Appendix B Horsham Highway Model Local Model Validation Report

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Stantec

Horsham Transport Study

Horsham Transport Model Data Report

On behalf of **Horsham District Council**

Project Ref: 45539| Rev: A | Date: November 2019

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Document Control Sheet

Project Name: **Horsham Transport Study**

Project Ref: **45539**

Report Title: **Horsham Highway Model Data Report**

Doc Ref: **HTM/R1**

Date: **1st November 2019**

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Approved by:				
For and on behalf of Peter Brett Associates LLP				

Revision	Date	Description	Prepared	Reviewed	Approved

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1 Introduction

1.1 Overview

1.1.1 Peter Brett Associates LLP (PBA) was commissioned by Horsham District Council (HDC) to create a Strategic Transport Model of the area, the Horsham Transport Model (HTM). The model is to be developed to support HDC in production of a transport evidence base for the emerging Local Plan for the District up to 2036.

1.1.2 This Data Report will be the first in a series of reports which will be produced to inform the transport evidence base and in production of the model.

1.1.3 The remit of the HTM required that as much existing data as possible, this is consistent with good practice guidance contained in the Department for Transport's (DfT) internet-based transport appraisal guidance known as TAG[1]. This guidance recognises that data collection can consume significant resources in a modelling project. Therefore, wherever possible, new data collection must be kept to a minimum while making efforts not to compromise the robustness of the model and its potential to conform to TAG criteria for calibration and validation.

1.1.4 This report summarises the data that will be used to create the HTM and includes both existing data and newly collected data.

1.1.5 The types of existing and newly collected data comprise of the following and the method for collecting this data is discussed later in this report:

- Automatic Traffic Counts (ATC)
- Manual Classified Counts (MCC)
- Pedestrian and cycle counts
- Journey Time data
- Mobile Phone data for matrix building
- Traffic Signal Data

1.2 Study Area and Model Overview

Study Area

1.2.1 The detailed study area is shown in Figure 1-1 and will include the urban area of Horsham town and the entire district of Horsham. It will also include some roads outside of the Horsham District, where the Horsham District Local Plan strategic housing allocations may have an impact and would need to be reported. These links include parts of the SRN, as well as links within neighbouring district authorities within West Sussex. and within Surrey.

[1] https://www.gov.uk/guidance/transport-analysis-guidance-TAG

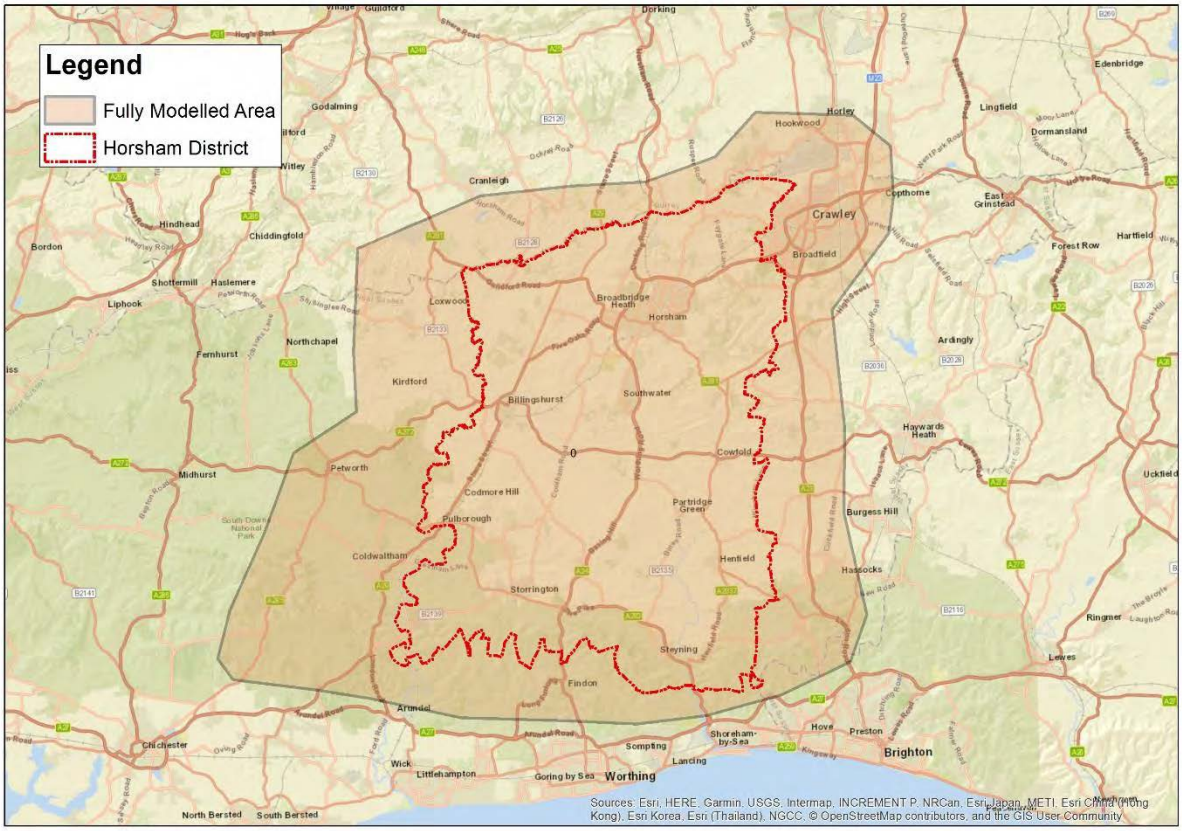


Figure 1-1: Horsham Transport Model – Study Area

Model Overview

1.2.2 The aim of the overall project is to develop a traffic model for the year 2019. This is known as the 'Base Year model' and will be developed with the aim to replicate the current conditions across the model area, thus meeting the validation criteria set out in TAG as best as possible. Validation is the process of checking the modelled outputs against observed traffic data. This process utilises traffic link and turning count data, along with journey time data. It should be noted that the aim is not to validate every link and turning count within the model area, but to provide a representation of the picture as best as possible, Further information on the development of the 'Base Year' model will be provided within a Local Model Validation Report, on completion of this stage.

1.2.3 Once a 'Base Year' model is produced, this then be used to create what is known as 'Reference Case' future forecast models. These models will be produced to represent possible future traffic conditions at the end point of the Local Plan period, which in this case is 2036. Further information on the development of the 'Reference Case' models will be provided within a Model Forecast Report on completion.

1.2.4 The 'Reference Case' models will then form the basis on which the assessment of the impact of proposed Local Plan development within Horsham District, as well as potential impacts within neighbouring authorities will be measured.

1.2.5 During the course of the development of the model, West Sussex County Council, the highway authority for the road network within Horsham District, will be consulted and will provide support in the development of the model.

1.2.6 Whilst none of the Strategic Road Network (SRN) is within Horsham District, Highways England, who manage the SRN, will also be consulted through the development of the model.

1.2.7 The HTM is a highway network model being developed using the established SATURN software. The model will be produced to represent an AM peak hour model (08:00 to 09:00), an average IP hour model (10:00 to 16:00) and a PM peak hour model (17:00 to 18:00). The model will consist of three vehicle types, comprising car, Light Goods Vehicles (LGV) and Heavy Goods Vehicles. The car element will then be broken down further to represent three trip purposes, namely commute, employer's business and other.

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

- Section 2 Outlines ATC Surveys
- Section 3 Outlines MCC Survey data
- Section 4 Outlines Traffic Master Journey Time Data
- Section 5 Outlines the mobile phone data
- Section 6 Outlines Signal Junction Data

2 Automatic Traffic Count (ATC) Surveys

2.1 Overview

2.1.1 Automatic traffic count (ATC) data collection is undertaken using pneumatic rubber tubes which are placed across a road. These count vehicles as they pass over the tube. The data is stored electronically and can differentiate vehicle types based on vehicle length. The ATC data has come from three separate sources;

- Newly collected data – collected by specialist data collection company, Streetwise who were commissioned by PBA
- Existing WSCC Data
- Highways England Data

2.2 New ATC Data

2.2.1 New ATC surveys were undertaken by Streetwise over a two-week period (14 days) from Friday 10th May 2019 to Thursday 23rd May 2019.

2.2.2 The data survey company was able to discern and classify the ATC data into cars, LGV, OGV1 and OGV2.

2.2.3 The data is available in excel format, broken down into 1-hour intervals. This data is provided in a digital format (DVD) accompanying this report.

2.2.4 The locations of the new ATC surveys data are set out in Table 2-1 and shown in Figure 2-1. Aerial plans for each site are provided in Appendix A. The data was collected at nine locations.

Table 2-1: New ATC locations

ATC Reference	Location Description	OSGR
1	Haven Road (Bucks Green)	TQ 08492 31988
2	Rowhook Road (Rowhook)	TQ 12260 34327
3	Muggeridge's Hill (Rusper)	TQ 18119 37815
4	Rusper Road (Rusper)	TQ 20329 39458
5	A29 Stane Street near St Andrews Farm	TQ 07888 24180
6	B2139 Coolham Road (South of A272)	TQ 11897 22482
7	B2133 Lordings Road (Billingshurst)	TQ 07128 24607
8	Marringdean Road (Billingshurst)	TQ 09089 23506
9	West Chiltington Lane (Storrington)	TQ 09984 23088
10	Pound Lane (Green Street)	TQ 14975 22557
11	Littleworth Lane (Cowfold)	TQ 19159 22122

ATC Reference	Location Description	OSGR
12	A283 Shoreham Road (South of Roundabout with A2037)	TQ 19774 09375
13	Annington Road (Botolphs)	TQ 18612 09568
14	Bostal Road (Steyning)	TQ 16443 09929
15	A281 Guildford Road near Weyhurst Farm	TQ 07451 33268
16	A272 Newbridge Road near River Arun	TQ 06919 25942
17	A29 London Road near Ingrams Farm	TQ 04083 17715
18	Loxwood Road (Bucks Green)	TQ 07426 32655
19	Brook Lane (Coldwaltham)	TQ 03251 16205
20	B2110 Handcross Road near Howards Nursery	TQ 22531 27655
21	B2116 Wheatsheaf Road near Gainsborough	TQ 21977 17539
22	Lambs Green Road (Lambs Green)	TQ 21697 36484
23	Tower Road (Faygate)	TQ 22087 33604
24	Forest Road (Colgate)	TQ 22156 32677
25	Grouse Road (Colgate)	TQ 22377 29712
26	Hammerpond Road (Horsham)	TQ 22449 28754
27	Horn Lane (Henfield)	TQ 21931 13870
28	Edburton Road (Henfield)	TQ 21294 11425
29	Blackbridge Lane N (Horsham)	TQ 16434 30152
30	Blackbridge Lane E (Horsham)	TQ 16395 30569
31	Wimblehurst Road (Horsham)	TQ 17672 31903
32	Foundary Lane (Horsham)	TQ 18205 31658
33	Depot Road (Horsham)	TQ 18789 30790
34	St Leonard's Road (Horsham)	TQ 18413 29984
35	Bashurst Hill (Bashurst Hill)	TQ 12227 28650
36	Fulfords Hill (Itchingfield)	TQ 13427 29851
37	Golding Lane (Mannings Heath)	TQ 20904 29279

2.2.5 The primary purpose of the ATC data is to provide independent data with which to inform the validation of the model as shown in Figure 2-1.

2.2.6 ATC data also provide evidence of day to day weekday flows to allow checks to be made, such that the model is representative of a weekday in a neutral month. The data will complement existing data from West Sussex County Council and Highways England ATC data collected as part of their permanent and periodic monitoring sites.

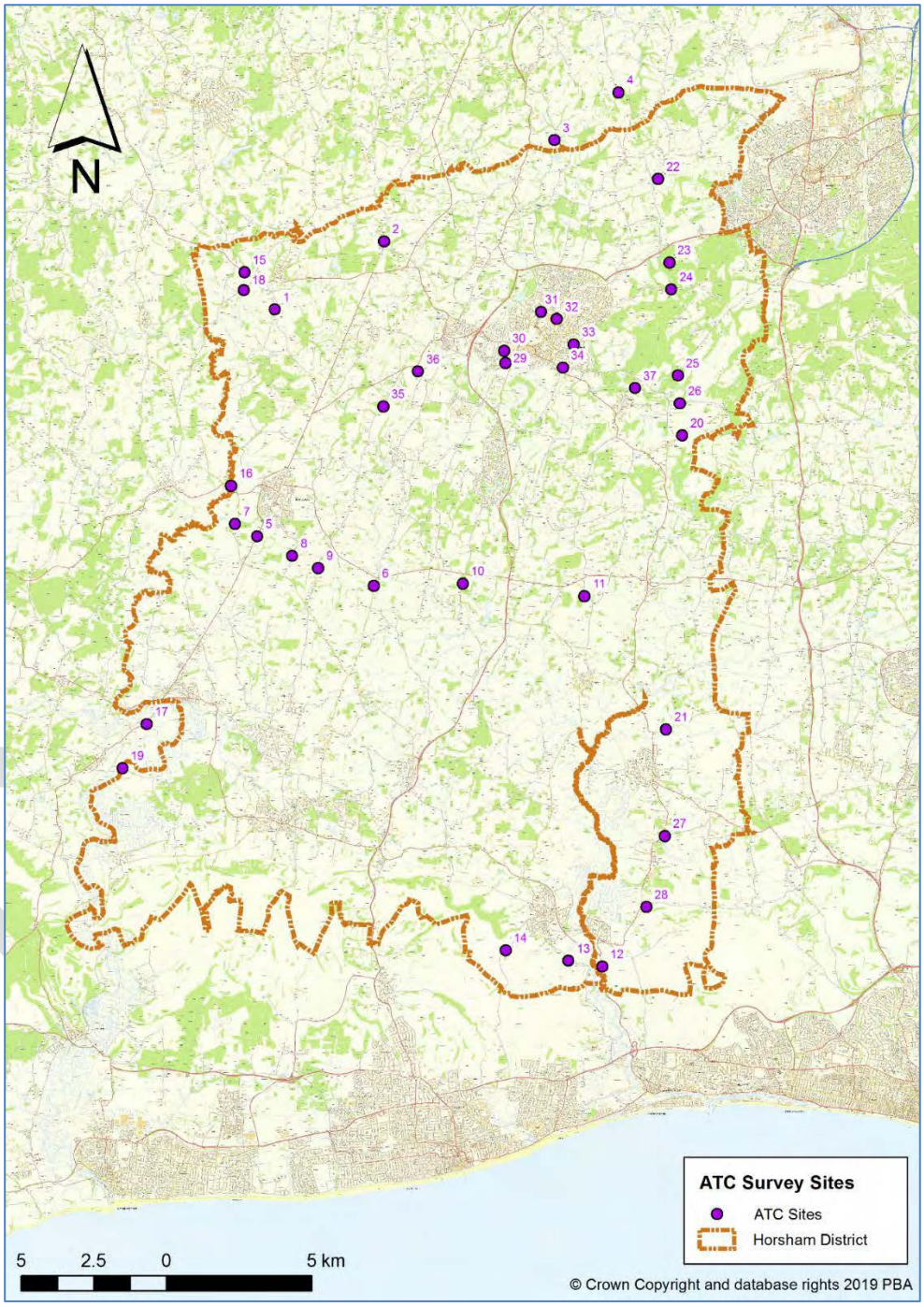


Figure 2-1: New ATC Survey data Locations

2.3 Issues

2.3.1 There have been several report issues with certain ATC sites, these issues have been identified as part of the quality checks during the ATC collection.

- Site 2: Tubes suffered damage on Friday May 17th. –fixed the day after, sufficient data available to acquire a statistically viable weekday average.
- Site 6: 1 week of data unusable due to ATC tube issues, sufficient data available to acquire a statistically viable weekday average.
- Site 15: Guildford Road – data is missing for extended period. To compensate for this, extra data was collected up until the 28th June 2019.
- Site 22: Tubes suffered damage from 16th-18th May. – Tubes fixed, enough data to provide weekday average.
- Site 33: Affected by vehicles parked on the tubes of the counter on the 14th and 15th May. Sufficient data available to acquire a statistically viable weekday average.
- Site 35: Issue with the tubes mid-way through week 2. Sufficient data available to acquire a statistically viable weekday average.
- Site 36: Tubes suffered damage from 15th-18th May. Sufficient data available to acquire a statistically viable weekday average.

2.4 ATC Data Analysis

2.4.1 Analysis of the ATC data has been undertaken to provide information on trends and peak flows. Furthermore, check have been done in order to remove any spurious data

2.4.2 Figures 2-2 to 2-38 provide 24-hour flow profile plots for each site by direction. The plots show how hourly vehicles flows vary across the day based on an average neutral day Tuesday to Thursday (i.e. all data from these days are combined and averaged).

2.4.3 In most cases it can be seen that the flows are tidal. The profiles also show that in most cases the flows peak at 08:00 to 09:00 in the AM peak period and at 17:00 to 18:00 in the PM peak period. This confirms the appropriateness of modelling these hours as the peak hours and modelling of an average IP hour.

