

Chichester Area Transport Model

Local Model Validation Report

On behalf of **Chichester District Council**



Project Ref: 43682 | Rev: 03 | Date: August 2018



Document Control Sheet



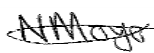

Project Name: Chichester Area Transport Model

Project Ref: 43682

Report Title: Local Model Validation Report

Doc Ref: CATM_43682_LMVR

Date: 26-July-2018

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Revision	Date	Description	Prepared	Reviewed	Approved
1	10/07/2018	1 st Draft Client Issue	EP	DC/NM	PB
2	26/07/2018	CDC/WSCC comments addressed	EP	DC/NM	
3	21/08/2018	HE comments on matrix estimation addressed	NM/EP	PG	
4	04/08/2018	Further HE comments on matrix estimation addressed	NM/EP	PG	
5	11/09/2018	Additional HE comments on matrix estimation addressed	NM/EP	PB	PB

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Glossary

AADT: Annual Average Daily Traffic, 12
ATC: Automatic Traffic Count, 12, 13
Buffer: Buffer network is a simplified version of the simulation network for away from our area of interest, 8
Built trees: A tool to create possible trip routes between an origin and a destination zone, 18
CATM: Chichester Area Transport Model, 2, 3, 4, 5, 6, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 24, 26, 29, 36, 39, 42, 44, 45
Centroid connectors: Are an imaginary roadway network links that connects the zone centroid to the roadway network at nodes, 9
Chi-squared: A chi-squared test, also written as χ^2 test, is any statistical hypothesis test where the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test, 22
Convergence: The seek for network stability (Wardrop's First Principle of Traffic Equilibrium or User Equilibrium), 4, 39, 44
Delta statistic or % gap: The difference between the costs along the chosen routes and those along the minimum cost routes, summed across the whole network, and expressed as a percentage of the minimum costs, usually known as 'Delta' or the '%GAP.', 39
DfT: Department for Transport, 12, 13, 15
DIADEM: Dynamic Intergrated Assignment and Demand Modelling, 2, 5
GEH: Geoffrey E. Havers statistic formula, 22, 23, 26, 27, 36, 38
HE: Highways England, 2, 5, 9, 10, 12, 13, 15, 17, 18, 36, 41, 45
HGV: Heavy Goods Vehicle, 2, 6, 18, 36
IP: Inter Peak, 6, 18, 28, 32, 34, 40, 43, 45
JTDB: Journey Time Database, 12
JTS: Journey Time Survey, 12
LGV: Light Goods Vehicle, 2, 6, 18, 26, 36, 38
Link based: Geometrical details of a link, 8
Link Flow: Number of PCU/hr, 22, 23, 27, 34, 35, 36
LMVR: Local Model Validation Report, 15, 36
Matrix estimation: Refine estimates of movements which have been synthesised, 4, 17, 21, 27, 45
MCC: Manual Classified Count, 12
MCTC: Manual Classified Turning Count, 12
ME: Matrix Estimation, 17, 18, 19
MIDAS: Motorway Incident Detection and Automatic Signalling, 13
MTU: Modelling Traffic Units, 13
OD: Origin / Destination, 5, 17, 19
Origin/destination matrix: Is a matrix which is each cell represent the number of trips from origin (row) to the destination (column), 4, 5, 17, 21, 22, 27, 45
P1X: SATURN Network Plotting Tool, 19
PCU: Passenger Car Unit, 6, 9, 31, 32, 33
PIJA: An input file used in the SATME2 matrix estimation program, 19
PPK: Price per Kilometre, 18
PPM: Price per Minute, 18
SATME2: Program in SATURN used to improve the fit between modelled and observed flows, 19

SATPIJA: Program in SATURN used in conjunction with SATME2 program to improve fit between modelled and observed flows, 19
Saturation flow: The number of vehicles that can sustain a link/junction, 9
SATURN: Simulation and Assignment of Traffic to Urban Road Networks, 2, 5, 9, 18, 19
SAVEIT: Parameter in SATURN SATURN that allows link costs used in the assignment tree build to be saved for subsequent analysis, 19
Screenline: Imaginary line providing a mean of comparing the results of a traffic assignment with traffic account data, 4, 22, 29, 45
SERTM: South East Region Traffic Model, 10, 17
Simulation: Network simulation is a technique whereby a software program models the behavior of a network by calculating the interaction between the different network entities, 5, 8, 9, 10, 12, 17, 45
TAG: Transport Analysis Guidance, 4, 9, 18, 19, 29, 39
TAME: Traffic Appraisal Modelling and Economics, 13
TLD: Trip Length Distribution, 27, 28
TRADS: Traffic Database System, 12
UC: User Class, 6
VC: Vehicle Class, 6
WebTAG: Web Based Transport Analysis Guidance, 4, 34, 39, 45
WSCC: West Sussex County Council, 12, 13

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1 Introduction

1.1 Purpose

- 1.1.1 The Chichester Area Transport Model (CATM) has been updated by PBA to investigate travel patterns in and around the Chichester area with a view to considering the changes that may occur to those patterns in response to the policies and strategy of the adopted Chichester Local Plan: Key Policies 2014-2029.

1.2 Background

- 1.2.1 PBA has been commissioned to undertake transport assessment to inform the preparation of the Chichester Local Plan Review: 2016-2035. The Local Plan Review will review the policies and strategy of the adopted Chichester Local Plan: Key Policies 2014-2029 whilst also seeking to meet the latest identified needs of the Plan Area through to 2035. Although the Council adopted the Chichester Local Plan 2014-2029, the examination concluded that the Plan fell short of meeting the full housing needs of the District outside of the South Downs National Park (the 'Plan Area'). The Inspector required that the Council commit to a review of the Local Plan within 5 years with the objective to ensure that housing needs are fully met. This work informs this review, to test the impact of the additional development needs (including housing) of the Plan Area.
- 1.2.2 The Local Model Validation Report (LMVR) is the first in a series of three reports, through which the preparation of the Chichester Local Plan Review:2016-2035 will be informed. The second report will be the Forecast Modelling 2035 Report which will compare the existing Local Plan to the proposed Local Plan developments. Last step is the creation of the Junction Mitigation Report, which will identify what junctions require mitigation and propose solutions.

1.3 Adopted Local Plan

- 1.3.1 The Chichester Local Plan: Key Policies 2014-2029 was adopted on 14th July 2015. The Plan sets out an overarching framework for the future of the plan area to 2029 and comprises a long term spatial vision, strategic objectives and spatial strategy. It also contains strategies for the settlement hubs and strategic and local development management policies, along with a monitoring framework.
- 1.3.2 The adopted Local Plan makes provision to deliver 7,388 homes over the period 2012 – 2029 equating to an average delivery of approximately 435 homes per year. A significant element of this housing is already identified through outstanding planning permissions with allowance also made for 'windfall' housing likely to come forward in small developments of less than 6 dwellings.
- 1.3.3 The remaining provision will be met through 4,750 homes of which:
- The bulk of 3,250 will be at the Strategic Development Locations (SDLs) at West of Chichester, Shopwyke, Westhampnett/North East Chichester and Tangmere (see Policies 15 – 18)
 - 630 homes on strategic sites at the settlement hubs of East Wittering/ Bracklesham, Selsey and Southbourne (Policies 20, 23 and 24)
 - 860 homes to be brought forward on parish housing sites (Policy 5)

1.4 Local Plan Review

- 1.4.1 The Chichester Local Plan: Key Policies 2014-2029 was subject to examination by an independent Inspector appointed by the Secretary of State. Although the Local Plan was found sound and was subsequently adopted, the Inspector required the Council to undertake a review within 5 years to ensure sufficient housing would be planned to meet the longer term needs of the area. As such, there is a requirement to review the current adopted Local Plan to provide a new policy framework for planning and development in the Plan Area up to 2035. This will form the Chichester Local Plan Review 2016-2035.
- 1.4.2 In addition to the strategic sites provided for in the adopted Chichester Local Plan 2014-2029, a number of further strategic development locations are being considered. Combined with updated information about the development pipeline (to include windfalls and greenfield sites not allocated in the adopted Local Plan) these will be the subject of this transport assessment. The majority of the strategic growth envisaged is in the east-west corridor through the Plan Area (including significant growth at Southbourne), with more moderate development in the Manhood Peninsula including at Selsey and East Wittering.

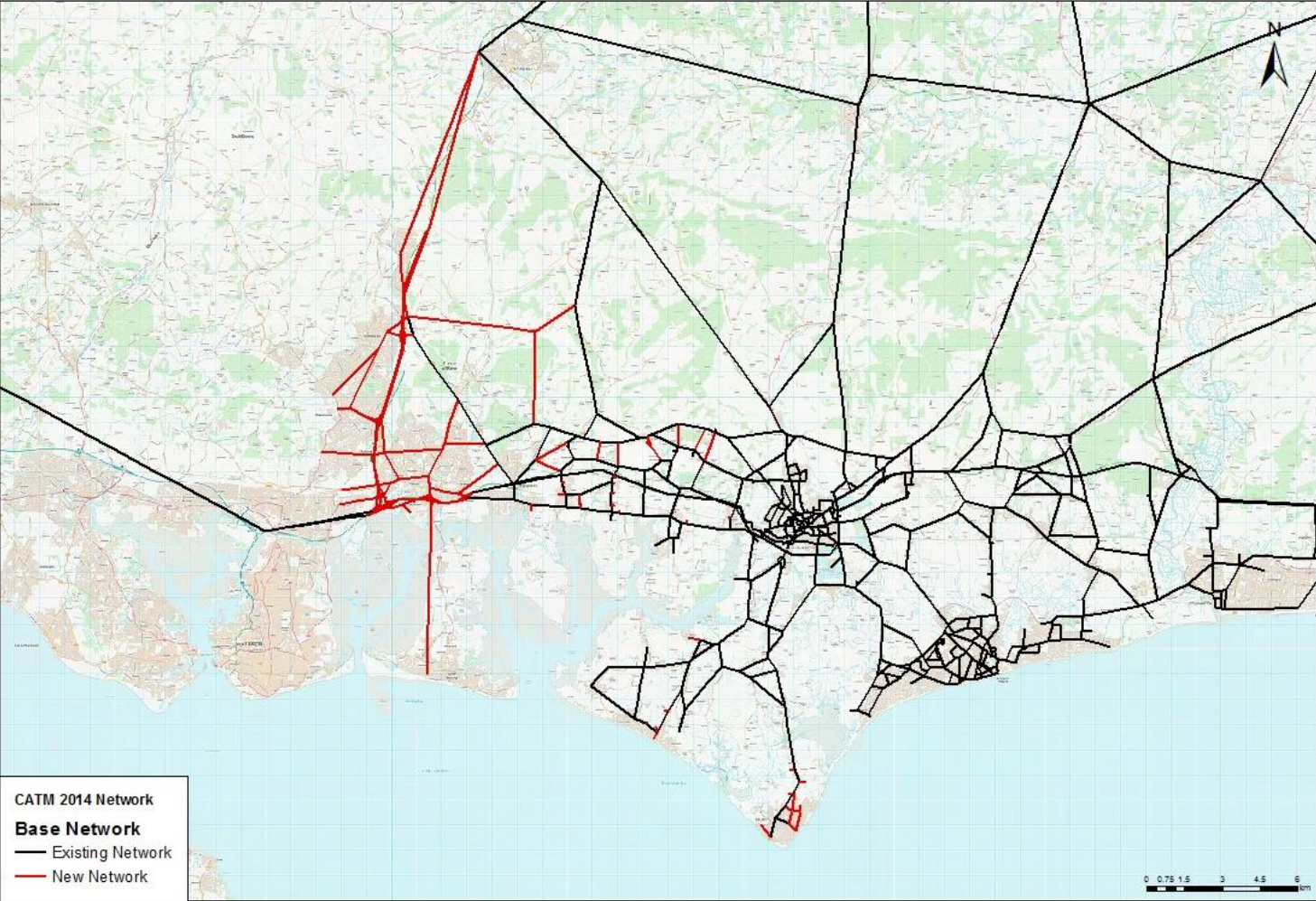
1.5 Current Model Overview

- 1.5.1 The key modelling assessment tool will be the Highways England (HE) SATURN highway model known as the Chichester Area Transport Model (CATM). This model has been validated to a 2014 base year and consists of a SATURN (V11.3.10E) highway model and a DIADEM V 5.0 demand model. The key objective behind development of CATM 2014 model was to understand the impact of identified options to relieve congestion on A27 Chichester bypass. Full details of the model development and validation are provided in the *A27 Chichester Local Model Validation Report, Highways England, July 2016*.
- 1.5.2 A previous version of CATM, which was validated to a 2009 base year was used to provide the transport evidence for the adopted local plan up to 2029. More information on this model and the outputs from that study are provided in *Chichester District Council – Local Plan Transport Study of Strategic Development Options and Sustainable Transport Measures, Jacobs, March 2013*.
- 1.5.3 A proportionate approach to modelling will be undertaken and this will utilise the SATURN highway model only. Further detail on the existing model and the modelling approach to assess the new allocations, is provided in the following sections of this report.

1.6 Model Area

- 1.6.1 The area covered by the model is shown in **Figure 1.1**. The updated model covers the same area with the previous CATM 2014 model but with a more detailed network along the A3(M) (highlighted in red), a detailed version of the A3(M)/A27 junction (highlighted in red), detailed network north of the A27, detailed network between the A27 and the A259 and detailed network south of Chichester at the wide area of West and East Wittering and Selsey.
- 1.6.2 CATM original highway network model and its updated version were developed using the established SATURN software. The model consists of an AM peak hour model (08:00 to 09:00), an average Inter Peak hour model (10:00 to 16:00) and a PM peak hour model (17:00 to 18:00). The model will consist of five user classes comprising car commute, car employer business, car other, Light Goods Vehicles (LGV) and Heavy Goods Vehicles (HGV). The peak hour model periods and vehicle classification was retained from the original HE CATM model.
- 1.6.3 We have extended the network in the areas highlighted red in **Figure 1.1** in order to include the network extents to take into account of the future strategic Local Plan developments, both employment and residential.

Figure 1.1 – CATM 2014 Network



1.7 Future Model Applications

1.7.1 When considering the use of the CATM for future work the following should be considered:

- Although it may appear to be desirable for the models to reflect the day to day variations, in practice models are tools with limited ability to capture all the intricate sensitivities inherent in a network like Chichester. The model represents average weekday conditions, and therefore it is not possible to replicate the day to day variability of route choices even though it may not be possible to match in every case, actual flows and journey times for specific competing routes. The model has therefore validated to replicate cordon and screenline flows by direction over individual link flows for example. The stability of the model is demonstrated through achieving acceptable convergence criteria demonstrating its robustness; and
- Considering the compliance of the CATM with WebTAG validation criteria and guidelines, it is important to understand the purpose for which the model is required. Guidance notes on validation acceptability are provided in TAG Unit M3.1. As stated in the guidance, this doesn't guarantee that a model is 'fit for purpose' and likewise a failure to meet the specified validation standards, does not mean that a model is not 'fit for purpose'. A model that meets the specified validation standards may not be fit for the purposes and conversely, a model that fails to meet to some degree the validation standards may be useable for certain applications. On this basis, the validation of the CATM prioritises areas of the network at which interventions and developments are proposed. The use of matrix estimation, select link analysis matrices and manual matrix manipulation has been minimised to alter the prior and post matrices to meet calibration and validation standards. It should be noted that the model has been created to test schemes that are currently known and consideration to the suitability of the model for testing all future schemes should be taken before any new scheme is tested. The model may need to be updated and/or therefore be subject to local area reviews before testing each scheme and/or development proposal.

1.8 Report Structure

1.8.1 Following this introduction, this report is presented with the following structure:

- Section 2 provides an overview of the highway assignment model;
- Section 3 summarises the traffic data used in the model development;
- Section 4 details the matrix development;
- Section 5 outlines the assignment, calibration and validation procedures;
- Section 6 outlines the calibration results;
- Section 7 outlines the model validation results; and
- Section 8 provides an overall summary.

2 Model Overview

2.1 Introduction

- 2.1.1 The CATM has been developed using SATURN version 11.4.06D. This software is suitable for developing the network and assignment of the matrix. The matrix building process has been carried out in Excel, with the final matrices output to SATURN format for assignment to the network.
- 2.1.2 One of the main benefits of using SATURN for the assignment process is that it is applicable to both urban and rural networks and can model peak hour congestion in sufficient detail. As a combined simulation and assignment model, SATURN also has the advantage that it enables detailed junction modelling.
- 2.1.3 The model in question is a highway assignment model only and does not include any multimodal or demand modelling. This is a proportionate and robust approach and represents the worst case scenario.
- 2.1.4 The assignment model predicts routes that drivers will choose and the way that traffic demand interacts with the available road capacity. The underlying principle used in the adopted assignment algorithm is Wardrop's First Principle of Traffic Equilibrium. Wardrop's First Principle states that:
- "Traffic arranges itself on networks such that the cost of travel on all routes used between each OD pair is equal to the minimum cost of travel and all unused routes have equal or greater cost".*
- 2.1.5 The aim of the assignment model is to reach equilibrium such that costs and flows are in balance under the assumption that individual users will seek to minimise their costs of travel through the network.

2.2 Previous Models

- 2.2.1 The key modelling assessment tool will be the Highways England (HE) SATURN highway model known as the Chichester Area Transport Model (CATM). This model has been validated to a 2014 base year and consists of a SATURN (version 11.3.10E) highway model and a DIADEM v 5.0 demand model. The key objective behind development of CATM 2014 model was to understand the impact of identified options to relieve congestion on A27 Chichester bypass. Full details of the model development and validation are provided in *the A27 Chichester Local Model Validation Report, Highways England, July 2016*.
- 2.2.2 The highway model has a 2014 base year, having been calibrated and validated using count and journey time data from that year. The matrix development was predominantly informed by Mobile Phone data (collected for weeks commencing 7th and 14th July 2014), with checks made against other more traditional data sources including Census Travel to Work Data. The Traffic Volume Calibration and the Journey Time Validation was checked against data collected in June and November of 2014.
- 2.2.3 A previous version of CATM, which was validated to a 2009 base year was used to provide the transport evidence for the adopted local plan up to 2029. More information on this model and the outputs from that study are provided in *Chichester District Council – Local Plan Transport Study of Strategic Development Options and Sustainable Transport Measures, Jacobs, March 2013*.

2.3 Model Year and Time periods

2.3.1 This updated model has been developed with a base year of 2014 (based on the existing).

2.3.2 Three time periods have been represented within the model:

- Weekday AM peak hour (0800-0900);
- Weekday IP (inter-peak) hour (average hour 1000-1600); and
- Weekday PM peak hour (1700-1800).

2.4 Vehicle Types (UC & VC) and Travel Purposes

2.4.1 The model has 5 user classes as follows:

- UC1: Cars for commuting;
- UC2: Cars for Employer's Business;
- UC3: Cars for Other purposes;
- UC4: Light Goods Vehicles (LGVs); and
- UC5: Heavy Goods Vehicles (HGVs).

2.4.2 The model aggregates the user classes into "vehicle classes" for use in reporting. The results of the Base Year model will be reported by these vehicle classes, which can be summarised as:

- Vehicle Class 1 (VC1): Cars;
- Vehicle Class 2 (VC2): Light Goods Vehicles (LGVs); and
- Vehicle Class 3 (VC3): Heavy Goods Vehicles (HGVs).

PCU Factors

2.4.3 Passenger Car Units (PCU) is used as the standard unit for demand and capacity within the model. This allows for the impact of large vehicles which take up more road space and take longer to clear junctions to be accounted for. The factors used within the CATM are:

- Car – 1.0;
- Light Goods Vehicle (LGV) – 1.0; and
- Heavy Goods Vehicle (HGV) – 2.3.

2.5 Network Development

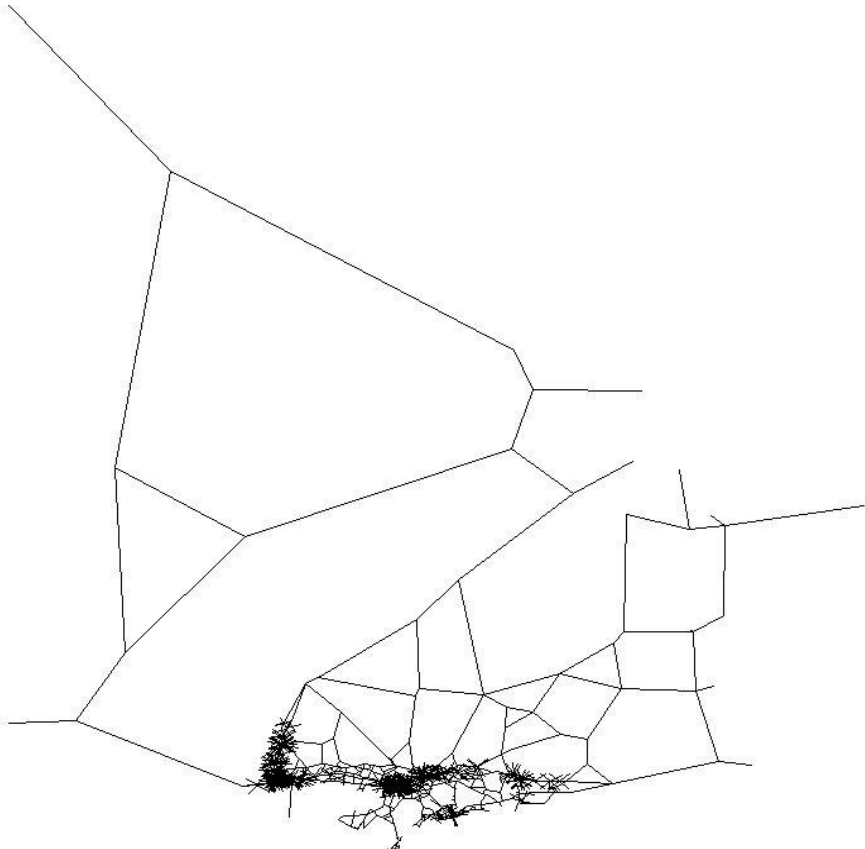
Network Extent

2.5.1 The extent of the detailed highway network is shown in **Figure 2.1** and the wider modelled network is shown in **Figure 2.2**.

Figure 2.1 – Detailed Highway Network



Figure 2.2 – Wider Highway Network



Network Structure

- 2.5.2 The network within the detailed modelled area was coded in simulation, while the area covered by the wider model was coded in buffer.
- 2.5.3 In the simulation area, junctions are modelled in detail and this allows the effects of junction delays to be represented more realistically. In the buffer area, junctions are not explicitly modelled. Routeings and assignment of trips in the buffer network are determined by link based attributes and speed/flow relationships.
- 2.5.4 In developing the highway network, key highway link characteristics were included in the network coding. This includes attributes such as:
- Link length;
 - Link type;
 - Link capacity;
 - Link cruise speed in kilometres per hour (Kph) initial coded as speed limits before being modified as necessary during the calibration/validation process;
 - Speed/flow relationship;
 - One way or two-way link operation as appropriate;
 - Bus lanes; and
 - Bus routes and frequencies – using scheduled bus timetables from local services.

Junction Types and Saturation Flows

- 2.5.5 The CATM consists of various types of junctions including priority junctions, roundabouts and signal controlled junctions. **Table 2.1** summarises the default turn saturation flows and **Table 2.2** the range of the turn saturation flow values that have been assumed in the CATM subject to amendment as part of the calibration process. In order to maintain consistency with the HE CATM model, the same saturation flows were used.
- 2.5.6 Within the simulated urban area, the main delays to a journey predominantly result from traffic interaction at junctions. In between junctions within the simulation network, traffic is assumed to travel at uniform speeds.
- 2.5.7 During the process of model calibration, some junctions were revisited in order to improve the model performance but were kept within the bounds of the values detailed in **Table 2.2**.

Table 2.1 – Default Turn Saturation Flows assumed (PCU/lane/hr)

Movement	Saturation Flow Left	Saturation Flow Ahead	Saturation Flow Right
Major Arm – Unopposed movement without flare	1650	2000	1650
Major Arm – Opposed movement without flare		1250	1200
Minor Arm – Give way link without flare	1200	950	875
Major Arm – Unopposed movement with flare	1681	2038	1681
Major Arm – Opposed movement with flare		1274	1223
Minor Arm – Give way link with flare	1223	968	892

Table 2.2 – Range Value Turn Saturation Flows assumed (PCU/lane/hr)

Movement	Saturation Flow Left	Saturation Flow Ahead	Saturation Flow Right
Major Arm – Unopposed movement without flare	1400 to 1900	1700 to 2300	1400 to 1900
Major Arm – Opposed movement without flare		1050 to 1450	1000 to 1400
Minor Arm – Give way link without flare	1000 to 1400	800 to 1100	750 to 1000
Major Arm – Unopposed movement with flare	1450 to 1950	1750 to 2350	1450 to 1950
Major Arm – Opposed movement with flare		1100 to 1450	1050 to 1400
Minor Arm – Give way link with flare	1050 to 1400	800 to 1100	750 to 1050

Speed Flow Curves

2.5.8 Speed flow curves were used to model the flow delay relationships. The speed/flow relationships were derived from the TAG Unit M3.1 Appendix D, but adjusted to give values in PCUs, which, as mentioned before, is the traffic unit that SATURN uses. Speed/flow curves have also been used on the A3(M) and A27. For the update of CATM the same speed flow curve values have been used as in the original HE CATM model.

Zone Centroid Connectors

2.5.9 Centroid connectors enable the zones to be linked to the highway network. These are coded where possible using specific entry/exit junctions from local access roads onto the main road network from self-contained residential areas, business parks, retail areas and car parks for example.

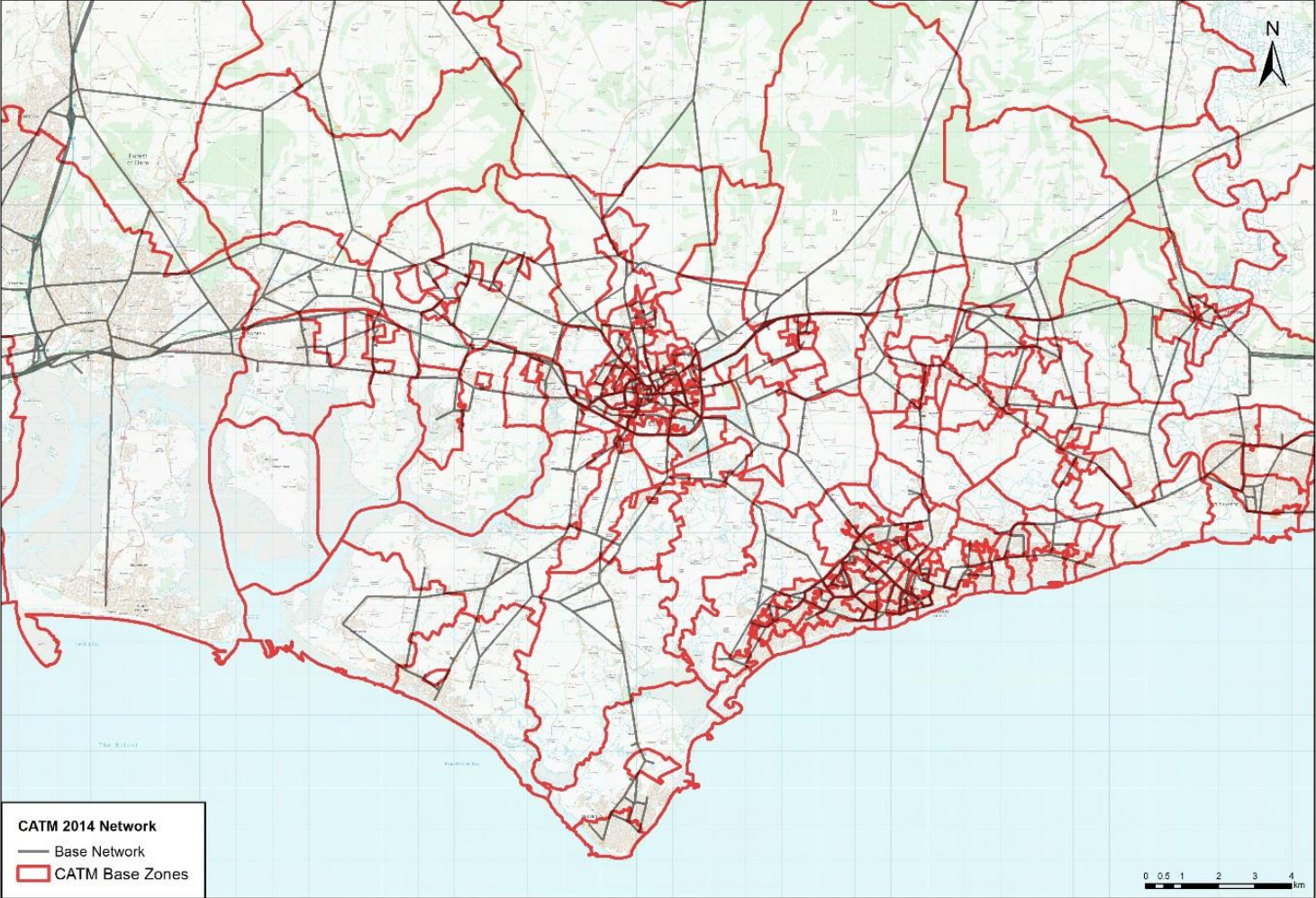
2.5.10 Judgement is used to determine the number of centroid connectors required from each zone to represent locations where the traffic from the zones was likely to load.

2.6 Zoning System

2.6.1 The zoning system used for the CATM is based on 2011 Census geography with consistency between Census Output Areas, Districts and Counties maintained where possible. The zoning system has largely been retained from the HE CATM model which has included 257 zones. In anticipation of future Local Plan development zones, PBA has coded in eleven additional zones to accommodate future Local Plan trips, thus taking the number of zones in the updated model to 268. The future Local Plan zones have no trips in the base year.

- 2.6.2 The benefit of using a zoning system based on the 2011 Census geography is the ease of use and comparison with planning data, such as population and employment estimates in both the development of the base model and for model forecasting onwards.
- 2.6.3 The CATM comprises 257 zones of which Zones 1 to 212 represent the study area zones of Chichester and Arun District, 213 to 252 are External Zones and 253 to 268 are for future development. To better replicate trip distribution in the western area of the model, a comparison between the existing zone structure in CATM and those in SERTM was undertaken. This resulted in the combination of some SERTM zones and trips from these zones, were subsequently used to replace or add trips onto existing zones. As such this involved maintaining the matrices within the existing simulation network area so not to affect the overall validation in the area within Chichester.
- 2.6.4 The zoning system is shown in **Figure 2.3**.

Figure 2.3 – CATM Simulation Area Zoning System



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3 Survey Data

3.1 Overview

3.1.1 This section provides an overview of the data sources that has been used to update the CATM and includes both existing data and new data that has been collected. The types of existing and new collected data comprise:

- Automatic Traffic Counts (ATC);
- Manual Classified Turning Counts (MCTC);
- Manual Classified Counts (MCC);
- Journey Time Surveys (JTS);
- Journey Time data (TrafficMaster and Bluetooth); and
- Anonymised Mobile Phone Data;

3.2 2014 CATM Existing Data

3.2.1 The data described below can be found in the Highways England A27 Chichester Bypass Local Model Validation Report, July 2016.

3.2.2 The validated existing 2014 HE CATM obtained information from the following sources, namely:

- Highways England (HE);
- West Sussex County Council (WSCC); and
- Department for Transport (DfT).

3.2.3 The information obtained included:

- Permanent WSCC Automatic Traffic Counts (ATC);
- Highways England TRADS Automatic Traffic Counts (ATC);
- DfT Traffic Count Database Annual Daily Traffic (AADT); and
- Highways England Journey Time Database (JTDB) data.

3.3 2014 CATM New Data

3.3.1 For the expansion of the simulation network and the implementation of the future development areas new datasets were used.

3.3.2 The new data derived from:

- Highways England (HE);
- West Sussex County Council (WSCC); and

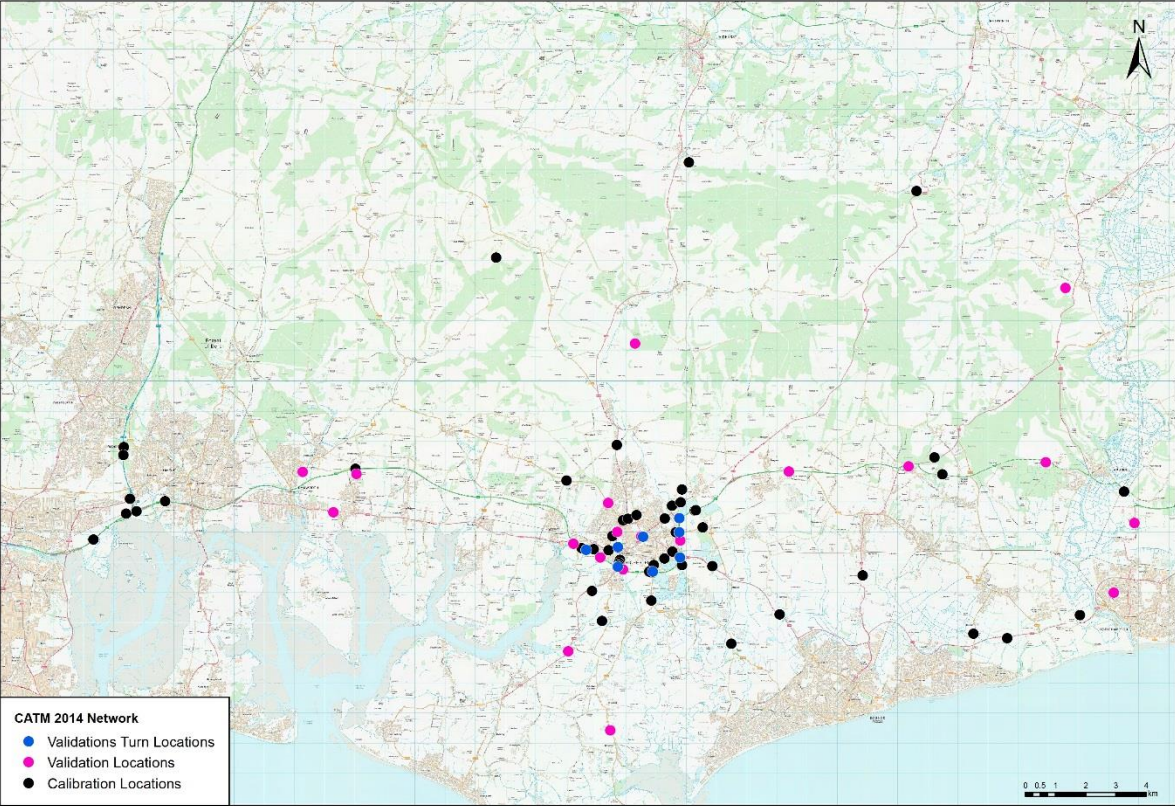
- Department of Transport (DfT).

3.3.3 The information obtained included:

- Highways England Motorway Incident Detection and Automatic Signalling Counts (MIDAS);
- Highways England Traffic Monitoring Units Counts (MTU);
- Highways England Traffic Appraisal, Modelling and Economics Counts (TAME);
- Permanent WSCC Automatic Traffic Counts (ATC); and
- TrafficMaster Journey Time Database.

3.3.4 The location of the counts used for the update process, (both 2014 HE CATM Existing data and 2014 CATM New Data) of the CATM is shown in **Figure 3.1**.

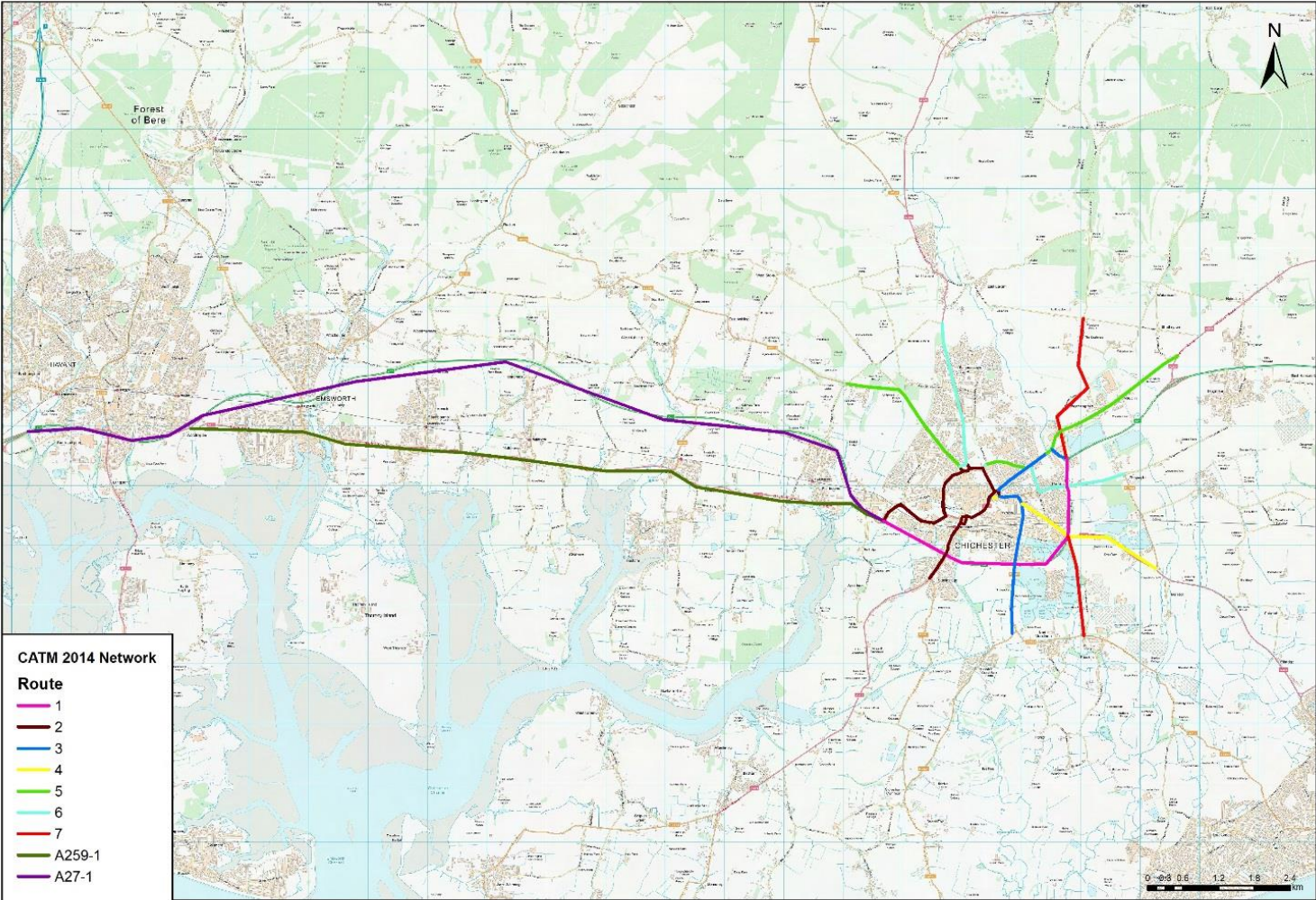
Figure 3.1 – Position of counts for the CATM



3.4 2014 CATM New Journey Time Data

- 3.4.1 The Journey time data for the model update was sourced from the Traffic Master Data via Department of Transport (DfT) covering the period of June and November 2014.
- 3.4.2 Journey Time routes for validation were defined and the relevant time data for the AM peak hour (08:00 to 09:00), Inter Peak average hour (10:00 to 16:00) and PM peak hour (17:00 to 18:00) extracted from the full data for the study area. The data used was for the neutral weekdays Tuesday to Thursday.
- 3.4.3 The journey time routes 1 to 7 are from the original HE CATM LMVR and routes A27 and A259 are new routes included in the updated model to cover the corridor west from Chichester to Emsworth and Havant. All journey time routes are shown in **Figure 3.2**. As part of the calibration process, thorough sense checks of free flow speeds against posted limits were undertaken. This gave comfort that for those routes across the network for where journey time data was not readily available, reasonable and proportionate checks had been made.

Figure 3.2 – Journey time routes for the CATM update



4 Matrix Development

4.1 Introduction

- 4.1.1 This section explains the methods used to develop the revised origin and destination (OD) demand matrices prior to them being assigned to the network. The approach taken is a pragmatic and proportionate approach, given the limited area over which the model requires extending and the purpose of the model update, to inform the Local Plan.
- 4.1.2 The matrices in the model have largely been retained from the original 2014 base year HE CATM model. The objective in the model update was to freeze or retain the HE CATM model matrices as far as possible, with effort concentrated on improving the matrices in the model extension areas to the west and south of Chichester.
- 4.1.3 To help support the extension of the western area, cordoned post matrix estimation matrices from the SERTM model were provided to PBA by HE's consultants of the model. For the purposes of extending the model to the west, these were assumed to inform the prior matrices. Whilst this approach is not a standard approach, it was felt that this was considered a proportionate approach given that the geographic scope of the extension to the west is very limited and the model is to be used for Local Plan testing only.
- 4.1.4 The original HE CATM model matrix building was largely informed by INRIX mobile phone data and hence the model update continues to be underpinned by this data. This section therefore concentrates on reporting the matrix update in the extended areas of the model including on the matrix estimation undertaken.

4.2 Overview

- 4.2.1 Having undertaken the extension of the network to the south and west, an initial check of model flows against observed flows at suitable locations of the extended model was undertaken. This identified that the existing volume of trips in the current matrices was underrepresented in order to achieve acceptable flow validation in the extended areas of the model.
- 4.2.2 Checks on trip distribution was also undertaken, initially using census travel to work data. These checks indicated that there were some issues of distribution from zones within the Southbourne area, for trips travelling west in particular.
- 4.2.3 To better replicate trip distribution in the western area of the model, a comparison between the existing zone structure/locations in CATM and those in SERTM was undertaken, this resulted in the combination of some SERTM zones and were subsequently used to replace or add trips onto existing zones for the western areas of the model only. As such, this involved maintaining the matrices within the existing simulation network area so not to affect the overall validation in the area within Chichester. The trips from the SERTM model were only used to improve the prior matrix in the western extended area of the model with the rest of the trips being retained from the original HE CATM model.
- 4.2.4 The SERTM matrices provided, are average hour for the peak period, therefore to maintain consistency with the time periods modelled and represented in the CATM, which are peak hour matrices, it has been necessary to factor up the SERTM peak period model. To do this, local ATC data has been interrogated to determine a peak period to peak hour factor for the AM and PM peak periods. This indicates that a factor of 1.07 applies to both periods, to represent peak hour. The inter peak SERTM matrices are average hour, which is consistent with the CATM model, therefore no further adjustments for this period were necessary.

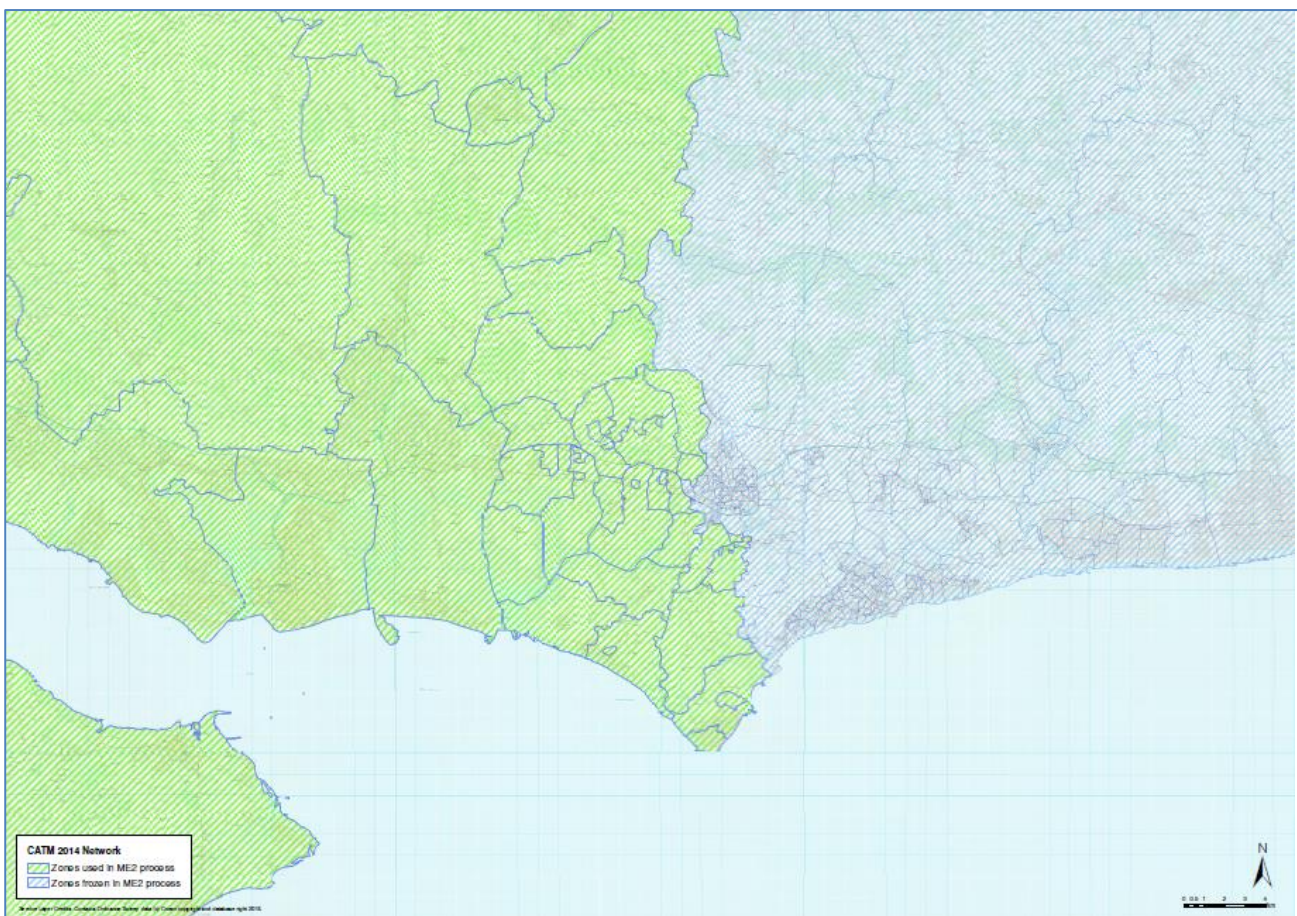
4.2.5 Having created an amended matrix based on the additional zones, matrix estimation (ME) was undertaken to further refine the matrices in the extended model area based on the calibration counts.

4.3 Matrix Estimation

4.3.1 Once the prior matrix was complete it was necessary to undertake Matrix Estimation to obtain a better matrix fit to the observed traffic counts and a new post matrix fit for purpose in the extended model area. As part of this process some OD movements, specifically within the region of Chichester City Centre were 'frozen' so not to effect sections of the matrices that the HE calibration and flow validation achieved in the previous HE CATM and where possible improved. The frozen sections of the prior matrices also included zones to the east and north of Chichester for which network changes were not required as the HE CATM was deemed adequate in these areas for the purposes of testing the additional Local Plan development sites that are the subject of this model update. Figure 4-1 illustrates the areas that were frozen in the ME process and those areas that were subject to ME. The area shown in blues indicates where zones were frozen.

4.3.2 The frozen parts of the matrix during matrix estimation refers to all cells in the rows and columns related to the 'frozen' zones. This means that any cell that has an origin or destination zone or both zones labelled as frozen, was fixed to its prior matrix cell value.

Figure 4.1 – Frozen Areas of Matrices in Matrix Estimation



4.3.3 In line with good practice guide, the matrix estimation was only undertaken after thorough checks of the network coding, to avoid potential network errors from distorting the matrix estimation process.

- 4.3.4 The SATURN manual also advises that the prior matrix gives total flows across the counted links which are broadly correct; i.e. within $\pm 10\%$ is deemed a good target before matrix estimation is undertaken. These fundamental checks were undertaken before the ME process was undertaken.
- 4.3.5 The matrix estimation process itself was undertaken using SATURN's SATME2 program. The SATME2 module uses the best estimate of trip movements as contained in the prior matrices. The process adjusts the pattern of trip distribution and trip numbers to match a file of input traffic counts informing the ME process. SATME2 requires a 'PIJA' file each element of representing the proportion of trips (P) between a particular OD pair (ij) which uses the counted link (A). The PIJA data are obtained through SATURN's SATPIJA program following an assignment using the SAVEIT option. The SAVEIT parameter in SATURN allows link costs as used in the assignment tree build to be saved for subsequent analysis. The matrix estimation was undertaken using separate counts for cars, LGV and HGV's. The primary input to the calibration process were the traffic flows used as target counts for the matrix estimation process.
- 4.3.6 The following section summarises the model assignment, calibration and validation of the network and matrices of the revised model. Given the purpose of the model update as a tool to test the impacts of the Local Plan, a proportionate approach has been taken in reporting the outcome of the matrix estimation. This has been based predominantly by looking at the trip length distribution (TLD) between the prior and post ME matrices. The TLD is a key measure of assessing the impacts of ME and is included as a key check within WebTAG Unit M3.1 on Highway Assignment Modelling. The TLD results are reported in Section 7.3 as part of the model calibration results.

4.3.7 In addition to the TLD, Tables 4.1 and 4.2 below provide a summary on the matrix zonal cell values and matrix total trip ends (slope, intercept and R squared) in line with Table 5 of WebTAG Unit M3.1. A green tick indicates where the guidance is met and an orange cross indicates where it is not. In most cases, the guidance is met. Where it is not, it is generally just outside the required envelope. It is considered that the provided outputs adequately demonstrate that the matrix estimation process is not overly changing the prior matrices.

Table 4.1 – Linear Regression results of matrix estimation checks

Measure	Significance Criteria	AM	IP	PM
Matrix Zonal Cell Values	Slope within 0.98 and 1.02	1.04	1.01	0.99
	Intercept near zero	0.00	0.00	0.00
	R squared in excess of 0.95	0.94	0.98	0.98
Matrix Zonal Trip Ends (Rows)	Slope within 0.98 and 1.02	1.02	1.00	0.98
	Intercept near zero	0.66	0.89	1.08
	R squared in excess of 0.95	0.98	0.99	0.99
Matrix Zonal Trip Ends (Columns)	Slope within 0.98 and 1.02	1.08	1.06	1.00
	Intercept near zero	-9.52	-5.72	0.59
	R squared in excess of 0.95	0.99	0.99	0.99

Table 4.2 – Linear Regression results -indication of WebTAG compliance

Measure	Significance Criteria	AM	IP	PM
Matrix Zonal Cell Values	Slope within 0.98 and 1.02	x	√	√
	Intercept near zero	√	√	√
	R squared in excess of 0.95	x	√	√
Matrix Zonal Trip Ends (Rows)	Slope within 0.98 and 1.02	√	√	√
	Intercept near zero	√	√	√
	R squared in excess of 0.95	√	√	√
Matrix Zonal Trip Ends (Columns)	Slope within 0.98 and 1.02	x	x	√
	Intercept near zero	√	√	√
	R squared in excess of 0.95	√	√	√

5 Model Assignment, Calibration and Validation Procedures

5.1 Introduction

5.1.1 Calibration of the network and matrices was undertaken to demonstrate that the model outputs provide a reasonable representation of observed traffic flows and behaviours in the updated model. The calibration process involved the refinement of the network detail to check that link lengths, link speeds and junction behaviour/operation are well represented. Junction parameters reviewed and amended as part of the calibration process include turn saturation flows and signal timings as appropriate.

5.2 Generalised Cost Parameters

5.2.1 Generalised cost parameters are used in the model network to determine the minimum cost routes by which traffic is assigned onto the network. Within SATURN, generalised cost parameters or coefficients are input by user class. The two parameters required are pence per minute (PPM) and pence per kilometre (PPK). TAG Unit M3-1, 2.8.1 provides the formula for the calculation. For the purposes of this model update, the parameters used in the HE CATM have been retained. These are shown in **Table 5.1**.

Table 5.1 – Generalised Cost Parameters for 2014 in 2010 prices

User Class	Class Type	AM		IP		PM	
		PPM	PPK	PPM	PPK	PPM	PPK
1	Car Commute	13.52	6.73	13.42	6.73	13.23	6.73
2	Car Employer-Business	45.84	12.51	44.78	12.51	44.07	12.51
3	Car Other	17.25	6.73	17.93	6.73	18.45	6.73
4	LGV	21.84	15.23	21.84	15.23	21.84	15.23
5	HGV	41.8	39.45	41.80	39.45	41.80	39.45

5.3 Network Calibration

5.3.1 In order to verify that the modelled network represents correctly the existing situation, a number of checks were undertaken as part of the calibration process. These include the following:

- Checks to verify that loading of zone connectors were reasonable;
- Link lengths checks including verifying that directional distances were matched and where different, that the differences were reasonable;
- Routeing checks through the network by using SATURN's 'built trees' facility;
- Verifying that lane designation at junction were correctly coded;
- Verifying of turn saturation flows at key junctions; and
- Checks of free flow speeds against posted speed limits.

- 5.3.2 An examination of the SATURN network has confirmed that each zone centroid has been loaded onto an appropriate link. Link length checks also confirmed that link lengths had been coded correctly.
- 5.3.3 The modelled routing of traffic throughout the network has been checked. **Appendix B** shows P1X plots of the routing calibration checks for all three modelled time periods.
- 5.3.4 The routings have been checked using SATURN's P1X module. Routes between a wide range of Origin and Destination pairs across the whole network were checked to verify that route choice in the model was reasonable. This included checks for north to south and south to north key movements; checks for east to west and west to east movements.
- 5.3.5 Major urban areas covered by the network were identified, and routes between them checked against local knowledge, common sense, and also routes suggested by Google Maps. The urban areas identified are listed below:
- Chichester;
 - Havant;
 - Cosham;
 - Purbrook;
 - Selsey;
 - West Wittering;
 - Bognor Regis;
 - Littlehampton;
 - Emsworth;
 - Petworth;
 - Arundel; and
 - Worthing.
- 5.3.6 In accordance to TAG M3.1 guidance, the number of routes that should be checked is defined by:
- $$\text{Number of OD Pairs} = ((\text{Number of Zones}) ^ 0.25) * (\text{Number of User Classes})$$
- 5.3.7 With 268 zones and 5 user classes, a minimum of 21 OD pairs should be checked. Using combinations of the above-mentioned locations, 22 OD combinations were identified, and checked directional, a total of 44 routes ensuring a robust network. The routes selected meet advised criteria as they:
- Relate to significant number of trips;
 - Are of significant length;
 - Pass through areas of interest;
 - Include both directions of travel;

- Link different compass areas; and
- Coincide with journey time routes as appropriate.

5.3.8 The routes checked for AM, IP and PM Peak are the following:

- 1. Chichester to Arundel (Zones 31 to 210)
- 2. Arundel to Chichester (Zones 210 to 31)
- 3. Chichester to Bognor Regis (Zones 31 to 133)
- 4. Bognor Regis to Chichester (Zones 133 to 31)
- 5. Chichester to Southbourne/Emsworth (Zones 31 to 77)
- 6. Southbourne/Emsworth to Chichester (Zones 77 to 31)
- 7. Chichester to Littlehampton (Zones 31 to 198)
- 8. Littlehampton to Chichester (Zones 198 to 31)
- 9. Chichester to Petworth (Zones 31 to 227)
- 10. Petworth to Chichester (Zones 227 to 31)
- 11. Chichester to Worthing (Zones 31 to 244)
- 12. Worthing to Chichester (Zones 244 to 31)
- 13. Southbourne/Emsworth to Arundel (Zones 77 to 210)
- 14. Arundel to Southbourne/Emsworth (Zones 210 to 77)
- 15. Southbourne/Emsworth to Bognor Regis (Zones 77 to 133)
- 16. Bognor Regis to Southbourne/Emsworth (Zones 133 to 77)
- 17. Southbourne/Emsworth to Littlehampton (Zones 77 to 198)
- 18. Littlehampton to Southbourne/Emsworth (Zones 198 to 77)
- 19. Southbourne/Emsworth to Petworth (Zones 77 to 227)
- 20. Petworth to Southbourne/Emsworth (Zones 227 to 77)
- 21. Southbourne/Emsworth to Worthing (Zones 77 to 244)
- 22. Worthing to Southbourne/Emsworth (Zones 244 to 77)
- 23. Purbrook to Chichester (Zones 221 to 31)
- 24. Chichester to Purbrook (Zones 31 to 221)
- 25. Cosham to Chichester (Zones 215 to 31)
- 26. Chichester to Cosham (Zones 31 to 215)
- 27. Purbrook to Selsey (Zones 221 to 67)
- 28. Selsey to Purbrook (Zones 67 to 221)

- 29. Cosham to Selsey (Zones 215 to 67)
- 30. Selsey to Cosham (Zones 67 to 215)
- 31. Purbrook to West Wittering (Zones 221 to 66)
- 32. West Wittering to Purbrook (Zones 66 to 221)
- 33. Cosham to West Wittering (Zones 215 to 66)
- 34. West Wittering to Cosham (Zones 66 to 215)
- 35. Bognor Regis to Littlehampton (Zones 133 to 198)
- 36. Littlehampton to Bognor Regis (Zones 198 to 133)
- 37. Bognor Regis to Petworth (Zones 133 to 227)
- 38. Petworth to Bognor Regis (Zones 227 to 133)
- 39. Havant to Chichester (Zones 258 to 31)
- 40. Chichester to Havant (Zones 31 to 258)
- 41. Havant to Purbrook (Zones 258 to 221)
- 42. Purbrook to Havant (Zones 221 to 258)
- 43. Havant to Cosham (Zones 258 to 215)
- 44. Cosham to Havant (Zones 215 to 258)

5.3.9 The ability of the model to robustly represent route choice within the network depends on:

- Correct zone sizing and definition, network structure and the realism of the zone centroid connectors to the modelled network;
- Accuracy of the network coding;
- Accuracy with which delays at junctions and cruise speeds on links are modelled; and
- Accuracy of the trip matrices.

5.4 Matrix Calibration

5.4.1 The matrix calibration involved assigning the prior matrices onto the network and checking that observed flows were reasonably replicated. The prior matrix was developed as described in **Section 4**.

5.4.2 Where necessary, selective factoring of matrices was also undertaken so that modelled flows were more consistent with observed flows. These matrix processes were only undertaken after the network checks had been made and applied prior to carrying out the matrix estimation process.

The results of the flow calibration following the matrix estimation process are reported in **Section 7**.

6 Flow and Journey Time Validation and Calibration Criteria and Acceptability Guidelines

6.1 Introduction

6.1.1 The criteria and guidelines apply to models created both for general purposes and those created to address specific interventions. In respect of the latter, it is expected that greater attention should be paid to validation quality in the vicinity of the interventions.

6.2 Trip Matrix Validation

6.2.1 For trip matrix validation, the measure is the percentage differences between modelled flows and counts. Comparisons at screenline level provide information of the quality of the matrices. The validation criterion and acceptability guideline for screenline flows are defined in **Table 6.1**.

Table 6.1 – Trip Matrix Screenline Validation

Screenline Flow Validation Criterion and Acceptability Guideline	
Criteria	Acceptability Guideline
Differences between modelled flows and counts should be less than 5% of the counts	All or nearly all screenlines

* TAG Unit M3.1, Section 3.2.5, Table 1

6.3 Link Flow Validation and Calibration

6.3.1 For link flow validation/calibration, the measures which should be used are:

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

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

* TAG Unit M3.1, Section 3.2.7

Where: GEH is the GEH Statistic

M is the modelled flow; and

C is the observed flow

6.3.2 The validation criteria and acceptability guidelines for link flows are defined in **Table 6.2**.

Table 6.2 – Link Flow Validation/Calibration

Link Flow and Turning Movement Validation/Calibration Criteria and Acceptability Guidelines		
Criteria		Acceptability Guideline
1	Individual flows within 100 veh/h of counts for flows less than 700 veh/h	> 85% of cases
	Individual flows within 15% of counts for flows from 700 to 2,700 veh/h	> 85% of cases
	Individual flows within 400 veh/h of counts for flows more than 2,700 veh/h	> 85% of cases
2	GEH < 5 for individual flows	> 85% of cases

* TAG Unit M3.1, Section 3.2.8, Table 2

6.4 Journey Time Validation

- 6.4.1 For the journey time validation, the measure that is used is the percentage difference between modelled and observed journey times, subject to an absolute maximum difference. The validation criterion and acceptability guideline for journey times are defined in **Table 6.3**.

Table 6.3 – Journey Time Validation

Journey Time Validation Criterion and Acceptability Guideline	
Criteria	Acceptability Guideline
Modelled times along routes would be within 15% of surveyed times (or 1 minute, if higher than 15%)	> 85% of routes

* TAG Unit M3.1, Section 3.2.10, Table 3

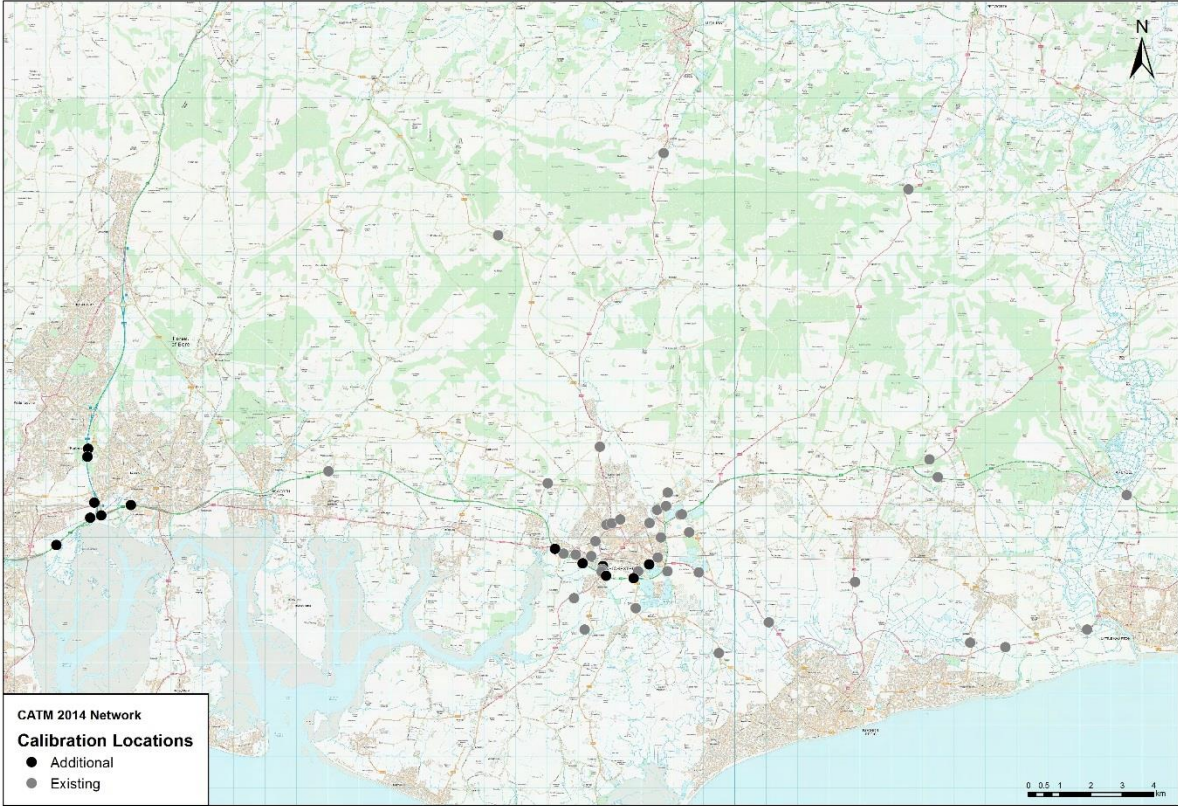
7 Model Calibration Results

7.1 Introduction

7.1.1 This section reports on the flow calibration. The calibration of the network and matrices were undertaken to seek to achieve an accurate representation of observed traffic flows and behaviours in the updated model. This section reports on the results of the flow calibration in the CATM for all three-time period undertaken for key locations.

7.1.2 **Figure 7.1** shows us the location of the calibration counts.

Figure 7.1 – Calibration Counts Location



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7.1.3 The CATM flow calibration consists of up to 93 records in each time period. This underlines the extensive coverage of the calibration with a view to developing a model that is reasonably robust across the network.

7.2 Flow Calibration Results

7.2.1 The summary of the calibration results is shown in **Table 7.1** with the full analysis attached in **Appendix C**. Out of the total of 93 survey locations, 87 of them are classified counts.

Table 7.1 – Calibration Counts Summary

Criteria	All Vehicles					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	83	89%	90	97%	80	86%
No of links meeting Acceptability criteria (GEH)	84	90%	89	96%	77	83%
No of links meeting Acceptability criteria (hourly flow or GEH)	84	90%	90	97%	80	86%
Total Number of links	93		93		93	
Criteria	Cars					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	79	91%	84	97%	79	91%
No of links meeting Acceptability criteria (GEH)	77	89%	84	97%	76	87%
No of links meeting Acceptability criteria (hourly flow or GEH)	79	91%	84	97%	79	91%
Total Number of links	87		87		87	
Criteria	LGVs					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	84	97%	87	100%	85	98%
No of links meeting Acceptability criteria (GEH)	82	94%	86	99%	84	97%
No of links meeting Acceptability criteria (hourly flow or GEH)	84	97%	87	100%	85	98%
Total Number of links	87		87		87	
Criteria	Lights (Cars + LGV)					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	77	89%	84	97%	77	89%
No of links meeting Acceptability criteria (GEH)	78	90%	84	97%	74	85%
No of links meeting Acceptability criteria (hourly flow or GEH)	78	90%	84	97%	77	89%
Total Number of links	87		87		87	
Criteria	HGVs					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	85	98%	87	100%	87	100%
No of links meeting Acceptability criteria (GEH)	85	98%	86	99%	86	99%
No of links meeting Acceptability criteria (hourly flow or GEH)	85	98%	87	100%	87	100%
Total Number of links	87		87		87	

- 7.2.2 Overall the Link Calibration of the network is shown to be good, achieving higher percentages than the 85% of the guideline.
- 7.2.3 The calibration analysis was based on the GEH statistic and the Link Flow Criteria. The GEH statistic is a formula used in traffic modelling to compare two sets of traffic volumes and assess the fit between the observed and modelled flows. It takes account of the fact that when traffic flows are low, the percentage difference between observed and modelled flows may be high but the significance of this difference is small.
- 7.2.4 A GEH of less than 5.0 is considered to represent a good match between the modelled and observed hourly flows. A GEH value greater than 10 indicates that the match between observed and modelled flows is poor and closer attention is required. The guideline is to aim for 85% of counts with a GEH below 5.

7.3 Trip Length Distribution Calibration Results

- 7.3.1 Trip length distribution pre and post matrix estimation has been checked. This is to check that the trip matrix estimation process does not materially alter the trip making patterns in the prior matrices. Matrix estimation can have the tendency to increase short distance trips at the expense of long trips, which needs to be kept to a minimum.
- 7.3.2 The results of the trip length distribution checks are shown in **Figures 7.2 to 7.4** for each of the AM, Inter Peak and PM peaks respectively. The results show that the trip length distribution does not change too greatly pre and post matrix estimation and this demonstrates that the matrix estimation has not overly altered trip length distribution within the model.

Figure 7.2 – AM Peak TLD Comparison

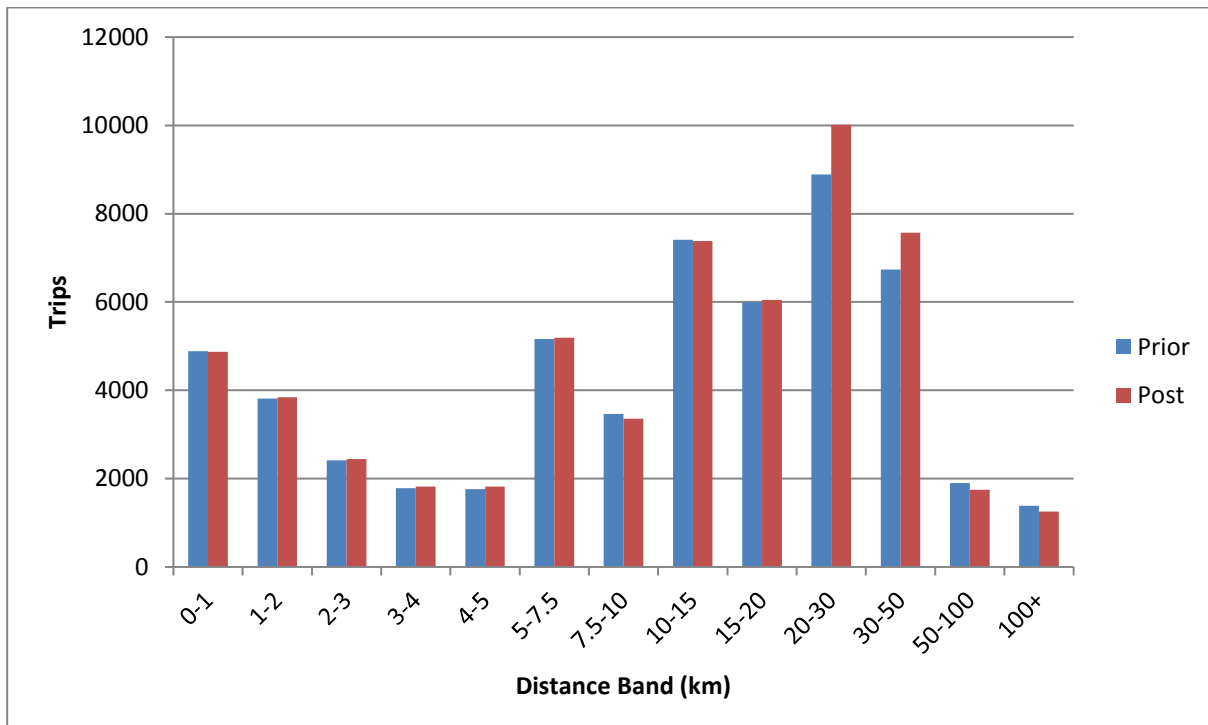


Figure 7.3 – IP Peak TLD Comparison

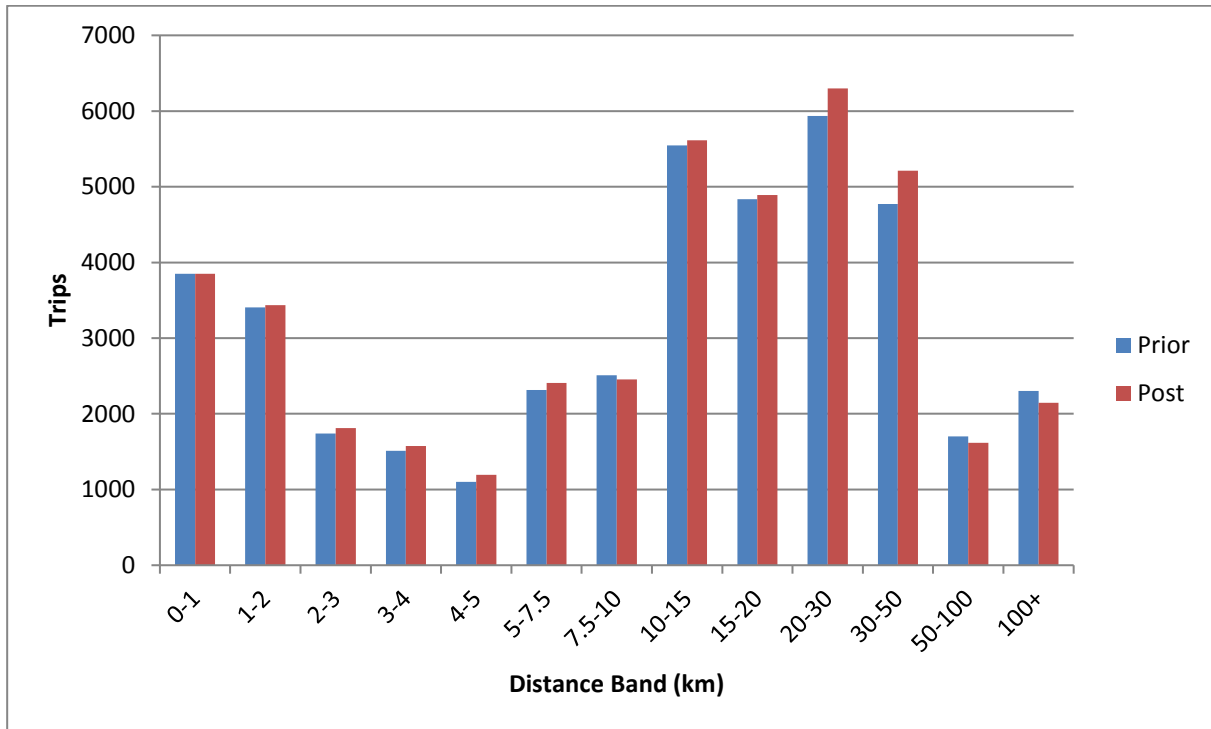
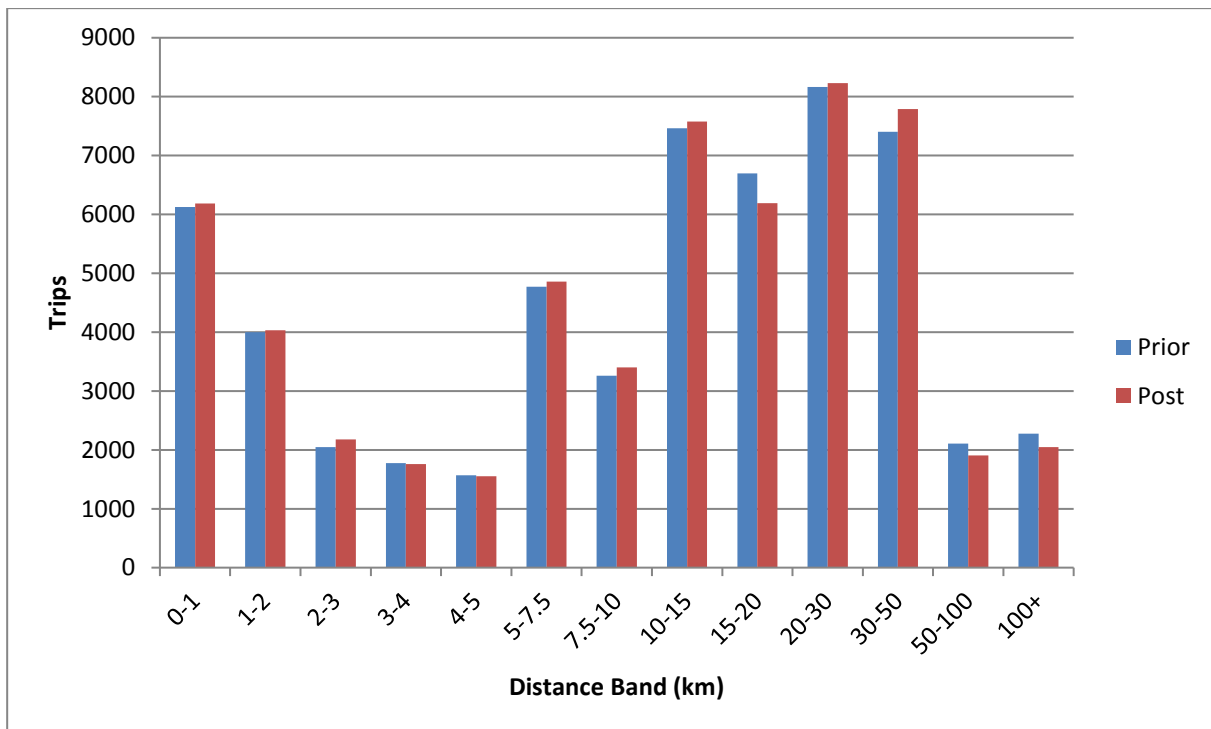


Figure 7.4 – PM Peak TLD Comparison



8 Model Validation Results

8.1 Introduction

8.1.1 This section reports on the flow and journey time validation achieved by CATM. The results have been considered with respect to validation criteria and acceptability guidelines contained in Section 3 of TAG Unit M3.1 (Highway Assignment Modelling). The guidance notes that any adjustments to the model intended to reduce the differences between the modelled and observed data should be regarded as calibration. Validation simply involves comparing modelled and observed data that is independent from that used in the calibration.

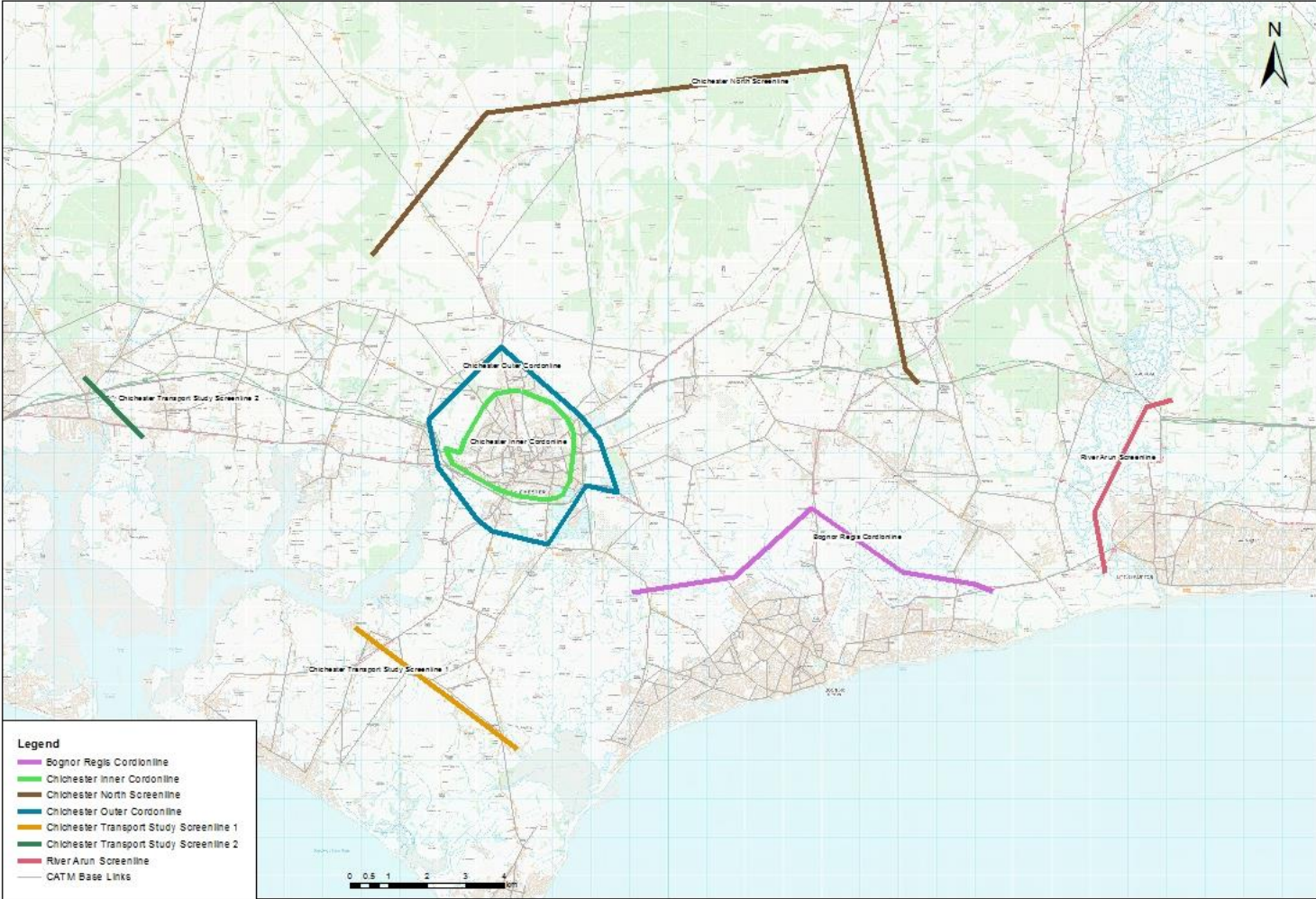
8.1.2 The main comparisons required for the validation of a highway assignment model as noted in the guidance are listed below:

- A check on the quality of the trip matrices – this requires a comparison of assigned flows and count totalled for each screenline or cordon;
- A check on the quality of the assignment – this is demonstrated by comparing flows and counts on individual links and turning movements at junctions; and
- A check on the quality of the network and assignment – this is demonstrated by comparing modelled and observed journey times along routes.

8.2 Screenline Validation Results

8.2.1 Flow validation has been undertaken on seven screenlines within the model. The screenlines are shown in **Figure 8.1**. The results of the flow validation are presented by time period below.

