POPE of LNMS

M1 Junction 39 Traffic Signals LNMS Evaluation Report

Highways Agency

October 2014

HIGHWAYS AGENCY

Safe roads, reliable journeys, informed travellers

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Glossary

Term	a.k.a.	Definition
Annual Average Daily Traffic	**AADT**	The 24 hour total traffic flow for the average day of the year
Appraisal Summary Table	**AST**	This records the impacts of the scheme according to the Government's five key objects for transport, as defined in **DfT** guidance contained on its **Transport Analysis Guidance** web pages, **WebTAG**
Automatic Traffic Count	**ATC**	An automated method of recording the volume (and sometimes classification) of vehicles passing a particular point on a road.
Average Daily Traffic	**ADT**	The 24 hour total traffic flow on an average day over a certain time period (Monday – Sunday)
Average Weekday Traffic	**AWT**	The 24 hour total traffic flow on an average weekday over a certain time period (Monday – Friday)
Benefit Cost Ratio	**BCR**	Benefit Cost Ratio is a ratio identifying the relationship between cost and benefits of a proposed project
Department for Transport	**DfT**	A Government department whose objective is to oversee the delivery of a reliable, safe and secure transport system that responds efficiently to the needs of individuals and business whilst safeguarding our environment. The **HA** is an executive of the **DfT**
Discounting	**-**	A technique used to compare costs and benefits that occur in different time periods and is the process of adjusting future cash flows to their present values to reflect the time value of money, e.g. £1 worth of benefits now is worth more than £1 in the future. A standard base year needs to be used which is 2002 for the appraisal used in this report
Dis-benefit	**-**	A negative benefit or something that detracts from the performance.
Evaluation Summary Table	**EST**	In **POPE** studies, this is a summary of the evaluations of the **TAG** objectives using a similar format to the forecasts in the **AST**
First Year Rate of Return	**FYRR**	First Year Rate of Return is the ratio of money gained on an investment relative to the amount of money invested.
Highways Agency	**HA**	An Executive Agency of the **DfT,** responsible for operating, maintaining and improving the strategic road network in England
Killed or Seriously Injured	**KSI**	A term used to describe the number of people killed or seriously injured as a result of **PICs.**

Local Network Management Scheme	**LNMS**	LNMS are improvement schemes where total overall estimated cost (including design, land, works, supervision, risk and VAT) is less than £10 million. They are categorised by the Government under Safety, Economy, Accessibility, Integration and Environment
Managing Agent Contractor	**MAC**	Responsible for the operation, maintenance, and improvement of the motorway and trunk road network of a HA area
Microprocessor Optimised Vehicle Actuation	**MOVA**	Self-optimising control system for traffic signals. MOVA maintains the optimum approach green time and control strategy to suit prevailing traffic conditions to minimise queuing.
New Approach to Appraisal	**NATA**	Used for transport scheme appraisal since 1998
Non Motorised User	**NMU**	Includes pedestrians, cyclists, horse riders and disabled people, whose needs must be addressed. An NMU audit considers the specific needs of these vulnerable road users
Project Appraisal Report	**PAR**	A key document summarising the need for a project, plus its costs and benefits (including those that cannot be quantified in monetary terms)
Personal Injury Collision	**PIC**	A term commonly used to refer to road accidents
Post-Opening Project Evaluation	**POPE**	Before and after monitoring of all highway schemes in England
Present Value of Costs	**PVC**	Present Value of Costs is a term used in cost-benefit analysis and project appraisal that refers to the discounted sum, or Present Value, of a stream of costs associated with a project or proposal
Risk Allowance	**-**	**Risk** refers to identifiable future situations that could result in an over spend or under spend occurring. The base cost estimate is adjusted to account for risk in order to obtain more accurate cost estimates
Section 278 Agreement	**S278**	A Section 278 Agreement is an agreement made between a developer and a Highway Authority to enable works to be carried out on the public highway to facilitate development
Severance	**-**	Community severance is the separation of adjacent areas by road or heavy traffic, causing negative impact on non-motorised users, particularly pedestrians
-	**STATS 19**	A database of injury accident statistics recorded by police officers attending accidents
Traffic Database System	**TRADS**	Traffic count database developed by the HA, to hold data from traffic monitoring sites on the strategic network

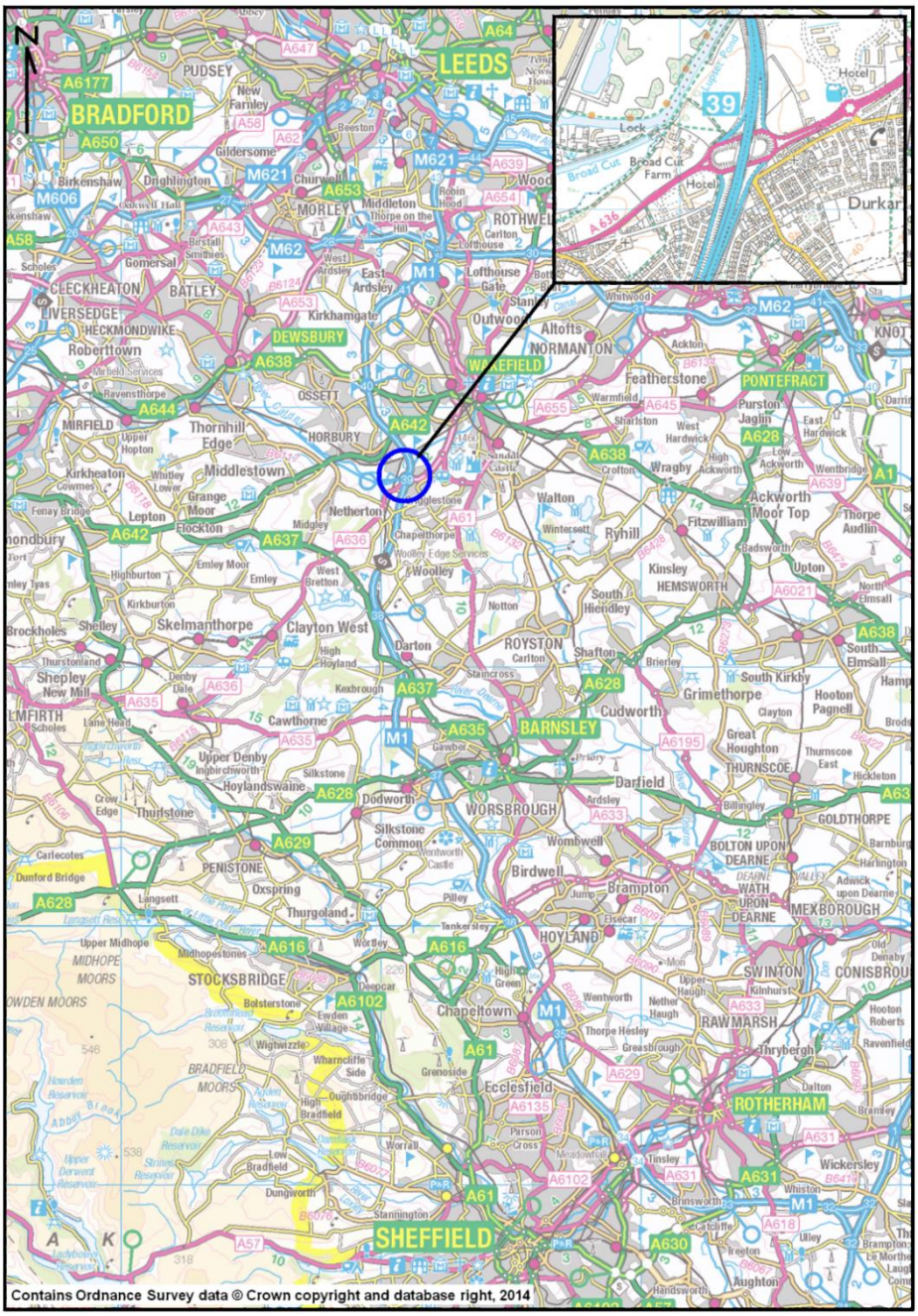
1. Introduction

Background

1.1. This report is the Post-Opening Project Evaluation (POPE) of the **M1 J39 Traffic Signals** Local Network Management Scheme (LNMS).

1.2. Junction 39 of the M1 is located 5km southwest of Wakefield in West Yorkshire. It is approximately 30km north of Sheffield and 16km south of Leeds. The junction is an interchange of the northbound and southbound M1 and the A636 east and west. The A636 provides access on to the M1 from Wakefield which is northeast of the junction and from Holmfirth which is southwest of the junction. The location of the junction is shown in **Figure 1-1**.

Figure 1-1 Strategic Context



1.3. The scheme involved the signalisation of the M1 exit-slip approaches to the junction, additional approach lanes to the junction and on the circulatory carriageway (2 to 3 lanes), and new carriageway markings. A controlled pedestrian crossing was also installed on the M1 northbound exit-slip.

1.4. Scheme construction commenced on the 5th December 2011 and was completed on the 25th February 2012.

Purpose of this report

1.5. As part of an ongoing programme, whereby the Highways Agency (HA) evaluates the impacts of trunk road schemes, Atkins is commissioned to undertake post-opening evaluations of LNMS with an implementation cost of between £25k and £10m.

1.6. This report sets out the results of the POPE of the M1 Junction 39 Traffic Signals Scheme. Specifically this report examines the economic and safety impacts resulting from the improvements, with consideration also given to the wider impacts on environment and society.

1.7. It is intended that the findings from this report will feed into a wider summary of the outcomes of POPE. This is a document (namely the LNMS Annual Evaluation Report) produced in the 4th quarter of each year outlining the key messages from the entire POPE of LNMS process.

2. Scheme Detail

Introduction

2.1. This section of the report outlines the pre-scheme and post-scheme layout of the junction with the use of diagrams, photographs and site observations to illustrate the changes made to the highway network. In addition, this section contains the views and feedback on the scheme from key stakeholders.

Background

2.2. The M1 Junction 39 Traffic Signals LNMS involved the signalisation of the M1 exit slip road approaches to the junction, additional approach lanes and carriageway marking, to:

- Reduce queuing on the M1 southbound and northbound exit-slip roads back to the M1 mainline;
- Reduce queuing on the A636 approaches to the junction (east and west);
- Reduce accidents on the exit-slip road approaches to the junction and on the circulatory carriageway; and
- Improve provision for pedestrians and cyclists negotiating the junction on the existing footway.

2.3. **Table 2.1** summarises the scheme details.

Table 2.1 – Summary of M1 Junction 39 LNMS

Scheme name	M1 Junction 39 Traffic Signals LNMS
Area	12
Opening date	25th February 2012
Category	Economy
Reason for scheme	Queuing on the M1 northbound exit and entry slips, M1 southbound exit-slips and on to the M1 mainline. Queuing on A636 approaches to the junction.
Objectives	To reduce congestion experienced by users of the strategic road network and primary road network. To reduce accidents at the junction, specifically on the M1 exit-slip road approaches to the interchange and in close proximity to the exit-slip junction with the circulatory carriageway. To improve provision for pedestrians and cyclists using the footway adjacent to the junction.
History	February 2011: M1 Junction 39 Economy Study, Highways Agency and AOne September 2011: Project Appraisal Report (PAR) produced 5th December 2011: Scheme construction commenced 25th February 2012: Construction completed
Alternative options	The Economic Study conducted in February 2011 considered 7 options for improvements to the junction, including the Preferred Option (Option 7) which was developed for delivery. Full signalisation of the junction is to be delivered under a Section 278 (s278) agreement with developers of the Calder Park Business area. The s278 agreement is between the Highways Agency, Wakefield City Metropolitan District Council and the developer.

Location

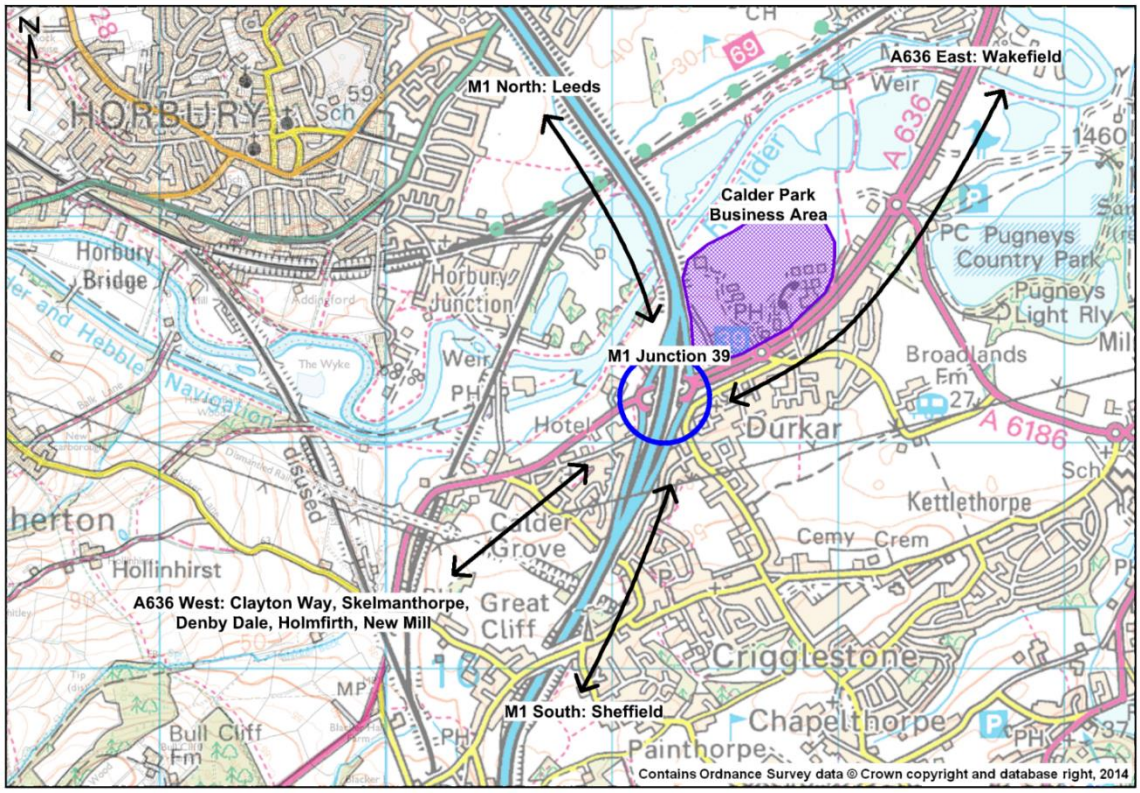
2.4. The scheme was implemented at M1 Junction 39 which is to the southwest of Wakefield, West Yorkshire. The junction is the interchange of the M1 which runs north to south, and the A636 which runs east to west and connects the junction to the primary road network.