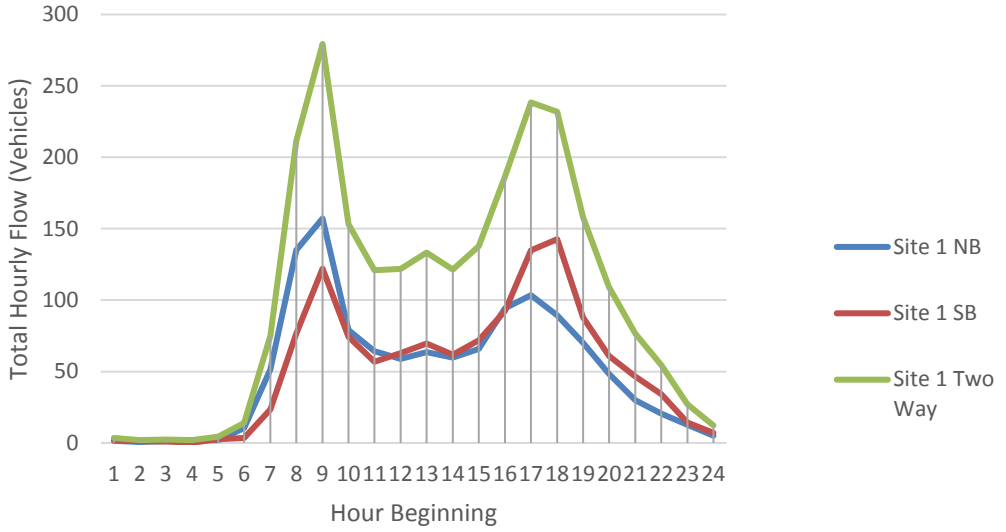


Figure 2-2 : ATC Site 1 Average Tues-Thurs Flow Profile

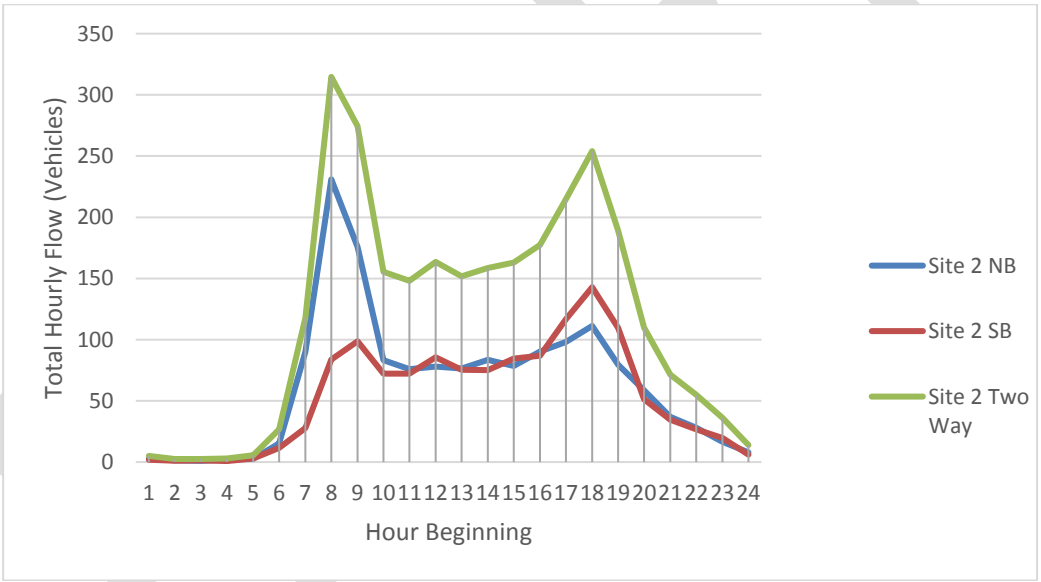


Figure 2-3: ATC Site 2 Average Tues-Thurs Flow Profile

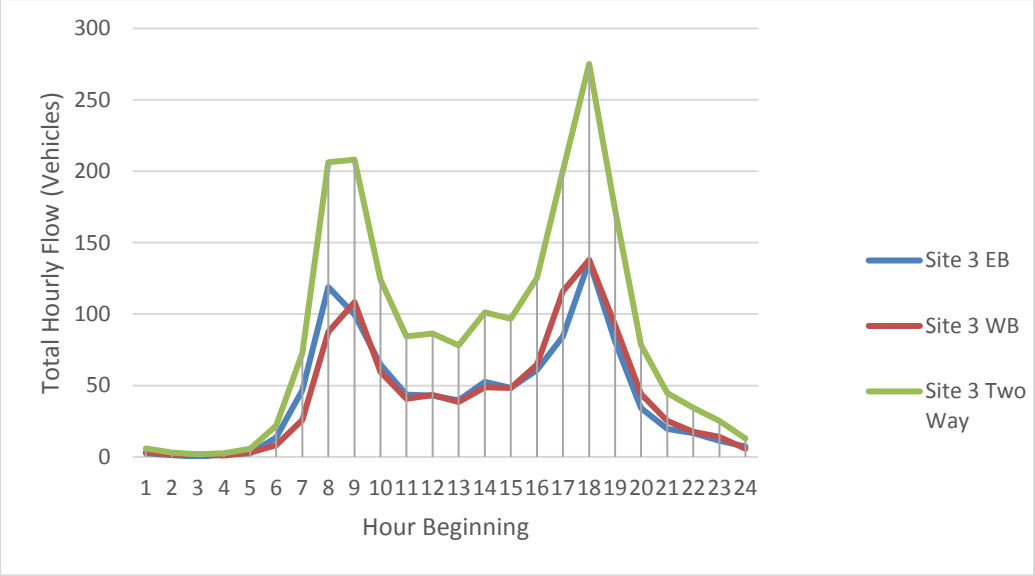


Figure 2-4: ATC Site 3 Average Tues-Thurs Flow Profile

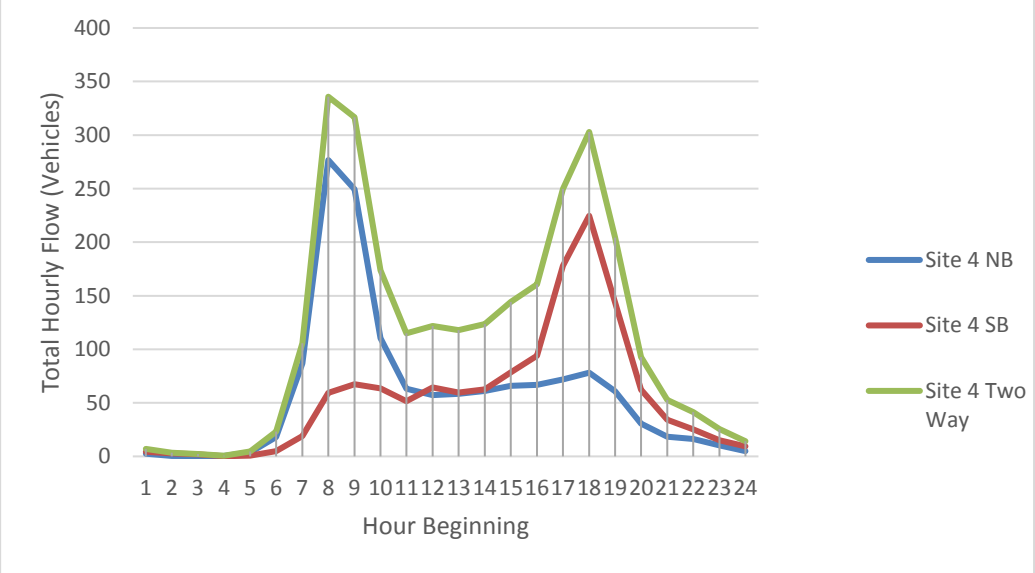


Figure 2-5: ATC Site 4 Average Tues-Thurs Flow Profile

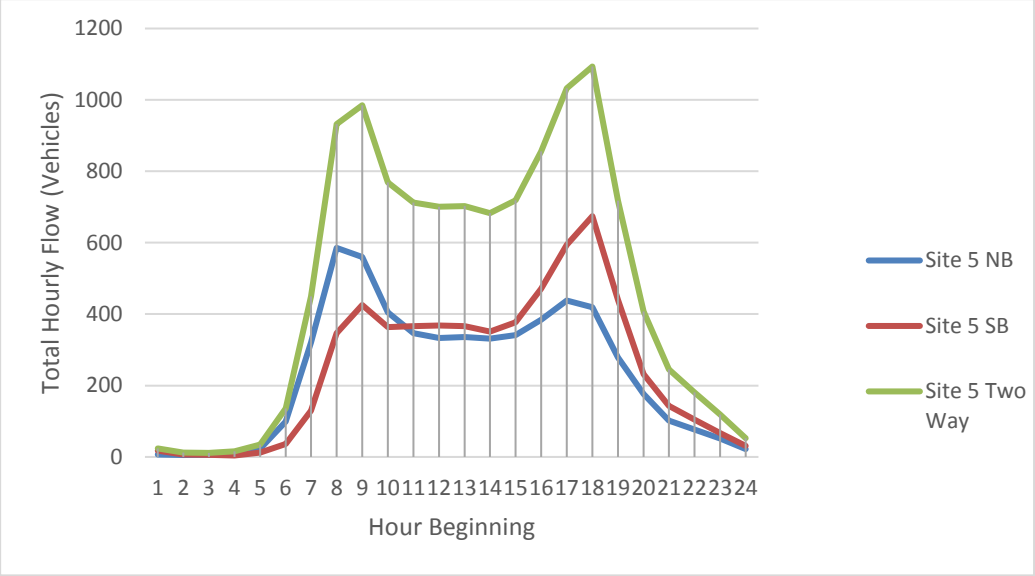


Figure 2-6: ATC Site 5 Average Tues-Thurs Flow Profile

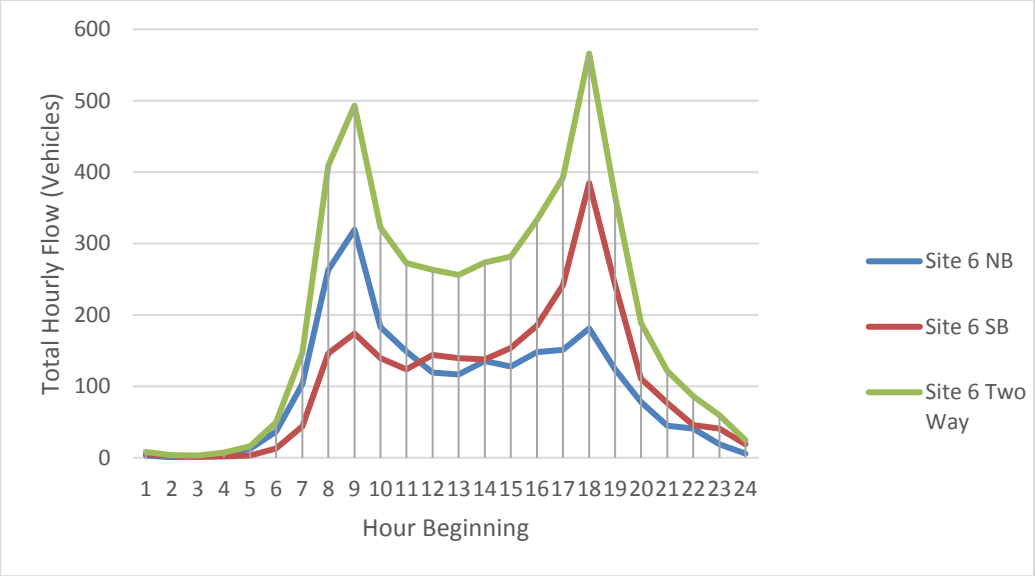


Figure 2-7: ATC Site 6 Average Tues-Thurs Flow Profile

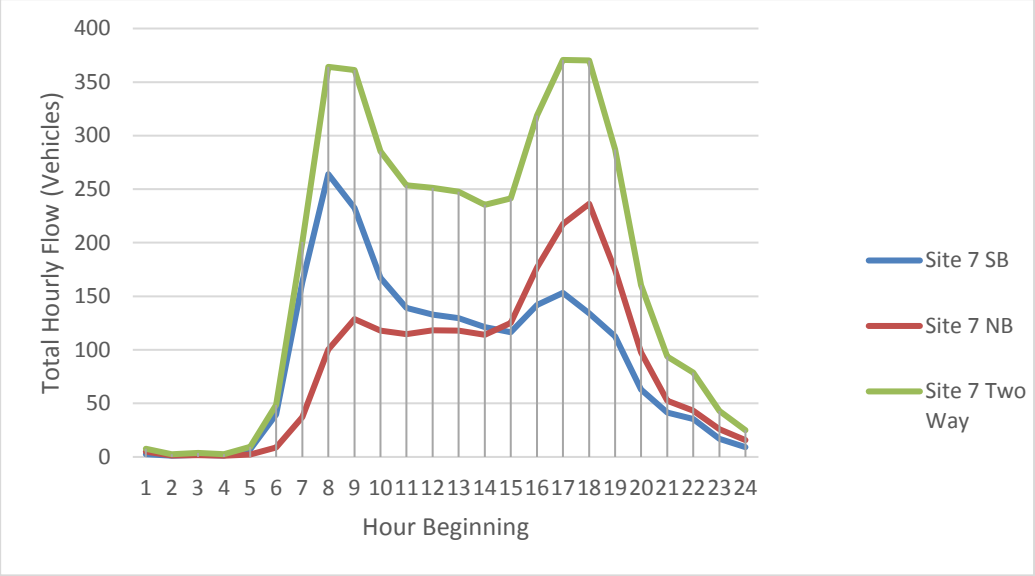


Figure 2-8: ATC Site 7 Average Tues-Thurs Flow Profile

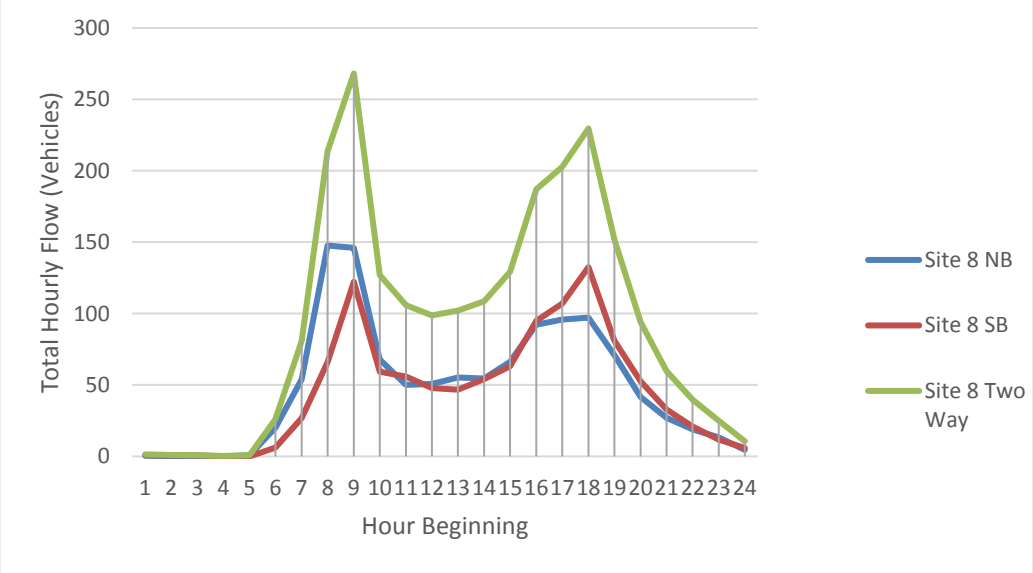


Figure 2-9: ATC Site 8 Average Tues-Thurs Flow Profile

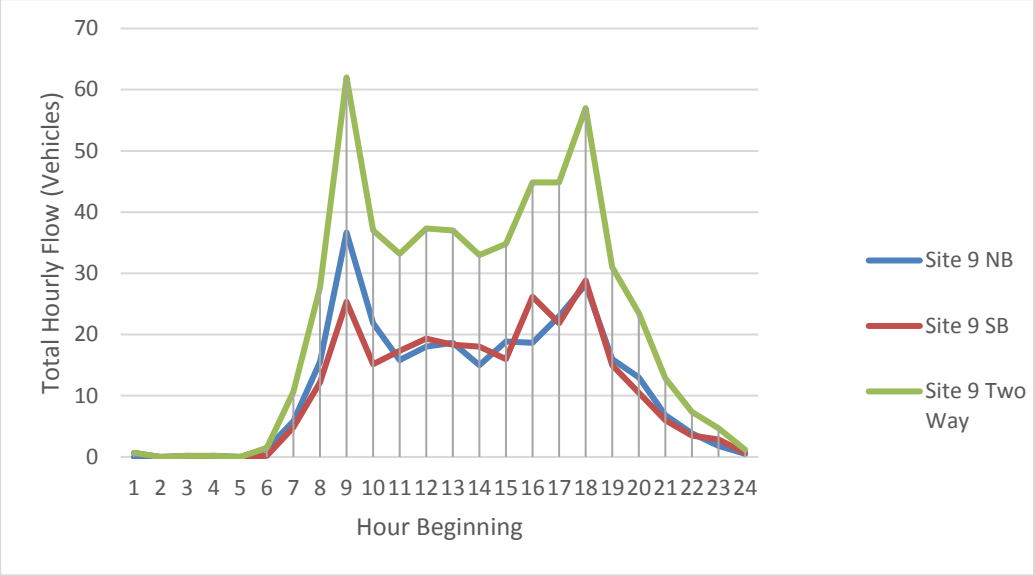


Figure 2-10: ATC Site 9 Average Tues-Thurs Flow Profile

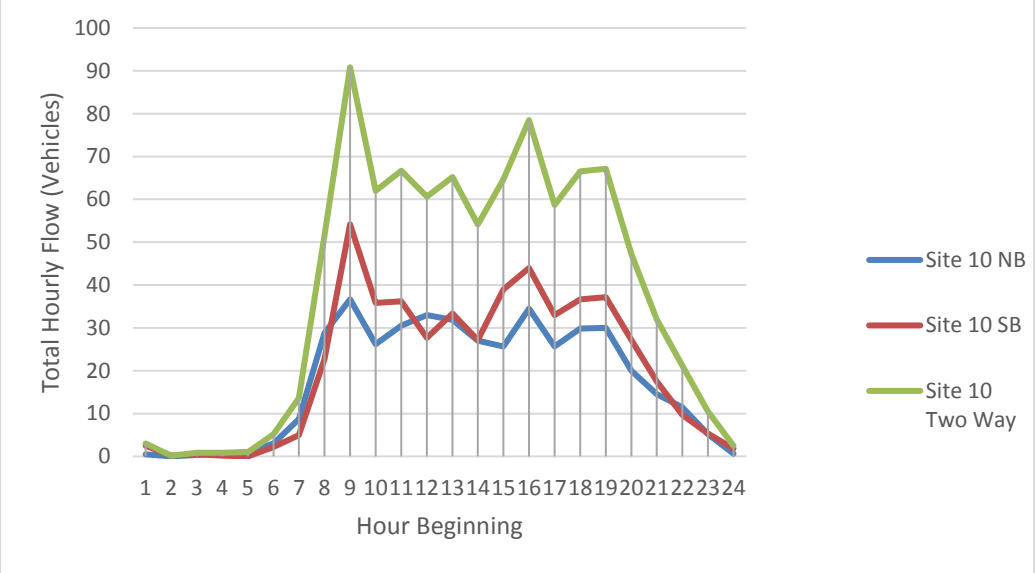


Figure 2-11: ATC Site 10 Average Tues-Thurs Flow Profile

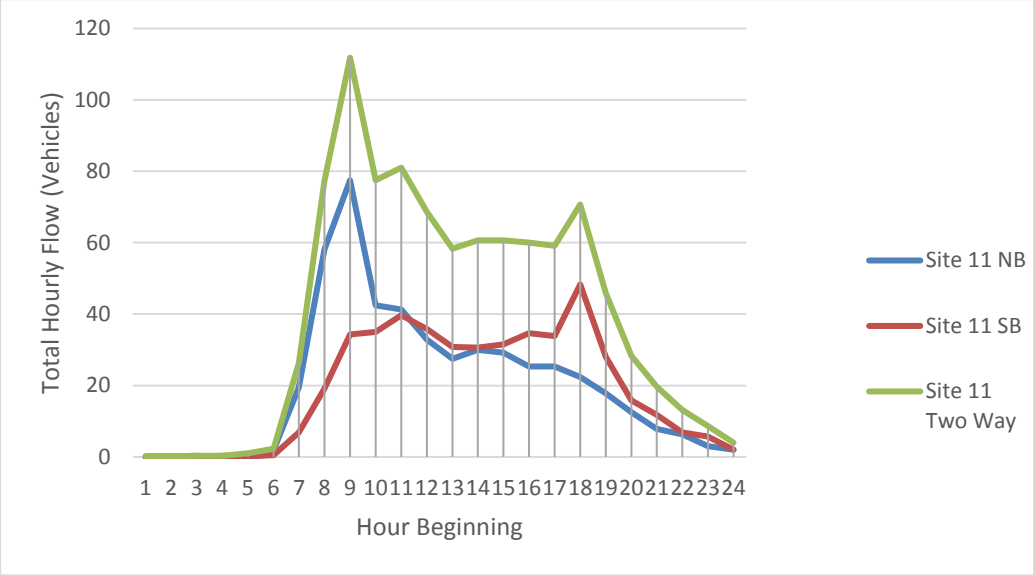


Figure 2-12: ATC Site 11 Average Tues-Thurs Flow Profile

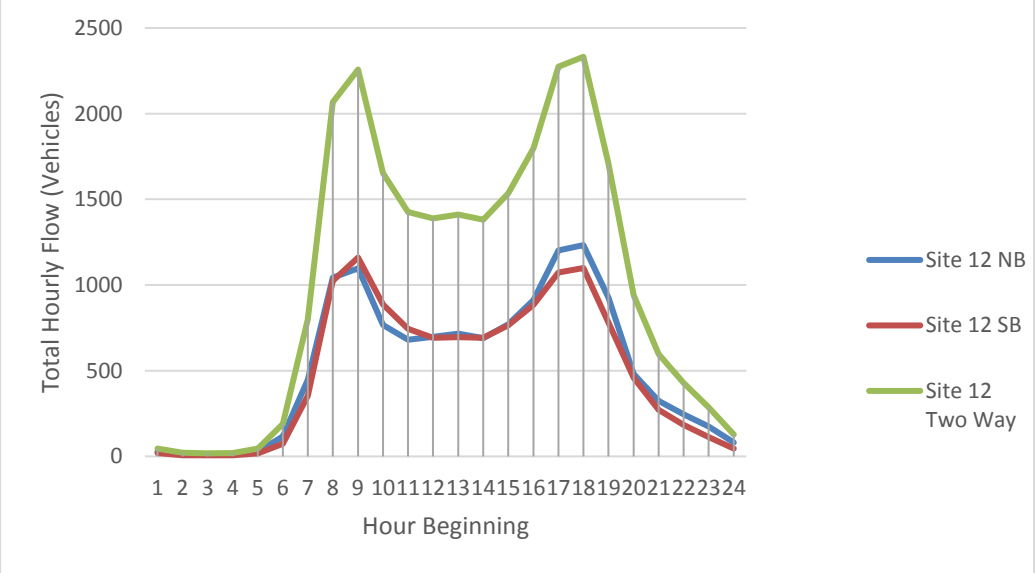


Figure 2-13: ATC Site 12 Average Tues-Thurs Flow Profile

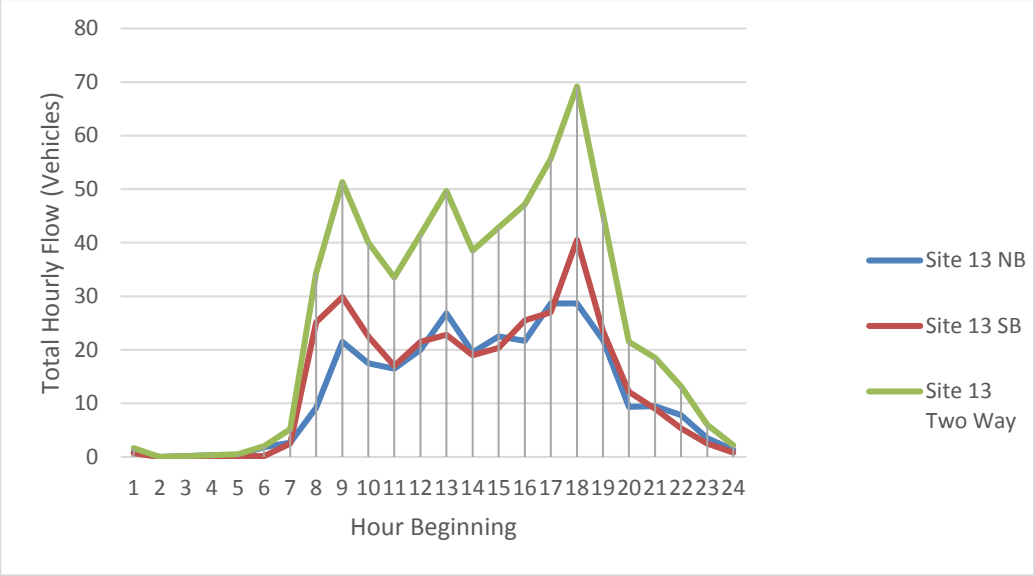


Figure 2-14: ATC Site 13 Average Tues-Thurs Flow Profile

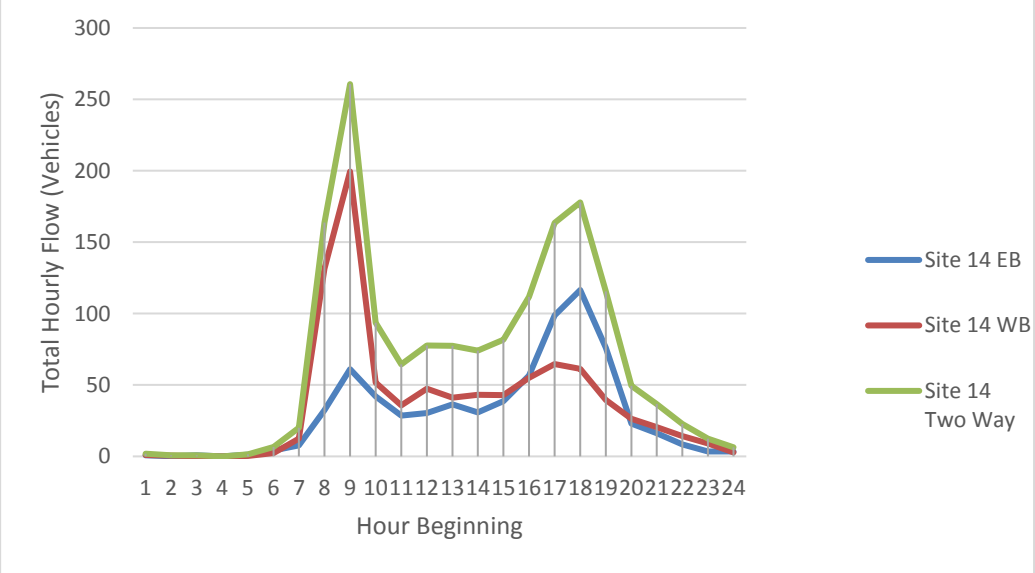


Figure 2-15: ATC Site 14 Average Tues-Thurs Flow Profile

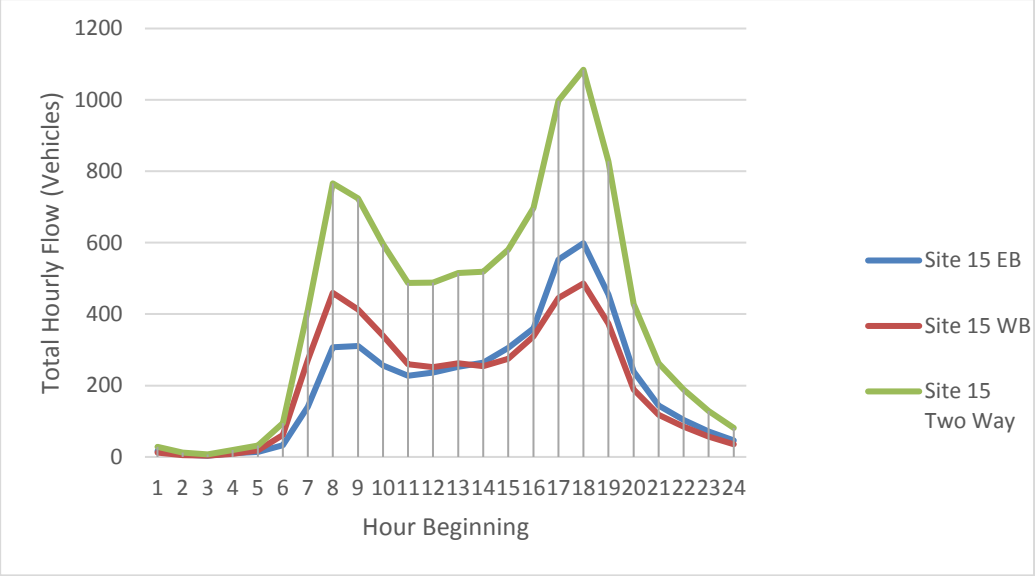


Figure 2-16: ATC Site 15 Average Tues-Thurs Flow Profile

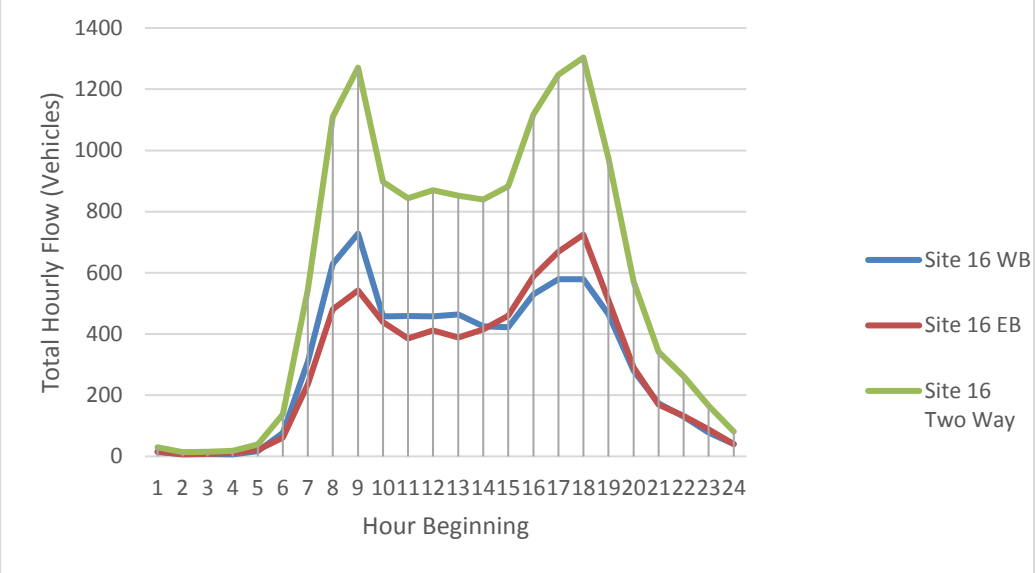


Figure 2-17: ATC Site 16 Average Tues-Thurs Flow Profile

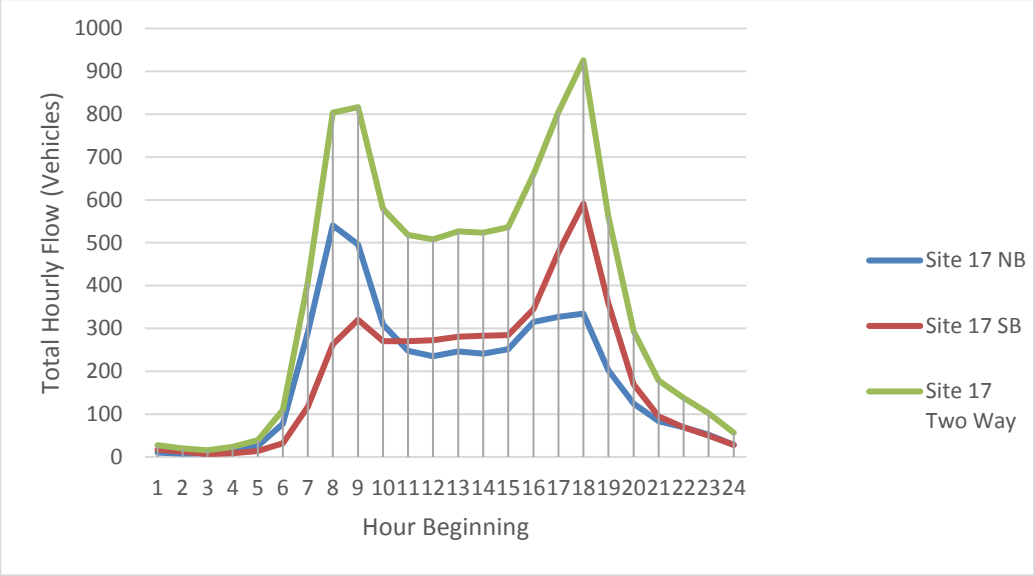


Figure 2-18: ATC Site 17 Average Tues-Thurs Flow Profile

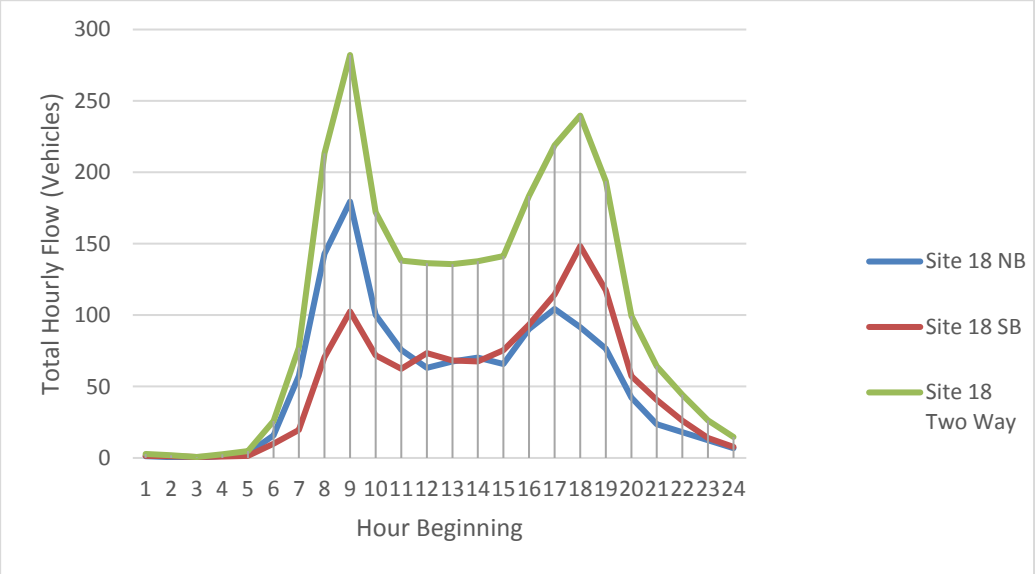


Figure 2-19: ATC Site 18 Average Tues-Thurs Flow Profile

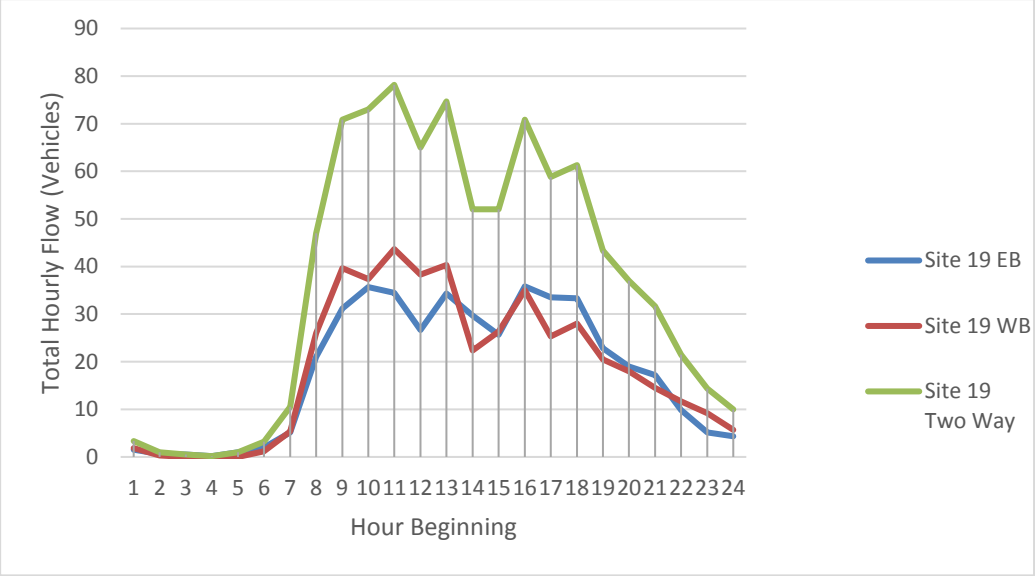


Figure 2-20: ATC Site 19 Average Tues-Thurs Flow Profile

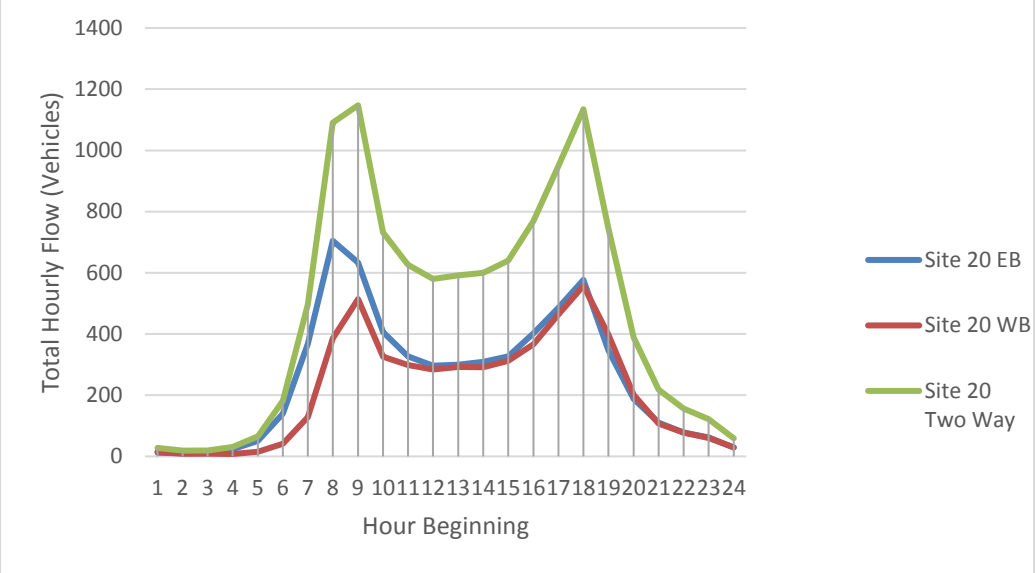


Figure 2-21: ATC Site 20 Average Tues-Thurs Flow Profile

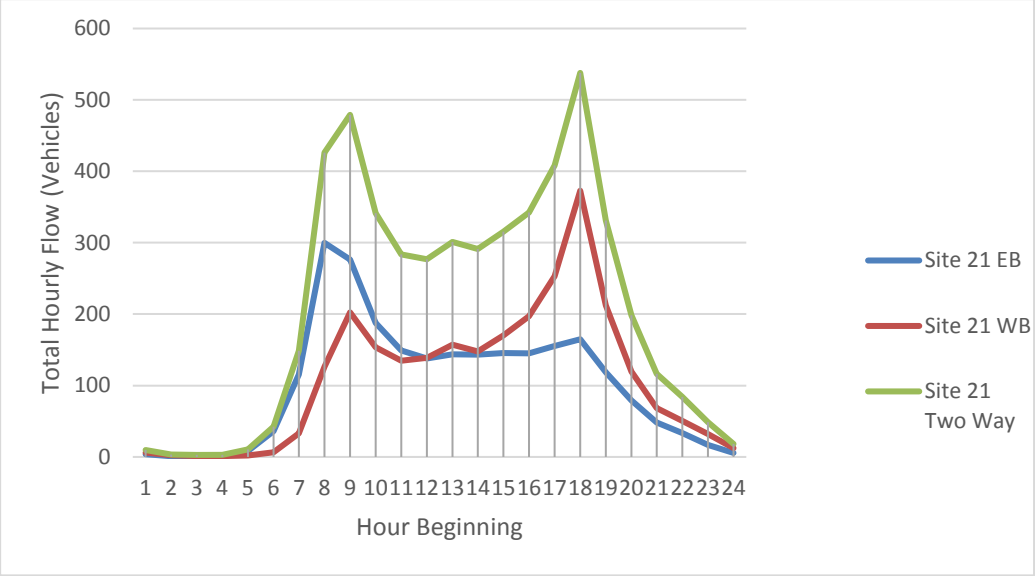


Figure 2-22: ATC Site 21 Average Tues-Thurs Flow Profile

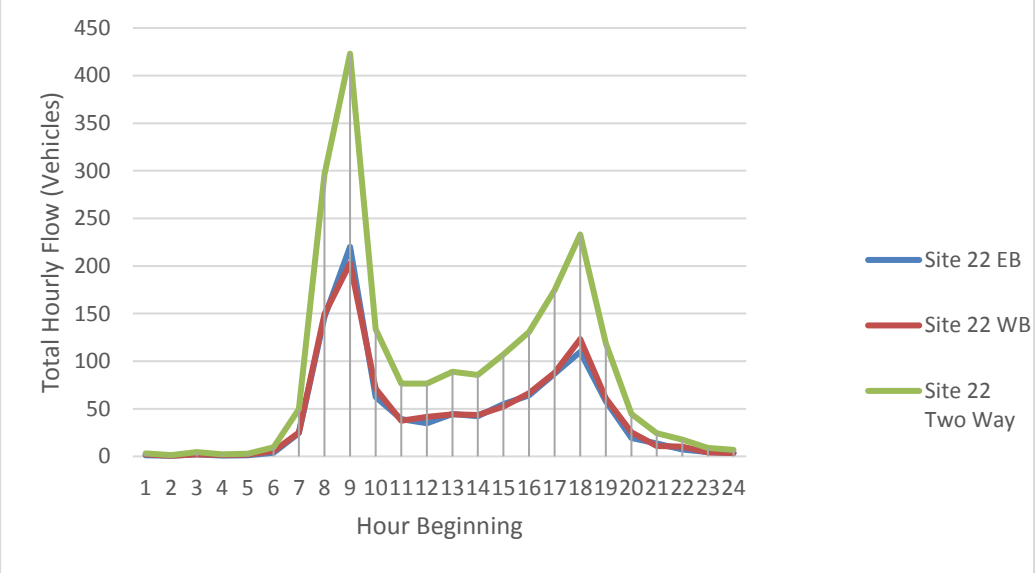


Figure 2-23: ATC Site 22 Average Tues-Thurs Flow Profile

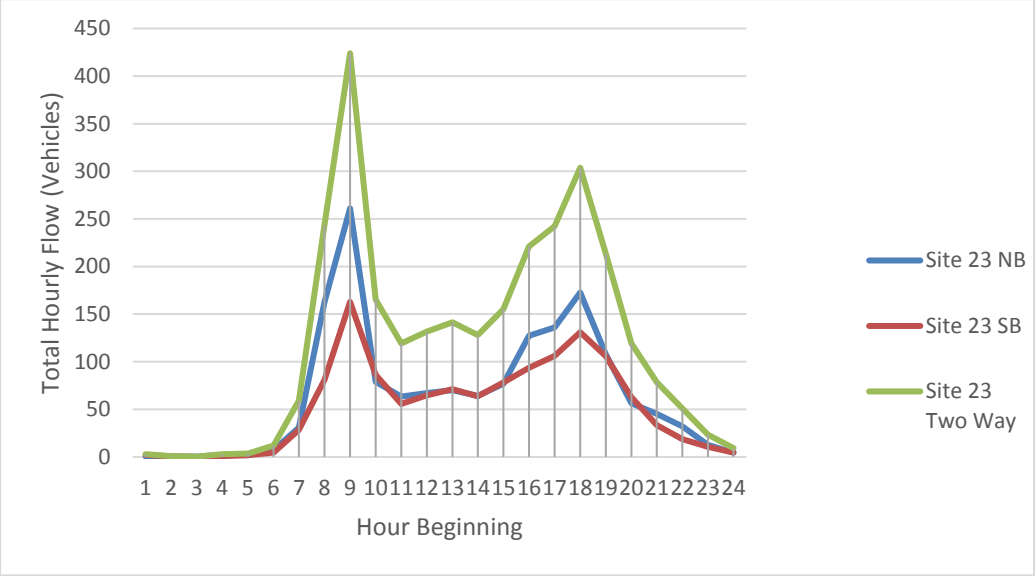


Figure 2-24: ATC Site 23 Average Tues-Thurs Flow Profile

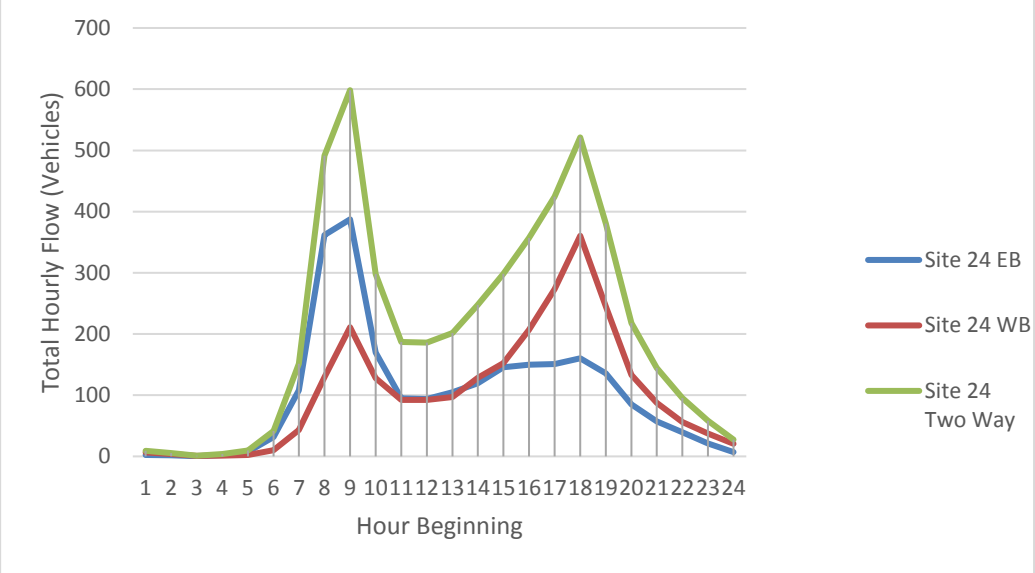


Figure 2-25: ATC Site 24 Average Tues-Thurs Flow Profile

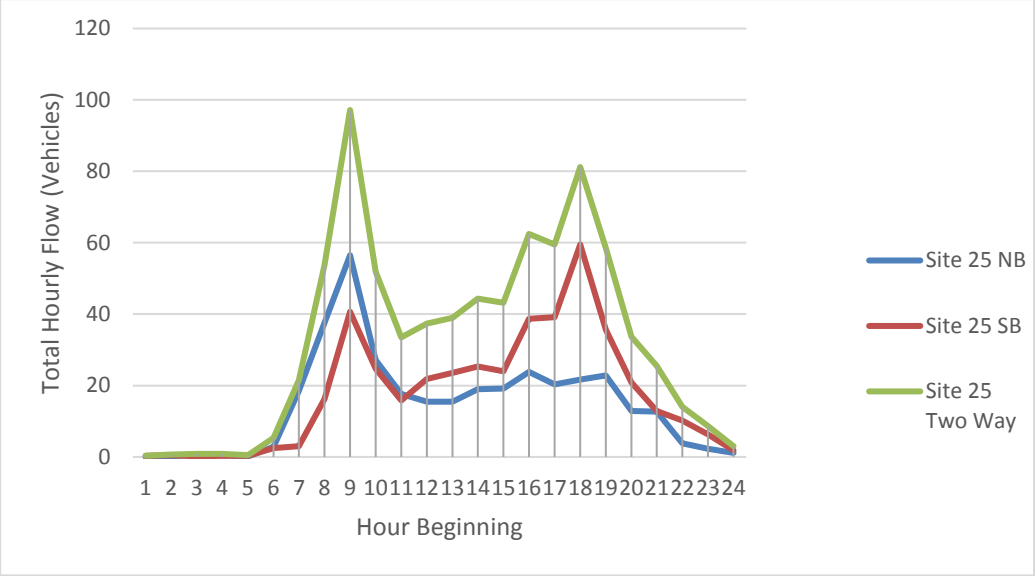


Figure 2-26: ATC Site 25 Average Tues-Thurs Flow Profile

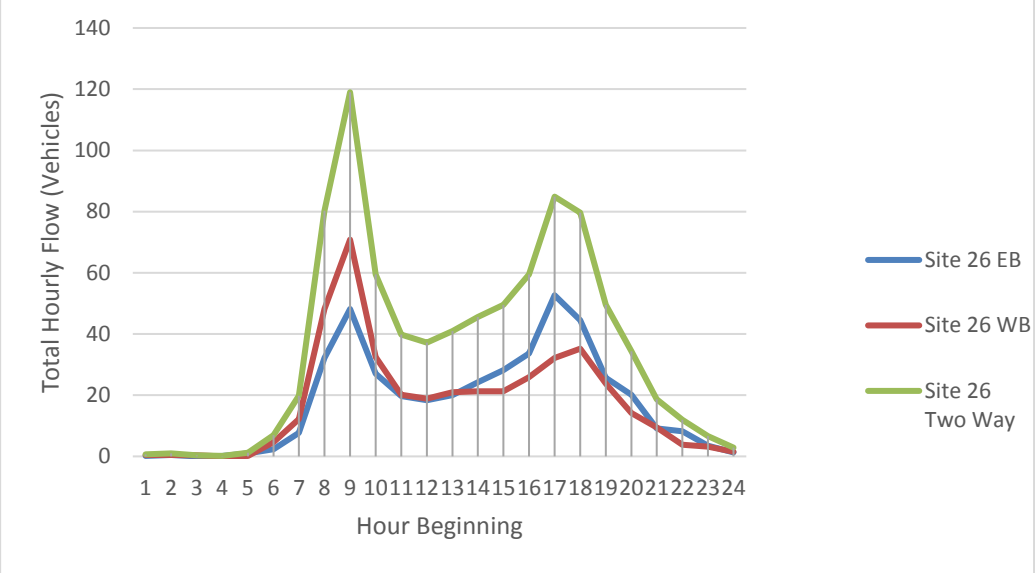


Figure 2-27: ATC Site 26 Average Tues-Thurs Flow Profile

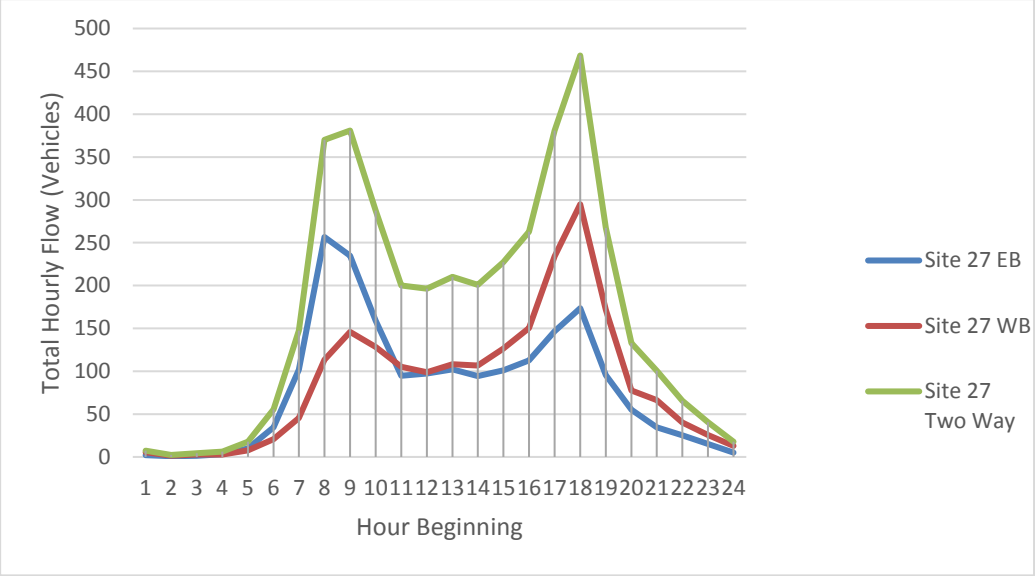


Figure 2-28: ATC Site 27 Average Tues-Thurs Flow Profile

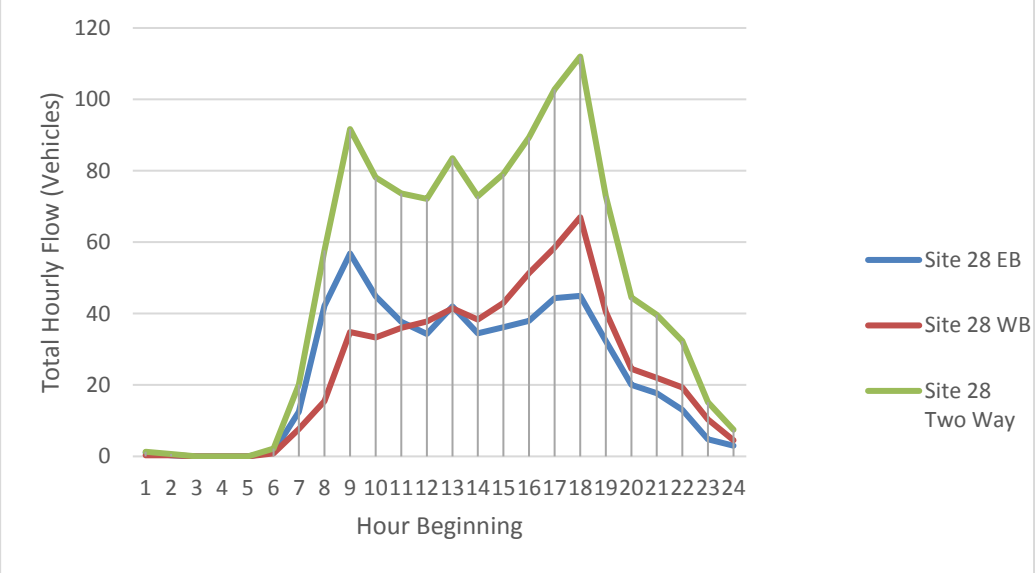


Figure 2-29: ATC Site 28 Average Tues-Thurs Flow Profile

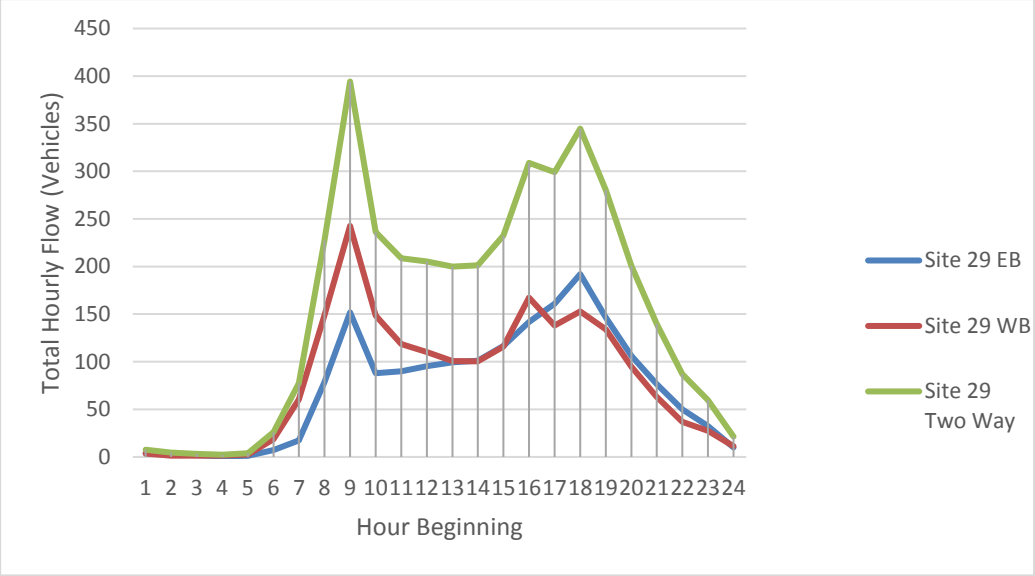


Figure 2-30: ATC Site 29 Average Tues-Thurs Flow Profile

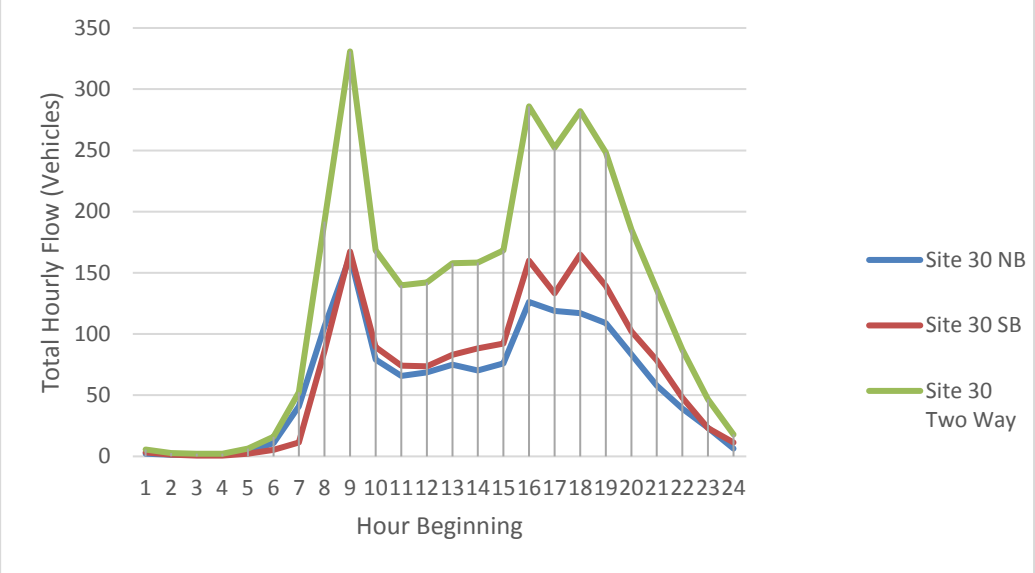


Figure 2-31: ATC Site 30 Average Tues-Thurs Flow Profile

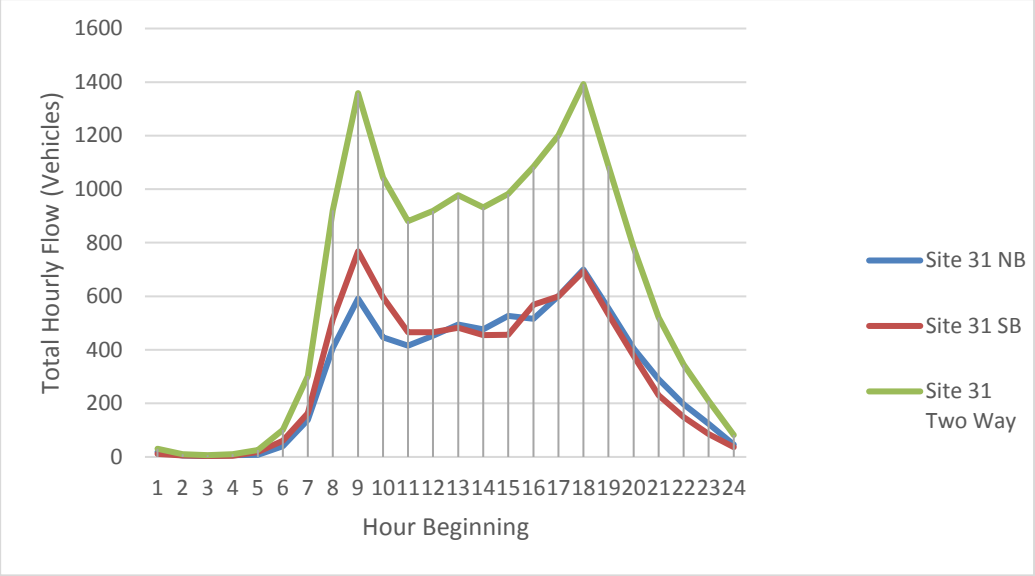


Figure 2-32: ATC Site 31 Average Tues-Thurs Flow Profile

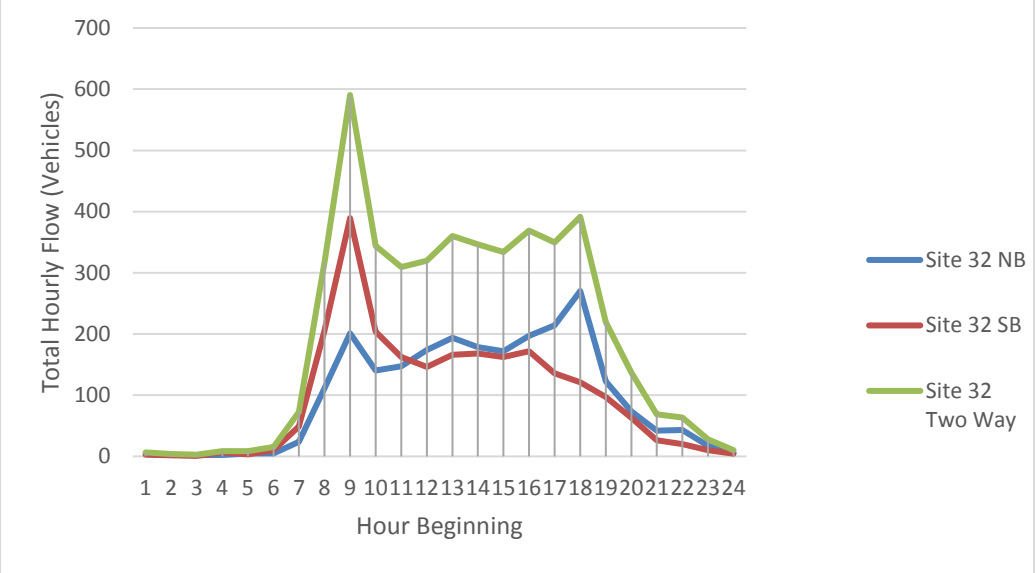


Figure 2-33: ATC Site 32 Average Tues-Thurs Flow Profile

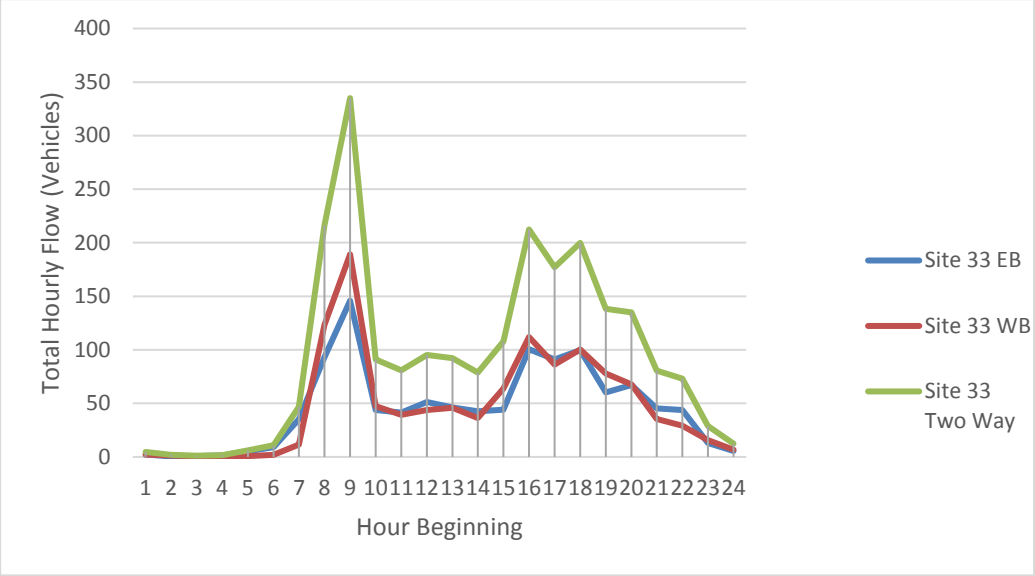


Figure 2-34: ATC Site 33 Average Tues-Thurs Flow Profile

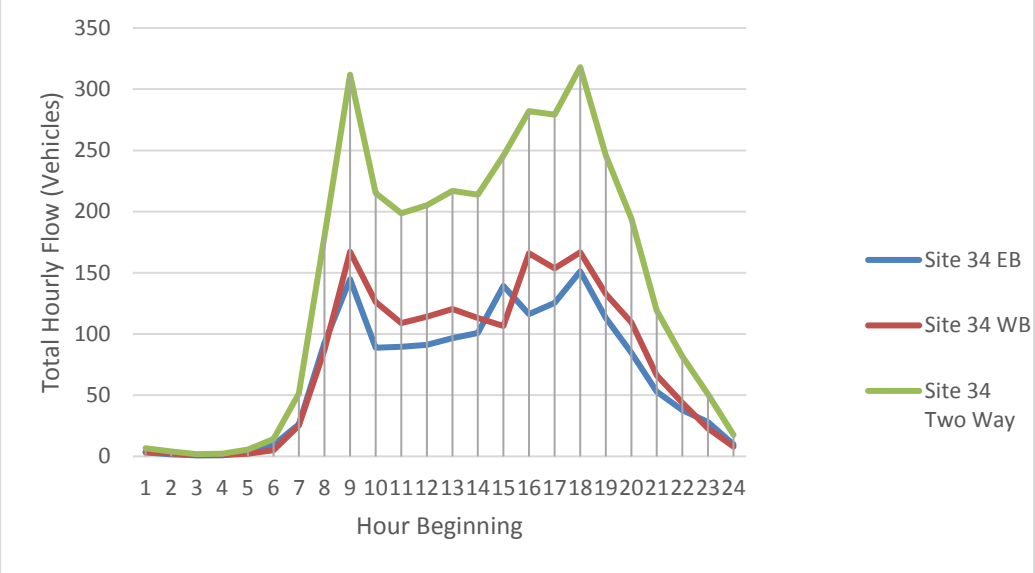


Figure 2-35: ATC Site 34 Average Tues-Thurs Flow Profile

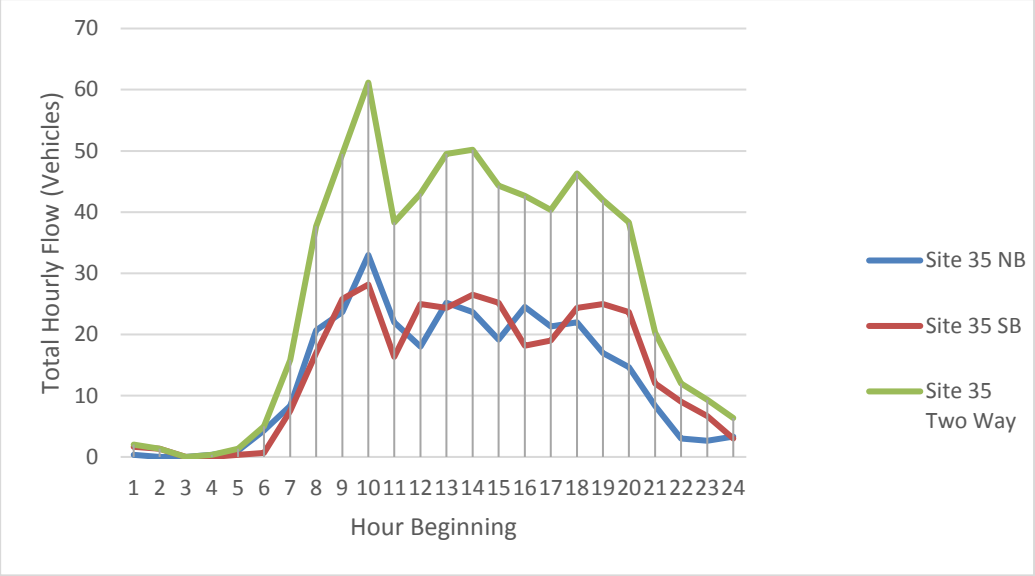


Figure 2-36: ATC Site 35 Average Tues-Thurs Flow Profile

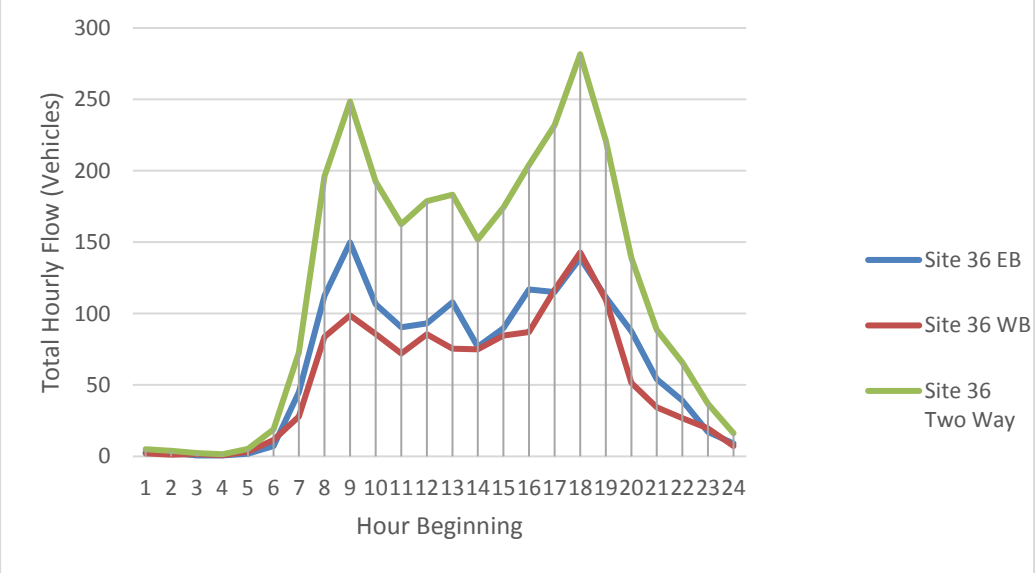


Figure 2-37: ATC Site 36 Average Tues-Thurs Flow Profile

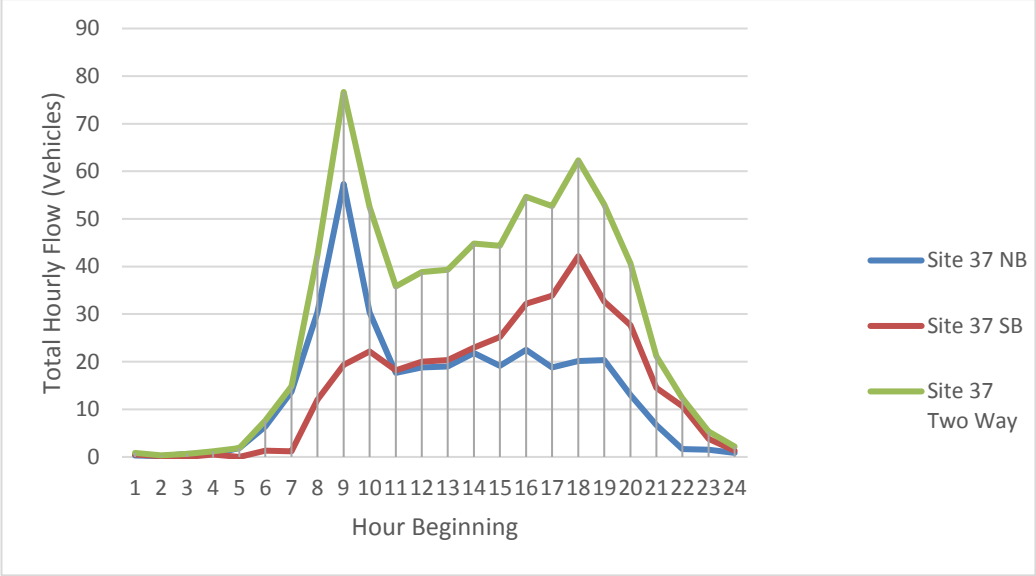


Figure 2-38: ATC Site 36 Average Tues-Thurs Flow Profile

2.5 Existing West Sussex County Council ATC Data

2.5.1 WSCC collect data across the county, including a number of sites within Horsham District. This data has been obtained from WSCC. These sites collect data permanently.

2.5.2 Existing ATC survey locations to be used in the model validation process are summarised in Table 2-2.