Figure 8.1 - Screenlines



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Table 8.1 – AM Peak Flow Validation (PCU/hr)

Screenline Name	No. of Links	AM				
		Observed	Modelled	% Diff.	Pass?	% of Links Compliant
Chichester Inner Cordon - Inbound	12	6,139	6,131	0%	Pass	100%
Chichester Inner Cordon - Outbound	12	3,900	3,965	2%	Pass	100%
Chichester Outer Cordon - Inbound	13	9,334	9,327	0%	Pass	85%
Chichester Outer Cordon - Outbound	13	6,841	6,900	1%	Pass	92%
Northern Screenline -SB	5	2,799	2,841	1%	Pass	100%
Northern Screenline - NB	5	2,344	2,306	-2%	Pass	100%
Bognor Regis Screenline - SB	5	2,172	2,230	3%	Pass	100%
Bognor Regis Screenline - NB	5	3,624	3,630	0%	Pass	100%
River Arun Screenline - EB	2	2,322	2,294	-1%	Pass	100%
River Arun Screenline - WB	2	2,444	2,343	-4%	Pass	100%
Chichester Transport Study Screenline 1 - NB	2	1,270	1,168	-8%	Fail	100%
Chichester Transport Study Screenline 1 - SB	2	980	1,008	3%	Pass	100%
Chichester Transport Study Screenline 2 - EB	3	2,298	2,180	-5%	Fail	67%
Chichester Transport Study Screenline 2 - WB	3	2,266	2,561	13%	Fail	67%

Table 8.2 – IP Peak Flow Validation (PCU/hr)

Screenline Name	No. of Links	IP				
		Observed	Modelled	% Diff.	Pass?	% of Links Compliant
Chichester Inner Cordon - Inbound	12	4,455	4,445	0%	Pass	100%
Chichester Inner Cordon - Outbound	12	4,556	4,577	0%	Pass	100%
Chichester Outer Cordon - Inbound	13	7,314	7,246	-1%	Pass	100%
Chichester Outer Cordon - Outbound	13	7,286	7,302	0%	Pass	100%
Northern Screenline -SB	5	2,126	2,099	-1%	Pass	100%
Northern Screenline - NB	5	1,964	1,886	-4%	Pass	100%
Bognor Regis Screenline - SB	5	2,532	2,532	0%	Pass	100%
Bognor Regis Screenline - NB	5	2,409	2,406	0%	Pass	100%
River Arun Screenline - EB	2	2,150	2,047	-5%	Pass	100%
River Arun Screenline - WB	2	2,161	2,065	-4%	Pass	100%
Chichester Transport Study Screenline 1 - NB	2	1,118	1,124	1%	Pass	100%
Chichester Transport Study Screenline 1 - SB	2	1,253	1,311	5%	Pass	100%
Chichester Transport Study Screenline 2 - EB	3	1,951	1,840	-6%	Fail	100%
Chichester Transport Study Screenline 2 - WB	3	1,840	1,839	0%	Pass	100%

Table 8.3 – PM Peak Flow Validation (PCU/hr)

Screenline Name	No. of Links	PM				
		Observed	Modelled	% Diff.	Pass?	% of Links Compliant
Chichester Inner Cordon - Inbound	12	4,448	4,329	-3%	Pass	100%
Chichester Inner Cordon - Outbound	12	5,949	6,042	2%	Pass	92%
Chichester Outer Cordon - Inbound	13	7,999	8,228	3%	Pass	92%
Chichester Outer Cordon - Outbound	13	10,000	9,706	-3%	Pass	69%
Northern Screenline -SB	5	2,618	2,549	-3%	Pass	100%
Northern Screenline - NB	5	2,750	2,625	-5%	Pass	80%
Bognor Regis Screenline - SB	5	4,172	4,162	0%	Pass	100%
Bognor Regis Screenline - NB	5	2,478	2,530	2%	Pass	100%
River Arun Screenline - EB	2	2,761	2,663	-4%	Pass	100%
River Arun Screenline - WB	2	2,453	2,430	-1%	Pass	100%
Chichester Transport Study Screenline 1 - NB	2	1,335	1,431	7%	Fail	50%
Chichester Transport Study Screenline 1 - SB	2	1,457	1,369	-6%	Fail	100%
Chichester Transport Study Screenline 2 - EB	3	2,544	2,622	3%	Pass	100%
Chichester Transport Study Screenline 2 - WB	3	2,466	2,630	7%	Fail	100%

- 8.2.2 Overall the Screenline Validation on the network is shown to be good. In the AM 11 out of 14 screenlines (78.6%) fulfil the criteria of 5% difference between observed and modelled flows, the IP, 13 out of 14 (92.9%) and in the PM, 11 out of 14 (78.6%).
- 8.2.3 It is important to note that the screenlines that fail the 5% criterion, are still close to this percentage without generally exceeding an 8% difference. It is also noted that individual link flows for the screenlines (column % of Links Compliant), largely achieve WebTAG validation criteria.
- 8.2.4 As noted, where the screenlines flows are lower than observed, none exceed an absolute difference of 8% which could be considered to be within day to day variations. The IP model shows the best fit to the observed screenline flows with 13 screenline flows out of 14 achieving WebTAG criteria. The AM and PM models also achieve good screenline validation. The IP is the least congested, and for the purposes of testing the Local Plan, focus will be on the more congested AM and PM peak periods.
- 8.2.5 The modelling assumes fixed trip assignment whereby route choice is the only traveller response, with variable demand not being accounted for. This means that future forecasts are likely to overestimate future demands on the highway network and hence the modelling represents a robust view of future network performance. The issues discussed above, will be borne in mind when undertaking model tests and in interpreting and understanding the impacts of proposed Local Plan development.

8.3 Link Flow Validation

- 8.3.1 **Table 8.4** and **Table 8.5** show the summary of the Link and Turn Flow Validation checks respectively. The analytical presentation of the results is in **Appendix D** for the Link Flow Validation and **Appendix E** for the Turn Flow Validation.
- 8.3.2 **Figure 8.2** shows the location of the validation counts.

Figure 8.2 – Validation Link Flow Counts Location

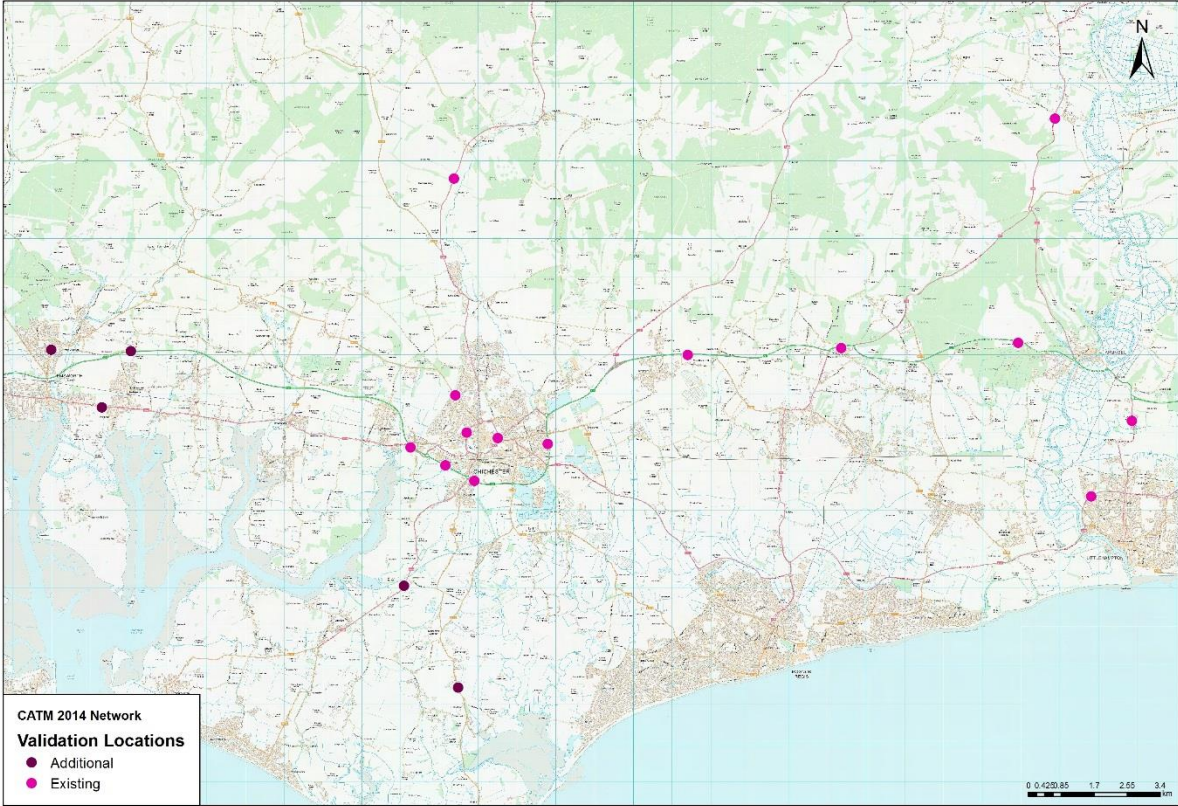


Table 8.4 – Link Flow Validation Summary

Criteria	All Vehicles					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	36	88%	36	88%	31	76%
No of links meeting Acceptability criteria (GEH)	36	88%	38	93%	35	85%
No of links meeting Acceptability criteria (hourly flow or GEH)	37	90%	38	93%	37	90%
Total Number of links	41		41		41	
Criteria	Cars					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	33	89%	36	97%	31	84%
No of links meeting Acceptability criteria (GEH)	33	89%	34	92%	30	81%
No of links meeting Acceptability criteria (hourly flow or GEH)	34	92%	36	97%	31	84%
Total Number of links	37		37		37	
Criteria	LGVs					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	35	95%	36	97%	35	95%
No of links meeting Acceptability criteria (GEH)	31	84%	33	89%	30	81%
No of links meeting Acceptability criteria (hourly flow or GEH)	35	95%	36	97%	35	95%
Total Number of links	37		37		37	
Criteria	Lights (Cars + LGV)					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	33	89%	37	100%	28	76%
No of links meeting Acceptability criteria (GEH)	34	92%	36	97%	31	84%
No of links meeting Acceptability criteria (hourly flow or GEH)	35	95%	37	100%	34	92%
Total Number of links	37		37		37	
Criteria	HGVs					
	AM Peak		Inter Peak		PM Peak	
No of links meeting Acceptability criteria (hourly flow)	37	100%	37	100%	37	100%
No of links meeting Acceptability criteria (GEH)	36	97%	35	95%	37	100%
No of links meeting Acceptability criteria (hourly flow or GEH)	37	100%	37	100%	37	100%
Total Number of links	37		37		37	

8.3.3 Overall the Link Flow Validation on the network is shown to be good, with only the cars in the PM Peak at 84% failing but still be close to the 85% guideline. Out of the total of 41 survey locations, 37 of them are classified counts.

8.4 Turn Flow Validation

8.4.1 Turn counts for key junction on A27 Chichester Bypass for all modelled periods were checked against observed flows. The data has been retained from the original HE CATM LMVR. **Figure 8.3** shows the location of the turn flow counts.

Figure 8.3 – Validation Turn Flow Counts Location



Service Layer Credits: Contains Ordnance Survey data (c) Crown copyright and database right 2018

Table 8.5 – Turn Flow Validation Summary

Criteria	All Vehicles					
	AM Peak		Inter Peak		PM Peak	
No of turns meeting Acceptability criteria (hourly flow)	122	88%	125	91%	116	84%
No of turns meeting Acceptability criteria (GEH)	85	62%	96	70%	73	53%
No of turns meeting Acceptability criteria (hourly flow or GEH)	122	88%	125	91%	118	86%
Total Number of turns	138		138		138	
Criteria	Cars					
	AM Peak		Inter Peak		PM Peak	
No of turns meeting Acceptability criteria (hourly flow)	121	88%	125	91%	117	85%
No of turns meeting Acceptability criteria (GEH)	90	65%	93	67%	81	59%
No of turns meeting Acceptability criteria (hourly flow or GEH)	124	90%	126	91%	117	85%
Total Number of turns	138		138		138	
Criteria	LGVs					
	AM Peak		Inter Peak		PM Peak	
No of turns meeting Acceptability criteria (hourly flow)	132	96%	135	98%	130	94%
No of turns meeting Acceptability criteria (GEH)	96	70%	110	80%	96	70%
No of turns meeting Acceptability criteria (hourly flow or GEH)	132	96%	135	98%	130	94%
Total Number of turns	138		138		138	
Criteria	Lights (Cars + LGV)					
	AM Peak		Inter Peak		PM Peak	
No of turns meeting Acceptability criteria (hourly flow)	123	89%	122	88%	112	81%
No of turns meeting Acceptability criteria (GEH)	86	62%	97	70%	73	53%
No of turns meeting Acceptability criteria (hourly flow or GEH)	123	89%	125	91%	114	83%
Total Number of turns	138		138		138	
Criteria	HGVs					
	AM Peak		Inter Peak		PM Peak	
No of turns meeting Acceptability criteria (hourly flow)	138	100%	138	100%	138	100%
No of turns meeting Acceptability criteria (GEH)	116	84%	123	89%	118	86%
No of turns meeting Acceptability criteria (hourly flow or GEH)	138	100%	138	100%	138	100%
Total Number of turns	138		138		138	

8.4.2 Overall the Turn Flow Validation on the network is shown to be good, with only the Cars and Lights in the PM Peak marginally failing at 85% and 83% respectively compared to the greater than 85% guideline threshold.

8.5 Model Convergence

- 8.5.1 WebTAG guidance notes that before the results of any traffic assignment are used to influence decisions, the stability or degree of convergence of the assignment must be confirmed at the appropriate level (TAG M3.1, paragraph 3.3).
- 8.5.2 The importance of achieving convergence at an appropriate level is related to the need to provide stable, consistent and robust model results. This is especially so when model outputs are used to compare 'with' and 'without' scheme scenarios in cost benefit analysis. It is important to be able to distinguish differences due to the scheme from those associated with different degrees of convergence.
- 8.5.3 The convergence checks have followed WebTAG guidance on the anticipated degree of model convergence and are the following:
- The main measure of the convergence is the Delta statistic or % gap which is the difference between the costs along the chosen routes and those along the minimum cost routes expressed as a percentage of the minimum costs. WebTAG recommends a guidance target for the % gap of 0.1% or less;
 - The proportion of links for which changes in traffic volumes is less than 1% is at least 98% for four consecutive iterations; and
 - The proportion of links for which changes in link delays is less than 1% is at least 98% for four consecutive iterations.
- 8.5.4 **Table 8.6** summarises the above-mentioned guidance.

Table 8.6 – Summary of Convergence Measures and Base Model Acceptable Values

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)

* TAG Unit M3.1, Section 3.3.17, Table 4

- 8.5.5 The results of convergence statistics achieved for all three periods of the CATM are shown in **Table 8.7**. This shows that all three time period models exceed the convergence criteria required and there demonstrate that the models are stable and robust.

Table 8.7 – Convergence Statistics

AM			
Iteration	% Gap/	% Flow	% Cost
	Delta		Delays
33	0.011	99.2	99.5
34	0.0074	99.2	99.6
35	0.01	99.1	99.4
36	0.0059	99.5	99.7
IP			
Iteration	% Gap/	% Flow	% Cost
	Delta		Delays
12	0.0038	99.1	99.9
13	0.0028	99.1	100
14	0.0025	99.5	99.9
15	0.0021	99.3	100.0
PM			
Iteration	% Gap/	% Flow	% Cost
	Delta		Delay
47	0.022	99.2	99.6
48	0.019	99.8	99.5
49	0.017	99.6	99.9
50	0.0088	99.5	99.7

8.6 Journey Time Validation

- 8.6.1 Journey time routes on key routes have been checked for validation. Each route has been checked for validation in both directions. The validation routes were previously shown in **Figure 3.2**.
- 8.6.2 Teletrac Navman journey time data (TrafficMaster) has been provided to PBA for journey time validation purposes along the A27 and A259 specifically.
- 8.6.3 **Table 8.9** gives a summary of the AM Peak, Inter Peak and PM Peak journey time validation. **Appendix E** gives graphical representation of the journey time validation.
- 8.6.4 The results show that in the AM Peak 16 out of the 18 routes (89%) fall within the 15% of the observed journey time.
- 8.6.5 Specifically, it was identified that the A27 Eastbound journey time route during the AM peak fails against the observed journey time data. Analysis was undertaken to review the output from Highways England WebTris data which identified that there was significant variation in travel time along this link and as such it is deemed that the modelled time, although doesn't validate against the data used, is a good replication to a general journey time across the link.

8.6.6 **Table 8.8** summarises the AM journey time data for Tuesdays, Wednesdays and Thursdays during March and June for the A27 Eastbound journey time route to provide an example of the variation between these days.

Table 8.8 – HE WebTris AM Journey Time Data for A27 Eastbound route

Date	Total Traffic Flow	AM Travel Time (sec)
04/03/2014	1,780	556
05/03/2014	2,023	899
06/03/2014	1,868	622
11/03/2014	2,028	742
12/03/2014	1,854	538
13/03/2014	1,964	898
18/03/2014	2,001	1,112
19/03/2014	1,970	758
20/03/2014	1,967	1,003
25/03/2014	1,980	1,021
26/03/2014	2,027	598
27/03/2014	1,857	753
03/06/2014	1,858	1,159
04/06/2014	1,922	824
05/06/2014	1,883	648
10/06/2014	1,982	866
11/06/2014	1,821	693
12/06/2014	1,819	864
17/06/2014	1,763	1,126
18/06/2014	1,958	847
19/06/2014	1,899	733
24/06/2014	1,966	719
25/06/2014	1,984	769
26/06/2014	2,045	1,312
Average March	1,943	792
Average June	1,908	880
Overall Average	1,926	836

8.6.7 In the Inter Peak 17 out of the 18 routes (94%) fall within the 15% of the observed journey time. In the PM Peak 16 out of the 18 routes (89%) fall within the 15% of the observed journey time. In the main, while generally lower than observed journey times, the modelled journey times are consistent with observed data across the three model time periods and adequately meet WebTAG journey time criteria.

8.6.8 The validation routes were previously shown in **Figure 3.2**, are shown again in **Figure 8.4**.

Figure 8.4 – Journey time routes for the CATM update

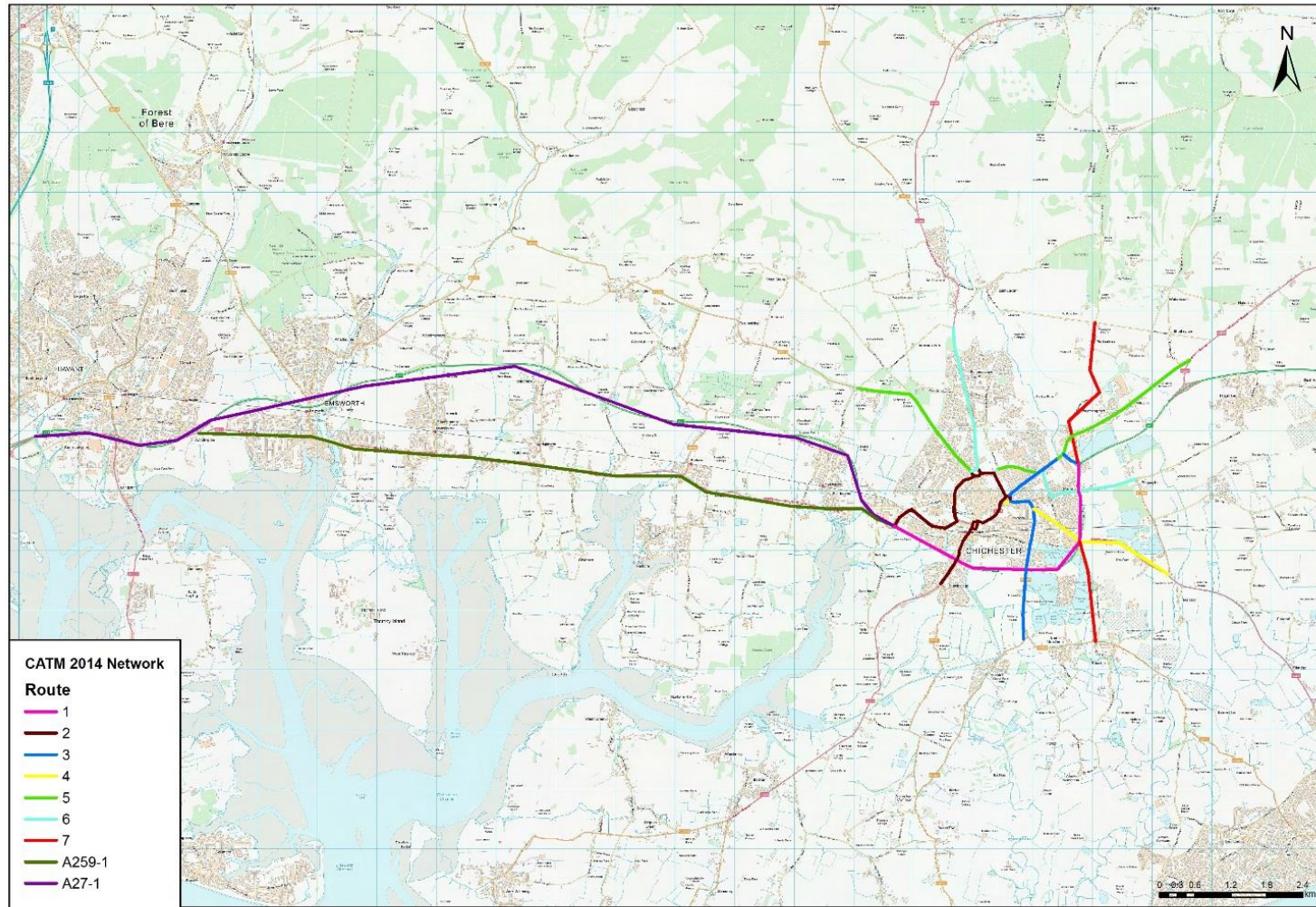


Table 8.9 – Journey Time Validation

Route	Direction	Peak	Av. Observed JT (secs)	Modelled JT (secs)	Diff (secs)	%Diff	Modelled JT within Confidence Interval?	Difference within 1 min?	Pass?
1	NB	AM	466	380	-86	-19%	No	No	Fail
		IP	361	342	-19	-5%	Yes	Yes	Pass
		PM	425	420	-5	-1%	Yes	Yes	Pass
	SB	AM	439	490	51	12%	Yes	Yes	Pass
		IP	498	350	-148	-30%	No	No	Fail
		PM	708	553	-155	-22%	No	No	Fail
2	EB	AM	593	666	73	12%	Yes	No	Pass
		IP	712	645	-67	-9%	Yes	No	Pass
		PM	817	803	-14	-2%	Yes	Yes	Pass
	WB	AM	670	721	51	8%	Yes	Yes	Pass
		IP	604	643	39	6%	Yes	Yes	Pass
		PM	735	743	8	1%	Yes	Yes	Pass
3	NB	AM	559	516	-43	-8%	Yes	Yes	Pass
		IP	549	483	-66	-12%	Yes	No	Pass
		PM	575	480	-95	-17%	No	No	Fail
	SB	AM	533	520	-13	-2%	Yes	Yes	Pass
		IP	472	477	5	1%	Yes	Yes	Pass
		PM	501	522	21	4%	Yes	Yes	Pass
4	EB	AM	254	257	3	1%	Yes	Yes	Pass
		IP	264	270	6	2%	Yes	Yes	Pass
		PM	347	365	18	5%	Yes	Yes	Pass
	WB	AM	409	435	26	6%	Yes	Yes	Pass
		IP	289	276	-13	-4%	Yes	Yes	Pass
		PM	271	230	-41	-15%	No	Yes	Pass
5	EB	AM	591	580	-11	-2%	Yes	Yes	Pass
		IP	601	542	-59	-10%	Yes	Yes	Pass
		PM	635	573	-62	-10%	Yes	No	Pass
	WB	AM	602	606	4	1%	Yes	Yes	Pass
		IP	620	573	-47	-8%	Yes	Yes	Pass
		PM	641	626	-15	-2%	Yes	Yes	Pass
6	EB	AM	583	617	34	6%	Yes	Yes	Pass
		IP	562	576	14	3%	Yes	Yes	Pass
		PM	606	653	47	8%	Yes	Yes	Pass
	WB	AM	614	622	8	1%	Yes	Yes	Pass
		IP	599	591	-8	-1%	Yes	Yes	Pass
		PM	624	635	11	2%	Yes	Yes	Pass
7	NB	AM	559	590	31	6%	Yes	Yes	Pass
		IP	507	433	-74	-15%	Yes	No	Pass
		PM	452	446	-6	-1%	Yes	Yes	Pass
	SB	AM	465	518	53	11%	Yes	Yes	Pass
		IP	498	470	-28	-6%	Yes	Yes	Pass
		PM	634	569	-65	-10%	Yes	No	Pass
A259	WB	AM	974	851	-123	-13%	Yes	No	Pass
		IP	923	835	-88	-10%	Yes	No	Pass
		PM	950	838	-112	-12%	Yes	No	Pass
	EB	AM	1174	1078	-96	-8%	Yes	No	Pass
		IP	949	871	-78	-8%	Yes	No	Pass
		PM	1021	931	-90	-9%	Yes	No	Pass
A27	WB	AM	607	688	81	13%	Yes	No	Pass
		IP	641	626	-15	-2%	Yes	Yes	Pass
		PM	648	737	89	14%	Yes	No	Pass
	EB	AM	1112	659	-453	-41%	No	No	Fail
		IP	648	643	-5	-1%	Yes	Yes	Pass
		PM	774	793	19	2%	Yes	Yes	Pass

8.7 Summary

- 8.7.1 This chapter has presented and discussed the flow validation and Journey Time validation of the CATM model. It has also presented convergence statistics achieved by the model. It has been concluded that the model achieves adequate validation to be considered a robust tool that can be relied upon for the purposes for which the model was commissioned. Considerable effort has been made to improve validation on key links likely to be critical to assessing schemes and development in the vicinity of the links.

9 Summary

9.1 Overview

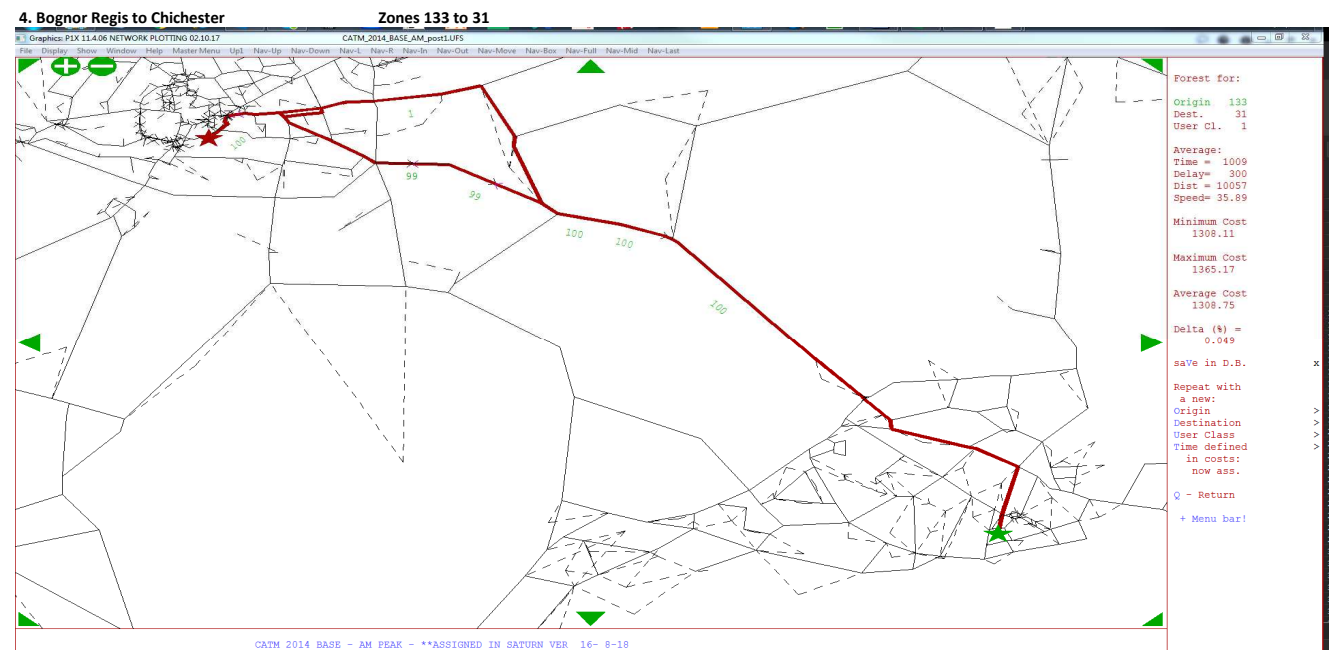
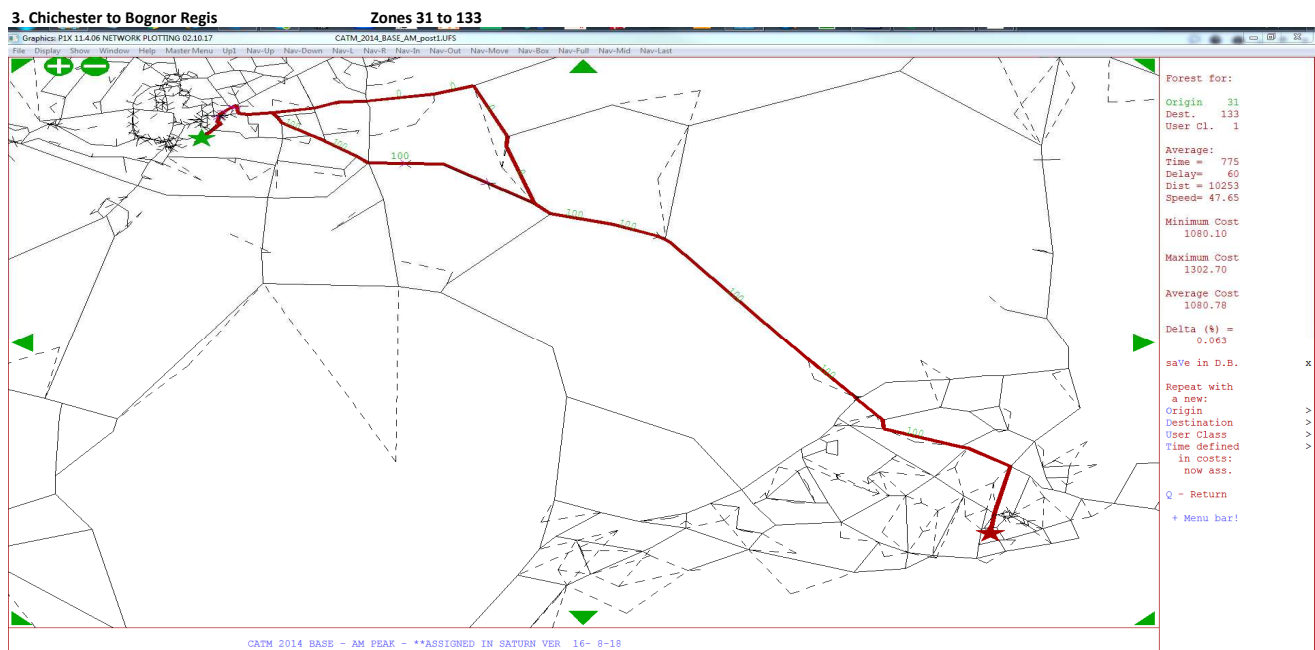
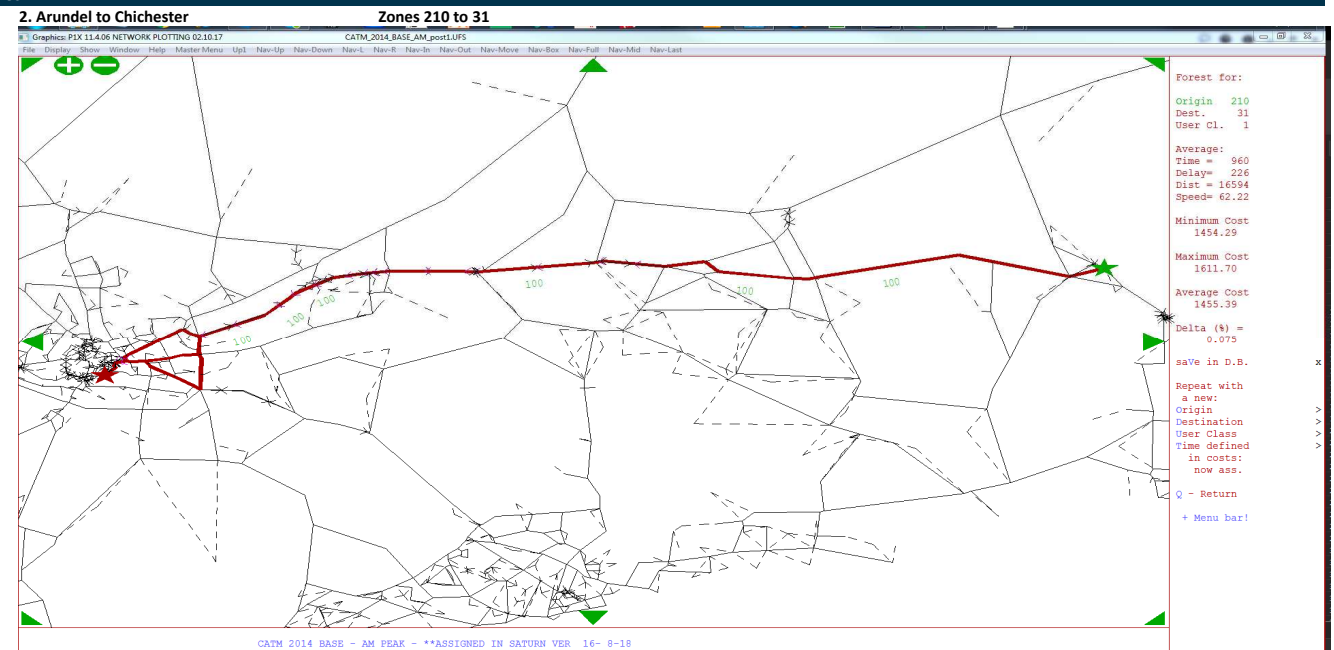
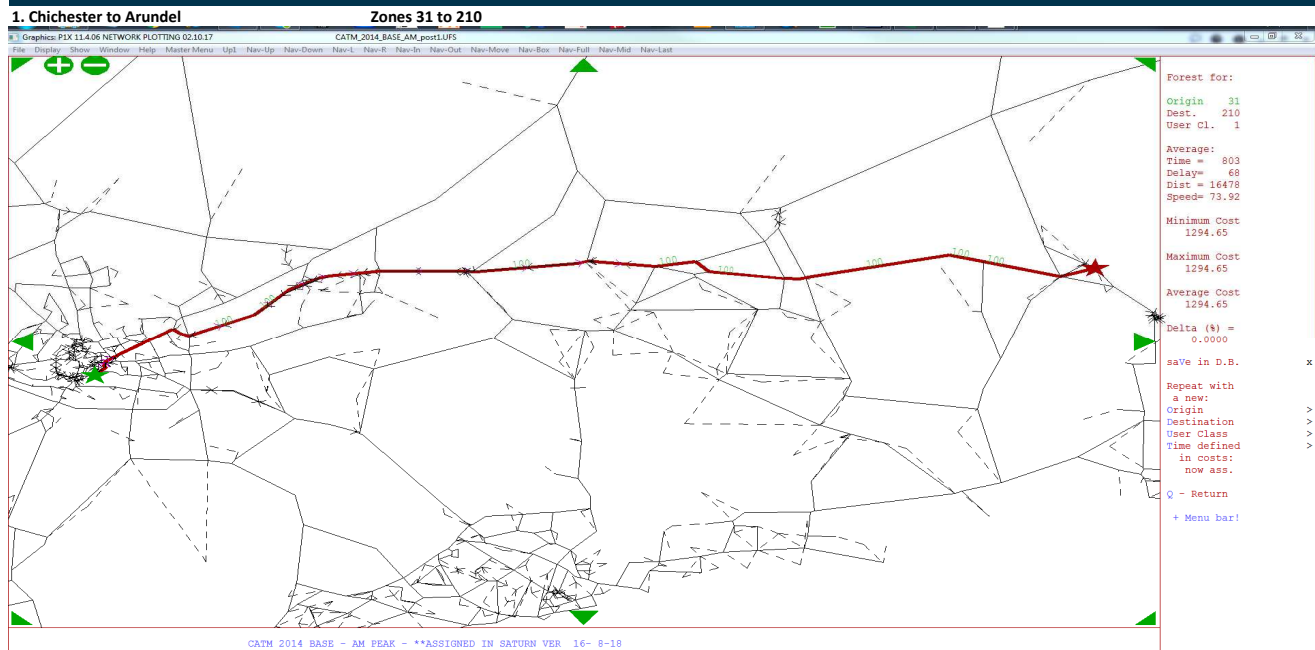
9.1.1 PBA has been commissioned to undertake transport assessment to inform the preparation of the Chichester Local Plan Review: 2016-2035. The Local Plan Review will review the policies and strategy of the adopted Chichester Local Plan: Key Policies 2014-2029 whilst also seeking to meet the latest identified needs of the Plan Area through to 2035. Although the Council adopted the Chichester Local Plan 2014-2029, the examination concluded that the Plan fell short of meeting the full housing needs of the District outside of the South Downs National Park (the 'Plan Area') The Inspector required that the Council commit to a review the Local Plan within 5 years with the objective to ensure that housing needs are fully met. This work informs this review, to test the impact of the additional development needs (including housing) of the Plan Area. In order to provide a robust evidence base for this work, the simulation extent of the existing HE CATM base model has been extended to the west and south so that it is suitable for informing the impacts of additional proposed Local Plan development to be located in these areas. The updated CATM model has been calibrated and validated to a base year of 2014 similar to the existing HE CATM model. This has enabled the original extensive data used in the model development to be retained with complementary or additional count and journey time data also used to calibrate and validate the updated model in the extended areas.

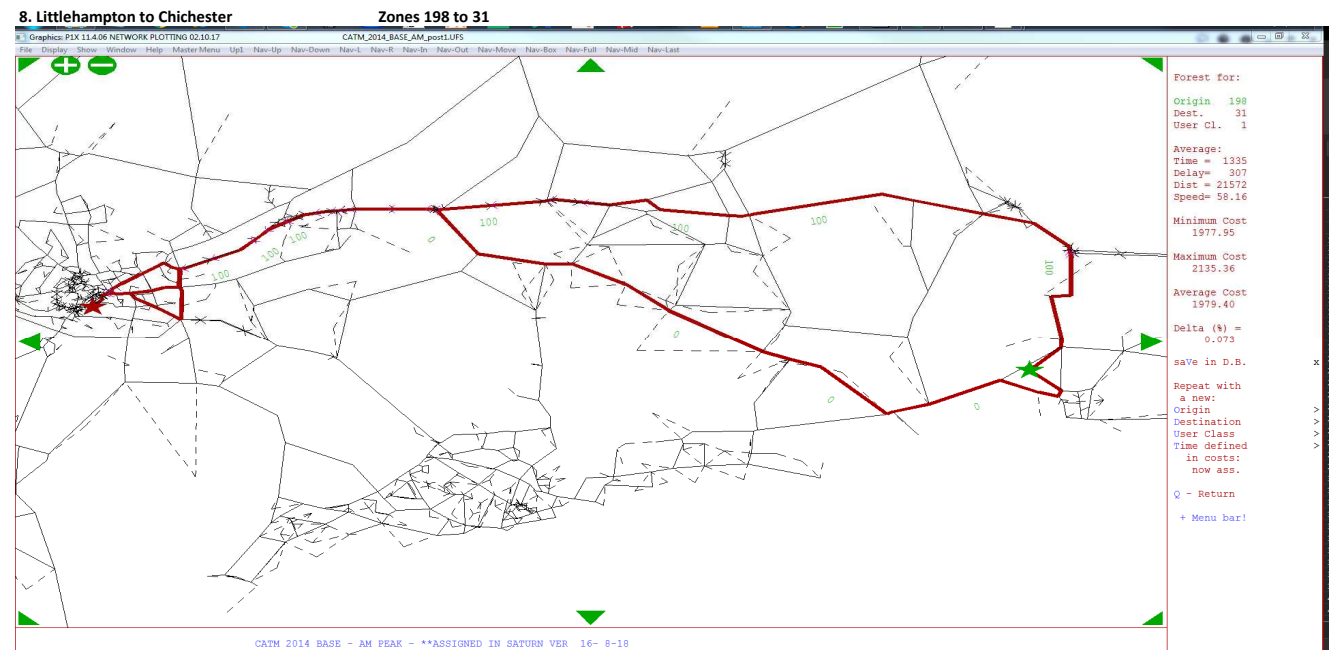
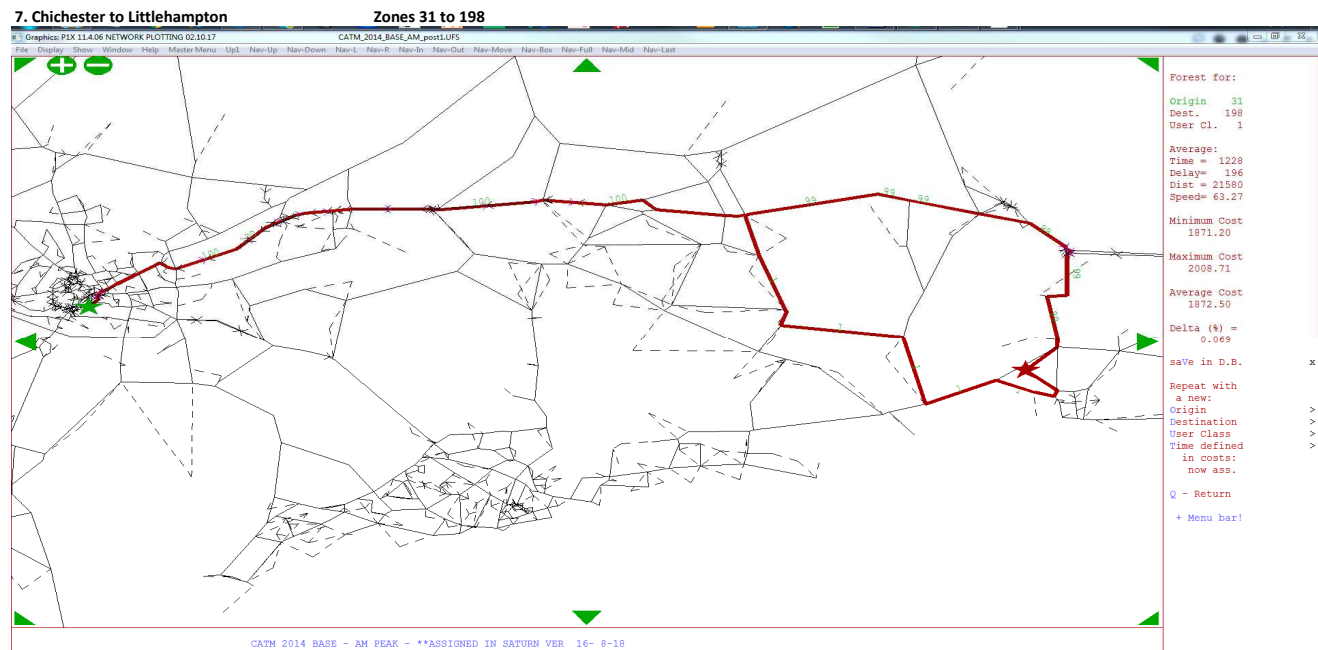
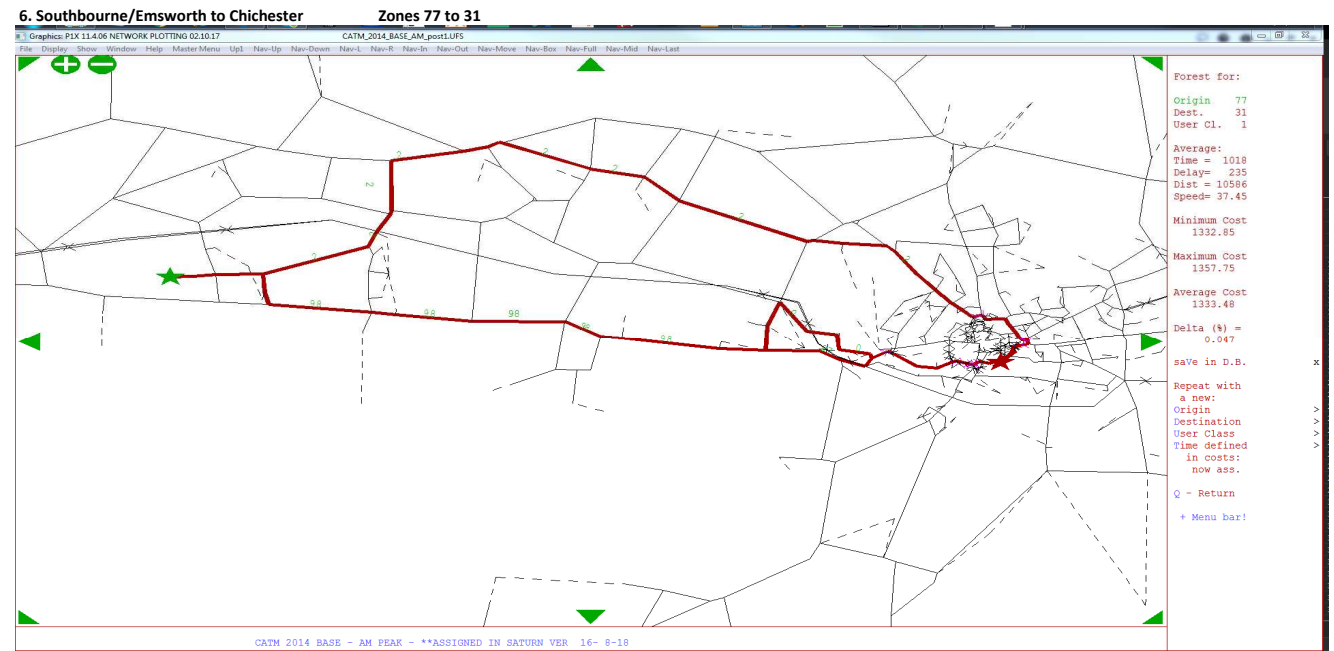
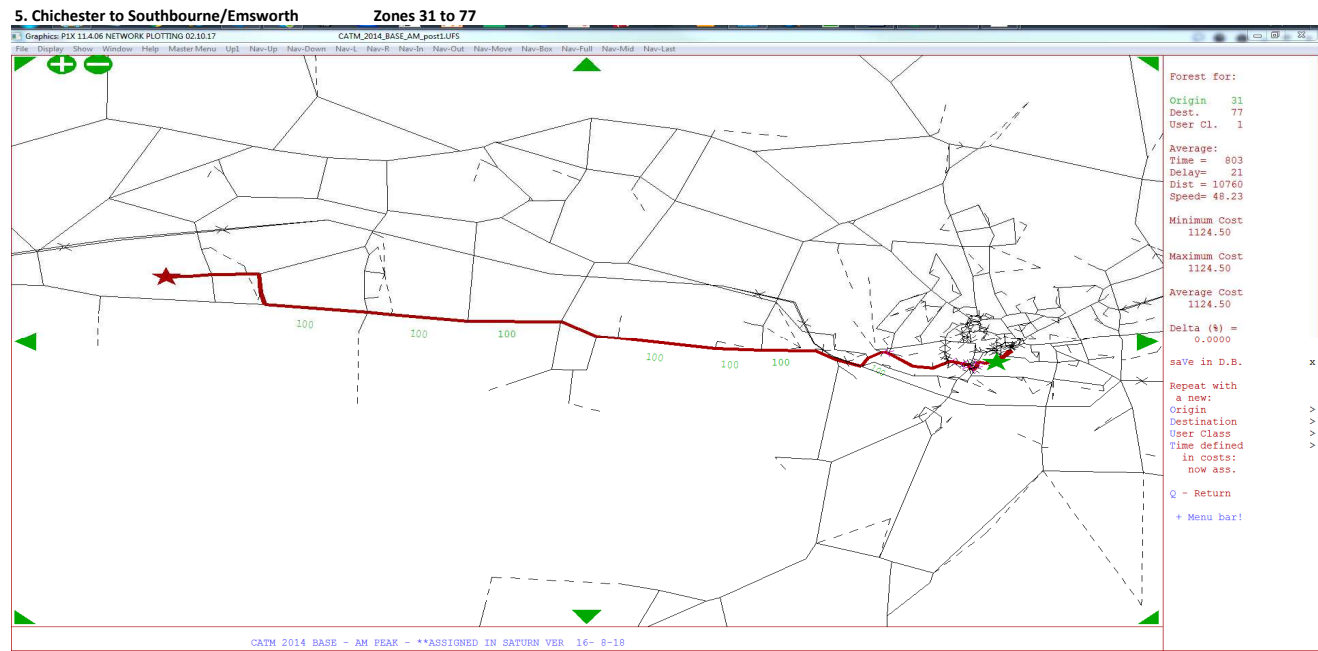
9.2 Conclusions

- 9.2.1 The revalidated CATM to 2014 base year, has been calibrated and validated using 2014 count and journey time data. The calibration and validation results in the three modelled peak hours have shown a good and acceptable fit between observed and modelled flows and journey times. The model has been validated against independent counts and shows an acceptable fit when measured against the Acceptability Guidelines in WebTAG Unit M3.1 (Highway Assignment Modelling).
- 9.2.2 Of the calibration counts, the AM peak achieved 90%, IP 97% and the PM peak achieved 86% respectively. These calibration results demonstrate that the model is well calibrated in respect of link flows and matches observed data very well. For all peak periods the Trip Length Distribution showed little change between the prior and post matrix estimation matrices indicating that the matrix estimation process had not fundamentally altered the trip making patterns from the prior matrices.
- 9.2.3 The link flow validation during the AM, IP and PM peaks were 93%, 85% and 90% respectively. With respect to turn flow validation for key A27 junctions, the model achieved 88% in the AM peak, 91% in the IP and 86% in the PM peak periods.
- 9.2.4 In terms of the screenlines validation, 11 out of 14 (78.6%) achieved compliance in the AM peak, 13 out of 14 (92.9%) in the IP and 11 out of 14 (78.6%) in the PM peak. It is noted that in most cases, the individual links forming the screenlines themselves achieve WebTAG flow validation. Furthermore, none but one of the modelled screenline flows exceed 8% of the observed flows underlying that the screenline flows reasonably match the observed.
- 9.2.5 Journey time routes have also been validated against which resulted in a total of 89%, 94% and 89% of routes falling within the journey time validation criteria.
- 9.2.6 From the analysis presented within this report it is concluded that this model is fit for the purposes of informing the traffic impacts of the additional local plan strategic sites for this study.

Appendix A Trip Routing Checks

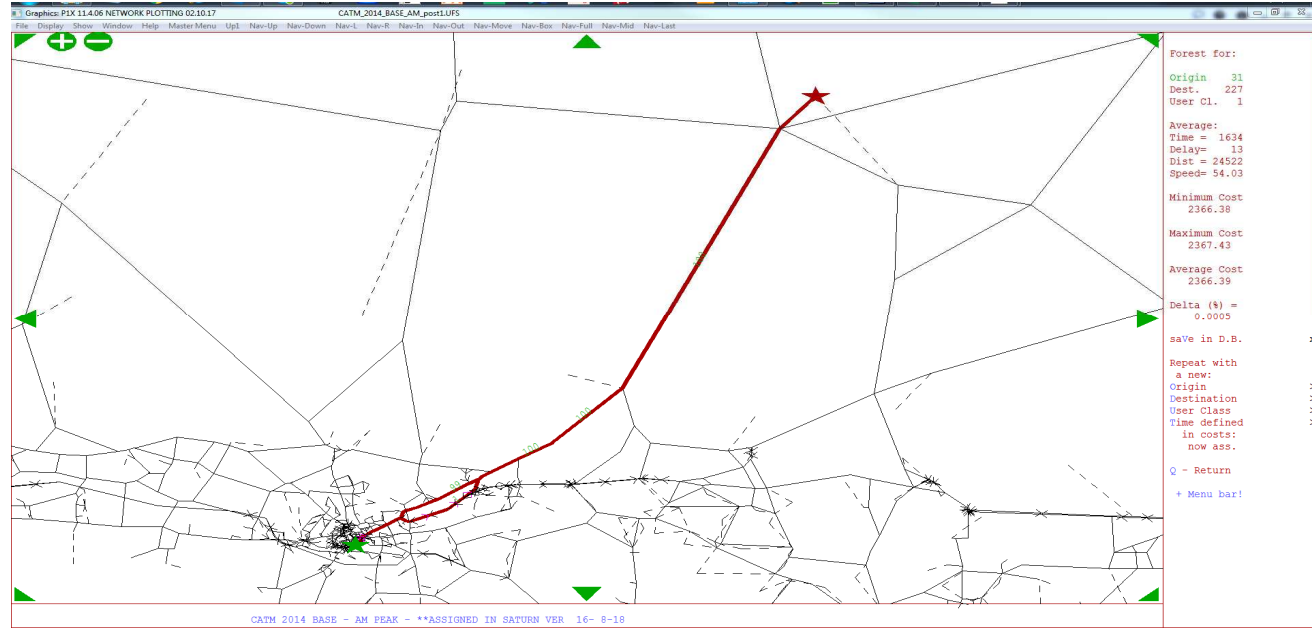
AM Journey Routes Check





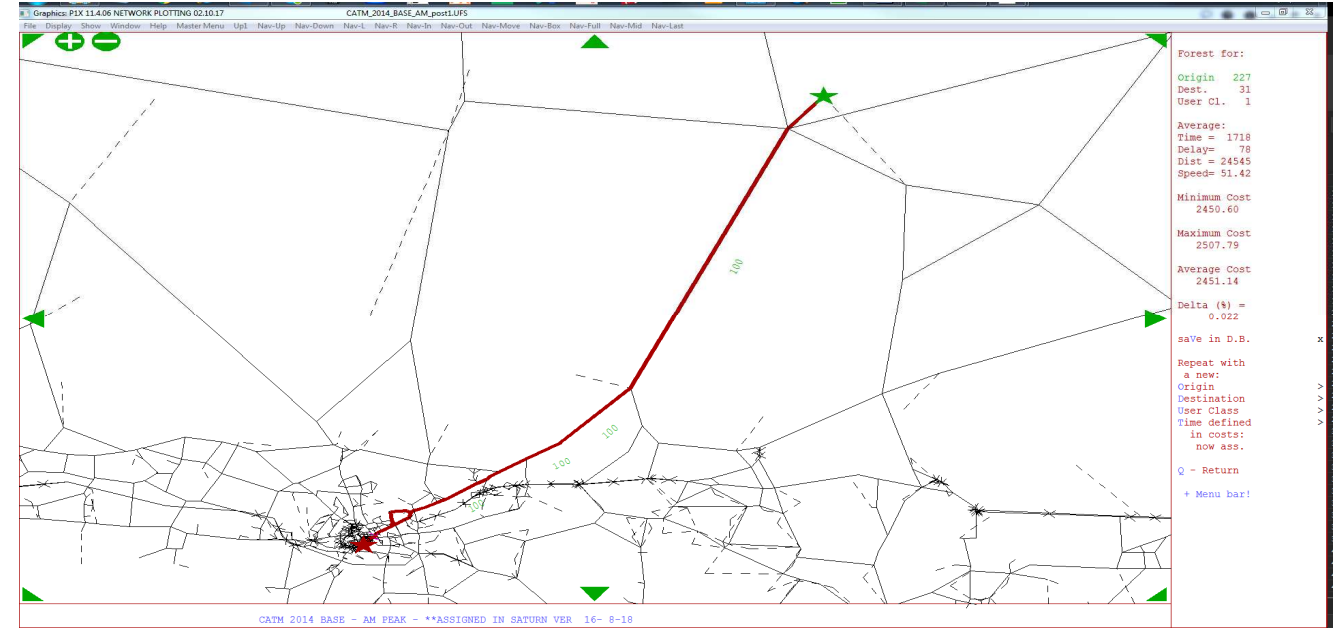
9. Chichester to Petworth

Zones 31 to 227



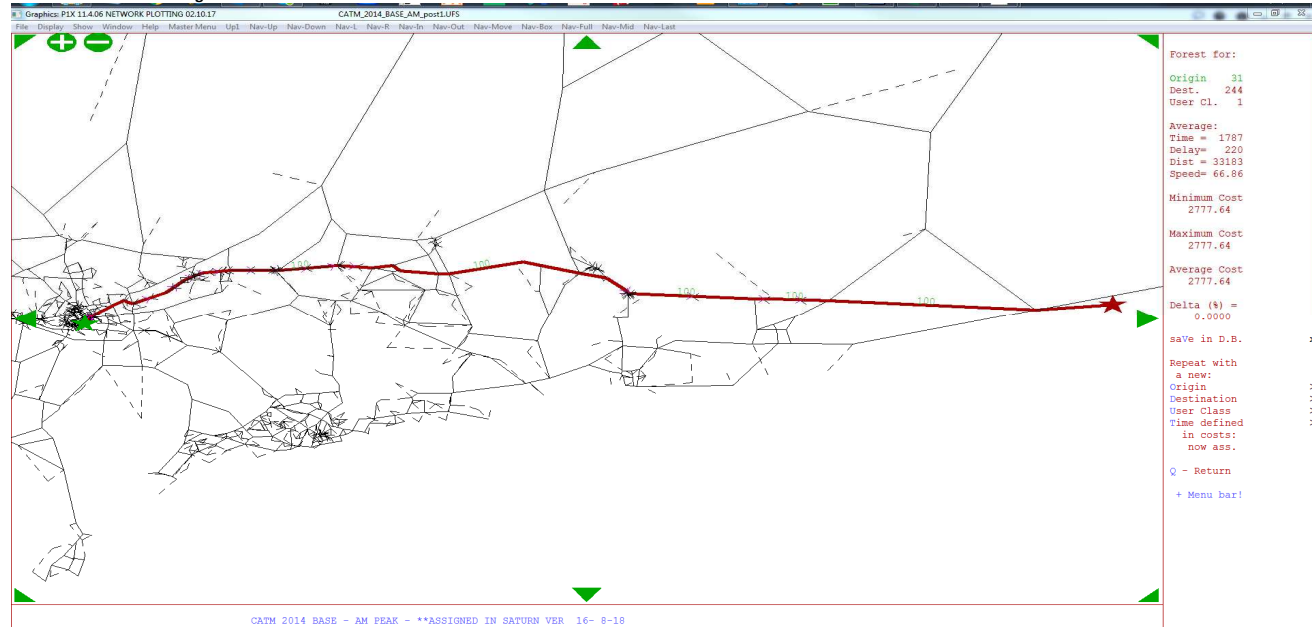
10. Petworth to Chichester

Zones 227 to 31



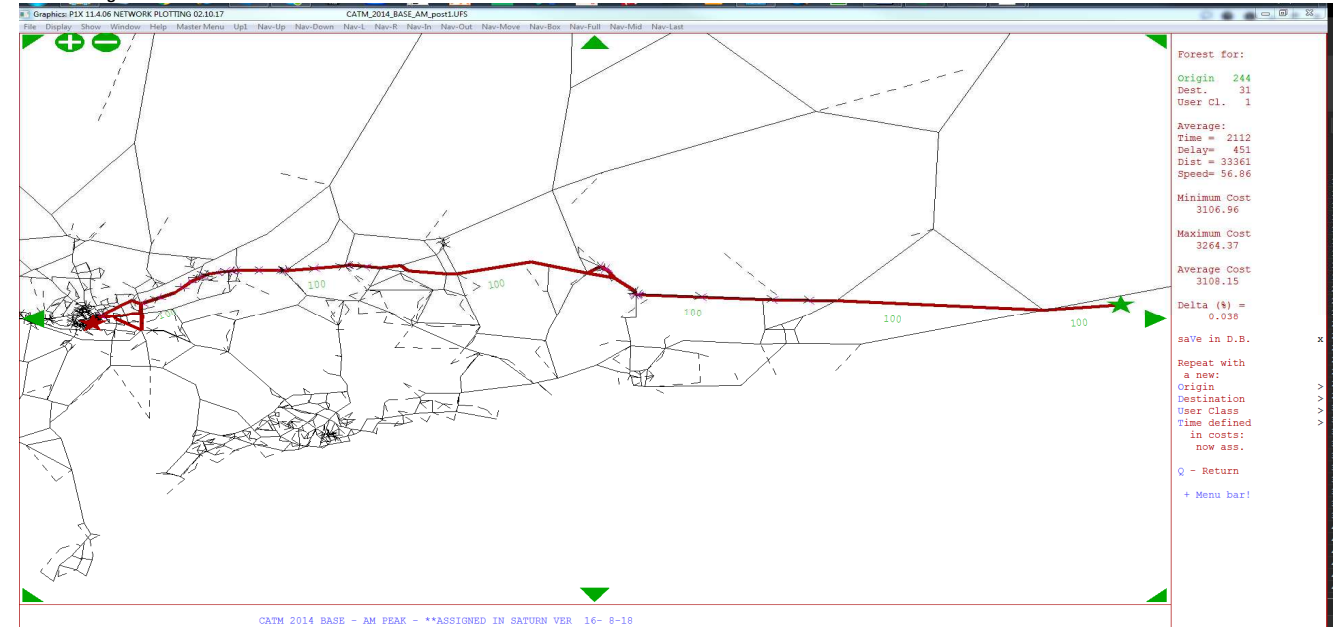
11. Chichester to Worthing

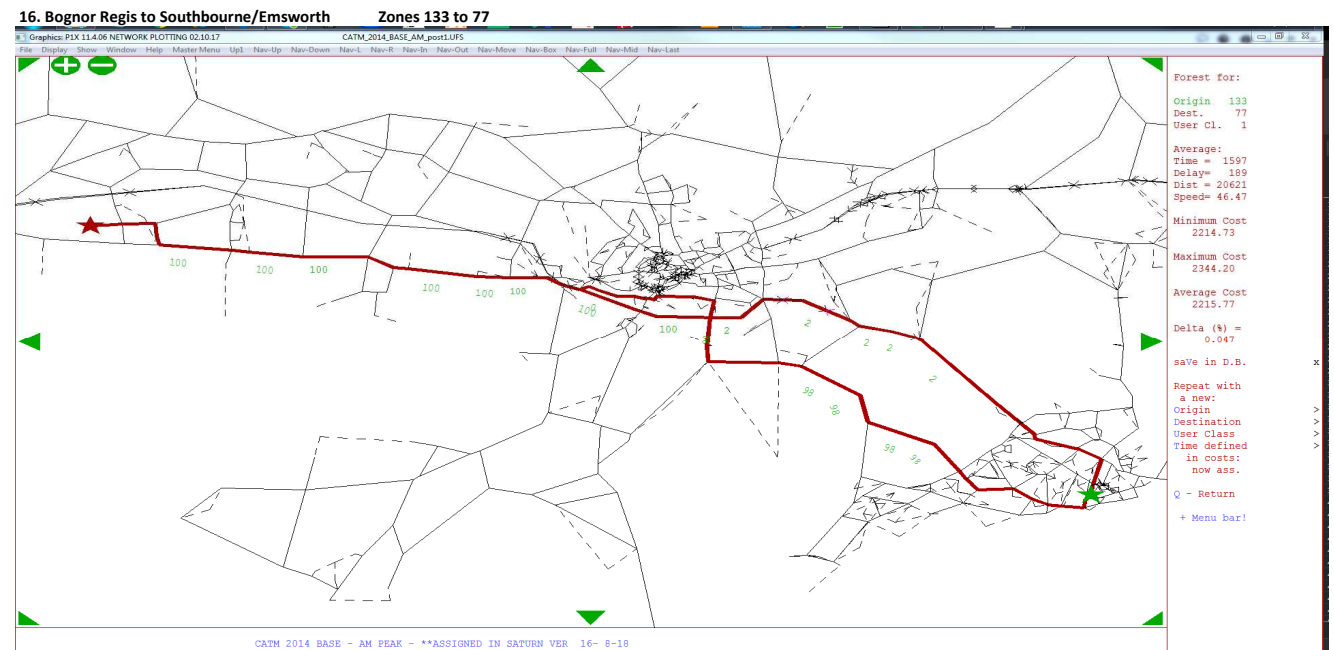
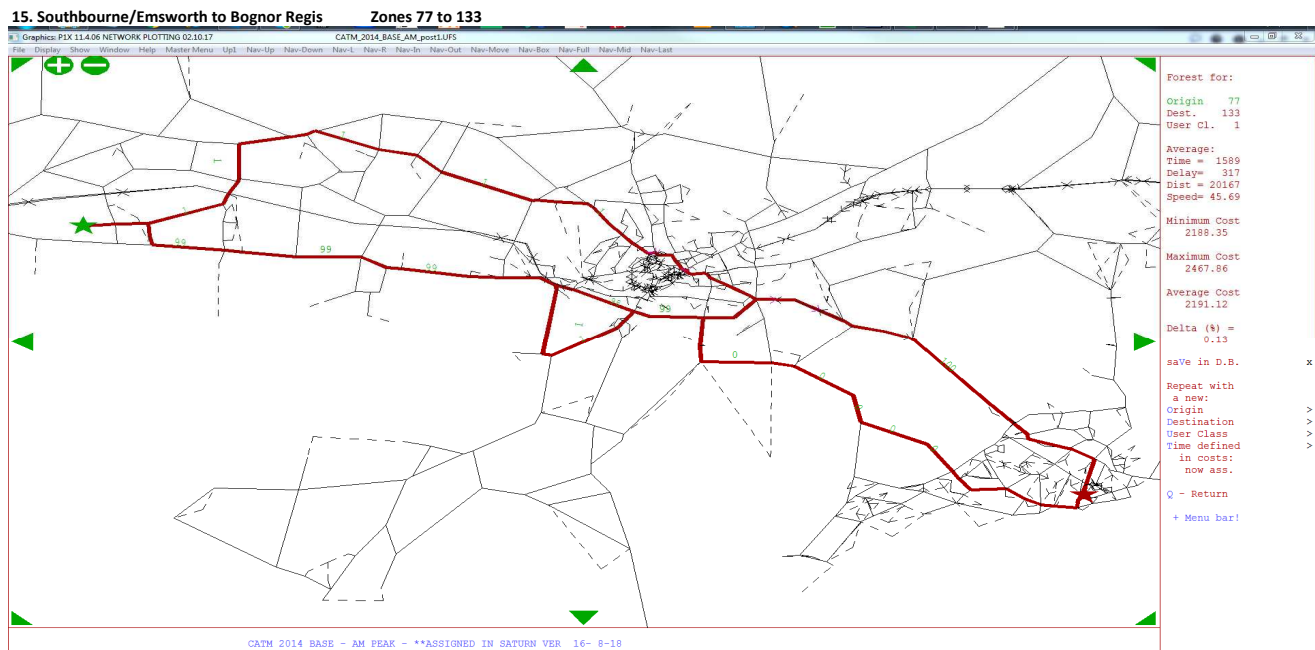
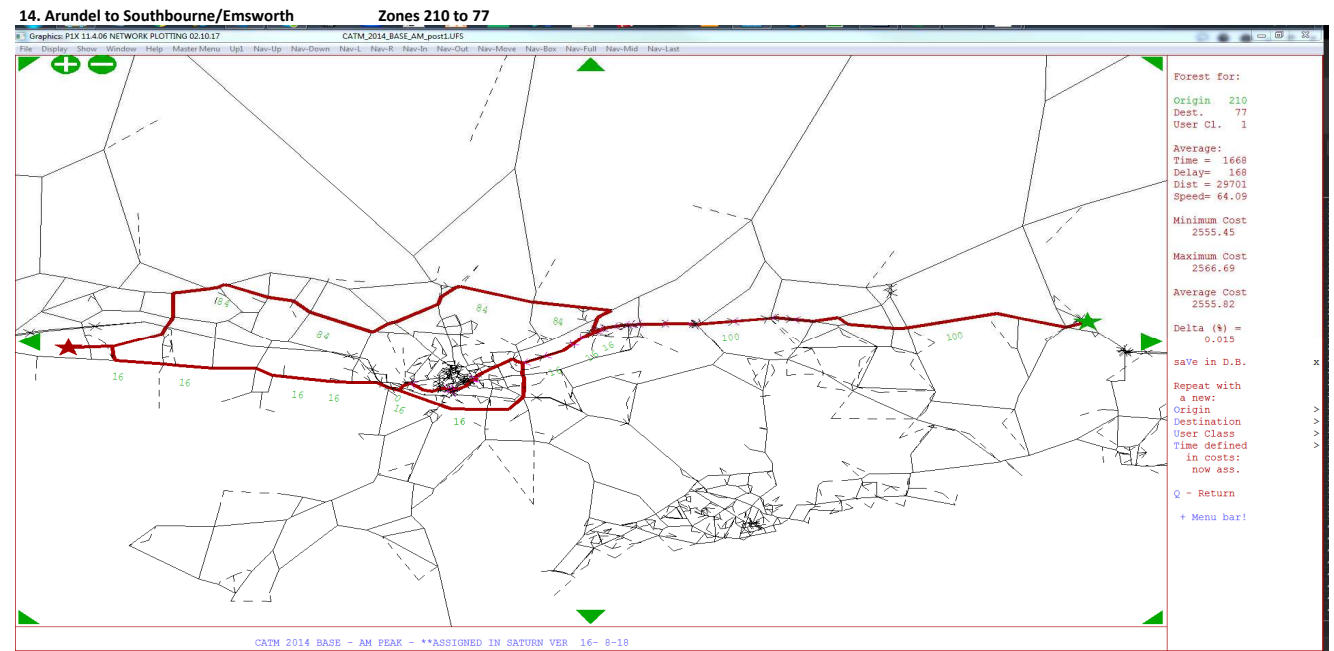
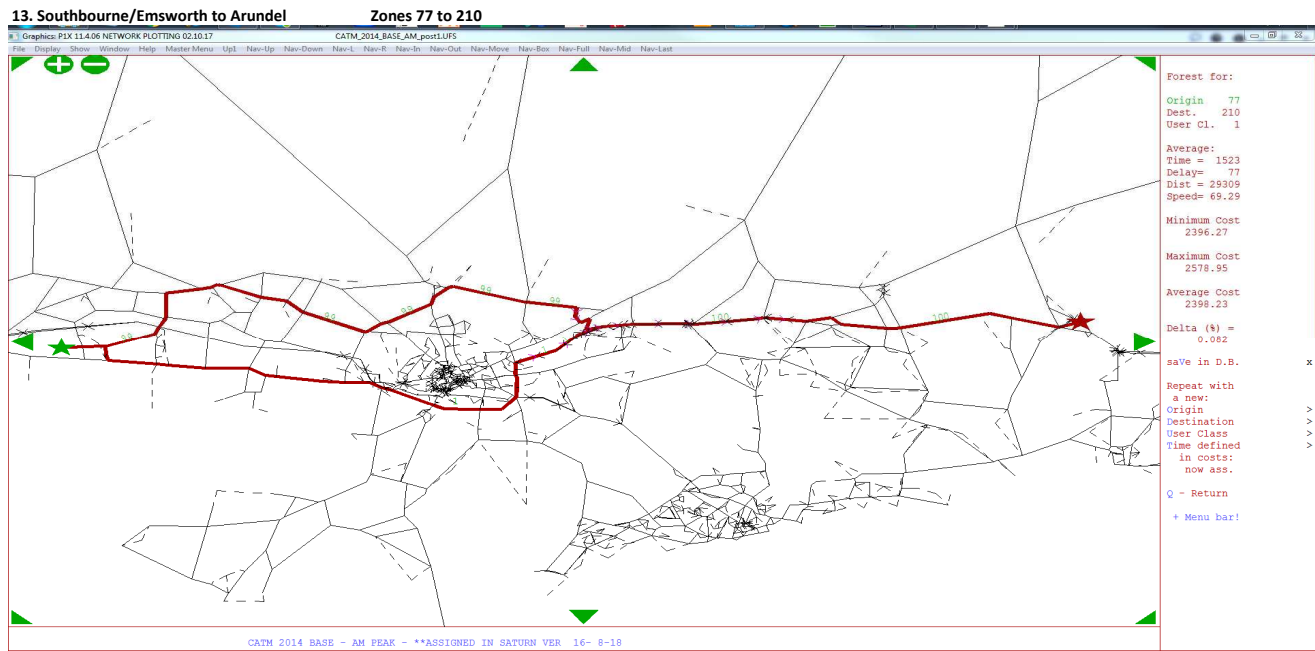
Zones 31 to 244



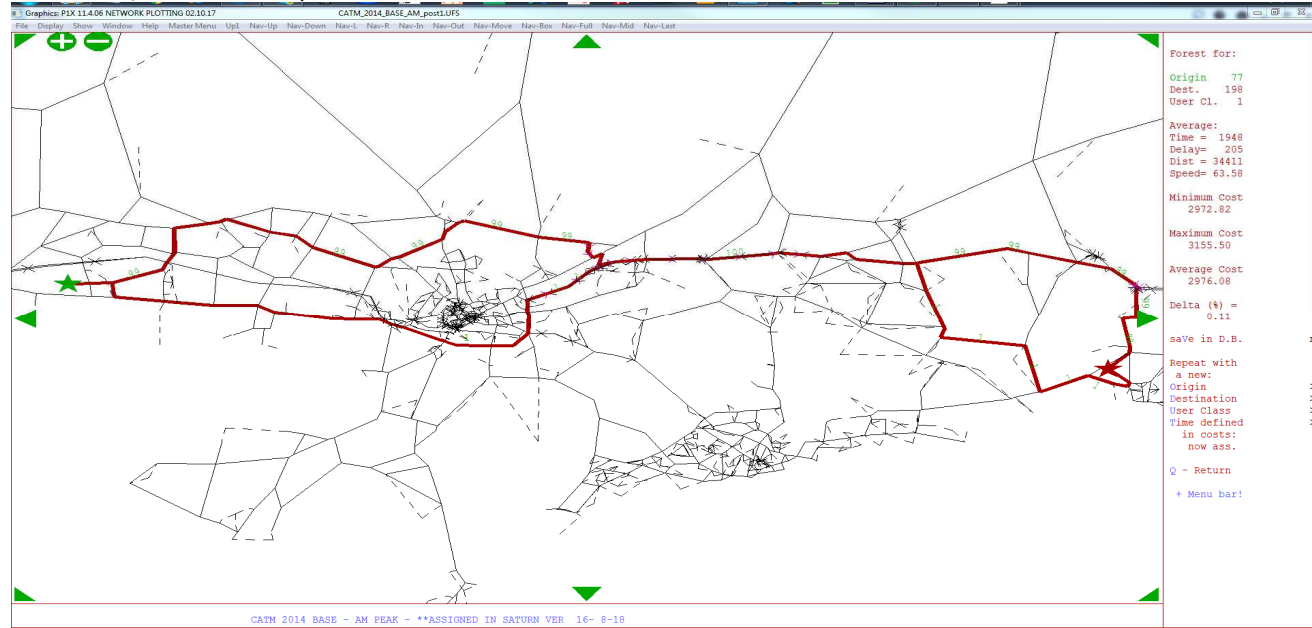
12. Worthing to Chichester

Zones 244 to 31

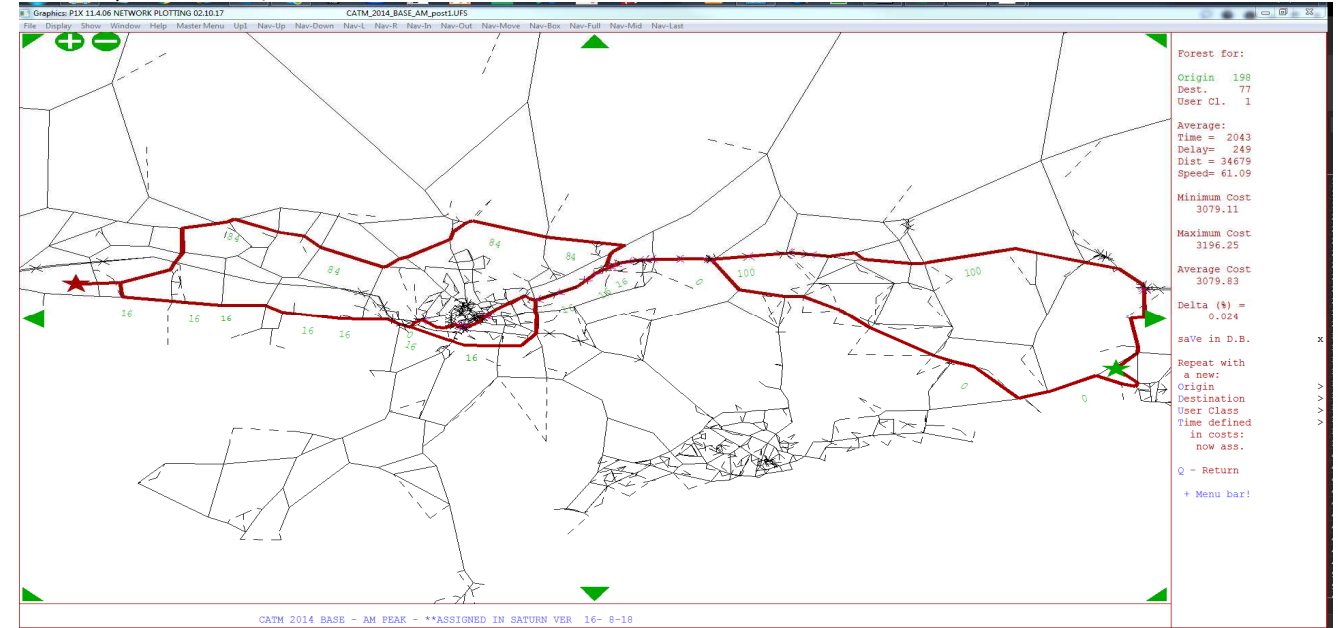




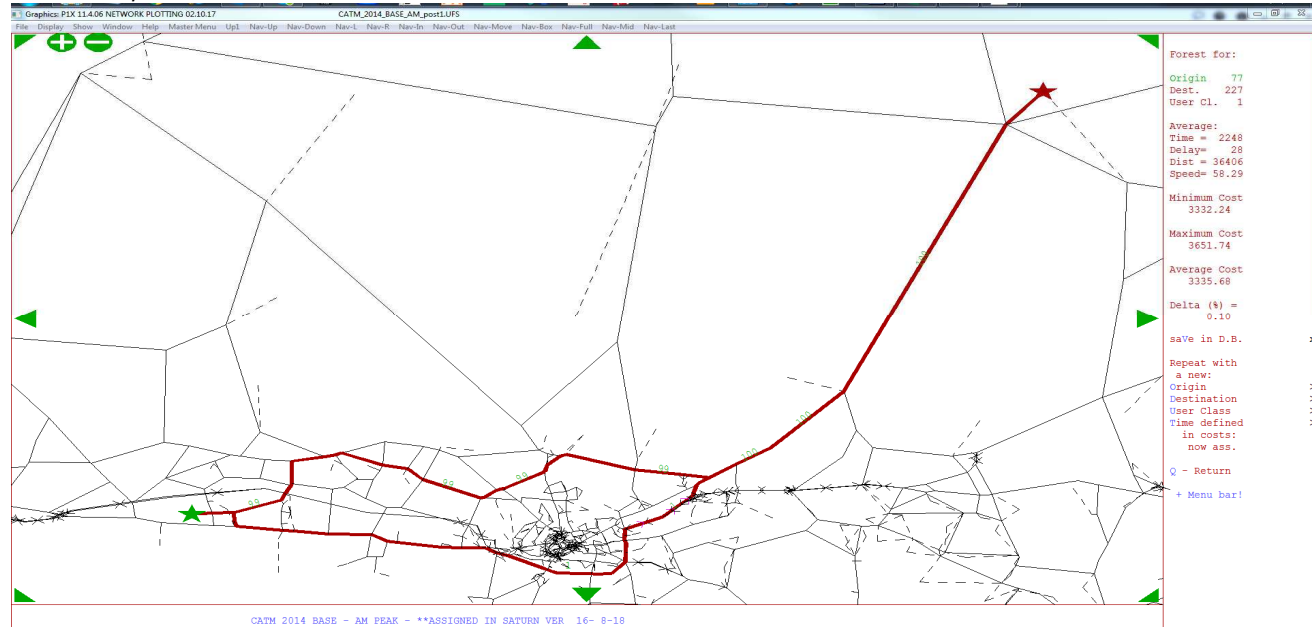
17. Southbourne/Emsworth to Littlehampton Zones 77 to 198



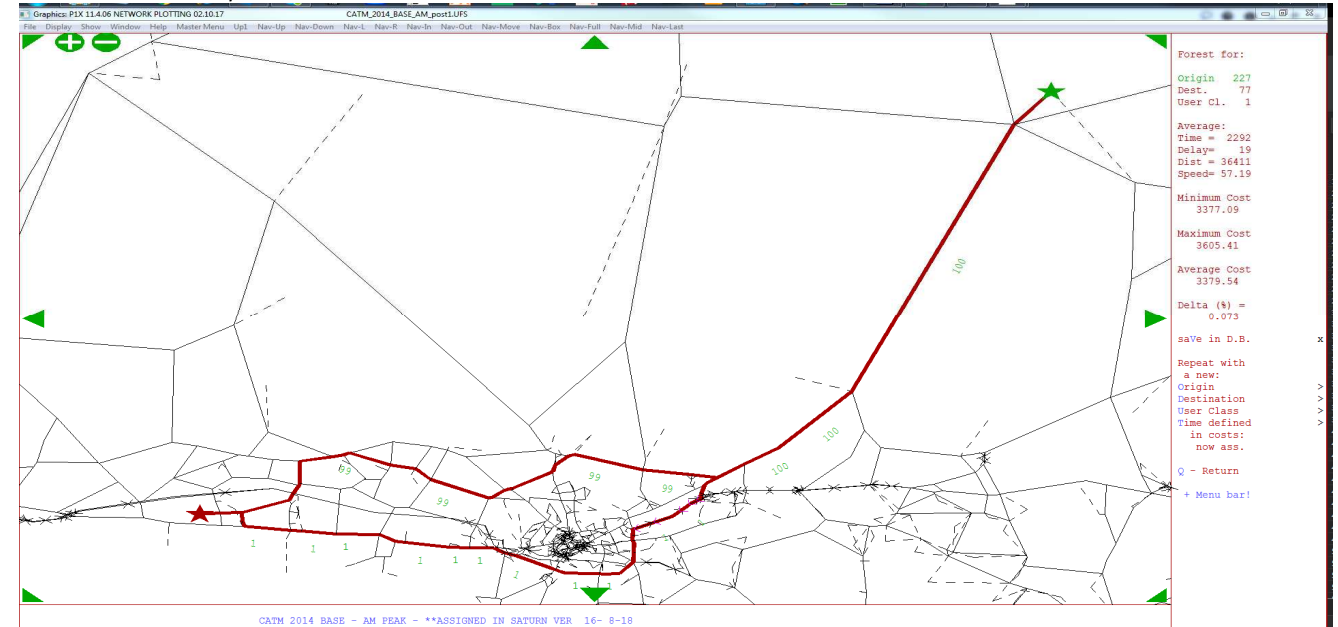
18. Littlehampton to Southbourne/Emsworth Zones 198 to 77

