national highways

A43 Abthorpe roundabout improvements

Five-year post-opening project evaluation

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Foreword

National Highways is the government-owned company that operates, maintains, and improves England's motorways and major A roads. Our roads help our customers get to their destination safely – and in the time they expect to. Road safety is, and will always be, our number one priority. We are committed to reducing the number of people killed or seriously injured on our roads.

As Chief Customer and Strategy Officer, I want to know that developments on our network are meeting their objectives and are putting the needs of our customers first. Post Opening Project Evaluations (POPEs) are a vital part of that assessment. POPEs are undertaken for all our major projects to understand how the project has influenced the safety and quality of road users' journeys, the local environment and the economy

We work to a five-year funding cycle, a radical new approach to road investment first introduced in 2015 which saw the government committing £15.2 billion in the period from 2015 to 2021. The A43 Abthorpe roundabout project was officially opened during this period, in March 2017.

The A43 Abthorpe roundabout experienced congestion, which was impacting the potential for investment in the area. Our improvements included widening the roundabout, enlarging the approaches and installation of traffic signals.

This report gives an indication of the project's performance in the fifth year of its operation. The project aimed to reduce congestion and increase capacity at the junction to accommodate anticipated future traffic growth, in addition to improving journey time reliability and safety for those using our network

The project has achieved its objective of increasing capacity and reducing congestion. Journey times have improved on the A43 southbound movement (morning peak) and the Brackley Road approach to the junction, where journey times nearly halved in the morning peak. Journey times for other routes and time periods are similar to the journey times before the project opened. Reliability improvements also demonstrated on A43 Northbound in evening peak. The reliability on other routes remained similar to before.

The safety objective was to improve road safety for all. We have not observed a reduction in the rate of collisions. However, we cannot be confident that this is the case due to the small project extent and number of collisions that occur over the project extent.

While the project is below the anticipated value for money, based on evidence from the first five years of operation, it is still expected to deliver a positive economic return on investment.

Elliot Shaw

Chief Customer and Strategy Officer

March 2025

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1. Executive summary

The A43 Abthorpe roundabout is situated to the west of Towcester and is located between the A43 Tove roundabout in the north and the A413 in the south. The project was designed to address the expected additional congestion, to provide additional capacity to cater for future traffic growth, and to unlock growth associated with developments in the area.

We installed traffic signals on the approaches of the A43, and on the Brackley Road approach. We also provided an additional lane on the A43 southbound approach and on the Brackley Road approach, and two extra lanes on the A43 northbound approach. The Wappenham Road approach was widened to include a flare, and we widened the roundabout circulatory from two lanes to three lanes.

The project has supported an increase in road users travelling through the A43 Abthorpe junction, with daily traffic volumes increasing by an average of 3% across the project. This is compared to background traffic growth of 5% in the East Midlands. The observed growth in traffic was generally lower than forecast in all time periods due to the impact of the COVID-19 pandemic.

The project has resulted in journey time improvements to the A43 southbound movement through the junction in the morning peak. We have also shown that a decrease in journey times occurred on the Brackley road approach to the junction, where journey times decreased in both peak periods, nearly halving in the morning peak. Journey times for other routes and time periods are similar to the journey times before the project opened.

The A43 southbound movement saw the largest improvements to reliability, in the morning peak. For this route, the longest journeys (the 95th percentile), reduced by over a minute. The reliability of other routes through the junction remained similar to before.

During the first five years of the project being open there were a total of 11 personal injury collisions, compared with eight before the project was constructed. Prior to the project, there was an annual average of 25 personal injury collisions per hundred million vehicle miles; this equates to traveling four million vehicle miles before a collision. After the implementation of the project, there was an increase to 48 personal injury collisions per hundred million vehicle miles, traveling two million vehicle miles before a personal injury collision occurs. The safety objective was to improve road safety for all, and we have not observed a reduction in the rate of collisions involving an injury. However, there is not enough data to determine whether the change is statistically significant or attributed to random variation, leading to uncertainty. Further analysis of the cause of collisions has not identified any underlying trends.

An evaluation of environmental impacts shows that the TAG environmental sub-objectives Landscape & Townscape, Heritage of Historic Resources, and Water Environment were ‘as expected’ compared to pre-project appraisal. Noise, Air Quality and Greenhouse Gases were evaluated as ‘likely as expected’ based on the limited information available. Biodiversity impacts were ‘worse than expected’ as more woodland habitat had been cleared than predicted and poor maintenance meant that no obvious biodiversity gain was noticeable.

Once a project has been operating for five years, the evaluation monitors the construction costs and trajectory of benefits as an estimate of the 60-year project

life value for money. The project was delivered at a cost of £7.98 million[1], which was higher than the anticipated cost of £4.95 million. This evaluation indicates that the project is on track to deliver a positive economic return on investment with the project likely achieving 'low' value for money once non-monetised impacts are considered.

[1] This is the PVC (present value cost) of the project. This means it is presented in 2010 market prices, discounted to 2010 to be comparable with the other monetary values presented.

2. Introduction

What is the project and what was it designed to achieve?

The A43 Abthorpe improvement project was a junction upgrade scheme. The key features of the project were:

- Installation of traffic signals on the approaches to Abthorpe roundabout from the A43 and Brackley Road.
- Provision of an additional lane on the A43 southbound approach increasing the capacity from two lanes to three lanes.
- Provision of two additional lanes on the A43 northbound approach, providing a four-lane approach.
- Widening of the circulatory carriageway from two to three lanes.
- Widening of Brackley Road approach to the roundabout from two to three lanes.
- Widening of Wappenham Road approach to the roundabout from one lane (without flare) to one lane with a flared approach.
- New sections of pedestrian / cycleway on Wappenham Road and a new footpath/ cycleway / equestrian route between the A43 and Green Lane to the southeast of the roundabout.
- Replacement of the existing Pegasus crossing on the A43 south approach arm with a new crossing and new signage.
- New signalised pedestrian crossing on Brackley Road between the A43 Abthorpe roundabout and the Brackley Road/Springfields/Belle Baulk/Greenview Drive roundabout.
- Installation of a noise barrier to the east of the roundabout parallel to the southbound approach to the roundabout.

Prior to construction, the roundabout experienced congestion problems, which was restricting development growth in the area. It was designed to improve capacity to cater for future traffic growth, as well as managing the flow of traffic being released from and towards Tove roundabout.

The project aimed to reduce congestion, improve journey times, improve safety and unlock growth in Towcester (immediately east of the roundabout). Without the project, these issues were expected to be exacerbated by predicted growth in traffic volumes.

South Towcester is identified as an area for development in the South Northamptonshire Local Plan. The are 3,000 planned new homes, with 2,750 currently confirmed in an outline planning application. Development of the site has started.

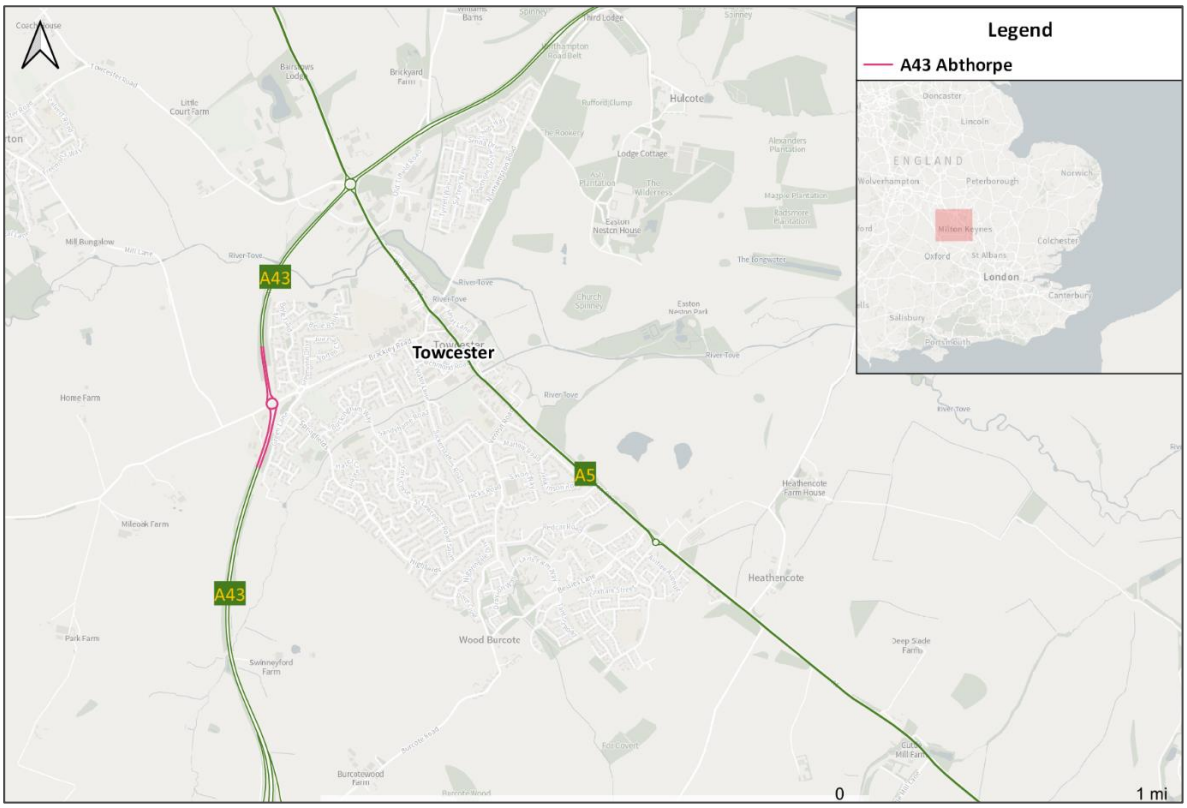
The A43 Abthorpe improvement projects began construction in February 2016 and was complete and opened to traffic in March 2017.

Project location

The A43 Abthorpe junction is situated to the west of Towcester, a historic town in West Northamptonshire in the East Midlands. It lies to south of Northampton on the A43 and north of Silverstone. North of the project the A43 intersects the A5 at Tove roundabout.

Figure 1 shows the location of the project. The A43 Abthorpe junction forms an intersection of the A43 (which provides a strategic connection between the M1 and m40 motorways) and the local road network; Brackley Road (which provides access to Towcester) and Wappenham Road (which provides access to the villages of Abthorpe and Wappenham).

Figure 1 Abthorpe Roundabout Project Location



Source: National Highways and OpenStreetMap contributors

How has the project been evaluated?

Post-opening project evaluations are carried out for major projects to validate the accuracy of expected project impacts which were agreed as part of the business case for investment. They seek to determine whether the expected project benefits are likely to be realised and are important for providing transparency and accountability for public expenditure, by assessing whether projects are on track to deliver value for money. They provide opportunities to learn and improve future project appraisals and business cases.

A post-opening project evaluation (POPE) compares changes in key impact areas[2] by observing trends on a route before a project is constructed (baseline) and tracking these after it had opened to traffic (outturn). The outturn impacts are evaluated against the expected impacts (presented in the forecasts made during

[2] Key impact areas include safety, journey reliability and environmental impacts.

the appraisal) to review the project's performance. For more details of the evaluation methods please refer to the POPE methodology manual on our website[3].

This report serves as a continuation of the one-year post-opening project evaluation (POPE) for the A43 Abthorpe Roundabout improvements. By examining the ongoing impacts of the improvements, this report seeks to provide an understanding of the project's long-term benefits and areas for further enhancement. Specifically, this report represents the five years after evaluation, building on the lessons learned from the one-year evaluation to help improve future highway projects.

[3] https://nationalhighways.co.uk/media/pq2jb142/pope-methodology-note-2024-v2.pdf

3. Delivering against objectives

How has the project performed against objectives?

All our major projects have specific objectives which are defined early in the business case when project options are being identified. The project's objectives primarily related to supporting the local economy, improving journey times and reliability, whilst also improving road safety.

These objectives are appraised to be realised over 60 years; a five-year evaluation provides an early indication of whether the project is on track to deliver the benefits. Table 1 summarises the project's performance against each of the objectives, using evidence gathered for this study.

