The Norfolk County Council (Norwich Northern Distributor Road (A1067 to A47(T))) Order

5.8 Report of Surveys

Planning Act 2008

Infrastructure Planning

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

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This document is submitted in relation to the application for a Development Consent Order by Norfolk County Council to the Secretary of State, under the Planning Act 2008.

The application is for the Norfolk County Council (Norwich Northern Distributor Road (A1067 to A47(T))) Order, to grant development consent for the construction of a new highway running west to east, to south, between the A1067 Fakenham Road and the A47 Trunk Road at Postwick, including improvements to the existing highway network to the north and north east of Norwich.

This document comprises part of the application documents and relates to Regulation 5(2)(q) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009.

PAGE NOT USED

Table of Contents

List of Tables

List of Figures

1 Key Summary

1.1 Summary

1.1.1 Data collected in support of the NATS Transport Model is required to ensure that the model is up to date and able to comprehensively and accurately reflect the travel behaviour currently being observed in the vicinity of the proposed Norwich Northern Distributor Road Scheme and the greater Norwich area.

1.1.2 This report provides a description of the traffic surveys undertaken in 2012 and presents a summary of the data collected. It also summarises other data sources that have been used in the modelling work.

1.1.3 The following surveys were undertaken:

- Automatic traffic counts were undertaken at 59 sites over a two-week period between 19 October and 26 November 2012.
- 12-hour manual classified counts were undertaken at 63 sites over a four-day period between 22 October and 26 October 2012.
- Road side interview data was collected at 30 sites over a two-week period between 5 November and 20 November 2012. This was accompanied by MCC and ATC data.
- Journey time data was sourced from TrafficMaster.
- Additional count data where required was obtained from the Highways Agency TRADS database.
- Inbound and outbound vehicle movements from the six Park and Ride sites.
- Supplementary turning count data was sourced for the following junctions:
  - Thickthorn and Postwick Park and Ride sites
  - Reepham Road/Middleton's Lane Roundabout
  - Holt Road Roundabout
  - Junctions to the north of Norwich located at Old Catton and Sprowston

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2 Introduction

2.1 Background

2.1.1 Mott MacDonald (MM) has been appointed by Norfolk County Council (NCC) to assist with the development and appraisal of the Norwich Northern Distributor Road (NDR), known as the NDR or referred to as the Scheme.

2.1.2 The Scheme would be a dual carriageway all-purpose strategic distributor road, to be classified as the A1270 Principal Road, which would link the A1067 Fakenham Road, near Attlebridge, to the A47 Trunk Road (T) at Postwick. This will be over a length of approximately 20.4km.

2.1.3 The NDR is a project of national significance which requires a Development Consent Order (DCO) under the Planning Act 2008 and this formal planning process began in early 2013. It is currently anticipated that the process will be completed in time for the NDR scheme to start construction in 2015 and to be opened in 2017.

2.1.4 This document is one of a number that support the DCO, each of which has its own unique document number, and should therefore be read in conjunction with the other documentation. The proposed layout of the NDR is shown in the General Arrangement Plans contained in document number 2.6, whilst the full needs case for the NDR is explained in the Statement of Reason (document 4.1) and the Environmental Statement (document 6.1).

2.1.5 To assist with the assessment of the NDR and NATS a multi-modal transport model has been developed. The model has been developed over many years, but the latest version had relied on data collected in 2002 and 2006. For the purpose of progressing the Scheme development surveys were commissioned in 2012 to enable the transport model to be updated. This document reports on those surveys.

2.2 Report contents

2.2.1 Following this introduction, the Report of Surveys is divided into the following sections:

- Section 3 provides an overview of the 2012 surveys and the survey programme;
- Section 4 describes the surveys undertaken to expand the 2006 roadside interviews;

- Section 5 presents the new roadside interviews;
- Section 6 describes the traffic counts undertaken to provide model calibration and validation data.
- Section 7 provides the process for obtaining the journey time data from TrafficMaster;
- Section 8 summarises the other sources of count data collated for the model development
- Section 9 contains information relating to the handling, checking and manipulation of the data prior to being used in the model development.

3 Overview of Surveys

3.1 Purpose and Scope of Data

3.1.1 The transport model comprises of separate highway and public transport assignment models developed in SATURN and VISUM software respectively, with variable demand responses catered for with the Department for Transport's DIADEM software.

3.1.2 This report contains details of the surveys undertaken for the highway model. Details of additional surveys for the public transport model are contained within the Public Transport Local Model Validation Report (document 5.10).

3.1.3 Data collected are required to ensure that the highway assignment model is able to comprehensively and accurately reflect the travel behaviour currently being observed in the vicinity of the proposed scheme and the greater Norwich area and thus form a robust basis for the testing of future (with and without NDR) scenarios.

3.1.4 The data has been be used in the calibration and validation of the highway assignment model, covering three time periods:

- The morning (AM) peak hour, representing traffic conditions between 08:00 and 09:00;
- An average inter-peak (IP) hour, representing the average hour between 10:00 and 16:00; and
- The evening (PM) peak hour between 17:00 and 18:00.

3.1.5 Consequently the data was required to cover these three model periods.

3.1.6 The survey programme was designed to capture the following data:

- New Roadside interviews (RSI) to replace interview data previously collected in 2002.
- Traffic counts to expand the new RSI
- Traffic counts to expand RSI data previously collected in 2006 and considered sufficiently contemporary to be re-used in the current model.
- Traffic counts, including turning counts, to provide matrix calibration and model validation data.

3.1.7 Where traffic counts were undertaken these were carried out in accordance with WebTAG Unit 3.19, in relation to the specific requirement to undertake

a minimum of a two-week automatic traffic count in conjunction with a single day manual classified count.

3.2 Commissioning Surveys

3.2.1 Mott MacDonald was requested by Norfolk County Council (NCC) to appoint a contractor through a procurement process to undertake traffic data collection in the Norwich area in October 2012. Nationwide Data Collection (NDC) was awarded the contract for the survey work following the tender period.

3.2.2 The three different survey types are summarised below.

3.3 Automatic Traffic Counts

3.3.1 Automatic Traffic Counts (ATC) record the hourly volume of traffic by direction. The data is collected to provide longer term flow levels, typically over at least two weeks, in order to avoid daily fluctuations in traffic and provide a longer term average.

3.3.2 The ATC data is used to provide both calibration data for the matrix estimation procedure and also to provide validation checks against modelled traffic flows. These validation checks are carried out independently of the sites used for calibration.

3.3.3 The ATC data is also used to derive factors to convert modelled time period flows into 12-hour Annual Average Weekday Traffic (AAWT), 18-hour AAWT, 6-hour night time AAWT and 24-hour Annual Average Daily Traffic (AADT) flows used in the economic and environmental appraisals.

3.3.4 WebTAG Unit 3.19 states that ATCs are accurate to +/- 5% for the measurement of total vehicle movements. Whilst ATC data is often split into vehicle classes, vehicle splits obtained from the data are not considered to be reliable.

3.4 Manual Classified Counts

3.4.1 Manual Classified Counts (MCCs) - of both link and turning volumes - record the directional volume of traffic by vehicle type. MCC counts are typically undertaken over a single 12-hour period, between 07:00 and 19:00 hours. The MCC data is used to split the longer term ATC volume data into vehicle categories, thus overcoming the daily fluctuations that can be expected in traffic volumes and the inability of ATC collection to record vehicle type with sufficient accuracy.

3.4.2 According to WebTAG Unit 3.19, the accuracy of MCCs for total vehicles is +/- 10%; for cars and taxis: ± 10%; light goods vehicles: ± 24%; other goods vehicles: ± 28%; and all goods vehicles: ± 18%.

3.4.3 For the purpose of the NDR surveys, MCCs were classified into the following vehicle types:

- Cars
- Taxi
- Light goods vehicle (LGV)
- Other goods vehicle (OGV1)
- Other goods vehicle (OGV2)
- Bus
- Motorcycles
- Bicycles

3.5 Roadside Interviews

3.5.1 Road Side Interviews are used to obtain the origin and destination of the driver along with information relating to the vehicle type, vehicle occupancy and the trip purpose (both the origin and destination end of the trip). Depending on the constraints of the interview site, the surveys may be undertaken by face to face interviews or through the distribution of questionnaires for completion by the driver at a later point in time (with a pre-paid envelope to encourage return).

3.6 Survey Programme

3.6.1 In accordance with the Design Manual for Roads and Bridges (DMRB) guidance, surveys were programmed to be carried out during neutral months, outside of school holidays and other local abnormal traffic periods.

3.6.2 The surveys were carried out as shown below in Table 3.1

Table 3.1: Survey programme

Survey Type	Date from	Date to	Timescales
Automatic traffic counts	19/10/12	26/11/12	Over a minimum two week period, 24 hour
Manual classified counts	22/10/12	26/10/12	Single day between 07:00 to 19:00
Road side interviews	5/11/12	20/11/12	07:00 to 19:00

3.7 Additional data sources

3.7.1 Additional count data were also obtained from other sources and surveys conducted by NCC and did not form part of the survey commission. This included the following:

- Highways Agency TRADS data;
- 2012 turning count data at:
  - Thickthorn Park and Ride site;
  - Postwick Park and Ride site;
  - Holt Road roundabout;
  - Reepham Road/Middleton Lane roundabout;
  - Junctions in the north of Norwich in the Old Catton and Sprowston carried out for the Beyond Green development Transport Appraisal;
- 2006 ATC count data to inform missing gaps in cordon data.
- Journey time data was sourced from TrafficMaster.

3.7.2 These additional data sources are described in more detail in Section 8.

4 Data for Re-Expansion of 2006 RSI Records

4.1 Overview

4.1.1 ATC and MCC surveys were undertaken at the site of the 2006 Road Side Interviews for the purpose of re-expanding the interview records collected in 2006.

4.2 Location

4.2.1 The location of the sites that were subject to a RSI in 2006 is shown in Figure 4.1. Surveys formed an inner and outer cordon around Norwich City centre, along with two screenlines to capture movements to the north-west of the city.

Figure 4.1: Location of 2006 RSI sites

Source: Extracted from Mott MacDonald Norwich Traffic Survey Brief, dated October 2012

4.2.2 The Highway Agency's (HA) monitors traffic on (nearly) every link of the trunk road network which is stored in an on-line database called TRADS, so this data was used where available. Table 4.1 provides a more detailed

description of the locations and indicates whether the commissioned ATC data or TRADS data was used.

Table 4.1: Existing ATC Data (2006)

2006 Site Reference	Site Description	Site Type	Data Type	Source
1	A47 West of A1074	2006 RSI	TRADS	HA
3	A140 south of B1149	2006 RSI	ATC	NDC
4	B1150 north of Walsham Road south of Spixworth	2006 RSI	ATC	NDC
5	A1151 Wroxham Road north of Sprowston	2006 RSI	ATC	NDC
6	C283 Salhouse Road	2006 RSI	ATC	NDC
7	C874 Plumstead Road northeast of Dussindale Drive	2006 RSI	ATC	NDC
9	A47 Potswick Junction west of Cucumber Lane	2006 RSI	TRADS	HA
10	A146 Loddon Road south of A47	2006 RSI	ATC	NDC
11	B1332 Bungay Road south of A47	2006 RSI	ATC	NDC
12	Ipswich Road south of A47	2006 RSI	ATC	NDC
13	B1113 Keswick Main Road north of Swardeston	2006 RSI	ATC	NDC
14	A11 southwest of A47	2006 RSI	TRADS	HA
15	B1172 east of Heathersett west of A47	2006 RSI	ATC	NDC
16	B1108 west of A47 east of Stocks Hill	2006 RSI	ATC	NDC
18	A1074 Dereham Road east of A140	2006 RSI	ATC	NDC
19	A1067 southeast of A140	2006 RSI	ATC	NDC
20	A1402 Aylsham Road south of Ring Road	2006 RSI	ATC	NDC
21	A1151 Sprowston Road south of Ring Road	2006 RSI	ATC	NDC
23	A1242 Yarmouth Road west of Harvey Lane	2006 RSI	ATC	NDC
25	A140 Ipswich Road north of A146	2006 RSI	ATC	NDC
26	A11 Newmarket Road northeast of A140	2006 RSI	ATC	NDC
28	Hellesdon Mill Lane north of A1074	2006 RSI	ATC	NDC
NW1	A1067 Fakenham Road Attlebridge	2006 RSI	ATC	NDC

2006 Site Reference	Site Description	Site Type	Data Type	Source
NW2	C167 Marl Hill Road Morton	2006 RSI	ATC	NDC
NW3	C173 Weston Hall Road Lenwade	2006 RSI	ATC	NDC
NW4	C245 The St Road Felthorpe	2006 RSI	ATC	NDC
NW6	C172 Ringland Road Ringland	2006 RSI	ATC	NDC
NW8	C461 Taverham Lane Taverham	2006 RSI	ATC	NDC
NW10	C162 Costessey Lane Costessey	2006 RSI	ATC	NDC