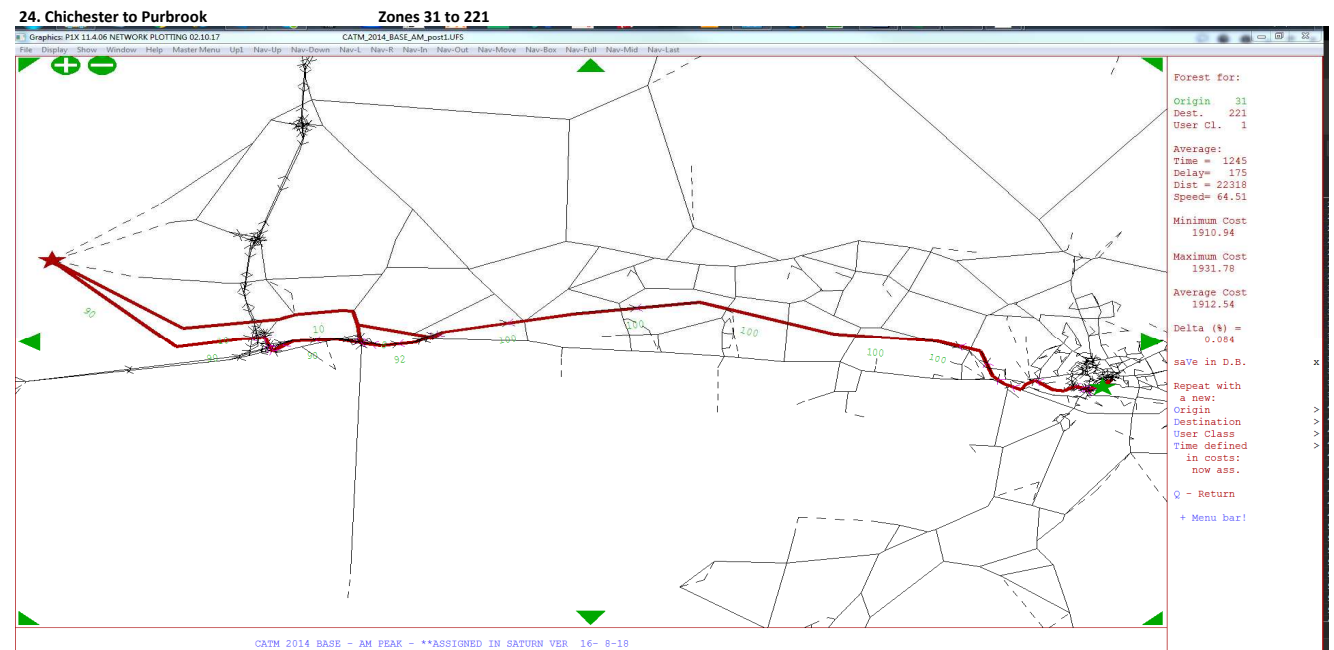
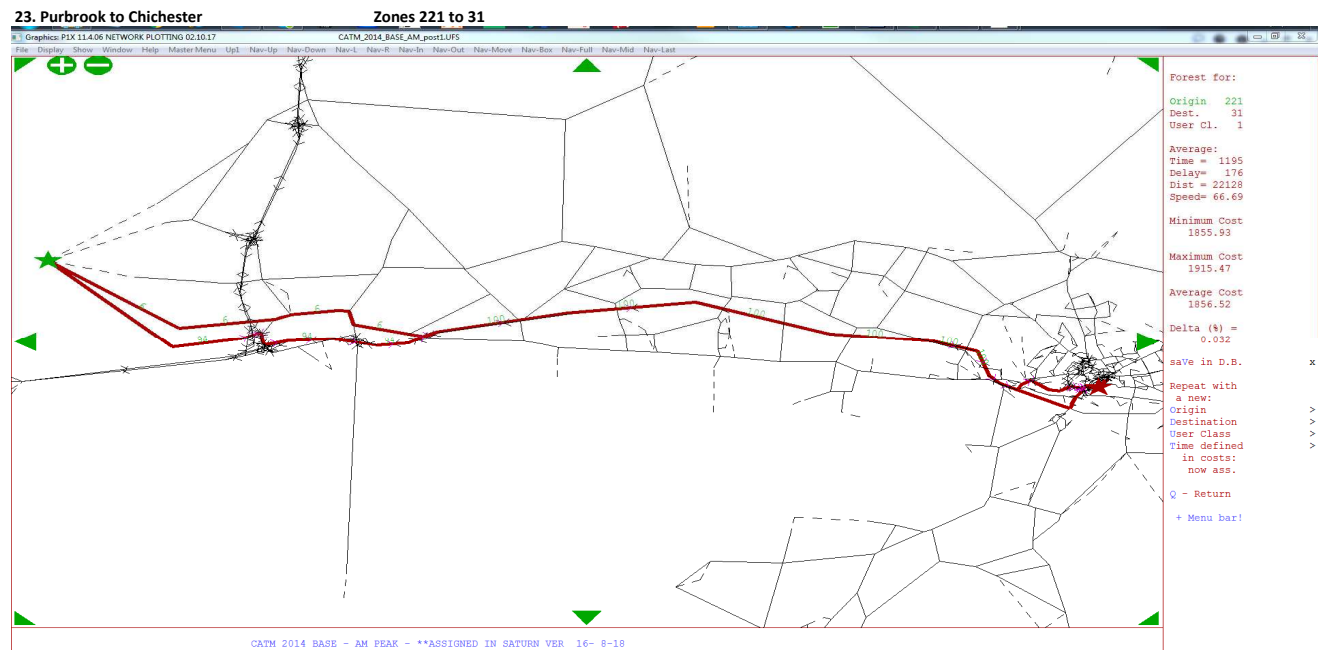
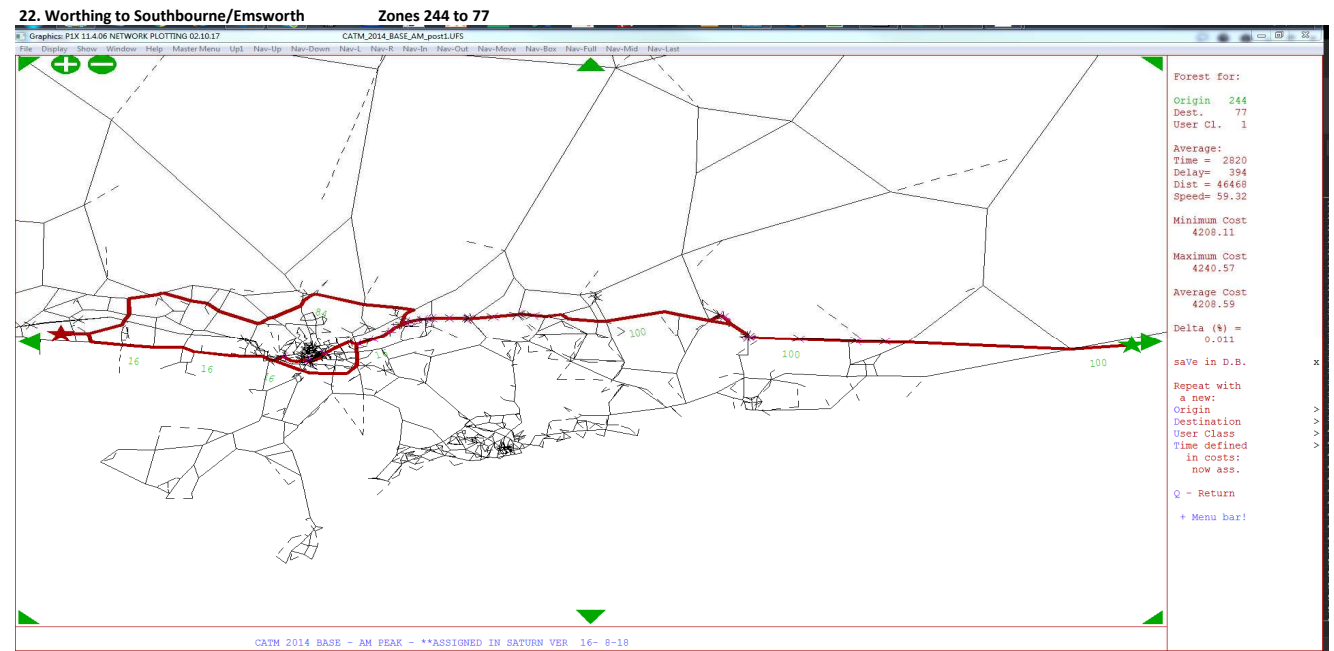
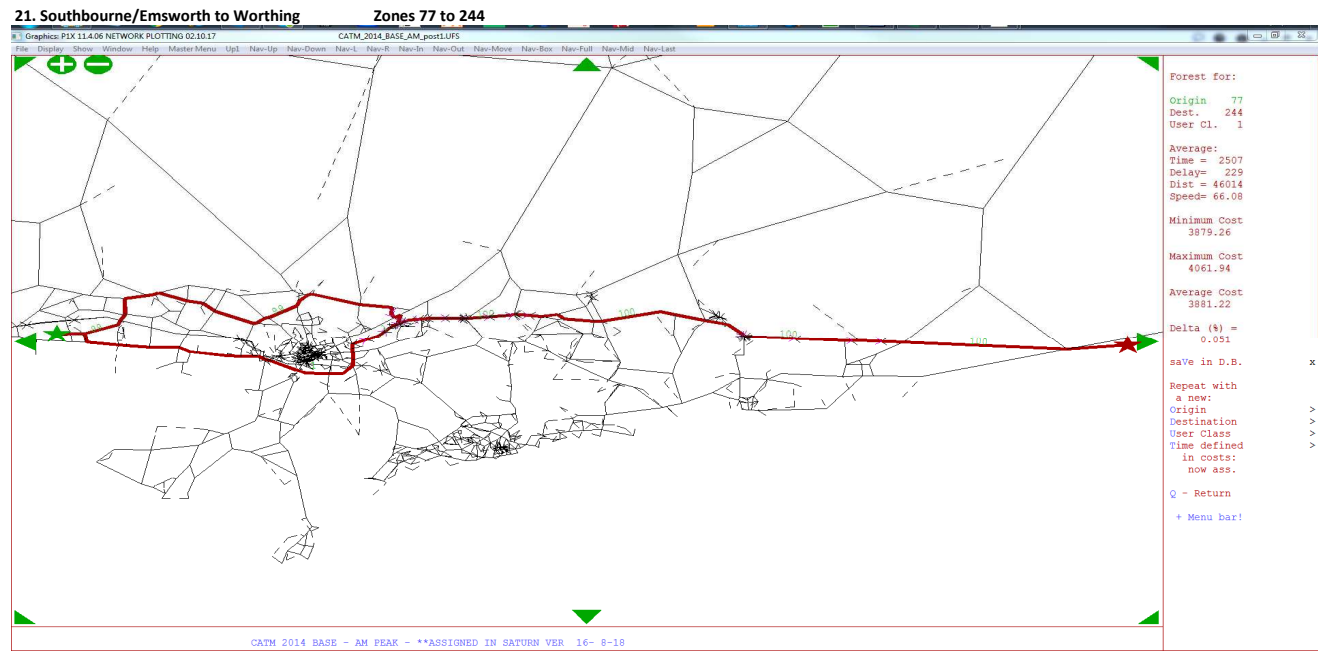


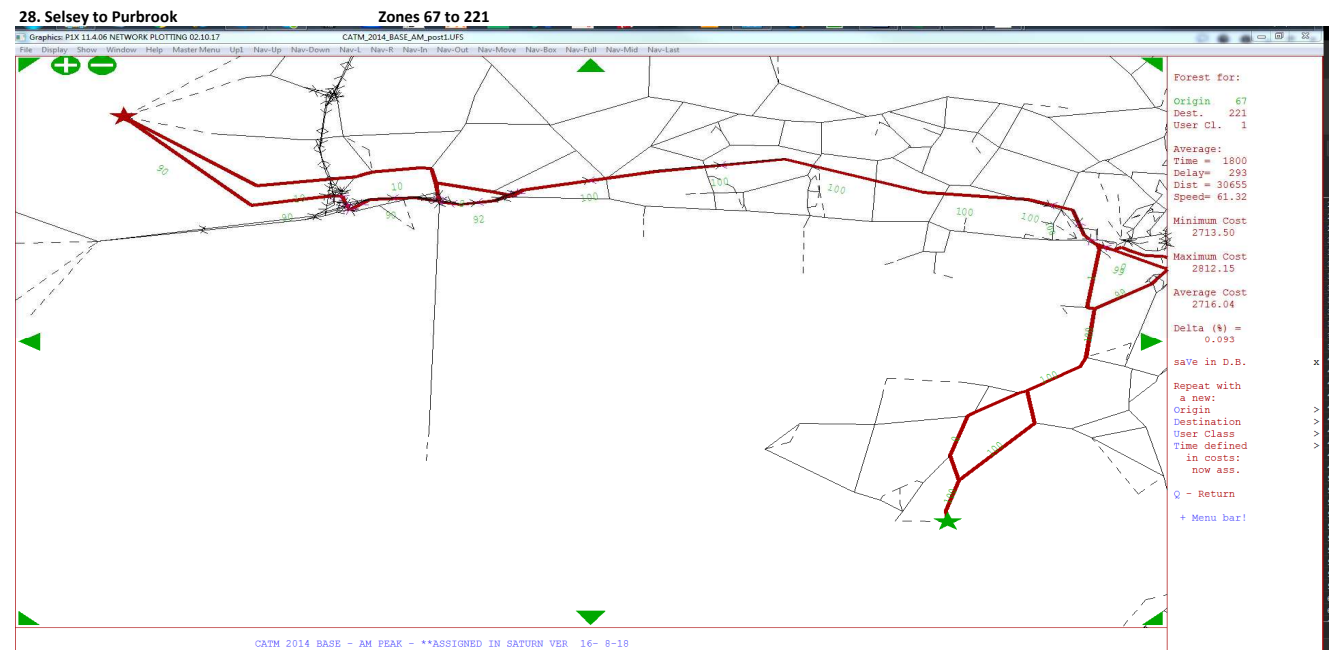
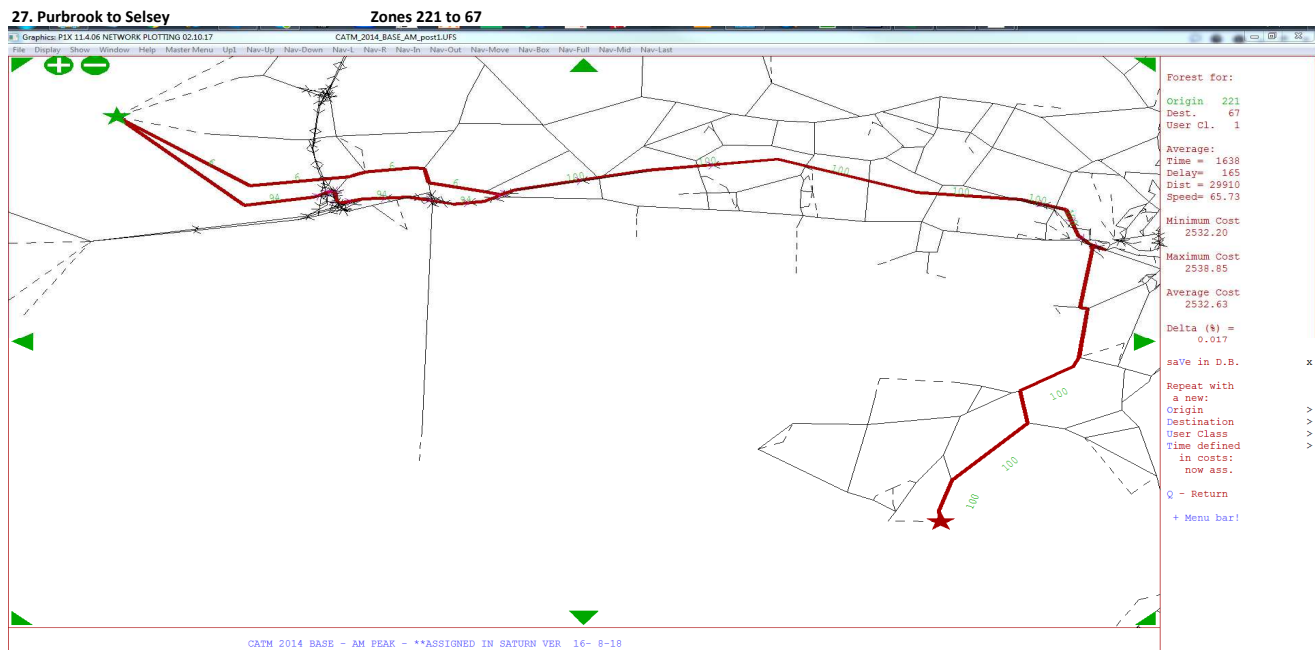
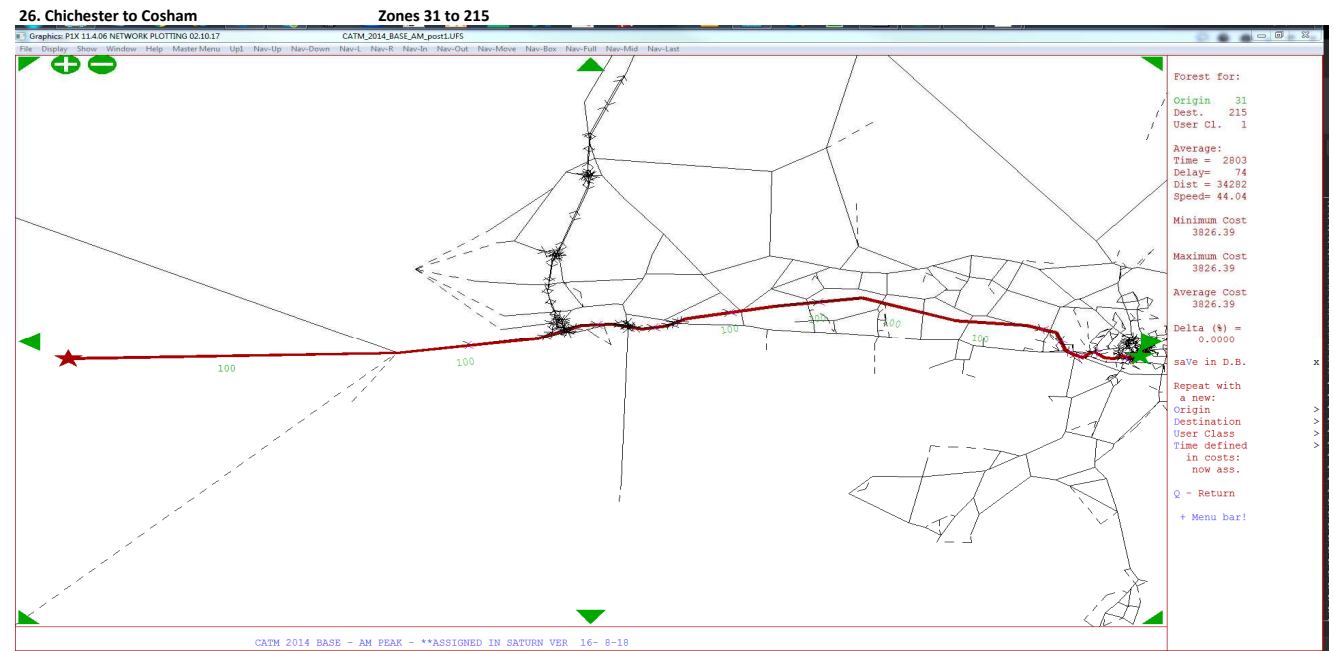
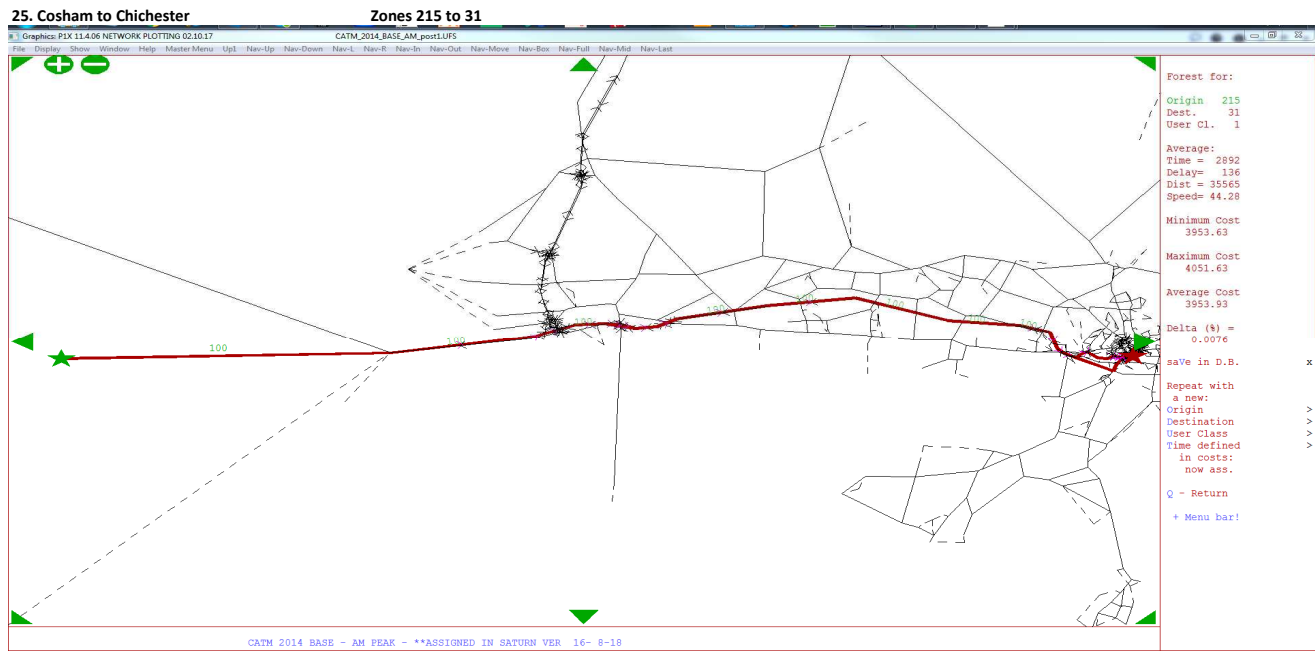
19. Southbourne/Emsworth to Petworth Zones 77 to 227

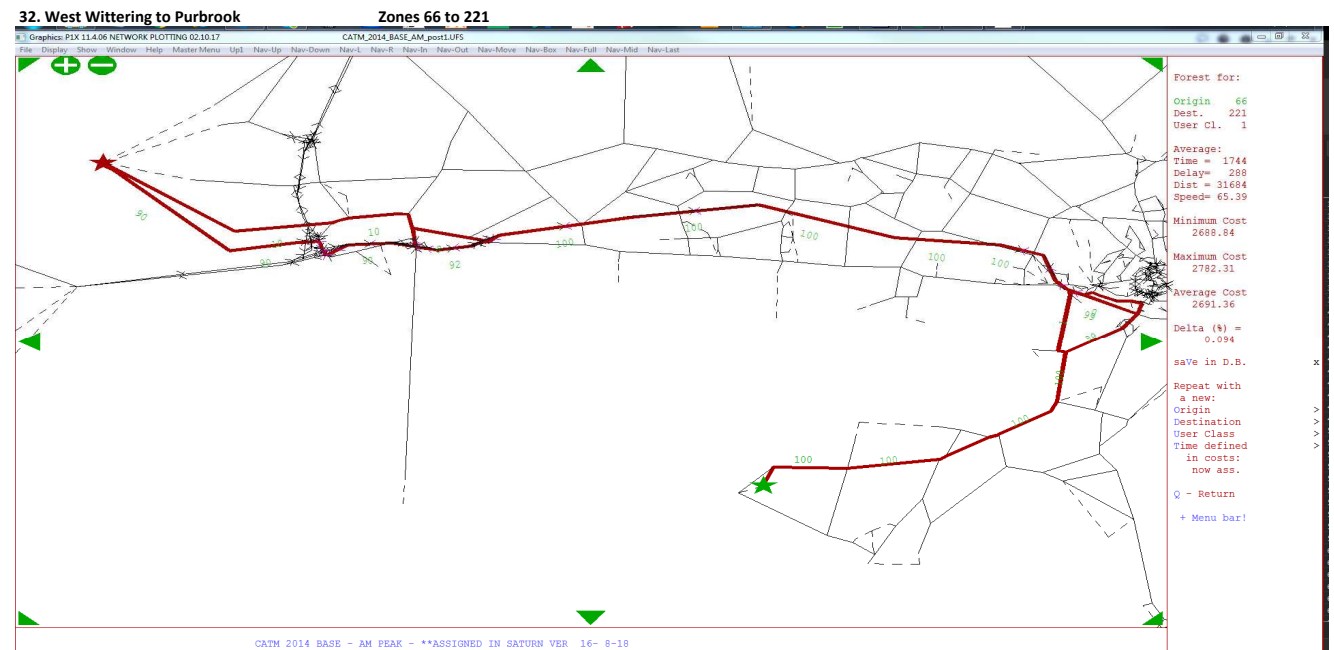
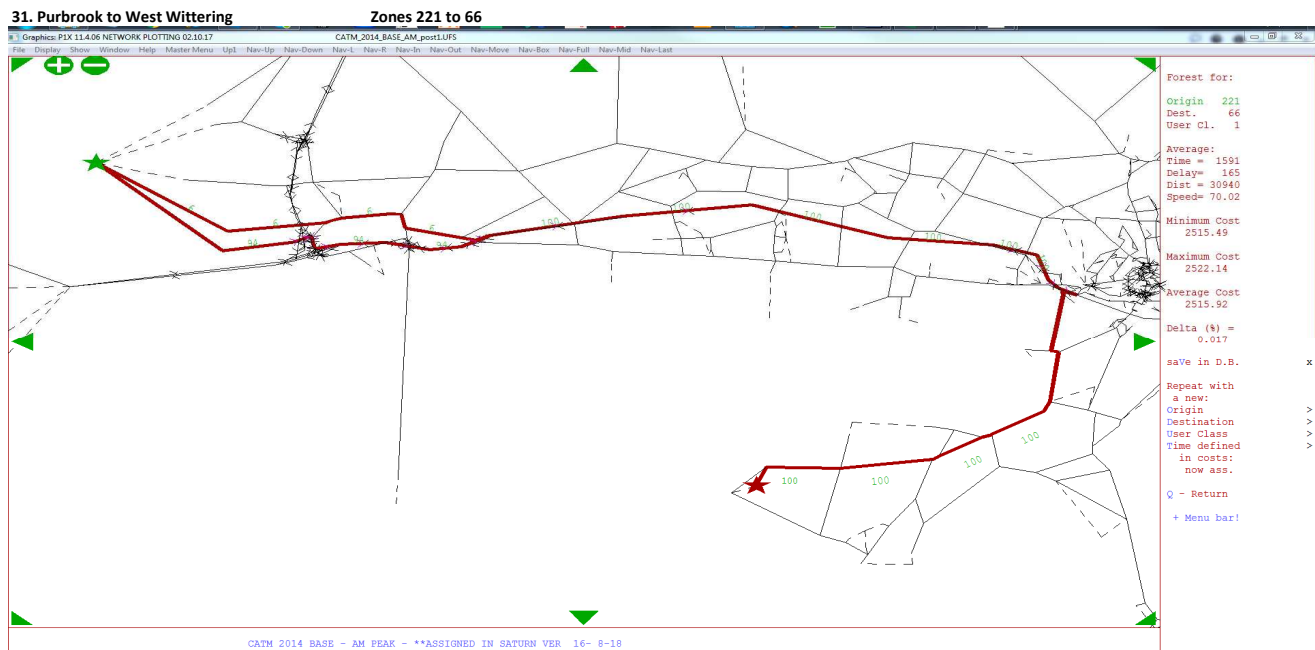
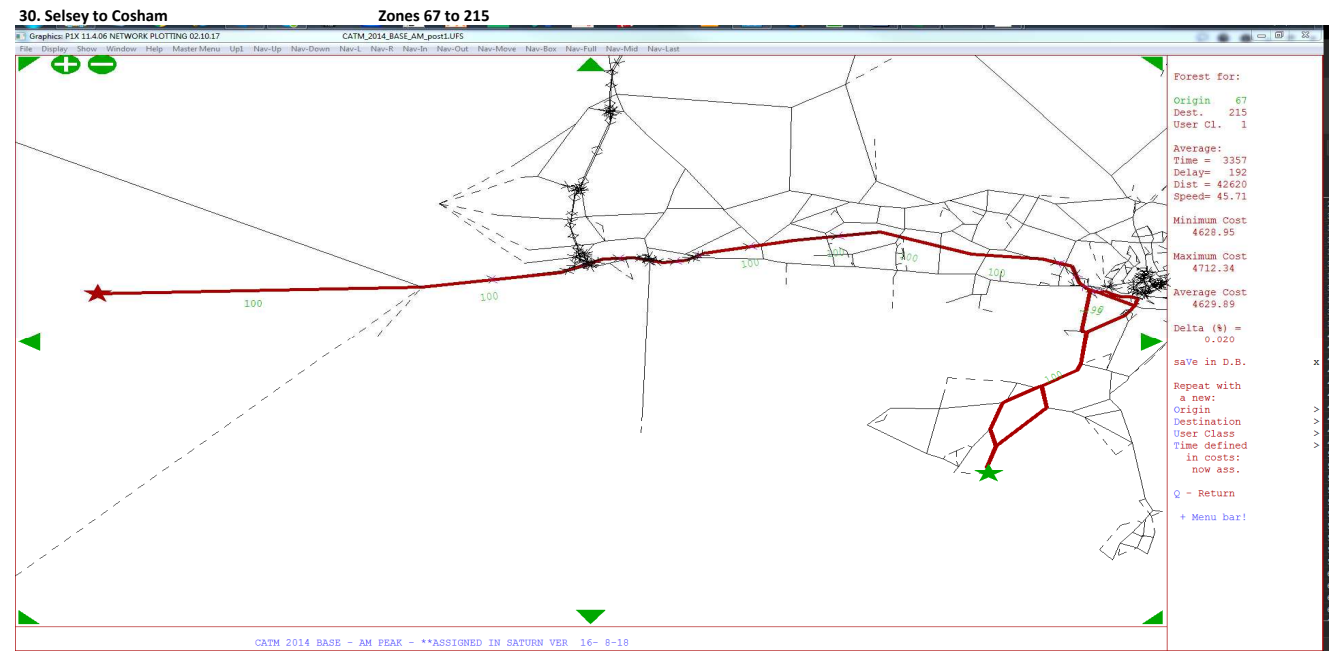
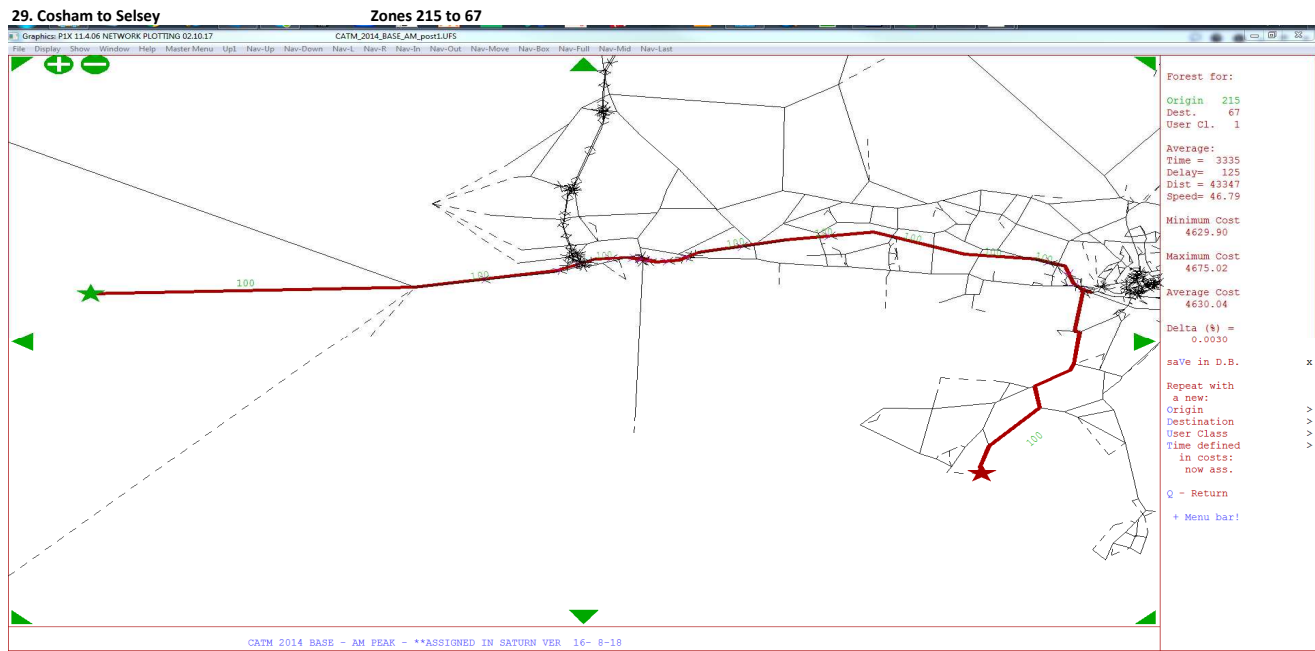


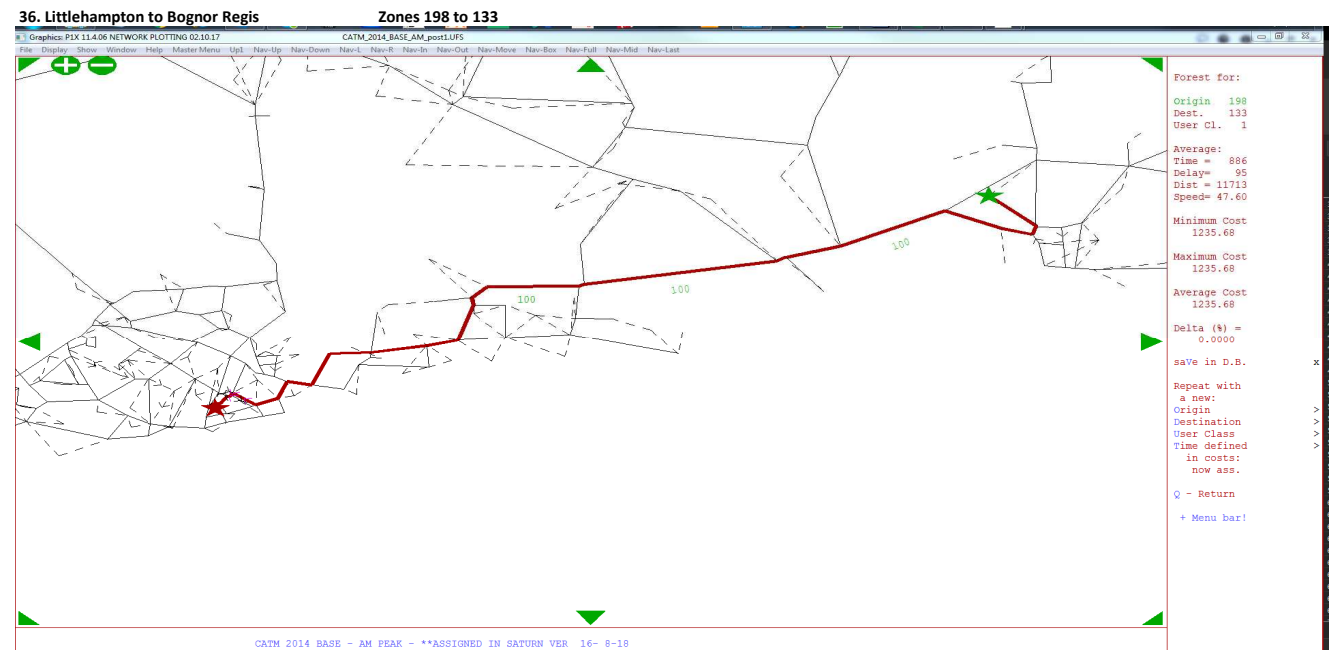
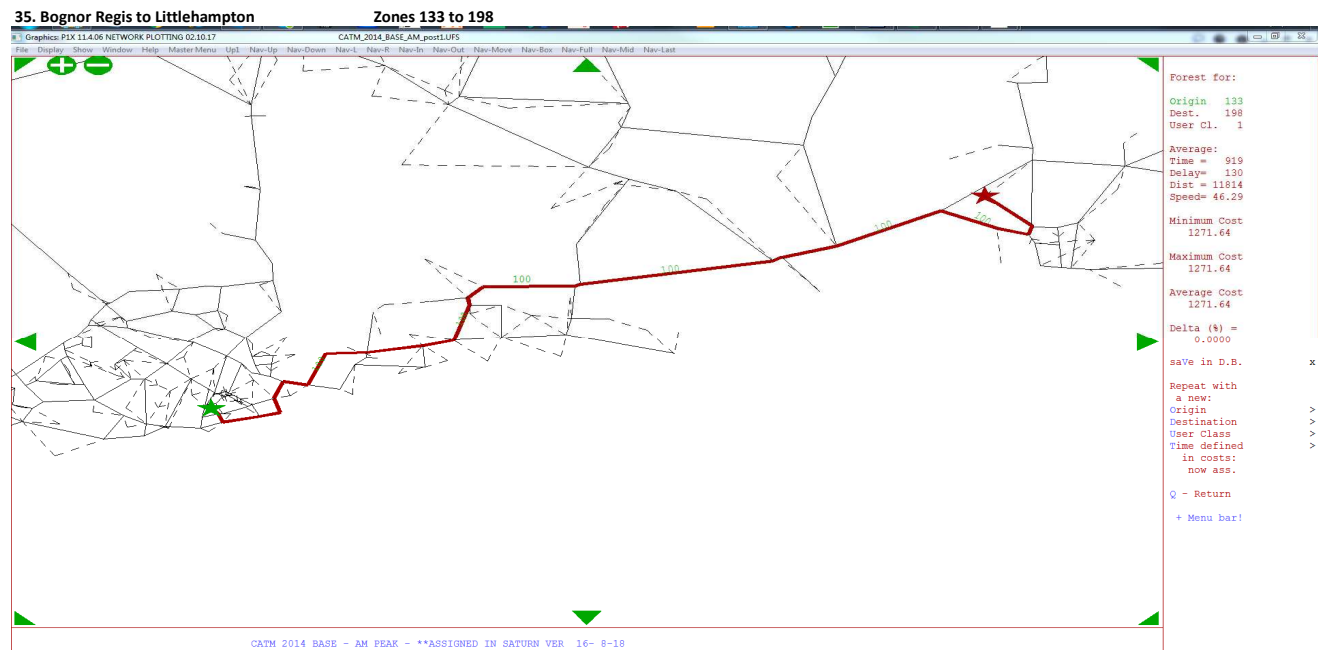
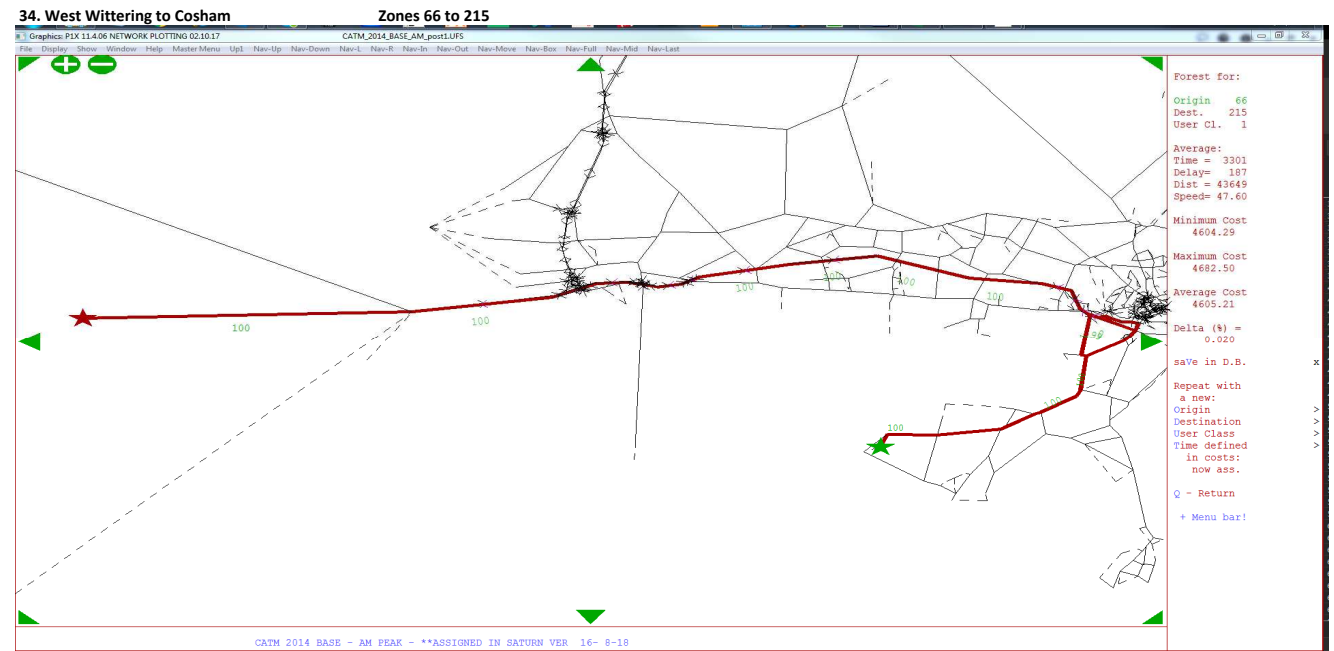
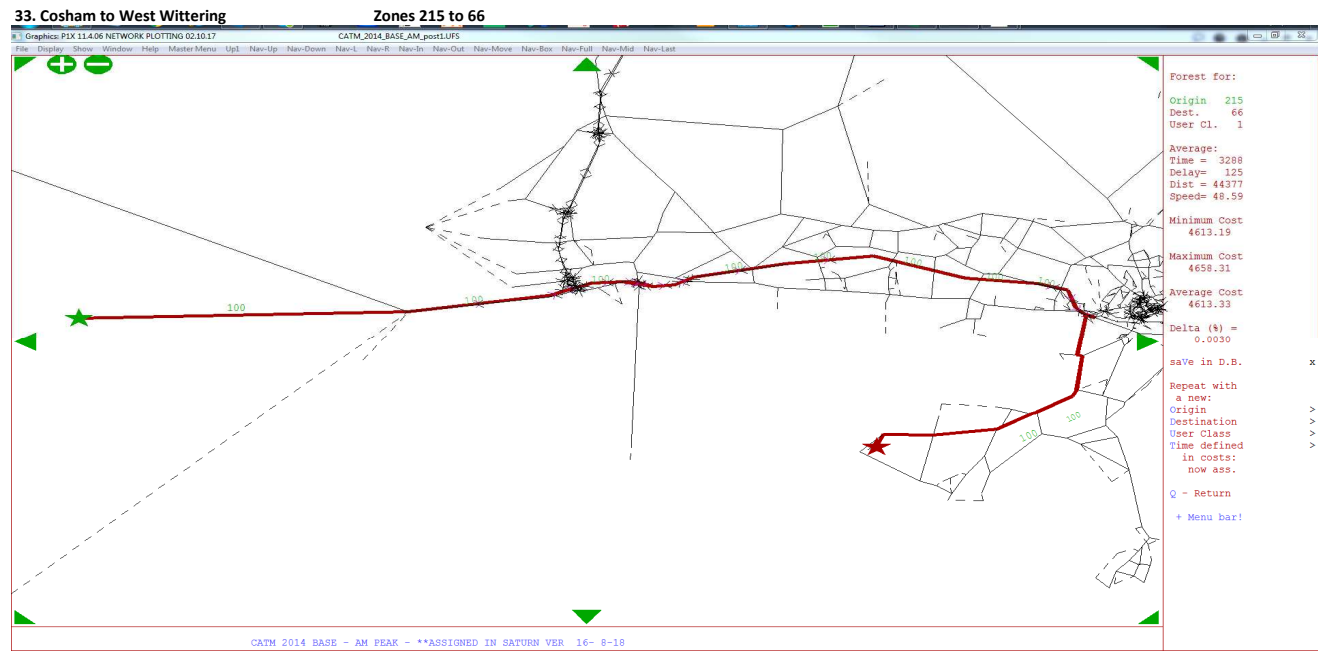
20. Petworth to Southbourne/Emsworth Zones 227 to 77

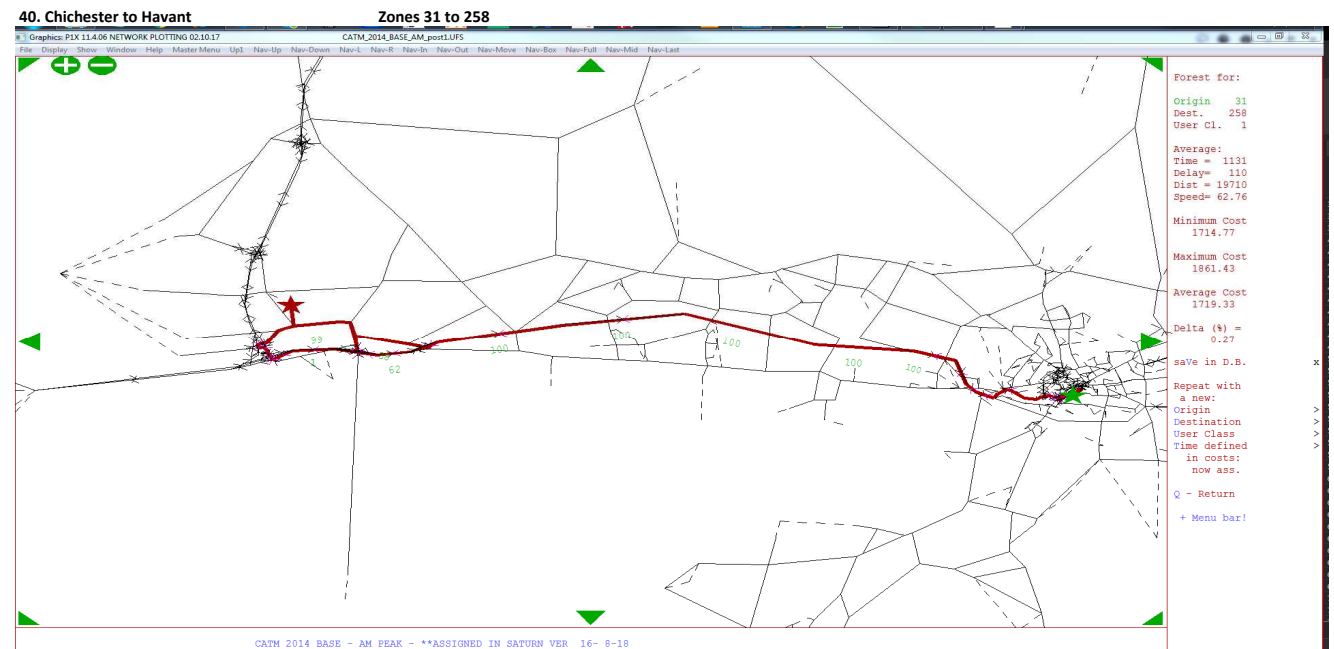
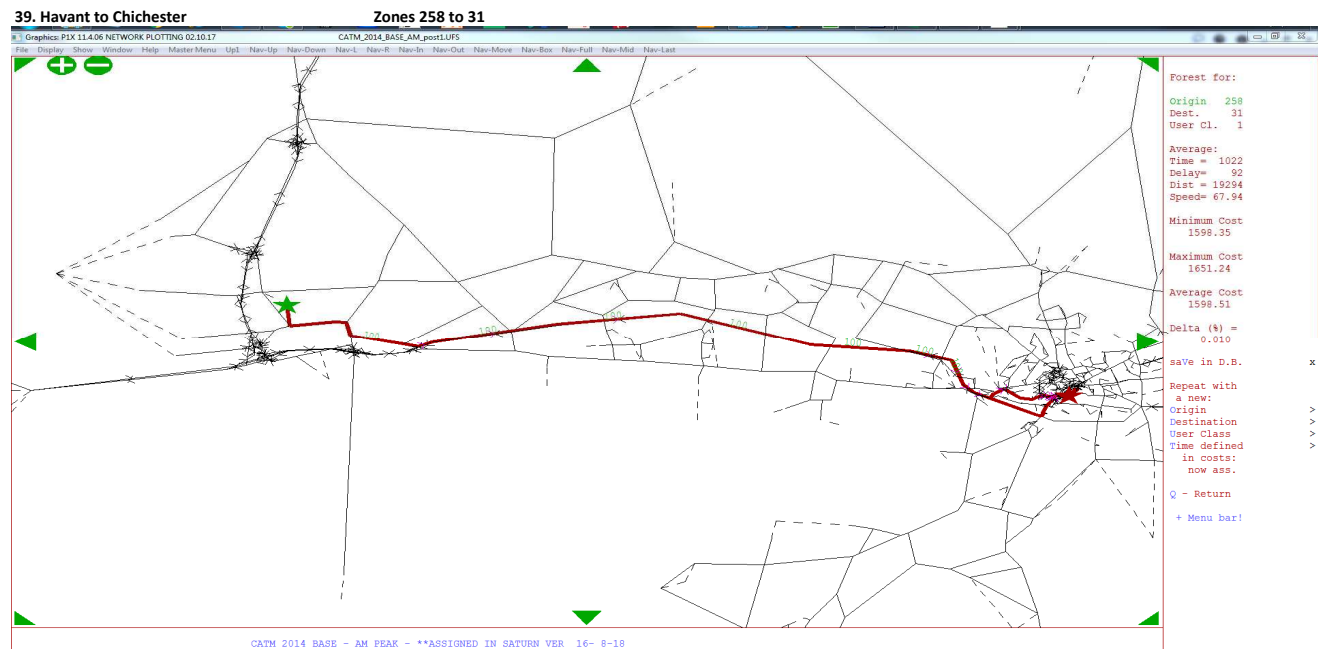
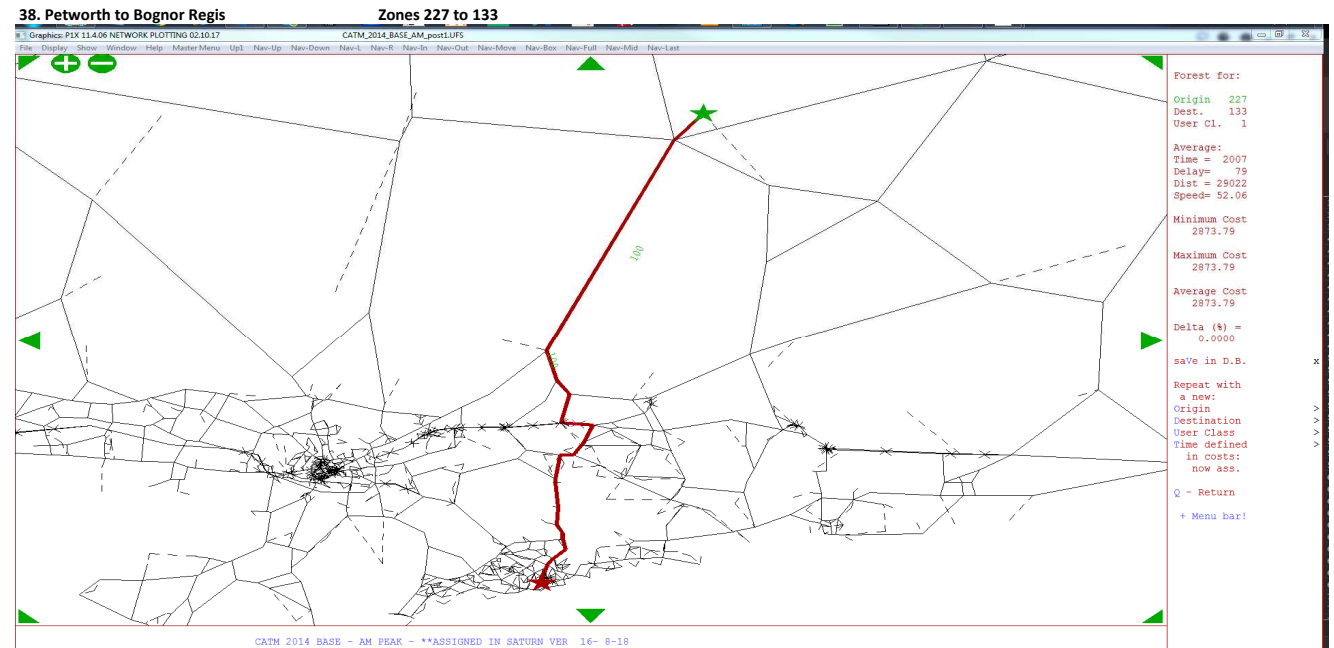
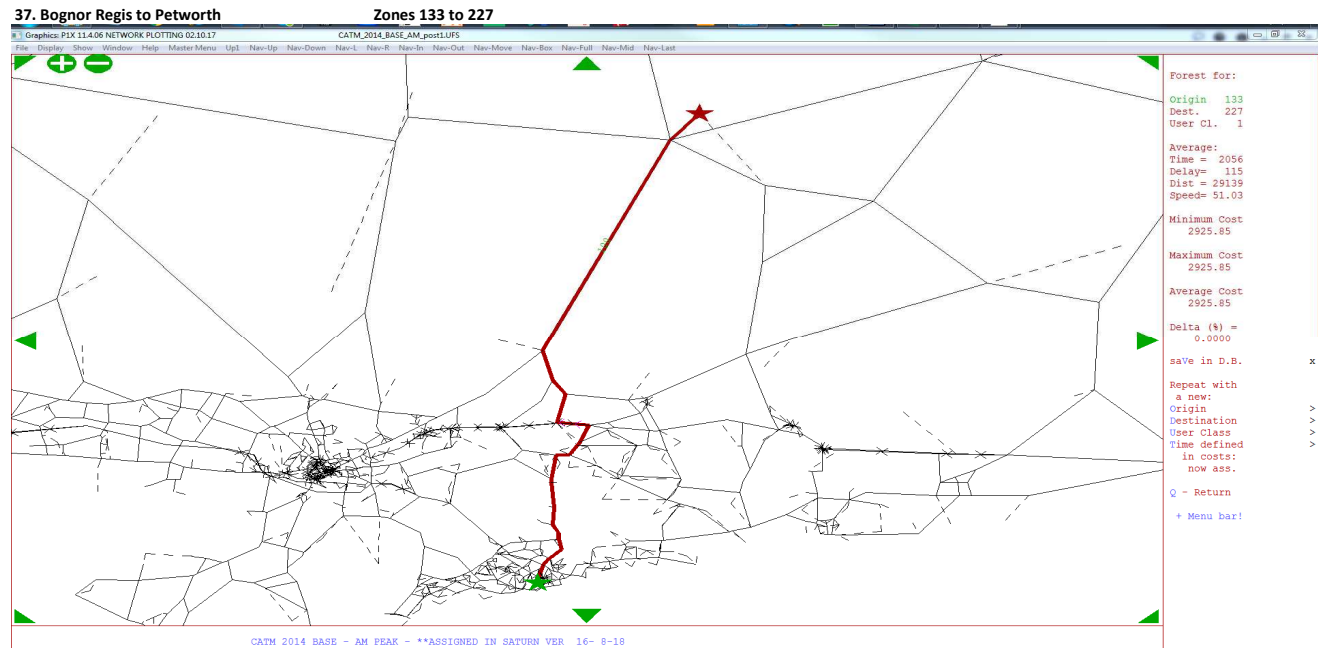


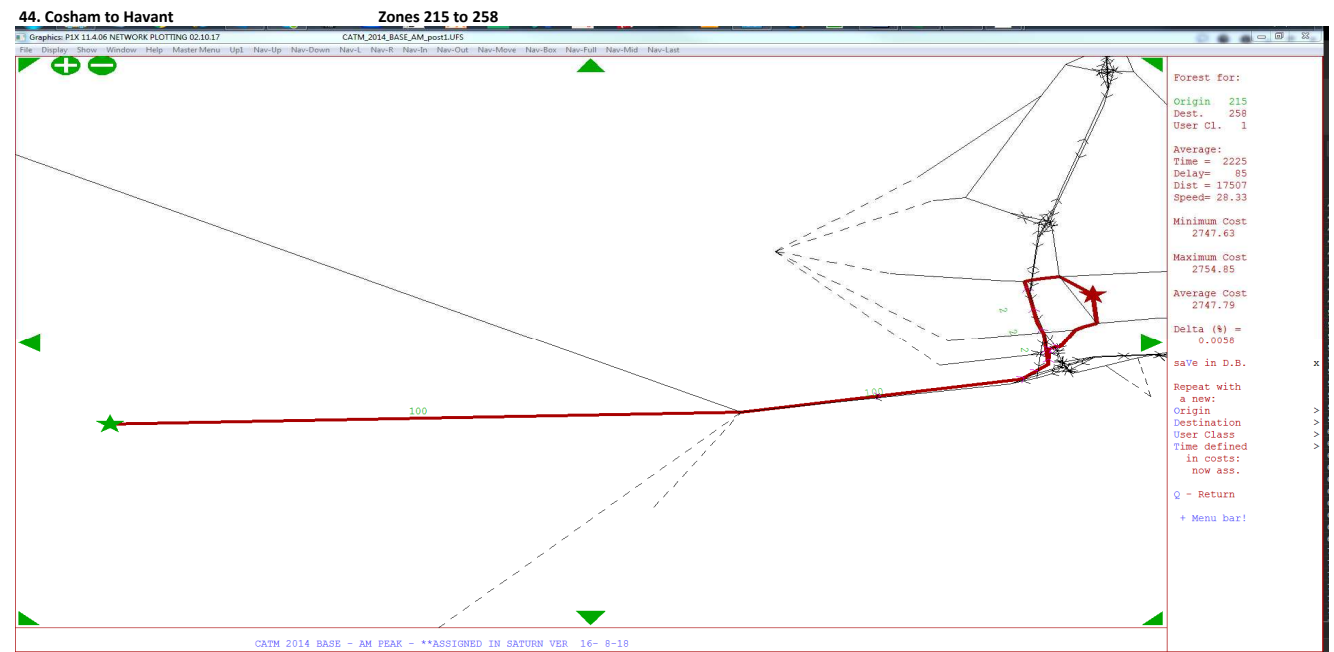
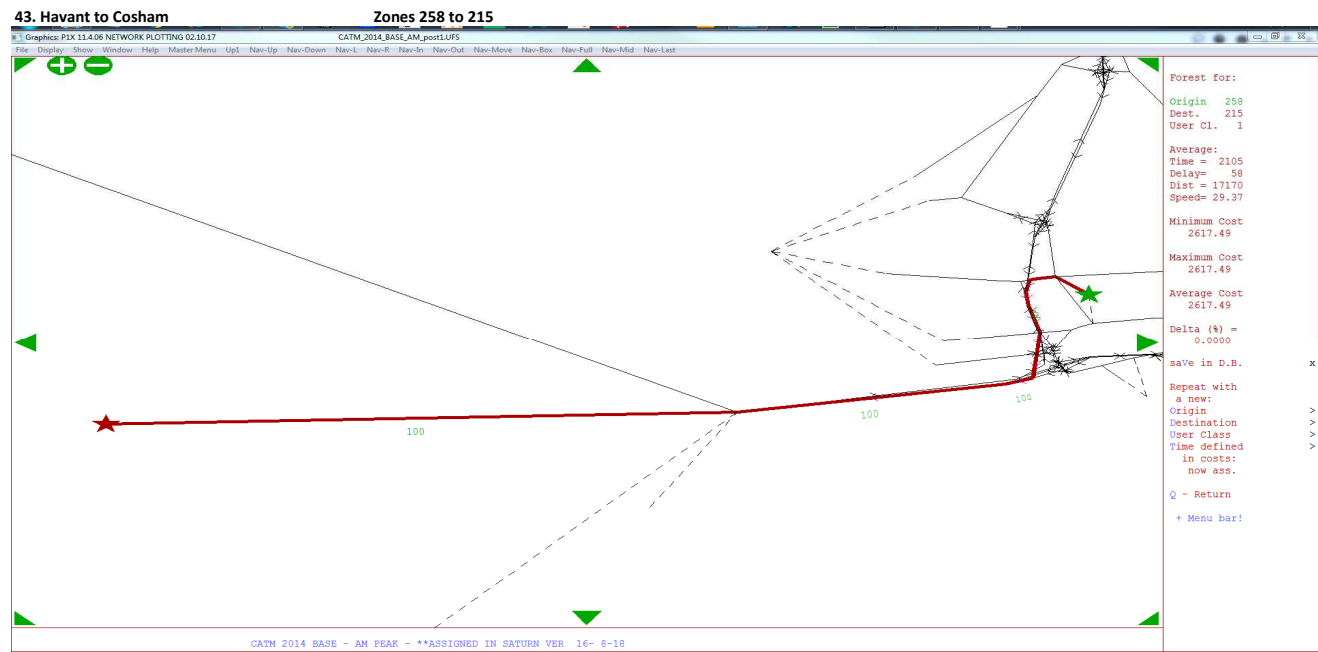
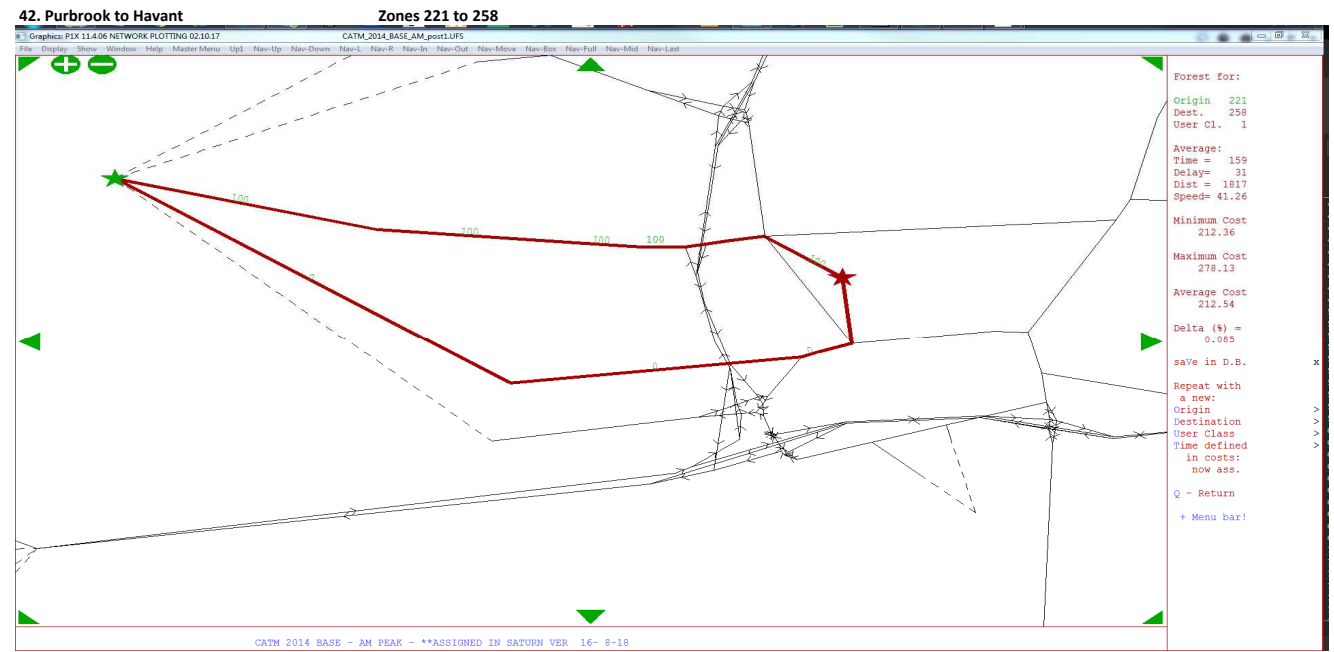
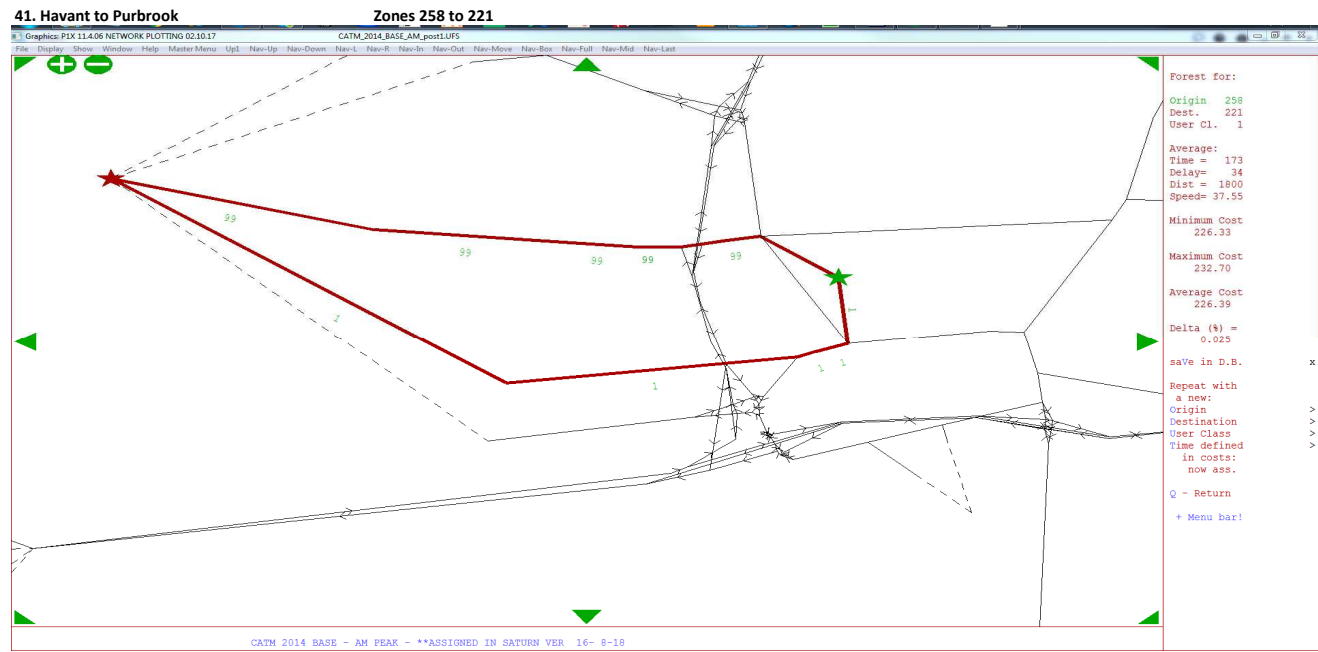




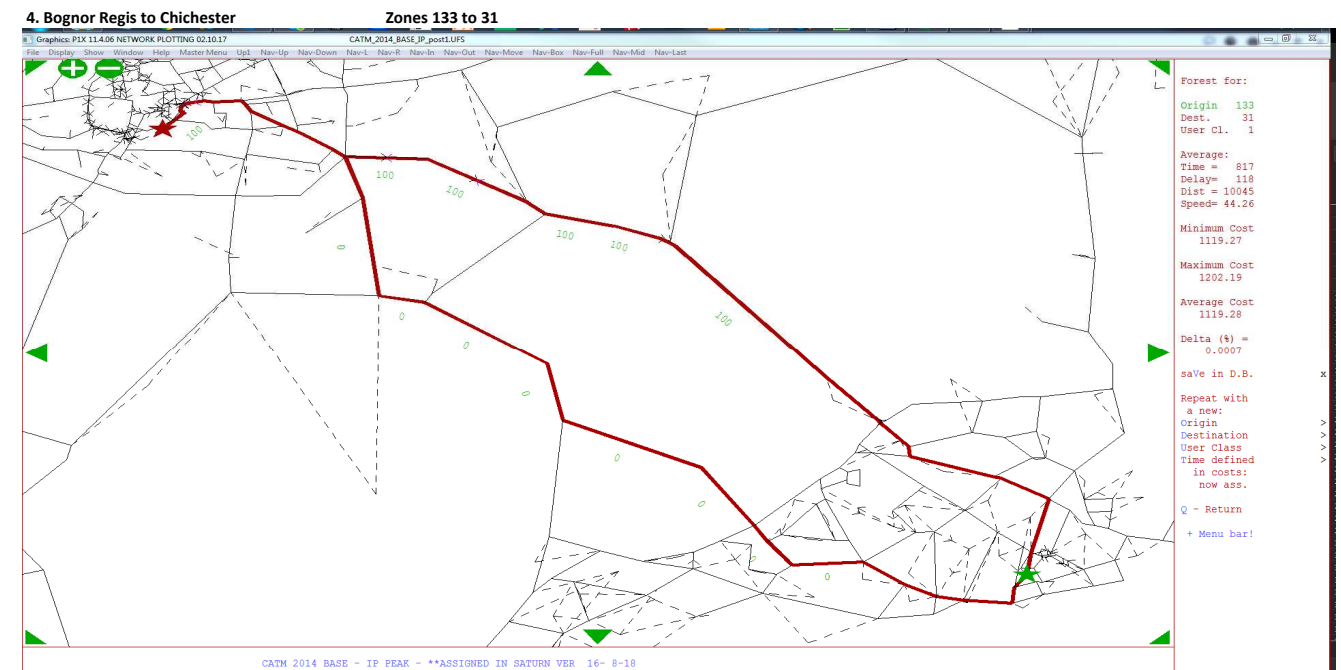
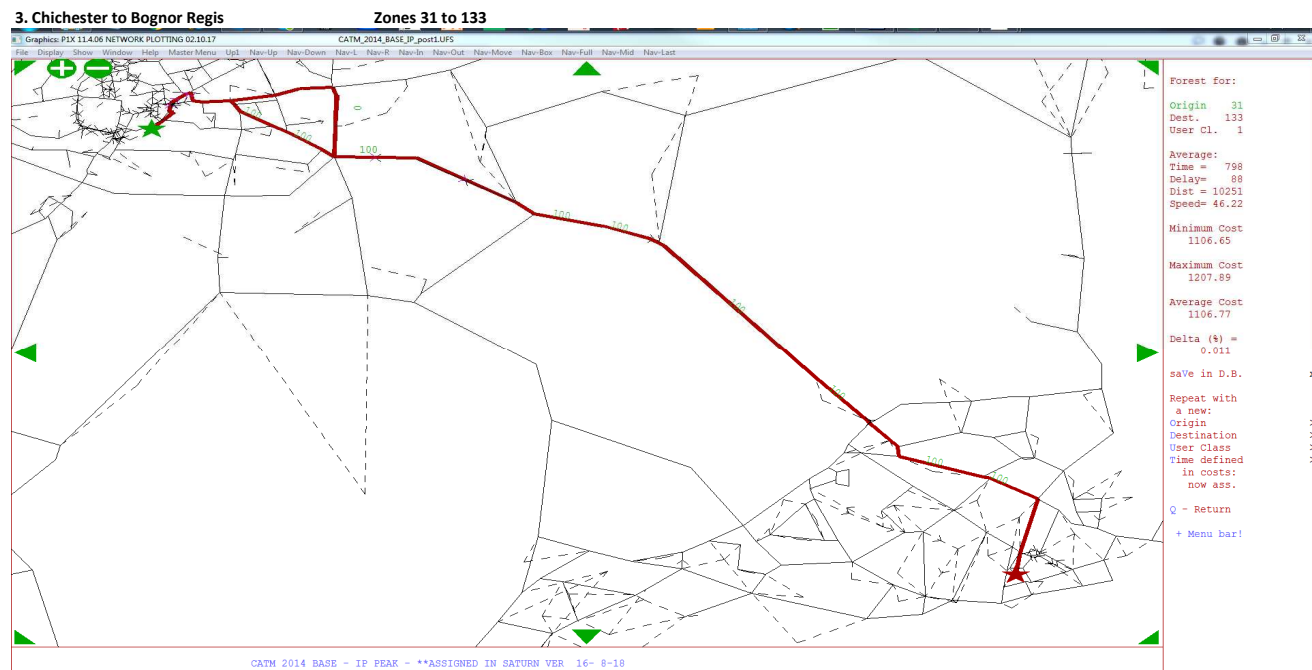
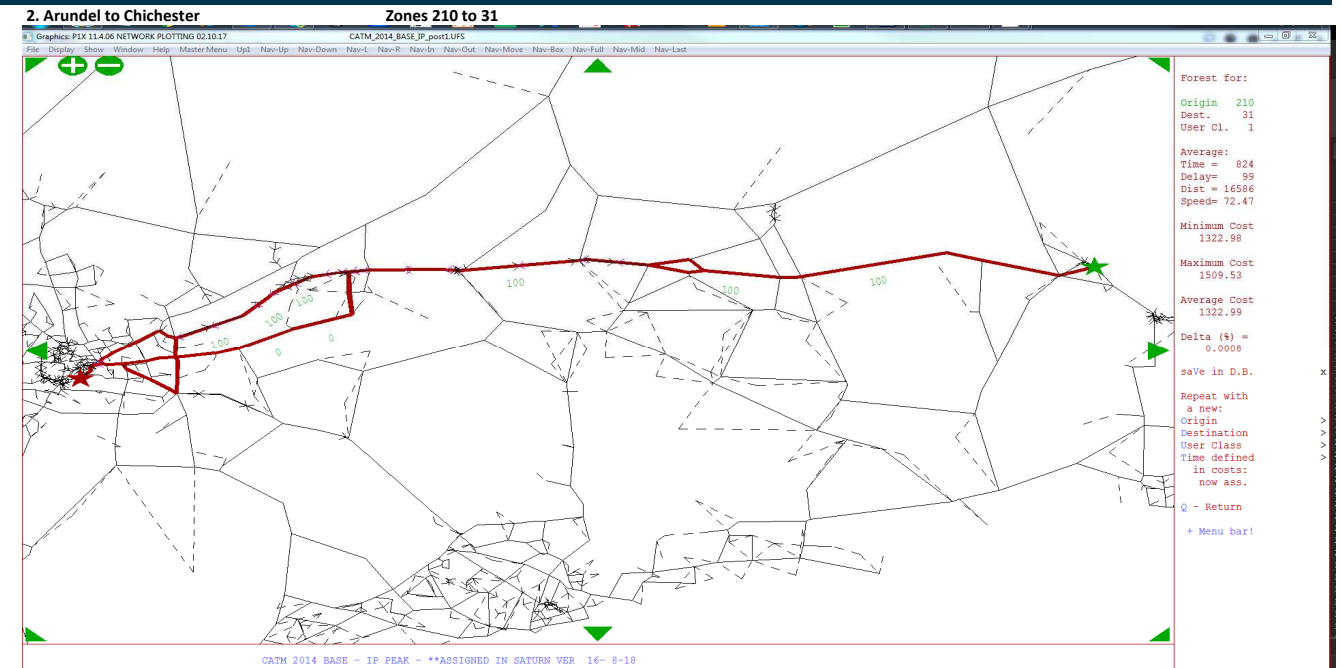
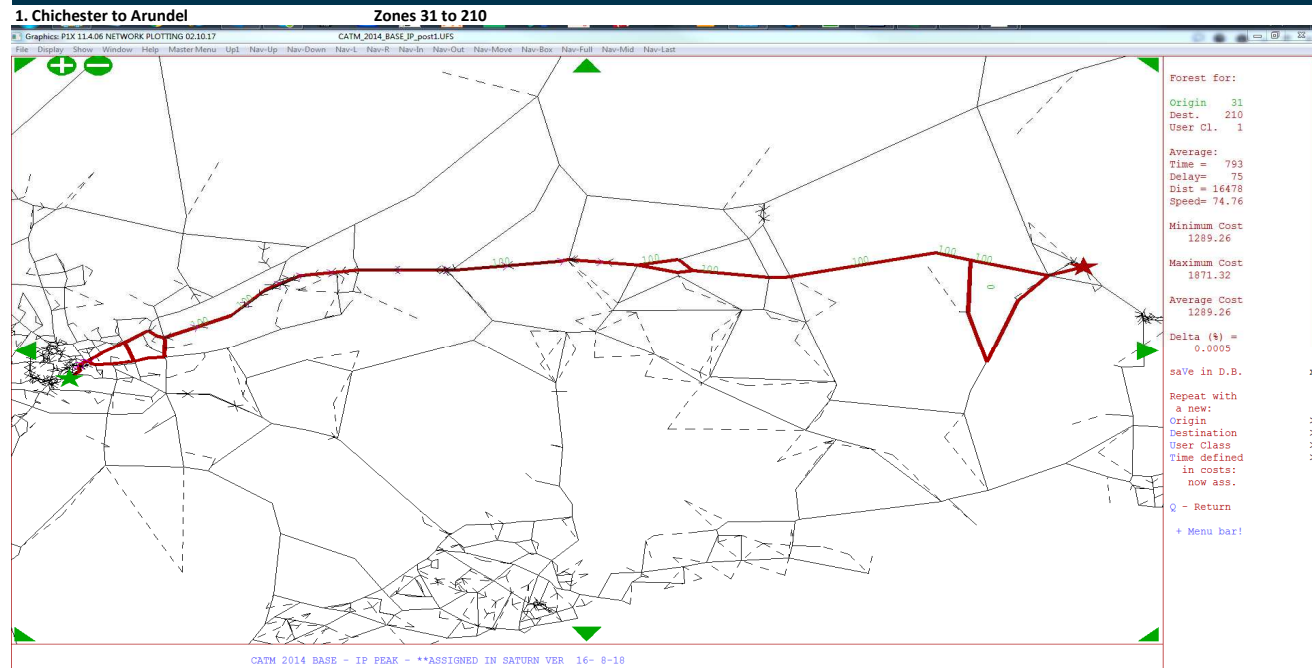




