_type  %Change_Petrol   %Change_Diesel   %Change_Electric
2011       2011     1       -3.7470        5.6289       0.0000
2012       2012     1       -3.7464        5.0987     177.5510
2013       2013     1       -3.9746        4.9486      85.2941
2014       2014     1       -3.6966        4.1406     170.6349
2015       2015     1       -3.2610        3.2940     113.0499
2016       2016     1       -3.8166        3.3901     136.3386
2017       2017     1       -3.0168        2.5925      28.7420
2018       2018     1       -1.9343        1.4421      29.4730
2019       2019     1       -1.0551        0.5626      30.8176
2020       2020     1       -0.2827       -0.1206      25.7212
2021       2021     1       -0.2099       -0.3483      30.0510
2022       2022     1       -0.2068       -0.5589      32.2143
2023       2023     1       -0.1575       -0.7308      28.5908
2024       2024     1       -0.0740       -1.0150      27.5715
2025       2025     1       -0.1700       -1.4663      31.9952
2026       2026     1       -0.1119       -1.6206      25.4551
2027       2027     1       -0.1050       -1.7119      20.9724
2028       2028     1       -0.1673       -1.7158      17.6091
2029       2029     1       -0.2797       -1.6978      15.3930
2030       2030     1       -0.3868       -1.6102      13.1997
2031       2031     1       -0.4820       -1.5972      11.9371
2032       2032     1       -0.5638       -1.5595      10.7177
2033       2033     1       -0.6500       -1.5213       9.7493
2034       2034     1       -0.7254       -1.5008       8.9813
2035       2035     1       -0.7716       -1.4842       8.2395

2011       2011     2      -11.0966        0.4238     100.0000
2012       2012     2       -9.4086        0.3181      99.1667
2013       2013     2      -12.2827        0.3397      43.5146
2014       2014     2       -9.8699        0.2290      97.6676
2015       2015     2       -7.8086        0.1521      50.8850
2016       2016     2      -11.5125        0.1855      65.7869
2017       2017     2      -10.2523        0.1011      57.1344
2018       2018     2       -9.2892        0.1976     -12.9081
2019       2019     2       -7.9519        0.1382      -5.1702
2020       2020     2       -6.5228        0.0851       4.4071
2021       2021     2       -5.2895        0.0241      20.4526
2022       2022     2       -4.0230       -0.0850      48.6994
```

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2023        2023    2       -3.9040         -0.1944         58.0175
2024        2024    2       -3.0790         -0.3757         62.2386
2025        2025    2       -3.4592         -0.6657         65.4189
2026        2026    2       -3.4461         -0.6389         37.7256
2027        2027    2       -20.0606         -0.5519         30.9817
2028        2028    2       -0.9119         -0.8176         25.1683
2029        2029    2       -1.0518         -0.9329         22.7641
2030        2030    2       -1.3528         -1.0726         21.1429
2031        2031    2       -1.3959         -1.0577         17.0349
2032        2032    2       -1.4529         -1.0780         14.6822
2033        2033    2       -1.5121         -1.0926         12.8368
2034        2034    2       -1.5225         -1.1305         11.6389
2035        2035    2       -1.5071         -1.1423         10.4114

2011        2011    3       -11.0966          0.4238         100.0000
2012        2012    3       -9.4086          0.3181         99.1667
2013        2013    3       -12.2827          0.3397          43.5146
2014        2014    3       -9.8699          0.2290         97.6676
2015        2015    3       -7.8086          0.1521         50.8850
2016        2016    3       -11.5125          0.1855          65.7869
2017        2017    3       -10.2523          0.1011          57.1344
2018        2018    3       -9.2892          0.1976         -12.9081
2019        2019    3       -7.9519          0.1382         -5.1702
2020        2020    3       -6.5228          0.0851          4.4071
2021        2021    3       -5.2895          0.0241         20.4526
2022        2022    3       -4.0230         -0.0850         48.6994
2023        2023    3       -3.9040         -0.1944         58.0175
2024        2024    3       -3.0790         -0.3757         62.2386
2025        2025    3       -3.4592         -0.6657         65.4189
2026        2026    3       -3.4461         -0.6389         37.7256
2027        2027    3       -20.0606         -0.5519         30.9817
2028        2028    3       -0.9119         -0.8176         25.1683
2029        2029    3       -1.0518         -0.9329         22.7641
2030        2030    3       -1.3528         -1.0726         21.1429
2031        2031    3       -1.3959         -1.0577         17.0349
2032        2032    3       -1.4529         -1.0780         14.6822
2033        2033    3       -1.5121         -1.0926         12.8368
2034        2034    3       -1.5225         -1.1305         11.6389
2035        2035    3       -1.5071         -1.1423         10.4114


FUEL_CONSUMPTION
** Source: TAG Data Book - Table A 1.3.8
** For 2010 base year
** Fuel consumption (l/km) = (a_fuel+b_fuel*V+c_fuel*V^2+d_fuel*v^3)/v where v is speed in km/h
*Veh_type  Fuel_type     a_Fuel      b_Fuel       c_Fuel        d_Fuel     Cut-off_speed(km/h)
  1          1        1.180114976  0.046394755 -8.58040E-05   2.58210E-06      120
  1          2        0.518874946  0.065559191 -6.23082E-04   4.89930E-06      120
  1          3        0.000000000  0.150770834  0.00000E+00   0.00000E+00      120
  2          1        2.056786303  0.036403260  7.16790E-05   3.91670E-06      120
  2          2        1.472750964  0.035295623 -2.42468E-04   8.08990E-06      120
  2          3        0.000000000  0.337725402  0.00000E+00   0.00000E+00      120
  3          1        2.056786303  0.036403260  7.16790E-05   3.91670E-06      120
  3          2        1.472750964  0.035295623 -2.42468E-04   8.08990E-06      120
  3          3        0.000000000  0.337725402  0.00000E+00   0.00000E+00      120
  4          2        1.911365681  0.344532728 -5.21655E-03   4.48971E-05       90
  5          2        3.050431814  0.636257248 -9.10602E-03   6.86386E-05       90
  6          2        6.304843405  0.258599871 -3.23145E-03   3.22775E-05       75

FUEL_EFFICIENCY
** Source: TAG Data Book - Table A 1.3.10
** %change per annum from 2010 base year
*Start_yr    End_yr    Veh_type  Fuel_type       Change
2011        2011          1        1          0.556
2011        2011          1        2          0.939
```

2011	2011	1	3	0.000
2011	2011	2	1	-0.230
2011	2011	2	2	0.270
2011	2011	2	3	0.201
2011	2011	3	1	0.000
2011	2011	3	2	0.000
2011	2011	3	3	0.000
2012	2012	1	1	0.638
2012	2012	1	2	1.054
2012	2012	1	3	1.776
2012	2012	2	1	-0.336
2012	2012	2	2	0.368
2012	2012	2	3	0.203
2012	2012	3	1	0.000
2012	2012	3	2	0.000
2012	2012	3	3	0.000
2013	2013	1	1	1.034
2013	2013	1	2	1.087
2013	2013	1	3	1.747
2013	2013	2	1	-0.193
2013	2013	2	2	0.123
2013	2013	2	3	0.205
2013	2013	3	1	0.000
2013	2013	3	2	0.000
2013	2013	3	3	0.000
2014	2014	1	1	1.263
2014	2014	1	2	1.277
2014	2014	1	3	1.720
2014	2014	2	1	-0.205
2014	2014	2	2	0.102
2014	2014	2	3	0.207
2014	2014	3	1	0.000
2014	2014	3	2	0.000
2014	2014	3	3	0.000
2015	2015	1	1	1.571
2015	2015	1	2	1.686
2015	2015	1	3	1.696
2015	2015	2	1	-0.158
2015	2015	2	2	0.340
2015	2015	2	3	0.207
2015	2015	3	1	0.000
2015	2015	3	2	0.000
2015	2015	3	3	0.000
2016	2016	1	1	1.886
2016	2016	1	2	1.601
2016	2016	1	3	1.169
2016	2016	2	1	0.157
2016	2016	2	2	0.238
2016	2016	2	3	0.208
2016	2016	3	1	0.000
2016	2016	3	2	0.000
2016	2016	3	3	0.000
2017	2017	1	1	1.715
2017	2017	1	2	1.496
2017	2017	1	3	1.169
2017	2017	2	1	-0.016
2017	2017	2	2	0.084
2017	2017	2	3	0.208
2017	2017	3	1	0.000
2017	2017	3	2	0.000
2017	2017	3	3	0.000
2018	2018	1	1	1.829
2018	2018	1	2	1.391
2018	2018	1	3	1.169
2018	2018	2	1	0.302

2018	2018	2	2	0.061
2018	2018	2	3	0.208
2018	2018	3	1	0.000
2018	2018	3	2	0.000
2018	2018	3	3	0.000
2019	2019	1	1	2.469
2019	2019	1	2	1.862
2019	2019	1	3	1.171
2019	2019	2	1	0.461
2019	2019	2	2	0.400
2019	2019	2	3	0.207
2019	2019	3	1	0.000
2019	2019	3	2	0.000
2019	2019	3	3	0.000
2020	2020	1	1	2.101
2020	2020	1	2	1.355
2020	2020	1	3	1.177
2020	2020	2	1	0.859
2020	2020	2	2	1.330
2020	2020	2	3	0.206
2020	2020	3	1	0.000
2020	2020	3	2	0.000
2020	2020	3	3	0.000
2021	2021	1	1	2.589
2021	2021	1	2	1.521
2021	2021	1	3	1.136
2021	2021	2	1	1.337
2021	2021	2	2	1.387
2021	2021	2	3	3.053
2021	2021	3	1	0.000
2021	2021	3	2	0.000
2021	2021	3	3	0.000
2022	2022	1	1	2.664
2022	2022	1	2	1.625
2022	2022	1	3	1.097
2022	2022	2	1	1.296
2022	2022	2	2	1.295
2022	2022	2	3	2.808
2022	2022	3	1	0.000
2022	2022	3	2	0.000
2022	2022	3	3	0.000
2023	2023	1	1	2.274
2023	2023	1	2	1.288
2023	2023	1	3	1.073
2023	2023	2	1	1.439
2023	2023	2	2	1.201
2023	2023	2	3	2.595
2023	2023	3	1	0.000
2023	2023	3	2	0.000
2023	2023	3	3	0.000
2024	2024	1	1	2.133
2024	2024	1	2	1.223
2024	2024	1	3	1.056
2024	2024	2	1	1.345
2024	2024	2	2	1.126
2024	2024	2	3	2.407
2024	2024	3	1	0.000
2024	2024	3	2	0.000
2024	2024	3	3	0.000
2025	2025	1	1	2.280
2025	2025	1	2	1.465
2025	2025	1	3	1.043
2025	2025	2	1	1.519
2025	2025	2	2	1.055
2025	2025	2	3	2.240

2025	2025	3	1	0.000
2025	2025	3	2	0.000
2025	2025	3	3	0.000
2026	2026	1	1	1.670
2026	2026	1	2	0.961
2026	2026	1	3	1.283
2026	2026	2	1	1.717
2026	2026	2	2	1.008
2026	2026	2	3	0.000
2026	2026	3	1	0.000
2026	2026	3	2	0.000
2026	2026	3	3	0.000
2027	2027	1	1	1.432
2027	2027	1	2	0.814
2027	2027	1	3	1.264
2027	2027	2	1	1.724
2027	2027	2	2	0.955
2027	2027	2	3	0.000
2027	2027	3	1	0.000
2027	2027	3	2	0.000
2027	2027	3	3	0.000
2028	2028	1	1	1.584
2028	2028	1	2	1.048
2028	2028	1	3	1.251
2028	2028	2	1	1.708
2028	2028	2	2	0.893
2028	2028	2	3	0.000
2028	2028	3	1	0.000
2028	2028	3	2	0.000
2028	2028	3	3	0.000
2029	2029	1	1	1.013
2029	2029	1	2	0.551
2029	2029	1	3	1.242
2029	2029	2	1	1.664
2029	2029	2	2	0.814
2029	2029	2	3	0.000
2029	2029	3	1	0.000
2029	2029	3	2	0.000
2029	2029	3	3	0.000
2030	2030	1	1	0.829
2030	2030	1	2	0.441
2030	2030	1	3	1.235
2030	2030	2	1	1.593
2030	2030	2	2	0.713
2030	2030	2	3	0.000
2030	2030	3	1	0.000
2030	2030	3	2	0.000
2030	2030	3	3	0.000
2031	2031	1	1	1.053
2031	2031	1	2	0.732
2031	2031	1	3	0.000
2031	2031	2	1	1.518
2031	2031	2	2	0.596
2031	2031	2	3	0.000
2031	2031	3	1	0.000
2031	2031	3	2	0.000
2031	2031	3	3	0.000
2032	2032	1	1	0.506
2032	2032	1	2	0.251
2032	2032	1	3	0.000
2032	2032	2	1	1.429
2032	2032	2	2	0.472
2032	2032	2	3	0.000
2032	2032	3	1	0.000
2032	2032	3	2	0.000

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2032       2032        3       3        0.000
2033       2033        1       1        0.359
2033       2033        1       2        0.165
2033       2033        1       3        0.000
2033       2033        2       1        1.336
2033       2033        2       2        0.357
2033       2033        2       3        0.000
2033       2033        3       1        0.000
2033       2033        3       2        0.000
2033       2033        3       3        0.000
2034       2034        1       1        0.628
2034       2034        1       2        0.487
2034       2034        1       3        0.000
2034       2034        2       1        1.243
2034       2034        2       2        0.261
2034       2034        2       3        0.000
2034       2034        3       1        0.000
2034       2034        3       2        0.000
2034       2034        3       3        0.000
2035       2035        1       1        0.120
2035       2035        1       2        0.019
2035       2035        1       3        0.000
2035       2035        2       1        1.161
2035       2035        2       2        0.190