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5 2012 RSI Data

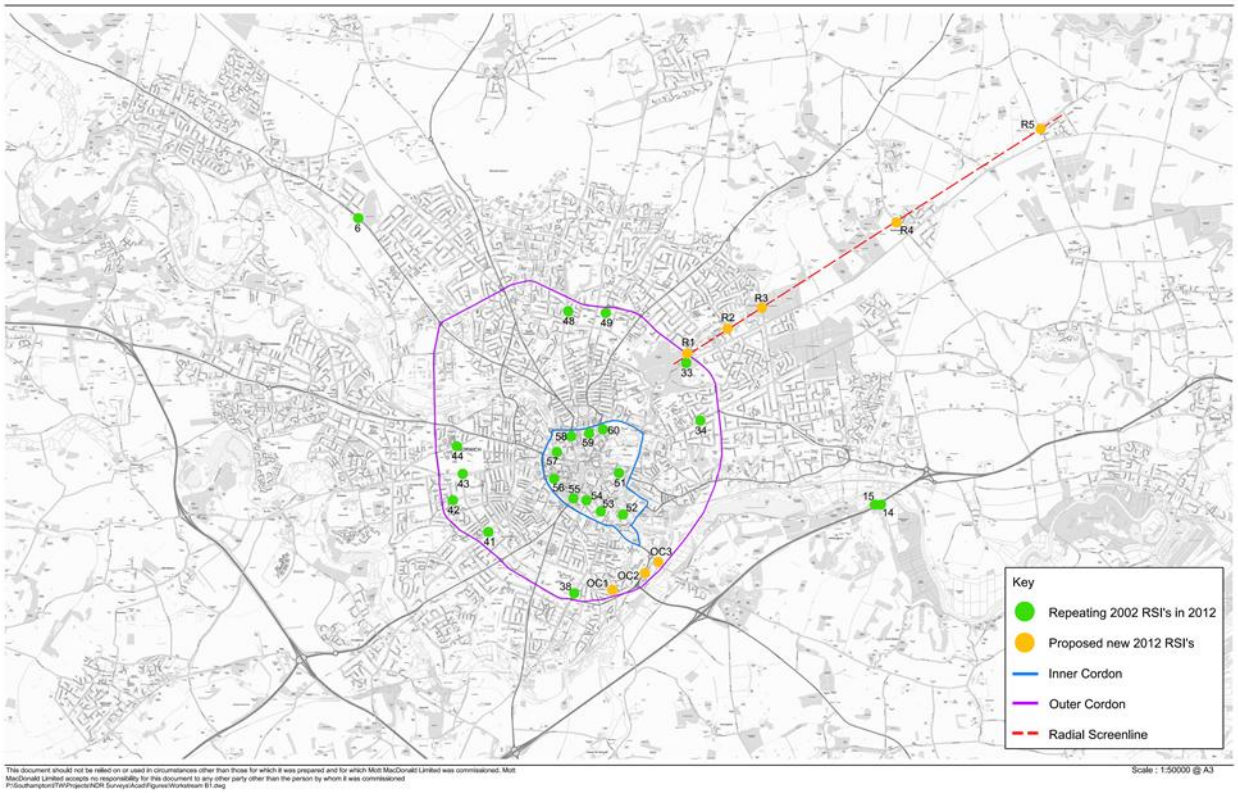
5.1 Overview

5.1.1 Roadside Interviews were undertaken to replace data previously collected in 2002 and to provide origin-destination data for trips crossing an additional radial screenline to the north-east of Norwich city centre. In total, 35 sites were surveyed through a combination of face-to-face interviews and postcard surveys.

5.2 Location

5.2.1 The location of the sites is shown in Figure 5.1.

Figure 5.1: 2012 RSI survey locations



5.3 Methodology

5.3.1 Prior to the commencement of the RSI surveys site visits were undertaken to confirm that the site was positioned in a safe location that did not compromise road user's safety; and that the location would provide an

accurate sample of traffic movements. The surveys located on the A47 required the approval of the Highways Agency and their agents.

5.3.2 The layout of the survey sites were designed in accordance with Chapter 8 of the Traffic Signs Manual, and the planning and management of survey sites was in conformity with the Design Manual for Roads and Bridges, Volume 5, Section 1, Part 4 (TA 11/09).

5.3.3 Data collection was undertaken at each site for a duration of 12 hours between 07:00 and 19:00. These were undertaken on weekdays, excluding Fridays and outside of school holidays. A 12-hour MCC was undertaken on the day of the survey, with longer term data provided by means of an ATC, or a TRADS site.

5.3.4 Postcard surveys were distributed where face-to-face interviews were not possible due to the busy nature of the route or other constraints. Postcard surveys were distributed to vehicle drivers with respondents required to manually complete and return the surveys within two weeks of the survey date. The postcard survey questions were identical to those in the face-to-face interviews. Examples of both the questionnaire form and postcard survey are included within Appendix A. A table detailing the chosen survey method for each site is included in Appendix B. RSI Summary.

5.3.5 Interview sample rates were monitored at regular intervals of fifteen minutes to ensure a good representation of vehicle types. The following vehicle classification was included within the interview sample:

- Car
- LGV/Van
- OGV 1
- OGV 2
- Minibus

5.3.6 For the two cordons around the city centre, the interviews were carried out in the outbound direction. On the new radial screenline, interviews were carried out in both directions.

5.3.7 Table 5.1 summaries the location and method of data collection. Whilst some sites were entirely face-to-face interviews, and others entirely postcard, it can be seen that both methods of survey collection were employed at some sites. In such cases, it was found that stopping and interviewing drivers was only possible during discreet periods of the day to avoid significant disruption to road users.

Table 5.1: 2012 RSI data collection

Site Reference	Site Locations	Survey Method	Survey Direction
Outer Cordon			
38	Hall Road North of A146 Roundabout	Both	Outbound
41	Unthank Road (Between Christchurch Rd & Mile End Rd	Both	Outbound
42	The Avenue (Between Christchurch Rd and Colman Rd)	Both	Outbound
43	B1108 Earlham Road (Between Christ \ Church Road & Coleman Road)	Face-to-face	Outbound
44	Bowthorpe Road (Between Dereham Road & Farrow Road)	Both	Outbound
48	Catton Grove Road (Between Woodcock Rd & Mile Cross Lane)	Postcard	Outbound
49	Constitution Hill (Between Wall Rd & Chartwell Rd)	Both	Outbound
33	Gurney Road (Between Gilman Rd & Mousehold Lane)	Face-to-face	Outbound
34	B1140 Plumstead Road (Between Hilary Ave & Heartsease Lane)	Both	Outbound
OC1	Long John Hill (between A146 & Cavell Rd)	Postcard	Outbound
OC2	A1054 Martineau Ln (between A146 & Bracondale Rd)	Postcard	Outbound
OC3	Bracondale Rd (between Europa Way & Bracondale Mill Gate)	Both	Outbound
Inner Cordon			
51	Prince of Wales Road (Between Recorder Road & Riverside Road)	Postcard	Outbound
52	King Street (Between Rouen Road & Carrow Bridge)	Both	Outbound
53	Ber Street (Between Thorn Lane & Finklegate)	Both	Outbound
54	All Saints green (Between Surrey St & Queens Rd)	Postcard	Outbound
55	St Stephen's Street (Between Surrey Street & Queens Road)	Postcard	Outbound
56	Chapelfield North	Face-to-face	Outbound

Site Reference	Site Locations	Survey Method	Survey Direction
57	Westwick Street (Between St Swithins Road & Barn Road)	Both	Outbound
58	Duke Street (Between St Crispins Rd & St Marys Plain)	Postcard	Outbound
59	Magdalen Street At Flyover	Both	Outbound
60	Whitefriars (Between Fishergate & Barrack Street)	Both	Outbound
Other Locations			
6	A1067 Draylon High Road south of Hurn Road	Both	Outbound
14	A47 Eastbound by Postwick Grove	Face-to-face	Eastbound
15	A47 Westbound by Postwick Grove	Face-to-face	Westbound
Radial Screenline			
R1	A1042 Mousehold Lane between Salhouse Road and Roundtree Way	Postcard	Northbound and Southbound
R2	Falcon Road E between Salhouse Road and Blithewood Gardens	Both	Northbound and Southbound
R3	Blue Boar Lane between Salhouse Road and Laundry Lane	Both	Northbound and Southbound
R4	Green Lane E between Salhouse Road and Wilkinson Road	Face-to-face	Northbound and Southbound
R5	B1140 Mill Road between Norwich Road and Hall Drive	Northbound – Both Southbound – Face-to-face	Northbound and Southbound

5.3.8 The total number of interview records collected is summarised in Table 5.2. Over 30,000 interviews were collected, representing just over 18% of all traffic passing the census points.

Table 5.2: Summary interview records

Method	Number of Interview Records
Face to Face	17,674
Postcards	12,815

Method	Number of Interview Records
Total	30,489
Total Traffic (vehicles)	165,814
Overall Sample Rate	18.4%

5.3.9 A summary of the survey sample rates achieved for each site are shown below in Table 5.3. A full interview summary showing the number of interviews and postcards returned at each site is provided in Appendix B.

Table 5.3: RSI Survey sample rates

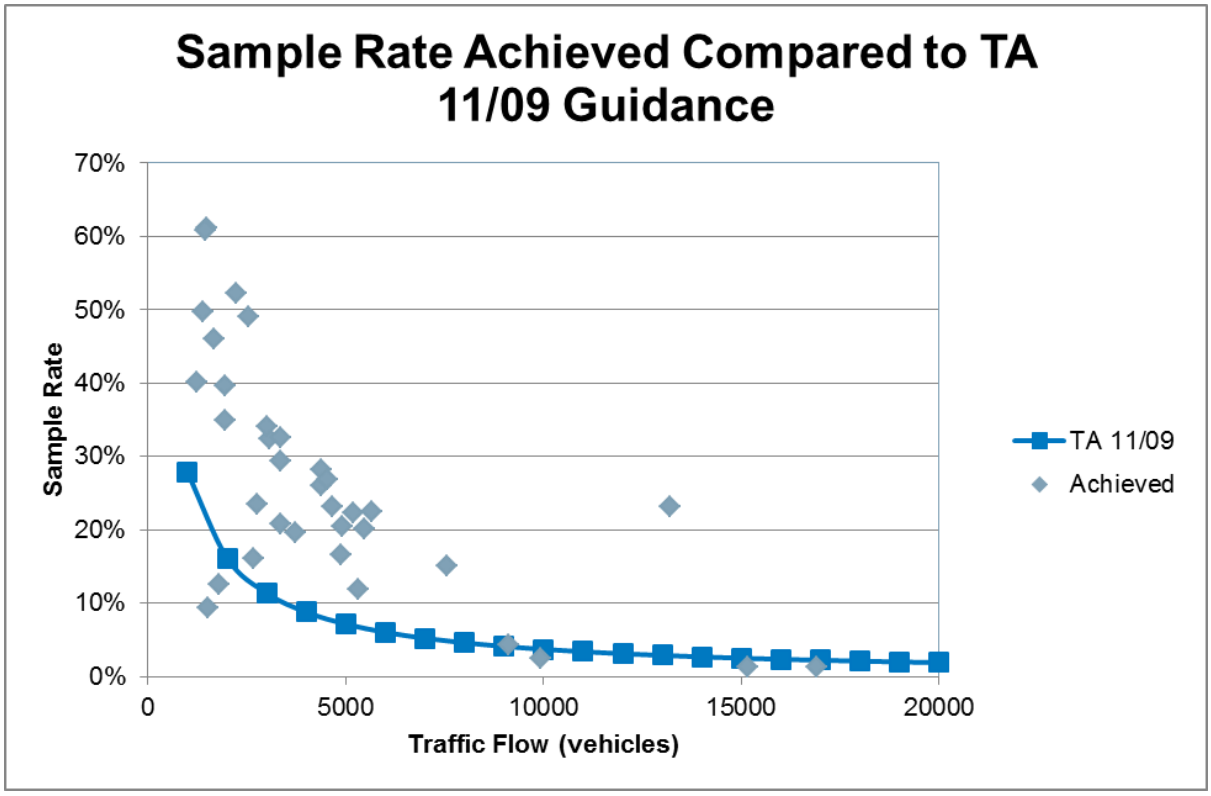
Site Reference	Site Locations	Sample Rate Versus MCC Data
Outer Cordon		
38	Hall Road North of A146 Roundabout	26.1%
41	Unthank Road (Between Christchurch Rd & Mile End Rd	32.3%
42	The Avenue (Between Christchurch Rd and Colman Rd)	34.9%
43	B1108 Earlham Road (Between Christ \ Church Road & Coleman Road)	26.8%
44	Bowthorpe Road (Between Dereham Road & Farrow Road)	23.2%
48	Catton Grove Road (Between Woodcock Rd & Mile Cross Lane)	16.1%
49	Constitution Hill (Between Wall Rd & Chartwell Rd)	19.6%
33	Gurney Road (Between Gilman Rd & Mousehold Lane)	28.1%
34	B1140 Plumstead Road (Between Hilary Ave & Heartsease Lane)	16.6%
OC1	Long John Hill (between A146 & Cavell Rd)	12.5%
OC2	A1054 Martineau Ln (between A146 & Bracondale Rd)	23.1%
OC3	Bracondale Rd (between Europa Way & Bracondale Mill Gate)	52.2%
Inner Cordons		
51	Prince of Wales Road (Between Recorder Road & Riverside Road)	11.8%

