M25 junction 30/A13 Congestion Relieving Project

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. Safety is our top priority, and we are committed to reducing the number of road users killed or seriously injured on the strategic road network by 50% (from the 2005-2009 baseline) by the end of 2025.

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 drivers first. Post Opening Project Evaluations (POPEs) are a vital part of that assessment. POPEs are undertaken for all our major projects to understand how traffic changes, due to a project being in place, the environmental and safety impacts and how a project supports the economy.

We work to a five-year funding cycle, a 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 M25 junction 30/A13 corridor congestion relieving project was officially opened during this period, in March 2017.

The project was designed to improve journey time reliability, relieve congestion, and facilitate future land use change within the Thames Gateway area. The project included multiple upgrades within the current highway boundary.

After the first five years of its operation, we found that journey times have improved on the M25 mainline and from the M25 to the A13. There has been an increase in journey times on the A13 mainline, which can be attributed to the speed limit reduction from 70-50 mph as part of the safety improvements. The project has improved the journey time reliability for all major routes of the project.

The number and rate of personal injury collisions have seen an improvement, but within the level which could have been expected without the project. We have observed a reduction in the number and rate of collisions in the wider safety area of the project as forecasted.

Improvements to journey times, safety and journey reliability suggest the project is on track to deliver value for money.

Elliot Shaw

Chief Customer and Strategy Officer

September 2024

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1. Executive summary

The M25 and the A13 are important strategic road network (SRN) routes and the M25 Junction 30, also known as the Mar Dyke Interchange, forms a key intersection between the two routes. Historically, this junction and the surrounding sections of the M25 experienced heavy congestion throughout the peak periods and increasingly during the inter-peak periods. This resulted in lengthy delays and poor journey time reliability.

The project is located within the Thames Gateway, which is a major regeneration and development area stretching 43 miles east from inner East London on both sides of the River Thames and the Thames Estuary towards the Isle of Sheppey/Southend-on-Sea.

Traffic demand in the Thames Gateway area was projected to increase and congestion expected to intensify as a result of the proposed development and regeneration works. The M25 junction 30 was identified as a constraint to growth in the region.

The purpose of the M25 junction 30/A13 corridor congestion-relieving project was to improve journey time reliability, relieve congestion and facilitate future land use change within the Thames Gateway area. The project included multiple upgrades within the current highway boundary.

Upgrades to the junction included two new segregated left turn lanes between the M25 southbound to the A13 eastbound, and between the A13 eastbound to the M25 northbound.

The A13 was widened from three to four lanes in each direction between junction 30 and the A126 (to the east). To improve safety a permanent 50 miles per hour speed limit was also implemented along the A13 between the Wennington interchange (to the west of junction 30) and the A1089 interchange (to the east of junction 30).

This report presents the findings of the evaluation of the project after the first five years of its operation (2022).

Evidence suggested the project's provision of additional capacity had supported traffic growth (10%) above background trends for motorways in England and roads in the south east of England (8%). It had also contributed to reliability improvements on all the major movements assessed.

Road user journeys on the movements provided with a new dedicated left turn lane[1] were around 28 to 51 seconds faster. Their southbound journeys on the M25 mainline through junction 30 were around two and a half minutes faster in the morning and evening. In several instances road user journeys through the junction had increased.

The implementation of a lower 50 mph speed limit on the widened A13 had contributed to reliability and safety benefits for motorists, while slightly increasing their journey times on the A13 between junction 30 and the A126 (by between 16 to 35 seconds), and on some movements through the junction 30 itself.

[1] From the M25 north to the A13 east and from the A13 west to the M25 north.

Active benefits management and junction optimisation work was conducted by our Major Projects team in August 2021[2] which is expected to bring further improvements to road user journeys through junction 30.

Overall, we obtained a limited picture of the project's traffic impacts due to the small amount of traffic volume data available and results should be interpreted accordingly.[3]

The project was on track to achieve its objective to maintain and where possible improve safety. There were 13 fewer personal injury collisions (PICs) observed on the project extent in the five years after opening (31) than the annual average in the five years before the project's construction (44). Had the project not taken place, we estimate that the number of personal injury collisions would have ranged between 22 and 56.

The average collision rate has decreased to 34 PICs per hundred million vehicle miles – this equates to travelling almost three million vehicle miles before a collision occurs. Before the project, this figure was 47 PICs per hundred million vehicle miles. The decrease is 14 personal injury collisions per hundred million vehicle miles. Had the project not taken place the collision rate would likely have been 40 PICs per hundred million vehicle miles in the counterfactual period.

The change in number of personal injury collisions was different than forecast within the business case. The reduction of 13 personal injury collisions is higher than the forecasted saving of four collisions per year.

The project had environmental impacts broadly similar to those anticipated in the appraisal. However, the impact on a protected species of plant (broad-leaved cudweed) was worse than expected. As part of the project, a small number of these plants were individually translocated on the A13 verge. This was accompanied by the spread of topsoil which had potential to contain the plant's seed. Evidence from monitoring surveys following construction were unable to confirm the mitigation measures for this protected species had been successful.[4] One more monitoring survey was planned for 2022. However, no update is available regarding the outcome of this inspection.

[2] The work involved installing additional detection at stop lines and adjusting the timings of the signals. The signals have since been running on the adaptive traffic control system SCOOT (Split Cycle Offset Optimisation Technique). The work occurred after data collection for this evaluation was complete.

[3] We encountered several issues relating to the availability of traffic data, and the modelling and economics appraisal data which prevented a direct like-for-like comparison with the before and after observed data.

[4] Included within Annual Condition Inspection of Landscaping Works 2017, 2018 and 2019.

2. Introduction

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

The M25 junction 30/A13 Corridor Relieving Congestion Scheme (CRCS) opened in March 2017. It was designed to improve journey time reliability, relieve congestion, and facilitate future land use change in Thurrock and the Thames Gateway area.

The M25 and the A13 are important routes within the SRN and junction 30 forms a key intersection between these routes. Historically, this junction and the surrounding sections of the M25 experienced heavy congestion throughout the peak periods and increasingly during the inter-peak period. This resulted in lengthy delays and poor journey time reliability.

The Government's Sustainable Communities policy, published in 2003, identified the Thames Gateway area as a major regeneration opportunity. Development of the policy led to the Thames Gateway Delivery Plan (TGDP)[5] in November 2007 which set the target of providing 160,000 new homes and 225,000 new jobs in the region by 2016. The TGDP also recognised that the M25 junction 30 was identified as a constraint to growth for the Thames Gateway.

Traffic in the Thames Gateway area was projected to increase, and congestion expected to intensify because of the proposed development and regeneration works. The increase in traffic volume and associated congestion was anticipated to cause problems on the surrounding highway network and threaten the economic benefits predicted to result from the development and regeneration works. The M25 junction 30/A13 corridor congestion-relieving project was therefore developed to improve journey time reliability, relieve congestion, and support future land use change within this area.

The upgrades to the junction (see Figure 1) occurred within the highways boundary and included:

- online widening on the A13 in both directions between junction 30 and the A126 (3 to 4 lanes)
- improvements to the junction 30 slip roads
- additional lane capacity and upgraded traffic signals on the gyratory roundabout
- introduction of dedicated left-turn lanes from the A13 to the M25 northbound and M25 southbound to the A13 eastbound, and
- permanent 50 mph speed limit on the A13 between Wennington and the A126 junction to improve safety.

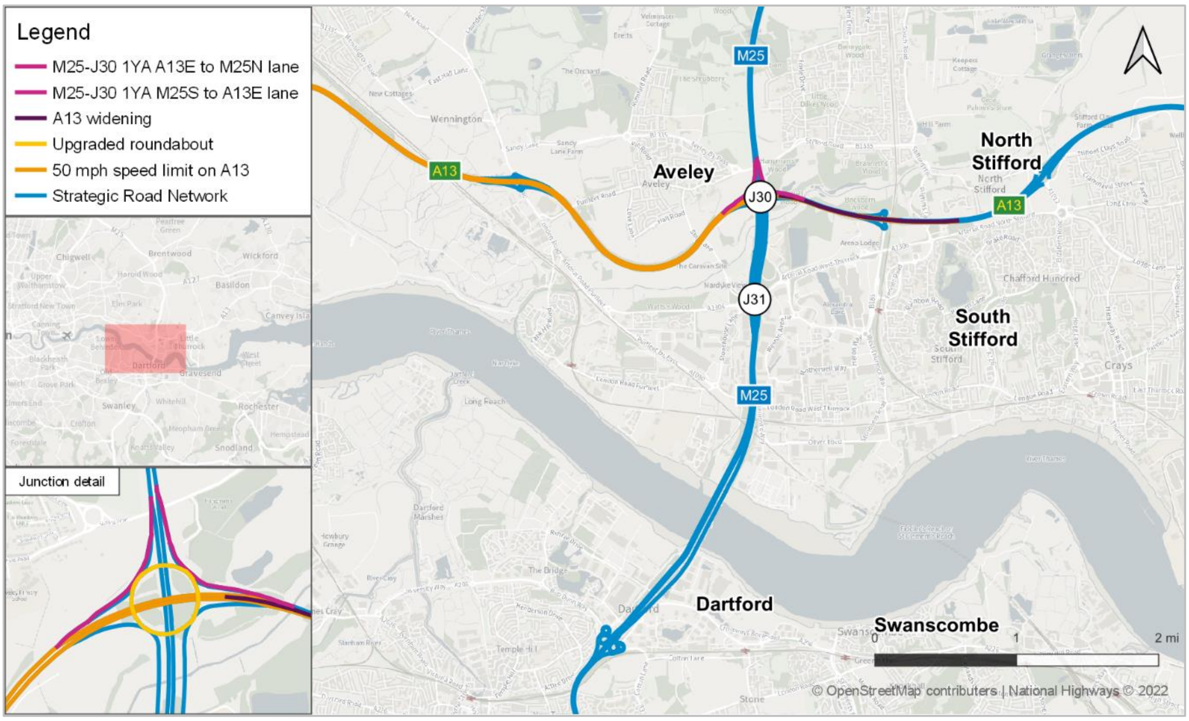
Project construction began in February 2015. It was fully opened in March 2017.

[5] https://www.thenbs.com/PublicationIndex/documents/details?DocId=284708

Project location

Junction 30 of the M25, also known as the Mar Dyke Interchange, is located less than a mile to the east of the small town of Aveley within the Unitary Authority of Thurrock. The junction is positioned on the eastern side of the M25 on the border with east London and is just over two miles north of the River Thames, as shown in Figure 1. It operates as a 'three-level stacked roundabout', and historically it has been a busy intersection, connecting the M25 motorway with the A13 trunk road, a major arterial route into London.

Figure 1 M25 junction 30 location



Source: National Highways and Open Streetmap.

The M25 and the A13 are important routes with vital roles in supporting the regional, sub-regional and local economies. Together, they serve a range of commercial interests and local communities in Thurrock, South Essex and beyond, including the Port of Tilbury and Lakeside Shopping Centre.

The M25 is a strategic orbital road in southeast England surrounding London and plays a pivotal role in our network. It is a vital route for freight, commuter, and tourist traffic. It is of local, regional, national, and international importance, forming part of the E30 route on the European E-road network. By linking with the M2 and M20, it also provides a gateway to and from the continent via the Eurotunnel, Port of Dover, and Heathrow Airport. High vehicle demand on the M25 can place pressure on the road network and lead to congestion and unpredictable journey times, particularly during peak hours.

The A13 starts at Aldgate in the City of London and runs around 40 miles east to Southend-on-Sea in Essex. Part of it is designated as a trunk road.[6]

[6] Around 6 miles of this route between the A1306 Wennington junction (west of M25 Junction 30) and the Baker Street Interchange with the A1089 (to the east of M25 Junction 30). A length of around 4 miles of the A1089 connecting the A13 at Baker Street Interchange to the Port of Tilbury (to the south) is also part of the strategic road network.

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 also provide opportunities to learn and improve future project appraisals and business cases.