2035       2035        2       3        0.000
2035       2035        3       1        0.000
2035       2035        3       2        0.000
2035       2035        3       3        0.000
2036       2100        1       1        0.000
2036       2100        1       2        0.000
2036       2100        1       3        0.000
2036       2100        2       1        0.000
2036       2100        2       2        0.000
2036       2100        2       3        0.000
2036       2100        3       1        0.000
2036       2100        3       2        0.000
2036       2100        3       3        0.000

NON_FUEL_VOC
** Source: TAG Data Book - Table A 1.3.14
** For 2010 base year
*Veh_type Fuel_type a_Nonfuel_wrk  b_Nonfuel_wrk  a_Nonfuel_nw   b_Nonfuel_nw
     1     1      4.966     135.946       3.846       0.000
     1     2      4.966     135.946       3.846       0.000
     1     3      1.157     135.946       1.157       0.000
     2     1      7.213      47.113       7.213       0.000
     2     2      7.213      47.113       7.213       0.000
     2     3      2.170      47.113       2.170       0.000
     3     1      7.213      47.113       7.213       0.000
     3     2      7.213      47.113       7.213       0.000
     3     3      2.170      47.113       2.170       0.000
     4     2      6.714     263.817       0.000       0.000
     5     2     13.061     508.525       0.000       0.000
     6     2     30.461     694.547       0.000       0.000

NON_FUEL_VOC_CHANGES
** Source: TAG Unit A1.3 para 5.1.17
** Note: Table A 1.3.15 shows changes by average car (taking into account changes in FLEET mix)
** %change per annum from 2010 base year
*Start_yr    End_yr   Veh_type    Growth
2011         2100       1        0.000
2011         2100       2        0.000
2011         2100       3        0.000
2011         2100       4        0.000
2011         2100       5        0.000
```

```
2011     2100     6     0.000
2011     2100     7     0.000
2011     2100     8     0.000

NON_FUEL_TAX_RATES
** For 2010 base year
** percentage
*Submode   Final   Intermediate
 1      17.5      0.0
 2      17.5      0.0
 3      17.5      0.0
 4      17.5      0.0
 5      17.5      0.0
 6      17.5      0.0
 7       0.0      0.0
 8       0.0      0.0

NON_FUEL_TAX_RATES_CHANGES
** %change per annum from 2010 base year
*Start_yr   End_yr   Submode    Final   Intermediate
2011     2011     1     14.286     0.000
2011     2011     2     14.286     0.000
2011     2011     3     14.286     0.000
2011     2011     4     14.286     0.000
2011     2011     5     14.286     0.000
2011     2011     6     14.286     0.000
2011     2011     7      0.000     0.000
2011     2011     8      0.000     0.000
2012     2100     1      0.000     0.000
2012     2100     2      0.000     0.000
2012     2100     3      0.000     0.000
2012     2100     4      0.000     0.000
2012     2100     5      0.000     0.000
2012     2100     6      0.000     0.000
2012     2100     7      0.000     0.000
2012     2100     8      0.000     0.000

DEFAULT_PURPOSE_SPLIT
** Source: TAG Data Book - Table A 1.3.4
** For 2010 base year
*Vtype/submode  Purpose  Period1  Period2  Period3  Period4  Period5
 1     1     16.5    11.8    16.5    12.9     3.5
 1     2     44.1    41.3    11.8    38.5     7.9
 1     3     39.4    46.9    71.7    48.6    88.6
 2     1      0.0     0.0     0.0     0.0     0.0
 2     2      0.0     0.0     0.0     0.0     0.0
 2     3    100.0   100.0   100.0   100.0   100.0
 3     1    100.0   100.0   100.0   100.0   100.0
 3     2      0.0     0.0     0.0     0.0     0.0
 3     3      0.0     0.0     0.0     0.0     0.0
 4     1    100.0   100.0   100.0   100.0   100.0
 4     2      0.0     0.0     0.0     0.0     0.0
 4     3      0.0     0.0     0.0     0.0     0.0
 5     1    100.0   100.0   100.0   100.0   100.0
 5     2      0.0     0.0     0.0     0.0     0.0
 5     3      0.0     0.0     0.0     0.0     0.0
 6     1      1.4     2.3     1.7     2.3     0.5
 6     2     18.4    25.9     6.5    35.4     6.1
 6     3     80.2    71.8    91.8    62.3    93.4
 7     1      4.5     5.2     3.2     2.5     0.7
 7     2     50.1    45.9    10.7    54.7     7.6
 7     3     45.4    48.9    86.1    42.8    91.7
 8     1     17.1    15.7    15.8    17.7     1.8
 8     2     31.2    38.1     5.5    38.6     2.8
 8     3     51.7    46.2    78.7    43.7    95.4
```

```
DEFAULT_PERSON_FACTORS
** Source: TAG Data Book - Table A 1.3.3
** For 2010 base year
*Vtype/submode  Purpose  Person_type  FactorPer1    FactorPer2    FactorPer3    FactorPer4    FactorPer5
 1         1      1          1.00          1.00          1.00          1.00          1.00
 1         1      2          0.13          0.15          0.16          0.17          0.31
 1         2      1          1.00          1.00          1.00          1.00          1.00
 1         2      2          0.13          0.14          0.15          0.15          0.21
 1         3      1          1.00          1.00          1.00          1.00          1.00
 1         3      2          0.71          0.79          0.82          0.79          1.12
 2         2      1          1.00          1.00          1.00          1.00          1.00
 2         2      2          0.46          0.46          0.46          0.46          1.03
 2         3      1          1.00          1.00          1.00          1.00          1.00
 2         3      2          0.46          0.46          0.46          0.46          1.03
 3         1      1          1.00          1.00          1.00          1.00          1.00
 3         1      2          0.20          0.20          0.20          0.20          0.26
 4         1      1          1.00          1.00          1.00          1.00          1.00
 5         1      1          1.00          1.00          1.00          1.00          1.00

DEFAULT_PERSON_FACTORS_CHANGE
** Source: TAG Data Book - Table A 1.3.3
** %change per annum from 2010 base year
*Start_yr  End_yr  Submode Purpose Person_type ChangePer1 ChangePer2 ChangePer3 ChangePer4 ChangePer5
2011      2036        1      1      2     0.00      0.00      0.00      0.00      0.00
2011      2036        1      2      2     0.00      0.00      0.00      0.00      0.00
2011      2036        1      3      2     0.00      0.00      0.00      0.00      0.00

PREPARATION&SUPERVISION
** Source: DMRB Volume 13, section 13.1.2.7 The Preparation of Cost Data
** total preparation (by stage & mode) and supervision costs as % of land and construction costs
*Mode  Prep:SI   Prep:PC   Prep:PR   Prep:OP   Prep:WC    Super
 1      12.0      9.0       9.0       6.0       2.0       5.0
 2      12.0      9.0       9.0       6.0       2.0       5.0
             3      12.0      9.0       9.0       6.0       2.0       5.0
```

APPENDIX C - Construction Traffic Management Arrangement and Construction Phasing

Traffic Management at Skippool Junction

Figure C- 1:Phase 1 Skippool Junction

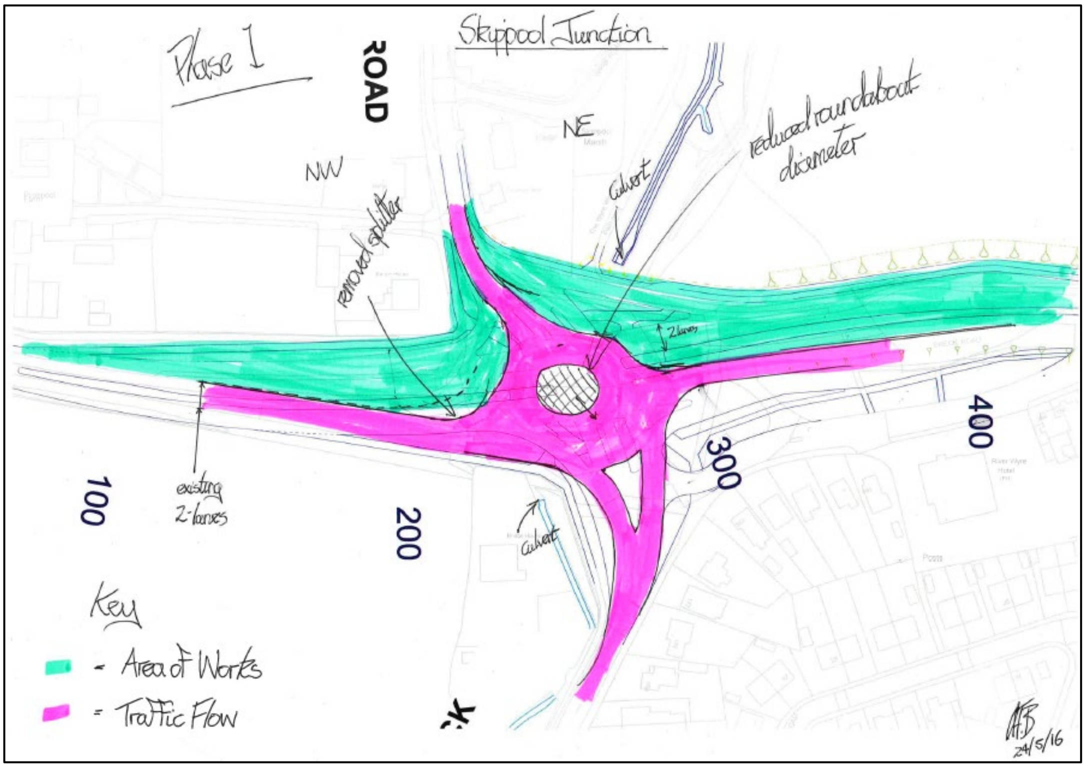


Figure C- 2: Phase 2 Skippool Junction

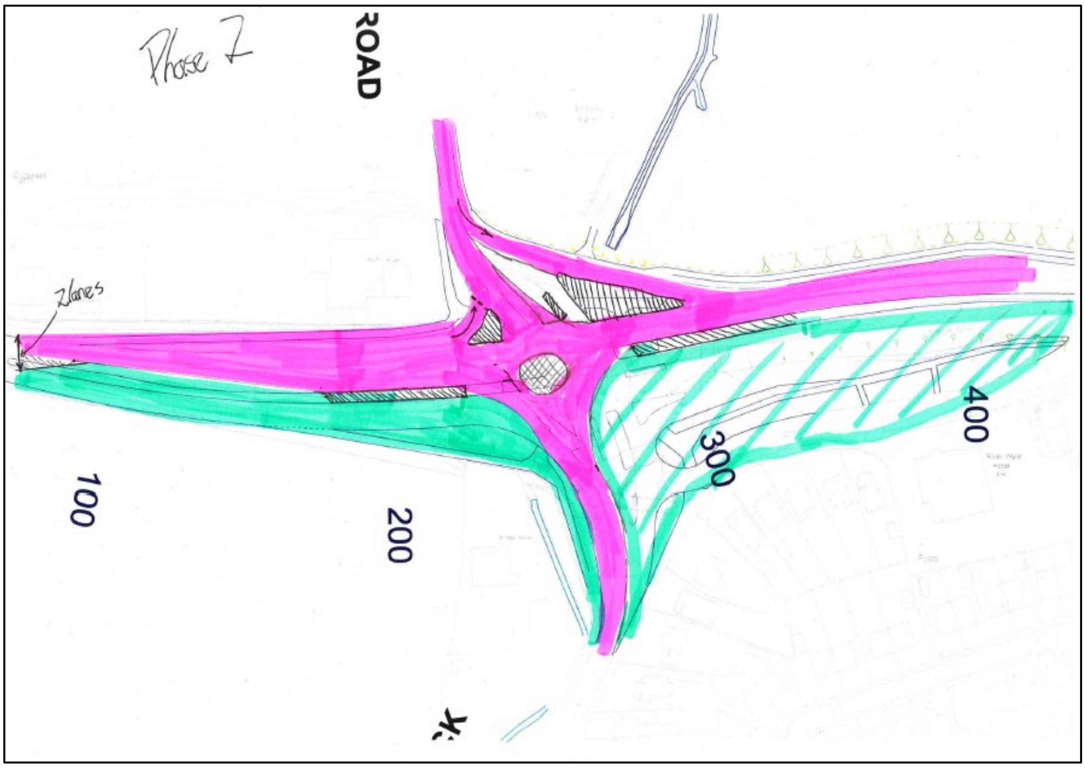


Figure C- 3: Phase 3 Skippool Junction

Traffic Management at Skippool Bridge Junction

Figure C- 4: North Phase Skippool Bridge Junction

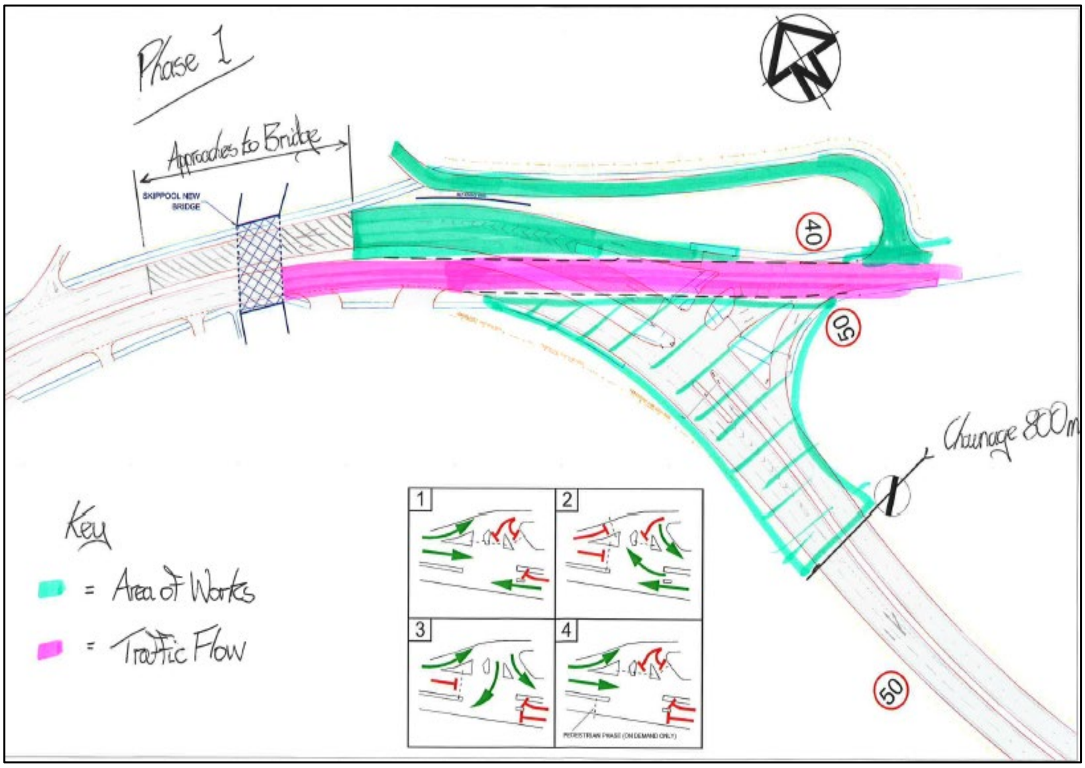
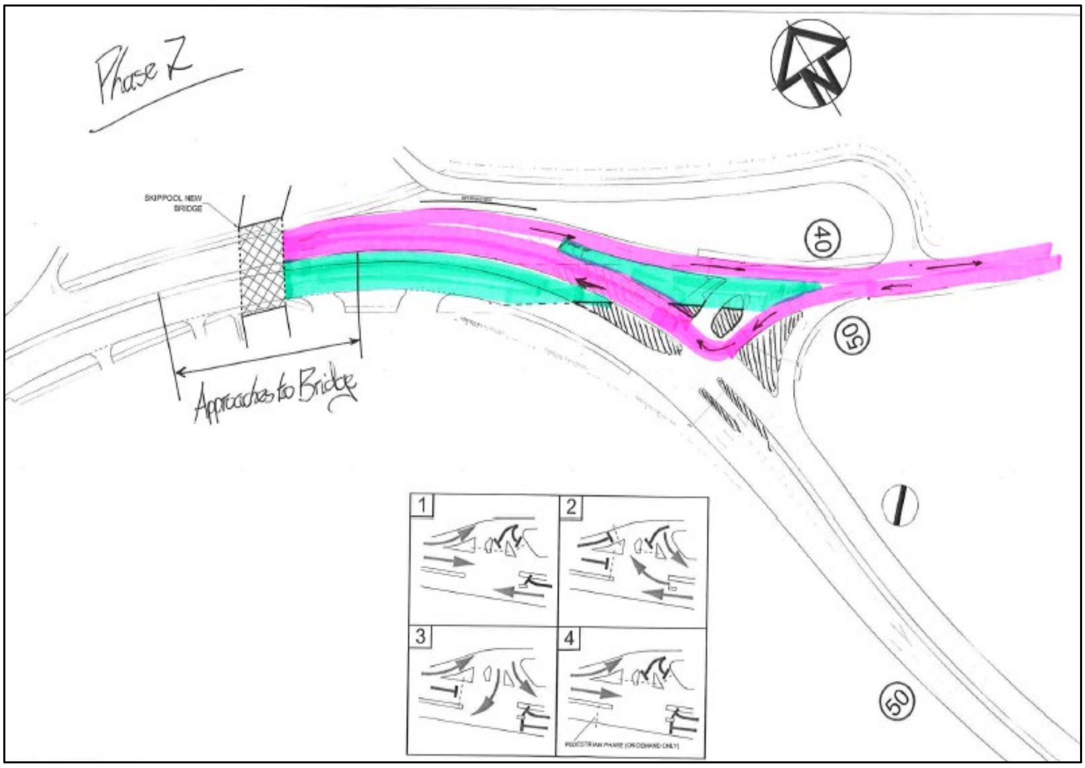


Figure C- 5: South Phase Skippool Bridge Junction



Traffic Management at Poulton Junction

Figure C- 6:Phase-1 Poulton Junction

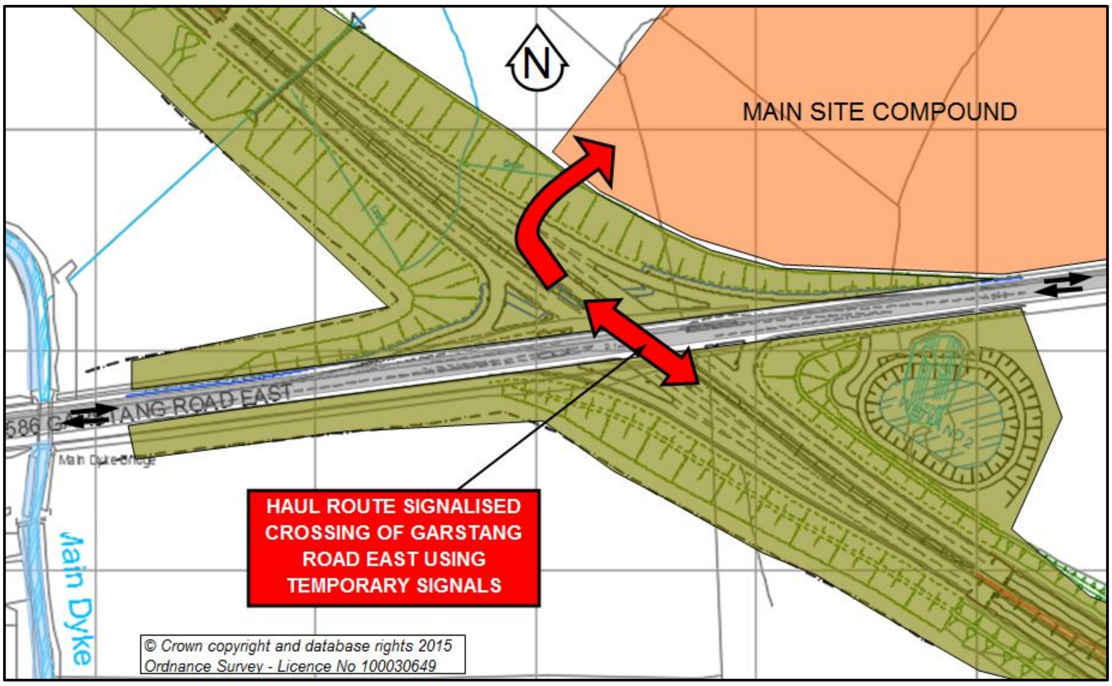


Figure C- 7: Phase 2 Poulton Junction

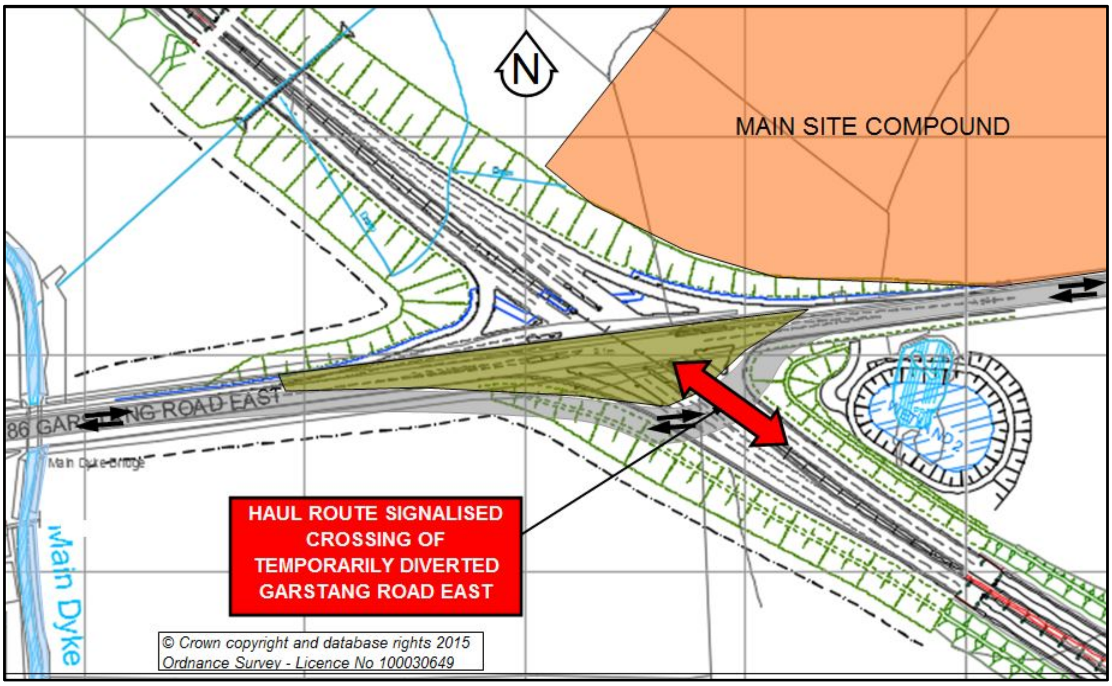
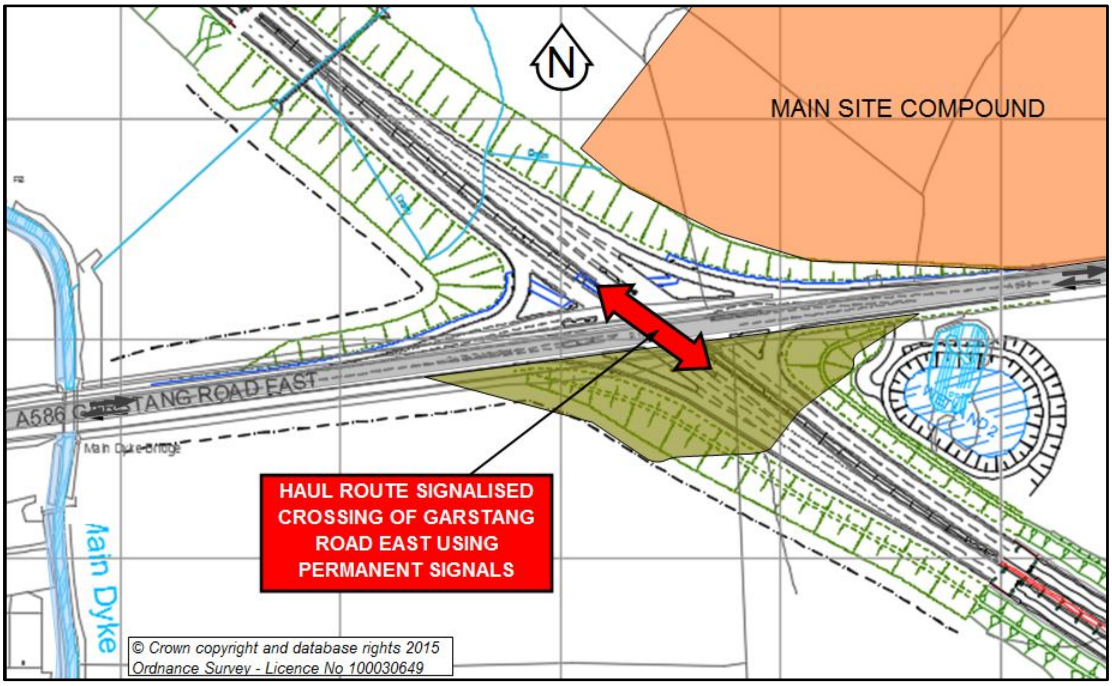


Figure C- 8: Phase 3 Poulton Junction



Traffic Management at Lodge Lane Bridge

Figure C- 9: Phase 1 Lodge Lane Bridge

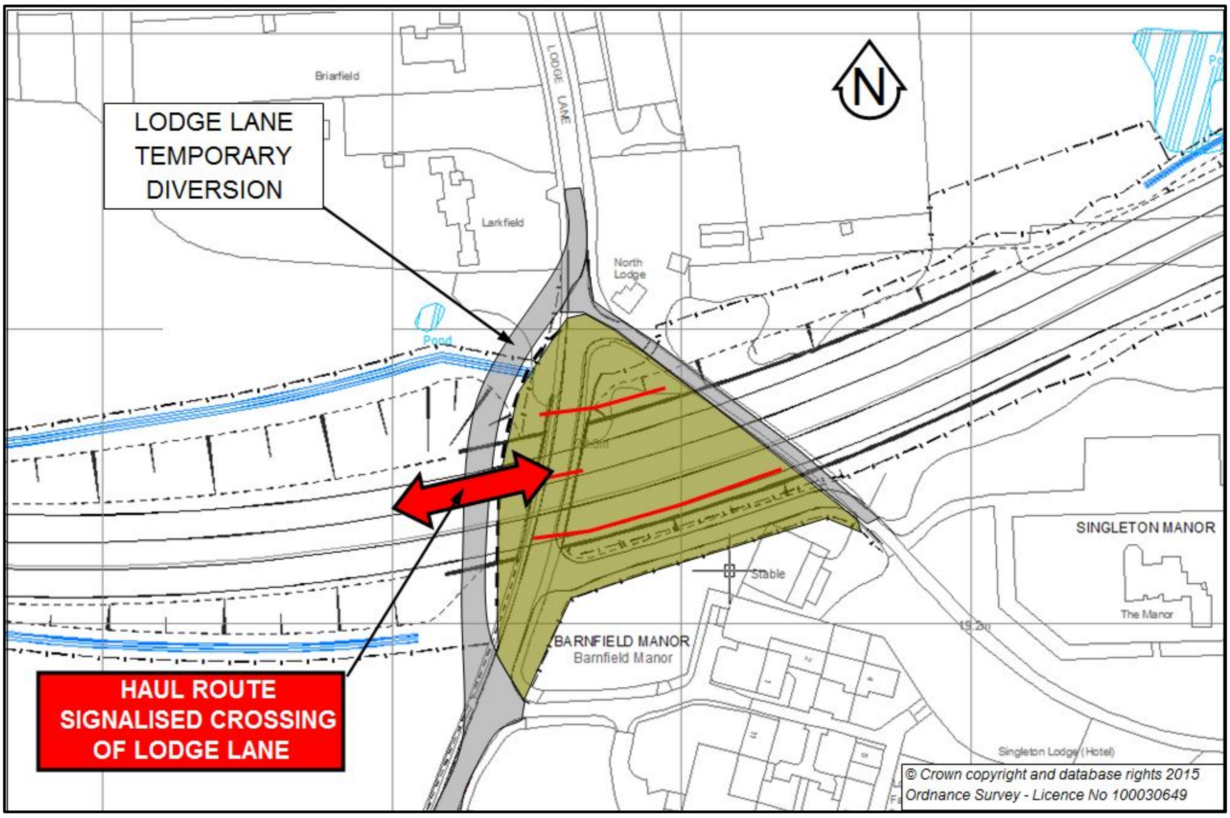


Figure C- 10: Phase 2 Lodge Lane Bridge

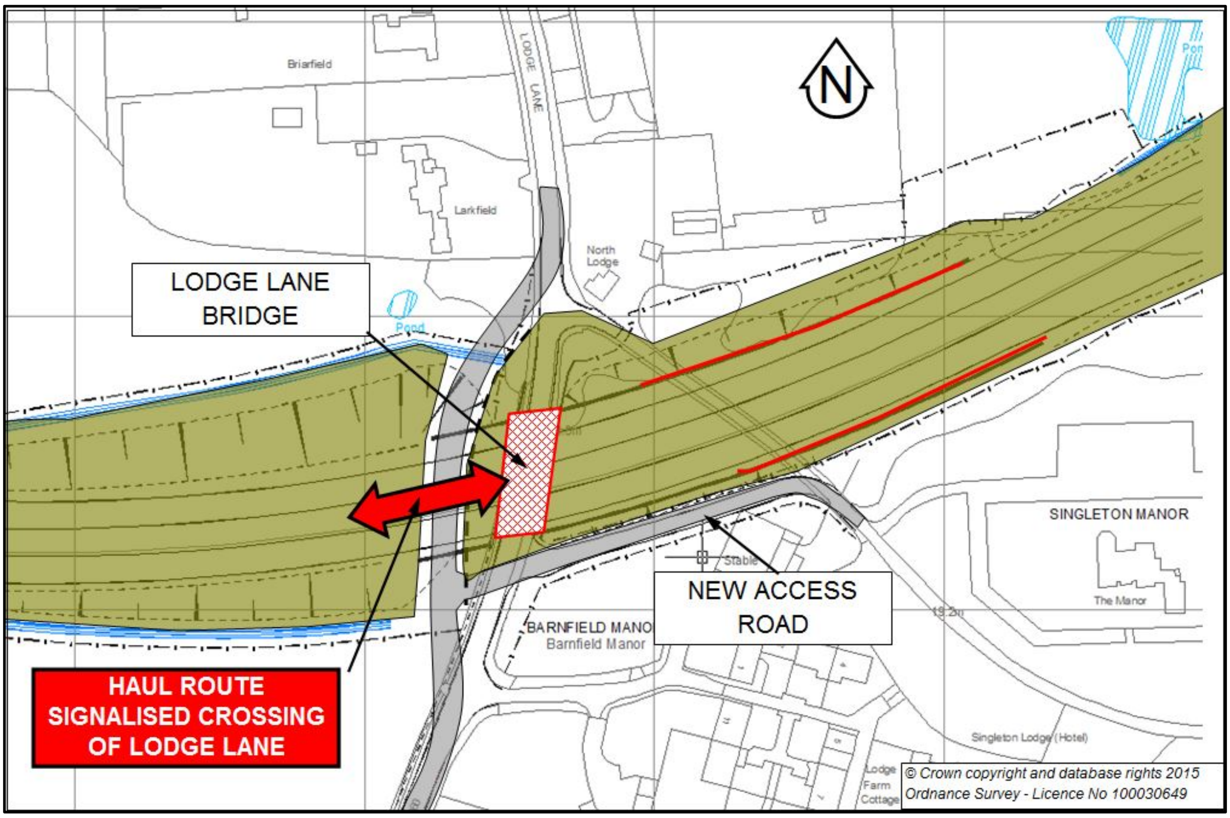
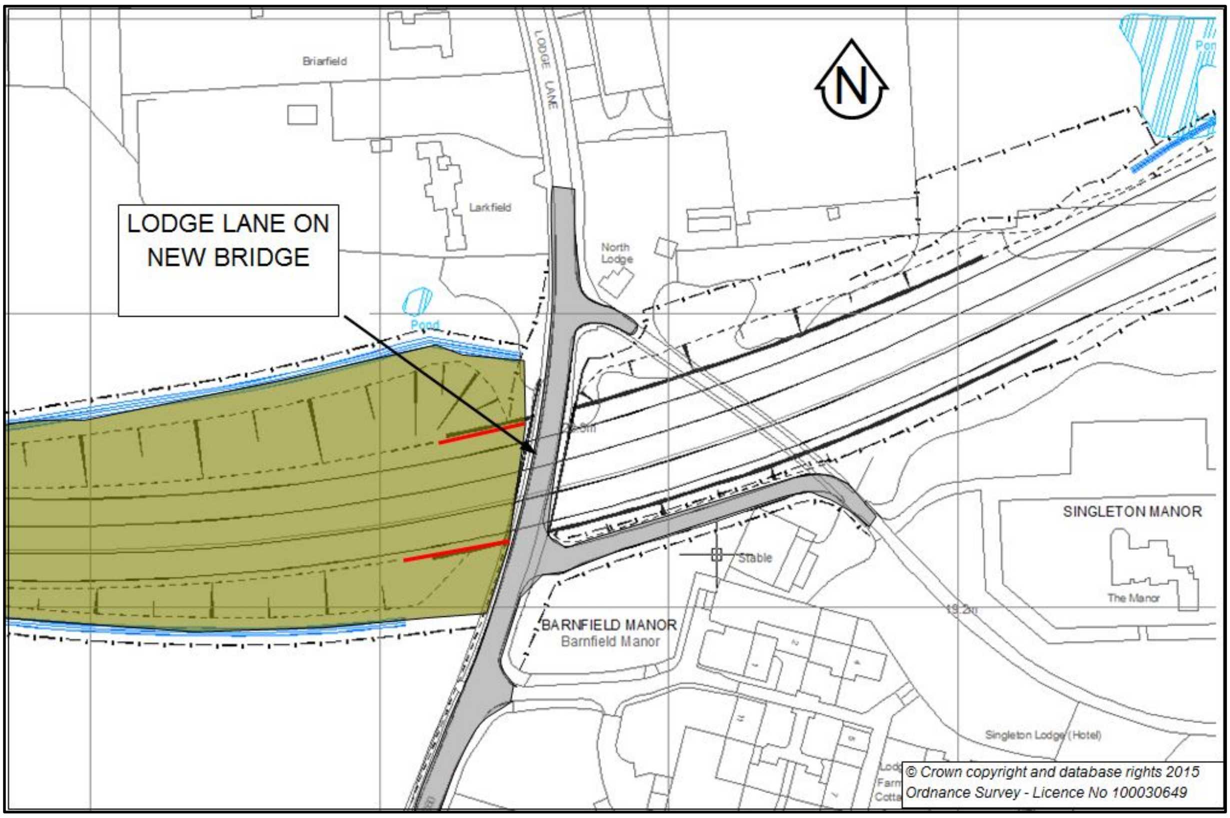


Figure C- 11:Phase 3 Lodge Lane Bridge



Traffic Management at Grange Footbridge to Windy Harbour Junction

Figure C- 12: Phase 1 Grange Footbridge

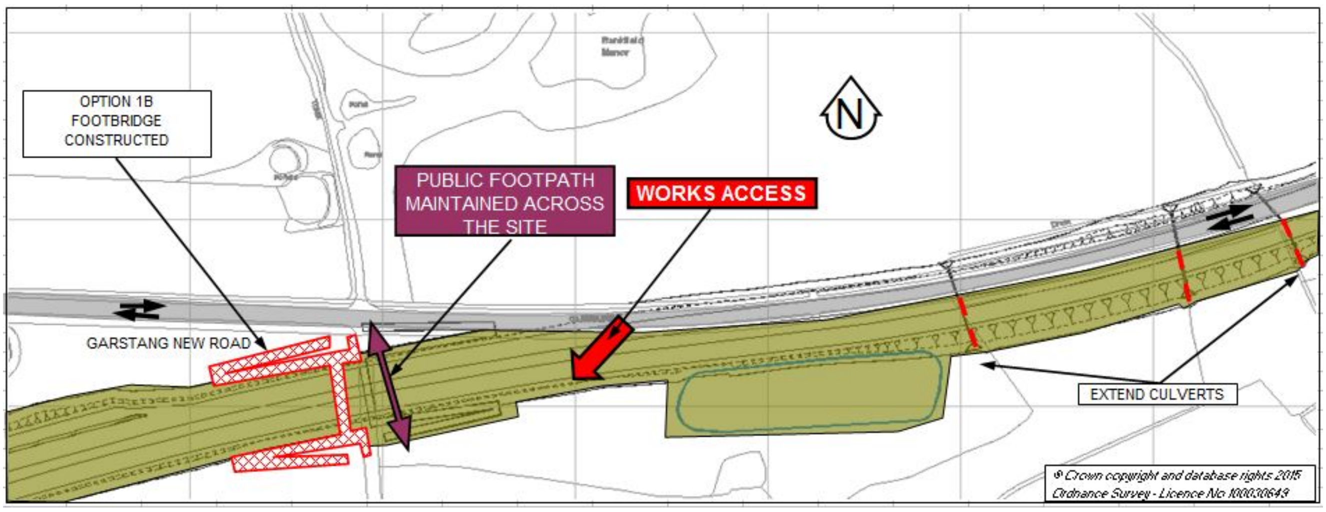


Figure C- 13: Phase 2 Grange Footbridge

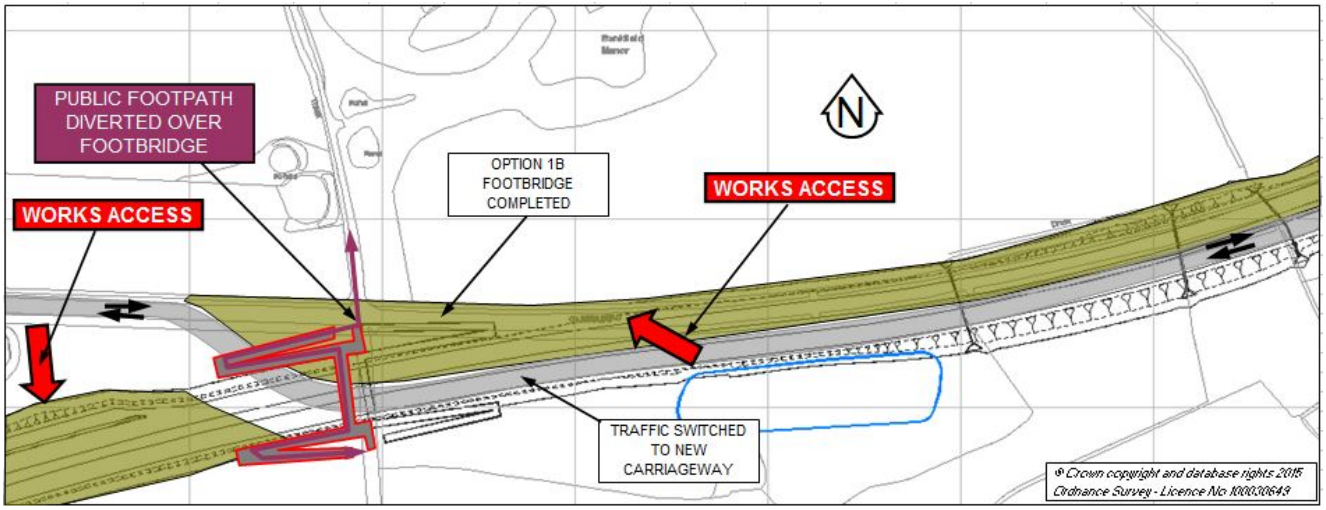
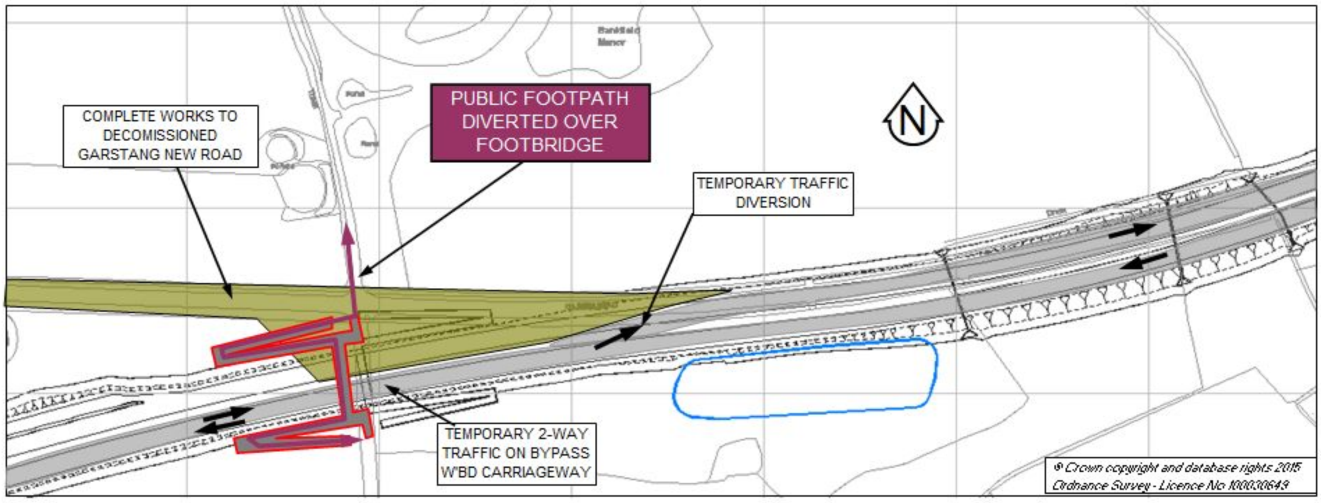


Figure C- 14 Phase 3 Grange Footbridge



Traffic Management Arrangement During Construction

Table C-1: Traffic Management Arrangement During Construction

S. No.	Location	Traffic Management and QUADRO Input
1.	Phase 1- East of Skippool Junction	• Traffic is restricted to a single lane in each direction. • Work site length – 142m • Main route length – 2580m; Approach length – 0 (EB), 2433m (WB) • Maximum speed limit during works – 40mph • Construction duration – 16 weeks for construction with TM in place for 7days/week
2.	Phase 1-North of Skippool Junction	• Traffic is restricted to a single lane in each direction. • Work site length – 72m • Main route length – 1035m; Approach length – 0 (NB), 963m (SB) • Maximum speed limit during works – 40mph • Construction duration – 16 weeks for construction with TM in place for 7days/week
3	Phase 1-West of Skippool Junction	• Traffic is restricted to a single lane in each direction. • Work site length – 140m • Main route length – 2003m; Approach length – 1860 (EB), 0m (WB) • Maximum speed limit during works – 40mph • Construction duration – 16 weeks for construction with TM in place for 7days/week
4	Phase 2- South of Skippool Junction	• Traffic is restricted to a single lane in each direction. • Work site length – 107m • Main route length – 845m; Approach length – 0m(SB), 738m (NB) • Maximum speed limit during works – 40mph • Construction duration – 16 weeks for construction with TM in place for 7days/week
5	Phase 2- West of Skippool Junction	• Traffic is restricted to a single lane in each direction. • Work site length – 140m • Main route length – 2003m; Approach length – 1860 (EB), 0m (WB) • Maximum speed limit during works – 40mph • Construction duration – 16 weeks for construction with TM in place for 7days/week
6	Phase 2- East of Skippool Junction	• Traffic is restricted to a single lane in each direction. • Work site length – 142m • Main route length – 2580m; Approach length – 0 (EB), 2433m (WB) • Maximum speed limit during works – 40mph • Construction duration – 16 weeks for construction with TM in place for 7days/week
7	North Phase- Skippool Bridge Junction	• Traffic is restricted to a single lane in each direction. • Work site length – 239m • Main route length – 2580m; Approach length – 294m(EB), 2050m (WB) • Maximum speed limit during works – 40mph • Construction duration – 21 weeks for construction with TM in place for 7days/week
8	South Phase- Skippool Bridge Junction	• Traffic is restricted to a single lane in each direction. • Work site length – 201m • Main route length – 2580m; Approach length – 294m(EB), 2024m (WB) • Maximum speed limit during works – 40mph • Construction duration – 21 weeks for construction with TM in place for 7days/week

S. No.	Location	Traffic Management and QUADRO Input
9	Phase-1,2 and 3-Poulton Junction	• Traffic management in the form of speed reduction in both the directions. Speed is reduced from 50 mph to 30 mph • Work site length – 200m • Main route length-2339m, Approach length-1445m(EB),691m(WB) • Traffic management duration-30 weeks including all the phases
10	Phase-1 and 2 Lodge lane bridge	• Traffic management in the form of speed reduction in both the directions. Speed is reduced from 40 mph to 30 mph • Work site length- 221m • Main route length-1350m; Approach length- 230m(SB), 899m(NB) • No traffic management during Phase 3 • Traffic management duration- 35 weeks for the two phases