Site Reference	Site Locations	Sample Rate Versus MCC Data
52	King Street (Between Rouen Road & Carrow Bridge)	40.1%
53	Ber Street (Between Thorn Lane & Finklegate)	34.0%
54	All Saints green (Between Surrey St & Queens Rd)	20.9%
55	St Stephen's Street (Between Surrey Street & Queens Road)	9.4%
56	Chapelfield North	22.5%
57	Westwick Street (Between St Swithins Road & Barn Road)	61.2%
58	Duke Street (Between St Crispins Rd & St Marys Plain)	15.0%
59	Magdalen Street At Flyover	29.3%
60	Whitefriars (Between Fishergate & Barrack Street)	32.5%
Other Locations		
6	A1067 Draylon High Road south of Hurn Road	20.2%
14	A47 Eastbound by Postwick Grove	1.3%
15	A47 Westbound by Postwick Grove	1.3%
Radial Screenlines		
R1	A1042 Mousehold Lane between Salhouse Road and Roundtree Way	2.4% NB / 4.4% SB
R2	Falcon Road E between Salhouse Road and Blithewood Gardens	49.8% NB / 60.8% SB
R3	Blue Boar Lane between Salhouse Road and Laundry Lane	20.5% NB / 22.3% SB
R4	Green Lane E between Salhouse Road and Wilkinson Road	46.0% NB / 39.7% SB
R5	B1140 Mill Road between Norwich Road and Hall Drive	23.5% NB / 49.1% SB

5.3.10 With the exception of the sites highlighted in grey, all interview sites had a sample rate (measured as the number of interviews as a percentage of the vehicle count) over 10%; over two-thirds of the sites had a sample rate greater than 20%.

5.3.11 Figure 5.2 shows the sample rate achieved with the desired rate as set out in DMRB Volume 5, Section 1 Part 4 TA 11/09. With the exception of the five sites highlighted, all sites had a sample rate over the required amount (shown by the points on or above the TA 11/09 line).

Figure 5.2: Comparison of achieved sample rate against TA 11/09 guidance



5.3.12 At Site 55 the operation of the survey site was affected by bus stops in close proximity along the road, and buses swinging in and out of the stops frequently struck the traffic management in the early part of the survey. As a result it was necessary to shorten the interview bay, which meant it was not possible to run a full contingent of staff distributing postcards.

5.3.13 The two sites on the A47 Norwich Southern Bypass (Sites 14 and 15) caused significant disruption and major queuing. As a result of Police and County Council requests the sites were abandoned at 09:30 and all traffic management removed from the carriageway. The classified counts continued for the entire period.

5.3.14 Sites R1 Northbound and Southbound operated as postcard distribution sites at adjacent traffic signals on the A1042. This was the only way to operate the sites due to insufficient room to accommodate traffic management for an interview bay. The on-site survey supervisor reported a

very short red phase at the signals, which severely limited the number of postcards that could be issued.

6 Counts for Calibration and Validation

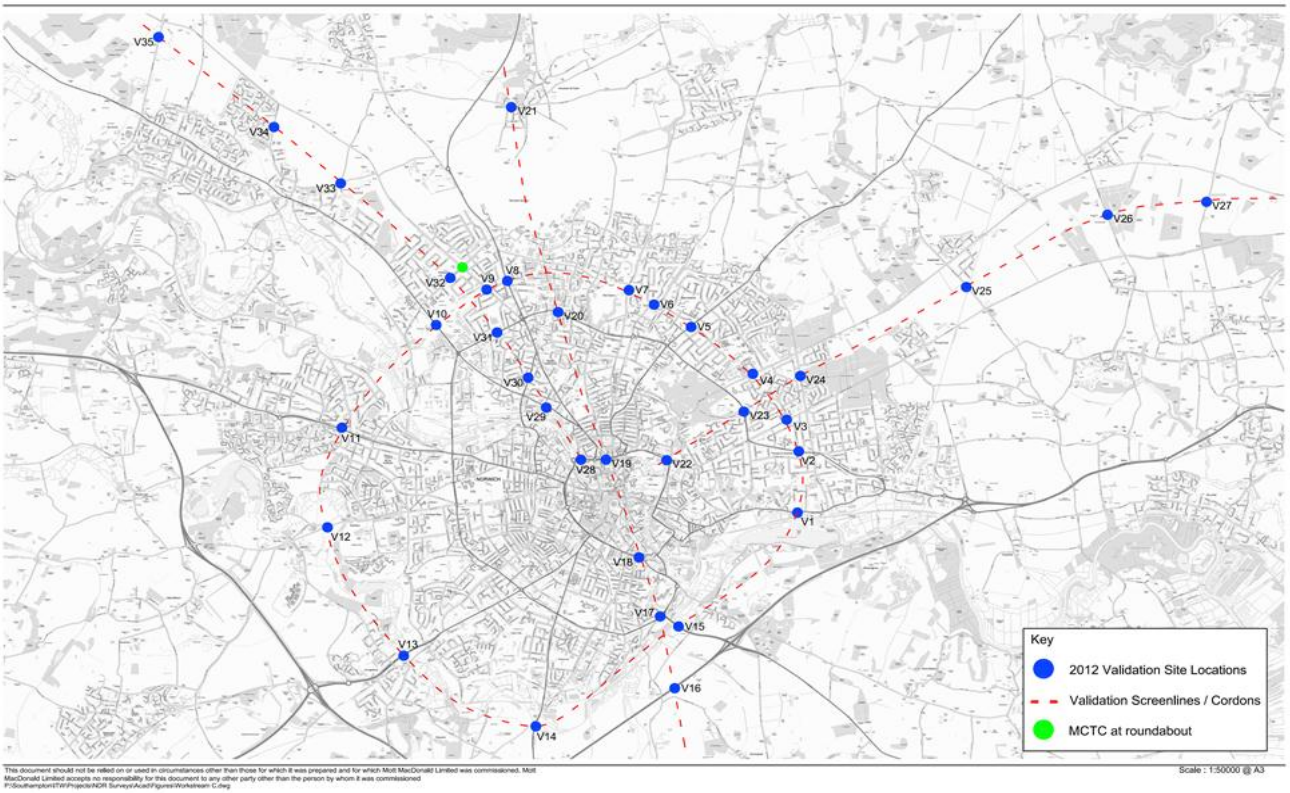
6.1 Overview

6.1.1 ATC and accompanying MCC were carried out on a cordon and screenlines to provide data points for the model calibration and validation.

6.2 Location

6.2.1 The location of these counts is shown in Figure 6.1 with a more detailed site description and period over which the data collected shown in Table 6.1. In one instance (Site V16 on the A47) TRADS data has been used.

Figure 6.1: Location of additional validation sites



Source: Extracted from Mott MacDonald Norwich Traffic Survey Brief, October 2012

Table 6.1: 2012 survey locations at calibration and validation sites

Site Reference	Site Description	Survey Period
V1	Yarmouth Road east of Harvey Lane	Friday 19 October 2012 – Thursday 25 October 2012 Monday 12 November 2012 – Sunday 18 November 2012
V2	St Williams Way east of Margetson Avenue	Monday 22 October 2012 – Sunday 28 October 2012 Monday 29 October 2012 – Sunday 4 November 2012 Monday 5 November 2012 – Sunday 11 November 2012
V3	Plumstead Road north of A1042	Monday 22 October 2012 – Sunday 28 October 2012 Monday 29 October 2012 – Sunday 4 November 2012 Monday 5 November 2012 – Sunday 11 November 2012
V4	Salhouse Road north of A1042	Friday 19 October 2012 – Thursday 25 October 2012 Monday 5 November 2012 – Sunday 11 November 2012
V5	Wroxham Road north of A1042	Friday 19 October 2012 – Thursday 25 October 2012 Monday 5 November 2012 – Sunday 11 November 2012
V6	Constitution Hill north of A1042	Monday 22 October 2012 – Sunday 287 October 2012 Monday 29 October 2012 – Sunday 4 November 2012 Monday 5 November 2012 – Sunday 11 November 2012
V7	Spixworth Road north of A1042	Monday 22 October 2012 – Sunday 28 October 2012 Monday 29 October 2012 – Sunday 4 November 2012 Monday 5 November 2012 – Sunday 11 November 2012

Site Reference	Site Description	Survey Period
V8	Cromer Road north of A140	Monday 22 October 2012 – Sunday 28 October 2012 Monday 29 October 2012 – Sunday 4 November 2012 Monday 5 November 2012 – Sunday 11 November 2012
V9	Reepham Road north of A140	Saturday 20 October 2012 – Friday 26 October 2012 Saturday 27 October 2012 – Friday 2 November 2012 Saturday 3 November 2012 – Friday 9 November 2012
V10	Drayton High Road north of A140	Friday 19 October 2012 – Thursday 25 October 2012 Monday 5 November 2012 – Sunday 11 November 2013
V11	Dereham Road west of Marl Pit Lane	Friday 19 October 2012 – Thursday 25 October 2012 Friday 2 November 2012 – Thursday 8 November 2012 Tuesday 20 November 2012 – Monday 26 November 2012
V12	Earlham Road west of Wilbertforce Road	Friday 19 October 2012 – Thursday 25 October 2012 Tuesday 13 November 2012 – Monday 19 November 2012
V13	A11 Newmarket Road west of Bluebell Road	Friday 19 October 2012 – Thursday 25 October 2012 Friday 26 October 2012 – Thursday 1 November 2012 Friday 2 November 2012 – Thursday 8 November 2012
V14	A140 south of Hall Road	Friday 19 October 2012 – Thursday 25 October 2012 Monday 5 November 2012 – Sunday 11 November 2012

Site Reference	Site Description	Survey Period
V15	A146 west of A47	Monday 22 October 2012 – Sunday 28 October 2012 Monday 29 October 2012 – Sunday 4 November 2012 Friday 9 November 2012 – Thursday 15 November 2012
V16	A47 east of Stoke Road	TRADS: Monthly flows for October 2012 Monthly flows for November 2012
V17	Barrett Road east of Long John Hill	Saturday 3 November 2012 – Friday 9 November 2012 Tuesday 4 December 2012 – Monday 10 December 2012
V18	A147 Bracondale Road east of City Road	Friday 19 October 2012 – Thursday 25 October 2012 Monday 5 November 2012 – Sunday 11 November 2012
V19	A147 St Crispins Road west of Magdalen Street	Monday 22 October 2012 – Sunday 28 October 2012 Monday 29 October 2012 – Sunday 4 November 2012 Monday 5 November 2012 – Sunday 11 November 2012
V20	A1042 Mile Cross Lane east of Vulcan Road	Monday 22 October 2012 – Sunday 28 October 2012 Saturday 3 November 2012 – Friday 9 November 2012
V21	Church Street west of Norwich Road	Monday 22 October 2012 – Sunday 28 October 2012 Monday 29 October 2012 – Sunday 4 November 2012 Monday 5 November 2012 – Sunday 11 November 2012
V22	Barrack Street west of Gurney Road	Friday 19 October 2012 – Thursday 25 October 2012 Monday 5 November 2012 – Sunday 11 November 2012

Site Reference	Site Description	Survey Period
V23	Heartsease Lane north of Rider Haggard Road	Saturday 20 October 2012 – Friday 26 October 2012 Monday 5 November 2012 – Sunday 11 November 2012
V24	Woodside Road south of Greenborough Road	Friday 19 October 2012 – Thursday 25 October 2012 Monday 5 November 2012 – Sunday 11 November 2012
V25	Broad Lane south of Vera Road	Friday 19 October 2012 – Thursday 25 October 2012 Sunday 28 October 2012 – Saturday 3 November 2012 Sunday 4 November 2012 – Saturday 10 November 2012
V26	Honeycombe Road north of Norwich Road	Monday 22 October 2012 – Sunday 28 October 2012 Monday 29 October 2012 – Sunday 4 November 2012 Monday 5 November 2012 – Sunday 11 November 2012
V27	Primrose Corner	Monday 22 October 2012 – Sunday 28 October 2012 Monday 29 October 2012 – Sunday 4 November 2012 Monday 5 November 2012 – Sunday 11 November 2012
V28	A147 St Crispins Road west of Pitt Street	Saturday 20 October 2012 – Friday 26 October 2012 Monday 5 November 2012 – Sunday 11 November 2012
V29	A1057 Drayton Road south of Junction Road	Saturday 20 October 2012 – Friday 26 October 2012 Saturday 27 October 2012 – Friday 2 November 2012 Monday 5 November 2012 – Sunday 11 November 2012

Site Reference	Site Description	Survey Period
V30	A1024 Mile Cross Road north of Half Mile Road	Monday 22 October 2012 – Sunday 28 October 2012 Monday 29 October 2012 – Sunday 4 November 2012 Tuesday 13 November 2012 – Monday 19 November 2012
V31	A140 Boundary Road west of Overbury Road	Friday 2 November 2012 – Thursday 8 November 2012 Friday 9 November 2012 – Thursday 15 November 2012 Friday 19 November 2012 – Monday 22 November 2012
V32	Middleton's Lane west of Westgate	Saturday 20 October 2012 – Friday 26 October 2012 Friday 2 November 2012 – Thursday 8 November 2012
V33	Hall Lane west of George Drive	Tuesday 23 October 2012 – Monday 29 October 2012 Tuesday 30 October 2012 – Monday 5 November 2012 Tuesday 6 November 2012 – Monday 12 November 2012
V34	School Road south of the Thorpe Marriott	Monday 5 November 2012 – Sunday 11 November 2012 Monday 12 November 2012 – Sunday 18 November 2012
V35	Fir Covert Road north of Fakenham Road	Tuesday 23 October 2012 – Monday 29 October 2012 Tuesday 30 October 2012 – Monday 5 November 2012 Tuesday 6 November 2012 – Monday 12 November 2012 Tuesday 13 November 2012 – Monday 19 November 2012

7 Journey Times

7.1 Overview

7.1.1 Journey time data was collected along key routes pertinent to the proposed scheme. The data recorded the journey time between pre-designated timing points along each route throughout the day. Journey time data were required as part of the assignment model validation and calibration appraisal to ensure any scheme benefits from journey time savings is accurately forecast. Comparison of observed and modelled journey times provides a measure of the appropriateness of the speed-flow relationship in a capacity restrained network, as well as junction delay calculations at fully simulated junctions.