A post-opening project evaluation compares changes in key impact areas[7] by observing trends on a route before a project is constructed (baseline) and tracking these after it has opened to traffic. The outturn impacts are evaluated against the expected impacts (presented in the forecasts made during the appraisal) to review the project's performance. For more details of the evaluation methods used in this study please refer to the post-opening project evaluation (POPE) methodology manual on our website.[8]

[7] Key impact areas include safety, journey reliability and environmental impacts.
[8] https://nationalhighways.co.uk/media/exypgk11/pope-methodology-note-jan-2022.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 had seven key objectives, primarily related to improving journey times, maintaining safety for road users, and supporting wider government transport policy.

These objectives are appraised to be realised over 60 years. The evaluation provides early indication if 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

Objective	Five-year evaluation
To improve highway infrastructure regarding access to ports of Tilbury and London Gateway.	Access to the ports of Tilbury and London Gateway had improved. Overall, the project had improved journey times and reliability.
To relieve congestion and improve resilience in the network on the strategic highway network and local highway network.	The project had improved reliability and relieved congestion on the strategic highway network. We were unable to confirm results of the local highway network.
Implement measures to enhance existing capacity.	Additional capacity on the A13 and the new dedicated left turn lanes had enhanced capacity.
To improve journey time reliability.	The project had improved journey time reliability on major movements of the project such as the A13 and the new dedicated left turns.
To maintain and where possible improve safety.	There has been a reduction in the number, rate and severity of personal injury collisions on the project extent and wider safety area. The project has met its objective.
To improve highway infrastructure to facilitate economic and housing growth in Thames Gateway Thurrock.	Highway infrastructure has been improved through multiple upgrades as part of the CRCS. The link to economic and housing growth in Thames Gateway Thurrock was not within the scope of this evaluation.
To minimise the environmental impact, enhancing the environment where appropriate	There was minimal landscape character change as the M25 junction 30 was already prominent, and the works were largely online. Landscape and ecology mitigations were undertaken and likely to perform as expected. The only exception was Broad-leaved cudweed where the translocation had been unsuccessful.

4. Customer journeys

Summary

At five years after, the project had improved access to Tilbury and London Gateway through improved journey times and more reliable journeys. The additional capacity provided through the project improvements had accommodated traffic growth (10%) above background trends for motorways in England (7%).

The journey times on the movements provided with a new dedicated left turn[9] were around 28 to 51 seconds faster. On the M25 mainline through junction 30, journey time savings of over 2 and a half minutes were observed in the morning and evening peak periods compared to the pre-construction period. The 50 miles per hour speed limit on the A13 had contributed to reliability and safety benefits for road users. Journey times had increased by 16 to 35 seconds on the A13 between junction 30 and the A126.

In comparison to the one year after assessment, there were only slight changes in the journey time reliability on most of the key major movements of the project. However, the journey time reliability had improved overall in comparison to before[10].

How have traffic levels changed?

The following section examines the changes in traffic flow along the project extent and on roads in its vicinity. We have compared these with the observed national, regional, and local trends.

National and regional

To assess the impact of the project on traffic levels, it is useful to understand the changes within the context of national and regional traffic. To do this, we use the Department for Transport annual statistics. The data is reported by local authority and road type, recording the total number of million vehicle kilometres travelled[11].

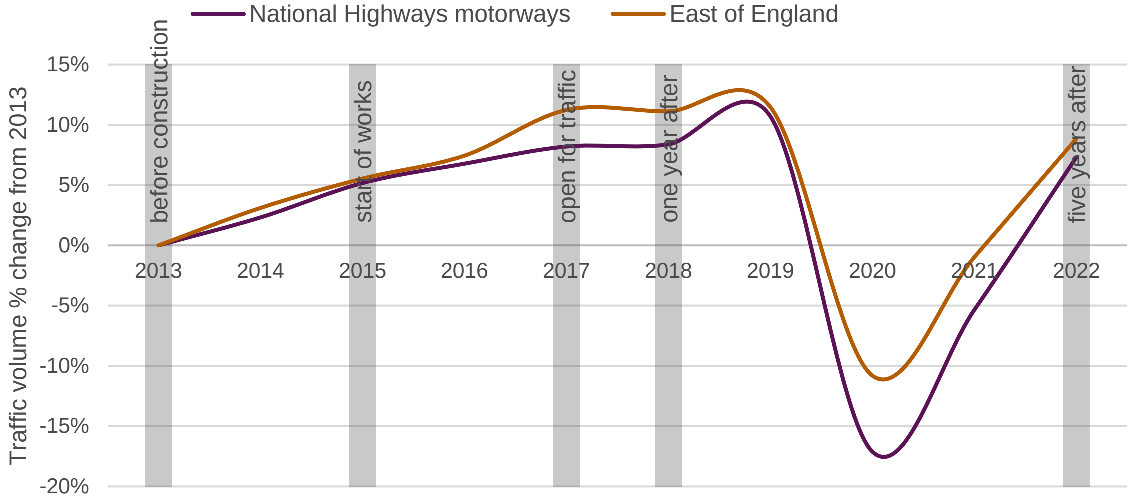
Between 2013 and 2022, there was increase in traffic of around 9% across the East of England region. Traffic growth of around 7% was observed on the motorways. (Figure 2)

[9] New dedicated left turns were introduced from A13 to the M25 northbound and M25 southbound to the A13 eastbound.

[10] Active benefit management and junction optimisation work was conducted by our Major Projects team in August 2021. Additional detection at stop lines and adjusting the timings of the signals. The signals have since been running on the adaptive traffic control system SCOOT (Split Cycle Offset Optimisation Technique). This optimisation has been included within the 5-year after analysis.

[11] Motor vehicle traffic (vehicle kilometres) by region in Great Britain, annual from 1993 to 2019, Table TRA 8904, Department for Transport

Figure 2 National, regional and local traffic trends

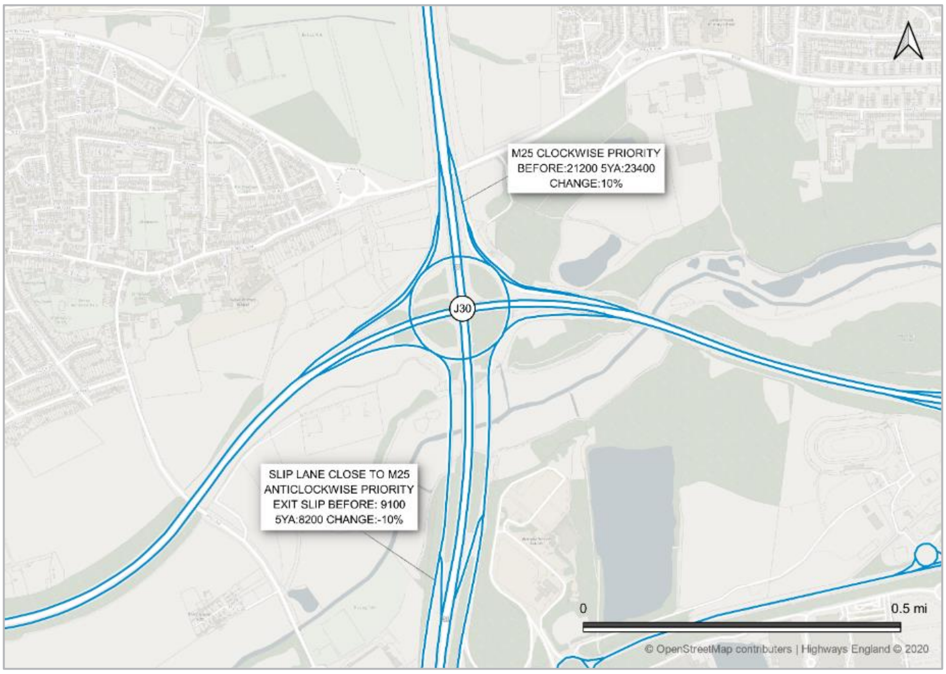


Source: Department for Transport (TRA8904). The data summarise figures as total number of million vehicle kilometres (mvkm) travelled

How did traffic volumes change?

Between 2014 and 2022, traffic growth on the slip road to the north of the junction (see Figure 3) was around 10% which was slightly higher than the average growth around the east of England region. Due to data limitations[12], we could not evaluate the slip road to the south of the junction, but we have evaluated the slip lane which joins this slip road from the south as the project was expected to have an impact on this slip lane. The traffic growth on this road to south of the junction was around -10% which was lower than the average growth observed in this region.

Figure 3 Comparison of pre-project and five-years after average weekly flows



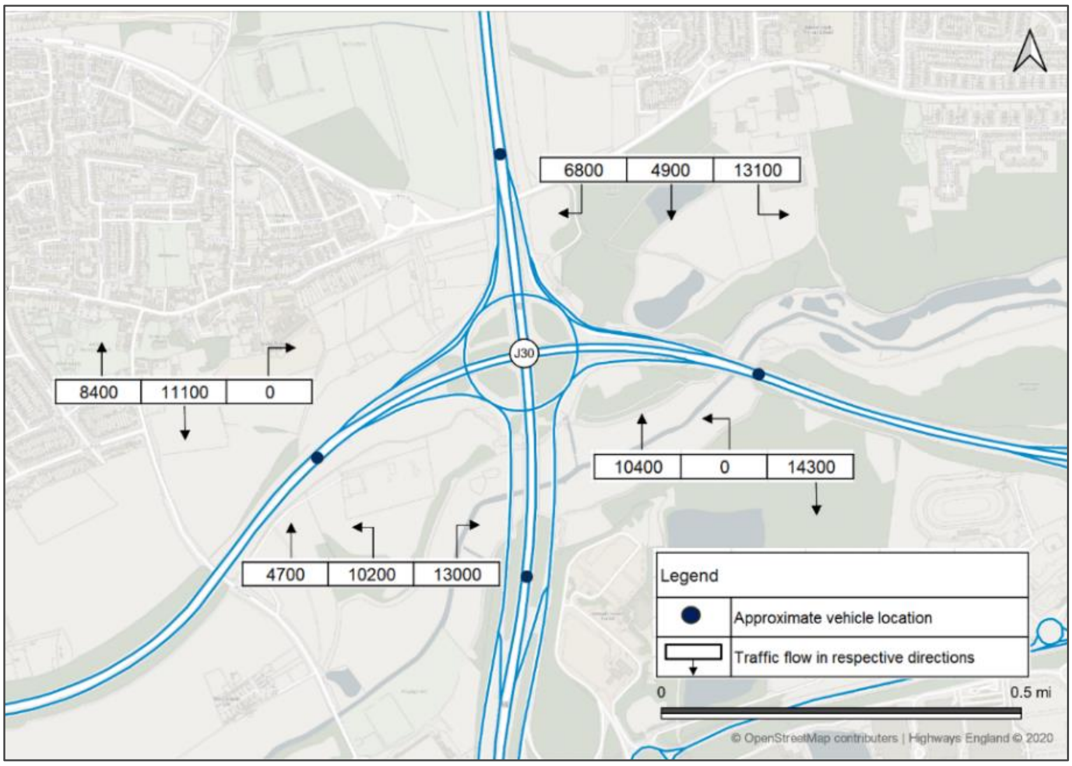
Source: WebTRIS traffic counts- 2014 (before) and 2022 (5 year-after)

[12] No flow data was available to evaluate the slip road to the south of junction 30.

Junction 30 flows

It can be observed from Figure 4, that high volumes of traffic[13] were observed from various directions across the junction. From the north of the junction, a significant amount of traffic flow was observed towards the east, west and south of the junction. High volumes of traffic were observed travelling to the north and south of the junction from the east of the junction. Similarly, from the south of the junction, higher volumes of traffic were observed travelling towards the west and east direction. Lastly, from the west of the junction, a significant amount of traffic volumes were observed towards the south and north of the junction. It was challenging to draw definitive conclusions, due to absence of before and one-year after data. However, it can be observed from Figure 4 that higher volumes of traffic appeared to be moving in various directions across the junction.