2.5.3 The flows at these sites are total flows and are not classified by vehicle type. The period of data collection aims to capture the latest existing data within a neutral month and over a two-week period, although this has not been used in the validation process of the model the counts will aid in the calibration process. The data can be referenced in appendix XX.

Table 2-2: Existing WSCC ATC locations

ATC Reference	Location
WSCC-1	Henfield A281, Brighton Rd. Just E. of Mill Dr
WSCC -7	A272 Cowfold, Cowfold Rd, Just E. of Fairfield Cot
WSCC -8	A281 Cowfold, Henfield Rd., By Singers Farm
WSCC -10	Pulborough, A283 Stopham Rd., W. of A29
WSCC -11	A24 Shipley, Worthing Road South of A24a272 Jct
WSCC -13	A24 Kingsfold, Layby 12 Mile S. of Surrey Border
WSCC -14	A29 Billingshurst, N. Of Town Just S. of New Rd
WSCC-16	A29 Bognor Road (Just S. of Surrey County Border)
WSCC -17	A281 Rudgwick, Guilford Rd., by House Called Hyes
WSCC -19	B2139 Amberley, New Barn Rd, E. of Railway Station
WSCC -23	A24, Washington, Horsham Rd

ATC Reference	Location
WSCC -27	A264 Faygate, Crawley Rd, by Park Road
WSCC -31	A24 Horsham, Broadbridge Heath S. of A281 Roundabout
WSCC -35	A281 Horsham, Brighton Rd S. of St Leonards Rd
WSCC -35	A281 Horsham, Brighton Rd S. of St Leonards Rd
WSCC -36	Horsham, Kings Rd S. of St Georges Gds
WSCC -37	B2237 Horsham, Warnham Rd N. of The Dog & Bacon Public House
WSCC -38	A281 Horsham, Guilford Rd East of Merryfield Drive
WSCC -39	B2237 Horsham, Worthing Rd N. of Tower Hill
WSCC -39	B2237 Horsham, Worthing Rd N. of Tower Hill
WSCC -40	B2195 Horsham, Harwood Rd Just E. of Elgin Close

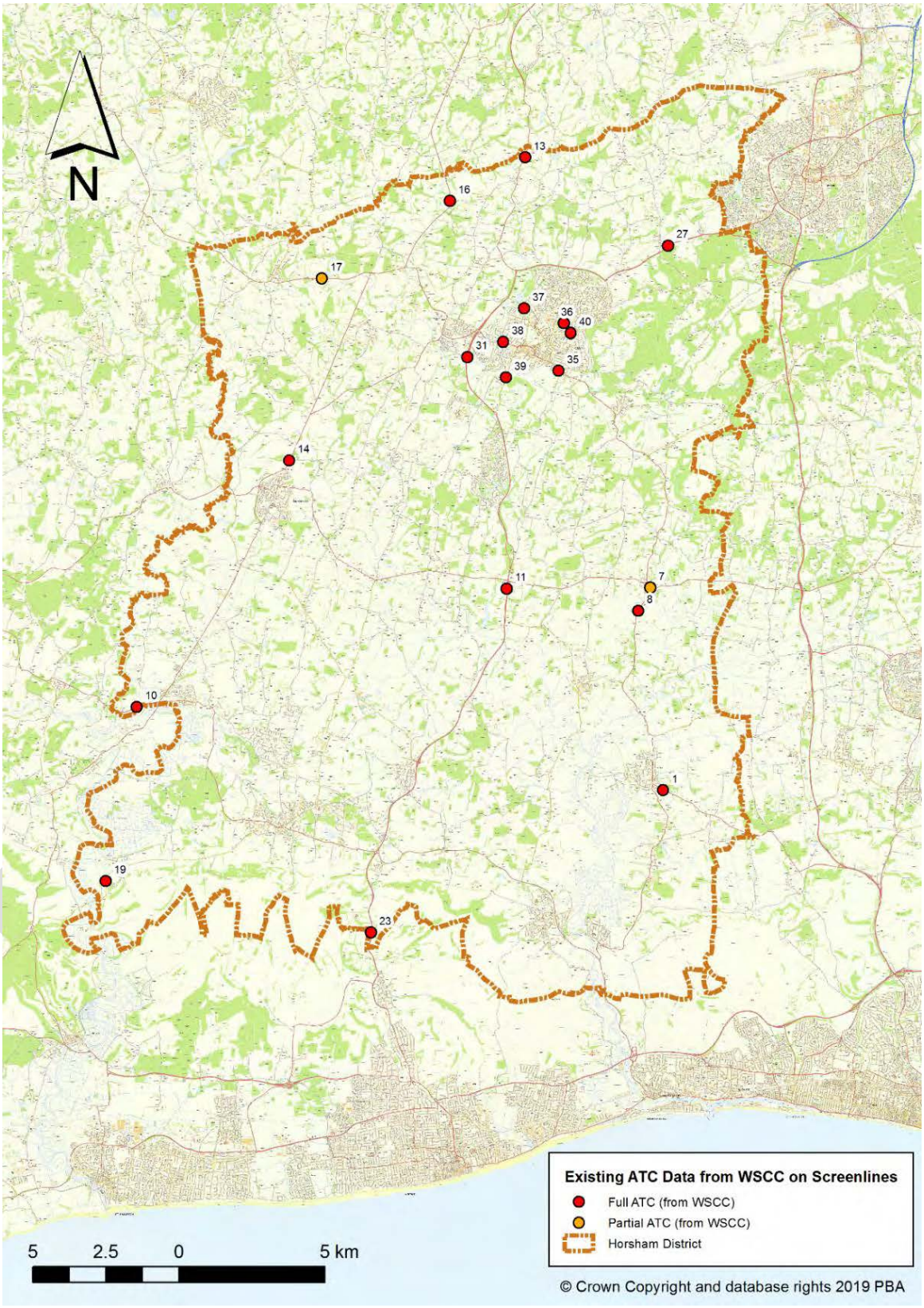


Figure 2-39 – Existing WSCC ATC Sites

2.6 Highways England ATC Data

2.6.1 To inform flow calibration and validation on the Highways England network within the Horsham model area, count data was obtained from Highways England's open data source website[2]. The data was downloaded for May 2019 and analysed for weekday (Tuesday to Thursday) AM and PM Peak period flows.

2.6.2 The data covers the M23 and A23 which is part of the SRN managed by Highways England. The locations of the data collected is listed in Table 2-3 and shown in Figure 2-40. The data is classified by vehicle length in metres making it possible to discern vehicle classes into car (<5.2m), LGV (5.21-6.6m), OGV1 (6.61-11.6m) and OGV2 (above 11.6m).

Table 2-2: Highways England Count Locations

ATC Reference.	Site Location
HE-1	M23 J10A NB On-slip
HE-2	M23 J10A SB Off-slip
HE-3	M23 between J10A and J11
HE-4	M23 J11 NB On-slip
HE-5	M23 J11 NB
HE-6	M23 J11 SB
HE-7	A23 SB between B2110 and B2114
HE-8	A23 SB B2114 Off-slip
HE-9	A23 NB between B2110 and M23/A264
HE-10	A23 SB between B2110 and B2115
HE-11	A23 NB at B2115 Junction
HE-12	A23 NB at B2115 Off-slip
HE-13	A23 NB at B2115 On-slip
HE-14	A23 NB at A272 Off-slip
HE-15	A23 NB at A272
HE-16	A23 SB at A272 Off-slip
HE-17	A23 SB at A272
HE-18	A23 SB at A2300
HE-19	A23 SB at A2300 Off-slip
HE-20	A23 NB at A2300 Off-slip
HE-21	A23 NB at A2300
HE-22	A23 SB at A281 On-Slip
HE-23	A23 SB at A281
HE-24	A23 NB at A281 Off-slip

[2] http://webtris.highwaysengland.co.uk/

ATC Reference.	Site Location
HE-25	A23 NB at A281

2.6.1 24-hour flow profiles are plotted for a number of selected Highways England (HE) maintained ATC sites for illustration. The flows were analysed for Tuesday to Thursday. The profiles can be seen for a selection of locations in Figures 2-41 to 2-51. The analysis suggests that the motorway links (M23) tend to peak earlier particularly in the AM peak between 07:00 to 08:00 compared to the more local network. The data has been collected over a one-month period between the 1st and the 31st of May 2018.

2.6.2 The data is classified by vehicle length in metres making it possible to discern vehicle classes into car (<5.2m), LGV (5.21-6.6m), OGV1 (6.61-11.6m) and OGV2 (above 11.6m).

2.6.3 Several HE ATC Sites listed above have been omitted due to data discrepancies and inconsistencies, these include HE Site 6,10,16,17,22 & 23

