Hertfordshire County Council and St Albans District Council

St Albans Local Plan

Traffic Modelling Report

July 2024

Confidential

Hertfordshire County Council and St Albans District Council

St Albans Local Plan

Traffic Modelling Report

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Contents

Tables

Figures

Appendices

Executive summary

To follow shortly

1 Introduction

1.1 Overview

1.1.1. WSP were commissioned by St Albans District Council (SADC) to undertake transport modelling work to assess the impact of SADC's Local Plan proposals. The assessment of the local plan allocations and associated infrastructure improvements will provide SADC, Hertfordshire County Council (HCC) and National Highways (NH) evidence of the impacts that the Regulation 19 Local Plan sites could have on the existing highway network and junctions.

1.1.2. The Countywide Model of Transport (COMET) transport model was used as a basis of the SADC Local Plan assessment. COMET is developed in the transport modelling software EMME and SATURN. WSP have undertaken the assessment of the Local Plan for both the AM (8:00-9:00) and PM (17:00-18:00) peak using a 2041 forecast year. Four scenarios have been developed to determine the impact of the Local Plan sites, the proposed infrastructure improvements and potential mode shift away from car which could occur.

1.1.3. This report provides details of the COMET model, the forecast scenarios developed, the methodology adopted and assumptions alongside the results of the scenarios.

1.2 Background to COMET Model

1.2.1. HCC own and maintain the COMET transport model, comprising a highway assignment model built in SATURN and public transport and Variable Demand Model (VDM) in EMME. The latest version of COMET which was used for the basis of this work has a base year of 2014. An updated COMET model with a base year of 2023 is currently being developed but still under construction at the time this work was undertaken.

1.2.2. COMET provides a multi-purpose transport modelling tool to test a range of potential transport schemes and policies including:

- Highway scheme appraisals
- Inputs for transport business cases and funding applications
- Inputs for environmental appraisal
- Local plan/ core strategy assessments
- Development impact assessments

1.2.3. COMET covers the entire county of Hertfordshire and surrounding area to varying degrees of detail, as shown in Figure 1-1. The area of detailed modelling, where all junctions are simulated, (within the green boundary line) includes all roads with significant traffic volumes and all realistic route choices. Outside of Hertfordshire, the rest of the fully modelled area encompasses a reduced level of detail, with principal strategic routes modelled and capacity restraint achieved using speed flow curves.

1.2.4. The external area includes a simplified network allowing traffic to enter the fully modelled area at the correct location without capacity restraint. It includes a skeleton network with approximate distances to allow the demand model to capture the full trip length.

1.2.5. This work has used COMET version 7.1 which aligns with NTEM 8 and the most recent TAG data book.

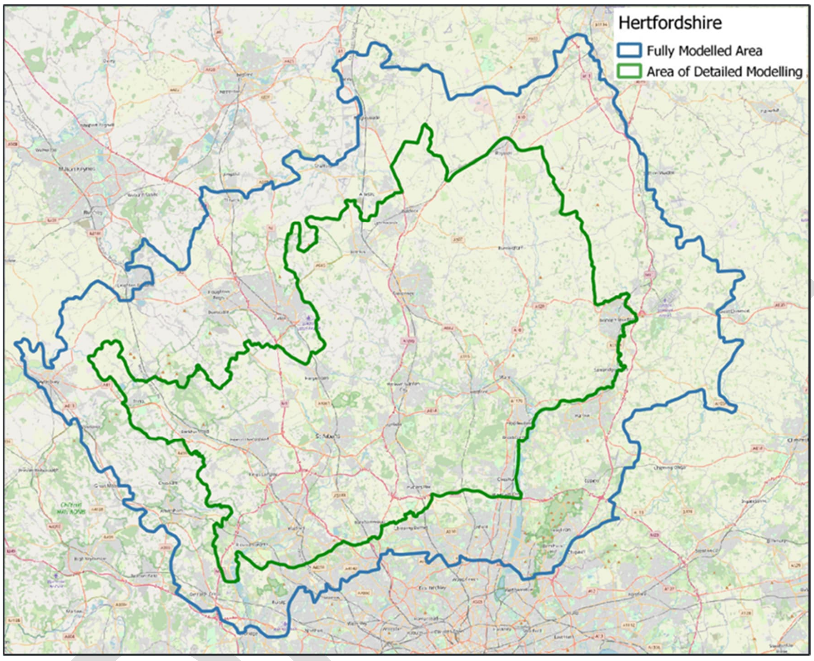

Figure 1-1: COMET Model Extent

1.3 Scenarios

1.3.1. A range of transport modelling scenarios have been used and generated for the purpose of assessing the SADC Local Plan, this includes the following:

- **2014 Base Year**
- **2041 Option 0**
  - All committed and consented developments and transport schemes
- **2041 Option 1**
  - Option 0 plus the SADC Local Plan allocations
- **2041 Option 2**
  - Option 1 plus the SADC Infrastructure Delivery Plan (IDP) schemes and 10% mode shift

- **2041 Option 3**
  - Option 1 plus the SADC IDP schemes and Opportunity to Shift Mode Tool impacts

1.3.2. Further details of the assumptions relating to these scenarios can be found in Chapters 2 for the base year, Chapter 3 for an overview of the scenarios and Chapters 5 to 8 of all the assumptions used to develop Option 0 to 3.

1.4 St Albans Local Plan Allocations

1.4.1. In total the Local Plan allocates 14,417 new houses and is expected to deliver 9,589 jobs through employment allocations over the plan period between 2014-41. This includes numerous smaller allocations and windfall development across the district, as well as a number of key sites which provide a larger concentration of development, as listed in Table 1-1 and illustrated in Figure 1-2.

1.4.2. The key sites in Table 1-1 have been treated separately within the transport modelling, and for these sites it is possible to isolate vehicle trips within the model and examine their trip generation and distribution patterns.

1.4.3. It is important to note that the East Hemel Hempstead development is part of the Hemel Garden City development which is split across SADC and Dacorum Borough Council (DBC). For this assessment in agreement with SADC and HCC only the St Albans portion of the development has been included in the assessment. There will be a further scenario, Option 4, which includes Hemel Garden City development within both the SADC and DBC and once undertaken the results will be reported in an addendum to this report.

Table 1-1: Key Local Plan Sites

Development Name	Planning Ref	Households	Jobs
East Hemel Hempstead South	H4	2,165	0
East Hemel Hempstead North	H2	1,335	0
North St Albans	B1	996	0
West of London Colney	B6	405	0
North East Harpenden	B2	762	0
East St Albans	B4	522	0
North Hemel Hempstead	H1	1,250	0
Glinwell, Hatfield Road, St Albans	B5	436	0
West Redbourn, Redbourn	B3	593	0
East Hemel Hempstead (Central)	H3	0	8,000

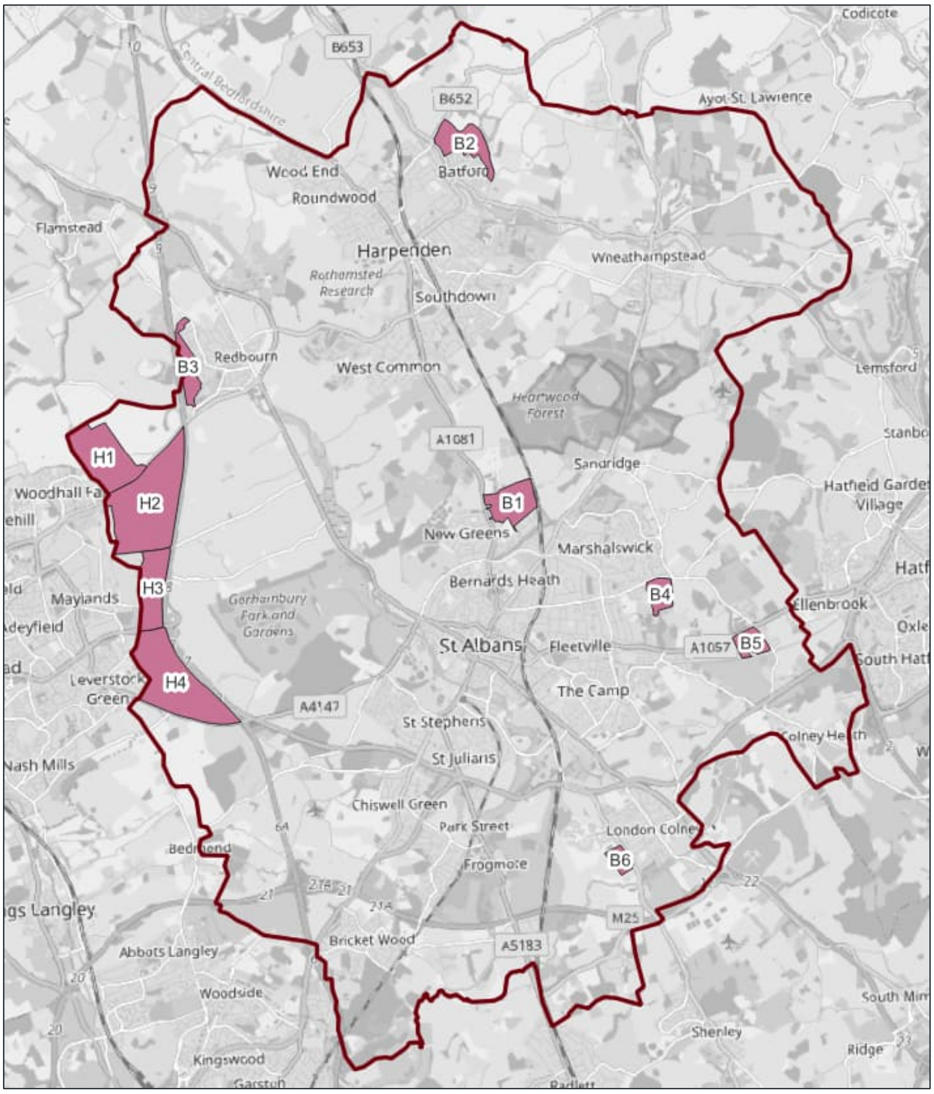

Figure 1-2: Location of Key Local Plan Sites

1.5 Purpose of the Report

1.5.1. The purpose of this report is to document the details of the forecast modelling process used to assess the SADC Local Plan development sites. This report outlines the methodology used for the development of the forecast matrices and forecast networks, it also describes the details of the proposed development modelled and their results. The analysis within this Forecasting Report has been undertaken and presented to support SADC's Regulation 19 Local Plan.

1.6 Structure of Report

1.6.1. The purpose of this report is to summarise the work carried out by WSP in the development of the 2041 Scenarios which assess the Regulation 19 Local Plan sites and associated infrastructure. This report is structured as follows:

- **Chapter 2: Base Year Model Review**
- **Chapter 3: Future Year Scenarios**
- **Chapter 4: COMET Model Forecast Methodology**
- **Chapter 5: 2041 Option 0 Assumptions**
- **Chapter 6: 2041 Option 1 Assumptions**
- **Chapter 7: 2041 Option 2 Assumptions**
- **Chapter 8: 2031 Option 3 Assumptions**
- **Chapter 9: Modelling Results**
- **Chapter 10: Conclusions**

2 Base Model Review

2.1 Introduction

2.1.1. WSP have undertaken a base year review of the COMET model in the St Albans District (SAD) area to understand the performance of the model and ensure it is a robust basis to undertake forecasting for the Local Plan.

2.1.2. In addition to the review of SAD following consultation with National Highways the base year model has been reviewed in the St Albans District and Dacorum Borough to understand the performance of the COMET model on the Strategic Road Network (SRN) M1 and M25 and roads approaching the SRN such as A424 Breakspear Way, A41, A414, A405 and A1081.

2.1.3. Appendix A to Appendix D provide the Technical Notes which present the full details of the reviews undertaken.

2.2 SAD Base Year Model Review

2.2.1. The base year review within SAD included the following checks:

- Review of the network coverage
- Review of the traffic flow performance between 2014 observed and modelled data
- Review of the journey time performance between 2014 and modelled data
- Comparison of observed traffic flows between 2014 and 2023
- Comparison of 2014 modelled traffic flow and 2023 observed traffic flows
- Comparison of 2014 link delays against 2024 google map typical traffic on key routes

2.2.2. Appendix A provides the full details of the above checks. In summary the review of the network coverage indicated that the base year model is fairly dense across Hertfordshire County and the density of the network within the SAD is appropriate. When reviewing the base year model performance, the AM peak is the weakest performing time period with IP and PM peak are close to meeting the Department for Transport (DfT) Transport Analysis Guidance (TAG) criteria. Count performance in each peak was then graphically presented alongside the Local Plan allocations indicating how the transport model was performing key areas where Local Plan development is proposed. This indicated that improvements were required in the AM peak model but not necessary in the IP and PM peak model.

2.2.3. The review in SAD indicated that traffic flow has reduced between 2014 and 2023 predominantly in the AM and PM peak hours with the interpeak reductions being a lot less. The traffic delay comparison between the 2014 Base Year model and the 2024 Google Map typical traffic conditions within the St Albans District indicated some similar locations on the key routes where the delays in the model and congestion in the Google Maps occurred. However, there were a few locations where the model presented subsequently high/low delays compared to Google Map congestion.

2.2.4. Appendix A recommended that the overall performance of the AM peak model in SAD needed to be improved specifically in areas where Local Plan development are proposing to put their accesses.

2.3 SAD Base Year Model Improvements

2.3.1. Appendix B provides a summary of the network and matrix improvements undertaken as a result of the SAD base year review. Within the transport model WSP investigated the key areas close to Local Plan sites which were not performing well against observed data. This results in identifying a range of network improvements to be fed into the base year model, which are documented in Table 1 of Appendix B. Alongside the network improvements matrix estimation was re-ran, prioritising counts within SAD. Overall there was an improvement in the performance of the model against observed data with the network coding and matrix improvements in all peaks. This transport model was used as a basis for the SAD Local Plan work.

2.4 SRN Base Year Model Review

2.4.1. The base year review of the SRN, in Appendix C, included the following tasks:

- Comparison of 2014 Observed and Modelled traffic flow for the SRN road network and road which approach the SRN
- Journey Time Performance on the SRN
- Comparison between 2014 and 2023 traffic count data

2.4.2. Overall this this analysis showed that the AM peak is the weakest performing timing period, the AM peak however does meet TAG criteria for the calibration counts.

2.4.3. This Technical Note was shared with National Highways for comment.

2.5 SRN Base Year Model Review Update

2.5.1. Appendix D presents an updated note which reflects the updated results from the network and matrix improvements undertaken in SAD. The updated technical note also provides the performance of the model against observed traffic data on the M25 just outside the St Albans and Dacorum Borough district boundary as requested by National Highways.

2.5.2. Overall Appendix D shows that with the SAD network and matrix improvements there is an improvement in performance on the SRN and roads approaching the SRN and overall performance on the COMET model on the SRN is adequate for the purposes of assessing the SADC Local Plan.

3 Future Year Scenarios

3.1 Future Year

3.1.1. The future year modelled is 2041, reflecting the horizon year for the new St Albans Local Plan.

3.2 Time Periods

3.2.1. The following time periods have been assessed using the model:

- AM peak (08:00 to 09:00)
- PM peak (17:00 to 18:00)

3.3 Scenarios

3.3.1. The following scenarios have been run within the COMET model:

- **Option 0**: This reflects completed or committed development across Hertfordshire over the period 2014-2041. This scenario is constrained to the growth in households and jobs within DfT National Trip End Model for all districts in Hertfordshire except St Albans.
- **Option 1**: This builds on option 0 by including the St Albans Local Plan Regulation 18 sites.
- **Option 2**: This builds on option 1 by including the transport infrastructure set out in the St Albans Infrastructure Delivery Plan (IDP) and also including a 10% mode shift assumption from car to public transport.
- **Option 3**: This is an alternative to option 2 which also reflects the IDP but has a different mode shift assumption applied based on WSP's Opportunity to Shift Mode tool.
- **Option 4**: This will include Dacorum Local Plan and their IDP schemes. This option has not been undertaken yet as Dacorum Local Plan IDP schemes are still being developed. It will be undertaken and added as an appendix to this report.

3.3.2. An overview of what is included in each scenario is also shown in Table 3-1.

Table 3-1: Scenario Overview

	Option 0	Option 1	Option 2	Option 3	Option 4
Completed / Consented developments (NTEM constrained except in SADC)					
SADC Local Plan development growth					
10% Modal Shift					
Opportunity to Shift Mode Tool					
SADC IDP					
Dacorum Local Plan development growth					
Dacorum IDP					

3.3.3. Details of how each scenario was developed, including information on inputs and assumptions is provided in Chapters 5 to 8.

4 COMET Model Forecast Methodology

4.1 Forecast Objectives

4.1.1. This chapter will set out the forecasting approach for the highway and public transport to understand the cumulative effect of the Local Plan growth for St Albans, in their respective scenarios.

4.1.2. This forecast takes into consideration the changes between 2014 and 2041 including increases in population, number of jobs and dwellings, rising cost of travel, and proposed transport infrastructure schemes. However, there is currently no allowance for factors that may fundamentally alter the nature of travel within Hertfordshire. These factors may include new technologies such as autonomous vehicles or COVID-19 pandemic which has caused changes in travel patterns.

4.2 Model Time Periods

4.2.1. The time periods for the highway model are:

- AM Peak: 08:00 to 09:00
- Inter Peak: 10:00 to 16:00 (average hour)
- PM Peak: 17:00 to 18:00

4.2.2. The time periods of the public transport model are:

- An average AM period hour (7:00am to 10:00am)
- An average Inter-peak hour (10:00am to 4:00pm)
- An average PM period hour (4:00pm to 7:00pm)

4.2.3. Although the Variable Demand Model covers periods spanning a full day, the assignment to the supply models has been undertaken in smaller but consistent time periods. The time periods are consistent with a three-hour time period in the Demand Model translated into a peak hour in the Highway assignment model and an average peak period in the Public Transport assignment model. As such, the analysis presented in this report reflects these time periods.

4.2.4. For the purpose of the SADC Local Plan assessment, the focus of results is on the AM and PM peaks within the highway model.

4.3 Treatment of Variable Demand

4.3.1. COMET includes a variable demand model, which has been used in the preparation of the forecast scenarios. The variable demand model is designed to estimate the effect of changes in transport infrastructure and travel cost upon patterns of demand. This considers changes in overall travel movements and is separate to modelling the way in which travellers respond to changes by choosing different routes. The latter is forecast by the highway and public transport assignment models.

4.4 Model Structure

4.4.1. The structure of the forecasting process, including the interaction between the demand models and assignment models is shown in Figure .

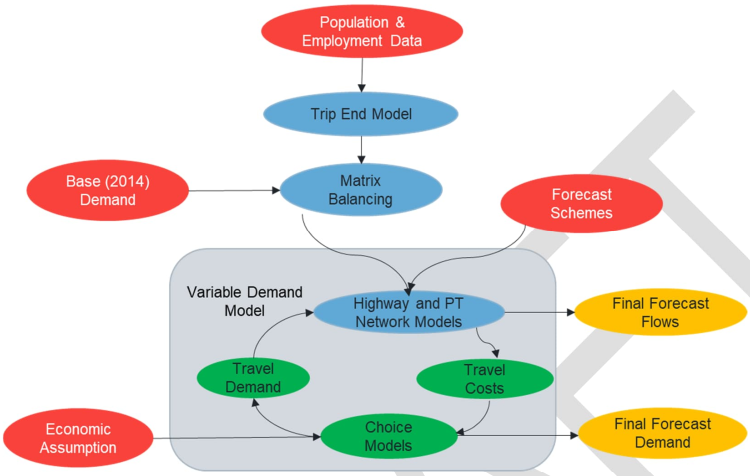

Figure 4-1: Model Structure

4.4.2. The forecast trip matrix is an estimation of future trips based on available population and employment data for Hertfordshire and growth assumptions for the rest of Great Britain from the most recent version of the Department for Transport (DfT) National Trip End Model (NTEM v8). Further details on the planning data for each assessment scenarios will be discussed in Chapters 5 to 8.

4.4.3. The COMET Trip End model is used to forecast future trip ends, i.e., total productions and attractions for each model zone. These trip ends are used to build a reference matrix for the forecast year (2041). The reference matrix is then adjusted based on the forecast Highway and Public Transport assignments through the VDM, which takes into account the changes in transport infrastructure, travel times and costs in future years. The resulting matrices constitute the forecast trip matrices.

4.5 COMET Trip End Model

4.5.1. A Trip End model has been built specifically for COMET as part of the COMET Base Year (2014) development. The COMET Trip End model is based on DfT's CTripEnd software package. The software creates trip end estimates based on NTEM planning data (v8) combined with a number of metrics based on population, car ownership and employment. It consists of a database of population/employment data and an executable file that runs a series of processes to create final trip end estimates for the desired model year, broken down by mode, time of day and demand segment.

4.5.2. If required more detailed information on the COMET Demand Model and CTripEnd model set up can be found in 2022-12-02 COMET 7 Forecasting Report_Final_Issued.pdf.

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5 2041 Option 0 Assumptions

5.1 Overview

5.1.1. This scenario represents the completed or committed developments and transport infrastructure across Hertfordshire over the period 2014-2041. This scenario is constrained to the growth in households and jobs within DfT National Trip End Model for all districts in Hertfordshire except St Albans.

5.2 Planning Data - Hertfordshire

Data Received

5.2.1. Planning data for all districts in Hertfordshire was received from Hertfordshire County Council. This included all completions and sites given planning permission between 2014 and 2022.

Processing of Planning Data

5.2.2. The list of planning data sites was processed to:

- Calculate the number of jobs from the floorspace for employment data
- Allocate the sites to a base zone in the model
- Allocate a new model development zone to it, for sites with more than 300 dwellings or 500 jobs
- Check that key sites and planning data totals were in line with the previous COMET 7 planning data

5.2.3. The employment planning data was provided with a floorspace and employment type rather than the number of jobs (which is the input the COMET model requires), the floorspace and employment type were used to calculate the number of jobs using assumed conversion factors. The factors used and the source of the factor is shown in Table 5-1. For user classes that were not available in the Employment Density Guide (EDG), the factors were calculated using TRICS data.

Table 5-1: Floorspace to Jobs Conversion Factors

Use Class type	User Class Name	Gross Floor Area per Employee	Source of conversion factor
B2	General industry	36	EDG 2015
B8	Warehouse, Distribution Centres	81	EDG 2015
C1	Hotels / guest houses	100	EDG 2015
C2	Residential institutions incl. hospitals, nursing homes, residential schools etc.	100	EDG 2015
D1	Non-residential institutions incl. churches, clinics, health centres, nurseries, museums, libraries etc.	36	EDG 2015
D2	Assembly and leisure incl. cinemas, music venues, sports facilities etc.	75	EDG 2015
Ea_A1_F2a	Shops	18	EDG 2015
Eb_A3	Restaurants and cafes	18	EDG 2015
Ec_A2	Financial and professional services e.g. banks, estate agents, betting offices etc.	16	EDG 2015
Ed	Indoor sport, recreation or fitness	83	EDG 2015
Ee	Provision of medical or health services	36	EDG 2015
Ef	Creche, day nursery or day centre	35	TRICS
Egi_B1a	Offices (not within A2)	10	EDG 2015
Egii_B1b	R&D	50	EDG 2015
Egiii_B1c	Light Industry	47	EDG 2015
F1	Schools	78	TRICS
F2	Community facilities	144	TRICS
SG	Sui Generis	70	EDG 2015

5.2.4. For sites with more than 300 dwellings or 500 jobs, specific new model development zones were allocated to the site. These sites with development zones that are in St Albans are shown in Table 5-2 and a full list of all development zones (including those in other districts) is provided in Appendix E.

Table 5-2: Sites with Development Zones in St Albans

Zone Number	Planning Reference	Site Name	District	Number of dwellings	Number of jobs
9063	5/22/0927	Land South of Chiswell Green Lane	St Albans	391	67
9064	5/2013/2589	Oaklands College, Smallford Campus, St Albans, AL4 0JA	St Albans	385	
9110	5/2016/3006	Proposed Rail Freight, North Orbital Road, Chiswell Green	St Albans		4095
9136	5/2016/0264	St Albans Retail Park, Griffiths Way, St Albans, AL1 2RJ	St Albans		631
9166	5/2020/1773	Civic Centre Opportunity Site (South), Victoria Street, St Albans	St Albans		620

Summary (before constraining)

5.2.5. The total number of dwellings and jobs included in the planning data is shown in Table 5-3.

Table 5-3: Planning Data Summary by District

District	Dwellings (2014 to 2022)	Jobs (2014 to 2022)
Broxbourne	6,407	11,975
Dacorum	8,392	5,798
East Hertfordshire	11,515	4,825
Hertsmere	4,354	4,097
North Hertfordshire	5,263	2,094
St Albans	6,298	8,157
Stevenage	4,942	7,202
Three Rivers	3,079	4,998
Watford	7,185	8,931
Welwyn Hatfield	7,117	5,470
Hertfordshire Total	**64,552**	**63,547**

NTEM Constraining

5.2.6. The number of dwellings and jobs was constrained to NTEM at a Hertfordshire county level, but not including St Albans. The planning data for St Albans was excluded from the constraining process to accurately model the known planning data in the district.

5.2.7. Thus the total number of dwellings and jobs for Hertfordshire without St Albans (so over 9 districts) was constrained to the NTEM total for those districts. The number of dwellings needed to be decreased by 7,059 dwellings and the number of jobs increased by 13,578 jobs to match the NTEM total. The constraint was applied in a way that preserves the planning data totals as far as possible.

5.2.8. For dwellings a reduction was not applied to North Hertfordshire or Welwyn Hatfield as the planning data total was already below NTEM in those districts. Reductions were applied in the other seven districts proportional to the size of the district, so larger districts have a larger reduction.

5.2.9. For jobs the increase was not applied to Broxbourne, Stevenage or Broxbourne as the planning data total was already above NTEM in those districts. Increases were applied in the other six districts proportional to the size of the district, so larger districts have a larger increase.

Summary (after constraining)

5.2.10. Table 5-4 and Table 5-5 shows the total number of dwellings and jobs respectively in each district after the NTEM constraint had been applied.

Table 5-4: Dwellings Summary after Constraining

	Dwellings in NTEM 8	Dwellings in planning data	Difference (planning data - NTEM 8)	Dwellings after constraint	Difference (after constraint - planning data)
Broxbourne	3,149	6,407	3,258	5,771	-636
Dacorum	7,133	8,392	1,259	6,952	-1,440
East Hertfordshire	10,237	11,515	1,278	9,449	-2,066
Hertsmere	3,030	4,354	1,324	3,742	-612
North Hertfordshire	6,521	5,263	-1,258	5,263	0
St Albans	6,420	6,298	-122	6,298	0
Stevenage	3,770	4,942	1,172	4,181	-761
Three Rivers	2,482	3,079	597	2,578	-501
Watford	5,780	7,185	1,405	6,018	-1,167
Welwyn Hatfield	8,970	7,117	-1,853	7,117	0
Hertfordshire	**57,493**	**64,552**	**7,059**	**57,370**	**-7,182**

Table 5-5: Jobs Summary after Constraining

	Jobs in NTEM 8	Jobs in planning data	Difference (planning data - NTEM 8)	Jobs after constraint	Difference (after constraint - planning data)
Broxbourne	5,368	11,975	6,607	11,975	0
Dacorum	9,477	5,798	-3,679	8,309	2,511
East Hertfordshire	8,415	4,825	-3,590	7,055	2,230
Hertsmere	6,584	4,097	-2,487	5,842	1,745
North Hertfordshire	7,558	2,094	-5,464	4,097	2,003
St Albans	9,271	8,157	-1,114	8,157	0
Stevenage	6,908	7,202	294	7,202	0
Three Rivers	5,076	4,998	-78	6,343	1,345
Watford	8,545	8,931	386	8,931	0
Welwyn Hatfield	9,922	5,470	-4,453	8,099	2,630
Hertfordshire	**77,124**	**63,547**	**-13,578**	**76,011**	**12,464**

5.3 Planning Data – Outside Hertfordshire

5.3.1. No planning data outside Hertfordshire was considered. The growth in other areas is therefore assumed to align with NTEM 8 values.

5.4 Goods Vehicle Demand

5.4.1. An uplift was applied to reflect the additional 5 years of growth between the existing COMET model forecasts for 2036 and the local plan forecast year of 2041. This uplift was based on DfT National Road Traffic Projections 2022 (NRTP22) which include the predicted increase in vehicle kilometres in future years based on the DfT National Transport Model (NTM). The factors set out in Table 5-6 were applied to cells within the LGV and HGV matrices. These factors are based on vehicle kilometre projections for the South East region, across all road types. As NRTP includes values in five year increments, values for intermediate years (such as 2036 and 2041) were calculated through linear interpolation.

Table 5-6: Goods Vehicle uplift factors for 2036-41 based on NRTP22

Year	NRTP22 Vehicle Kilometres (billions)	
	LGV	HGV
2036	11.185	2.761
2041	11.986	2.840
Uplift Factor 2036-41	1.072	1.029

5.5 Transport Infrastructure

5.5.1. The forecast network for Option 0 scenario is based on the existing COMET 7 NTEM network as a starting point. The incorporated infrastructure schemes in this COMET 7 NTEM network are selected based on their certainty levels, which include schemes categorised as "near certain" and "more than likely" inline with DfT guidance. The proposed transport schemes were agreed upon with the districts in Spring 2022 and align with the Infrastructure Delivery Plans and Transport Strategies at that time.

5.5.2. In addition to the above schemes, a selection of infrastructure schemes situated in St Albans and Dacorum districts are also included for Option 0 forecast network due to their improved certainty status since the COMET 7 Update in 2022. These schemes are summarised in Table 5-7.

5.5.3. These highway schemes are modelled using the latest drawings and maps provided by HCC from the developers to inform the schemes details. Where sufficient detail is not provided by the scheme maps/drawings or other information WSP assumed the coding based on the information available.

Table 5-7: Additional Infrastructure Schemes Incorporated in Option 0

HCC_REF	Description of Scheme	District
RRv3	Radlett Rail freight, new access junction onto A414 and new spine road connecting to A5183 Radlett Road (south of Frogmore)	St Albans
RR_M25_21a	M25 junction 21a capacity improvements (Radlett Rail freight mitigation)	St Albans
PR140	St Albans City Centre 20mph zone expansion	St Albans
StAlbans_TC_Covid	Social distancing measures in St Albans high street area	St Albans
ITP170003-1	ATF Jarman Park Pedestrian & Cycling Improvements Phase 1	Dacorum
EATF_60	Amendment of existing facilities and junctions to facility better cycling journeys in the vicinity of St Albans town centre Status Ongoing/Active	St Albans
BISP-Miles House and London Rd	Bus lane on Mile House and London Rd junction	St Albans
BISP_ Drakes Lane_Lodnon Rd	Bus Lane on Drakes Lane_London Rd Junction	St Albans
BISP_ London Colney	BISP-Bus Lane on Lodnon Colney SB	St Albans
Bus route_907	Brookfield Centre to Stevenage	Hertfordshire/ Cross District
Bus route_908	Stevenage to Welwyn Garden City	Hertfordshire/ Cross District
Bus route_323	Hertford to Welwyn Garden City	Hertfordshire/ Cross District
Bus route_725	Stevenage to Rickmansworth	Hertfordshire/ Cross District
Bus route_721	Luton to Hemel Hempstead	Hertfordshire/ Cross District
Bus route 324	Existing route to be revised	Hertfordshire/ Cross District
Bus route 390	Existing route to be revised	Hertfordshire/ Cross District
Bus route 724	Existing route to be revised	Hertfordshire/ Cross District

Base Year Network Adjustment

5.5.4. As discussed in Chapter 2, the base year model network coding in St Albans district was also reviewed with checks being undertaken to improve base year calibration. Issues including incorrect junction configuration or allocation of lane marking or incorrect saturation flow were revised accordingly. These network changes are also incorporated to all forecast scenarios.

5.6 Generalised Cost Parameters

5.6.1. The generalised cost parameters used in the forecast models are from the latest version of the TAG databook – November 2023 v1.22. Value of time is calculated in pence per minute (PPM) and vehicle operating cost is calculated in pence per kilometre (PPK). As in the base model, the value of time (PPM) for the HGVs was doubled from the value provided in the TAG databook. This is in line with TAG Unit A1.3 which advises for HGV that the driver's time does not take account of the influence of owners on the routing of these vehicles.

5.6.2. The generalised cost parameters adopted for the 2036 forecast year is shown in Table 5-8. A split of 36.4% OGV1 and 63.6% OGV2 has been used to calculate the average generalised cost parameters for HGVs and an average simulation network speed of 54 kph has been used.

Table 5-8: Generalised Cost Values 2041

User Class	VOC (PPK)			VOT (PPM)		
	AM	IP	PM	AM	IP	PM
UC1: Car Commute	4.71	4.71	4.71	26.6	27.0	26.7
UC2: Car Employers Business	9.22	9.22	9.22	39.6	40.6	40.2
UC3: Car Other	4.71	4.71	4.71	18.3	19.5	19.2
UC4: LGV	12.72	12.72	12.72	29.5	29.5	29.5
UC5: HGV	39.94	39.94	39.94	61.6	61.6	61.6

6 2041 Option 1 Assumptions

6.1 Overview

6.1.1. This scenario adds the SADC Local Plan allocations onto Option 0. There are no changes in other Hertfordshire districts or in the wider external model area.

6.2 Planning Data – St Albans

6.2.1. A list of the local plan allocations included as part of Option 1 was provided by HCC. The sites, together with the number of dwellings / jobs and the zone that they have been allocated to is provided in Appendix F and Appendix G. Sites where the number of dwellings is greater than 300 or jobs greater than 500 have been allocated a specific development zone (with a zone number over 9000). The locations of the sites are shown in Figure 6-1.

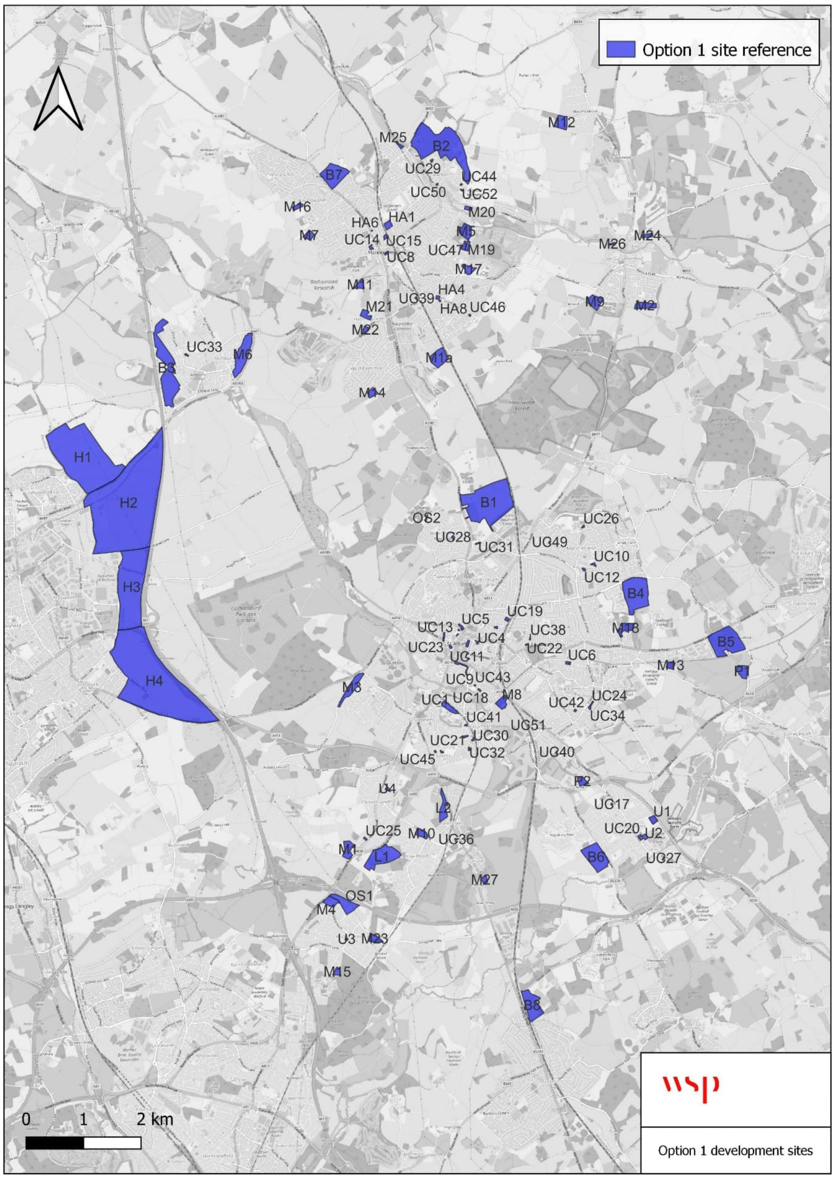

Figure 6-1: Location of Option 1 Local Plan Sites

6.3 Transport Infrastructure

6.3.1. The transport infrastructure changes remain the same between Option 0 and Option 1 with the only addition being the East Hemel spine road. For the Option 1 scenario, only the portion of the spine road that falls within the St Albans district has been modelled. The remainder of the Hemel Garden Community development and spine road (which falls within the Dacorum district) will be modelled at a later date within Option 4 and reported as an addendum to this report.

6.3.2. Figure 6-2 shows the proposed layout of the East Hemel spine road and indicates where the main development areas (sites H1-H4) have been connected within the model. The proposed improvement to the A414/Green Lane junction has not been included in Option 1.

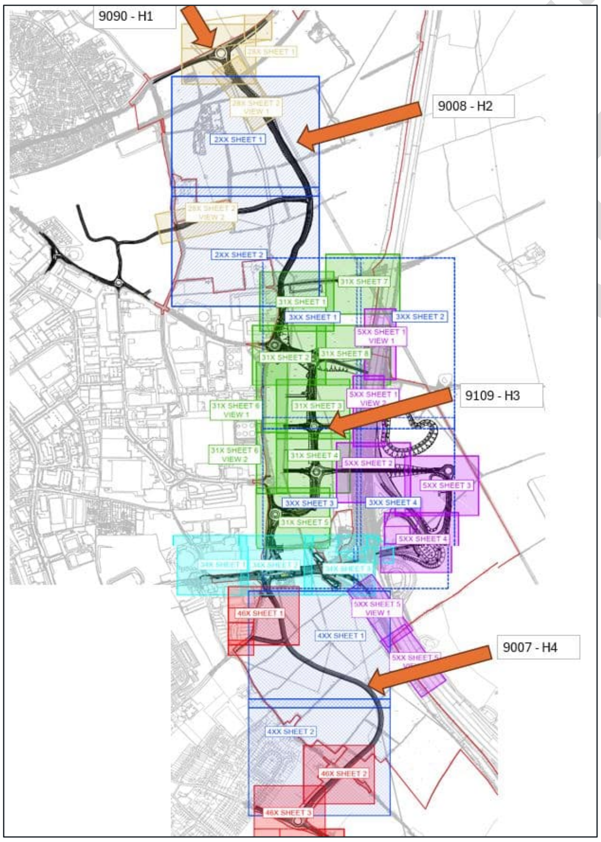

Figure 6-2: Proposed East Hemel Spine Road within the St Albans District Boundary

6.4 Zone Connectors

6.4.1. The largest Local Plan sites were modelled as separate zones and connected to the network at the location which are currently considered by SADC and HCC to the most likely access points at the time of undertaking the modelling.

6.4.2. In some cases, is has been possible to represent specific access arrangements where these are already know (for example the spine road within the Eats Hemel site as referred to above). In all cases care has been taken to ensure that there is sufficient capacity at the zone connection points and that all development traffic is able to load into the network within the modelled time periods.

6.5 Trip Generation Adjustment

6.5.1. The highway trip generation for Local Plan sites that the COMET model generated were reviewed and trip rates for proposed key Local Plan sites were deemed to be under-representing the highway trip generation. Following conversations with HCC, SADC and NH the highway trip generation was agreed to be uplifted to better reflect the projected traffic generation for the key Local Plan sites.

6.5.2. HCC provided WSP with a generic highway trip rate which was used for most of the key Local Plan sites alongside the latest trip generation reports for East Hemel Hempstead and North St Albans which contained specific trip rates which HCC were in agreement with. Table 6-1 provides details of the key Local Plan sites and the trip rate used. Appendix H and Appendix I provide the trip generation reports for East Hemel Hempstead and North St Albans.

6.5.3. The highway trip generation adjustment is carried out with post COMET VDM highway matrix and the trip totals (tripends) for the required developments are uplifted accordingly. The assumed trip rate and the final trip generation for these developments are summarised in Table 6-2 and Table 6-3.

Table 6-1: Key Local Plan Sites

Development Name	Type	Households	Jobs	Trip Rate Source
East Hemel Hempstead South	Housing	2165	0	TA
East Hemel Hempstead North	Housing	1335	0	TA
North St Albans	Housing	996	0	TA
West of London Colney	Housing	405	0	Generic
North East Harpenden	Housing	762	0	Generic
East St Albans	Housing	522	0	Generic
North Hemel Hempstead	Housing	1250	0	Generic
Glinwell, Hatfield Road, St Albans	Housing	436	0	Generic
West Redbourn, Redbourn	Housing	593	0	Generic
East Hemel Hempstead (Central)	Employment	0	8000	TA

Table 6-2: Adopted Car Trip Rate

Car Trips		AM Peak Hour		PM Peak Hour	
Development	**Type**	**Departs**	**Arrivals**	**Departs**	**Arrivals**
North St Albans	Households	0.394	0.191	0.221	0.313
East Hemel Hempstead South	Households	0.613	0.235	0.376	0.645
East Hemel Hempstead North	Households	0.613	0.235	0.376	0.645
East Hemel Hempstead (Central)	Employment	0.016	0.118	0.116	0.008
Generic	Households	0.347	0.119	0.221	0.363

Table 6-3: Assumed Trip Generation for Key Local Plan Sites

	Trip Generation (VDM)				Uplift Trip Generation				Difference (Uplifted – VDM)			
	AM		PM		AM		PM		AM		PM	
Development Name	Departs	Arrivals	Departs	Arrivals	Departs	Arrivals	Departs	Arrivals	Departs	Arrivals	Departs	Arrivals
East Hemel Hempstead South	252	177	186	235	1312	514	814	1404	1060	337	628	1169
East Hemel Hempstead North	151	101	106	138	809	326	515	880	658	225	409	742
North St Albans	140	87	90	117	393	192	223	314	253	105	132	197
West of London Colney	53	32	36	44	141	49	91	148	88	17	54	104
North East Harpenden	104	63	65	84	265	92	170	279	161	28	106	194
East St Albans	68	41	42	59	182	63	117	191	114	21	75	132
North Hemel Hempstead	150	103	105	135	441	159	299	475	292	56	194	340
Glinwell, Hatfield Road, St Albans	57	37	38	51	152	52	98	160	95	15	60	108
West Redbourn, Redbourn	73	48	50	65	209	75	141	224	136	26	91	159
East Hemel Hempstead (Central)	809	1414	1252	889	127	964	943	68	-682	-450	-310	-821

7 2041 Option 2 Assumptions

7.1 Overview

7.1.1. The Option 2 scenarios represents the future year of 2041 with the Local Plan in place but including the following additional elements:

- A number of transport schemes based on infrastructure proposals developed as part of the St Albans Infrastructure Delivery Plan (IDP).
- An assumption that there will be a 10% modal shift away from car across SADC as a result of sustainable transport measures that are envisaged.

7.2 Transport Infrastructure Schemes

7.2.1. Table 7-1 lists the transport schemes that have been modelled in Options 2 and 3 whilst the broad location of each scheme is shown in Figure 7-1.

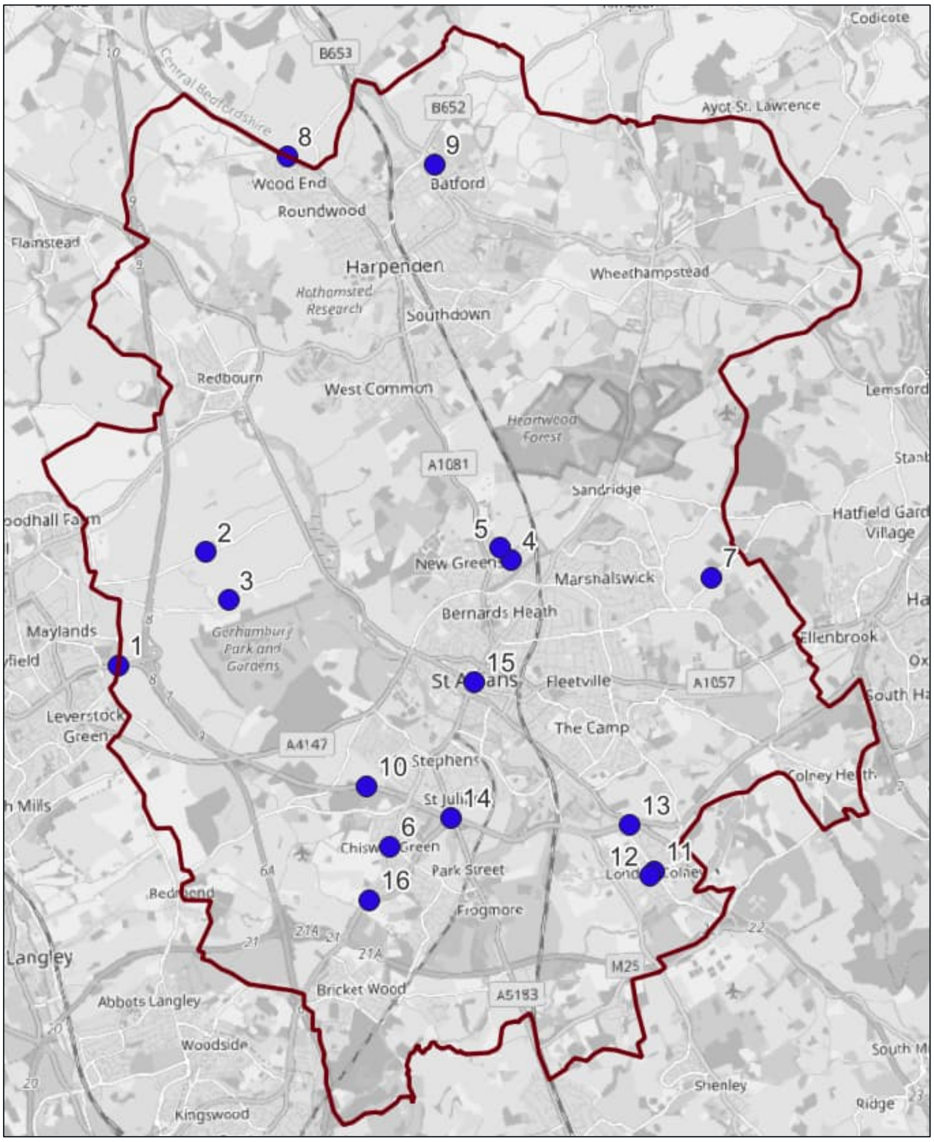

Figure 7-1: Location of Transport Schemes Modelled in Option 2 and 3

Table 7-1: **Highway Schemes Modelled in Options 2 and 3**

Map Id	HCC Ref	Name
Highway Schemes		
1	-	A414 Breakspear Way/Green Lane junction improvement – Introduction of signal junctions to replace existing roundabout
2	-	Closure/restriction of Punchbowl Lane
3	-	Closure/restriction of Hogg End Lane
4	-	Valley Rd Bus Gate
5	-	Sandridgebury Lane Bus Gate
6	CG-Acc	Chiswell Green - convert mini-roundabouts to signal junction
7	-	Coopers Green Lane Speed Limit Reduction
8	-	A1081 cycle corridor – Speed reduction in Kinsbourne Green area
9	-	B653 Lower Luton Road pedestrian and cycle crossing
10	SM179	A414 Smart Traffic Management - A review of traffic speed limits and measures required to improve compliance along the A414
11	PR193	London Colney High Street 20mph speed limit
12	PR194	London Colney Town wide 20mph speed limit
13	650534762_SA DC_DWG_Site2 / SC SM176	A414/A1081 London Colney Roundabout upgrade
14	SM174	A414 Park Street Roundabout Improvements - signalisation of roundabout
15	PR140	St Albans City Centre 20mph zone expansion
16	SM201	A405/B4630 Watford Road junction - conversion to signal crossroads
	StAlb_14	Highway schemes associated with the North East Harpenden site
	N_STAD	Highway schemes associated with the North St Albans site
	10338_HL_07	Highway schemes associated with the North West Harpenden site
	10338_HL_07 & W_LCD	Highway schemes associated with the West of London Colney site
Public Transport Schemes		
-	-	High frequency bus corridor along A414
-	SL7 / SM152	Bus route connecting St Albans City and St Albans Abbey stations
-	-	Corby service on East Midlands franchise to call at St Albans

7.3 Traffic Signal Optimisation

7.3.1. Traffic signal timings have been optimised within Option 2 where signal junctions were forecast with high increase of delay (>30 seconds) between Option 1 and 2 in the AM or PM peak hours. The following list sets out the junctions where signal timings have been adjusted, their locations are presented in Figure 7-2.

- **Maylands Avenue / Wood End Lane** (node 2450) – this junction was found to be over-capacity in option 2 and was optimised.
- **A414 Breakspear Way / Green Lane** (nodes 2580 and 2461) – this is a key junction and the location of an improvement scheme in option 2 (scheme ref SM7_SW). The new layout was found to be over-capacity and was optimised, although it remains slightly over-capacity in the AM peak following optimisation.
- **A405 / Watford Road (**node 6295) – this is the location of an improvement scheme in option 2 (scheme ref SM201). The junction was signalised in Option 2 network thus the signal timings at this junction have been optimised to best suit the traffic flows.
- **Watford Road / Tippendell Lane** (node 6299/16850) – this is the location of an improvement scheme in option 2 (scheme ref CG_Acc). The new junction layout was forecast with increased delay on Tippendell Lane approach, thus the signal settings were optimised.
- **Ancient Britton** (node 6348) – this is a key junction in the network and is over-capacity in the future years. Signal optimisation was attempted here but it was not possible to improve the performance of the junction as all arms are over-capacity.
- **King William IV** (node 6372) – this is a key junction in the network and is over-capacity in the future years. Signal optimisation was attempted here but it was not possible to improve the performance of the junction as three out of four arms are over-capacity.
- **A414 / A1081** (node 6475/6482) – this is a key junction in the network which is the location of an improvement scheme in Option 1 whereby the existing roundabout becomes signalised (scheme ref 650534762_SADC_DWG_Site2 / SC SM176). The signal timings at this junction have been optimised to best suit the traffic flows for Option 2.
- **A1081 Luton Road/ Roundwood Lane** (node 6538), this is the signalised access node for North West Harpenden developments. (scheme ref 10338_HL_07) The new development access has increased traffic delay along Luton Road thus requires optimisation.

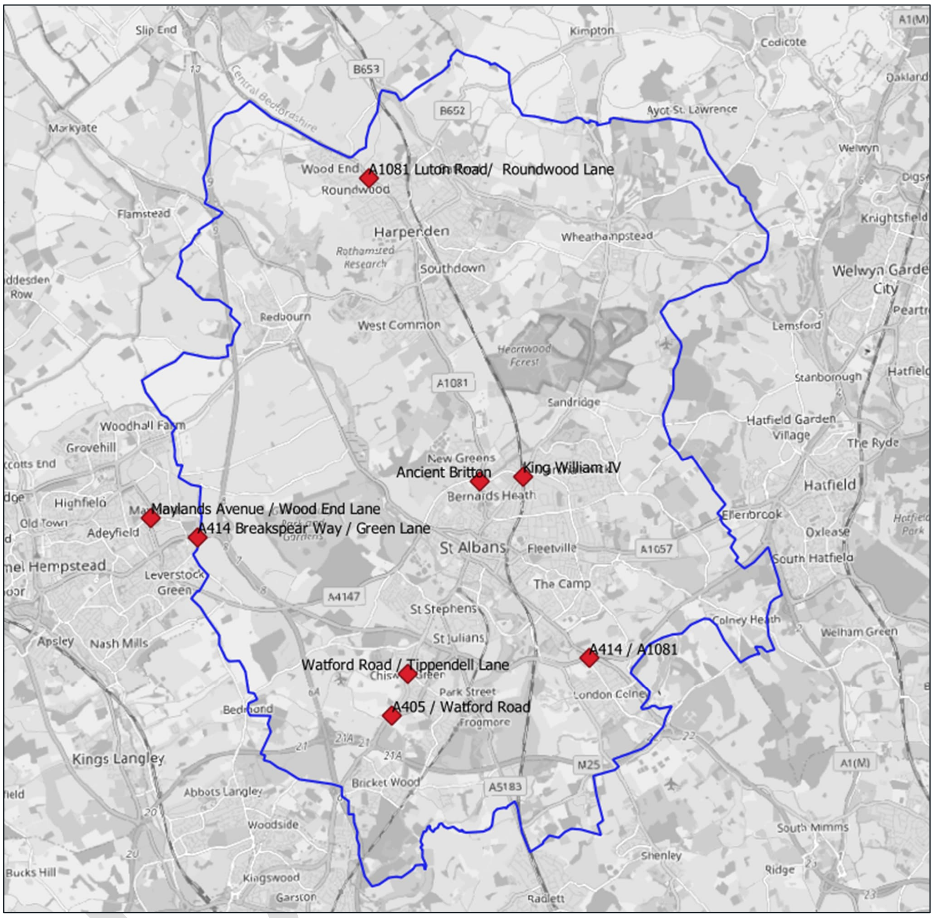

Figure 7-2: Signal Junctions with Traffic Signal Optimisation

7.4 Modal Shift

7.4.1. For Option 2 it was assumed that there would be a 10% shift away from car for all model zones within the St Albans district. This assumption was applied uniformly to all zone pairs representing movements to, from or between the model zones representing St Albans and therefore does not reflect any specific interventions or the propensity to switch modes based on the availability/accessibility of alternative modes or the distance of the journey. The adjustment was applied to all car trips, including those associated with future development sites.

Commented [EC2]: HCC/ SADC it would be good to add in here a list of measures which will help to achieve this modal shift to help justify it's application

7.4.2. As shown by Table 7-2, the 10% mode shift assumption has resulted in a reduction of around 4,000 car trips within the peak hours.

Table 7-2: Reduction in Peak Hour Car Trips due to 10% Mode Shift Assumption

Time Period	Total Car Trips to/from/within St Albans District – 2041 Future Year with Local Plan in place		
	No Mode Shift	10% Mode Shift	Reduction
AM Peak Hour	38,276	34,448	-3,828
PM Peak Hour	38,459	34,612	-3,847

8 2041 Option 3 Assumptions

8.1 Overview

8.1.1. Option 3 represents the future year of 2041 with the Local Plan in place, along with the same transport mitigation schemes as Option 2, but with alternative assumptions around mode shift away from car.

8.1.2. For this option, the WSP Opportunity to Shift Modes (OSM) tool has been used to develop specific assumptions regarding potential modal shift for different movements within the study area, based on journey distance, the availability of alternative modes and the propensity of residents to walk, cycle or use public transport in St Albans.

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8.1.3. The report provided in Appendix J gives more information on the underlying study that was undertaken to determine the modal shift assumptions applied in this scenario.

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8.1.4. The mode shift assumptions provided by the OSM tool were applied to the highway model demand matrices as a demand matrix adjustment after the normal variable demand modelling process within the COMET model.

8.2 Alternative Mode Shift Assumptions

8.2.1. Table 8-1 and Table 8-2 illustrate the degree of modal shift that was estimated by the OSM tool. This shows a relatively high reduction in car trips for journeys within St Albans, and a more modest reduction for trips from St Albans to other areas. As the OSM considers outbound trips only, there is no reduction in trips to St Albans from other areas, however it is possible that measures introduced to encourage modal shift may also impact on these trips. Additionally, it could be expected that some outbound trips made by non-car modes in the AM peak would similarly return by a non-car mode in other time periods, such as the PM peak. Therefore, in practice a higher level of mode shift may be achieved than has been modelled in this scenario.

Table 8-1: Reduction in Car Trips from OSM tool (AM Peak)

	To		
From	**St Albans District**	**St Albans LP Sites**	**Other Areas**
St Albans District	-26.5%	-18.4%	-5.8%
St Albans LP Sites	-2.2%	-1.2%	-1.0%
Other Areas	0.0%	0.0%	0.0%

Table 8-2: Reduction in Car Trips from OSM tool (PM Peak)

	To		
From	**St Albans District**	**St Albans LP Sites**	**Other Areas**
St Albans District	-29.0%	-18.2%	-6.7%
St Albans LP Sites	-2.1%	0.0%	-1.2%
Other Areas	0.0%	0.0%	0.0%

8.2.2. Table 8-3 shows the equivalent reduction in peak hour car trips to, from and within St Albans as a result of these mode shift assumptions. Similar to Option 2, the overall reduction in car trips is around 10%, however the distribution of the modal shift is more nuanced in this scenario.

Table 8-3: Reduction in Peak Hour Car Trips due to OSM mode Shift Assumption

Time Period	**Total Car Trips to/from/within St Albans District – 2041 Future Year with Local Plan in place**			
	No Mode Shift	**With OSM Mode Shift**	**Reduction in Trips**	**% Reduction**
AM Peak Hour	33,489	29,912	-3,577	-10.7%
PM Peak Hour	32,828	29,130	-3,698	-11.3%

9 Modelling Results

9.1 Overview

9.1.1. This chapter presents the results of the scenarios and within this section the transport modelling results are presented in a number of ways. In some cases results for each scenario are presented individually, whereas in other cases a series of comparisons has been drawn to show the incremental change between scenarios. These comparisons are as follows:

- **Option 0 vs Base Year**: This comparison shows the forecast changes between the model base year of 2014 and the future year of 2041 when all completed and consented transport schemes developments are built out.
- **Option 1 vs Option 0**: This comparison shows the impact of the Local Plan development allocations without any transport infrastructure mitigation measures.
- **Option 2 vs Option 1:** This comparison shows the impact of the transport infrastructure mitigation measures alongside the 10% modal shift away from car across SAD.
- **Option 3 vs Option 1**: This comparison also shows the impact of the proposed mitigation measures but with the alternative mode shift assumptions derived from the Opportunity to Shift Modes tool

9.1.2. The following metrics are presented:

- **Traffic flows** (section 9.2)
  - Diagrams showing forecast traffic flows to and from the key development allocations.
  - Diagrams showing the net change in traffic flow between the options, as described above.
  - Diagrams to show the impact to the SRN
- **Highway network performance** (section 9.3)
  - Highway network statistics for St Albans
  - Diagrams showing Volume / Capacity ratio (V/C%) for all links in the network – this indicates how close to capacity each link is.
  - Diagrams showing link delays.
- **Performance of junctions** (section 9.4)
  - Diagrams showing the changes in junction delay across St Albans district
  - Summary of total flow entering each key junction across each scenario

- Summary of average delay per vehicle at each key junction across each scenario
- **Journey times** (section 9.5)
  - Tabulation of journey times along a selection of routes through the network between each scenario.
  - Graphs showing travel time along each route in more detail.
  - Tabulation of average travel time between St Albans (areas of St Albans city, Redbourn and Harpenden) and neighbouring towns and districts.

9.1.3. All of the modelling results have been presented for the AM and PM peak hours.

9.2 Traffic Flows

Development Traffic Flow Analysis

9.2.1. The diagrams in this section show the forecast traffic flows to and from each of the key development sites in the Local Plan. This shows how each site is likely to affect different areas of the network and confirms the routes that are likely to be used in conjunction with each site. All results have been extracted from Option 1 with the exception of East Hemel Hempstead where it was decided given the scale of the development, the A414 Breakspear Way/ Green Lane improvement scheme and the closure of Punchbowl Lane and Hogg End Lane to also present Option 2. It is important to note that the scale used for the traffic plots is the same for all developments to allow easy comparisons.

East Hemel Hempstead

9.2.2. Figure 9-1 and Figure 9-2 shows the combined traffic to and from the four individual sites comprising the East Hemel Garden Community development within the St Albans district in Option 1. In both figures it is clear the proposed development increases traffic flow on the nearby network significantly with increases in flow of over 500 pcus on the new spine road, A414 Breakspear Way and some sections of the M1 close to junction 8. Given the scale of the development the traffic flow increases from the site are wide reaching with increases of up to 200 pcus reaching across Hemel Hempstead, to St Albans, London Colney on the A414 and increases on the M25 at the South Mimms interchange, junction 23. To the west of the site traffic flow increases of up to 500 pcus are experiences on the A414, B487 and Link Road. To the east of the site increases in traffic flow up to 500 pcus are experienced on the B487, the M1, A4147, A5183, M25. It is also important to note that there are increases on Punchbowl Lane and Hogg End Lane in both peaks with increases of up to 200pcus in the PM peak. These roads are narrow single lane roads and would not be able to cope with these increases in demand, hence their closure in Option 2.

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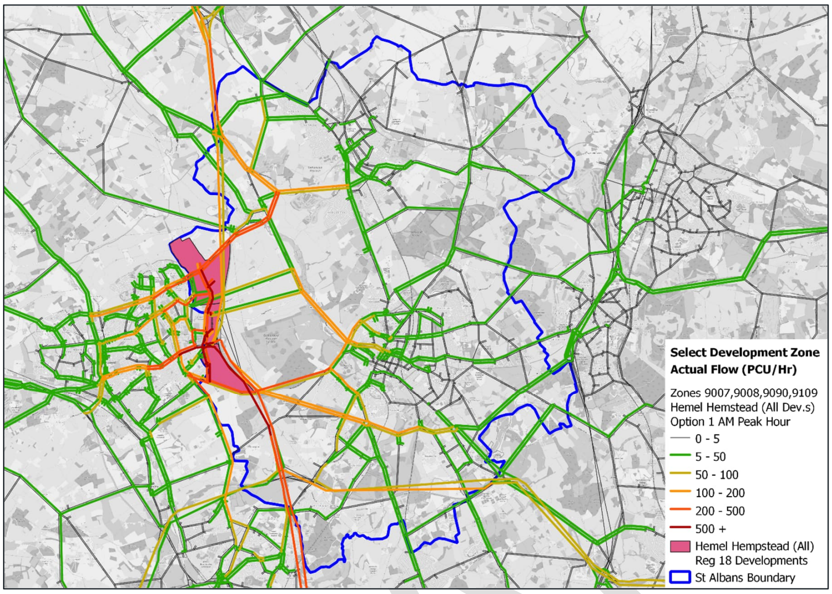


Figure 9-1: Traffic to and from East Hemel Development (AM Peak) Option 1

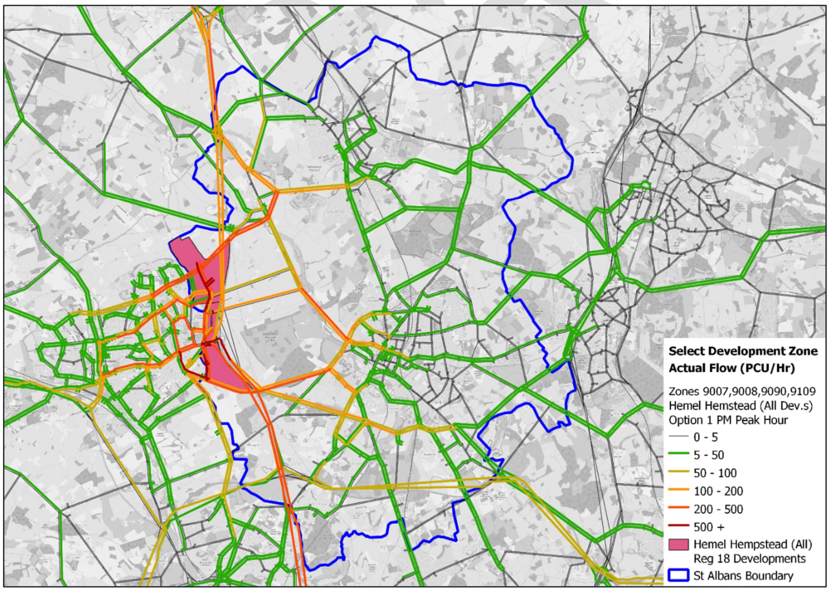


Figure 9-2: Traffic to and from East Hemel development (PM Peak) Option 1

9.2.3. Figure 9-3 and Figure 9-4 shows the combined traffic to and from the four individual sites comprising the East Hemel Garden Community development within the St Albans district in Option 2. The figures show very similar patterns of traffic flow distribution to those which were extracted from Option 1. The key differences is that no traffic flow is now travelling on Punchbowl Lane and Hogg End Lane which results in reductions in traffic on the southern section of the A5183 in both peaks but increases in traffic flow on the northern section of A5183 which is a result of traffic now using the A5183 to travel to Redbourne instead of using Punchbowl Lane and Hogg End Lane as a route to travel south to St Albans.

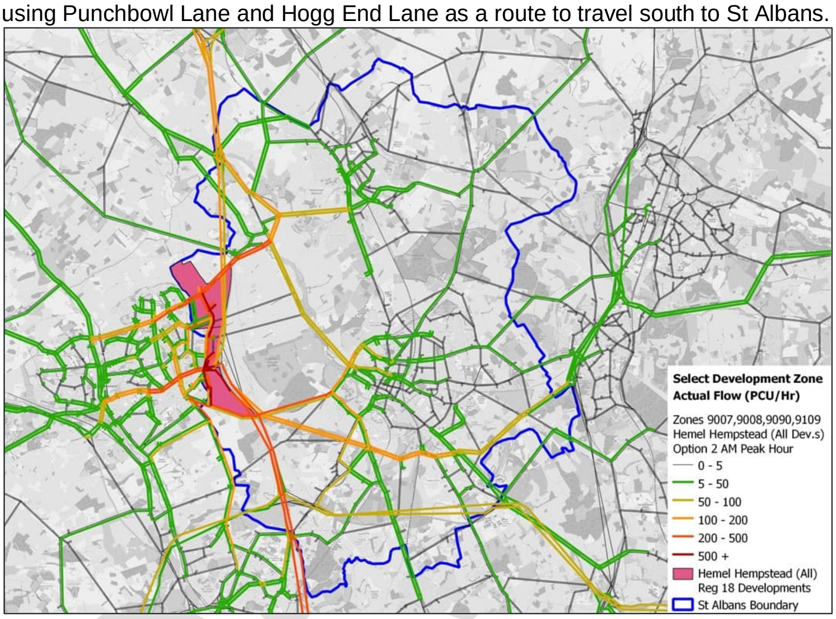


Figure 9-3: Traffic to and from East Hemel Development (AM Peak) Option 2

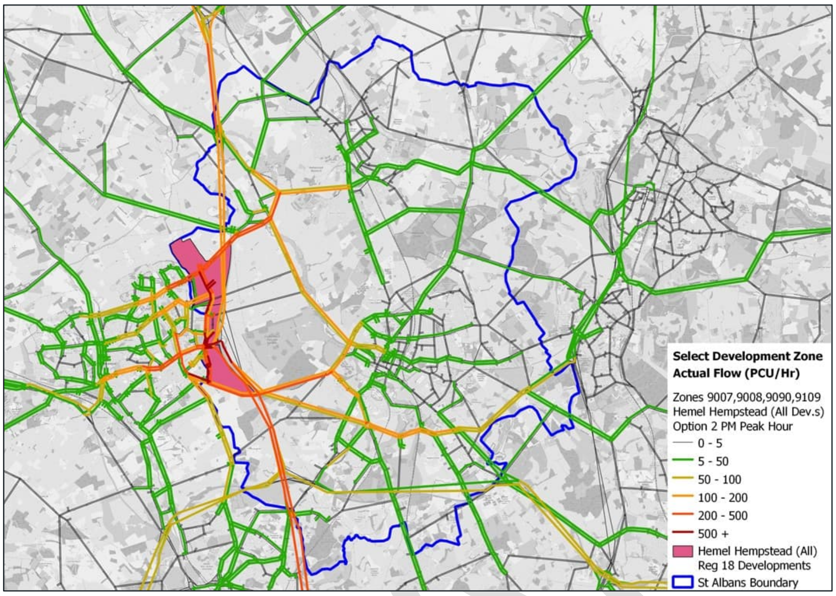


Figure 9-4: Traffic to and from East Hemel development (PM Peak) Option 2

North St Albans

Commented [CE5]: HCC/ SADC do you want us to include an Option 2 plot for North St Albans given the closure of Sandrigebury Lane/ Valley Road in Option 2?

9.2.4. Figure 9-5 and Figure 9-6 shows the traffic to and from the North of St Albans development within the St Albans district. In both figures it is clear the proposed development increases traffic flow on the nearby network, predominantly A1081 Harpenden Road both north and south of the development with increases in flow of over 500 pcus. Increases in traffic are also experienced on Sandridgebury Lane and Valley Road of up to 200 pcus in both peaks. In the PM peak there are also increases along Ferrers Lane and Ayres End Lane of up to 200 pcus in the westbound direction, with only small increases of traffic on these roads in the AM peak.

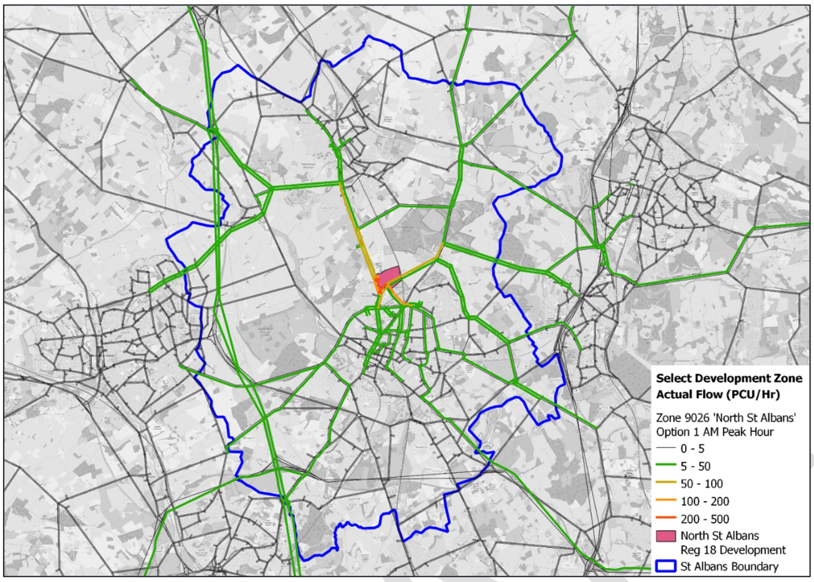


Figure 9-5: Traffic to and from North St Albans Development (AM Peak) Option 1

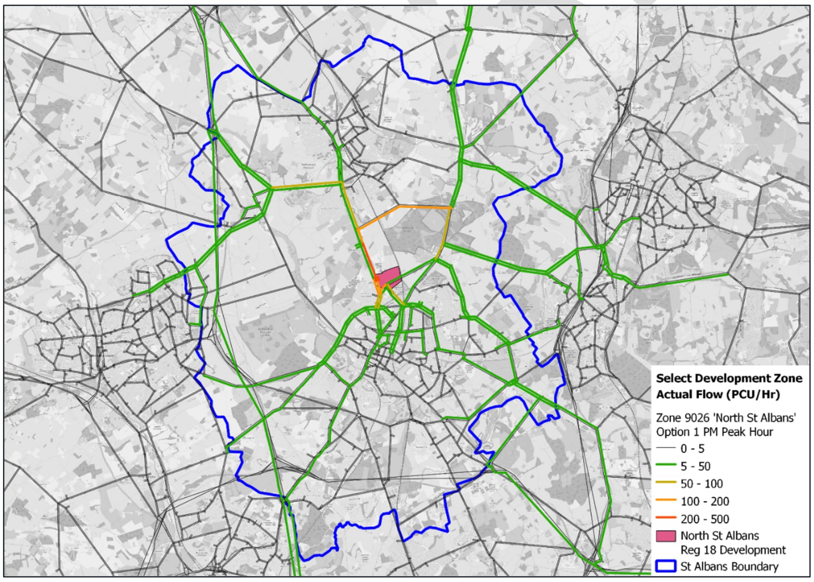


Figure 9-6: Traffic to and from North St Albans development (PM Peak) Option 1

West of London Colney

9.2.5. Figure 9-7 and Figure 9-8 shows the traffic to and from the West of London Colney development within the St Albans district. In both figures it is clear the proposed development increases traffic flow on the nearby network, predominantly on B5378 between the A4141 and M25 with increases up to 200 pcus. All other increases on traffic on other roads are between 0-50 pcus impacting roads in the local area, but also M1, A414 and M25.

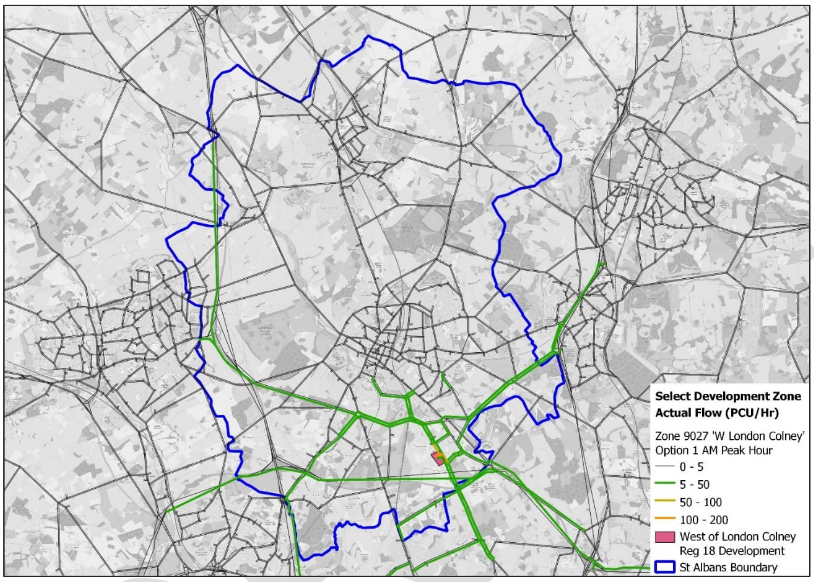


Figure 9-7: Traffic to and from West of London Colney Development (AM Peak)

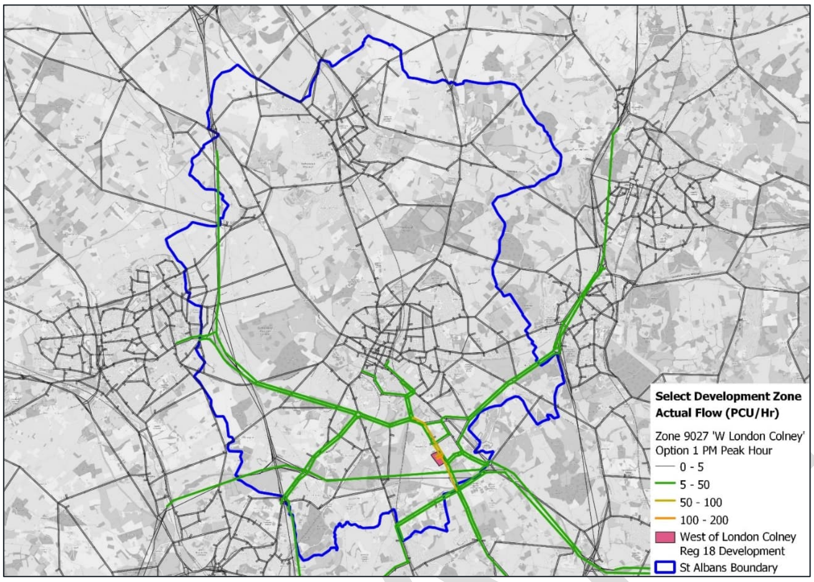


Figure 9-8: Traffic to and from West of London Colney Development (PM Peak)

North East Harpenden

9.2.6. Figure 9-9 and Figure 9-10 shows the traffic to and from the North East Harpenden development within the St Albans district. In both figures it is clear the proposed development increases traffic flow on the nearby network, predominantly on B653 and B652 with increases of up to 200 pcus. In the PM peak there are also increases of traffic of up to 100 pcus on Station Road heading back to the development, increases of traffic on Station Road in the AM peak are between 5 and 50pcus.

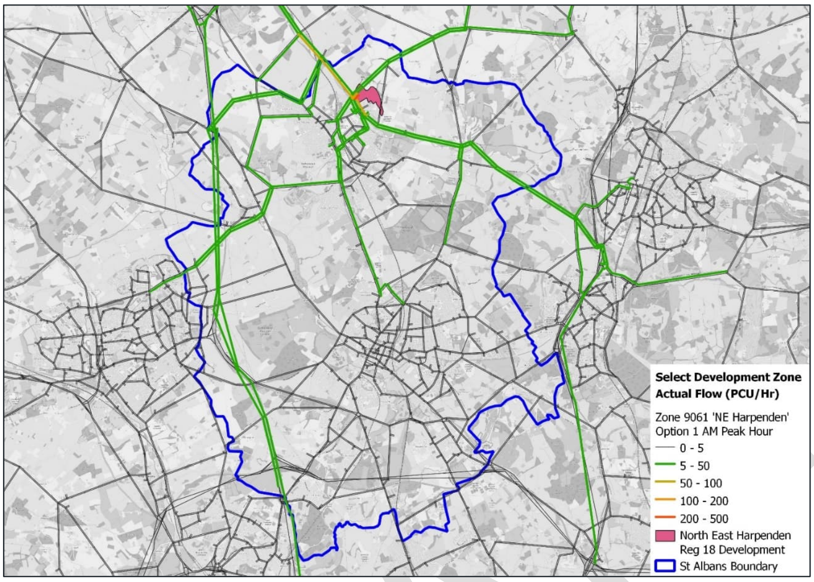


Figure 9-9: Traffic to and from North East Harpenden Development (AM Peak)

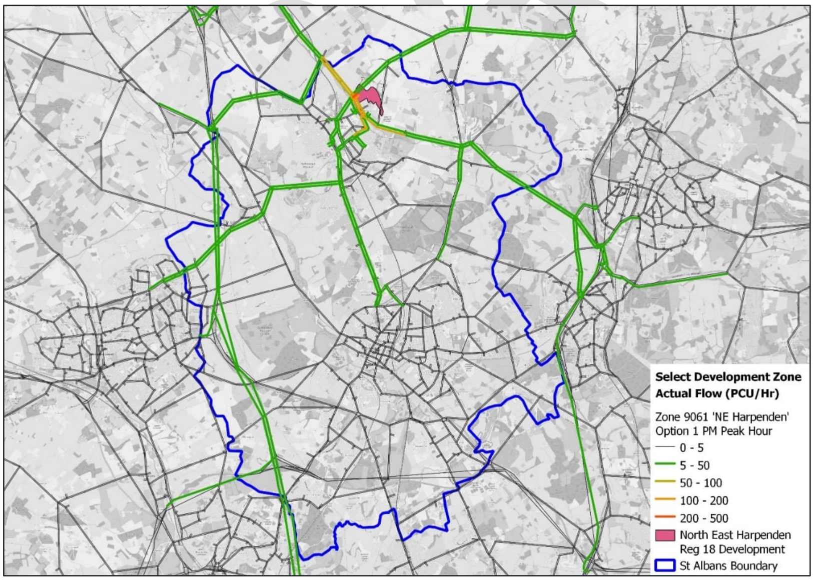


Figure 9-10: Traffic to and from North East Harpenden Development (PM Peak)

East St Albans

9.2.7. Figure 9-11 and Figure 9-12 shows the traffic to and from the East St Albans development within the St Albans district. In both figures it is clear the proposed development increases traffic flow on the nearby network, predominantly on Sandpit Lane Oaklands Lane with increases of up to 200 pcus. All other increases in traffic flow are between 5 and 50 pcus and impact nearby roads including Station Road, House Lane and A1057.

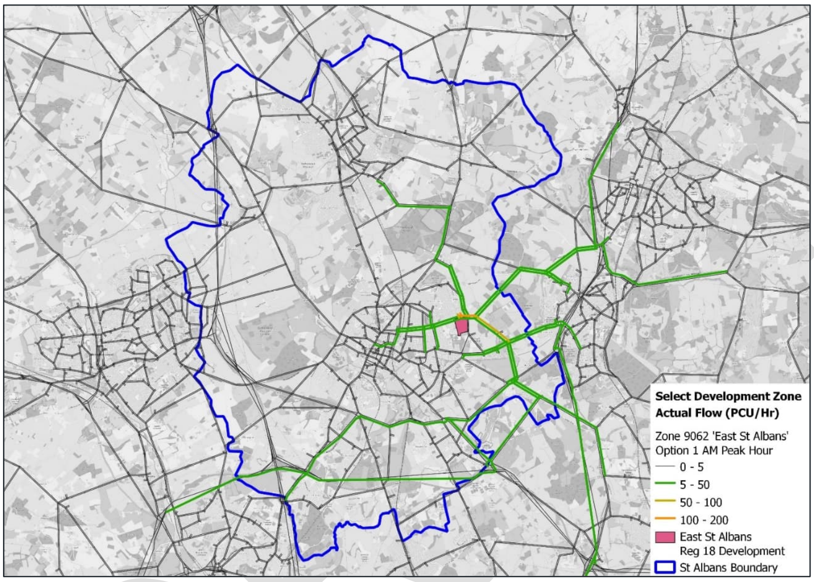


Figure 9-11: Traffic to and from East St Albans Development (AM Peak)

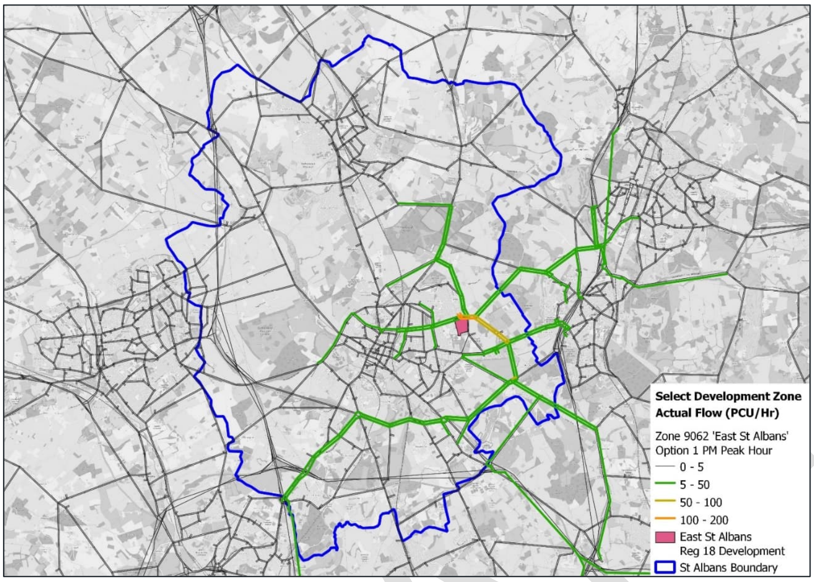


Figure 9-12: Traffic to and from East St Albans Development (PM Peak)

Glinwell, Hatfield Road

9.2.8. Figure 9-13 and Figure 9-14 shows the traffic to and from the Glinwell development within the St Albans district. In both figures it is clear the proposed development increases traffic flow on the nearby network, predominantly on A1057 with increases of up to 200 pcus. All other increases in traffic flow are between 5 and 50 pcus and impact nearby roads including Oaklands Lane, Station Road and Colney Heath Lane.

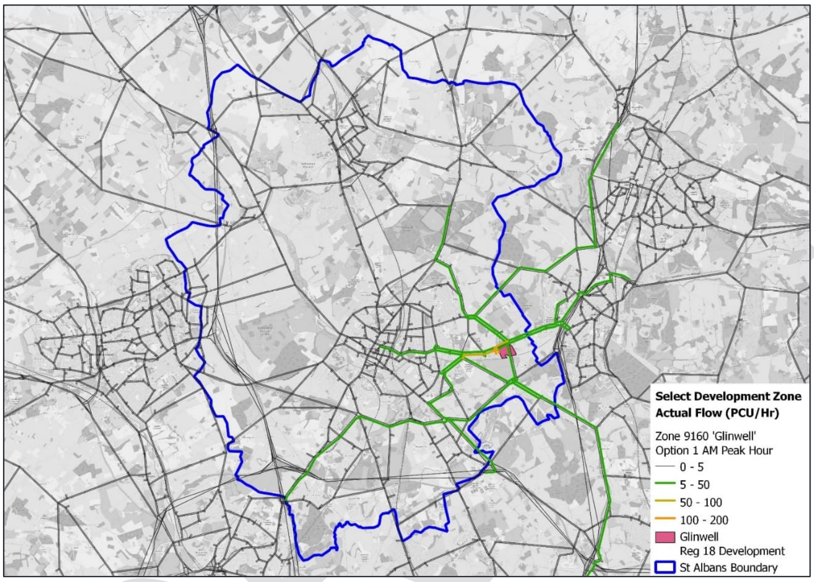


Figure 9-13: Traffic to and from Glinwell, Hatfield Road Development (AM Peak)

wsp

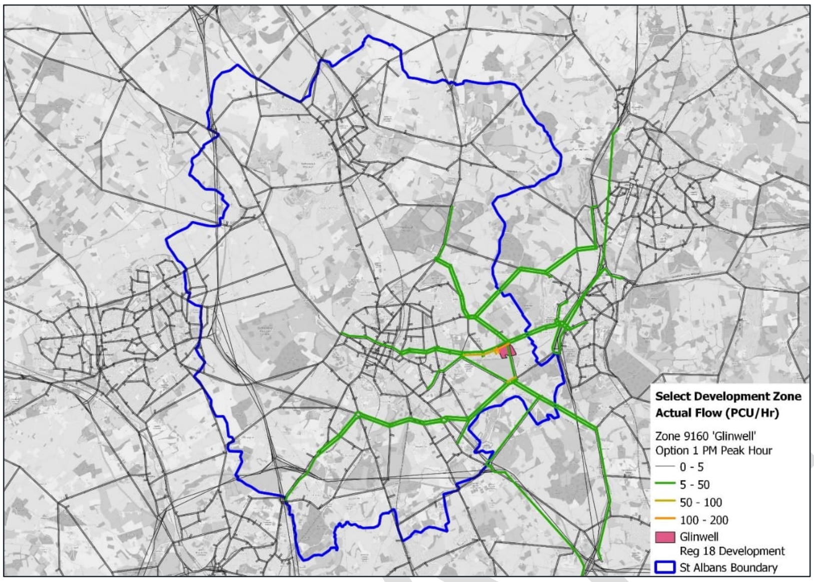


Figure 9-14: Traffic to and from Glinwell, Hatfield Road Development (PM Peak)

West Redbourn

9.2.9. Figure 9-15 and Figure 9-16 shows the traffic to and from the West Redbourn development within the St Albans district. In both figures it is clear the proposed development increases traffic flow on the nearby network, predominantly on B487 and Hemel Hempstead Road within Redbourn with increases up to 200 pcus. All other increases in traffic flow are between 5 and 50 pcus and impact nearby roads including A5183, B487 and Gaddesden Lane and Lybury Lane.

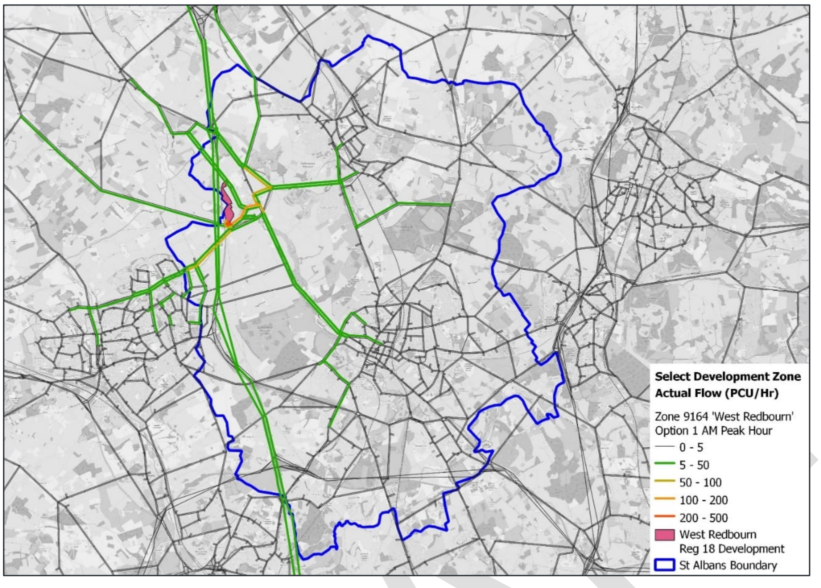


Figure 9-15: Traffic to and from West Redbourn Development (AM Peak)

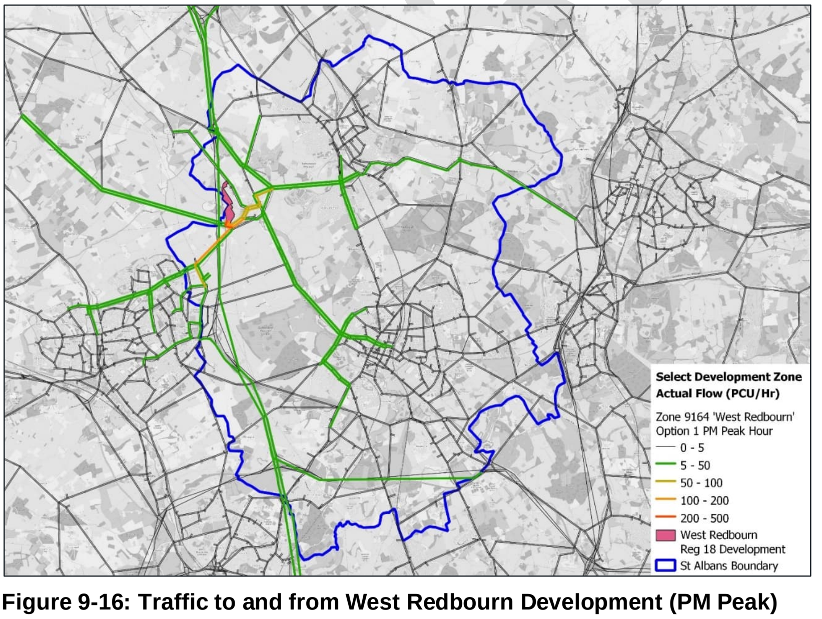


Figure 9-16: Traffic to and from West Redbourn Development (PM Peak)

St Albans District Traffic Flow Changes

9.2.10. This section of the report provides details of the traffic flow changes across SAD between the following scenarios:

- **Option 0 vs Base Year**
  - Changes in traffic as a result of the predicted future year growth in traffic and the completed and committed developments
- **Option 1 vs Option 0**
  - Changes in traffic as a result of the SADC Local Plan developments
- **Option 2 vs Option 1**
  - Changes in traffic as a result of the IDP transport schemes and 10% mode shift assumption
- **Option 3 vs Option 1**
  - Changes in traffic as a result of the IDP transport schemes and Opportunity to Shift Modes tool

Impact of Future Year Growth and Committed Developments

9.2.11. Figure 9-17 and Figure 9-18 present the changes in traffic flow which occur as a result of the predicted future year growth in traffic and the completed and committed developments. Both figures show that across St Albans District there are increases in traffic flow which many roads showing increases of over 300 pcus. There are some roads which experience a reduction in traffic flows which is a result of increased congestion occurring on the network.

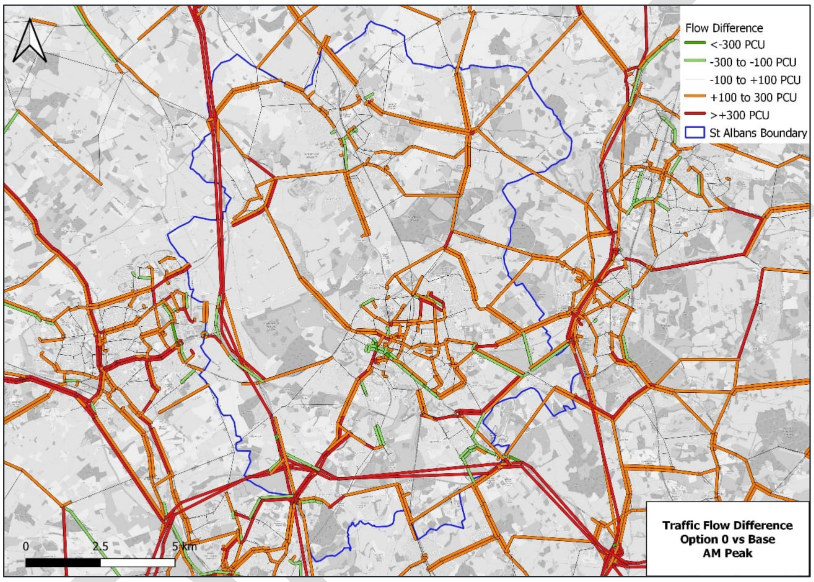


Figure 9-17: SAD Changes in Traffic Flow between Option 0 and Base Year (AM Peak)

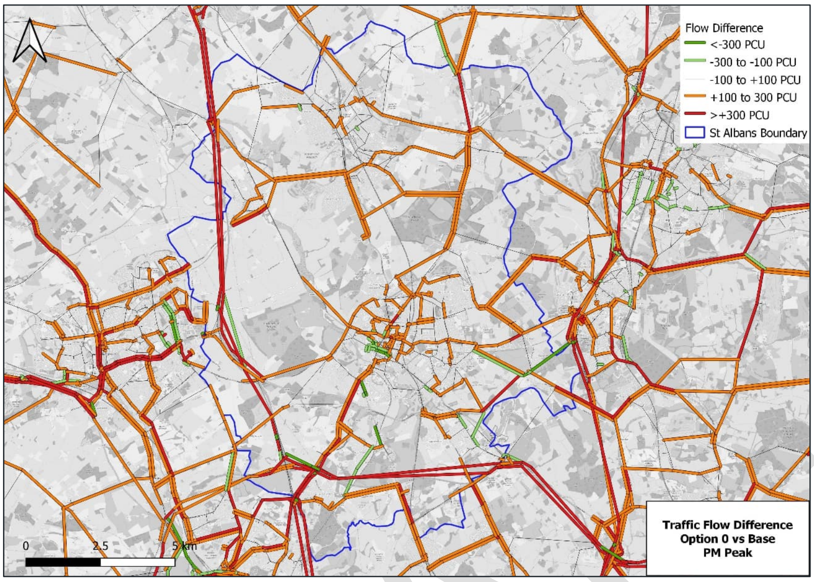


Figure 9-18: SAD Changes in Traffic Flow between Option 0 and Base Year (PM Peak)

Impact of Local Plan Developments without Mitigation

9.2.12. Figure 9-19 and Figure 9-20 present the changes in traffic flow which occur as a result of the SADC Local Plan developments. These show increases in traffic around the key Local Plan sites and with the biggest increases in traffic flow being around the East Hemel Hempstead site. The increases around this site are similar to the stand-alone development plot with the greatest increases occurring on A4147, A5183, B487, M1, Bedmond Road, Punchbowl Lane and Hogg End Lane. The plot shows reductions on A414 Breakspear Way which is a result of the additional delays and congestion which are being experienced in this area as a result on no transport improvements being introduced. Increases in traffic around other Local Plan sites are between 100-300 pcus.

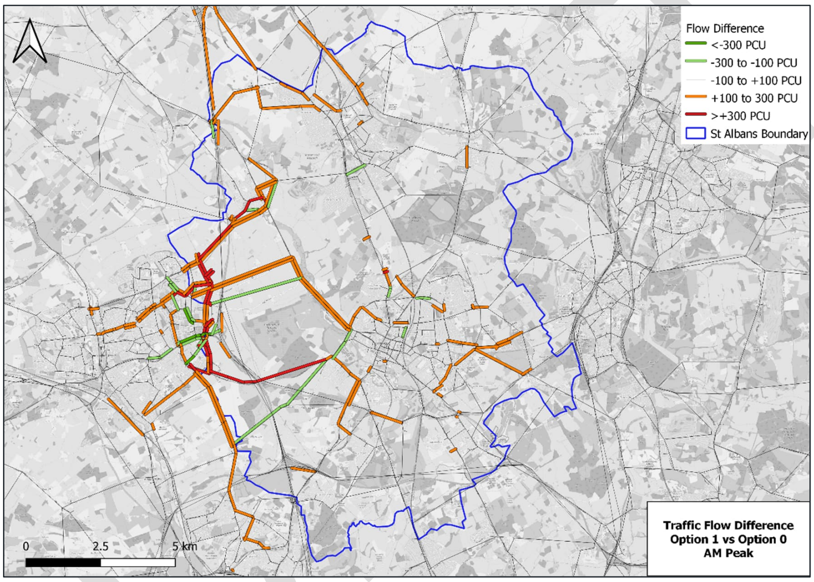


Figure 9-19: SAD Changes in Traffic Flow between Option 1 and Option 0 (AM Peak)

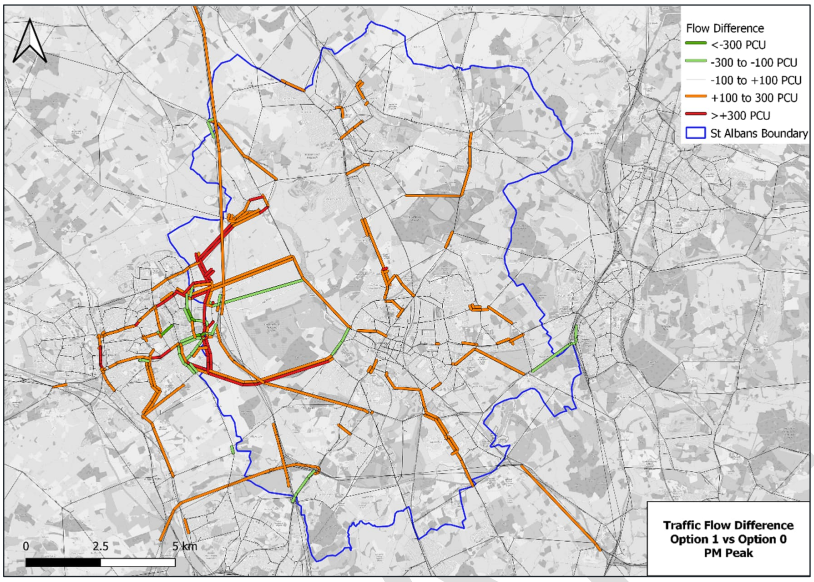


Figure 9-20: SAD Changes in Traffic Flow between Option 1 and Option 0 (PM Peak)

Impact of Mitigation (IDP and 10% Modal Shift)

9.2.13. Figure 9-21 and Figure 9-22 present the changes in traffic flow which occur as a result of the IDP schemes and 10% modal shift. Overall the changes show a mixture of both increases and decreases in traffic across the district. Around the East Hemel Hempstead site in both peaks there are increases in traffic on the A414 Breakspear Way which is a result of the introduction of the A414 Breakspear Way/ Green Lane improvement scheme which as reduced traffic delays along this corridor and made it more attractive for traffic to use. As a result of the reduction of delays on the A414 Breakspear Way there are reductions in traffic flow on other east-west corridors across Hemel Hempstead such as A4146, B487 and A4147. There are also increases in traffic flow onto the M1 which is a result of traffic flow in Option 1 being held up in congestion on A414 and being released as part of the A414 improvement scheme. There are traffic flow reductions on Punchbowl Lane, Hogg End Lane, Valley Road and Sandridge Valley Lane as a result of the close of these roads which has been incorporated as part of mitigation measures associated with the Local Plan developments. The reductions in traffic across the district is a result of the mode shift assumptions which are incorporated into the scenario. There are increases in traffic on the A414 south of St Albans and reductions in traffic on the M25 which is a combination of the increase in traffic associated with East Hemel which is now able to access the network alongside the two A414 roundabout improvements which are part of the IDP improvements which are reducing delays and making the route more attractive.

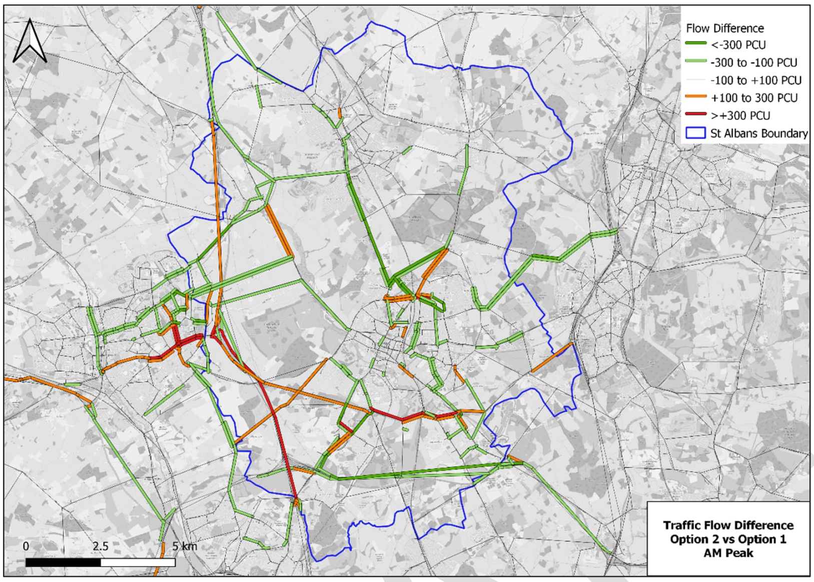


Figure 9-21: SAD Changes in Traffic Flow between Option 2 and Option 1 (AM Peak)

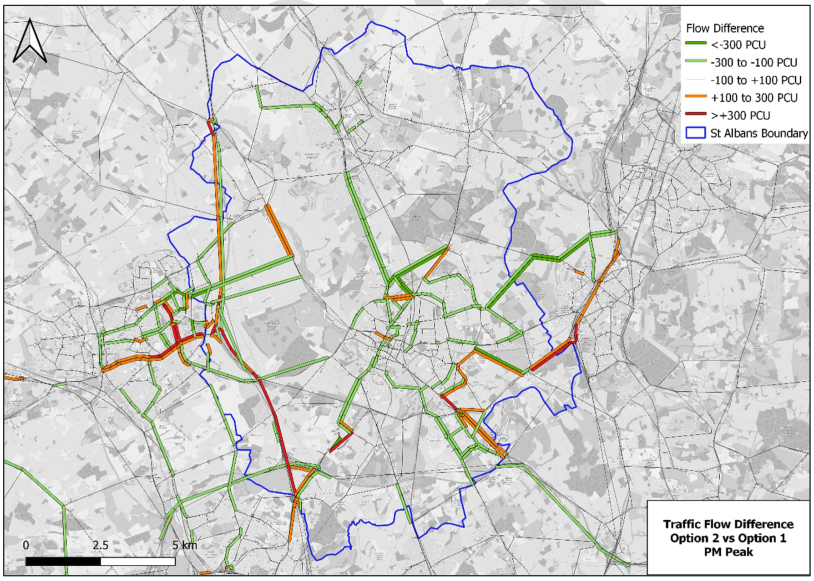


Figure 9-22: SAD Changes in Traffic Flow between Option 2 and Option 1 (PM Peak)

Impact of Mitigation (IDP and Alternative Modal Shift)

9.2.14. Figure 9-23 and Figure 9-24 present the changes in traffic flow which occur as a result of the IDP schemes and the OTS mode tool. Overall the changes are very similar to those presented between Option 2 and 1. However there are some interesting differences. The OTS mode tool targets short trips which are more likely to can mode and hence the shift away from car is more focussed on urban areas. This is why the Option 3 vs 1 difference plots show greater reductions in traffic flow in St Albans and in some instances greater increase in traffic on other roads such as A5183. Noting that the plots will only show link flow differences if the traffic flow moves difference moves outside of the colour band

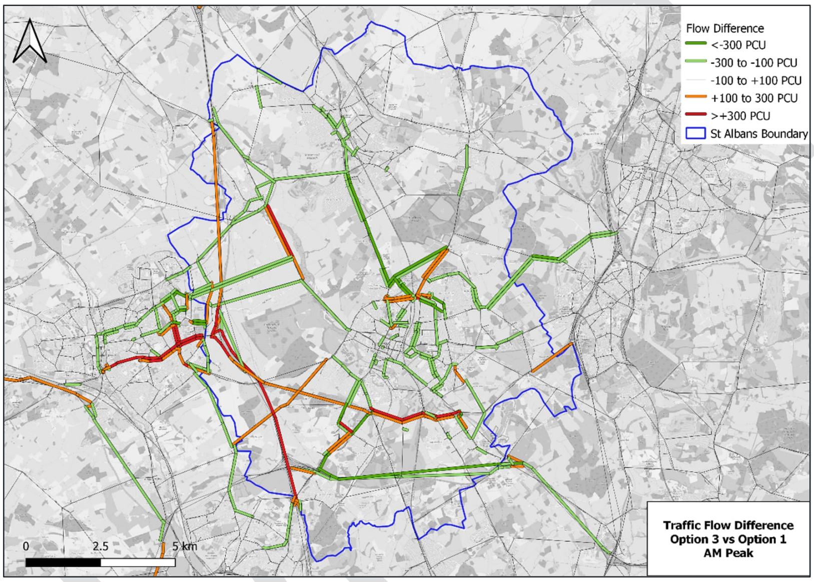


Figure 9-23: SAD Changes in Traffic Flow between Option 3 and Option 1 (AM Peak)

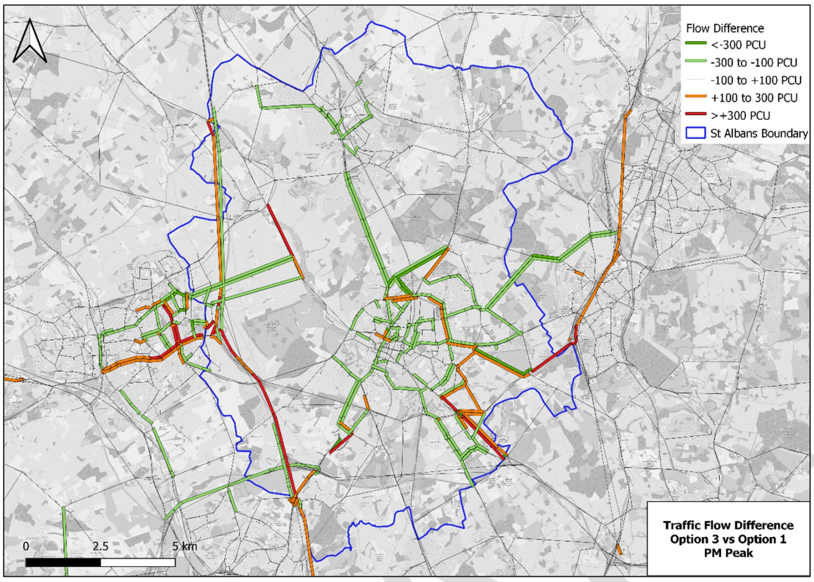


Figure 9-24: SAD Changes in Traffic Flow between Option 3 and Option 1 (PM Peak)

SRN Traffic Flow Changes

9.2.15. This section of the report provides details of the % traffic flow changes on the SRN between the scenarios as outlined in 9.2.10.

Impact of Future Year Growth and Committed Developments

9.2.16. Figure 9-25 and Figure 9-26 present the changes in SRN traffic flow which occur as a result of the predicted future year growth in traffic and the completed and committed developments. These figures show increases in traffic in excess of 20% expected to occur in both AM and PM peaks on the M1, M25 and A1(M) as a result of predicted future year traffic growth and consented developments.

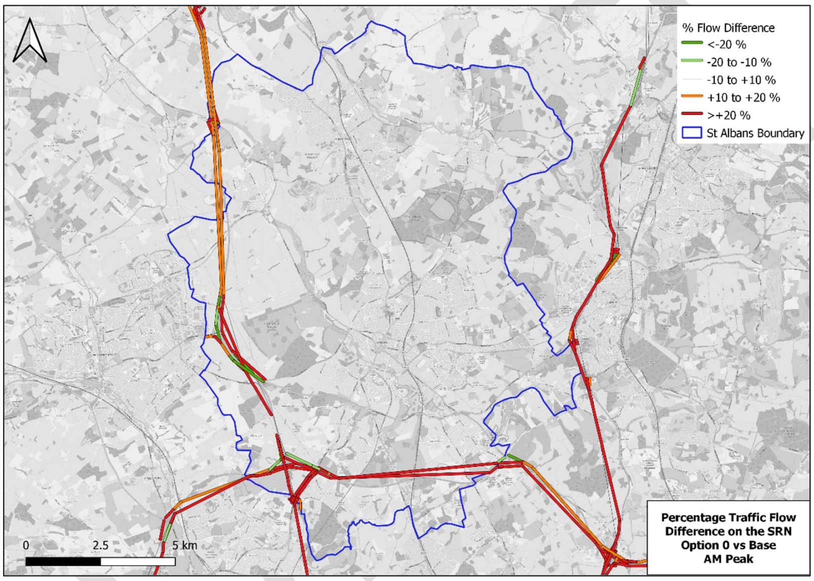


Figure 9-25: % Changes in Traffic Flow on SRN between Option 0 and Base Year (AM Peak)

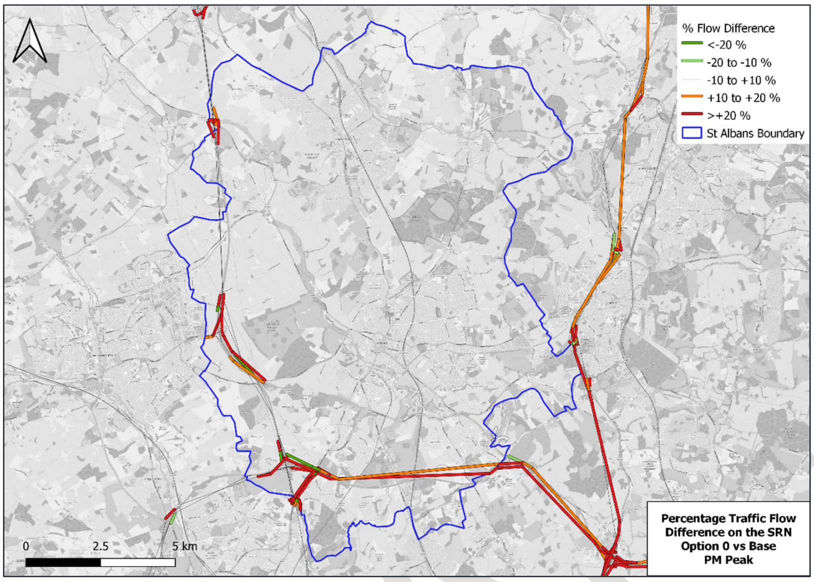


Figure 9-26: % Changes in Traffic Flow on SRN between Option 0 and Base Year (PM Peak)

Impact of Local Plan Developments without Mitigation

9.2.17. Figure 9-27 and Figure 9-28 present the changes in traffic flow which occur as a result of the SADC Local Plan developments. The figures show that the only percentage change in traffic flow occur at M1 Junction 8, which is to be expected as a result of the East Hemel Hempstead development proposals. Noting there are some reduction in traffic flow which is a result of increased congestion in this area without the A414 Breakspear Way/ Green Lane improvement scheme. In both the AM and PM peak there are increases in traffic flow at M1 Junction 9 and in the PM peak only also some reductions. These changes are associated with the on/off slips at the junction. In the PM peak there are also some changes in traffic flow at the M1/ M25 junction with both increases and decreases in % traffic flow which are a result of the St Albans Local Plan development.

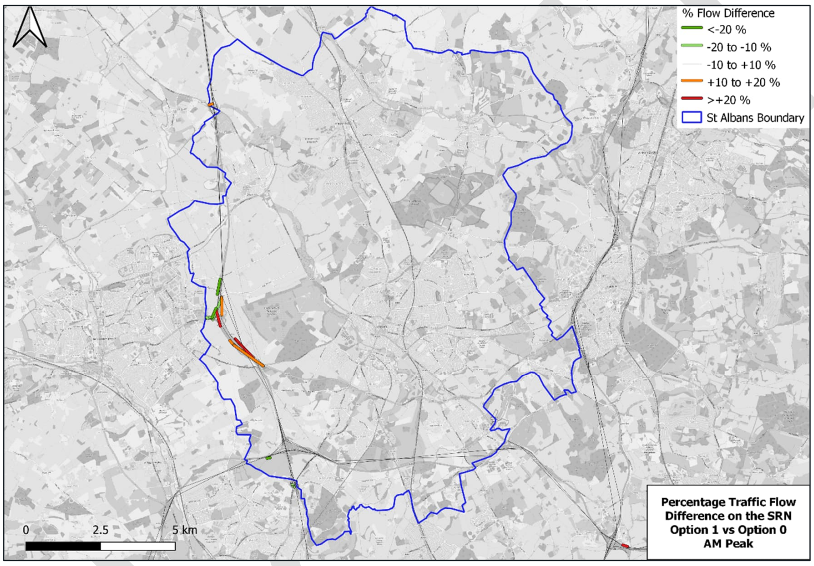


Figure 9-27: % Changes in Traffic Flow on SRN between Option 1 and Option 0 (AM Peak)

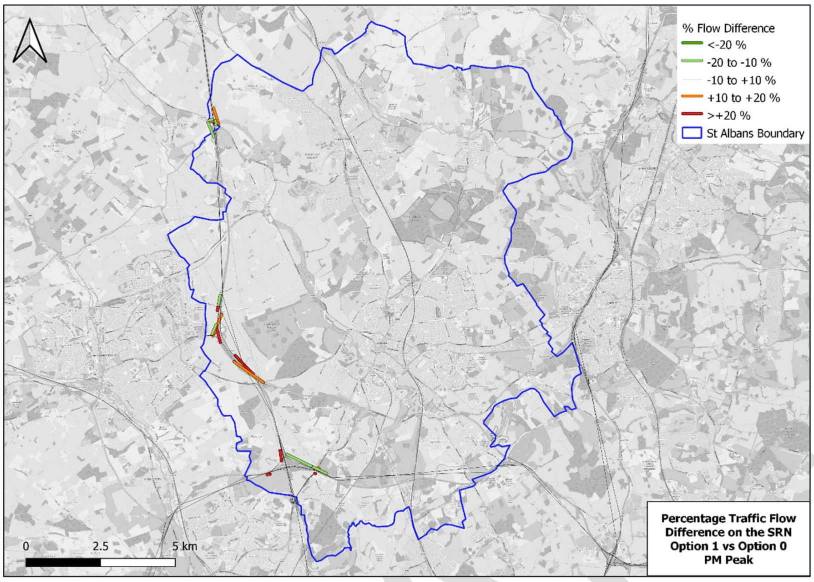


Figure 9-28: % Changes in Traffic Flow on SRN between Option 1 and Option 0 (PM Peak)

Impact of Mitigation (IDP and 10% Modal Shift)

9.2.18. Figure 9-29 and Figure 9-30 present the changes in traffic flow which occur as a result of the IDP schemes and 10% modal shift. These show an a increase in the percentage increase in traffic at M1 Junction 8 which is a result of the A414 Breakspear Way/ Green Lane junction improvement reducing delay and making this route more attractive for traffic. In the AM peak there are reductions in traffic at M1 Junction 9, however in the PM peak there are increases in traffic on the off slips. In the AM peak flow difference increases greater than 10% are also occurring at M25 Junctions 20 and 22, these are between 10-20%. In the PM peak there are increases in traffic flow at the M25/M1 junction greater than 20% and M25 Junction 20 between 10-20% and the A1(M) Junction 3 of 10-20%.

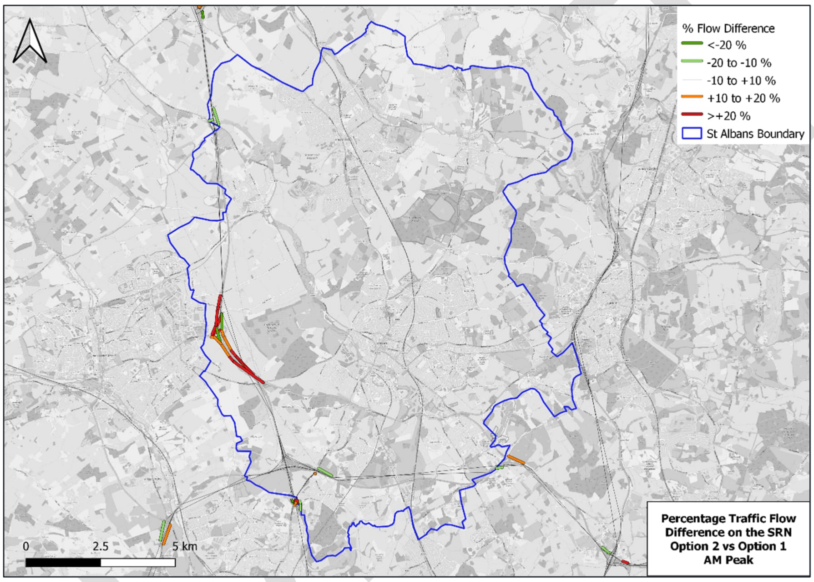


Figure 9-29: % Changes in Traffic Flow on SRN between Option 2 and Option 1 (AM Peak)

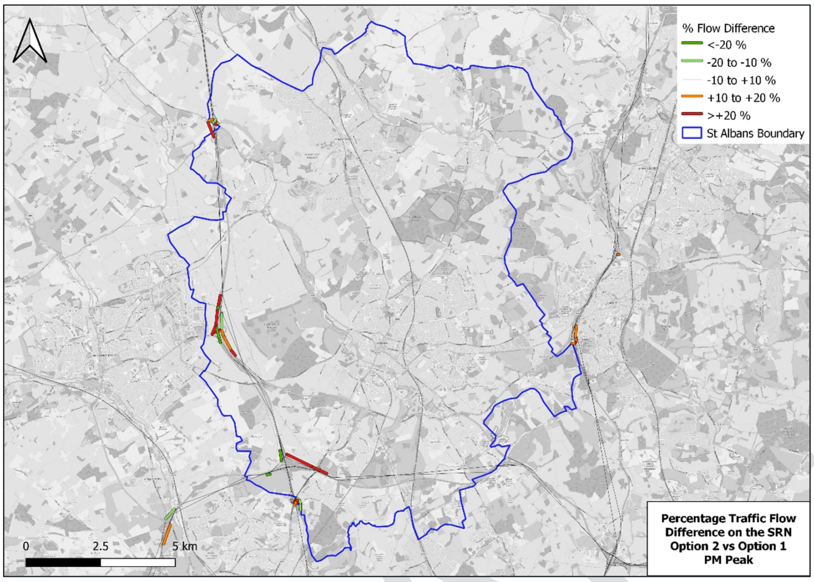


Figure 9-30: % Changes in Traffic Flow on SRN between Option 2 and Option 1 (PM Peak)

Impact of Mitigation (IDP and Alternative Modal Shift)

9.2.19. Figure 9-31 and Figure 9-32 present the changes in traffic flow which occur as a result of the IDP schemes and the OTS mode tool. These show very similar percentage increase in traffic flow on the SRN as the results for Option 2.

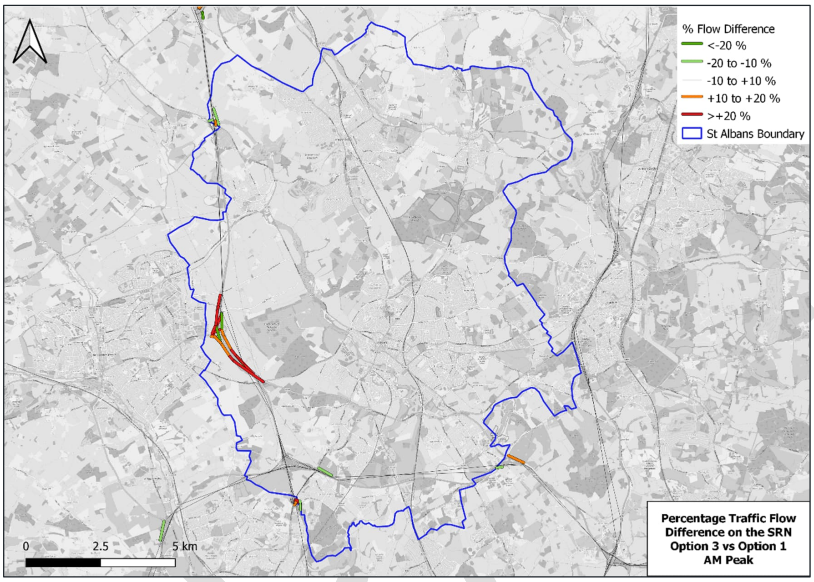


Figure 9-31: % Changes in Traffic Flow on SRN between Option 3 and Option 1 (AM Peak)

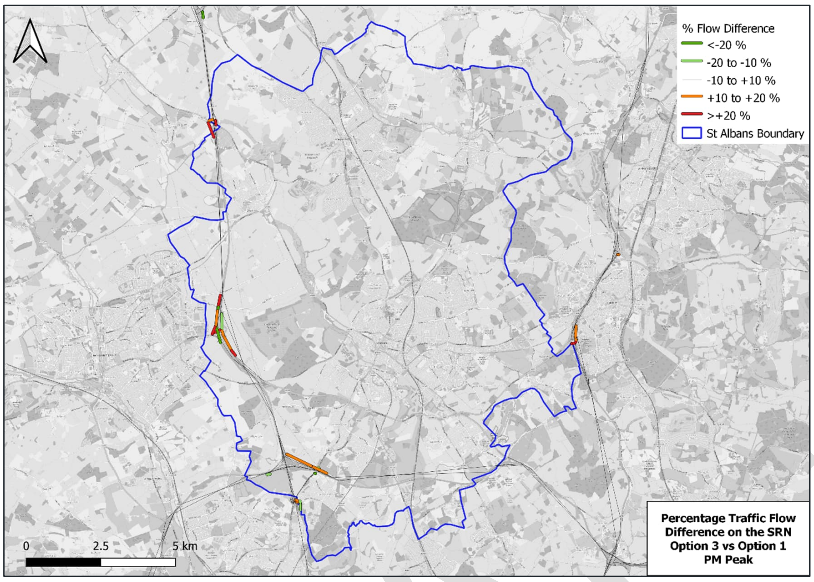


Figure 9-32: % Changes in Traffic Flow on SRN between Option 3 and Option 1 (PM Peak)

9.3 Highway Network Performance

9.3.1. Table 9-1 and Table 9-2 shows summary indicators of network performance for the St Albans District highway network. These have been derived by cordoning the St Albans network from the wider COMET model area and examining the network statistics within the SATURN highway assignment model.

9.3.2. These results show the following changes between scenarios:

- **Total Vehicle Trips**
  - In both AM and PM peak total vehicle trips increases across St Albans between the base year and Option 0 and 1 as a result of the consented and proposed developments. In Option 2 and 3 as a result of the mode shift changes applied the number of trips in St Albans is lower compared to Option 1, with Option 3 being the lowest overall.
- **Total Time Travelled**
  - In both AM and PM peak total time travelled increases across St Albans between the base year and Option 0 and 1 as a result of the consented and proposed developments. In Option 2 and 3 as a result of the mode shift changes and IDP schemes the total time travelled in St Albans is lower compared to Option 1.
- **Time on Links**
  - In both AM and PM peak time on links increases across St Albans between the base year and Option 0 and 1 as a result of the consented and proposed developments. In Option 2 and 3 as a result of the mode shift changes and IDP schemes the time on links in St Albans is lower compared to Option 1.
- **Time at Junctions**
  - In both AM and PM peak time at junctions increases across St Albans between the base year and Option 0 and 1 as a result of the consented and proposed developments. In Option 2 and 3 as a result of the mode shift changes and IDP schemes the time at junctions in St Albans is lower compared to Option 1.
- **Average Speed**
  - The average speed in the AM and PM peak is highest in the base year and lowest in Option 1. Average speed increases in Option 2 and 3 compared to Option 1, as a result of the IDP infrastructure and mode shift changes. The average speed in Option 2 and 3 is only 0.2-0.6 mph slower compared to Option 0 when there is no Local Plan developments, IDP schemes or mode shift.

Table 9-1: Summary of St Albans Highway Network Performance (AM Peak Hour)

Indicator	Base 2014	Future 2041			
		Option 0	**Option 1**	**Option 2**	**Option 3**
		Committed Developments and Infrastructure	**With Local Plan allocations added**	**With Local Plan Allocations and IDP plus mode shift**	**With Local Plan Allocations and IDP plus alternative mode shift**
Total vehicle trips	58,598	69,189	74,664	72,054	71,876
Total Time Travelled (PCU.Hrs)	9,699	12,813	14,299	13,069	13,206
- Time on links (PCU.Hrs)	8,026	9,929	10,511	10,174	10,271
- Time at junctions (PCU.Hrs)	1,673	2,884	3,789	2,895	2,935
Average Speed (mph)	36.2	32.4	30.1	32.2	32.1

Table 9-2: Summary of St Albans Highway Network Performance (PM Peak Hour)

Indicator	Base 2014	Future 2041			
		Option 0	**Option 1**	**Option 2**	**Option 3**
		Committed Developments and Infrastructure	**With Local Plan allocations added**	**With Local Plan Allocations and IDP plus mode shift**	**With Local Plan Allocations and IDP plus alternative mode shift**
Total vehicle trips	58,095	65,905	71,604	69,133	68,595
Total Time Travelled (PCU.Hrs)	9,836	12,369	13,737	12,841	12,801
- Time on links (PCU.Hrs)	8,095	9,548	10,199	9,880	9,926
- Time at junctions (PCU.Hrs)	1,741	2,821	3,538	2,961	2,876
Average Speed (mph)	36.6	32.7	30.7	32.1	32.4

Link Capacity

9.3.3. The following figures show the Volume/Capacity (V/C) ratio for all links in the St Albans network. In these plots, yellow indicates where links are approaching capacity, 85%-100%, orange indicates where the link is just over capacity, 100-105% and red indicates that the link is over greater than 105%.

Base Year

9.3.4. Figure 9-33 and Figure 9-34 show the base year V/C for St Albans in the AM and PM peaks. These show the majority of links are within capacity across the district with only a handful of locations where capacity of greater than 100%. Key locations where base year links are over capacity are roads approaching the SRN such as A405 approaching M1 junction 6, the A414 approaching M25 Junction 21A, the A414 around Colney Heath and the approach to A1(M) Junction 3.

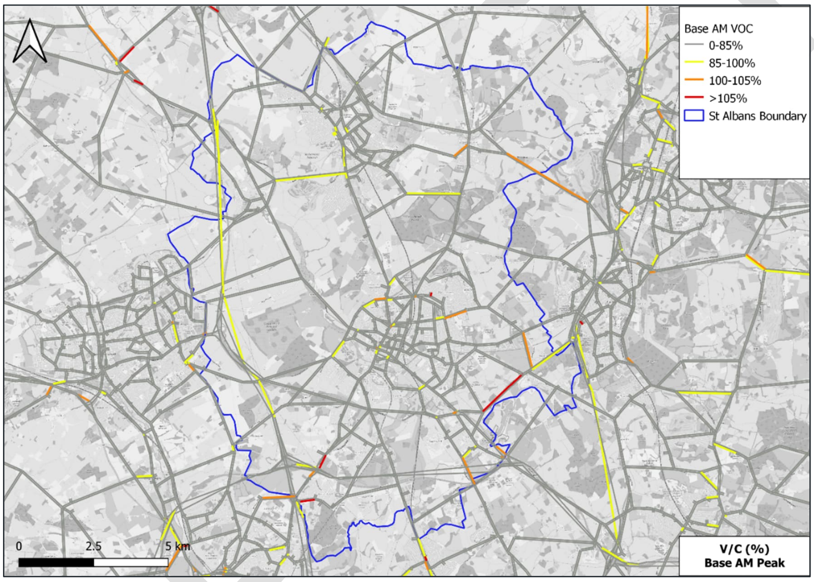


Figure 9-33: Base Year Link Volume/Capacity Ratio, AM Peak Hour

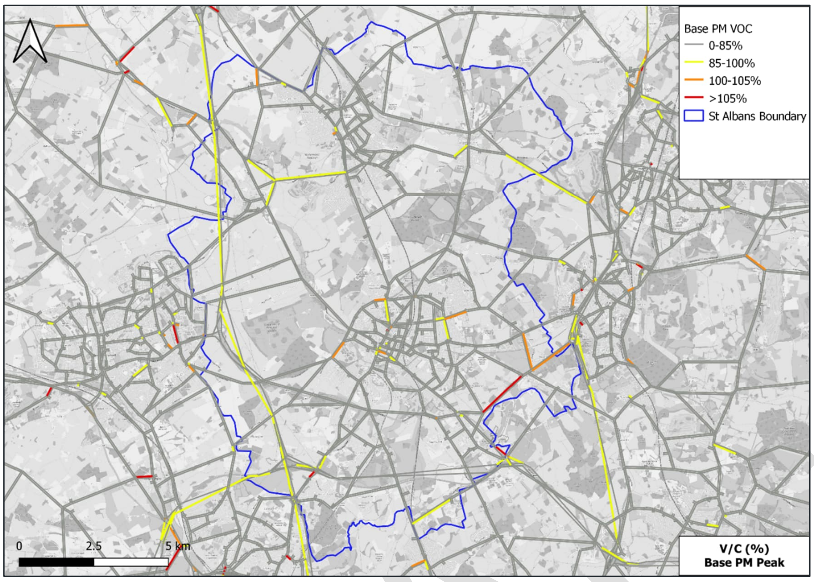


Figure 9-34: Base Year Link Volume/Capacity Ratio PM Peak Hour

Option 0

9.3.5. Figure 9-35 and Figure 9-36 show the 2041 Option 0 V/C for St Albans in the AM and PM peaks. As a result of the future increase in traffic and consented schemes there is a deterioration in V/C across the district. Key roads which experience increases in V/C in the AM peaks include A4147 to the west of St Albans, the A414 approaching A1(M) Junction 3, Church Street in Wheathampstead and Ferrers Lane approaching the B651. In the PM peak key roads which experience increases in V/C are the M25 Junction with the M1, the A4141, A1057 and A1(M) in the approach to A1(M) Junction 3 and B653 between Wewlyn Garden City and Wheathampstead.

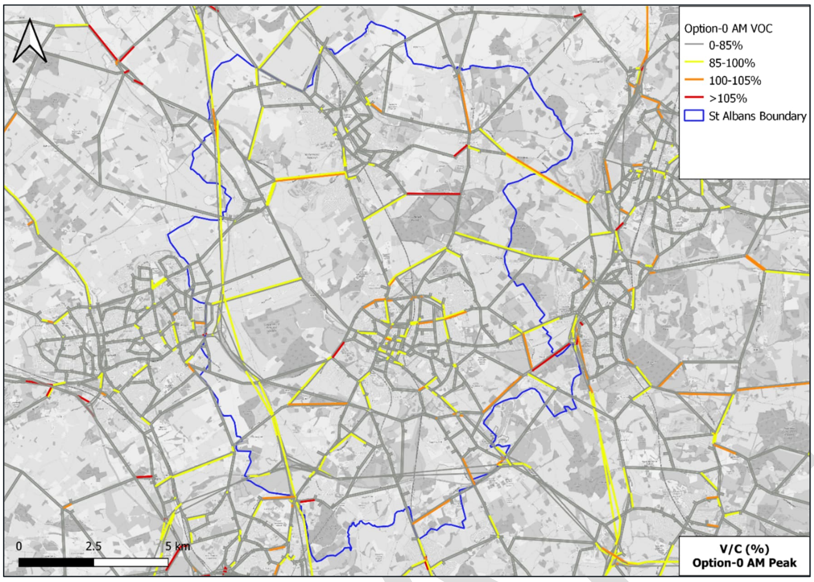


Figure 9-35: Option 0 Link Volume/Capacity Ratio, AM Peak Hour

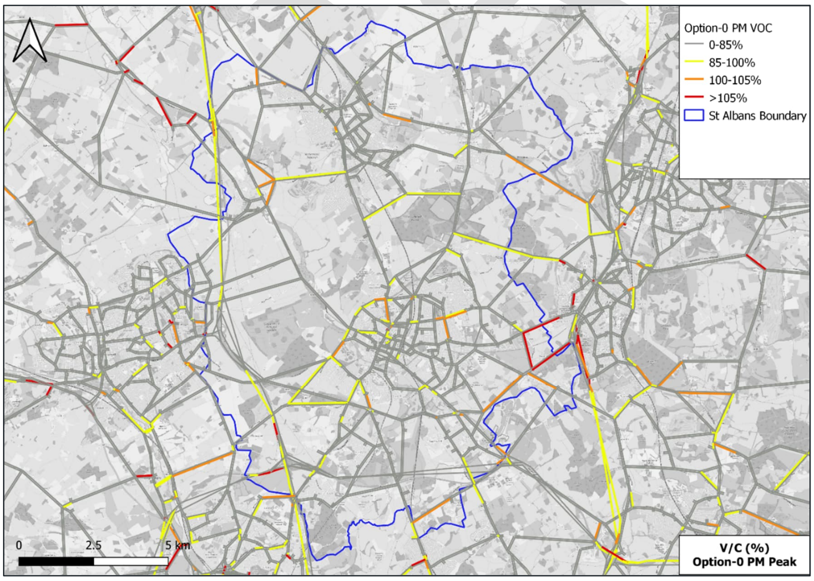


Figure 9-36: Option 0 Link Volume/Capacity Ratio, PM Peak Hour

Option 1

9.3.6. Figure 9-37and Figure 9-38 show the 2041 Option 1 V/C for St Albans in the AM and PM peaks. As a result of the SADC Local Plan key roads which experience increases in V/C in the AM peak include A414 approaching A1(M) Junction 3, Potterscrouch Lane, Ragged Hall Lane, Chequers Lane, Sandridgbury Lane, B651 north of Wheathampstead as well as roads approaching the A414 Breakspear Way. In the PM peak key roads which experience increases in V/C are Potterscrouch Lane, Ragged Hall Lane, roads approaching the A414 Breakspear Way, Church Street in Wheathampstead and Ferrers Lane approaching the B651 and B651 north of Wheathampstead.

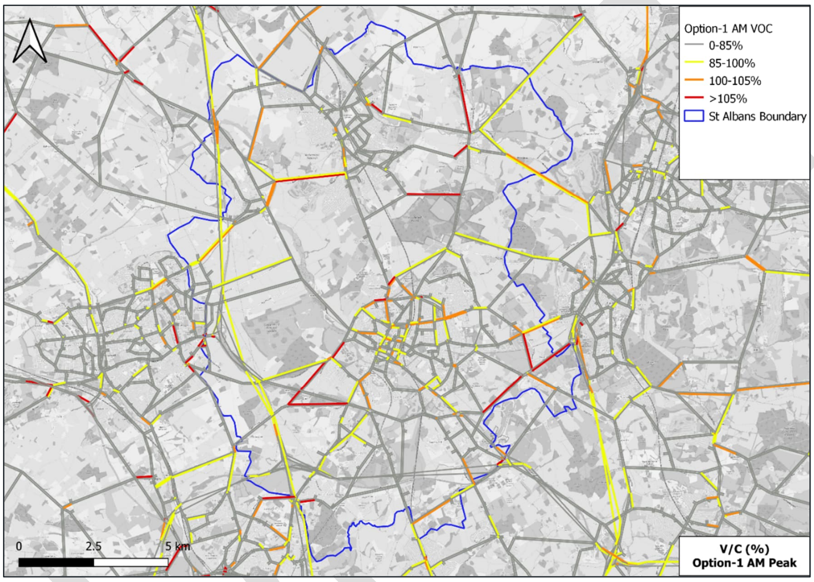


Figure 9-37: Option 1 Link Volume/Capacity Ratio, AM Peak Hour

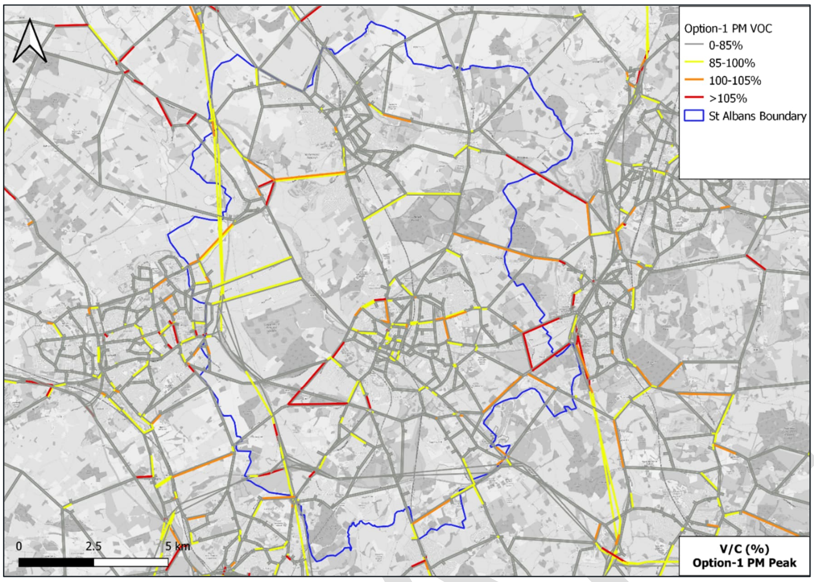


Figure 9-38: Option 1 Link Volume/Capacity Ratio, PM Peak Hour

Option 2

9.3.7. Figure 9-39 and Figure 9-40 show the 2041 Option 2 V/C for St Albans in the AM and PM peaks. As a result of the SADC IDP schemes and 10% mode shift there is a general improvement in V/C on some of the local roads such as Potterscrouch Lane, Ragged Hall Lane, Chequers Lane, Sandridgebury Lane and the roads approaching A414 Breakspear Way. On area of the highway network which does deteriorate is on B487 in the both peaks. Generally as a result of the IDP schemes and mode shift there is an improvement in capacity on local routes which suggests the improvements of the IDP schemes are reducing traffic rat running.

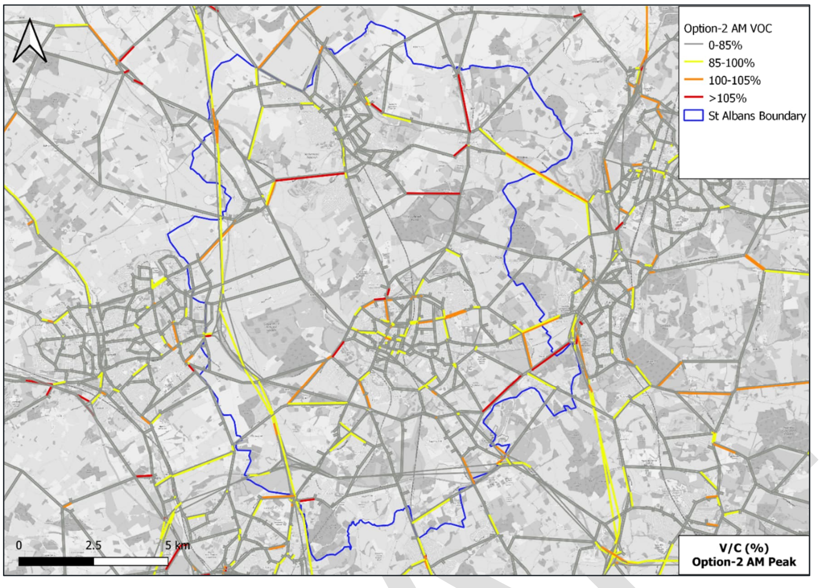


Figure 9-39: Option 2 Link Volume/Capacity Ratio, AM Peak Hour

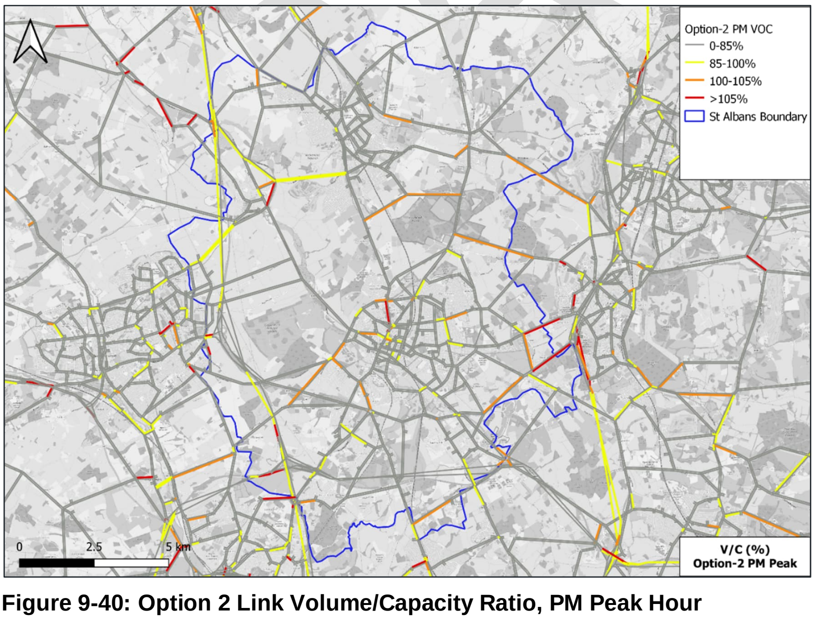


Figure 9-40: Option 2 Link Volume/Capacity Ratio, PM Peak Hour

Option 3

9.3.8. Figure 9-41 and Figure 9-42 show the 2041 Option 3 V/C for St Albans in the AM and PM peaks. As a result of the SADC IDP schemes and 10% OTS mode tool the V/C is very similar to Option 2 with a general improvement, compared to Option 1, in V/C on some of the local roads such as Potterscrouch Lane, Ragged Hall Lane, Chequers Lane, Sandridgebury Lane and the roads approaching A414 Breakspear Way. Parts of the highway network which do deteriorate are B487 in both peaks. In Option 3 the V/C of A1081 south of Batchwood Drive improves in the PM peak which is a result of the OTS mode tool impacting more urban trips within St Albans. Generally as a result of the IDP schemes and OTS mode tool there is an increase in traffic on key strategic roads and a reduction on local more rural routes.

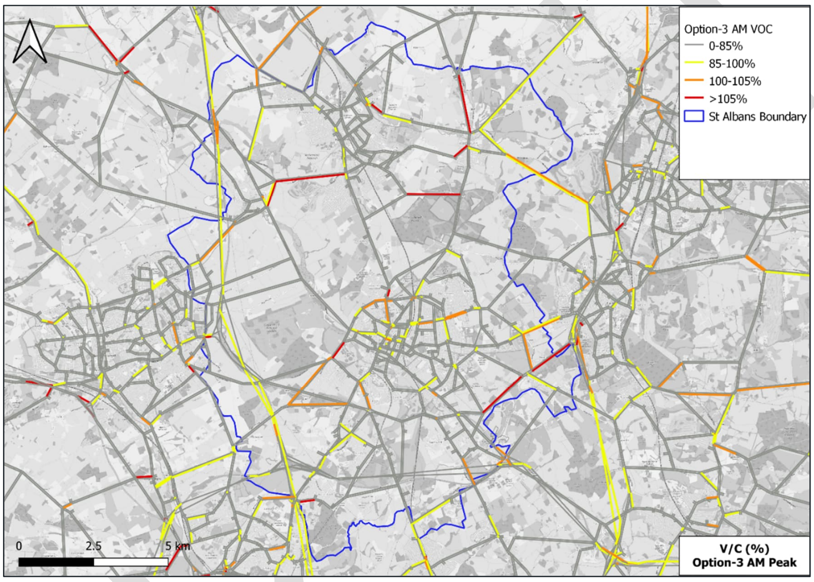


Figure 9-41: Option 3 Link Volume/Capacity Ratio, AM Peak Hour

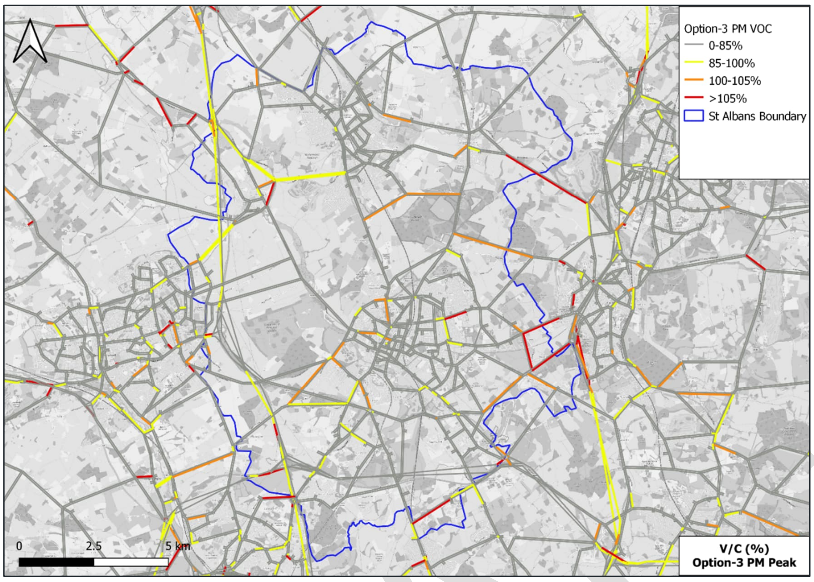


Figure 9-42: Option 3 Link Volume/Capacity Ratio, PM Peak Hour

Link Delay

9.3.9. The following figures show the link delay for all links in the St Albans network. In these plots:

- Dark green indicates a delay decrease of minutes or less
- Light green indicates a link delay of between 1-2 minutes
- Orange is a link increase of between 1-2 minutes
- Red is an increase in link delay of over 2 minutes.

Impact of Future Year Growth and Committed Developments

9.3.10. The impact of future year growth and committed developments on the link delays is presented in Figure 9-43 and Figure 9-44, which show the delay difference between Option 0 and the Base. Across St Albans there is generally increases in delay on primary key roads in the area such as A414, A4147, B487, Ferrers Lane, B651 and Church Lane in Wheathampstead. There are some links which do experience a reduction in delays which is a result of either junction improvements in the area or traffic re-routing.

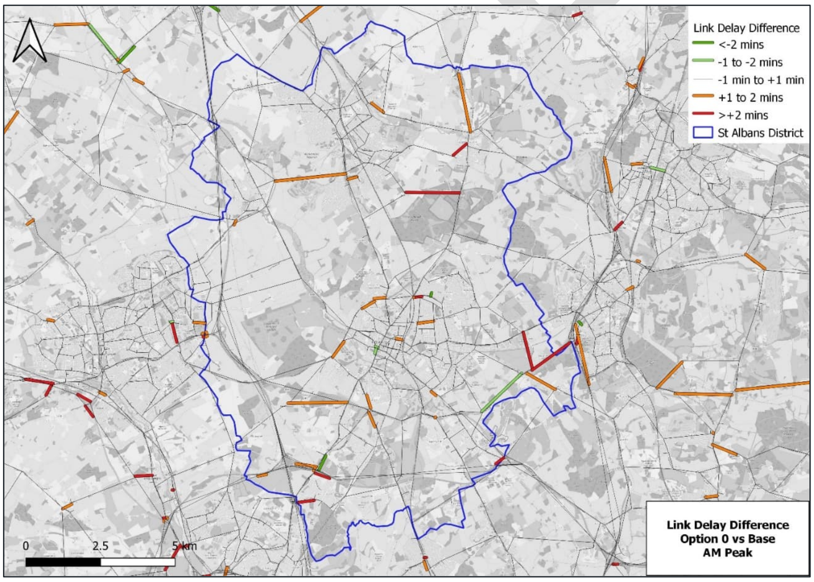


Figure 9-43: Link Delay Difference Option 0 vs Base AM Peak

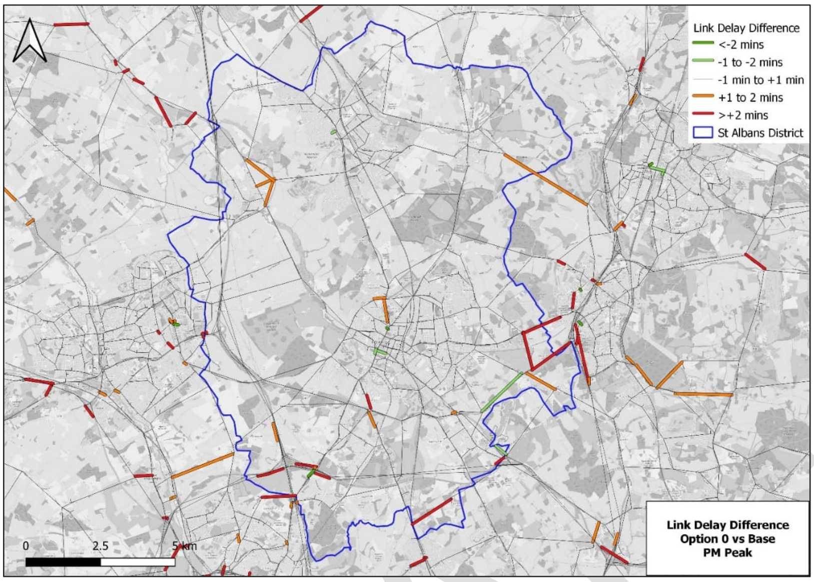


Figure 9-44: Link Delay Difference Option 0 vs Base PM Peak

Impact of Local Plan without Mitigation

9.3.11. The impact of the Local Plan without mitigation on the link delays is presented in Figure 9-45 and Figure 9-46, which show the delay difference between Option 1 and Option 0. These show increases in delay on links which experience an increase in V/C as outline earlier. Key links which experience increases in delay are, A414 approaching A1(M) Junction 3, Potterscrouch Lane, Ragged Hall Lane, Chequers Lane, Sandridgbury Lane, Punchbowl Lane, A414 Breakspear Way, Church Street in Wheathampstead and Ferrers Lane approaching the B651, A4147, B653 and B487.

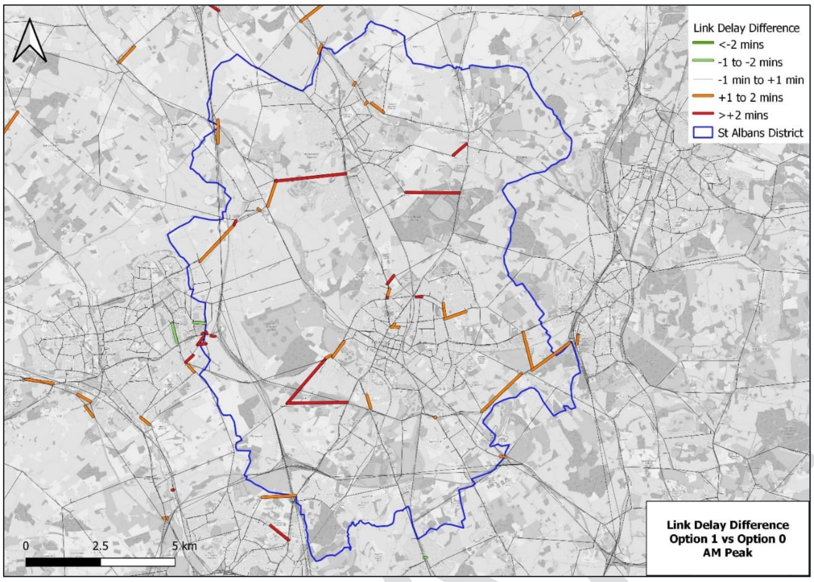


Figure 9-45: Link Delay Difference Option 1 vs Option 0 AM Peak

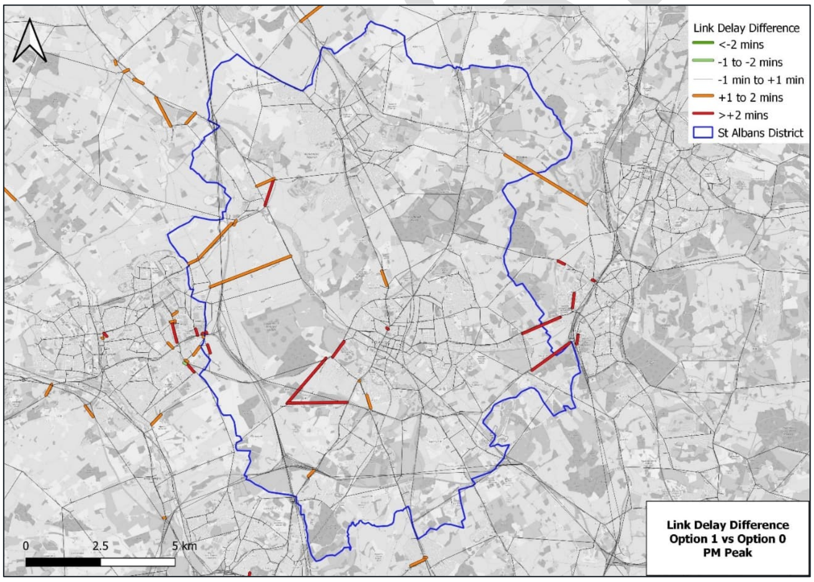


Figure 9-46: Link Delay Difference Option 1 vs Option 0 PM Peak

Impact of Mitigation (IDP and 10% Modal Shift)

9.3.12. The impact of the IDP mitigation and 10% Modal Shift on the link delays is presented in Figure 9-47 and Figure 9-48, which show the delay difference between Option 2 and Option 1. This shows that for the majority of links in St Albans as a result of the IDP schemes and 10% mode shift there is a reduction in link delays. This indicates the proposed improvements to the network and mode shift are generating a positive impact on the highway network. There are some links where delays increase which include A1081 southbound where increases in link delay, over 2 minutes, which are occurring as a result of Valley Road and Sandridgebury Lane being closed to traffic in Option 2. There are also smaller increases in delay on The Common north of Harpenden, Ferrers Lane approach to B651 and on Colney Heath Lane and A414 Tippendell Lane and some residential roads to the west of the East Heel development. It is advised that further work is undertaken at these locations to understand what mitigation could be adopted to reduce the delays as part of the next stage of the Local Plan.

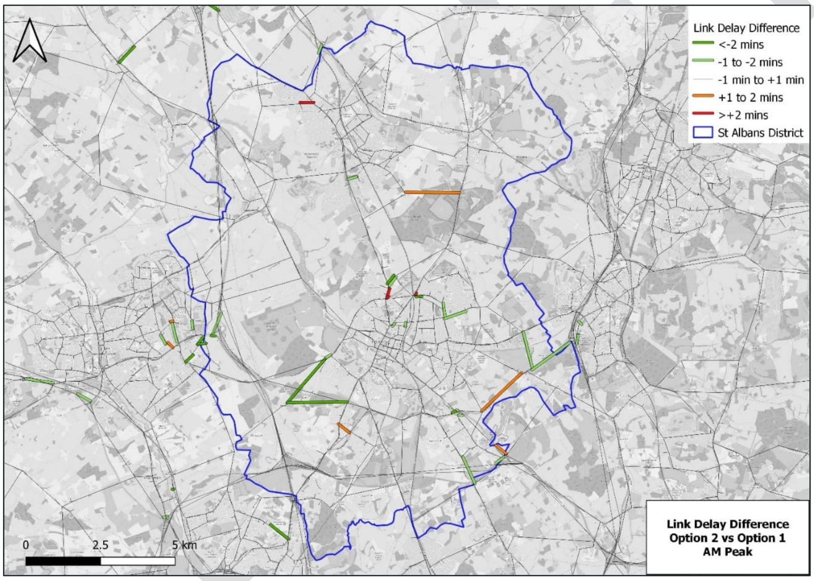


Figure 9-47: Link Delay Difference Option 2 vs Option 1 AM Peak

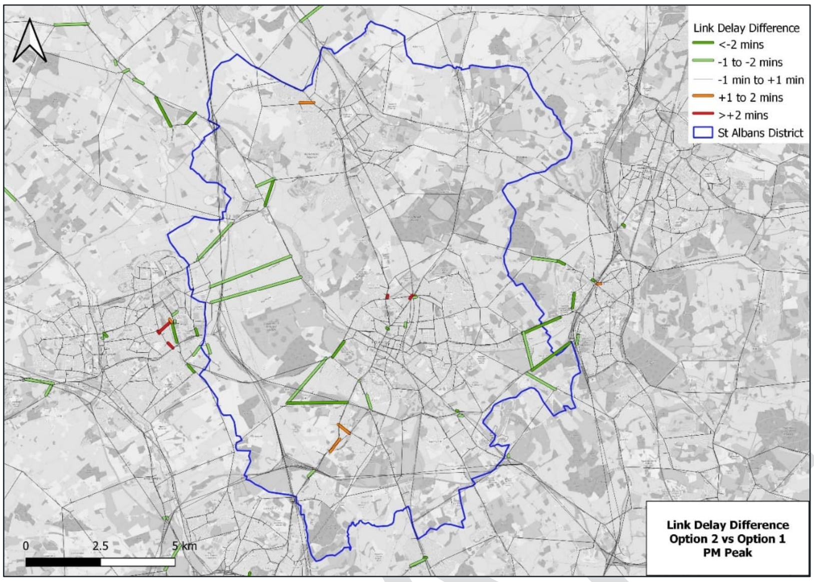


Figure 9-48: Link Delay Difference Option 2 vs Option 1 PM Peak

Impact of Mitigation (IDP and Alternative Modal Shift)

9.3.13. The impact of the IDP mitigation and the alternative modal shift on the link delays is presented in Figure 9-49 and Figure 9-50, which show the delay difference between Option 3 and Option 1. The locations where delay increases is broadly the same as the delay increases between Option 2 and 1. The only differences is an increase in delay at Ferrers Lane, delays at Church Street in Wheathampstead and an increase in delay on the M1 slip road at junction 8 in the AM peak.

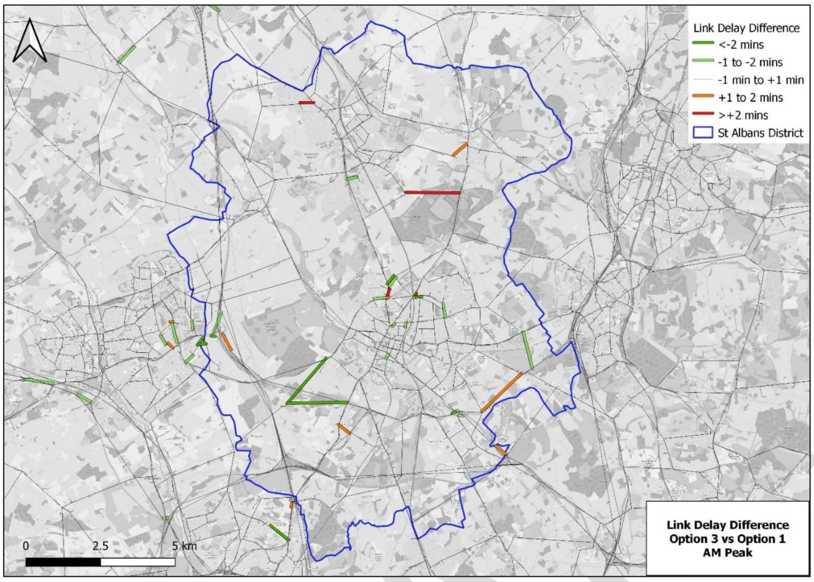


Figure 9-49: Link Delay Difference Option 3 vs Option 1 AM Peak

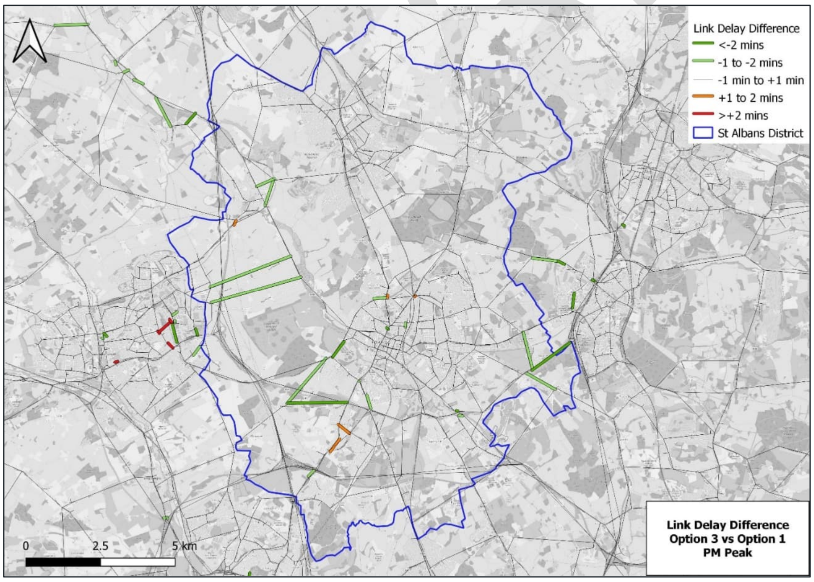


Figure 9-50: Link Delay Difference Option 3 vs Option 1 PM Peak

9.4 Junction Performance

Overview

9.4.1. Junction delay plots have been generated for all the junctions in St Albans district to illustrate the changes in delays which occur between scenarios as outlined in section 9.2.10.

Impact of Future Year Growth and Committed Developments

9.4.2. The impact of future year growth and committed developments on the juncion delays is presented Figure 9-51 and Figure 9-52. More text to be added shortly.

9.4.3.

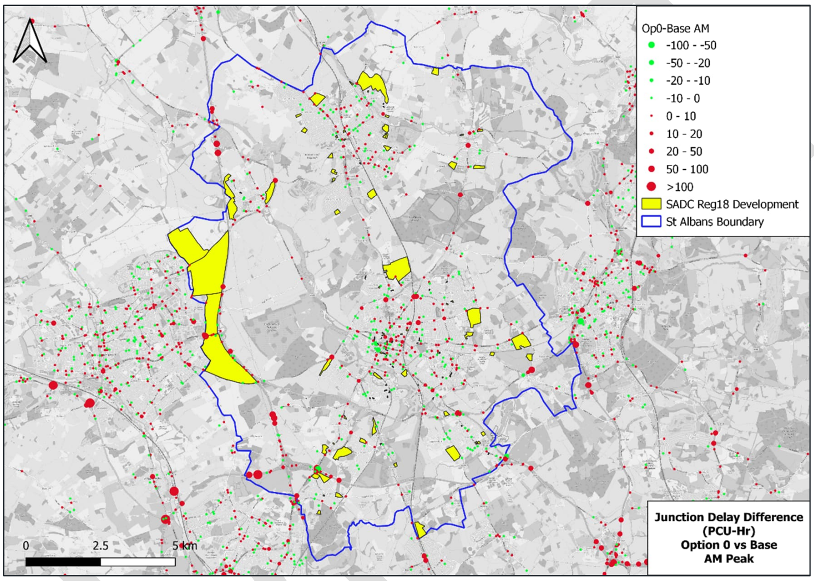


Figure 9-51: Node Delay Difference Option 0 vs Base AM Peak

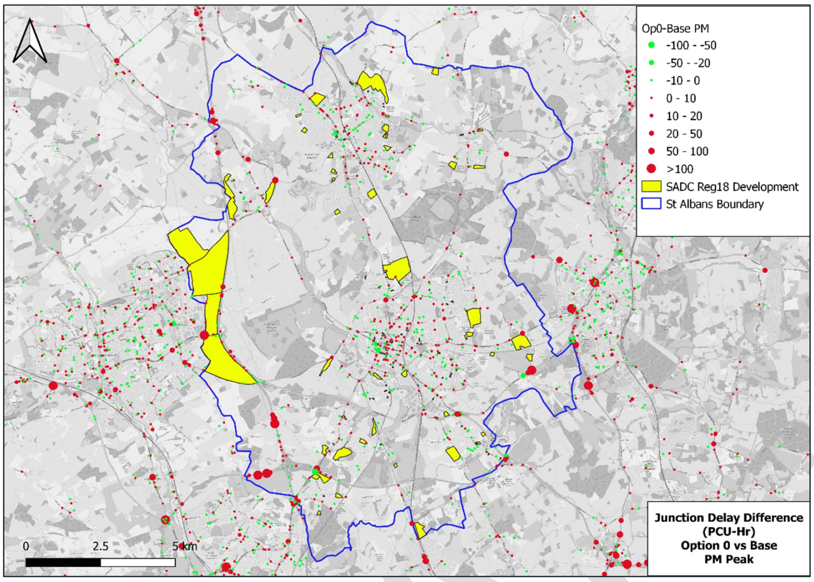


Figure 9-52: Node Delay Difference Option 0 vs Base PM Peak

Impact of Local Plan without Mitigation

9.4.4. The impact of the Local Plan without mitigation on the junction delays is presented in Figure 9-53 and Figure 9-54. More text to follow shortly.

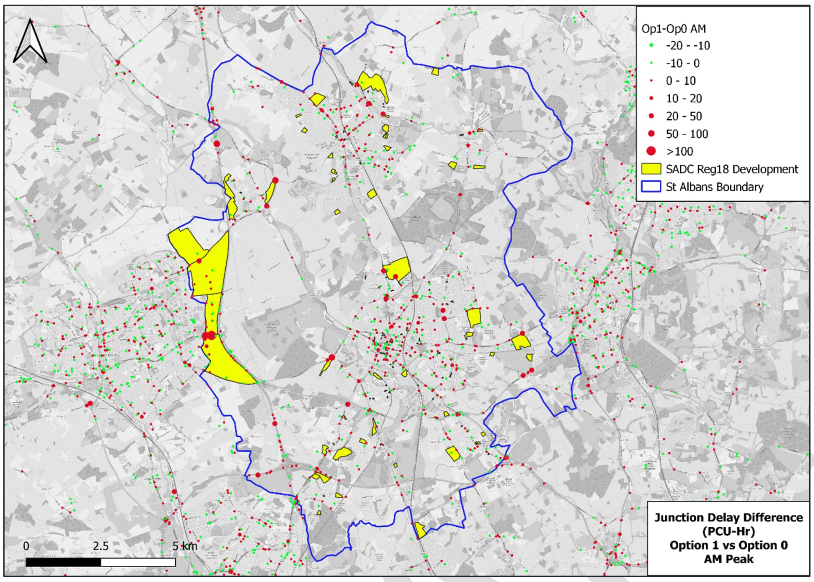


Figure 9-53: Node Delay Difference Option 1 vs Option 0 AM Peak

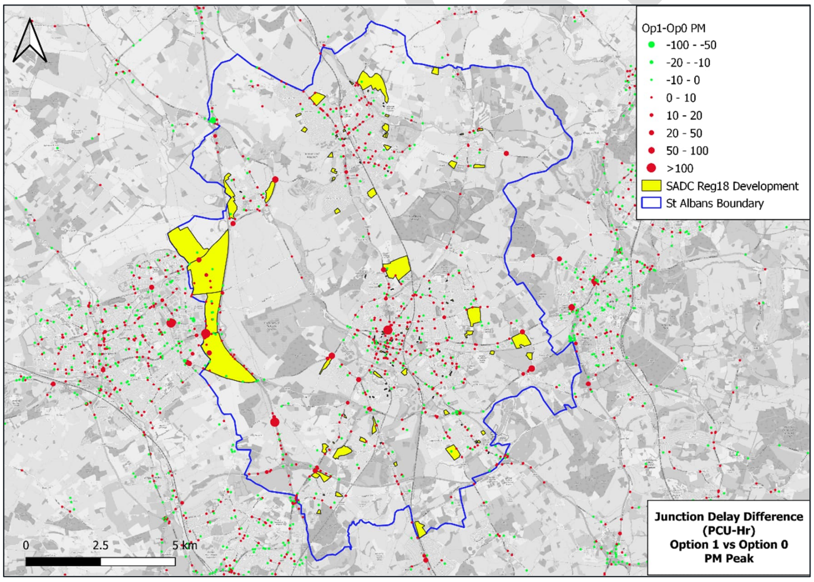


Figure 9-54: Node Delay Difference Option 1 vs Option 0 PM Peak

Impact of Mitigation (IDP and 10% Modal Shift)

9.4.5. The impact of the IDP mitigation and 10% Modal Shift on the link delays is presented in Figure 9-55 and Figure 9-56. More text to follow shortly.

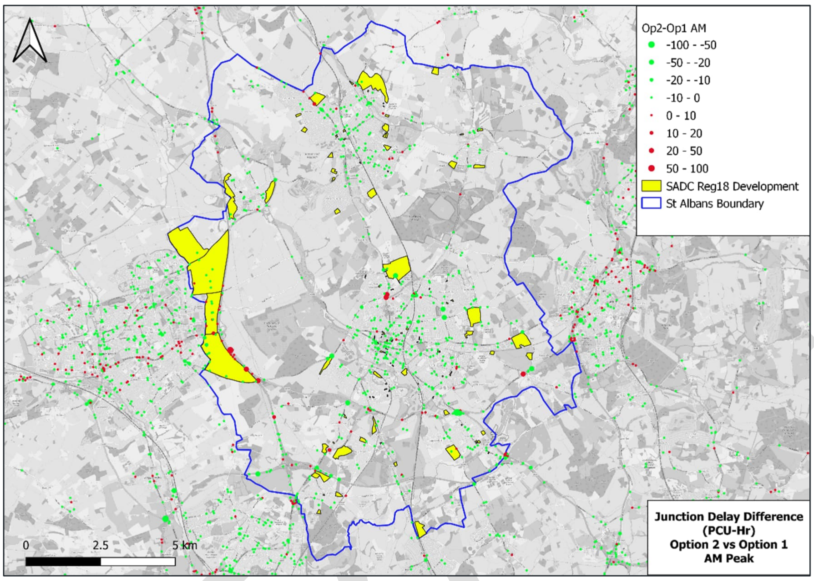


Figure 9-55: Node Delay Difference Option 2 vs Option 1 AM Peak

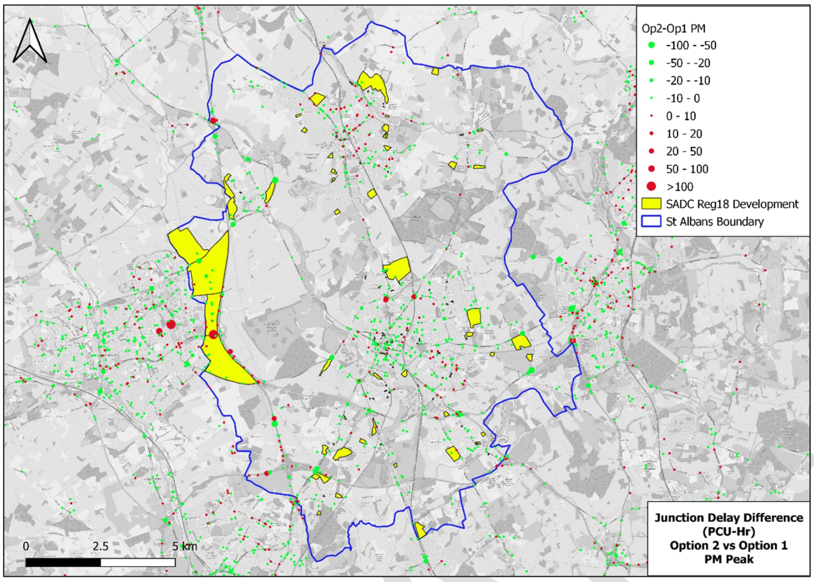


Figure 9-56: Node Delay Difference Option 2 vs Option 1 PM Peak

Impact of Mitigation (IDP and Alternative Modal Shift)

9.4.6. The impact of the IDP mitigation and the alternative modal shift on the link delays is presented in Figure 9-57 and Figure 9-58. More text to follow shortly.

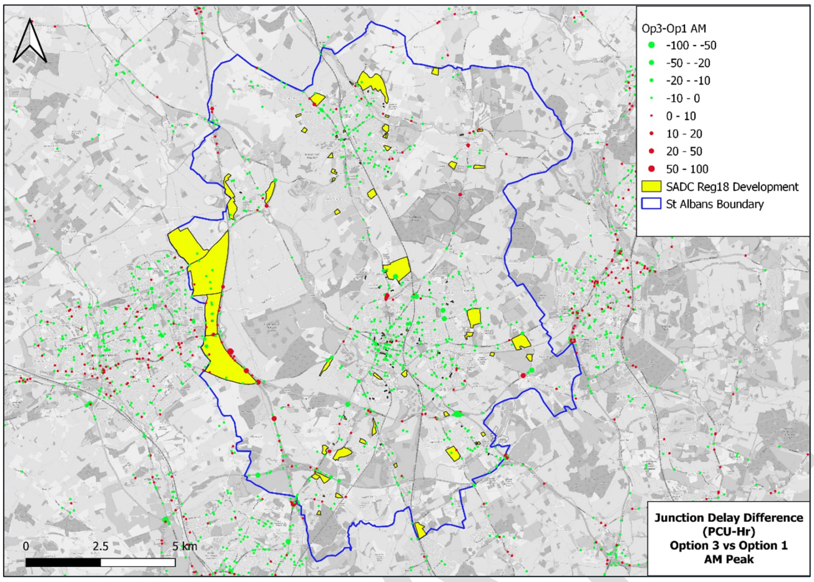


Figure 9-57: Node Delay Difference Option 3 vs Option 1 AM Peak

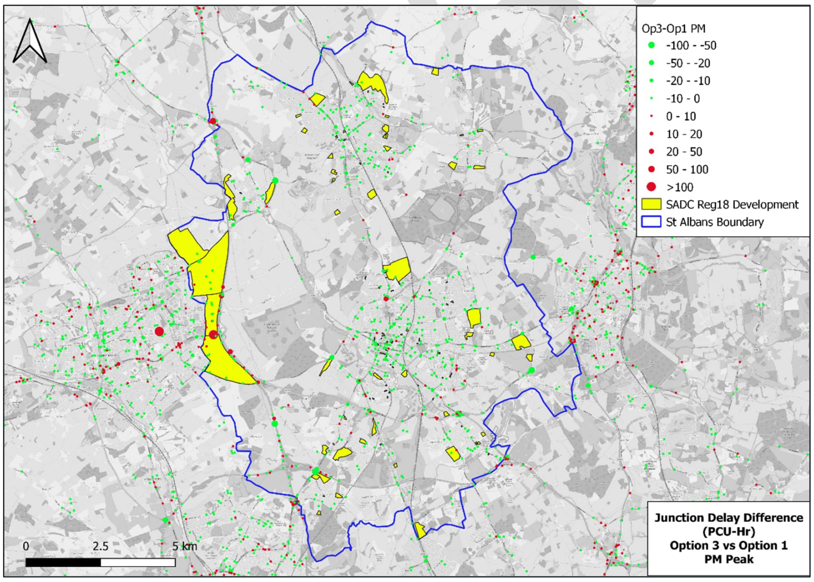


Figure 9-58: Node Delay Difference Option 3 vs Option 1 PM Peak

Performance of Key Junctions

Overview

9.4.7. Twenty-seven key junctions were identified by SADC in the St Albans district as shown in Figure 9-59. For these junctions more detailed information has been extracted from the strategic transport model to understand the differences which occur within the scenarios. It is important to note COMET is a strategic model and detailed junction modelling is required to understand the performance of the junctions more precisely.

Figure 9-59: Key Junctions in St Albans

Summary of Flows at Key Junctions

9.4.8. Table 9-3 and Table 9-4 summarises the change in total entry flow at each of the key junctions across each of the scenarios. The changes in total flow have been analysed by comparing the following scenarios:

- Option vs Base year
- Option 1 vs Option 0
- Option 2 vs Option 1

- Option 3 vs Option 1

9.4.9. If the traffic flow change between the options was an increase the cell in the table is orange, if there is a reduction the cell in the table is green. More text to follow.

Table 9-3: Summary of Total Entry flow at Key Junctions by scenario (AM Peak Hour)

Ref	Junction Name	Total Entry Flow (PCU)				
		Base	Option 0	Option 1	Option 2	Option 3
1A	Peahen	1,537	1,121	1,222	1,078	1,050
1B	King William IV	1,956	2,108	2,233	2,068	2,061
1C	Ancient Britton	2,230	2,233	2,272	2,469	2,460
1D	Sandpit Lane/Beechwood Avenue	1,972	2,233	2,174	2,181	2,133
1E	King Harry	2,413	2,758	2,980	2,615	2,625
2A	A1081 Luton Road/Station Road	1,688	1,692	1,689	1,507	1,476
2B	A1081/The Common	1,722	1,858	2,023	1,875	1,918
2C	A1081 Luton Road/Redbourn Road	3,646	4,089	3,980	3,504	3,495
3A	A414/A1081 London Colney	5,114	5,813	5,808	6,378	6,422
3B	A414/A405	5,194	5,730	5,755	5,992	5,981
3C	A414/Shenley Lane,Napsbury	1,218	1,469	1,531	1,472	1,544
4	A1057 Hatfield Road/Station Road	2,067	2,626	2,806	2,683	2,664
5A	A405/Watford Road (the Noke)	2,451	4,433	4,548	4,254	4,289
5B	A405/Tippendell Lane	2,361	4,064	4,238	4,269	4,247
6A	Harper Lane/Shenley Road	2,138	2,631	2,658	2,540	2,601
6B	Harper Lane/Watling Street	1,541	1,947	2,016	1,908	1,945
7	A414/M1 Junction 8	5,453	6,232	6,013	7,482	7,509
8	A414/Green Lanes	4,554	4,921	5,090	7,136	7,201
9A	Redbourn Road/Queensway	1,982	2,455	2,751	2,561	2,658
9B	Redbourn Road/Link Road	3,242	3,956	4,138	3,958	4,020
9C	Redbourn Road/Shenley Road	1,774	2,373	2,622	2,408	2,438
9D	Redbourn Road/Cherry Tree Lane	1,738	2,364	2,649	2,489	2,520
10	Leverstock Green Road/Bedmond Road	1,761	1,835	2,268	2,151	2,256
11	B653 Cory Wright Way/Marford Road	2,325	2,613	2,662	2,619	2,670
12A	M25 Junction 21					
12B	M25 Junction 21a	12,028	16,079	16,186	15,606	15,678
12C	M25 Junction 22	4,421	15,600	15,791	15,322	15,473

Table 9-4: Summary of Total Entry Flow at Key Junctions by Scenario (PM Peak Hour)

Ref	Junction Name	Total Entry Flow (PCU)				
		Base	Option 0	Option 1	Option 2	Option 3
1A	Peahen	1,439	891	1,034	828	857
1B	King William IV	1,776	2,097	2,268	1,920	1,864
1C	Ancient Britton	2,025	2,158	2,288	2,297	2,316
1D	Sandpit Lane/Beechwood Avenue	2,054	2,201	2,232	2,094	2,100
1E	King Harry	2,439	2,587	2,753	2,504	2,566
2A	A1081 Luton Road/Station Road	1,707	1,655	1,820	1,683	1,638
2B	A1081/The Common	1,687	1,844	1,936	1,841	1,882
2C	A1081 Luton Road/Redbourn Road	3,571	4,020	4,224	4,007	3,987
3A	A414/A1081 London Colney	5,899	6,164	6,166	6,799	6,884
3B	A414/A405	6,232	6,144	6,139	6,355	6,253
3C	A414/Shenley Lane,Napsbury	1,301	1,507	1,742	1,440	1,477
4	A1057 Hatfield Road/Station Road	2,046	2,500	2,717	2,546	2,534
5A	A405/Watford Road (the Noke)	3,539	4,303	4,349	4,291	4,313
5B	A405/Tippendell Lane	3,205	4,021	4,195	4,388	4,359
6A	Harper Lane/Shenley Road	2,101	2,539	2,640	2,470	2,541
6B	Harper Lane/Watling Street	1,680	2,189	2,255	2,161	2,206
7	A414/M1 Junction 8	6,164	6,832	6,805	8,111	8,052
8	A414/Green Lanes	4,854	5,013	5,232	6,944	6,940
9A	Redbourn Road/Queensway	2,232	2,452	2,874	2,637	2,740
9B	Redbourn Road/Link Road	3,319	3,984	4,090	4,027	4,084
9C	Redbourn Road/Shenley Road	1,794	2,438	2,675	2,617	2,647
9D	Redbourn Road/Cherry Tree Lane	1,671	2,338	2,537	2,555	2,574
10	Leverstock Green Road/Bedmond Road	1,689	1,794	2,126	2,036	2,075
11	B653 Cory Wright Way/Marford Road	2,098	2,430	2,440	2,443	2,470
12A	M25 Junction 21					
12B	M25 Junction 21a	12,155	14,590	14,586	14,535	14,624
12C	M25 Junction 22	4,634	14,724	14,832	14,980	15,186

Summary of Delays at Key Junctions

Table 9-5 to Table 9-6 summarise the performance of the key junctions in each of the scenarios assessed in the AM and PM peak hours. The delays shown are the average delay per vehicle across all movements at each junction. More text to follow.

Table 9-5: Summary of Average Delay at Key Junctions (AM Peak Hour)

Average Delay per Vehicle	Rating	Proportion of Key Junctions				
		Base	Option 0	Option 1	Option 2	Option 3
0 – 30 sec	Green	67%	70%	56%	67%	63%
30 – 60 sec	Amber	15%	7%	22%	11%	15%
> 60 sec	Red	19%	22%	22%	22%	22%

Table 9-6: Summary of Average Delay at Key Junctions (PM Peak Hour)

Average Delay per Vehicle	Rating	Proportion of Key Junctions				
		Base	Option 0	Option 1	Option 2	Option 3
0 – 30 sec	Green	78%	52%	44%	59%	59%
30 – 60 sec	Amber	11%	26%	22%	19%	19%
> 60 sec	Red	11%	22%	33%	22%	22%

9.4.10. Table 9-7 and Table 9-8 present the delays at each of the key junction for all scenarios and the AM and PM peak. The cells are coloured in the same way as explained in 9.4.8. More text to follow.

Table 9-7: Summary of Delay at Key Junctions by Scenario (AM Peak Hour)

Ref	Junction Name	Average Delay Per Vehicle (s)				
		Base	Option 0	Option 1	Option 2	Option 3
1A	Peahen	124	89	119	82	79
1B	King William IV	72	120	119	122	112
1C	Ancient Britton	135	168	195	190	191
1D	Sandpit Lane/Beechwood Avenue	67	85	137	79	83
1E	King Harry	12	29	45	42	38
2A	A1081 Luton Road/Station Road	12	14	16	15	14
2B	A1081/The Common	13	15	38	30	33
2C	A1081 Luton Road/Redbourn Road	14	20	18	15	14
3A	A414/A1081 London Colney	32	42	44	18	18
3B	A414/A405	13	12	14	15	15
3C	A414/Shenley Lane,Napsbury	12	13	12	6	7
4	A1057 Hatfield Road/Station Road	11	21	51	28	40
5A	A405/Watford Road (the Noke)	11	13	14	26	25
5B	A405/Tippendell Lane	12	16	17	18	19
6A	Harper Lane/Shenley Road	33	30	41	24	27
6B	Harper Lane/Watling Street	8	23	23	18	21
7	A414/M1 Junction 8	2	5	10	9	10
8	A414/Green Lanes	30	85	146	67	75
9A	Redbourn Road/Queensway	13	13	13	14	14
9B	Redbourn Road/Link Road	12	18	26	16	17
9C	Redbourn Road/Shenley Road	5	5	8	6	6
9D	Redbourn Road/Cherry Tree Lane	3	6	7	5	5
10	Leverstock Green Road/Bedmond Road	85	104	104	81	79
11	B653 Cory Wright Way/Marford Road	11	14	15	14	15
12A	M25 Junction 21	1	5	10	9	9
12B	M25 Junction 21a	43	38	44	38	44
12C	M25 Junction 22	11	14	18	21	24

Table 9-8: Summary of Delay at Key Junctions by Scenario (PM Peak Hour)

Ref	Junction Name	Average Delay Per Vehicle (s)				
		Base	Option 0	Option 1	Option 2	Option 3
1A	Peahen	123	57	67	55	55
1B	King William IV	44	61	57	104	82
1C	Ancient Britton	125	159	176	206	175
1D	Sandpit Lane/Beechwood Avenue	86	110	132	110	121
1E	King Harry	11	16	39	21	23
2A	A1081 Luton Road/Station Road	11	12	12	12	12
2B	A1081/The Common	22	38	44	34	32
2C	A1081 Luton Road/Redbourn Road	14	18	30	18	18
3A	A414/A1081 London Colney	23	36	37	21	21
3B	A414/A405	14	16	18	18	17
3C	A414/Shenley Lane,Napsbury	5	5	5	4	4
4	A1057 Hatfield Road/Station Road	11	60	109	65	98
5A	A405/Watford Road (the Noke)	12	12	13	11	13
5B	A405/Tippendell Lane	12	15	16	19	20
6A	Harper Lane/Shenley Road	12	16	21	16	17
6B	Harper Lane/Watling Street	11	48	48	45	46
7	A414/M1 Junction 8	2	4	4	14	16
8	A414/Green Lanes	12	77	149	24	27
9A	Redbourn Road/Queensway	14	14	15	14	14
9B	Redbourn Road/Link Road	13	19	38	20	22
9C	Redbourn Road/Shenley Road	4	8	12	12	13
9D	Redbourn Road/Cherry Tree Lane	3	6	5	5	5
10	Leverstock Green Road/Bedmond Road	47	76	139	131	133
11	B653 Cory Wright Way/Marford Road	17	70	110	77	99
12A	M25 Junction 21	2	47	60	50	54
12B	M25 Junction 21a	49	59	76	49	56
12C	M25 Junction 22	16	19	20	19	22

9.5 Highway Journey Times

Routes

9.5.1. Twenty-one journey time routes within the St Albans network have been examined, as shown in Figure 9-60. These routes and cover all of the main corridors in the network.

Figure to be added shortly

Figure 9-60: Journey Time Routes

Route Times

9.5.2. Figure 9-61 to Figure 9-62 show the variation in journey time on each of the routes between the scenarios.

Figure to be added shortly

Figure 9-61: AM Peak Journey Time Route Summary

Figure to be added shortly

Figure 9-62: PM Peak Journey Time Route Summary

9.5.3. Table 9-9 and Table 9-10 provide details of each journey time route, the time taken to travel in each time scenario and time period. More text to follow.

Table 9-9: Summary of Journey Times by Route and Scenario (AM peak hour)

Route	Route Name	Journey Time (mins:secs)				
		Base	Option 0	Option 1	Option 2	Option 3
HPD1_NB	A1081	9:00	9:24	11:24	10:30	10:36
HPD1_SB		9:00	8:42	9:12	8:30	8:30
HPD2A_NB	B653	12:06	12:48	13:54	13:18	13:36
HPD2A_SB		12:36	14:18	16:00	16:06	16:30
HPD3_NB	B652 Westfield Road	12:42	13:12	15:48	14:48	14:54
HPD3_SB		12:36	12:42	13:18	12:42	12:48
HPD4_WB	Wheathampstead Road	4:36	4:42	4:42	4:36	4:36
HPD4_EB		4:36	4:36	4:36	4:36	4:36
HPD5_NB	Station Road/Hollybush Lane	8:48	9:00	9:12	9:00	9:06
HPD5_SB		8:00	8:06	8:18	8:06	8:12
HPD6A_NB	Grove Road	7:06	7:18	7:18	7:12	7:12
HPD6A_SB		7:00	7:06	7:06	7:00	7:00
HPD6B_EB	B487	5:00	5:54	6:24	5:24	5:30
HPD6B_WB		6:30	7:54	10:06	10:12	10:12
STA1_NB	St Albans Road	8:48	9:42	10:00	10:00	9:48
STA1_SB		9:30	10:36	10:48	11:24	11:30
STA2A_WB	Marshalswick Lane	11:12	17:12	21:30	15:36	14:36
STA2A_EB		11:24	13:06	16:12	13:00	12:48
STA2B_NB	Cotton Mill Lane	14:06	15:18	16:18	15:06	15:00
STA2B_SB		12:54	14:42	15:30	14:42	14:36
STA2_NB	Ring Road	**1:18**	9:18	14:36	7:24	6:12
STA2_SB		**23:30**	3:48	8:48	3:12	2:54
STA3_NB	A1081	10:00	13:42	14:18	13:18	13:24
STA3_SB		11:06	12:48	13:24	13:42	13:42
STA3A_NB	A1081 North	12:00	12:54	14:06	13:42	13:30
STA3A_SB		12:42	14:18	18:48	23:24	**0:12**
STA4_WB	A4147	8:24	10:18	12:12	11:36	11:48
STA4_EB		8:30	10:00	12:42	9:54	10:42
STA5_NB	Sandpit Lane	10:06	11:54	13:48	11:48	11:48
STA5_SB		9:54	11:00	12:54	11:06	11:00
STA6_NB	A5183 (south)	7:18	9:36	9:48	9:36	9:36
STA6_SB		7:24	9:30	10:54	11:18	10:54
STA7_NB	Colney Heath Lane	7:54	8:54	9:48	9:42	9:42
STA7_SB		7:30	8:24	8:54	8:42	8:48
STA8A_WB	A1057 (centre)	11:06	12:54	13:48	12:18	12:18
STA8A_EB		11:00	12:48	13:42	12:18	12:00
STA9_NB	A5183 (north)	7:06	7:18	7:24	7:24	7:24
STA9_SB		7:24	7:54	8:36	9:00	9:12
STA10_NB	A5183 (west)	7:30	8:00	8:24	8:42	8:48
STA10_SB		7:36	9:18	10:42	10:54	10:30
STA11_NB	Coopers Green Lane	5:24	5:54	6:24	7:54	8:00
STA11_SB		5:18	5:30	5:36	7:36	7:48

Table 9-10: Summary of Journey Times by Route and Scenario (PM peak hour)

Route	Route Name	Journey Time (mins)				
		Base	Option 0	Option 1	Option 2	Option 3
HPD1_NB	A1081	9:24	10:30	11:00	10:06	9:54
HPD1_SB		8:12	8:18	8:30	8:24	8:24
HPD2A_NB	B653	12:18	14:12	14:48	14:18	14:18
HPD2A_SB		11:48	12:12	12:36	12:24	12:30
HPD3_NB	B652 Westfield Road	12:12	12:18	12:36	12:24	12:24
HPD3_SB		11:54	12:24	13:06	12:24	12:30
HPD4_WB	Wheathampstead Road	4:36	4:42	4:48	4:42	4:42
HPD4_EB		4:36	4:36	4:36	4:36	4:36
HPD5_NB	Station Road/Hollybush Lane	8:48	8:48	8:54	8:48	8:48
HPD5_SB		7:54	7:54	8:00	7:54	7:54
HPD6A_NB	Grove Road	7:00	7:06	7:18	7:18	7:18
HPD6A_SB		7:06	7:06	7:06	7:06	7:06
HPD6B_EB	B487	6:24	8:54	11:30	8:48	9:00
HPD6B_WB		5:06	5:54	6:18	6:42	6:36
STA1_NB	St Albans Road	8:42	9:54	9:00	11:30	9:00
STA1_SB		9:12	9:12	9:18	11:30	11:30
STA2A_WB	Marshalswick Lane	8:42	9:54	10:48	10:24	9:54
STA2A_EB		11:18	12:54	14:30	12:48	12:12
STA2B_NB	Cotton Mill Lane	12:54	14:24	15:12	14:30	14:36
STA2B_SB		12:48	14:30	15:06	14:12	14:06
STA2_NB	Ring Road	**22:00**	**1:18**	3:12	1:42	1:12
STA2_SB		**23:18**	**2:42**	4:54	2:12	1:36
STA3_NB	A1081	10:12	12:48	13:42	11:42	11:48
STA3_SB		15:06	13:36	14:42	12:54	12:42
STA3A_NB	A1081 North	12:48	14:42	15:36	15:30	14:18
STA3A_SB		12:06	13:06	14:06	16:18	16:00
STA4_WB	A4147	8:48	11:12	12:42	10:18	10:24
STA4_EB		8:12	9:24	11:54	10:24	11:18
STA5_NB	Sandpit Lane	11:12	12:30	13:48	12:42	13:18
STA5_SB		9:36	10:42	11:36	10:30	10:36
STA6_NB	A5183 (south)	7:36	10:06	10:30	10:36	10:36
STA6_SB		7:18	10:54	12:36	10:48	10:54
STA7_NB	Colney Heath Lane	7:54	9:48	10:42	9:30	9:42
STA7_SB		7:30	8:30	8:48	8:18	8:18
STA8A_WB	A1057 (centre)	11:00	11:30	12:00	11:42	11:30
STA8A_EB		10:48	11:36	12:30	11:12	11:06
STA9_NB	A5183 (north)	7:30	7:30	7:30	7:36	7:30
STA9_SB		7:06	7:30	8:12	7:48	8:00
STA10_NB	A5183 (west)	7:30	8:06	8:24	8:48	8:54
STA10_SB		7:30	8:30	10:12	9:12	9:12
STA11_NB	Coopers Green Lane	5:18	5:24	5:24	7:30	7:24
STA11_SB		5:18	6:36	7:30	8:18	8:36

Journey Time Graphs

9.5.4. Appendix K contains each journey time route with the journey time graphs showing each scenario. This shows in more detail the journey time and speed along each route and provides a comparison between all of the scenarios.

Travel Times between Key Areas

Trips to/from St Albans

9.5.5. More text to follow.

Table 9-11: Travel times to St Albans City by Scenario (AM Peak)

From	Travel Time (hh:mm)				
	Base	Option 0	Option 1	Option 2	Option 3
Bishop's Stortford	0:51	0:58	0:59	0:59	0:59
Cheshunt	0:28	0:35	0:36	0:36	0:36
Borehamwood	0:19	0:22	0:22	0:22	0:22
Rickmansworth	0:27	0:35	0:36	0:35	0:36
Watford	0:22	0:28	0:29	0:28	0:29
Hertford	0:25	0:31	0:32	0:32	0:32
Welwyn Garden City	0:19	0:23	0:24	0:24	0:25
Stevenage	0:32	0:37	0:38	0:37	0:38
Hitchin	0:34	0:38	0:40	0:39	0:40
Hemel Hempstead	0:19	0:22	0:26	0:22	0:23
East Hemel	0:14	0:18	0:19	0:17	0:17
Redbourn	0:14	0:16	0:18	0:17	0:18
Harpenden	0:18	0:20	0:24	0:26	0:27
Wheathampstead	0:15	0:18	0:20	0:20	0:20

Table 9-12: Travel times from St Albans City by Scenario (AM Peak)

To	Travel Time (hh:mm)				
	Base	Option 0	Option 1	Option 2	Option 3
Bishop's Stortford	0:52	0:56	0:58	0:57	0:58
Cheshunt	0:29	0:36	0:37	0:37	0:37
Borehamwood	0:21	0:22	0:24	0:23	0:23
Rickmansworth	0:27	0:32	0:34	0:33	0:33
Watford	0:28	0:31	0:33	0:32	0:32
Hertford	0:26	0:30	0:32	0:31	0:32
Welwyn Garden City	0:21	0:25	0:27	0:26	0:26
Stevenage	0:28	0:35	0:37	0:37	0:37
Hitchin	0:32	0:37	0:39	0:39	0:39
Hemel Hempstead	0:18	0:22	0:25	0:23	0:24
East Hemel	0:14	0:17	0:19	0:19	0:19
Redbourn	0:09	0:16	0:17	0:16	0:16
Harpenden	0:14	0:19	0:21	0:20	0:20
Wheathampstead	0:15	0:16	0:18	0:17	0:17

Table 9-13: Travel times to St Albans City by Scenario (PM Peak)

From	Travel Time (hh:mm)				
	Base	Option 0	Option 1	Option 2	Option 3
Bishop's Stortford	0:51	0:57	0:58	0:57	0:59
Cheshunt	0:29	0:36	0:37	0:36	0:36
Borehamwood	0:19	0:22	0:23	0:22	0:22
Rickmansworth	0:28	0:40	0:42	0:40	0:36
Watford	0:30	0:37	0:40	0:37	0:29
Hertford	0:26	0:32	0:34	0:32	0:32
Welwyn Garden City	0:20	0:25	0:27	0:26	0:25
Stevenage	0:28	0:35	0:37	0:36	0:38
Hitchin	0:31	0:36	0:37	0:37	0:40
Hemel Hempstead	0:18	0:22	0:27	0:24	0:23
East Hemel	0:14	0:17	0:20	0:17	0:17
Redbourn	0:14	0:15	0:17	0:16	0:18
Harpenden	0:17	0:18	0:19	0:20	0:27
Wheathampstead	0:14	0:15	0:16	0:17	0:20

Table 9-14: Travel times from St Albans City by Scenario (PM Peak)

To	Travel Time (hh:mm)				
	Base	Option 0	Option 1	Option 2	Option 3
Bishop's Stortford	0:52	0:58	0:59	0:58	0:58
Cheshunt	0:31	0:37	0:38	0:37	0:37
Borehamwood	0:20	0:21	0:22	0:22	0:23
Rickmansworth	0:26	0:36	0:38	0:36	0:33
Watford	0:22	0:27	0:28	0:27	0:32
Hertford	0:26	0:30	0:30	0:30	0:32
Welwyn Garden City	0:20	0:22	0:23	0:23	0:26
Stevenage	0:33	0:36	0:37	0:37	0:37
Hitchin	0:34	0:37	0:37	0:37	0:39
Hemel Hempstead	0:18	0:21	0:23	0:22	0:24
East Hemel	0:14	0:16	0:17	0:17	0:19
Redbourn	0:09	0:09	0:10	0:10	0:10
Harpenden	0:14	0:15	0:16	0:16	0:16
Wheathampstead	0:15	0:16	0:17	0:17	0:17

Trips to/from Redbourn

9.5.6. More text to follow.

Table 9-15: Travel times to Redbourn by Scenario (AM Peak)

From	Travel Time (hh:mm)				
	Base	Option 0	Option 1	Option 2	Option 3
Bishop's Stortford	1:00	1:07	1:09	1:09	1:10
Cheshunt	0:35	0:44	0:45	0:45	0:45
Borehamwood	0:26	0:31	0:32	0:31	0:32
Rickmansworth	0:28	0:36	0:36	0:36	0:36
Watford	0:23	0:28	0:29	0:29	0:29
Hertford	0:35	0:40	0:42	0:42	0:43
Welwyn Garden City	0:27	0:29	0:32	0:32	0:33
Stevenage	0:34	0:36	0:37	0:36	0:37
Hitchin	0:29	0:32	0:32	0:32	0:32
Hemel Hempstead	0:11	0:12	0:13	0:12	0:12
East Hemel	0:07	0:08	0:08	0:07	0:07
St Albans City	0:14	0:16	0:17	0:16	0:16
Harpenden	0:10	0:12	0:14	0:14	0:15
Wheathampstead	0:14	0:16	0:19	0:19	0:19

Table 9-16: Travel times from Redbourn by Scenario (AM Peak)

To	Travel Time (hh:mm)				
	Base	Option 0	Option 1	Option 2	Option 3
Bishop's Stortford	0:59	1:08	1:12	1:12	1:12
Cheshunt	0:39	0:47	0:50	0:49	0:50
Borehamwood	0:29	0:33	0:36	0:34	0:35
Rickmansworth	0:28	0:37	0:39	0:38	0:39
Watford	0:28	0:32	0:34	0:34	0:34
Hertford	0:33	0:41	0:45	0:45	0:46
Welwyn Garden City	0:27	0:34	0:38	0:38	0:39
Stevenage	0:33	0:39	0:42	0:42	0:42
Hitchin	0:30	0:35	0:38	0:37	0:38
Hemel Hempstead	0:10	0:13	0:17	0:15	0:16
East Hemel	0:07	0:09	0:11	0:10	0:10
St Albans City	0:14	0:16	0:18	0:17	0:18
Harpenden	0:09	0:10	0:11	0:10	0:10
Wheathampstead	0:13	0:16	0:18	0:19	0:20

Table 9-17: Travel times to Redbourn by Scenario (PM Peak)

From	Travel Time (hh:mm)				
	Base	Option 0	Option 1	Option 2	Option 3
Bishop's Stortford	1:00	1:05	1:07	1:06	1:10
Cheshunt	0:37	0:46	0:48	0:46	0:45
Borehamwood	0:27	0:32	0:34	0:33	0:32
Rickmansworth	0:31	0:41	0:43	0:40	0:36
Watford	0:27	0:38	0:41	0:39	0:29
Hertford	0:35	0:38	0:40	0:39	0:43
Welwyn Garden City	0:27	0:30	0:32	0:31	0:33
Stevenage	0:34	0:37	0:39	0:38	0:37
Hitchin	0:29	0:34	0:35	0:34	0:32
Hemel Hempstead	0:11	0:12	0:16	0:14	0:12
East Hemel	0:08	0:08	0:09	0:07	0:07
St Albans City	0:14	0:15	0:16	0:16	0:16
Harpenden	0:09	0:10	0:11	0:11	0:15
Wheathampstead	0:13	0:14	0:15	0:15	0:19

Table 9-18: Travel times from Redbourn by scenario (PM Peak)

To	Travel Time (hh:mm)				
	Base	Option 0	Option 1	Option 2	Option 3
Bishop's Stortford	1:00	1:07	1:10	1:08	1:12
Cheshunt	0:39	0:47	0:51	0:48	0:50
Borehamwood	0:27	0:31	0:35	0:31	0:35
Rickmansworth	0:30	0:40	0:43	0:40	0:39
Watford	0:24	0:30	0:32	0:30	0:34
Hertford	0:33	0:38	0:41	0:39	0:46
Welwyn Garden City	0:26	0:28	0:31	0:29	0:39
Stevenage	0:35	0:38	0:41	0:39	0:42
Hitchin	0:33	0:36	0:39	0:36	0:38
Hemel Hempstead	0:11	0:13	0:15	0:14	0:16
East Hemel	0:07	0:09	0:09	0:09	0:10
St Albans City	0:14	0:15	0:17	0:16	0:18
Harpenden	0:10	0:13	0:15	0:13	0:10
Wheathampstead	0:14	0:16	0:19	0:17	0:20

Trips to/from Harpenden

Table 9-19: Travel times to Harpenden by scenario (AM Peak)

From	Travel Time (hh:mm)				
	Base	Option 0	Option 1	Option 2	Option 3
Bishop's Stortford	0:56	1:01	1:01	1:01	1:01
Cheshunt	0:38	0:45	0:46	0:45	0:45
Borehamwood	0:29	0:33	0:34	0:33	0:33
Rickmansworth	0:32	0:40	0:41	0:40	0:41
Watford	0:27	0:33	0:34	0:33	0:34
Hertford	0:30	0:33	0:33	0:32	0:33
Welwyn Garden City	0:21	0:22	0:23	0:22	0:22
Stevenage	0:28	0:30	0:30	0:30	0:30
Hitchin	0:27	0:29	0:30	0:29	0:29
Hemel Hempstead	0:18	0:20	0:23	0:20	0:21
East Hemel	0:14	0:16	0:18	0:15	0:16
St Albans City	0:18	0:19	0:21	0:20	0:20
Redbourn	0:09	0:10	0:11	0:10	0:10
Wheathampstead	0:09	0:09	0:10	0:09	0:10

Table 9-20: Travel times from Harpenden by scenario (AM Peak)

To	Travel Time (hh:mm)				
	Base	Option 0	Option 1	Option 2	Option 3
Bishop's Stortford	0:57	1:03	1:06	1:06	1:07
Cheshunt	0:41	0:49	0:53	0:52	0:53
Borehamwood	0:34	0:38	0:42	0:41	0:42
Rickmansworth	0:36	0:43	0:46	0:46	0:46
Watford	0:33	0:38	0:42	0:41	0:42
Hertford	0:30	0:36	0:40	0:39	0:41
Welwyn Garden City	0:24	0:29	0:32	0:32	0:33
Stevenage	0:28	0:33	0:36	0:36	0:36
Hitchin	0:27	0:31	0:34	0:34	0:34
Hemel Hempstead	0:19	0:23	0:28	0:27	0:28
East Hemel	0:15	0:17	0:22	0:22	0:22
St Albans City	0:18	0:20	0:24	0:26	0:27
Redbourn	0:10	0:12	0:14	0:14	0:15
Wheathampstead	0:09	0:11	0:13	0:14	0:14

Table 9-21: Travel times to Harpenden by scenario (PM Peak)

From	Travel Time (hh:mm)				
	Base	Option 0	Option 1	Option 2	Option 3
Bishop's Stortford	0:56	0:59	1:00	0:59	1:01
Cheshunt	0:39	0:46	0:47	0:46	0:45
Borehamwood	0:30	0:35	0:37	0:36	0:33
Rickmansworth	0:36	0:46	0:49	0:47	0:41
Watford	0:32	0:44	0:46	0:45	0:34
Hertford	0:30	0:34	0:35	0:34	0:33
Welwyn Garden City	0:23	0:25	0:27	0:26	0:22
Stevenage	0:29	0:31	0:32	0:31	0:30
Hitchin	0:27	0:29	0:30	0:29	0:29
Hemel Hempstead	0:19	0:24	0:30	0:25	0:21
East Hemel	0:15	0:19	0:22	0:19	0:16
St Albans City	0:18	0:19	0:21	0:20	0:20
Redbourn	0:10	0:13	0:15	0:13	0:10
Wheathampstead	0:09	0:10	0:10	0:10	0:10

Table 9-22: Travel times from Harpenden by scenario (PM Peak)

To	Travel Time (hh:mm)				
	Base	**Option 0**	**Option 1**	**Option 2**	**Option 3**
Bishop's Stortford	0:55	0:59	1:00	1:00	1:07
Cheshunt	0:40	0:46	0:47	0:47	0:53
Borehamwood	0:31	0:35	0:36	0:35	0:42
Rickmansworth	0:36	0:43	0:44	0:44	0:46
Watford	0:28	0:33	0:33	0:33	0:42
Hertford	0:28	0:31	0:31	0:31	0:41
Welwyn Garden City	0:20	0:21	0:21	0:22	0:33
Stevenage	0:28	0:29	0:30	0:30	0:36
Hitchin	0:27	0:28	0:28	0:28	0:34
Hemel Hempstead	0:18	0:20	0:23	0:22	0:28
East Hemel	0:14	0:16	0:17	0:17	0:22
St Albans City	0:17	0:18	0:19	0:20	0:27
Redbourn	0:09	0:10	0:11	0:11	0:15
Wheathampstead	0:09	0:09	0:09	0:10	0:14

10 Conclusions

To follow shortly

Appendix A

St Albans Base Year Model Review

Confidential

TECHNICAL NOTE 1

DATE:	03 April 2024	**CONFIDENTIALITY:**	Confidential
SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	St Albans Local Plan Assessment	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

1 INTRODUCTION

WSP has been commissioned to undertake a Local Plan assessment for St Albans District Council (SADC) to inform and be the evidence base their Local Plan. To test the impacts of the Local Plan growth in St Albans, Hertfordshire County Council's (HCC) transport model COMET will be used for this work, which has a 2014 base year model.

The purpose of this technical note is to present the findings of the review of the existing 2014 base year model in St Albans District (SAD), to understand the performance and to ensure it is a robust basis to undertake forecasting for the Local Plan.

2 BASE YEAR MODEL REVIEW

The following tasks have been undertaken to review the 2014 base year model:

1. Review of the network coverage
2. Review of the traffic flow performance between 2014 observed and modelled data
3. Review of the journey time performance between 2014 observed and modelled data
4. Comparison of observed traffic flows between 2014 and 2023 a both link and screenline / cordon level
5. Comparison of 2014 modelled traffic flow and 2023 observed traffic flows
6. Comparison of 2014 link delays against 2024 google map typical traffic in key routes

These criteria were deemed suitable which would cover most of the critical aspects of the 2014 base year model and will provide a robust assessment for its suitability to use for the Local Plan assessment.

The study area identified for this review is all links within SAD.

3 NETWORK COVERAGE

Figure 1[1] presents the network coverage of the 2014 base year model within SAD (highlighted in red). The overall network coverage of the 2014 base year model is presented at the top right corner of the same figure.

Figure 1: 2014 Base Year Model Network Coverage

As expected, the network is fairly dense in the Hertfordshire region covering all the major towns within the county council – Hemel Hempstead, St Albans, Watford, Hatfield, Harpenden, Welwyn Garden City, Hertford, Stevenage and Bishop's Stortford.

It is observed that the 2014 base year model within SADC includes the strategic road network comprising M1, M25, A1(M), major road network comprising A414 and A405 North Orbital Road and A1081 London Colney Bypass. Other important roads such as A5183, A1081 Harpenden Road, B651, B487, and A1057 have been included connecting various towns within SAD such as Harpenden, Redbourne, Wheathampstead, London Colney and Bricket Wood.

Within St Albans town centre, circular roads covering the town centre such as Batchwood Drive, Beech Road, Marshalwicks Lane, and London Road have been included while radial routes such as B651 Sandridge Road, Sandpit Lane, Hatfield Road, Catherine Street, Folly Lane, St Albans Road, Watford Road and London Road are also present in the model.

Overall, the network coverage of the 2014 base year model within SAD looks well represented for a strategic model. All the A and B roads are fully covered in the model in addition to the minor roads with key rat runs.

[1] The lines represent an approximation of the route as the links in SATURN are coded as straight lines.

4 TRAFFIC FLOW PERFORMANCE

For the traffic flow performance, only those traffic count locations that lie within SAD were identified. This is deemed acceptable as these are only relevant for understanding the model performance for SADC Local Plan assessment.

As per the TAG unit M3.1 (Section 3.3.11), the criteria and guidelines for link flows are defined in Table 1. These two measures are broadly consistent and link flows that meet either criterion should be regarded as satisfactory.

Table 1: Link Flow Validation Criteria and Acceptability Guideline

Criteria	Description of 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	
	Individual flows within 400 veh/h of counts for flows more than 2,700 veh/h	
2	GEH < 5 for individual flows	> 85% of cases

Figure 2 to Figure 4 present the location of all calibration and validation count sites in SAD for all vehicles for AM, IP and PM peaks respectively with the GEH values. It is to be noted that the lengths of the link are based on the set-up of the SATURN model and typically represent the length of the route between key junctions. Therefore, they tend to be longer in rural areas and shorter in urban areas. The colours represent the comparison between modelled and observed flows.

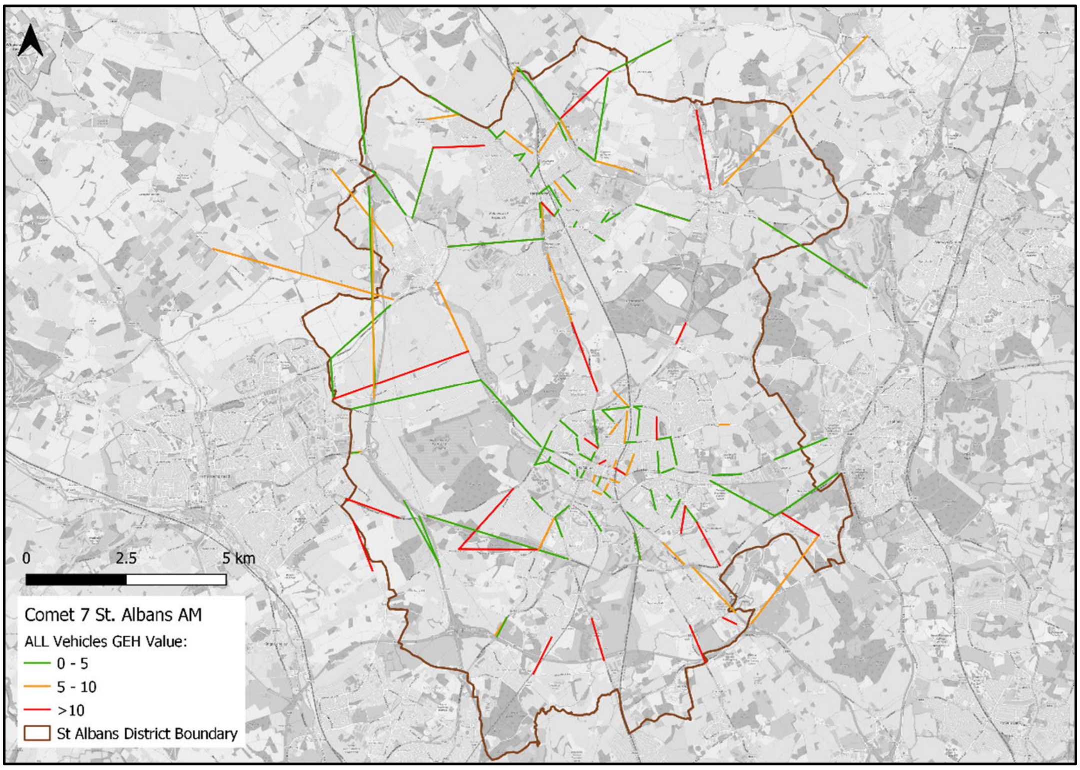


Figure 2: Link Flow Performance All Vehicles (AM)

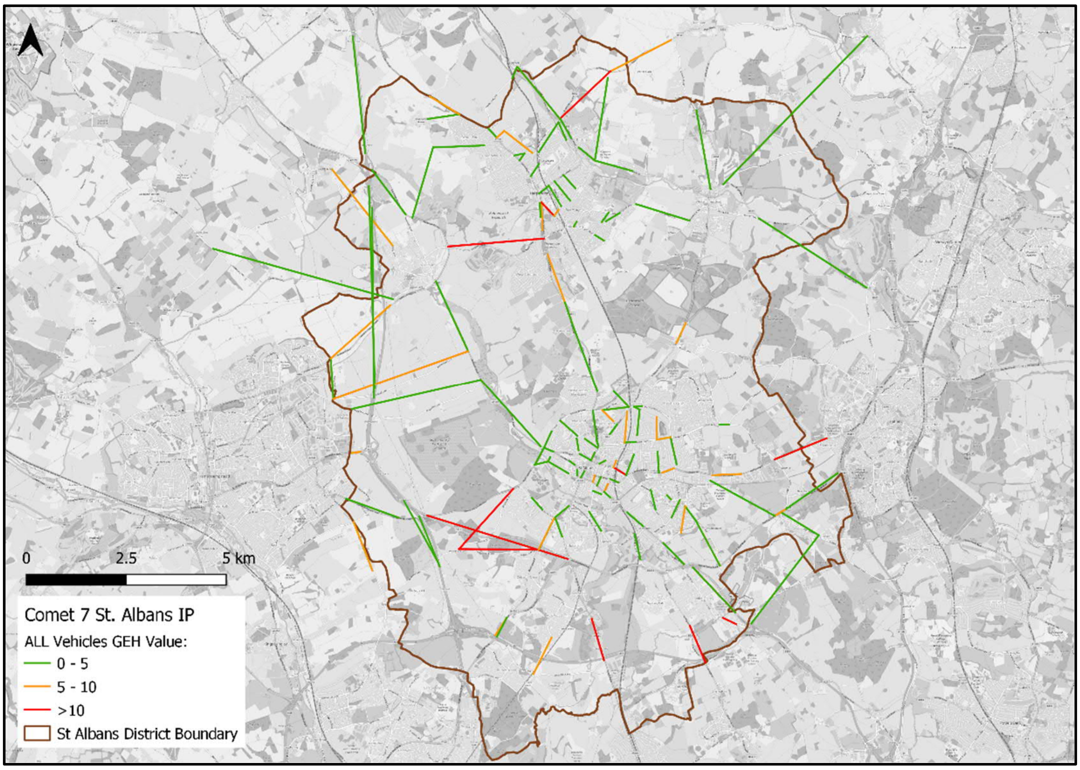


Figure 3: **Link Flow Performance All Vehicles (IP)**

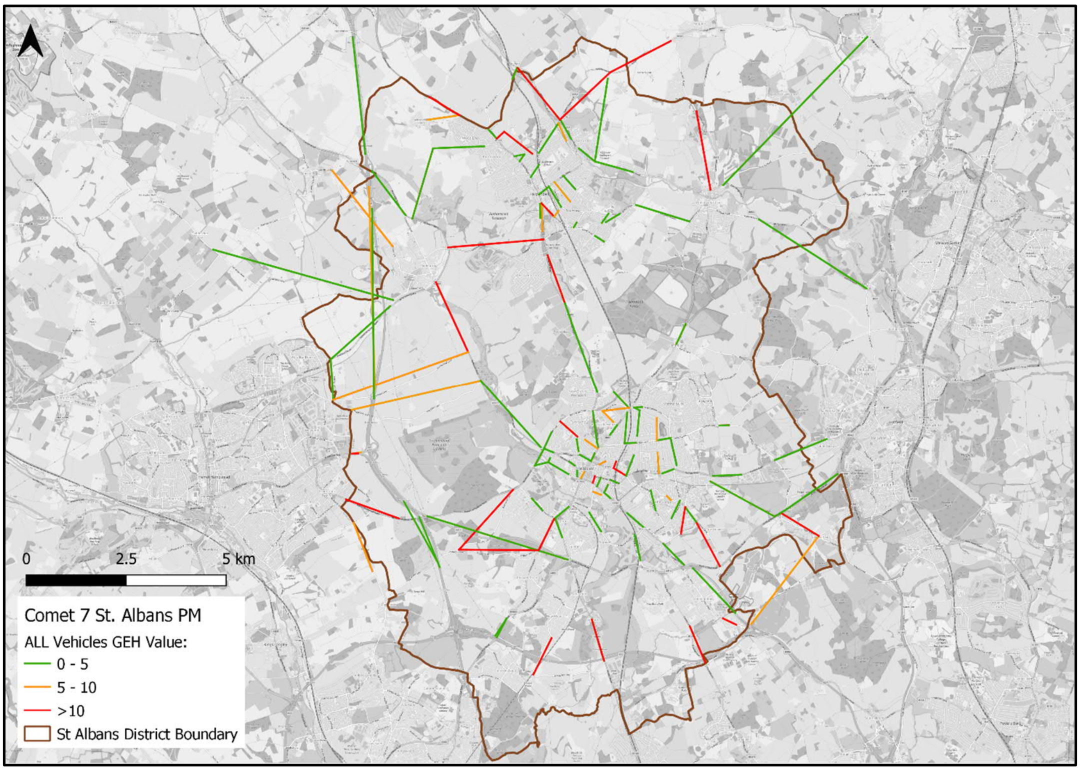


Figure 4: **Link Flow Performance All Vehicles (PM)**

Figure 2 to Figure 4 show count performance in St Albans town centre perform reasonably well (with GEH < 5) compared to the overall SAD level in each time period (AM, IP, and PM). It is also observed that there are several locations where GEH > 10 (in red) indicating a poor level of match between the observed and modelled traffic flows.

The summary of the calibration and validation count performance for each time period (AM, IP and PM) and by each vehicle type (Total, Car, LGV and HGV) are presented in Table 2 and Table 3 respectively. A total of 173 calibration and 78 validation traffic count locations were identified that lie within St Albans District boundary for the performance assessment. Table 4 shows the performance of all the counts.

Table 2: Link Performance of St Albans District Calibration Counts

Period	TAG Criteria				GEH Performance Only				Flow Performance Only			
	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV
AM	78%	82%	100%	99%	69%	69%	98%	95%	77%	82%	100%	99%
IP	90%	96%	100%	100%	79%	82%	99%	97%	90%	95%	100%	100%
PM	84%	84%	100%	100%	71%	70%	98%	99%	83%	83%	100%	100%

Table 3: Link Performance of St Albans District Validation Counts

Period	TAG Criteria				GEH Performance Only				Flow Performance Only			
	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV
AM	45%	46%	99%	100%	36%	32%	79%	88%	44%	46%	99%	99%
IP	68%	72%	99%	92%	53%	56%	87%	87%	68%	72%	99%	92%
PM	55%	56%	99%	99%	49%	47%	88%	94%	50%	51%	99%	99%

Table 4: Link Performance of St Albans District All Counts

Period	TAG Criteria				GEH Performance Only				Flow Performance Only			
	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV
AM	68%	71%	100%	100%	59%	57%	92%	93%	67%	71%	100%	99%
IP	83%	88%	100%	98%	71%	74%	87%	94%	83%	88%	100%	98%
PM	75%	75%	100%	100%	64%	63%	95%	98%	73%	73%	100%	100%

Table 2 shows that within SAD the IP and PM peak calibration counts meet TAG criteria, however the AM calibration counts are slightly lower than TAG criteria but close enough not to be of a concern. Table 3 shows the performance of the validation counts, this shows that all time periods are quite a long way away from meeting TAG criteria, particularly the AM peak where only 45% of counts meet TAG criteria. This performance between observed and modelled counts is weak.