2.5. The M1 mainline is elevated over the junction whilst the A636 adjoins the M1 slip-roads at ground level. The A636 adjoins the interchange to the northeast as a dual two-lane carriageway and to the southwest as a single carriageway. All movements were priority controlled prior to the introduction of the LNMS improvements. The A636 east of the junction provides a direct link to the M1 from Wakefield city centre and the residential areas of south Wakefield.

2.6. The A636 east of the junction is a key route between Durkar and south Wakefield to access the M1 for longer distance journeys north and south. Movements between the A636 east and M1 north are the dominant movements on this junction in the AM and PM peaks. The A636 west provides a link to M1 J39 from a number of smaller settlements including Clayton Way, Skelmanthorpe Denby Dale, New Mill and Holmfirth.

2.7. **Figure 2-1** shows the local context of the junction.

Figure 2-1 M1 Junction 39 Local Context



2.8. In close proximity to the junction, is Calder Park Business Park, which is a major employment site in the area and is planned for further expansion. This site contains a range of land-uses which would generate traffic on the interchange, these include: a hotel, petrol filling station, pub/restaurant, car showrooms, B1 offices, B2 light industrial/business units.

2.9. Full signalisation of the scheme junction is planned and would be delivered under a s278 agreement with developers of Calder Park Business Park. It is understood that the developer funded improvements would be implemented in line with the phasing of development as per the s278 agreement. This full scheme has not been implemented to date due to these trigger points not being reached.

Pre Scheme Opening

2.10. Prior to the implementation of the scheme, all traffic movements were priority controlled and there were no formal crossing points for pedestrians and cyclists using the footway adjacent to the circulatory carriageway. Specific issues were identified with the performance of the junction, these are outlined below.

M1 Exit-Slip Roads

2.11. The highest volumes of traffic at the interchange were occurring on the A636 east–M1 northbound movement. In a 12 hour period, the greatest flows are for the movements M1 southbound exit-slip to A636 east (20% of all vehicles) and A636 east to M1 northbound entry-slip (17%).This resulted in high speed cross flows on the circulatory carriageway which, under the priority arrangement, limited the opportunities for queuing traffic to enter the circulatory carriageway and move through the junction. This situation resulted in the following issues:

- M1 southbound exit-slip: queues extending on to the mainline;
- M1 northbound exit-slip: queues extend back to the mainline for right-turning traffic (to Wakefield); and
- A636 east and west: queuing on the approach to the junction.

M1 Entry-Slip Road

2.12. Movements to the M1 northbound entry-slip road account for 29% of traffic using the junction in a 12 hour period. This traffic merges with the M1 mainline and results in increased northbound mainline flows which are beyond the capacity of the layout at this merge. This situation results in the following issues:

- Queues on the northbound entry-slip extend in to the circulatory carriageway on the junction;
- Queuing on the M1 mainline occasionally extends back approximately 3.5km from the merge with the northbound entry-slip road;
- Queuing on other arms of the junction and delays to traffic flows moving through the junction, A636 west to east (Wakefield); and
- Considerable delays are experienced when negotiating the roundabout for all users, both on the strategic and primary road network.

2.13. Although identified as an issue the implemented scheme was not specifically designed to address this issue.

Accidents

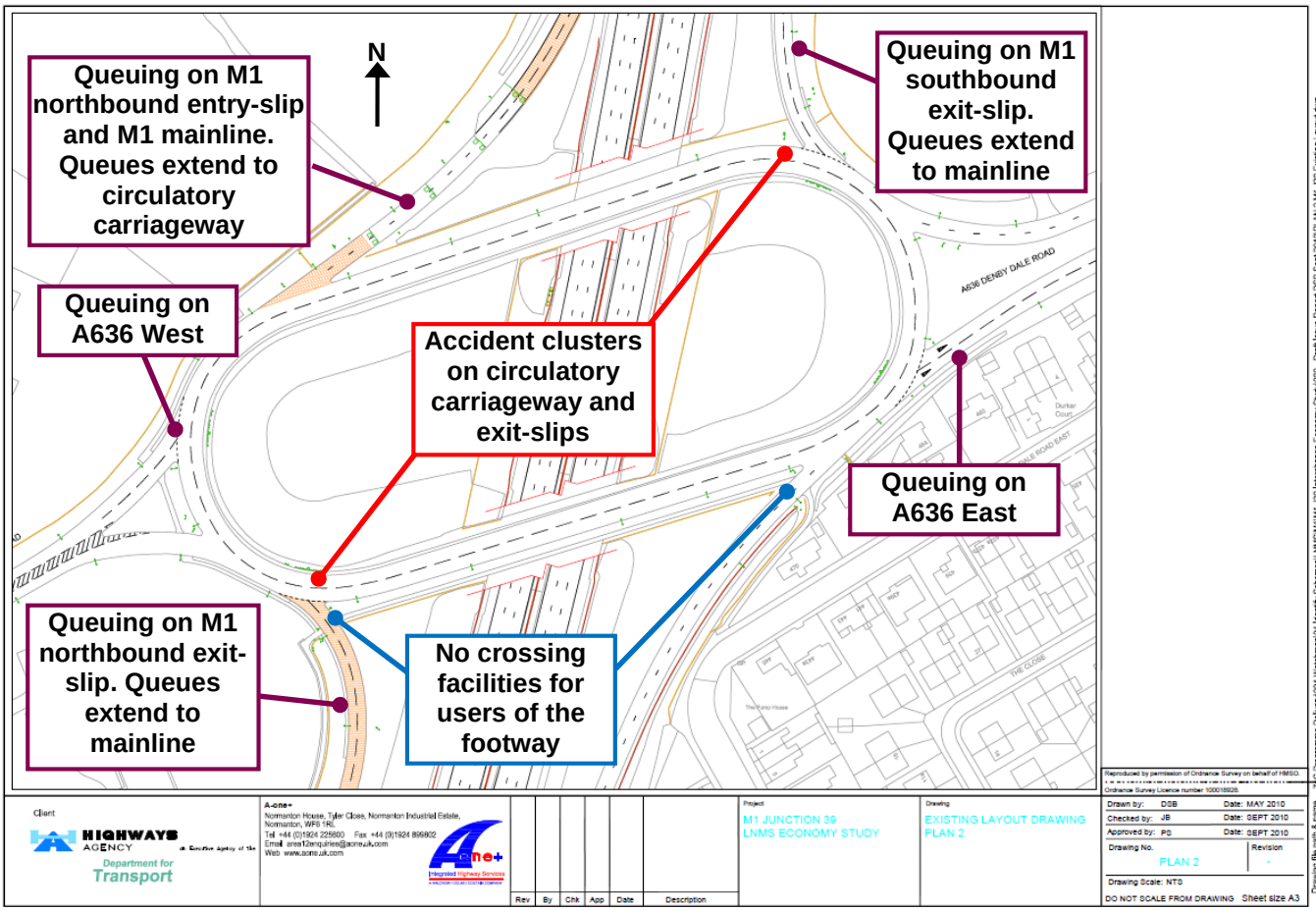
2.14. The majority of the recorded accidents occurred on weekdays and during the busiest periods of traffic. It was considered that the incidents were directly related to the congestion problems discussed above. The safety issues at the junction are:

- Majority of accidents occur on the M1 exit-slip road approaches to the junction; and
- Further accident issues were recorded on the circulatory carriageway in close proximity to the exit-slip junctions.

2.15. There was no provision for safe crossing of the northbound exit-slip and southbound entry-slip for users of the footway which runs along the southern outer limits of the circulatory carriageway and links the residential areas of Durkar to Calder Grove.

2.16. The pre-scheme layout of the junction and the issues outlined above are presented in **Figure 2-2**.

Figure 2-2 Pre-Scheme Junction Layout and Issues

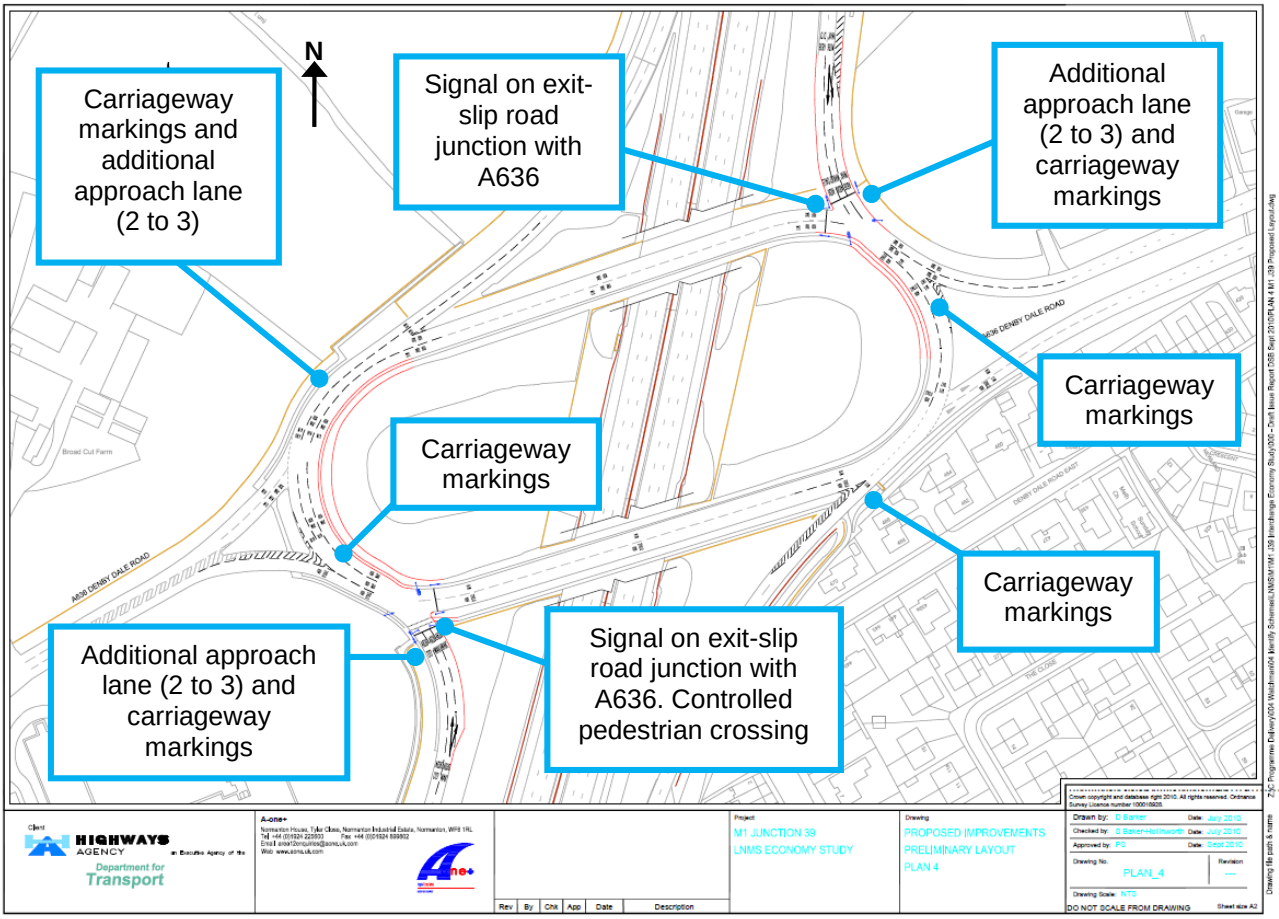


Post Scheme Opening

2.17. The LNMS improvements implemented at the junction were signal control (MOVA) on the M1 exit-slip road junctions with the circulatory carriageway (A636). Additional approach lanes on the M1 exit-slip roads and the circulatory carriageway approach to the M1 northbound entry-slip. Markings on sections of the circulatory carriageway which were required to facilitate the operation of the signalisation of the M1 exit-slip junctions. A near side toucan crossing was installed where the M1 northbound exit-slip road joins the interchange.

2.18. The components of the LNMS improvements are shown in **Figure 2-3**.

Figure 2-3 M1 Junction 39 LNMS Components



2.19. The images shown in **Figure 2-4** to **2-6** illustrate the pre and post scheme layout of the junction at specific locations.

Figure 2-4 M1 Southbound Exit-Slip Road Signals

Pre Scheme *Post Scheme*

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2.20. Figure 2-4 shows that signals have been implemented at the M1 southbound exit-slip approach to the circulatory carriageway and the additional approach lane to the junction. The provision of new carriageway markings is also visible and makes for clear lane definitions.

Figure 2-5 A636 East Junction with Roundabout

Pre Scheme *Post Scheme*

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2.21. Figure 2-5 shows that signal heads and carriageway markings have been installed at the junction. The carriageway markings include lane destination markings, making it easier for drivers to navigate the junction.

2.22. Figure 2-6 shows the carriageway markings and an additional approach lane have been delivered on the northbound entry-slip road.

Figure 2-6 M1 Northbound Entry-Slip Road

Pre Scheme *Post Scheme*

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Highway Network Schemes in the Area

2.23. It is acknowledged that since the scheme has been implemented, works have commenced on the M1 J39 to J40 Smart Motorways scheme. Works for this scheme were observed during the site visit, as can be seen in Figure 2-6.

2.24. The works for this scheme are scheduled to take place between November 2013 and autumn 2015. As such, there is sufficient time to evaluate this scheme appropriately using data from prior to November 2013 and after the scheme opening.

Site Observations

2.25. A site visit was undertaken on the 18th July 2014 between 1400 and 1500. The visit observed that all the components of the scheme outlined above had been implemented.

2.26. It was observed that the road markings have faded and that anti-skid surfacing has worn down in places. No major issues with the performance of the junction were observed.

2.27. The new controlled toucan crossing on the northbound exit-slip has been implemented, this is shown in **Figure 2-7**. The crossing connects the existing footway between Durkar and Calder Grove. There is no controlled crossing on M1 southbound entry-slip which means that users of the footway must negotiate potentially high speed traffic at this location to access the new crossing, which could be unsafe. Two cyclists and one pedestrian were observed using the path.

2.28. As discussed above and shown in Figure 2-6, it was observed that works associated with the M1 J39-40 Smart Motorway were being carried out on the southbound exit slip and the northbound entry-slip. Lane closures and speed restrictions are in place on the slip roads.

Figure 2-7 M1 Northbound Exit-Slip Pedestrian Crossing

Stakeholder Feedback

2.29. While the analysis in this report can consider the quantifiable impact of this scheme based on empirical data, it is also worth considering the opinions of major stakeholders of the scheme. For example, a scheme may save journey times in practice, but if this saving isn't perceived, the scheme may not be as successful as first thought.

2.30. The major stakeholder contacted for feedback on the M1 Junction 39 Traffic Signals LNMS was the Highways Agency Project Sponsor. The Highways Agency comment on the scheme was:

"the scheme has **achieved its objectives to ease congestion and improve safety** by making it more clear as to which lane motorists need to be positioned in to reach their desired destination. We meet with Wakefield District Council on a regular basis and the **feedback on the operation of the roundabout is positive**."