11	Phase-1-Garstang to Windy Harbour	• Speed is reduced from 50 mph to 40 mph • Work site length- 900m • Main route length- 1702m; Approach length-802m(SB), 0m (NB) • Traffic management duration- 22 weeks
12	Phase-2-Garstang to Windy Harbour	• Speed is reduced from 50 mph to 30 mph • Work site length- 900m • Main route length- 1702m; Approach length-802m(SB), 0m (NB) • Traffic management duration- 12 weeks
13	Phase-3-Garstang to Windy Harbour	• Speed is reduced from 50 mph to 40 mph • Work site length- 100m • Main route length- 802m; Approach length-702m(SB), 0m (NB) • Traffic management duration- 4 weeks

APPENDIX D – Maintenance Profiles and Diversion Route

Table D-1: Without Scheme Maintenance Profile – 40mm “MINOR” Intervention (2022,2036,2049,2062,2074)

Link	Link Distance (m)	Number of Lanes	Permanent Speed Limit (mph)	Closure Type/Duration	Full Closure Extents & Length	Number of lanes open	Temporary Speed Limit (mph)
Skippool Junction to Old Mains Lane	330	2 Lanes each direction	40	1 Lane closure 2 night	Full length of link	1	30
Old Mains Lane to Shard Road Junction	820	1 Lane each direction	40	1 Lane closure 2 night	Full length of link	1	30
Shard Road Junction to Little Singleton Junction	1540	1 Lane each direction	40	1 Lane closure 4 night	Full length of link	1	30
Little Singleton Junction to Windy Harbour Junction	1730	1 + Hard Strip each direction	50	1 Lane closure 6 night	Full length of link	1	30

Table D-2: Without Scheme Maintenance Profile – 100mm “MAJOR” Intervention (2042,2068)

Link	Link Distance (m)	Number of Lanes	Permanent Speed Limit (mph)	Closure Type/Duration	Full Closure Extents & Length	Number of lanes open	Temporary Speed Limit (mph)
Skippool Junction to Old Mains Lane	330	2 Lanes each direction	40	1 Lane closure 2 nights	Full length of Link	1	30
Old Mains Lane to Shard Road Junction	820	1 Lane each direction	40	1 Lane closure 3 nights	Full length of Link	1	30
Shard Road Junction to Little Singleton Junction	1540	1 Lane each direction	40	1 Lane closure 5 nights	Full length of Link	1	30
Little Singleton Junction to Windy Harbour Junction	1730	1 + Hard Strip each direction	50	1 Lane closure 7 nights	Full length of Link	1	30

Table D-3: Without Scheme Maintenance Profile – 150mm+ “MAJOR” Intervention (2029,2055,2080)

Link	Link Distance (m)	Number of Lanes	Permanent Speed Limit (mph)	Closure Type/Duration	Full Closure Extents & Length	Number of lanes open	Temporary Speed Limit (mph)
Skippool Junction to Old Mains Lane	330	2 Lanes each direction	40	1 + Night closure	Full length of Link	1	30
Old Mains Lane to Shard Road Junction	820	1 Lane each direction	40	Full Link Night closure	Full length of Link	0	0
Shard Road Junction to Little Singleton Junction	1540	1 Lane each direction	40	Full Link Night closure	Full length of Link	0	0
Little Singleton Junction to Windy Harbour Junction	1730	1 + Hard Strip each direction	50	1 + Night closure	Full length of Link	1	30

Table D-4: Scheme Maintenance Profile – 40mm “MINOR” Intervention (2028,2041,2054,2067,2079)

Link	Link Distance (m)	Number of Lanes	Permanent Speed Limit (mph)	Closure Type/Duration	Full Closure Extents & Length	Number of lanes open	Temporary Speed Limit (mph)
Skippool Junction to Skippool Bridge Junction	800	2 + Hard Strip each direction	40	1 Lane closure 1 night	Full length of link	1	30
Skippool Bridge Junction to Poulton Roundabout	1470	2 + Hard Strip each direction	70	1 Lane closure 2 night	Full length of link	1	50
Poulton Roundabout to Grange Junction	1660	2 + Hard Strip each direction	70	1 Lane closure 4 night	Full length of link	1	50
Grange Junction to Windy Harbour Junction	1230	2 + Hard Strip each direction	70	1 Lane closure 4 night	Full length of link	1	50

Table D-5: Scheme Maintenance Profile – 100mm “MAJOR” Intervention (2035,2061)

Link	Link Distance (m)	Number of Lanes	Permanent Speed Limit (mph)	Closure Type/Duration	Full Closure Extents & Length	Number of lanes open	Temporary Speed Limit (mph)
Skippool Junction to Skippool Bridge Junction	800	2 + Hard Strip each direction	40	1 Lane closure 2 nights	Full length of Link	1	30
Skippool Bridge Junction to Poulton Roundabout	1470	2 + Hard Strip each direction	70	1 Lane closure 4 nights	Full length of Link	1	50
Poulton Roundabout to Grange Junction	1660	2 + Hard Strip each direction	70	1 Lane closure 8 nights	Full length of Link	1	50
Grange Junction to Windy Harbour Junction	1230	2 + Hard Strip each direction	70	1 Lane closure 8 nights	Full length of Link	1	50

Table D-1: Scheme Maintenance Profile – 150mm+ “MAJOR” Intervention (2048,2073)

Link	Link Distance (m)	Number of Lanes	Permanent Speed Limit (mph)	Closure Type/Duration	Full Closure Extents & Length	Number of lanes open	Temporary Speed Limit (mph)
Skippool Junction to Skippool Bridge Junction	800	2 + Hard Strip each direction	40	full Road weekend closure	Full length of Link	1	30
Skippool Bridge Junction to Poulton Roundabout	1470	2 + Hard Strip each direction	70	full Road weekend closure	Full length of Link	1	50
Poulton Roundabout to Grange Junction	1660	2 + Hard Strip each direction	70	full Road weekend closure	Full length of Link	1	50
Grange Junction to Windy Harbour Junction	1230	2 + Hard Strip each direction	70	full Road weekend closure	Full length of Link	1	50

Diversion Route Plan for Without Scheme

Figure D-1: Diversion route between Old Mains Lane to Shard Road Junction

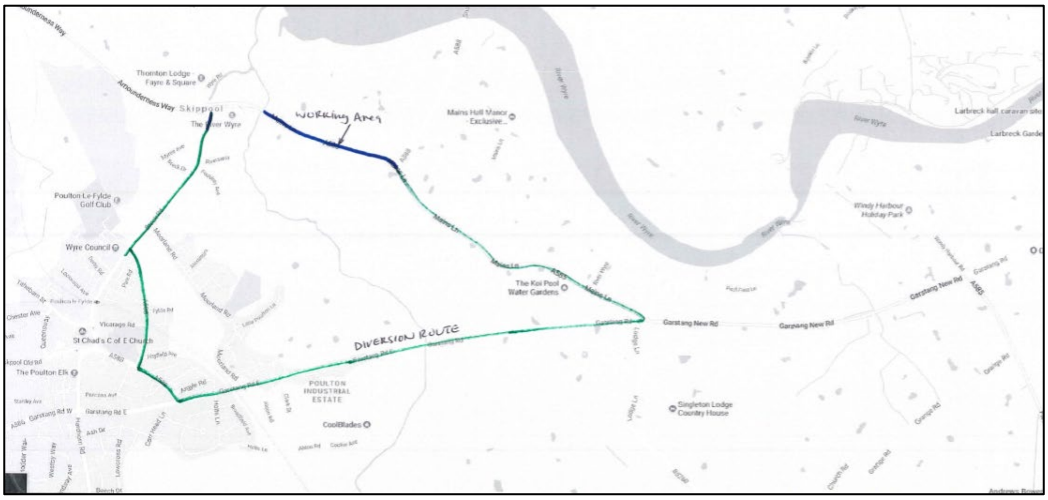


Figure D-2: Diversion route between Shard Road Junction to Little Singleton Junction

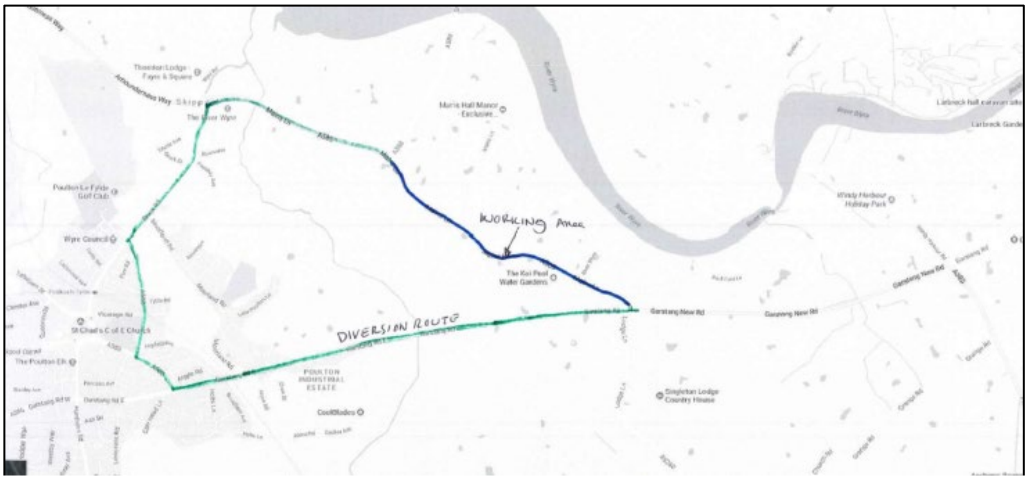
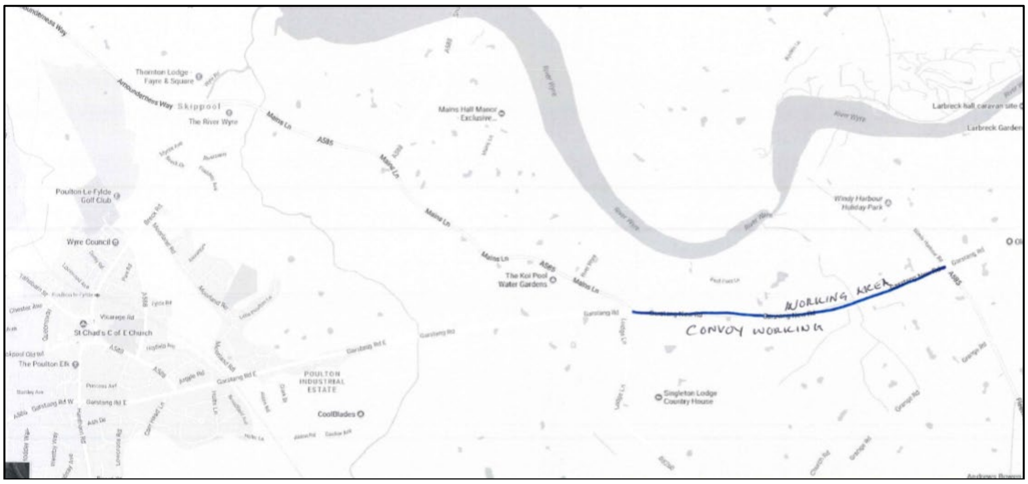


Figure D-3: Working Condition from Little Singleton Junction to Windy Harbour Junction



QUADRO Inputs

Table D-7: QUADRO Inputs – Without Scheme

S. No.	Link	QUADRO Input
1.	Skippool Junction to Old Mains Lane	• Work site length – 330m • Main route length – 2580m; Approach length – 0 (EB), 2234m (WB) • Duration of work – 1 week
2.	Old Mains Lane to Shard Road Junction	• Work site length – 820m • Main route length – 2580m; Approach length – 346m(EB), 1535m (WB) • Duration of work – 1 week
3.	Shard Road Junction to Little Singleton Junction	• Work site length – 1540m • Main route length – 2580m; Approach length – 1040m(EB), 0 (WB) • Duration of work – 1 week
4.	Little Singleton Junction to Windy Harbour Junction	• Work site length – 500m (Since it is a single carriageway convoy working is assumed and site length is divided into 0.5km stretches for each job) • Main route length – 1730m; Approach length – 0(EB), 1230m (WB) • Duration of work – 1 week

Table D-8: QUADRO Inputs – Scheme

S. No.	Link	QUADRO Input
1.	Skippool Junction to Skippool Bridge Junction	• Work site length – 460m • Main route length – 2000m; Approach length – 0 (EB), 1540m (WB) • Duration of work – 1 week
2.	Skippool Bridge Junction to Poulton Roundabout	• Work site length – 1470m • Main route length – 1470m; Approach length – 0m(EB), 0m (WB) • Duration of work – 1 week
3.	Poulton Roundabout to Grange Junction	• Work site length – 1660m • Main route length – 1660m; Approach length – 0m(EB), 0 (WB) • Duration of work – 1 week
4.	Grange Junction to Windy Harbour Junction	• Work site length – 1230m • Main route length – 1230m; Approach length – 0m(EB), 0 (WB) • Duration of work – 1 week

APPENDIX E – Stage 3 Scheme Design Update Sensitivity Test

working on behalf of

Technical Note 24

Project	**A585 Windy Harbour to Skippool**	Date	26 SEPTEMBER 2018
Subject	**Stage 3 Scheme Design Update Economic Appraisal**	Ref	**HE548643-ARC-HDG-A585-TN-TR-3024** **Version 1.0**

Author Shirin Antony

Table of Contents

Prepared by	Shirin Antony	Date	26/09/2018
Checked by	Clare-Louise Douglas	Date	26/09/2018
Approved by	Claire Bond	Date	26/09/2018

Revision Status	Amendments	Date
1.0	First Draft for comment	26/09/18

List of Tables

List of Figures

1 Introduction

1.1 Overview

1.1.1 The 4.5km section of the A585 between Windy Harbour junction and Skippool junction is a bottle-neck, affecting people's journeys between the M55 and the northern part of the Fylde peninsula as well as contributing to severance across the A585 between the Little Singleton and Skippool junctions.

1.1.2 In October 2017 Highways England announced Option 1, a southern bypass to the south of the current route for improving the A585 between Windy Harbour and Skippool as the preferred route for the scheme.

1.1.3 The extent of the scheme from Windy Harbour Junction to Skippool Junction is shown in Figure 1-1.

1.2 Purpose of this Technical Note

1.2.1 The purpose of this Technical Note is to set out the scheme's updated Stage 3 economic assessment results following an update to the Stage 3 scheme design.

1.2.2 Equilibrium demand traffic forecasts for the Core Scenario and Optimistic Growth Scenario were prepared using a traffic model developed using SATURN Version 11.3.12W and the July 2017 V1.8 TAG Databook Values of Time (VoT) and Vehicle Operating Costs (VOC) for assignment of the forecast matrices onto the modelled highway network and DIADEM Version 5.0 for modelling the traffic redistribution effects in response to changes in travel cost using a variable demand approach. An assessment of the Low Growth Scenario was not undertaken for the updated scheme design.

1.2.3 For further information regarding the updated scheme design and the preparation of the traffic forecasts for the updated Stage 3 scheme assessment please refer to the Stage 3 Scheme Design Update Traffic Forecasting Technical Note [HE548643-ARC-HDG-A585-TN-TR-3023].

1.2.4 The economic appraisal approach and scheme costs remain unchanged from the initial Stage 3 Economic Appraisal which can be referred to in further detail in the Economic Appraisal Package [HE548643-ARC-TTM-A585-RP-ZM-3145].

1.2.5 The Construction and Maintenance Delay Assessment has not been revisited.

1.2.6 An Appraisal Summary Table of the updated Stage 3 scheme design was not produced. The scheme's Appraisal Summary Table [HE548643-ARC-GEN-A585-SH-LE-3015] has been prepared based on the initial Stage 3 scheme design.

Figure 1-1: A585 Windy Harbour to Skippool scheme extent

Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

2 Appraisal Results

2.1 Transport User Benefits

2.1.1 The methodology and the economic parameters to prepare the updated scheme design's transport user benefits remains unchanged from the initial scheme design appraisal and can be referred to in more detail in Chapter 3 of the Economic Appraisal Package [HE548643-ARC-TTM-A585-RP-ZM-3145].

2.1.2 The updated scheme design traffic forecasts were used in the assessment of user benefits using DfT's TUBA version 1.9.9 program.

2.1.3 Table 2-1 presents the Core Scenario updated scheme design transport user benefits by time period as a result of the scheme.

Table 2-1: Core Scenario Updated Scheme Design Transport User Benefits by Time Period (2010 prices and discounted to 2010)

Benefit Type	AM Peak	Inter-Peak	PM Peak	OP	WE	Total Initial	Total Adjusted
Travel Time	£17.4m	£56.9m	£45.2m	£33.9m	£17.2m	**£153.1m**	**£170.5m**
VOCs	-£.1m	-£.7m	£.3m	-£3.2m	-£.2m	**-£3.6m**	**-£3.8m**
Non-Fuel VOC	-£1.9m	-£14.8m	-£8.2m	-£7.4m	-£7.7m	**-£32.4m**	**-£40.1m**
Total	**£15.3m**	**£41.4m**	**£37.3m**	**£23.2m**	**£9.3m**	**£117.21m**	**£126.5m**
% Benefits (Without Weekend)	13%	35%	32%	20%	-	**100%**	**-**
% Benefits (With Weekend)	12%	33%	29%	18%	7%		**100%**
Hours per week	10 (2×5)	27.5 (5.5×5)	15 (3×5)	15 (3×5)	12 (6×2)		
Benefits per hour/week (sum over 60 years)	**£1.5m**	**£1.5m**	**£2.5m**	**£1.5m**	**£.8m**		

2.1.4 Table 2-2 presents the Optimistic Growth Scenario updated scheme design transport user benefits by time period as a result of the scheme.