Table 4 show the performance of all counts (calibration and validation). The IP and PM peak performance for all counts is close enough to TAG criteria not to be of a concern. The AM peak performs the weakest with only 68% of all counts meeting TAG criteria. .

TECHNICAL NOTE 1

DATE:	03 April 2024	**CONFIDENTIALITY:**	Confidential
SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	St Albans Local Plan Assessment	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

Screenline and Cordons

As per the TAG unit M3.1 (Section 3.3.7), the validation criteria and guidelines for screenline flows are defined in Table 5.

Table 5: Screenline Flow Validation Criteria and Guideline

Criteria	Acceptability Guideline
Differences between modelled flows and observed counts should be less than 5% of the counts	All or nearly all screenlines (i.e., 95%)

Figure 5 shows the screenlines and cordon in St Albans district, with blue screenlines as calibration counts and red representing validation counts. There are 22 calibration and 8 validation screenlines in SAD.

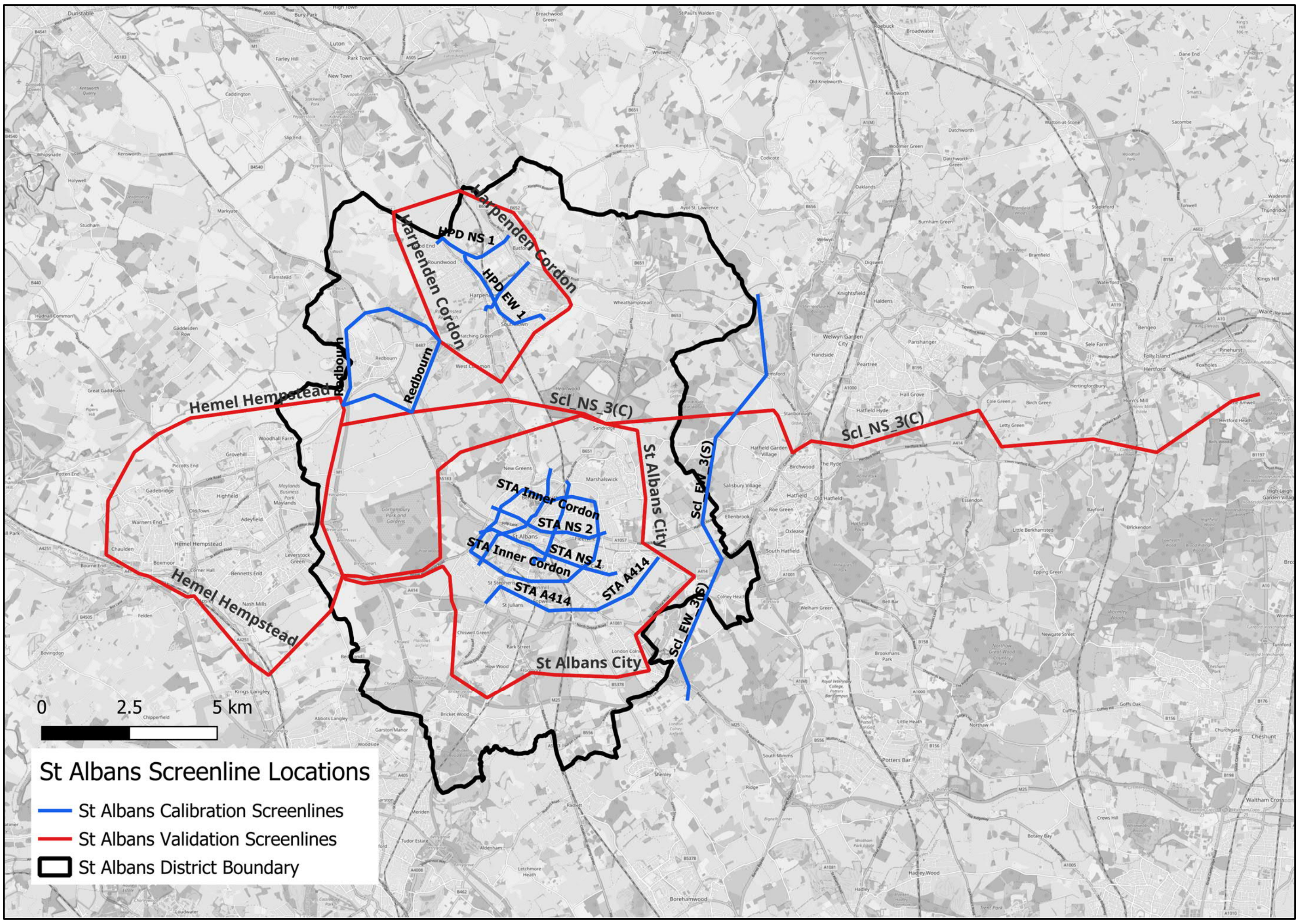


Figure 5: Screenlines and Cordons in St Albans

Table 6 provides the overall summary of the calibration and validation of the screenlines.

Table 6: Screenline Flow Validation Criteria and Guideline

Screenline/Cordons	AM	IP	PM
Calibration Screenlines/ Cordons	82%	82%	77%
Validation Screenlines/ Cordons	50%	25%	50%
All Screenlines/ Cordons	73%	67%	70%

Table 7 to Table 9 shows the calibration screenline summary for AM, IP and PM peak respectively. Out of the 22 calibration screenlines within the SAD, 82% (18 screenlines) meet TAG criteria for AM and IP while 77% (17 screenlines) meet the TAG criteria for PM peak for total vehicles.

Table 10 to Table 12 presents the validation screenline summary for AM, IP and PM peaks respectively. Out of the total 8 validation screenlines within SAD, 50% (4 screenlines) meet TAG criteria for AM and PM peaks while 25% (2 screenlines) meet the TAG criteria for IP for total vehicles. .

Overall, out of the 30 calibration and validation screenlines, 73% (22 screenlines) in the AM peak, 67% (20 screenlines) and 70% (21 screenlines) meet the TAG criteria for total vehicles.

Table 7: Screenline Calibration Summary AM Peak

Route Name	Direction	Observed Flows				Modelled Flows				Difference				% Difference				TAG Compliant			
		Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total
Scl_EW_3(S)	Eastbound	9,171	1,093	726	10,990	9,218	1,099	744	11,061	47	6	18	70	1%	1%	2%	1%	YES	YES	YES	YES
Scl_EW_3(S)	Westbound	7,638	1074	633	9,345	7,647	1073	638	9,358	9	-1	5	13	0%	0%	1%	0%	YES	YES	YES	YES
Redbourn	Inbound	3,222	375	124	3,722	3,155	375	108	3,638	-67	0	-16	-83	-2%	0%	-13%	-2%	YES	YES	NO	YES
Redbourn	Outbound	2,935	343	116	3,394	3,073	366	107	3,546	138	23	-9	152	5%	7%	-7%	4%	YES	NO	NO	YES
STA Inner Cordon	Inbound	4,735	566	203	5,504	4,777	572	191	5,540	42	6	-12	36	1%	1%	-6%	1%	YES	YES	NO	YES
STA Inner Cordon	Outbound	4,417	522	184	5,123	4,431	524	172	5,127	14	2	-12	4	0%	0%	-6%	0%	YES	YES	NO	YES
STA NS 1	Northbound	3,266	376	127	3,769	3,262	364	125	3,751	-5	-12	-1	-18	0%	-3%	-1%	0%	YES	YES	YES	YES
STA NS 1	Southbound	3,082	360	124	3,566	3,072	360	122	3,554	-9	0	-3	-12	0%	0%	-2%	0%	YES	YES	YES	YES
HPD EW 1	Eastbound	1,499	160	46	1,705	1,472	161	35	1,668	-27	1	-11	-37	-2%	0%	-24%	-2%	YES	YES	NO	YES
HPD EW 1	Westbound	1,752	187	54	1,993	1,757	190	37	1,984	6	2	-17	-9	0%	1%	-31%	0%	YES	YES	NO	YES
HPD NS 1	Northbound	1,641	188	63	1,892	1,656	186	60	1,902	14	-2	-3	10	1%	-1%	-4%	1%	YES	YES	YES	YES
HPD NS 1	Southbound	1,790	205	68	2,062	1,748	204	53	2,005	-42	-1	-15	-57	-2%	0%	-21%	-3%	YES	YES	NO	YES
HPD NS 2	Northbound	2,082	238	78	2,398	2,082	240	56	2,378	1	2	-22	-19	0%	1%	-28%	-1%	YES	YES	NO	YES
HPD NS 2	Southbound	1,892	217	71	2,179	1,849	216	66	2,132	-43	0	-5	-48	-2%	0%	-6%	-2%	YES	YES	NO	YES
STA EW 1	Eastbound	2,198	264	104	2,566	1,936	246	91	2,273	-262	-18	-13	-293	-12%	-7%	-12%	-11%	NO	NO	NO	NO
STA EW 1	Westbound	2,503	298	114	2,914	2,423	283	110	2,817	-79	-15	-4	-98	-3%	-5%	-3%	-3%	YES	YES	YES	YES
STA EW 2	Eastbound	2,161	242	78	2,481	2,207	251	78	2,537	46	9	0	55	2%	4%	0%	2%	YES	YES	YES	YES
STA EW 2	Westbound	2,336	260	82	2,678	2,343	260	85	2,688	7	0	2	10	0%	0%	3%	0%	YES	YES	YES	YES
STA A414	Northbound	3,250	393	151	3,794	2,733	334	99	3,166	-517	-59	-52	-628	-16%	-15%	-34%	-17%	NO	NO	NO	NO
STA A414	Southbound	2,578	313	123	3,015	2,422	311	90	2,823	-157	-2	-33	-192	-6%	-1%	-27%	-6%	NO	YES	NO	NO
STA NS 2	Northbound	2,498	273	85	2,856	2,297	259	72	2,628	-201	-14	-13	-228	-8%	-5%	-15%	-8%	NO	NO	NO	NO
STA NS 2	Southbound	2,388	266	86	2,740	2,378	266	84	2,728	-10	0	-2	-12	0%	0%	-3%	0%	YES	YES	YES	YES
															Meet TAG Criteria			**82%**	**82%**	**41%**	**82%**

Table 8: Screenline Calibration Summary IP Peak

Route Name	Direction	Observed Flows				Modelled Flows				Difference				% Difference				TAG Compliant			
		Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total
Scl_EW_3(S)	Eastbound	5,115	454	197	5,766	5,169	456	213	5,837	53	2	16	71	1%	1%	8%	1%	YES	YES	NO	YES
Scl_EW_3(S)	Westbound	4,272	544	194	5,010	4,296	550	209	5,054	24	6	15	44	1%	1%	8%	1%	YES	YES	NO	YES
Redbourn	Inbound	1,542	249	97	1,888	1,994	341	94	2,429	452	92	-3	541	29%	37%	-3%	29%	NO	NO	YES	NO
Redbourn	Outbound	1,500	242	94	1,836	1,945	331	91	2,367	445	89	-4	531	30%	37%	-4%	29%	NO	NO	YES	NO
STA Inner Cordon	Inbound	2,999	527	216	3,742	3,009	534	189	3,732	10	7	-27	-9	0%	1%	-13%	0%	YES	YES	NO	YES
STA Inner Cordon	Outbound	3,030	532	217	3,779	3,033	542	192	3,767	2	10	-25	-13	0%	2%	-12%	0%	YES	YES	NO	YES
STA NS 1	Northbound	2,232	380	149	2,761	2,142	351	144	2,637	-91	-29	-5	-124	-4%	-8%	-3%	-5%	YES	NO	YES	YES
STA NS 1	Southbound	2,151	366	143	2,660	2,114	352	139	2,605	-36	-14	-4	-54	-2%	-4%	-3%	-2%	YES	YES	YES	YES
HPD EW 1	Eastbound	974	151	51	1,176	974	151	33	1,158	0	0	-18	-18	0%	0%	-36%	-1%	YES	YES	NO	YES
HPD EW 1	Westbound	937	144	49	1,130	938	144	31	1,113	1	0	-17	-16	0%	0%	-35%	-1%	YES	YES	NO	YES
HPD NS 1	Northbound	886	148	58	1,091	887	147	58	1,091	1	-1	0	0	0%	-1%	0%	0%	YES	YES	YES	YES
HPD NS 1	Southbound	888	146	57	1,091	888	146	53	1,086	0	-1	-4	-5	0%	-1%	-7%	0%	YES	YES	NO	YES
HPD NS 2	Northbound	1,272	209	80	1,561	1,271	210	68	1,550	-1	1	-11	-11	0%	0%	-14%	-1%	YES	YES	NO	YES
HPD NS 2	Southbound	1,236	204	78	1,518	1,238	205	73	1,516	2	1	-5	-2	0%	0%	-6%	0%	YES	YES	NO	YES
STA EW 1	Eastbound	1,687	304	130	2,121	1,593	282	128	2,003	-94	-22	-2	-118	-6%	-7%	-2%	-6%	NO	NO	YES	NO
STA EW 1	Westbound	1,778	319	136	2,233	1,759	319	124	2,202	-20	1	-11	-31	-1%	0%	-8%	-1%	YES	YES	NO	YES
STA EW 2	Eastbound	1,505	249	93	1,847	1,502	249	94	1,845	-3	0	1	-2	0%	0%	1%	0%	YES	YES	YES	YES
STA EW 2	Westbound	1,550	257	96	1,903	1,547	256	96	1,899	-3	-1	0	-4	0%	0%	0%	0%	YES	YES	YES	YES
STA A414	Northbound	1,855	322	138	2,314	1,782	320	100	2,201	-73	-2	-38	-113	-4%	-1%	-28%	-5%	YES	YES	NO	YES
STA A414	Southbound	1,798	312	133	2,243	1,681	307	102	2,090	-117	-5	-31	-153	-6%	-2%	-23%	-7%	NO	YES	NO	NO
STA NS 2	Northbound	1,661	279	103	2,043	1,668	279	94	2,040	7	0	-9	-3	0%	0%	-9%	0%	YES	YES	NO	YES
STA NS 2	Southbound	1,770	299	112	2,181	1,770	298	109	2,177	1	-2	-3	-4	0%	-1%	-3%	0%	YES	YES	YES	YES
															Meet TAG Criteria			**82%**	**82%**	**41%**	**82%**

Table 9: Screenline Calibration Summary PM Peak

Route Name	Direction	Observed Flows				Modelled Flows				Difference				% Difference				TAG Compliant			
		Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total
Scl_EW_3(S)	Eastbound	5,429	1,147	825	7,401	5,417	1,145	843	7,405	-12	-2	18	4	0%	0%	2%	0%	YES	YES	YES	YES
Scl_EW_3(S)	Westbound	5,386	1,085	804	7,275	5,382	1,085	827	7,294	-4	0	23	19	0%	0%	3%	0%	YES	YES	YES	YES
Redbourn	Inbound	2,659	283	43	2,984	3,207	359	40	3,606	549	76	-2	622	21%	27%	-6%	21%	NO	NO	NO	NO
Redbourn	Outbound	3,145	339	56	3,540	3,601	407	50	4,058	455	68	-5	517	14%	20%	-10%	15%	NO	NO	NO	NO
STA Inner Cordon	Inbound	3,889	410	77	4,376	3,924	413	73	4,410	36	3	-4	34	1%	1%	-5%	1%	YES	YES	NO	YES
STA Inner Cordon	Outbound	4,580	485	91	5,156	4,586	488	81	5,155	6	3	-10	-1	0%	1%	-11%	0%	YES	YES	NO	YES
STA NS 1	Northbound	3,113	325	58	3,496	3,086	324	58	3,468	-27	-1	0	-28	-1%	0%	0%	-1%	YES	YES	YES	YES
STA NS 1	Southbound	3,184	331	58	3,573	3,168	329	57	3,554	-16	-2	-2	-20	-1%	-1%	-3%	-1%	YES	YES	YES	YES
HPD EW 1	Eastbound	1,512	149	22	1,682	1,509	134	17	1,660	-3	-15	-5	-22	0%	-10%	-22%	-1%	YES	NO	NO	YES
HPD EW 1	Westbound	1,239	122	17	1,379	1,232	121	12	1,365	-7	-1	-5	-14	-1%	-1%	-30%	-1%	YES	YES	NO	YES
HPD NS 1	Northbound	1,594	167	28	1,790	1,543	167	24	1,734	-52	-1	-4	-56	-3%	0%	-13%	-3%	YES	YES	NO	YES
HPD NS 1	Southbound	1,437	152	23	1,612	1,430	141	19	1,591	-7	-10	-4	-22	-1%	-7%	-18%	-1%	YES	NO	NO	YES
HPD NS 2	Northbound	2,015	209	33	2,257	1,976	209	28	2,213	-39	0	-5	-44	-2%	0%	-14%	-2%	YES	YES	NO	YES
HPD NS 2	Southbound	1,815	189	31	2,035	1,812	188	20	2,020	-3	0	-11	-15	0%	0%	-37%	-1%	YES	YES	NO	YES
STA EW 1	Eastbound	2,135	230	48	2,413	2,009	219	45	2,273	-126	-10	-3	-139	-6%	-4%	-6%	-6%	NO	YES	NO	NO
STA EW 1	Westbound	2,545	272	56	2,873	2,452	260	46	2,757	-93	-12	-11	-116	-4%	-4%	-19%	-4%	YES	YES	NO	YES
STA EW 2	Eastbound	2,164	218	36	2,419	2,161	218	37	2,416	-4	0	0	-4	0%	0%	0%	0%	YES	YES	YES	YES
STA EW 2	Westbound	2,350	239	41	2,630	2,340	240	36	2,616	-10	1	-5	-14	0%	0%	-11%	-1%	YES	YES	NO	YES
STA A414	Northbound	2,947	322	60	3,329	2,582	284	44	2,910	-364	-38	-16	-418	-12%	-12%	-27%	-13%	NO	NO	NO	NO
STA A414	Southbound	2,816	307	59	3,183	2,492	277	44	2,813	-324	-31	-16	-370	-12%	-10%	-26%	-12%	NO	NO	NO	NO
STA NS 2	Northbound	2,492	246	43	2,781	2,448	242	41	2,731	-43	-4	-2	-49	-2%	-2%	-4%	-2%	YES	YES	YES	YES
STA NS 2	Southbound	2,626	261	46	2,934	2,619	261	40	2,921	-7	0	-6	-14	0%	0%	-13%	0%	YES	YES	NO	YES
														Meet TAG Criteria				**77%**	**73%**	**27%**	**77%**

Table 10: Screenline Validation Summary AM Peak

Route Name	Direction	Observed Flows				Modelled Flows				Difference				% Difference				TAG Compliant			
		Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total
Hempstead	Inbound	6,624	769	366	7,759	7,093	876	313	8,282	469	107	-53	523	7%	14%	-15%	7%	NO	NO	NO	NO
Hempstead	Outbound	6,393	959	405	7,758	6,972	939	355	8,266	579	-21	-50	508	9%	-2%	-12%	7%	NO	YES	NO	NO
Scl_NS_3(C)	Northbound	13,437	1,824	1,200	16,461	13,284	1,693	1,231	16,207	-154	-131	31	-254	-1%	-7%	3%	-2%	YES	NO	YES	YES
Scl_NS_3(C)	Southbound	14,941	1,993	1,347	18,281	14,531	2,078	1,439	18,048	-409	84	92	-233	-3%	4%	7%	-1%	YES	YES	NO	YES
St Albans City	Inbound	9,355	1,143	438	10,935	8,902	1,064	563	10,530	-452	-78	125	-405	-5%	-7%	29%	-4%	YES	NO	NO	YES
St Albans City	Outbound	9,301	1,044	424	10,769	8,902	944	548	10,393	-399	-100	123	-376	-4%	-10%	29%	-3%	YES	NO	NO	YES
Harpenden	Inbound	3,892	448	156	4,496	4,533	503	107	5,143	642	55	-49	648	16%	12%	-31%	14%	NO	NO	NO	NO
Harpenden	Outbound	4,071	474	168	4,713	4,787	526	141	5,455	717	52	-27	742	18%	11%	-16%	16%	NO	NO	NO	NO
														Meet TAG Criteria				**50%**	**25%**	**13%**	**50%**

Table 11: Screenline Validation Summary IP Peak

Route Name	Direction	Observed Flows				Modelled Flows				Difference				% Difference				TAG Compliant			
		Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total
Hempstead	Inbound	4,004	644	271	4,919	4,313	759	334	5,407	309	115	63	488	8%	18%	23%	10%	NO	NO	NO	NO
Hempstead	Outbound	4,336	652	276	5,264	4,504	775	372	5,651	169	123	96	388	4%	19%	35%	7%	YES	NO	NO	NO
Scl_NS_3(C)	Northbound	9,114	1,967	1,437	12,518	9,024	2,054	1,502	12,580	-90	87	64	62	-1%	4%	4%	0%	YES	YES	YES	YES
Scl_NS_3(C)	Southbound	8,759	1,880	1,372	12,010	8,871	1,908	1,414	12,193	112	28	42	182	1%	1%	3%	2%	YES	YES	YES	YES
St Albans City	Inbound	6,110	1,065	455	7,631	6,647	1,131	727	8,505	537	66	271	875	9%	6%	60%	11%	NO	NO	NO	NO
St Albans City	Outbound	6,097	1,062	462	7,621	6,296	1,063	732	8,091	199	1	270	470	3%	0%	59%	6%	YES	YES	NO	NO
Harpenden	Inbound	2,061	336	134	2,531	2,780	443	128	3,351	719	107	-6	820	35%	32%	-5%	32%	NO	NO	YES	NO
Harpenden	Outbound	2,079	338	135	2,551	2,838	432	140	3,411	759	95	6	860	37%	28%	4%	34%	NO	NO	YES	NO
														Meet TAG Criteria				**50%**	**38%**	**50%**	**25%**

Table 12: Screenline Validation Summary PM Peak

Route Name	Direction	Observed Flows				Modelled Flows				Difference				% Difference				TAG Compliant			
		Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total
Hempstead	Inbound	6,447	858	179	7,484	7,322	787	163	8,272	875	-71	-15	789	14%	-8%	-9%	11%	NO	NO	NO	NO
Hempstead	Outbound	6,919	700	181	7,801	7,496	717	165	8,378	577	16	-17	577	8%	2%	-9%	7%	NO	YES	NO	NO
Scl_NS_3(C)	Northbound	16,074	1,789	781	18,645	15,873	2,037	859	18,769	-202	248	78	125	-1%	14%	10%	1%	YES	NO	NO	YES
Scl_NS_3(C)	Southbound	14,920	1,703	710	17,333	14,500	1,641	723	16,865	-419	-62	13	-468	-3%	-4%	2%	-3%	YES	YES	YES	YES
St Albans City	Inbound	10,408	1,091	212	11,711	10,495	1,146	350	11,991	87	55	138	280	1%	5%	65%	2%	YES	NO	NO	YES
St Albans City	Outbound	9,504	999	196	10,698	9,408	1,038	350	10,796	-96	40	154	98	-1%	4%	79%	1%	YES	YES	NO	YES
Harpenden	Inbound	3,766	403	66	4,235	4,647	483	51	5,180	881	80	-16	945	23%	20%	-24%	22%	NO	NO	NO	NO
Harpenden	Outbound	3,745	398	61	4,204	4,426	457	48	4,931	681	59	-14	727	18%	15%	-22%	17%	NO	NO	NO	NO
														Meet TAG Criteria				**50%**	**38%**	**13%**	**50%**

5 JOURNEY TIME PERFORMANCE

A review of the journey time validation was conducted between the observed and modelled data for all journey time routes in SAD. For the purpose of this review, similar to Section 4, only those routes which are relevant for understanding the model performance across the SAD were identified. The 2014 observed journey time data is sourced from Traffic Master journey time data as specified in the COMET LMVR[2].

As per TAG M3.1 (Section 3.3.15), the journey time validation and acceptability guideline is presented in Table 13.

Table 13: Journey Time Validation Criteria and Acceptability Guideline

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

The location of the overall journey time routes in the 2014 base year model (highlighted in blue) and journey time routes lying within the SAD (highlighted in red) is shown in Figure 6. A zoomed image of the journey time routes within the SAD is presented in Figure 7 with route numbers highlighted yellow.

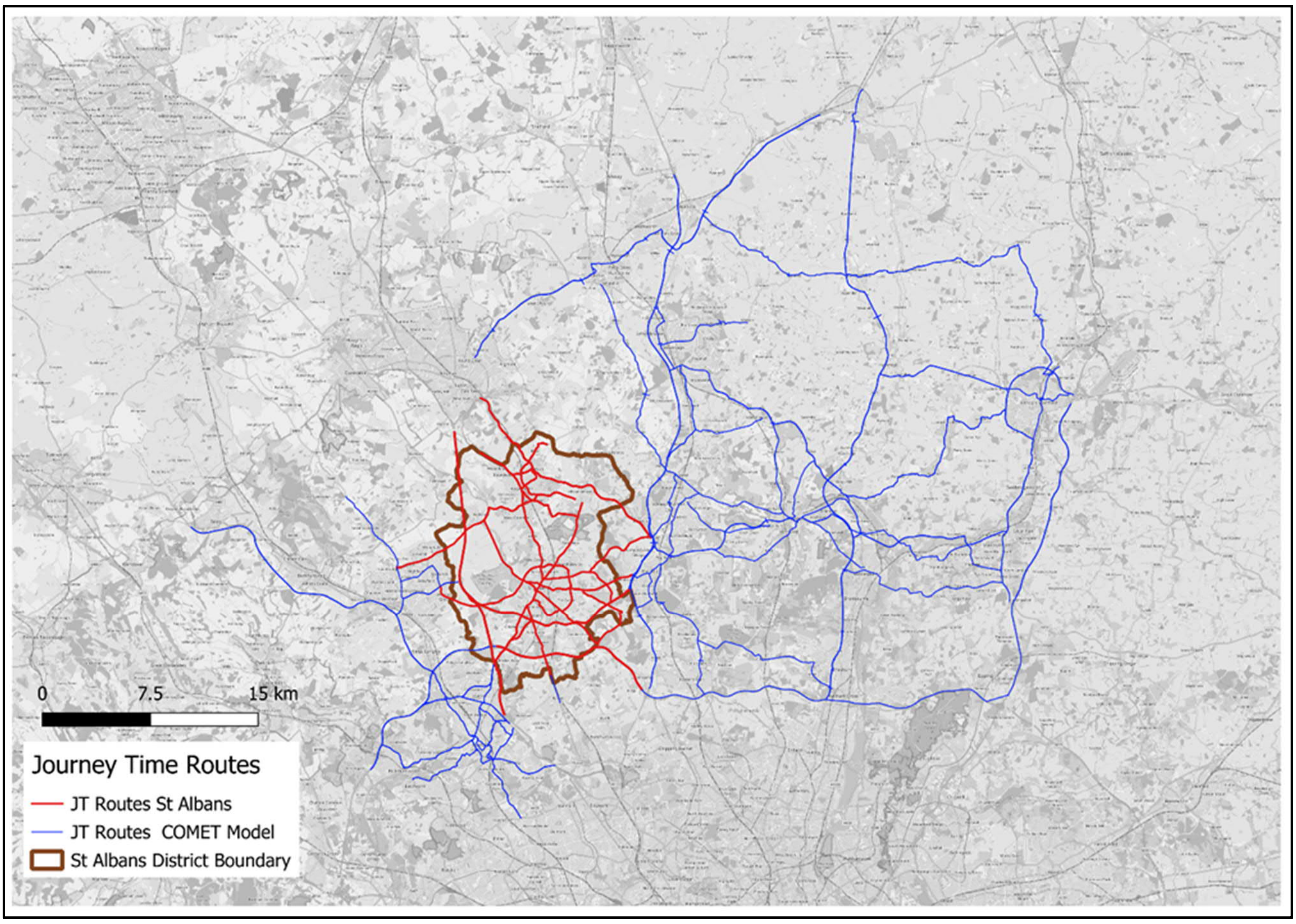


Figure 6: Journey Time Routes

[2] Hertfordshire COMET: Local Model Development and Validation Report (LMVR) v5.2, March 2020

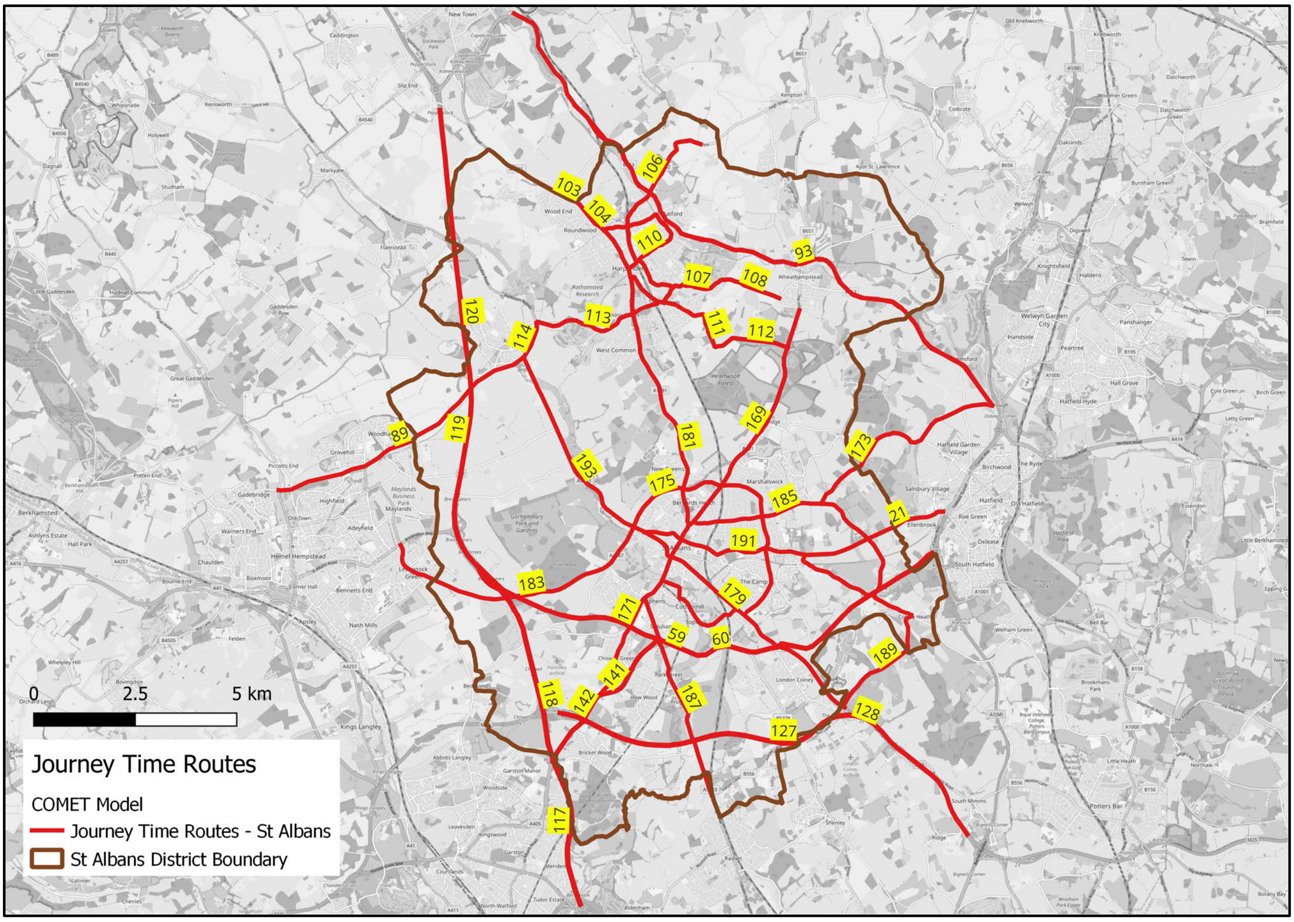


Figure 7: Journey Time Routes within SAD

A total of 52 routes (two-way) were identified to be lying within or majorly crossing the SAD boundary. Table 13 provides the journey time validation summary along these for each time period (AM, IP and PM) and by direction.

Table 14 shows that a total of 67%, 94% and 79% of the journey time routes within SAD pass the TAG criteria in the AM, IP and PM peaks respectively. As such, only the Inter-peak meets the TAG guideline for journey times with the PM peak not too far off criteria and AM peak outside of criteria.

Table 14: Journey Time Validation Summary

Route ID	Route Name	Direction	Observed Time (sec)			Modelled Time (sec)			Difference			% Difference			TAG Compliant		
			AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
191	A1057 Centre	Eastbound	787	692	751	668	640	655	-120	-52	-96	-15%	-8%	-13%	NO	YES	YES
192	A1057 Centre	Westbound	789	725	834	680	651	666	-109	-74	-168	-14%	-10%	-20%	YES	YES	NO
21	A1057 Hatfield Rd	Eastbound	340	339	391	368	310	371	27	-29	-20	8%	-9%	-5%	YES	YES	YES
22	A1057 Hatfield Rd	Westbound	331	300	314	315	283	328	-15	-17	14	-5%	-6%	4%	YES	YES	YES
103	A1081 Harpenden	Northbound	507	544	577	549	512	574	43	-32	-3	8%	-6%	-1%	YES	YES	YES
104	A1081 Harpenden	Southbound	604	483	465	553	498	517	-51	15	52	-8%	3%	11%	YES	YES	YES
181	A1081 North	Northbound	686	660	771	725	688	811	39	28	40	6%	4%	5%	YES	YES	YES
182	A1081 North	Southbound	915	789	755	834	756	793	-82	-33	38	-9%	-4%	5%	YES	YES	YES
179	A1081 St Albans	Westbound	788	670	765	675	634	779	-113	-36	14	-14%	-5%	2%	YES	YES	YES
180	A1081 St Albans	Eastbound	595	549	616	665	583	728	70	33	112	12%	6%	18%	YES	YES	NO
59	A414 J8 - A1(M) J3	Eastbound	934	690	736	982	707	796	48	17	60	5%	2%	8%	YES	YES	YES
60	A414 J8 - A1(M) J3	Westbound	755	670	712	590	653	648	-165	-16	-64	-22%	-2%	-9%	NO	YES	YES
183	A4147	Eastbound	636	446	666	523	467	503	-113	21	-163	-18%	5%	-24%	NO	YES	NO
184	A4147	Westbound	467	438	506	494	471	529	27	33	23	6%	8%	5%	YES	YES	YES
171	A5183	Northbound	710	544	647	587	614	561	-123	70	-86	-17%	13%	-13%	NO	YES	YES
172	A5183	Southbound	404	429	486	469	455	463	66	27	-23	16%	6%	-5%	NO	YES	YES
193	A5183 - St Albans to Harpenden	Northbound	429	436	453	438	433	459	9	-3	6	2%	-1%	1%	YES	YES	YES
194	A5183 - St Albans to Harpenden	Southbound	803	580	644	631	545	575	-172	-35	-69	-21%	-6%	-11%	NO	YES	YES
187	A5183 - St Albans to Radlett	Northbound	736	736	942	741	661	715	5	-74	-227	1%	-10%	-24%	YES	YES	NO

Route ID	Route Name	Direction	Observed Time (sec)			Modelled Time (sec)			Difference			% Difference			TAG Compliant		
			AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
188	A5183 - St Albans to Radlett	Southbound	804	695	733	867	639	657	63	-56	-76	8%	-8%	-10%	YES	YES	YES
113	B487	Eastbound	408	319	365	314	293	391	-93	-26	26	-23%	-8%	7%	NO	YES	YES
114	B487	Westbound	319	297	320	407	289	318	87	-8	-2	27%	-3%	-1%	NO	YES	YES
89	B487 Redbourne Rd / Link Rd	Eastbound	500	428	478	464	407	435	-36	-21	-43	-7%	-5%	-9%	YES	YES	YES
90	B487 Redbourne Rd / Link Rd	Westbound	477	429	459	405	397	448	-72	-33	-10	-15%	-8%	-2%	NO	YES	YES
105	B652 Westfield Rd	Northbound	673	601	593	689	614	642	17	13	49	2%	2%	8%	YES	YES	YES
106	B652 Westfield Rd	Southbound	658	617	614	673	613	632	15	-3	17	2%	-1%	3%	YES	YES	YES
93	B653 Lower Harpenden Rd - Luton to Batford	Eastbound	525	425	473	502	447	477	-24	12	3	-5%	3%	1%	YES	YES	YES
93	B653 Lower Harpenden Rd - Luton to Batford	Westbound	455	444	487	494	456	477	39	12	-10	9%	3%	-2%	YES	YES	YES
189	Colney Heath Lane	Northbound	622	516	634	480	453	480	-142	-62	-155	-23%	-12%	-24%	NO	YES	NO
190	Colney Heath Lane	Southbound	546	522	556	538	661	560	-8	139	4	-1%	27%	1%	YES	NO	YES
173	Coopers Green Ln	Eastbound	338	338	483	341	315	343	3	-23	-140	1%	-7%	-29%	YES	YES	NO
174	Coopers Green Ln	Westbound	338	319	347	326	309	327	-13	-10	-20	-4%	-3%	-6%	YES	YES	YES
111	Grove Rd	Westbound	552	486	462	438	430	433	-113	-56	-30	-21%	-12%	-6%	NO	YES	YES
112	Grove Rd	Eastbound	484	472	475	444	428	431	-40	-44	-44	-8%	-9%	-9%	YES	YES	YES
117	M1 J5 -J7	Northbound	370	392	554	372	370	487	2	-22	-67	1%	-6%	-12%	YES	YES	YES
118	M1 J5 -J7	Southbound	501	382	387	597	380	398	97	-2	10	19%	-1%	3%	NO	YES	YES
119	M1 J7 -J10	Northbound	356	371	472	348	347	448	-7	-23	-23	-2%	-6%	-5%	YES	YES	YES
120	M1 J7 -J10	Southbound	407	311	318	361	316	330	-46	5	12	-11%	2%	4%	YES	YES	YES
127	M25 J21a -J23	Eastbound	483	450	466	426	406	418	-57	-44	-48	-12%	-10%	-10%	YES	YES	YES

Route ID	Route Name	Direction	Observed Time (sec)			Modelled Time (sec)			Difference			% Difference			TAG Compliant		
			AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
128	M25 J21a -J23	Westbound	464	421	415	415	409	415	-49	-12	0	-11%	-3%	0%	YES	YES	YES
175	Marshalswick Ln	Eastbound	594	526	591	725	660	735	131	134	144	22%	26%	24%	NO	NO	NO
176	Marshalswick Ln	Westbound	624	520	543	700	534	542	76	14	-2	12%	3%	0%	YES	YES	YES
185	Sandpit Ln	Westbound	778	561	637	617	558	691	-161	-3	53	-21%	0%	8%	NO	YES	YES
186	Sandpit Ln	Eastbound	631	542	585	763	572	795	131	29	210	21%	5%	36%	NO	YES	NO
167	St Albans Rd	Northbound	524	506	518	569	547	561	45	41	43	9%	8%	8%	YES	YES	YES
168	St Albans Rd	Southbound	688	509	497	696	569	736	8	60	239	1%	12%	48%	YES	YES	NO
109	Station Rd/ Hollybush Ln	Northbound	489	466	459	511	503	508	22	36	49	5%	8%	11%	YES	YES	YES
110	Station Rd/ Hollybush Ln	Southbound	549	484	525	540	521	528	-9	37	2	-2%	8%	0%	YES	YES	YES
141	Watford Route 2a upper	Northbound	388	324	505	282	305	630	-106	-20	125	-27%	-6%	25%	NO	YES	NO
142	Watford Route 2a upper	Southbound	556	273	437	461	214	220	-95	-59	-217	-17%	-22%	-50%	NO	NO	NO
107	Wheathampstead Rd	Eastbound	279	255	261	277	276	278	-2	21	17	-1%	8%	6%	YES	YES	YES
108	Wheathampstead Rd	Westbound	305	276	272	285	282	285	-20	6	13	-7%	2%	5%	YES	YES	YES
														Total Routes	52	52	52
														Total Routes Passing TAG criteria	35	49	41
														Pass %	67%	94%	79%

6 COMPARISON OF OBSERVED TRAFFIC FLOWS BETWEEN 2014 AND 2023

A comparison of the observed traffic flows between 2014 and 2023 was undertaken to understand the changes in traffic before and after the Covid pandemic within SAD.

Figure 8 presents the location of the 2023 traffic count location along with the 2014 observed traffic count location within SAD.

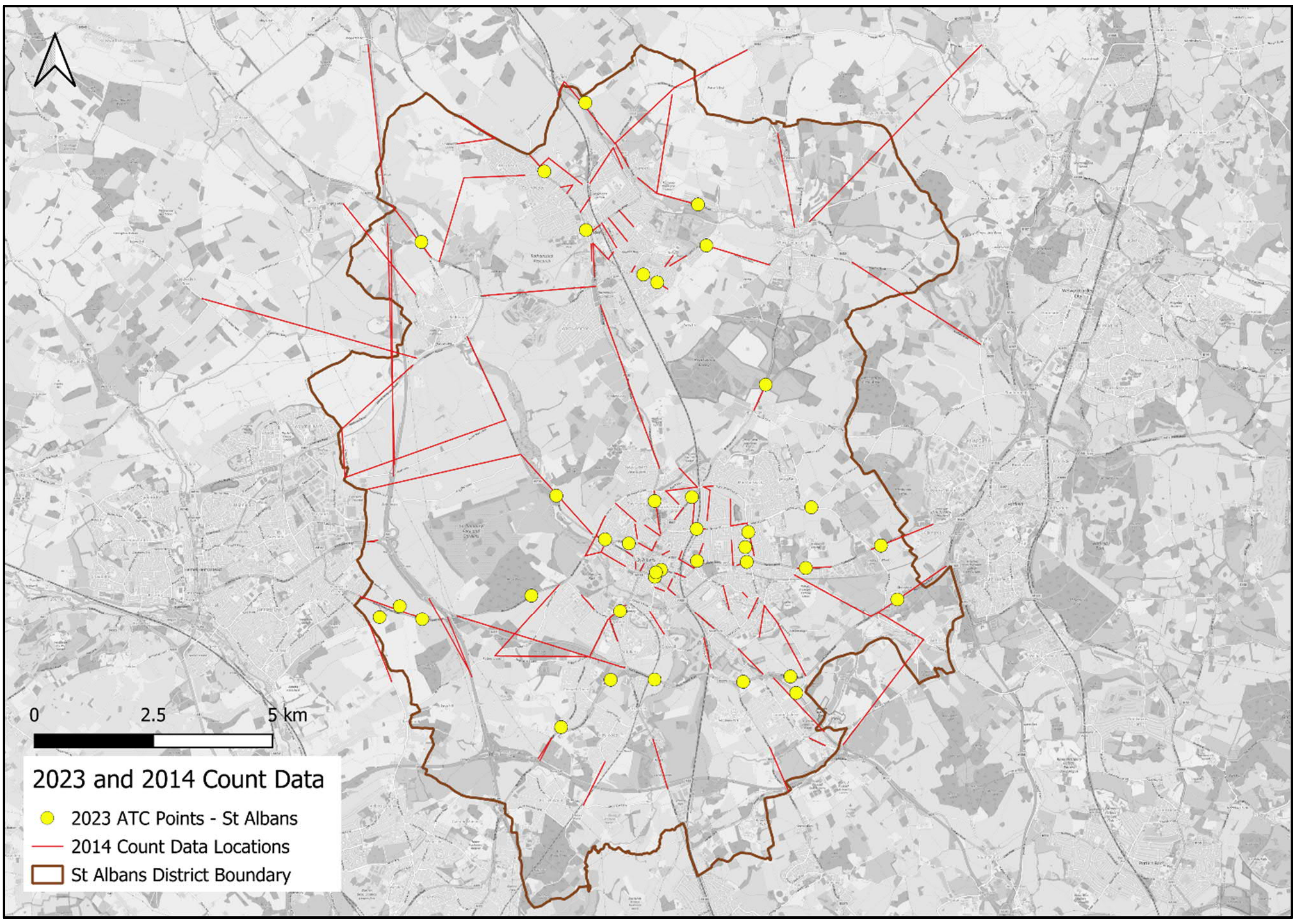


Figure 8: 2023 and 2014 Observed Count Locations within SAD

Table 15 summarises the total observed traffic flow values in 2023 and 2014 with differences.

Table 15: Comparison of 2023 and 2014 Observed Traffic Flows

S.No.	Direction	2023 Observed Flows All Vehicles			2014 Observed Flows All Vehicles			Absolute Difference (2023 – 2014)			Percentage Difference		
		AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
125	North East	585	645	690	552	617	560	33	28	130	6%	5%	23%
125	South West	717	598	677	702	562	529	15	36	148	2%	6%	28%
130	North	515	229	508	1,086	697	1,010	-572	-469	-503	-53%	-67%	-50%
130	South	736	599	879	899	632	945	-163	-33	-67	-18%	-5%	-7%
166	East	1,522	1,356	1,516	1,824	1,255	1,835	-302	102	-318	-17%	8%	-17%
166	West	1,346	1,398	1,598	1,937	1,285	1,971	-591	113	-373	-31%	9%	-19%
220	East	491	475	615	778	489	699	-286	-14	-84	-37%	-3%	-12%
220	West	466	465	635	668	493	760	-202	-28	-125	-30%	-6%	-16%
258	East	538	412	422	597	456	506	-59	-44	-84	-10%	-10%	-17%
258	West	597	412	546	613	453	751	-16	-41	-204	-3%	-9%	-27%
371	North	379	289	553	605	298	773	-226	-9	-220	-37%	-3%	-28%
371	South	608	248	317	681	260	513	-74	-12	-197	-11%	-5%	-38%
443	East	555	274	418	671	265	411	-116	9	7	-17%	3%	2%
443	West	568	267	509	486	255	505	82	13	4	17%	5%	1%
582	North	188	89	177	190	97	281	-1	-8	-103	-1%	-8%	-37%
582	South	322	144	195	387	138	194	-66	6	1	-17%	5%	0%
583	East	480	475	532	427	444	352	53	31	180	12%	7%	51%
583	West	499	456	484	418	481	394	81	-25	89	19%	-5%	23%
585	North	388	425	460	369	451	531	19	-25	-71	5%	-6%	-13%
585	South	577	469	562	373	450	513	204	19	49	55%	4%	10%
592	East	612	399	598	729	416	690	-118	-17	-92	-16%	-4%	-13%
592	West	755	412	588	894	466	714	-140	-54	-127	-16%	-12%	-18%
63	Eastbound	601	351	498	705	379	639	-104	-28	-141	-15%	-7%	-22%
63	Westbound	537	355	606	679	399	785	-142	-44	-179	-21%	-11%	-23%
64	Northbound	316	277	407	664	287	320	-348	-10	87	-52%	-4%	27%
64	Southbound	528	253	287	403	303	575	125	-51	-288	31%	-17%	-50%
66	Eastbound	988	532	654	1,153	483	682	-165	49	-29	-14%	10%	-4%
66	Westbound	718	528	872	752	503	1,070	-33	24	-197	-4%	5%	-18%
67	Northbound	399	381	725	453	413	848	-54	-31	-123	-12%	-8%	-15%
67	Southbound	888	378	474	880	400	560	8	-22	-86	1%	-6%	-15%
68	Northbound	304	272	397	325	280	439	-21	-9	-42	-6%	-3%	-10%
68	Southbound	362	301	327	445	303	336	-83	-2	-9	-19%	-1%	-3%
69	Northbound	315	213	293	222	209	278	92	4	15	41%	2%	5%
69	Southbound	354	168	198	284	226	227	70	-58	-29	25%	-26%	-13%
73	Northbound	926	603	1,217	1,118	573	1,250	-192	30	-33	-17%	5%	-3%
73	Southbound	998	552	833	674	558	879	323	-5	-47	48%	-1%	-5%
98	Eastbound	487	304	423	731	299	420	-244	5	3	-33%	2%	1%
98	Westbound	466	343	622	535	315	606	-68	28	16	-13%	9%	3%
177	Eastbound	974	474	608	974	515	671	1	-41	-64	0%	-8%	-9%
177	Westbound	514	486	860	670	573	974	-156	-87	-114	-23%	-15%	-12%
Total		**24,119**	**17,307**	**23,780**	**27,553**	**17,978**	**26,996**	**-3,436**	**-670**	**-3,220**	**-12%**	**-4%**	**-12%**

Overall, it is observed that there is a reduction in traffic flows in 2023 compared to 2014 in each time period AM, IP and PM peak within SAD with an average net reduction of circa 12% in the AM and PM peaks and 4% in the IP.

7 COMPARISON OF 2014 MODELLED TRAFFIC FLOW AND 2023 OBSERVED TRAFFIC FLOWS

Further analysis was carried out by comparing the following at the same locations as outlined in Section 6.

- 2014 modelled traffic flows with 2014 observed traffic flows within SAD
- 2014 modelled traffic flows with 2023 observed traffic flows within SAD at the same locations as specified in Section 6.

Table 17 and Table 18Table 18 present the detailed results with the overall statistics presented in Table 16.

Table 16: Summary of the 2023 and 2014 Count Performance

Period	2014 Observed vs Modelled Comparison	2023 Observed vs 2014 Modelled Comparison
	Total	Total
AM	73%	68%
IP	80%	78%
PM	85%	60%

Table 16 shows that when using the 2014 and 2023 observed counts and comparing against the 2014 modelled data for the same locations the performance deteriorates when using the 2023 observed counts which is a result of the overall reductions in traffic as outlined in section 6. The AM peak performance against TAG criteria reduces from 73% to 68% as a result of comparing against the 2023 observed data. The Inter peak performance does not change very much from 80% with 2014 observed data to 78% with 2023 observed data this is to be expected as the changes in observed data between 2014 and 2023 are only a reduction of 4%. The changes in the PM peak go from 85% to 60% as a result of the 2023 observed data, this is primarily a result of the reduction in observed flows in 2023 with 7 links going from a GEH of under 5 with the 2014 comparison to just over 5 (between 5.4 and 6.2) with the 2023 observed data which is a result in the reduced traffic flow following the Covid pandemic.

Table 17: Comparison of 2014 Observed and Modelled Traffic Flows

S.No	Direction	2014 Observed flow All Vehicles			2014 Modelled Flow All vehicles			(Observed 2023 – modelled 2014) Difference			% Difference			GEH		
		AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
125	North East	552	617	560	588	629	564	-36	-12	-4	-7%	-2%	-1%	1.5	0.5	0.2
125	South West	702	562	529	712	554	562	-10	8	-33	-1%	1%	-6%	0.4	0.3	1.4
130	North	1,086	697	1,010	794	698	948	292	-1	62	27%	0%	6%	9.5	0.0	2.0
130	South	899	632	945	832	1,073	1,001	67	-441	-56	7%	-70%	-6%	2.3	15.1	1.8
166	East	1,824	1,255	1,835	1,657	1,425	1,705	167	-170	130	9%	-14%	7%	4.0	4.7	3.1
166	West	1,937	1,285	1,971	1,973	1,321	2,022	-36	-36	-51	-2%	-3%	-3%	0.8	1.0	1.1
220	East	778	489	699	818	289	756	-40	200	-57	-5%	41%	-8%	1.4	10.1	2.1
220	West	668	493	760	595	438	756	73	55	4	11%	11%	1%	2.9	2.6	0.2
258	East	597	456	506	566	277	550	31	179	-44	5%	39%	-9%	1.3	9.4	1.9
258	West	613	453	751	540	344	701	73	109	50	12%	24%	7%	3.0	5.5	1.8
371	North	605	298	773	565	355	479	40	-57	294	7%	-19%	38%	1.6	3.1	11.7
371	South	681	260	513	659	356	602	22	-96	-89	3%	-37%	-17%	0.9	5.5	3.7
443	East	671	265	411	378	268	411	293	-3	0	44%	-1%	0%	12.8	0.2	0.0
443	West	486	255	505	524	319	521	-38	-64	-16	-8%	-25%	-3%	1.7	3.8	0.7
582	North	190	97	281	172	118	221	18	-21	60	9%	-21%	21%	1.3	2.0	3.8
582	South	387	138	194	257	168	265	130	-30	-71	34%	-22%	-36%	7.3	2.5	4.7
583	East	427	444	352	511	323	414	-84	121	-62	-20%	27%	-18%	3.9	6.2	3.2
583	West	418	481	394	476	316	477	-58	165	-83	-14%	34%	-21%	2.7	8.3	4.0
585	North	369	451	531	369	416	448	0	35	83	0%	8%	16%	0.0	1.7	3.8
585	South	373	450	513	440	412	434	-67	38	79	-18%	8%	15%	3.3	1.8	3.6
592	East	729	416	690	699	457	698	30	-41	-8	4%	-10%	-1%	1.1	2.0	0.3
592	West	894	466	714	782	513	704	112	-47	10	13%	-10%	1%	3.9	2.1	0.4
63	Eastbound	705	379	639	582	370	521	123	9	118	17%	2%	18%	4.9	0.4	4.9
63	Westbound	679	399	785	523	397	675	156	2	110	23%	1%	14%	6.4	0.1	4.1
64	Northbound	664	287	320	296	190	306	368	97	14	55%	34%	4%	16.8	6.3	0.8
64	Southbound	403	303	575	627	346	397	-224	-43	178	-56%	-14%	31%	9.9	2.4	8.1
66	Eastbound	1,153	483	682	962	550	721	191	-67	-39	17%	-14%	-6%	5.9	2.9	1.5
66	Westbound	752	503	1,070	558	513	700	194	-10	370	26%	-2%	35%	7.6	0.4	12.4
67	Northbound	453	413	848	500	425	842	-47	-12	6	-10%	-3%	1%	2.2	0.6	0.2
67	Southbound	880	400	560	811	370	599	69	30	-39	8%	7%	-7%	2.4	1.5	1.6
68	Northbound	325	280	439	349	272	271	-24	8	168	-7%	3%	38%	1.3	0.5	8.9
68	Southbound	445	303	336	495	324	344	-50	-21	-8	-11%	-7%	-2%	2.3	1.2	0.5
69	Northbound	222	209	278	171	182	364	51	27	-86	23%	13%	-31%	3.7	1.9	4.8
69	Southbound	284	226	227	428	220	258	-144	6	-31	-51%	3%	-14%	7.6	0.4	2.0
73	Northbound	1,118	573	1,250	1,066	563	1,095	52	10	155	5%	2%	12%	1.6	0.4	4.5
73	Southbound	674	558	879	683	543	788	-9	15	91	-1%	3%	10%	0.3	0.6	3.2
98	Eastbound	731	299	420	341	263	210	390	36	210	53%	12%	50%	16.8	2.2	11.8
98	Westbound	535	315	606	370	273	335	165	42	271	31%	13%	45%	7.7	2.5	12.5
177	Eastbound	974	515	671	940	512	711	34	3	-40	3%	1%	-6%	1.1	0.1	1.5
177	Westbound	670	573	974	687	574	938	-17	-1	36	-3%	0%	4%	0.7	0.0	1.2
% meet TAG criteria														73%	80%	85%

Table 18: Comparison of 2023 Observed and 2014 Modelled Traffic Flows

S.No	Direction	2023 Observed flow All Vehicles			2014 Modelled Flow All vehicles			(Observed 2023 – modelled 2014) Difference			% Difference			GEH		
		AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
125	North East	585	645	690	588	629	564	-3	16	125	0%	3%	22%	0.1	0.6	5.0
125	South West	717	598	677	712	554	562	5	43	115	1%	8%	20%	0.2	1.8	4.6
130	North	515	229	508	794	698	948	-279	-469	-440	-35%	-67%	-46%	10.9	21.8	16.3
130	South	736	599	879	832	1,073	1,001	-96	-474	-123	-12%	-44%	-12%	3.4	16.4	4.0
166	East	1,522	1,356	1,516	1,657	1,425	1,705	-136	-69	-188	-8%	-5%	-11%	3.4	1.8	4.7
166	West	1,346	1,398	1,598	1,973	1,321	2,022	-627	77	-424	-32%	6%	-21%	15.4	2.1	10.0
220	East	491	475	615	818	289	756	-327	186	-141	-40%	64%	-19%	12.8	9.5	5.4
220	West	466	465	635	595	438	756	-129	27	-121	-22%	6%	-16%	5.6	1.3	4.6
258	East	538	412	422	566	277	550	-28	135	-128	-5%	49%	-23%	1.2	7.3	5.8
258	West	597	412	546	540	344	701	57	68	-155	11%	20%	-22%	2.4	3.5	6.2
371	North	379	289	553	565	355	479	-187	-66	73	-33%	-18%	15%	8.6	3.7	3.2
371	South	608	248	317	659	356	602	-51	-108	-285	-8%	-30%	-47%	2.0	6.2	13.3
443	East	555	274	418	378	268	411	177	5	6	47%	2%	2%	8.2	0.3	0.3
443	West	568	267	509	524	319	521	43	-52	-12	8%	-16%	-2%	1.9	3.0	0.5
582	North	188	89	177	172	118	221	16	-28	-44	9%	-24%	-20%	1.2	2.8	3.1
582	South	322	144	195	257	168	265	64	-24	-70	25%	-14%	-26%	3.8	1.9	4.6
583	East	480	475	532	511	323	414	-31	152	118	-6%	47%	29%	1.4	7.6	5.4
583	West	499	456	484	476	316	477	23	140	6	5%	44%	1%	1.0	7.1	0.3
585	North	388	425	460	369	416	448	19	10	12	5%	2%	3%	1.0	0.5	0.6
585	South	577	469	562	440	412	434	137	57	128	31%	14%	30%	6.1	2.7	5.8
592	East	612	399	598	699	457	698	-87	-59	-100	-13%	-13%	-14%	3.4	2.8	3.9
592	West	755	412	588	782	513	704	-27	-101	-116	-3%	-20%	-17%	1.0	4.7	4.6
63	Eastbound	601	351	498	582	370	521	19	-20	-23	3%	-5%	-5%	0.8	1.0	1.0
63	Westbound	537	355	606	523	397	675	14	-42	-69	3%	-11%	-10%	0.6	2.2	2.7
64	Northbound	316	277	407	296	190	306	20	87	101	7%	46%	33%	1.2	5.7	5.3
64	Southbound	528	253	287	627	346	397	-99	-93	-110	-16%	-27%	-28%	4.1	5.4	6.0
66	Eastbound	988	532	654	962	550	721	26	-18	-67	3%	-3%	-9%	0.8	0.8	2.6
66	Westbound	718	528	872	558	513	700	160	14	173	29%	3%	25%	6.4	0.6	6.2
67	Northbound	399	381	725	500	425	842	-101	-43	-118	-20%	-10%	-14%	4.8	2.2	4.2
67	Southbound	888	378	474	811	370	599	77	8	-125	9%	2%	-21%	2.6	0.4	5.4
68	Northbound	304	272	397	349	272	271	-45	0	126	-13%	0%	46%	2.5	0.0	6.9
68	Southbound	362	301	327	495	324	344	-134	-23	-17	-27%	-7%	-5%	6.5	1.3	0.9
69	Northbound	315	213	293	171	182	364	144	31	-71	84%	17%	-20%	9.2	2.2	3.9
69	Southbound	354	168	198	428	220	258	-75	-52	-60	-17%	-23%	-23%	3.8	3.7	3.9
73	Northbound	926	603	1,217	1,066	563	1,095	-139	40	122	-13%	7%	11%	4.4	1.7	3.6
73	Southbound	998	552	833	683	543	788	314	10	45	46%	2%	6%	10.8	0.4	1.6
98	Eastbound	487	304	423	341	263	210	145	41	213	43%	16%	101%	7.1	2.4	12.0
98	Westbound	466	343	622	370	273	335	96	70	287	26%	26%	86%	4.7	4.0	13.1
177	Eastbound	974	474	608	940	512	711	34	-38	-104	4%	-7%	-15%	1.1	1.7	4.0
177	Westbound	514	486	860	687	574	938	-173	-87	-78	-25%	-15%	-8%	7.1	3.8	2.6
% meet TAG criteria														68%	78%	60%

8 COMPARISON OF 2014 LINK DELAYS AGAINST 2024 GOOGLE MAP TYPICAL TRAFFIC ON KEY ROUTES

A comparison of the 2014 link delays from the 2014 Base Year model and 2024 Google Map typical traffic on key routes was also carried out to see how the COMET model is representing delays compared to current typical conditions on key routes in the St Albans District.

Figure 9 to Figure 20 present the comparison of the traffic delays between 2014 base year model and the typical traffic observed at present Google map for AM, IP and PM peaks respectively. The comparison is carried out at 4 levels – SAD, St Albans Town Centre, B653 Marford Road and B487 Redbourn Lane.

In the AM peak, the A405 North Orbital Road at the M25 junction 21A shows congestion in both the SATURN model and Google Map. A similar observation is found along A414 North Orbital Road and A1(M) J3 and A414 Breakspear Way at Phoenix Gateway Roundabout and slight congestion on M1 J9 southbound.

Similarly, in the PM peak, delays are observed along the M1 J9 Northbound, A405 North Orbital Road at the M25 junction 21A, A1(M) J6 Northbound, A5183 near Markyate and A414 North Orbital Road and A1(M) J3.

As expected, the inter-peak period shows very slight congestion compared to AM and PM peaks. Slight delays are seen along A414 North Orbital Road at London Colney Roundabout and A414 Great North Road near A1(M) J4 in both the SATURN model and Google Maps.

It is to be noted that there are few roads where the delays/congestion are either not captured or shows too much delay in the 2014 Base Year model when compared to Google Maps' typical traffic. These include A405 North Orbital Road and A414 at Park Street Roundabout in the AM and PM peak, A5183 near Markyate, A405 North Orbital Road and Chequers Lane at M1 J6 in the AM peak and M1 J6A, M25 J21 and M1 J8 in the PM peak.

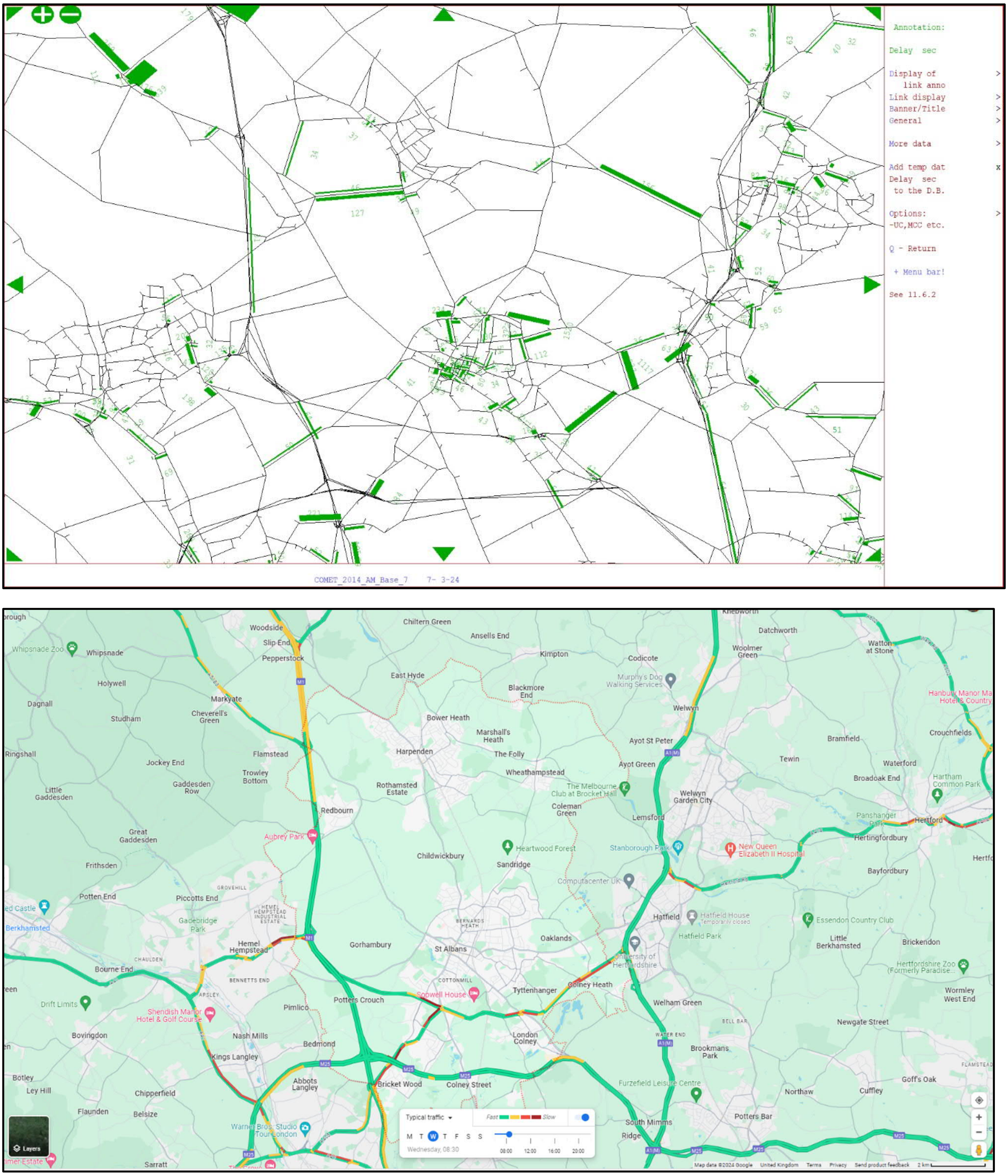


Figure 9: **Comparison of 2014 Link Delays against 2024 Google Map Typical Traffic – AM Peak (SAD Level)**

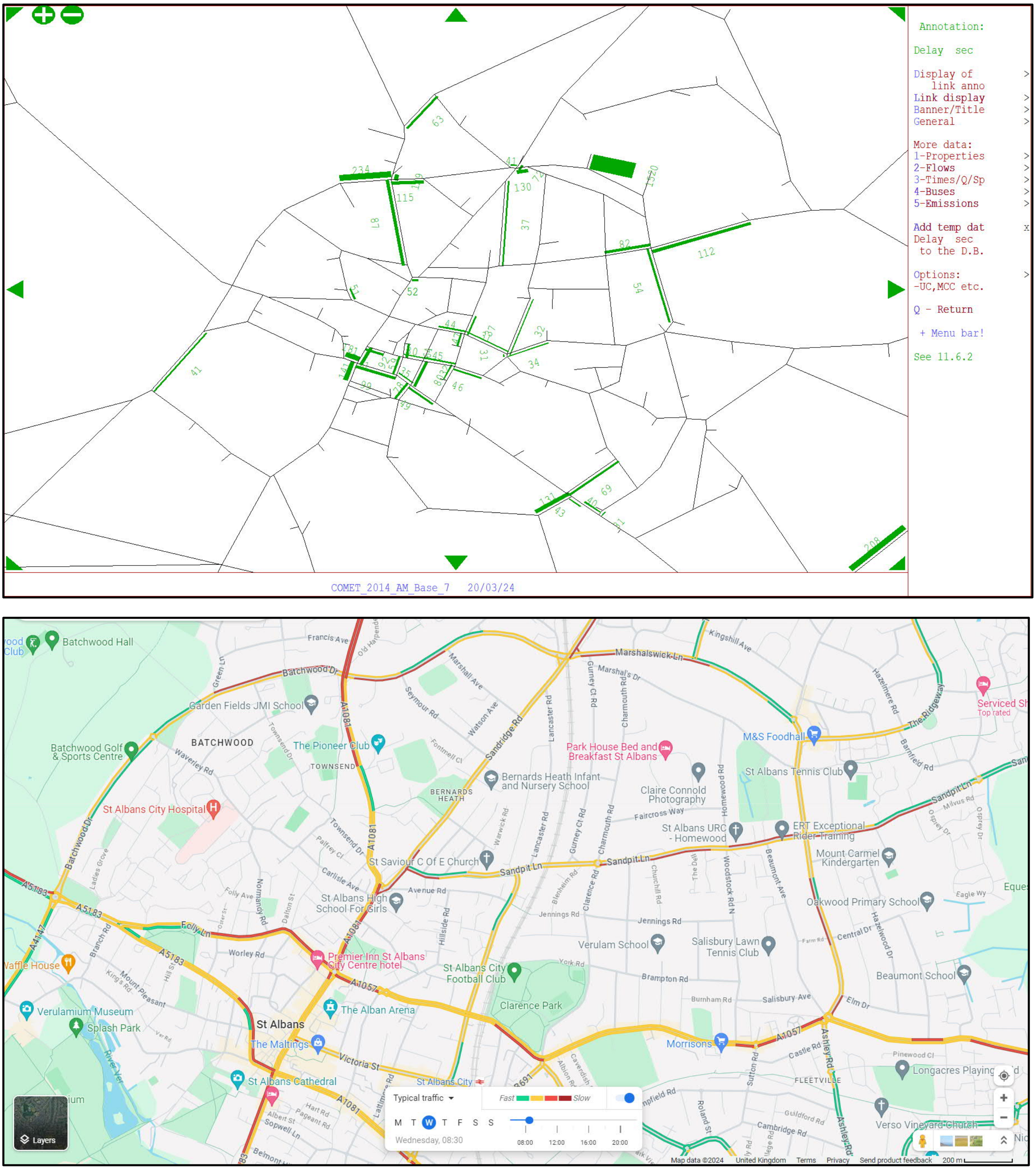


Figure 10: **Comparison of 2014 Link Delays against 2024 Google Map Typical Traffic – AM Peak (St Albans Town Centre)**

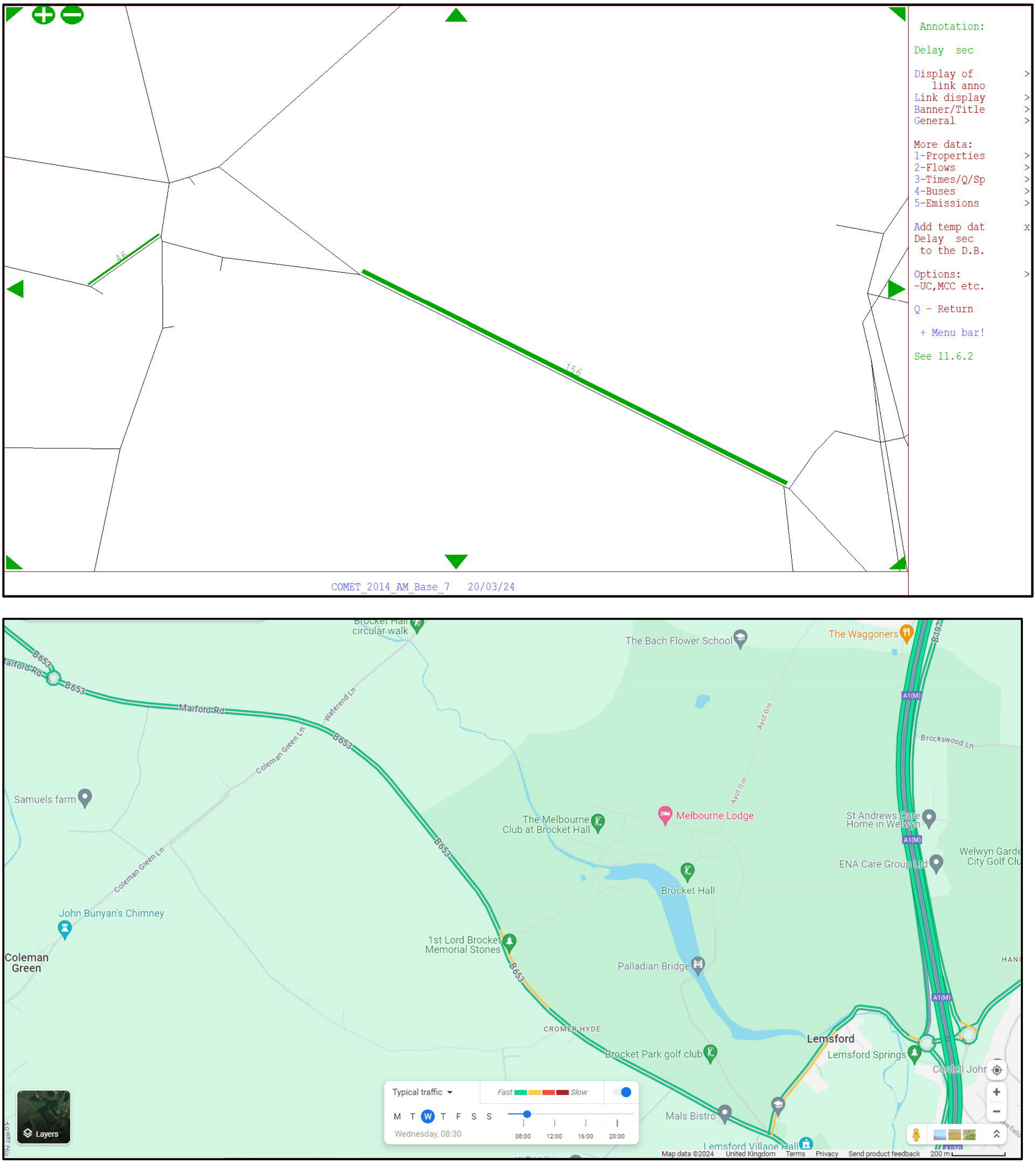


Figure 11: **Comparison of 2014 Link Delays against 2024 Google Map Typical Traffic – AM Peak (B653 Marford Road)**

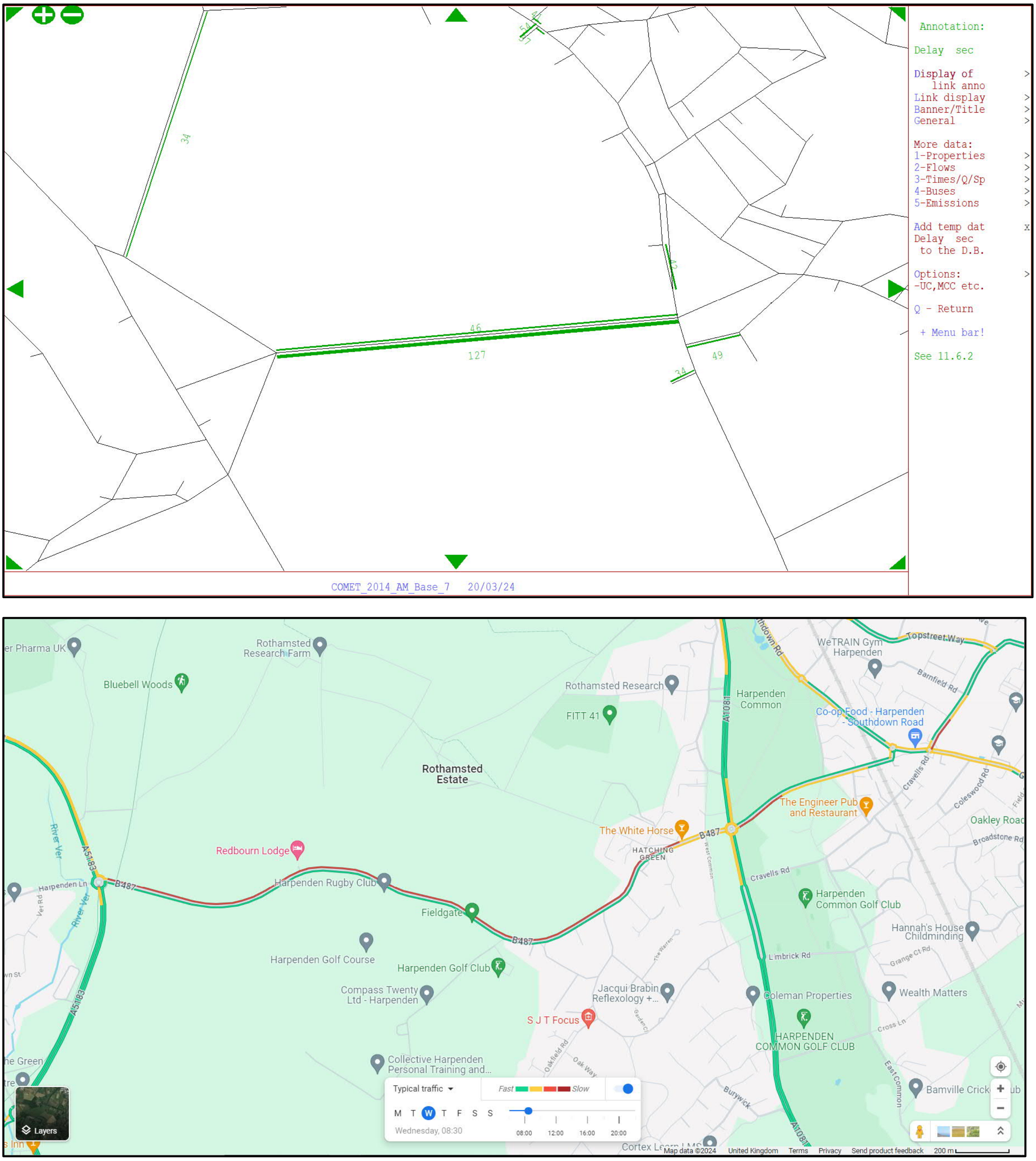


Figure 12: **Comparison of 2014 Link Delays against 2024 Google Map Typical Traffic – AM Peak (B487 Redbourn Lane)**

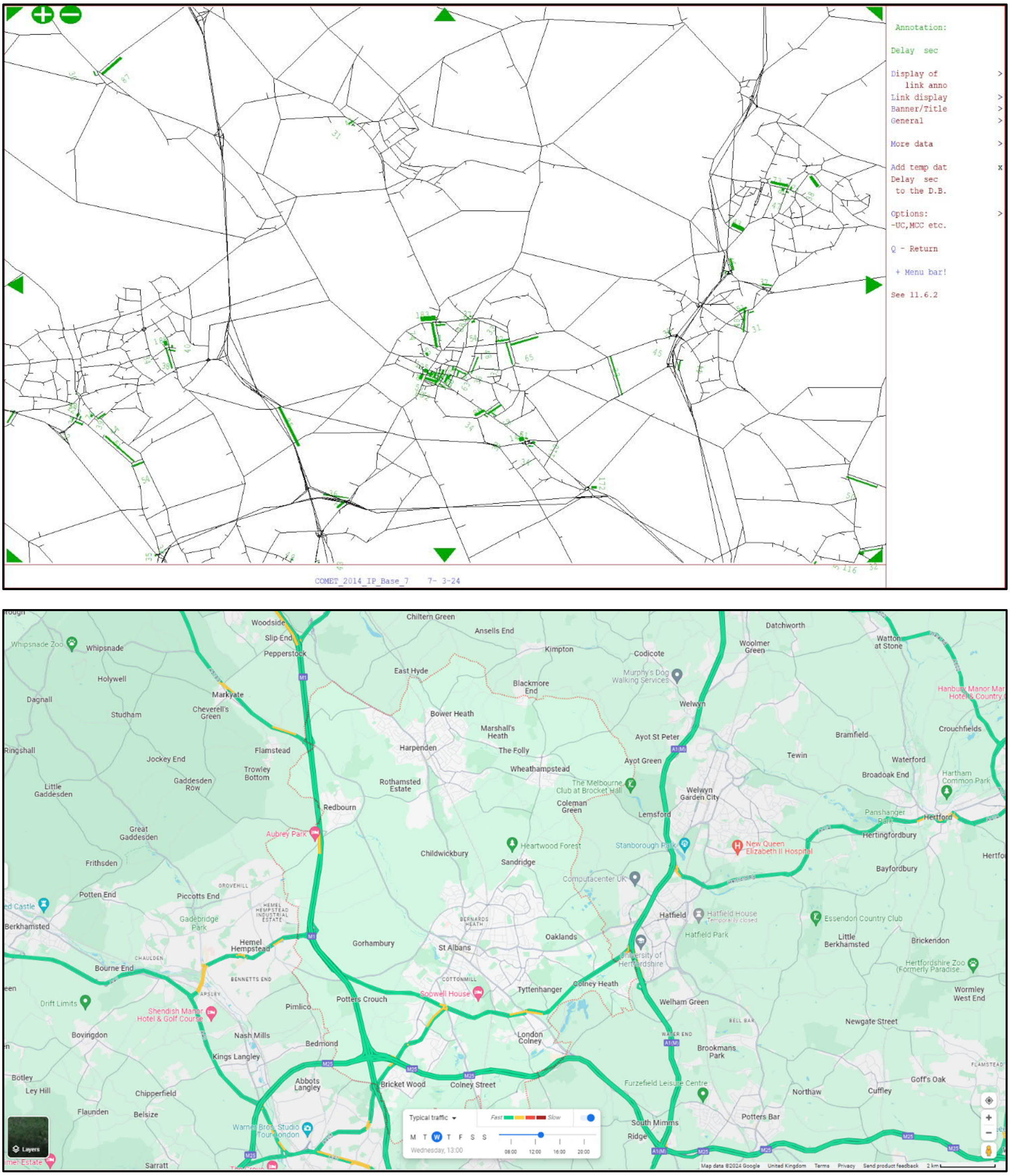
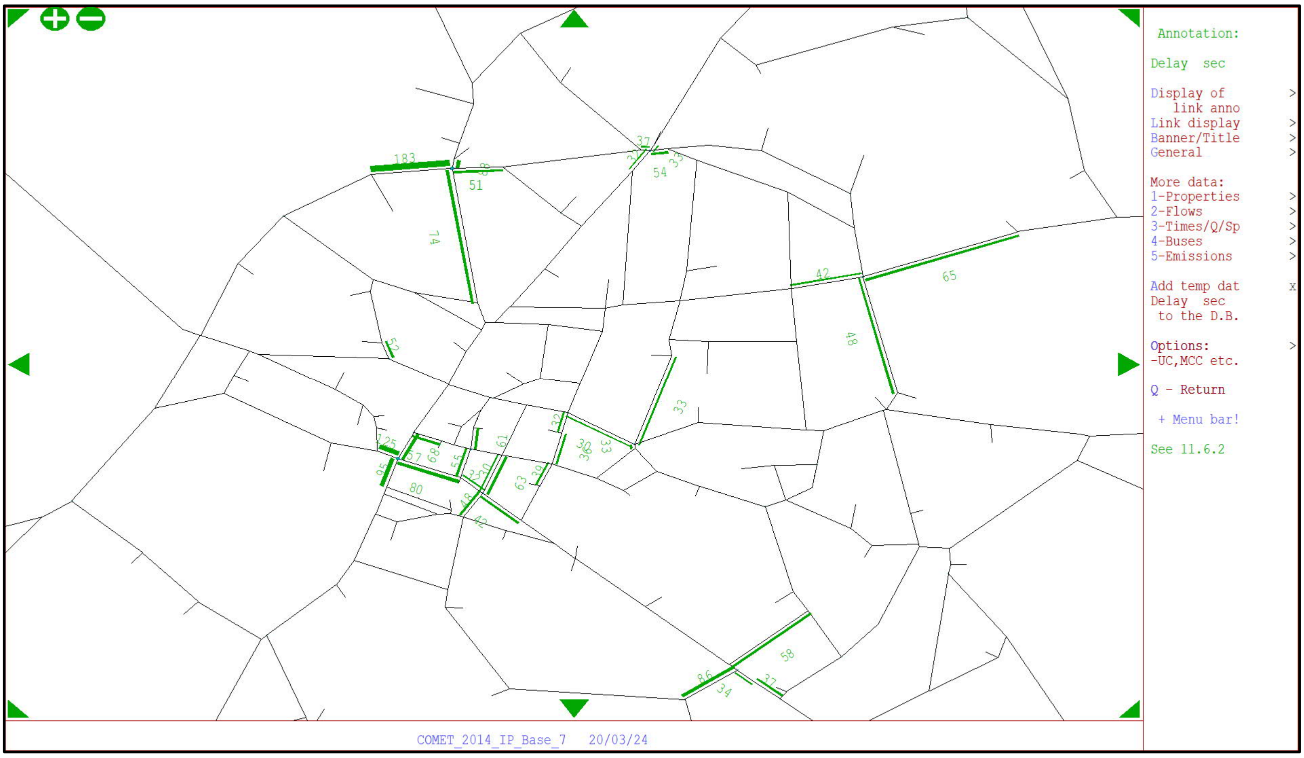


Figure 13: **Comparison of 2014 Link Delays against 2024 Google Map Typical Traffic – Inter-Peak (SAD Level)**



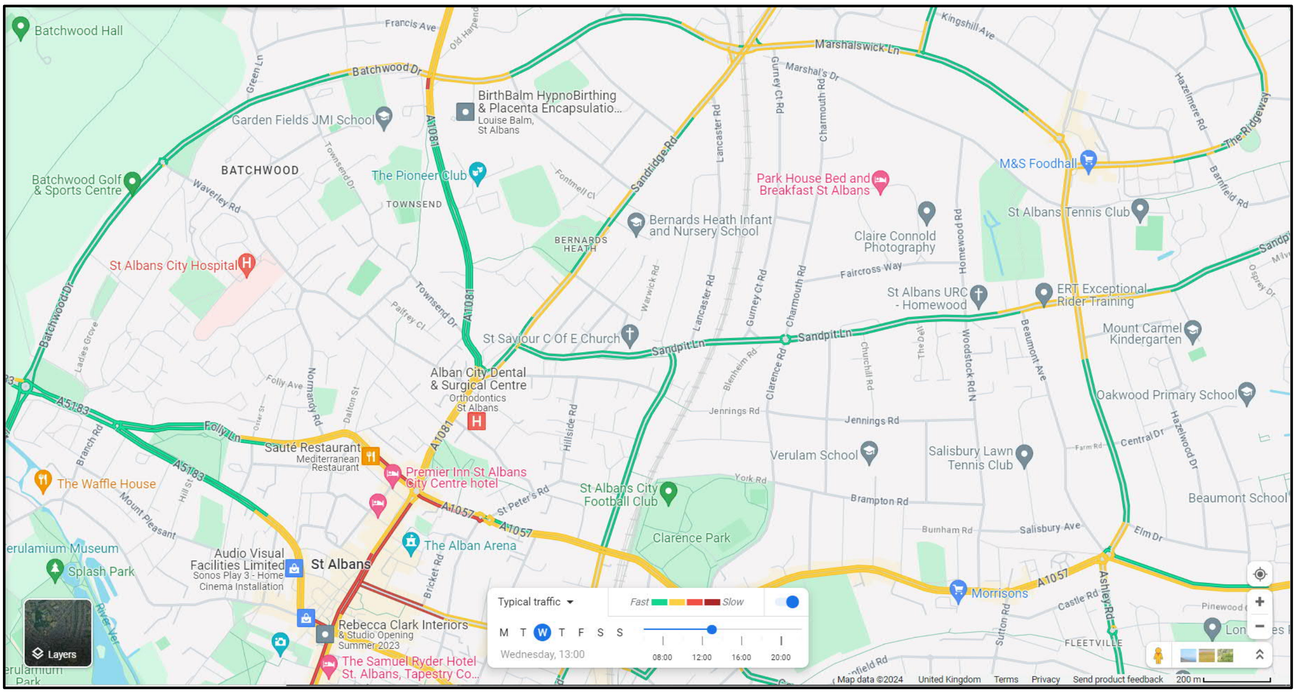
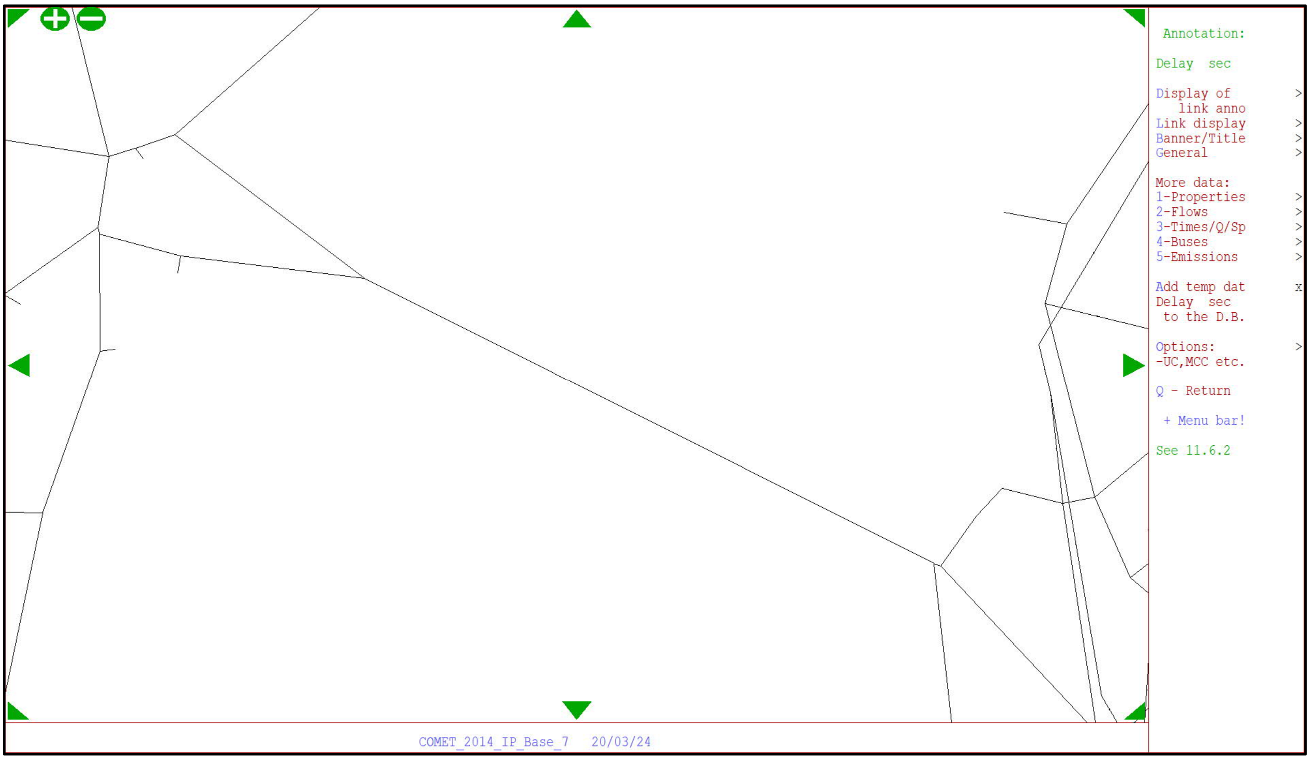


Figure 14: Comparison of 2014 Link Delays against 2024 Google Map Typical Traffic – Inter-Peak (St Albans Town Centre)



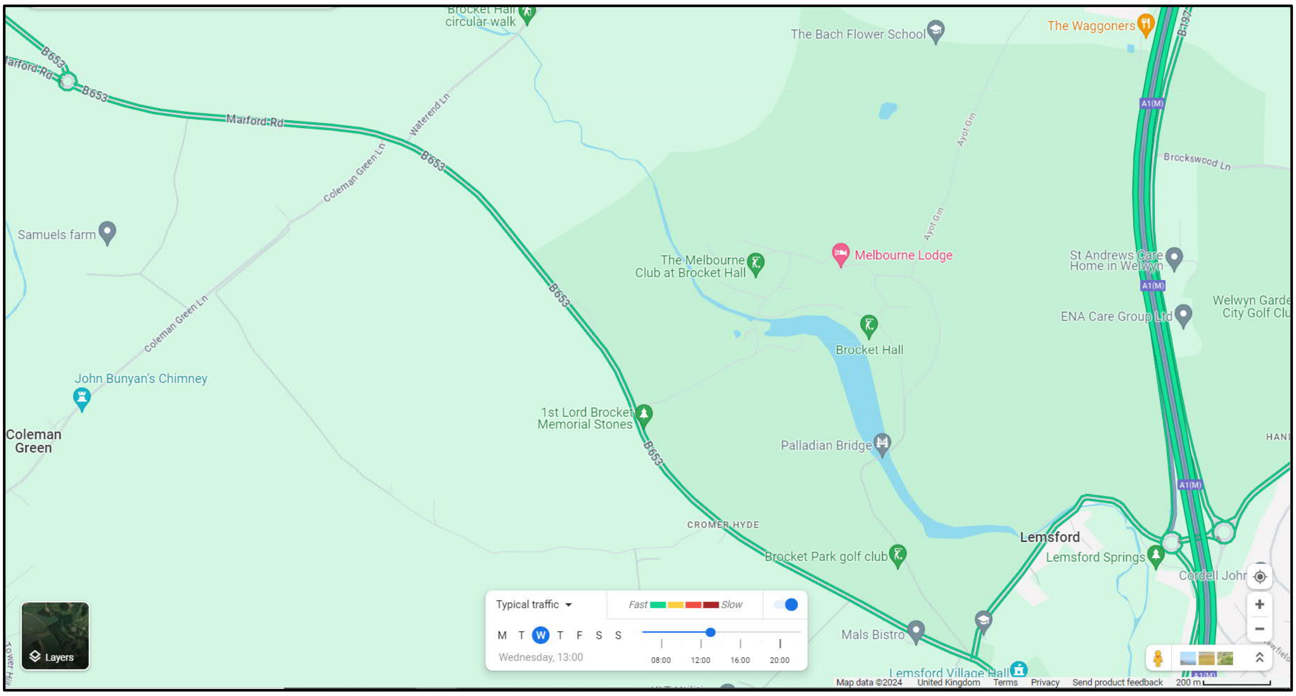
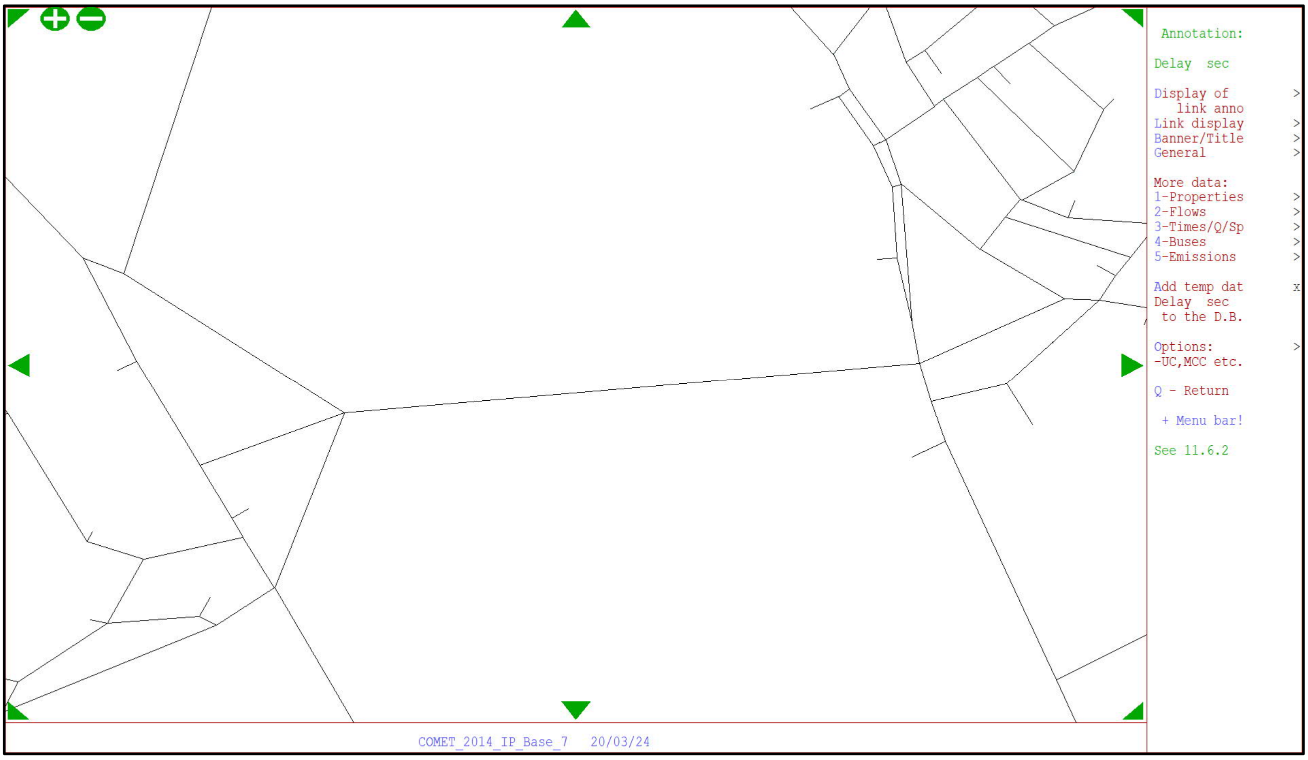


Figure 15: Comparison of 2014 Link Delays against 2024 Google Map Typical Traffic – Inter-Peak (B653 Marford Road)



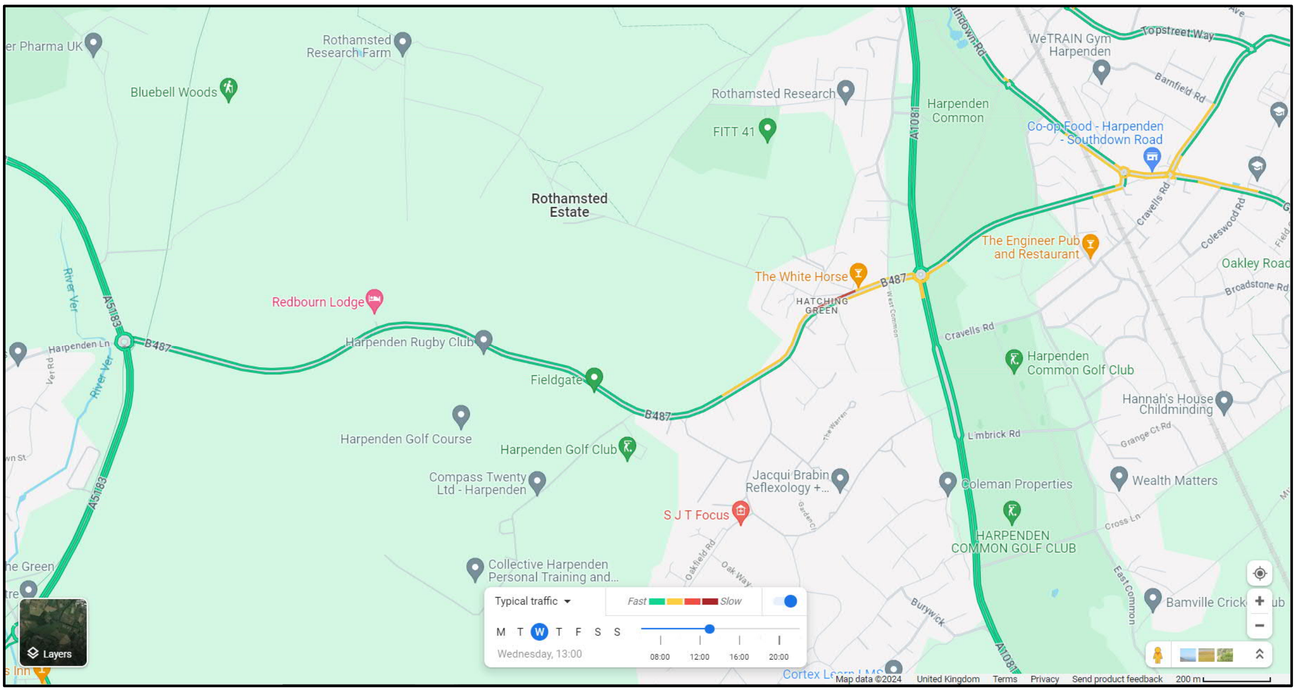


Figure 16: Comparison of 2014 Link Delays against 2024 Google Map Typical Traffic – Inter-Peak (B487 Redbourn Lane)

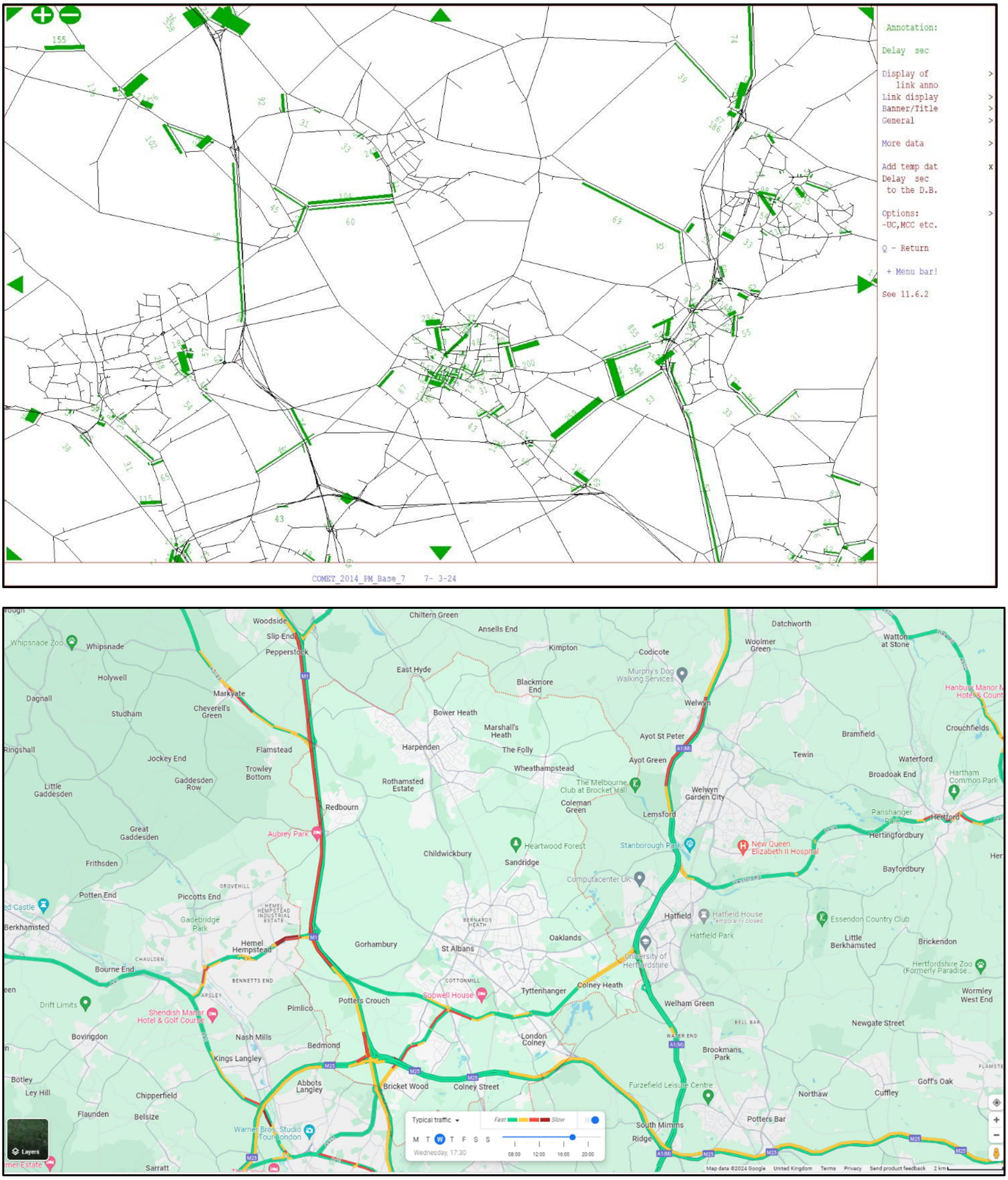
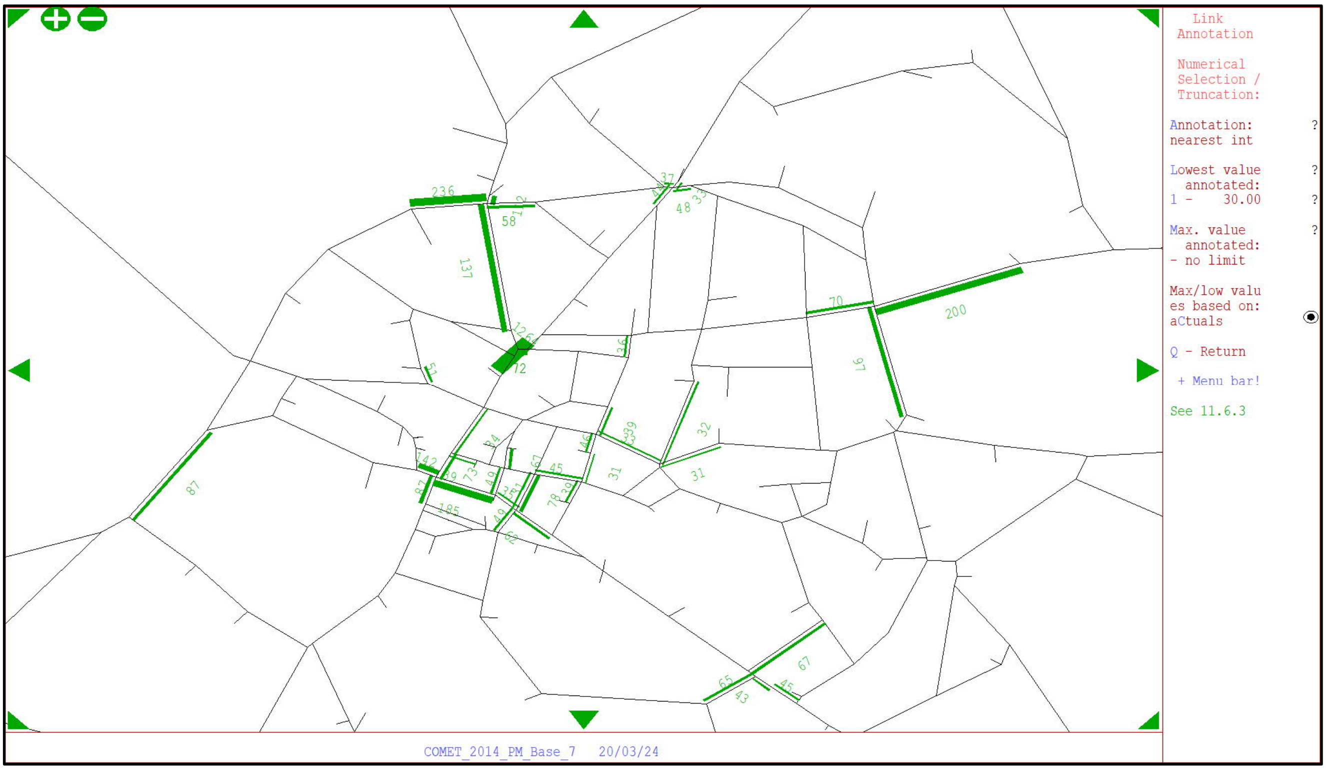


Figure 17: Comparison of 2014 Link Delays against 2024 Google Map Typical Traffic – PM Peak (SAD Level)



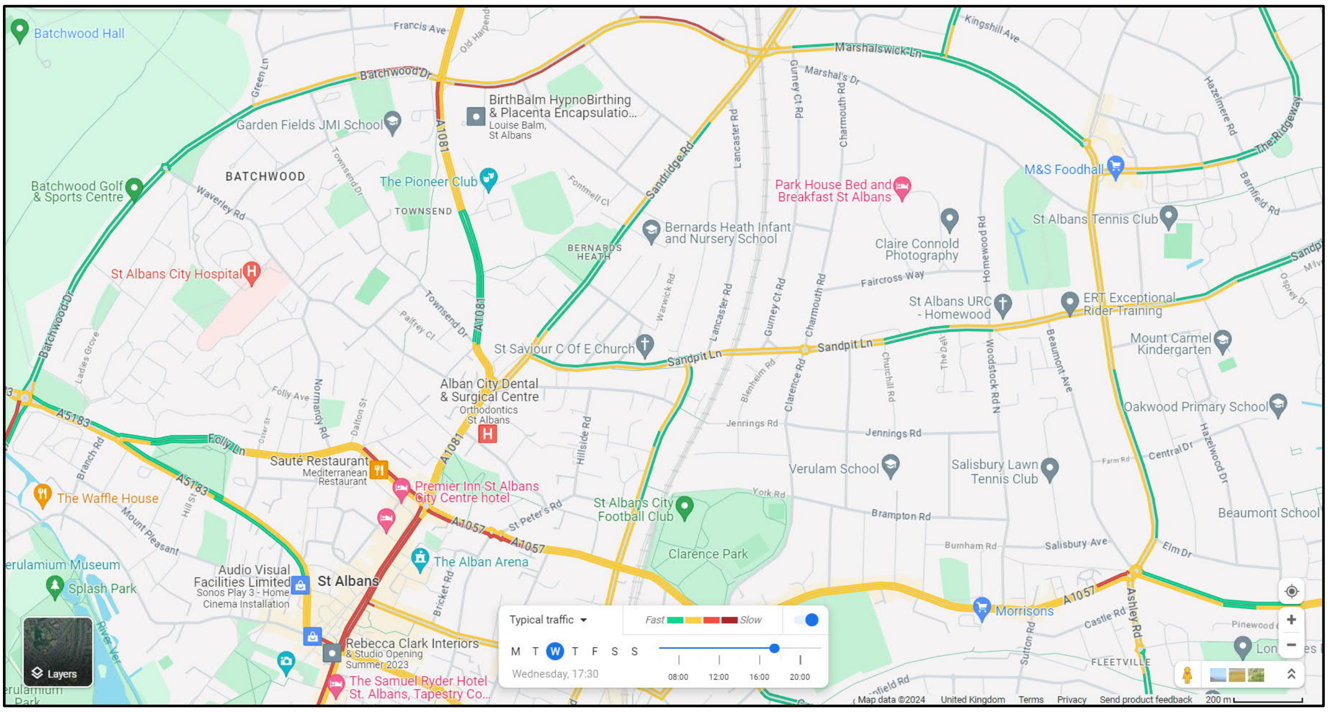


Figure 18: **Comparison of 2014 Link Delays against 2024 Google Map Typical Traffic – PM Peak (St Albans Town Centre)**

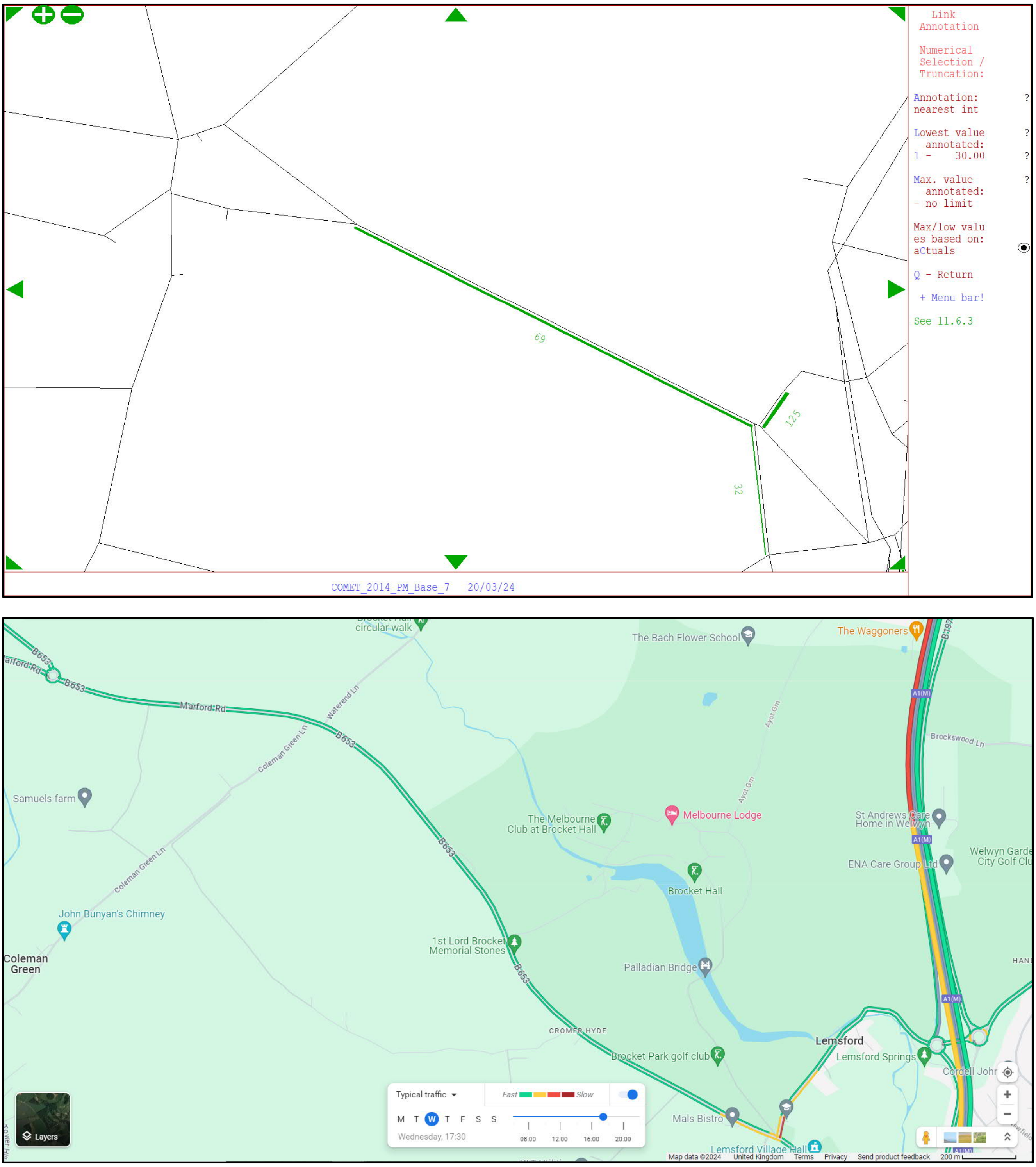


Figure 19: **Comparison of 2014 Link Delays against 2024 Google Map Typical Traffic – PM Peak (B653 Marford Road)**

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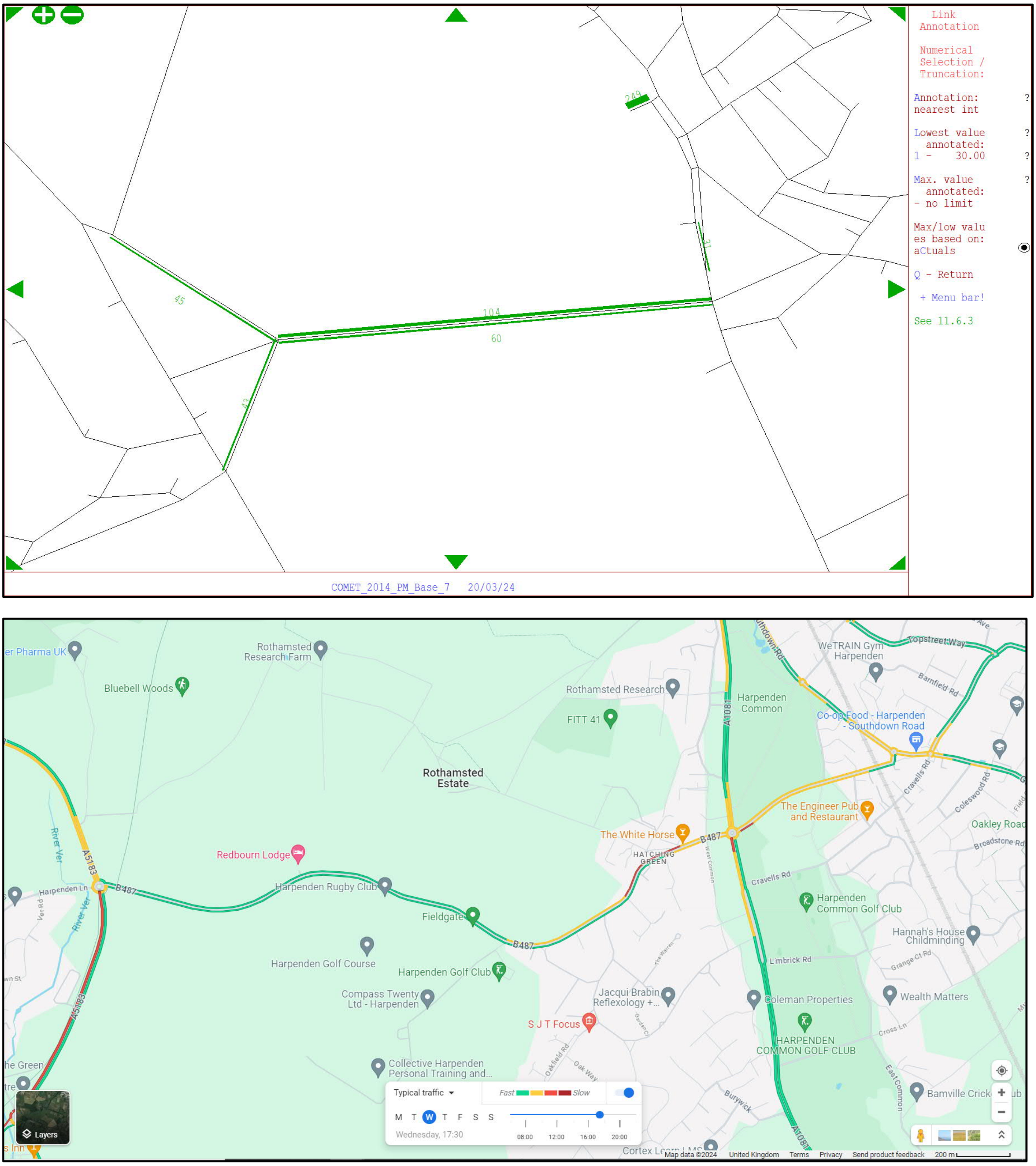

Figure 20: **Comparison of 2014 Link Delays against 2024 Google Map Typical Traffic – PM Peak (B487 Redbourn Lane)**

9 SUMMARY AND RECOMMENDATIONS

This technical note summarises the review undertaken for the COMET 2014 Base Year traffic model within SADC as part of the St Albans Local Plan assessment.

The 2014 Base review comprises of:

- Review of model network coverage
- Model flow performance (comparing the 2014 modelled flows against observed flows)
- Performance of model screenlines and cordons
- Comparison of 2014 observed and modelled journey times
- Comparison of 2014 and 2023 observed counts
- Comparison of 2014 modelled flows against 2023 observed flows
- Comparisons of 2014 link delays in the Base year model against 2024 google map typical traffic

The review of the network coverage indicated that 2014 Base Year model is fairly dense across Hertfordshire County and the density of the network within the St Albans District Council is appropriate.

The performance of the 2014 Base Year model within SAD is summarised in Table 19.

Table 19: 2014 Base Year Model Performance in SAD

	AM	IP	PM
Calibration Counts	78%	90%	84%
Validation Counts	45%	68%	55%
All Counts	68%	83%	75%
Calibration Screenlines/ Cordons	82%	82%	77%
Validation Screenlines/ Cordons	50%	25%	50%
All Screenlines/ Cordons	73%	67%	70%
Journey Times	67%	94%	79%

This shows that overall the AM peak is the weakest performing time period and fails to meet TAG criteria in most areas. This performance is a concern for using the base year as a basis for forecasting for the SADC Local Plan and is an area which could be challenged at the Local Plan consultation and examination. The IP and PM although do not meet TAG criteria for the validation counts do meet or are close to TAG criteria in all other aspects and therefore the base year for these time periods is more accurate and less likely to be challenged.

As a result of this performance WSP have generated plots which over lay the base year calibration and validation performance links with the locations of the SADC Local Plan allocations. This is a useful graphic to understand the performance of the base year models in all time periods in the areas where proposed Local Plan developments are located. These are shown in Figure 21 to Figure 23.

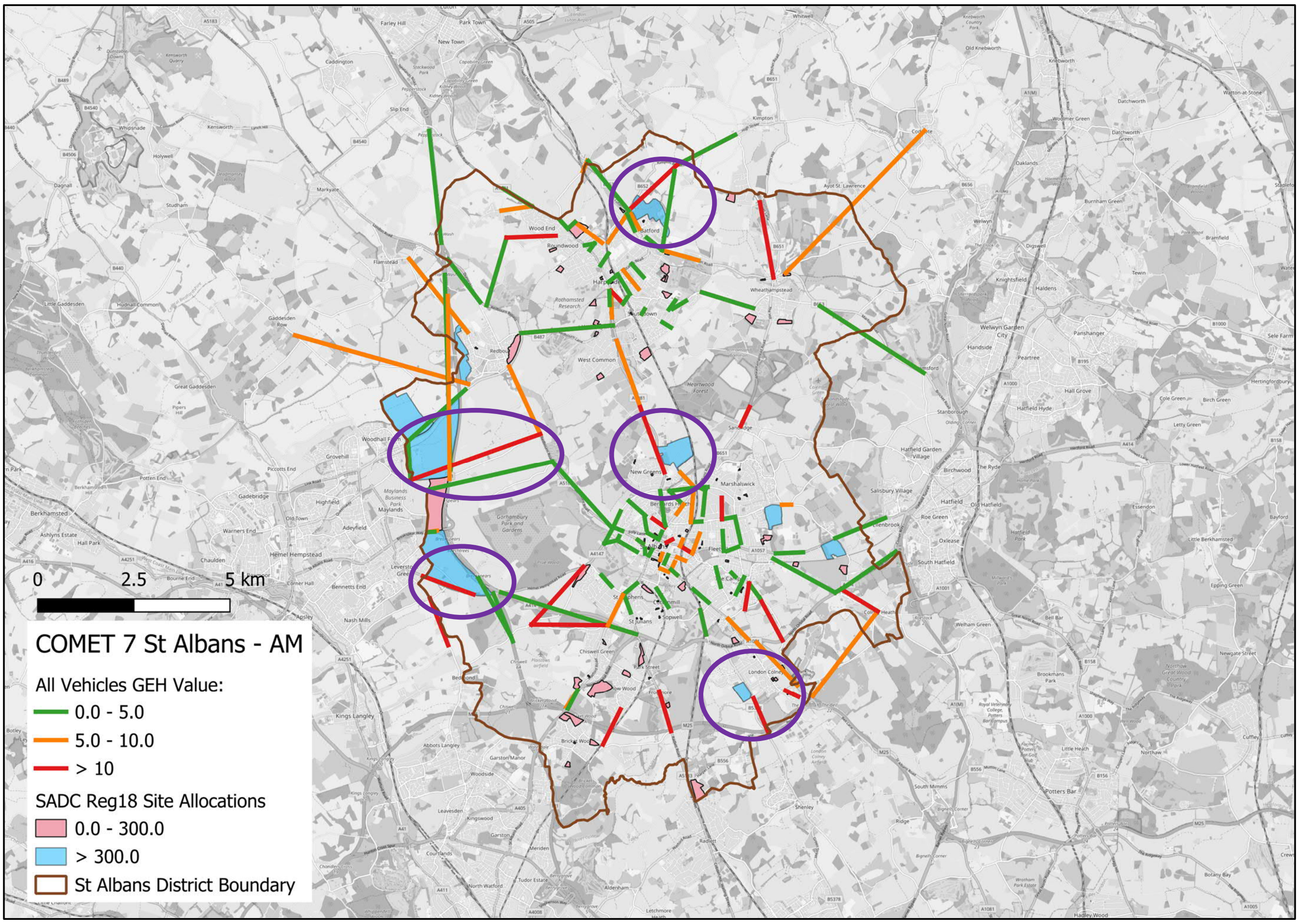

Figure 21: AM Peak Base Year Count Performance with SADC Local Plan Allocations

Figure 21 shows the AM Peak count performance alongside the SADC Local Plan allocations. The pink areas are sites with less than 300 dwellings and blue sites with more than 300 dwellings the sites also include the associated employment uses within the with counts nearby which have a GEH of over 5. There are 5 locations where there are developments proposed greater than 300 dwellings where the GEH is over 10. It would be useful for HCC/ SADC to confirm whether these developments would have access locations on the road network where the GEH is high. If the developments access is directly onto the roads which have a high GEH WSP would recommend investigating the poor performance of these links and trying to reduce the GEH so that the modelled and observed flows are a closer match. Given the overall poor performance of the AM peak against TAG criteria WSP are of the view that improvements to the AM peak base year model are necessary.

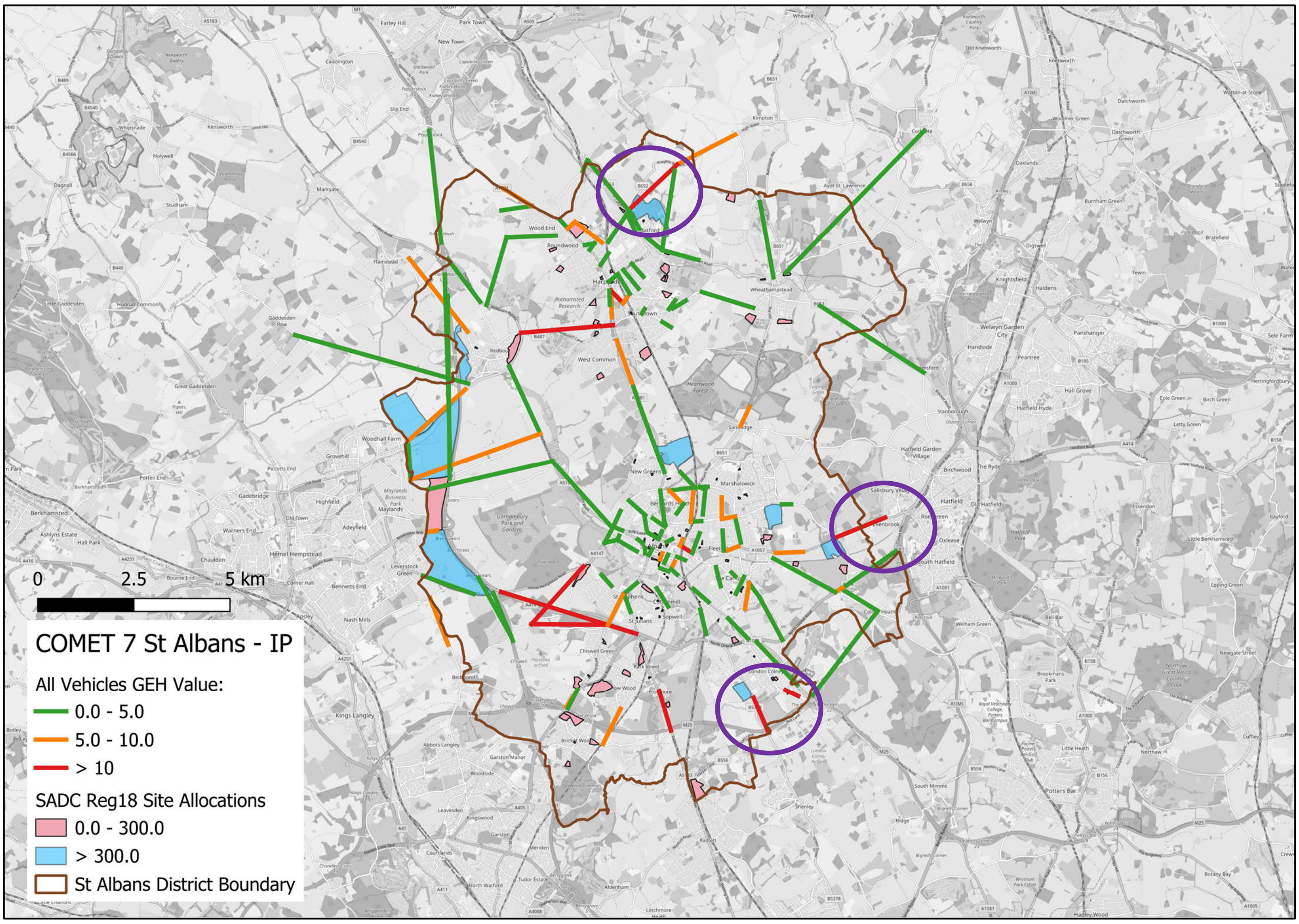

Figure 22: Inter Peak Base Year Count Performance with SADC Local Plan Allocations

Figure 22 shows that there are 3 locations where there are developments proposed of over 300 houses with counts in the interpeak nearby which have a GEH of over 5. It would be useful for HCC/ SADC to confirm whether these developments would have access locations on the road network where the GEH is high. If the developments access is directly onto the roads which have a high GEH WSP would recommend investigating the poor performance of these links and trying to reduce the GEH so that the modelled and observed flows are a closer match. Given however the overall good performance of the Inter Peak model WSP are of the view that no overall improvements are required subject to confirmation of the access locations at the 3 locations in Figure 22.

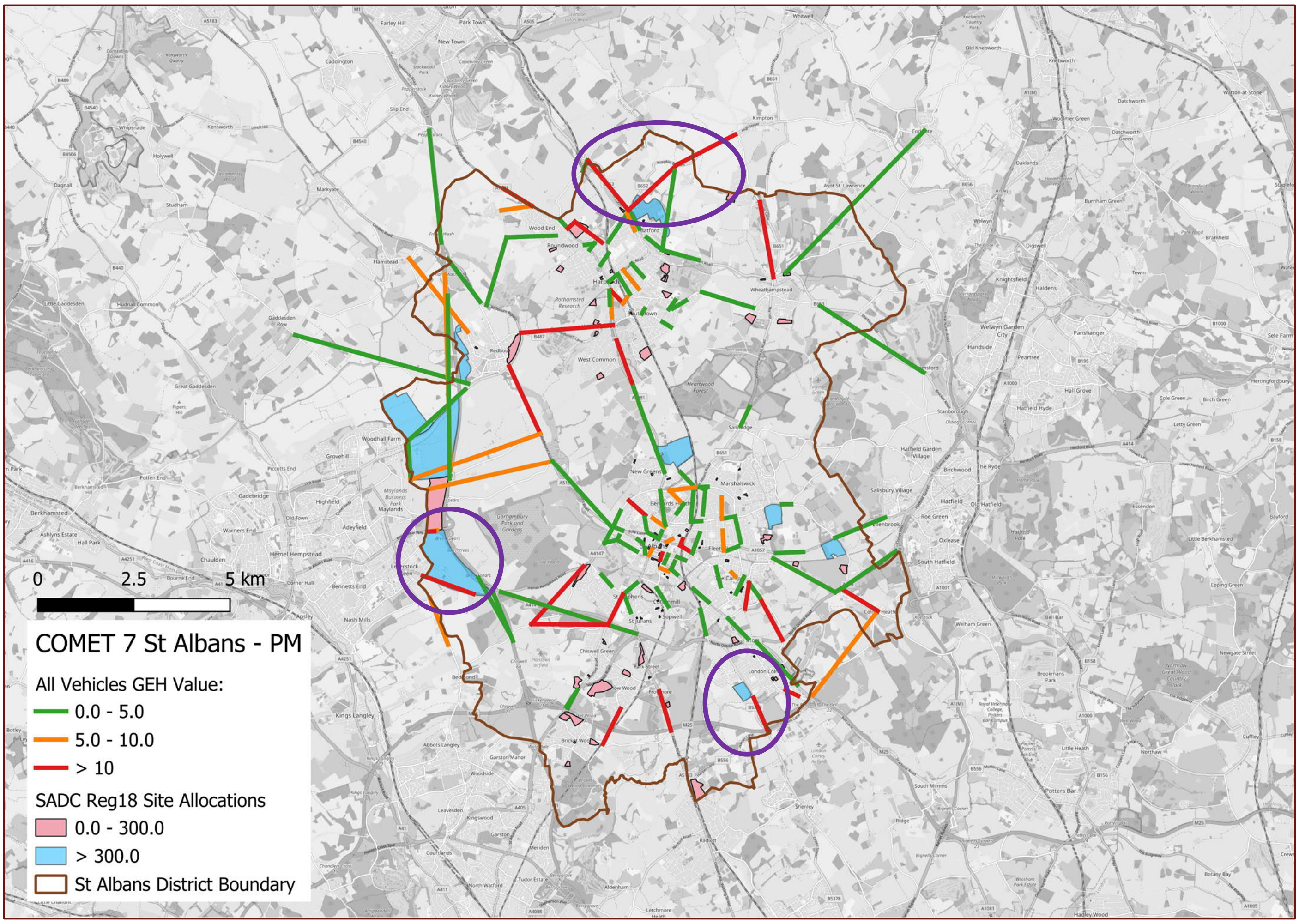

Figure 23: PM Peak Base Year Count Performance with SADC Local Plan Allocations

Figure 23 shows that there are 3 locations where there are developments proposed of over 300 houses with counts nearby which have a GEH of over 5. It would be useful for HCC/ SADC to confirm whether these developments would have access locations on the road network where the GEH is high. If the developments access is directly onto the roads which have a high GEH WSP would recommend investigating the poor performance of these links and trying to reduce the GEH so that the modelled and observed flows are a closer match. Given however the overall good performance of the PM peak model WSP are of the view that no overall improvements are required subject to confirmation of the access locations at the 3 locations in Figure 23.

It would be good for HCC/ SADC to confirm whether there are any proposals to use the traffic flow data from the COMET model to feed into environmental assessments for the Local Plan such as air quality, noise and green house gas. If this is required the AM, IP and PM peak hour data would be used to factor up to 18/24 hour traffic flow data for environmental assessment purposes. If this is required there could be justification to ensure some locations in the IP and PM which have a GEH of over 10 and are close to proposed development were closer to the observed data so not to over or underestimate the traffic demand for environmental purposes.

Similarly, overlaying the base year screenline/cordons with the SADC Local Plan allocation provided a useful graphic to understand the performance of the screenlines/cordons in these areas.

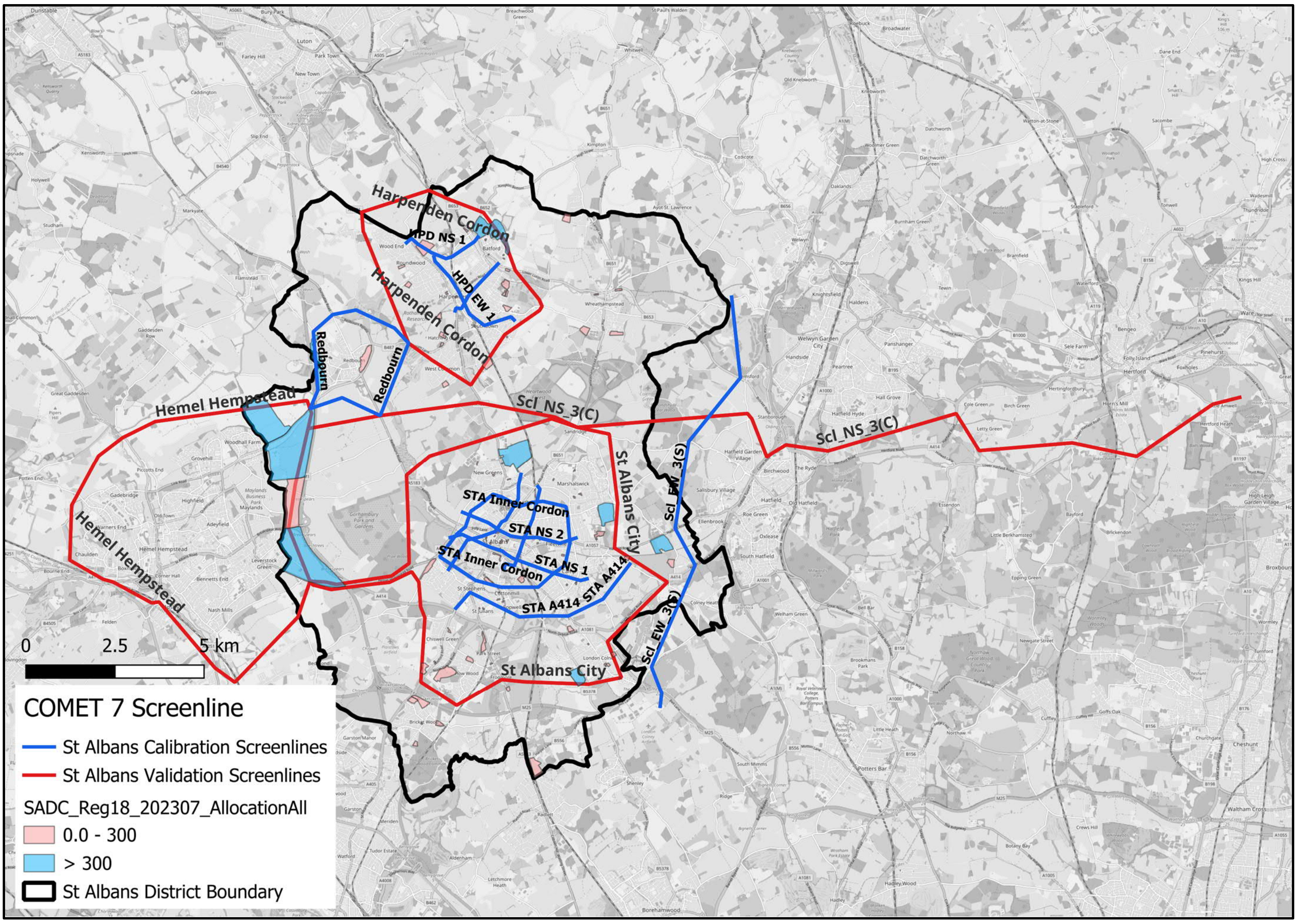

Figure 24: Screenline/Cordon Performance with SADC Local Plan Allocations

From Figure 24, it is observed that the Hemel Hempstead and Harpenden Cordon lie/cross through the East Hemel Hempstead and North East Harpenden development sites respectively. The performance of these cordons in each time period is unsatisfactory with only LGV in AM and PM and Cars in IP for the Hemel Hempstead (outbound) and HGV in IP for Harpenden Cordon (inbound and outbound) meeting the TAG criteria. As such, some localised improvements in these locations would be ideal noting that the Hemel Hempstead cordon in all time periods is 7-11% flow difference so relatively close to the 5% target, whereas the Harpenden cordon is further away from meeting criteria.

Traffic flow in SAD has reduced between 2014 and 2023 predominantly in the AM and PM peak hours with the interpeak reductions being a lot less.

The traffic delay comparison between the 2014 Base Year model and the 2024 Google Map typical traffic conditions within the St Albans District indicated some similar locations on the key routes where the delays in the model and congestion in the Google Maps occurred. However, there were a few locations where the model presented subsequently high/low delays compared to Google Map congestion. In the AM peak, the A405 North Orbital Road at the M25 junction 21A shows congestion in both the SATURN model and Google Map. A similar observation is found along A414 North Orbital Road and A1(M) J3 and A414 Breakspear Way at Phoenix Gateway Roundabout and slight congestion on M1 J9 southbound. Similarly, in the PM peak, delays are observed along the M1 J9 Northbound, A405 North Orbital Road at the M25 junction 21A, A1(M) J6 Northbound, A5183 near Markyate and A414 North Orbital Road and A1(M) J3.

Recommendation:

Following the 2014 base year model review, it is recommended that overall the performance of the AM peak model in SAD needs to be improved specifically in areas where large developments are proposed, subject to confirmation from SAD/ HCC of where the developments are proposing to put their accesses. The IP and PM perform a lot better against TAG criteria and no overall improvements are required however confirmation of the large development access points is necessary to ensure key links close to these sites are accurately represented.

WSP will as a first step look at the worst performing counts (over GEH 10) and initially on these links check that the modelled speeds and saturation flows accurately reflect the road when compared to google maps. The next steps would be to understand whether there is any reason for the count to be too high – such as delays at nearby junctions which are causing traffic to not choose the route (if the flow is low). If any coding changes are identified they would need to be incorporated into the network and the model will be re-assigned.

Depending on the results of the above changes, if required, we can also re-run matrix estimation using the counts where the model performance is poor to improve the model validation.

Appendix B

St Albans Base Year Model Review Addendum

Confidential

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	St Albans Local Plan Assessment	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

1 INTRODUCTION

WSP has been commissioned to undertake a Local Plan assessment for St Albans District Council (SADC) to inform and be the evidence base for their Local Plan. To test the impacts of the Local Plan growth in St Albans, Hertfordshire County Council's (HCC) transport model COMET will be used for this work, which has a 2014 base year model.

WSP undertook a base year review of the model in St Albans district and presented their findings of the performance of the model and recommendations to improve the model in a technical note[1].

Based on the findings from the Base year review, WSP undertook network and matrix improvements and this note is an addendum to the base year review note, presenting the results of the improvements made to the 2014 Base year in St Albans district.

2 MODEL IMPROVEMENTS

OVERVIEW

Following the review of the existing 2014 base year COMET 7 model in SADC, preliminary network investigations and checks were carried out where the GEH statistic was over 10 near the SADC Regulation 18 development sites allocations in the model. Based on those checks, changes to the network coding were identified to improve the network. These changes were applied to the model in all time periods and the results showed very minor improvements. As the improvements were very small, matrix estimation was re-run in an attempt to further improve the network.

Table 1 presents the summary of the network coding improvements that were identified as part of the network investigations. It is to be noted that these changes have been carried out in all three peak time periods (AM, IP and PM).

[1] 240403 COMET 2014 Base Year Model Review-St Albans_FINAL

TECHNICAL NOTE – ADDENDUM

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SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	St Albans Local Plan Assessment	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

Table 1: Network Coding Improvements

Link	Road Name	Time Period	Observed Flow	Modelled Flow	GEH	Action
6263-6288	Punchbowl Lane	AM	5	190	18.75	Reduce speed to 10/20mph. Keep the SFC as same.
6319-6101	B652 Bower Heath Lane		63	306	17.92	Reduce the speed to 10/20mph
6101-6319	B652 Bower Heath Lane		106	249	10.79	Reduce the speed to 10/20mph
6082-6350	A1081 Harpenden Road		433	701	11.27	The road currently modelled as 72kph should be 64kph/ 40mph road and Capacity Index should be 36.
6231-6414	B5378 Shenley Lane		571	896	12.02	The road currently modelled as 72kph should be 64kph/ 40mph road and Capacity Index should be 36.
6101-6319	B652 Bower Heath Lane	IP	26	149	13.18	Reduce speed to 10/20mph. Keep the SFC as same.
6414-6231	B5378 Shenley Lane		254	481	11.79	The road currently modelled as 72kph should be 64kph/ 40mph road and Capacity Index should be 36.
6231-6414	B5378 Shenley Lane		244	487	12.74	The road currently modelled as 72kph should be 64kph/ 40mph road and Capacity Index should be 36.
6229-6252	Barnet Road		304	148	10.39	The road currently modelled as 40kph should be 48kph/ 30mph road.
6231-6414	B5378 Shenley Lane	PM	398	737	14.21	The road currently modelled as 72kph should be 64kph/ 40mph road and Capacity Index should be 36.
6319-6101	B652 Bower Heath Lane		85	265	13.65	Reduce speed to 10/20mph. Keep the SFC as same.

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CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

Link	Road Name	Time Period	Observed Flow	Modelled Flow	GEH	Action
6101-6319	B652 Bower Heath Lane		21	229	18.55	Reduce speed to 10/20mph. Keep the SFC as same.
6101-5397	B652 Kimpton Btm		82	214	10.83	Reduce speed to 10/20mph. Keep the SFC as same.
5397-6101	B652 Kimpton Btm		36	159	12.41	Reduce speed to 10/20mph. Keep the SFC as same.

The corresponding images of Punchbowl Lane, Bower Heath Lane and Kimpton Bottom are provided in Figure 1, Figure 2 and Figure 3 respectively.

Figure 1: Punch Bowl Lane

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Figure 2: B652 Bower Heath Lane

Figure 3: Kimpton Bottom

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RESULTS

As per the TAG unit M3.1 (Section 3.3.11), the validation criteria and guidelines for link flows are defined in Table 2.

Table 2: Link Flow Validation Criteria and Acceptability Guideline

Criteria	Description of 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	
	Individual flows within 400 veh/h of counts for flows more than 2,700 veh/h	
2	GEH < 5 for individual flows	> 85% of cases

The network coding and matrix improvements were carried out in the 2014 base year COMET 7 model. To test the impact of the changes three scenarios were compared:

1. COMET 7 – Original model
2. COMET 7 (Revised) – original model revised with the network coding improvements
3. COMET 7 (Revised 2) – original model with network coding and matrix improvements

Table 3 presents the summary of the link performance for all the counts as per TAG criteria.

Table 3: Link Performance of St Albans District – All Counts (TAG Criteria)

Period	COMET 7				COMET 7 (Revised)				COMET 7 (Revised 2)			
	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV
AM	68%	71%	100%	100%	68%	72%	100%	99%	69%	70%	100%	99%
IP	83%	88%	100%	98%	84%	88%	100%	100%	82%	85%	100%	99%
PM	75%	75%	100%	100%	77%	77%	100%	98%	78%	78%	99%	98%

From Table 3, it is observed that there is a slight improvement in the overall link performance with the network and matrix improvements in comparison to the original model, especially in the AM and PM peaks. The inter-peak, in comparison to the original COMET 7 model, shows an improvement with the network coding improvements while the matrix and network coding improvements show a slight reduction. Overall, the inter-peak is still close to or meets the TAG criteria.

A comparison of the GEH values for each of these scenarios was also carried out for the SADC in each time period (AM, IP and PM). Figure 4 to Figure 12 presents these. The circles in purple indicate the changes in the GEH near the Regulation 18 development sites.

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	St Albans Local Plan Assessment	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

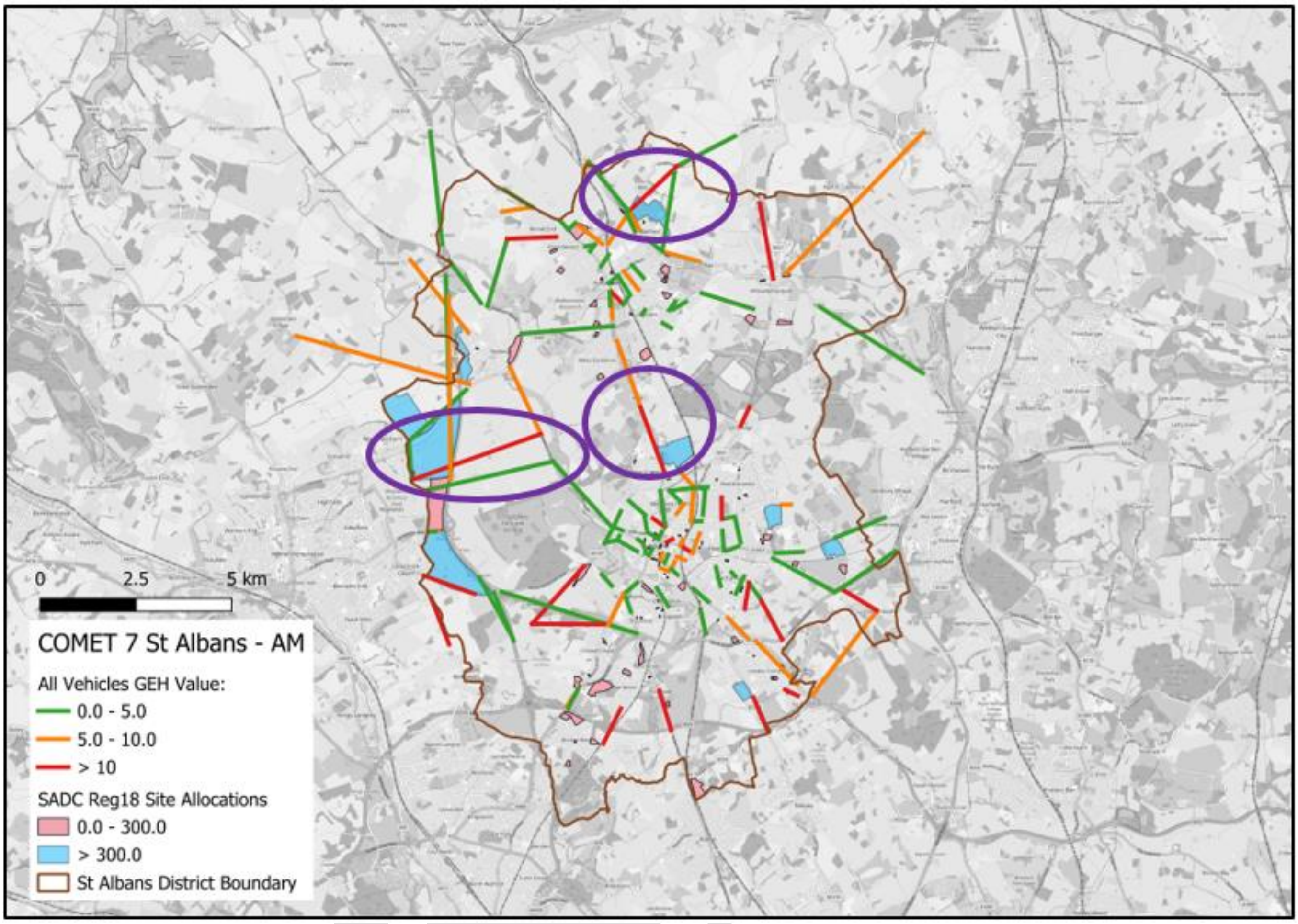

Figure 4: **AM Peak Base Year Count Performance with SADC Local Plan Allocations – Original Model**

TECHNICAL NOTE – ADDENDUM

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PROJECT:	St Albans Local Plan Assessment	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

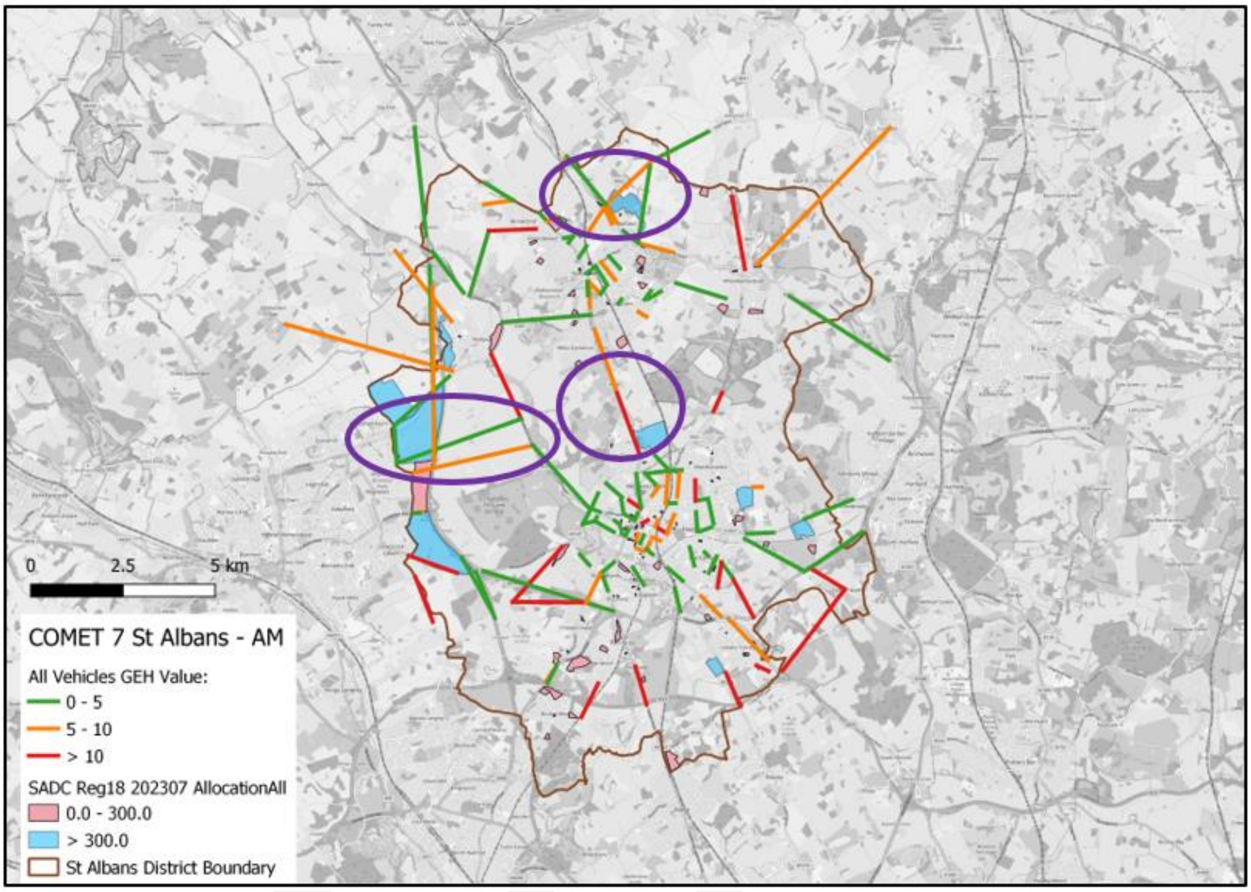

Figure 5: AM Peak Base Year Count Performance with SADC Local Plan Allocations – With Network Improvements

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PROJECT:	St Albans Local Plan Assessment	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

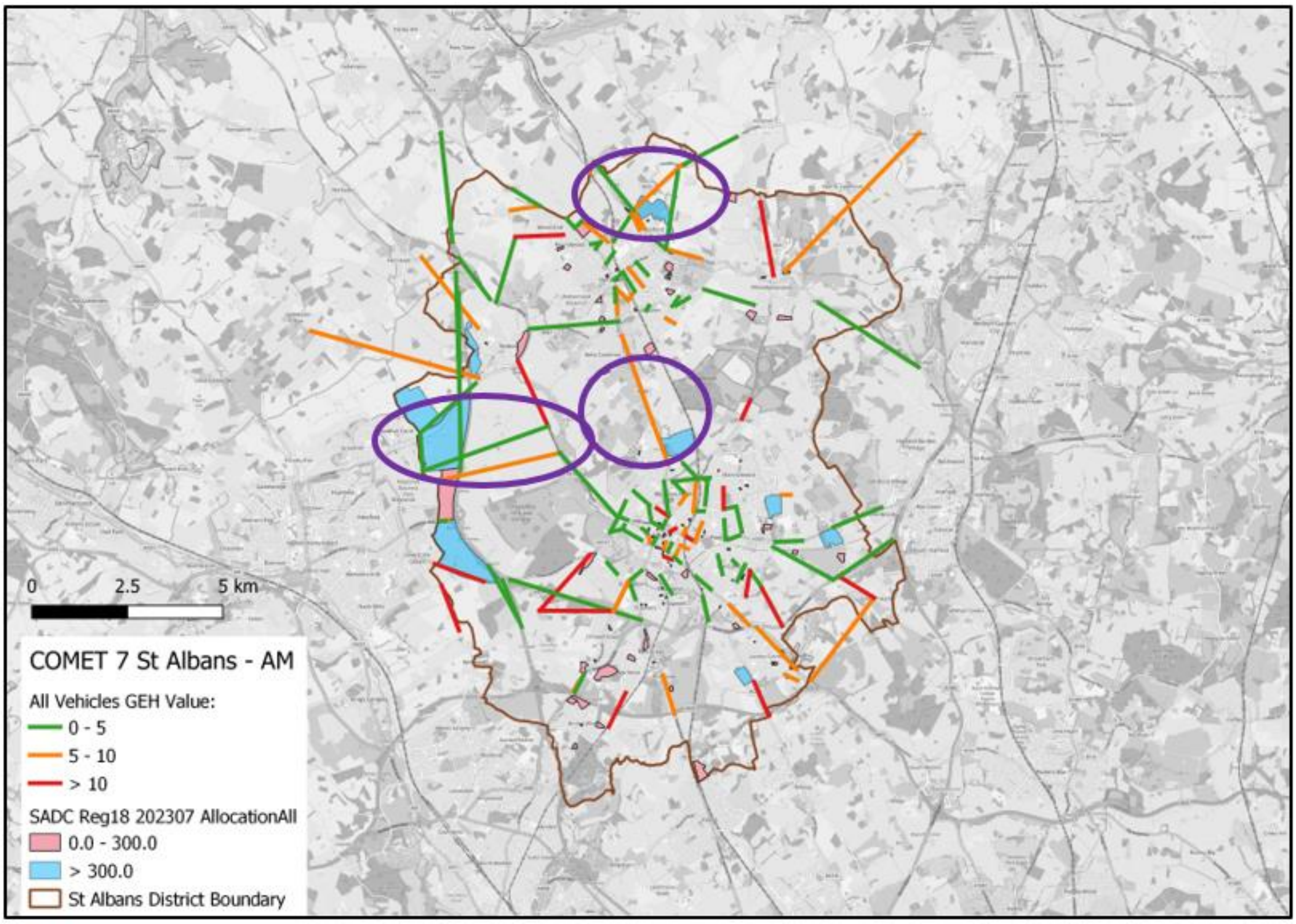

Figure 6: AM Peak Base Year Count Performance with SADC Local Plan Allocations – With Network and Matrix Improvements

TECHNICAL NOTE – ADDENDUM

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SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	St Albans Local Plan Assessment	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

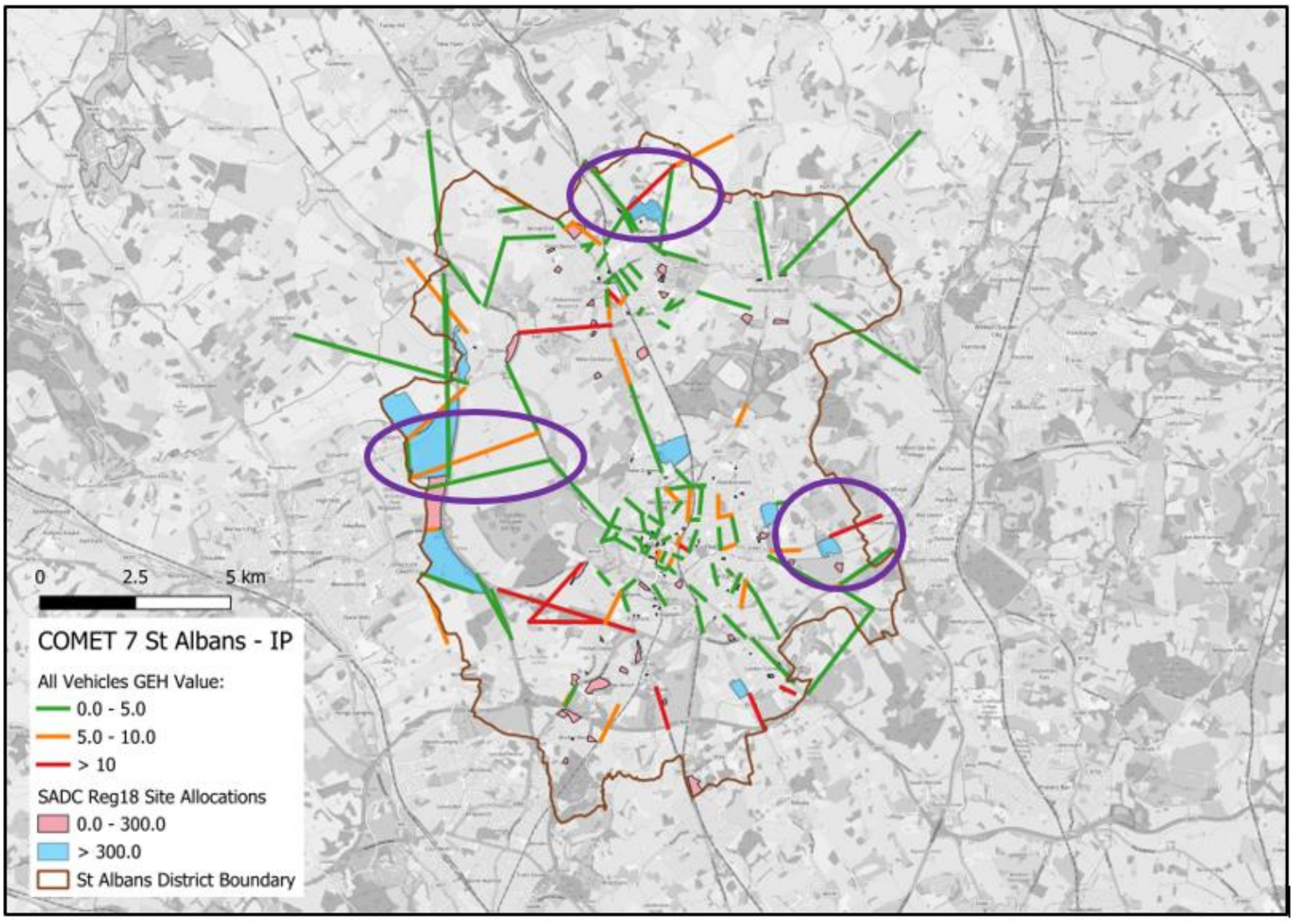

Figure 7: Inter-Peak Base Year Count Performance with SADC Local Plan Allocations – Original Model

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CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

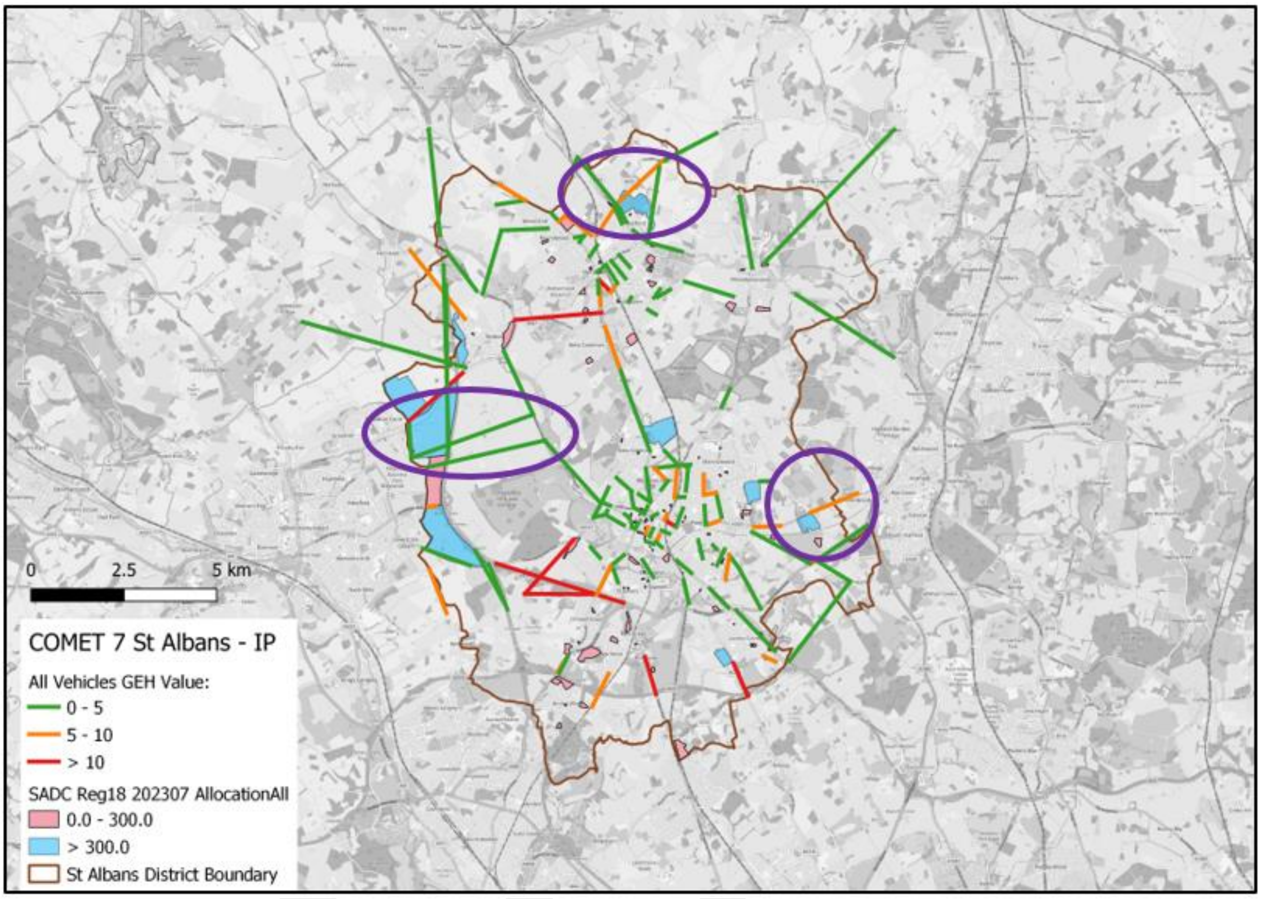

Figure 8: Inter-Peak Base Year Count Performance with SADC Local Plan Allocations – With Network Improvements

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	St Albans Local Plan Assessment	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

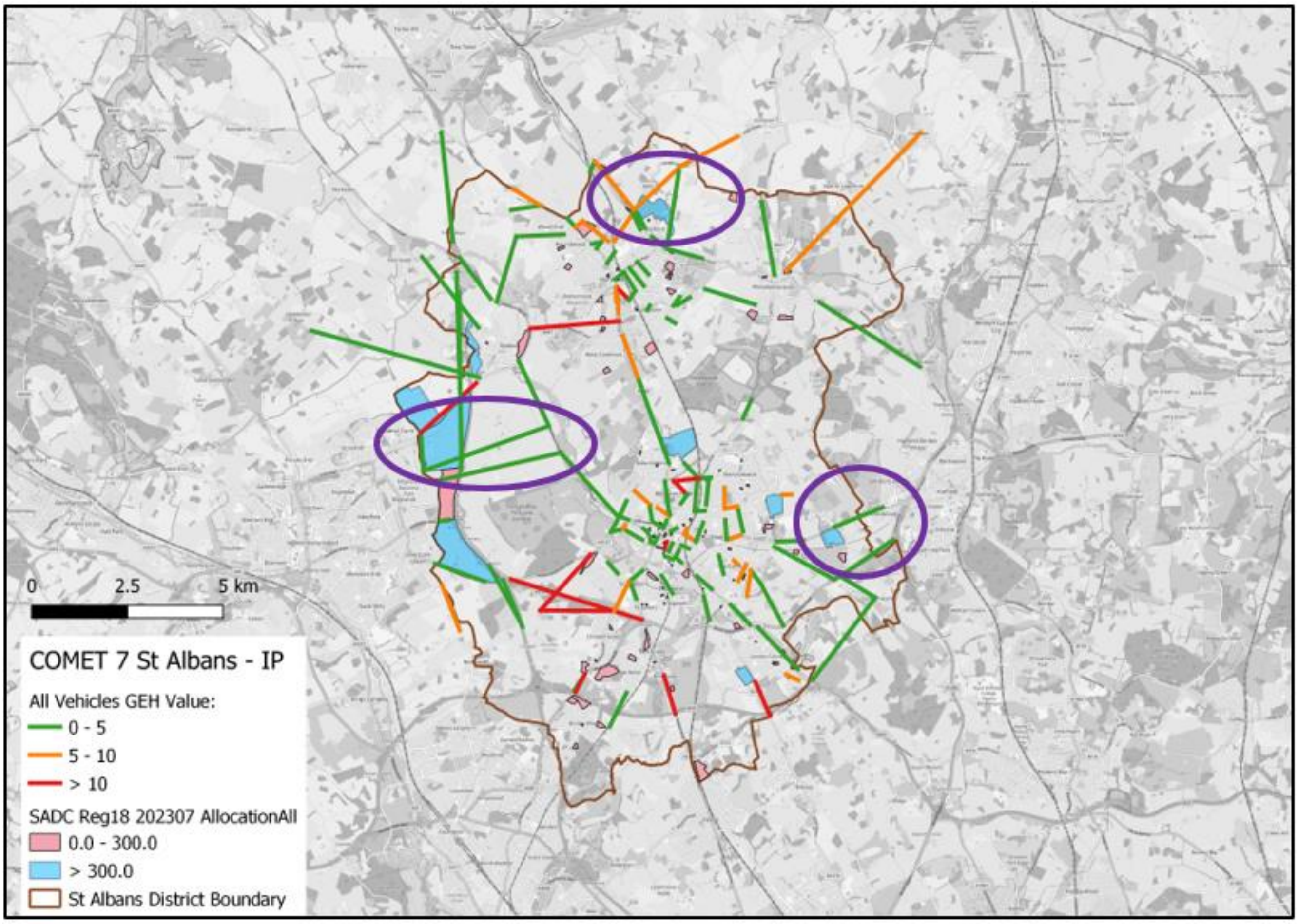

Figure 9: Inter-Peak Base Year Count Performance with SADC Local Plan Allocations – With Network and Matrix Improvements

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	St Albans Local Plan Assessment	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

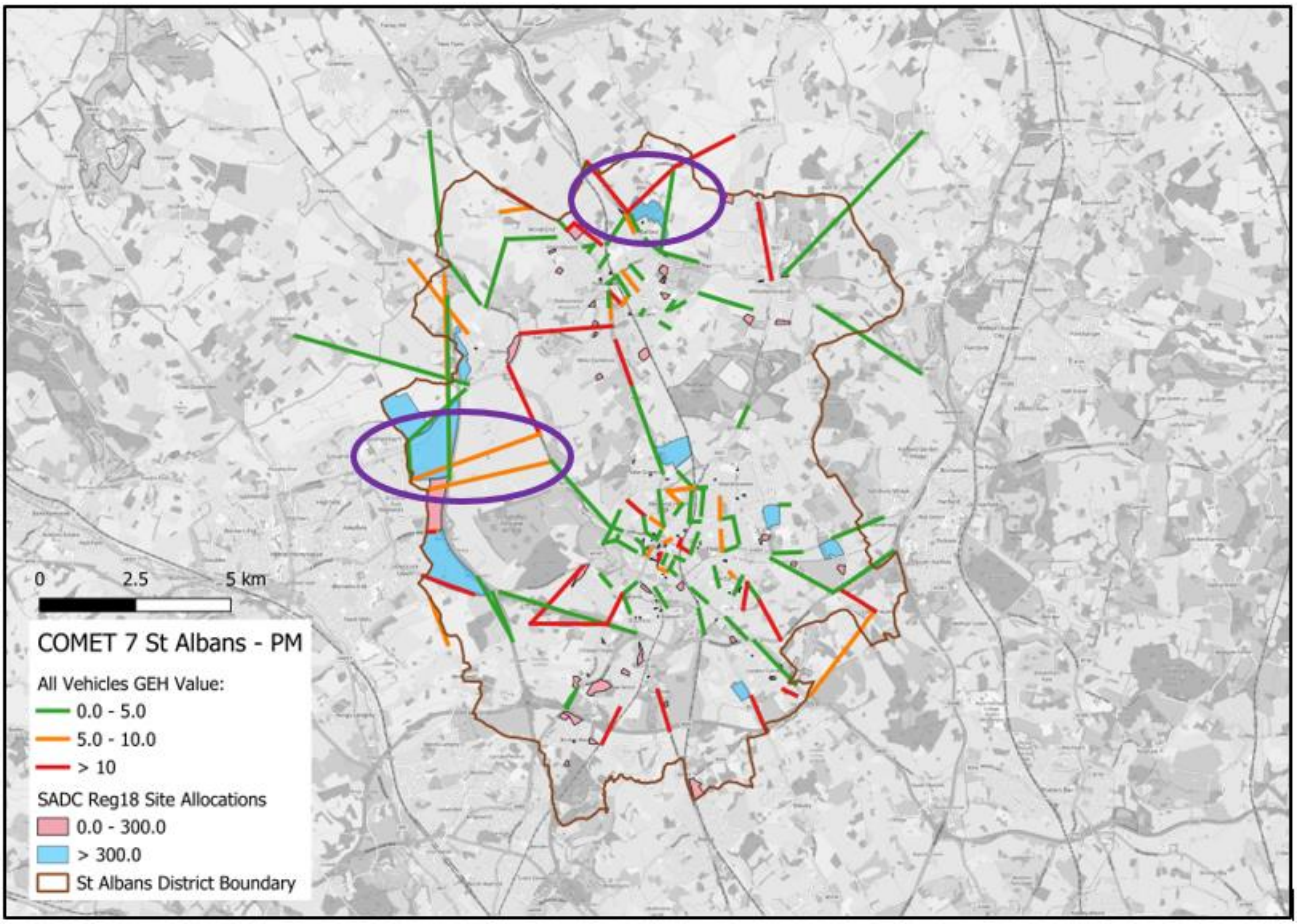

Figure 10: PM Peak Base Year Count Performance with SADC Local Plan Allocations – Original Model

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	St Albans Local Plan Assessment	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

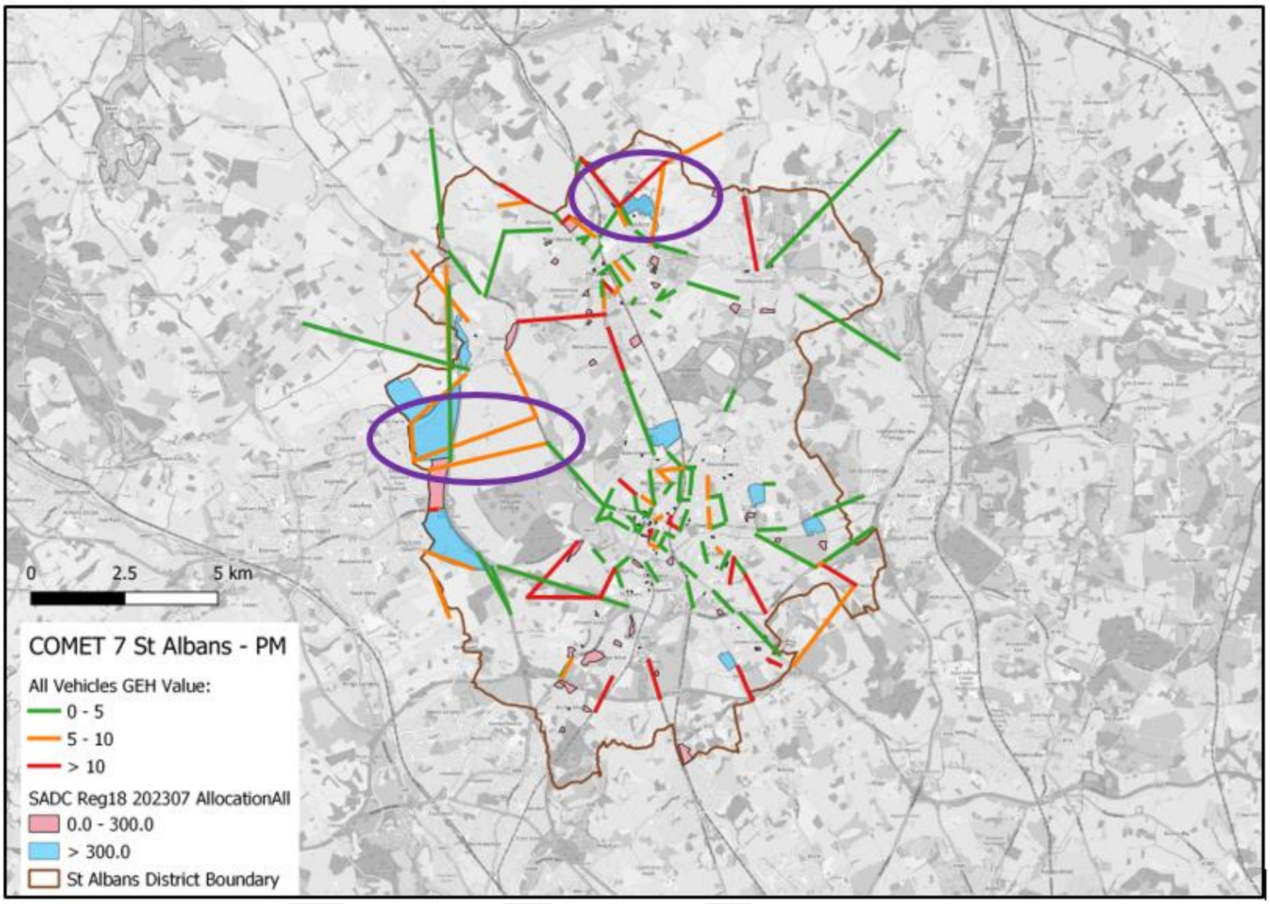

Figure 11: PM Peak Base Year Count Performance with SADC Local Plan Allocations – With Network Improvements

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	St Albans Local Plan Assessment	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

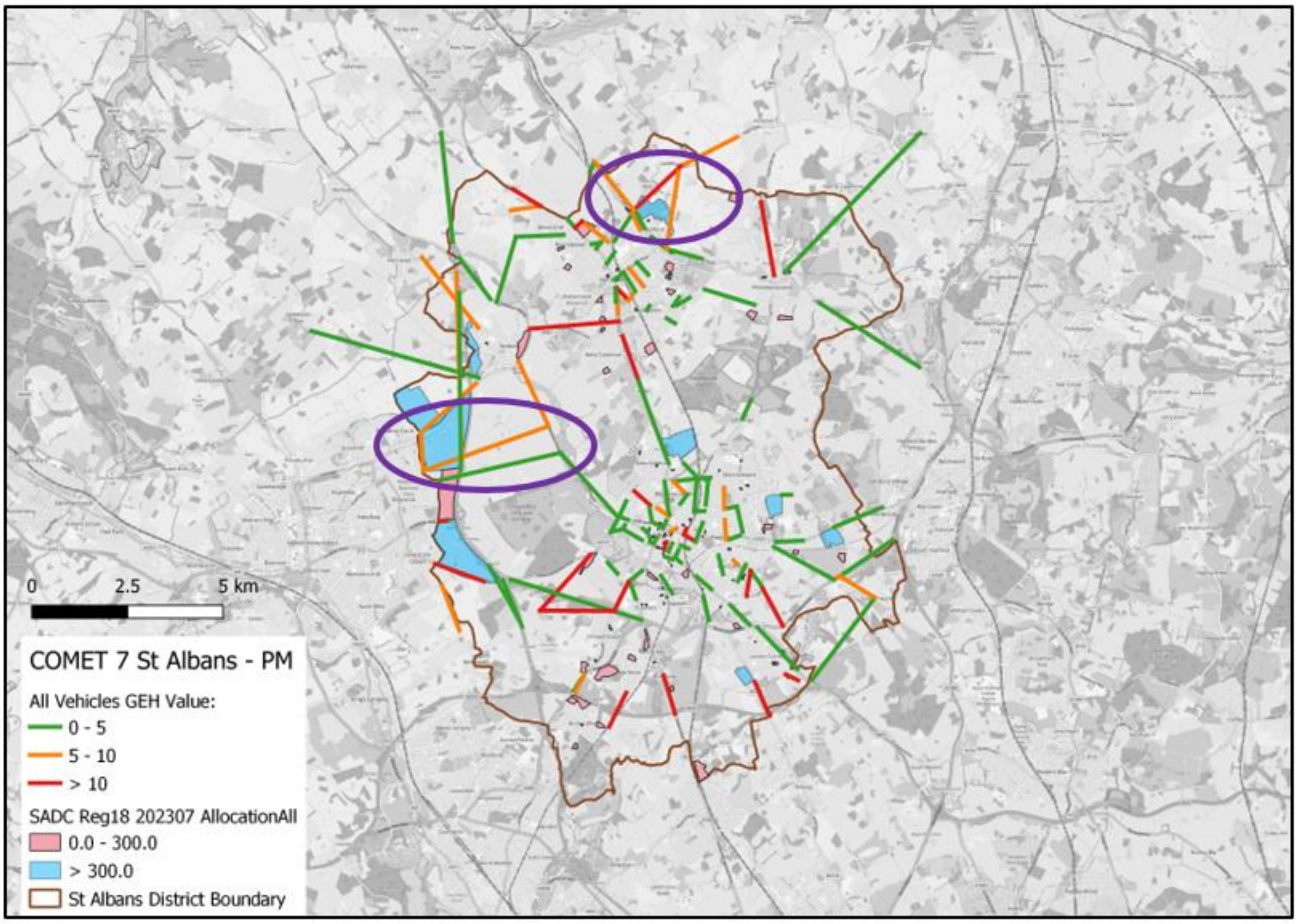

Figure 12: PM Peak Base Year Count Performance with SADC Local Plan Allocations – With Network and Matrix Improvements

SUMMARY

Overall, there is an improvement in the GEH statistics in the 2014 Base year model with network coding and matrix improvements. For instance, in the AM peak, the Punchbowl Lane which had GEH > 10 in the original COMET 7 model and now has GEH < 5 in the model after the network and matrix improvements. A similar case is observed for the A1081 Harpenden Road and B652 Bower Heath Lane.

In the inter-peak, there is an improvement in the A1057 St Albans Road West and B652 Bower Heath Lane and in the PM peak, there is an improvement in the B652 Kimpton Bottom Road after the network and matrix improvements.

Appendix C

SRN Base Year Model Review

Confidential

TECHNICAL NOTE 1

DATE:	12 April 2024	**CONFIDENTIALITY:**	Confidential
SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	Strategic Road Network (SRN) – St Albans And Dacorum District	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

1 INTRODUCTION

WSP has been commissioned to undertake a Strategic Road Network (SRN) review for National Highways (NH) for St Albans District Council (SADC) and Dacorum District. Hertfordshire County Council's (HCC) transport model COMET will be used for this work, which has a 2014 base year model.

The purpose of this technical note is to present the findings of the review of the existing 2014 base year model in the St Albans District (SAD) and Dacorum District to understand the performance of the COMET model on the SRN (M1, M25, A1(M)), roads approaching the SRN (such as A414 Breakspear Way) and major road network (such as A41, A414, A405 and A1081) within these two districts.

2 BASE YEAR MODEL REVIEW

To carry out the 2014 base year model review, the list of criteria identified is given below:

1. Comparison of 2014 Observed and Modelled traffic flow for the SRN road network, roads which approach the SRN and major road network
2. Journey Time Performance on SRN road network
3. Comparison between 2014 and 2023 traffic count data

These criteria were deemed suitable which would cover most of the critical aspects of the 2014 base year model for the Strategic Road Network (SRN) review within the SAD and Dacorum District.

3 COMPARISON OF 2014 OBSERVED AND MODELLED TRAFFIC FLOW

For the traffic flow validation performance review, only those traffic count locations on the SRN, roads approaching the SRN and major road network which lie within the SAD and Dacorum District boundary were identified. This is deemed acceptable as these are only relevant for understanding the model performance on the SRN within SADC and Dacorum District.

As per the TAG unit M3.1 (Section 3.3.11), the validation criteria and guidelines for link flows are defined in Table 1.

Table 1: Link Flow Validation Criteria and Acceptability Guideline

Criteria	Description of 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	
	Individual flows within 400 veh/h of counts for flows more than 2,700 veh/h	
2	GEH < 5 for individual flows	> 85% of cases

Figure 1 to Figure 3 present the location of all calibration and validation links in the SAD and Dacorum District boundary for all vehicles for each time period AM, IP and PM peaks respectively with the GEH values. It is important to note that there are 33 calibration counts and 31 validation counts in this area.

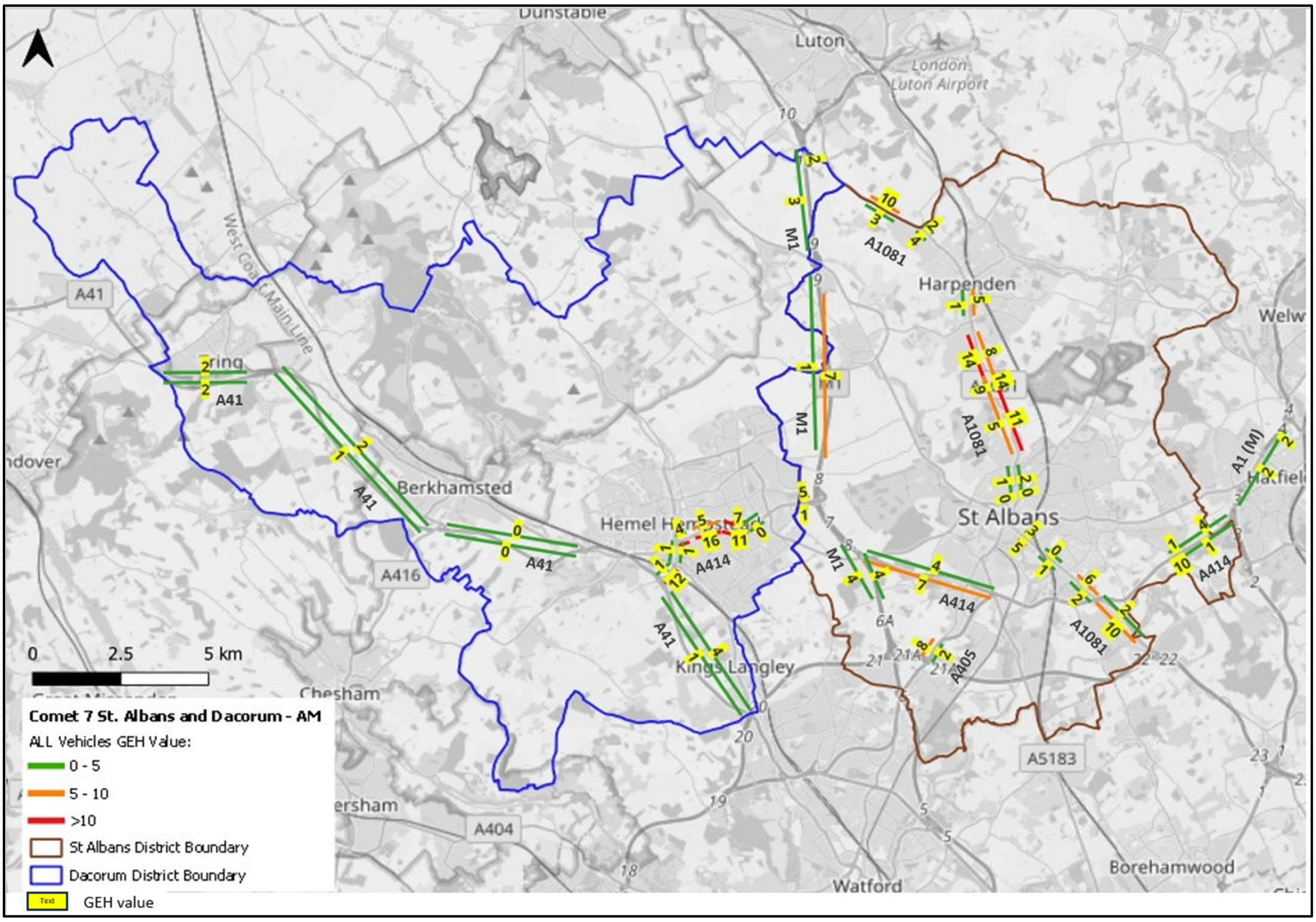

Figure 1: Link Flow Performance Calibration and Validation – All Vehicles (AM)

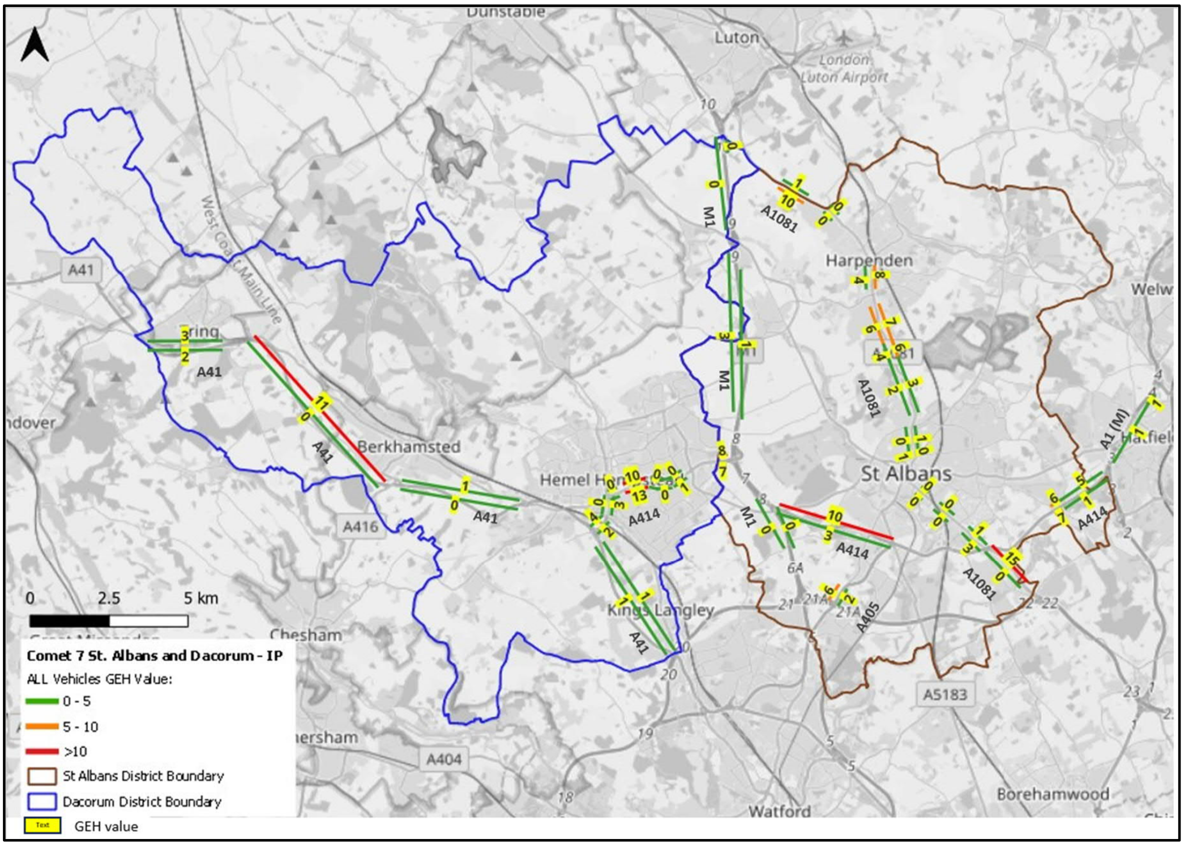

Figure 2: **Link Flow Performance Calibration and Validation – All Vehicles (IP)**

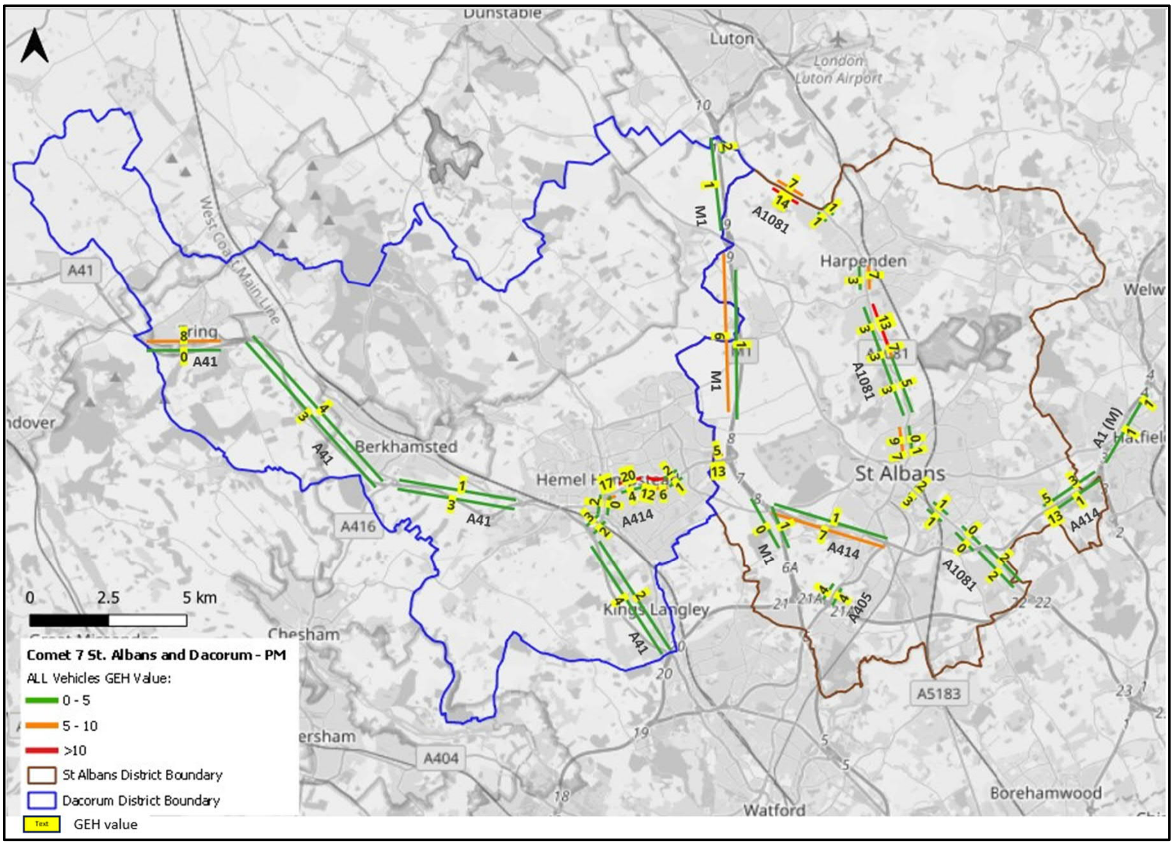

Figure 3: **Link Flow Performance Calibration and Validation – All Vehicles (PM)**

From Figure 1 to Figure 3, it is observed that calibration and validation of the total vehicles perform reasonably well (with GEH < 5) on the M1 and the A414 North Orbital Road in each time period (AM, IP, and PM). It is also observed that there are locations such as A414 St Albans Road in Hemel Hempstead, where GEH > 10 (in red) in each time period (AM, IP and PM), indicating a poor level of match between the observed and modelled traffic flows.

The summary of the calibration and validation for each time period (AM, IP and PM) and by each vehicle type (total vehicles, car, LGV and HGV) are presented in Table 2 and Table 3. Table 4 presents the performance of all the counts. The link performance is present for all roads (SRN, roads approaching SRN and major road network) as well as for the SRN roads only (M1, M25 and A1(M)) within St Albans and Dacorum District.

Table 2: Link Performance within St Albans and Dacorum District – Calibration Counts

Road Type	Period	TAG Criteria				GEH Performance Only				Flow Performance Only			
		Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV
All Roads	AM	91%	94%	100%	97%	91%	91%	100%	85%	91%	94%	100%	94%
	IP	94%	94%	100%	100%	94%	94%	97%	97%	94%	91%	100%	100%
	PM	88%	88%	100%	100%	88%	88%	100%	100%	88%	88%	100%	100%
SRN Roads only	AM	100%	100%	100%	80%	100%	100%	100%	80%	100%	100%	100%	60%
	IP	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	PM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 3: Link Performance within St Albans and Dacorum District – Validation Counts

Road Type	Period	TAG Criteria				GEH Performance Only				Flow Performance Only			
		Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV
All Roads	AM	35%	29%	90%	100%	32%	29%	74%	86%	35%	29%	90%	97%
	IP	58%	58%	97%	81%	58%	58%	90%	77%	58%	55%	97%	81%
	PM	52%	52%	94%	97%	48%	48%	74%	84%	48%	45%	94%	97%
SRN Roads only	AM	67%	67%	100%	100%	67%	67%	100%	88%	67%	67%	100%	67%
	IP	100%	100%	100%	67%	100%	100%	100%	67%	100%	100%	100%	67%
	PM	67%	100%	67%	67%	67%	100%	67%	67%	67%	100%	67%	67%

Table 4: Link Performance within St Albans and Dacorum District – All Counts

Road Type	Period	TAG Criteria				GEH Performance Only				Flow Performance Only			
		Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV
All Roads	AM	64%	63%	95%	98%	63%	61%	88%	86%	64%	63%	95%	95%
	IP	77%	77%	98%	91%	77%	77%	90%	88%	77%	73%	98%	91%
	PM	70%	70%	97%	98%	69%	69%	88%	92%	69%	67%	97%	98%
SRN Roads only	AM	88%	88%	100%	88%	88%	88%	100%	88%	88%	88%	100%	63%
	IP	100%	100%	100%	88%	100%	100%	100%	88%	100%	100%	100%	88%
	PM	88%	100%	88%	88%	88%	100%	88%	88%	88%	100%	88%	88%

Table 2 shows that the calibration links (for all roads and SRN roads only) perform very well and meet TAG criteria for each of the time period (AM, IP and PM) and vehicle classes (total vehicles, cars, LGV and HGV). However, from Table 3, it is observed that the validation links performance (for all roads) is weaker, especially for total vehicles and cars on all roads and does not meet the TAG criteria in any time period for all roads. The validation link performance for SRN only links is better than the all roads performance however total vehicles and cars do not meet TAG criteria in the AM and PM while it meets the TAG criteria in the IP. Out of the 31 validation links (all roads), there are 21, 13, and 16 links which have GEH > 5 in the AM, IP and PM peaks respectively. Further analysis showed there are 11, 9 and 7 links that have GEH between 5 and 10 while there are 10, 4 and 9 links which have GEH > 10 in the AM, IP and PM peaks respectively.

Table 4 shows the performance of all the counts (calibration and validation). The total vehicles and cars do not meet the TAG criteria in any of the time periods for all roads but do meet TAG criteria for SRN in each time period (AM, IP and PM) for all vehicle classes. For all roads the AM peak performs is the weakest with only 64% of all the counts meeting the criteria.

The detailed summary of the calibration and validation for each link location is provided in Appendix A.

Overall, the 2014 base year model's traffic flow performance on the SRN, roads approaching the SRN and major road networks within the SAD and Dacorum District boundary indicate there are some areas which perform well against TAG criteria and others which are weaker.

4 JOURNEY TIME PERFORMANCE

A review of the journey time validation was conducted between the observed and modelled data for all the SRN, roads approaching the SRN and major road network within the SAD and Dacorum District boundary. The 2014 observed journey time data is sourced from Traffic Master journey time data as specified in the COMET LMVR[1].

As per TAG M3.1 (Section 3.3.15), the journey time validation and acceptability guidelines are presented in Table 5.

Table 5: Journey Time Validation Criteria and Acceptability Guideline

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

The location of overall journey time routes in the 2014 base year model (highlighted in black) and journey time routes assessed within the SAD and Dacorum District boundary (highlighted in red) is shown in Figure 4. A zoomed image of the journey time routes within the SAD is presented in Figure 5 with route identifications highlighted yellow.

A total of 22 routes (two-way) were identified to be lying within or majorly crossing the SAD and Dacorum District boundary. Table 6 provides the journey time validation summary along these routes for each time period (AM, IP and PM) and by direction.

It is observed that a total of 73%, 95% and 68% of the journey time routes on the SRN, roads approaching the SRN and major road networks pass the TAG criteria in the AM, IP and PM peaks respectively. As such, only the Inter-peak meets the TAG guideline for journey times with AM and PM falling short of meeting TAG criteria. However, the Journey time routes for SRN links perform well, with 80% passing in AM, 100% in IP and 90% in the PM peak.

[1] Hertfordshire COMET: Local Model Development and Validation Report (LMVR) v5.2, March 2020

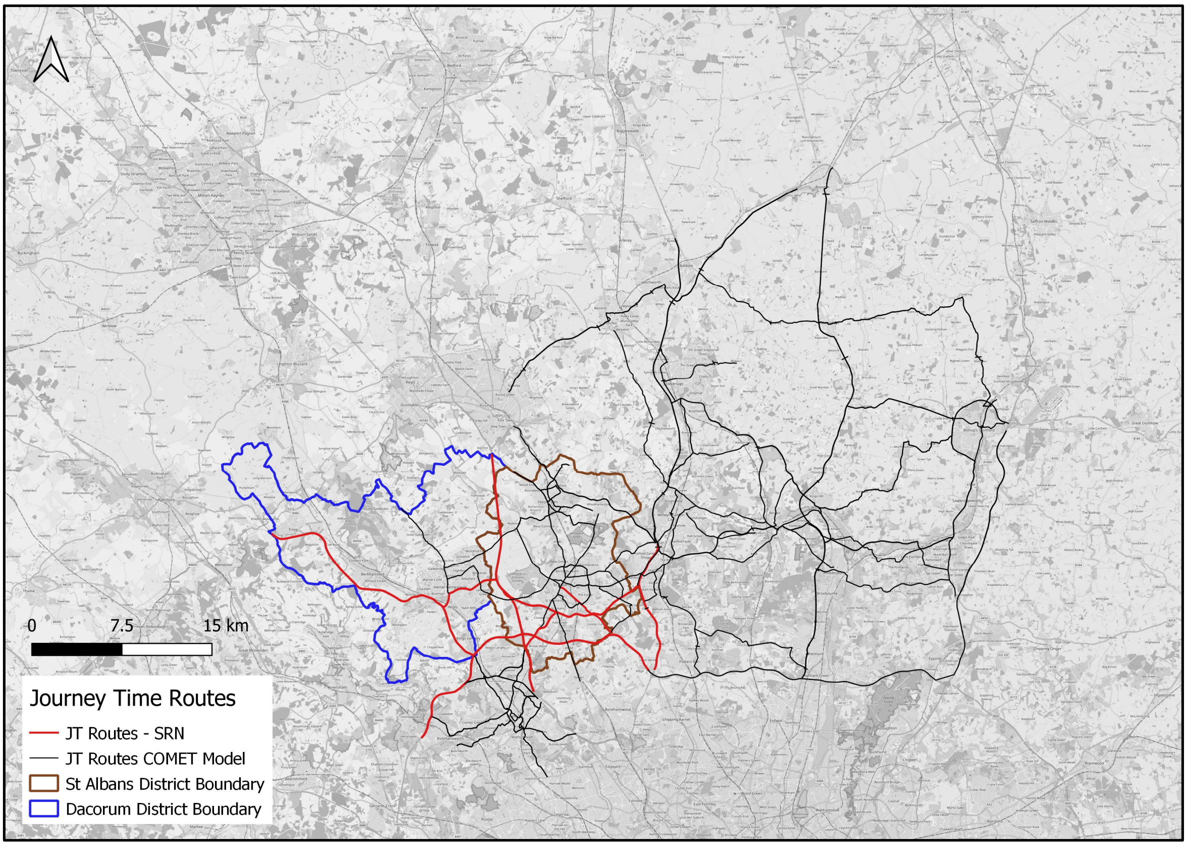

Figure 4: Journey Time Routes (SRN)

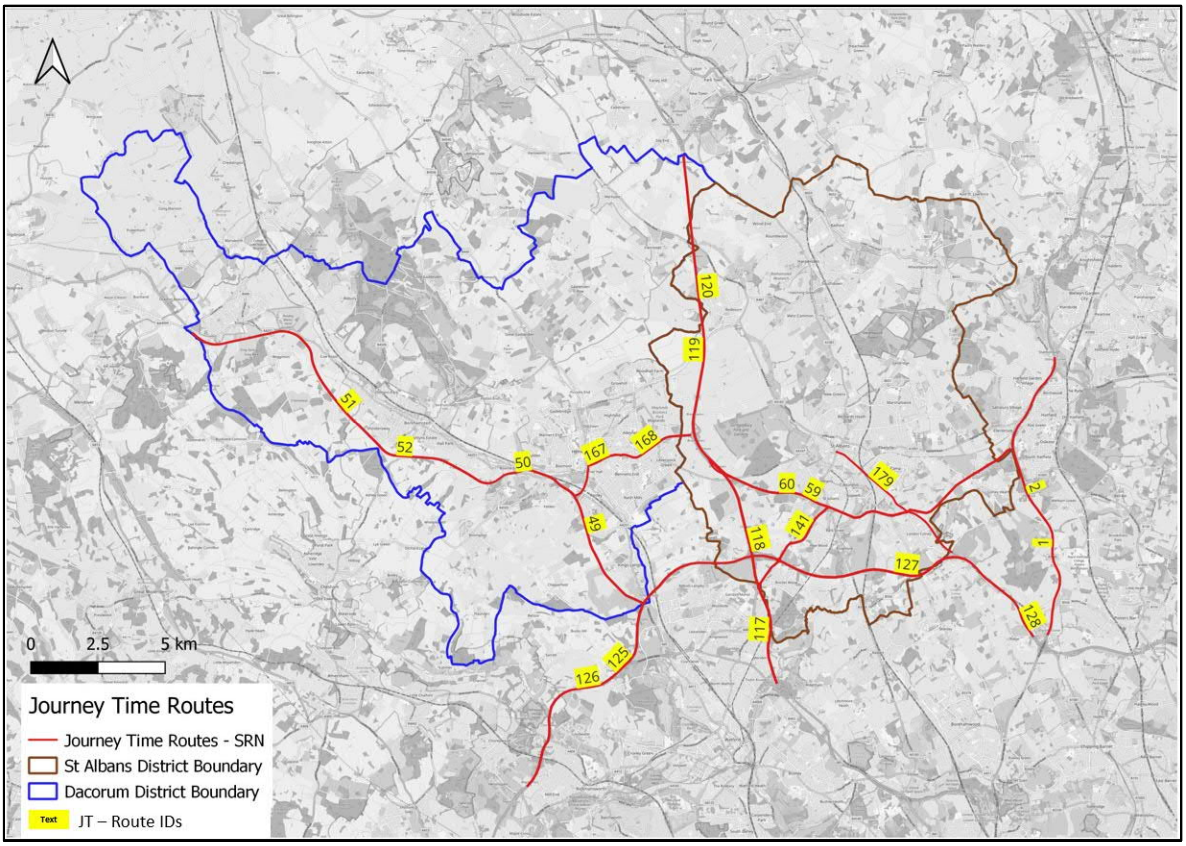

Figure 5: Journey Time Routes (SRN) within SAD and Dacorum District

Table 6: Journey Time Validation Summary

Route ID	Route	Direction	Observed Time (sec)			Modelled Time (sec)			Difference			% Difference			TAG Compliant		
			AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
1	A1(M) J1-J4	Northbound	435	398	478	421	401	433	-14	3	-45	-3%	1%	-10%	YES	YES	YES
2	A1(M) J1-J4	Southbound	466	403	456	528	398	506	62	-5	50	13%	-1%	11%	YES	YES	YES
51	A41 B4009 - A4251	Eastbound	508	494	486	555	544	546	47	50	60	9%	10%	12%	YES	YES	YES
52	A41 B4009 - A4251	Westbound	494	490	488	551	546	573	57	56	85	12%	11%	17%	YES	YES	NO
49	A41 A4251 - M25	Eastbound	489	276	281	526	290	308	37	15	27	7%	5%	9%	YES	YES	YES
50	A41 A4251 - M25	Westbound	262	260	267	278	276	282	16	17	15	6%	6%	6%	YES	YES	YES
125	M25 J17 -J21a	Northbound	502	504	533	569	526	716	68	21	183	13%	4%	34%	YES	YES	NO
126	M25 J17 -J21a	Southbound	624	487	515	483	517	568	-140	30	53	-22%	6%	10%	NO	YES	YES
127	M25 J21a -J23	Eastbound	483	450	466	426	406	418	-57	-44	-48	-12%	-10%	-10%	YES	YES	YES
128	M25 J21a -J23	Westbound	464	421	415	415	409	415	-49	-12	0	-11%	-3%	0%	YES	YES	YES
59	A414 J8 - A1(M) J3	Eastbound	934	690	736	982	707	796	48	17	60	5%	2%	8%	YES	YES	YES
60	A414 J8 - A1(M) J3	Westbound	755	670	712	590	653	648	-165	-16	-64	-22%	-2%	-9%	NO	YES	YES
167	St Albans Rd - A414 to M1	Eastbound	701	512	837	496	481	479	-205	-31	-358	-29%	-0.06	-43%	NO	YES	NO
168	St Albans Rd - A414 to M1	Westbound	539	504	701	473	462	511	-66	-42	-191	-12%	-8%	-27%	YES	YES	NO
117	M1 J5 -J7	Northbound	370	392	554	372	370	487	2	-22	-67	1%	-6%	-12%	YES	YES	YES
118	M1 J5 -J7	Southbound	501	382	387	597	380	398	97	-2	10	19%	-1%	3%	NO	YES	YES
119	M1 J7 -J10	Northbound	356	371	472	348	347	448	-7	-23	-23	-2%	-6%	-5%	YES	YES	YES
120	M1 J7 -J10	Southbound	407	311	318	361	316	330	-46	5	12	-11%	2%	4%	YES	YES	YES
141	A405 N Orbital Road (Watford Route 2a upper)	Northbound	388	324	505	282	305	630	-106	-20	125	-27%	-6%	25%	NO	YES	NO
142	A405 N Orbital Road (Watford Route 2a upper)	Southbound	556	273	437	461	214	220	-95	-59	-217	-17%	-22%	-50%	NO	NO	NO
179	A1081 St Albans	Westbound	788	670	765	675	634	779	-113	-36	14	-14%	-5%	2%	YES	YES	YES
180	A1081 St Albans	Eastbound	595	549	616	665	583	728	70	33	112	12%	6%	18%	YES	YES	NO
Total Routes															**22**	**22**	**22**
Total Routes Passing TAG criteria															**16**	**21**	**15**
Pass %															**73%**	**95%**	**68%**
SRN Routes (A1(M), M25 and M1)															**10**	**10**	**10**
SRN Routes Passing TAG criteria															**8**	**10**	**9**
SRN Pass %															**80%**	**100%**	**90%**

5 COMPARISON OF OBSERVED TRAFFIC FLOWS BETWEEN 2014 AND 2023

A comparison of the observed traffic flows between the 2014 and 2023 observed traffic counts was undertaken to understand the level of growth in traffic on the SRN, roads approaching the SRN and major road networks within the SAD and Dacorum boundary.

Figure 6 presents the location of the 2023 traffic count location along with the 2014 observed traffic count location.

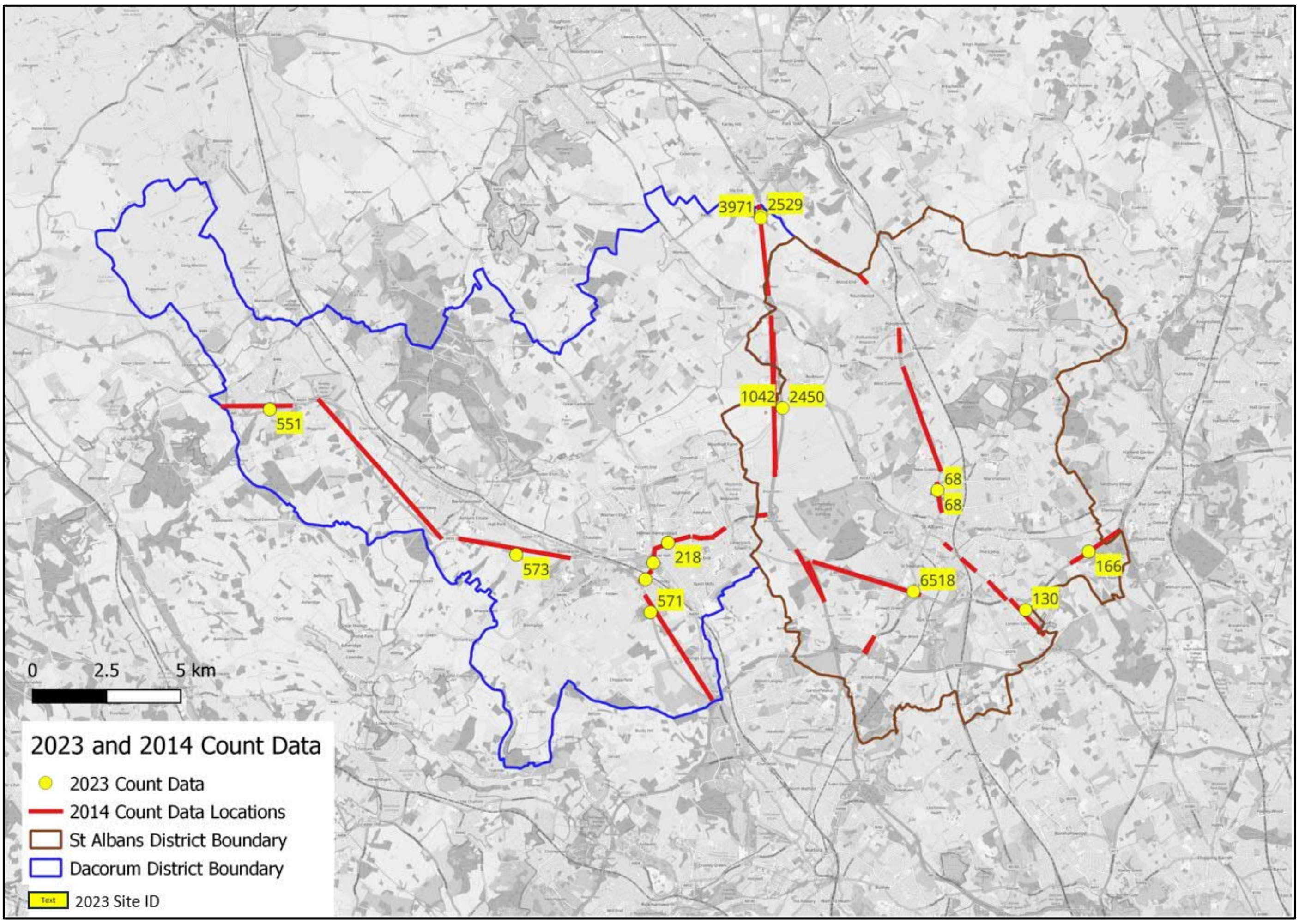

Figure 6: 2023 and 2014 Observed Count Locations within SAD and Dacorum District

Table 7 summarises the total observed traffic flow values in 2023 and 2014 with differences.

Table 7: Comparison of 2023 and 2014 Observed Traffic Flows

Site ID	Direction	2023 Total Flow			2014 Observed Flow			Difference (2023 – 2014)			% Difference		
		AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
68	Northbound	304	221	397	325	280	439	-21	-9	-42	6%	-3%	-10%
68	Southbound	362	306	327	445	303	336	-83	-2	-9	19%	-1%	-3%
103	Southbound	874	659	919	834	775	1,211	40	-67	-292	-5%	-9%	-24%
130	Southbound	736	579	879	899	632	945	-163	-33	-67	18%	-5%	-7%
130	Northbound	515	178	508	1,086	697	1,010	-572	-469	-503	53%	-67%	-50%
166	Westbound	1,346	1,334	1,598	1,937	1,285	1,971	-591	113	-373	31%	9%	-19%
166	Eastbound	1,522	1,254	1,516	1,824	1,255	1,835	-302	102	-318	17%	8%	-17%
218	Westbound	1,205	942	1,311	1,360	1,088	1,355	-155	-30	-44	11%	-3%	-3%
218	Eastbound	1,238	942	1,230	1,056	1,059	1,347	182	-27	-117	-17%	-3%	-9%
349	Northbound	953	786	991	1,103	842	977	-150	10	14	14%	1%	1%
349	Southbound	1,069	833	1,138	1,153	897	1,232	-84	-3	-94	7%	0%	-8%
551	Northbound	1,359	769	1,082	1,018	662	1,427	341	127	-345	-34%	19%	-24%
551	Southbound	1,122	718	1,544	1,293	631	984	-171	198	560	13%	31%	57%
571	Northbound	1,538	1,123	2,507	1,344	1,185	2,393	193	137	113	-14%	12%	5%
571	Southbound	1,770	1,302	1,650	1,467	1,138	1,488	304	142	162	-21%	12%	11%
573	Northbound	1,599	1,030	2,235	1,527	1,026	2,364	72	189	-129	-5%	18%	-5%
573	Southbound	1,882	1,181	1,588	2,112	1,030	1,464	-230	167	124	11%	16%	8%
1042	Northbound	5,191	5,503	6,499	4,858	4,727	6,120	333	776	379	**7%**	**16%**	**6%**
2450	Southbound	6,384	4,952	5,606	6,499	4,561	5,707	-115	392	-102	**-2%**	**9%**	**-2%**
2529	Southbound	5,311	4,784	5,600	5,142	4,222	5,529	169	562	71	**3%**	**13%**	**1%**
3971	Northbound	5,343	5,325	6,464	5,090	4,711	6,494	252	614	-31	**5%**	**13%**	**0%**
6518	Eastbound	1,037	763	1,305	1,032	752	1,239	5	12	66	1%	2%	5%
Total		**42,660**	**35,486**	**46,893**	**43,404**	**33,759**	**47,868**	**-744**	**2,899**	**-975**	**-2%**	**8%**	**-2%**

*The **bold** entries represent counts on the SRN link.

Overall, it is observed that there is a net reduction in traffic flows in 2023 compared to 2014 in the AM and PM peak, -2%, on the SRN, roads approaching the SRN and major road network within the SAD and Dacorum District. However, there is an average increase in the inter-peak of 8%.

6 SUMMARY AND RECOMMENDATIONS

This technical note summarises the review undertaken for the COMET 2014 base year traffic model on the SRN, roads approaching the SRN and major road networks within SADC and Dacorum District.

The 2014 base year review comprises of:

- Comparison of the 2014 observed and modelled traffic flows
- Journey Time Performance
- Comparison of observed traffic flows between 2014 and 2023

The performance of the 2014 base year traffic model is summarised in Table 8.

Table 8: Summary of Performance

Road Type	Criteria	AM	IP	PM
All Roads	Calibration Counts	91%	94%	88%
	Validation Counts	35%	58%	52%
	All Counts	64%	77%	70%
	Journey Times	73%	95%	68%
SRN Roads only (M1, M25 and A1(M))	Calibration Counts	100%	100%	100%
	Validation Counts	67%	100%	67%
	All Counts	88%	100%	88%
	Journey Times	80%	100%	90%

This shows the performance of SRN roads is good. The calibration and all counts meet the TAG criteria in each time period (AM, IP and PM) while the validation counts only meets the TAG criteria in the IP. The journey times also meet the TAG criteria in IP and PM, while very close to TAG criteria in the AM.

For the 'all road' performance the AM peak is the weakest performing time period, it meets TAG criteria for the calibration counts but fails to meet TAG criteria for other elements, with the validation counts being the weakest. In the IP the calibration counts and journey times meet TAG criteria, with the validation counts performance being the weakest against TAG criteria and all count performance not far from meeting TAG. The PM peak like the AM peak meets TAG criteria for the calibration counts but fails to meet TAG criteria in other elements although the validation count performance is not as weak as the AM peak.