2.31. The Managing Agent Contractor (MAC) for Area 12 was also contacted for their views. The comments from AOne+ were:

"A-One+ identified significant accident and congestion issues at M1 junction 39 interchange. A total of 41 accidents were identified on the M1 slip roads and mainline with causation associated with congestion and queues. In addition significant delays and queues were observed on the slip road especially the southbound exit slip during the busiest peak hours. Queues regularly extended back to the M1 southbound mainline carriageway."

"The scheme recommended signalisation of the two motorway slip roads with some localised widening to provide much needed capacity benefits. In addition additional signing and lining improvements would help to address some of the more minor safety issues."

"The improvements have led to **greatly reduced queues and a reduction in journey time through the interchange**. Queues on the slip road no longer reach the mainline southbound carriageway. It is **anticipated that accidents numbers have also reduced**."

3. Traffic Trends

Introduction

3.1. This section of the report considers the impact that the M1 Junction 39 Traffic Signals LNMS has had on traffic volumes.

Data Source

3.2. Scheme development, planning and construction is a process that takes a number of years, therefore it is important to understand how traffic trends (distance travelled and volumes) have changed over time and whether this will impact on scheme performance. The following traffic data has been assessed to provide this context:

- Department for Transport (DfT) National Road Statistics (continuous);
- Highways Agency TRADS data: M1 mainline and slip roads (continuous);
- Classified Turning Count at the junction (April 2010);
- Local Authority Automatic Traffic Count (ATC) data on the A636 east (continuous); and
- ATC data collected for Smart Motorways Scheme (July 2013).

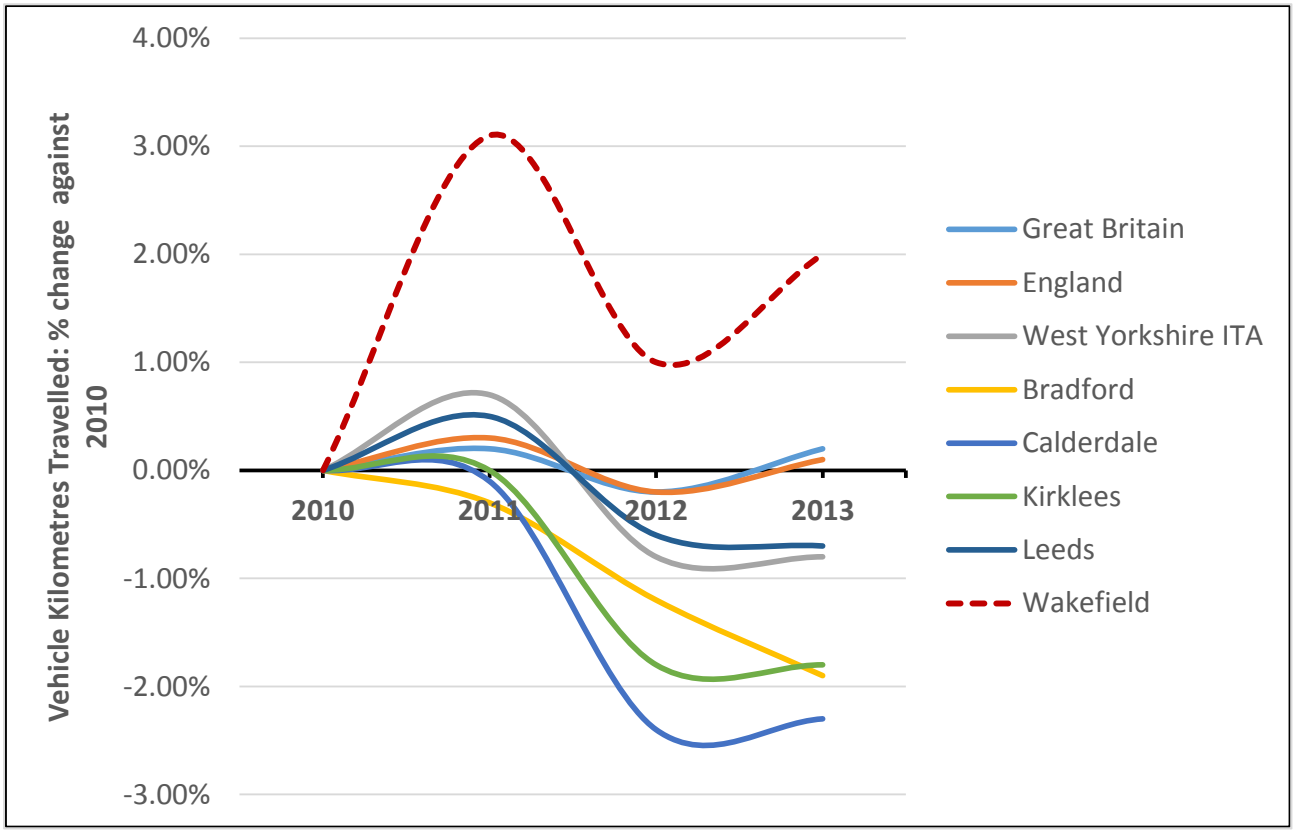
Vehicle-Kilometres

National Trends

3.3. The development and implementation of the scheme needs to be considered in the context of national, regional and local trends. The DfT statistics on vehicle-kilometres travelled by road traffic provide this, and the data is available to 2013[1]. **Figure 3-1** presents the percentage change in annual vehicle kilometres travelled from 2010, the year that the scheme's Project Appraisal Report (PAR) was produced. The scheme is located in Wakefield District.

[1] DfT Road Statistics for Local Authorities 1993-2013 (www.gov.uk/government/organisations/department-for-transport/series/road-traffic-statistics)

Figure 3-1 National, regional and district trends: annual million vehicle kilometres travelled, % change against 2010 (PAR year)



3.4. The data provided shows the following changes in vehicle kilometres travelled compared to 2010:

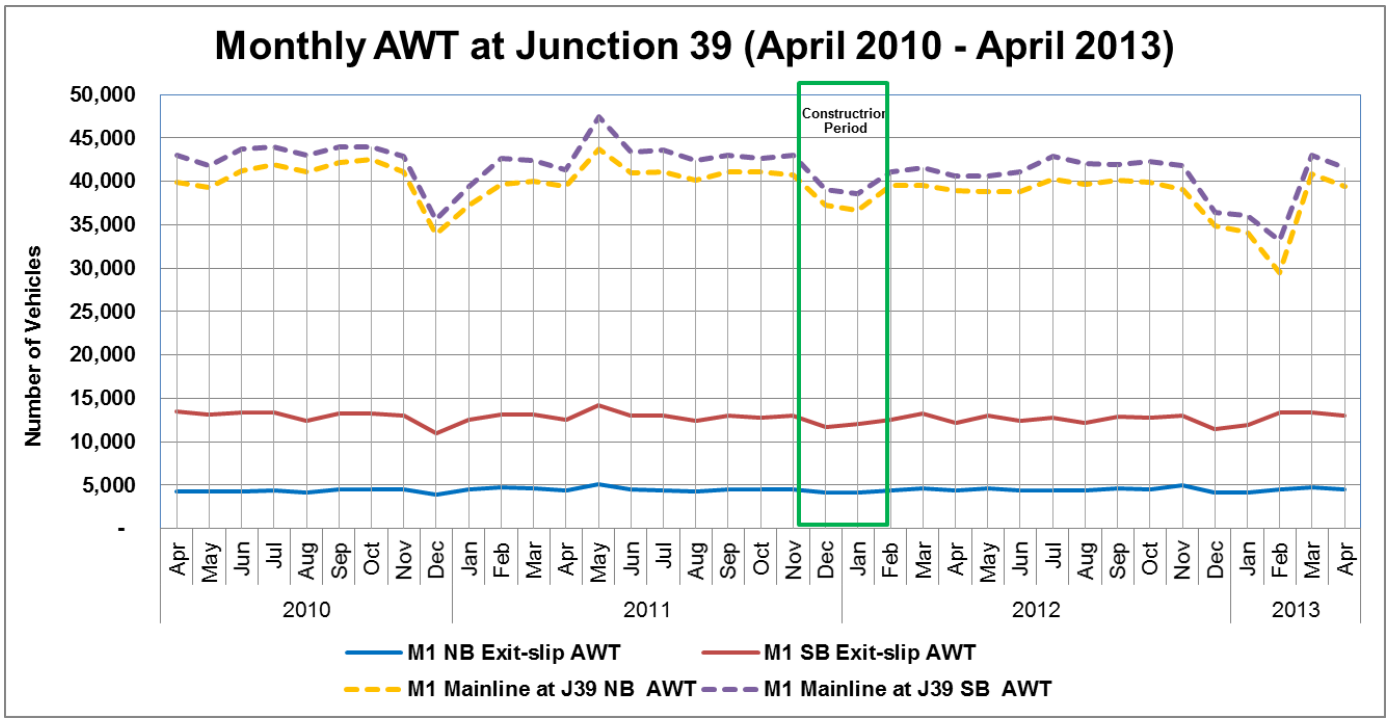
- **England:** fluctuations in distance travelled since 2010; from 2010 to 2011 there was an increase, a decrease between 2011-2012 and a return to 2010 levels in 2013;
- **West Yorkshire Region and Local areas:** whilst there was an increase in 2011, there has been a general reduction in distance travelled from 2011 onwards. In 2013 distance travelled was below the 2010 level; and
- **Wakefield:** there has been an overall increase since 2010, and whilst there was a reduction in 2012 and in 2013 the distance travelled is higher than 2010 levels.

3.5. The national and local trends provided in Figure 3-1 illustrate that in Wakefield, the distance travelled has increased since 2010, whereas nationally and regionally it has decreased. The annual and monthly traffic flows at the junction are now discussed.

Traffic Volumes

3.6. **Figure 3-2** illustrates the average weekly traffic flows on the M1 mainline and the exit-slip roads at Junction 39. This data provides the context of traffic levels at the junction pre and post scheme implementation. The data has been extracted from TRADs.

Figure 3-2 Monthly Average Weekly Traffic (AWT) Flow at M1 Junction 39



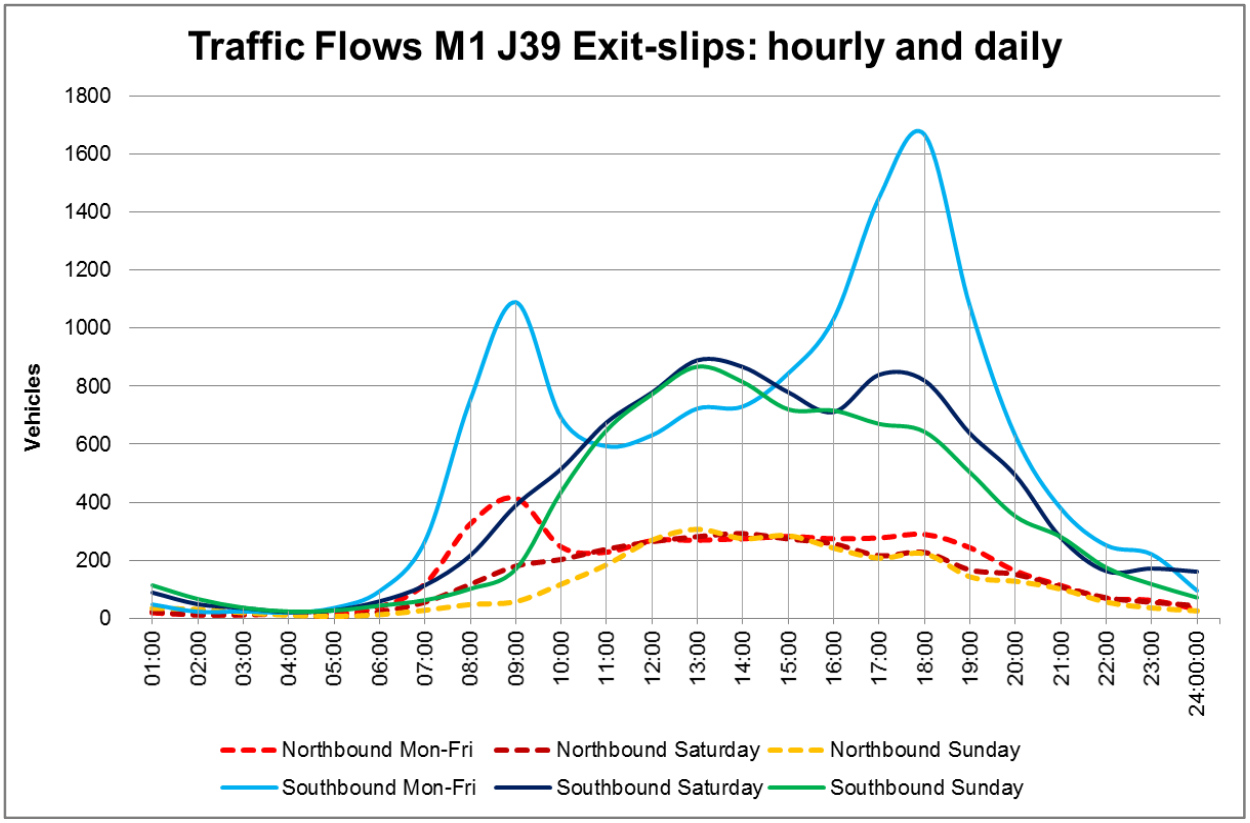
3.7. The data presented indicates that:

- The M1 southbound mainline and exit-slips at the junction have a greater volume of traffic than their northbound equivalents;
- The M1 southbound exit-slip demand is significantly higher than the northbound exit-slip road;
- There has been no significant change in the volume of traffic at the junction since 2010;
- There have been more significant fluctuations on the M1 mainline, in particularly significant reductions in December 2010, and February 2013, which could be due to inclement winter weather; and
- During the scheme construction there was a reduction in traffic flows on the M1 mainline, however this is less pronounced than the winter reductions in 2010 and 2013.

3.8. The data indicates that there have been no significant variations in traffic volumes at the junction since the scheme has been implemented. This is despite the increases in distance travelled recorded within Wakefield district.

3.9. The daily and hourly volumes of traffic on the exit-slip roads are provided in **Figure 3-3**. This data has been sourced from TRADS.

Figure 3-3 Traffic flows at M1 Junction 39 Exit-slip roads (April 2013)



3.10. The daily and weekly data shows that demand on the northbound exit-slip road is significantly less than the southbound exit-slip. The weekday (Monday to Friday) volumes are higher than the weekends (Saturday and Sunday). The data shows that the key time periods are:

- For both exit-slip roads for a weekday:
  - AM peak period is 0800-0900
  - PM peak period is 1600-1800
  - Inter-peak period is 0900-1500
- PM shoulder peaks on the southbound exit-slip are 1500-1600 and 1800-1900, and;
- The differences between the northbound and southbound exit-slips at the weekends are consistent with the weekday differences, whilst there are no discernable peak-periods on Saturday or Sunday daytime

3.11. The data presented in this sub-section has informed us that:

- There has been an increase in vehicle-kilometres travelled in Wakefield, this is different to the national and regional trends;
- In contrast to this, there have been no significant changes in traffic volumes at the scheme junction post-scheme implementation;
- The M1 southbound mainline and exit-slip roads has substantially higher demand than the northbound mainline and exit-slips; and
- The highest demand on the M1 southbound exit slip road is in the AM and PM peak periods.