Table 1 Objectives and evaluation summary – Abthorpe Roundabout

RIS Objective[4]	Project objective[5]	Five years evaluation
A network that supports the economy - It will evolve and adapt to meet the changing shape of the economy and housing developments	Allow local development and growth to take place (through futureproofing)	This objective is not assessed within our methodology. However, it is expected that the project has helped to unlock opportunities for growth as the signalisation has improved access to the SRN from Brackley Road and Wappenham Road which would support local development.
Improving safety for all - We want to improve the safety of those that use, work on and are affected by the network.	Improve Safety	We have not observed a reduction in the rate of collisions involving an injury. Due to the small data set, the evaluation outcomes may be due to random variations in collision numbers. Analysis of the cause of collisions has not identified any underlying trends.
Providing fast and reliable journeys - We want road users to have reliable journeys, with journey times on the network regularly matching that predicted.	Reduce congestion and improve journey times	The project provided increased capacity which enabled improvements in customers journey on the A43 southbound movement (morning peak) and the Brackley Road approach to the junction, where journey times nearly halved in the morning peak. Journey times for other routes and time periods are similar to the journey times before the project opened.

[4] During the first Road Investment Strategy (RIS) from 2015 to 2020, and subsequent RIS2 (2020-2025), universal objectives were created to ensure consistency.
[5] The objectives as part of the original business case when the investment decision was made for the project.

RIS Objective[4]	Project objective[5]	Five years evaluation
		The longest journeys on the A43 southbound movement in the morning reduced by over a minute indicating improved reliability. Reliability improvements also demonstrated on A43 Northbound in evening peak. The reliability on other routes remained similar to before.

4. Customer journeys

Summary

For our evaluation of traffic impacts, the baseline was May 2013 and September 2015 (before construction). For our five years after study, we have used data from March 2022 and September 2022. This avoids the periods directly impacted by COVID-19 lockdown restrictions (which were largely between March 2020 and December 2021).

Our analysis indicates that the project has supported an increase in road users travelling through the A43 Abthorpe junction, with daily traffic volumes using the junction increasing by an average of 3%.

Traffic volumes using the junction in the morning peak increased by an average of 10% and decreased by 2% in the evening peak. This is compared to background traffic growth of 5% in the East Midlands.

The observed growth in traffic was generally lower than forecast in all time periods. We think this is due to the impact of the COVID-19 pandemic upon traffic levels in the East Midlands region. The major A43 movements through the junction were between 13% to 38% lower than forecast in the business case for the project.

The project had an objective to improve journey time reliability and journey times. The project has resulted in journey time improvements to the A43 southbound movement through the junction in the morning peak. We have also shown that a decrease in journey times occurred on the Brackley road approach to the junction, where journey times decreased in both peak periods, nearly halving in the morning peak. Journey times for other routes and time periods are similar to the journey times before the project opened.

The A43 Southbound in the morning peak saw the largest changes in reliability, with 75% of journeys ranging from 3:18 minutes to 5:59 minutes with the scheme in place, compared to between 3:20 minutes and 6:34 minutes before; in addition, the longest journeys (the 95th percentile), reduced by over a minute. The reliability in other time periods and in both directions remained similar to before.

How have traffic levels changed?

The following sections examine how the traffic levels changed over the evaluation period and to what extent the forecast traffic levels were realised. We have compared these with the observed national, regional and local trends. We have also compared the observed and forecast traffic flows to understand to what extent the forecast flows were realised.

National and regional

To assess the impact of the project on traffic levels, it was useful to understand the changes within the context of national and regional traffic. To do this, we use annual statistics from the Department for Transport. The data is reported by local authority and road type, recording the total number of million vehicle kilometres travelled[6]. This data was used as a baseline, and we attribute any growth observed

[6] Motor vehicle traffic (vehicle kilometres) by region in Great Britain, annual from 1993 to 2021, Table TRA 8904, Department for Transport

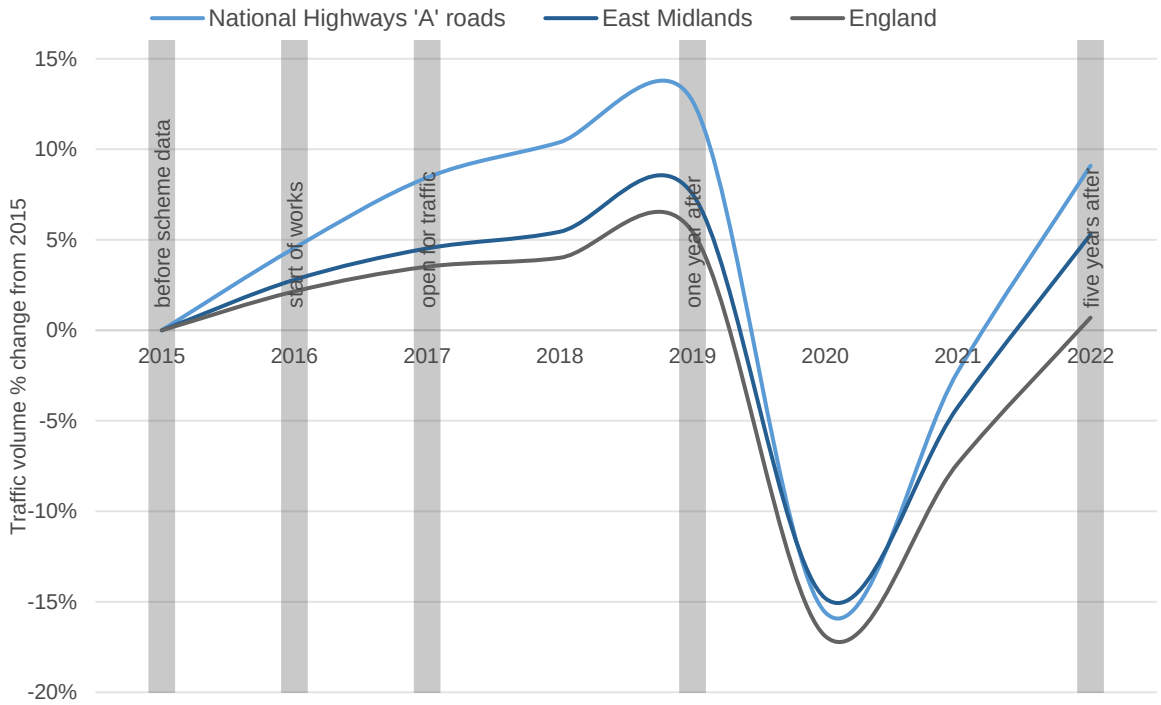
on roads in the project area which is above national and regional trends to the project.

Figure 2 shows the changes in traffic growth in England and the East Midlands between 2015 (before construction) to 2022 (five years after project opening).

Traffic increased by 5% between 2015 and 2022.[7] More widely, traffic grew by 1% and 9% in England and on National Highways 'A' Roads respectively during the same period. Averaging these two numbers gives background growth in the project area of 5% between 2014 and 2022.

The graph demonstrates the impact COVID-19 and related lockdown and travel restrictions had upon traffic levels in the UK from 2020. Post-pandemic (2022) traffic growth recovered but growth was lower than pre-pandemic levels.

Figure 2 Changes in national and regional background levels of traffic



Source: Department for Transport Road Traffic Statistics Table TRA8904.

How did traffic volumes change?

To show variation across the day, traffic volumes were analysed by comparing the average weekday traffic (AWT) data from a long-term traffic count on the A43 to the south of project. The data was compared before (September 2015), one year after (September 2019) and five years after (September 2022) project implementation.

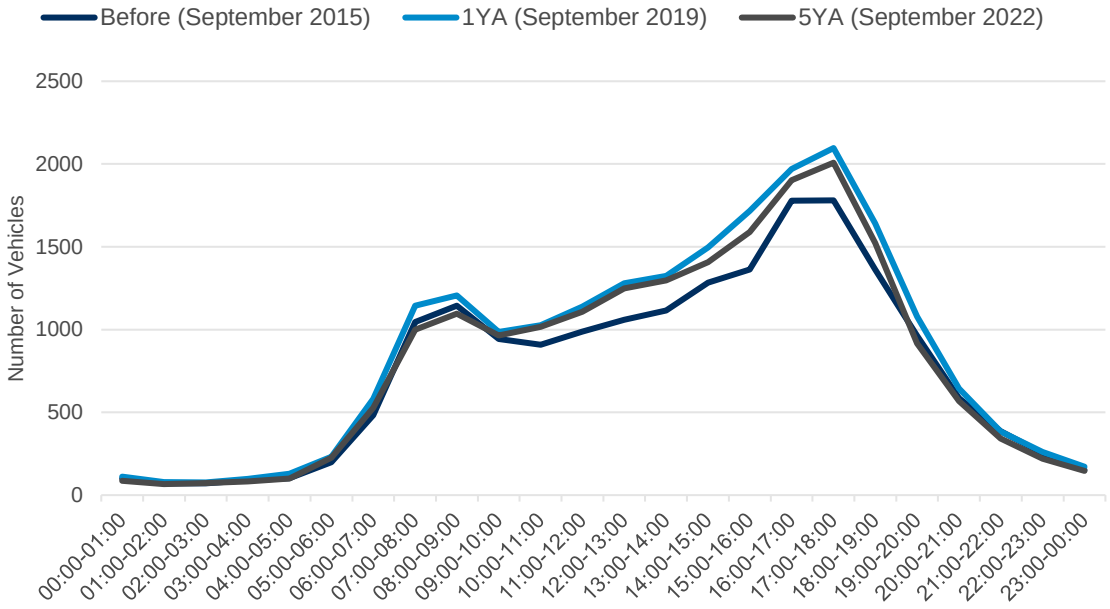
Figure 3 and Figure 4 demonstrates the tidal flow of traffic using the A43. The southbound direction had a peak in the morning and the northbound direction had a large peak in the evening.

[7] We collated the background changes in the levels of traffic nationally and regionally, and local to the project between 2013 and 2022 using the annual statistics for all observed traffic by local authority and road type produced by the Department for Transport (DfT). This data includes the total number of million vehicle kilometres (mvkm) travelled and allows us to contextualise the project within the wider picture. DfT Data Table TRA4112, TR0202, TRA8904 (Motor vehicle traffic (vehicle kilometres) by local authority in Great Britain, annual from 1993), https://www.gov.uk/government/statistical-data-sets/road-traffic-statistics-tra .

Our analysis showed that the average post-opening traffic levels have increased across the day in both directions. Both directions largely maintained a similar flow profile (i.e. there has been minimal shifting to non-peak periods).

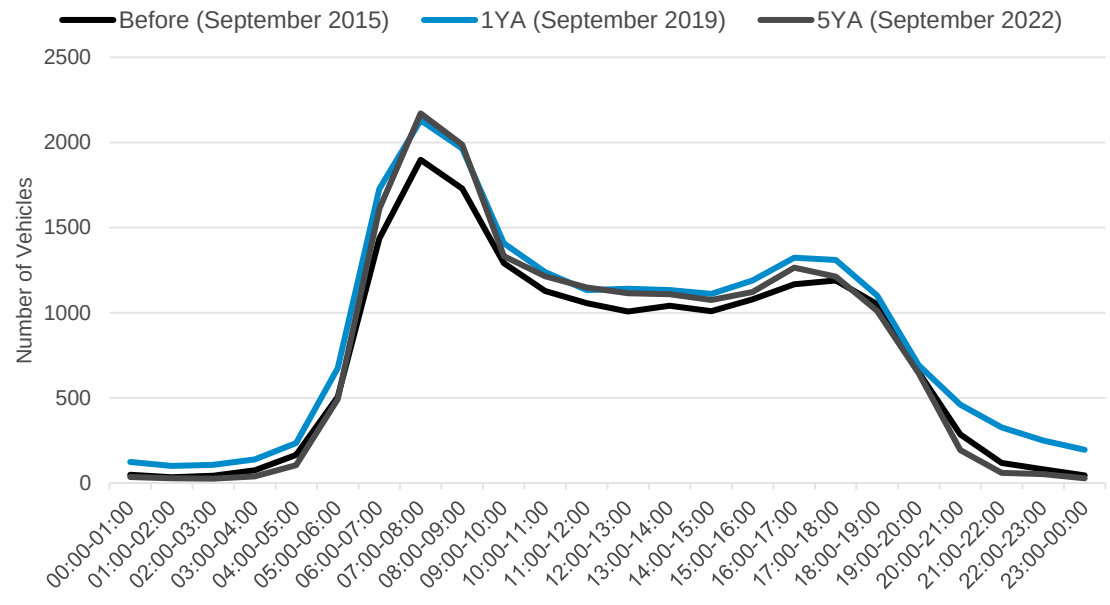
In the northbound direction, in the evening peak, there was an increase in traffic of 13% compared to the before period. This increase was above the background growth for the project. Similarly, in the southbound direction, traffic volumes on the A43 were 14% higher in the morning peak. The observed increases in peak periods were above the background growth for the project. The increase may be due to improvements to the roundabout or due to the housing developments in Towcester. suggests that the route is better able to accommodate peak traffic due to an increase in capacity.