Figure 4 Average Weekly Flows around the M25 Junction 30



Source: Turning Counts – 2022 (five year-after)

M25 flows

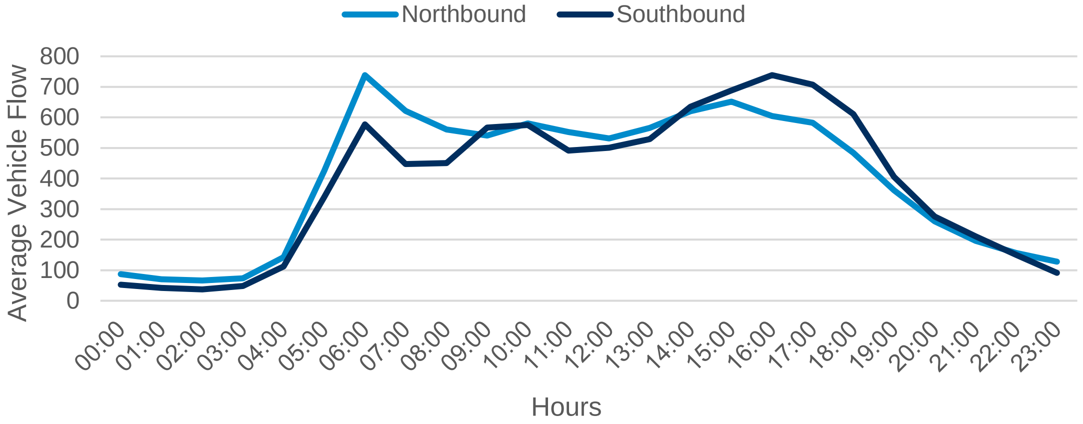
Figure 5 depicts the average hourly flows along the M25. The time periods[14] used for our analysis are Morning Peak: 08:00-09:00, Interpeak: 10:00-16:00, Evening Peak: 17:00-18:00.

There was a similar trend in the traffic along the northbound and southbound directions with some fluctuations. In both northbound and southbound directions, there was a steady increase in traffic followed by a decline before the morning peak hour. In the northbound direction, traffic volumes increased slightly followed by a decrease after the morning peak hour, and this was followed by relatively consistent flows, with some fluctuations throughout the morning peak and

[13] Traffic volume across the junction are indicated using arrows in the figure. The arrows from the boxes indicate the traffic flow in those respective directions of the junction.
[14] The time periods chosen are in accordance with the appraisal.

interpeak hours. The traffic volumes in the southbound direction showed a gradual increase with some fluctuations after the morning peak hour. Moving towards the evening peak hours, an increase in traffic volumes was observed in both directions. The southbound traffic showed a slight increase compared to the northbound traffic during these hours. The traffic in both directions gradually decreased in the evening peak hours.

Figure 5 Average Hourly Flows on M25



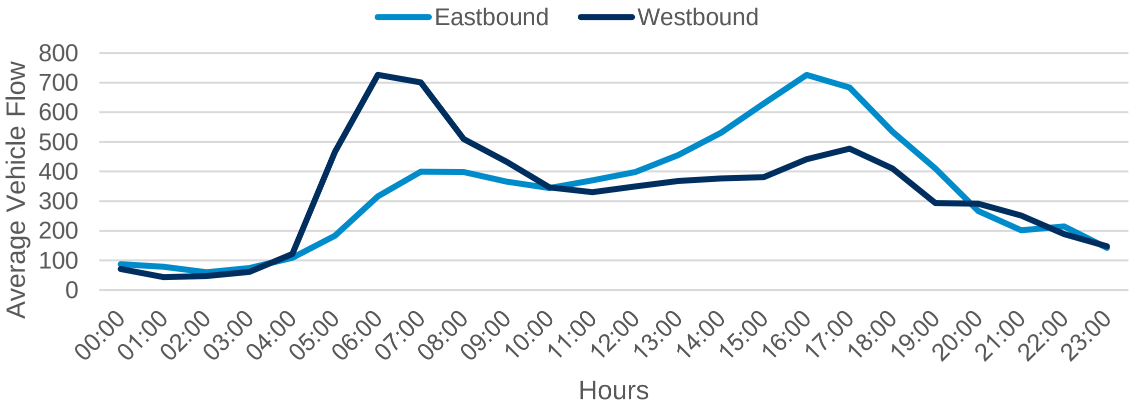
Source: Turning Counts – 2022 (five year-after)

A13 flows

Figure 6 depicts the average hourly flows along the A13. In the eastbound direction traffic increased steadily before the morning peak hour. Traffic volumes decreased slightly at the end of the morning peak hour before steadily increasing in the later part of the interpeak period. The traffic volumes eventually decreased in the evening peak period.

In the westbound direction, a slightly different trend was observed. The westbound direction showed a significant increase in comparison to the eastbound direction, and this was followed by an eventual decrease before the morning peak hour. There was a relatively consistent decrease in the traffic volumes in the morning and interpeak hours, with a slight increase between the interpeak and evening peak period. This was followed by a gradual decrease in traffic after this.

Figure 6: Average Hourly Flows on A13



Source: Turning Counts – 2022 (five year-after)

Was traffic growth as expected?

The forecast information in the appraisal focussed only on the total modelled trips in the project area, therefore it was not possible to compare observed flows for the M25 and A13 with the modelled trips.

Relieving congestion and making journeys more reliable

We also analysed the average journey times[15] and reliability of journeys[16] to understand the impact of the project on road user journeys.

Did the project deliver journey time savings?

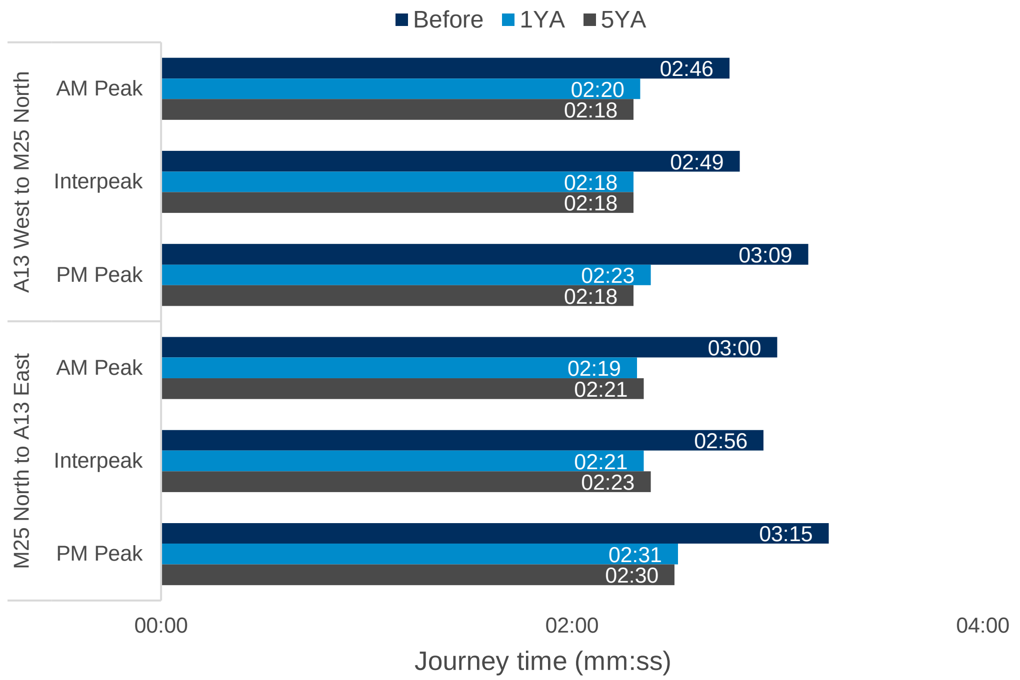
We assessed the average journey times of relevant movements on the project extent (see Figure 1). One of the project's upgrades included introduction of dedicated left-turns from A13 to M25 northbound and M25 southbound to A13 eastbound. We assessed the impact of these upgrades on the average journey times for these movements and the results are shown Figure 7 to Figure 9**.**

There were only slight changes in the average journey times on these routes as compared to the one year after results, but overall, the journey times had improved in comparison to the pre-construction period. The average journey times had improved by around 28 to 51 seconds for road users travelling on these movements.

[15] We use satnav data for analysing the average journey times. We obtained data for before (October 2013 to October 2014), one-year after (October 2017 to October 2018) and five-year period (October 2021 to October 2022) and compared the results. We used the same time periods as used in the appraisal: Morning peak (08:00-09:00), Interpeak (10:00-16:00), PM peak (17:00-18:00).

[16] To understand a project's impact on reliability, we compare the changes in the percentile ranges of a large sample of journey times, relative to the median journey time. A percentile represents the value below which a given percentage of data points in a sample lie. For example, the 20th percentile is the value below which 20% of the data points lie. It follows that 80% of the data points lie above the 20th percentile value.

Figure 7 Comparison of observed average journey times-new dedicated lanes



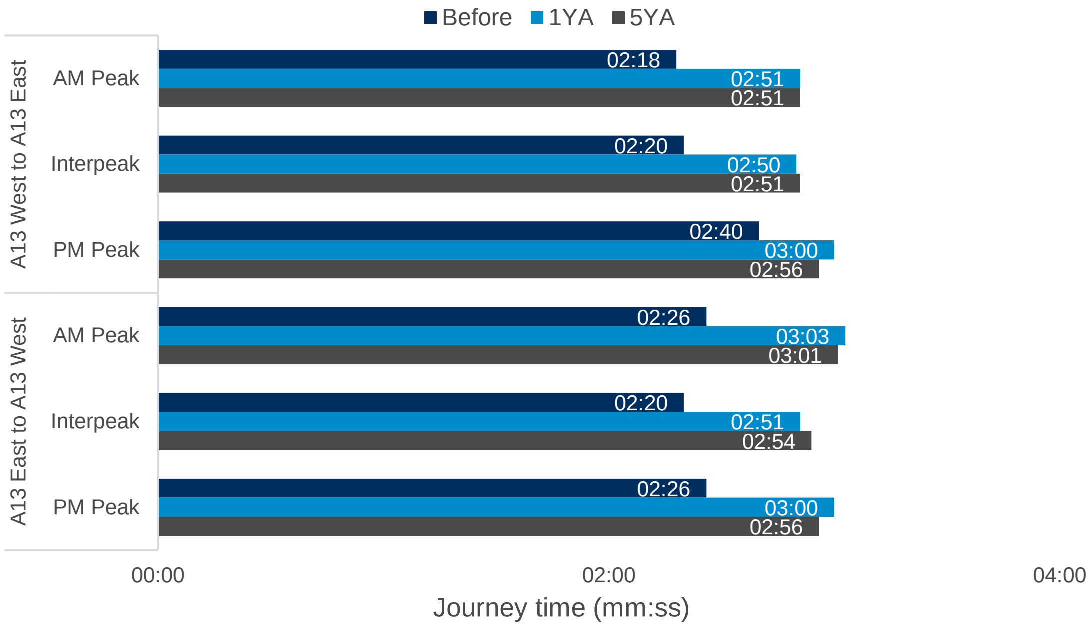
Source: TomTom satnav (Before: October 2013 to October 2014; one year-after: October 2017 to October 2018; five year-after: October 2021 to October 2022).

As a part of the project's improvements, additional capacity was provided on the A13[17] and the speed limit[18] was also reduced from 70 miles per hour to 50 miles per hour.

We assessed the average journey times on this route and the results are shown in Figure 8Figure 8. At five years after, the results observed are similar to what was observed in the one year after period. Only slight changes were observed in the journey times in both eastbound and westbound directions across all time periods on the A13. The journey times in the before period were 18 to 40 seconds slower than the theoretical journey time at 70 miles per hour speed limit[19]. At five years after, journey times were 4 to 14 seconds slower than the theoretical journey time at 50 miles per hour speed limit. The impact of the permanent 50mph speed limit (to improve safety between Wennington and A126) could be observed as the road user journeys at five years after had increased by around 16 to 35 seconds compared to before.

[17] A13 was widened in both directions from 3 to 4 lanes between junction 30 and A126.
[18] The speed limit on the A13 between Wennington and the A126 Junction was reduced from 70 miles per hour to 50 miles per hour to provide safety benefits and enable the delivery of shorter slip roads at the junction.
[19] We analysed the relationship between observed journey times to a theoretical journey time of a vehicle traveling at the speed limit in free-flow conditions. A vehicle travelling at 70 miles per hour would traverse the 2.3 miles-long route in two minutes, whereas a vehicle travelling at 50 miles per hour would take two minutes 47 seconds. This indicated post-project journey times were more reliable.