3.12. To further understand the traffic flows at the junction, more detailed traffic turning movement data has been analysed. This is discussed in the next section.

Traffic Turning Movements

3.13. Classified turning count surveys were undertaken at the junction in April 2010 from 0700 to 1900 on a weekday. The 12 hour total traffic volumes making each movement on the junction are presented in **Table 3.1**.

3.14. 2010 data has been used because there have been no significant developments in the area since the scheme opened which could have affected the proportional turning movements at the junction.

Table 3.1 – M1 Junction 39 12 hour (0700-1900) Traffic Turning Movements (total vehicles and percentage of total vehicles)

12 hour (0700-1900)		Destination				Total Flow from
		M1 NB Entry	A636 East of J39	M1 SB Entry	A636 West of J39	
Origin	M1 SB Exit to J39	**3**	**7,485**	**6**	**4,756**	**12,250**
		0%	20%	0%	12%	
	A636 East of J39	**6,381**	**21**	**3,304**	**3,925**	**13,631**
		17%	0%	9%	10%	
	M1 NB Exit to J39	**13**	**3,295**	**41**	**439**	**3,788**
		0%	9%	0%	1%	
	A636 West of J39	**4,468**	**3,784**	**450**	**13**	**8,715**
		12%	10%	1%	0%	
Total Flow to		**10,865**	**14,585**	**3,801**	**9,133**	**38,384**

3.15. The turning movement data shows that during a weekday, the M1 southbound exit-slip and the A636 east of the junction generate the highest volume of traffic moving on to the junction. These are also the arms of the junction which attract the highest volume of traffic.

3.16. The key traffic movements on the junction, in order of traffic volumes, are:

- Left-turn from the M1 southbound exit-slip to the A636 east of the junction (20% of all vehicles);
- Right turn from the A636 east to the M1 northbound entry-slip road travelling north (17%);
- Right-turn from M1 southbound exit-slip to the A636 west (12%); and
- Left-turn from the A636 west to M1 northbound entry-slip for journeys north of the junction (12%).

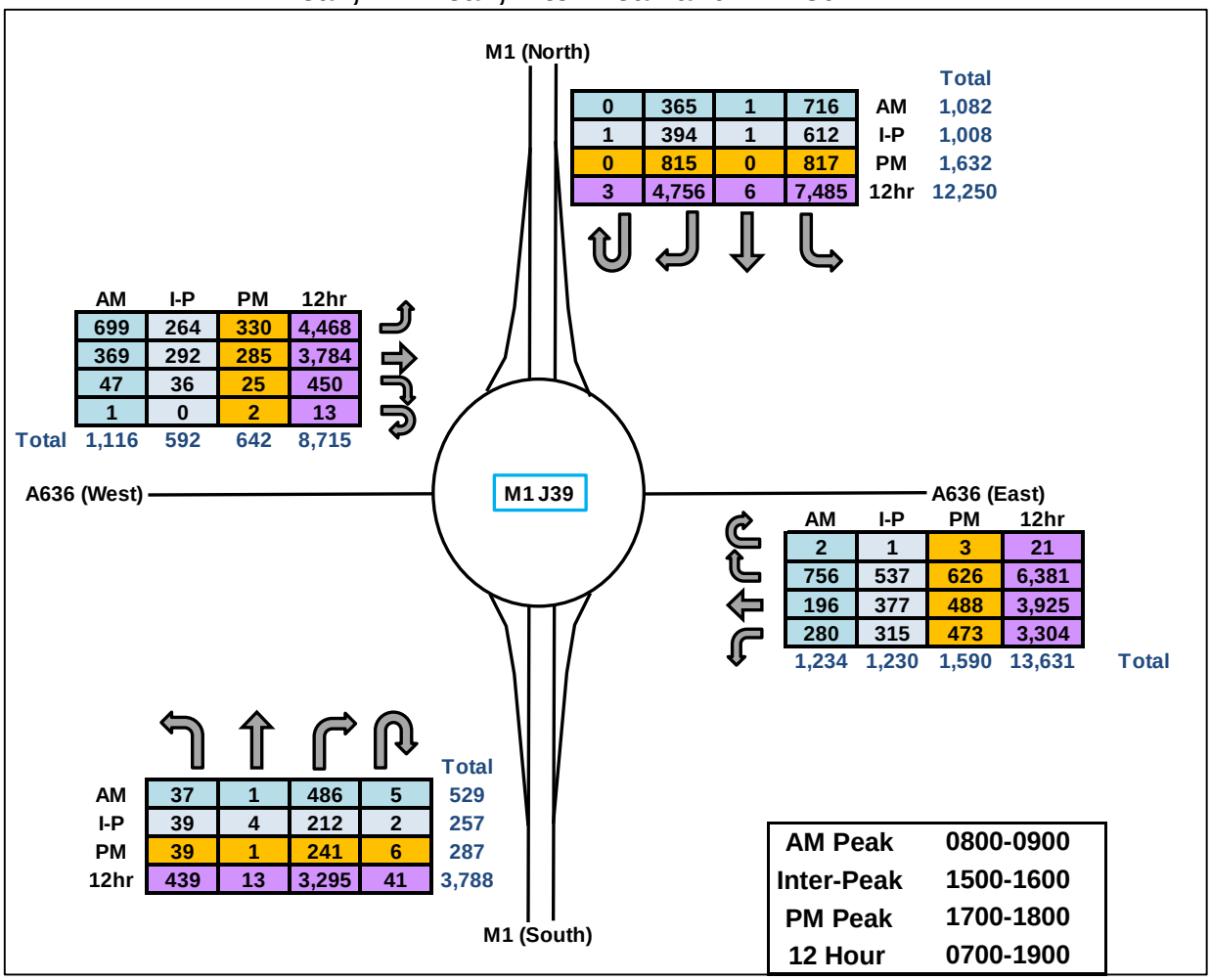
3.17. Other key movements on the junction are:

- Straight-on from A636 west to A636 east (each movement – 10%); and
- Right-turn from M1 northbound exit-slip to A636 east (9%).

3.18. The remaining movements have very little demand.

3.19. The vehicle turning movements for specific time-periods throughout the day are provided in **Figure 3-4**.

Figure 3-4 M1 Junction 39 Weekday Vehicle Turning Movements: AM Peak, PM Peak, Inter-Peak and 12 hour



3.20. Analysis of the turning movements throughout the weekday highlights the following:

- **M1 southbound exit-slip:** right-turn and left-turn movements are highest in the PM peak;
- **A636 east:** right-turn movements are highest in the AM peak, whilst straight-on and left turn movements are higher during inter-peak and PM peak periods;
- **M1 northbound exit-slip:** right-turn movements are highest in the AM peak;
- Volumes from the A636 west are highest in the AM peak, left-turn and straight-on movements are highest in the AM peak, the inter-peak and PM periods are lower.

3.21. The data indicates that in the AM peak, the dominant flow on the junction is to/from the M1 north of the junction to/from the A636 east. In the PM peak, this remains the case, however there is also a high volume of traffic turning right from the M1 southbound exit-slip to the A636 west.

Summary

3.22. The data presented within this chapter shows the traffic volumes have not changed significantly since the scheme was implemented. The key movements on the junction are M1 southbound exit-slip to A636 east and from the A636 east to the M1 northbound entry-slip road.

3.23. These are the two movements the scheme was designed to improve, whilst also seeking to improve the junction throughput for all movements.

3.24. The pre and post scheme journey times for these movements need to be considered to assess the impact of the scheme on reducing delays at the junction. The analysis is discussed in the following chapter.

4. Journey Time Analysis

Introduction

4.1. The key objective of the scheme was to reduce congestion and improve journey times for road users making movements on the junction. The scheme introduced signals on the M1 exit-slip road approaches to the junction to reduce significant weekday peak hour queuing problems on the M1 mainline, the circulatory carriageway and the A636 approaches to the junction (east and west).

4.2. Analysis of journey times for specific movements through the junction is required to assess whether the scheme has delivered a journey time benefit to road users.

Data Source

4.3. For the journey time analysis, Satellite Navigation (Sat Nav) data has been used to inform pre and post scheme journey times. This data is available from some motorists who use satellite navigation devices and allow their data to be used anonymously for the purpose of generating travel statistics. This data can provide crucial intelligence on the operation of the highway network. The data also has the benefit of being historic, so that it is possible to retrieve pre-scheme journey time data after the scheme has opened.

4.4. To conduct the analysis and capture all relevant time-periods in terms of traffic flows, trip purposes and highway network conditions the flow profiles presented in section 3 have been analysed. These have resulted in 7 distinct time-periods for analysis which are listed in **Table 4.1**.

4.5. The Sat Nav data has been extracted for the time-periods outlined in Table 4.1, for all movements around the junction and for the following date range:

- **Pre-Scheme:** 01/10/2010 to 30/09/2011.
- **Post-Scheme:** 01/03/2012 to 28/02/2013.

Table 4.1 – Time-Periods for Journey Time Analysis

Time Period	Hours
Weekday AM Peak	0800 – 0900
Weekday Inter-Peak	0900 – 1500
Weekday PM Peak	1600 – 1800
Weekday PM Peak shoulder	1500 – 1600 and 1800 – 1900
Weekday Peak Ramp Up/Down	0700 – 0800 and 1900 – 2000
Saturday and Sunday Daytime	0900 – 2000
Monday to Sunday Overnight	2000 – 0700

4.6. The Saturday and Sunday 0700 – 0900 time-period has not been included in the analysis because the network conditions in this time period are similar to the Overnight period and thus the impacts can be approximated.

Journey Time Comparison

4.7. The analysis of the pre and post-scheme journey times for movements on the junction are presented in **Table 4.2**. This provides the journey times per vehicle.

Table 4.2 – Journey Time Changes (vehicle seconds)

Arm from	Arm to	Weekday					Sat and Sun	7 days
		AM Peak	Inter-Peak	PM Peak	PM Peak Shoulder	Weekday Peak Ramp Up / Down	Daytime	Overnight
M1 Southbound exit-slip	A636 east	-38	-4	-19	-6	-7	-1	2
	M1 south	-39	-4	-19	-6	-7	-1	2
	A636 west	-31	2	-11	1	0	5	6
A636 east	M1 south	-1	12	-0	0	0	0	0
	A636 west	5	19	6	5	0	8	3
	M1 north	5	19	6	5	0	9	3
M1 Northbound exit-slip	A636 west	-3	-62	-11	-3	0	-23	1
	M1 north	-3	-63	-11	-3	0	-24	1
	A636 east	4	-52	-3	3	0	-13	4
A636 west	M1 north	-15	-3	-3	-1	8	-10	-1
	A636 east	-1	12	-0	0	0	0	0
	M1 south	-16	11	16	15	22	-12	10

Negative values indicate a journey time saving and hence a benefit. Savings > 10 secs are highlighted in Green.
Positive values indicate an increase in journey time and hence a dis-benefit. Increases of > 10 seconds are highlighted in Red.
All seconds displayed are an average per vehicle.

4.8. The journey time analysis shows journey time benefits for:

- **All movements from M1 southbound exit-slip during AM and PM peak**. The greatest savings being 39 seconds to M1 southbound entry in the AM peak and also to the A636 east; and 19 seconds to the A636 east and M1 south in the PM peak;
- **All movements from M1 northbound exit-slip during the inter-peak, PM peak and weekend daytime.** The greatest savings being 64 seconds in the AM peak and 24 seconds during weekend daytime for the straight-on movement to the M1 northbound entry;
- **All left and right turn movements from A636 west in the AM peak and weekend daytime.** The greatest savings being for the right-turn movement, 16 seconds and 12 seconds respectively.

4.9. The data highlights journey time dis-benefits for:

- From the **A636 east to M1 north and A636 west** journey times increased by 19 seconds during the inter-peak, and 9 seconds during the weekend daytime. Smaller increases in journey time have also been identified for the

right-turn and straight on movements during the AM and PM peaks and weekend daytime; and,

- **Straight-on and right-turn movements from the A636 west during the inter-peak, PM peak, peak shoulders and overnight.** The highest increases ranging between 11 and 22 seconds for the right-turn movement to the M1 south during these time-periods.

4.10. The time-periods with the greatest benefits are the AM peak, inter-peak, PM peak and weekend daytime. However, these benefits do not occur for all movements as outlined above. For example journey time increases have been identified for specific time-periods and movements, most notably from the A636 east and west.

4.11. The journey time analysis highlights that the scheme is performing well by reducing the journey times on the M1 exit-slip roads when the volume of traffic is greatest. However the introduction of signals has had a negative impact on journey times from the A636 east and west, which means a dis-benefit to users undertaking the A636 east to M1 northbound. This movement accounts for 17% of the total demand on the junction. There have also been improvements for movements which are undertaken by a small volume of traffic compared to other movements, for example M1 northbound exit-slip to M1 northbound entry-slip.

4.12. The full pre and post-scheme journey times are provided in **Appendix A**.

Journey Time Reliability

4.13. The journey time data can also be used to quantify changes in journey time reliability as a result of the scheme. The journey time data for right-turning movements on the junction have been extracted, this accounts for the majority of key movements using the circulatory carriageway.

4.14. Changes in journey time reliability is quantified by using the inter-quartile range and the 5th to 95th percentile journey time pre and post-scheme. The movements which have been analysed are:

- M1 southbound exit-slip to A636 west;
- M1 northbound exit-slip to A636 east;
- A636 west to M1 southbound entry-slip; and
- A636 east to M1 northbound entry-slip.

4.15. A summary of the journey time reliability analysis for these movements is provided in **Table 4.3**, and more detailed analysis for the M1 southbound exit-slip to the A636 west is provided in **Figure 4-1**. The full journey time reliability data is provided in **Appendix B**.

4.16. Table 4.3 summarises the reliability data for all the time-periods on the basis of changes to the inter-quartile range of journey times on each route before and after the scheme was implemented. Improvement has been quantified as a reduction in the inter-quartile range of journey times for that route, and No improvement has been defined as an increase in the inter-quartile range, which means that in some cases journey time reliability has worsened.