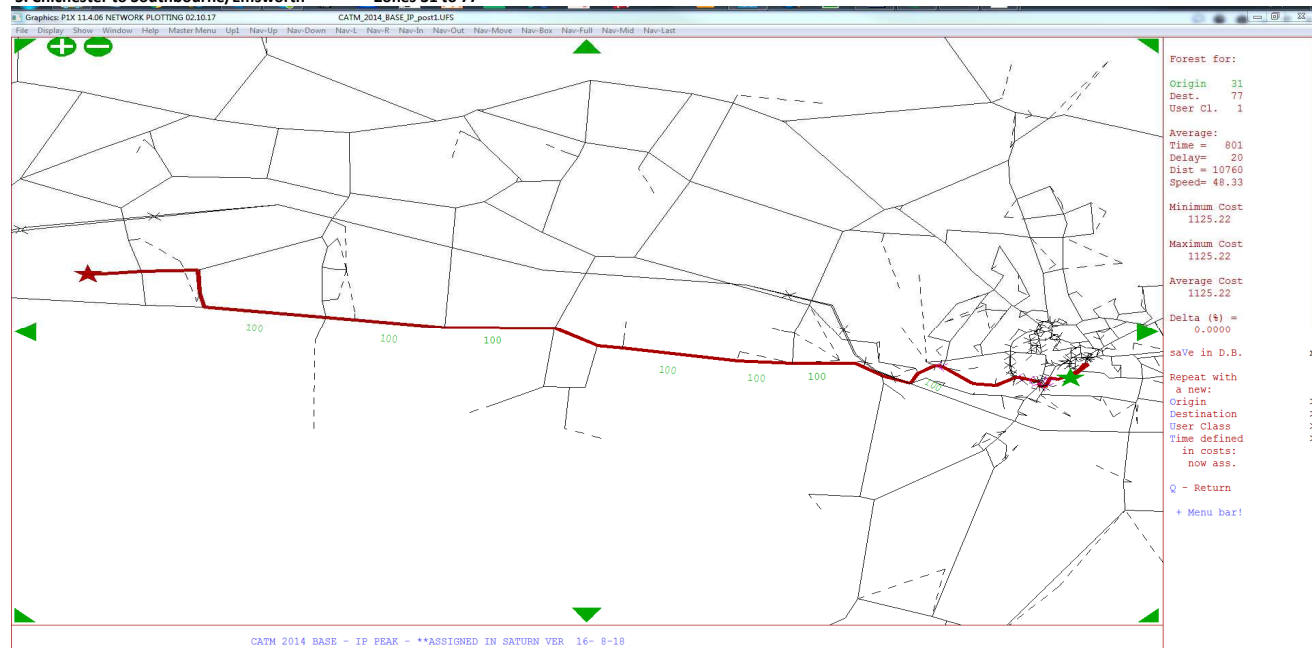




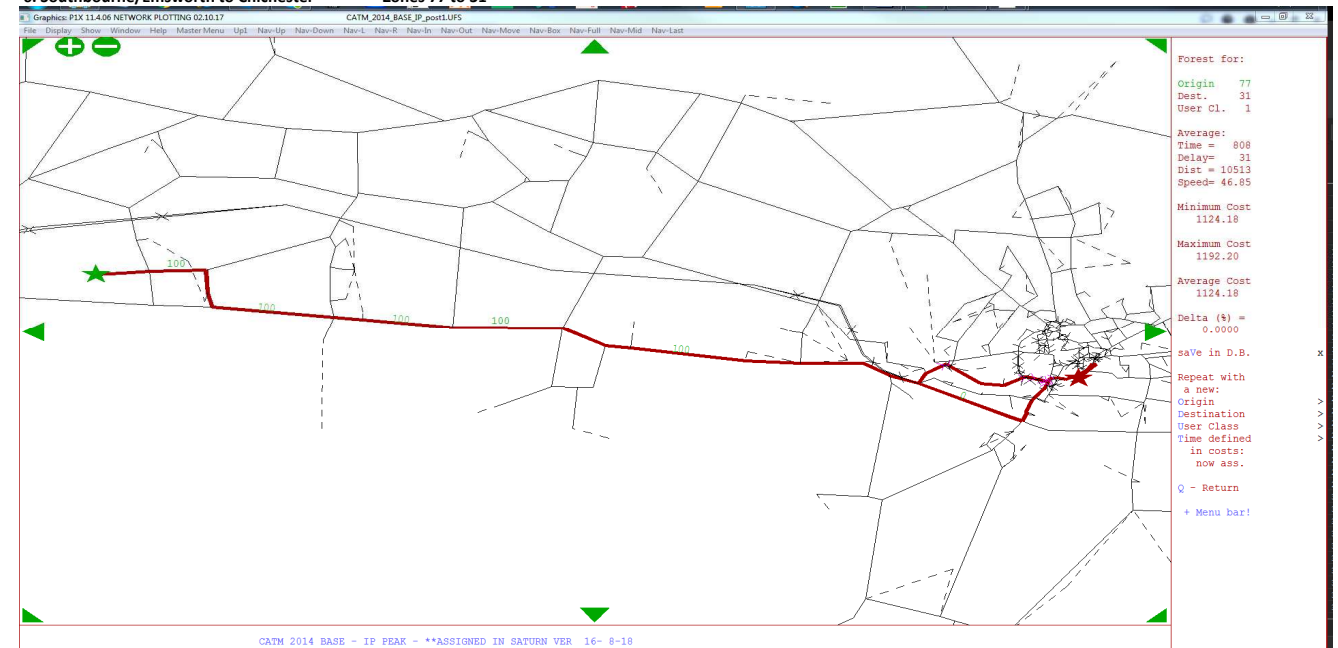
IP Journey Routes Check



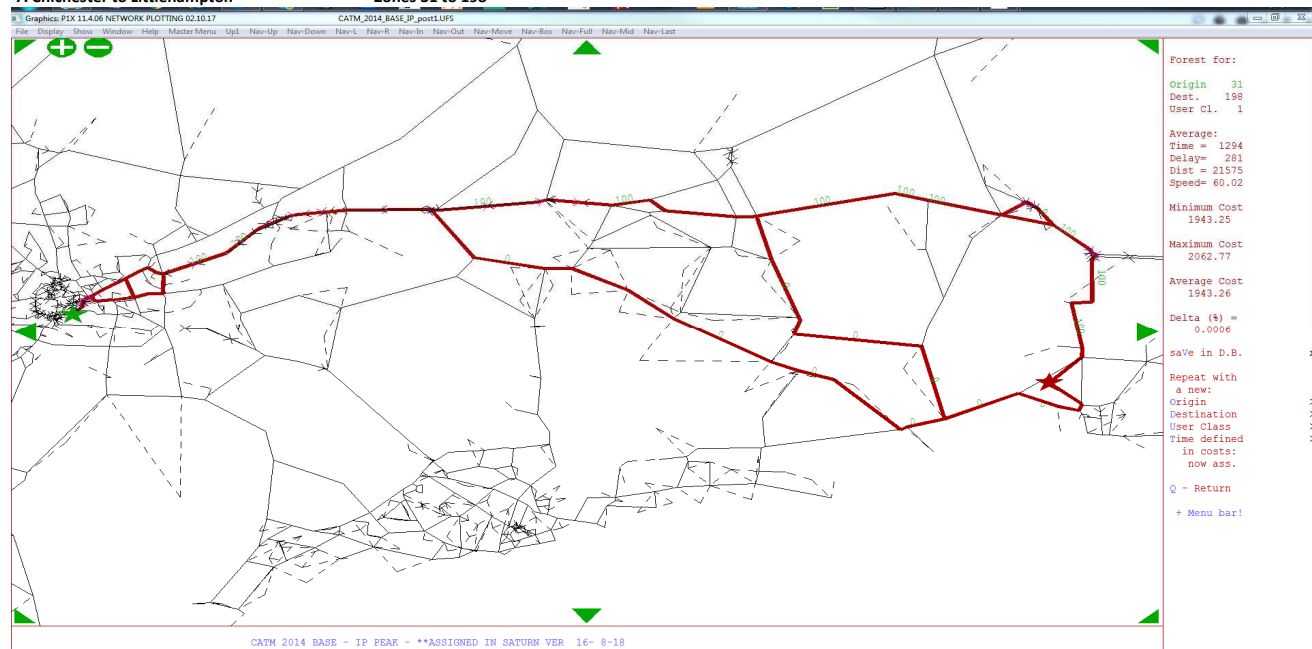
5. Chichester to Southbourne/Emsworth Zones 31 to 77



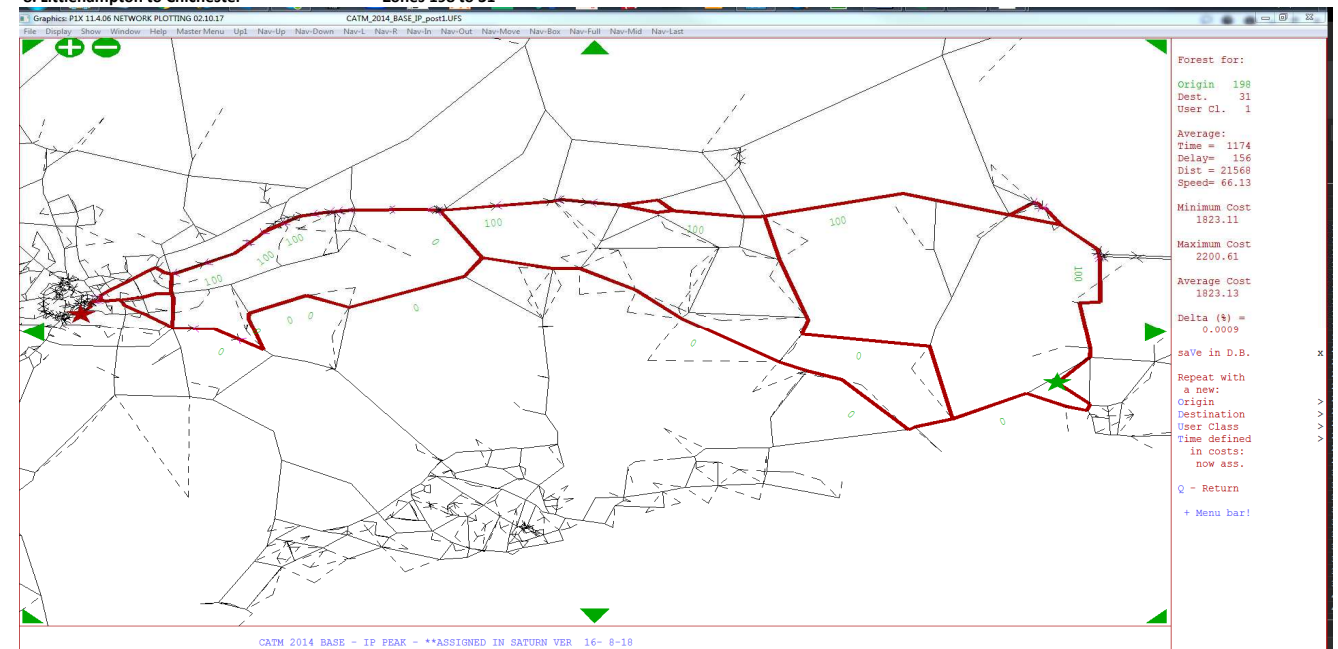
6. Southbourne/Emsworth to Chichester Zones 77 to 31



7. Chichester to Littlehampton Zones 31 to 198

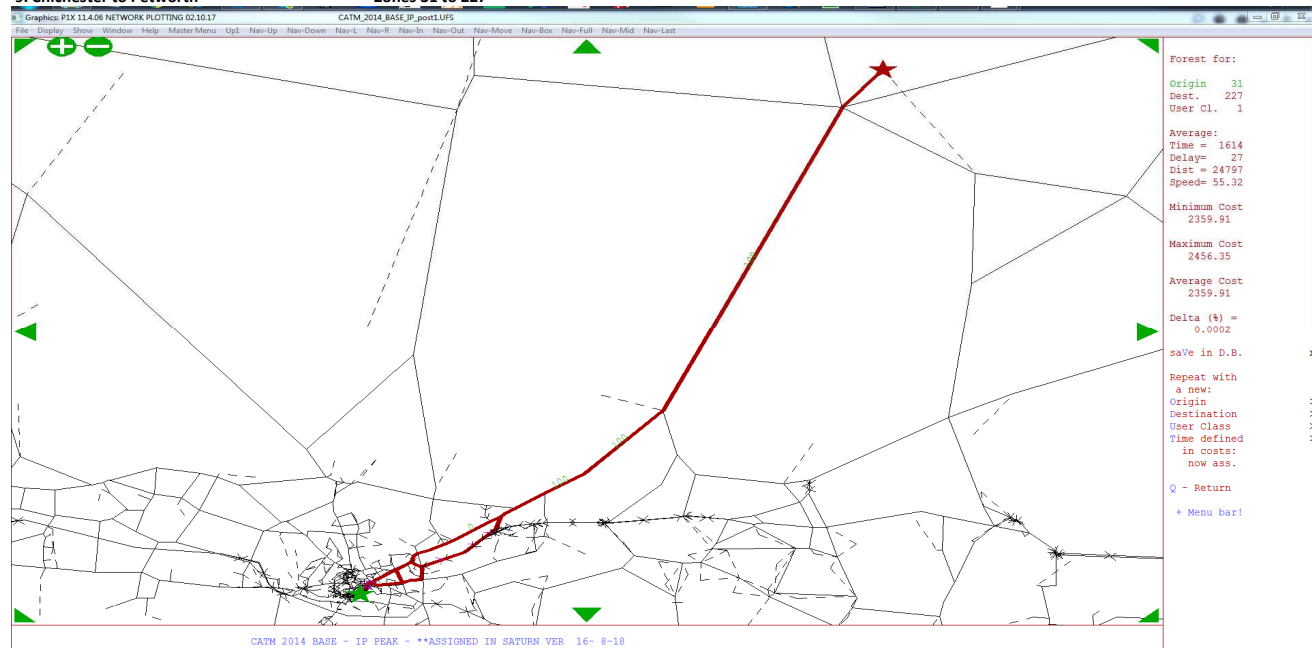


8. Littlehampton to Chichester Zones 198 to 31



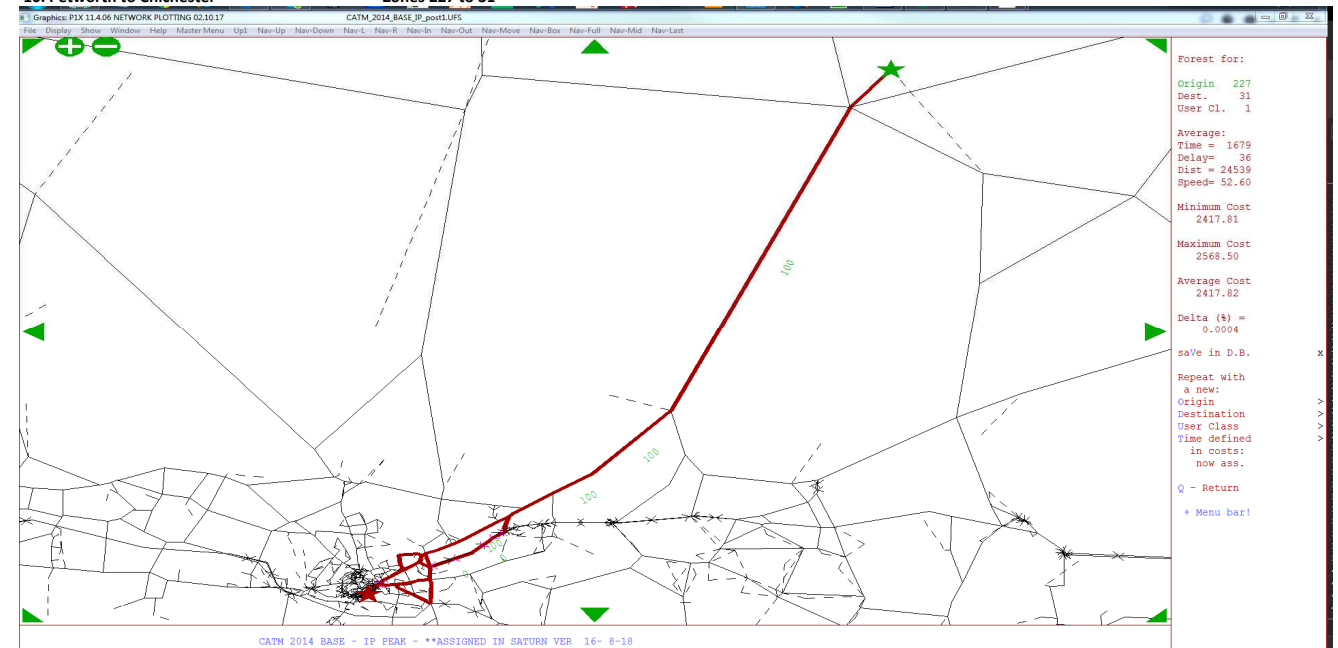
9. Chichester to Petworth

Zones 31 to 227



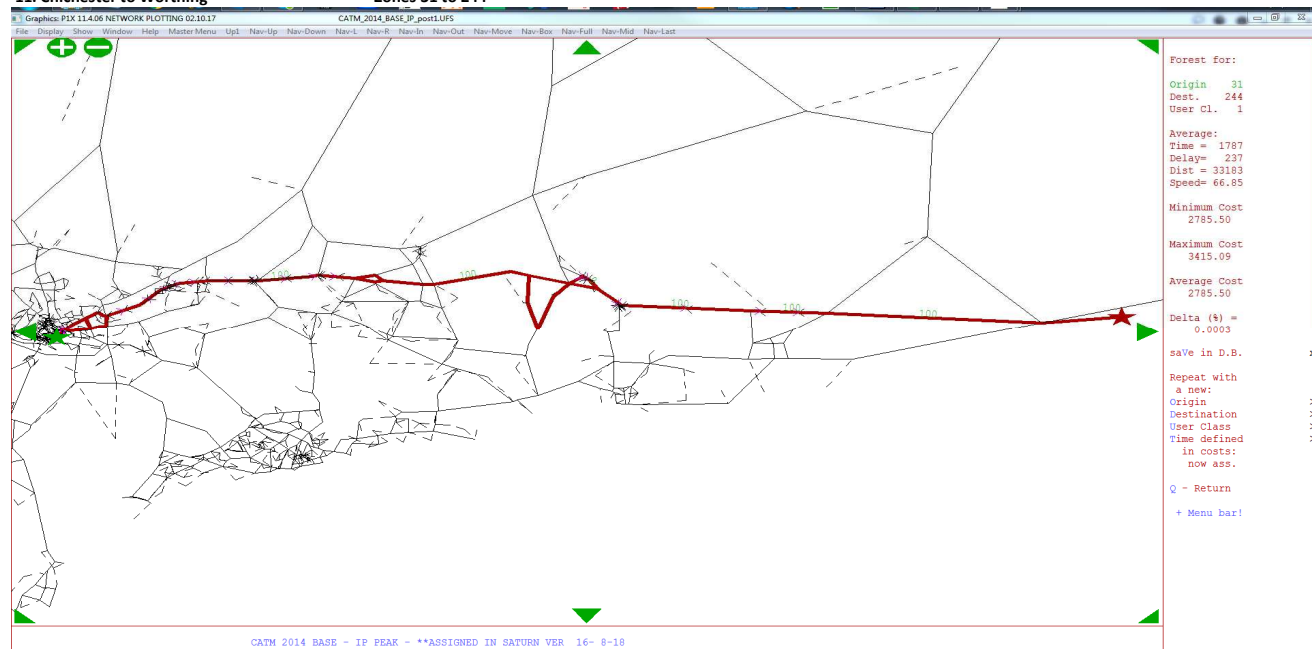
10. Petworth to Chichester

Zones 227 to 31



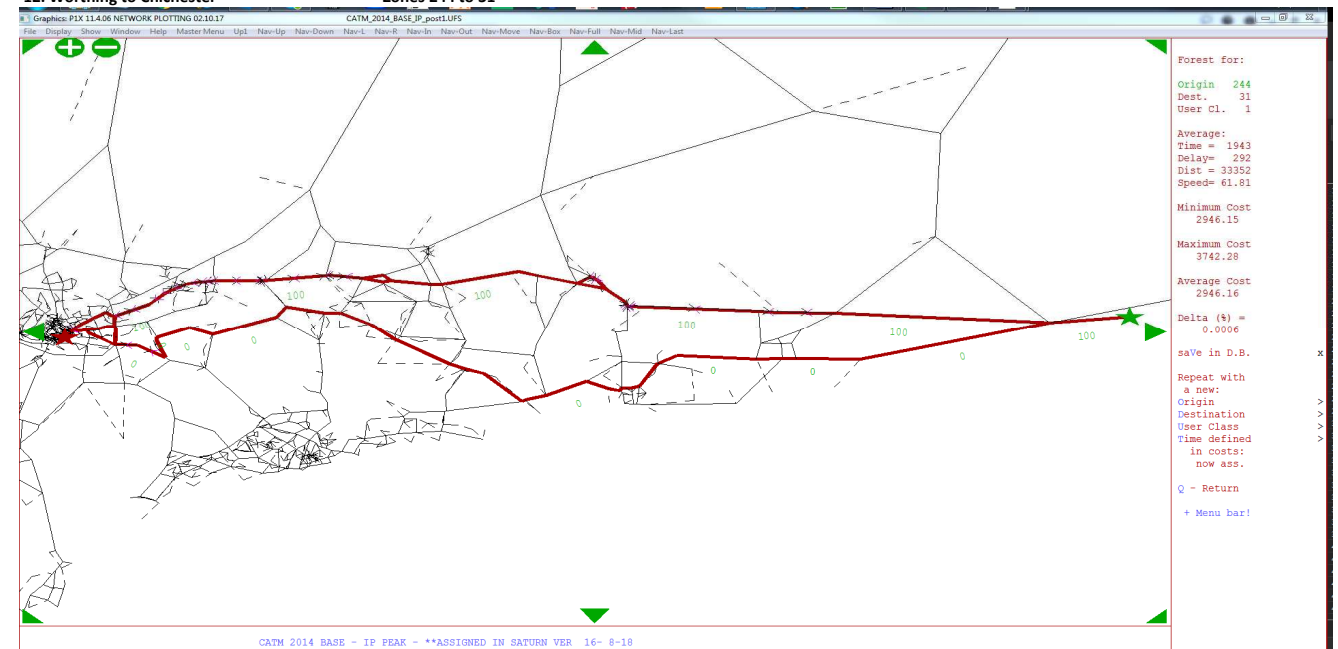
11. Chichester to Worthing

Zones 31 to 244

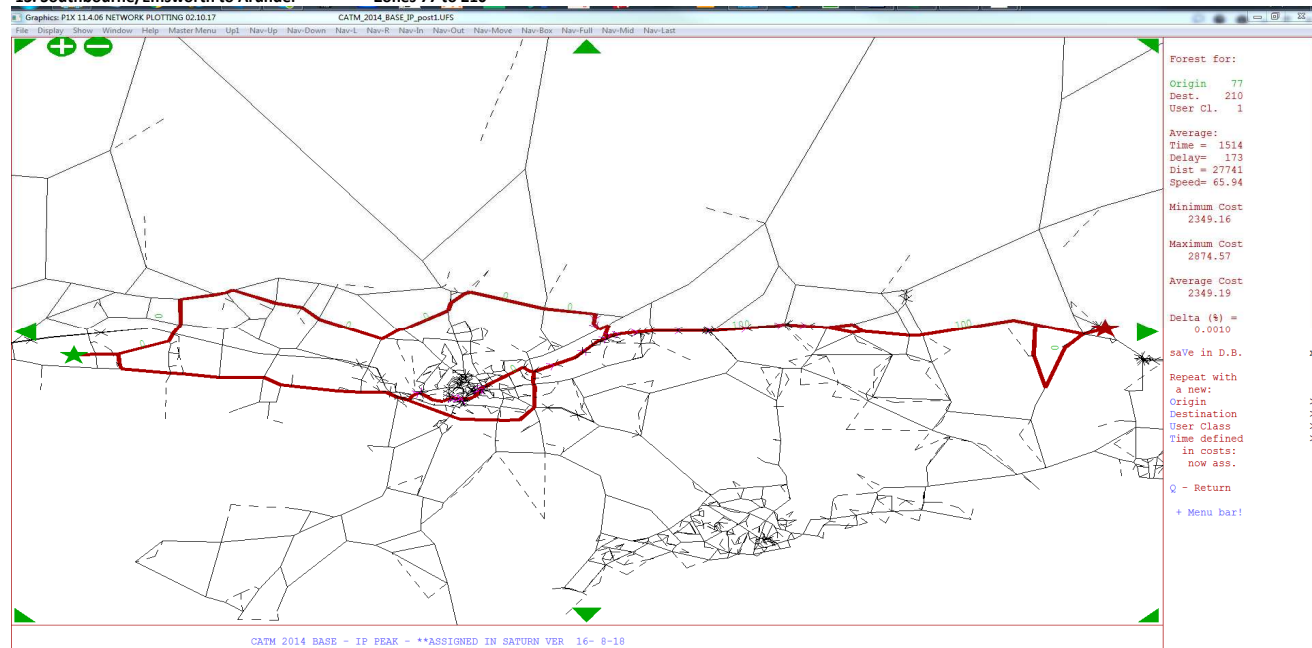


12. Worthing to Chichester

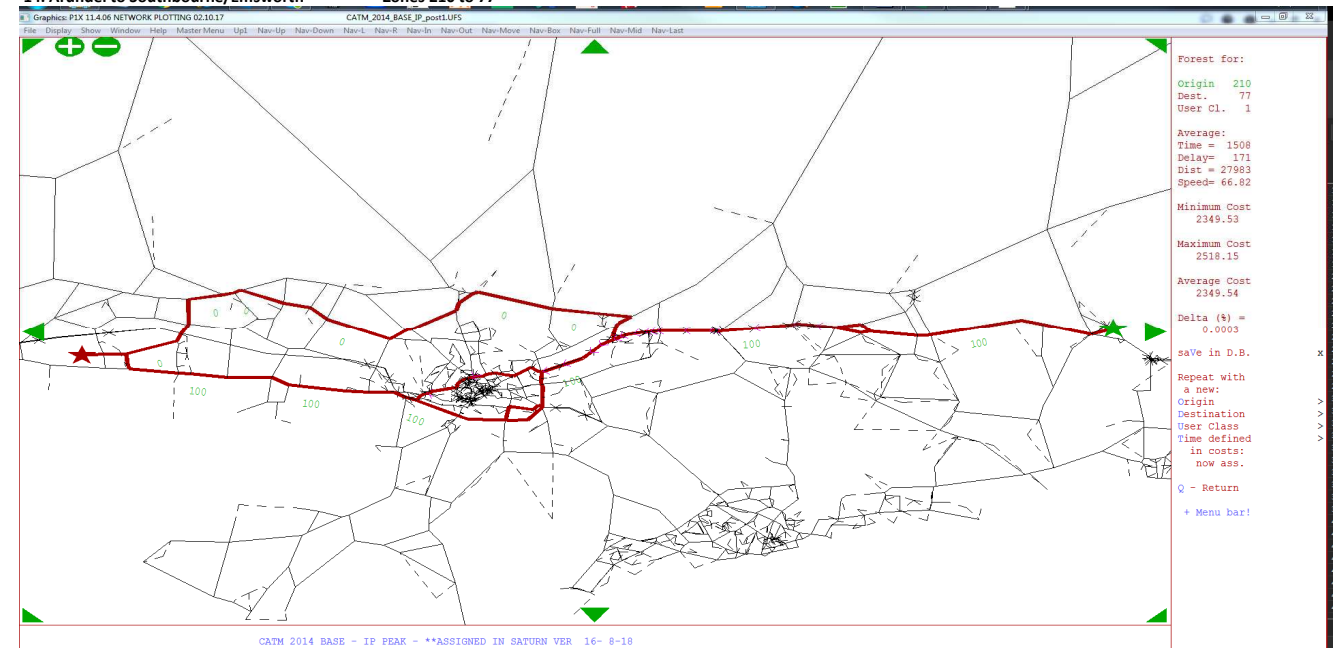
Zones 244 to 31



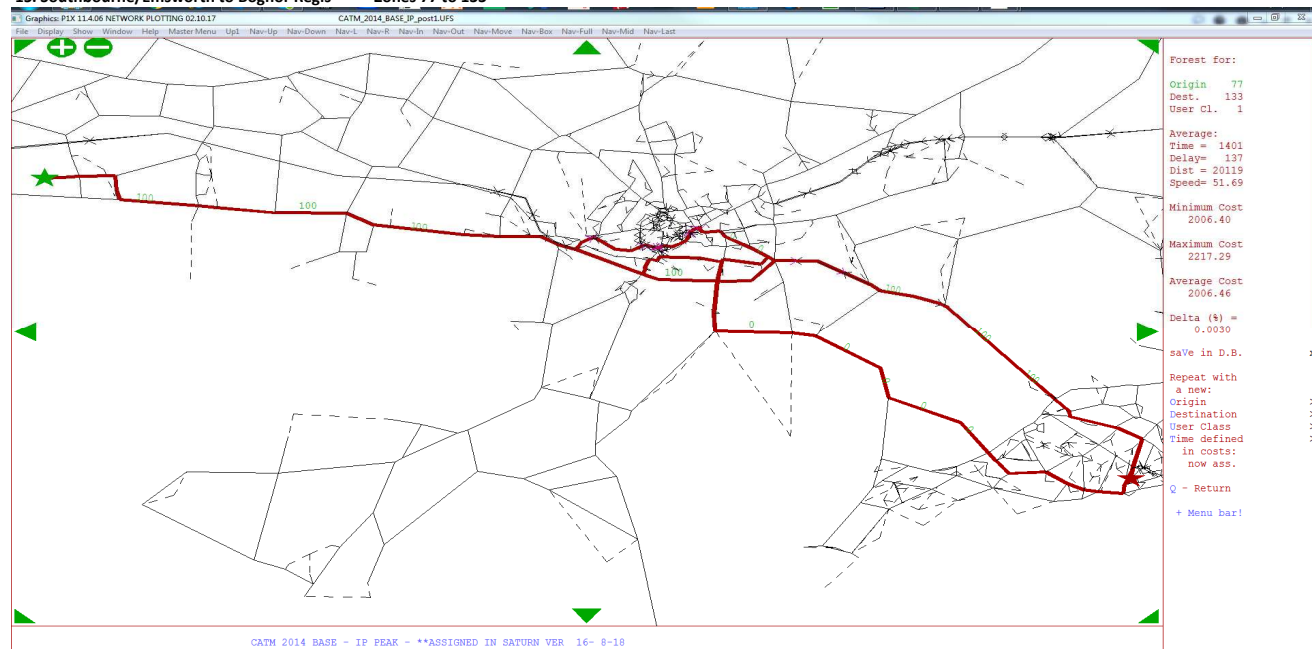
13. Southbourne/Emsworth to Arundel Zones 77 to 210



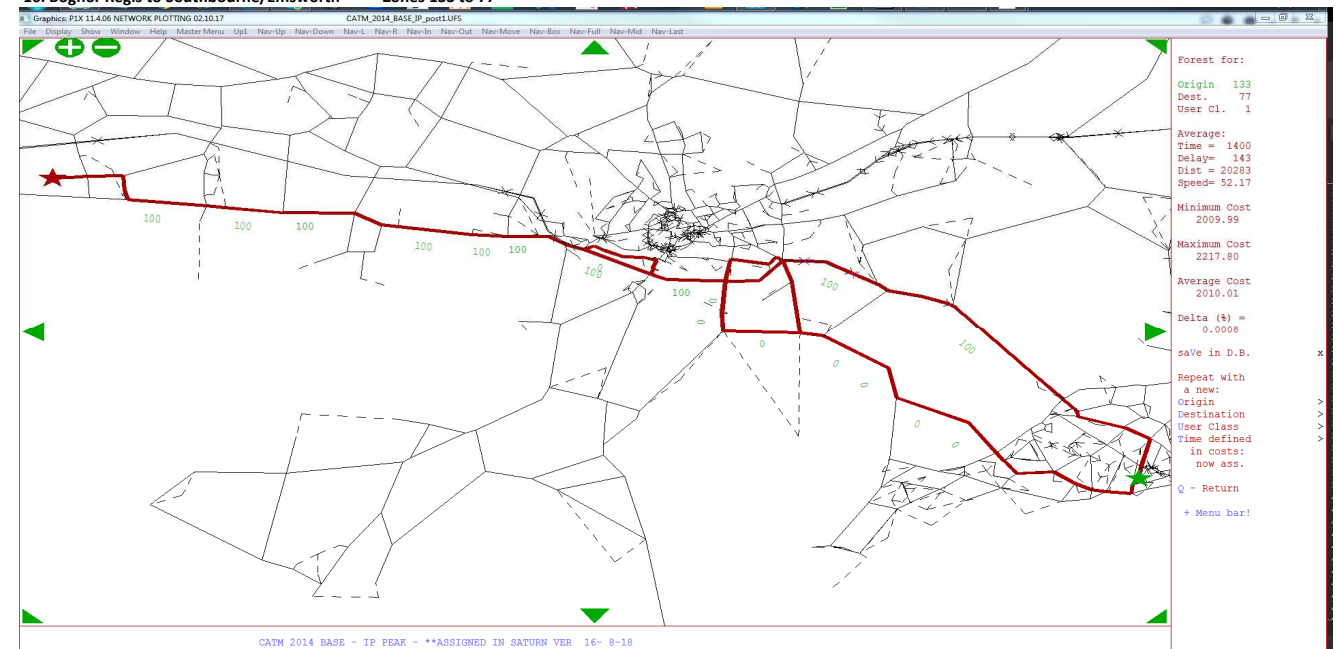
14. Arundel to Southbourne/Emsworth Zones 210 to 77



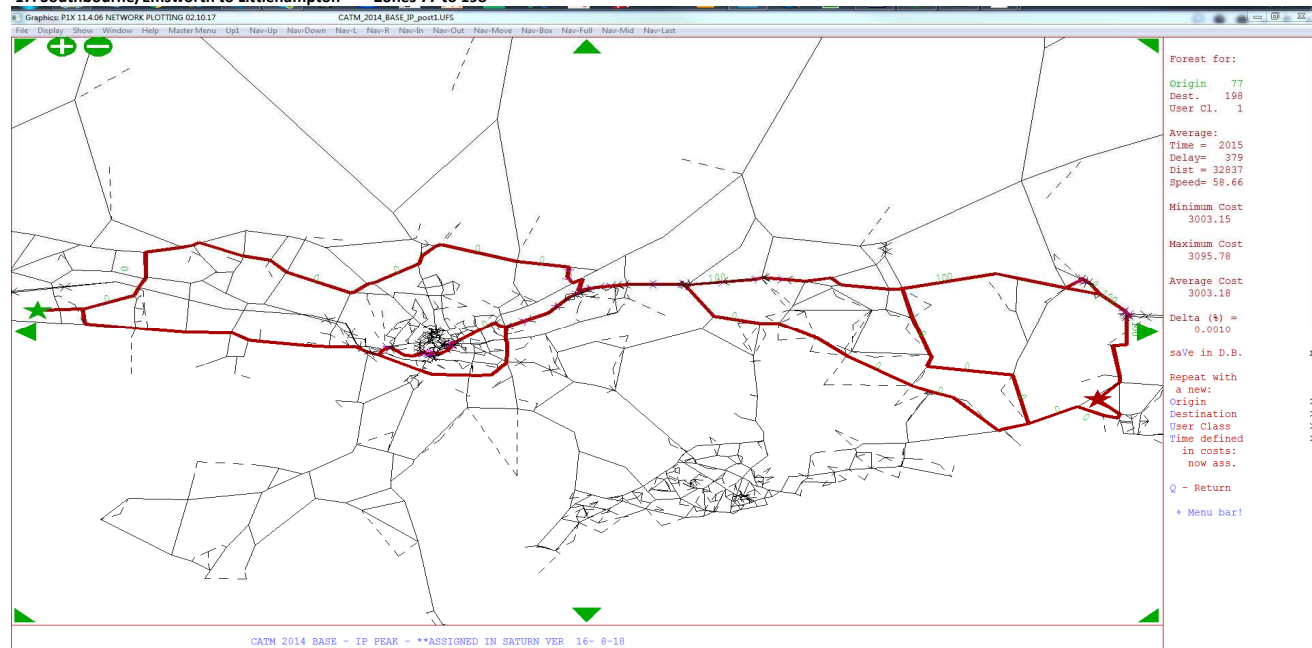
15. Southbourne/Emsworth to Bognor Regis Zones 77 to 133



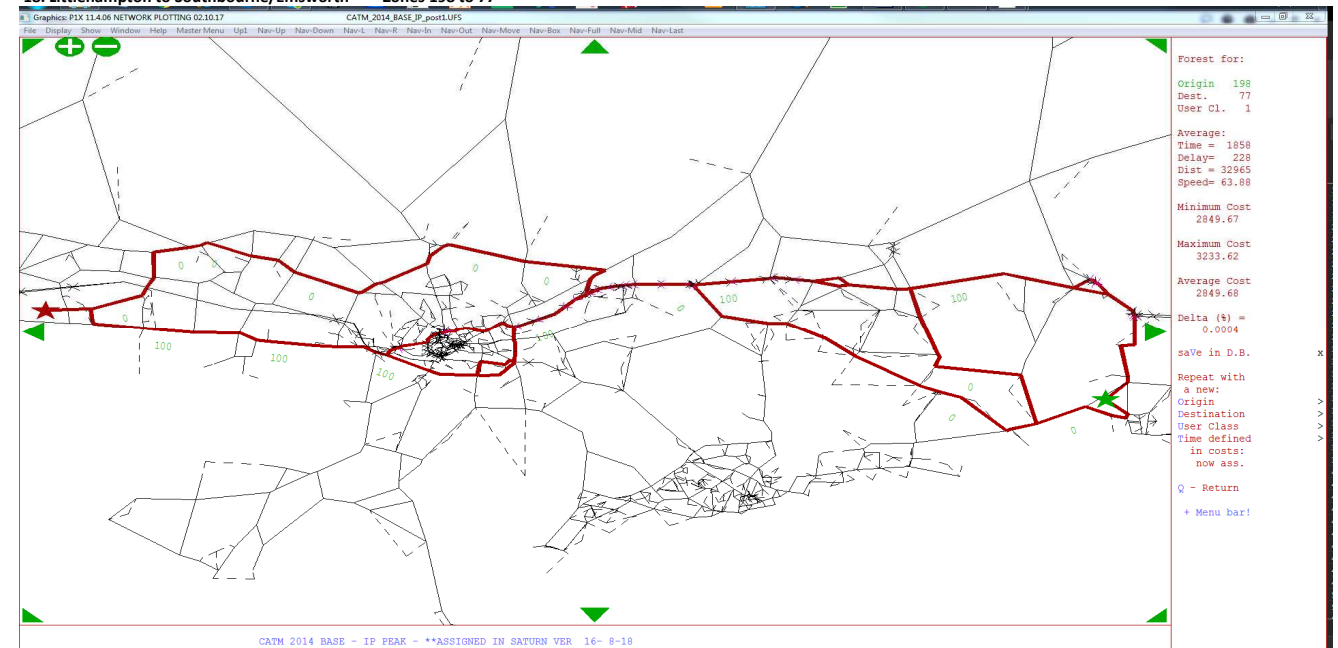
16. Bognor Regis to Southbourne/Emsworth Zones 133 to 77



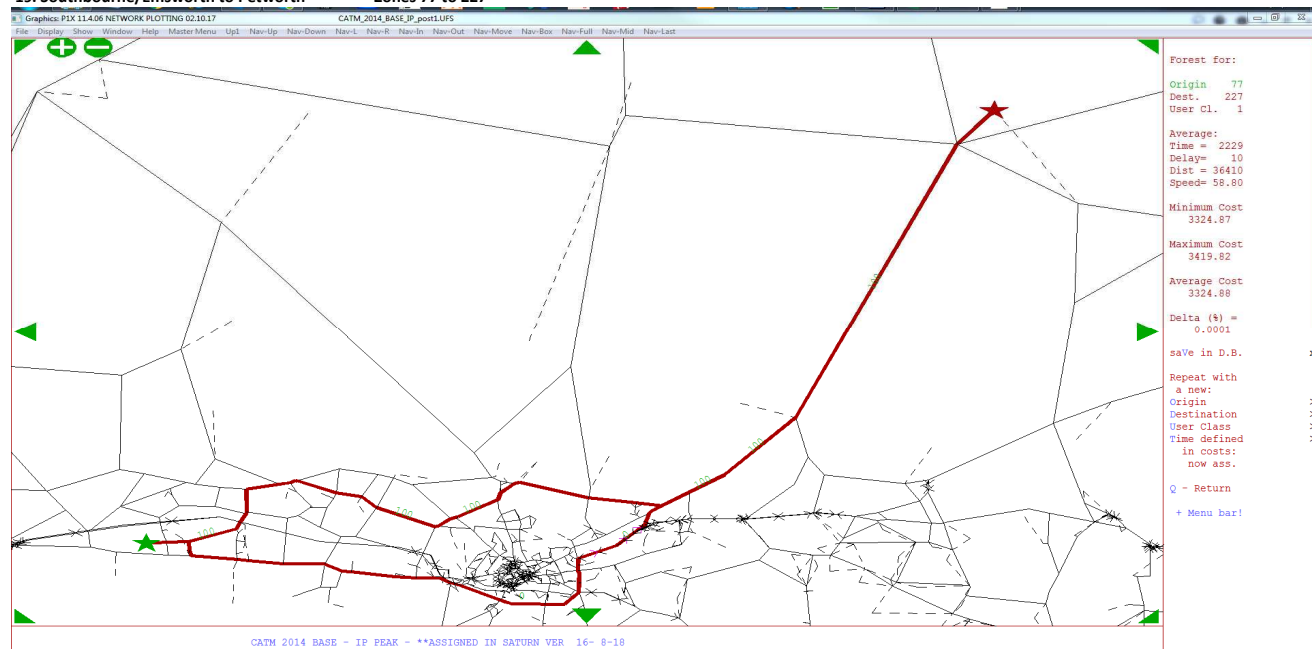
17. Southbourne/Emsworth to Littlehampton Zones 77 to 198



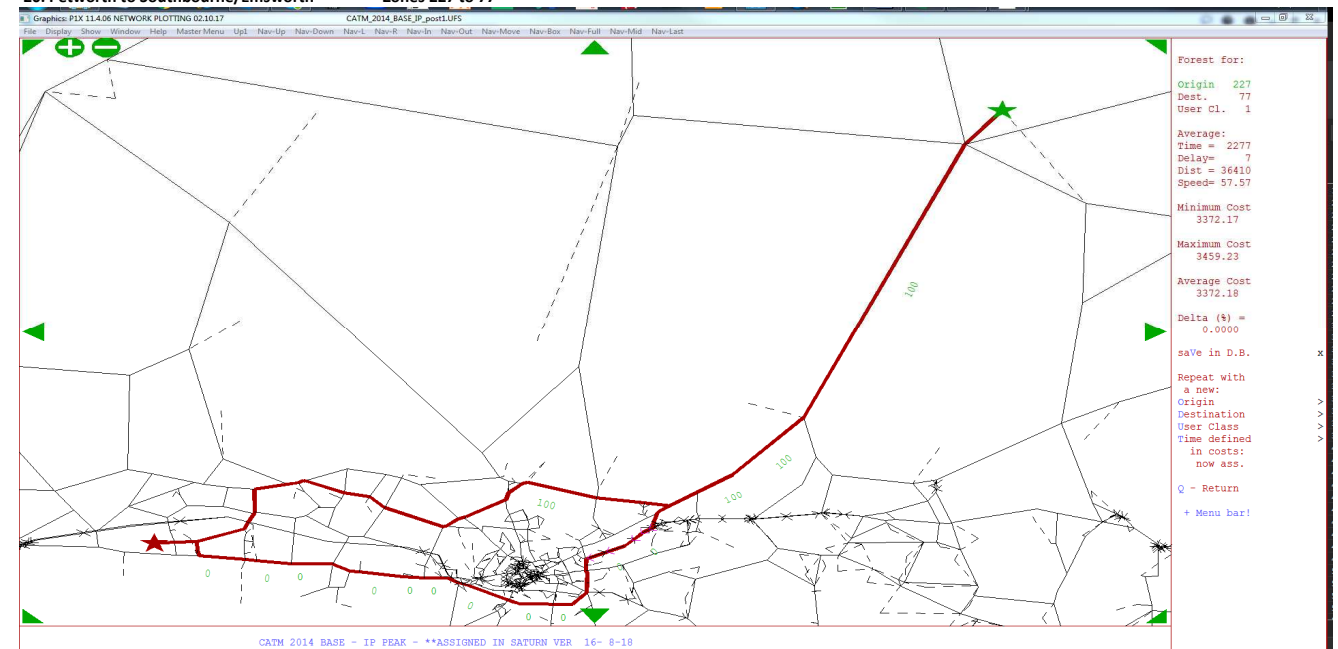
18. Littlehampton to Southbourne/Emsworth Zones 198 to 77



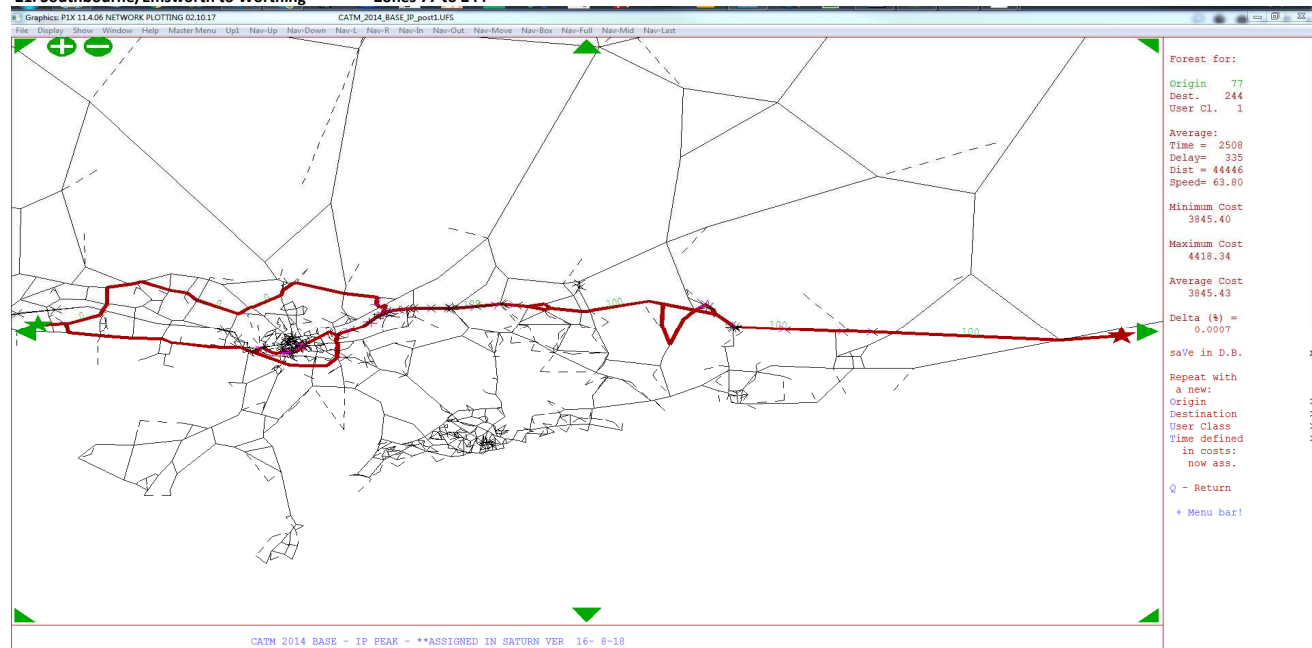
19. Southbourne/Emsworth to Petworth Zones 77 to 227



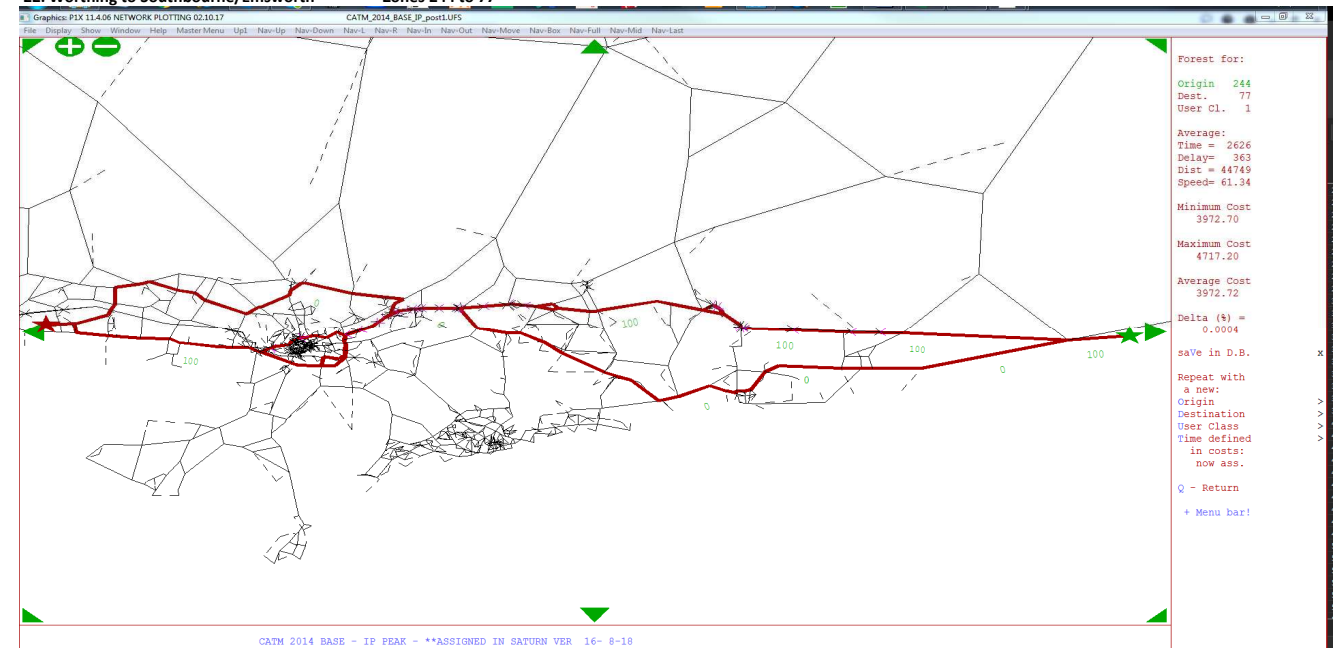
20. Petworth to Southbourne/Emsworth Zones 227 to 77



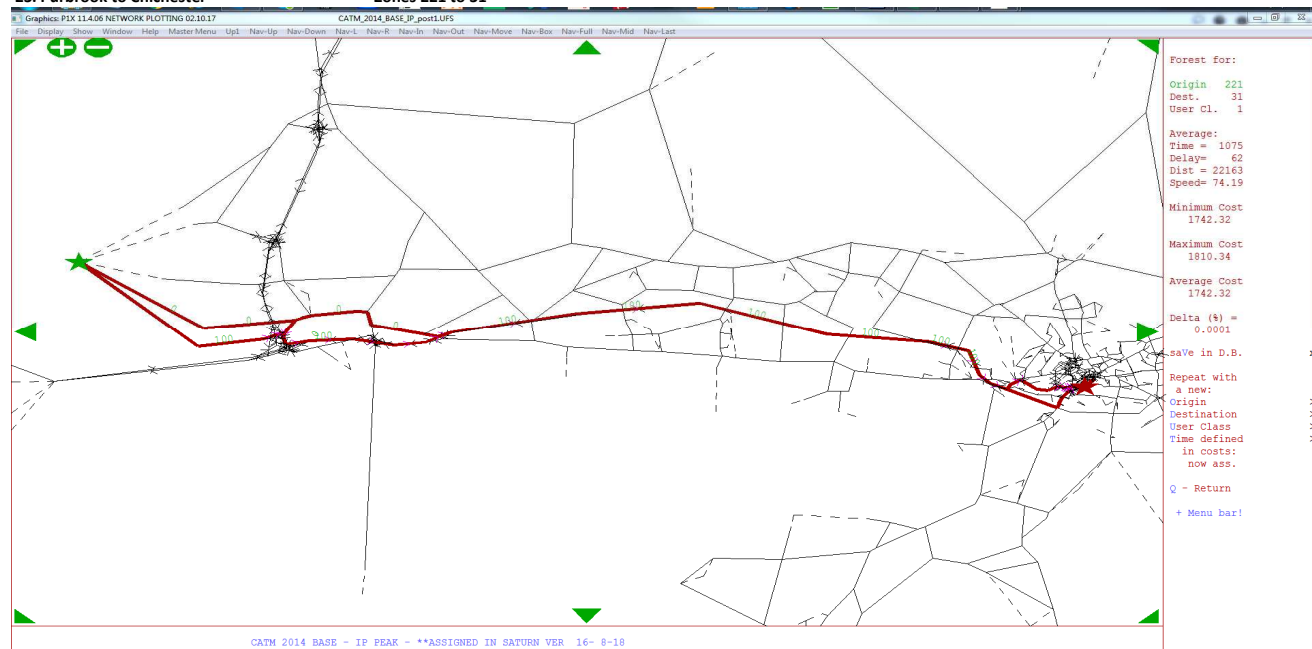
21. Southbourne/Emsworth to Worthing Zones 77 to 244



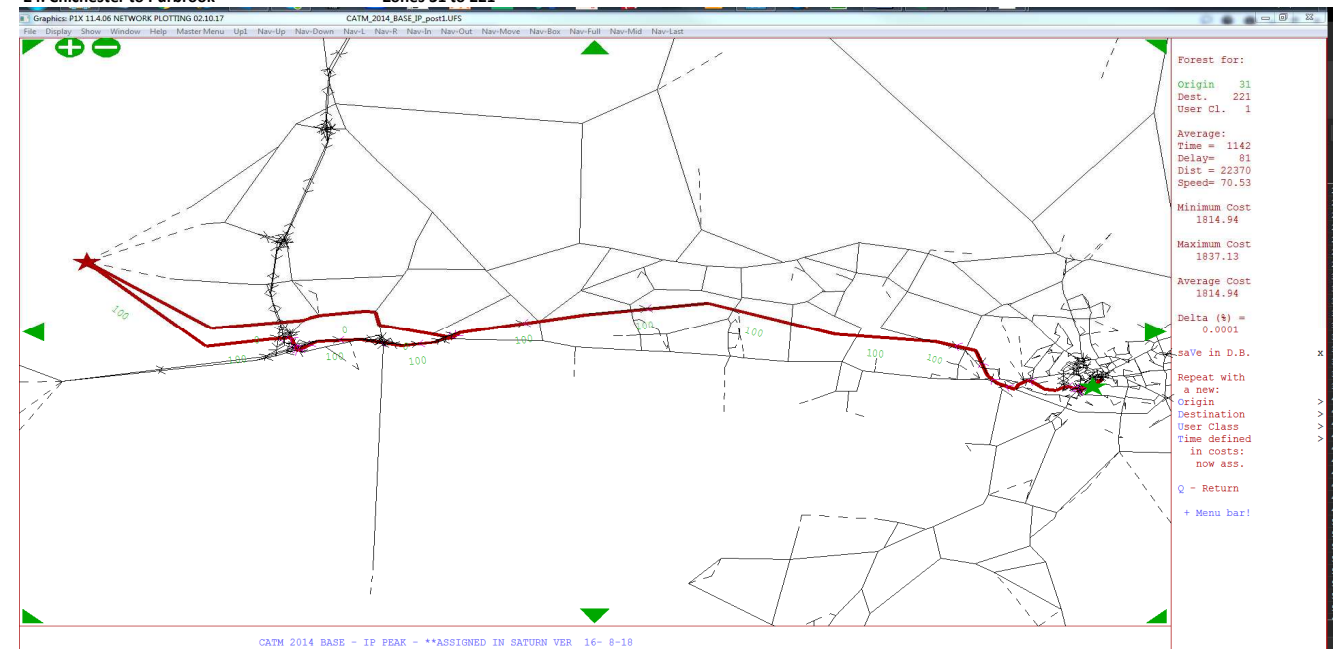
22. Worthing to Southbourne/Emsworth Zones 244 to 77



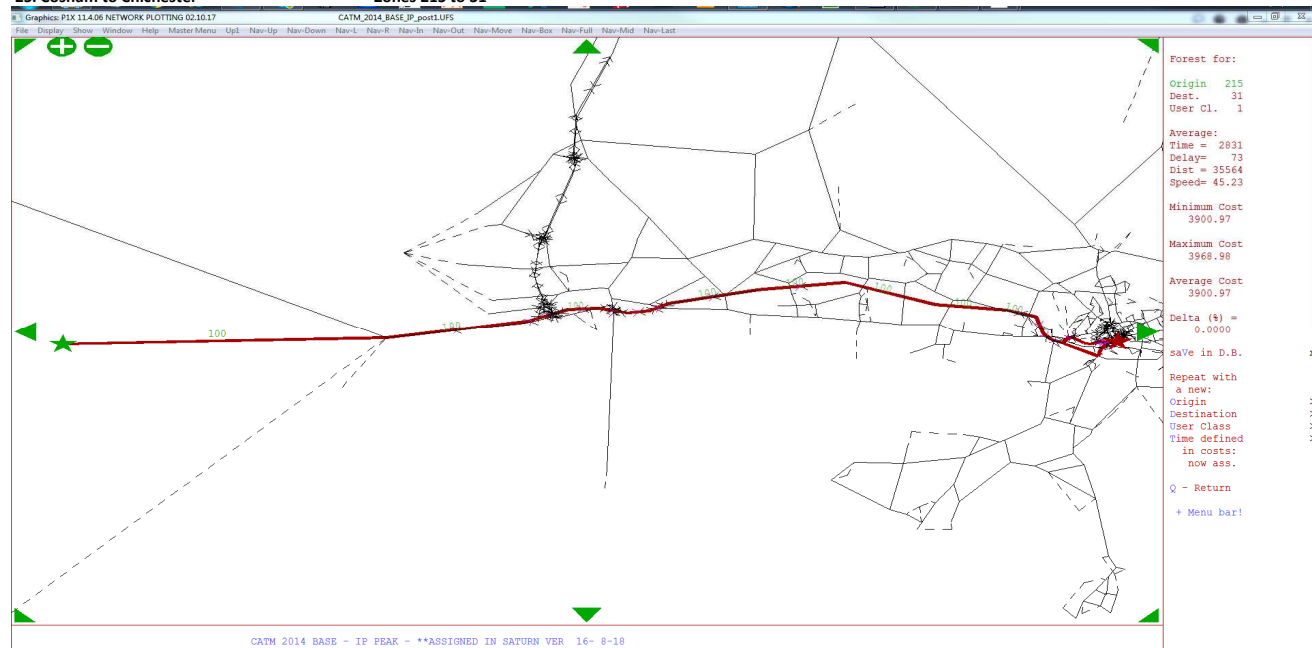
23. Purbrook to Chichester Zones 221 to 31



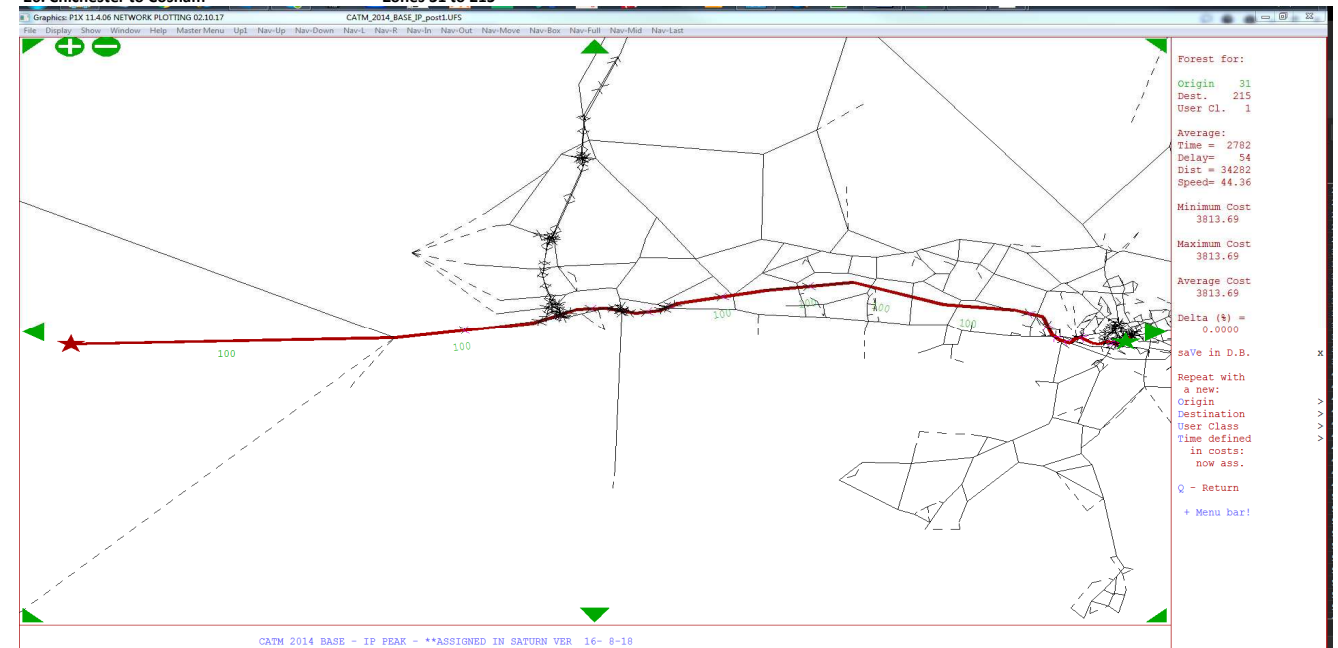
24. Chichester to Purbrook Zones 31 to 221



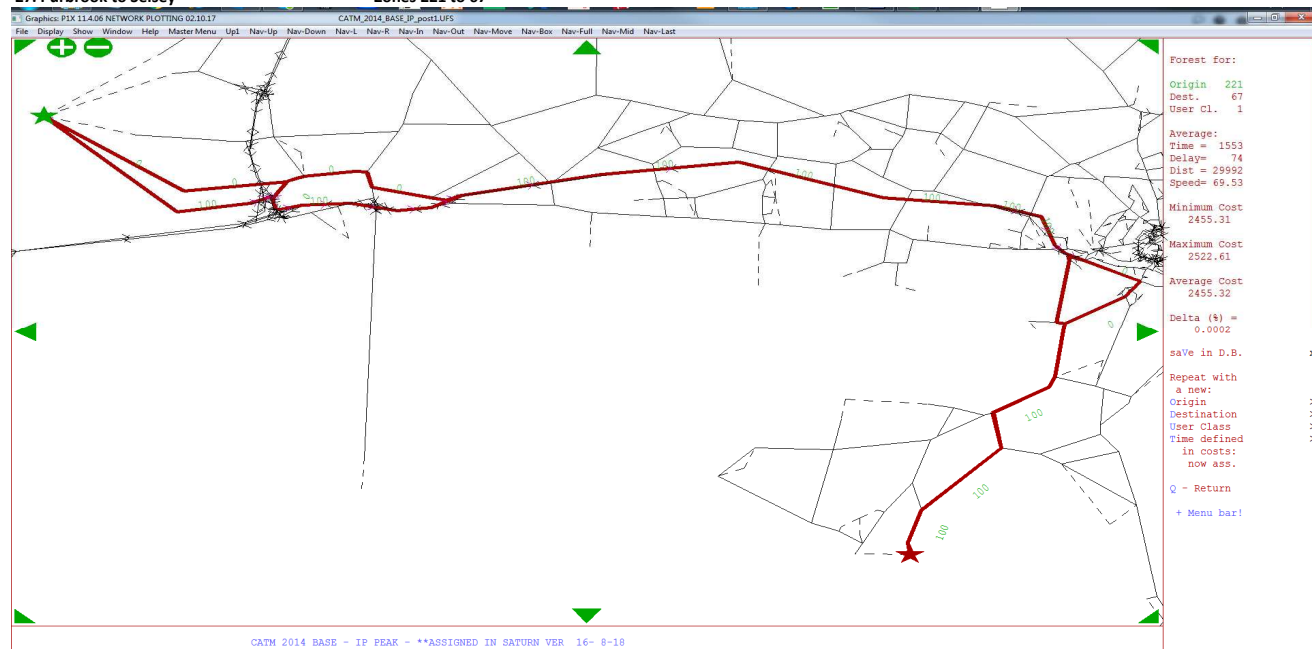
25. Cosham to Chichester Zones 215 to 31



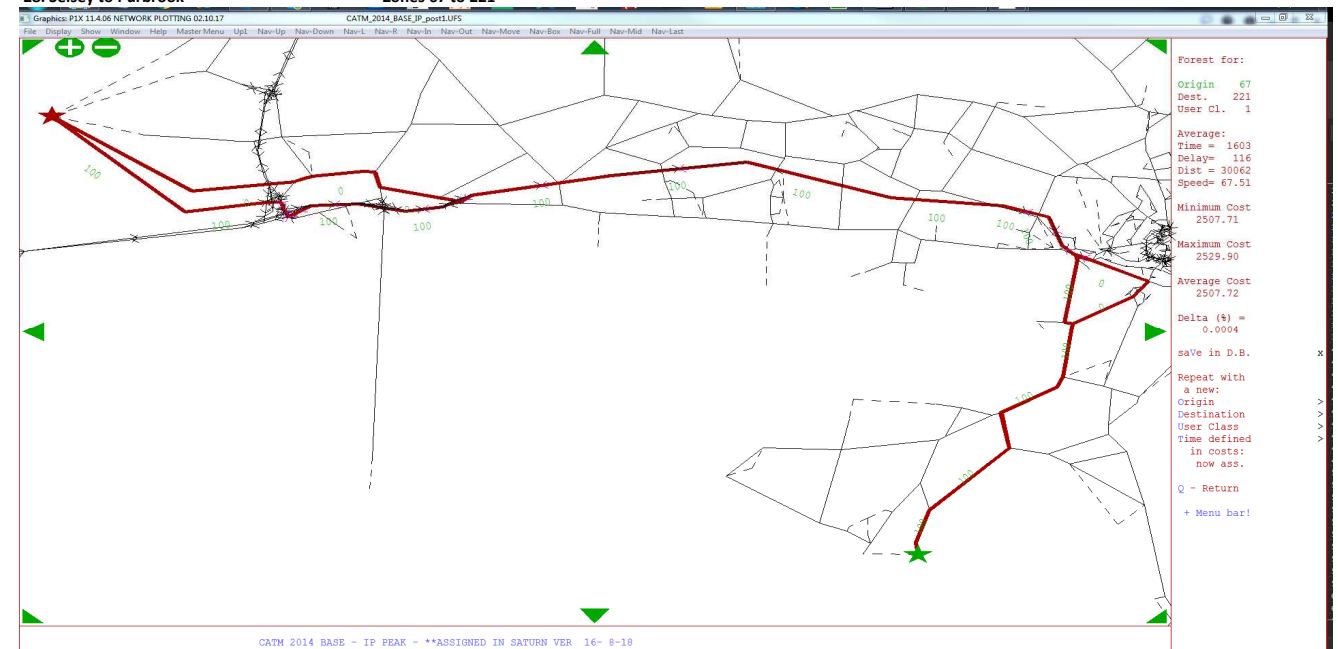
26. Chichester to Cosham Zones 31 to 215



27. Purbrook to Selsey Zones 221 to 67

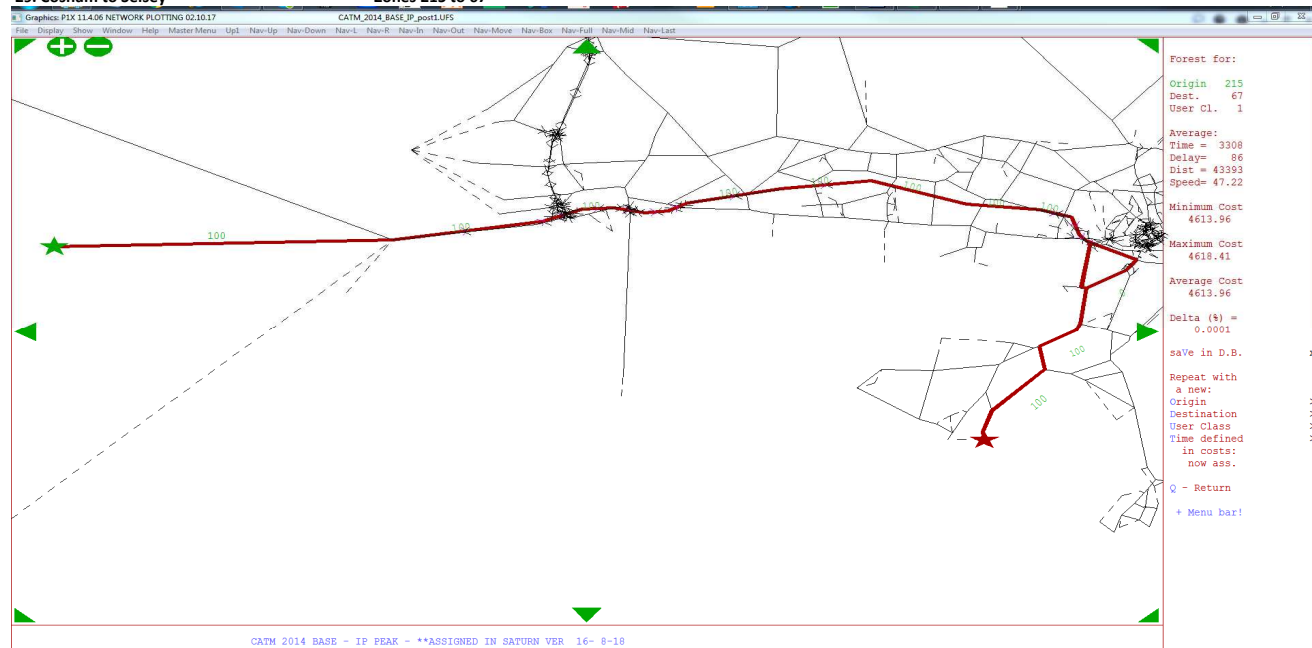


28. Selsey to Purbrook Zones 67 to 221



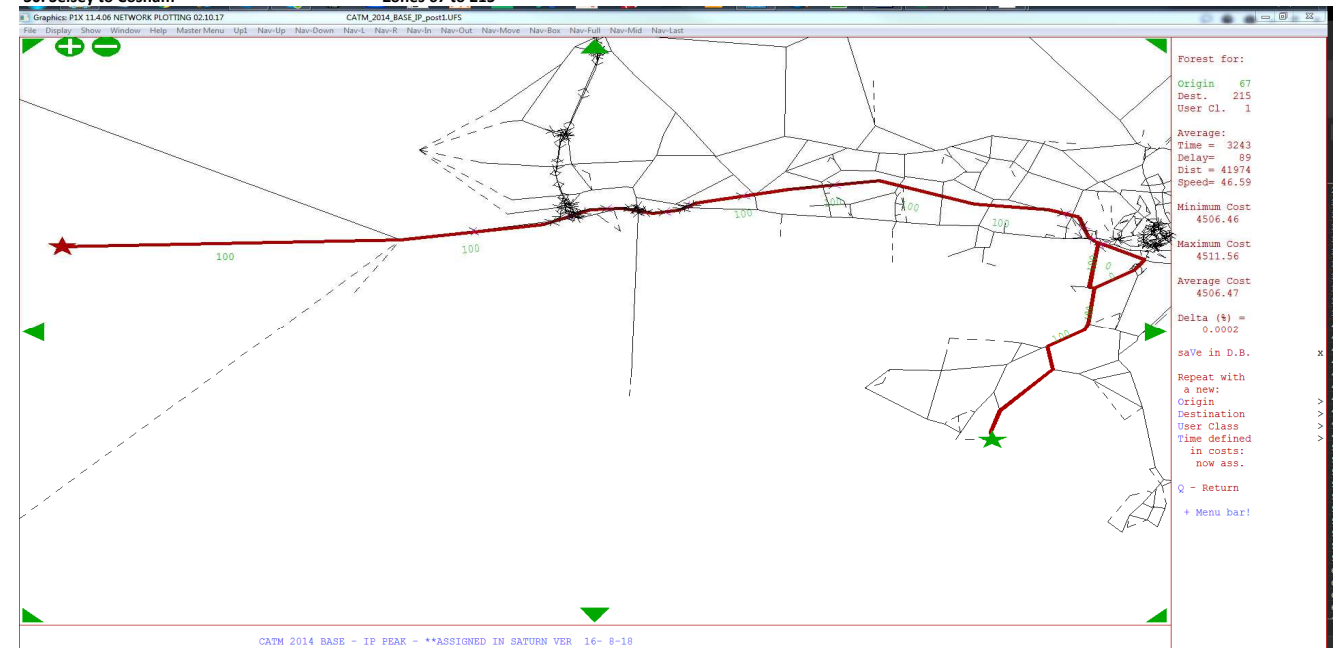
29. Cosham to Selsey

Zones 215 to 67



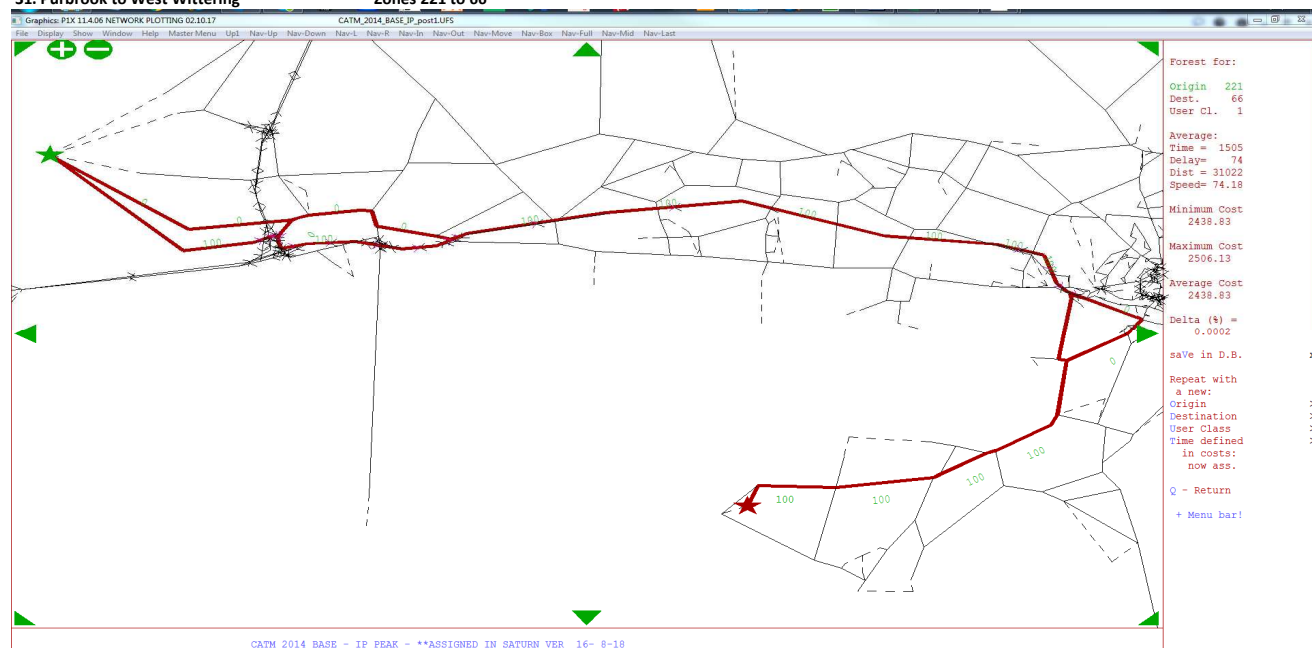
30. Selsey to Cosham

Zones 67 to 215



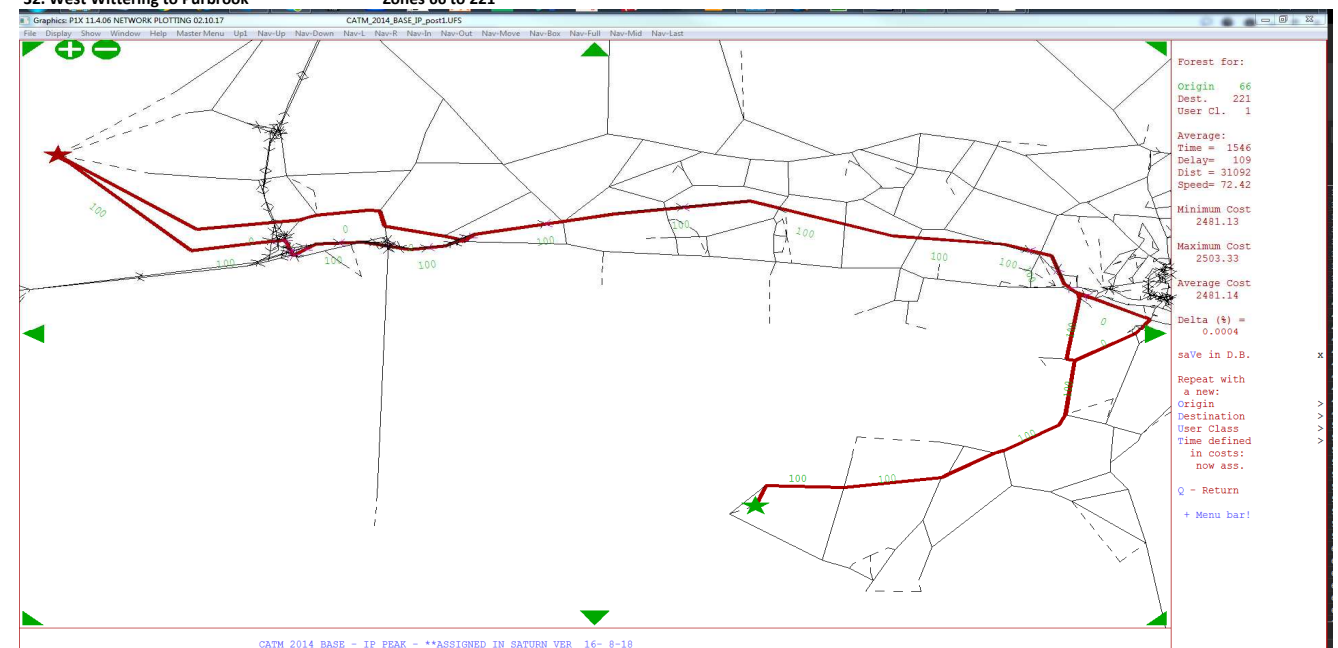
31. Purbrook to West Wittering

Zones 221 to 66

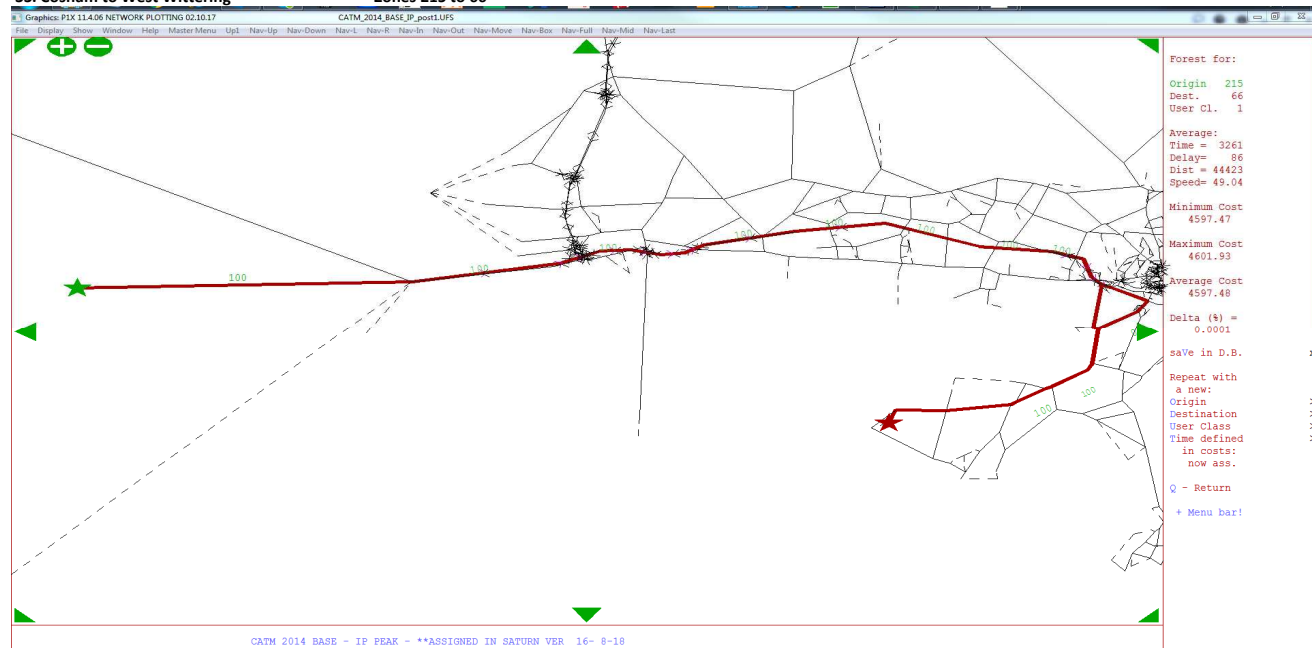


32. West Wittering to Purbrook

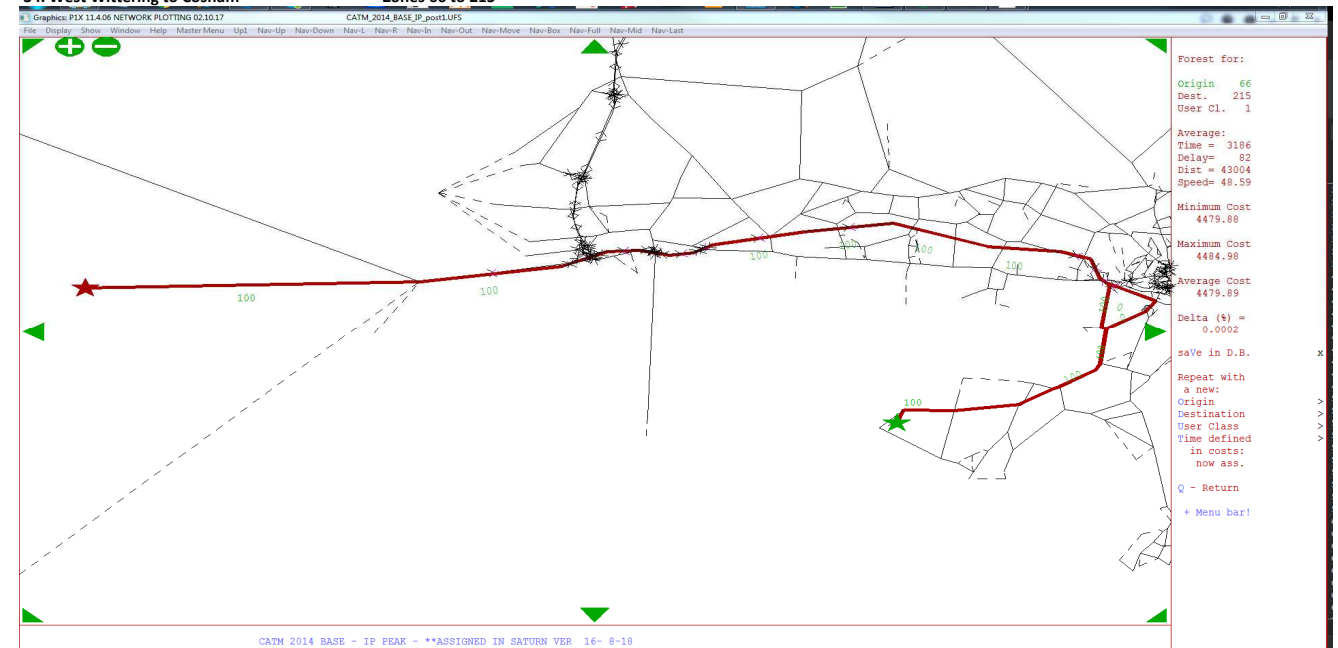
Zones 66 to 221



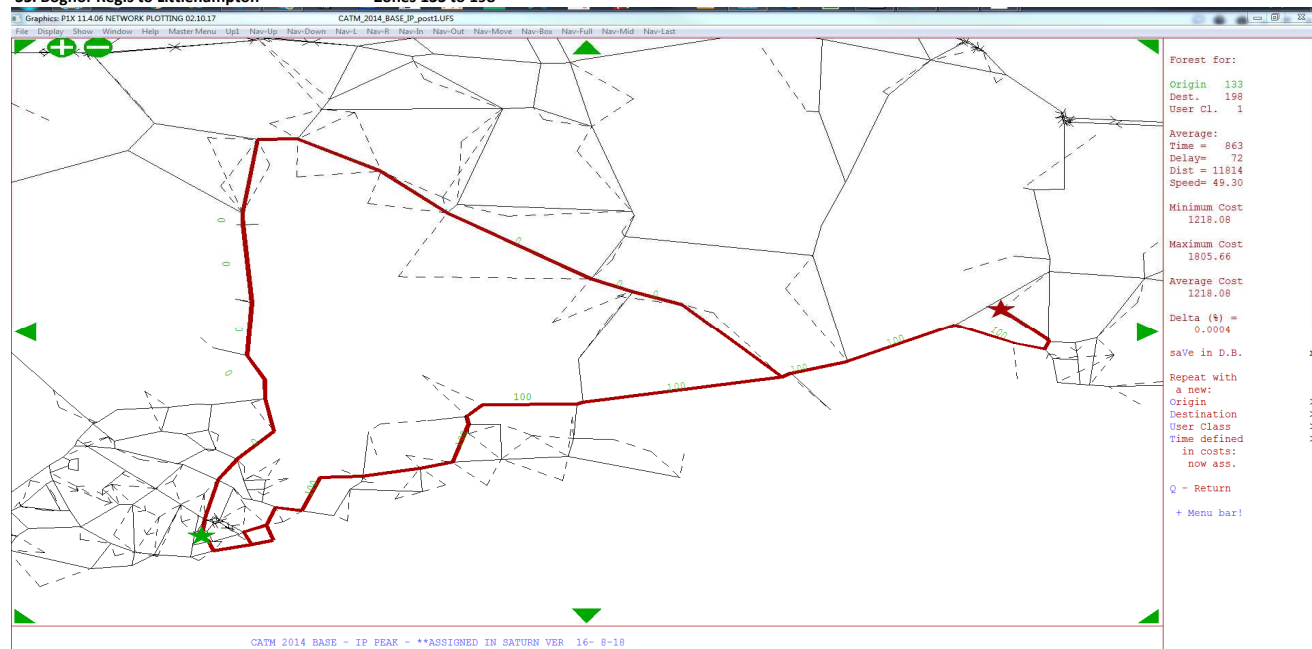
33. Cosham to West Wittering Zones 215 to 66