APPENDIX A

Table A1: Individual Link Flow Calibration and Validation – AM

Location	Direction	Calibration /Validation	Total Observed	Total Modelled	Difference (Modelled - Observed)	% Difference	GEH	Meet TAG Criteria
A41 Tring	NB	Calibration	1018	1090	72	7%	2.22	Yes
A41	NWB	Calibration	1189	1217	28	2%	0.80	Yes
A41 Tring	SB	Calibration	1293	1223	-70	-5%	1.98	Yes
A41	WB	Calibration	1527	1531	4	0%	0.10	Yes
A41	SEB	Calibration	949	1007	58	6%	1.86	Yes
Two Waters Rd	NB	Calibration	1103	1127	24	2%	0.72	Yes
A414 St Albans Road	WB	Calibration	1281	1287	6	0%	0.16	Yes
A414 St Albans Road	EB	Calibration	1388	1245	-143	-10%	3.95	Yes
A41 Kings Langley	NB	Calibration	1344	1381	37	3%	0.99	Yes
M1 J9 to J10	NB	Calibration	5090	4882	-209	-4%	2.96	Yes
M1 J10 to J9	SB	Calibration	5142	5020	-122	-2%	1.71	Yes
A41 Kings Langley	SB	Calibration	1467	1615	149	10%	3.78	Yes
A41	EB	Calibration	2112	2091	-21	-1%	0.46	Yes
Two Waters Rd	SB	Calibration	1153	1123	-29	-3%	0.87	Yes
A1081 London Road	WB	Calibration	762	748	-14	-2%	0.51	Yes
A1081 St Albans Road	NB	Calibration	802	831	30	4%	1.04	Yes
A1081 St Albans Road	SB	Calibration	731	888	156	21%	5.49	No
Harpenden Road	NB	Calibration	325	349	25	8%	1.34	Yes
Harpenden Road	SB	Calibration	445	495	51	11%	2.35	Yes
Harpenden Road	NB	Calibration	409	414	5	1%	0.23	Yes
Harpenden Road	SB	Calibration	627	619	-8	-1%	0.33	Yes
A1081 London Road	WB	Calibration	384	497	113	29%	5.39	No
A1081 London Road	EB	Calibration	514	580	66	13%	2.81	Yes
A1081 London Road	NWB	Calibration	1188	1110	-78	-7%	2.29	Yes
A414	WB	Calibration	1937	1973	36	2%	0.82	Yes
M1 J7 to J6A	SB	Calibration	6368	6072	-296	-5%	3.76	Yes
M1 J6A to J7	NB	Calibration	5581	5318	-263	-5%	3.56	Yes
A1081 London Road	SEB	Calibration	882	1077	196	22%	6.25	No
A1081 London Road	EB	Calibration	496	498	2	0%	0.09	Yes
A1081 Luton Road	SB	Calibration	674	623	-51	-8%	2.01	Yes
A1081 Luton Road	NB	Calibration	486	583	96	20%	4.16	Yes
A414	EB	Calibration	1824	1657	-166	-9%	3.99	Yes

Location	Direction	Calibration /Validation	Total Observed	Total Modelled	Difference (Modelled - Observed)	% Difference	GEH	Meet TAG Criteria
A1(M) Hatfield Tunnel	SB	Calibration	3988	3845	-143	-4%	2.28	Yes
A414 St Albans Road between Lower Yott and Wood Lane	WB	Validation	1360	845	-515	-38%	15.50	No
A414 St Albans Road	EB	Validation	1389	1152	-237	-17%	6.66	No
A414 St Albans Road	SWB	Validation	1603	881	-722	-45%	20.48	No
A414 St Albans Road	NEB	Validation	1122	1002	-120	-11%	3.68	Yes
A414 St Albans Road	WB	Validation	1507	1095	-412	-27%	11.41	No
A414 St Albans Road	EB	Validation	1257	835	-422	-34%	13.06	No
A414	SB	Validation	834	1202	368	44%	11.54	No
A414 St Albans Road between Lower Yott and Wood Lane	EB	Validation	1056	889	-168	-16%	5.37	No
A414 St Albans Road	WB	Validation	1520	835	-685	-45%	19.96	No
A414	NB	Validation	1290	1328	38	3%	1.04	Yes
A405 North Orbital Road	NEB	Validation	1414	1125	-289	-20%	8.12	No
A1081 Harpenden Road	SB	Validation	405	750	344	85%	14.32	No
A1081 Harpenden Road	NB	Validation	530	658	127	24%	5.23	No
A405 North Orbital Road	SWB	Validation	1177	1264	87	7%	2.49	Yes
A1081 St Albans Road	NB	Validation	486	841	355	73%	13.78	No
A414 Breakspear Way	EB	Validation	1836	2071	235	13%	5.32	Yes
A414	WB	Validation	1032	814	-218	-21%	7.16	No
M1 J7 to J9	NB	Validation	4858	4921	63	1%	0.90	Yes
A1081 Luton Road	EB	Validation	456	693	237	52%	9.88	No
A1081 St Albans Road	SB	Validation	736	970	234	32%	8.01	No
A1081 Harpenden Road	NB	Validation	532	748	215	40%	8.51	No
A414	EB	Validation	1143	1002	-141	-12%	4.31	Yes
A1081 Harpenden Road	SB	Validation	433	701	268	62%	11.27	No
A414	WB	Validation	2019	2502	482	24%	10.15	No
A414	EB	Validation	1721	1768	46	3%	1.10	Yes
A1081 London Road	SB	Validation	899	832	-67	-7%	2.28	Yes
M1 J9 to J7	SB	Validation	6499	5949	-551	-8%	6.98	No

Location	Direction	Calibration /Validation	Total Observed	Total Modelled	Difference (Modelled - Observed)	% Difference	GEH	Meet TAG Criteria
A1081 London Road	NB	Validation	1086	794	-293	-27%	9.54	No
A1081 Luton Road	WB	Validation	586	655	69	12%	2.77	Yes
A414 - Breakspear Way	WB	Validation	2190	2155	-35	-2%	0.76	Yes
A1(M) Oldings Corner	SB	Validation	3988	3845	-143	-4%	2.28	Yes

Table A2: Individual Link Flow Calibration and Validation – IP

Location	Direction	Calibration /Validation	Total Observed	Total Modelled	Difference (Modelled - Observed)	% Difference	GEH	Meet TAG Criteria
A41 Tring	NB	Calibration	662	706	45	7%	1.71	Yes
A41	NWB	Calibration	796	797	1	0%	0.03	Yes
A41 Tring	SB	Calibration	631	550	-81	-13%	3.35	Yes
A41	WB	Calibration	1026	1015	-12	-1%	0.36	Yes
A41	SEB	Calibration	209	411	202	96%	11.44	No
Two Waters Rd	NB	Calibration	842	852	10	1%	0.33	Yes
A414 St Albans Road	WB	Calibration	1165	1146	-19	-2%	0.56	Yes
A414 St Albans Road	EB	Calibration	1183	1177	-5	0%	0.16	Yes
A41 Kings Langley	NB	Calibration	1185	1229	44	4%	1.27	Yes
M1 J9 to J10	NB	Calibration	4711	4713	1	0%	0.02	Yes
M1 J10 to J9	SB	Calibration	4222	4233	10	0%	0.16	Yes
A41 Kings Langley	SB	Calibration	1138	1174	36	3%	1.06	Yes
A41	EB	Calibration	1030	1054	25	2%	0.76	Yes
Two Waters Rd	SB	Calibration	897	803	-94	-10%	3.23	Yes
A1081 London Road	WB	Calibration	476	476	0	0%	0.01	Yes
A1081 St Albans Road	NB	Calibration	593	689	95	16%	3.76	Yes
A1081 St Albans Road	SB	Calibration	600	820	220	37%	8.27	No
Harpenden Road	NB	Calibration	280	272	-8	-3%	0.5	Yes
Harpenden Road	SB	Calibration	303	324	21	7%	1.2	Yes
Harpenden Road	NB	Calibration	326	336	9	3%	0.52	Yes
Harpenden Road	SB	Calibration	348	348	0	0%	0.01	Yes
A1081 London Road	WB	Calibration	445	442	-3	-1%	0.13	Yes
A1081 London Road	EB	Calibration	445	455	10	2%	0.45	Yes
A1081 London Road	NWB	Calibration	726	798	72	10%	2.61	Yes
A414	WB	Calibration	1285	1321	36	3%	1	Yes

Location	Direction	Calibration /Validation	Total Observed	Total Modelled	Difference (Modelled - Observed)	% Difference	GEH	Meet TAG Criteria
M1 J7 to J6A	SB	Calibration	4532	4517	-15	0%	0.23	Yes
M1 J6A to J7	NB	Calibration	4975	4967	-7	0%	0.11	Yes
A1081 London Road	SEB	Calibration	746	783	37	5%	1.33	Yes
A1081 London Road	EB	Calibration	481	480	-1	0%	0.03	Yes
A1081 Luton Road	SB	Calibration	478	474	-4	-1%	0.19	Yes
A1081 Luton Road	NB	Calibration	512	512	0	0%	0.02	Yes
A414	EB	Calibration	1255	1425	171	14%	4.66	Yes
A1(M) Hatfield Tunnel	SB	Calibration	2458	2410	-48	-2%	0.97	Yes
A414 St Albans Road between Lower Yott and Wood Lane	WB	Validation	1088	697	-390	-36%	13.07	No
A414	SB	Validation	775	839	63	8%	2.23	Yes
A414 St Albans Road between Lower Yott and Wood Lane	EB	Validation	1059	752	-308	-29%	10.22	No
A414	NB	Validation	866	975	109	13%	3.6	Yes
A405 North Orbital Road	NEB	Validation	1390	1638	248	18%	6.38	No
A1081 Harpenden Road	SB	Validation	459	595	136	30%	5.92	No
A1081 Harpenden Road	NB	Validation	459	508	49	11%	2.22	Yes
A405 North Orbital Road	SWB	Validation	1455	1364	-91	-6%	2.42	Yes
A1081 St Albans Road	NB	Validation	439	577	138	31%	6.12	No
A414 Breakspear Way	EB	Validation	1363	1689	326	24%	8.35	No
A414	WB	Validation	752	684	-67	-9%	2.51	Yes
M1 J7 to J9	NB	Validation	4727	4920	193	4%	2.78	Yes
A1081 Luton Road	EB	Validation	400	412	12	3%	0.59	Yes
A1081 St Albans Road	SB	Validation	457	617	159	35%	6.88	No
A1081 Harpenden Road	NB	Validation	468	558	89	19%	3.94	Yes
A414	EB	Validation	693	984	291	42%	10.04	No
A1081 Harpenden Road	SB	Validation	446	522	76	17%	3.47	Yes
A414	WB	Validation	1381	1659	278	20%	7.13	No
A414	EB	Validation	1366	1591	225	16%	5.85	No
A1081 London Road	SB	Validation	632	1073	441	70%	15.1	No
M1 J9 to J7	SB	Validation	4561	4630	69	2%	1.02	Yes

Location	Direction	Calibration /Validation	Total Observed	Total Modelled	Difference (Modelled - Observed)	% Difference	GEH	Meet TAG Criteria
A1081 London Road	NB	Validation	697	698	0	0%	0.01	Yes
A1081 Luton Road	WB	Validation	368	582	214	58%	9.82	No
A414 - Breakspear Way	WB	Validation	1277	1549	272	21%	7.23	No
A1(M) Oldings Corner	SB	Validation	2458	2410	-48	-2%	0.97	Yes

Table A3: Individual Link Flow Calibration and Validation – PM

Location	Direction	Calibration /Validation	Total Observed	Total Modelled	Difference (Modelled - Observed)	% Difference	GEH	Meet TAG Criteria
A41 Tring	NB	Calibration	1427	1440	13	1%	0.35	Yes
A41	NWB	Calibration	2008	1879	-129	-6%	2.92	Yes
A41 Tring	SB	Calibration	984	756	-228	-23%	7.74	No
A41	WB	Calibration	2364	2207	-157	-7%	3.29	Yes
A41	SEB	Calibration	453	545	93	21%	4.16	Yes
Two Waters Rd	NB	Calibration	977	902	-74	-8%	2.42	Yes
A414 St Albans Road	WB	Calibration	1476	1516	40	3%	1.04	Yes
A414 St Albans Road	EB	Calibration	1280	1208	-72	-6%	2.05	Yes
A41 Kings Langley	NB	Calibration	2393	2192	-202	-8%	4.21	Yes
M1 J9 to J10	NB	Calibration	6494	6451	-43	-1%	0.54	Yes
M1 J10 to J9	SB	Calibration	5529	5376	-153	-3%	2.07	Yes
A41 Kings Langley	SB	Calibration	1488	1554	66	4%	1.69	Yes
A41	EB	Calibration	1464	1508	44	3%	1.13	Yes
Two Waters Rd	SB	Calibration	1232	1246	14	1%	0.40	Yes
A1081 London Road	WB	Calibration	547	534	-13	-2%	0.55	Yes
A1081 St Albans Road	NB	Calibration	735	826	91	12%	3.26	Yes
A1081 St Albans Road	SB	Calibration	766	973	206	27%	6.99	No
Harpenden Road	NB	Calibration	439	271	-168	-38%	8.92	No
Harpenden Road	SB	Calibration	336	344	8	2%	0.44	Yes
Harpenden Road	NB	Calibration	560	410	-150	-27%	6.83	No
Harpenden Road	SB	Calibration	430	451	21	5%	0.98	Yes
A1081 London Road	WB	Calibration	640	569	-71	-11%	2.88	Yes
A1081 London Road	EB	Calibration	491	536	45	9%	1.98	Yes
A1081 London Road	NWB	Calibration	962	973	11	1%	0.34	Yes
A414	WB	Calibration	1971	2022	51	3%	1.14	Yes
M1 J7 to J6A	SB	Calibration	5740	5660	-80	-1%	1.06	Yes
M1 J6A to J7	NB	Calibration	6830	6840	10	0%	0.12	Yes

Location	Direction	Calibration /Validation	Total Observed	Total Modelled	Difference (Modelled - Observed)	% Difference	GEH	Meet TAG Criteria
A1081 London Road	SEB	Calibration	917	911	-6	-1%	0.21	Yes
A1081 London Road	EB	Calibration	745	717	-28	-4%	1.03	Yes
A1081 Luton Road	SB	Calibration	572	556	-16	-3%	0.69	Yes
A1081 Luton Road	NB	Calibration	776	758	-18	-2%	0.64	Yes
A414	EB	Calibration	1835	1705	-130	-7%	3.09	Yes
A1(M) Hatfield Tunnel	SB	Calibration	3762	3796	34	1%	0.56	Yes
A414 St Albans Road between Lower Yott and Wood Lane	WB	Validation	1355	1198	-157	-12%	4.39	Yes
A414 St Albans Road	EB	Validation	1534	1083	-451	-29%	12.46	No
A414 St Albans Road	SWB	Validation	1591	1260	-331	-21%	8.77	No
A414 St Albans Road	NEB	Validation	1277	742	-535	-42%	16.83	No
A414 St Albans Road	WB	Validation	1502	1274	-228	-15%	6.11	No
A414 St Albans Road	EB	Validation	1681	660	-1021	-61%	29.83	No
A414	SB	Validation	1211	1290	80	7%	2.25	Yes
A414 St Albans Road between Lower Yott and Wood Lane	EB	Validation	1347	693	-654	-49%	20.47	No
A414 St Albans Road	WB	Validation	1631	1171	-460	-28%	12.28	No
A414	NB	Validation	1345	1233	-112	-8%	3.13	Yes
A405 North Orbital Road	NEB	Validation	1724	1558	-166	-10%	4.10	Yes
A1081 Harpenden Road	SB	Validation	547	732	186	34%	7.34	No
A1081 Harpenden Road	NB	Validation	709	622	-87	-12%	3.36	Yes
A405 North Orbital Road	SWB	Validation	1624	1799	175	11%	4.23	Yes
A1081 St Albans Road	NB	Validation	673	739	67	10%	2.51	Yes
A414 Breakspear Way	EB	Validation	2056	2296	239	12%	5.13	Yes
A414	WB	Validation	1239	1009	-230	-19%	6.86	No
M1 J7 to J9	NB	Validation	6120	6608	487	8%	6.11	No
A1081 Luton Road	EB	Validation	624	466	-158	-25%	6.78	No
A1081 St Albans Road	SB	Validation	502	826	325	65%	12.59	No
A1081 Harpenden Road	NB	Validation	739	672	-67	-9%	2.53	Yes
A414	EB	Validation	1106	1129	23	2%	0.68	Yes
A1081 Harpenden Road	SB	Validation	538	651	113	21%	4.65	Yes

Location	Direction	Calibration /Validation	Total Observed	Total Modelled	Difference (Modelled - Observed)	% Difference	GEH	Meet TAG Criteria
A414	WB	Validation	2057	2697	640	31%	13.13	No
A414	EB	Validation	1760	1965	205	12%	4.75	Yes
A1081 London Road	SB	Validation	945	1001	56	6%	1.79	Yes
M1 J9 to J7	SB	Validation	5707	5651	-57	-1%	0.75	Yes
A1081 London Road	NB	Validation	1010	948	-63	-6%	2.01	Yes
A1081 Luton Road	WB	Validation	543	923	381	70%	14.06	No
A414 - Breakspear Way	WB	Validation	1794	2398	604	34%	13.19	No
A1(M) Oldings Corner	SB	Validation	3762	3796	34	1%	0.56	Yes

Appendix D

SRN Base Year Model Review Addendum

Confidential

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	Strategic Road Network – St Albans and Dacorum District	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

1 INTRODUCTION

WSP has been commissioned to undertake a Strategic Road Network (SRN) review for National Highways (NH) for St Albans District Council (SADC) and Dacorum District. Hertfordshire County Council's (HCC) transport model COMET was used for this work, which has a 2014 base year model.

WSP undertook a review of the 2014 base year model in the St Albans District (SAD) and Dacorum District to understand the performance of the COMET model on the SRN (M1, M25, A1(M)), roads approaching the SRN (such as A414 Breakspear Way) and major road network (such as A41, A414, A405 and A1081) within these two districts and presented their findings in a technical note[1] .

Based on the findings from the Base year SRN review, WSP undertook network and matrix improvements and this note is an addendum to the SRN note, presenting the results of the improvements made to the 2014 Base year in St Albans and Dacorum district on the SRN network.

In addition to that, on the request of National Highways, the performance of the model flows against the WebTRIS sites on M25 which lie just outside the St Albans and Dacorum District boundary is also included in this addendum.

2 MODEL IMPROVEMENTS

Following the Strategic Road Network (SRN) review for National Highways (NH) for SADC and Dacorum District, preliminary network investigations and checks were carried out where the GEH is over 10 near the SADC Regulation 18 development site allocations. Based on those checks, changes to the network coding were identified to improve the network. These changes were applied to the model in all time periods and the results showed very minor improvements. As the improvements were very small, matrix estimation was re-run in an attempt to further improve the network, prioritising the counts in SADC in the matrix estimation process. It should be noted that the network changes were made to local roads and not to any SRN links or any other links assessed in the SRN review e.g. roads approaching SRN.

Table 1 presents the summary of the network changes identified as part of the network investigations. It is to be noted that these changes have been carried out in all three peak time periods (AM, IP and PM).

[1] 240409 COMET 2014 Base Year Model Review-SRN_FINAL

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	Strategic Road Network – St Albans and Dacorum District	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

Table 1: Network Coding Improvements

Link	Road Name	Time Period	Observed Flow	Modelled Flow	GEH	Action
6263-6288	Punchbowl Lane	AM	5	190	18.75	Reduce speed to 10/20mph. Keep the SFC as same.
6319-6101	B652 Bower Heath Lane		63	306	17.92	Reduce the speed to 10/20mph
6101-6319	B652 Bower Heath Lane		106	249	10.79	Reduce the speed to 10/20mph
6082-6350	A1081 Harpenden Road		433	701	11.27	The road currently modelled as 72kph should be 64kph/ 40mph road and Capacity Index should be 36.
6231-6414	B5378 Shenley Lane		571	896	12.02	The road currently modelled as 72kph should be 64kph/ 40mph road and Capacity Index should be 36.
6101-6319	B652 Bower Heath Lane	IP	26	149	13.18	Reduce speed to 10/20mph. Keep the SFC as same.
6414-6231	B5378 Shenley Lane		254	481	11.79	The road currently modelled as 72kph should be 64kph/ 40mph road and Capacity Index should be 36.
6231-6414	B5378 Shenley Lane		244	487	12.74	The road currently modelled as 72kph should be 64kph/ 40mph road and Capacity Index should be 36.
6229-6252	Barnet Road		304	148	10.39	The road currently modelled as 40kph should be 48kph/ 30mph road.
6231-6414	B5378 Shenley Lane	PM	398	737	14.21	The road currently modelled as 72kph should be 64kph/ 40mph road and Capacity Index should be 36.
6319-6101	B652 Bower Heath Lane		85	265	13.65	Reduce speed to 10/20mph. Keep the SFC as same.
6101-6319	B652 Bower Heath Lane		21	229	18.55	Reduce speed to 10/20mph. Keep the SFC as same.

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	Strategic Road Network – St Albans and Dacorum District	**AUTHOR:**	Bipin Muley
CHECKED:	Shaista Farooq	**APPROVED:**	Christine Elphicke

Link	Road Name	Time Period	Observed Flow	Modelled Flow	GEH	Action
6101-5397	B652 Kimpton Btm		82	214	10.83	Reduce speed to 10/20mph. Keep the SFC as same.
5397-6101	B652 Kimpton Btm		36	159	12.41	Reduce speed to 10/20mph. Keep the SFC as same.

RESULTS

As per the TAG unit M3.1 (Section 3.3.11), the validation criteria and guidelines for link flows are defined in Table 2.

Table 2: Link Flow Validation Criteria and Acceptability Guideline

Criteria	Description of 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	
	Individual flows within 400 veh/h of counts for flows more than 2,700 veh/h	
2	GEH < 5 for individual flows	> 85% of cases

The network coding and matrix improvement were carried out in the 2014 base year COMET 7 model. To test the impact of the changes three scenarios were compared:

1. COMET 7 – Original model
2. COMET 7 (Revised) – original model revised with the network coding improvements
3. COMET 7 (Revised 2) – original model with network coding and matrix improvements

Table 3 presents the summary of the link performance for all the counts as per TAG criteria, noting that "All Roads" in the table are SRN (M1, M25, A1(M)), roads approaching the SRN (such as A414 Breakspear Way) and major road network (such as A41, A414, A405 and A1081). The values color-coded with green are close to/meeting the TAG criteria while the amber and red color-coded indicate values not meeting/far away from TAG criteria respectively.

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
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Table 3: Link Performance of St Albans and Dacorum District – All Counts (TAG Criteria)

Road Type	Period	COMET 7				COMET 7 (Revised)				COMET 7 (Revised 2)			
		Total	Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Cars	LGV	HGV
All Roads	AM	64%	63%	95%	98%	66%	64%	95%	98%	69%	63%	95%	97%
	IP	77%	77%	98%	91%	78%	78%	98%	98%	80%	78%	98%	97%
	PM	70%	70%	97%	98%	72%	70%	97%	98%	72%	70%	97%	98%
SRN Roads only	AM	88%	88%	100%	88%	88%	88%	100%	88%	88%	88%	100%	88%
	IP	100%	100%	100%	88%	100%	100%	100%	88%	100%	100%	100%	100%
	PM	88%	100%	88%	88%	88%	100%	88%	88%	88%	100%	88%	88%

It is observed that there is a slight improvement in the calibration and validation of the counts with network coding and matrix improvements. However, as expected, the SRN roads only show the same overall results for each time period (AM, IP and PM).

A comparison of the GEH values for each of the above 3 scenarios was also carried out for the SADC and Dacorum Districts in each time period**.** Figure 1 to Figure 9 presents these.

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
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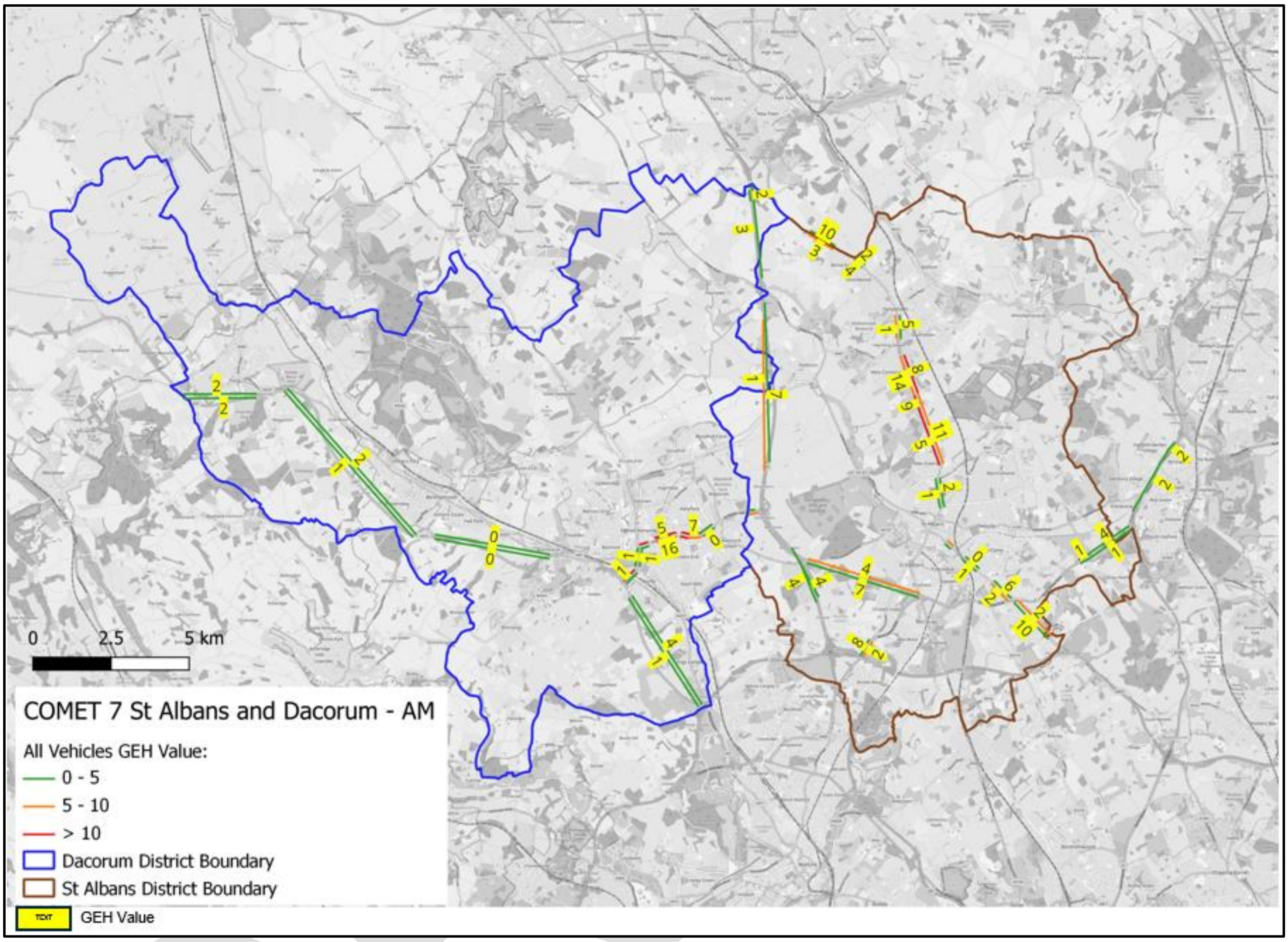

Figure 1: AM Peak Base Year Count Performance within SAD and Dacorum District – Original Model

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
SUBJECT:	COMET 2014 Base Year Model Review		
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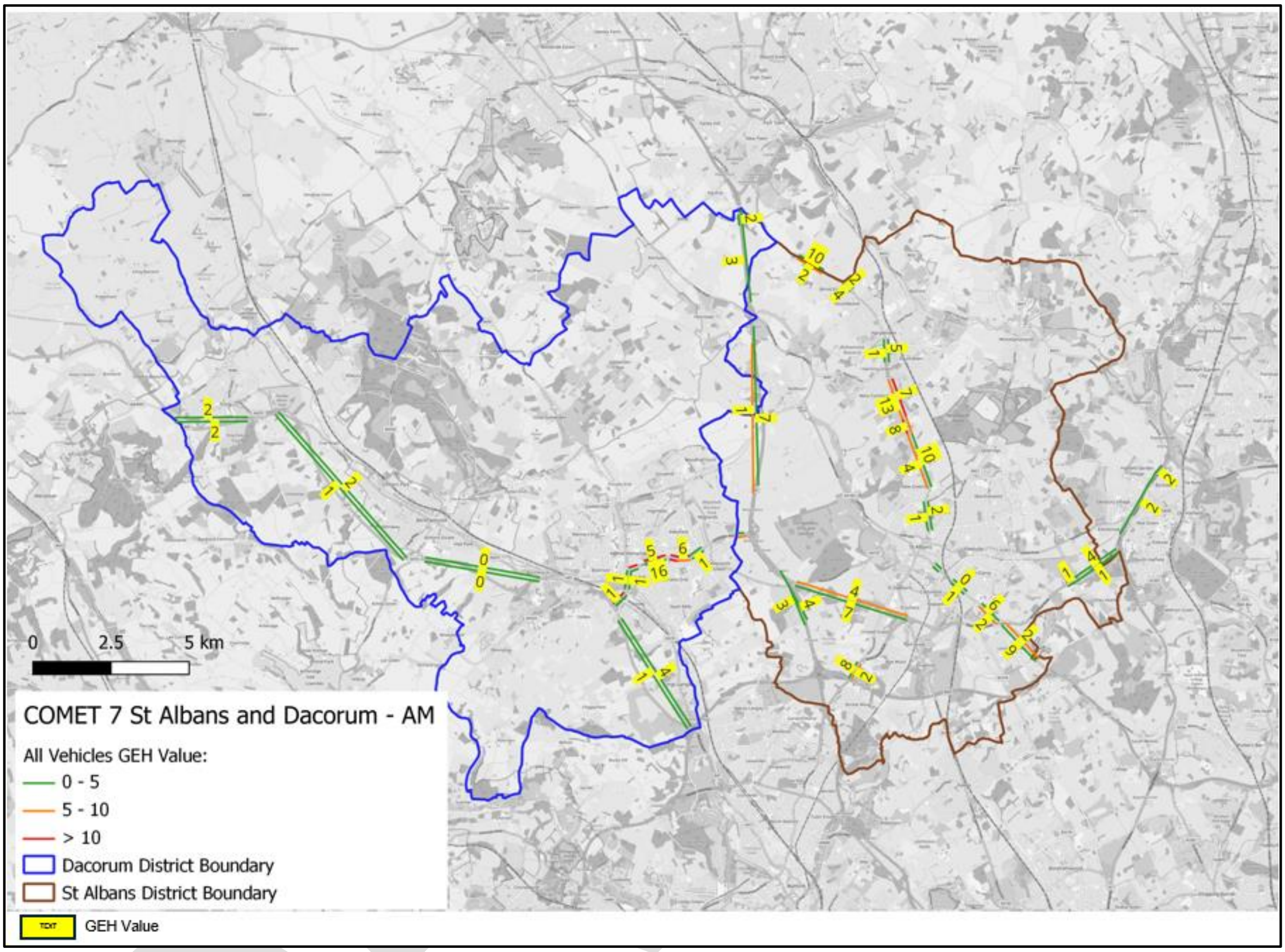

Figure 2: AM Peak Base Year Count Performance within SAD and Dacorum District – With Network Improvements

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
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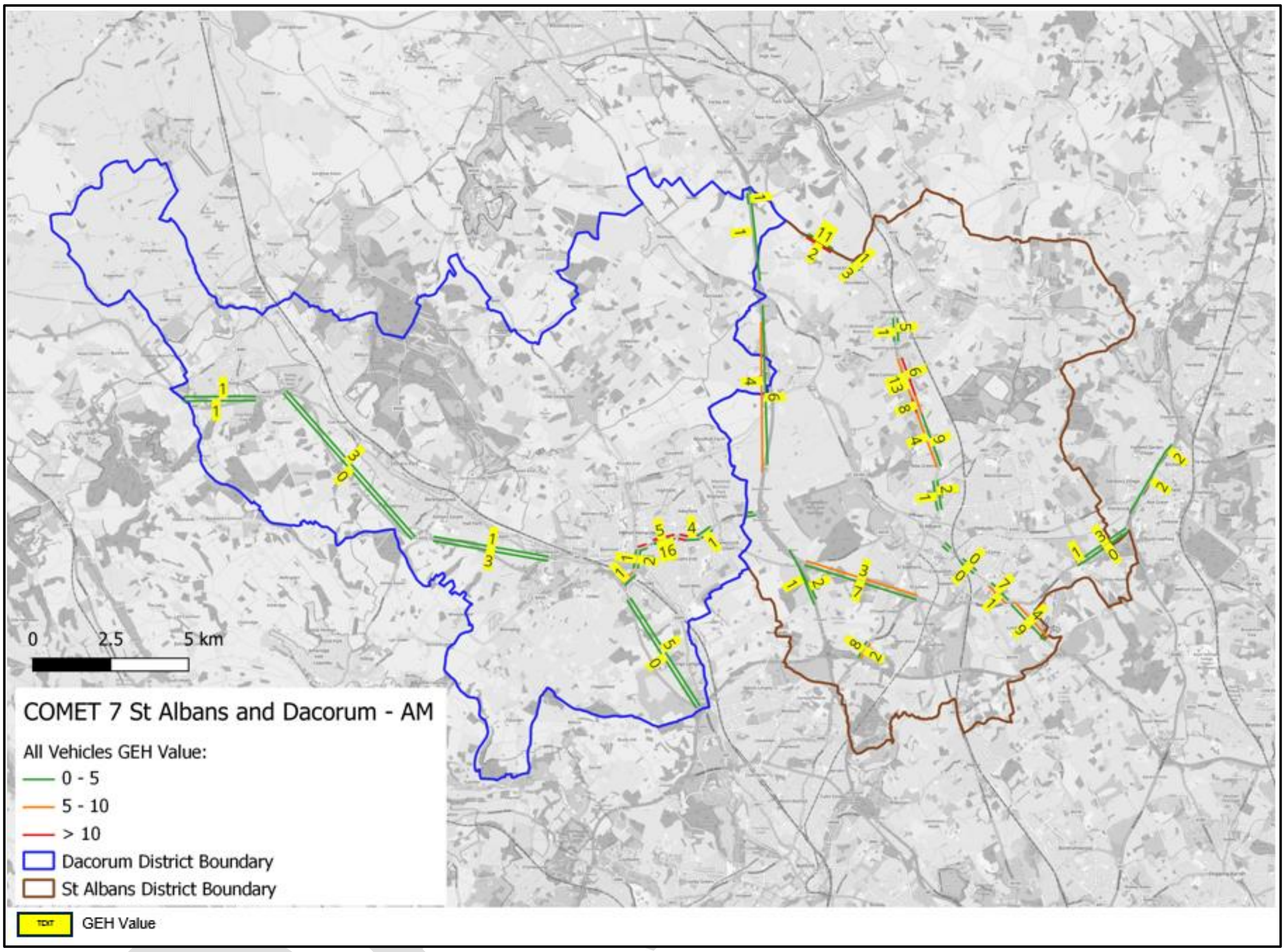

Figure 3: AM Peak Base Year Count Performance within SAD and Dacorum District – With Network and Matrix Improvements

TECHNICAL NOTE – ADDENDUM

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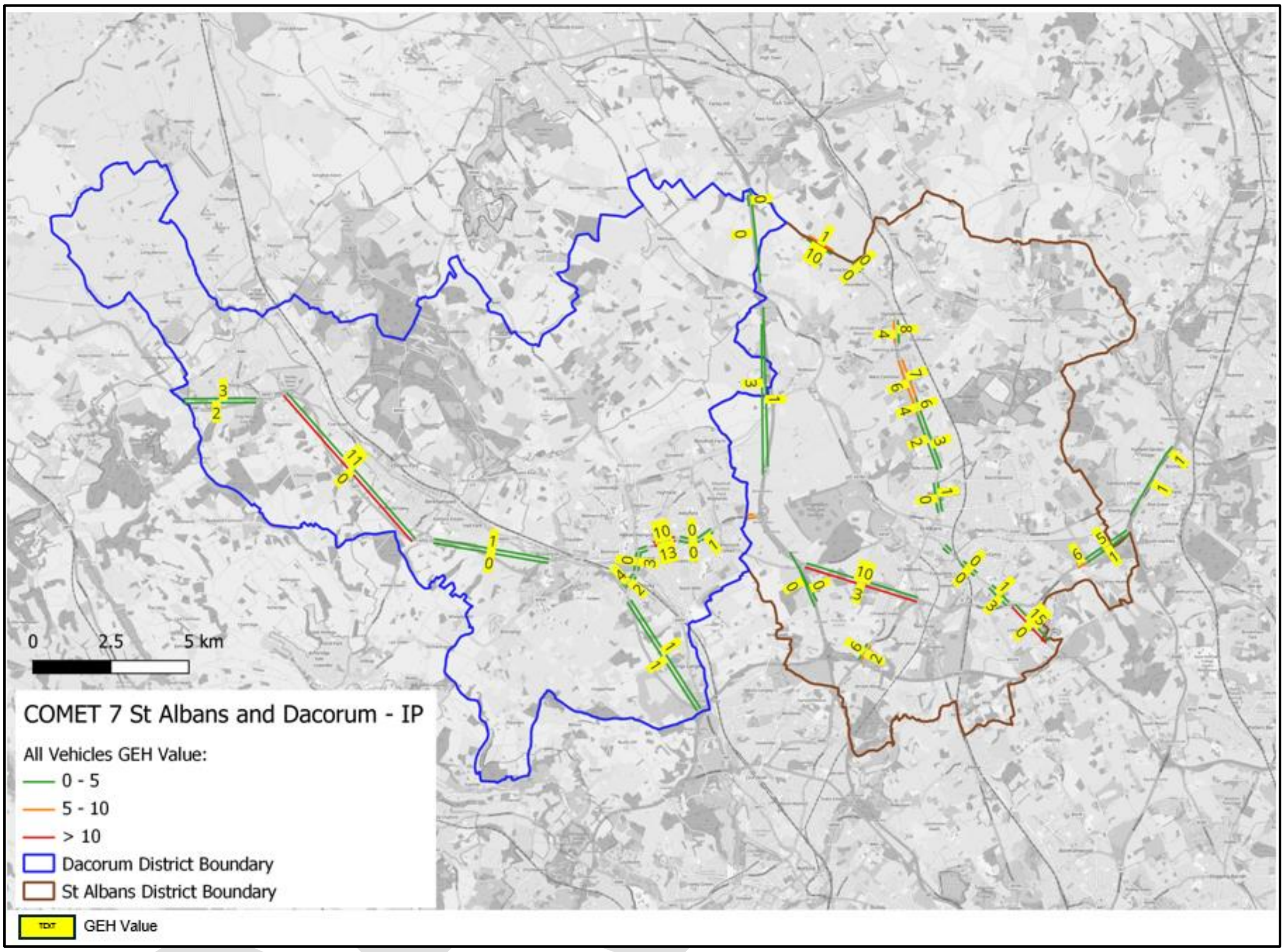

Figure 4: Inter-Peak Base Year Count Performance within SAD and Dacorum District – Original Model

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
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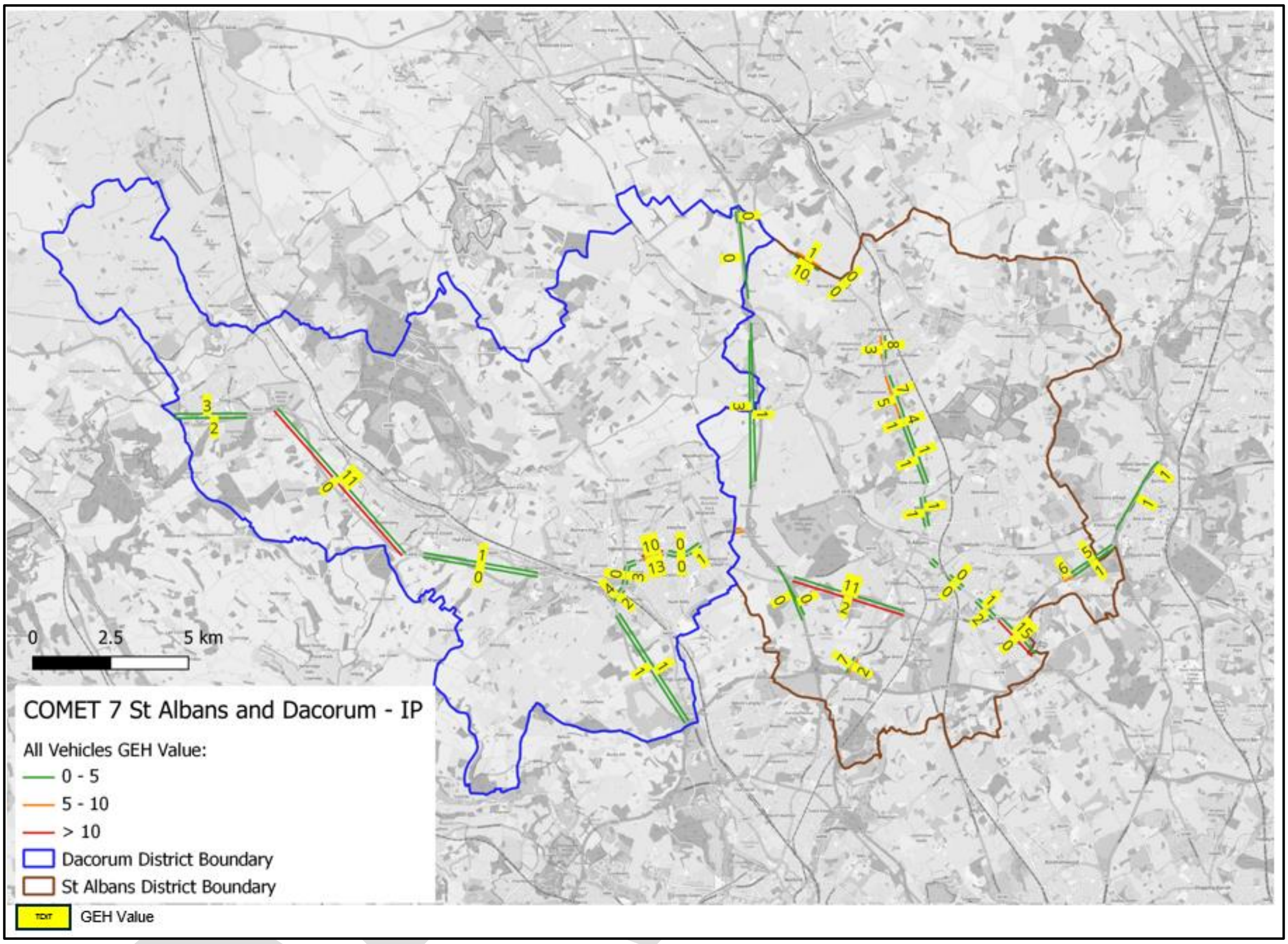

Figure 5: Inter-Peak Base Year Count Performance within SAD and Dacorum District – With Network Improvements

TECHNICAL NOTE – ADDENDUM

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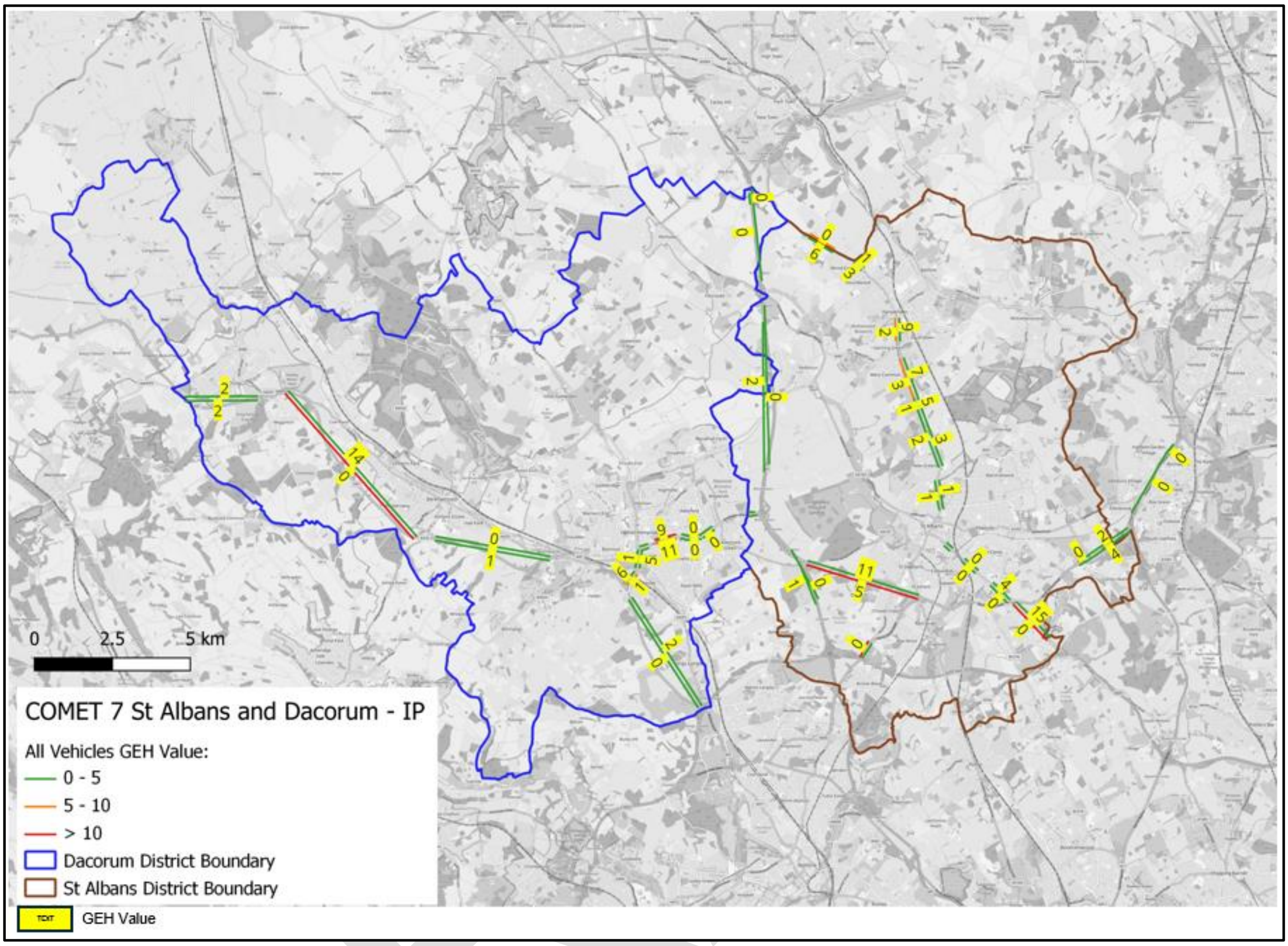

Figure 6: Inter-Peak Base Year Count Performance within SAD and Dacorum District – With Network and Matrix Improvements

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
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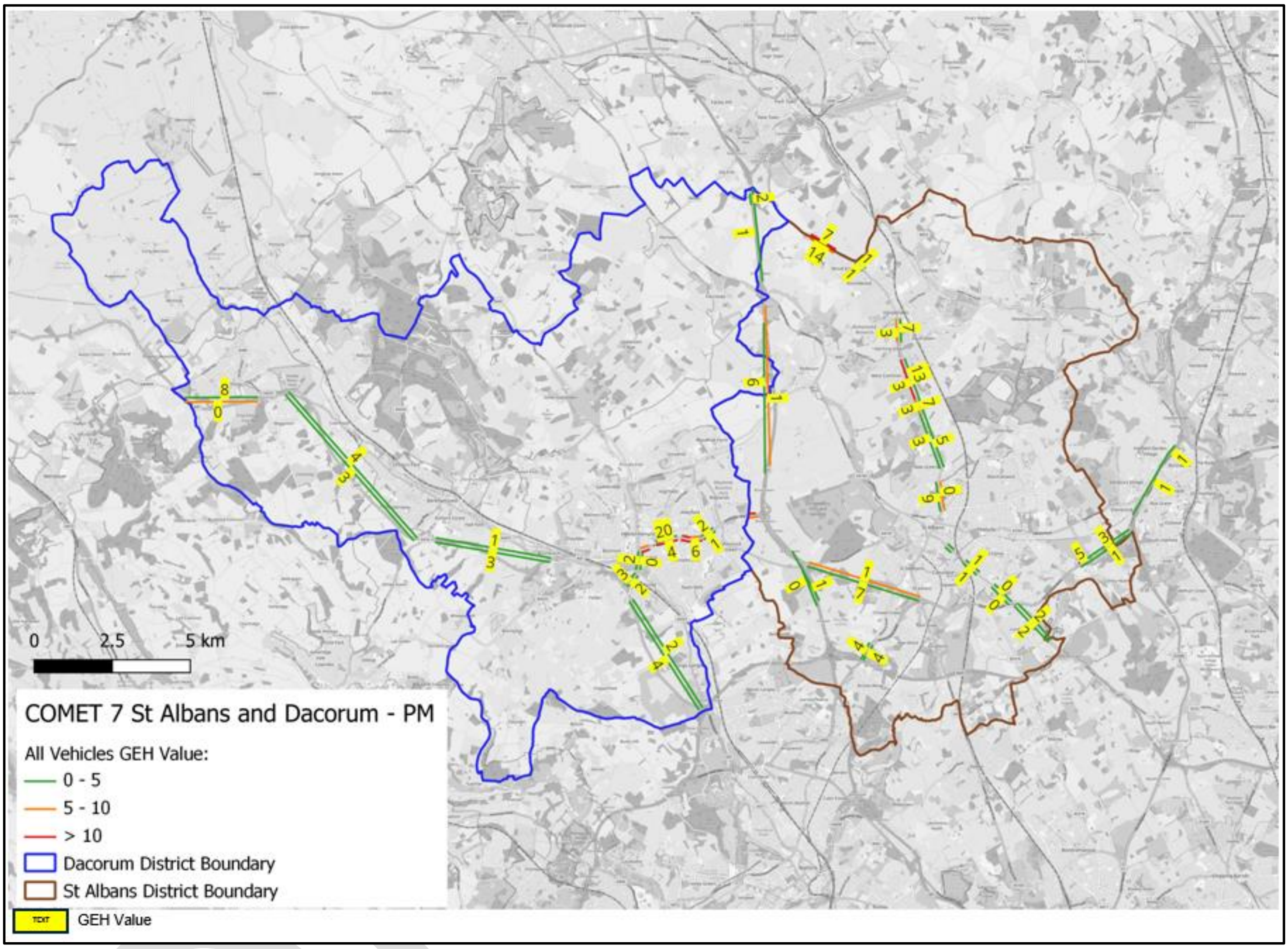

Figure 7: PM Peak Base Year Count Performance within SAD and Dacorum District – Original Model

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
SUBJECT:	COMET 2014 Base Year Model Review		
PROJECT:	Strategic Road Network – St Albans and Dacorum District	**AUTHOR:**	Bipin Muley
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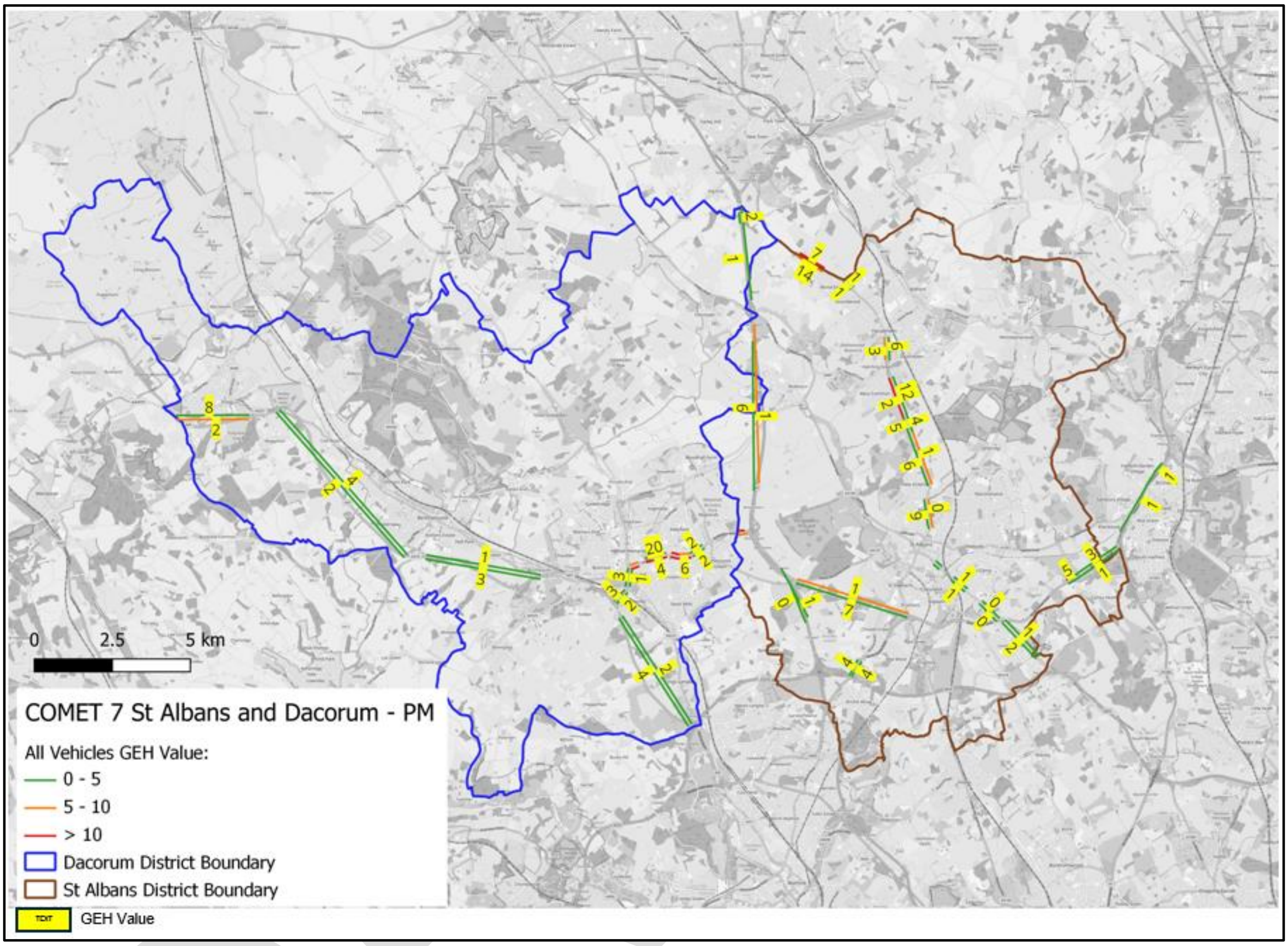

Figure 8: PM Peak Base Year Count Performance within SAD and Dacorum District – With Network Improvements

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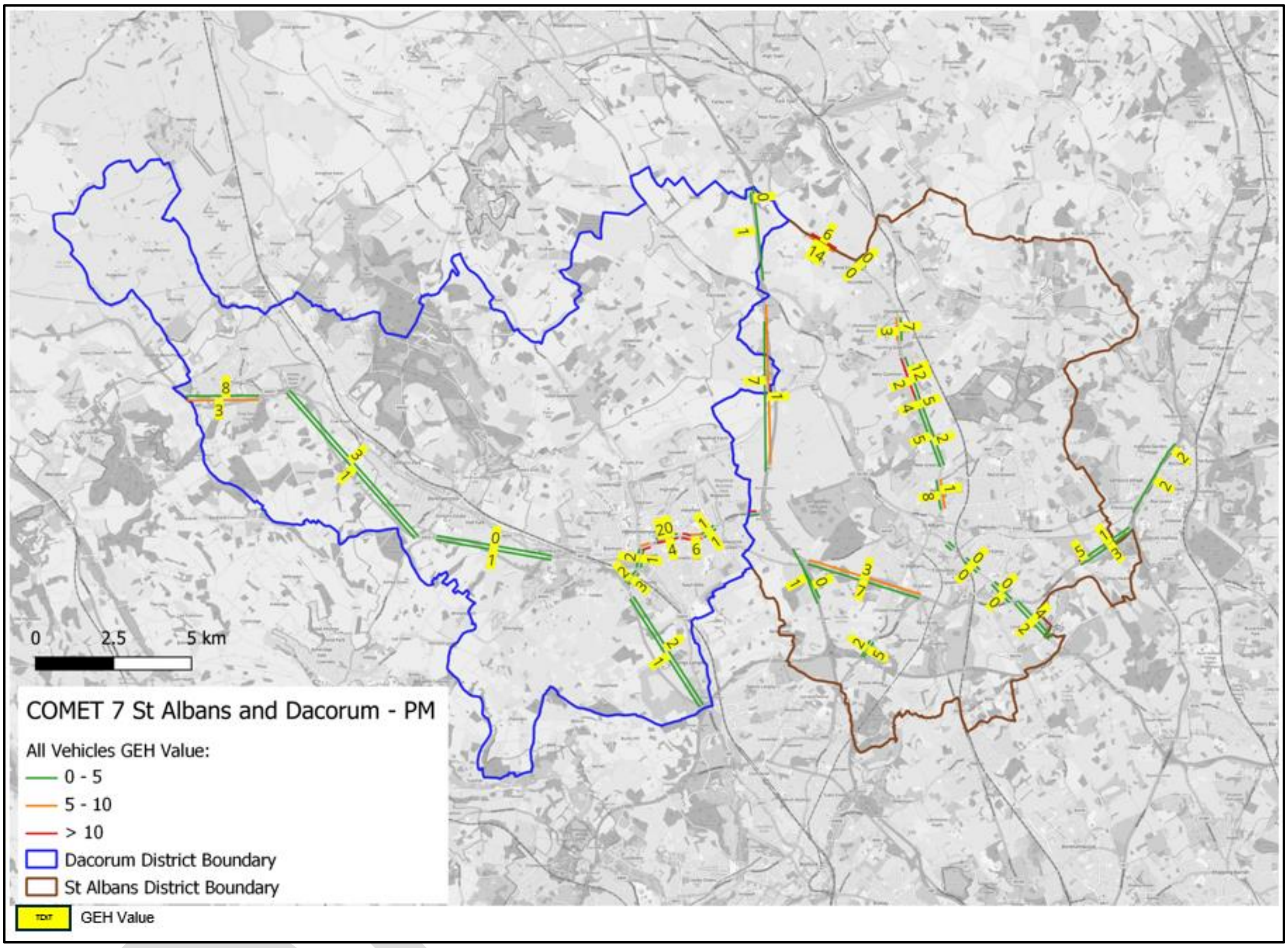

Figure 9: PM Peak Base Year Count Performance within SAD and Dacorum District – With Network and Matrix Improvements

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
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M25 COUNT PERFORMANCE

In addition to the above analysis, the WebTRIS sites on M25 which lie just outside the SADC and Dacorum District boundary were checked for their performance. A total of 8 counts were identified and 2014 counts were extracted. Figure 10 presents the location of the sites on M25.

Figure 10: Location of M25 WebTRIS sites near SADC

Table 4 presents the traffic count performance of the M25 near the SADC boundary.

Table 4 Link Performance of M25 counts near SADC boundary – All Counts (TAG Criteria)

Road Type	Period	COMET 7	COMET 7 (Network improvements)	COMET 7 (network & matrix improvements)
		Total	Total	Total
M25 near SADC	AM	38%	38%	75%
	IP	75%	75%	75%
	PM	50%	50%	63%

It is observed that the performance of M25 links in the original COMET 7 model near SADC is not very satisfactory, especially in the AM and PM peaks. The performance of M25 links near SADC in the COMET 7 with network coding improvements also does not have any changes as the network changes carried out were

TECHNICAL NOTE – ADDENDUM

DATE:	01 July 2024	**CONFIDENTIALITY:**	Confidential
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on minor roads near the Regulation 18 allocation sites. However, the performance of the M25 links improved when matrix estimation was run (prioritising counts in SADC) with the network improvements (from 38% to 75%), especially in the AM peak, in comparison to the original COMET 7 base year model.

The individual link count performance of the original COMET 7 model and COMET 7 model with network and matrix improvements for the counts on the M25 near the SADC boundary is presented in Table 5 to Table 7 for AM, IP and PM peaks respectively. The values color-coded with green are close to/meeting the TAG criteria while the amber and red color-coded indicate values not meeting/far away from TAG criteria respectively.

TECHNICAL NOTE – ADDENDUM

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Table 5: Link Performance of counts on M25 near SADC boundary – AM

Location	Description	Direction	Total Observed	COMET 7					COMET 7 with network and matrix improvements				
				Total Modelled	Difference (Modelled – Observed)	% Difference	GEH	Meet TAG Criteria	Total Modelled	Difference (Modelled - Observed)	% Difference	GEH	Meet TAG Criteria
5312A	Junction 22-23	Clockwise	5239	4850	390	7%	5.5	Yes	5123	116	2%	1.6	Yes
5312B	Junction 23-22	Anti-Clockwise	4316	3874	442	10%	6.9	No	4263	53	1%	0.8	Yes
5271A	Junction 21A-22	Clockwise	5485	4472	1013	18%	14.4	No	4645	840	15%	11.8	No
5271B	Junction 22-21A	Anti-clockwise	4381	3592	789	18%	12.5	No	4007	374	9%	5.8	Yes
5232A	Junction 21-21A	Clockwise	3095	2944	152	5%	2.8	Yes	3108	-13	0%	0.2	Yes
5231B	Junction 21A-21	Anti-Clockwise	2336	2061	274	12%	5.9	Yes	2297	39	2%	0.8	Yes
5207A	Junction 20-21	Clockwise	5772	5103	669	12%	9.1	No	5528	244	4%	3.3	Yes
5206B	Junction 21-20	Anti-Clockwise	4427	3555	872	20%	13.8	No	3722	705	16%	11.0	No

TECHNICAL NOTE – ADDENDUM

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Table 6: Link Performance of counts on M25 near SADC boundary – IP

Location	Description	Direction	Total Observed	COMET 7					COMET 7 with network and matrix improvements				
				Total Modelled	Difference (Modelled – Observed)	% Difference	GEH	Meet TAG Criteria	Total Modelled	Difference (Modelled - Observed)	% Difference	GEH	Meet TAG Criteria
5312A	Junction 22-23	Clockwise	4155	4078	77	2%	1.2	Yes	3977	178	4%	2.8	Yes
5312B	Junction 23-22	Anti-Clockwise	4024	3965	59	1%	0.9	Yes	3903	121	3%	1.9	Yes
5271A	Junction 21A-22	Clockwise	4104	3098	1006	25%	16.8	No	3596	508	12%	8.2	No
5271B	Junction 22-21A	Anti-clockwise	3902	3328	574	15%	9.6	No	3594	308	8%	5.0	Yes
5232A	Junction 21-21A	Clockwise	2427	2542	-115	-5%	2.3	Yes	2876	-449	-18%	8.7	No
5231B	Junction 21A-21	Anti-Clockwise	2174	1909	265	12%	5.9	Yes	2144	30	1%	0.6	Yes
5207A	Junction 20-21	Clockwise	5033	4954	79	2%	1.1	Yes	5029	4	0%	0.1	Yes
5206B	Junction 21-20	Anti-Clockwise	4567	4240	328	7%	4.9	Yes	4167	400	9%	6.1	Yes

TECHNICAL NOTE – ADDENDUM

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Table 7: Link Performance of counts on M25 near SADC boundary – PM

Location	Description	Direction	Total Observed	COMET 7					COMET 7 with network and matrix improvements				
				Total Modelled	Difference (Modelled – Observed)	% Difference	GEH	Meet TAG Criteria	Total Modelled	Difference (Modelled - Observed)	% Difference	GEH	Meet TAG Criteria
5312A	Junction 22-23	Clockwise	5040	4736	304	6%	4.4	Yes	5083	-43	-1%	0.6	Yes
5312B	Junction 23-22	Anti-Clockwise	4838	4610	228	5%	3.3	Yes	4818	20	0%	0.3	Yes
5271A	Junction 21A-22	Clockwise	5193	4159	1034	20%	15.1	No	4426	766	15%	11.1	No
5271B	Junction 22-21A	Anti-clockwise	5036	3762	1274	25%	19.2	No	3980	1056	21%	15.7	No
5232A	Junction 21-21A	Clockwise	3170	3528	-357	-11%	6.2	Yes	3508	-338	-11%	5.9	Yes
5231B	Junction 21A-21	Anti-Clockwise	2900	2528	372	13%	7.1	Yes	2770	129	4%	2.4	Yes
5207A	Junction 20-21	Clockwise	6080	5636	444	7%	5.8	No	5756	325	5%	4.2	Yes
5206B	Junction 21-20	Anti-Clockwise	5721	4949	773	14%	10.6	No	5229	493	9%	6.7	No

Appendix E

Option 0 Sites with Development Zones

Confidential

Zone Number	Planning Reference	Site Name	District	Number of dwellings	Number of jobs
9009	07/18/0461/O	Land at Delamare Road, Cheshunt	Broxbourne	1303	
9018	4/02539/16/MOA	SPENCERS PARK PHASE 2, LAND BETWEEN, THREE CHERRY TREES LANE AND CHERRY TREE LANE,, HEMEL HEMPSTEAD	Dacorum	357	
9024	17/00862/OPM	Land to N of Stevenage, Weston Road, Stevenage, SG1 4DE	Stevenage	557	
9030	6/2018/0171/MAJ	Former Shredded Wheat Factory, Welwyn Garden City, AL8 6UN	Welwyn Hatfield	1454	
9034	4/03266/18/MFA	LA3, Land At West Hemel Hempstead, Hemel Hempstead	Dacorum	1145	
9044	3/15/0300/OUT	Former Sainsburys Distribution Depot, London Road, Buntingford, SG9 9JR	East Hertfordshire	316	
9045	3/13/0804/OP	Land At Bishops Stortford North, Bishops Stortford	East Hertfordshire	1606	
9046	3/17/2588/OUT	Bishops Stortford Goods Yard, Station Road, Bishops Stortford, CM23 3BL	East Hertfordshire	617	
9049	EOS1	East of Gresley Way, Stevenage	East Hertfordshire	453	
9063	5/22/0927	Land South of Chiswell Green Lane	St Albans	391	67

9064	5/2013/2589	Oaklands College, Smallford Campus, St Albans, AL4 0JA	St Albans	385	
9065	14/00559/OPM	Matalan Retail Park, Danestrete, Stevenage, SG1 1XB	Stevenage	526	
9078	17/01511/FULM	Land To The South Of, Thomas Sawyer Way, Comprising The Waterside Area And Forming Part Of The Watford Riverwell Development (formerly Known , Watford	Watford	407	
9079	18/00703/NONMAT	Land To The East Of, Ascot Road, Watford	Watford	486	
9082	MU05	Land and Buildings at 94-98 St. Albans Road	Watford	1265	
9087	6/2018/0873/OUTLINE	Land to North East of Welwyn Garden City Panshanger Welwyn Garden City AL7 2QJ	Welwyn Hatfield	656	
9098	6/2015/2043/OUTLINE	Plots 4100, 5000, 5600, 6000,, Hatfield Business Park, Hatfield, AL10 9UH	Welwyn Hatfield		825
9100	PP1	Park Plaza West - Release of Green Belt Land to meet medium and long term employment needs	Broxbourne		4000
9104	CH1b	Delamare Road/Cheshunt Lakeside	Broxbourne		1152
9105	3/13/0804/OP	Land At Bishops Stortford North, Bishops Stortford	East Hertfordshire		1000

9110	5/2016/3006	Proposed Rail Freight, North Orbital Road, Chiswell Green	St Albans		4095
9112	07/00810/OP	Town Centre, Stevenage	Stevenage		2917
9113	20/00726/NMA	Airbus Defence And Space, Gunnels Wood Road, Stevenage, SG1 2DB	Stevenage		1127
9115	18/00935/FULM	Gresham House 53, Clarendon Road, Watford, WD17 1LA	Watford		830
9116	16/00076/VAR	Charter Place, Watford, WD17 2RN	Watford		2687
9118	17/00558/FULM	Land at 64 &, 73-77 Clarendon Road, Watford, WD17 1DS	Watford		2451
9119	21/00934/VARM	Hanny House, 37 And 39 Clarendon Road, Watford, WD17 1JA	Watford		1276
9123	MFW	Maxwells Farm West & Rush Meadow (500 new jobs)	Broxbourne		500
9126	4/00064/17/MFA	MAYLANDS GATEWAY, MAYLANDS AVENUE, HEMEL HEMPSTEAD, HP2 4FQ	Dacorum		504
9127	4/03355/14/MFA	LIBRARY AND ADJACENT LAND, COMBE STREET, HEMEL HEMPSTEAD	Dacorum		644
9136	5/2016/0264	St Albans Retail Park, Griffiths Way, St Albans, AL1 2RJ	St Albans		631
9141	15/1427/FUL	Building 1 & 2, Marlins Meadow, Watford	Three Rivers		724

9146	07/17/0352/O	Land North and South of Andrew's Lane and, South of Peakes Way, Cheshunt, EN7 6SP	Broxbourne	366	
9150	19/00474/FPM	Land To The West Of, Lytton Way, Stevenage, SG1 1AG	Stevenage	576	
9151	19/2133/FUL	Demolition of existing buildings and provision of 345 residential units (Use Class C3) in 2 buildings ranging from 3-7 storeys including a 1 and 2 storey podium; 621sqm of flexible commercial floor space (Use Class A1-A5, B1, D1/D2); 1,754sqm retail floorspace (Use Class A1) podium and surface level car and cycle parking; landscaping; and associated works.	Three Rivers	345	
9159	07/22/0287/F	Theobalds Park Farm, Great Cambridge Road, Goffs Oak, EN8 8EU	Broxbourne		2653
9161	6/2021/2125/MAJ	Hertfordshire Constabulary, Stanborough Road, Weleyn Garden City, AL8 6XF	Welwyn Hatfield		1317
9162	18/00416/FPM	Bank House, Primett Road, Stevenage, SG1 3EE	Stevenage		1055
9163	21/04352/MFA	Unit 4 The Hub, Paradise, Hemel Hempstead, HP2 4TF	Dacorum		718
9166	5/2020/1773	Civic Centre Opportunity Site	St Albans		620

		(South), Victoria Street, St Albans			
9167	12/0646/FUL	Unit B Imagination Technologies, Home Park Industrial Estate, Station Road, Kings Langley, Kings Langley, WD4 8LZ	Three Rivers		501
9168	6/2019/1411/MAJ	Plot 5100, Mosquito Way, Hatfield Business Park, Hatfield, AL10 9WN	Welwyn Hatfield		655
9171	07/18/1181/O	Outline application for construction of a high-tech employment development in a parkland setting together with associated infrastructure comprising: 1) A data centre facility (upto 65,000 sq.m) and associated ancillary plant storage and office space 2) Business space (upto 36,400 sq.m) reserved for B1/B2/B8 use 3) Open space, landscaping and flood mitigation 4) Associated vehicular access from the A10 (Great Cambridge Road) and Lieutenant Ellis Way 5) Electricity sub-station	Broxbourne		1371

Appendix F

Residential Development Sites included in Option 1

Reference	Address	Number of dwellings	Zone Number
H1	North Hemel Hempstead, AL3 7AU	1,250	9090
H2	East Hemel Hempstead (North), HP2 7HT	1,335	9008
H4	East Hemel Hempstead (South), HP2 4PA4	2,165	9007
B2	North East Harpenden, AL5 5EG	762	9061
B5	Glinwell, Hatfield Road, St Albans, AL4 0HE	436	9160
B7	North West of Harpenden, AL5 3NP	293	3603
B8	Harper Lane, north of Radlett, WD7 7HU	274	3608
B3	West Redbourn, Redbourn, AL3 7HZ	593	9164
B1	North St Albans, AL3 6DD	996	9026
B4	East St Albans, AL4 9JJ	522	9062
B6	West of London Colney, AL2 1LN	405	9027
L2	West of Watling Street, Park Street, AL2 2PZ	104	3518
L1	Burston Nurseries, North Orbital Road, St Albans, AL2 2DS	36	3517
P2	Land at North Orbital Road, AL2 1DL	64	3536
P1	Smallford Works, Smallford Lane, AL4 0SA	80	3609
M25	Baulk Close, Harpenden, AL5 4LY	8	3605
M16	Falconers Field, Harpenden, AL5 3ES	39	3593
M7	Townsend Lane, Harpenden, AL5 2RH	65	3590
M22	Wood End, Hatching Green, Harpenden, AL5 2JT	14	3584
M21	Rothamsted Lodge, Hatching Green, AL5 2GT	20	3589
M1a	Cross Lane, Harpenden, AL5 1BX	95	3583
M5	Sewage Treatment Works, Piggottshill Lane, Harpenden, AL5 5UN	70	3596

Reference	Address	Number of dwellings	Zone Number
M19	Piggottshill Lane, Harpenden, AL5 5UN	29	3596
M24	South of Codicote Road, Wheathampstead, AL4 8GD	12	3606
M2	Hill Dyke Road, Wheathampstead, AL4 8TR	85	3573
M26	Highway Chipping Depot, Lower Luton Road, AL4 8JJ	7	3606
M17	North of Wheathampstead Road, Harpenden, AL5 1AB	38	3588
M20	Lower Luton Road, Harpenden, AL5 5AF	25	3597
M4	North of Oakwood Road, Bricket Wood, AL2 3PT	74	3521
M15	Bucknalls Drive, Bricket Wood, AL2 3YT	44	3524
M1	East and West of Miriam Lane, Chiswell Green, AL2 3NY	98	3516
M3	Bedmond Lane, St Albans, AL3 4AH	78	3502
M23	Ashdale Lye Lane, Bricket Wood, AL2 3LQ	14	3523
M10	Tippendell Lane and Orchard Drive, How Wood, AL2 2HJ	51	3518
M27	Frogmore Vicarage, Frogmore, AL2 2JU	5	3526
M13	North of Boissy Close, Colney Heath, AL4 0UE	49	3609
M18	East of Kay Walk, St Albans, AL4 0XH	37	3535
M8	Verulam Golf Club, St Albans, AL1 1JG	65	3611
M14	Beesonend Lane, Harpenden, AL5 2AB	43	3583
M9	Amwell Top Field, Wheathampstead, AL4 8DZ	60	3573
M12	North of The Slype, Gustard Wood, AL4 8SA	49	3572
M11	Rothamsted Research, Harpenden Campus, AL5 2JQ	55	3584

Reference	Address	Number of dwellings	Zone Number
M6	South of Harpenden Lane, Redbourn, AL3 7RQ	68	3503
U1	East of Morris Recreation Ground, adjacent to A1081 and White Horse Lane	53	3616
U3	Former Bricket Wood United Reformed Church, AL2 3QR	10	3522
U4	Greenwood United Reformed Church, AL2 3HG	5	3515
U2	Land South West of London Colney Allotments, AL2 1RG	25	3616
UC28	New Greens Residents Association, 2 High Oaks, St Albans, AL3 6DL	8	3560
UC40	Land Rear of New House Park Shops, St Albans, AL1 1UJ	6	3536
UC4	Car Park to rear of 32-34 Upper Marlborough Road, St Albans, AL1 3UU	35	3564
UC25	318 Watford Road, Chiswell Green, AL2 3DP	10	3517
UC10	Garage Block rear of 109-179 Hughenden Road, St Albans, AL4 9QW	24	3565
UC12	Garage Block Between Hughenden Road and The Ridgeway, St Albans, AL4 9RH	20	3617
UC14	Car Park to rear of 3 Church Green (Waitrose), Harpenden, AL5 2TJ	19	3590
UC7	5 Spencer Street, St Albans, AL3 5EH	28	3564
UC51	Garage Block to south of Abbots Park Abbots Park, St Albans, AL1 1TW	5	3626
UC27	Berkeley House, Barnet Road, London Colney, AL2 1BG	9	3528
UC39	Garage Block to east of 8 Heath Close, Harpenden, AL5 1QN	6	3586

Reference	Address	Number of dwellings	Zone Number
UC16	Garage Block west of Thirlestane, St Albans, AL1 3PE	17	3510
UC52	Garage Block off Tallents Crescent, Harpenden, AL5 5BS	5	3597
UC43	Garage block to west of 32-46 Riverside Road, St Albans, AL1 1SD	6	3542
UC18	Garage block to front of 94-142 Riverside Road, Riverside Road, St Albans, AL1 1SE	14	3542
UC38	Garage block to rear of 27-32 St Pauls Place, St Pauls Place, St Albans, AL1 4JW	6	3624
UC44	Garage Block off Millford Hill, Harpenden, AL5 5BN	6	3597
UC23	Garage Site adj. Verulam House, Verulam Road, St Albans, AL3 5EN	11	3506
UC17	Garage Block off Cotlandswick, London Colney, AL2 1ED	15	3531
UC32	Garages off Creighton Avenue, St Albans, AL1 2LZ	8	3537
UC45	Garages off Watling View (West), St Albans, AL1 2PA	6	3612
UC30	Garages Between Abbotts Avenue West and Abbey Line, St Albans, AL1 2JH	8	3537
UC42	Garages off Thirlmere Drive, St Albans, AL1 5QS	6	3544
UC29	Garage Block off Noke Shot, Harpenden, AL5 5HS	8	3604
UC33	Land Rear of 53 Snatchup, Redbourn, AL3 7HF	7	3579
UC26	Garage Block to Malvern Close, St Albans, AL4 9SZ	10	3566
UC21	Garages off Chapel Place, St Albans, AL1 2JZ	12	3537
UC41	Garages at Grindcobbe, St Albans, AL1 2ED	6	3537

Reference	Address	Number of dwellings	Zone Number
UC34	Garages Rear of Hill End Lane (South), St Albans, AL4 0AE	7	3545
UC24	Garages Rear of Hill End Lane (North), St Albans, AL4 0AE	10	3545
UC31	Garages rear of Tudor Road, St Albans, AL3 6AY	8	3562
UC36	Garages off Park Street Lane, Park Street, AL2 2ND	7	3518
UC49	Garage Block rear of 18-30 Furse Avenue, St Albans, AL4 9NE	5	3566
UC37	Garages off Watling View (East), St Albans, AL1 2NT	7	3612
UC22	Car Park to rear of 77-101 Hatfield Road, Hatfield Road, St Albans, AL1 4JL	12	3624
UC15	Bowers Way East Car Park Bowers Way, Harpenden, AL5 4EQ	18	3602
UC2	Civic Close Car Park Bricket Road, St Albans, AL1 3JX	57	3564
UC35	Market Depot, Drovers Way, St Albans, AL3 5FA	7	3506
UC9	Keyfield Terrace Car Park, Keyfield Terrace, St Albans, AL1 1PD	25	3555
UC8	Public Hall, 6 Southdown Road, Harpenden, AL5 1TE	26	3590
UC13	Car Park adjacent to Verulam House, Verulam Road, St Albans, AL3 5EN	19	3506
UC3	London Road Car Park, London Road, St Albans, AL1 1NG	36	3555
UC50	Southview Car Park, Lower Luton Road, Harpenden, AL5 5AW	5	3597
UC1	Sainsbury's Supermarket, Everard Close, St Albans AL1 2QU	92	3538

Reference	Address	Number of dwellings	Zone Number
UC47	Crabtree Fields / Land at Waldegrave Park, Harpenden, AL5 5SA	5	3596
UC46	Garage Blocks adj. to 76 Oakley Road and 151 Grove Road, Harpenden, AL5 1HJ	6	3587
UC11	50 Victoria Street St Albans, AL1 3HZ	10	3555
UC19	54 Lemsford Road St Albans, AL1 3PR	14	3511
UC20	104 High Street London Colney, AL2 1QL	13	3616
UC5	18- 20 Catherine Street St Albans, AL3 5BY	31	3507
UC6	13-19 Sutton Road & 5-11a Pickford Road St Albans, AL1 5JH	29	3548
UC48	Car Park adj. to 42-46 Adelaide Street, St Albans, AL3 5BH	5	3564
HA8	Land and Garages at Longfield Road, Harpenden	4	3585
HA1	Harpenden Memorial Hospital, Harpenden	34	3599
HA4	Jewsons, Grove Road, Harpenden	14	3587
HA6	Land at 63 High Street, Harpenden	5	3602
Windfall	St Albans	1,758	
Windfall	Harpenden	432	
Windfall	Chiswell Green	29	
Windfall	How Wood	29	
Windfall	London Colney	88	
Windfall	Park Street/Frogmore	29	
Windfall	Redbourn	59	
Windfall	Wheathampstead	29	
Windfall	Sandridge	29	

Reference	Address	Number of dwellings	Zone Number
Windfall	Metropolitan Green Belt	398	
	Total	**14,417**	

Appendix G

Employment Development Sites included in Option 1

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Reference	Location	Description	Number of jobs	Zone Number
EHHN.2	East Hemel Hempstead (North) BL	New neighbourhood centre and local centre	13	3503
EHHN.3	East Hemel Hempstead (North) BL	Other community facilities, including health provision	5	3503
EHHS.2	East Hemel Hempstead (South) BL	New neighbourhood centre and local centre	19	3501
EHHS.3	East Hemel Hempstead (South) BL	Other community facilities, including health provision	8	3501
NHH.2	North Hemel Hempstead BL	New neighbourhood centre and local centre	12	3503
NHH.3	North Hemel Hempstead BL	Other community facilities, including health provision	5	3503
ESA.2	East St Albans BL	New neighbourhood centre	10	3617
ESA.3	East St Albans BL	Other community facilities, including health provision	4	3617
NSA.2	North St Albans BL	New neighbourhood centre	9	3562
NSA.3	North St Albans BL	Other community facilities, including health provision	4	3562
NEH.2	North East Harpenden BL	Other community facilities, including health provision	2	3604
NWH.2	North West Harpenden BL	Other community facilities, including health provision	2	3603

Reference	Location	Description	Number of jobs	Zone Number
WLC.2	West of London Colney BL	Other community facilities, including health provision	1	3527
LOLR	Former Ariston Works (Land off London Road)	School allocation (1 x 2 form entry primary)	67	3561
Maylands_East H3	East Hemel Hempstead (Central) BL	Employment (Offices, R and D, Light Industrial, Logistics)	8000	9109
ROTH	Rothamsted Research Institute	Employment (R and D)	85	3589
BRE	Building Research Institute	Employment (R and D)	43	3524
EHHN.1	East Hemel Hempstead (North) BL	School allocation (1 x 3 form entry primary and 1 x 8-10 form entry secondary)	266	3503
EHHS.1	East Hemel Hempstead (South) BL	School allocation (1 x 3 form entry primary and 1 x 2 form entry primary)	170	3501
NHH.1	North Hemel Hempstead BL	School allocation (1 x 3 form entry primary)	103	3503
ESA.1	East St Albans BL	School allocation (1 x 3 form entry primary and 1 x 6-8 form entry secondary)	205	3617
NSA.1	North St Albans BL	School allocation (1 x 2 form entry primary)	67	3562
NEH.1	North East Harpenden BL	School allocation (1 x 2 form entry primary)	67	3604
NWH.1	North West Harpenden BL	School allocation (1 x 2 form entry primary)	67	3603

Reference	Location	Description	Number of jobs	Zone Number
WLC.1	West of London Colney BL	School allocation (1 x 2 form entry primary and 1 x 6-8 form entry secondary)	219	3527
OS1	Land to the North of Bricket Wood, bounded by the M25 and A405 North Orbital	Community Facilities	1	3522
OS2	Toulmin Drive / Highelms, St Albans, AL3 6DX	Community Facility	1	3503
	South of HGC Secondary School	An 8FE secondary school to serve the new and existing communities	135	3503
		Total	**9,589**	

Appendix H

East Hemel Hempstead Trip Generation Report

Confidential

TRIP GENERATION AND INTERNALISATION REPORT

The Crown Estate

Hemel Garden Communities

February 2024

Report Control

Document:	Trip Generation and Internalisation Report
Project:	Hemel Garden Communities
Client:	The Crown Estate
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Issue	Date	Status	Checked for Issue
1	13/02/2024	Final	DB

Contents

Figures

Appendices

1 Executive Summary

1.1 Vectos, part of SLR, have been appointed by The Crown Estate to provide transport advice in relation to the proposed development of a new garden community known as Hemel Garden Community.

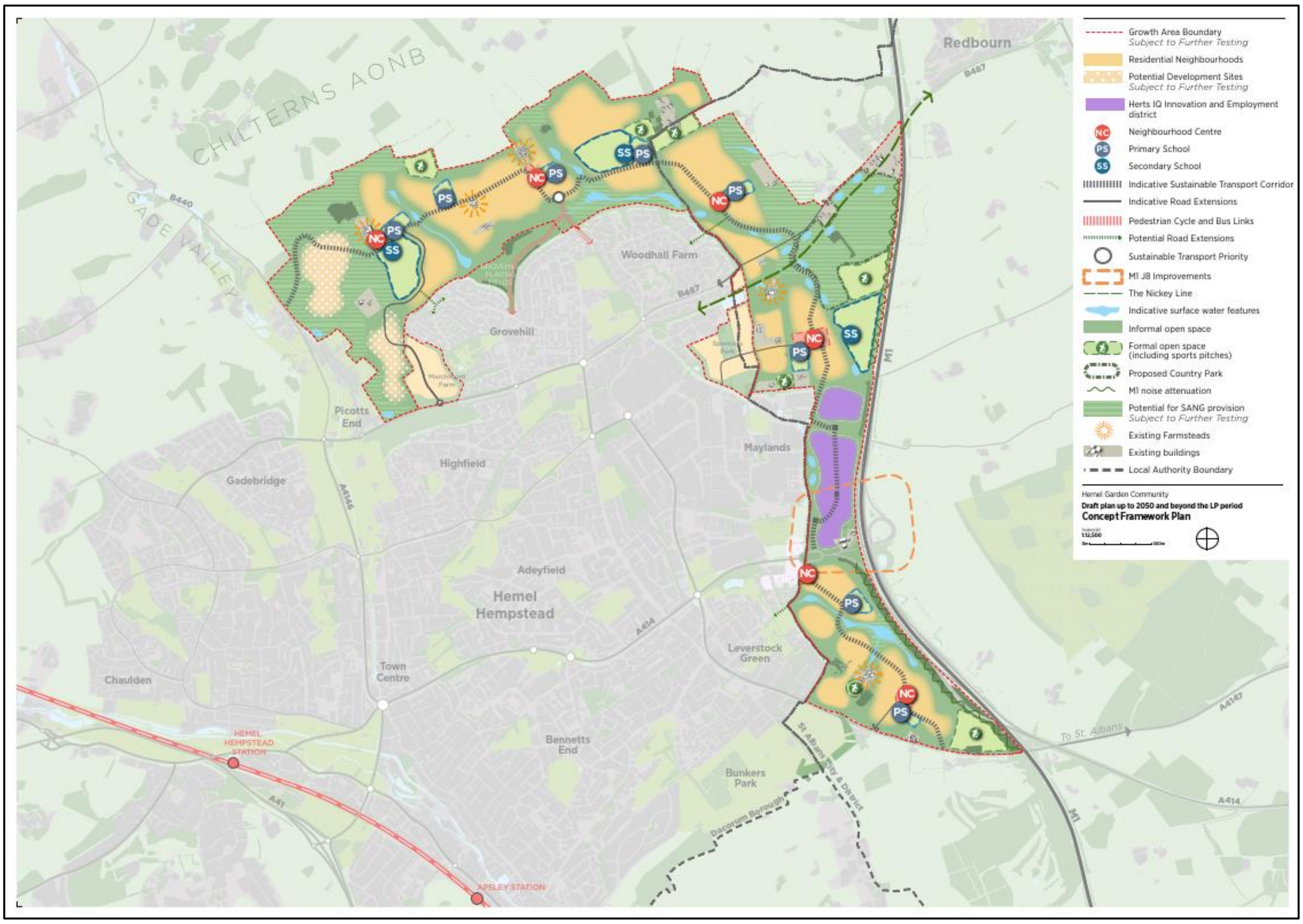
1.2 HGC are undertaking modelling in relation to supporting the Local Plans for both Dacorum Borough Council (DBC) and St Albans District Council (SADC).

1.3 To assist in that regard, this paper sets out a suggested approach to trip generation, internalisation, and modal share for use in that modelling. This builds on the methodology used at the Gilston Development (part of the Harlow and Gilston Garden Town) which was agreed by Herts County Council.

1.4 It is considered important to establish realistic trip generation estimates at this stage which are compatible with the Garden Town objectives and fully reflect the mixed-use nature of the HGC development and hence the high propensity for internalisation of trips.

1.5 A Draft Masterplan from HGC Framework Plan is shown below for context.

Figure 1.1: Draft Masterplan



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Transport Vision

1.6 The overarching objective of the Transport Vision is to achieve the Garden Town target set within "Garden City Standards for the 21st Century – Practical Guides for Creating Successful New Communities – Guide 3 – Design and Master Planning." The target is as follows:

> *"A Garden City's design must enable at least 50% of trips originating in the Garden City to be made by non-car means, with a goal to increase this over time to at least 60%; and the latest best practice in street and transport design should be used as a minimum standard."*

1.7 This is recognised by the Department for Transport as creating a Vision Led approach to transport planning in which we identify the set outcomes that we want to achieve, then provide transport solutions to deliver those outcomes. The Transport Plan for HGC has been developed in a way that achieving the outcomes is achieved in the following ways:

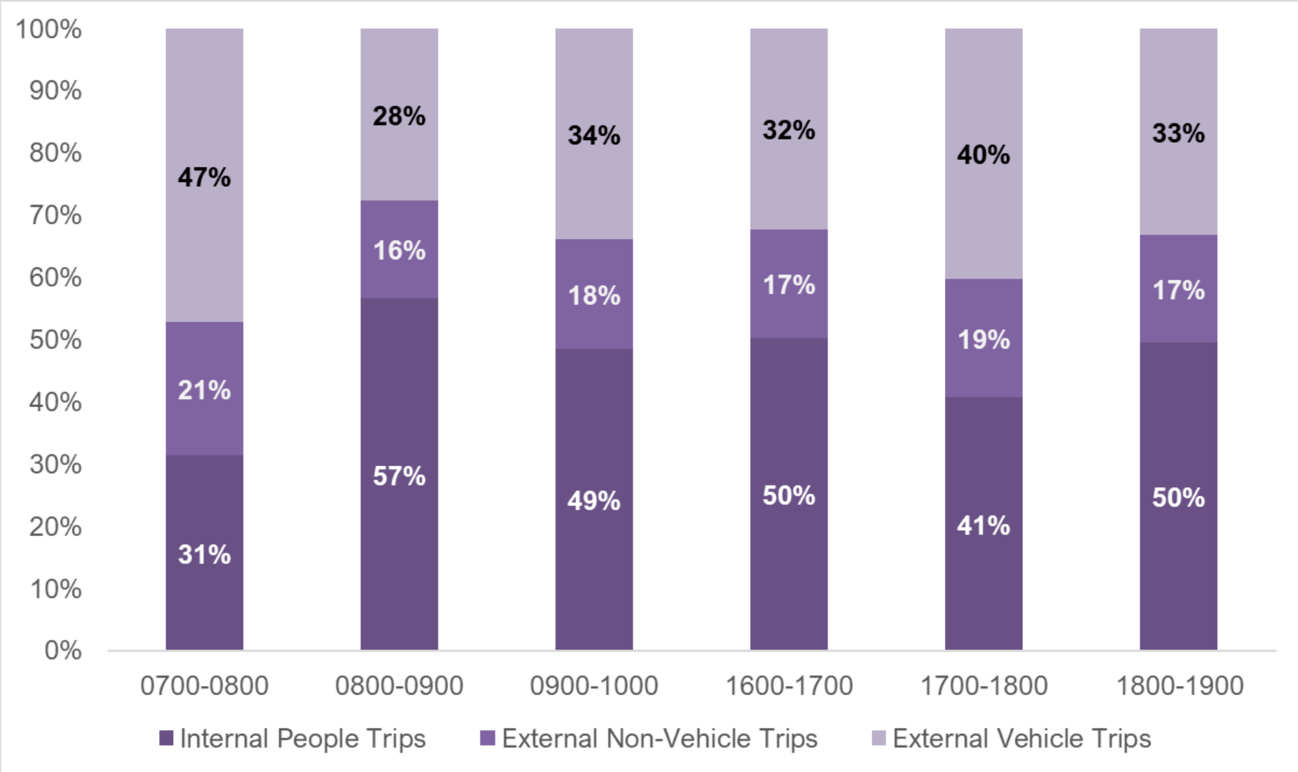
1.8 HGC themselves have developed various strategies and vision documents which reflect the above objectives.

Overall Approach and Internalisation

1.9 As a result of the overall transport strategy and vision for HGC, we are anticipating that across the day the majority of trips are either internal to the growth area or are undertaken by sustainable modes of transport. Therefore, in any strategic assessment the vision needs to be taken into account and traditional high vehicle trip generation needs to be refined to account for the significant level of internal and sustainable trips.

1.10 **Figure 1.2** summarises how movement changes by hour across peak periods to ensure that vehicle trips are limited to 40% of all movements. For example, between 08:00-09:00 schools (which are provided across the growth area) account for a large proportion of trips, and as such in that hour the level of internal trips increases significantly compared to 07:00-08:00 when employment trips are a more prominent journey purpose.

Figure 1.2 – Percentage of Internal / External Vehicle Trips compared to Total Trips



2 Trip Generation

Introduction

2.1 This report summarises the trip generation methodology used to inform the impact assessments. The methodology is the same as that adopted by Vectos/SLR for the Gilston Park Estate scheme, which was agreed by HCC and Essex County Council. It was on the basis of the agreed trip generation methodology that all the modelling was undertaken.

2.2 It is important to note at the outset that the trip generation for Gilston was derived per the COVID pandemic and the significant effects this had on travel patterns. In particular, in the post COVID era there is a greater propensity to flexible working which includes hybrid working travelling outside peak periods. This is not reflected at this stage in the analysis below and, for example, all the TRICS surveys referred were carried out pre-COVID.

2.3 The trip generation methodology includes details of the anticipated:

- Trips by Land Use and Journey Purpose;
- Level of Internalisation by Journey Purpose;
- Modal Splits of Journeys; and
- Total Person and Vehicle Trips.

2.4 The purpose of the report is to provide information to facilitate appropriate testing of the Hemel Garden Community.

Summary of the Proposed Development

2.5 The Hemel Garden Community (HGC) draft Framework Masterplan is shown in **Section 1** of this report. The site comprises residential development, on-site facilities such as retail, education and community uses and substantial employment (located in the central part of East Hemel).

2.6 The proposals include up to 11,000 residential dwellings plus up to 8,000 jobs.

2.7 At this time, the level of jobs has been refined to be approximately 166,000sqm of new employment floorspace within East Hemel Hempstead (Central) but this may be subject to change up to planning submission.

2.8 The scale of development is summarised below in **Table 2.1**.

Table 2.1: Scale of Development

Land Use	Quantum	Units
Residential (Total)	11,000	dwellings
Residential (North of Redbourn Road)	7,000	dwellings
Residential (South of Redbourn Road – EHH North and South)	4,000	dwellings
EHH Central - Employment E(g)(i)	40,000	sqm
EHH Central - Employment B8	126,000	sqm

Residential Trips

Trip Generation

2.9 Total person trip rates have been derived from the TRICS database, in order to provide an estimation of the trip generation potential of the HGC. The following criteria was used to select appropriate sites:

- Sub-Land Use: Mixed Private/Affordable Housing as it is uncertain at this stage what the split of private and affordable housing will be;
- Calculation Option: Multi-modal trip rates;
- Regions: England but excluding Greater London;
- Location Types: Suburban Area, Edge of Town or Neighbourhood Centre;
- Date Range: 8 years between 01/01/2012 to 27/06/2019 to avoid Covid-19 affected years;
- Major Cities: removal of sites within major cities (e.g. 2 sites in Liverpool).

2.10 **Table 2.2** summarises the multi-modal residential TRICS sites that have been selected, based on the above criteria.

Table 2.2: Multi-Modal Residential TRICS Sites

TRICS Site Reference	Town/ City	Area	Location	Number of Dwellings
ES-03-M-05	Near Uckfield	East Sussex	Neighbourhood Centre	138
ES-03-M-07	Peacehaven	East Sussex	Edge of Town	188
ES-03-M-10	Polegate	East Sussex	Edge of Town	108
ES-03-M-11	Hailsham	East Sussex	Edge of Town	354
ES-03-M-14	Eastbourne	East Sussex	Edge of Town	119
ES-03-M-16	Bexhill	East Sussex	Edge of Town	119
HC-03-M-06	Titchfield	Hampshire	Edge of Town	328
HC-03-M-09	Stanmore	Hampshire	Edge of Town	157
HC-03-M-10	Alton	Hampshire	Edge of Town	176
HC-03-M-11	Basingstoke	Hampshire	Edge of Town	238
KC-03-M-02	Barming	Kent	Edge of Town	119
KC-03-M-03	Allington	Kent	Edge of Town	140
NF-03-M-02	Aylsham	Norfolk	Edge of Town	250
NF-03-M-05	Poringland	Norfolk	Neighbourhood Centre	150
NF-03-M-14	Wymondham	Norfolk	Edge of Town	321
OX-03-M-01	Thame	Oxfordshire	Edge of Town	100
SC-03-M-06	Redhill	Surrey	Edge of Town	500
SC-03-M-07	Guildford	Surrey	Suburban Area	199
SC-03-M-08	Longcross	Surrey	Neighbourhood Centre	107
SM-03-M-01	Taunton	Somerset	Neighbourhood Centre	135
SP-03-M-02	Hedge End	Southampton	Edge of Town	181
WL-03-M-03	Longhedge	Wiltshire	Neighbourhood Centre	260
WS-03-M-04	Chichester	West Sussex	Suburban Area	214
WS-03-M-12	Shoreham-by-Sea	West Sussex	Suburban Area	192
WS-03-M-16	Chichester	West Sussex	Suburban Area	252
WS-03-M-16	Broadbridge Heath	West Sussex	Neighbourhood Centre	121

2.11 The resultant 'Total Person' trip rates for each hour within the AM peak period (07:00-10:00) and the PM peak period (16:00-19:00) are summarised in **Table 2.3** below. Within each table, the corresponding total person residential trip generation associated with 11,000 residential units has also been calculated.

Table 2.3: Residential Total Person Trip Rates and Trip Generation (AM & PM Peak Period)

	07:00-10:00			16:00-19:00		
	Arr.	**Dep.**	**2-Way**	**Arr.**	**Dep.**	**2-Way**
Trip Rate	0.507	1.600	2.107	1.519	0.740	2.259
Trips	5,577	17,600	23,177	16,709	8,140	24,849

2.12 It should be noted that **Table 2.3** does not account for any reductions, which are explained in the following section, regarding journey purpose or internalisation etc.

Journey Purpose

2.13 A detailed assessment of residential trips by journey purpose was undertaken to provide the basis for a more accurate estimation of the level of internalisation, the modal splits of the resultant external trips, and the distribution of these trips across the transport network.

2.14 The TEMPRO database (version 8.1) was interrogated to determine the assignment of trips by origin/destination and journey purpose for Dacorum, for the AM (07:00-10:00) and PM (16:00-19:00) 3-hour peak periods, as shown in **Table 2.4**. Whilst parts of HGC fall within SADC, it is considered that Dacorum is more reflective of the travel patterns in Hemel Hempstead.

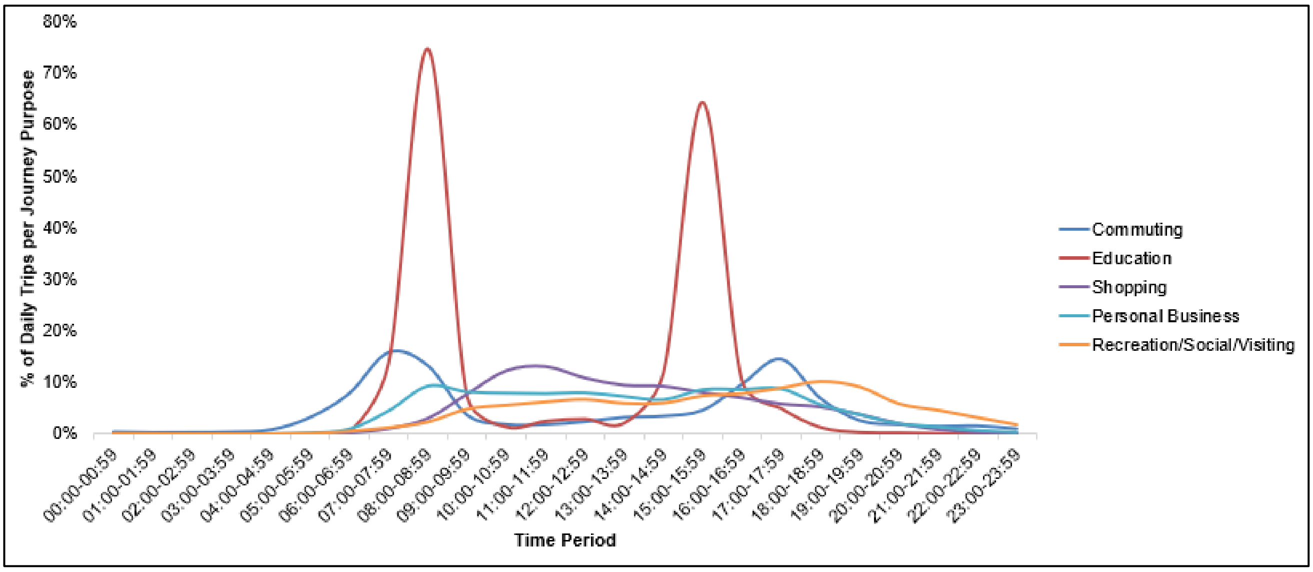
2.15 Home Based Employers Business Trips have been removed from the calculation as they do not represent regular trips and are a small proportion of the overall level of trips.

Table 2.4: 2041 TEMPRO Journey Purpose – Dacorum

Journey Purpose (Homebound)	Weekday AM Peak (0700-1000)		Weekday PM Peak (1600-1900)	
	Origin	**Destination**	**Origin**	**Destination**
Work	40%	37%	33%	34%
Education	36%	41%	12%	10%
Shopping	11%	11%	21%	20%
Personal Business	7%	6%	8%	9%
Other (Recreation/Social/Visiting)	5%	5%	25%	27%
Total	100%	100%	100%	100%

2.16 These journey purpose proportions have then been broken down by the hourly distribution proportions set out within the National Travel Survey (NTS) datasets to provide an accurate split by purpose by hour. In particular, the NTS502b dataset has been utilised, thus combining the most appropriate aspects of both the NTS and TEMPRO datasets.

Figure 2.1: NTS Trips by Journey Purpose



2.17 The data in **Figure 2.1** was extrapolated for each journey purpose to equate to 100% across both the AM and PM 3-hour peak periods, as demonstrated in **Table 2.5**.

Table 2.5: NTS Trips by Journey Purpose (Extrapolated)

Journey Purpose	AM Peak Period				PM Peak Period			
	0700-0800	0800-0900	0900-1000	Total	1600-1700	1700-1800	1800-1900	Total
Work	49%	41%	11%	100%	31%	47%	22%	100%
Education	14%	78%	8%	100%	63%	29%	9%	100%
Shopping	9%	26%	65%	100%	39%	32%	29%	100%
Personal Business	21%	42%	37%	100%	37%	38%	25%	100%
Recreation/ Social/ Visiting	15%	28%	57%	100%	29%	33%	38%	100%

2.18 The proportions shown in **Table 2.5** were then applied to the AM and PM 3-hour peak period data obtained from TEMPRO, thereby distributing the TEMPRO data by hour. This provided an accurate split of trips by purpose by hour, as shown in **Table 2.6** and **Table 2.7**.

Table 2.6: Distribution by Journey Purpose by Peak Hour (AM Peak Period)

Journey Purpose	0700-0800		0800-0900		0900-1000		0700-1000	
	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Work	20%	18%	16%	15%	4%	4%	40%	37%
Education	5%	6%	28%	32%	3%	3%	36%	41%
Shopping	1%	1%	3%	3%	7%	7%	11%	11%
Personal Business	2%	1%	3%	3%	3%	2%	7%	6%
Recreation/ Social/ Visiting	1%	1%	1%	1%	3%	3%	5%	5%
Total	28%	27%	52%	54%	20%	20%	100%	100%

Table 2.7: Distribution by Journey Purpose by Peak Hour (PM Peak Period)

Journey Purpose	1600-1700		1700-1800		1800-1900		1600-1900	
	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Work	10%	11%	16%	16%	7%	8%	33%	34%
Education	7%	6%	3%	3%	1%	1%	12%	10%
Shopping	8%	8%	7%	7%	6%	6%	21%	20%
Personal Business	3%	3%	3%	3%	2%	2%	8%	9%
Recreation/ Social/ Visiting	7%	8%	8%	9%	10%	10%	25%	27%
Total	36%	36%	37%	38%	26%	27%	100%	100%

2.19 The proportions shown in **Table 2.6** and **2.7** were then applied to the AM (0700-1000) and PM (1600-1900) 3-hour peak period total person trip generation shown previously in **Table 2.3.**

2.20 The resulting total person trips from the residential element of the HGC (without the application of any internalisation factors) are shown in **Table 2.8** and **2.9** below.

Table 2.8: Residential Total Person Trips by Journey Purpose – AM Peak Period

Journey Purpose	AM (0700-0800)			AM (0800-0900)			AM (0900-1000)		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
Work	997	3,445	4,442	835	2,883	3,717	224	774	998
Education	328	918	1,246	1,776	4,966	6,742	175	488	663
Shopping	55	168	223	159	480	639	405	1,227	1,632
Personal Business	72	270	342	148	557	705	131	490	621
Residential Recreation/ Social	40	139	179	76	260	336	156	535	691
Total	**1,493**	**4,939**	**6,433**	**2,993**	**9,146**	**12,140**	**1,090**	**3,514**	**4,604**

Table 2.9: Residential Total Person Trips by Journey Purpose – PM Peak Period

Journey Purpose	AM (1600-1700)			AM (1700-1800)			AM (1800-1900)		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
Work	1,775	844	2,619	2,690	1,279	3,969	1,266	602	1,868
Education	1,035	609	1,645	473	279	752	147	86	233
Shopping	1,329	652	1,981	1,102	541	1,643	993	487	1,480
Personal Business	542	258	800	550	262	811	357	170	527
Residential Recreation/ Social	1,297	603	1,900	1,473	686	2,159	1,680	782	2,462
Total	**5,978**	**2,967**	**8,945**	**6,288**	**3,046**	**9,334**	**4,443**	**2,127**	**6,570**

Employment Trips

2.21 The proposed commercial core will provide up to 166,000sqm of floorspace comprised of a mixture of commercial uses including office units (E(g)(i) land use) and warehousing units (B8 land use). An indicative breakdown of employment floorspace across the HGC is estimated to be as follows and it should be noted that these figures are up to and are subject to change at this stage:

— Employment E(g)(i): 40,000sqm

— Employment B8: 126,000sqm

— **Total: 166,000sqm**

Employment E(g)(i): Office

2.22 Due to a low number of relevant multi-modal sites in the TRICS database, it was considered more representative to obtain vehicle trip rates for the proposed E(g)(i) floorspace at the Site. The following criteria was used to select appropriate sites within the TRICS database:

— Sub Land Use: Office

— Calculation Option: Vehicular trip rates

— Regions: England but excluding Greater London

— Floor Area: 1,000-30,000 sqm

— Location Types: Suburban Area, Edge of Town and Neighbourhood Centre

— Date Range: TRICS default range of 8 years (i.e. 01/01/15 to 24/05/23)

— Local Population: population within 1 mile less than 15,000 people

— Major Cities: removal of sites in major cities

— Covid: removal of sites flagged by TRICS as having been undertaken during a Covid year

2.23 **Table 2.10** below summarises the employment TRICS sites that have been selected based on the above criteria.

Table 2.10: Office TRICS Sites

TRICS Site Reference	Town/ City	Area	Location	Floor area
AK-02-A-01	Whitwood	Wakefield	Edge of Town	1,230sqm
DA-02-A-02	Darlington	Darlington	Edge of Town	3,530sqm
PB-02-A-04	Peterborough	Peterborough	Edge of Town	4,040sqm
WL-02-A-01	Amesbury	Wiltshire	Edge of Town	2,500sqm

2.24 The resultant peak hour vehicle trip rates are summarised in **Table 2.11** below.

Table 2.11: Office Vehicle Trip Rates per 100sqm

	0800-0900			1700-1800		
	Arr.	**Dep.**	**2-Way**	**Arr.**	**Dep.**	**2-Way**
Vehicle Trip Rate	2.735	0.212	2.947	0.106	2.788	2.894

2.25 In order to achieve person trip rates for the employment land uses, the 2011 Census Journey to Work data for the daytime population for Dacorum Middle Super Output Area (MSOA) 013 was obtained, which includes the local Maylands area. This shows that 78.9% of employees in that area drive a car or van as their main mode of transport. As such the vehicle trip rates above have been factored up and the results are shown in **Table 2.12** below. It should be notes that an alternative methodology is to look at the census data for each of the TRICS sites. This exercise has been undertaken as a cross check and yields very similar results.

Table 2.12: Office Total Person Trip Rates per 100sqm

	0800-0900			1700-1800		
	Arr.	**Dep.**	**2-Way**	**Arr.**	**Dep.**	**2-Way**
Total Person Trip Rate	3.468	0.269	3.737	0.134	3.536	3.670

2.26 The resulting total person trips from the office element of the HGC (without the application of any internalisation factors) are shown in **Table 2.13** below.

Table 2.13: Office Total Person Trip Generation – 40,000sqm

	0800-0900			1700-1800		
	Arr.	**Dep.**	**2-Way**	**Arr.**	**Dep.**	**2-Way**
Total Person Trips	1,387	108	1,495	54	1,414	1,468

2.27 It should be noted that **Table 2.13** shows gross person trip generation and does not take into account any of the adjustments to these rates that need to be made (e.g. internalisation). These will be explained in the following section.

B8 Employment: Warehousing

2.28 To determine a representative trip rate for the proposed B8 land uses, vehicle trip rates were obtained for B8 Warehousing. It should be noted that Vectos have experience of developing an alternative trip generation methodology based on extensive surveys at DIRFT – a major freight and logistics centre near Rugby. It may be appropriate to refine the estimated trip generation in due course based on this methodology.

2.29 The following criteria was used to select appropriate sites:

— Sub Land Use: Warehousing Commercial/ Warehousing Self Storage

— Calculation Option: Vehicular trip rates

— Regions: England

— Floor Area: 387-80,066sqm

- Location Types: Suburban Area, Edge of Town
- Date Range: Since 2000 due to a limited number of sites within default period of 8 years
- Local Population: population within 1 mile less than 15,000 people
- Major Cities: removal of sites in major cities
- Covid: removal of sites flagged by TRICS as having been undertaken during a Covid year

2.30 **Table 2.14** below summarises the employment TRICS sites that have been selected based on the above criteria.

Table 2.14: B8 TRICS Sites

TRICS Site Reference	Town/ City	Area	Location	Floor area
EX-02-F-01	Colchester	Essex	Edge of Town	6,560sqm
HC-02-F-03	Park Gate	Hampshire	Edge of Town	3,665sqm
SF-02-F-03	Ipswich	Suffolk	Edge of Town	4,700sqm
TB-02-F-01	Paignton	Torbay	Edge of Town	190sqm
TW-02-F-01	Washington	Tyne & Wear	Edge of Town	31,000sqm

2.31 The resultant vehicle trip rates are summarised in **Table 2.15** below.

Table 2.15: B8 Vehicle Trip Rates per 100sqm

	0800-0900			1700-1800		
	Arr.	**Dep.**	**2-Way**	**Arr.**	**Dep.**	**2-Way**
Vehicle Trip Rate	0.128	0.065	0.193	0.035	0.095	0.130

2.32 In order to achieve person trip rates, the same methodology has been applied as for the office element i.e. assuming 78.9% of employees in that area use driving a car or van as the main mode of transport. As such the vehicle trip rates above have been factored up and the results are shown in **Table 2.16** below.

Table 2.16: B8 Total Person Trip Rates per 100sqm

	0800-0900			1700-1800		
	Arr.	**Dep.**	**2-Way**	**Arr.**	**Dep.**	**2-Way**
Total Person Trip Rate	0.162	0.082	0.245	0.044	0.120	0.165

2.33 The resulting total person trips from the B8 element of the HGC are shown in **Table 2.17** below.

Table 2.17: B8 Total Person Trip Generation – 166,000sqm

	0800-0900			1700-1800		
	Arr.	**Dep.**	**2-Way**	**Arr.**	**Dep.**	**2-Way**
Total Person Trips	205	104	308	56	152	208

Educational Trips

Primary Education

2.34 Primary education facilities are to be delivered within the HGC.

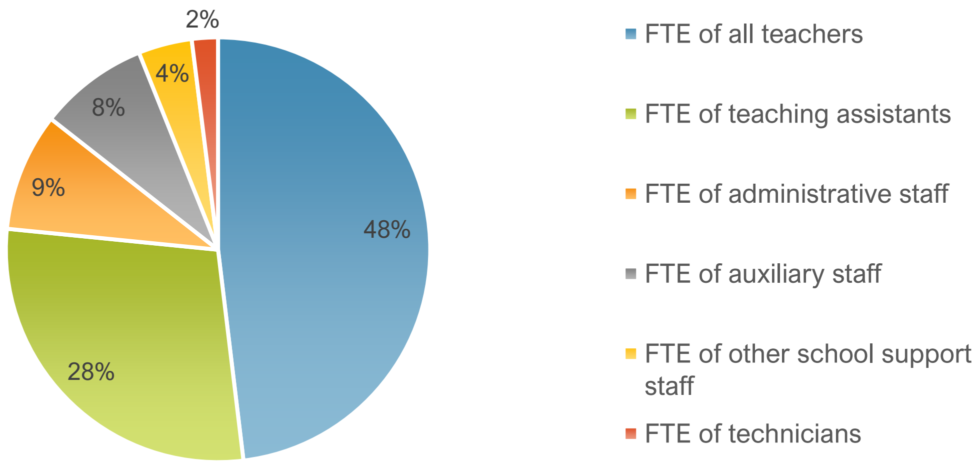
2.35 We have used a first principles approach to estimate the trips associated with primary schools rather than TRICS so that internalisation can be calculated based on the number of pupils from the HGC.

2.36 As well as pupil and parent trips, there will also be staff trips, and these have been assessed using the assumptions shown in **Figure 2.2** and **Table 2.18**.

2.37 The Department for Education (DfE) 'School Workforce in England: November 2022' Statistical Release has been utilised to identify the proportion of teachers versus support staff in schools.

2.38 For the academic year 2021/2022, the following proportions are identified:

Figure 2.2: Make-up of Teaching Versus Support Staff in English Schools



2.39 Based on **Figure 2.2**, the calculation of staff numbers is as follows (the number of pupils is based on an estimate of pupil yield):

Table 2.18: FTE Employees Associated with the Primary School Provision

Total Pupils (only used to determine staff)	2,700
Pupils per Class	30
Number of Classes	90
Number of Teachers	90
Number of Teaching Assistants	53
Other Staff	43
Total Staff	186

2.40 It can be observed from **Table 2.18** above that the number of staff assumed to be employed at the primary schools is robust, as it follows the guidance provided by the DfE outlined above.

2.41 The majority of primary school pupils will use the facilities delivered as part of the HGC.

2.42 Additionally, it is assumed that 50% of all primary-aged pupil trips will be accompanied by a parent. These parent trips will be counted as both arrivals and departures to account for the parent arriving at the school and then departing shortly after during the respective peak hours.

2.43 The distribution of pupil trips across the peak periods has been assumed to have the following distribution. It is assumed that only 10% of pupil trips will occur between 07:00 and 08:00 with the remaining 90% of pupils arriving between 08:00 and 09:00 and no pupils are expected to arrive after this point. This presents a robust assessment as most pupils will be expected to arrive before the school day starts (between 08:30-09:00), although a number of pupils will also arrive before 08:00 in order to use breakfast club facilities for example.

2.44 In the afternoon, it has been assumed that the majority of pupils (90%) will leave between 15:00-16:00 on completion of the school day. This is prior to the peak hour which has been assessed within this report. However, 10% of pupil trips have been assumed to occur between 16:00-17:00 to allow for pupils attending after-school clubs who may stay later.

2.45 Regarding the distribution of staff trips across the peak periods, it has been assumed that 75% of the employee trips will occur between 07:00 and 08:00, accounting for staff arriving prior to the start of the school day. The remaining 25% of staff are assumed to arrive between 08:00 and 09:00. This presents a robust assessment as in reality, non-teaching staff may arrive later, for example those who are part time. In the evening, it is assumed that 25% of staff members depart the school between 16:00 and 17:00, immediately after the school day ends. The remaining 75% are assumed to depart between 17:00 and 18:00.

2.46 The total person trip generation for pupils, parents and staff associated with a primary school with facilities of this size and prior to any further adjustments (i.e. internalisation) are presented in **Table 2.19** below.

Table 2.19: Primary School Total Person Trips (Pupils, Parents and Staff)

Hour	Pupil Trips			Parent Trips			Staff Trips		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
0700-0800	440	0	440	220	220	440	139	0	139
0800-0900	3960	0	3960	1980	1980	3960	46	0	46
0900-1000	0	0	0	0	0	0	0	0	0
1600-1700	0	440	440	220	220	440	0	46	46
1700-1800	0	0	0	0	0	0	0	139	139
1800-1900	0	0	0	0	0	0	0	0	0

Secondary Education

2.47 Secondary education facilities are to be built to accommodate the demand created by HGC.

2.48 For the purpose of this assessment, it has been assumed that the proposed secondary schools will accommodate up to 4,320 pupils, based on provision of 3 schools. There will also be additional staff trips, and these have been assessed using the assumptions shown in **Table 2.20**.

2.49 The same DfE data, set out above in **Figure 2.2** for primary education, has been used again to provide a robust estimate for the number for full-time employees of the proposed secondary school.

Table 2.20: FTE Employees for Secondary Schools

Total Pupils	4,320
Pupils per Class	30
Number of Classes	144
Number of Teachers	144
Number of Teaching Assistants	84
Other Staff	72
Total Staff	300

2.50 The distribution of pupil and staff trips across the peak periods has been assumed to be the same as for primary education and this is robust.

2.51 Additionally, it is assumed that 10% of all secondary-aged pupil trips will be accompanied by a parent. These parent trips will be counted as both arrivals and departures to account for the parent arriving at the school and then immediately departing during the respective peak hours.

2.52 The total person trip generation for pupils, parents and staff associated with the secondary school facilities, prior to any further adjustments (i.e. internalisation) are presented in **Table 2.21** below.

Table 2.21: Secondary School Total Person Trips (Pupils, Parents and Staff)

Hour	Pupil Trips			Parent Trips			Staff Trips		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
0700-0800	432	0	432	43	43	86	225	0	225
0800-0900	3,888	0	3,888	389	389	778	75	0	75
0900-1000	0	0	0	0	0	0	0	0	0
1600-1700	0	432	432	43	43	86	0	75	75
1700-1800	0	0	0	0	0	0	0	225	225
1800-1900	0	0	0	0	0	0	0	0	0

Summary

2.53 A summary of the total person trips anticipated for each proposed land use described within this section for the AM and PM peak periods are presented in **Table 2.22** and **Table 2.23** respectively. These tables therefore combine the data presented in **Tables 2.18-2.19**, **2.13**, **2.17**, **2.19** and **2.21**. It should be noted that only employment and education land uses are expected to generate external trips – for other land uses such as retail and community, all trips are expected to be internal.

Table 2.22: Total Person Trips Generated (AM Peak)

Land Use	AM (0700-0800)			AM (0800-0900)			AM (0900-1000)		
	In	Out	Tot	In	Out	Tot	In	Out	Tot
Residential to Employment	997	3,445	4,442	835	2,883	3,717	224	774	998
Residential to Education (Primary)	164	459	623	888	2,483	3,371	87	244	331
Residential to Education (Secondary)	164	459	623	888	2,483	3,371	87	244	331
Residential to Food Retail	28	84	112	79	240	320	203	613	816
Residential to Non-Food Retail	28	84	112	79	240	320	203	613	816
Residential to Personal Business	72	270	342	148	557	705	131	490	621
Residential to Recreation/ Social	40	139	179	76	260	336	156	535	691
Employment E(g)(i)	494	63	556	1,387	108	1,495	862	76	938
Employment (B8)	131	53	184	205	104	308	184	69	252
Primary School (Staff)	139	0	139	46	0	46	0	0	0
Primary School (Pupils)	440	0	440	3,960	0	3,960	0	0	0
Primary School (Parents)	220	220	440	1,980	1,980	3,960	0	0	0
Secondary School (Staff)	225	0	225	75	0	75	0	0	0
Secondary School (Pupils)	432	0	432	3,888	0	3,888	0	0	0
Secondary School (Parents)	43	43	86	389	389	778	0	0	0
Total	**3,617**	**5,318**	**8,936**	**14,923**	**11,727**	**26,650**	**2,136**	**3,659**	**5,795**

**Residential to Education Trips have been split 50:50 between Primary and Secondary Education*

Table 2.23: Total Person Trips Generated (PM Peak)

Land Use	AM (0700-0800)			AM (0800-0900)			AM (0900-1000)		
	In	Out	Tot	In	Out	Tot	In	Out	Tot
Residential to Employment	1,775	844	2,619	2,690	1,279	3,969	1,266	602	1,868
Residential to Education (Primary)	518	305	822	237	139	376	73	43	117
Residential to Education (Secondary)	518	305	822	237	139	376	73	43	117
Residential to Food Retail	664	326	990	551	271	822	496	244	740
Residential to Non-Food Retail	664	326	990	551	271	822	496	244	740
Residential to Personal Business	542	258	800	550	262	811	357	170	527
Residential to Recreation/ Social	1,297	603	1,900	1,473	686	2,159	1,680	782	2,462
Employment E(g)(i)	94	723	817	54	1,414	1,468	36	413	448
Employment (B8)	66	157	222	56	152	208	42	110	152
Primary School (Staff)	0	46	46	0	139	139	0	0	0
Primary School (Pupils)	0	440	440	0	0	0	0	0	0
Primary School (Parents)	220	220	440	0	0	0	0	0	0
Secondary School (Staff)	0	75	75	0	225	225	0	0	0
Secondary School (Pupils)	0	432	432	0	0	0	0	0	0
Secondary School (Parents)	43	43	86	0	0	0	0	0	0
Total	**6,401**	**5,103**	**11,504**	**6,398**	**4,976**	**11,374**	**4,520**	**2,651**	**7,170**

**Residential to Education Trips have been split 50:50 between Primary and Secondary Education*

2.54 One thing to note is that there is an element of double counting in these figures eg residential to Education (Primary) is double counted with Primary School (pupil) trips. This issue gets resolved later in the process.

HGV Trip Generation

2.55 The OGV trip rates for the proposed residential, E(g)(i) and B8 land uses have used the same TRICS selection parameters detailed for the person trip rates (as set out previously) and these HGV trip rates will be applied in addition to the person trip rates set out previously.

2.56 In order to understand potential HGV trips associated with the proposed primary and secondary school provision, specific HGV/OGV trip rates have been derived for these two uses. In both cases, selection parameters have been limited to weekday surveys for suburban areas, edge of town locations, and neighbourhood centres. Upon extracting these trip rates, it could be seen that neither use generated any material HGV trips during the peak hours.

2.57 **Table 2.24** outlines the peak hour HGV trip rates that have been extracted from the TRICS database for the relevant uses using the same sites as set out previously in this section.

Table 2.24: HGV Trip Rates

Land Use	0800-0900			1700-1800		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
Residential	0.002	0.001	0.003	0	0	0
E(g)(i) Office	0.009	0	0.009	0	0	0
B8	0.041	0.037	0.078	0.013	0.039	0.052
Primary School	0.000	0.000	0.000	0.000	0.000	0.000
Secondary School	0.001	0.001	0.002	0.000	0.000	0.000

2.58 **Table 2.25** outlines the peak hour HGV trip generation associated with the HGC.

Table 2.25: HGV Trip Generation

Land Use	Quantum	0800-0900			1700-1800		
		Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
Residential	11,000 dwellings	22	11	33	0	0	0
E(g)(i) Office	40,000sqm	4	0	4	0	0	0
B8	126,000sqm	52	47	98	16	49	66
Primary School	2,700 pupils	0	0	0	0	0	0
Secondary School	4,320 pupils	4	4	9	0	0	0
Total:		**82**	**62**	**144**	**16**	**49**	**66**

2.59 On the basis of **Table 2.25**, it can be seen that the HGC could potentially generate approximately 144 two-way HGV trips during the AM peak hour and 66 two-way HGV trips during the PM peak hour. This is typical as more HGVs avoid the peak hours and for B8 warehouses these typically reflect shift times which also avoid the peak hours.

2.60 Unlike the trip generation discussed previously within this report, the trips presented in **Table 2.25** above are all vehicle trips and therefore no modal spit percentages will be applied to these trips. Furthermore, there will be no internalisation applied to the HGV trip generation.

Total Trip Generation

2.61 A summary of the total person trips by land use, as well as the additional HGVs, for the AM and PM peak periods are presented in **Table 2.26** and **Table 2.27** respectively. These tables therefore represent a combination of **Tables 2.22-2.23** and **Table 2.25**.

Table 2.26: Total Person Trips + HGV Trips (AM Peak)

Land Use	AM (0700-0800)			AM (0800-0900)			AM (0900-1000)		
	In	Out	Tot	In	Out	Tot	In	Out	Tot
Residential to Employment	997	3,445	4,442	835	2,883	3,717	224	774	998
Residential to Education (Primary)	164	459	623	888	2,483	3,371	87	244	331
Residential to Education (Secondary)	164	459	623	888	2,483	3,371	87	244	331
Residential to Food Retail	28	84	112	79	240	320	203	613	816
Residential to Non-Food Retail	28	84	112	79	240	320	203	613	816
Residential to Personal Business	72	270	342	148	557	705	131	490	621
Residential to Recreation/ Social	40	139	179	76	260	336	156	535	691
Employment E(g)(i)	494	63	556	1,387	108	1,495	862	76	938
Employment (B8)	131	53	184	205	104	308	184	69	252
Primary School (Staff)	139	0	139	46	0	46	0	0	0
Primary School (Pupils)	440	0	440	3,960	0	3,960	0	0	0
Primary School (Parents)	220	220	440	1,980	1,980	3,960	0	0	0
Secondary School (Staff)	225	0	225	75	0	75	0	0	0
Secondary School (Pupils)	432	0	432	3,888	0	3,888	0	0	0
Secondary School (Parents)	43	43	86	389	389	778	0	0	0
HGVs	39	48	87	82	62	144	71	62	133
Total	**3,656**	**5,366**	**9,022**	**15,005**	**11,789**	**26,794**	**2,207**	**3,721**	**5,928**

Table 2.27: Total Person Trips Generated (PM Peak)

Land Use	PM (1600-1700)			PM (1700-1800)			PM (1800-1900)		
	In	Out	Tot	In	Out	Tot	In	Out	Tot
Residential to Employment	1,775	844	2,619	2,690	1,279	3,969	1,266	602	1,868
Residential to Education (Primary)	518	305	822	237	139	376	73	43	117
Residential to Education (Secondary)	518	305	822	237	139	376	73	43	117
Residential to Food Retail	664	326	990	551	271	822	496	244	740
Residential to Non-Food Retail	664	326	990	551	271	822	496	244	740
Residential to Personal Business	542	258	800	550	262	811	357	170	527
Residential to Recreation/ Social	1,297	603	1,900	1,473	686	2,159	1,680	782	2,462
Employment E(g)(i)	94	723	817	54	1,414	1,468	36	413	448
Employment (B8)	66	157	222	56	152	208	42	110	152
Primary School (Staff)	0	46	46	0	139	139	0	0	0
Primary School (Pupils)	0	440	440	0	0	0	0	0	0
Primary School (Parents)	220	220	440	0	0	0	0	0	0
Secondary School (Staff)	0	75	75	0	225	225	0	0	0
Secondary School (Pupils)	0	432	432	0	0	0	0	0	0
Secondary School (Parents)	43	43	86	0	0	0	0	0	0
HGVs	39	42	80	16	49	66	16	25	41
Total	**6,440**	**5,145**	**11,584**	**6,414**	**5,025**	**11,439**	**4,536**	**2,675**	**7,212**

3 Internalisation

3.1 Due to the mixed-use nature of the proposals, a significant proportion of trips will remain internal to the HGC.

3.2 This section of the report provides details of the level of internalisation proposed for each land use. Justification and details of the assumptions used are also provided.

Residential Trips – Explanation of Internalisation by Journey Purpose

3.3 The proposed levels of internalisation for residential trips by journey purpose are summarised below in **Table 3.1** and are discussed in further detail within this section of the report.

Table 3.1: Residential Trip Internalisation

Trip Purpose	Distribution	
	External (Off-site)	Internal (On-site)
Residential to Employment	88%	12%
Residential to Education (Primary)	0%	100%
Residential to Education (Secondary)	10%	90%
Residential to Food Retail	10%	90%
Residential to Non-Food Retail	75%	25%
Residential to Personal Business	50%	50%
Residential to Recreation/Social	25%	75%

Residential to Employment

3.4 Census 2011 Origin-Destination data for other towns with similar locational characteristics and size to the proposed HGC has been sourced to observe the proportion of trips remaining within the area.

3.5 A summary of this data, provided for settlements with comparable sizes and locations, is presented at **Table 3.2**. This has been calculated using the ‘WU03EW – Location of usual residence and place of work by method of travel to work (MSOA Level)’ dataset from the 2011 Census.

3.6 The HGC is for up to 11,000 residential units. Assuming an average of 1.54 people of working age per house, around 16,940 workers are expected. This is significantly higher than the average of the locations shown below and the raw data for towns looking at the population and level of employment is set out in **Appendix A**. In general, one would expect the level of internalisation to increase as the size of settlement increases and this is also shown in **Appendix A** with a study of a range of towns varying in size with a population of between 10,000-50,000 across England.

Table 3.2: 2011 Census Data - Percentage of People Living and Working in Middle Super Output Area

Town	County	Workers that Live in MSOA	Workers that Live and Travel to Work in MSOA	Percentage
Cottenham	Cambridgeshire	2,758	353	13%
Cranleigh	Surrey	3,842	1,226	32%
Cullompton	Devon	3,313	855	26%
Diss	Norfolk	3,929	1,586	40%
Edenbridge	Kent	3,477	828	24%
Faringdon	Oxfordshire	3,613	721	20%
Glastonbury	Somerset	2,524	612	24%
Heathfield	East Sussex	2,936	583	20%
Hook	Hampshire	3,435	567	17%
Hunstanton	Norfolk	1,370	562	41%
Ingatestone	Essex	2,155	298	14%
Ledbury	Herefordshire	3,508	1,597	46%
Liskeard	Cornwall	4,792	2,346	49%
Marlborough	Wiltshire	2,955	1,248	42%
Paddock Wood	Kent	4,313	887	21%
Sawbridgeworth	Hertfordshire	3,456	363	11%
Sherborne	Dorset	2,974	1,314	44%
Soham	Cambridgeshire	5,260	1,148	22%
St Blazey	Cornwall	2,527	361	14%
St Ives	Cornwall	2,431	1,257	52%
Swaffham	Norfolk	2,354	870	37%
Tenterden	Kent	4,427	1,358	31%
Tetbury	Gloucestershire	3,354	1,084	32%
Tidworth	Wiltshire	7,223	3,753	52%
Tiptree	Essex	6,011	1,113	19%
Watton	Norfolk	5,513	1,674	30%
Wincanton	Somerset	2,627	1,065	41%
Yatton	Somerset	3,704	665	18%
Average		**3,599**	**1,082**	**30%**

3.7 The analysis demonstrates that the average level of internalisation of trips to work across the selected areas is 30%. As such, an assumption that 12% residential employment trips will remain internal to the HGC growth area and the remaining 88% will commute to work at external locations is robust.

3.8 This has been calculated on the basis that:

- 11000 homes x 2.4 = 26,400 people
- 1.54 people per dwelling employable = 16,940
- Total Jobs = 8,000-10,000
- 25% of jobs filled internally – circa 2,000-2,500
- 2,000-2,500 jobs equal circa 12% of total employable people.

3.9 In addition to the 12% of trips within the growth area a substantial number of trips will also be attracted to the adjacent Maylands Area.

3.10 Upon review of the towns chosen for this exercise, it can be seen that in the majority of cases, the towns examined are often actually within the proximity of a larger existing town or city which is reflective of the situation proposed for the HGC. Furthermore, many of the towns selected for the exercise offer less in terms of employment uses when compared with the proposals at the HGC, yet still manage to retain an average of 30% of residents within the daytime population. The proposals for up to 166,000sqm of employment use which is significant compared with the existing settlements listed, with this area also likely to accommodate a substantial number of end-use employers which means that there will be considerable variety in terms of potential employers and job types within the site, i.e. attracting a larger overall employable population.

3.11 Further interrogation of 2011 Census Origin-Destination data has been used to understand the proportion of residents from Dacorum 013 (the MSOA most local to the Maylands Employment Area) that live and work within MSOA 013. This comprises 19.4% of residents who work within Dacorum 013 itself (430/2,223).

3.12 The overall internalisation of the MSOA 013 within the Hemel Hempstead built area ie those who live within the MSOA but work in Hemel Hempstead is circa 46.6% which shows the potential for a significant portion of residents to live within the site and also choose to work where employment is available locally, a lifestyle that clearly works for a significant portion of existing Hemel Hempstead residents. With around 166,000sqm of employment proposed to be built within the growth area, it is anticipated that a significant portion of future residents will also work within HGC in addition to the people working within the existing Hemel urban area.

3.13 In summary, it is considered that 12% is a highly robust figure for internalisation of residential to employment trips within HGC.

3.14 In addition to this a significant proportion of trips will be to Maylands for employment and while not internal are semi-internal as they have the opportunities to travel by sustainable modes given the close proximity of the largest employment area in Hertfordshire to the Site. This will be addressed within the assignment which is not captured within this note but is summarised within the modal split as circa 25% of journeys being undertaken by non-car modes to work.

3.15 **Table 3.3** and **Table 3.4** set out the summary of internal/external total person trips associated with residential to employment trips. These tables therefore consider the Residential to Employment trips set out within **Tables 2.26-2.27** and apply the trip internalisation assumptions set out in **Table 3.1**.

Table 3.3: Residential to Employment Trips AM Peak

	0700-0800			0800-0900			0900-1000		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
External Trips	876	3,027	3,903	733	2,533	3,266	197	680	877
Internal Trips	121	418	539	101	350	451	27	94	121
Total Trips	**997**	**3,445**	**4,442**	**835**	**2,883**	**3,717**	**224**	**774**	**998**

Table 3.4: Residential to Employment Trips PM Peak

	1600-1700			1700-1800			1800-1900		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
External Trips	1,560	742	2,301	2,363	1,124	3,487	1,112	529	1,641
Internal Trips	215	102	318	326	155	481	154	73	227
Total Trips	**1,775**	**844**	**2,619**	**2,690**	**1,279**	**3,969**	**1,266**	**602**	**1,868**

Residential to Education – Primary School

3.16 It is proposed that primary school provision is included as part of the HGC, with sufficient capacity to accommodate all pupil demand. As a result, it is assumed that 100% of all primary school pupils will remain on-site with potentially only a very small element that would go off-site but these may be to immediately adjacent schools such as that proposed in Spencer's Park for example.

3.17 **Table 3.5** and **Table 3.6** set out the summary of internal/external total person trips associated with residential to primary school trips. These tables therefore consider the Residential to Education (Primary) trips set out within **Tables 2.26-2.27** and apply the trip internalisation assumptions set out in **Table 3.1**.

Table 3.5: Residential to Primary School Trips AM Peak

	0700-0800			0800-0900			0900-1000		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
External Trips	0	0	0	0	0	0	0	0	0
Internal Trips	164	459	623	888	2,483	3,371	87	244	331
Total Trips	**164**	**459**	**623**	**888**	**2,483**	**3,371**	**87**	**244**	**331**

Table 3.6: Residential to Primary School Trips PM Peak

	1600-1700			1700-1800			1800-1900		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
External Trips	0	0	0	0	0	0	0	0	0
Internal Trips	518	305	822	237	139	376	73	43	117
Total Trips	**518**	**305**	**822**	**237**	**139**	**376**	**73**	**43**	**117**

Residential to Education - Secondary School

3.18 Secondary education facilities are also proposed within the HGC. As noted earlier, there will be the capacity for up to 4,320 pupils.

3.19 From the residential area of the HGC, it is assumed that 10% of secondary school pupils will travel externally and the remaining 90% will be internal.

3.20 The remaining pupils that will fill the secondary schools (i.e. external pupils travelling into HGC) are discussed in further detail later in this section.

3.21 **Table 3.7** and **Table 3.8** set out the summary of internal/external total person trips associated with residential to secondary school trips. These tables therefore consider the Residential to Education (Secondary) trips set out within **Tables 2.26-2.27** and apply the trip internalisation assumptions set out in **Table 3.1**.

Table 3.7: Residential to Secondary School Trips AM Peak

	0700-0800			0800-0900			0900-1000		
	In	**Out**	**2-way**	**In**	**Out**	**2-way**	**In**	**Out**	**2-way**
External Trips	16	46	62	89	248	337	9	24	33
Internal Trips	148	413	561	799	2,235	3,034	79	220	298
Total Trips	**164**	**459**	**623**	**888**	**2,483**	**3,371**	**87**	**244**	**331**

Table 3.8: Residential to Secondary School Trips PM Peak

	1600-1700			1700-1800			1800-1900		
	In	**Out**	**2-way**	**In**	**Out**	**2-way**	**In**	**Out**	**2-way**
External Trips	52	30	82	24	14	38	7	4	12
Internal Trips	466	274	740	213	125	338	66	39	105
Total Trips	**518**	**305**	**822**	**237**	**139**	**376**	**73**	**43**	**117**

Residential to Food Retail

3.22 Based on the TEMPRO/NTS journey purpose data, it has been assumed that 50% of shopping trips by residents will be for food. This is considered to be a robust assumption.

3.23 It has been assumed that 90% of food retail trips during the peak periods will be internal to HGC, based on the provision of food retail floorspace on-site, suitable for day-to-day and top-up shopping. This is also considered appropriate for peak period assessments, when primary (single purpose) retail trips are less likely to be made and food shopping tends to be undertaken as part of a linked trip.

3.24 For the purposes of a robust assessment, 10% of trips have been assigned to external locations for larger weekly shops or the purchase of items that may not be available at the on-site facilities. To be clear this is new single purpose trips i.e. people deciding to drive to a food store and then home again during the peak hours without any linking of their trip to another purpose. It should also be noted that, based on ONS data, there has been general growth in the use of home delivery services for retail over recent years and this is likely to continue in future.

3.25 **Table 3.9** and **Table 3.10** set out the summary of internal/external total person trips associated with residential to food retail trips. These tables therefore consider the Residential to Food Retail trips set out within **Tables 2.26-2.27** and apply the trip internalisation assumptions set out in **Table 3.1**.

Table 3.9: Residential to Food Retail Trips AM Peak

	0700-0800			0800-0900			0900-1000		
	In	**Out**	**2-way**	**In**	**Out**	**2-way**	**In**	**Out**	**2-way**
External Trips	3	8	11	8	24	32	20	61	82
Internal Trips	25	75	100	71	216	288	182	552	735
Total Trips	**28**	**84**	**112**	**79**	**240**	**320**	**203**	**613**	**816**

Table 3.10: Residential to Food Retail Trips PM Peak

	1600-1700			1700-1800			1800-1900		
	In	**Out**	**2-way**	**In**	**Out**	**2-way**	**In**	**Out**	**2-way**
External Trips	66	33	99	55	27	82	50	24	74
Internal Trips	598	293	891	496	243	739	447	219	666
Total Trips	**664**	**326**	**990**	**551**	**271**	**822**	**496**	**244**	**740**

Residential to Non-Food Retail

3.26 It has been assumed that 50% of shopping trips from the TEMPRO/NTS journey purpose data will be for non-food.

3.27 The assessment has assumed that up to 25% of non-food retail trips will be internal and 75% will travel to external locations. These figures are based on the provision of an element of non-food retail floorspace within the HGC.

3.28 As for food retail it is important to note that this figure is for single purpose retail trips in the peak periods. Whilst one might nip to a very local shop, or call in as part of another trip, the propensity to undertake a dedicated retail trip when the network is most congested is low.

3.29 **Table 3.11** and **Table 3.12** set out the summary of internal/external total person trips associated with residential to non-food retail trips. These tables therefore consider the Residential to Non-Food Retail trips set out within **Tables 2.26-2.27** and apply the trip internalisation assumptions set out in **Table 3.1**.

Table 3.11: Residential to Non-Food Retail Trips AM Peak

	0700-0800			0800-0900			0900-1000		
	In	**Out**	**2-way**	**In**	**Out**	**2-way**	**In**	**Out**	**2-way**
External Trips	21	63	84	60	180	240	152	460	612
Internal Trips	7	21	28	20	60	80	51	153	204
Total Trips	**28**	**84**	**112**	**79**	**240**	**320**	**203**	**613**	**816**

Table 3.12: Residential to Non-Food Retail Trips PM Peak

	1600-1700			1700-1800			1800-1900		
	In	**Out**	**2-way**	**In**	**Out**	**2-way**	**In**	**Out**	**2-way**
External Trips	498	245	743	413	203	616	372	183	555
Internal Trips	166	82	248	138	68	205	124	61	185
Total Trips	**664**	**326**	**990**	**551**	**271**	**822**	**496**	**244**	**740**

Residential to Personal Business

3.30 The TEMPRO definition of personal business includes visits to services including hairdressers, betting shops, dry cleaners, solicitors, banks, estate agents, libraries, churches and medical consultations.

3.31 Local centres will be provided within the HGC, and it is highly likely that facilities such as those set out above will be provided. Therefore, it is considered that up to 50% of trips are likely to be internal.

3.32 **Table 3.13** and **Table 3.14** set out the summary of internal/external total person trips associated with residential to personal business trips. These tables therefore consider the Residential to Personal Business trips set out within **Tables 2.26-2.27** and apply the trip internalisation assumptions set out in **Table 3.1**.

Table 3.13: Residential to Personal Business Trips AM Peak

	0700-0800			0800-0900			0900-1000		
	In	**Out**	**2-way**	**In**	**Out**	**2-way**	**In**	**Out**	**2-way**
External Trips	36	135	171	74	278	353	65	245	310
Internal Trips	36	135	171	74	278	353	65	245	310
Total Trips	**72**	**270**	**342**	**148**	**557**	**705**	**131**	**490**	**621**

Table 3.14: Residential to Personal Business Trips PM Peak

	1600-1700			1700-1800			1800-1900		
	In	**Out**	**2-way**	**In**	**Out**	**2-way**	**In**	**Out**	**2-way**
External Trips	271	129	400	275	131	406	179	85	264
Internal Trips	271	129	400	275	131	406	179	85	264
Total Trips	**542**	**258**	**800**	**550**	**262**	**811**	**357**	**170**	**527**

Residential to Recreation/Social

3.33 As for personal business, it is assumed that the majority of recreation/social trips will be associated with on-site recreation/social facilities. As such, it is considered that up to 75% of trips are likely to be internal. This is considered to be a robust assessment, as recreational/social trips will also comprise trips such as dog walking, jogging and children playing, which is likely to occur on site.

3.34 **Table 3.15** and **Table 3.16** set out the summary of internal/external total person trips associated with residential to recreation/social trips. These tables therefore consider the Residential to Recreation/Social trips set out within **Tables 2.26-2.27** and apply the trip internalisation assumptions set out in **Table 3.1**.

Table 3.15: Residential to Recreation/Social Trips AM Peak

	0700-0800			0800-0900			0900-1000		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
External Trips	10	35	45	19	65	84	39	134	173
Internal Trips	30	104	134	57	195	252	117	401	518
Total Trips	**40**	**139**	**179**	**76**	**260**	**336**	**156**	**535**	**691**

Table 3.16: Residential to Recreation/Social Trips PM Peak

	1600-1700			1700-1800			1800-1900		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
External Trips	324	151	475	368	171	540	420	195	616
Internal Trips	973	453	1,425	1,105	514	1,619	1,260	586	1,847
Total Trips	**1,297**	**603**	**1,900**	**1,473**	**686**	**2,159**	**1,680**	**782**	**2,462**

Non-residential Trips

3.35 The proposed levels of internalisation for non-residential trips are summarised below in **Table 3.17** and are discussed in further detail within this section of the report.

Table 3.17: Non-Residential Trip Internalisation

Trip Purpose	Distribution	
	External (Off-site)	Internal (On-site)
Employment	75%	25%
Primary School Staff	75%	25%
Secondary School Staff	90%	10%
Secondary School Pupils	10%	90%

Primary Education

Pupils & Parents

3.36 As discussed previously, there are no external pupil (and therefore parent) trips into the HGC area.

Staff

3.37 It has been assumed that 25% of primary education staff trips will be internal to the site for the primary schools. For the purposes of this assessment, a figure of 75% of primary school staff have been assumed to travel from external origins to the site.

3.38 In general, primary schools are more numerous than secondary schools and serve a more local population, both in terms of pupils and staff. This assumption is reflected in the higher rate of internalisation for primary school staff than secondary school staff (presented below).

3.39 **Table 3.18** below sets out the internal and external trips for the proposed primary schools and includes a breakdown of pupil, parent and staff trips. These tables therefore consider the Primary School (Staff, Pupils and Parents) trips set out within **Tables 2.26-2.27** and apply the trip internalisation assumptions set out in **Table 3.17**.

Table 3.18: Primary School External/Internal Person Trips (Pupils, Parents and Staff)

External									
Hour	**Pupil Trips**			**Staff Trips**			**Parent Trips**		
	Arr.	**Dep.**	**2-Way**	**Arr.**	**Dep.**	**2-Way**	**Arr.**	**Dep.**	**2-Way**
0700-0800	0	0	0	104	0	104	0	0	0
0800-0900	0	0	0	35	0	35	0	0	0
0900-1000	0	0	0	0	0	0	0	0	0
1600-1700	0	0	0	0	35	35	0	0	0
1700-1800	0	0	0	0	104	104	0	0	0
1800-1900	0	0	0	0	0	0	0	0	0
Internal									
Hour	**Pupil Trips**			**Staff Trips**			**Parent Trips**		
	Arr.	**Dep.**	**2-Way**	**Arr.**	**Dep.**	**2-Way**	**Arr.**	**Dep.**	**2-Way**
0700-0800	440	0	440	35	0	35	220	220	440
0800-0900	3,960	0	3,960	12	0	12	1,980	1,980	3,960
0900-1000	0	0	0	0	0	0	0	0	0
1600-1700	0	440	440	0	12	12	220	220	440
1700-1800	0	0	0	0	35	35	0	0	0
1800-1900	0	0	0	0	0	0	0	0	0
Total									
Hour	**Pupil Trips**			**Staff Trips**			**Parent Trips**		
	Arr.	**Dep.**	**2-Way**	**Arr.**	**Dep.**	**2-Way**	**Arr.**	**Dep.**	**2-Way**
0700-0800	440	0	440	139	0	139	220	220	440
0800-0900	3,960	0	3,960	46	0	46	1,980	1,980	3,960
0900-1000	0	0	0	0	0	0	0	0	0
1600-1700	0	440	440	0	46	46	220	220	440
1700-1800	0	0	0	0	139	139	0	0	0
1800-1900	0	0	0	0	0	0	0	0	0

Secondary Education

<u>Pupils</u>

3.40 In order to determine the level of internalisation of secondary school pupil trips, the first stage has been to establish the percentage of pupils from the HGC area as set out earlier in this report.

3.41 To ensure a robust assessment and element of choice for secondary school aged students, the proportion of external trips to the HGC area has been calculated as circa 10% of the total number of pupils (4,320) which equals 432 external pupils. This is shown in **Table 3.19**.

Parents

3.42 The parental trips are based on the modal spilt for secondary school aged pupils for those who travel as a car passenger. This is presented in **Table 3.19** below. Further detail about the mode split is set out in **Section 4**.

Staff

3.43 It has been assumed that 10% of secondary education staff trips will be internal to the HGC for the secondary schools.

3.44 For the purposes of this assessment, a figure of 90% of secondary school staff have been assumed to travel from external origins to the site.

3.45 **Table 3.19** below sets out the internal and external trips for the proposed secondary schools and includes a breakdown of pupil, parent and staff trips based on the explanations set out above. These tables therefore consider the Secondary School (Staff, Pupils and Parents) trips set out within **Tables 2.26-2.27** and apply the trip internalisation assumptions set out in **Table 3.17**.

Table 3.19: Secondary School External/Internal Person Trips (Pupils, Parents and Staff)

External									
Hour	Pupil Trips			Staff Trips			Parent Trips		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
0700-0800	44	0	44	203	0	203	11	11	23
0800-0900	399	0	399	68	0	68	78	78	157
0900-1000	0	0	0	0	0	0	0	0	0
1600-1700	0	44	44	0	68	68	12	12	24
1700-1800	0	0	0	0	203	203	0	0	0
1800-1900	0	0	0	0	0	0	0	0	0
Internal									
Hour	Pupil Trips			Staff Trips			Parent Trips		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
0700-0800	388	0	388	23	0	23	32	32	64
0800-0900	3,489	0	3,489	8	0	8	310	310	621
0900-1000	0	0	0	0	0	0	0	0	0
1600-1700	0	388	388	0	8	8	31	31	62
1700-1800	0	0	0	0	23	23	0	0	0
1800-1900	0	0	0	0	0	0	0	0	0
Total									
Hour	Pupil Trips			Staff Trips			Parent Trips		
	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
0700-0800	432	0	432	225	0	225	43	43	86
0800-0900	3,888	0	3,888	75	0	75	389	389	778
0900-1000	0	0	0	0	0	0	0	0	0
1600-1700	0	432	432	0	75	75	43	43	86
1700-1800	0	0	0	0	225	225	0	0	0
1800-1900	0	0	0	0	0	0	0	0	0

Employment

3.46 HGC is forecast to employ up to 8,000 people but this is across all land uses. Of these jobs it is envisaged that 25% of the trips would be internal based on circa 12% of employable people remaining on site as described previously for the residential element. This is robust on the basis of similar areas.

3.47 **Table 3.20** and **Table 3.21** set out the summary of internal/external total person trips associated with employment trips. These tables therefore consider the Employment E(g)(i) and Employment B8 trips in **Tables 2.26-2.27** and the internalisation assumptions set out in **Table 3.17**.

Table 3.20: Employment Trips AM Peak

	0700-0800			0800-0900			0900-1000		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
External Trips	468	87	555	1,194	159	1,352	784	109	893
Internal Trips	156	29	185	398	53	451	261	36	298
Total Trips	**625**	**116**	**740**	**1,592**	**211**	**1,803**	**1,046**	**145**	**1,190**

Table 3.21: Employment Trips PM Peak

	1600-1700			1700-1800			1800-1900		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
External Trips	120	660	779	82	1,175	1,257	58	392	450
Internal Trips	40	220	260	27	392	419	19	131	150
Total Trips	**160**	**879**	**1,039**	**110**	**1,566**	**1,676**	**77**	**523**	**600**

Total Trips Summary

3.48 **Table 3.22** and **Table 3.23** set out the summary of internal/external total person trips associated with all the proposed uses across the site and should be considered as the sum of the data presented in the internal/external trip generation tables set out in **Section 3**. Additionally, the HGV trips set out in **Table 2.25** (**Section 2)** have been added into the tables below.

Table 3.22: Total Trips AM Peak

	0700-0800			0800-0900			0900-1000		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
External Trips	1,793	3,412	5,205	2,756	3,566	6,322	1,266	1,713	2,980
HGVs	39	48	87	82	62	144	71	62	133
Internal Trips	1,824	1,906	3,730	12,168	8,161	20,328	870	1,946	2,815
Total Trips	**3,656**	**5,366**	**9,022**	**15,005**	**11,789**	**26,794**	**2,207**	**3,721**	**5,928**

Table 3.23: Total Trips PM Peak

	1600-1700			1700-1800			1800-1900		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
External Trips	2,903	2,147	5,051	3,581	3,151	6,732	2,198	1,413	3,611
HGVs	39	42	80	16	49	66	16	25	41
Internal Trips	3,498	2,956	6,453	2,817	1,825	4,642	2,322	1,237	3,559
Total Trips	**6,440**	**5,145**	**11,584**	**6,414**	**5,025**	**11,439**	**4,536**	**2,675**	**7,212**

3.49 The resultant numbers of external total person trips by land use are presented in **Table 3.24** and **Table 3.25** respectively. These tables can then be compared directly to the total trips in **Table 2.26** and **Table 2.27** respectively.

Table 3.24: Total External People Trips (AM Peak)

Land Use	AM (0700-0800)			AM (0800-0900)			AM (0900-1000)		
	In	**Out**	**Tot**	**In**	**Out**	**Tot**	**In**	**Out**	**Tot**
Residential to Employment	876	3,027	3,903	733	2,533	3,266	197	680	877
Residential to Education (Primary)	0	0	0	0	0	0	0	0	0
Residential to Education (Secondary)	16	46	62	89	248	337	9	24	33
Residential to Food Retail	3	8	11	8	24	32	20	61	82
Residential to Non-Food Retail	21	63	84	60	180	240	152	460	612
Residential to Personal Business	36	135	171	74	278	353	65	245	310
Residential to Recreation/ Social	10	35	45	19	65	84	39	134	173
Employment E(g)(i)	370	47	417	1041	81	1121	646	57	703
Employment (B8)	98	40	138	153	78	231	138	52	189
Primary School (Staff)	104	0	104	35	0	35	0	0	0
Primary School (Pupils)	0	0	0	0	0	0	0	0	0
Primary School (Parents)	0	0	0	0	0	0	0	0	0
Secondary School (Staff)	203	0	203	68	0	68	0	0	0
Secondary School (Pupils)	44	0	44	399	0	399	0	0	0
Secondary School (Parents)	11	11	23	78	78	157	0	0	0
HGVs	39	48	87	82	62	144	71	62	133
Total	**1,832**	**3,460**	**5,292**	**2,837**	**3,628**	**6,465**	**1,337**	**1,775**	**3,112**

Table 3.25: Total External People Trips (PM Peak)

Land Use	1600-1700			1700-1800			1800-1900		
	In	Out	Tot	In	Out	Tot	In	Out	Tot
Residential to Employment	1,560	742	2,301	2,363	1,124	3,487	1,112	529	1,641
Residential to Education (Primary)	0	0	0	0	0	0	0	0	0
Residential to Education (Secondary)	52	30	82	24	14	38	7	4	12
Residential to Food Retail	66	33	99	55	27	82	50	24	74
Residential to Non-Food Retail	498	245	743	413	203	616	372	183	555
Residential to Personal Business	271	129	400	275	131	406	179	85	264
Residential to Recreation/ Social	324	151	475	368	171	540	420	195	616
Employment E(g)(i)	71	542	613	40	1061	1101	27	310	336
Employment (B8)	49	117	167	42	114	156	31	83	114
Primary School (Staff)	0	35	35	0	104	104	0	0	0
Primary School (Pupils)	0	0	0	0	0	0	0	0	0
Primary School (Parents)	0	0	0	0	0	0	0	0	0
Secondary School (Staff)	0	68	68	0	203	203	0	0	0
Secondary School (Pupils)	0	44	44	0	0	0	0	0	0
Secondary School (Parents)	12	12	24	0	0	0	0	0	0
HGVs	39	42	80	16	49	66	16	25	41
Total	**2,942**	**2,189**	**5,131**	**3,597**	**3,200**	**6,798**	**2,214**	**1,438**	**3,652**

4 Baseline Mode Splits

4.1 The trips discussed in the previous sections of this report are total person trips (except the HGV trip generation). Therefore, the following section sets out the modal splits by journey purpose for all the proposed land uses. For the purposes of this note, these modal splits are applied to external trips only. It is assumed that the majority of internal trips will be by sustainable modes or linked as part of another trip. The residual primary car-based trips will not have any effect on the external highway network.

Residential

Residential to Employment

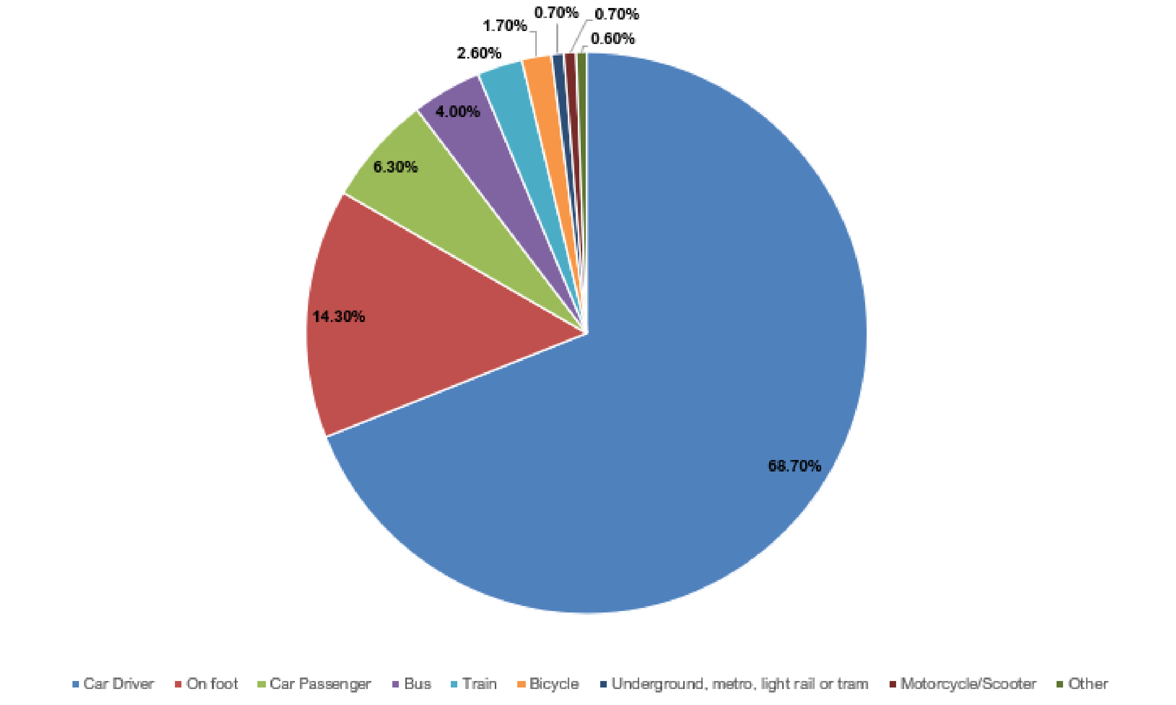
4.2 The travel to work mode share has been devised using data from the 2011 Census data for the Dacorum 013 MSOA. 2011 Census data has been utilised instead of 2021 Census data as the latter data is not considered to be robust given that at the time of the 2021 Census survey, government advice was for people to work from home and not to travel due to the ongoing Covid-19 pandemic. As such, the data relating to method of travel to work in the 2021 Census is not considered to be representative.

4.3 The residents travel to work mode share is as shown in **Figure 4.1**.

4.4 The method of travel to work dataset includes usual residents who ‘work mainly at or from home’ as well as those who are not in employment. In order to be robust and consider only usual residents who travel to work, those categories have been removed from the assessment and the remaining proportions have been extrapolated.

4.5 It would also be conventional to exclude walking and cycling trips on the basis that they are already included in the internal trip element. However, in this case, there are external facilities within easy walking and cycling proximity – in particular Maylands employment area. Hence this element has been retained.

Figure 4.1: 2011 Census Mode Share for Journey to Work (Residents of Dacorum 013 MSOA)



4.6 The mode spilt outlined above is therefore considered a robust estimation of the modal split for external trips.

4.7 **Table 4.1** and **Table 4.2** set out the resultant residential to employment external trips by mode. These tables therefore reflect the Residential to Employment trips set out in **Tables 3.24-3.25** with the mode share assumptions set out below and in **Figure 4.1** applied.

Table 4.1: External Residential to Employment Trips by Mode (AM Peak)

Mode	%	07:00-08:00			08:00-09:00			09:00-10:00		
		In	Out	2-way	In	Out	2-way	In	Out	2-way
Driving a car or van	68.7%	602	2,080	2,682	504	1,740	2,244	135	467	602
On foot	14.3%	125	433	559	105	363	468	28	97	125
Passenger in a car or van	6.3%	55	190	245	46	159	205	12	43	55
Bus, minibus or coach	4.0%	35	120	155	29	100	129	8	27	35
Train	2.6%	23	80	103	19	67	86	5	18	23
Bicycle	1.7%	15	51	65	12	42	55	3	11	15
Underground, metro, light rail, tram	0.7%	6	22	28	5	18	24	1	5	6
Motorcycle, scooter or moped	0.7%	6	22	28	5	18	24	1	5	6
Other method of travel to work	0.6%	5	17	22	4	14	19	1	4	5
Taxi	0.4%	4	13	16	3	11	14	1	3	4
Total	**100%**	**876**	**3,027**	**3,903**	**733**	**2,533**	**3,266**	**197**	**680**	**877**

Table 4.2: External Residential to Employment Trips by Mode (PM Peak)

Mode	%	16:00-17:00			17:00-18:00			18:00-19:00		
		In	Out	2-way	In	Out	2-way	In	Out	2-way
Driving a car or van	68.7%	1,072	509	1,581	1,624	772	2,396	764	363	1,128
On foot	14.3%	223	106	329	338	161	499	159	76	235
Passenger in a car or van	6.3%	98	47	145	148	71	219	70	33	103
Bus, minibus or coach	4.0%	62	29	91	94	44	138	44	21	65
Train	2.6%	41	19	60	62	30	92	29	14	43
Bicycle	1.7%	26	12	39	40	19	58	19	9	27
Underground, metro, light rail, tram	0.7%	11	5	17	17	8	25	8	4	12
Motorcycle, scooter or moped	0.7%	11	5	17	17	8	25	8	4	12
Other method of travel to work	0.6%	9	4	13	13	6	20	6	3	9
Taxi	0.4%	7	3	10	10	5	15	5	2	7
Total	**100%**	**1,560**	**742**	**2,301**	**2,363**	**1,124**	**3,487**	**1,112**	**529**	**1,641**

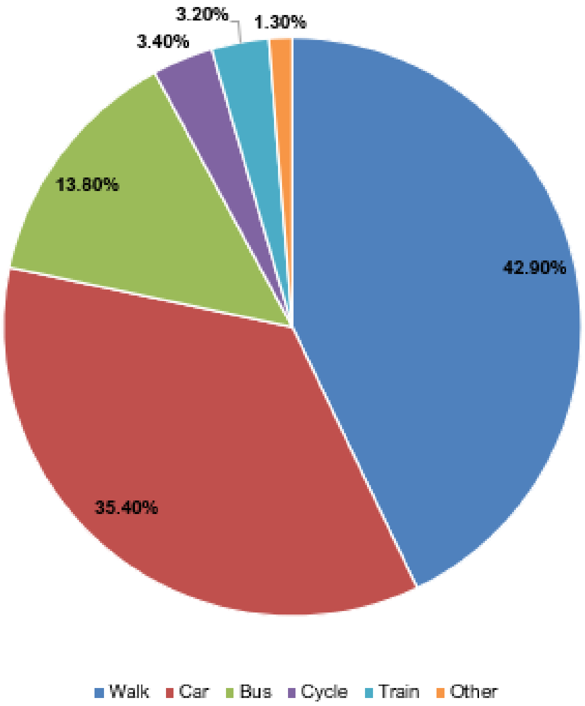
Residential to Education – Primary School

4.8 As explained previously, all the primary school trips are internal. As such, these trips are assumed to be walking / cycling trips or other sustainable modes.

Residential to Education – Secondary School External Trips

4.9 A similar approach has also been used to establish the modal split for secondary school pupils. Figure 5.4.2 within the 'Hertfordshire Traffic and Transport Data Report (2022)' provides a percentage breakdown of modal split for journeys made to secondary school. A summary of this data is provided in **Figure 4.2** below.

Figure 4.2: Mode of Travel to School (Secondary)



4.10 Once again, the data shown above does not separate 'car driver' and 'car passenger'. Therefore, all trips were split proportionally between car driver and car passenger, based on the NTS proportions per hour for 'Education' and Escort Education,' provided in Table NTS0502a. The resultant mode split for secondary school aged pupils is presented in **Table 4.3** below. It should be noted that the actual sustainable mode may vary between walk, cycle and bus, depending on the location of the residential area within HGC and the external school. However, for the purposes of this note and at a high level, the car driver and passenger numbers are considered reasonable.

Table 4.3: Residential to Secondary Education Modal Split (External Trips)

Mode	0700-0800	0800-0900	0900-1000	1600-1700	1700-1800	1800-1900
Walk	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%
Cycle	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%
Bus	13.8%	13.8%	13.8%	13.8%	13.8%	13.8%
Train	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%
Car Driver	9.8%	15.7%	24.3%	7.9%	16.6%	15.4%
Car Passenger	25.6%	19.7%	11.1%	27.5%	18.8%	20.0%
Other	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

4.11 **Table 4.4** and **Table 4.5** set out the resultant residential to secondary school external trips by mode. These tables therefore reflect the Residential to Education (Secondary) trips set out in **Tables 3.24-3.25** with the mode share assumptions set out in **Table 4.3** applied.

Table 4.4: External Residential to Secondary School Trips by Mode (AM Peak)

Mode	07:00-08:00			08:00-09:00			09:00-10:00		
	In	**Out**	**2-way**	**In**	**Out**	**2-way**	**In**	**Out**	**2-way**
Walk	7	20	27	38	107	145	4	10	14
Cycle	1	2	2	3	8	11	0	1	1
Bus	2	6	9	12	34	47	1	3	5
Train	1	1	2	3	8	11	0	1	1
Car Driver	2	5	6	14	39	53	2	6	8
Car Passenger	4	12	16	17	49	66	1	3	4
Other	0	1	1	1	3	4	0	0	0
Total	**16**	**46**	**62**	**89**	**248**	**337**	**9**	**24**	**33**

Table 4.5: External Residential to Secondary School Trips by Mode (PM Peak)

Mode	16:00-17:00			17:00-18:00			18:00-19:00		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
Walk	22	13	35	10	6	16	3	2	5
Cycle	2	1	3	1	0	1	0	0	0
Bus	7	4	11	3	2	5	1	1	2
Train	2	1	3	1	0	1	0	0	0
Car Driver	4	2	6	4	2	6	1	1	2
Car Passenger	14	8	23	4	3	7	1	1	2
Other	1	0	1	0	0	0	0	0	0
Total	**52**	**30**	**82**	**24**	**14**	**38**	**7**	**4**	**12**

Residential to Food/Non-Food Retail & Personal Business

4.12 As the mode choice is likely to be similar for food/non-food shopping and personal business, the same modal split has been applied to trips associated with each purpose.

4.13 The TRICS database was interrogated to obtain an appropriate modal split for these trip purposes, based on food retail sites, as these will provide robust modal splits. The following selection criteria was used to obtain representative sites:

- Sub Land Use: Food Superstore
- Calculation Option: Multi-Modal Trip Rates
- Regions: England, but excluding Greater London
- Number of Units: 2,000-6,000sqm
- Location Types: Suburban Area, Edge of Town and Neighbourhood Centre
- Date Range: TRICS default range of 8 years (i.e. 01/01/15 to 29/09/22)
- Local Population within 1 mile: All included (sites to be individually interrogated)
- Major Cities: removal of sites within major cities
- Covid: removal of sites flagged by TRICS as having been undertaken during a Covid year

4.14 The modal splits per hour for each AM (0700-1000) and PM (1600-1900) period were then extracted from TRICS.

4.15 For the purposes of this assessment and to be robust, it has been assumed that residents will travel by bus and car only for external trips, but it is anticipated that cycling will make up a reasonable volume of trips in future.

4.16 The modal shares for travel by bus, single-occupancy vehicles and multi-occupancy vehicles were extracted and used to form the basis of the final mode split. Walking, cycling and other public transport trips have been removed. The subsequent TRICS mode split applied to external trips is presented in **Table 4.6** below.

Table 4.6: TRICS Mode Split (Food Retail)

Mode	0700-0800	0800-0900	0900-1000	1600-1700	1700-1800	1800-1900
Bus	7.3%	11.2%	8.0%	6.9%	4.6%	4.2%
Single-Occupancy Vehicle	26.1%	17.1%	22.9%	22.9%	23.9%	24.9%
Multi-Occupancy Vehicle	38.3%	36.9%	46.2%	45.5%	47.8%	48.8%
Other Modes*	28.3%	34.8%	22.9%	24.7%	23.7%	22.1%
Total	100%	100%	100%	100%	100%	100%

**Not included within the assessment*

4.17 The bus mode shares presented in **Table 4.6** have not been adjusted for the final mode split used within the assessment.

4.18 The single and multi-occupancy mode shares have been used to derive car driver and car passenger mode shares.

4.19 As the single-occupancy vehicles and multi-occupancy vehicles both include a car driver it is necessary to assume the number of occupants within a multi-occupancy vehicle. For the purposes of this assessment, we have assumed just one passenger per multi-occupancy vehicle, which provides a worst-case assessment.

4.20 For example, to obtain the proportion of people travelling by car who are car driver for 0700-0800, the following calculation was undertaken:

$$(26.1\% + 38.3\%) / (26.1\% + 38.3\% + 38.3\%) = 62.7\%$$

4.21 To obtain the car passenger mode share for 0700-0800, the following calculation was undertaken:

$$38.3\% / (26.1\% + 38.3\% + 38.3\%) = 37.3\%$$

4.22 This calculation was applied to each hour, to obtain the split between car drivers and car passengers. The results are presented in **Table 4.7** below.

Table 4.7: Car Driver/Car Passenger Mode Split

Mode	0700-0800	0800-0900	0900-1000	1600-1700	1700-1800	1800-1900
Car Driver	62.7%	59.4%	59.9%	60.1%	60.0%	60.2%
Car Passenger	37.3%	40.6%	40.1%	39.9%	40.0%	39.8%
Total	100%	100%	100%	100%	100%	100%

4.23 However, as described previously, residents are also expected to travel by bus for the purposes of shopping and personal business. Therefore, the mode splits presented in **Table 4.7** have been applied to the percentage mode share remaining once the bus mode share, as shown in **Table 4.6**, has been taken into account.

4.24 For example, the following calculation has been undertaken to obtain the final car driver mode share for 0700-0800:

*(100% - 7.3%) * 62.7% = 58.1%*

4.25 To obtain the car passenger mode share for 0700-0800, the following calculation was undertaken:

*(100% - 7.3%) * 37.3% = 34.6%*

4.26 This calculation was subsequently applied to each hour, to obtain the final car driver and car passenger mode shares for the purposes of this assessment. The results are presented in **Table 4.8.**

Table 4.8: Food/ Non-Food Retail & Personal Business External Trips Mode Split

Mode	0700-0800	0800-0900	0900-1000	1600-1700	1700-1800	1800-1900
Bus	7.3%	11.2%	8.0%	6.9%	4.6%	4.2%
Car Driver	58.1%	52.8%	55.1%	55.9%	57.2%	57.6%
Car Passenger	34.6%	36.0%	36.9%	37.2%	38.2%	38.2%
Total	100%	100%	100%	100%	100%	100%

4.27 **Table 4.9** and **Table 4.10** set out the resultant residential to food/non-food retail & personal business external trips by mode. These tables therefore reflect the Residential to Food, Residential to Non-Food Retail and Residential to Personal Business trips set out in **Tables 3.24-3.25** with the mode share assumptions set out in **Table 4.8** applied.

Table 4.9: External Residential to Food/Non-Food Retail & Personal Business Trips by Mode (AM Peak)

Mode	07:00-08:00			08:00-09:00			09:00-10:00		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
Bus	4	15	19	16	54	70	19	61	80
Car Driver	35	120	155	75	255	329	131	423	554
Car Passenger	21	71	92	51	174	225	88	283	370
Total	60	206	266	142	483	624	238	767	1,004

Table 4.10: External Residential to Food/Non-Food Retail & Personal Business Trips by Mode (PM Peak)

Mode	16:00-17:00			17:00-18:00			18:00-19:00		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
Bus	58	28	86	34	17	51	25	12	37
Car Driver	467	227	694	425	206	632	346	168	514
Car Passenger	311	151	462	284	138	421	229	111	341
Total	836	406	1,242	743	361	1,104	600	292	892

Residential to Recreation/Social

4.28 The TRICS database was interrogated to obtain an appropriate modal split for trips associated with recreation and social purposes. For the purposes of this assessment, modal splits were obtained for 'Fitness Clubs.' This is deemed to be appropriate due to the lack of AM peak period data for other Leisure land uses within the TRICS database.

4.29 The following selection criteria was used to obtain representative sites:

- Land Use: Leisure
- Sub Lane Use: Fitness Club (Private)
- Calculation Option: Multi-Modal Trip Rates
- Regions: England, but excluding Greater London
- Number of Units: Default
- Date Range: TRICS default range of 8 years (i.e. 01/01/15 to 19/11/22)
- Local Population within 1 mile: All included (sites to be individually interrogated)
- Major Cities: removal of sites within major cities
- Removal of sites that do not present modal share by vehicle occupancy
- Covid: removal of sites flagged by TRICS as having been undertaken during a Covid year

4.30 Subsequently, the modal splits for 0700-0800, 0800-0900, 0900-1000, 1600-1700, 1700-1800 and 1800-1900 were obtained and are summarised in **Table 4.11**.

Table 4.11: TRICS Mode Split (Fitness Club)

Mode	0700-0800	0800-0900	0900-1000	1600-1700	1700-1800	1800-1900
Single Vehicle Occupants	54.2%	28.7%	25.3%	29.3%	28.6%	40.3%
Multi Vehicle Occupants	25.0%	19.5%	44.2%	38.7%	42.3%	33.5%
Pedestrians	16.7%	28.7%	19.5%	24.3%	18.8%	17.3%
Cyclists	0.0%	8.0%	5.8%	5.0%	8.1%	6.3%
Bus	4.2%	12.6%	4.5%	2.8%	1.7%	2.1%

4.31 However, due to the location of the HGC, it was concluded that few external leisure or social trips will be by walking. Therefore, for the purposes of this assessment and to be robust, it has been assumed that residents will travel by bus and car or will choose to cycle for external trips.

4.32 The modal shares for travel by cycle, bus, single-occupancy vehicles and multi-occupancy vehicles were extracted and used to form the basis of the final mode split. The mode shares for walking trips have been redistributed across the remaining modes, based on their proportion of the total mode split.

4.33 For example, to calculate the increase in single vehicle occupants from 0700-0800, the following calculation was undertaken:

*16.7% * (54.2% / (54.2% + 25% + 0.0% + 4.2%)) = 10.9%*

4.34 This calculation was applied to the remaining modes, and across each hour. The additional mode share per mode, as a result of the removal of walking trips is presented in **Table 4.12**.

Table 4.12: Additional Mode Share per Mode

Mode	0700-0800	0800-0900	0900-1000	1600-1700	1700-1800	1800-1900
Single Vehicle Occupants	10.9%	12.0%	6.2%	9.4%	6.7%	8.5%
Multi Vehicle Occupants	5.0%	8.1%	10.8%	12.4%	9.9%	7.1%
Cyclists	0.0%	3.3%	1.4%	1.6%	1.9%	1.3%
Bus	0.8%	5.3%	1.1%	0.9%	0.4%	0.4%

Subsequently, the percentages shown in **Table 4.12** were added to the original mode shares presented in **Table 4.11**, resulting in a mode split without pedestrian trips. This is presented in **Table 4.13**.

Table 4.13: Mode Share (Without Pedestrian Trips)

Mode	0700-0800	0800-0900	0900-1000	1600-1700	1700-1800	1800-1900
Single Vehicle Occupants	65.1%	40.7%	31.5%	38.7%	35.3%	48.8%
Multi Vehicle Occupants	30.0%	27.6%	55.0%	51.1%	52.2%	40.6%
Cyclists	0.0%	11.3%	7.2%	6.6%	10.0%	7.6%
Bus	5.0%	17.9%	5.6%	3.7%	2.1%	2.5%

4.35 To convert the single-occupancy vehicle and multi-occupancy vehicle to car driver and car passenger trips, the same methodology that was used to obtain the Shopping and Personal Business mode split was used.

4.36 For example, to obtain the car driver mode share for 0700-0800, the following calculation was undertaken:

(65.1% + 30%) / (65.1% + 30% + 30%) = 76.0%

4.37 To obtain the car passenger mode share for 0700-0800, the following calculation was undertaken:

30% / (65.1% + 30% + 30%) = 24%

4.38 This calculation was applied to each hour, to obtain the split between car drivers and car passengers. The results are presented in **Table 4.10** below.

Table 4.14: Car Driver/ Car Passenger Mode Split

Mode	0700-0800	0800-0900	0900-1000	1600-1700	1700-1800	1800-1900
Car Driver	76.0%	71.2%	61.1%	63.7%	62.6%	68.8%
Car Passenger	24.0%	28.8%	38.9%	36.3%	37.4%	31.2%
Total	100%	100%	100%	100%	100%	100%

4.39 As undertaken previously, the mode splits presented in **Table 4.14** have subsequently been applied to the percentage mode share remaining once the bus and cycle mode shares, as shown in **Table 4.13**, have been taken into account.

4.40 For example, the following calculation has been undertaken to obtain the final car driver mode share for 0700-0800:

*(100% - (0% + 5%)) * 76% = 72.2%*

4.41 Likewise, to obtain the final car passenger mode share for 0700-0800, the following calculation has been undertaken:

*(100% - (0% + 5%)) * 24% = 22.8%*

4.42 This calculation was subsequently applied to each hour, to obtain the final car driver and car passenger mode shares for the purposes of this assessment. The results are presented in **Table 4.15**.

Table 4.15: Recreation/ Social Mode Split for External Trips

Mode	0700-0800	0800-0900	0900-1000	1600-1700	1700-1800	1800-1900
Car Driver	72.2%	50.4%	53.3%	57.2%	55.1%	61.8%
Car Passenger	22.8%	20.4%	33.9%	32.5%	32.9%	28.0%
Bus	5.0%	17.9%	5.6%	3.7%	2.1%	2.5%
Cycle	0.0%	11.3%	7.2%	6.6%	10.0%	7.6%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

4.43 **Table 4.16** and **Table 4.17** set out the resultant residential to recreation/social external trips by mode. These tables therefore reflect the Residential to Recreation/Social trips set out in **Tables 3.24-3.25** with the mode share assumptions set out below and in **Table 4.15** applied.

Table 4.16: External Residential to Recreation/ Social Trips by Mode (AM Peak)

Mode	07:00-08:00			08:00-09:00			09:00-10:00		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
Bus	1	2	2	3	12	15	2	7	10
Car Driver	7	25	32	10	33	42	21	71	92
Car Passenger	2	8	10	4	13	17	13	45	59
Cycle	0	0	0	2	7	10	3	10	12
Total	10	35	45	19	65	84	39	134	173

Table 4.17: External Residential to Recreation/ Social Trips by Mode (PM Peak)

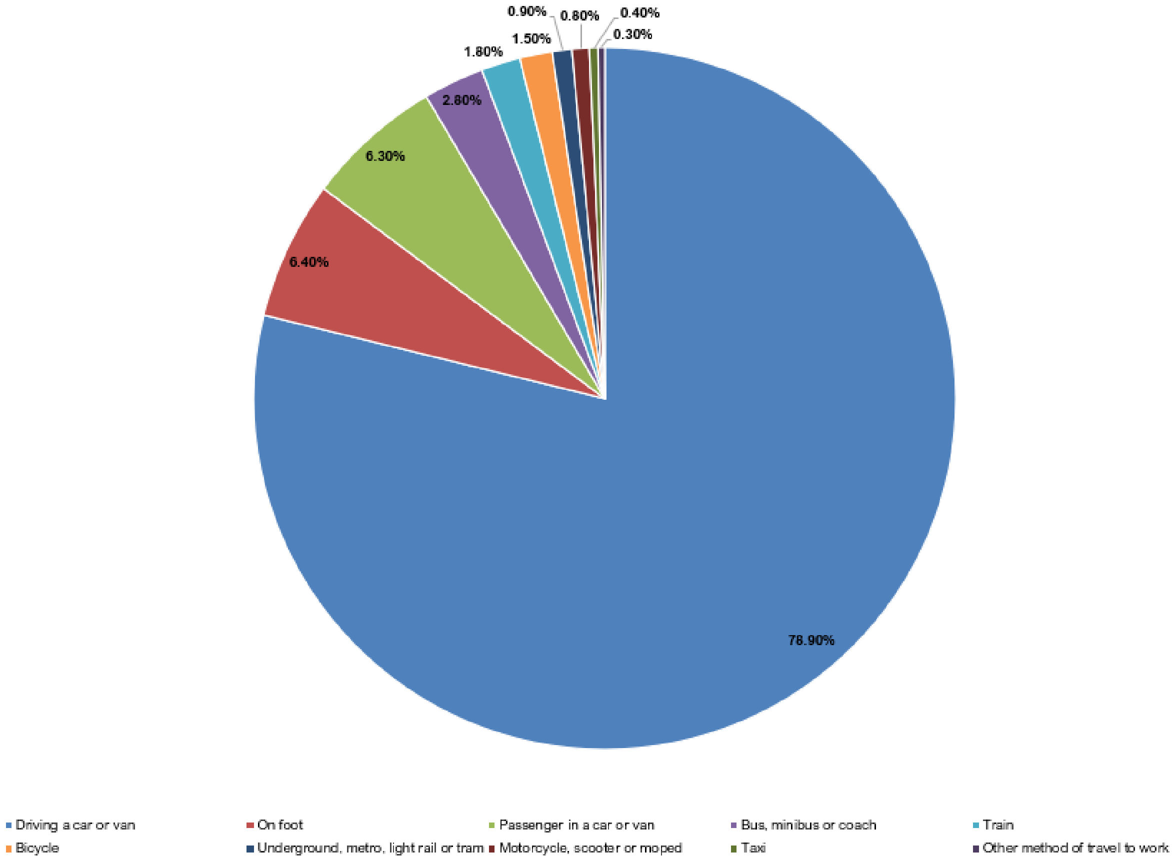
Mode	16:00-17:00			17:00-18:00			18:00-19:00		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
Bus	12	6	18	8	4	11	11	5	16
Car Driver	185	86	272	203	94	297	260	121	380
Car Passenger	105	49	155	121	56	177	118	55	173
Cycle	21	10	31	37	17	54	32	15	47
Total	324	151	475	368	171	540	420	195	616

Employment

4.44 To determine an appropriate baseline modal split for trips generated by the employment land uses at the HGC, the 2011 Census Origin-Destination data was interrogated. The method of travel to work data was extracted for people employed within the Dacorum 013 Middle Super Output Area, which lies adjacent to the HGC.

4.45 The modal split derived from this data is presented below in **Figure 4.3**.

Figure 4.3: 2011 Census Mode Share for Journey to Work (Employees of Dacorum 013 MSOA)



4.46 **Table 4.18** and **Table 4.19** set out the resultant employment external trips by mode. These tables therefore reflect the Employment E(g)(i) and Employment B8 trips set out in **Tables 3.24-3.25** with the mode share assumptions set out below and in **Figure 4.3** applied.

Table 4.18: External Employment Trips by Mode (AM Peak)

Mode	%	07:00-08:00			08:00-09:00			09:00-10:00		
		In	Out	2-way	In	Out	2-way	In	Out	2-way
Driving a car or van	78.9%	369	68	438	941	125	1,066	618	86	704
On foot	6.4%	30	6	35	76	10	86	50	7	57
Passenger in a car or van	6.3%	30	5	35	75	10	85	49	7	56
Bus, minibus or coach	2.8%	13	2	16	34	4	38	22	3	25
Train	1.8%	9	2	10	22	3	25	14	2	16
Bicycle	1.5%	7	1	8	18	2	20	12	2	13
Underground, metro, light rail, tram	0.9%	4	1	5	10	1	12	7	1	8
Motorcycle, scooter or moped	0.8%	4	1	4	10	1	11	6	1	7
Other method of travel to work	0.3%	1	0	2	4	0	4	2	0	3
Taxi	0.4%	2	0	2	5	1	6	3	0	4
Total	100.0%	468	87	555	1,194	159	1,352	784	109	893

Table 4.19: External Employment Trips by Mode (PM Peak)

Mode	%	16:00-17:00			17:00-18:00			18:00-19:00		
		In	Out	2-way	In	Out	2-way	In	Out	2-way
Driving a car or van	78.9%	95	520	615	65	926	991	46	309	355
On foot	6.4%	8	42	50	5	75	80	4	25	29
Passenger in a car or van	6.3%	8	42	49	5	74	79	4	25	28
Bus, minibus or coach	2.8%	3	19	22	2	33	35	2	11	13
Train	1.8%	2	12	14	2	22	23	1	7	8
Bicycle	1.5%	2	10	11	1	17	18	1	6	7
Underground, metro, light rail, tram	0.9%	1	6	7	1	10	11	0	3	4
Motorcycle, scooter or moped	0.8%	1	5	6	1	9	10	0	3	4
Other method of travel to work	0.3%	0	2	2	0	4	4	0	1	1
Taxi	0.4%	0	3	3	0	5	5	0	2	2
Total	100.0%	120	660	779	82	1,175	1,257	58	392	450

Education

Primary School (External)

<u>Staff</u>

4.47 The same modal share applied to the proposed employment uses - see **Figure 4.3** has been applied to primary school staff trips to the HGC.

4.48 The resulting trip generation is presented in **Table 4.20** and **Table 4.21**. These tables therefore reflect the Primary School (Staff) trips set out in **Tables 3.24-3.25** with the mode share assumptions set out below and in **Figure 4.3** applied.

Table 4.20: External Primary School (Staff) Trips by Mode (AM Peak)

Mode	%	07:00-08:00			08:00-09:00			09:00-10:00		
		In	Out	2-way	In	Out	2-way	In	Out	2-way
Driving a car or van	78.9%	82	0	82	27	0	27	0	0	0
On foot	6.4%	7	0	7	2	0	2	0	0	0
Passenger in a car or van	6.3%	7	0	7	2	0	2	0	0	0
Bus, minibus or coach	2.8%	3	0	3	1	0	1	0	0	0
Train	1.8%	2	0	2	1	0	1	0	0	0
Bicycle	1.5%	2	0	2	1	0	1	0	0	0
Underground, metro, light rail, tram	0.9%	1	0	1	0	0	0	0	0	0
Motorcycle, scooter or moped	0.8%	1	0	1	0	0	0	0	0	0
Other method of travel to work	0.3%	0	0	0	0	0	0	0	0	0
Taxi	0.4%	0	0	0	0	0	0	0	0	0
Total	100.0%	104	0	104	35	0	35	0	0	0

Table 4.21: External Primary School (Staff) Trips by Mode (PM Peak)

Mode	%	16:00-17:00			17:00-18:00			18:00-19:00		
		In	Out	2-way	In	Out	2-way	In	Out	2-way
Driving a car or van	78.9%	0	27	27	0	82	82	0	0	0
On foot	6.4%	0	2	2	0	7	7	0	0	0
Passenger in a car or van	6.3%	0	2	2	0	7	7	0	0	0
Bus, minibus or coach	2.8%	0	1	1	0	3	3	0	0	0
Train	1.8%	0	1	1	0	2	2	0	0	0
Bicycle	1.5%	0	1	1	0	2	2	0	0	0
Underground, metro, light rail, tram	0.9%	0	0	0	0	1	1	0	0	0
Motorcycle, scooter or moped	0.8%	0	0	0	0	1	1	0	0	0
Other method of travel to work	0.3%	0	0	0	0	0	0	0	0	0
Taxi	0.4%	0	0	0	0	0	0	0	0	0
Total	100.0%	0	35	35	0	104	104	0	0	0

Secondary School (External)

<u>Pupils travelling Into the HGC For Secondary School</u>

4.49 In order to establish the number of car driver trips associated with the secondary school provision, the External Pupil trips (outlined in **Tables 3.24-3.25**) have been split into self-driven and car passenger (parental driver) trips per hour using the modal split presented in **Table 4.3**.

4.50 This methodology has been used to allow for a small number of self-driven pupil trips (students of driving age) and thus is considered to be robust.

4.51 The number of parent-driven pupil trips is assumed to represent 100% of parental trips to secondary school. Any external pupils will travel by foot, cycle or public transport, if not a car passenger/driver, to the school.

Staff

4.52 The same modal share applied to the proposed employment uses (**Figure 4.3)** has been applied to secondary school staff trips to the HGC.

4.53 The resulting trip generation for pupil, parent and staff trips is presented below in **Table 4.22** and **Table 4.23**. These tables therefore reflect the Secondary School (Staff, Pupils and Parents) trips set out in **Tables 3.24-3.25** with the mode share assumptions set out in **Table 4.3** and **Figure 4.3** applied, as described above.

Table 4.22: Secondary School External Trips (AM Peak)

Mode	07:00-08:00			08:00-09:00			09:00-10:00		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
STAFF									
Driving a car or van	160	0	160	53	0	53	0	0	0
On foot	13	0	13	4	0	4	0	0	0
Passenger in a car or van	13	0	13	4	0	4	0	0	0
Bus, minibus or coach	6	0	6	2	0	2	0	0	0
Train	4	0	4	1	0	1	0	0	0
Bicycle	3	0	3	1	0	1	0	0	0
Underground, metro, light rail, tram	2	0	2	1	0	1	0	0	0
Motorcycle, scooter or moped	2	0	2	1	0	1	0	0	0
Other method of travel to work	1	0	1	0	0	0	0	0	0
Taxi	1	0	1	0	0	0	0	0	0
Total	203	0	203	68	0	68	0	0	0
PUPILS									
Walk	19	0	19	171	0	171	0	0	0
Cycle	2	0	2	14	0	14	0	0	0
Bus	6	0	6	55	0	55	0	0	0
Train	1	0	1	13	0	13	0	0	0
Car Driver	4	0	4	63	0	63	0	0	0
Car Passenger	11	0	11	78	0	78	0	0	0
Other	1	0	1	5	0	5	0	0	0
Total	44	0	44	399	0	399	0	0	0
PARENTS									
Walk	0	0	0	0	0	0	0	0	0
Cycle	0	0	0	0	0	0	0	0	0
Bus	0	0	0	0	0	0	0	0	0
Train	0	0	0	0	0	0	0	0	0
Car Driver	11	11	23	78	78	157	0	0	0
Car Passenger	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0
Total	11	11	23	78	78	157	0	0	0
TOTAL									
Walk	32	0	32	175	0	175	0	0	0
Cycle	4	0	4	15	0	15	0	0	0
Bus	12	0	12	57	0	57	0	0	0
Train	5	0	5	14	0	14	0	0	0
Car Driver	175	11	187	194	78	273	0	0	0
Car Passenger	24	0	24	83	0	83	0	0	0
Other	5	0	5	7	0	7	0	0	0
Total	258	11	269	544	78	623	0	0	0

Table 4.23: Secondary School External Trips (PM Peak)

Mode	16:00-17:00			17:00-18:00			18:00-19:00		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
			STAFF						
Driving a car or van	0	53	53	0	160	160	0	0	0
On foot	0	4	4	0	13	13	0	0	0
Passenger in a car or van	0	4	4	0	13	13	0	0	0
Bus, minibus or coach	0	2	2	0	6	6	0	0	0
Train	0	1	1	0	4	4	0	0	0
Bicycle	0	1	1	0	3	3	0	0	0
Underground, metro, light rail, tram	0	1	1	0	2	2	0	0	0
Motorcycle, scooter or moped	0	1	1	0	2	2	0	0	0
Other method of travel to work	0	0	0	0	1	1	0	0	0
Taxi	0	0	0	0	1	1	0	0	0
Total	0	68	68	0	203	203	0	0	0
PUPILS									
Walk	0	19	19	0	0	0	0	0	0
Cycle	0	2	2	0	0	0	0	0	0
Bus	0	6	6	0	0	0	0	0	0
Train	0	1	1	0	0	0	0	0	0
Car Driver	0	3	3	0	0	0	0	0	0
Car Passenger	0	12	12	0	0	0	0	0	0
Other	0	1	1	0	0	0	0	0	0
Total	0	44	44	0	0	0	0	0	0
PARENTS									
Walk	0	0	0	0	0	0	0	0	0
Cycle	0	0	0	0	0	0	0	0	0
Bus	0	0	0	0	0	0	0	0	0
Train	0	0	0	0	0	0	0	0	0
Car Driver	12	12	24	0	0	0	0	0	0
Car Passenger	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0
Total	12	12	24	0	0	0	0	0	0
TOTAL									
Walk	0	23	23	0	13	13	0	0	0
Cycle	0	2	2	0	3	3	0	0	0
Bus	0	8	8	0	6	6	0	0	0
Train	0	3	3	0	4	4	0	0	0
Car Driver	12	69	81	0	160	160	0	0	0
Car Passenger	0	16	16	0	13	13	0	0	0
Other	0	2	2	0	5	5	0	0	0
Total	12	124	136	0	203	203	0	0	0

Total External Trips

4.54 **Table 4.24** and **Table 4.25** set out the total external trips by mode summarising each land use as set out above. These do not include HGVs, but they are considered at the end of this section. These tables should therefore be considered the sum of all trip generation tables included within **Section 4**.

Table 4.24: Total External Trips by Mode (AM Peak)

Mode	07:00-08:00			08:00-09:00			09:00-10:00		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
Walk	201	458	659	396	479	876	82	115	196
Cycle	28	54	82	50	61	111	18	23	41
Bus	70	145	215	152	205	357	52	102	154
Train	39	83	122	59	77	136	20	21	40
Car Driver	1,273	2,309	3,582	1,765	2,270	4,036	907	1,053	1,960
Car Passenger	142	287	429	278	405	684	164	380	544
Other	41	76	117	55	69	124	24	19	43
Total	**1,793**	**3,412**	**5,205**	**2,756**	**3,566**	**6,322**	**1,266**	**1,713**	**2,980**

Table 4.25: Total External Trips by Mode (PM Peak)

Mode	16:00-17:00			17:00-18:00			18:00-19:00		
	In	Out	2-way	In	Out	2-way	In	Out	2-way
Walk	253	187	440	354	261	615	166	102	269
Cycle	51	36	87	78	58	137	52	30	81
Bus	142	95	237	141	108	249	83	50	132
Train	45	36	81	64	57	121	31	21	52
Car Driver	1,835	1,442	3,277	2,321	2,243	4,564	1,417	963	2,379
Car Passenger	536	315	851	563	360	923	422	225	647
Other	42	37	79	60	63	123	29	22	51
Total	**2,903**	**2,147**	**5,051**	**3,581**	**3,151**	**6,732**	**2,198**	**1,413**	**3,611**

Total External Car Trips

4.55 Following on from **Table 4.24** and **Table 4.25**, **Table 4.26** and **Table 4.27** summarise the external car driver trips by mode for each journey purpose, in addition to HGV trips. These tables therefore extract the car driver trips only from each of the trip generation tables contained in **Section 4** and can be compared to

Table 4.26: Total External Car Driver Trips (AM Peak)

Land Use	AM (0700-0800)			AM (0800-0900)			AM (0900-1000)		
	In	**Out**	**Tot**	**In**	**Out**	**Tot**	**In**	**Out**	**Tot**
Residential to Employment	602	2,080	2,682	504	1,740	2,244	135	467	602
Residential to Education (Primary)	0	0	0	0	0	0	0	0	0
Residential to Education (Secondary)	2	5	6	14	39	53	2	6	8
Residential to Food Retail	2	5	6	4	13	17	11	34	45
Residential to Non-Food Retail	12	37	49	31	95	126	84	254	337
Residential to Personal Business	21	79	99	39	147	186	36	135	171
Residential to Recreation/ Social	7	25	32	10	33	42	21	71	92
Employment E(g)(i)	292	37	329	821	64	884	510	45	555
Employment (B8)	77	31	109	121	61	182	109	41	149
Primary School (Staff)	82	0	82	27	0	27	0	0	0
Primary School (Pupils)	0	0	0	0	0	0	0	0	0
Primary School (Parents)	0	0	0	0	0	0	0	0	0
Secondary School (Staff)	160	0	160	53	0	53	0	0	0
Secondary School (Pupils)	4	0	4	63	0	63	0	0	0
Secondary School (Parents)	11	11	23	78	78	157	0	0	0
HGVs	39	48	87	82	62	144	71	62	133
Total	**1,311**	**2,357**	**3,669**	**1,847**	**2,332**	**4,179**	**978**	**1,115**	**2,093**

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Table 4.27: Total External Car Driver Trips (PM Peak)

Land Use	1600-1700			1700-1800			1800-1900		
	In	Out	Tot	In	Out	Tot	In	Out	Tot
Residential to Employment	1,072	509	1,581	1,624	772	2,396	764	363	1,128
Residential to Education (Primary)	0	0	0	0	0	0	0	0	0
Residential to Education (Secondary)	4	2	6	4	2	6	1	1	2
Residential to Food Retail	37	18	55	32	15	47	29	14	43
Residential to Non-Food Retail	279	137	415	237	116	353	215	105	320
Residential to Personal Business	152	72	224	157	75	232	103	49	152
Residential to Recreation/ Social	185	86	272	203	94	297	260	121	380
Employment E(g)(i)	56	428	483	32	836	868	21	244	265
Employment (B8)	39	93	131	33	90	123	25	65	90
Primary School (Staff)	0	27	27	0	82	82	0	0	0
Primary School (Pupils)	0	0	0	0	0	0	0	0	0
Primary School (Parents)	0	0	0	0	0	0	0	0	0
Secondary School (Staff)	0	53	53	0	160	160	0	0	0
Secondary School (Pupils)	0	3	3	0	0	0	0	0	0
Secondary School (Parents)	12	12	24	0	0	0	0	0	0
HGVs	39	42	80	16	49	66	16	25	41
Total	**1,874**	**1,483**	**3,357**	**2,337**	**2,293**	**4,630**	**1,433**	**987**	**2,420**

5 Proposed Trips Summary

5.1 This section of the report summarises the number of person trips generated by the HGC, based on the methodology described previously.

Total Person & Vehicle Trips

5.2 Summaries of the total person trips by land use for the AM and PM peak periods are presented in **Table 5.1** and **Table 5.2.** These tables reproduce the trips set out in **Tables 2.26-2.27**.

Table 5.1: Total Person Trip Generation + HGVs (AM Peak)

Land Use	AM (0700-0800)			AM (0800-0900)			AM (0900-1000)		
	In	Out	Tot	In	Out	Tot	In	Out	Tot
Residential to Employment	997	3,445	4,442	835	2,883	3,717	224	774	998
Residential to Education (Primary)	164	459	623	888	2,483	3,371	87	244	331
Residential to Education (Secondary)	164	459	623	888	2,483	3,371	87	244	331
Residential to Food Retail	28	84	112	79	240	320	203	613	816
Residential to Non-Food Retail	28	84	112	79	240	320	203	613	816
Residential to Personal Business	72	270	342	148	557	705	131	490	621
Residential to Recreation/ Social	40	139	179	76	260	336	156	535	691
Employment E(g)(i)	494	63	556	1,387	108	1,495	862	76	938
Employment (B8)	131	53	184	205	104	308	184	69	252
Primary School (Staff)	139	0	139	46	0	46	0	0	0
Primary School (Pupils)	440	0	440	3,960	0	3,960	0	0	0
Primary School (Parents)	220	220	440	1,980	1,980	3,960	0	0	0
Secondary School (Staff)	225	0	225	75	0	75	0	0	0
Secondary School (Pupils)	432	0	432	3,888	0	3,888	0	0	0
Secondary School (Parents)	43	43	86	389	389	778	0	0	0
HGVs	39	48	87	82	62	144	71	62	133
Total	**3,656**	**5,366**	**9,022**	**15,005**	**11,789**	**26,794**	**2,207**	**3,721**	**5,928**

Table 5.2: Total Person Trips Generated + HGVs (PM Peak)

Land Use	PM (1600-1700)			PM (1700-1800)			PM (1800-1900)		
	In	Out	Tot	In	Out	Tot	In	Out	Tot
Residential to Employment	1,775	844	2,619	2,690	1,279	3,969	1,266	602	1,868
Residential to Education (Primary)	518	305	822	237	139	376	73	43	117
Residential to Education (Secondary)	518	305	822	237	139	376	73	43	117
Residential to Food Retail	664	326	990	551	271	822	496	244	740
Residential to Non-Food Retail	664	326	990	551	271	822	496	244	740
Residential to Personal Business	542	258	800	550	262	811	357	170	527
Residential to Recreation/ Social	1,297	603	1,900	1,473	686	2,159	1,680	782	2,462
Employment E(g)(i)	94	723	817	54	1,414	1,468	36	413	448
Employment (B8)	66	157	222	56	152	208	42	110	152
Primary School (Staff)	0	46	46	0	139	139	0	0	0
Primary School (Pupils)	0	440	440	0	0	0	0	0	0
Primary School (Parents)	220	220	440	0	0	0	0	0	0
Secondary School (Staff)	0	75	75	0	225	225	0	0	0
Secondary School (Pupils)	0	432	432	0	0	0	0	0	0
Secondary School (Parents)	43	43	86	0	0	0	0	0	0
HGVs	39	42	80	16	49	66	16	25	41
Total	**6,440**	**5,145**	**11,584**	**6,414**	**5,025**	**11,439**	**4,536**	**2,675**	**7,212**

5.3 The individually determined levels of internalisation were then applied to each land use. The resultant numbers of external total person trips by land use are presented in **Table 5.3** and **Table 5.4** respectively. These tables reproduce the data presented in **Tables 3.24-3.25**.

Table 5.3: Total External Peron Trips (AM Peak)

Land Use	AM (0700-0800)			AM (0800-0900)			AM (0900-1000)		
	In	**Out**	**Tot**	**In**	**Out**	**Tot**	**In**	**Out**	**Tot**
Residential to Employment	876	3,027	3,903	733	2,533	3,266	197	680	877
Residential to Education (Primary)	0	0	0	0	0	0	0	0	0
Residential to Education (Secondary)	16	46	62	89	248	337	9	24	33
Residential to Food Retail	3	8	11	8	24	32	20	61	82
Residential to Non-Food Retail	21	63	84	60	180	240	152	460	612
Residential to Personal Business	36	135	171	74	278	353	65	245	310
Residential to Recreation/ Social	10	35	45	19	65	84	39	134	173
Employment E(g)(i)	370	47	417	1041	81	1121	646	57	703
Employment (B8)	98	40	138	153	78	231	138	52	189
Primary School (Staff)	104	0	104	35	0	35	0	0	0
Primary School (Pupils)	0	0	0	0	0	0	0	0	0
Primary School (Parents)	0	0	0	0	0	0	0	0	0
Secondary School (Staff)	203	0	203	68	0	68	0	0	0
Secondary School (Pupils)	44	0	44	399	0	399	0	0	0
Secondary School (Parents)	11	11	23	78	78	157	0	0	0
HGVs	39	48	87	82	62	144	71	62	133
Total	**1,832**	**3,460**	**5,292**	**2,837**	**3,628**	**6,465**	**1,337**	**1,775**	**3,112**

Table 5.4: Total External Person Trips (PM Peak)

Land Use	1600-1700			1700-1800			1800-1900		
	In	**Out**	**Tot**	**In**	**Out**	**Tot**	**In**	**Out**	**Tot**
Residential to Employment	1,560	742	2,301	2,363	1,124	3,487	1,112	529	1,641
Residential to Education (Primary)	0	0	0	0	0	0	0	0	0
Residential to Education (Secondary)	52	30	82	24	14	38	7	4	12
Residential to Food Retail	66	33	99	55	27	82	50	24	74
Residential to Non-Food Retail	498	245	743	413	203	616	372	183	555
Residential to Personal Business	271	129	400	275	131	406	179	85	264
Residential to Recreation/ Social	324	151	475	368	171	540	420	195	616
Employment E(g)(i)	71	542	613	40	1061	1101	27	310	336
Employment (B8)	49	117	167	42	114	156	31	83	114
Primary School (Staff)	0	35	35	0	104	104	0	0	0
Primary School (Pupils)	0	0	0	0	0	0	0	0	0
Primary School (Parents)	0	0	0	0	0	0	0	0	0
Secondary School (Staff)	0	68	68	0	203	203	0	0	0
Secondary School (Pupils)	0	44	44	0	0	0	0	0	0
Secondary School (Parents)	12	12	24	0	0	0	0	0	0
HGVs	39	42	80	16	49	66	16	25	41
Total	**2,942**	**2,189**	**5,131**	**3,597**	**3,200**	**6,798**	**2,214**	**1,438**	**3,652**

5.4 **Table 5.5** and **Table 5.6** below then show the breakdown of external trips by mode, as described in **Section 4**. These tables reproduce the data presented in **Tables 4.24-4.25**.

Table 5.5: Total External Trips by Mode (AM Peak)

Mode	07:00-08:00			08:00-09:00			09:00-10:00		
	In	**Out**	**2-way**	**In**	**Out**	**2-way**	**In**	**Out**	**2-way**
Walk	201	458	659	396	479	876	82	115	196
Cycle	28	54	82	50	61	111	18	23	41
Bus	70	145	215	152	205	357	52	102	154
Train	39	83	122	59	77	136	20	21	40
Car Driver	1,273	2,309	3,582	1,765	2,270	4,036	907	1,053	1,960
Car Passenger	142	287	429	278	405	684	164	380	544
Other	41	76	117	55	69	124	24	19	43
Total	**1,793**	**3,412**	**5,205**	**2,756**	**3,566**	**6,322**	**1,266**	**1,713**	**2,980**

Table 5.6: Total External Trips by Mode (PM Peak)

Mode	16:00-17:00			17:00-18:00			18:00-19:00		
	In	**Out**	**2-way**	**In**	**Out**	**2-way**	**In**	**Out**	**2-way**
Walk	253	187	440	354	261	615	166	102	269
Cycle	51	36	87	78	58	137	52	30	81
Bus	142	95	237	141	108	249	83	50	132
Train	45	36	81	64	57	121	31	21	52
Car Driver	1,835	1,442	3,277	2,321	2,243	4,564	1,417	963	2,379
Car Passenger	536	315	851	563	360	923	422	225	647
Other	42	37	79	60	63	123	29	22	51
Total	**2,903**	**2,147**	**5,051**	**3,581**	**3,151**	**6,732**	**2,198**	**1,413**	**3,611**

5.5 **Table 5.7** and **Table 5.8** then provide a breakdown of the vehicle traffic flows generated by the HGC by journey purpose, as described in **Section 4**. These tables reproduce the data presented in **Tables 4.26-4.27**.

Table 5.7: Total External Vehicle Trips (Car Driver + HGV) (AM Peak)

Land Use	AM (0700-0800)			AM (0800-0900)			AM (0900-1000)		
	In	**Out**	**Tot**	**In**	**Out**	**Tot**	**In**	**Out**	**Tot**
Residential to Employment	602	2,080	2,682	504	1,740	2,244	135	467	602
Residential to Education (Primary)	0	0	0	0	0	0	0	0	0
Residential to Education (Secondary)	2	5	6	14	39	53	2	6	8
Residential to Food Retail	2	5	6	4	13	17	11	34	45
Residential to Non-Food Retail	12	37	49	31	95	126	84	254	337
Residential to Personal Business	21	79	99	39	147	186	36	135	171
Residential to Recreation/ Social	7	25	32	10	33	42	21	71	92
Employment E(g)(i)	292	37	329	821	64	884	510	45	555
Employment (B8)	77	31	109	121	61	182	109	41	149
Primary School (Staff)	82	0	82	27	0	27	0	0	0
Primary School (Pupils)	0	0	0	0	0	0	0	0	0
Primary School (Parents)	0	0	0	0	0	0	0	0	0
Secondary School (Staff)	160	0	160	53	0	53	0	0	0
Secondary School (Pupils)	4	0	4	63	0	63	0	0	0
Secondary School (Parents)	11	11	23	78	78	157	0	0	0
HGVs	39	48	87	82	62	144	71	62	133
Total	**1,311**	**2,357**	**3,669**	**1,847**	**2,332**	**4,179**	**978**	**1,115**	**2,093**

Table 5.8: Total External Vehicle Trips (Car Driver + HGV) (PM Peak)

Land Use	1600-1700			1700-1800			1800-1900		
	In	**Out**	**Tot**	**In**	**Out**	**Tot**	**In**	**Out**	**Tot**
Residential to Employment	1,072	509	1,581	1,624	772	2,396	764	363	1,128
Residential to Education (Primary)	0	0	0	0	0	0	0	0	0
Residential to Education (Secondary)	4	2	6	4	2	6	1	1	2
Residential to Food Retail	37	18	55	32	15	47	29	14	43
Residential to Non-Food Retail	279	137	415	237	116	353	215	105	320
Residential to Personal Business	152	72	224	157	75	232	103	49	152
Residential to Recreation/ Social	185	86	272	203	94	297	260	121	380
Employment E(g)(i)	56	428	483	32	836	868	21	244	265
Employment (B8)	39	93	131	33	90	123	25	65	90
Primary School (Staff)	0	27	27	0	82	82	0	0	0
Primary School (Pupils)	0	0	0	0	0	0	0	0	0
Primary School (Parents)	0	0	0	0	0	0	0	0	0
Secondary School (Staff)	0	53	53	0	160	160	0	0	0
Secondary School (Pupils)	0	3	3	0	0	0	0	0	0
Secondary School (Parents)	12	12	24	0	0	0	0	0	0
HGVs	39	42	80	16	49	66	16	25	41
Total	**1,874**	**1,483**	**3,357**	**2,337**	**2,293**	**4,630**	**1,433**	**987**	**2,420**

5.6 The external trip estimates in this note do not take into account a number of factors such as:

i) peak hour congestion causing people to vary their journey time to avoid that congestion (peak spreading);

ii) combining of trips e.g. many retail trips in the peak hours will be combined with a journey to work.

HGV Trips

5.7 A summary of the HGV trips per land use are set out below at **Table 5.9** and **5.10** for reference. These tables reproduce the data outlined in **Table 2.25**.

Table 5.7: HGV Trip Generation - AM

Land Use	Quantum	0700-0800			0800-0900			0900-1000		
		Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
Residential	11,000 dwellings	11	11	22	22	11	33	11	22	33
E(g)(i) Office	40,000sqm	0	0	0	4	0	4	4	7	11
B8	126,000sqm	28	33	60	52	47	98	49	30	79
Primary School	2,700 pupils	0	0	0	0	0	0	3	3	5
Secondary School	4,320 pupils	0	4	4	4	4	9	4	0	4
Total:		**39**	**48**	**87**	**82**	**62**	**144**	**71**	**62**	**133**

Table 5.8: HGV Trip Generation - PM

Land Use	Quantum	1600-1700			1700-1800			1900-2000		
		Arr.	Dep.	2-Way	Arr.	Dep.	2-Way	Arr.	Dep.	2-Way
Residential	11,000 dwellings	11	0	11	0	0	0	0	11	11
E(g)(i) Office	40,000sqm	0	0	0	0	0	0	0	0	0
B8	126,000sqm	28	42	69	16	49	66	16	14	30
Primary School	2,700 pupils	0	0	0	0	0	0	0	0	0
Secondary School	4,320 pupils	0	0	0	0	0	0	0	0	0
Total:		**39**	**42**	**80**	**16**	**49**	**66**	**16**	**25**	**41**

Conclusions

5.8 Notwithstanding that further work is needed to refine the above trip estimates, we consider they present a reasonable basis for undertaking Local Plan modelling.

Appendix A

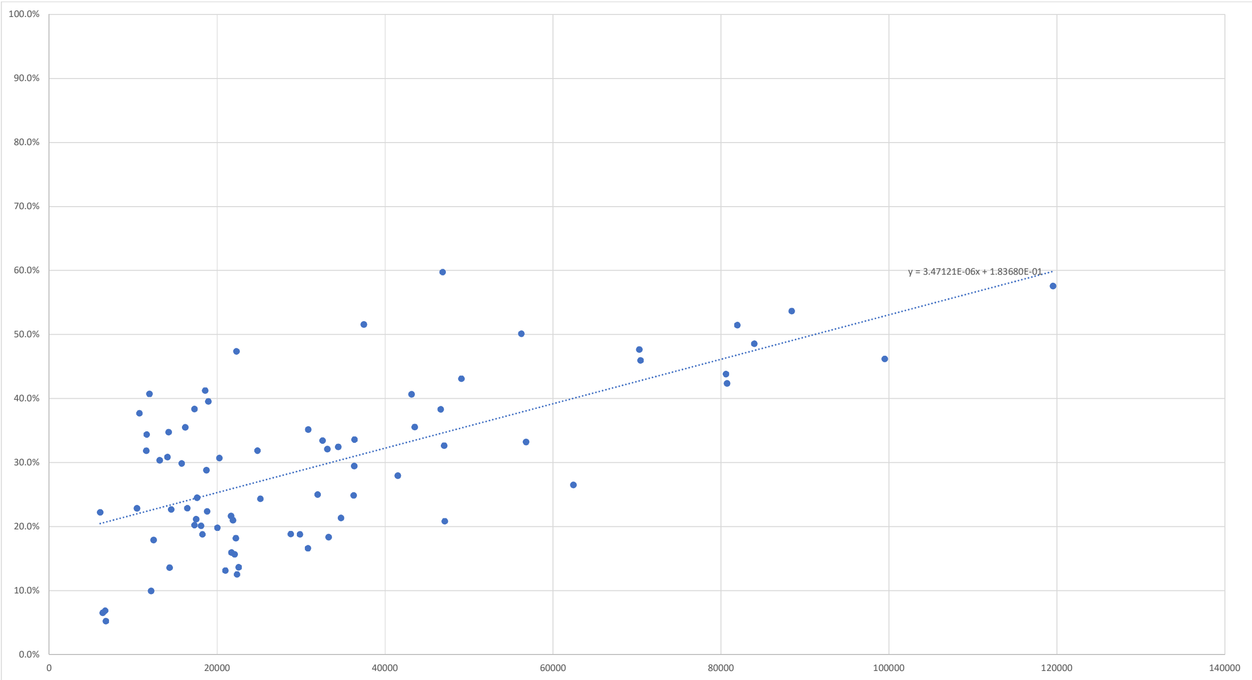
Summary of Working Populations % within Similarly Populated Settlements									
Location			% of Workers working in MSOA compared with All Workers Living in MSOA	% of People Living and Working in MSOA			% of Employment Offer Usual Residents of MSOA Comprise		
Town	County	District		Total Workers from MSOA	Workers from MSOA	%	Total Workers in MSOA	Workers from MSOA	%
Cottenham	Cambridgeshire	South Cambridgeshire	54%	2,758	353	13%	1,482	353	24%
Cranleigh	Surrey	Waverly	79%	3,842	1,226	32%	3,020	1,226	41%
Cullompton	Devon	Mid Devon	76%	3,313	855	26%	2,528	855	34%
Diss	Norfolk	South Norfolk	114%	3,929	1,586	40%	4,480	1,586	35%
Edenbridge	Kent	Sevenoaks	82%	3,477	828	24%	2,860	828	29%
Faringdon	Oxfordshire	Vale of White Horse	49%	3,613	721	20%	1,772	721	41%
Glastonbury	Somerset	Mendip	89%	2,524	612	24%	2,254	612	27%
Heathfield	East Sussex	Wealden	64%	2,936	583	20%	1,878	583	31%
Hook (Hart)	Hampshire	Hart	180%	3,435	567	17%	6,197	567	9%
Hunstanton	Norfolk	King's Lynn and West Norfolk	124%	1,370	562	41%	1,695	562	33%
Ingatestone	Essex	Brentwood	69%	2,155	298	14%	1,489	298	20%
Ledbury	Herefordshire	Herefordshire	107%	3,508	1,597	46%	3,761	1,597	42%
Liskeard	Cornwall	Cornwall	116%	4,792	2,346	49%	5,562	2,346	42%
Marlborough	Wiltshire	Wiltshire	124%	2,955	1,248	42%	3,676	1,248	34%
Paddock Wood	Kent	Tunbridge Wells	101%	4,313	887	21%	4,349	887	20%
Sawbridgeworth	Hertfordshire	East Hertfordshire	77%	3,456	363	11%	2,658	363	14%
Sherborne	Dorset	West Dorset	145%	2,974	1,314	44%	4,305	1,314	31%
Soham	Cambridgeshire	East Cambridgeshire	51%	5,260	1,148	22%	2,658	1,148	43%
St. Blazey	Cornwall	Cornwall	59%	2,527	361	14%	1,494	361	24%
St. Ives (Cornwall)	Cornwall	Cornwall	113%	2,431	1,257	52%	2,759	1,257	46%
Swaffham	Norfolk	Breckland	113%	2,354	870	37%	2,650	870	33%
Tenterden	Kent	Ashford	66%	4,427	1,358	31%	2,920	1,358	47%
Tetbury	Gloucestershire	Cotswold	90%	3,354	1,084	32%	3,008	1,084	36%
Tidworth	Wiltshire	Wiltshire	107%	7,223	3,753	52%	7,748	3,753	48%
Tiptree	Essex	Colchester	59%	6,011	1,113	19%	3,541	1,113	31%
Watton	Norfolk	Breckland	74%	5,513	1,674	30%	4,102	1,674	41%
Wincanton	Somerset	South Somerset	115%	2,627	1,065	41%	3,011	1,065	35%
Yatton	Somerset	North Somerset	93%	3,704	665	18%	3463	665	19%
Average			**93%**	**3,599**	**1,082**	**30%**	**3,261**	**1,082**	**33%**

Population Bracket	Total Population	Population in Employment	Employed Population Living & Working in Same Town	Working population including commuters
Population < 10,000	6,463	2,942	261	1,759
10,000 ≤ Population < 20,000	15,229	6,118	1,683	6,747
20,000 ≤ Population < 30,000	23,106	9,683	2,064	7,840
30,000 ≤ Population < 40,000	34,014	13,925	4,070	13,384
40,000 ≤ Population < 50,000	45,611	19,140	7,160	21,486
50,000 ≤ Population	79,228	33,467	15,649	36,139

Town	District	Total Population	Population in Employment	Employed Population Living & Working in Same Town	Working population including commuters
Harwich	Tendring	6072	2,050	456	1,888
Chigwell	Epping	6367	2,511	164	1,681
Sandhurst	Bracknell Forest	6670	2,850	196	1,238
Esher	Elmbridge	6743	4,355	228	2,230
Chatteris	Fenland	10453	4,181	956	2,688
Selsey	Chichester	10737	3,464	1,306	2,640
Thame	South Oxfordshire	11561	5,021	1,599	6,923
Henley-on-Thames	South Oxfordshire	11619	4,187	1,440	5,984
Sheerness	Swale	11938	3,753	1,529	5,187
Kidlington	Cherwell	12142	5,310	528	1,689
Epping	Epping	12430	4,854	870	5,137
Dorking	Mole Valley	13153	5,218	1,585	9,626
New Milton	New Forest	14095	4,688	1,447	5,454
Maldon	Maldon	14220	5,429	1,887	6,789
Rickmansworth	Three Rivers	14329	5,522	751	5,108
Godalming	Waverley	14533	5,972	1,355	7,202
Royston	North Hertfordshire	15781	7,275	2,174	6,042
Alton	East Hampshire	16198	6,850	2,433	6,809
South Woodham Ferrers	Chelmsford	16453	7,508	1,718	3,815
Reigate	Reigate and Banstead	17292	6,758	1,368	10,929
Lewes	Lewes	17297	6,378	2,447	11,949
Amersham	Chiltern	17501	6,549	1,386	7,785
Great Dunmow	Uttlesford	17,616	6,801	1,668	4,844
Ascot	Windsor and Maidenhead	18091	6,236	1,255	7,428
Brentwood	Brentwood	18241	8,085	1,520	9,066
Newmarket	Forest Heath	18575	8,665	3,575	9,291
Tonbridge	Tonbridge and Malling	18729	8,071	2,326	11,352
Ware	East Hertfordshire	18799	8,450	1,891	7,445
Saffron Walden	Uttlesford	18949	7,732	3,058	7,485
Redhill	Reigate and Banstead	20031	9,356	1,856	12,281
Ely	East Cambridgeshire	20256	8,707	2,674	8,293
Sunbury-on-Thames	Spelthorne	20980	8,599	1,129	6,815
Wokingham	Wokingham	21651	8,950	1,938	10,695
Staines-upon-thames	Spelthorne	21702	9,662	1,542	10,136
Potters bar	Hertsmere	21882	8,097	1,699	7,430
Horley	Reigate and Banstead	22076	10,093	1,583	5,281
Swanley	Sevenoaks	22227	8,694	1,581	5,302
March	Fenland	22298	7,991	3,787	7,774
Thatcham	West Berkshire	22354	10,426	1,308	2,961
Loughton	Epping Forest	22556	8,889	1,213	5,823
Witham	Braintree	24810	10,476	3,340	10,438
Didcot	South Oxfordshire	25140	12,105	2,948	6,369
Cheshunt	Broxbourne	28765	11,242	2,117	10,383
Billericay	Basildon	29857	11,961	2,247	7,621
Wickford	Basildon	30822	12,695	2,109	6,473
Bicester	Cherwell	30854	14,937	5,252	11,592
Borehamwood	Hertsmere	31955	12,964	3,243	12,146
Braintree	Braintree	32559	13,502	4,515	13,341
Abingdon	Vale of White Horse	33130	15,271	4,902	13,077
Rayleigh	Rochford	33276	13,320	2,447	8,216
Hatfield	Welwyn Hatfield	34426	13,069	4,241	22,027
Strood	Medway	34745	13,763	2,939	12,742
Dunstable	Central bedfordshire	36253	14,739	3,667	11,840
Aldershot	Rushmoor	36321	16,815	4,956	15,307
Horsham	Horsham	36353	15,845	5,323	17,316
Leighton Buzzard	Central bedfordshire	37469	10,178	5,249	16,526
Bishop's Stortford	East Hertfordshire	41509	18,019	5,037	11,992
Sittingbourne	Swale	43149	17,054	6,935	17,779
Letchworth	North Hertfordshire	43529	17,295	6,147	15,554
Welwyn Garden City	Welwyn Hatfield	46619	19,321	7,405	28,061
Banbury	Cherwell	46853	20,618	12,321	24,721
Dartford	Dartford	47036	20,050	6,548	37,184
Farnborough	Rushmoor	47104	21,014	4,378	14,966
Wellingborough	Wellingborough	49087	19,746	8,509	21,631
Kettering	Kettering	56226	23,733	11,901	26,148
Maidenhead	Windsor and Maidenhead	56774	23,182	7,703	24,009
St Albans	St Albans	62420	26,568	7,046	23,280
Aylesbury	Aylesbury Vale	70272	30,999	14,777	28,819
Guildford	Guildford	70407	29,602	13,606	43,506
High Wycombe	Wycombe	80589	32,554	14,270	33,965
Hemel Hempstead	Dacorum	80718	33,424	14,160	33,176
Harlow	Harlow	81944	33,967	17,485	33,458
Stevenage	Stevenage	83,957	36,007	17,491	38,180
Royal Leamington Spa	Warwick	88411	37,819	20,297	48,364
Chelmsford	Chelmsford	99,494	43,309	20,013	47,697
Colchester	Colchester	119,526	50,443	29,042	53,062
Average		32,592	13,576	4,842	13,940

Working population inc. commuters excl. town	% of workers both living & working in town compared with entire employed population of town	% of employment offer that usual residents comprise
1,498	8.9%	14.8%
5,064	27.5%	24.9%
5,776	21.3%	26.3%
9,313	29.2%	30.4%
14,326	37.4%	33.3%
20,489	46.8%	43.3%

Working population inc. commuters excl. town	% of workers both living & working in town compared with entire employed population of town	% of employment offer that usual residents comprise
1,432	22.2%	24.2%
1,517	6.5%	9.8%
1,042	6.9%	15.8%
2,002	5.2%	10.2%
1,732	22.9%	35.6%
1,334	37.7%	49.5%
5,324	31.8%	23.1%
4,544	34.4%	24.1%
3,658	40.7%	29.5%
1,161	9.9%	31.3%
4,267	17.9%	16.9%
8,041	30.4%	16.5%
4,007	30.9%	26.5%
4,902	34.8%	27.8%
4,357	13.6%	14.7%
5,847	22.7%	18.8%
3,868	29.9%	36.0%
4,376	35.5%	35.7%
2,097	22.9%	45.0%
9,561	20.2%	12.5%
9,502	38.4%	20.5%
6,399	21.2%	17.8%
3,176	24.5%	34.4%
6,173	20.1%	16.9%
7,546	18.8%	16.8%
5,716	41.3%	38.5%
9,026	28.8%	20.5%
5,554	22.4%	25.4%
4,427	39.5%	40.9%
10,425	19.8%	15.1%
5,619	30.7%	32.2%
5,686	13.1%	16.6%
8,757	21.7%	18.1%
8,594	16.0%	15.2%
5,731	21.0%	22.9%
3,698	15.7%	30.0%
3,721	18.2%	29.8%
3,987	47.4%	48.7%
1,653	12.5%	44.2%
4,610	13.6%	20.8%
7,098	31.9%	32.0%
3,421	24.4%	46.3%
8,266	18.8%	20.4%
5,374	18.8%	29.5%
4,364	16.6%	32.6%
6,340	35.2%	45.3%
8,903	25.0%	26.7%
8,826	33.4%	33.8%
8,175	32.1%	37.5%
5,769	18.4%	29.8%
17,786	32.5%	19.3%
9,803	21.4%	23.1%
8,173	24.9%	31.0%
10,351	29.5%	32.4%
11,993	33.6%	30.7%
11,277	51.6%	31.8%
6,955	28.0%	42.0%
10,844	40.7%	39.0%
9,407	35.5%	39.5%
20,656	38.3%	26.4%
12,400	59.8%	49.8%
30,636	32.7%	17.6%
10,588	20.8%	29.3%
13,122	43.1%	39.3%
14,247	50.1%	45.5%
16,306	33.2%	32.1%
16,234	26.5%	30.3%
14,042	47.7%	51.3%
29,900	46.0%	31.3%
19,695	43.8%	42.0%
19,016	42.4%	42.7%
15,973	51.5%	52.3%
20,689	48.6%	45.8%
28,067	53.7%	42.0%
27,684	46.2%	42.0%
24,020	57.6%	54.7%
9,098	35.7%	34.7%



y = 3.47121E-06x + 0.183680

y (internalisation %)	25.3%
x (total population)	20000

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Appendix I

North of St Albans Trip Generation Report

Confidential

Topic Note

Project: North St Albans

Subject: Trip Generation, Travel Demand Model Principles, Distribution and Assignment Topic Note

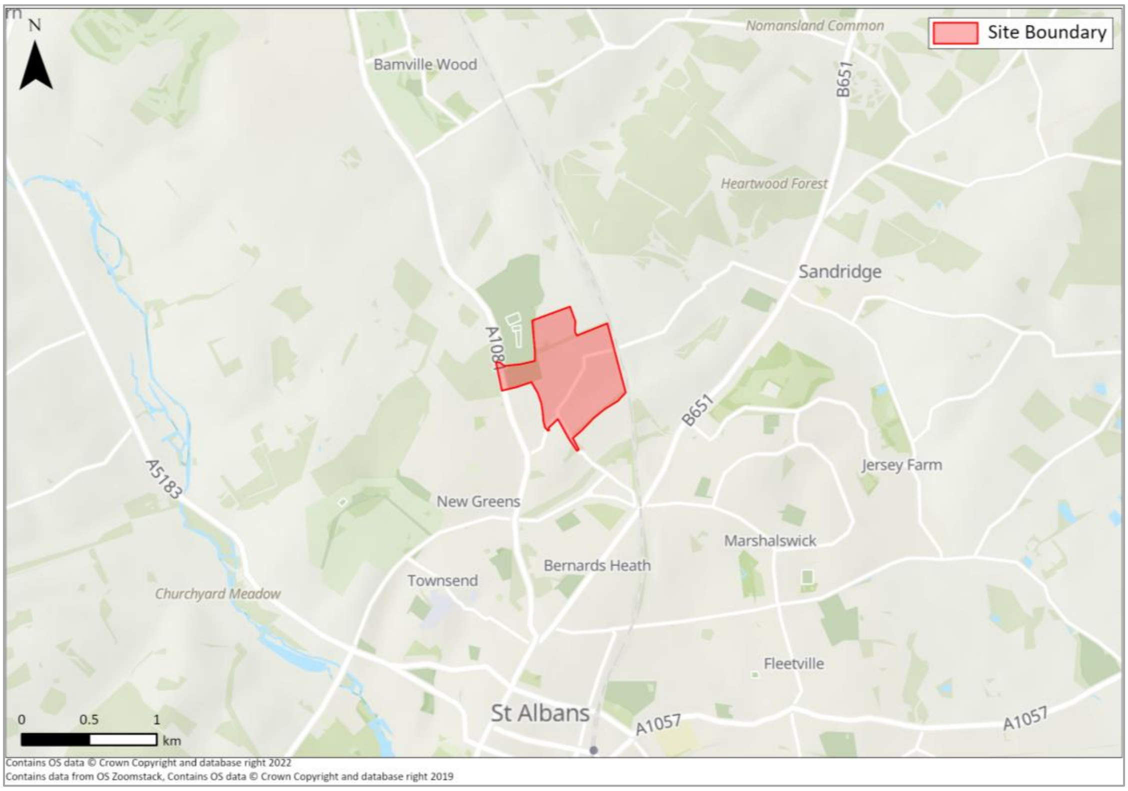
Client:	Hallam Land Management	**Version:**	02
Project No:	05920	**Author:**	KN/LB
Date:	31/03/2023	**Approved:**	MM

1 Introduction

1.1 Background

1.1.1 PJA has been commissioned by Hallam Land Management to provide transport planning support for the proposed development of North St Albans. The location of the site is shown in Figure 1.1.