Table 2-2: Optimistic Growth Scenario Updated Scheme Design Transport User Benefits by Time Period (2010 prices and discounted to 2010)

Benefit Type	AM Peak	Inter-Peak	PM Peak	OP	WE	Total Initial	Total Adjusted
Travel Time	£19.7m	£58.6m	£58.8m	£36.4m	£16.3m	**£173.45m**	**£189.7m**
VOCs	£.0m	-£.4m	£.8m	-£3.4m	-£.2m	**-£2.97m**	**-£3.1m**
Non-Fuel VOC	-£1.9m	-£15.4m	-£8.4m	-£7.8m	-£8.0m	**-£33.45m**	**-£41.4m**
Total	**£17.9m**	**£42.7m**	**£51.3m**	**£25.2m**	**£8.1m**	**£137.02m**	**£145.2m**
% Benefits (Without Weekend)	13%	31%	37%	18%	-	**100%**	**-**
% Benefits (With Weekend)	12%	29%	35%	17%	6%		**100%**
Hours per week	10 (2×5)	27.5 (5.5×5)	15 (3×5)	15 (3×5)	12(2x6)		
Benefits per hour/week (sum over 60 years)	**£1.8m**	**£1.6m**	**£3.4m**	**£1.7m**	**£.7m**		

2.2 Monetised Safety Assessment

2.2.1 The safety impacts of the updated scheme design were assessed quantitatively and monetised and incorporated into the overall economic assessment for the scheme. Accident saving benefits have been calculated using the Cost and Benefit to Accidents – Light Touch (COBALT) program (Version 2013.2), a spreadsheet application developed by the DfT to undertake the analysis of the impacts on accidents as part of the economic appraisal of road schemes.

2.2.2 The methodology to prepare the updated scheme design's monetised safety assessment remains unchanged from the initial scheme design and can be referred to in more detail in Chapter 4 of the Economic Appraisal Package [HE548643-ARC-TTM-A585-RP-ZM-3145].

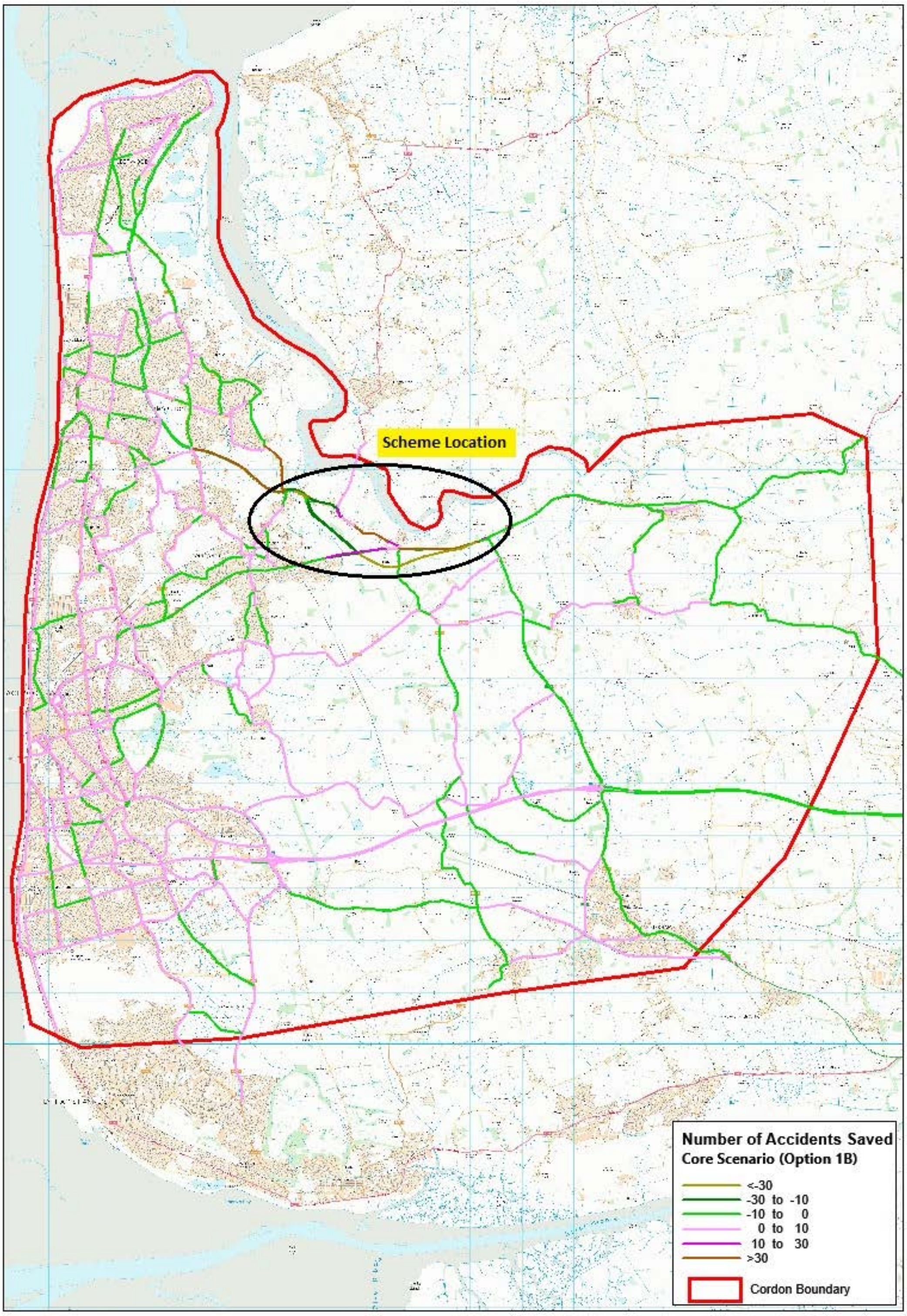
2.2.3 The number of accidents saved by the updated scheme design is shown in Table 2-3. The accidents saved as a result of the scheme are calculated as the difference between the number of accidents in the Without Scheme and the With Scheme Scenarios.

Table 2-3: Accident Savings

Scenario	Total Accidents		Accidents Saved
	Without Scheme	With Scheme	
Core	15,641	15,612	30
Optimistic Growth	17,083	17,052	31

2.2.4 Figure 2-1 presents the change in the number of accidents due to the scheme for the Core Scenario.

Figure 2-1: Accident Savings - Core Scenario



2.2.5 The change in the number of casualties between the With Scheme and the Without Scheme scenarios is shown in Table 2-4.

Table 2-4: Updated Scheme Design Summary of Casualties

Scenario	Number of Casualties						Casualties Saved		
	Without Scheme			With Scheme					
	Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight
Core	171	2079	19254	163	2039	19183	8	41	71
Optimistic Growth	187	2276	21001	178	2235	20930	8	41	71

2.2.6 It is observed that there is reduction in all types of casualties i.e. fatal, serious and slight injuries over the appraisal period with the scheme in place. The casualties on fatal, serious and slight injuries saved by the scheme is similar for the core and the optimistic scenarios.

2.2.7 A summary of the economic results of the accident assessment for the updated scheme design is shown in Table 2-5. The accidents costs from the initial scheme design QUADRO assessment during maintenance is also presented in the table to evaluate overall accident benefits. A detailed description of the QUADRO assessment can be referred to in Chapter 6 of the Economic Appraisal Package [HE548643-ARC-TTM-A585-RP-ZM-3145].

2.2.8 The accident benefits are calculated as a difference between accident costs of the Without Scheme and With Scheme scenarios. Hence, an overall positive value indicates that there are accident benefits (or savings) and a negative value indicates accident disbenefits.

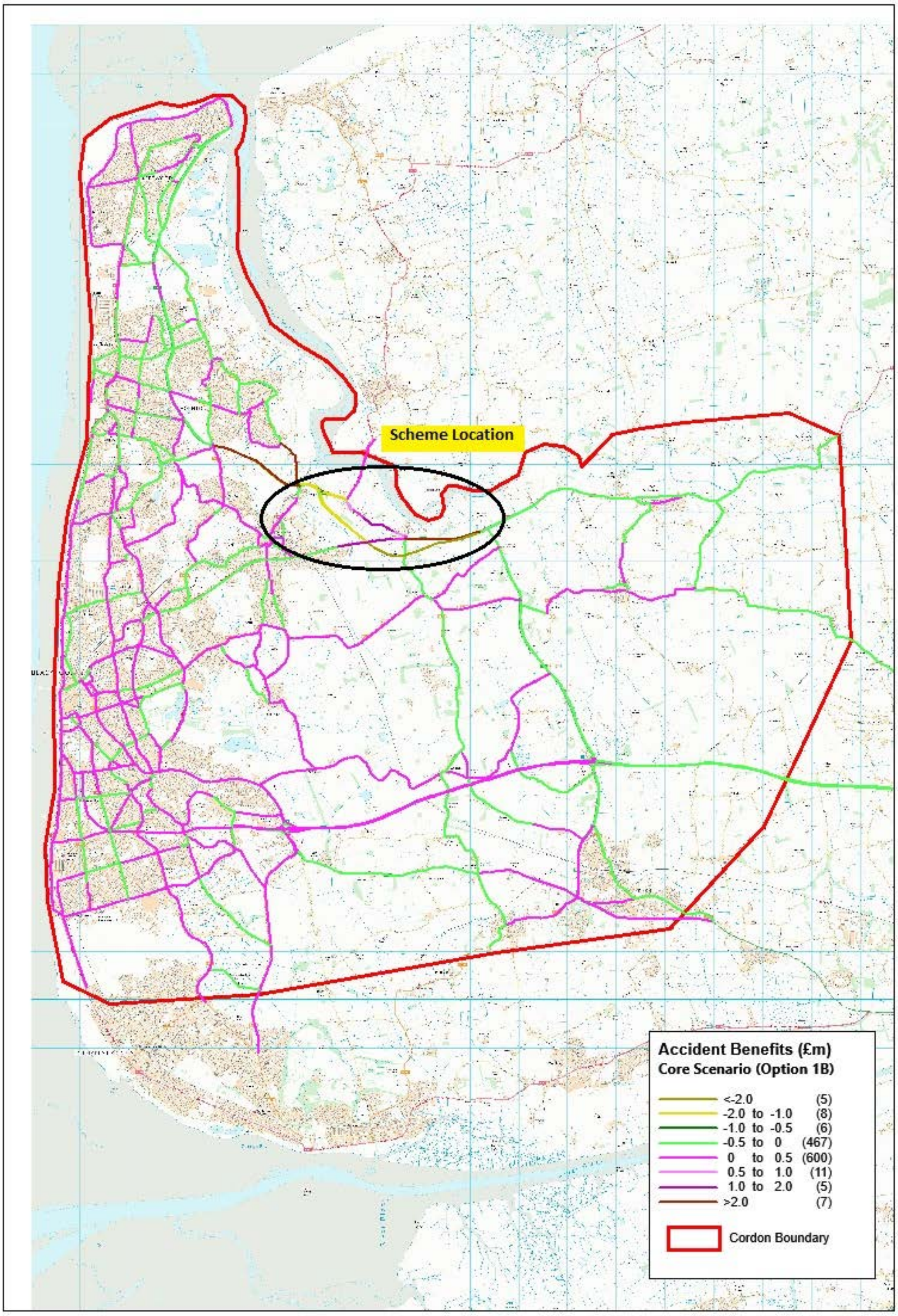
Table 2-5: Accident Benefits (2010 prices and discounted to 2010)

Scenario	Accident Costs (£m)		Accident Benefits saved by scheme (£m)	QUADRO Accident Costs (£m)		Total Accident Benefits Saved by the Scheme (£m)
	Without Scheme	With Scheme		Without Scheme	With Scheme	
Core	£726.26	£715.87	£10.40	£0.0049	£0.0001	£10.40
Optimistic Growth	£791.73	£781.38	£10.36	£0.0049	£0.0001	£10.36

2.2.9 The accident benefits saved by scheme for the core scenario and the optimistic growth scenario are within the same range. It can be observed that the accident savings for the core scenario is marginally higher than the optimistic growth scenario. The accident benefits saved by scheme for the core scenario is observed to be £10.40m and £10.36m for the optimistic growth scenario.

2.2.10 Figure 2-2 presents the network wide accident benefits for the core scenario over the appraisal period resulting from the scheme.

Figure 2-2: Accident Benefits- Core Scenario



2.3 Greenhouse Gases, Air Quality and Noise Assessment

2.3.1 The effects of the scheme on the following indicators have been monetised in line with TAG Unit A3 - Environmental Impact Appraisal:

- Greenhouse Gases - The emission factor toolkit (EFT) version 8 was used to generate the carbon emissions for the opening year 2022 and the design year 2037 both with and without the Scheme. The total emissions were then input into the TAG greenhouse gas worksheets to generate the monetarised values. Emissions from EFT can only be generated up to the year 2030 and therefore the 2030 emissions are used to represent the design year and the remaining years of the 60 year appraisal period. This is likely to overestimate the impact on carbon emissions as there would be a greater number of Ultra Low Emissions Vehicles (ULEV) beyond 2030 than is assumed in the assessment.
- Local Air Quality - The local air quality monetarisation has been generated by calculating emissions of NOx and concentrations of PM10 for inclusion in the local air quality worksheets. Calculations were undertaken for the opening year and design year both with and without the Scheme.
- Noise - The daytime and night-time predicted road traffic noise levels have been converted to an L_{Aeq} value in accordance with TAG Unit A3 and used to populate the TAG noise workbook (Dec 2017 version) spreadsheet to produce a monetarised value for the Scheme.

2.3.2 The Environmental Statement [HE548643-ARC-EGN-A585-RP-LE-3088] contains further detail in relation to the methodology and assessment results of the air quality and noise assessments.

2.4 Journey Time Reliability

2.4.1 The methodology of undertaking the journey time reliability remains unchanged from the initial scheme design appraisal and can be referred to in more detail in Chapter 9 of the Economic Appraisal Package [HE548643-ARC-TTM-A585-RP-ZM-3145].

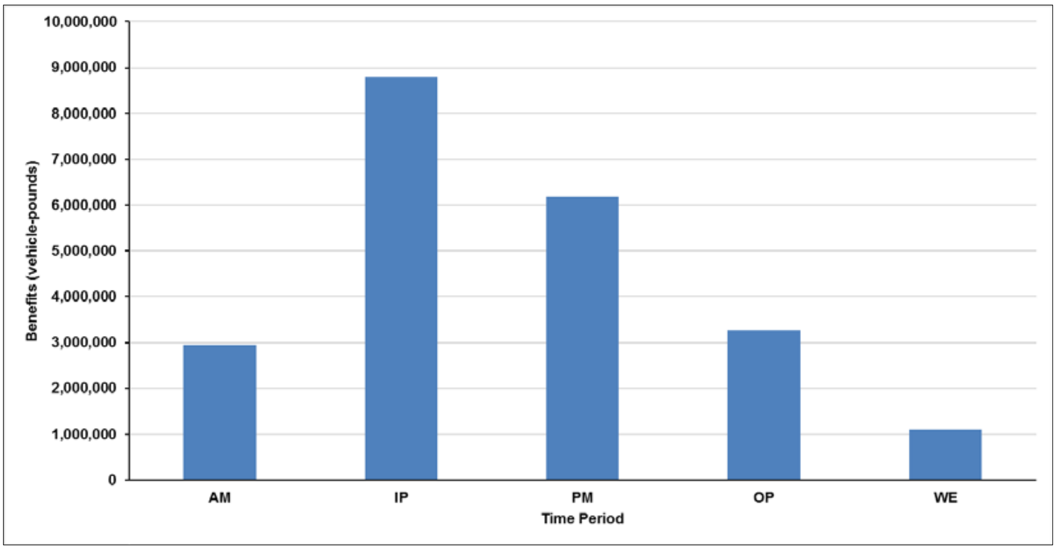
2.4.2 Table 2-6 presents the Core Scenario economic assessment of the valuation of the journey time variability by trip purpose over a 60 year appraisal period for the modelled time periods (AM, IP, PM, OP and WE).

Table 2-6: Core Scenario Journey Time Variability Economic Assessment by Trip Purpose (£) – Modelled Time Periods (2010 prices and discounted to 2010)

Car-Commuting	Car-Business	Car-Other	LGV	HGV	Total
3,259,756	689,950	5,982,801	4,698,141	7,695,243	22,325,892

2.4.3 The total annualised journey time reliability benefits for each modelled time period is shown Figure 2-3. Annualisation factors were used to convert the reliability benefits per time slice to the annual user benefits.

Figure 2-3: Core Scenario Annualised Journey Time Reliability Benefits (By Time Period)



2.4.4 It is seen from Figure 2-3 that all time periods show an increase in journey time reliability benefits, indicating that the journey time reliability improves with the scheme in place.

2.4.5 The highest JTR benefits are seen in the Inter-Peak period, whilst the lowest JTR benefits are seen in the weekend peak period.

2.4.6 The Core Scenario present value of benefits (PVB), considering journey time reliability benefits incurring to all modelled time periods was seen to be £22.3m (in 2010 prices).

2.5 Wider Impacts

2.5.1 The methodology of undertaking the Wider Impacts remains unchanged from the initial scheme design appraisal and can be referred to in more detail in Chapter 10 of the Economic Appraisal Package [HE548643-ARC-TTM-A585-RP-ZM-3145].

Agglomeration Impacts

2.5.2 Table 2-7: Agglomeration Impacts – A585 Scheme (2010 prices and not discounted to 2010, £) shows the agglomeration benefits predicted by the A585 traffic model for the forecast years.

Table 2-7: Agglomeration Impacts – A585 Scheme (2010 prices and not discounted to 2010, £)

LAD	2022	2037	2051
Fylde	301,270	1,193,423	1,676,178
Wyre	517,638	725,259	1,022,713
Preston	1,370,715	1,659,845	2,362,953
Blackpool	171,587	224,229	316,082
Total	**2,361,210**	**3,802,757**	**5,377,926**

2.5.3 The total agglomeration benefits are predicted to be £2.3m in 2022 and £3.8m in 2037 and £5.3m in 2051(2010 prices and not discounted to 2010).

2.5.4 Agglomeration benefits are observed to be the highest in the producer services sector, which accounts for 69% of the total benefits in 2051.

Output Changes in Imperfectly Competitive Markets

2.5.5 Table 2-8 presents the business user benefits and the output change in imperfectly competitive markets for the 60-year appraisal period.

2.5.6 It is observed that the total additional benefits arising due to this is c£2.3m (in 2010 prices and discounted to 2010), assuming that benefits were being incurred across all time periods.

Table 2-8: Output Change in Imperfectly Competitive Markets (2010 prices and discounted to 2010, £)

Business User Benefits	Benefits of All Time Periods
Fylde	5,944,112
Wyre	9,182,533
Preston	3,299,942
Blackpool	4,425,177
Total Region	22,851,764
WI2 (10% of Business User Benefits)	
Fylde	594,411
Wyre	918,253
Preston	329,994
Blackpool	442,518
Total Region	2,285,176

Labour Supply Impacts

2.5.7 The total benefits arising from the 60 year appraisal period is shown in Table 2-9.

Table 2-9: Core Scenario Labour Supply Impact on GDP (2010 prices and not discounted to 2010, £)

LAD	Fylde			Wyre			Preston			Blackpool		
Year	2022	2037	2051	2022	2037	2051	2022	2037	2051	2022	2037	2051
Labour Supply Impact	24,652	36,734	61,138	41,027	52,340	54,905	11,734	18,985	26,317	13,855	24,826	88,944

Summary of Results

2.5.8 The scale and breakdown of the wider economic impacts of the scheme by type are set out in Table 2-10: Core Scenario Wider Economic Impacts (PVB 2010 prices and discounted to 2010, £) – Net Present Value (60-year Appraisal Period).

2.5.9 The scheme is expected to generate c£24m of wider impacts in Fylde, £17 m in Wyre, £37m in Preston and £6 m in Blackpool (in 2010 prices and discounted to 2010), producing a total of £83.6m over the full 60-year appraisal period across all time periods. If it was considered that the benefits from Preston overestimates the total Wider Impacts, this LAD could be excluded. Excluding Preston, the total Core Scenario Wider Impacts for the scheme is £46.5m.

Table 2-10: Core Scenario Wider Economic Impacts (PVB 2010 prices and discounted to 2010, £) – Net Present Value (60-year Appraisal Period)

Description	Fylde	Wyre	Preston	Blackpool	Total	Total (excl. Preston)
Agglomeration	23,026,405	15,549,028	36,625,780	4,858,813	80,060,026	43,434,247
Output in Imperfectly Competitive market	594,411	918,253	329,994	442,518	2,285,176	1,955,182
Labour supply impact	344,707	389,676	157,926	393,778	1,286,087	1,128,161
Total Wider Impacts	**23,965,524**	**16,856,957**	**37,113,699**	**5,695,109**	**83,631,290**	**46,517,590**

2.6 Distributional Impact Appraisal

2.6.1 The methodology of assessing the Distributional Impact remains unchanged from the initial scheme design appraisal and can be referred to in more detail in Chapter 11 of the Economic Appraisal Package [HE548643-ARC-TTM-A585-RP-ZM-3145].

Distributional Impacts of User Benefits and Affordability

2.6.2 The User Benefits and Affordability benefits have been applied to the LSOAs to assess the results using the associated Indices of Deprivation as required by TAG. As these indicators make use of the full model which covers the entire country, the population split is equal between all income quintiles.

2.6.3 In order to better reflect the benefits based on population, the benefits are calculated different depending on the peak in which they are generated. The AM and PM peaks take the benefits by Origin and Destination respectively in order to take benefits based on population locations as it is assumed that people with be leaving their homes in the morning peak and returning in the evening peak. The Inter peak and off peak benefits are the average of the Origin and Destination benefits as it is not possible to determine the primary direction of travel.

2.6.4 The detailed analysis of the User Benefits and Affordability has been carried out and the assessment results for the scheme presented in Table 2-11: User Benefits and Affordability Assessment Results.

Table 2-11: User Benefits and Affordability Assessment Results

Indicator	Output	IMD Income Domains				
		Most deprived <-		-> Least deprived		
		0% - 20%	20% - 40%	40% - 60%	60-% - 80%	80% - 100%
User Benefits	Total Benefits (£)	£16,295,578	£13,446,657	£31,479,343	£38,724,630	£17,341,279
	Benefits %	13.89%	11.46%	26.84%	33.02%	14.79%
	Grading	✓	✓	✓✓✓	✓✓✓	✓✓
Affordability	Total Benefits (£)	-£4,887,073	-£4,826,204	-£11,198,798	-£9,890,622	-£5,255,550
	Benefits %	13.55%	13.38%	31.06%	27.43%	14.58%
	Grading	×	×	×××	×××	××

2.6.5 The User Benefits derived from the TUBA results are positive across all quintiles for the scheme. The spread of benefits is reasonably consistent with the lower two quintiles and highest quintile each receiving slightly less than 15% of the total benefits. The third and fourth quintiles receive a slightly higher proportion of the benefits at around 27% and 33% respectively.

2.6.6 The Affordability benefits are the benefits associated with Vehicle Operating Costs. These form part of the total User Benefits, but are analysed separately for the Affordability impacts. These are found to be negative across the board for both options, with the proportion split very similar to the overall User Benefits.

2.6.7 While the Affordability benefits are negative, they are a part of the overall User Benefits, and therefore, the overall Distributional Impacts arising from the schemes are positive. While the middle and upper income domains receive a higher proportion of the benefits as a result of the schemes, all income domains experience a positive impact as a result of the proposed options.

Accidents

2.6.8 The assessment results for the Accidents can be found in Table 2-12.

Table 2-12: Accident Assessment Results

SATURN Link ID	Accidents/ 5 year period	Scheme Flow Change
1104_7005	67.0	1.1%
7004_1104	61.4	1.0%
4036_4099	59.6	-1.8%
4037_4081	64.1	-3.0%
4081_4037	53.6	-1.8%
4097_4033	60.6	-2.2%

2.6.9 WebTAG Unit A4.2 states that if an identified link has a flow change of +/-5%, then any Distributional Impact it would have on any vulnerable social groups or road network users would be Neutral. Therefore, the Distributional Impact of the scheme on Accidents is Neutral across all user groups.