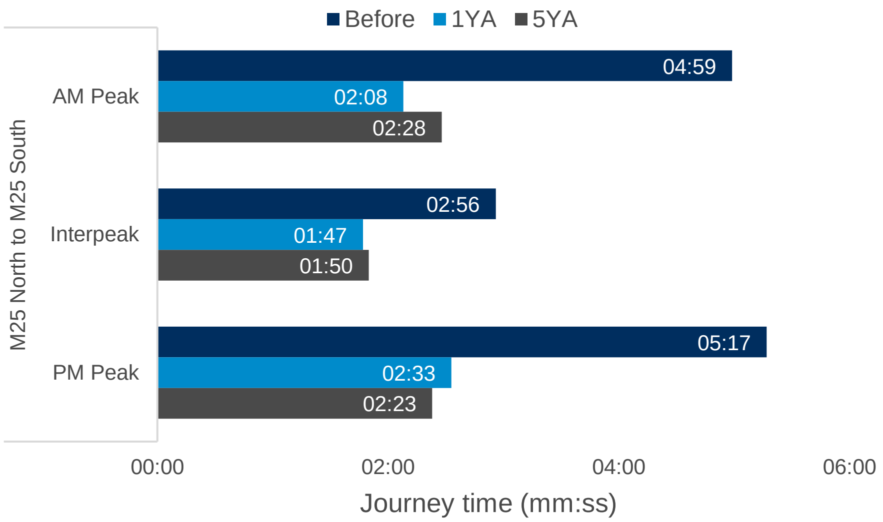
Figure 8 Comparison of observed average journey times- A13



Source: TomTom satnav (Before: October 2013 to October 2014; one year-after October 2017 to October 2018; five year-after: October 2021 to October 2022).

We also evaluated the average journey times on the M25 mainline south to north through junction 30 and the results are shown in Figure 9. The observed journey times showed substantial improvements in all time periods in comparison to the pre-construction period. At five years after journey time savings of over 2 and a half minutes were observed in morning and evening peak periods compared to before. The journey times were only slightly slower in morning (20 seconds) and interpeak periods (3 seconds) in comparison to the one year after period.

Figure 9 Comparison of observed average journey times- M25 mainline



Source: TomTom satnav (Before: October 2013 to October 2014; one year-after: October 2017 to October 2018; five year-after: October 2021 to October 2022).

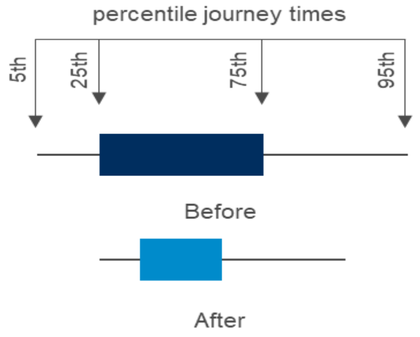
As a part of the project improvements, traffic signals were upgraded on the gyratory roundabout and the timings of the signals were adjusted. These changes had brought improvements to some journey times on the project extent. The results for the time periods assessed can be found in Table 5, Table 6 and Table 7 in Appendix A.

In the evening peak period, journey times from A13 west to M25 southbound were faster by one minute and fourteen seconds. The journey times between M25 southbound to A13 east were faster during the evening peak period. However, in other peak periods (morning and interpeak), road user journeys through the junction had mostly increased. It was likely that the implementation of the lower speed limit on the A13 and the introduction of segregated left turns were the factors that may have affected the journey times.

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.

Figure 10 What does a box plot show?

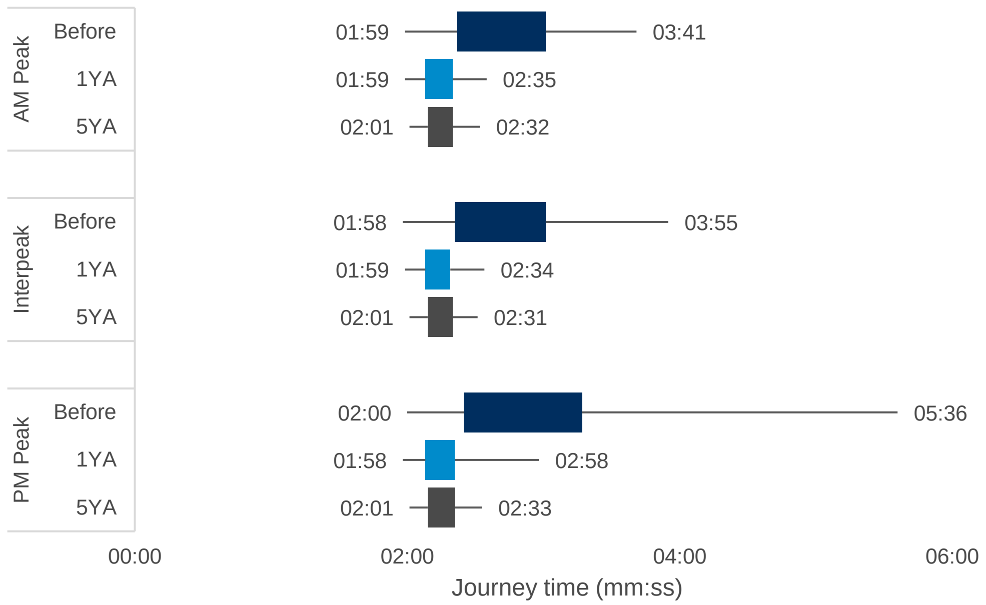


The lowest point is the 5th percentile, this means 5% of journeys take less than this amount of time to complete. The highest point is the 95th percentile, this means 95% of journeys take less time than this to complete.

The length of the box shows how the journey times vary between the 25th and 75th percentile (the journey time 25% and 75% of journeys are faster than). The narrower the box the less variable, and hence more reliable, the journey.

We analysed the journey time reliability on the new segregated left turns from the A13 west to M25 north and M25 north to A13 east (Figure 11 and Figure 12). At five years after, we found that the journey time reliability had improved in all time periods on the A13 west to M25 north in comparison to the before and the one year after period.

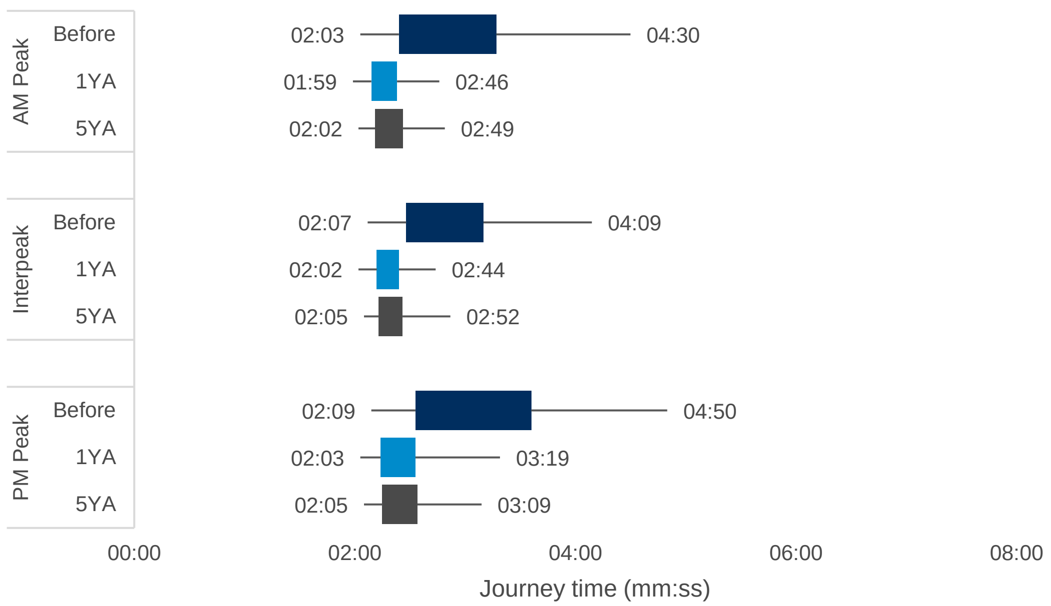
Figure 11 Journey time variability along A13 West to M25 North with new lane



Source: TomTom satnav. Before: October 2013 to October 2014; one year-after: October 2017 to October 2018; five year-after October 2021 to October 2022. Weekday time periods: Morning peak: 08:00-09:00; Interpeak: 10:00-16:00; Evening peak: 17:00-18:00)

There were only slight changes in the journey time variability on the M25 north to A13 east in the morning and interpeak periods in comparison to the one year after period. However, the journey time reliability in all time periods was still better than the pre-construction period.

Figure 12 Journey time variability along M25 north to A13 east new dedicated lane

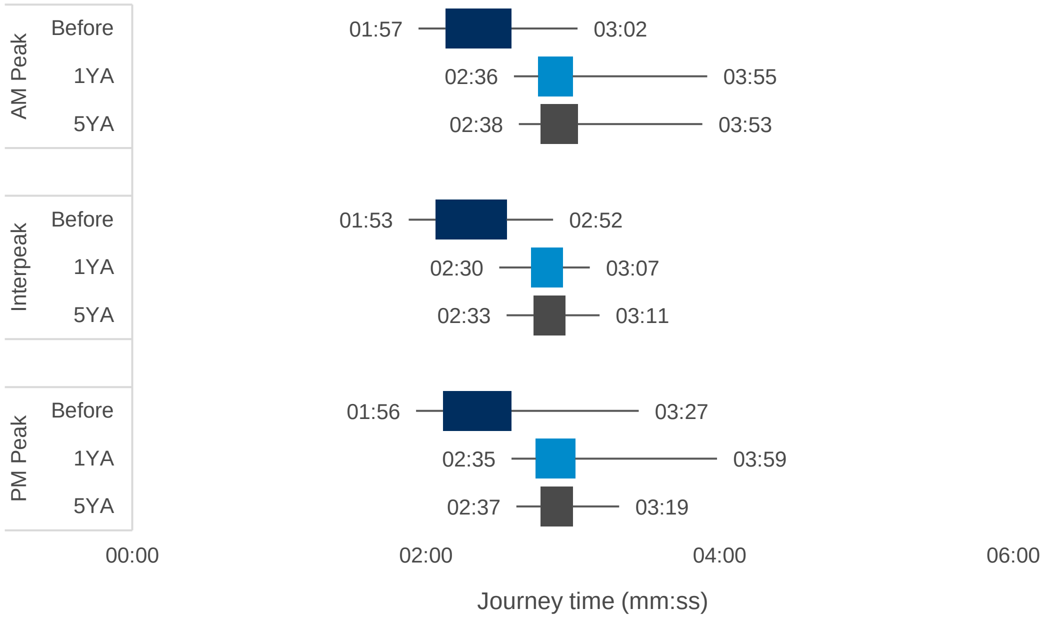


Source: TomTom satnav. Before: October 2013 to October 2014; one year-after: October 2017 to October 2018; five year-after October 2021 to October 2022. Weekday time periods: Morning peak: 08:00-09:00; Interpeak: 10:00-16:00; Evening peak: 17:00-18:00)

We also analysed the reliability impacts on the widened sections of the A13 with speed limit change and the results are shown in Figure 13 and Figure 14. At five years after, the journey time reliability had improved substantially in comparison to the before period due to the implementation of the lower speed limit. The five years after journey times were only slightly variable in comparison to the one year after period but were better than those observed during the before period.