Figure 1.1: Site Location



Specifically, PJA has been commissioned to help develop a robust access and movement strategy to be presented in a Transport Assessment and Travel Plan/Travel Demand Management Strategy which can be used to support a planning application for development following the withdrawal of the previous draft Local Plan for St Albans City and District in November 2020.

1.2 Progress to Date and Technical Note Purpose

1.2.1 PJA presented an initial Scoping Note and attended a follow up meeting on 19th January 2023 with the Local Highway Authority, Hertfordshire County Council (HCC), to discuss the intended assessment parameters. It was agreed that a series of topic notes would be prepared and follow up meetings arranged to discuss, as follows:

- Initial trip generation, mode share and use of the TDM;
- Trip distribution, assignment and use of mobile network data;
- Active travel strategy and interface with emerging LCWIP;
- Public transport strategy;
- On-site design principles and approach to parking and parking standards; and
- Coordination of transport strategy (feeding from previous topics), TDM forecasts of modal shift and trip banking and residual impacts of development.

1.2.2 This Technical Note sets out the initial trip generation, baseline mode share, use of the TDM and principles for distribution and assignment of trips.

1.2.3 The note provides the baseline estimates of travel patterns at the proposed development before wider infrastructure and improvements are put forward as part of the strategy. It is suggested that these wider infrastructure interventions would affect a modal shift amongst journeys to/from the site and adjacent network. This projected modal shift would be forecast as part of subsequent topic notes based on the strategy which is developed in close engagement with HCC.

1.2.4 Following this introduction, the note comprises the following sections:

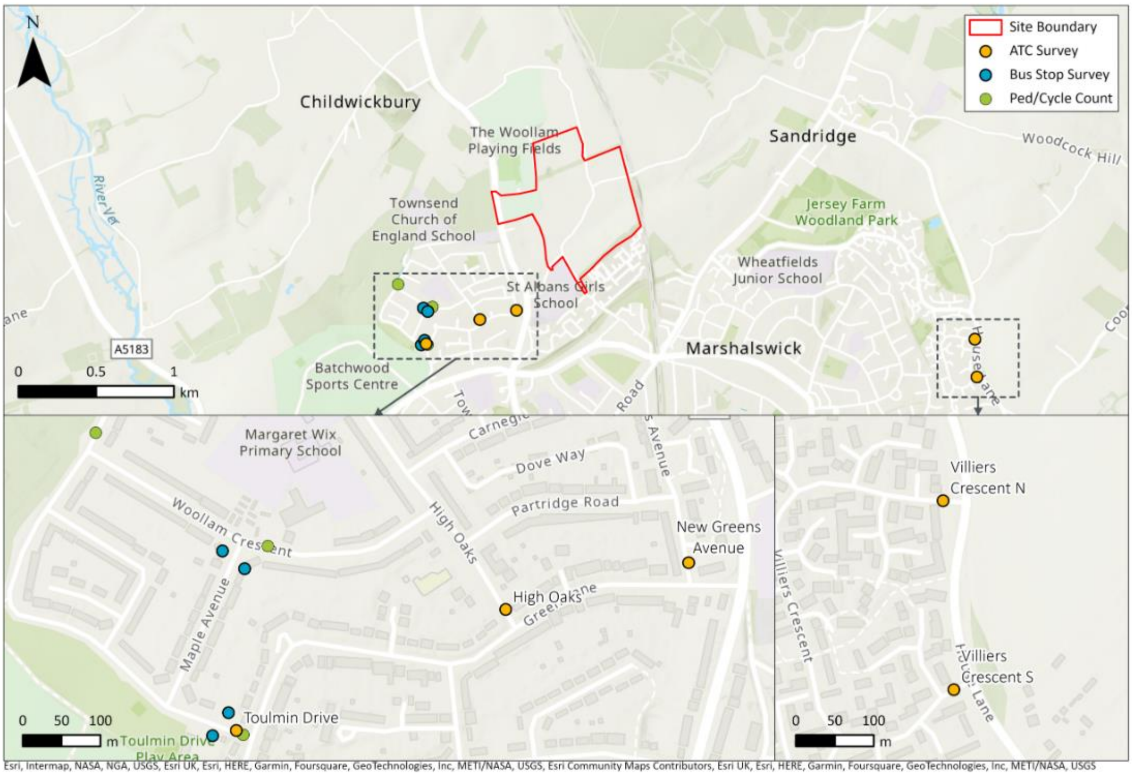
- Section 2 Data Collection;
- Section 3 Travel Demand Model Principles;
- Section 4 Trip Generation Estimates and Baseline Modal Split;
- Section 5 Trip distribution and assignment principles; and
- Section 6 Summary.

2 Data Collection

2.1.1 As set out in the initial Scoping Note, data has been collected to assist in the understanding of existing conditions and trip making patterns to include person trip generation and modal split in areas surrounding the proposed development. This includes the following which is illustrated in Figures 2-1:

- **Multi-modal surveys at the adjacent New Greens area to understand multi-modal trip making patterns at this adjacent area:**
  - Automatic Traffic Counts – for a 7-day period between Saturday 8th October and Friday 14th October 2022:
    - (i) Toulmin Drive
    - (ii) High Oaks.
    - (iii) New Greens Avenue.
  - Pedestrian and Cycle Counts - 12 hour (07:00 to 19:00) on Tuesday 11th October 2022:
    - (i) Woollam Crescent.
    - (ii) Toulmin Drive North.
    - (iii) Toulmin Drive South.
  - Bus stop surveys – 12 hour (07:00 to 19:00) on Tuesday 11th October 2022 to include counts of the number of buses at each stop and total number of passengers boarding and alighting each service at:
    - (i) 4 bus stop locations highlighted on the below plan.
- **Reference Site to understand vehicle trip making patterns at another location in St Albans not affected by local facilities/amenities:**
  - Two Automatic Traffic Counts are labelled in the inset map of Figure 2-1 in East St Albans at Villiers Crescent (North) and Villiers Crescent (South).

Figure 2-1: Survey Locations



2.1.2 The results of the above traffic surveys have been used to estimate initial travel patterns at the proposed development, feeding into the Travel Demand Model.

3 Travel Demand Model

3.1 Introduction

3.1.1 It has been agreed in principle that a comprehensive Travel Demand Model (TDM) will be used to understand baseline and future trip making patterns at the proposed development and within existing nearby communities.

3.1.2 The TDM is being developed with the use of a range of data from the Census, TRICS database, the National Travel Survey 2019, the Propensity to Cycle Tool (PCT), geospatial information and potentially mobile network data.

3.1.3 The TDM considers a weekday morning and afternoon period and a daily period and the key principles of this are as follows:

- A broader geographic scope covering not only the development but also neighbouring communities in wider St Albans and strategic destinations beyond. This has been established by using a broad geographic area to understand journeys starting and terminating in wider St Albans. The reach of the TDM has to therefore be broader than St Albans to encompass these journeys.

- The baseline trip generation position is informed by survey data collected for the New Greens and Villiers Crescent areas of St Albans providing a baseline multi-modal trip generation. This will also be supported by mobile network data to be obtained to understand current trip making patterns and validate the calculated modal split.
- Develop a **future** projected position through consideration of other datasets (to be agreed as part of subsequent topic notes):
  - Reduced travel demand – based on the masterplan for the site and the complementary land uses which reduce the need to travel offsite.
  - Active travel – considering the strategy for the site and surrounding area and using PCT data to understand the projected uplift in cycling at the development and locally which could be achieved from active travel interventions.
  - Public transport – considering the strategy for the site and determining a donor area for which data can be extracted to forecast uptake of public transport modes at the development and locally resulting from public transport enhancements.
  - Vehicle travel – consider the projected uplift in sustainable modes and determine the resultant reduction in vehicle trips both development and background trips

3.2 Travel Demand Model Coverage

3.2.1 The TDM covers a large area which encompasses the proposed development, the area surrounding the development, wider St Albans and key origins/destinations further afield for journeys terminating/beginning in St Albans.

3.2.2 The zones covered within the TDM are set out in Figures 3-1 and 3-2 (local focus). These zones have been determined using 2011 Census Journey to Work data for St Albans 009 (Middle Super Output Area, MSOA), journeys to/from these zones cover 89% of the total journeys to work for those residing in the St Albans 009 MSOA (Zone 1), as the donor site for the purpose of this assessment. Thus, providing a suitable sample size and a suitable coverage for the TDM.

3.2.3 Typical daily journeys for other purposes, such as education, retail and leisure would likely be over a shorter distance and so the zoning determined through consideration of the Journey to Work data would be adequate to cover other journey purposes.

Figure 3-1: TDM Zones

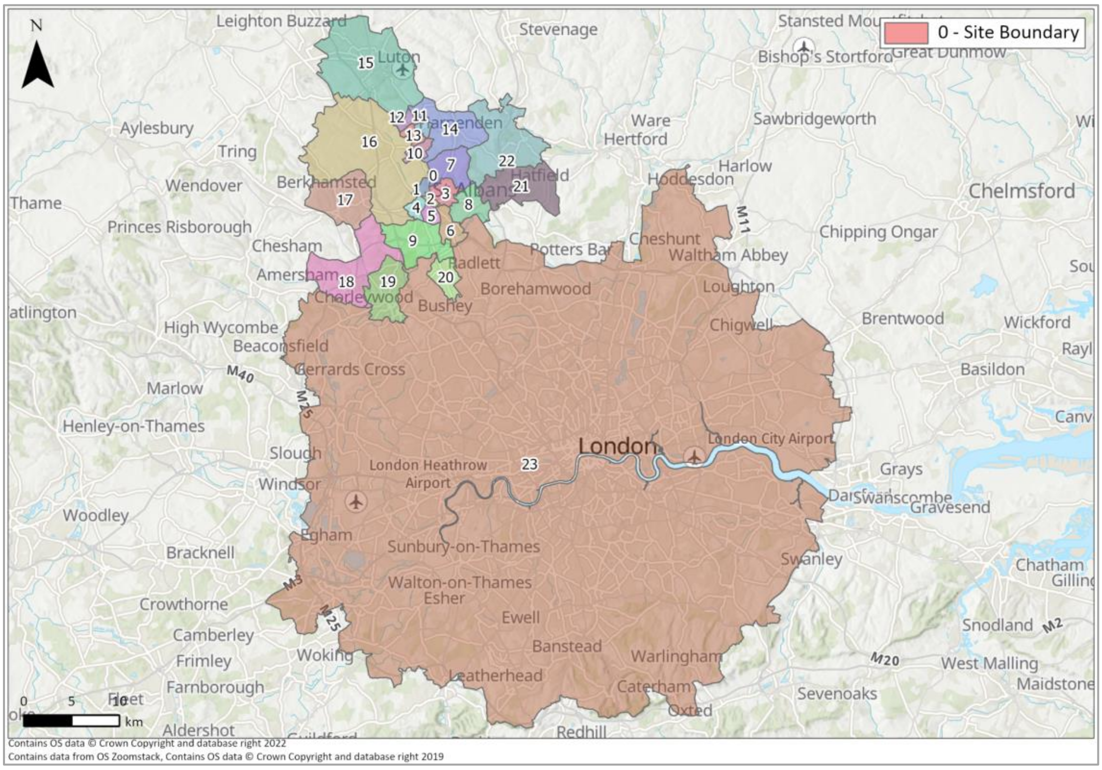
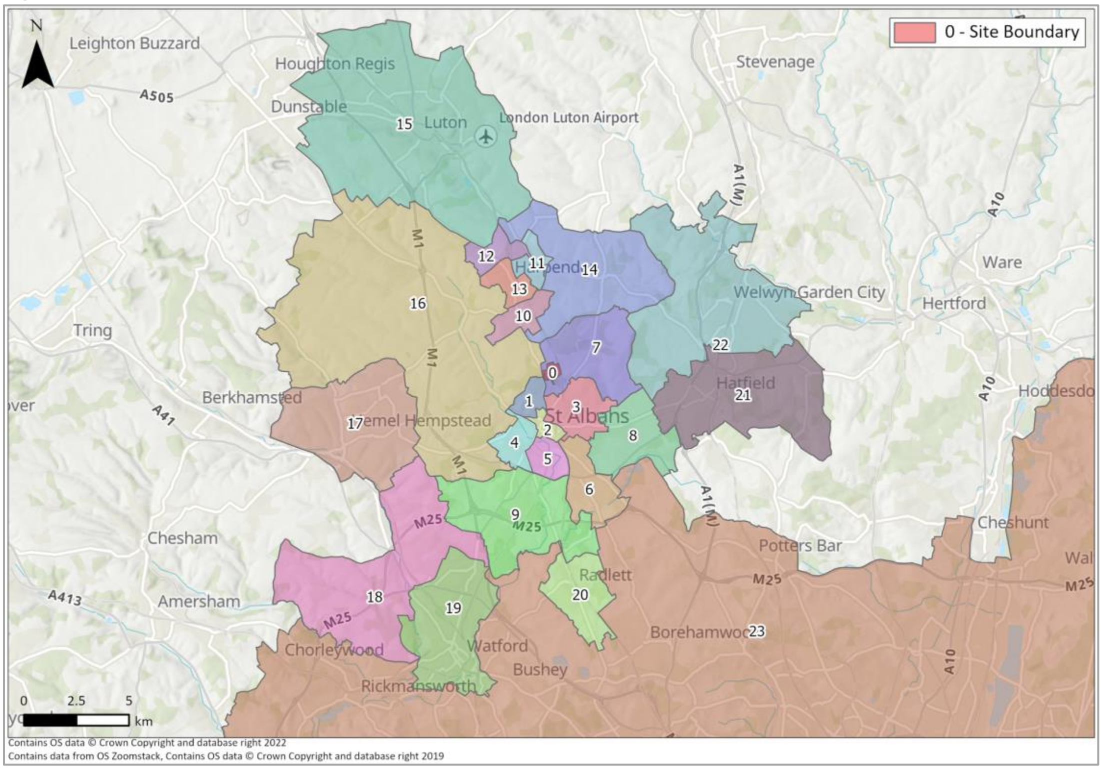


Figure 3-2: TDM Zones (Local Extract)

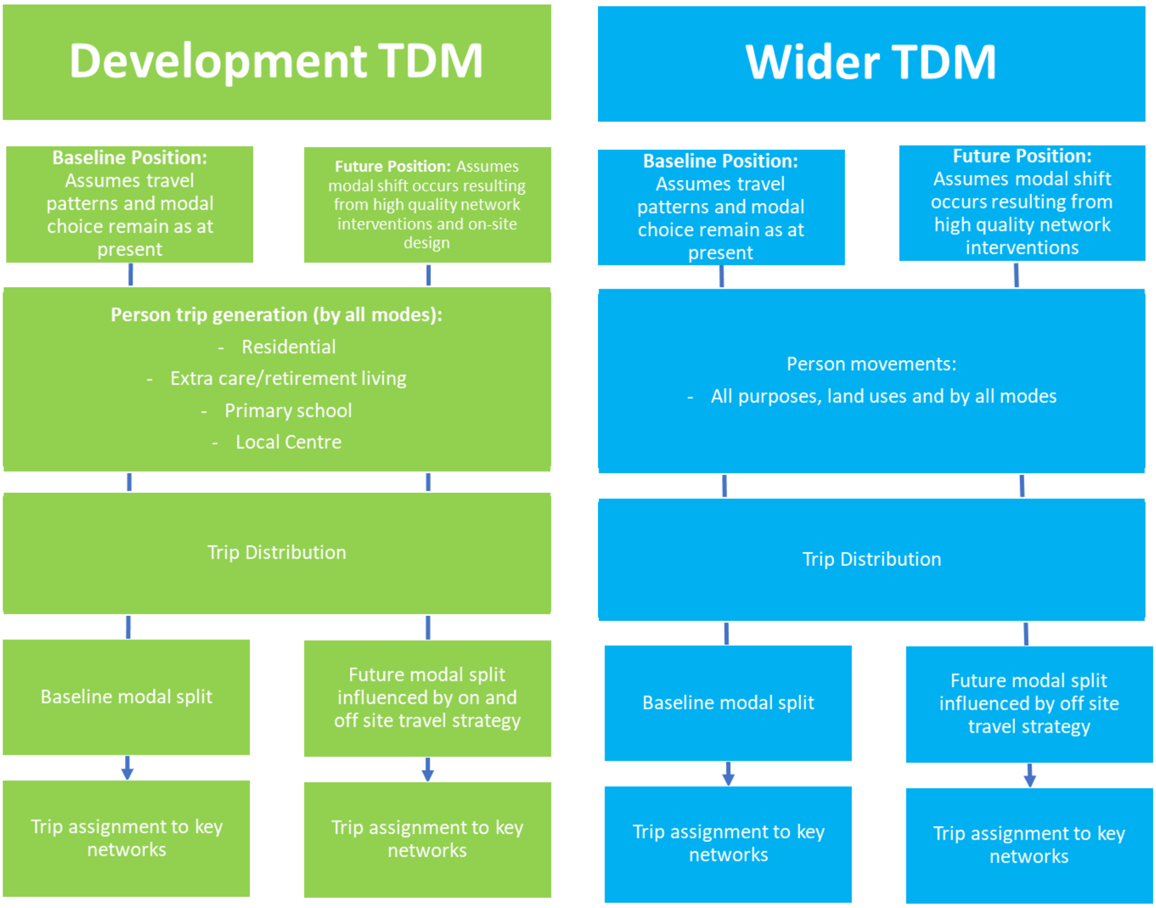


3.3 Outline Setup of the TDM

3.3.1 The diagram shown in Figure 3-3 provides an outline of the TDM setup. The TDM is split into two sections; a development element and a wider element. The development element covers trips to and from the proposed development whilst the wider background element covers trips between the areas surrounding the development in the defined zoning.

3.3.2 Both the development and wider sections of the TDM have a baseline and a future element. The baseline element covers the existing travel patterns in terms of modal choice and the future element will forecast the potential change in modal choice assuming various interventions across the network. It is important to understand the distribution of trips to understand how future interventions may influence mode choice as it is assumed that only those journeys which would utilise networks enhanced by future improvements could see a change in mode of travel used.

Figure 3-3: TDM Principles



3.3.3 This note focusses on the baseline element of the TDM along with the principles for determining some of the key inputs to the TDM. In particular:

Development TDM:

- Person trip generation – this will remain the same in the baseline and future TDM and is calculated from the multi-modal surveys undertaken nearby for the residential land use and TRICS for the primary school and extra care/retirement living uses (see Section 4).
- Trip distribution – subject to agreement from HCC this is proposed to be extracted from mobile network data for the New Greens area. This will provide a view on current Origin-Destination pairs for journeys starting or ending in this proxy area. Initial discussions with HCC suggested that the Strategic Comet model would not provide sufficiently detailed information to inform distribution assumptions. This will broadly remain the same in the baseline and future TDM (see Section 5).
- Baseline modal split – this is determined by combining TEMPro data, Census data and the multi-modal surveys undertaken (see Section 4) and would also be validated against the mobile network data which provides an indication of mode of travel.
- Future modal split – this will be determined by considering the proposed on and off-site travel strategy and understanding the effects on modal choice for journeys to/from the site (to be presented in future topic notes).
- Trip assignment to key networks – this will be calculated by undertaking a vehicular assignment exercise considering existing network conditions (see Section 5). For the future position, a vehicular assignment exercise will be carried out along with a multi-modal assignment exercise using PCT data and public transport data for donor corridors applied to those journeys which could be influenced by upgrades to the active travel and public transport networks (to be presented in future topic notes).

Wider TDM:

- Person trip generation – this will remain the same in the baseline and future TDM and will be extracted from the mobile network data which will provide an indication of the quantum of trips within the wider TDM area by journey purpose (see Section 5).
- Trip distribution – this is proposed to be extracted from mobile network data from the zoning area defined previously. This will provide a view on current Origin-Destination pairs for journeys starting or ending in the defined zoning area.
- Baseline modal split – this is determined from TEMPro data, census data and the mobile network data (see Section 5).

- Future modal split – this will be determined by considering the proposed off-site travel strategy and network interventions and understanding the effects on modal choice for journeys within the defines zoning area (to be presented in future topic notes).
- Trip assignment to key network – For the future position, a vehicular assignment exercise will be undertaken along with a multi-modal assignment exercise using PCT data and public transport data for donor corridors applied to those journeys which could be influenced by upgrades to the active travel and public transport networks (to be presented in future topic notes).

4 Total Person Trip Rates, Generation and Baseline Modal Split

4.1 Residential Trip Rates, Generation and Baseline Modal Split

Background

4.1.1 As we move on from the COVID pandemic, there appears to be a long-lasting impact on travel patterns particularly those trips to/from home; including a reduction in overall travel demand with greater levels of home working, changes in modal split following an increased uptake of walking/cycling modes and a change in the times of day in which people travel. With only a limited number of surveys undertaken recently in the TRICS database, following the lifting of travel restrictions, it is not deemed suitable to use the TRICS database in the calculation of appropriate trip rates for the residential elements or as the basis for factoring daily flow profiles.

4.1.2 The total person trip rates and baseline modal split of the proposed residential elements have therefore been determined by surveying existing residential areas near to the site. These surveys comprise multi-modal surveys and Automatic Traffic Counts (ATCs).

4.1.3 Multi-modal surveys have been undertaken at the New Greens area to the west of the A1081 Harpenden Road and in close proximity to the proposed development. This area was surveyed to understand the multi-modal trip generation of this area as a proxy for the proposed development. The area surveyed includes a closed loop of roads with three points of vehicular access; Toulmin Drive, High Oaks and New Green. The area contains a number of residential properties, Margaret Wix Primary School, Townsend Church of England Secondary School and a small local centre with shops, dental practice, social club and church.

4.1.4 Based on location, access to the existing transport network and potential mix of complementary facilities, the area is deemed a possible donor site from which to understand potential baseline travel patterns at the proposed development.

4.1.5 Further vehicle surveys have been undertaken at the Villiers Crescent residential area to the east. This area is wholly residential but has nearby local facilities which are within walking distance.

Survey Results

Surveyed Vehicle Movements (New Greens Area)

4.1.6 The total vehicle traffic flows arriving at and departing the New Greens area (via either Toulmin Drive, High Oaks or New Green) are summarised by hour in Table 4-1. It has been established there are 604 dwellings within the area, the corresponding vehicle trip rates for the total area have been calculated on this basis and presented in Table 4-2.

Table 4-1: Total Vehicle Average Midweek[1] Traffic Flows (New Greens Area)

Hour Starting	Toulmin Drive		High Oaks		New Green		Total		
	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep	Tot
07:00	86	58	80	76	27	52	193	186	379
08:00	159	153	206	197	61	101	426	451	877
09:00	66	50	100	84	42	40	209	174	382
10:00	59	33	81	72	35	42	175	148	323
11:00	53	42	70	80	32	41	155	164	318
12:00	51	55	80	76	52	49	183	180	363
13:00	54	58	75	76	44	45	173	179	352
14:00	53	69	87	92	53	42	193	204	397
15:00	108	123	170	176	99	86	376	385	761
16:00	65	89	128	130	68	56	261	275	535
17:00	71	90	132	132	76	56	279	279	557
18:00	67	77	121	116	48	48	236	241	477

[1] Midweek refers to Tuesday-Thursday throughout note.

Table 4-2: Corresponding Weekday Vehicle Trip Rates per Dwelling (New Greens Area)

Hour Starting	Trip Rates per Dwelling		
	Arrivals	Departures	Total
07:00	0.32	0.31	0.63
08:00	**0.71**	**0.75**	**1.45**
09:00	0.35	0.29	0.63
10:00	0.29	0.24	0.53
11:00	0.26	0.27	0.53
12:00	0.30	0.30	0.60
13:00	0.29	0.30	0.58
14:00	0.32	0.34	0.66
15:00	**0.62**	**0.64**	**1.26**
16:00	0.43	0.45	0.89
17:00	0.46	0.46	0.92
18:00	0.39	0.40	0.79

4.1.7 It can be seen that the calculated vehicular trip rates are higher than would typically be expected, particularly during the extended morning and afternoon peak periods.

4.1.8 A site visit was conducted on 21/02/2023 to observe the area surrounding the site, including the New Greens area to help better understand the surveyed movements. Observations undertaken during school drop off / pick up times revealed there was a material number of external vehicle trips associated with dropping off and picking up pupils at the Townsend Church of England Secondary School. This was particularly noted along Toulmin Drive where vehicles would proceed to drop off / pick up in the St Albans Centurions Rugby League Club Car Park, during the pick-up period this car park was observed to be significantly over capacity with vehicles picking up.

4.1.9 This may be due to its specific admission criteria and resulting large catchment area restricting modal choice.

4.1.10 It is suggested that the residential vehicular trip generation of the area is likely to be skewed by the presence of these vehicular trips to local amenities, particularly during the periods 08:00 to 09:00 and 15:00 to 16:00 but also during hours either side of the peak periods. A process to manually isolate school related trips has been investigated:

- TRICS was utilised; however there were no representative sites which have the same selective admissions criteria which would likely influence modal choice nor would it capture the off-site drop offs and pick-ups.

- A first principles approach which considered the likely people movements and modal splits from similar schools from other PJA projects was utilised.

4.1.11 There was a lack of certainty over both of these approaches and therefore it is deemed appropriate to consider another donor area.

4.1.12 It was also observed that the primary school and local centre, although having a relatively local catchment, also generate some external vehicle trips which would have been picked up within these surveys. Since trip generation associated with other land uses at the proposed development are to be calculated separately, it is suggested that it would be appropriate to calculate baseline vehicular trip rates from an area where there are no local facilities within the survey area but are within a suitable proximity to reflect likely baseline travel patterns at the site. As such, data collected at Villiers Crescent has been used to estimate vehicle movements at the proposed development.

Surveyed Vehicle Movements (Villiers Crescent)

4.1.13 ATCs have been undertaken at Villiers Crescent in East St Albans. This is a residential area situated a similar distance from St Albans city centre, as is the case with the proposed development. The vehicle trip generation collected is not influenced by other land uses since there are no such facilities accessed from the surveyed roads, but such facilities are within a close proximity to support modal choice as would be the case for the proposed development. On this basis, it is deemed that this provides a suitable proxy of baseline vehicular trip generation at the proposed development. A summary of the surveyed traffic flows and corresponding trip rates is provided in Table 4-3 and 4-4.

Table 4-3: Total Vehicle Average Midweek Traffic Flows (Villiers Crescent)

Hour Starting	Arrivals	Departures	Total
07:00	31	130	161
08:00	90	185	275
09:00	75	90	165
10:00	68	86	154
11:00	76	83	159
12:00	86	84	170
13:00	81	73	154
14:00	79	95	174
15:00	134	106	240
16:00	124	97	221
17:00	147	104	251
18:00	121	82	203

Table 4-4: Corresponding Weekday Vehicle Trip Rates per Dwelling (Villiers Crescent)

Hour Starting	Trip Rates per Dwelling		
	Arrivals	Departures	Total
07:00	0.066	0.277	0.343
08:00	**0.191**	**0.394**	**0.586**
09:00	0.159	0.191	0.350
10:00	0.145	0.182	0.327
11:00	0.161	0.177	0.338
12:00	0.182	0.179	0.362
13:00	0.173	0.155	0.328
14:00	0.168	0.201	0.370
15:00	0.284	0.226	0.511
16:00	0.264	0.207	0.471
17:00	**0.313**	**0.221**	**0.533**
18:00	0.257	0.174	0.432

Multi-Modal Trip Generation

4.1.14 While it has been observed there is a material number of vehicle trips to/from the New Greens area due to drop offs / pick-ups associated with Townsend Church of England School and the other local facilities within this area, the multi-modal trips across other modes (walking, cycling and public transport) may be suitable to determine baseline multi-modal trip rates for the proposed development.

4.1.15 To try to isolate out the residential trip making patterns within this area, a subsection of the wider New Greens area was surveyed. This included surveying movements within the area bound by Woollam Crescent, Toulmin Drive and Maple Avenue, as shown in Figure 2-1.

4.1.16 The number of users travelling on foot, bicycle and public transport within this area, are summarised in the tables below.

Table 4-5: Surveyed Average Midweek Pedestrian Movements (New Greens Area Subsection)

Hour Starting	Toulmin Drive South		Toulmin Drive North		Woollam Crescent		Total		
	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep	Tot
07:00	8	8	5	2	7	16	20	26	46
08:00	20	30	14	22	41	78	75	130	205
09:00	6	9	2	6	7	6	15	21	36
10:00	6	5	6	7	10	8	22	20	42
11:00	4	16	8	3	8	12	20	31	51
12:00	8	7	5	5	12	8	25	20	45
13:00	13	20	12	6	7	10	32	36	68
14:00	8	8	6	5	4	10	18	23	41
15:00	14	18	31	11	83	28	128	57	185
16:00	10	13	10	4	17	9	37	26	63
17:00	8	4	5	9	11	9	24	22	46
18:00	12	13	23	6	15	20	50	39	89

Table 4-6: Surveyed Average Midweek Cycle Movements (New Greens Area Subsection)

Hour Starting	Toulmin Drive South		Toulmin Drive North		Woollam Crescent		Total		
	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep	Tot
07:00	0	1	0	0	0	1	0	2	2
08:00	2	4	2	1	0	3	4	8	12
09:00	0	0	0	0	0	1	0	1	1
10:00	0	2	2	1	0	0	2	3	5
11:00	0	2	1	1	0	0	1	3	4
12:00	0	0	0	0	0	0	0	0	0
13:00	0	0	0	0	0	0	0	0	0
14:00	2	0	1	0	1	0	4	0	4
15:00	2	2	2	4	2	1	6	7	13
16:00	0	2	1	0	1	0	2	2	4
17:00	2	1	1	1	4	5	7	7	14
18:00	1	0	1	0	2	1	4	1	5

Table 4-7: Surveyed Average Midweek Public Transport Passenger Movements (New Greens Area Subsection)

Hour Starting	Arrivals	Departures	Total
07:00	0	4	4
08:00	0	4	4
09:00	0	3	3
10:00	1	1	2
11:00	2	2	4
12:00	2	1	3
13:00	3	1	4
14:00	0	1	1
15:00	3	2	5
16:00	4	1	5
17:00	2	1	3
18:00	3	0	3

4.1.17 The number of pedestrian movements recorded is greater than would be expected and observations demonstrated that there were a number of pedestrians travelling through the closed loop surveyed to/from the Margaret Wix Primary School access from Woollam Crescent.

4.1.18 The calculation of baseline modal split will therefore be considered in line with multi-modal surveys utilising interpeak values (between 09:00 and 15:00) which would be not impacted by school movements, Census data and TEMPro data.

Multi-Modal Trip Rates

4.1.19 A summary of the modal splits calculated from the multi-modal surveys for the inter-peak period is provided below. For comparison, modal splits have been extracted from TEMPro for all home-based journey purposes. These will be validated against the mobile network data.

4.1.20 The surveys enumerated the number of vehicles arriving at and departing from the Villiers Crescent area. It did not however quantify the number of occupants per car. In order to estimate the number of movements which may be undertaken as a car passenger to supplement the numbers below, the National Travel Survey has been interrogated. Specifically, data from Table 0504 – Number of Trips by Day of Week and Main Mode in England has been extracted to understand the ratio of car passengers to car drivers for typical journeys. This has been applied in the resulting modal splits below which can be refined further by time period and journey purpose through the TDM, if required. The potential baseline modal splits are provided in Table 4-8.

Table 4-8: Baseline Modal Split (Residential Units)

Modal Split	Walking	Cycling	Public Transport	Car Passenger	Car Driver
Multi-modal Surveys	36%	2%	2%	14%	46%
TEMPro – St Albans LA	24%	2%	8%	27%	39%
TEMPro – St Albans 009 (MSOA)	26%	2%	9%	29%	34%

4.2 Care Home and Retirement Living Trip Rates, Generation and Modal Split

4.2.1 A retirement living complex comprising 60 units and an 80-bed care home are proposed with the development. A review of the different retirement uses within the TRICS database has been undertaken to find robust traffic and person trip rates to represent a worst case across both uses, in this case the 'Retirement Flats' land use category has been selected. Although, the inclusion of the care home units will apply a reduction to the trip rates and generation shown below as a lower trip generator.

4.2.2 It is anticipated that ancillary community uses will be provided alongside the retirement living units and care home such as a hair salon, shop, gym or lounge which would add a level of self-containment to the sites and prevent a demand for off-site trips. As such, the travel demand associated is likely to be minimal, particularly during the network peak hours.

4.2.3 The following criteria have been applied to the TRICS database to provide the person trip rates provided in Table 4-9 below with full TRICS outputs provided in Appendix A.

- Category: 03 – Residential / N – Retirement Flats
- Regions: Excluding Greater London and Northern Ireland
- Only weekday surveys selected

Table 4-9: Person Trip Generation – Retirement Flats (140 units (80 bed care home and 60 retirement living units)

Time Period	Arrivals		Departures		Total	
	Trip Rate	Trip Gen	Trip Rate	Trip Gen	Trip Rate	Trip Gen
07:00-08:00	0.082	11	0.143	20	0.225	32
08:00-09:00	0.126	18	0.159	22	0.285	40
09:00-10:00	0.209	29	0.258	36	0.467	65
10:00-11:00	**0.225**	**32**	**0.275**	**39**	**0.5**	**70**
11:00-12:00	0.203	28	0.187	26	0.39	55
12:00-13:00	0.253	35	0.154	22	0.407	57

Time Period	Arrivals		Departures		Total	
	Trip Rate	Trip Gen	Trip Rate	Trip Gen	Trip Rate	Trip Gen
13:00-14:00	0.209	29	0.198	28	0.407	57
14:00-15:00	0.231	32	0.242	34	0.473	66
15:00-16:00	0.198	28	0.165	23	0.363	51
16:00-17:00	0.269	38	0.187	26	0.456	64
17:00-18:00	0.17	24	0.11	15	0.28	39
18:00-19:00	0.088	12	0.176	25	0.264	37

4.2.4 The modal split of trips has also been extracted from the TRICS outputs and summarised in Table 4-10.

Table 4-10: Baseline Modal Split (Retirement Living Units)

Modal Split	Walking	Cycling	Public Transport	Car Driver	Car Passenger
Daily (12 Hour)	15%	2%	11%	60%	13%

4.3 Education Trip Rates, Generation and Modal Split

4.3.1 Whilst travel patterns of journeys to/from home have changed since the COVID pandemic, the nature of journeys to school have not changed in the same way. It is therefore deemed appropriate to adopt trip rates extracted from the TRICS database from the 04 – Education, A – Primary category as follows. The location of sites have been reviewed to ensure similarities between the sites and the development site.

- Category: 04 – Education / A – Primary
- Regions: Excluding Greater London and Ireland
- Only weekday surveys selected
- 92 to 449 pupil range selected

4.3.2 The person trip generation is presented in Table 4-11 with full TRICS outputs provided in Appendix A. The modal split of trips has also been extracted from the TRICS outputs and summarised in Table 4-12.

Table 4-11: Total Person Trip Rates and Trip Generation (420 pupils)

Time Period	Arrivals		Departures		Total	
	Trip Rate	Trip Gen	Trip Rate	Trip Gen	Trip Rate	Trip Gen
07:00-08:00	0.124	52	0.039	16	0.163	68
08:00-09:00	**1.296**	**544**	**0.293**	**123**	**1.589**	**667**
09:00-10:00	0.089	37	0.122	51	0.211	89
10:00-11:00	0.024	10	0.048	20	0.072	30
11:00-12:00	0.038	16	0.025	11	0.063	26
12:00-13:00	0.034	14	0.051	21	0.085	36
13:00-14:00	0.032	13	0.058	24	0.09	38
14:00-15:00	0.14	59	0.063	26	0.203	85
15:00-16:00	**0.34**	**143**	**1.044**	**438**	**1.384**	**581**
16:00-17:00	0.103	43	0.366	154	0.469	197
17:00-18:00	0.028	12	0.09	38	0.118	50
18:00-19:00	0.019	8	0.027	11	0.046	19
Daily Trip Rates:	**2.267**	**952**	**2.226**	**935**	**4.493**	**1887**

Table 4-12: Baseline Modal Split (Primary School)

Modal Split	Walking	Cycling	Public Transport	Car Driver	Car Passenger
Daily (12 Hour)	34%	4%	6%	50%	6%

4.4 Summary of Modal Splits

4.4.1 Table 4-13 provides a summary of all baseline modal splits for the residential, education and retirement living land uses to be provided onsite.

Table 4-13: Summary Table of Modal Splits for Residential, Educational and Retirement Living

Modal Split	Walking	Cycling	Public Transport	Car Driver	Car Passenger
Residential					
Daily (12 Hour)	43%	3%	2%	12%	40%
Retirement Living					
Daily (12 Hour)	15%	1%	4%	67%	13%
Education (Primary School)					
Daily (12 Hour)	34%	4%	6%	50%	6%

4.5 Local Centre Trip Rates and Generation

4.5.1 It is deemed that the local centre would primarily fulfil onsite demand for facilities and therefore the external trip generation is likely to be negligible.

4.6 Future Modal Split and Next Steps

4.6.1 The above baseline modal splits provide an indication of travel patterns assuming historic attitudes to travel and methods for forecasting demand remain. It is proposed to provide an aspirational transport strategy for the site to influence future travel patterns. This strategy will influence modal choice amongst future residents encouraging a higher uptake of sustainable travel modes and reduced usage of vehicle modes, as well as reducing the need to travel offsite. It is also worth noting that this strategy would influence background trips that would be picked up separately.

4.6.2 The projected future modal splits will be determined as follows:

- Active travel modes: PCT.
  - Key corridors will be determined where improvements could be implemented for cyclists. The resultant PCT levels for the 'Go Dutch' scenario would be applied to journeys to/from the development which begin/end within 400m of an improved corridor.
- Public transport modes: Donor corridors.
  - Key PT corridors will be determined with donor levels of bus uptake applied to journeys to/from the development which begin/end within 400m of a PT corridor.
- Vehicle modes: A corresponding downturn relating to the projected uplift in sustainable travel modes will be applied.

4.6.3 This will be set out in the subsequent topic notes to be issued to HCC along with the effects on wider existing journeys through the network.

5 Distribution and Assignment

5.1.1 The TDM has given an indication of the distribution of person trips to/from the development. It is, however, proposed to consider this using mobile network data and we seek to agree the principle of the use of this data with HCC with this note and subsequent meeting.

5.2 Mobile Network Data Background

5.2.1 PJA are in close discussions with BT Active Travel Intelligence to understand capabilities around the data they own and how this could be used in this project. The data which can be provided is

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sourced from the EE network which has approximately a third network coverage across the UK providing a good sample size from which travel characteristics can be understood.

5.2.2 Mobile network data has been used for a number of years by various authorities, public bodies and government departments in the assessment of schemes, for giving a better understand of the movement of people and also the development of traffic models. This includes Warwickshire County Council, Transport for Greater Manchester, National Highways and the Department for Transport.

5.2.3 Historically, mobile network data has lacked granularity, attributed to “cells” which are broad geographic locations. However, in recent times, BT and EE have invested heavily in new network technology which provides higher location accuracy and as a result, detection of a higher number of signal events (i.e., multiple detection occurrences of each handset as a customer moves on a journey) providing greater accuracy for tracking movements through the network.

5.2.4 This enhanced network detection means that the data is accurate to 50m grid squares whereas historically, accuracy may have been as low as 300m to 15km (in a less urban setting). On average, a typical handset would have around 60 data points per day detected using the previous technology which has now increased to an average of over 300 data points per day detected per handset.

5.2.5 BT Active Intelligence has provided the following screenshots to demonstrate the detection of customers handsets using the traditional technology and the latest network technology; the latter of which is proposed to be used for this project.

Figure 5-1: BT Active Travel Example - 4G cell coverage in London covering multiple roads, train stations (avg. radius 910m)

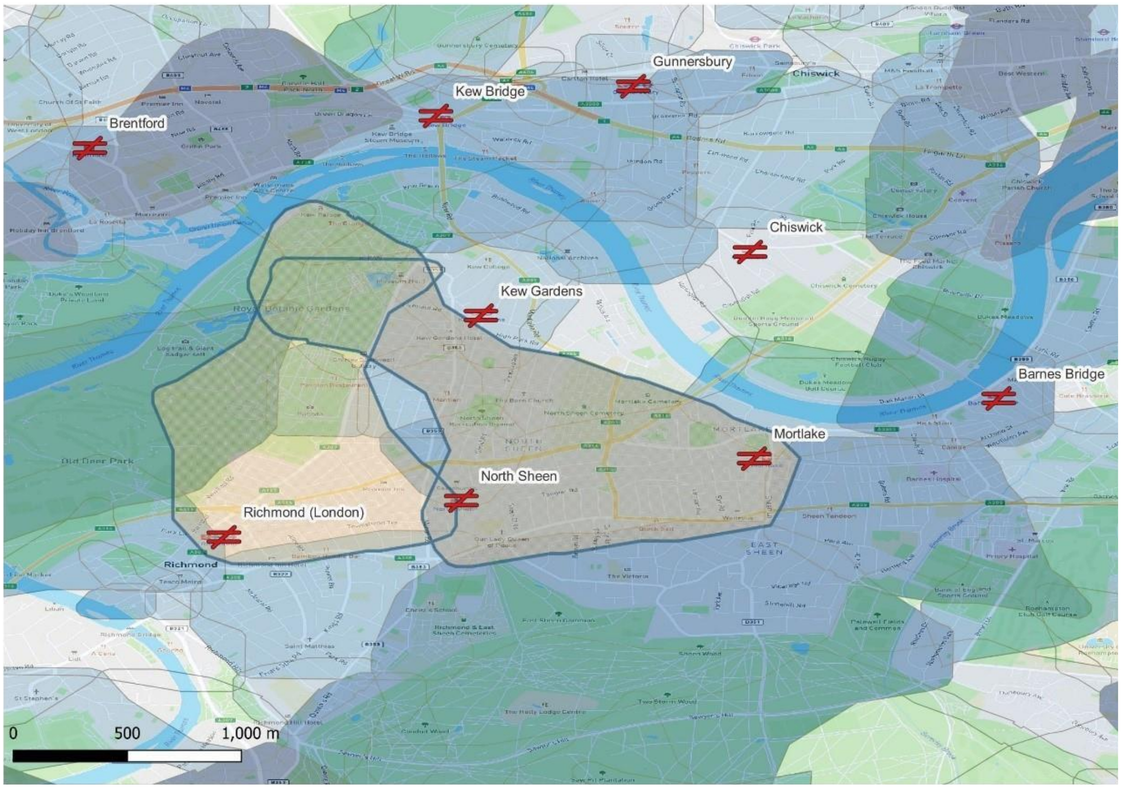

Figure 5-2: BT Active Travel Example - Subscribers within each 50m grid in London

5.3 Mobile Network Data Proposal

5.3.1 The following data is proposed to be sourced from BT Active Intelligence for the TDM zoning system included in Section 3.

Table 5-1: Proposed Mobile Network Data Coverage

Type	Coverage	Notes
Geographic Coverage	Journeys for all zones within the TDM zoning plan	Provided at MSOA/LSOA level, as required.
Temporal Coverage	Broken down hourly, by day of the week	The more detailed data improves the number of data points and therefore there is an adequate sample size to provide hourly data. Data is available from mid-2022 onwards.
Journey Purpose	Broken down by home/work/other	-
Mode of Travel	-Road -Rail -Walk -Other	-

5.3.2 It is proposed that the above data would be utilised to distribute trips for the proposed development, as well as understand the origins and destinations (O-D) of existing trips occurring on the network surrounding the site.

5.3.3 For the proposed development, consideration will be given to various potential donor areas from which the O-D pairs either starting or ending in those areas will be extracted. This will be undertaken in line with an analysis of demographic and housing type/tenure from the census to ensure an appropriate area is selected.

5.3.4 The appropriate donor area data will be used to estimate the distribution of movements to/from the site. The modal split information will also be used to validate the baseline modal split estimates set out in Section 4.

5.4 Trip Assignment

5.4.1 Once the distribution of trips is extracted from the mobile network dataset, a vehicular assignment exercise will be undertaken.

5.4.2 This will utilise the O-D pairs extracted from the mobile network dataset and will be routed using GIS software. This utilises typical traffic conditions to determine the quickest route. This assumes an all or nothing assignment whereby the quickest route will always be used. In reality, there could be alternative route choices which may be comparable in journey times and therefore to supplement the GIS analysis a manual exercise will be undertaken to assign trips to such alternative routes, in discussion with HCC.

6 Summary

6.1.1 PJA has been commissioned by Hallam Land Management to provide transport planning support for the proposed development of North St Albans. This Technical Note forms the first of a series of topic notes covering approach and assessment of the transport access and movement strategy to be presented in a Transport Assessment and Travel Plan/Travel Demand Management Strategy, to be agreed with HCC. This will in turn be used to support a planning application for development.

6.1.2 This first topic note covers initial trip generation, baseline mode share, use of the TDM and principles for distribution and assignment of trips.

6.1.3 A series of multi-modal surveys have been undertaken to understand existing travel patterns in proxy areas which can be used to forecast baseline travel characteristics of the site and will also be considered in line with census, TEMPro and mobile network data statistics, as appropriate. This assumes that historical travel patterns continue. Another scenario will also be developed (and set out in subsequent topic notes) to understand the influence an aspirational access and movement strategy and offsite enhancements could have on travel to/from the site and in the surrounding area.

6.1.4 A comprehensive Travel Demand Model will underpin the assessment and the principles of this have been set out in more detail in the note. This will cover the development and also the wider area with both a baseline and future element.

6.1.5 Person trip rates have been set out for the various land uses proposed and an estimate of baseline modal split has been provided. These have been established from the multi-modal surveys and thorough interrogation of the TRICS database.

6.1.6 An outline of the next steps to forecast future modal split has been set out; it is proposed to utilise the PCT and donor bus corridor data to understand the future propensity to shift from vehicle modes to sustainable travel modes.

6.1.7 An outline of the principles to distribute trips has been set out. This proposes the use of mobile network data. Further information on the level of detail which can be provided within this dataset, along with the high sample size, has been set out to demonstrate the reliability and justify the use of this data.

6.1.8 Finally, the process of the assignment of vehicular trips has been set out which utilises typical conditions on the local highway network along with manual adjustments to account for realistic route choice.

6.1.9 In summary, we seek agreement to the following from HCC along with suitable timescales for responding to allow for the project to continue in a timely manner:

- The proposed person trip generations and baseline modal splits set out for the various land uses.
- The use of mobile network data, as set out, to understand trip distribution.
- The use of GIS software and typical traffic conditions to inform the route assignment of vehicle trips.

Appendix A TRICS Outputs

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL TOTAL VEHICLES
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period
Total People to Total Vehicles ratio (all time periods and directions): 1.67

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.033	5	36	0.049	5	36	0.082
08:00 - 09:00	5	36	0.066	5	36	0.066	5	36	0.132
09:00 - 10:00	5	36	0.148	5	36	0.165	5	36	0.313
10:00 - 11:00	5	36	0.148	5	36	0.170	5	36	0.318
11:00 - 12:00	5	36	0.132	5	36	0.110	5	36	0.242
12:00 - 13:00	5	36	0.121	5	36	0.093	5	36	0.214
13:00 - 14:00	5	36	0.137	5	36	0.148	5	36	0.285
14:00 - 15:00	5	36	0.148	5	36	0.181	5	36	0.329
15:00 - 16:00	5	36	0.126	5	36	0.104	5	36	0.230
16:00 - 17:00	5	36	0.132	5	36	0.077	5	36	0.209
17:00 - 18:00	5	36	0.110	5	36	0.077	5	36	0.187
18:00 - 19:00	5	36	0.044	5	36	0.110	5	36	0.154
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			1.345			1.350			2.695

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	27 - 48 (units:)
Survey date date range:	01/01/14 - 20/10/21
Number of weekdays (Monday-Friday):	5
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	2
Surveys manually removed from selection:	3

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL TAXIS
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.000	5	36	0.000	5	36	0.000
08:00 - 09:00	5	36	0.000	5	36	0.000	5	36	0.000
09:00 - 10:00	5	36	0.005	5	36	0.005	5	36	0.010
10:00 - 11:00	5	36	0.005	5	36	0.005	5	36	0.010
11:00 - 12:00	5	36	0.011	5	36	0.011	5	36	0.022
12:00 - 13:00	5	36	0.000	5	36	0.000	5	36	0.000
13:00 - 14:00	5	36	0.000	5	36	0.000	5	36	0.000
14:00 - 15:00	5	36	0.011	5	36	0.011	5	36	0.022
15:00 - 16:00	5	36	0.011	5	36	0.011	5	36	0.022
16:00 - 17:00	5	36	0.005	5	36	0.005	5	36	0.010
17:00 - 18:00	5	36	0.005	5	36	0.005	5	36	0.010
18:00 - 19:00	5	36	0.005	5	36	0.005	5	36	0.010
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.058			0.058			0.116

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL OGVS
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.000	5	36	0.000	5	36	0.000
08:00 - 09:00	5	36	0.000	5	36	0.000	5	36	0.000
09:00 - 10:00	5	36	0.000	5	36	0.000	5	36	0.000
10:00 - 11:00	5	36	0.005	5	36	0.005	5	36	0.010
11:00 - 12:00	5	36	0.000	5	36	0.000	5	36	0.000
12:00 - 13:00	5	36	0.005	5	36	0.005	5	36	0.010
13:00 - 14:00	5	36	0.000	5	36	0.000	5	36	0.000
14:00 - 15:00	5	36	0.000	5	36	0.000	5	36	0.000
15:00 - 16:00	5	36	0.000	5	36	0.000	5	36	0.000
16:00 - 17:00	5	36	0.000	5	36	0.000	5	36	0.000
17:00 - 18:00	5	36	0.000	5	36	0.000	5	36	0.000
18:00 - 19:00	5	36	0.000	5	36	0.000	5	36	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.010			0.010			0.020

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL PSVS
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.000	5	36	0.000	5	36	0.000
08:00 - 09:00	5	36	0.000	5	36	0.000	5	36	0.000
09:00 - 10:00	5	**36**	**0.005**	5	**36**	**0.005**	5	**36**	**0.010**
10:00 - 11:00	5	36	0.000	5	36	0.000	5	36	0.000
11:00 - 12:00	5	36	0.005	5	36	0.005	5	36	0.010
12:00 - 13:00	5	36	0.000	5	36	0.000	5	36	0.000
13:00 - 14:00	5	36	0.000	5	36	0.000	5	36	0.000
14:00 - 15:00	5	36	0.005	5	36	0.005	5	36	0.010
15:00 - 16:00	5	36	0.000	5	36	0.000	5	36	0.000
16:00 - 17:00	5	36	0.000	5	36	0.000	5	36	0.000
17:00 - 18:00	5	36	0.000	5	36	0.000	5	36	0.000
18:00 - 19:00	5	36	0.000	5	36	0.000	5	36	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.015			0.015			0.030

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL CYCLISTS
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.016	5	36	0.016	5	36	0.032
08:00 - 09:00	5	36	0.011	5	36	0.000	5	36	0.011
09:00 - 10:00	5	36	0.000	5	36	0.000	5	36	0.000
10:00 - 11:00	5	36	0.005	5	36	0.005	5	36	0.010
11:00 - 12:00	5	36	0.000	5	36	0.000	5	36	0.000
12:00 - 13:00	5	36	0.000	5	36	0.005	5	36	0.005
13:00 - 14:00	5	36	0.000	5	36	0.000	5	36	0.000
14:00 - 15:00	5	36	0.005	5	36	0.000	5	36	0.005
15:00 - 16:00	5	36	0.000	5	36	0.005	5	36	0.005
16:00 - 17:00	5	36	0.000	5	36	0.005	5	36	0.005
17:00 - 18:00	5	36	0.000	5	36	0.000	5	36	0.000
18:00 - 19:00	5	36	0.000	5	36	0.000	5	36	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.037			0.036			0.073

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL VEHICLE OCCUPANTS
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.049	5	36	0.066	5	36	0.115
08:00 - 09:00	5	36	0.082	5	36	0.088	5	36	0.170
09:00 - 10:00	5	36	0.187	5	36	0.220	5	36	0.407
10:00 - 11:00	5	36	0.176	5	36	0.203	5	36	0.379
11:00 - 12:00	5	36	0.148	5	36	0.115	5	36	0.263
12:00 - 13:00	5	36	0.143	5	36	0.104	5	36	0.247
13:00 - 14:00	5	36	0.165	5	36	0.176	5	36	0.341
14:00 - 15:00	5	36	0.176	5	36	0.209	5	36	0.385
15:00 - 16:00	5	36	0.159	5	36	0.132	5	36	0.291
16:00 - 17:00	5	36	0.176	5	36	0.099	5	36	0.275
17:00 - 18:00	5	36	0.126	5	36	0.082	5	36	0.208
18:00 - 19:00	5	36	0.055	5	36	0.143	5	36	0.198
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			1.642			1.637			3.279

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL PEDESTRIANS
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.016	5	36	0.027	5	36	0.043
08:00 - 09:00	5	36	0.022	5	36	0.027	5	36	0.049
09:00 - 10:00	5	36	0.022	5	36	0.022	5	36	0.044
10:00 - 11:00	5	36	0.027	5	36	0.038	5	36	0.065
11:00 - 12:00	5	36	0.033	5	36	0.033	5	36	0.066
12:00 - 13:00	5	36	0.071	5	36	0.038	5	36	0.109
13:00 - 14:00	5	36	0.016	5	36	0.011	5	36	0.027
14:00 - 15:00	5	36	0.022	5	36	0.016	5	36	0.038
15:00 - 16:00	5	36	0.016	5	36	0.022	5	36	0.038
16:00 - 17:00	5	36	0.049	5	36	0.049	5	36	0.098
17:00 - 18:00	5	36	0.022	5	36	0.022	5	36	0.044
18:00 - 19:00	5	36	0.016	5	36	0.022	5	36	0.038
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.332			0.327			0.659

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL BUS/TRAM PASSENGERS
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

Time Range	ARRIVALS			DEPARTURES			TOTALS		
	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.000	5	36	0.011	5	36	0.011
08:00 - 09:00	5	36	0.011	5	36	**0.033**	5	36	0.044
09:00 - 10:00	5	36	0.000	5	36	0.005	5	36	0.005
10:00 - 11:00	5	36	0.016	5	36	0.027	5	36	0.043
11:00 - 12:00	5	36	0.022	5	36	0.022	5	36	0.044
12:00 - 13:00	5	36	0.027	5	36	0.005	5	36	0.032
13:00 - 14:00	5	36	0.027	5	36	0.011	5	36	0.038
14:00 - 15:00	5	36	0.022	5	36	0.016	5	36	0.038
15:00 - 16:00	5	36	0.022	5	36	0.005	5	36	0.027
16:00 - 17:00	5	36	**0.038**	5	36	0.027	5	36	**0.065**
17:00 - 18:00	5	36	0.011	5	36	0.005	5	36	0.016
18:00 - 19:00	5	36	0.005	5	36	0.011	5	36	0.016
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.201			0.178			0.379

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL TOTAL RAIL PASSENGERS
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.000	5	36	**0.022**	5	36	**0.022**
08:00 - 09:00	5	36	0.000	5	36	0.011	5	36	0.011
09:00 - 10:00	5	36	0.000	5	36	0.005	5	36	0.005
10:00 - 11:00	5	36	0.000	5	36	0.000	5	36	0.000
11:00 - 12:00	5	36	0.000	5	36	0.005	5	36	0.005
12:00 - 13:00	5	36	**0.011**	5	36	0.000	5	36	0.011
13:00 - 14:00	5	36	0.000	5	36	0.000	5	36	0.000
14:00 - 15:00	5	36	0.000	5	36	0.000	5	36	0.000
15:00 - 16:00	5	36	0.000	5	36	0.000	5	36	0.000
16:00 - 17:00	5	36	0.005	5	36	0.005	5	36	0.010
17:00 - 18:00	5	36	0.011	5	36	0.000	5	36	0.011
18:00 - 19:00	5	36	0.011	5	36	0.000	5	36	0.011
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.038			0.048			0.086

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL COACH PASSENGERS
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.000	5	36	0.000	5	36	0.000
08:00 - 09:00	5	36	0.000	5	36	0.000	5	36	0.000
09:00 - 10:00	5	36	0.000	5	36	0.005	5	36	0.005
10:00 - 11:00	5	36	0.000	5	36	0.000	5	36	0.000
11:00 - 12:00	5	36	0.000	5	**36**	**0.011**	5	**36**	**0.011**
12:00 - 13:00	5	36	0.000	5	36	0.000	5	36	0.000
13:00 - 14:00	5	36	0.000	5	36	0.000	5	36	0.000
14:00 - 15:00	5	**36**	**0.005**	5	36	0.000	5	36	0.005
15:00 - 16:00	5	36	0.000	5	36	0.000	5	36	0.000
16:00 - 17:00	5	36	0.000	5	36	0.000	5	36	0.000
17:00 - 18:00	5	36	0.000	5	36	0.000	5	36	0.000
18:00 - 19:00	5	36	0.000	5	36	0.000	5	36	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.005			0.016			0.021

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL PUBLIC TRANSPORT USERS
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.000	5	36	0.033	5	36	0.033
08:00 - 09:00	5	36	0.011	5	36	**0.044**	5	36	0.055
09:00 - 10:00	5	36	0.000	5	36	0.016	5	36	0.016
10:00 - 11:00	5	36	0.016	5	36	0.027	5	36	0.043
11:00 - 12:00	5	36	0.022	5	36	0.038	5	36	0.060
12:00 - 13:00	5	36	0.038	5	36	0.005	5	36	0.043
13:00 - 14:00	5	36	0.027	5	36	0.011	5	36	0.038
14:00 - 15:00	5	36	0.027	5	36	0.016	5	36	0.043
15:00 - 16:00	5	36	0.022	5	36	0.005	5	36	0.027
16:00 - 17:00	5	36	**0.044**	5	36	0.033	5	36	**0.077**
17:00 - 18:00	5	36	0.022	5	36	0.005	5	36	0.027
18:00 - 19:00	5	36	0.016	5	36	0.011	5	36	0.027
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.245			0.244			0.489

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL TOTAL PEOPLE
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period
Total People to Total Vehicles ratio (all time periods and directions): 1.67

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.082	5	36	0.143	5	36	0.225
08:00 - 09:00	5	36	0.126	5	36	0.159	5	36	0.285
09:00 - 10:00	5	36	0.209	5	36	0.258	5	36	0.467
10:00 - 11:00	5	36	0.225	5	36	0.275	5	36	0.500
11:00 - 12:00	5	36	0.203	5	36	0.187	5	36	0.390
12:00 - 13:00	5	36	0.253	5	36	0.154	5	36	0.407
13:00 - 14:00	5	36	0.209	5	36	0.198	5	36	0.407
14:00 - 15:00	5	36	0.231	5	36	0.242	5	36	0.473
15:00 - 16:00	5	36	0.198	5	36	0.165	5	36	0.363
16:00 - 17:00	5	36	0.269	5	36	0.187	5	36	0.456
17:00 - 18:00	5	36	0.170	5	36	0.110	5	36	0.280
18:00 - 19:00	5	36	0.088	5	36	0.176	5	36	0.264
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			2.263			2.254			4.517

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL CARS
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

Time Range	ARRIVALS			DEPARTURES			TOTALS		
	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.027	5	36	0.044	5	36	0.071
08:00 - 09:00	5	36	0.060	5	36	0.060	5	36	0.120
09:00 - 10:00	5	36	0.110	5	36	0.132	5	36	0.242
10:00 - 11:00	5	36	0.121	5	36	0.137	5	36	0.258
11:00 - 12:00	5	36	0.093	5	36	0.077	5	36	0.170
12:00 - 13:00	5	36	0.099	5	36	0.071	5	36	0.170
13:00 - 14:00	5	36	0.115	5	36	0.126	5	36	0.241
14:00 - 15:00	5	36	0.115	5	36	**0.148**	5	36	**0.263**
15:00 - 16:00	5	36	0.099	5	36	0.077	5	36	0.176
16:00 - 17:00	5	36	**0.126**	5	36	0.071	5	36	0.197
17:00 - 18:00	5	36	0.099	5	36	0.066	5	36	0.165
18:00 - 19:00	5	36	0.033	5	36	0.104	5	36	0.137
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			1.097			1.113			2.210

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL LGVS
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.005	5	36	0.005	5	36	0.010
08:00 - 09:00	5	36	0.005	5	36	0.005	5	36	0.010
09:00 - 10:00	5	36	0.027	5	36	0.022	5	36	0.049
10:00 - 11:00	5	36	0.016	5	36	0.022	5	36	0.038
11:00 - 12:00	5	36	0.016	5	36	0.016	5	36	0.032
12:00 - 13:00	5	36	0.016	5	36	0.016	5	36	0.032
13:00 - 14:00	5	36	0.022	5	36	0.022	5	36	0.044
14:00 - 15:00	5	36	0.016	5	36	0.016	5	36	0.032
15:00 - 16:00	5	36	0.016	5	36	0.016	5	36	0.032
16:00 - 17:00	5	36	0.000	5	36	0.000	5	36	0.000
17:00 - 18:00	5	36	0.005	5	36	0.005	5	36	0.010
18:00 - 19:00	5	36	0.000	5	36	0.000	5	36	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.144			0.145			0.289

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL MOTOR CYCLES
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.000	5	36	0.000	5	36	0.000
08:00 - 09:00	5	36	0.000	5	36	0.000	5	36	0.000
09:00 - 10:00	5	36	0.000	5	36	0.000	5	36	0.000
10:00 - 11:00	5	36	0.000	5	36	0.000	5	36	0.000
11:00 - 12:00	**5**	**36**	**0.005**	5	36	0.000	**5**	**36**	**0.005**
12:00 - 13:00	5	36	0.000	5	36	0.000	5	36	0.000
13:00 - 14:00	5	36	0.000	5	36	0.000	5	36	0.000
14:00 - 15:00	5	36	0.000	5	36	0.000	5	36	0.000
15:00 - 16:00	5	36	0.000	5	36	0.000	5	36	0.000
16:00 - 17:00	5	36	0.000	5	36	0.000	5	36	0.000
17:00 - 18:00	5	36	0.000	5	36	0.000	5	36	0.000
18:00 - 19:00	5	36	0.005	5	36	0.000	5	36	0.005
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.010			0.000			0.010

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 03 - RESIDENTIAL/N - RETIREMENT FLATS
MULTI-MODAL Servicing Vehicles
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

Time Range	ARRIVALS			DEPARTURES			TOTALS		
	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	5	36	0.000	5	36	0.000	5	36	0.000
08:00 - 09:00	5	36	0.000	5	36	0.000	5	36	0.000
09:00 - 10:00	5	36	**0.027**	5	36	0.022	5	36	0.049
10:00 - 11:00	5	36	0.022	5	36	**0.027**	5	36	0.049
11:00 - 12:00	5	36	0.016	5	36	0.016	5	36	0.032
12:00 - 13:00	5	36	0.016	5	36	0.016	5	36	0.032
13:00 - 14:00	5	36	0.027	5	36	0.027	5	36	**0.054**
14:00 - 15:00	5	36	0.016	5	36	0.016	5	36	0.032
15:00 - 16:00	5	36	0.005	5	36	0.005	5	36	0.010
16:00 - 17:00	5	36	0.000	5	36	0.000	5	36	0.000
17:00 - 18:00	5	36	0.000	5	36	0.000	5	36	0.000
18:00 - 19:00	5	36	0.000	5	36	0.000	5	36	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.129			0.129			0.258

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Calculation Reference: AUDIT-231601-220720-0700

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 04 - EDUCATION
Category : A - PRIMARY
MULTI-MODAL TOTAL VEHICLES

Selected regions and areas:

03	SOUTH WEST		
	CW	CORNWALL	1 days
	SM	SOMERSET	1 days
08	NORTH WEST		
	LC	LANCASHIRE	1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Primary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: Number of pupils
Actual Range: 407 to 449 (units:)
Range Selected by User: 92 to 449 (units:)

Parking Spaces Range: All Surveys Included

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/14 to 03/04/19

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Tuesday	1 days
Thursday	2 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	3 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Suburban Area (PPS6 Out of Centre)	1
Neighbourhood Centre (PPS6 Local Centre)	2

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Residential Zone	2
Village	1

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:

F1(a)	3 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Population within 500m Range:
All Surveys Included

Population within 1 mile:

1,001 to 5,000	1 days
5,001 to 10,000	1 days
50,001 to 100,000	1 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

50,001 to 75,000	1 days
75,001 to 100,000	1 days
250,001 to 500,000	1 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.6 to 1.0	1 days
1.1 to 1.5	2 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

No	3 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:

No PTAL Present	3 days

This data displays the number of selected surveys with PTAL Ratings.

LIST OF SITES relevant to selection parameters

1 CW-04-A-03 PRIMARY ACADEMY CORNWALL
TREVERBYN RISE
PENRYN

Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Number of pupils: 440
Survey date: THURSDAY 28/03/19 Survey Type: MANUAL

2 LC-04-A-06 PRIMARY SCHOOL LANCASHIRE
SEVERN ROAD
BLACKPOOL
SOUTH SHORE
Neighbourhood Centre (PPS6 Local Centre)
Residential Zone
Total Number of pupils: 449
Survey date: TUESDAY 27/09/16 Survey Type: MANUAL

3 SM-04-A-01 PRIMARY SCHOOL SOMERSET
BRIDGWATER ROAD
NEAR TAUNTON
BATHPOOL
Neighbourhood Centre (PPS6 Local Centre)
Village
Total Number of pupils: 407
Survey date: THURSDAY 27/09/18 Survey Type: MANUAL

This section provides a list of all survey sites and days in the selected set. For each individual survey site, it displays a unique site reference code and site address, the selected trip rate calculation parameter and its value, the day of the week and date of each survey, and whether the survey was a manual classified count or an ATC count.

MANUALLY DESELECTED SITES

Site Ref	Reason for Deselection
NY-04-A-04	Size
WL-04-A-02	Size

TRIP RATE for Land Use 04 - EDUCATION/A - PRIMARY
MULTI-MODAL TOTAL VEHICLES
Calculation factor: 1 PUPILS
BOLD print indicates peak (busiest) period
Total People to Total Vehicles ratio (all time periods and directions): 2.95

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	3	432	0.058	3	432	0.027	3	432	0.085
08:00 - 09:00	3	432	0.279	3	432	0.215	3	432	0.494
09:00 - 10:00	3	432	0.037	3	432	0.031	3	432	0.068
10:00 - 11:00	3	432	0.014	3	432	0.017	3	432	0.031
11:00 - 12:00	3	432	0.023	3	432	0.013	3	432	0.036
12:00 - 13:00	3	432	0.017	3	432	0.021	3	432	0.038
13:00 - 14:00	3	432	0.021	3	432	0.029	3	432	0.050
14:00 - 15:00	3	432	0.044	3	432	0.028	3	432	0.072
15:00 - 16:00	3	432	0.176	3	432	0.208	3	432	0.384
16:00 - 17:00	3	432	0.072	3	432	0.120	3	432	0.192
17:00 - 18:00	3	432	0.016	3	432	0.032	3	432	0.048
18:00 - 19:00	3	432	0.015	3	432	0.013	3	432	0.028
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.772			0.754			1.526

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	407 - 449 (units:)
Survey date date range:	01/01/14 - 03/04/19
Number of weekdays (Monday-Friday):	3
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	0
Surveys manually removed from selection:	2

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE for Land Use 04 - EDUCATION/A - PRIMARY

MULTI-MODAL TAXIS

Calculation factor: 1 PUPILS

BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	3	432	0.000	3	432	0.000	3	432	0.000
08:00 - 09:00	3	432	0.001	3	432	0.001	3	432	0.002
09:00 - 10:00	3	432	0.000	3	432	0.000	3	432	0.000
10:00 - 11:00	3	432	0.001	3	432	0.001	3	432	0.002
11:00 - 12:00	3	432	0.000	3	432	0.000	3	432	0.000
12:00 - 13:00	3	432	0.000	3	432	0.000	3	432	0.000
13:00 - 14:00	3	432	0.000	3	432	0.000	3	432	0.000
14:00 - 15:00	3	432	0.000	3	432	0.000	3	432	0.000
15:00 - 16:00	3	432	0.001	3	432	0.001	3	432	0.002
16:00 - 17:00	3	432	0.000	3	432	0.000	3	432	0.000
17:00 - 18:00	3	432	0.000	3	432	0.000	3	432	0.000
18:00 - 19:00	3	432	0.000	3	432	0.000	3	432	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.003			0.003			0.006

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 04 - EDUCATION/A - PRIMARY
MULTI-MODAL OGVS
Calculation factor: 1 PUPILS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	3	432	0.000	3	432	0.000	3	432	0.000
08:00 - 09:00	3	432	0.001	3	432	0.001	3	432	0.002
09:00 - 10:00	3	432	0.001	3	432	0.001	3	432	0.002
10:00 - 11:00	3	432	0.000	3	432	0.000	3	432	0.000
11:00 - 12:00	3	432	0.000	3	432	0.000	3	432	0.000
12:00 - 13:00	3	432	0.000	3	432	0.000	3	432	0.000
13:00 - 14:00	3	432	0.000	3	432	0.000	3	432	0.000
14:00 - 15:00	3	432	0.000	3	432	0.000	3	432	0.000
15:00 - 16:00	3	432	0.000	3	432	0.000	3	432	0.000
16:00 - 17:00	3	432	0.000	3	432	0.000	3	432	0.000
17:00 - 18:00	3	432	0.000	3	432	0.000	3	432	0.000
18:00 - 19:00	3	432	0.000	3	432	0.000	3	432	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.002			0.002			0.004

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 04 - EDUCATION/A - PRIMARY
MULTI-MODAL PSVS
Calculation factor: 1 PUPILS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	3	432	0.000	3	432	0.000	3	432	0.000
08:00 - 09:00	3	432	0.000	3	432	0.000	3	432	0.000
09:00 - 10:00	3	432	0.001	3	432	0.001	3	432	0.002
10:00 - 11:00	3	432	0.000	3	432	0.000	3	432	0.000
11:00 - 12:00	3	432	0.000	3	432	0.000	3	432	0.000
12:00 - 13:00	3	432	0.000	3	432	0.000	3	432	0.000
13:00 - 14:00	3	432	0.000	3	432	0.000	3	432	0.000
14:00 - 15:00	3	432	0.000	3	432	0.000	3	432	0.000
15:00 - 16:00	3	432	0.001	3	432	0.001	3	432	0.002
16:00 - 17:00	3	432	0.000	3	432	0.000	3	432	0.000
17:00 - 18:00	3	432	0.000	3	432	0.000	3	432	0.000
18:00 - 19:00	3	432	0.000	3	432	0.000	3	432	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.002			0.002			0.004

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 04 - EDUCATION/A - PRIMARY
MULTI-MODAL CYCLISTS
Calculation factor: 1 PUPILS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	3	432	0.002	3	432	0.000	3	432	0.002
08:00 - 09:00	3	**432**	**0.035**	3	432	0.005	3	**432**	**0.040**
09:00 - 10:00	3	432	0.000	3	432	0.000	3	432	0.000
10:00 - 11:00	3	432	0.000	3	432	0.000	3	432	0.000
11:00 - 12:00	3	432	0.000	3	432	0.000	3	432	0.000
12:00 - 13:00	3	432	0.000	3	432	0.002	3	432	0.002
13:00 - 14:00	3	432	0.002	3	432	0.001	3	432	0.003
14:00 - 15:00	3	432	0.000	3	432	0.001	3	432	0.001
15:00 - 16:00	3	432	0.002	3	**432**	**0.030**	3	432	0.032
16:00 - 17:00	3	432	0.002	3	432	0.003	3	432	0.005
17:00 - 18:00	3	432	0.004	3	432	0.003	3	432	0.007
18:00 - 19:00	3	432	0.000	3	432	0.000	3	432	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.047			0.045			0.092

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 04 - EDUCATION/A - PRIMARY
MULTI-MODAL VEHICLE OCCUPANTS
Calculation factor: 1 PUPILS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	3	432	0.100	3	432	0.028	3	432	0.128
08:00 - 09:00	3	**432**	**0.389**	3	432	0.034	3	**432**	**0.423**
09:00 - 10:00	3	432	0.046	3	432	0.028	3	432	0.074
10:00 - 11:00	3	432	0.017	3	432	0.018	3	432	0.035
11:00 - 12:00	3	432	0.025	3	432	0.013	3	432	0.038
12:00 - 13:00	3	432	0.017	3	432	0.021	3	432	0.038
13:00 - 14:00	3	432	0.022	3	432	0.032	3	432	0.054
14:00 - 15:00	3	432	0.033	3	432	0.029	3	432	0.062
15:00 - 16:00	3	432	0.054	3	**432**	**0.289**	3	432	0.343
16:00 - 17:00	3	432	0.052	3	432	0.195	3	432	0.247
17:00 - 18:00	3	432	0.019	3	432	0.056	3	432	0.075
18:00 - 19:00	3	432	0.015	3	432	0.019	3	432	0.034
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.789			0.762			1.551

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 04 - EDUCATION/A - PRIMARY
MULTI-MODAL PEDESTRIANS
Calculation factor: 1 PUPILS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	3	432	0.019	3	432	0.012	3	432	0.031
08:00 - 09:00	3	432	0.725	3	432	0.194	3	432	0.919
09:00 - 10:00	3	432	0.034	3	432	0.037	3	432	0.071
10:00 - 11:00	3	432	0.007	3	432	0.030	3	432	0.037
11:00 - 12:00	3	432	0.009	3	432	0.012	3	432	0.021
12:00 - 13:00	3	432	0.016	3	432	0.028	3	432	0.044
13:00 - 14:00	3	432	0.008	3	432	0.022	3	432	0.030
14:00 - 15:00	3	432	0.083	3	432	0.032	3	432	0.115
15:00 - 16:00	3	432	0.195	3	432	0.598	3	432	0.793
16:00 - 17:00	3	432	0.036	3	432	0.126	3	432	0.162
17:00 - 18:00	3	432	0.005	3	432	0.030	3	432	0.035
18:00 - 19:00	3	432	0.004	3	432	0.008	3	432	0.012
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			1.141			1.129			2.270

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 04 - EDUCATION/A - PRIMARY
MULTI-MODAL BUS/TRAM PASSENGERS
Calculation factor: 1 PUPILS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	3	432	0.002	3	432	0.000	3	432	0.002
08:00 - 09:00	3	432	0.139	3	432	0.056	3	432	0.195
09:00 - 10:00	3	432	0.006	3	432	0.005	3	432	0.011
10:00 - 11:00	3	432	0.000	3	432	0.000	3	432	0.000
11:00 - 12:00	3	432	0.002	3	432	0.000	3	432	0.002
12:00 - 13:00	3	432	0.001	3	432	0.000	3	432	0.001
13:00 - 14:00	3	432	0.000	3	432	0.004	3	432	0.004
14:00 - 15:00	3	432	0.024	3	432	0.002	3	432	0.026
15:00 - 16:00	3	432	0.033	3	432	0.110	3	432	0.143
16:00 - 17:00	3	432	0.008	3	432	0.039	3	432	0.047
17:00 - 18:00	3	432	0.000	3	432	0.001	3	432	0.001
18:00 - 19:00	3	432	0.000	3	432	0.000	3	432	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.215			0.217			0.432

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 04 - EDUCATION/A - PRIMARY
MULTI-MODAL TOTAL RAIL PASSENGERS
Calculation factor: 1 PUPILS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	3	432	0.000	3	432	0.000	3	432	0.000
08:00 - 09:00	3	**432**	**0.008**	3	432	0.005	3	432	0.013
09:00 - 10:00	3	432	0.002	3	432	0.001	3	432	0.003
10:00 - 11:00	3	432	0.000	3	432	0.000	3	432	0.000
11:00 - 12:00	3	432	0.001	3	432	0.000	3	432	0.001
12:00 - 13:00	3	432	0.000	3	432	0.000	3	432	0.000
13:00 - 14:00	3	432	0.000	3	432	0.000	3	432	0.000
14:00 - 15:00	3	432	0.000	3	432	0.000	3	432	0.000
15:00 - 16:00	3	432	0.004	3	**432**	**0.017**	3	**432**	**0.021**
16:00 - 17:00	3	432	0.005	3	432	0.002	3	432	0.007
17:00 - 18:00	3	432	0.000	3	432	0.000	3	432	0.000
18:00 - 19:00	3	432	0.000	3	432	0.000	3	432	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.020			0.025			0.045

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

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TRIP RATE for Land Use 04 - EDUCATION/A - PRIMARY
MULTI-MODAL COACH PASSENGERS
Calculation factor: 1 PUPILS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	3	432	0.000	3	432	0.000	3	432	0.000
08:00 - 09:00	3	432	0.000	3	432	0.000	3	432	0.000
09:00 - 10:00	3	432	0.000	3	432	0.051	3	432	0.051
10:00 - 11:00	3	432	0.000	3	432	0.000	3	432	0.000
11:00 - 12:00	3	432	0.000	3	432	0.000	3	432	0.000
12:00 - 13:00	3	432	0.000	3	432	0.000	3	432	0.000
13:00 - 14:00	3	432	0.000	3	432	0.000	3	432	0.000
14:00 - 15:00	3	432	0.000	3	432	0.000	3	432	0.000
15:00 - 16:00	3	432	0.051	3	432	0.000	3	432	0.051
16:00 - 17:00	3	432	0.000	3	432	0.000	3	432	0.000
17:00 - 18:00	3	432	0.000	3	432	0.000	3	432	0.000
18:00 - 19:00	3	432	0.000	3	432	0.000	3	432	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.051			0.051			0.102

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 04 - EDUCATION/A - PRIMARY
MULTI-MODAL PUBLIC TRANSPORT USERS
Calculation factor: 1 PUPILS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	3	432	0.002	3	432	0.000	3	432	0.002
08:00 - 09:00	3	**432**	**0.147**	3	432	0.060	3	432	0.207
09:00 - 10:00	3	432	0.008	3	432	0.057	3	432	0.065
10:00 - 11:00	3	432	0.000	3	432	0.000	3	432	0.000
11:00 - 12:00	3	432	0.003	3	432	0.000	3	432	0.003
12:00 - 13:00	3	432	0.001	3	432	0.000	3	432	0.001
13:00 - 14:00	3	432	0.000	3	432	0.004	3	432	0.004
14:00 - 15:00	3	432	0.024	3	432	0.002	3	432	0.026
15:00 - 16:00	3	432	0.088	3	**432**	**0.127**	3	**432**	**0.215**
16:00 - 17:00	3	432	0.013	3	432	0.042	3	432	0.055
17:00 - 18:00	3	432	0.000	3	432	0.001	3	432	0.001
18:00 - 19:00	3	432	0.000	3	432	0.000	3	432	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.286			0.293			0.579

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 04 - EDUCATION/A - PRIMARY
MULTI-MODAL TOTAL PEOPLE
Calculation factor: 1 PUPILS
BOLD print indicates peak (busiest) period
Total People to Total Vehicles ratio (all time periods and directions): 2.95

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	3	432	0.124	3	432	0.039	3	432	0.163
08:00 - 09:00	3	432	1.296	3	432	0.293	3	432	1.589
09:00 - 10:00	3	432	0.089	3	432	0.122	3	432	0.211
10:00 - 11:00	3	432	0.024	3	432	0.048	3	432	0.072
11:00 - 12:00	3	432	0.038	3	432	0.025	3	432	0.063
12:00 - 13:00	3	432	0.034	3	432	0.051	3	432	0.085
13:00 - 14:00	3	432	0.032	3	432	0.058	3	432	0.090
14:00 - 15:00	3	432	0.140	3	432	0.063	3	432	0.203
15:00 - 16:00	3	432	0.340	3	432	1.044	3	432	1.384
16:00 - 17:00	3	432	0.103	3	432	0.366	3	432	0.469
17:00 - 18:00	3	432	0.028	3	432	0.090	3	432	0.118
18:00 - 19:00	3	432	0.019	3	432	0.027	3	432	0.046
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			2.267			2.226			4.493

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

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TRIP RATE for Land Use 04 - EDUCATION/A - PRIMARY
MULTI-MODAL CARS
Calculation factor: 1 PUPILS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	3	432	0.055	3	432	0.025	3	432	0.080
08:00 - 09:00	3	432	0.270	3	432	0.207	3	432	0.477
09:00 - 10:00	3	432	0.032	3	432	0.025	3	432	0.057
10:00 - 11:00	3	432	0.012	3	432	0.014	3	432	0.026
11:00 - 12:00	3	432	0.020	3	432	0.009	3	432	0.029
12:00 - 13:00	3	432	0.015	3	432	0.019	3	432	0.034
13:00 - 14:00	3	432	0.013	3	432	0.025	3	432	0.038
14:00 - 15:00	3	432	0.042	3	432	0.022	3	432	0.064
15:00 - 16:00	3	432	0.171	3	432	0.205	3	432	0.376
16:00 - 17:00	3	432	0.069	3	432	0.118	3	432	0.187
17:00 - 18:00	3	432	0.016	3	432	0.030	3	432	0.046
18:00 - 19:00	3	432	0.015	3	432	0.013	3	432	0.028
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.730			0.712			1.442

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE for Land Use 04 - EDUCATION/A - PRIMARY
MULTI-MODAL LGVS
Calculation factor: 1 PUPILS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate	No. Days	Ave. PUPILS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	3	432	0.003	3	432	0.002	3	432	0.005
08:00 - 09:00	3	432	0.007	3	**432**	**0.006**	3	**432**	**0.013**
09:00 - 10:00	3	432	0.003	3	432	0.004	3	432	0.007
10:00 - 11:00	3	432	0.002	3	432	0.002	3	432	0.004
11:00 - 12:00	3	432	0.003	3	432	0.004	3	432	0.007
12:00 - 13:00	3	432	0.002	3	432	0.002	3	432	0.004
13:00 - 14:00	3	**432**	**0.008**	3	432	0.004	3	432	0.012
14:00 - 15:00	3	432	0.002	3	432	0.005	3	432	0.007
15:00 - 16:00	3	432	0.003	3	432	0.002	3	432	0.005
16:00 - 17:00	3	432	0.003	3	432	0.002	3	432	0.005
17:00 - 18:00	3	432	0.000	3	432	0.002	3	432	0.002
18:00 - 19:00	3	432	0.000	3	432	0.000	3	432	0.000
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			0.036			0.035			0.071

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

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Appendix J

Opportunity to Shift Modes Report

Confidential

St Albans Modal Shift Study

Final draft report

March 2024

Hertfordshire County Council

70120547

INTRODUCTION & EXECUTIVE SUMMARY

PART 1
SUSTAINABLE TRAVEL POTENTIAL FOR EXISTING COMMUNITIES

PART 2
SUSTAINABLE TRAVEL POTENTIAL FOR NEW DEVELOPMENTS

APPENDIX A
BREAKDOWN OF SUSTAINABLE TRAVEL OPPORTUNITY FOR EXISTING COMMUNITIES

APPENDIX B
RANGE OF TRIPS BY COMMUNITIES WITH THE OPPORTUNITY TO SHIFT BY MODE

APPENDIX C
BREAKDOWN OF SUSTAINABLE TRAVEL PROPENSITY FOR EXISTING COMMUNITIES

APPENDIX D
BREAKDOWN OF SUSTAINABLE TRAVEL POTENTIAL FOR EXISTING COMMUNITIES

Document Control

Issue / revision	Draft	Final draft	Final
Date	28/02/2024	25/03/24	18/07/24
Prepared by	STJ	TA	TA
Checked by	TA	DQ	DQ
Authorised by	DQ	DQ	DQ

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INTRODUCTION

Project overview and executive summary

Introduction

Overview

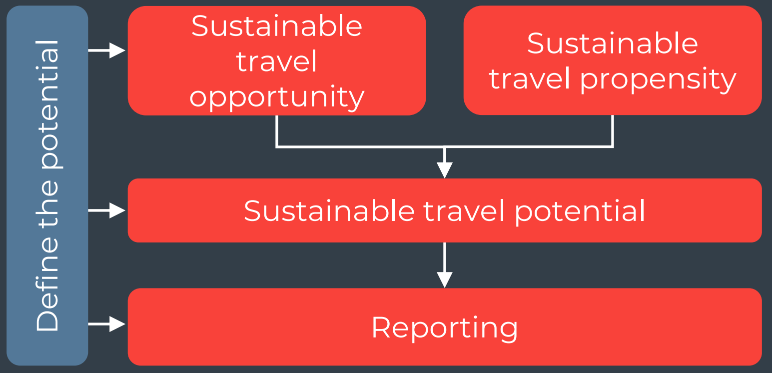
WSP have been commissioned by Hertfordshire County Council (HCC) to undertake a modal shift study for the existing and future communities in St Albans district.

The County Council's Local Transport Plan 2018-2031 (LTP4) seeks to achieve a modal shift away from car use to more sustainable modes such as public transport, walking and cycling.

WSP's sustainable travel analysis provides an evidence-led approach to estimating potential modal shift that can be used in the local plan process.

The final report

This report summarises the key findings on the opportunity and propensity to shift existing car trips to sustainable travel, and the resulting sustainable travel potential for the existing communities and new developments in St Albans district (see Figure 1).



Project aims

The aim of this project is to estimate sustainable travel opportunity, propensity and potential for:

- Task 1 - the existing communities in St Albans district.
- Task 2 - the specified new developments in St Albans district.

Report structure

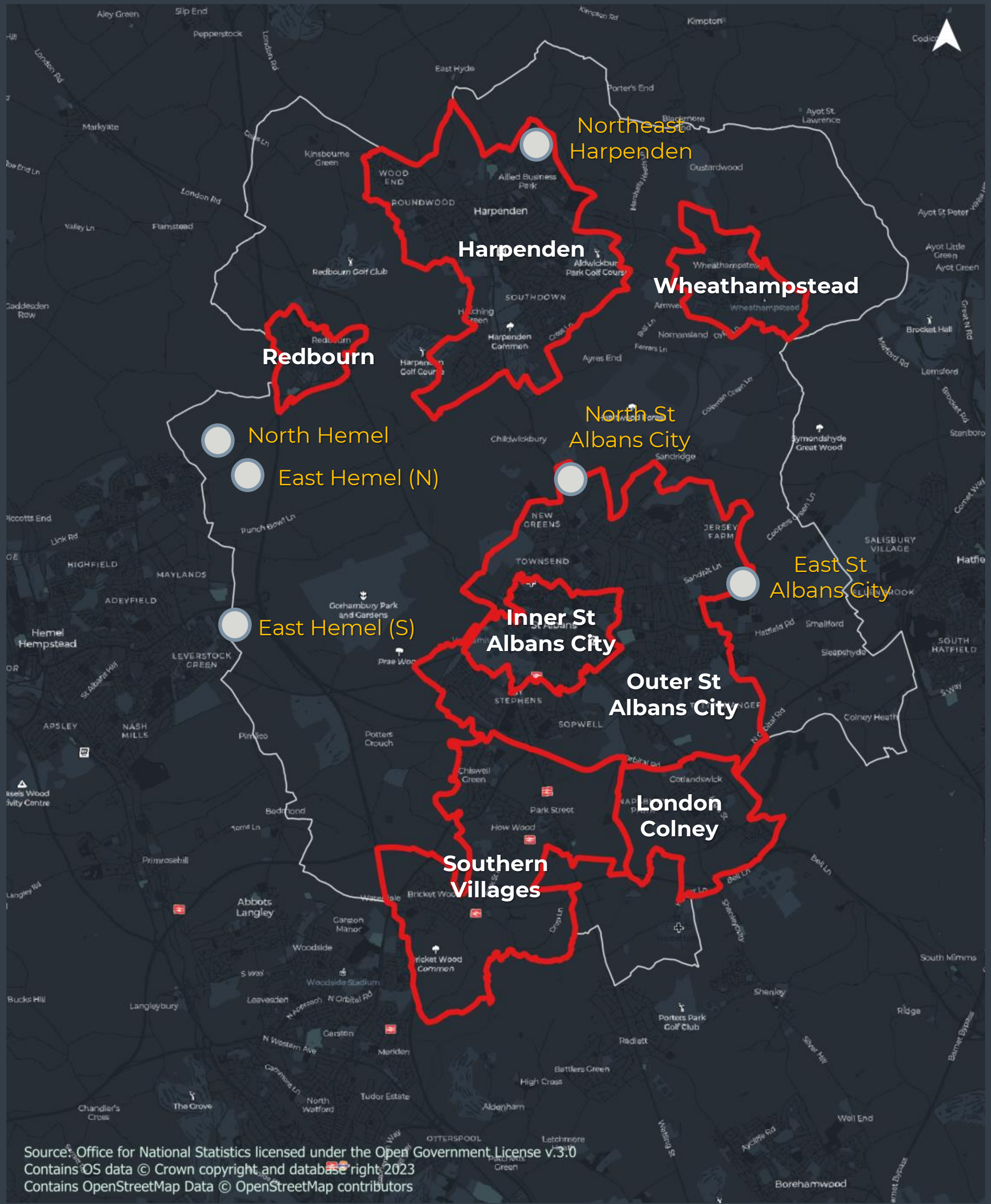
The report is structured as follows:

- Part 1 – Sustainable travel potential for existing communities
- Part 2 – Sustainable travel potential for new developments

Both parts follow the structure of:

- A-Sustainable travel opportunity summarising the number of car trips that could be made by walking, cycling and public transport
- B-Sustainable travel propensity calculating the propensity (or likelihood) of residents to walk, cycle or use public transport
- C-Sustainable travel potential estimates which car trips are likely to switch to walk, cycle or public transport based on the opportunity and propensity.

Figure 1 Study area



The study covers St Albans district and its existing communities, as well as the following new developments: East Hemel (north and south), North Hemel, Northeast Harpenden, North St Albans City, and East St Albans City.

Methodology

Opportunity

What is it?

The sustainable travel opportunity estimates the number of modelled car trips that can switch to sustainable modes (walking, cycling or public transport). It is considered the 'best-case scenario' and does not consider individual travel behaviours – this is covered in propensity.

What did we do?

Existing car journeys were extracted from the 2031 Countywide model (COMET) and alternative route options were provided using the Google API.

Routes for walking, cycling and public transport were compared to the existing driving journey using high and lower mode shift scenarios:

- The high mode shift scenario aims to align to targets set out in the DfT's Gear change (cycling and walking vision), i.e. two miles for walking, five miles for cycling and a maximum public transport journey time of 2.4x the driving alternative.
- The lower mode shift scenario is more conservative and aims for a 15–20 minute neighbourhood – one mile for walking, three miles for cycling and a maximum public transport journey time of 1.5x the driving alternative.

Part 1A and 2A of this report summarises the findings of the **sustainable travel opportunity** analysis for existing communities and new developments.

Propensity

What is it?

The sustainable travel propensity is the likelihood that a resident or household will take a given mode (walking, cycling, bus or rail). It is benchmarked against the England average which is set at 100.

What did we do?

WSP's Mobility Insights survey response bank was used to derive propensities for walking, cycling, public transport (bus and rail), and driving by grouping survey results to the Dominant Experian Mosaic Group.

Responses were categorised into different variables (such as owning a car) and socio-demographic groups (derived from Experian Mosaic), then compared to the England average response.

A weighted average of relevant variables for each mode was calculated to determine propensity and is presented at a model zone level and based on the mix of the Mosaic Groups in that zone.

Part 1B and 2B of this report summarises the findings of the **sustainable travel propensity** analysis for existing communities and new developments.

Potential

What is it?

The sustainable travel potential estimates which car trips are likely to shift to sustainable modes – considering the opportunity and propensity findings.

It is intended to provide a more 'realistic' scenario for estimating the total number of switchable trips.

What did we do?

Outputs from the **opportunity** analysis and the **propensity** analysis were combined to determine **sustainable travel potential**.

For active travel – the Gear Change target of 50% was used as the baseline mode shift for walking and cycling trips for the England average. If propensity was 100 (England average) then 50% of the opportunity trips would shift – with a higher proportion switching if propensity was greater than 100, and the inverse for propensity scores below 100.

Public transport trips were adjusted by comparing the propensity to take public transport to that of driving.

Part 1C and 2C of this report summarises the findings of the **sustainable travel potential** analysis for existing communities and new developments.

Key findings

Existing communities

Up to 33% of existing car trips in St Albans district have the potential to switch to sustainable modes based on existing active and public transport networks / services, and the current socio-demographics / travel behaviour of residents).

- Cycling provides the highest opportunity for mode shift (up to 37% across St Albans district) and is also likely to provide the highest potential for mode shift (once propensities are taken account of) - up to 17% of existing car trips across St Albans district have the potential to switch to cycling.
- Walking has a slightly lower opportunity for mode shift than cycling (up to 35% across St Albans district), but similar potential for mode shift - up to 17% of existing car trips across the district have the potential to switch to walking.
- Public transport has the lowest opportunity (up to 6%) and potential for mode shift - up to 3% of existing car trips in St Albans district have the potential to switch to public transport.

Based on existing socio-demographics and compared to the England average, existing St Albans district residents generally have below average propensities for walking, cycling and bus, but above average propensity for rail and drive. However, Inner St Albans City residents are the exception and have a higher propensity for using sustainable modes.

New developments

Up to 27% of modelled car trips across the assessed St Albans district development zones have the potential to switch to sustainable modes (based on existing active and public transport networks / services, and the likely socio-demographics / travel behaviour of new residents).

- Cycling provides the highest opportunity for mode shift (up to 40% across the development zones) and the highest potential for mode shift - up to 16% of existing car trips across the development zones have the potential to switch to cycling.
- Walking has a lower opportunity for mode shift than cycling (up to 27% across the development zones) and potential for mode shift - up to 11% of existing car trips across the development zones have the potential to switch to walking.
- Public transport has the lowest opportunity and potential for mode shift - less than 1% of existing car trips across the development zones have the potential to switch to public transport. However, this is a worst-case scenario as it is unlikely that the new developments wouldn't have additional public transport provision.

Based on the expected socio-demographics of the new development zones in St Albans district, the new residents will have below average propensities for walking, cycling, bus and rail, but above average propensity to drive, compared to the England average. However, propensities could change if sustainable transport provision is improved.

Next steps

The findings of this study provide an evidence base for identifying and prioritising sustainable travel interventions in St Albans district, both for existing and future communities. The study also highlights the areas and modes where there is a gap between the opportunity and the potential for mode shift, suggesting the need for further improvements in the active and public transport networks, as well as behaviour change initiatives to encourage the use of sustainable modes.

The next steps for HCC and its partners are to:

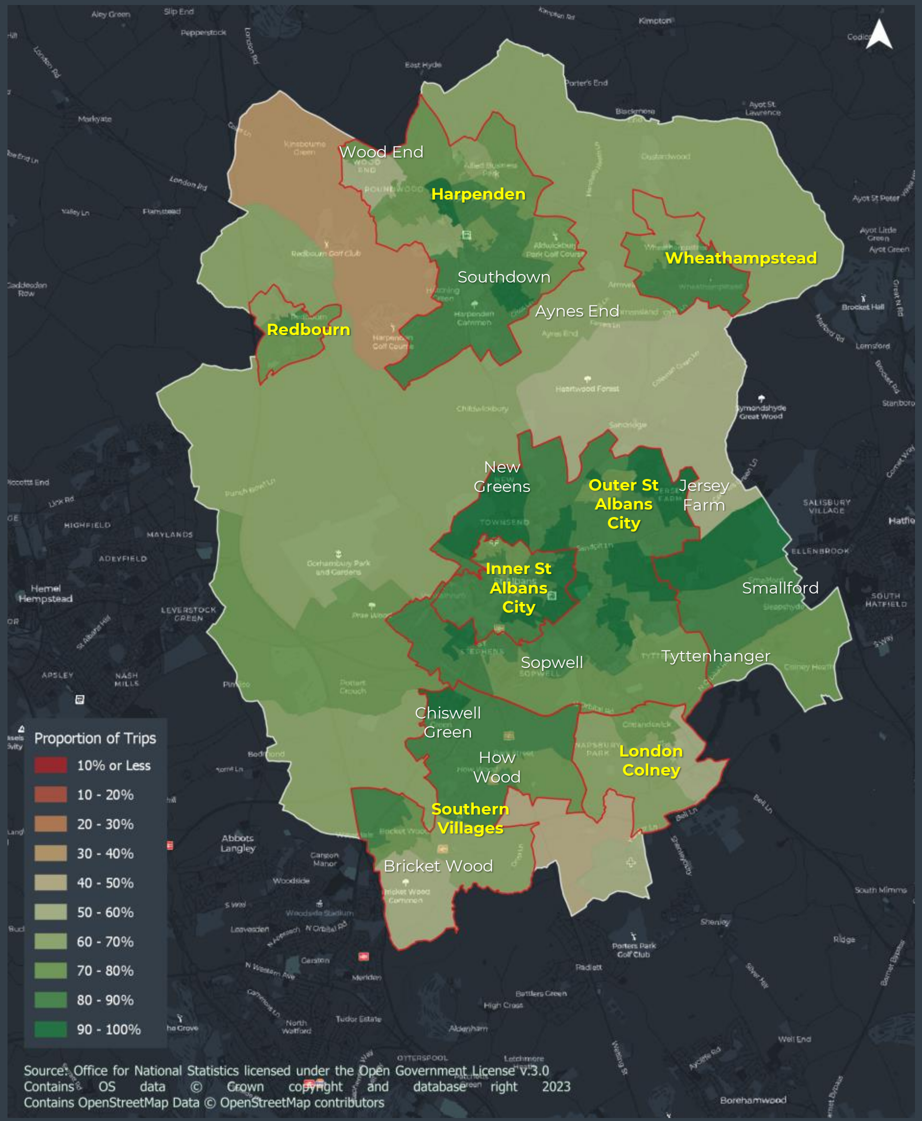
- Review the findings of this study and consider the implications for the local plan process and the LTP delivery.
- Identify and appraise the potential sustainable travel interventions that could increase the opportunity and propensity for mode shift in St Albans district, such as enhanced walking, cycling, bus and rail networks, demand management measures, travel planning and marketing campaigns.
- Engage with the relevant stakeholders, including the local authorities, developers, transport operators and community groups, to secure the support and funding for the delivery of sustainable travel interventions.
- Monitor and evaluate the impact of the sustainable travel interventions on the travel behaviour and outcomes of the existing and future residents in St Albans district.

EXECUTIVE SUMMARY

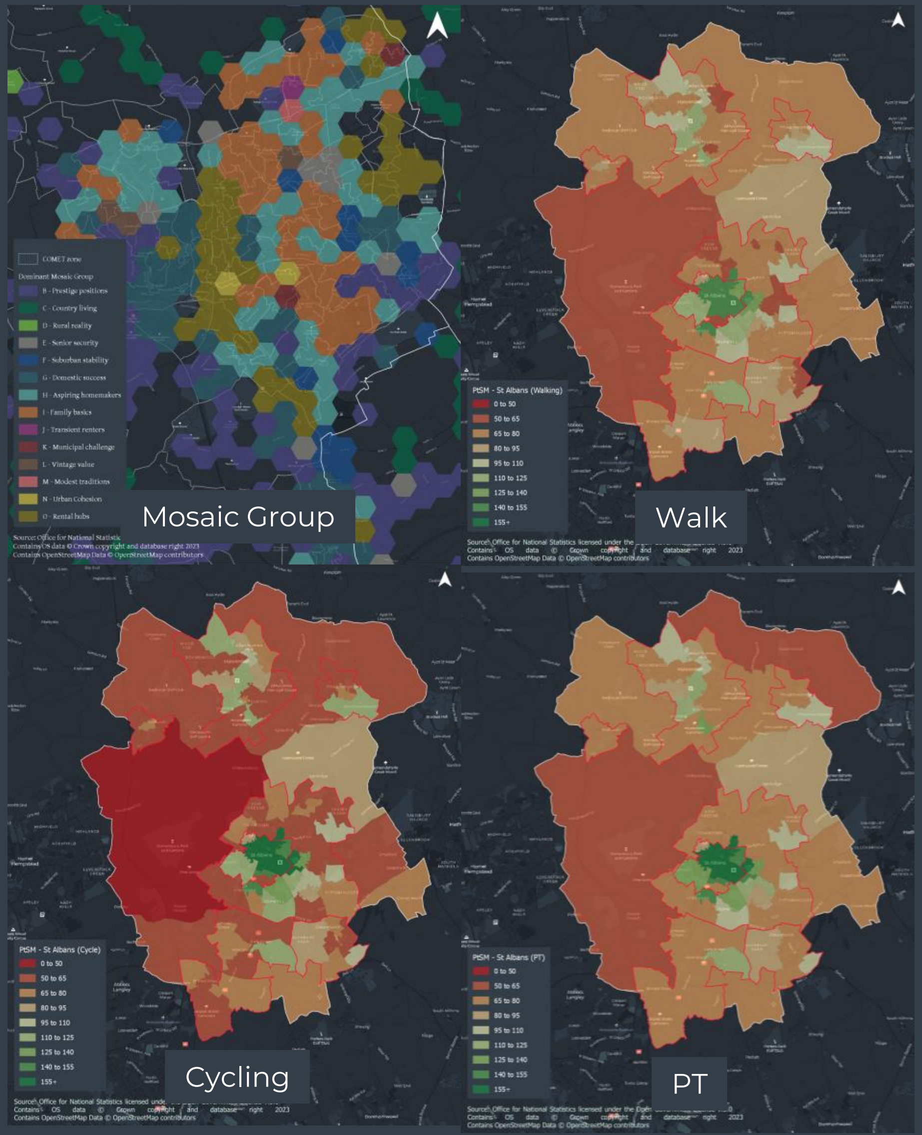
Sustainable travel potential for existing communities

SUSTAINABLE TRAVEL POTENTIAL FOR EXISTING COMMUNITIES

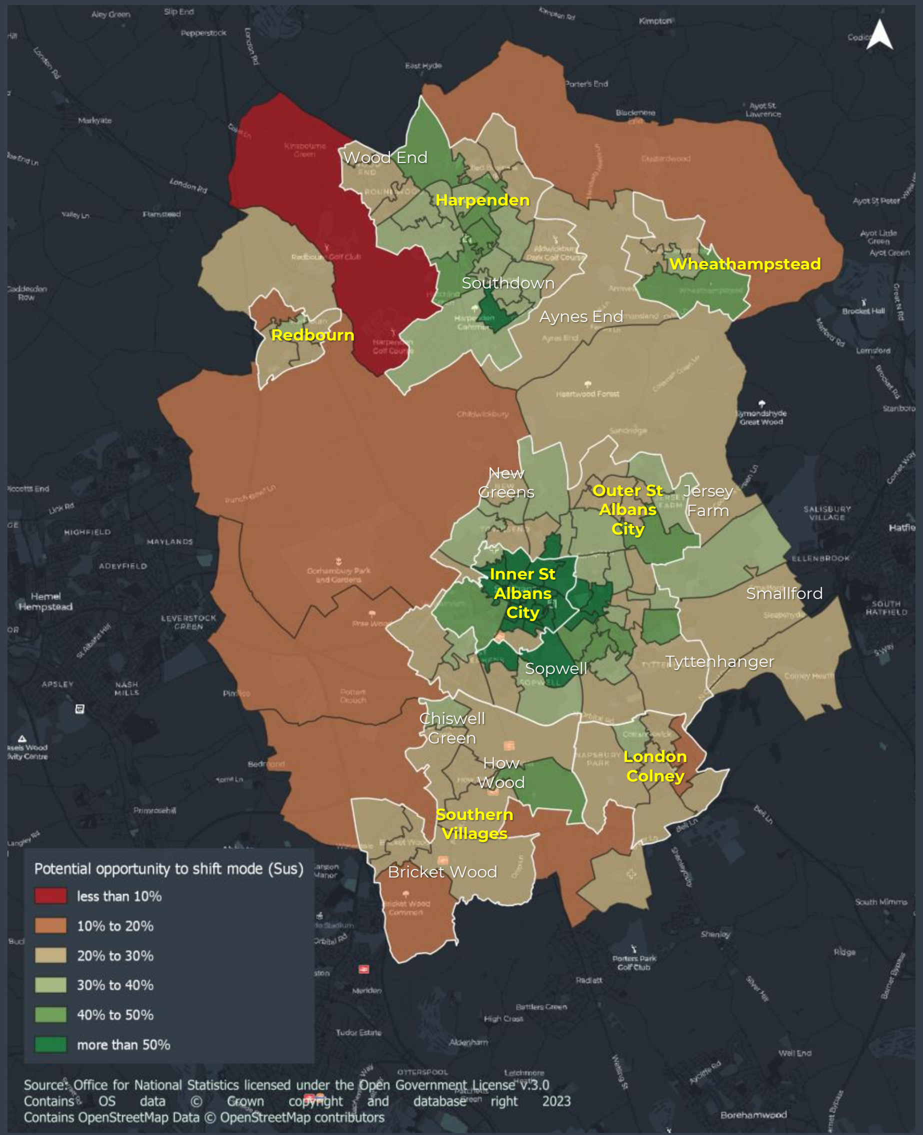
Sustainable travel opportunity



Sustainable travel propensity



Sustainable travel potential



We calculated that:

- Up to 68% of existing car trips across the St Albans district have the opportunity to switch to sustainable modes.
- Outer St Albans City has the highest opportunity - up to 79% of existing car trips have the opportunity to switch, followed by Inner St Albans City (up to 68%), Harpenden (up to 67%), Wheathampstead (up to 66%), Southern Villages (up to 63%), Redbourn (up to 62%) and London Colney (up to 54%).

What did we find:

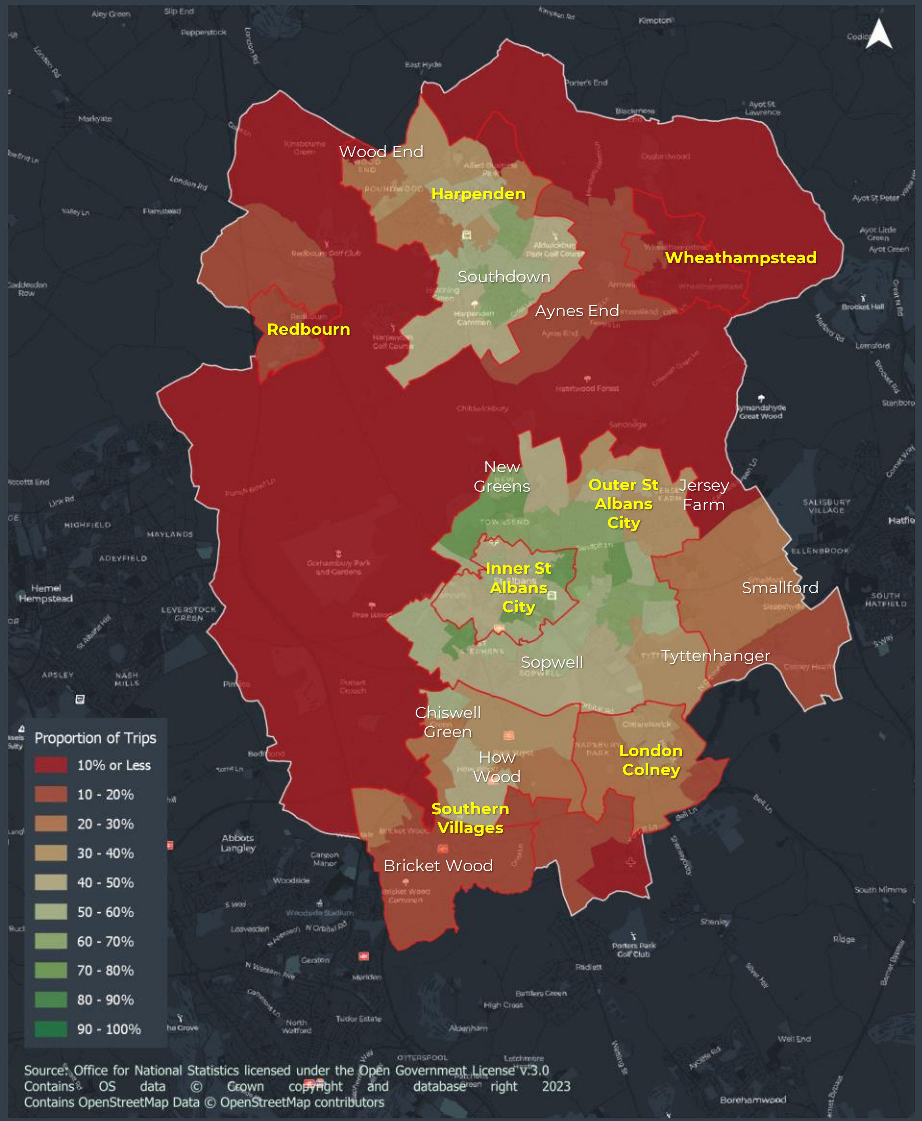
Based on existing socio-demographics, existing St Albans district residents have below average propensities for walking, cycling and bus but above average propensity to use rail and drive. However, Inner St Albans City residents have a high propensity for using sustainable modes. As new development areas are developed, the propensity to use sustainable modes could increase with new residents.

We calculated that:

- Up to 32% of existing car trips across the St Albans district have the potential to switch to sustainable modes.
- Inner St Albans City has the highest potential - up to 47% of existing car trips have the potential to switch, followed by Outer St Albans City (up to 33%), Harpenden (up to 30%), Wheathampstead (up to 27%), Southern Villages (up to 24%), London Colney (up to 22%) and Redbourn (up to 21%).

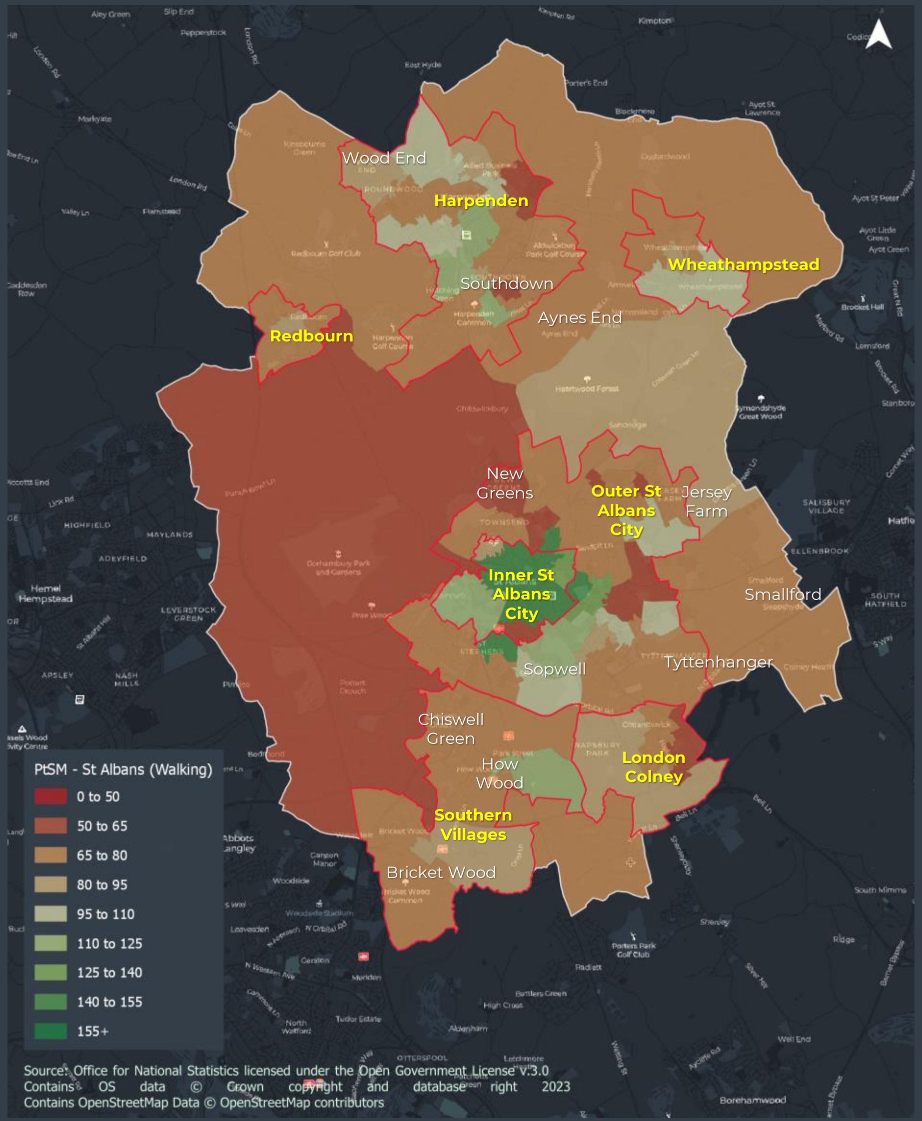
WALKING POTENTIAL FOR EXISTING COMMUNITIES

Opportunity to walk



X

Propensity to walk



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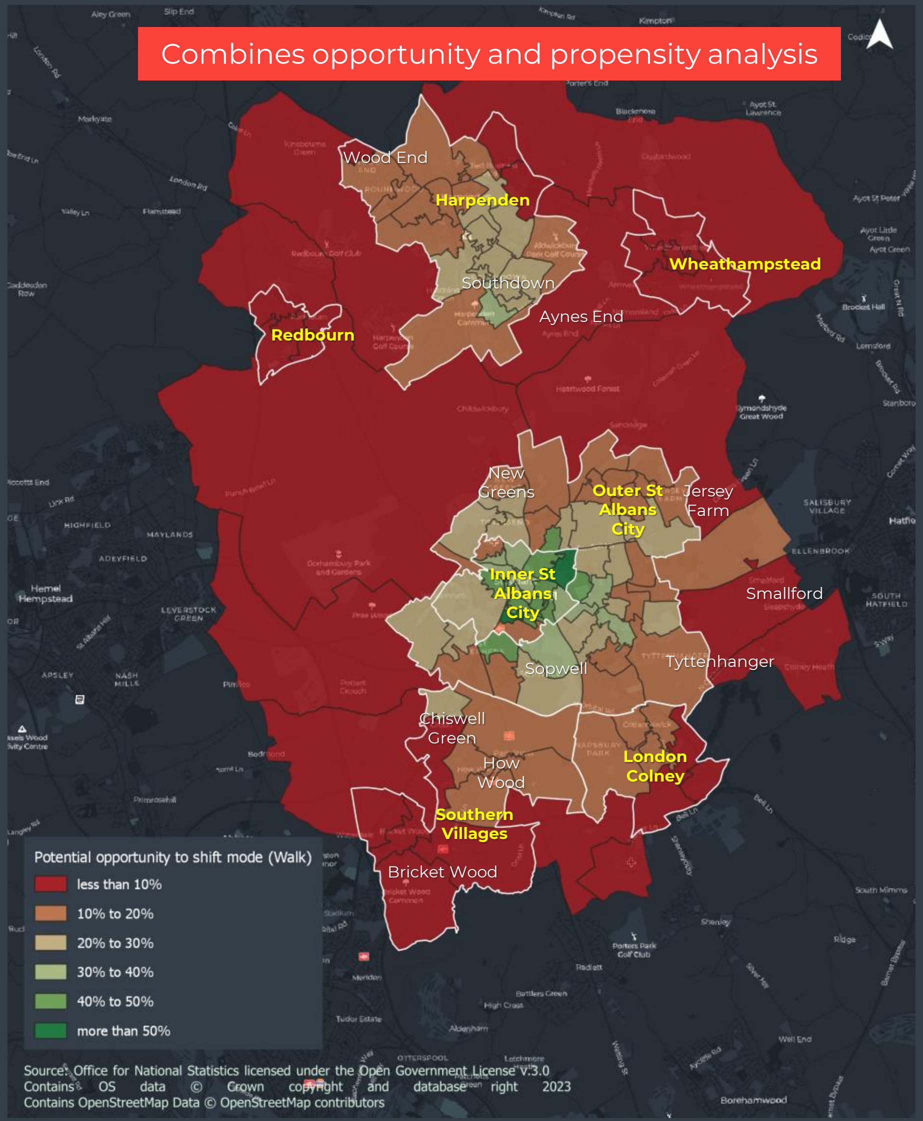
Walking potential



We calculated that:

- Up to 35% of existing car trips across the St Albans district have the opportunity to switch to walking.
- Outer St Albans City has the highest opportunity - up to 49% of existing car trips have the opportunity to switch to walking, followed by Inner St Albans City (up to 42%), Harpenden (up to 34%), London Colney (up to 21%), Southern Villages (up to 21%), Redbourn (up to 10%) and Wheathampstead (up to 7%).

What did we find:

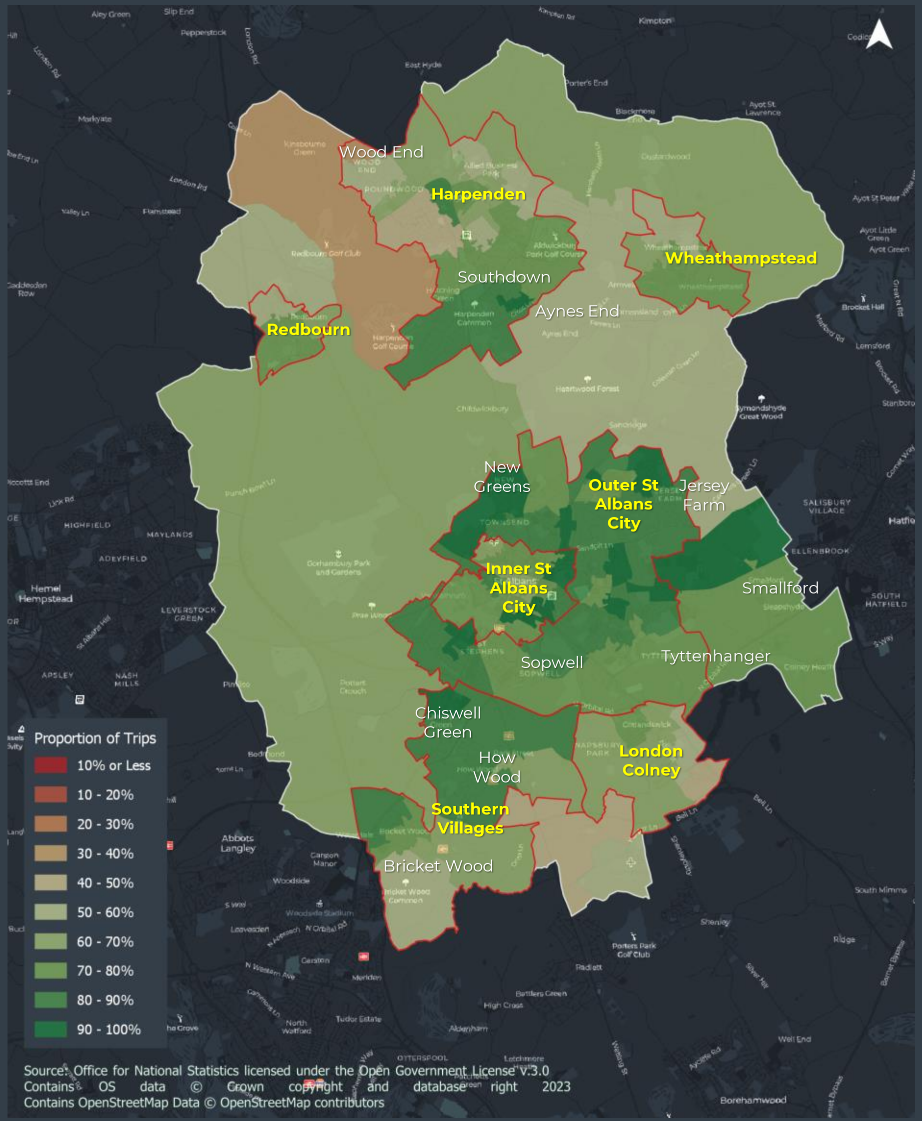
Propensity to walk varies across St Albans district, including the characteristics of the residents and the local infrastructure. The Inner St Albans City has a higher-than-average propensity to walk. These areas may have a higher proportion of residents who prioritise active lifestyles and are more inclined to engage in walking activities for leisure or commuting purposes.

We calculated that:

- Up to 17% of existing car trips across the St Albans district have the potential to switch to walking.
- Inner St Albans City has the highest potential - up to 29% of existing car trips have the potential to switch to walking, followed by Outer St Albans City (up to 21%), Harpenden (up to 15%), Southern Villages and London Colney (both up to 8%), Redbourn (up to 4%) and Wheathampstead (up to 3%).

CYCLING POTENTIAL FOR EXISTING COMMUNITIES

Opportunity to cycle



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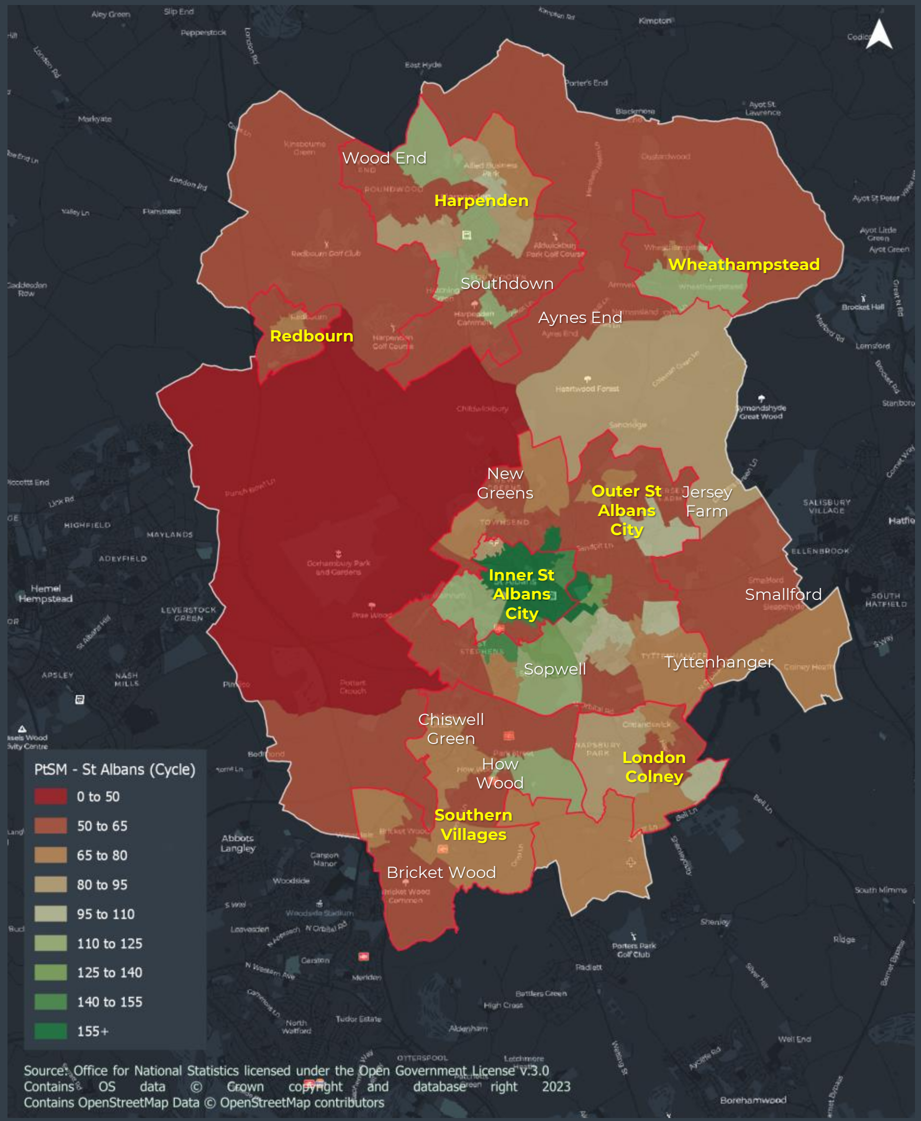
Propensity to cycle



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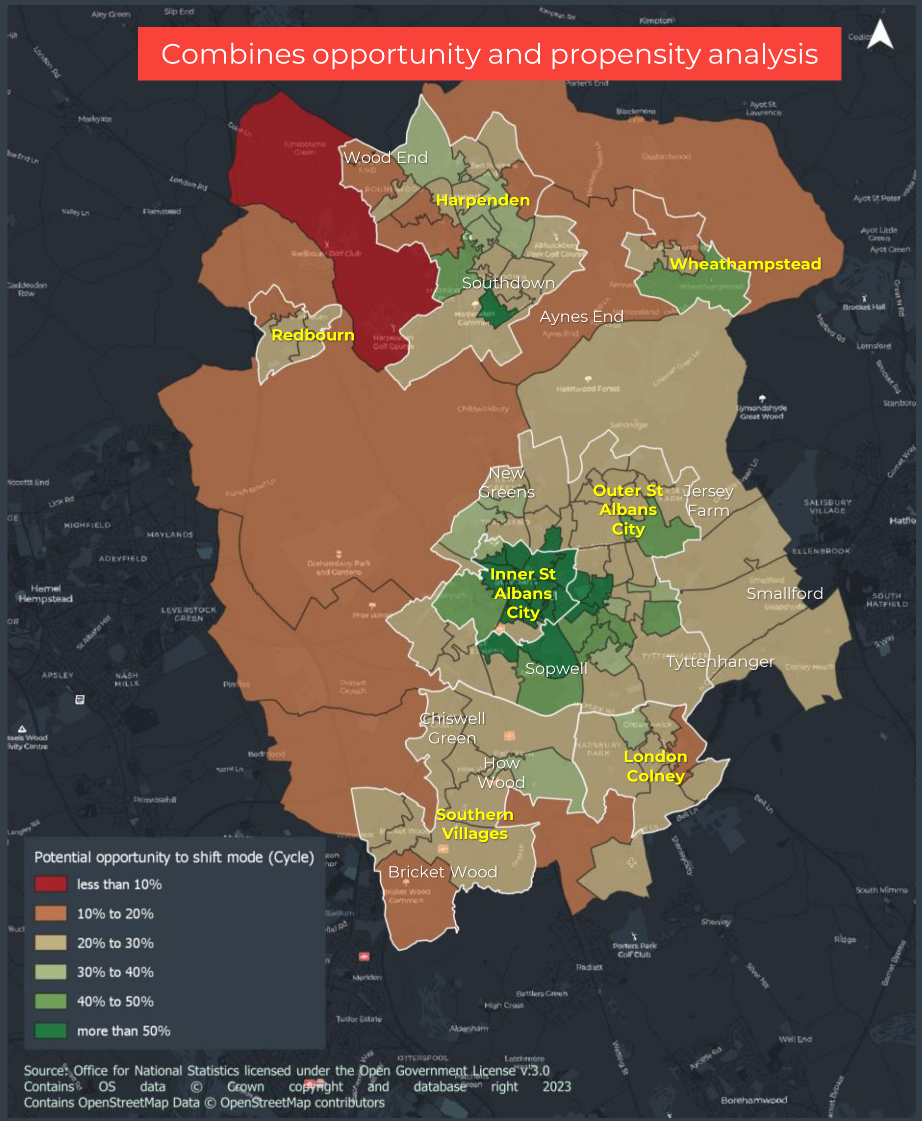
Cycling potential



We calculated that:

- Up to 37% of existing car trips across the St Albans district have the opportunity to switch to cycling.
- Outer St Albans City has the highest opportunity - up to 52% of existing car trips have the opportunity to switch to cycling, followed by Wheathampstead (up to 50%), Redbourn (up to 45%), Southern Villages (up to 40%), Inner St Albans City and Harpenden (both up to 33%), and London Colney (up to 29%).

What did we find:

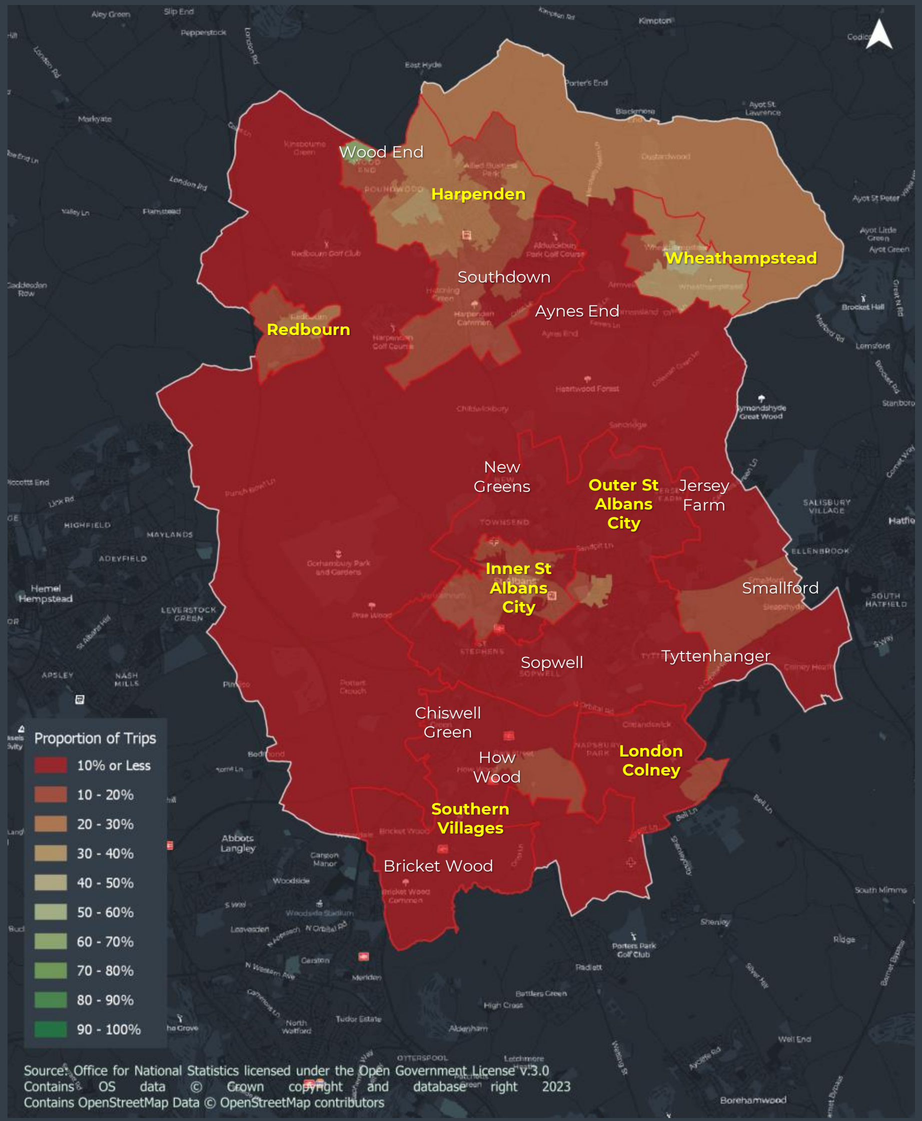
Propensity to cycle varies across St Albans district, including the characteristics of the residents and the local infrastructure. The Inner St Albans City has a higher-than-average propensity to cycle. These areas may have a higher proportion of residents who prioritise active lifestyles, prefer cycling, or find it a convenient means of getting around.

We calculated that:

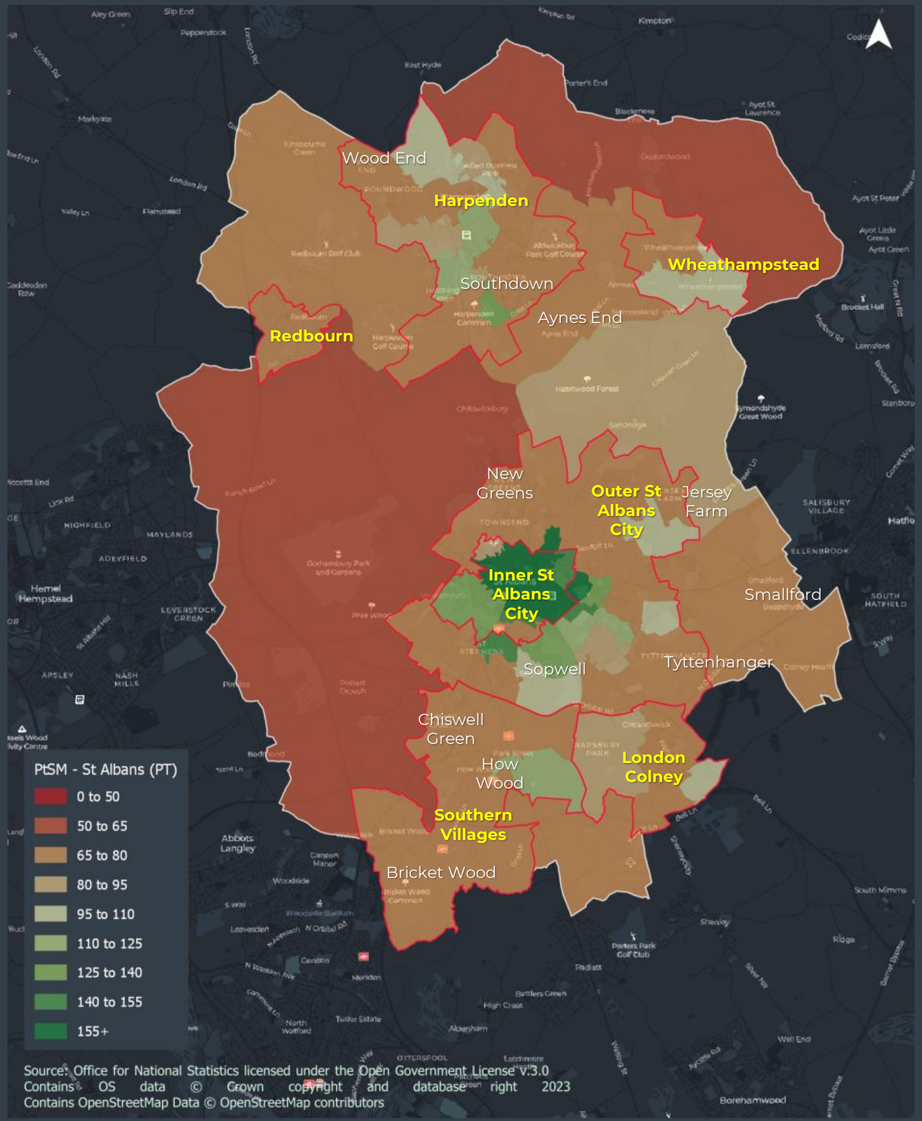
- Up to 17% of existing car trips across the St Albans district have the potential to switch to cycling.
- Inner St Albans City has the highest potential - up to 24% of existing car trips have the potential to switch to cycling, followed by Outer St Albans City (up to 21%), Wheathampstead (up to 20%), Redbourn and Southern Villages (both up to 14%), Harpenden (up to 13%) and London Colney (up to 12%).

PUBLIC TRANSPORT POTENTIAL FOR EXISTING COMMUNITIES

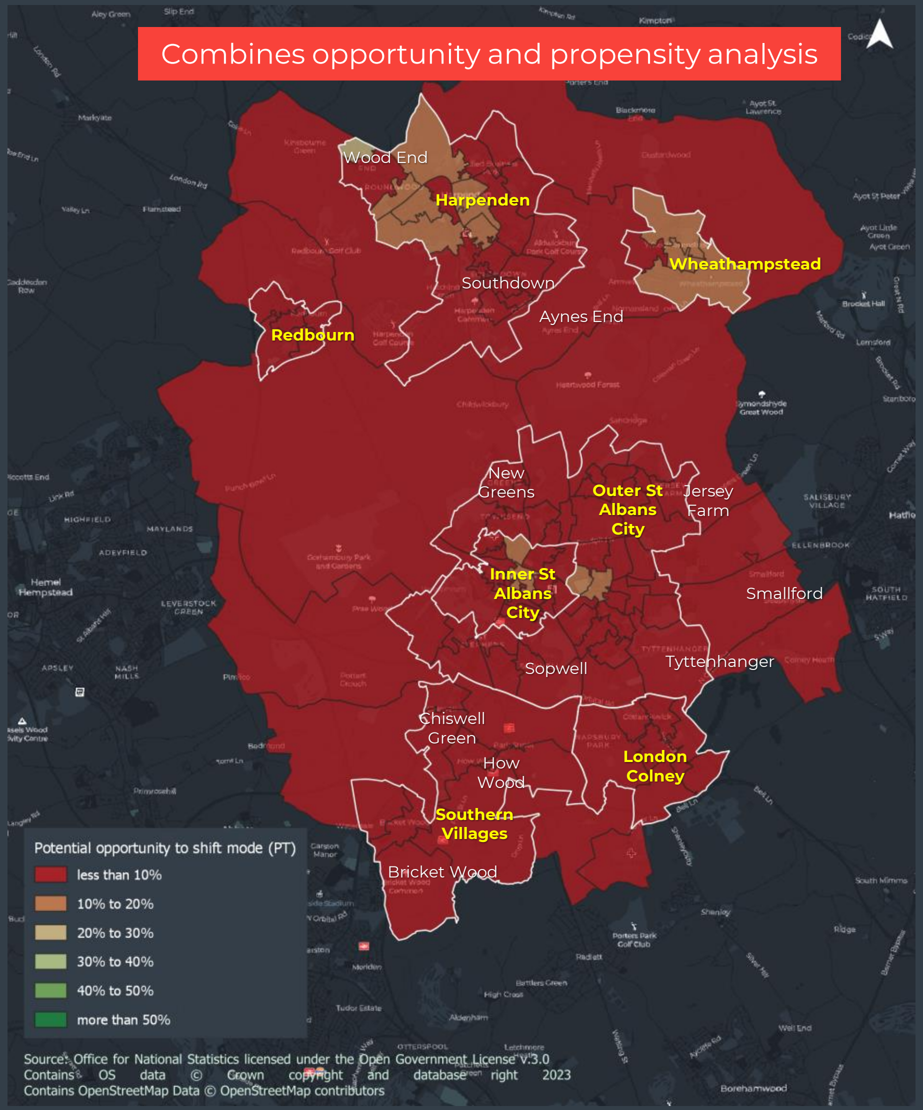
Opportunity to use public transport



Propensity to use public transport



Public transport potential



We calculated that:

- Up to 6% of existing car trips across the St Albans district have the opportunity to switch to public transport.
- Harpenden has the highest opportunity - up to 13% of existing car trips have the opportunity to switch to public transport, followed by Wheathampstead (up to 8%), Inner St Albans City and Redbourn (both up to 7%), London Colney (up to 3%), Outer St Albans City (up to 2%) and Southern Villages (up to 1%).

What did we find:

Propensity to use public transport (which is an average of bus and rail) varies across St Albans district, including the characteristics of the residents and the local transport infrastructure. The Inner St Albans City have a higher-than-average propensity to use public transport. These areas may have a higher proportion of residents who prioritise sustainable transport methods due to personal preferences and/or environmental consciousness.

We calculated that:

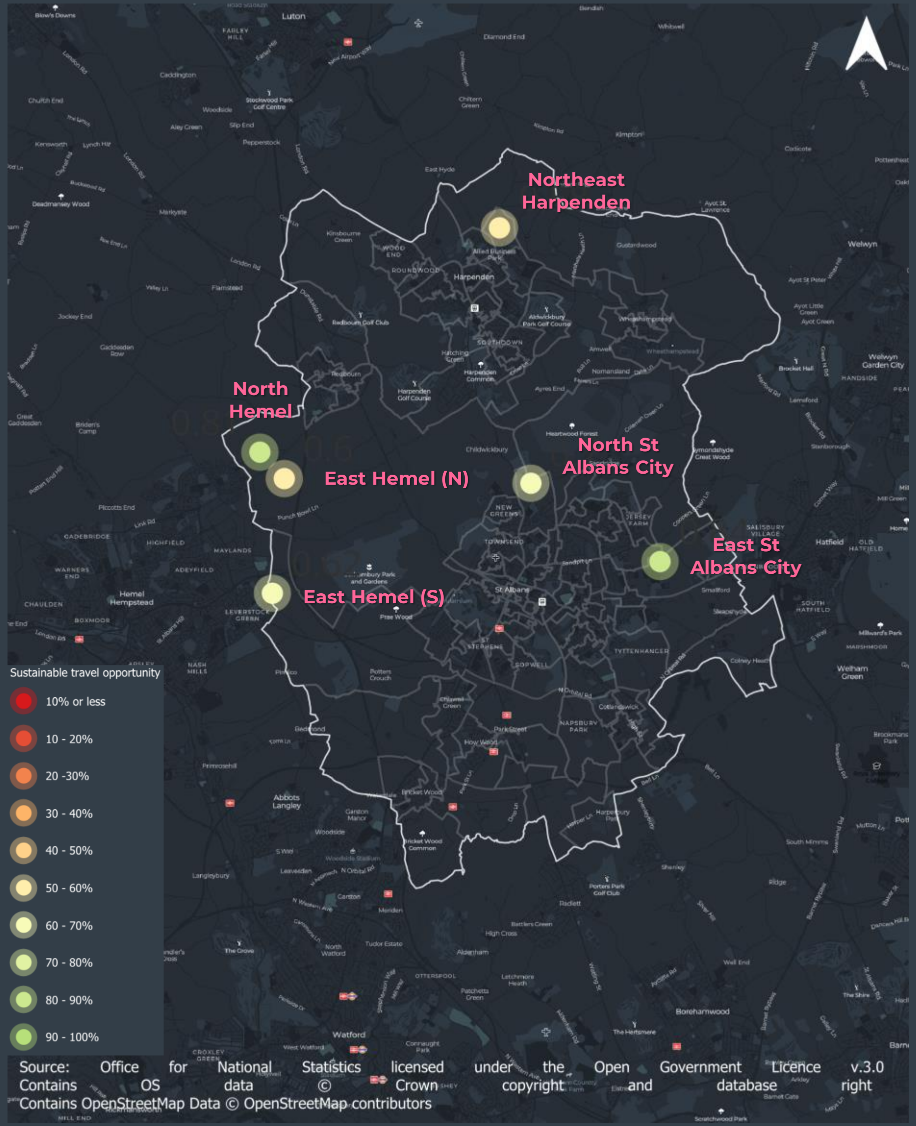
- Up to 3% of existing car trips across the St Albans district have the potential to switch to public transport.
- Harpenden has the highest opportunity - up to 13% of existing car trips have the opportunity to switch to public transport, followed by Inner St Albans City (up to 5%), Wheathampstead (up to 4%), Redbourn (up to 3%) and Outer St Albans City, Southern Villages and London Colney (all up to 1%).

EXECUTIVE SUMMARY

Sustainable travel potential for new developments

SUSTAINABLE TRAVEL POTENTIAL FOR NEW DEVELOPMENTS

Sustainable travel opportunity



We calculated that:

- Up to 65% of modelled car trips across the assessed development zones in St Albans district have the opportunity to switch to sustainable modes.
- East St Albans City has the highest opportunity - up to 84% of modelled car trips have the opportunity to switch, followed by North Hemel (up to 81%), North St Albans City (up to 70%), East Hemel (S) (up to 62%), East Hemel (N) (up to 60%) and Northeast Harpenden (up to 58%).

X

Sustainable travel propensity

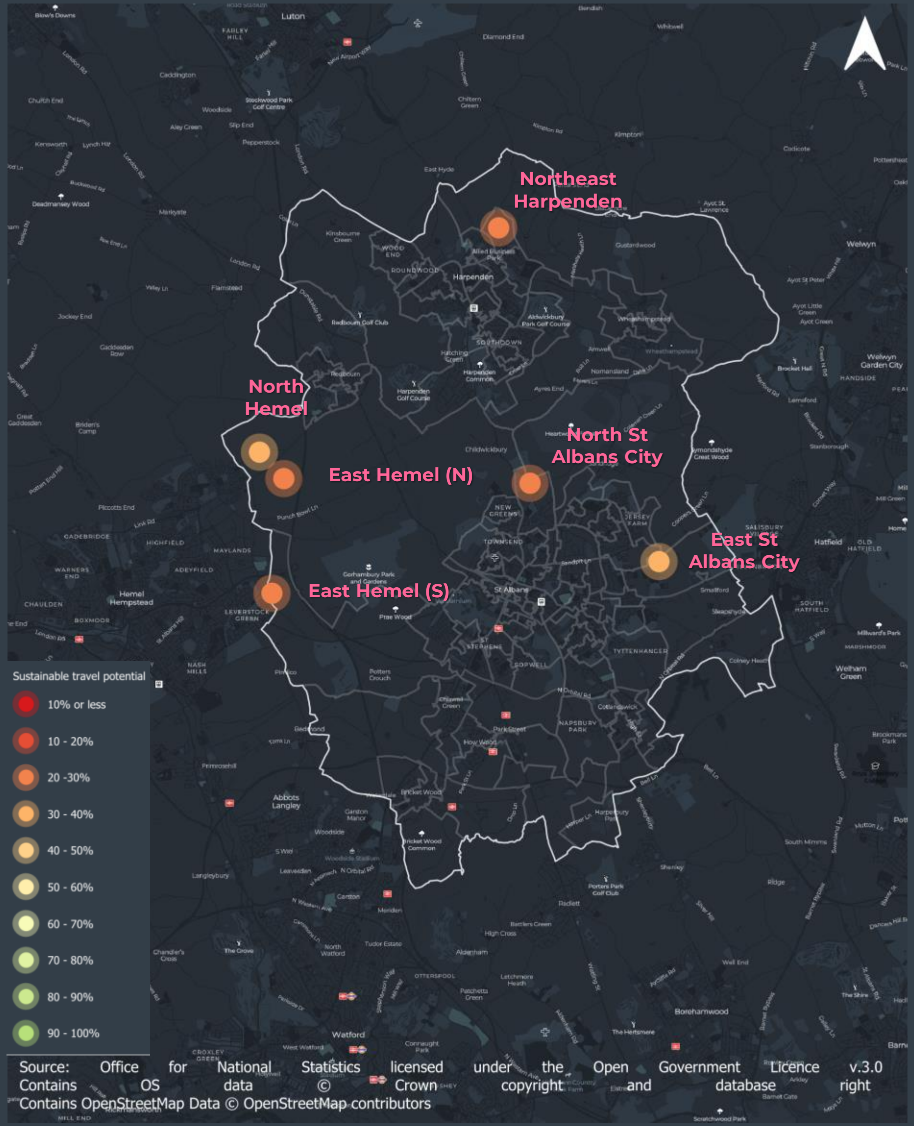
	Mosaic Group	New developments
B	Prestige Positions	10%
G	Domestic Success	60%
H	Aspiring Homemakers	15%
O	Rental Hubs	15%

What did we find:

Based on expected socio-demographics of the St Albans district development zones, new residents will have below average propensities for walking, cycling, bus and rail but above average propensity to drive. The Mosaic profile is based on the existing development of Oaklands in St Albans district, proposed housing types (e.g. affordable, social and rental) and validated using similar developments in the wider region. These propensities could change if sustainable travel provision is improved.

=

Sustainable travel potential

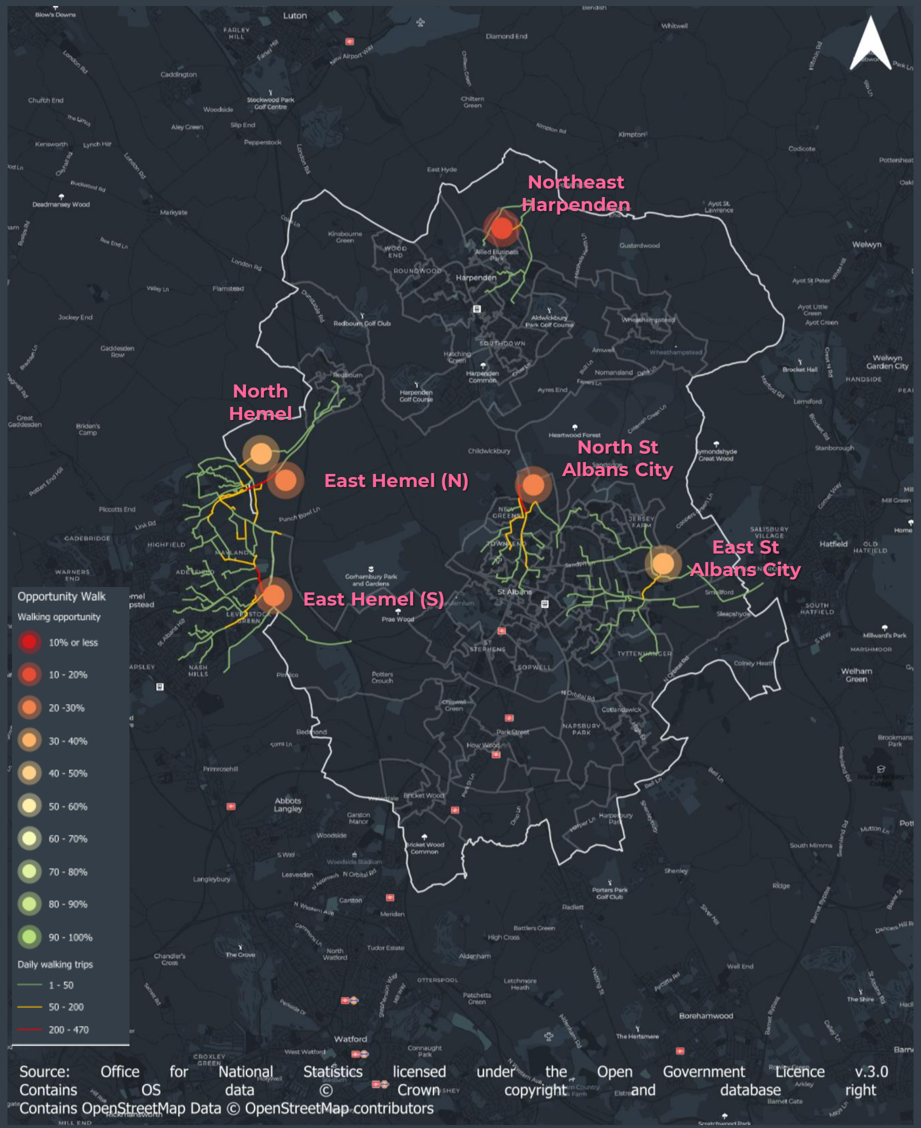


We calculated that:

- Up to 27% of modelled car trips across the assessed development zones in St Albans district have the potential to switch to sustainable modes.
- East St Albans City has the highest potential - up to 34% of modelled car trips have the potential to switch, followed by North Hemel (up to 32%), North St Albans City and East Hemel (N) (both up to 28%), East Hemel (S) (up to 25%) and Northeast Harpenden (up to 23%).

Walking potential for new developments

Opportunity to walk



We calculated that:

- Up to 27% of modelled car trips across the assessed development zones in St Albans district have the opportunity to switch to walking.
- North Hemel has the highest opportunity - up to 35% of modelled car trips have the opportunity to switch, followed by East St Albans City (up to 32%), East Hemel (S) (up to 30%), North St Albans City (up to 27%), East Hemel (N) (up to 25%) and Northeast Harpenden (up to 18%).

Propensity to walk

X

	Mosaic Group	New developments
B	Prestige Positions	10%
G	Domestic Success	60%
H	Aspiring Homemakers	15%
O	Rental Hubs	15%

	Propensity
Walk	80

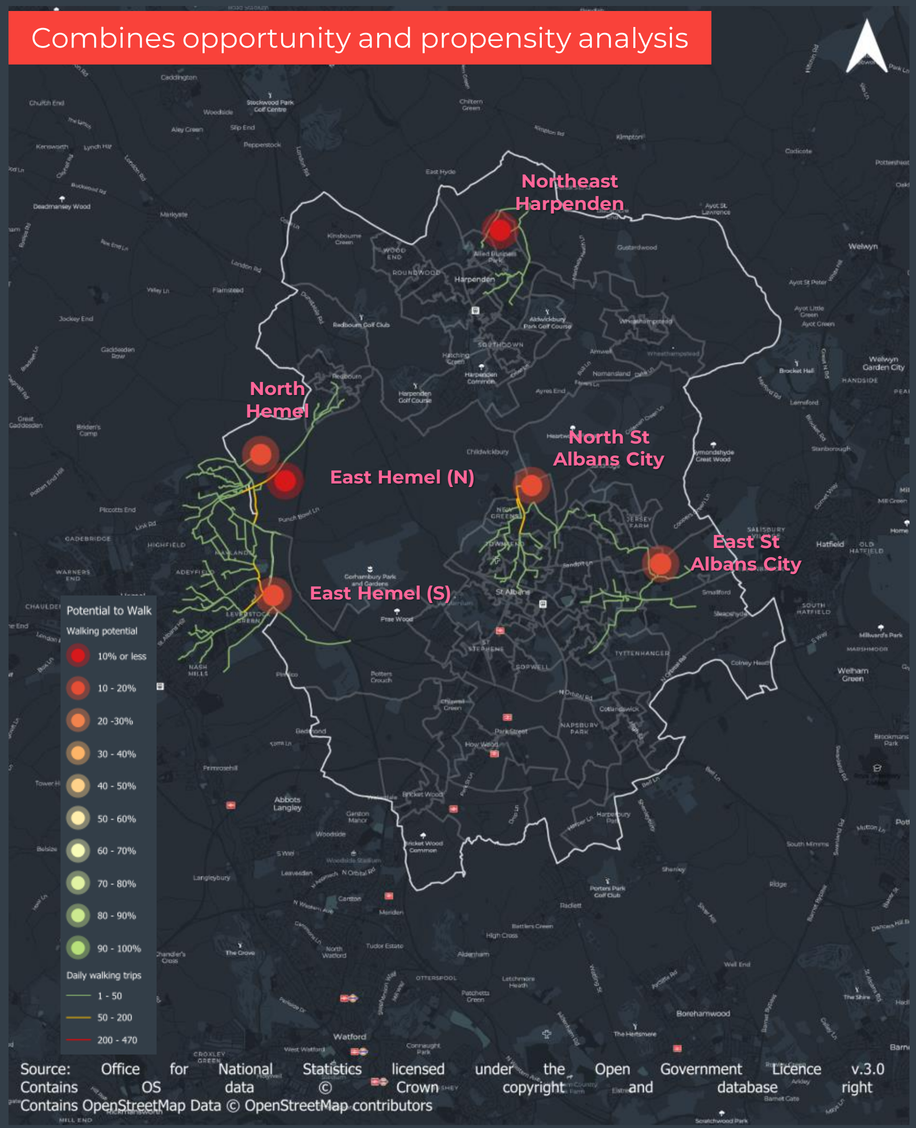
=

What did we find:

Propensity to walk in the new developments is lower than the England average due to the projected high proportion of the Domestic success mosaic group, who are more likely to be car dependant as they have larger dwellings and higher levels of car ownership. It is worth noting that these propensities could change if walking provision is improved.

Walking potential

Combines opportunity and propensity analysis

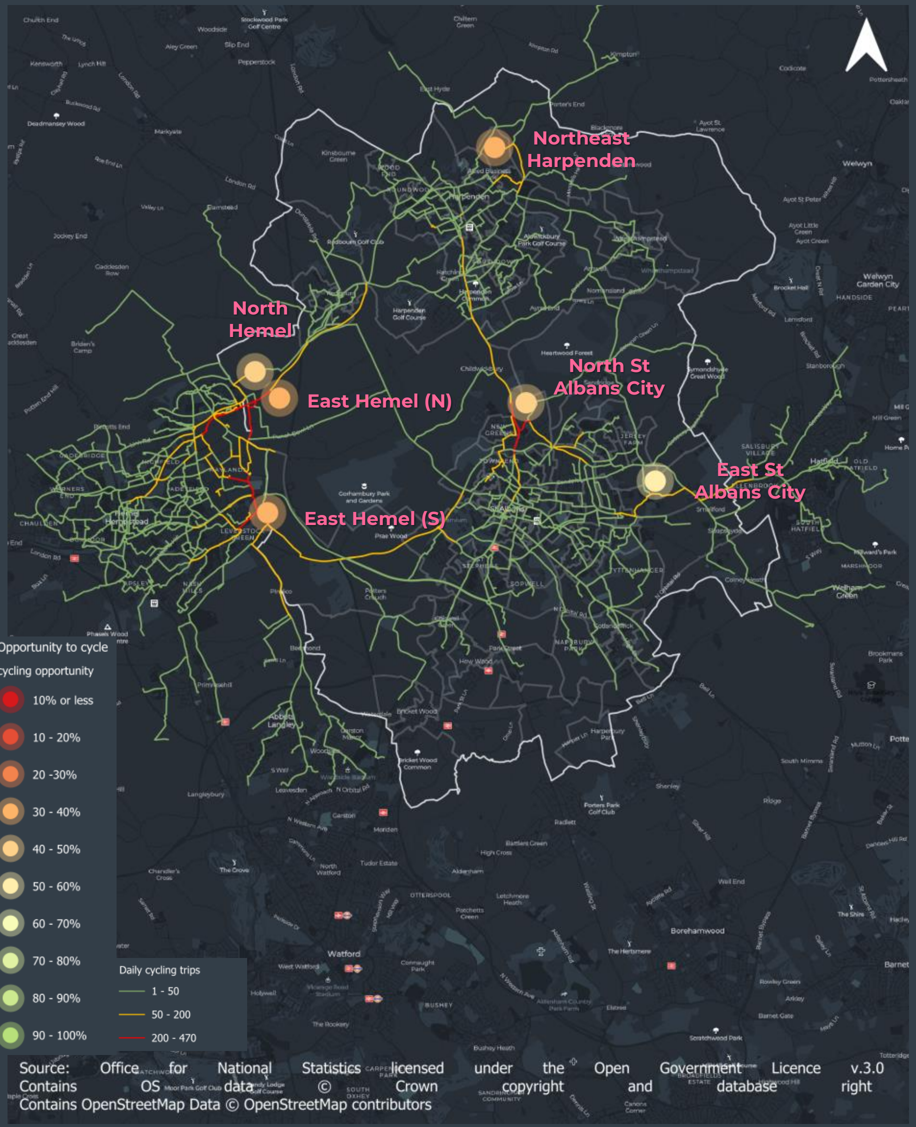


We calculated that:

- Up to 11% of modelled car trips across the assessed development zones in St Albans district have the potential to switch to walking
- North Hemel has the highest potential - up to 14% of modelled car trips have the opportunity to switch, followed by East St Albans City (up to 13%), East Hemel (S) (up to 12%), North St Albans City (up to 11%), East Hemel (N) (up to 10%) and Northeast Harpenden (up to 7%).

CYCLING POTENTIAL FOR NEW DEVELOPMENTS

Opportunity to cycle



We calculated that:

- Up to 40% of modelled car trips across the assessed development zones in St Albans district have the opportunity to switch to cycling.
- East St Albans City has the highest opportunity - up to 63% of modelled car trips have the opportunity to switch, followed by North Hemel (up to 60%), Northeast Harpenden (up to 45%), North St Albans City (up to 42%), East Hemel (N) (up to 41%) and East Hemel (S) (up to 32%).

Propensity to cycle

X

	Mosaic Group	New developments
B	Prestige Positions	10%
G	Domestic Success	60%
H	Aspiring Homemakers	15%
O	Rental Hubs	15%

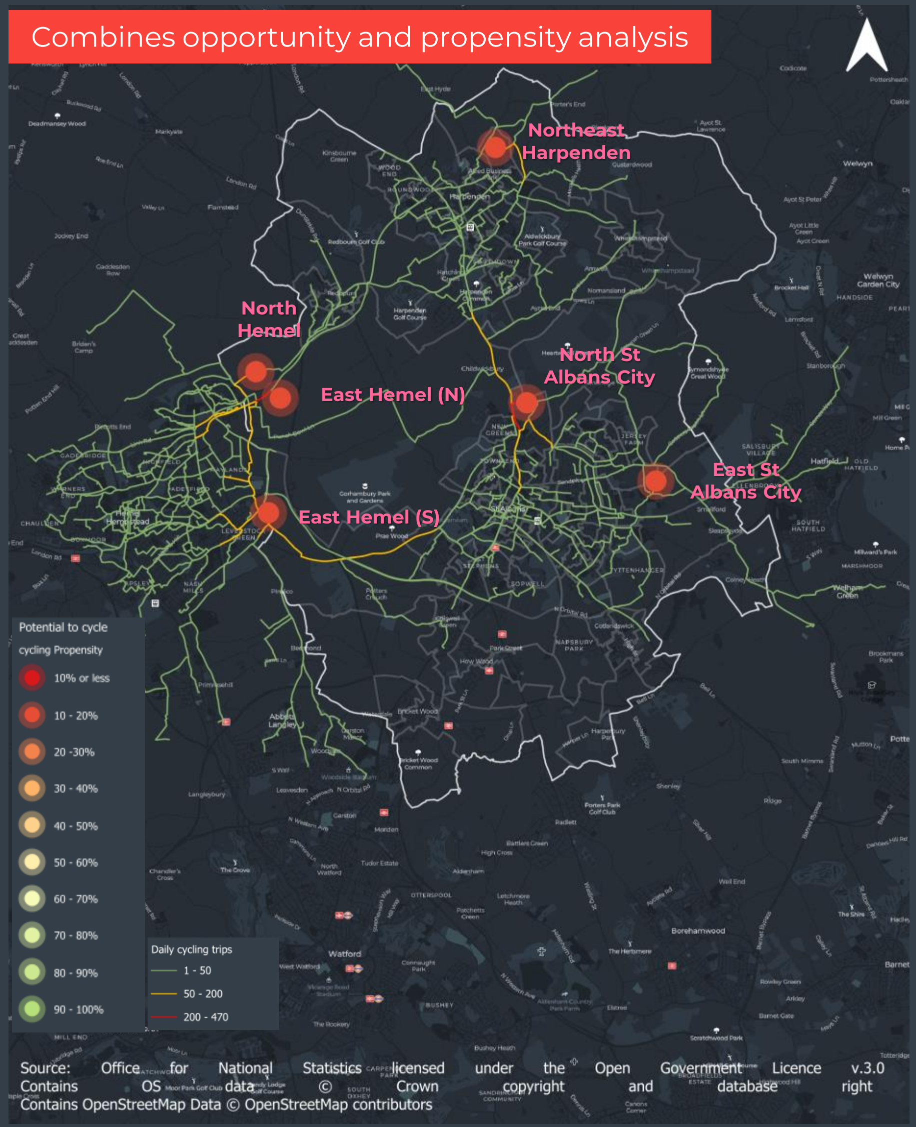
	Propensity
Cycle	80

=

What did we find:

Propensity to cycle in the new developments is lower than the England average due to the projected high percentage of the Domestic success mosaic group, who are more likely to be car dependant as they have larger dwellings and higher levels of car ownership. It is worth noting that these propensities could change if cycling provision is improved.

Cycling potential

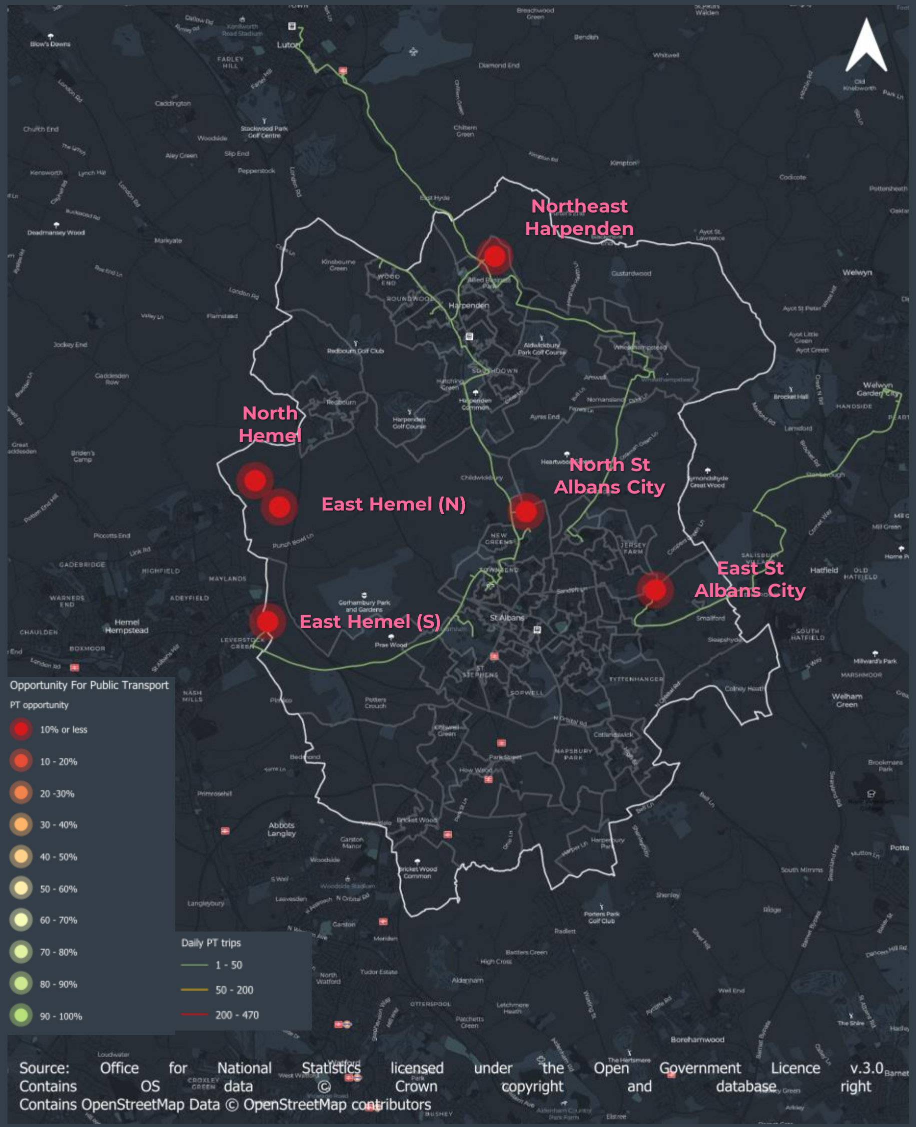


We calculated that:

- Up to 16% of modelled car trips across the assessed development zones in St Albans district have the potential to switch to cycling.
- East St Albans City has the highest opportunity - up to 25% of modelled car trips have the opportunity to switch, followed by North Hemel (up to 24%), Northeast Harpenden (up to 18%), North St Albans City (up to 17%), East Hemel (N) (up to 15%) and East Hemel (S) (up to 13%).

PUBLIC TRANSPORT POTENTIAL FOR NEW DEVELOPMENTS

Opportunity to use public transport



We calculated that:

- Less than 1% of modelled car trips across the assessed development zones in St Albans district have the opportunity to switch to public transport.
- Most of the new development zones have less than 1% opportunity, only East St Albans City (up to 2%) and Northeast Harpenden (up to 6%) has more.
- This is based on existing public transport provision.

Propensity to use public transport

X

	Mosaic Group	New developments
B	Prestige Positions	10%
G	Domestic Success	60%
H	Aspiring Homemakers	15%
O	Rental Hubs	15%

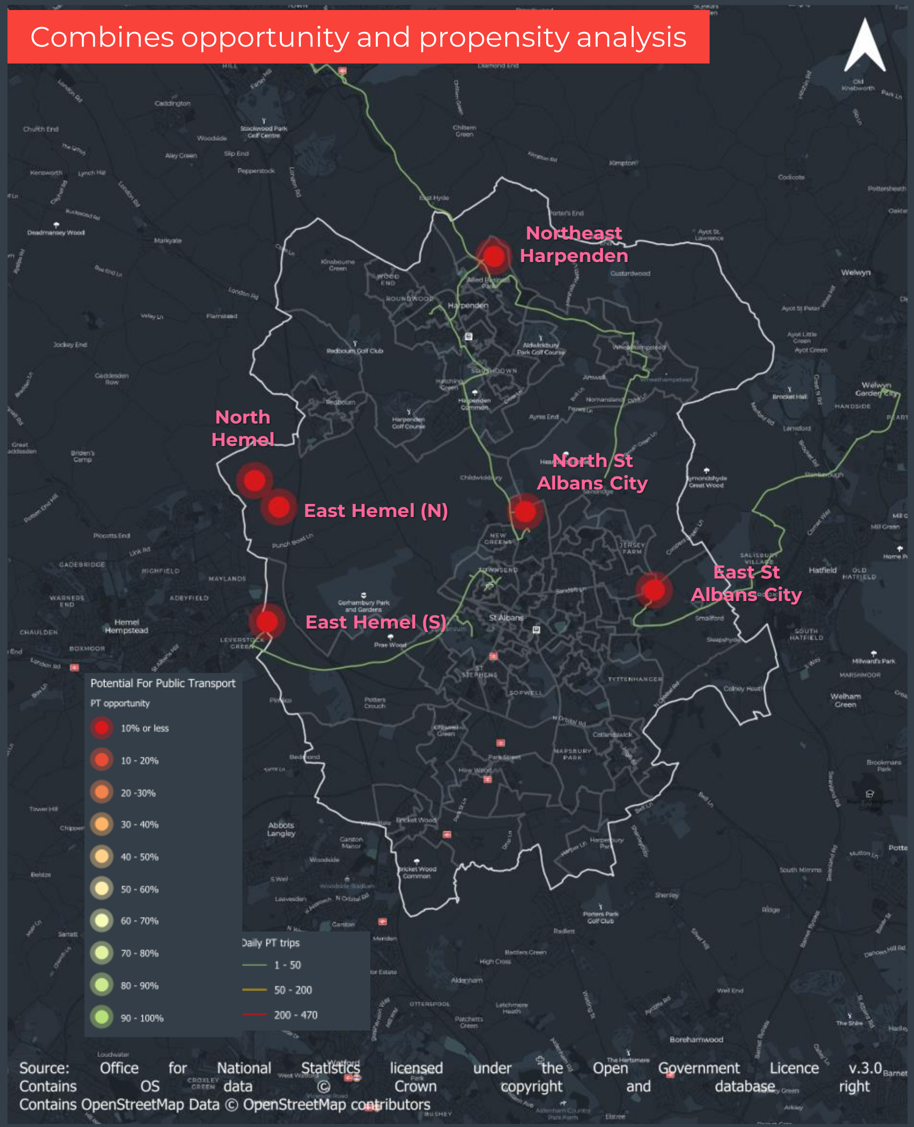
	Propensity
Bus	72
Rail	87

=

What did we find:

Propensity to use public transport (which is an average of bus and rail) in the new developments is lower than the England average due to the projected high percentage of the Domestic success mosaic and preference to use personal vehicles over public transport due to their higher levels of car ownership. It is worth noting that these propensities could change if public transport provision is improved.

Public transport potential



We calculated that:

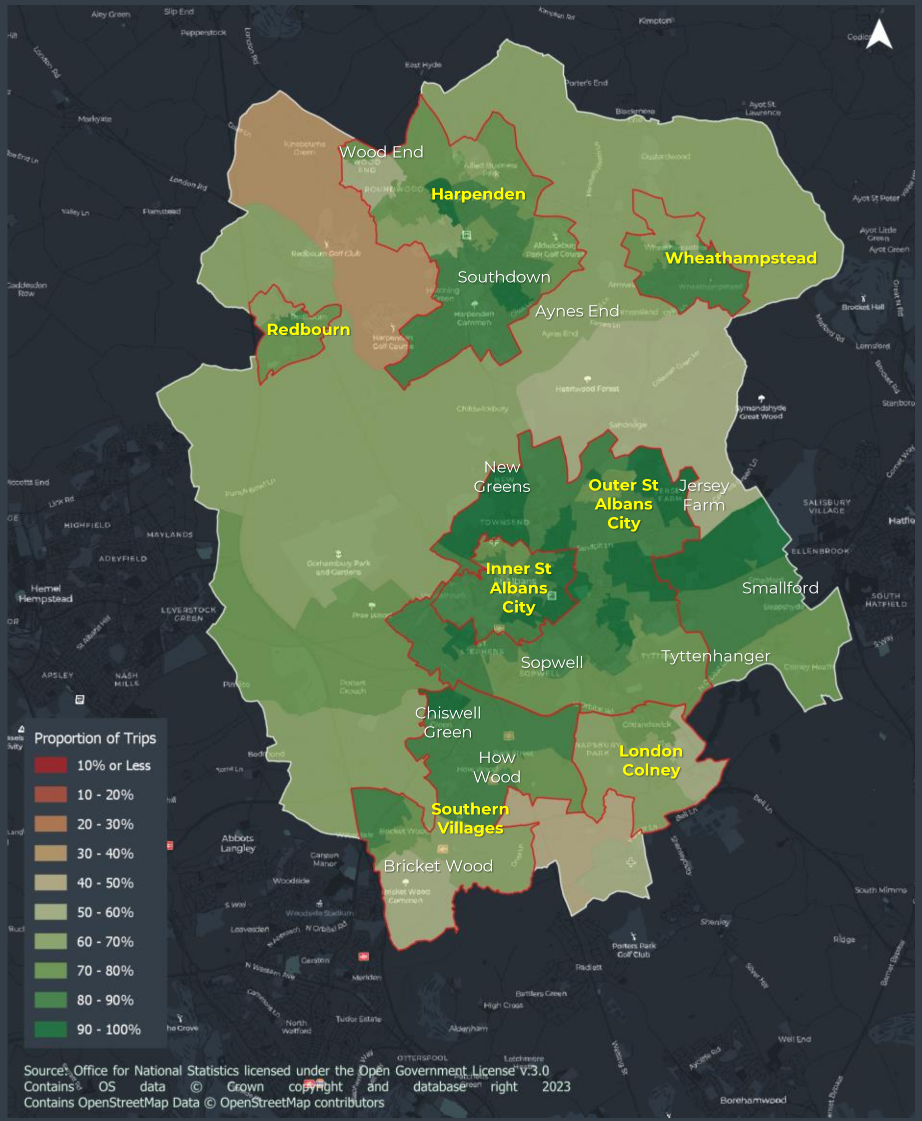
- Less than 1% of modelled car trips across the assessed development zones in St Albans district have the potential to switch to public transport.
- Most of the new development zones have less than 1% potential, only East St Albans City (up to 1%) and Northeast Harpenden (up to 2%) has more.
- This is a worst-case scenario as it assumes that the developments have no new public transport provision.

PART 1

Sustainable travel potential for existing communities

SUSTAINABLE TRAVEL POTENTIAL FOR EXISTING COMMUNITIES

Sustainable travel opportunity



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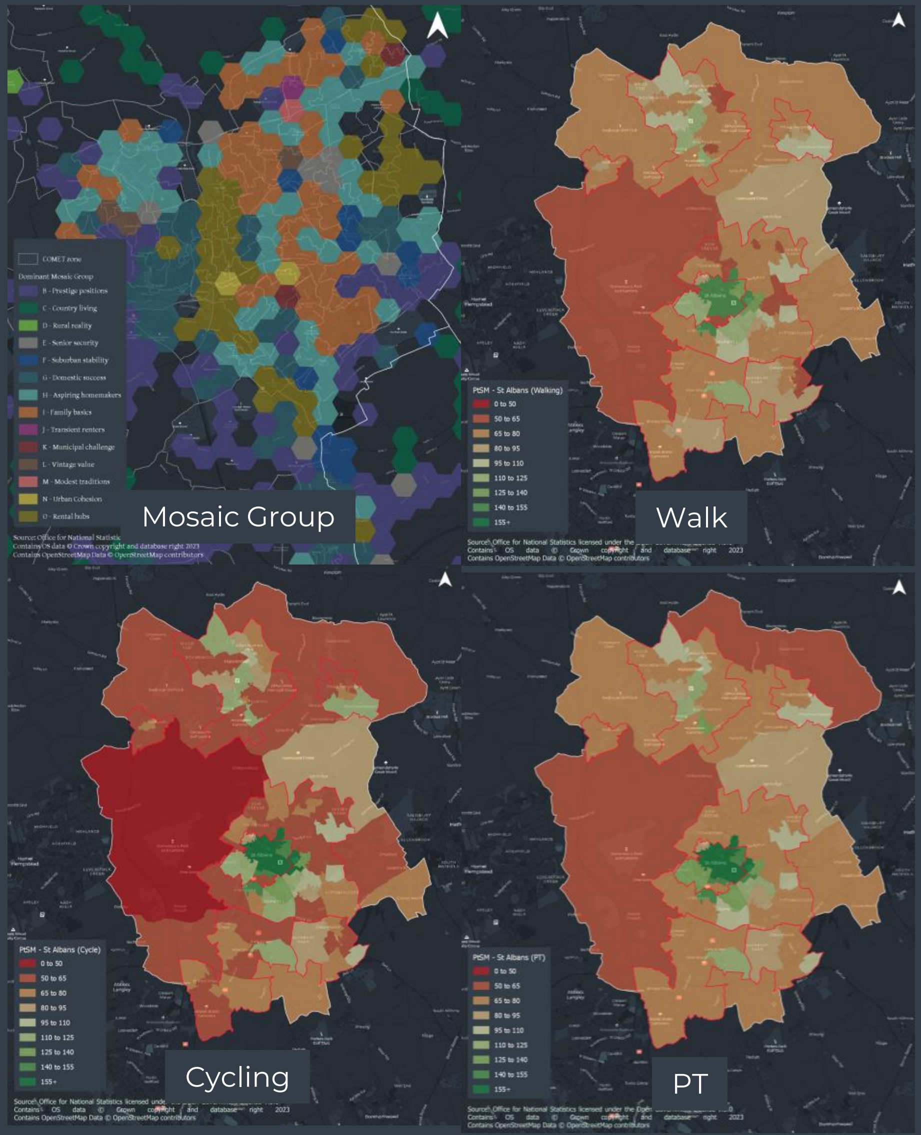
Sustainable travel propensity



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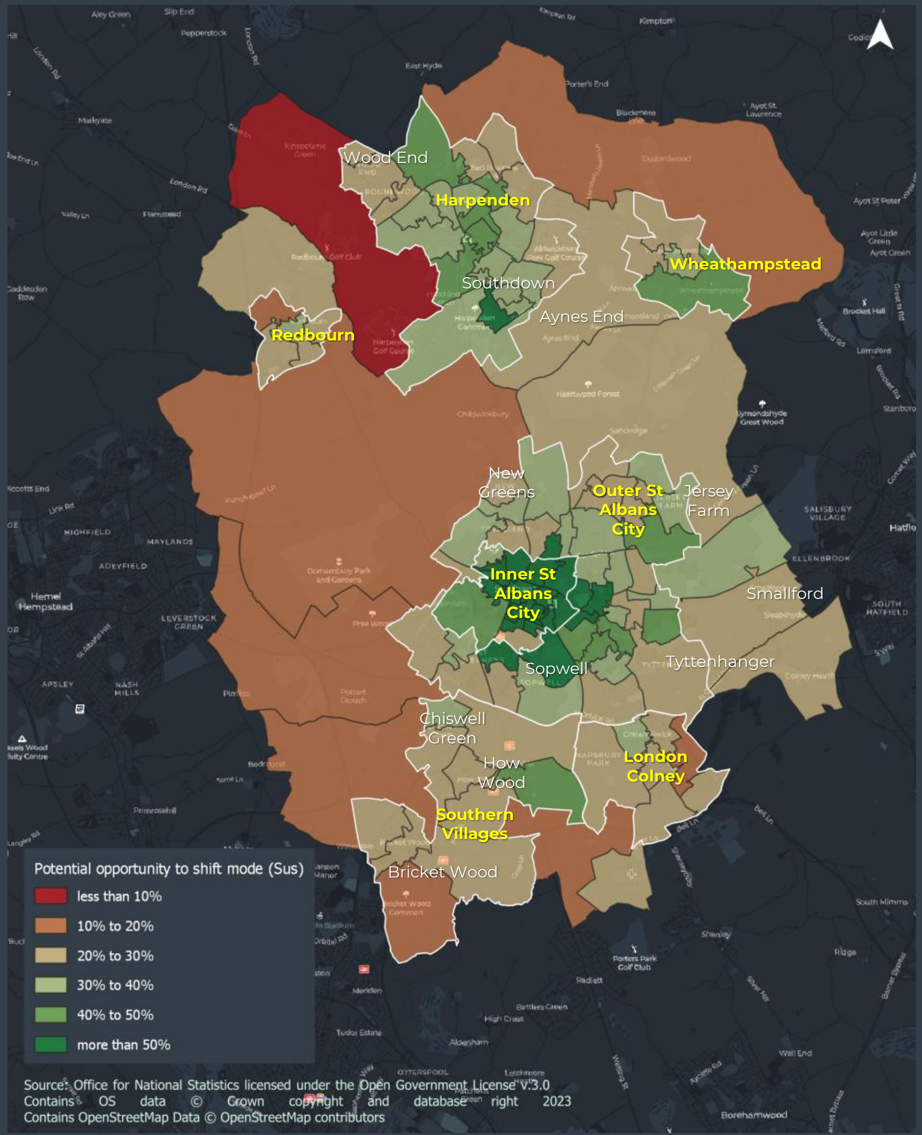
Sustainable travel potential



We calculated that:

- Up to 68% of existing car trips across the St Albans district have the opportunity to switch to sustainable modes.
- Outer St Albans City has the highest opportunity - up to 79% of existing car trips have the opportunity to switch, followed by Inner St Albans City (up to 68%), Harpenden (up to 67%), Wheathampstead (up to 66%), Southern Villages (up to 63%), Redbourn (up to 62%) and London Colney (up to 54%).

What did we find:

Based on existing socio-demographics, existing St Albans district residents have below average propensities for walking, cycling and bus but above average propensity to use rail and drive. However, Inner St Albans City residents have a high propensity for using sustainable modes. As new development areas are developed, the propensity to use sustainable modes could increase with new residents.

We calculated that:

- Up to 32% of existing car trips across the St Albans district have the potential to switch to sustainable modes.
- Inner St Albans City has the highest potential - up to 47% of existing car trips have the potential to switch, followed by Outer St Albans City (up to 33%), Harpenden (up to 30%), Wheathampstead (up to 27%), Southern Villages (up to 24%), London Colney (up to 22%) and Redbourn (up to 21%).

PART 1A

Sustainable travel opportunity for existing communities

Sustainable travel opportunity

How many car trips in St Albans district could be made by sustainable modes?

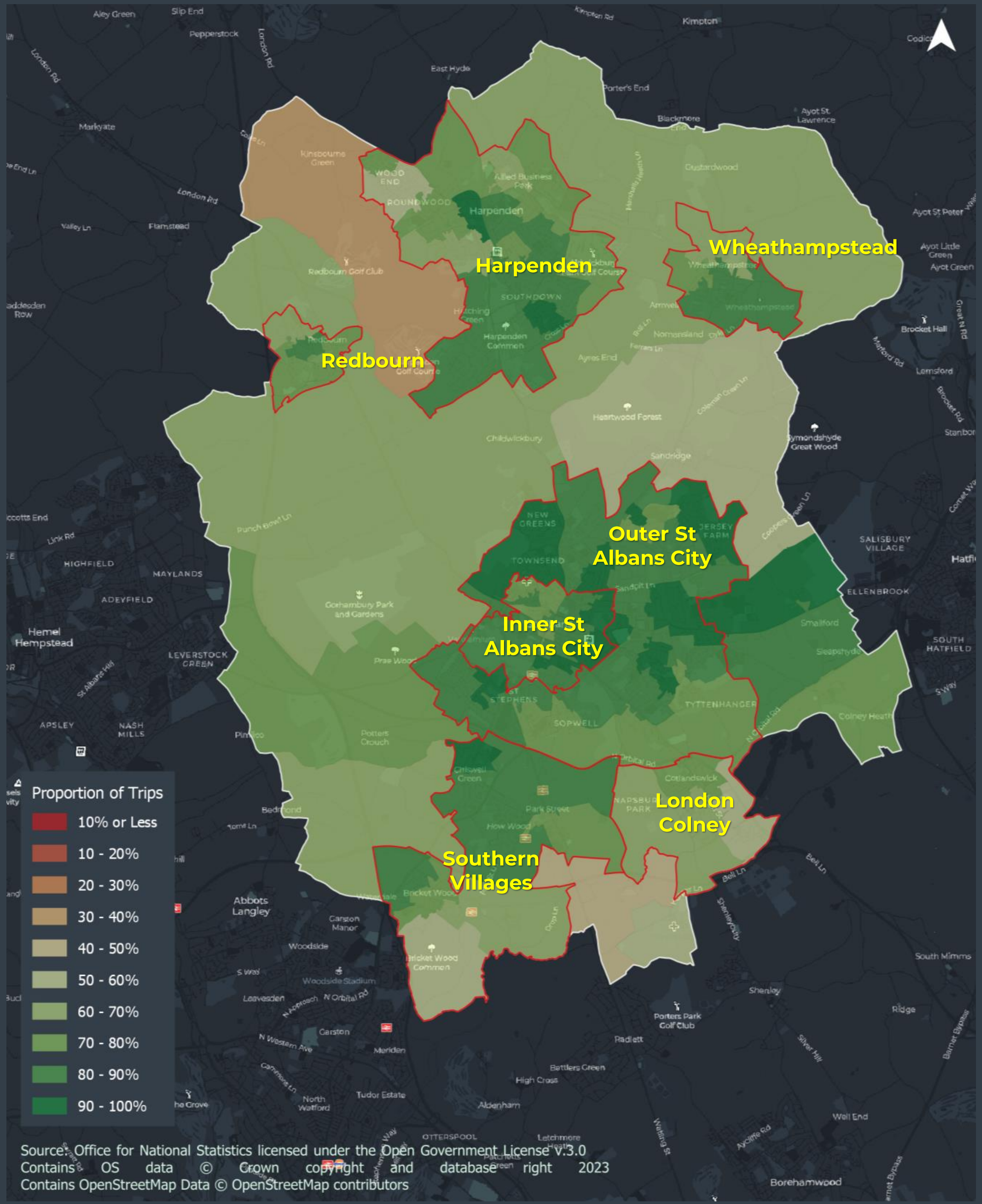
Figure 1.1 shows where in St Albans district there is the largest opportunity for sustainable travel (high scenario), such as Harpenden and Inner / Outer St Albans City and where there may be slightly less opportunity for sustainable travel, such as Redbourn, London Colney and more rural areas. A high and lower scenarios for sustainable travel opportunity have been estimated based on distance and time (see methodology note).

Key findings include:

- 48-68% of existing car trips in St Albans district have the opportunity to shift to sustainable modes. Cycling provides the highest opportunity with 27-37% of car trips able to switch to cycling. 10-35% of car trips could switch to walking and 1-6% to public transport.
- Outer St Albans City has the highest opportunity for car trips to shift to sustainable modes, with 64-79% of trips able to shift.
- Inner St Albans City has the second highest opportunity, with 51-68% of car trips able to shift to sustainable modes. Harpenden has the third highest opportunity with 44-67%
- The more rural areas have a lower sustainable travel opportunity. Wheathampstead has 22-66%, Southern Villages has 38-63%, London Colney has 33-54% and Redbourn has 22-62%.

The following pages break down the sustainable travel opportunity for each existing community by high and lower sustainable travel opportunity scenarios (trips and vehicle kilometres travelled (VKT)).

Figure 1.1 Sustainable travel opportunity in St Albans district (high scenario)



Sustainable travel opportunity

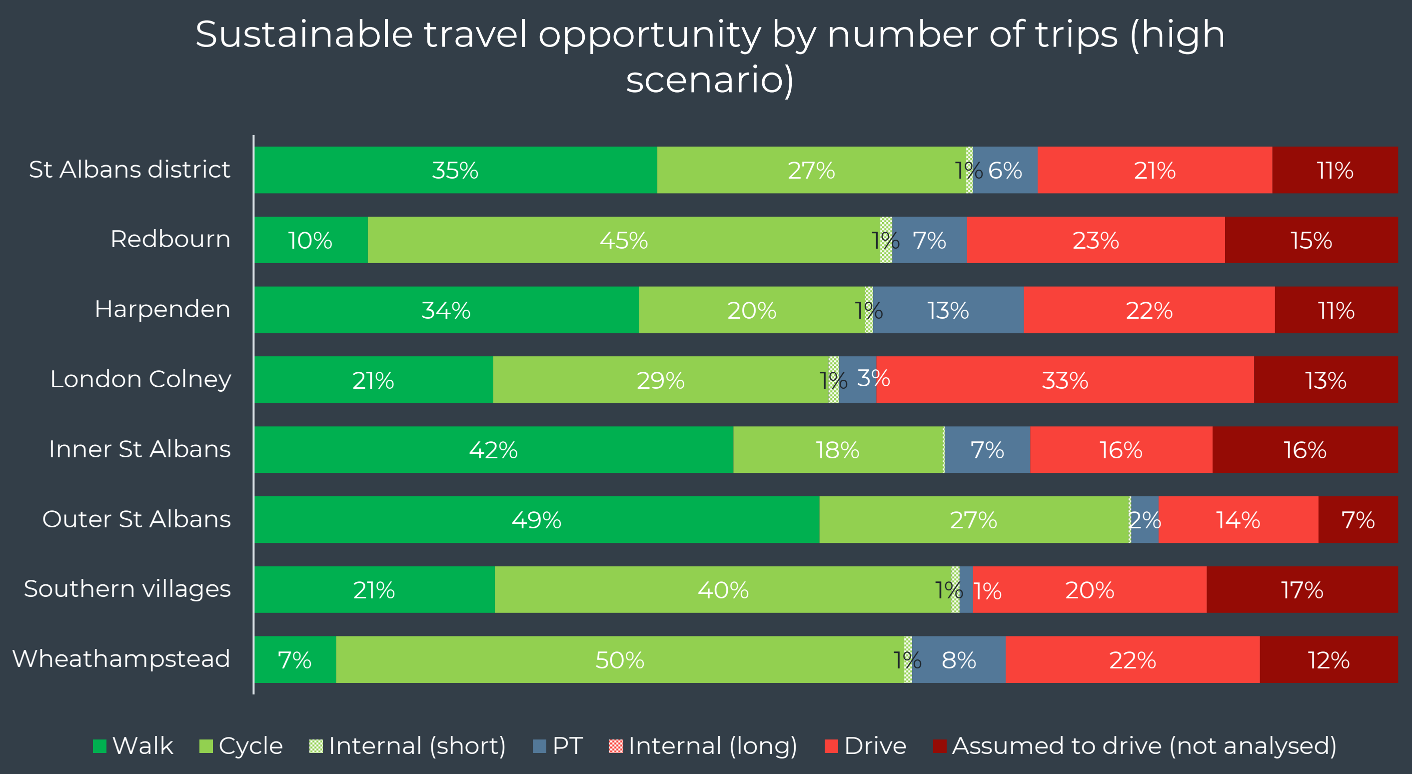
How many car trips in St Albans district could be made by sustainable modes?

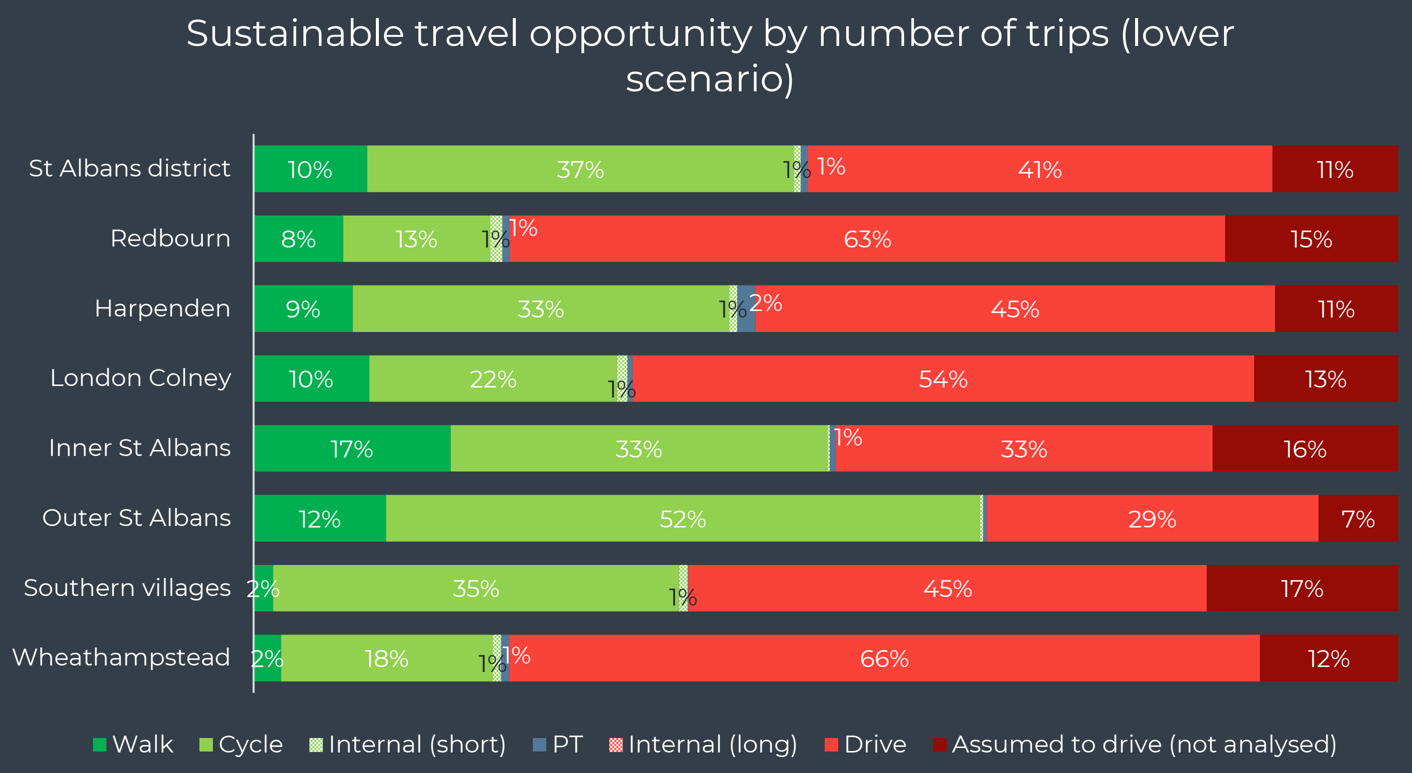
Figure 1.2 shows sustainable travel opportunity by trips (high and lower scenarios) for St Albans district as a whole and the existing communities of Redbourn, Harpenden, London Colney, Inner St Albans City, Outer St Albans City, Southern villages and Wheathampstead. These areas are aligned to COMET zones and the trips are based on the 2031 COMET O-D matrix which includes assumed future growth and development, but with the existing active travel and public transport networks. The intention is to provide a baseline on the number of future trips that could be made by walking, cycling and public transport – in the absence of any new transport network improvements.

- **St Albans district** – opportunity is between 49-68%, with walking being 10-35%, cycling 27-37% and public transport 1-6%. This results in 32-52% of car trips that could not switch (including not analysed trips assumed to be driven).
- **Inner St Albans City** – opportunity is between 51-67%, with walking being 17-42%, cycling 18-33% and public transport being 1-7%. This results in 32-49% of car trips that could not switch (including not analysed trips assumed to be driven).
- **Outer St Albans City** – opportunity is between 64-78%, with walking being 12-49%, cycling 27-52% and public transport being 0-2%. About 21-36% of car trips that could not switch (including not analysed trips assumed to be driven).

Outer St Albans City has a higher opportunity than Inner St Albans City because Outer St Albans City has a higher proportion of shorter trips than Inner St Albans City (54% of trips from Inner are considered 'short', whereas 65% of trips from Outer are considered short) and more densely modelled urban areas are within the cycle range for the outer regions of St Albans (e.g. Hatfield).

Figure 1.2 Mode shift split (trips) by community (high scenario is top and lower scenario is bottom)





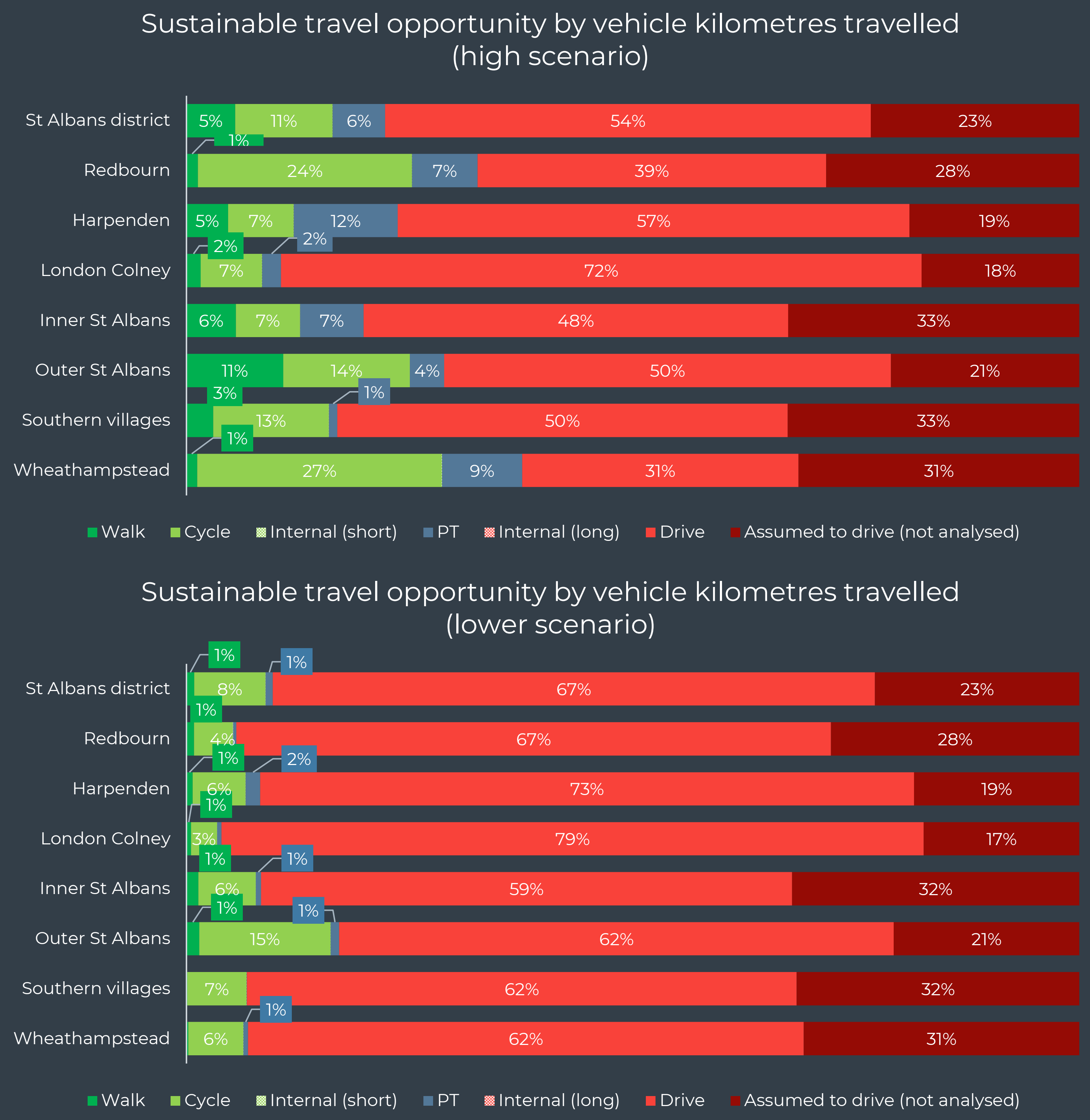
Sustainable travel opportunity

What is the sustainable travel opportunity by vehicle kilometres travelled (VKT)?

Figure 1.3 shows high and lower sustainable travel opportunity based on distance travelled. VKT (or people km) is important to consider as it highlights longer distance journeys, which typically have fewer trips, but can have a large effect on carbon emissions.

- St Albans district – opportunity is between 10-22%, with walking being 1-5%, cycling 8-11% and public transport being 1-6%. This results in 78-90% of car kilometres that would need to be driven (including not analysed trips assumed to be driven).
- Inner St Albans City – opportunity is between 8-20%, with walking being 1-6%, cycling 6-7% and public transport being 1-7%. This results in 80-92% of car kilometres that would need to be driven (including not analysed trips assumed to be driven).
- Outer St Albans City – opportunity is between 17-29%, with walking being 1-11%, cycling 14-15% and public transport being 1-4%. About 71-83% of car kilometres will need to be driven (including not analysed trips assumed to be driven).
- Other communities – highest opportunity is in Wheathampstead (7-38%), followed by Redbourn (6-33%), Harpenden (8-24%), Southern Villages (7-17%) and London Colney (4-11%).

Figure 1.3 Mode shift split (VKT) by community (high scenario is top and lower scenario is bottom)



Sustainable travel opportunity

Walking, cycling and public transport opportunity in St Albans district

Figure 1.4 shows the number of trips that could be walked, cycled or taken by public transport while Figure 1.6, 1.7 and 1.8 shows the proportion of trips that could be taken by each mode across the district.

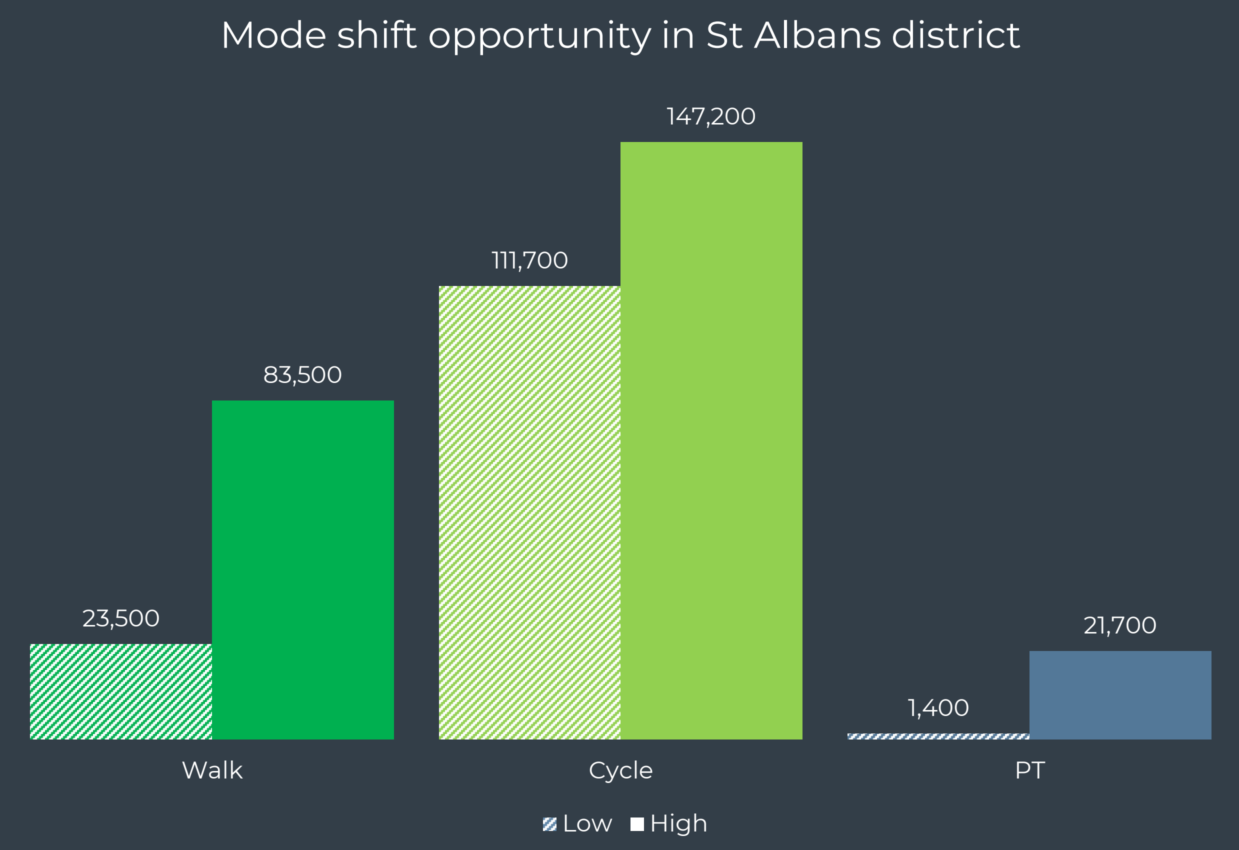
Key findings include:

- Cycling presents the greatest opportunity for mode shift with a range of 111,700 – 147,200 car trips able to be cycled across the district. Generally, cycling opportunity is evenly distributed across the district, though Outer St Albans City sees the largest opportunity with 51,000 – 61,400 cyclable trips.
- Walking opportunity is concentrated more towards the urban areas (such as St Albans and Harpenden), where journeys are likely to be of a smaller distance to nearby zones, with a range of 23,500 – 83,500 trips able to be walked.
- The sustainable travel opportunity for public transport is relatively low across the district, with a range of only 1,400 – 21,700 trips. Most of the study zones show less than 10% opportunity, with zones in Harpenden showing a marginally higher opportunity of 10-20% in comparison with other zones. This is likely to be capturing journeys to nearby Luton.

Figure 1.5 (overleaf) shows the number of trips able to be walked, cycled or taken by public transport across the communities in St Albans district.

A full breakdown of sustainable travel opportunity figures can be found in Appendix A and a detailed list of range of trips with the opportunity to shift by mode table can be found in Appendix B (Table B1).

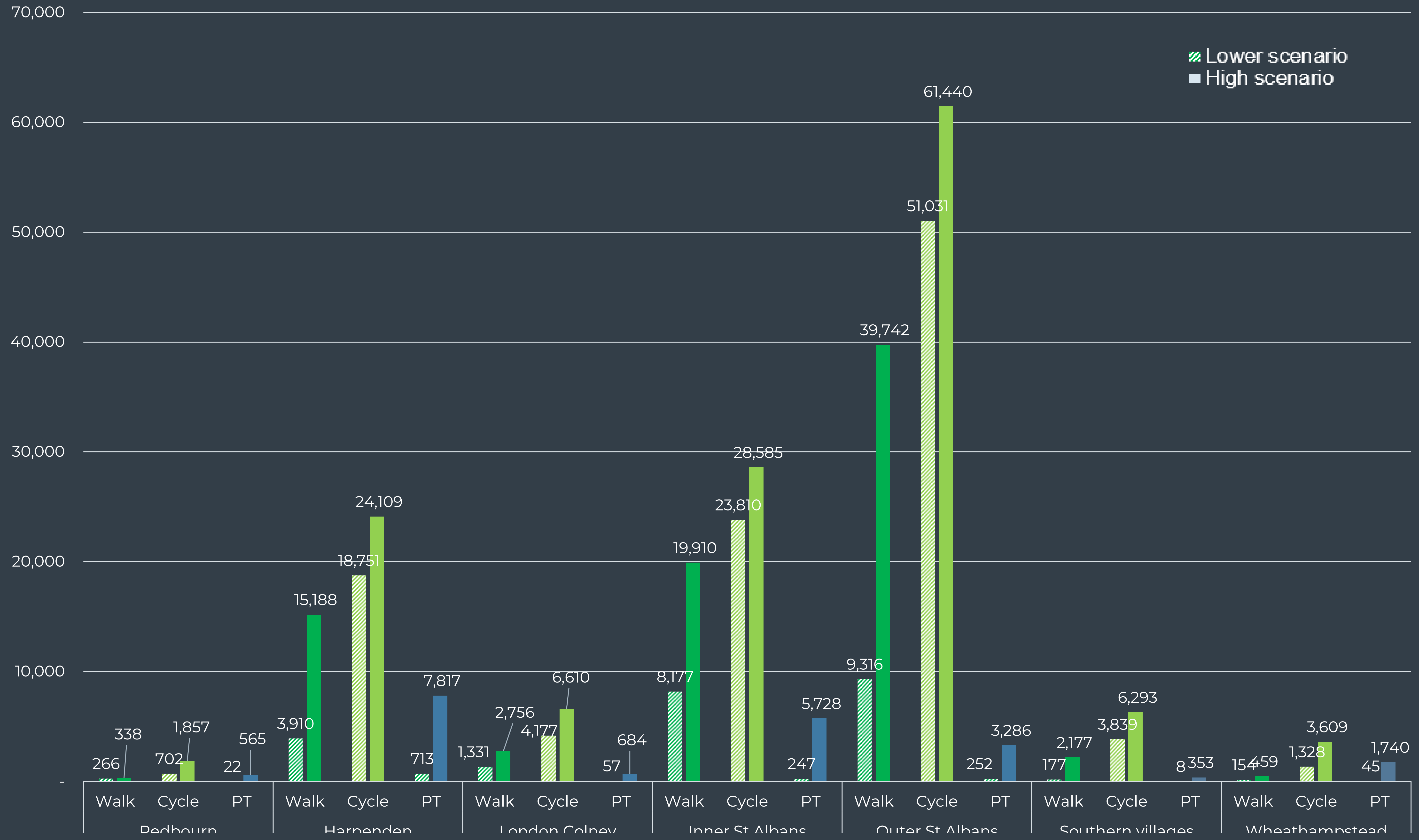
Figure 1.4 Range of trips with the opportunity to shift by mode (St Albans)



	Walking opportunity		Cycling opportunity		PT opportunity
	Main mode	First and last mile*	Main mode	First and last mile*	Main mode
Daily trips	23,500 - 83,500	1,400 – 21,700	111,700 – 147,200	1,400 – 21,700	1,400 – 21,700
Daily people km	27,300 - 169,400	27,400 – 240,200	279,500 – 506,800	27,400 – 240,200	25,000 – 237,400

* Linked to public transport trips

Figure 1.5 Mode shift split (trips) in existing communities under high and lower sustainable travel opportunity scenarios



Sustainable travel opportunity

Walking opportunity in St Albans

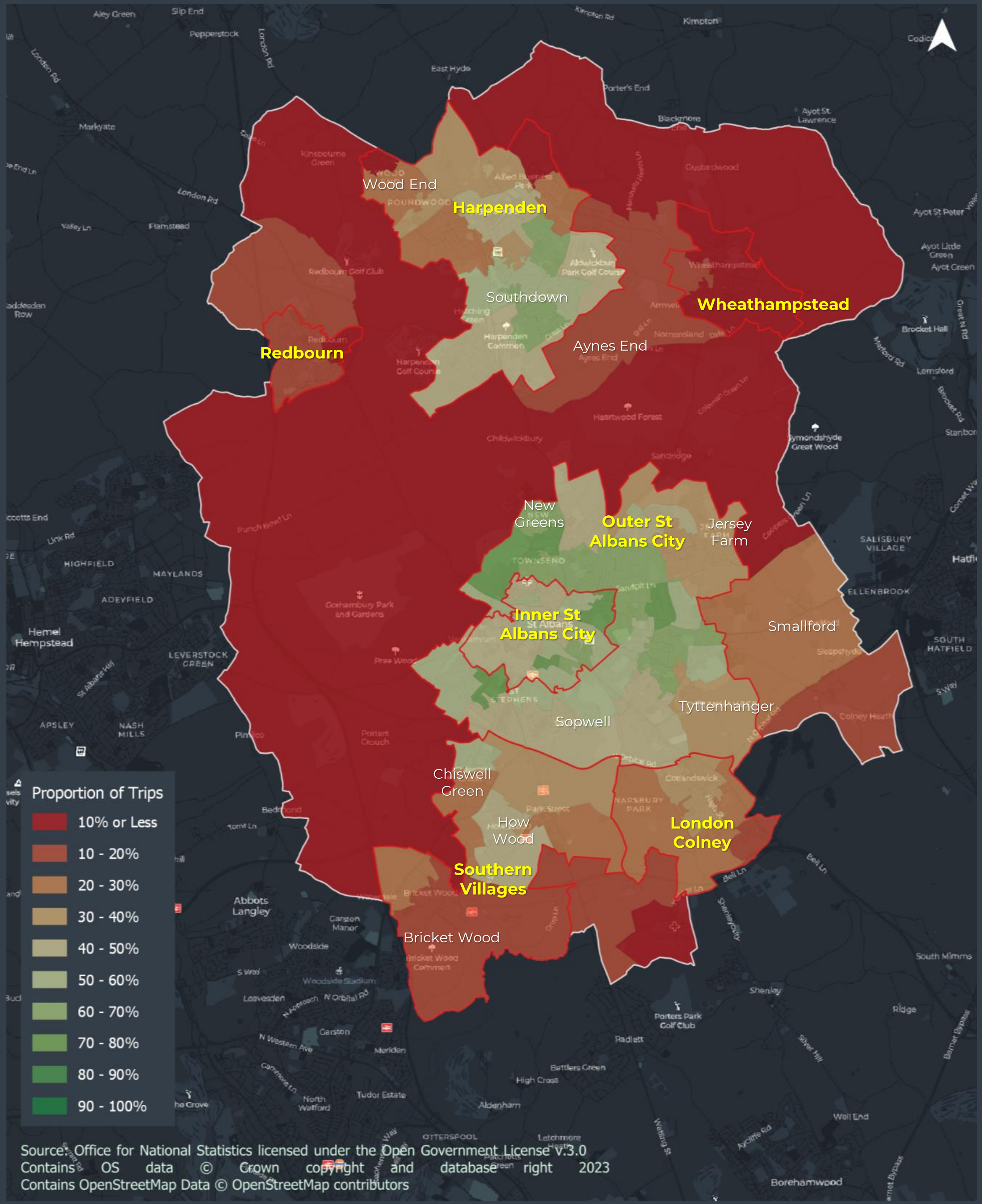
Figure 1.6 sets out the opportunity to walk for St Albans district (high scenario).