3 Economic Appraisal Summary Tables

3.1 The Transport Economic Efficiency Table

3.1.1 The transport economic efficiency (TEE) results for the updated scheme design has been presented in two sets. The transport user benefits are initially presented for the AM, IP, PM and OP. The second set includes an assessment of the weekend benefits. The TEE tables for the core scenario and the optimistic growth scenario are presented in Table 3-1 to Table 3-4

Table 3-1: Core Scenario TEE Table

Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£35,268,804		£35,268,804					
Vehicle operating costs	-£4,120,768		-£4,120,768					
User charges	£0		£0					
During Construction & Maintenance	-£274,317		-£274,317					
NET NON-BUSINESS BENEFITS: COMMUTING	£30,873,719	*(1a)*	£30,873,719					
Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£62,955,036		£62,955,036					
Vehicle operating costs	-£29,853,935		-£29,853,935					
User charges	£0		£0					
During Construction & Maintenance	-£1,098,491		-£1,098,491					
NET NON-BUSINESS BENEFITS: OTHER	£32,002,610	*(1b)*	£32,002,610					
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£55,029,351		£15,242,482	£39,786,869				
Vehicle operating costs	-£2,073,257		£985,219	-£3,058,476				
User charges	£0		£0	£0				
During Construction & Maintenance	-£581,868		-£301,043	-£280,825				
Subtotal	£52,374,226	*(2)*	£15,926,658	£36,447,568				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue								
Operating costs								
Investment costs								
Grant/subsidy								
Subtotal		*(3)*						
Other business impacts								
Developer contributions		*(4)*						
NET BUSINESS IMPACT	£52,374,226	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	£115,250,555	*(6) = (1a) + (1b) + (5)*						

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Table 3-2: Core Scenario TEE Table (Including Weekend)

Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£36,661,012		£36,661,012					
Vehicle operating costs	-£4,338,365		-£4,338,365					
User charges	£0		£0					
During Construction & Maintenance	-£274,317		-£274,317					
NET NON-BUSINESS BENEFITS: COMMUTING	£32,048,330	*(1a)*	£32,048,330					
Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£76,309,635		£76,309,635					
Vehicle operating costs	-£37,352,263		-£37,352,263					
User charges	£0		£0					
During Construction & Maintenance	-£1,098,491		-£1,098,491					
NET NON-BUSINESS BENEFITS: OTHER	£37,858,881	*(1b)*	£37,858,881					
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£57,521,461		£15,489,934	£42,031,527				
Vehicle operating costs	-£2,259,022		£997,471	-£3,256,493				
User charges	£0		£0	£0				
During Construction & Maintenance	-£581,868		-£301,043	-£280,825				
Subtotal	£54,680,571	*(2)*	£16,186,362	£38,494,209				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue								
Operating costs								
Investment costs								
Grant/subsidy								
Subtotal		*(3)*						
Other business impacts								
Developer contributions		*(4)*						
NET BUSINESS IMPACT	£54,680,571	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	£124,587,782	*(6) = (1a) + (1b) + (5)*						

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Table 3-3: Optimistic Growth Scenario TEE Table

Non-business: Commuting	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	£42,917,873		£42,917,873			
Vehicle operating costs	-£4,173,625		-£4,173,625			
User charges	£0		£0			
During Construction & Maintenance	-£274,317		-£274,317			
NET NON-BUSINESS BENEFITS: COMMUTING	£38,469,931	*(1a)*	£38,469,931			

Non-business: Other	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	£69,312,139		£69,312,139			
Vehicle operating costs	-£30,503,818		-£30,503,818			
User charges	£0		£0			
During Construction & Maintenance	-£1,098,491		-£1,098,491			
NET NON-BUSINESS BENEFITS: OTHER	£37,709,830	*(1b)*	£37,709,830			

Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£61,217,040		£16,827,570	£44,389,470				
Vehicle operating costs	-£1,748,781		£1,368,762	-£3,117,543				
User charges	£0		£0	£0				
During Construction & Maintenance	-£581,868		-£301,043	-£280,825				
Subtotal	£58,886,391	*(2)*	£17,895,289	£40,991,102				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue								
Operating costs								
Investment costs								
Grant/subsidy								
Subtotal		*(3)*						
Other business impacts								
Developer contributions		*(4)*						
NET BUSINESS IMPACT	£58,886,391	*(5) = (2) + (3) + (4)*						

TOTAL

Present Value of Transport Economic Efficiency Benefits (TEE)	£135,066,152	*(6) = (1a) + (1b) + (5)*

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Table 3-4: Optimistic Growth Scenario TEE Table (Including Weekend)

Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£44,243,532		£44,243,532					
Vehicle operating costs	-£4,435,061		-£4,435,061					
User charges	£0		£0					
During Construction & Maintenance	-£274,317		-£274,317					
NET NON-BUSINESS BENEFITS: COMMUTING	£39,534,154	*(1a)*	£39,534,154					
Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£81,797,268		£81,797,268					
Vehicle operating costs	-£38,187,444		-£38,187,444					
User charges	£0		£0					
During Construction & Maintenance	-£1,098,491		-£1,098,491					
NET NON-BUSINESS BENEFITS: OTHER	£42,511,333	*(1b)*	£42,511,333					
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£63,687,857		£17,094,162	£46,593,695				
Vehicle operating costs	-£1,938,347		£1,371,071	-£3,309,418				
User charges	£0		£0	£0				
During Construction & Maintenance	-£581,868		-£301,043	-£280,825				
Subtotal	£61,167,642	*(2)*	£18,164,190	£43,003,452				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue								
Operating costs								
Investment costs								
Grant/subsidy								
Subtotal		*(3)*						
Other business impacts								
Developer contributions		*(4)*						
NET BUSINESS IMPACT	£61,167,642	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	£143,213,129	*(6) = (1a) + (1b) + (5)*						

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

3.2 The Public Accounts Table

3.2.1 The Public Accounts (PA) tables for the updated scheme design have been presented in two sets. The Public Accounts tables are initially presented for the AM, IP, PM and OP. The second set includes an assessment of the weekend benefits. The PA tables for the core scenario and the optimistic growth scenario are presented in Table 3-5 to Table 3-8.

3.2.2 The Broad Transport Budget for the A585 Windy Harbour to Skippool scheme is £108m.

Table 3-5: Core Scenario PA Table

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue						
Operating Costs						
Investment Costs						
Developer and Other Contributions						
Grant/Subsidy Payments						
NET IMPACT		*(7)*				
Central Government Funding: Transport						
Revenue	£0					
Operating costs						
Investment Costs	£104,703,544		£104,703,544			
Developer and Other Contributions						
Maintenance Cost	£4,191,913		£4,191,913			
Grant/Subsidy Payments						
NET IMPACT	£108,895,457	*(8)*	£108,895,457			
Central Government Funding: Non-Transport						
Indirect Tax Revenues	-£26,047,351	*(9)*	-£26,047,351			
TOTALS						
Broad Transport Budget	£108,895,457	*(10) = (7) + (8)*				
Wider Public Finances	-£26,047,351	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and ‘Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Table 3-6: Core Scenario PA Table (including Weekend)

	ALL MODES TOTAL		ROAD INFRASTRUCTURE	BUS and COACH	RAIL	OTHER
Local Government Funding						
Revenue						
Operating Costs						
Investment Costs						
Developer and Other Contributions						
Grant/Subsidy Payments						
NET IMPACT		*(7)*				
Central Government Funding: Transport						
Revenue	£0					
Operating costs						
Investment Costs	£104,703,544		£104,703,544			
Developer and Other Contributions						
Maintenance Cost	£4,191,913		£4,191,913			
Grant/Subsidy Payments						
NET IMPACT	£108,895,457	*(8)*	£108,895,457			
Central Government Funding: Non-Transport						
Indirect Tax Revenues	-£31,511,051	*(9)*	-£31,511,051			
TOTALS						
Broad Transport Budget	£108,895,457	*(10) = (7) + (8)*				
Wider Public Finances	-£31,511,051	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Table 3-7: Optimistic Growth Scenario PA Table

	ALL MODES TOTAL		ROAD INFRASTRUCTURE	BUS and COACH	RAIL	OTHER
Local Government Funding						
Revenue						
Operating Costs						
Investment Costs						
Developer and Other Contributions						
Grant/Subsidy Payments						
NET IMPACT		*(7)*				
Central Government Funding: Transport						
Revenue	£0					
Operating costs						
Investment Costs	£104,703,544		£104,703,544			
Developer and Other Contributions						
Maintenance Cost	£4,191,913		£4,191,913			
Grant/Subsidy Payments						
NET IMPACT	£108,895,457	*(8)*	£108,895,457			
Central Government Funding: Non-Transport						
Indirect Tax Revenues	-£26,721,585	*(9)*	-£26,721,585			
TOTALS						
Broad Transport Budget	£108,895,457	*(10) = (7) + (8)*				
Wider Public Finances	-£26,721,585	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and ‘Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Table 3-8: Optimistic Growth Scenario PA Table (Including Weekend)

Local Government Funding	**ALL MODES TOTAL**		**ROAD INFRASTRUCTURE**	**BUS and COACH**	**RAIL**	**OTHER**
Revenue						
Operating Costs						
Investment Costs						
Developer and Other Contributions						
Grant/Subsidy Payments						
NET IMPACT		*(7)*				
Central Government Funding: Transport						
Revenue	£0					
Operating costs						
Investment Costs	£104,703,544		£104,703,544			
Developer and Other Contributions						
Maintenance Cost	£4,191,913		£4,191,913			
Grant/Subsidy Payments						
NET IMPACT	£108,895,457	*(8)*	£108,895,457			
Central Government Funding: Non-Transport						
Indirect Tax Revenues	-£32,398,132	*(9)*	-£32,398,132			
TOTALS						
Broad Transport Budget	£108,895,457	*(10) = (7) + (8)*				
Wider Public Finances	-£32,398,132	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and ‘Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

3.3 The Analysis of Monetised Costs and Benefits

3.3.1 The AMCB tables for the updated scheme design have been presented in two sets. The AMCB tables are initially presented for the AM, IP, PM and OP. The second set includes an assessment of the weekend benefits. The AMCB tables for the core scenario and the optimistic growth scenario are presented in Table 3-9: Core Scenario AMCB Table to Table 3-12: Optimistic Growth Scenario AMCB Table (including Weekend).

Table 3-9: Core Scenario AMCB Table

Noise	£659,945	*(12)*
Local Air Quality	£240,000	*(13)*
Greenhouse Gases	-£15,730,000	*(14)*
Journey Ambience		*(15)*
Accidents	£10,399,239	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£30,873,719	*(1a)*
Economic Efficiency: Consumer Users (Other)	£32,002,610	*(1b)*
Economic Efficiency: Business Users and Providers	£52,374,226	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£26,047,351	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Present Value of Benefits (see notes) (PVB)	£136,867,090	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)*
Broad Transport Budget	£108,895,457	*(10)*
Present Value of Costs (see notes) (PVC)	£108,895,457	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£27,971,633	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	**1.26**	BCR=PVB/PVC
	2022 to 2081	

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

Table 3-10: Core Scenario AMCB Table (including Weekend)

Noise	£659,945	*(12)*
Local Air Quality	£240,000	*(13)*
Greenhouse Gases	-£15,730,000	*(14)*
Journey Ambience		*(15)*
Accidents	£10,399,239	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£32,048,330	*(1a)*
Economic Efficiency: Consumer Users (Other)	£37,858,881	*(1b)*
Economic Efficiency: Business Users and Providers	£54,680,571	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£31,511,051	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Present Value of Benefits (see notes) (PVB)	£151,668,017	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)*
Broad Transport Budget	£108,895,457	*(10)*
Present Value of Costs (see notes) (PVC)	£108,895,457	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£42,772,560	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	**1.39**	BCR=PVB/PVC
	2022 to 2081	

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

Table 3-11: Optimistic Growth Scenario AMCB Table

Noise	£659,945	*(12)*
Local Air Quality	£240,000	*(13)*
Greenhouse Gases	-£15,730,000	*(14)*
Journey Ambience		*(15)*
Accidents	£10,361,339	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£38,469,931	*(1a)*
Economic Efficiency: Consumer Users (Other)	£37,709,830	*(1b)*
Economic Efficiency: Business Users and Providers	£58,886,391	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£26,721,585	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Present Value of Benefits (see notes) (PVB)	£157,319,021	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)*
Broad Transport Budget	£108,895,457	*(10)*
Present Value of Costs (see notes) (PVC)	£108,895,457	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£48,423,564	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	**1.44**	BCR=PVB/PVC
	2022 to 2081	

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

Table 3-12: Optimistic Growth Scenario AMCB Table (including Weekend)

Noise	£659,945	*(12)*
Local Air Quality	£240,000	*(13)*
Greenhouse Gases	-£15,730,000	*(14)*
Journey Ambience		*(15)*
Accidents	£10,361,339	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£39,534,154	*(1a)*
Economic Efficiency: Consumer Users (Other)	£42,511,333	*(1b)*
Economic Efficiency: Business Users and Providers	£61,167,642	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£32,398,132	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Present Value of Benefits (see notes) (PVB)	£171,142,545	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)*
Broad Transport Budget	£108,895,457	*(10)*
Present Value of Costs (see notes) (PVC)	£108,895,457	*(PVC) = (10)*
<u>OVERALL IMPACTS</u>		
<u>Net Present Value (NPV)</u>	£62,247,088	NPV=PVB-PVC
<u>Benefit to Cost Ratio (BCR)</u>	**1.57**	BCR=PVB/PVC
	2022 to 2081	

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

4 Overall Appraisal Summary

4.1 Economic Appraisal Process and results

4.1.1 The results of the updated scheme design economic appraisal have been produced using standard Department for Transport and Highways England guidance and procedures.

4.1.2 Traffic forecasts were prepared to illustrate the sensitivity of transport user benefits to the core scenario as well as traffic growth uncertainties including local and national uncertainties in traffic growth. As such, in addition to the Core Scenario, one additional growth scenarios, the Optimistic Growth Scenario was assessed.

4.1.3 Combining the scheme cost estimated at £108.9m in 2010 prices discounted to 2010 and the user benefits/dis-benefits, provides an overall economic appraisal of the scheme. The Benefit-Cost Ratios (BCRs) for the updated Stage 3 scheme design for the Core Scenario and Optimistic Growth scenarios are presented in Table 4-1 which includes an Initial BCR appraised using the AM, IP, PM and OP time periods and an adjusted BCR which includes an appraisal of the AM, IP, PM, OP and Weekend time periods and an appraisal of Journey Time Reliability (JTR) and Wider Impacts.

Table 4-1: Updated Stage 3 Scheme Appraisal Results (2010 prices discounted to 2010)

Description	Metric	Core Scenario	Optimistic growth Scenario
Excluding Journey Time Reliability Benefits and Wider Impacts	TUBA Benefits	£143,105,105	£163,594,936
	Accident Benefits	£10,399,239	£10,361,339
	Construction & Maintenance Appraisal	-£1,807,199	-£1,807,199
	AQ, GHG and Noise	-£14,830,055	-£14,830,055
	Present value of Benefits (**PVB**)	£136,867,090	£157,319,021
	Present value of Cost (**PVC**)	£108,895,457	£108,895,457
	Net Present Value (**NPV**)	£27,971,633	£48,423,564
	Initial Benefit-Cost Ratio (BCR)	**1.26**	**1.44**
Including Journey Time Reliability Benefits and Wider Impacts	TUBA Benefits (including Weekend)	£157,906,032	£177,418,460
	Accident Benefits	£10,399,239	£10,361,339
	Construction & Maintenance Appraisal	-£1,807,199	-£1,807,199
	AQ, GHG and Noise	-£14,830,055	-£14,830,055
	JTR Benefits	22,325,892	22,325,892
	Wider Impacts	£46,517,590	£46,517,590
	Present value of Benefits (**PVB**)	£220,511,499	£239,986,027
	Present value of Cost (**PVC**)	£108,895,457	£108,895,457
	Net Present Value (**NPV**)	£111,616,042	£131,090,570
	Adjusted Benefit-Cost Ratio (BCR)	**2.02**	**2.20**
Journey Time Reliability as % of total benefits		10.1%	9.3%
Wider Impacts as % of total benefits		21.1%	19.4%

4.2 Conclusions and Recommendations

4.2.1 The purpose of economic assessment is to help to support decision making for major investment by summarising the impact on the Economic Case of the transport intervention.

4.2.2 The initial BCR of the updated Stage 3 scheme design for the Core Scenario is 1.26. Adding in Weekend benefits, Journey Time Reliability and Wider Impacts to provide an Adjusted BCR, increases the updated Stage 3 scheme design Core Scenario BCR to 2.02.

4.2.3 The scheme continues to provide user benefits when taking into account both Local and National economic uncertainty. An assessment of the updated Stage 3 scheme design for the Low Growth Scenario was not undertaken. The initial BCR of the updated Stage 3 scheme design for the Optimistic Growth Scenario is 1.44. Adding in Weekend benefits, Journey Time Reliability and Wider Impacts to provide an Adjusted BCR, increases the updated Stage 3 scheme design Optimistic Growth Scenario BCR to 2.20.

4.2.4 The accident cost savings shows that the scheme provides better accident measures and reduces accidents.

4.2.5 On this basis the A585 Windy Harbour to Skippool updated Stage 3 scheme design Economic Assessment has shown that the overall objectives of the scheme to support economic growth in the area, improve safety along the route and to improve journey time reliability have been met and it is therefore worthwhile in economic terms to proceed with the updated Stage 3 scheme design.

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Appendix H – Stage 3 Traffic Operational Appraisal Report

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A585 Windy Harbour to Skippool

Traffic Operational Appraisal Report

HE548643-ARC-GEN-A585-RP-D-3065
13 SEPTEMBER 2018

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This report dated 13/09/2018 has been prepared for Highways England (the “Client”) in accordance with the terms and conditions of appointment dated 16 March 2016 (the “Appointment”) between the client and Arcadis Consulting (UK) Limited (“Arcadis”) for the purposes specified in the Appointment. For the avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

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1 Introduction

1.1.1 The report Version 2.0 is a re-submission of Version 1.0, approved by Highways England. The re-submission of the report follows the update of the strategic model with the final scheme design. This report has been updated for consistency.

1.2 Overview

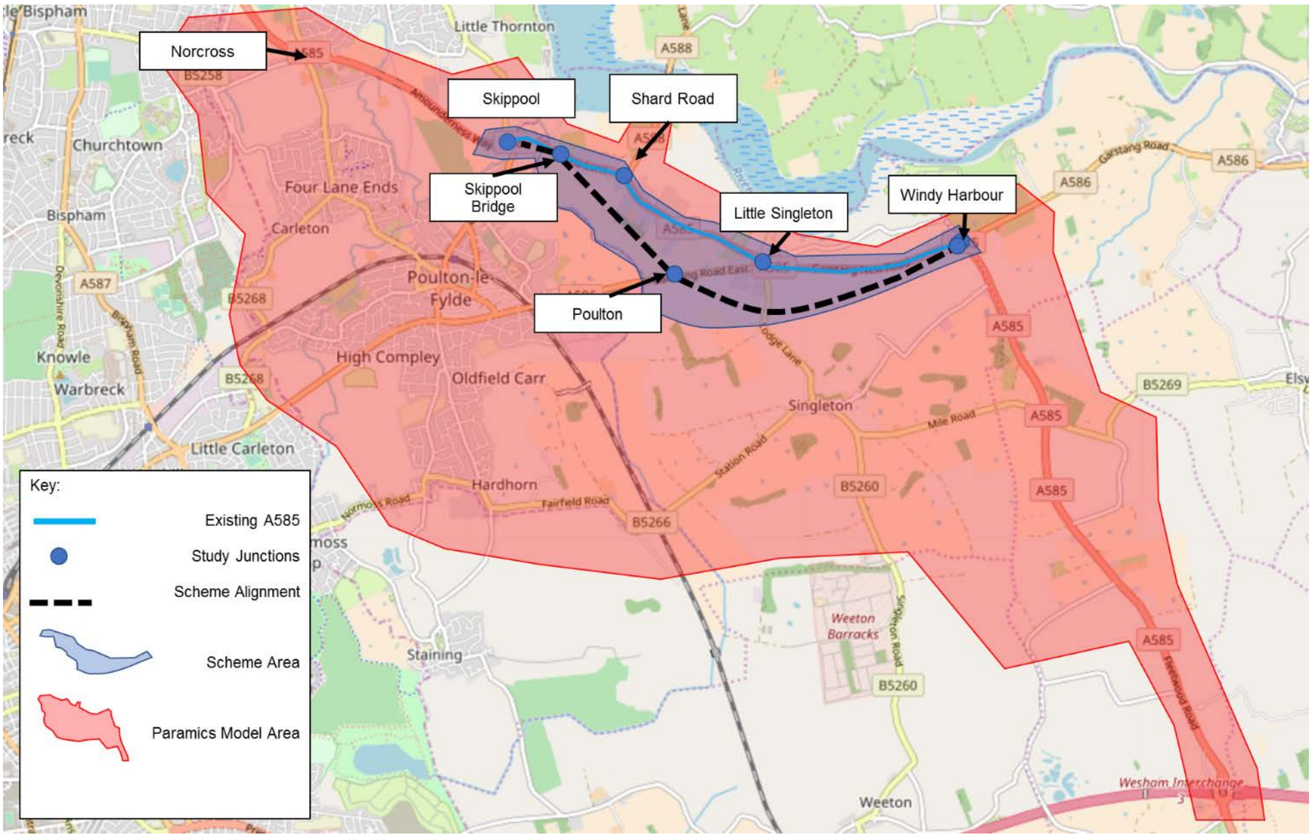
1.2.1 This report has been prepared to outline the traffic operational appraisal undertaken in Stage 3, Preliminary Design, for the A585 Windy Harbour to Skippool improvement scheme. The operational assessment was carried out on the Scheme design year (2037) traffic flows from the SATURN strategic model.

1.2.2 The purpose of the Stage 3 traffic operational appraisal work was to inform the refinement process of the design of the key junctions. All transport planning reporting for the economic and environmental analysis is part of the transport forecasting report, using Saturn software.

1.2.3 All operational modelling has been undertaken using Paramics Discovery v19.

1.2.4 The scheme study area as well as key junctions are shown in Figure 1.1.

Figure 1.1 - A585 Scheme Study Area



Operations Appraisal Limitations

1.1.1 An important finding during Stage 2 assessments was the severe congestion in the Norcross area predicted in the design year. This congestion significantly constrains the throughput of traffic eastbound from the Norcross area towards the Skippool junction. With the Stage 3 forecast matrices, this issue is exacerbated.

1.2.5 The design assessment presented in this document does not take into account the upgrade of the network in the Norcross area. There may be limited reserve capacity at the proposed Skippool junction as a result of possible increases in traffic from an improved Norcross junction.

1.3 Report Scope

1.3.1 This report includes the following chapters:

- Chapter 2 summarises the previous traffic operational modelling work undertaken during Stage 1 and 2 of the A585 scheme;
- Chapter 3 details the methodology for the design year demand matrices used in the Paramics models;
- Chapter 4 presents the operational appraisal results for the final Stage 3 scheme designs; and
- Chapter 5 summarises the tests that have been undertaken throughout Stage 3 to develop the design of each of the scheme junctions.

2 Summary of Previous Work

2.1 Stage 0

2.1.1 Project Control Framework (PCF) Stage 0 - Scheme assessments undertaken in February 2015 tested an ‘offline solution to the A585’, in the form of ‘Southern Bypass’ and an ‘online solution’ featuring a one-way gyratory system around the Little Singleton area, along with junction improvements at Little Singleton (Five Lane Ends) and at the Shard Road junction with A585 Mains Lane.

2.1.2 These tests concluded that both options would potentially offer considerable benefits to drivers in terms of journey times and congestion relief.

2.1.3 It was recommended that the Skippool roundabout was upgraded to a fully signalised junction to maximise the potential benefits and resilience of the scheme.

2.2 Stage 1

2.2.1 Arcadis was then commissioned to undertake the PCF Stage 1 (Option Identification) by Highways England. This involved sifting of the three main options of the proposed A585 Windy Harbour to Skippool Improvement Scheme using S-Paramics microsimulation models.

2.2.2 As a part of PCF Stage 1, 48 different variants of the three main options of the proposed A585 Windy Harbour to Skippool Improvement Scheme were developed and assessed. The results have been reported in the “S-Paramics Sensitivity Testing Report”, Reference No - HE548643-HYD-GEN-A585-RP-TR-1023.

2.2.3 The outcome of this sifting process was the selection of three variants of the proposed A585 Windy Harbour to Skippool Improvement Scheme. These were:

- Option S1 Grange + Skippool Bridge – Southern Bypass including a signalised junction with Garstang New Road (Grange junction) east of Little Singleton, a roundabout junction with the A586 Garstang Road East (Poulton junction) and a signalised junction with the existing Mains Lane (Skippool Bridge junction);
- Option O1 Base - improvements to the existing A585 (no bypass); and
- Option N1 Grange + Skippool Bridge (with a section north of the existing A585) – Bypass with southerly alignment between Windy Harbour and the Poulton junction (as per Option S1) which then follows a northernly alignment until re-joining Mains Lane at Skippool Bridge.

2.2.4 It should be noted that Option N1 was not taken to the non-statutory consultation and that Option S1 was described as Option 1A or 1B depending on whether the Grange Junction connecting the bypass to Garstang New Road or not. Option O1 was similarly described as Option 2.

2.2.5 All three scheme options included an upgraded, fully-signalised Skippool junction, replacing the existing roundabout.

2.2.6 All the three schemes assessed offered value for money, with the online scheme offering the highest Benefit to Cost Ratio (BCR). In the end, when combined with various other factors, and measured against the scheme objectives at the A585 Options Sifting Workshop on April 1st 2016, the Project recommended:

- that Option S1 Grange + Skippool Bridge be taken forward for consultation as the preferred option; and
- That the O1 Base and N1 Grange + Skippool Bridge being presented as non-preferred options.

2.2.7 The results of the above work have been documented in the Stage 1 Traffic Forecasting Report (ref. HE548643-HYD-GEN-A585-RP-TR-1014) submitted in May 2016.

2.3 Stage 2

2.3.1 Following a value management workshop which considered each scheme option for their compliance with the project objectives, the following options were taken forward for Stage 2 Option Selection assessments:

- Option 1A (Formerly Option S1 Grange + Skippool Bridge in Stage 1 Assessments) – Southern Bypass including a signalised junction with Garstang New Road (Grange Junction) east of Little Singleton; and
- Option 1B (Formerly Option S1A Skippool Bridge in Stage 1 Assessments) – Southern Bypass but

not including a junction with Garstang New Road east of Little Singleton

- Option 2 (Formerly Option O1 Base in Stage 1 Assessments) – improvements to the existing A585 (no bypass).

2.3.2 Stage 2 traffic operational appraisals were undertaken for Option 1B and Option 2 only. The demand matrices were extracted from the post-VDM SATURN model runs, for which an Option 1A model had not yet been developed.