Figure 3 Hourly weekday volume profile (northbound) - AWT



Source: National Highways (WebTRIS).

Figure 4 Hourly weekday volume profile (southbound) - AWT



Source: National Highways (WebTRIS).

We reviewed how trips used the A43 Abthorpe junction by collecting turning counts at the junction (see Figure 5).

Our observations revealed an increase in users from the A43 northbound approach (11% overall increase from before to five years after), particularly those heading north along the A43.

There was a decrease in trips entering the junction from the A43 southbound approach (5% overall reduction from before to five years after).

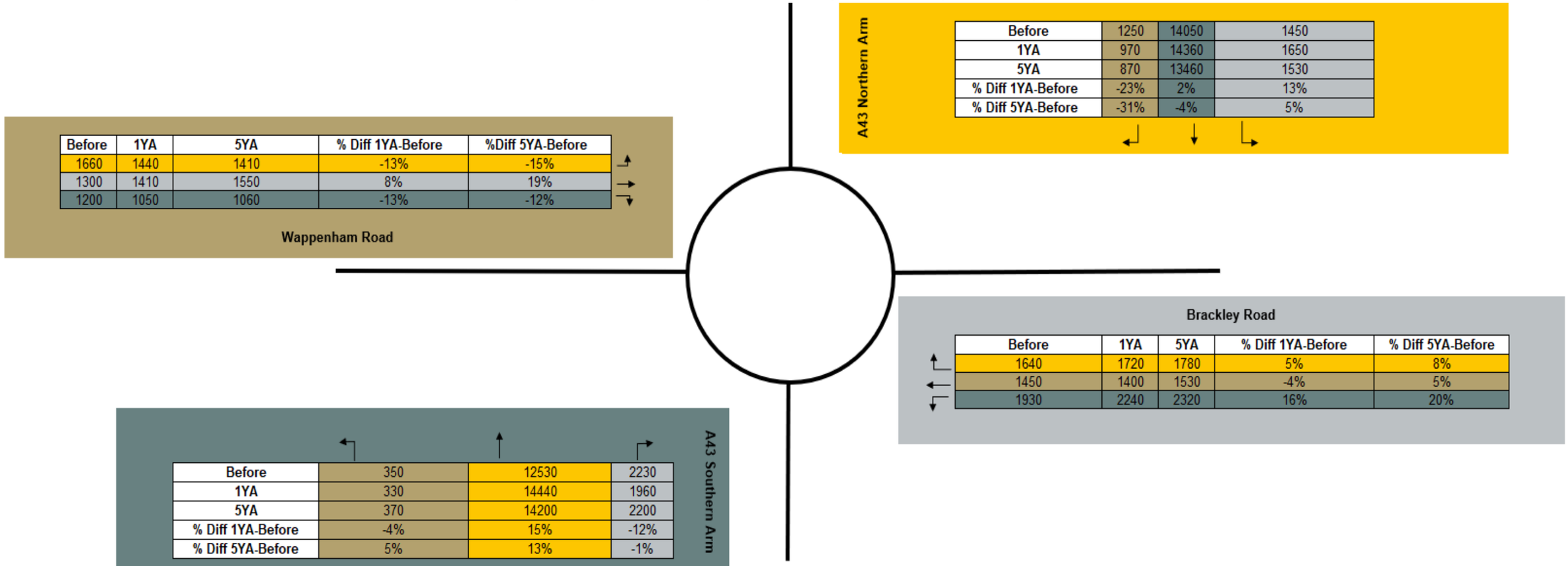
We found an overall 3% decrease in vehicles entering the junction from Wappenham Road and a 12% increase in vehicles entering the junction from Brackley Road. This has been summarised in Table 2.

Table 2 Changes in flow before and five years after (Percentage increase)

Approach Arm	Over 12 hours	Morning peak	Evening peak
A43 Southbound	-5.3%	12.0%	-20.8%
Wappenham Road	-3.3%	-9.8%	-3.6%
A43 Northbound	11.0%	2.0%	13.7%
Brackley Road	12.2%	40.5%	-4.7%

When comparing the change in traffic volumes passing through the A43 Abthorpe junction before and five years after opening, traffic volumes increased by an average of 3% across the day. Traffic volumes in the morning peak increased by 10% and decreased by 2% in the evening peak. The overall increase in traffic using the junction in both the peak periods and across the day, combined with the longer-term trend profiles indicates that the junction is better able to accommodate peak traffic owing to an increase in capacity at the A43 Abthorpe junction.

Figure 5 Comparison of turning counts at Abthorpe Roundabout (12-hour AWT)



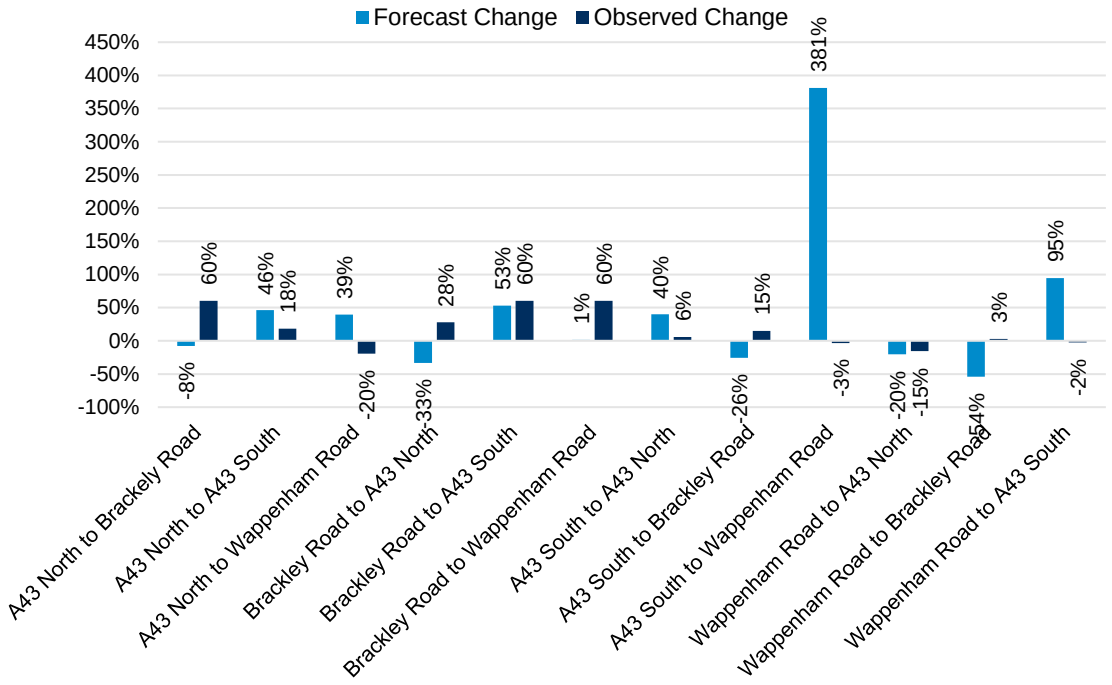
Source: Manual Classified Turning Counts, commissioned by National Highways, taken in September in 2013, 2019 and 2022, with 2013 counts factored up to 2015.

Was traffic growth as expected?

Prior to construction, traffic growth forecasts were developed to support the business case for the project. The forecasts calculated likely changes to traffic levels 'with' and 'without' the project. The forecast changes in traffic volumes are shown in Figure 6 and Figure 7. This compares the forecasts for 2015 'without' improvements and 2022 'with' improvements. The 2022 forecast was linearly interpolated from the 2016 and 2026 forecasts.

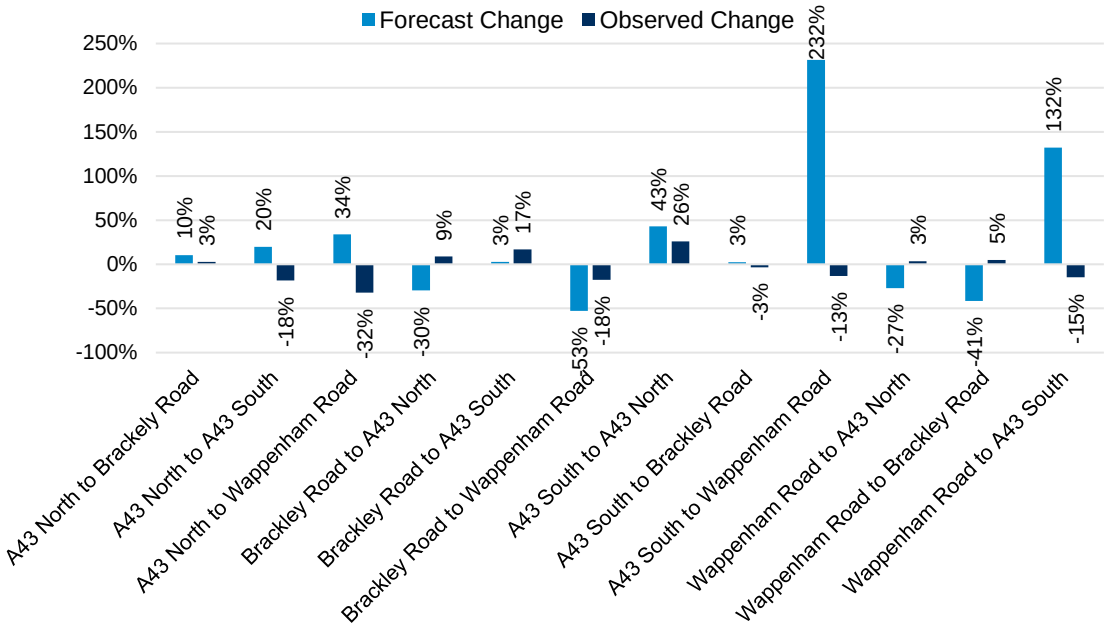
Figure 6 and Figure 7 compare the expected (forecast) change in traffic flows the project (light blue) to the observed growth (darker blue). The comparison is presented for each arm of the A43 Abthorpe roundabout for the morning and evening peak.

Figure 6 Forecast and observed growth between 2015 and 2022 (morning peak in vehicles)



Source: National Highways (A43 Abthorpe Option Testing Report and MCTC Traffic Data collected in May 2013)

Figure 7 Forecast vs observed growth between 2015 and 2022 (evening peak in vehicles)



Source: National Highways (A43 Abthorpe Option Testing Report and MCTC Traffic Data collected in May 2013)

The observed growth in traffic (dark blue) was generally lower than forecast flows in all time periods, indicating that actual growth in traffic was not as much as expected. We think this is due to the impact of the COVID-19 pandemic upon traffic levels in the East Midlands region (as demonstrated in Figure 2).

It is noted that modest changes on small numbers result in large percentage changes as demonstrated on some of the movements to and from the local road network.

The major movements through the junction are the A43 to A43 movements. In the morning peak, the observed A43 north to A43 south movement was 38% lower than forecast and the A43 south to A43 north movement was 13% lower than forecast.

In the evening peak, the observed A43 north to A43 south movement was 28% lower than forecast and the A43 south to A43 north movement was 34% lower than forecast.

Growth in traffic was higher than forecast on Brackley Road, in both directions and in both the morning and evening peaks. This is likely due to the new development to the south of Towcester.

Relieving congestion and making journeys more reliable

Analysis of journey times and speeds indicated the impact of the project on congestion. The extent to which journey times vary from the expected average journey time indicates how reliable a journey was.