Table 4.3 – Summary of Journey Time Reliability Analysis

Arm from	Arm to	Weekday					Sat and Sun	7 days
		AM Peak	Inter-Peak	PM Peak	PM Peak shoulder	Weekday Peak Ramp up / Down	Daytime	Overnight
M1 SB exit-slip	A636 west	🟢	🔴	🟢	🟡	🔴	🔴	🔴
A636 east	M1 north	🔴	🔴	🔴	🟡	🟡	🟡	🟡
M1 NB exit-slip	A636 east	🟢	🟡	🟢	🔴	🟡	🔴	🔴
A636 west	M1 south	🟢	🔴	🔴	🔴	🟢	🔴	🟡

Journey Time Reliability

- 🟢 Improvement: reduced inter-quartile range
- 🟡 Minimal change to inter-quartile range
- 🔴 Negative impact: increased inter-quartile range

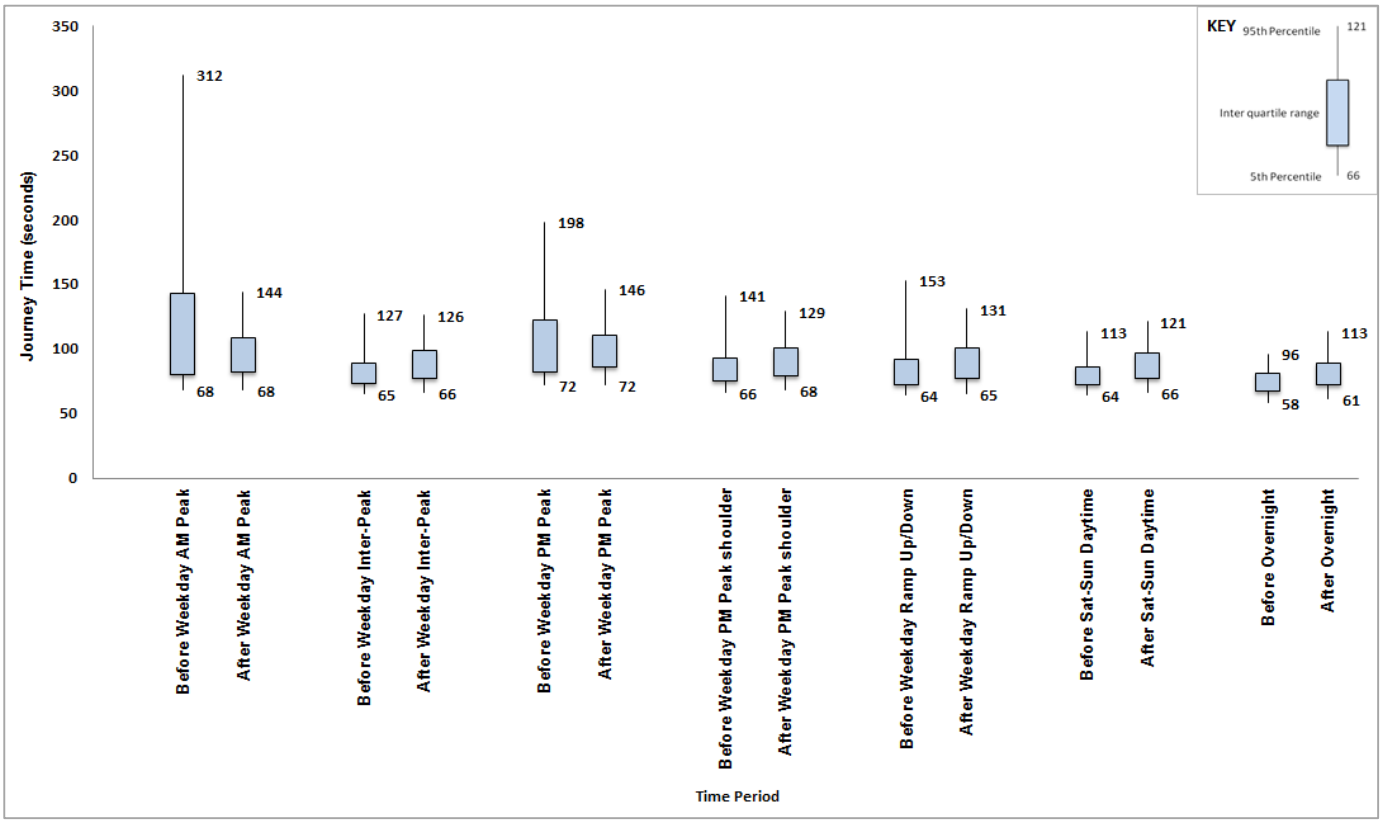
4.17. Summary Table 4.3 shows:

- The majority of reliability improvements have been delivered during the weekday AM and PM peak time-periods with the exception of the A636 east;
- Benefits to the movements from the M1 exit-slip roads during the AM and PM peak weekday periods, no benefits recorded during the other time-periods;
- No improvement in reliability on the A636 east during all time-periods;
- No reliability improvements have been recorded during the PM peak shoulder, weekend daytime and overnight; and
- During the weekday ramp up/down period the only benefit was recorded from the A636 west.

4.18. The data shows that the scheme resulted in journey time reliability improvements on the junction during the weekday, however there has been little benefit during the other time-periods.

4.19. **Figure 4-1** presents the journey time reliability analysis for the M1 southbound exit-slip to the A636 west only. This is the movement, from those assessed, which has benefitted most from the introduction of the scheme. The full reliability analysis is provided in Appendix B.

Figure 4-1 Journey Time Reliability Analysis: M1 Southbound Exit-Slip to A636 West



4.20. **M1 southbound exit-slip to A636 west:** the analysis shows that the inter-quartile range of journey times in the weekday AM and PM peak has reduced which means that reliability has improved. The inter-quartile range has increased in the remainder of the time-periods which means that reliability has not improved.

4.21. Whilst it has been identified that journey time reliability has not improved for all movements during all time-periods, the highest demand on the junction occurs during the weekday peak hours, and for specific movements which have not been analysed in the right-turn movement analysis. This particularly relates to the M1 southbound exit-slip road to A636 east left-turn movement which accounts for 20% of total demand at the junction. There is a dedicated left-turn facility at the junction for this movement.

4.22. The journey time analysis presented above considers the day to day operation of the junction and has identified that whilst there have been improvements in journey time reliability there has also been a worsening during some time-periods. It is for this reason that this scheme has been evaluated as having a **Neutra**l impact on journey time reliability. The next section presents the annual vehicle hour changes as a result of the scheme.

Calculation of Annual Vehicle Hour Benefits

4.23. The journey time data has been analysed further to derive the annualised user benefits by time-period and movement. The analysis presented above accounts for all journey times savings, however for the purposes of calculating the annualised benefits only journey time changes in excess of 10 seconds (positive or negative) are considered when calculating the annual vehicle hours saved. This is because the small changes calculated may be unperceivable to regular users. The annual vehicles hours are calculated by multiplying the weekly journey time differences (pre and post scheme) by the volume of vehicles undertaking each movement and factoring by 52 weeks to derive the annual vehicle hour changes.

4.24. **Table 4.4** presents the annualised journey time changes for each of the time-periods assessed. This is for all movements on the junctions.

Table 4.4 – Annualised Journey Time Changes (annual vehicle-hours): Time-Periods

Time-Period	Annual Vehicle Hours
Weekday AM Peak	-3,622
Weekday Inter-Peak	17,408
Weekday PM Peak	-6,671
Weekday PM Peak shoulder	133
Weekday Peak Ramp Up/Down	113
Saturday and Sunday Daytime	-12,600
Monday to Sunday Overnight	0

4.25. The table shows that the scheme delivers significant benefits during the weekend daytime whilst during the AM and PM peak benefits have also been realised. There is a significant dis-benefit for all users during the weekday inter-peak, and less significant dis-benefits during the PM peak shoulder and peak ramp up/down. **Table 4.5** presents the annualised journey time changes for each of the movements on the junction.

Table 4.5 – Annualised Journey Time Changes (annual vehicle-hours): Movements

		Destination				Total
		M1 NB Entry	A636 East of J39	M1 SB Entry	A636 West of J39	
Origin	M1 SB Exit to J39		-6,373	-3	-3,112	**-9,487**
	A636 East of J39	23,165	-	7,173	14,571	**44,909**
	M1 NB Exit to J39	-207	-37,921	-	-7,130	**-45,258**
	A636 West of J39	-6,008	9,955	650	-	**4,598**
Total		**16,951**	**-34,339**	**7,820**	**4,329**	**-5,238**

4.26. Table 4.5 demonstrates the following:

- The M1 northbound exit-slip road benefits the most from the scheme, particularly for right turn movements to the A636 east;
- The M1 southbound exit-slip benefits, but to a lesser extent; and
- The A636 east and west, which are not signalised, suffer dis-benefits from the scheme. In particular, the dis-benefits to the A636 east are such that they significantly offset the benefits to the M1 northbound exit.

4.27. The benefits shown during the weekend daytime are for the following movements:

- A636 west to M1 northbound entry;
- M1 northbound exit-slip to A636 east;
- A636 west to M1 southbound entry; and
- M1 northbound entry to A636 west.

4.28. The full vehicle-hour journey time calculations are provided in Appendix A.

4.29. The analysis shows that the scheme has delivered benefits to the AM and PM peak hours, the periods identified in the PAR as being when the issues occurring at the junction were most acute. Therefore, the scheme has delivered improvements to the targeted time-periods, and also provided a significant benefit to weekend time-periods. However, the scheme has also resulted in dis-benefits to other time-periods which could be due to the varying levels of demand through the junction throughout the day and across the week.

4.30. The PAR forecast and observed journey time changes (vehicle-hours) calculated are outlined below:

- 2010 PAR Forecast (AM, Inter-peak and PM): -113,202.33
- POPE Observed (all time-periods): -5,238.

4.31. The analysis identifies that the journey time benefits are greater when taking in to account the PAR time-periods, whilst with all time-periods there are journey time benefits, however they are of a lower magnitude than forecast in the PAR.

4.32. A sensitivity test was undertaken to calculate the POPE Observed journey times using the PAR time-periods (AM, Inter-peak and PM peak). This analysis identified that there would be journey time benefits of -7,116 vehicle hours.

4.33. The analysis identifies that the scheme has delivered journey time savings, but these are significantly lower than the forecast (using observed data) which is a result of dis-benefits to some of the movements at the junction. It can therefore be concluded that the scheme has had a **Slight Beneficial** impact on reducing journey times across the junction.

Summary

4.34. The analysis above indicates that the scheme has benefitted movements from the M1 exit-slips, especially the M1 NB exit-slip to A636 east movement. However, benefits to this movement have come at the cost of the dis-benefits to the A636 east and west. Specifically there have been significant dis-benefits on the A636 east arm.

4.35. The time-periods with the most significant JT benefits are AM, PM and weekend daytime which suggests that the scheme configuration and traffic signals are suitable for these time periods, but less appropriate for the demands at other time-periods.

4.36. The additional approach lanes have benefitted the M1 NB exit to A636 west, the A636 west to M1 northbound entry, and the M1 southbound exit-slip to A636 east. Overall the journey time benefit of the scheme is significantly lower than anticipated.

5. Safety Impacts

Introduction

5.1. A critical component of any highway scheme is safety. Irrespective of whether a scheme is intended to reduce accidents or not, it is imperative to consider the safety record pre and post scheme to understand whether the scheme has had an impact on accidents.

5.2. This analysis is undertaken to assess whether the secondary objective of the scheme has been met:

> *To reduce accidents at the junction, specifically on the M1 exit-slip road approaches to the interchange and in close proximity to these junction on the circulatory carriageway.*

5.3. This section considers the occurrence of accidents in two time-periods: 5 years pre-scheme, and post-scheme accidents up to the most recent date that data is available.

5.4. These will be considered to determine the impact of the scheme on safety.

Data Source

5.5. The PAR uses accident data[2] from the five year period 1st January 2005 to 31st December 2009 as evidence for the pre-scheme conditions at the scheme location. The area over which accidents are considered is highlighted in **Figure 5-1**.

[2] All references to accidents in this report refer to Personal Injury Collisions (PICs).
The accident data referred to in this report has not necessarily been derived from the national validated accident statistics produced by Department for Transport (DfT). As such, the data may subsequently be found to be incomplete or contain inaccuracies. The requirement for up-to date information and site specific data was a consideration in the decision to use non-validated data and, as it is sourced from Local Processing Units through the Managing Agent Contractors or Asset Support Contractors, it is sufficiently robust for use in this context.

Figure 5-1 Accident Analysis Area

5.6. Once a PAR has been completed and agreed there can be a time delay before scheme construction commences, which could affect the accident rate, therefore accident data is collected 5 years prior to commencement of scheme construction.

5.7. Pre-scheme data was collected for the five year period up to scheme construction: December 2006 to December 2011. Post scheme accident data has been collected from March 2012 to December 2013 which is the most recent data available.

Analysis

5.8. The accident data for the area outlined in Figure 5-1 has been collated to assess the impact of the scheme on accidents by undertaking a pre and post scheme analysis of accidents. This is provided in **Table 5.1**. Further analysis of contributory factors, beyond that presented below, was not possible as the data was provided in pdf format.

Table 5.1 – Pre and Post Scheme Accidents

Period	Pre Scheme Opening		Post Scheme Opening	
Date Range	December 2006 to November 2011		March 2012 to December 2013	
	No. of accidents	Accident rate per year	No. of accidents	Accident rate per year
Fatal	2	0.4	0	0
Serious	6	1.2	1	0.5
Slight	36	7.2	6	3.3
TOTAL	44	**8.8**	7	**3.8**
Severity Index	18%		14%	

5.9. A total of 44 accidents occurred in the five years before scheme construction. The data shows that 18% of these accidents involved a fatal or serious casualty. This data indicates that there were accident issues at this junction as outlined in section 2 of this report.

5.10. The PAR forecast that the scheme would result in a reduction of two accidents per annum and 121 across the scheme duration (60 years). The post-scheme accident data has been analysed and identified an outturn reduction in accidents of **5 per annum**, and 300 across the scheme life.

5.11. The data shows that the accident rate per year has reduced by approximately 50% for serious and slight accidents, and there has been no fatal accident at the junction since the scheme was implemented. Whilst the total number of accidents has reduced, the severity of accidents has also reduced.

5.12. Interrogation of the post-scheme accident data indicates that the implemented scheme has not been a contributory factor in any of the accidents which have occurred post scheme construction. It should be noted that the three accidents which occurred on the junction were caused by human error and have not been recorded as being caused by the implemented scheme. Therefore the absolute accident saving as a result of the scheme would be greater.

5.13. It was not possible to conduct further analysis of contributory factors, which would have identified whether any particular type of accident has been reduced by the scheme. However, the data provided above provides a clear indication as to the performance of the scheme in reducing the occurrence of accidents at the junction.

5.14. It can therefore be concluded that the scheme has had a **Beneficial** impact on reducing the number of accidents at the junction, and the impact has been better than that forecast.

6. Economy

Introduction

6.1. The monetary value of the journey time and accident impacts previously discussed are outlined in this section. This includes a comparison of the forecast and outturn economic benefits of the scheme. These benefits are then considered against the scheme construction costs (forecast and outturn) in order to analyse the value for money of the scheme. Two measures of value for money are considered: First Year Rate of Return (FYRR) and Benefit Cost Ratio (BCR).