2.3.3 The results of the traffic operational appraisals can be found in HE548643-ARC-GEN-A585-TN-TR-2029. From a traffic point of view, the Operational Appraisal Report concluded that the Option 1B Southern Bypass scheme offered the greatest overall benefits compared to Option 2 No Bypass and was demonstrated to accommodate higher flows than the Option 2 scheme, with capacity in reserve to accommodate future development in the area.

2.3.4 An important finding during Stage 2 assessments was the severe congestion in the Norcross area predicted in the design year. This constrained the throughput of traffic eastbound from the Norcross area towards the Skippool junction.

2.3.5 Some design issues with the proposed Scheme junctions were identified during the Stage 2 traffic operational appraisal. The following recommendations for Stage 3:

- Poulton junction – Long queues on the side roads (A586 Garstang Road) were observed in the Paramics model, due to the large volume of traffic through the junction, which was in roundabout form. This was causing significant delays to side road. It was recommended that the design of the Poulton junction was re-visited and improved during Stage 3.
- Skippool Bridge junction – Long queues were observed on the Mains Lane approach to the signalised Skippool Bridge junction. These queues were observed to block back across the Old Mains Lane side road and required a high green time allocation to clear them, decreasing the operational efficiency of the junction as a result. It was recommended that a longer multi-lane approach for traffic travelling westbound onto the bypass was included in Stage 3 designs.
- Skippool junction – It was observed that straight ahead/right turning traffic on the Breck Road and Skippool Road approaches to the signalised Skippool junction was blocking left turning traffic from entering the segregated left turn lanes. This was causing delays and decreasing the operational efficiency of the junction. It was recommended that the multi-lane approaches on each arm were extended where possible to minimise the issue.

3 Stage 3 Traffic Demand

3.1 Overview

3.1.1 The Stage 3 Traffic Operational Appraisal was undertaken for the scheme design year of 2037 only. As in Stage 2, the Paramics demands for the Scheme model were extracted from a cordoned version of the SATURN strategic model. Details of the Stage 3 demand forecasting methodology can be found in the Stage 3 Traffic Forecasting Package (HE548643-ARC-TTM-A585-RP-ZM-3144).

3.2 Demand Model

3.2.1 Demand matrices were extracted from a cordoned version of the SATURN strategic model, in the following format:

- Model ID – VDM_06 Core Scenario
- Forecast Year – 2037 (Design Year)
- Periods – AM and PM peak hours only (based on an average hour between 0730-0930 and 1500-1800, respectively)
- User class breakdown:
    - Matrix 1 – Car Commute
    - Matrix 2 – Car Non-Commute
    - Matrix 3 – Car Work (Employers Business)
    - Matrix 4 – LGVs
    - Matrix 5 - HGVs
- Units - PCUs

3.3 Paramics Matrices Preparation

3.3.1 A cordoned version of the SATURN model was prepared. Demand matrices for the AM and PM peak hours were then extracted into text files. The text files were processed and formatted for importing into Paramics Discovery. This required the removal of trips between origin and destination zones associated with the through-movements at the M55 Junction 3. This movement is modelled in the SATURN model, but not it is outside the study area of the Paramics model.

3.3.2 The AM and PM peak periods, as represented in the SATURN Scheme model, are simulated in the Paramics Discovery Scheme model: The AM peak hour demands are based on a typical peak hour between 07:30-09:30, and the PM peak hour is based on a typical peak hour between 15:00-18:00.

3.3.3 ‘Warm-up’ periods are also present in the Paramics model, to ensure realistic conditions at the start of each peak hour. ‘Cool down’ periods were also included to ensure the accurate collecting of statistics in the model.

3.3.4 The demand release profiles used in the calibrated and validated Stage 2 Base model, from which the Stage 3 Scheme model was developed, were retained for Stage 3 assessments. Full details of the calibrated and validated base year model can be found in the Stage 2 Paramics Model Validation Report (HE548643-ARC-EGN-A585-RP-TR-2061).

3.3.5 The demands extracted from the SATURN model were in PCUs. These were converted into vehicles for use in Paramics, and can be referred to in further detail in Appendix A, using the following factors:

- Cars = 1 PCU
- LGVs = 1 PCU
- HGVs = 2 PCUs

4 Traffic Operational Appraisal

4.1 Overview

4.1.1 This chapter presents the results of the traffic operational appraisal of stage 3 preliminary design for the Poulton, Skippool Bridge and Skippool scheme junctions, and also for the Shard Road/Mains Lane junction which will also change as part of the scheme.

4.1.2 All modelling results have been taken as an average across ten random seed runs of the Paramics model.

4.2 Poulton Junction

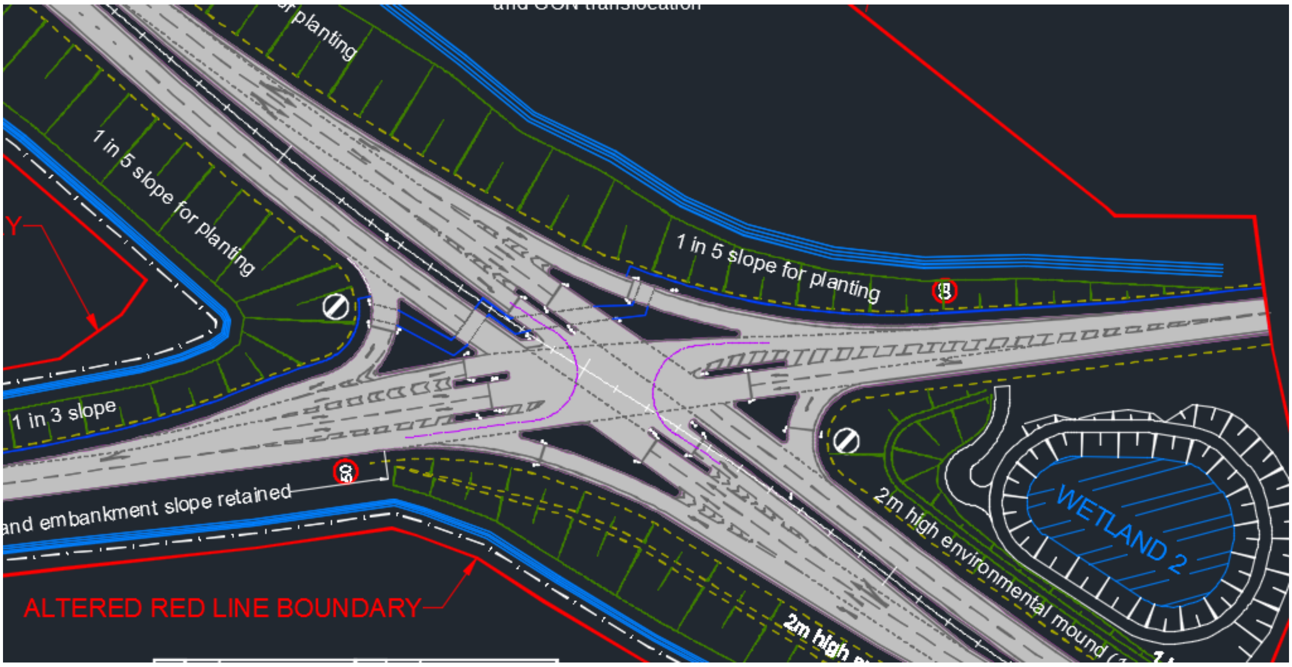
Junction Overview

4.2.1 The Poulton junction connects the A585 bypass to the existing A586 Garstang Road East between Poulton and Little Singleton.

4.2.2 During Stage 2 assessments for Option 1b, which was taken forward as the preferred scheme design, the Poulton junction was in roundabout form. The Stage 2 traffic operational appraisal concluded that the roundabout was approaching capacity on the A586 approaches. Due to the increase in Stage 3 demand flows, the design and form of junction at Poulton was re-visited, as detailed in the technical note HE548643-ARC-HGN-A585-TN-ZM-3020 (Appendix C).This concluded that the roundabout was saturated with the Stage 3 demands and that a fully signalised junction, as tested during Stage 1, was the preferred junction design.

4.2.3 The Stage 3 design for the signalised Poulton junction is shown in Figure 4.1.

Figure 4.1 – Poulton Junction Layout



Modelling Results and Analysis

4.2.4 Full junction analysis files including phase/stage diagrams, capacity calculations, intergreens and timing sheets can be found in Appendix B.

Queues

4.2.5 Table 4.1 shows the maximum queue lengths on each junction arm, along with the maximum expected queue length under free flow conditions, which is calculated based on the green time allocated to each movement. These calculations and figures are detailed further in Appendix B. Also shown is the proximity of each arm to the next junction in the model. These results assume that the pedestrian phases are called for every cycle, which would not be the case on site.

Table 4.1 – Poulton Junction Max Queue Lengths

Approach	AM		PM		Distance from Upstream Junction in Model (m)	Next Junction in Model
	Max Expected Free-Flow Queue – Early Assessment (m)	Max Modelled Queue – Paramics Output (m)	Max Expected Free-Flow Queue – Early Assessment (m)	Max Modelled Queue – Paramics Output (m)		
A585 South	203	154	203	168	2,632	Windy Harbour
A586 West	137	104	112	92	601	Poulton Industrial Estate
A585 North	137	106	126	110	1,435	Skippool Bridge
A586 East	35	27	42	45	826	Little Singleton

4.2.6 The queue length results show that all maximum modelled queue lengths are within the expected maximum free-flow value, with the exception of the A586 eastern approach in the PM peak, which exceeds this by 3m. This is not seen as a major issue given that there is very little chance of this queue causing blocking back to the next junction.

Delays

4.2.7 Table 4.2 summarises the average delay and congestion delay to traffic through the junction.

4.2.8 Because of the high levels of traffic, congestion delay is expected. This additional delay can be due to:

- Excessive queuing; and
- Green time extensions because of actuated traffic signals.

4.2.9 In the Paramics model, pedestrian crossings have been called at every cycle, which is unlikely to occur on the ground.

Table 4.2 – Poulton Junction Delays

Approach	AM			PM		
	Volume (Vehicles)	Average Delay (s)	Average Congestion Delay (s)	Volume (Vehicles)	Average Delay (s)	Average Congestion Delay (s)
A585 S Ahead	899	39	15	1187	34	11
A585 S RT	6	44	14	1	42	12.5
A585 S LT	484	14	7	480	14	8
A586 W Ahead	117	41	26	45	41	19
A586 W RT	738	47	27	667	50	31
A586 W LT	157	15	19	178	13	18
A585 N Ahead	807	39	8	997	33	2
A585 N RT	178	55	31	112	48	21
A585 N LT	149	13	11	106	6	7
A586 E Ahead/Right	113	44	27	188	46	22
A586 E LT	7	4	3	6	6	5

4.2.10 The junction was observed to be free flowing in the Paramics model.

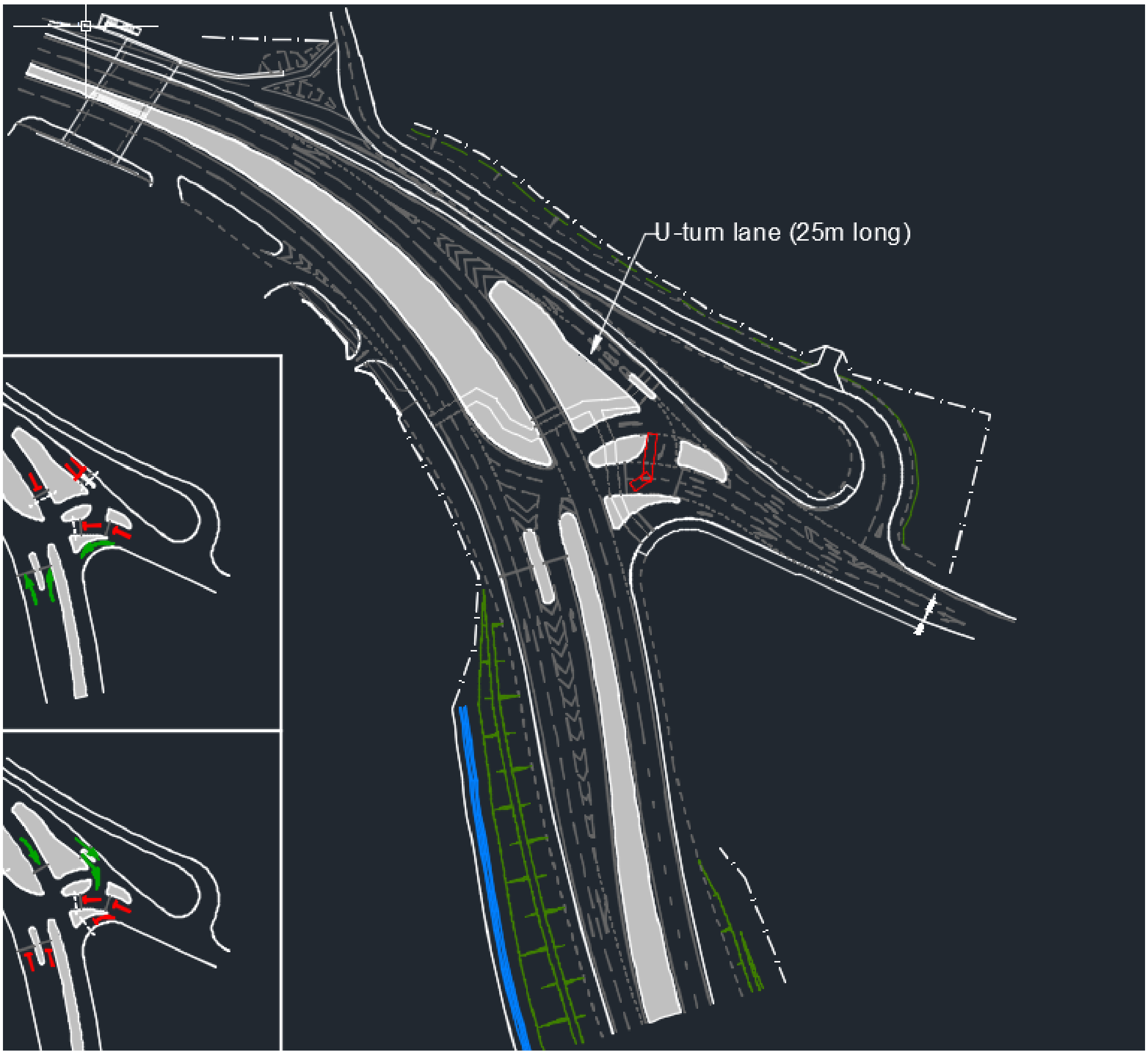
4.3 Skippool Bridge Junction

Junction Overview

4.3.1 Stage 2 assessments concluded that a longer westbound multi-lane approach to the junction from Mains Lane was required in order to prevent blocking back across the Old Mains Lane junction, and to improve the efficiency of the junction through a reduced cycle time. The final Stage 3 design includes a longer multi-lane approach, and the provision for the U-turn movement from the A585 SB to A585 NB.

4.3.2 The Stage 3 design for the signalised Skippool Bridge junction is shown in Figure 4.2.

Figure 4.2 – Skippool Bridge Junction Layout



Modelling Results and Analysis

4.3.3 Full junction analysis files including phase/stage diagrams, capacity calculations, inter-greens and timing sheets can be found in Appendix B.

4.3.4 **Queues**

Table 4.3 shows the maximum queue lengths on each junction arm, along with the maximum expected queue length under free flow conditions, which is calculated based on the green time allocated to each movement. These calculations and figures are detailed further in Appendix B.

Table 4.3 – Skippool Bridge Junction Max Queue Lengths

Approach	AM		PM		Distance from Next Junction in Model (m)	Next Junction in Model
	Max Expected Free-Flow Queue – Early Assessment (m)	Max Modelled Queue – Paramics Output (m)	Max Expected Free-Flow Queue – Early Assessment (m)	Max Modelled Queue – Paramics Output (m)		
A585 South	154	100	196	115	1435	Poulton
A585 North	102	87	140	87	455	Skippool
A585 North Left Slip	168	38	210	58	465	Skippool
Mains Lane	133	63	133	49	55	Old Mains Lane

4.3.5 The results show that all queue lengths are within the maximum expected free-flow values. The modelled queue length on Mains Lane in the AM peak hour is 63m, which may cause some occasional blocking of the Old Mains Lane junction, which is approximately 55m back from the stop-line on Mains Lane. These queues, however, occur only briefly and clear each cycle.

4.3.6 The profile of demands arriving at the junction is such that traffic detection and variable green timings for all movements through the junction significantly improves the operation of the junction compared to fixed timings and allows queues to clear each cycle with minimal chance of blocking back on any of the other approaches

Delays

4.3.7 Table 4.4 summarises the average delay and congestion delay to traffic through the junction. In the Paramics model, pedestrian crossings have been called at every cycle, which is unlikely to occur on the ground.

Table 4.4 – Skippool Bridge Junction Delays

Approach	AM			PM		
	Volume (Vehicles)	Average Delay (s)	Average Congestion Delay (s)	Volume (Vehicles)	Average Delay (s)	Average Congestion Delay (s)
A585 South	934	15	13	1245	12	8
A585 South RT	176	25	19	254	35	26
A585 North	840	21	6	1036	20	5
A585 North LT	361	6	1	576	8	4
Mains Lane RT	577	25	10	379	27	12
Mains Lane LT	293	10	11	173	8	8

4.3.8 The junction was observed to be free flowing in the Paramics model and the introduction of traffic detectors has been particularly effective.

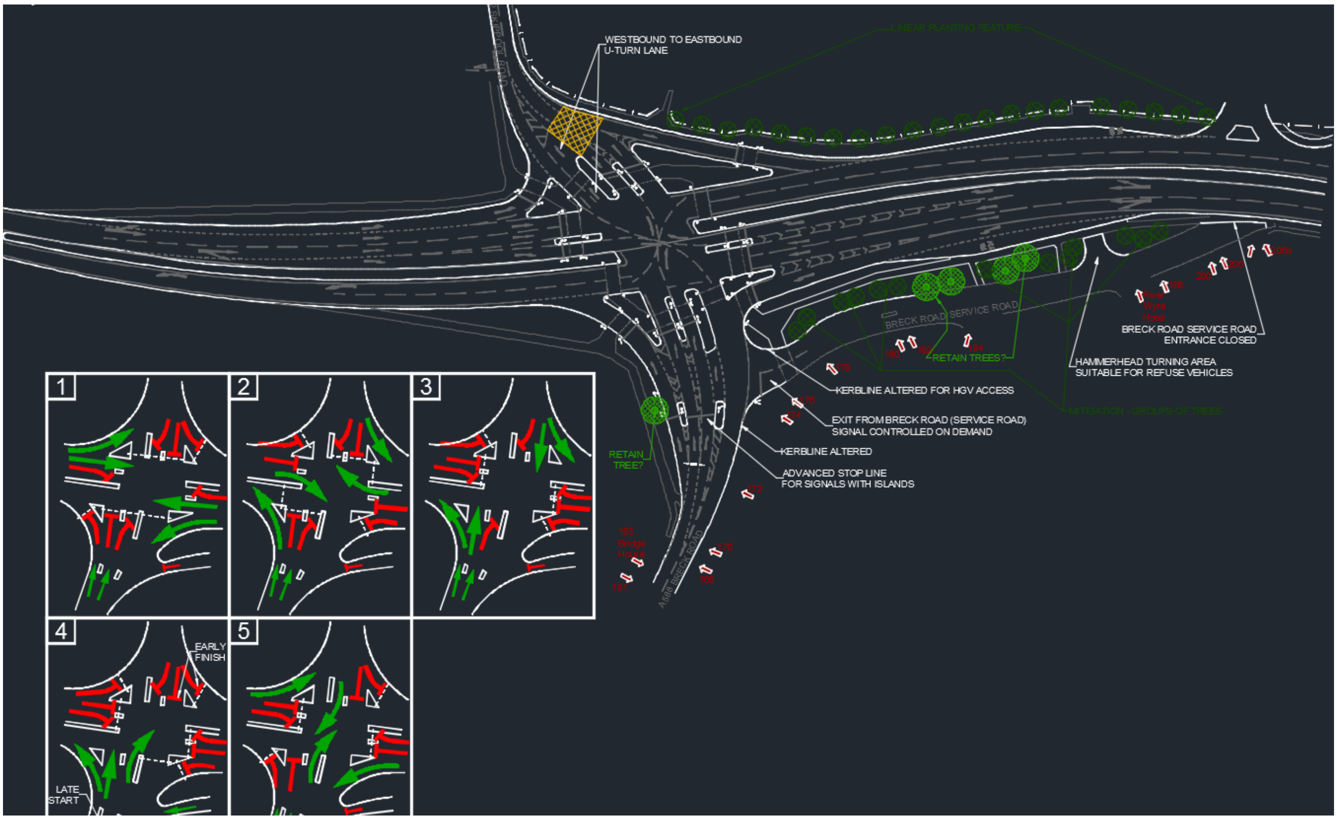
4.4 Skippool Junction

Junction Overview

4.4.1 The design of the Skippool junction was developed during Stage 3 to accommodate the U-turn movement from the A585 Mains Lane westbound to eastbound. Additionally, the junction was expanded to include the service road which currently runs between Mains Lane and Breck Road. This road is to be severed at its eastern extent, meaning all access to properties along the road will be via Breck Road. In order to allow the safe exit of vehicles from this road, an advanced stop-line and an additional stage was added to the junction to allow on demand green time to be allocated to this movement. The U-turn and service road movements did not have a demand in the design year forecast matrices, so these were tested using dummy demands to ensure the movements were working properly.

4.4.2 The Stage 3 design for the signalised Skippool junction is shown in Figure 4.3.

Figure 4.3 – Skippool Junction Layout



Modelling Results and Analysis

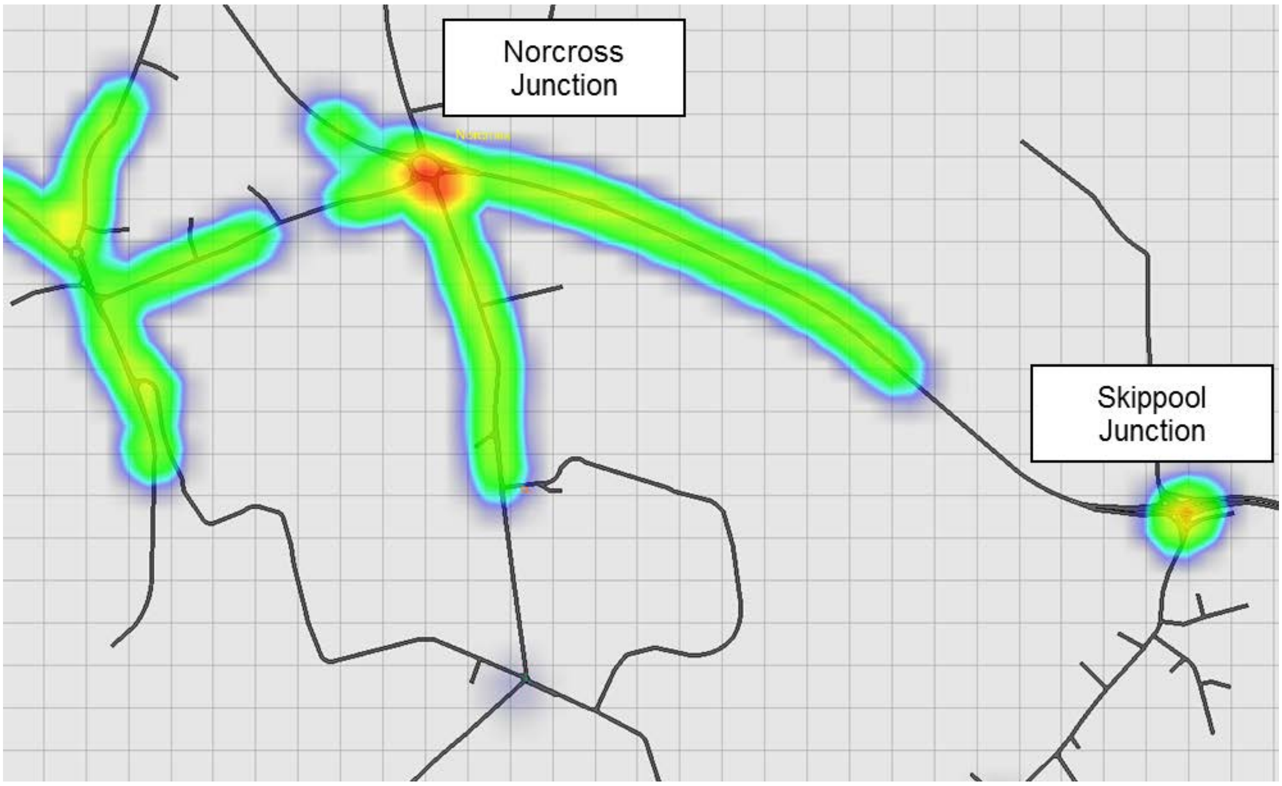
4.4.3 An important finding during Stage 2 assessments was the severe congestion in the Norcross area predicted in the design year. With the Stage 3 forecast matrices, this issue is exacerbated. This has a significant impact on the throughput of traffic eastbound from the Norcross area towards the Skippool junction.

4.4.4 shows the congestion in the Norcross area towards the end of the PM peak hour. The heatmap represents the severity of queuing, rather than having a specific numerical scale.

4.4.5 There may be limited reserve capacity at the proposed Skippool junction as a result of possible increases in traffic from an improved Norcross junction.

4.4.6 Full junction analysis files including phase/stage diagrams, capacity calculations, inter-greens and timing sheets can be found in Appendix B.