Overall, the opportunity for trips to be walked in St Albans district appears inconsistent, with the map being split into large sections of high or low opportunity for walked trips.

Areas of higher opportunity to walk tend to be concentrated in more urban areas such as Inner St Albans City, New Greens in Outer St Albans City and Southdown in Harpenden. This will be because denser areas like these will have a lot more reason for shorter trips to occur as points of interest will all be closer together than in more rural areas.

Generally, the rural areas and villages – particularly Redbourn and Wheathampstead - in St Albans district have very low opportunity for car trips to switch to walking, as shown by the red areas in the map. This is likely due to the areas not being within walking distance to other areas or attractions.

Figure 1.6 Walking opportunity in St Albans (high scenario)



Sustainable travel opportunity

Cycling opportunity in St Albans

Figure 1.7 sets out the opportunity to cycle for St Albans district (high scenario).

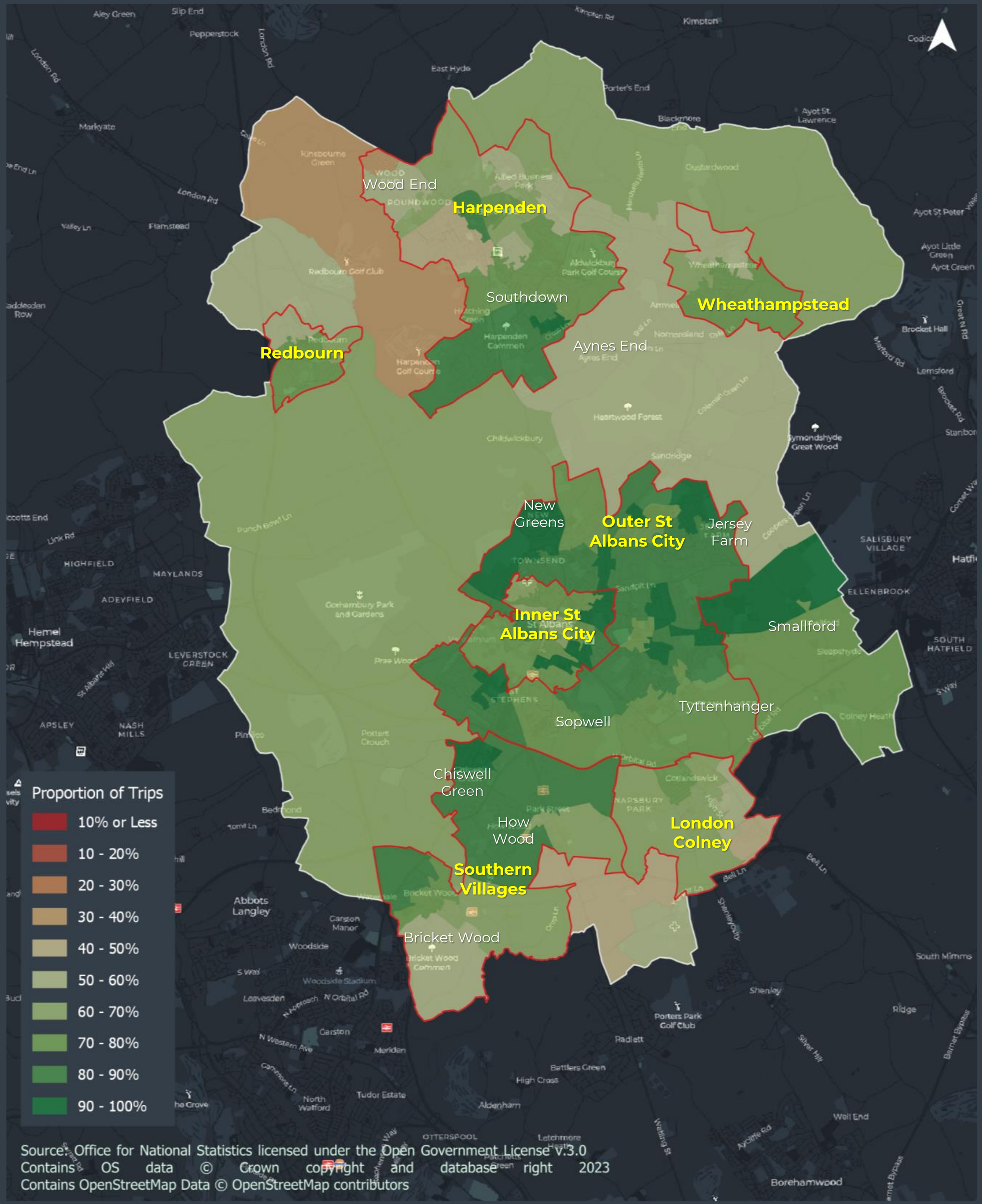
The opportunity to cycle is relatively high in St Albans district with the highest opportunities generally concentrated around denser areas such as zones in Inner St Albans City, Outer St Albans City and Harpenden. This is likely due to them being within a short cycle from the town centres or other attractions.

Rural areas that have a relatively high opportunity to cycle include Smallford to the east of St Albans City, Chiswell Green and How Wood in the Southern Villages, and Wheathampstead. This is likely due to the proximity of these areas to more dense areas (e.g. within a reasonable cyclable distance).

Areas that have a moderate opportunity to cycle include London Colney and Bricket Wood. The rural area between Wood End in Harpenden and Redbourn shows lower opportunity than other rural areas due to limited (and smaller) destinations within a reasonable range for cycling. Furthermore, there is a golf club in this area which may restrict the public right of way.

Outer St Albans City has areas with higher opportunity to cycle than areas in Inner St Albans City. This is likely due to there being a higher proportion of shorter trips in Outer than Inner (54% of trips from Inner are considered 'short', whereas 65% of trips from Outer are considered short) as other denser areas such as Hatfield and Harpenden will be within a reasonable cyclable range to areas in Outer St Albans City, but not to areas in Inner St Albans City. Furthermore, there is less building density in Outer St Albans City.

Figure 1.7 Cycling opportunity in St Albans (high scenario)



Sustainable travel opportunity

Public transport opportunity in St Albans

Figure 1.8 sets out the opportunity to use public transport for St Albans district (high scenario).

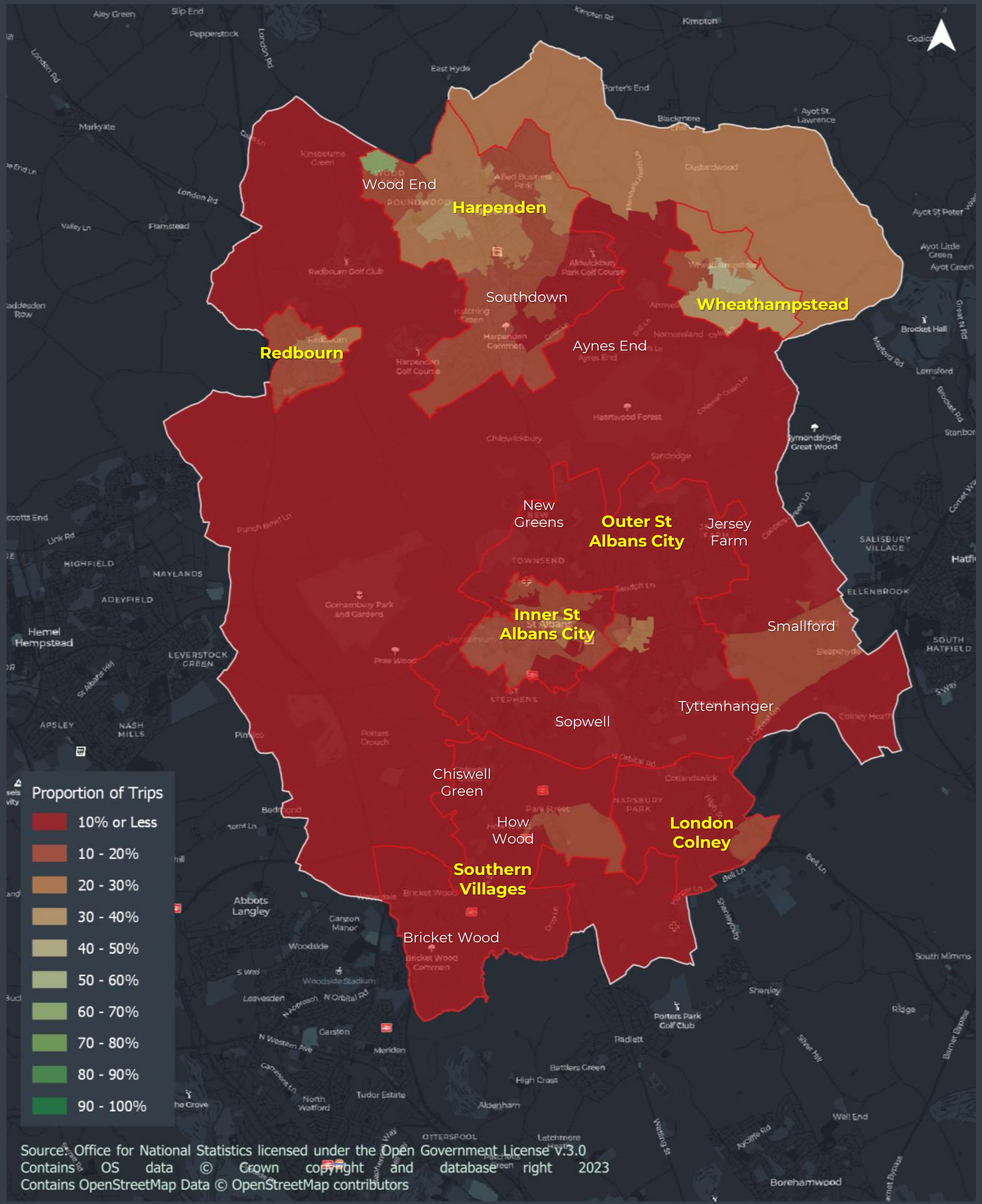
Overall, public transport has lower opportunity than walking and cycling. Most of the study area has 10% or less opportunity for mode shift to public transport.

The main reason that public transport opportunity is not higher in St Albans City (and other more urban areas with public transport options) is because a lot of trips in these areas are dominated by shorter trips and therefore more attractive to cycling or walking. For this reason, we did not run any of the shorter trips through the Google API for the Hemel Hempstead study and therefore they are also not included in this study. For longer trips, where there was public transport analysis, the proportion is higher.

The areas in St Albans district with a slightly higher opportunity for public transport trips relative to the study area include Wheathampstead. This is likely due to the coach and bus services that link it to Luton and the surrounding urban areas.

For the zone in north Harpenden, the higher opportunity for public transport is likely due to there being only a small number of OD pairs in this area, so any small absolute change could result in a larger percentage change.

Figure 1.8 Public transport opportunity in St Albans (high scenario)



PART 1B

Sustainable travel propensity for existing communities

Sustainable travel propensity

Proportion of household

Table 1.1 sets out the proportion of households for St Albans district and its communities compared to the England average.

This analysis highlights the differences in existing demographics and lifestyles between St Albans district and its communities, and the England average across various categories.

In England, the proportions of households in each Mosaic Group are relatively evenly spread, with Aspiring Homemakers having the highest proportion with 11% and Modest Traditions having the lowest at 4%.

In St Albans district, the proportions of households in each Mosaic Group are less evenly spread. Some Mosaic Groups have little to no households in St Albans district (e.g. Municipal Challenge and Modest Traditions) while a few Mosaic Groups represent a large proportion of households (e.g. Prestige Positions, Domestic Success and City Prosperity account for 76% of households).

The dominant Mosaic Group in St Albans district is Prestige Positions, representing 33% of households. Prestige Positions is also the dominant Mosaic Group of Redbourn (56% of households), Harpenden (57% of households), and Wheathampstead (65% of households).

The overwhelming dominant Mosaic Group in Inner St Albans City is City Prosperity (69% of households), whereas there is more of a mix of Mosaic Groups in London Colney (Domestic Success is the marginal dominant Mosaic Group with 37% of households).

On the next page, Figure 1.9 and Figure 1.10 show the dominant Mosaic Group across St Albans district and Inner / Outer St Albans City at hex level.

Table 1.1 Proportion of households in each Mosaic Group in St Albans, its communities and England

	Mosaic Group	St Albans district	Redbourn	Harpenden	London Colney	Southern Villages	Wheathampstead	Inner St Albans City	Outer St Albans City	England average
A	City Prosperity	**14%**	0%	5%	0%	0%	0%	69%	7%	**5%**
B	Prestige Positions	**33%**	56%	57%	10%	51%	65%	6%	25%	**7%**
C	Country Living	**1%**	0%	0%	0%	0%	0%	0%	0%	**7%**
D	Rural Reality	**0%**	0%	0%	0%	0%	0%	0%	0%	**6%**
E	Senior Security	**4%**	19%	0%	5%	17%	0%	0%	2%	**8%**
F	Suburban Stability	**1%**	12%	0%	11%	0%	0%	0%	0%	**5%**
G	Domestic Success	**29%**	2%	24%	37%	21%	4%	8%	48%	**9%**
H	Aspiring Homemakers	**5%**	11%	1%	19%	9%	10%	2%	2%	**11%**
I	Family Basics	**4%**	0%	0%	16%	0%	20%	2%	5%	**9%**
J	Transient Renters	**0%**	0%	0%	0%	0%	0%	0%	0%	**6%**
K	Municipal Challenge	**0%**	0%	0%	0%	0%	0%	0%	0%	**6%**
L	Vintage Value	**1%**	0%	3%	0%	1%	0%	0%	0%	**6%**
M	Modest Traditions	**0%**	0%	0%	0%	0%	0%	0%	0%	**4%**
N	Urban Cohesion	**1%**	0%	0%	0%	0%	0%	0%	3%	**6%**
O	Rental Hubs	**7%**	0%	8%	3%	3%	0%	12%	7%	**8%**

Figure 1.9 Dominant Mosaic Group for St Albans district

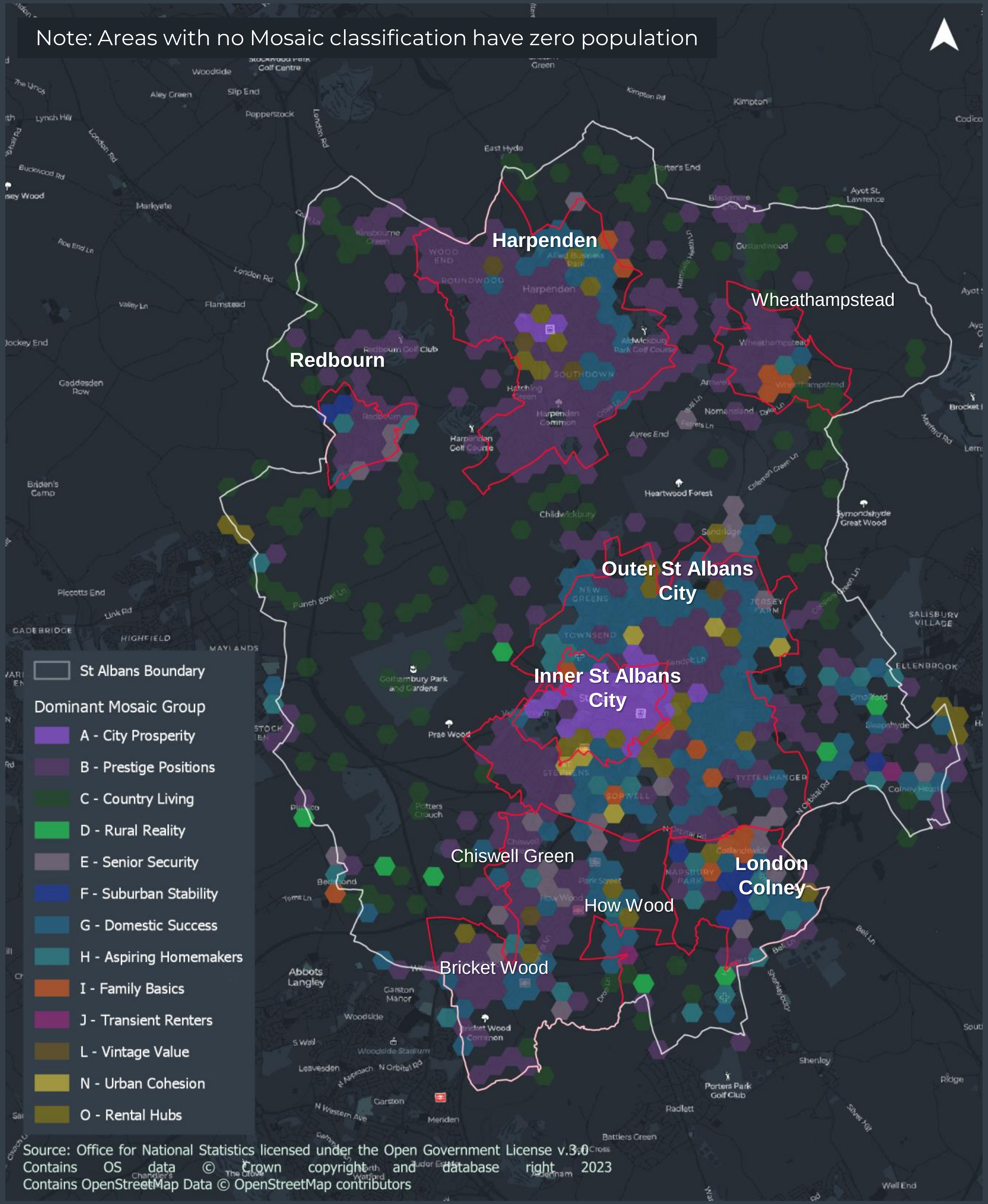
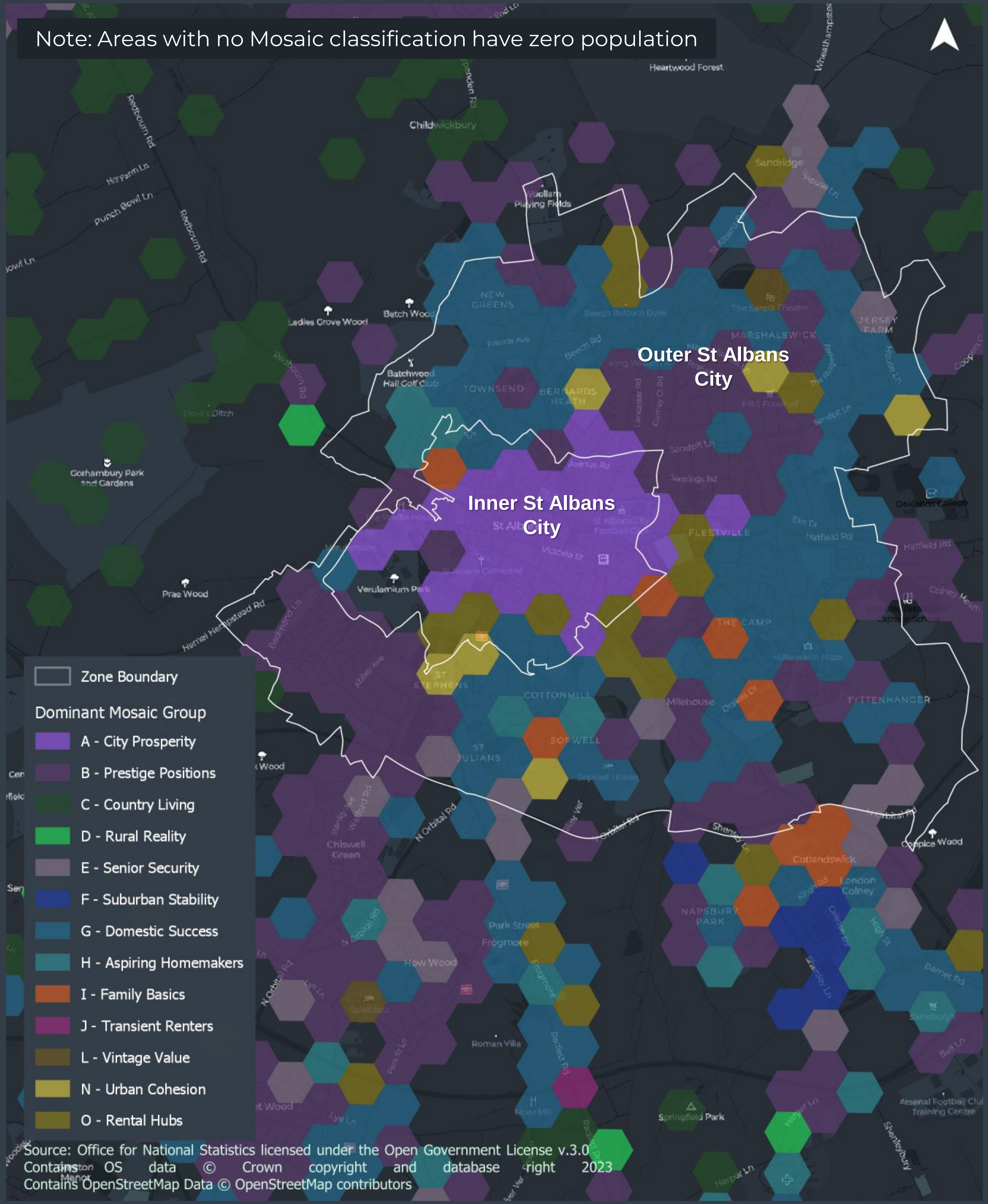


Figure 1.10 Dominant Mosaic Group for Inner and Outer St Albans City



Sustainable travel propensity

Average mode propensity

Table 1.2 sets out the average mode propensity (i.e. average of all trip types) based on the socio-demographics for St Albans district and its communities compared to the England average (which is 100). A score greater than 100 suggests a higher than England average propensity to use that mode, while a value below 100 suggests the opposite.

In general, due to the people living there, **St Albans district is relatively car dependent**, with most communities matching or being greater than the England average of 100, and propensities to take sustainable modes being less than average.

The propensity to take sustainable modes in St Albans district is mostly below the English average with all corresponding propensity scores being below 100 besides the score for rail:

- **Walking** – 91
- **Cycling** – 88
- **Bus** – 85
- **Rail** – 106

Inner St Albans City is the only community to go against this trend – with propensity to walk (139), cycle (148), take bus (148) or rail (174) all being well above the England average. Those living in Inner St Albans City are also less likely to drive than the England average, with a propensity of 87.

The following pages show the propensity to walk, cycle, use bus, use rail and drive across the St Albans district. Appendix C provides the same analysis but for each existing community zoomed in.

More information on Mosaic Groups and Mobility Insights survey and how they feed into propensities can be found in the methodology note

Table 1.2 Average propensity for walking, cycling, using bus, using rail and driving (all journey purposes)

Propensity	England average	St Albans district	Redbourn	Harpenden	London Colney	Southern Villages	Wheathampstead	Inner St Albans City	Outer St Albans City
Walk	100	91	75	86	80	80	89	139	85
Cycle	100	88	64	79	79	71	85	148	84
Bus	100	85	63	75	76	67	76	148	78
Rail	100	106	85	98	81	90	87	174	99
Drive	100	100	104	100	109	102	105	87	101

Sustainable travel propensity

Propensity to walk in St Albans

Figure 1.11 sets out the propensity to walk for St Albans compared to the England average at COMET model zone level.

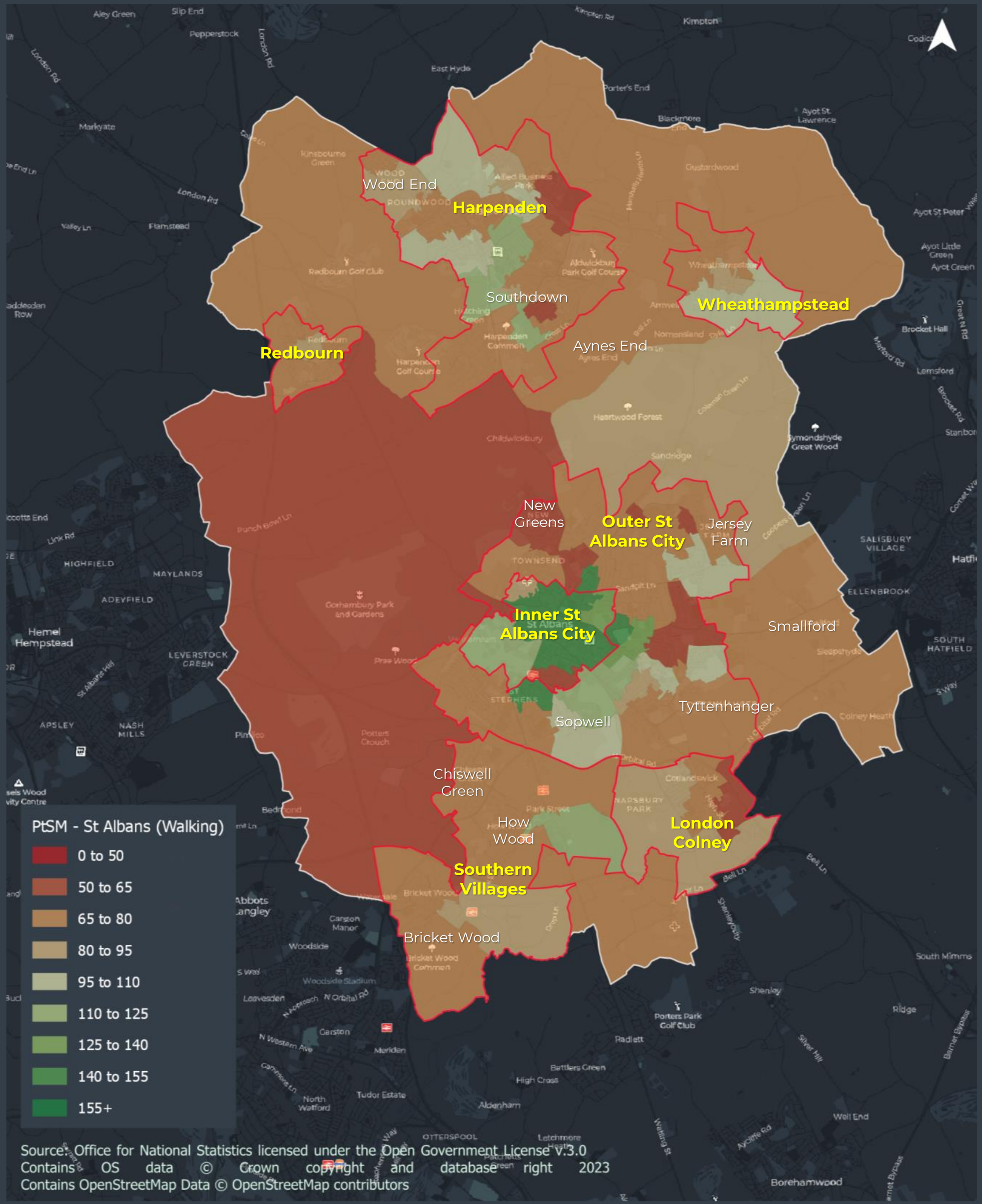
The area with the highest propensity to walk is in Inner St Albans City, with areas such as Harpenden, How Wood and Outer St Albans City also having higher propensities for walking.

Generally, in St Albans district, propensity to walk is 91% of the England average. This indicates that other modes may be preferred within St Albans as a whole. However, as noted in the map, some urban areas such as Inner St Albans have a higher propensity for walking than the England average.

Comparing these regions to the opportunity map, most areas in St Albans that have a higher propensity to walk also have relatively high opportunity for walked trips.

The similarity in areas with higher opportunity and higher propensity for walking could be because having the opportunity available would make people more likely to use this option.

Figure 1.11 Propensity to walk in St Albans



Sustainable travel propensity

Propensity to cycle in St Albans

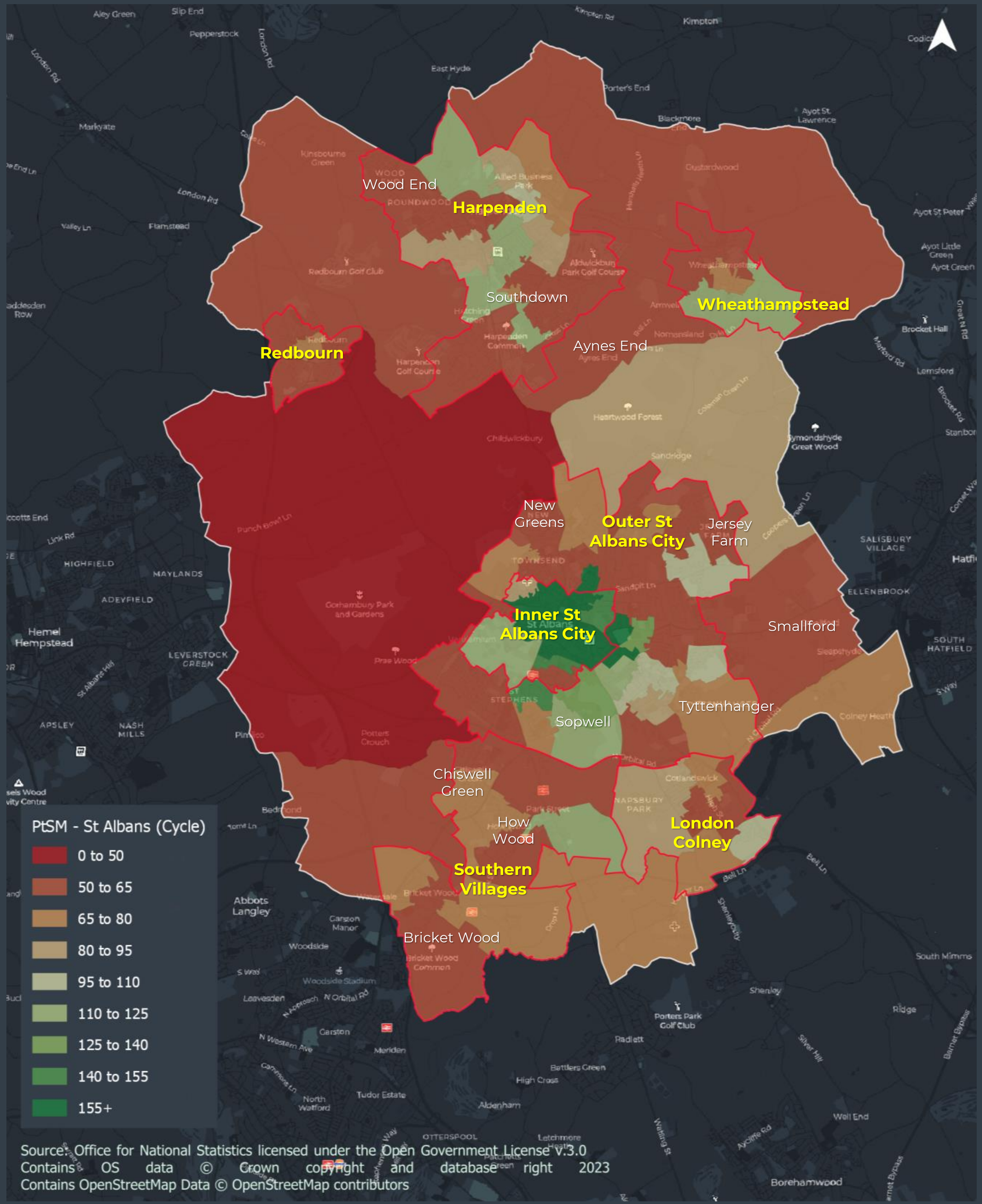
Figure 1.12 sets out the propensity to cycle for St Albans compared to the England average – the average propensity for cycling across St Albans is 88%. In general, cycling has a lower propensity than walking.

The propensities to cycle in major areas of St Albans district are lower than the England average - with the exception of Inner St Albans City which has a significantly higher propensity than the England average. It appears that most of the areas with lower propensities for cycling are the rural areas of St Albans, it's anticipated that most of these areas would be less likely to favour cycling due to the longer distance trips and therefore have more of a preference for driving.

In urban areas such as Inner St Albans City, Wheathampstead, and parts of Outer St Albans City, the propensity to cycle is closer to or above the England average. It's likely that in these areas' destinations such as community facilities, shops and education establishments may be within a shorter distance. These trips are easier to be completed by more active modes such as cycling and therefore would make people more likely to cycle.

The areas in St Albans district with high propensity for cycling match up well with the areas with high opportunity for cycling, meaning a lot of the trips with the opportunity to be cycled would also have the potential to be cycled.

Figure 1.12 Propensity to cycle in St Albans



Sustainable travel propensity

Propensity to use bus in St Albans

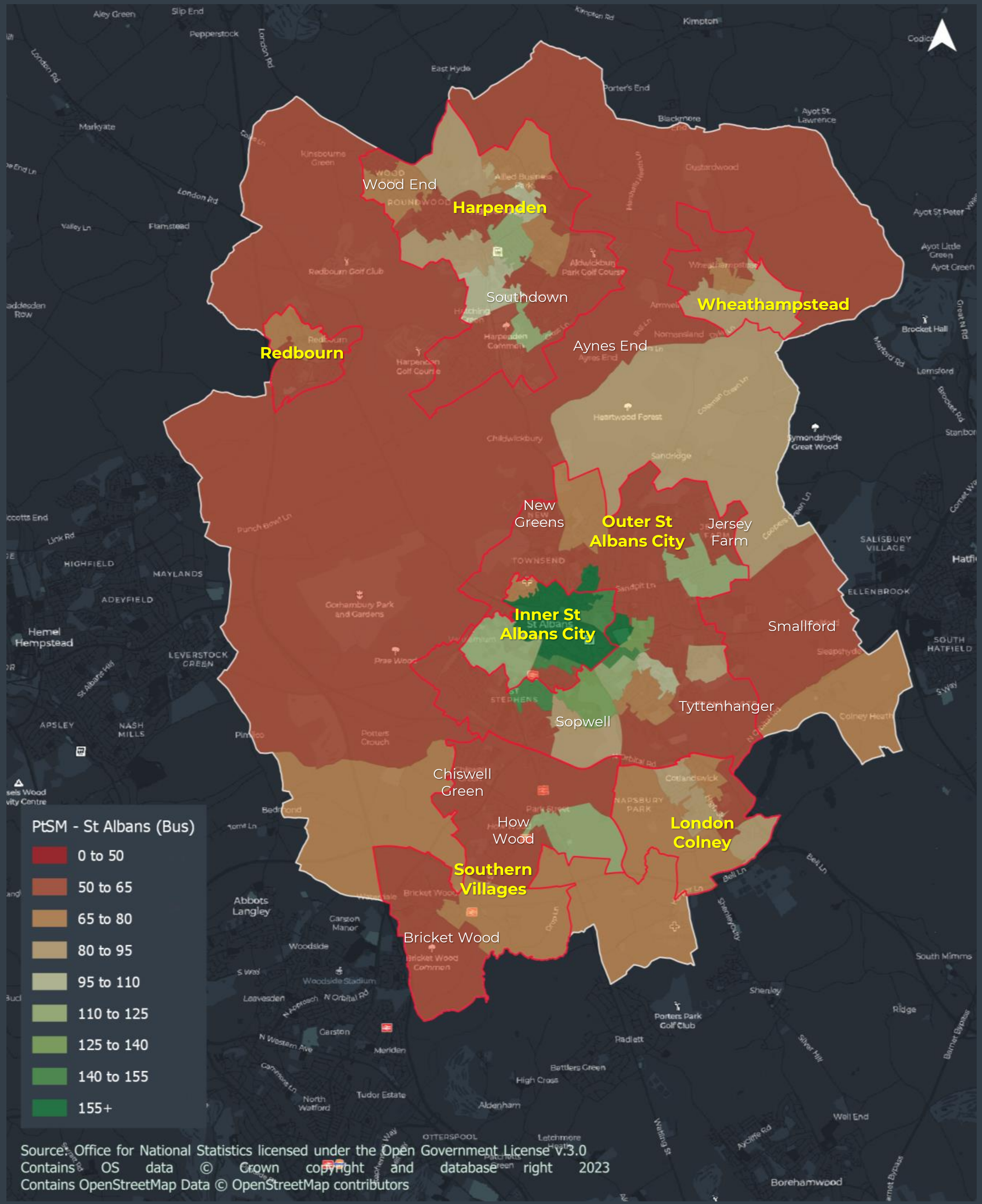
Figure 1.13 sets out the propensity to use bus for St Albans – which is about 85% of the England average.

Within St Albans, the overall propensity to travel by bus is lower than the England average, with most areas having propensity in the range of 50 to 80. This is with the exception of Inner St Albans City which has an average propensity of 148% to use buses.

These figures are supported by the limited opportunity to use public transport at present in St Albans, (with the exception of Inner St Albans City) highlighting an opportunity to increase bus services to better cater to the needs of users.

In a similar pattern to walking and cycling propensity, there is a greater willingness to travel by bus in the more urban areas within St Albans (such as in St Albans City and Harpenden).

Figure 1.13 Propensity to use bus in St Albans



Sustainable travel propensity

Propensity to use rail in St Albans

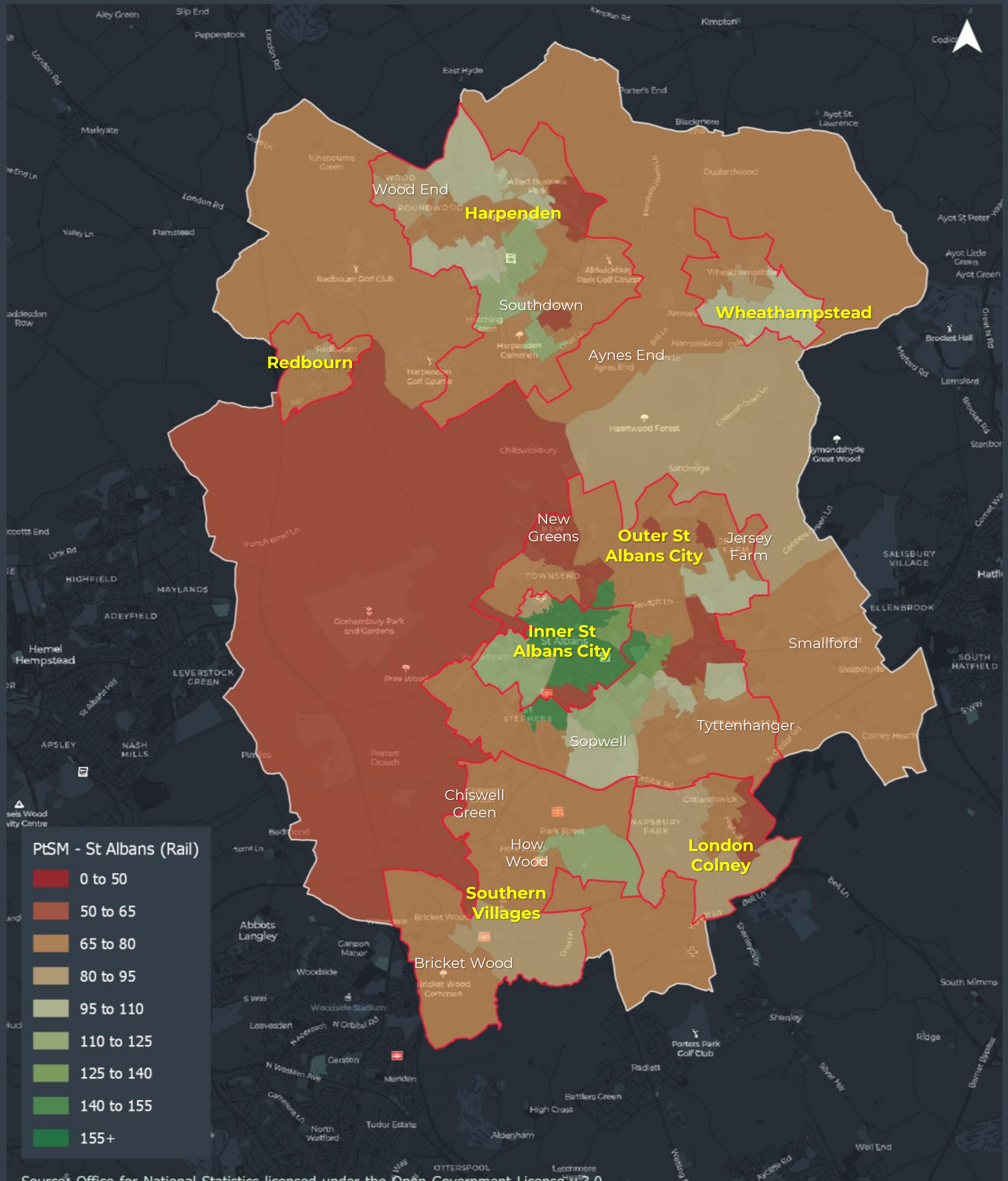
Figure 1.14 sets out the propensity to use rail for St Albans – which is above the England average at about 106% of the England average. This is the mode with the highest average propensity in St Albans. In general, rail has a higher propensity than bus.

Propensity to travel by rail is varied across St Albans district. While most areas have a high propensity for rail travel there is still a large section of St Albans district to the west of St Albans City with lower propensity for rail travel compared with the England average. A lack of rail provision in this area is likely to play a part in the lower propensity, as well as existing demographics and perceptions.

The areas where rail propensity is highest tend to align with the location of the rail stations in these settlements, suggesting that residents do not need to travel far to reach the rail stations. However, many areas without rail stations such as Redbourn, Wheathampstead, and London Colney still have fairly high propensities for rail travel (80% - 90% of the England average).

This data indicates limited potential to use public transport, suggesting that the current public transport network needs to be improved to ensure that the existing communities are better served by public transport.

Figure 1.14 Propensity to use rail in St Albans



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Sustainable travel propensity

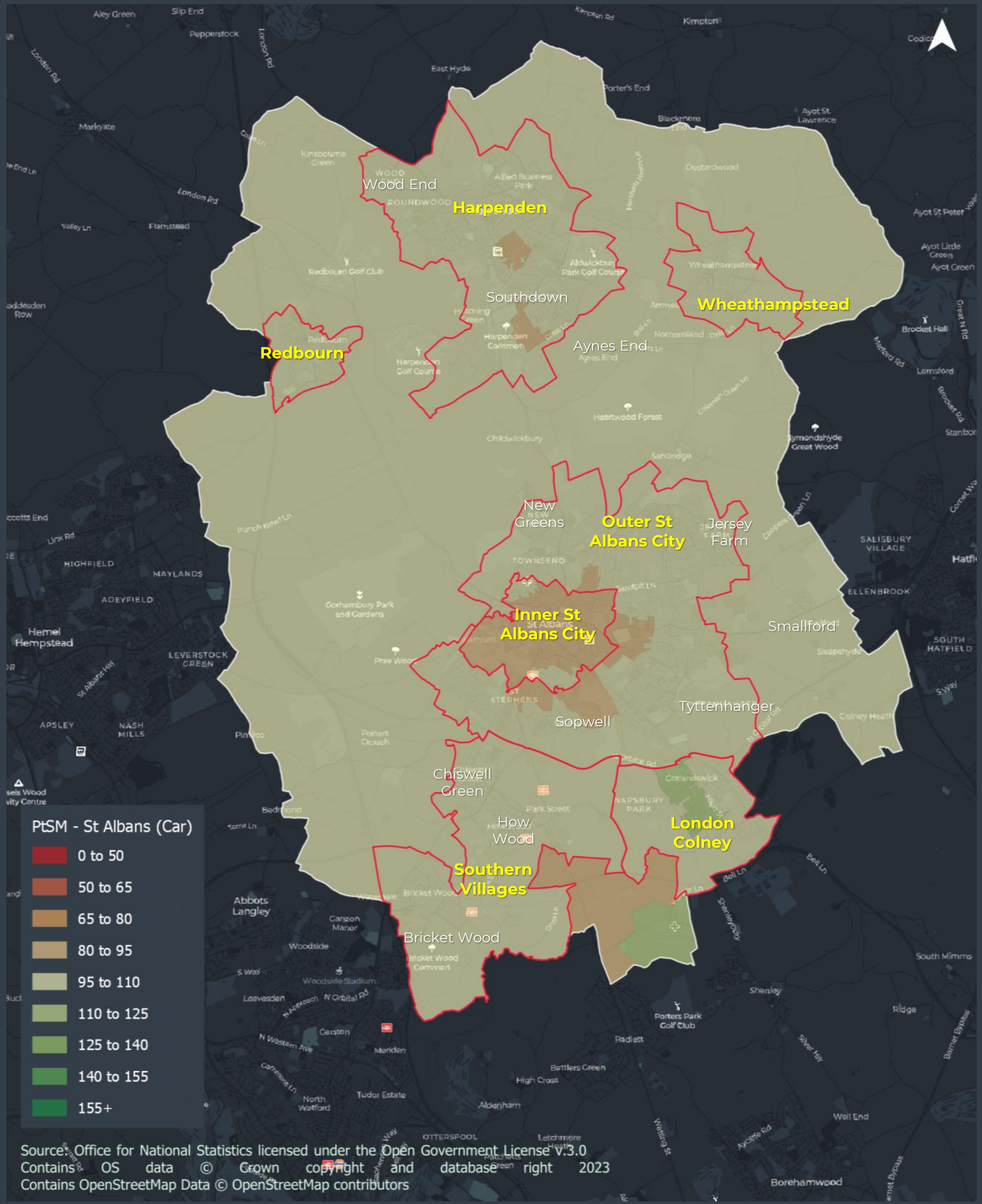
Propensity to use car in St Albans

Figure 1.15 sets out the propensity for car use across St Albans compared to the England average.

Across most of the region, the propensity for driving is roughly equal to the England average – with all major areas besides, Inner St Albans City being slightly above the England average. This highlights the car dependency at present. This could be due to the lack of public transport connectivity or frequency in these areas discouraging people from taking the bus or train instead of driving.

There are pockets of lower-than-average driving propensity in the region, namely in Inner St Albans City. This supports the idea that lack of alternatives to driving could be the cause for the higher propensities towards driving in most areas since Inner St Albans City seems to have the most opportunity to use public transport and make shorter trips that can be walked/cycled.

Figure 1.15 Propensity to use car in St Albans



PART 1C

Sustainable travel potential for existing communities

Sustainable travel potential

What is the likely sustainable travel potential for existing communities?

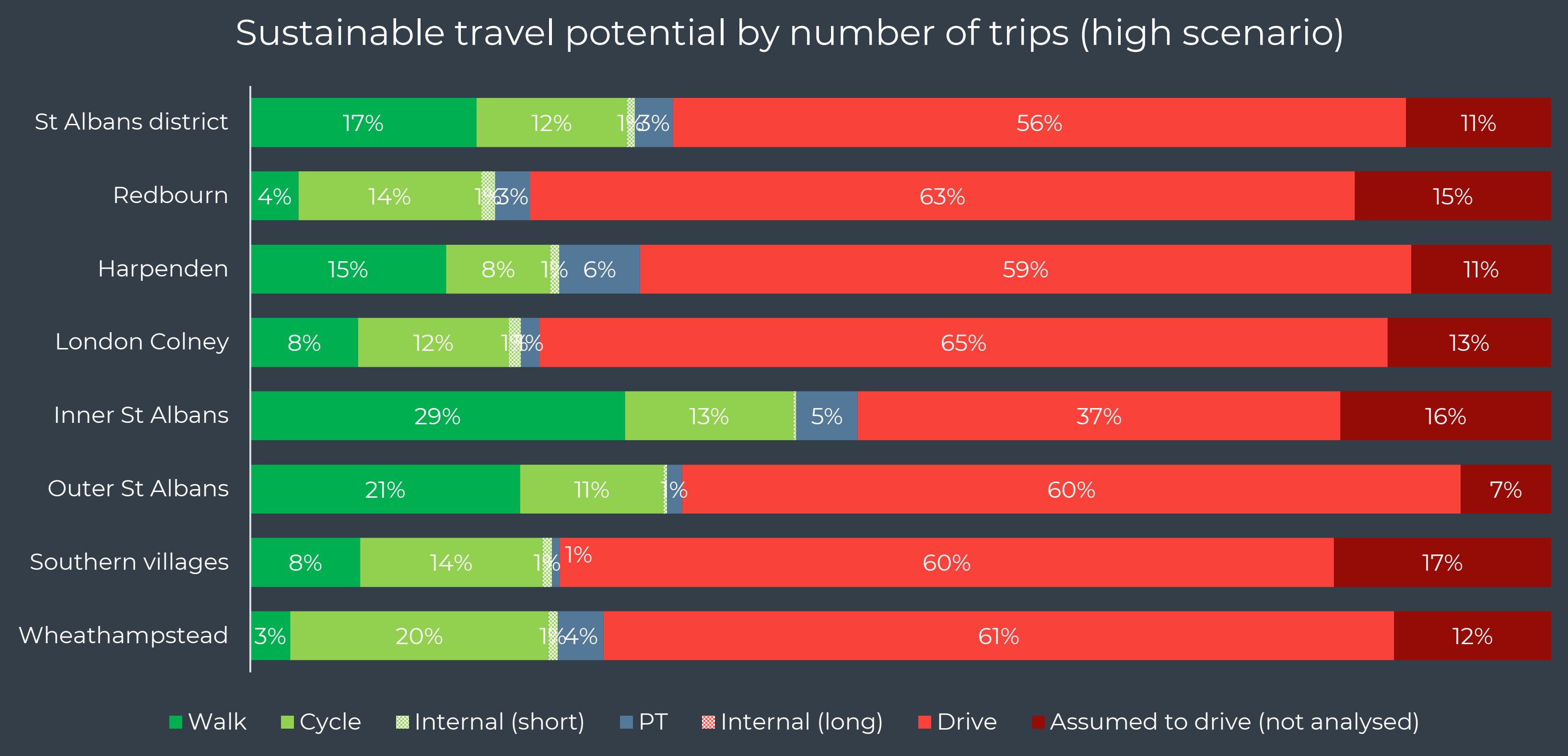
Figure 1.16 shows high and lower sustainable travel potential for trips:

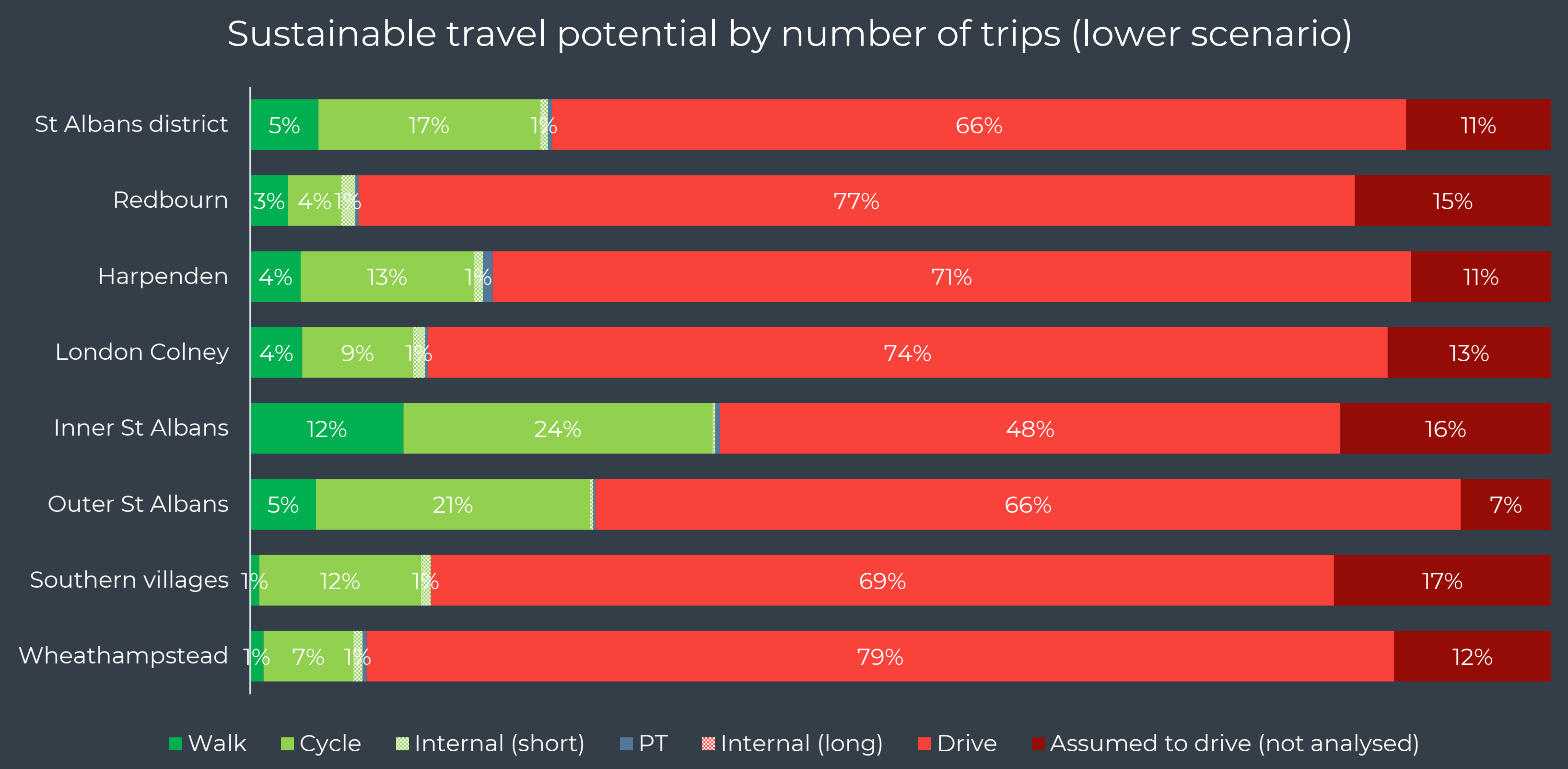
- St Albans district– potential is between 23-32%, with walking being 5-17%, cycling 12-17% (including short internal trips) and public transport up to 3%. Around 68-77% of trips will be driven (including not analysed trips assumed to be driven).

- Inner St Albans City – potential is between 36-47%, with walking being 12-29%, cycling 13-24% (including short internal trips) and public transport up to 5%. Around 53-64% of trips will be driven (including not analysed trips assumed to be driven).

- Outer St Albans City – potential is between 27-33%, with walking being 5-21%, cycling 11-21% (including short internal trips) and public transport up to 1%. Around 67-73% of trips will be driven (including not analysed trips assumed to be driven).

Figure 1.16 Sustainable travel potential by number trips for high (top) and lower (bottom) scenarios





Walking potential

Up to **17%** of trips across St Albans district, **29%** in the Inner St Albans City and **21%** in the Outer St Albans City could be made by walking as the main mode

Redbourn	Main mode	First and last mile*
Daily trips	Around 100	0 - 200
Daily people km	100 - 200	0 - 1,200

Harpenden	Main mode	First and last mile*
Daily trips	1,700 - 6,800	300 - 3,600
Daily people km	2,200 - 14,000	6,100 - 49,400

London Colney	Main mode	First and last mile*
Daily trips	500 – 1,100	0 - 300
Daily people km	600 - 2,000	500 - 1,900

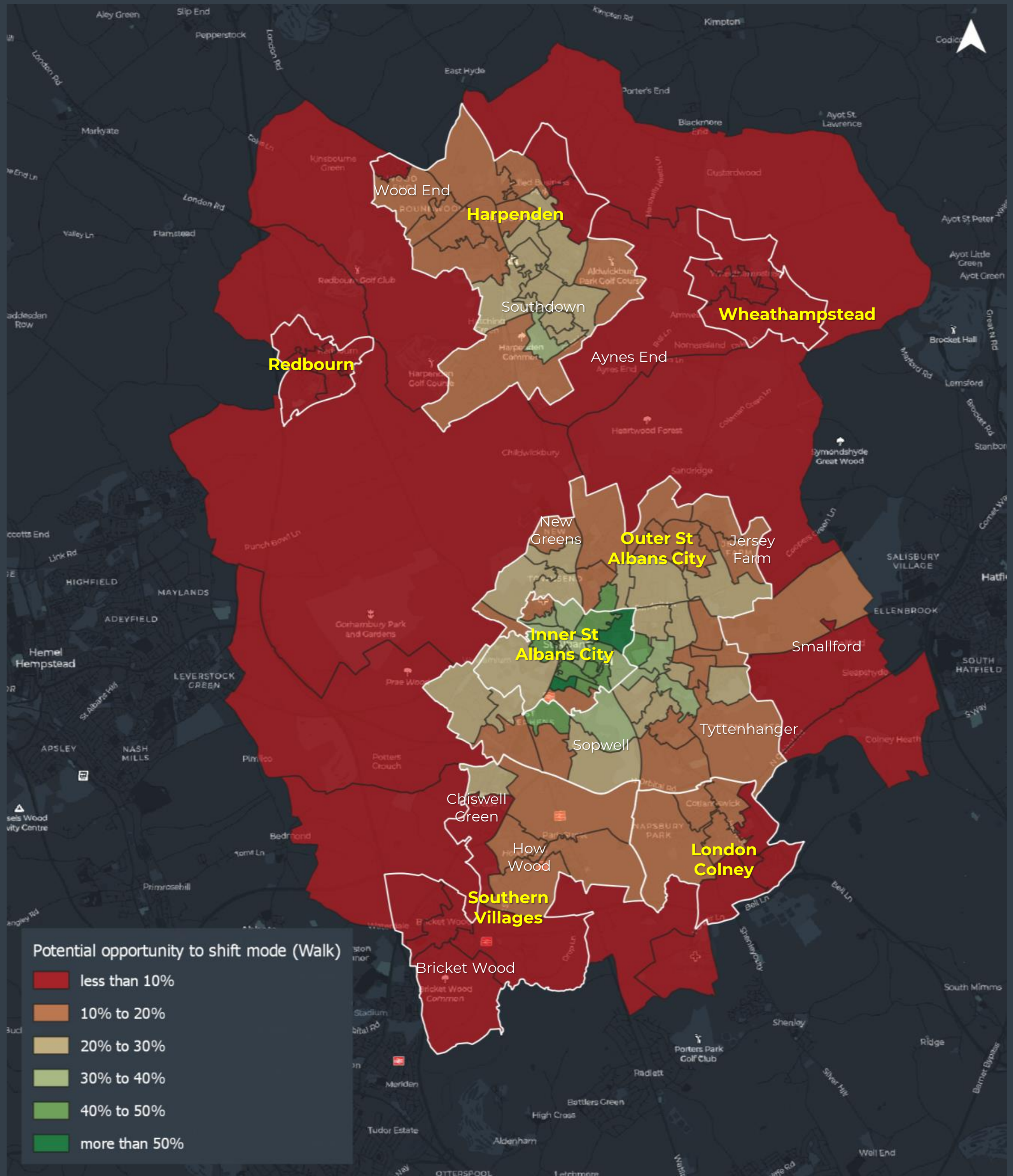
Inner St Albans	Main mode	First and last mile*
Daily trips	5,600 - 13,700	200 - 3,700
Daily people km	6,000 - 25,000	3,800 - 41,400

Outer St Albans	Main mode	First and last mile*
Daily trips	4,000 - 16,700	100 – 1,600
Daily people km	4,900 - 34,700	3,900 - 18,600

Southern villages	Main mode	First and last mile*
Daily trips	100 - 900	0 - 200
Daily people km	100 - 2,000	0 - 2,200

Wheathampstead	Main mode	First and last mile*
Daily trips	100 - 200	0 - 800
Daily people km	100 - 300	100 - 3,400

Figure 1.17 Walking potential in St Albans district (high scenario)



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Cycling potential

Up to **12%** of trips across St Albans district, **13%** in the Inner St Albans City and **11%** in the Outer St Albans City could be made by cycling as the main mode

Redbourn	Main mode	First and last mile*
Daily trips	200 - 600	0 - 200
Daily people km	600 - 2,900	0 - 1,200

Harpenden	Main mode	First and last mile*
Daily trips	7,600 - 9,800	300 - 3,600
Daily people km	18,500 - 33,000	6,100 - 49,400

London Colney	Main mode	First and last mile*
Daily trips	1,600 - 2,600	0 - 300
Daily people km	4,200 - 10,300	500 - 1,900

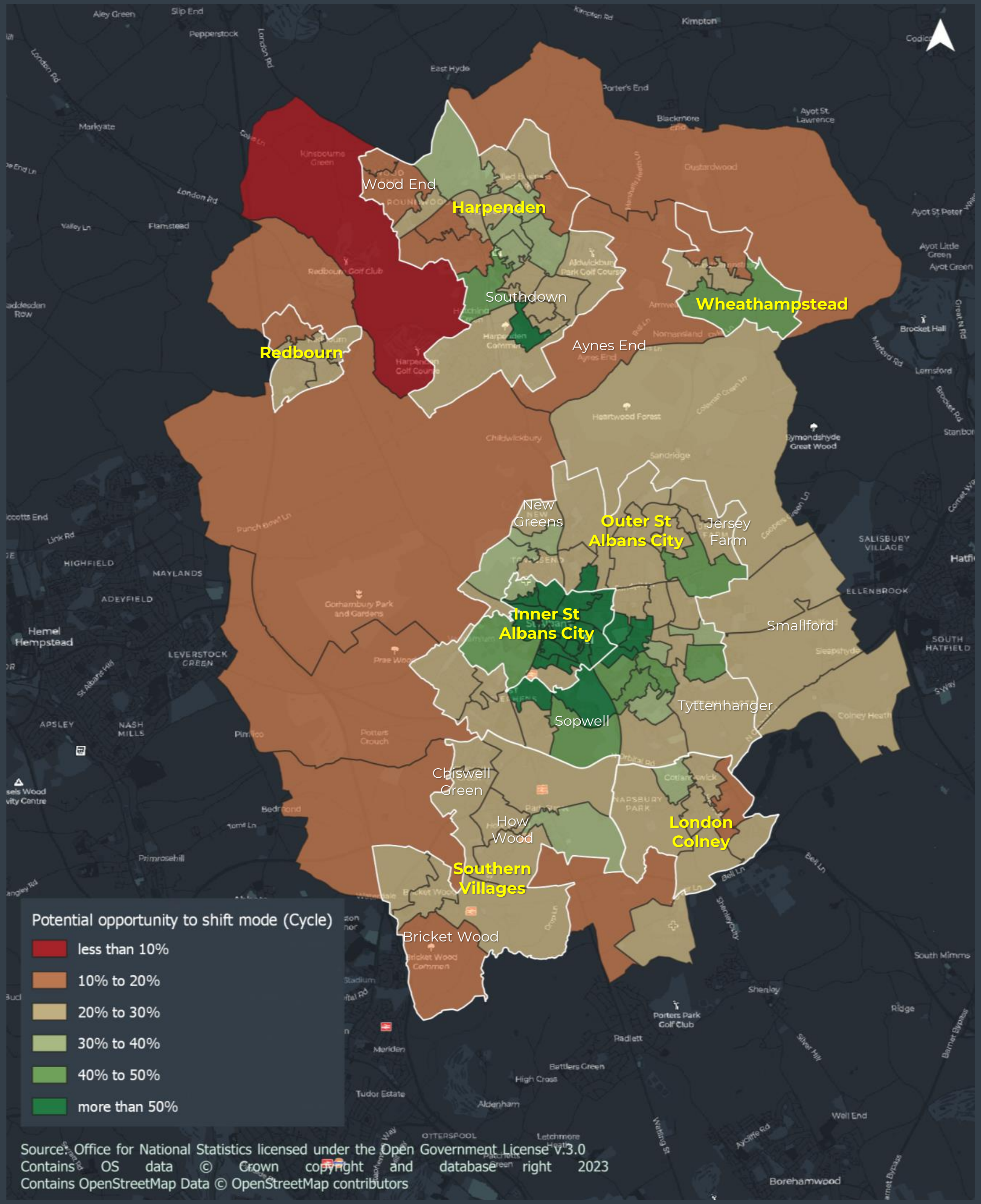
Inner St Albans	Main mode	First and last mile*
Daily trips	17,200 - 20,600	200 - 3,700
Daily people km	37,100 - 60,300	3,800 - 41,400

Outer St Albans	Main mode	First and last mile*
Daily trips	21,000 - 25,300	100 – 1,600
Daily people km	51,500 - 78,800	3,900 - 18,600

Southern villages	Main mode	First and last mile*
Daily trips	1,300 - 2,200	0 - 200
Daily people km	4,200 - 9,500	0 - 2,200

Wheathampstead	Main mode	First and last mile*
Daily trips	500 – 1,400	0 - 800
Daily people km	1,600 - 7,700	100 - 3,400

Figure 1.18 Cycling potential in St Albans (high scenario)



Public transport potential

Up to **3%** of trips across St Albans district, **5%** in the Inner St Albans City and **1%** in the Outer St Albans City could be made by public transport as the main mode

Redbourn	Main mode
Daily trips	0 - 200
Daily people km	100 - 2,100

Harpenden	Main mode
Daily trips	300 - 3,600
Daily people km	5,600 - 43,400

London Colney	Main mode
Daily trips	0 - 300
Daily people km	700 - 3,700

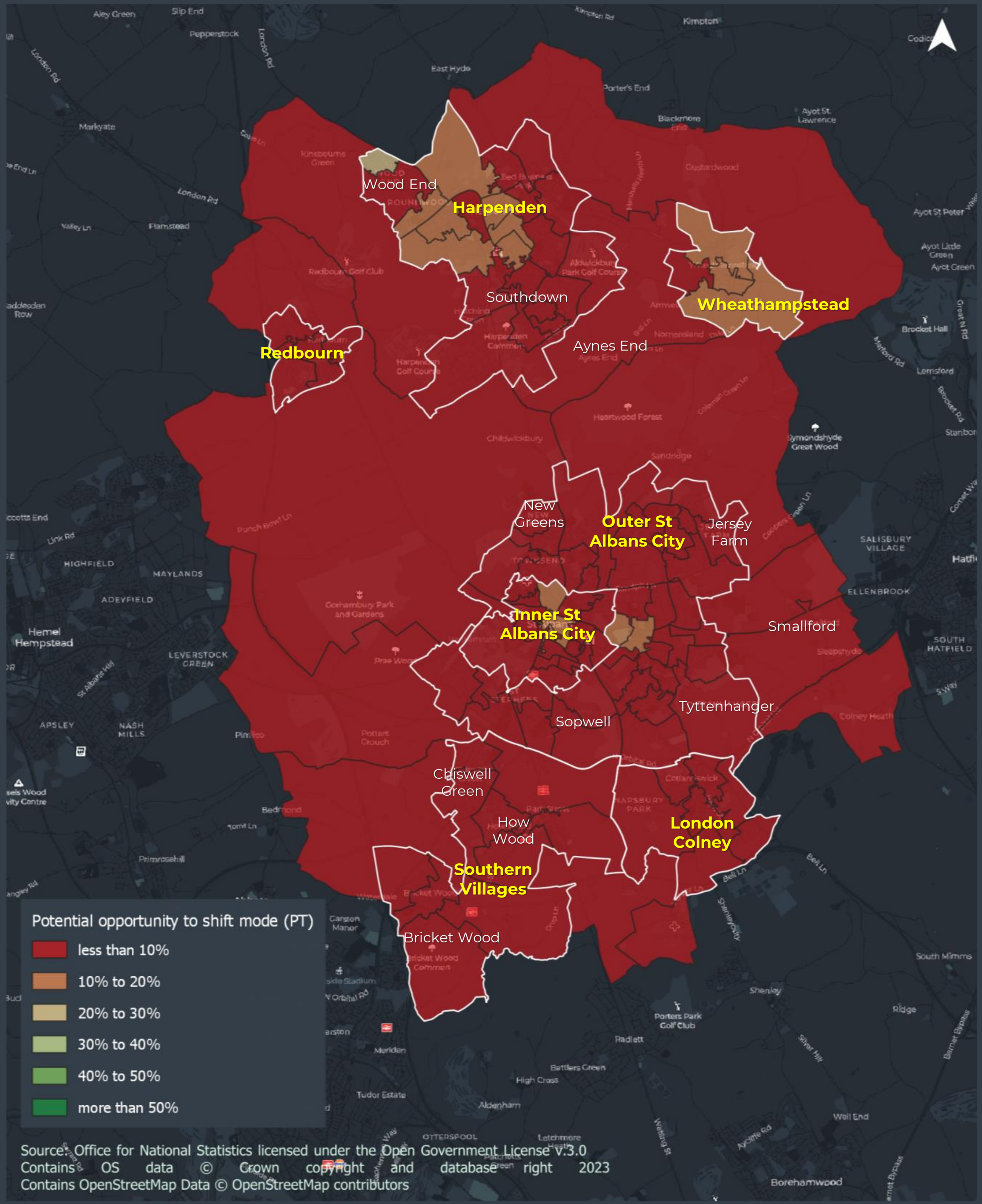
Inner St Albans	Main mode
Daily trips	200 - 3,700
Daily people km	2,700 - 39,300

Outer St Albans	Main mode
Daily trips	100 – 1,600
Daily people km	3,600 - 18,400

Southern villages	Main mode
Daily trips	0 - 200
Daily people km	0 - 1,300

Wheathampstead	Main mode
Daily trips	0 - 800
Daily people km	100 - 6,200

Figure 1.19 Public transport potential in St Albans (high scenario)



SUMMARY AND NEXT STEPS

Findings

This part of the report focuses on understanding the sustainable travel opportunity, propensity and potential for St Albans district to understand its modal shift.

Sustainable travel opportunity

The assessment indicates that based on modelled origin-destination matrices for 2031, current active travel networks and available public transport services – up to 68% of existing car trips in the St Albans district, 68% in the Inner St Albans City and 79% in the Outer St Albans City could be made by sustainable methods - predominantly by active modes.

The walking and cycling opportunity provides detail around where to focus active travel improvements to unlock additional trips and could be used to support the Local Cycling and Walking Infrastructure Plan being developed for St Albans district.

Only about 6% of car trips could reasonably use public transport based on existing services – which suggests an opportunity to improve the network to better match the origins-destinations of users (coverage and frequency) and be more time competitive with driving (speed) – focussed on commuting, education, shopping and personal business trips.

Sustainable travel propensity

This work which is benchmarked to the England average and based on current socio-demographics of the area, shows that while propensity is mixed across St Albans district – there are areas with a higher likelihood to walk, cycle and use public transport. These areas should be prioritised for active and public transport interventions to unlock the potential.

Sustainable travel potential

Based on the findings on the opportunity and propensity work, it is estimated that up to 32% of car trips in the St Albans district, 47% in the Inner St Albans City and 33% in the Outer St Albans City would use sustainable modes. It is noted that this is a worst-case scenario – based on the existing active and public transport options available, as well as the propensities of the current population.

Measures to increase sustainable travel opportunity such as enhanced walking, cycling, bus and rail networks could increase the number of trips that could be made.

Demographic change in existing communities and new developments could increase the propensity to use active and public transport.

Next part

Part 2 of this report will summarise the findings from Task 2 – sustainable travel opportunity, propensity, and potential for specified new developments in St Albans district. The new developments (with projected number of households) assessed were:

- East Hemel (north) – 1,600 households
- East Hemel (south) – 1,835 households
- North Hemel – 325 households
- Northeast Harpenden – 610 households
- North St Albans City – 1,100 households
- East St Albans City – 511 households

As with Part 1, an average across the assessed new developments will also be set out.

Part 2 follows the same structure as Part 1:

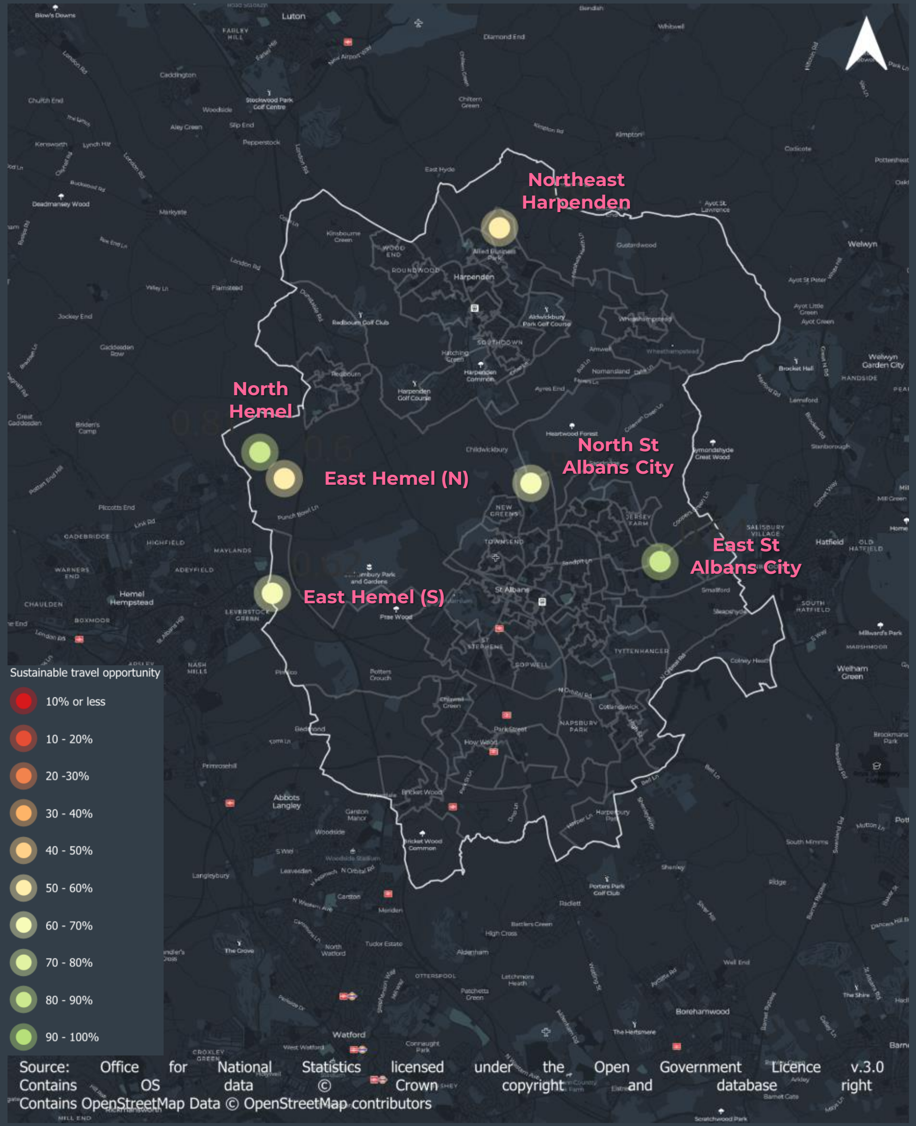
- Part 2A: Sustainable travel opportunity for new developments
- Part 2B: Sustainable travel propensity for new developments
- Part 2C: Sustainable travel potential for new developments

PART 2

Sustainable travel potential for new developments

SUSTAINABLE TRAVEL POTENTIAL FOR NEW DEVELOPMENTS

Sustainable travel opportunity



We calculated that:

- Up to 65% of modelled car trips across the assessed development zones in St Albans district have the opportunity to switch to sustainable modes.
- East St Albans City has the highest opportunity - up to 84% of modelled car trips have the opportunity to switch, followed by North Hemel (up to 81%), North St Albans City (up to 70%), East Hemel (S) (up to 62%), East Hemel (N) (up to 60%) and Northeast Harpenden (up to 58%).

X

Sustainable travel propensity

	Mosaic Group	New developments
B	Prestige Positions	10%
G	Domestic Success	60%
H	Aspiring Homemakers	15%
O	Rental Hubs	15%

What did we find:

Based on expected socio-demographics of the St Albans district development zones, new residents will have below average propensities for walking, cycling, bus and rail but above average propensity to drive. The Mosaic profile is based on the existing development of Oaklands in St Albans district, proposed housing types (e.g. affordable, social and rental) and validated using similar developments in the wider region. These propensities could change if sustainable travel provision is improved.

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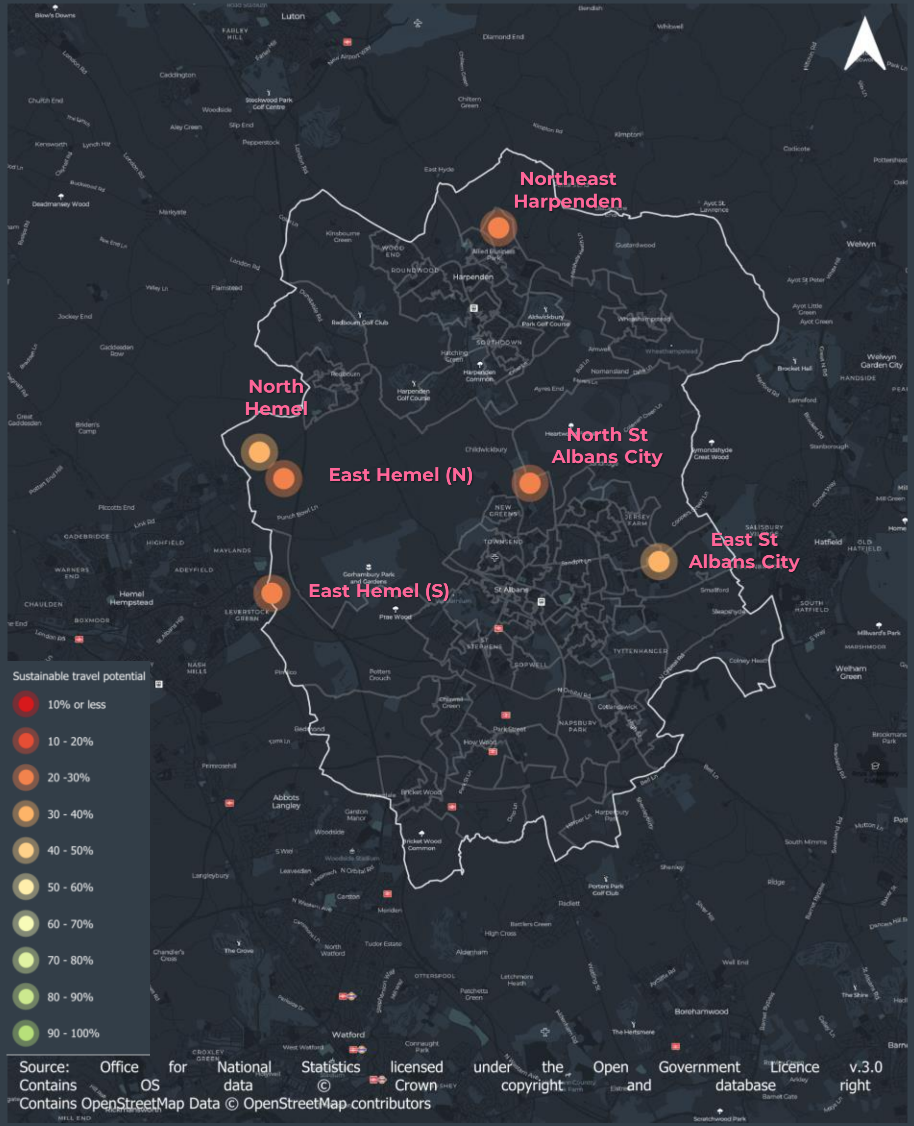
Sustainable travel potential



We calculated that:

- Up to 27% of modelled car trips across the assessed development zones in St Albans district have the potential to switch to sustainable modes.
- East St Albans City has the highest potential - up to 34% of modelled car trips have the potential to switch, followed by North Hemel (up to 32%), North St Albans City and East Hemel (N) (both up to 28%), East Hemel (S) (up to 25%) and Northeast Harpenden (up to 23%).

PART 2A

Sustainable travel opportunity for new developments

Sustainable travel opportunity

How many car trips in St Albans development zones could be made by sustainable modes?

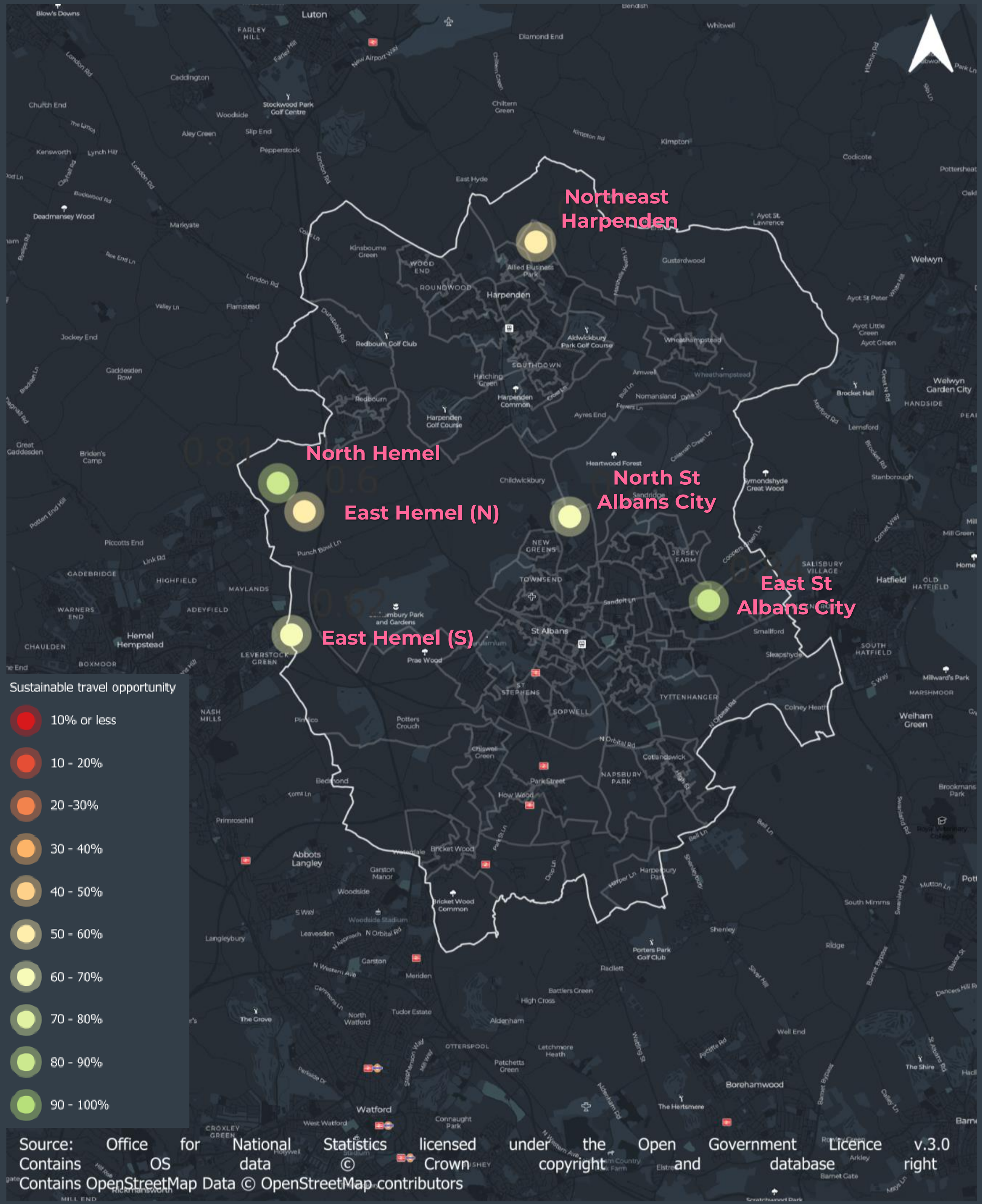
Figure 2.1 shows where the opportunity for modelled car trips to switch to sustainable modes across the different St Albans district development zones (high scenario). East St Albans City and North Hemel have the largest opportunity and Northeast Harpenden has the lowest. A high and lower scenarios for sustainable travel opportunities have been estimated based on distance and time (see methodology note). It is worth noting that these outputs assume no new sustainable transport provision, which is unlikely in reality – and therefore can be seen as a baseline level of opportunity.

Key findings include:

- 46-65% of modelled car trips in the new developments have the opportunity to shift to sustainable modes. Cycling provides the highest opportunity with 37-40% of car trips able to switch to cycling. 6-27% of car trips could switch to walking and less than 1% to public transport
- East St Albans City has the highest opportunity for car trips to shift to sustainable modes, with 67-84% of trips able to shift.
- North Hemel has the second highest opportunity, with 62-81% of car trips able to shift to sustainable modes, and North St Albans city has the third highest with 50-70% opportunity.
- The two East Hemel developments have similar opportunity – the southern development has 41-62% and the northern has 43-60%.
- Northeast Harpenden has the lowest sustainable travel opportunity, with 45-58% of car trips able to switch.

The following pages break down the sustainable travel opportunity for each existing community by high and lower sustainable travel opportunity scenarios (trips and vehicle kilometres travelled (VKT)).

Figure 2.1 Sustainable travel opportunity in St Albans development zones (high scenario)



Sustainable travel opportunity

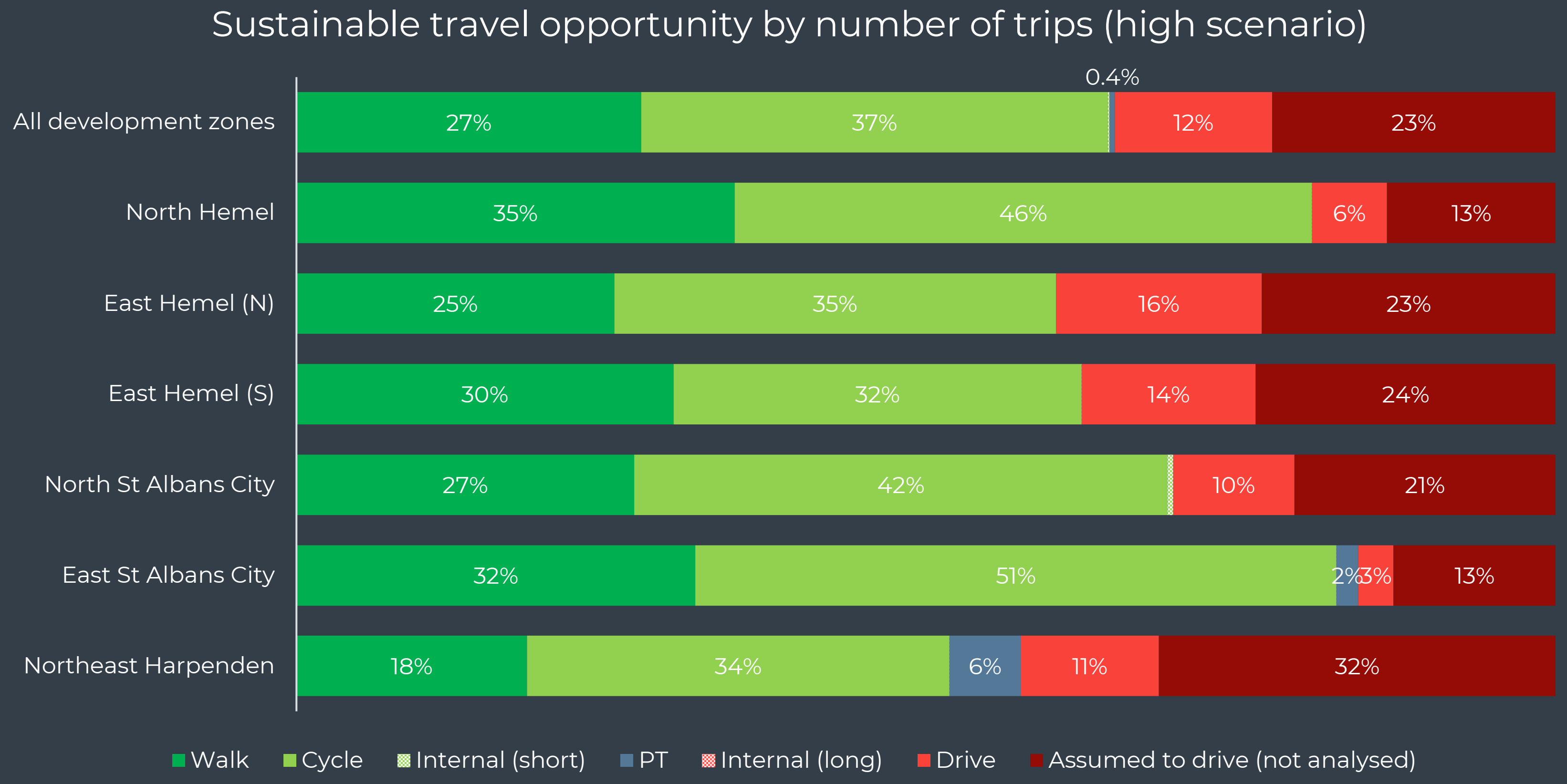
How many car trips in St Albans development zones could be made by sustainable modes?

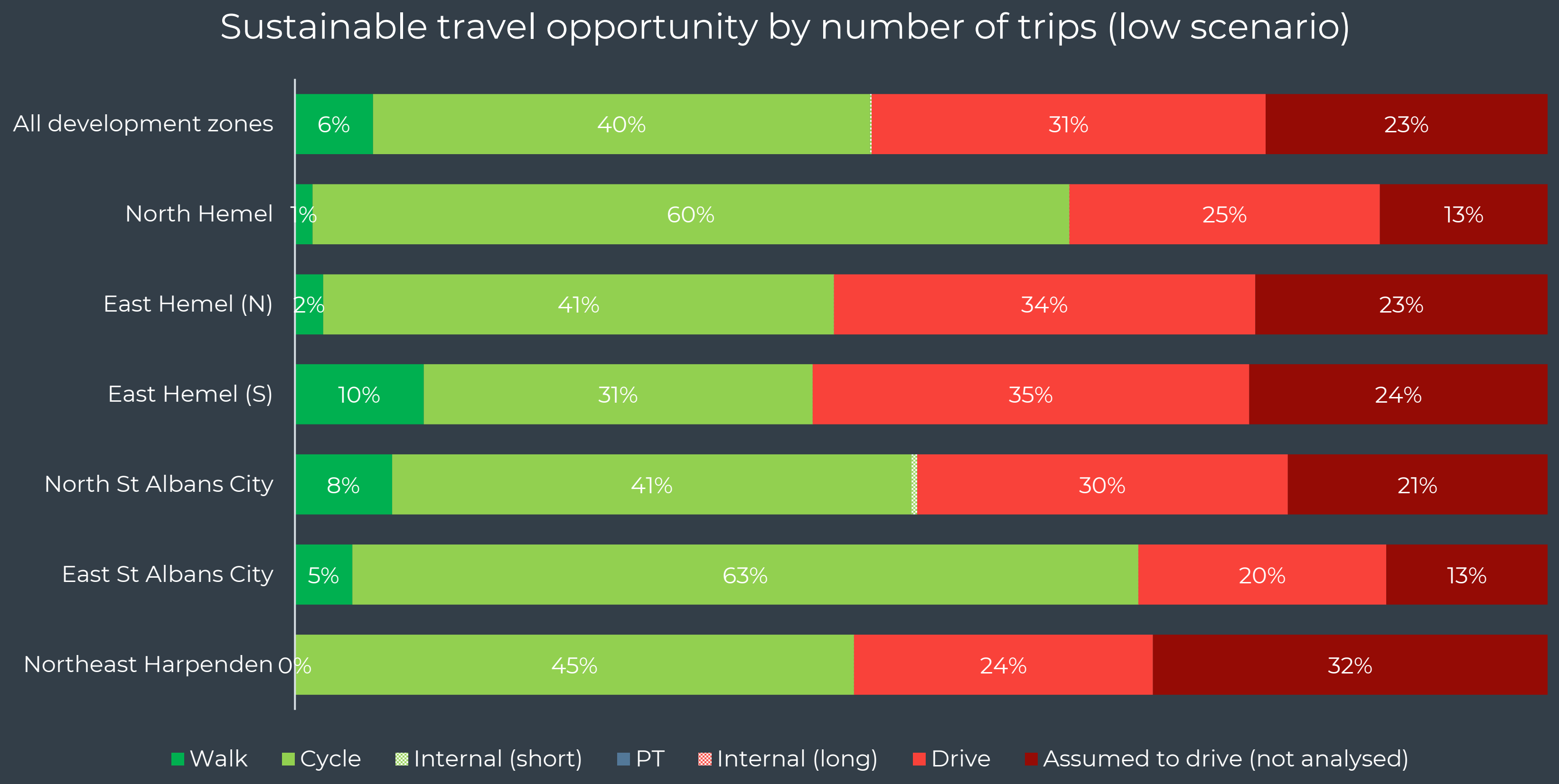
Figure 2.2 shows the total sustainable travel opportunity by trips (high and lower scenarios) for the assessed developments across St Albans district and individually for each zone. Generally, the development zones with higher opportunity are the ones in closer proximity to more denser areas like Hemel Hempstead and St Albans City.

- All assessed development zones – opportunity is between 46-65%, with walking between 6-27%, cycling 37-40% and public transport less than 1%. This results in 35-54% of car trips that could not switch (including not analysed trips assumed to be driven).
- East St Albans City – opportunity is between 67-85% with walking being 5-32%, cycling 51-63% and public transport being up to 2%.
- North St Albans City – opportunity is between 50-70% with walking being 8-27%, cycling 41-42% and public transport less than 1%
- North Hemel – opportunity is between 62-81%, with walking 1-35%, cycling 46-60% and less than 1% for public transport.
- East Hemel – the northern development has 43-60% opportunity, with walking 2-25%, cycling 35-41% and less than 1% public transport. The southern development has 41-62% opportunity, with walking 10-30%, cycling 31-32% and less than 1% for public transport.
- Northeast Harpenden – opportunity is between 45-58%, with walking up to 18%, cycling 34-45% and up to 6% for public transport.

These areas are aligned to COMET zones and the trips are based on the 2031 O-D matrix which includes assumed future growth and development, but with existing sustainable transport provision. The intention is to provide a baseline on the number of future trips that could be made by sustainable modes – in the absence of any new provision.

Figure 2.2 Mode shift split (trips) by development (high scenario is top and lower scenario is bottom)





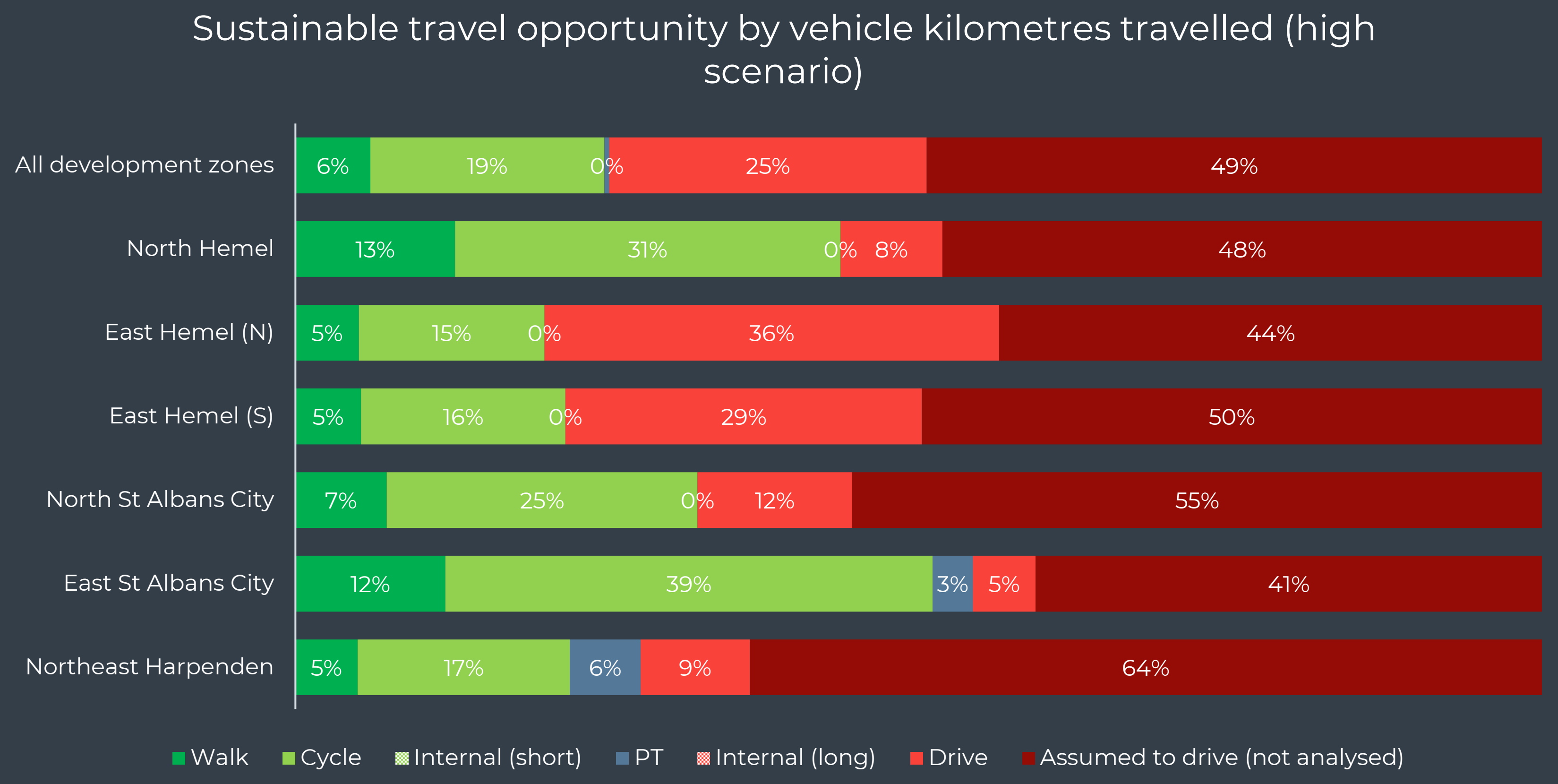
Sustainable travel opportunity

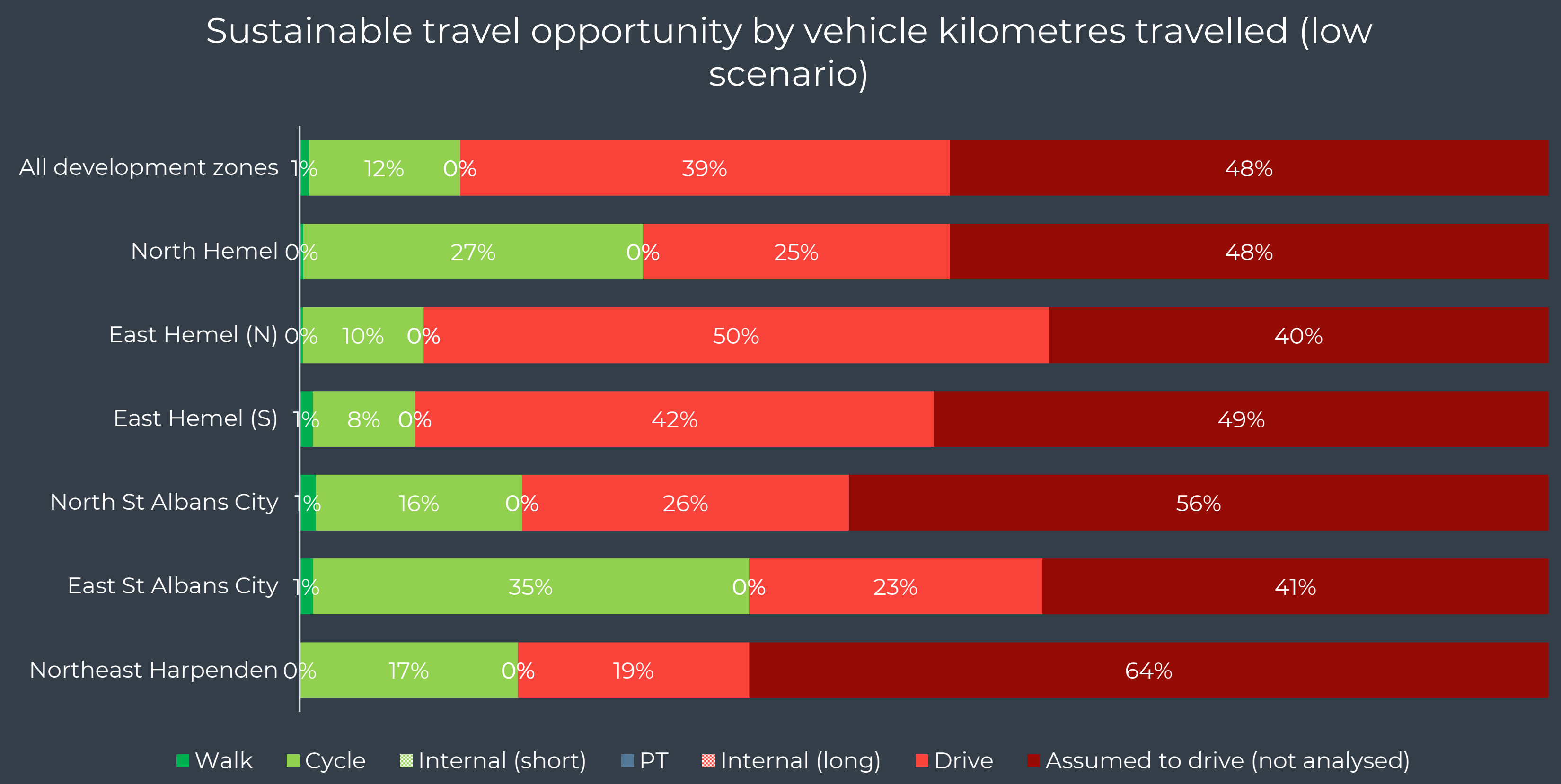
What is the sustainable travel opportunity by vehicle kilometres travelled (VKT)?

Figure 2.3 shows high and lower sustainable travel opportunity based on distance travelled. VKT (or people km) is important to consider as it highlights longer distance journeys, which typically have fewer trips, but can have a large effect on carbon emissions.

- All assessed development zones opportunity is between 13-25%, with walking being 1-6%, cycling 12-19% and public transport less than 1%. This results in 75-87% of car kilometres that could not switch (including not analysed trips assumed to be driven).
- East St Albans City opportunity is between 36-54% with walking at 1-12%, cycling at 35-39% and public transport up to 3%.
- North St Albans City – opportunity is between 18-32% with walking being 1-7%, cycling 16-25% and public transport less than 1%
- North Hemel opportunity is between 27-44% with walking up to 13%, cycling at 27-31% and less than 1% public transport.
- Northeast Harpenden opportunity is between 17-28% with walking up to 5%, cycling around 17% and up to 6% public transport.
- East Hemel (S) opportunity is between 9-22% with walking at 1-5%, cycling at 8-16% and less than 1% for public transport
- East Hemel (N) opportunity is between 10-20% with walking at up to 5%, cycling at 10-15% and less than 1% for public transport

Figure 2.3 Mode shift split (VKT) by new development (high scenario is top and lower scenario is bottom)





Sustainable travel opportunity

Walking, cycling and public transport opportunity in St Albans development zones

Figure 2.4 shows the number of trips that could be walked, cycled or taken by public transport while **Figure 2.6, 2.7 and 2.8** shows the proportion of trips that could be taken by each mode across the district.

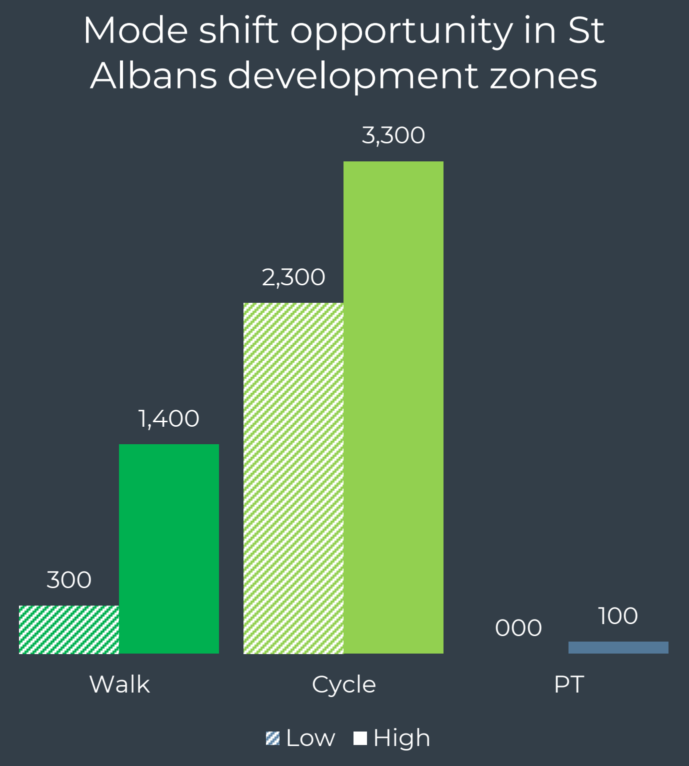
Key findings include:

- **Cycling** presents the greatest opportunity for mode shift with a range of 2,300 - 3,300 modelled car trips able to be cycled across the development zones. Generally, cycling opportunity is evenly distributed across the zones with no zone showing below 30% opportunity.
- **Walking** opportunity is higher is the zones closer to Hemel Hempstead such as North Hemel and East Hemel, followed by zones closer to St Albans such as North and East St Albans where journeys are likely to be smaller distances to nearby urban centres. 300-1,400 such trips are able to be walked.
- **Public transport** opportunity is less than 1% in most zones except East St Albans and Northeast Harpenden with 2% and 6 opportunity, respectively. In terms of daily trips this is between 0 - 100. However, this is based on existing public transport provision.

Figure 2.5 (overleaf) shows the number of trips able to be walked, cycled or taken by public transport across the St Albans development zones.

A detailed list of the range of trips with the opportunity to shift by mode table can be found in **Appendix B (Table B2)**.

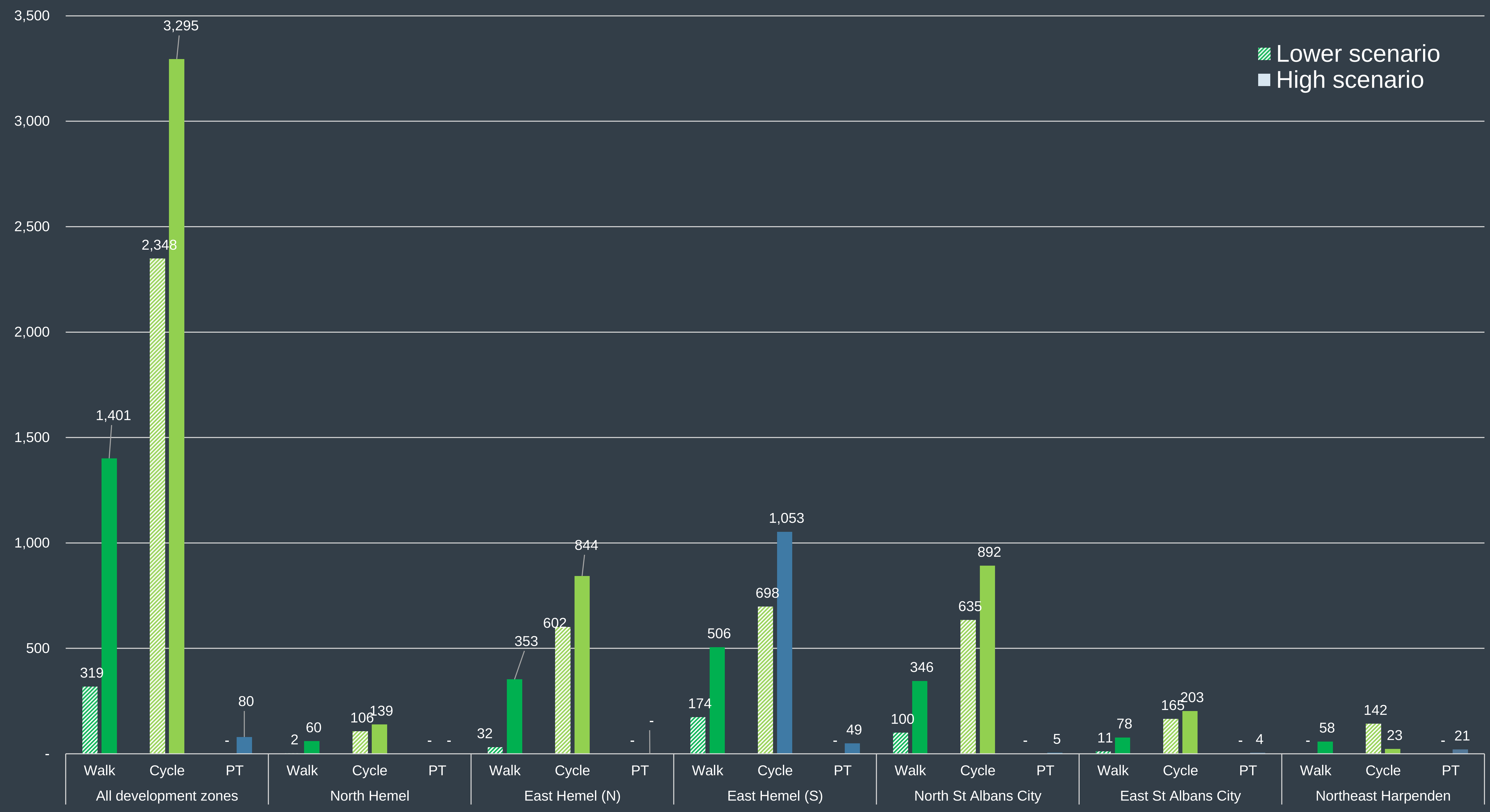
Figure 2.4 Range of trips with the opportunity to shift by mode (St Albans)



	Walking opportunity		Cycling opportunity		PT opportunity
	Main mode	First and last mile*	Main mode	First and last mile*	Main mode
Daily trips	300 - 1,400	0 - 100	2,300 - 3,300	0 - 100	0 - 100
Daily people km	400 - 3,000	0 - 100	6,700 - 12,600	0 - 100	0 - 600

* Linked to public transport trips

Figure 2.5 Mode shift split (trips) in new development zones under high and lower sustainable travel opportunity scenarios



Sustainable travel opportunity

Walking opportunity in St Albans development zones

Figure 2.6 sets out the opportunity to walk for the new development zones in St Albans district (high scenario).

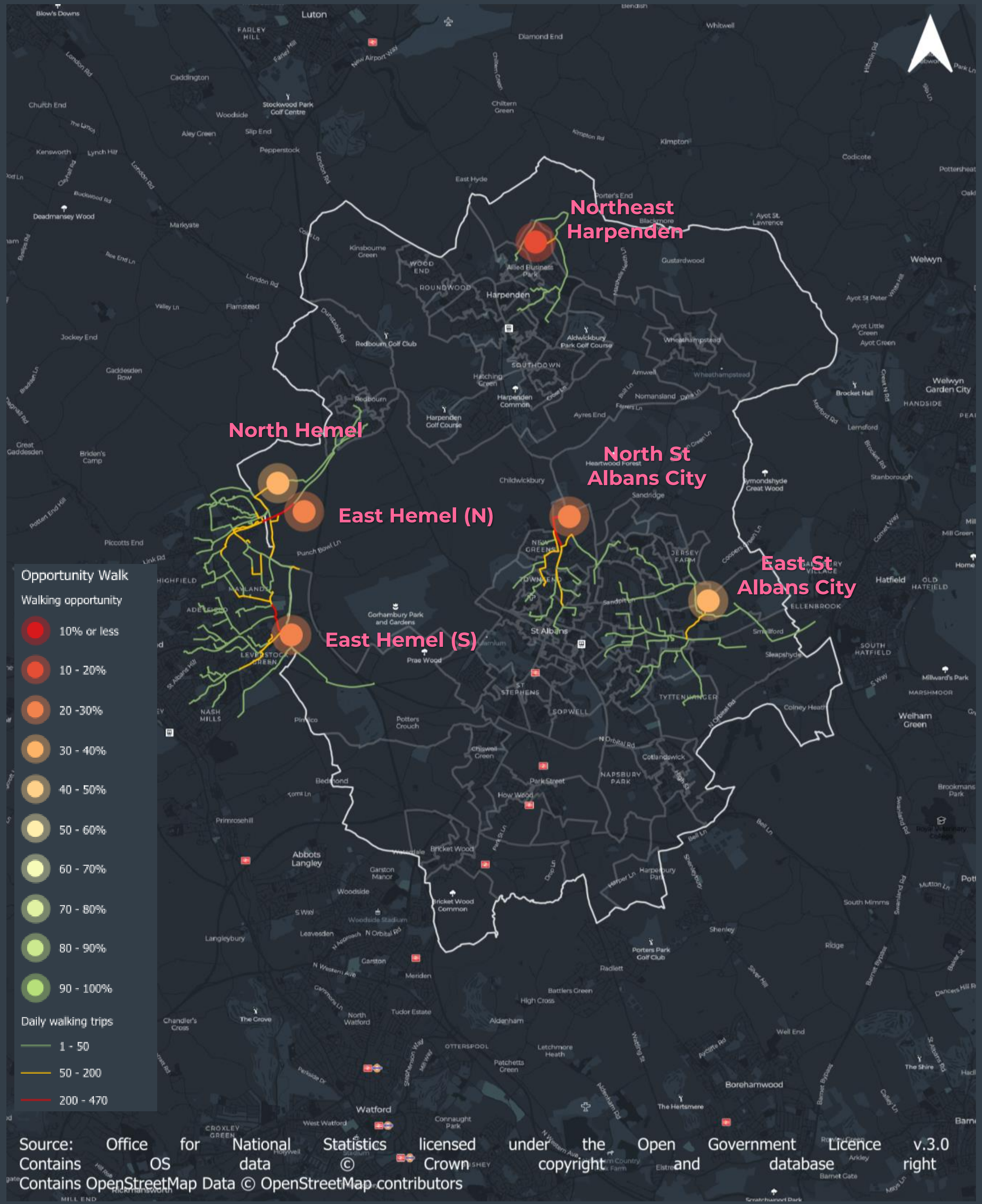
Walking opportunity varies across the six developments, with zones closer to Hemel Hempstead and St Albans City showing higher opportunity.

In the high scenario, walking opportunity is highest in North Hemel with 35% opportunity and routes connecting to Hemel Hempstead having a high trip opportunity between 50-470 trips. Some walking opportunity is also observed from North Hemel to Redbourn with up to 50 trips. However, in the lower scenario – walking opportunity is only 1% which shows that most of the car trips that could switch to walking are between 1-2 miles and only a small number of trips from this zone under 1 mile.

Northeast Harpenden (0-18%) and East Hemel (N) (2-25%) also have a large range for walking opportunity, and a particularly low opportunity for walking in the lower scenario, showing that there are limited number of modelled car trips under 1 mile.

East St Albans City (5-32%), North St Albans City (8-27%) and East Hemel (S) (10-30%) have a higher proportion of modelled car trips under 1 mile, due to their proximity to denser areas such as St Albans City and Hemel Hempstead.

Figure 2.6 Walking opportunity in St Albans (high scenario)



Sustainable travel opportunity

Cycling opportunity in St Albans development zones

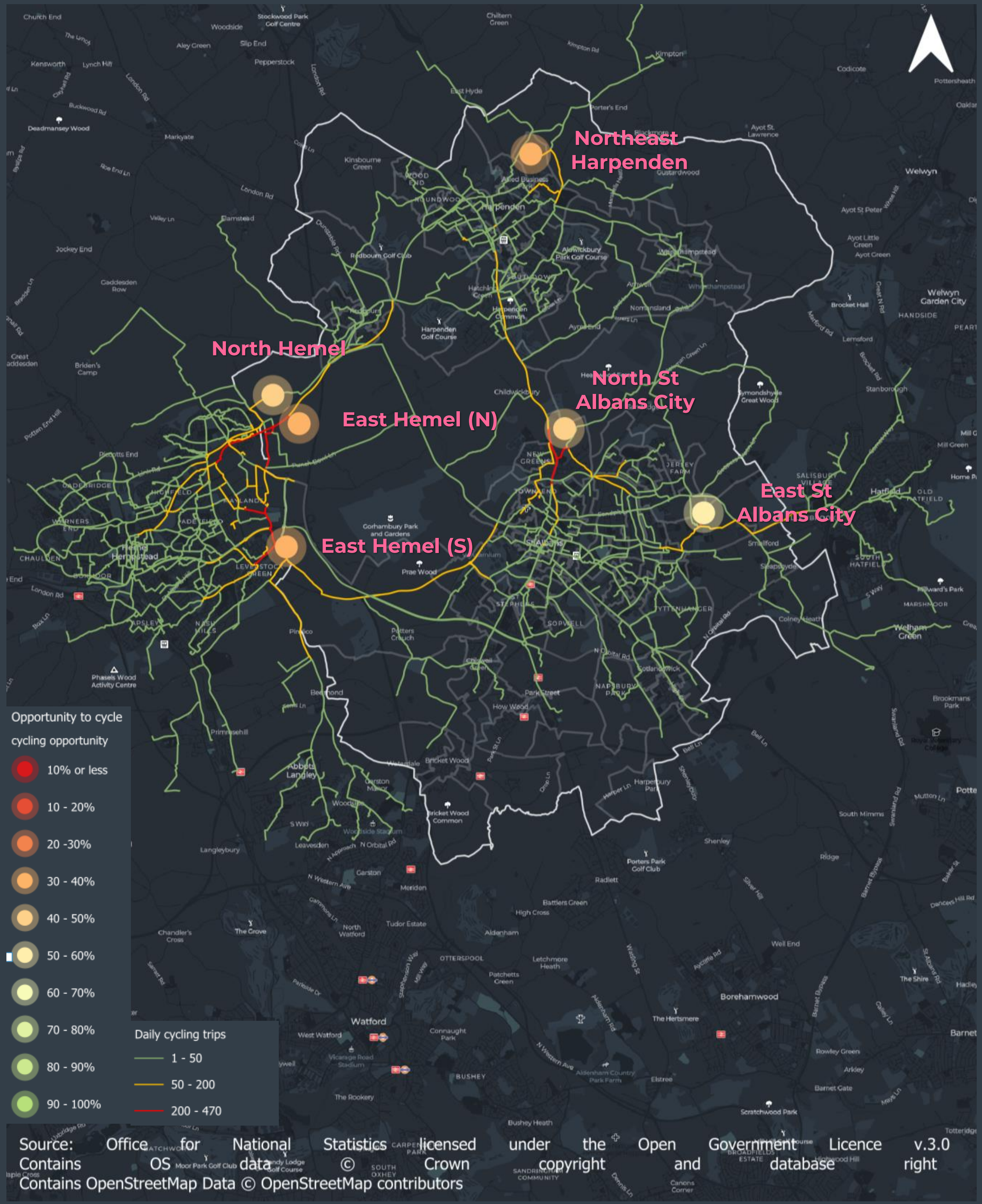
Figure 2.7 sets out the opportunity to cycle for the new development zones in St Albans district (high scenario).

Cycling opportunities across the six developments are higher than walking. The highest opportunity exists in North Hemel, with 46-60% of modelled car trips that could switch to cycling. Perhaps unintuitively, the higher end of the range relates to the lower mode shift scenario here. This is due to trip distance thresholds between walking and cycling, with car trips more than 1 mile not able to switch to walking in the lower scenario, but still able to be cycled. Whereas, in the high scenario, car trips up to 2 miles can be walked – subsequently, reducing the cycling opportunity. This also happens for East Hemel (N), East St Albans City and Northeast Harpenden.

East St Albans City has the second highest cycling opportunity with 51-63% of car trips that could switch to cycling. East Hemel (S) has the lowest opportunity with 31-32%.

Cycling opportunities extend beyond the town centres with 50-200 car trips that could switch to cycling on routes connecting the three denser areas of St Albans City, Hemel Hempstead and Harpenden).

Figure 2.7 Cycling opportunity in St Albans (high scenario)



Sustainable travel opportunity

Public transport opportunity in St Albans development zones

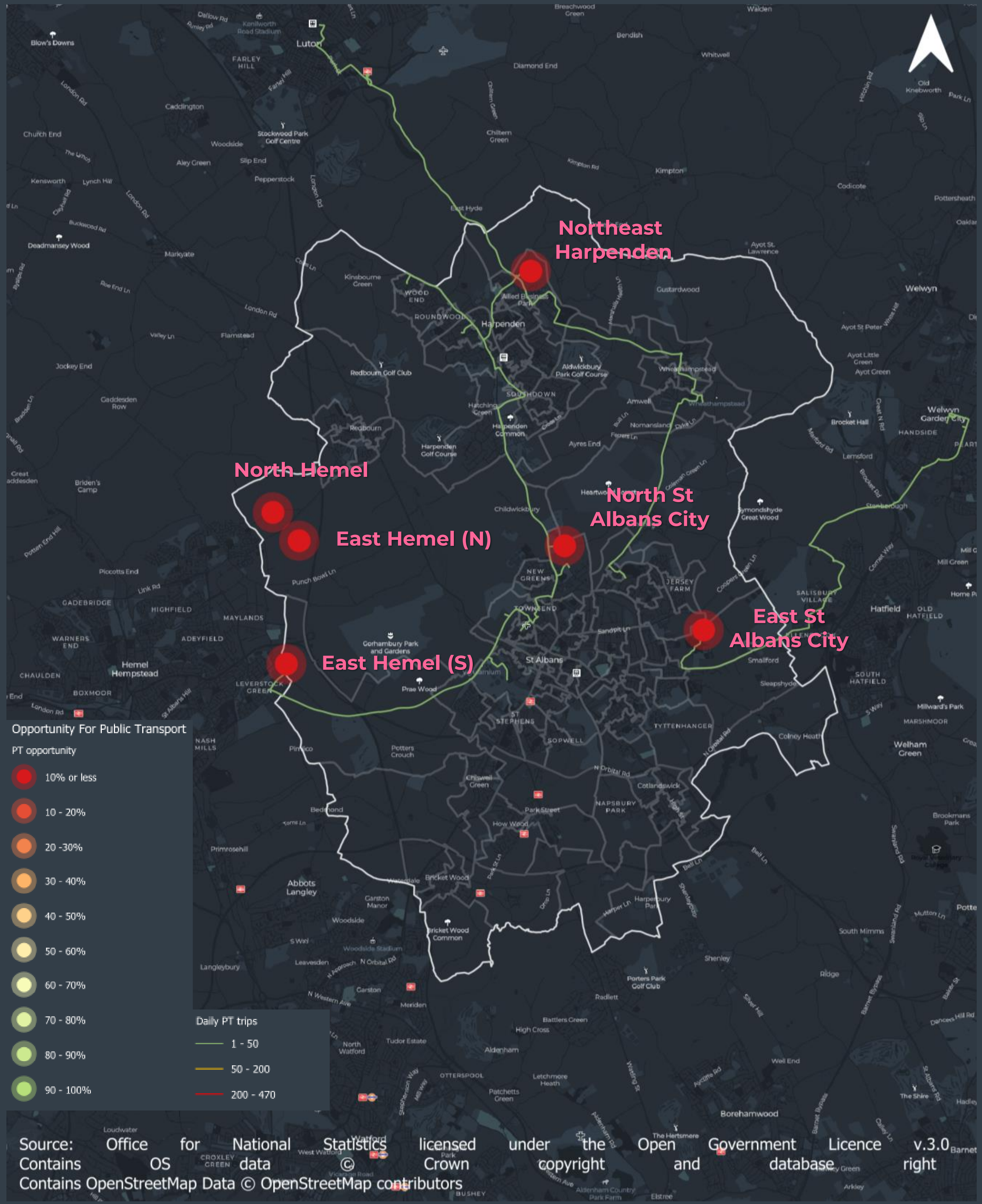
Figure 2.8 sets out the opportunity to use public transport for the new development zones in the St Albans district (high scenario).

Public transport opportunity is very low across the development zones. Northeast Harpenden has some public transport opportunities (up to 6%) with routes to St Albans City (via trains and buses along the A1081) and Luton. East St Albans City also has some opportunities (up to 2%) in public transport opportunity due to connectivity with Welwyn Garden City.

North and East Hemel (N) do not currently have any public transport opportunities and lack connections to Hemel Hempstead. There is an observed public transport connection to St Albans City from East Hemel (South), but very limited opportunity (less than 1%).

However, it should be stressed that this analysis is based on current public transport provision and does not assume any additional infrastructure or services which in reality is unlikely.

Figure 2.8 Public transport opportunity in St Albans (high scenario)



PART 2B

Sustainable travel propensity for new developments

Sustainable travel propensity

Proportion of household

Table 2.1 sets out the proportion of households for St Albans district and the new developments compared to the England average.

This analysis highlights the differences in existing demographics and lifestyles between St Albans district and the new developments, and the England average across various categories.

In England, the proportions of households in each Mosaic Group are relatively evenly spread, with Aspiring Homemakers having the highest proportion at 11% and Modest Traditions having the lowest at 4%.

In St Albans development zones, the proportions of households in each Mosaic Group are different, as they are expected to attract more Aspiring Homemakers, Domestic Success and Rental Hubs households. The Mosaic profiles are based on the existing development of Oaklands in St Albans district, proposed housing types (e.g. affordable, social and rental) and validated using similar developments in the wider region.

The dominant Mosaic Group within the new development zones is assumed to be Domestic Success, representing 60% of households. These households typically have a greater propensity to drive and lower propensity to use sustainable modes than the England average, due to higher incomes, larger dwellings and higher levels of car ownership. Aspiring Homemakers make up 15% of households and have similar propensities to Domestic Success.

Rental Hubs make up 15% of households which typically have a greater propensity to use sustainable modes and a lower propensity to drive than the England average. Prestige Positions make up 10% and these households have a lower propensity to travel in general, with rail and driving propensity just under the England average and lower propensities for walk, cycle and bus.

Table 2.1 Proportion of households in each Mosaic Group in St Albans, its new developments and England

Mosaic Group		St Albans district	New developments	Hemel Hempstead	England average
A	City Prosperity	14%	-	0%	5%
B	Prestige Positions	33%	10%	7%	7%
C	Country Living	1%	-	0%	7%
D	Rural Reality	0%	-	0%	6%
E	Senior Security	4%	-	4%	8%
F	Suburban Stability	1%	-	7%	5%
G	Domestic Success	29%	60%	13%	9%
H	Aspiring Homemakers	5%	15%	21%	11%
I	Family Basics	4%	-	17%	9%
J	Transient Renters	0%	-	4%	6%
K	Municipal Challenge	0%	-	2%	6%
L	Vintage Value	1%	-	6%	6%
M	Modest Traditions	0%	-	3%	4%
N	Urban Cohesion	1%	-	3%	6%
O	Rental Hubs	7%	15%	14%	8%

Sustainable travel propensity

Average mode propensity

Table 2.2 sets out the average mode propensity (i.e. average of all trip types) based on expected socio-demographics for St Albans district development zones compared to the England average (which is 100). A score greater than 100 suggests a higher than England average propensity to use that mode, while a value below 100 suggests the opposite.

In general, based on the expected socio-demographics of new residents, the **St Albans development zones are relatively car-dependent**, with the zones having greater than the England average drive propensity of 100, and propensities to take sustainable modes being less than average.

The propensity to take sustainable modes in St Albans development zones is below the English average with all corresponding propensity scores being below 100 :

- Walking – 80
- Cycling – 80
- Bus – 72
- Rail – 87

More information on Mosaic Groups and Mobility Insights survey and how this feeds into propensities can be found in the methodology note.

Table 2.2 Average propensity for walking, cycling, using bus, using rail and driving (all journey purposes)

Propensity	England average	Hemel Hempstead	St Albans district	New developments
Walk	100	95	91	80
Cycle	100	98	88	80
Bus	100	91	85	72
Rail	100	91	106	87
Drive	100	105	100	104

PART 2C

Sustainable travel potential for new developments

Sustainable travel potential

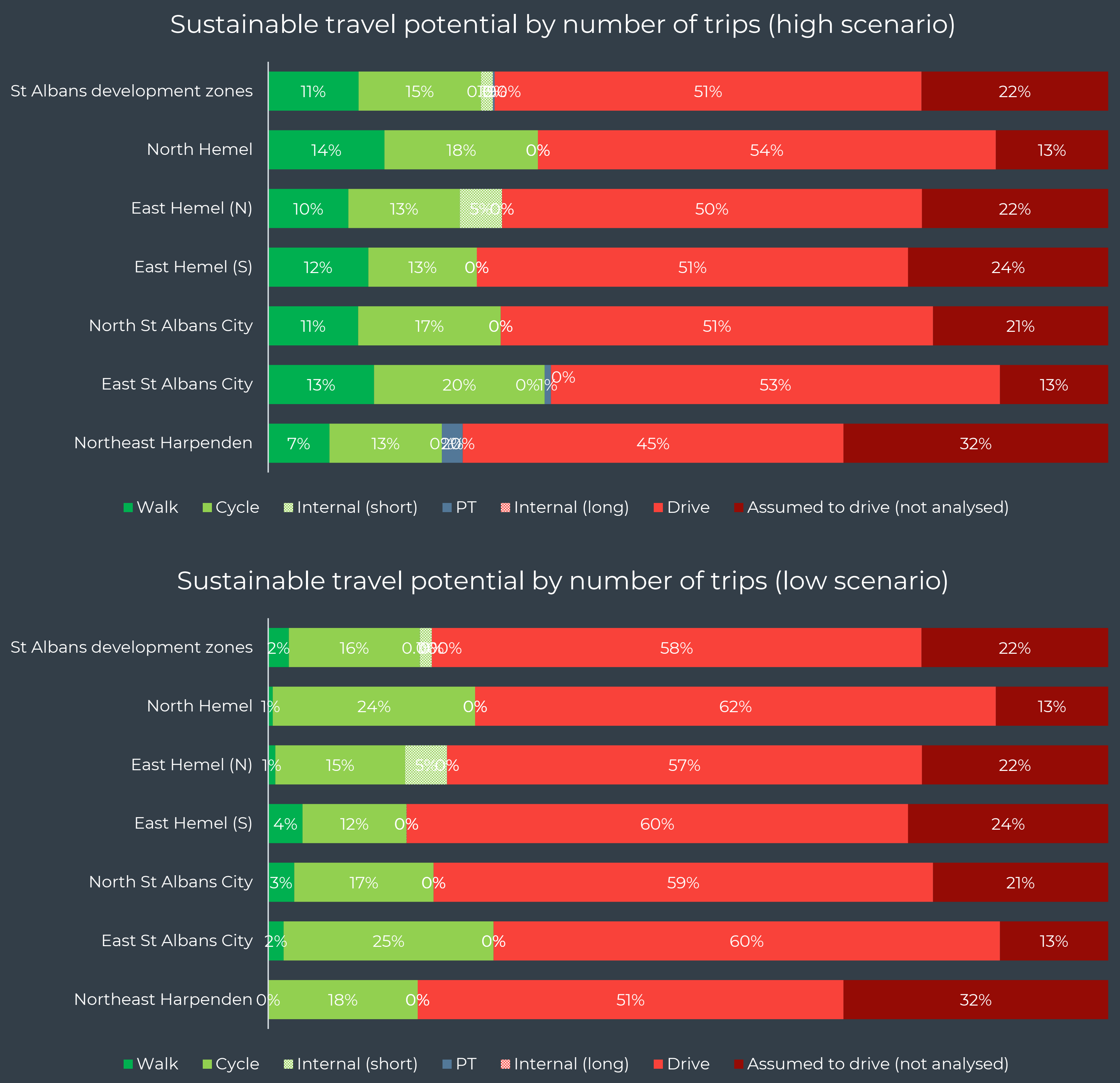
What is the likely sustainable travel potential for the new developments?

Figure 2.9 shows high and lower sustainable travel potential for trips, based on existing provision and expected socio-demographics:

- St Albans development zones – potential is between 19-27% with walking being 2-11%, cycling 15-16% (including short internal trips) and public transport less than 1%. About 73-81% of car trips would not switch (including not analysed trips assumed to be driven)
- East St Albans & North St Albans – potential is highest in East St Albans City at 27-34%, walking being 2-13%, cycling at 20-25% and public transport up to 1%. In North St Albans City, the potential is between 20-28% with 3-11% walking and cycling around 17%. Public transport potential is less than 1%.
- North Hemel & East Hemel – potential is between 25-32% in North Hemel, with walking being 1-14% and cycling at 18-24%. In East Hemel, potential is higher in the northern development with between 21-28% (1-10% walking and 13-15% cycling), compared to 16-25% (4-12% walking and 12-13$ cycling) in the southern development. All Hemel developments have less than 1% potential for public transport.
- Northeast Harpenden – potential is lowest at 18-23%, with walking up to 7%, cycling 13-18% and public transport up to 2%.

This data indicates limited potential to use public transport, suggesting that the current public transport network needs to be improved to ensure that the new developments are better served by public transport.

Figure 2.9 Sustainable travel potential by number trips for high (top) and lower (bottom) scenarios



Walking potential

Up to **11%** of trips across the new developments could be made by walking as the main mode.

North Hemel	Main mode
Daily trips	Less than 50
Daily people km	Up to 100

East Hemel (North)	Main mode
Daily trips	Up to 100
Daily people km	100 - 300

East Hemel (South)	Main mode
Daily trips	100 – 200
Daily people km	100 - 400

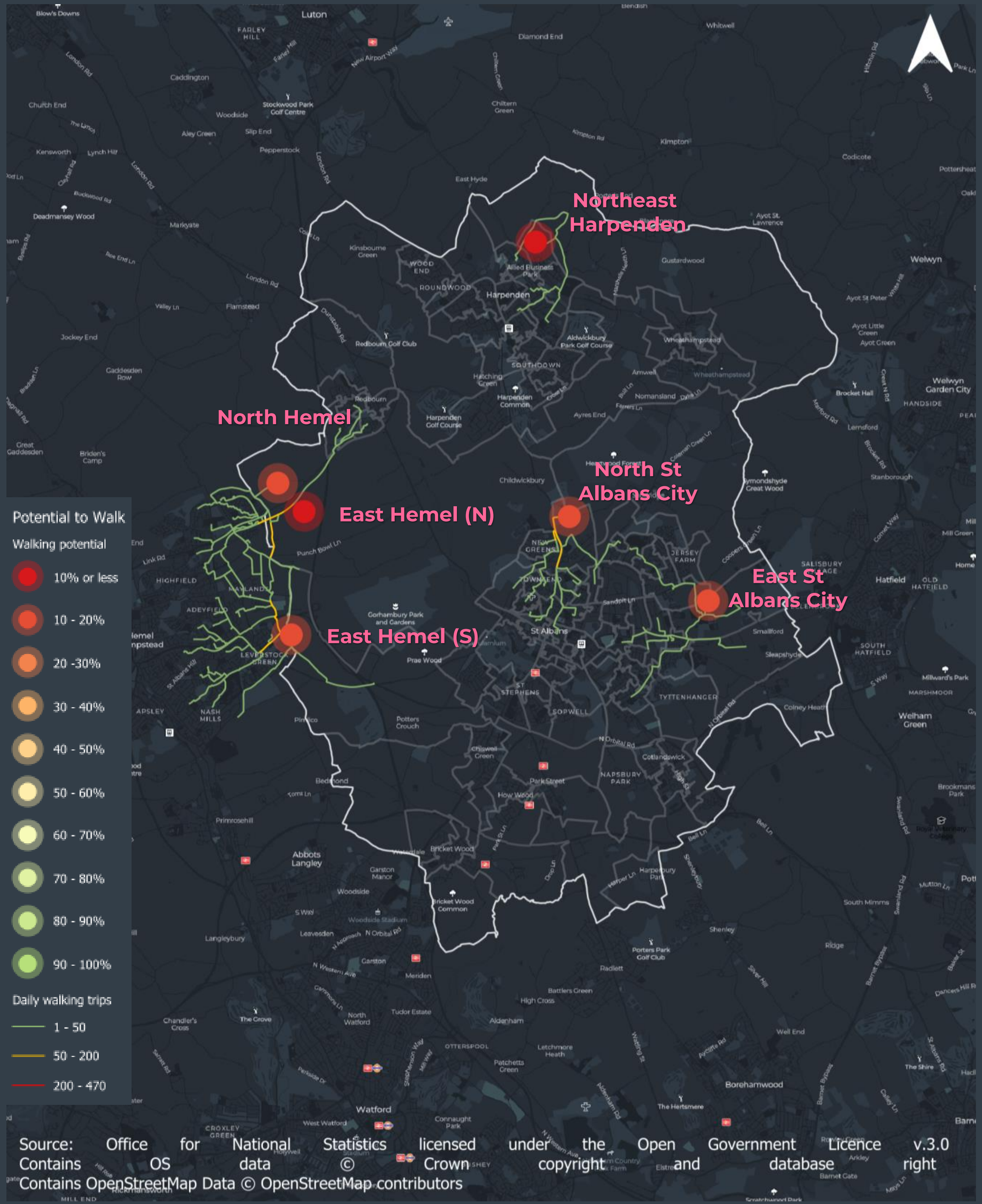
North St Albans City	Main mode
Daily trips	Up to 100
Daily people km	100 - 300

East St Albans City	Main mode
Daily trips	Less than 50
Daily people km	Up to 100

Northeast Harpenden	Main mode
Daily trips	Less than 50
Daily people km	Up to 100

Note – given the limited public transport potential, there is limited potential for additional walk trips through first/last mile to public transport stops.

Figure 2.10 Walking potential in St Albans district (high scenario)



Cycling potential

Up to **16%** of trips across the new developments could be made by cycling as the main mode

North Hemel	Main mode
Daily trips	Up to 100
Daily people km	100 - 200

East Hemel (North)	Main mode
Daily trips	200 – 300
Daily people km	700 – 1,300

East Hemel (South)	Main mode
Daily trips	300 – 400
Daily people km	700 – 1,600

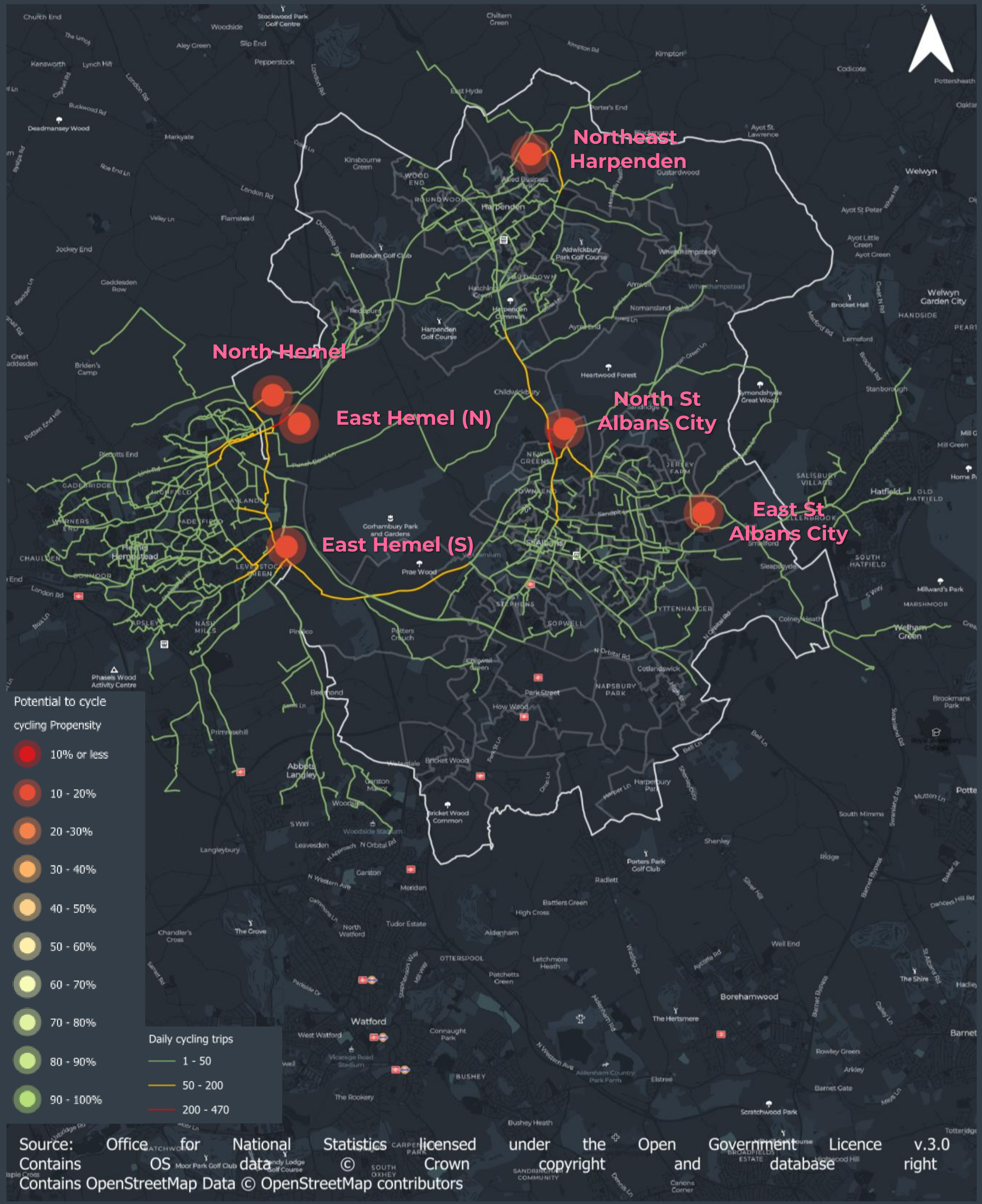
North St Albans City	Main mode
Daily trips	300 - 400
Daily people km	700 – 1,400

East St Albans City	Main mode
Daily trips	Around 100
Daily people km	200 – 300

Northeast Harpenden	Main mode
Daily trips	Around 100
Daily people km	Around 200

Note – given the limited public transport potential, there is limited potential for additional cycle trips through first/last mile to public transport stops.

Figure 2.11 Cycling potential in St Albans (high scenario)



Public transport potential

Less than **1%** of trips across the new developments, 2% in Northeast Harpenden and 1% in East St Albans could be made by public transport as the main mode (based on existing provision)

North Hemel	Main mode
Daily trips	Less than 50
Daily people km	Less than 50

East Hemel (North)	Main mode
Daily trips	Less than 50
Daily people km	Less than 50

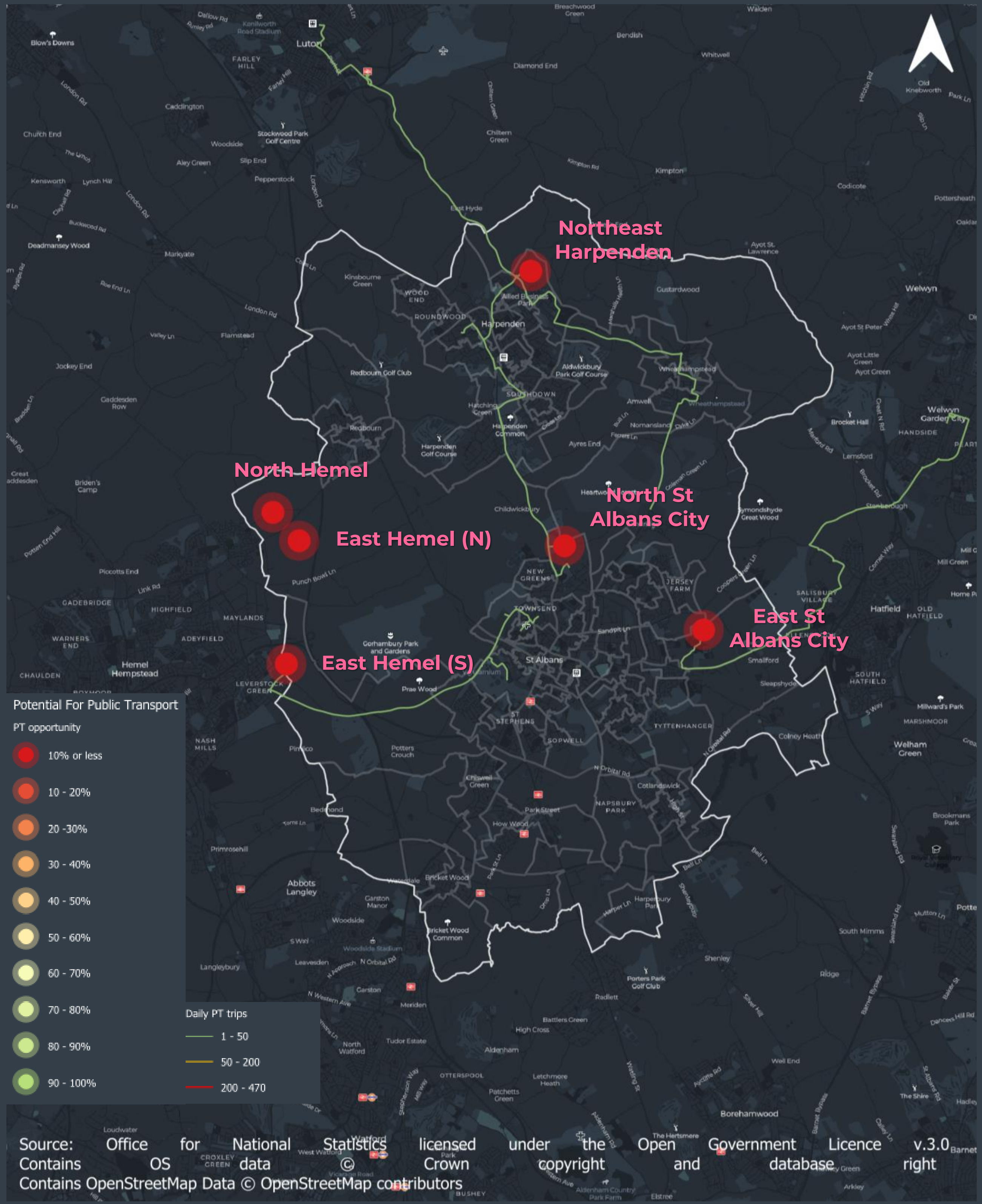
East Hemel (South)	Main mode
Daily trips	Less than 50
Daily people km	Up to 100

North St Albans City	Main mode
Daily trips	Less than 50
Daily people km	Less than 50

East St Albans City	Main mode
Daily trips	Less than 50
Daily people km	Less than 50

Northeast Harpenden	Main mode
Daily trips	Less than 50
Daily people km	Up to 100

Figure 2.12 Public transport potential in St Albans (high scenario)



Summary

Sustainable travel opportunity

Sustainable travel opportunity is the proportion of car trips that could be switched to walking, cycling or public transport based on distance and time criteria.

Based on assumed growth but existing active travel and public transport networks and services:

- Up to 65% of modelled car trips across the assessed St Albans district development zones have the opportunity to switch to sustainable modes.
- Cycling provides the highest opportunity, with up to 40% of car trips able to be cycled across the development zones.
- Up to 27% of modelled car trips could switch to walking
- Less than 1% could switch to public transport.

Sustainable travel propensity

Sustainable travel propensity is the likelihood of using a mode based on the projected socio-demographics and lifestyles of the new development residents.

Based on existing developments, and likely housing proportions, it is expected that St Albans development zone residents will have below average propensities for walking, cycling and bus, but above average propensity for rail and drive, compared to the England average.

The projected dominant Mosaic Group within the new development zones is Domestic Success, representing 60% of the households. This group is more likely to be car-dependent, as they have higher incomes, larger dwellings and more car ownership.

The propensities for walking, cycling, bus and rail in the new development zones are 80, 80, 72 and 87 respectively, while the propensity for drive is 104, based on a scale where the England average is 100.

It is worth noting that propensities can change if sustainable travel options are improved.

Sustainable travel potential

Sustainable travel potential is the combination of opportunity and propensity, indicating the realistic mode shift potential for the new development zones.

Based on assumed growth but existing active travel and public transport networks and services, and expected socio-demographics and travel behaviours:

- Up to 27% of modelled car trips across the assessed St Albans district development zones have the potential to switch to sustainable modes.
- Cycling provides the highest potential, with up to 24% of car trips that have the potential to be cycled across the development zones.
- Up to 14% of modelled car trips have the potential to switch to walking
- Less than 1% would switch to public transport.

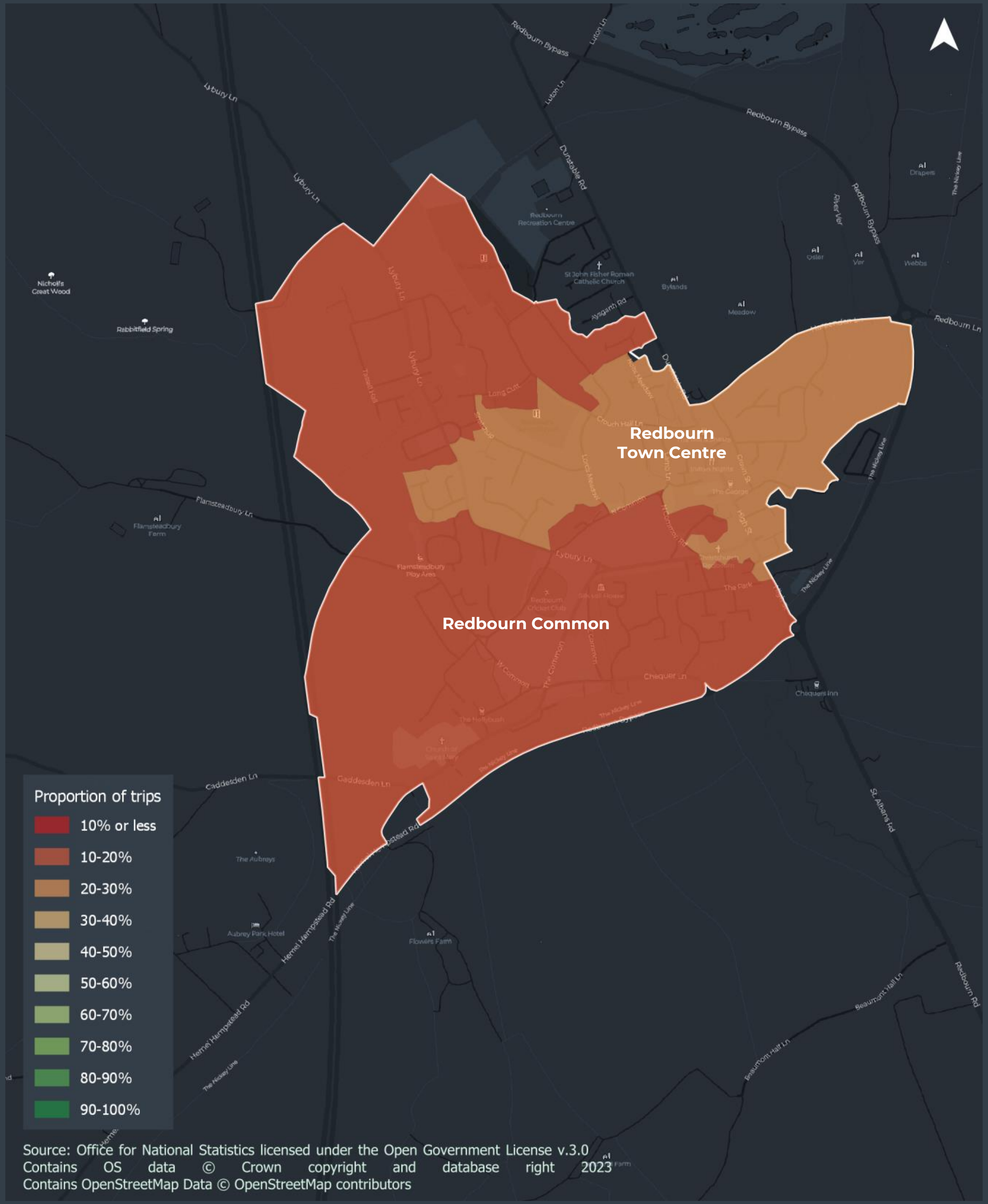
Note – not all new developments in St Albans district have been assessed but the findings here can be used to estimate the likely opportunity and potential in other development areas.

For example, for the new development proposed in West Redbourn – it is likely that this development would have lower mode shift opportunity and potential given it is further away from denser areas such as St Albans City, Hemel Hempstead and Harpenden.

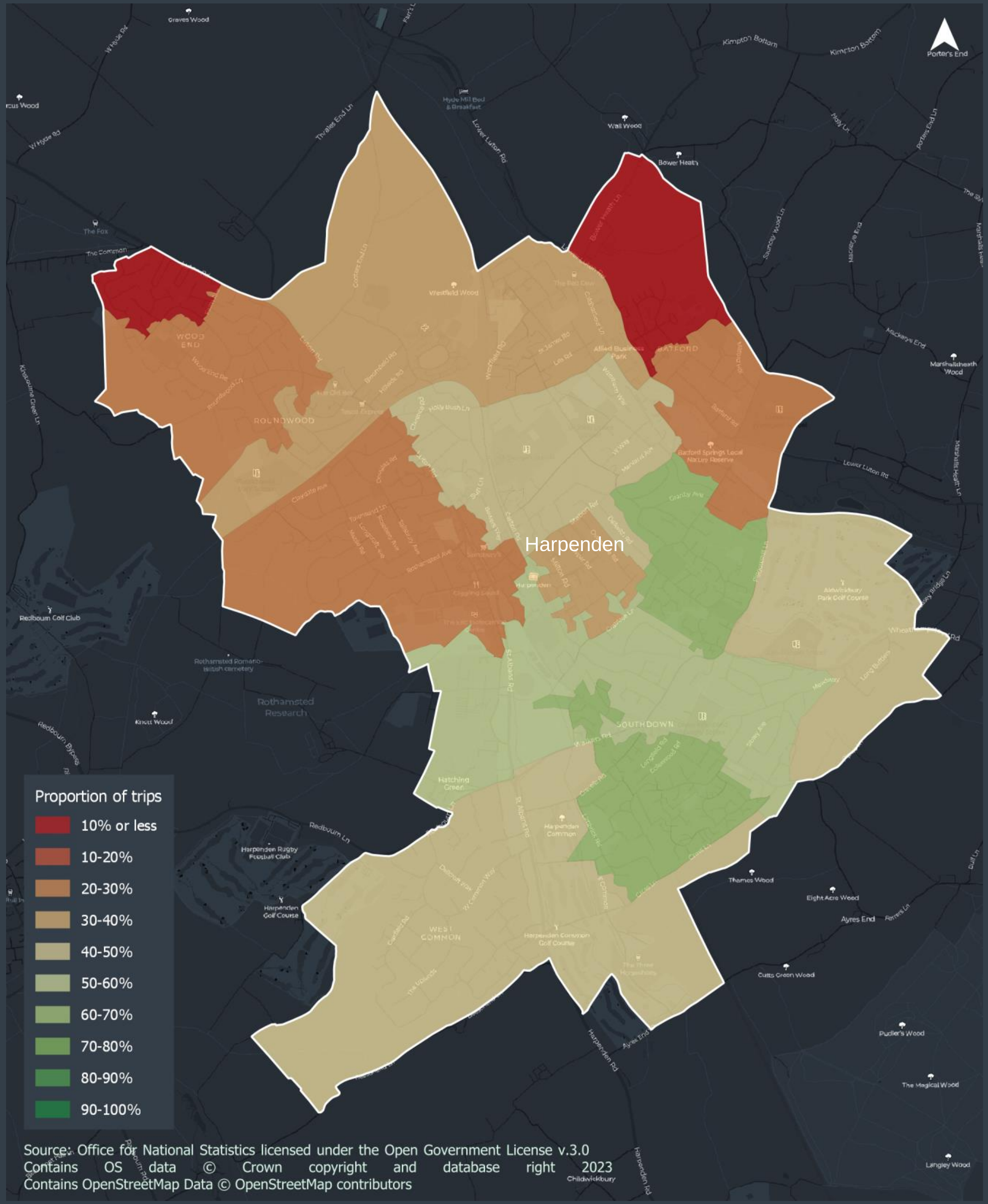
APPENDIX A
Breakdown of sustainable travel opportunity for existing communities

Walking opportunity

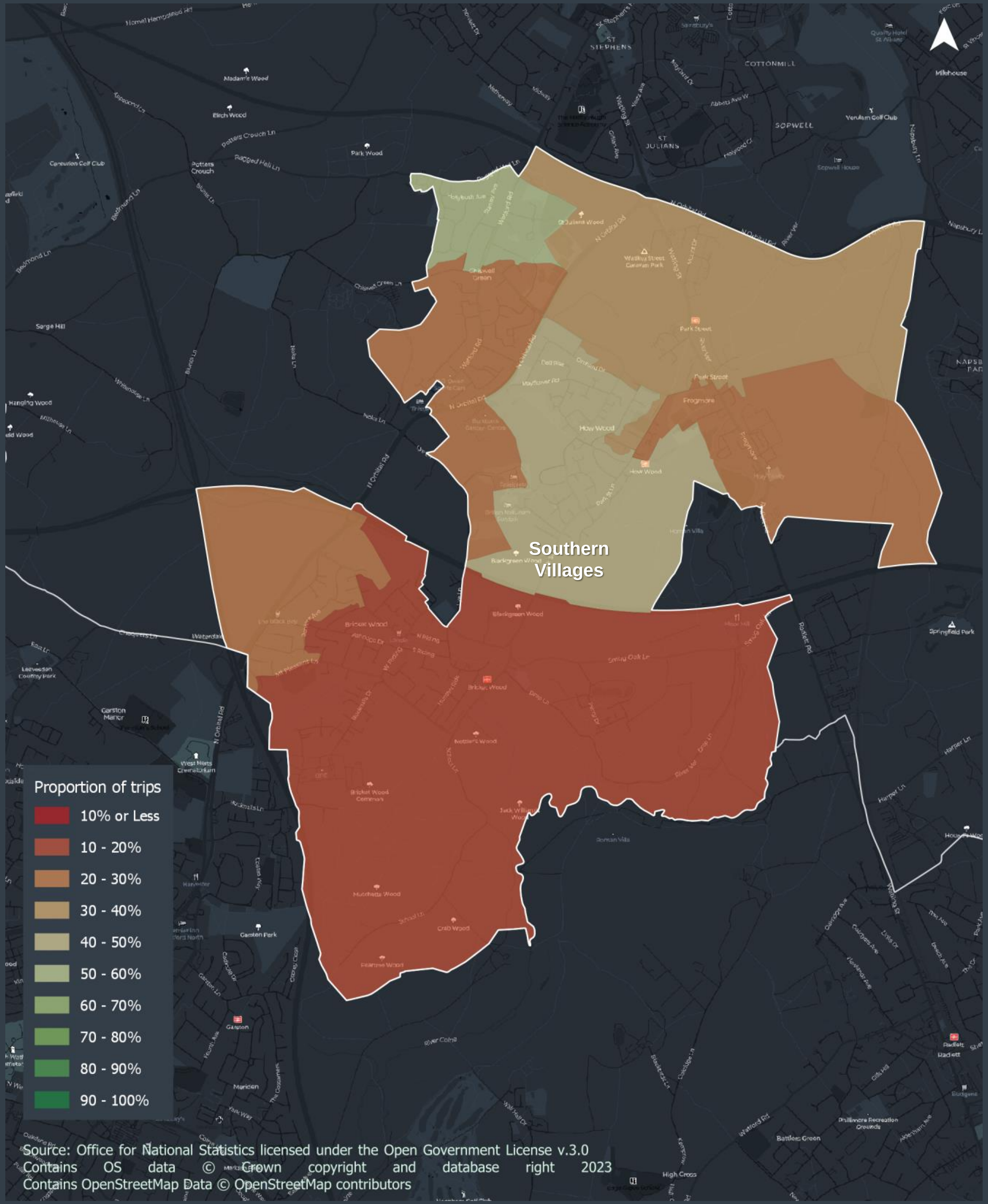
Appendix A1 Walking opportunity in Redbourn



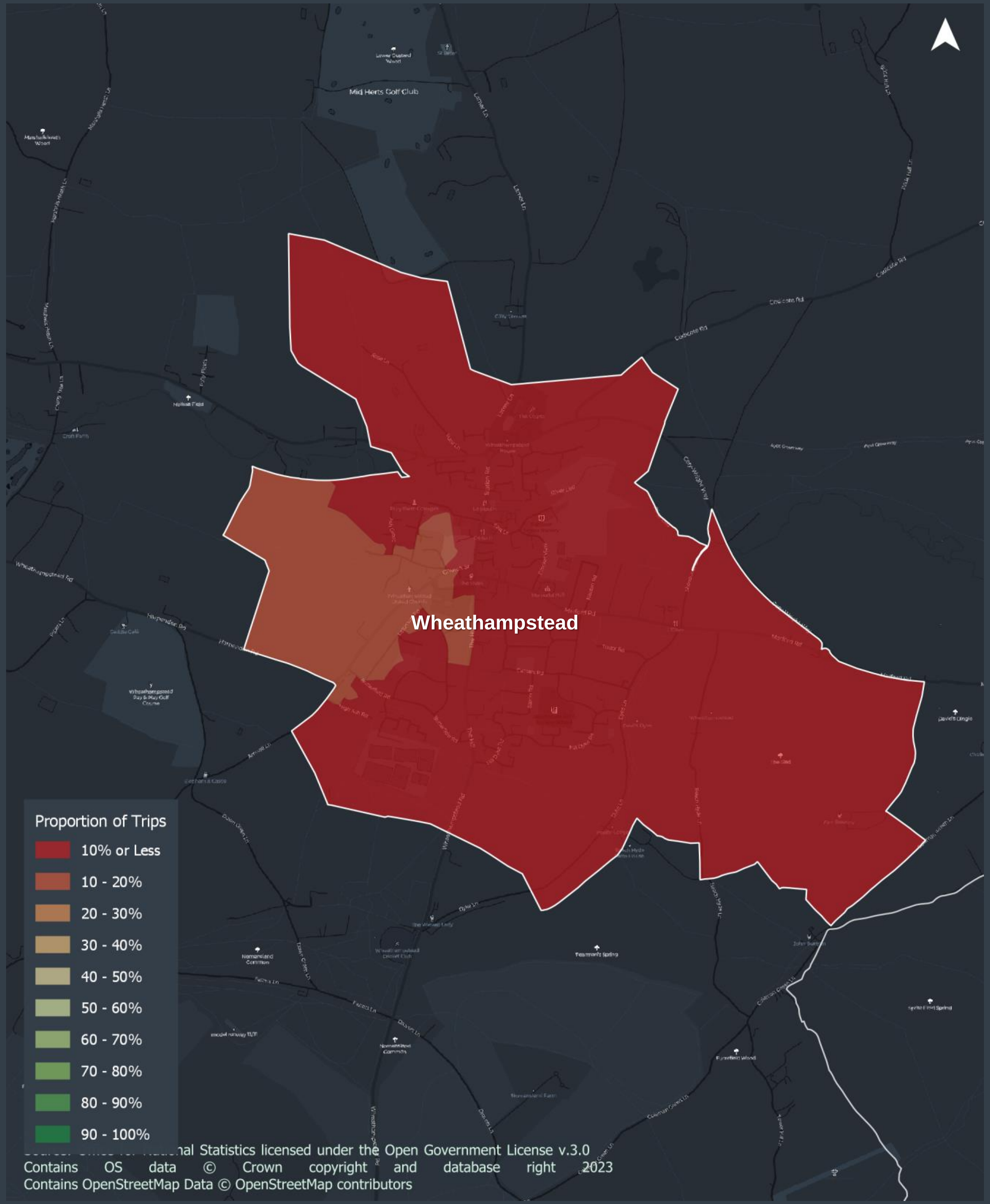
Appendix A2 Walking opportunity in Harpenden



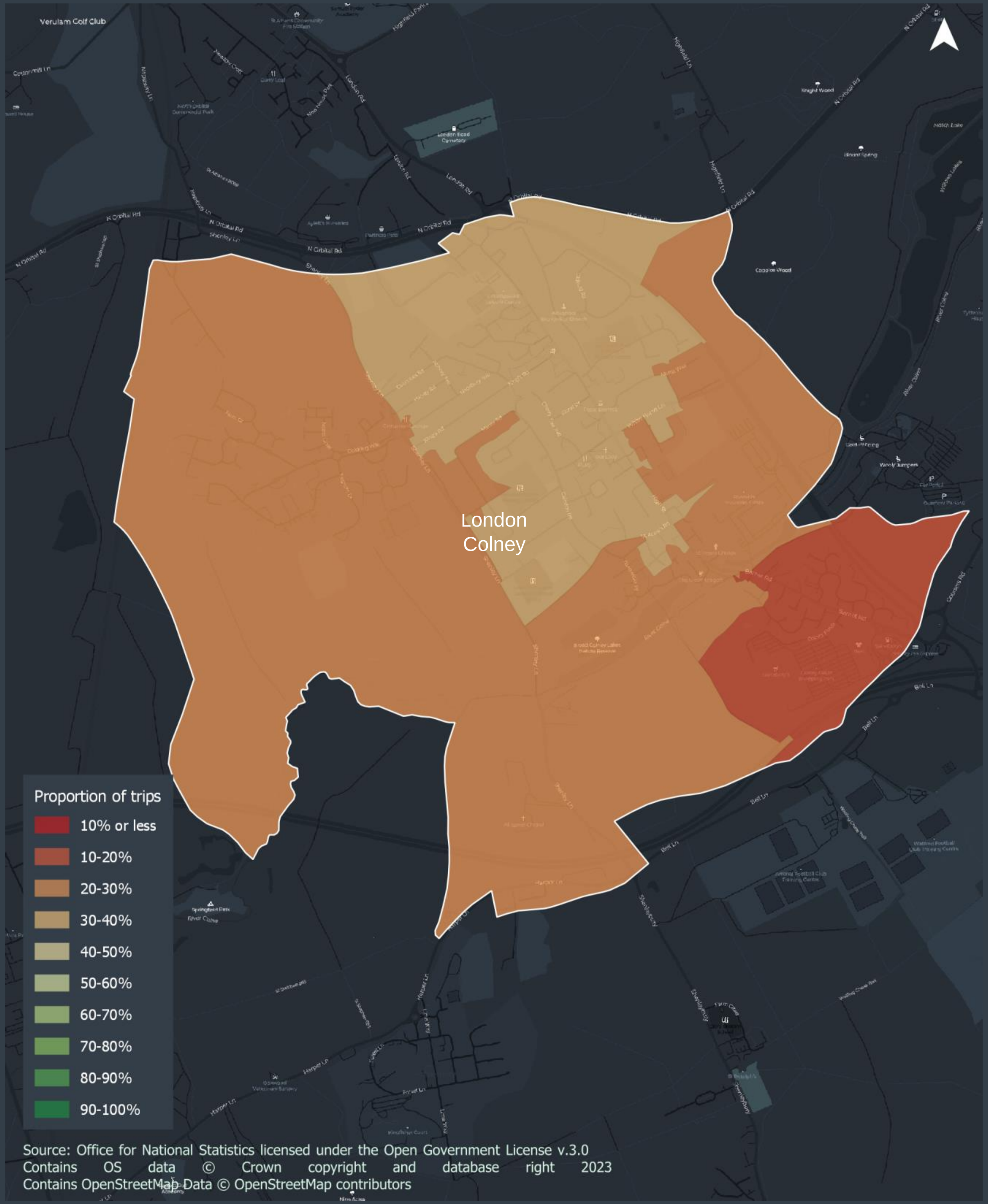
Appendix A3 Walking opportunity in Southern Villages



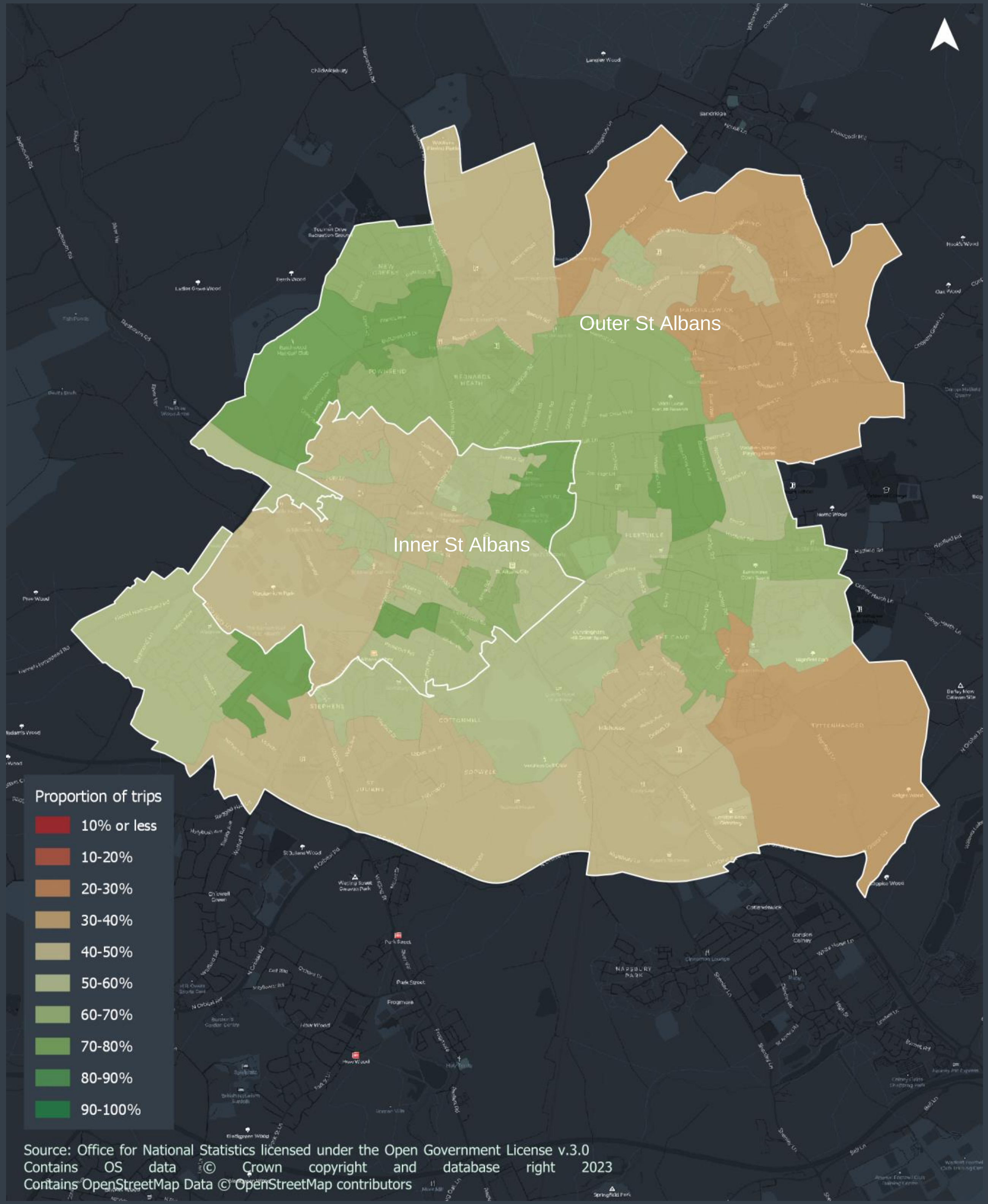
Appendix A4 Walking opportunity in Wheathampstead



Appendix A5 Walking opportunity in London Colney

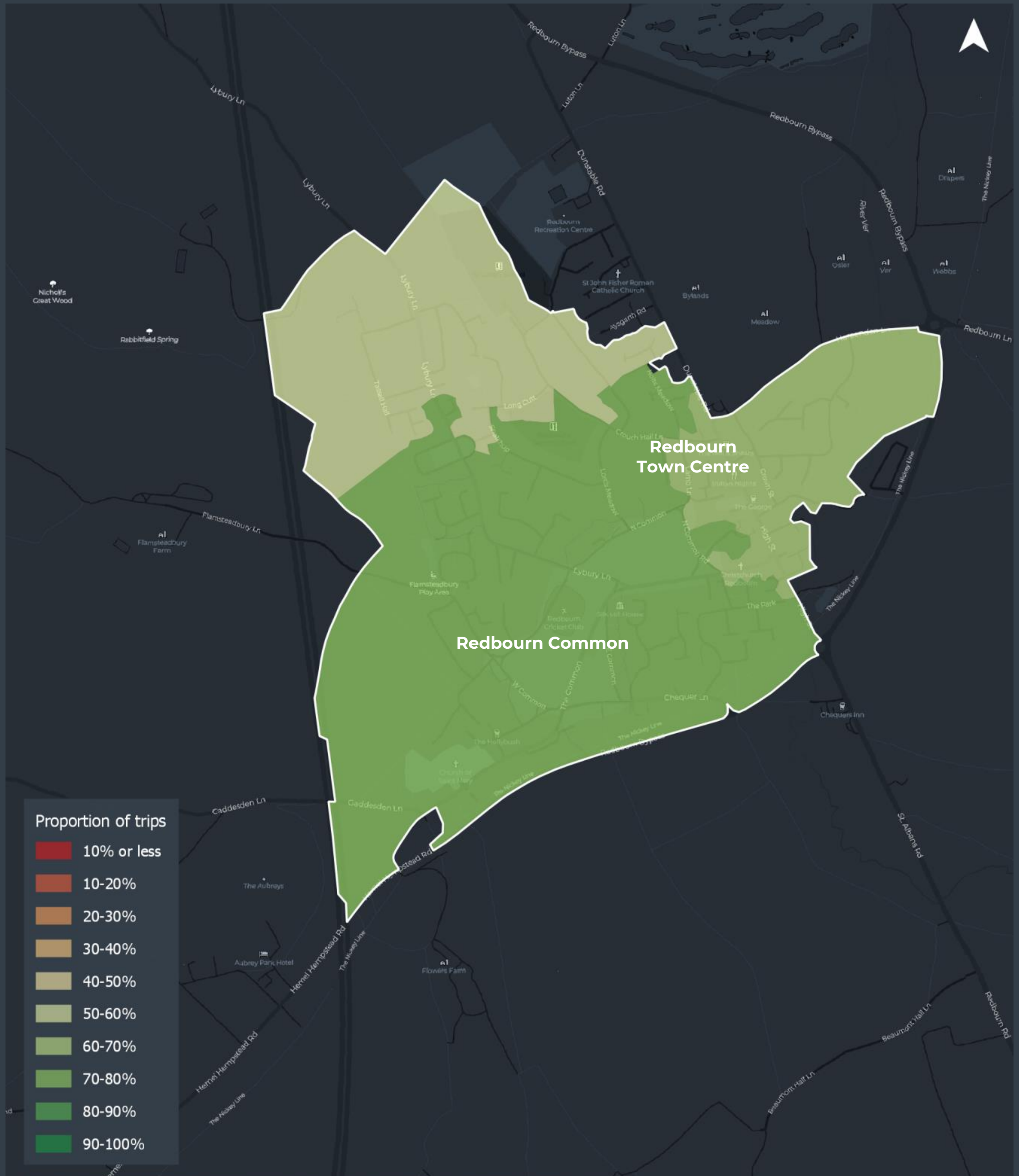


Appendix A6 Walking opportunity in Inner & Outer St Albans



Cycling opportunity

Appendix A7 Cycling opportunity in Redbourn



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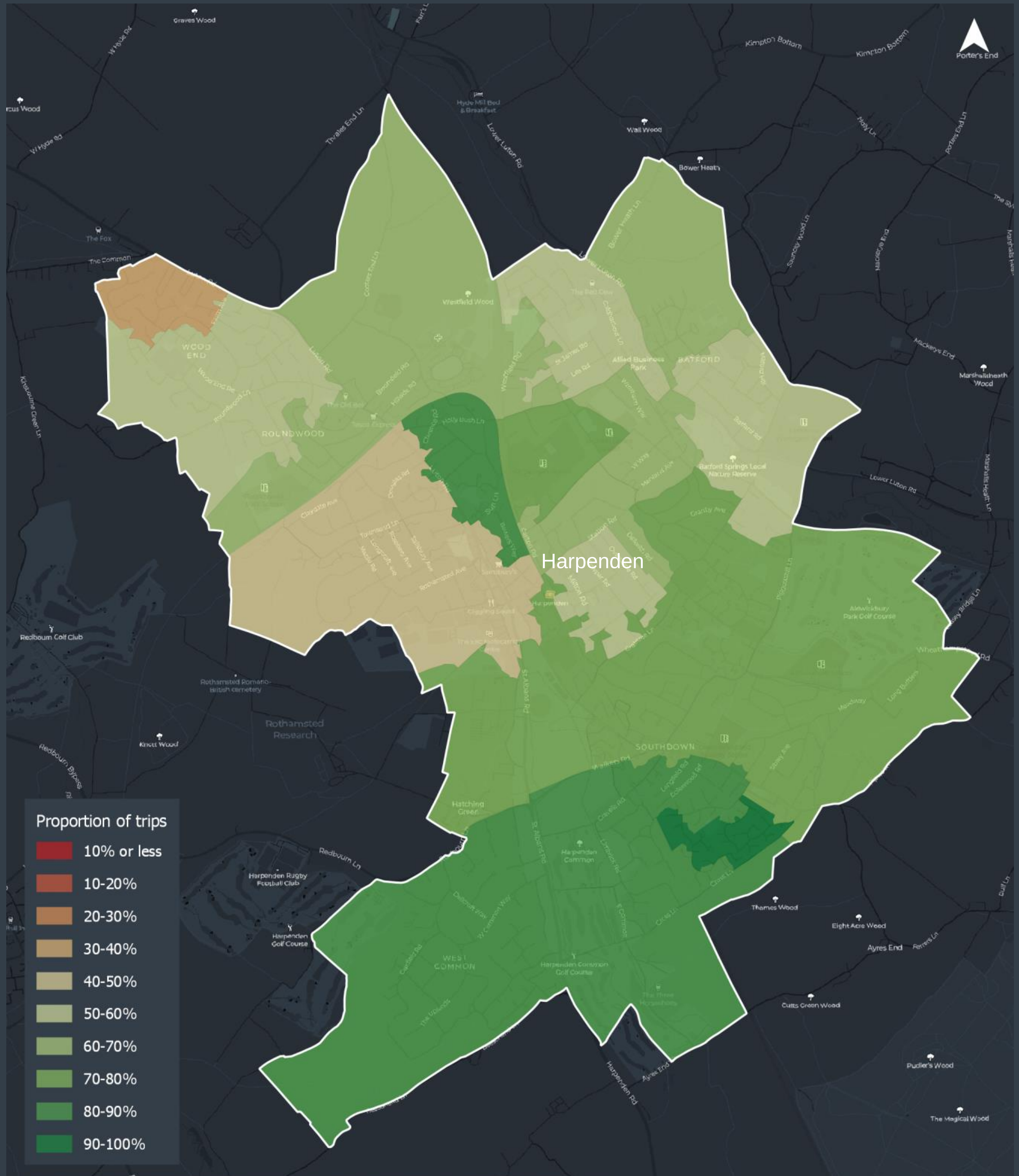
Appendix A8 Cycling opportunity in Harpenden



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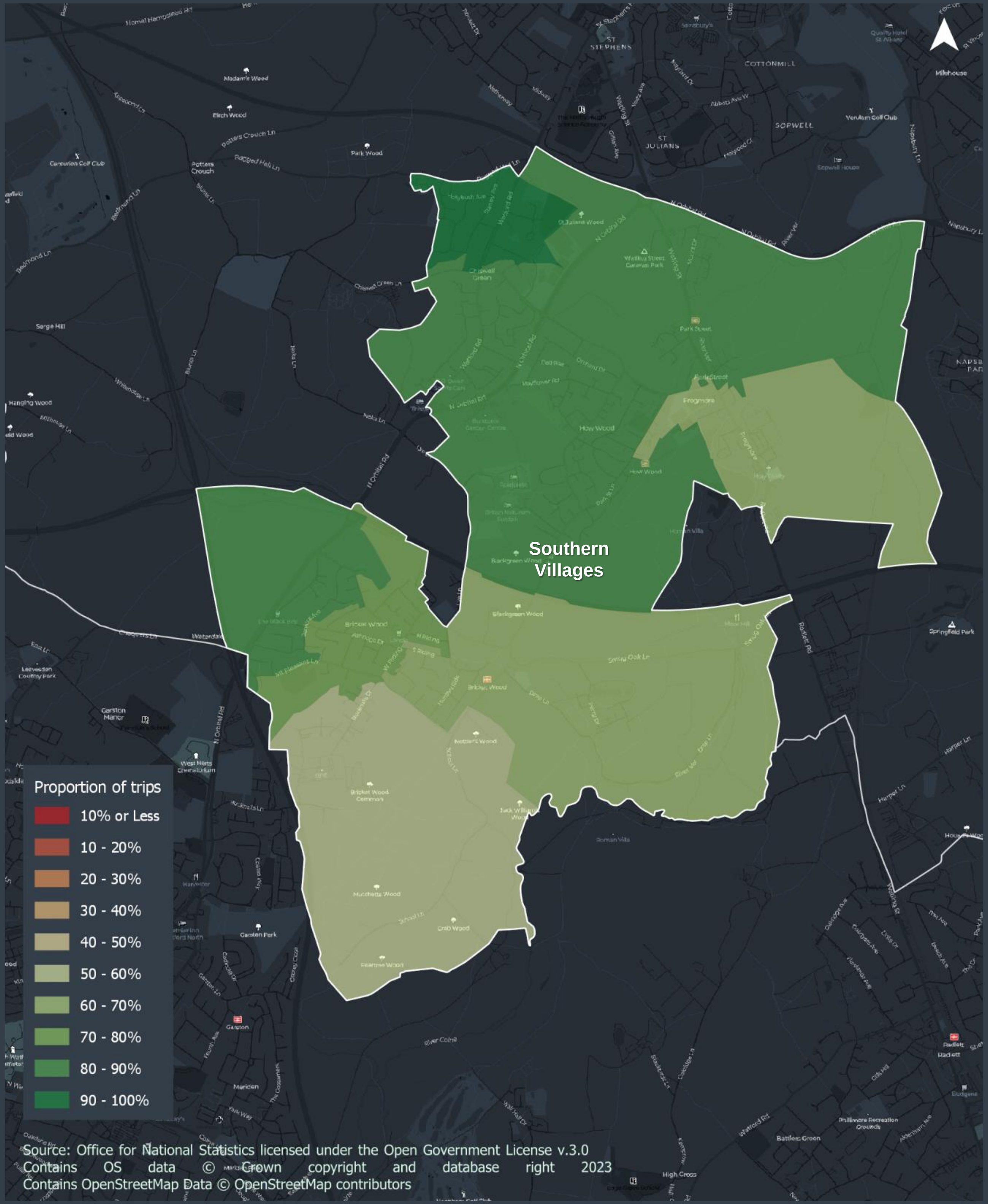
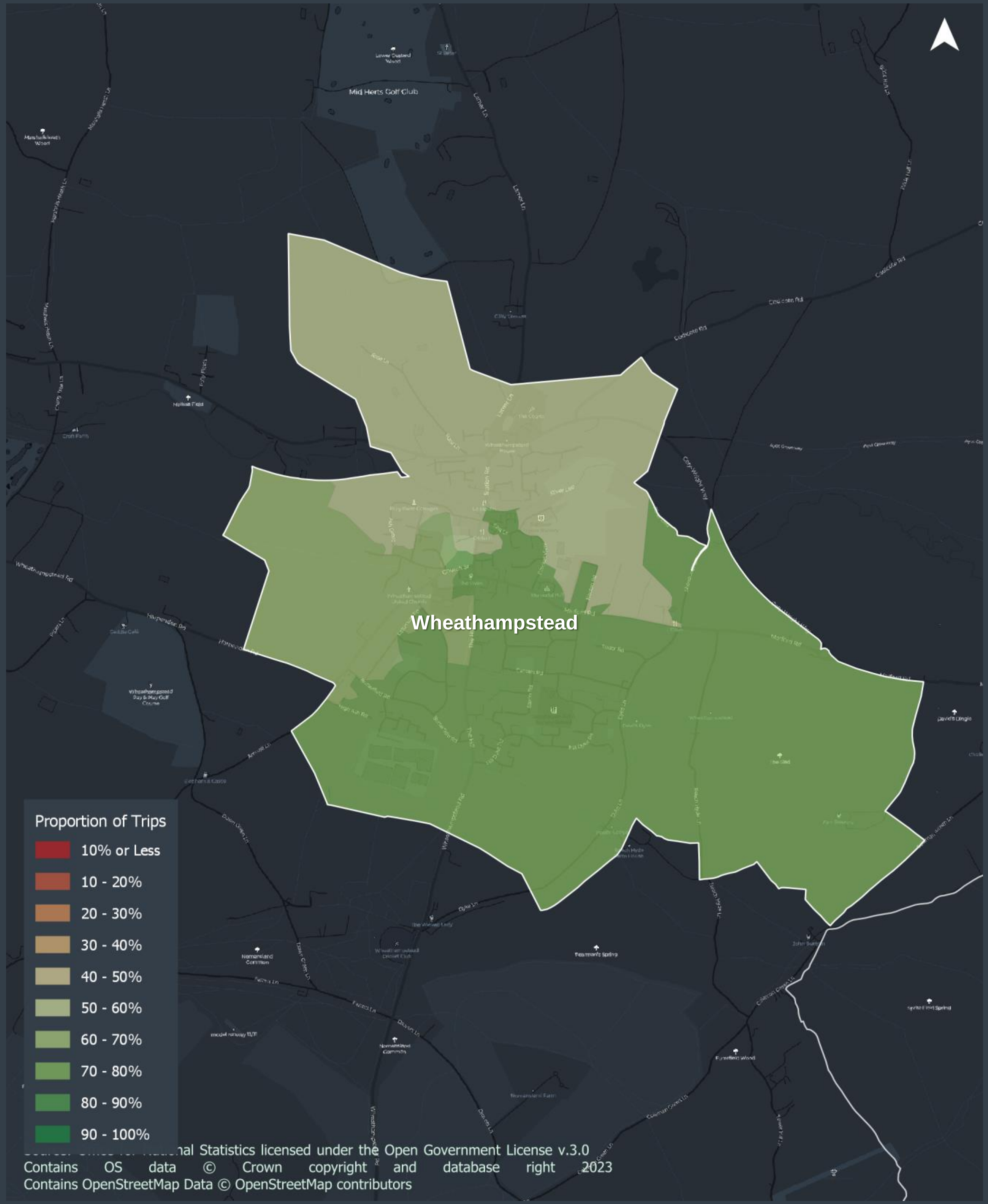
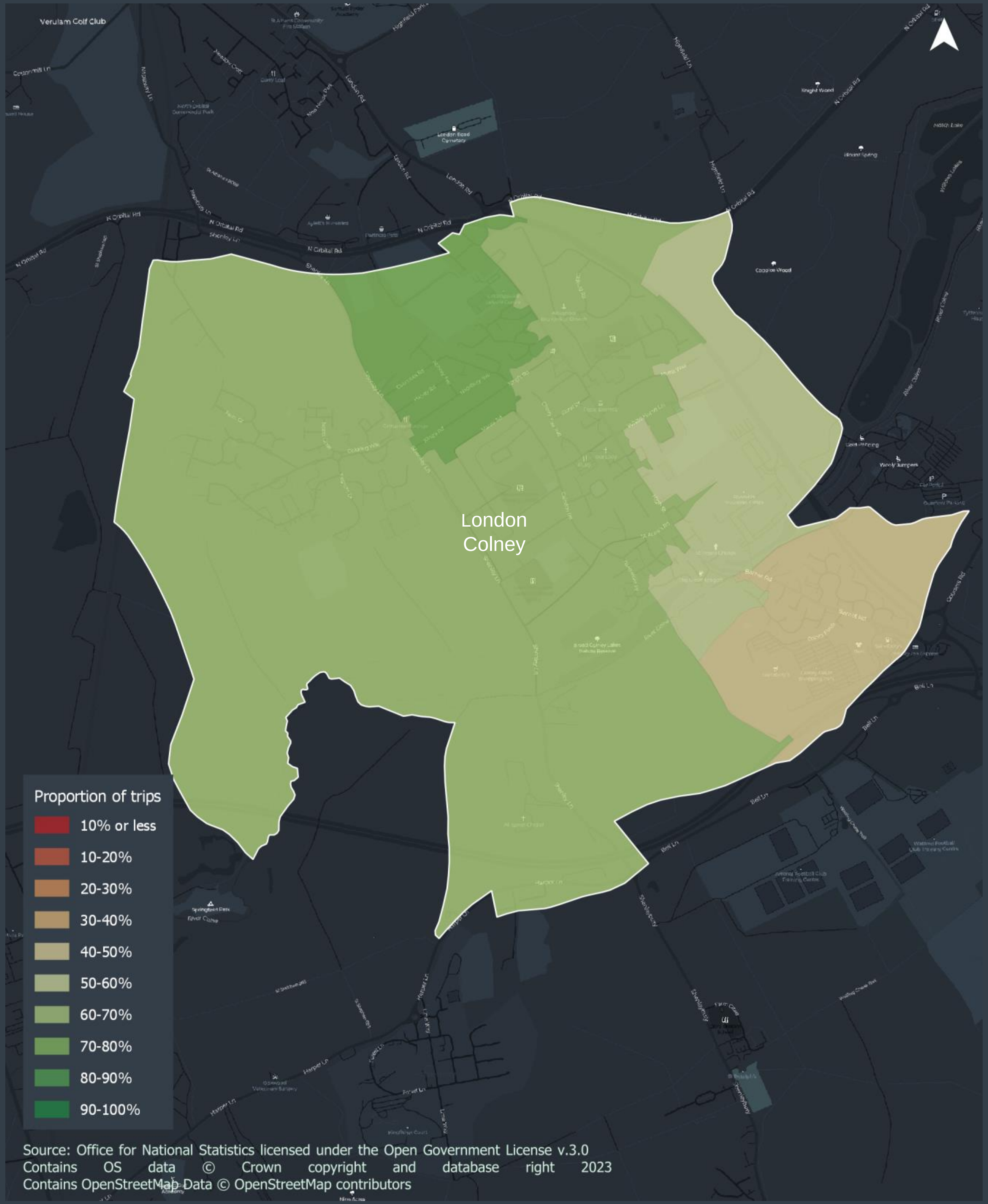
Appendix A9 Cycling opportunity in Southern Villages



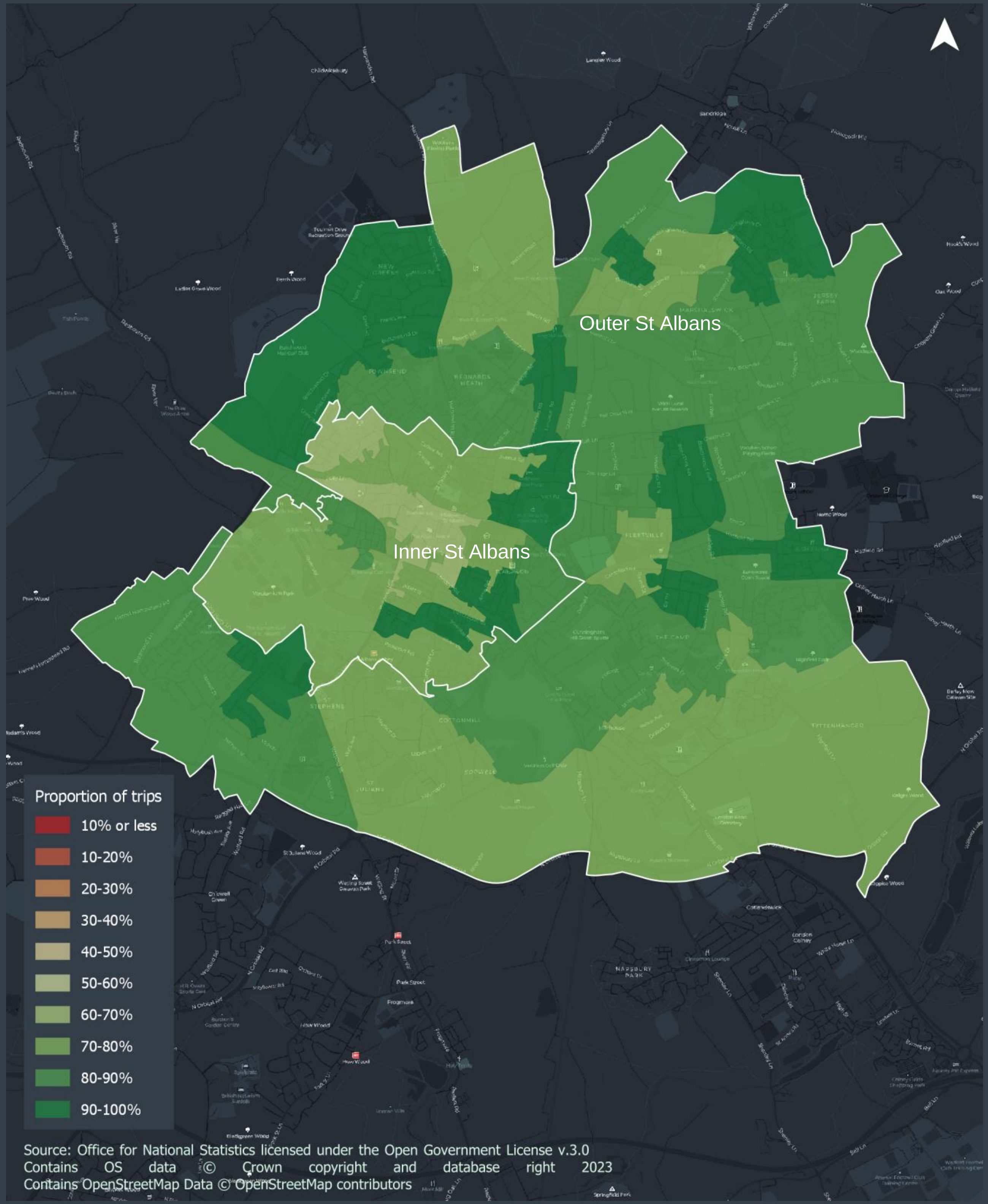
Appendix A10 Cycling opportunity in Wheathampstead



Appendix A11 Cycling opportunity in London Colney

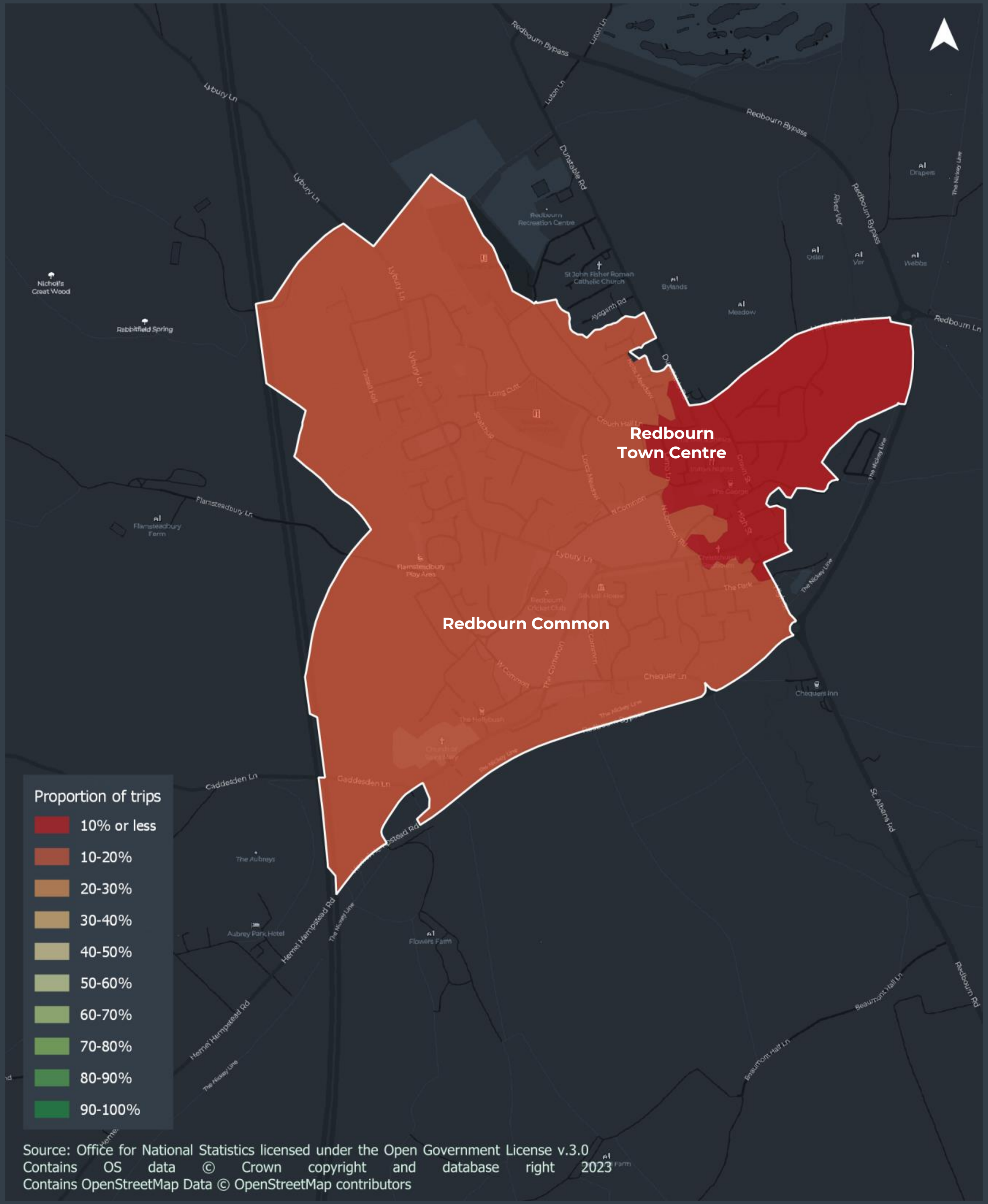


Appendix A12 Cycling opportunity in Inner & Outer St Albans

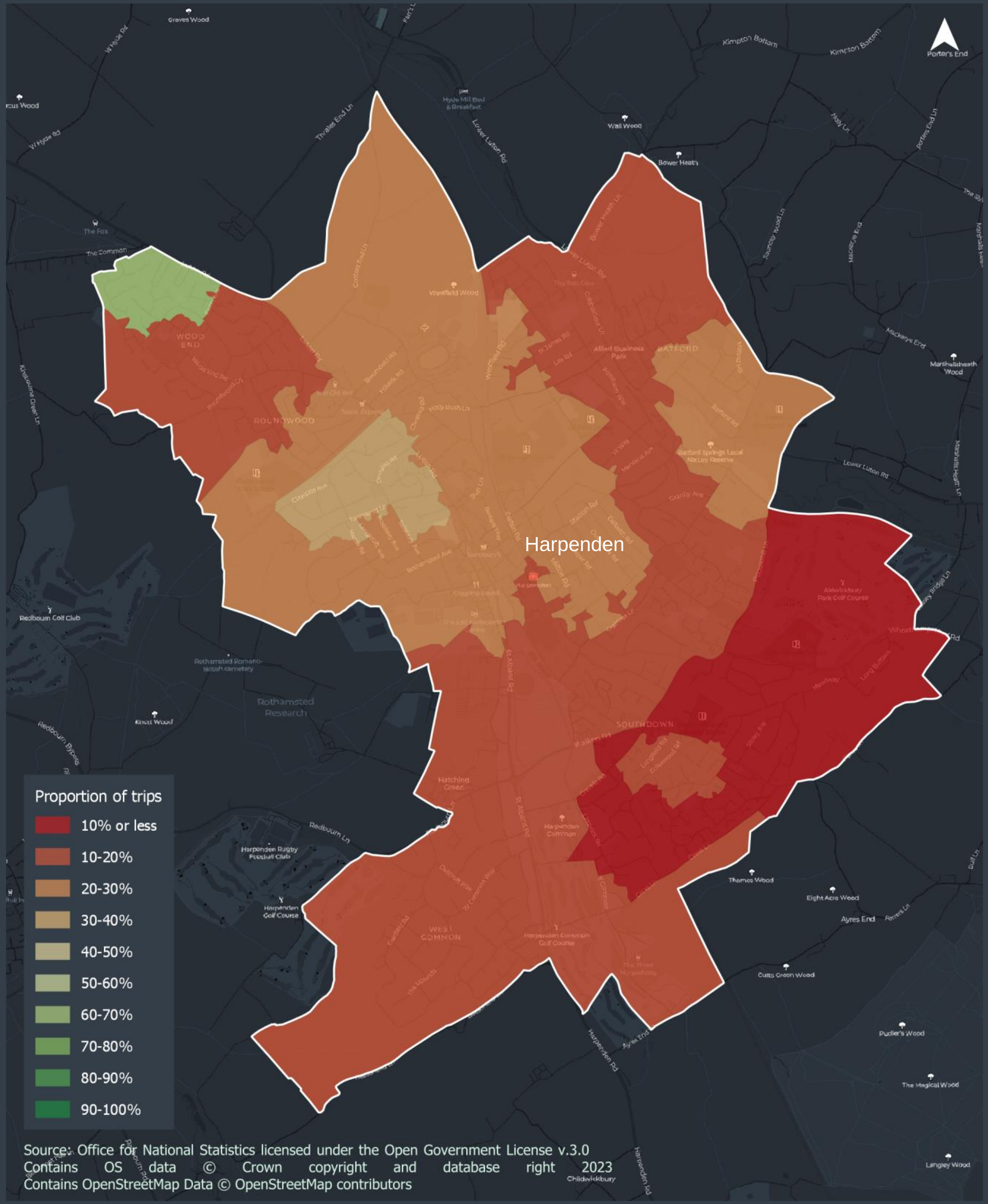


PT opportunity

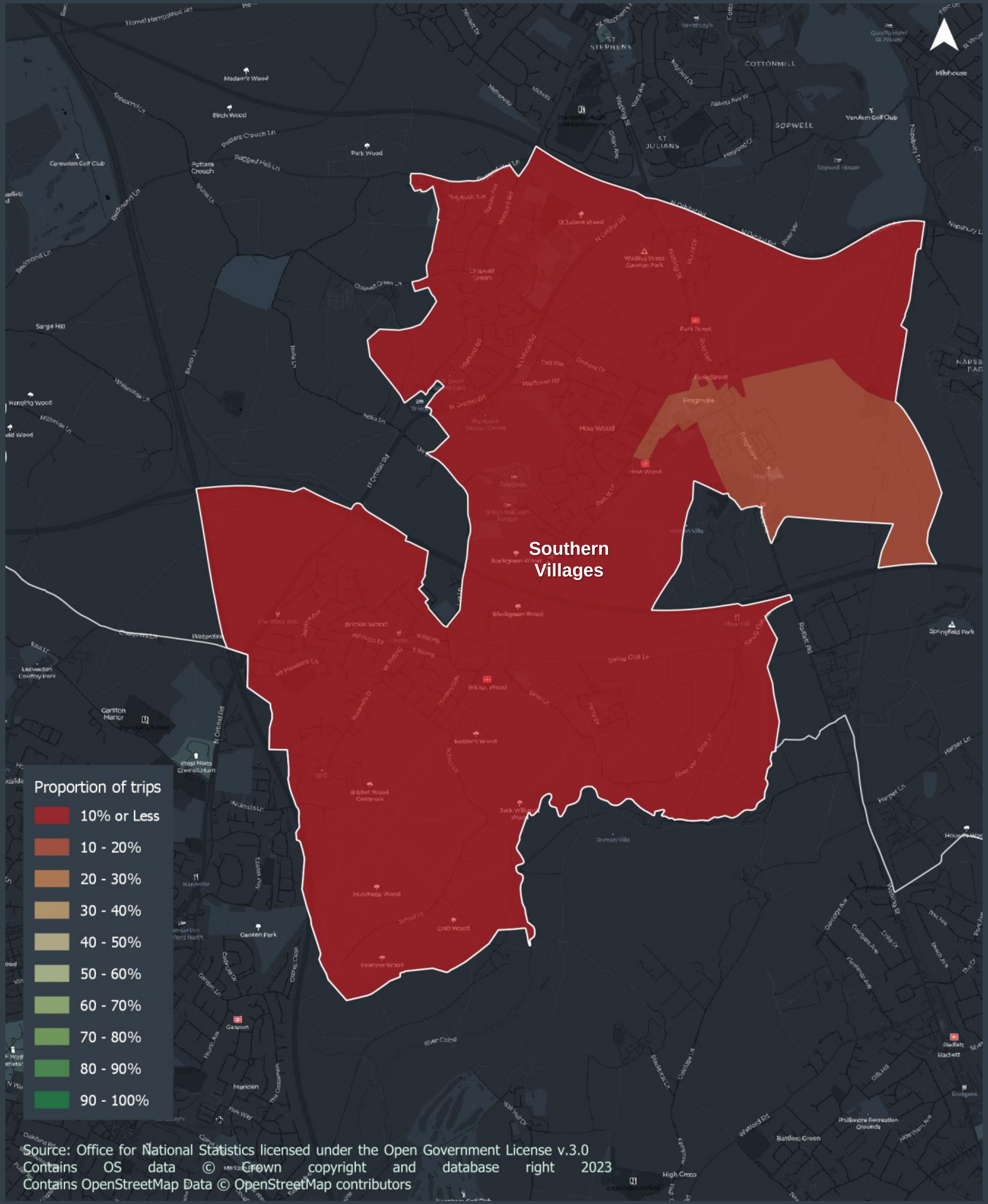
Appendix A13 Public transport opportunity in Redbourn



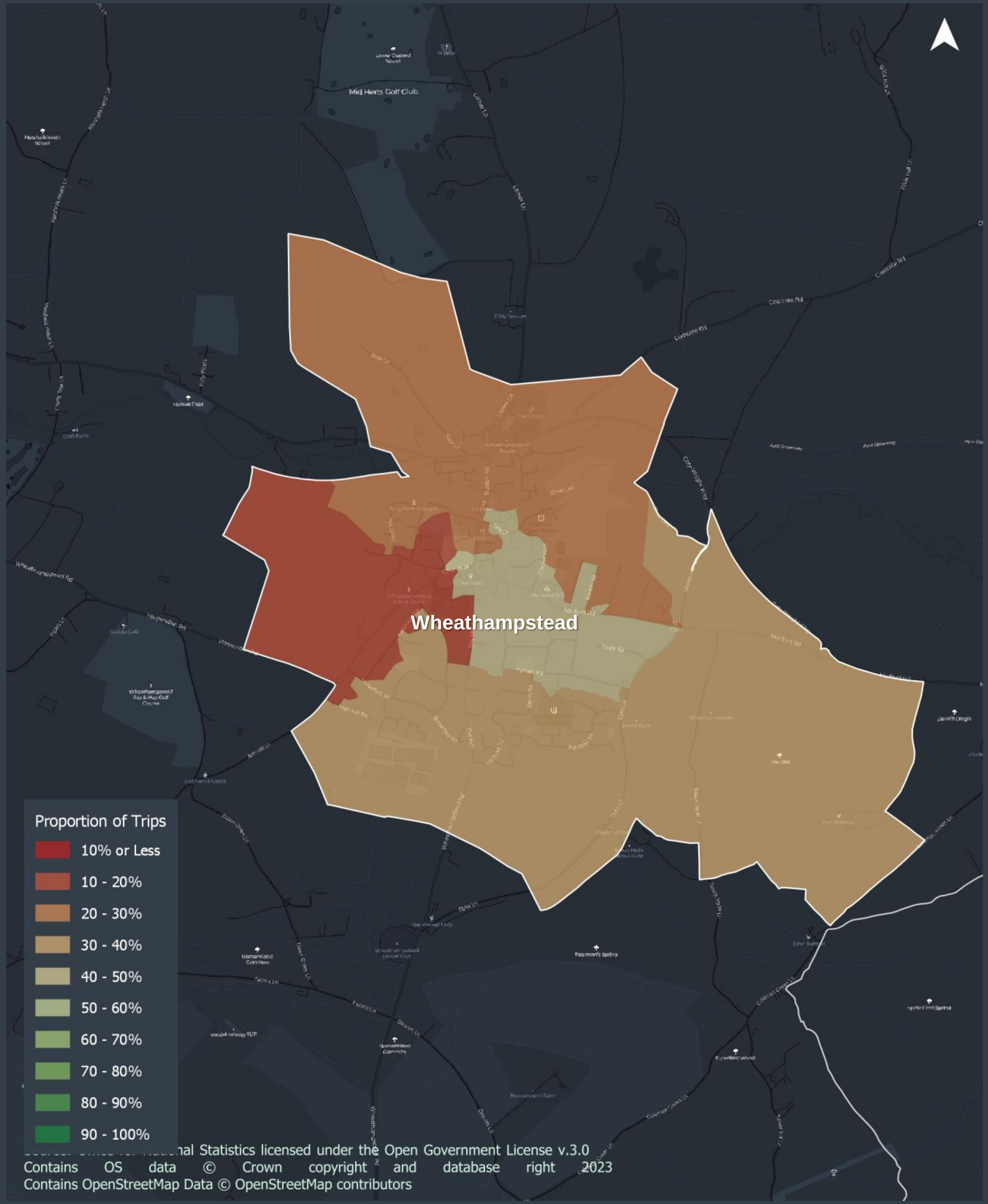
Appendix A14 Public transport opportunity in Harpenden



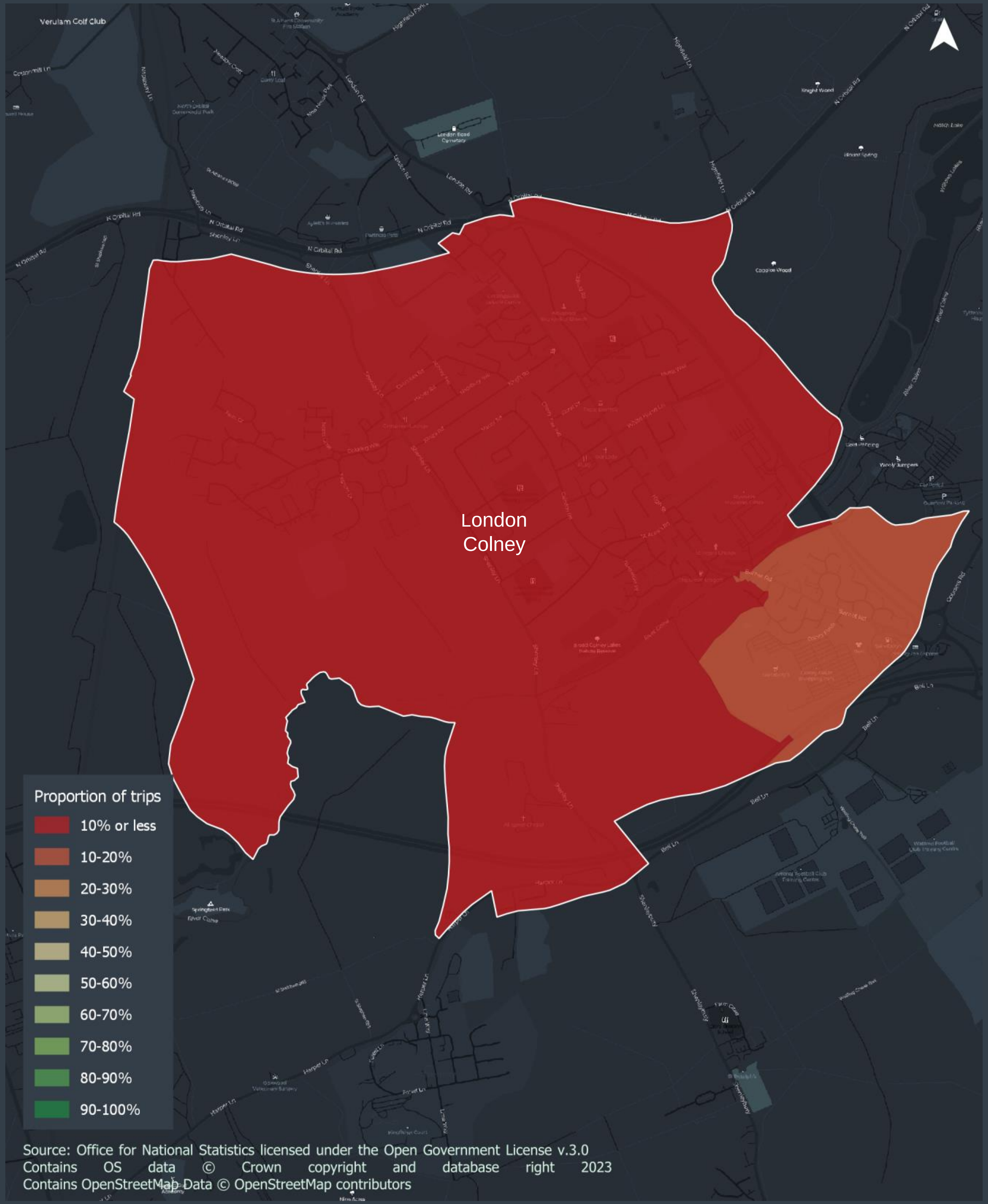
Appendix A15 Public transport opportunity in Southern Villages



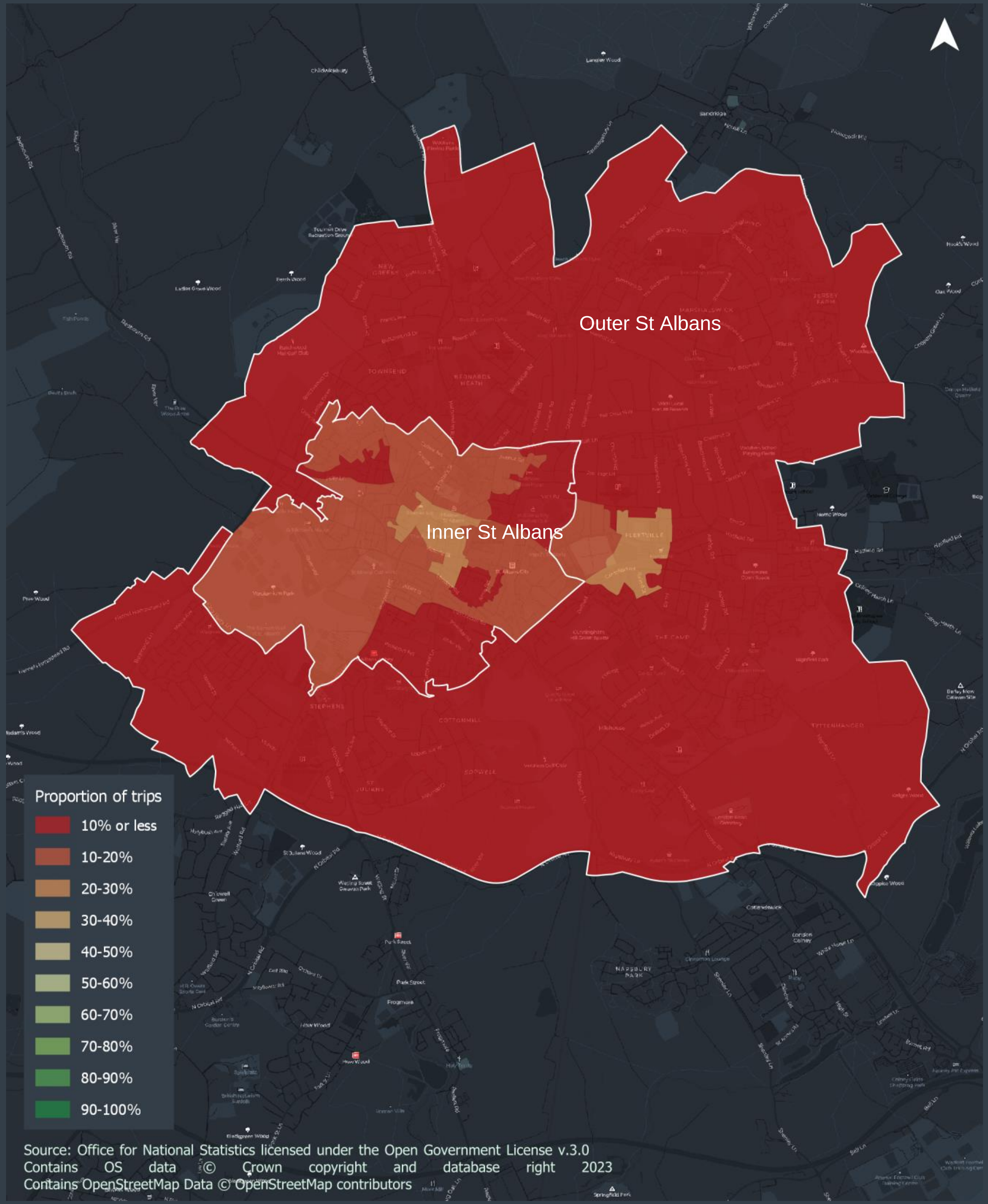
Appendix A16 Public transport opportunity in Wheathampstead



Appendix A17 Public transport opportunity in London Colney



Appendix A18 Public transport opportunity in Inner & Outer St Albans



APPENDIX B

Range of trips by communities and developments with the opportunity to shift by mode