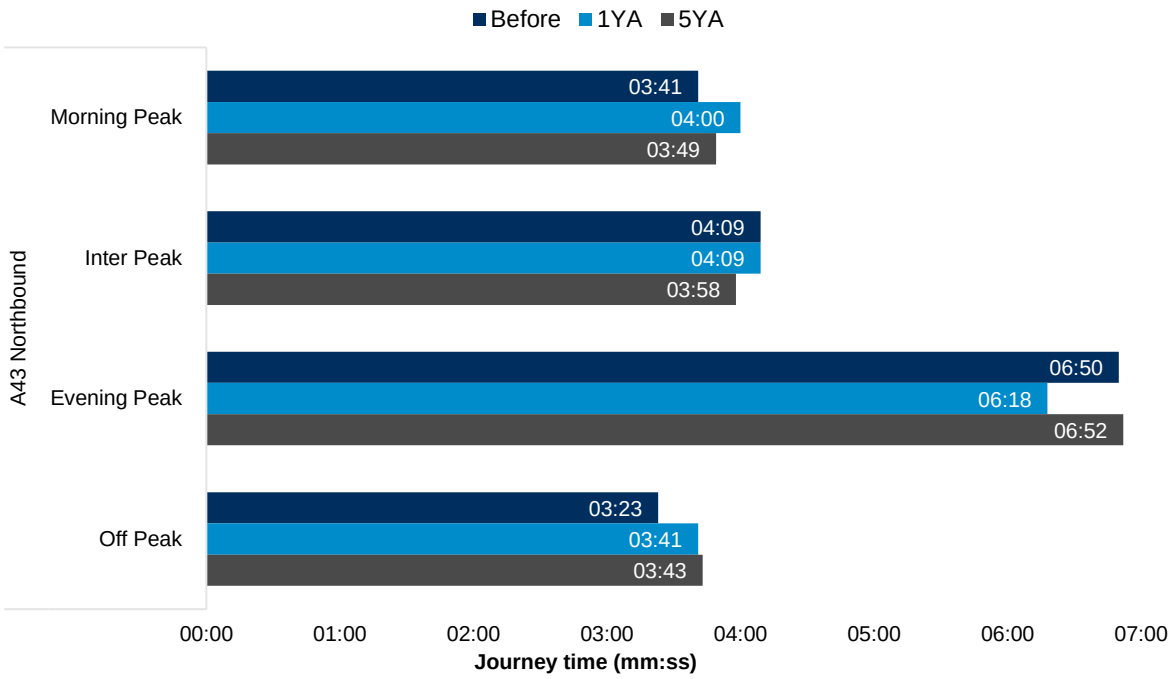
Did the project deliver journey time savings?

The project intended to remove bottlenecks at the A43 Abthorpe junction. Observed average journey times along the A43 (between south of Abthorpe junction to north of A43 Tove junction) are presented in Figure 8 and Figure 9.

Journey times along the A43 northbound are similar to the journey times before the project opened. However, southbound in the morning peak there was a reduction

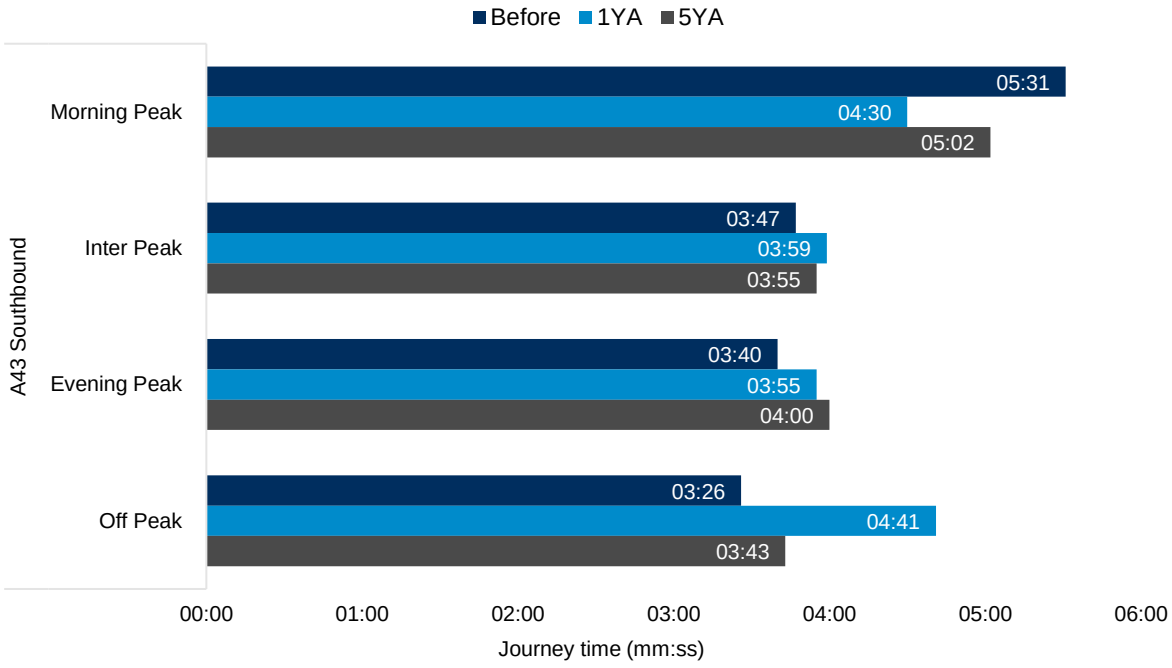
in journey times of nearly 30 seconds. There was an increase in journey times of around 20 seconds during the off-peak period both northbound and southbound. This was due to the introduction of traffic lights on the roundabout.

Figure 8 A43 Northbound from A43/A413 junction to A43/Northampton Road average observed journey times before and five years after project opening (mm:ss)



Source: TomTom Traffic Analytics (September 2015, September 2019, September 2022)

Figure 9 A43 Southbound from A43/Northampton Road junction to A43/A413 average observed journey times before and five years after project opening (mm:ss)

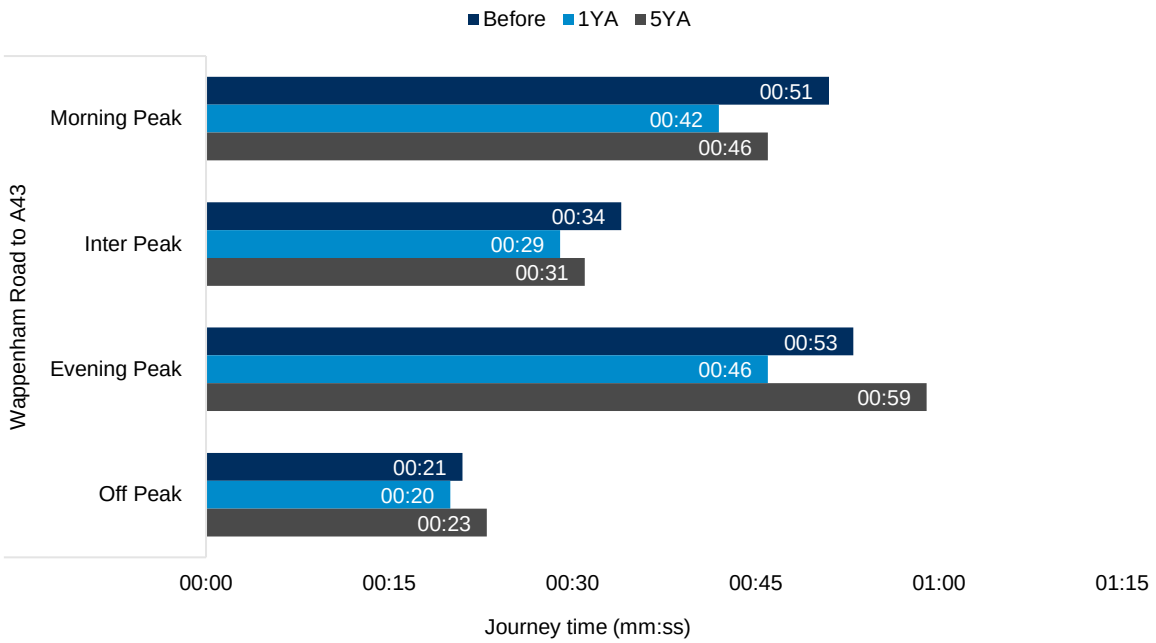


Source: TomTom Traffic Analytics (September 2015, September 2019, September 2022)

Observed average journey times along the local road approaches to the junction are presented in Figure 10 and Figure 11.

Wappenham Road saw some slight journey time improvements (Figure 10), likely due to the traffic light phasing, as a result of the project. However, journey times did not change substantially, with there being slight decreases in journey times in both the morning and interpeak periods, and slight increases in the evening and off-peak periods.

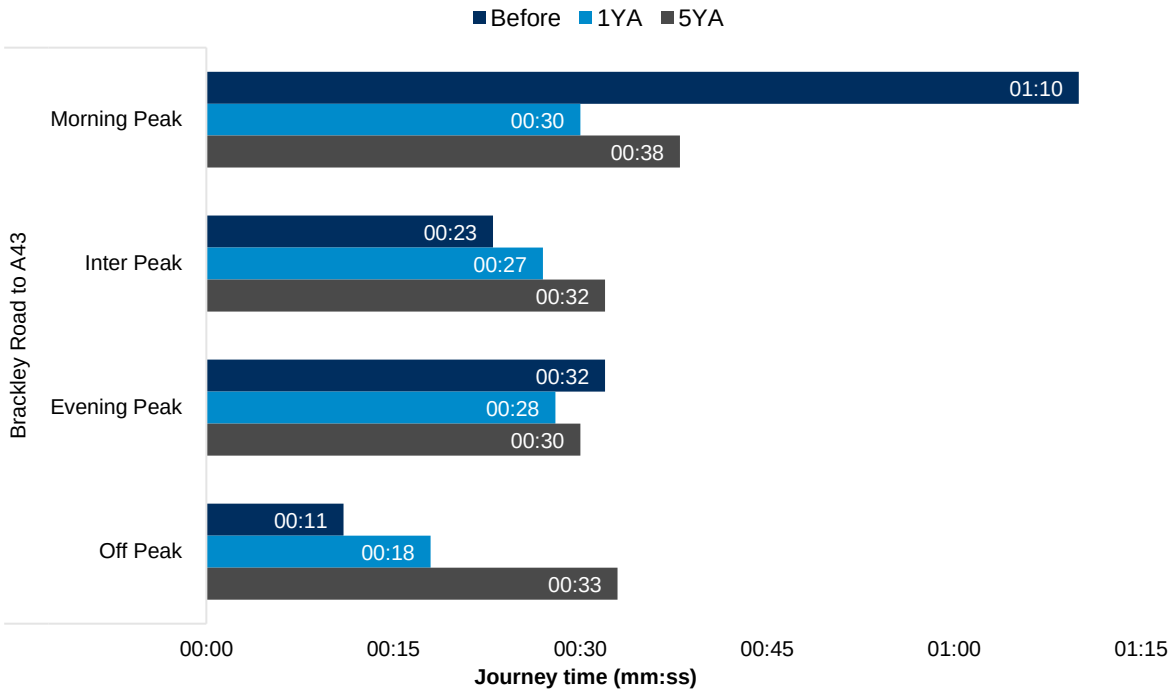
Figure 10 Wappenham Road to Abthorpe Roundabout average observed journey times before and five years after project opening (mm:ss)



Source: TomTom Traffic Analytics (September 2015, September 2019, September 2022)

There was a decrease in journey times in both peak periods on the Brackley road approach to the junction, nearly halving in the morning peak. This is attributed to the widening of the approach from two lanes to three lanes. Peak hour journey times were similar to those in the off-peak period prior to the project. Journey times increased in the off-peak period due to the introduction of traffic lights resulting in more consistent journey times throughout the day.

Figure 11 Brackley Road to Abthorpe Roundabout average observed journey times before and five years after project opening (mm:ss)



Source: TomTom Traffic Analytics (September 2015, September 2019, September 2022)

Were journey time savings in line with forecast?