6.2. **First Year Rate of Return (FYRR):** a measure of the opening year scheme benefits as a proportion of the scheme cost, it is calculated as a %. It measures the proportion of the scheme costs recovered by the momentary value of scheme benefits in the opening year.

6.3. **Benefit Cost Ratio (BCR):** a comparative measure of the scheme costs and monetary benefits of the scheme over the 60 year assessment period. The post-scheme evaluation of BCR is undertaken using available evidence from one year after the scheme opened. This provides an update forecast of the scheme BCR based upon opening year observations.

6.4. All monetised figures in this section are quoted in 2002 prices, discounted to the 2012 opening year, unless otherwise specified.

PAR and Outturn Comparison

6.5. The evidence provided in this report has been provided to consider the scheme costs and economic benefits of the scheme provided in the PAR (2011) and to calculate the outturn costs and scheme benefits based on empirical evidence from a year after opening.

6.6. **Table 6.1** provides this comparison between the PAR and Outturn costs and benefits of the scheme. It also includes the opening year and scheme life costs and benefits of the scheme. The journey time and accident benefits of the scheme discussed earlier in the report have been monetised using standard value of time and accident values from WebTAG. This is undertaken to understand whether the monetised scheme benefits offset the cost of scheme implementation and assess the overall value for money of the scheme.

Table 6.1 – PAR and Outturn Scheme Costs and Economic Benefits: Opening Year and Scheme Lift

		PAR	Outturn
Opening Year (2012)	Total Cost	£1.514m	£1.041m
	Opening Year Accident Saving (no)	2.0	5.0
	Opening Year Accident Saving (£)	£0.149m	£0.372m
	Annual Vehicle Hours Saved	113,202	5,238
	Journey Time	£1.643m	£0.064m
	Total Benefits	£1.792m	£0.436m
	FYRR	**118%**	**42%**
Scheme Life (60 years)	Costs	£1.514m	£1.041m
	Safety	£5.997m	£14.938m
	Journey Time	£62.547m	£2.441m
	Total Benefits	£68.544m	£17.378m
	BCR	**45.26**	**16.70**

6.7. The scheme information provided in Table 6.1 shows that:

- The outturn costs for scheme implementation were lower than forecast in the PAR – An actual cost of £1.041m compared to £1.514m predicted;
- The safety benefits of the scheme are substantially higher than forecast, this is due to the accident rate reducing by 56% since scheme opening;
- The economic benefits of journey time savings were considerably lower than those forecast in the PAR. This is because the PAR forecast journey time benefits have not been realised in the AM peak, Inter-peak and PM peak
- The outturn FYRR is lower than forecast, this is due to the significantly lower outturn journey time benefits; and
- The outturn BCR is reforecast to 16.70 which was lower than the PAR predicted BCR of 45.26.

Summary

6.8. The analysis of the economic benefits of the scheme using the data contained within this report has identified that the scheme has performed better than forecast in terms of accident benefits whilst journey time benefits have been substantially lower than forecast.

6.9. The scheme's economic performance was much more dependent on journey time savings than accident benefits in the PAR, with the journey time benefits expected to be 11 times the monetary value of accident benefits.

6.10. However, based on the observed first year data the outturn journey time benefits are only 4% of that predicted. This is the primary reason for the scheme not delivering its anticipated value for money.

6.11. In summary the overall scheme performance has been lower than forecast in the PAR however with an Outturn BCR of 16.70 the scheme still represents value for money and has successfully achieved its objectives of improving journey times through the junction and improving safety.

7. Society and Environmental Impacts

Introduction

7.1. This section of the report presents information relating to the WebTAG objectives of scheme impact on society and environment. This information will be compared to the forecasts made in the PAR's Appraisal Summary Table (AST) (see **Appendix C**).

7.2. The full scheme Evaluation Summary Table (EST) is provided in **Appendix D**.

Society Impacts

7.3. **Reliability (DDV):** the scheme has a **Slight Beneficial** impact on journey time reliability during specific time-periods, particularly the weekday peak periods when demand at the junction is the highest. The PAR forecast a **Large Beneficial** impact, however the analysis presented in this evaluation indicates that the impact on journey time reliability has been limited to specific time-periods.

7.4. **Physical Activity:** the site visit observed that pedestrians and cyclists were using the controlled crossing implemented as part of the scheme, and therefore the scheme has a **Slight Beneficial** impact on physical activity in the area by providing a safe route for people to walk and cycle across the junction.

7.5. **Severance:** The scheme has a **Slight Beneficial** impact on severance by improving connectivity for pedestrians and cyclists between two residential areas to the east and west of the junction and to the Calder Park business park.

7.6. The PAR did not assess the impact of the scheme on physical activity or severance, however the inclusion of the controlled crossing on the northbound exit-slip has improved connectivity for pedestrians and cyclists and has therefore been assessed in the EST.

7.7. The assessment criteria including Access to Services, Affordability and Option Values have not been assessed as these are not relevant to this specific scheme.

Environmental Impacts

7.8. There are a small number of houses to the southeast of the junction which are within 300 metres (for noise assessment) of the scheme and may be affected in terms of noise, whilst there are some houses within 50 metres (for air quality assessment) which may be affected by air quality. Insufficient data is available to quantify the noise and air quality impacts of the scheme, however a qualitative assessment is provided below.

7.9. **Noise**: The data indicates that there has been no change in traffic volumes and journey time benefits have been limited (resulting in neutral change to speeds at the junction), which suggests that the noise impact of the scheme would be **Neutral**.

7.10. **Air Quality:** data indicates that there has been no change in traffic volumes and journey time benefits have been limited (resulting in neutral change to speeds at

the junction), which suggests that the impact of the scheme on air quality is **Neutral.**

7.11. **Greenhouse Gases:** the available data suggests that traffic volumes and distance travelled have not increased as a result of the scheme, it is therefore unlikely that the scheme resulted in increased greenhouse gas emissions from traffic. This suggests that the impact of the scheme on greenhouse gases is **Neutral**.

7.12. **Townscape:** The traffic signals implemented as part of the scheme were constructed within the existing carriageway. The junction is a busy grade-separated motorway junction, the townscape of which was not materially altered by the scheme. Therefore the impact of the scheme on the townscape is considered **Neutral**.

Heritage of Historic Resources, Biodiversity and Water Environment have not been assessed as they were not relevant to the scheme.

8. Conclusions and Recommendations

Introduction

8.1. This section draws conclusions of the report and seeks to understand whether the scheme satisfied its objectives. This section also suggests some recommendations.

Summary

8.2. The M1 Junction 39 Traffic Signals LNMS opened in February 2012 The scheme was implemented to address issues of queuing and delays on the M1 exit-slip roads, the M1 mainline and the A636 approaches to the junction. The scheme objective was to address these issues and identified accident problems on the circulatory carriageway.

8.3. The analysis of trends in the area has identified that the distance travelled in Wakefield district has increased since 2010 whilst nationally the annual vehicle kilometres travelled has decreased. However, there has been no significant change in traffic volumes on the junction over time, and in particular since the scheme was introduced. This may be due to the junction already operating at capacity and not being able to cope with more traffic.

8.4. The journey time analysis identified that the scheme had a positive impact on journey times for movements form the M1 exit-slip roads (north and south) whilst dis-benefits were recorded for the A636 approaches to the junction (east and west). Whilst journey time improvements have been recorded during the weekdays, there is also a benefit during the weekend daytime, whilst overnight there has been a limited change in journey times.

8.5. The movements which benefitted most from the scheme are movements from M1 northbound and southbound exit to the A636 east and west and from the A636 west to the M1 northbound entry slip road. These benefits have been significantly offset by the dis-benefits to movements from the A636 east, therefore a small journey time benefit has been recorded for the junction as a whole. These benefits have also been identified as being smaller than those forecast in the PAR.

8.6. Improvements in journey time reliability have been recorded during the weekday peak periods (AM and PM) however there were limited changes or no improvements in journey time reliability for the other time-periods assessed.

8.7. Since the scheme opened the accident rate has reduced from 8.8 to 3.8, whilst the severity of accidents has reduced.

8.8. The Outturn economic benefits of the scheme were lower than those forecast in the 2010 PAR. This is because the PAR forecast journey time benefits for the AM, Inter-peak and PM peak were not realised. The scheme has delivered greater than forecast accident benefits.

8.9. Overall the scheme delivered excellent value for money with an outturn BCR of 16.70 calculated.

Recommendations

8.10. It has been identified that the part signalisation of this junction has delivered some benefits however there have been specific dis-benefits to the A636 east. It is recognised that other scheme options were considered with the implemented scheme being identified as the best option.

8.11. Further options for improvement of this junction could be examined, however the s278 agreement to fully signalise the junction has been identified as a suitable option. Therefore it is recommended that the design of the s278 scheme considers the findings of this report.

8.12. Implementation of a controlled crossing for pedestrians and cyclists on the M1 southbound entry-slip road should be considered to complement the crossing implemented as part of the LNMS.

Appendices

Appendix A. M1 Junction 39 Journey Time Analysis

A.1. Journey Time Analysis: Absolute Pre and Post Scheme Journey Times

Before

Arm from	Arm to	Weekday					Sat and Sun	7 days
		AM Peak	Inter-Peak	PM Peak	PM Peak shoulder	Weekday Peak Ramp up / Down	Daytime	Overnight
M1 southbound exit-slip	*A636 east*	69	31	47	33	34	27	22
	M1 south	79	40	57	42	44	37	31
	A636 west	102	62	81	64	66	58	52
A636 east	*M1 south*	60	114	66	59	0	58	53
	A636 west	76	132	83	75	0	74	69
	M1 north	84	140	90	82	0	82	76
M1 northbound exit-slip	*A636 west*	49	124	62	47	0	75	40
	M1 north	59	136	72	56	0	86	49
	A636 east	76	153	89	74	0	103	66
A636 west	*M1 north*	68	40	40	37	36	55	33
	A636 east	61	115	67	60	0	59	54
	M1 south	108	61	61	58	56	91	53

After

Arm from	Arm to	Weekday					Sat and Sun	7 days
		AM Peak	Inter-Peak	PM Peak	PM Peak shoulder	Weekday Peak Ramp up / Down	Daytime	Overnight
M1 southbound exit-slip	*A636 east*	31	27	28	27	28	26	24
	M1 south	40	36	38	36	37	35	33
	A636 west	71	64	70	65	65	63	57
A636 east	*M1 south*	59	126	66	59	0	58	54
	A636 west	81	151	89	80	0	82	72
	M1 north	88	159	96	88	0	91	79
M1 northbound exit-slip	*A636 west*	46	63	51	44	0	52	41
	M1 north	55	73	60	53	0	62	49
	A636 east	80	102	86	77	0	91	70
A636 west	*M1 north*	53	37	37	36	44	45	32
	A636 east	60	127	67	60	0	59	54
	M1 south	92	71	77	73	78	79	63

A.2. Journey Time Analysis: Pre and Post Scheme Journey Time Changes

Arm from	Arm to	Weekday					Sat and Sun	7 days
		AM Peak	Inter-Peak	PM Peak	PM Peak shoulder	Weekday Peak Ramp up / Down	Daytime	Overnight
M1 southbound exit-slip	*A636 east*	-38	-4	-19	-6	-7	-1	2
	M1 south	-39	-4	-19	-6	-7	-1	2
	A636 west	-31	2	-11	1	0	5	6
A636 east	*M1 south*	-1	12	0	0	0	0	0
	A636 west	5	19	6	5	0	8	3
	M1 north	5	19	6	5	0	9	3
M1 northbound exit-slip	*A636 west*	-3	-62	-11	-3	0	-23	1
	M1 north	-3	-63	-12	-3	0	-24	1
	A636 east	4	-52	-3	3	0	-13	4
A636 west	*M1 north*	-15	-3	-3	-1	8	-10	-1
	A636 east	-1	12	0	0	0	0	0
	M1 south	-16	11	16	15	22	-12	10

A.3. Journey Time Analysis: Journey Time and Annual Vehicle Hours Saved

JT Changes

Time Period	Overnight - Mon to Sun
Period Hours	11
Days	7
Weekly Hours	81

*missing TT hours: 4

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A		2.21	2.4	5.6	10
A636 East	B	3.22		0.4	3.18	7
M1 NB Exit	C	0.7	4.13		0.7	6
A636 West	D	-1.01	0.41	9.57		9
		3	7	12	9	32

Time Period	Ramp up / down - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A		-6.76	-7.22	-0.36	-14
A636 East	B	0		0	0	0
M1 NB Exit	C	0	0		0	0
A636 West	D	7.9	0	22.39		30
		8	-7	15	0	16

Time Period	AM Peak - Weekday
Period Hours	1
Days	5
Weekly Hours	5

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A		-38.38	-38.93	-30.54	-108
A636 East	B	4.89		-0.54	4.7	9
M1 NB Exit	C	-3.31	3.8		-2.93	-2
A636 West	D	-15.36	-0.52	-15.8		-32
		-14	-35	-55	-29	-133

Time Period	Interpeak - Weekday
Period Hours	6
Days	5
Weekly Hours	30

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A		-3.74	-3.96	2.2	-6
A636 East	B	19.32		11.9	19.16	50
M1 NB Exit	C	-63.4	-51.76		-61.61	-177
A636 West	D	-3.26	11.99	10.55		19
		-47	-44	18	-40	-113

Time Period	PM Peak Build-up - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A		-5.74	-5.84	0.71	-11
A636 East	B	5.44		0.3	5.31	11
M1 NB Exit	C	-3.3	3.38		-3.05	-3
A636 West	D	-0.76	0.31	15.09		15
		1	-2	10	3	12

Time Period	PM Peak - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A		-18.88	-18.54	-10.52	-48
A636 East	B	5.76		-0.29	5.55	11
M1 NB Exit	C	-11.53	-2.66		-11.31	-26
A636 West	D	-2.47	-0.23	16.39		14
		-8	-22	-2	-16	-49

Time Period	Daytime - Sat Sun
Period Hours	11
Days	2
Weekly Hours	22

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A		-1.17	-1.38	4.47	2
A636 East	B	8.53		0.1	7.72	16
M1 NB Exit	C	-23.93	-12.61		-23.24	-60
A636 West	D	-10.36	0.12	-11.84		-22
		-26	-14	-13	-11	-64

10 second cut

Time Period	Overnight - Mon to Sun
Period Hours	11
Days	7
Weekly Hours	81

22%

*missing TT hours: 4

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A		0	0	0	0
A636 East	B	0		0	0	0
M1 NB Exit	C	0	0		0	0
A636 West	D	0	0	0		0
		0	0	0	0	0

Time Period	Ramp up / down - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A		0	0	0	0
A636 East	B	0		0	0	0
M1 NB Exit	C	0	0		0	0
A636 West	D	0	0	22		22
		0	0	22	0	22