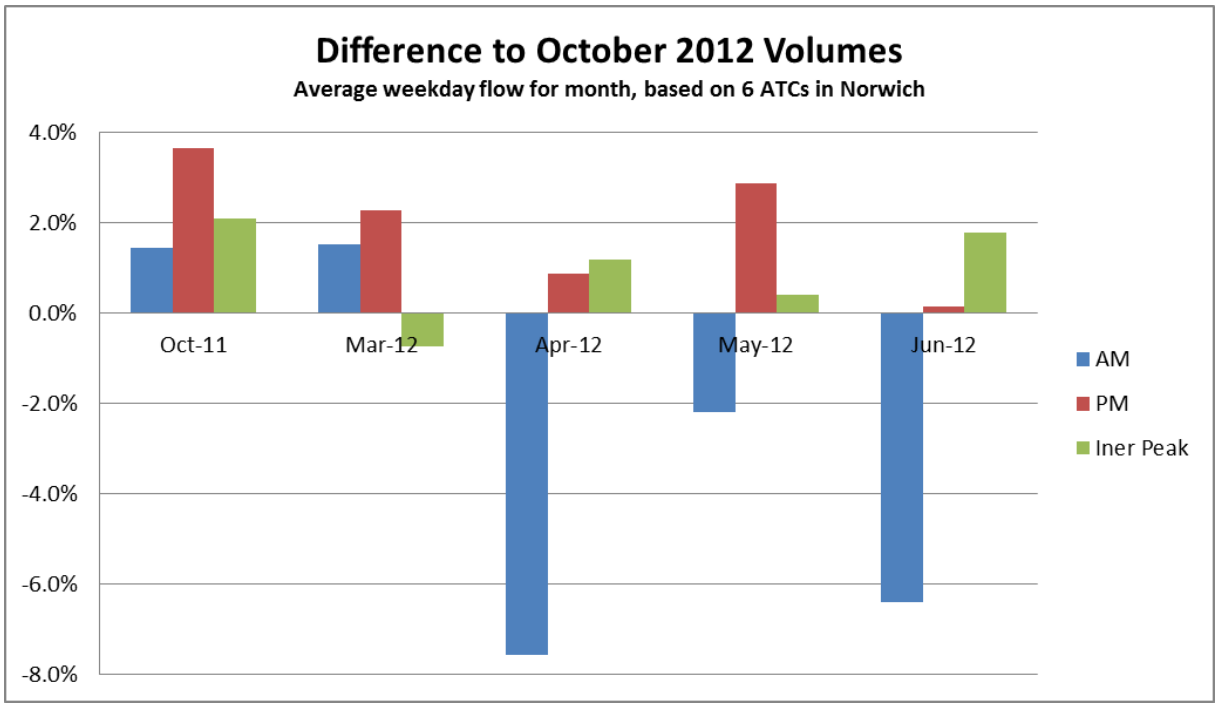
7.2 Methodology

7.2.1 Data generated from the movements of GPS-equipped 'probe' vehicles are mapped to a representation of the road network (provided by the Department for Transport) in order to estimate average vehicle journey times across England. Traffic Master collate this data for the whole of England and provide it to the DfT annually, who pass the data on to local authorities.

7.2.2 Extraction of journey times from the data provided to Norfolk County Council was undertaken by Mott MacDonald using their in-house "Strat-e-gis" software. The data provided each year is for a 12 month period starting in September. Whilst the traffic model represents traffic demand for October 2012, TrafficMaster data sets were only available for September 2011 to August 2012.

7.2.3 Data for March 2012 was used as it represented the closest month to October 2012 in terms of overall traffic demand – as shown in Figure 7.1.

Figure 7.1: Comparison of traffic data with October 2012

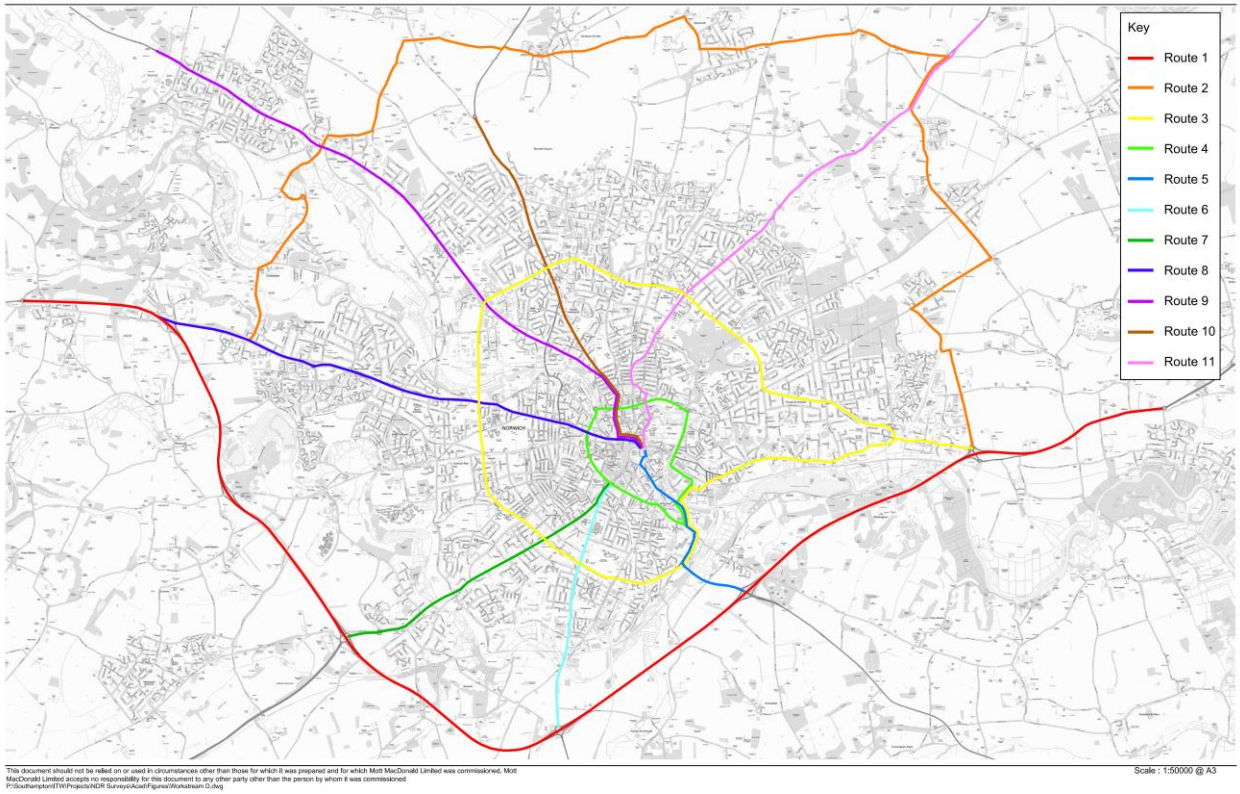


7.2.4 Specific journey time routes were selected for use in validating the SATURN model, with each route split into sections between junctions in the SATURN model. Data was extracted for all school term-time weekdays in March 2012, covering the modelled periods:

- AM peak 08:00-09:00
- Inter-peak averaged over 10:00-16:00
- PM peak 17:00-18:00

7.2.5 The journey time routes assessed are shown below in Figure 7.2 below.

Figure 7.2: Journey time routes



7.3 Data Output

7.3.1 The journey time results were provided for each section, including data on section lengths, together with cumulative results, from which time/distance graphs were produced. TrafficMaster data are provided at a disaggregated level, with a separate link between every junction and main access on each road, with all public roads included. Therefore, each section for the journey time analysis consisted of several TrafficMaster links.

7.3.2 The data on section lengths were compared to the SATURN link lengths, to ensure that there was consistency between the two sets of data.

PAGE NOT USED

8 Other Sources of Data

8.1 TRADS

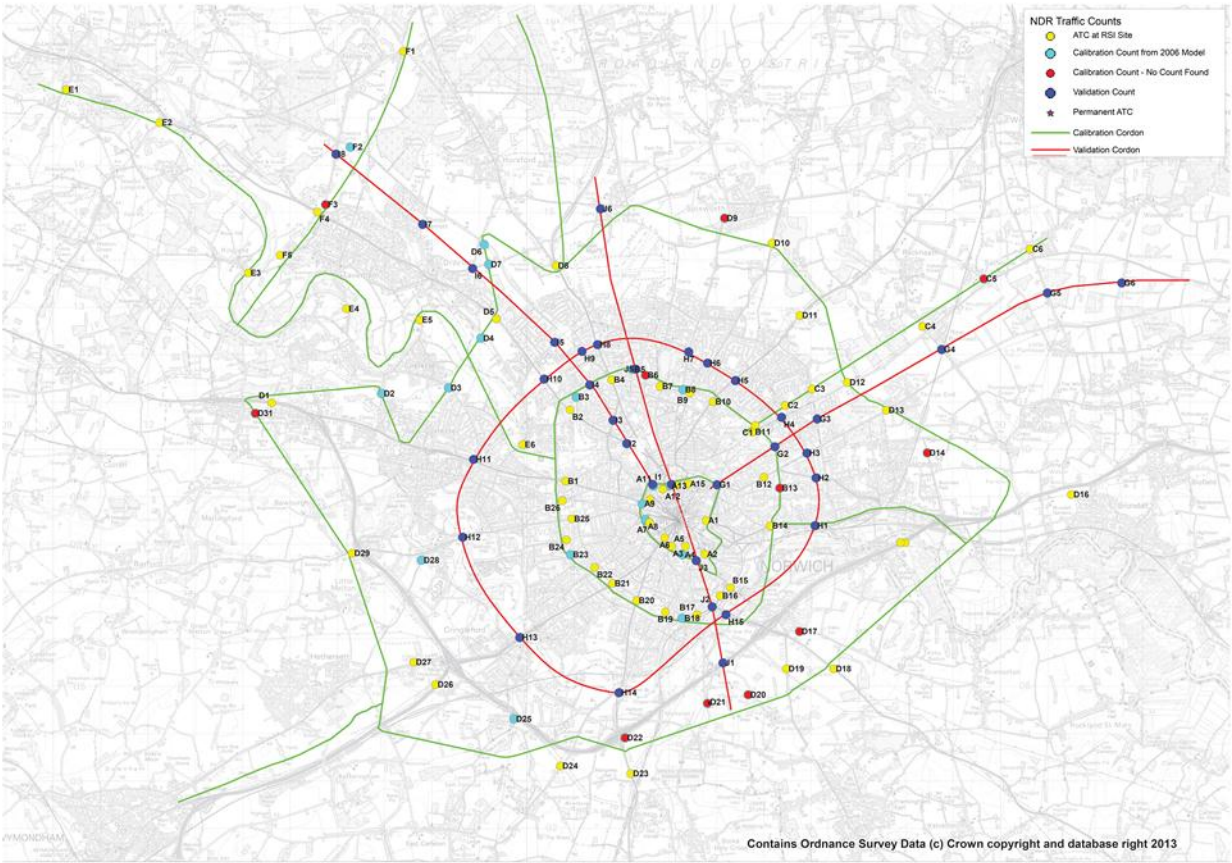
8.1.1 ATC data on the trunk road network was obtained from the Highways Agency's Traffic Flow Data System (TRADS) at the following locations:

- A47 West of A1074;
- A47 Postwick Junction west of Cucumber Lane;
- A11 Southwest of A47; and
- A47 East of Stoke Road.