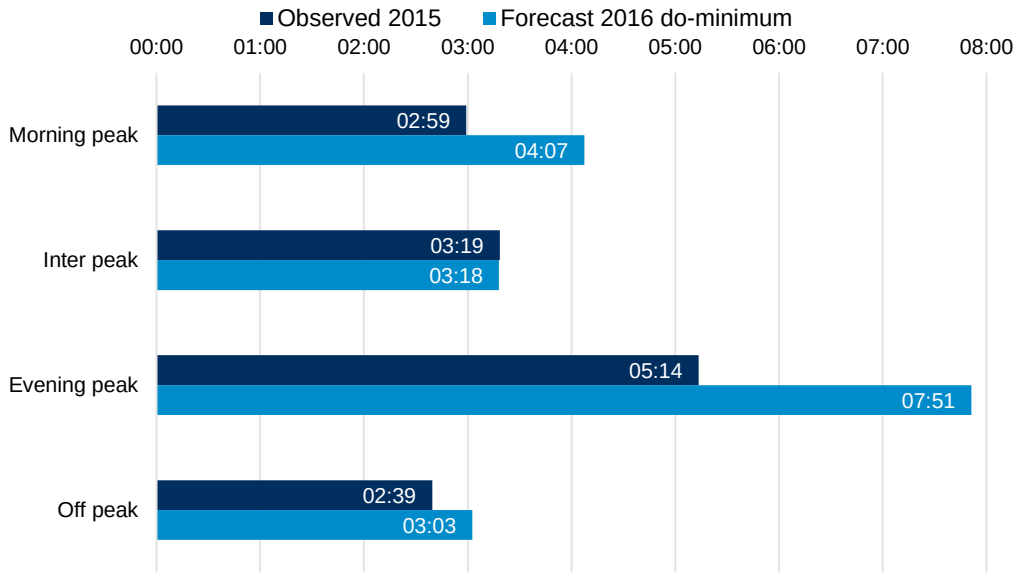
We aim to compare forecast journey times against observed journey times five years after opening. However, forecast journey times were only available from a 2016 “without project” (do-minimum) forecast[8].

Figure 12 and Figure 13 present the comparison of observed pre-project journey times with forecast journey times (without the project). In both time periods and directions, the forecast journey times were higher than observed. This indicates that the forecast overestimated journey times and that the level of delay observed at the junction was lower than forecast, particularly as modelled traffic volumes in 2015 were comparable with observed.

The largest overestimations were the evening peak northbound and morning peak southbound, with the morning peak southbound having an overestimation of over 5 minutes.

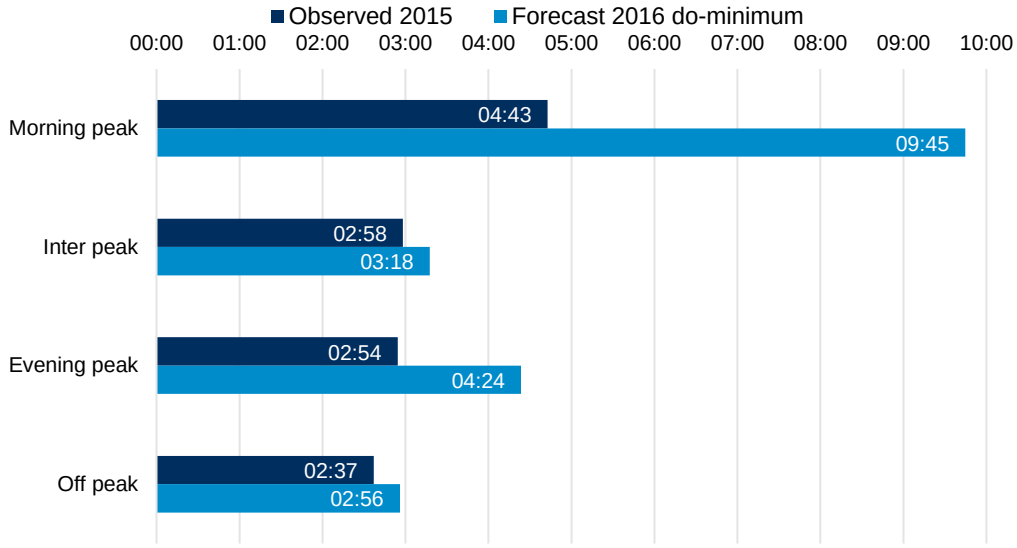
[8] As presented in the options assessment report.

Figure 12 Without project (do-minimum) vs observed before (2015) journey times (A43 NB)



Time periods: Morning peak (07:30-09:00); Interpeak (11:00-12:00); Evening peak (16:45-18:15); Off-peak (23:00-00:00).
Source: Traffic Forecasting Report & TomTom (September 2015).

Figure 13 Without project (do-minimum) vs observed before (2015) journey times (A43 SB)



Time periods: Morning peak (07:30-09:00); Interpeak (11:00-12:00); Evening peak (16:45-18:15); Off-peak (23:00-00:00).
Source: Traffic Forecasting Report & TomTom (September 2015).

How did the project impact road users' speeds?

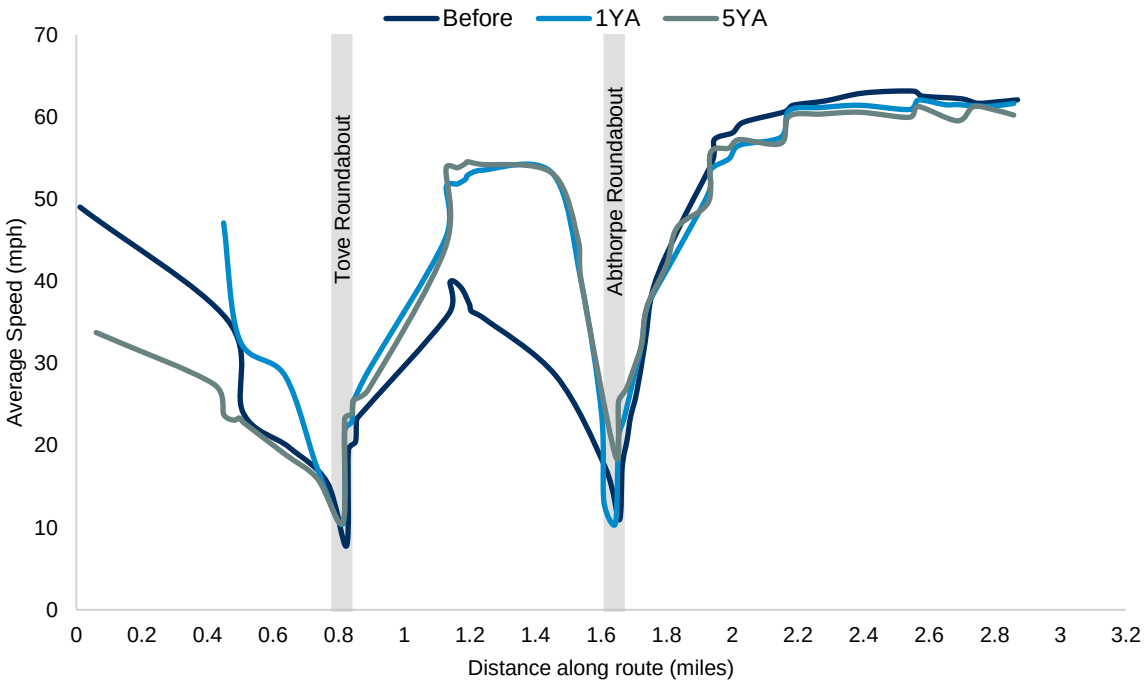
In combination with journey time analysis, analysis of vehicle speeds helped to determine the impact the project has had on congestion. Higher speeds would have suggested that there was less queuing along the route.

looking at motorists' speeds could help to determine the effect the junction improvement had on relieving congestion, even though the project was only over a small area.

Figure 14 shows the average journey speeds southbound in the morning peak. Average speeds on the A43 between Tove and Abthorpe have increased following the implementation of the project. This is likely due to the increased capacity of the Abthorpe junction and indicates that congestion on the southbound approach to the

junction is reduced. The northbound direction in the morning peak demonstrates similar trend, but of lower magnitude.

Figure 14 Southbound speed over distance before and five years after project opening during the morning peak (mph) [9]



Source: TomTom Satnav Data (September 2015, 2019, 2022)

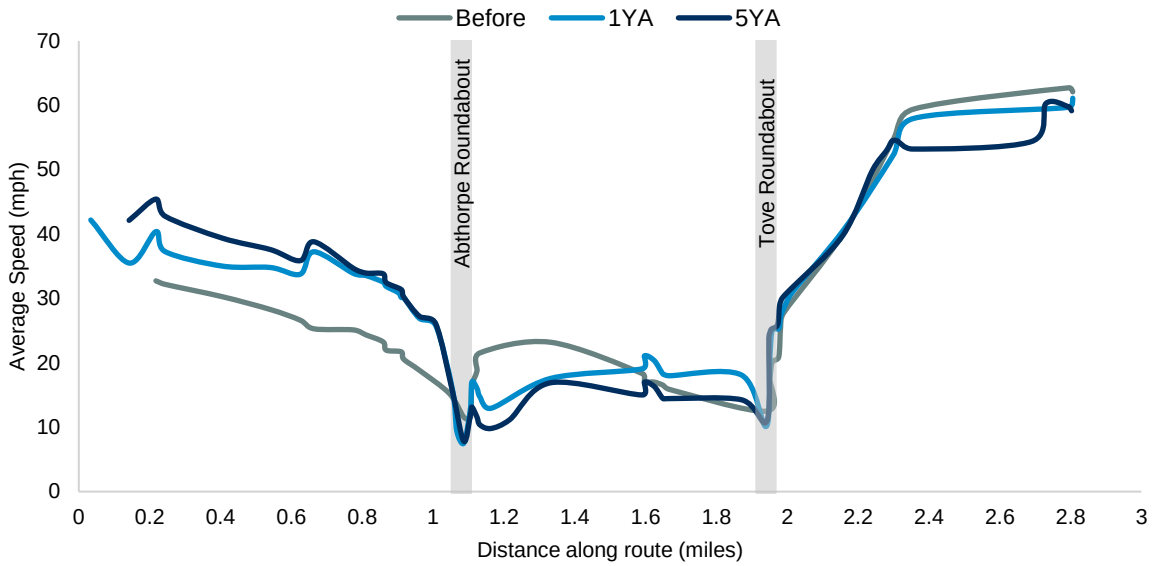
Figure 15 and Figure 16 show average journey speeds during the evening peak along the A43 northbound and southbound respectively.

Figure 15 shows an increase in average northbound speeds approaching the Abthorpe junction five years after opening. Between Abthorpe and Tove roundabouts, average speeds remain low, indicating delays on the northbound approach to Tove Roundabout in the evening peak.

In the southbound direction, average speeds did not change substantially, although there was a slight decrease in speed on the approach to Abthorpe.

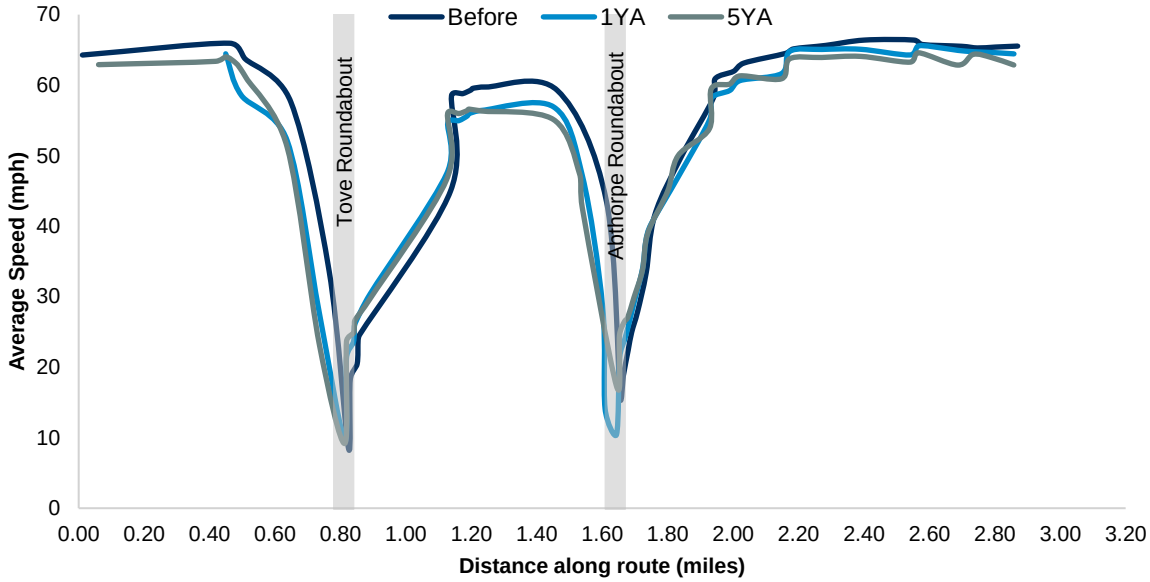
[9] the speed data does not exist along the whole route. For consistency with other parts of the report, we have kept the start point the same and shown the data from the point it starts along the route.