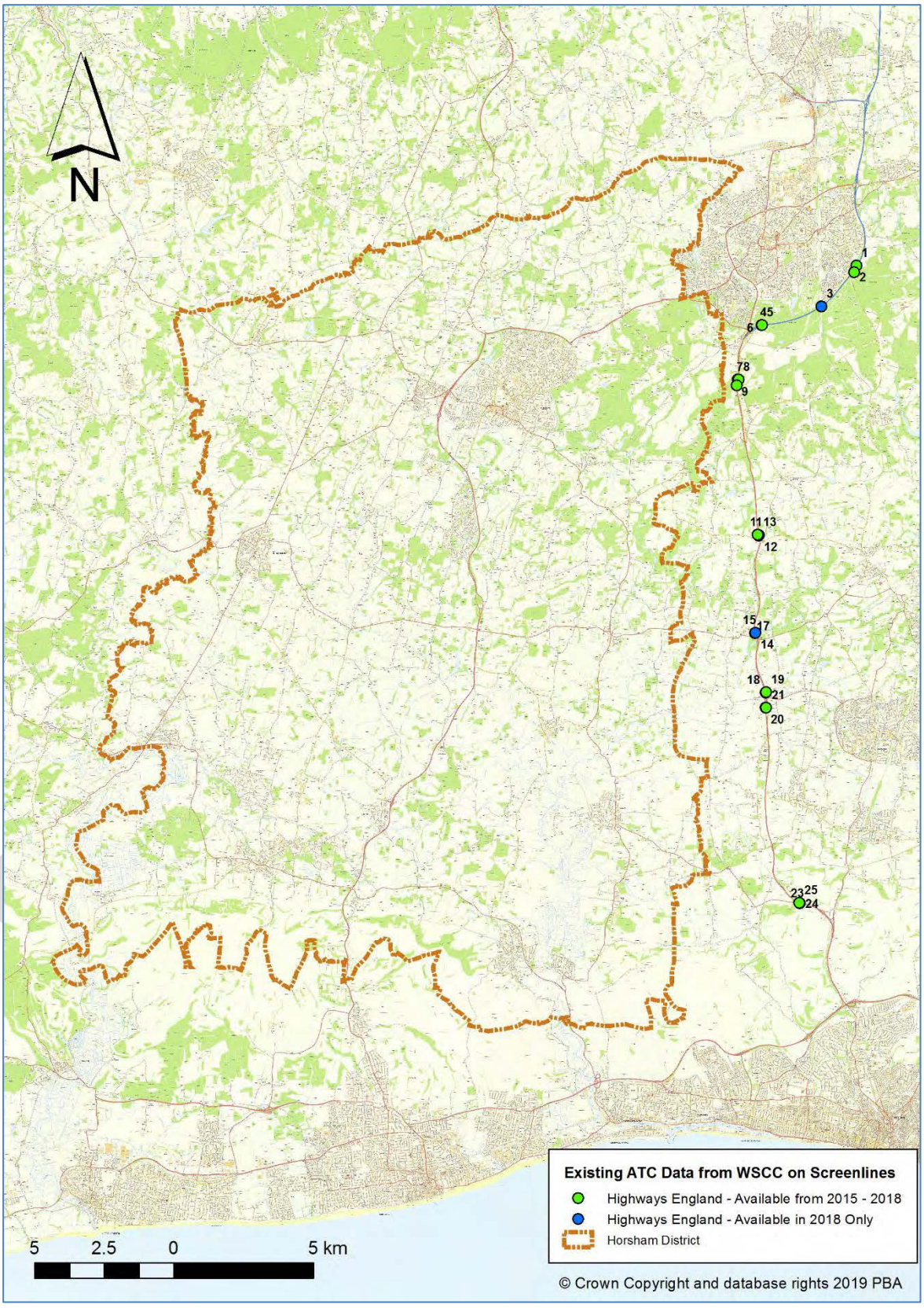


Figure 2-40: Highways England ATC data Locations

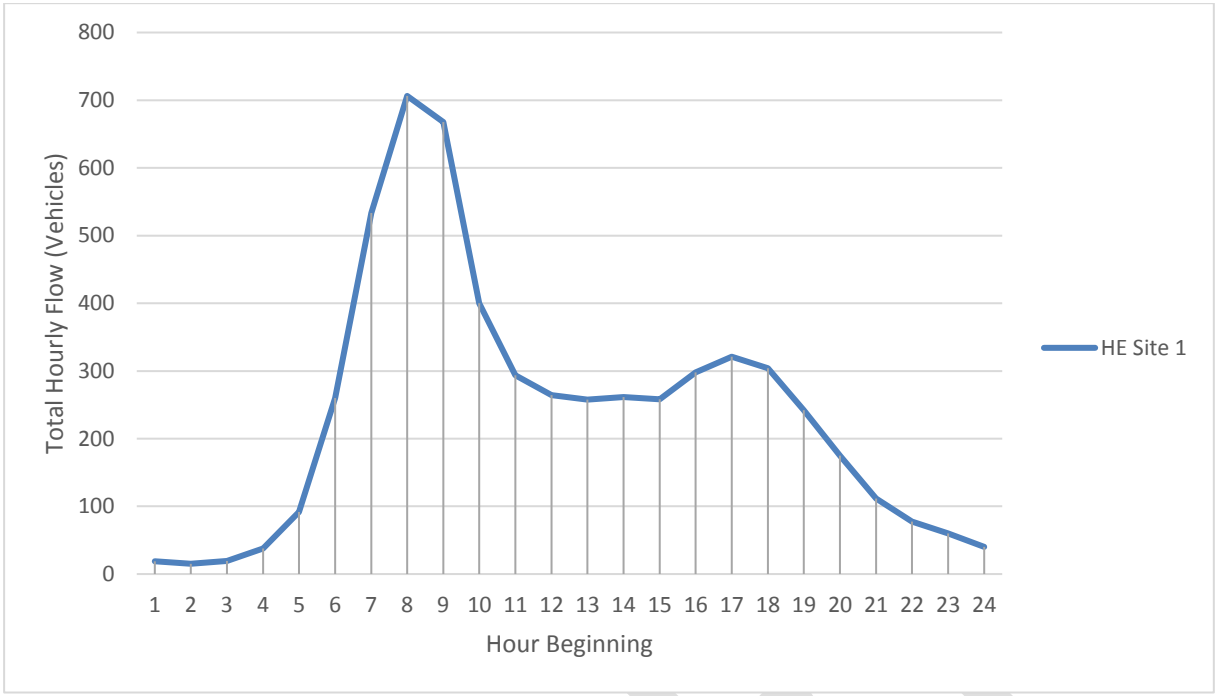


Figure 2-41: HE ATC Site 1

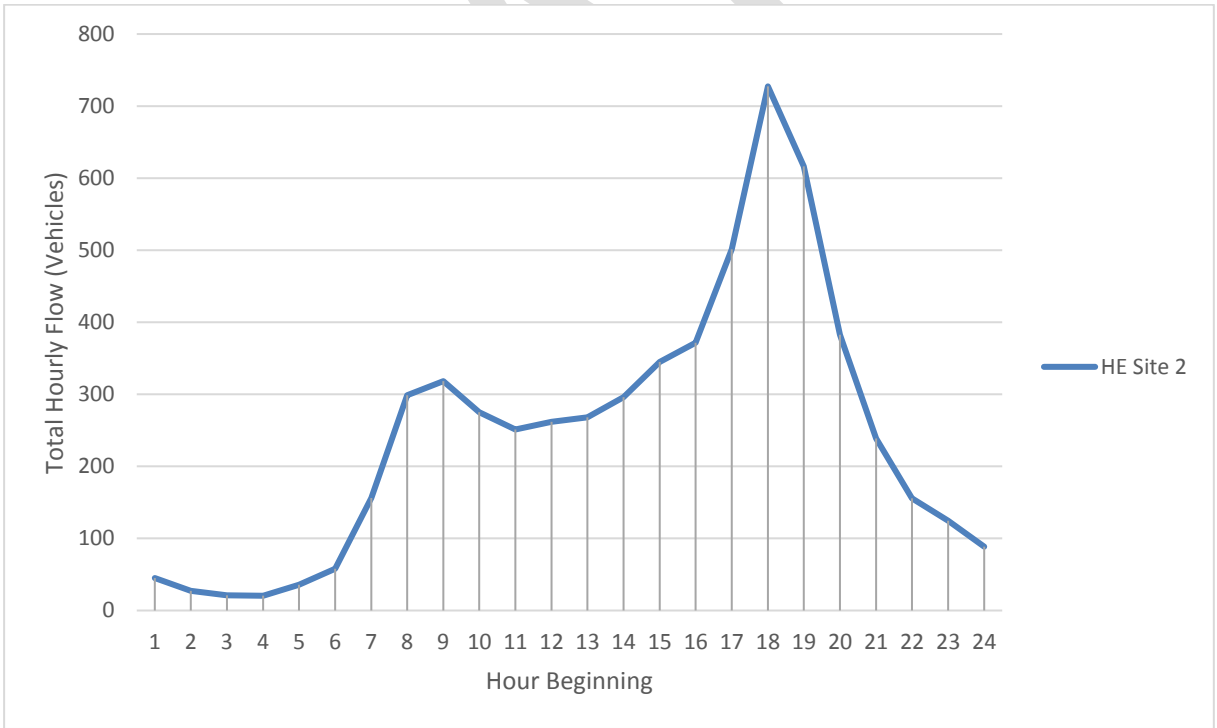


Figure 2-42: HE ATC Site 2

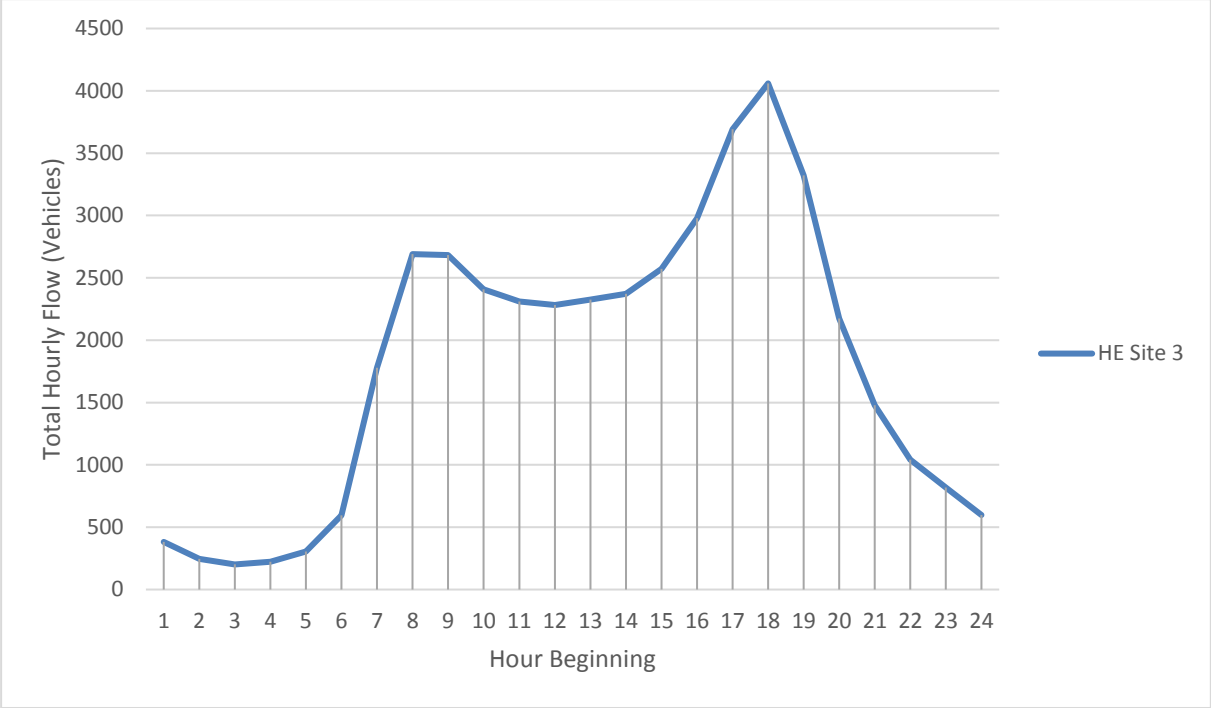


Figure 2-43: HE ATC Site 3

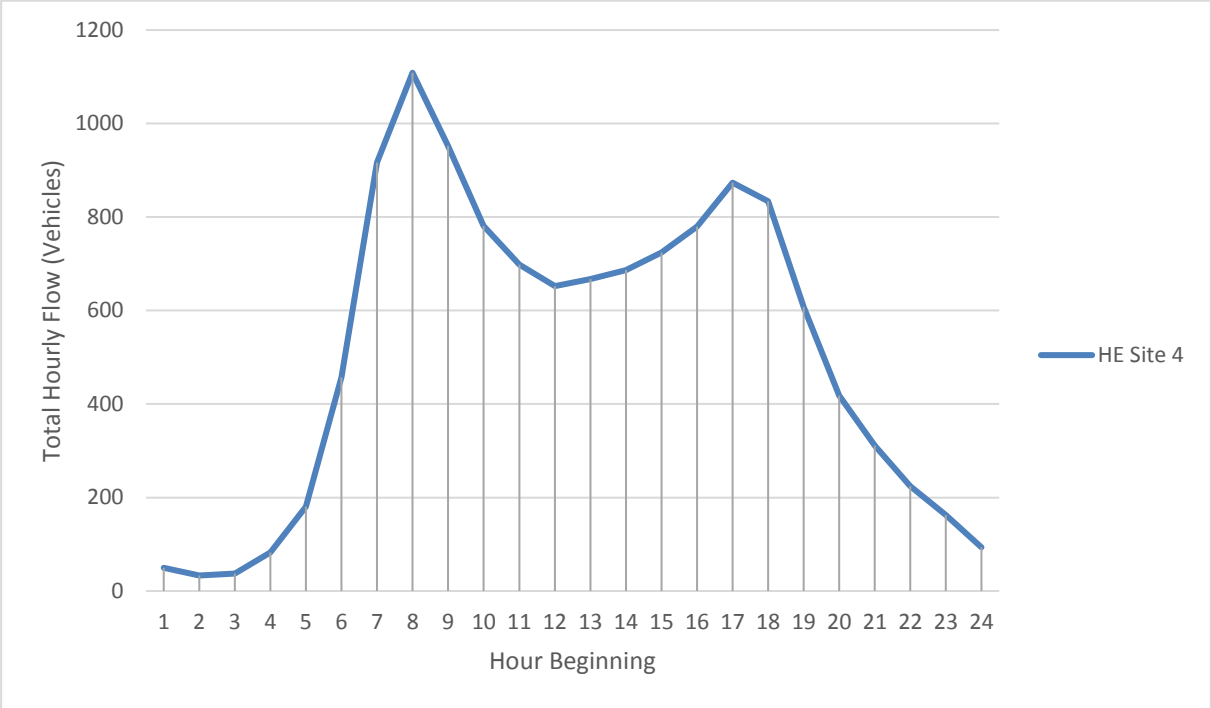


Figure 2-44: HE ATC Site 4

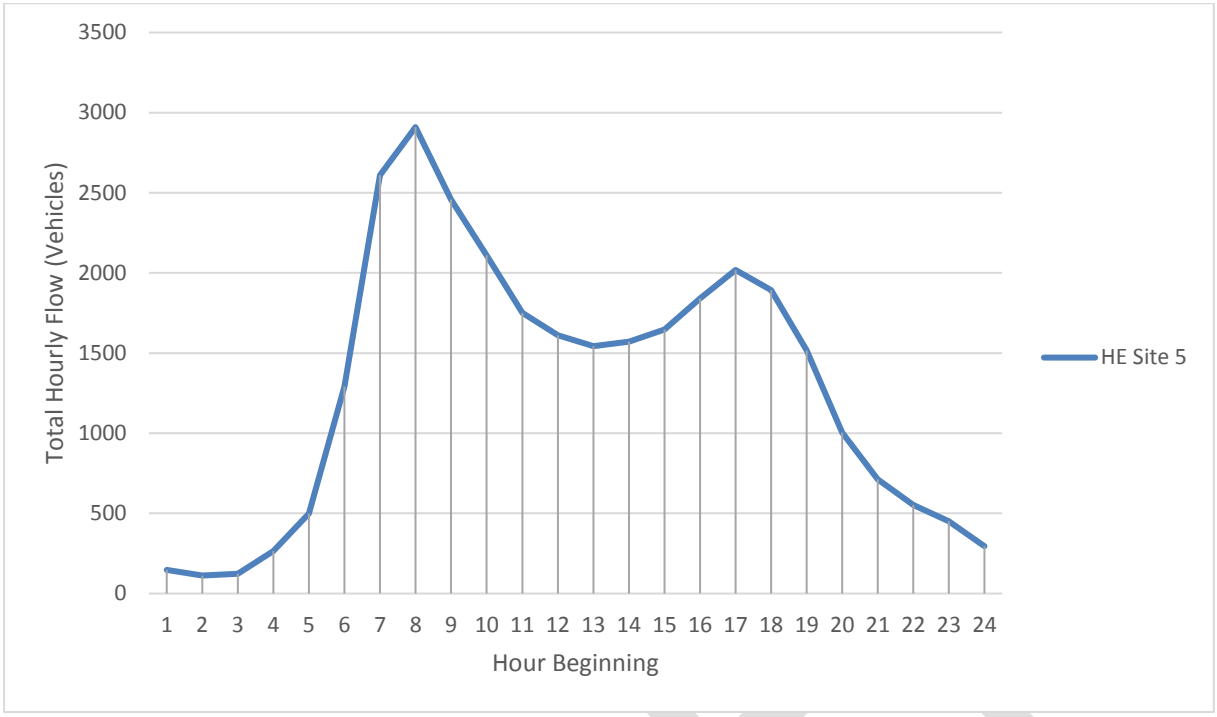


Figure 2-45: HE ATC Site 5

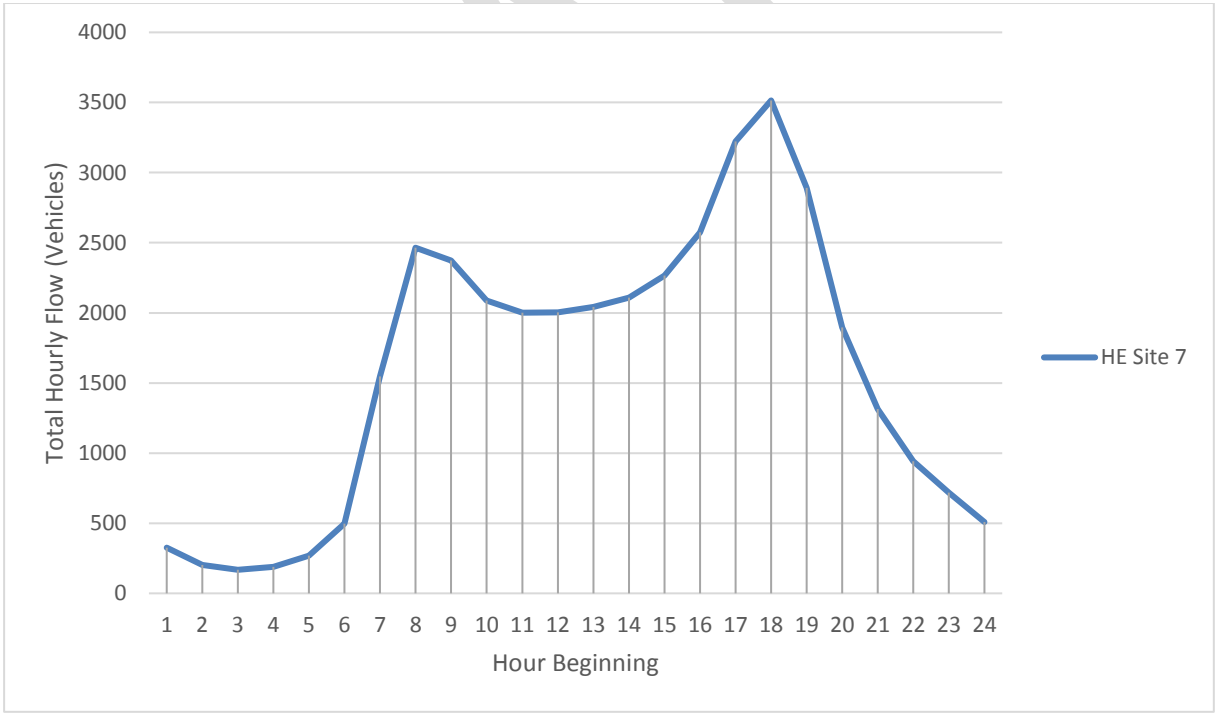


Figure 2-46: HE ATC Site 7

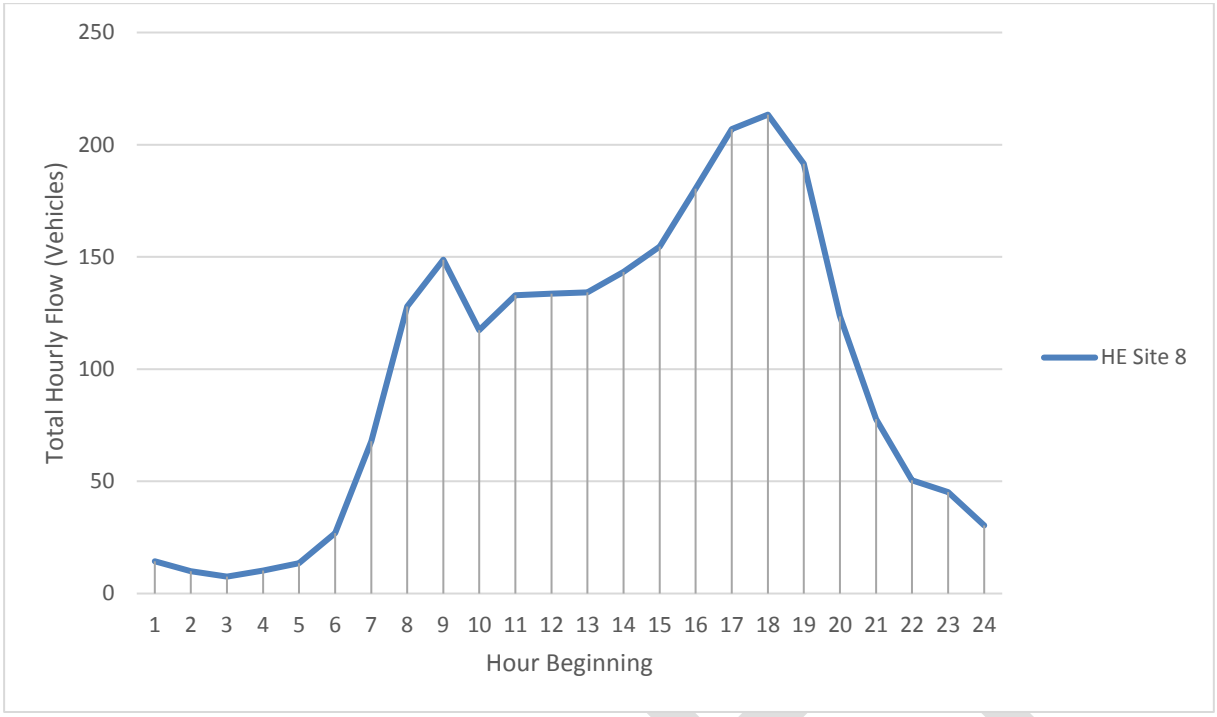


Figure 2-47: HE ATC Site 8

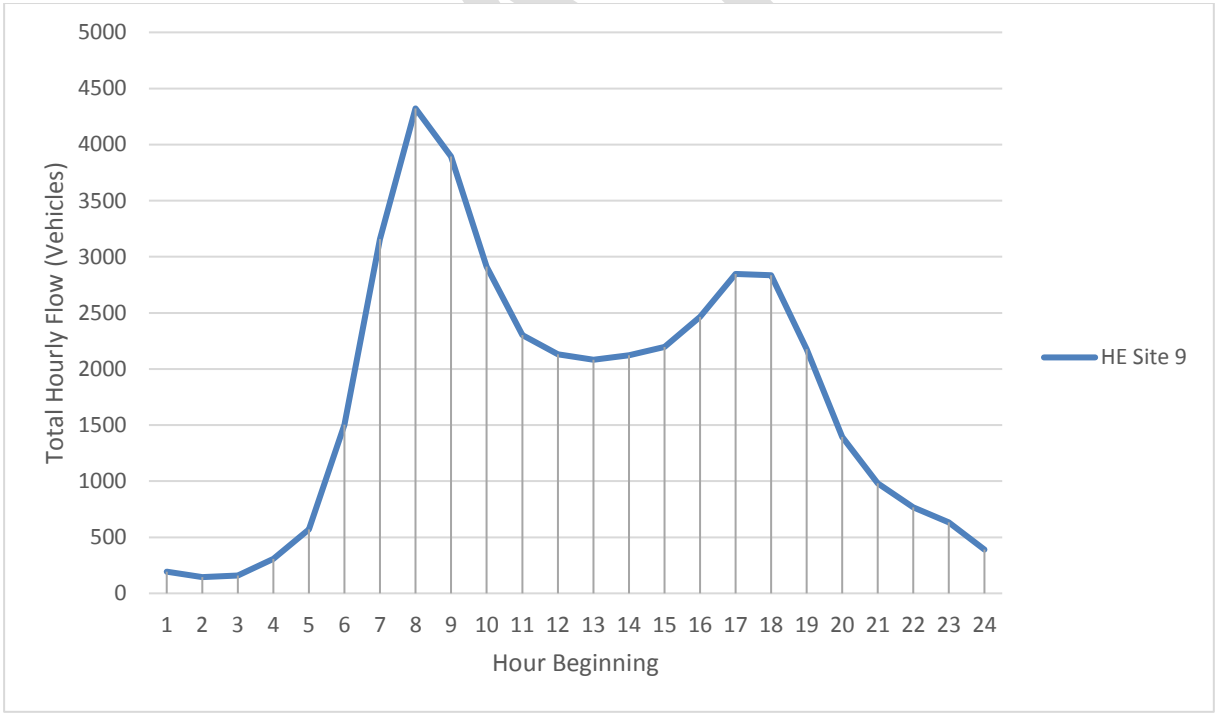


Figure 2-48: HE ATC Site 9

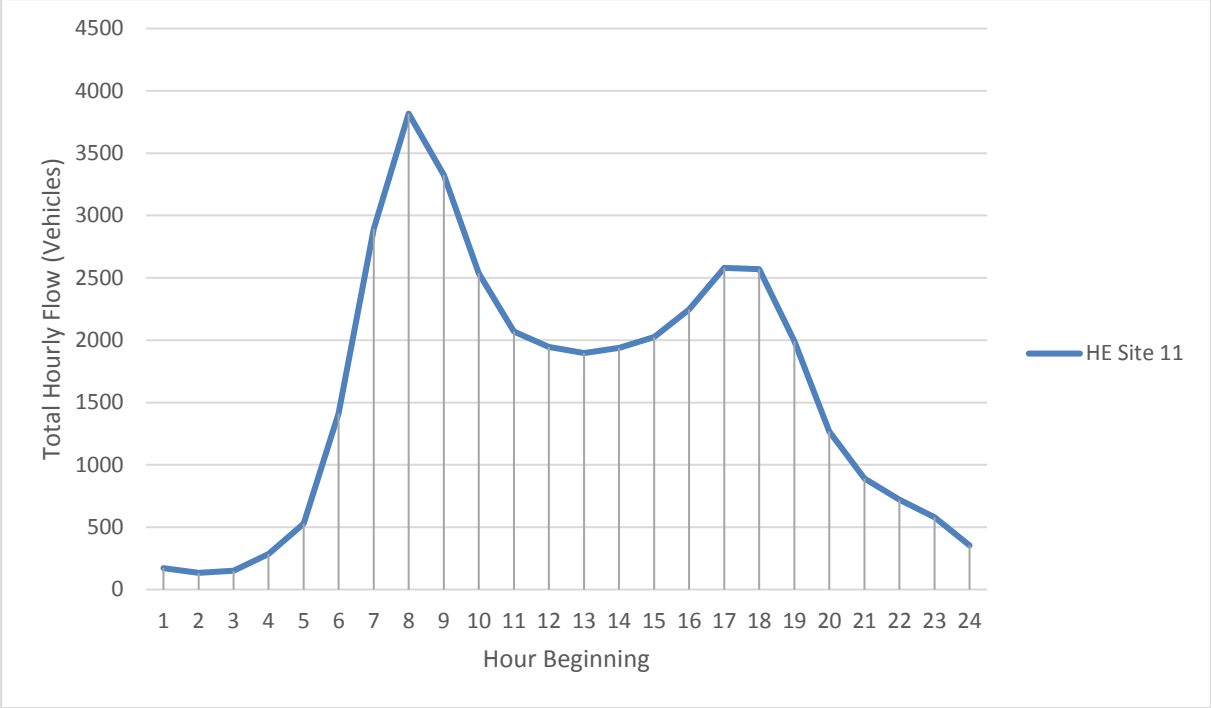


Figure 2-49: HE ATC Site 11

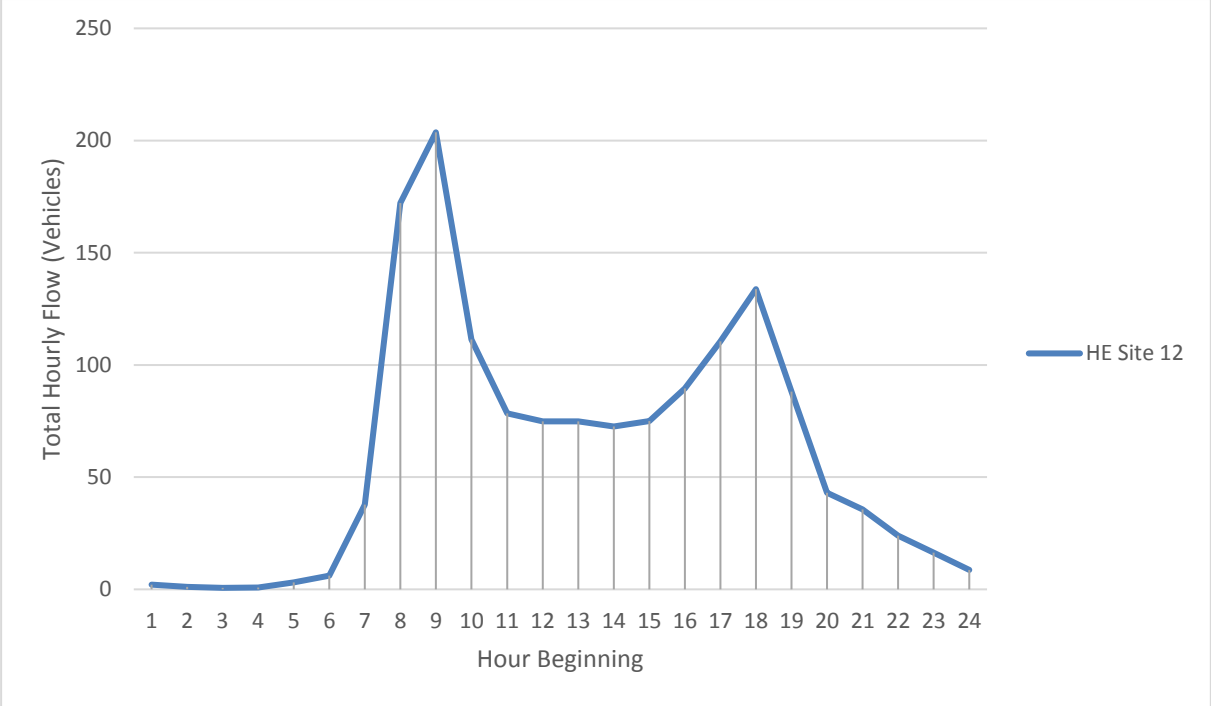


Figure 2-50: HE ATC Site 12

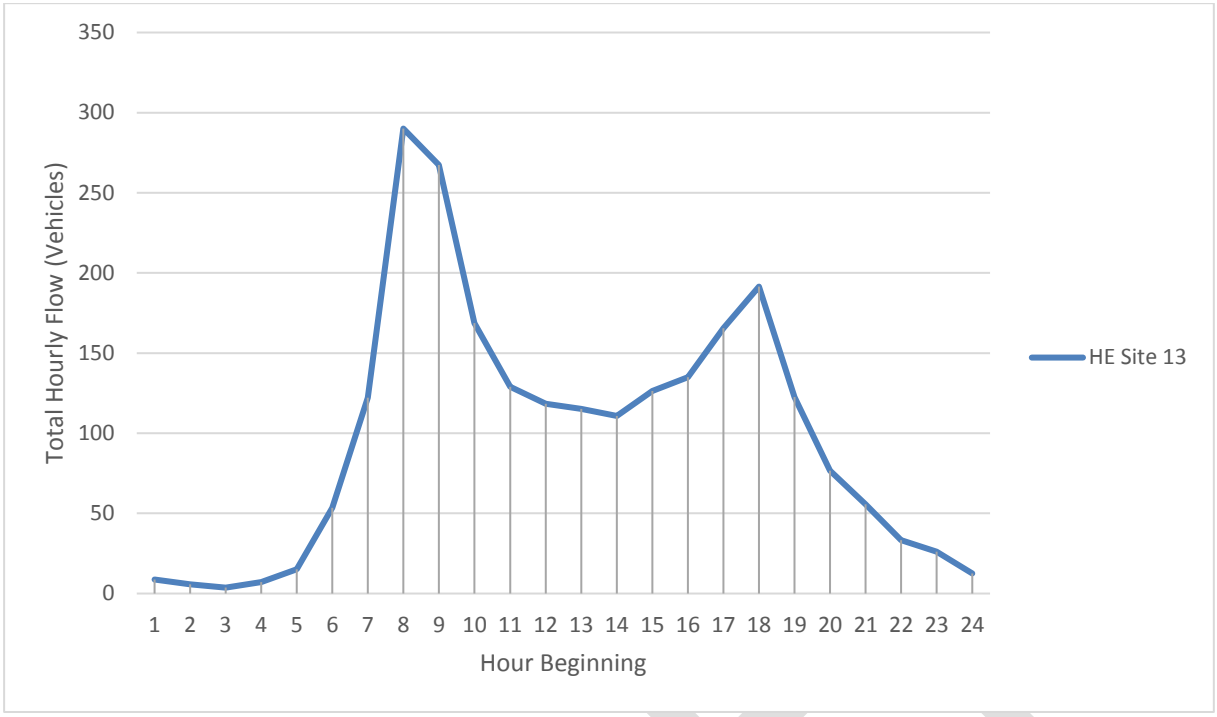


Figure 2-51: HE ATC Site 13

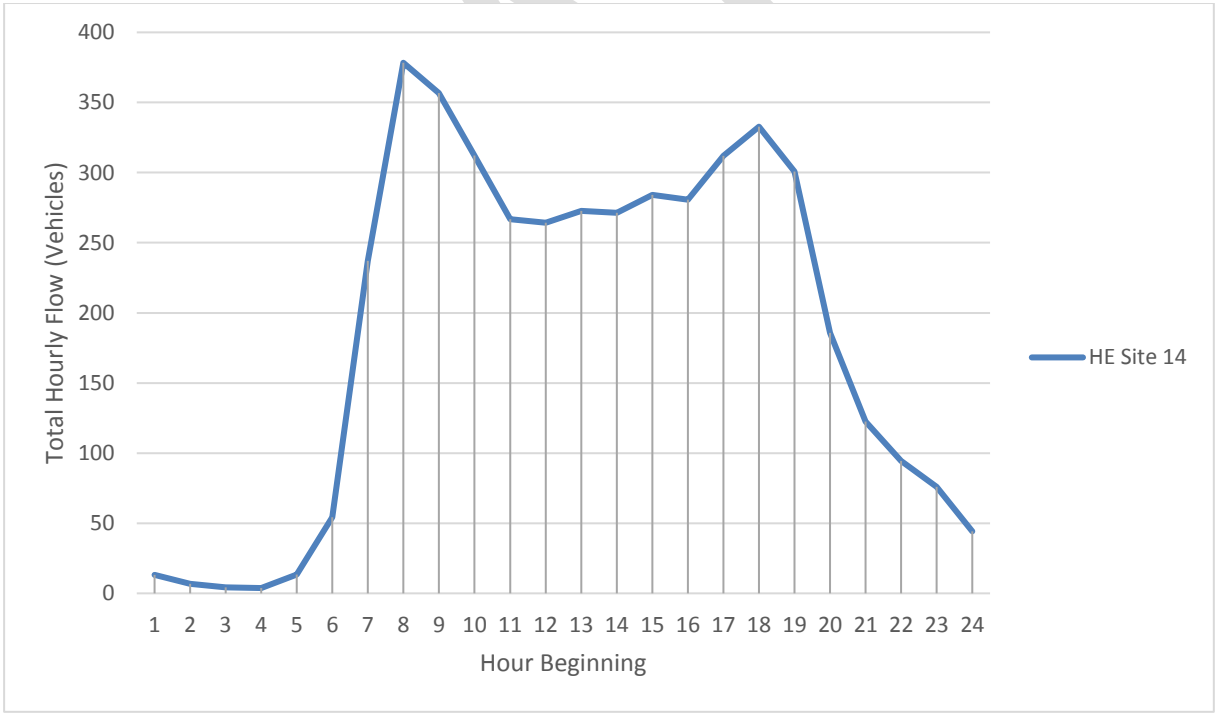


Figure 2-52: HE ATC Site 14

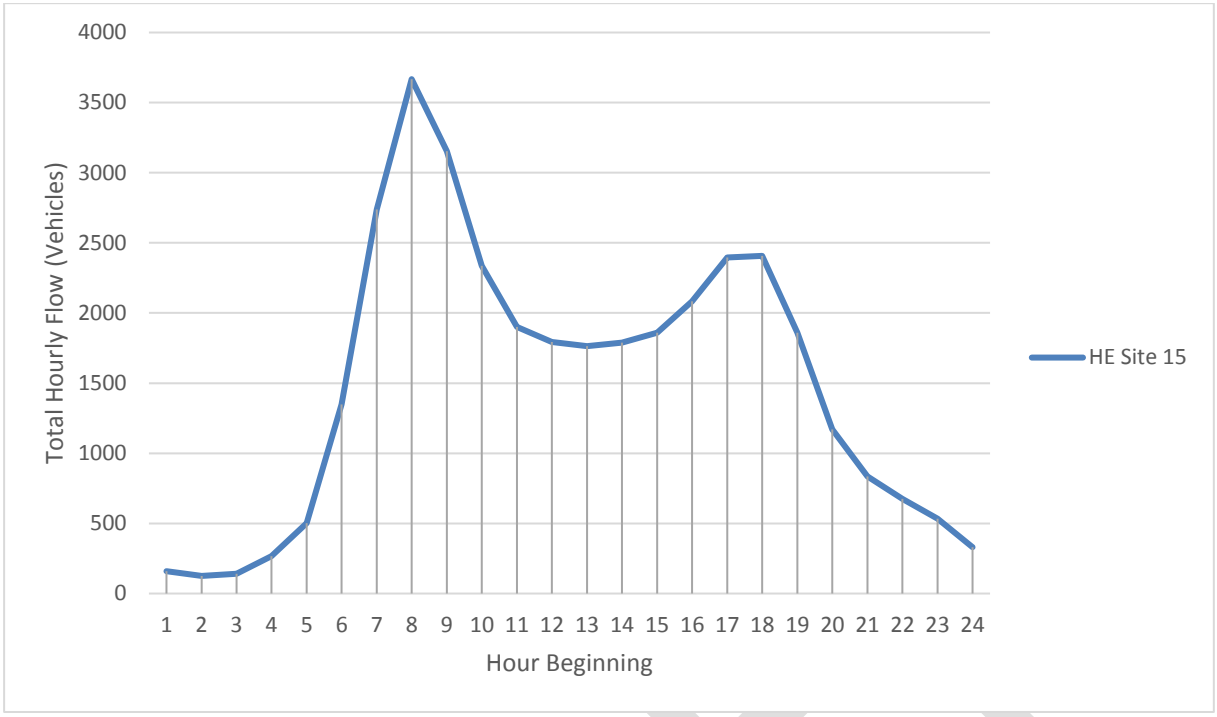


Figure 2-53: HE ATC Site 15

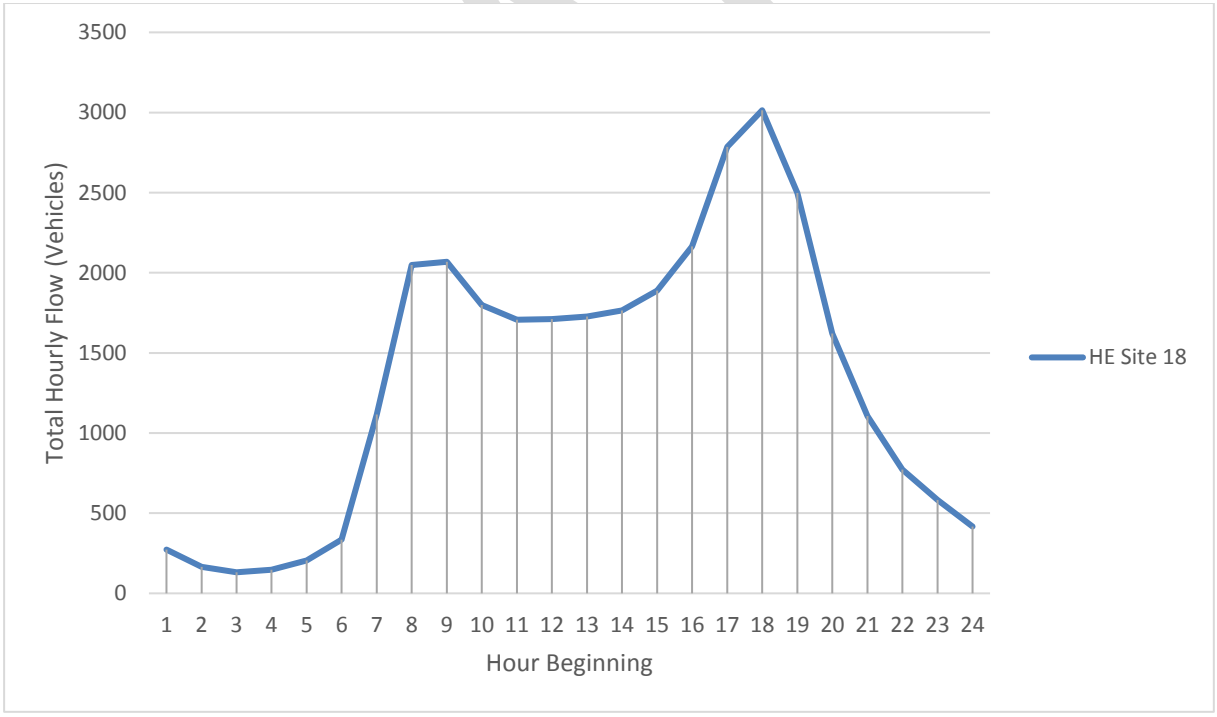


Figure 2-54: HE ATC Site 18

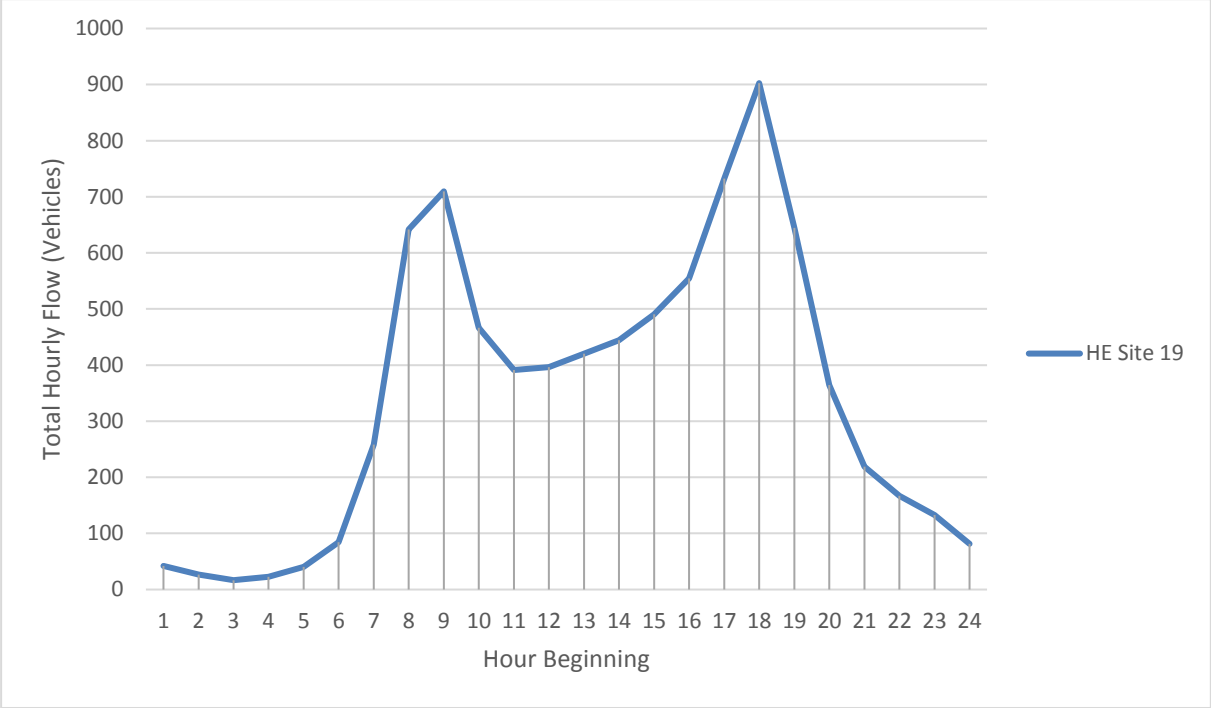


Figure 2-55: HE ATC Site 19

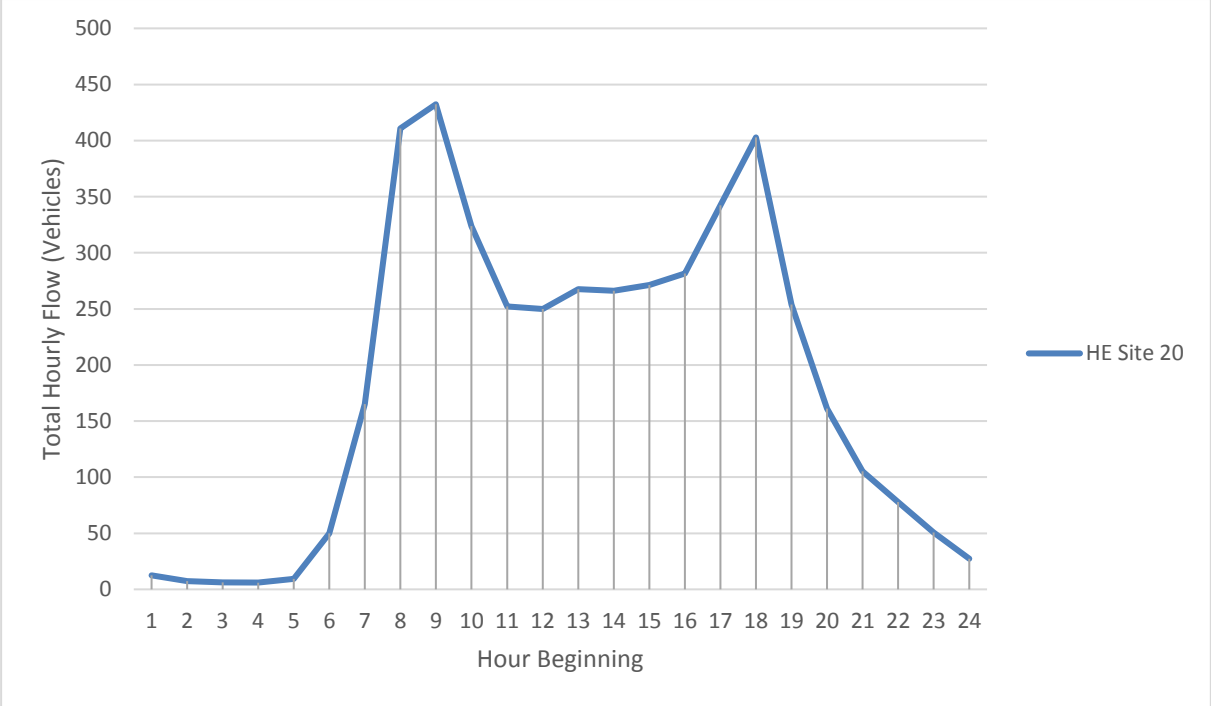


Figure 2-56 : HE ATC Site 20

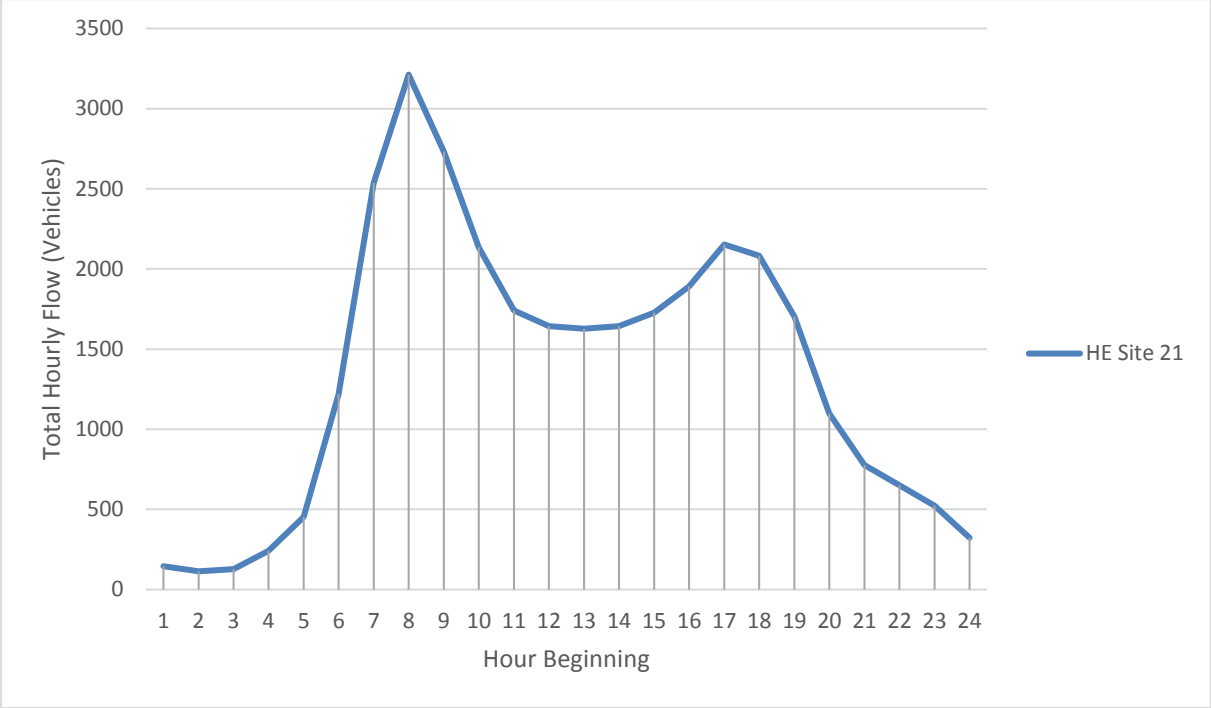


Figure 2-57: HE ATC Site 21

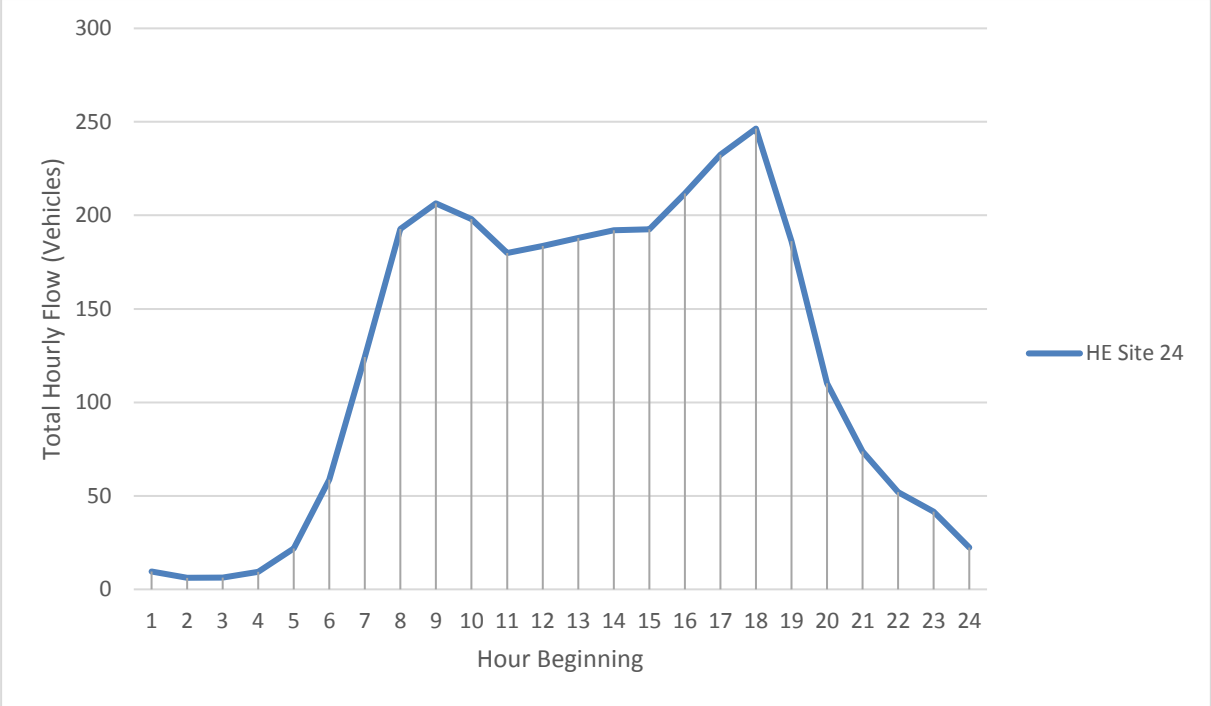


Figure 2-58: HE ATC Site 24

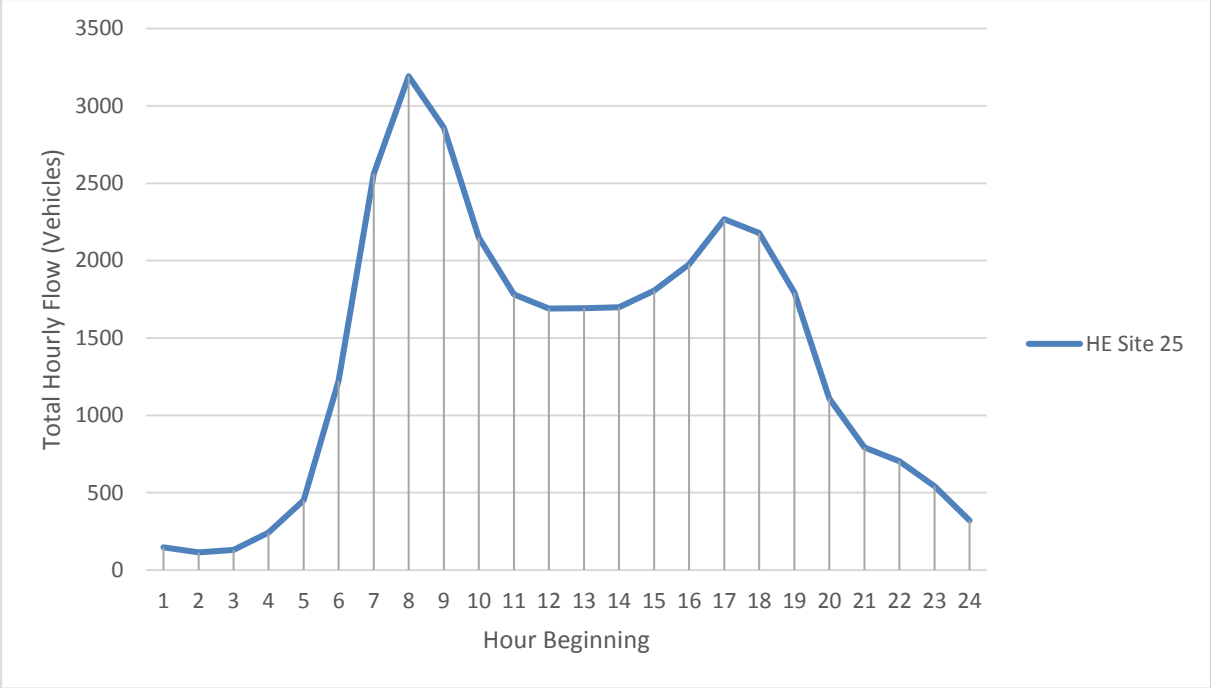


Figure 2-59: HE ATC Site 25

3 Manual Classified Counts

3.1 Overview

3.1.1 Manual classified counts (MCC) are counts undertaken at junctions, normally utilising video technology and are used to record all turning movements through a junction.

3.1.2 Surveys are undertaken for a 12-hour period (0700 to 1900) and for the purposes of the model development, should represent a typical average day, therefore avoiding school holidays and avoiding any major events or road works that could distort the data. Typically, they are undertaken on Tuesday, Wednesday or Thursday.

3.1.3 The surveys for the HTM were undertaken on Thursday the 23rd of May 2019.

3.1.4 The data has been fully classified into car, LGV, OGV1, OGV2, PSV, Motorcycles and cycles and is provided in 15-minute periods in excel format and is provided on DVD accompanying this report. This includes summary hourly turn flows provided by way of flow diagrams.

3.2 Survey Locations

3.2.1 The locations of the MCC surveys undertaken are set out in Table 3-1 and aerial plans are provided in Appendix B. Figure 3-1 shows a plan of the MCC surveys data locations. The surveys were undertaken on Thursday the 23rd of May 2019 being within the two-week period within which the new ATC surveys were undertaken.

3.2.2 The main purpose of the MCC data is to inform the matrix estimation process as part of the matrix development process.

Table 3-1: MCC locations

MCC Reference	Location
1	A24 Dorking Road / A281 / A24
2	A264 / A264 Crawley Road / B2195
3	A264 / Sullivan Drive / A2220 Horsham Road / A264
4	A281 / Old Guildford Road / A24 NB On-slip / A24 SB Off-slip / A281 Guildford Road / A24 SB On-Slip / A24 NB Off-slip
5	A272 / A24 Worthing Road
6	A24 NB On-slip / A24 SB Off-slip / A24 SB On-slip / East Wolves Farm / A24 NB Off-slip
7	A283 Storrington Road / A24 A283 The Pike / A24

MCC Reference	Location
8	Stane Street / A29
9	A272 / A29 / A272 West Street / A29
10	Albian Way / A281
11	A264 / A23 / M23 NB On-slip / M23 SB Off-slip / B2114 Brighton Road / A23 SB On-slip / A23 NB Off-slip
12	A272 Cowfold Road / London Road / A23 NB On-slip / A23 NB Off-slip
13	A272 Cowfold Road / A23 SB Off-slip / Crossways / A272 / A23 On-slip
14	A283 / A2037
15	Hop Oast Roundabout
16	A29 Stane Street/High Street
17	A281 / A29 Roman Road / A281 Guildford Road
18	Ingfield Manor School / A29 / A264 Horsham Road / A29
19	B2133 / A29
20	A283 Station Road / A29 London Road / A283 Lower Street / A29 Roman Road
21	A283 High Street / B2139 School Hill / A283 Manley's Hill
22	A283 Washington Road / Water Lane / Chanctonbury Ring Road
23	Clays Hill / A283 / Roman Road / The Street / A283 / Maudlin Lane
24	A272 Station Road / A281 Brook Hill / A272 / A281
25	A281 High Street / A2037 High Street / A281 Brighton Road

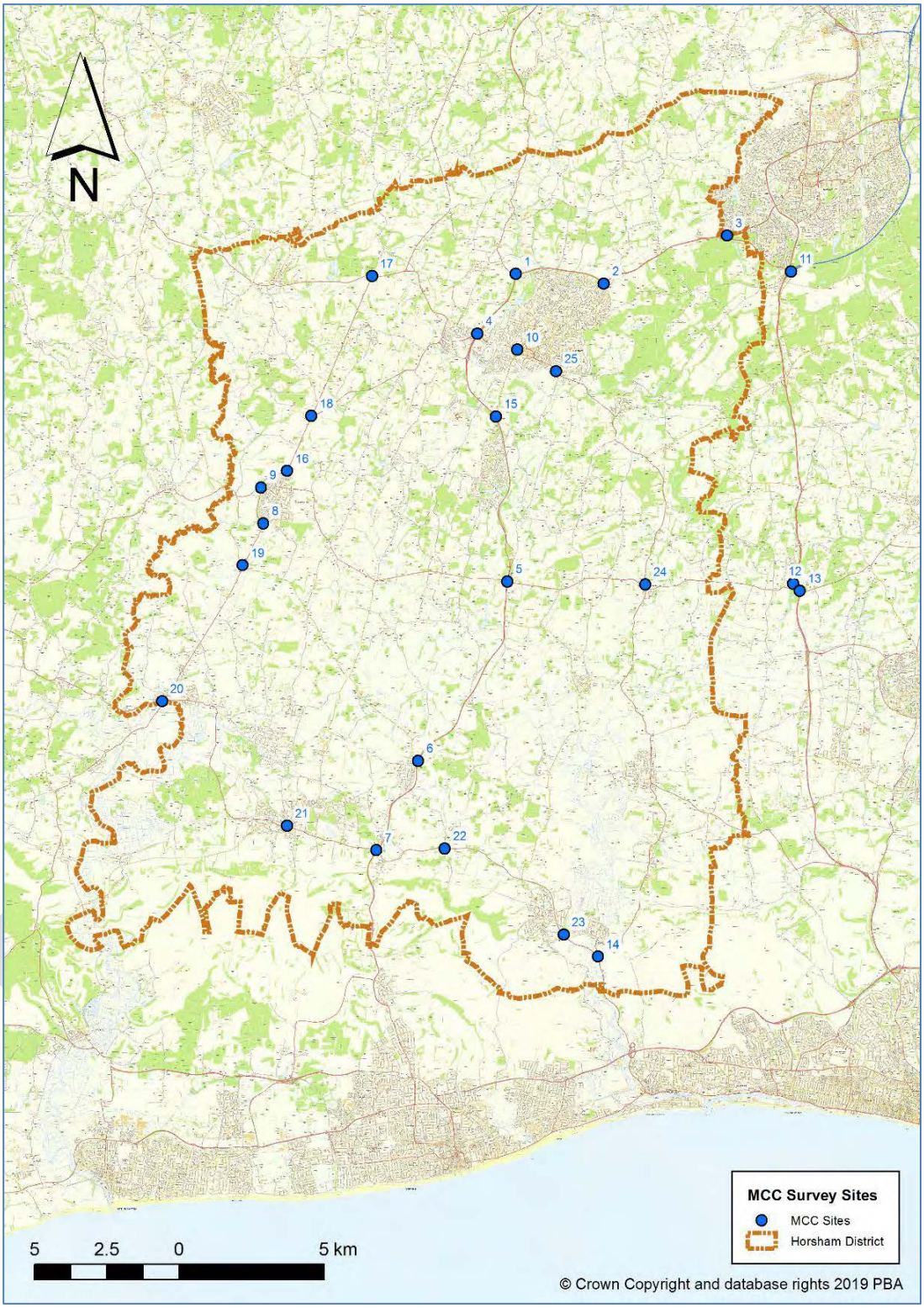


Figure 3-1: MCC Surveys data Locations

4 Journey Time Data

4.1 Overview

4.1.1 Journey time data for model update is sourced from Trafficmaster data via the Department for Transport (DfT) covering the period May 2019.

4.1.2 Trafficmaster journey time data has been sourced from in vehicle GPS tracking data and is broken into links with 15-minute segment. Trafficmaster data is made up of a mixture of vehicles.

4.1.3 Journey time data is used to validate the model through comparison of modelled journey times and observed data from this data source, on a number of routes within the model area. In total, 12 routes have been defined for the HTM which cover the main links within the study area.

4.1.4 Journey time routes for validation have been defined and the relevant journey time data for the AM peak hour (08:00 to 09:00), IP average hour (10:00 to 16:00) and PM peak hour (17:00 to 18:00) extracted from the full data for each of these routes. The data used was for the neutral weekdays Tuesday to Thursday.

4.1.5 The journey time routes are described in Table 4-1 and can be seen in Figure 4-1. The raw Traffic Master data is included in the DVD accompanying this report.

Table 4-1: Journey Time Routes

Route Number	Description	From	To
1	A272 – Petworth to Billingshurst	A283	A29
2	A281 - Cowfold to Horsham/A24	A272	A24
3	A264	M23 J11	A24
4	A272 – Billingshurst to Bolney	A272 High Street	A23
5	A24 North Horsham	A272	Horsham A264
6	A24 South Horsham	Findon	A272
7	A29 Madhurst to Billingshurst	A284	West Street
8	A281 – Alfold Crossways to Horsham	Alfold By-Pass	A24
9	Harwood Road, Horsham	A264	Albion Way
10	A283 – Petworth to Botolphs	Golden Square	A2037
11	A29 Billingshurst to Ockley	A272	B2126
12	A24 – Capel to Horsham	Wolves Hill	A264

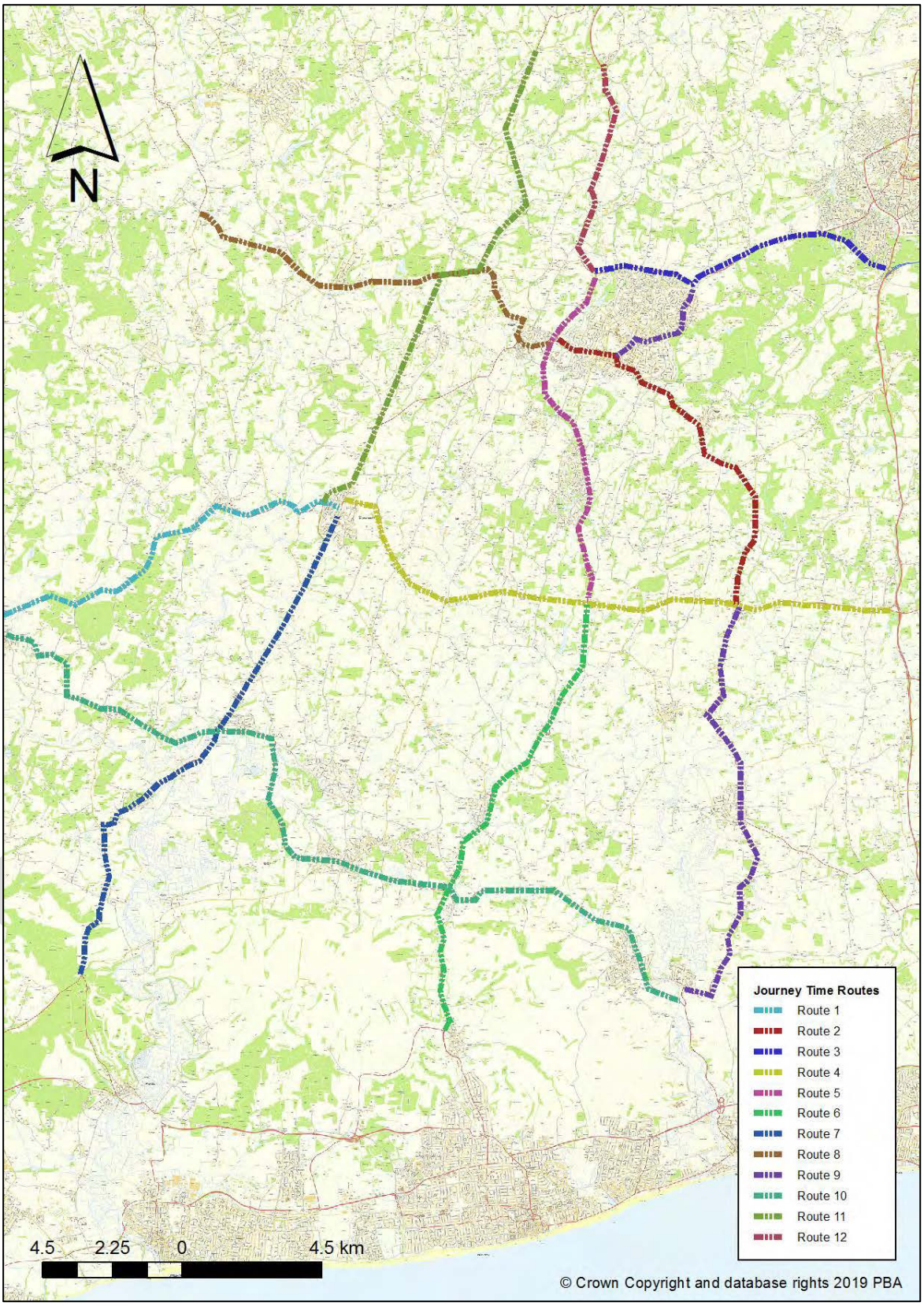


Figure 4-1: Journey Time Routes

4.1.6 Table 6–2 summarises the results for the AM peak hour for each of the eight routes by direction. This data will be used in validating the journey times for HTM AM peak model. The average speed for each route was determined from the route distance and average journey time and is given both in kilometres per hour and miles per hour. Speeds are easier to understand than journey times and give context as to the operation of the road network.

Table 4-2: Summary of AM Peak hour Traffic

Route	Direction	Length (km)	Observed Avg. JT (mm:ss)	Lower 15% JT (mm:ss)	Upper 15% JT (mm:ss)	Avg. Speed (kph)	Avg. Speed (mph)
1	Eastbound	13.0	12:26	10:34	14:18	63	39
	Westbound	13.2	13:19	11:19	15:19	59	37
2	Northbound	12.7	17:29	14:52	20:07	44	27
	Southbound	12.7	16:39	14:09	19:09	46	28
3	Eastbound	10.5	11:05	09:25	12:45	57	35
	Westbound	10.4	09:12	07:49	10:35	68	42
4	Eastbound	20.0	22:04	18:46	25:23	54	34
	Westbound	19.8	20:55	17:46	24:03	57	35
5	Southbound	11.8	08:41	07:23	09:59	82	51
	Northbound	11.7	11:27	09:44	13:10	61	38
6	Northbound	15.6	11:22	09:40	13:04	82	51
	Southbound	15.6	10:33	08:58	12:08	89	55
7	Northbound	17.9	21:38	18:24	24:53	50	31
	Southbound	18.0	21:08	17:58	24:18	51	32