8.2 2006 Counts

8.2.1 The locations of the 2006 ATC sites which have been used to infill gaps in the cordons are shown as the light blue markers within Figure 8.1 below.

Figure 8.1: NDR traffic counts



8.2.2 The factors used to convert 2006 count data to 2012 values are detailed in Table 8.1 and Table 8.2 below. These factors were calculated from ATC data collected from 10 locations where data was available for both years.

8.2.3 Table 8.1 shows the factor required to convert from 2006 peak periods to equivalent peak periods in 2012. In this case the peak periods are defined as:

- AM peak period: 07:00-10:00
- IP period: 10:00-16:00
- PM peak period: 16:00-19:00

Table 8.1: 2006 to 2012 yearly growth factors peak periods

Direction	AM	IP	PM
Inbound	0.98	1.04	1.06
Outbound	1.08	1.03	0.99

8.2.4 Table 8.2 shows the factor required to convert from peak hours to the peak periods. These factors are used to allow the transport model flows to be aggregated to daily traffic flows and for the purpose of aggregation associated with the demand modelling processes.

Table 8.2: Time period factors (peak hour to the peak period).

Direction	AM	IP	PM
Inbound	2.56	6.00	2.81
Outbound	2.62	6.00	2.67

8.3 Park and Ride

8.3.1 In and outbound vehicle flows to the following Park and Ride sites was provided by Norfolk County Council:

- Airport;
- Sprowton;
- Postwick;
- Costessey;
- Hartford; and
- Thickthorn.

8.4 Turning Counts

8.4.1 Turning count data was obtained for the roundabout junction on the A47 at the Thickthorn Park and Ride site in April 2012.

8.4.2 ATC and turning count data was obtained in 2012 for the roundabout junction on the A47 at the Postwick Park and Ride site.

8.5 Other Locations

8.5.1 Turning count data was obtained for the Beyond Green development scheme in Old Catton and Sprowston in North Norwich in February 2012. This took the form of 22 turning count sites at junctions within Old Catton and Sprowston. In total 21 sites were used for validation and model calibration purposes.

8.5.2 Manual classified turning counts (MCTCs) were undertaken at the Reepham Road/Middleton Lane roundabout. This was undertaken for a period of 12 hours on 22nd October 2012 using video cameras with the classification reported in line with the MCC surveys.

8.5.3 Traffic counts for the A140 Cromer Road and A1149 Holt Road were derived from turning count proportions from a 2006 turning count survey of the Holt Road Roundabout.

PAGE NOT USED

9 Data Handling

9.1 ATC data

9.1.1 The ATC data was supplied in Microsoft Excel spreadsheet format as summarised in Table 9.1 below.

Table 9.1: Incoming ATC data from NDC

Data	Mott MacDonald Reference	Date Received
Norwich ATC Data – batch 1	233906DP01-NDC-001 Rev A	21 November 2012
Norwich ATC Data – batch 2	233906DP01-NDC-003 Rev A	27 November 2012
Norwich Link Counts – full data set (including batch 1 and 2)	233906DP01-NDC-005 Rev A	29 November 2012
Norwich ATC Data – additional data for site 5, V32 and V33	233906DP01-NDC-006 Rev A	3 December 2012
Norwich ATC Data – batch 3	233906DP01-NDC-007 Rev A	3 December 2012
Norwich ATC Data – remaining data	233906DP01-NDC-008 Rev A	4 December 2012
NDR Count Data Revisions 2 Jan 2013	233906DP01-NDC-010 Rev A	2 January 2013
NDR Count Data Revisions 3 Jan 2013	233906DP01-NDC-011 Rev A	3 January 2013

9.1.2 A copy of this data is available upon request.

9.1.3 Figure 9.1 shows an example of the data received.

Figure 9.1: ATC Data Sample

1	Site		V8																				2425 / Norwich
2	Location		Cromer Road, Att - Bus Shelter, OSGR: TG 21515 12136																				October 2012
3	Direction		Two way																				Automatic Traffic Count
4			Mon, 22 October 2012																				
5	Time	Total	Classification												>PSL	>PSL%	>SL1	>SL1%	>SL2	>SL2%	Mean	Vpp	
6			1	2	3	4	5	6	7	8	9	10	11	12	30	30	35	35	45	45		85	
7			MCL	SV	SVT	TB2	TB3	T4	ART3	ART4	ART5	ART6	BD	DRT			ACPO	ACPO	Dft	Dft			
8	0000	55	1	52	0	2	0	0	0	0	0	0	0	0	51	92.7	31	56.4	8	14.5	37.8	44.3	
9	0100	39	2	34	0	3	0	0	0	0	0	0	0	0	34	87.2	25	64.1	4	10.3	37.9	43.2	
10	0200	34	0	24	0	4	0	0	0	4	0	2	0	0	31	91.2	23	67.6	3	8.8	37.4	44.1	
11	0300	53	0	36	0	8	0	0	0	5	1	3	0	0	47	88.7	36	67.9	10	18.9	37.9	45.9	
12	0400	111	2	83	1	14	3	1	0	2	3	2	0	0	101	91	75	67.6	12	10.8	37.1	42.5	
13	0500	309	13	252	0	27	5	1	0	1	6	4	0	0	274	88.7	150	48.5	23	7.4	35.4	40.9	
14	0600	612	14	505	4	71	8	3	0	0	0	6	1	0	512	83.7	231	37.7	24	3.9	34.3	39.1	
15	0700	1484	28	1300	10	112	14	7	0	8	3	2	0	0	630	42.5	105	7.1	6	0.4	28.8	33.1	
16	**0800**	**1621**	**30**	**1432**	**9**	**103**	**19**	**7**	**3**	**5**	**4**	**6**	**2**	**1**	**484**	**29.9**	**65**	**4**	**2**	**0.1**	**27.9**	**32**	
17	0900	1270	17	1084	7	120	18	7	0	4	6	6	0	1	561	44.2	92	7.2	4	0.3	29.1	33.6	
18	1000	1229	10	1070	6	103	11	7	2	3	5	10	0	2	574	46.7	90	7.3	1	0.1	29.7	33.3	
19	1100	1307	6	1156	12	98	11	7	2	2	4	5	2	2	622	47.6	79	6	1	0.1	29.5	32.9	
20	1200	1314	10	1157	6	110	8	4	1	5	4	9	0	0	692	52.7	146	11.1	4	0.3	30.5	34.2	
21	1300	1315	13	1156	5	97	11	11	3	4	7	7	1	0	722	54.9	158	12	1	0.1	30.4	34.4	
22	1400	1394	14	1223	7	106	14	7	1	3	7	11	1	0	625	44.8	102	7.3	1	0.1	29.2	33.3	
23	1500	1369	13	1190	9	121	17	4	0	4	4	5	1	1	629	45.9	84	6.1	1	0.1	29.5	33.1	
24	**1600**	**1613**	**35**	**1429**	**10**	**107**	**14**	**7**	**0**	**0**	**4**	**3**	**2**	**2**	**659**	**40.9**	**125**	**7.7**	**7**	**0.4**	**29.1**	**33.1**	
25	1700	1612	25	1486	4	76	6	8	0	2	0	4	1	0	691	42.9	102	6.3	5	0.3	29.3	32.9	
26	1800	1138	12	1042	4	59	7	5	0	3	3	1	2	0	619	54.4	159	14	2	0.2	30.3	34.7	
27	1900	782	15	727	3	27	2	2	1	1	0	3	1	0	586	74.9	176	22.5	6	0.8	32.5	36	
28	2000	474	9	440	1	18	1	1	0	1	0	3	0	0	371	78.3	151	31.9	13	2.7	33.4	38	
29	2100	405	9	379	2	10	2	0	0	1	2	0	0	0	328	81	117	28.9	11	2.7	33.7	38.5	
30	2200	339	7	312	1	15	2	1	0	0	0	1	0	0	281	82.9	126	37.2	8	2.4	33.7	38.3	
31	2300	143	3	135	0	4	0	0	0	0	1	0	0	0	117	81.8	65	45.5	12	8.4	35.2	40.3	
32	**07-19**	**16666**	**213**	**14725**	**89**	**1212**	**150**	**81**	**12**	**43**	**51**	**69**	**12**	**9**	**7508**	**45**	**1307**	**7.8**	**35**	**0.2**	**29.4**	**33.3**	
33	**06-22**	**18939**	**260**	**16776**	**99**	**1338**	**163**	**87**	**13**	**46**	**53**	**81**	**14**	**9**	**9305**	**49.1**	**1982**	**10.5**	**89**	**0.5**	**29.9**	**34**	
34	**06-00**	**19421**	**270**	**17223**	**100**	**1357**	**165**	**88**	**13**	**46**	**54**	**82**	**14**	**9**	**9703**	**50**	**2173**	**11.2**	**109**	**0.6**	**30**	**34**	
35	**00-00**	**20022**	**288**	**17704**	**101**	**1415**	**173**	**90**	**13**	**58**	**64**	**93**	**14**	**9**	**10241**	**51.1**	**2513**	**12.6**	**169**	**0.8**	**30.2**	**34.4**	

9.2 MCC data

9.2.1 The MCC data was supplied in Microsoft Excel spreadsheet format. The following data files were received.

Table 9.2: Incoming MCC data

Data	Mott MacDonald Reference	Date received
Norwich MCC Data – Batch 1	233906DP01-NDC-002	21 November 2012
Norwich MCC Data – Batch 2	233906DP01-NDC-004	27 November 2012

Source: Mott MacDonald incoming document register

9.2.2 The data was issued to the modelling team without any modification. A copy of this data is available upon request.

9.2.3 Figure 9.2 shows an example of the MCC data received.

Figure 9.2: MCC data sample

NDC — 2425 / NORWICH — OCTOBER 2012 — CLASSIFIED COUNT

SITE: 1 — DATE: 25/10/2012 — LOCATION: A47 Between A1074 and Easton Roundabout — DAY: Thursday

EASTBOUND

TIME	CAR	TAXI	LGV	OGV1	OGV2	PSV	MCL	PCL	TOT
07:00	202	0	34	13	22	1	1	0	273
07:15	259	0	52	7	13	3	2	0	336
07:30	313	2	47	13	22	0	5	0	402
07:45	334	2	52	15	12	0	3	0	418
H/TOT	1108	4	185	48	69	4	11	0	1429
08:00	365	15	52	6	13	2	0	0	453
08:15	360	12	35	18	17	1	1	1	445
08:30	317	14	31	17	19	3	2	0	403
08:45	255	7	42	10	15	2	0	0	331
H/TOT	1297	48	160	51	64	8	3	1	1632
09:00	271	10	32	9	17	4	2	0	345
09:15	237	11	21	15	15	5	0	0	304
09:30	231	4	25	18	12	1	1	0	292
09:45	180	6	39	11	16	2	0	0	254
H/TOT	919	31	117	53	60	12	3	0	1195
10:00	156	8	25	13	14	2	0	0	218
10:15	186	2	35	13	18	3	1	0	258
10:30	161	2	26	16	17	1	0	0	223
10:45	167	3	23	13	14	1	1	0	222
H/TOT	670	15	109	55	63	7	2	0	921
11:00	172	2	26	11	15	0	2	0	228
11:15	143	4	31	10	13	1	1	0	203
11:30	175	0	18	15	12	0	1	0	221
11:45	173	2	20	11	19	2	1	0	228
H/TOT	663	8	95	47	59	3	5	0	880
12:00	166	2	13	17	19	0	0	0	217
12:15	154	2	11	12	6	1	0	0	186
12:30	198	3	28	10	16	0	0	0	255
12:45	143	3	22	5	11	2	4	0	190
H/TOT	661	10	74	44	52	3	4	0	848
13:00	197	1	23	14	20	0	0	0	255
13:15	193	2	24	8	10	1	1	0	239
13:30	209	1	25	10	21	0	1	0	267
13:45	168	0	25	8	15	1	2	0	219

NDC — 2425 / NORWICH — OCTOBER 2012 — CLASSIFIED COUNT

SITE: 1 — DATE: 25/10/2012 — LOCATION: A47 Between A1074 and Easton Roundabout — DAY: Thursday