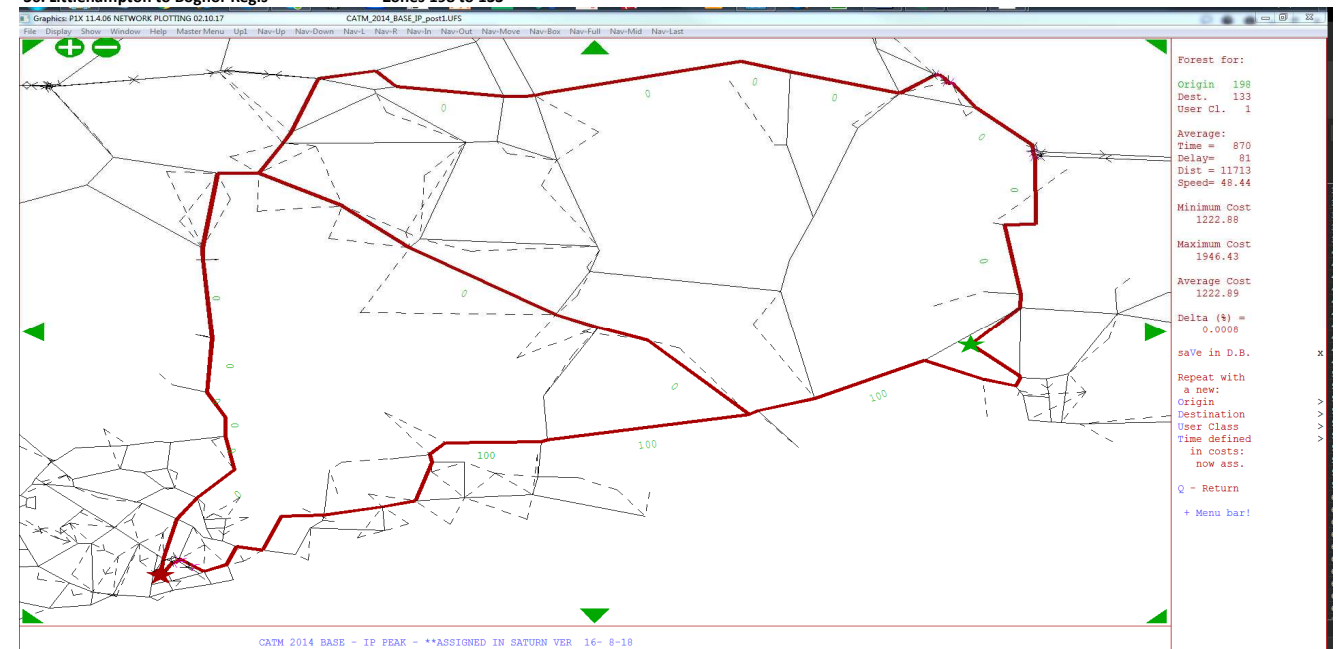
34. West Wittering to Cosham Zones 66 to 215

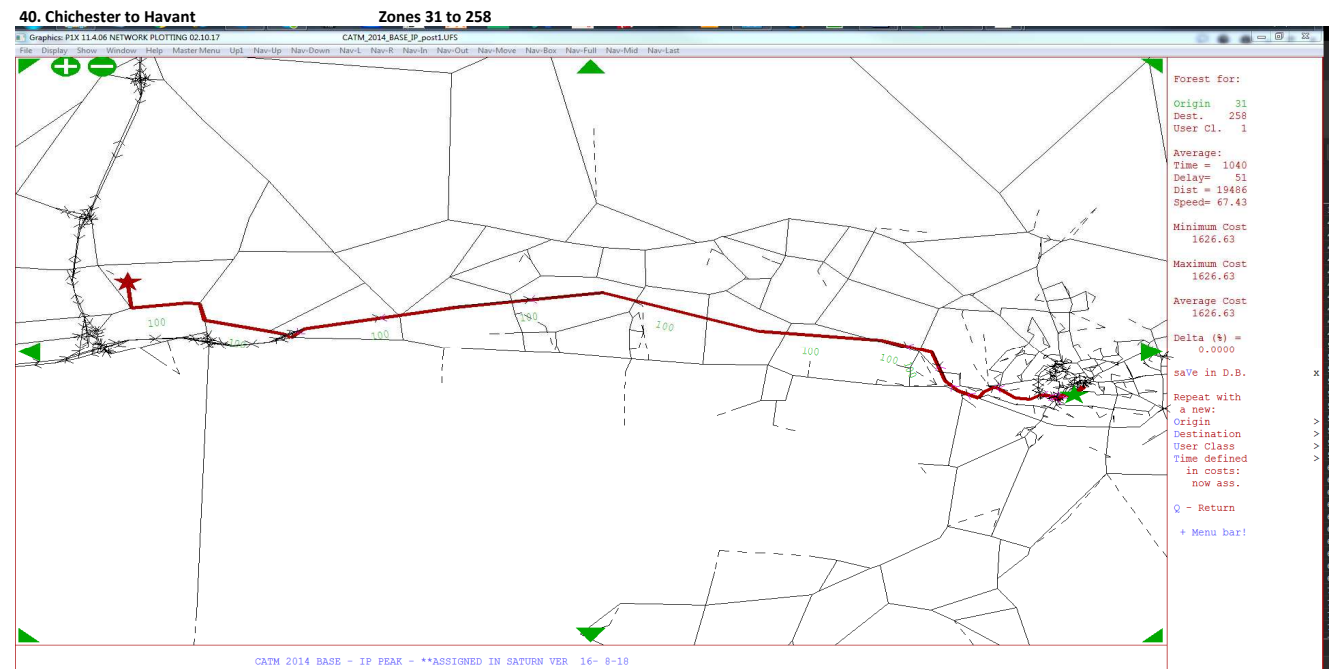
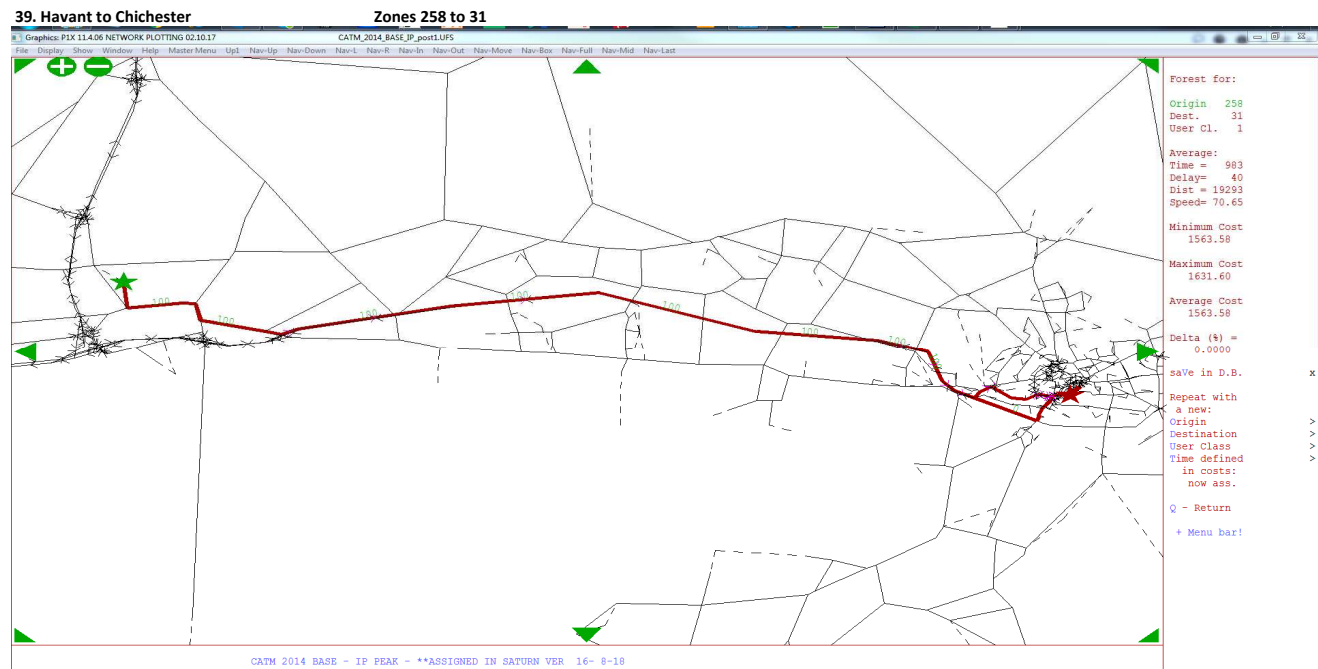
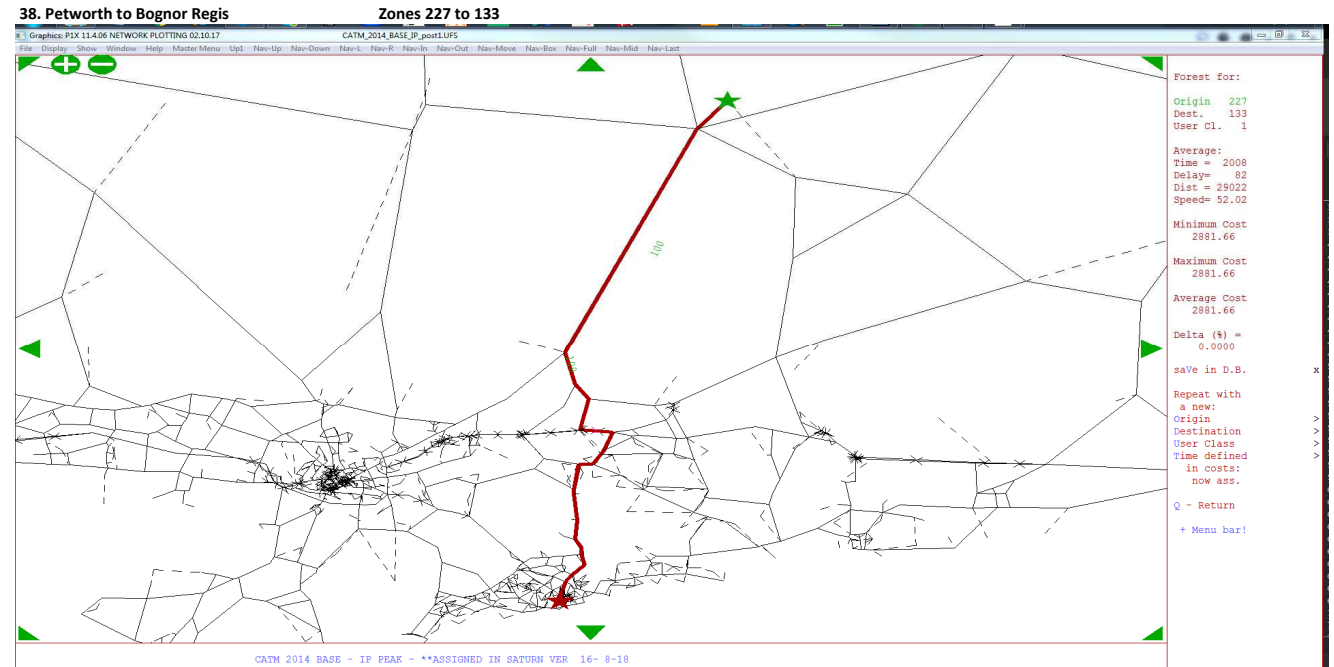
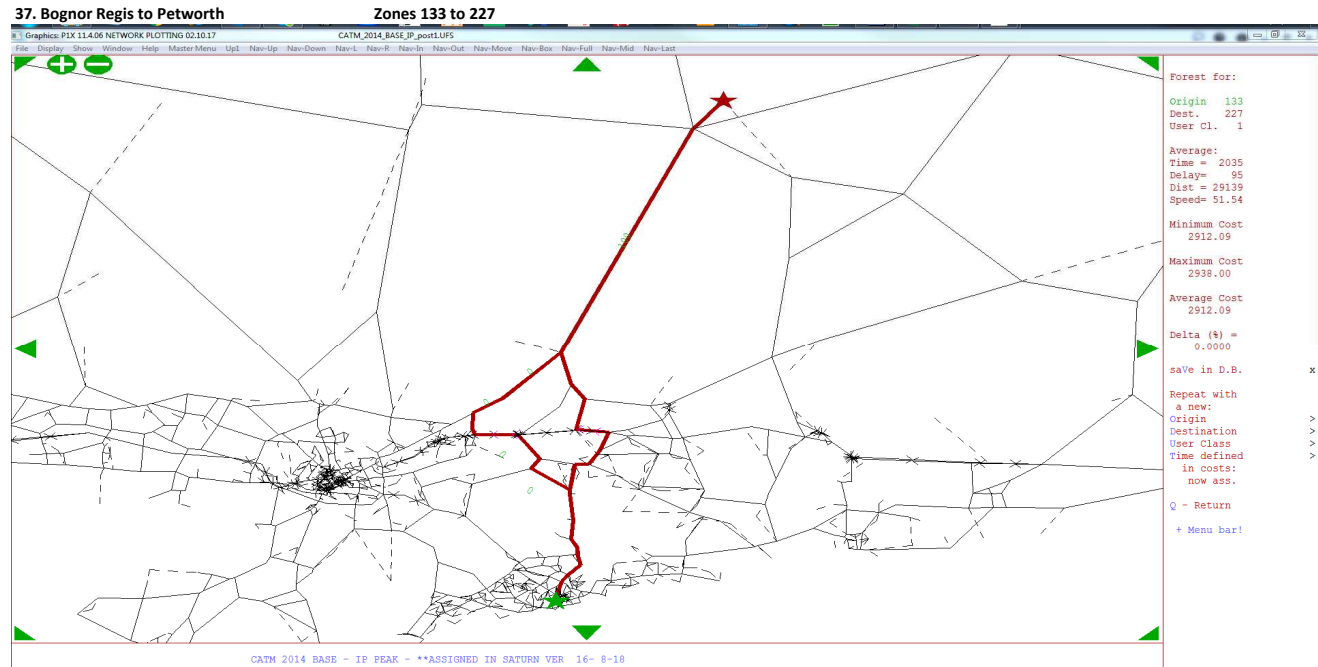


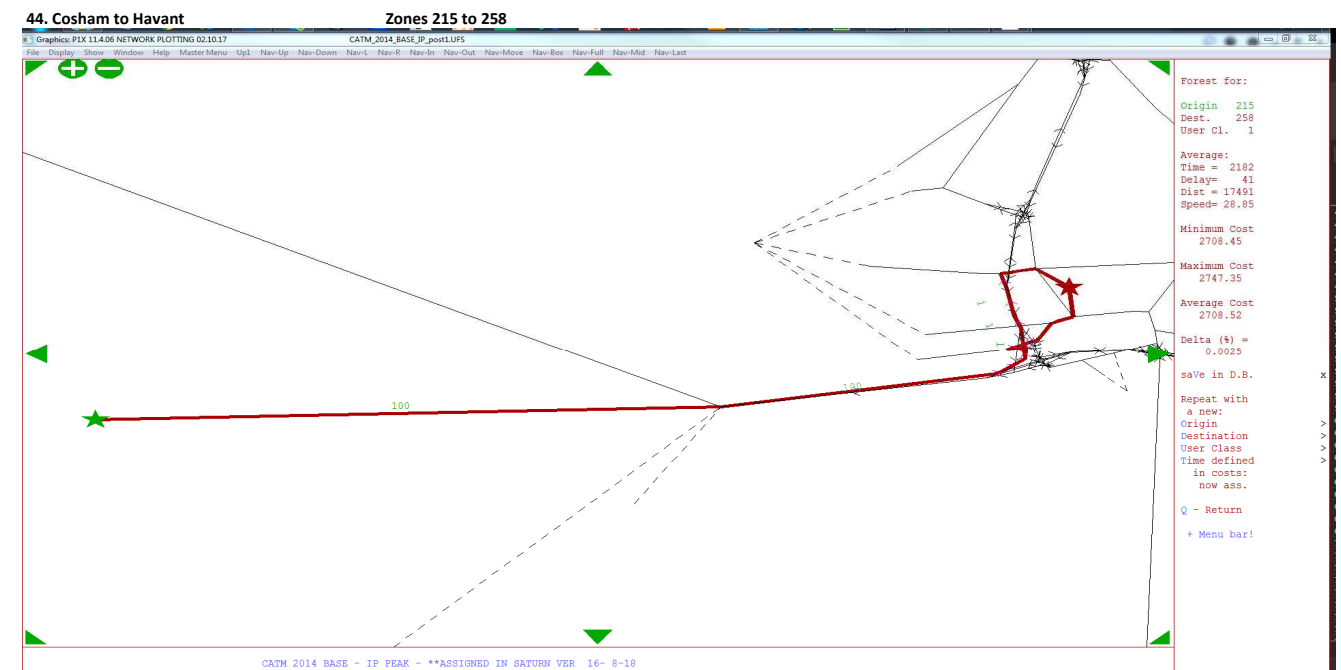
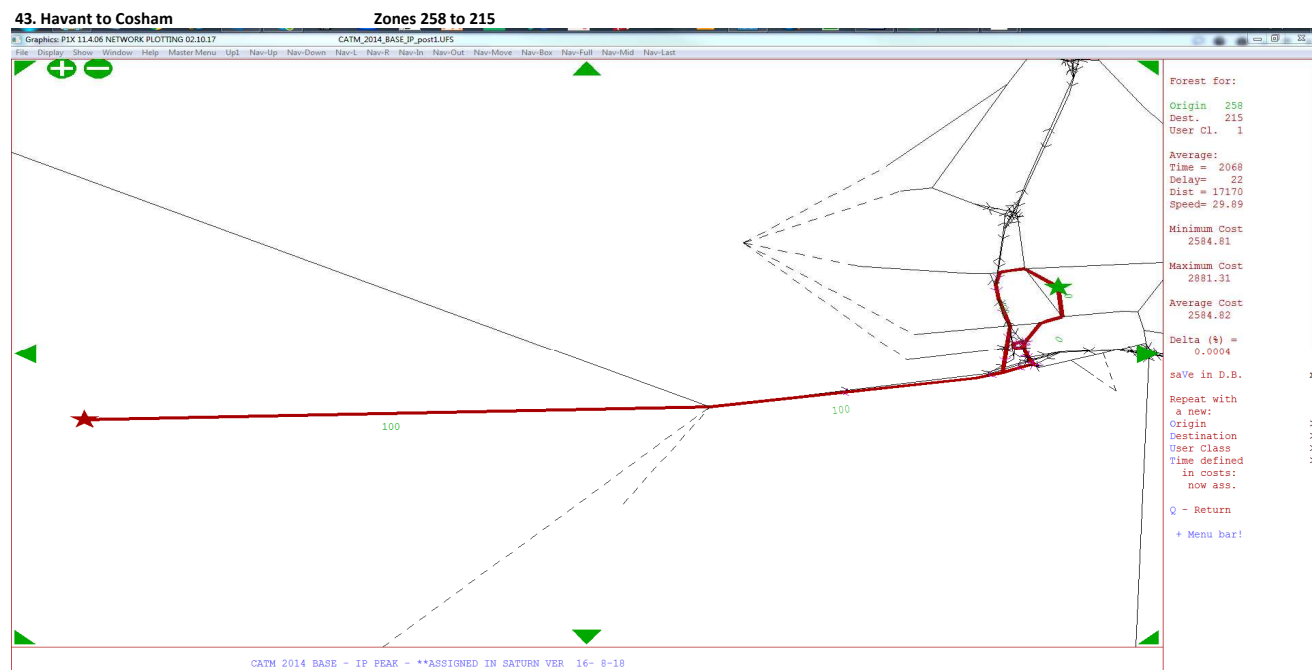
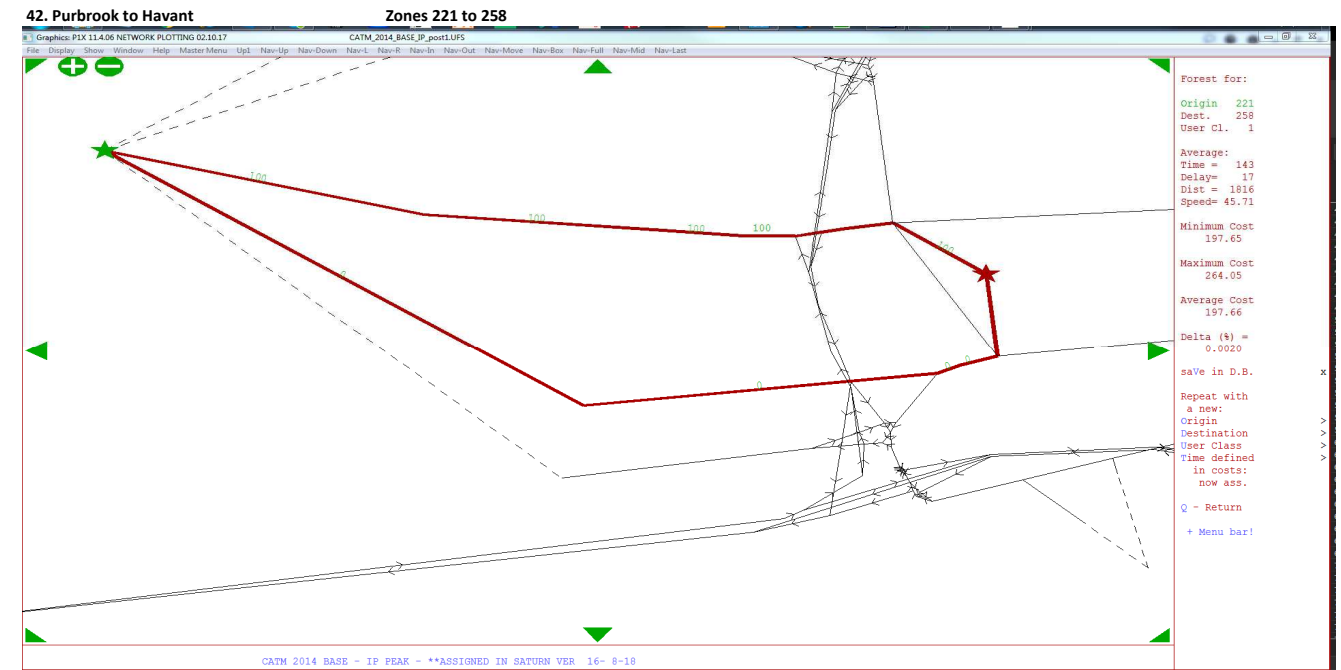
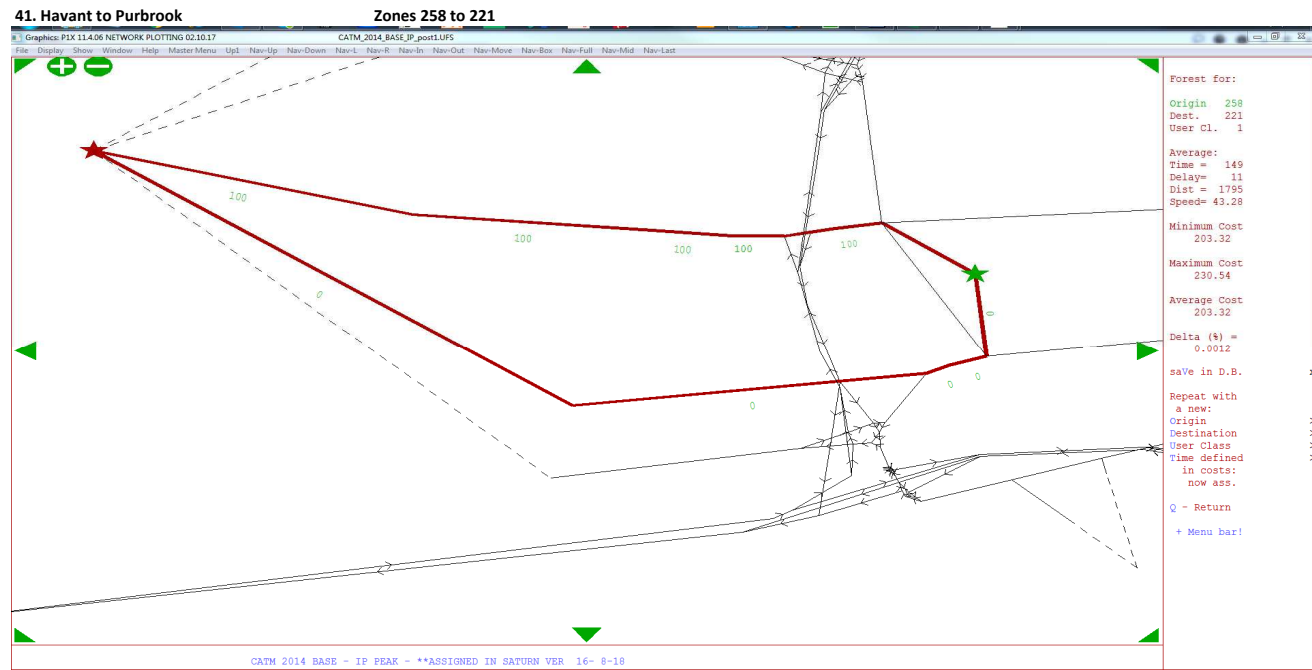
35. Bognor Regis to Littlehampton Zones 133 to 198



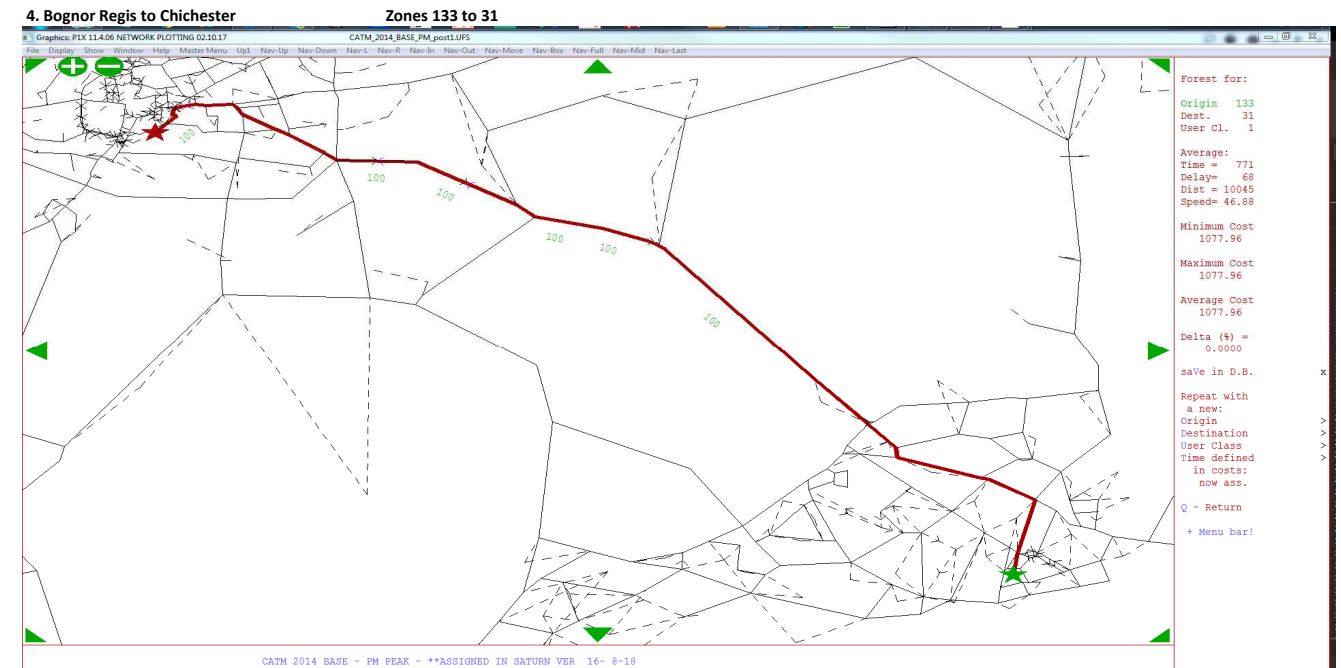
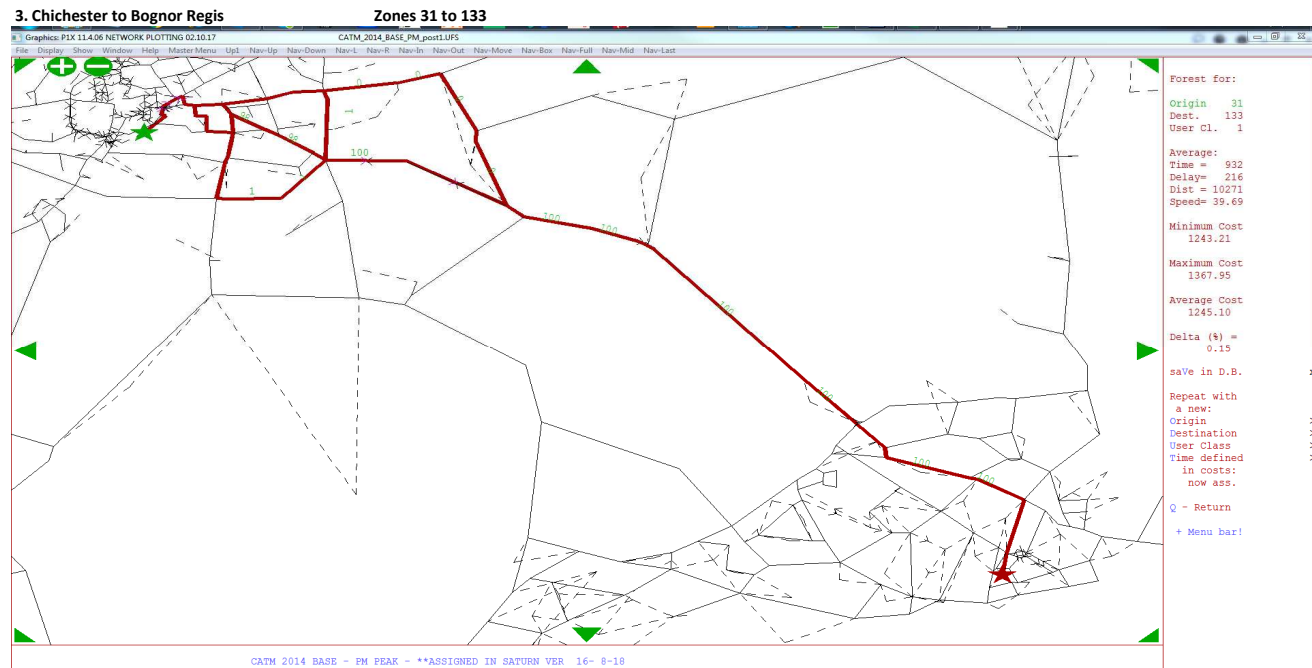
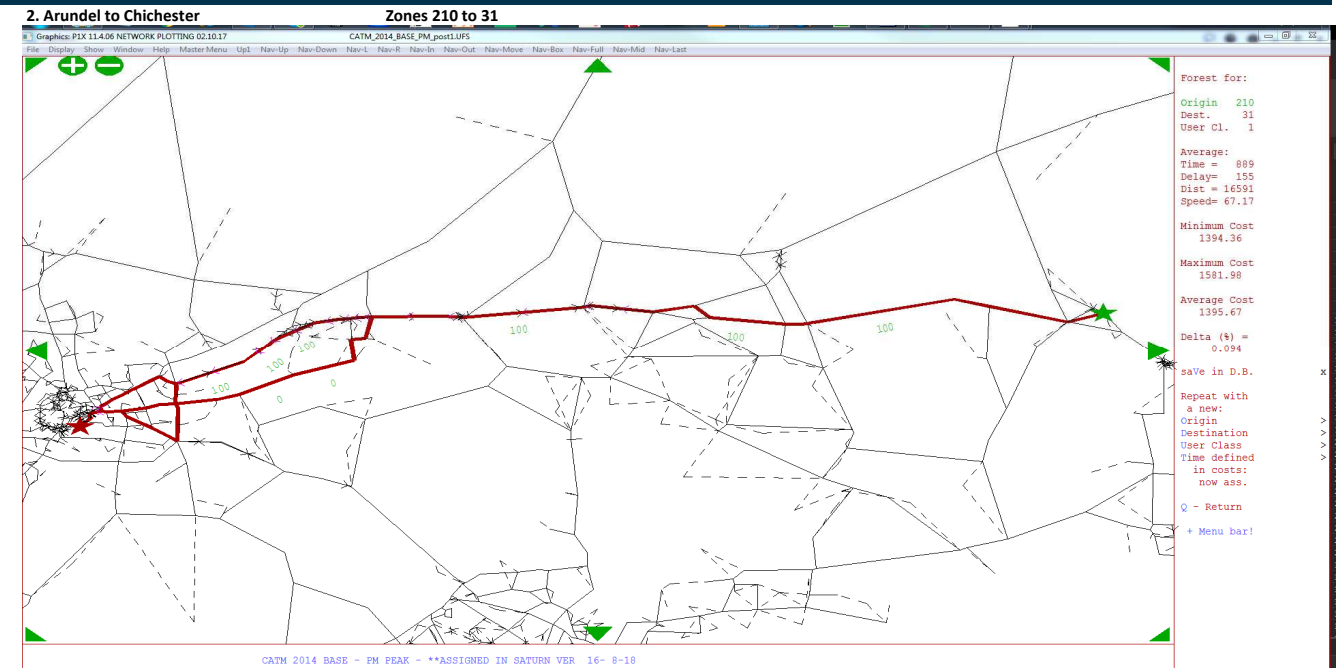
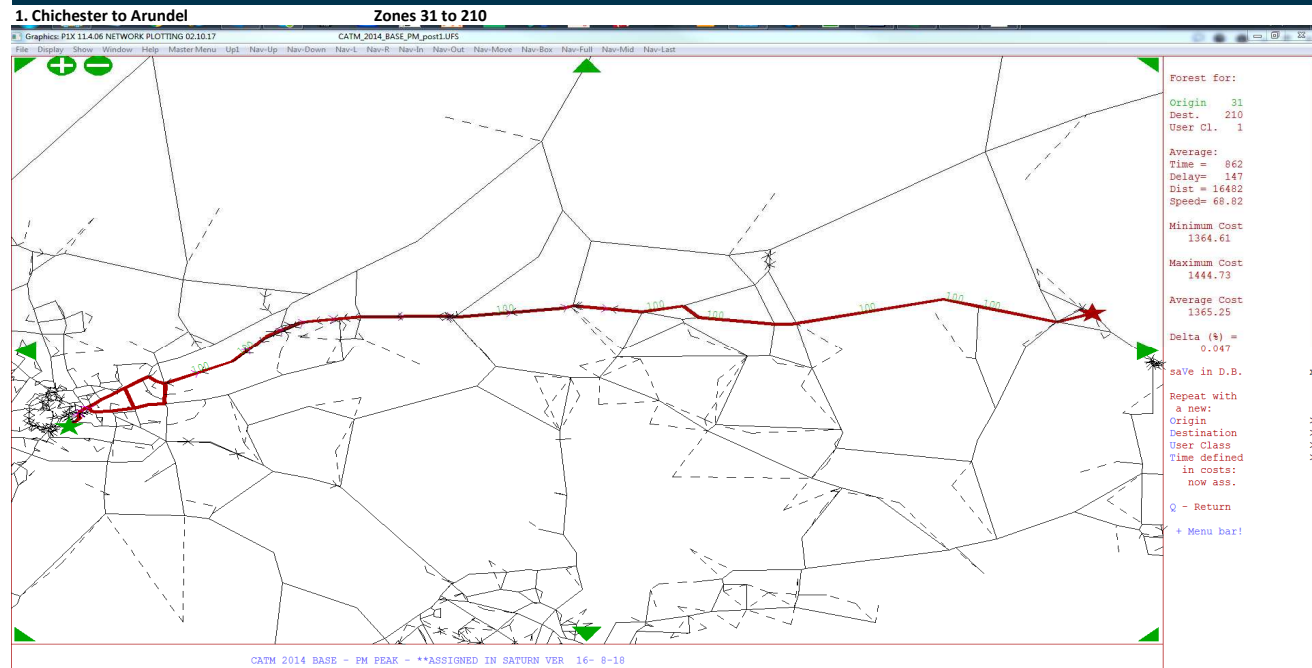
36. Littlehampton to Bognor Regis Zones 198 to 133



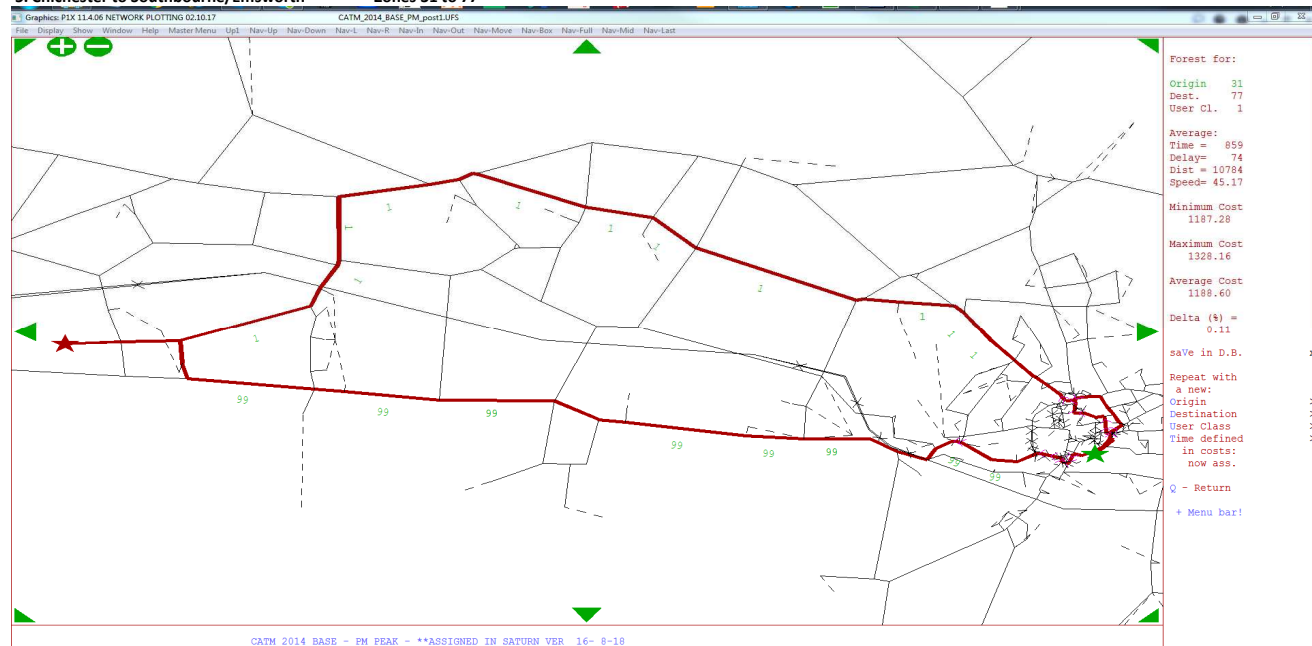




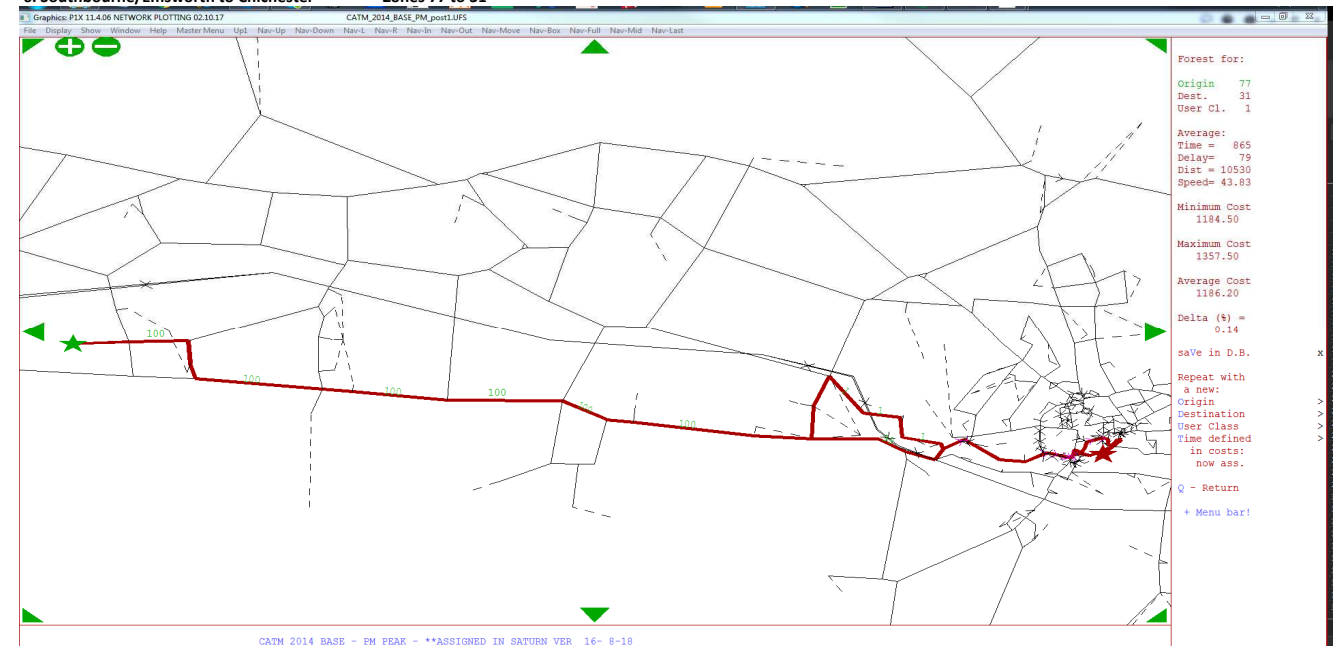
PM Journey Routes Check



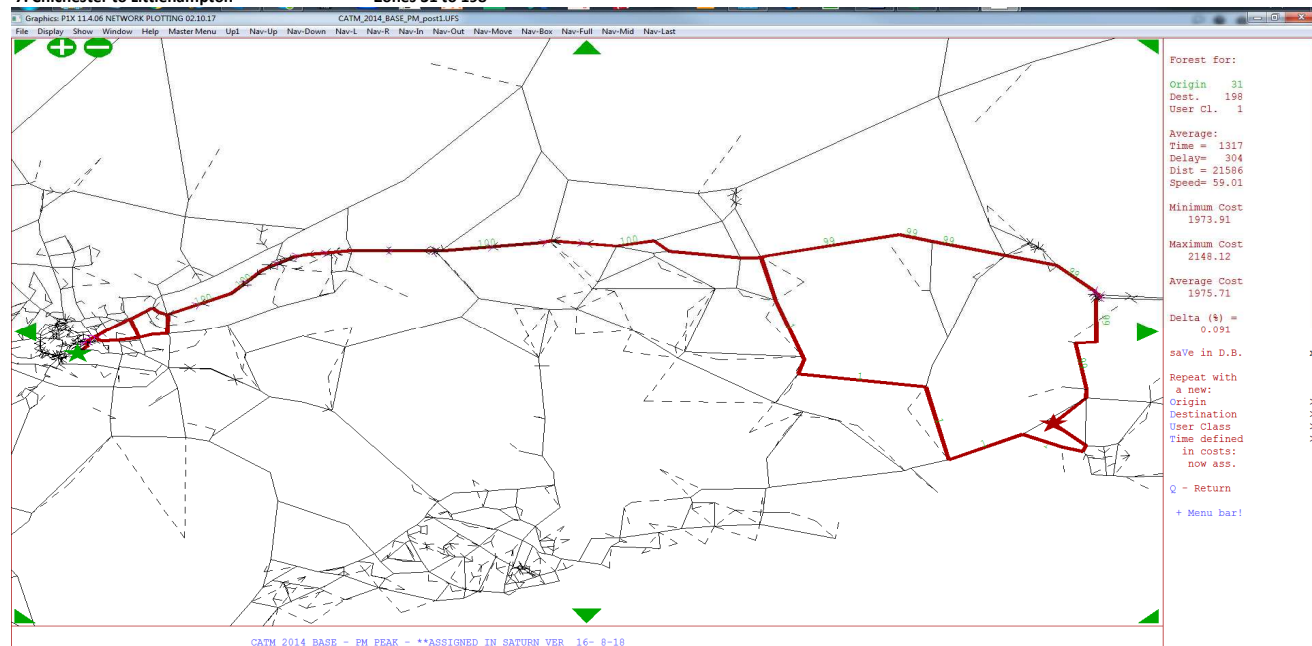
5. Chichester to Southbourne/Emsworth Zones 31 to 77



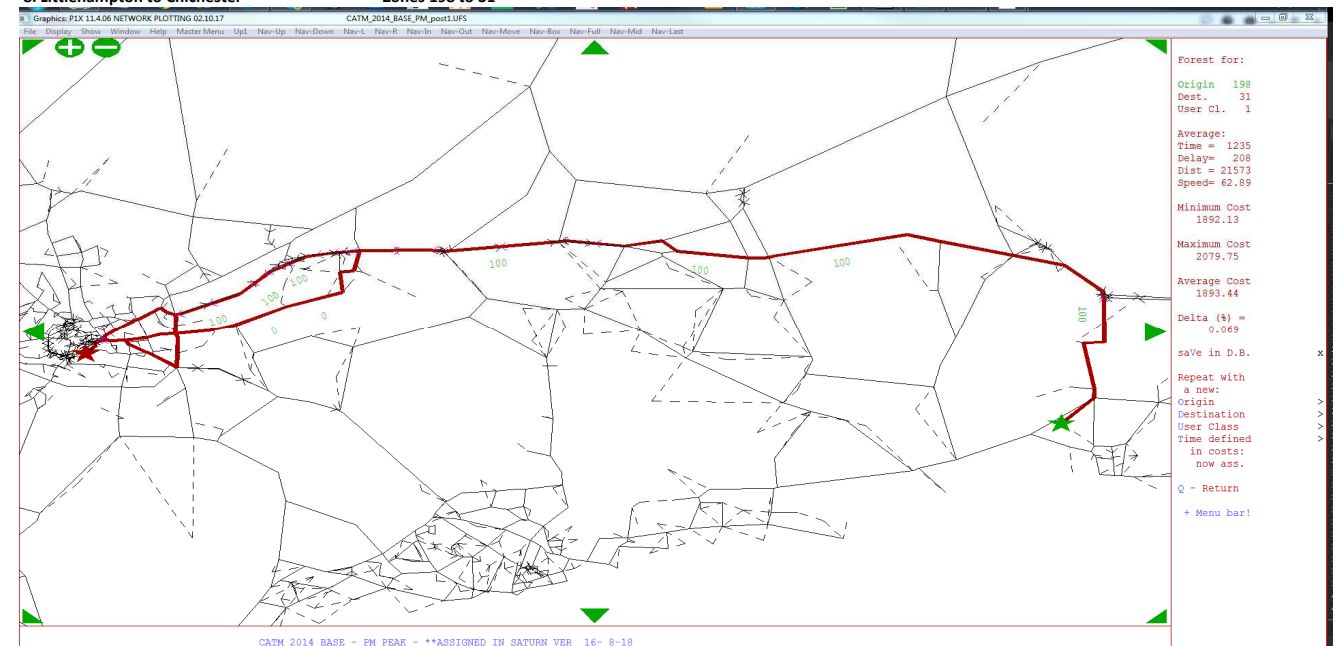
6. Southbourne/Emsworth to Chichester Zones 77 to 31



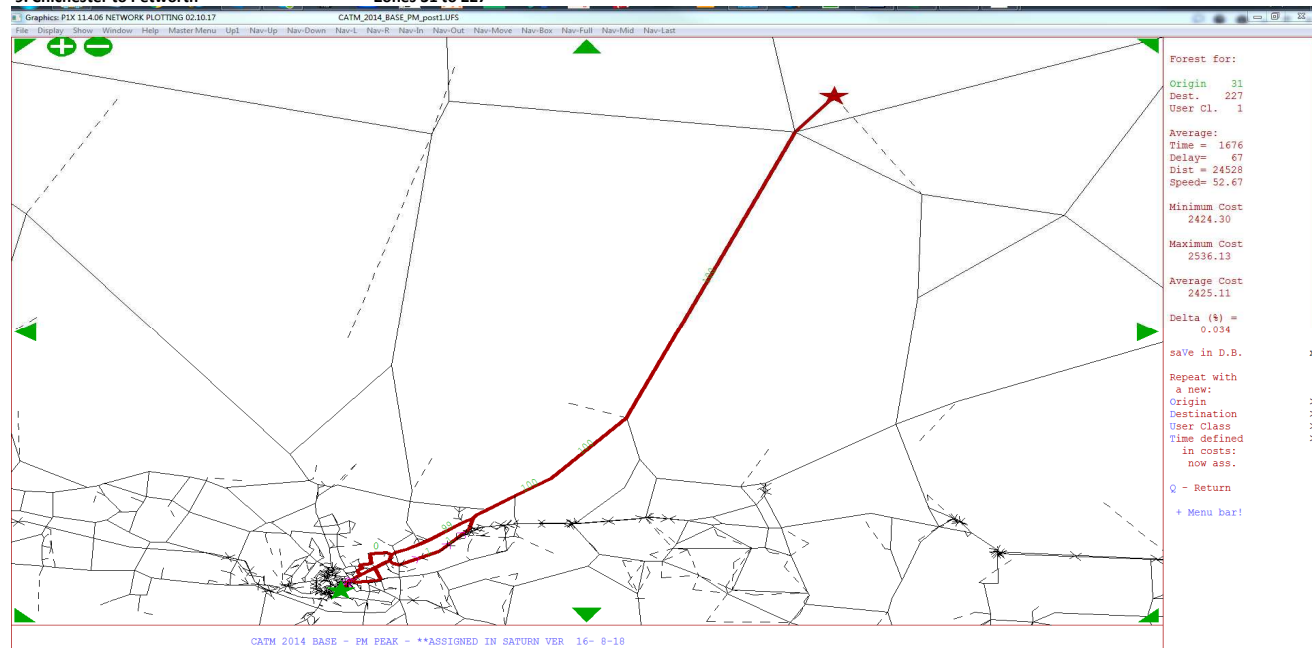
7. Chichester to Littlehampton Zones 31 to 198



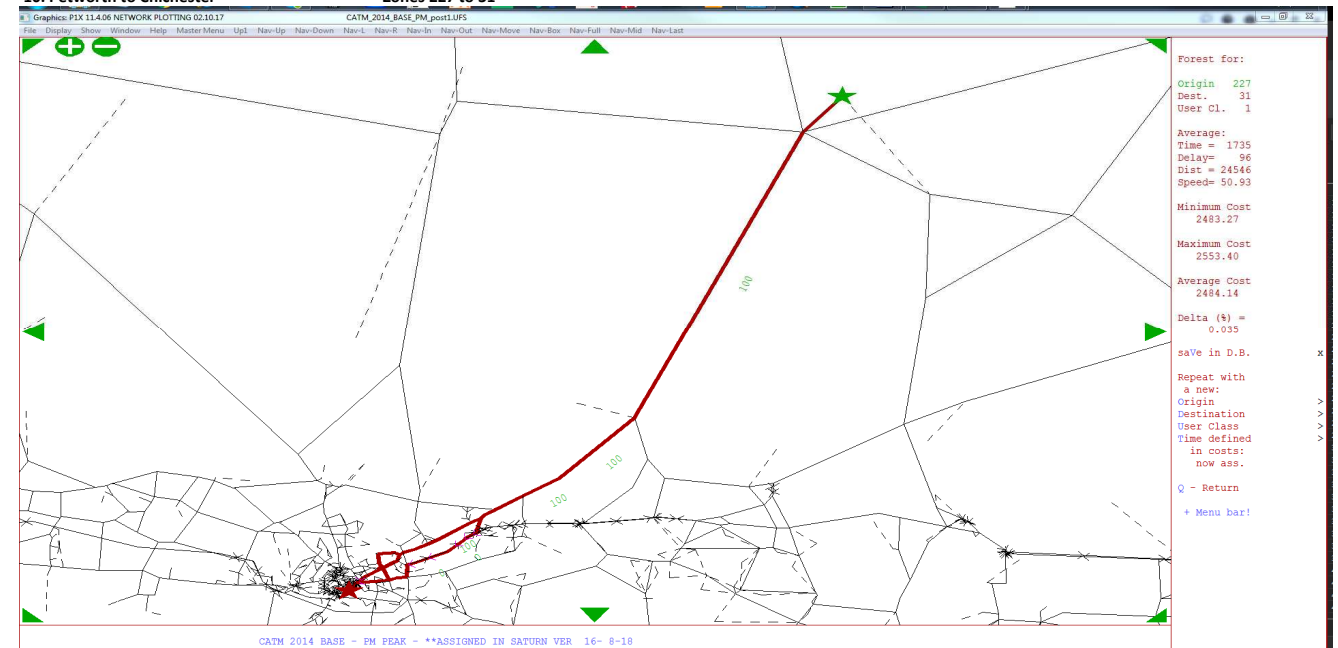
8. Littlehampton to Chichester Zones 198 to 31



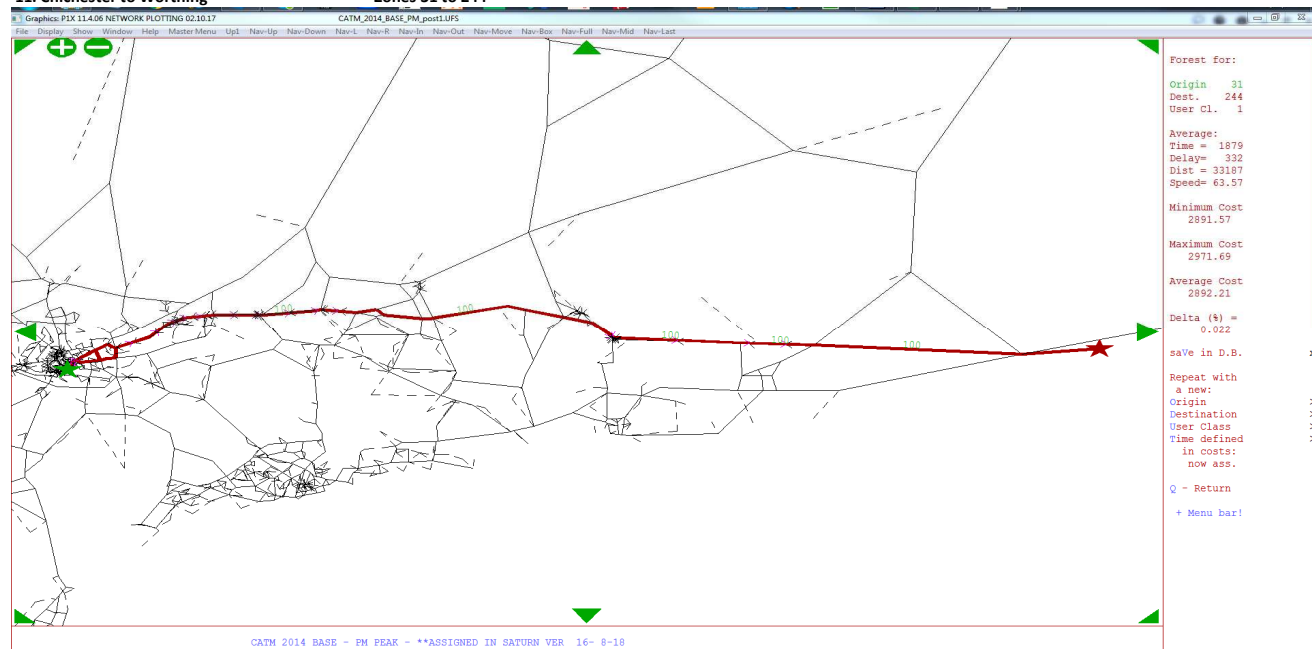
9. Chichester to Petworth Zones 31 to 227



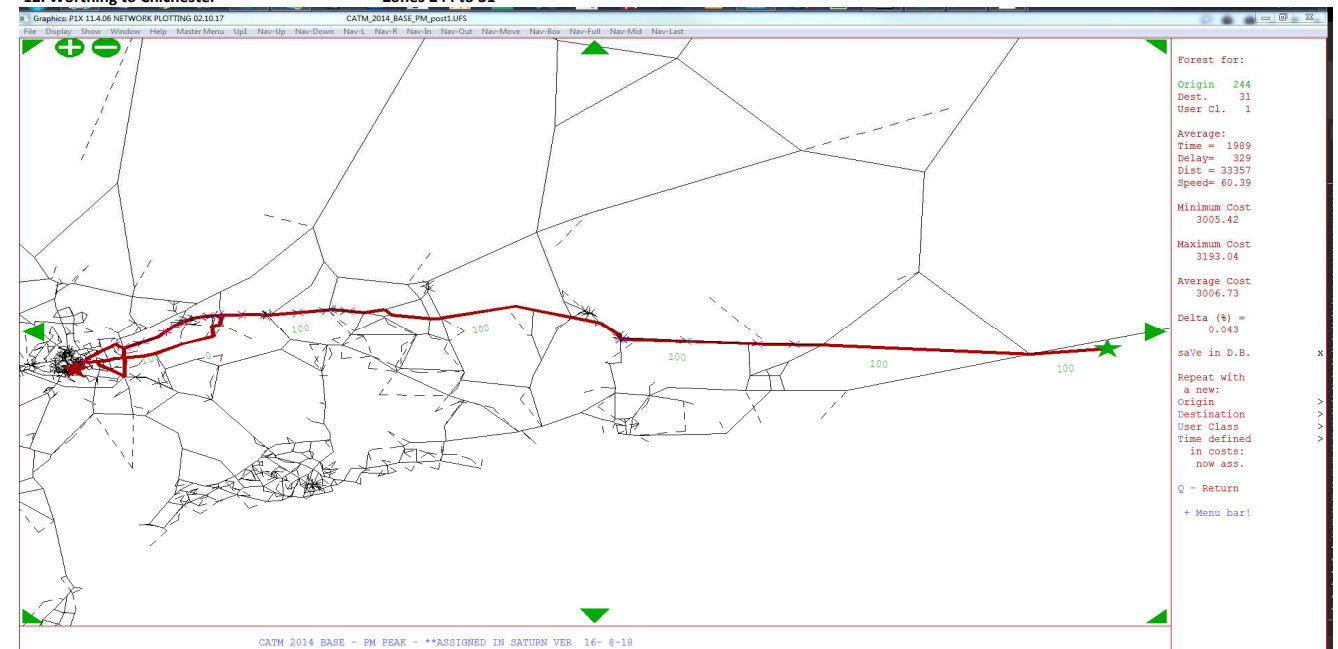
10. Petworth to Chichester Zones 227 to 31



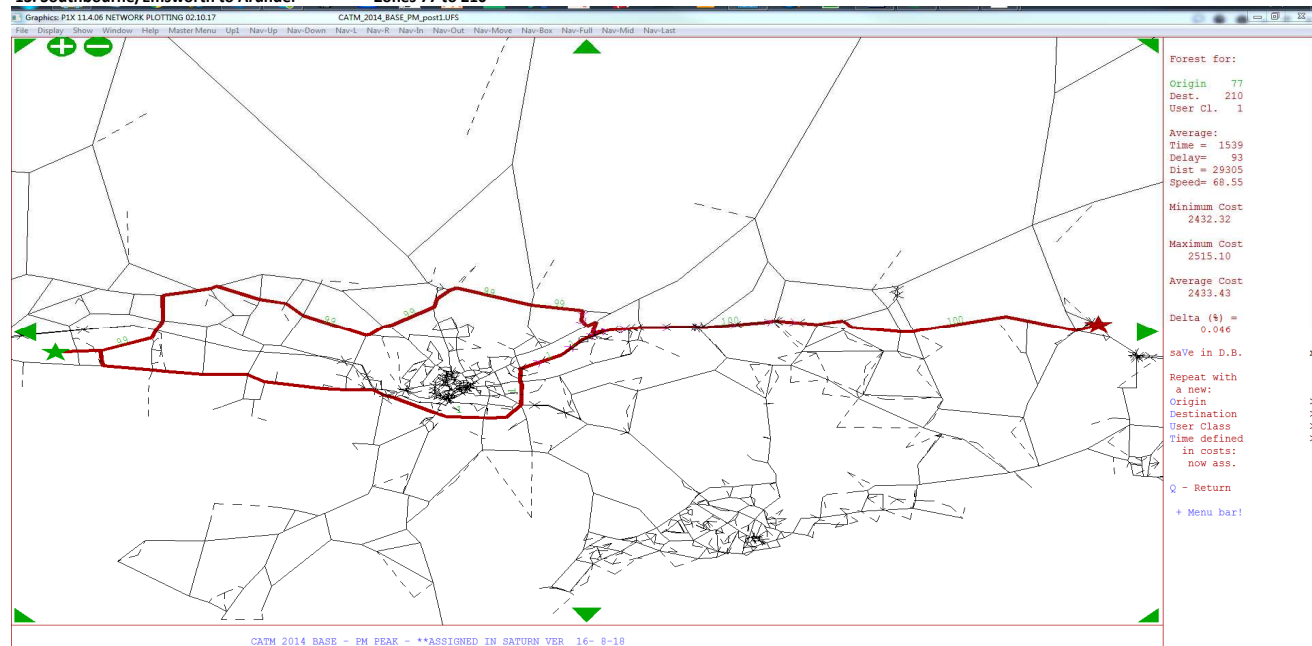
11. Chichester to Worthing Zones 31 to 244



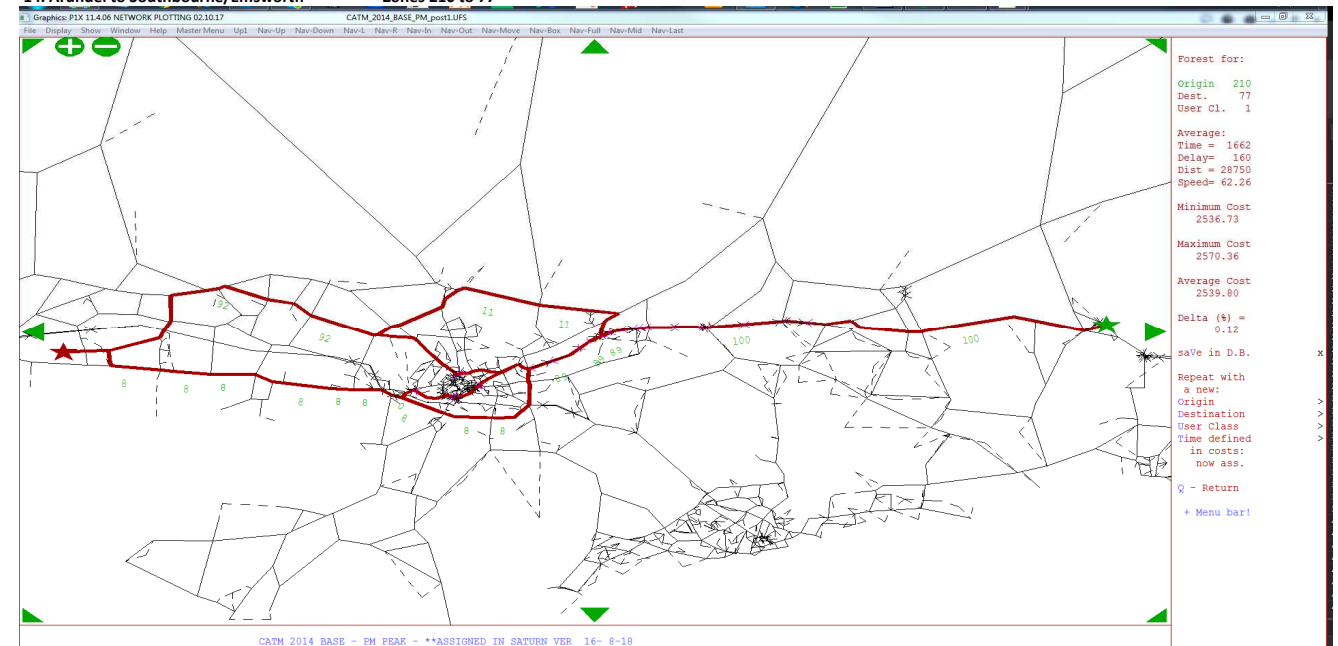
12. Worthing to Chichester Zones 244 to 31



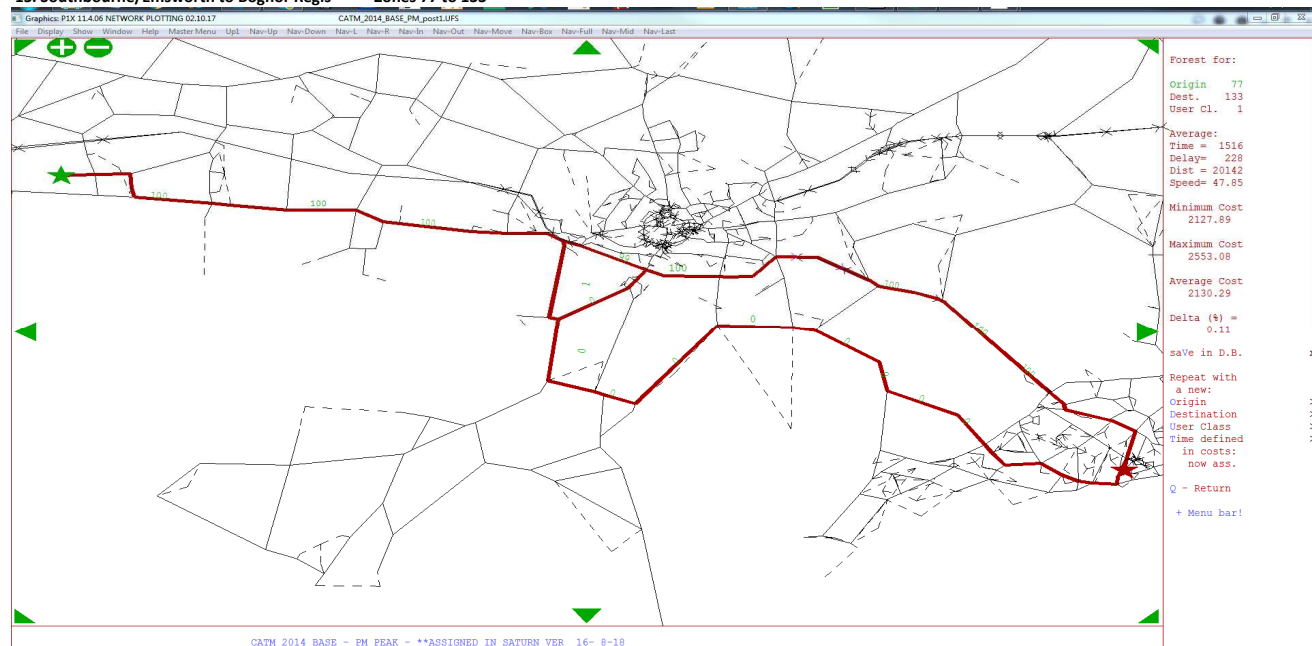
13. Southbourne/Emsworth to Arundel Zones 77 to 210



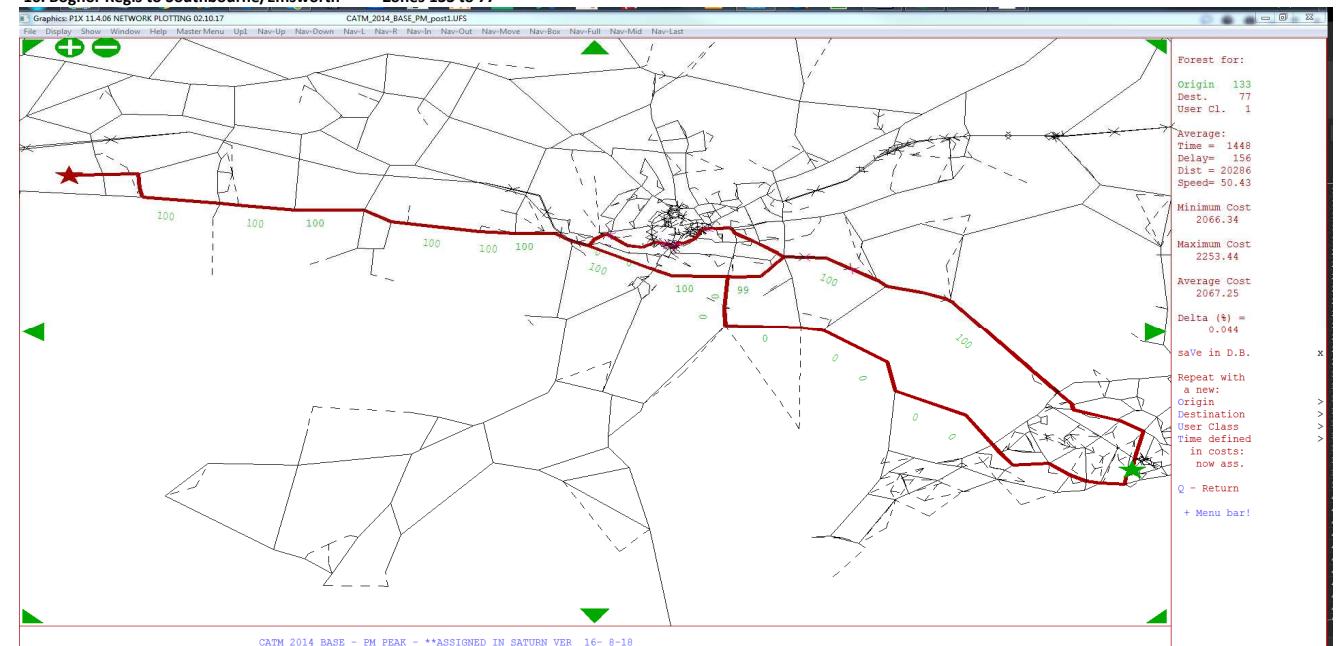
14. Arundel to Southbourne/Emsworth Zones 210 to 77



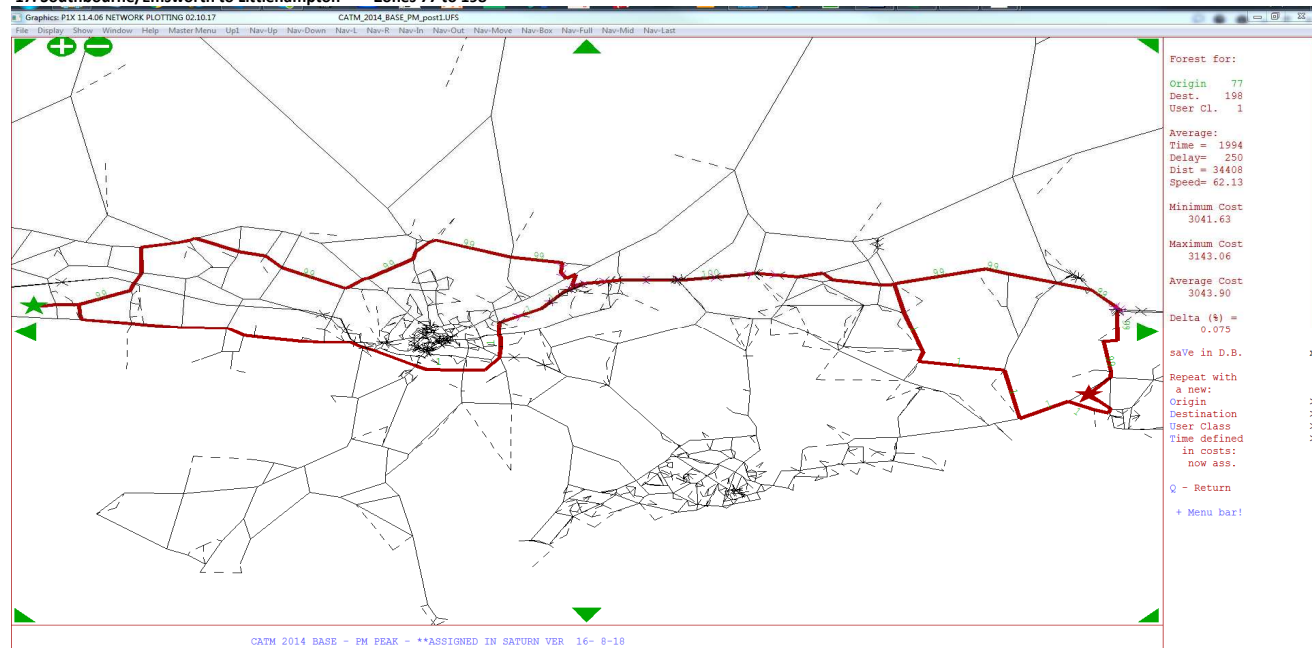
15. Southbourne/Emsworth to Bognor Regis Zones 77 to 133



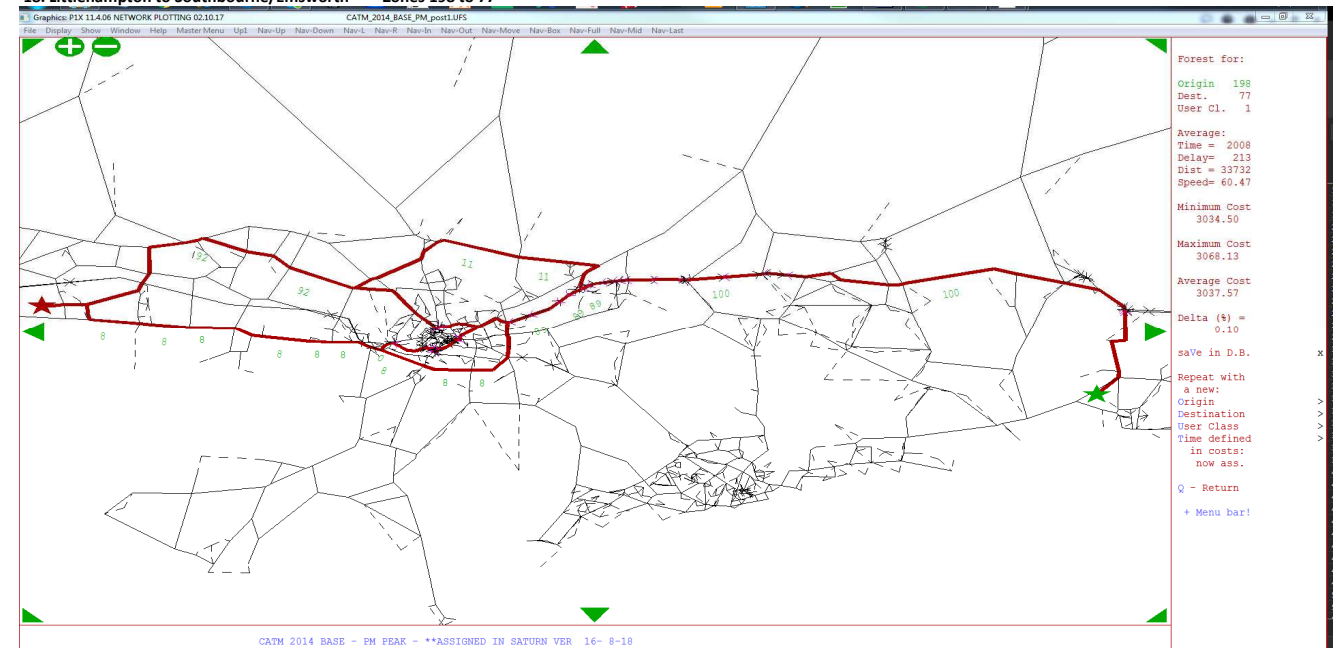
16. Bognor Regis to Southbourne/Emsworth Zones 133 to 77



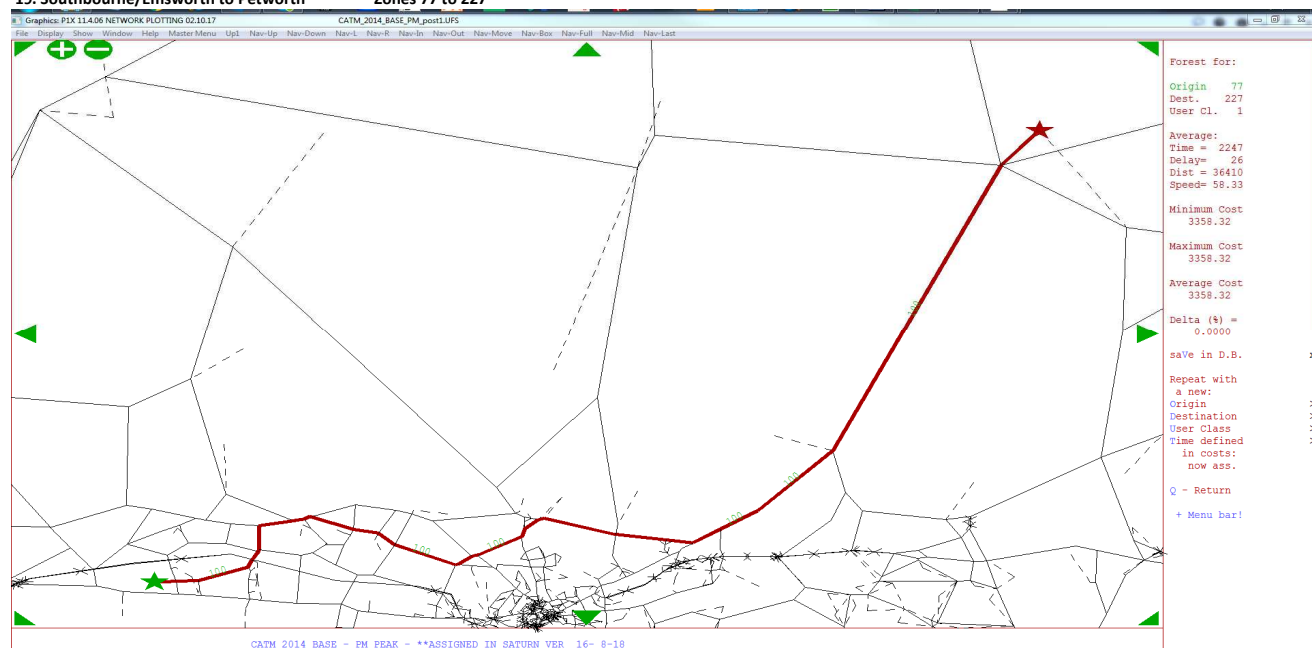
17. Southbourne/Emsworth to Littlehampton Zones 77 to 198



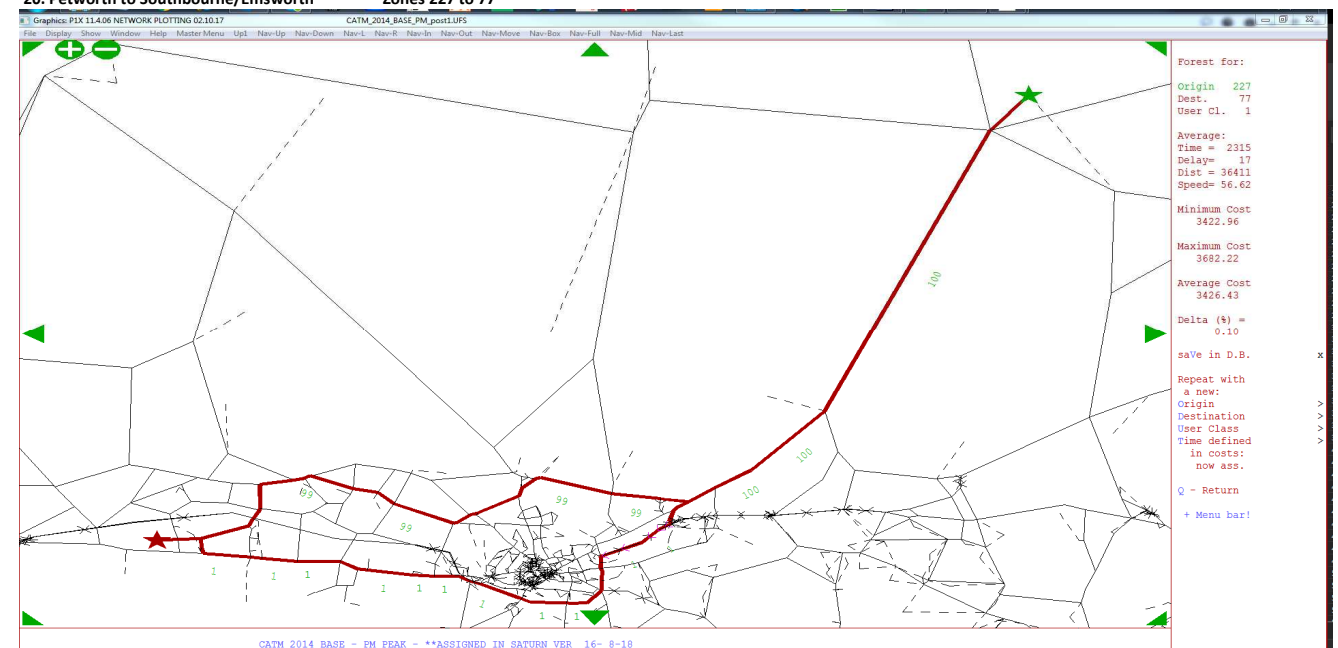
18. Littlehampton to Southbourne/Emsworth Zones 198 to 77