Figure 15 Northbound speed over distance before and five years after project opening during the evening peak (mph)



Source: TomTom Satnav Data (September 2015, 2019, 2022)

Figure 16 Southbound speed over distance before and five years after project opening during the evening peak (mph)



Source: TomTom Satnav Data (September 2015, 2019, 2022)

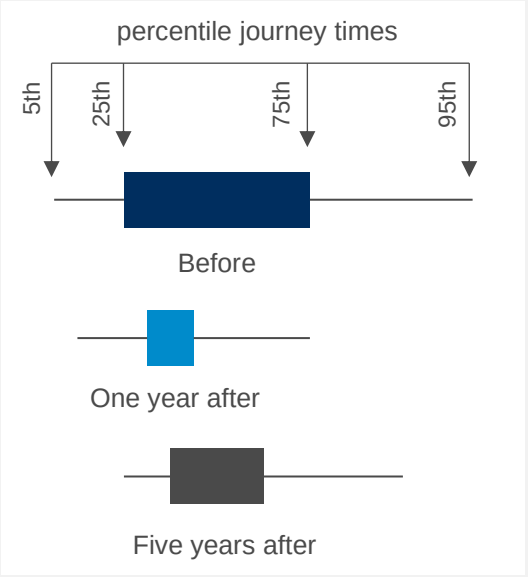
Did the project make journeys more reliable?

Congestion can make journey times unreliable. If the time taken to travel the same journey each day varies, journey times are unreliable, and the road user is less confident in planning how long their journey will take them. If journey times do not vary, the road user can be more confident in the time their journey will take and allow a smaller window of time to make that journey.

To measure journey time reliability, we examine how much journey times vary from the average journey time, on any day or time-period. Where journeys are less variable, road users can allow a smaller window of time to travel through the stretch of road, when travelling at a similar time.

Four metrics of the distribution of journey times for Abthorpe roundabout have been used and presented as box-and-whiskers diagrams for northbound and southbound journeys. An explanation of the metrics shown in the box-and-whiskers diagrams is provided in Figure 17.

Figure 17 Explanation of box-whisker plot



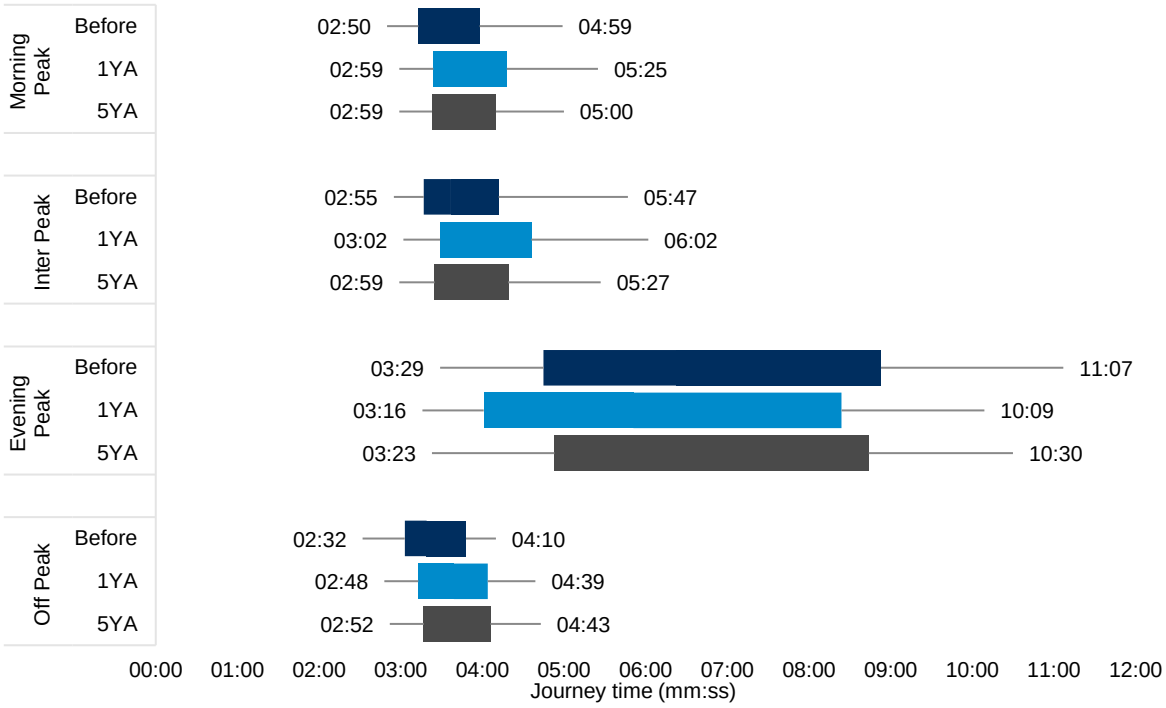
The lowest point is the 5th percentile, this means 5% of journeys take less than this to complete. The highest point is the 95th percentile, this means 95% of journeys take less time than this to complete. This shows the difference between the longest and the shortest journey times observed.

The length of the block shows how the journey times vary between the 25th and 75th percentile (25% and 75% of journeys). The shorter the block the less variable and hence more reliable a journey would be.

Figure 18 demonstrates there was not a large change in the northbound journey time reliability for any period. Northbound journey times were less unreliable in the evening peak period. This may be due to congestion that occurs at Tove roundabout, which regularly impacts Abthorpe roundabout.

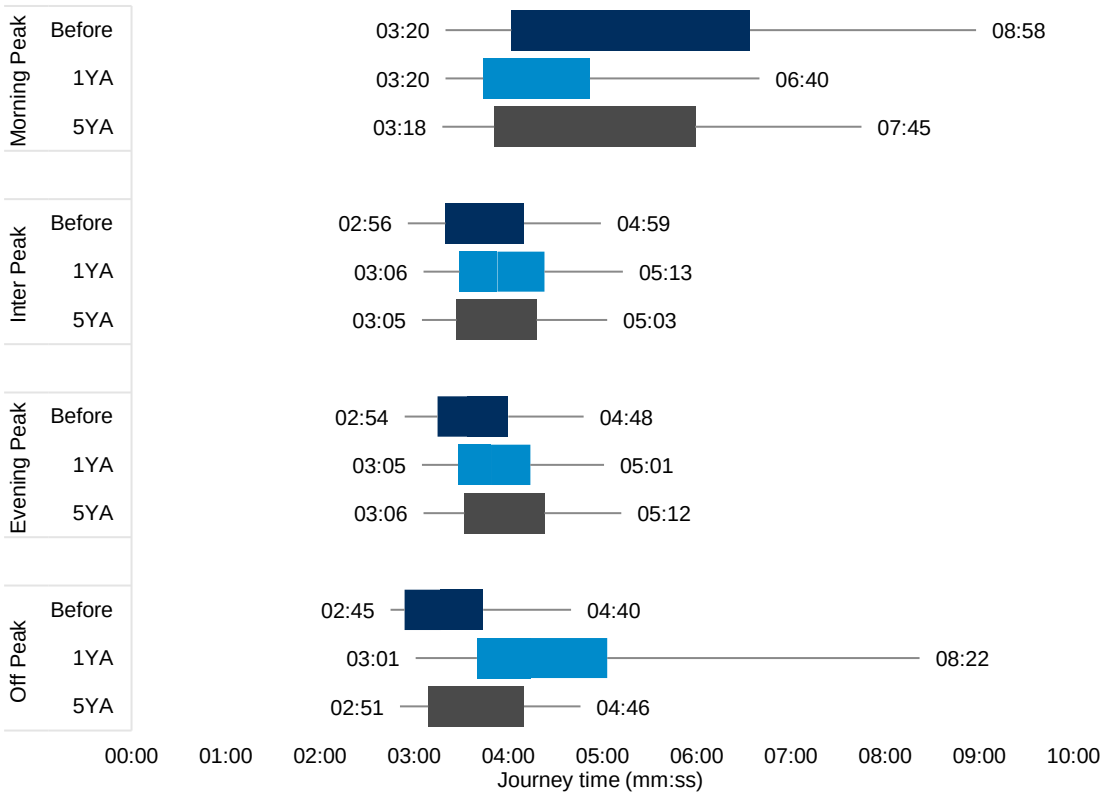
The A43 Southbound (Figure 19) in the morning peak saw the largest changes in reliability, with 75% of journeys ranging from 3:18 minutes to 5:59 minutes with the scheme in place, compared to between 3:20 minutes and 6:34 minutes before. In addition, the longest journeys (the 95th percentile), reduced by over a minute. The reliability in other time periods remained similar to before.

Figure 18 Journey time reliability (northbound) (time taken to drive through the project, mm:ss)



Source: Observed journey times from TomTom satnav data.

Figure 19 Journey time reliability (southbound) (time taken to drive through the project, mm:ss)



Source: Observed journey times from TomTom satnav data.

5. Safety Evaluation

Summary

The project's safety objective was to improve safety. The number of personal injury collisions[10] and the rate of these collisions per hundred million vehicle miles were analysed to track change over time.

There has not been a reduction in the rate and number of personal injury collisions along the project extent. This is based on comparing the first five years of the project being operational with the annual average for the five years before the project improvements.

During the first five years of the project being open there were a total of 11 personal injury collisions, compared with eight before the project was constructed.

The annual average rate of personal injury collisions per hundred million vehicle miles has not improved. The average collision rate increased to 48 personal injury collisions per annual hundred million vehicle miles. This equates to travelling two million vehicle miles before a personal injury collision occurs. Prior to the project, there was an annual average of 25 personal injury collisions per annual hundred million vehicle miles. This equates to traveling four million vehicle miles before a personal injury collision occurs.

The number of fatal collisions has not changed with a total of zero before and after the project became operational.

The number of Fatal and Weighted Injuries (FWI)[11] had slightly increased. Before the project there was an annual average of 0.06 FWI per year. After the project became operational, this had increased to 0.07 FWI per year. When accounting for the change in the number of road users over this period, there had been an increase from 0.9 FWI per hundred million vehicle miles travelled to 1.6.

Due to the modest extent of the project, and to align with the business case, analysis was restricted to the A43 mainline and the A43 Abthorpe roundabout. This results in a small sample size of collision data and meant that a counterfactual could not be produced.

Overall, we have not observed a reduction in the rate and number of collisions involving an injury and a neutral change to the impact on casualties. However, there is not enough data to determine whether the change is statistically significant or attributed to random variation, leading to too much uncertainty.

Safety study area

The safety study area for the Abthorpe roundabout is shown in pink in Figure 20. This area was assessed to check any potential implications of the intervention. This information was then used with other predictions around the potential impact of the project such as by how much traffic may grow. We have therefore replicated the appraisal study area to understand the emerging safety trends.

[10] A collision that involves at least one vehicle and results in an injury to at least one person

[11] The FWI weights Collisions based on their severity. A fatal collision is 1, a serious collision is 0.1 and a slight collision is 0.01. The combined measure is added up. A full number is the equivalent to a fatality.

Figure 20 Abthorpe Roundabout safety study area

Source: National Highways and OpenStreetMap contributors

What impact did the project have on road user safety?

Safety data was obtained from the Department for Transport[12]. This data records incidents on public roads that are reported to the police. This evaluation considers only collisions that resulted in personal injury.