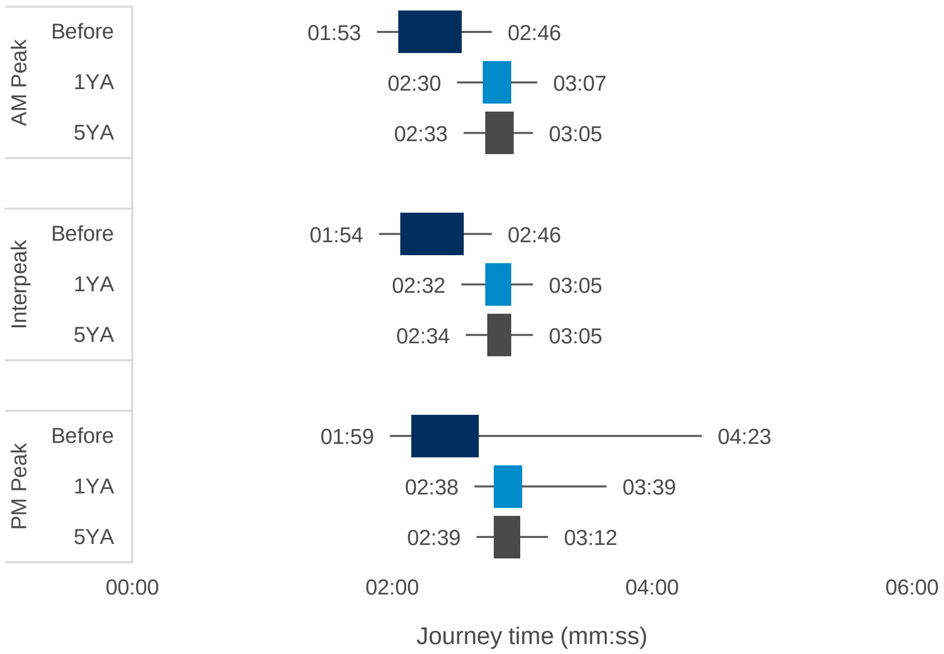
Overall, the project had improved the journey time reliability for all major routes of the project.

Figure 13:Journey time variability along A13 westbound with widening



Source: TomTom satnav. Before: October 2013 to October 2014; one year-after: October 2017 to October 2018; five year-after October 2021 to October 2022. Weekday time periods: Morning peak: 08:00-09:00; Interpeak: 10:00-16:00; Evening peak: 17:00-18:00)

Figure 14 Journey time variability along A13 eastbound with widening.



Source: TomTom satnav. Before: October 2013 to October 2014; one year-after: October 2017 to October 2018; five year-after October 2021 to October 2022. Weekday time periods: Morning peak: 08:00-09:00; Interpeak: 10:00-16:00; Evening peak: 17:00-18:00)

5. Safety evaluation

Summary

The safety objective for this project was to maintain and where possible improve safety.

Appraised expectation for the project forecast a reduction in the number of collisions. However, due to increased traffic volumes some links could witness an increase in the number of collisions. Overall, the forecasts predict an annual saving of four personal injury collisions for the project extent and wider area.

At this five-year evaluation point the project has met its objective to maintain and where possible improve safety[20]. However, we cannot be confident that this is because of the project itself and not part of observed wider regional trends for a reduction in collisions and rates.

There has been a reduction in the rate and number of personal injury collisions on both the project extent and the surrounding network. 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[21].

There had been an annual average reduction of 13 personal injury collisions, which exceeds the appraised business case for the project. This is based on an annual average of 31 personal injury collisions after the project was operational compared with 44 before the project. If the corridor enhancements had not taken place, we estimate that the number of personal injury collisions would have been between 22 and 56 (Figure 18).

When accounting for the increased volume of road users over this period, the annual average rate of personal injury collisions per hundred million vehicle miles had also improved over time. The average collision rate had decreased to 34 personal injury collisions per hundred million vehicle miles, this equates to travelling three million vehicle miles before seeing an accident. Before the project, the collision rate was 47 per hundred million vehicle miles, this equates to traveling two million vehicle miles before seeing an accident. If the enhancements had not taken place, we estimate the collision rate would be 40 collisions per hundred million vehicle miles. The reduction in collision rates suggests that safety has improved but we are less confident in this conclusion.

The number of fatal collisions has not changed, with no recorded fatal collisions before or after the project became operational[22].

The number of Fatal and Weighted Injuries (FWI[23]) has decreased annually. Before the project there was an annual average of 1 FWI per year. After the project became operational, this remained stable at 1 FWI per year. When accounting for

[20] Projects are appraised over a 60-year period. This conclusion is based on the findings at five years after the project opened for traffic.

[21] We have tested the results at 95% confidence interval. The critical value at 95% confidence interval is 57, the observed collision savings for the project extent are lower that this value of 57. We believe that the collisions savings observed for the project extent and wider safety area ensure that the project has met its safety objective.

[22] Two fatal collisions occurred during the period of construction for the project.

[23] 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.

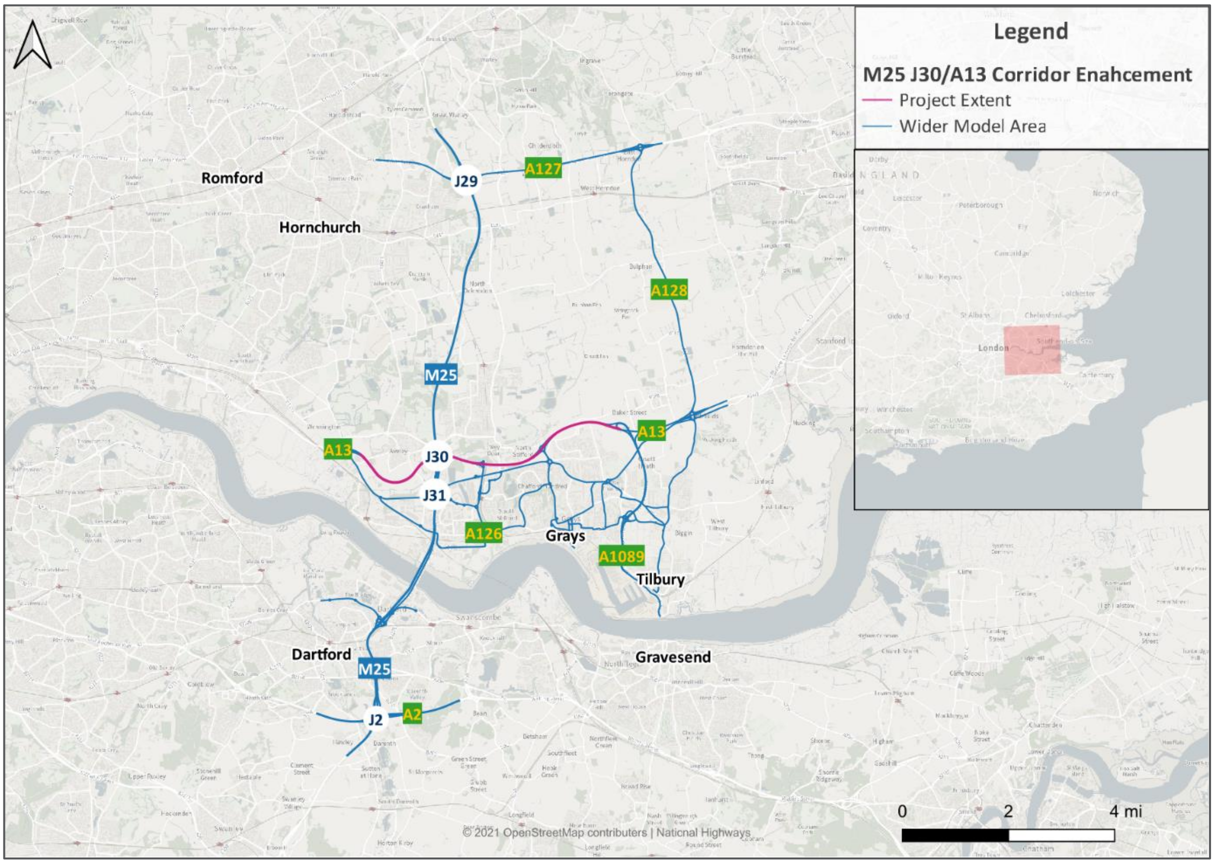
the increased number of road users over this period, there had been a reduction from 1.4 to 0.9 FWI per hundred million vehicle miles travelled.

On the surrounding network[24] there was an average decrease of 93 personal injury collisions per year (based on an annual average of 233 personal injury collisions observed after the project had opened compared with 326 before the project). If the project had not taken place, we estimate that the number of personal injury collisions would be between 250 to 345.

Safety study area

The safety study area is shown in Figure 15. This area was assessed in the appraisal supporting the business case for the project to check any potential wider implications of the intervention[25]. This information was then used with other projections around the potential impact of the project, such as by how much traffic may grow. The evaluation has used the strategic roads within the same area as the appraisal to understand the emerging safety trends.

Figure 15 Safety study area



Source: National Highways and OpenStreetMap contributors

[24] The road network is determined as part of the appraisal process to understand changes to road safety on the project extent and roads which the project may have an impact.
[25] The wider area evaluation has compared before and after analysis for the strategic road network, where the main impact is likely to occur. The appraisal also included some local roads, but we do not have the data to include this in our evaluation.

Road user safety on the project extent

What impact did the project have on road user safety?

Safety data was obtained from the Department for Transport road safety data[26]. This records incidents on public roads that are reported to the police. This evaluation considers only collisions that resulted in personal injury via this dataset.

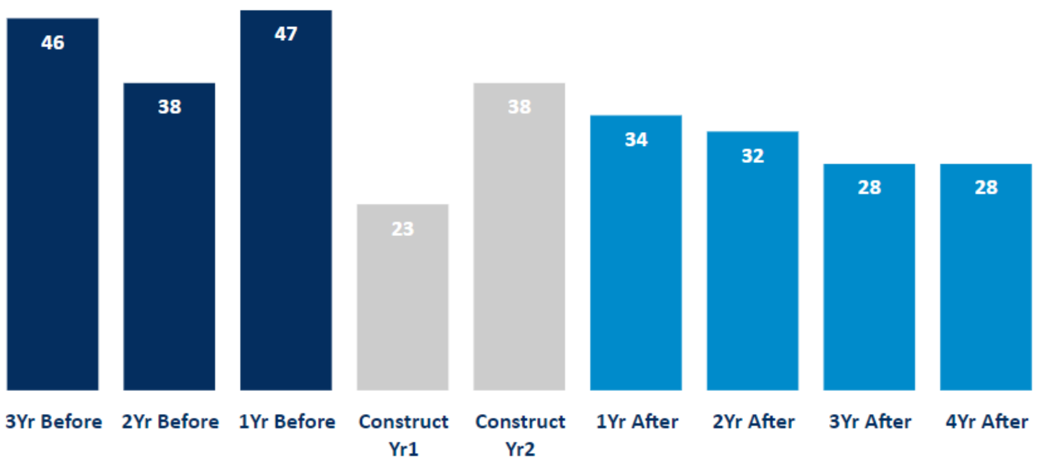
The safety analysis was undertaken to assess changes over time looking at the trends in the five years before the project was operational to provide an annual average. We have then assessed the trends five years after.

The analysis draws on the following data collection periods:

- Pre-construction: 30 March 2012 to 28 February 2015[27]
- Construction: 1 March 2015 to 28 February 2017
- Post-opening: 1 March 2017 to 28 February 2021[28]

The evaluation found the number of personal injury collisions on the project extent had decreased[29]. Over the five years after the project was operational, there were an average of 31 personal injury collisions per year, 13 fewer than the average 44 per year over the five years before the project was constructed.

Figure 16 Annual Personal Injury Collisions



Source: STATS19: 30th March 2012 to 28th February 2021

As part of the safety evaluation, we look to assess what changes in personal injury collisions might have occurred due to factors external to the project over this timeframe. To do this we estimate the trend in personal injury collisions which might have occurred (this is referred to as a counterfactual – refer to Figure 17 and the POPE methodology manual[30]).