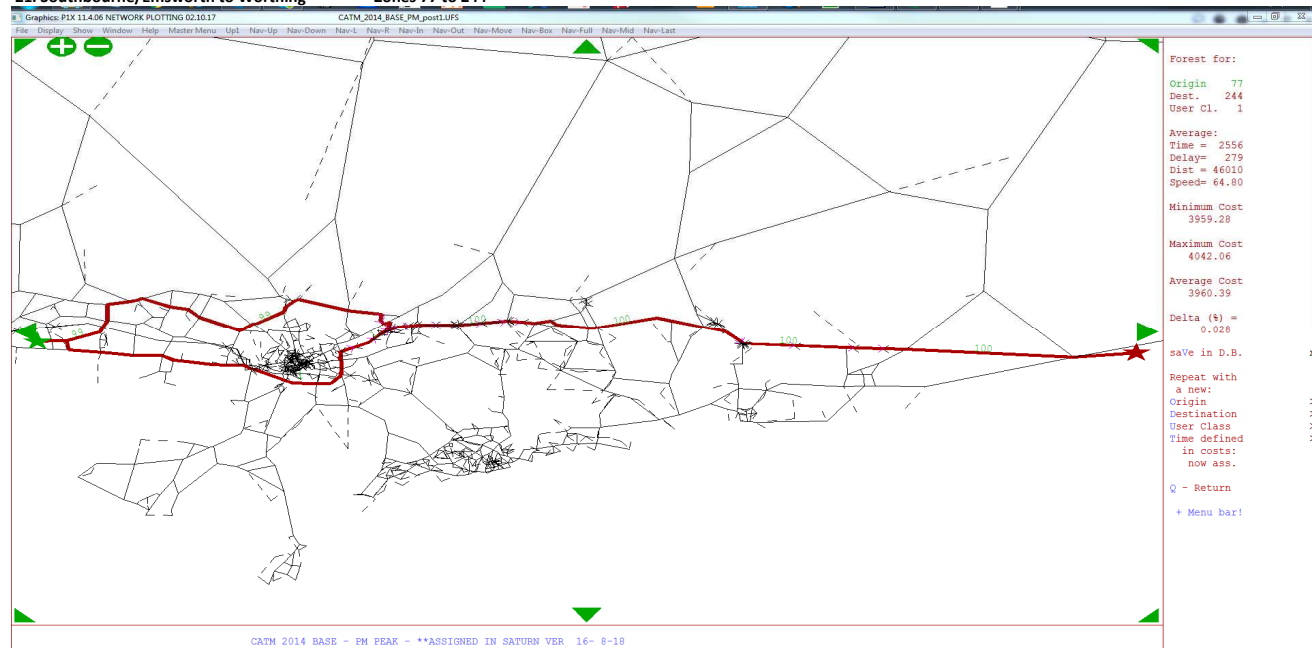
19. Southbourne/Emsworth to Petworth Zones 77 to 227



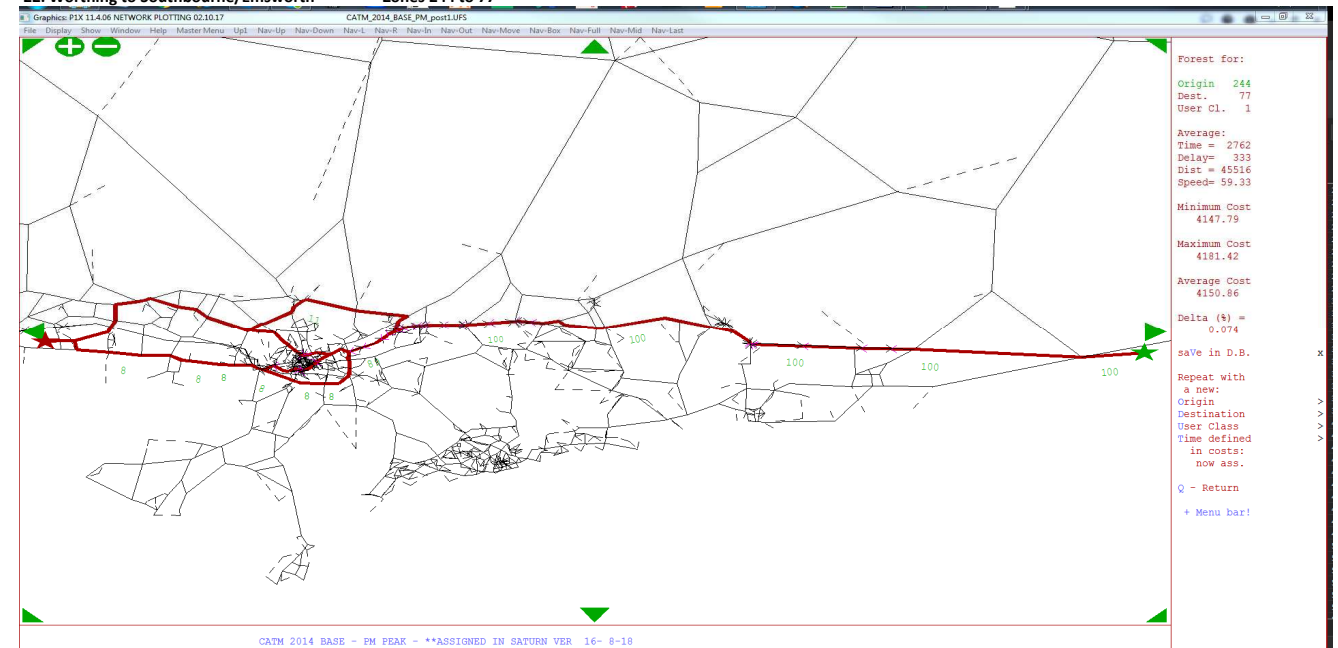
20. Petworth to Southbourne/Emsworth Zones 227 to 77



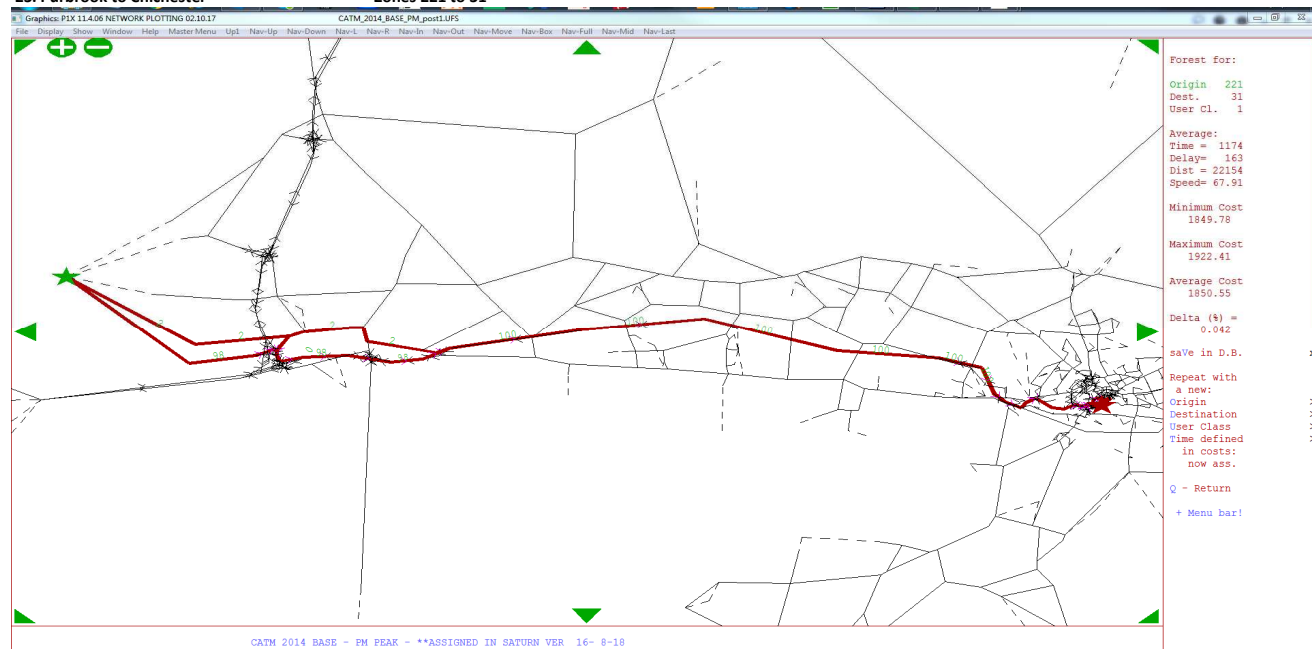
21. Southbourne/Emsworth to Worthing Zones 77 to 244



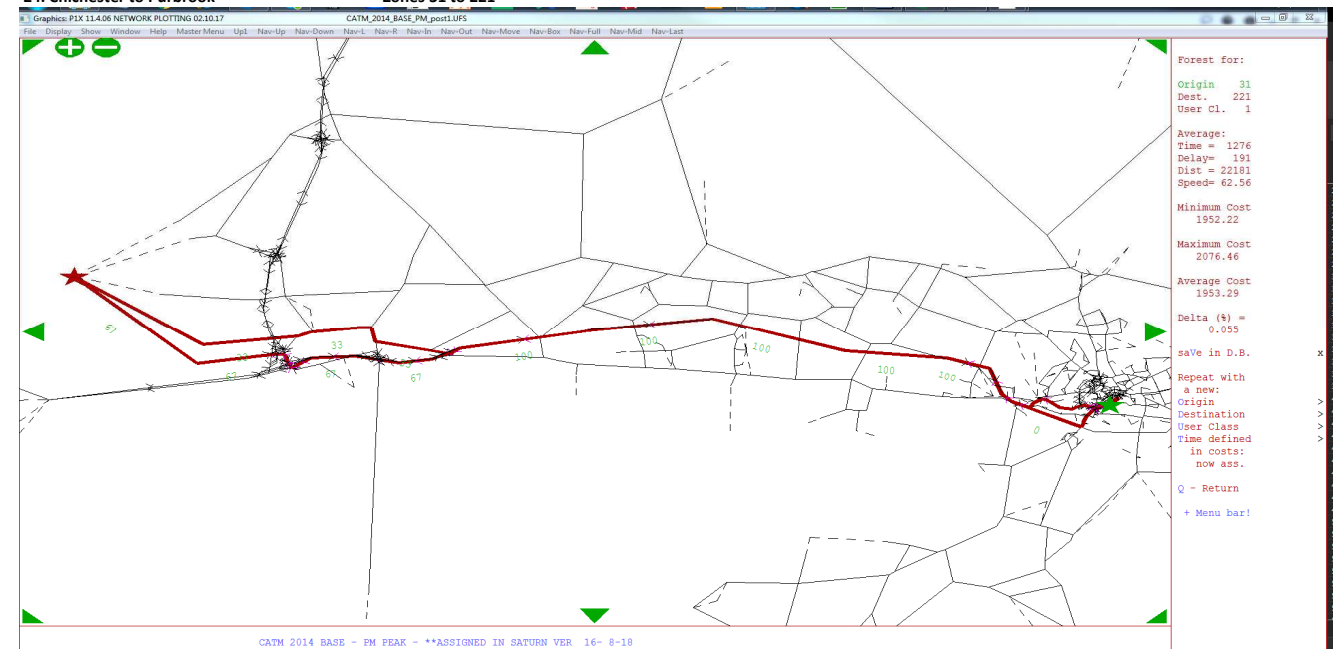
22. Worthing to Southbourne/Emsworth Zones 244 to 77



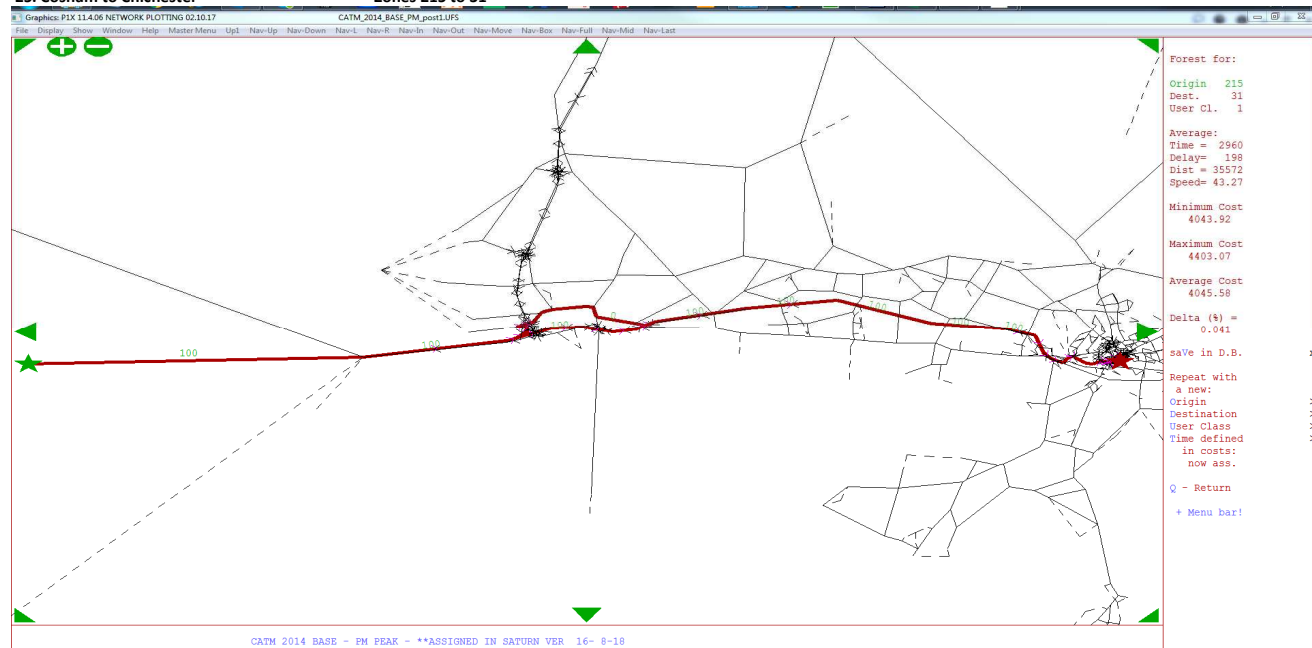
23. Purbrook to Chichester Zones 221 to 31



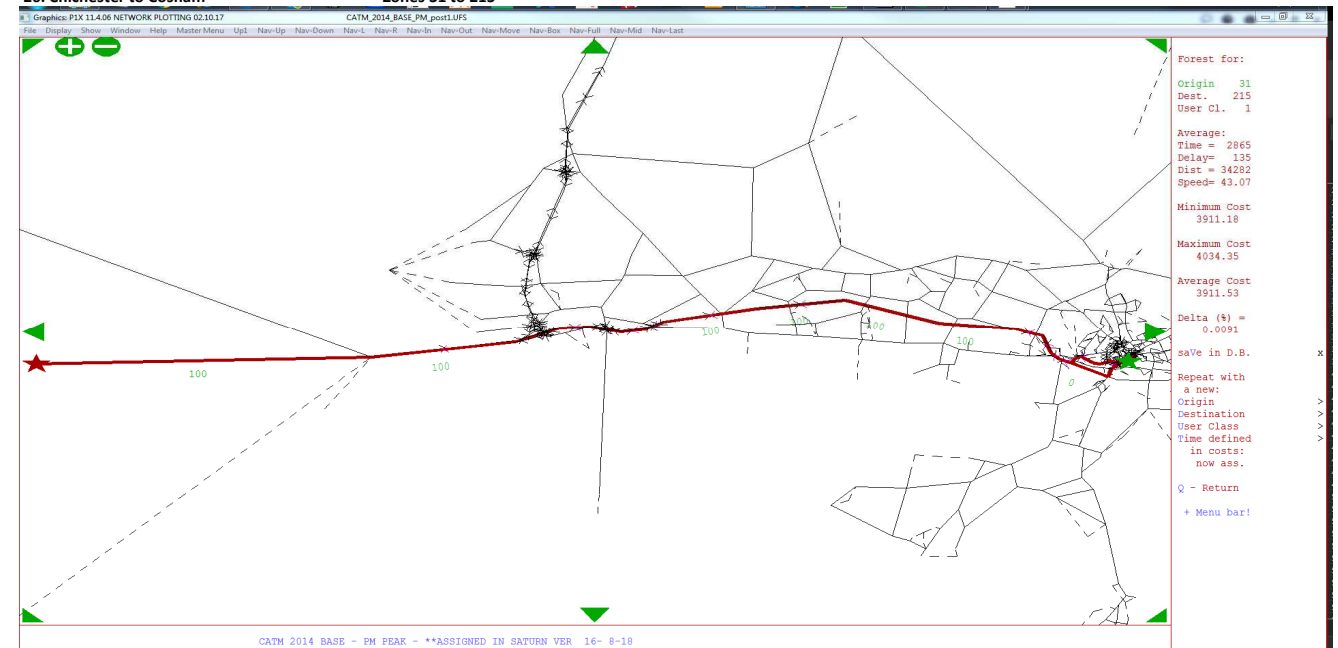
24. Chichester to Purbrook Zones 31 to 221



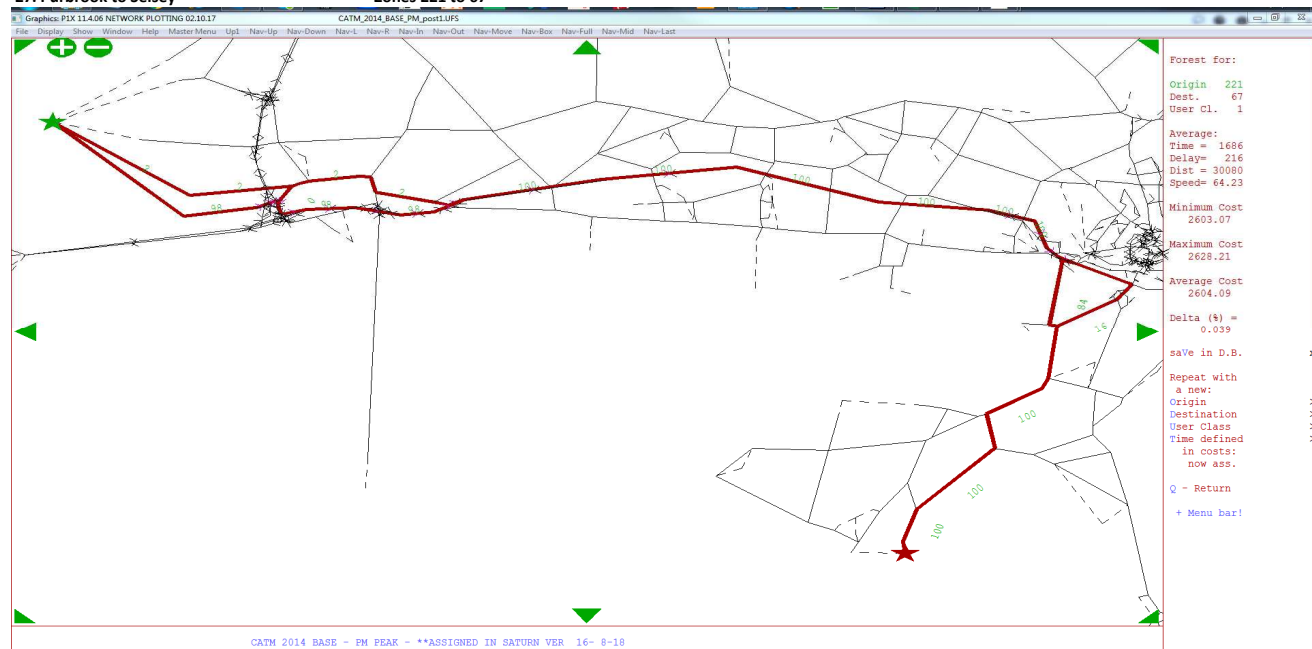
25. Cosham to Chichester Zones 215 to 31



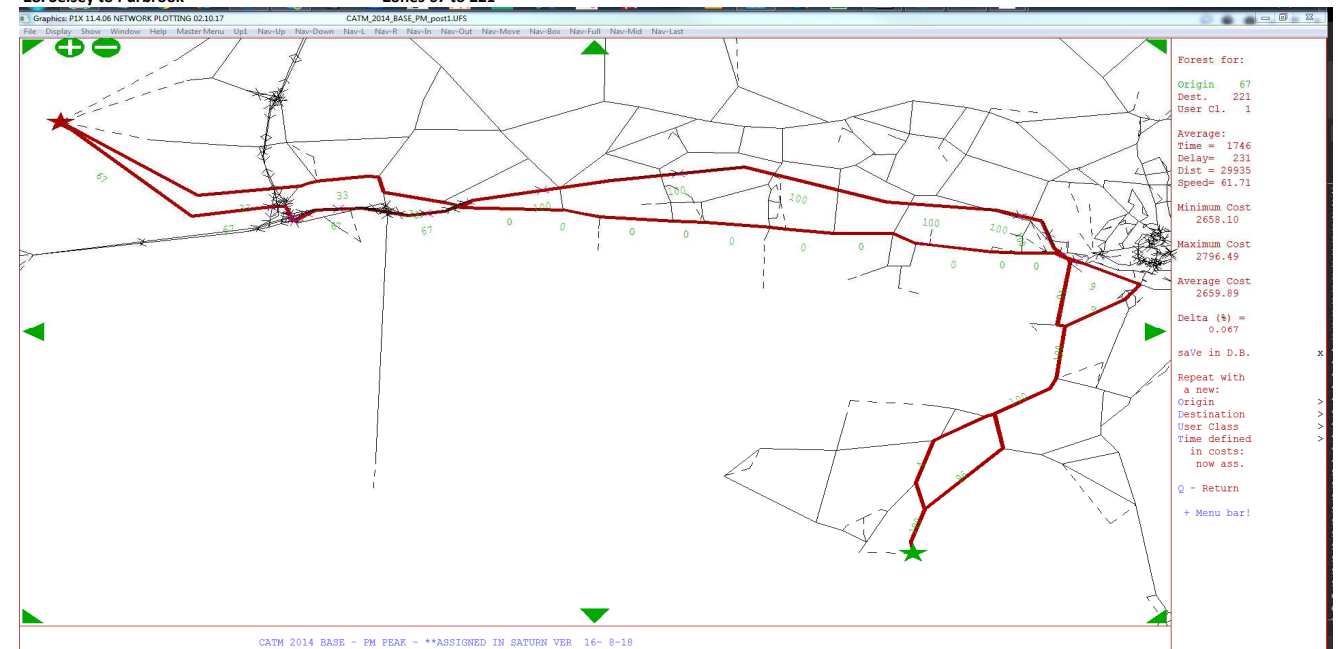
26. Chichester to Cosham Zones 31 to 215



27. Purbrook to Selsey Zones 221 to 67

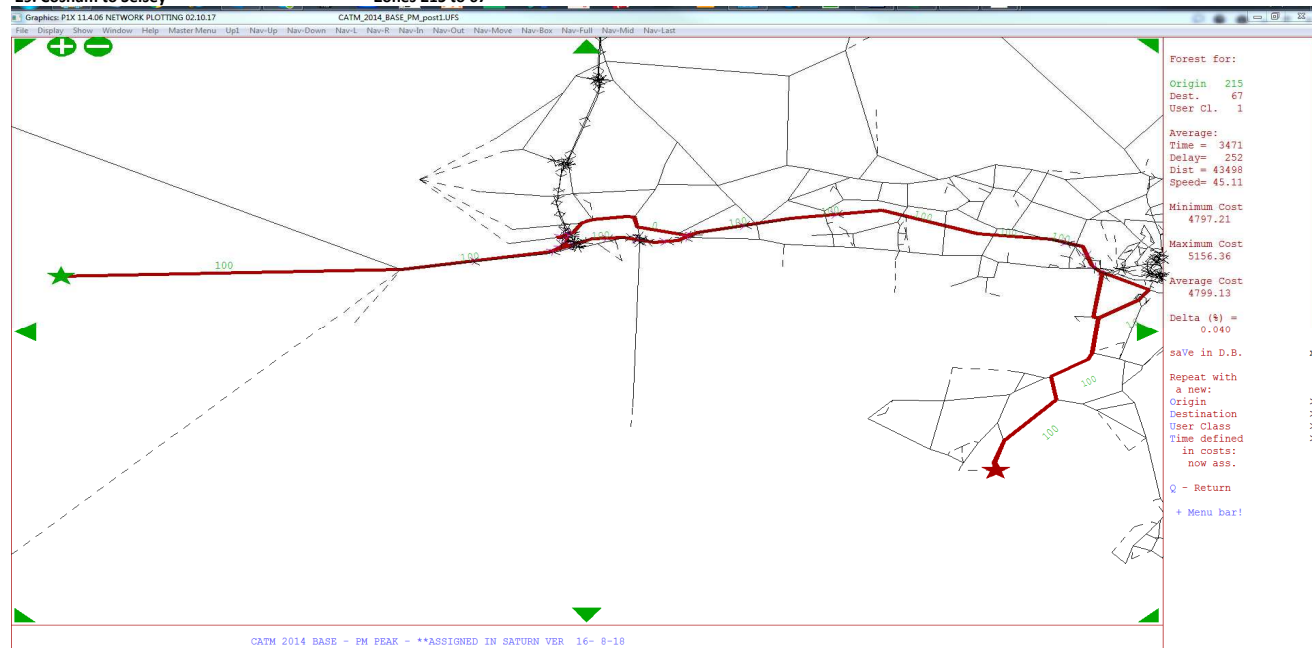


28. Selsey to Purbrook Zones 67 to 221



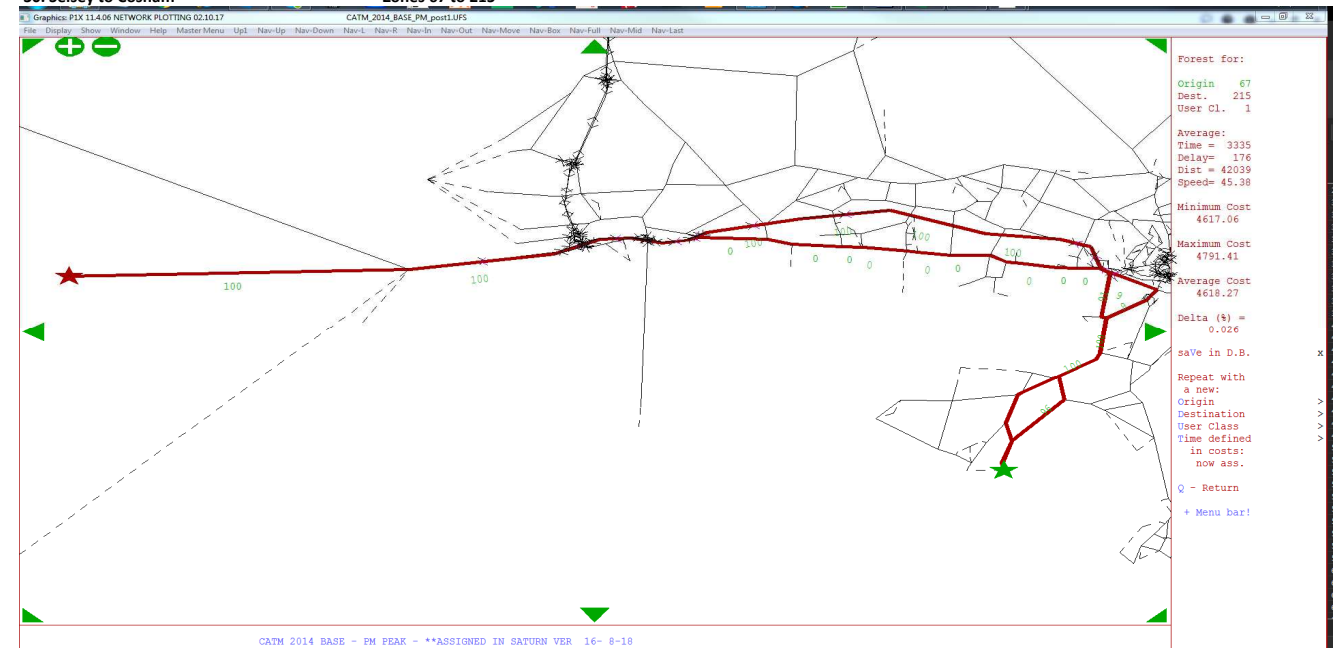
29. Cosham to Selsey

Zones 215 to 67



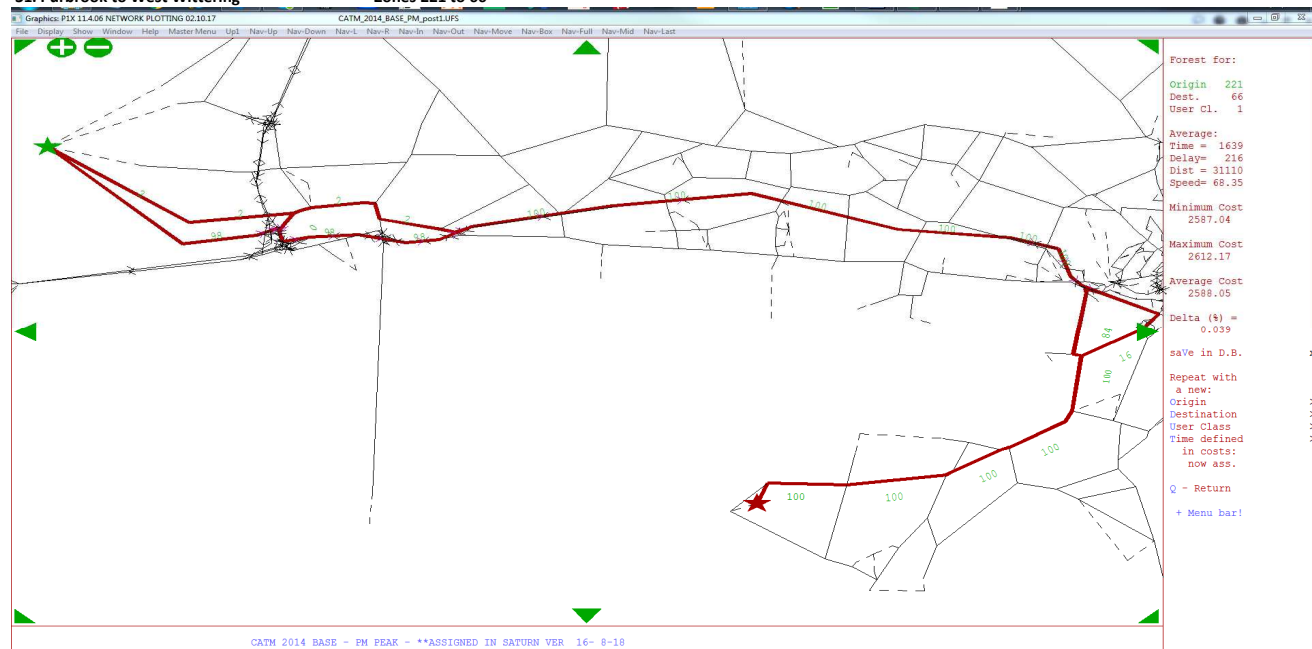
30. Selsey to Cosham

Zones 67 to 215



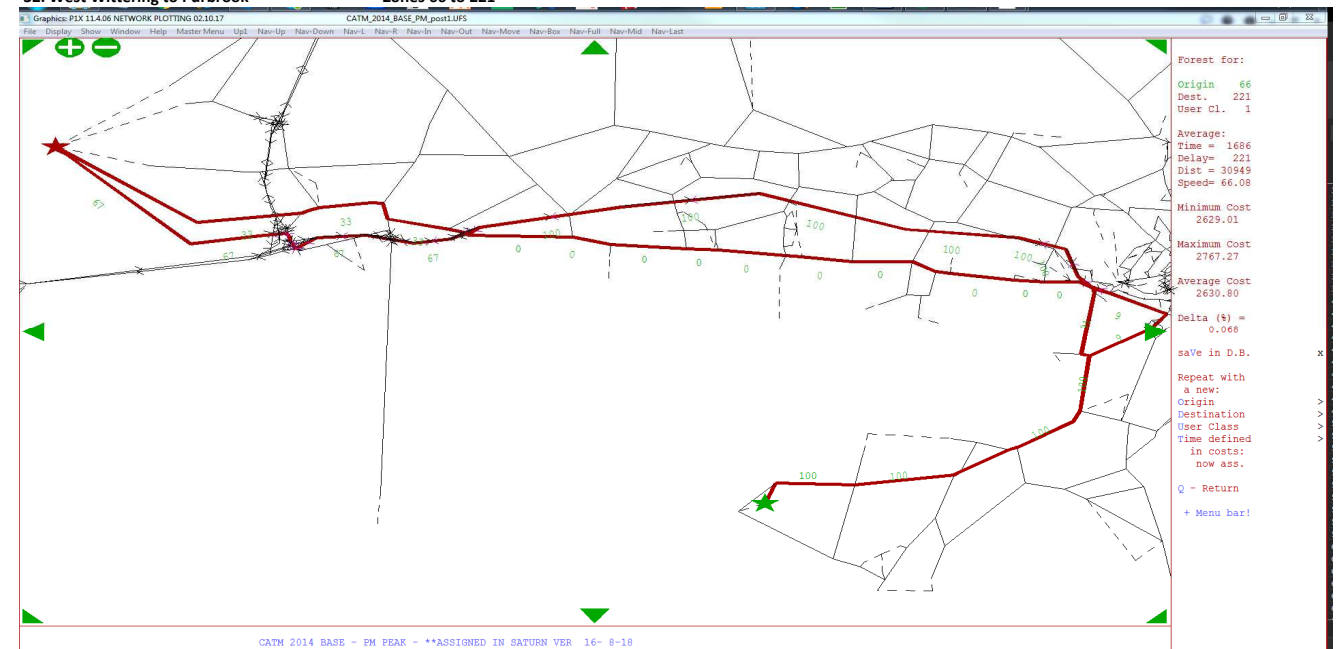
31. Purbrook to West Wittering

Zones 221 to 66

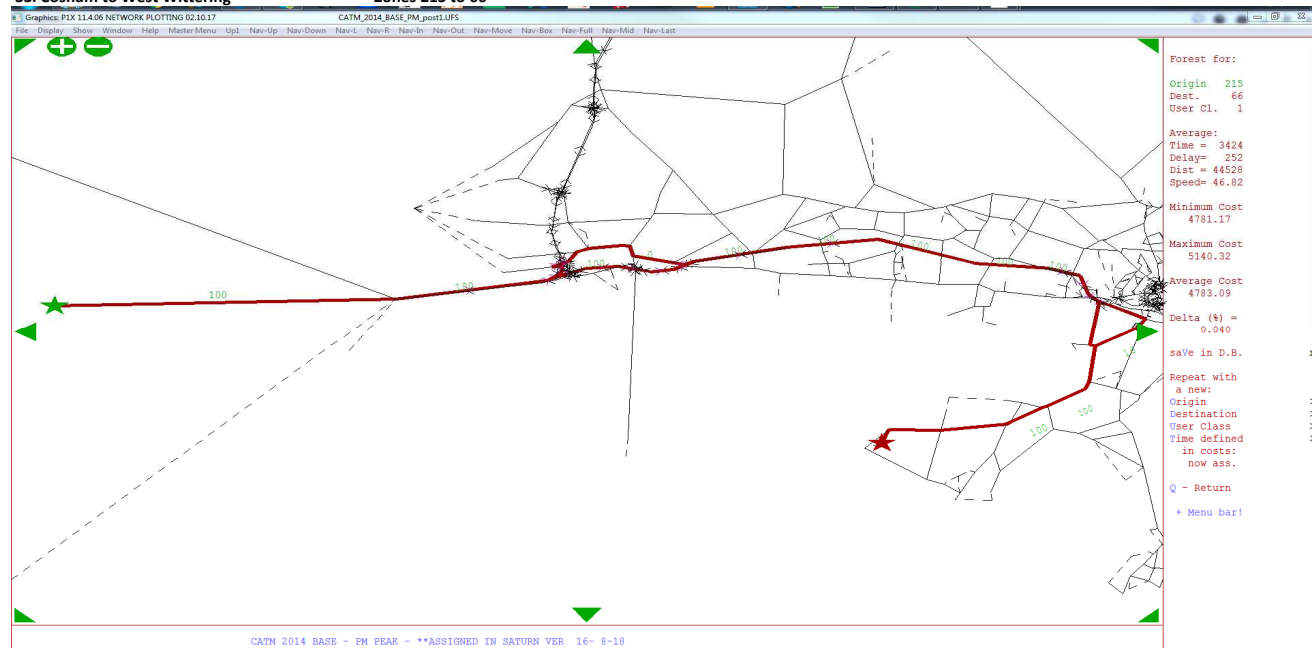


32. West Wittering to Purbrook

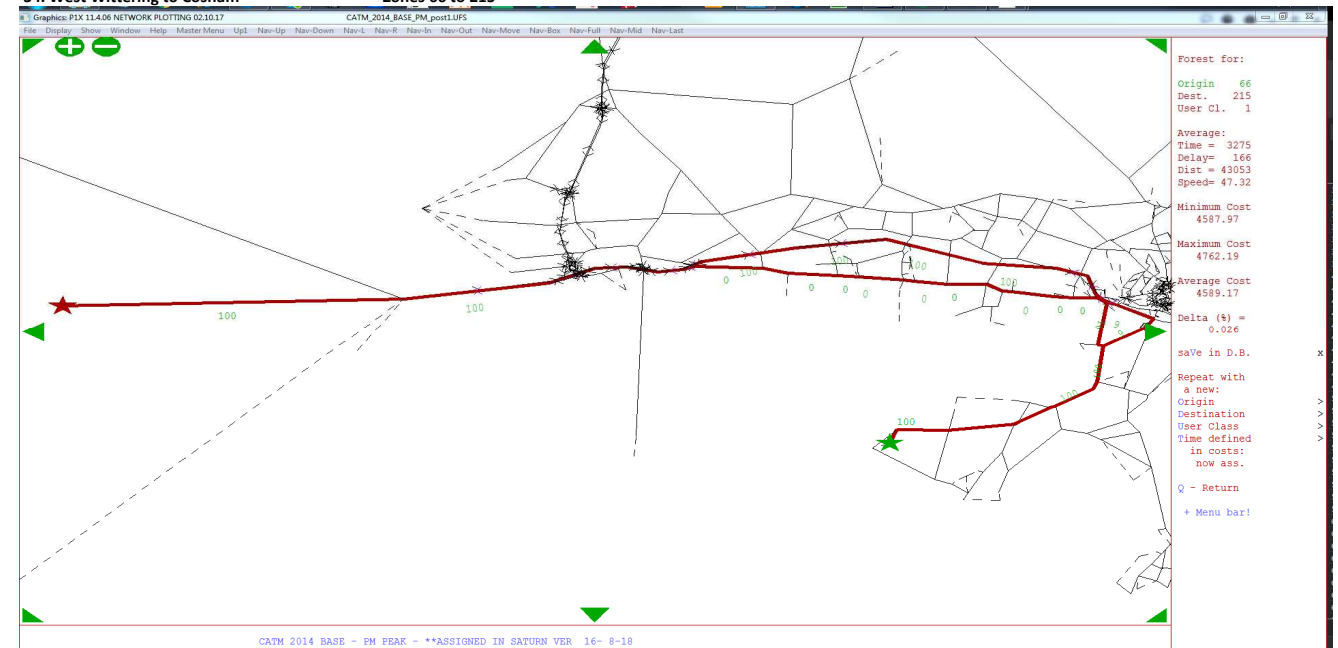
Zones 66 to 221



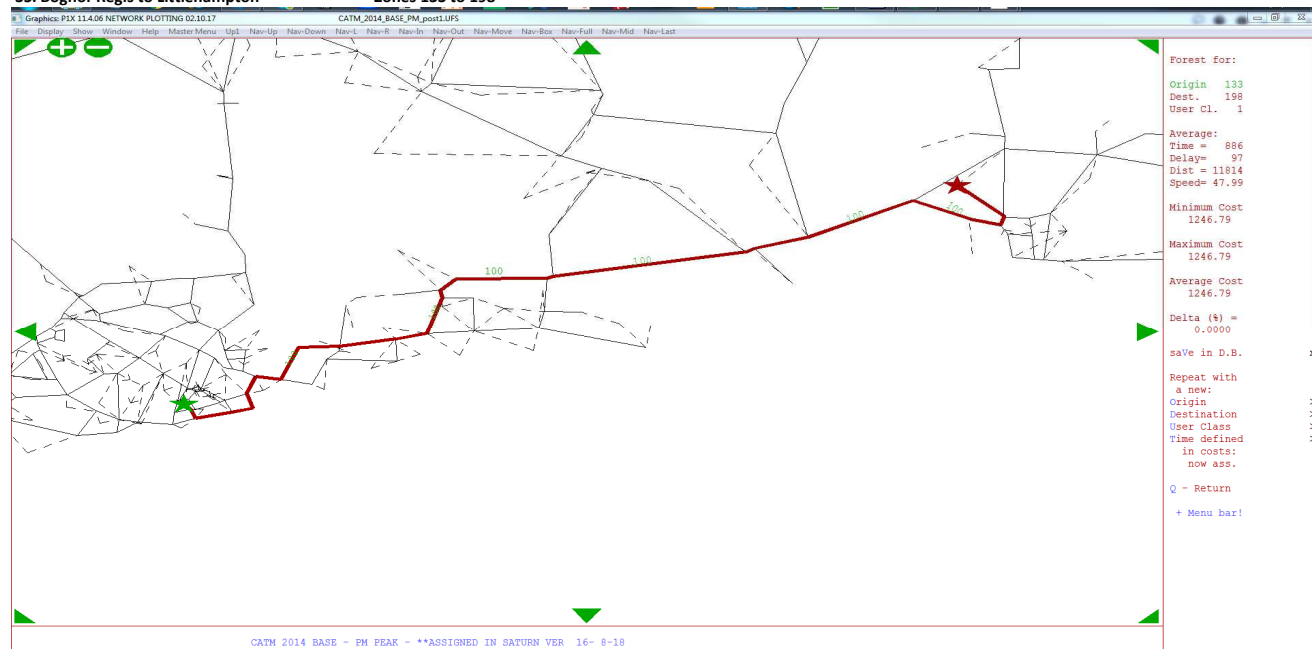
33. Cosham to West Wittering Zones 215 to 66



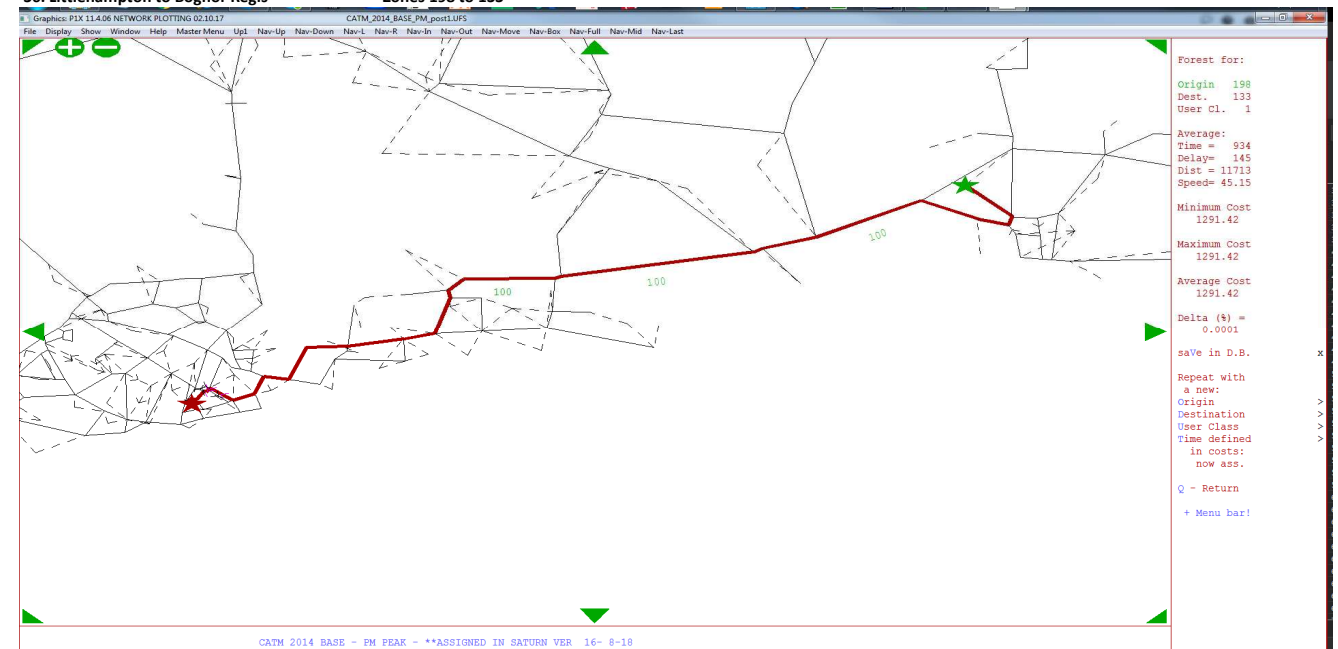
34. West Wittering to Cosham Zones 66 to 215

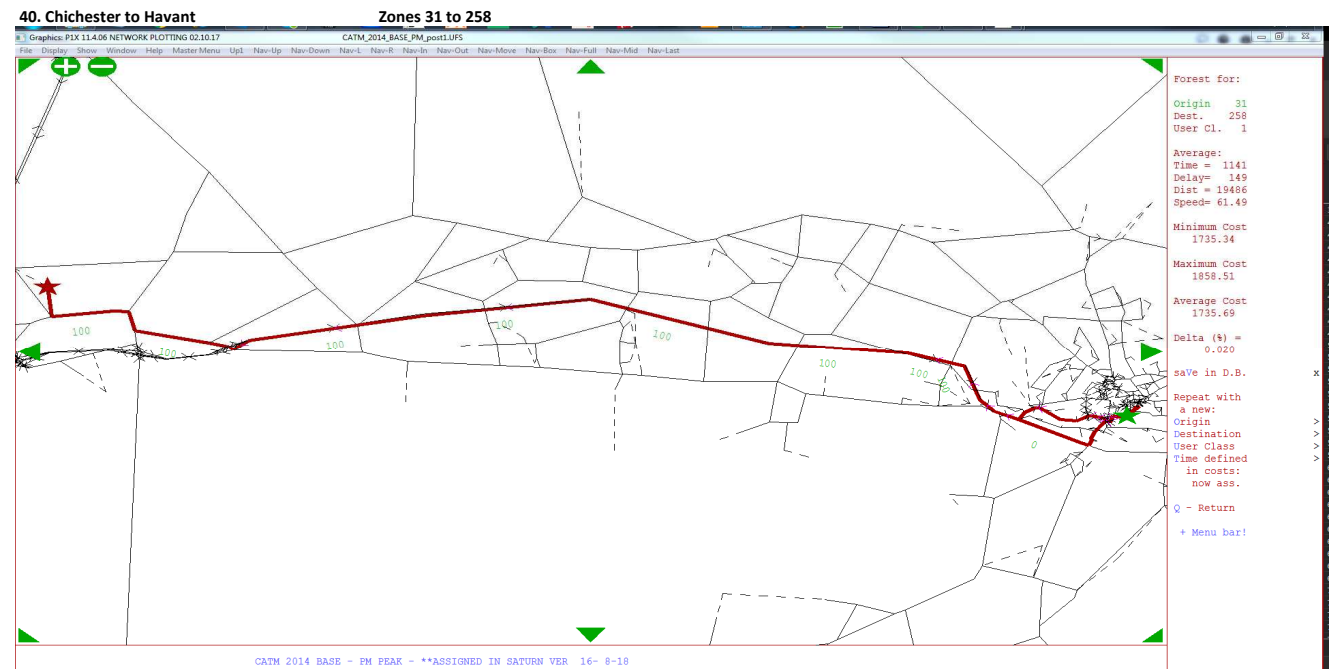
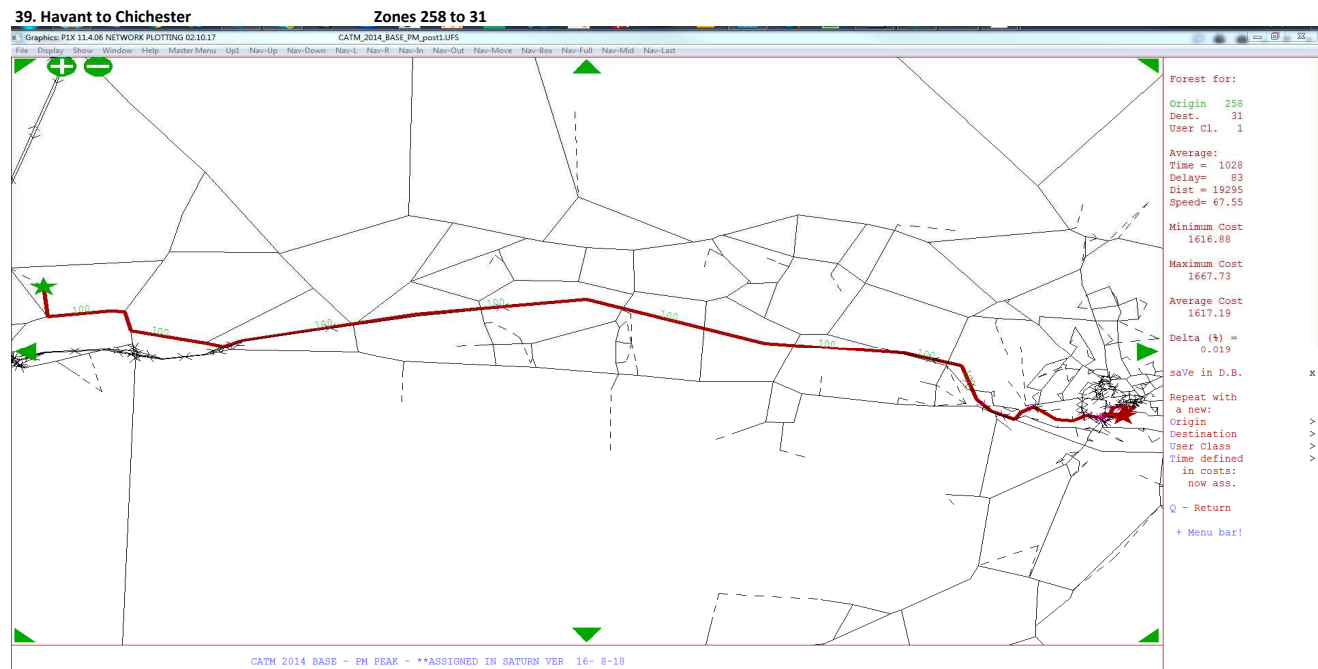
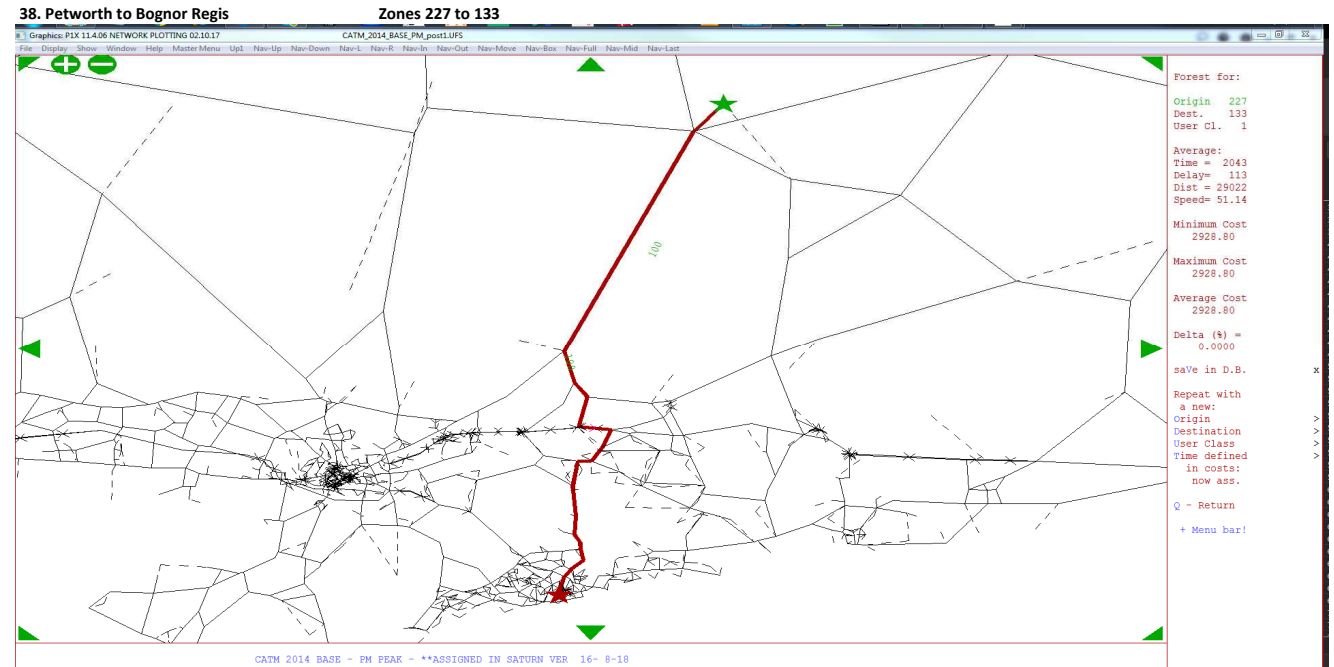
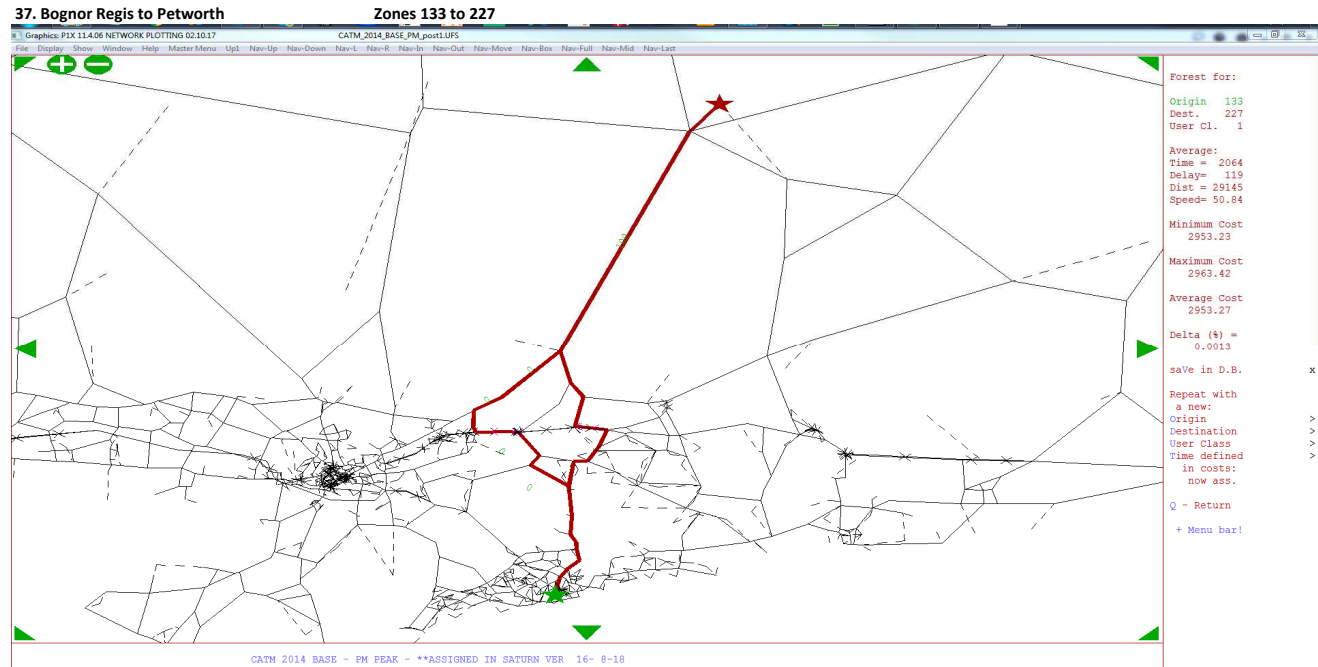


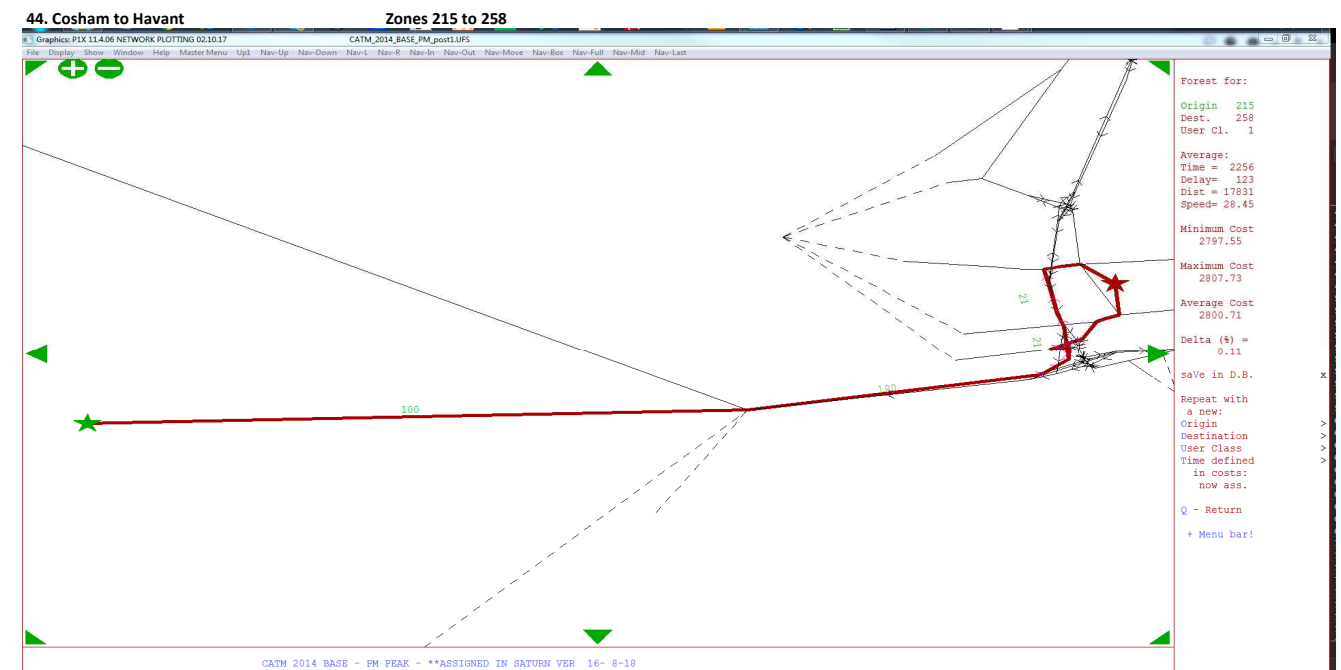
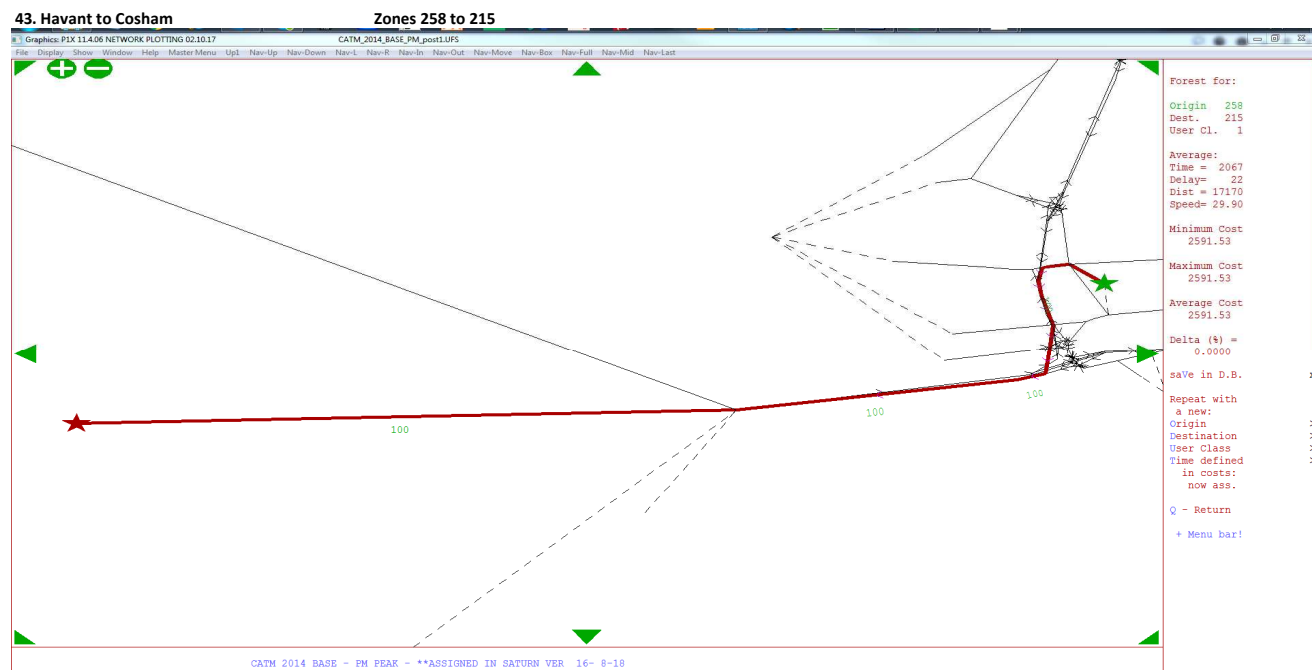
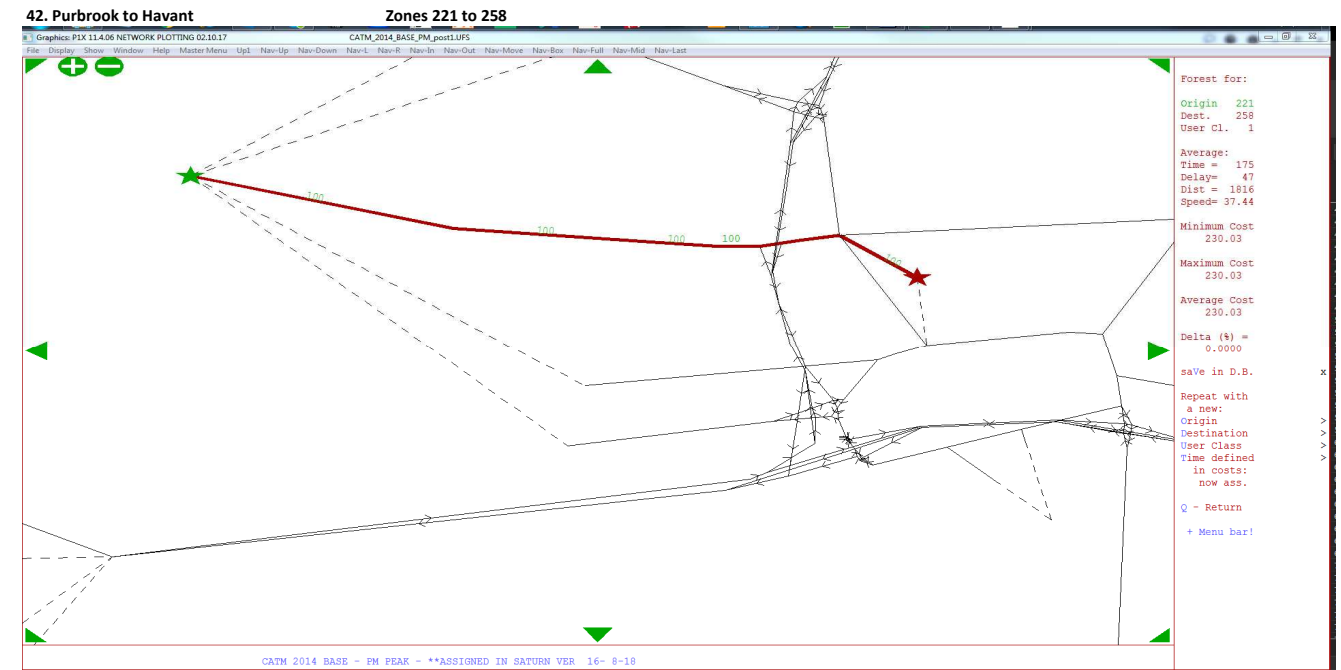
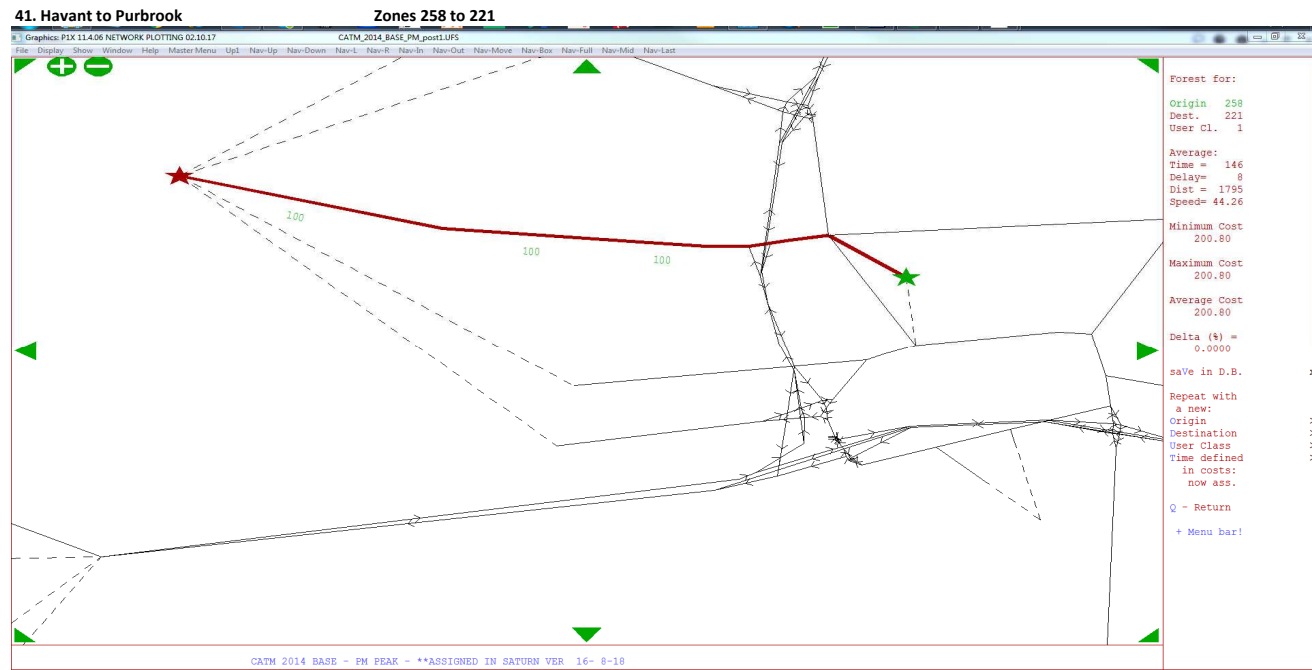
35. Bognor Regis to Littlehampton Zones 133 to 198



36. Littlehampton to Bognor Regis Zones 198 to 133







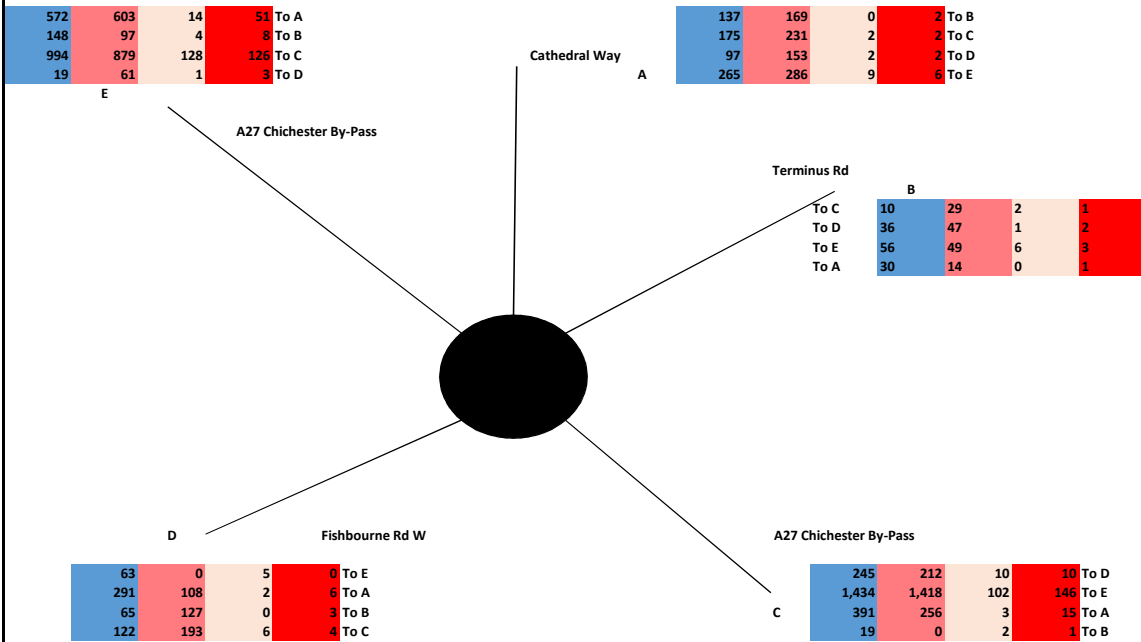
Appendix B Calibration Counts

Appendix C Flow Validation

AM FLOW VALIDATION																																																									
Link Details			SATURN Link	Observed					Modelled					Diff					% Diff					GEH					Flows					WebTAG criterion GEH or																							
Ref	Direction	Source		Road	Car	LGV	Lights	HGV	Total	Car	LGV	Lights	HGV	Total	Car	LGV	Lights	HGV	Total	Car	LGV	Lights	HGV	Total	Car	LGV	Lights	HGV	Total	Car	LGV	Lights	HGV	Total	Car	LGV	Lights	HGV	Total																		
1	EB	TRADS	Arundel Road	50030_50029	1,238	120	1,358	151	1,509	1,233	182	1,415	144	1,559	-5	62	57	-7	50	0%	52%	4%	-5%	3%	0.1	5.0	1.5	0.6	1.3	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
2	WB	TRADS	Arundel Road	50029_50030	1,739	95	1,834	124	1,958	1,778	150	1,929	115	2,044	39	55	95	-9	86	2%	58%	5%	-7%	4%	0.9	5.0	2.2	0.8	1.9	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
3	EB	TRADS	Arundel Road	10006_50152	1,143	134	1,276	135	1,411	1,153	145	1,299	135	1,434	10	11	23	0	23	1%	8%	2%	0%	2%	0.3	1.0	0.6	0.0	0.6	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
4	WB	TRADS	Arundel Road	50160_50150	1,644	87	1,731	121	1,852	1,690	128	1,819	113	1,932	46	41	88	-8	80	3%	47%	5%	-7%	4%	1.1	4.0	2.1	0.7	1.8	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
5	EB	TRADS	Chichester By-Pass	11070_11007	920	106	1,025	128	1,153	791	121	912	112	1,024	-129	15	-113	-16	-129	-14%	14%	-11%	-12%	-11%	4.4	1.4	3.6	1.5	3.9	Fail	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
6	WB	TRADS	Chichester By-Pass	11007_11070	1,137	97	1,234	125	1,359	1,101	109	1,210	135	1,346	-36	12	-24	10	-13	-3%	12%	-2%	8%	-1%	1.1	1.2	0.7	0.9	0.4	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
7	EB	TRADS	Chichester By-Pass	11002_11003	1,163	137	1,300	160	1,460	1,048	211	1,259	127	1,386	-115	74	-41	-33	-74	-10%	54%	-3%	-20%	-5%	3.5	5.6	1.1	2.7	1.9	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
8	WB	TRADS	Chichester By-Pass	6936_11004	1,667	137	1,804	164	1,968	1,560	249	1,809	166	1,975	-107	112	5	2	7	-6%	82%	0%	1%	0%	2.7	8.1	0.1	0.1	0.2	Pass	Fail	Pass	Pass	Pass	Pass	Pass	Fail	Pass	Pass	Pass	Pass																
9	EB	TRADS	Chichester By-Pass	9001_11001	1,101	154	1,256	185	1,440	1,099	218	1,317	132	1,449	-2	64	61	-53	9	0%	41%	5%	-28%	1%	0.0	4.7	1.7	4.2	0.2	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
10	WB	TRADS	Chichester By-Pass	11001_9001	1,726	134	1,860	160	2,020	1,641	245	1,886	171	2,057	-85	111	26	11	37	-5%	83%	1%	7%	2%	2.1	8.0	0.6	0.9	0.8	Pass	Fail	Pass	Pass	Pass	Pass	Fail	Pass	Pass	Pass	Pass	Pass																
15	EB	TRADS	Chichester Road	50230_50278	939	70	1,009	109	1,118	790	67	857	116	973	-149	-3	-152	7	-145	-16%	-4%	-15%	7%	-13%	5.1	0.4	5.0	0.7	4.5	Fail	Pass	Fail	Pass	Pass	Fail	Pass	Pass	Pass	Pass	Pass	Pass																
16	WB	TRADS	Chichester Road	50278_50230	1,164	55	1,219	97	1,316	1,260	73	1,333	107	1,439	96	18	114	10	123	8%	32%	9%	10%	9%	2.8	2.2	3.2	1.0	3.3	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
53	NB	WSCC	St Pancras	6546_6547	826	80	905	20	925	844	86	929	18	948	18	6	24	-2	23	2%	7%	3%	-8%	2%	0.6	0.7	0.8	0.4	0.7	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
55	NB	WSCC	Stockbridge Road	5447_5750	486	37	523	22	545	449	24	473	25	498	-37	-13	-50	3	-47	-8%	-36%	-10%	15%	-9%	1.7	2.4	2.2	0.7	2.1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
56	SB	WSCC	Orchard Street	5750_5447	582	27	609	22	631	630	38	667	9	676	48	11	58	-13	45	8%	39%	10%	-61%	7%	1.9	1.9	2.3	3.4	1.8	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
57	NB	WSCC	St Paul's Road	5558_5459	277	27	304	6	310	204	25	230	13	243	-73	-2	-74	7	-67	-26%	-6%	-24%	120%	-22%	4.7	0.3	4.5	2.3	4.0	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
58	SB	WSCC	St Paul's Road	5459_5558	639	40	679	9	688	671	94	766	19	784	32	54	87	10	96	5%	136%	13%	109%	14%	1.3	6.6	3.2	2.6	3.6	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
65	NB	WSCC	Selsey Road	4226_4132	560	64	624	27	651	544	57	602	23	624	-16	-7	-22	-4	-27	-3%	-10%	-4%	-16%	-4%	0.7	0.8	0.9	0.9	1.1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
66	SB	WSCC	Selsey Road	4132_4226	372	61	432	23	455	327	40	368	19	387	-45	-21	-64	-4	-68	-12%	-34%	-15%	-17%	-15%	2.4	2.9	3.2	0.9	3.3	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
67	NB	WSCC	Main Road	30003_11012	550	50	600	19	619	470	47	517	27	544	-80	-3	-83	8	-75	-15%	-6%	-14%	42%	-12%	3.6	0.4	3.5	1.7	3.1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
68	SB	WSCC	Main Road	11012_30003	424	84	508	17	525	501	87	588	33	622	77	3	80	16	97	18%	4%	16%	94%	18%	3.6	0.4	3.4	3.2	4.0	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
69	EB	WSCC	Fisbourne Road (West)	30001_4741	439	55	494	13	507	490	81	571	25	596	51	26	77	12	89	12%	48%	16%	93%	18%	2.3	3.2	3.3	2.8	3.8	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
70	WB	WSCC	Fisbourne Road (West)	4741_30001	374	80	454	20	474	443	106	550	25	575	69	26	96	5	101	19%	33%	21%	27%	21%	3.4	2.7	4.3	1.1	4.4	Pass	Pass	Pass	Pass	Fail	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
71	EB	WSCC	A286	4068_4880	154	26	179	6	185	178	36	213	5	219	24	10	34	-1	34	15%	37%	19%	-9%	18%	1.8	1.7	2.5	0.2	2.4	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
72	WB	WSCC	A286	4880_4068	204	16	220	8	228	181	32	213	3	216	-23	16	-7	-5	-12	-11%	98%	-3%	-57%	-5%	1.6	3.2	0.5	1.9	0.8	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
83	NB	WSCC	A29	1038_1199	436	63	499	21	520	321	76	397	24	421	-115	13	-102	3	-99	-26%	20%	-20%	14%	-19%	5.9	1.5	4.8	0.6	4.6	Fail	Pass	Fail	Pass	Pass	Fail	Pass	Pass	Pass	Pass	Pass	Pass																
84	SB	WSCC	A29	1199_1038	306	39	345	24	369	344	56	400	16	416	38	17	55	-8	47	12%	44%	16%	-33%	13%	2.1	2.5	2.8	1.7	2.4	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass																
101	EB	WSCC	A259	50204_50202					698	576	68	644	23	667					-31																										Pass					Pass							
102	WB	WSCC	A259	50202_50204					840	429	46	475	35	510					-330																												Fail					Fail					
103	NB	WSCC	A284 - Lyminster Road	50201_50200					464	428	24	451	19	470					6																														Pass					Pass			
104	SB	WSCC	A284 - Lyminster Road	50200_50201					477	281	45	326	22	348					-129																																	Fail					Fail
534	NB	CTS_SL_1_NB	Main Road	30003_11012	550	50	600	19	619	470	47	517	27	544	-80	-3	-83	8	-75	-15%	-6%	-14%	42%	-12%	3.6	0.4	3.5	1.7	3.1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass								
540	NB		Selsey Road	4226_4132	560	64	624	27	651	544	57	602	23	624	-16	-7	-22	-4	-27	-3%	-10%	-4%	-16%	-4%	0.7	0.8	0.9	0.9	1.1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass					
535	SB	CTS_SL_1_SB	Main Road	11012_30003	424	84	508	17	525	501	87	588	33	622	77	3	80	16	97	18%	4%	16%	94%	18%	3.6	0.4	3.4	3.2	4.0	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass			
541	SB		Selsey Road	4132_4226	372	61	432	23	455	327	40	368	19	387	-45	-21	-64	-4	-68	-12%	-34%	-15%	-17%	-15%	2.4	2.9	3.2	0.9	3.3	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	
521	EB	CTS_SL_2_EB	A27 EB	40124_1760	1,512	146	1,658	190	1,848	1,450	189	1,639	189	1,828	-62	43	-19	-1	-20	-4%	29%	-1%	-1%	-1%	1.6	3.3	0.5	0.1	0.5	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass			
552	EB		Main Road	1001_1255	259	52	311	15	327	160	37	198	14	212	-99	-14	-113	-2	-115	-38%	-28%	-36%	-10%	-35%	6.8	2.1	7.1	0.4	7.0	Pass	Pass	Fail	Pass	Fail	Pass	Pass	Fail	Pass	Pass	Fail	Pass	Fail	Pass	Fail	Pass	Fail	Pass	Fail	Pass	Fail	Pass	Fail	Pass	Fail			
600	EB		New Brighton Road	40045_40136	108	10	118	5	123	95	33	127	14	141	-14	23	9	8	18	-13%	240%																																				

Appendix D Turn Flow Validation

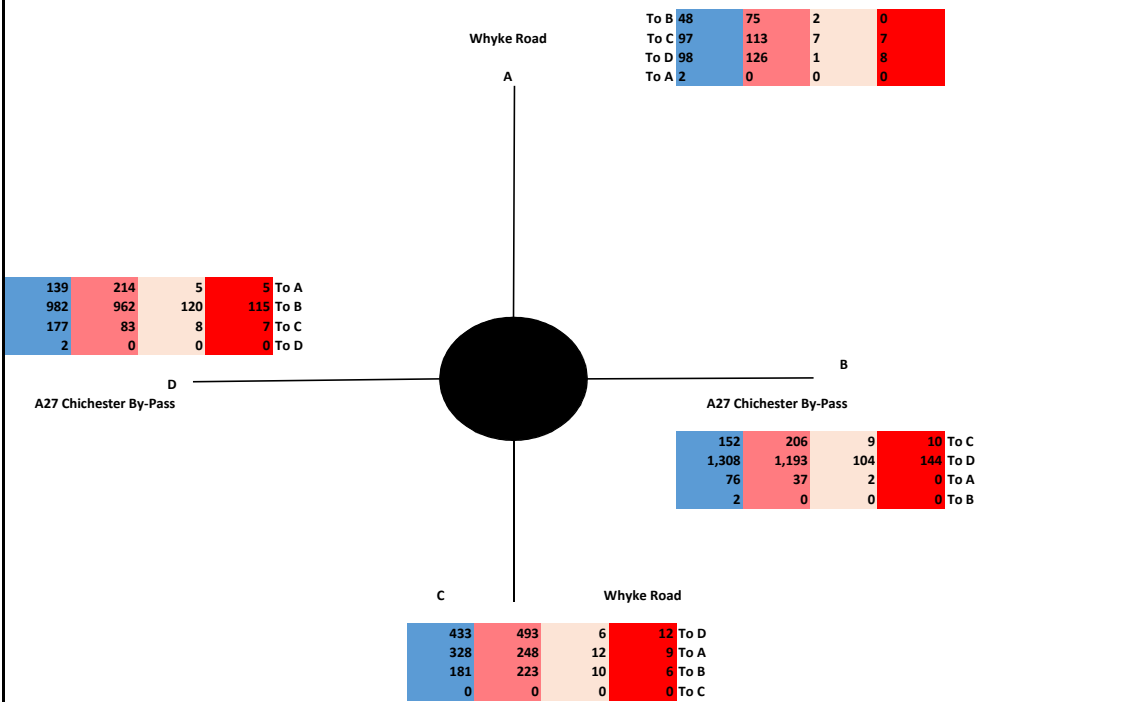
A27 Fishbourne Roundabout



Observed Light Vehicles (includes Cars, Taxis and LGVs)
Modelled Light Vehicles
Observed Heavy Vehicles (includes HGVs, OGVs, Buses and Coaches)
Modelled Heavy Vehicles