8	Eastbound	8.6	07:56	06:45	09:07	65	41
	Westbound	8.6	08:04	06:51	09:17	64	40
9	Northbound	4.0	11:50	10:04	13:37	20	12
	Southbound	3.9	07:20	06:14	08:26	32	20
10	Eastbound	29.9	35:01	29:46	40:16	51	32
	Westbound	29.6	35:46	30:24	41:08	50	31
11	Northbound	17.2	15:03	12:48	17:19	69	43
	Southbound	17.5	15:57	13:33	18:20	66	41
12	Northbound	7.6	07:12	06:07	08:17	64	40
	Southbound	7.6	07:20	06:14	08:25	63	39

4.1.7 Similar analysis for the PM average hour is shown in Table 6-3. The rural nature of the network is also evident with speeds generally below or just above 30 mph. The more strategic Route A24 shows speeds of the order of just above 50 mph in both directions. The results appear reasonable.

Table 4-3: Summary of PM average hour Traffic

Route	Direction	Length (km)	Observed Avg. JT (mm:ss)	Lower 15% JT (mm:ss)	Upper 15% JT (mm:ss)	Avg. Speed (kph)	Avg. Speed (mph)
1	Eastbound	13.0	11:38	09:54	13:23	67	42
	Westbound	13.2	12:27	10:35	14:19	64	40
2	Northbound	12.7	15:43	13:22	18:05	48	30
	Southbound	12.7	17:36	14:57	20:14	43	27
3	Eastbound	10.5	08:56	07:35	10:16	71	44
	Westbound	10.4	10:52	09:14	12:30	57	36
4	Eastbound	20.0	19:38	16:41	22:35	61	38
	Westbound	19.8	19:41	16:44	22:38	60	38
5	Southbound	11.8	08:26	07:10	09:41	84	52
	Northbound	11.7	09:21	07:57	10:45	75	47
6	Northbound	15.6	10:15	08:43	11:48	91	57
	Southbound	15.6	10:48	09:10	12:25	87	54
7	Northbound	17.9	18:27	15:41	21:13	58	36
	Southbound	18.0	18:28	15:41	21:14	59	36
8	Eastbound	8.6	07:33	06:25	08:41	69	43
	Westbound	8.6	07:20	06:14	08:26	70	44
9	Northbound	4.0	10:44	09:07	12:20	22	14
	Southbound	3.9	06:29	05:31	07:28	36	23
10	Eastbound	29.9	30:14	25:42	34:46	59	37
	Westbound	29.6	31:31	26:47	36:14	56	35
11	Northbound	17.2	14:27	12:17	16:37	71	44
	Southbound	17.5	14:36	12:24	16:47	72	45
12	Northbound	7.6	07:07	06:03	08:11	64	40
	Southbound	7.6	07:43	06:34	08:53	59	37

4.1.8 Journey time data has been cross-referenced against online travel data sources, in all cases and in all route direction the GPS data falls within other online journey time estimations, this further verifies the accuracy of the collected GPS journey times used within the model calibration.

5 Mobile Network Data

5.1 Overview

5.1.1 Mobile network data (MND) will be used as the main source of data to develop the initial origin and destination matrices for the HTM. This was in preference to undertaking Roadside Interview Surveys (RSI) which has been the traditional method of developing matrices for transport models in the UK for a long time. However, RSI surveys are disruptive to travellers and sample rates can be low leading to less robust matrices. Use of mobile phone data is increasingly being seen as a credible alternative although understanding and experience of using this data for matrix development is still limited.

5.1.2 The origin and destination matrices provide information on where trips start and where they end within the model. The model is split up into a number of zones, which are smaller within the study area and get larger as you get further away. Zone size is also reflective of density of development and the highway network, i.e. zones will be smaller in built up areas and larger in rural areas. The zones can also reflect areas of different land use where these are differentiated i.e. representing residential or employment areas.

5.1.3 The existing Telefonica data was collected within West Sussex County in 2015 for the purposes of providing travel demand data for a transport model for the Crawley district. It has been deemed after further analysis that the existing mobile phone data is still appropriate to use as a base for prior demand in 2015. The analysis undertaken looked to verify if there have been any substantial changes to travel movement or land use within the Horsham District, and it was deemed that since 2015 general travel demand movements caused by changes to transport infrastructure and land use changes have remained similar.

5.1.4 The MND was provided by Telefonica (O2 in the UK) for the West Sussex region for six neutral weeks in April and May 2015. The data as provided was separated into different modes (road, rail and HGV). The data had also been split by purpose into the following categories:

- Non-Home Based (NHB) Trips
- Outbound Home-Based Work (OB_HBW) Trips
- Outbound Home Based Other (OB_HBO) Trips
- Inbound Home-Based Work (IB_HBW) Trips
- Inbound Home Based Other (IB_HBO) Trips

5.1.5 As MND is known to possess some biases the data for the Horsham model area has been validated to ensure that it is fit for purpose. The purpose of the validation is to demonstrate that the mobile phone data is consistent with known sources of trip making data such as census journey to work data and National Travel Survey (NTS) data.

5.2 Initial Validation by Telefonica

5.2.1 Telefonica undertook some initial validation of the mobile phone data prior to releasing it to WSCC. The initial validation is reported in '*West Sussex OD from Mobile Phone Data, Project Report*', issued 25/02/2016.

5.2.2 The validation looked at the dataset for the whole of West Sussex whereas the HTM is only interested in a subset of this region itself~~. PBA have carried out similar validation checks to those undertaken by Telefonica, on the data but on the data for the HTM study area.~~. It has been deemed that the validation checks conducted by Telefonica are sufficient to validate the Horsham Transport Model, where Horsham can be deemed to be representative of similar trip generation rates of the wider West Sussex area.

5.2.3 Telefonica compared a number of different factors in the data to the Census data (including journey to work data) and the National Travel Survey (NTS). These tests included:

- Comparison of home-based origins with zone home population
- Comparison of work-based origins with zone work population
- Analysis of trip purpose split
- Comparison of trips starting and ending per zone (trip symmetry)
- Trip length distribution against the census journey to work and NTS data
- Comparison of travel start time with NTS data
- Comparison of rail mode share with the census journey to work data

5.2.4 Telefonica used these tests to verify that there is a strong correlation and good fit between the mobile data and the census/NTS data. Thereby ensuring that the data is suitable for use. Their results also highlighted some known biases in the mobile data such as the under-representation in short trips up to about 5 miles.

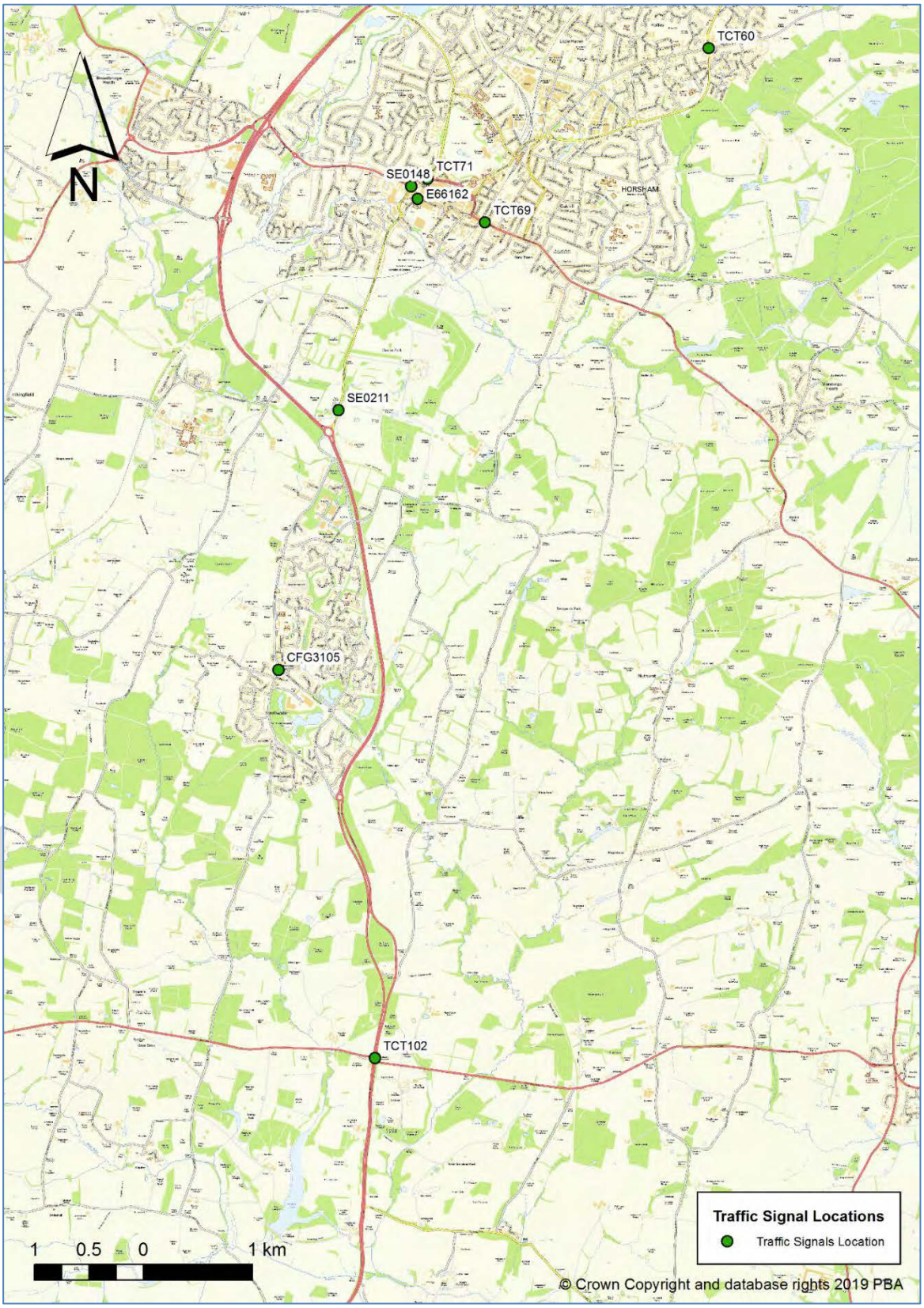
6 Traffic Signal Data

6.1 Overview

6.1.1 Traffic Signal data has been provided by WSCC in the form of signal timing data sheets. The data provided will provide initial signal timing data for input into the SATURN model by time period. This included information on phase movements by stage including pedestrian phases, minimum and maximum green times, inter-green times and cycle times.

6.1.2 Figure 6-1 shows the locations of signal junctions in Horsham. Signal data was provided for these junctions. As stated, the timings will be used as initial inputs to the model and it is expected that these might change during the calibration and/or validation process. The data is included in electronic format.