Time Period	AM Peak - Weekday
Period Hours	1
Days	5
Weekly Hours	5

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A		-38	-39	-31	-108
A636 East	B	0		0	0	0
M1 NB Exit	C	0	0		0	0
A636 West	D	-15	0	-16		-31
		-15	-38	-55	-31	-139

Time Period	Interpeak - Weekday
Period Hours	6
Days	5
Weekly Hours	30

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A		0	0	0	0
A636 East	B	10		12	19	50
M1 NB Exit	C	-63	-52		-62	-177
A636 West	D	0	12	11		23
		-44	-40	22	-42	-104

Time Period	PM Peak Build-up - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A		0	0	0	0
A636 East	B	0		0	0	0
M1 NB Exit	C	0	0		0	0
A636 West	D	0	0	15		15
		0	0	15	0	15

Time Period	PM Peak - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A		-19	-19	-11	-48
A636 East	B	0		0	0	0
M1 NB Exit	C	-12	0		-11	-23
A636 West	D	0	0	16		16
		-12	-19	-2	-22	-54

Time Period	Daytime - Sat Sun
Period Hours	11
Days	2
Weekly Hours	22

88%

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A		0	0	0	0
A636 East	B	0		0	0	0
M1 NB Exit	C	-24	-13		-23	-60
A636 West	D	-10	0	-12		-22
		-34	-13	-12	-23	-82

Flows

Time Period	Overnight - Mon to Sun
Period Hours	11
Days	7
Weekly Hours	81

22%

*missing TT hours: 4

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	0	755	1	325	1,081
A636 East	B	609	0	306	388	1,303
M1 NB Exit	C	1	321	0	46	374
A636 West	D	397	422	53	1	874
		1,008	1,500	365	758	3,631

Time Period	Ramp up / down - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	0	467	1	275	743
A636 East	B	660	0	233	190	1,085
M1 NB Exit	C	1	441	0	27	469
A636 West	D	806	392	35	0	1,234
		1,467	1,302	269	493	3,531

Time Period	AM Peak - Weekday
Period Hours	1
Days	5
Weekly Hours	5

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	0	716	1	365	1,082
A636 East	B	756	0	280	196	1,234
M1 NB Exit	C	1	486	0	37	529
A636 West	D	699	369	47	0	1,116
		1,456	1,573	333	599	3,961

Time Period	Interpeak - Weekday
Period Hours	6
Days	5
Weekly Hours	30

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	0	3432	3	1475	4,912
A636 East	B	2767	0	1391	1755	5,922
M1 NB Exit	C	6	1461	0	211	1,700
A636 West	D	1806	1916	243	0	3,971
		4,581	6,818	1,659	3,447	16,505

Time Period	PM Peak Build-up - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	0	1261	0	1123	2,386
A636 East	B	932	0	557	812	2,304
M1 NB Exit	C	4	447	0	87	545
A636 West	D	499	556	61	0	1,116
		1,436	2,267	626	2,022	6,351

Time Period	PM Peak - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	0	1609	0	1518	3,127
A636 East	B	1266	0	843	972	3,086
M1 NB Exit	C	1	460	0	77	545
A636 West	D	658	551	64	0	1,278
		1,925	2,625	914	2,572	8,036

Time Period	Daytime - Sat Sun
Period Hours	11
Days	2
Weekly Hours	22

88%

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	0	3020	3	1298	4,323
A636 East	B	2435	0	1224	1544	5,211
M1 NB Exit	C	5	1286	0	186	1,496
A636 West	D	1589	1686	214	0	3,494
		4,031	6,000	1,460	3,033	14,524

Veh Hrs

Time Period	Overnight - Mon to Sun
Period Hours	11
Days	7
Weekly Hours	81

22%

*missing TT hours: 4

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	-	-	-	-	0
A636 East	B	-	-	-	-	0
M1 NB Exit	C	-	-	-	-	0
A636 West	D	-	-	-	-	0
		0	0	0	0	0

Time Period	Ramp up / down - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	-	-	-	-	0
A636 East	B	-	-	-	-	0
M1 NB Exit	C	-	-	-	-	0
A636 West	D	-	-	113	-	113
		0	0	113	0	113

Time Period	AM Peak - Weekday
Period Hours	1
Days	5
Weekly Hours	5

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	-	-	-	-	-
A636 East	B	-	-	-	-	-
M1 NB Exit	C	-	-	-	-	-
A636 West	D	-	-	-	-	-
		-	-	-	-	-

Time Period	Interpeak - Weekday
Period Hours	6
Days	5
Weekly Hours	30

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	-	-	-	-	-
A636 East	B	-	-	-	-	-
M1 NB Exit	C	-	-	-	-	-
A636 West	D	-	-	-	-	-
		-	-	-	-	-

Time Period	PM Peak Build-up - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	-	-	-	-	-
A636 East	B	-	-	-	-	-
M1 NB Exit	C	-	-	-	-	-
A636 West	D	-	-	133	-	133
		-	-	133	-	133

Time Period	PM Peak - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	-	-	-	-	-
A636 East	B	-	-	-	-	-
M1 NB Exit	C	-	-	-	-	-
A636 West	D	-	-	152	-	152
		-	-	152	-	152

Time Period	Daytime - Sat Sun
Period Hours	11
Days	2
Weekly Hours	22

88%

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	-	-	-	-	-
A636 East	B	-	-	-	-	-
M1 NB Exit	C	-	-	-	-	-
A636 West	D	-	-	805	-	-
		-	-	805	-	-

Time Period	Overnight - Mon to Sun
Period Hours	11
Days	7
Weekly Hours	81

22%

*missing TT hours: 4

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	-	-	-	-	-
A636 East	B	-	-	-	-	-
M1 NB Exit	C	-	-	-	-	-
A636 West	D	-	-	-	-	-
		-	-	-	-	-

Time Period	Ramp up / down - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	-	-	-	-	-
A636 East	B	-	-	-	-	-
M1 NB Exit	C	-	-	-	-	-
A636 West	D	-	-	-	-	-
		-	-	-	-	-

Time Period	AM Peak - Weekday
Period Hours	1
Days	5
Weekly Hours	5

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	-	1,985	- 3	- 805	- 2,793
A636 East	B	-	-	-	-	-
M1 NB Exit	C	-	-	-	-	-
A636 West	D	- 773	-	- 54	-	- 829
		- 773	- 1,985	- 56	- 805	- 3,622

Time Period	Interpeak - Weekday
Period Hours	6
Days	5
Weekly Hours	30

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	-	-	-	-	-
A636 East	B	- 23,168	-	- 7,173	- 14,571	- 44,909
M1 NB Exit	C	- 165	- 12,769	-	- 5,633	- 38,567
A636 West	D	-	- 9,952	- 1,111	-	- 11,066
		- 23,000	- 22,814	- 8,284	- 8,938	- 17,408

Time Period	PM Peak Build-up - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	-	-	-	-	-
A636 East	B	-	-	-	-	-
M1 NB Exit	C	-	-	-	-	-
A636 West	D	-	-	133	-	133
		-	-	133	-	133

Time Period	PM Peak - Weekday
Period Hours	2
Days	5
Weekly Hours	10

FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	-	- 4,388	-	- 2,307	- 6,695
A636 East	B	-	-	-	-	-
M1 NB Exit	C	- 2	-	-	- 126	- 127
A636 West	D	-	-	152	-	- 152
		- 2	- 4,388	- 152	- 2,432	- 6,671

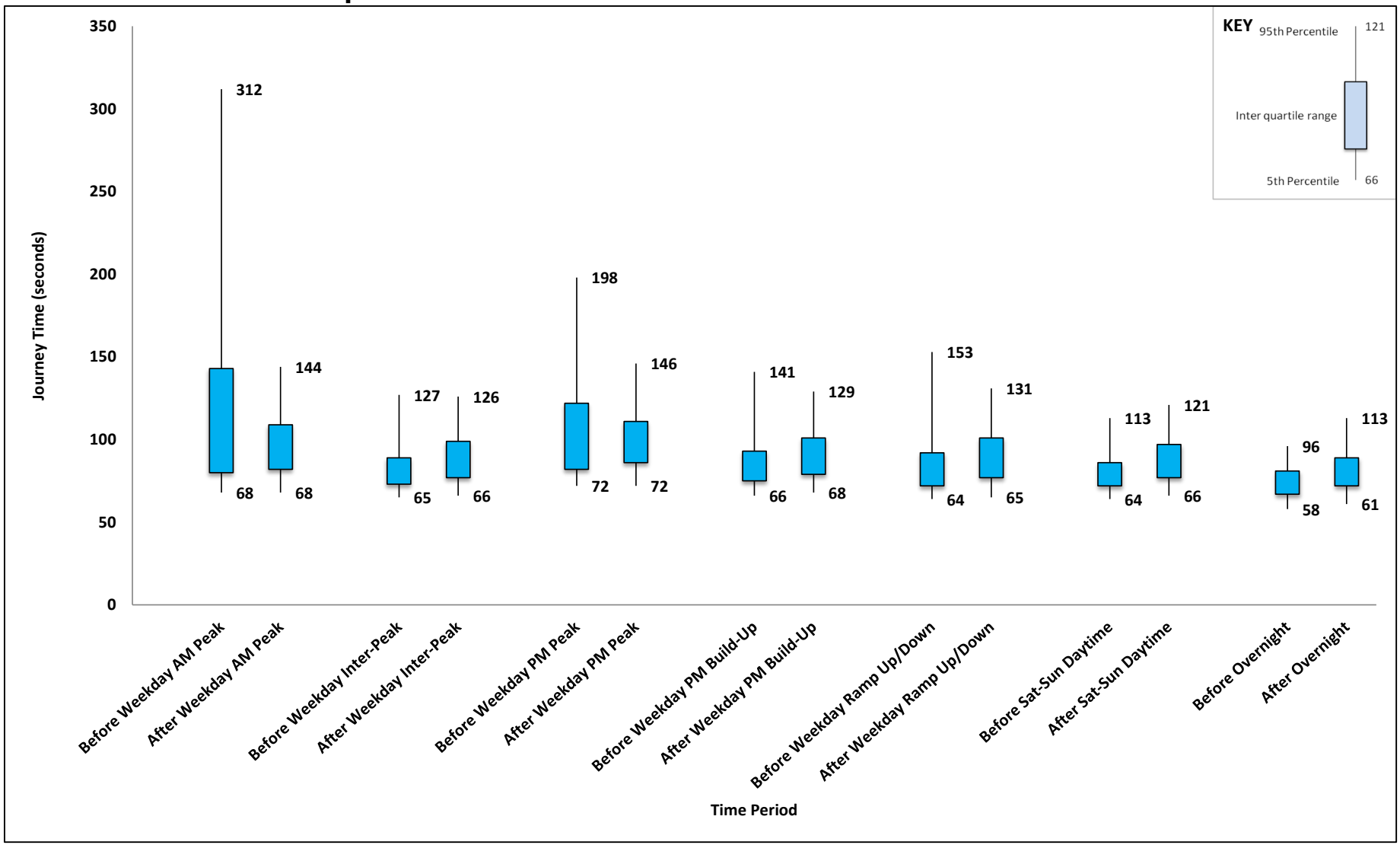
Time Period	Daytime - Sat Sun
Period Hours	11
Days	2
Weekly Hours	22

88%

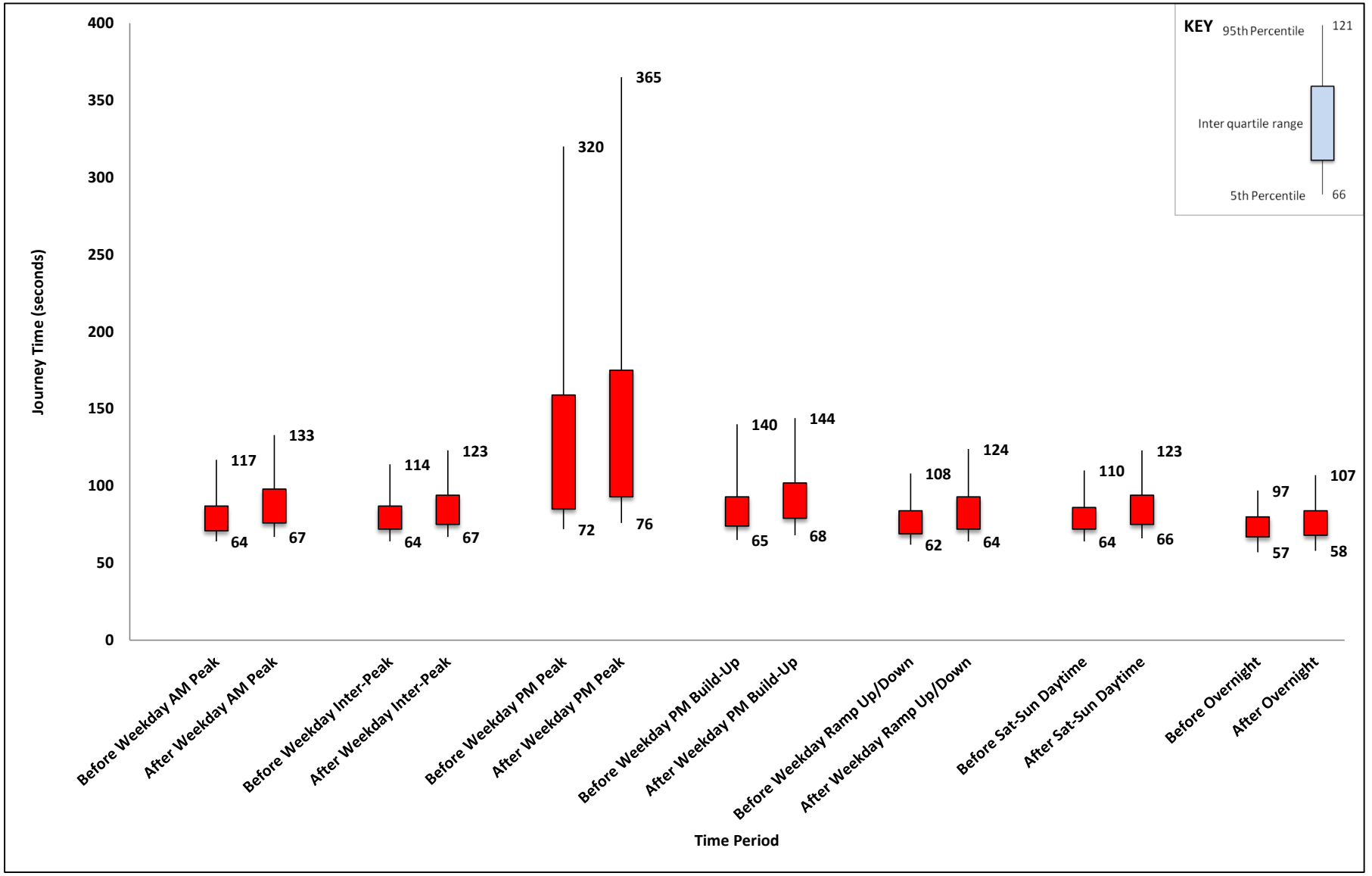
FROM \ TO		A	B	C	D	Total
		M1 SB Exit	A636 East	M1 NB Exit	A636 West	
M1 SB Exit	A	-	-	-	-	-
A636 East	B	-	-	-	-	-
M1 NB Exit	C	- 40	- 5,152	-	- 1,371	- 6,563
A636 West	D	- 5,232	-	- 805	-	- 6,037
		- 5,272	- 5,152	- 805	- 1,371	- 12,600