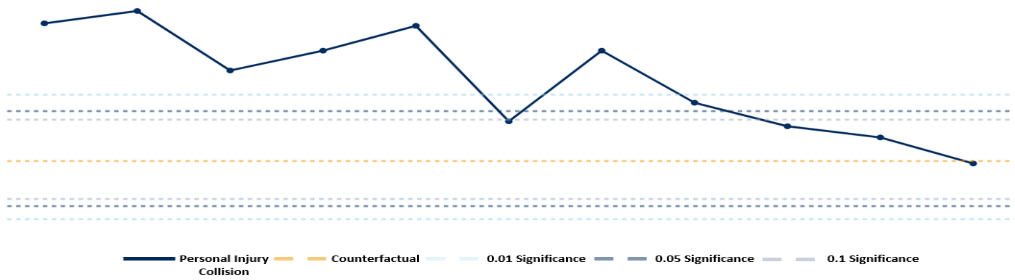
[26] https://data.gov.uk/dataset/cb7ae6f0-4be6-4935-9277-47e5ce24a11f/road-safety-data
[27] M25 J27-30 does not include M25 J13/A30 Corridor Enhancement in its Do Minimum (DM) scenario, as a consequence we have shortened the before period to 3 years to minimise the overlap of observation time periods and avoid the risk of double counting safety benefits
[28] We descoped the M25 J30/13 Corridor Enhancement from the M25 J27-30 Wider Safety Area so we can observe safety benefits from the Open for Traffic date.
[29] Impacts on the wider area are discussed in the next section.
[30] https://nationalhighways.co.uk/media/exypgk11/pope-methodology-note-2024-v2.pdf

Based on this assessment we estimate that if the junction had not been upgraded, the trend in the number of personal injury collisions would likely have increased, and collision rates would remain stable as shown in Figure 18 below.

Figure 17 What does the Counterfactual show?

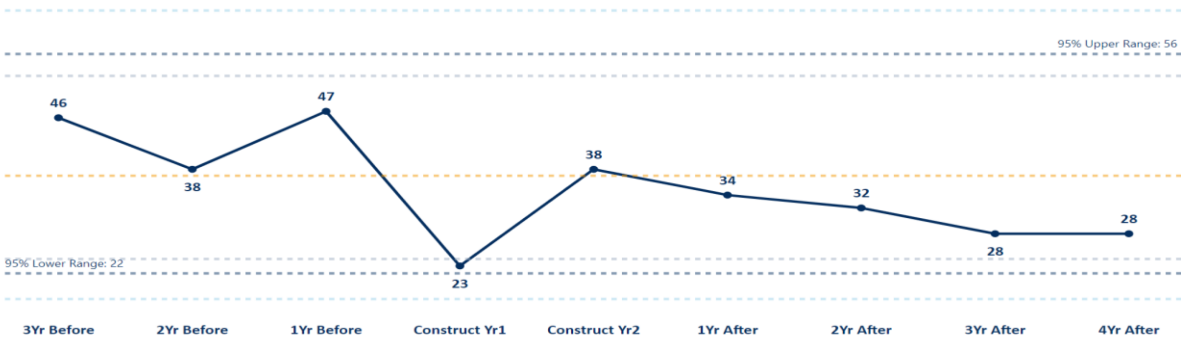
The counterfactual is an estimation of what we think would occur without the project taking place. We estimate a range of collisions that follow regional trends. The chart shows:

1. Timeseries of personal injury collisions
2. Estimated counterfactual range, which comes from a X^2 hypothesis test on one degree of freedom using a significance level of 0.05. More details can be found in the POPE Methodology Manual.
3. National Highways are developing new statistical methods to compare collision and casualty rates. We anticipate adopting these once the methods are finalised.



A range of between 22 and 56 personal injury collisions[31] during the five-year post project period would be expected, as shown in Figure 18

Figure 18 Observed and expected range of personal injury collisions (annual average)



Source: STATS19: 30th March 2012 to 28th February 2021

An annual average of 31 personal injury collisions were observed over the five-year post-opening period. This falls within the counterfactual range but is closer to the lower limit of 22 than the upper limit of 56. Therefore, this may be evidence to suggest that safety has improved[32], however we cannot be fully confident with these results.

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[31] The safety methodology is different from one-year to five-year evaluation. We still have confidence in the accuracy of the previous methodology but have made suitable changes that will ensure a methodology fit for purpose for the future.

[32] We have tested the results at 95% confidence interval. The critical value at 95% confidence interval is 37, the observed collision savings for the project extent are lower than this value of 37.

How had traffic flows impacted collision rates?

It is important to consider traffic changes and the implications on road safety through a collisions rate, the number of personal injury collisions per annual hundred million vehicle miles (hmvm). Our evaluation has identified a decrease in the rate of personal injury collisions per annual hundred million miles.

Prior to the project, there was an annual average of 47 personal injury collisions per annual hmvm. After the project improvements were made, there was a decrease to 34 personal injury collisions per annual hmvm.

The average distance travelled before a personal injury collision occurred increased from two to three million vehicle miles per personal injury collision.

A counterfactual test was undertaken. It found that the collision rate would likely have been 40 collisions per annual hmvm in the counterfactual scenario. The reduction in collision rates suggest that safety has also improved[33].

What changes in the severity of collisions did we see?

Department for Transport have developed a severity adjustment methodology[34] to enable robust comparisons to be made.

For this evaluation, one reporting mechanism was largely used prior to the smart motorway conversion and another afterwards. The pre-conversion collision severity has been adjusted, using the Department for Transport's severity adjustment factors, to enable comparability with the post-conversion safety trends[35].

After the improvement, we have observed no change in collisions resulting in fatalities (the total before the project was zero, compared to zero after).

There was an average of four fewer collisions resulting in serious injuries per year (the annual average before the project was seven, compared to three after). The annual average of collisions resulting in slight injuries has reduced by nine (the annual average before the project was 36, compared to 27 after). Figure 19 shows the severity of personal injury collisions.

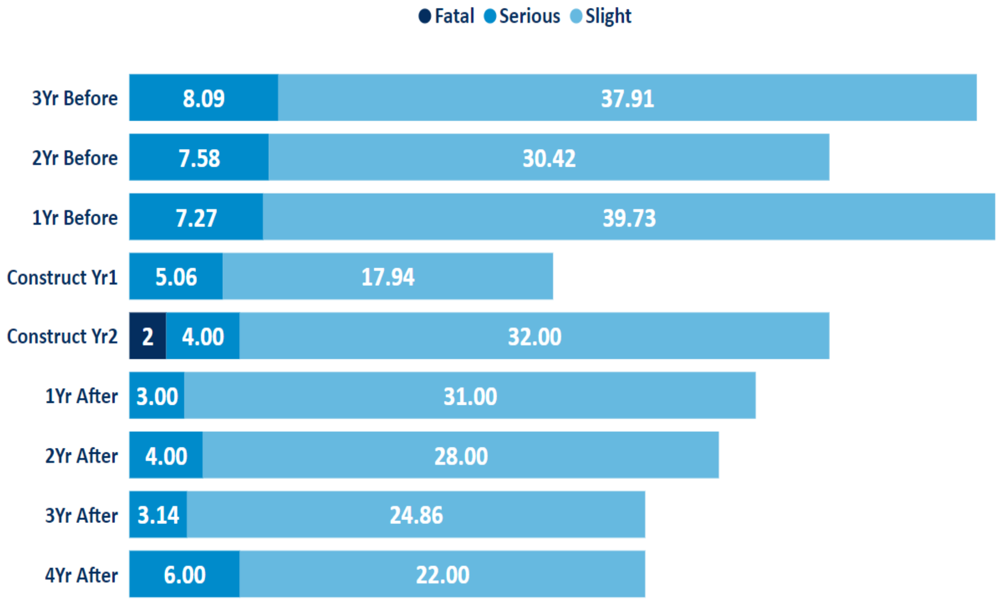
We believe that the collisions savings observed for the project extent and wider safety area ensure that the project has met its safety objective.

[33] We have tested the results at 95% confidence interval and believe the project has met its safety objective.

[34] 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

[35] Collision Severities within this report use the 2021 adjustment factor.

Figure 19 Severity of personal injury collisions within the project extent[36]



Source: STATS19: 30th March 2012 to 28th February 2021

How had had traffic flows impacted casualty severity?

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[37]. In effect, it takes all non-fatal injuries and adds them up using a weighting factor to give a total number of fatality equivalents[38]. This is represented by an annual average and a rate that standardise casualty severities against flow to show the likelihood of a fatality equivalent occurring per distance travelled.

FWI has remained stable at one FWI observed annually. The severity of casualties occurring after the project became operational has not changed on the project extent. Before the project, an annual average of one FWI was observed. After the project, this had reduced to an annual average of one FWI.

The combined measure showed an extra 62 million vehicle miles was travelled before a fatality[39]. The rate of FWI per hmvm[40] has reduced. This suggests that, taking into account changes in traffic, the project is having a positive safety impact on the severity of casualties within the project extent.

[36] As per DfT guidance, adjusted severities are presented with two decimal points
[37] 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. So 10 serious collisions, or 100 slight collisions are taken as being statistically equivalent to one fatality.
[38] Casualty Severities within this report use the 2021 adjustment factor.
[39] Before the project, 72 million vehicle miles needed to be travelled before a fatality equivalent (1.3 fatality equivalents per hmvm). After the project, this increased to 134 million vehicle miles (0.7 fatality equivalents per hmvm).
[40] hmvm – hundred million vehicle miles.

We have also observed a reduction in the average number of Killed and Serious Injuries (KSI)[41]. Before the project an annual average of eight KSI, this has reduced to four KSI[42] since the project became operational.

Road user safety in the wider area

What changes in safety numbers did we see in the wider area?

Personal injury collisions were observed for a wider impact area, which is derived from the safety appraisal for the project. Before the project an annual average of 326 collisions were observed. After the project, this had reduced to 233, a decrease of 93.

The counterfactual analysis indicated that it is likely that an annual average of between 250 and 345[43] personal injury collisions would have occurred. The observed annual average of 233 personal injury collisions falls outside the range. Therefore, this may be evidence to suggest that safety has improved.

The evaluation has identified a decrease in the rate of collisions per hundred million vehicle miles. Prior to the project, there was an annual average of 21 personal injury collisions per hundred million vehicle miles. After the project improvements were made, there was a decrease to 15 personal injury collisions per hundred million vehicle miles.

A counterfactual test was undertaken. It found that the collision rate would likely have been 22 collisions per hundred million vehicle miles in the counterfactual scenario. This indicates we have observed a larger reduction in the rate that personal injury collisions occur than predicted. Statistical testing indicates this reduction is significant suggesting that the project could be having a positive impact on the wider area.

After the scheme we have observed, an increase in collisions resulting in fatalities (the total before the project was seven, compared to 11 after). There was an average of eight fewer collisions resulting in serious injuries per year (the annual average before the project was 19, compared to 11 after). There was an average of 24 fewer collisions resulting in slight injuries per year (the annual average before the project was 89, compared to 65 after).

A decrease of one FWI has been observed. Before the project the average 11 fatality equivalents were observed. After the project this had decreased to 10[44]. We have also observed a reduction in the average KSI from 58 to 37[45].

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[41] The number of people killed or seriously injured in road traffic collisions. This metric is non-weighted but does not pick up all injuries (e.g. slight casualties).

[42] The KSI rate per hmvm has reduced from eight to five KSI/hmvm.

[43] We have tested the results at 95% confidence interval. The critical value at 95% confidence interval is 296, the observed collision savings for the project extent are lower than this value of 296. We believe that the collisions savings observed for the project extent and wider safety area ensure that the project has met its safety objective.

[44] The combined measure showed an increase of 37 million vehicle miles was travelled before a fatality. Before the project, 222 million vehicle miles needed to be travelled before a FWI (2.8 FWI per hmvm). After the project this increased to 259 million vehicle miles (0.7 FWI per hmvm).

[45] The KSI rate per hmvm has reduced from four to three KSI/hmvm.

Has the project achieved its safety objective?

The safety objective for this scheme was to maintain and, where possible, improve safety. We believe that because of the changes we have observed the project has met its safety objective.

The evaluation found personal injury collisions and rates have both decreased. The counterfactual scenario suggests that safety has improved but we are less confident in this conclusion[46].

We have observed an improvement when comparing the severity of collisions before and after the project became operational.

Appraised expectation for the project forecast a reduction in the number of collisions. Overall, the forecasts predict an annual saving of four personal injury collisions for the project extent and wider area. The evaluation found that the appraisal underestimated collisions savings for this scheme with an average of 13 collisions saved annually on the project extent.