Figure 6-1 – Horsham Traffic Signal Sites



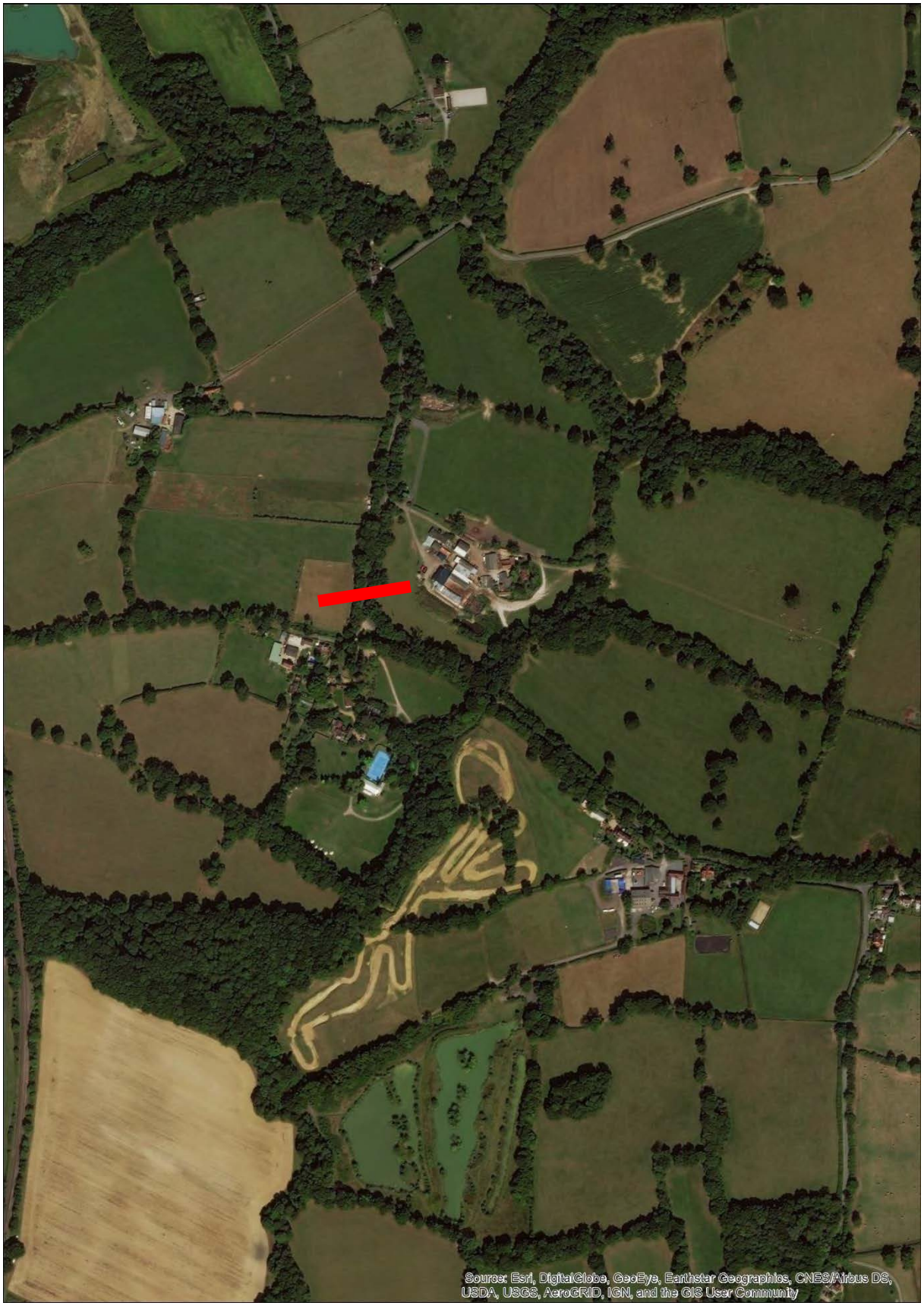
Appendix A ATC Location Plans

ATC 1

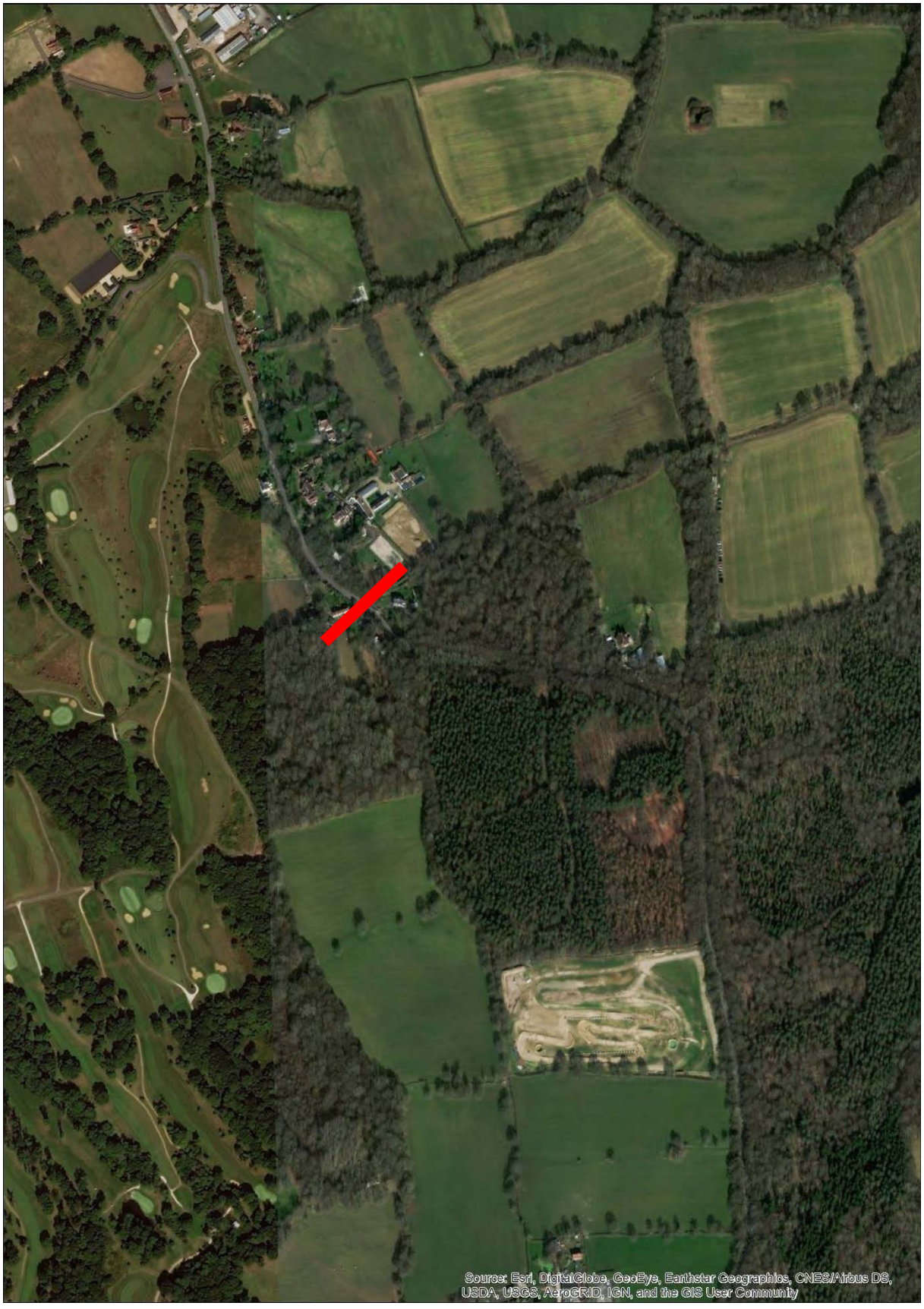
ATC 2


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ATC 3


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ATC 4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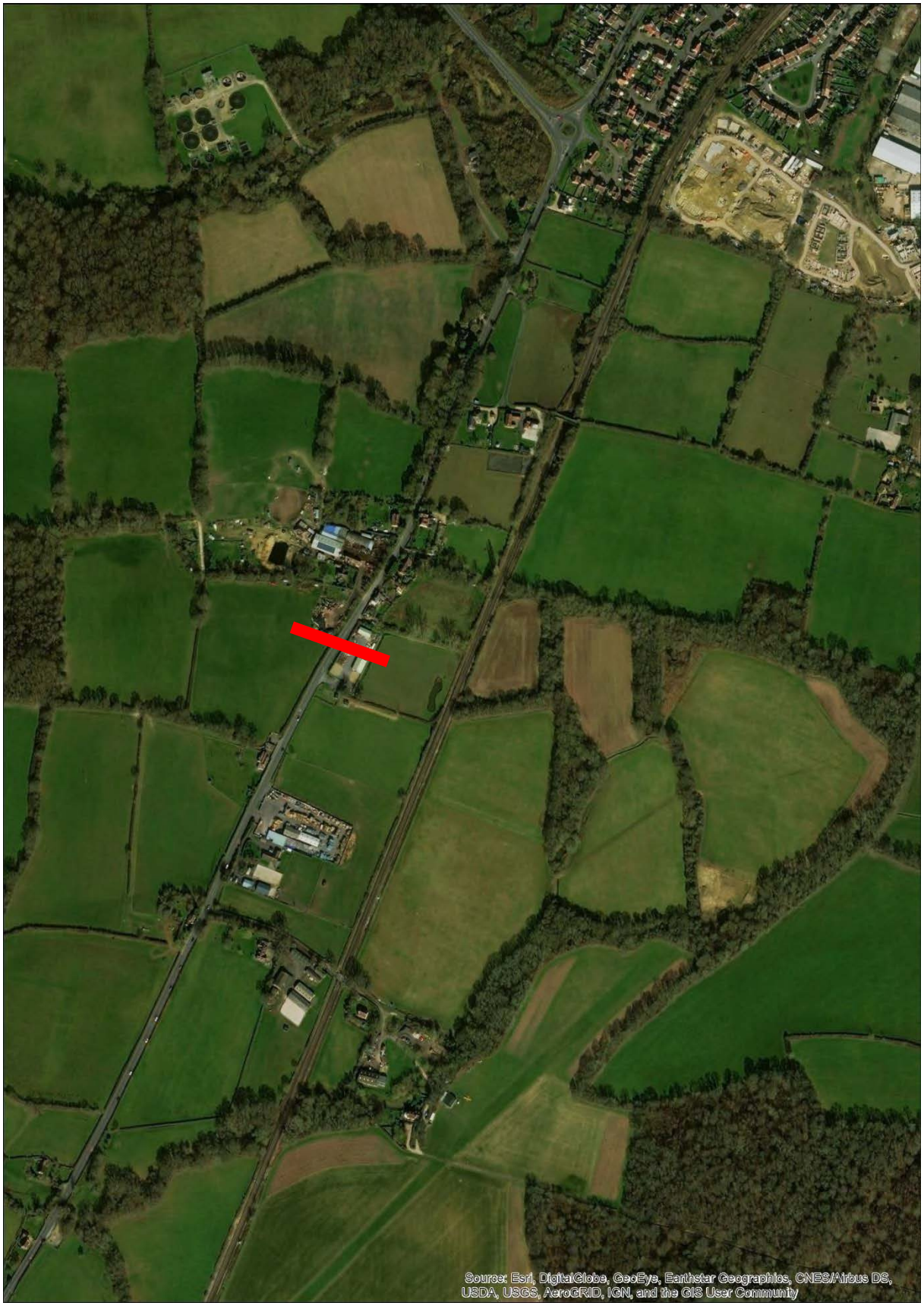
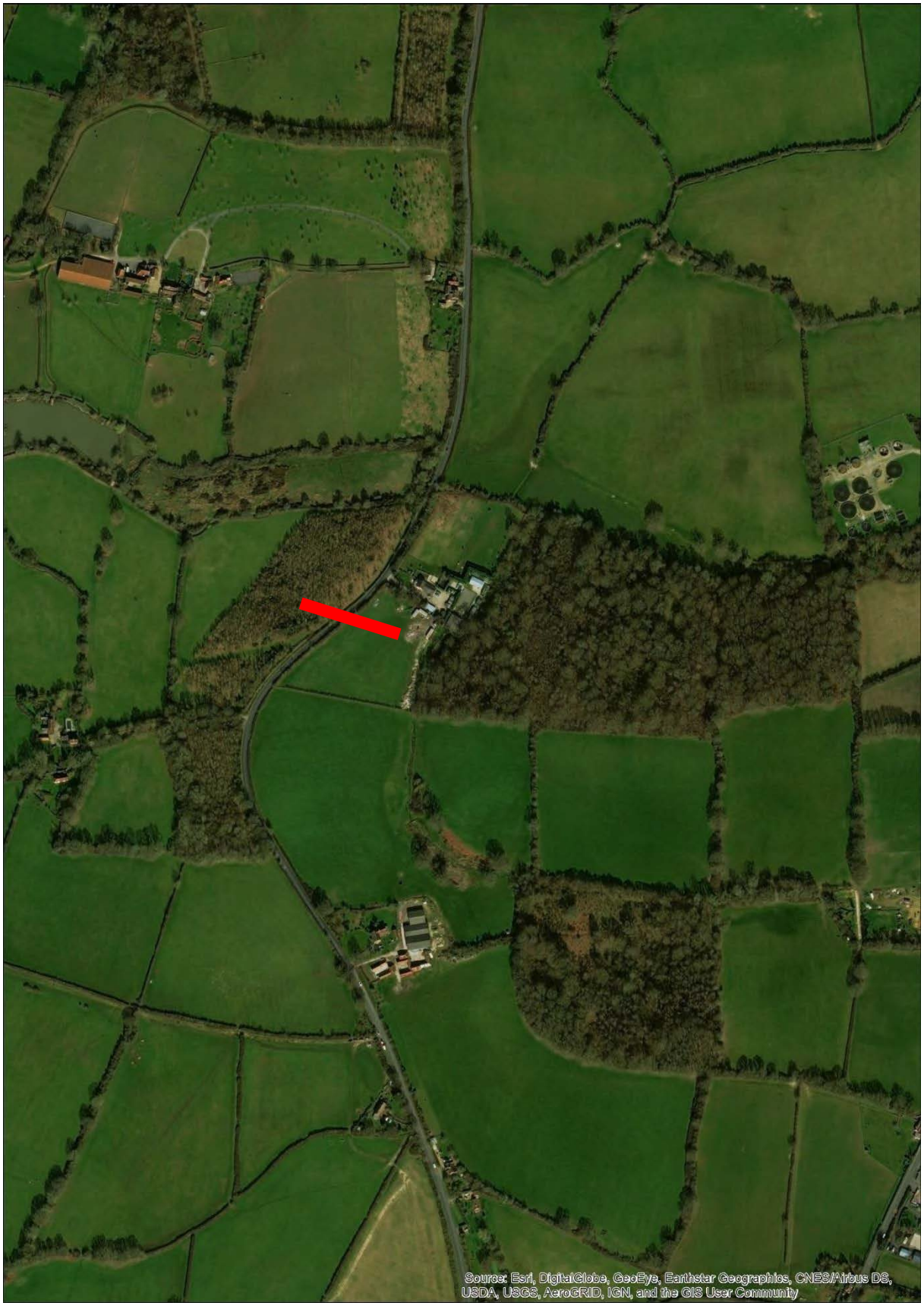

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ATC 6


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ATC 7


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ATC 8


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

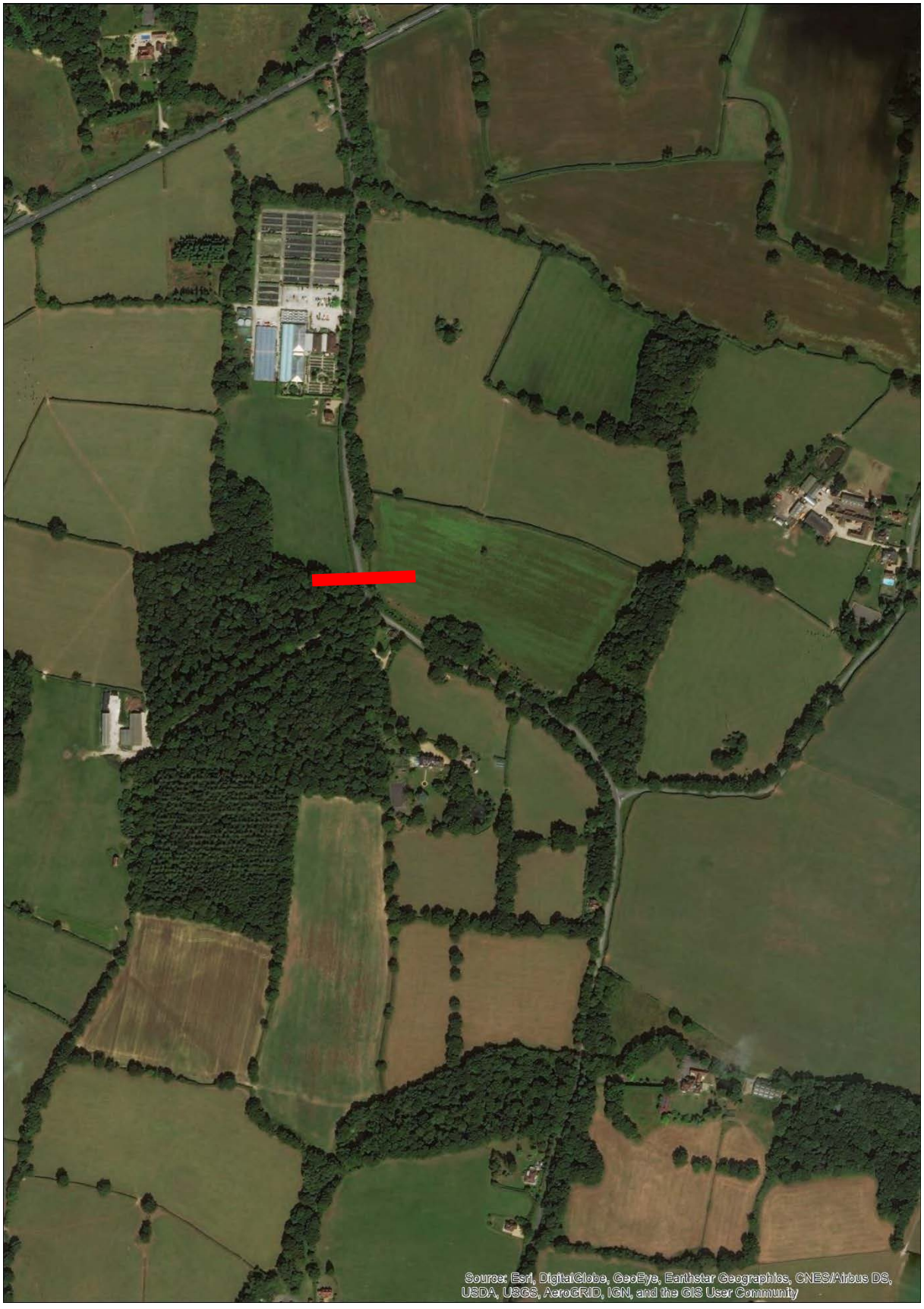
ATC 9


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ATC 10


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

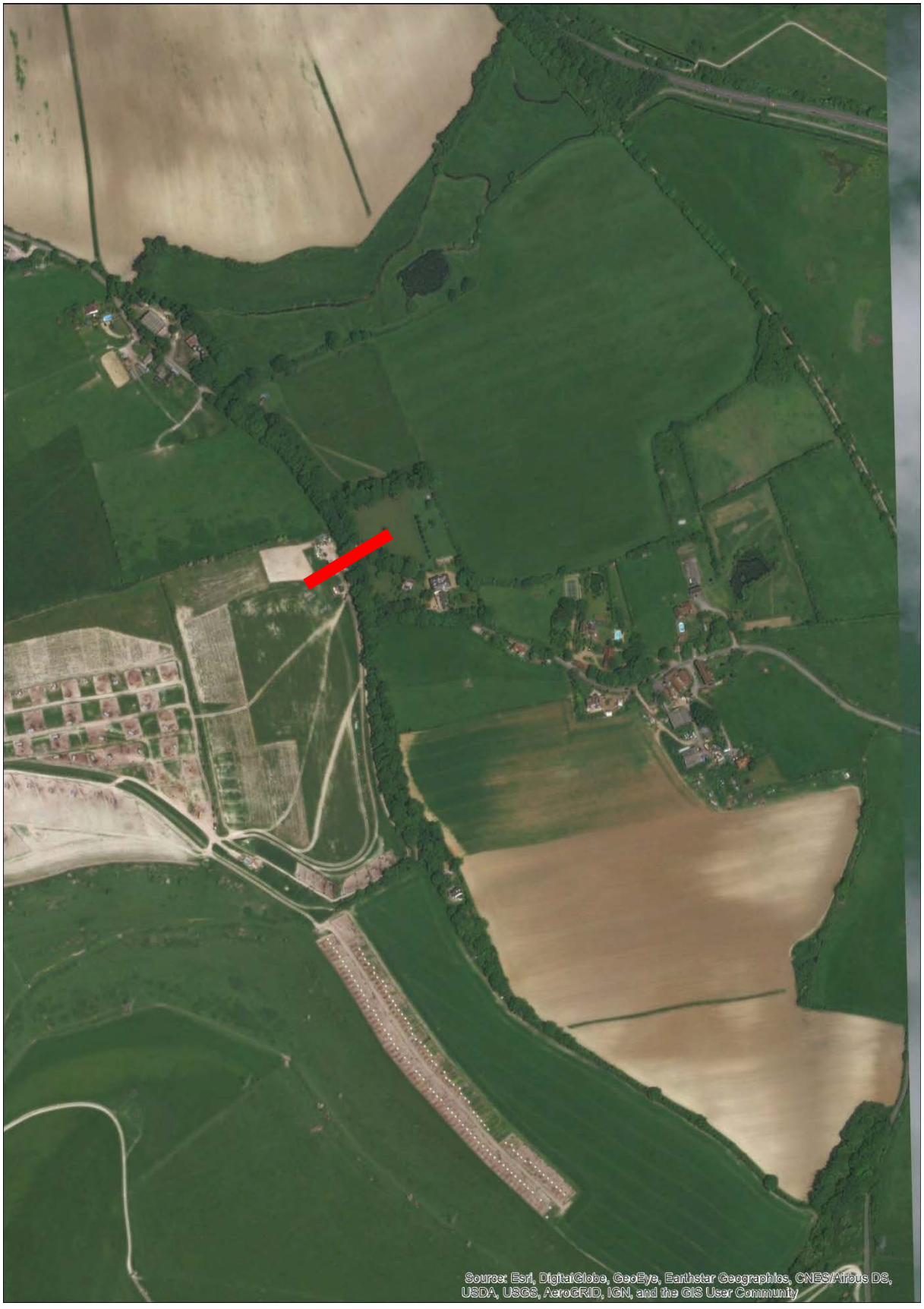
ATC 11


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ATC 12


A283
S Downs Way
S Downs Way
S Downs Way
S Downs Way
Shoreham Rd
S Downs Way
River Adur
S Downs Way
A283
Shoreham Rd
Dacre Gardens
Dacre Gardens
A283
River Adur
Google
Imagery ©2019 Bluesky, DigitalGlobe, Getmapping plc, Infoterra Ltd & Bluesky, Map data ©2019 Google
United Kingdom

ATC 13


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS,
USDA, USGS, AeroGRID, IGN, and the GIS User Community

ATC 14


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ATC 15


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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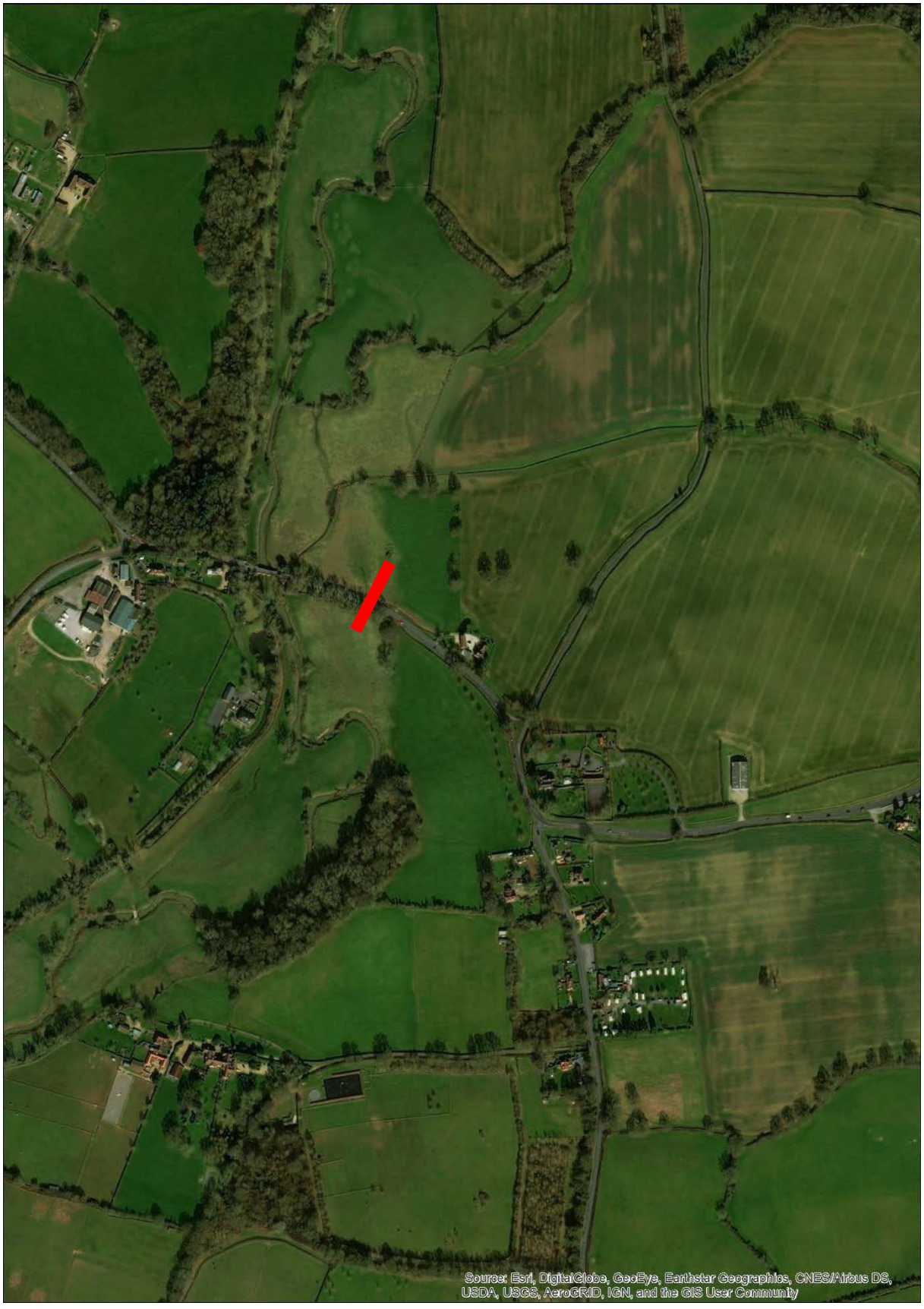
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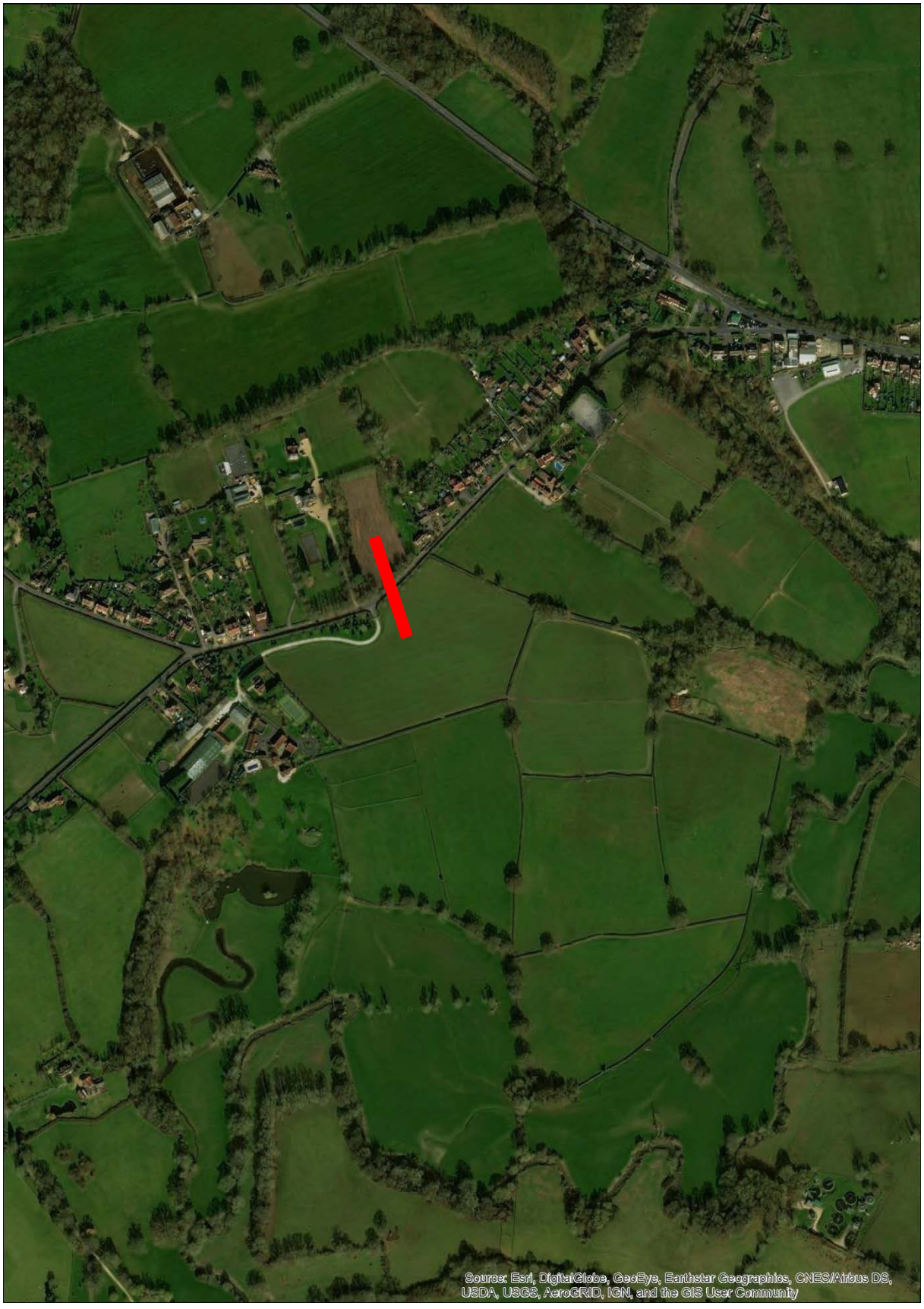
ATC 18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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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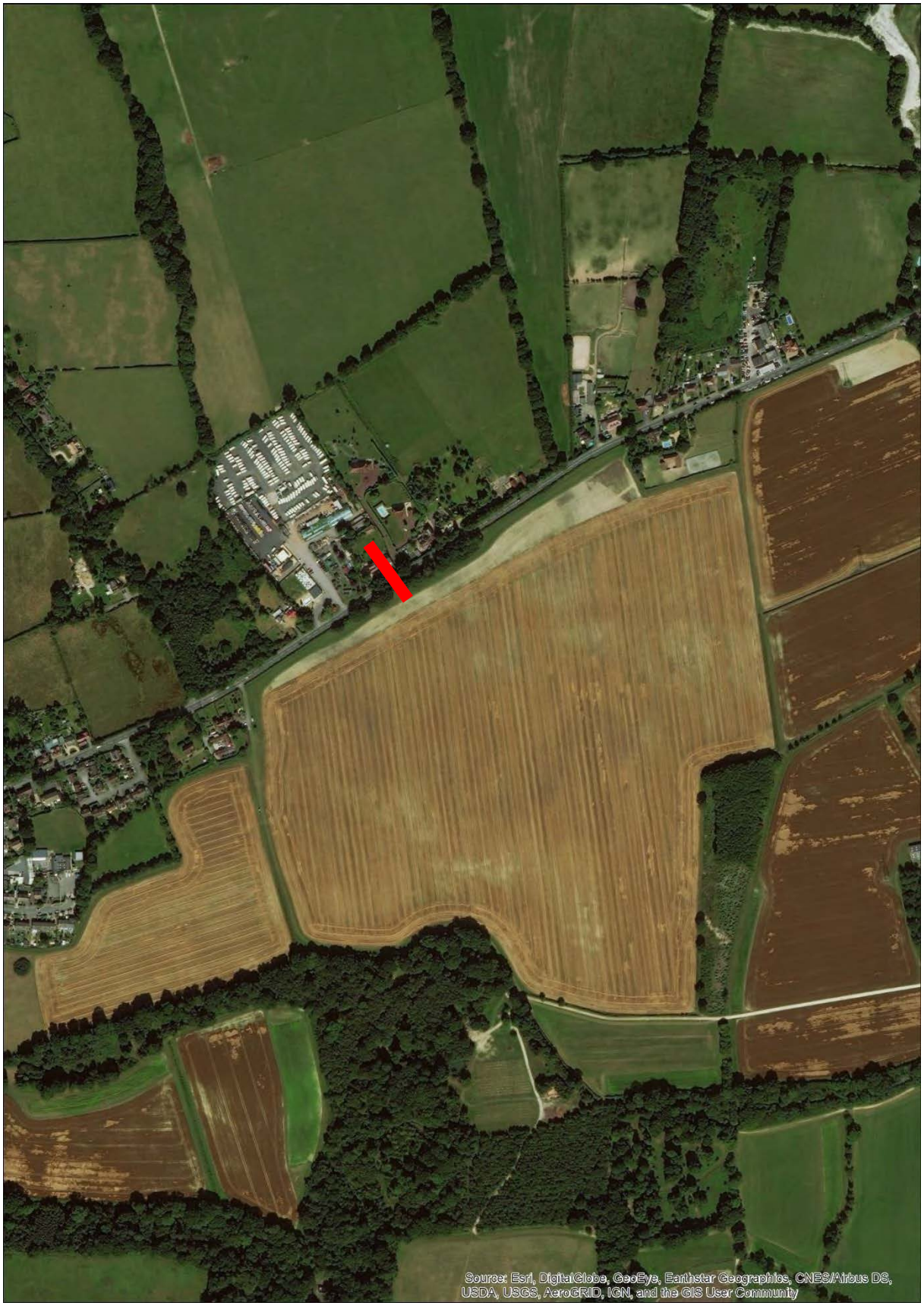
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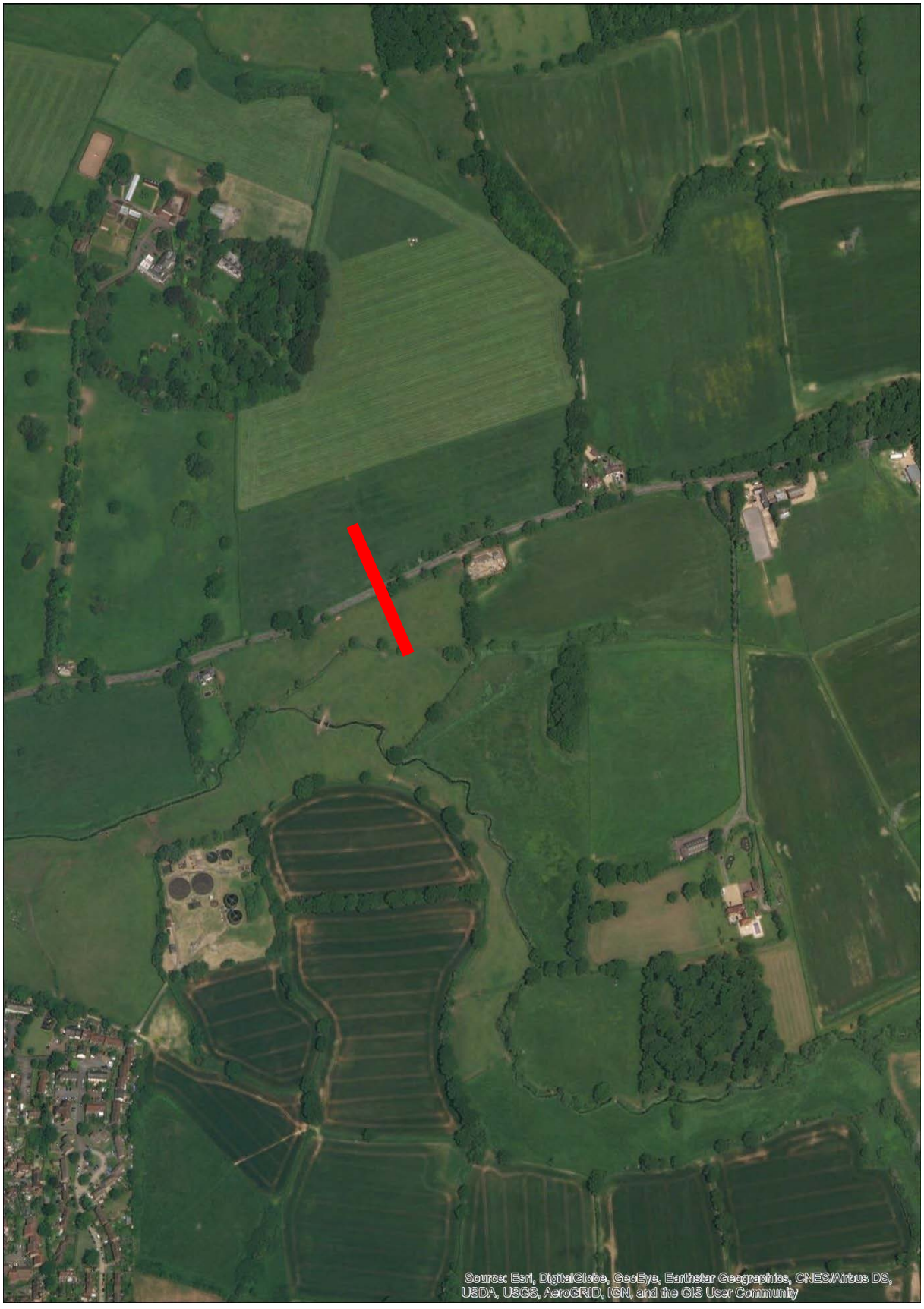
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ATC 22


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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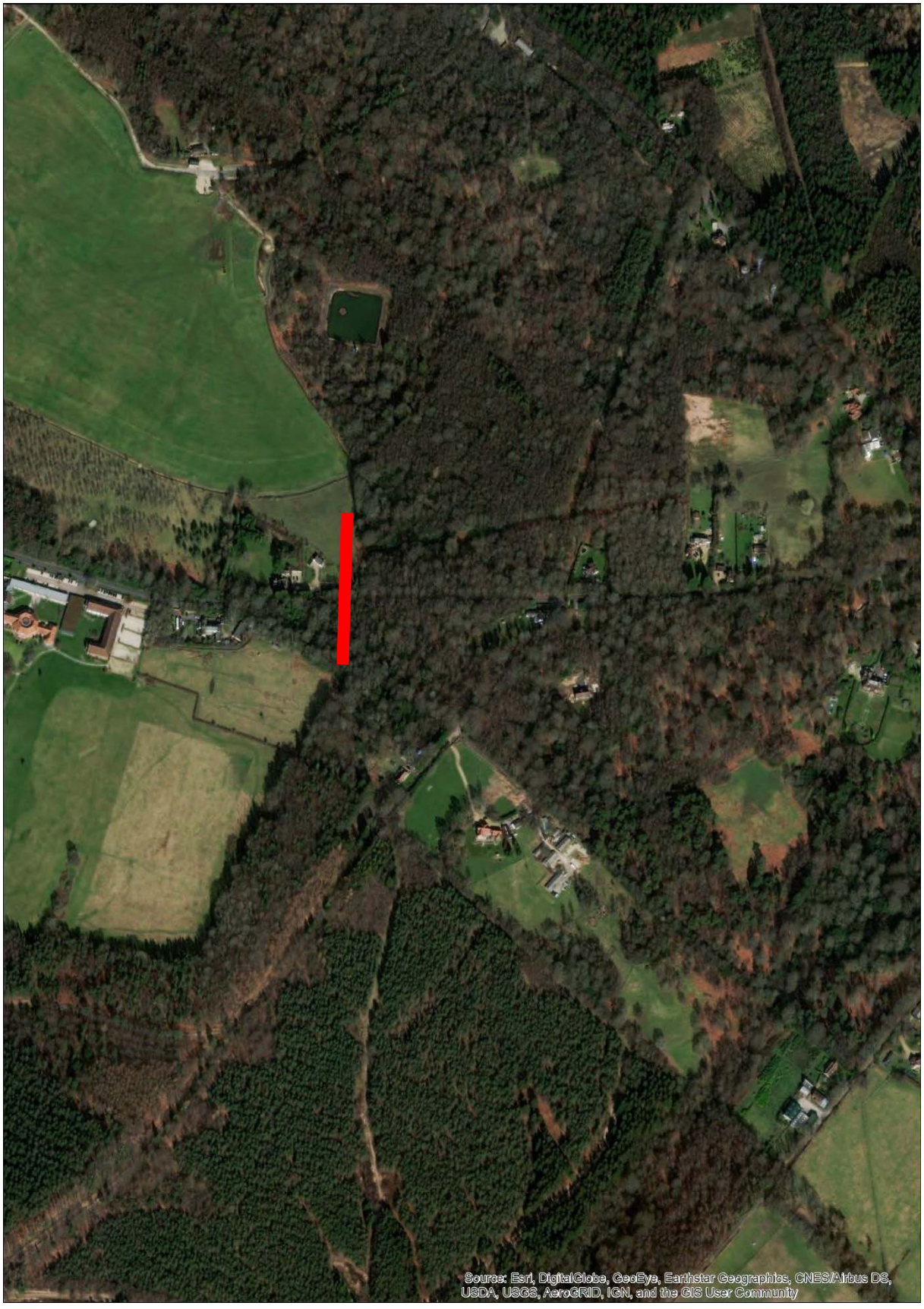
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ATC 25