The safety analysis was undertaken to assess changes over time looking at the trends in the five years before the project was operational to provide an annual average. We have then assessed the trends five years after.

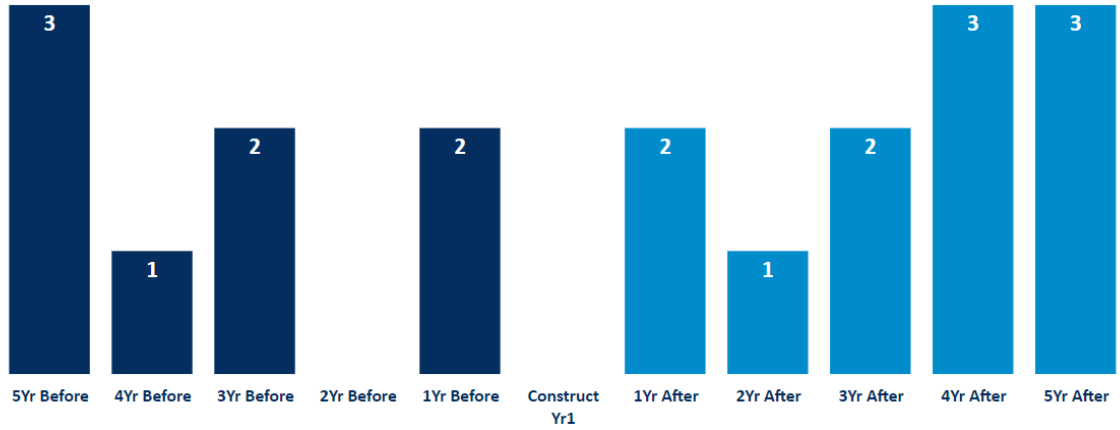
The analysis draws on the following data collection periods:

- Pre-construction: 15 February 2011- 14 February 2016.
- Construction: 15 February 2016 – 11 April 2017.
- Post-opening: 12 April 2017 – 11 April 2022. It should be noted that the final two years (2020/21 and 2021/22) were affected by COVID-19 and various lockdown restrictions.

The number of annual personal injury collisions is shown in Figure 21. The evaluation found the number of personal injury collisions within the project extent had increased. Over the five years after the project was operational, there were a total of 11 personal injury collisions. This is higher than the total of eight in the five years before construction commenced.

[12] https://data.gov.uk/dataset/cb7ae6f0-4be6-4935-9277-47e5ce24a11f/road-safety-data

Figure 21 Annual personal injury collisions for Abthorpe Roundabout



Source: STATS19 15 February 2011 – 11 April 2022

How have traffic volumes impacted collision rates?

It is important to contextualise the number of incidents with the volume of traffic. To do so a collision rate is calculated: the number of personal injury collisions per annual hundred million vehicle miles (hmvm).

The average collision rate after construction was 48 personal injury collisions per hmvm. This equates to travelling two million vehicle miles before seeing a collision.

Before the project the collision rate was 25 personal injury collisions per hundred million vehicle miles, this equates to traveling four million vehicle miles before seeing a collision.

What changes in the severity of collisions did we see?

Collisions that result in injury are recorded by severity as either fatal, serious, or slight. The way the police record the severity of road safety collisions changed within the timeframes of the evaluation, following the introduction of a standardised reporting tool – Collision Recording and Sharing. This is an injury-based reporting system, whereby the severity of an incident is categorised automatically by the most severe injury. This has led to some disparity when comparing trends with the previous reporting method, where severity was categorised by the attending police officer[13]. As a consequence, the Department for Transport has developed a severity adjustment methodology[14] to enable robust comparisons to be made, (more information on this can be found in Appendix A.1).

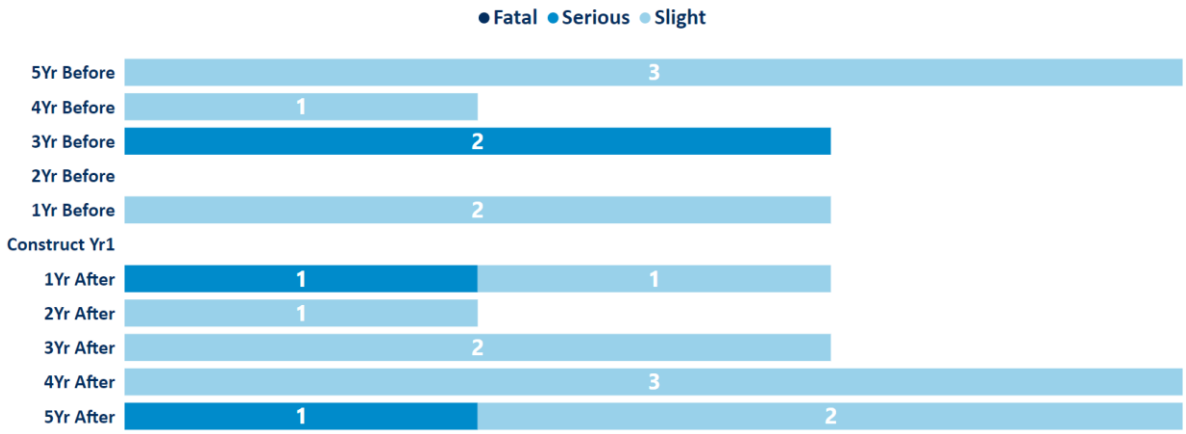
Northamptonshire policy constabulary have not converted to the injury-based reporting mechanism. The pre-conversion collision severity has not been adjusted.

Figure 22 shows the severity of personal injury collisions on Abthorpe roundabout. After the project was constructed, we have observed no change in collisions resulting in fatalities (the total before the project was zero, compared to zero after). We also have not observed a change in the number of collisions resulting in serious injuries (the annual average before and after the project was 0.4). There

[13] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/820588/severity-reporting-methodology-final-report.odt
[14] https://www.gov.uk/government/publications/guide-to-severity-adjustments-for-reported-road-casualty-statistics/guide-to-severity-adjustments-for-reported-road-casualties-great-britain#guidance-on-severity-adjustment-use

was an average of 0.6 more collisions resulting in slight injuries per year (the annual average before the project was 1.2, compared to 1.8 after).

Figure 22 Personal injury collisions by severity for Abthorpe Roundabout



Source: STATS19 15 February 2011 – 11 April 2022

Like other transport authorities across the UK, the key measure we use to assess the safety of roads is Fatal and Weighted Injuries (FWI). This gives a fatality 10 times the weight of a serious casualty, and a serious casualty 10 times the weight of a slight casualty. In effect, it takes all non-fatal injuries and adds them up using a weighting factor to give a total number of fatality equivalents. This is represented by an annual average and a rate that standardises casualty severities against flow to show the likelihood of a fatality equivalent occurring per distance travelled.

There has been a small increase in the FWI observed annually. The severity of casualties occurring after the project became operational has not reduced in the project area. An annual average of 0.06 FWI were observed before and an average of 0.07 FWI after. This is likely due to the small sample size of collisions collected.

There has been an increase in the rate of FWI per hmvm. Before the project an average of 0.9 FWI/hmvm was observed. This has increased to 1.5 FWI/hmvm after.

Is the project on track to achieve its safety objective?

The safety objective was to improve road safety for all and we have not observed a reduction in the rate of collisions involving an injury. However, due to the small data set, the evaluation outcomes may be due to random variations in collision numbers and needs further monitoring for the causes of the increase. Analysis of the cause of collisions has not identified an underlying trend for any increases.

There was no change to the annual average number collisions involving a fatal or serious injury, but a slight increase in the number of collisions resulting in slight injuries. The average number of personal injury collisions per year increased from 1.6 pre scheme construction to 2.2 post-scheme opening.

6. Environmental Evaluation

Summary

The environmental impacts of projects are assessed during the development of projects and consider the environmental sub-objectives within the DfT's Transport Analysis Guidance (TAG). The evaluation of environmental impacts compares the predicted impact from appraisal, as set out in the Appraisal Summary Table (AST), to observed impacts.

This five years after evaluation of environmental impacts used information on the predicted impacts gathered from the environmental appraisal and the environmental assessment report (EAR) and compared them with findings obtained five years after the project opened for traffic. Observed impacts were determined during a site visit in July 2022, supported by desktop research. The results of the evaluation are recorded against each of the TAG environmental sub-objectives.

The appraisal considered that due to the small scale of the project, there would not be any environmental impacts applicable to the decision to invest in the project. Impacts on the three society sub-objectives physical activity, severance, and journey quality were considered not applicable. An environmental assessment was however undertaken, and the impacts assessed have been considered in this evaluation.

Our five years after evaluation found that most of the impacts on the sub-objectives were confined to within the highway boundary and were 'as expected' by the assessment. However, the site visit found that landscape and ecology impacts were likely to be worse than expected at the five years after stage. But with mitigation observed during the site visit and recommended aftercare, the outcomes are likely to improve in the long term. This was because vegetation clearance within part the highway boundary was more extensive than predicted and new planting designed to minimise the impacts and improve biodiversity was being poorly maintained.

Due to a lack of 2022 forecast data against which to compare observations, quantitative noise and air quality assessments could not be done. Greenhouse gas emission evaluation also has been scoped out at this stage.

Noise

The environmental assessment predicted that in the short term, the majority of nearby residential properties would experience a negligible increase in noise. This would be caused by changes in traffic and by traffic being brought closer to properties due to junction expansion. Approximately four properties were predicted to experience minor but perceptible increases. In the longer term, the impacts would remain broadly the same. The assessment considered proposals for mitigation and concluded that as the road surface was already a low noise surface. A noise barrier was proposed to increase the number of properties experiencing a decrease in noise in both the short and long term. Overall, the assessment concluded that the project would not cause a significant impact and that the provision of a noise barrier would support the delivery of the aims of the

Government's Noise Policy Statement for England[15].The one year after evaluation visit confirmed that the noise barrier was in place on the northbound approach to the Abthorpe Roundabout and at Broadwater Lane with plastic reflective noise barriers and timber barriers located along the southbound approach and Broadwater Lanes respectively. Asset data confirmed that the A43 has a low noise surface. As only limited post opening traffic flow data was available for the project, it was not possible to fully evaluate the effects any changes in traffic flows may have had on the local noise climate. The five years after evaluation confirmed that the barriers were likely to be performing some auditory and screening functions.

Air Quality

The air quality assessment reported that the project would bring traffic closer to residential properties on Ouse Lane and Broadwater Lane. Traffic flows would increase along the A43 adjacent to these properties and daily average speeds would reduce. These changes in traffic would lead to increases in nitrogen dioxide (NO_2) at these properties. But these would not cause any new exceedances of UK annual mean NO_2 air quality standards[16]. The assessment concluded that the impacts would not be significant.

As only limited post-opening traffic flow data was available for the project, it was not possible to compare with any pre-constriction traffic data and thus, to evaluate the effects any changes in traffic flows may have had on local air quality. Based on local air quality monitoring at five years after, the project was unlikely to have an impact on local air quality.

It has not been possible to complete a quantitative assessment of air quality due to the absence of forecast traffic data.

Greenhouse Gases

It was not possible to evaluate greenhouse gas emissions as forecast traffic data is not available.

Landscape & Townscape

The environmental assessment reported that the project lies on the urban fringe providing a boundary between the residential areas of Towcester and rural areas beyond. There were no designated landscapes within the assessment study area and no direct impacts to the local townscape were expected. The assessment predicted that mature vegetation around the junction would need to be cleared to accommodate the project. This would open up new views of the project from nearby residential properties and also change distant views of the project from Grafton Way National Trail. However, new planting would be provided which was predicted to mitigate for the loss of mature vegetation over time. By the design year, it was predicted that the changes would be barely noticeable with impacts expected to be neutral.

Our one year after evaluation confirmed that the impacts of the project were confined to within the highway boundary and no impacts to townscape were likely to have occurred. However, the site visit identified that significantly more

[15] https://www.gov.uk/government/publications/noise-policy-statement-for-england
[16] https://uk-air.defra.gov.uk/air-pollution/uk-eu-limits

vegetation had been cleared adjacent to Green Lane than predicted in the assessment due to design changes during construction. There was also limited evidence of any recent aftercare maintenance which may affect the establishment of the new planting provided to minimise project impacts. As more vegetation was cleared than predicted, we considered that the outcome for landscape at one year after was worse than expected.