[46] Projects are appraised over a 60-year period. This conclusion is based on the findings at five years after the project opened for traffic.

6. Environmental evaluation

Summary

The evaluation of environmental impacts uses information on the predicted impacts gathered from the environmental appraisal and the environmental assessment report. The five years after observations have then been compared with findings observed one year after the project opened for traffic, and background environmental reporting to help understand how the performance of the project is progressing. Observed five years after impacts have been determined during a site visit in August 2021, supported by desktop research. The results of the evaluation are recorded against each of the TAG[47] environmental sub-objectives. These are presented in table 2.

This five years after environmental evaluation focuses on the environmental sub-objectives (noise, air quality, greenhouse gas emissions, landscape, heritage, and biodiversity). The project was set within the context of existing heavy infrastructure and large-scale commercial development. Environmental design measures were planned to help blend the project into the surrounding context and to reduce the extent of visual intrusion. Overall, the townscape was not considered to be highly vulnerable to change, and the project was not expected to have any significant impact on the existing townscape character. Thus, no further evaluation of townscape is done in this five years after report.

In addition to environmental sub objectives, society impacts such as physical fitness, travel experience and severance are evaluated. But the project was expected to have no direct effect on the activity durations of pedestrians, cyclists or equestrians and routes used by them, and no severance issues were recorded at one year after. Thus, physical fitness and severance have been scoped out of this five years after evaluation. As comparison post opening traffic data was not available to enable a full evaluation of the impact of the project on journey quality at one year after, journey quality has also been scoped out.

The five years after evaluation has found that the project's impact on noise, air quality or greenhouse gases could not be assessed due to lack of forecast traffic data. Landscape mitigation measures (especially planting) were implemented in-line with expectations and were establishing. Ecology mitigation measures also appeared to have been implemented generally as expected. However, while monitoring surveys confirmed the success of landscape mitigations, we were unable to similarly confirm whether the translocation of broad-leaved cudweed (a protected species) had been successful from earlier one year after field visits. The requirement for an archaeological watching brief to manage impacts on archaeology was removed during construction as works all took place within the highway boundary. The impacts of the project on cultural heritage features (historic buildings and landscapes) were as expected.

Noise, air quality and Greenhouse gas emissions

The environmental appraisal predicted that there would be no perceptible increase in noise levels at sensitive receptors, or within any of the Defra Noise Important

[47] TAG provides guidance on appraising transport options against the Government's objective for transport. https://www.gov.uk/guidance/transport-analysis-guidance-tag

Areas[48]. Despite this, the M25 junction 30 and A13 was resurfaced with a low noise surface and existing noise barriers were retained and replaced as proposed in the environmental assessment. On air quality, the project was predicted to lead to a worsening in particulate matter (PM_{10}) and an improvement in nitrogen dioxide (NO_2) overall. It was also predicted that there would be a decrease in regional emissions of oxides of nitrogen (NOx) in the opening year due to speeds and an increase in the design year due to the growth of vehicles on the network. Local air quality monitoring reported in 2021 suggested that emissions from 2018 to 2020 at monitoring locations were either constant or reducing, with no new exceedances likely to be caused by the project. On greenhouse gases, the environmental appraisal predicted that the project would reduce greenhouse gas emissions in the opening year by 0.8 kilo tonnes (800 tonnes) due to an improvement in traffic volumes. However, by the design year, the growth in traffic would result in an increase in overall emissions.

We were unable to assess the overall impact of the project on noise, air quality or greenhouse gases at one year after because the required traffic data was not available[49]. At five years after, retained and replaced noise barriers were observed during the evaluation visit, and low noise surfacing was present before the project and renovated by the project. The local air quality monitoring report for 2021 suggests that no new exceedances are likely to be caused by the project. However, while outturn traffic data was available, forecast data was not available to enable a comparison of pre and post opening traffic data. So, no evaluation of the impact of traffic on noise, air quality and Greenhouse Gas emissions could be done.

Landscape

The environmental appraisal reported that the project would be entirely within the highway boundary and would be set within the context of existing heavy infrastructure and large-scale commercial development to the south. The landscape around the M25 junction 30 was not considered to be highly vulnerable to change, and the project would not have any significant impact on the existing landscape character. Environmental design measures were put in to help to blend the project into the surrounding context and reduce the extent of visual intrusion. It was not considered that the project would have any impact on tranquillity, which is already significantly affected by the existing road infrastructure and traffic movement. The overall impact of the project on landscape was expected to be neutral.

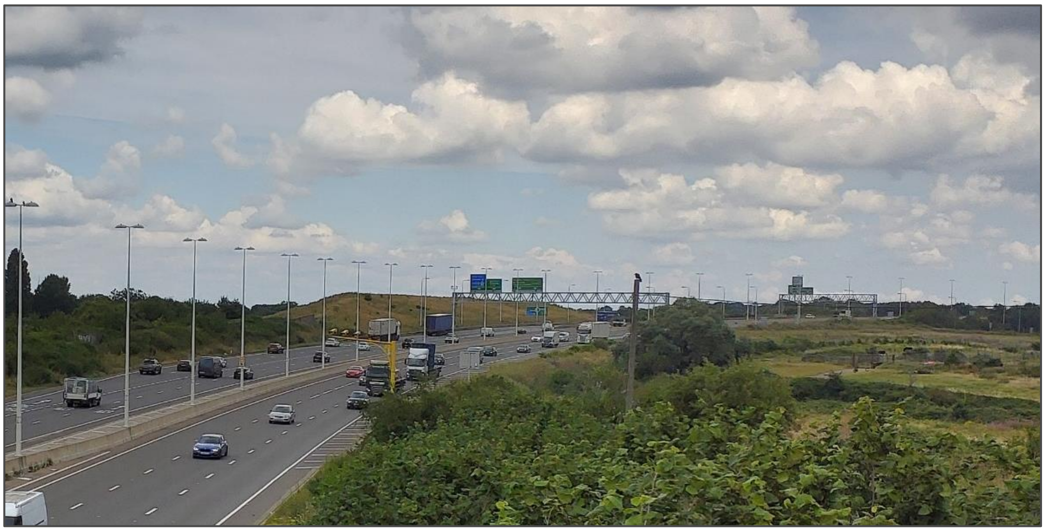
Our one-year after evaluation, reported that the clearance of roadside vegetation had been minimised and at many locations, the project remained well screened from the wider landscape. New gantries, signs and lighting had been installed and for some properties, such as those at the edge of Aveley, this new infrastructure had opened up views and made the route more prominent. However, replacement planting had been implemented to help mitigate vegetation loss and minimise landscape and visual impacts. At one year after, the mitigation planting had yet to be established but it was considered that, provided it did, the landscape character would not be significantly altered and the effects of the project on the landscape is likely to be neutral, as expected.

[48] Locations identified by Government in its noise action plans as experiencing the highest levels of noise: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/813666/noise-action-plan-2019-roads.pdf
[49] Post-opening traffic flow data should be available to enable evaluation.

At five years after, we visited several locations along the route to consider how well the mitigation planting was progressing. This, combined with a review of background information on inspections and maintenance programmes, helped us determine if the design year outcome was likely to be met.

Our evaluation confirmed that maintenance works had been undertaken and the new mitigation planting, including new trees and hedge planting, was establishing well. Observations taken near junction 30 identified that the new species rich grassland on the side of the false cutting was doing well and at Stifford Road overbridge planting had progressed since one year after.

Figure 20 View east from Ship Lane towards junction 30 with species-rich grassland on doing well on the false cutting.



Source: Evaluation visit, 04 August 2021

Figure 21 View of planting with guards visible on the northbound embankment of M25 from Stifford Road Overbridge at one year after

Source: One-year after Evaluation Report, January 2019

Figure 22 Establishing treelines and hedgerows visible from Stifford Road Overbridge

Source: Five years after Evaluation visit, 04 August 2021

Heritage of historic resources

The environmental appraisal identified a total of 29 cultural heritage assets within the appraisal study area surrounding the project extent. This comprised 23 archaeological remains; one historic building; and five historic landscape types. However, the proposed works were expected to be largely confined within the highway boundary. Thus, no physical impacts on known heritage assets from works were predicted. Overall, the impact on the heritage resource was predicted to be neutral.

Our evaluation included a site visit and a review of the available documentary evidence including our findings at one year after. Our one-year after evaluation reported that all the works took place within the highway boundary and that the proposed water pipeline diversion works, which would have required mitigation, did not go ahead. Overall, at one year after, it was considered that the impacts of the project on cultural heritage features were as expected.

The environmental assessment predicted that the project had potential to have slight adverse impacts on the settings of Belhus Park, a Grade II Registered Park and Garden, and Aveley Hall, a Grade II Listed Building. Belhus Park sits within an urban edge setting and is locally valued for recreation. The M25 was a prominent existing feature bisecting the park in a cutting. It was expected that the project would be visible from areas of the park nearest to the M25 but retained vegetation would filter views. Our one-year after evaluation confirmed that this was the case.

At five years after, no further investigation regarding archaeology and watching brief were required because the Essex & Suffolk Water pipeline diversion did not go ahead. We re-examined the impacts on Belhus Park and Aveley Hall. Our visit confirmed that the new infrastructure including tops of gantries, signs and lighting remained visible although limited as much of the project lay in a cutting. There were views from Aveley Hall, but these were distant and were filtered by the intervening fields and retained vegetation. Overall, our evaluation confirmed that the highway infrastructure was slightly more prominent in views from Aveley Hall, but this was broadly as expected.

Biodiversity

The environmental appraisal predicted that the project had the potential to affect several legally protected species present within and near the project. This included bats, badgers, great crested newts, common reptiles and broad-leaved cudweed. The potential impact on the Common dormouse was reviewed but monitoring activity before construction did not find them to be present. It was predicted that there was the potential for impacts on the adjacent habitats designated for nature conservation, including Brickbarn Wood, Mar Dyke, Low Well Wood and Arena Essex. A range of mitigation measures were proposed to minimise these impacts. This included the creation of new replacement habitats such as species rich grasslands, a new habitat area for great crested newts and five receptor sites for translocated reptiles. Overall, the impact of the project on ecology resources was assessed as slight adverse.

Our one-year after evaluation reported that five receptor sites were created along with a habitat compensation area for great crested newts on the old highways Aveley Depot site. Monitoring information confirmed that 33 reptiles had been translocated but no post opening surveys had been undertaken, so it was not possible to review the success of these translocation for these species at one year after. A small number of broad-leaved cudweed[50] plants were also translocated and replanted on the A13 verge along with stored topsoil that was thought to contain the plant's seed. Monitoring surveys of all potential habitats in 2017, 2018 and 2019 found no confirmed sightings of the plant. This suggested that mitigation measures for this protected species may not have been successful.

Our five-years after evaluation reviewed the impacts of the project and progress of the mitigation since one year after. The works were confined to be limited to within the highway boundary and impacts to species and habitat were likely to be very minimal, as expected. A review of the Handover Environmental Management plan supported by observations along the project and around the Aveley Depot mitigation pond, confirmed that species mitigations and habitat replacements and enhancements (e.g., vegetation retention, species-rich grassland, woodland edge planting) were undertaken as expected.

Post-construction habitat surveys had been carried out as expected. The reports did not confirm that broad-leaved cudweed plants had established at five years after. No specific reporting for species was included for Great Crested Newts and common reptiles as had been proposed by the environmental assessment. The success of any translocation for these species could not be confirmed. Overall, the effects of the project on biodiversity were broadly as expected, but as the broad-leaved cudweed translocation had not been successful, the effects of the project were worse than expected for cudweed.

Water environment

The environmental appraisal expected that the project would retain much of the existing drainage arrangements, including underground pipe system except where it would be modified to accommodate new infrastructure and road layout. The new combined drainage system would be sustainable, i.e., it would improve the control of surface water runoff from the road, pollution, and spillage containment. Thus, the

[50] Broad-leaved Cudweed is classified as endangered and protected under Schedule 8 of the Wildlife and Countryside Act 1981.

flood risk[51] from the works was expected to be negligible and there were anticipated neutral effects on surface water resources, surface water drainage and groundwater quality. The environmental assessment proposed that attenuation storage be provided to ensure that the existing peak discharge rates are not exceeded at existing outfalls due to the additional hard surfaced impermeable area created by the project. Therefore, the project was not expected to lead to floodplain loss and no flood compensation storage is required.