Appendix B1 Range of trips by communities with the opportunity to shift by mode

	Walking opportunity		Cycling opportunity		PT opportunity
	Main mode	First and last mile*	Main mode	First and last mile*	Main mode
St Albans district					
Daily trips	23,500 - 83,500	1,400 - 21,700	111,700 - 147,200	1,400 - 21,700	1,400 - 21,700
Daily people km	27,300 - 169,400	27,400 - 240,200	279,500 - 506,800	27,400 - 240,200	25,000 - 237,400
Redbourn					
Daily trips	300	0 - 600	700 - 1,900	0 - 600	0 - 600
Daily people km	300 - 500	100 - 2,900	2,000 - 9,400	100 - 2,900	100 - 5,100
Harpenden					
Daily trips	3,900 - 15,200	700 - 7,800	18,800 - 24,100	700 - 7,800	700 - 7,800
Daily people km	4,800 - 31,500	12,100 - 102,500	45,900 - 80,900	12,100 - 102,500	11,200 - 91,600
London Colney					
Daily trips	1,300 - 2,800	100 - 700	4,200 - 6,600	100 - 700	100 - 700
Daily people km	1,600 - 4,900	1,200 - 4,500	10,700 - 26,100	1,200 - 4,500	1,500 - 8,400
Inner St Albans					
Daily trips	8,200 - 19,900	200 - 5,700	23,800 - 28,600	200 - 5,700	200 - 5,700
Daily people km	8,900 - 36,400	5,600 - 65,300	51,600 - 83,500	5,600 - 65,300	4,000 - 61,100
Outer St Albans					
Daily trips	9,300 - 39,700	300 - 3,300	51,000 - 61,400	300 - 3,300	300 - 3,300
Daily people km	11,200 - 83,200	7,900 - 38,700	125,700 - 191,800	7,900 - 38,700	7,300 - 37,900
Southern villages					
Daily trips	200 - 2,200	0 - 400	3,800 - 6,300	0 - 400	0 - 400
Daily people km	200 - 5,100	100 - 4,800	11,800 - 27,200	100 - 4,800	0 - 2,900
Wheathampstead					
Daily trips	200 - 500	0 - 1,700	1,300 - 3,600	0 - 1,700	0 - 1,700
Daily people km	100 - 800	100 - 7,700	4,300 - 19,000	100 - 7,700	300 - 14,200

* Linked to public transport trips

Appendix B2 Range of trips by developments with the opportunity to shift by mode

	Walking opportunity		Cycling opportunity		PT opportunity
	Main mode	First and last mile*	Main mode	First and last mile*	Main mode
St Albans development zones					
Daily trips	300 - 1,400	0 - 100	2,300 - 3,300	0 - 100	0 - 100
Daily people km	400 - 3,000	0 - 100	6,700 - 12,600	0 - 100	0 - 600
North Hemel					
Daily trips	0 - 100	0	100 - 100	0	0
Daily people km	0 - 200	0	300 - 500	0	0
East Hemel (North)					
Daily trips	0 – 400	0	600 – 800	0	0
Daily people km	0 – 800	0	1,800 – 3,200	0	0
East Hemel (South)					
Daily trips	200 – 500	0	700 – 1,100	0	0
Daily people km	200 – 1,000	0-100	1,700 – 4,000	0 - 100	0 - 300
North St Albans City					
Daily trips	100 - 300	0	600 - 900	0	0
Daily people km	100 - 800	0	1,900 - 3,400	0	0
East St Albans City					
Daily trips	0 - 100	0	200 - 200	0	0
Daily people km	0 - 200	0	500 - 800	0	0
Northeast Harpenden					
Daily trips	0 - 100	0	100 - 200	0	0
Daily people km	0 - 100	0	500 - 600	0	0 - 200

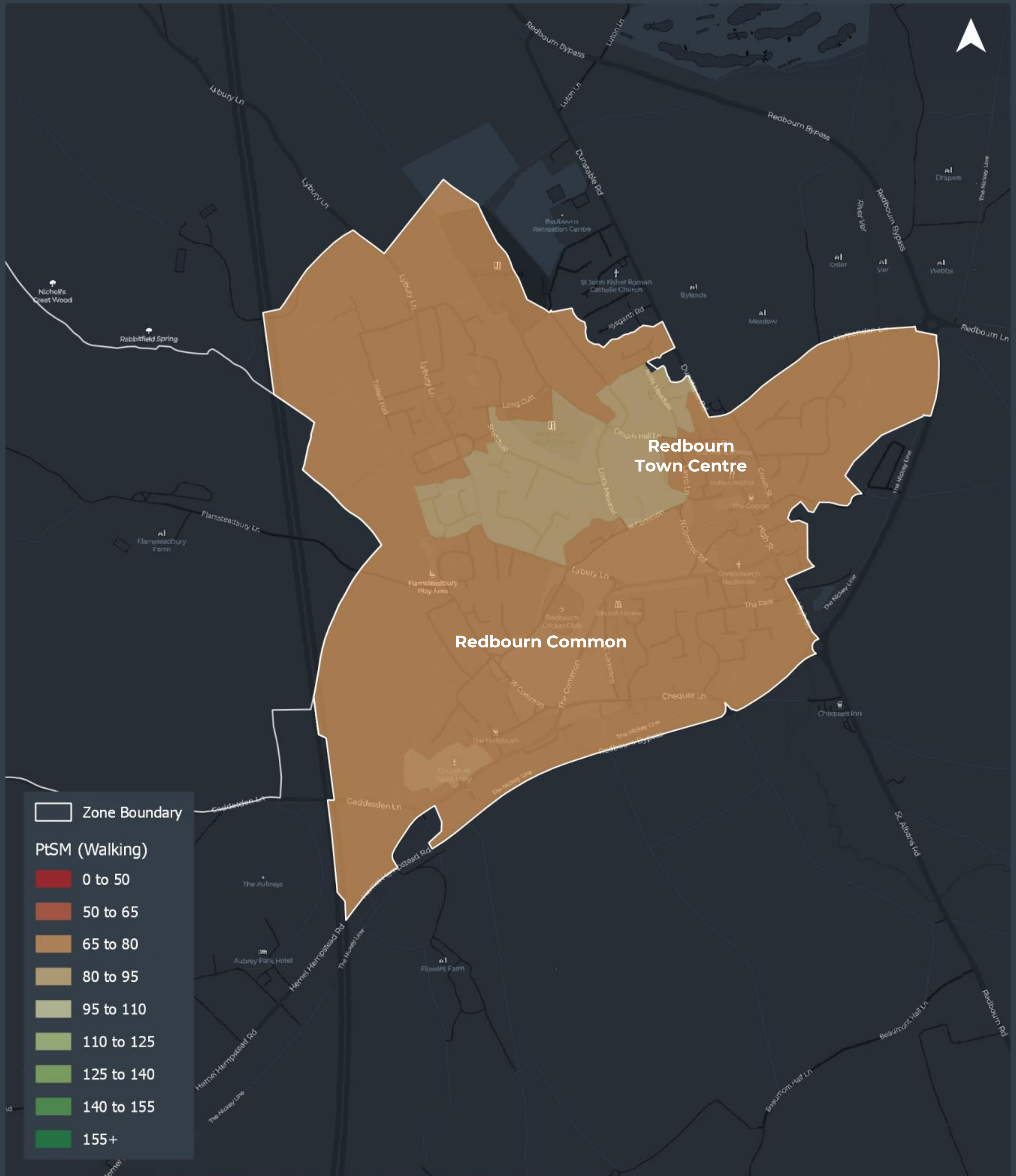
* Linked to public transport trips

APPENDIX C

Breakdown of sustainable travel propensity for existing communities

Walking propensity

Appendix C1 Walking propensity in Redbourn



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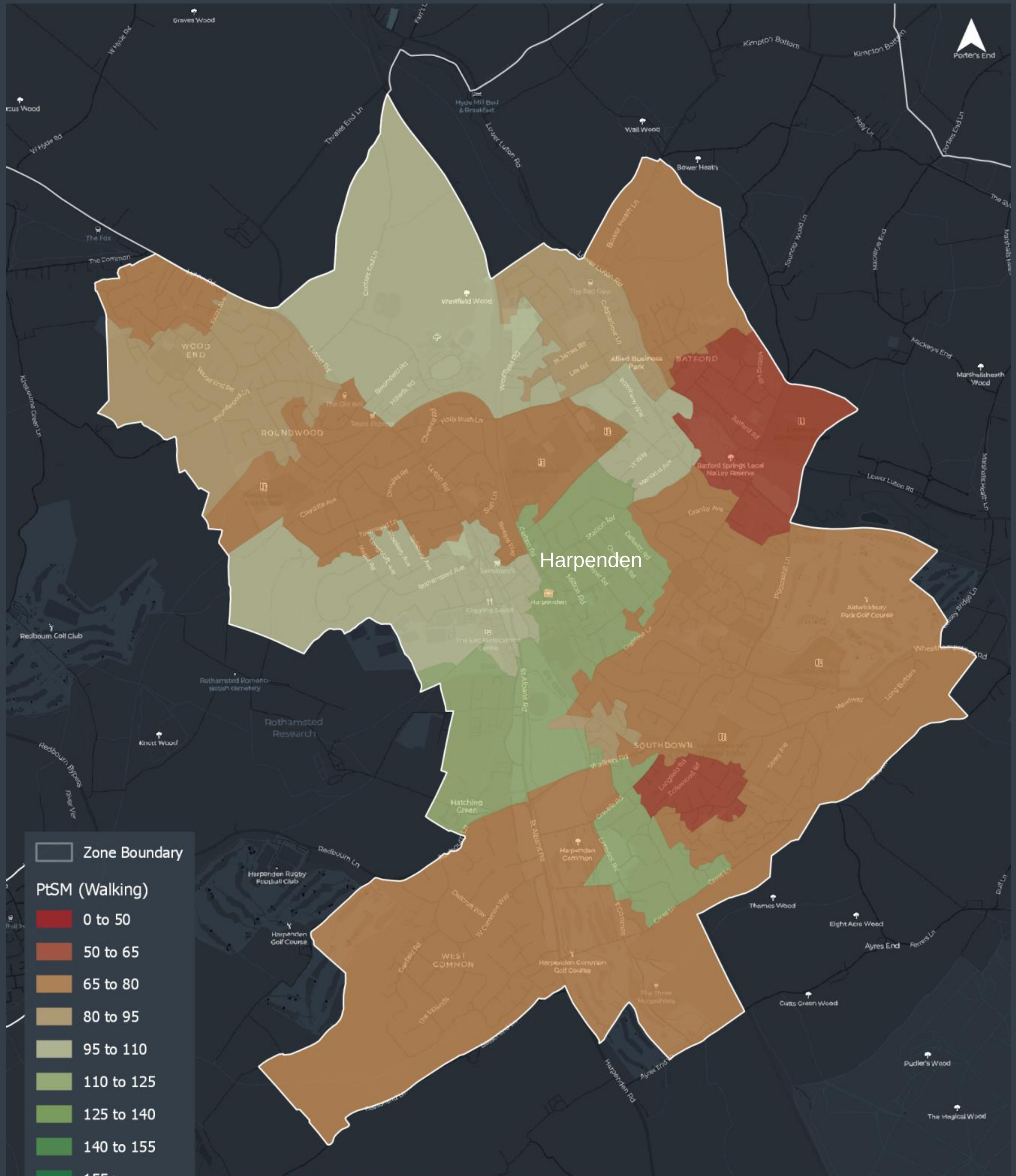
Appendix C2 Walking propensity in Harpenden



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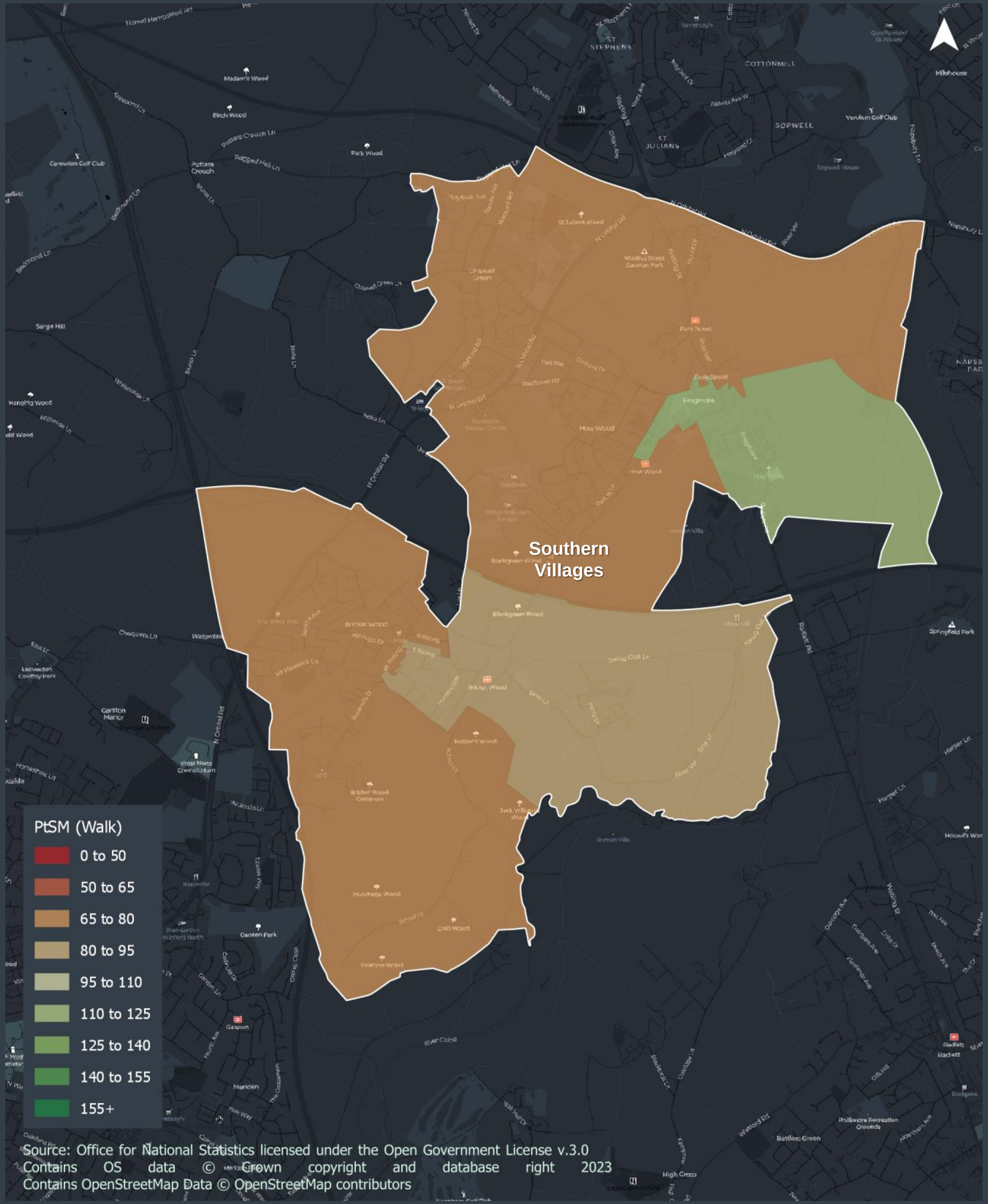
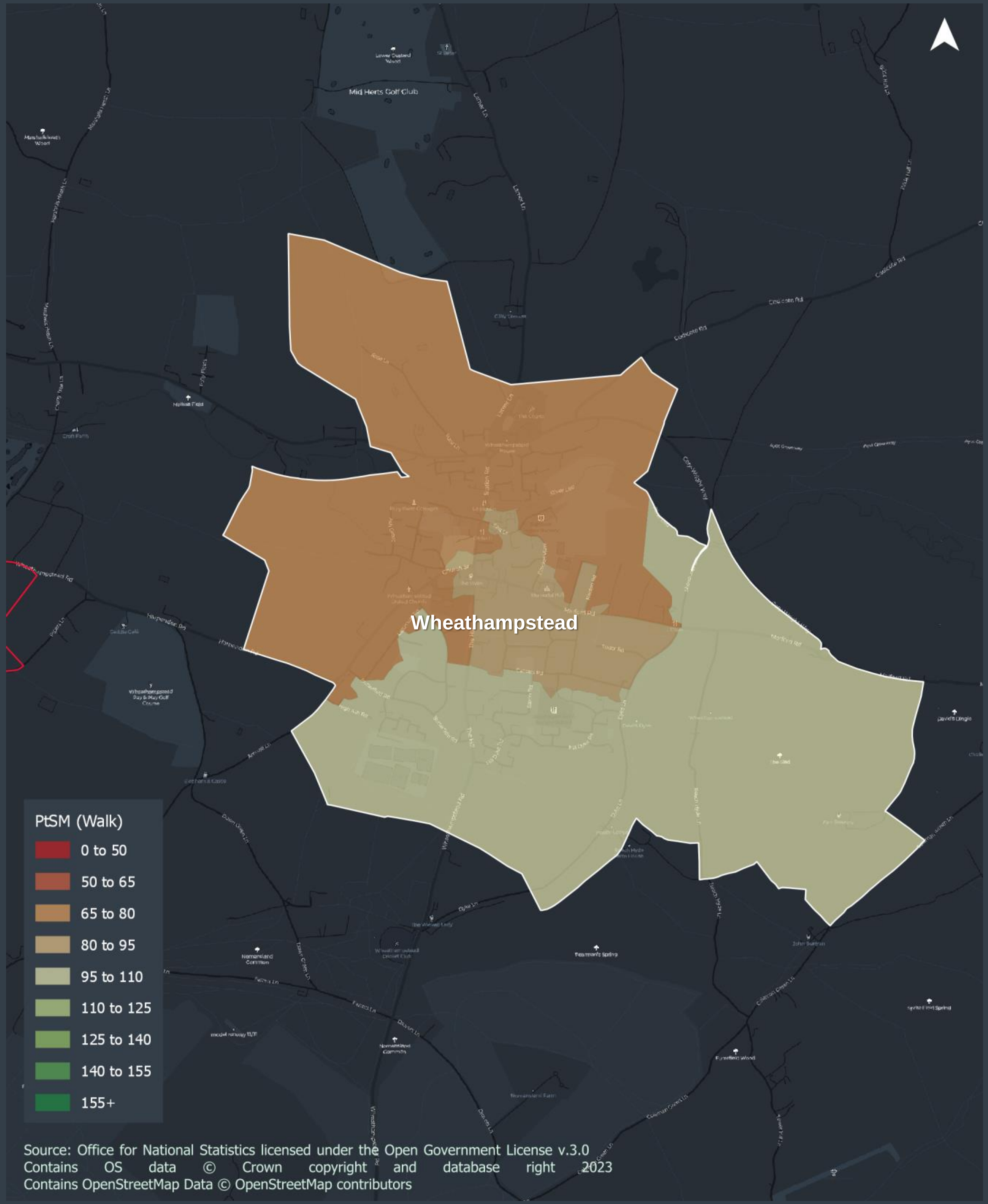
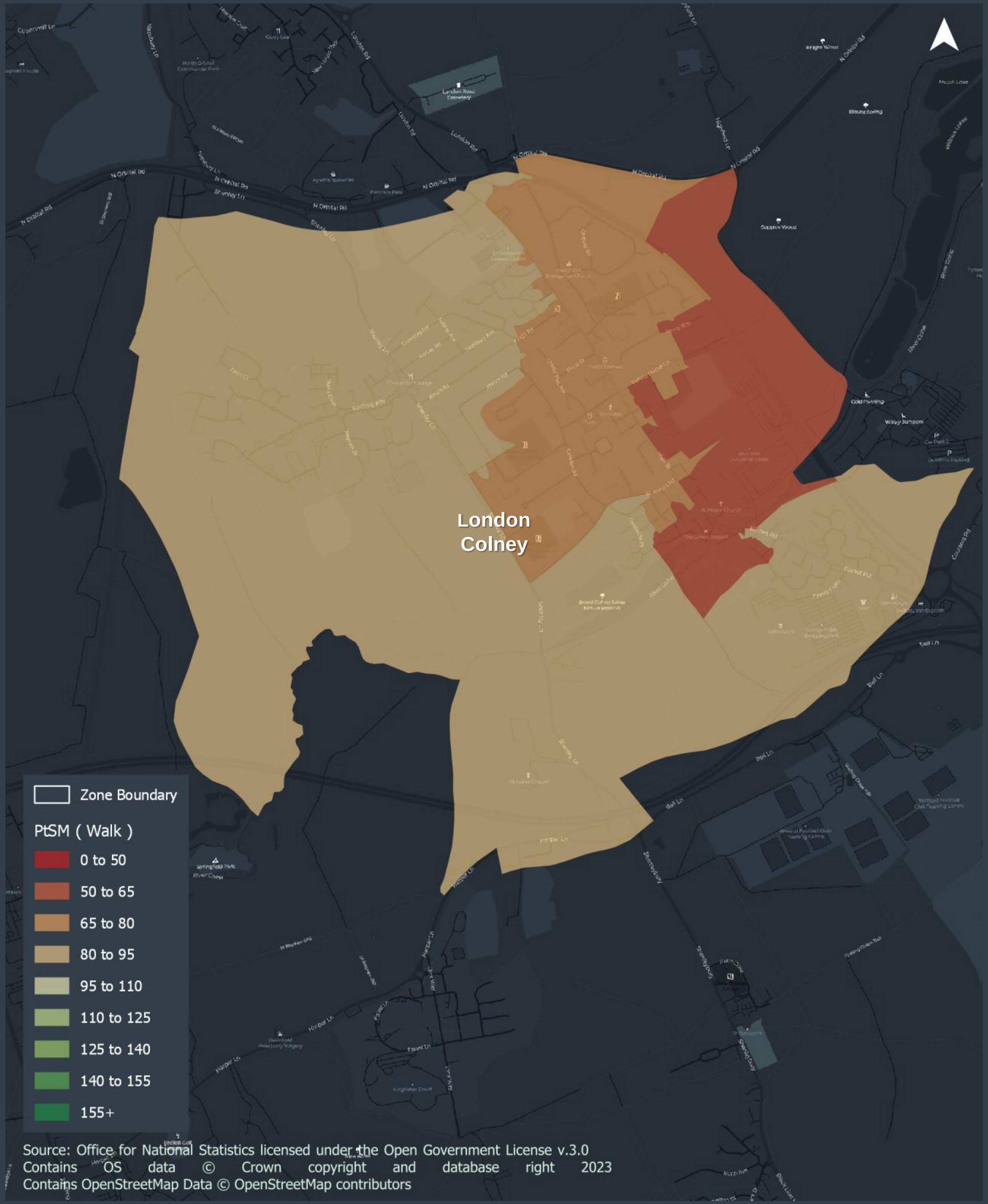
Appendix C3 Walking propensity in Southern Villages



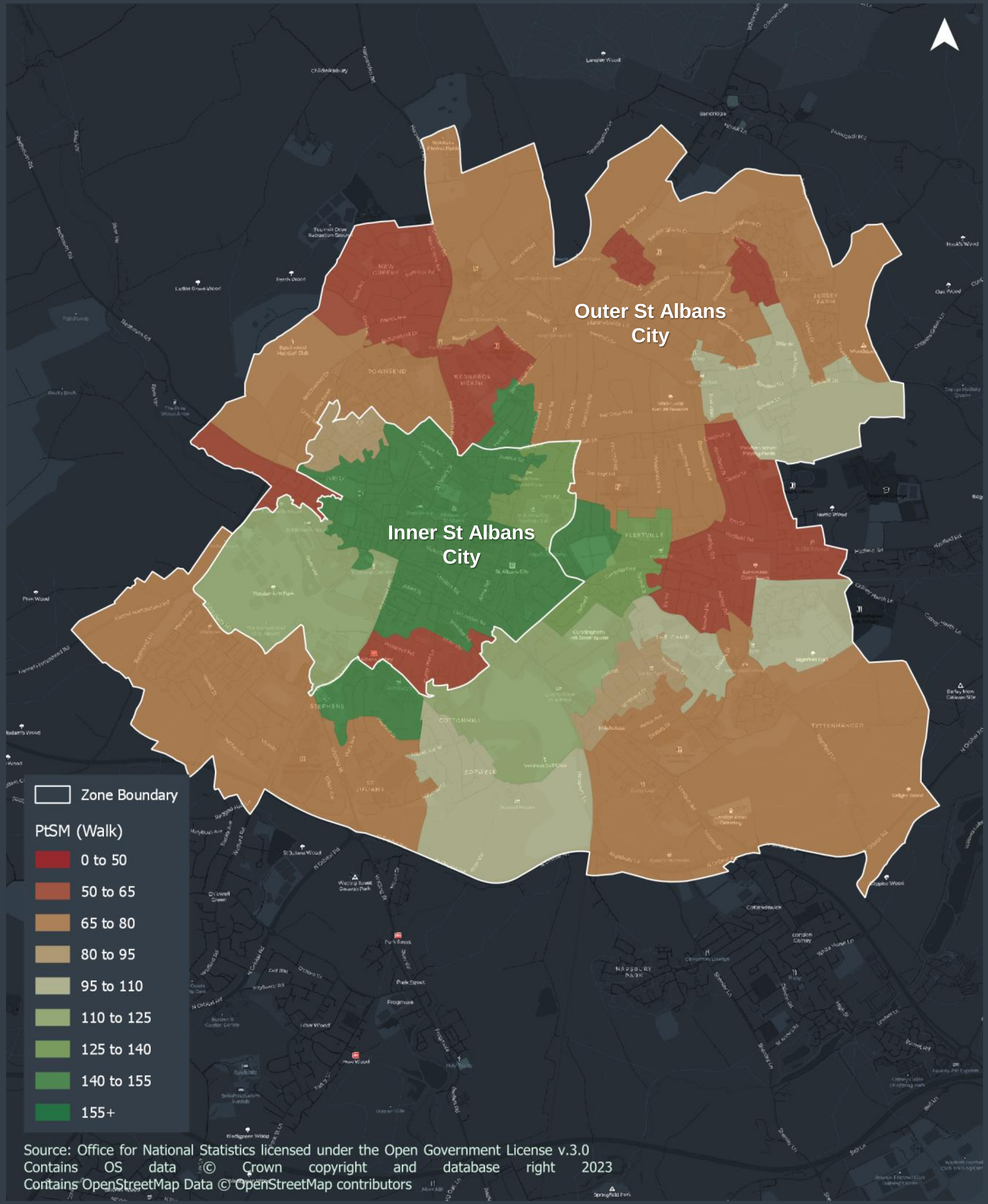
Appendix C4 Walking propensity in Wheathampstead



Appendix C5 Walking propensity in London Colney

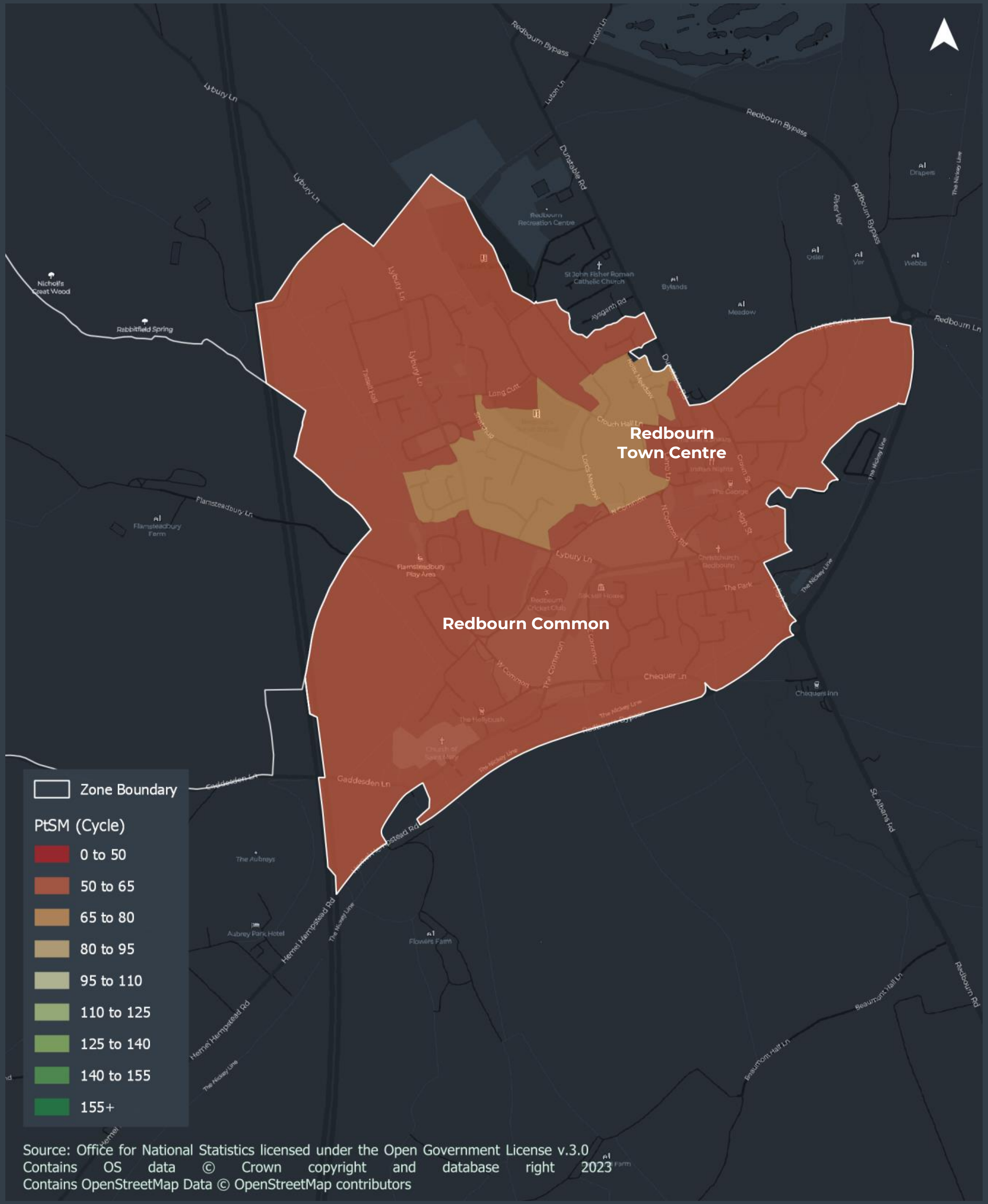


Appendix C6 Walking propensity in Inner & Outer St Albans

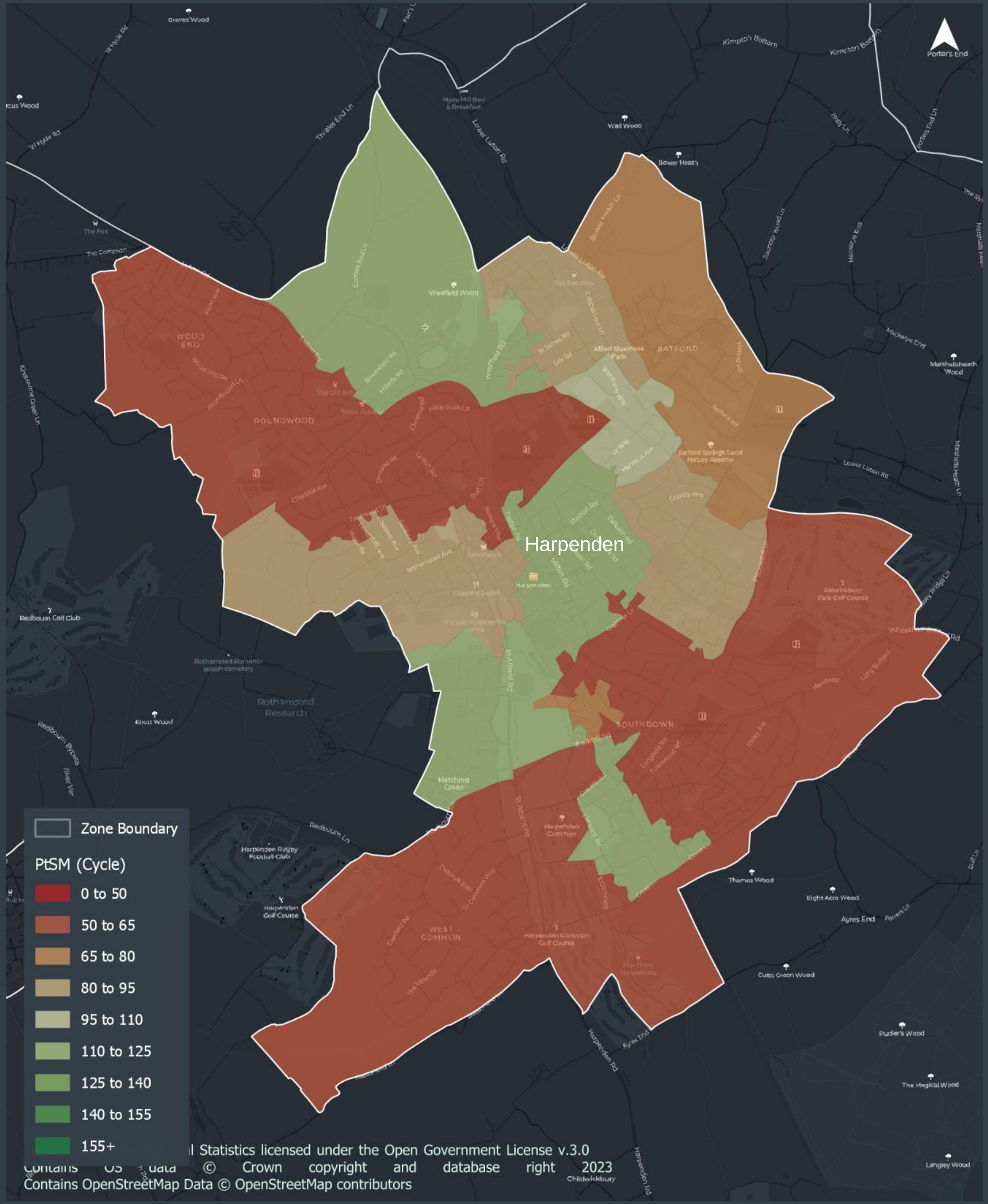


Cycling propensity

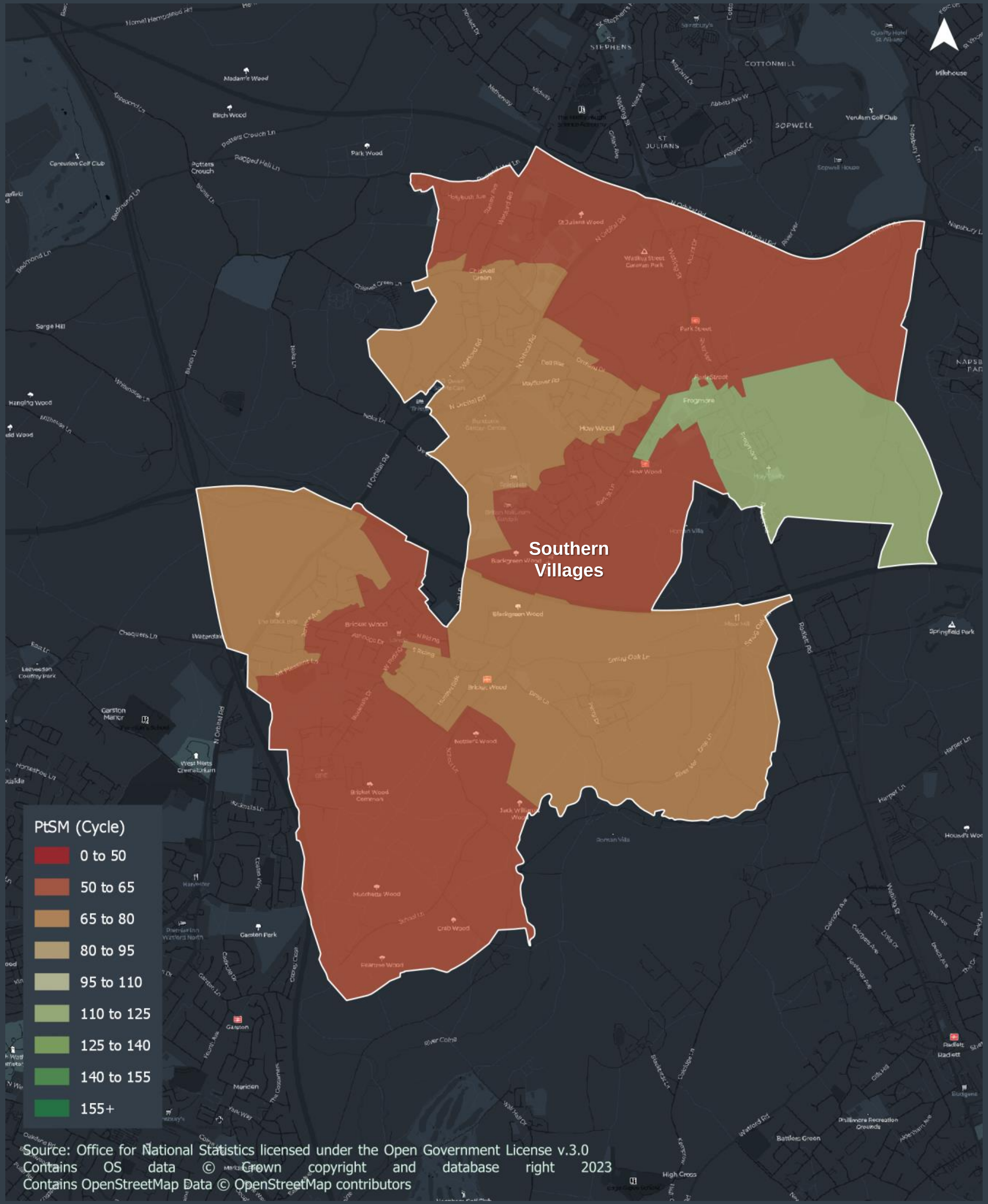
Appendix C7 Cycling propensity in Redbourn



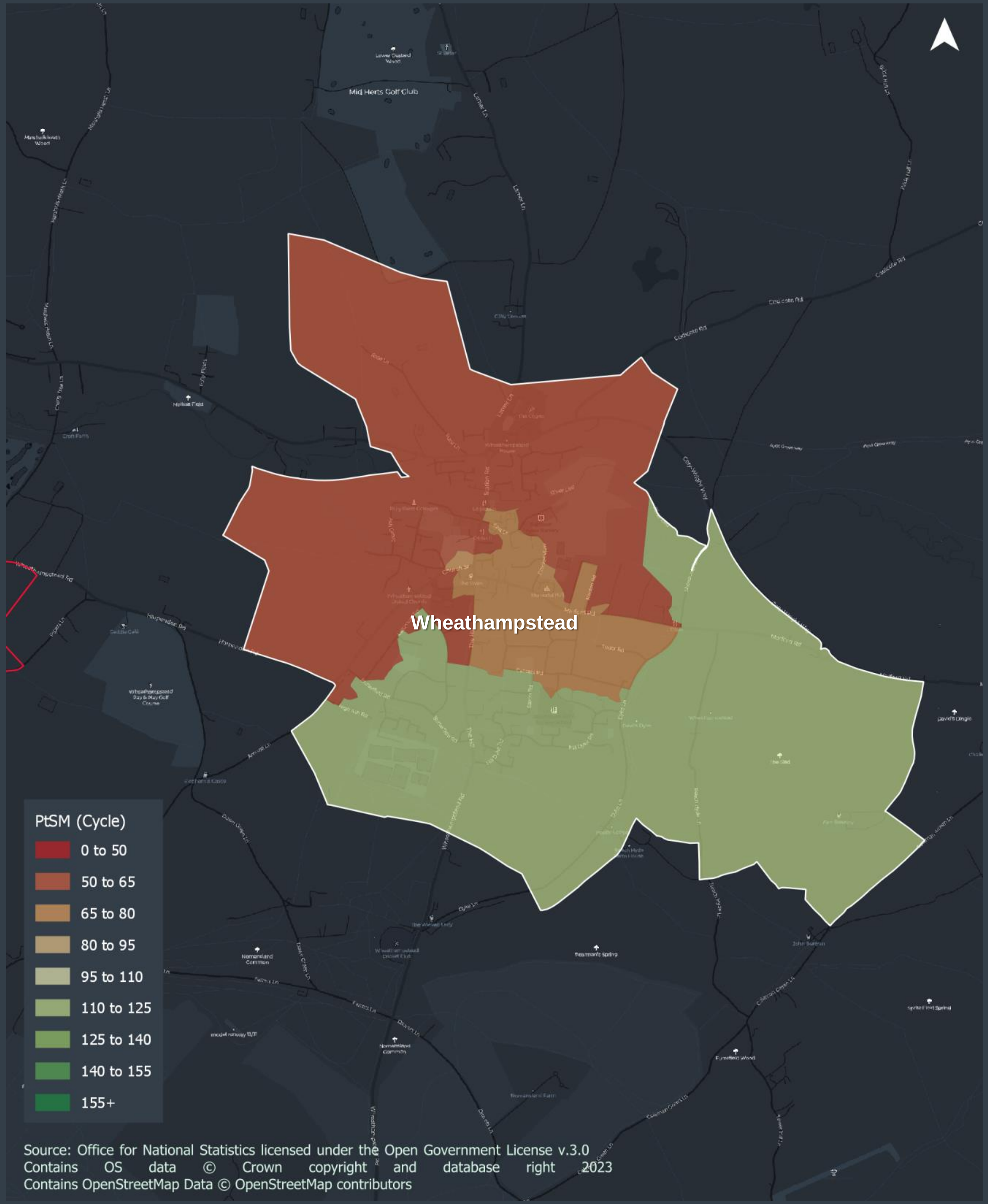
Appendix C8 Cycling propensity in Harpenden



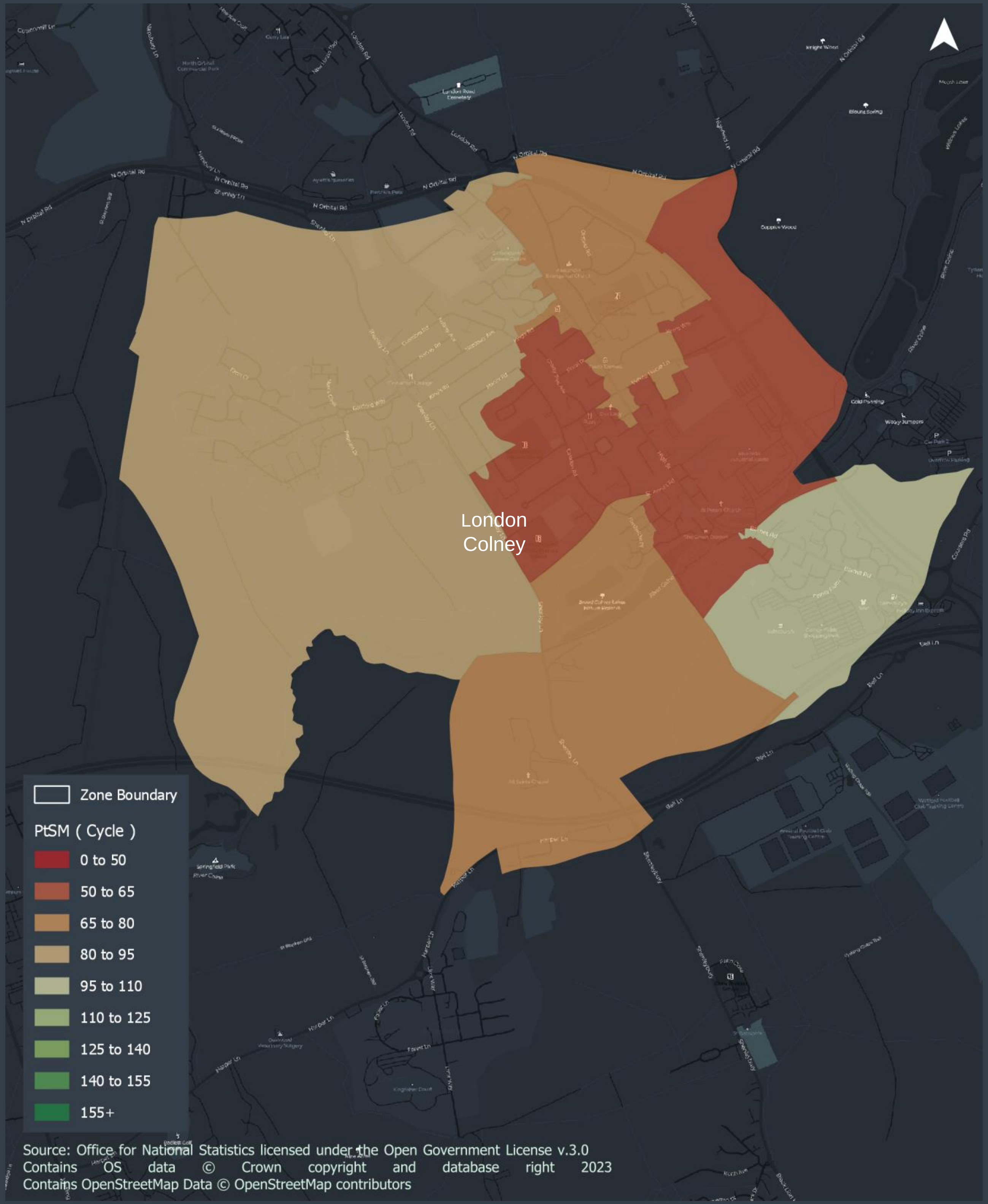
Appendix C9 Cycling propensity in Southern Villages



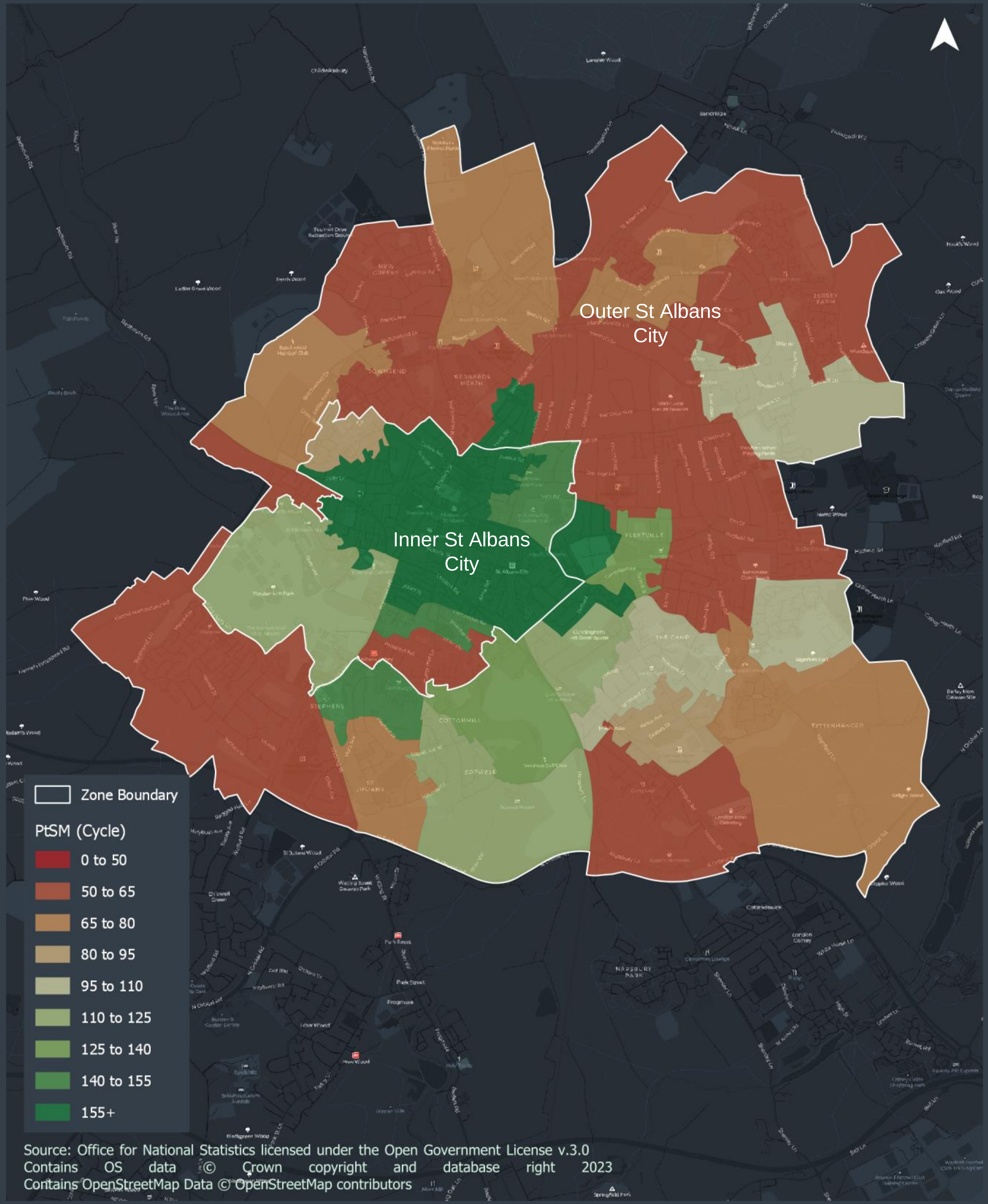
Appendix C10 Cycling propensity in Wheathampstead



Appendix C11 Cycling propensity in London Colney

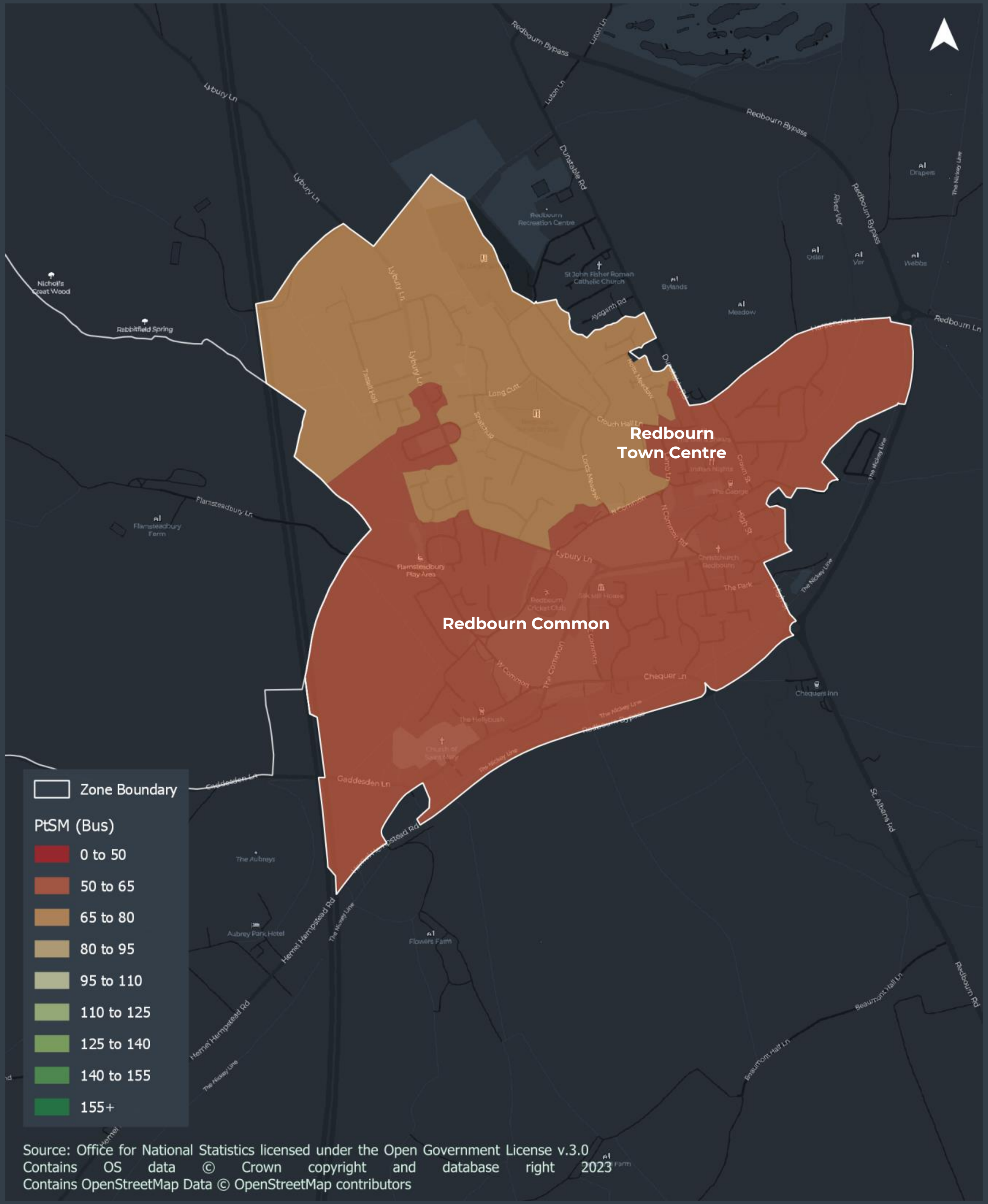


Appendix C12 Cycling propensity in Inner & Outer St Albans

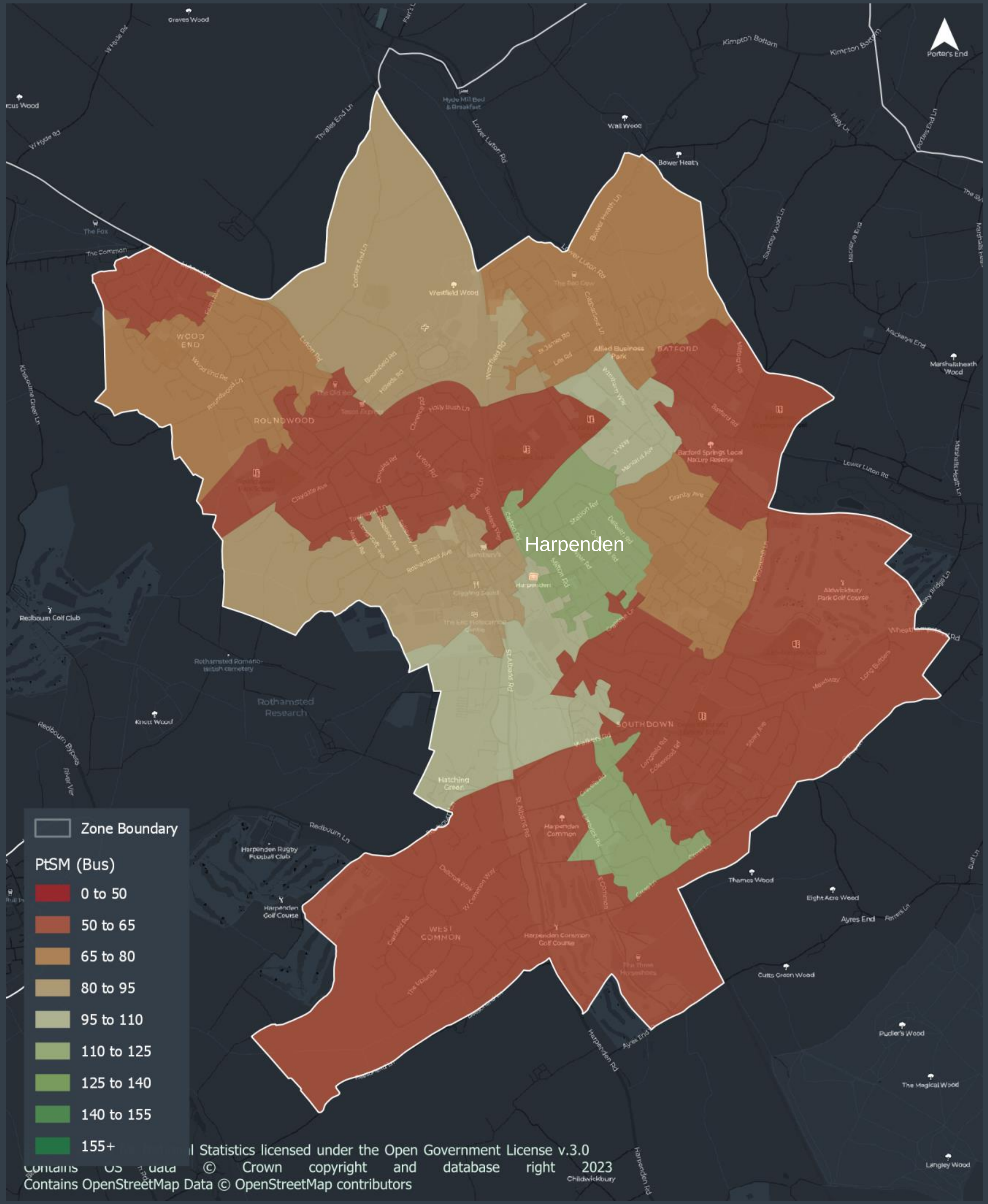


Bus propensity

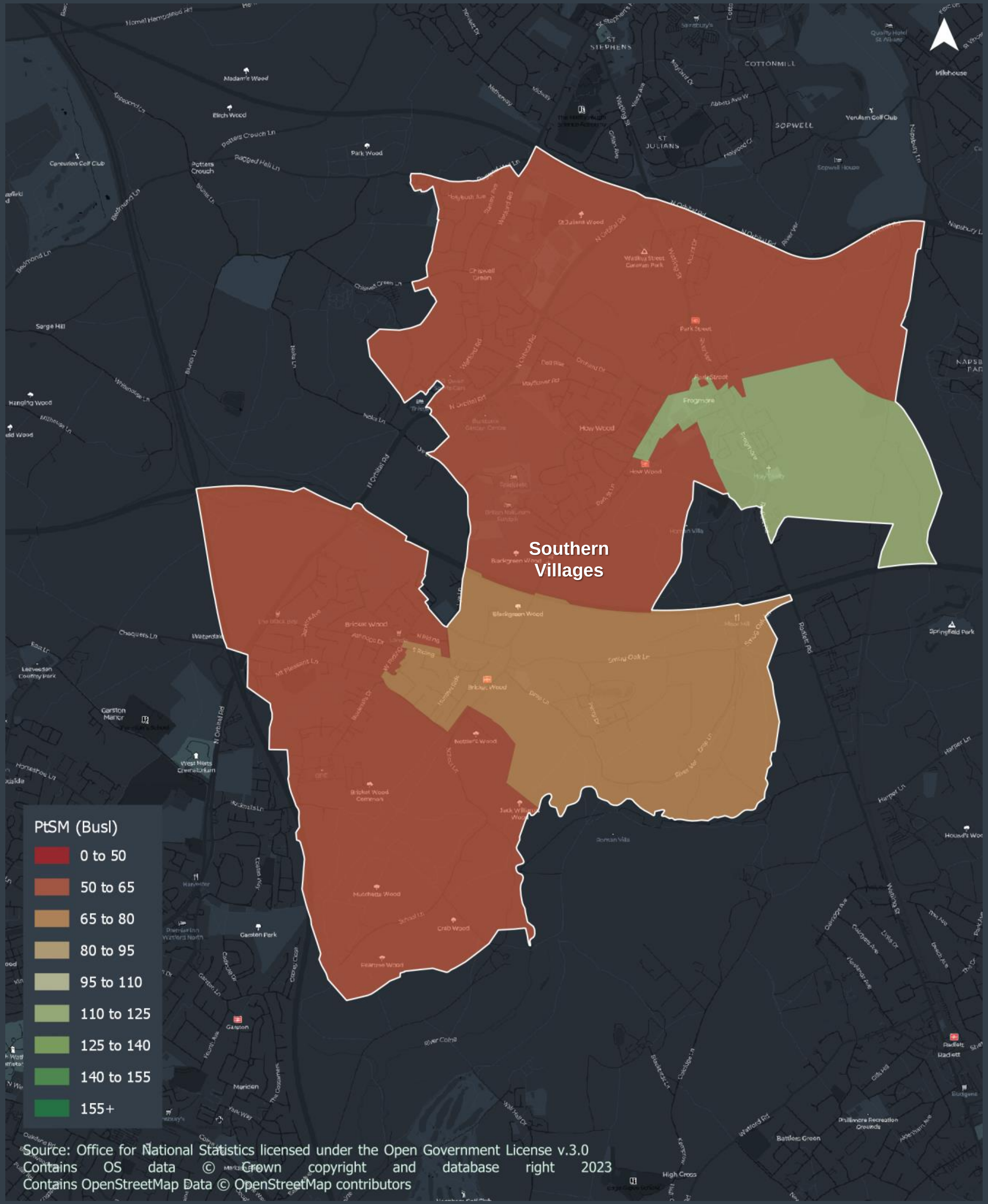
Appendix C13 Bus propensity in Redbourn



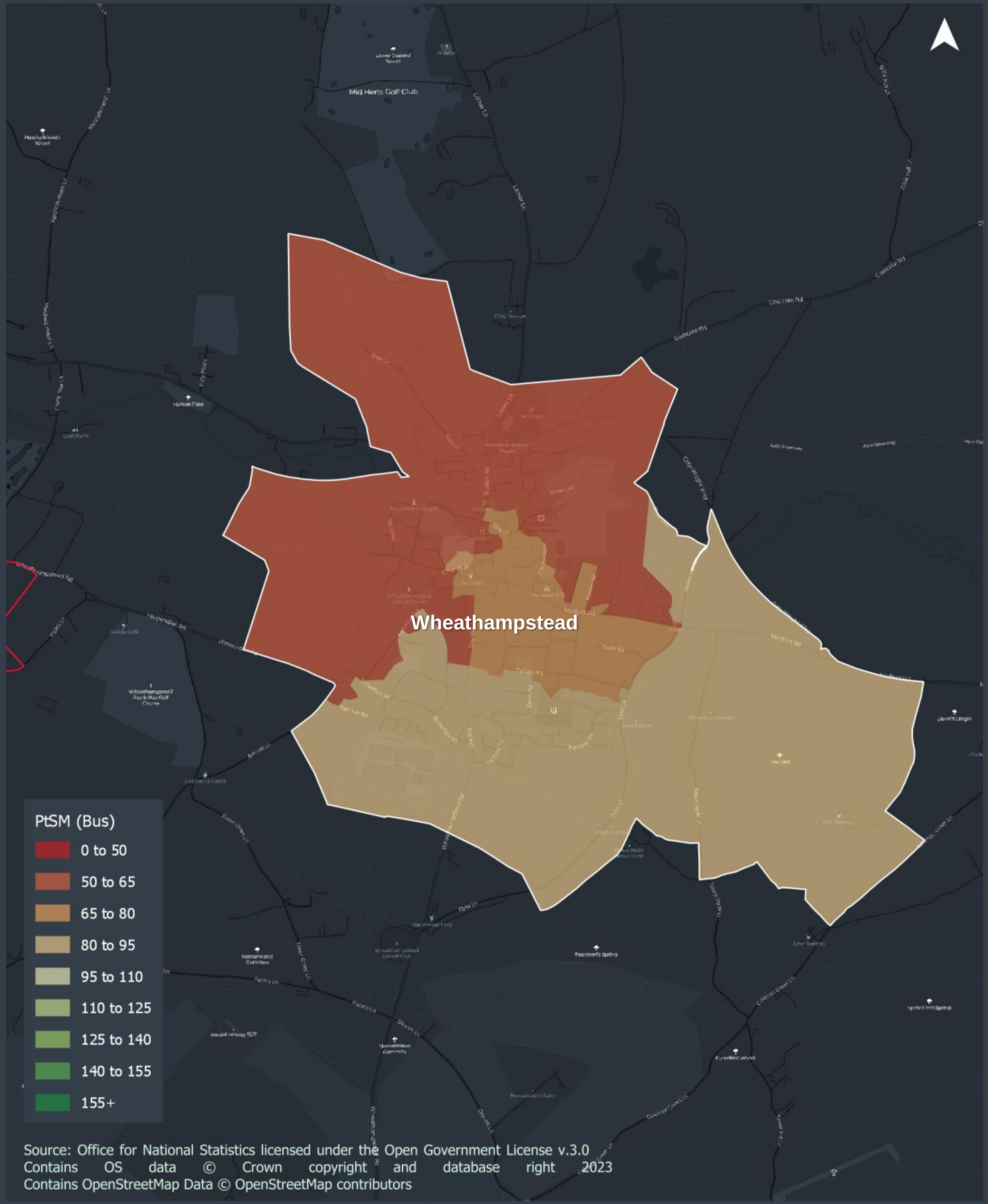
Appendix C14 Bus propensity in Harpenden



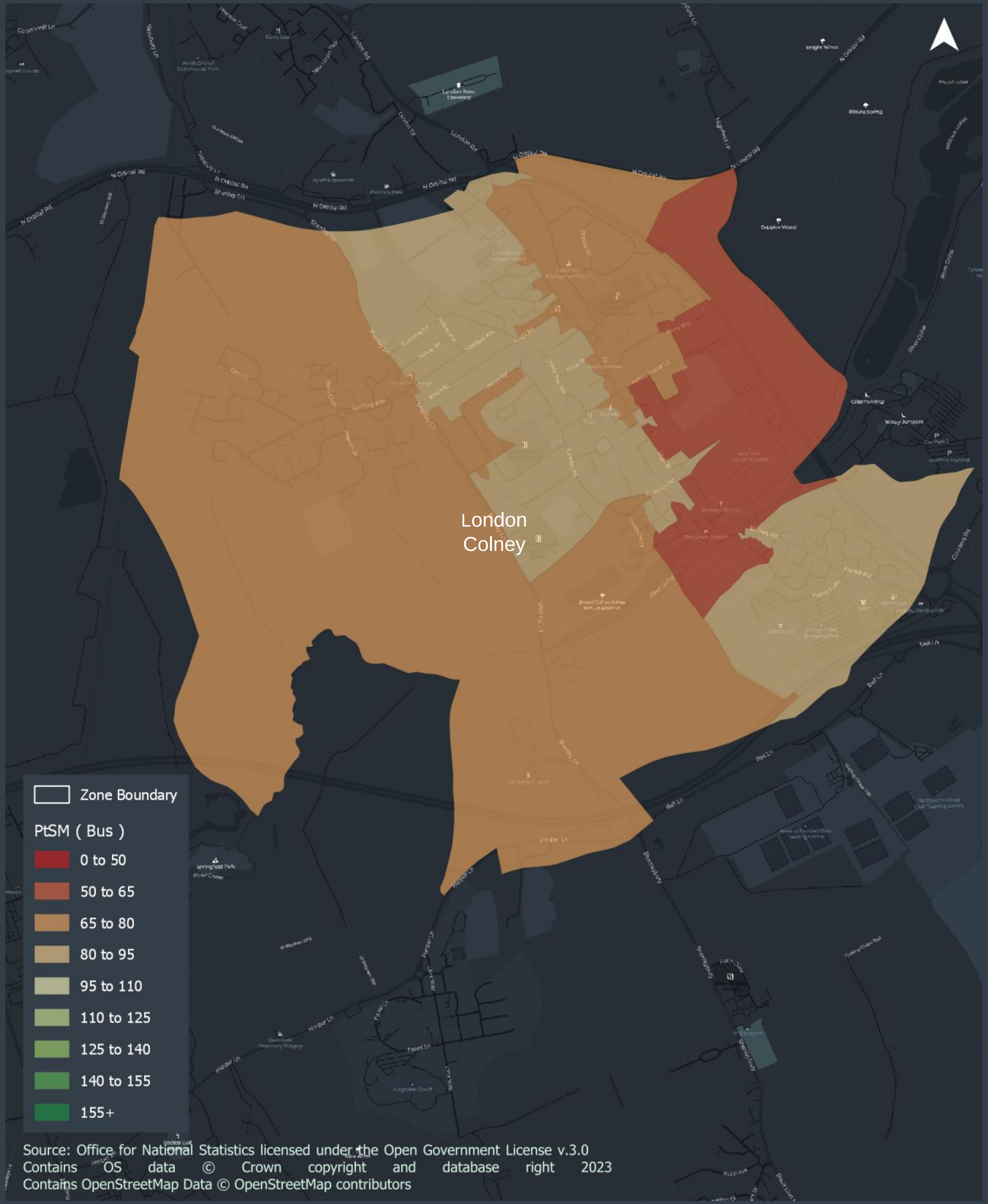
Appendix C15 Bus propensity in Southern Villages



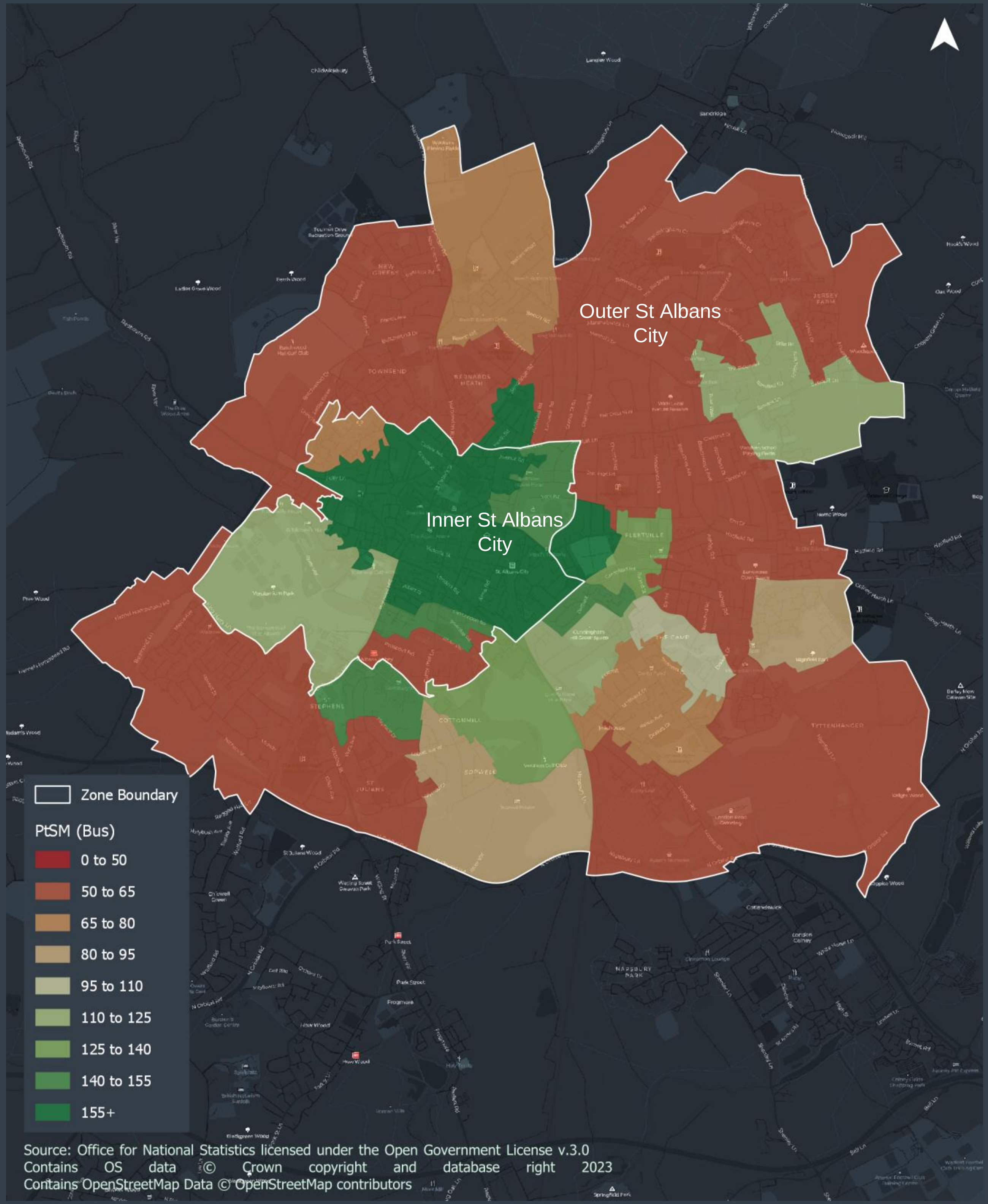
Appendix C16 Bus propensity in Wheathampstead



Appendix C17 Bus propensity in London Colney

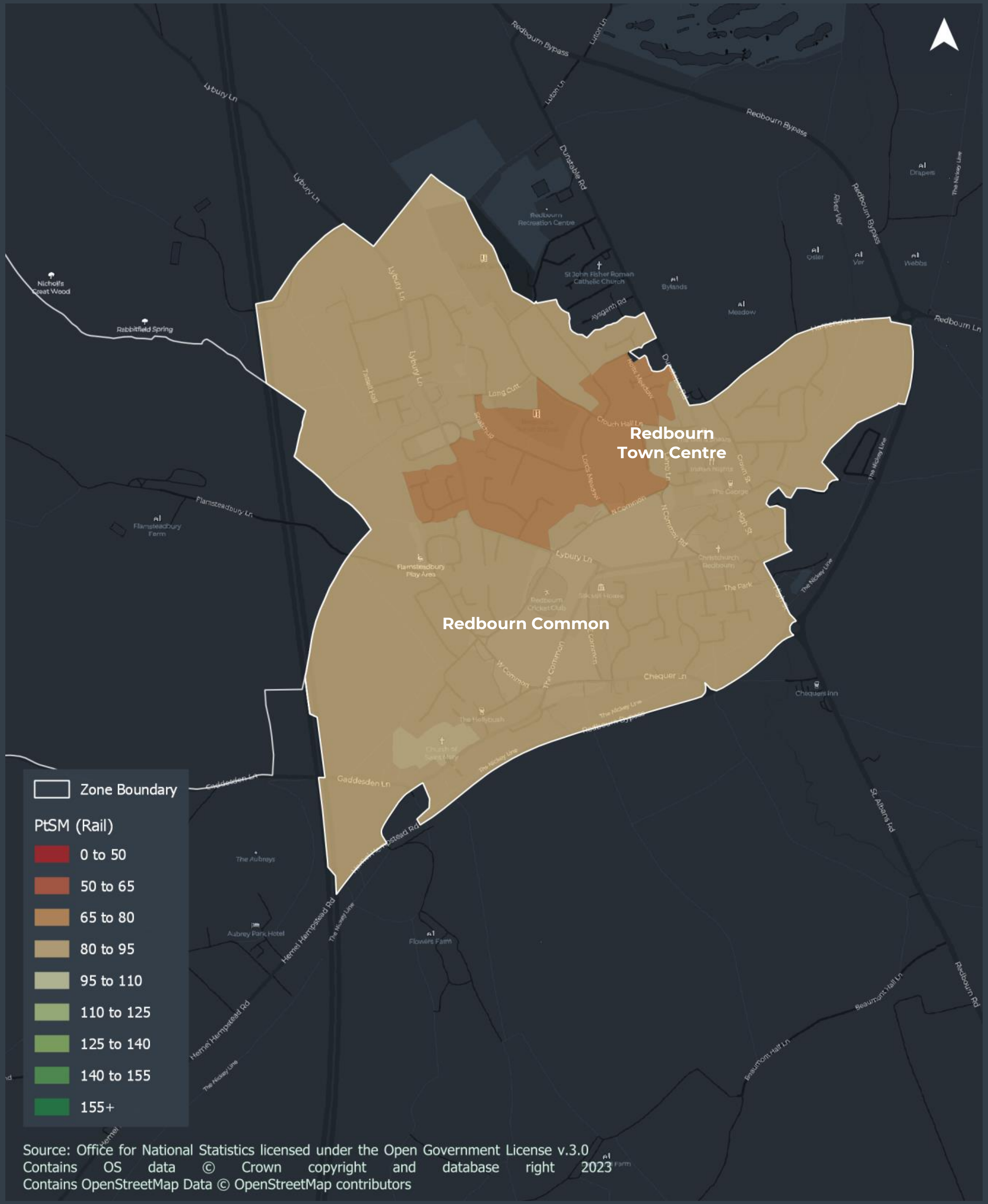


Appendix C18 Bus propensity in Inner & Outer St Albans

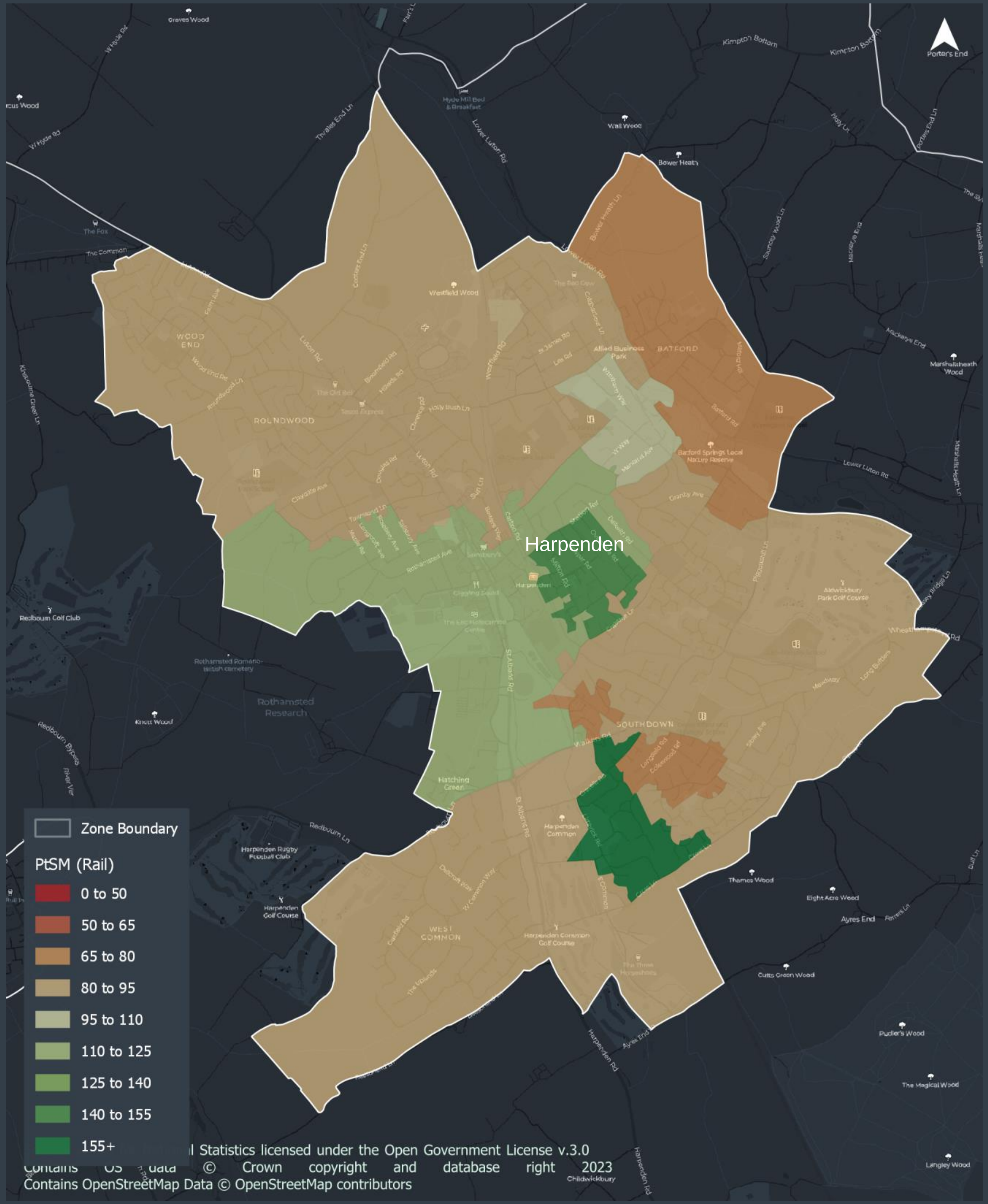


Rail propensity

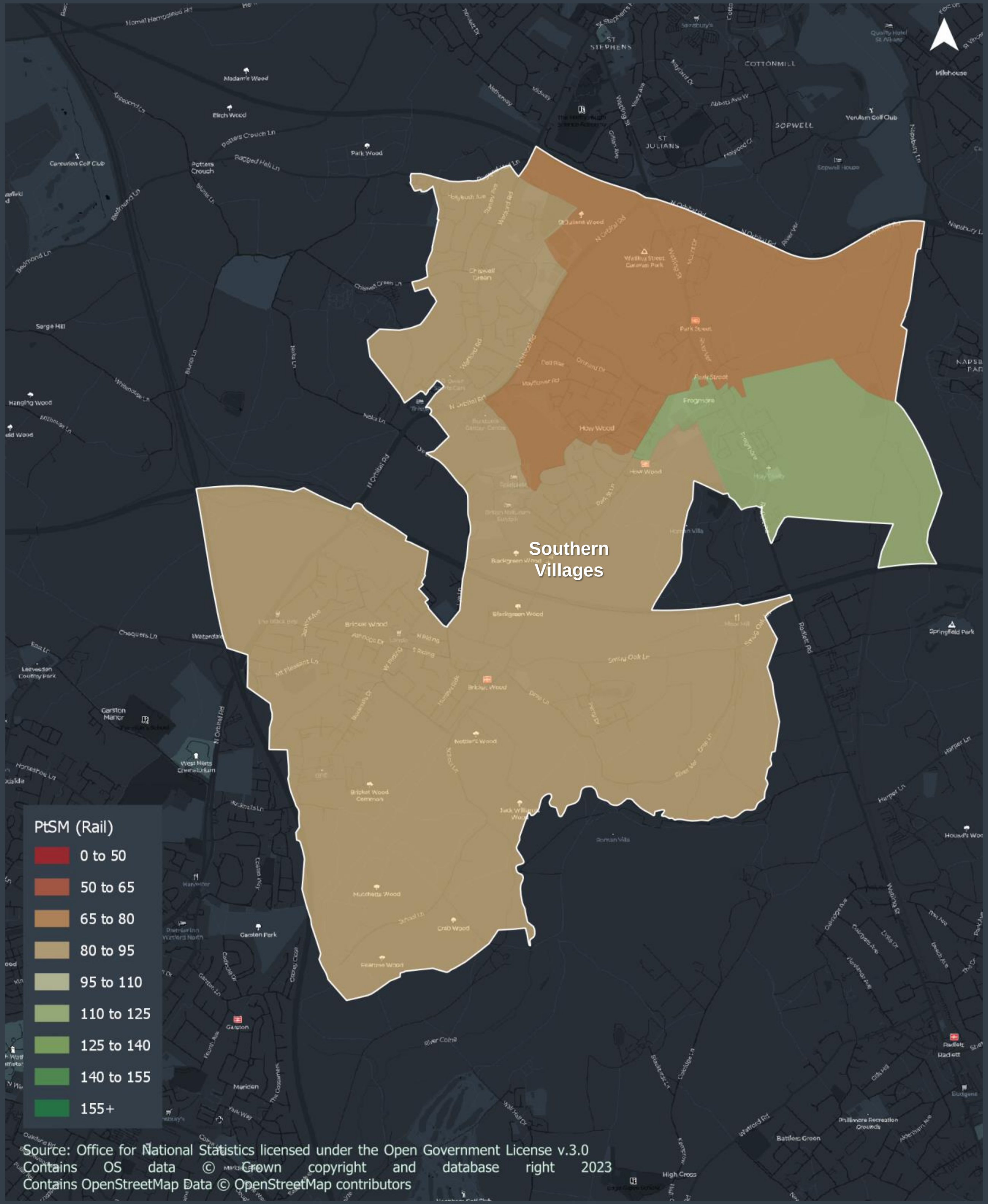
Appendix C19 Rail propensity in Redbourn



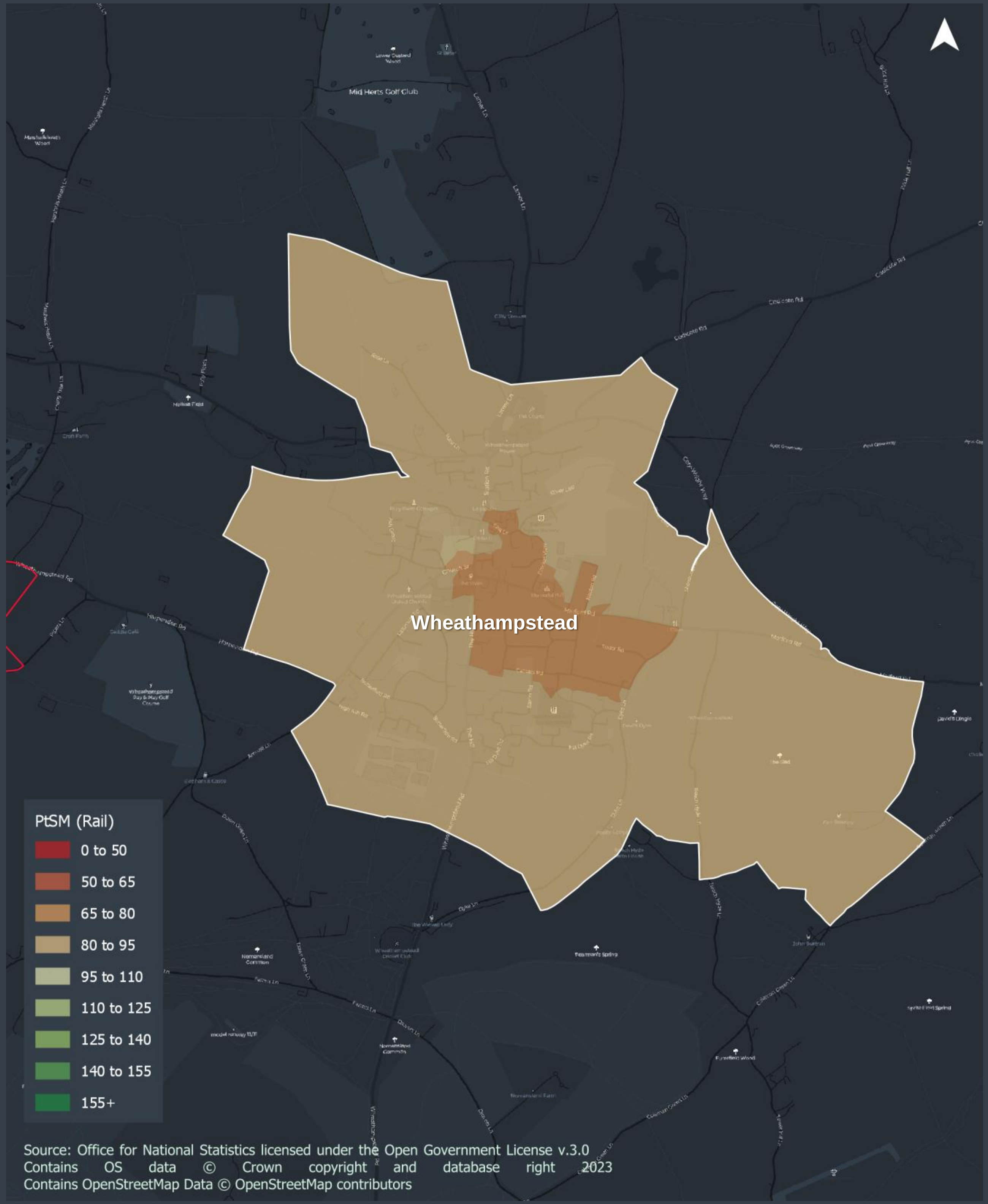
Appendix C20 Rail propensity in Harpenden



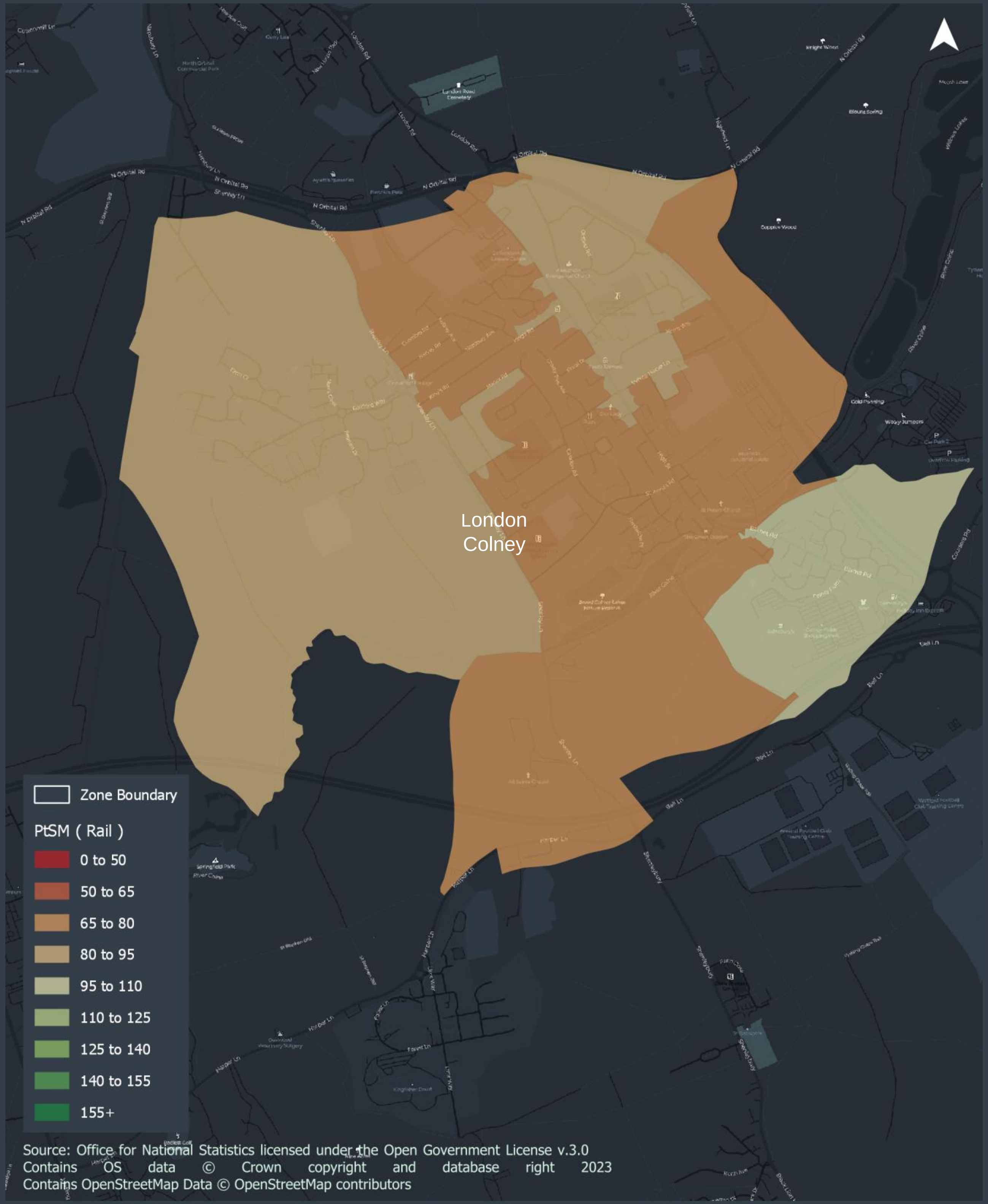
Appendix C21 Rail propensity in Southern Villages



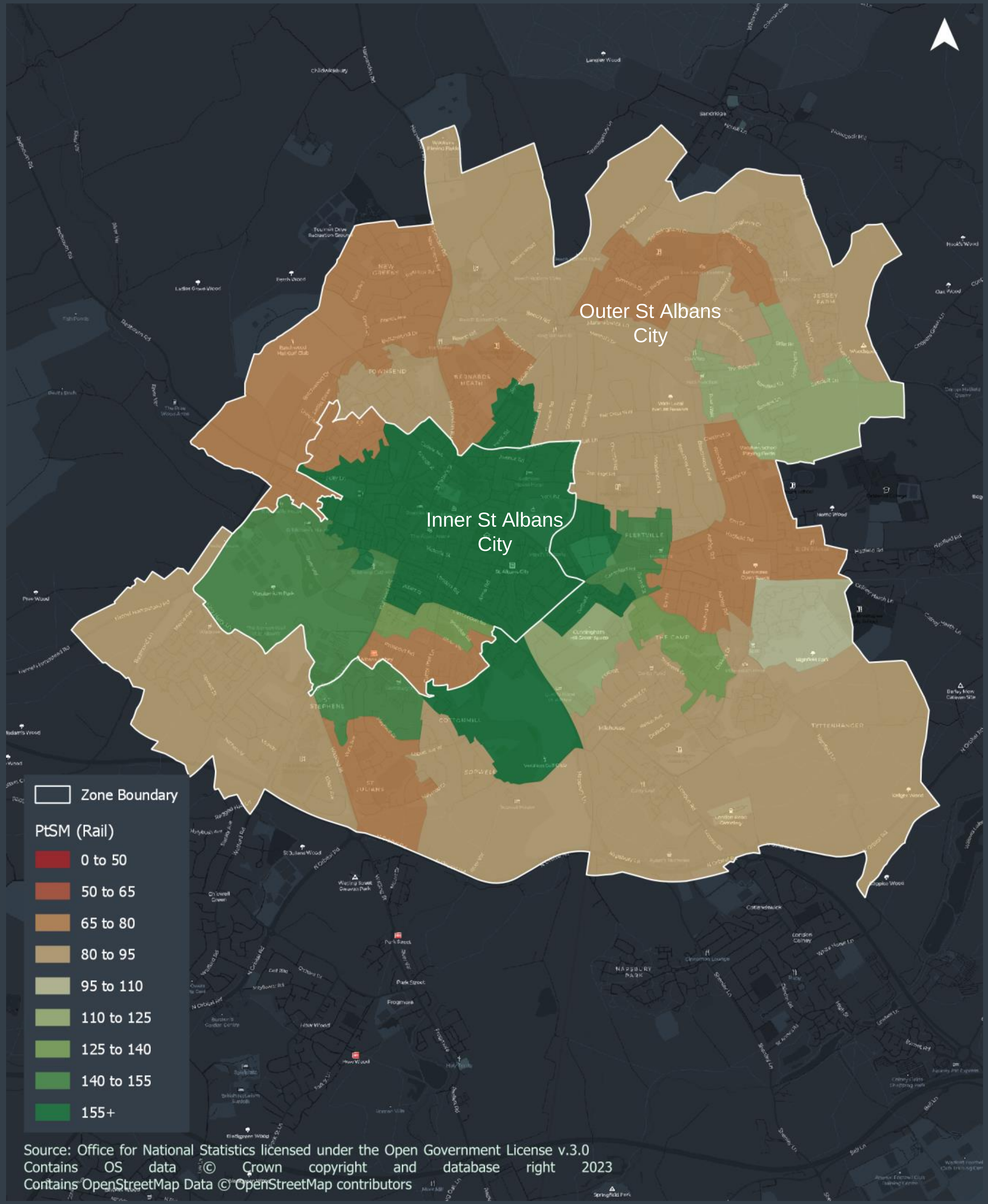
Appendix C22 Rail propensity in Wheathampstead



Appendix C23 Rail propensity in London Colney

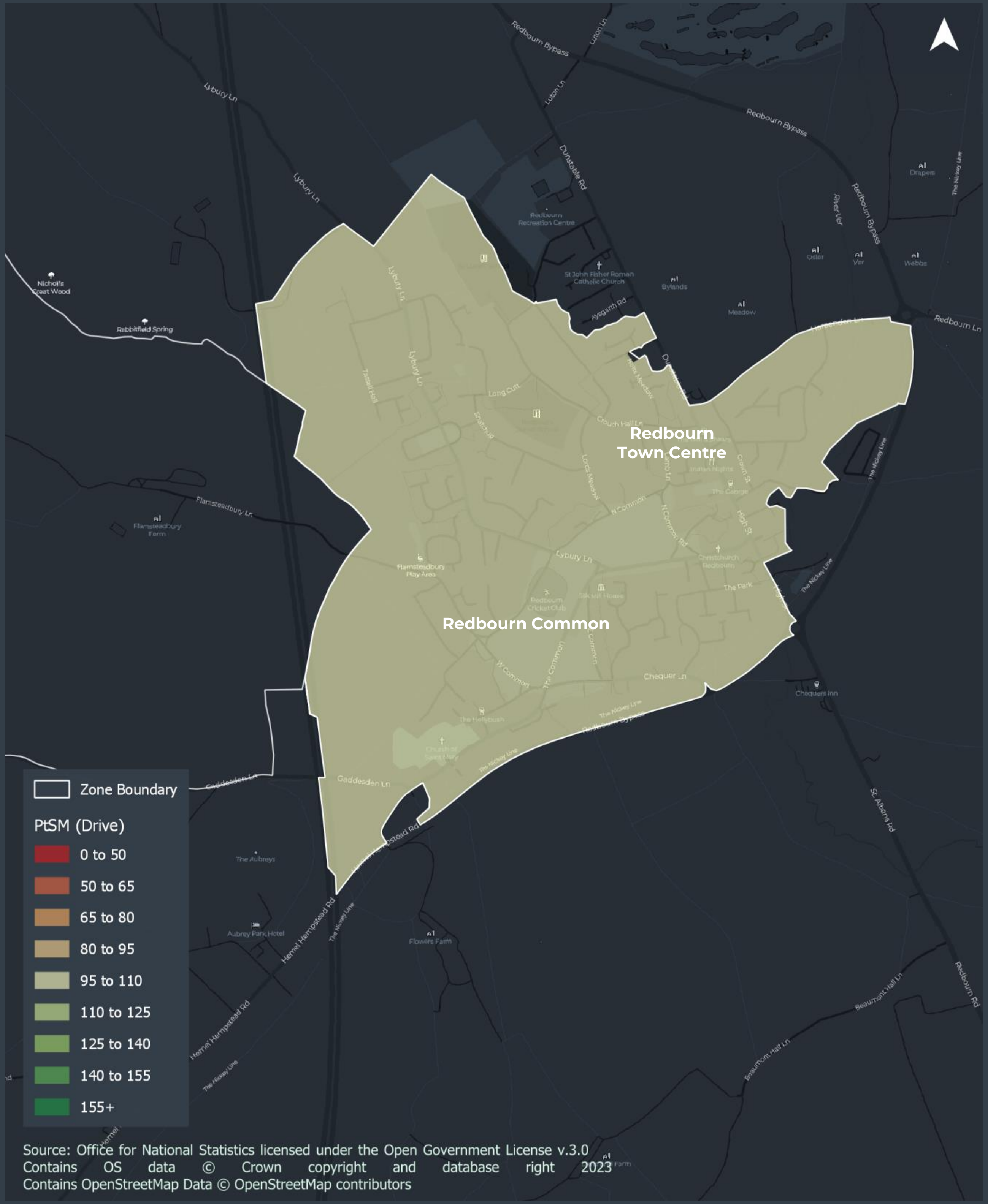


Appendix C24 Rail propensity in Inner & Outer St Albans

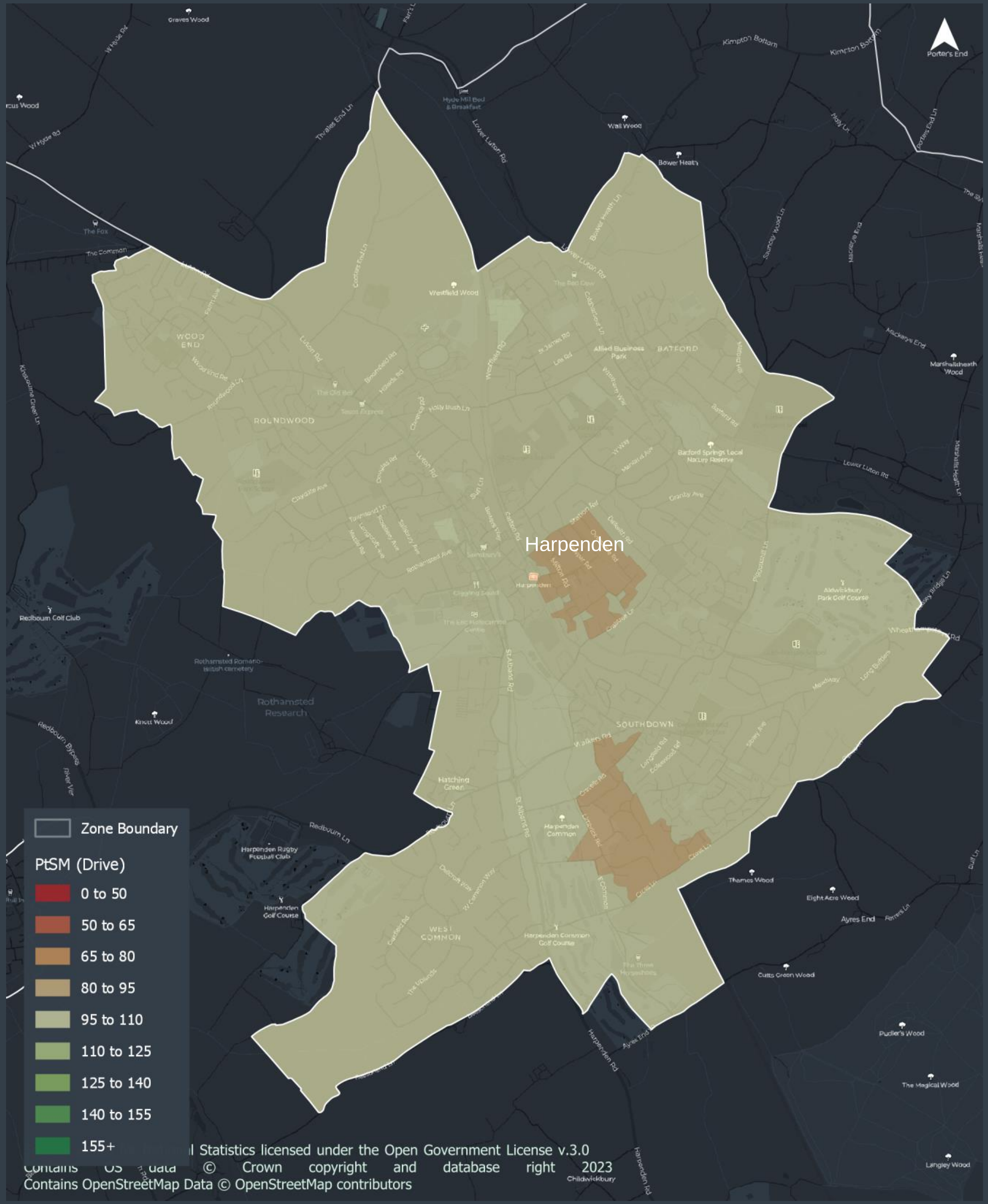


Driving propensity

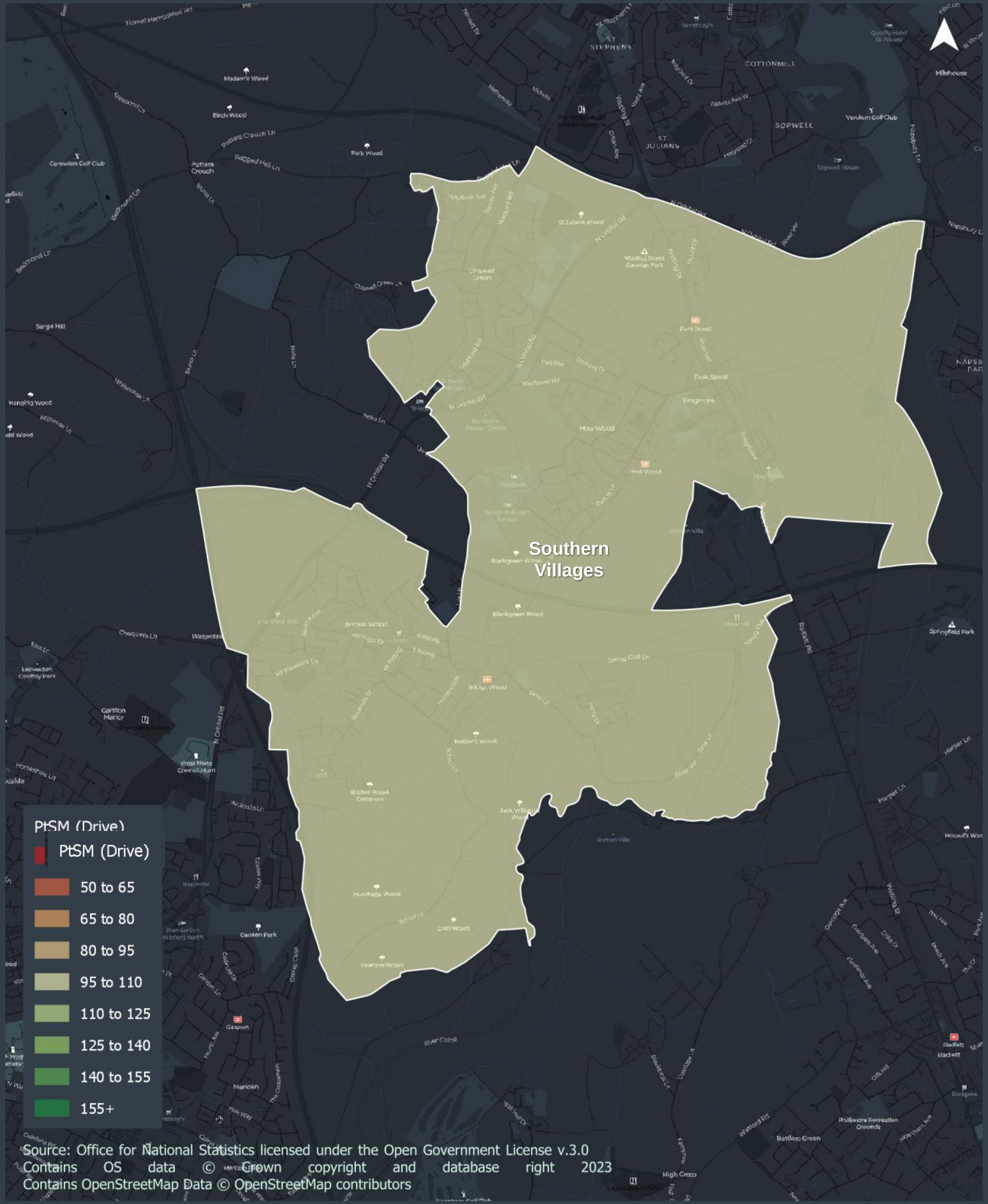
Appendix C25 Driving propensity in Redbourn



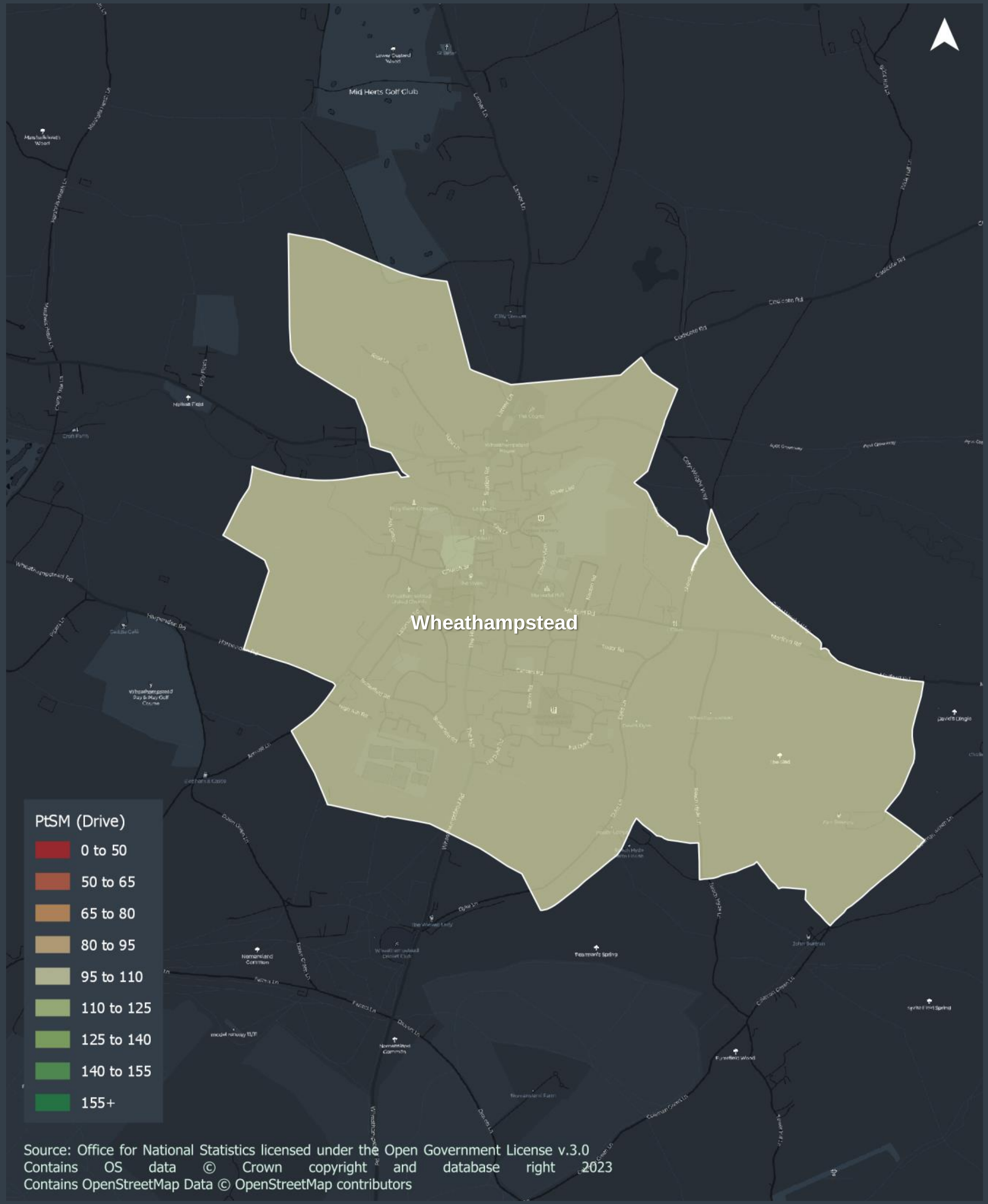
Appendix C26 Driving propensity in Harpenden



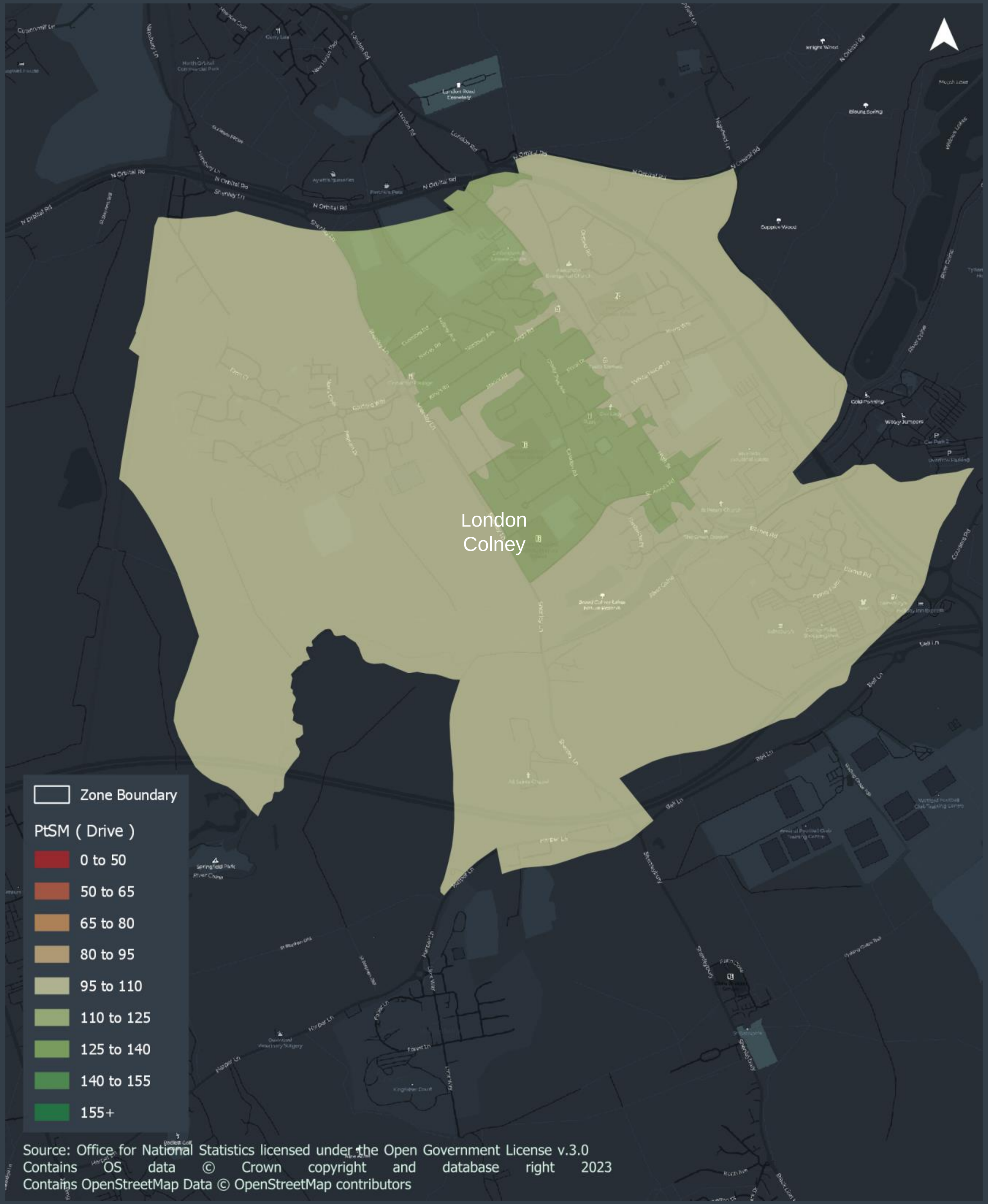
Appendix C27 Driving propensity in Southern Villages



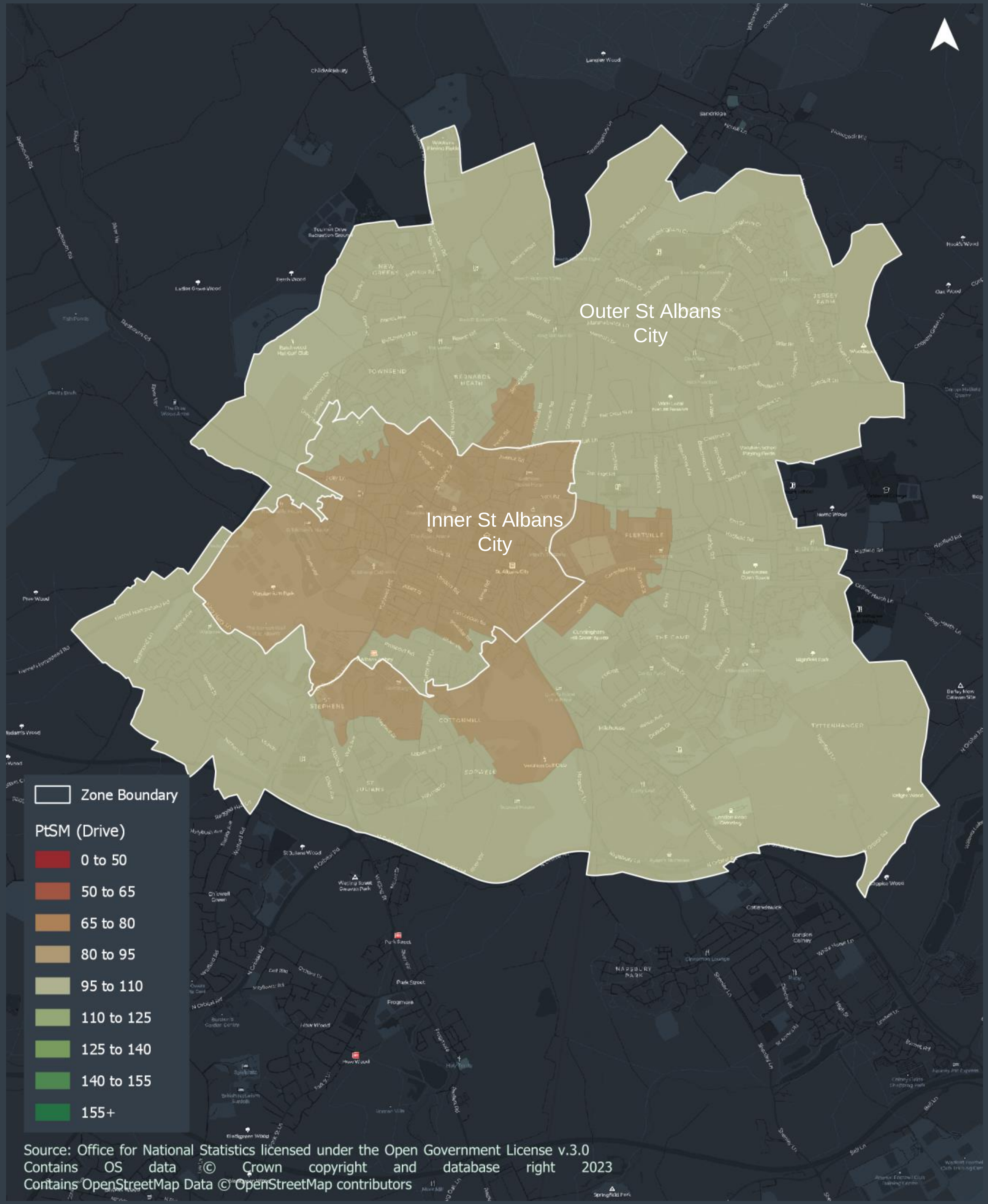
Appendix C28 Driving propensity in Wheathampstead



Appendix C29 Driving propensity in London Colney



Appendix C30 Driving propensity in Inner & Outer St Albans

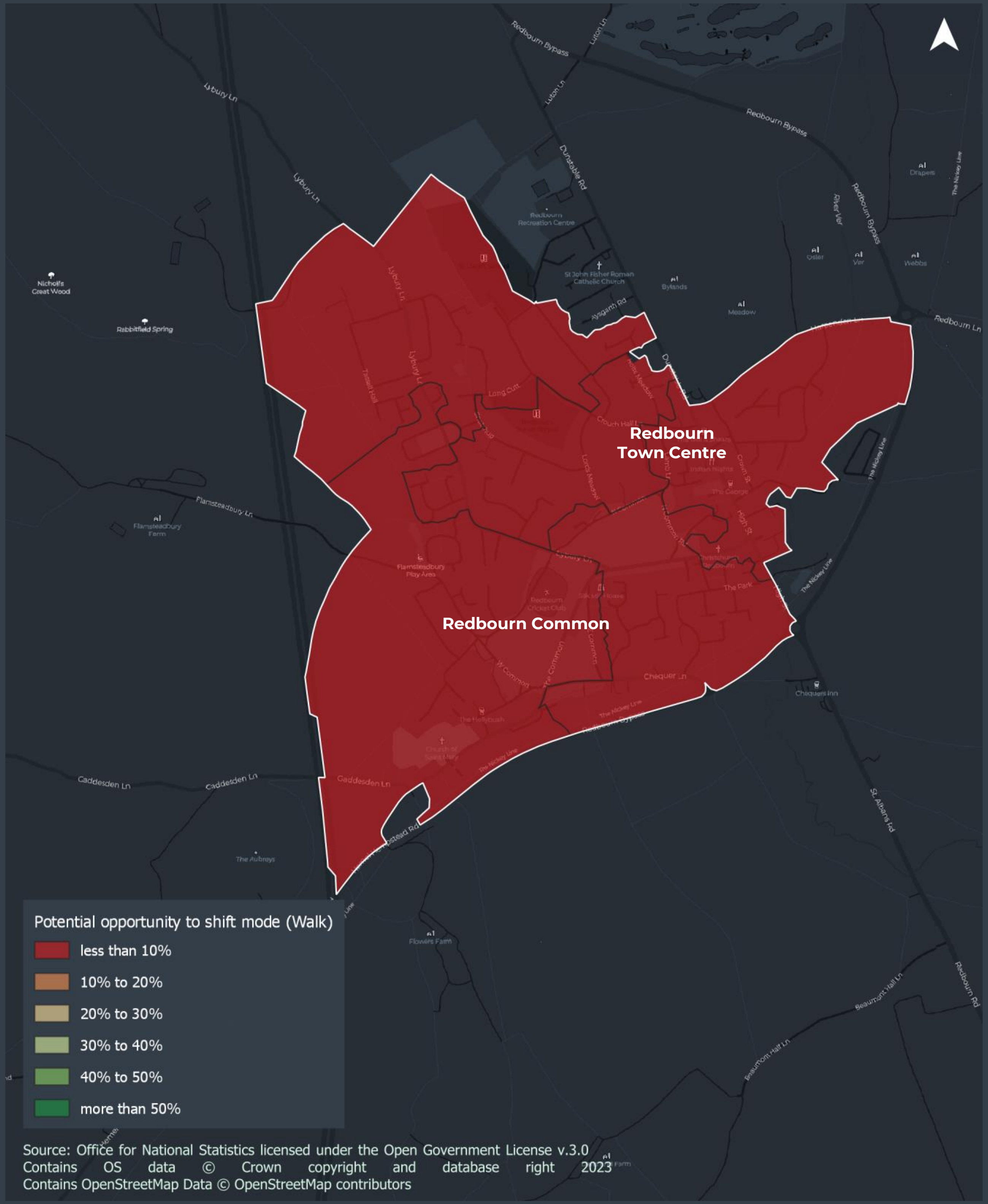


APPENDIX D

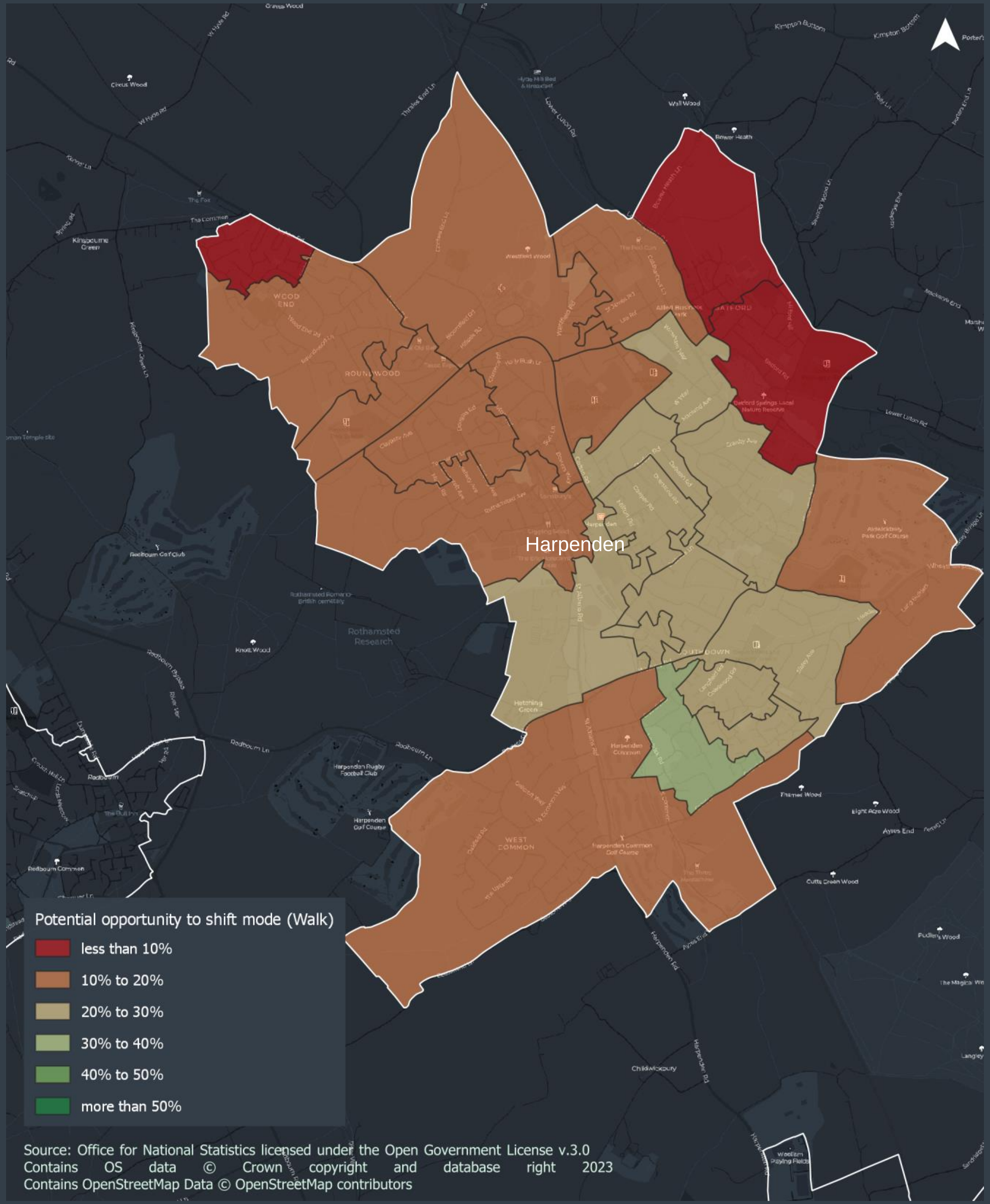
Breakdown of sustainable travel potential for existing communities

Walking potential

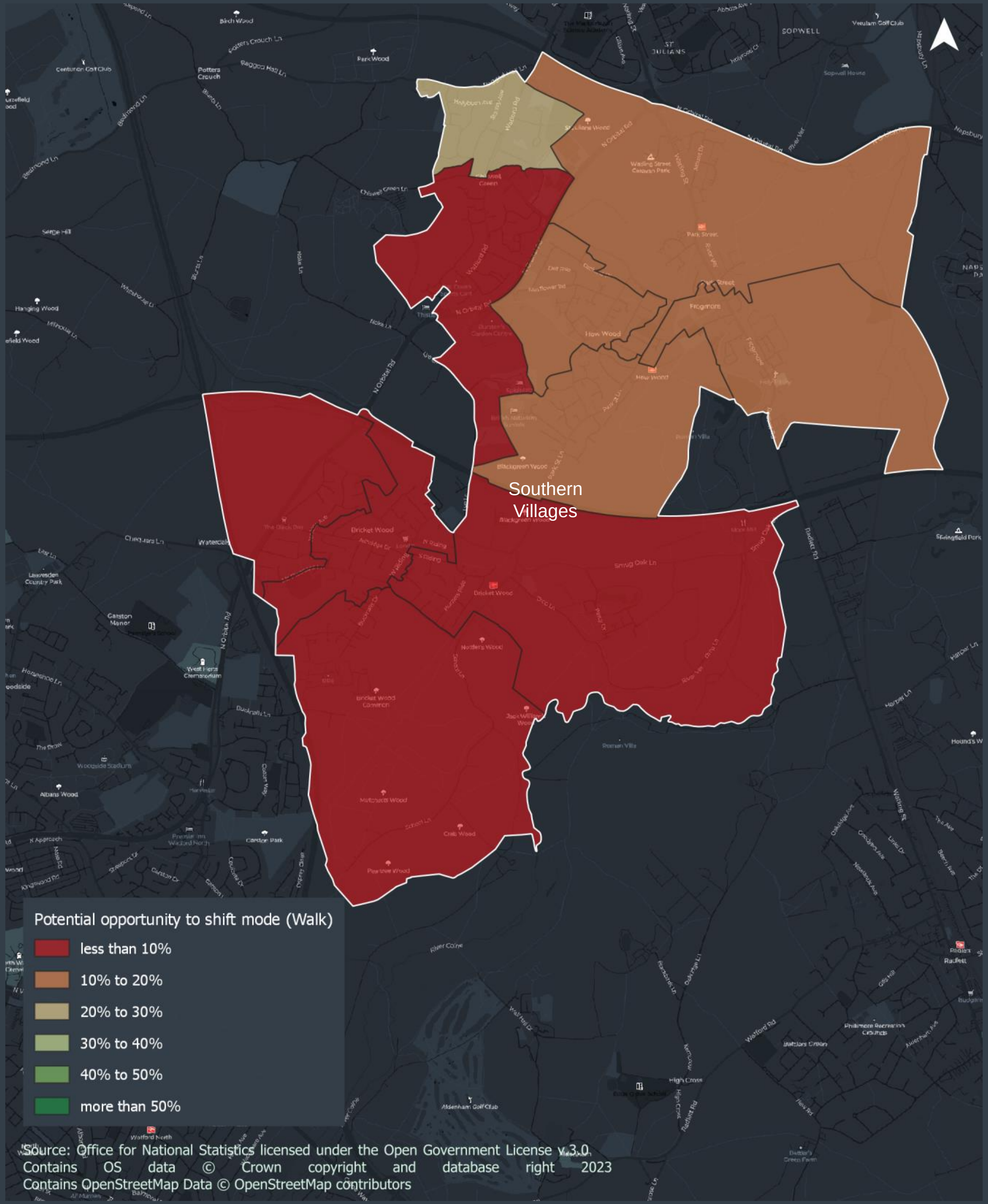
Appendix D1 Walking potential in Redbourn



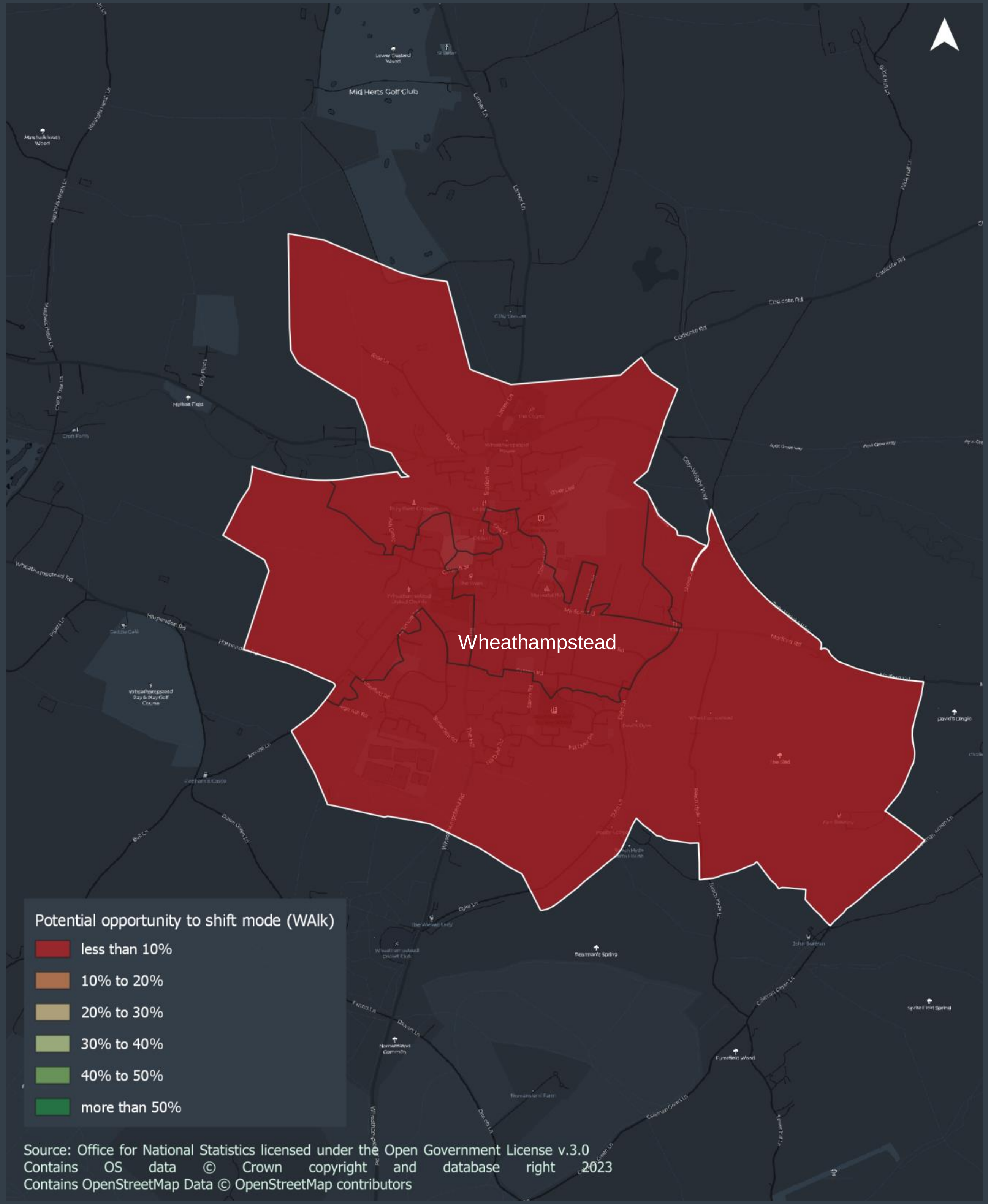
Appendix A1 Walking potential in Harpenden



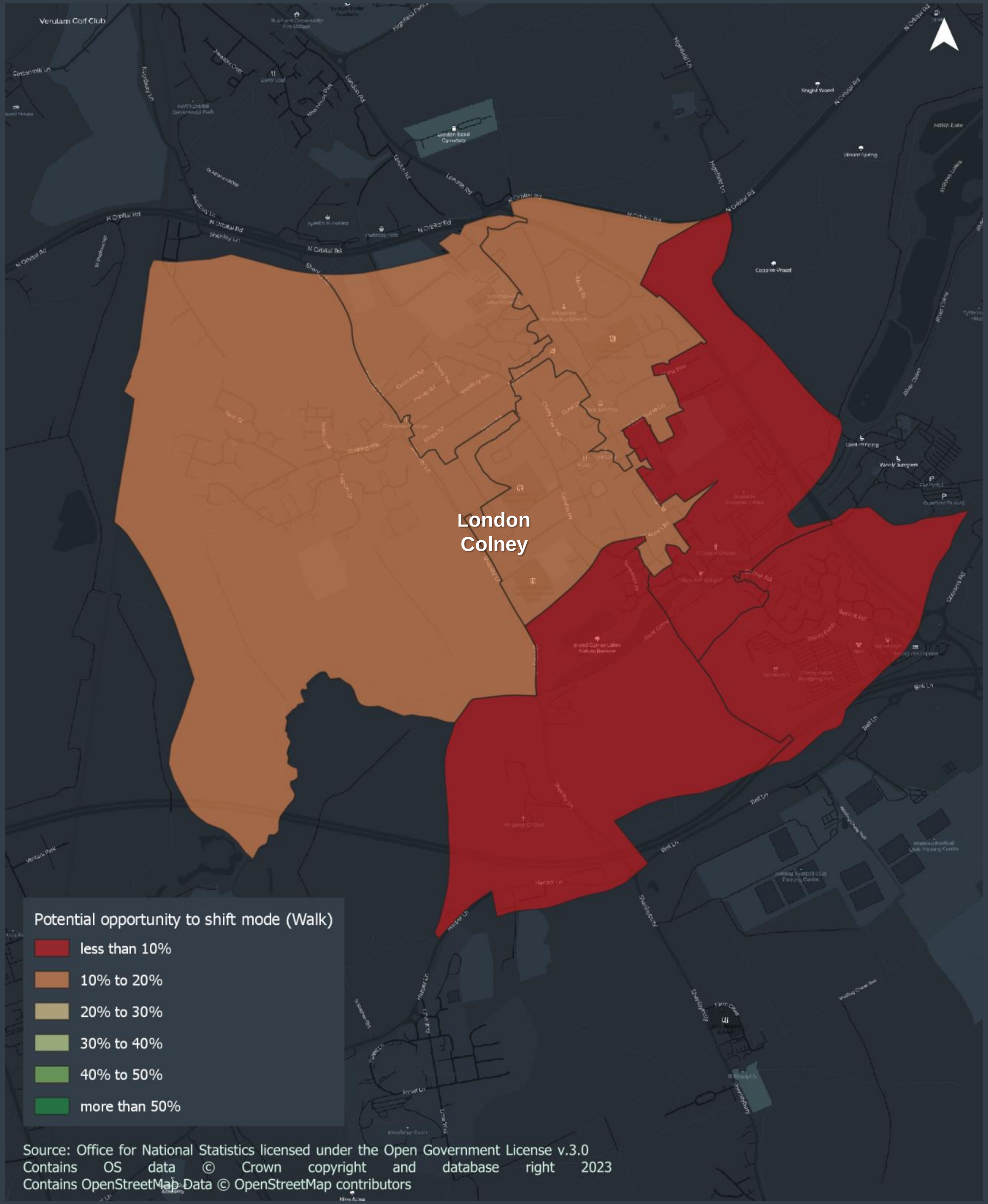
Appendix D3 Walking potential in Southern Villages



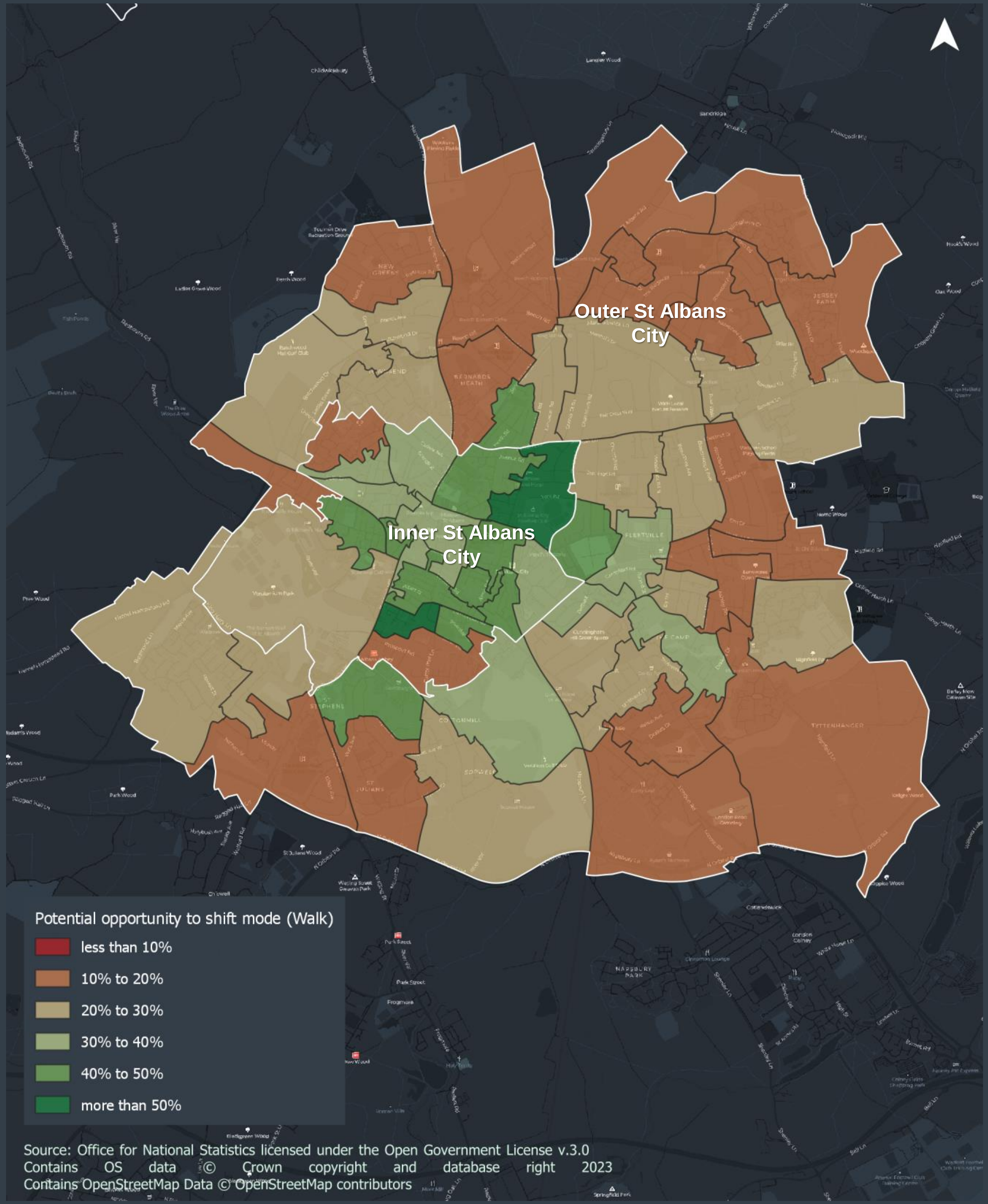
Appendix D4 Walkng potential in Wheathampstead



Appendix D5 Walking potential in London Colney

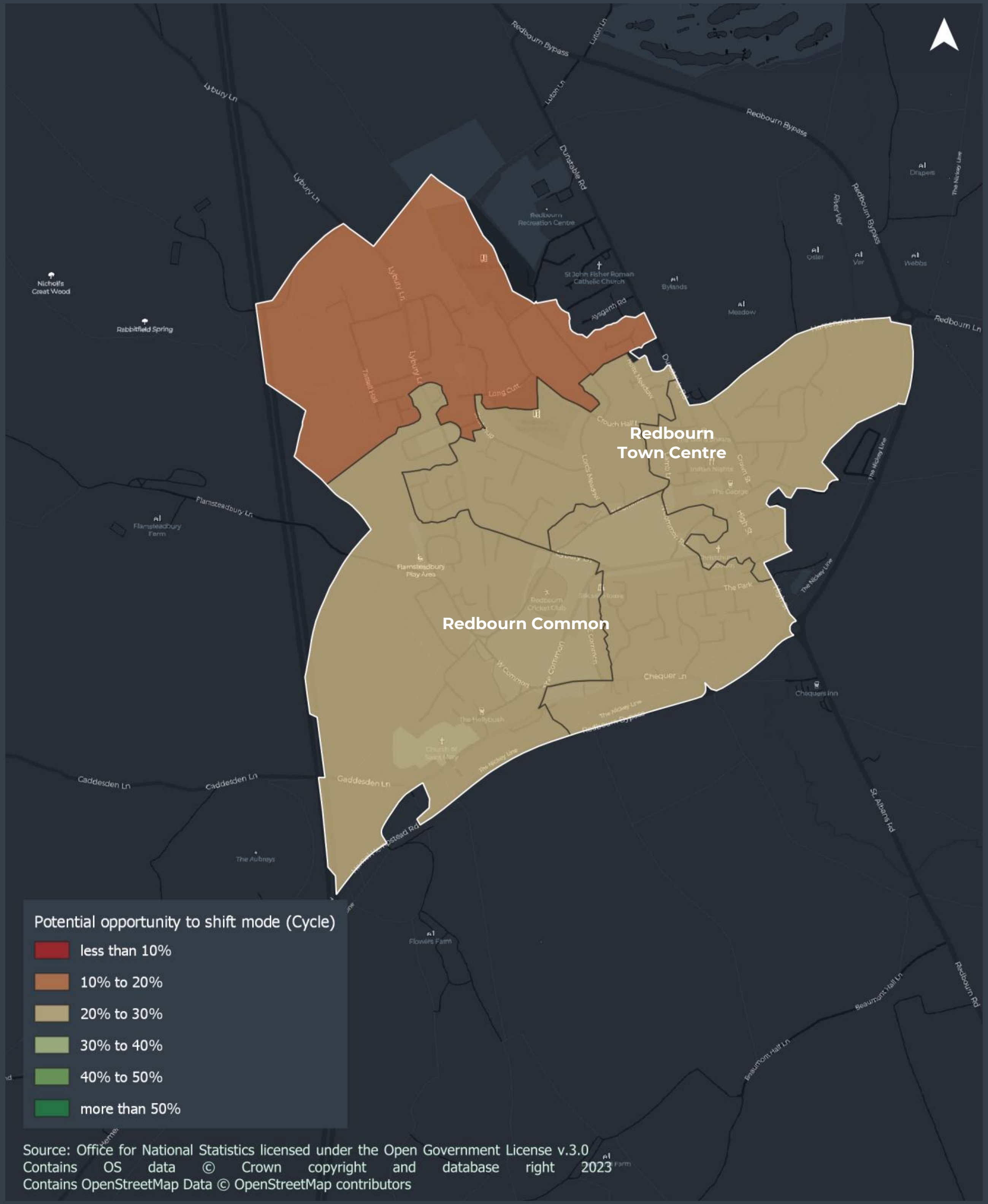


Appendix D6 Walking potential in Inner & Outer St Albans

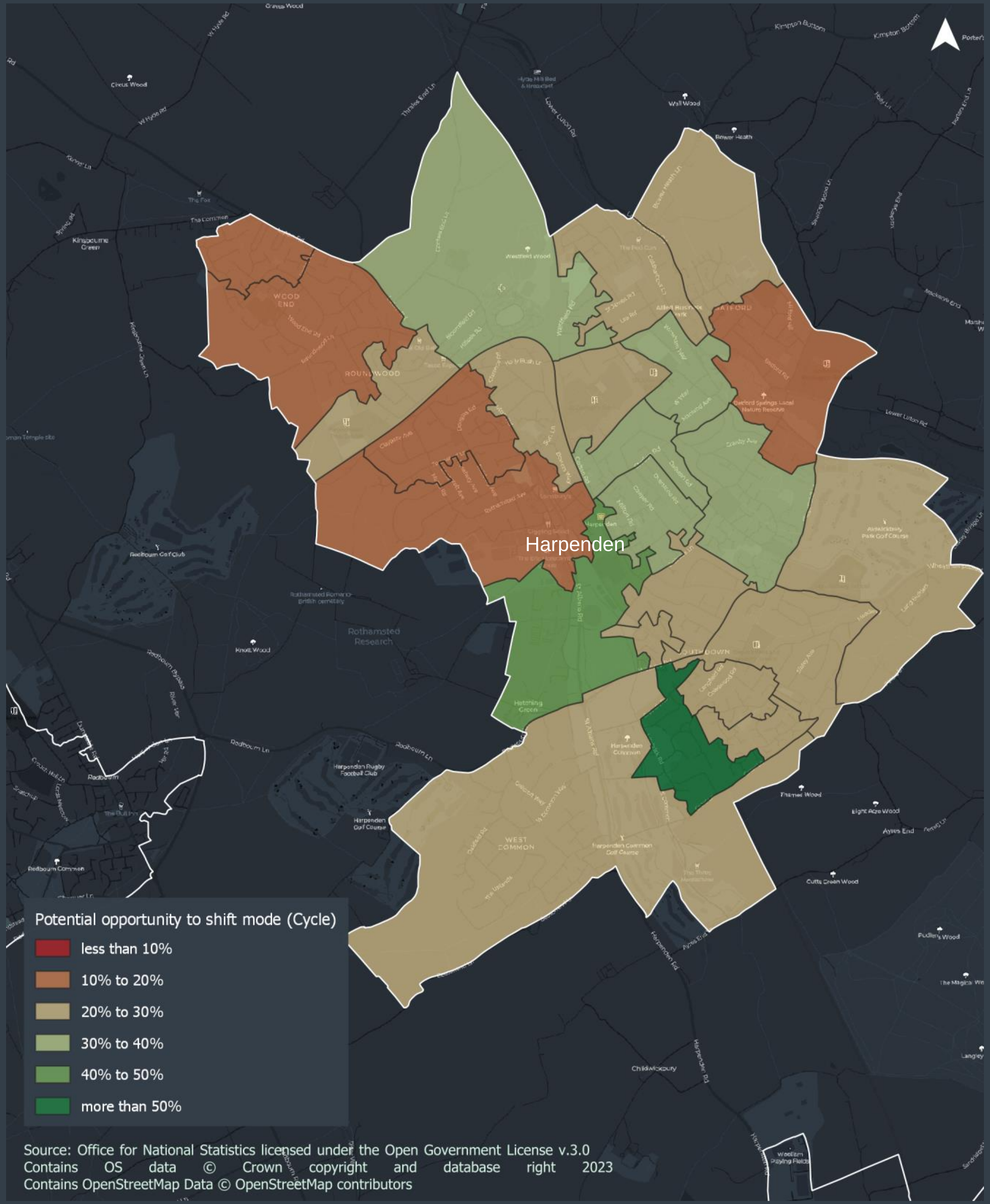


Cycling potential

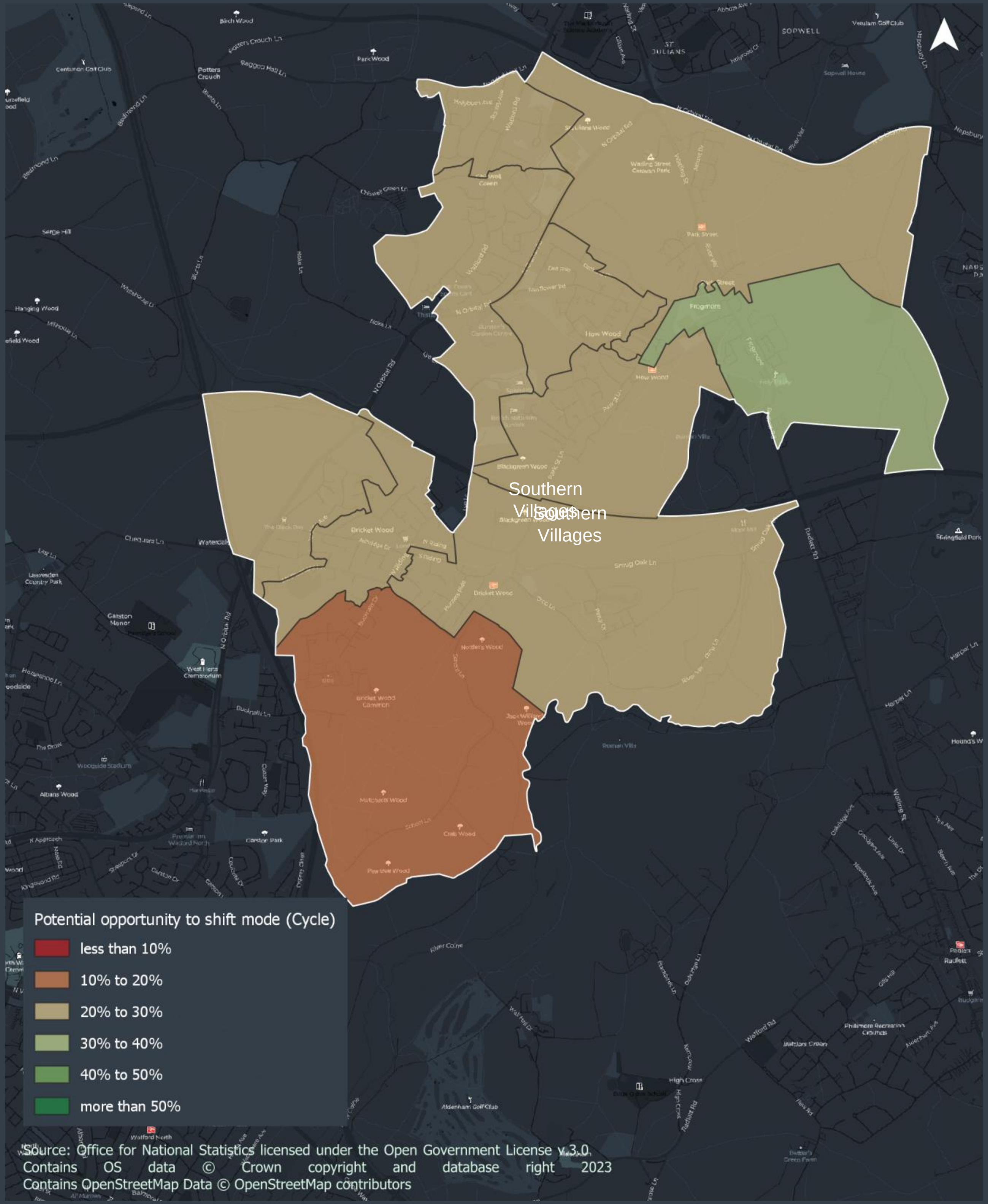
Appendix D7 Cycling potential in Redbourn



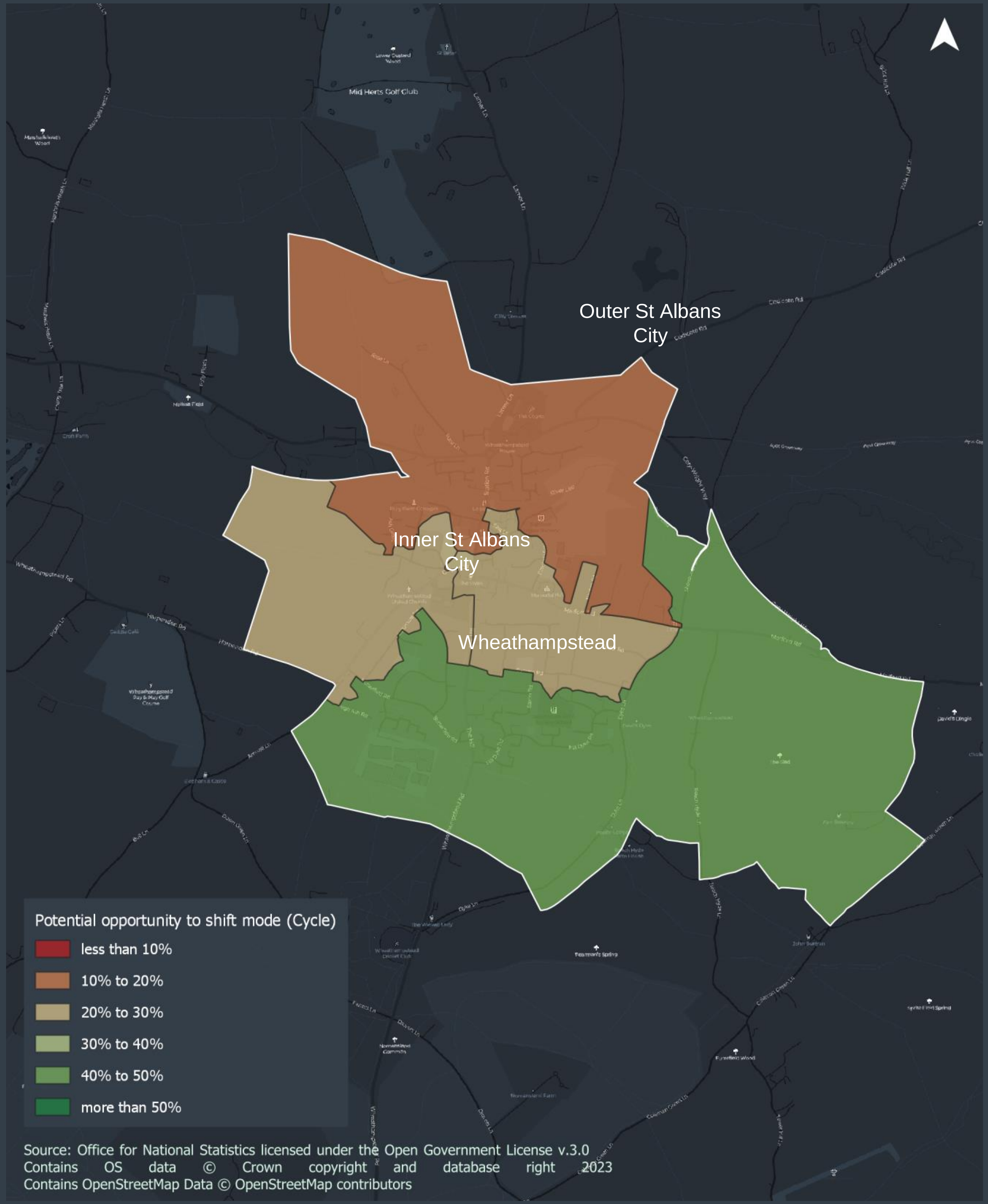
Appendix D8 Cycling potential in Harpenden



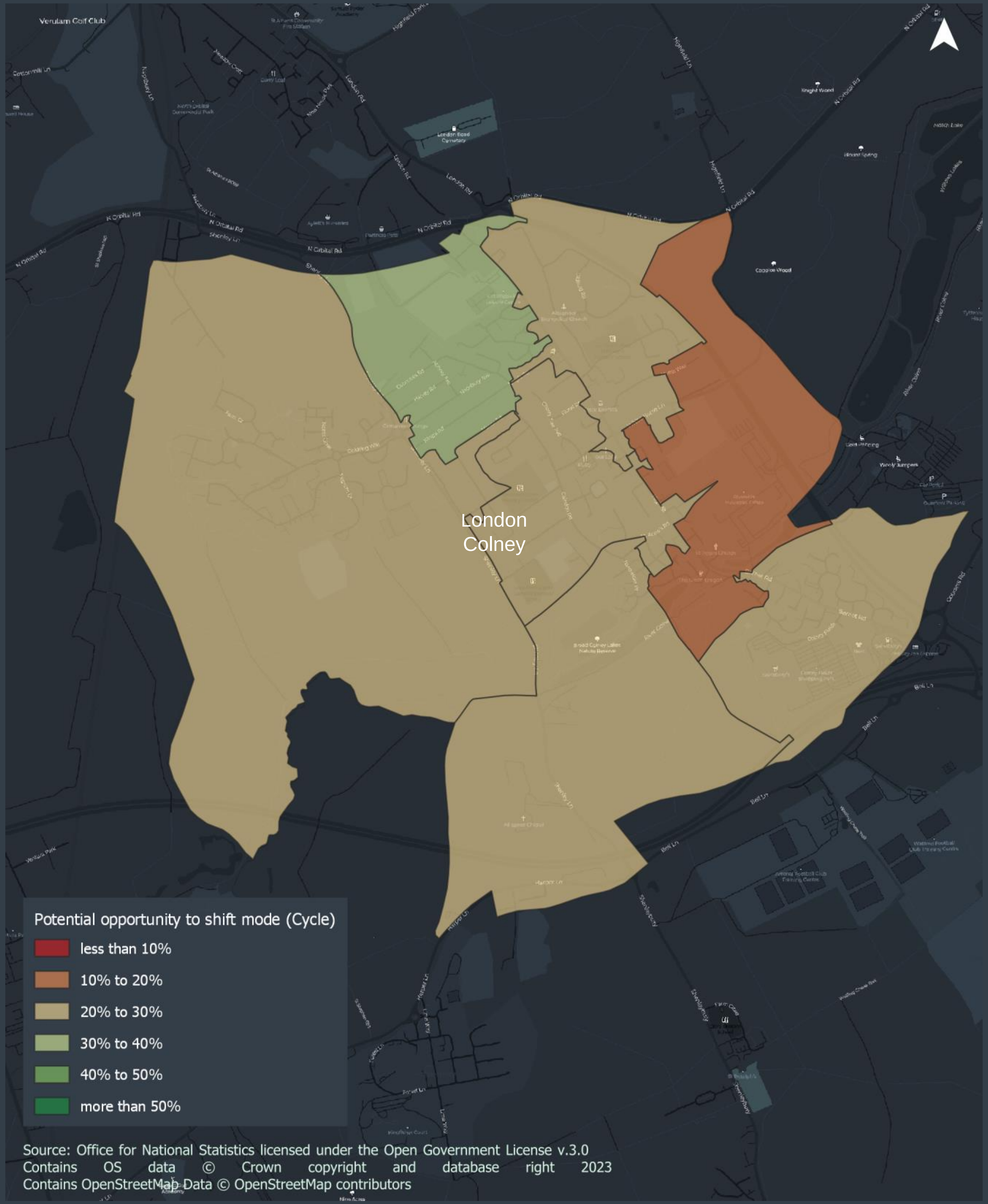
Appendix D9 Cycling potential in Southern Villages



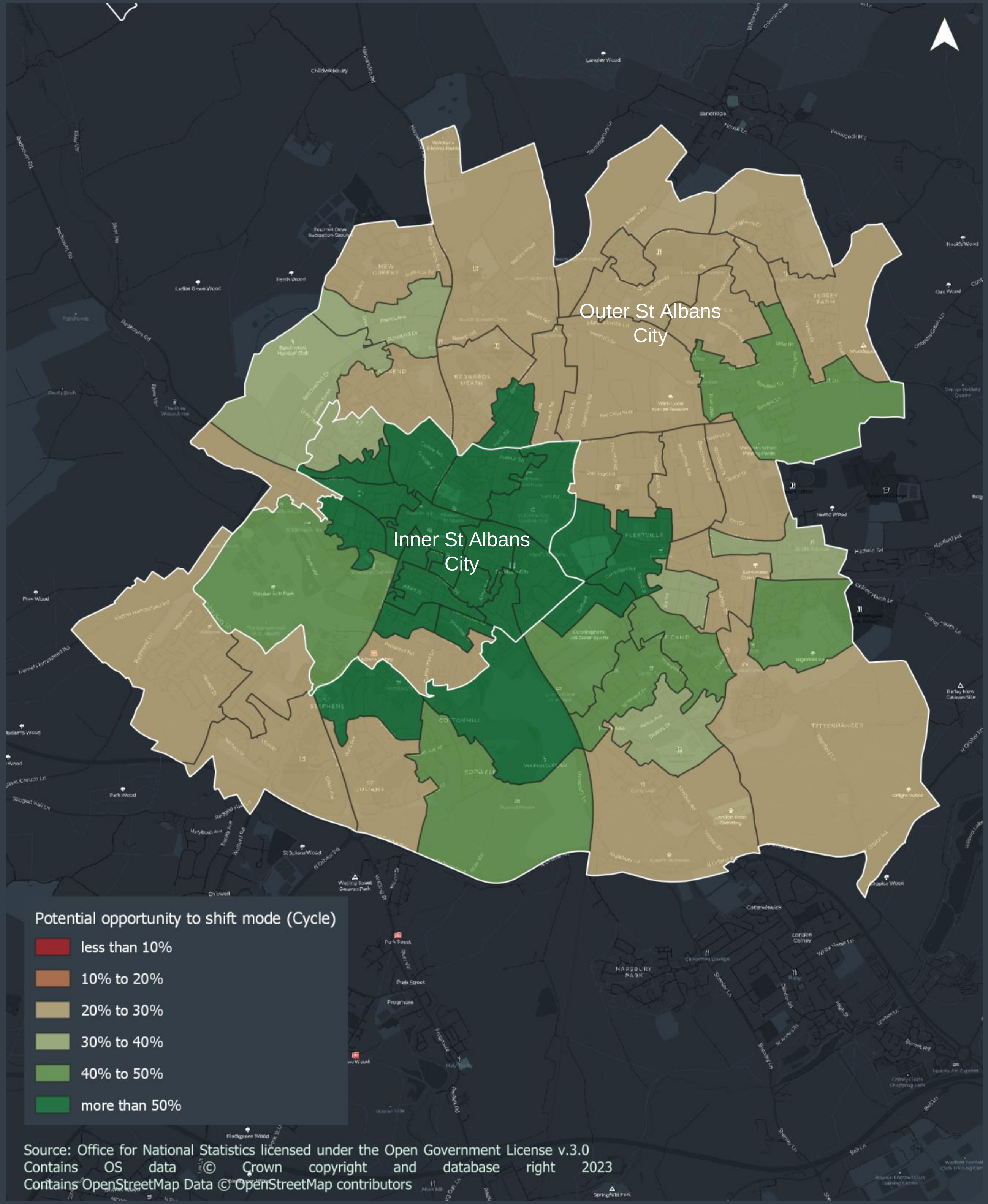
Appendix D10 Cycling potential in Wheathampstead



Appendix D11 Cycling potential in London Colney

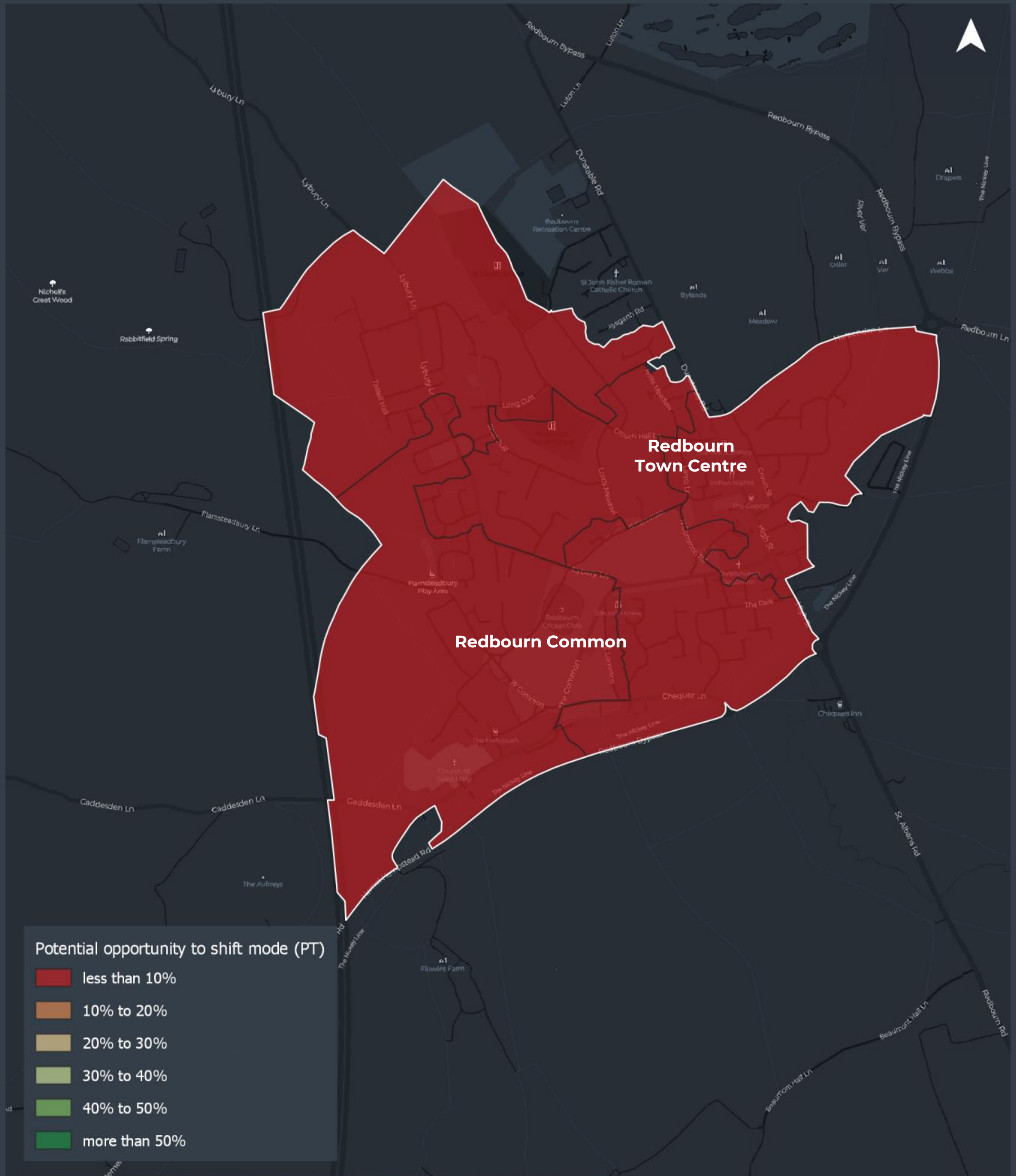


Appendix D12 Cycling potential in Inner & Outer St Albans



Public transport potential

Appendix D13 Public transport potential in Redbourn



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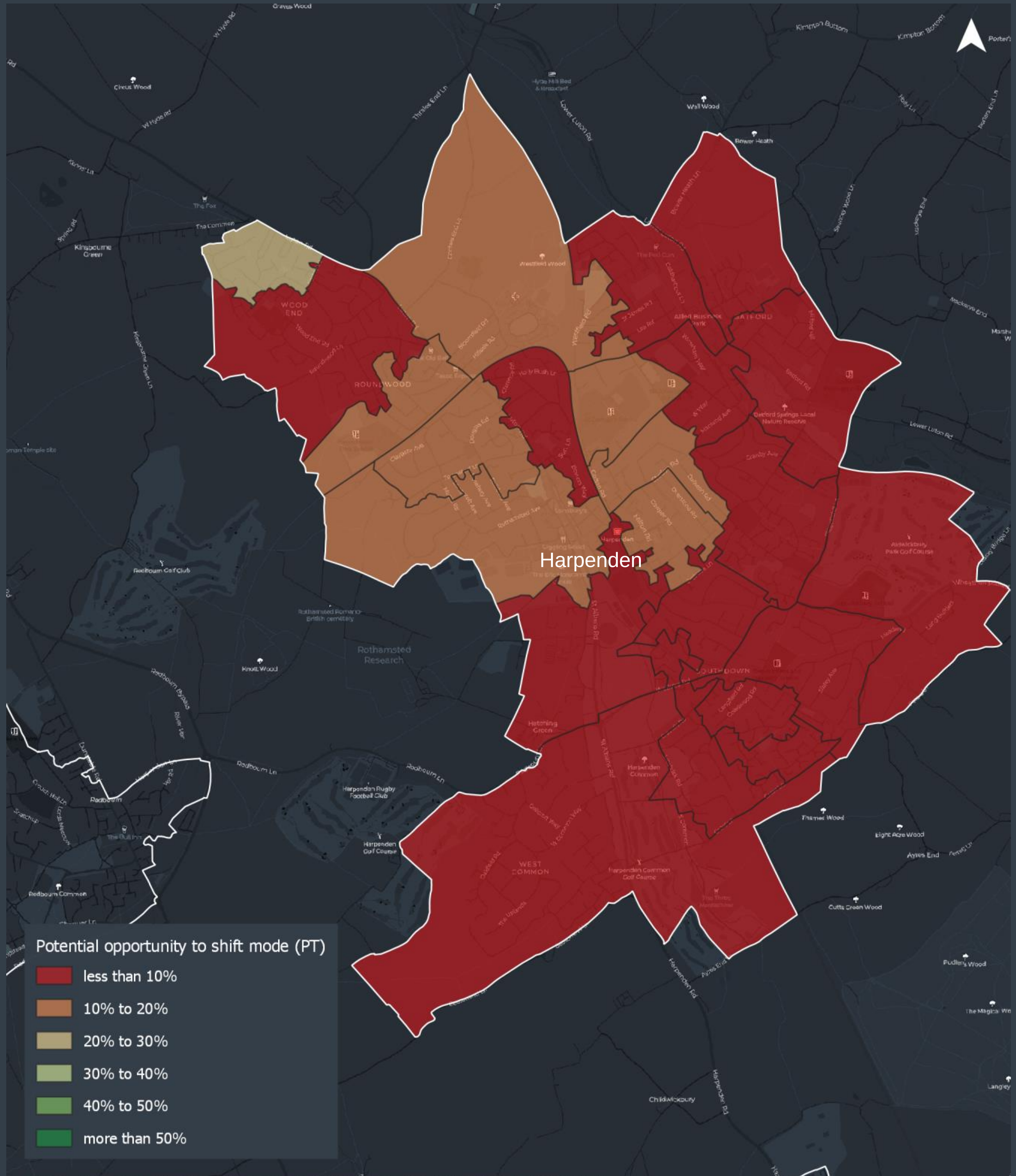
Appendix D14 Public transport potential in Harpenden



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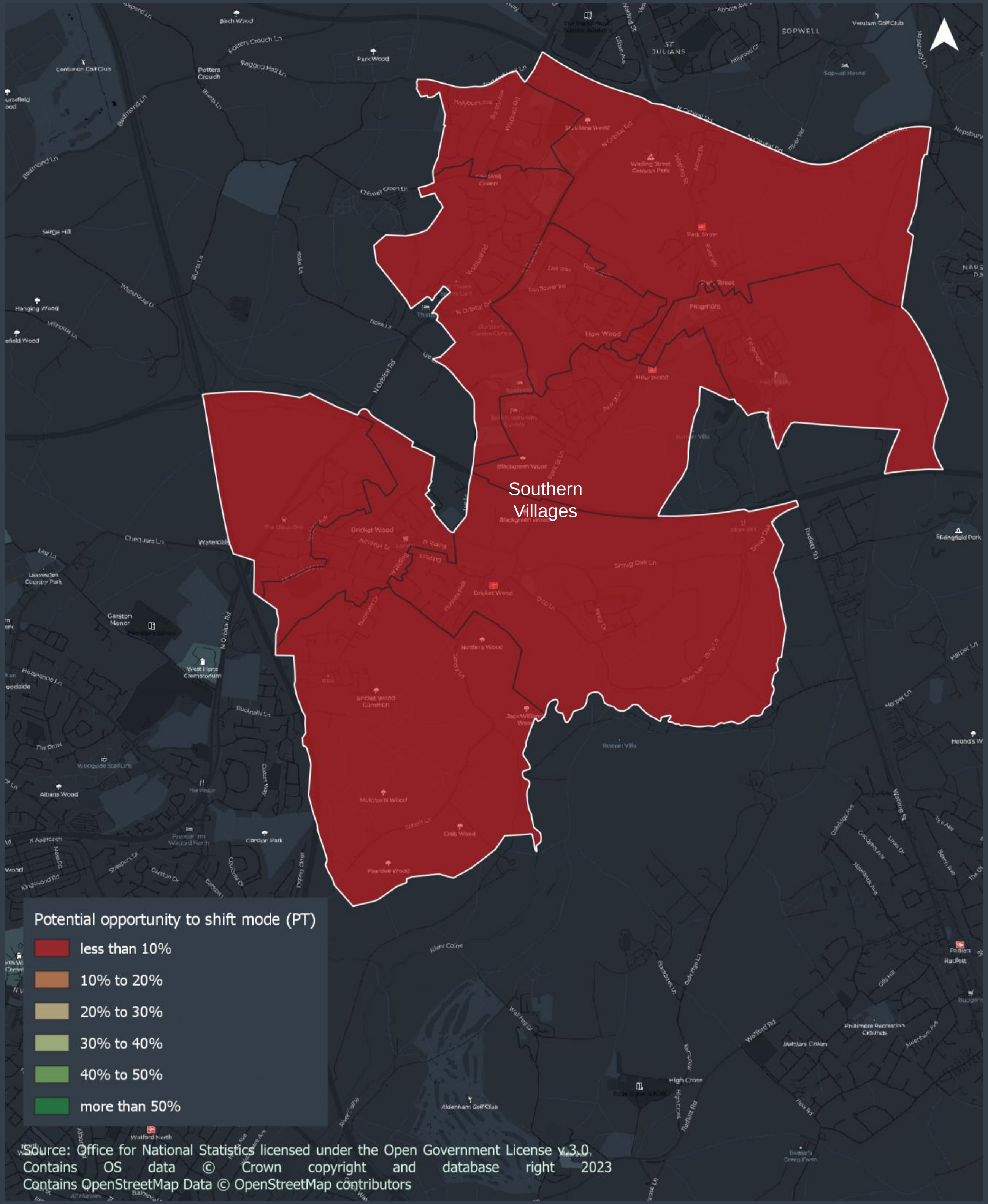
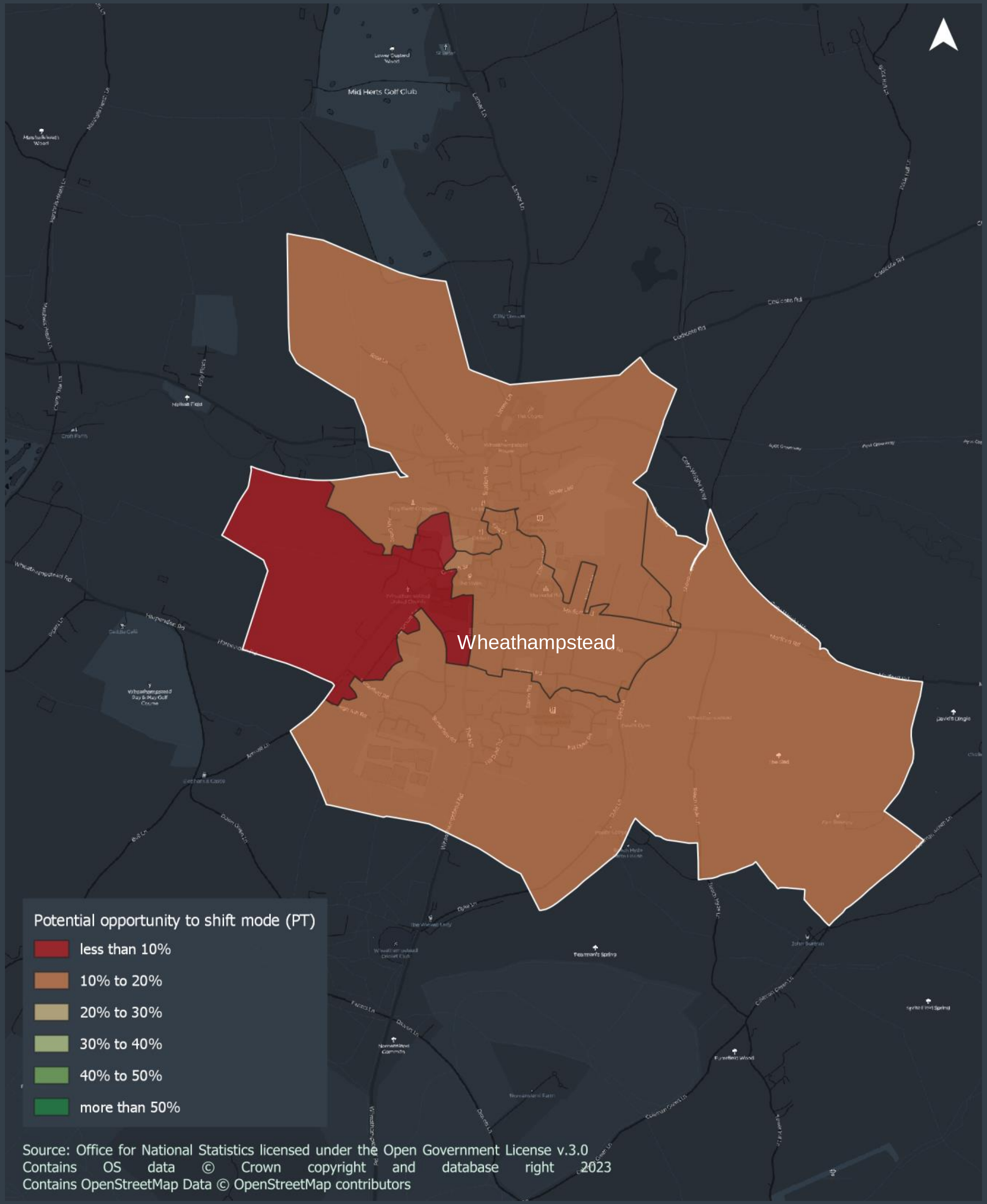
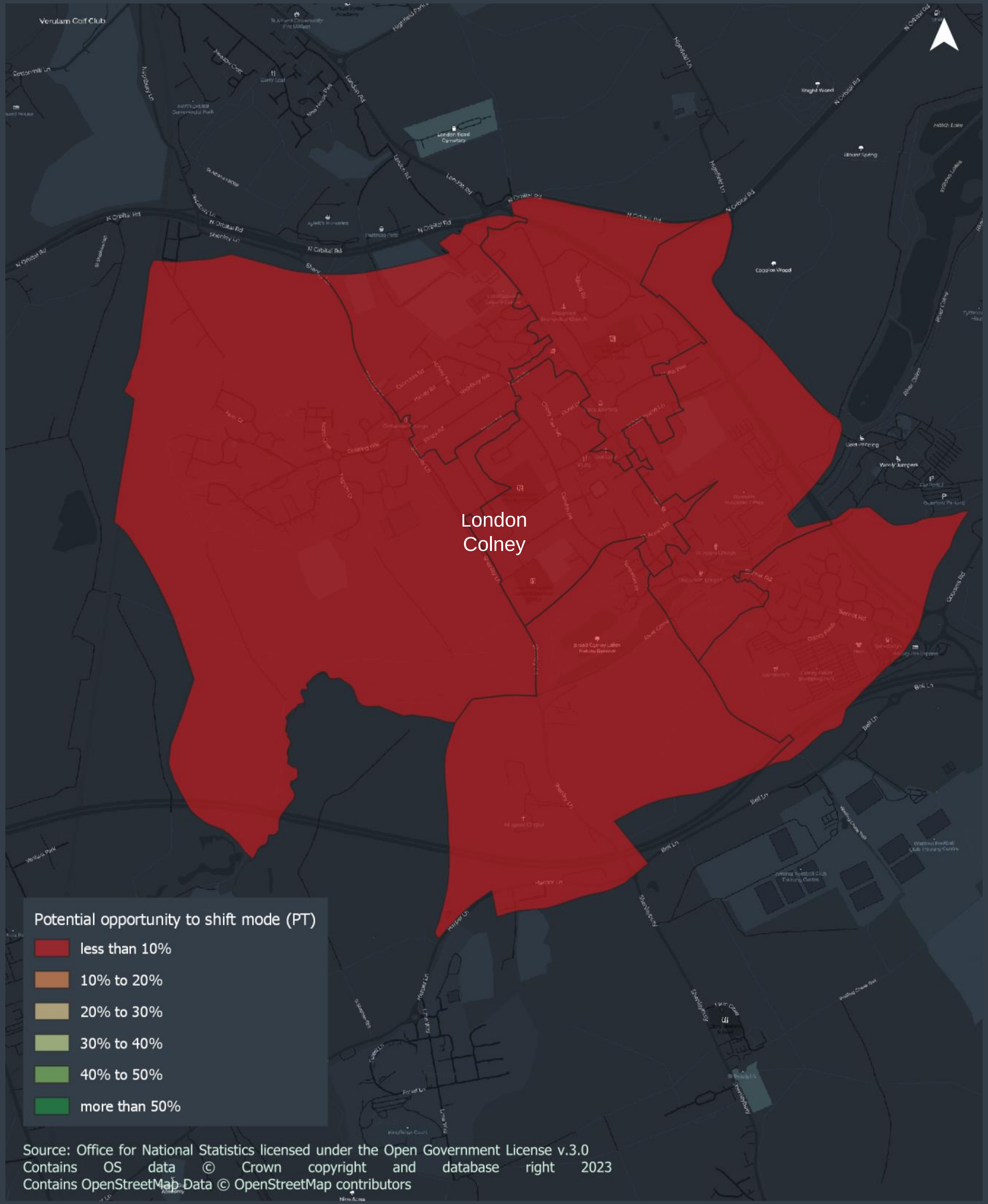
Appendix D15 Public transport potential in Southern Villages



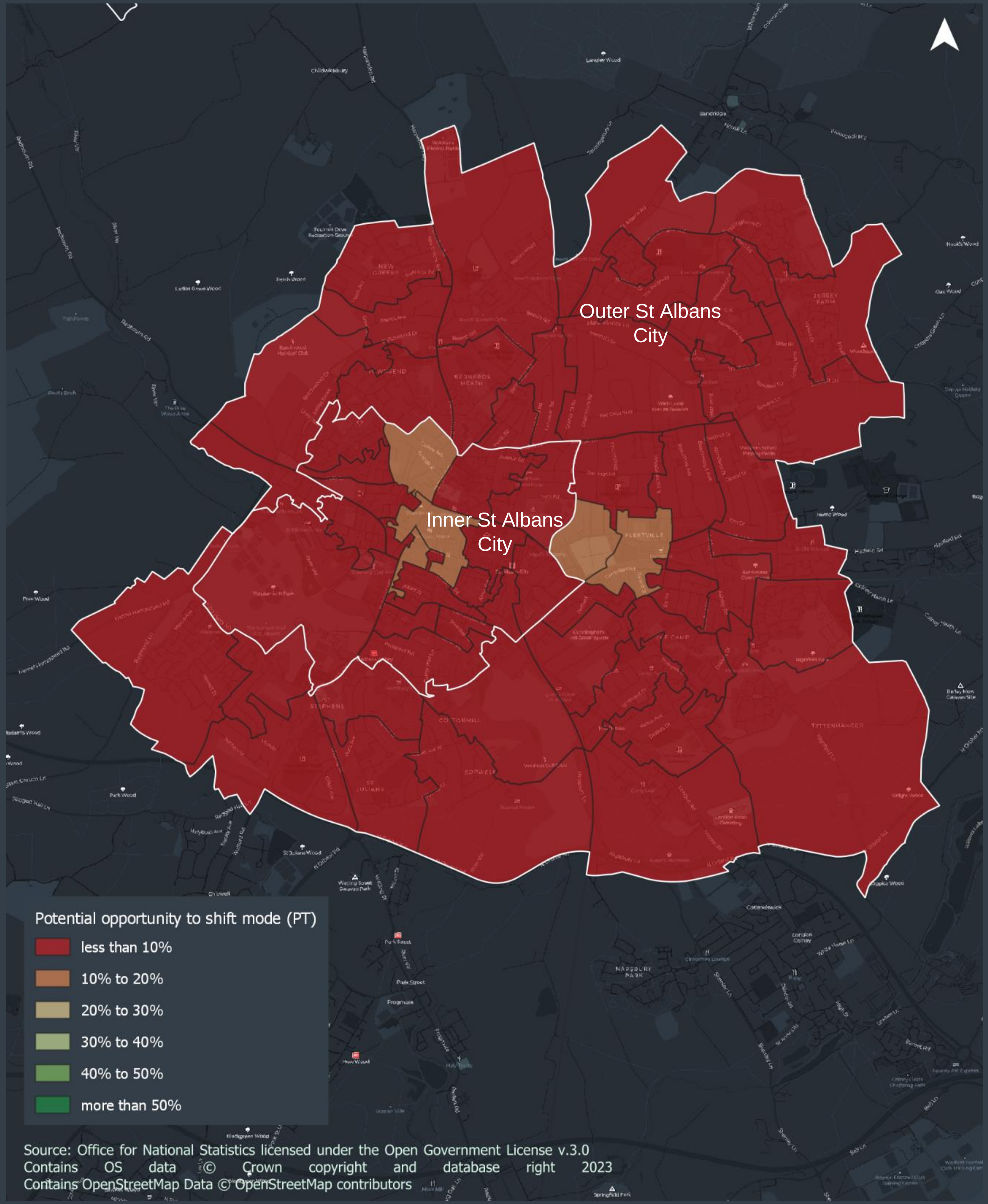
Appendix D16 Public transport potential in Wheathampstead



Appendix D17 Public transport potential in London Colney



Appendix D18 Public transport potential in Inner & Outer St Albans

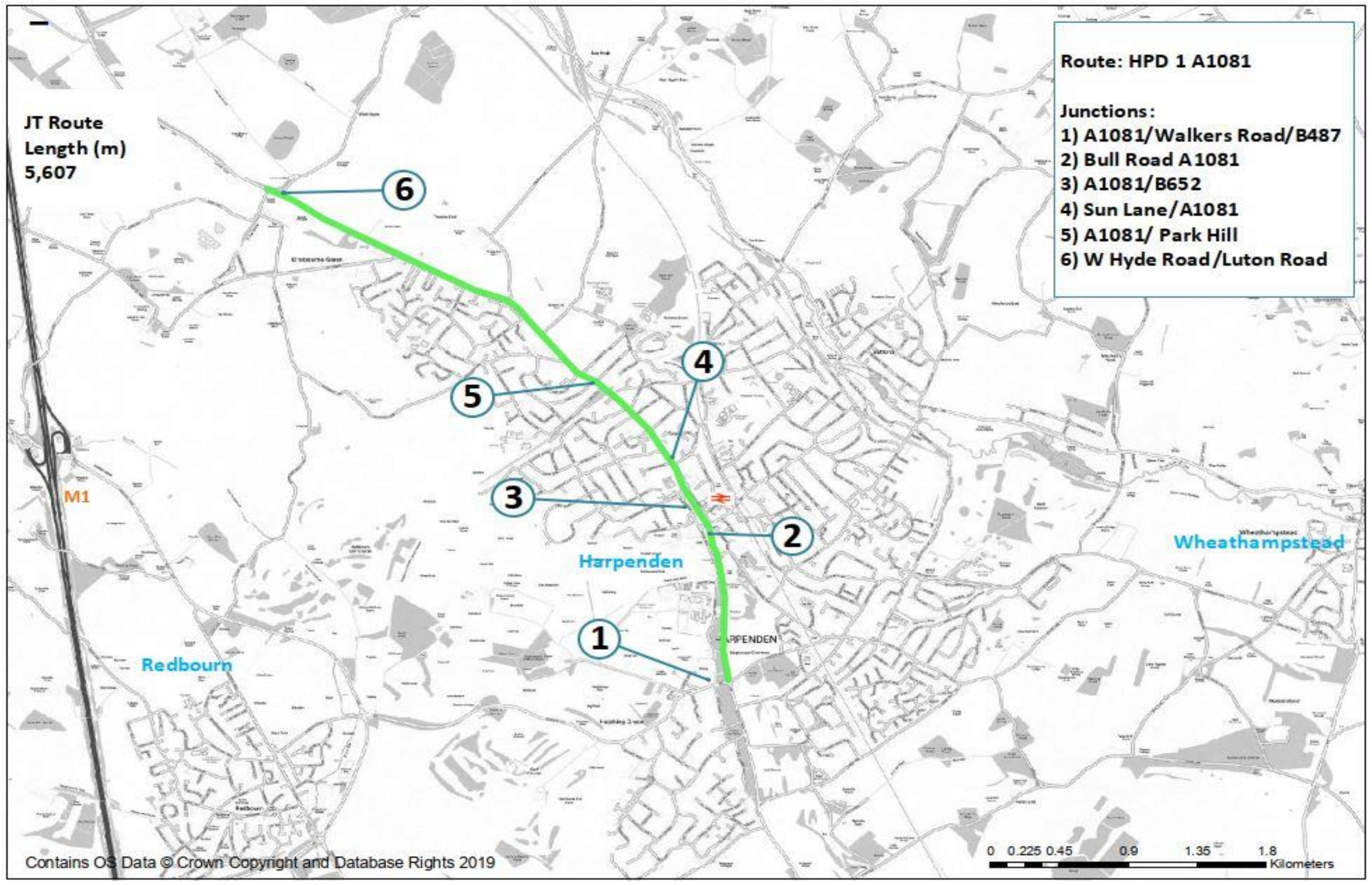


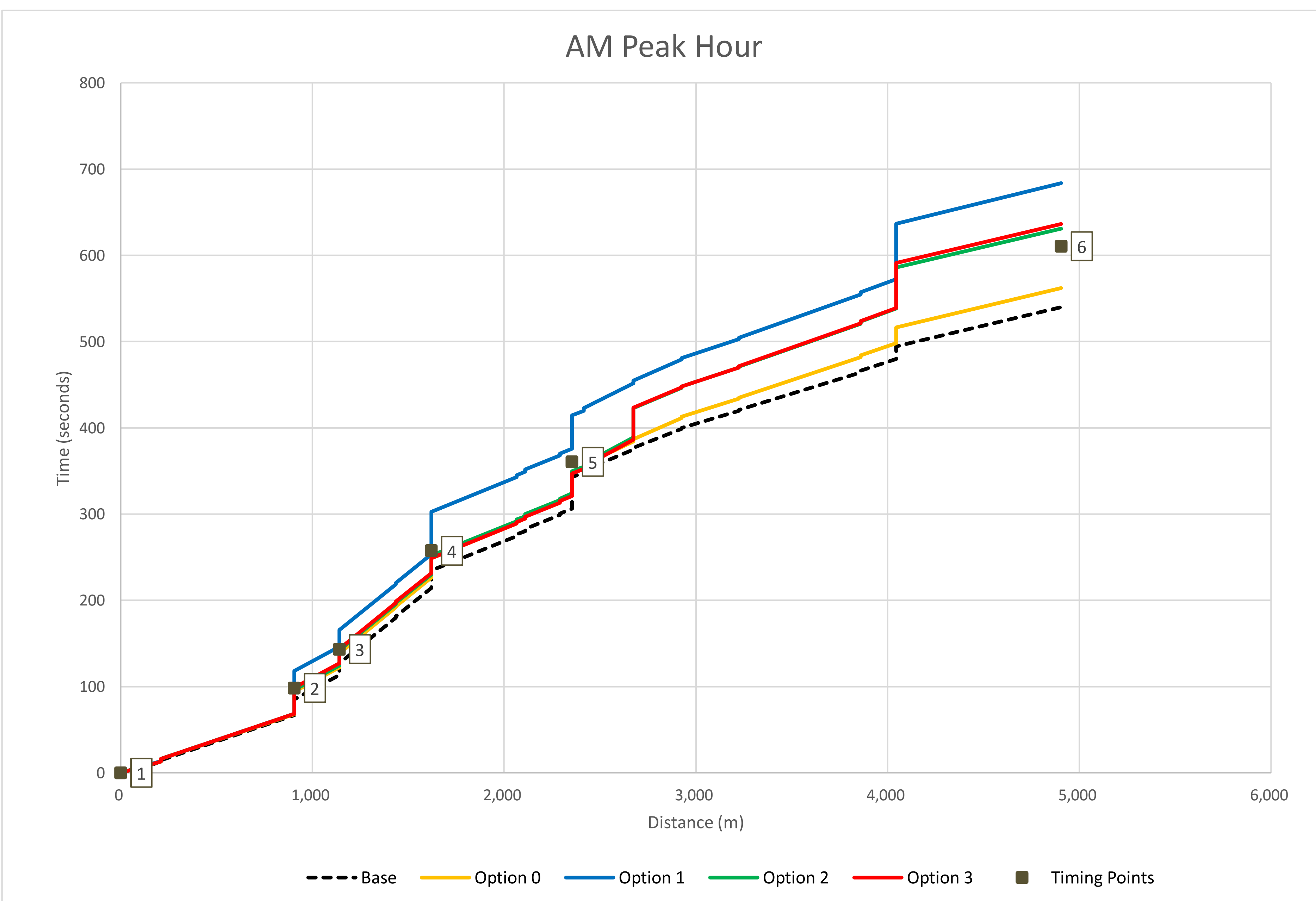
Let's change the way we think.
Let's create change.