The five years after evaluation visit, along with the construction phase planting plan, confirmed that the roundabout is slightly more open with more infrastructure than before. With mitigation (replacement) in place, the effects of the project were likely to be as expected in the environmental assessment (and appraisal assuming a neutral score). However, the additional vegetation clearance means that overall, at the five years after stage, the impacts are worse than expected, though this may be improved by the design year.

Heritage of historic resource

The environmental assessment identified that there were no sites important for cultural heritage within the study area. The assessment suggested that there was the potential for buried archaeology associated with Towcester's Romano-British heritage to be present, but the risk was considered low as much of the project area had previously been disturbed. The assessment reported that the results of any geotechnical surveys would be shared with the archaeology planning advisory service of Northamptonshire County Council to ensure any buried archaeology was identified and appropriate mitigation implemented. Overall, no significant effects were predicted.

Our one year after evaluation confirmed that no known cultural heritage resources were affected by the project and no evidence was provided to suggest any buried archaeology was encountered. Our site visit identified that that the Towcester war memorial, which was not considered within the project assessment, is located within 100m of the project extent. However intervening vegetation means there was no inter-visibility and so no impacts were identified. Overall, the impacts of the project on heritage were determined to be as expected. The five years after evaluation confirms that the setting of the War Memorial was unlikely to be affected.

Biodiversity

The environmental assessment reported that vegetation clearance would be required to accommodate the project within the existing highways boundary. This would involve the loss of mixed woodland, scrub and semi-improved grasslands. No protected species were predicted to be affected. Replacement planting would be provided, and it was suggested by the project's project team that the new planting would provide a slight net gain in biodiversity.

Our one year after evaluation confirmed that the impacts were confined to the highway boundary and involved the loss of mixed woodland, scrub and semi-improved grasslands. However, our site visit identified that more vegetation clearance adjacent to Green Lane than predicted and we saw little evidence of recent aftercare maintenance. Many plots were overgrown and weeds including ragwort and dock weeds were common. Little evidence was found at one year after to suggest the new planting was providing a net gain in biodiversity. Overall, it was considered that the outcome at one year after was worse than expected.

The five years after evaluation confirmed that the impacts were broadly as expected. The proposed mitigation planting was implemented broadly as expected. However, more vegetation was lost than predicted. And many of the plots were overgrown with injurious weeds present. The net loss in soft estate would suggest a net loss is currently more likely. The maintenance regime will need to be improved if the design outcomes are to be achieved. Overall, based on the evidence gathered at the five years stage, the outcome was considered to be worse than expected. But mitigation planting was growing and likely to improve in the future.

Water Environment

The environmental assessment identified that the increase in impermeable area due to the extra lanes would cause an increase in the volume of routine surface water runoff. This could increase flood risk. Changes in traffic volumes could also impact the quality of the runoff and the risk of accidental spillage. The assessment considered these impacts and determined that including oversized pipes and hydrobrakes in the project drainage design would mitigate these impacts. Overall, the assessment predicted that the impacts would be neutral.

We reviewed the drainage asset data and observed drainage features visible from the surface during site visits at one year after and at five years after. Asset data on the environmental asset system confirmed that the pipework had been replaced and that the hydrobrake flow control devices had been installed. A formal drainage inspection was not undertaken but based on the evidence available the network appeared to have been installed as expected. We considered that the outcome at one year after was as expected.

The five years after evaluation found no evidence suggesting that the drainage system was likely to perform other than as expected. However, the drainage system requires regular monitoring and maintenance for it to continue to function as intended.

Summary

The results of the evaluation are summarised against each of the Transport Appraisal Guidance (TAG) environmental sub-objectives and presented in Table 3. We report the evaluation as expected if we believe that the observed impacts at five years after were as predicted in the appraisal. We report them as better or worse than expected if we feel the observed impacts were better or worse than expected. Finally, we report impacts as too soon to say if we feel that at five years after there was still insufficient evidence to draw firm conclusions.

Table 3 Summary of environmental findings

Sub-Objective	AST score	Five-year evaluation outcome	Evaluation Summary
Noise	Not significant	Likely to be as expected	Plastic reflective noise barriers and timber barriers located along the southbound approach at the back of the properties on Broadwater and Ouse lanes. A low noise surface is also in place. Overall, the barriers

Sub-Objective	AST score	Five-year evaluation outcome	Evaluation Summary
			were likely to be providing some noise reduction.
Air quality	Not significant	No likely significant impacts	Local air quality monitoring suggested that air quality levels are consistently below the 40 $\mu g/m^3$ threshold of NO_2 irrespective of the project. However, the latest records were unreliable due to the lower traffic volumes in 2021 due to COVID-19 pandemic.
Greenhouse gases	Not significant	Descoped	Descoped, due to limited data availability.
Landscape	Assumed to be Neutral	Worse than expected	The effects of the project were likely to be largely as expected by the design year (2026). The roundabout is slightly more open with more infrastructure, as expected. However, the net loss in vegetation due to the project means that overall, at five years after, post mitigation aftercare will be required to enable replacement planting to perform its intended function in the long-term.
Heritage of historic resource	Not applicable. Assumed to be neutral.	As expected	The project was unlikely to have any impact on heritage resources such as the Towcester War Memorial (a Grade II listed building).
Biodiversity	Slight beneficial	Worse than expected	The impact of the project on habitats was confined to within the highway boundary and broadly as expected. The proposed mitigation planting had been implemented but weeds were widespread. However more woodland habitat had been cleared than predicted i with biodiversity gain delayed until the replacement planting matures.
Water Environment	Not applicable. Assumed to be Neutral	As expected	The drainage system was likely to perform as expected. However, the drainage system requires regular monitoring and maintenance for it to continue to function as intended.

7. Value for Money

Summary

As part economic study for the Abthorpe roundabout improvement, a project appraisal report was created to determine the project's value for money. The assessment was based on an estimation of costs and benefits over a 60-year period.

The project was delivered at a cost of £7.98 million[17], which was higher than the anticipated cost of £4.95 million. The project increased the capacity of the roundabout by providing additional lanes and by signalising the junction.

This evaluation indicates that the project is on track to deliver a positive economic return on investment with the project likely achieving 'low' value for money once non-monetarised impacts are considered.

Forecast Value for Money

An economic assessment is undertaken prior to construction to determine a project's value for money and inform the business case. The assessment is based on an estimation of costs and benefits. The impacts of the project such as journey time savings, changes to user costs, safety impacts and some environmental impacts are able to be monetised. This is undertaken using standard values which are consistent across government. The positive and negative impacts over the life of the project are summed together and compared against the investment cost to produce a benefit-to-cost ratio (BCR). The monetised impacts are considered alongside additional impacts which are not able to be monetised to allocate the project a 'value for money' category.

The monetised benefits forecast by the appraisal which supported the A43 Abthorpe business case are set out in Table 4 and includes the percentage of total benefits each impact accounted for.

Only journey time benefits were forecasted by the appraisal.

Table 4 Monetised benefits of the project over 60 years (£ million)

	Forecast (£m)	% of forecast monetised benefits	Evaluation approach
Journey times	44	100%	Reforecast for the project area using observed traffic flow and journey time data
Total present value benefits	**44**	**100%**	

Note: 2010 prices discounted to 2010

[17] This is the PVC (present value cost) of the project. This means it is presented in 2010 market prices, discounted to 2010 to be comparable with the other monetary values presented.

Evaluation of Costs

The project was delivered at a cost of £7.98 million[18], which was higher than the anticipated cost of £4.95 million (see Table 5).

The appraisal expected that the project would result in an increase in maintenance costs over the life of the project. As the majority of this maintenance is still in the future, the evaluation uses the maintenance costs forecast within the A43 Abthorpe Roundabout Foundation Project Appraisal Report (PAR)[19].

Table 5 Cost of the project (£ million)

	Forecast (£m)	% of forecast costs	Evaluation approach
Construction costs	4.95	83%	Current estimate of project cost
Maintenance costs	1.04	17%	Not evaluated (assumed as forecast)
Total present value costs	**5.99**	**100%**	

Note: 2010 prices discounted to 2010.

Evaluation of monetised benefits

Once a project has been operating for five years, the evaluation monitors the construction costs and the trajectory of benefits to re-forecast these for the 60-year project life.

It is not proportionate to replicate modelling undertaken at the appraisal of a project or to monitor benefits over the entire lifecycle, so we take an assessment based on the trends observed over the first three years of operation and estimate the trend over the project life, based on these observations. This provides a useful indication and helps to identify opportunities for optimising benefits. In instances where it was not feasible to robustly compare forecast and observed impacts, the findings have been presented with relevant caveats.

Table 4 shows that forecast monetised benefits were wholly driven by forecasted reductions in journey times over the modelled period compared to a 'without project' scenario (what would be expected to happen if the project had not been constructed).

If the trends observed at the fifth year of operation continue over the 60-year period, the monetised impact on journey times, for those using the road, would be £11 million. This is lower than the £44 million forecast prior to project construction.

The lower re-forecast figure is to be expected based on the findings in Section 4 because:

- Observed growth in traffic was generally lower than forecast flows in all time periods, which is consistent with wider trends during and in the immediate years after COVID-19 and the associated lockdowns.

[18] This is the PVC (present value cost) of the project. This means it is presented in 2010 market prices, discounted to 2010 to be comparable with the other monetary values presented.
[19] Completed as part of this project appraisal in order to determine the value of the project on the economy and surrounding area in 2015.

- The level of observed delay at the junction was lower than predicted to happen without the project, meaning the level of congestion relief provided by the junction was less than expected.

Overall Value for Money

This evaluation indicates that the project is on track to deliver a positive economic return on investment with the project likely achieving 'low' value for money once non-monetarised impacts are considered.

The driver for the overall level of forecast benefits from this project was from a reduction to journey times. However, the business case forecast more traffic than was observed five years after opening due to the impact of COVID-19. In addition, improvements to journeys times were less than expected.

When considering an investment's value for money, we also consider benefits that we are not able to monetise. For this project, we have seen that there was less congestion southbound when leaving Tove roundabout, allowing for growth in Towcester and helping to unlock opportunities for growth. Furthermore, the increase in peak traffic volumes suggest more people can travel when they want to.

Therefore, with few non-monetised benefits to take into consideration, it is likely that this project will offer 'low' value for money, in comparison to the 'high' value for money originally forecast.

Appendix A

A.1 Incident reporting methodology

Police forces choose how they collect STATS19 data. Some police forces do this electronically, for example using mobile devices, while others complete paper forms which are later digitised. In addition, some collisions are reported by members of the public after the event. Since 2016, new data collection systems (called CRaSH and COPA) have been introduced by some police forces.

Before these new systems, reporting police officers categorised the severity of non-killed casualties as either serious or slight according to their own judgment of the injuries sustained. This was based on information available within a short time of the collision, and often did not reflect the results of medical examination. This sometimes led to casualties being incorrectly classified as slight injuries when they were serious, or vice versa.

In November 2015 Warwickshire police constabulary transferred from Stats19 to CRaSH (Collision Recording and Sharing) system for reporting personal injury collisions. In CRaSH reporting, police officers record the types of injuries suffered by the casualty rather than the severity. In previous systems the determination of severity was at the discretion of the reporting police officer. CRaSH automatically converted the injury type to a severity classification. This led to implications for reporting on collision severity as there had been an increase in the number of serious collisions recorded.

These changes make it difficult to monitor trends in the number of KSI casualties over time or between different police forces. To help with this, the Office for National Statistics (ONS) has undertaken research to identify methods of estimating and adjusting for the increased recording of serious injuries in the new systems. Based on this work, DfT have published an adjusted time series of KSIs at the national level and statistical adjustments at the record level. These adjustments are based on estimates of how casualty severities may have been recorded had injury-based severity reporting systems always been used.

The adjustments will be reviewed by the ONS and DfT as more data becomes available, and it is possible that further refinements will be made to the adjustment methodology in the future. Currently it is not possible to reliably adjust collision severity information at the granular level required for this project.

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