Figure 4.4 – Norcross Area Congestion



Queues

4.4.7 Table 4.5 shows the maximum queue lengths on each junction arm, along with the maximum expected queue length under free flow conditions, which is calculated based on the green time allocated to each movement. These calculations and figures are detailed further in Appendix B.

Table 4.5 – Skippool Junction Max Queue Lengths

Approach	AM		PM		Distance from Next Junction (m)	Next Junction
	Max Expected Free-Flow Queue – Early Assessment (m)	Max Modelled Queue – Paramics Output (m)	Max Expected Free-Flow Queue – Early Assessment (m)	Max Modelled Queue – Paramics Output (m)		
A585 Mains Lane	147	152	133	147	455	Skippool Bridge
Breck Road	147	84	147	129	283	Riversway
A585 Amounderness Way	154	128	133	148	1974	Norcross
Skippool Road	147	50	147	62	n/a	n/a

4.4.8 The queue length results show that the queues on the A585 Mains Lane slightly exceed the maximum expected free flow queue length, by approximately 1 PCU in the AM peak, and approximately 2 PCUs in the PM peak. The distance to the next junction (Skippool Bridge) is far enough that there is minimal risk of these queues causing blocking back to the junction. The PM peak maximum modelled queue length on A585 Amounderness Way exceeds the maximum expected by approximately 2.5 PCUs. Similarly, there is a minimal risk of this causing blocking back across any upstream junctions.

4.4.9 These queue lengths represent a small number of cases where the queues do not fully clear in a cycle, as a result of the non-uniform arrival of trips at the junction. These are observed to occur within a 5-minute peak period. Out-with this period queues are observed to clear each cycle.

4.4.10 The operation of the junction could be improved in practice by implementing a link between the Skippool and Skippool Bridge junctions in order to minimise delays and queue lengths.

4.4.11 Furthermore, it has been assumed that the pedestrian phases are called during each cycle in the model, which is unlikely to occur in reality.

Delays

4.4.12 Table 4.6 summarises the average and congestion delay to traffic through the junction.

4.4.13 A level of congestion delay is expected due to the use of variable signal timings under congested conditions compared to free-flow conditions which require a shorter cycle length.

Table 4.6 – Skippool Junction Delays

Approach	AM			PM		
	Volume (Vehicles)	Average Delay (s)	Average Congestion Delay (s)	Volume (Vehicles)	Average Delay (s)	Average Congestion Delay (s)
Mains Lane Ahead	1013	51	22	1066	49	21
Mains Lane RT	412	41	15	466	47	27
Mains Lane LT	70	23	18	88	22	15
Breck Road Ahead	195	54	28	277	56	35
Breck Road RT	123	43	11	128	60	9
Breck Road LT	348	19	9	444	31	26
Amounderness Way Ahead	748	35	10	983	36	16
Amounderness Way RT	478	33	14	363	24	15
Amounderness Way LT	5	12	21	12	10	8
Skippool Road Ahead	179	40	14	222	33	15
Skippool Road LT	333	12	6	512	11	10
Skippool Road RT	6	33	23	4	37	27

4.4.14 The junction was observed to be free flowing in the Paramics model but an irregular traffic arrival pattern requires the vehicle actuation setup with the ability to clear excess traffic queueing.

4.5 Shard Road Junction

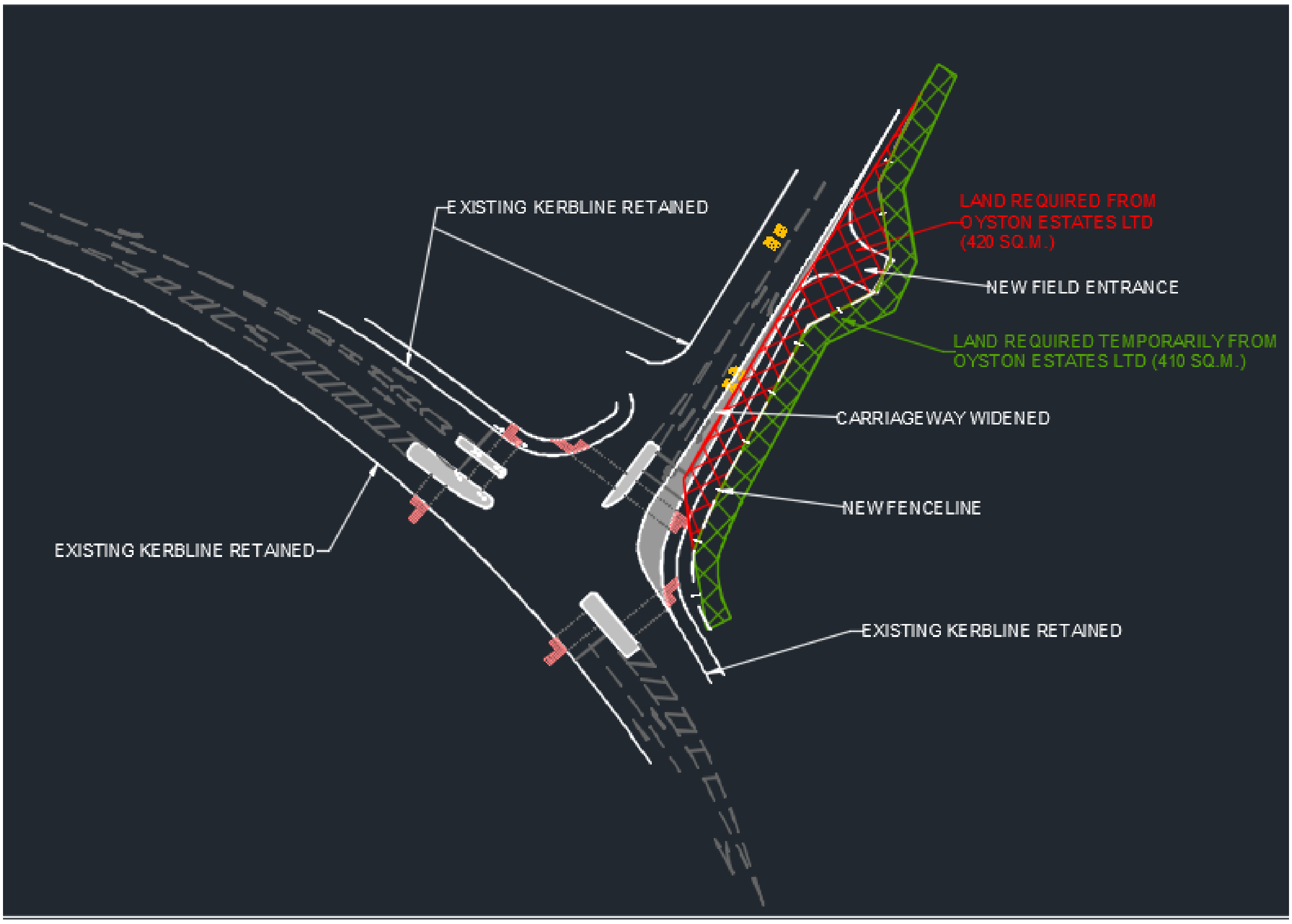
Junction Overview

4.5.1 Stage 2 assessments highlighted some queuing issues on the Shard Road and Mains Lane North-western approaches to the junction, which was maintained in its existing layout and staging arrangement.

4.5.2 Tests were undertaken during Stage 3 to determine the optimum layout and staging arrangement to accommodate the change in traffic movements and flows through the junction as a result of the scheme. The movements both ways between Shard Road and Mains Lane NW are the dominant movements through the junction in both peaks, so the final design has been developed to allow for these movements to run in a single stage, by implementing a splitter island on the Mains Lane NW approach. This, in conjunction with reduced flows on the bypassed Mains Lane, significantly improves the operation of the junction compared to its existing layout.

4.5.3 The Stage 3 design for the signalised Shard Road junction is shown in Figure 4.5.

Figure 4.5 – Shard Road Junction Layout



Modelling Results and Analysis

4.5.4 Full junction analysis files including phase/stage diagrams, capacity calculations, inter-greens and timing sheets can be found in Appendix B.

Queues

4.5.5 Table 4.7 shows the maximum queue lengths on each junction arm, along with the maximum expected queue length under free flow conditions, which is calculated based on the green time allocated to each movement. These calculations and figures are detailed further in Appendix B.

Table 4.7 – Shard Road Junction Max Queue Lengths

Approach	AM		PM		Distance from Next Junction in Model (m)	Next Junction in Model
	Max Expected Free-Flow Queue – Early Assessment (m)	Max Modelled Queue – Paramics Output (m)	Max Expected Free-Flow Queue – Early Assessment (m)	Max Modelled Queue – Paramics Output (m)		
Mains Lane NW	140	54	140	92	514	Skippool Bridge
Shard Road	140	78	140	52	n/a	n/a
Mains Lane SE	24.5	8	24.5	20	1532	Little Singleton

4.5.6 The results demonstrate that all maximum modelled queues are within the expected maximum free-flow queue lengths. These were observed to clear during each cycle during model runs. The junction was modelled using fixed timings, as the traffic profile through the junction is relatively uniform, and the non-dominant movements have a sufficiently low demand as to only require the minimum green time of 7 seconds.

Delays

4.5.7 Table 4.8 summarises the average free-flow and congestion delay to traffic through the junction.

Table 4.8 – Shard Road Junction Delays

Approach	AM			PM		
	Volume (Vehicles)	Average Delay (s)	Average Congestion Delay (s)	Volume (Vehicles)	Average Delay (s)	Average Congestion Delay (s)
Shard Road	922	14	7	558	9	2
Mains Lane NW	542	8	2	832	8	5
Mains Lane SE	30	31	6	74	33	5

4.5.8 The junction was observed to be free flowing in the Paramics model.

5 Record of Operational Assessments

5.1.1 Table 5.1 summarises the tests undertaken during Stage 3 Preliminary Design operational assessments.

Table 5.1 - Summary of Operational Assessments

Junction	Tests Undertaken	Outcomes
Poulton	Stage 2 assessments had concluded that the roundabout design could become over-capacity with increased demands. The Stage 3 model, with updated demands and pedestrian/cyclist facilities taken into consideration, was operating over-capacity and the flows through the junction resulted in an unsafe arrangement for side road traffic. Several alternative solutions were tested: 1. Small Roundabout (priority control) (Existing roundabout) 2. Larger Standard Roundabout (priority control) 3. Non-standard Roundabout (signalised) 4. Larger Standard Roundabout (signalised) (Same as 2 with signals) 5. Fully Signalised Crossroads	The results of the tests concluded that the signalised crossroads was the best performing junction arrangement, and was agreed with Highways England as the design taken forward
Skippool Bridge	The provision for u-turning vehicles was included in the stage 3 design, which required the re-positioning of the stop-lines on Mains Lane for right turning traffic. As per Stage 2 recommendations, the two-lane approach for right turners from Mains Lane was extended to prevent queuing across the junction with Old Mains Lane.	The allowance for u-turn was tested by using dummy demands in the Paramics model, as there was no demand for this movement in the existing matrix/zone structure. Model observations showed this movement to work well. The extended multi-lane approach on Mains Lane resolves the issue of vehicles queuing back across the Old Mains Lane junction
Skippool	U-turn provision for Mains Lane westbound to Mains Lane eastbound traffic was tested, which included an additional lane on the northbound Skippool Road exit The junction design was also updated to include a signalised movement from the Breck Road service road, which is to be severed at its eastern junction with Mains Lane. An additional on demand stage was added to the junction to allow for vehicles to safely exit the service road.	The allowance for u-turn was tested by using dummy demands in the Paramics model, as there was no demand for this movement in the existing matrix/zone structure. Model observations showed this movement to work well. The on-demand side road stage was coded and tested using dummy demands, as no demand existed in the model. Model observations found this to operate satisfactorily for all movements to/from the service road.
Shard Road	Tests were undertaken on revised junction layouts, required to incorporate pedestrian/cycle crossing facilities, and also on alternative junction layouts to accommodate optimum staging arrangement based on the change in traffic movements associated with the scheme. Layouts included two-lane exits on Mains Lane, and two lanes for right turns from Shard Road	Best performing solution involved splitter island on the north-western Mains Lane arm to allow the separate staging of the left turn and ahead movements from this arm. This arrangement performed best with two lanes allowing the right turn from Shard Road to Mains Lane, however land constraints made this option difficult, so the Mains Lane exit was retained as one lane, with one right turn lane from Shard Road, which still performs significantly better than the existing arrangement
Little Singleton	The existing Little Singleton junction is signalised. The scheme design at the start of Stage 3 included a roundabout at Little Singleton. This was changed during Stage 3 to a revised signalised junction which includes a Q-turn facility for bus services.	Both the roundabout and signalised junctions were found to operate well due to the low vehicle demand. A bus route was added to the model to test the Q-turn movement, which operated satisfactorily. Signal timings were set to values which did not represent the most efficient operation of the junction, in order to minimise the attractiveness of a potential rat run route between Mains Lane/Shard Road and A585 Fleetwood Road via Lodge Lane. The junction form has little impact on the design/operation of the Scheme junctions.

6 Conclusion

6.1.1 The operational assessment has highlighted no significant issues with the final Stage 3 Preliminary Design.

6.1.2 The Paramics Discovery operational scheme model is consistent with the final Stage 3 highways design and the Stage 3 strategic SATURN model.

6.1.3 The operational modelling assumes no scheme at the Norcross junction is in place in the design year for the A585 Windy Harbour to Skippool scheme. Inclusion of the Norcross scheme would require a separate assessment to determine its impact.

6.1.4 The scheme junctions have been optimised for free-flowing conditions.

Appendix A – Paramics Matrices

Electronic version only

Appendix B – Signalised Junction Summaries/Signal Timing Sheets

Electronic version only

Appendix C – Poulton Junction Assessment Technical Note

working on behalf of

Technical Note 20

Project	**A585 Windy Harbour to Skippool**	Date	**04/05/2018**
Subject	**Amendments to Poulton junction layout.**	Ref	**HE548643-ARC-HGN-A585-TN-ZM-3020**

Author Nick Henderson

Table of Contents

Prepared by	Nick Henderson	Date	02/05/2018
Checked by	Claire Bond / Paul Thomas	Date	03/05/2018
Approved by	Elena Vrabie	Date	04/05/2018

Revision Status	Amendments	Date
1.0	Issued for comment	04/05/2018

1 INTRODUCTION

1.1.1 This Technical Note has been produced to provide some background into the Operational Modelling and the issues that have been observed associated with Poulton junction, and seeks approval from Highways England on;

- Modifying the Stage 3 design at Poulton junction,
- The level of traffic modelling required for DCO

1.2 Background

1.2.1 During Stage 2 the Operational Assessment was carried out for Option 1B (which now reflects the Preferred Route) and Option 2 (Online option) using the outputs from the validated Saturn Donor Model. Technical Note 29 (HE548643-ARC-GEN-A585-TN-TR-2029) summarises the Stage 2 Operational Modelling Results and was submitted to Highways England on 23/08/2017.

1.2.2 Section 4.8 of Technical Note 29 outlines the findings from the operational assessment in relation to Poulton junction and concluded that "*junction is observed and demonstrated to work well, with some minor queues building up on the A586 Western arm in the AM peak hour. This is due to the short length of dual-lane approach on this arm and consists primarily of traffic wishing to join the southbound bypass*". Refer to Figure 1 which demonstrates the AM peak queuing on A586.

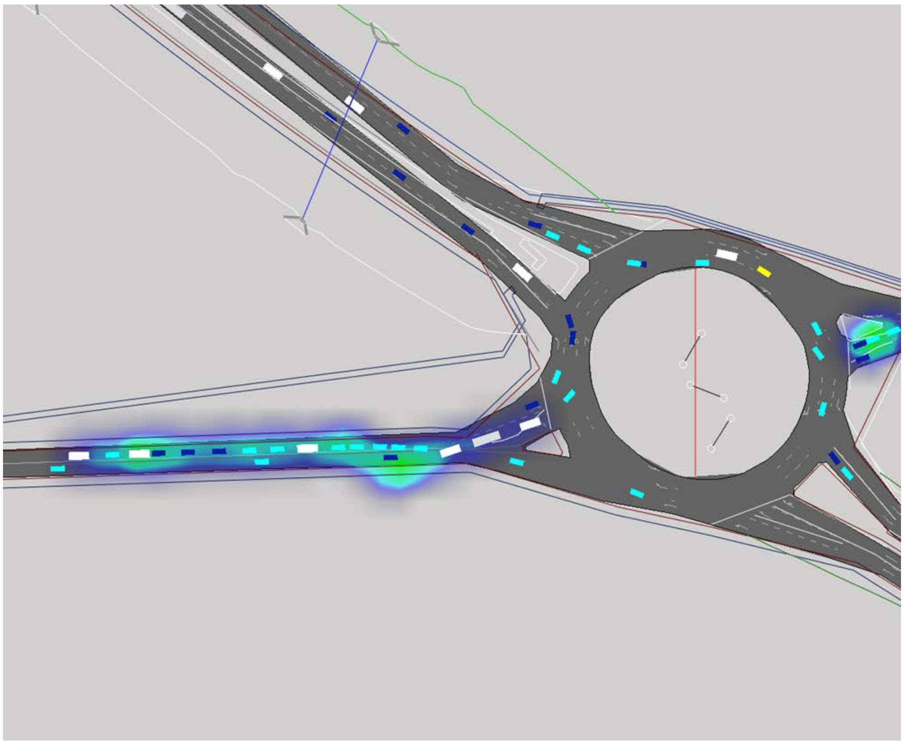


Figure 1 - AM peak queuing on A586

1.2.3 Figure 2 and Figure 3 indicate that the A586 attracts the greatest queues in the peak periods, followed by the westbound A585 traffic.

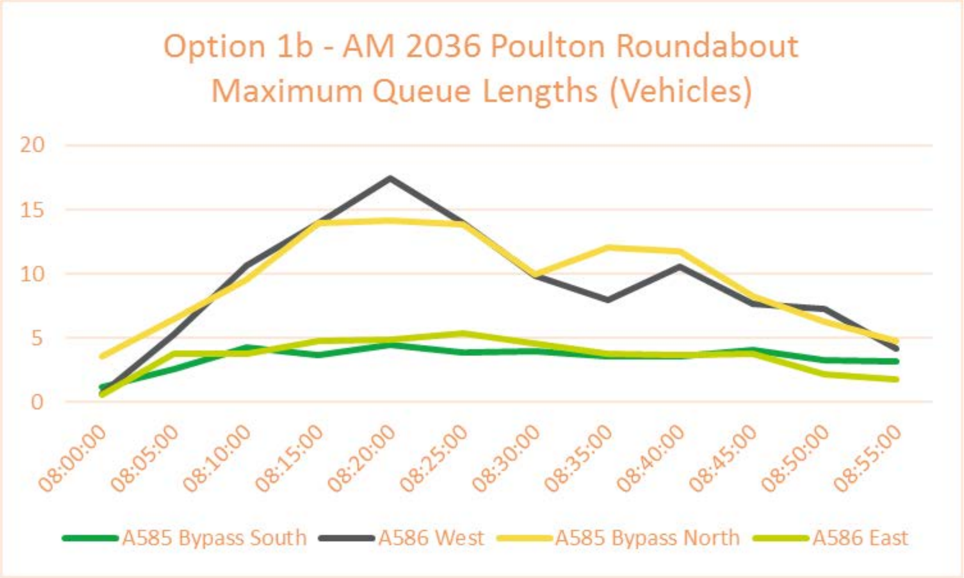


Figure 2 - AM 2036 Poulton Junction Queue Comparison

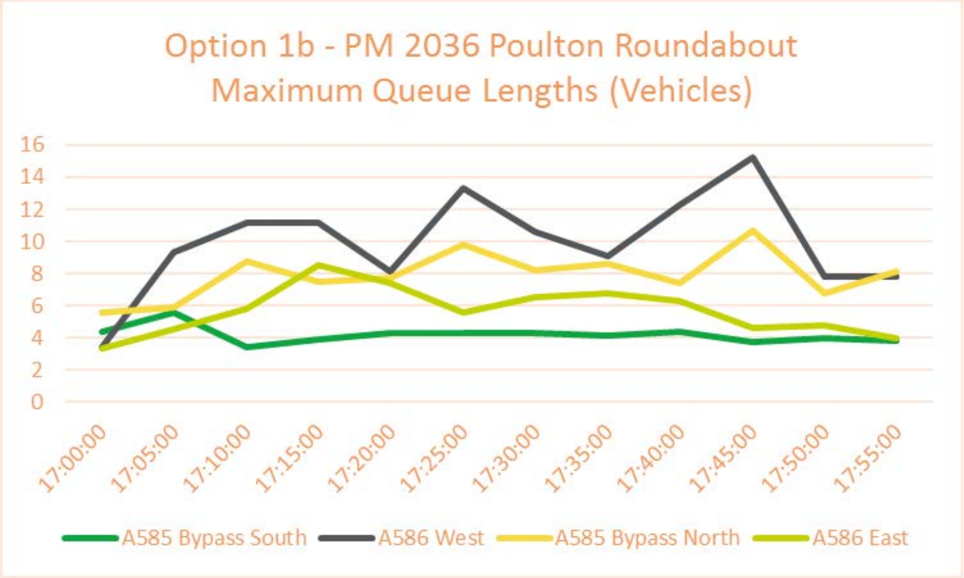


Figure 3 - PM 2036 Poulton Junction Queue Comparison

2 STAGE 3 OPERATIONAL ASSESSMENT

2.1.1 Before any work could be carried out in Stage 3, updated Traffic Forecasting information (Actual flow Core Scenario 2022, 2037 AM, PM With and Without Scheme Cordons) was required, this information was supplied to the Operational Assessment team on 27/02/2018.

2.1.2 As detailed in the Traffic Forecasting Package (HE548643-ARC-TTM-A585-RP-ZM-3144) updates were made to the Do Minimum (DM) and Do Something (DS) models to reflect changes in VoT (Value of Time), VOC (Vehicle Operating Costs) and changes to NTEM (National Trip End Model).

2.1.3 In Stage 3, the Opening and Design years were also revised from 2021 and 2036 to 2022 and 2037 and, as a consequence, traffic volumes increase slightly due to the design year being 2037 instead of 2036.

2.1.4 We have also undertaken further safety and pedestrian/cyclist user assessments.

2.1.5 Initial issues associated with Poulton junction were communicated with Highways England on 10/04/2018, and during subsequent discussions with Benchmark the uncertainty “pot” was increased to reflect the potential for the junction to either become a signalised roundabout or a signalised cross-roads.

2.2 Results from initial runs

2.2.1 In order to accommodate the change in design year traffic flows and the needs of other road users, the roundabout would require to be significantly larger as well as signalised (see Figure 4);

2.2.2 This initial result is prompting the traffic team to re-assess the suitability of the traffic signal cross-road solution (see Figure 5).

2.2.3 The following junction configurations have been tested in Paramics;

1. Small Roundabout (priority control) (Existing roundabout)
2. Larger Standard Roundabout (priority control)
3. Non-standard Roundabout (signalised)
4. Larger Standard Roundabout (signalised) (Same as 2 with signals)
5. Fully Signalised Crossroads

2.2.4 The team reviewed the requirements for accommodating these flows through a roundabout in terms of lane provision and signalising and came up with the design shown in Figure 4 and Figure 5.