Appendix B. Journey Time Reliability Analysis

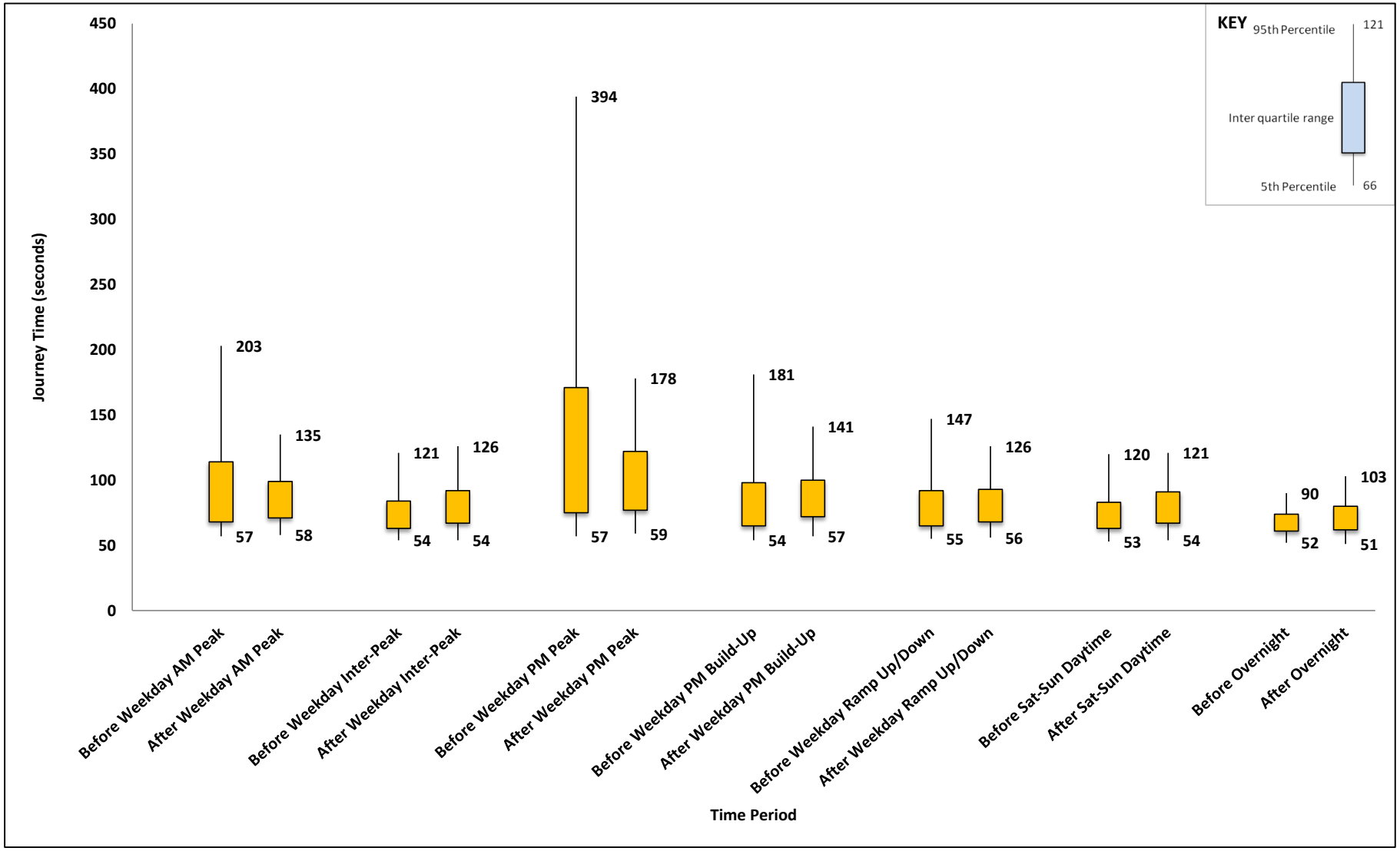
B.1. M1 Southbound Exit-Slip to A636 West



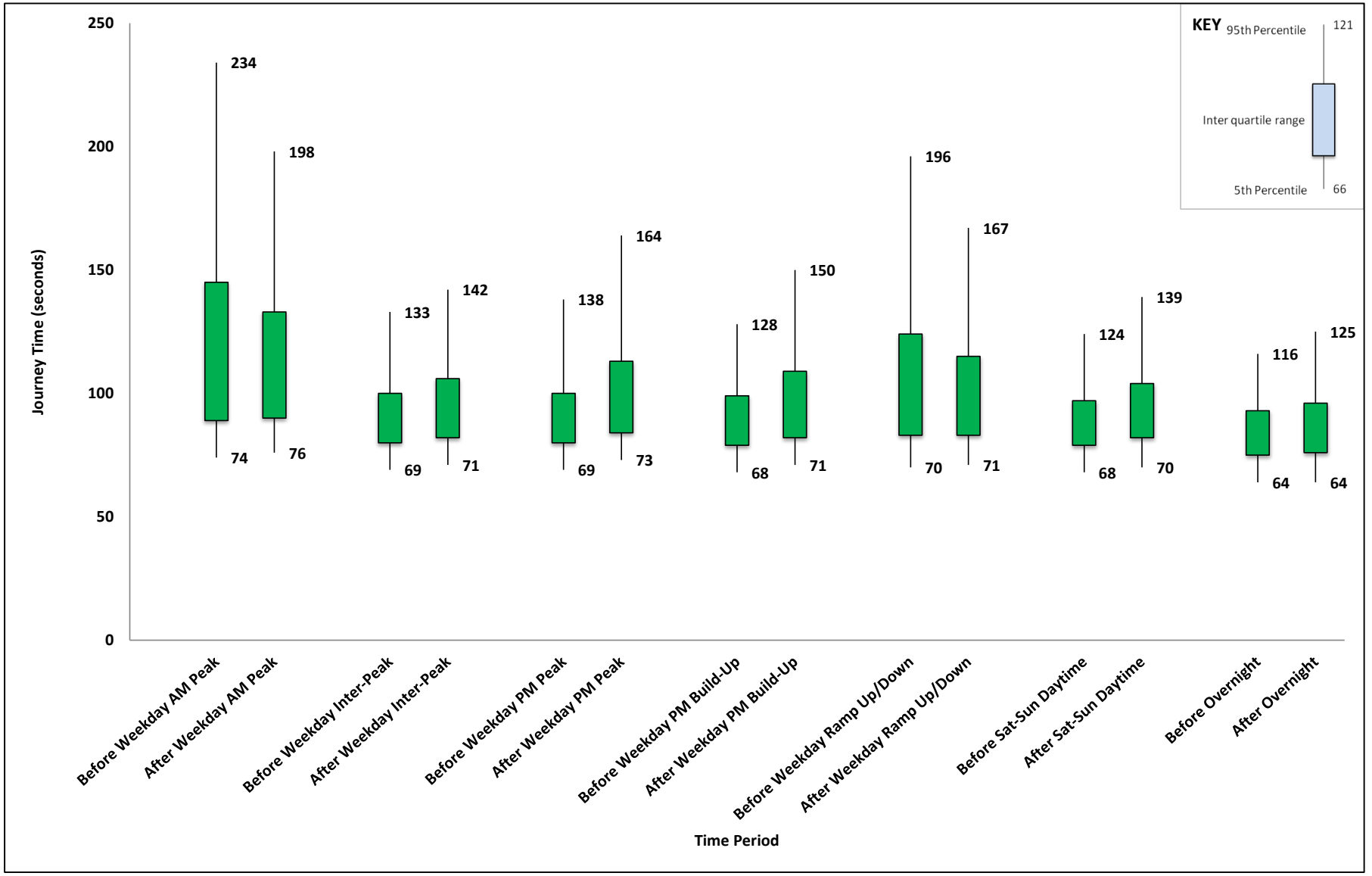
B.2. A636 East to M1 Northbound Entry



B.3. M1 Northbound Exit-Slip to A636 East



B.4. A636 West to M1 Southbound Entry



Appendix C. Appraisal Summary Table (AST)

	Sub-Objective	Key Points	Metrics	Assessment
ECONOMY	TEE (Business and Commuting Users)	Results developed from Traffic Modelling	Total hours saved (Business and Commuting Users) = Unknown	Travel Time & VOC PVB = £27.113M (Net of developer contributions)
	Reliability (Business and Commuting Users)	The benefits are the result of an increase in the capacity of overstaurated traffic lanes.The benefits	Not Applicable	DDV Large Beneficial, IRV Moderate Beneficial
	Regeneration	<impact not applicable>	<impact not applicable>	<impact not applicable>
	Journey Quality	<impact not applicable>	<impact not applicable>	<impact not applicable>
	Wider Impacts	<impact not applicable>	<impact not applicable>	<impact not applicable>
ENVIRONMENT	Noise	<impact not applicable>	<impact not applicable>	<impact not applicable>
	Air Quality	<impact not applicable>	<impact not applicable>	<impact not applicable>
	Greenhouse gases	<impact not applicable>	<impact not applicable>	<impact not applicable>
	Landscape	<impact not applicable>	<impact not applicable>	<impact not applicable>
	Townscape	<impact not applicable>	<impact not applicable>	<impact not applicable>
	Heritage of Historic Resources	<impact not applicable>	<impact not applicable>	<impact not applicable>
	Biodiversity	<impact not applicable>	<impact not applicable>	<impact not applicable>
	Water Environment	<impact not applicable>	<impact not applicable>	<impact not applicable>
SOCIETY	TEE (Other users)	Results developed from Traffic Modelling	Total hours saved (Other Users) = Unknown	Travel Time & VOC PVB = £18.779M
	Reliability (Other Users)	The benefits are the result of an increase in the capacity of overstaurated traffic lanes. The benefits	Not Applicable	DDV Large Beneficial, IRV Moderate Beneficial
	Physical Activity	<impact not applicable>	<impact not applicable>	<impact not applicable>
	Accidents	Project predicted to save 24% of accidents. Targeted at problems remedied by the improvement. 100%	121 accidents saved.	Accidents PVB = £4.400M
	Security	<impact not applicable>	<impact not applicable>	<impact not applicable>
	Access to Services	<impact not applicable>	<impact not applicable>	<impact not applicable>
	Affordability	<impact not applicable>	<impact not applicable>	<impact not applicable>
	Severance	<impact not applicable>	<impact not applicable>	<impact not applicable>
	Option Values	<impact not applicable>	<impact not applicable>	<impact not applicable>
PUBLIC ACCOUNTS	Transport Budget	None	Investment Cost PVC = £1.065M, Operating Cost PVC = £0.046M	Total Cost PVC = £1.111M
	Wider Public Finances	None	Tax Benefit PVB = £0.000M	Tax Benefit PVB = £0.000M

Appendix D. Evaluation Summary Table (EST)

	Sub-Objective	Key Points	Metrics	Assessment	Assess
ECONOMY	TEE (Business and Commuting Users)	N/A	Total hours saved (Business and Commuting Users) = Unknown	Net journey time increases across the scheme life = £1.7M	Beneficial
	Reliability (Business and Commuting Users)	IRV - the assessment is the result of the large reduction in accidents DDV - The adverse impact is as a result of an increase in overall journey times across the year	-	IRV - Large Beneficial, DDV - Slight Adverse	Neutral
	Regeneration	Not applicable as set out in the PAR 6 TAME ACO Guidance Note	N/A	Not applicable	Not Applicable
	Journey Quality	New lane designation markings / signalisation have reduced the fear of potential accidents. Benefits to journey times / reliability mean driver frustration is reduced	-	Not applicable	Beneficial
	Wider Impacts	Not applicable as set out in the PAR 6 TAME ACO Guidance Note	-	Not applicable	Not Applicable
ENVIRONMENT	Noise	Insufficient data available to undertake quantitative assessment.	-	Data suggests no change.	Neutral
	Air Quality	Insufficient data available to undertake quantitative assessment.	-	Data suggests no change.	Neutral
	Greenhouse gases	No change in the total distance travelled by traffic	-	Neutral	Neutral
	Landscape	Not applicable as the scheme is situate din an urban area.	-	Not applicable.	Not Applicable
	Townscape	Scheme within carriageway/verge, not within/adjacent to sensitive site, and include intrusive measures (traffic signals)	-	Neutral	Neutral
	Heritage of Historic Resources	Scheme does not impact on any archaeological or heritage site	-	Not applicable.	Not Applicable
	Biodiversity	Scheme does not impact on Biodiversity	-	Not applicable.	Not Applicable
	Water Environment	Scheme does not impact on Water Environment	-	Not applicable.	Not Applicable
SOCIETY	TEE (Other users)	N/A	Total hours saved (Business and Commuting Users) = Unknown	Net journey time increases across the scheme life = £1.7M	Beneficial
	Reliability (Other Users)	IRV - the assessment is the result of the large reduction in accidents DDV - The adverse impact is as a result of an increase in overall journey times across the year	-	IRV - Large Beneficial, DDV - Slight Adverse	Neutral
	Physical Activity	Slight Beneficial' rating due to installation of a controlled pedestrian crossing, with evidence of its use	Two cyclists and one pedestrian observed using the crossing during one hour visit	Slight Beneficial	Beneficial
	Accidents	The scheme has saved 5.0 PICs/annum	300 accidents saved	Accidents PVB = £10.6M	Beneficial
	Security	Scheme does not impact on Security	-	Neutral	Neutral
	Access to Services	Not applicable, as set out in the PAR Standard Impact Assessment page	-	Not applicable	Not Applicable
	Affordability	Scheme does not impact on Affordability	-	Neutral	Neutral
	Severance	Slight Beneficial' rating due to installation of a controlled pedestrian crossing, with evidence of its use	Two cyclists and one pedestrian observed using the crossing during one hour visit	Slight Beneficial	Beneficial
	Option Values	Not applicable, as set out in the PAR Standard Impact Assessment page	-	Not applicable	Not Applicable
PUBLIC ACCOUNTS	Transport Budget	PVC calculated within evaluation	Outturn Investment Cost = £0.694M, Operating Cost = £0.044M	Outturn PVC = £0.738M	Not Applicable
	Wider Public Finances	PVB for wider finances not calculated within evaluation	-	Not assessed	Not Applicable