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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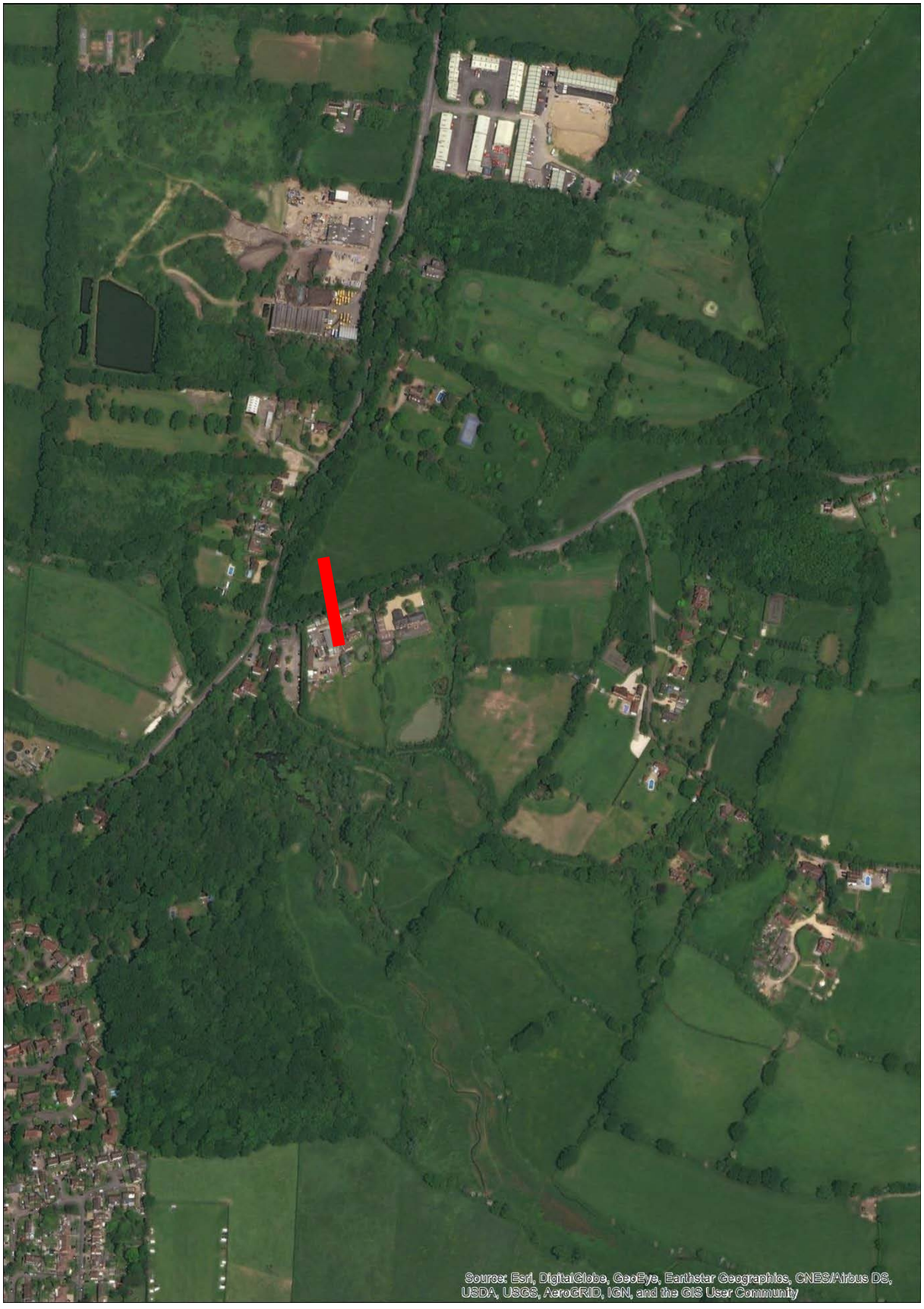
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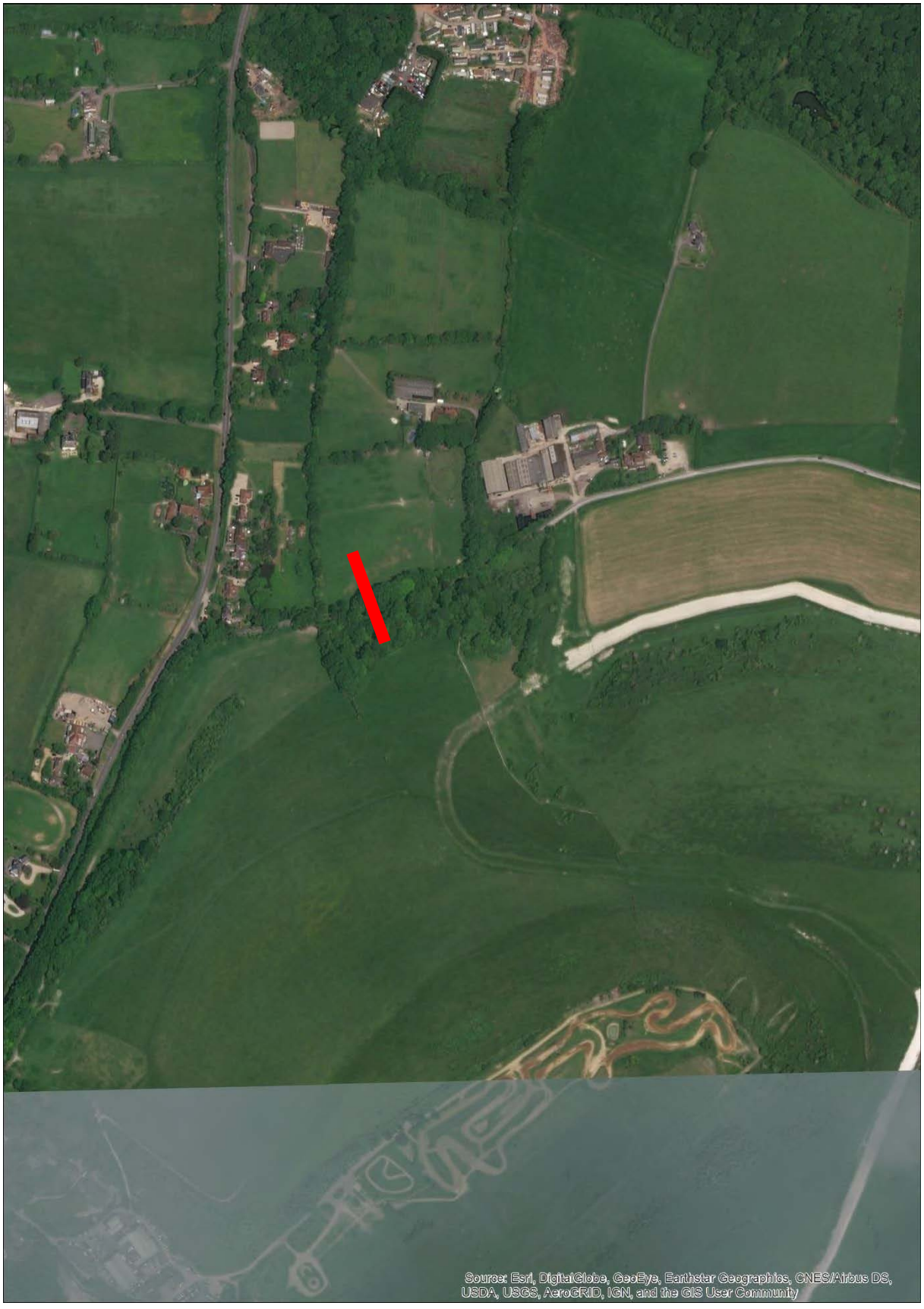
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ATC 30


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ATC 31


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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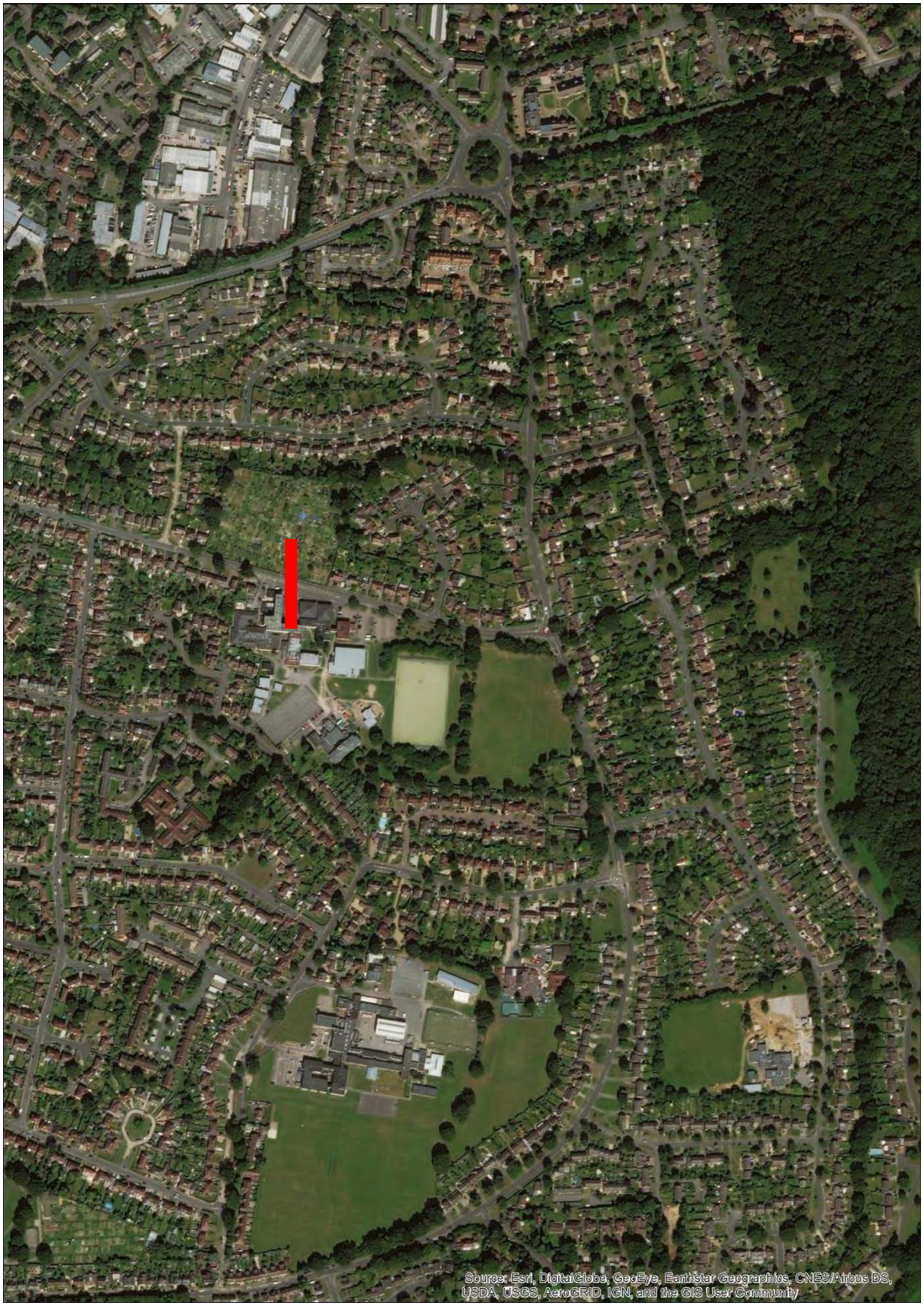
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ATC 35


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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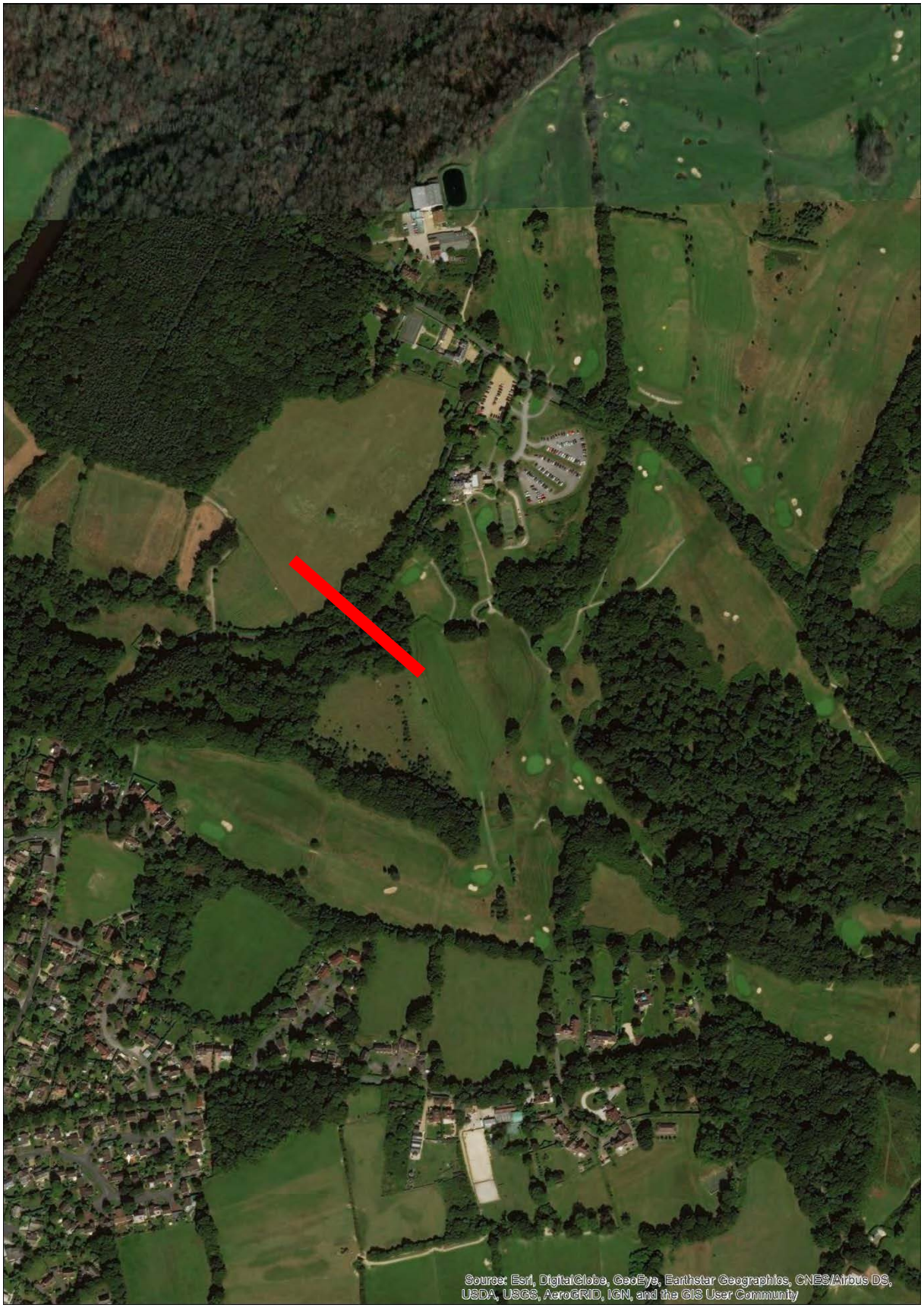
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Appendix B MCC Locations

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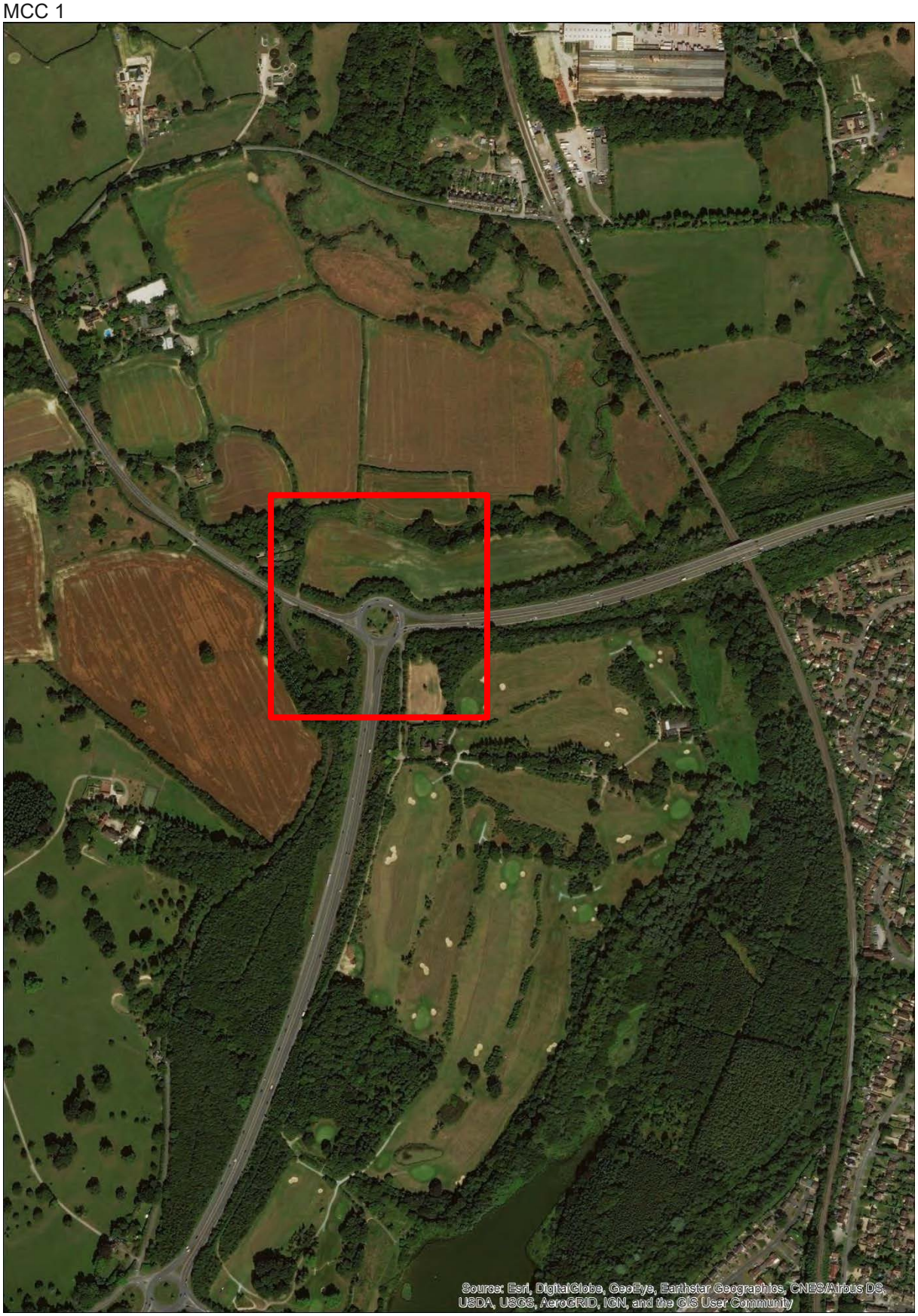
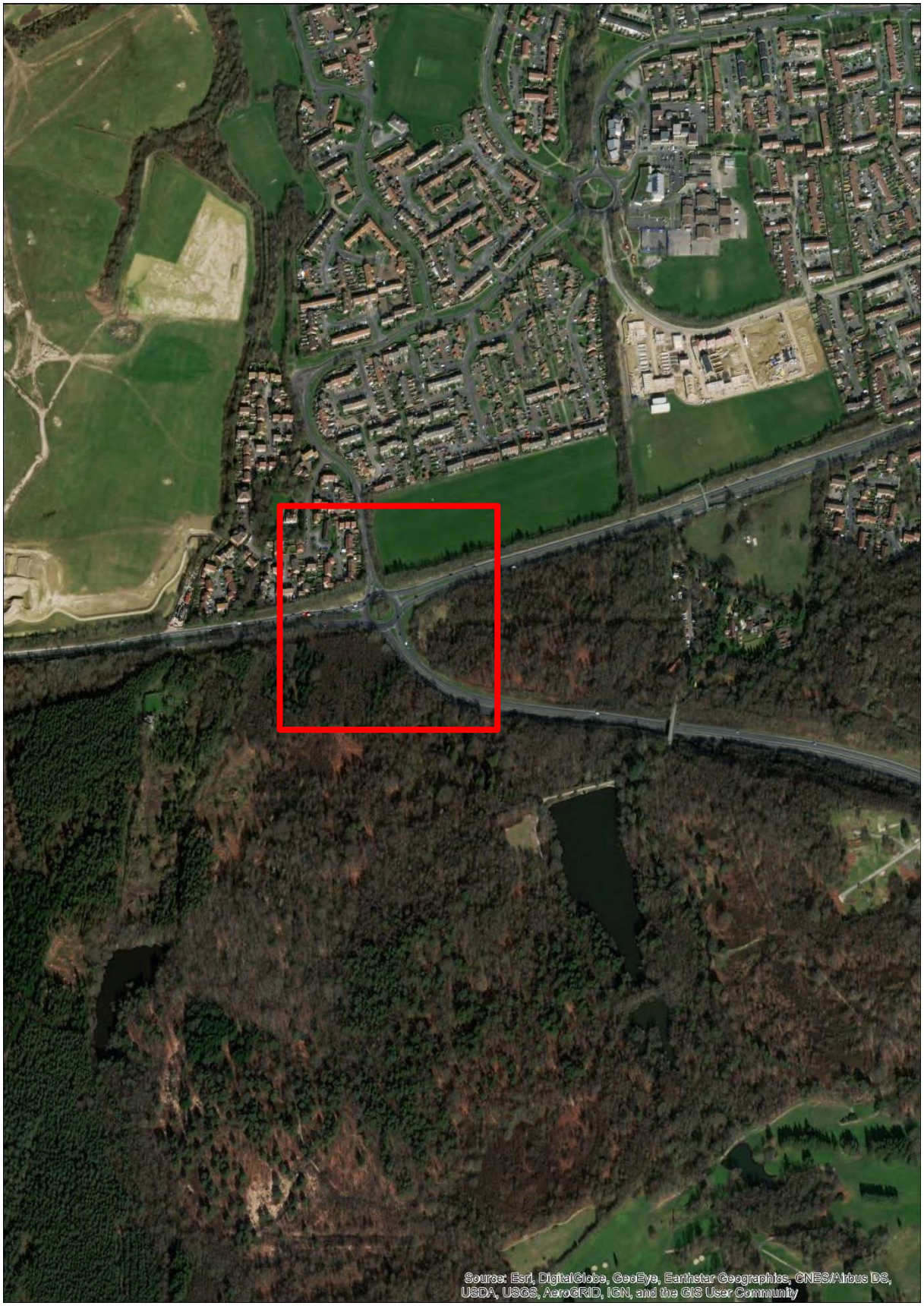


MCC 2


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

MCC 3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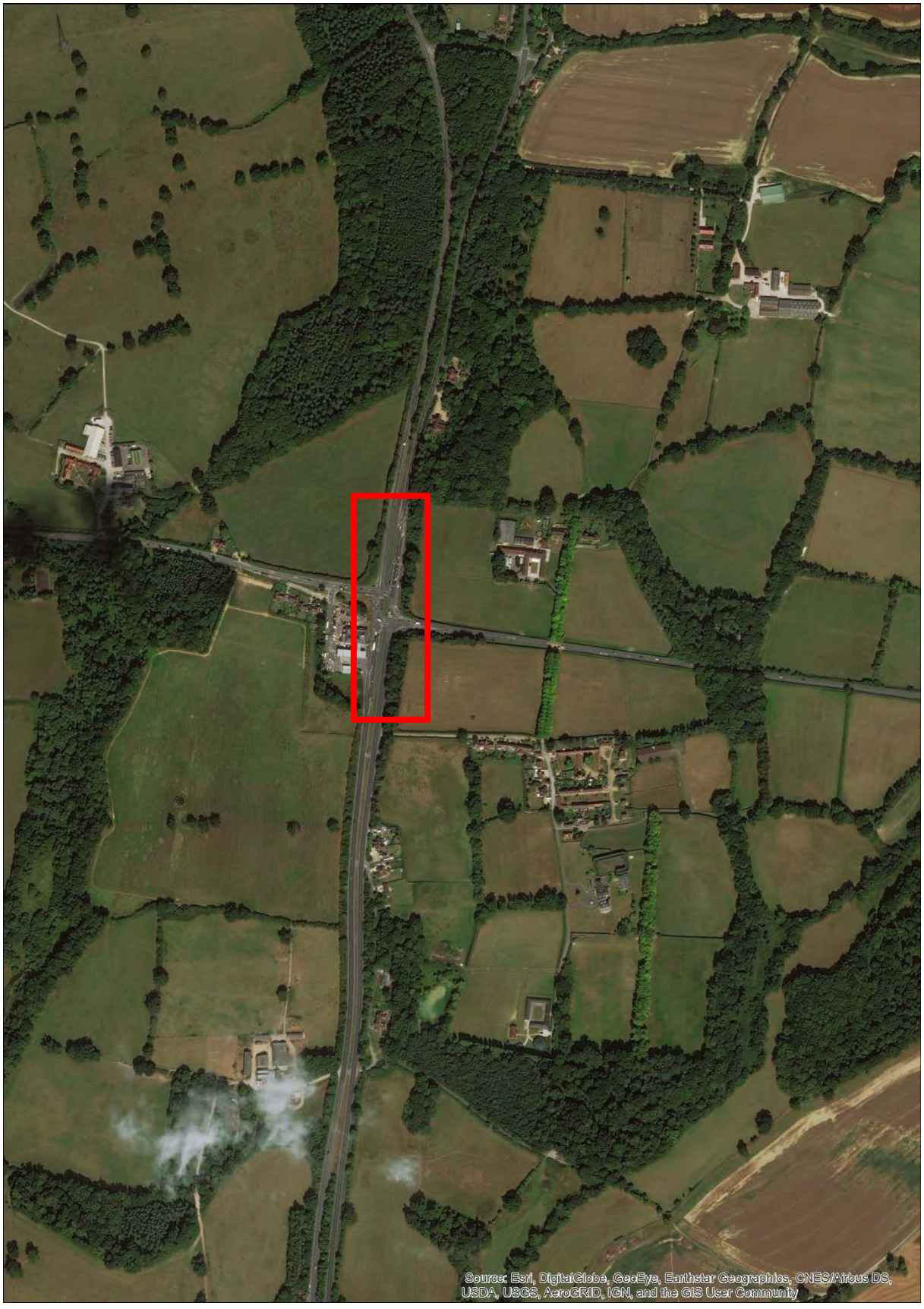
MCC 4


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

MCC 5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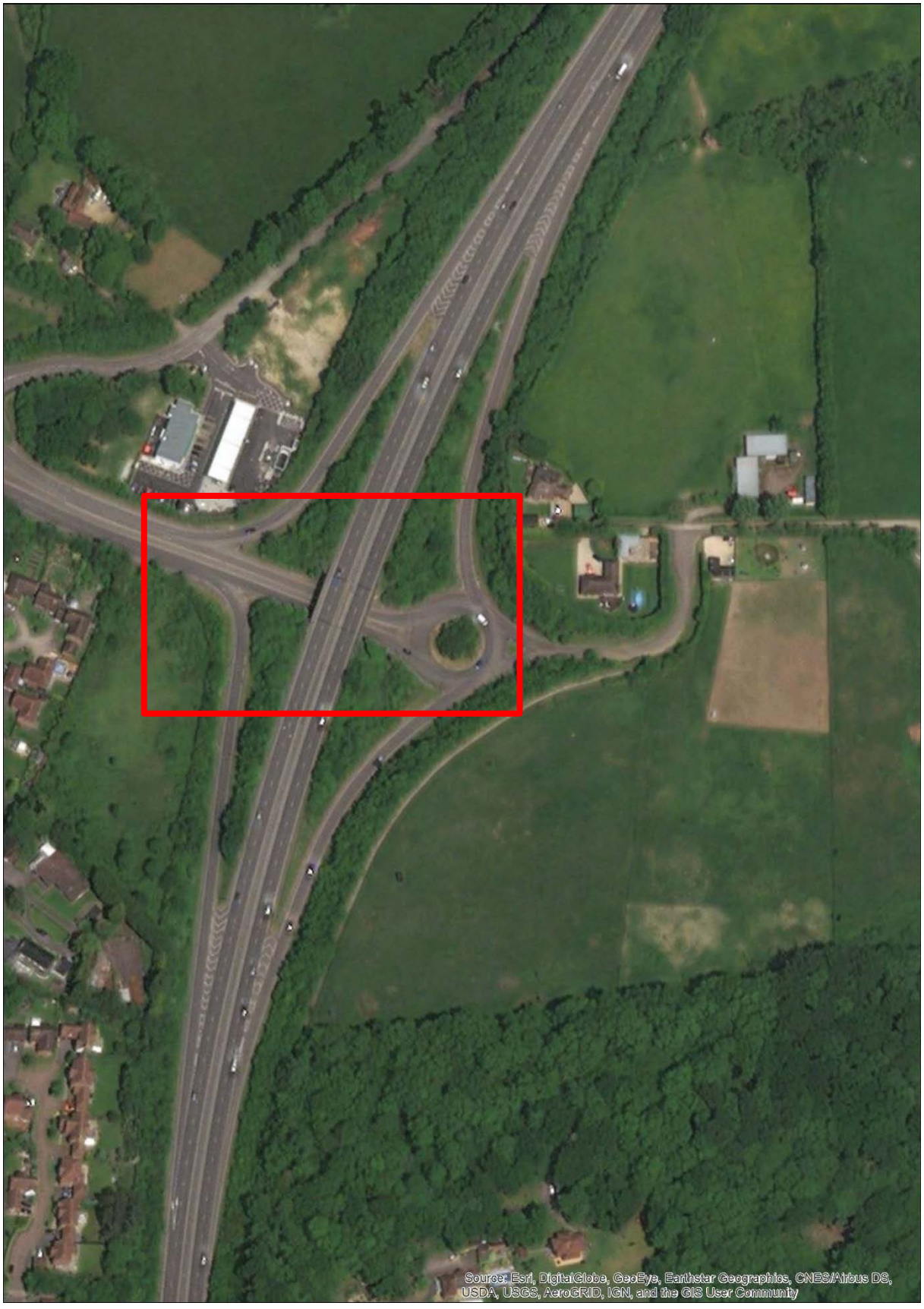
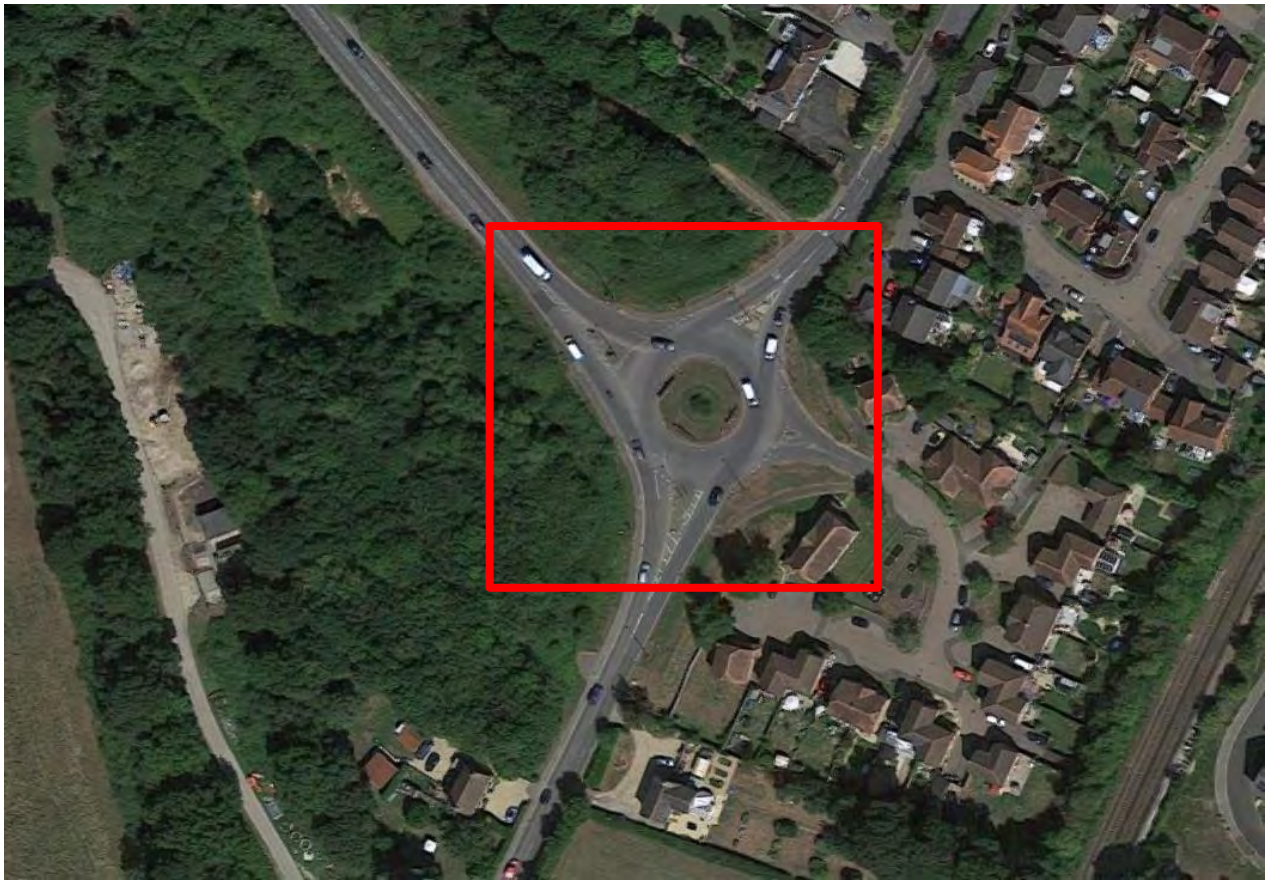
MCC 6