WESTBOUND

TIME	CAR	TAXI	LGV	OGV1	OGV2	PSV	MCL	PCL	TOT
07:00	160	1	34	9	12	0	1	0	217
07:15	171	5	42	6	12	2	0	0	238
07:30	201	3	36	9	13	5	1	0	268
07:45	259	1	32	12	17	1	2	0	324
H/TOT	791	10	144	36	54	8	4	0	1047
08:00	221	0	34	14	10	1	1	0	281
08:15	261	0	54	25	11	0	0	0	351
08:30	232	4	31	17	17	1	1	0	303
08:45	181	5	30	22	16	1	1	0	256
H/TOT	895	9	149	78	54	3	3	0	1191
09:00	158	7	23	14	16	3	0	0	221
09:15	171	1	22	17	25	2	0	0	238
09:30	153	2	26	13	15	4	1	0	214
09:45	160	1	24	17	16	1	0	0	219
H/TOT	642	11	95	61	72	10	1	0	892
10:00	137	4	19	9	14	3	0	0	186
10:15	145	2	35	9	21	0	1	0	213
10:30	153	1	23	8	16	1	1	0	203
10:45	122	2	37	12	21	1	1	0	196
H/TOT	557	9	114	38	72	5	3	0	798
11:00	144	2	24	14	28	2	1	0	215
11:15	160	1	20	16	10	0	3	0	210
11:30	154	0	13	16	14	1	0	0	198
11:45	159	1	22	10	20	1	0	0	213
H/TOT	617	4	79	56	72	4	4	0	836
12:00	186	3	16	11	24	1	1	0	242
12:15	180	3	13	6	11	0	1	0	214
12:30	176	1	16	12	13	1	1	0	220
12:45	164	0	24	13	14	1	1	0	217
H/TOT	706	7	69	42	62	3	4	0	893
13:00	173	5	14	11	12	1	0	0	216
13:15	189	1	24	13	14	0	0	0	241
13:30	198	0	27	15	12	4	0	0	256
13:45	163	2	14	14	13	2	1	0	209

9.3 RSI data

9.3.1 The RSI data was supplied in Microsoft Excel spreadsheet format. The following data files were received:

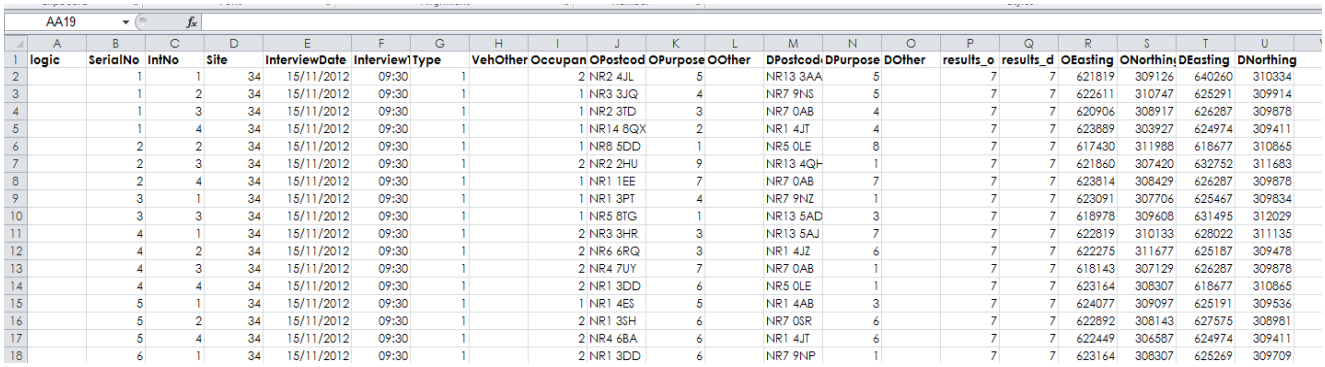
- Site 4nb.xls
- Site 4sb_mi.xls
- Site 6 face to face_mi.xls
- Site 6 postcards_mi.xls
- Site 14_mi.xls
- Site 15_mi.xls
- Site 38 face to face_mi.xls
- Site 38 postcards_mi.xls
- Site 41 face to face_mi.xls
- Site 41 postcards_mi.xls
- Site 42 face to face_mi.xls

- Site 42 postcards_mi.xls
- Site 43_mi.xls
- Site 44 face to face_mi.xls
- Site 44 postcards_mi.xls
- Site 48_mi_revised.xls
- Site 49 face to face_mi.xls
- Site 49 postcards_mi.xls
- Site 51_mi.xls
- Site 52 face to face_mi.xls
- Site 52 postcards_mi.xls
- Site 53 face to face_mi.xls
- Site 53 postcards_mi.xls
- Site 54_mi.xls
- Site 55 face to face_mi.xls
- Site 55 postcards_mi.xls
- Site 57 face to face_mi.xls
- Site 57 postcards_mi.xls
- Site 58_mi.xls
- Site 59 face to face_mi.xls
- Site 59 postcards_mi.xls
- Site 60 face to face_mi.xls
- Site 60 postcards_mi.xls
- Site OC1_mi.xls
- Site OC2_mi.xls
- Site OC3 face to face_mi.xls
- Site OC3 postcards_mi.xls
- Site R1Nb_mi.xls
- Site R1sb_mi.xls
- Site R2 NB face to face_mi.xls
- Site R2 NB postcards_mi.xls
- Site R2 SB face to face_mi.xls
- Site R2 SB postcards_mi.xls
- Site R3 NB face to face_mi.xls
- Site R3 NB postcards_mi.xls
- Site R3 SB face to face_mi.xls
- Site R3 SB postcards_mi.xls
- Site R5 NB face to face_mi.xls
- Site R5 NB postcards_mi.xls
- Site R5 SB_mi.xls

9.3.2 The data was issued to the modelling team without any modification. A copy of this data is available upon request.

9.3.3 Figure 9.3 shows the typical presentation of the RSI data received.

Figure 9.3: Typical RSI Spreadsheet



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	logic	SerialNo	IntNo	Site	InterviewDate	Interview1	Type	VehOther	Occupan	OPostcod	OPurpose	OOther	DPostcod	DPurpose	DOther	results_o	results_d	OEasting	ONorthin	DEasting	DNorthing
2		1	1	34	15/11/2012	09:30	1		2	NR2 4JL	5		NR13 3AA	5		7	7	621819	309126	640260	310334
3		1	2	34	15/11/2012	09:30	1		1	NR3 3JQ	4		NR7 9NS	5		7	7	622611	310747	625291	309914
4		1	3	34	15/11/2012	09:30	1		1	NR2 3TD	3		NR7 0AB	4		7	7	620906	308917	626287	309878
5		1	4	34	15/11/2012	09:30	1		1	NR14 8QX	2		NR1 4JT	4		7	7	623889	303927	624974	309411
6		2	2	34	15/11/2012	09:30	1		1	NR8 5DD	1		NR5 0LE	8		7	7	617430	311988	618677	310865
7		2	3	34	15/11/2012	09:30	1		2	NR2 2HU	9		NR13 4QH	1		7	7	621860	307420	632752	311683
8		2	4	34	15/11/2012	09:30	1		1	NR1 1EE	7		NR7 0AB	7		7	7	623814	308429	626287	309878
9		3	1	34	15/11/2012	09:30	1		1	NR1 3PT	4		NR7 9NZ	1		7	7	623091	307706	625467	309834
10		3	3	34	15/11/2012	09:30	1		1	NR5 8TG	1		NR13 5AD	3		7	7	618978	309608	631495	312029
11		4	1	34	15/11/2012	09:30	1		2	NR3 3HR	3		NR13 5AJ	7		7	7	622819	310133	628022	311135
12		4	2	34	15/11/2012	09:30	1		2	NR6 6RQ	3		NR1 4JZ	6		7	7	622275	311677	625187	309478
13		4	3	34	15/11/2012	09:30	1		2	NR4 7UY	7		NR7 0AB	1		7	7	618143	307129	626287	309878
14		4	4	34	15/11/2012	09:30	1		2	NR1 3DD	6		NR5 0LE	1		7	7	623164	308307	618677	310865
15		5	1	34	15/11/2012	09:30	1		1	NR1 4ES	5		NR1 4AB	3		7	7	624077	309097	625191	309536
16		5	2	34	15/11/2012	09:30	1		2	NR1 3SH	6		NR7 0SR	6		7	7	622892	308143	627575	308981
17		5	4	34	15/11/2012	09:30	1		2	NR4 6BA	6		NR1 4JT	6		7	7	622449	306587	624974	309411
18		6	1	34	15/11/2012	09:30	1		2	NR1 3DD	6		NR7 9NP	1		7	7	623164	308307	625269	309709

9.3.4 On receipt of the data a series of manual checks were carried out by the survey contractor, NDC, and Mott MacDonald to ensure its accuracy.

9.4 ATC Data Checking

9.4.1 All ATC data was checked to ensure its accuracy and reliability. Checks included:

- Tidality - ATC flows were plotted by time and direction, and judged as to whether the inbound/outbound flows were as expected (for example, Inbound; AM peak flows, Outbound; PM peak flows).
- Anomalies - any recorded spikes or troughs in the data that did not follow the overall trend of the site, were removed from the dataset.
- Vehicle Class - flows by vehicle classification were examined to confirm they appeared sensible in terms of the relative proportions.

9.4.2 Anomalous results were relatively rare, but when observed these instances were removed from the dataset.

9.4.3 At sites where ATC and MCC counts had been undertaken on the same site, on the same day, an analysis of the data was carried out to confirm that both counts had recorded similar volumes of traffic. A sample of the MCC videos was also undertaken to ensure the vehicle classification split had been accurately recorded.

9.5 RSI Data Checking

9.5.1 The Contractor NDC was to undertake and provide evidence of a series of checks on the collected data. This included:

- Evidence of RSI interview sample rates;
- Accuracy of transcription between enumerator records and electronic spreadsheets;
- Evidence that the compilation of raw RSI interview records was carried out correctly;
- Logic checks to ensure that origins and destinations were representative for the survey site;
- Accuracy of classification of vehicle types;
- Checks to ensure that traffic counts are representative of the characteristics of the survey site (i.e. checks of direction, tidality, hourly profiles); and
- Checks to identify any data anomalies.

9.5.2 In addition, Mott MacDonald carried out an independent review of the new RSI data. Data checks included general sense checking and origin/destination checking.

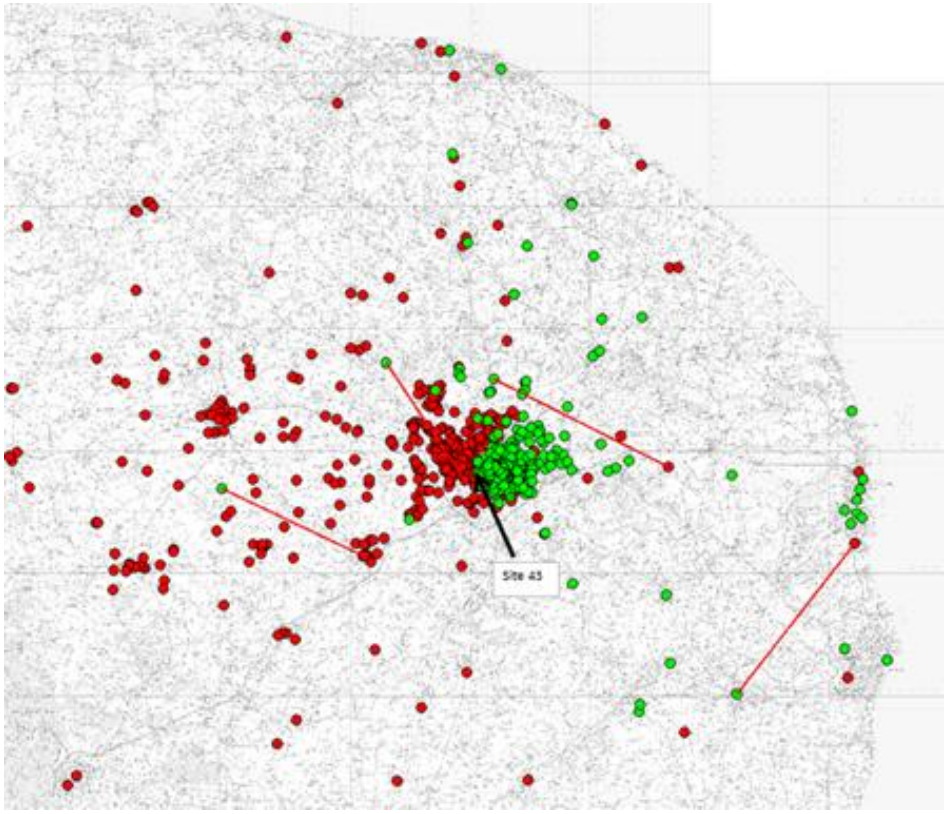
9.5.3 The following checks have been performed in regards to general sense checking:

- Time period - all data received was checked to ensure that records were correctly referenced to a valid time. The RSIs were carried out between the hours of 07:00 and 19:00, and were referenced to 15 minute intervals.
- Vehicle - data was checked to ensure that no more than five vehicle types were represented and that vehicle occupancy was appropriate. Car occupancy should not be greater than 7, LGV, OGV1 and OGV2 not greater than 3 and Bus no greater than 14.
- Postcode & purpose - all data was checked for the presence of records with the same origin/destination postcode or journey purpose. For example, ‘home-home’ and ‘work-work’ journey purposes were deemed to be erroneous and removed from the data set.
- Journey purpose - data was organised into charts representing the proportion of trips by origin and destination purposes. This was reviewed in relation to the site location in order to convey any systematic problems with the data.
- Vehicle distribution - data was organised to show the distribution of vehicle classification obtained. Again, this was reviewed in relation to the site location order to ensure sensibility and express any recognisable problems with the data.
- ATC cross-check - manual vehicle counts from RSI sites were compared with the Automatic Traffic Count data for the same site,

where available on the same day. The percentage difference between these two measures was calculated in order to ensure a good level of accuracy was achieved in the manual counts, and so we could calculate an accurate sample rate.