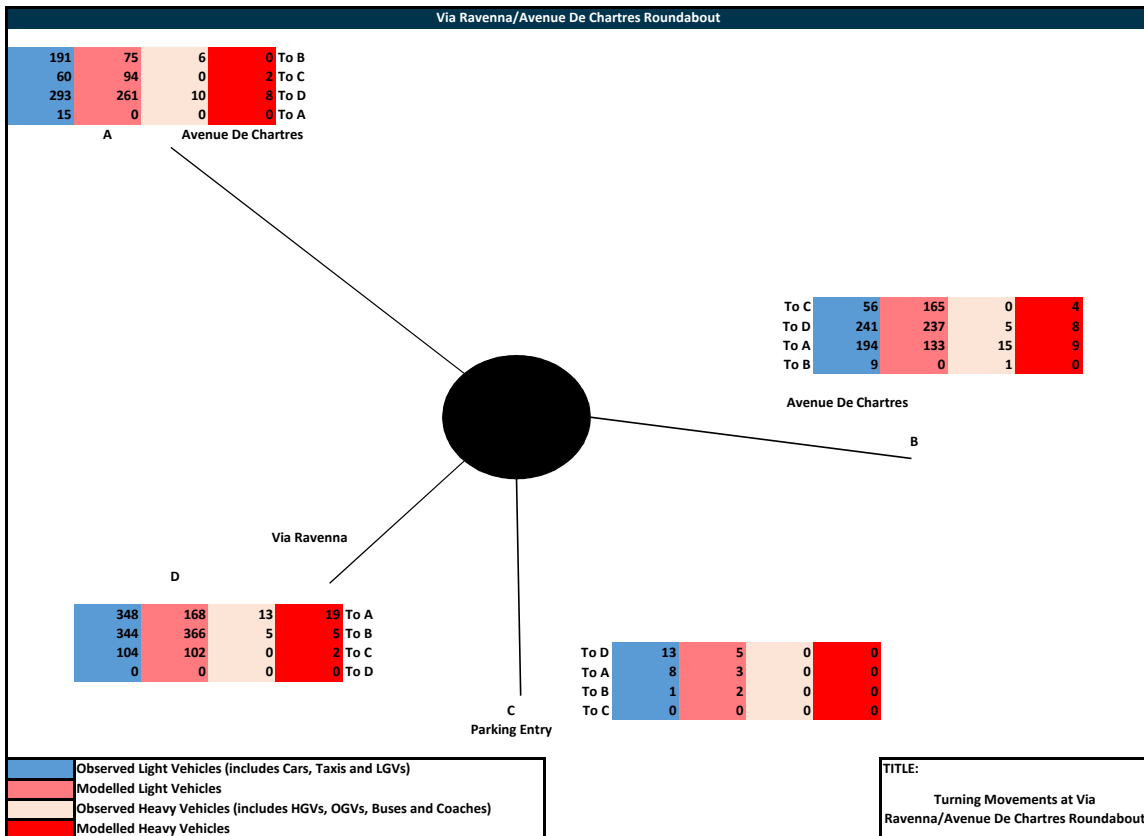
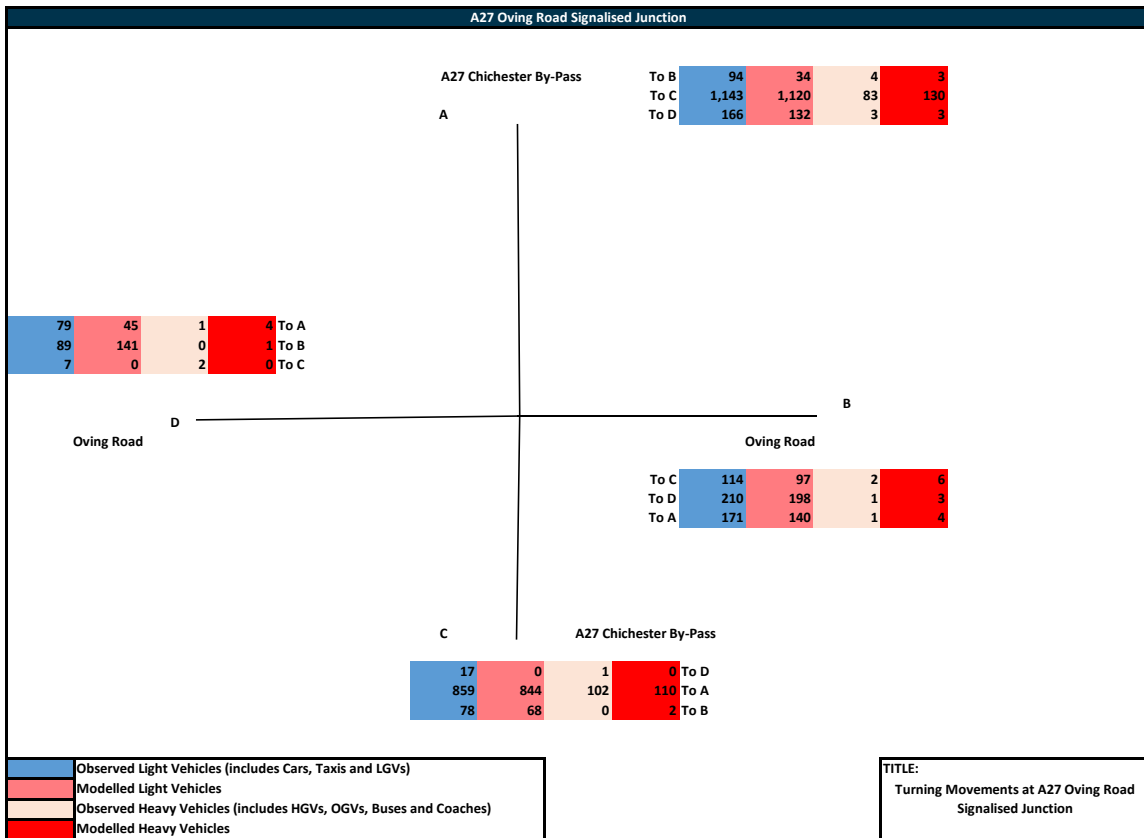
TITLE: Turning Movements at A27 Fishbourne Roundabout

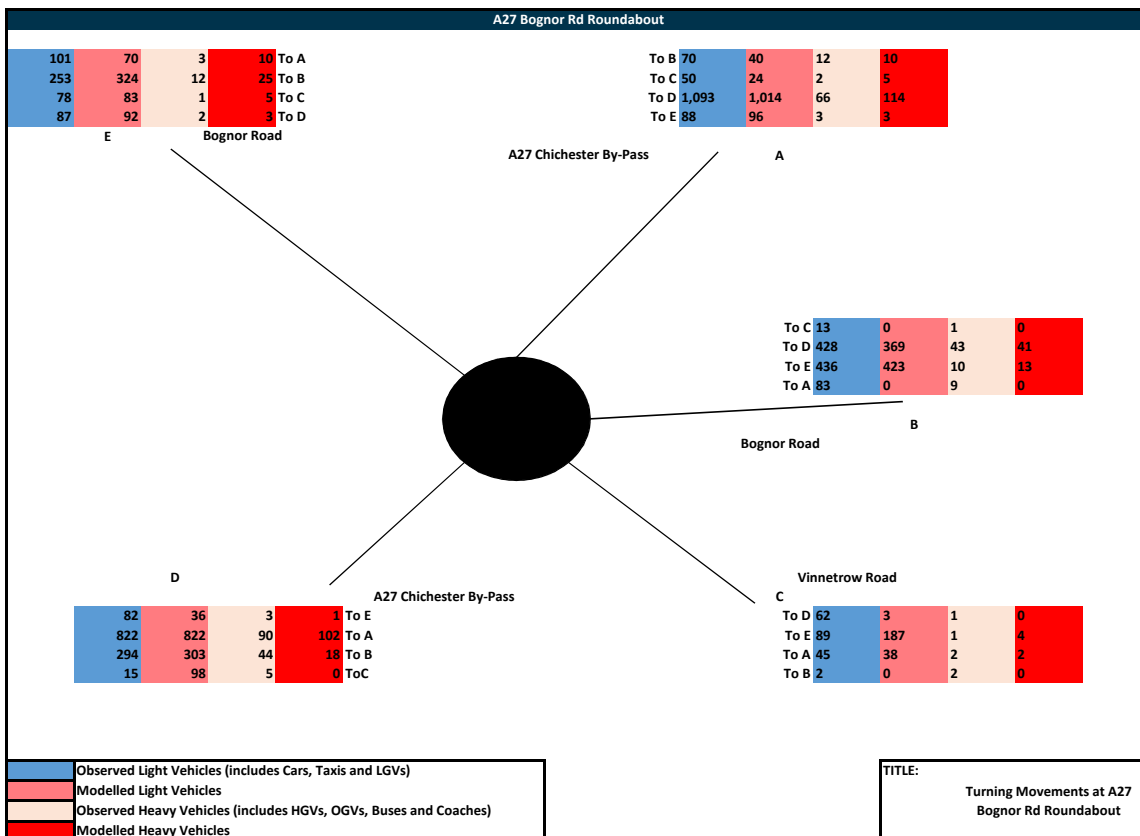
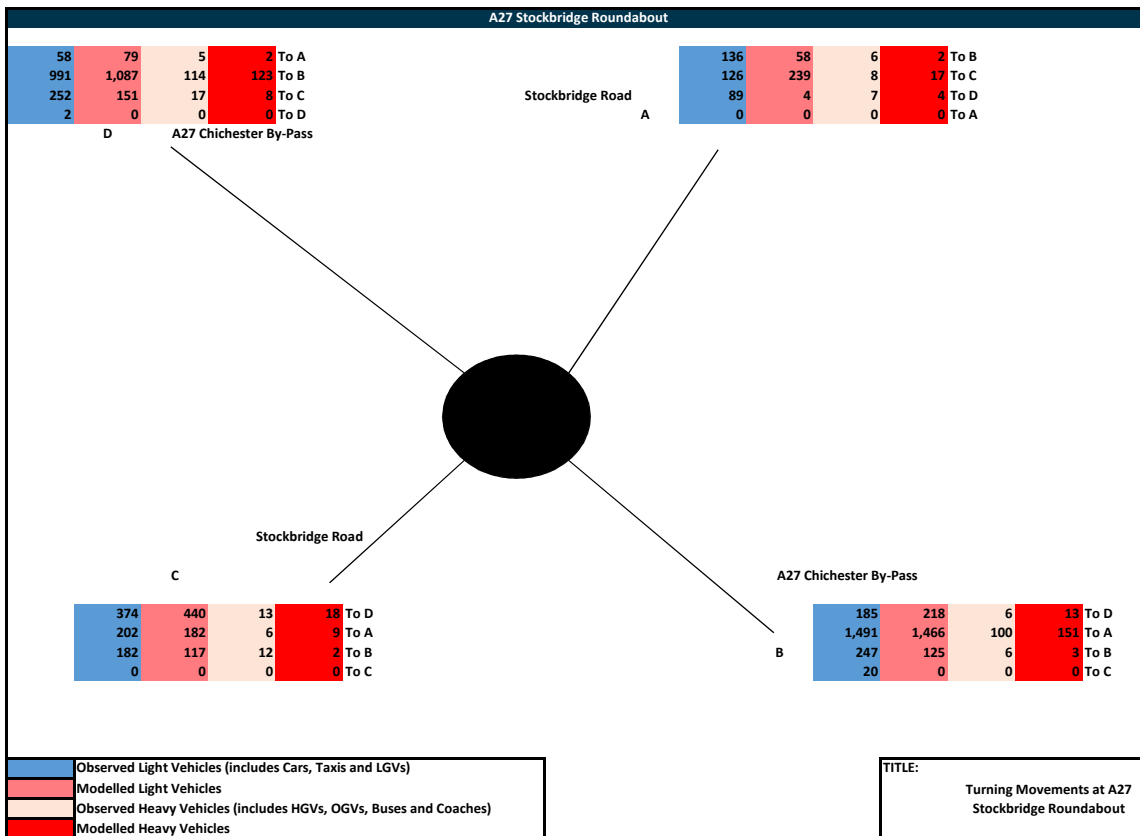
A27 Whyke Roundabout

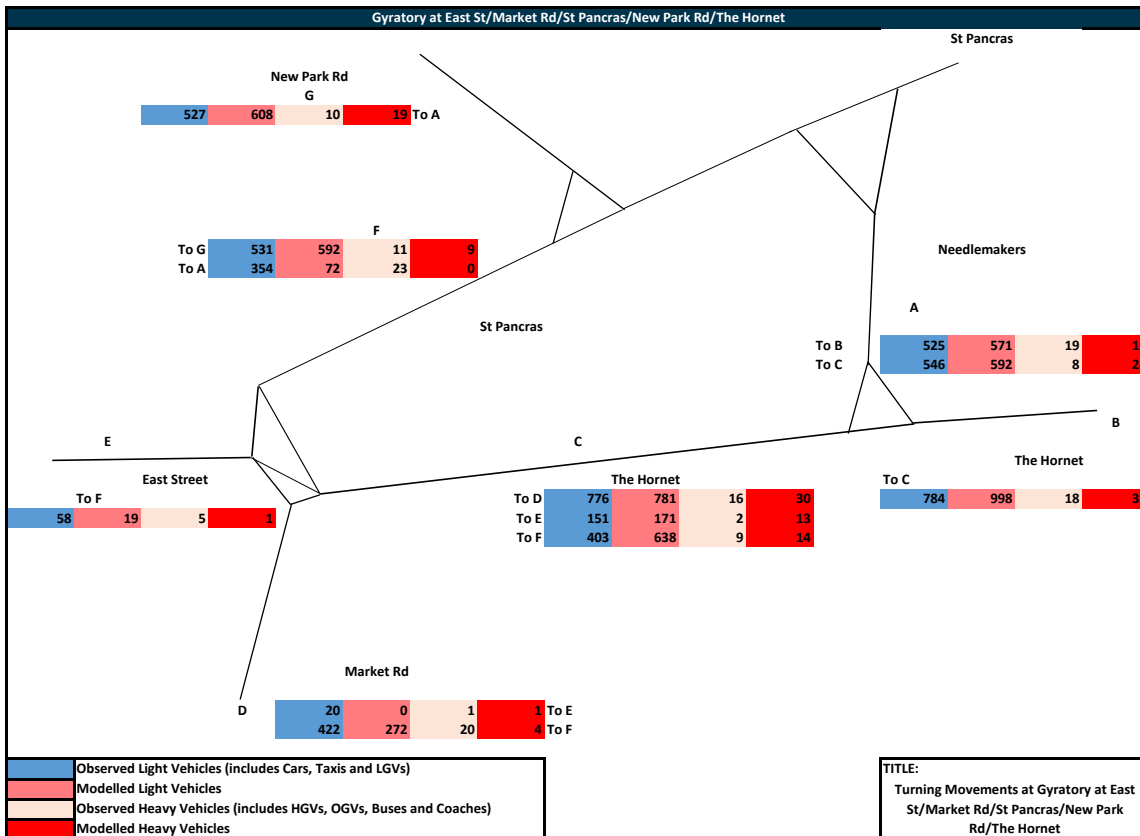
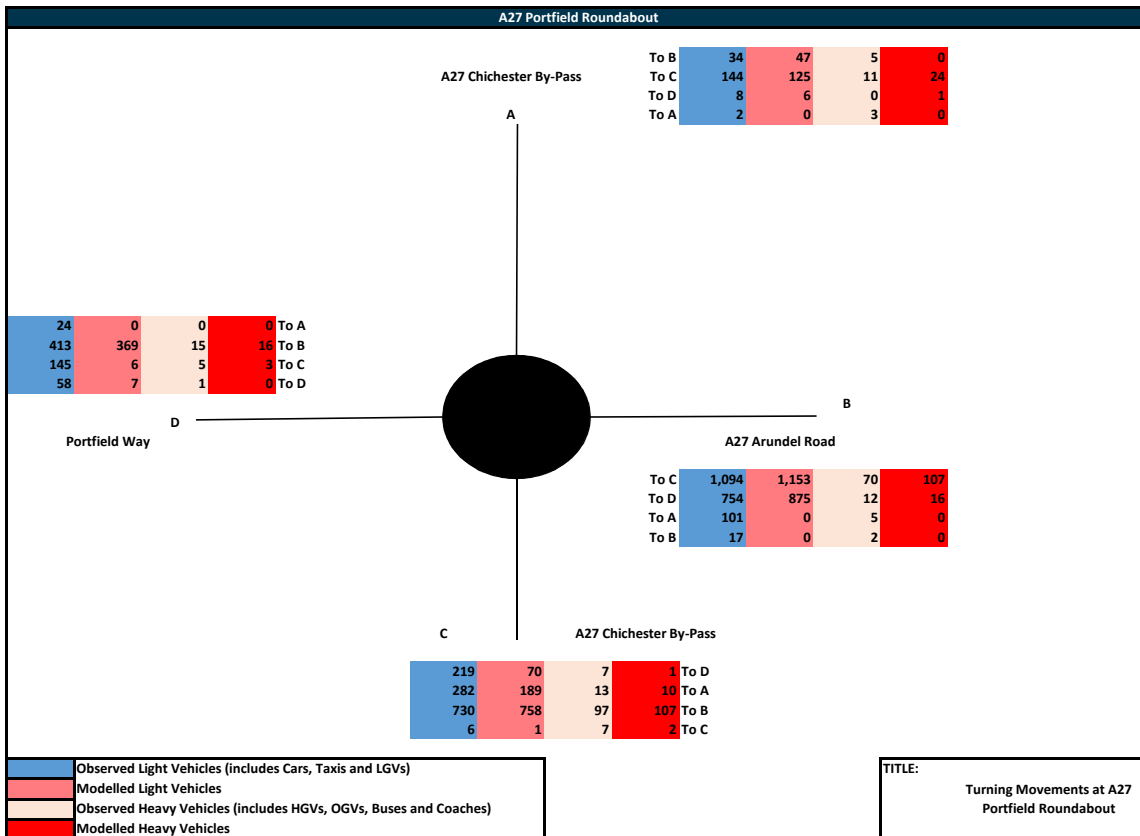


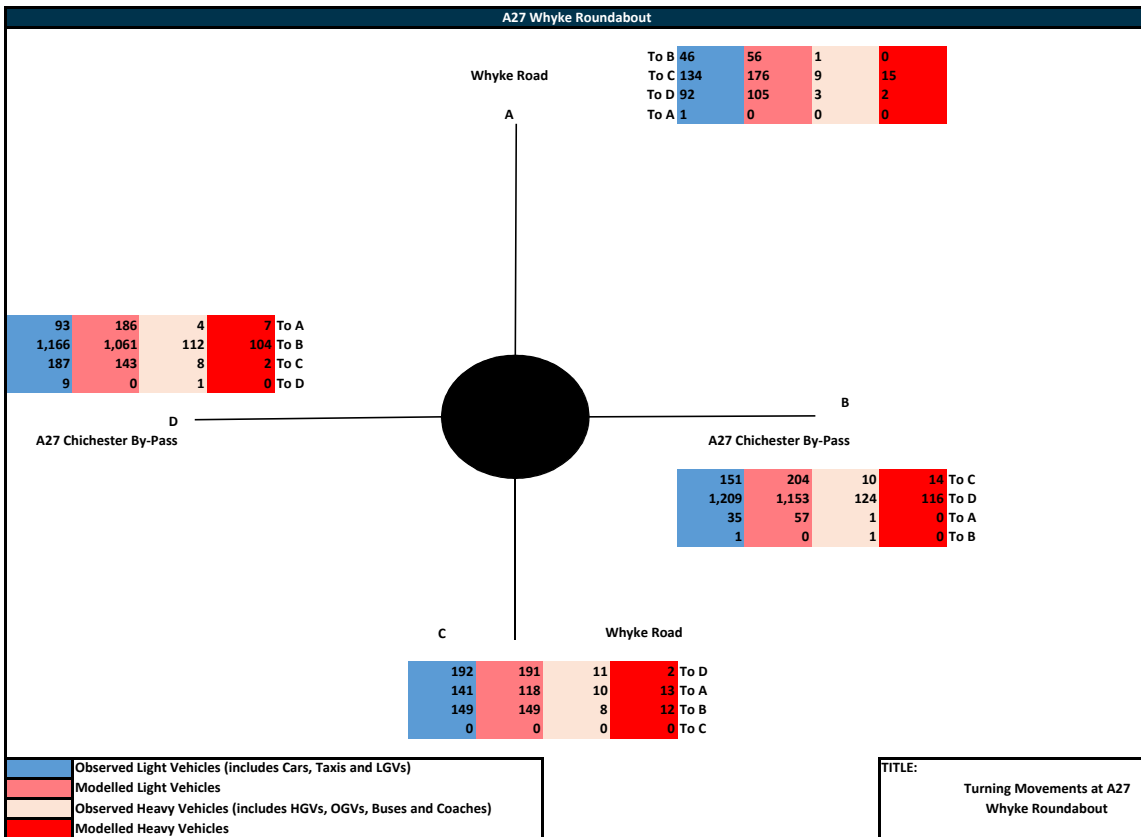
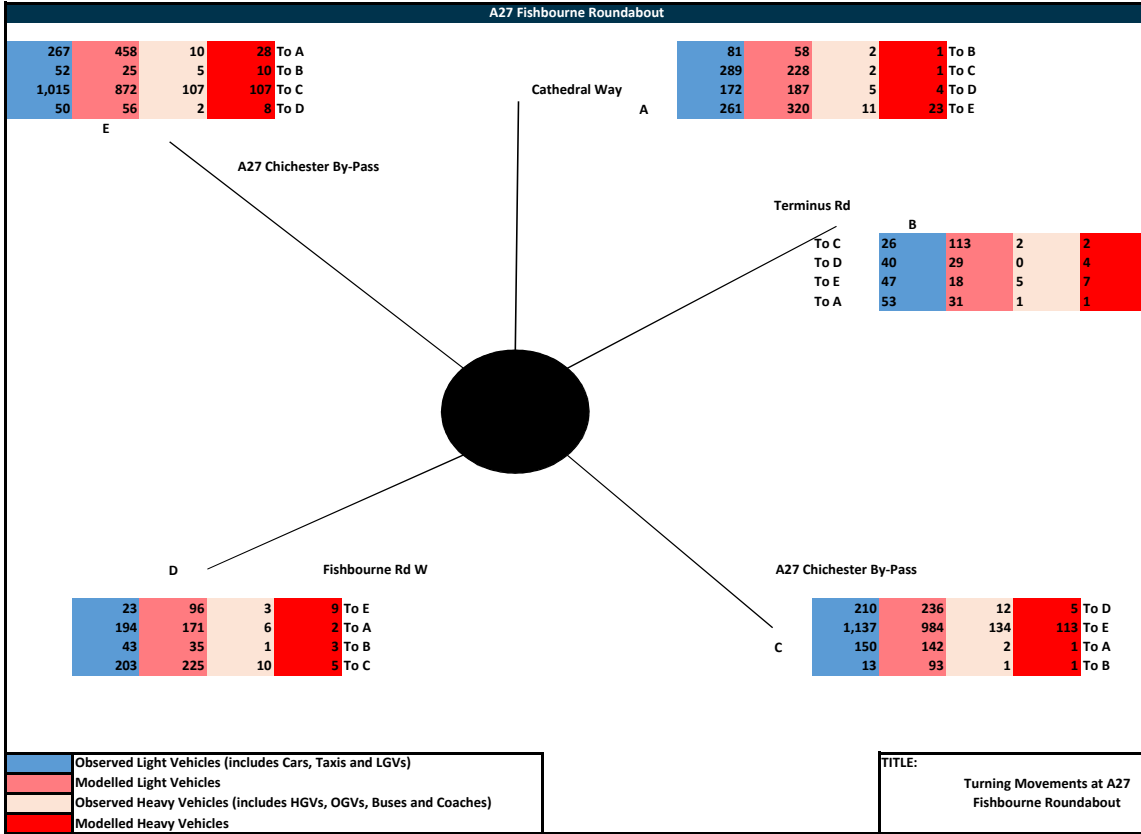
Observed Light Vehicles (includes Cars, Taxis and LGVs)
Modelled Light Vehicles
Observed Heavy Vehicles (includes HGVs, OGVs, Buses and Coaches)
Modelled Heavy Vehicles

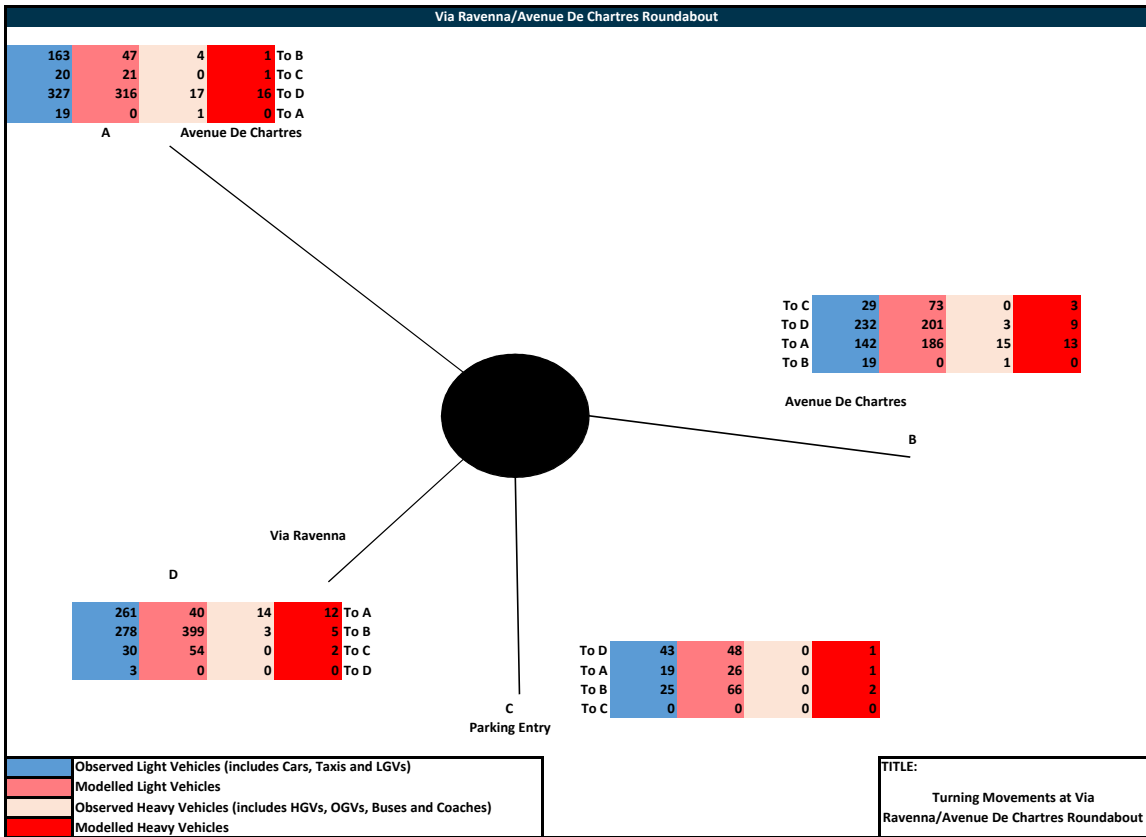
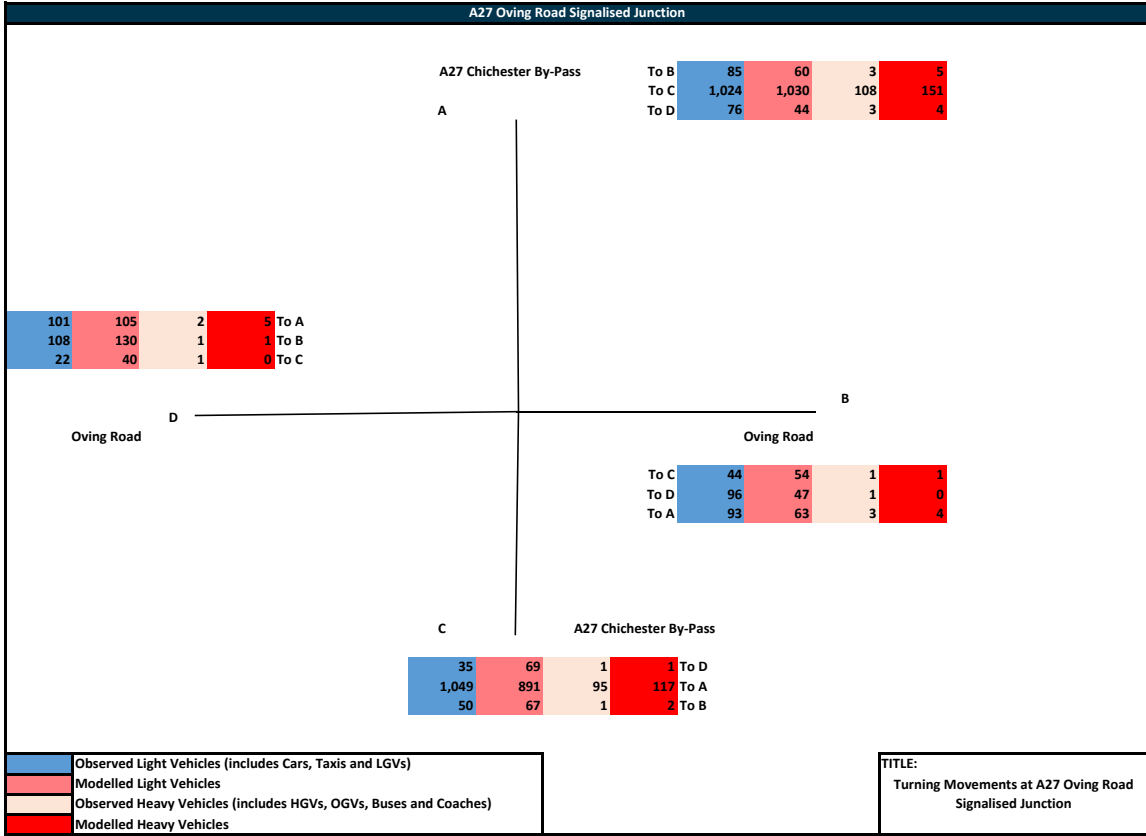
TITLE: Turning Movements at A27 Whyke Roundabout

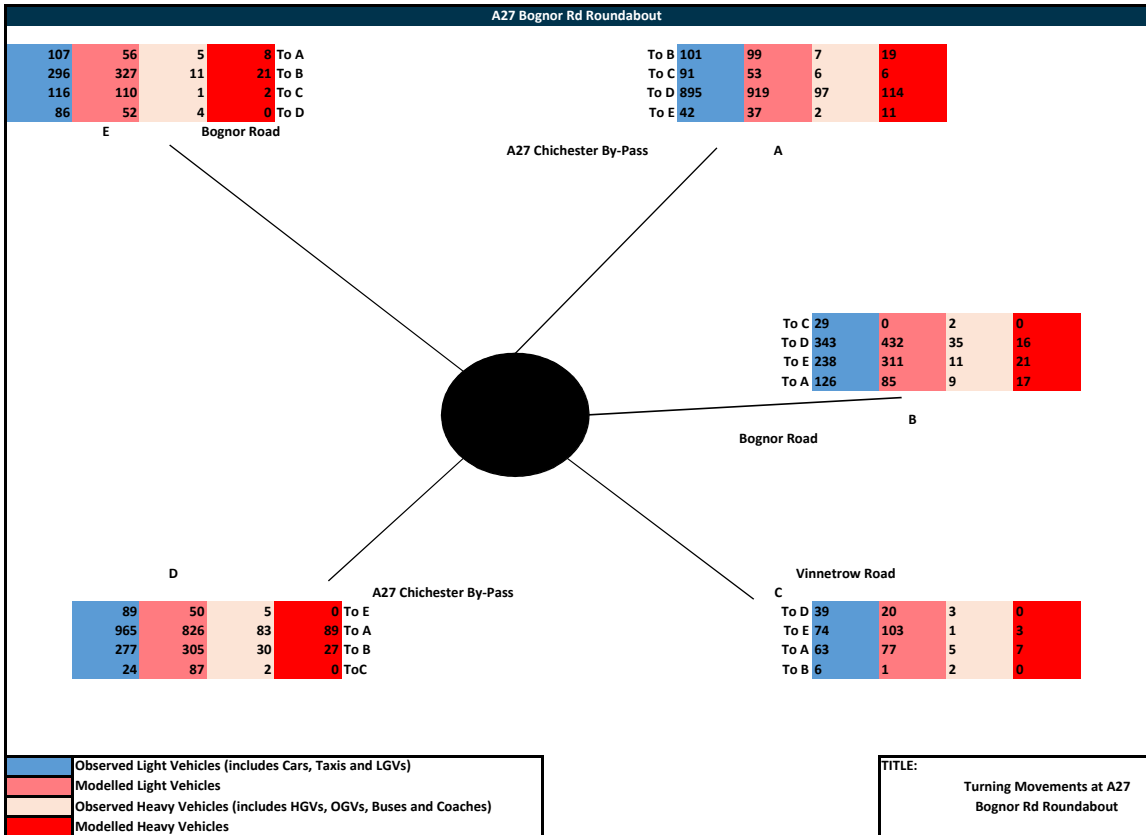
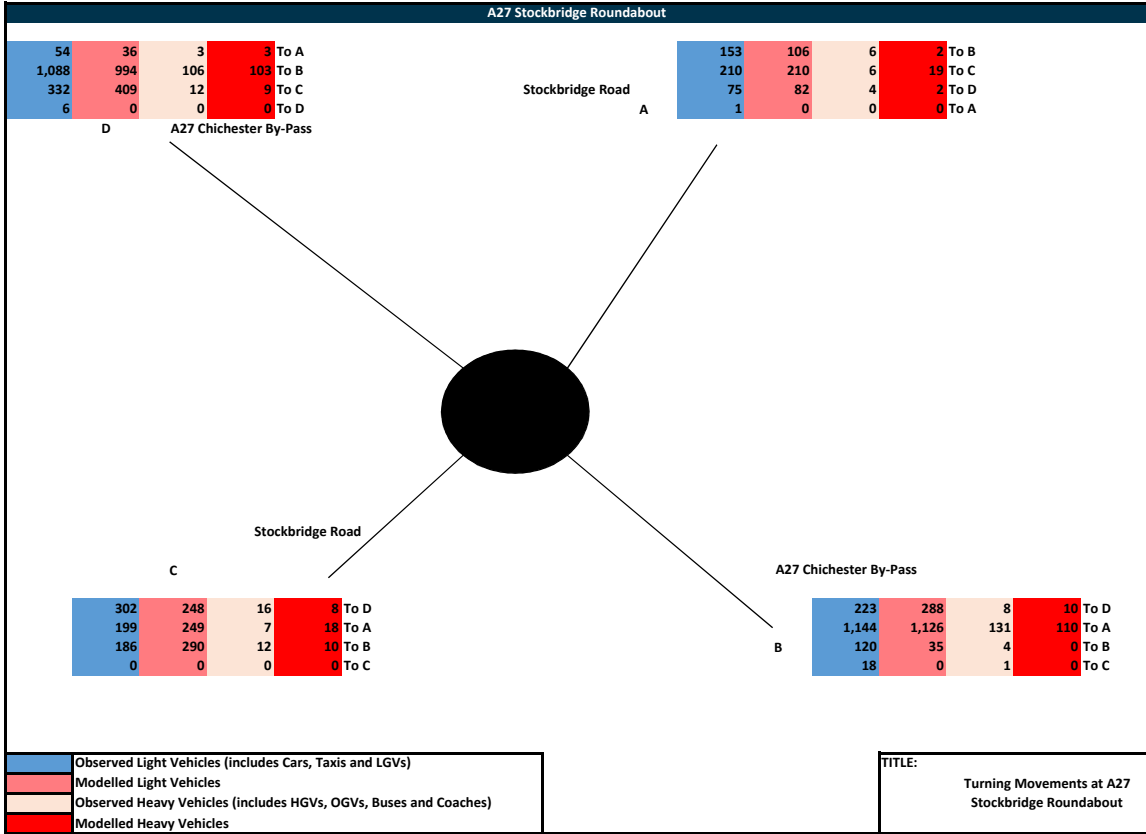


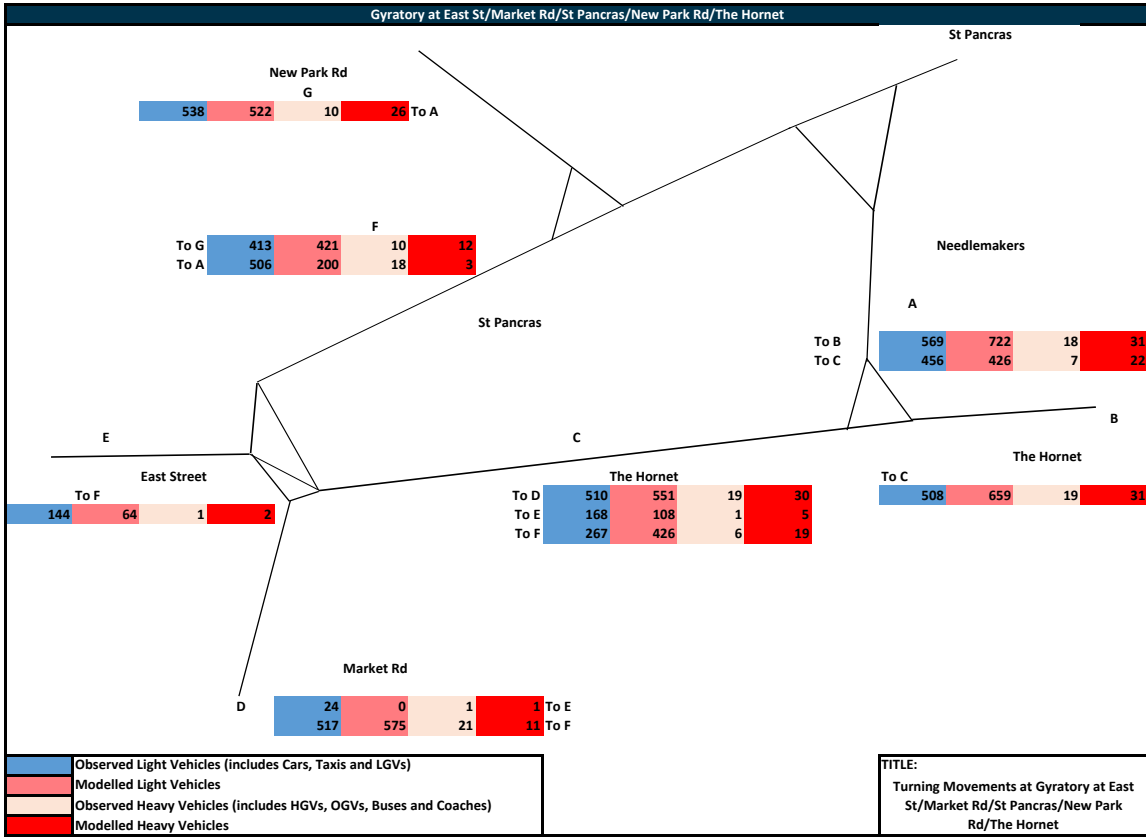
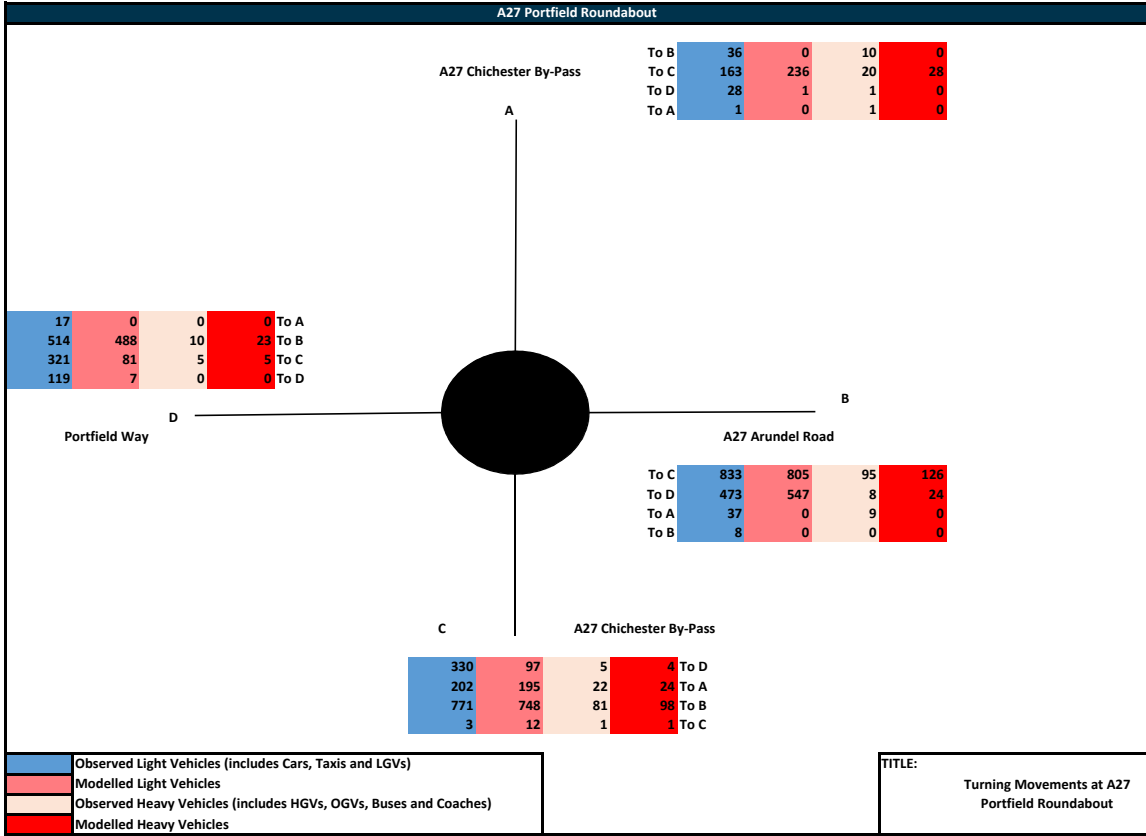




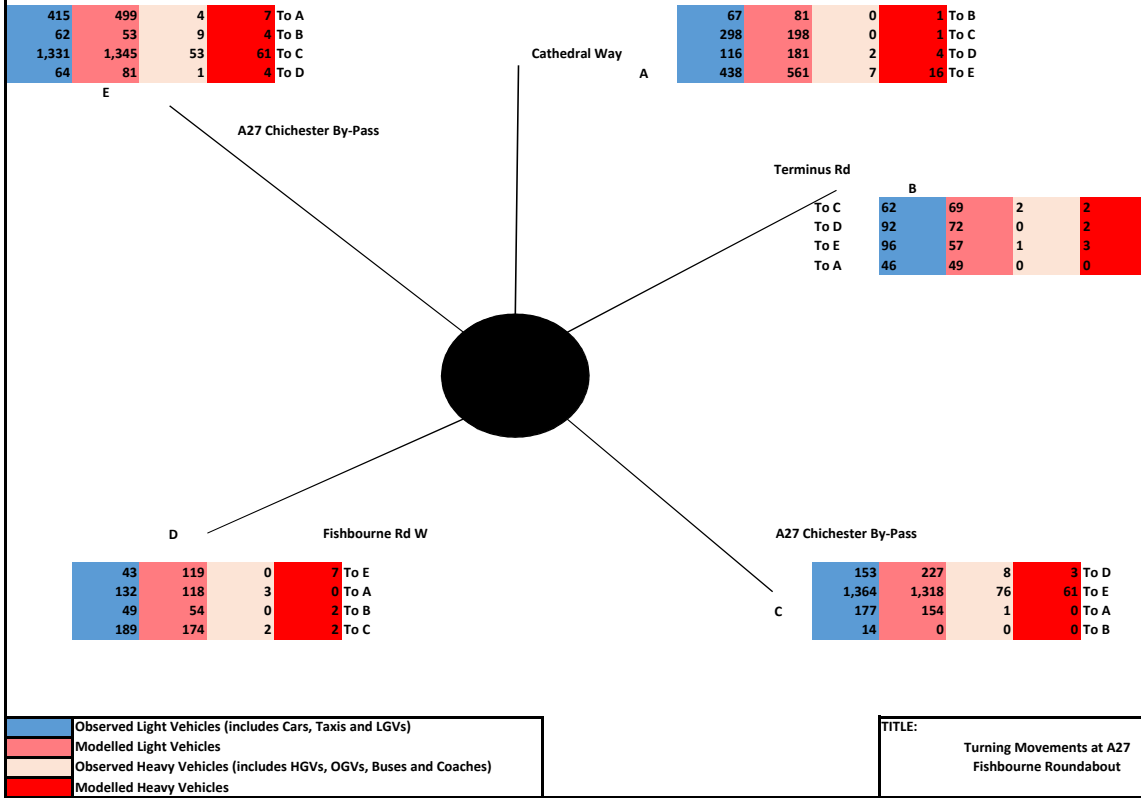




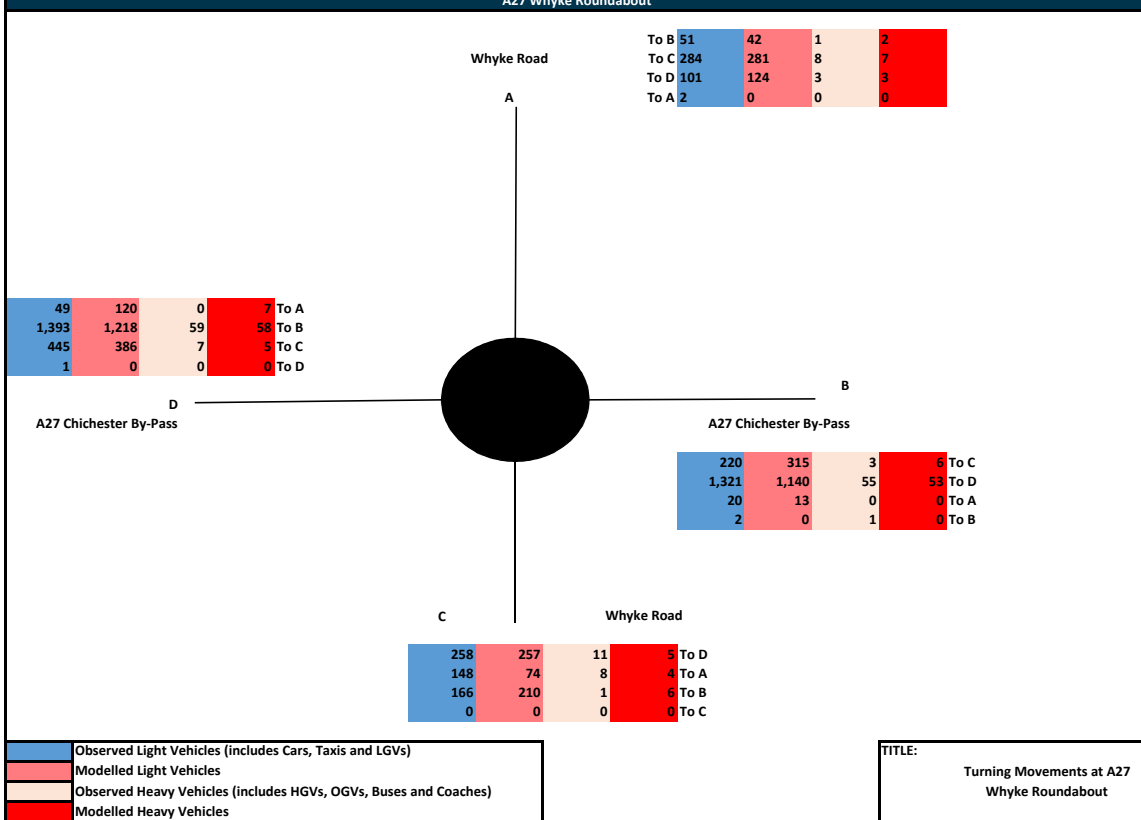


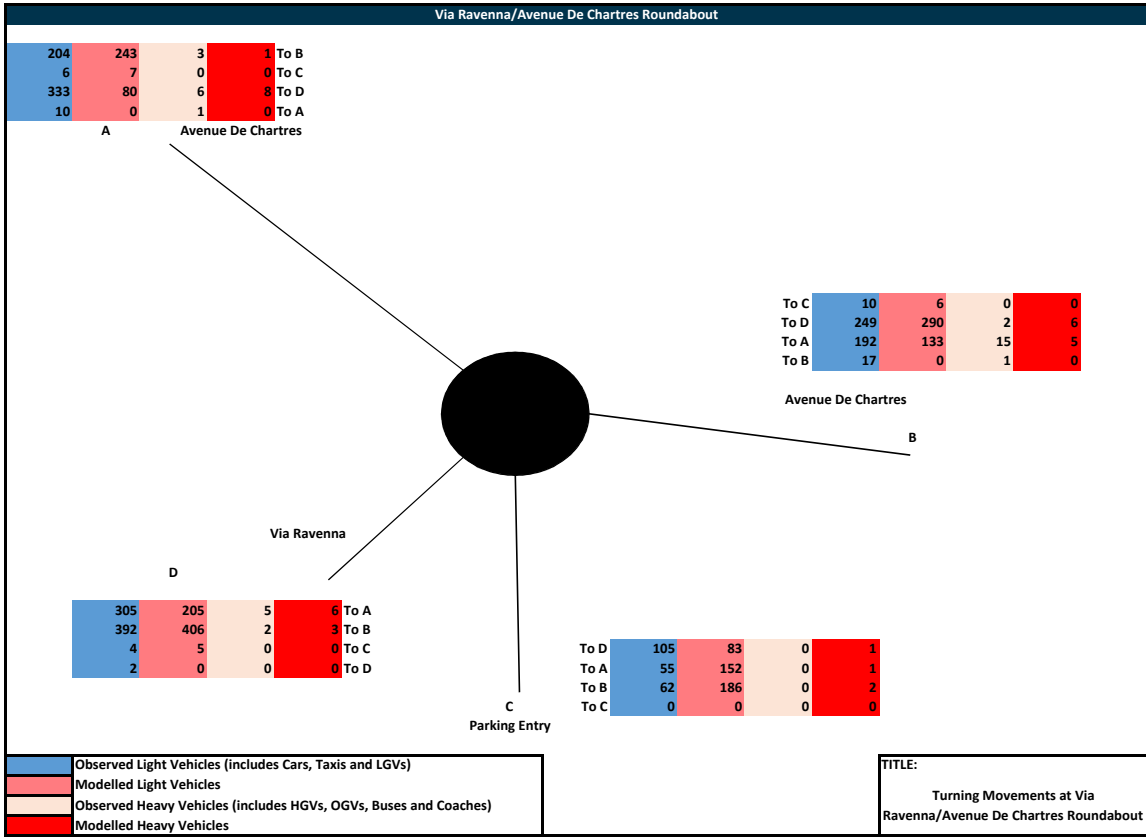
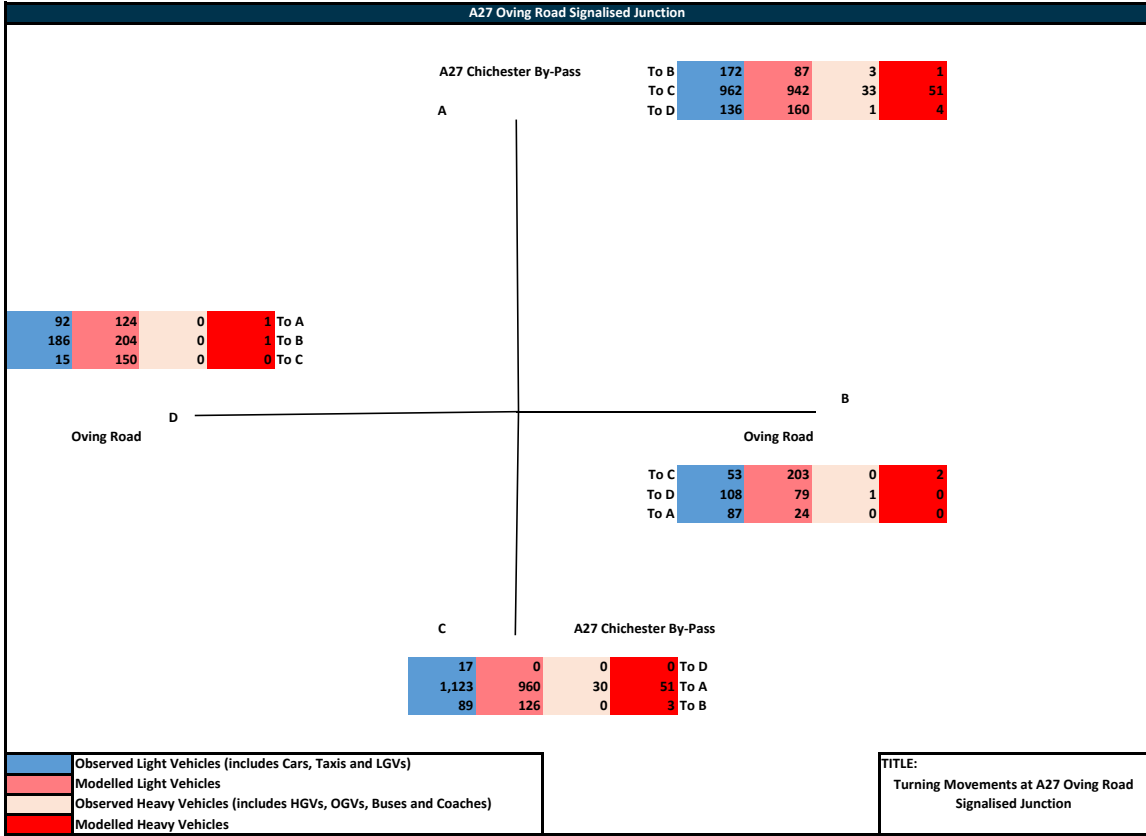


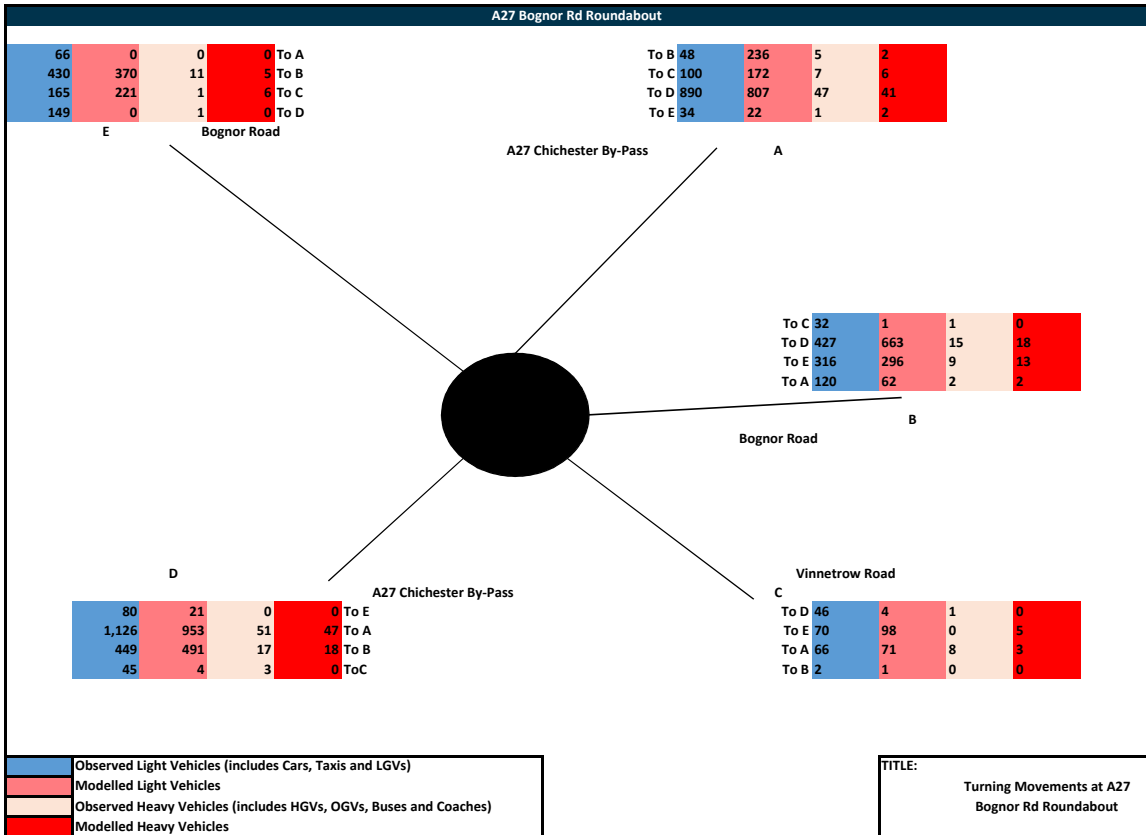
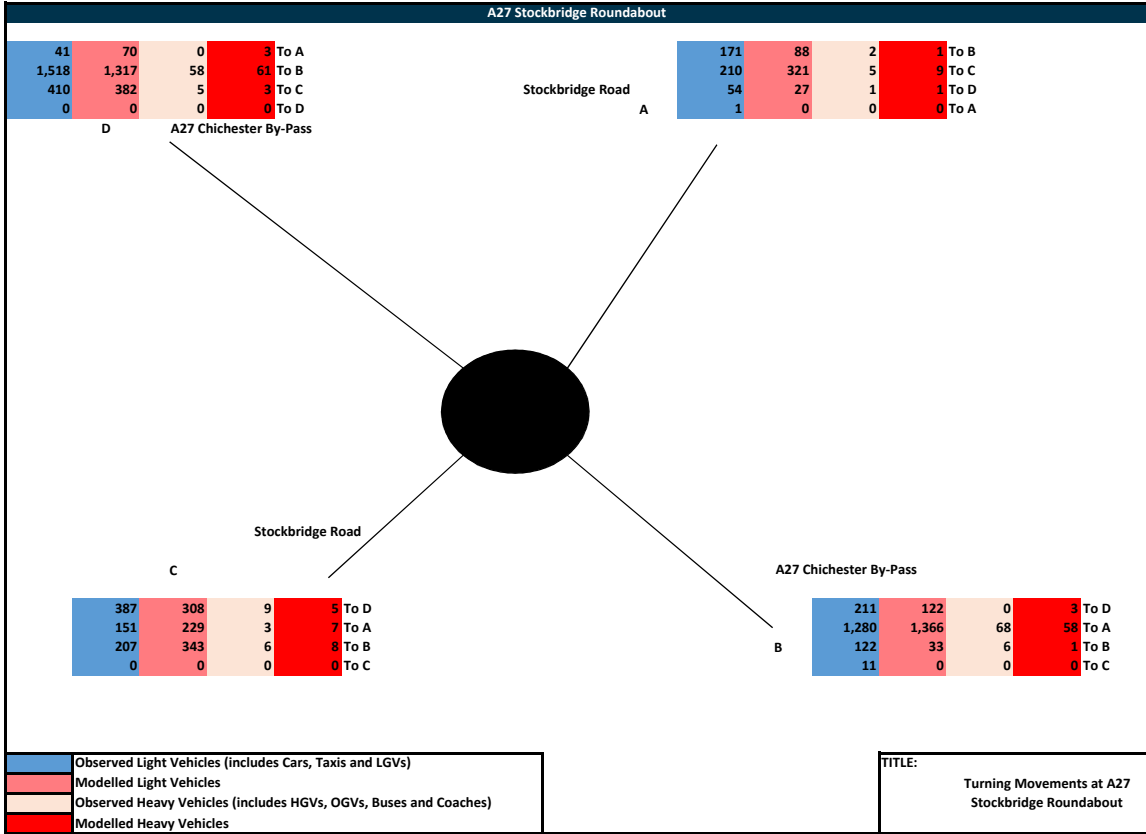
A27 Fishbourne Roundabout

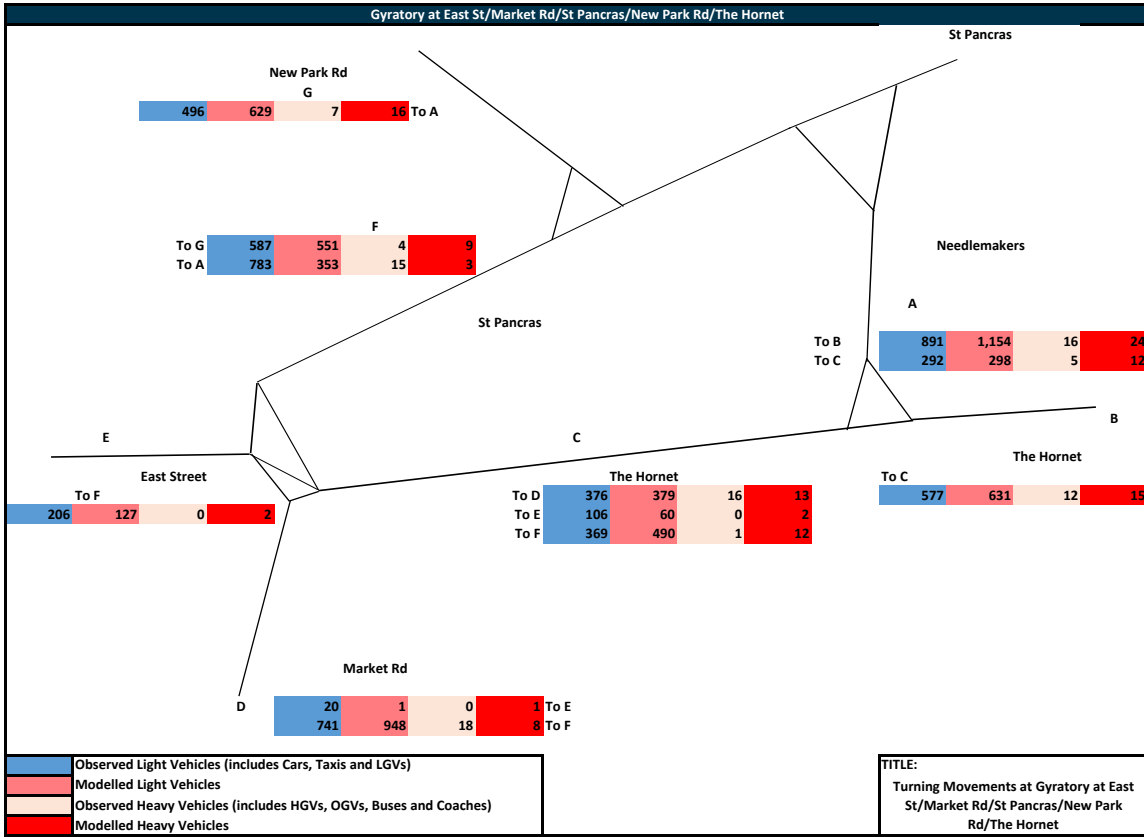
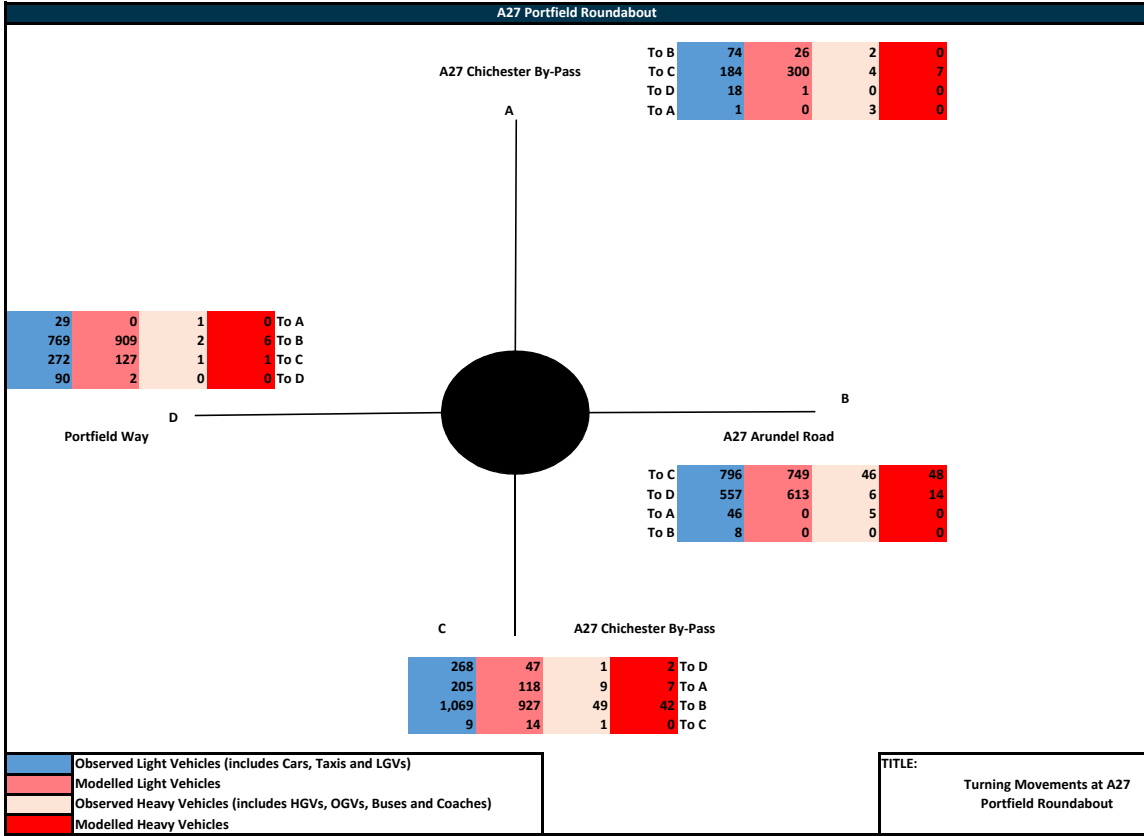


A27 Whyke Roundabout



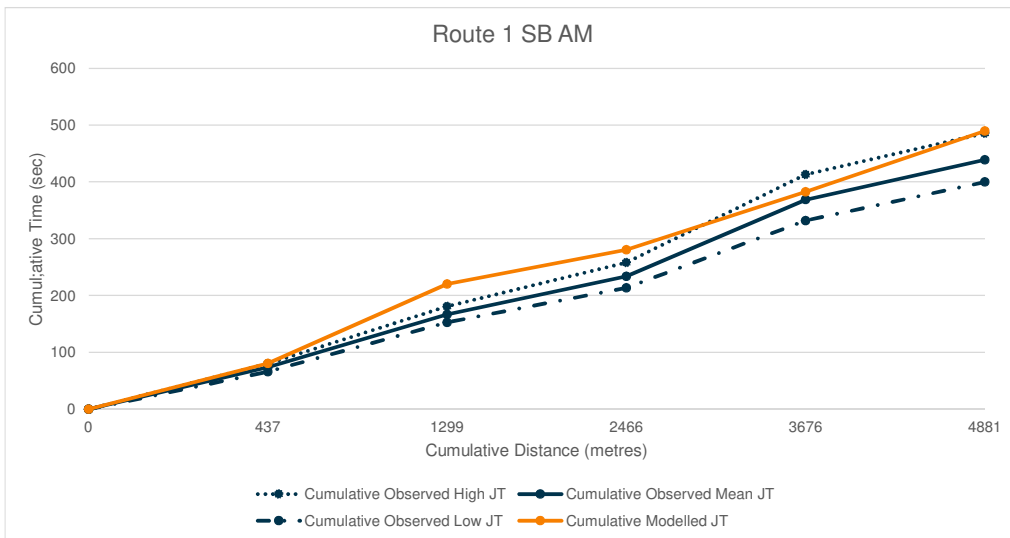
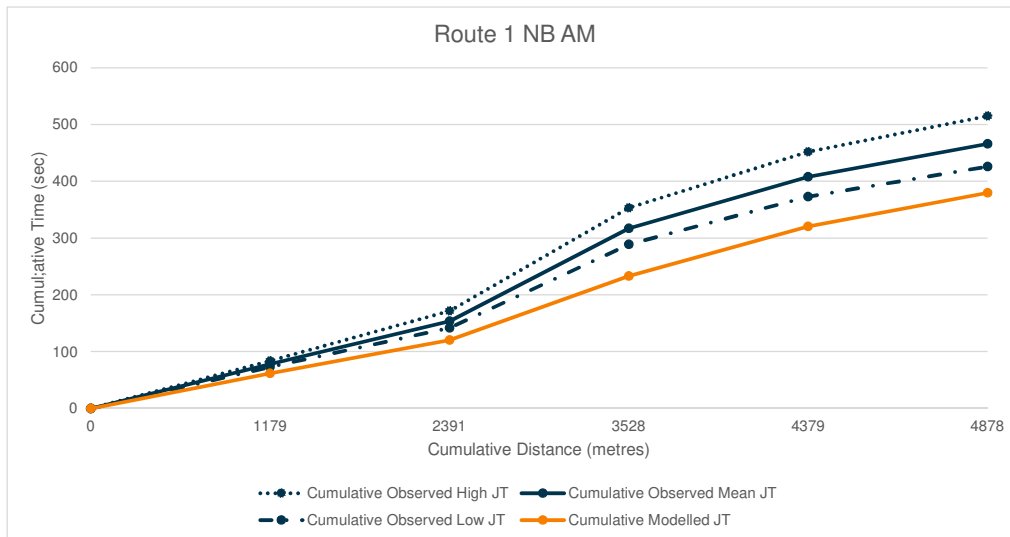


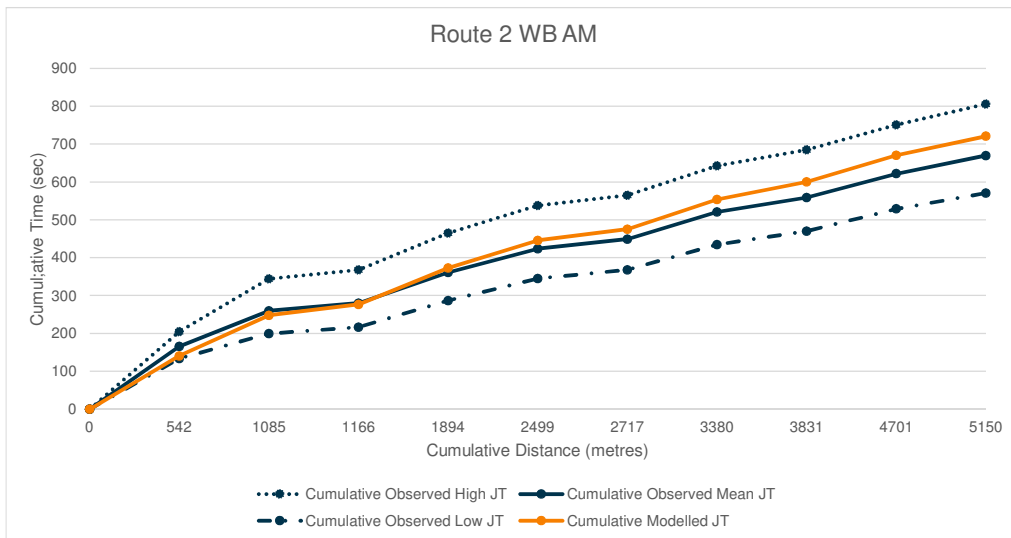
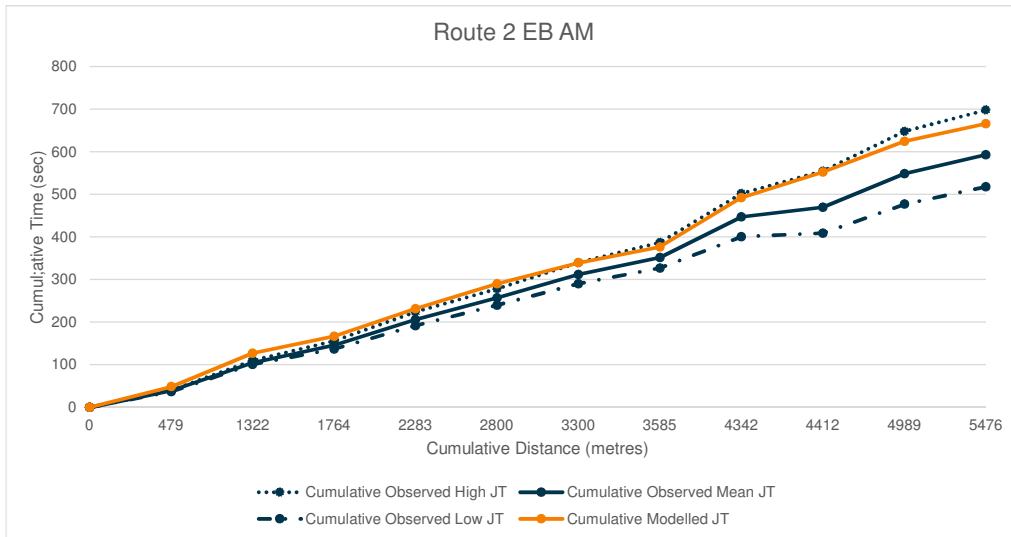


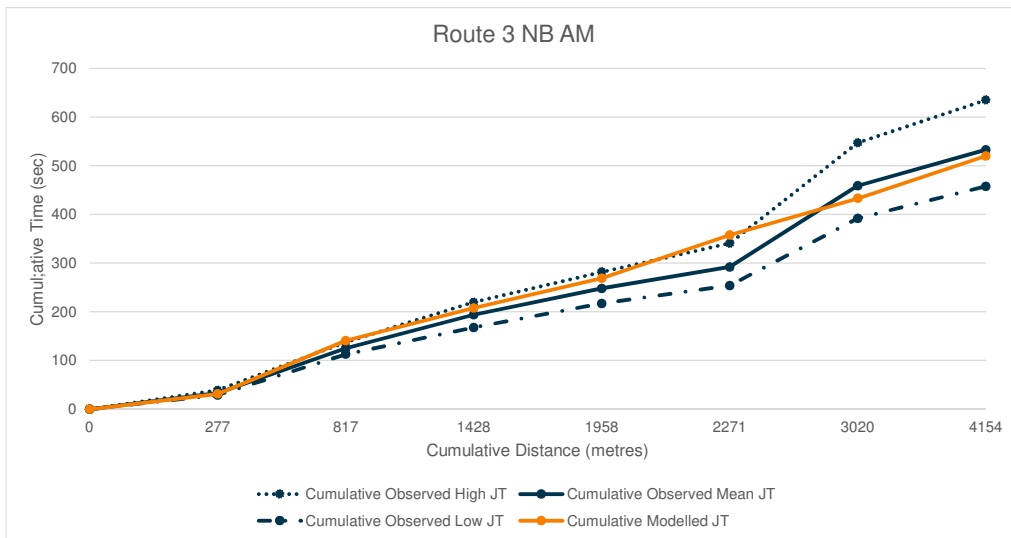
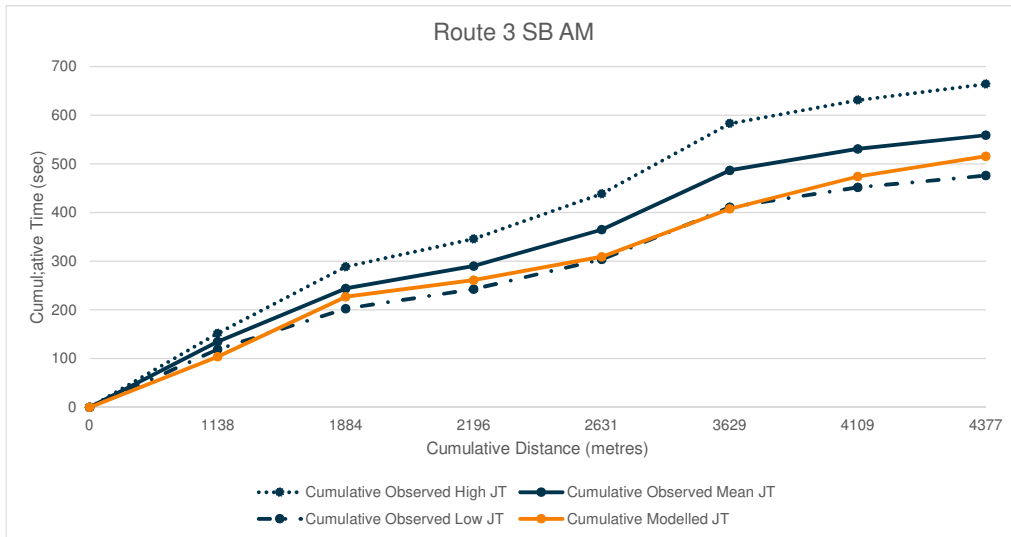


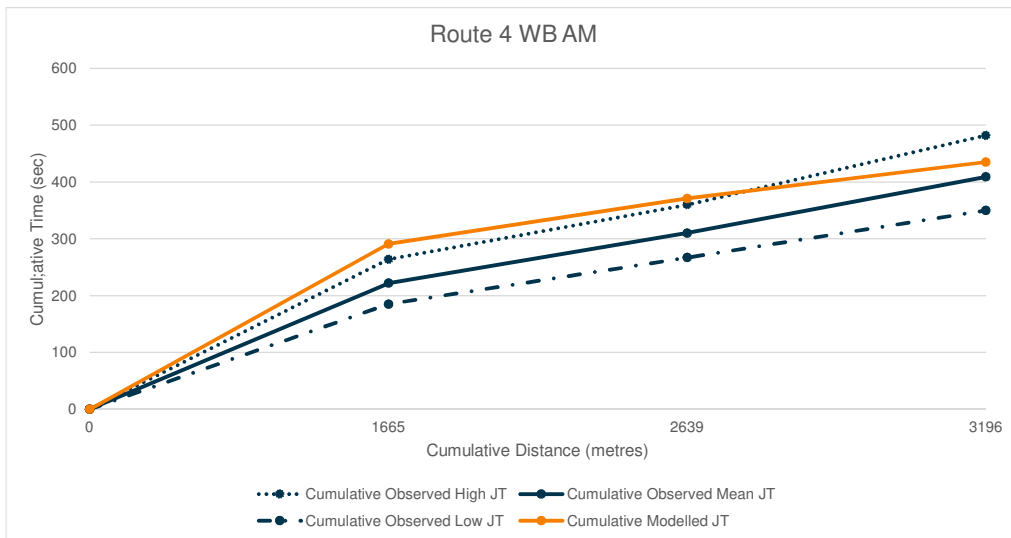
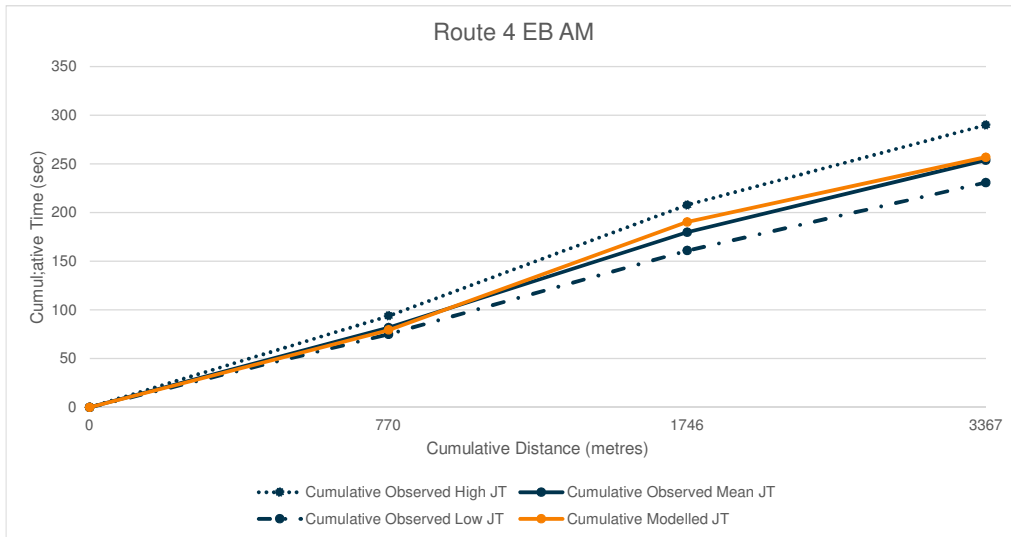
Appendix E Journey Time Validation