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

MCC 7


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

MCC 8



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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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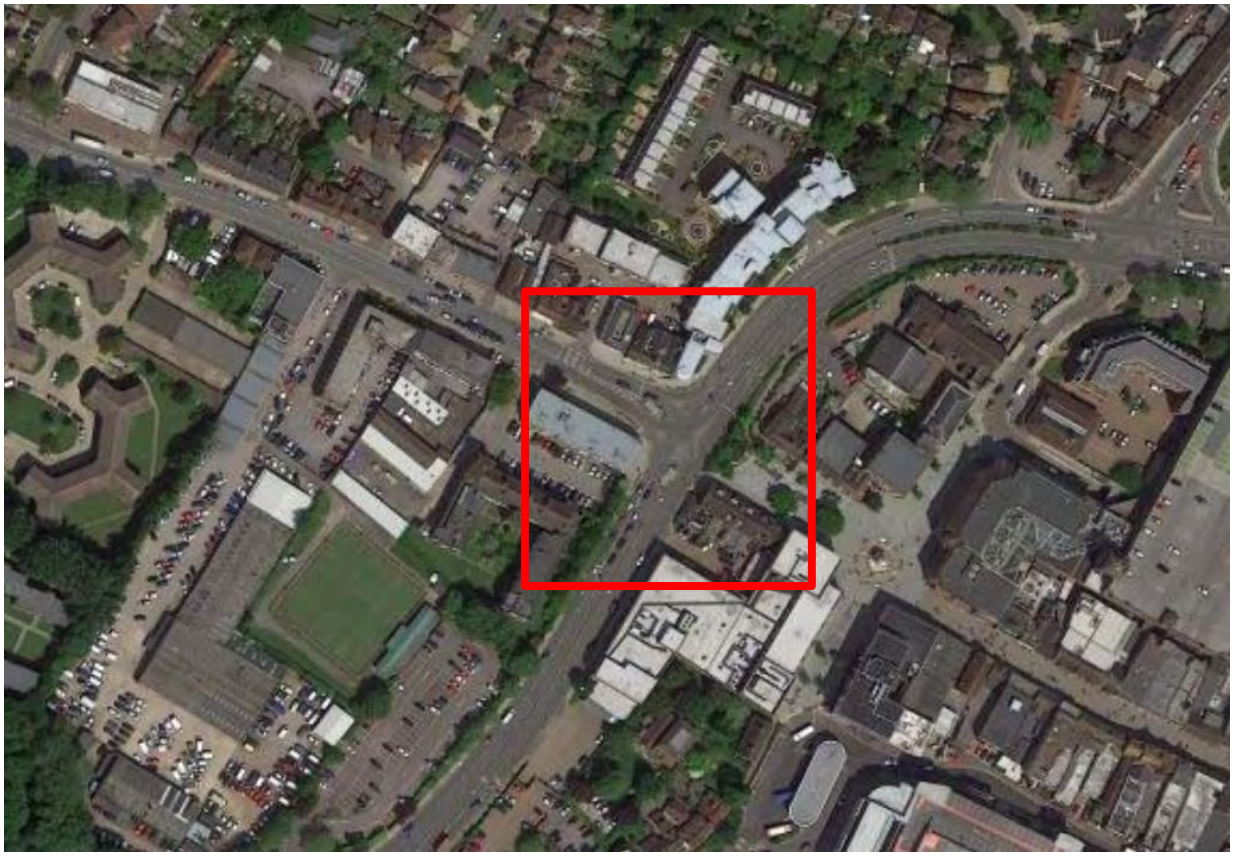
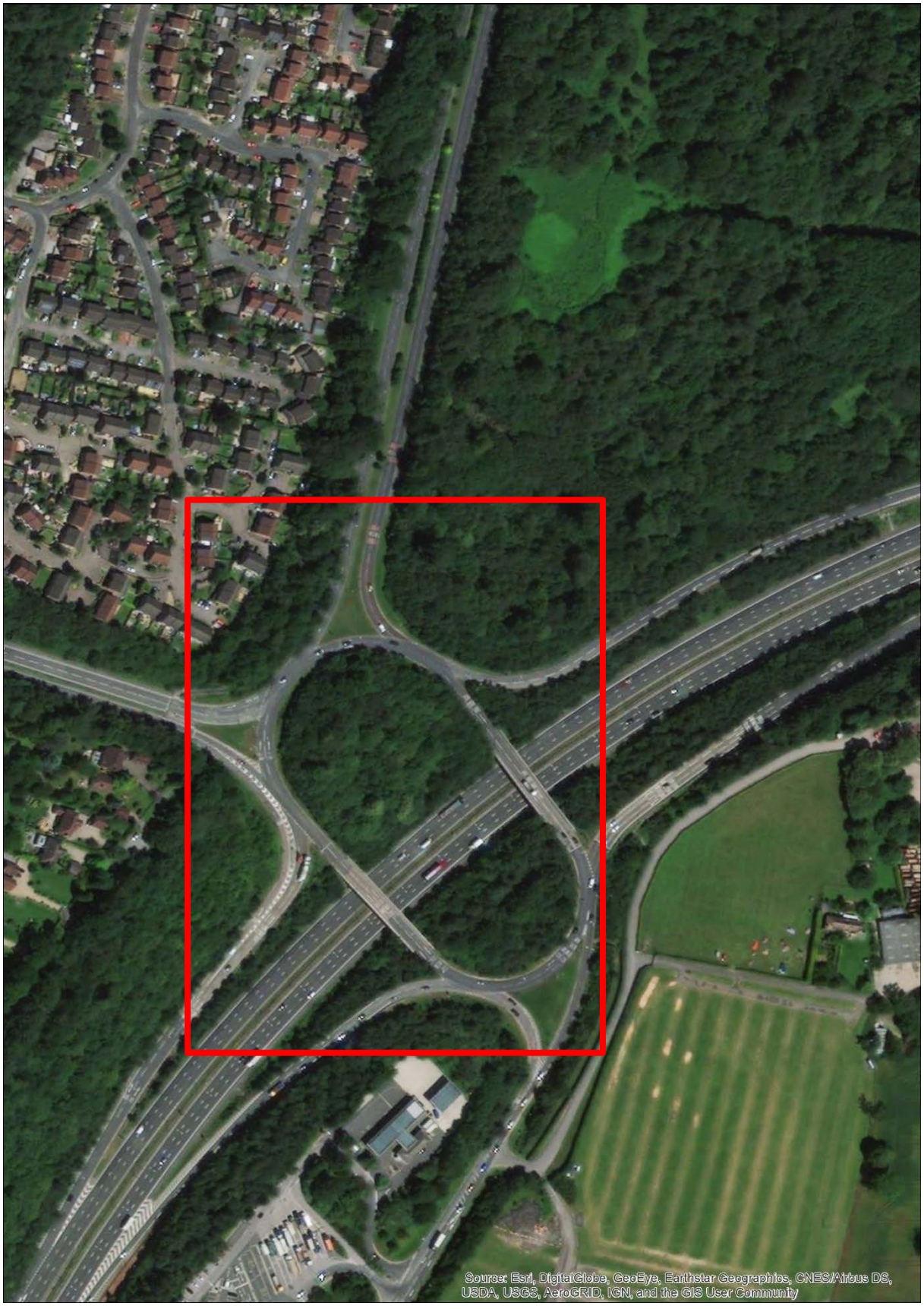


MCC 11


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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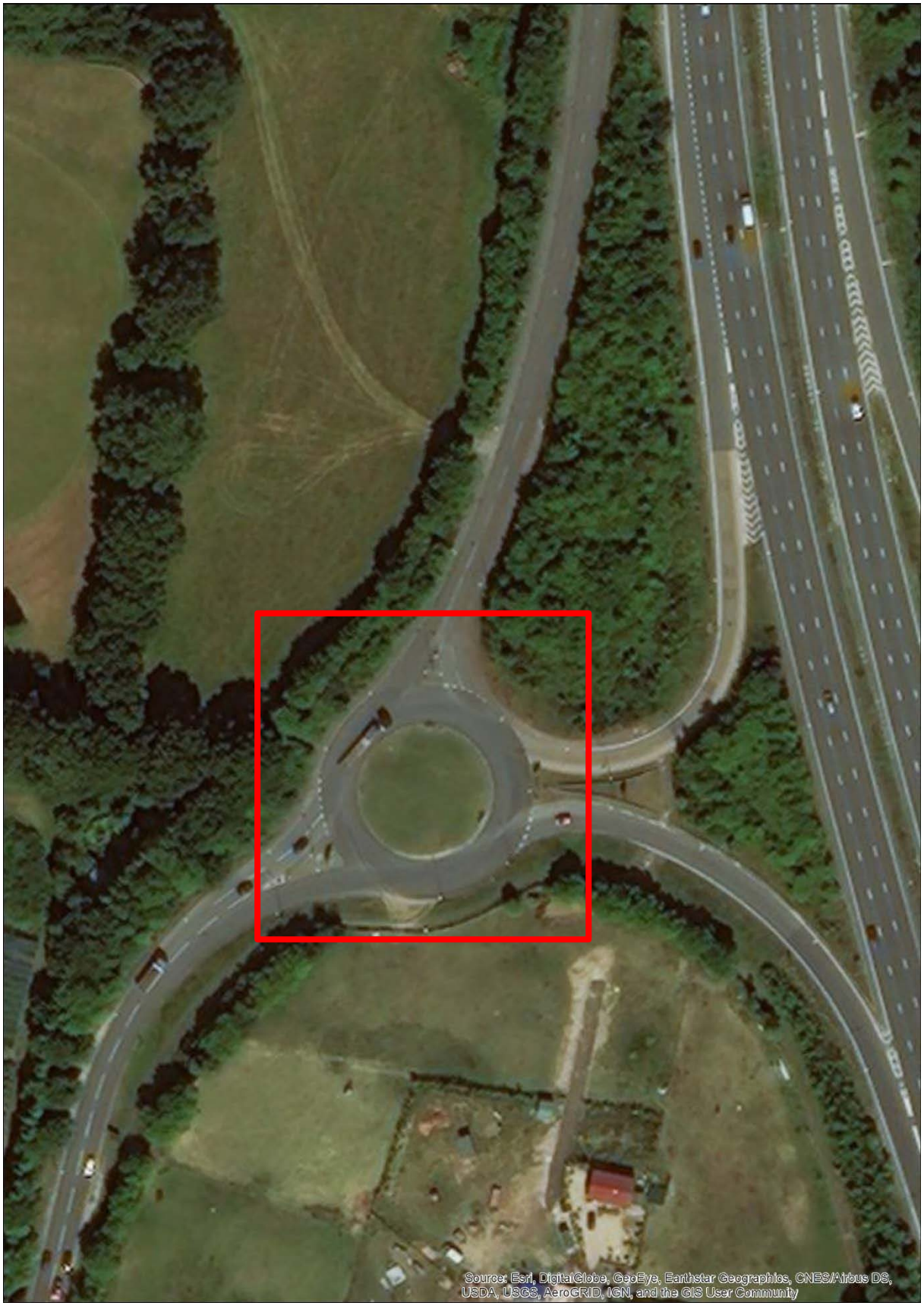
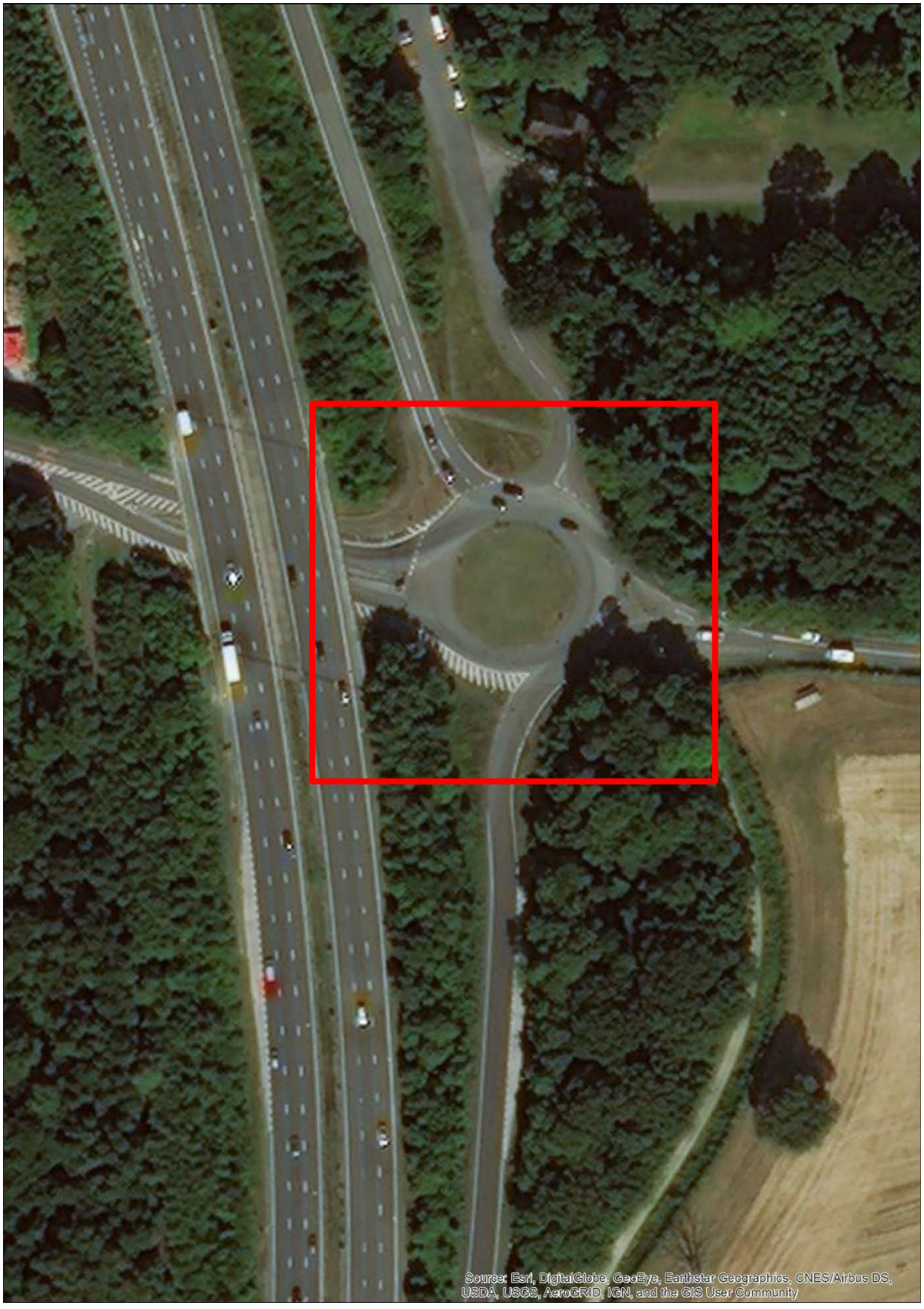

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

MCC 13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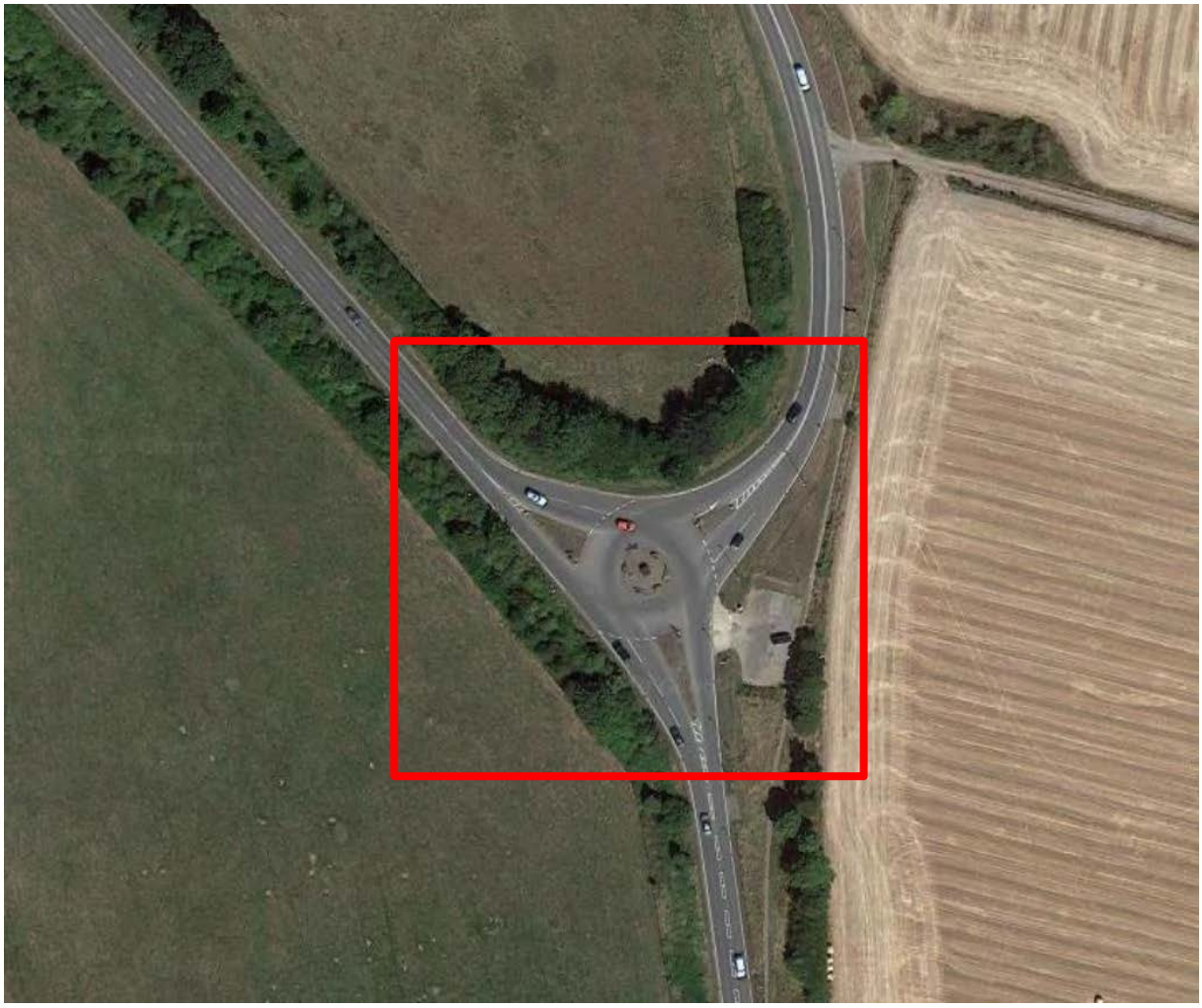
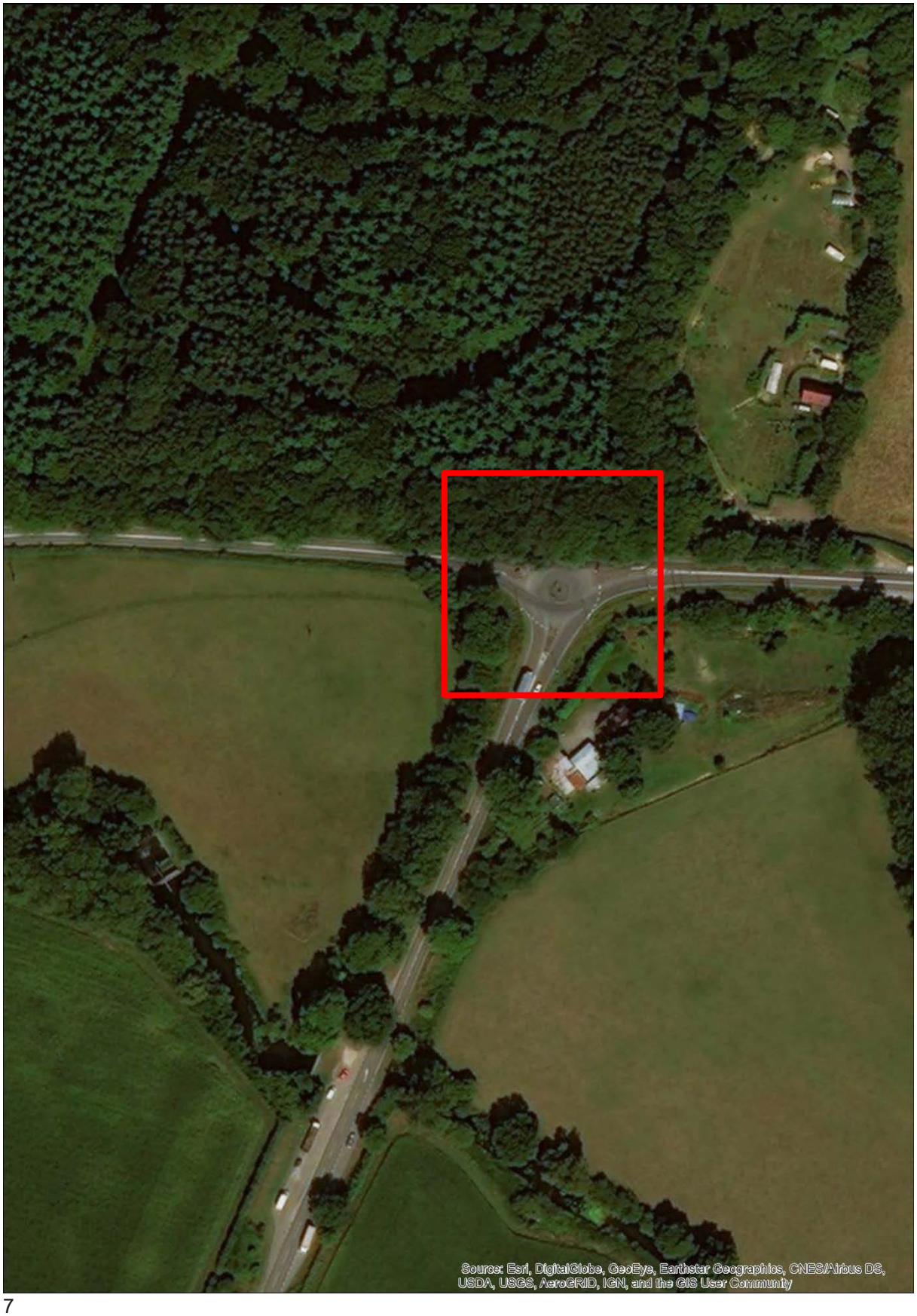


MCC 15

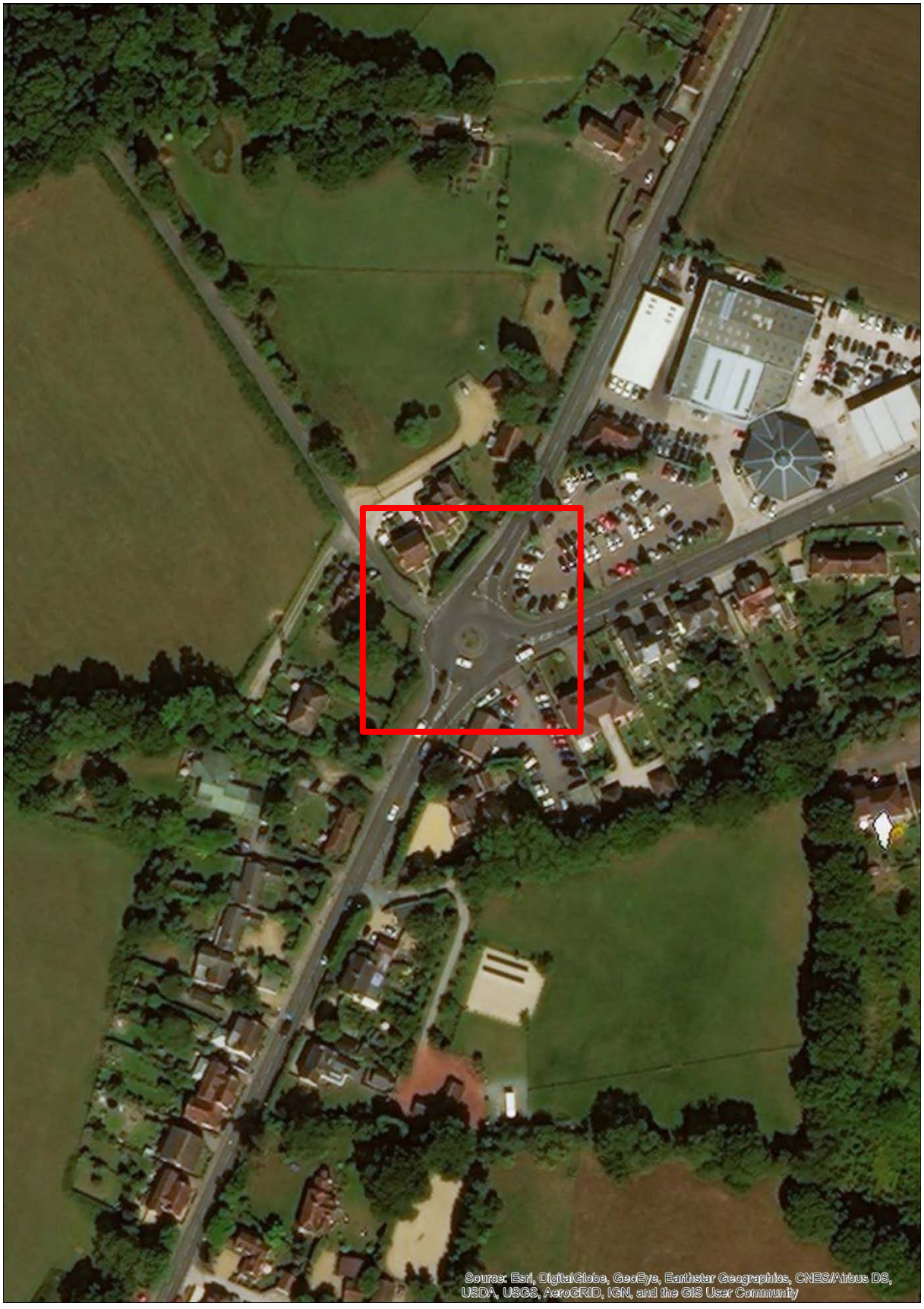
MCC 16

MCC 17


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

7

MCC 18


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

MCC 19


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

MCC 20


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

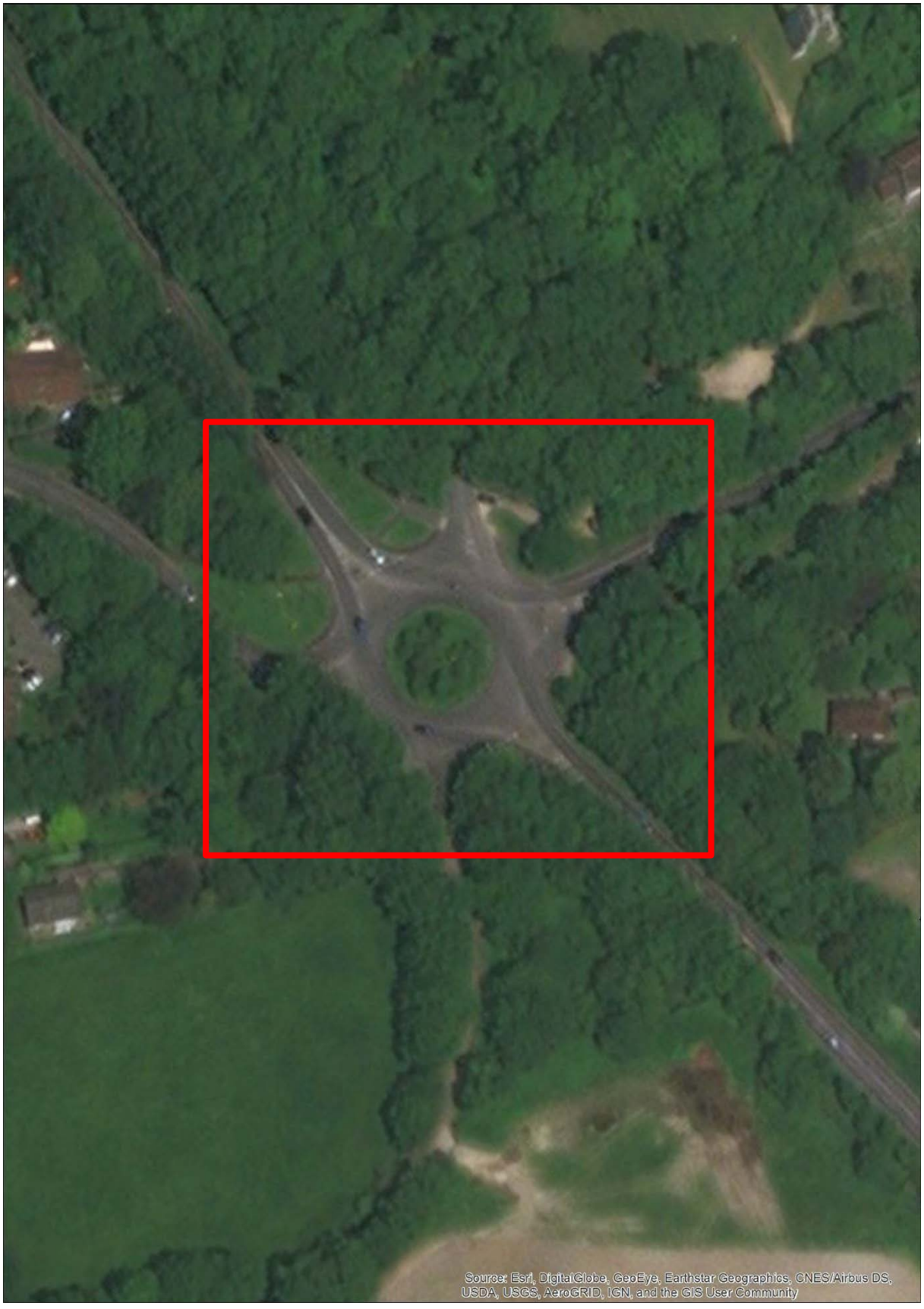
MCC 21


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

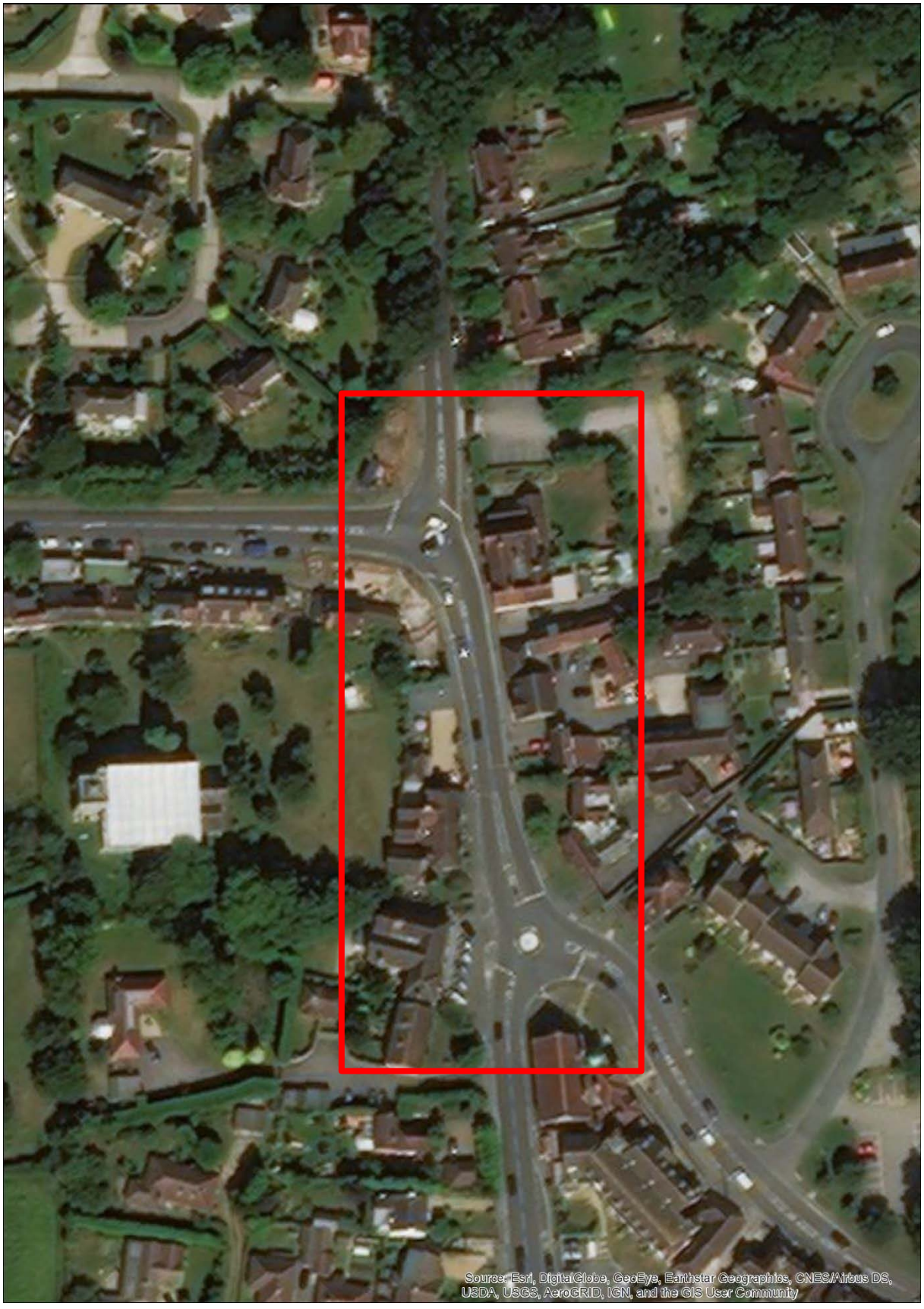
MCC 22


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

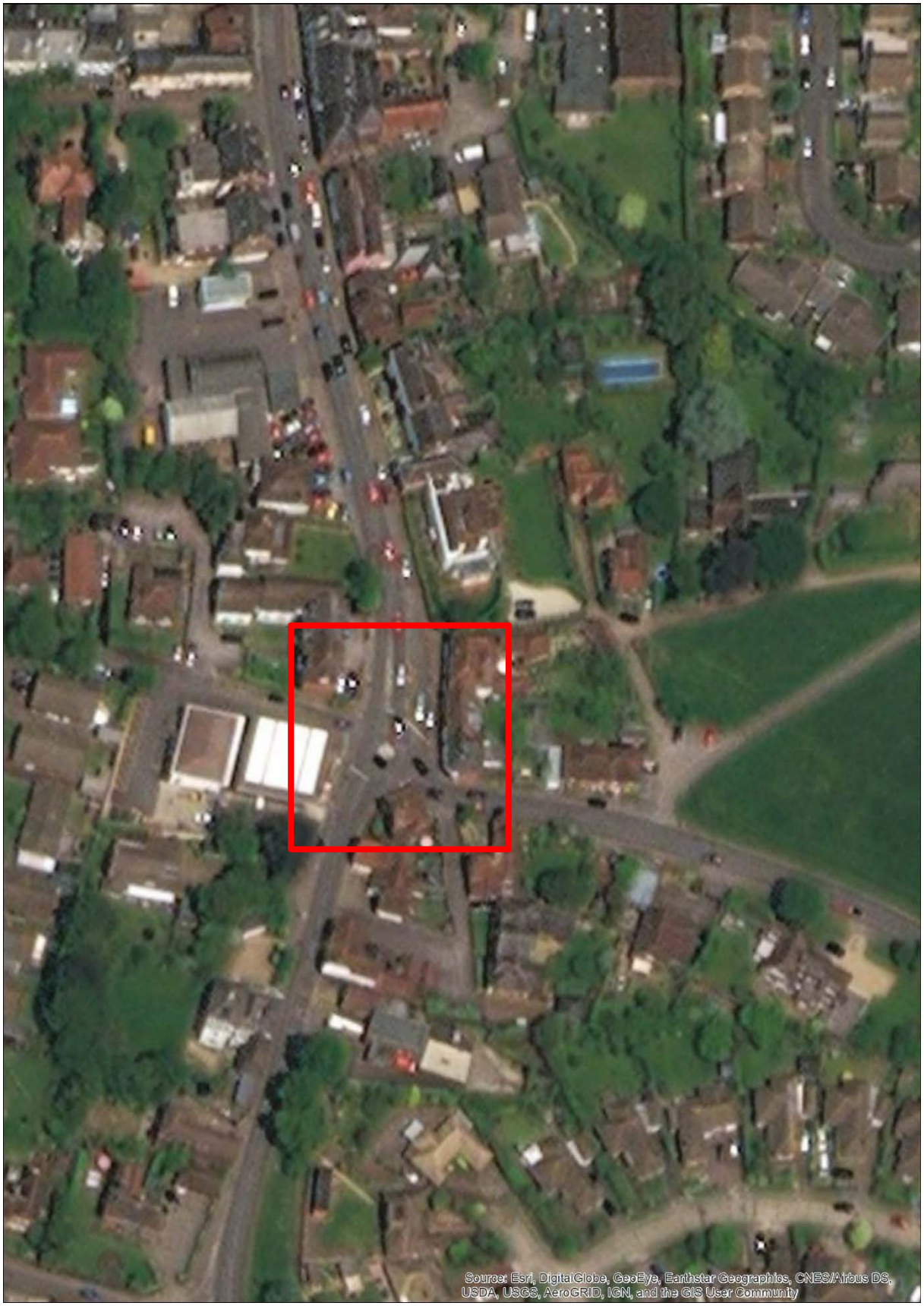
MCC 23


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

MCC 24


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

MCC 25


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Appendix C Telefonica Mobile Phone Data Validation Report

DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Reviewed (Discipline Lead)	Approved (Project Director)
35981/5002/TN001	-	19.03.16	DC	NM	PG	

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