9.5.4 MapInfo GIS software was used to plot origin and destination postcodes, with a straight line (i.e. crow fly route) drawn between the two points in order to visually represent the recorded trip. This process enabled potentially invalid journeys to be highlighted; in particular that the journey records were in the appropriate direction (i.e. the origin and destination appeared on the correct side of the RSI location) and that the recorded trip was likely to have passed through the RSI. Figure 9.4 shows an example of a GIS origin/direction check for RSI Site 43, with illogical trips highlighted with a red line

Figure 9.4: Typical RSI Origin-Destination Check



9.5.5 In the case shown in Figure 9.4 4 illogical journeys were highlighted from 1,053 records. On completion of this process it was determined that illogical trips did not represent a significant number of trips within the dataset, and therefore were not removed from the dataset.

9.6 Data Manipulation

9.6.1 The average hourly weekday traffic flows from ATC data have been calculated for each direction of travel. The corresponding MCC was then used to split the ATC into vehicle categories.

9.7 Data Output

9.7.1 The data output from all surveys is available upon request.

10 Glossary of Abbreviations

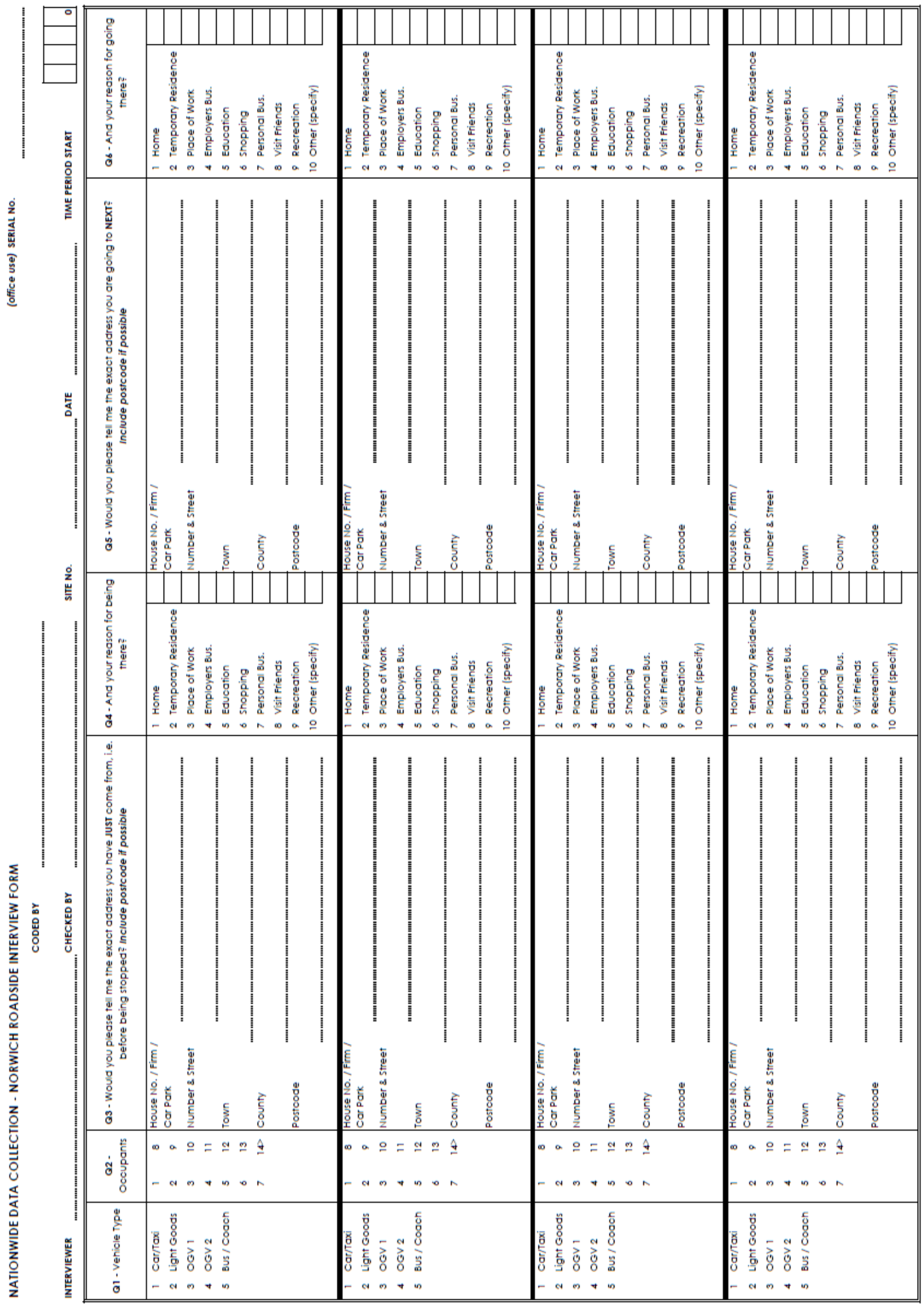
AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekday Traffic
ATC	Automatic Traffic Count
DfT	Department for Transport
DIADEM	Dynamic Integrated Assignment and Demand Modelling - software released by the Department for Transport
DMRB	Design Manual for Roads and Bridges – a Highways Agency publication setting out guidance and good practice for design and appraisal of road schemes
EB	East Bound
GIS	Geographic Information System - designed to capture, store, manipulate, analyse, manage, and present all types of geographical dat
GPS	Global Positioning System
HA	Highways Agency
HGV	Heavy Goods Vehicle
LGV	Light Goods Vehicle
MCC	Manual Classified Count (for a link)
MCTC	Manual Classified Turning Counts
NATS	Norwich Area Transportation Strategy
NB	North Bound
NCC	Norfolk County Council
NDC	Nationwide Data Collection (company specialising in traffic surveys)
NDR	Norwich Northern Distributor Road

OD	Origin Destination
OGV1	A sub-category of OGV. Includes all rigid vehicles over 3.5 tonnes gross vehicle weight with two or three axles
OGV2	A sub-category of OGV. Includes all rigid vehicles with four or more axles and all articulated vehicles
RSI	Road Side Interview
SATURN	Simulation – Assignment model of Traffic on Urban Road Networks software
SB	South Bound
TRADS	Traffic flow Data System – the Highways Agency's database of traffic count data
TrafficMaster	The company that collates movements of vehicles equipped with GPS equipped 'probe vehicles'
VISUM	Transport modelling software used (in this case) for public transport modelling
WB	West Bound
WebTAG	Web-based Transport Appraisal Guidance produced by the Department for Transport

11 Appendices

11.1 Appendix A RSI Interview and Postcard Forms

Figure A.1: Example of roadside interview form



NATIONWIDE DATA COLLECTION - NORWICH ROADSIDE INTERVIEW FORM

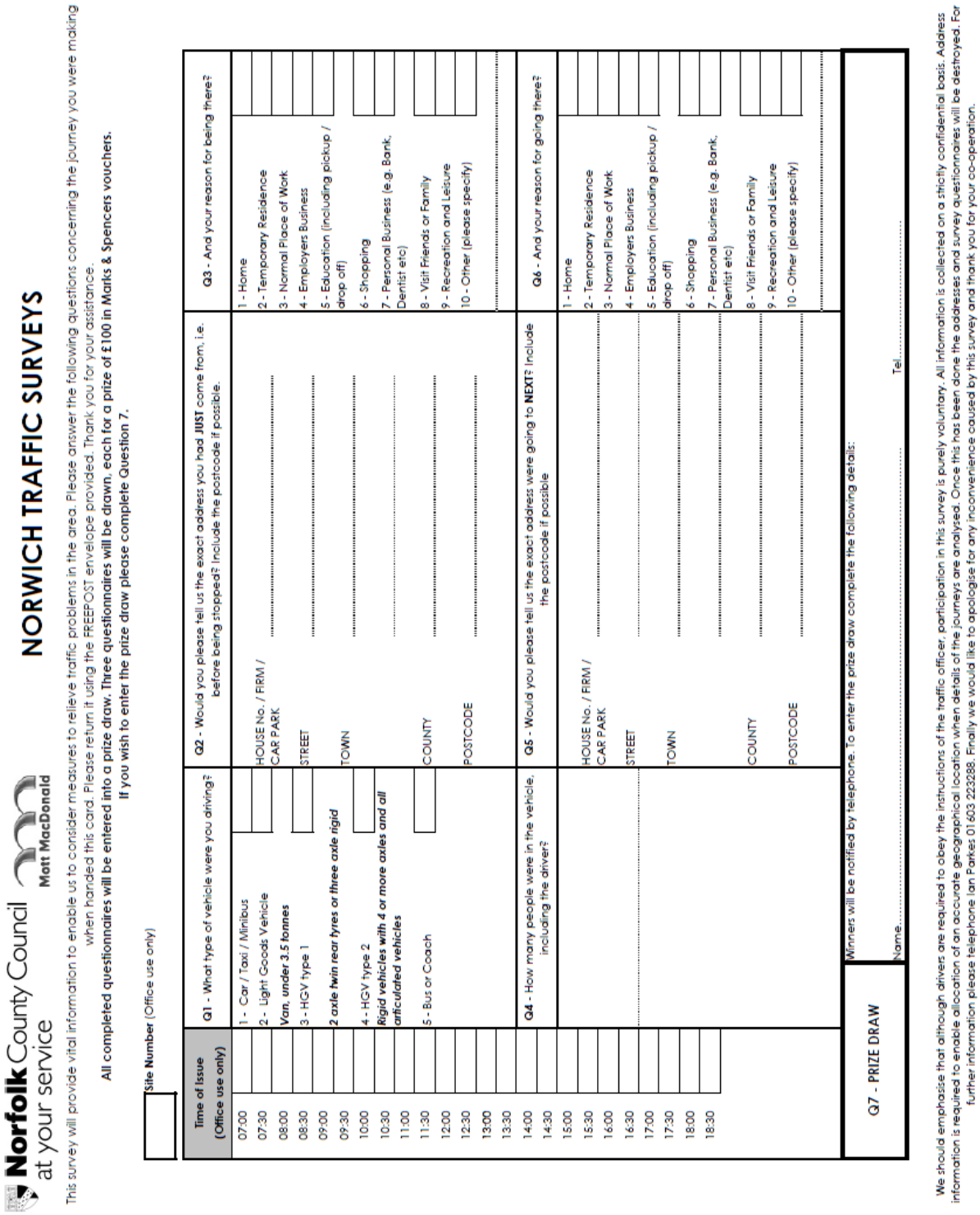
CODED BY

(office use) SERIAL NO.

INTERVIEWER | CHECKED BY | SITE NO. | DATE | TIME PERIOD START

Q1 - Vehicle Type	Q2 - Occupants	Q3 - Would you please tell me the exact address you have JUST come from, i.e. before being stopped? *Include postcode if possible*	Q4 - And your reason for being there?	Q5 - Would you please tell me the exact address you are going to NEXT? *Include postcode if possible*	Q6 - And your reason for going there?
1 Car/Taxi 2 Light Goods 3 OGV 1 4 OGV 2 5 Bus / Coach	1 8 2 9 3 10 4 11 5 12 6 13 7 14>	House No. / Firm / Car Park Number & Street Town County Postcode	1 Home 2 Temporary Residence 3 Place of Work 4 Employers Bus. 5 Education 6 Shopping 7 Personal Bus. 8 Visit Friends 9 Recreation 10 Other (specify)	House No. / Firm / Car Park Number & Street Town County Postcode	1 Home 2 Temporary Residence 3 Place of Work 4 Employers Bus. 5 Education 6 Shopping 7 Personal Bus. 8 Visit Friends 9 Recreation 10 Other (specify)
1 Car/Taxi 2 Light Goods 3 OGV 1 4 OGV 2 5 Bus / Coach	1 8 2 9 3 10 4 11 5 12 6 13 7 14>	House No. / Firm / Car Park Number & Street Town County Postcode	1 Home 2 Temporary Residence 3 Place of Work 4 Employers Bus. 5 Education 6 Shopping 7 Personal Bus. 8 Visit Friends 9 Recreation 10 Other (specify)	House No. / Firm / Car Park Number & Street Town County Postcode	1 Home 2 Temporary Residence 3 Place of Work 4 Employers Bus. 5 Education 6 Shopping 7 Personal Bus. 8 Visit Friends 9 Recreation 10 Other (specify)
1 Car/Taxi 2 Light Goods 3 OGV 1 4 OGV 2 5 Bus / Coach	1 8 2 9 3 10 4 11 5 12 6 13 7 14>	House No. / Firm / Car Park Number & Street Town County Postcode	1 Home 2 Temporary Residence 3 Place of Work 4 Employers Bus. 5 Education 6 Shopping 7 Personal Bus. 8 Visit Friends 9 Recreation 10 Other (specify)	House No. / Firm / Car Park Number & Street Town County Postcode	1 Home 2 Temporary Residence 3 Place of Work 4 Employers Bus. 5 Education 6 Shopping 7 Personal Bus. 8 Visit Friends 9 Recreation 10 Other (specify)
1 Car/Taxi 2 Light Goods 3 OGV 1 4 OGV 2 5 Bus / Coach	1 8 2 9 3 10 4 11 5 12 6 13 7 14>	House No. / Firm / Car Park Number & Street Town County Postcode	1 Home 2 Temporary Residence 3 Place of Work 4 Employers Bus. 5 Education 6 Shopping 7 Personal Bus. 8 Visit Friends 9 Recreation 10 Other (specify)	House No. / Firm / Car Park Number & Street Town County Postcode	1 Home 2 Temporary Residence 3 Place of Work 4 Employers Bus. 5 Education 6 Shopping 7 Personal Bus. 8 Visit Friends 9 Recreation 10 Other (specify)

Figure A.2: Example of roadside interview postcard survey



Norfolk County Council at your service

Mott MacDonald

NORWICH TRAFFIC SURVEYS

This survey will provide vital information to enable us to consider measures to relieve traffic problems in the area. Please answer the following questions concerning the journey you were making when handed this card. Please return it using the FREEPOST envelope provided. Thank you for your assistance.