Enlarged Poulton Roundabout

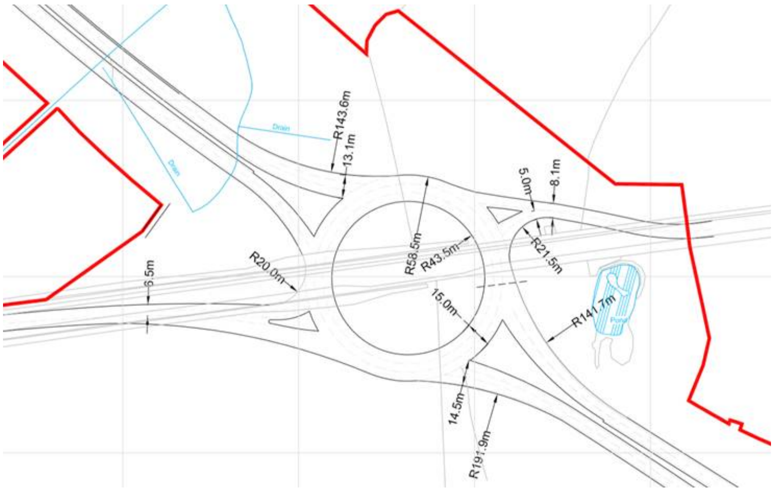


Figure 4 - Stage 3 Enlarged Roundabout Poulton Junction

2.2.5 The roundabout design changes at the Poulton junction required to accommodate the new traffic volumes are shown in Figure 4:

- Increased ICD by 30% (Inner Circle Diameter)
- Option tested with and without traffic signals

Non-standard Roundabout signalised

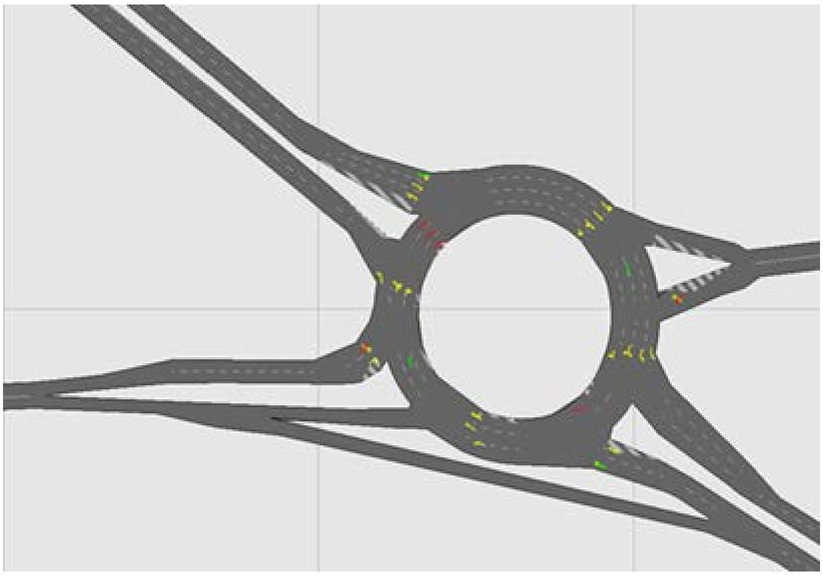


Figure 5 - Stage 3 Non-standard Poulton roundabout (signalised)

2.2.6 The roundabout design changes at the Poulton junction required to accommodate the new traffic volumes are shown in Figure 4:

- Full signalisation (but may only need to be peak periods operation);
- A left turn free flow slip from the South East to the West
- Three lanes exit towards the South East and a four-lane circulating carriageway within the junction

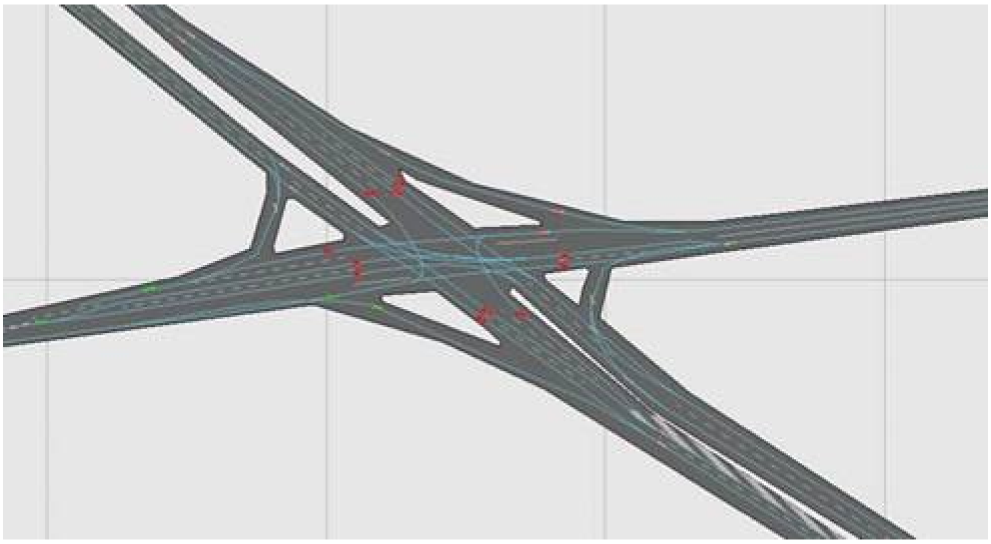


Figure 6 - Stage 3 Poulton Junction Revision 2 (Draft)

Note: Change to Junction Type and Capacity from the Preferred Route scheme design shown at the Stage 3 Public Consultation

2.2.7 In Stages 1 and 2, the decisions for favouring a roundabout over a fully signalised junction was the potential future provision of a fifth arm to serve a possible development to the southwest of the junction, and previously consideration was made predominantly to the journey time and queuing to the A585 bypass, rather than the local road network, as such the roundabout was shown to perform better than a signalised cross roads. This approach was taken due to the number of different scenarios that had been introduced.

2.2.8 The development opportunity would no longer exist considering the overall saturation of the junction in Stage 3, and the left slip lane required in the southwest of the roundabout. However it has been noted that a T-junction adjacent to the Poulton junction could be introduced if a development were promoted in the future, still providing a connection onto the A585 bypass.

2.2.9 This means that the signalised junction is potentially more advantageous in terms of reserve capacity and resilience to increased demands.

2.2.10 Furthermore, as part of the S42 Consultation process a specific question in relation to the Poulton roundabout was included in the Consultation Feedback Form. There is a risk that this change would need to be communicated in an updated Consultation Event or Public Information Event.

2.3 Initial Comparison of roundabout vs signalised cross-road

2.3.1 In terms of the comparison between the revised design and the roundabout see below Figure 6 which show average journey times on the A586 approaches to the junction when in roundabout form vs signals. It is clear that the roundabout results in significant delays to traffic on the A586 during the peak hours, whereas the signals keep entry times broadly consistent throughout each peak hour compared to the warm up hours. There's a short spike in the AM peak on the western approach to the junction, which can be improved with some tweaks to the signal timings.

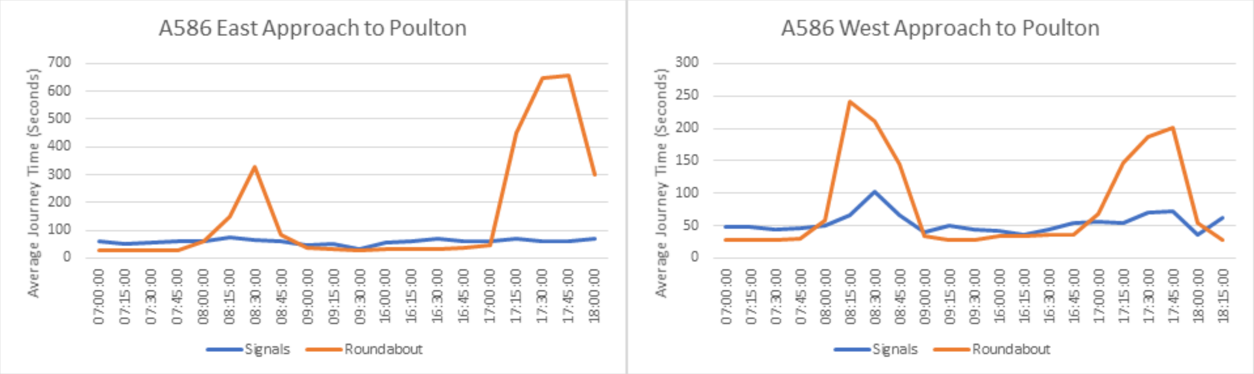


Figure 7 - Comparison of signalised cross-road vs existing roundabout for the A586 approaches to A585

2.3.2 Refer to Table 1 for a comparison of the various Poulton junction variants that were outlined in 2.2.3 above.

Table 1 - Comparison of the Poulton junction variants

Option Ref	Junction Configuration	Safety	Delays	Queuing	Futureproofing	Resilience	Consistency with other Scheme Junctions	Consistency with Public Consultation	NMUs	Design Criteria	Ranking
1	Small roundabout - priority	Not enough gaps for traffic from A586 Eastern arm to enter junction safely - not taken forward. Peak hour demands neccesitate signalising									
2	Larger standard roundabout - priority	Not enough gaps for traffic from A586 Eastern arm to enter junction safely - not taken forward. Peak hour demands neccesitate signalising									
3	Non-standard roundabout - signalised	Could potentially be non-signalised during off peak periods, subject to local operation team analysis	Low cycle time should mean shorter delays, but a lot of traffic has to wait two cycles	Max cycle time advisable for roundabout to prevent blocking on circulatory links (60s) doesn't allow for queues to be cleared in each cycle on some approaches	Left turn free flow lane. Would require additional t-junction to the west	No reserve capacity	Skippool, Skippool Bridge and Windy Harbour are all signalised	Non-standard roundabout, but still generally in line with consultation	Risk of blocking back into roundabout if pedestrian phase called too often	DMRB Volume/Capacity ratio standard not met (0.85) Above 0.9	3
4	Larger standard roundabout - signalised	Could potentially be non-signalised during off peak periods, subject to local operation team analysis	Low cycle time should mean shorter delays, but a lot of traffic has to wait two cycles	Max cycle time advisable for roundabout to prevent blocking on circulatory links (60s) doesn't allow for queues to be cleared in each cycle on some approaches	Geometry allows for 5th arm in southwest of junction	No reserve capacity	Skippool, Skippool Bridge and Windy Harbour are all signalised	Roundabout presented at public consultation	Risk of blocking back into roundabout if pedestrian phase called too often	DMRB Volume/Capacity ratio standard not met (0.85) Above 0.9	2
5	Fully signalised crossroads	🟩	High cycle time means higher free flow delay compared to roundabouts but majority of traffic clears in one cycle, meaning less delay in congested conditions relative to roundabouts	Queues clear within each cycle in majority of cases on all arms	Would require additional t-junction to the west	There appears to be reserve capacity to accommodate further traffic growth (longer cycle time)	Skippool, Skippool Bridge and Windy Harbour are all signalised	Not presented at public consultation	Safe signalised crossing point from A586 West-East provided	DMRB Volume/Capacity ratio standard met (0.85)	1

KEY:

- 🟥 Critical issue which cannot be mitigated
- 🟨 Potential Issue - Not fully complying with design requirements
- 🟩 Complies with design requirements

2.4 Operational Assessment Reporting

2.4.1 Highways England TPG to confirm that they are content for the Highways Operation report to include the following options:

- The preferred route scheme design, as presented at the Stage 3 Public Consultation (with design as at beginning of Stage 3)
- The Stage 3 final scheme design, incorporating the preferred option for the Poulton junction, as well as tweaks to other scheme junctions
- (Optional) The final scheme design, tested and reported using flows from the updated strategic model using the final Stage 3 scheme design (undertaken in conjunction with Strategic Modelling Approach 2 or 3 described below).

3 TRAFFIC MODELLING APPROACH

3.1.1 Based on the operational assessments conclusions that have been outlined above, the team need guidance from Highways England on how they wish to proceed with the strategic modelling, as a result of the changes to the Stage 3 Preferred Route scheme design. The 3 proposed approaches are detailed below:

- Strategic Modelling Approach 1, our current scope does not have an impact on cost or programme although Highways England would need to assess the risk of a rejection of the DCO application as there would be no economic or environmental assessment on the final Stage 3 route scheme design and no commentary on the impact of the changes to the Preferred Route scheme design on the economic and environmental assessments.
- Strategic Modelling Approach 2 will have an impact on cost and a small impact on programme.
- Strategic Modelling Approach 3 has a greater impact on both cost and programme.

3.2 Strategic Modelling Approach 1

There is no impact on cost and programme.

3.2.1 Do no further Strategic modelling of the preferred scheme. The flows provided to the Operational Team used in the Highways Operational Report are based on the preferred route scheme design, as presented at the Stage 3 Public Consultation which has different junction types and capacity to the final scheme design.

3.2.2 The final scheme design is not tested with consistent traffic flow data from the Strategic Model.

3.2.3 The Environmental Assessment is based on traffic flows which is not the final scheme design and there is no commentary on the impact of the final Stage 3 scheme design on the Environment Assessment.

3.2.4 Highways England to confirm they are content to sign-off the Stage 3 PCF products, Transport Forecasting Package, Economic Appraisal Package, AST and ComMA which reports on a scheme design which isn't the final Stage 3 preferred route scheme design and where the final Stage 3 scheme design is different to the scheme design shared at the Stage 3 Public Consultation.

3.3 Strategic Modelling Approach 2

There is an impact on cost and short impact on programme to prepare the revised traffic models for the Core Scenario, flows for the Environmental team and prepare a Sensitivity Test Technical Note.

3.3.1 Undertake the strategic modelling of the final Stage 3 scheme design arising from the Stage 3 Highways Operational Report for the Core Scenario for the opening and design year 2022 and 2037. The horizon year 2051 would not be included in the Sensitivity Test.

3.3.2 Undertake a sensitivity test of the Transport User Benefits only using TUBA.

3.3.3 Prepare a Technical Note reporting the Stage 3 Preferred Route Strategic Modelling Sensitivity Test.

3.3.4 Prepare the Environmental Flows EFE workbook for the Environment Team to assess the impact of the change in flows on the Environment Assessment results.

3.3.5 Highways England to confirm they are content to sign-off the Stage 3 PCF products, Transport Forecasting Package, Economic Appraisal Package, AST and ComMA which reports on a scheme design which isn't the final Stage 3 preferred route scheme design and where the final Stage 3 scheme design is different to the scheme design shared at the Stage 3 Public Consultation. The Technical Note on the final Stage 3 scheme design could be included as an appendix in a revision of the Stage 3 PCF products.

3.3.6 The indicative fee for this approach is £35k. The programme impacts have been attached to Appendix A.

3.4 Strategic Modelling Approach 3

There is a significant impact on both cost and programme.

3.4.1 Undertake the strategic modelling of the final Stage 3 scheme design arising from the Stage 3 Highways Operational Report for the Core Scenario, Low and Optimistic Scenario

3.4.2 Prepare the Environmental Flows EFE workbook for the Environment Team to assess the impact of the change in flows on the Environment Assessment results.

3.4.3 Update the Transport Forecasting Package based on the final Stage 3 scheme design

3.4.4 Prepare the Economic Appraisal Package and ComMA based on the final Stage 3 scheme design

3.4.5 The Strategic Model for the Core, Low and Optimistic Scenarios would need to be re-run and the work could not begin until the Stage 3 preferred route scheme design has been finalised. The Transport Forecasting Package would need to be revised to include the results of the final Stage 3 preferred route scheme forecasts. The Economic Assessment tasks and documentation could not begin until the completion of the final Stage 3 scheme design forecasts.

3.4.6 The indicative fee for this approach is £160k. The programme impacts have been attached to Appendix B.

4 RECOMMENDATIONS

4.1.1 The Technical Note has presented a number of junction variants that have been tested in Paramics and Table 1 has compared the relative benefits and disbenefits of the options.

4.1.2 Additional assessments have been carried out during Stage 3 including road safety implications of excessive delays on minor arms. The recommended option should be signalised and, for that reason, the signalised crossroads is shown to perform better than both the non-standard and larger standard roundabouts. During meetings on 03 May 2018, the implications of varying the junction were discussed. It was considered that a targeted consultation exercise may be sufficient for the residents/ businesses adjacent to the junction. A meeting with the DCO team has been arranged for 09 May to confirm approach and way forward and will be reported back to the Project Committee on 10 May 2018.

4.1.3 As the traffic model is something that is likely to be scrutinised at DCO, it is considered that the most appropriate modelling approach would be to undertake Approach 3 - strategic modelling of the final Stage 3 scheme design arising from the Stage 3 Highways Operational Report for the Core Scenario, Low and Optimistic Scenario. Without this work, there would not be the supporting traffic documentation that would reflect the final Stage 3 design, which could well result in more substantial delays during the DCO process that could impact the SoS decision and Start of works dates.

4.1.4 A Project Committee has been arranged for 10 May 2018 to agree the approach to be undertaken for Poulton Junction.

APPENDIX A

Approach 2 programme

Economic Appraisal Work Programme

Week Commencing	23/04/2018	30/04/2018	07/05/2018	14/05/2018	21/05/2018	28/05/2018	04/06/2018	11/06/2018	18/06/2018	25/06/2018	Starting Date	Completion Date	Days	Resouce			Approve	Details / Comments
Core Scenario														Lead	Support	Check		
Network Coding (2022 and 2037)			▨	11/05							07/05/2018	11/05/2018	5 days	SA/BM	New resource	LC		
Review and Checks				▨ 15/05							14/05/2018	15/05/2018	2 days	SA/BM/AA	New resource	LC		
Fixed assignment				▨	21/05						16/05/2018	21/05/2018	4 days	SA/BM	PD	LC		
VDM Assignment _Core (2022 and 2037)					▨	▨ 29/05					22/05/2018	29/05/2018	6 days	BM	PD	LC		
Tuba Check		Friday 15/06 PH GEC Ramzan				▨	▨ 05/06				30/05/2018	05/06/2018	5 days	SA/BM	New resource	LC		
Prepare EFE workbook		Monday 07/05 Early May Bank UK					▨	08/06			06/06/2018	08/06/2018	3 days	SA/BM	New resource	LC		
Sensitivity Test Technical Note		Monday 28/05 Late May Bank UK					▨	▨ 12/06			06/06/2018	12/06/2018	5 days	SA/BM	PD	LC		
Update Transport Forecasting Package								▨	15/06		13/06/2018	15/06/2018	3 days	CLD	AA	CB		
Economic Appraisal														Lead	Support	Check		
COBALT Accident Rates	▨	27/04									23-04-2018	27-04-2018		SA	PD	LC		5 years (2013-2017)
COBALT Accident Analysis		▨	▨ 09/05								30-04-2018	09-05-2018		SA	PD	LC		Core, Low and Opt additional FY 2051 and Checks
Construction Delay Assessment	▨	▨	▨	▨ 14/05							23-04-2018	14-05-2018		BM	J RR	LC		If construction drawings are received before start of work
Maintenance Delay Assessment		▨	▨	▨	18/05						30-04-2018	18-05-2018		BM	AD	LC		If maintenance profiles are received before start of work
Distributional Impact Assessment				▨	▨	25/05					17-05-2018	25-05-2018		AA		LC		
Transport User Benefits	▨	▨	04/05								23-04-2018	04-05-2018		SA/BM	AD	LC		
Scheme Costs			▨	11/05							07-05-2018	11-05-2018		SA/BM	PD	LC		To be received from UK
Wider Impacts			▨	▨ 16/05							07-05-2018	16-05-2018		AA		BM		
JTR Assessment	▨	▨	04/05								23-04-2018	04-05-2018		AA		BM		
Economic Assessment Results																		
TEE, PA, AMCB tables					▨ 25/05						21-05-2018	25-05-2018		SA/BM	J RR, PD & AD	LC		
Economic Appraisal Package Reporting						▨	▨ 08/06				28-05-2018	08-06-2018		SA	J RR, PD & AD	LC		Need to discuss
AST						▨	01/06				28-05-2018	01-06-2018						
Update Economic Appraisal Package								▨ 15/06			13/06/2018	15/06/2018						
Contingency									▨	25/06	18/06/2018	25/06/2018		SA	J RR, PD & AD	LC		

Strategic Modelling Approach 1 & 2

Provide Final Preferred Route scheme design EFE workbook	Friday 08 th June
Current Due Date for Strategic Programme 1 Economic Appraisal Package	Monday 11 th June
2 week Delay to Issue Updated Strategic Programme 2 Economic Appraisal Package	Monday 25 th June
Current Due Date for Strategic Programme 1 ComMA	Wednesday 04th July
2 week Delay to issue the Updated Strategic Programme 2 ComMA	Wednesday 18th July

Bangalore		
Day	**Date**	**Occasion**
Friday	26/01/2018	Republic Day
Friday	15/06/2018	Ramzan
Wednesday	15/08/2018	Independence Day
Thursday	13/09/2018	Ganesh Chaturthi
Tuesday	02/10/2018	Gandhi Jayanthi
Thursday	01/11/2018	Kannada Rajyotsav
Thursday	08/11/2018	Deepavali
Tuesday	25/12/2018	Christmas Day

Reference for Resouce name	
LC	Lila Chitrabhanu
SA	Shirin Antony
BM	Bipin Muley
AA	Aref Alipour
J RR	Jisha RR
AD	Asmita Deshmukh
PD	Pavani Darla

Staff Member	From Date	To Date
Darla Pavani	30.04.2018	01.05.2018
	14.06.2018	15.062018
RR Jisha	27.04.2018	06.05.2018
	25.06.2018	26.06.2018
Asmita	10.05.2018	11.05.2018
Bipin	10.09.2018	17.09.2018
Shirin	21.05.2018	25.05.2018
	20.06.2018	22.06.2018
Lila	04.05.2018	09.05.2018

2018

January

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
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28	29	30	31			

February

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25	26	27	28			

March

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18	19	20	21	22	23	24
25	26	27	28	29	30	31

April

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29	30					

May

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20	21	22	23	24	25	26
27	28	29	30	31		

June

S	M	T	W	T	F	S
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17	18	19	20	21	22	23
24	25	26	27	28	29	30

July

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15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

August

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26	27	28	29	30	31	

September

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16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

October

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14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

November

S	M	T	W	T	F	S
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11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

December

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						1
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9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

APPENDIX B

Approach 3 programme

Economic Appraisal Work Programme

Week Commencing	23/04/2018	30/04/2018	07/05/2018	14/05/2018	21/05/2018	28/05/2018	04/06/2018	11/06/2018	18/06/2018	25/06/2018	02/07/2018	09/07/2018	16/07/2018	23/07/2018	30/07/2018	06/08/2018	13/08/2018	20/08/2018	27/08/2018	03/09/2018	10/09/2018	Starting Date	Completion Date	Days	Resouce			Approve	Details / Comments
																									Lead	Support	Check		
Core Scenario																													
Network Coding Changes (2022, 2037 and 2051) (7 days)				15/05																		07/05/2018	15/05/2018	7	SA/BM	J RR, PD & AD	LC		
Review and Checks (2 day)				17/05																		16/05/2018	17/05/2018	2	SA/BM	J RR, PD & AD	LC		
fixed assignment (2022, 2037 and 2051) (4 days)					23/05																	18/05/2018	23/05/2018	4	SA/BM	J RR, PD & AD	LC		
VDM Runs (2022, 2037 and 2051) (7 days)							01/06															24/05/2018	01/06/2018	7	SA/BM	J RR, PD & AD	LC		
Tuba Check (5 days)								08/06														04/06/2018	08/06/2018	5	SA/BM	J RR, PD & AD	LC		
Prepare EFE Workbook								13/06														11/06/2018	13/06/2018	3	SA/BM	J RR, PD & AD	LC		
Low Growth Scenario																													
fixed assignment (2022, 2037 and 2051) (5 days)									14/06													11/06/2018	14/06/2018	4	SA/BM	J RR, PD & AD	LC		
VDM Runs (2022, 2037 and 2051) (7 days)										26/06												15/06/2018	26/06/2018	7	SA/BM	J RR, PD & AD	LC		
Tuba Check (5 days)											03/07											27/06/2018	03/07/2018	5	SA/BM	J RR, PD & AD	LC		
Optimistic Scenario																													
fixed assignment (2022, 2037 and 2051) (5 days)								14/06														11/06/2018	14/06/2018	4					
VDM Runs (2022, 2037 and 2051) (7 days)										26/06												15/06/2018	26/06/2018	7	SA/BM	J RR, PD & AD	LC		
Tuba Check (5 days)											03/07											27/06/2018	03/07/2018	5	SA/BM	J RR, PD & AD	LC		
Update Transport Forecasting Package													19/07									04/07/2018	19/07/2018	12 days	AA/CLD				
Economic Appraisal																													
COBALT Accident Analysis													17/07									04-07-2018	17-07-2018	10 days	SA	PD	LC		Core, Low and Opt additional FY 2051 and Checks
Construction Delay Assessment										28/06												11-06-2019	27-06-2018	13 days	BM	J RR	LC		If construction drawings are received before start of work
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Distributional Impact Assessment													13/07									23-07-2018	27-07-2018	5 days	AA		LC		
Transport User Benefits														20/07								09-07-2018	20-07-2018	10 days	SA/BM	AD	LC		
Scheme Costs												06/07										02-07-2018	06-07-2018	5 days	SA/BM	PD	LC		To be received from UK
Wider Impacts										22/06												11-06-2018	22-06-2018	10 days	AA		BM		
JTR Assessment												06/07										25-06-2018	06-07-2018	10 days	AA		BM		
Economic Assessment Results																													
TEE, PA, AMCB tables															27/07							23-07-2018	27-07-2018	5 days	SA/BM	J RR, PD & AD	LC		
Economic Appraisal Package Reporting																07/08						23-07-2018	07-08-2017	12 days	SA	J RR, PD & AD	LC		Need to discuss
AST																03/08						30-08-2018	03-08-2018	5 days	SA	J RR, PD & AD	LC		
COMMA																													
COMMA																	14/08					30-07-2018	14-08-2018	12 days	AA	J RR, PD & AD	LC		
COMMA CHECK																		17/08				15-08-2018	17-08-2018	3 days					
Contingency																			24/08			20/08/2018	24-08-2018	5 days					

Bangalore		
Day	**Date**	**Occasion**
Friday	26/01/2018	Republic Day
Friday	15/06/2018	Ramzan
Wednesday	15/08/2018	Independence Day
Thursday	13/09/2018	Ganesh Chaturthi
Tuesday	02/10/2018	Gandhi Jayanthi
Thursday	01/11/2018	Kannada Rajyotsav
Thursday	08/11/2018	Deepavali
Tuesday	25/12/2018	Christmas Day

Monday	07/05	UK Early May Bank Holiday
Monday	28/05	UK Late May Bank Holiday
Monday	27/08	UK August Bank Holiday

Strategic Modelling Approach 3

Provide Final Preferred Route scheme design EFE workbook	Wednesday 13 th June
Transport Forecasting Package	Thursday 19 th July
Economic Appraisal Package	Tuesday 07th August
ComMA	Friday 24th August

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Staff Member	From Date	To Date
Darla Pavani	30.04.2018	01.05.2018
	14.06.2018	15.062018
RR Jisha	27.04.2018	06.05.2018
	25.06.2018	26.06.2018
Asmita	10.05.2018	11.05.2018
Bipin	10.09.2018	17.09.2018
Shirin	21.05.2018	25.05.2018
	20.06.2018	22.06.2018
Lila	04.05.2018	09.05.2018

Reference for Resouce name	
LC	Lila Chitrabhanu
SA	Shirin Antony
BM	Bipin Muley
AA	Aref Alipour
J RR	Jisha RR
AD	Asmita Deshmukh
PD	Pavani Darla