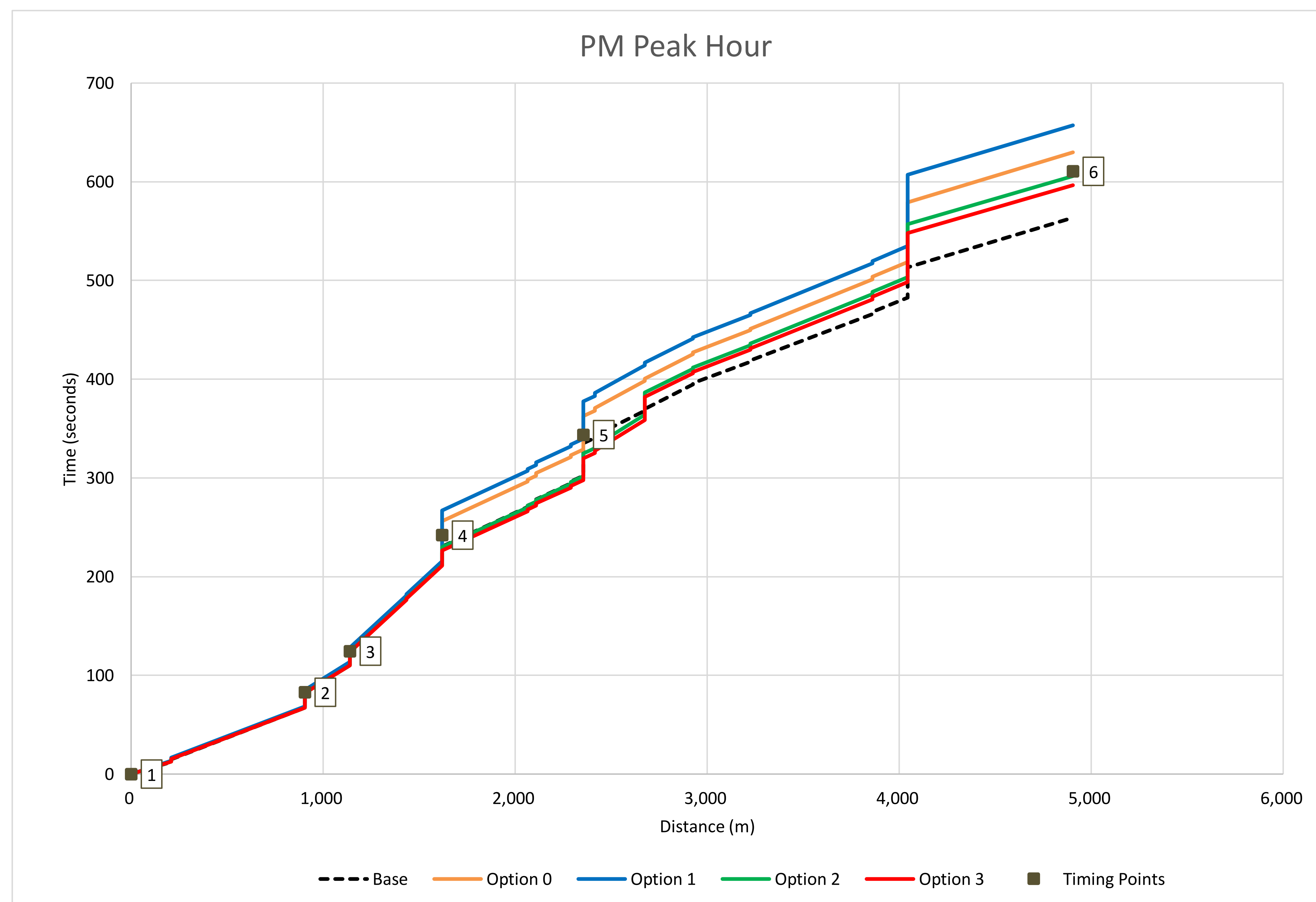
Appendix K

Journey Time Graphs

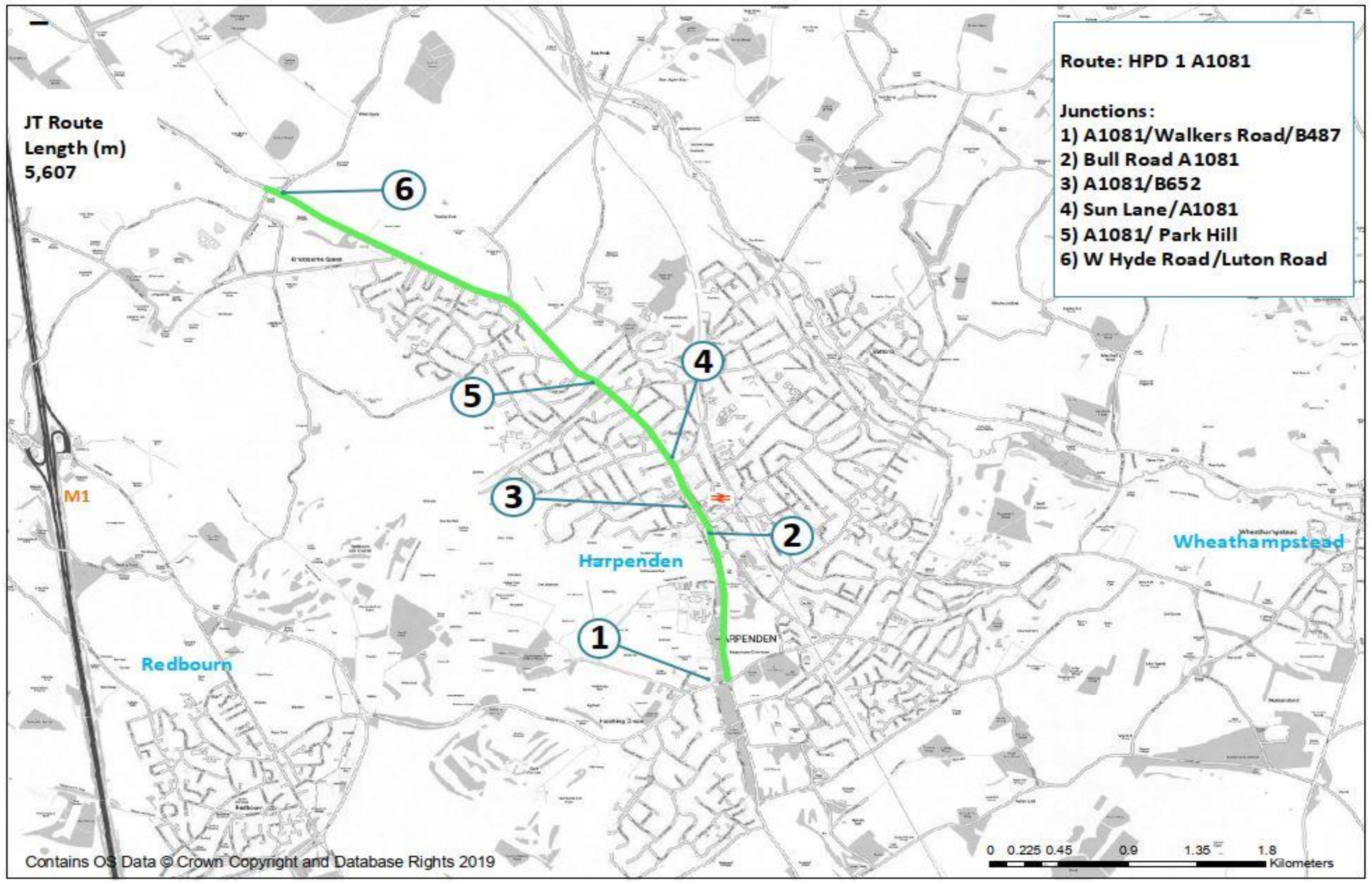
Route: HPD1_NB

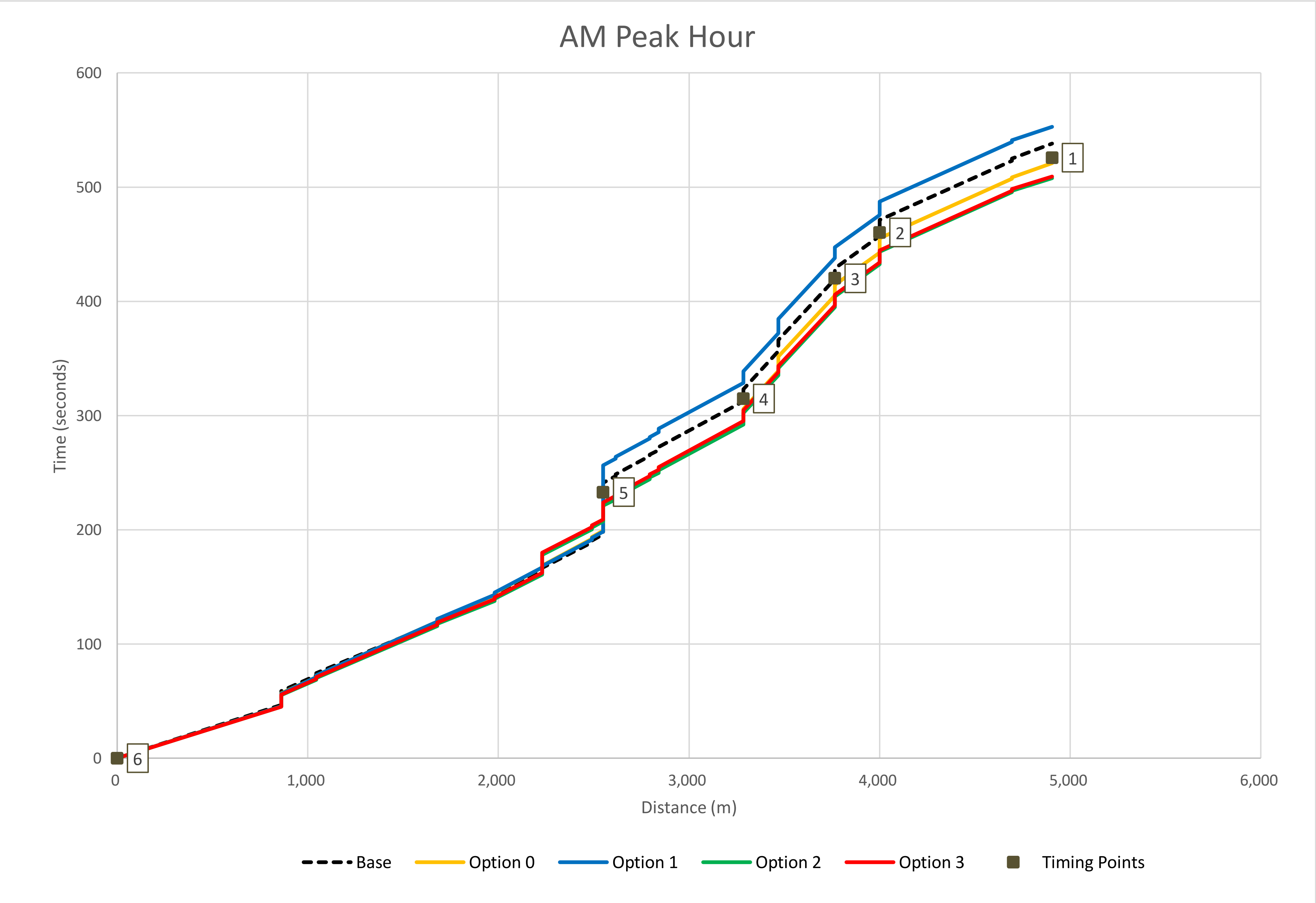


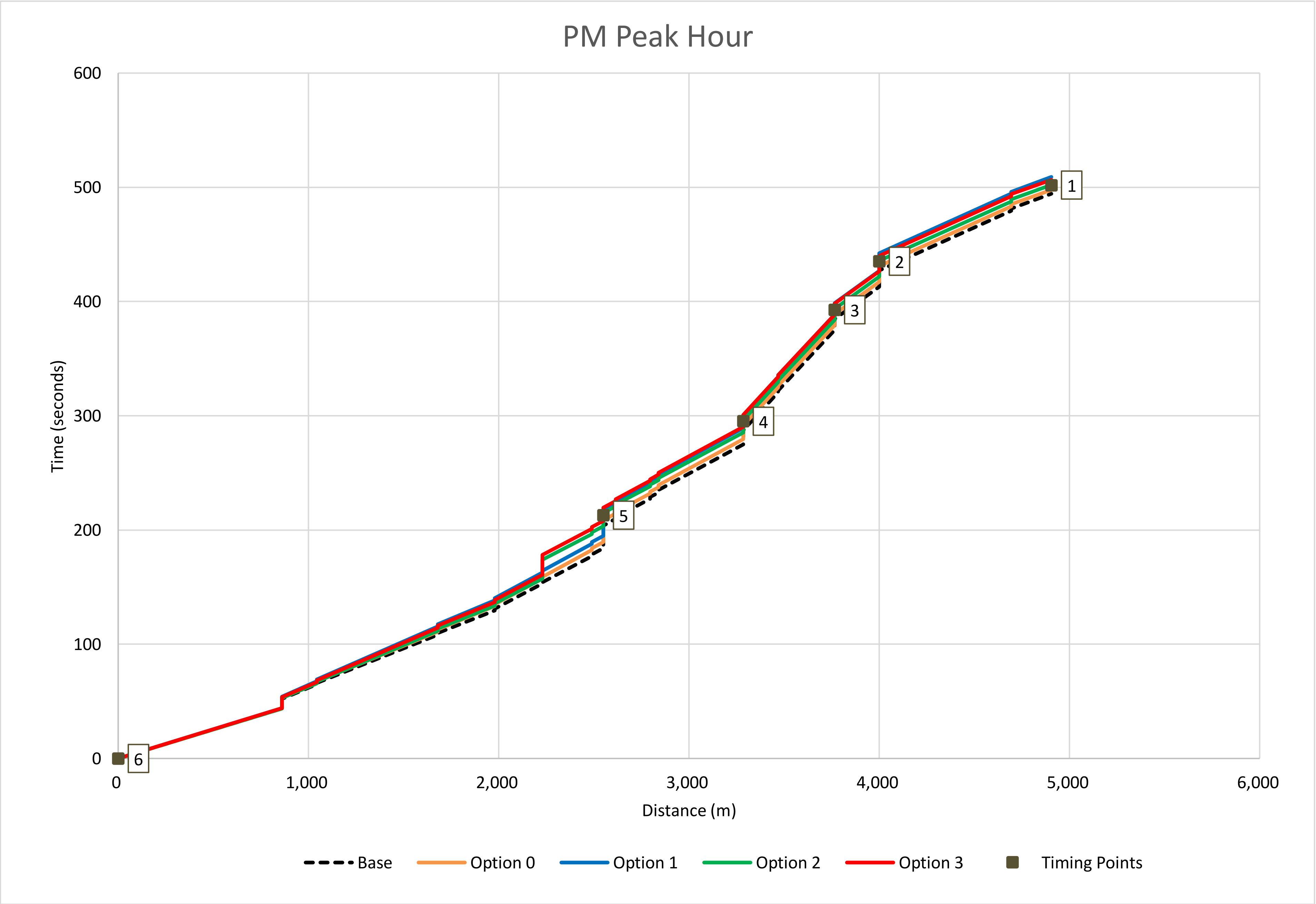




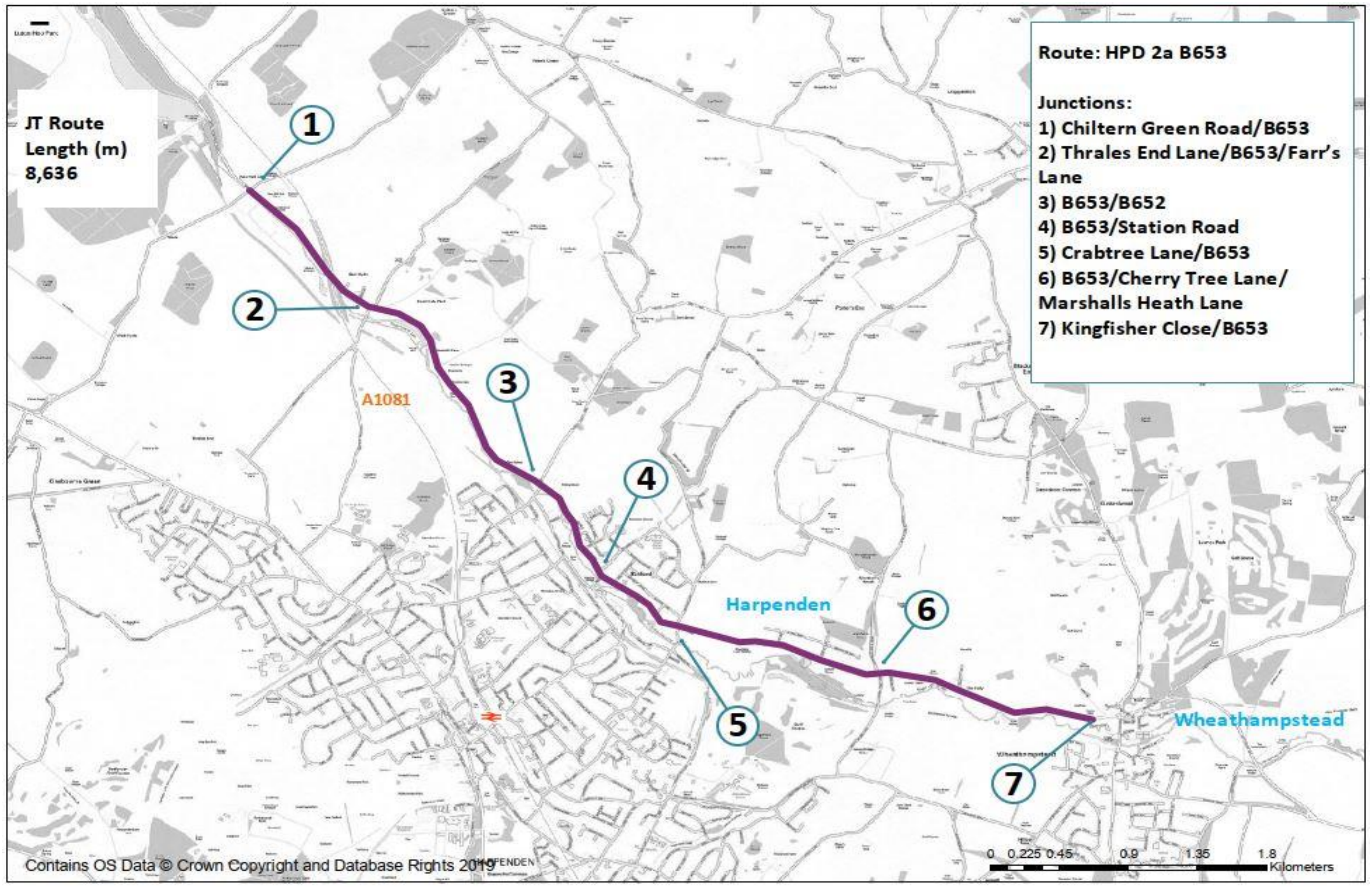
Route: HPD1_SB

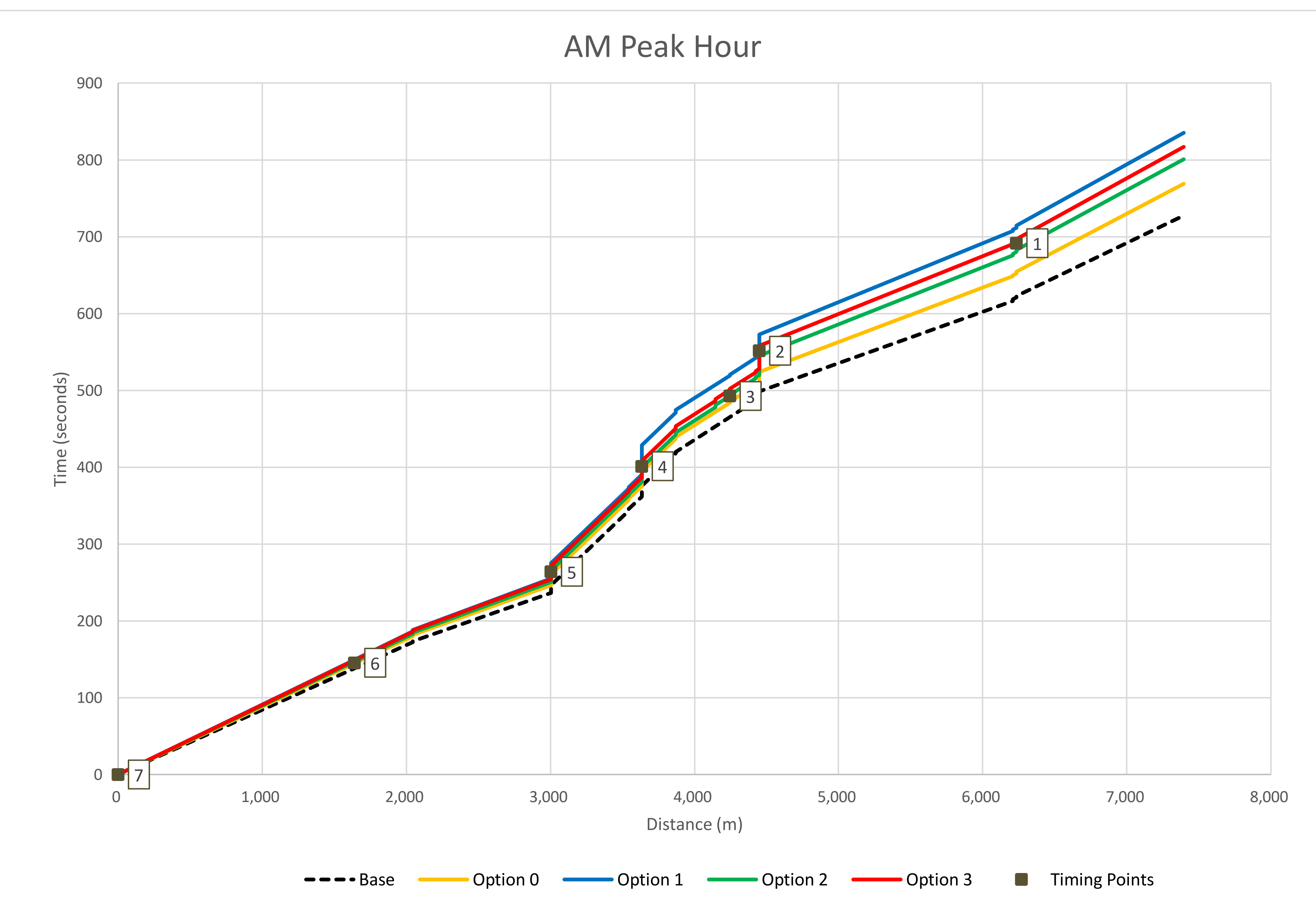


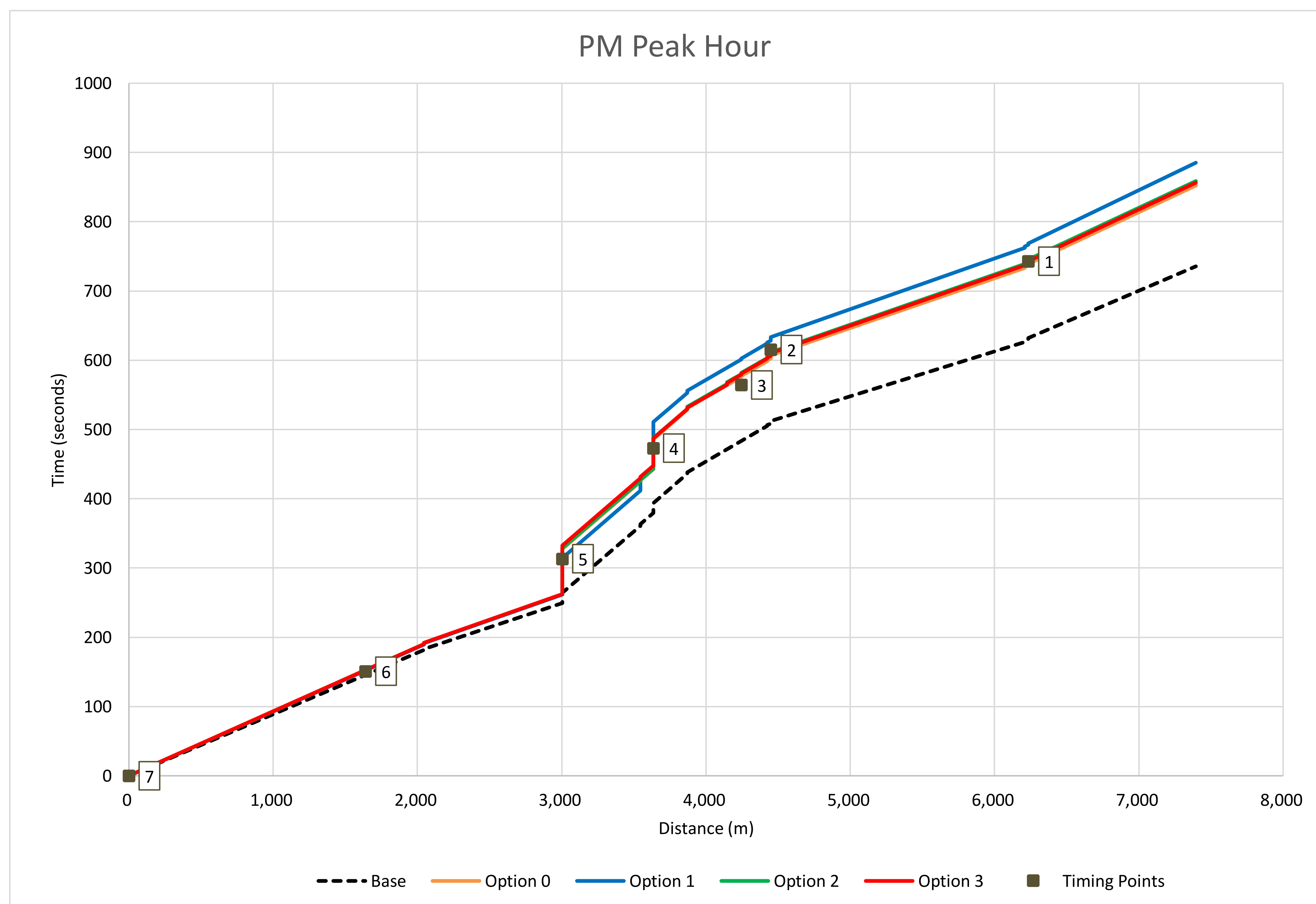




Route: HPD2A_NB







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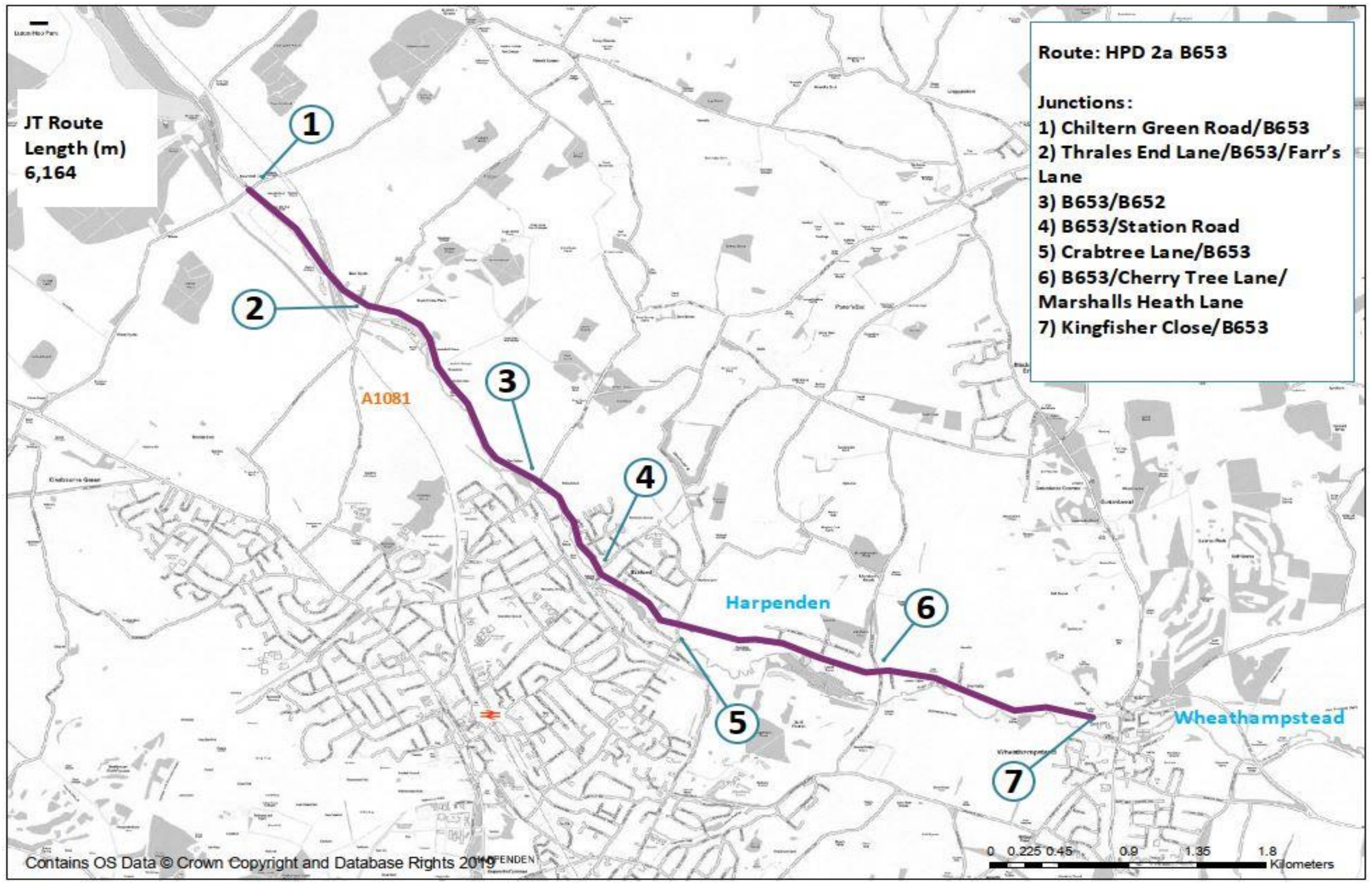

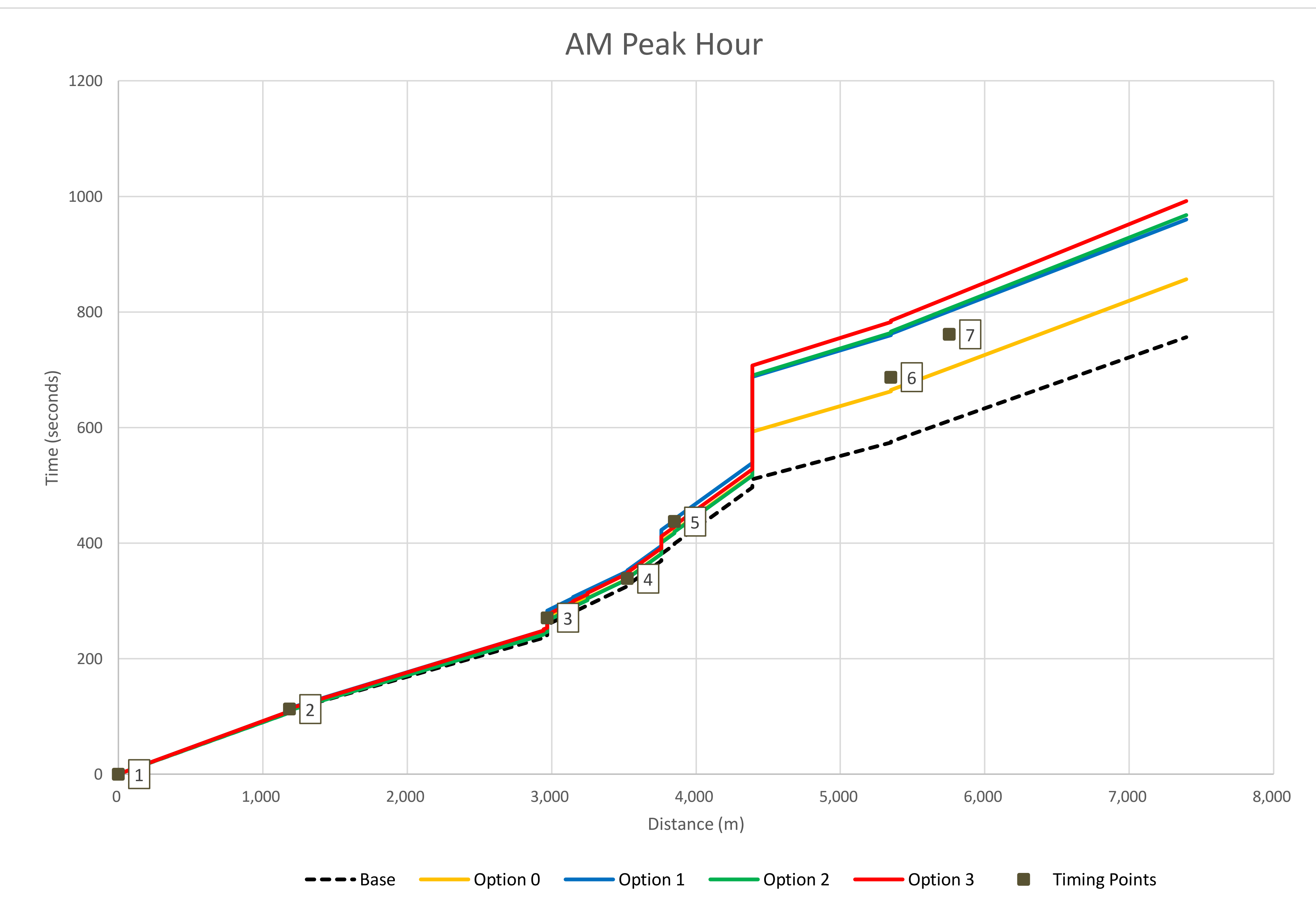

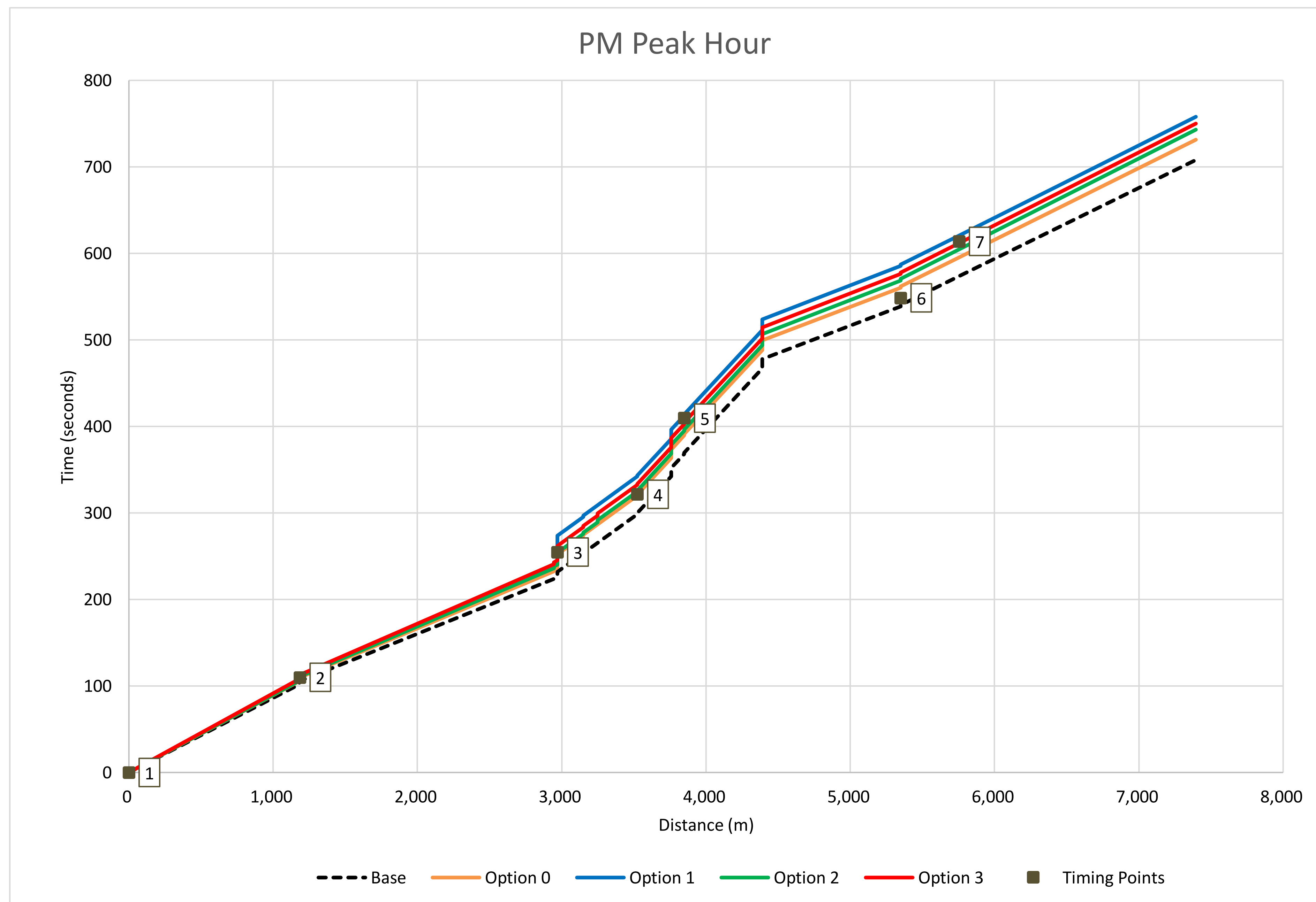

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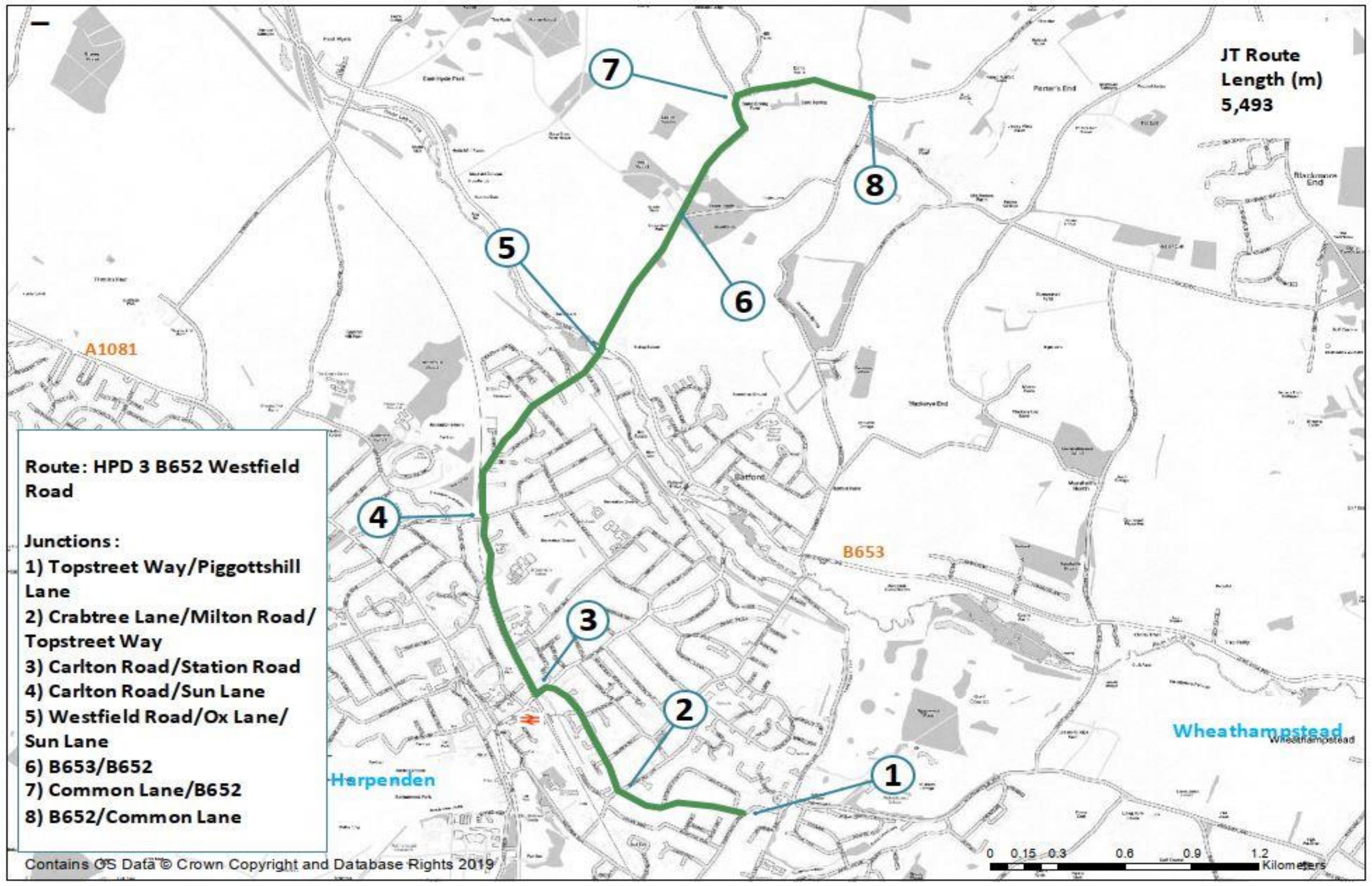
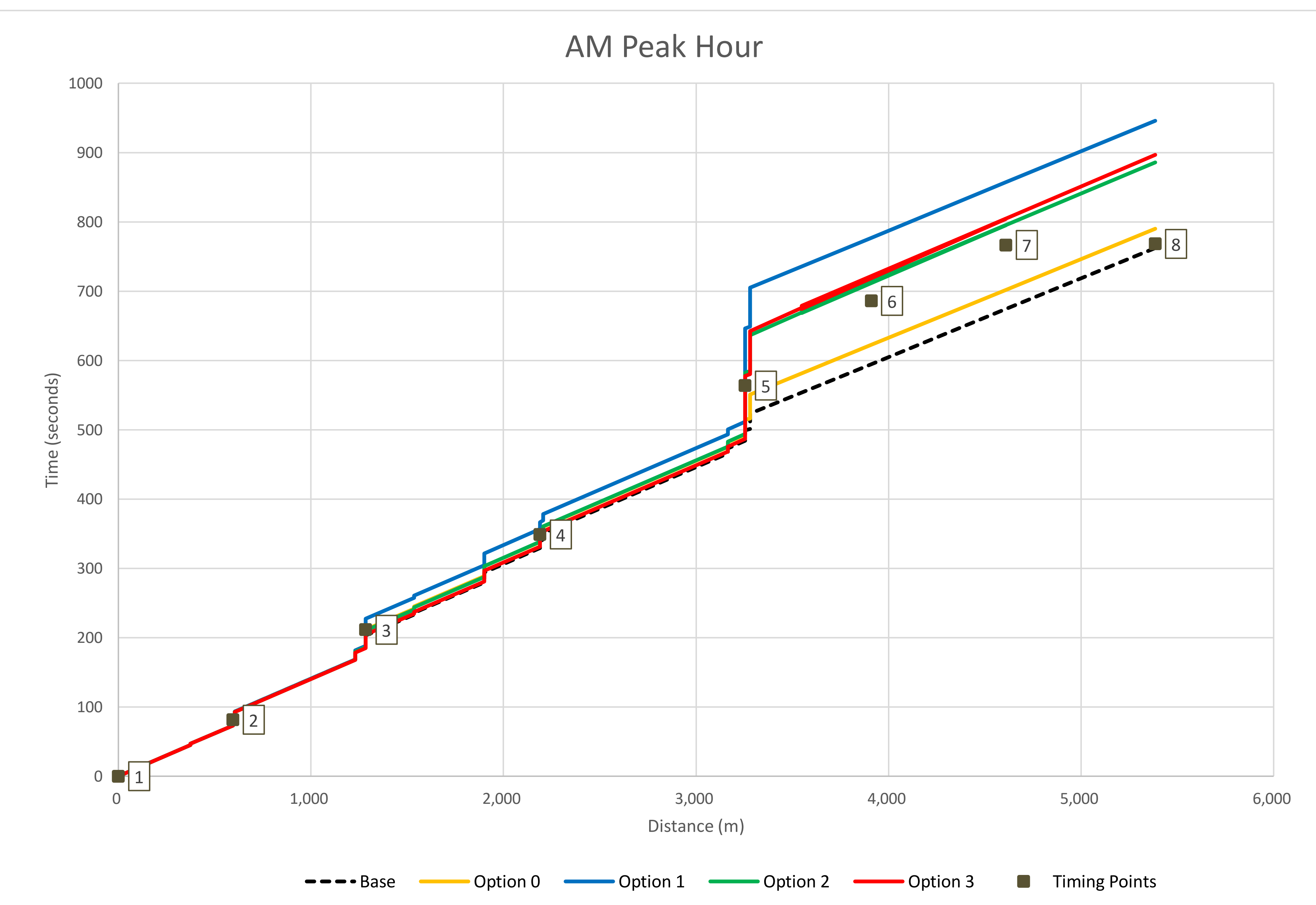
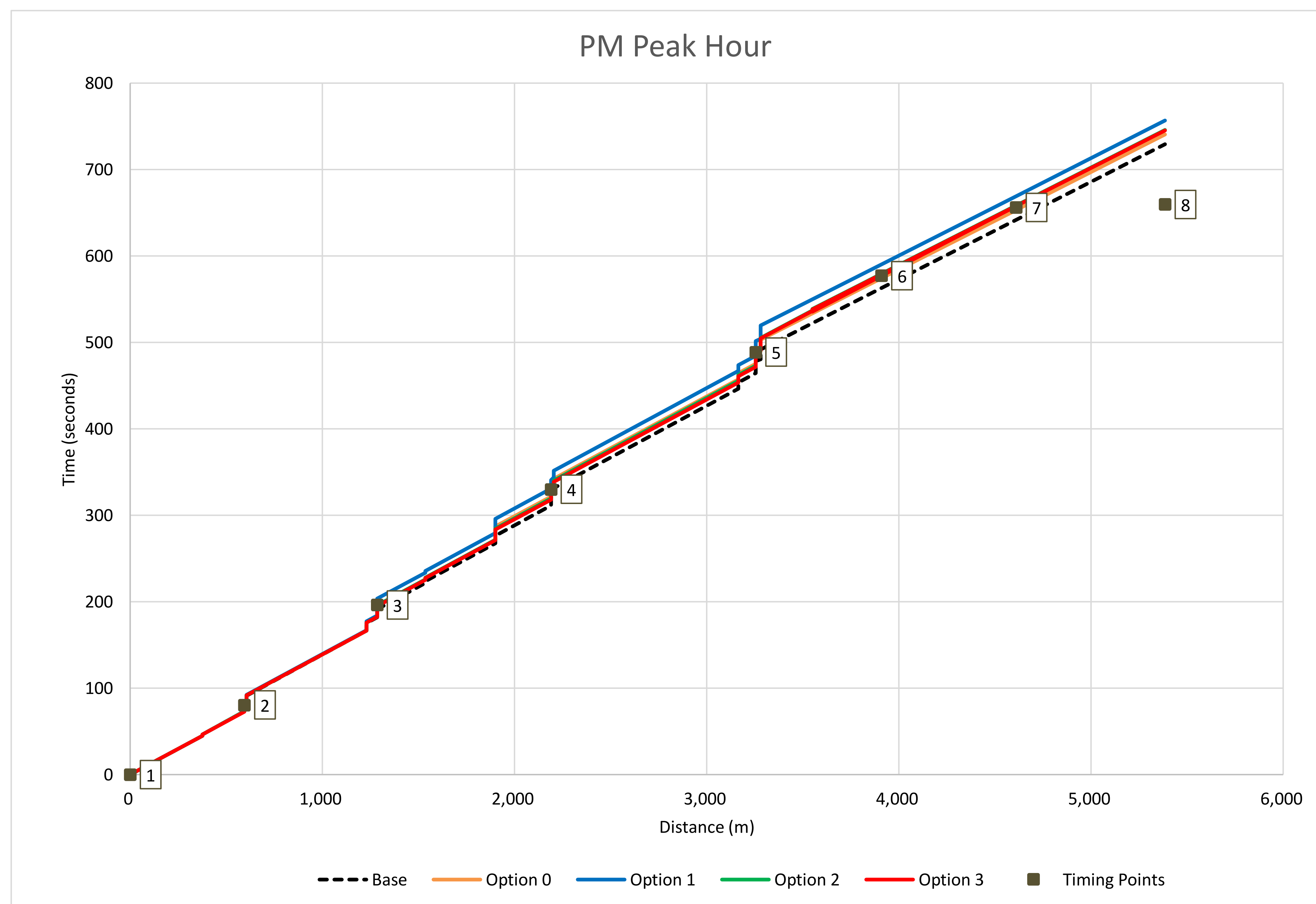
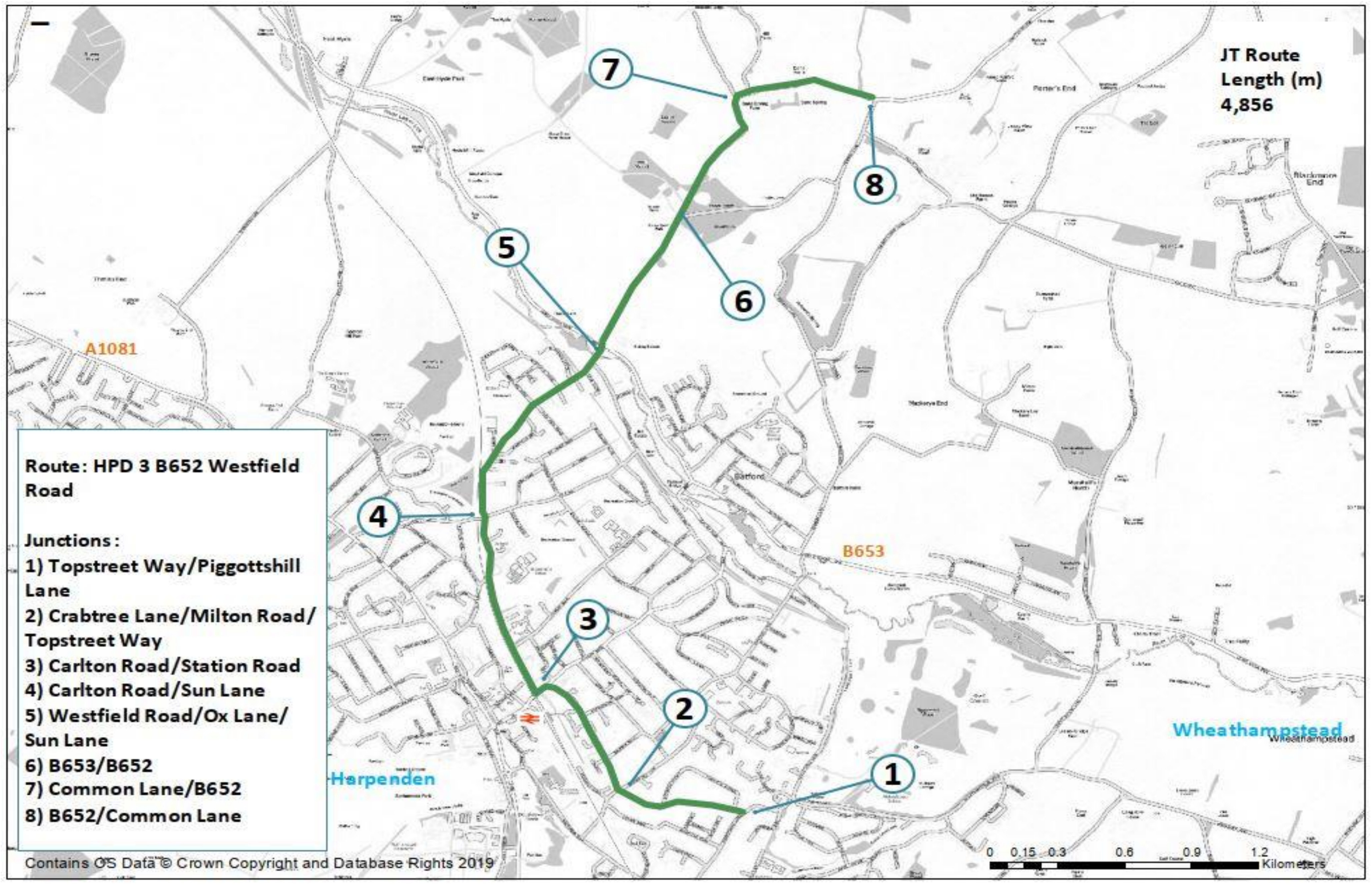
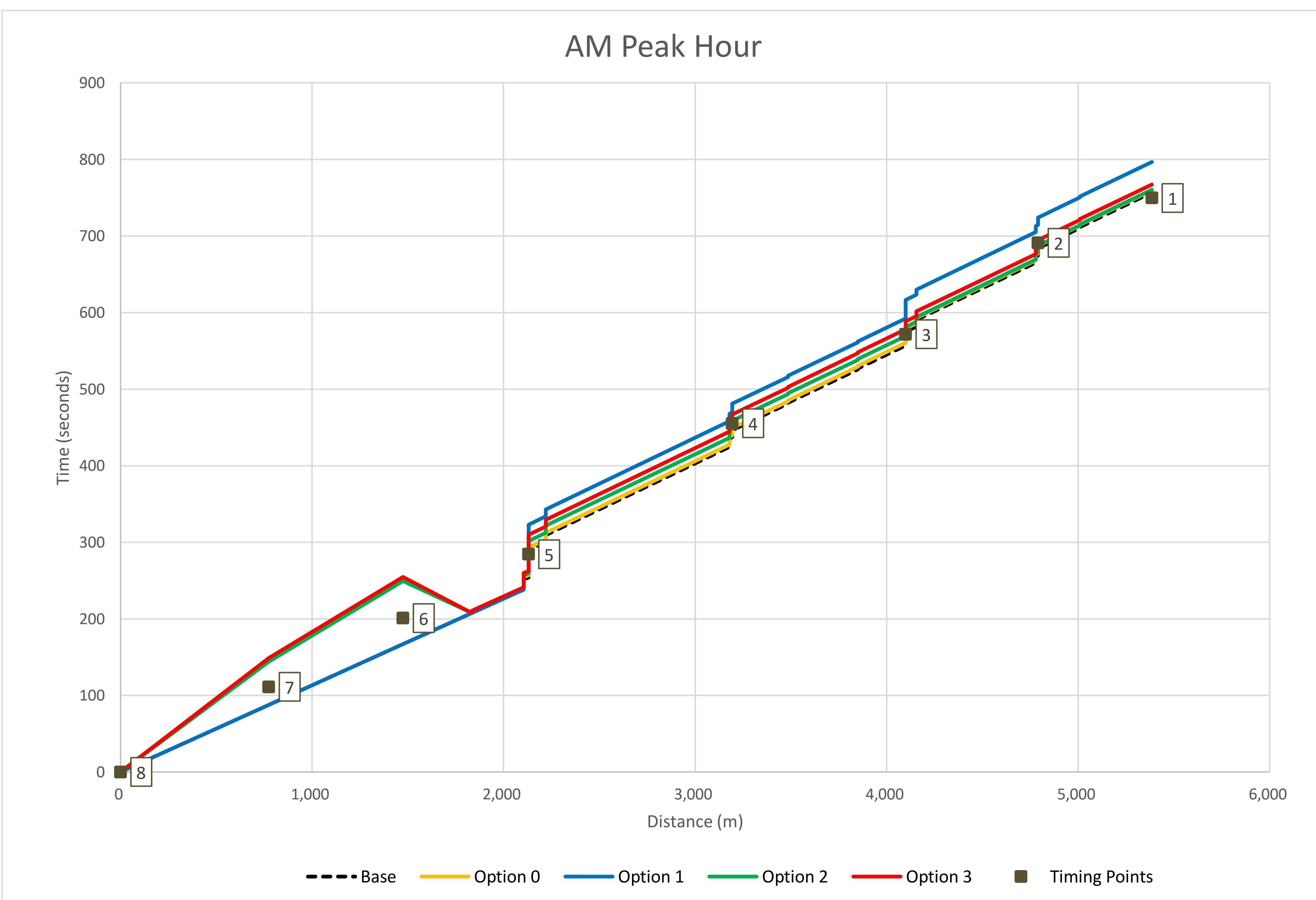


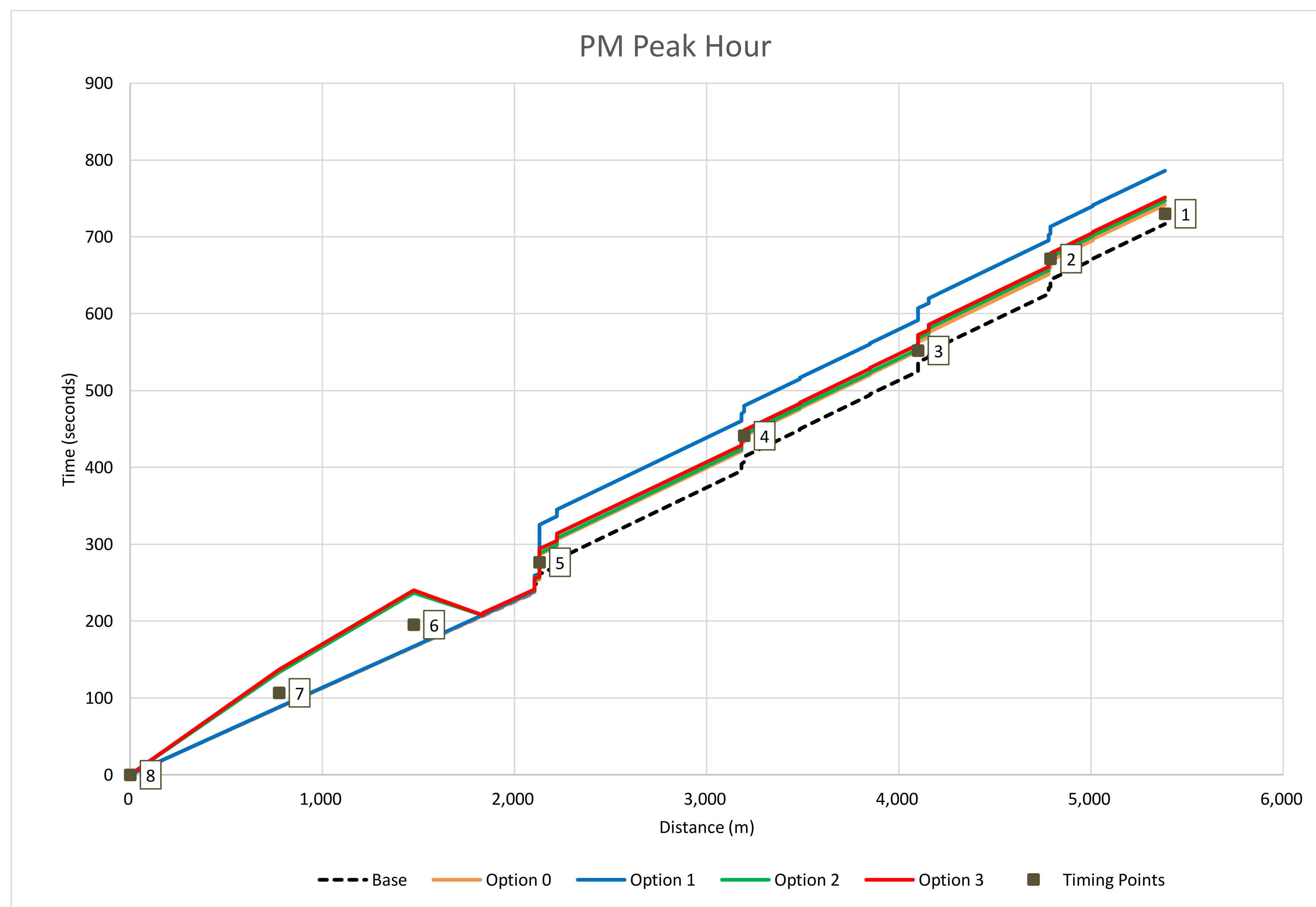




Route: HPD3_SB







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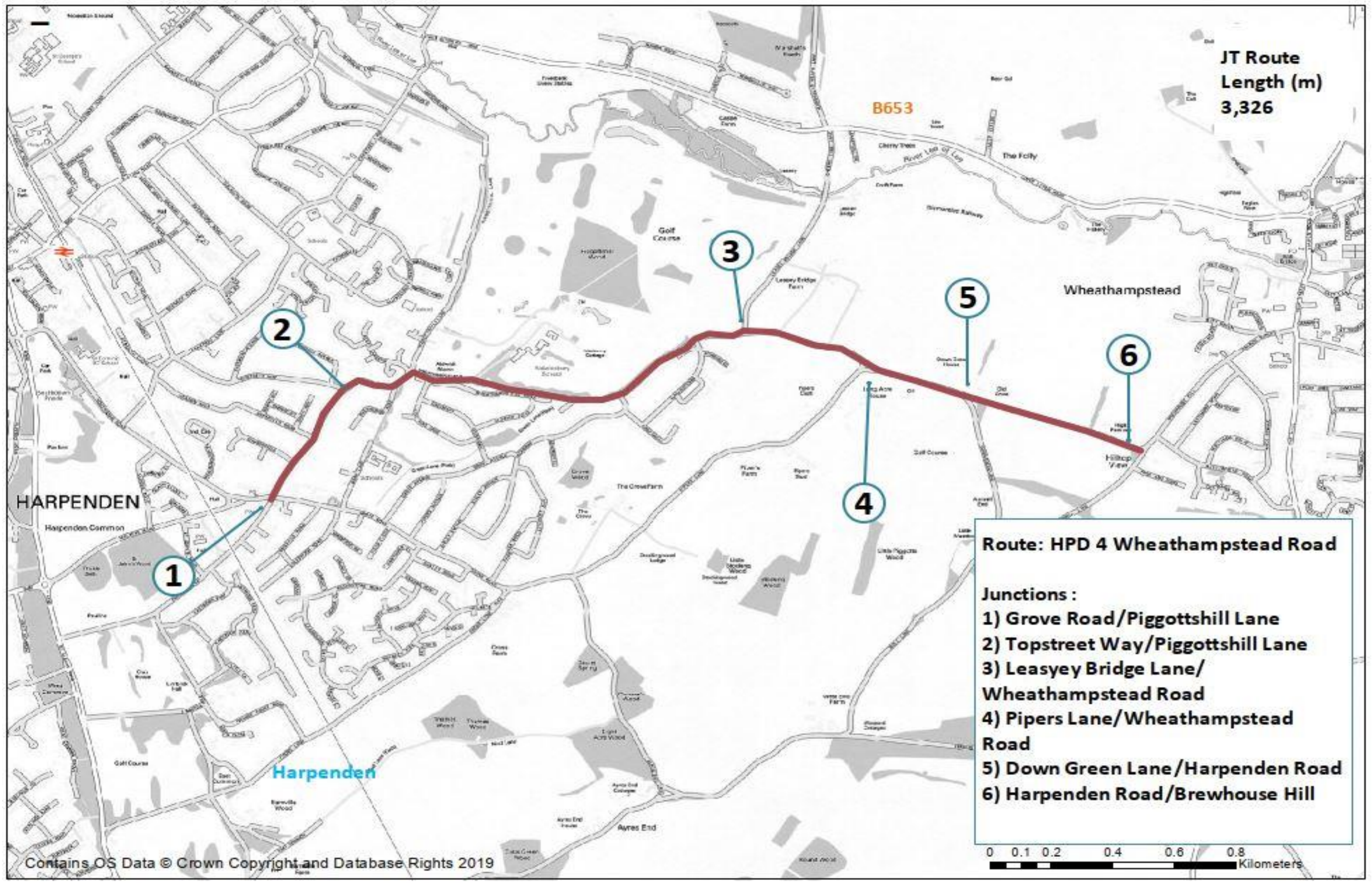

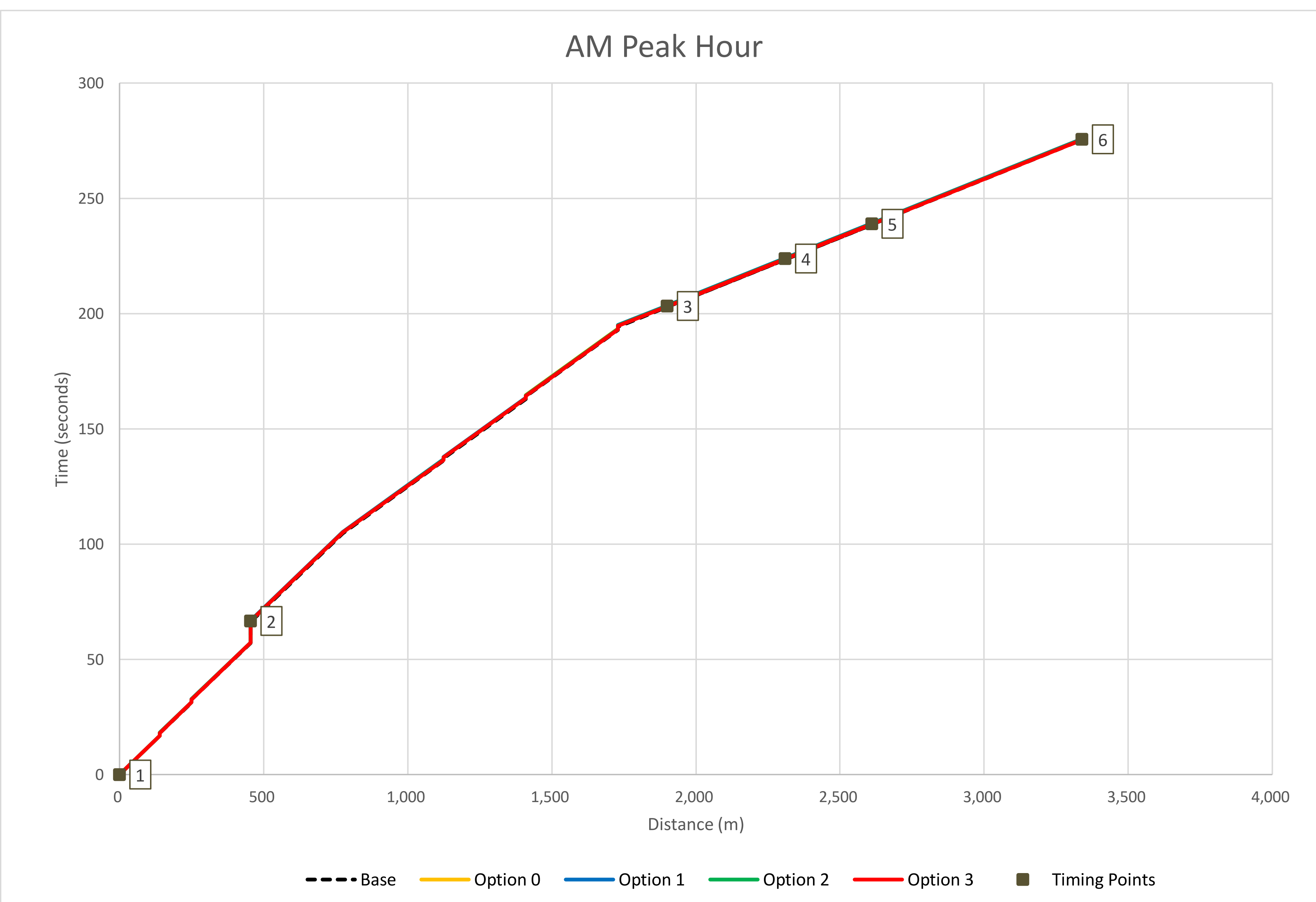

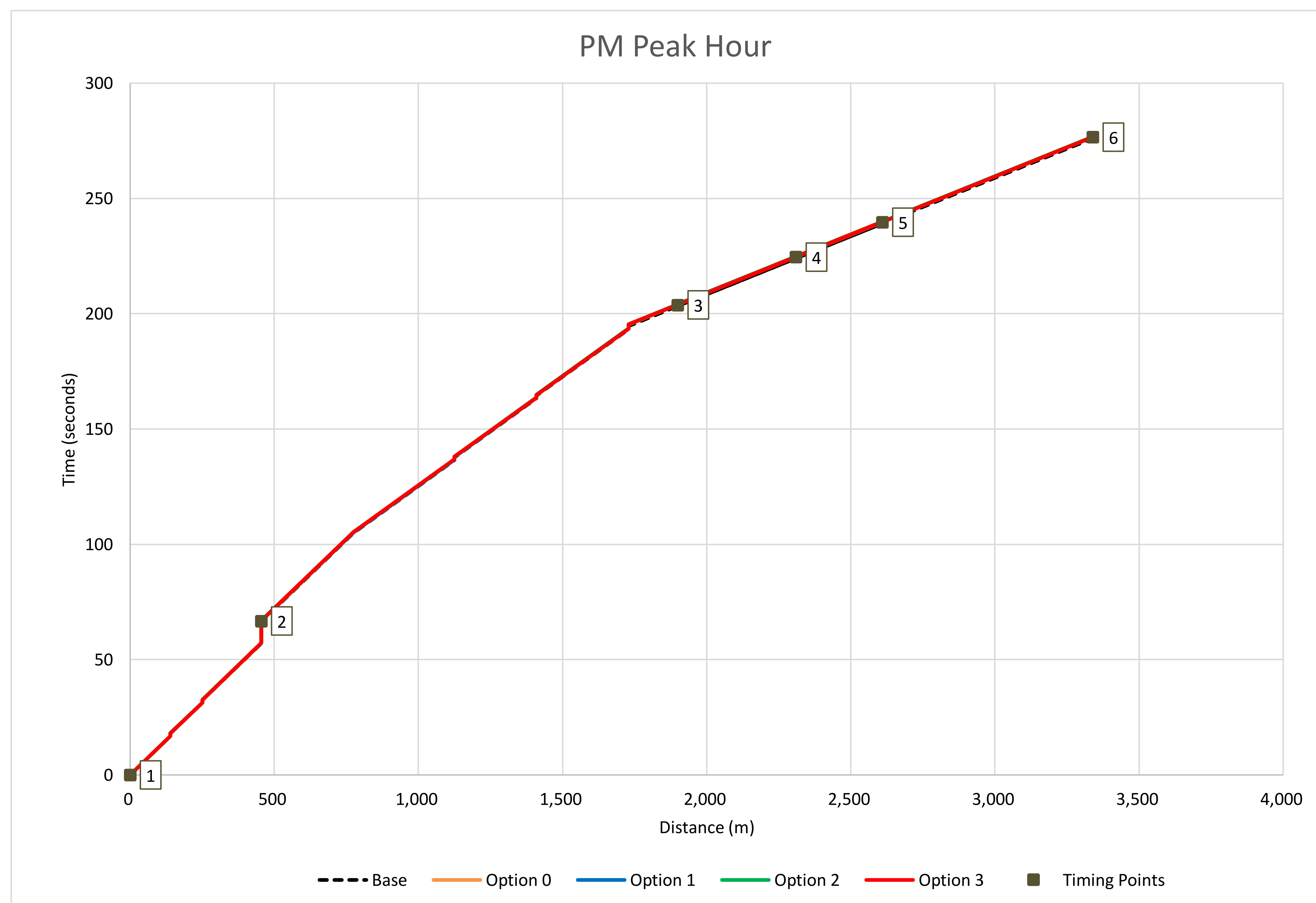

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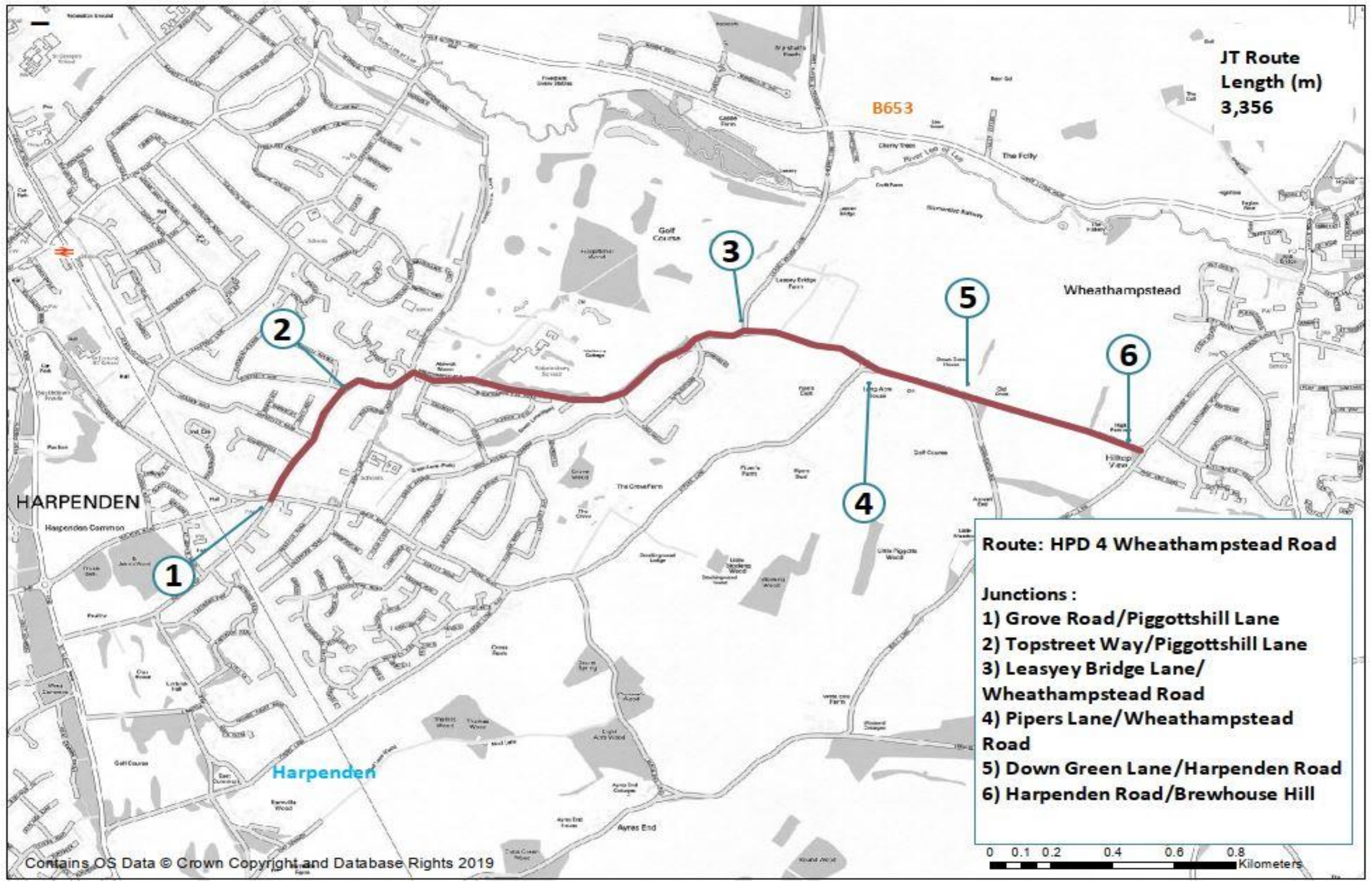

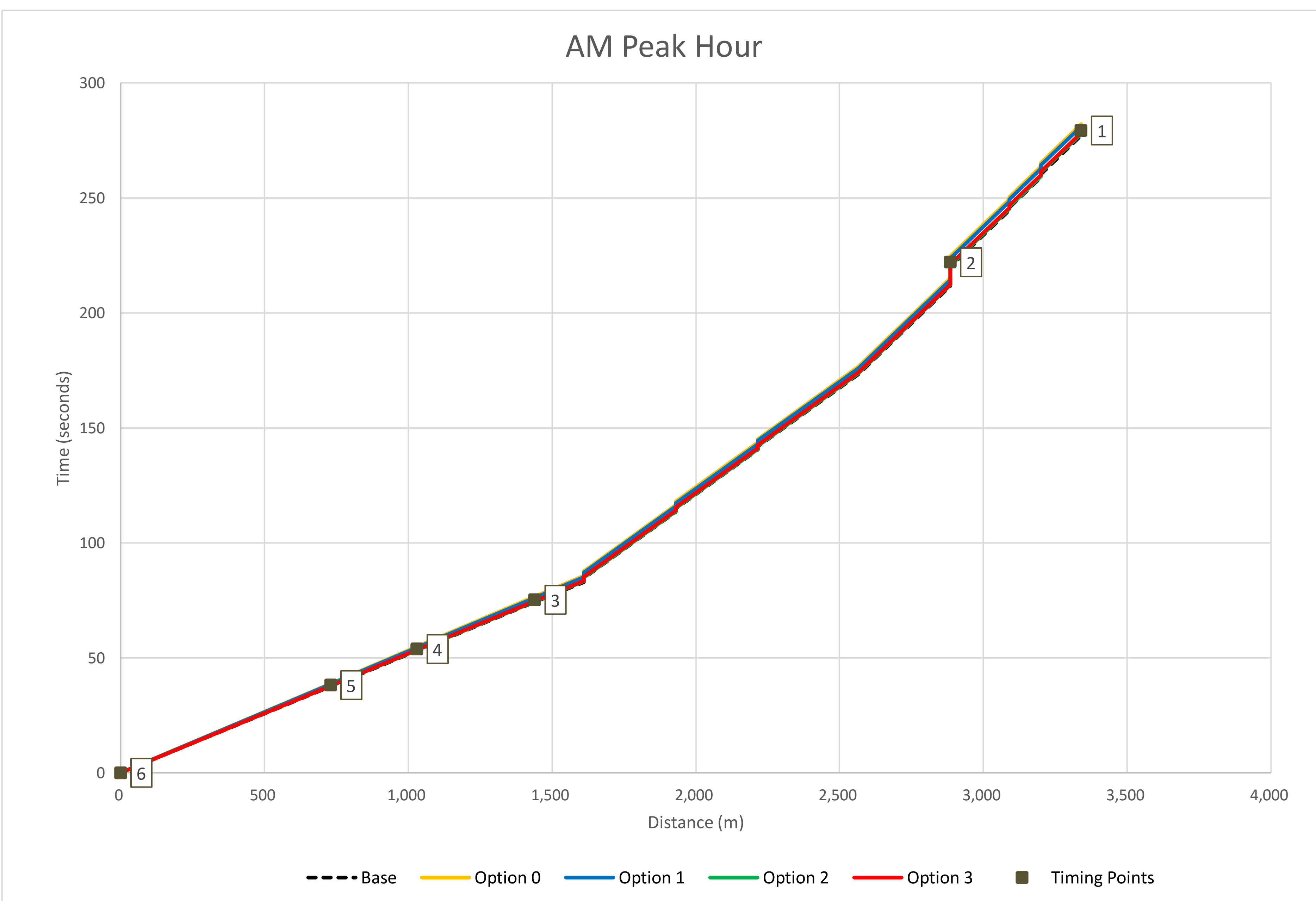

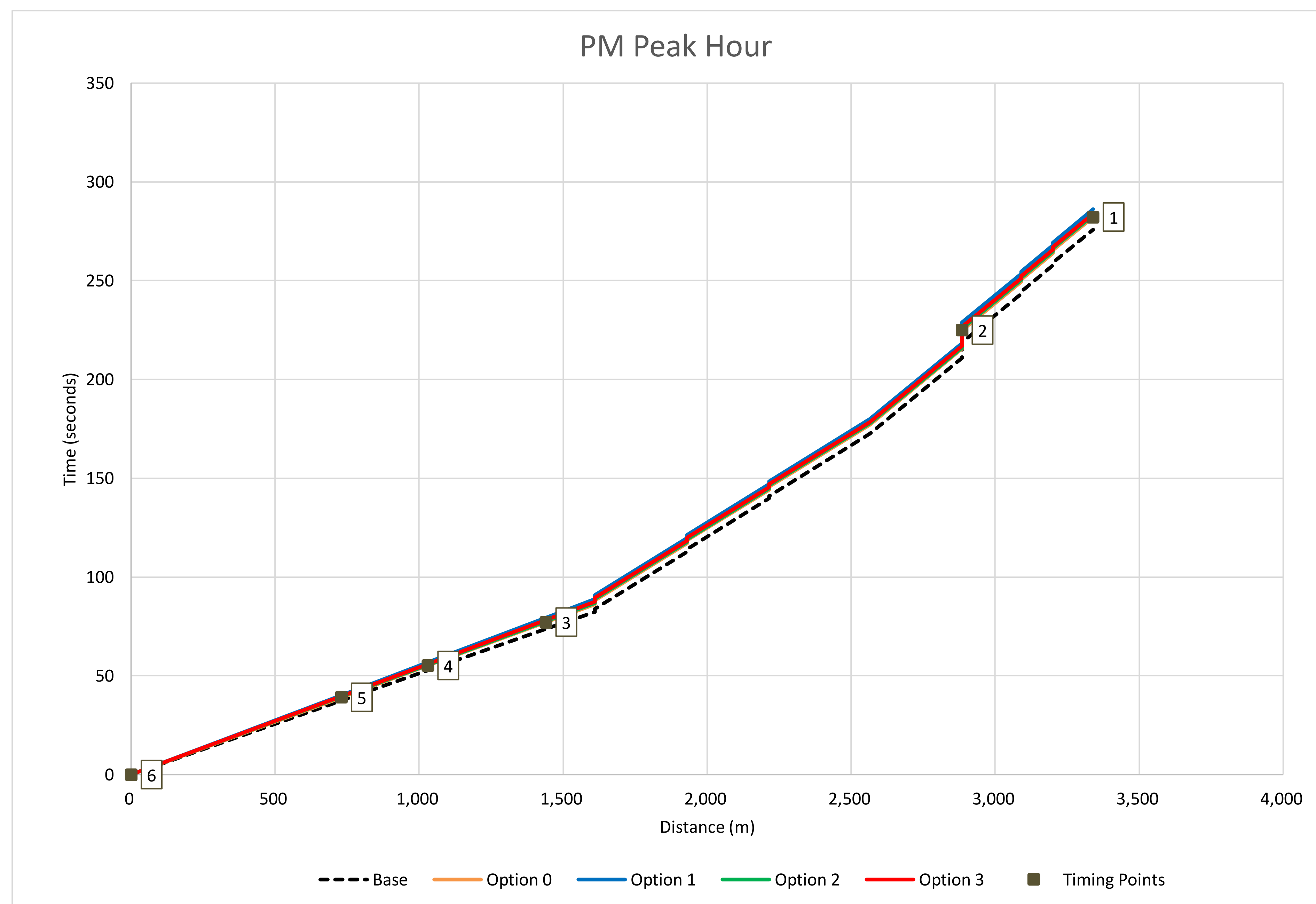

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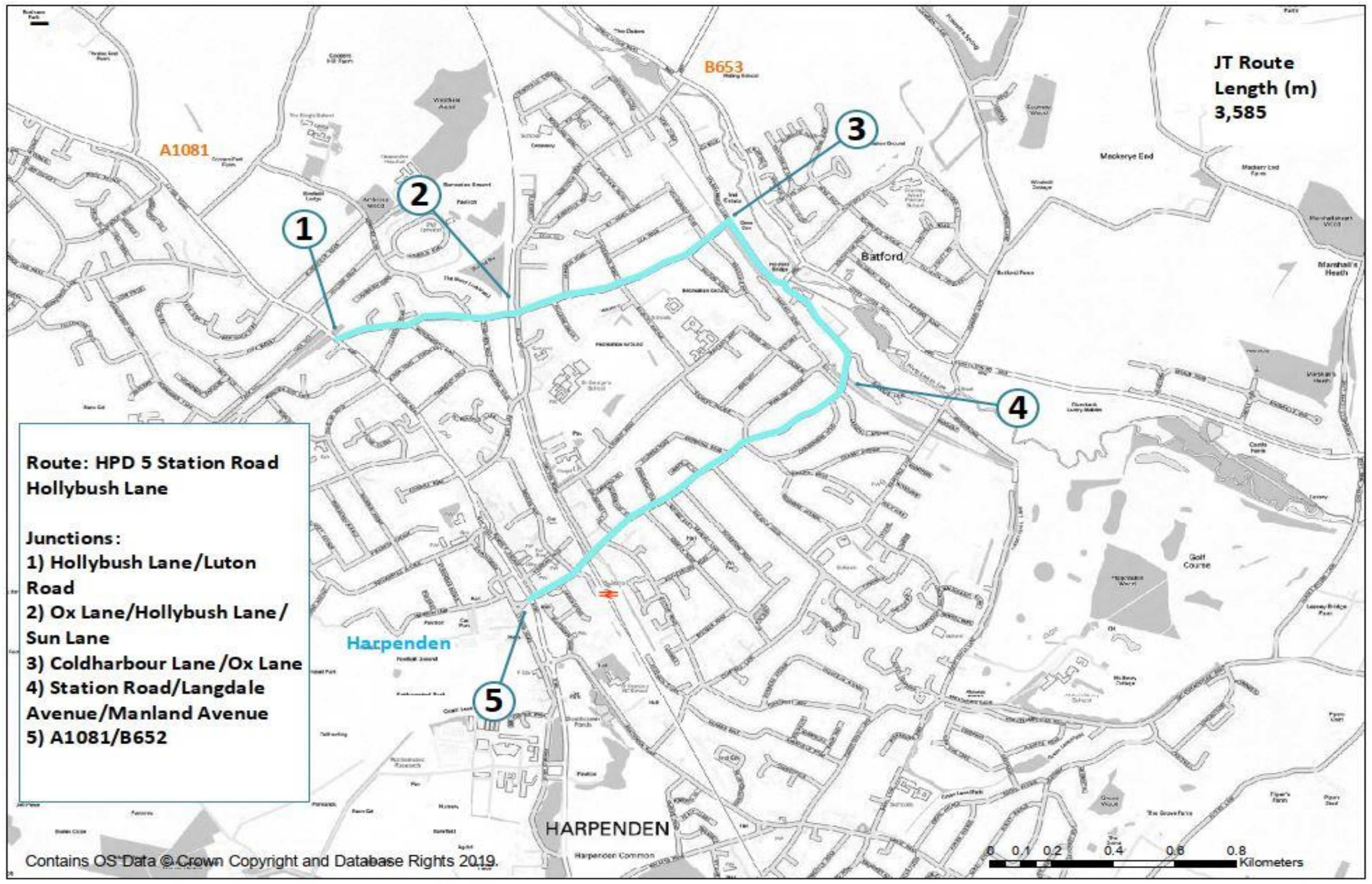
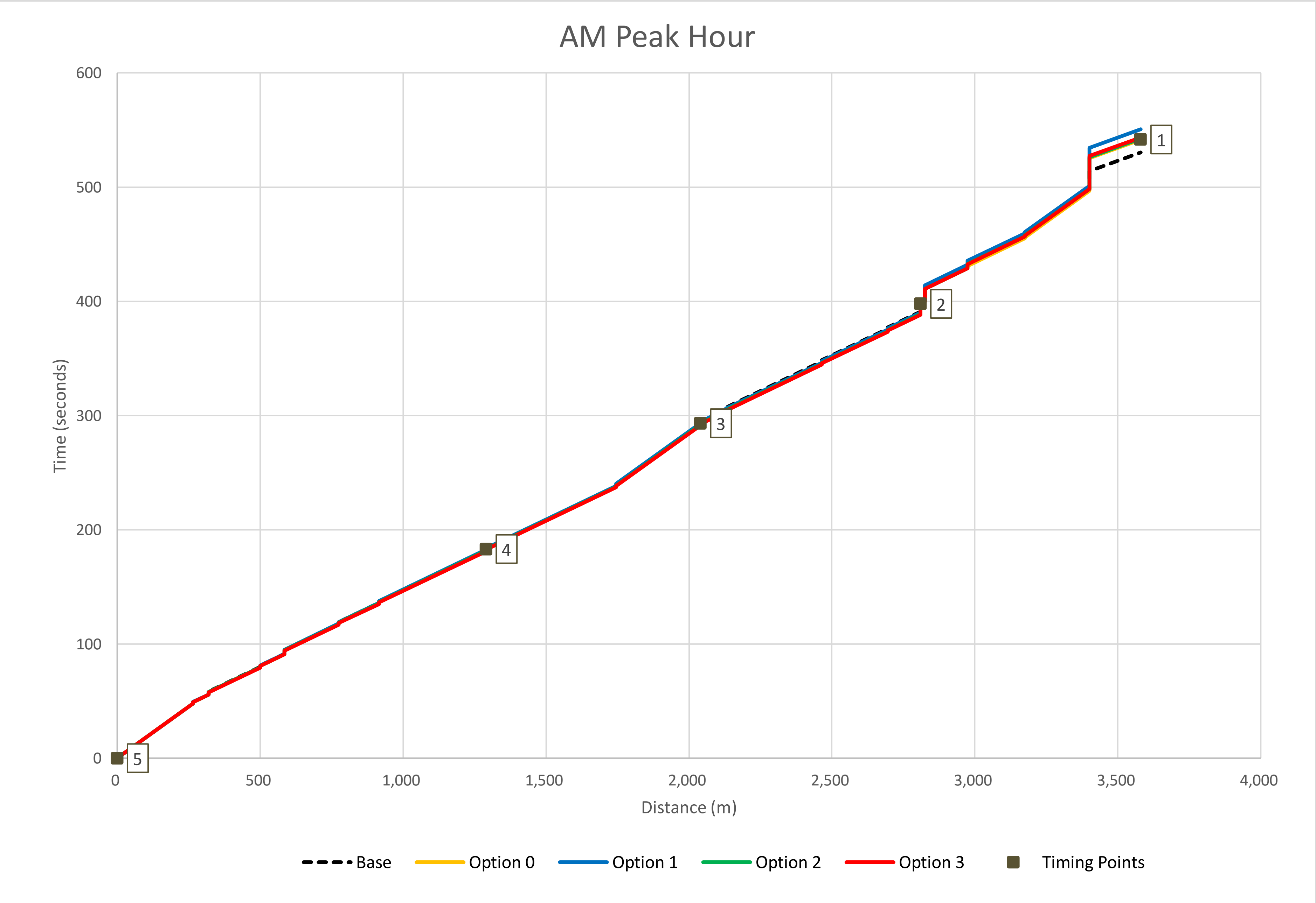
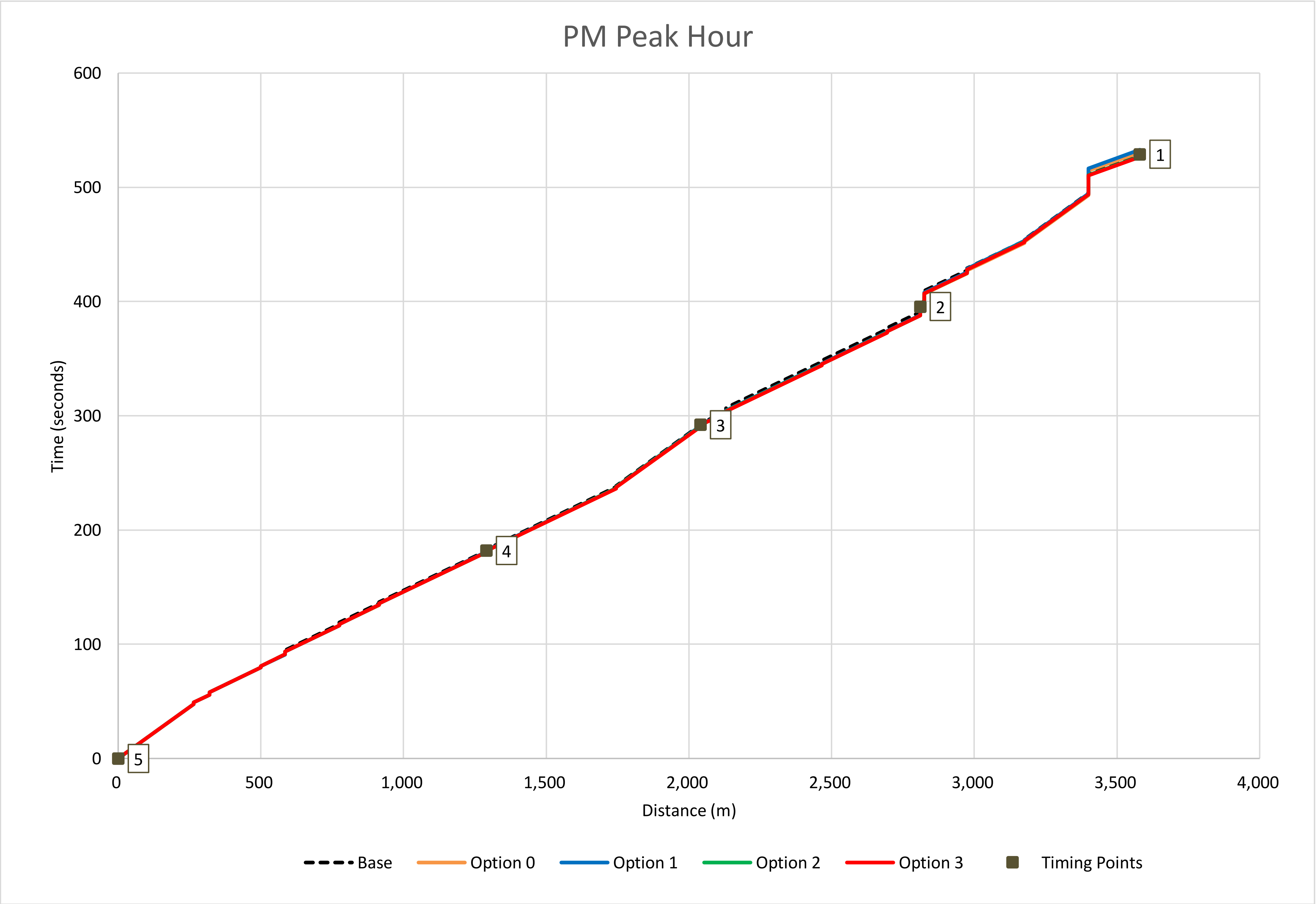
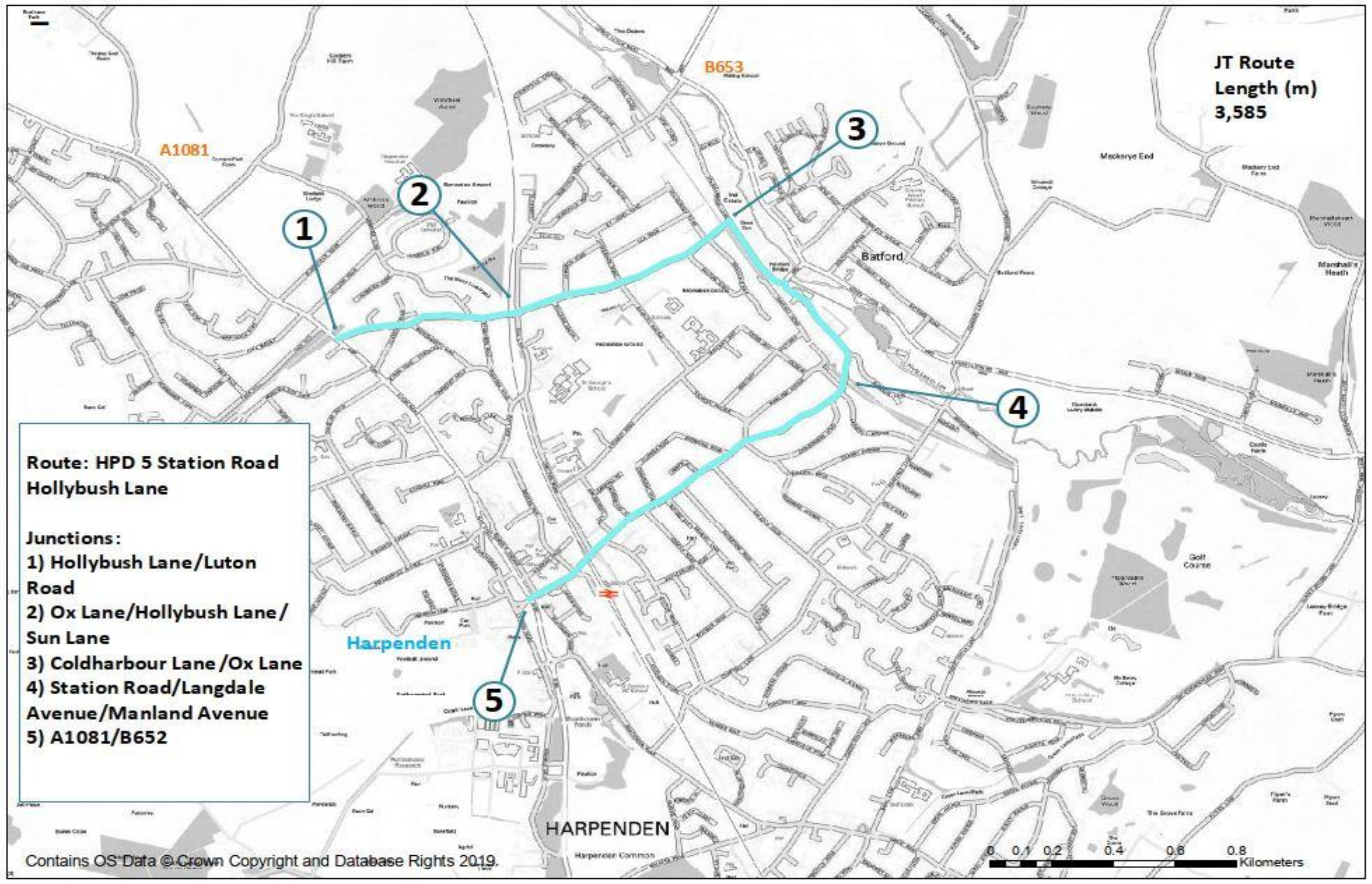
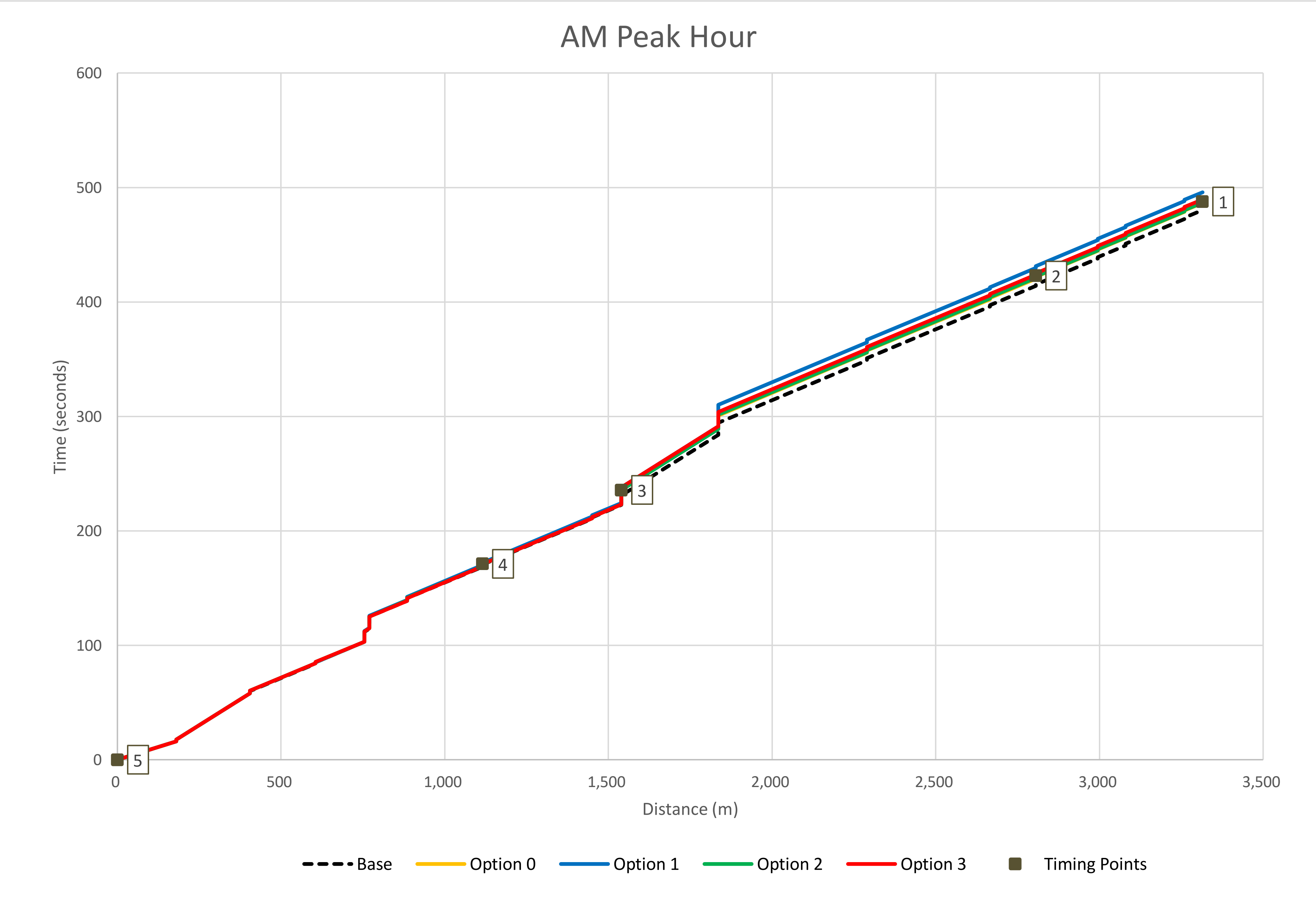


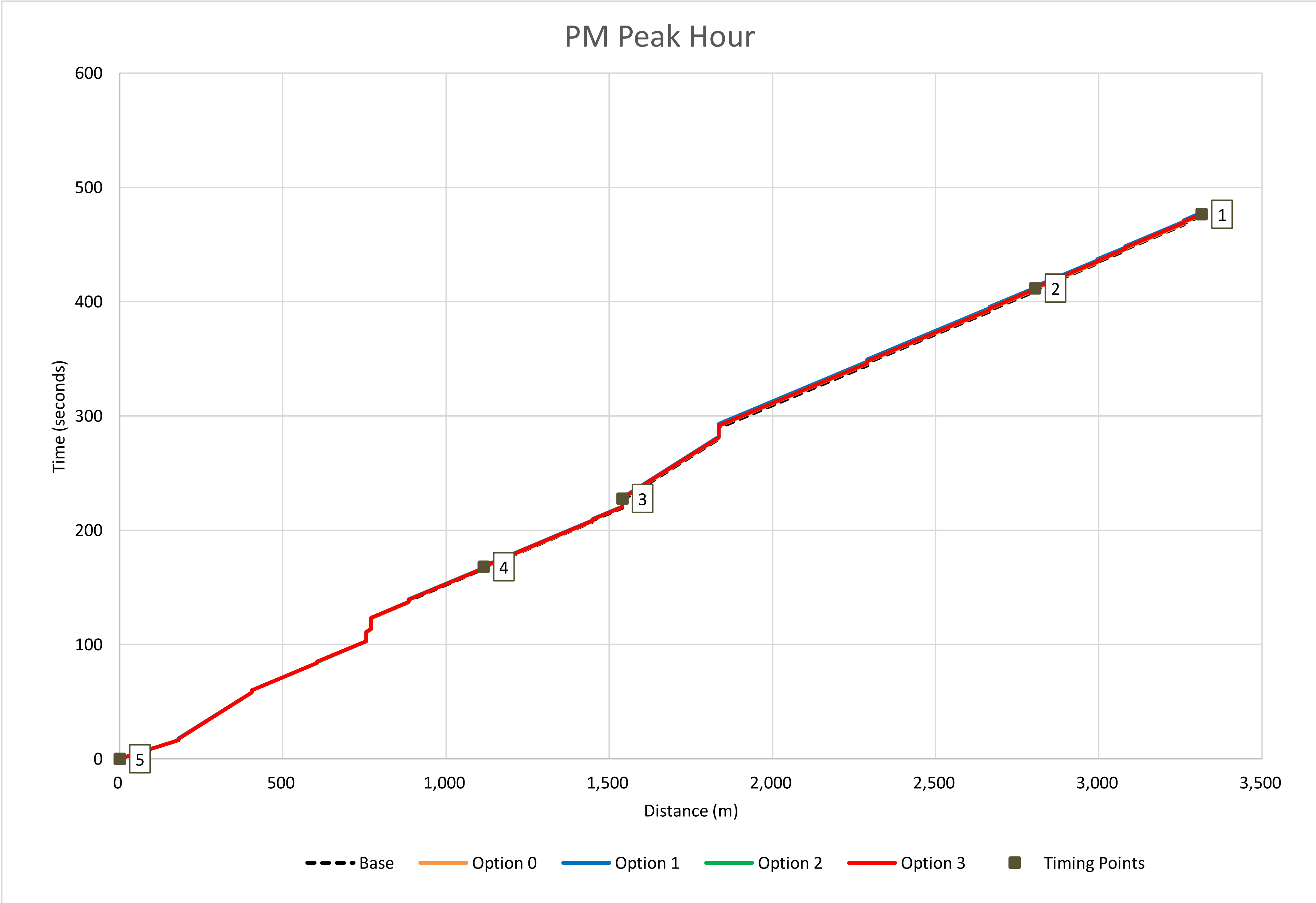




Route: HPD5_SB







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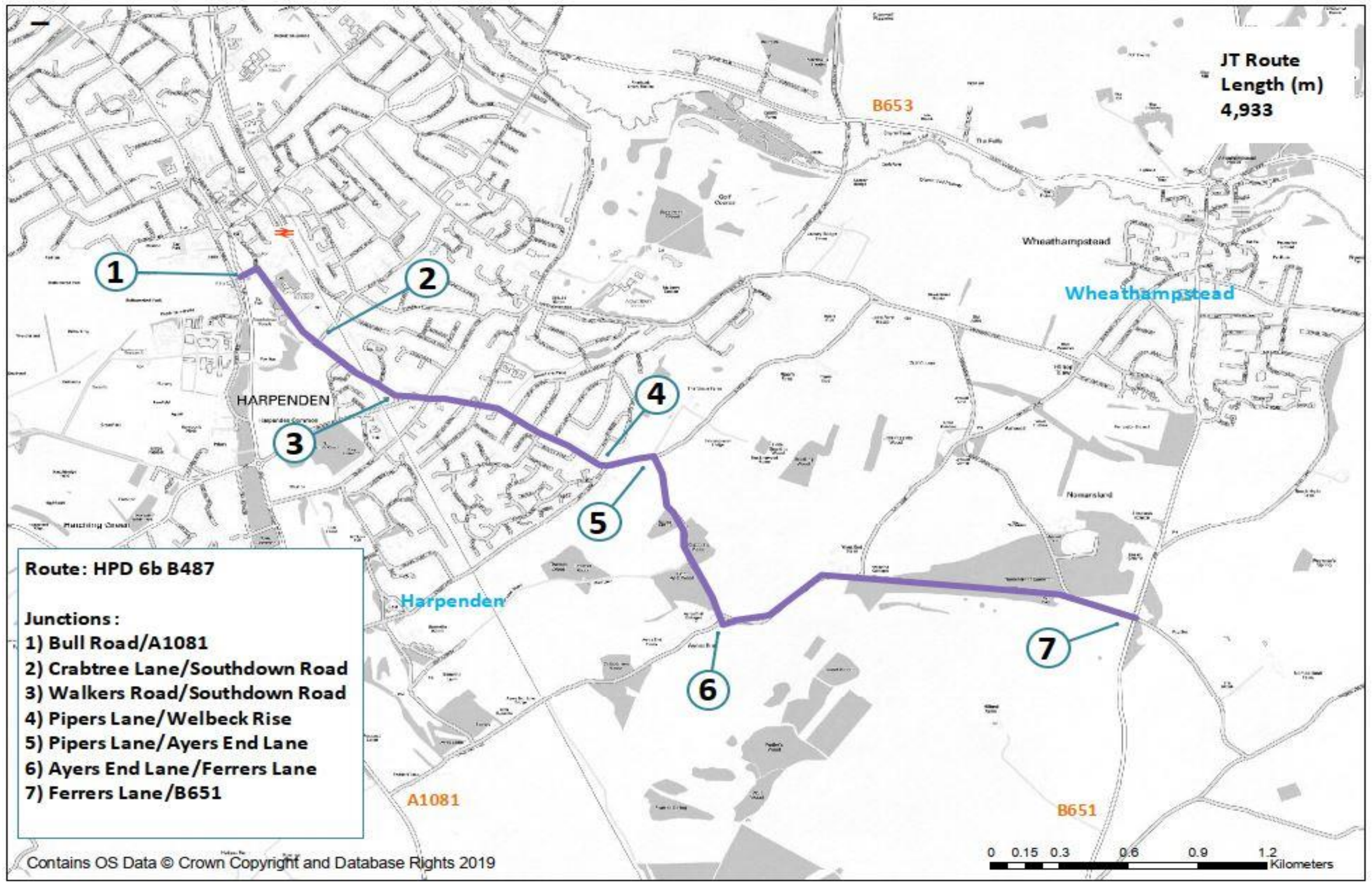

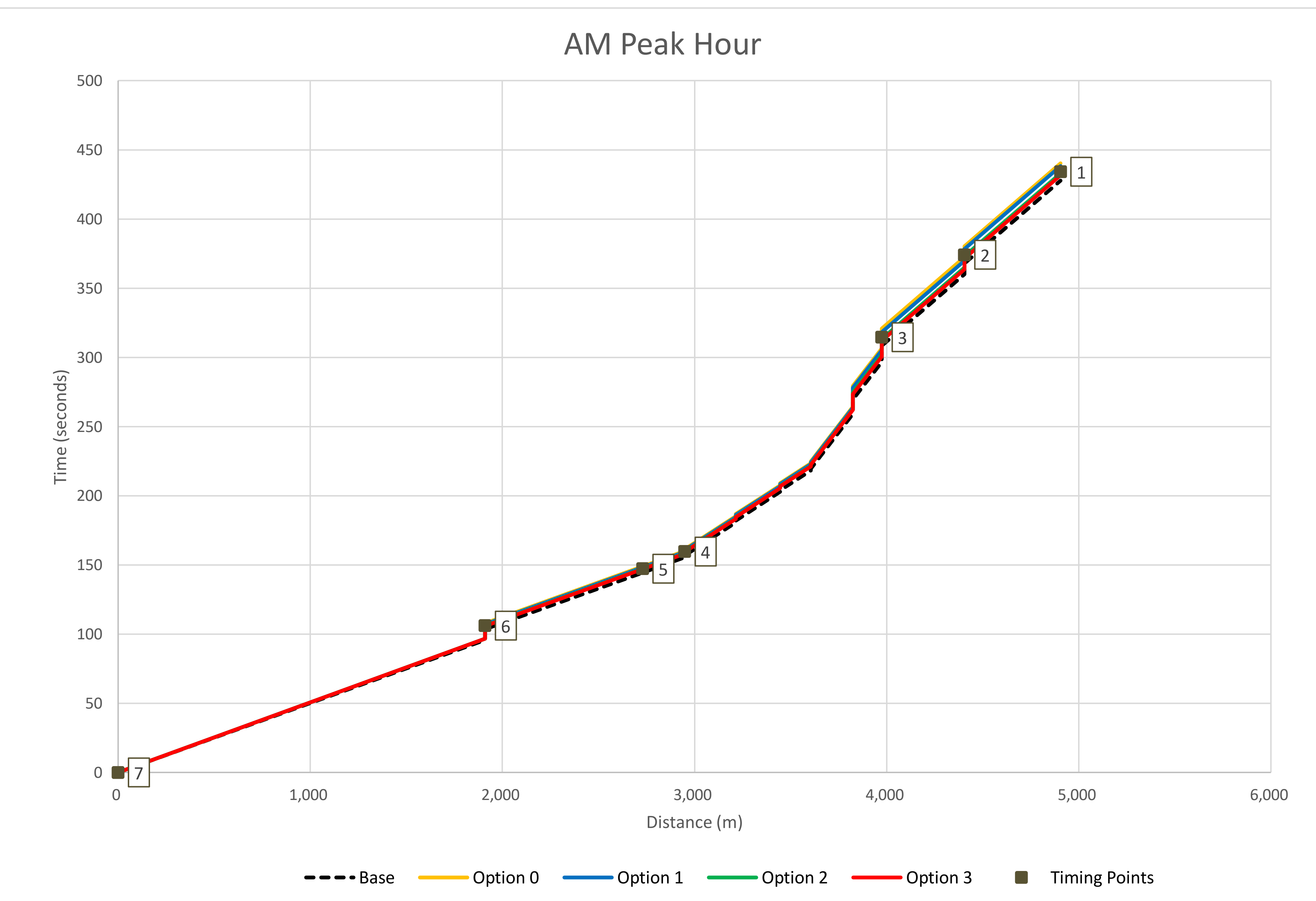

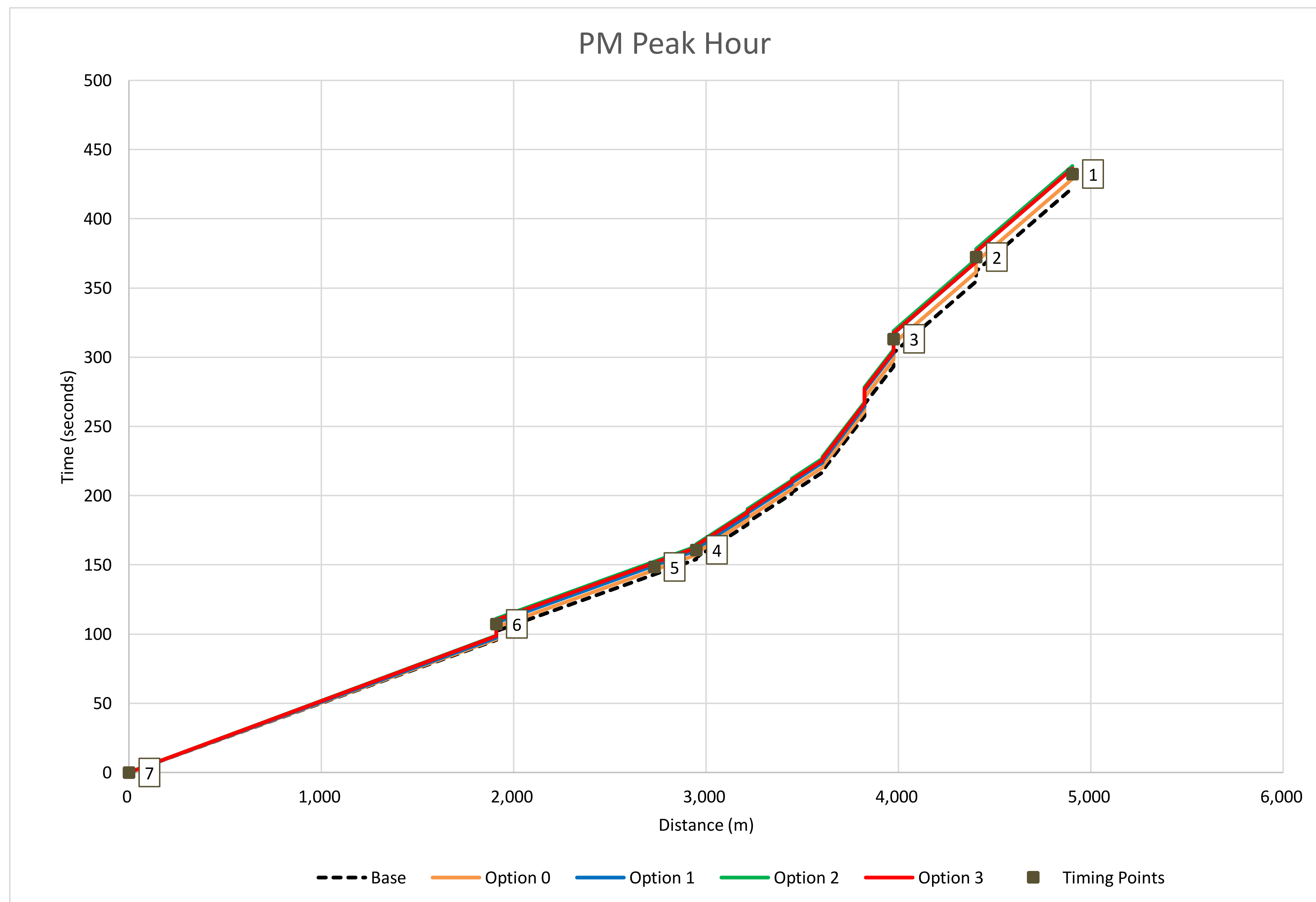

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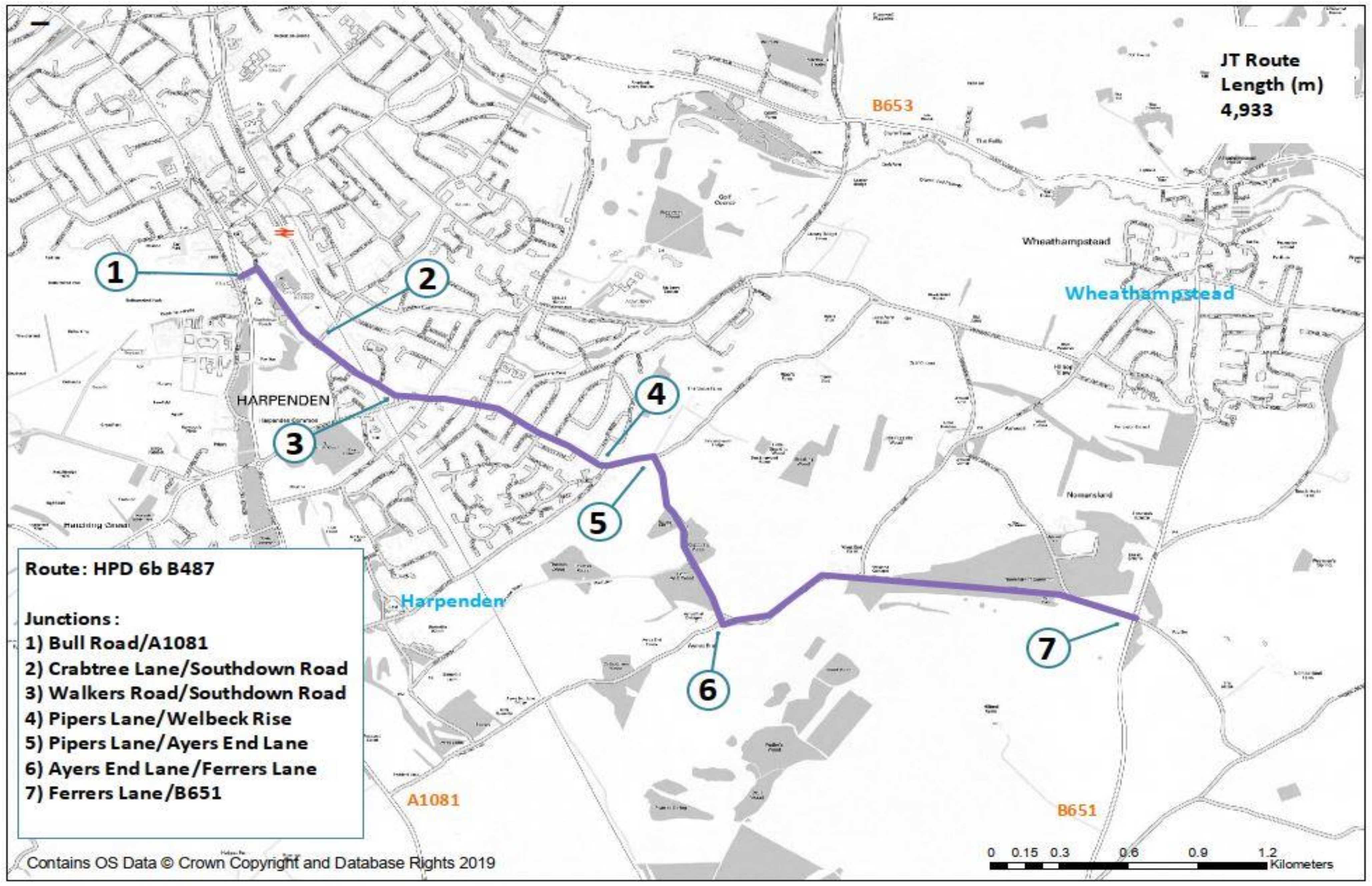

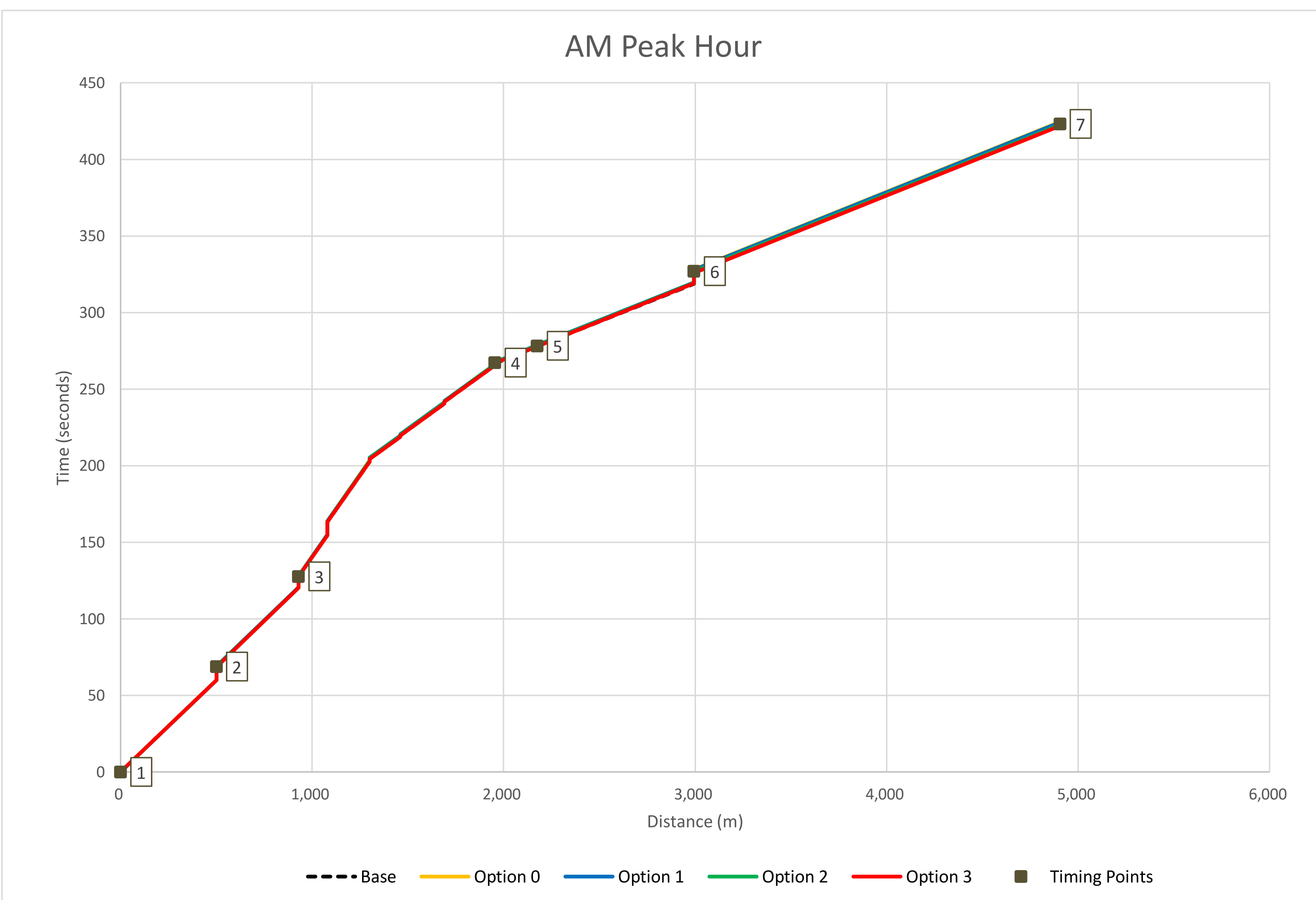

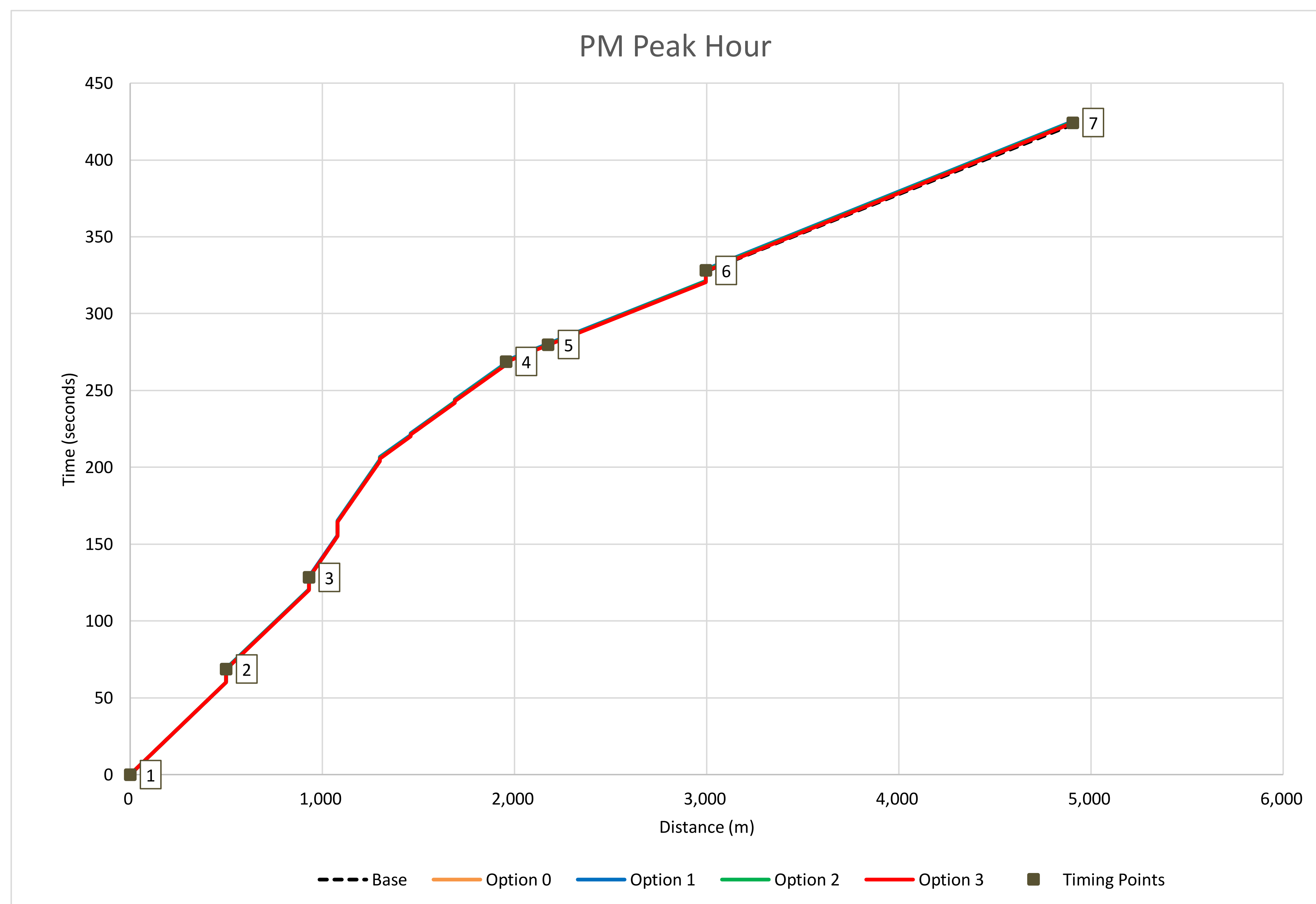

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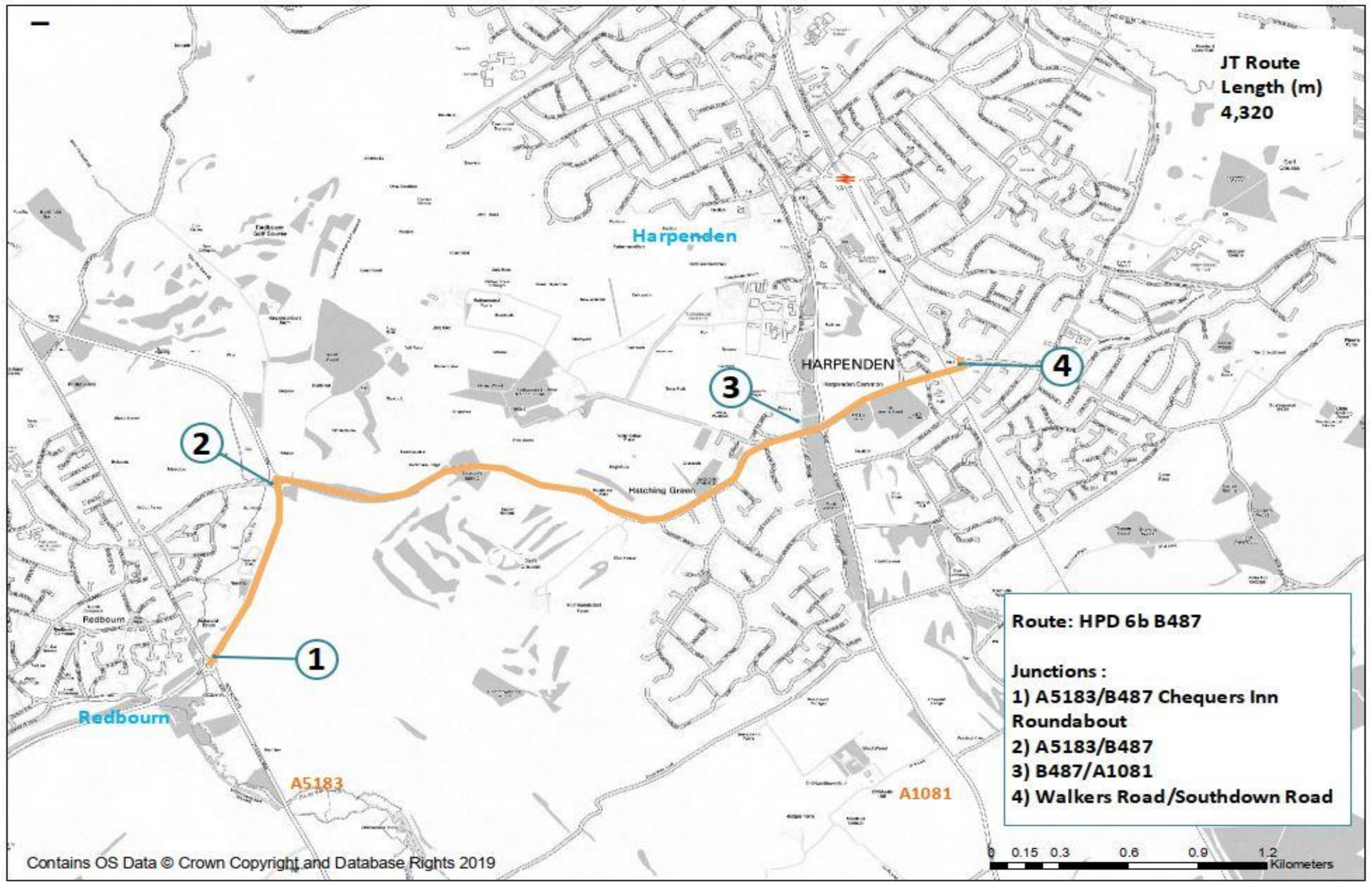

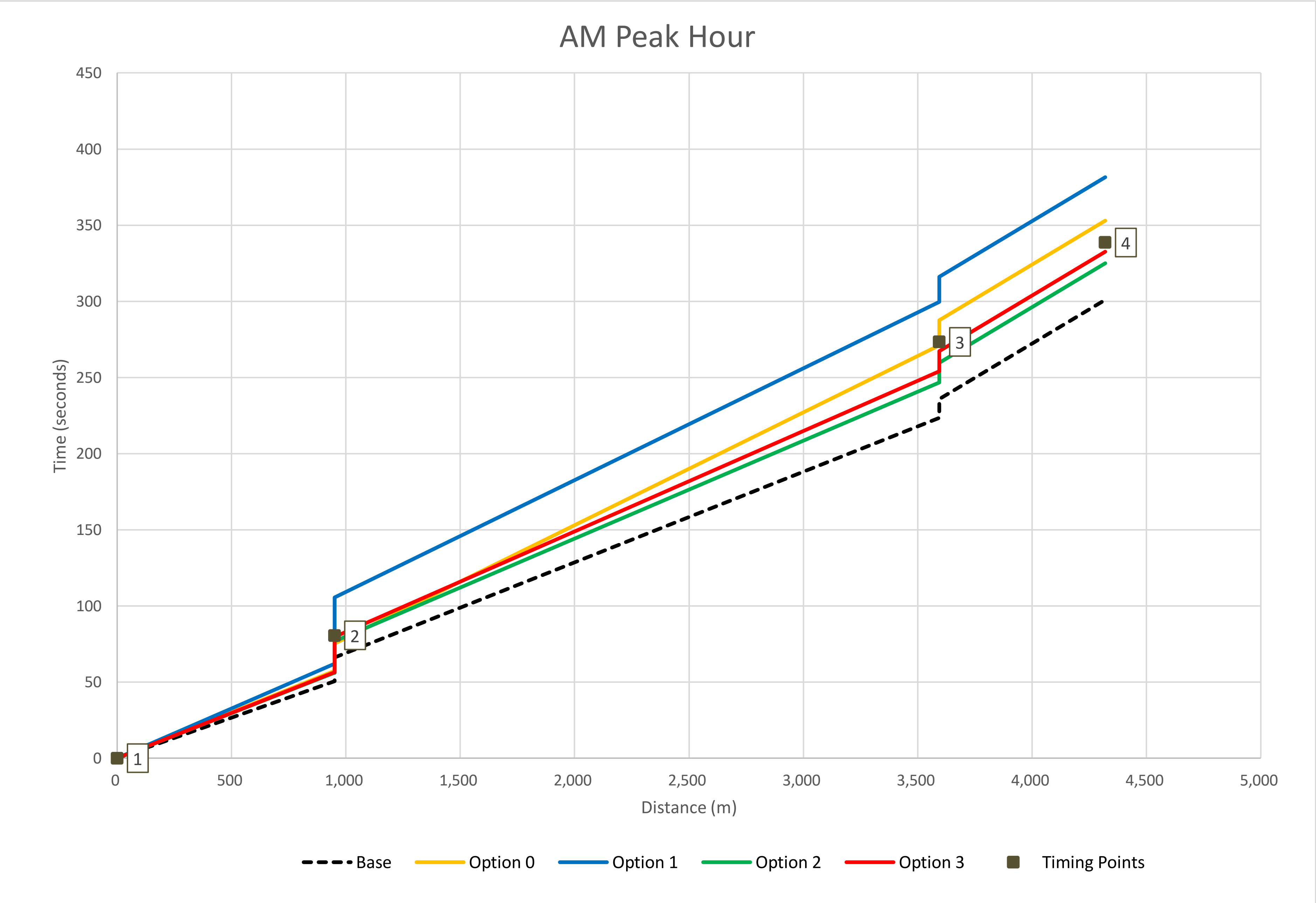

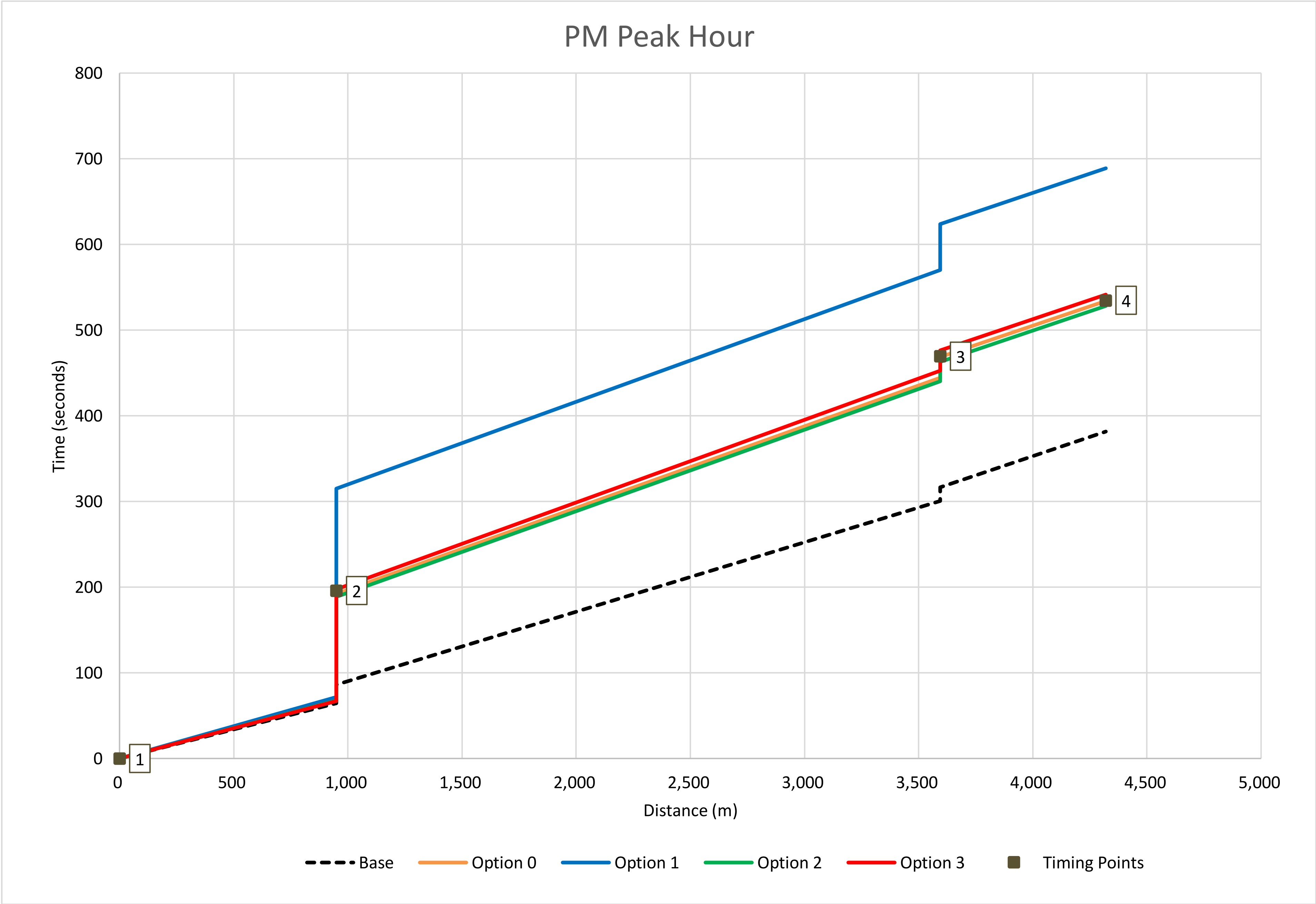

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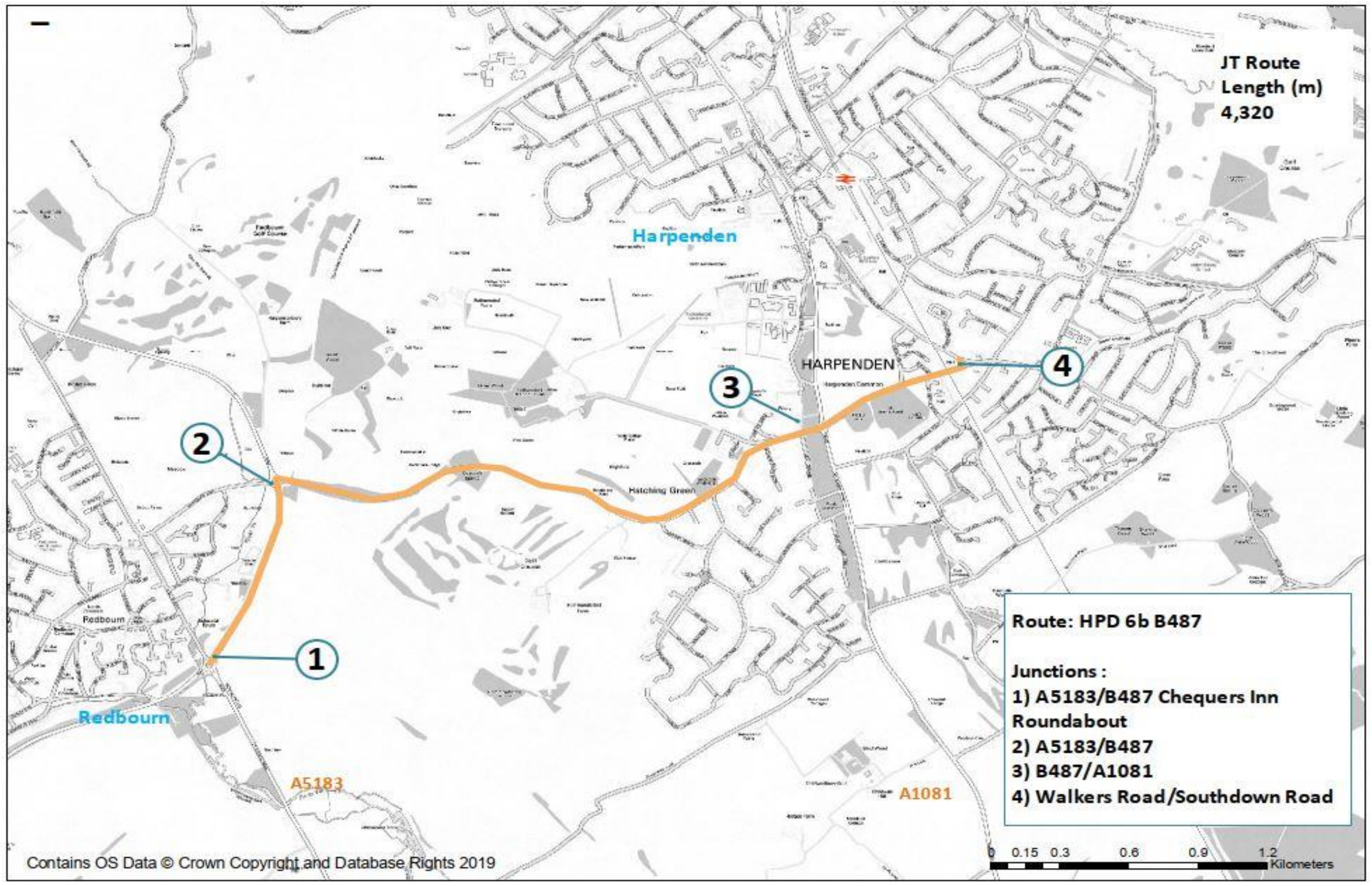

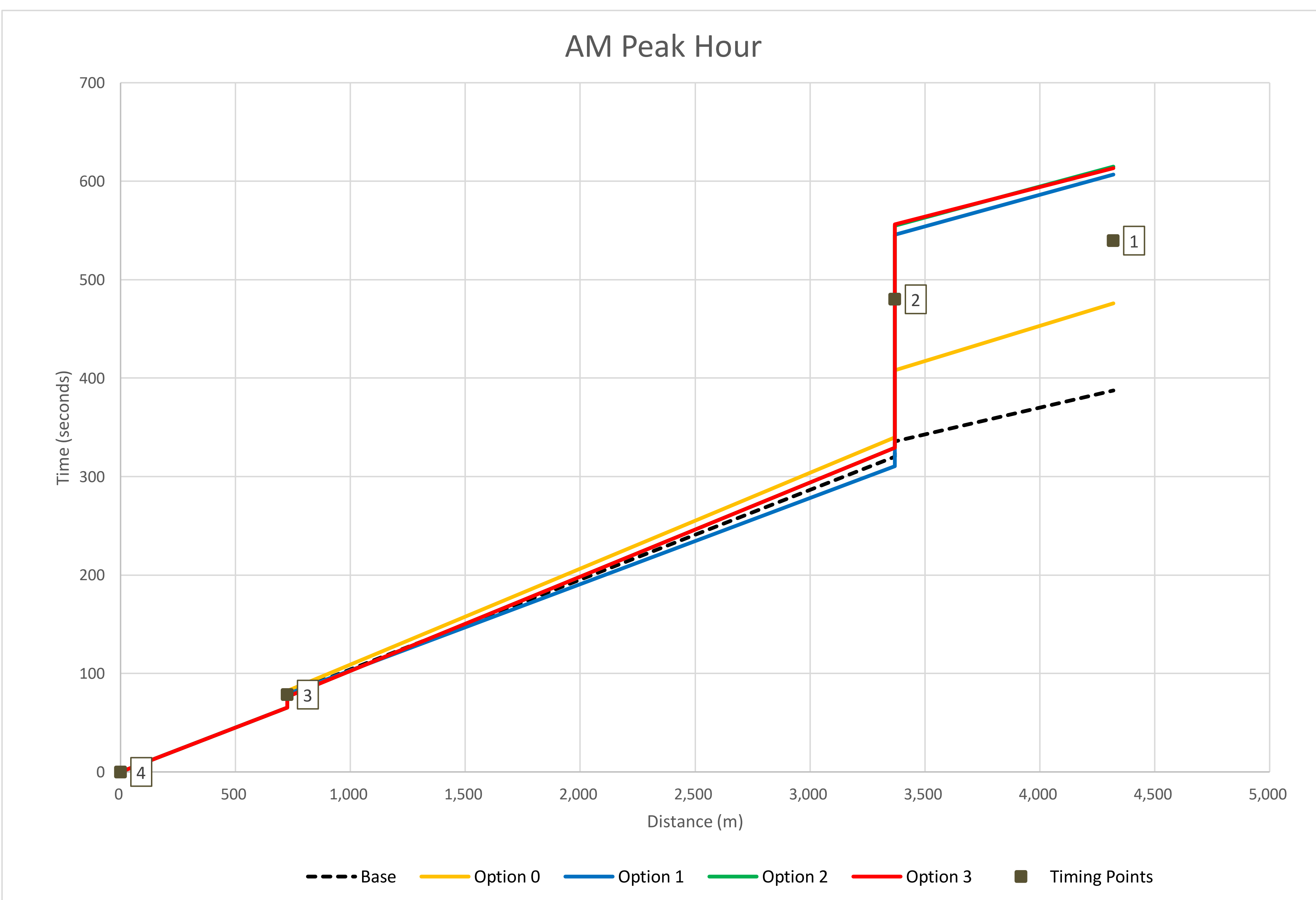

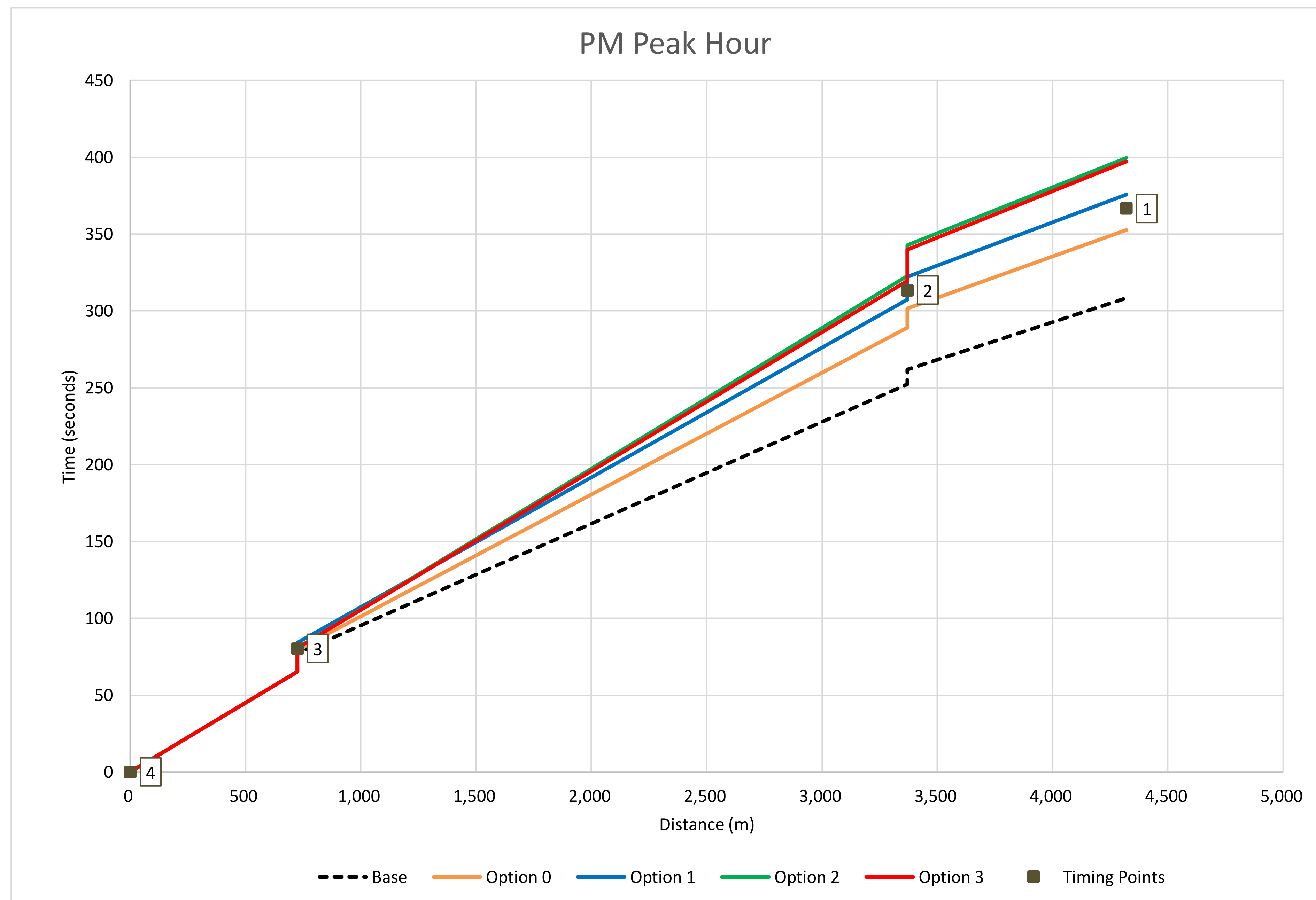

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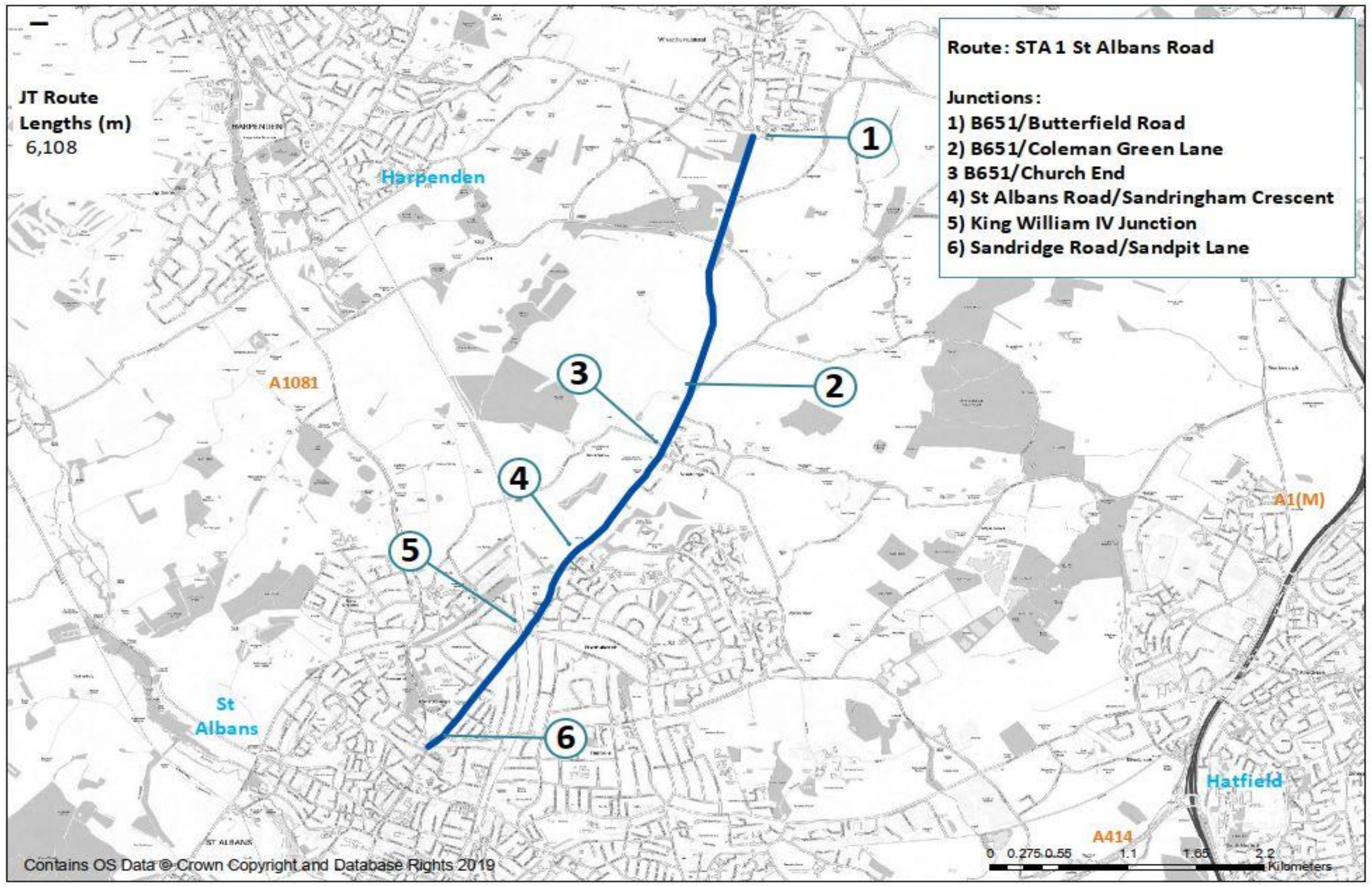

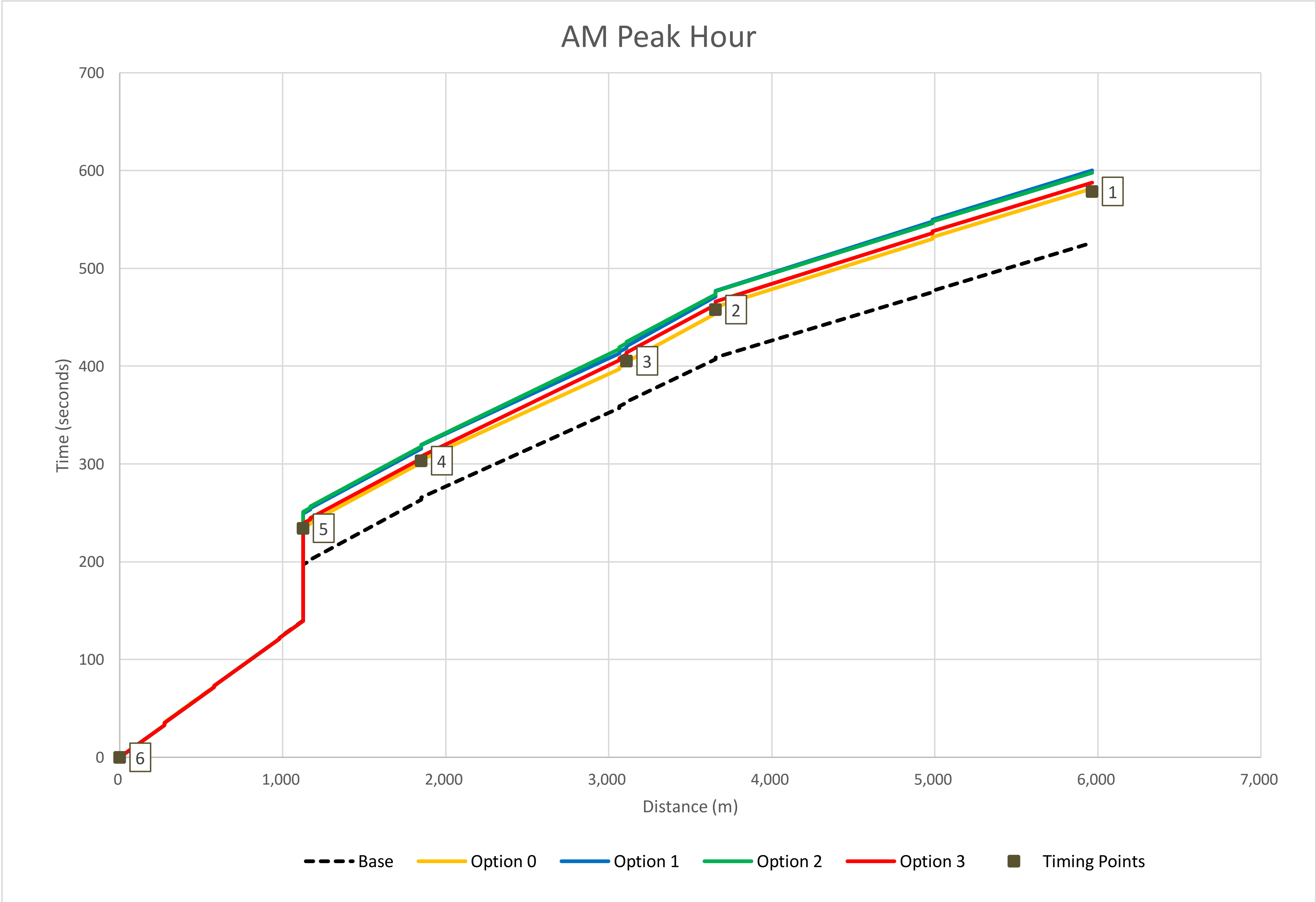

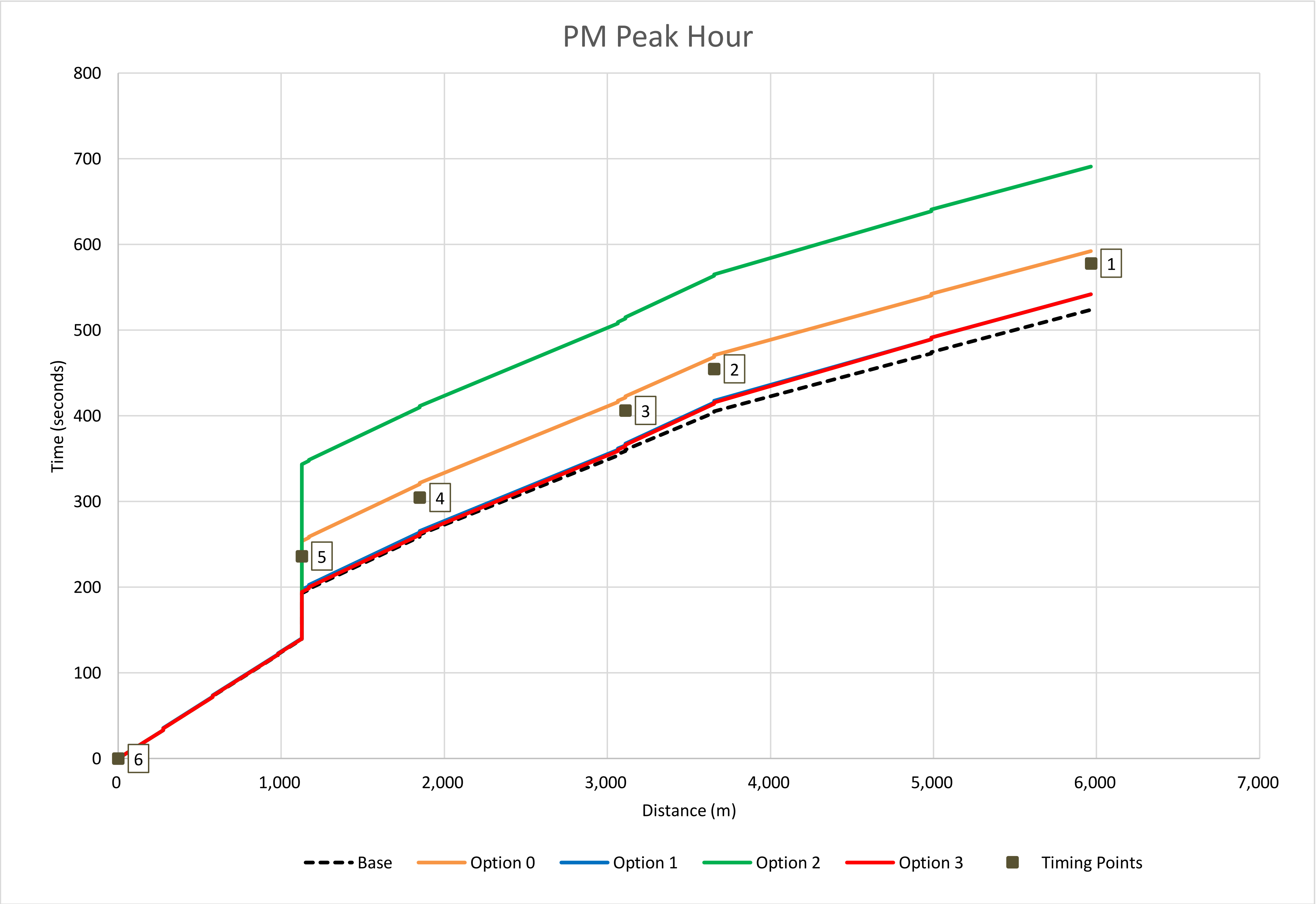

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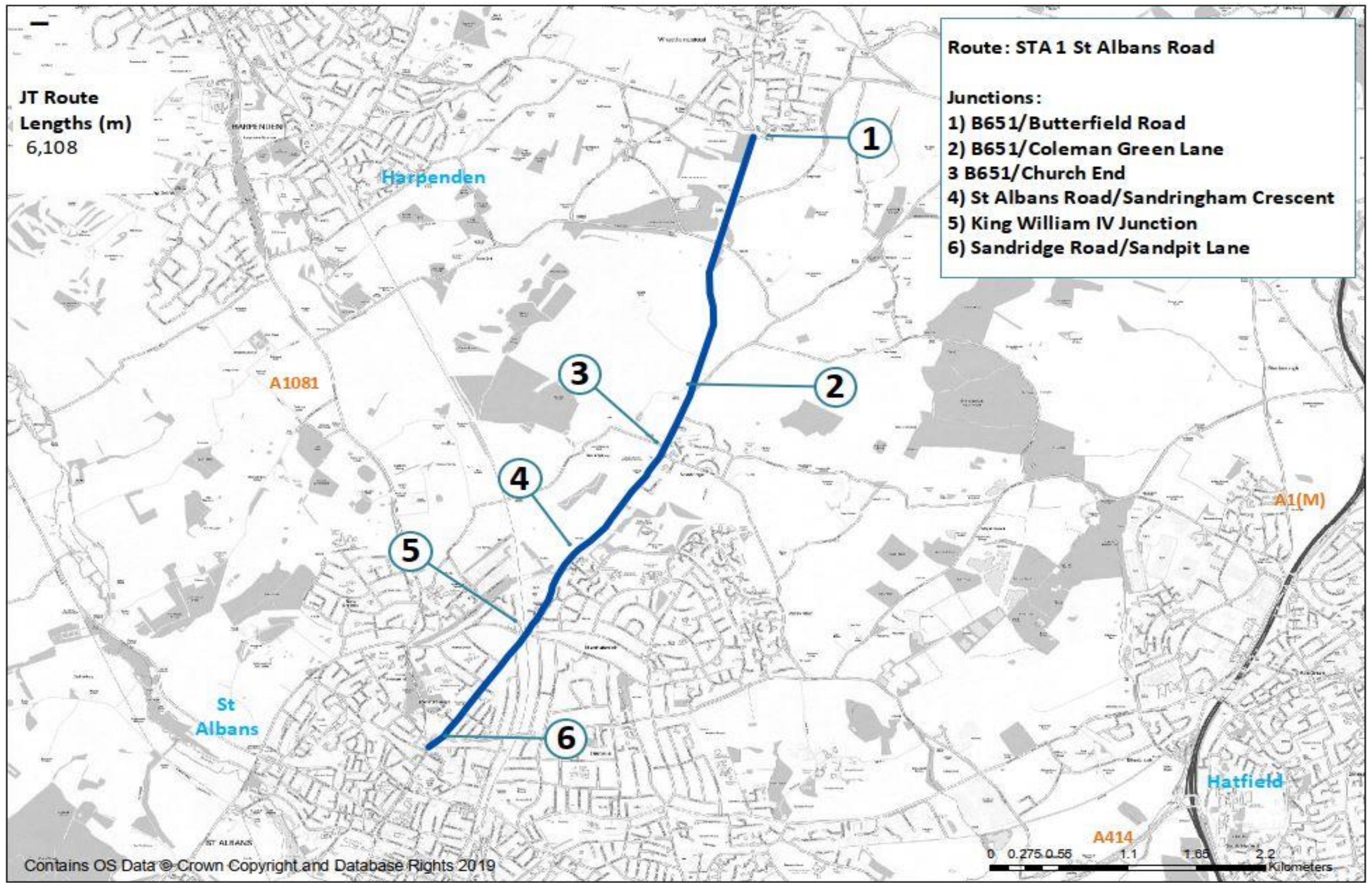

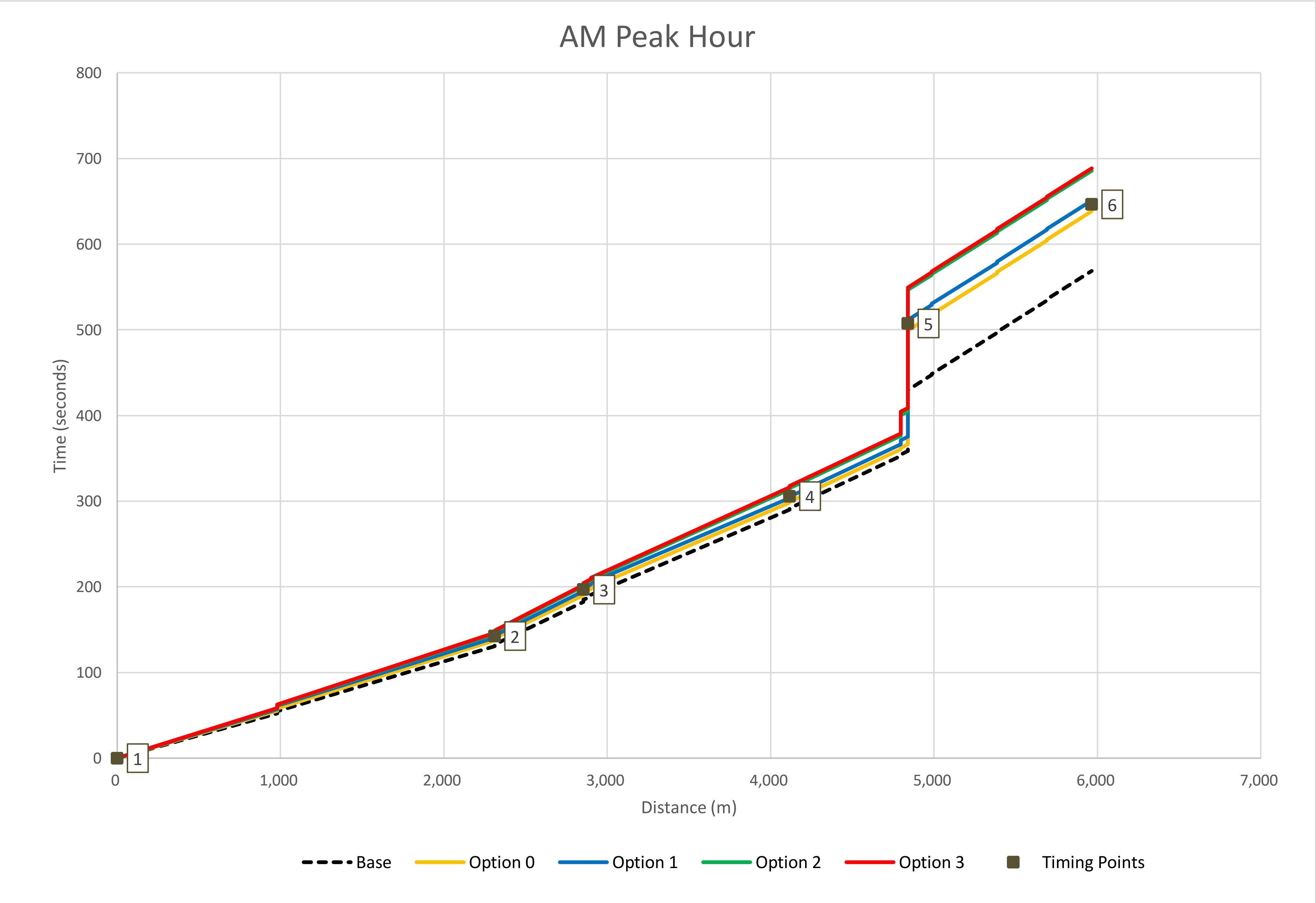

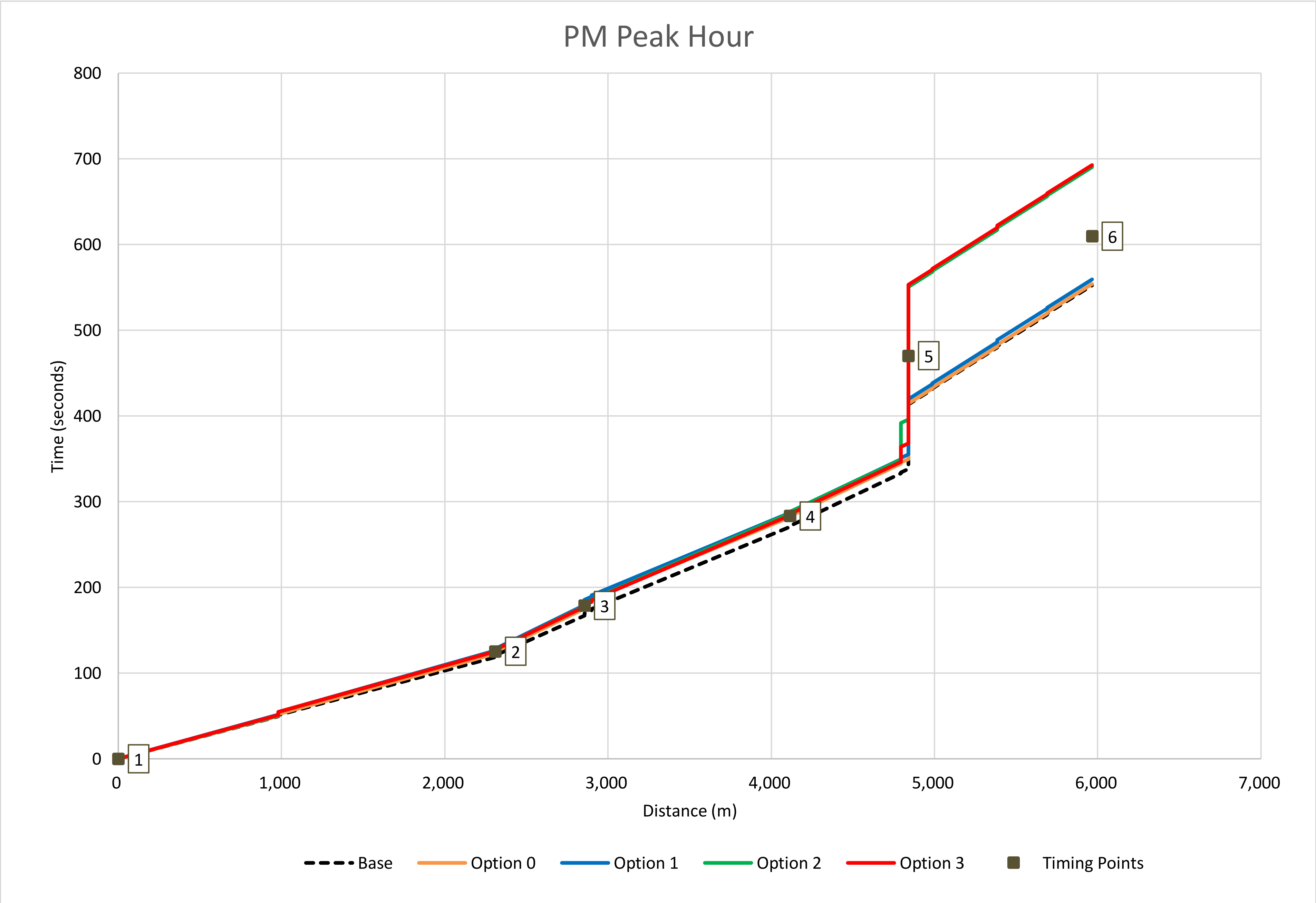

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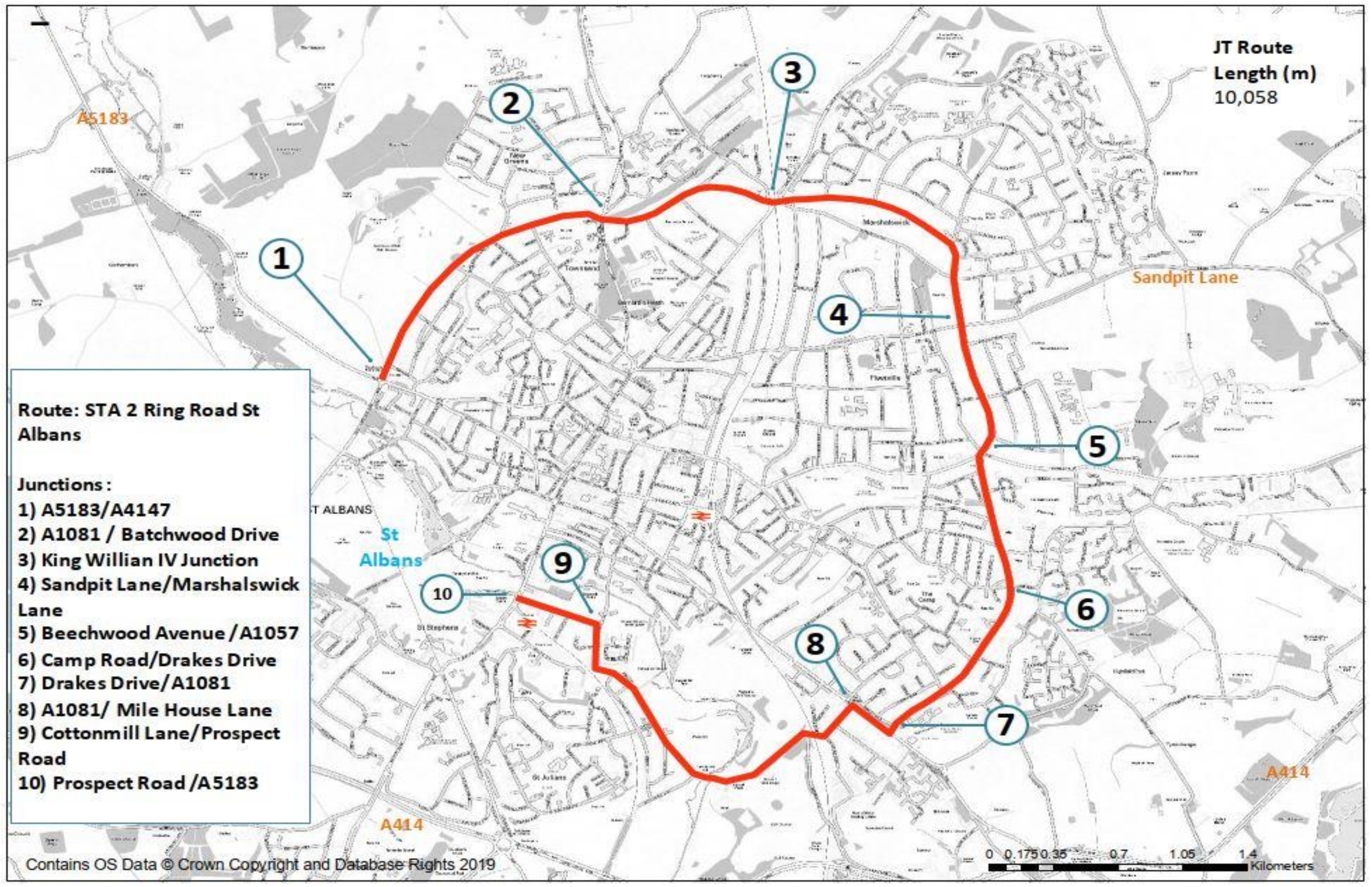

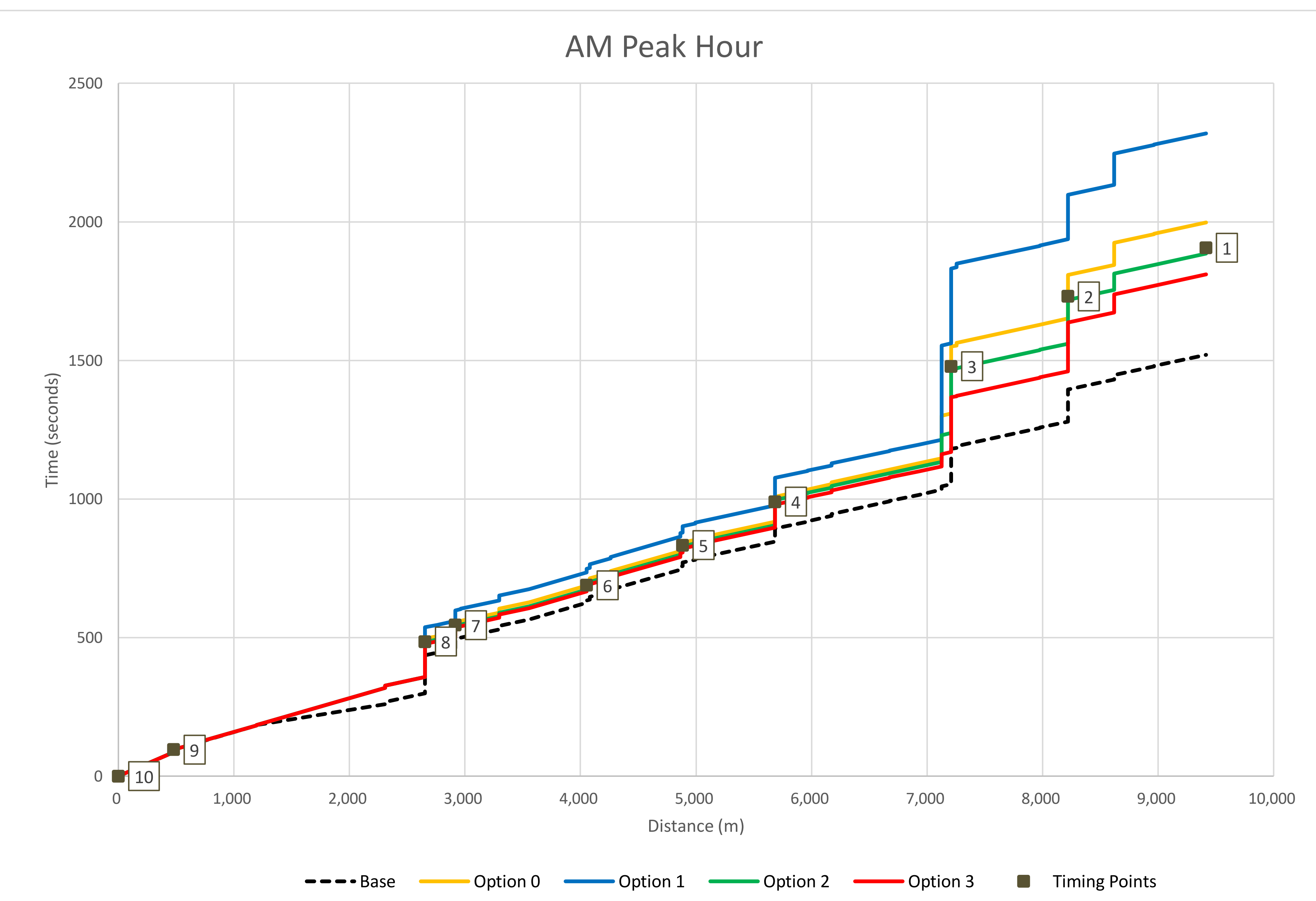

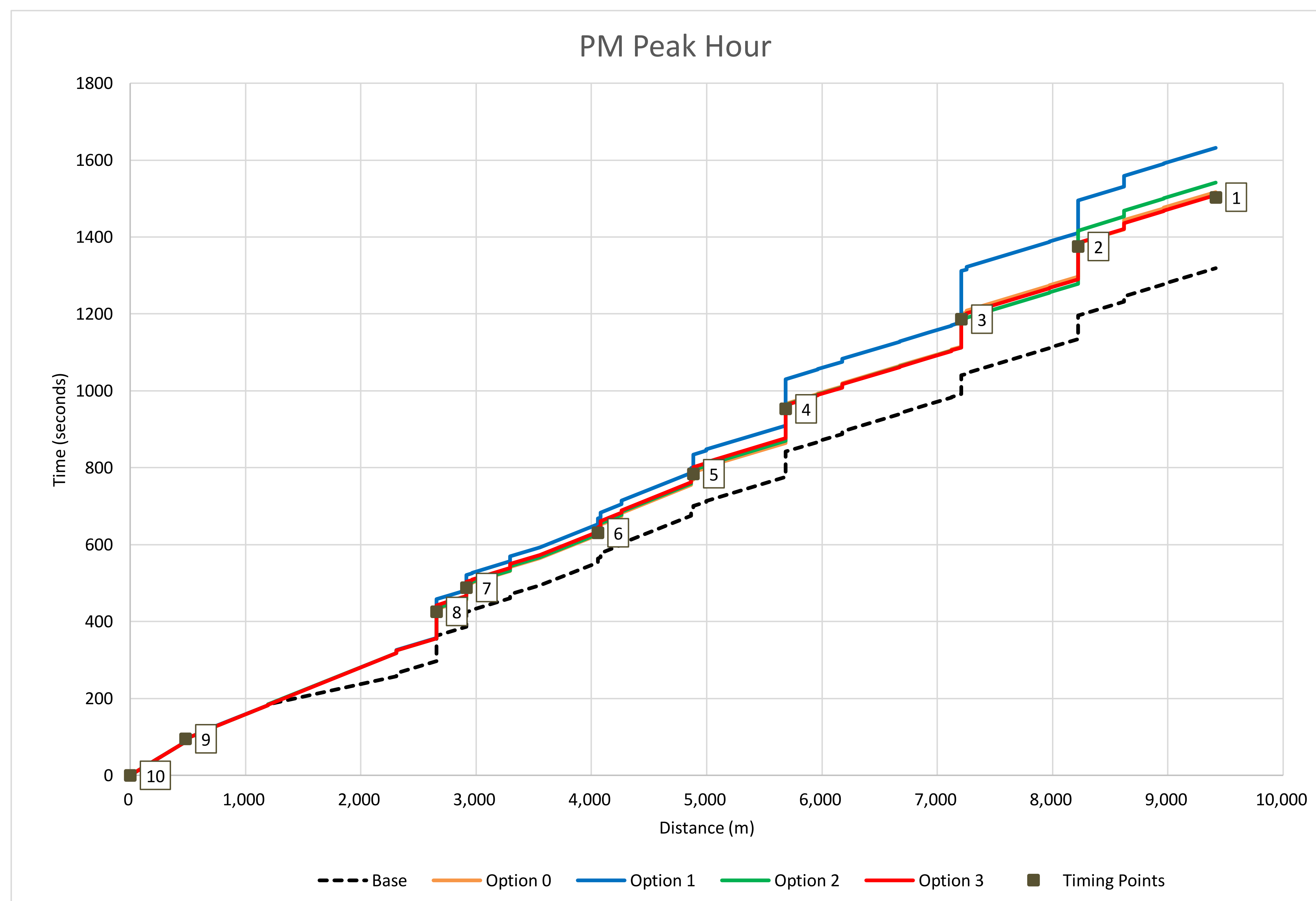

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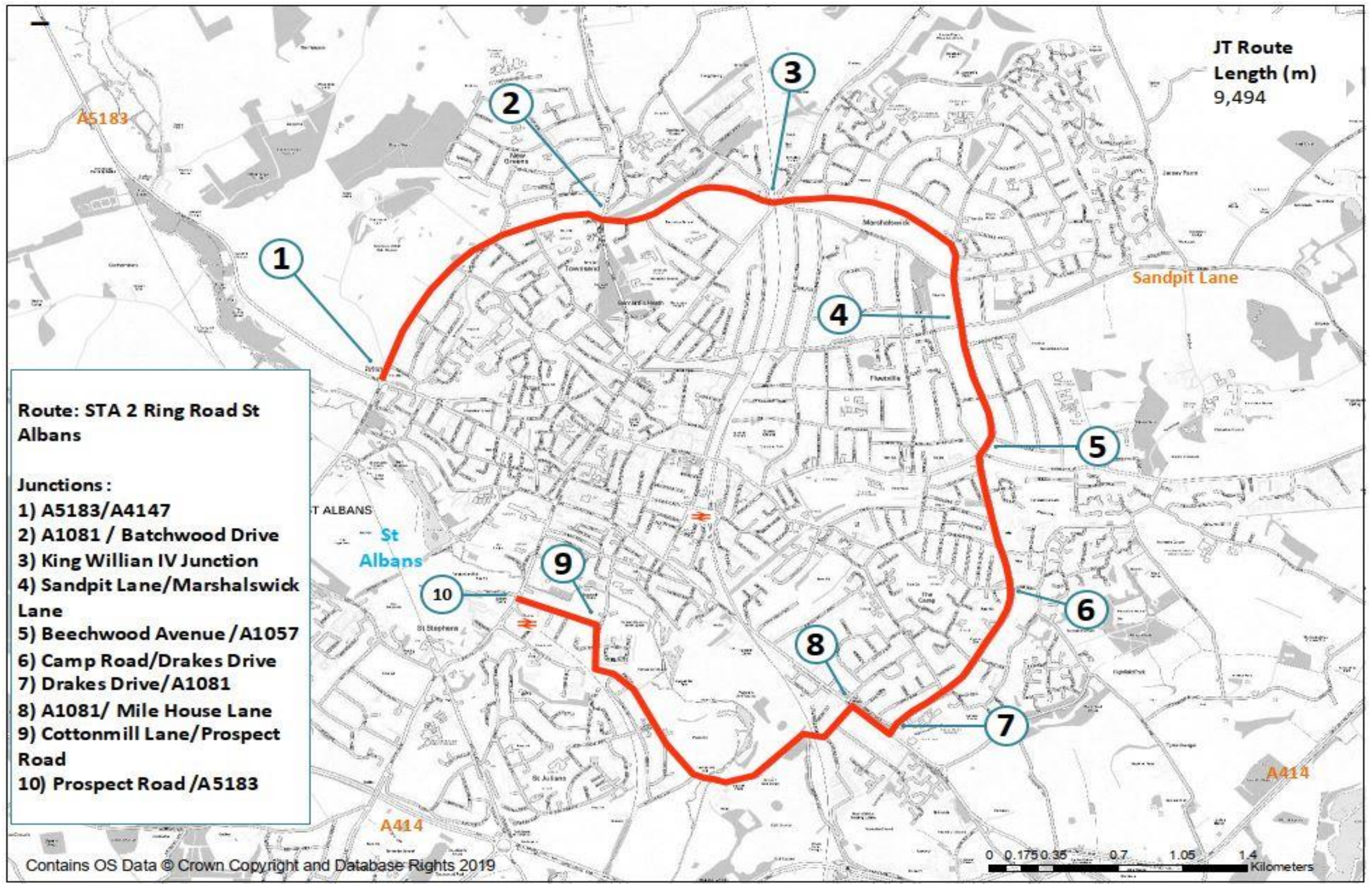
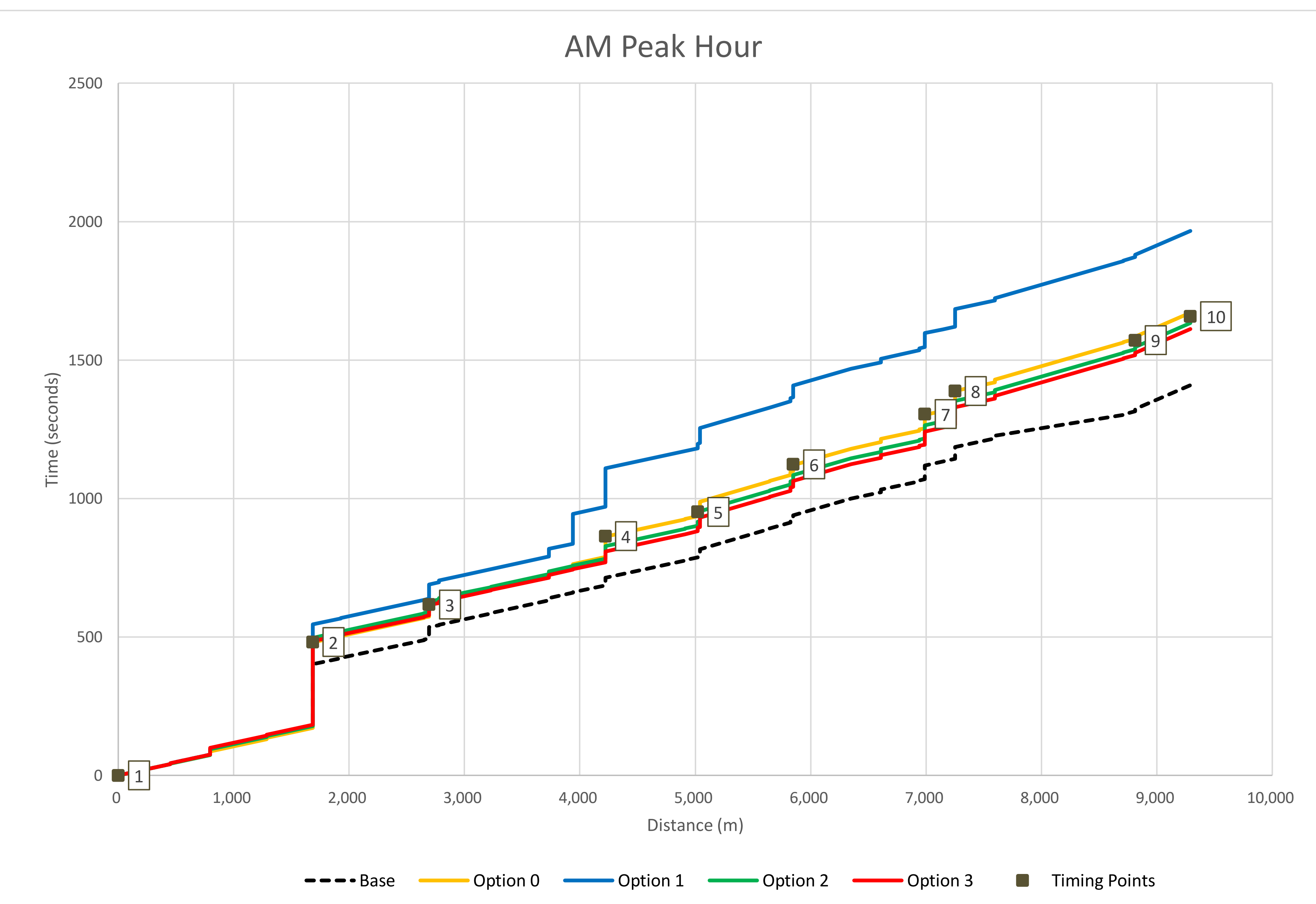
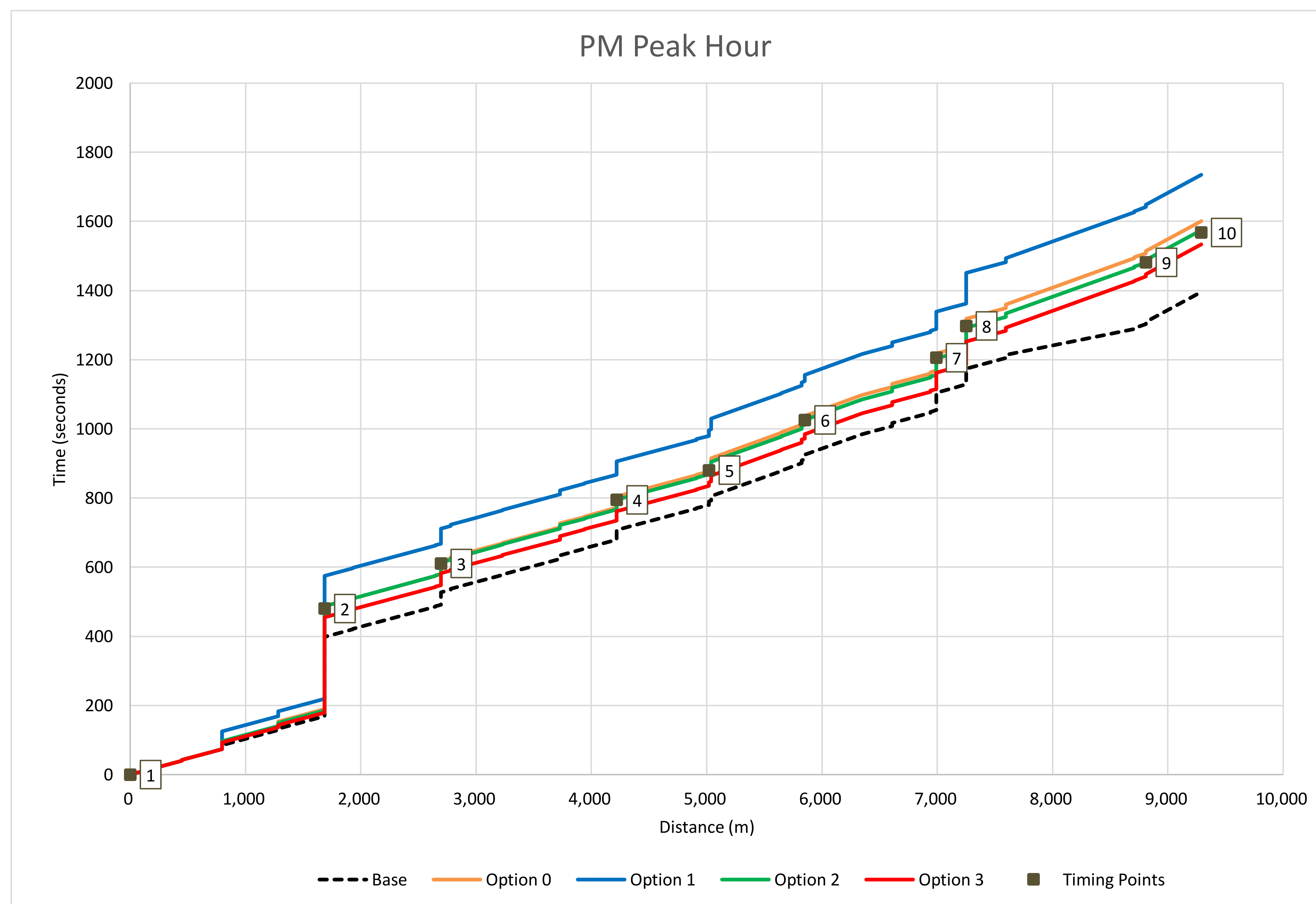
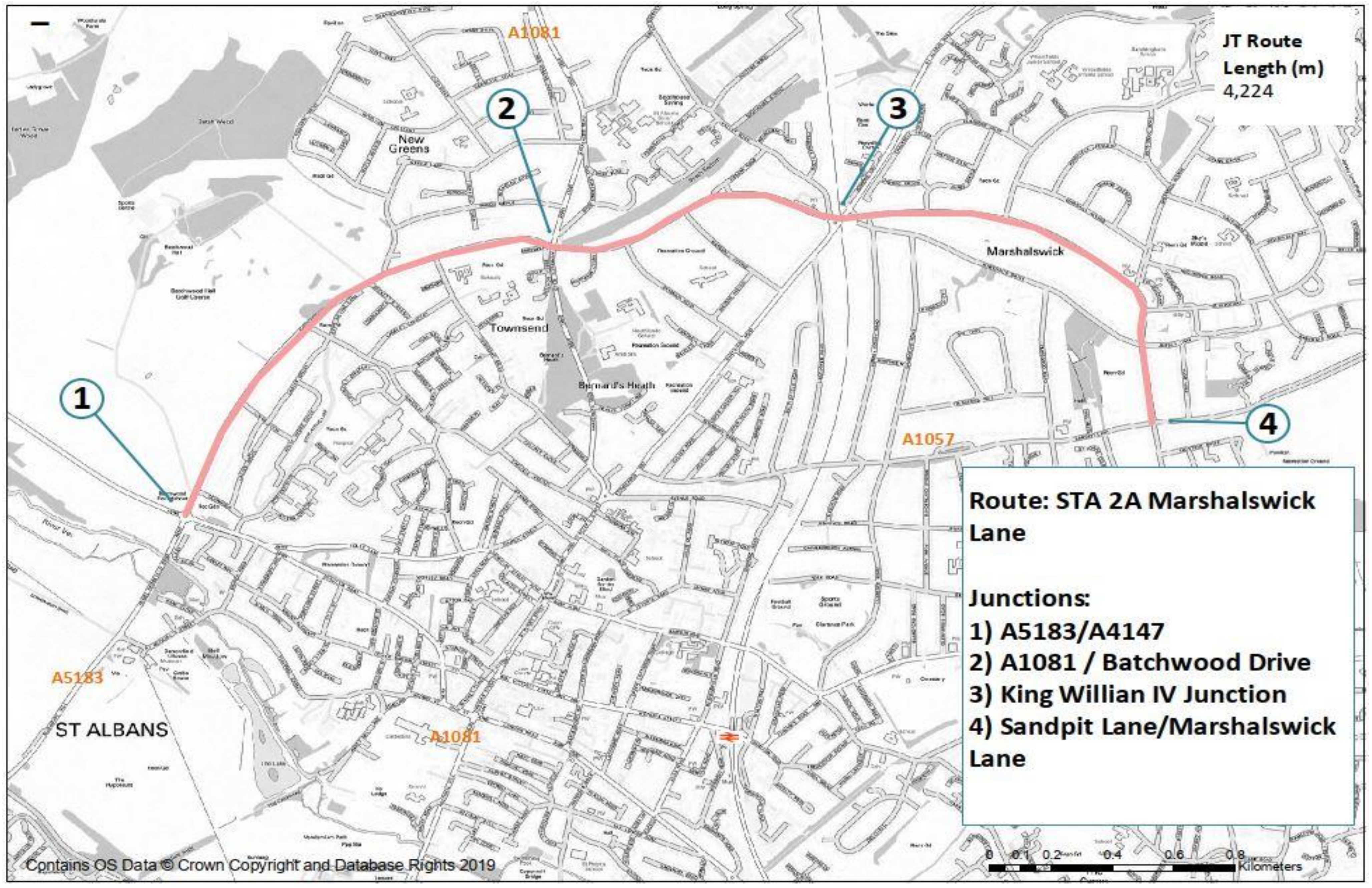
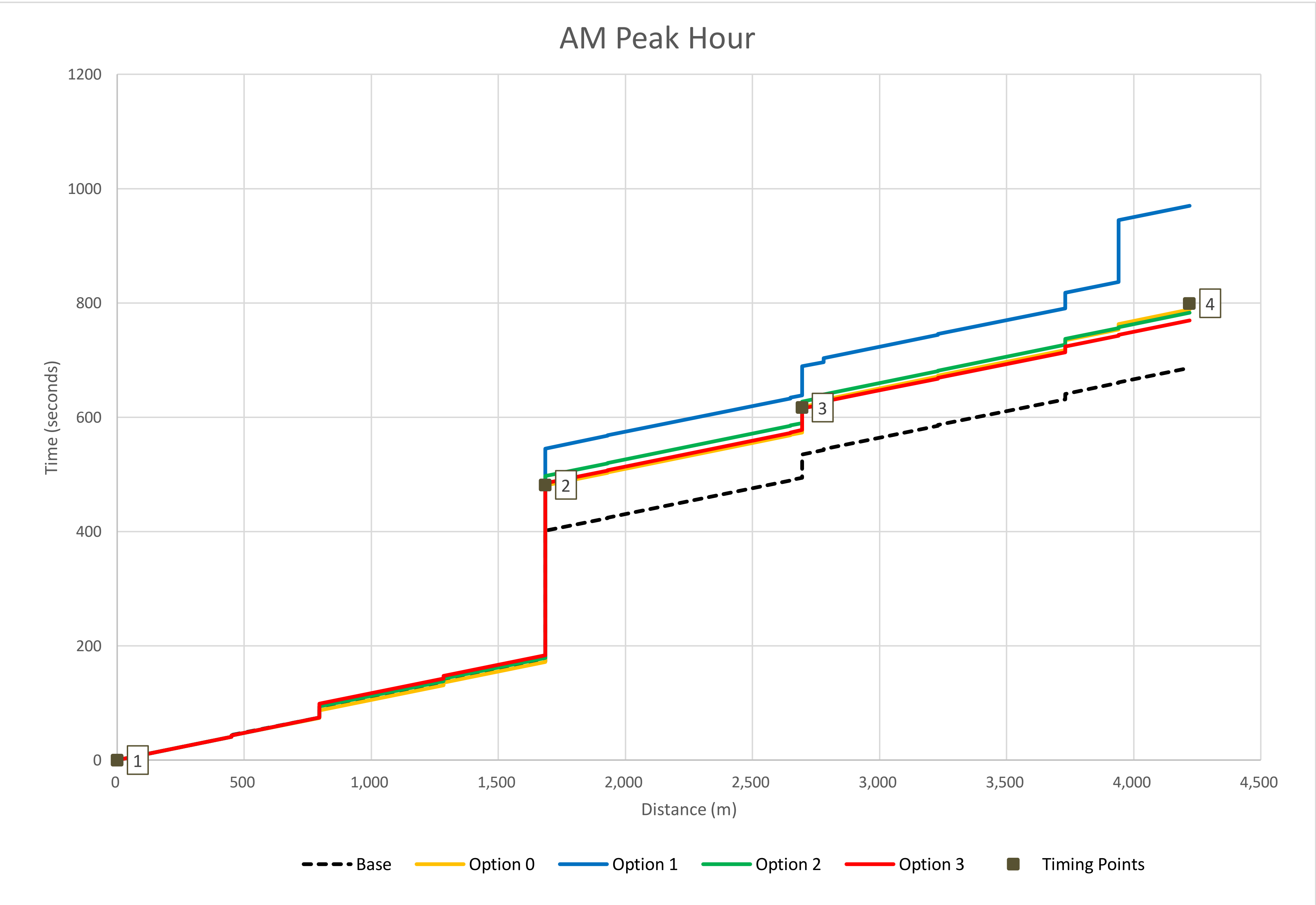


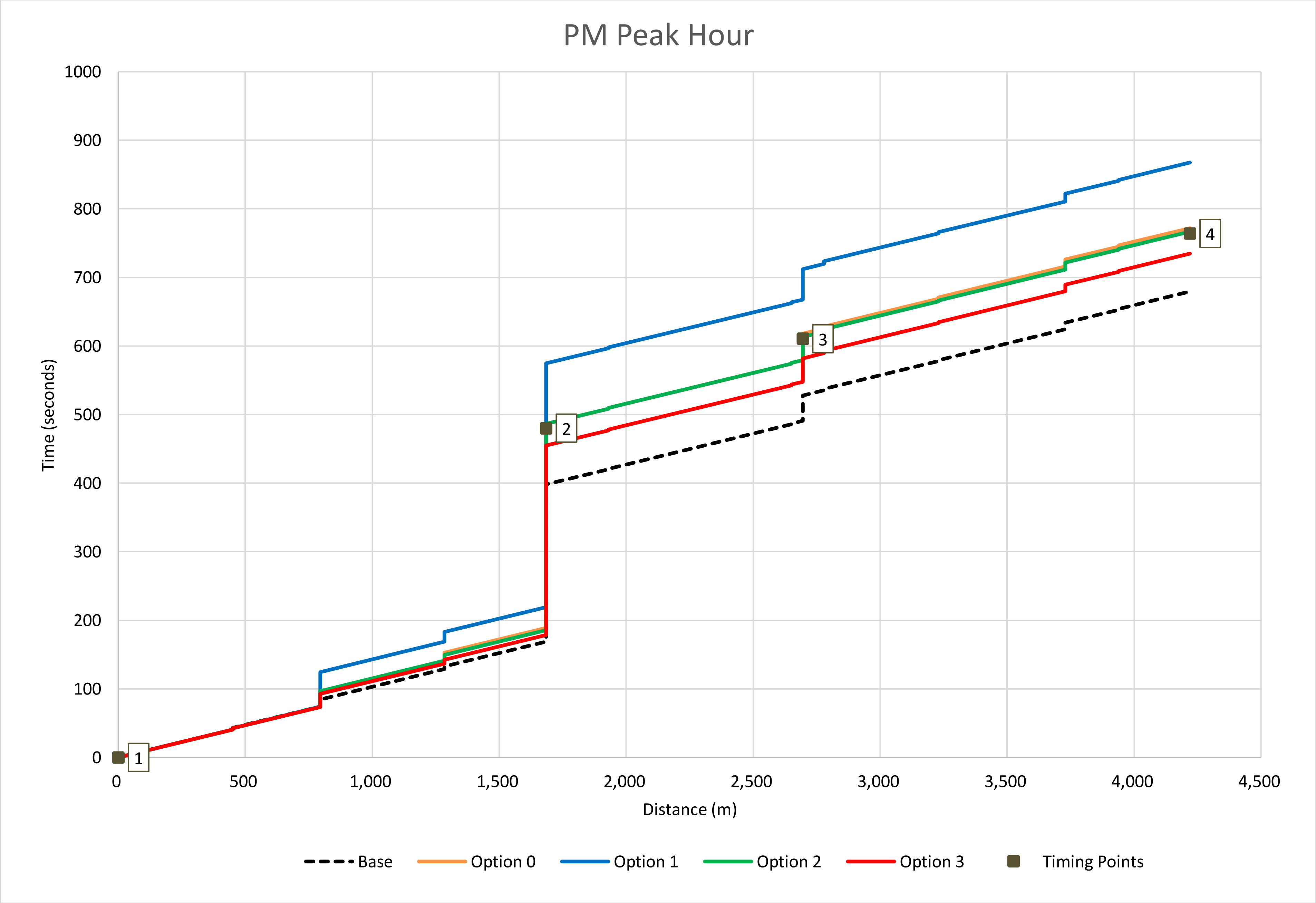




Route: STA2A_EB







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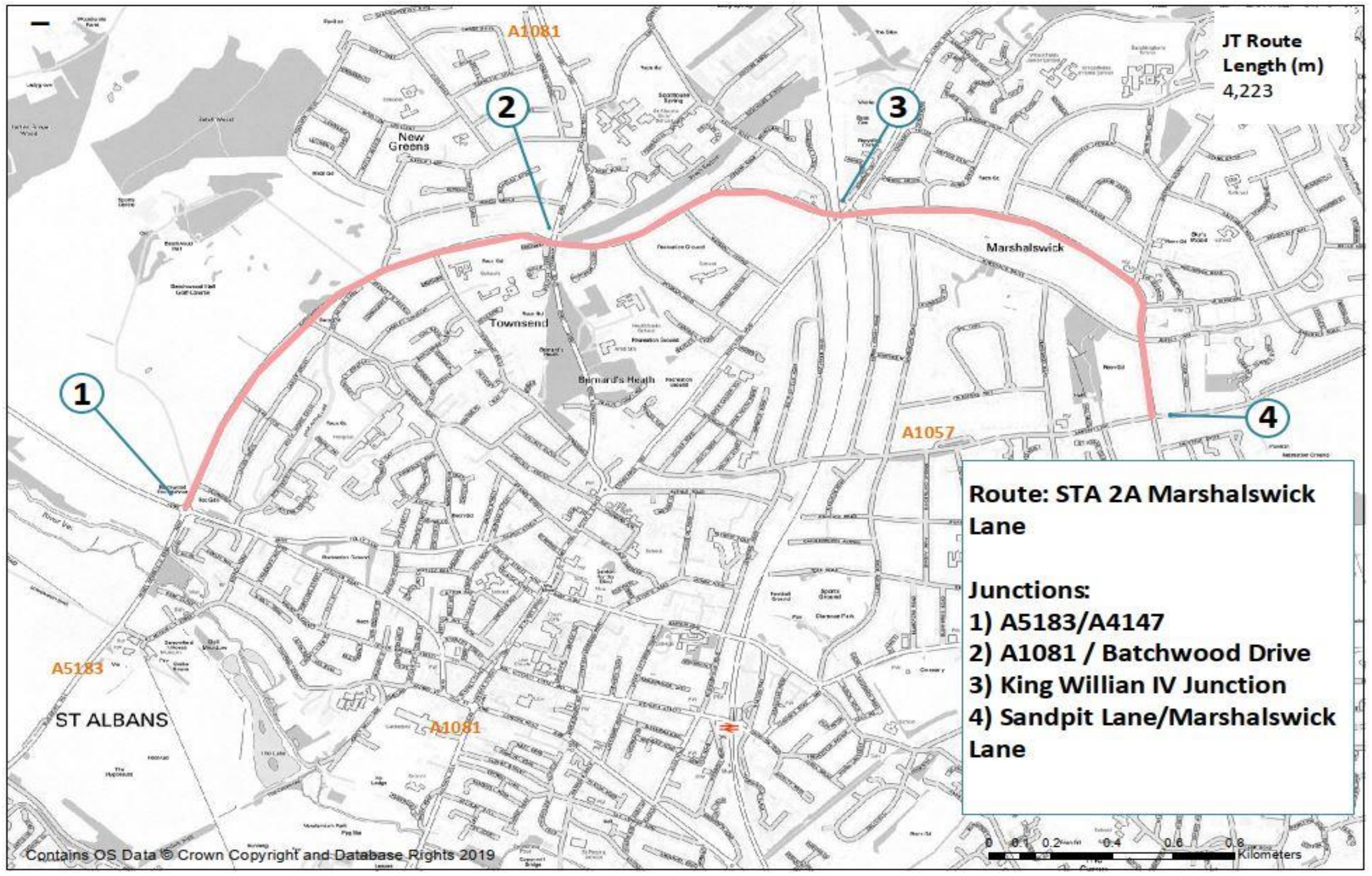

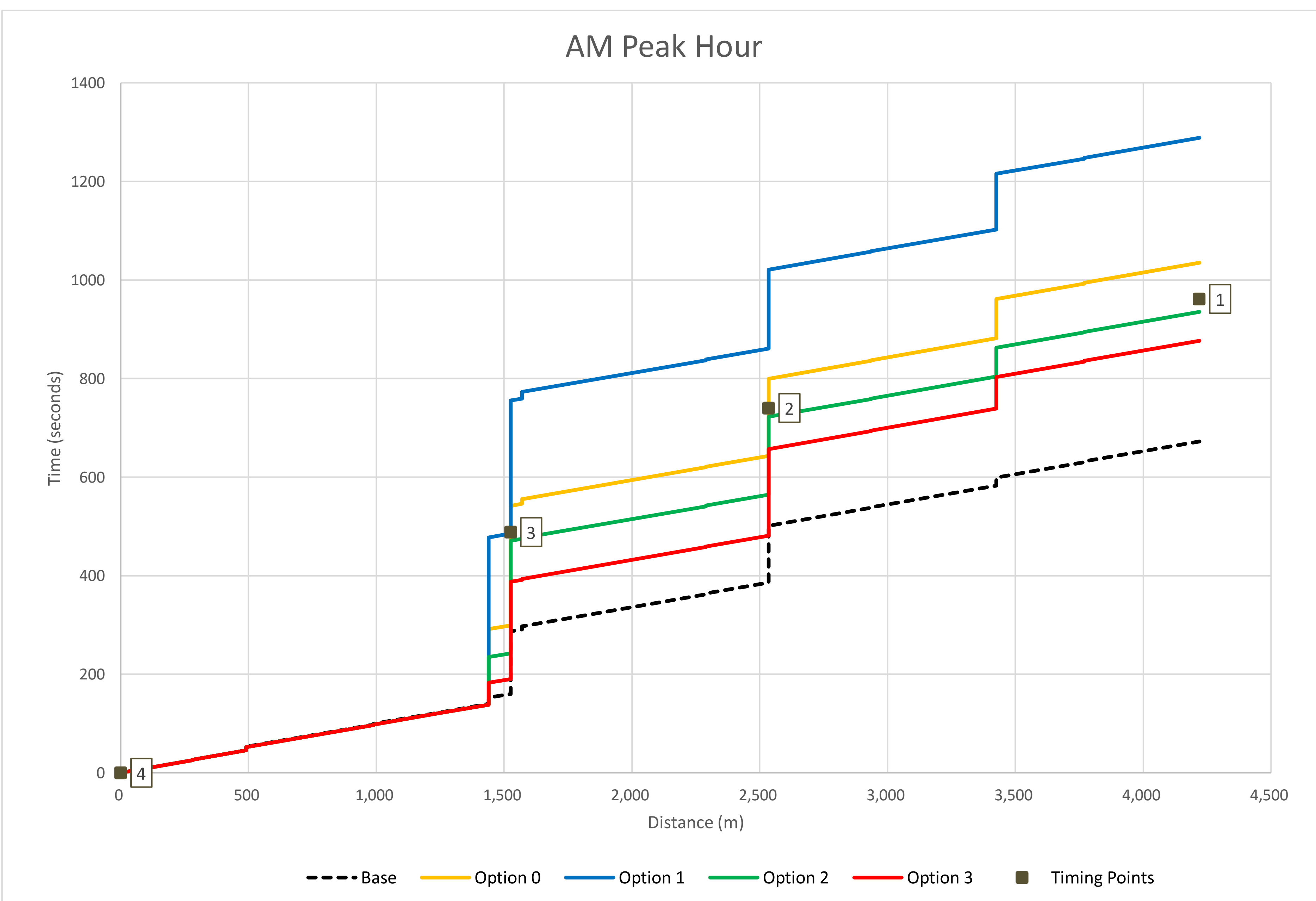

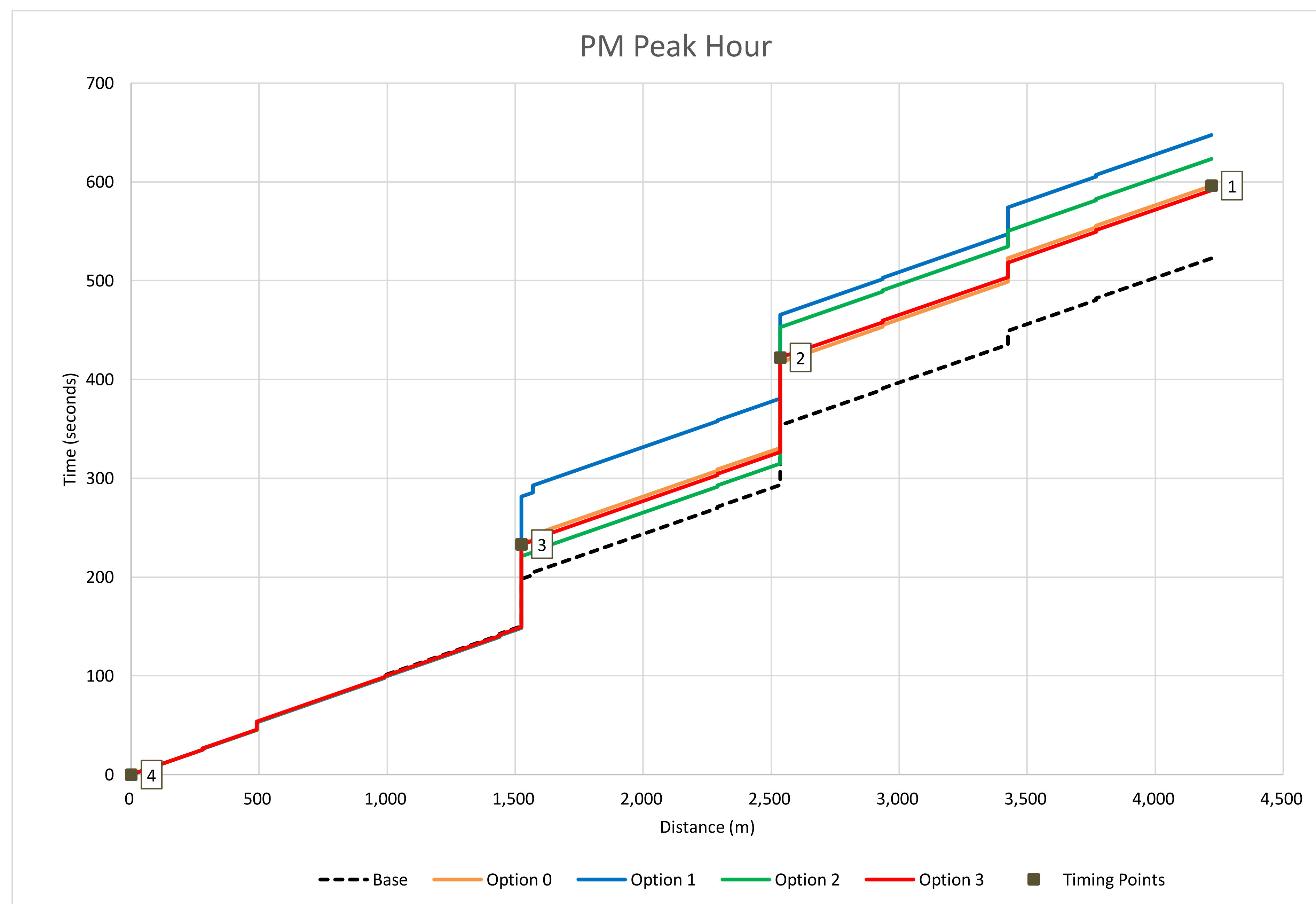

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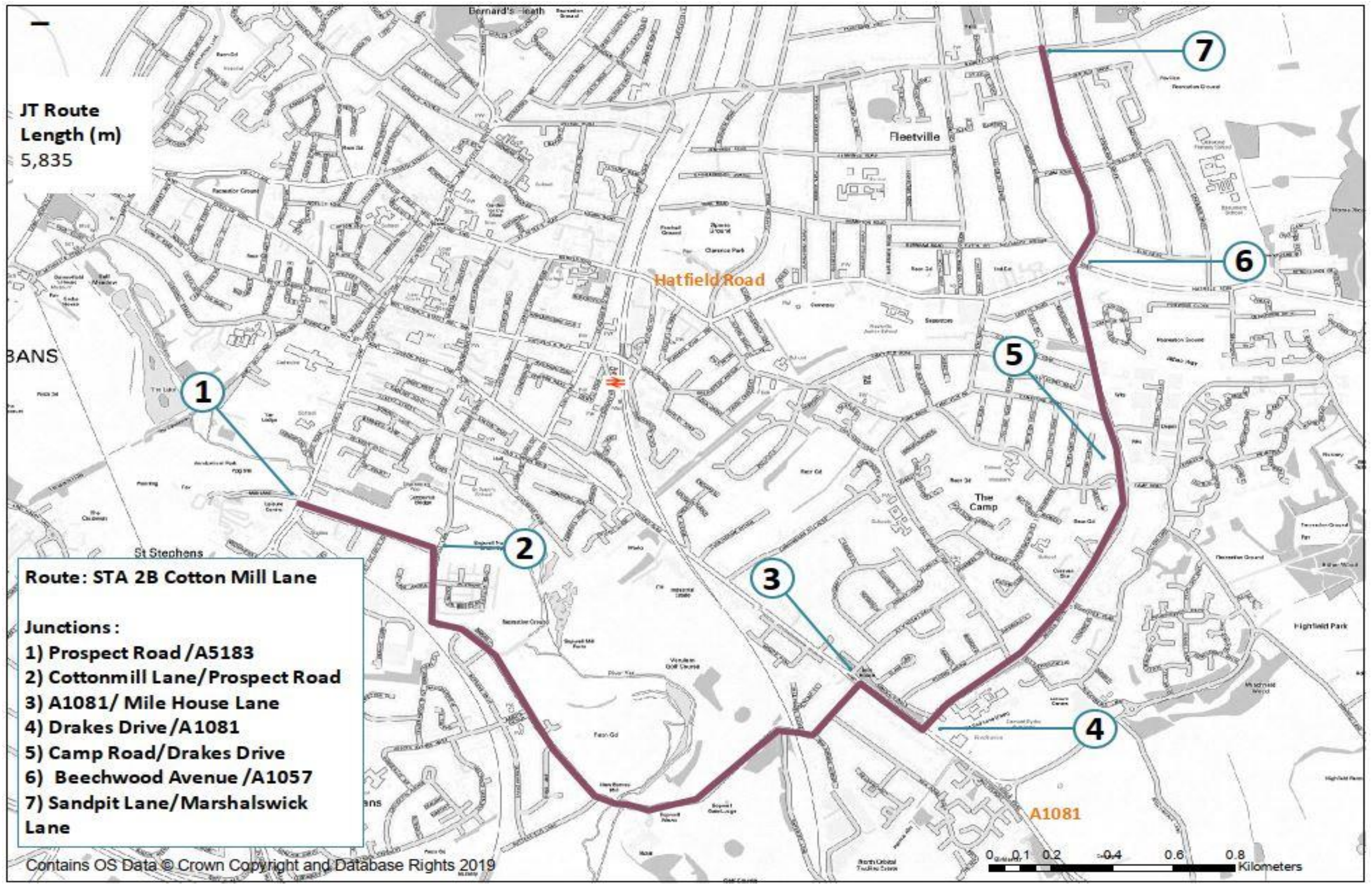

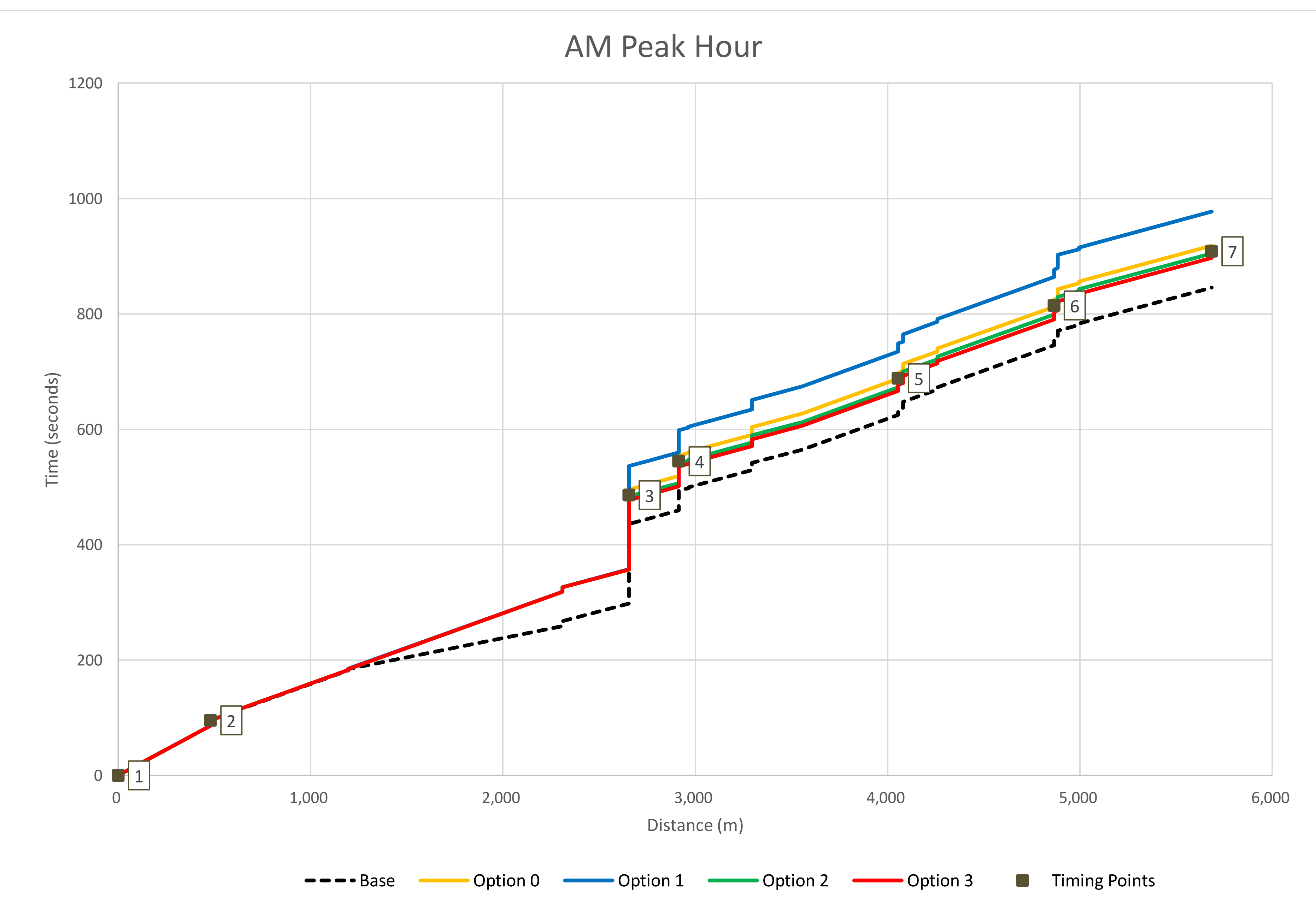

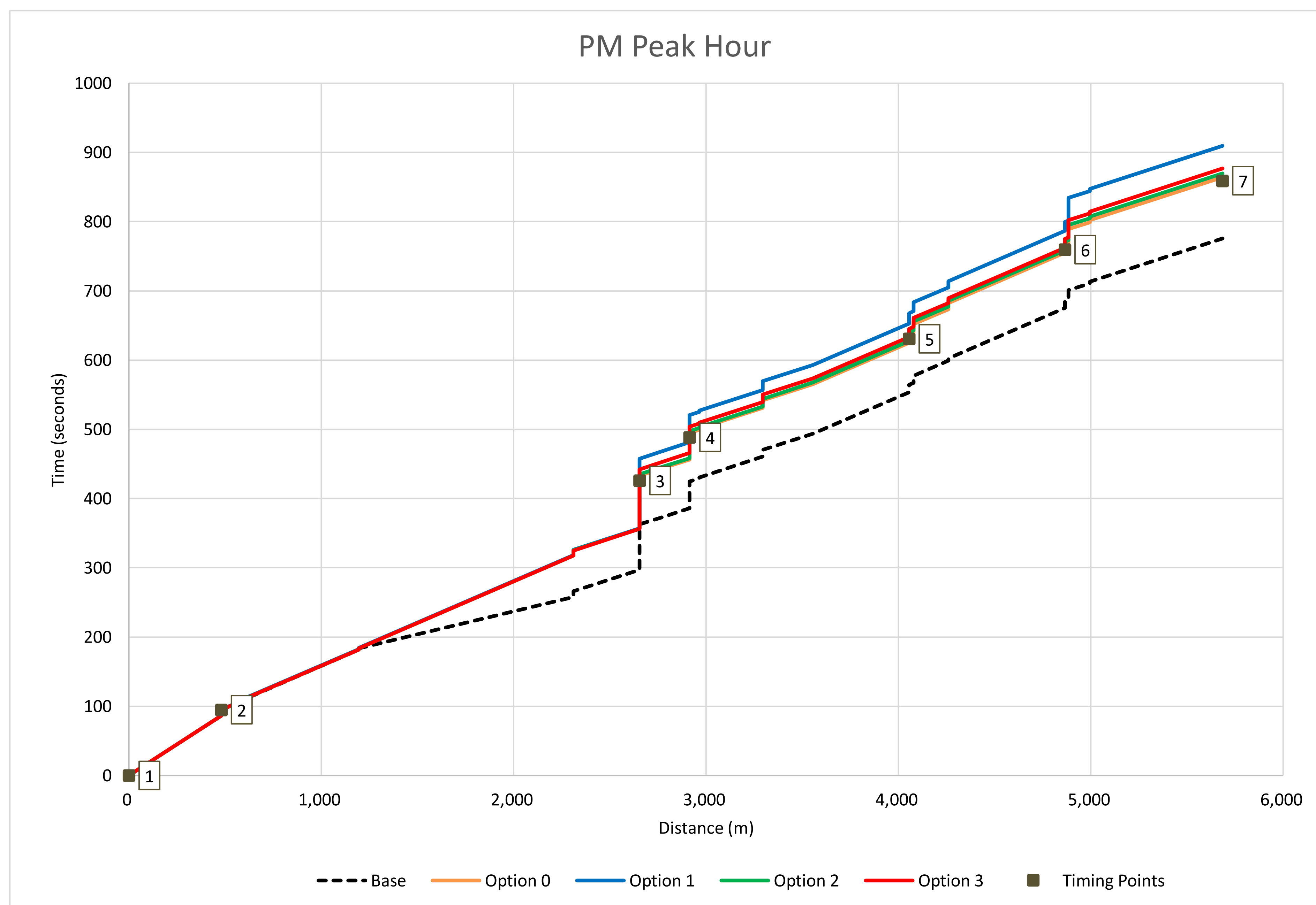

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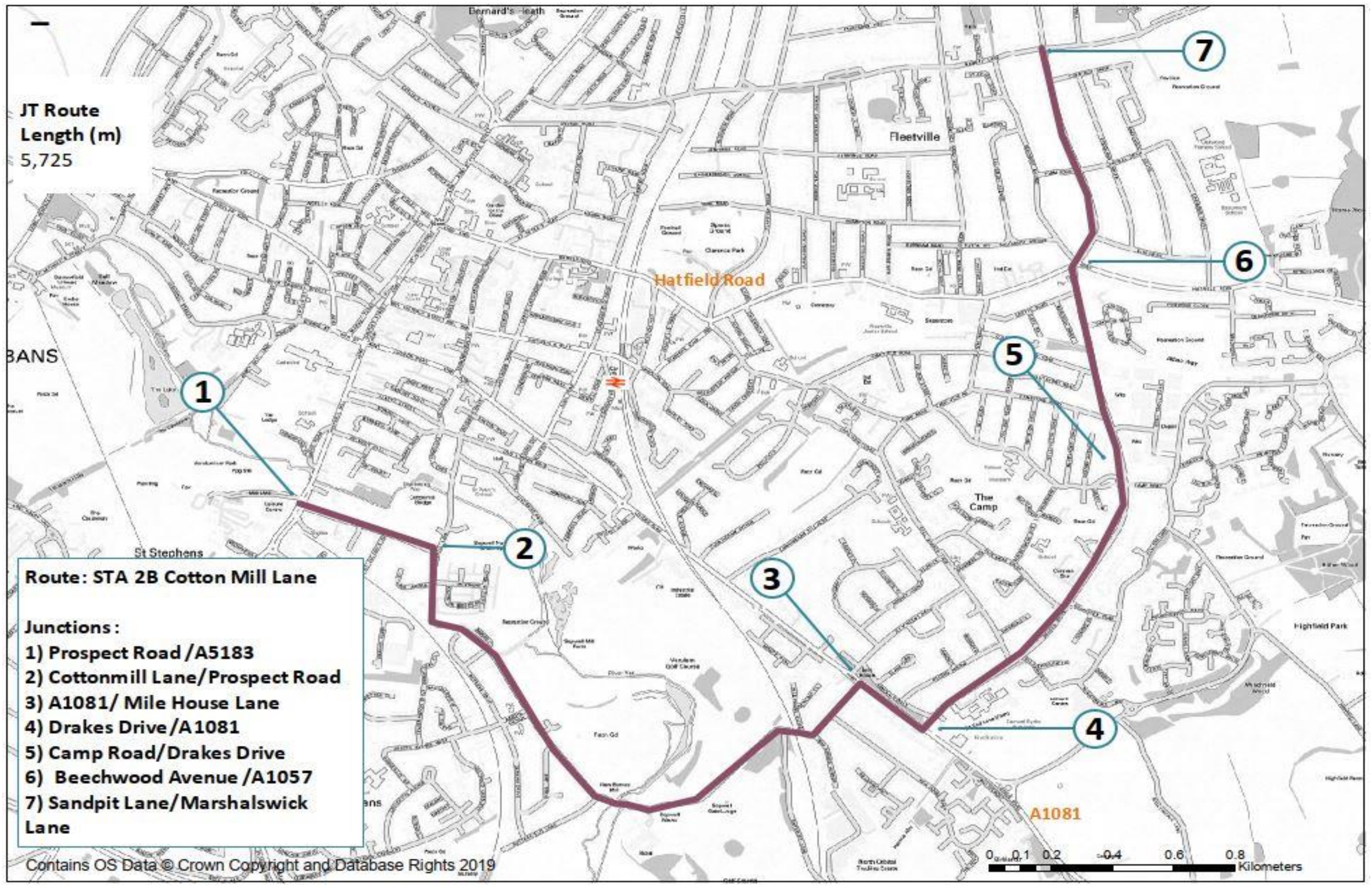

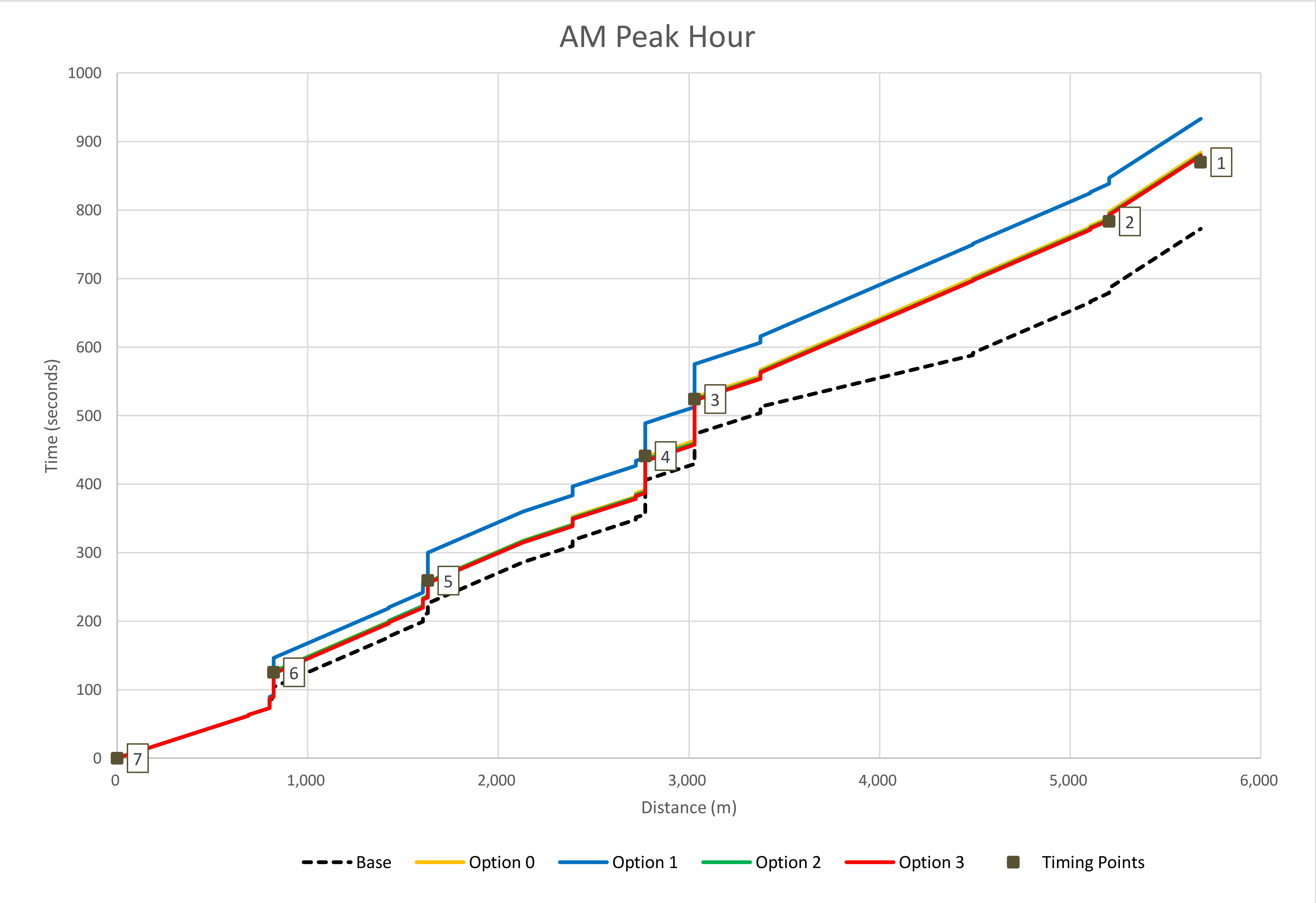

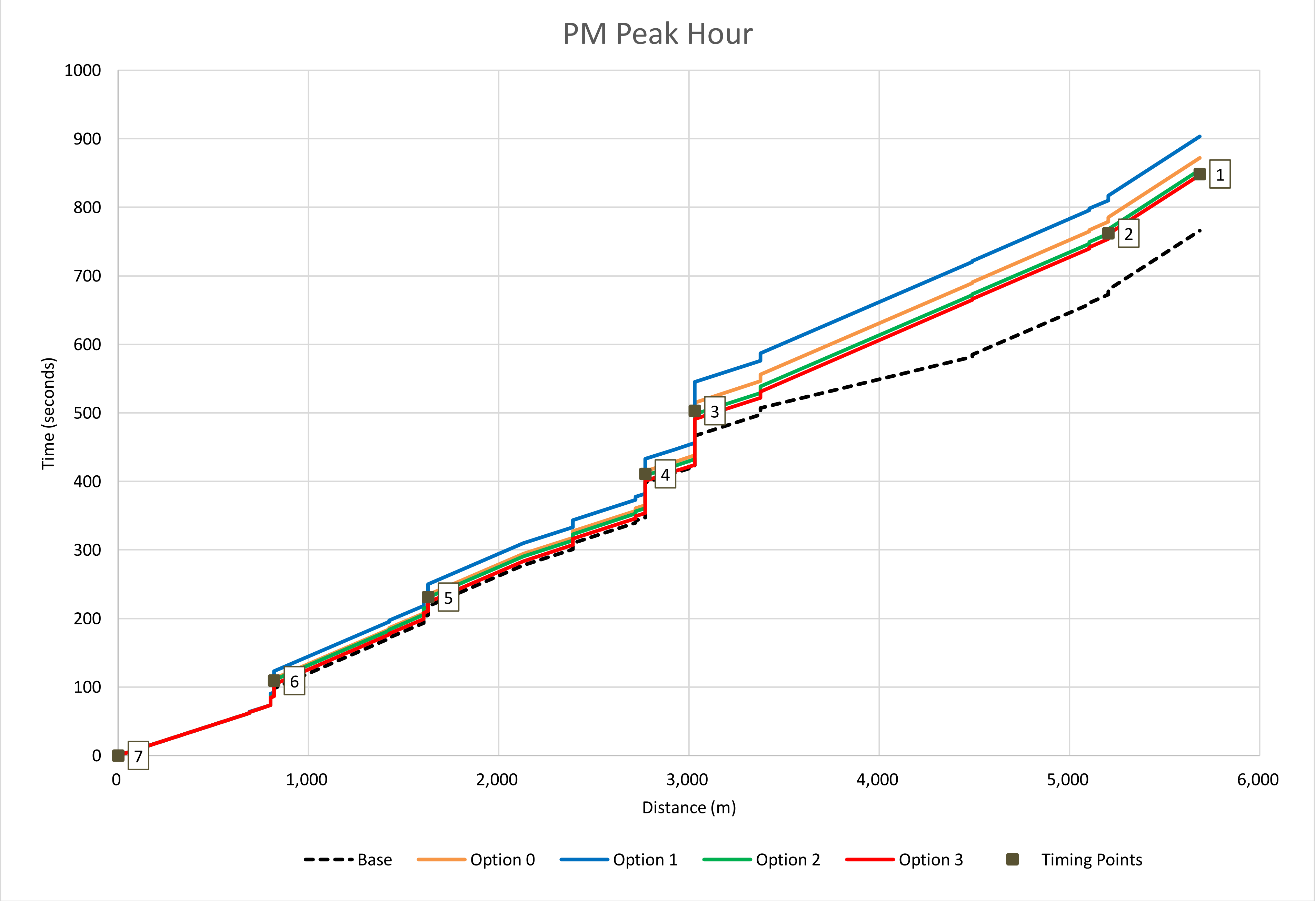

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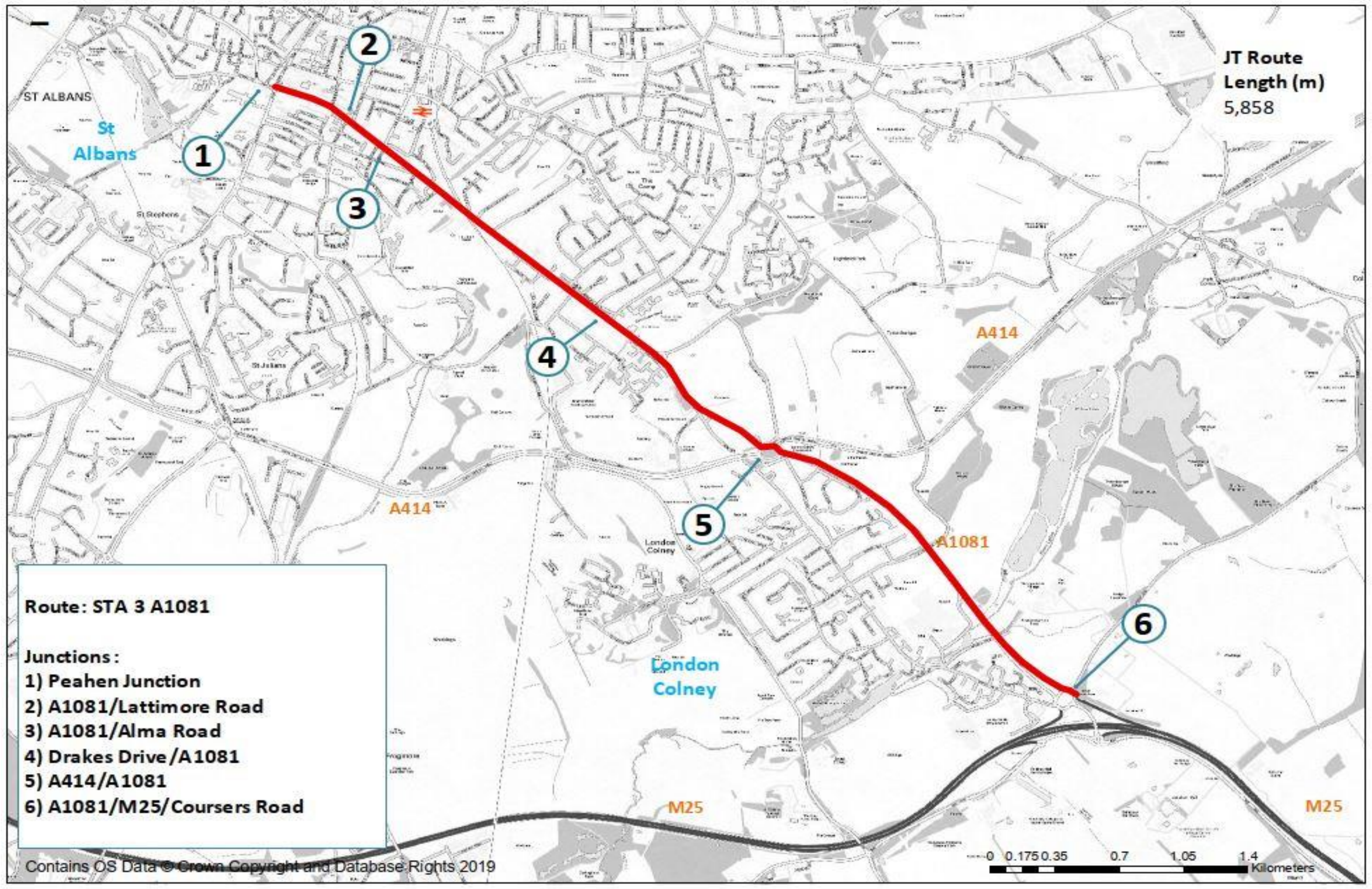
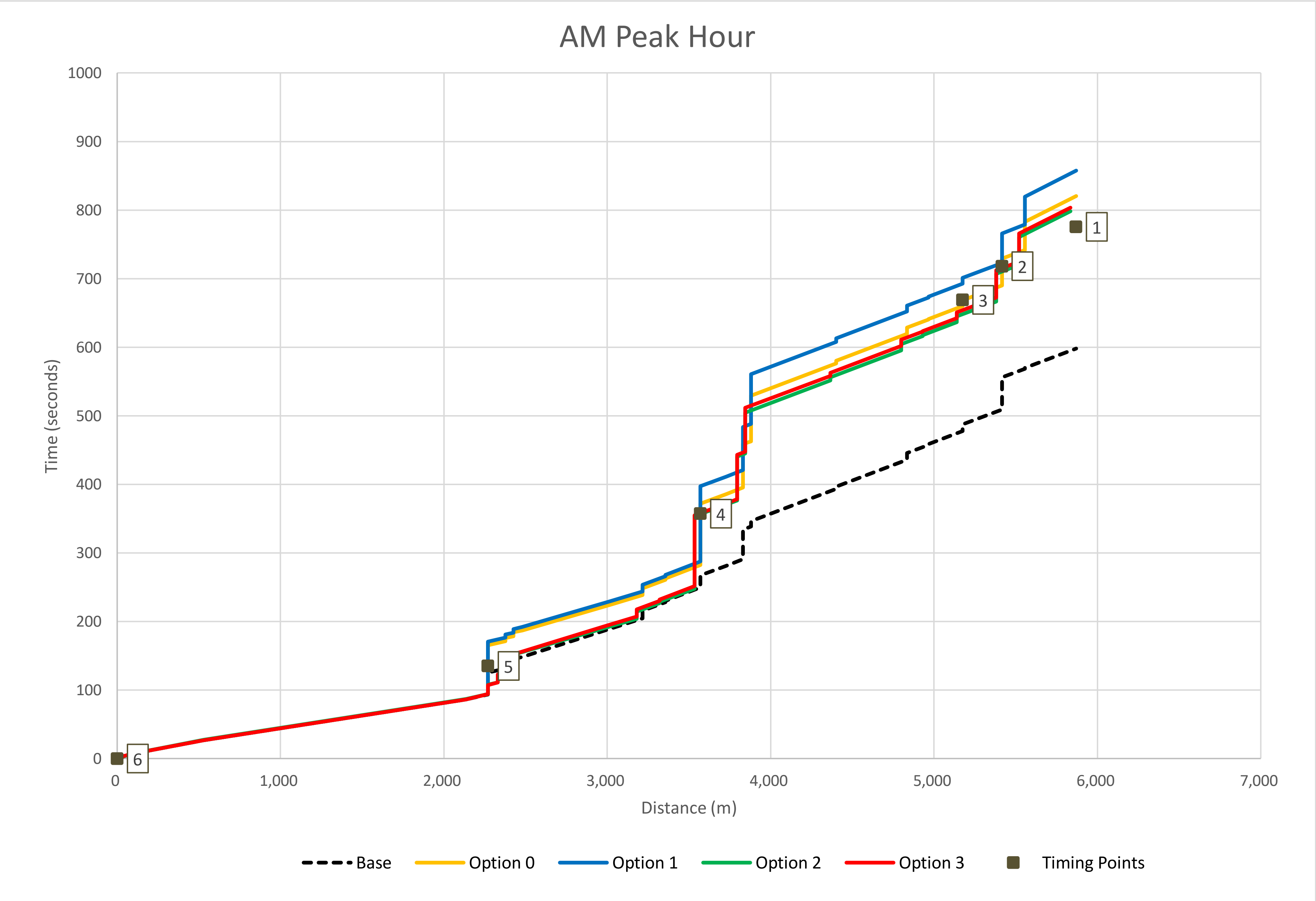
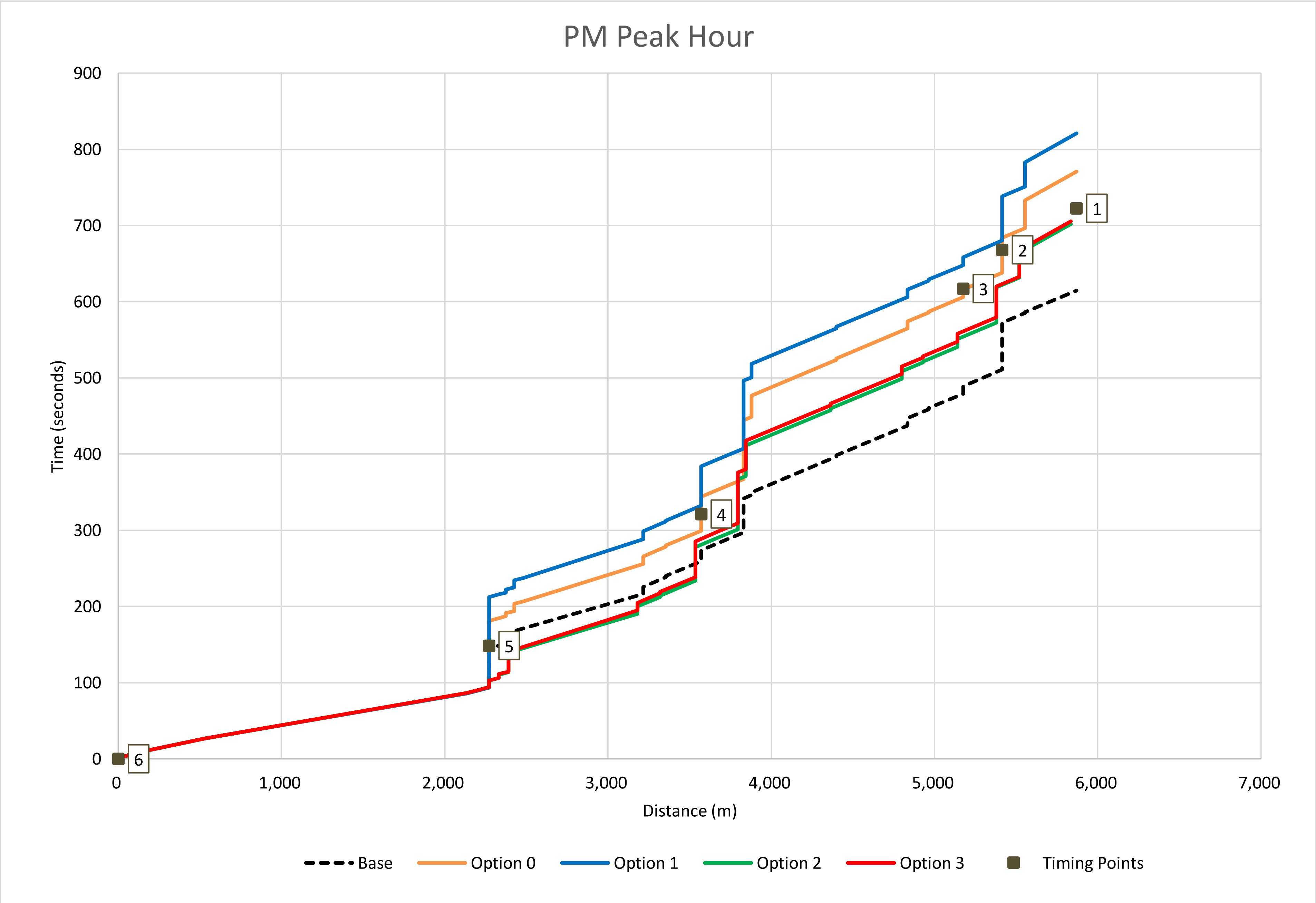
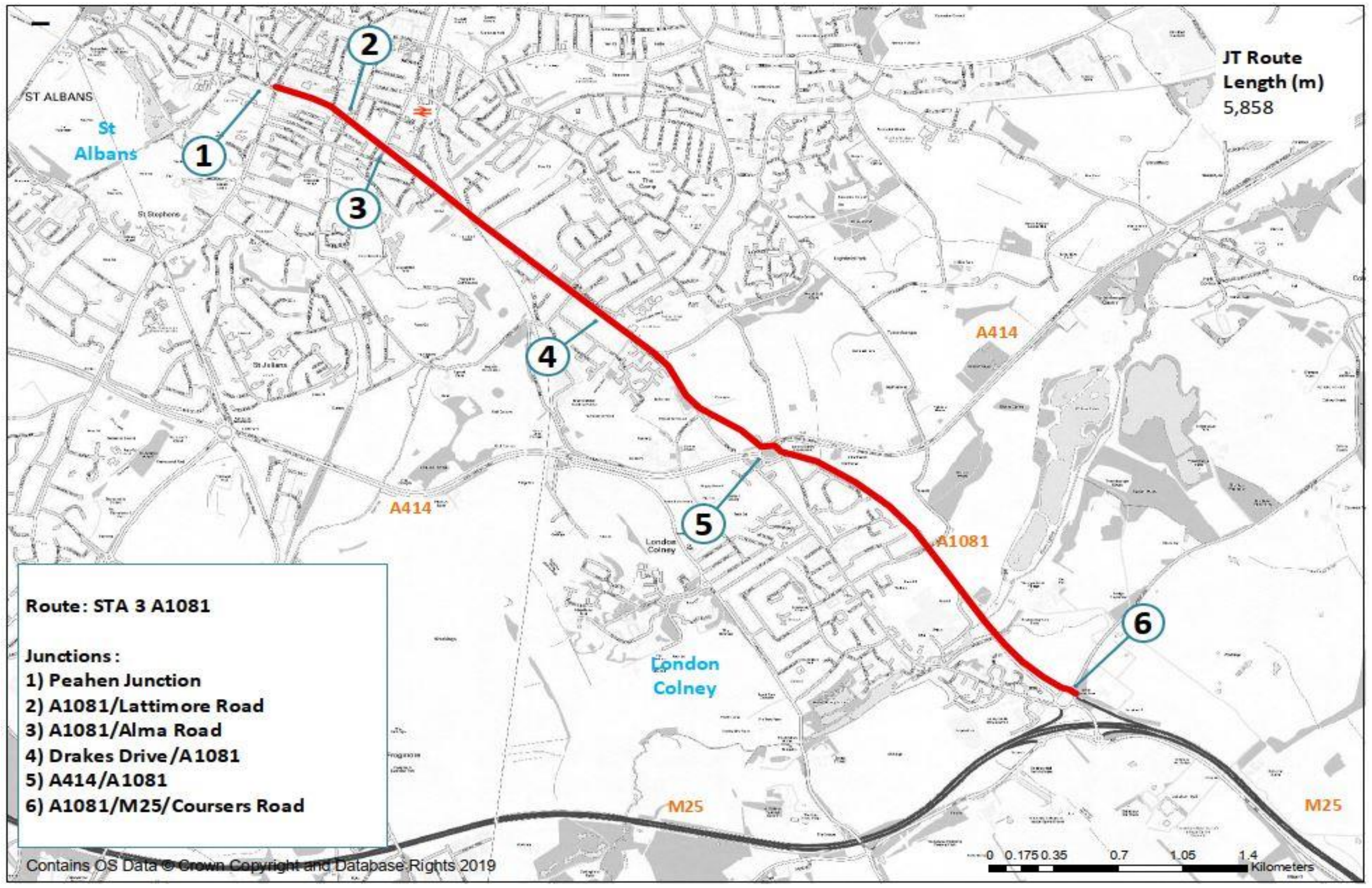
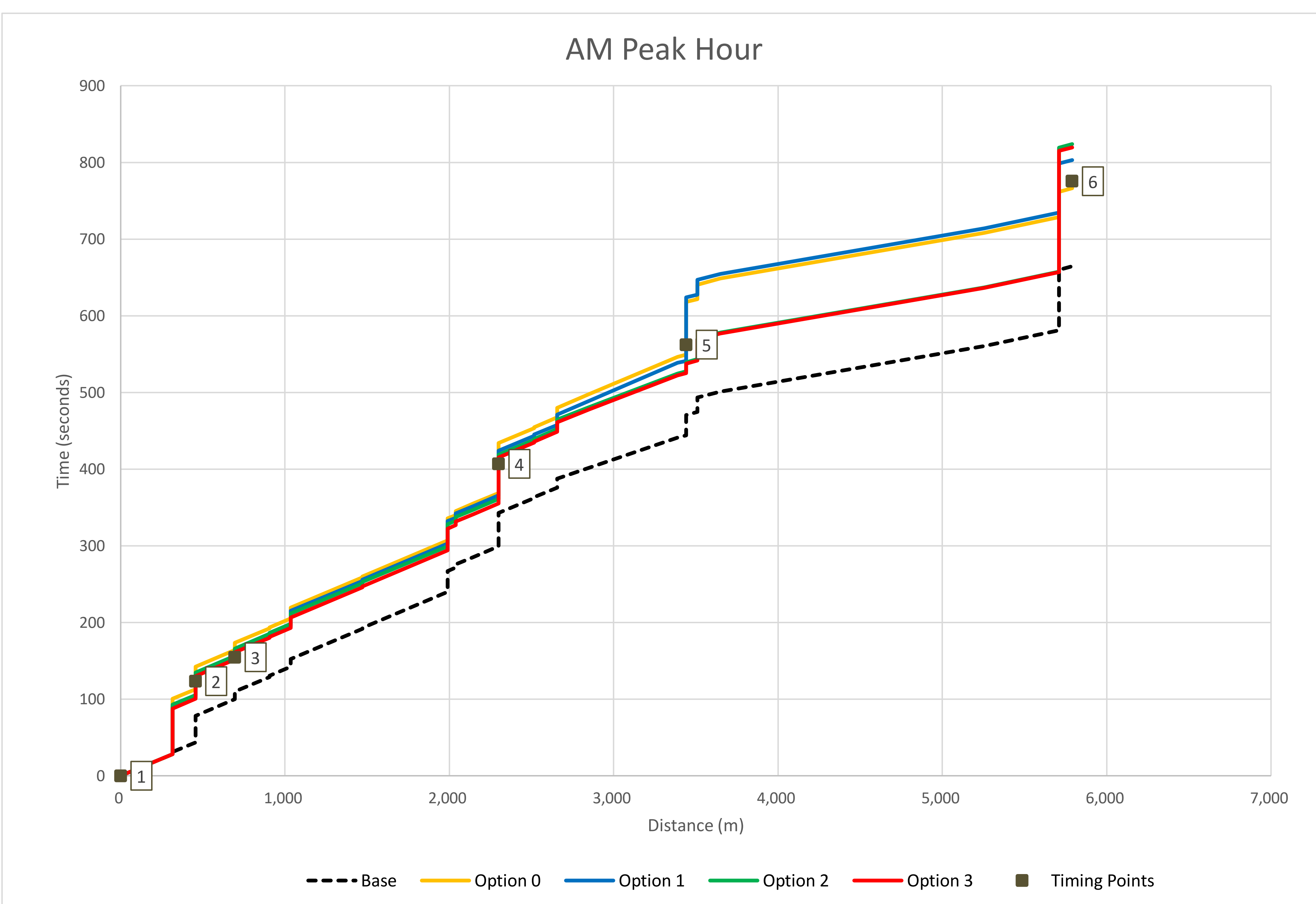