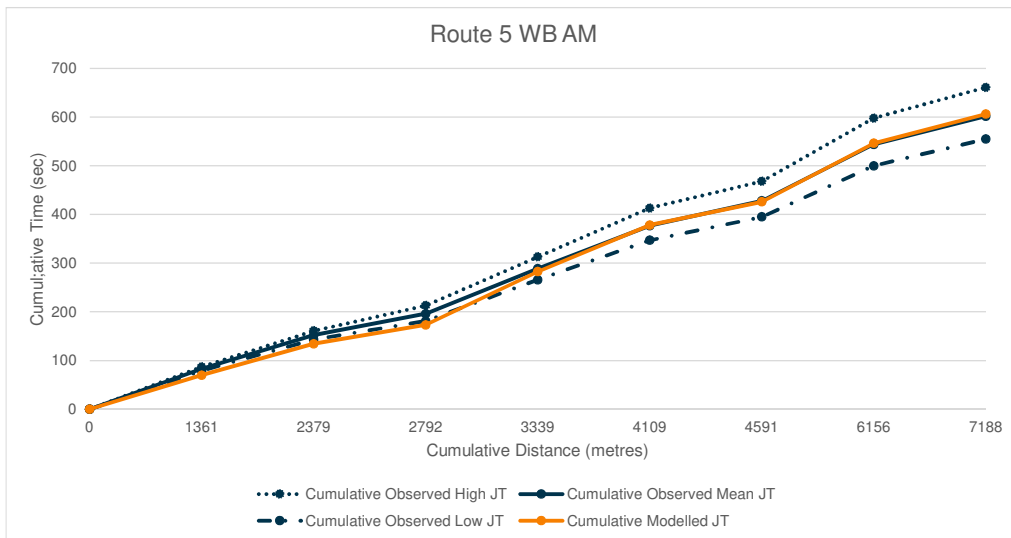
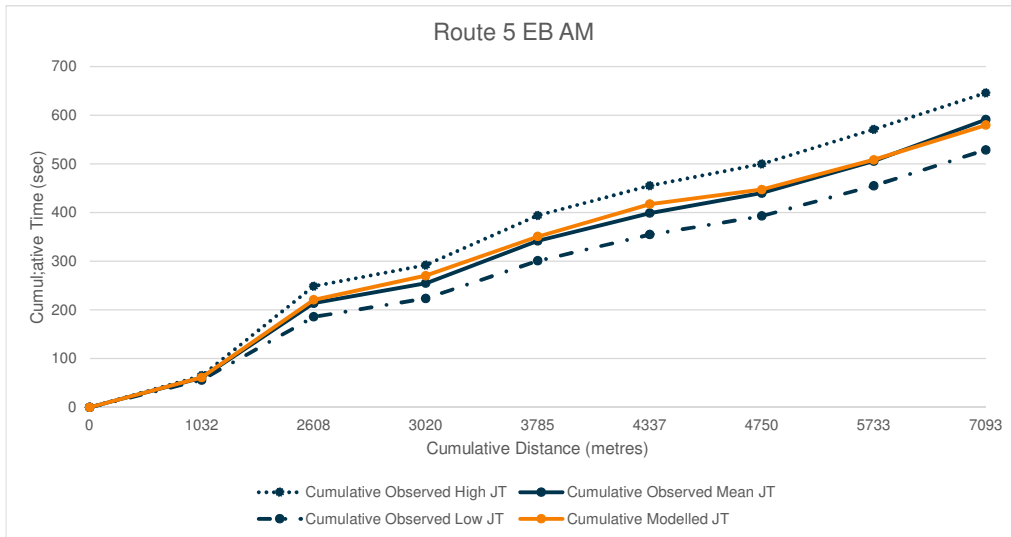
AM JOURNEY TIME VALIDATION												
Route	Direction	Section	SATURN Link CATM	Cumulative Distance	Cumulative Observed High JT	Cumulative Observed Mean JT	Cumulative Observed Low JT	Model Distance	Cumulative Modelled JT	Difference (seconds)	Difference %	DMRB
1	NB	0-1	9001	0	0	0	0	0	0			
1	NB	1-2	11001_5739	1179	84	78	73	1200	62.15	-15.85	-20%	Pass
1	NB	2-3	11004_6936	2391	172	154	142	2392	120.44	-17.71	-23%	Pass
1	NB	3-4	11006_10002	3528	353	317	289	3562	233.38	-50.06	-31%	Pass
1	NB	4-5	11007_7952	4379	452	408	373	4446	320.69	-3.69	-4%	Pass
1	NB	5-6	30022_10003	4878	515	466	426	4888	379.7	1.01	2%	Pass
1	NB	Total		4878	515	466	426	4888	379.7	-86.3	-19%	Fail
1	SB	0-1	10003	0	0	0	0	0	0			
1	SB	1-2	11008_7952	437	80	74	66	442	80.84	6.84	9%	Pass
1	SB	2-3	11070_10002	1299	181	167	153	1326	220.61	46.77	50%	Pass
1	SB	3-4	11005_6936	2466	258	234	214	2496	280.83	-6.78	-10%	Pass
1	SB	4-5	11002_5739	3676	413	369	332	3688	382.8	-33.03	-24%	Pass
1	SB	5-6	11001_9001	4881	486	439	400	4888	489.67	36.87	53%	Pass
1	SB	Total		4881	486	439	400	4888	489.67	50.67	12%	Pass
2	EB	0-1	9001	0	0	0	0	0	0			
2	EB	1-2	4946_5046	479	40	39	37	492	48.72	9.72	25%	Pass
2	EB	2-3	5544_5744	1322	110	105	101	1327	126.9	12.18	18%	Pass
2	EB	3-4	5747_5648	1764	156	146	137	1734	167.28	-0.62	-2%	Pass
2	EB	4-5	6055_6054	2283	224	206	192	2296	231.45	4.17	7%	Pass
2	EB	5-6	11009_10005	2800	278	257	240	2833	289.95	7.5	15%	Pass
2	EB	6-7	20003_6547	3300	340	312	290	3349	339.48	-5.47	-10%	Pass
2	EB	7-8	6648_6543	3585	387	352	327	3650	376.95	-2.53	-6%	Pass
2	EB	8-9	6043_6044	4342	502	447	401	4434	492.12	20.17	21%	Pass
2	EB	9-10	5943_5940	4412	555	490	450	4509	552.18	37.06	8%	Pass
2	EB	10-11	5839_5739	4989	648	549	477	5021	624.91	-6.27	-8%	Pass
2	EB	11-12	50257_5635	5476	698	593	518	5537	665.89	-3.02	-7%	Pass
2	EB	Total		5476	698	593	518	5537	665.89	72.89	12%	Pass
2	WB	0-1	5635	0	0	0	0	0	0			
2	WB	1-2	50257_5739	542	205	166	134	516	140.52	-25.48	-15%	Pass
2	WB	2-3	5940_5943	1085	344	308	280	1048	248	13.48	14%	Pass
2	WB	3-4	5943_6044	1166	368	280	217	1103	276.58	8.58	43%	Pass
2	WB	4-5	6446_6542	1894	465	361	287	1895	373.22	15.64	19%	Pass
2	WB	5-6	6454_10005	2499	538	424	345	2551	446.08	9.86	16%	Pass
2	WB	6-7	11009_11010	2717	565	449	368	2776	475.34	4.26	17%	Pass
2	WB	7-8	5650_5648	3380	643	521	435	3469	553.95	6.61	9%	Pass
2	WB	8-9	5745_5744	3831	685	559	470	3900	600.36	8.41	22%	Pass
2	WB	9-10	5344_5046	4701	751	622	529	4735	670.59	7.23	11%	Pass
2	WB	10-11	4945_9001	5150	806	670	571	5227	720.96	2.37	5%	Pass
2	WB	Total		5150	806	670	571	5227	720.96	50.96	8%	Pass
3	NB	0-1	6925	0	0	0	0	0	0			
3	NB	1-2	50264_6936	1138	152	119	111	1141	104.19	-30.81	-23%	Pass
3	NB	2-3	7041_7042	1884	289	244	203	1841	226.87	13.68	13%	Pass
3	NB	3-4	7044_7047	2196	346	290	243	2194	261.43	-11.44	-25%	Pass
3	NB	4-5	6748_6648	2631	439	365	304	2676	309	-27.43	-37%	Pass
3	NB	5-6	20006_7153	3629	583	487	411	3624	407.66	-23.34	-19%	Pass
3	NB	6-7	7555_7656	4109	631	531	452	4183	474.19	22.53	51%	Pass
3	NB	7-8	7755_10003	4377	664	559	476	4490	515.74	13.55	48%	Pass
3	NB	Total		4377	664	559	476	4490	515.74	-43.26	-8%	Pass
3	SB	0-1	10003	0	0	0	0	0	0			
3	SB	1-2	7755_7656	277	39	33	29	307	31.47	-1.53	-5%	Pass
3	SB	2-3	20004_7153	817	138	125	113	866	140.76	17.29	19%	Pass
3	SB	3-4	6649_6650	1428	220	194	168	1500	208.09	-1.67	-2%	Pass
3	SB	4-5	7048_7047	1958	282	248	217	2099	269.23	7.14	13%	Pass
3	SB	5-6	7044_7042	2271	341	292	254	2452	357.83	44.6	101%	Fail
3	SB	6-7	7040_6936	3020	547	459	392	3152	433.12	-91.71	-55%	Fail
3	SB	7-8	50264_6925	4154	635	533	458	4293	520.06	12.94	17%	Pass
3	SB	Total		4154	635	533	458	4293	520.06	-12.94	-2%	Pass
4	EB	0-1	6543	0	0	0	0	0	0			
4	EB	1-2	7048_7047	770	94	82	75	793	79.55	-2.45	-3%	Pass
4	EB	2-3	7742_10002	1746	208	180	161	1761	190.57	13.02	13%	Pass
4	EB	3-4	9137_9236	3367	290	254	231	3401	256.98	-7.59	-10%	Pass
4	EB	Total		3367	290	254	231	3401	256.98	2.98	1%	Pass
4	WB	0-1	9135	0	0	0	0	0	0			
4	WB	1-2	9135_10002	1665	264	222	185	1650	290.86	68.86	31%	Fail
4	WB	2-3	7345_7047	2639	360	310	267	2618	371.19	-7.67	-9%	Pass
4	WB	3-4	6648_6543	3196	482	409	350	3220	435.16	-35.03	-35%	Pass
4	WB	Total		3196	482	409	350	3220	435.16	26.16	6%	Pass
5	EB	0-1	40138	0	0	0	0	0	0			
5	EB	1-2	50255_3958	1032	65	61	56	1071	61.23	0.23	0%	Pass
5	EB	2-3	5854_5953	2608	249	214	186	2729	220.84	6.61	4%	Pass
5	EB	3-4	11009_10005	3020	292	255	224	3166	270.6	8.76	21%	Pass
5	EB	4-5	7053_7153	3785	394	340	301	3930	350.98	-6.62	-8%	Pass
5	EB	5-6	7555_7656	4337	455	399	355	4489	417.51	9.53	17%	Pass
5	EB	6-7	7658_10004	4750	500	440	393	4899	447.48	-1.03	-2%	Pass
5	EB	7-8	8362_8765	5733	571	506	455	5984	508.51	-4.97	-8%	Pass
5	EB	8-9	9471_9773	7093	646	591	529	7211	579.71	-13.8	-16%	Pass
5	EB	Total		7093	646	591	529	7211	579.71	-11.29	-2%	Pass
5	WB	0-1	9773	0	0	0	0	0	0			
5	WB	1-2	9471_8765	1361	87	83	79	1227	70.02	-12.98	-16%	Pass
5	WB	2-3	8261_10004	2379	161	152	143	2312	134.62	-4.4	-6%	Pass
5	WB	3-4	7658_7656	2792	213	196	181	2722	173.32	-5.3	-12%	Pass
5	WB	4-5	20004_7153	3339	313	289	266	3281	282.61	16.29	18%	Pass
5	WB	5-6	6456_10005	4109	413	377	347	4045	378.1	7.49	9%	Pass
5	WB	6-7	5955_5953	4591	468	428	395	4501	425.93	-3.17	-6%	Pass
5	WB	7-8	5459_40137	6156	598	544	500	6009	546.22	4.29	4%	Pass
5	WB	8-9	50255_40138	7188	661	602	555	7193	606.36	2.14	4%	Pass
5	WB	Total		7188	661	602	555	7193	606.36	4.36	1%	Pass
6	EB	0-1	4262	0	0	0	0	0	0			
6	EB	1-2	6158_6157	2429	224	205	186	2548	221.19	16.19	8%	Pass
6	EB	2-3	11009_10005	2734	256	235	214	2867	260.73	9.54	32%	Pass
6	EB	3-4	20004_7253	3594	375	339	307	3717	360.95	-3.78	-4%	Pass
6	EB	4-5	7253_7349	4070	427	388	353	4180	418.06	8.11	17%	Pass
6	EB	5-6	7750_7952	4550	570	512	454	4658	538.17	-3.89	-3%	Pass
6	EB	6-7	8652_8752	5539	647	583	520	5668	616.88	7.71	11%	Pass
6	EB	Total		5539	647	583	520	5668	616.88	33.88	6%	Pass
6	WB	0-1	8752	0	0	0	0	0	0			
6	WB	1-2	8652_7952	989	180	157	130	1010	143.38	-13.62	-9%	Pass
6	WB	2-3	7550_7349	1469	235	209	179	1488	203.55	8.17	16%	Pass
6	WB	3-4	7349_7253	1945	352	287	238	1951	269.68	-11.87	-15%	Pass
6	WB	4-5	6456_10005	2843	474	396	338	2801	394.85	16.17	15%	Pass
6	WB	5-6	5953_6157	3381	534	452	391	3375	452.9	2.05	4%	Pass
6	WB	6-7	5775_4262	5832	708	614	540	5923	622.3	7.4	5%	Pass
6	WB	Total		5832	708	614	540	5923	622.3	8.3	1%	Pass
7	NB	0-1	8024	0	0	0	0	0	0			
7	NB	1-2	8024_50266	1234	74	72	70	1240	70.51	-1.49	-2%	Pass
7	NB	2-3	50266_10002	1813	305	241	195	1770	285.69	46.18	27%	Pass
7	NB	3-4	30022_10003	3164	467	390	332	3096	432.01	-2.68	-2%	Pass
7	NB	4-5	7863_8166	4607	567	483	420	4552	513.65	-11.36	-12%	Pass
7	NB	5-6	5058_5063	5824	647	559	492	5739	589.9	0.25	0%	Pass
7	NB	Total		5824	647	559	492	5739	589.9	30.9	6%	Pass
7	SB	0-1	5063	0	0	0	0	0	0			
7	SB	1-2	5058_8166	1260	81	76	72	1187	74.8	-1.2	-2%	Pass
7	SB	2-3	10004_10003	2747	200</							

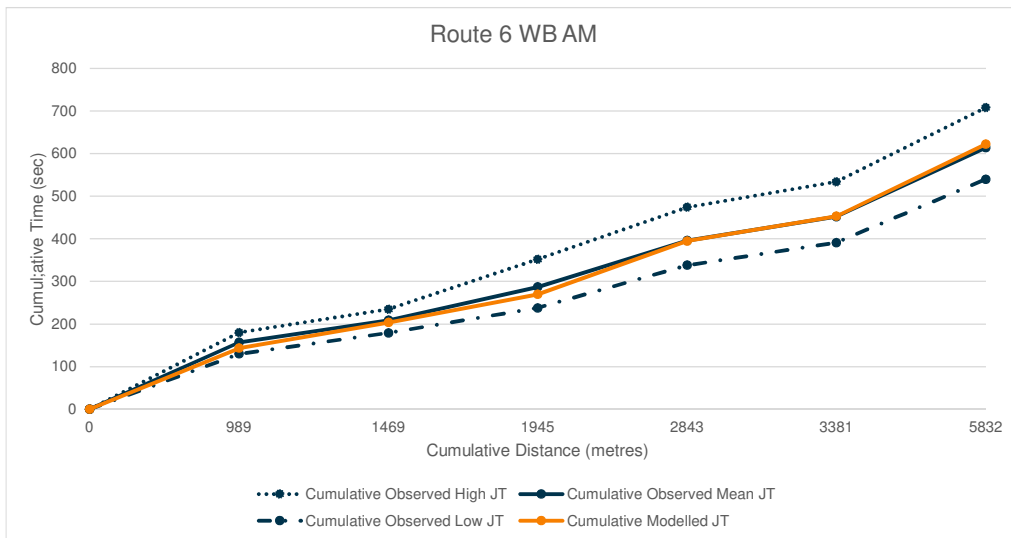
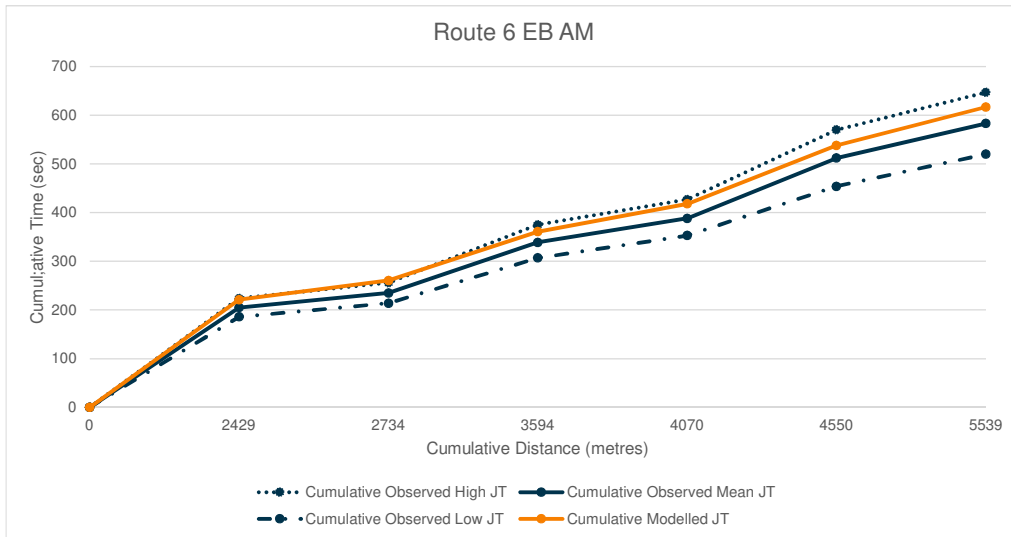


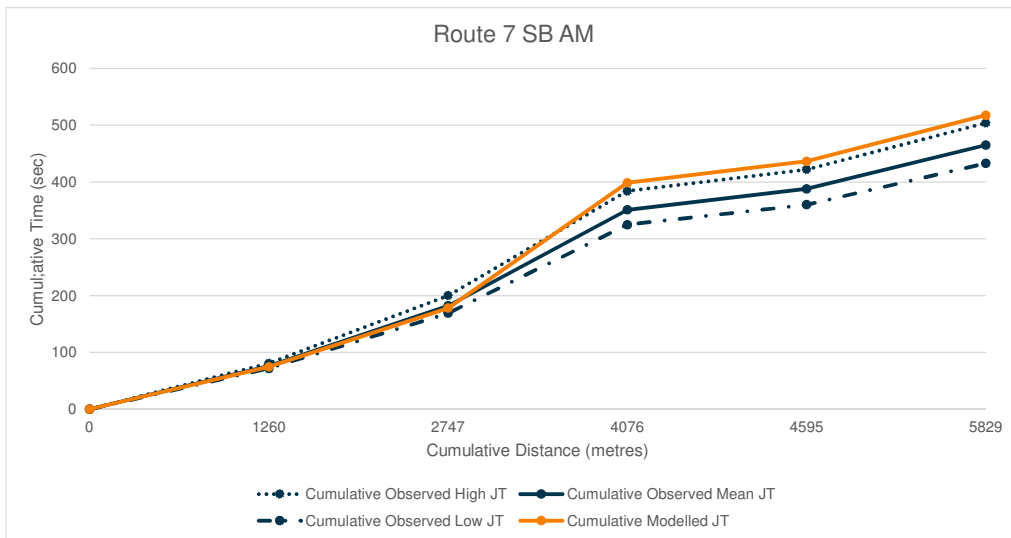
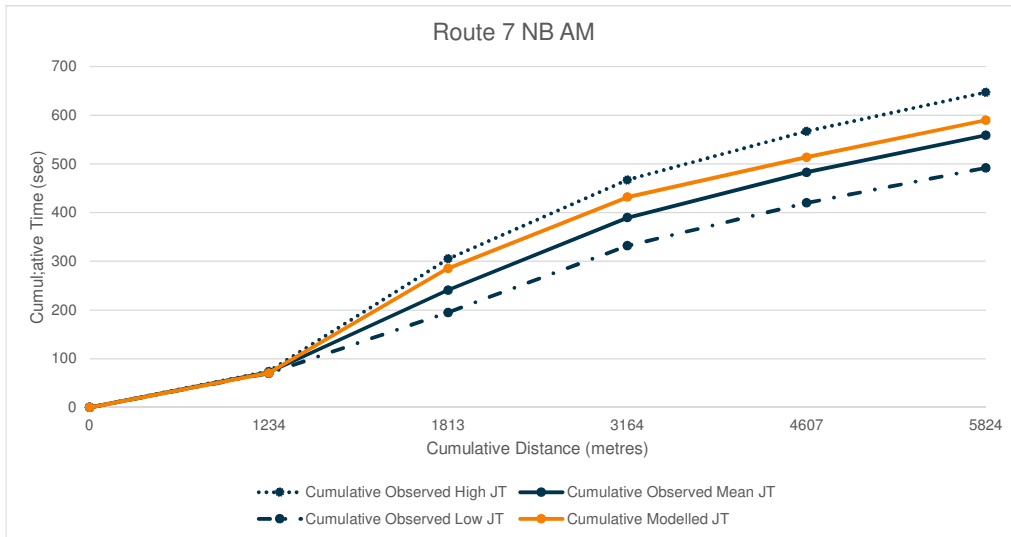


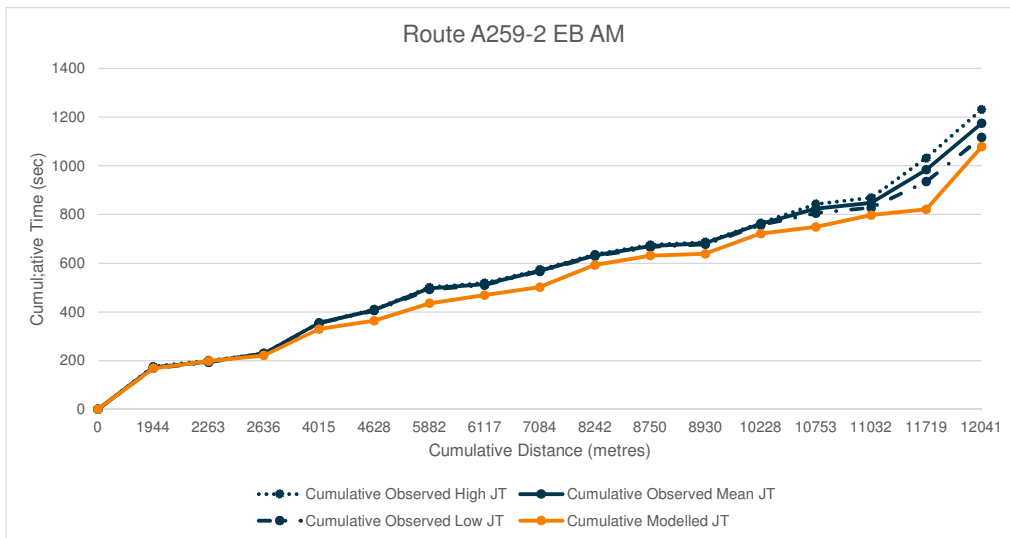
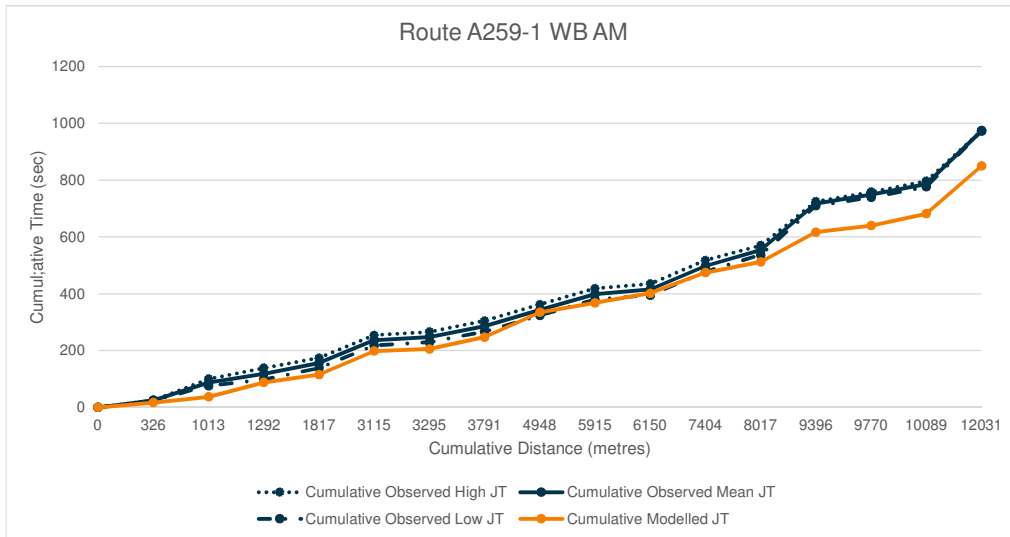


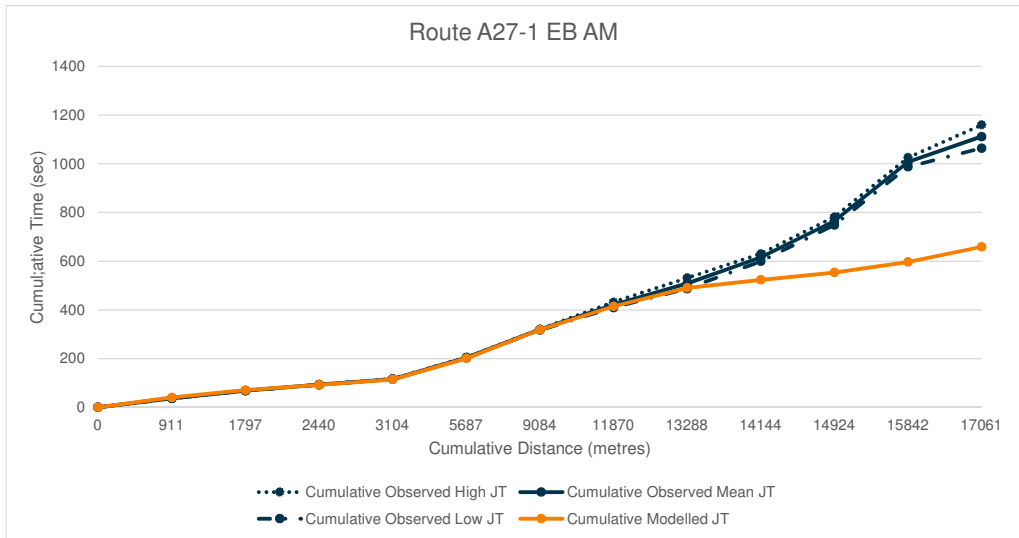
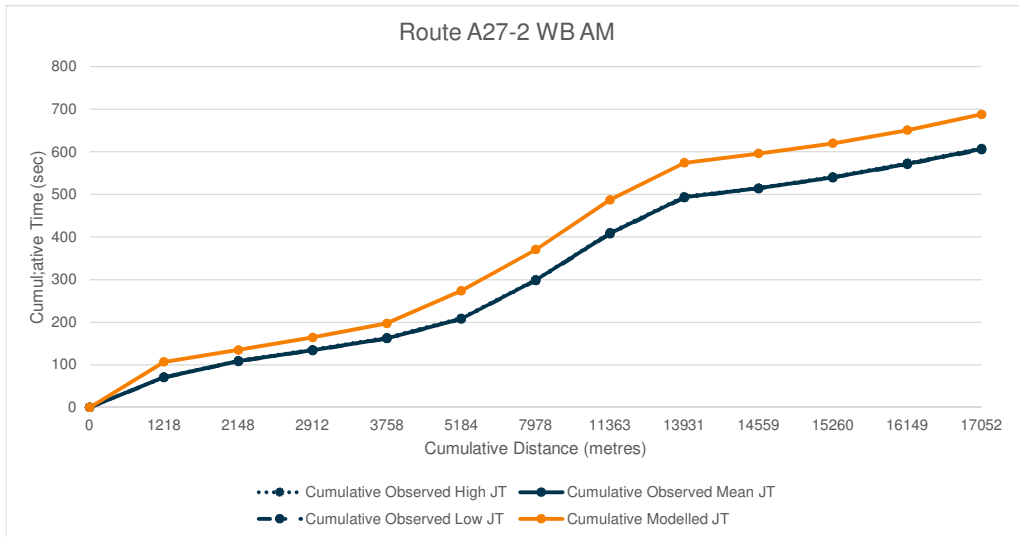




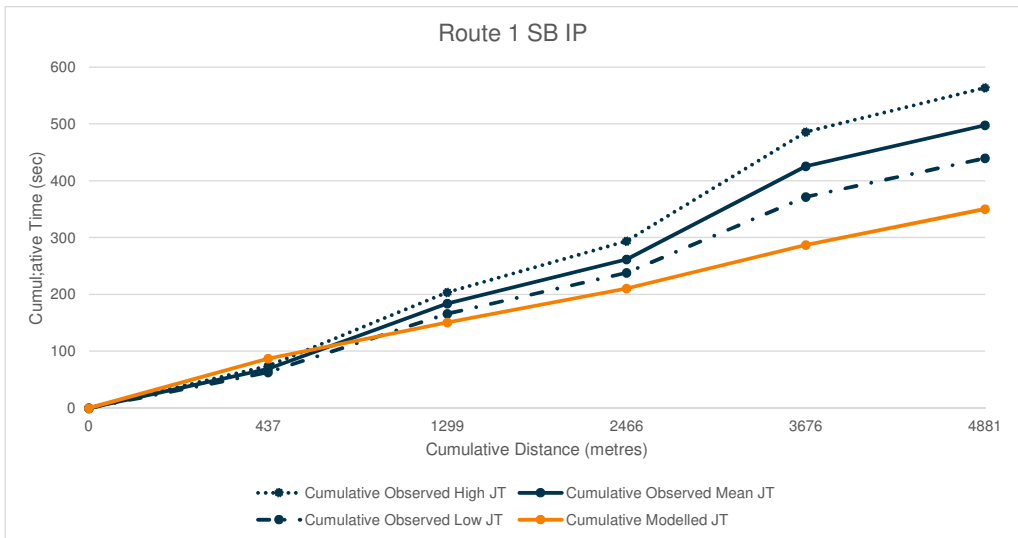
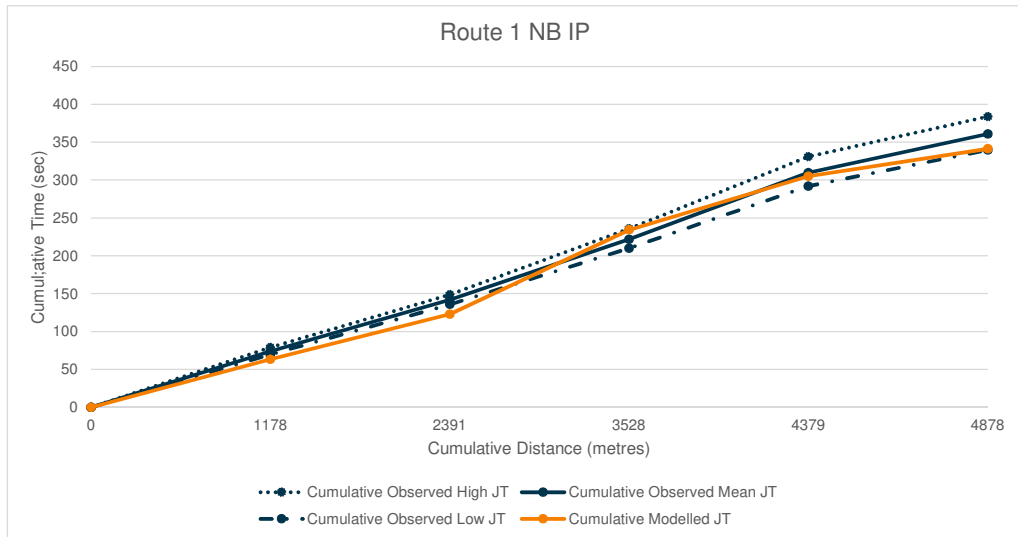


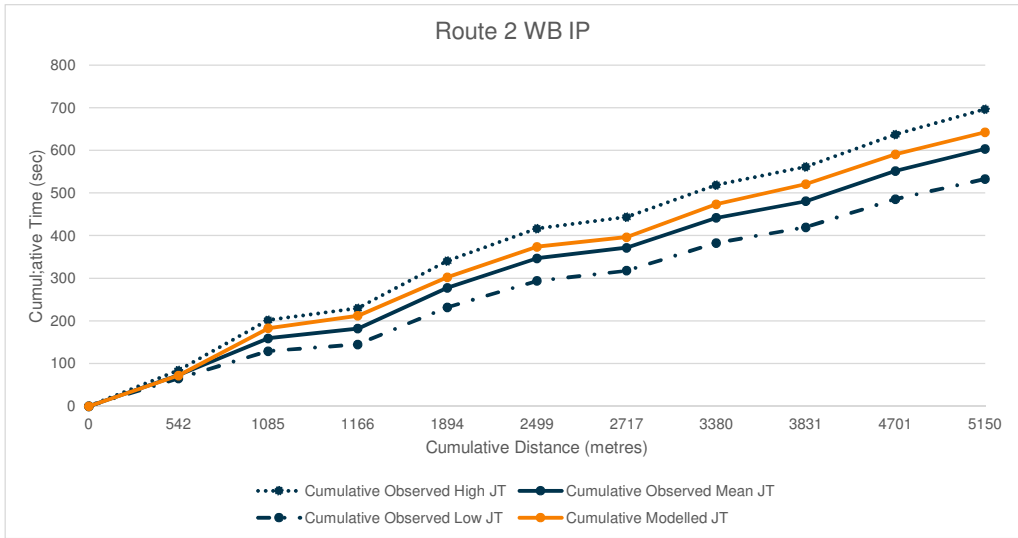
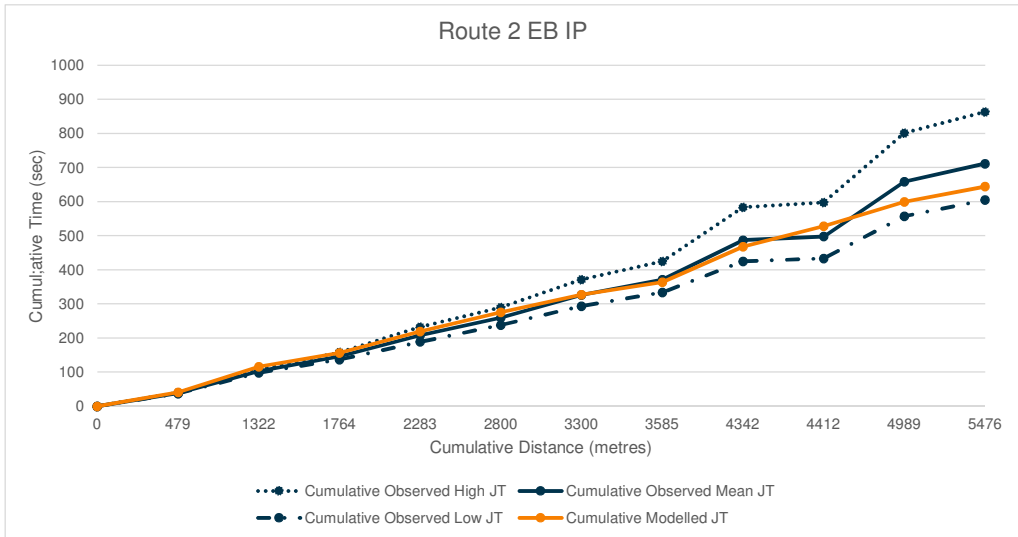


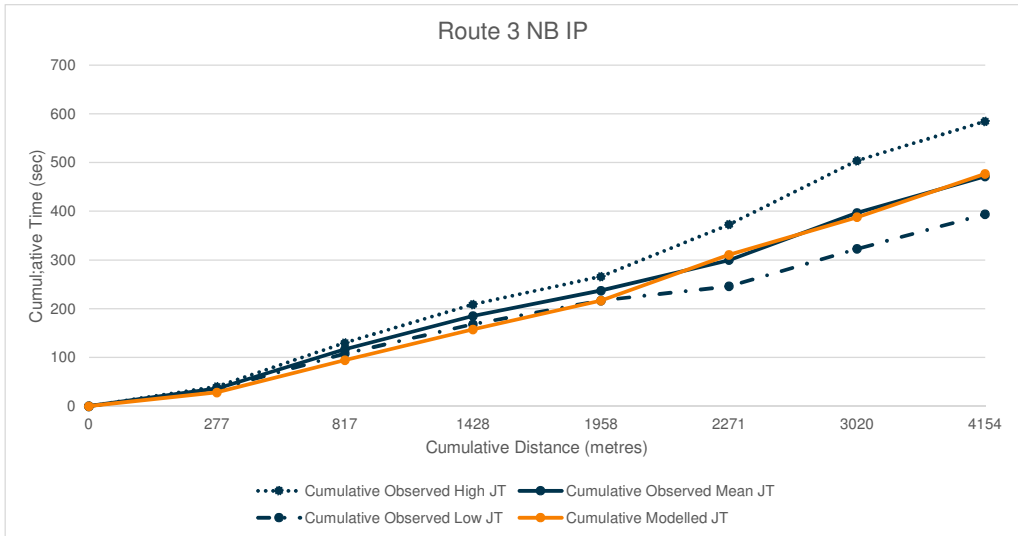
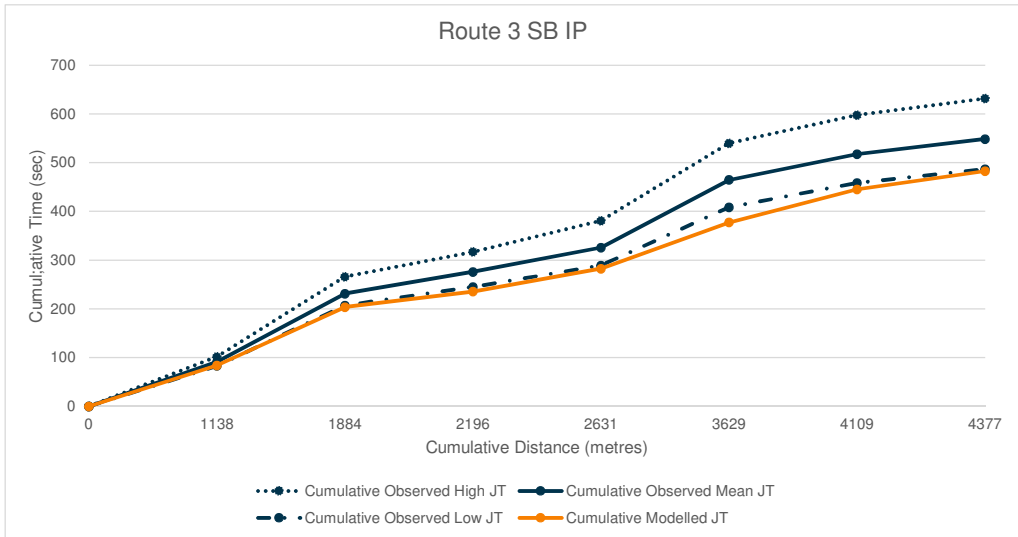


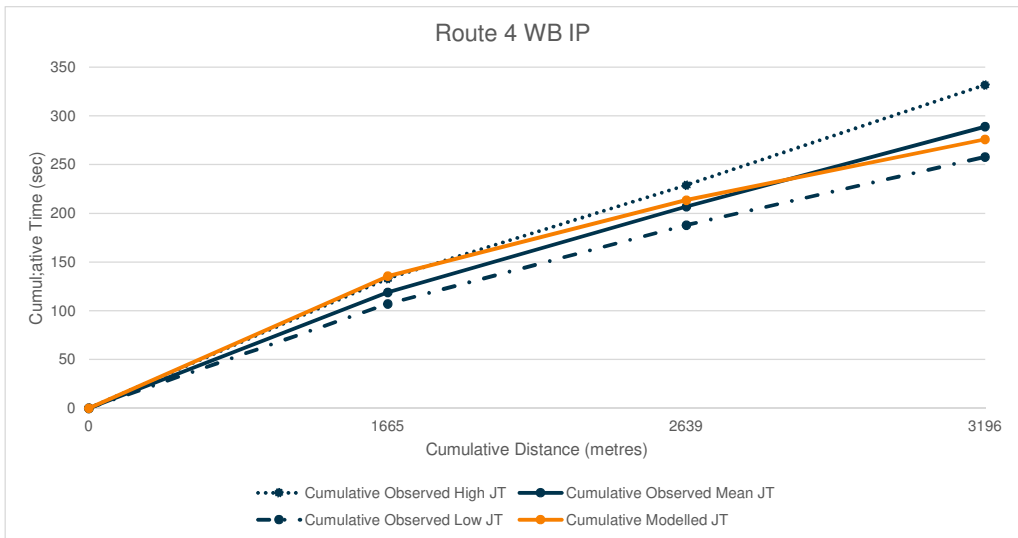
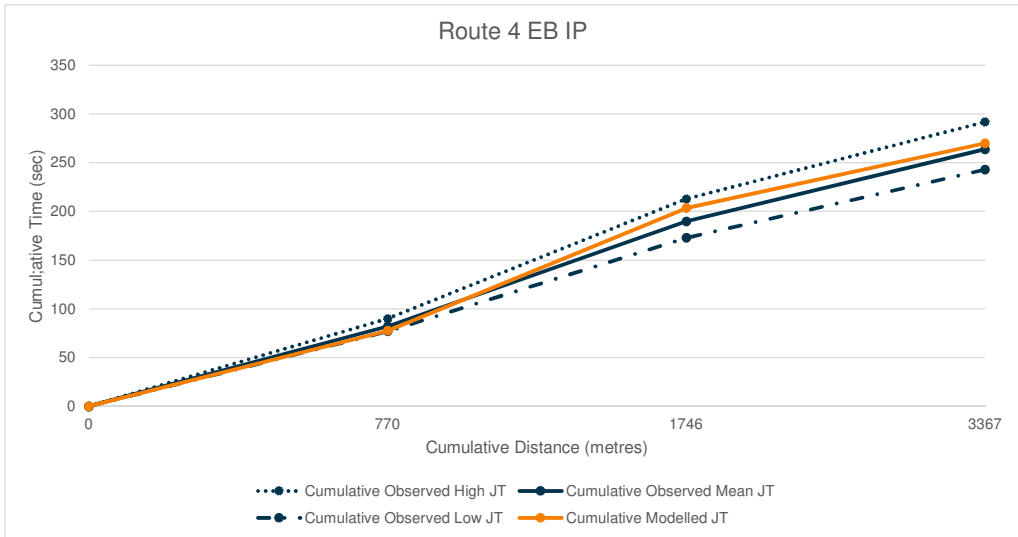


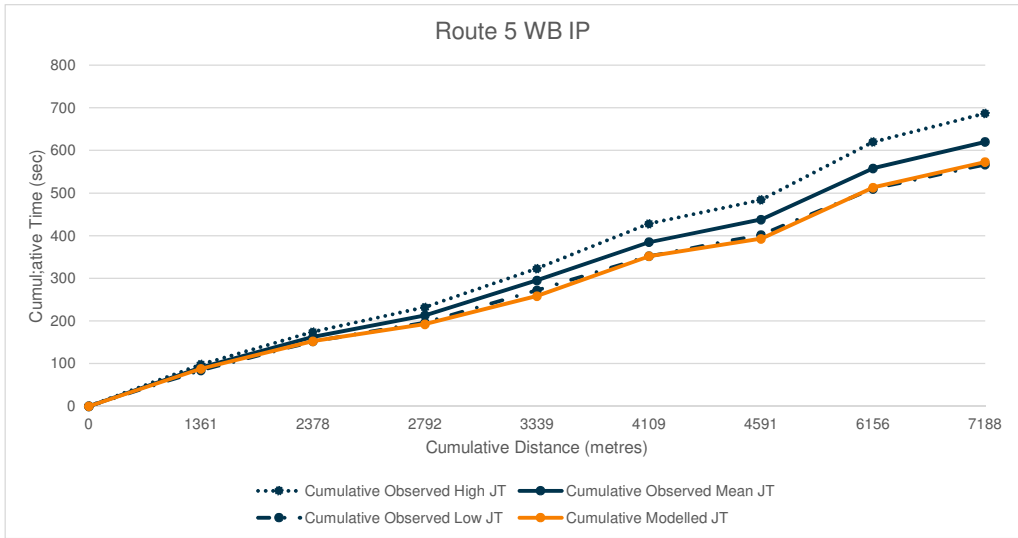
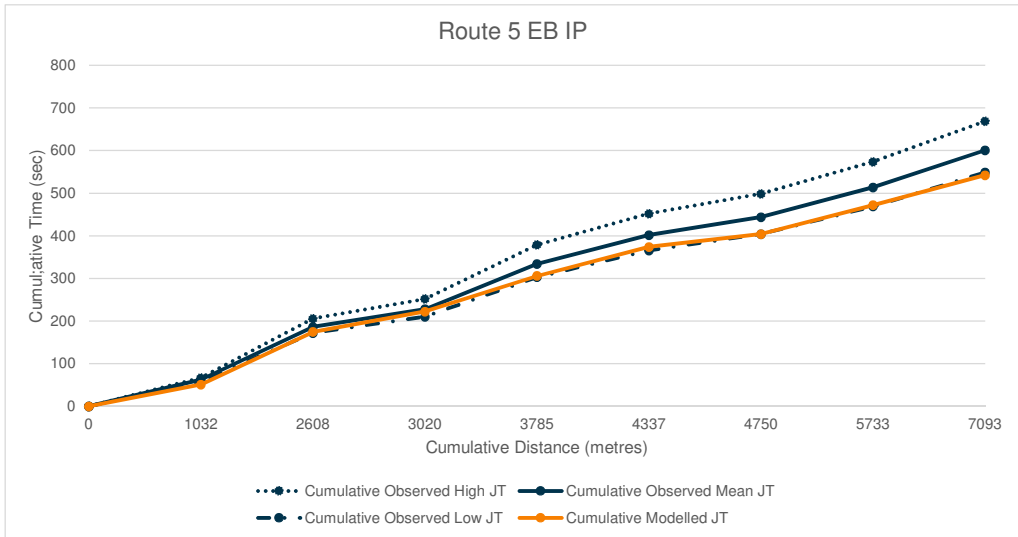
IP JOURNEY TIME VALIDATION												
Route	Direction	Section	SATURN Link CATM	Cumulative Distance	Cumulative Observed High JT	Cumulative Observed Mean JT	Cumulative Observed Low JT	Model Distance	Cumulative Modelled JT	Difference (seconds)	Difference %	DMRB
1	NB	0-1	9001	0	0	0	0	0	0			
1	NB	1-2	11001_5739	1178	79	74	70	1200	63.58	-10.42	-14%	Pass
1	NB	2-3	11004_6936	2391	149	142	136	2392	123.09	-8.49	-12%	Pass
1	NB	3-4	11006_10002	3528	236	222	210	3562	234.47	-31.38	-9%	Pass
1	NB	4-5	11007_7952	4379	331	310	292	4446	305.43	-17.04	-19%	Pass
1	NB	5-6	30022_10003	4878	384	361	340	4888	341.51	-14.92	-29%	Pass
1	NB	Total		4878	384	361	340	4888	341.51	-19.49	-5%	Pass
1	SB	0-1	10003	0	0	0	0	0	0			
1	SB	1-2	11008_7952	437	74	69	63	442	87.44	-18.44	-27%	Pass
1	SB	2-3	11070_10002	1299	204	184	166	1326	150.83	-51.61	-45%	Pass
1	SB	3-4	11005_6936	2466	294	262	238	2496	210.58	-18.25	-23%	Pass
1	SB	4-5	11002_5739	3676	486	426	372	3688	287.26	-87.32	-53%	Fail
1	SB	5-6	11001_9001	4881	564	498	440	4888	350.44	-8.82	-12%	Pass
1	SB	Total		4881	564	498	440	4888	350.44	-147.56	-30%	Fail
2	EB	0-1	9001	0	0	0	0	0	0			
2	EB	1-2	4946_5046	479	40	38	37	492	41.31	3.31	9%	Pass
2	EB	2-3	5544_5744	1322	108	103	98	1327	116.21	9.9	15%	Pass
2	EB	3-4	5747_5648	1764	158	146	137	1734	156.47	-2.74	-6%	Pass
2	EB	4-5	6055_6054	2283	233	208	189	2296	219.66	1.19	2%	Pass
2	EB	5-6	11009_10005	2800	290	260	238	2833	276.12	4.46	9%	Pass
2	EB	6-7	20003_6547	3300	372	327	294	3349	327.79	-15.33	-23%	Pass
2	EB	7-8	6648_6543	3585	425	372	334	3650	364.17	-8.62	-19%	Pass
2	EB	8-9	6043_6044	4342	584	487	425	4434	468.44	-10.73	-9%	Pass
2	EB	9-10	5943_5940	4412	598	498	434	4509	528.4	48.96	445%	Pass
2	EB	10-11	5839_5739	4989	802	659	558	5021	600.05	-89.35	-55%	Fail
2	EB	11-12	50257_5635	5476	864	712	605	5537	644.51	-8.54	-16%	Pass
2	EB	Total		5476	864	712	605	5537	644.51	-67.49	-9%	Pass
2	WB	0-1	5635	0	0	0	0	0	0			
2	WB	1-2	50257_5739	542	84	73	65	516	71.88	-1.12	-2%	Pass
2	WB	2-3	5940_5943	1085	202	159	129	1048	182.76	24.88	29%	Pass
2	WB	3-4	5943_6044	1166	230	182	145	1103	212.02	6.26	27%	Pass
2	WB	4-5	6446_6542	1894	341	278	232	1895	302.4	-5.62	-6%	Pass
2	WB	5-6	6454_10005	2499	417	347	294	2551	373.93	2.53	4%	Pass
2	WB	6-7	11009_11010	2717	444	372	318	2776	396.46	-2.47	-10%	Pass
2	WB	7-8	5650_5648	3380	519	442	383	3469	473.83	7.37	11%	Pass
2	WB	8-9	5745_5744	3831	562	481	420	3900	521.31	8.48	22%	Pass
2	WB	9-10	5344_5046	4701	638	552	486	4735	591.41	-0.9	-1%	Pass
2	WB	10-11	4945_9001	5150	697	604	533	5227	642.9	-0.51	-1%	Pass
2	WB	Total		5150	697	604	533	5227	642.9	38.9	6%	Pass
3	NB	0-1	6925	0	0	0	0	0	0			
3	NB	1-2	50264_6936	1138	102	91	83	1141	83.88	-7.12	-8%	Pass
3	NB	2-3	7041_7042	1884	266	231	207	1841	203.62	-20.26	-14%	Pass
3	NB	3-4	7044_7047	2196	317	276	245	2194	235.58	-13.04	-29%	Pass
3	NB	4-5	6748_6648	2631	381	326	289	2676	282.77	-2.81	-6%	Pass
3	NB	5-6	20006_7153	3629	540	465	409	3624	377.58	-44.19	-32%	Pass
3	NB	6-7	7555_7656	4109	598	518	459	4183	445.45	14.87	28%	Pass
3	NB	7-8	7755_10003	4377	632	549	487	4490	482.93	6.48	21%	Pass
3	NB	Total		4377	632	549	487	4490	482.93	-66.07	-12%	Pass
3	SB	0-1	10003	0	0	0	0	0	0			
3	SB	1-2	7755_7656	277	40	36	34	307	28.35	-7.65	-21%	Pass
3	SB	2-3	20004_7153	817	108	117	108	866	94.76	-14.59	-18%	Pass
3	SB	3-4	6649_6650	1428	209	185	168	1500	157.42	-5.34	-8%	Pass
3	SB	4-5	7048_7047	1958	266	237	217	2099	216.69	7.27	14%	Pass
3	SB	5-6	7044_7042	2271	373	300	246	2452	310.8	31.11	49%	Pass
3	SB	6-7	7040_6936	3020	504	397	323	3152	388.07	-19.73	-20%	Pass
3	SB	7-8	50264_6925	4154	585	472	394	4293	476.81	13.74	18%	Pass
3	SB	Total		4154	585	472	394	4293	476.81	4.81	1%	Pass
4	EB	0-1	6543	0	0	0	0	0	0			
4	EB	1-2	7048_7047	770	90	82	77	793	77.68	-4.32	-5%	Pass
4	EB	2-3	7742_10002	1746	213	190	173	1761	203.58	17.9	17%	Pass
4	EB	3-4	9137_9236	3367	292	264	243	3401	270.03	-7.55	-10%	Pass
4	EB	Total		3367	292	264	243	3401	270.03	6.03	2%	Pass
4	WB	0-1	9135	0	0	0	0	0	0			
4	WB	1-2	9135_10002	1665	133	119	107	1650	135.51	16.51	14%	Pass
4	WB	2-3	7345_7047	2639	229	207	188	2618	213.59	-9.92	-11%	Pass
4	WB	3-4	6648_6543	3196	332	289	258	3220	276.02	-19.57	-24%	Pass
4	WB	Total		3196	332	289	258	3220	276.02	-12.98	-4%	Pass
5	EB	0-1	40138	0	0	0	0	0	0			
5	EB	1-2	50255_3958	1032	67	62	58	1071	51.14	-10.86	-18%	Pass
5	EB	2-3	5854_5953	2608	206	186	172	2729	174.66	-0.48	0%	Pass
5	EB	3-4	11009_10005	3020	252	228	210	3166	222.42	5.76	14%	Pass
5	EB	4-5	7053_7153	3785	379	334	303	3930	305.94	-22.48	-21%	Pass
5	EB	5-6	7555_7656	4337	452	402	366	4489	373.81	-0.13	0%	Pass
5	EB	6-7	7658_10004	4750	499	444	404	4899	403.93	-11.58	-28%	Pass
5	EB	7-8	8362_8765	5733	574	514	469	5984	472.08	-1.85	-3%	Pass
5	EB	8-9	9471_9773	7093	669	601	549	7211	542.48	-16.6	-19%	Pass
5	EB	Total		7093	669	601	549	7211	542.48	-58.52	-10%	Pass
5	WB	0-1	9773	0	0	0	0	0	0			
5	WB	1-2	9471_8765	1361	98	91	84	1227	87.89	-3.11	-3%	Pass
5	WB	2-3	8261_10004	2378	174	162	152	2312	152.46	-6.43	-9%	Pass
5	WB	3-4	7658_7656	2792	232	213	196	2722	192.11	-11.35	-22%	Pass
5	WB	4-5	20004_7153	3339	323	295	272	3281	258.52	-15.59	-19%	Pass
5	WB	5-6	6456_10005	4109	428	385	352	4045	351.8	3.28	4%	Pass
5	WB	6-7	5955_5953	4591	484	438	402	4501	392.86	-11.94	-23%	Pass
5	WB	7-8	5459_40137	6156	620	558	510	6009	513.18	0.32	0%	Pass
5	WB	8-9	50255_40138	7188	687	620	567	7193	573.04	-2.14	-3%	Pass
5	WB	Total		7188	687	620	567	7193	573.04	-46.96	-8%	Pass
6	EB	0-1	4262	0	0	0	0	0	0			
6	EB	1-2	6158_6157	2429	205	186	172	2548	188.48	2.48	1%	Pass
6	EB	2-3	11009_10005	2734	240	217	200	2867	226.57	7.09	23%	Pass
6	EB	3-4	20004_7253	3594	386	341	309	3717	329.29	-21.28	-17%	Pass
6	EB	4-5	7253_7349	4070	455	402	362	4180	387.03	-3.26	-5%	Pass
6	EB	5-6	7750_7952	4550	559	490	438	4658	496.96	21.93	25%	Pass
6	EB	6-7	8652_8752	5539	562	504	458	5668	576.3	7.34	10%	Pass
6	EB	Total		5539	637	562	504	5668	576.3	14.3	3%	Pass
6	WB	0-1	8752	0	0	0	0	0	0			
6	WB	1-2	8652_7952	989	149	122	92	1010	137.97	15.97	13%	Pass
6	WB	2-3	7550_7349	1469	205	174	141	1488	197.24	7.27	14%	Pass
6	WB	3-4	7349_7253	1945	300	253	205	1951	258.47	-17.77	-22%	Pass
6	WB	4-5	6456_10005	2843	428	364	304	2801	369.46	-0.01	0%	Pass
6	WB	5-6	5953_6157	3381	489	422	359	3375	420.19	-7.27	-13%	Pass
6	WB	6-7	5775_4262	5832	679	599	525	5923	591.21	-5.98	-3%	Pass
6	WB	Total		5832	679	599	525	5923	591.21	-7.79	-1%	Pass
7	NB	0-1	8024	0	0	0	0	0	0			
7	NB	1-2	8024_50266	1234	82	77	73	1240	70.3	-6.7	-9%	Pass
7	NB	2-3	50266_10002	1813	226	202	178	1770	169.17	-26.13	-21%	Pass
7	NB	3-4	30022_10003	3164	374	341	308	3096	276.21	-31.96	-23%	Pass
7	NB	4-5	7863_8166	4607	473	434	397	4552	357.46	-11.75	-13%	Pass
7	NB	5-6	5058_5063	5824	551	507	466	5739	432.63	2.17	3%	Pass
7	NB	Total		5824	551	507	466	5739	432.63	-74.37	-15%	Pass
7	SB	0-1	5063	0	0	0	0	0	0			
7	SB	1-2	5058_8166	1260	84	79	73	1187	75.15	-3.85	-5%	Pass
7	SB	2-3	10004_10003	2								

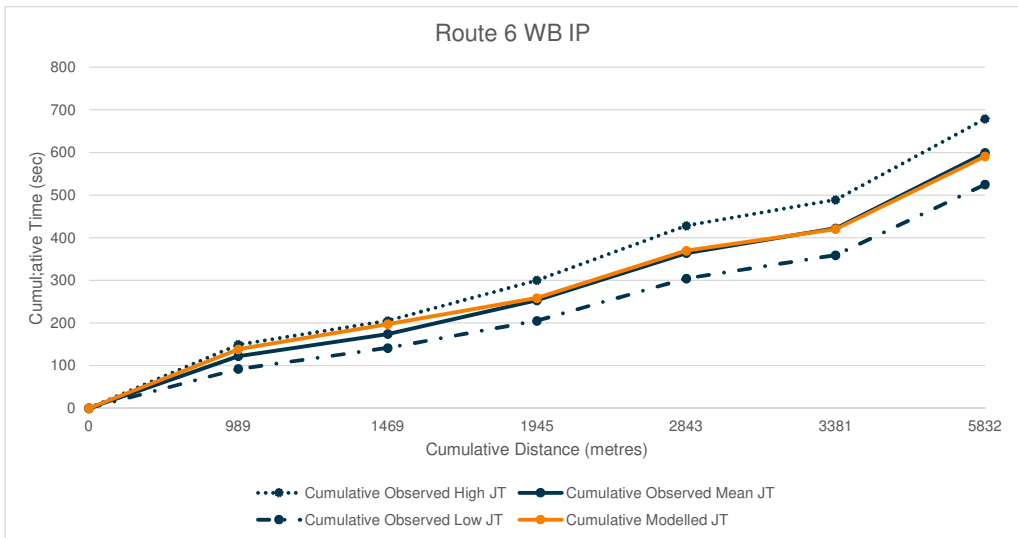
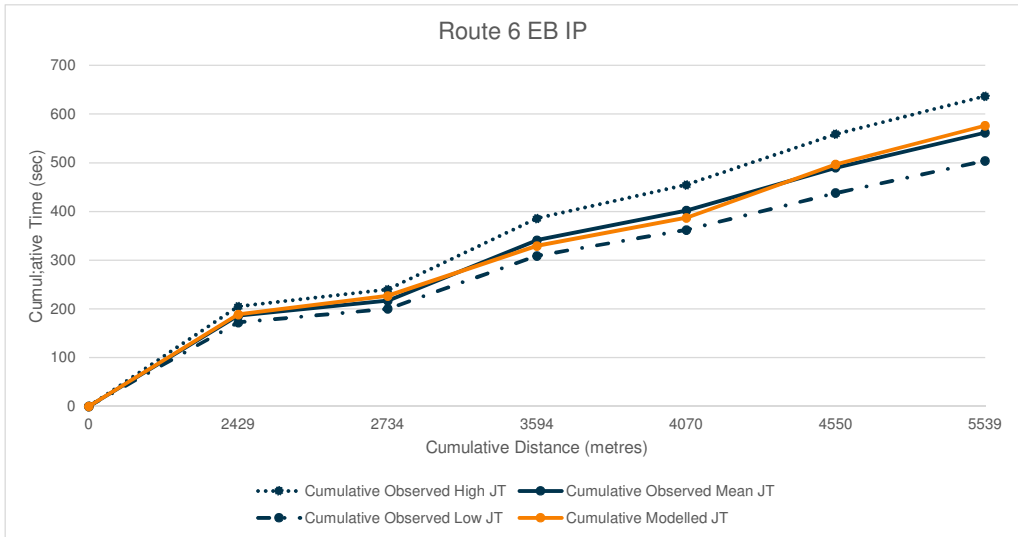


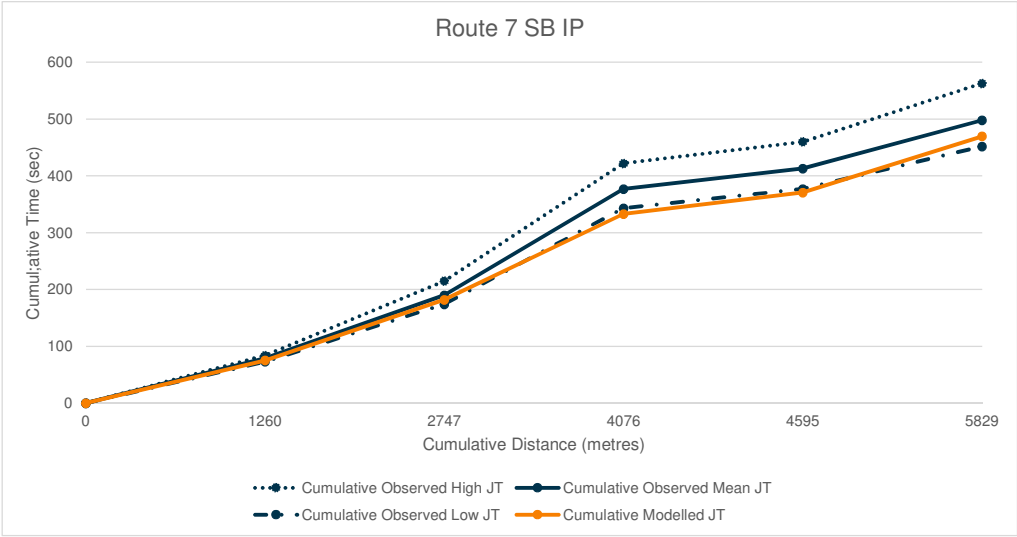
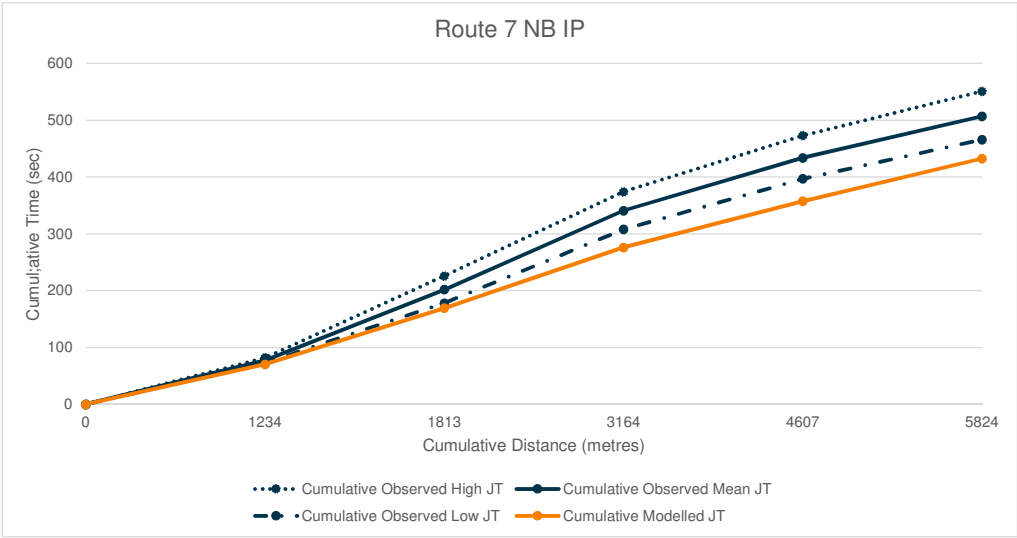


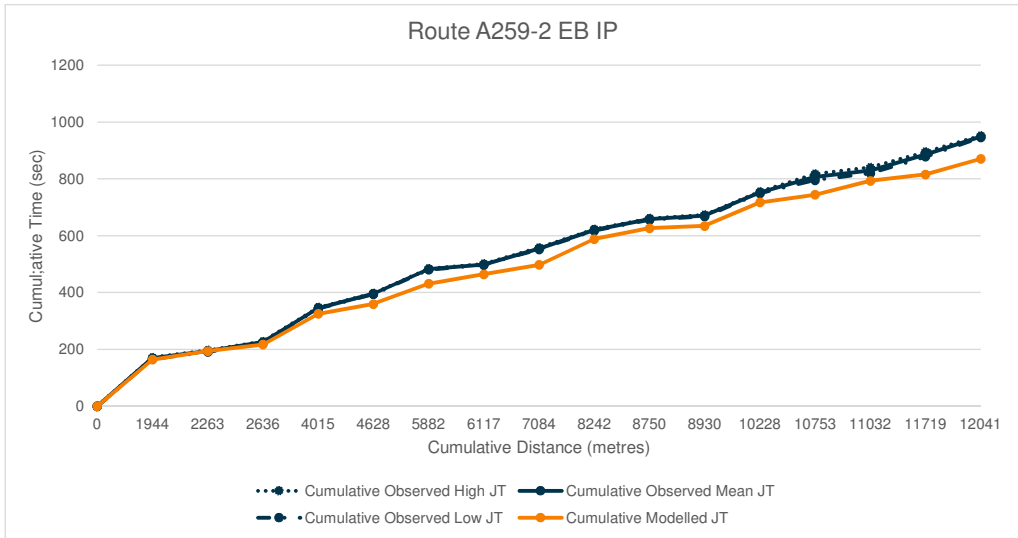
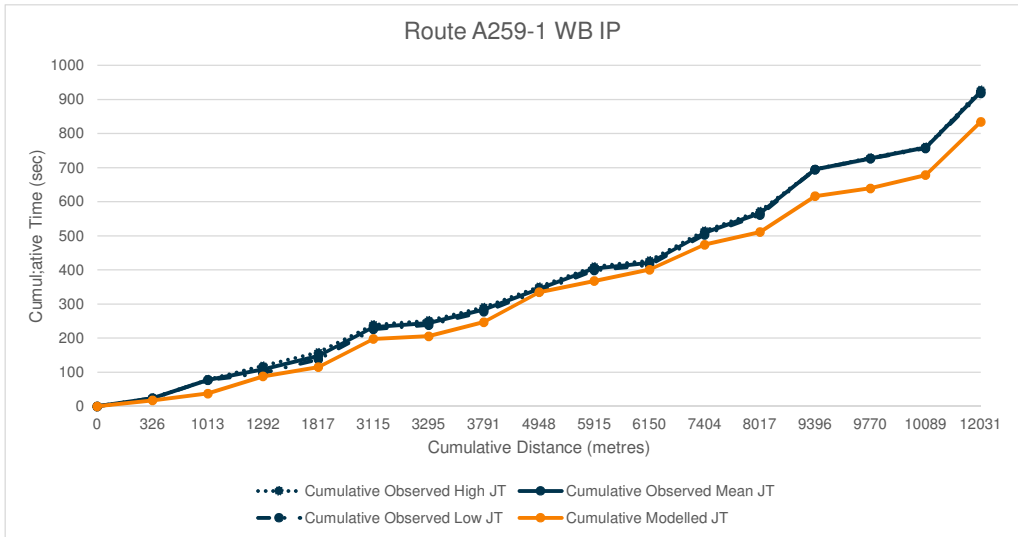


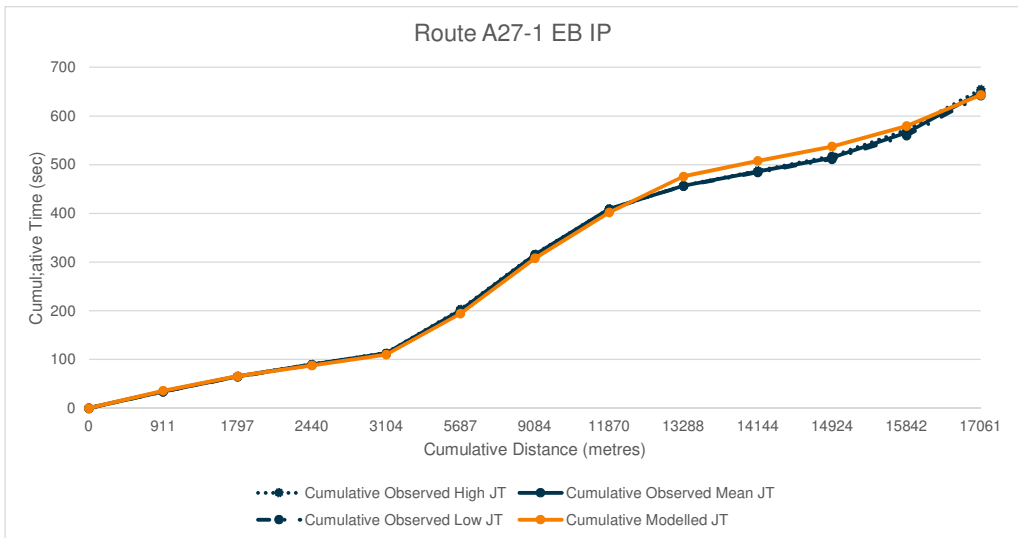
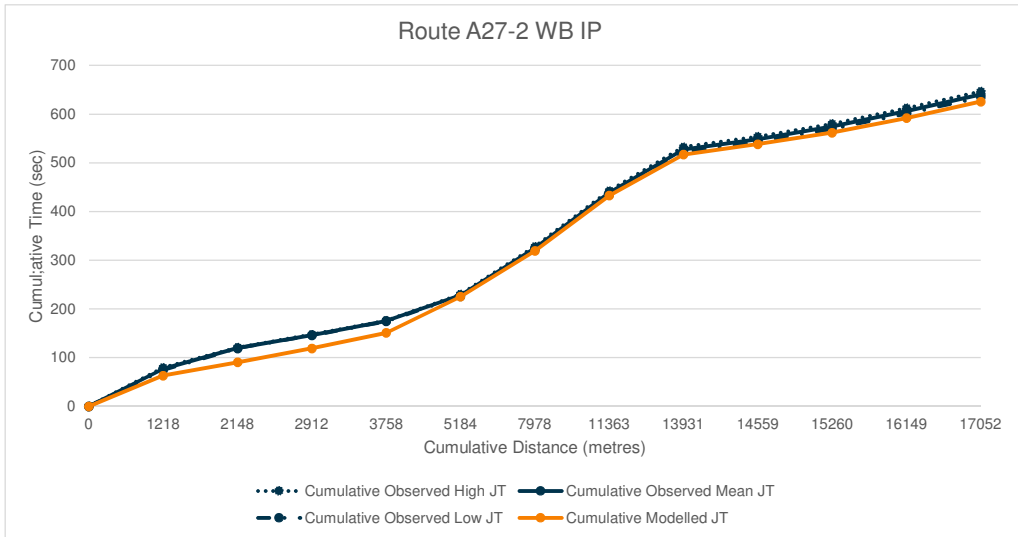












PM JOURNEY TIME VALIDATION												
Route	Direction	Section	SATURN Link CATM	Cumulative Distance	Cumulative Observed High JT	Cumulative Observed Mean JT	Cumulative Observed Low JT	Model Distance	Cumulative Modelled JT	Difference (seconds)	Difference %	DMRB
1	NB	0-1	9001	0	0	0	0	0	0			
1	NB	1-2	11001_5739	1178	153	139	126	1200	114.38	-24.62	-18%	Pass
1	NB	2-3	11004_6936	2391	226	207	190	2392	178.61	-3.77	-6%	Pass
1	NB	3-4	11006_10002	3528	315	285	261	3562	269.86	13.25	17%	Pass
1	NB	4-5	11007_7952	4379	414	377	345	4446	384.94	23.08	25%	Pass
1	NB	5-6	30022_10003	4878	466	425	390	4888	420.44	-12.5	-26%	Pass
1	NB	Total		4878	466	425	390	4888	420.44	-4.56	-1%	Pass
1	SB	0-1	10003	0	0	0	0	0	0			
1	SB	1-2	11008_7952	437	93	82	75	442	158.14	76.14	93%	Fail
1	SB	2-3	11070_10002	1299	345	316	297	1376	257.68	-134.46	-57%	Fail
1	SB	3-4	11005_6936	2466	460	411	382	2496	332.15	-20.53	-22%	Pass
1	SB	4-5	11002_5739	3676	646	572	520	3688	440.92	-52.23	-32%	Pass
1	SB	5-6	11001_9001	4881	798	708	646	4888	552.75	-24.17	-18%	Pass
1	SB	Total		4881	798	708	646	4888	552.75	-155.25	-22%	Fail
2	EB	0-1	9001	0	0	0	0	0	0			
2	EB	1-2	4946_5046	479	40	38	36	492	41.12	3.12	8%	Pass
2	EB	2-3	5544_5744	1322	113	106	98	1327	115.34	6.22	9%	Pass
2	EB	3-4	5747_5648	1764	171	156	140	1734	157.34	-8	-16%	Pass
2	EB	4-5	6055_6054	2283	311	267	219	2296	243.53	-24.81	-22%	Pass
2	EB	5-6	11009_10005	2800	366	318	268	2833	300.72	6.19	12%	Pass
2	EB	6-7	20003_6547	3300	483	414	344	3349	405.26	8.54	9%	Pass
2	EB	7-8	6648_6543	3585	523	450	377	3650	433.58	-7.68	-21%	Pass
2	EB	8-9	6043_6044	4342	653	548	459	4434	545.97	14.39	15%	Pass
2	EB	9-10	6044_5943	4412	674	560	467	4489	552.16	-5.81	-1%	Pass
2	EB	10-11	5839_5739	4989	969	768	611	5021	760.51	0.35	0%	Pass
2	EB	11-12	50257_5635	5476	1025	817	657	5537	803.12	-6.39	-13%	Pass
2	EB	Total		5476	1025	817	657	5537	803.12	-13.88	-2%	Pass
2	WB	0-1	5635	0	0	0	0	0	0			
2	WB	1-2	50257_5739	542	133	105	88	516	81.9	-23.1	-22%	Pass
2	WB	2-3	5940_5943	1085	283	183	143	1048	193.24	33.34	43%	Pass
2	WB	3-4	5943_6044	1166	316	210	167	1103	222.53	2.29	8%	Pass
2	WB	4-5	6446_6542	1894	435	310	253	1895	328.29	5.76	6%	Pass
2	WB	5-6	6454_10005	2499	512	378	314	2551	401.66	5.37	8%	Pass
2	WB	6-7	11009_11010	2717	547	409	342	2776	435.97	3.31	11%	Pass
2	WB	7-8	5650_5648	3380	629	480	405	3469	522.1	15.13	21%	Pass
2	WB	8-9	5745_5744	3831	675	521	441	3900	564.34	1.24	3%	Pass
2	WB	9-10	5344_5046	4701	767	594	504	4735	633.81	-3.53	-5%	Pass
2	WB	10-11	4945_9001	5150	932	735	619	5227	742.51	-32.3	-23%	Pass
2	WB	Total		5150	932	735	619	5227	742.51	7.51	1%	Pass
3	NB	0-1	6925	0	0	0	0	0	0			
3	NB	1-2	50264_6936	1138	92	84	77	1141	84.24	0.24	0%	Pass
3	NB	2-3	7041_7042	1884	242	222	201	1841	167.62	-54.62	-40%	Pass
3	NB	3-4	7044_7047	2196	290	264	237	2194	200.4	-9.22	-22%	Pass
3	NB	4-5	6748_6648	2631	348	313	281	2676	248.02	-1.38	-3%	Pass
3	NB	5-6	20006_7153	3629	541	486	429	3624	346.38	-74.64	-43%	Fail
3	NB	6-7	7555_7656	4109	601	539	477	4183	441.92	42.54	80%	Pass
3	NB	7-8	7755_10003	4377	650	575	505	4490	479.52	1.6	4%	Pass
3	NB	Total		4377	650	575	505	4490	479.52	-95.48	-17%	Fail
3	SB	0-1	10003	0	0	0	0	0	0			
3	SB	1-2	7755_7656	277	39	33	29	307	29.5	-3.5	-11%	Pass
3	SB	2-3	20004_7153	817	141	128	116	866	137.43	12.93	14%	Pass
3	SB	3-4	6649_6650	1428	210	189	169	1500	226.99	28.56	47%	Pass
3	SB	4-5	7048_7047	1958	270	243	218	2099	281.54	0.55	1%	Pass
3	SB	5-6	7044_7042	2271	320	281	250	2452	336.34	16.8	44%	Pass
3	SB	6-7	7040_6936	3020	516	426	362	3152	442.58	-38.76	-27%	Pass
3	SB	7-8	50264_6925	4154	604	501	430	4293	521.97	4.39	6%	Pass
3	SB	Total		4154	604	501	430	4293	521.97	20.97	4%	Pass
4	EB	0-1	6543	0	0	0	0	0	0			
4	EB	1-2	7048_7047	770	92	83	77	793	72.96	-10.04	-12%	Pass
4	EB	2-3	7742_10002	1746	325	276	239	1761	298.13	32.17	17%	Pass
4	EB	3-4	9137_9236	3367	399	347	307	3401	365.04	-4.09	-6%	Pass
4	EB	Total		3367	399	347	307	3401	365.04	18.04	5%	Pass
4	WB	0-1	9135	0	0	0	0	0	0			
4	WB	1-2	9135_10002	1665	125	114	104	1650	88.62	-25.38	-22%	Pass
4	WB	2-3	7345_7047	2639	222	201	185	2618	168.16	-7.46	-9%	Pass
4	WB	3-4	6648_6543	3196	304	247	220	3220	229.57	-8.59	-12%	Pass
4	WB	Total		3196	304	247	220	3220	229.57	-41.43	-15%	Pass
5	EB	0-1	40138	0	0	0	0	0	0			
5	EB	1-2	50255_3958	1032	67	63	59	1071	51.98	-11.02	-17%	Pass
5	EB	2-3	5854_5953	2608	210	192	177	2729	176.8	-4.18	-3%	Pass
5	EB	3-4	11009_10005	3020	253	233	215	3166	224.79	6.99	17%	Pass
5	EB	4-5	7053_7153	3785	421	390	335	3930	314.52	-52.27	-37%	Pass
5	EB	5-6	7555_7656	4337	498	445	399	4489	410.06	25.54	36%	Pass
5	EB	6-7	7658_10004	4750	542	436	371	4899	440.5	-9.56	-24%	Pass
5	EB	7-8	8362_8765	5733	612	551	498	5984	501.53	-4.97	-8%	Pass
5	EB	8-9	9471_9773	7093	703	635	577	7211	572.54	-12.99	-15%	Pass
5	EB	Total		7093	703	635	577	7211	572.54	-62.46	-10%	Pass
5	WB	0-1	9773	0	0	0	0	0	0			
5	WB	1-2	9471_8765	1361	96	90	85	1227	71.83	-18.17	-20%	Pass
5	WB	2-3	8261_10004	2379	172	161	152	2312	136.94	-5.89	-8%	Pass
5	WB	3-4	7658_7656	2792	228	212	198	2722	182.55	-5.39	-11%	Pass
5	WB	4-5	20004_7153	3339	333	308	285	3281	290.48	11.93	12%	Pass
5	WB	5-6	6456_10005	4109	445	399	367	4045	388.55	7.07	8%	Pass
5	WB	6-7	5955_5953	4591	510	458	421	4501	441.89	-5.66	-10%	Pass
5	WB	7-8	5459_40137	6156	650	581	531	6009	565.58	0.69	1%	Pass
5	WB	8-9	50255_40138	7188	716	641	587	7193	626.4	0.82	1%	Pass
5	WB	Total		7188	716	641	587	7193	626.4	-14.6	-2%	Pass
6	EB	0-1	4262	0	0	0	0	0	0			
6	EB	1-2	6158_6157	2429	200	182	167	2548	187.75	5.75	3%	Pass
6	EB	2-3	11009_10005	2734	233	212	196	2867	226.01	8.26	28%	Pass
6	EB	3-4	20004_7253	3594	422	374	333	3717	356.49	-31.52	-19%	Pass
6	EB	4-5	7253_7349	4070	483	428	381	4180	434.19	23.7	44%	Pass
6	EB	5-6	7750_7952	4550	603	531	468	4658	570.74	33.55	33%	Pass
6	EB	6-7	8652_8752	5539	685	606	537	5668	652.88	7.14	10%	Pass
6	EB	Total		5539	685	606	537	5668	652.88	46.88	8%	Pass
6	WB	0-1	8752	0	0	0	0	0	0			
6	WB	1-2	8652_7952	989	179	156	135	1010	146.85	-9.15	-6%	Pass
6	WB	2-3	7550_7349	1469	236	205	178	1488	205.82	9.97	20%	Pass
6	WB	3-4	7349_7253	1945	327	276	235	1951	283.41	6.59	9%	Pass
6	WB	4-5	6456_10005	2843	461	387	335	2801	396.93	2.52	2%	Pass
6	WB	5-6	5953_6157	3381	531	451	394	3375	460	-0.93	-1%	Pass
6	WB	6-7	5775_4262	5832	716	624	557	5923	635.41	2.41	1%	Pass
6	WB	Total		5832	716	624	557	5923	635.41	11.41	2%	Pass
7	NB	0-1	8024	0	0	0	0	0	0			
7	NB	1-2	8024_50266	1234	88	85	81	1240	70.12	-14.88	-18%	Pass
7	NB	2-3	50266_10002	1813	168	146	129	1770	138.55	7.43	12%	Pass
7	NB	3-4	30022_10003	3164	319	286	259	3096	289.13	10.58	8%	Pass
7	NB	4-5	7853_8166	4607	417	379	345	4552	370.46	-11.67	-13%	Pass
7	NB	5-6	5058_5063	5824	493	452	415	5739	446.12	2.66	4%	Pass
7	NB	Total		5824	493	452	415	5739	446.12	-5.88	-1%	Pass
7	SB	0-1	5063	0	0	0	0	0	0			
7	SB	1-2	5058_8166	1260	80	75	71	1187	76.04	1.04	1%	Pass
7	SB	2-3	10004_10003	27								