All completed questionnaires will be entered into a prize draw. Three questionnaires will be drawn, each for a prize of £100 in Marks & Spencers vouchers.

If you wish to enter the prize draw please complete Question 7.

Site Number (Office use only)

Time of Issue (Office use only)	Q1 - What type of vehicle were you driving?	Q2 - Would you please tell us the exact address you had JUST come from, i.e. before being stopped? Include the postcode if possible.	Q3 - And your reason for being there?
07:00	1 - Car / Taxi / Minibus	HOUSE No. / FIRM / CAR PARK	1 - Home
07:30	2 - Light Goods Vehicle *Van, under 3.5 tonnes*	STREET	2 - Temporary Residence
08:00	3 - HGV type 1	TOWN	3 - Normal Place of Work
08:30	*2 axle twin rear tyres or three axle rigid*	COUNTY	4 - Employers Business
09:00	4 - HGV type 2 *Rigid vehicles with 4 or more axles and all articulated vehicles*	POSTCODE	5 - Education (including pickup / drop off)
09:30	5 - Bus or Coach		6 - Shopping
10:00			7 - Personal Business (e.g. Bank, Dentist etc)
10:30			8 - Visit Friends or Family
11:00			9 - Recreation and Leisure
11:30			10 - Other (please specify)
12:00			
12:30			
13:00			
13:30			
14:00	Q4 - How many people were in the vehicle, including the driver?	Q5 - Would you please tell us the exact address were going to **NEXT**? Include the postcode if possible	Q6 - And your reason for going there?
14:30			1 - Home
15:00		HOUSE No. / FIRM / CAR PARK	2 - Temporary Residence
15:30		STREET	3 - Normal Place of Work
16:00		TOWN	4 - Employers Business
16:30		COUNTY	5 - Education (including pickup / drop off)
17:00		POSTCODE	6 - Shopping
17:30			7 - Personal Business (e.g. Bank, Dentist etc)
18:00			8 - Visit Friends or Family
18:30			9 - Recreation and Leisure
			10 - Other (please specify)

Q7 - PRIZE DRAW

Winners will be notified by telephone. To enter the prize draw complete the following details:

Name.....

Tel.....

We should emphasise that although drivers are required to obey the instructions of the traffic officer, participation in this survey is purely voluntary. All information is collected on a strictly confidential basis. Address information is required to enable allocation of an accurate geographical location when details of the journeys are analysed. Once this has been done the addresses and survey questionnaires will be destroyed. For further information please telephone Ian Parkes 01603 223288. Finally we would like to apologise for any inconvenience caused by this survey and thank you for your co-operation.

11.2 Appendix B. RSI Summary

Figure B.1: RSI Summary

Site No	Name	Day/Date	Direction	face to face					postcards			postcards					interview total	mcc	sample
				clean	reversed	illogical	void	total	issued	returned	sample	clean	reversed	illogical	void	total			
6	A1067 Drayton High Road south of Hurn Road	14-Nov	N	1015	4	43	30	1092	99	14	14.1%	14	0	0	0	14	1106	5483	20.2%
14	A47 Eastbound by Postwick Grove	21-Nov	E	198	2	13	5	218									218	16921	1.3%
15	A47 Westbound by Postwick Grove	21-Nov	W	164	3	8	25	200									200	15153	1.3%
33	Gurney Road (Between Gilman Rd & Mousehold Lane)	19-Nov	E	1078	14	39	100	1231									1231	4375	28.1%
34	B1140 Plumstead Road (Between Hilary Ave & Heartsease Lane)	15-Nov	E	299	7	14	37	357	1905	452	23.7%	415	19	8	10	452	809	4880	16.6%
38	Hall Road North of A146 Roundabout	12-Nov	S	479	21	61	72	633	2189	512	23.4%	442	29	20	21	512	1145	4391	26.1%
41	Unthank Road (Between Christchurch Rd & Mile End Rd	12-Nov	S	458	16	22	41	537	1411	461	32.7%	420	19	16	6	461	998	3087	32.3%
42	The Avenue (Between Christchurch Rd and Colman Rd)	13-Nov	W	538	20	32	36	626	181	55	30.4%	52	0	2	1	55	681	1954	34.9%
43	B1108 Earlham Road (Between Christchurch Road & Coleman Road)	13-Nov	W	1053	21	57	84	1215									1215	4532	26.8%
44	Bowthorpe Road (Between Dereham Road & Farrow Road)	13-Nov	W	352	17	25	53	447	2503	632	25.2%	593	13	19	7	632	1079	4647	23.2%
48	Catton Grove Road (Between Woodcock Rd & Mile Cross Lane)	14-Nov	N						1476	430	29.1%	406	9	9	6	430	430	2670	16.1%
49	Constitution Hill (Between Wall Rd & Chartwell Rd)	14-Nov	N	254	5	16	15	290	1766	441	25.0%	409	14	11	7	441	731	3721	19.6%
51	Prince of Wales Road (Between Recorder Road & Riverside Road)	05-Nov	E						2350	628	26.7%	517	40	40	31	628	628	5330	11.8%
52	King Street (Between Rouen Road & Carrow Bridge)	08-Nov	E	296	20	20	42	378	421	120	28.5%	103	11	0	6	120	498	1242	40.1%
53	Ber Street (Between Thorn Lane & Finklegate)	05-Nov	S	577	42	36	136	791	826	239	28.9%	218	9	6	6	239	1030	3026	34.0%
54	All Saints green (Between Surrey St & Queens Rd)	05-Nov	S						2392	700	29.3%	614	34	28	24	700	700	3357	20.9%
55	St Stephen's Street (Between Surrey Street & Queens Road)	06-Nov	S						580	141	24.3%	92	13	17	19	141	141	1503	9.4%
56	Chapelfield North	06-Nov	W	959	74	115	128	1276									1276	5663	22.5%
57	Westwick Street (Between St Swithins Road & Barn Road)	06-Nov	W	702	52	17	45	816	411	89	21.7%	76	4	7	2	89	905	1478	61.2%
58	Duke Street (Between St Crispins Rd & St Marys Plain)	07-Nov	N						3968	1132	28.5%	989	39	67	37	1132	1132	7549	15.0%
59	Magdalen Street At Flyover	07-Nov	N	565	9	2	82	658	1131	320	28.3%	282	18	9	11	320	978	3340	29.3%
60	Whitefriars (Between Fishergate & Barrack Street)	07-Nov	N	532	11	19	118	680	1450	414	28.6%	347	15	33	19	414	1094	3365	32.5%
OC1	Long John Hill (between A146 & Cavell Rd)	12-Nov	S						894	224	25.1%	206	6	10	2	224	224	1792	12.5%
OC2	A1054 Martineau Ln (between A146 & Bracondale Rd)	08-Nov	W						9921	3058	30.8%	2937	35	25	61	3058	3058	13214	23.1%
OC3	Bracondale Rd (between Europa Way & Bracondale Mill Gate)	08-Nov	S	913	6	24	43	986	513	180	35.1%	168	1	6	5	180	1166	2234	52.2%
R1 - NB	A1042 Mousehold Lane between Salhouse Road and Roundtree Way	19-Nov	N						925	240	25.9%	203	15	6	16	240	240	9915	2.4%
R1 - SB	A1042 Mousehold Lane between Salhouse Road and Roundtree Way	19-Nov	S						1605	399	24.9%	340	2	39	18	399	399	9118	4.4%
R2 - NB	Falcon Road E between Salhouse Road and Blithewood Gardens	15-Nov	N	453	36	36	19	544	526	143	27.2%	127	8	7	1	143	687	1380	49.8%
R2 - SB	Falcon Road E between Salhouse Road and Blithewood Gardens	15-Nov	S	600	79	54	51	784	283	94	33.2%	90	2	2	0	94	878	1444	60.8%
R3 - NB	Blue Boar Lane between Salhouse Road and Laundry Lane	15-Nov	N	325	25	89	24	463	2858	544	19.0%	418	53	55	18	544	1007	4914	20.5%
R3 - SB	Blue Boar Lane between Salhouse Road and Laundry Lane	15-Nov	S	376	26	37	17	456	2063	706	34.2%	586	84	27	9	706	1162	5200	22.3%
R4 - NB	Green Lane E between Salhouse Road and Wilkinson Road	20-Nov	N	694	9	18	49	770									770	1673	46.0%
R4 - SB	Green Lane E between Salhouse Road and Wilkinson Road	20-Nov	S	615	60	38	61	774									774	1951	39.7%
R5 - NB	B1140 Mill Road between Norwich Road and Hall Drive	20-Nov	N	152	1	16	37	206	1419	447	31.5%	382	15	34	16	447	653	2775	23.5%
R5 - SB	B1140 Mill Road between Norwich Road and Hall Drive	20-Nov	S	1090	18	76	62	1246									1246	2537	49.1%
			Totals	14737	598	927	1412	17674	46066	12815	27.8%	11446	507	503	359	12815	30489	165814	18.4%
			%split	83.4%	3.4%	5.2%	8.0%					89.3%	4.0%	3.9%	2.8%				

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11.3 Appendix C. Journey Time Output Examples

Figure C.1: Time distance graph example

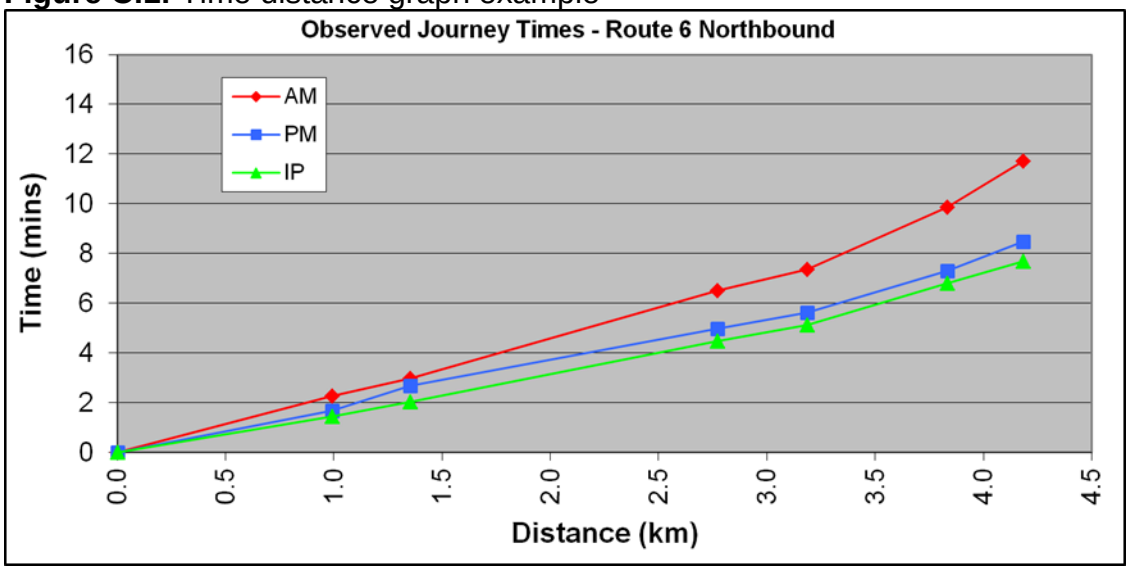

Figure C 2: Heat map