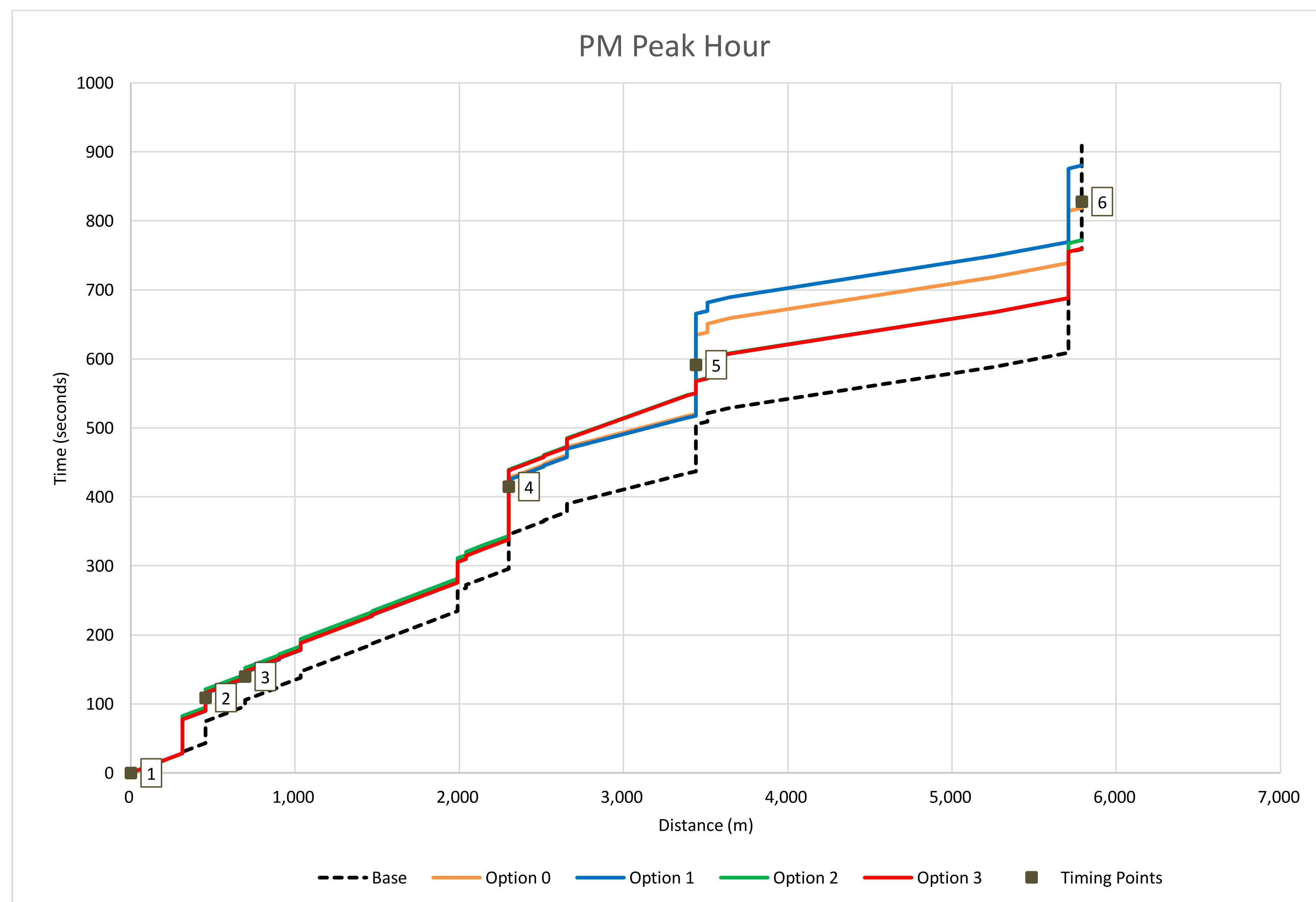




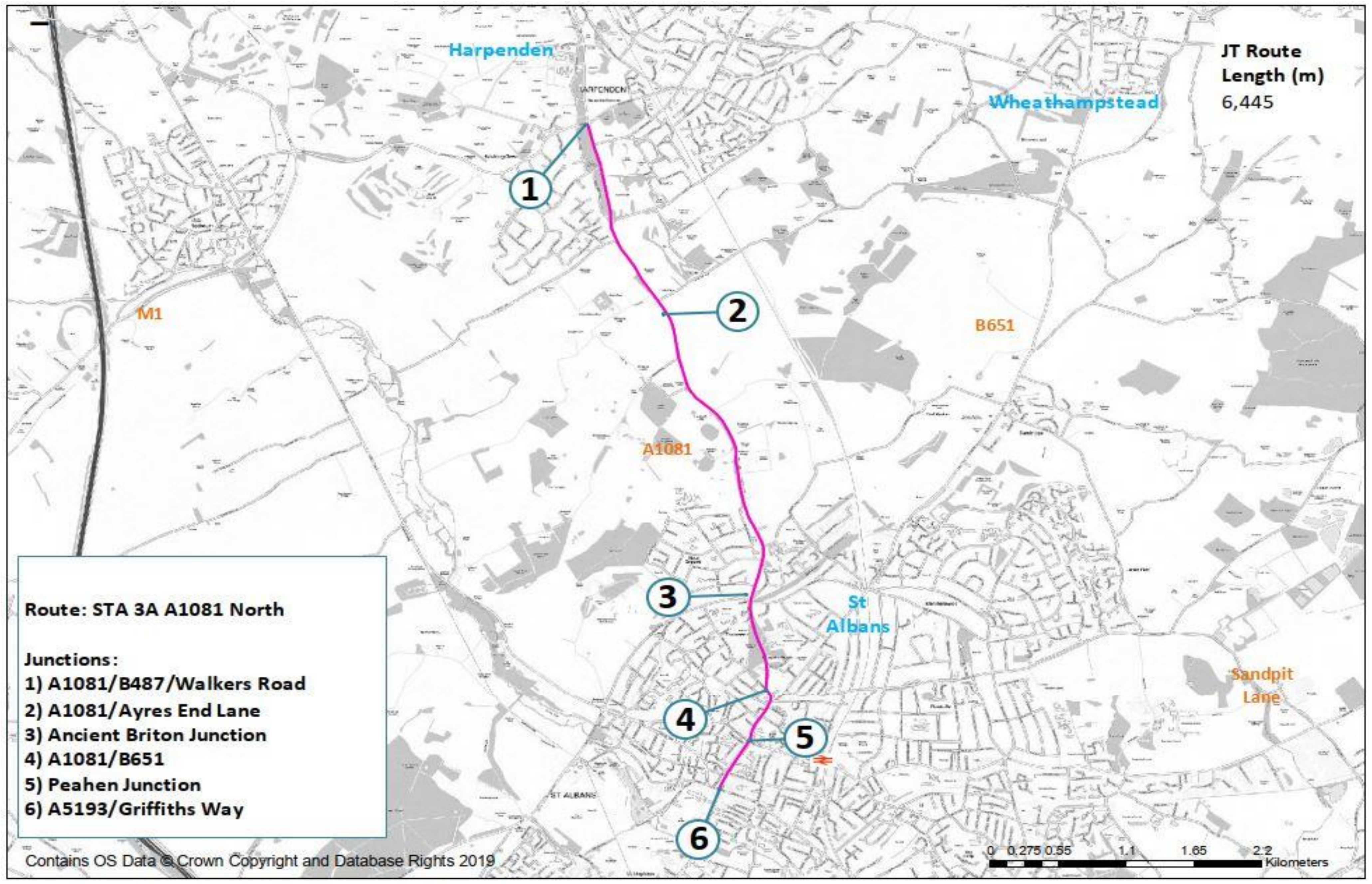
Route: STA3_SB

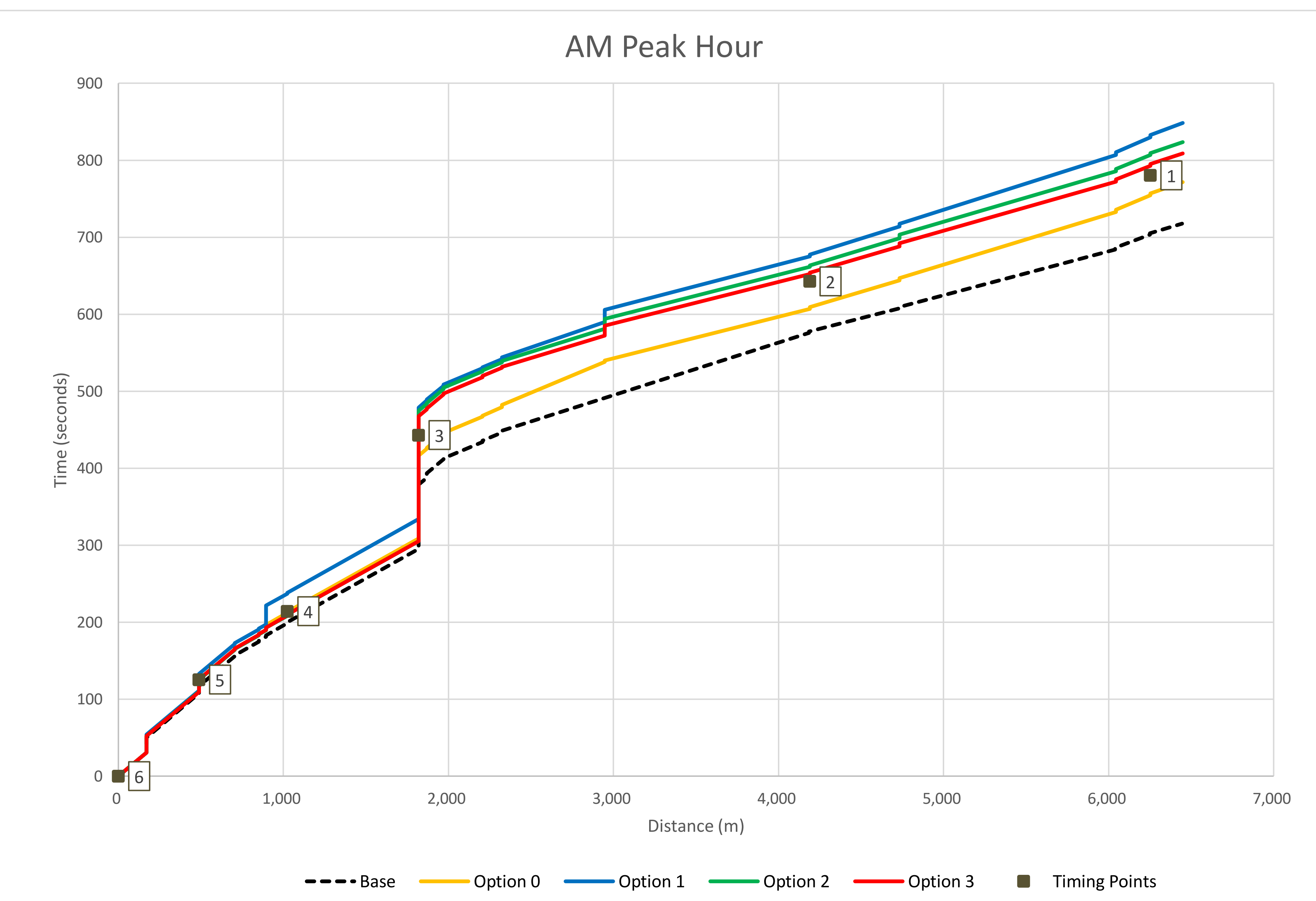


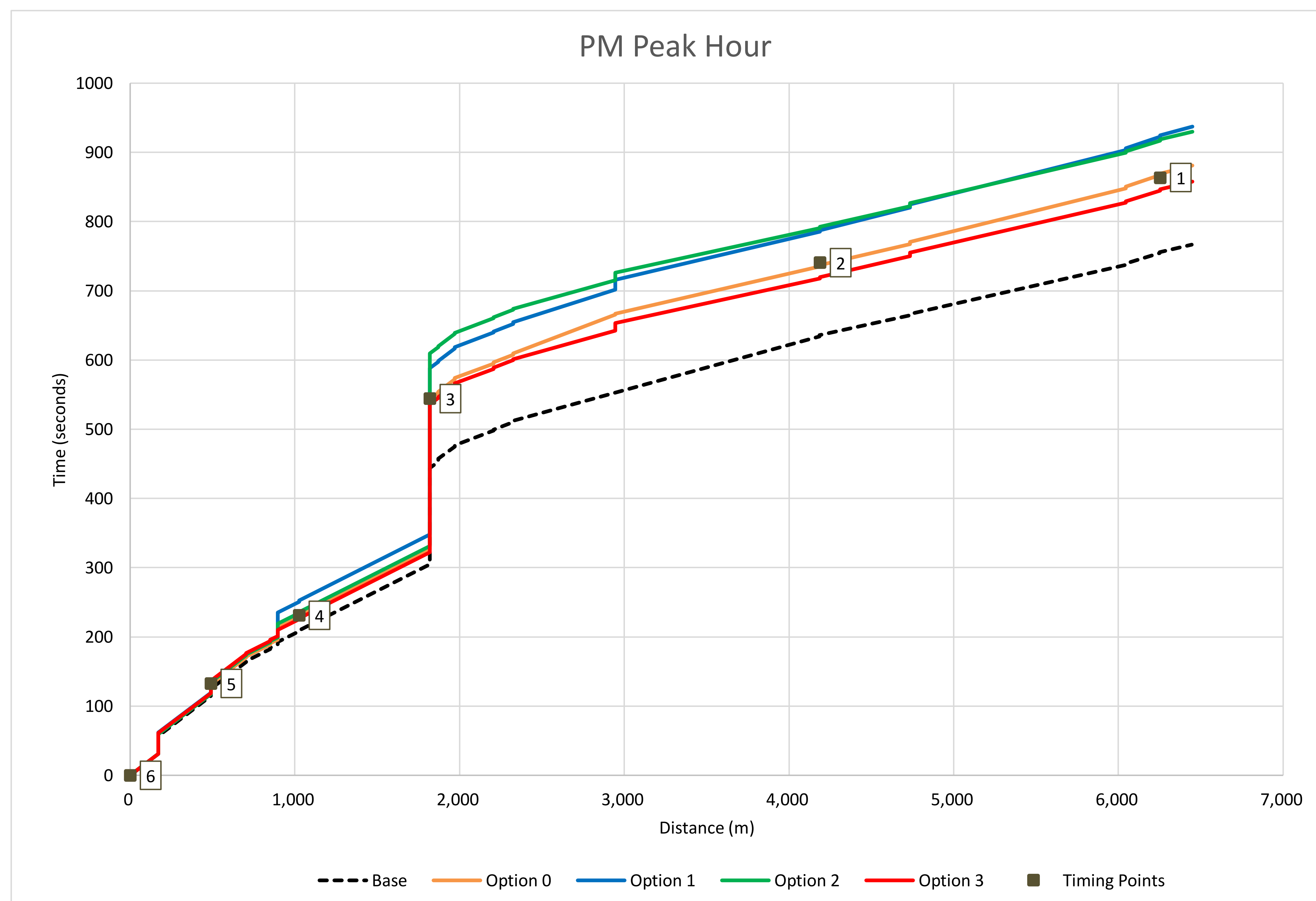




Route: STA3A_NB







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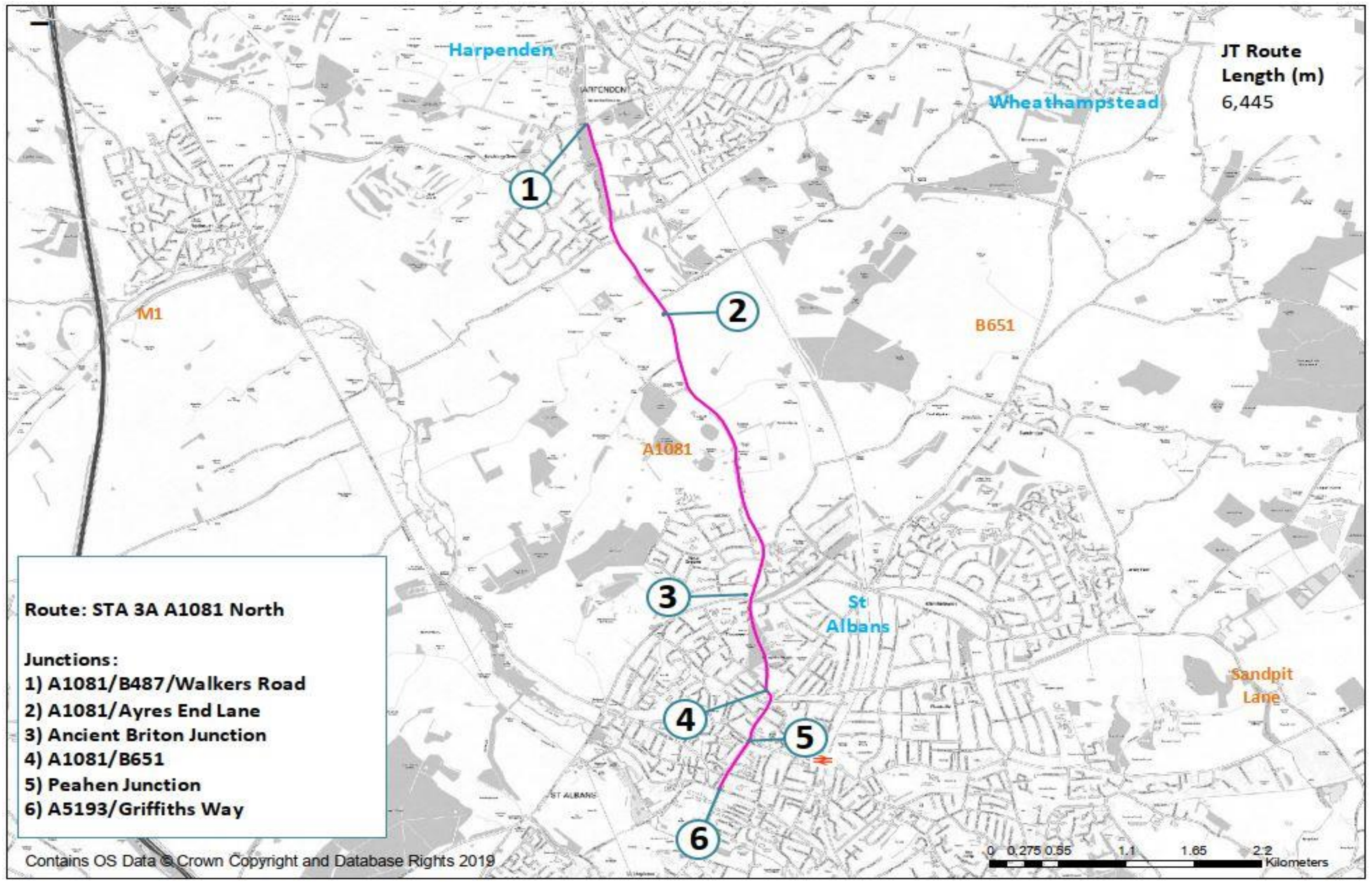
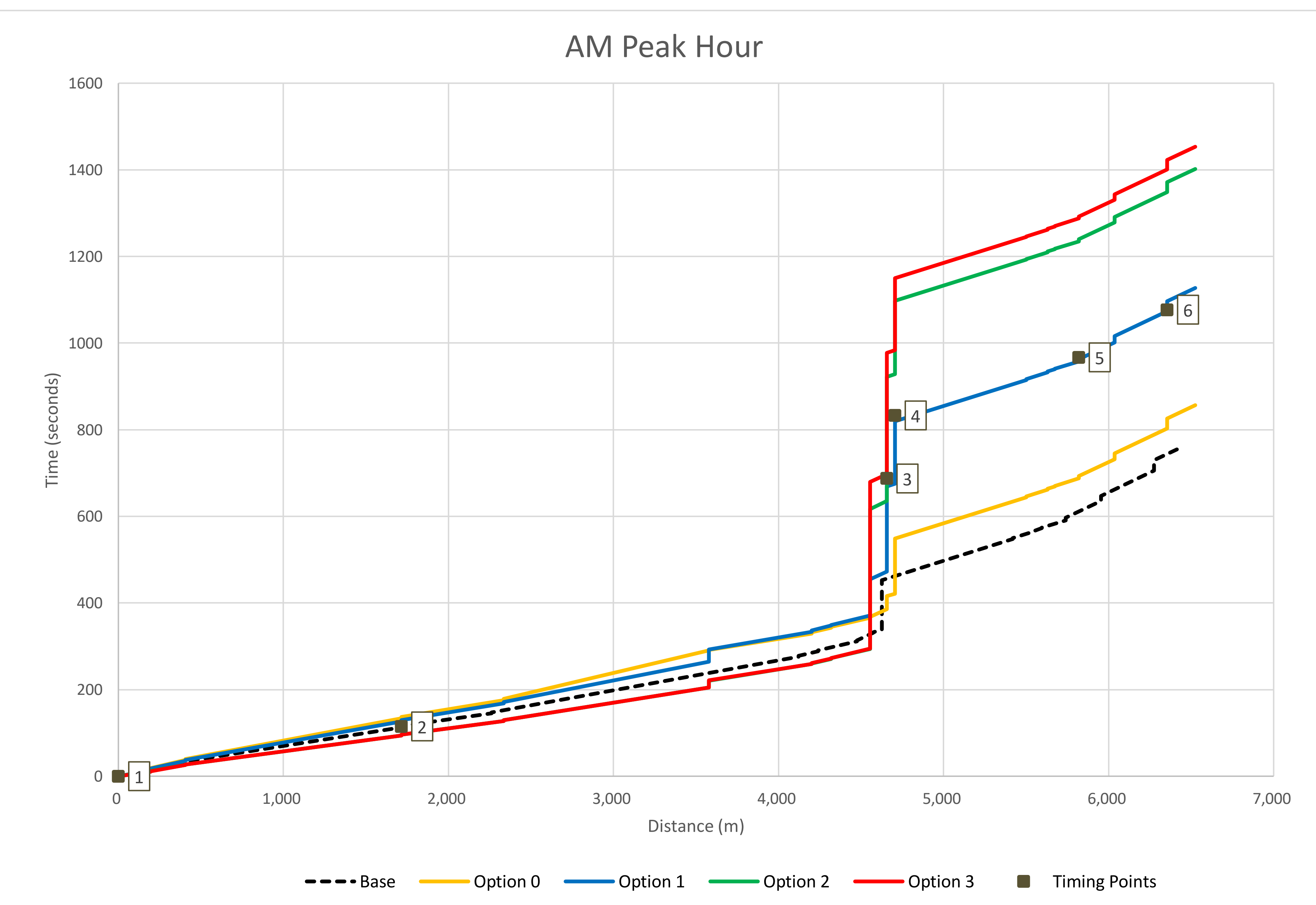
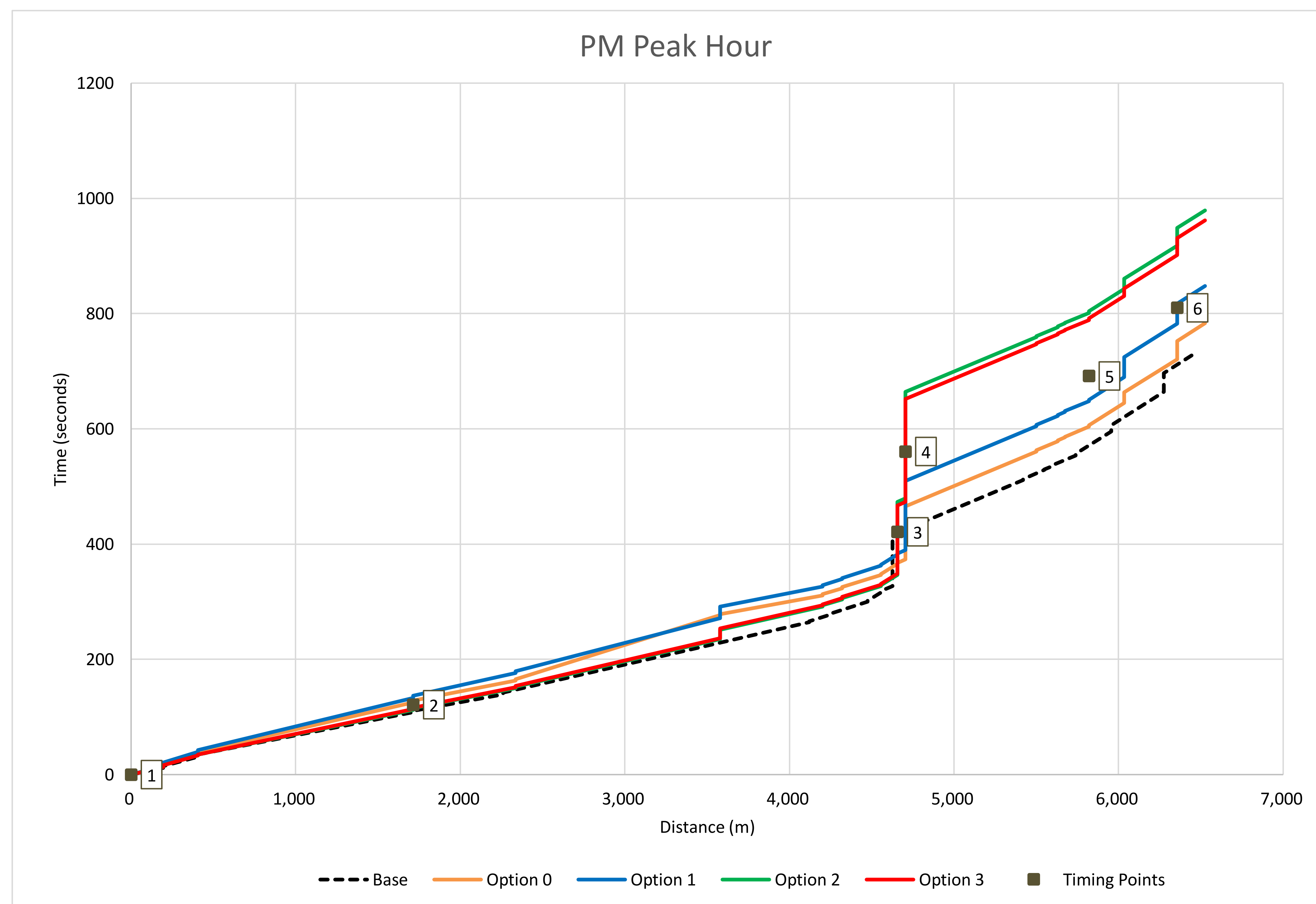
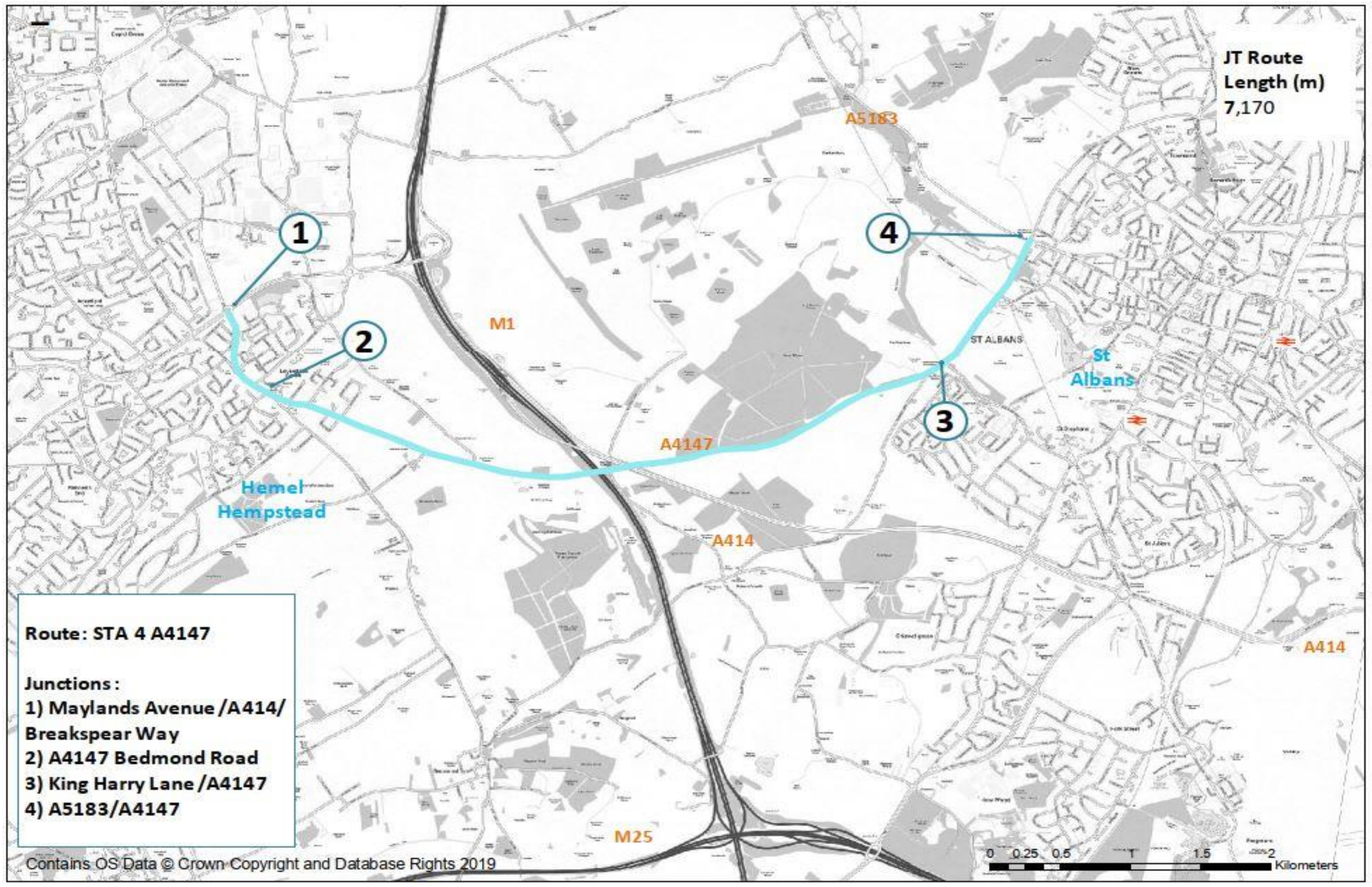
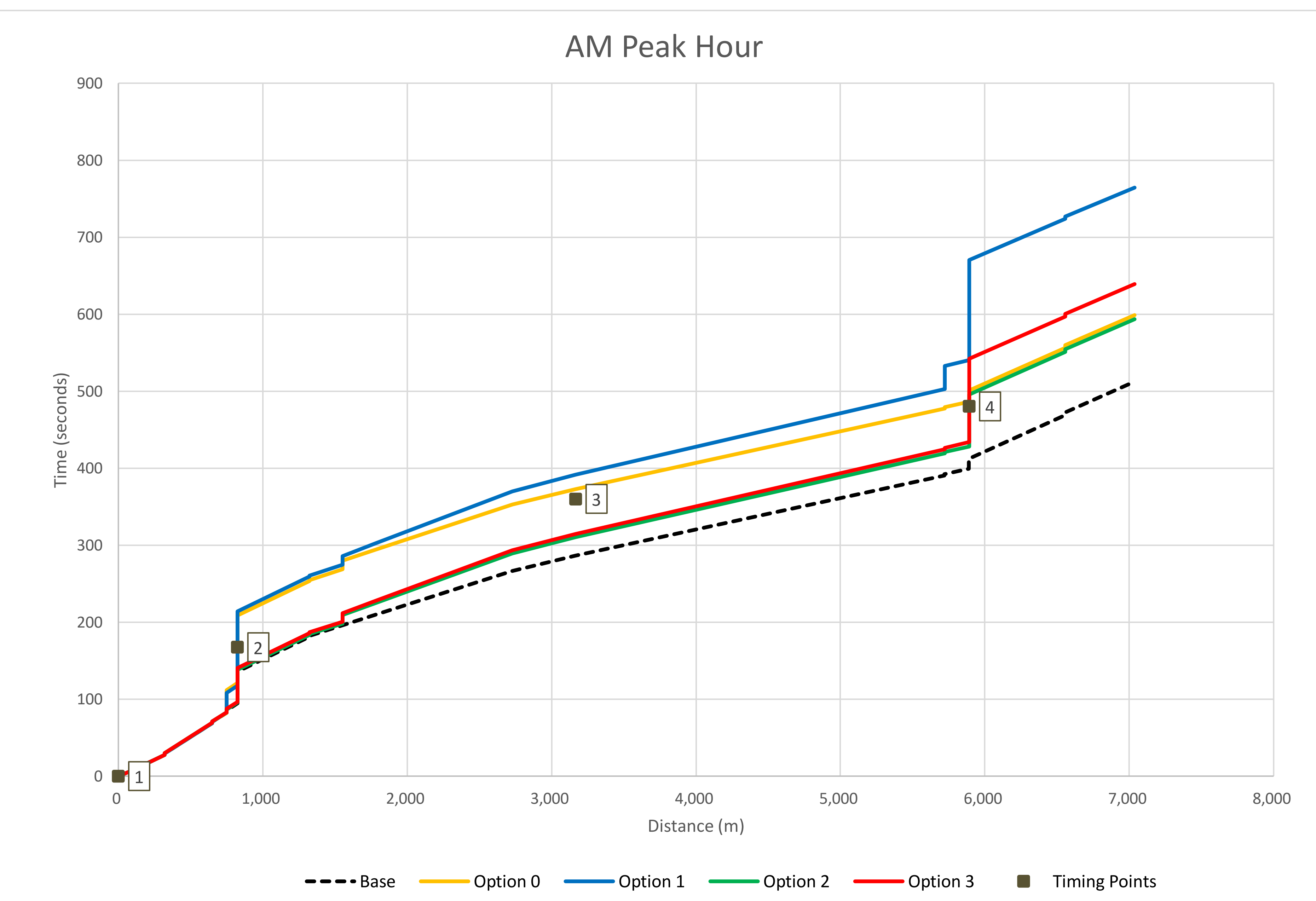


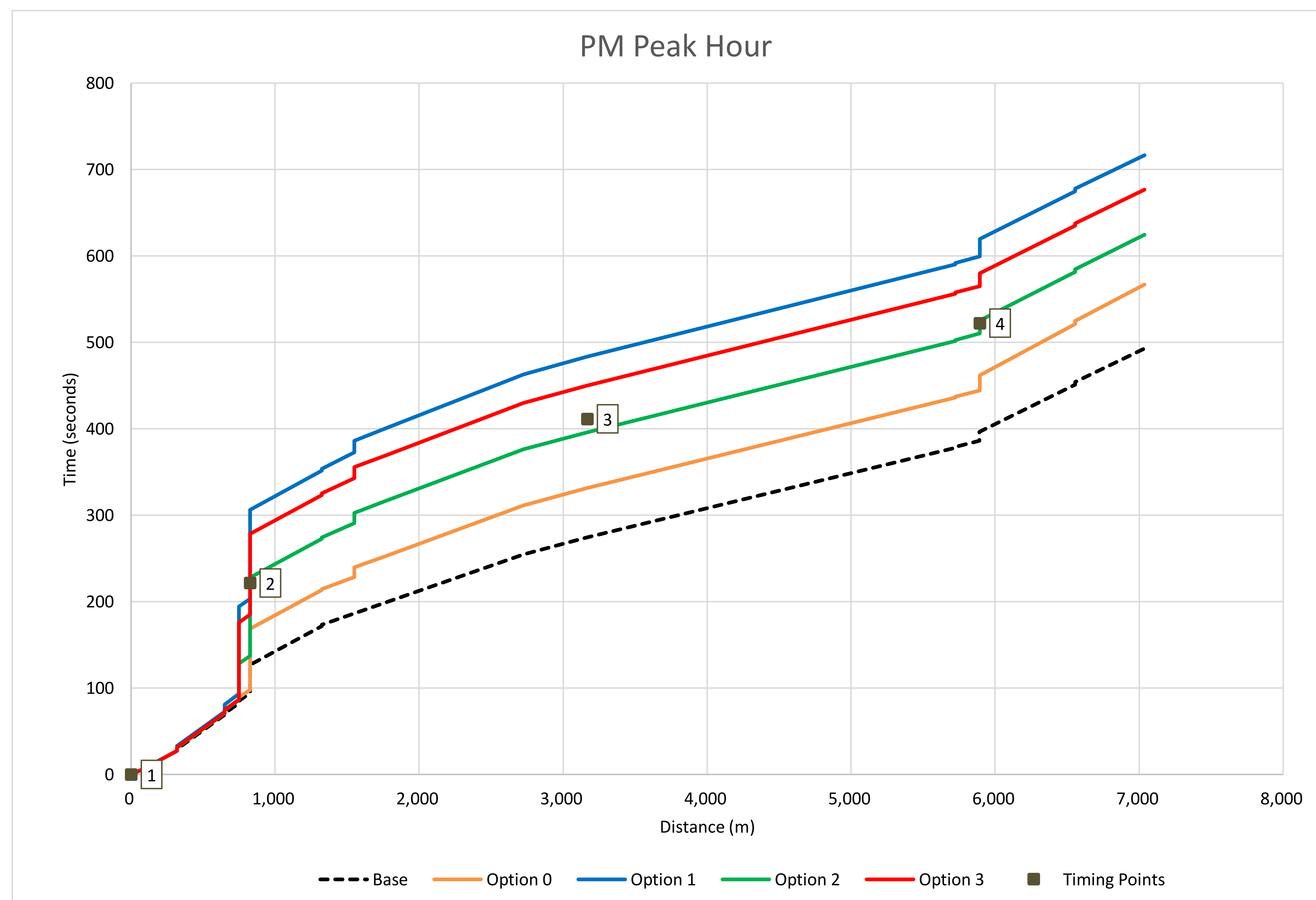




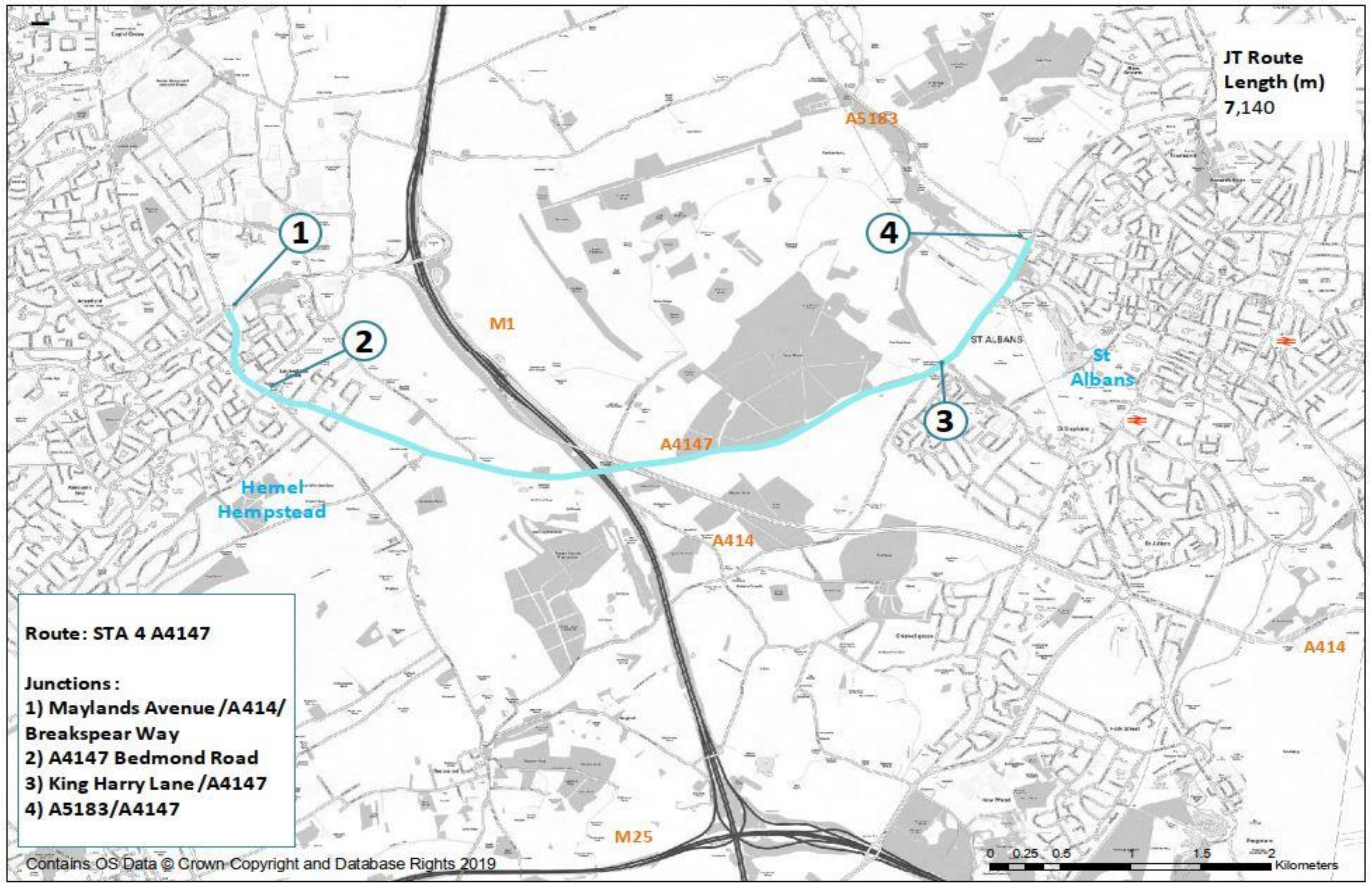
Route: STA4_EB

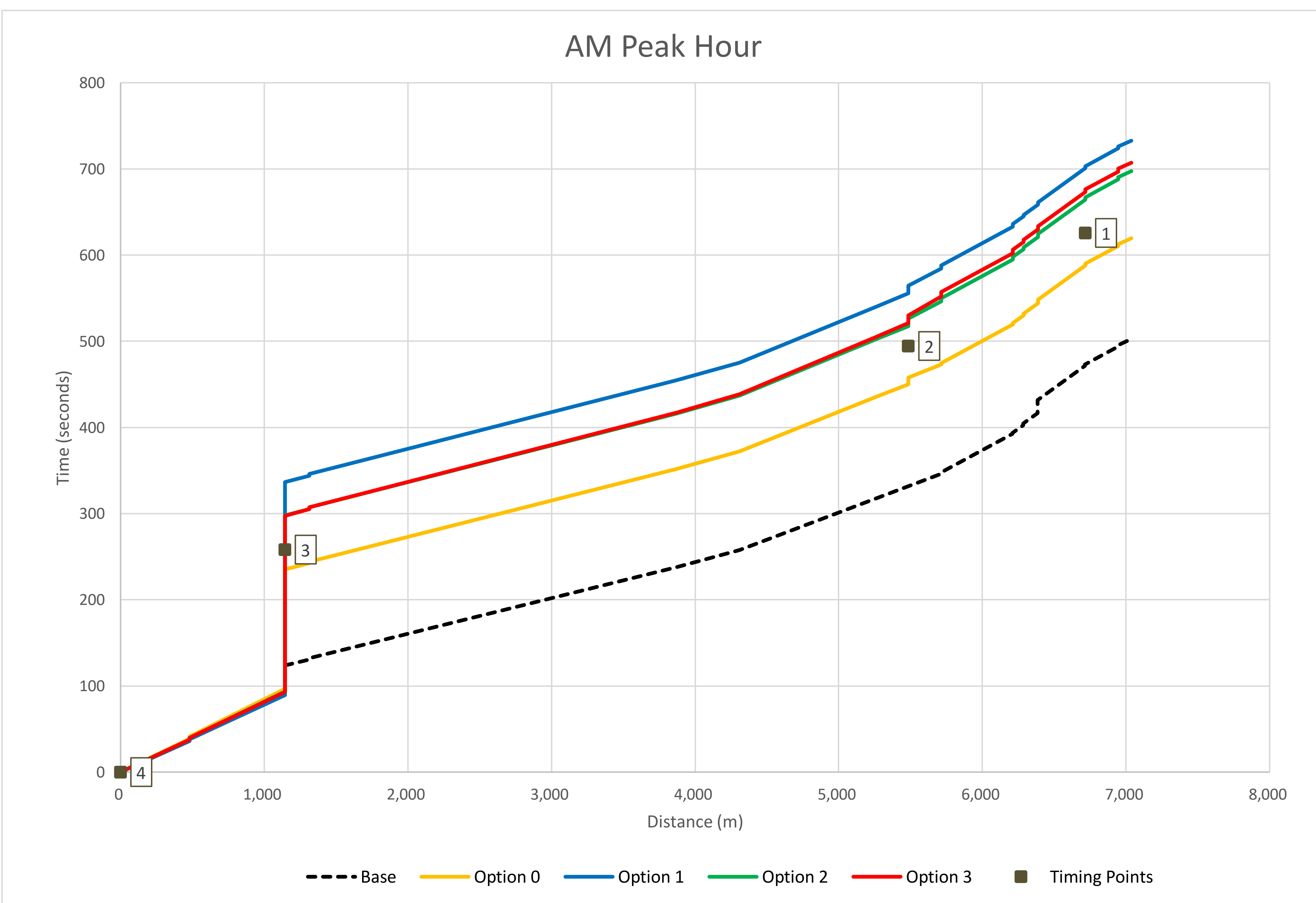


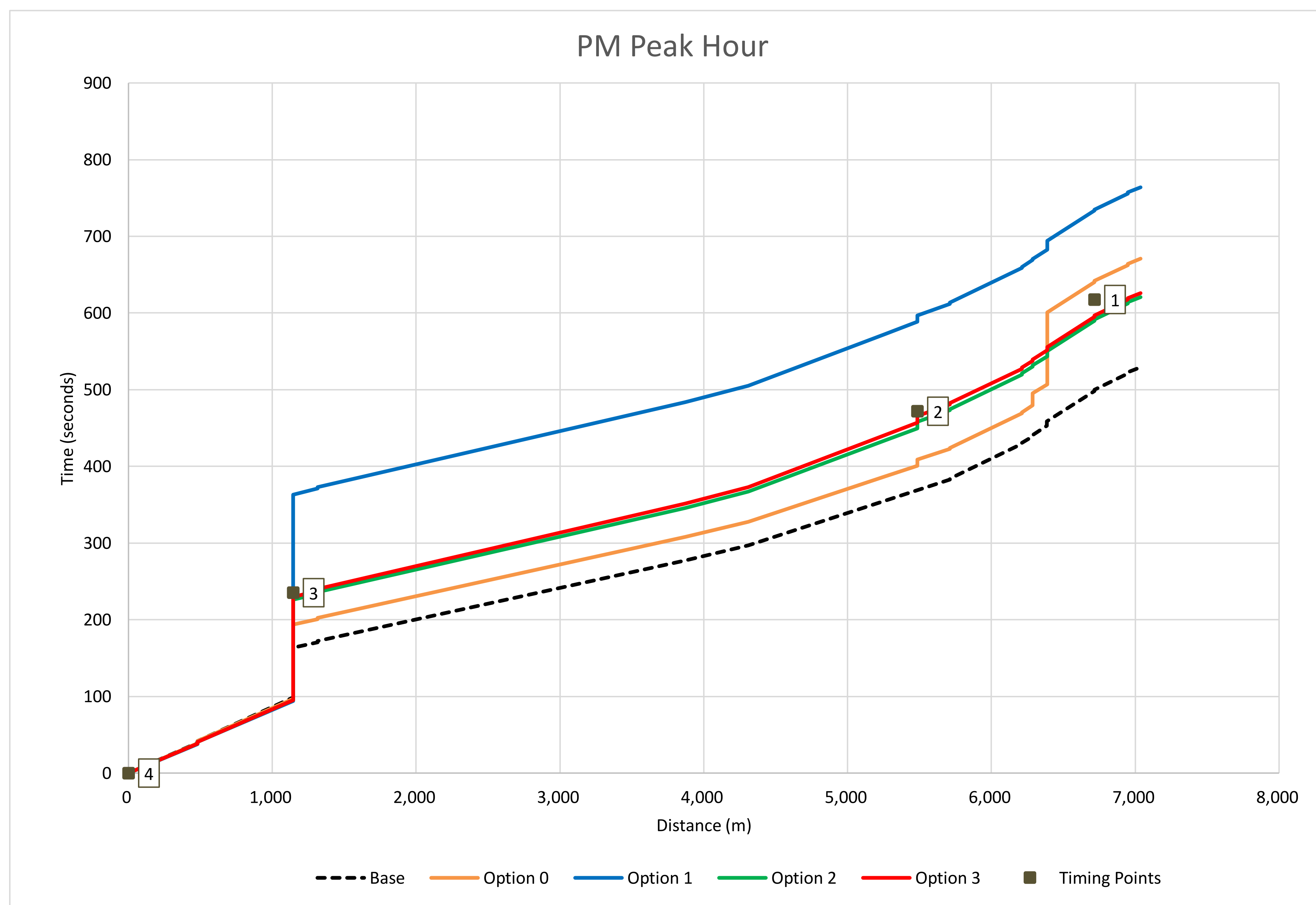




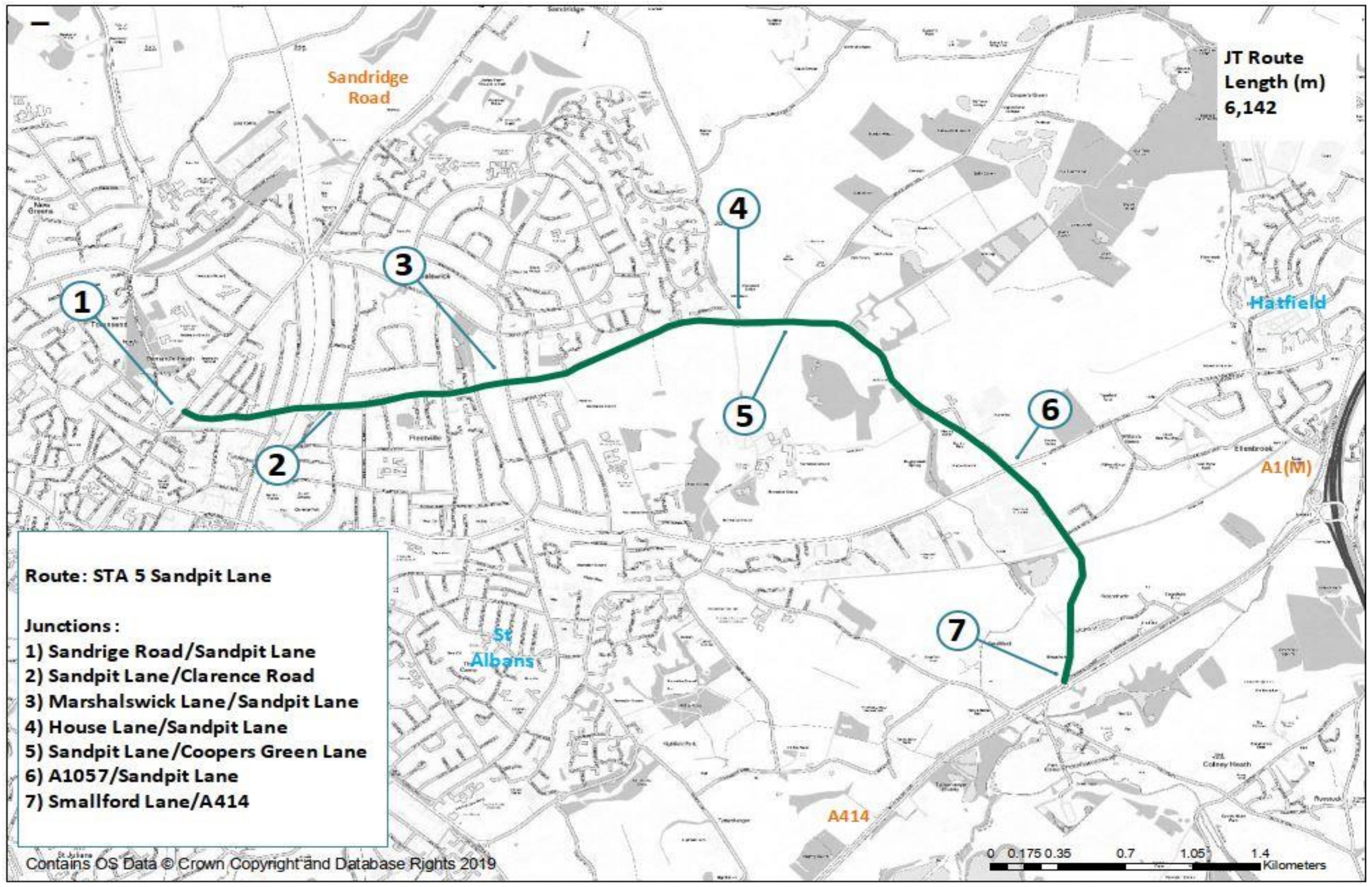
Route: STA4_WB

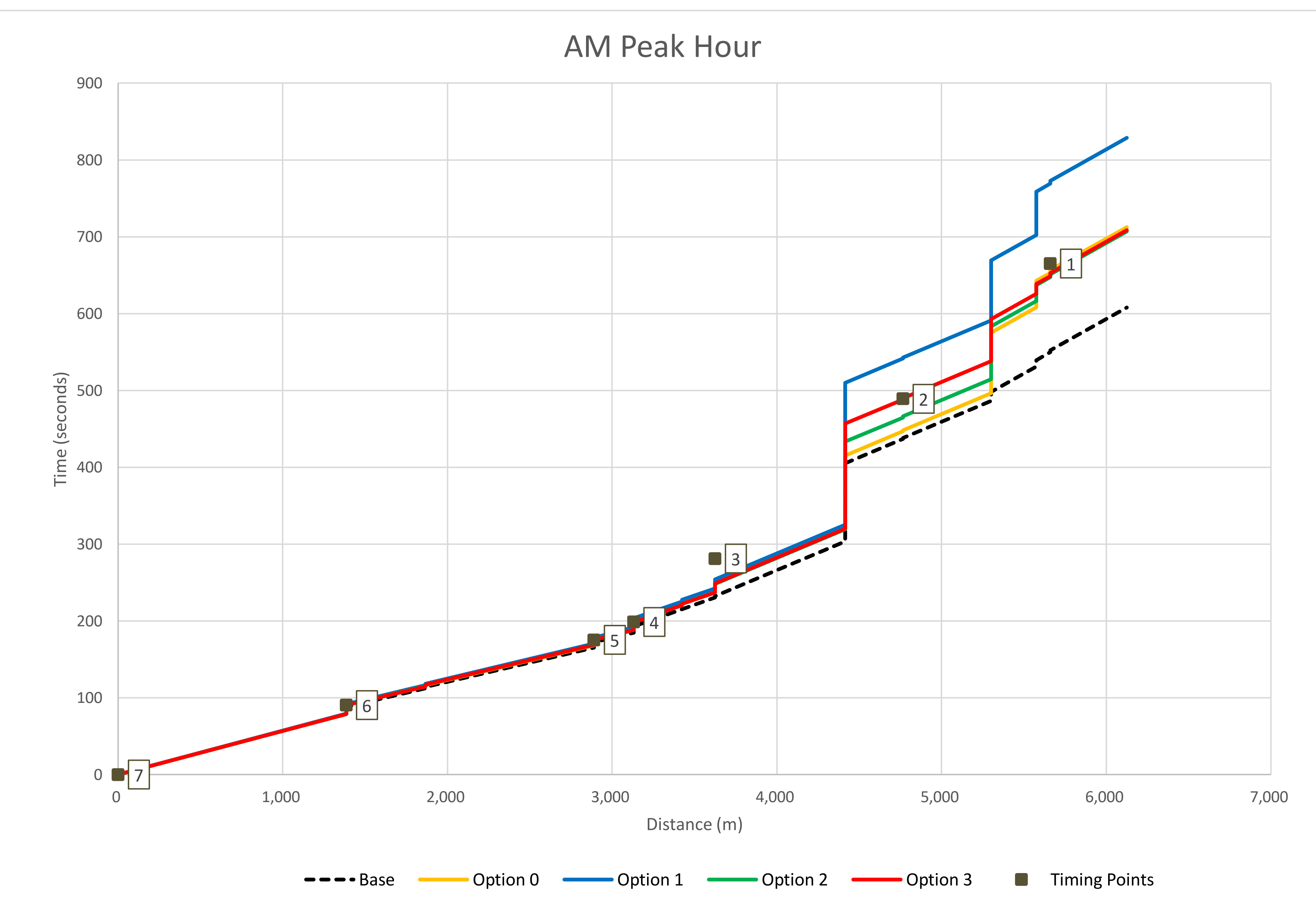


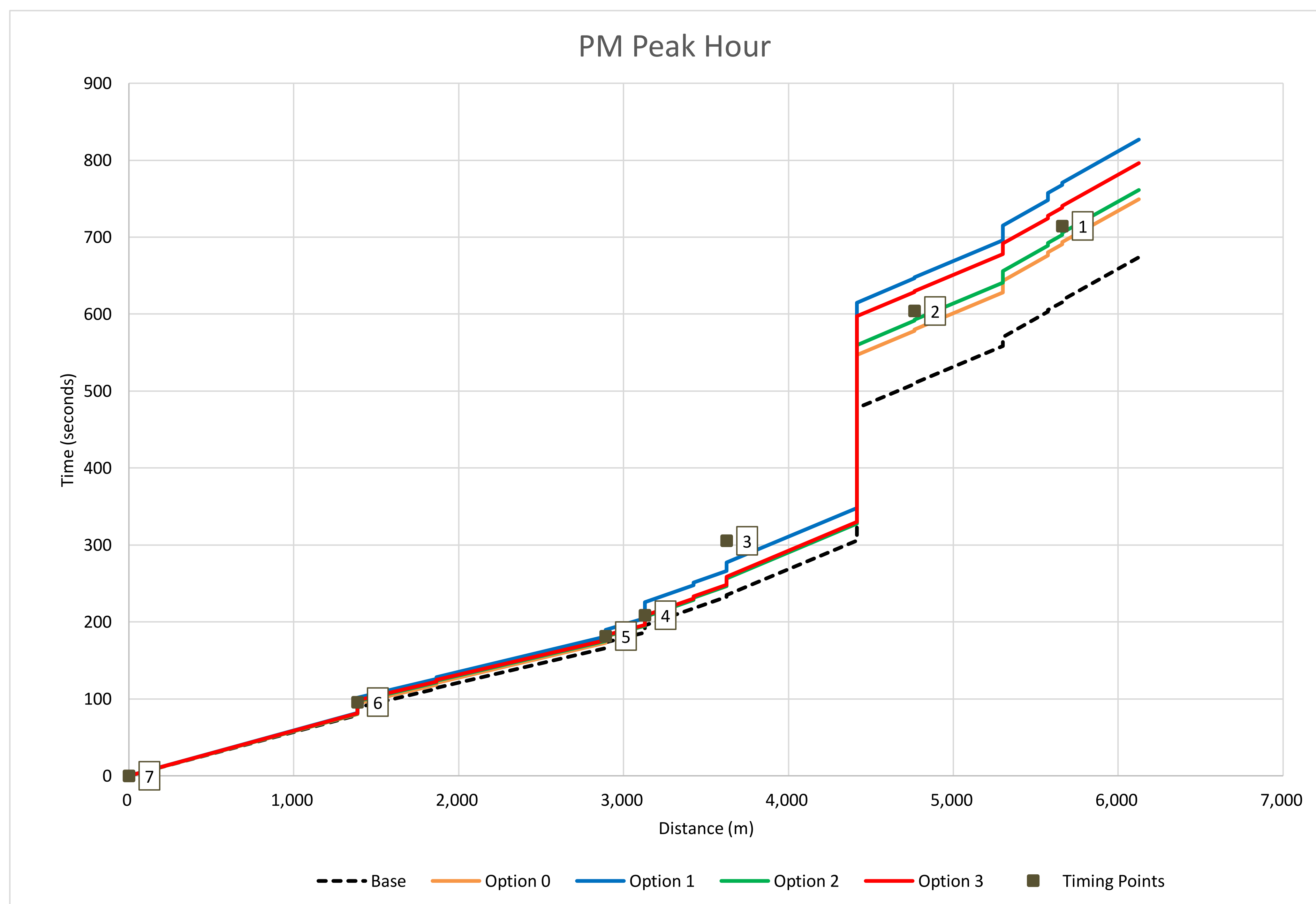




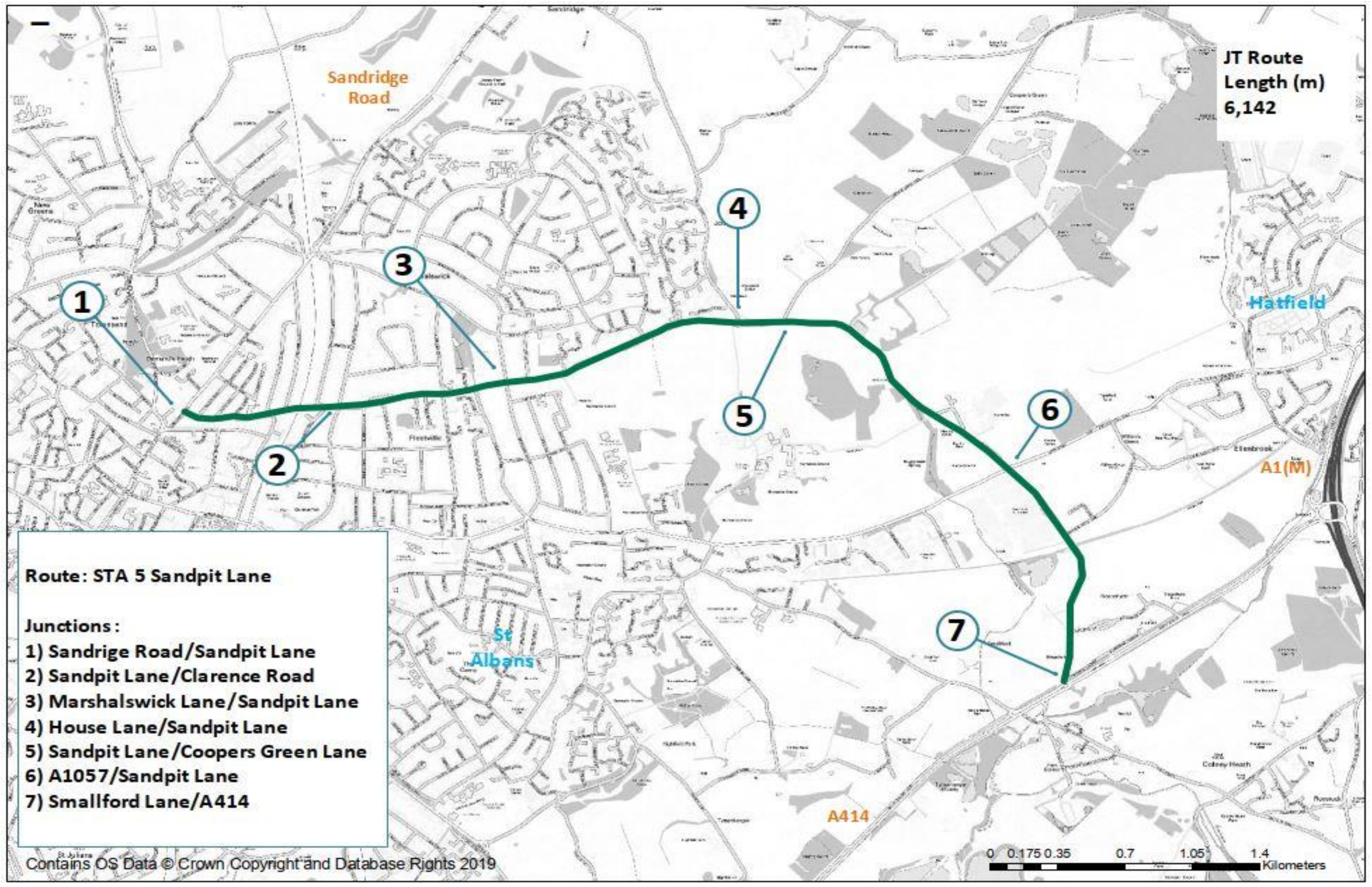
Route: STA5_NB

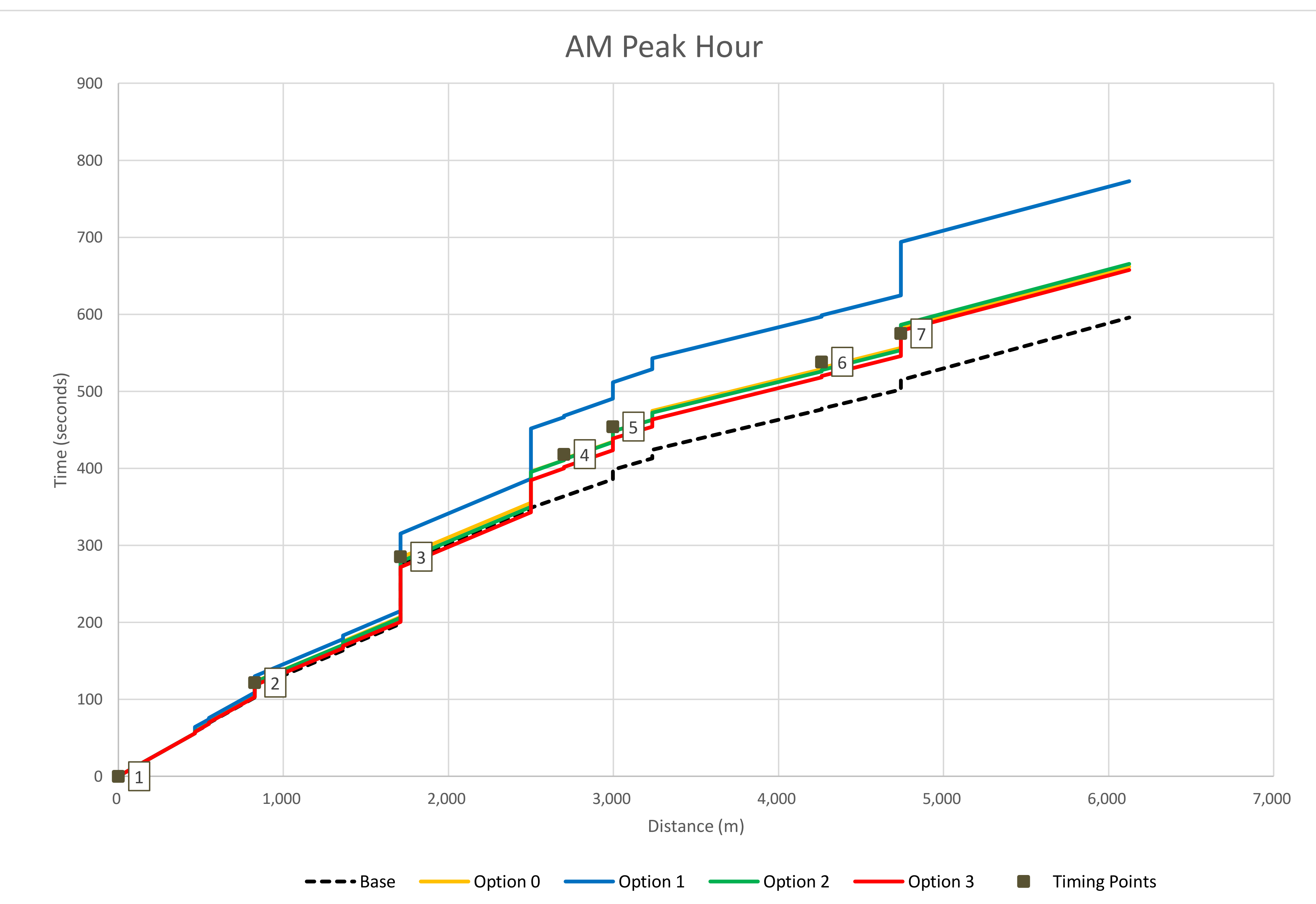


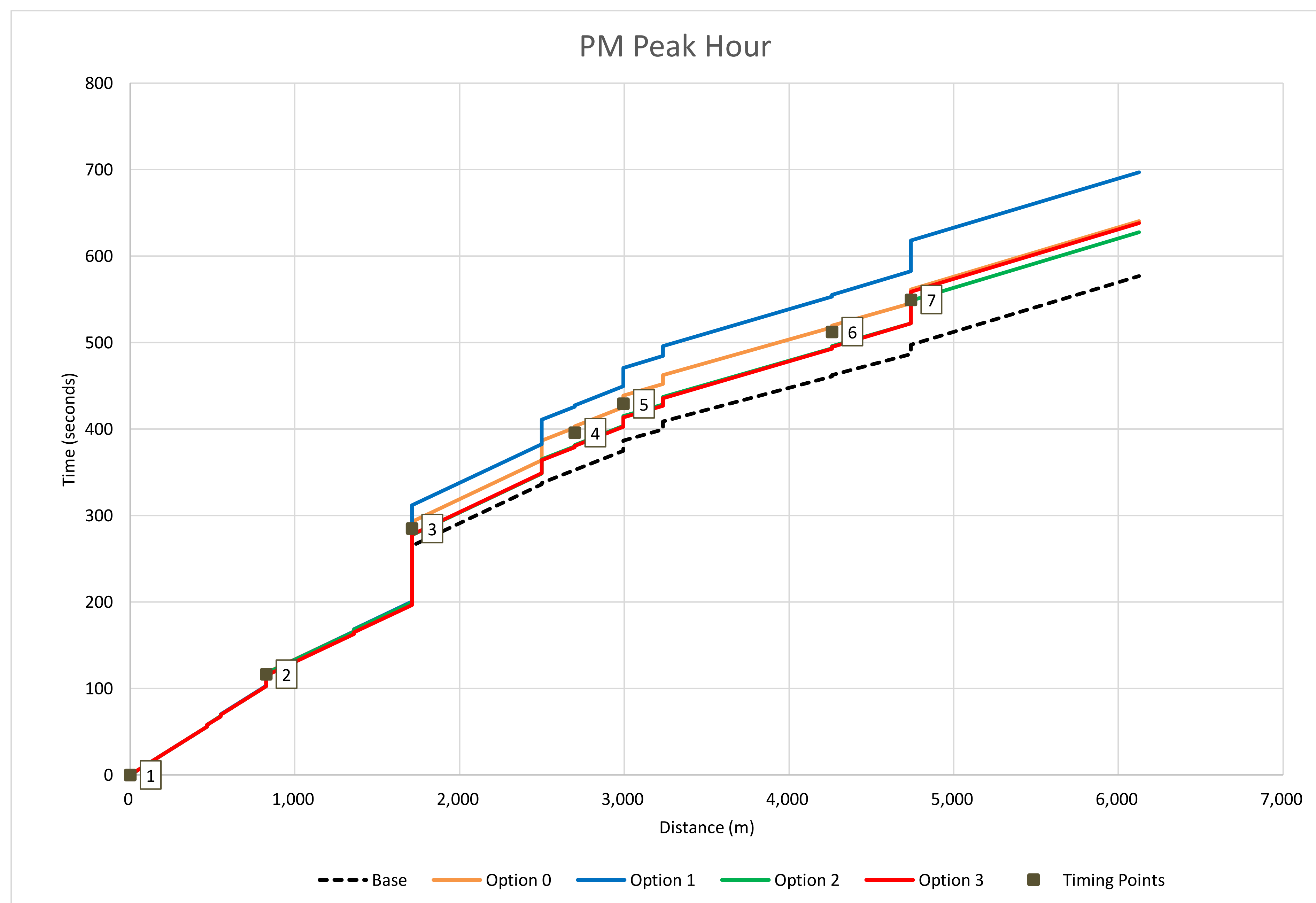




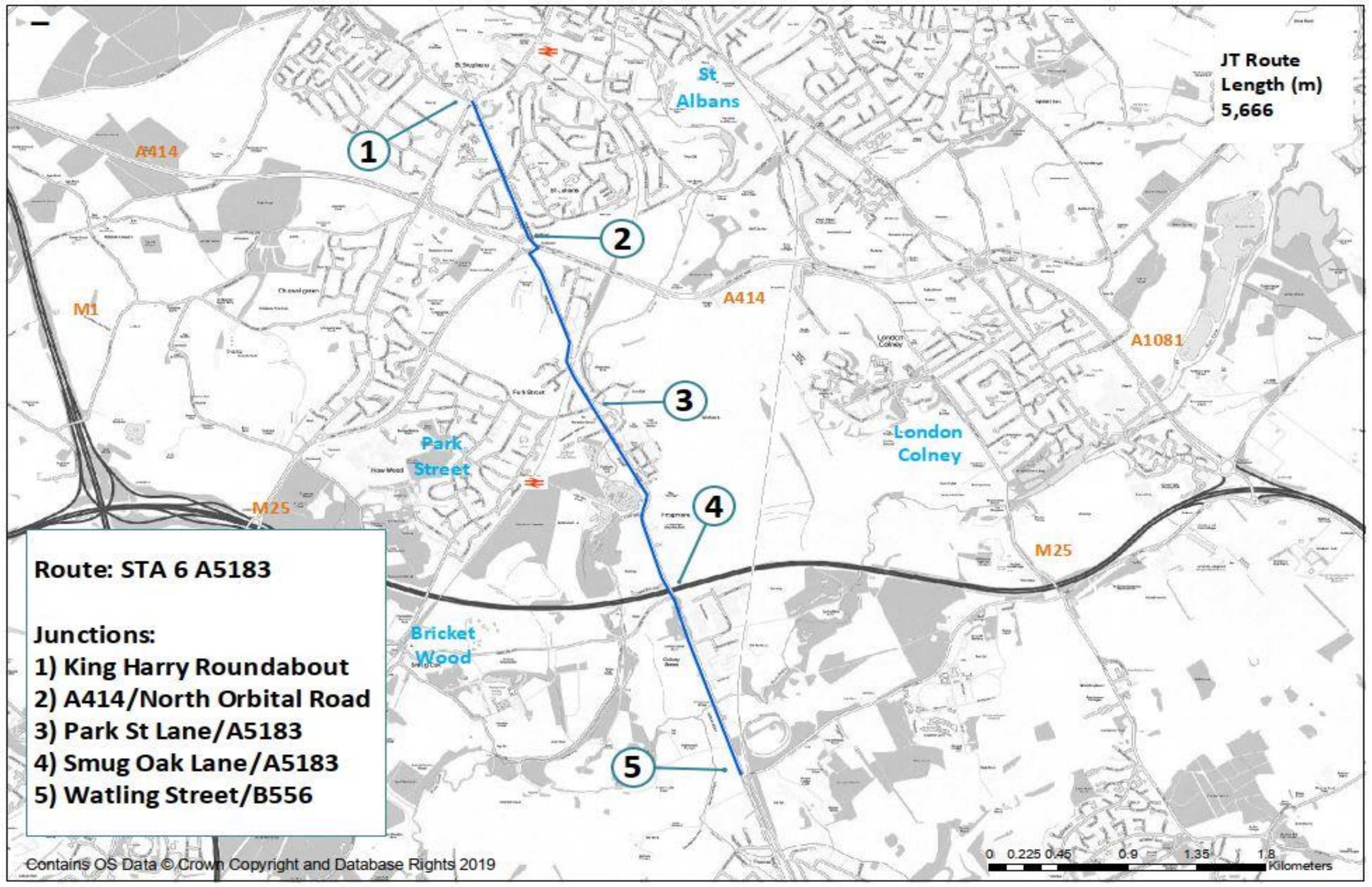
Route: STA5_SB

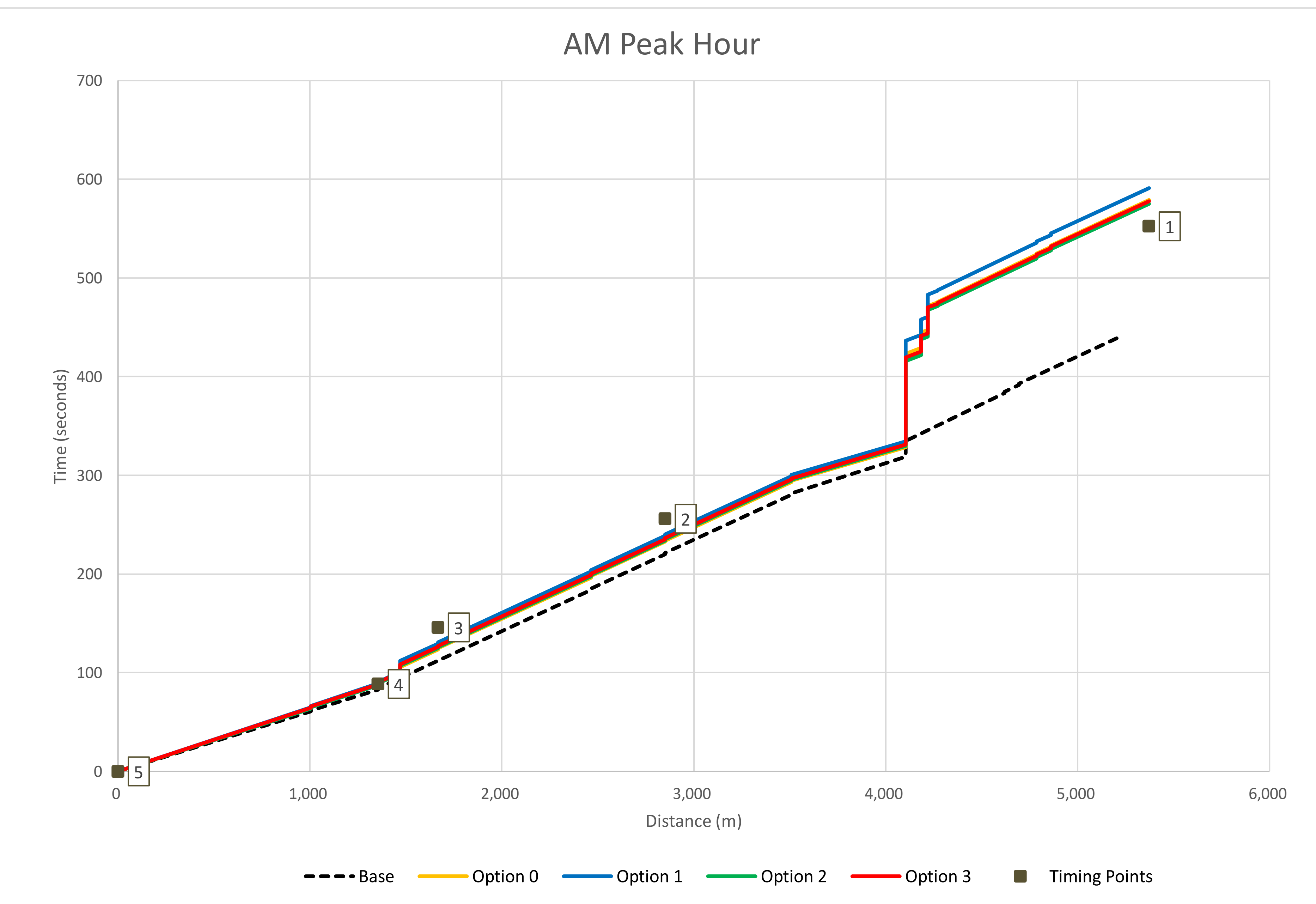


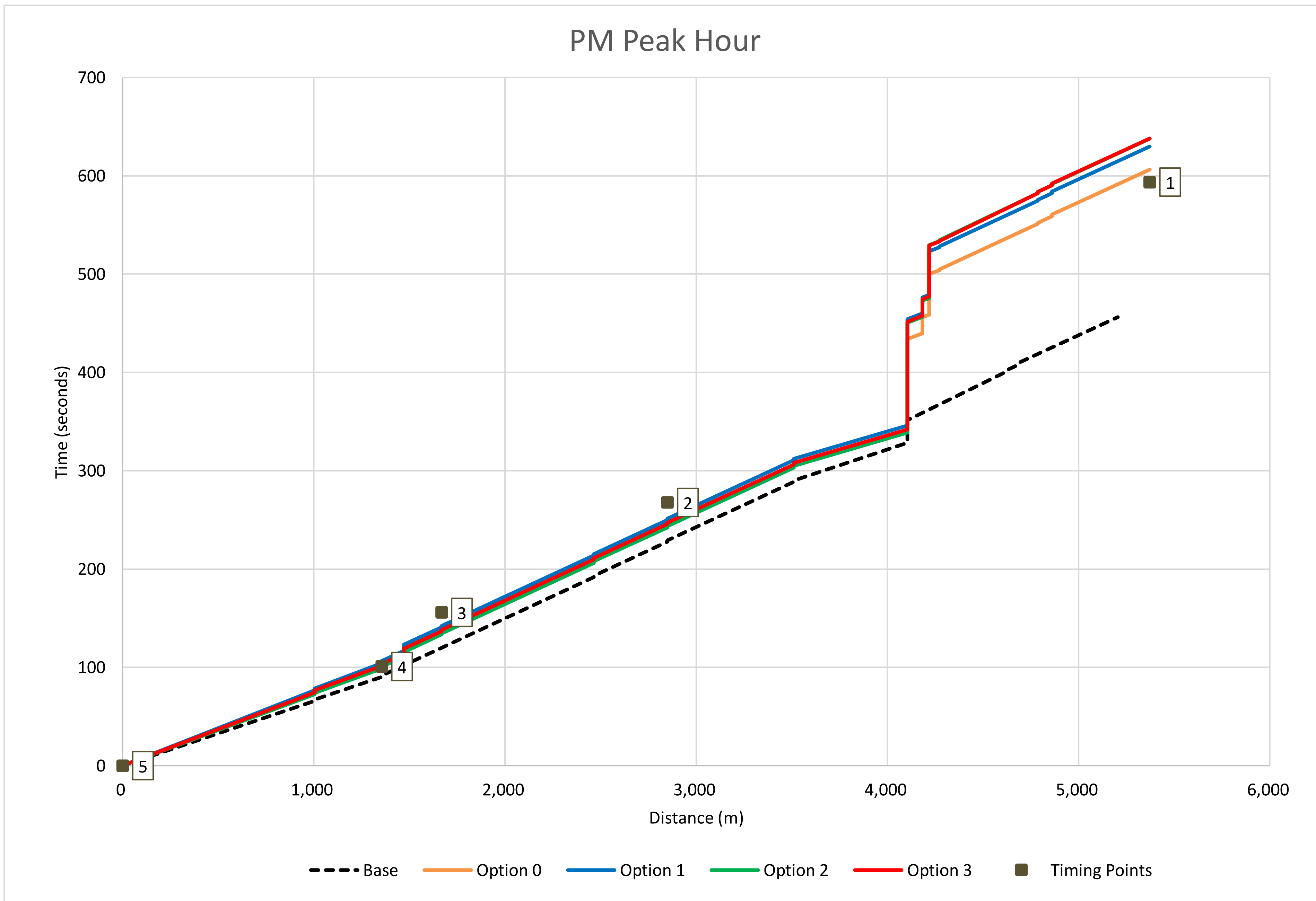




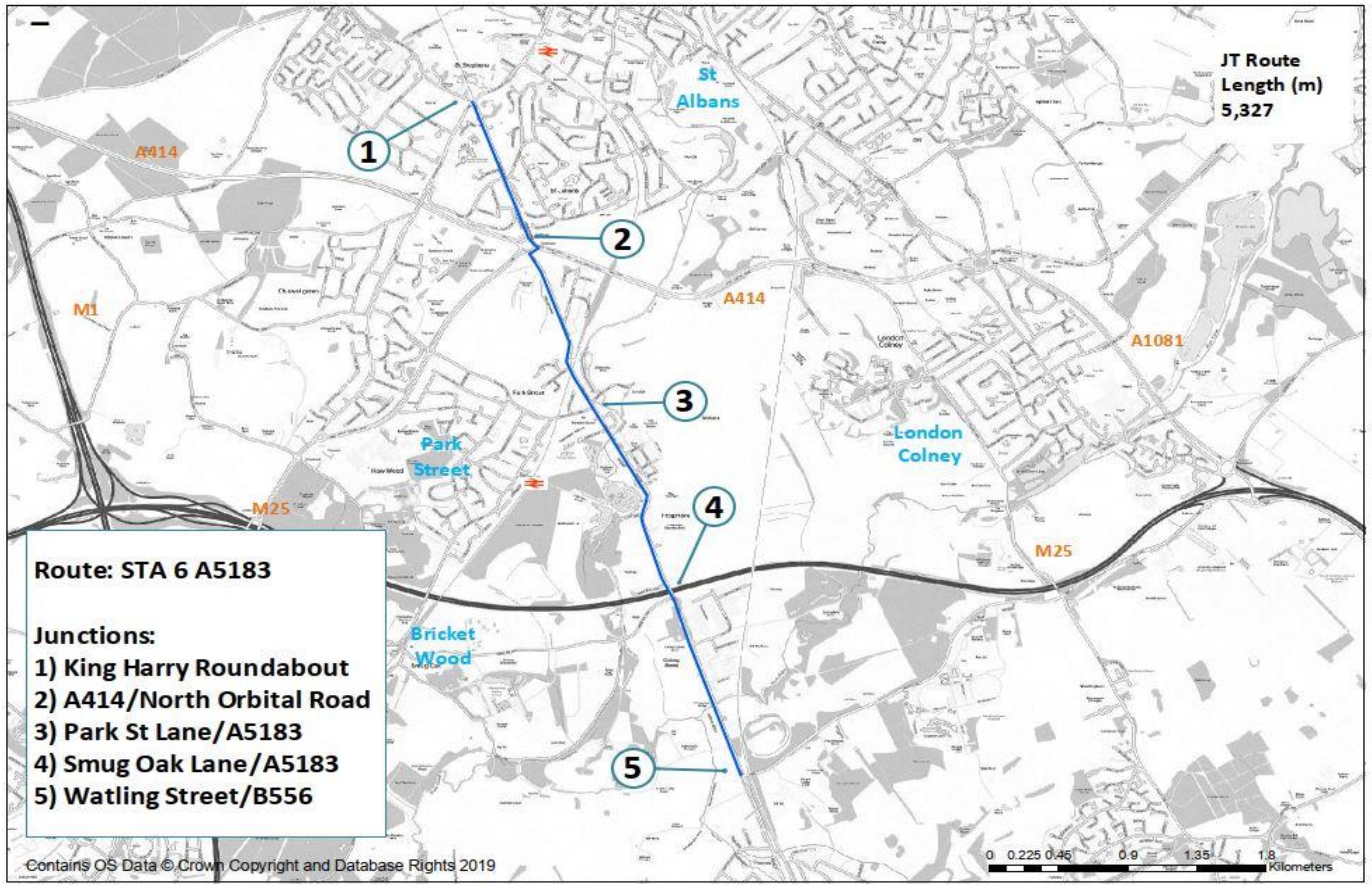
Route: STA6_NB

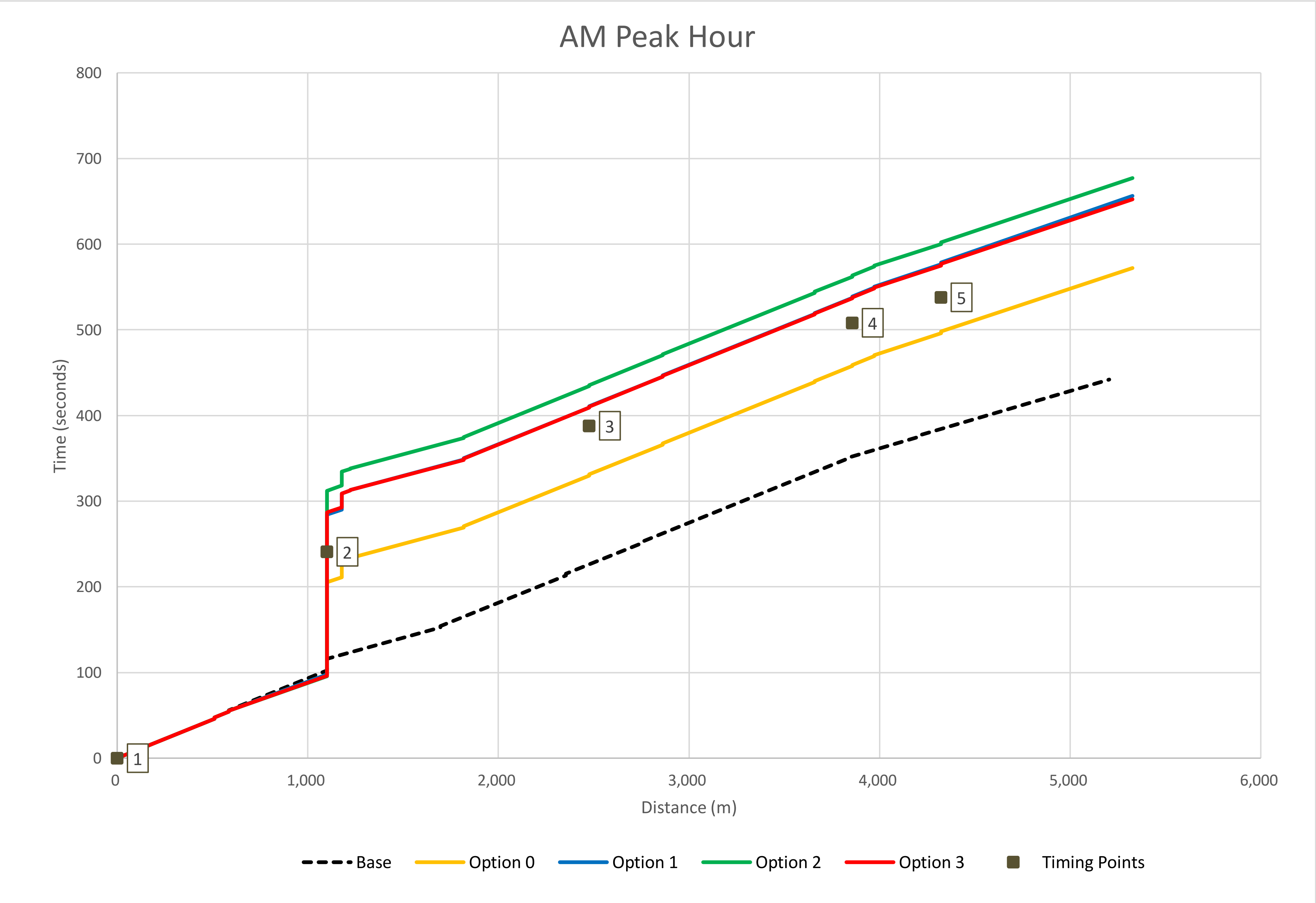


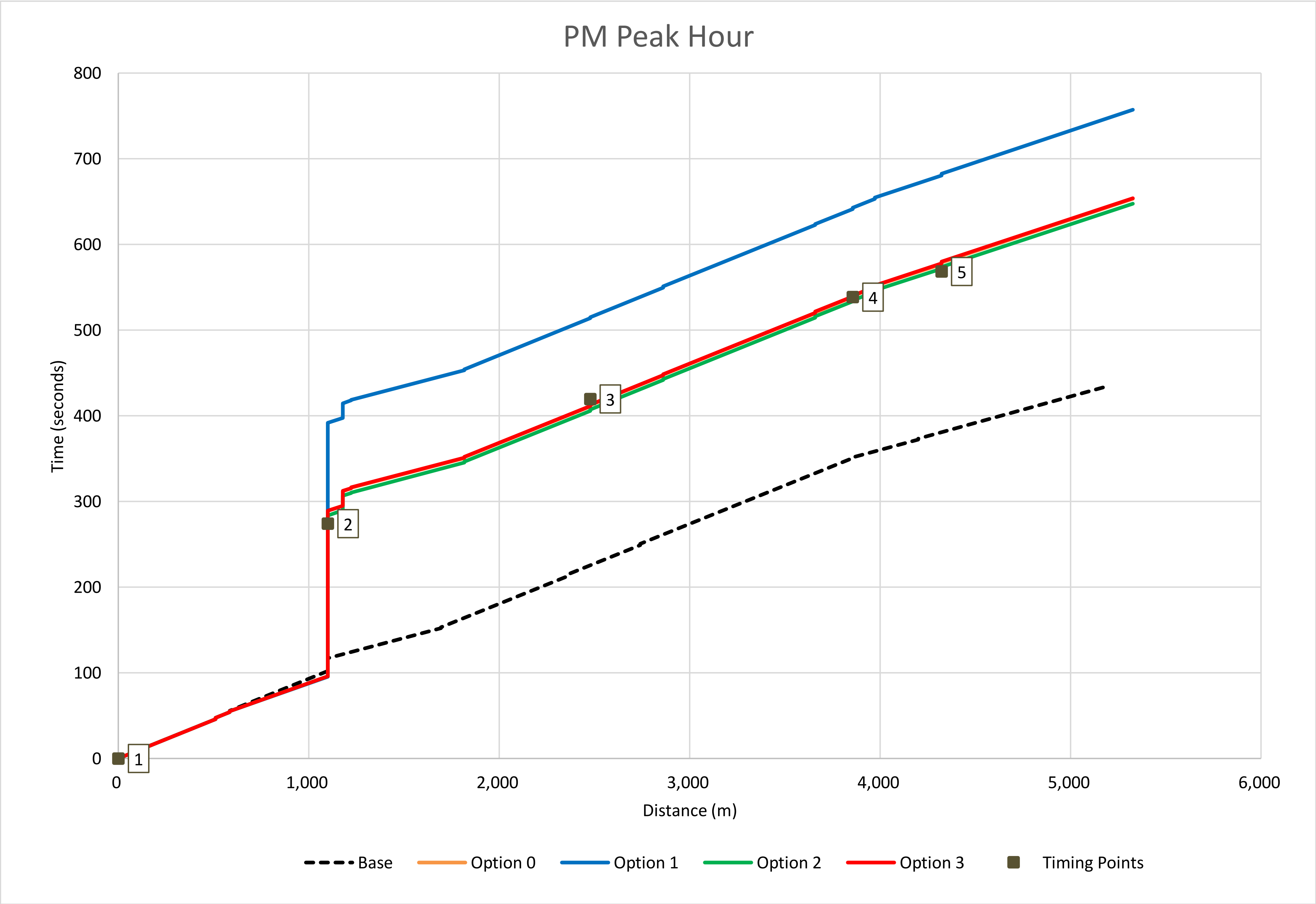




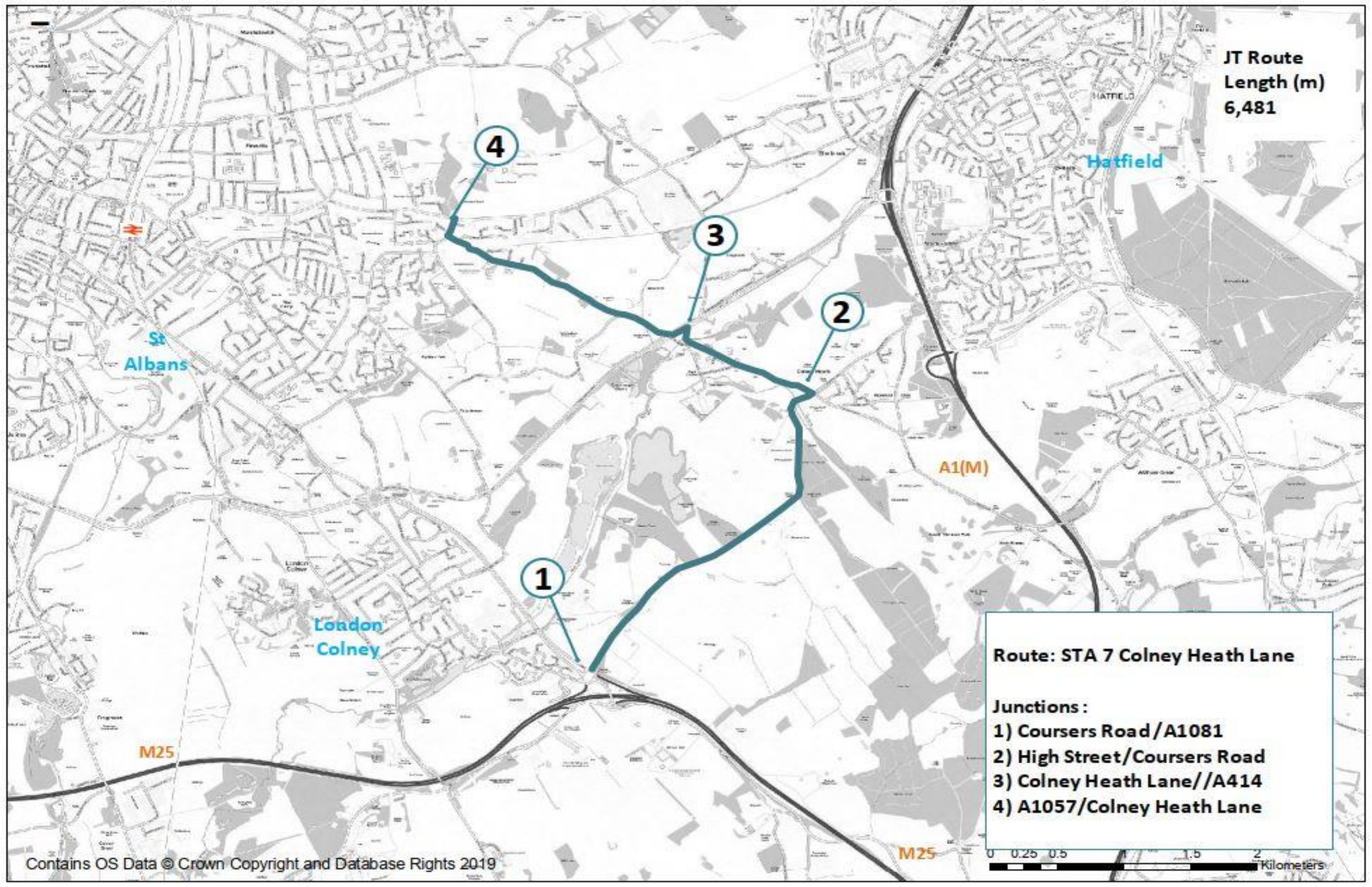
Route: STA6_SB

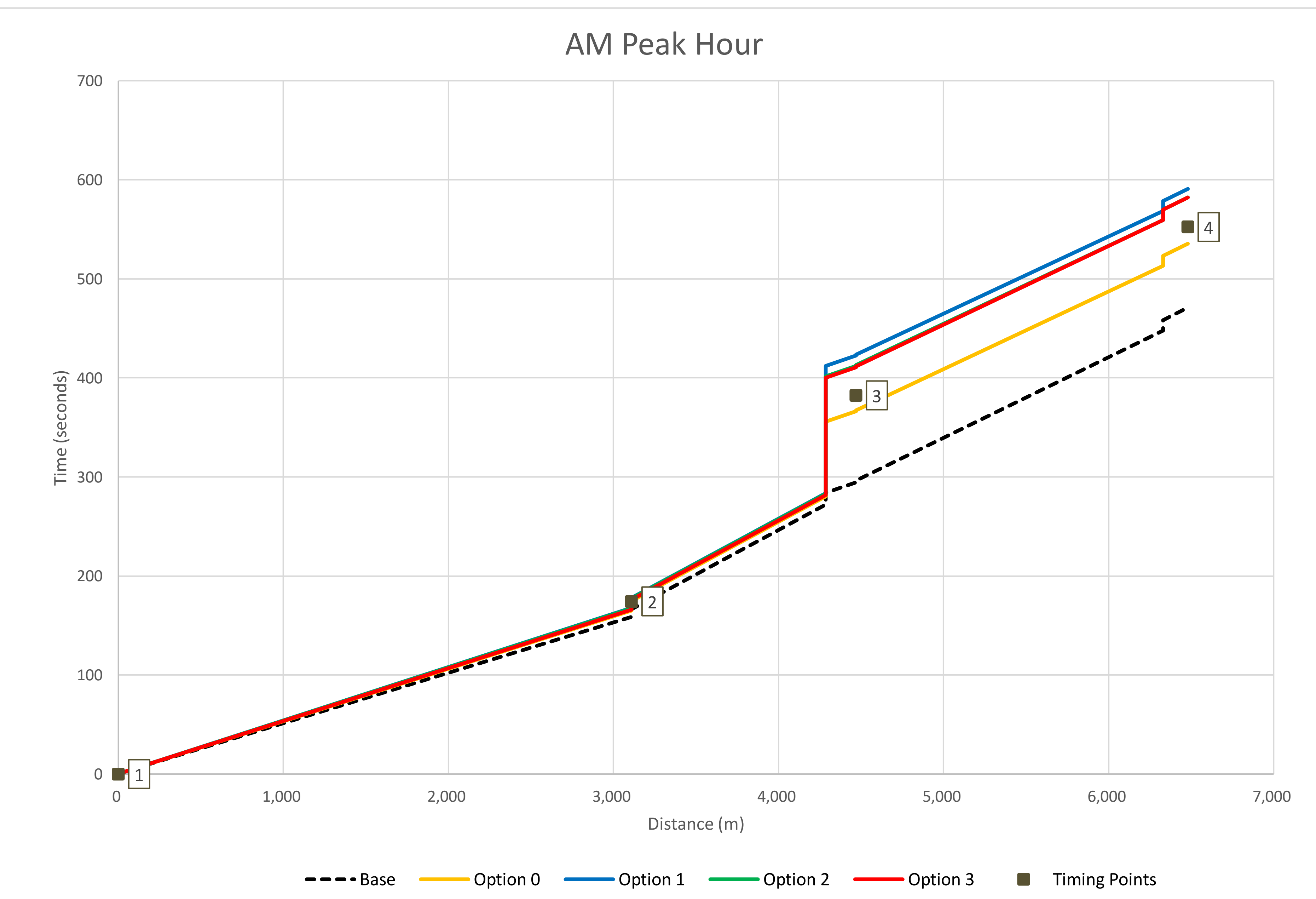


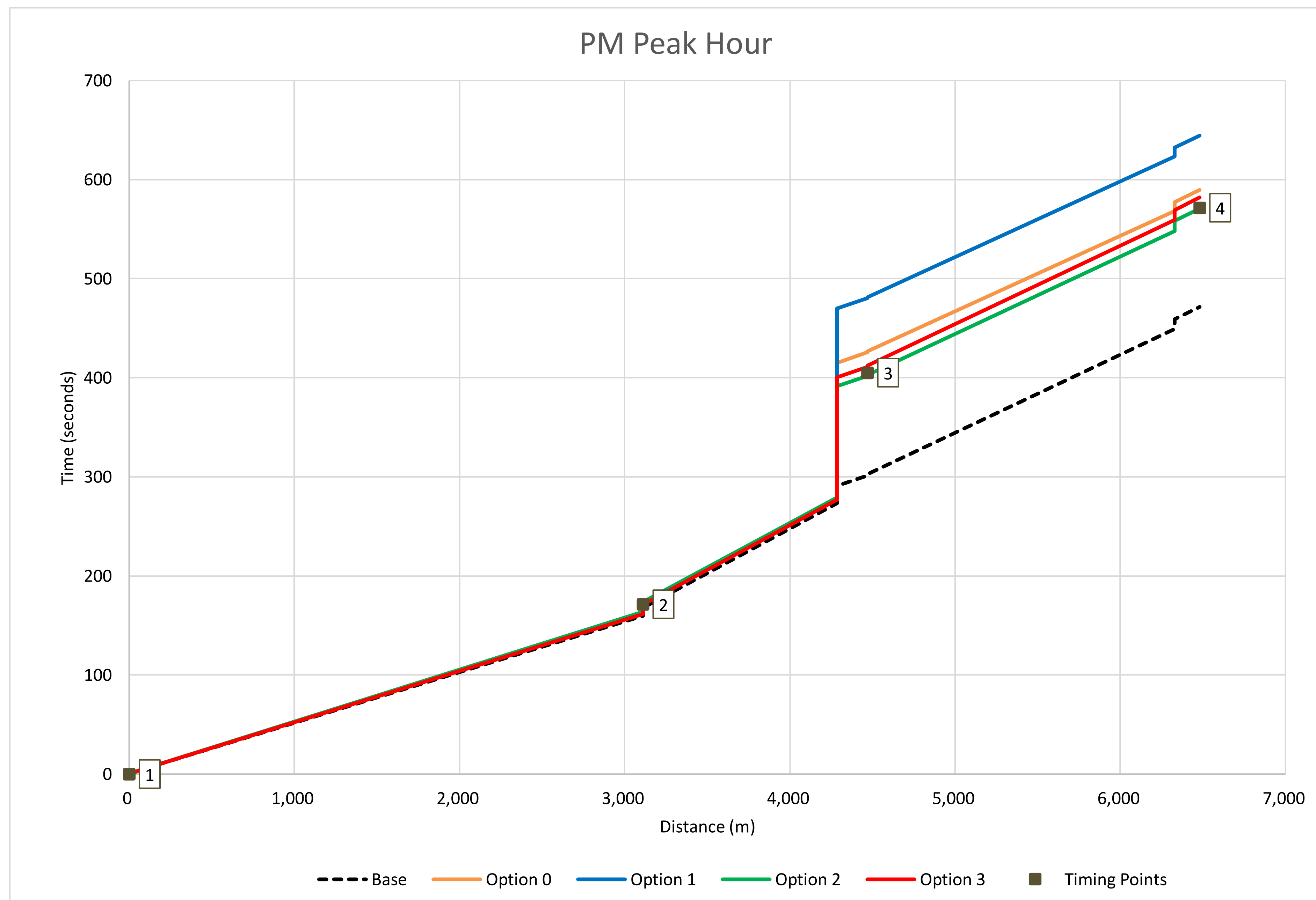




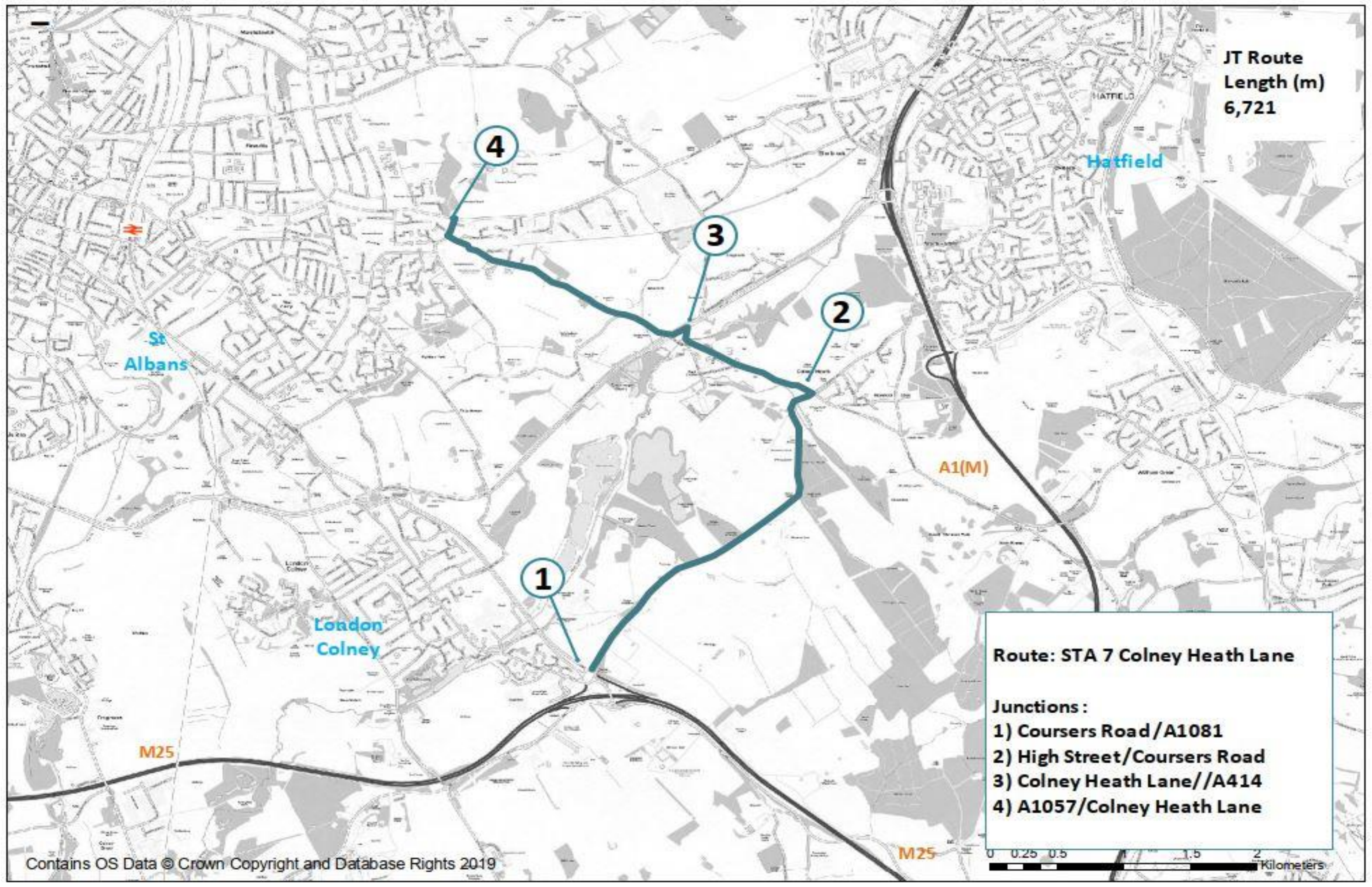
Route: STA7_NB

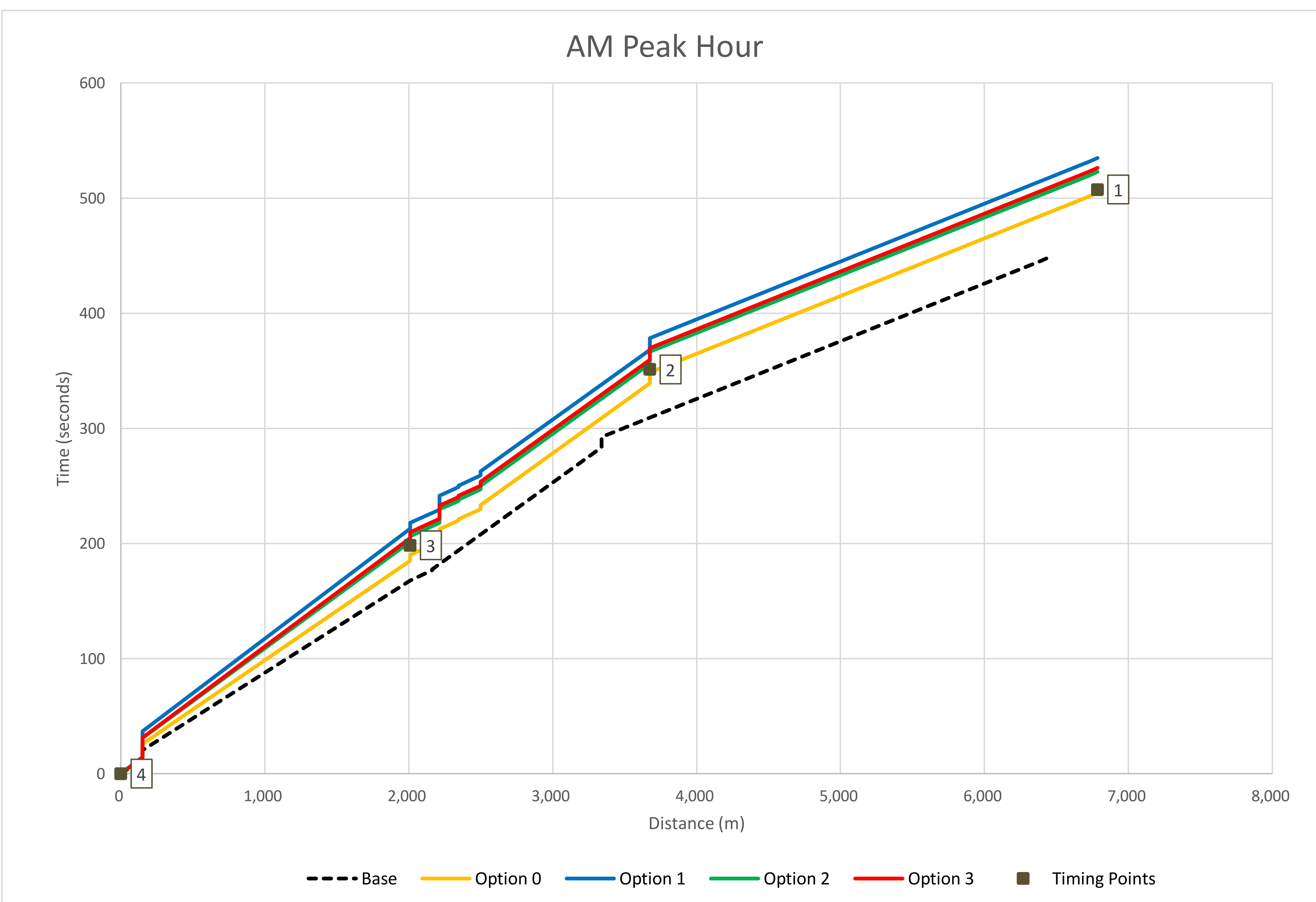


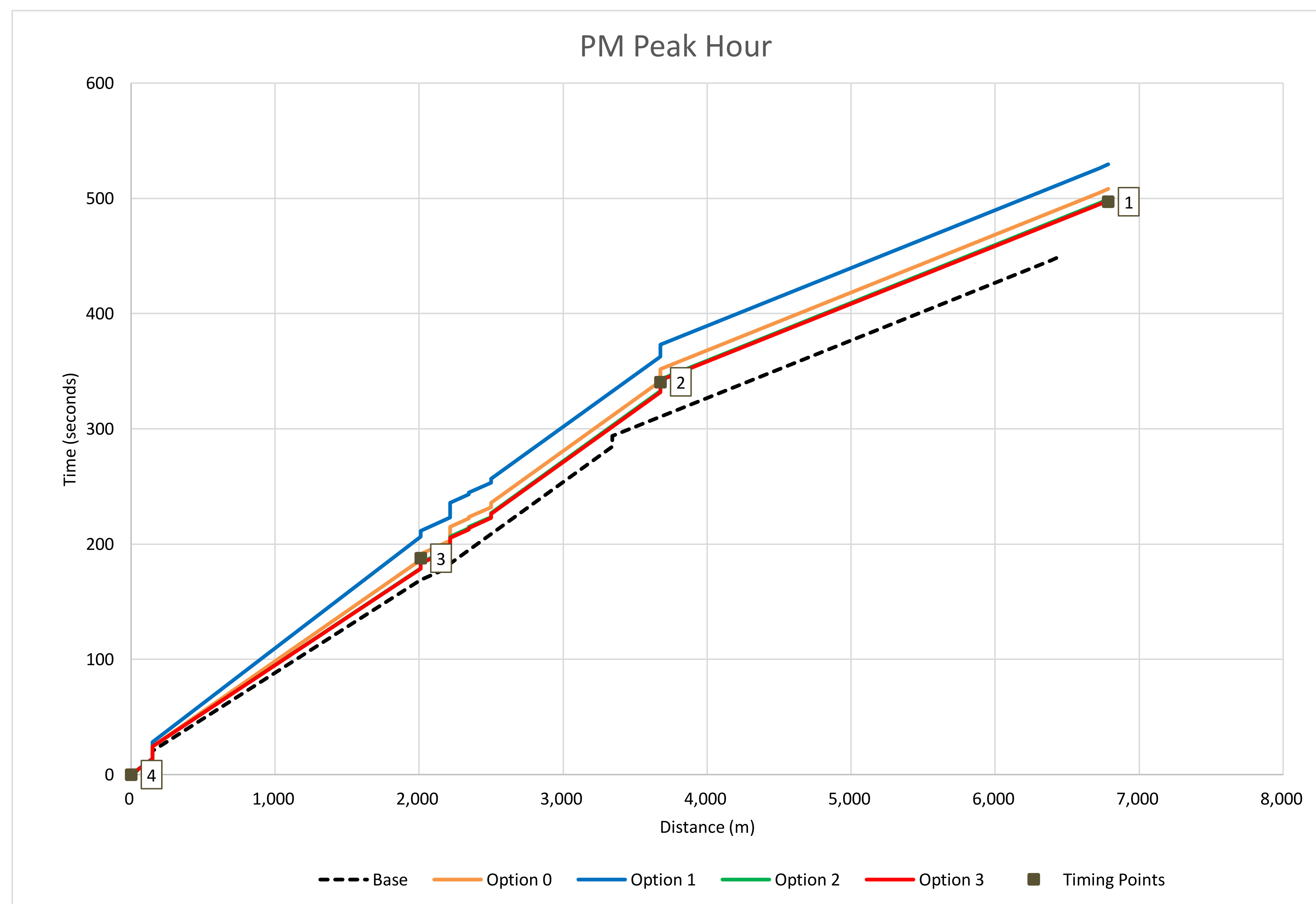




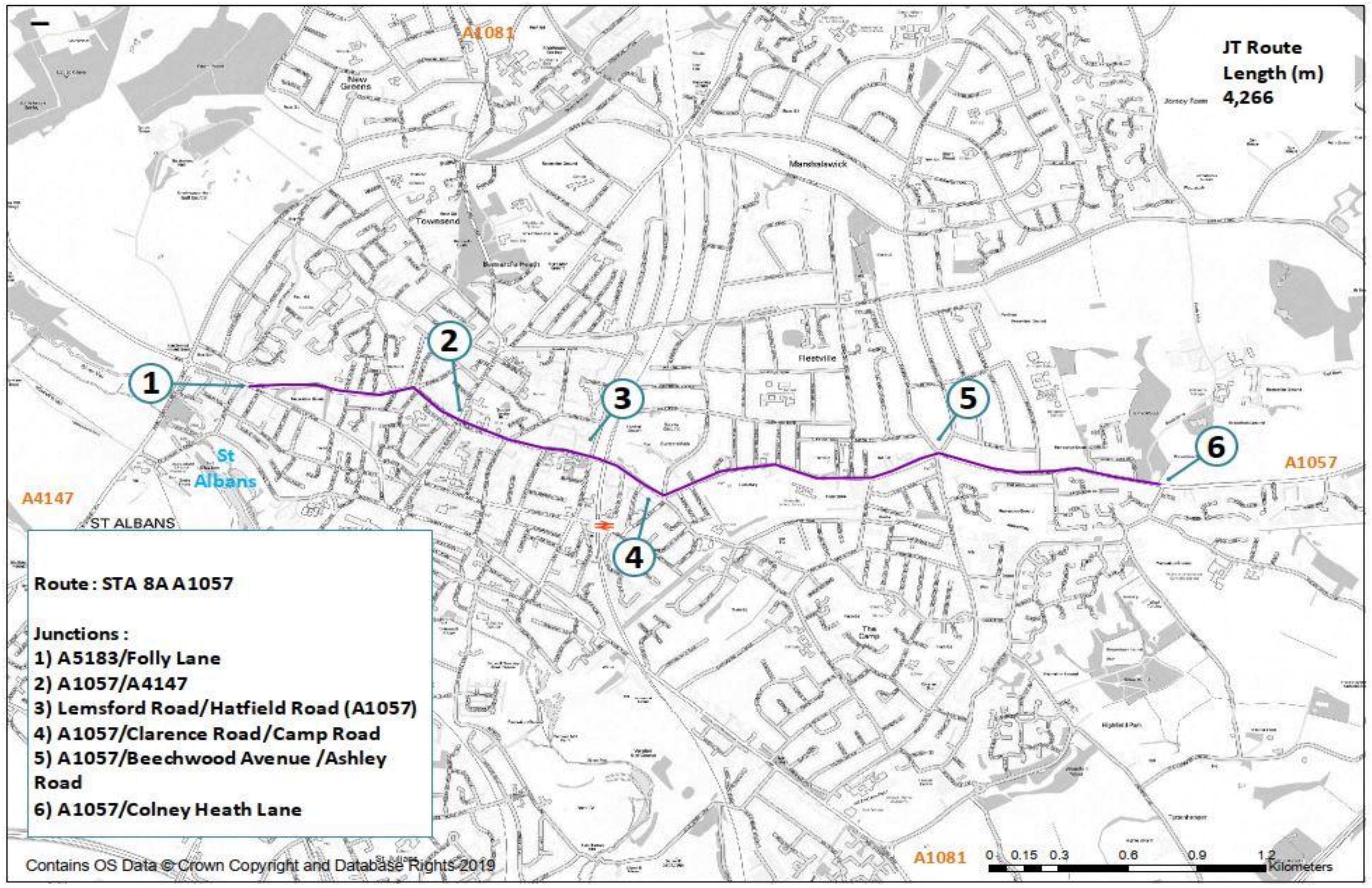
Route: STA7_SB

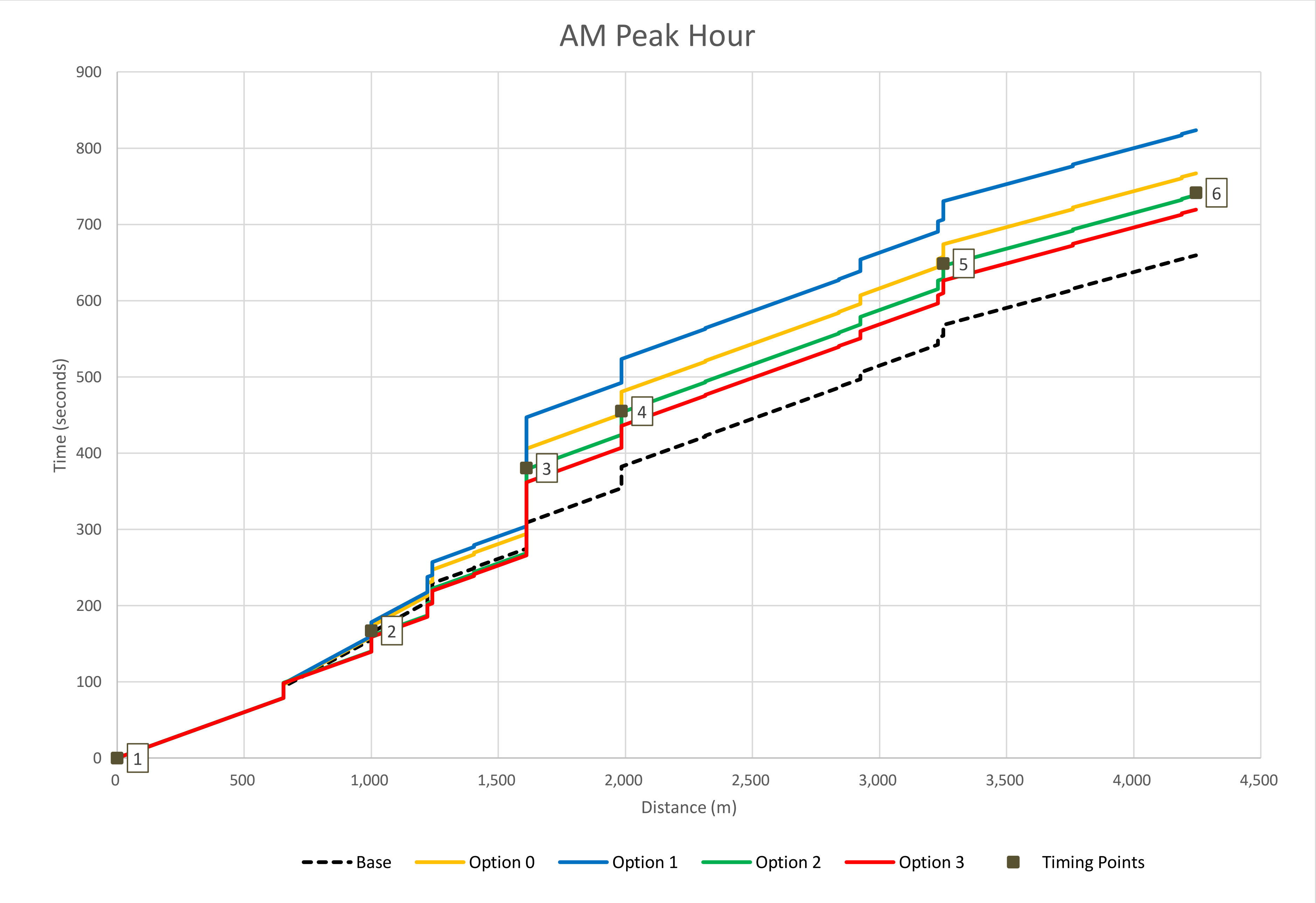


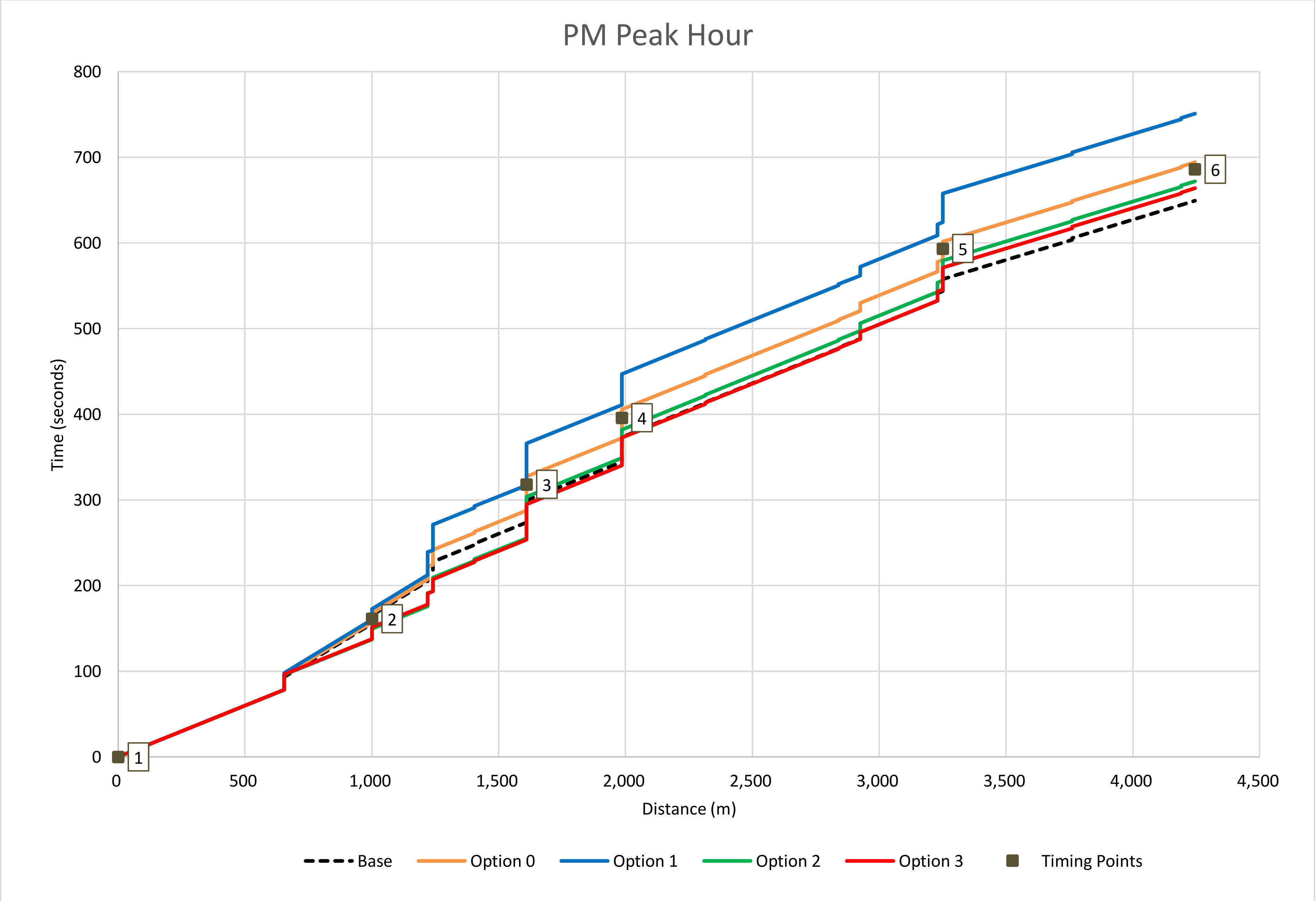




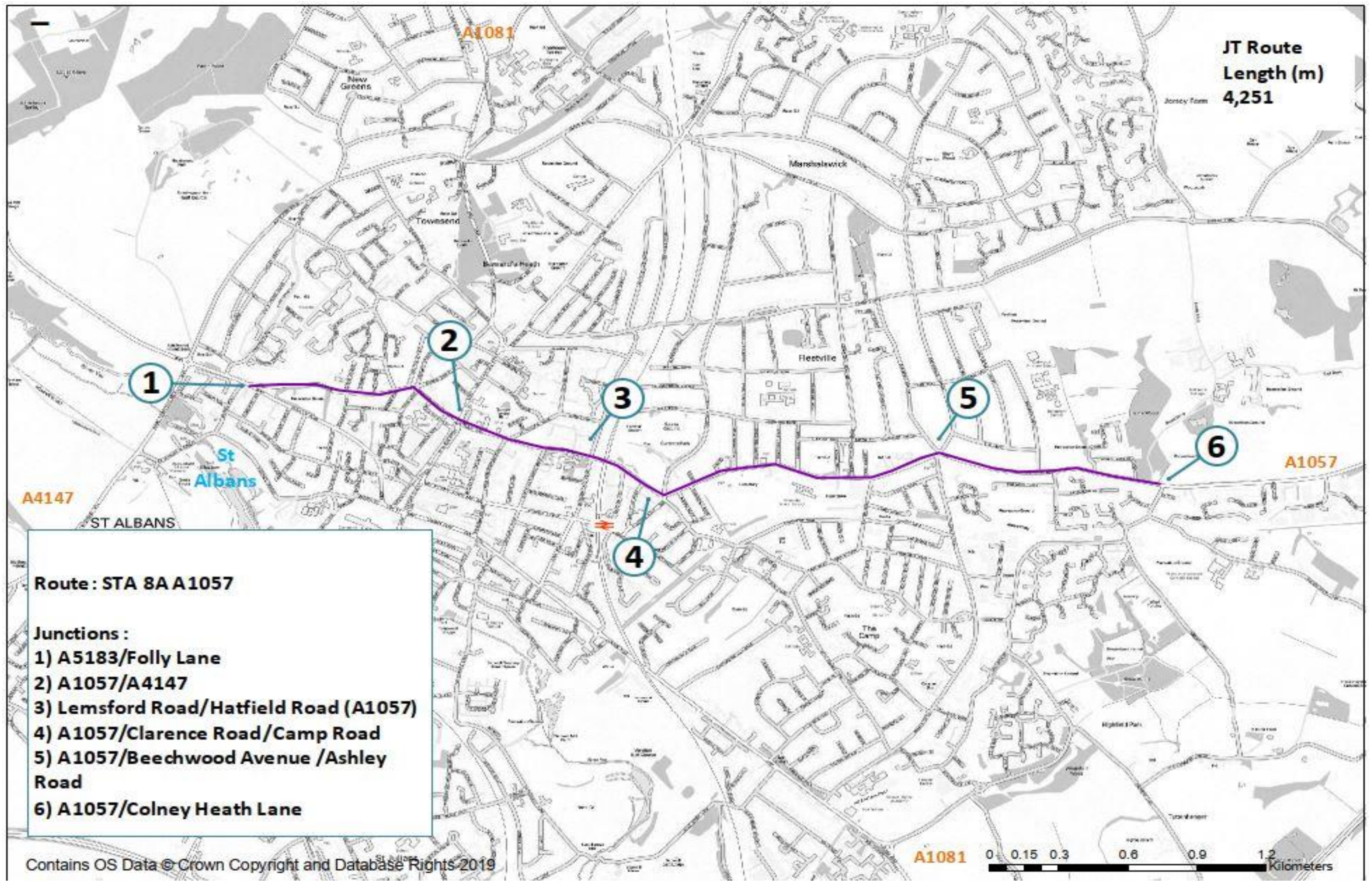
Route: STA8A_EB

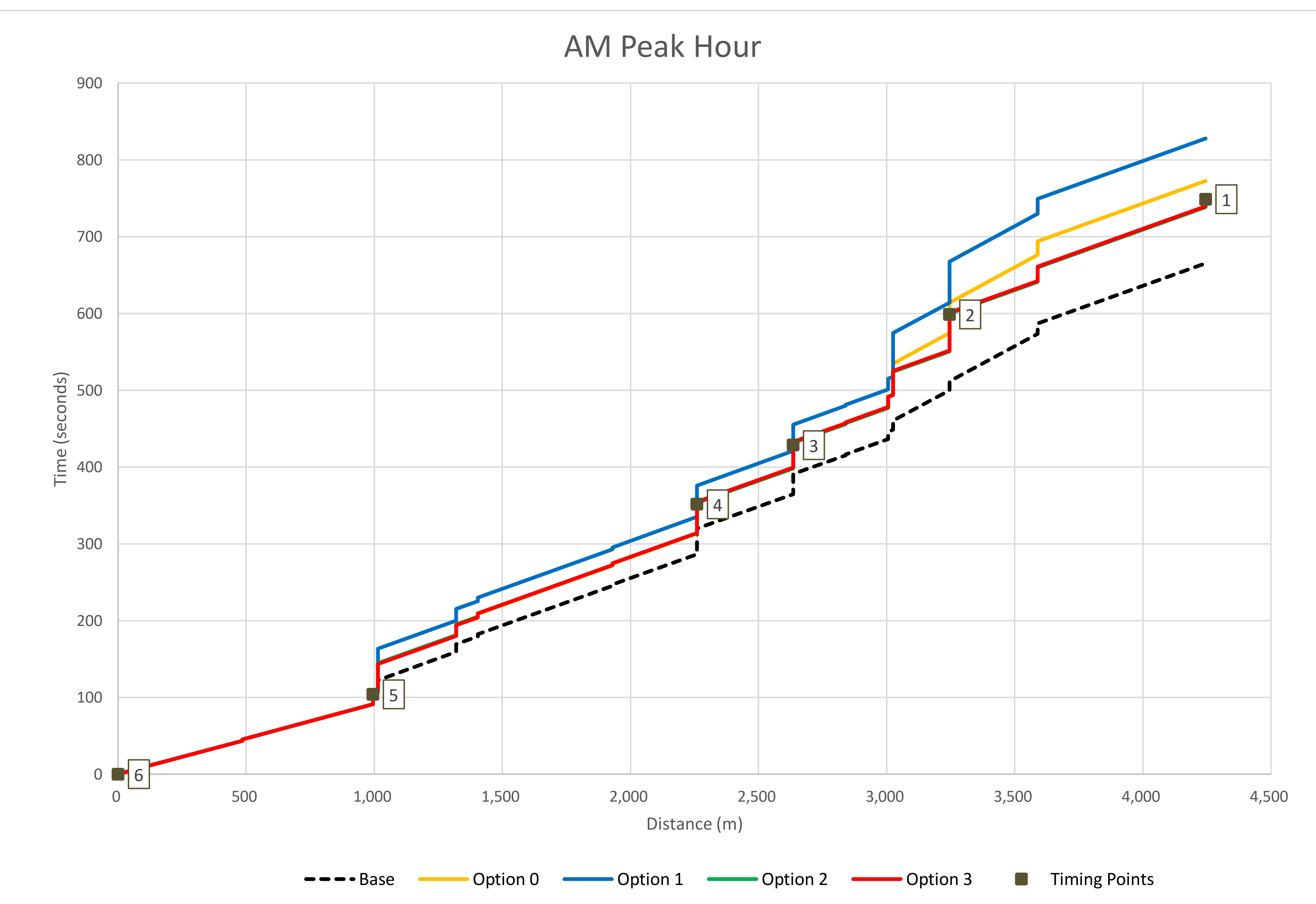


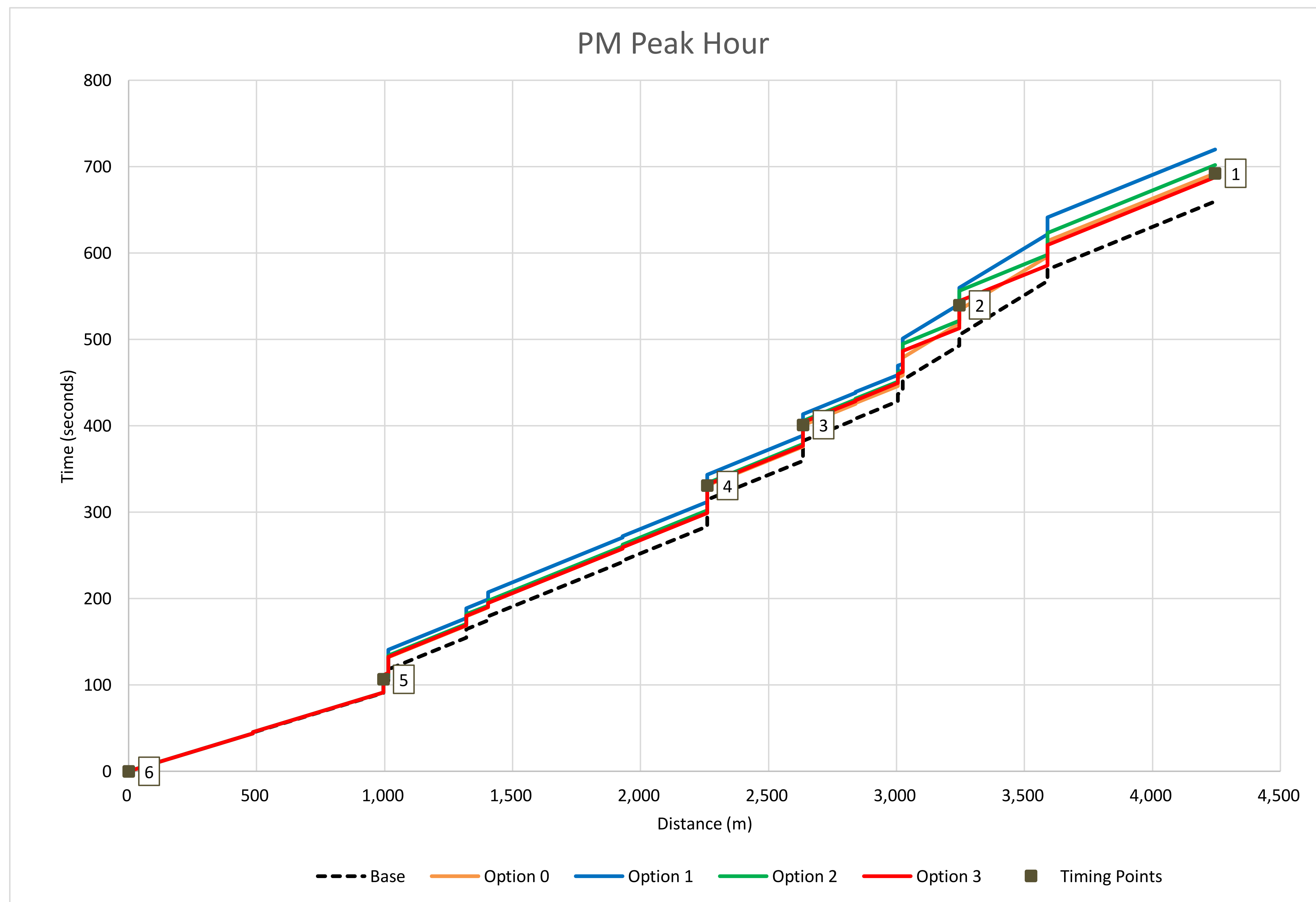




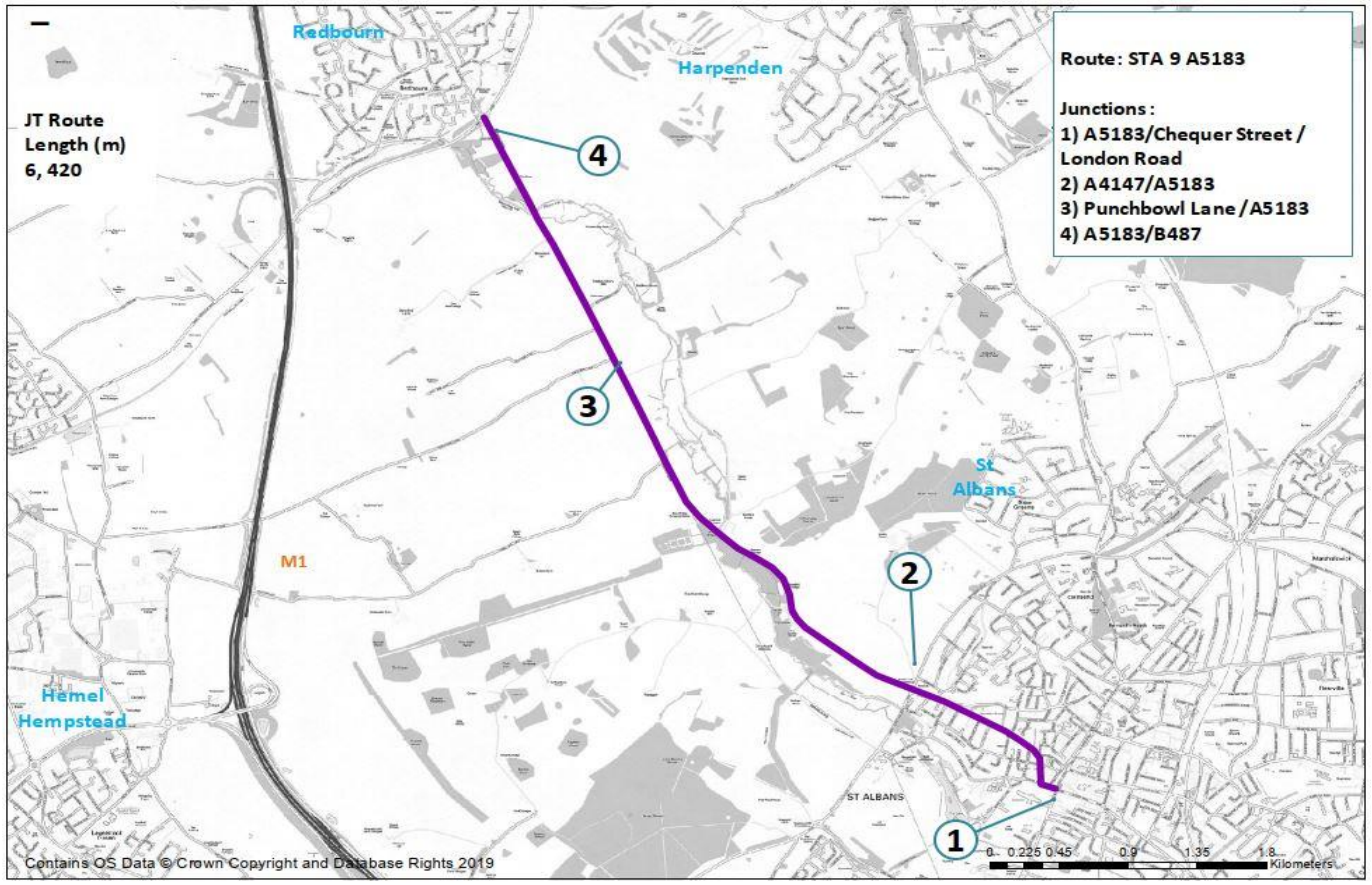
Route: STA8A_WB

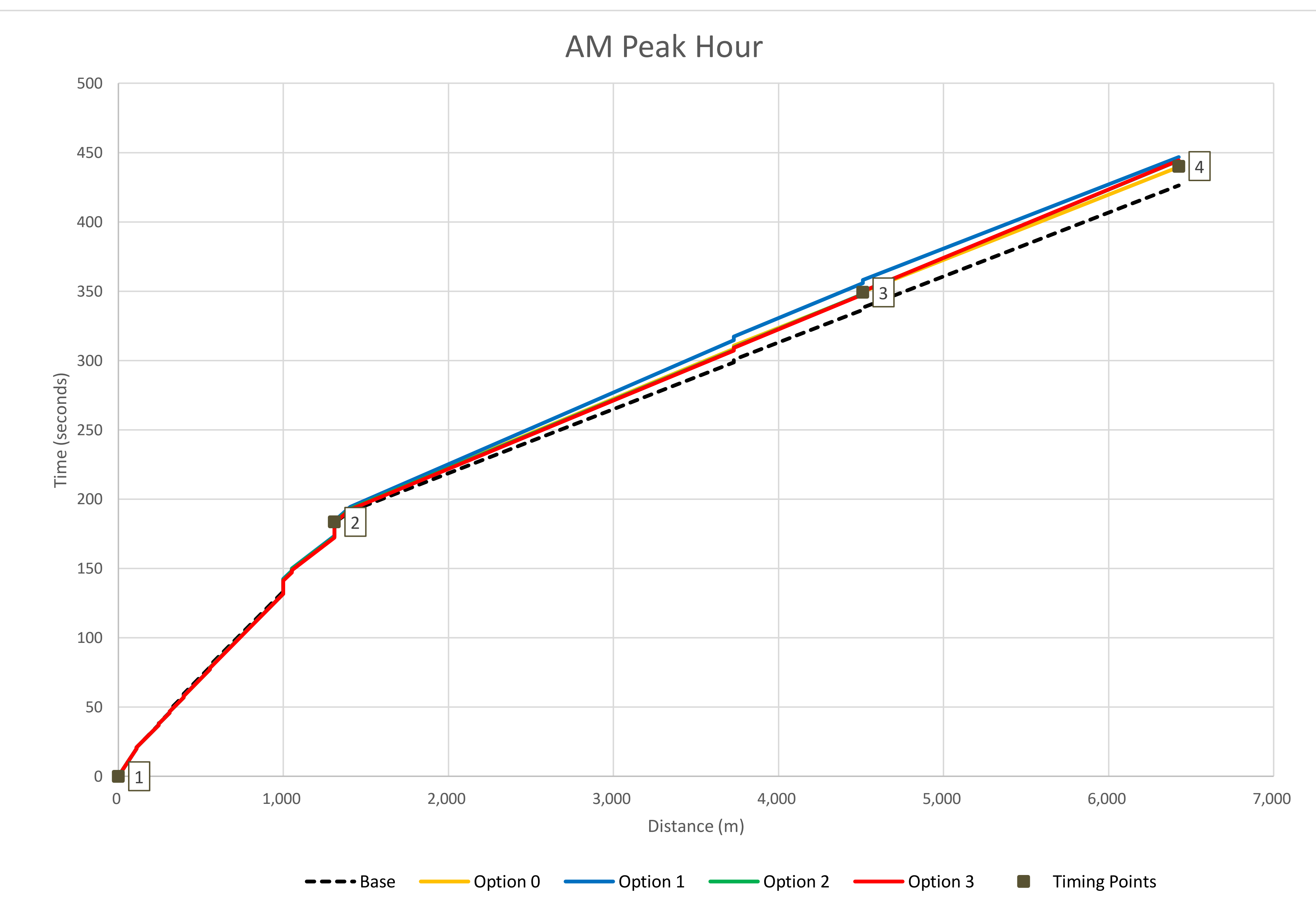


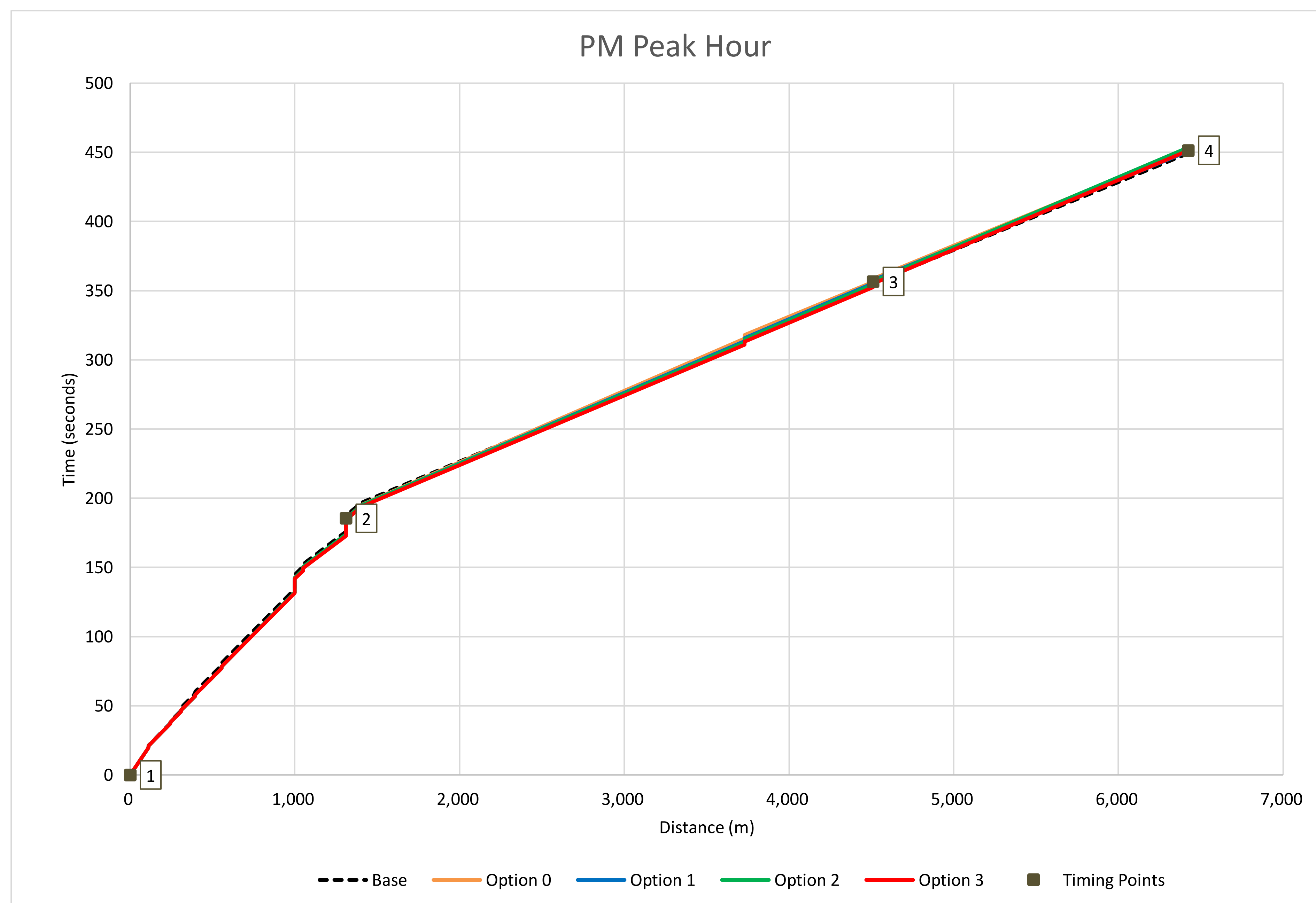




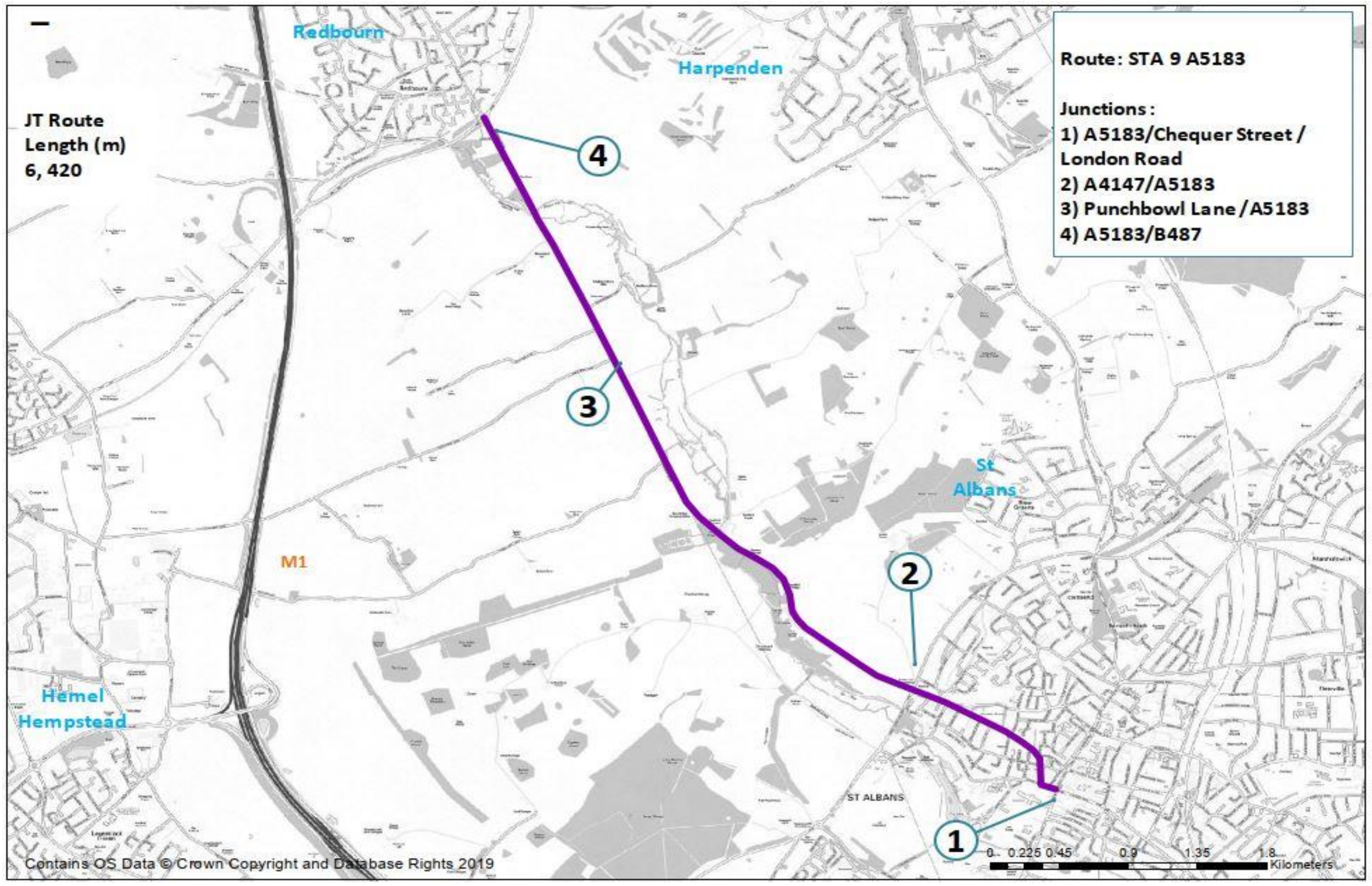
Route: STA9_NB

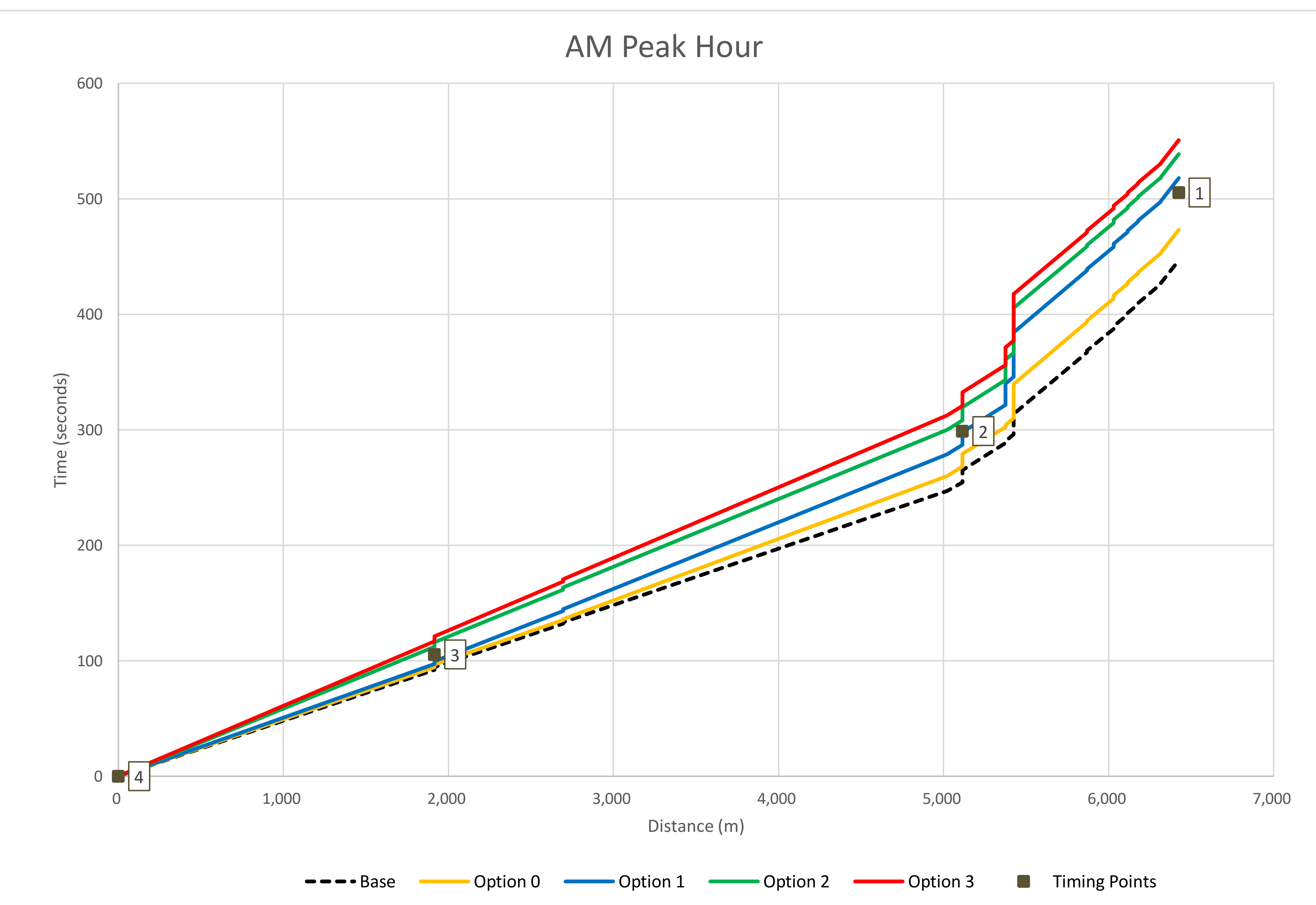


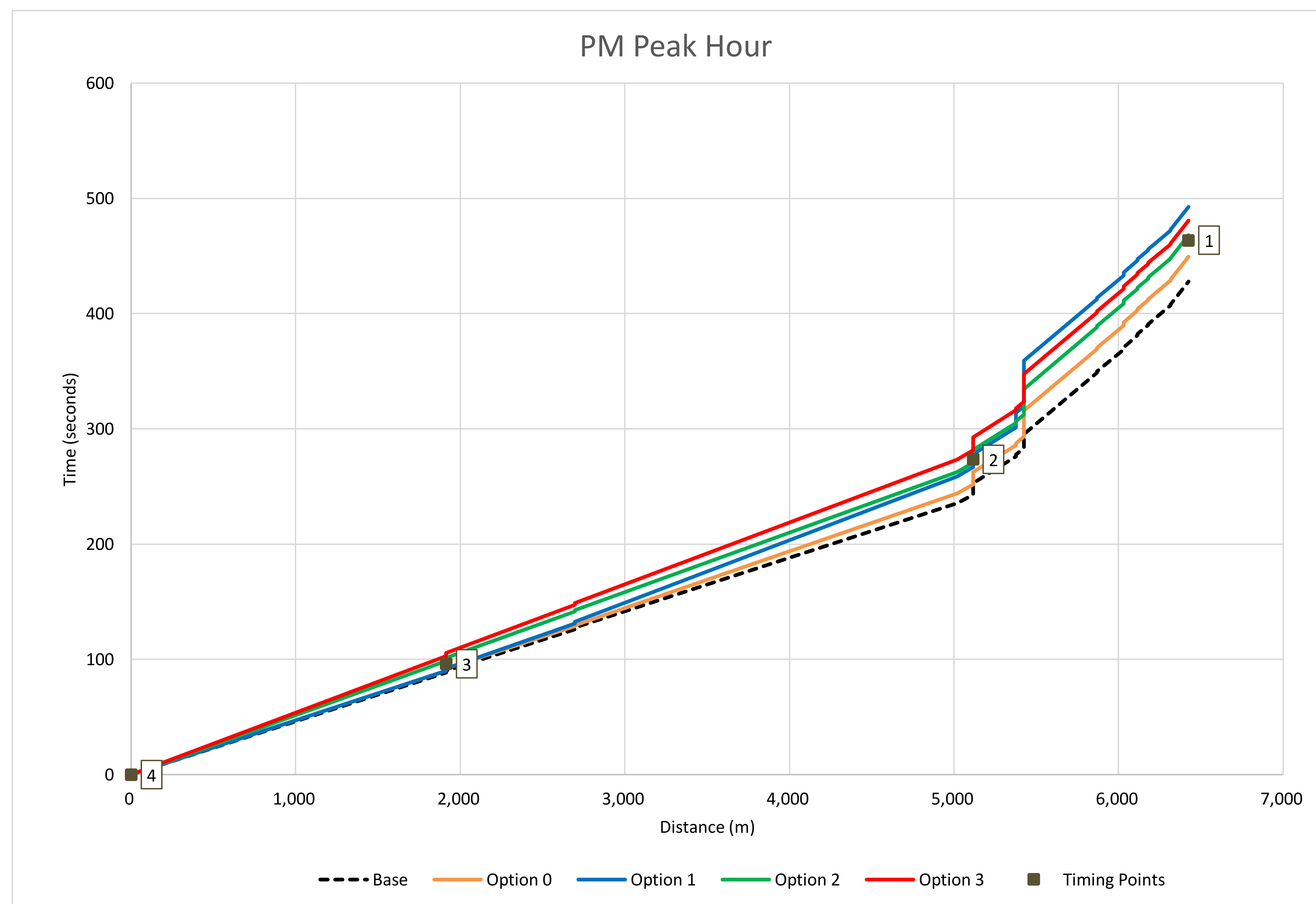




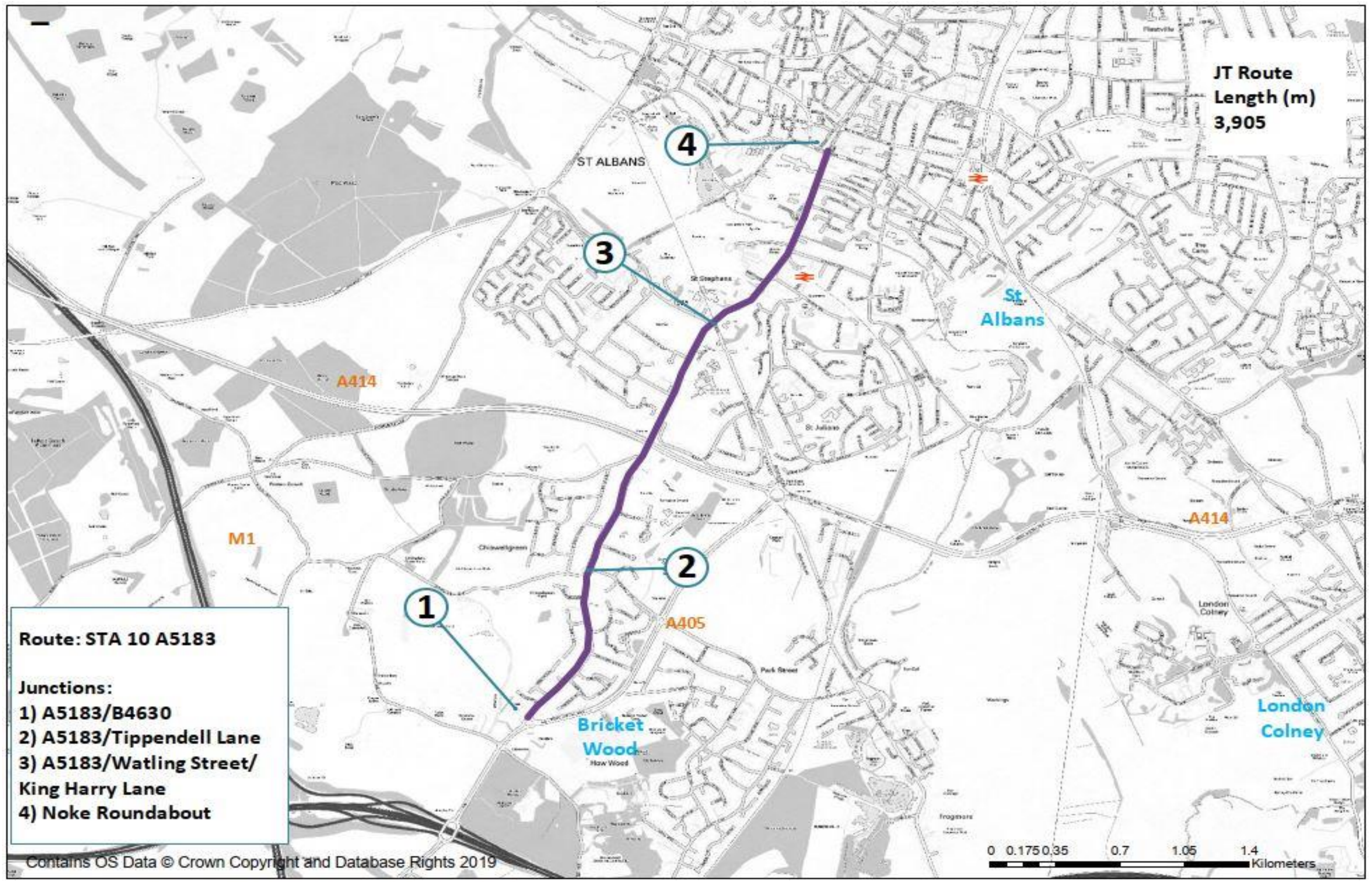
Route: STA9_SB

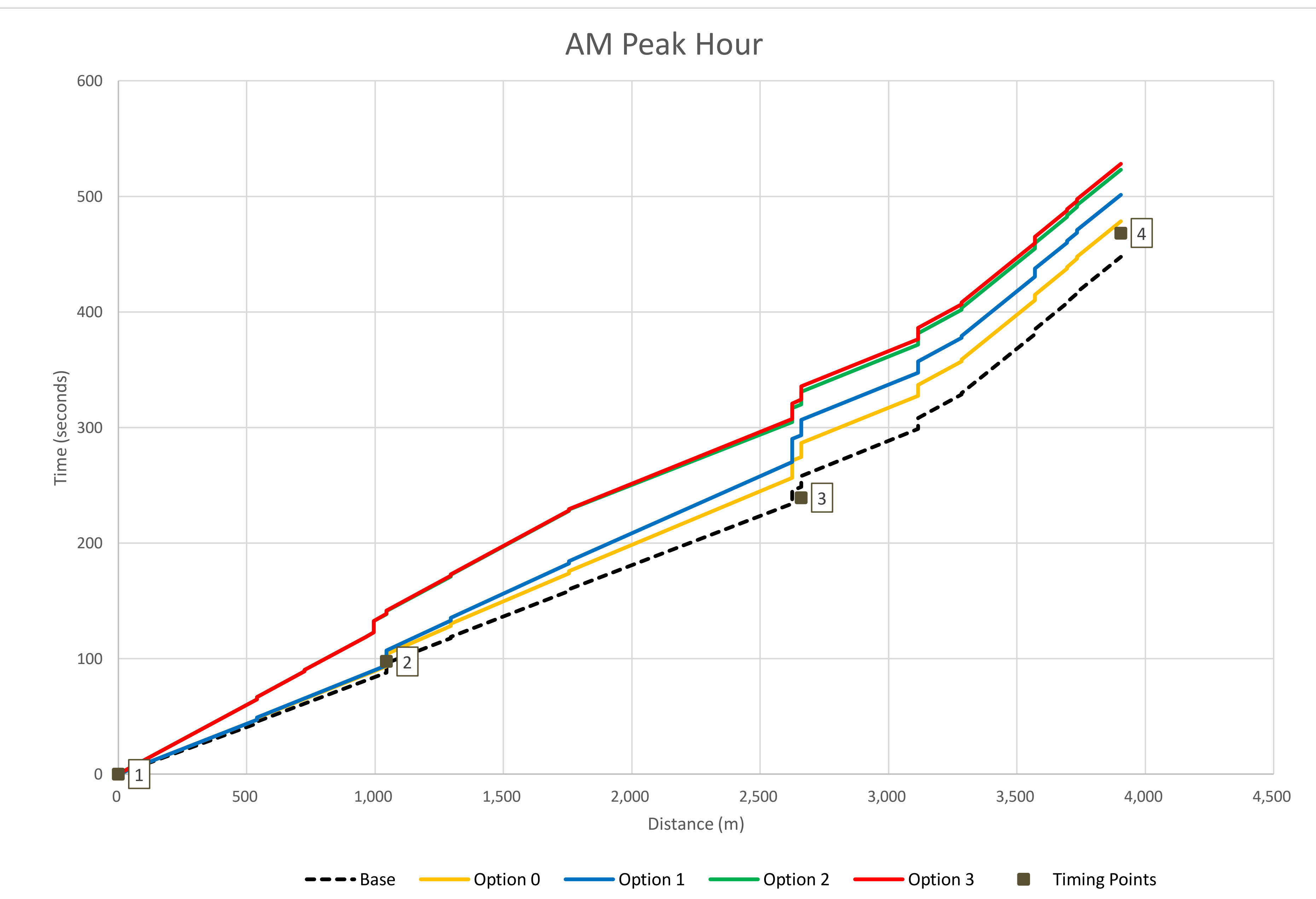


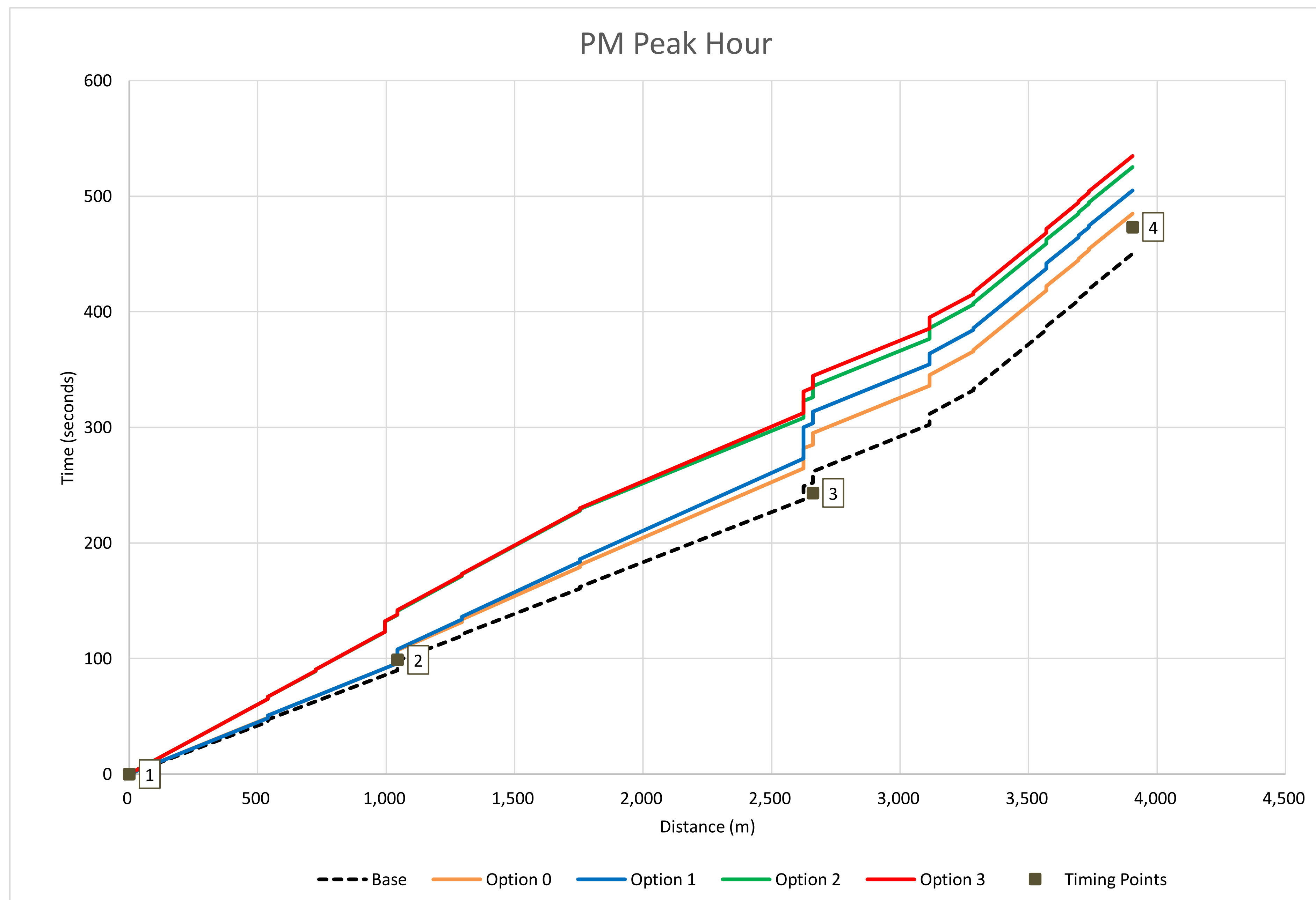




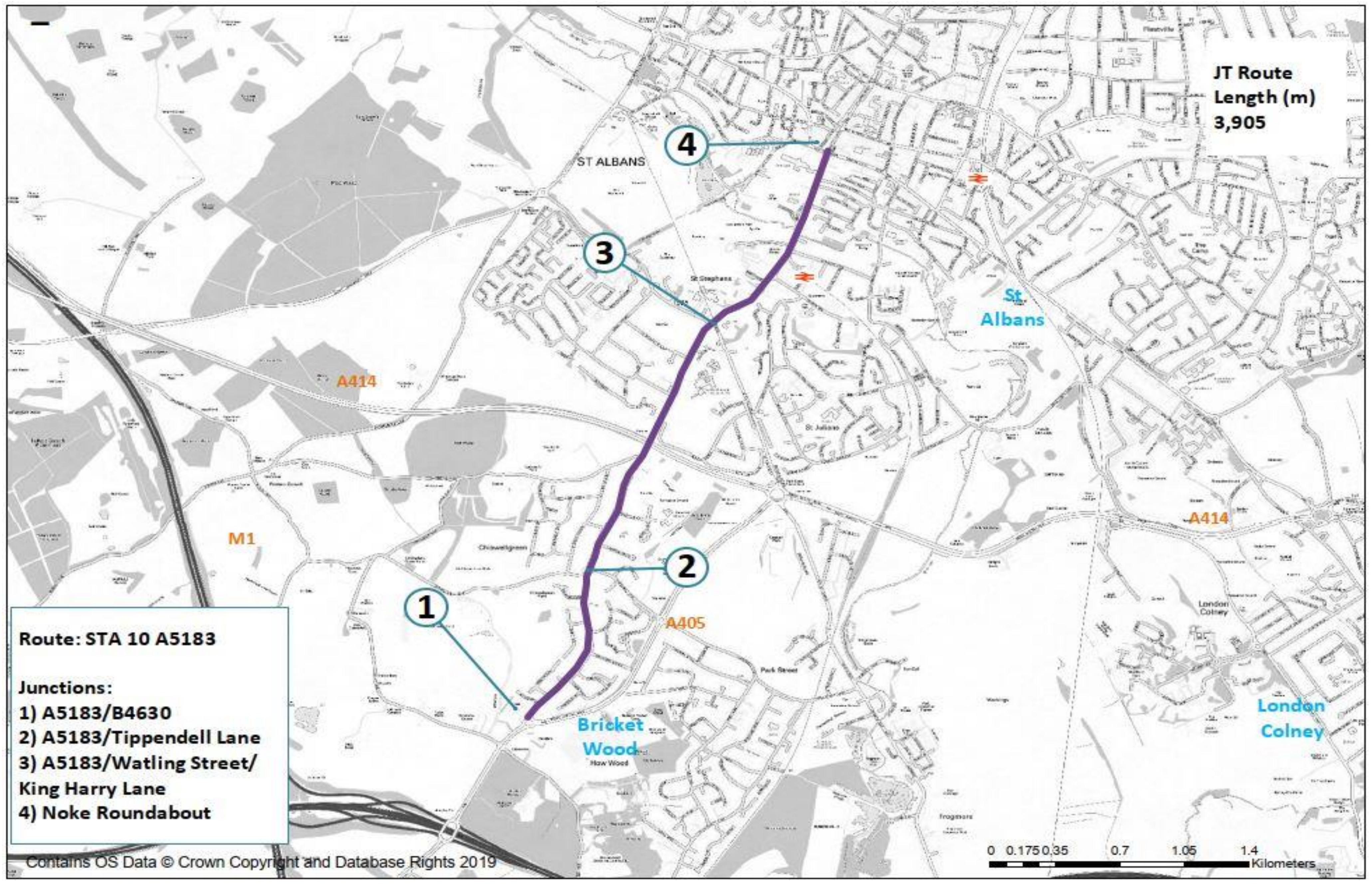
Route: STA10_NB

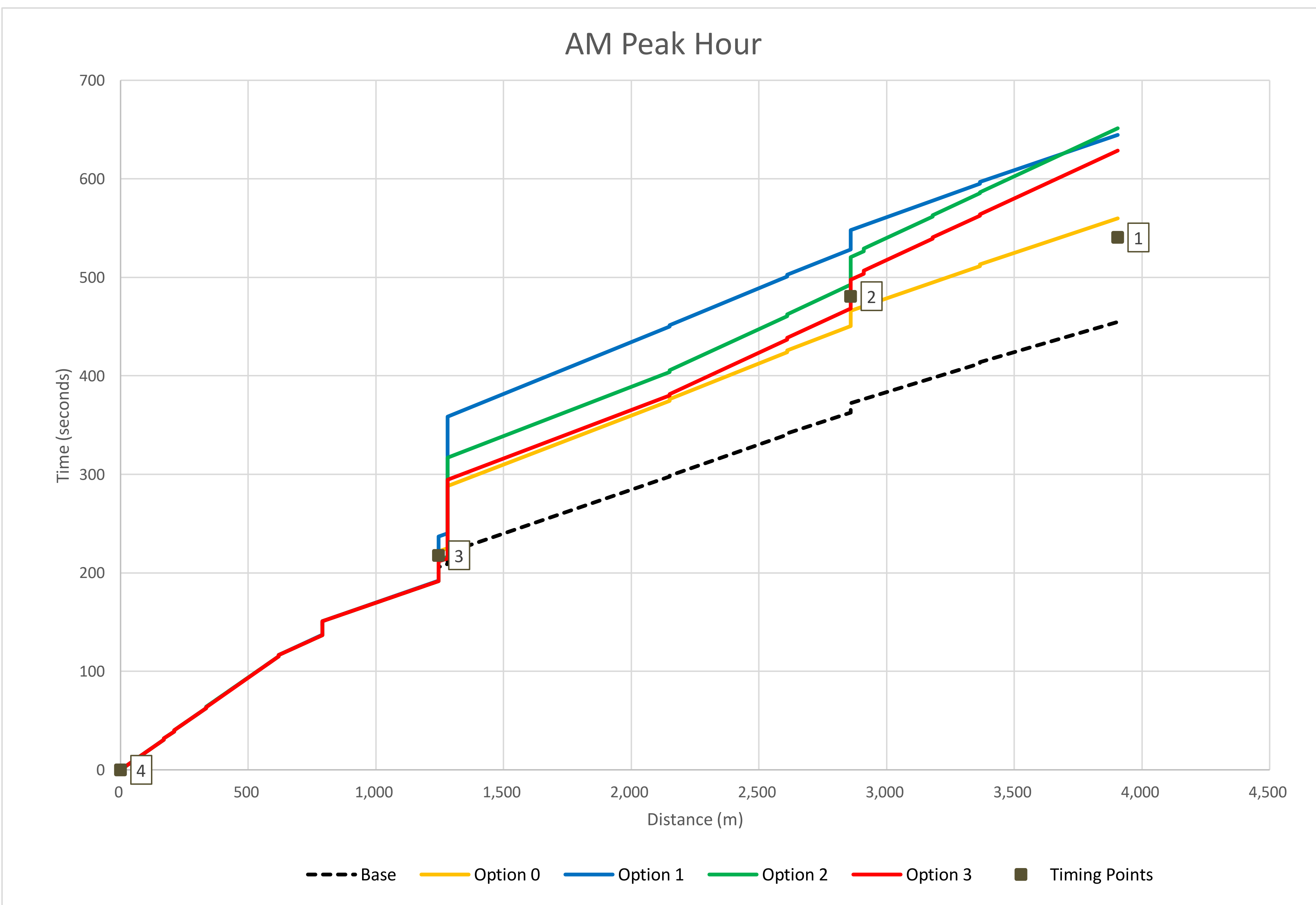


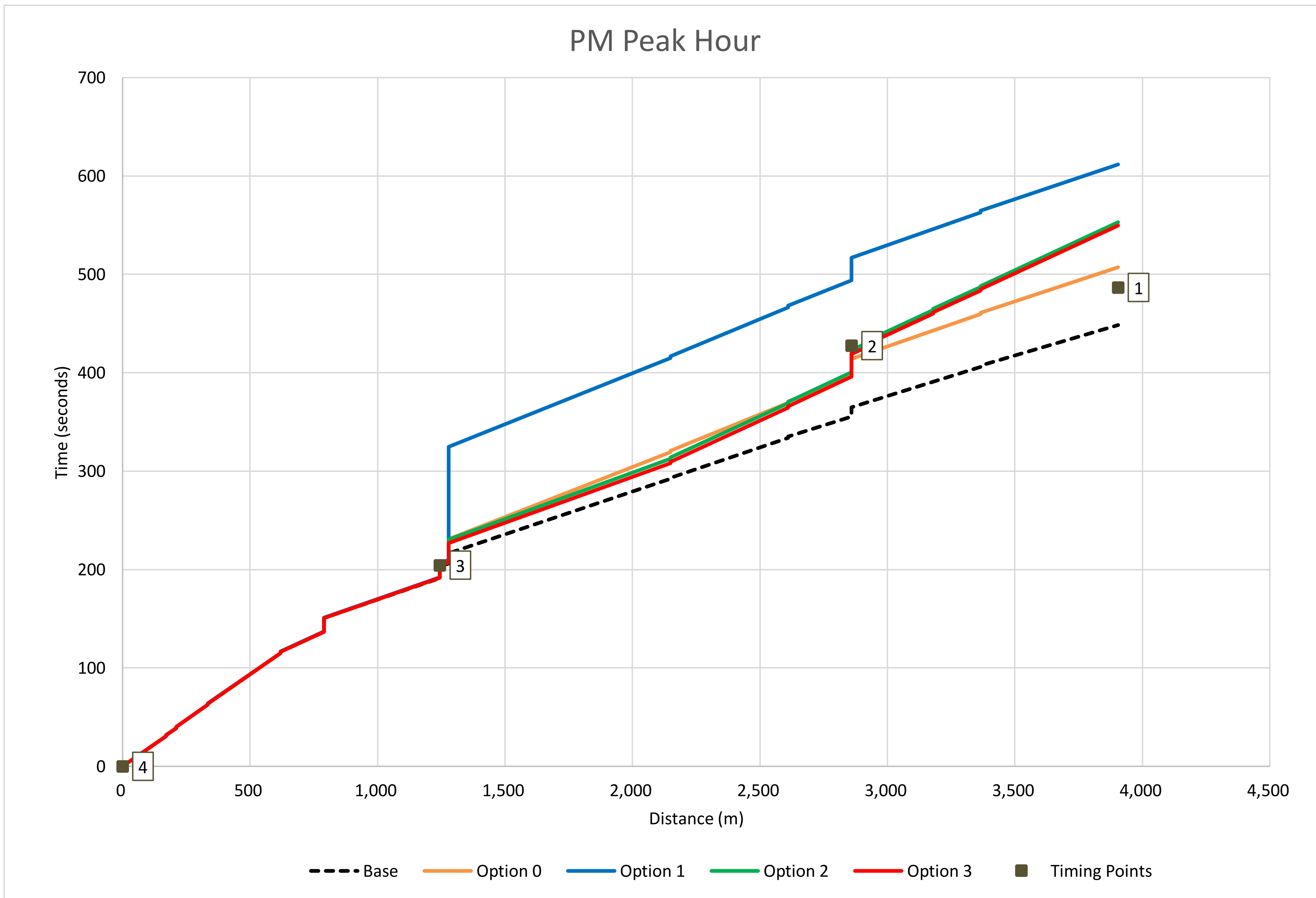




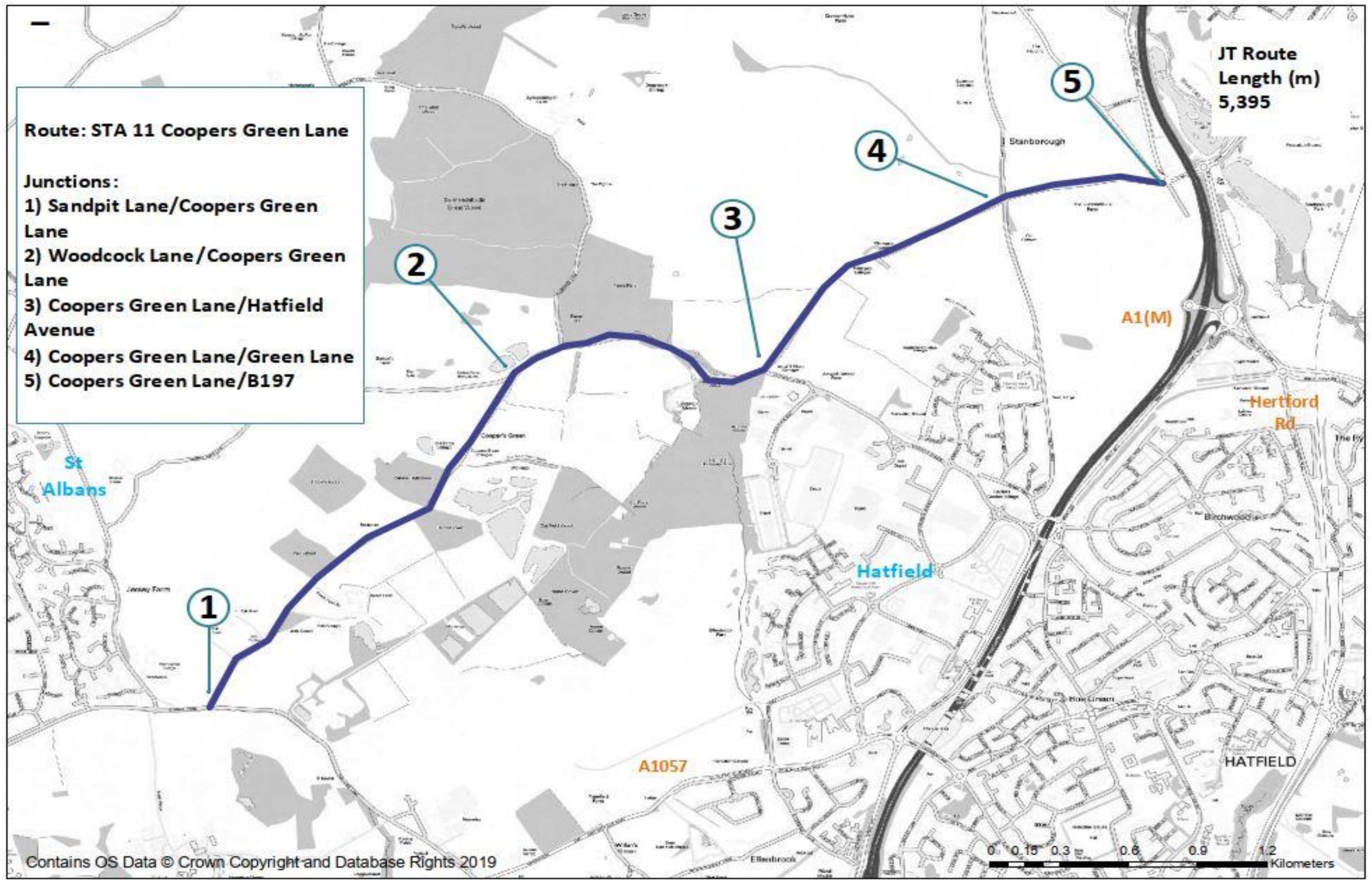
Route: STA10_SB

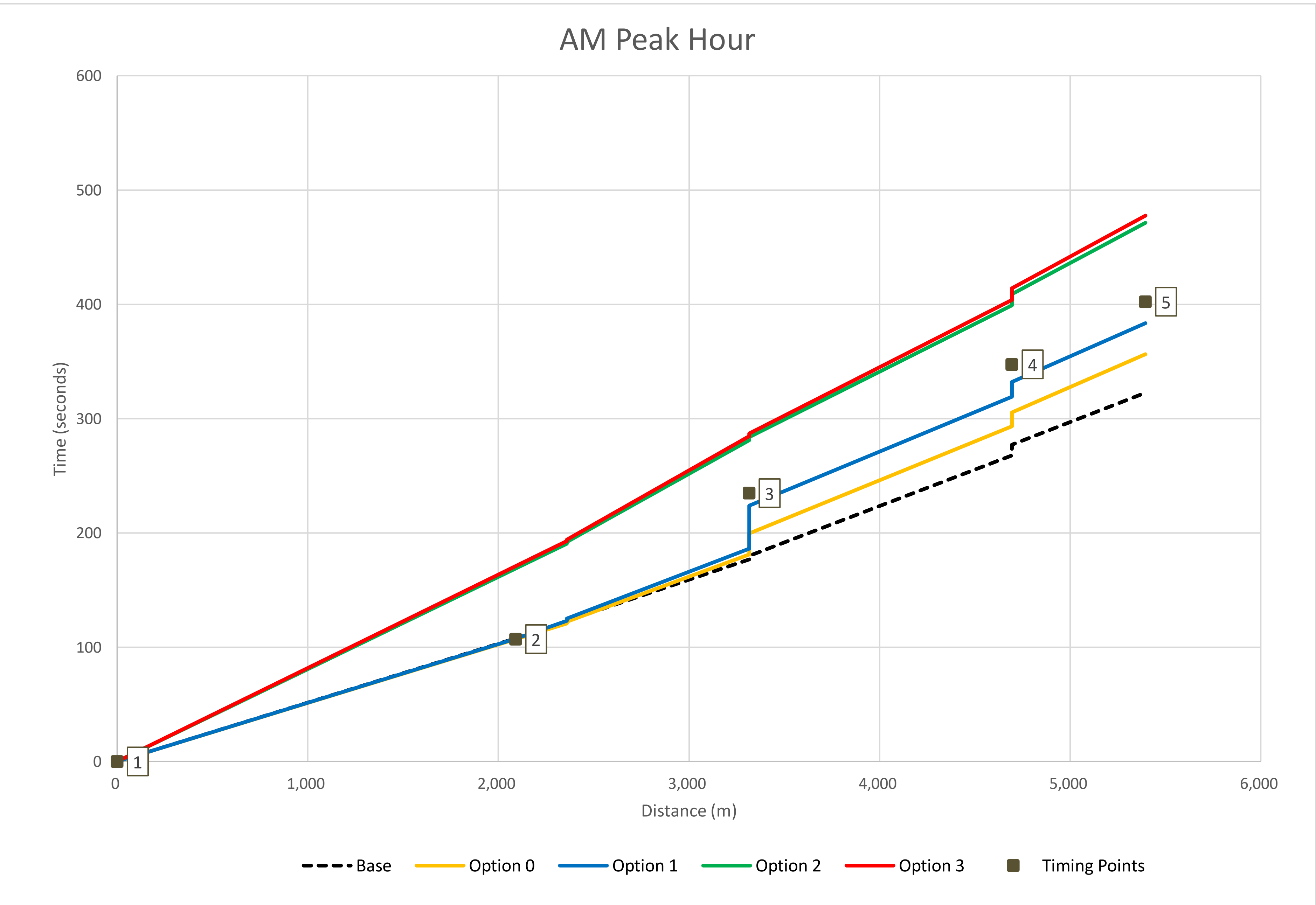


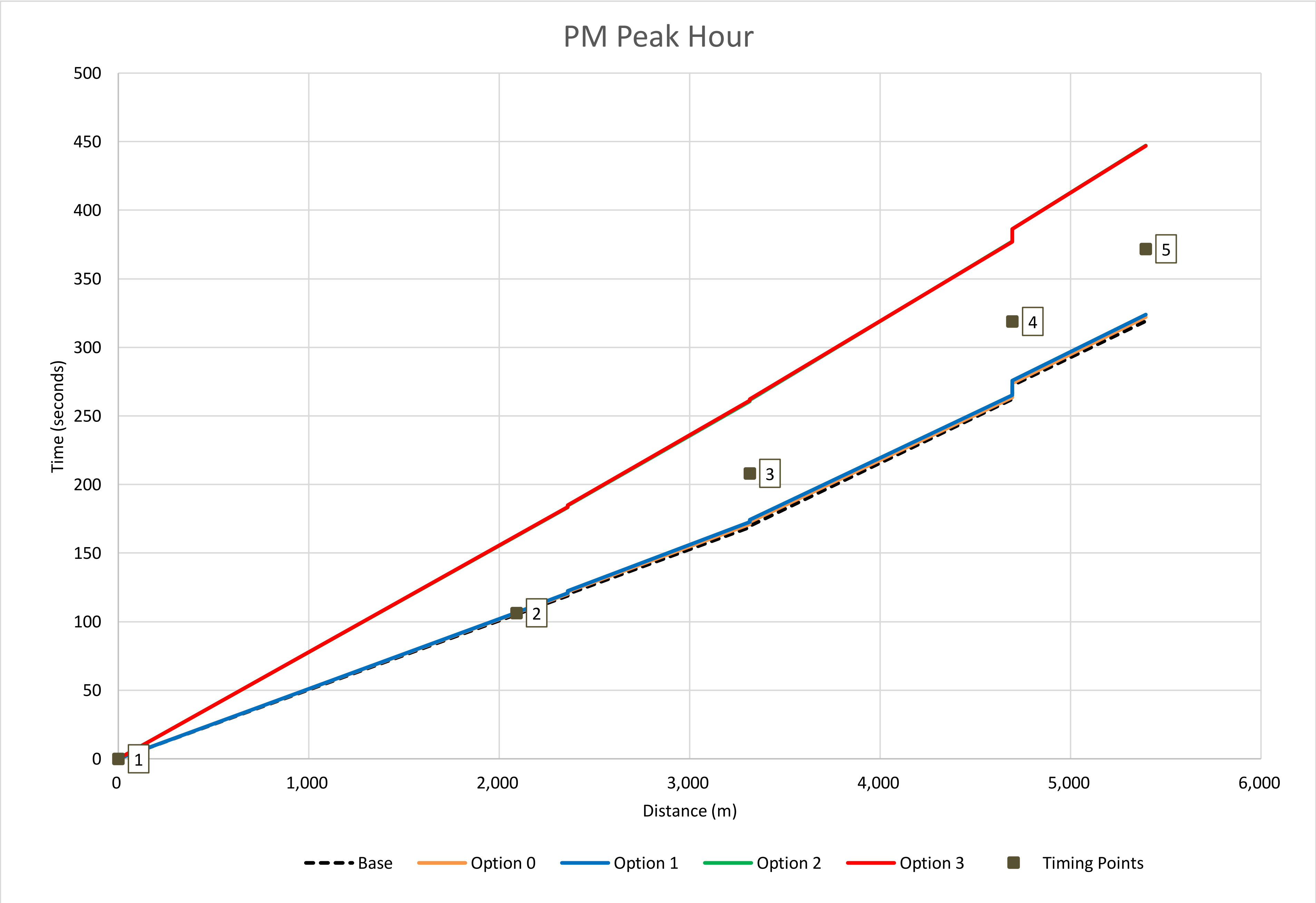




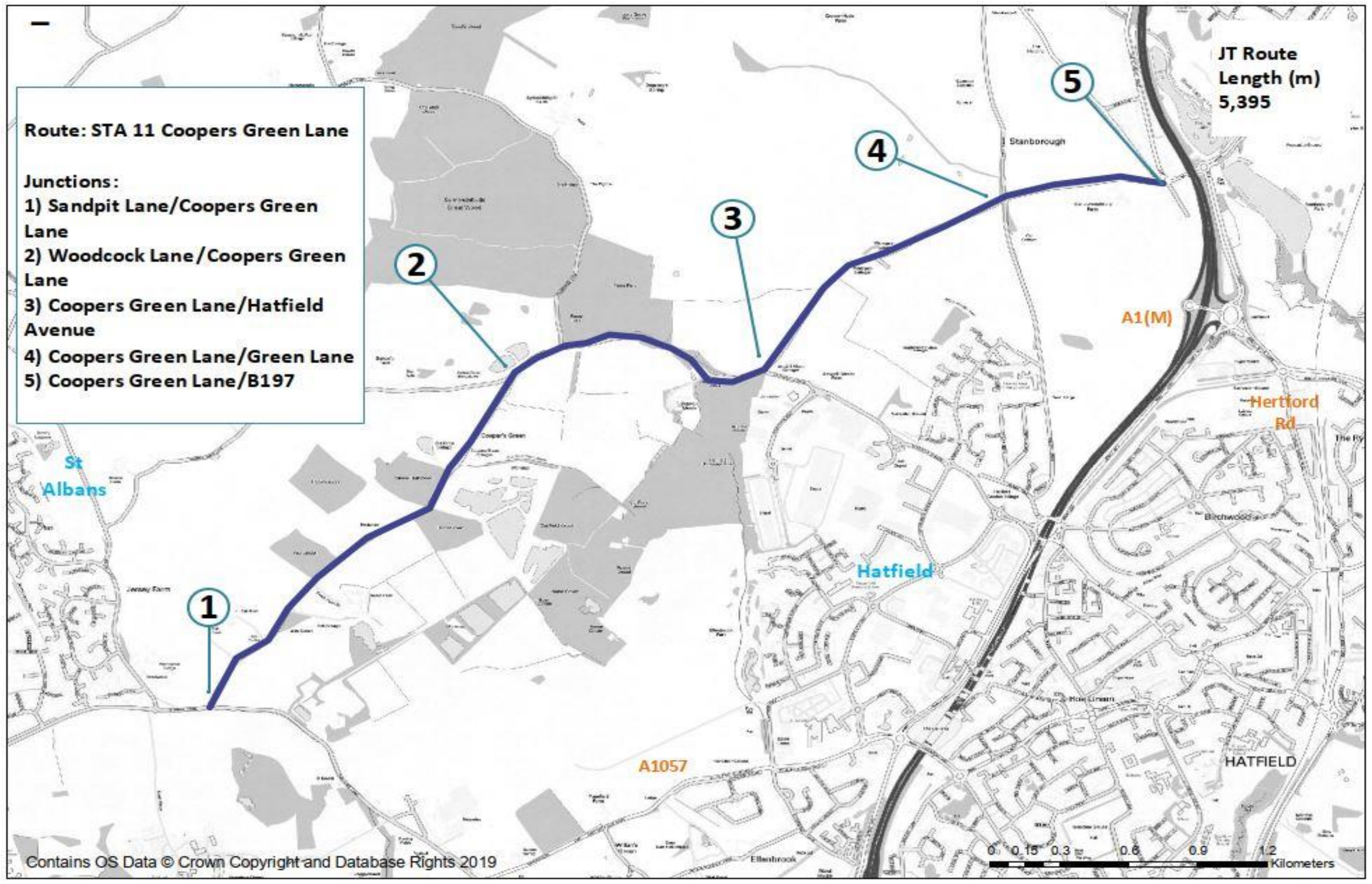
Route: STA11_NB

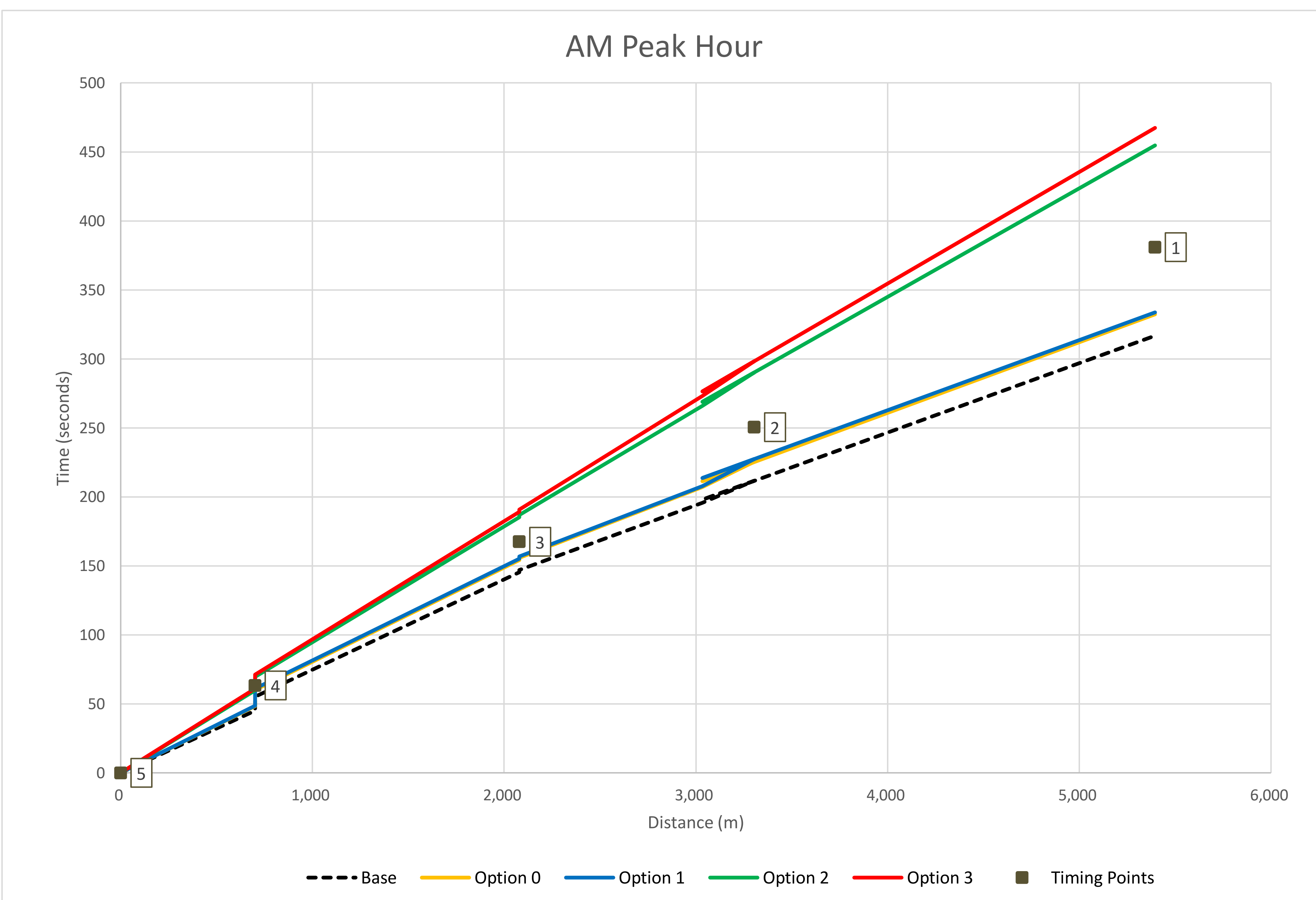


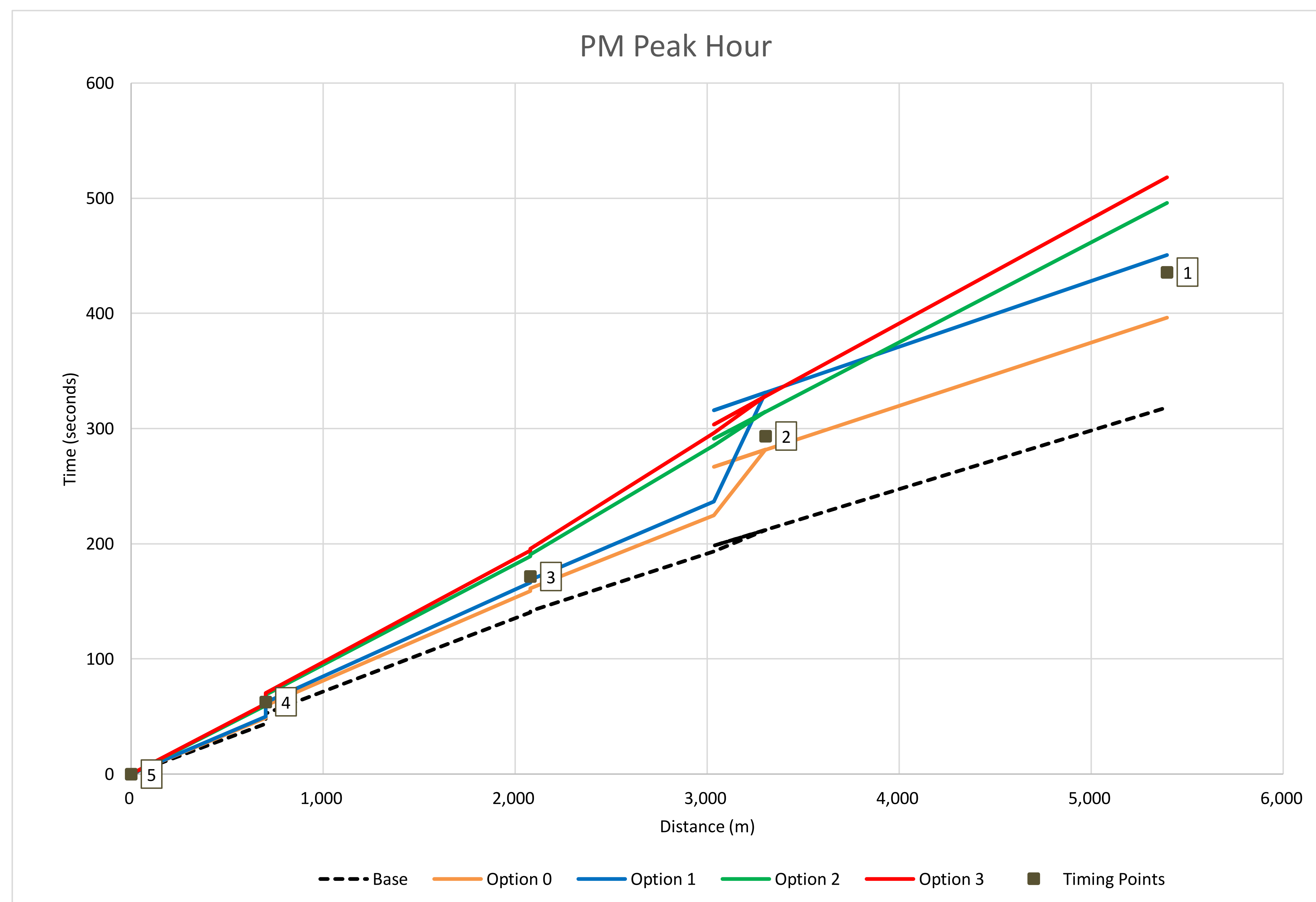




Route: STA11_SB







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