Our one-year evaluation reported that much of the existing drainage network had been retained and, where the road layout had been modified, the proposed new kerb edge drainage system had been provided. However, no detailed as-built information relating to project drainage had been made available, meaning a full one-year after evaluation of this sub-objective could not be completed. However, at five years after, our evaluation has received no information which would indicate that the project drainage is performing other than as designed. Therefore, based on the outcome of the one-year after evaluation, this five-years after evaluation concludes that it was likely that the project made an improvement on the water environment and no negative impacts were likely.

Overview

The results of the evaluation are summarised against each of the Transport Appraisal Guidance (TAG)[52] environmental sub-objectives and presented in Table 22. In the table we report the evaluation as expected if we believe that the observed impacts at one year after are as predicted in the appraisal. We report them as better or worse than expected if we feel the observed impacts are better or worse than expected. Finally, we report impacts as too soon to say if we feel that at one year after there is insufficient evidence to draw firm conclusions.

Table 2 Summary of Environmental findings – five years after

Sub Objective	AST Score	Five-year Evaluation Outcome	Five-year Evaluation Summary
Noise	NPV - £0.162m.	As expected from site visit. But cannot be confirmed with traffic data	Noise barriers were retained and replaced, and low noise surfacing was present before the project and renovated by the project. Thus, noise mitigations were likely to be undertaken and were likely to be working as expected. But no forecast traffic data was available to enable a full evaluation of the impact of the project on local noise.
Air Quality	Total value of change in air quality	Cannot be confirmed with traffic data	Local air quality monitoring reported in 2021 (containing air quality figures 2018 to 2020) suggested that no new

[51] Link to sustainable drainage systems: https://www.ciwem.org/policy-reports/sustainable-drainage
[52] TAG provides guidance on appraising transport options against the Government's objective for transport

Sub Objective	AST Score	Five-year Evaluation Outcome	Five-year Evaluation Summary
	concentration: NPV -£0.088m		exceedances likely to be caused by the project. But no forecast traffic data was available to enable a full evaluation of the impact of the project on air quality.
Greenhouse Gases	Overall value of change: NPV = £-6.987m.	Cannot be confirmed with traffic data	Cannot be confirmed with traffic data.
Landscape	Neutral	As expected	Based on evaluation visit of August 2021, as the M25 junction 30 (gantries, signs, lighting) was already prominent, and the works were largely online, general landscape character change and impacts on the visual amenity were minimal. Inspection reports confirm that landscape mitigations were doing well at five years after.
Heritage of historic resource	Neutral	As expected	The requirement for an archaeological watching brief was removed as works all took place within the highway boundary. The impacts of the project on Aveley Manor Homestead Moat (scheduled monument), listed buildings and historic landscapes within the project footprint were broadly as expected.
Biodiversity	Slight Adverse	Broadly as expected except for broad-leaved cudweed	The project's impacts on species and habitats were likely to be limited to within the highway verge, as expected. Habitat/species mitigations (e.g., the mitigation pond at the Aveley Depot, vegetation retention, species-rich grassland, woodland edge planting) were undertaken as expected. However, post-mitigation surveys report that the translocation of broad-leaved cudweed was unsuccessful.
Water Environment	Neutral	Likely to be as expected	The flood risk from the project was likely to be negligible, and the impacts of the project on surface water resources, surface water

Sub Objective	AST Score	Five-year Evaluation Outcome	Five-year Evaluation Summary
			drainage and groundwater were likely to be insignificant.

7. Value for money

Summary

As part of the business case, an economic appraisal was conducted to determine the project's value for money. This assessment was based on an estimation of costs and benefits over a 60-year period.

The project was delivered at a cost of £83 million, around £7 million over the forecast cost[53]. In the first five years, the road provided additional capacity to support more road users (an increase of around 10%), whilst improving the safety of those journeys.

While we have been unable to reforecast the monetised journey time and safety benefits, considering the improvements to journeys since opening, it is likely that the project has delivered, or is on track to delivering, most of its expected benefits over the 60-year period. However, as we could not evaluate all monetised impacts and outturn benefits, it was not possible to confirm that the predicted high value for money will be delivered.

Forecast value for money

An economic appraisal is undertaken prior to construction to determine a project's value for money and inform the business case. The appraisal is based on an estimation of costs and benefits. The impacts of a project, such as journey time savings, changes to user costs, safety impacts and some environmental impacts can be monetised. This is undertaken using standard values which are consistent across government. The positive and negative impacts over the life of the project[54] are summed together and compared against the investment cost to produce a benefit 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 M25 junction 30 / A13 corridor business case is set out in Table 3-. We have also included an indication of what proportion of the monetised benefits each impact accounted for and a summary of how we have treated the monetisation of each impact in this evaluation.

[53] Present value of costs in 2010 prices and values.
[54] Typically project life is taken to be 60 years.

Table 3- Monetised benefits of the project (£ million)

	Forecast (£M)	% forecast monetised benefits[55]	Evaluation approach
Journey times	210	84%	Monetised benefits assumed as forecast
Vehicle operating costs (VOC)	5	2%	Monetised benefits assumed as forecast
Journey time & VOC during construction and maintenance	-21	-8%	Not evaluated (assumed as forecast)
Journey time reliability	37	15%	Monetised benefits assumed as forecast
Safety	17	7%	Monetised benefits assumed as forecast
Carbon	-7	-3%	Not evaluated (assumed as forecast)
Air quality	0	0%	Not evaluated (assumed as forecast)
Noise	0	0%	Not evaluated (assumed as forecast)
Indirect tax revenues	6	2%	Monetised benefits assumed as forecast
User charges	-1	0%	Not evaluated (assumed as forecast)
Operating costs (private toll revenue)	5	2%	Not evaluated (assumed as forecast)
Total present value benefits	**251**	**100%**	

Note: 2010 prices discounted to 2010. Due to rounding the numbers and percentages may not always add up exactly to the presented totals.

The costs anticipated in the appraisal are set out in Table 4. Based on this information, the scheme was anticipated to give £251 million value for money over the 60-year appraisal period.

Evaluation of costs

The project was delivered at a cost of £83 million[56], above the anticipated cost of £76 million (see Table 4).

The appraisal expected that the project would result in an increase in maintenance costs over the life of the project. As most of this maintenance is still in the future, the evaluation uses the maintenance costs forecast within the business case.

[55] Disbenefits are presented as negative numbers and percentages. The total of the positive and negative contributions total to 100%

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

Table 4 Cost of the project (£ million)

	Forecast (£M)	% of forecast costs	Evaluation approach
Construction costs	76	97%	Current estimate of project cost
Maintenance costs	2	3%	Not evaluated (assumed as forecast)
Total present value costs	**78.9**	**100%**	

Note: 2010 prices discounted to 2010. Due to rounding the numbers and percentages may not always add up exactly to the presented totals.

Evaluation of monetised benefits

In our five years after evaluations, we attempt to reassess the project costs and benefits and reforecast these for the 60-year scheme life. Our methods are much simpler than those used in appraisal, so consequently there is a degree of uncertainty around these numbers.

For this project, although we have been able to evaluate journey times, we have been unable to assess changes in traffic levels and compare to forecasts. This has meant we have not been able to estimate what proportion of monetised journey time benefits, which were anticipated at the time of the appraisal, have been realised since the project opened for traffic. As journey times and traffic volumes are the key input for estimating changes in fuel consumption, we have also been unable to evaluate vehicle operating costs and indirect tax revenues. Other aspects of the monetised benefits have been assumed as forecast, such as journey time reliability, safety, noise, air quality and greenhouse gases.

Monetised journey time & reliability benefits

A large proportion of the forecasted project benefits were attributed to improvements in journey times and journey time reliability. Our evaluation identified that both journey times (Figure 7) and reliability (Figure 11) had improved compared to before the project. It was not possible to analyse observed flows and so direct comparisons to forecasted journeys and reliability benefits were not undertaken. However, as the analysis showed both journey time and journey reliability improvements, it is expected that the project will have delivered benefits to road users.

Other impacts assumed as forecast

We forecasted total safety benefits to be £17 million. This relates to the benefit on the strategic road network over 60-years, for both the project extent and the wider area, which was expected to be a saving of 261 PICs. In the evaluation we have observed a decrease of 13 in the annual average number of PICs for the project extent, and 93 for the wider area. To be able to reforecast this we require a breakdown of the project extent and wider area, which we did not have, therefore we have assumed as forecast.

We would also routinely calculate the monetised benefits for indirect tax revenues and vehicle operating costs by estimating changes in fuel consumption. As these calculations require traffic volumes and journey times for both observed and forecast scenarios, we have been unable to calculate these, so they have been assumed as forecast. Other aspects assumed as forecast are carbon, air quality, noise, user charges and operating costs (private toll revenue).[57]

Overall value for money

Our evaluation demonstrated that there had been improvements in journey times and journey time reliability. These had been predicted to contribute over 80% of the project's benefits.

Overall, the evaluation indicated that in the first five years this investment is on track to deliver benefits for road users. However, as we could not evaluate all monetised impacts and all the outturn benefits, it was not possible to confirm that the predicted high value for money would be delivered.

[57] User charges and operating costs (private toll revenue) are not routinely appraised and are only done so for projects which have tolls (road user charges) or projects near tolls where we would expect some impact. As these are very few projects this applies to we have no method for evaluating these benefits and are therefore assumed as forecast.

Appendix A

Through junction journey times

Table 5 Average journey time changes for through junction movements - AM peak

AM Peak		To			
		M25 N	A13 E	M25 S	A13 W
From	M25 N				00:04
	A13 E	01:09		00:34	
	M25 S		00:20		00:40
	A13 W			-00:21	

Note: Values are in mm: ss. Positive values indicate slower journey times. Does not include journey time results for movements discussed separately in section. Source: TomTom satnav (Before: October 2013 to October 2014; 5YA: October 2021 to October 2022)

Table 6 Average journey time changes for through junction movements - Interpeak

Interpeak		To			
		M25 N	A13 E	M25 S	A13 W
From	M25 N				00:28
	A13 E	00:39		00:28	
	M25 S		00:20		00:33
	A13 W			00:02	

Note: Values are in mm: ss. Positive values indicate slower journey times. Does not include journey time results for movements discussed separately in section. Source: TomTom satnav (Before: October 2013 to October 2014; 5YA: October 2021 to October 2022)

Table 7 Average journey time changes for through junction movements – PM peak

PM Peak		To			
		M25 N	A13 E	M25 S	A13 W
From	M25 N				00:11
	A13 E	00:24		-00:44	
	M25 S		-00:29		00:24
	A13 W			-01:14	

Note: Values are in mm: ss. Positive values indicate slower journey times. Does not include journey time results for movements discussed separately in section. Source: TomTom satnav (Before: October 2013 to October 2014; 5YA: October 2021 to October 2022)

Appendix B

B.1 Incident reporting mechanisms

Since 2012, many police forces have changed the way they collect STATS19 data (for more information see here). These changes mean casualty severity is now categorised automatically based on the most severe injury, rather than the judgement of an attending police officer.

Police forces using the new systems, called injury-based severity reporting systems, (also known as CRaSH and COPA) report more seriously injured casualties than those which don't. These changes make it particularly difficult to monitor trends in the number of killed and seriously injured casualties over time, or between different police forces. In response to these challenges, DfT and the Office for National Statistics (ONS) have developed an approach to adjust the data collected from those police forces not currently using injury-based reporting systems.

These adjustments are estimates for how casualty severity may have been recorded had the new injury-based reporting system been used. These adjusted estimates apply retrospectively from 2004 and adjust historical data to show casualty severity 'as if' this was recorded under the new injury-based system. Until all police forces have started using the new systems, these historical adjustments will continue to be updated every year. Using these adjusted totals allows for more consistent and comparable reporting when tracking casualty severity over time, across a region, or nationally. While there is no impact on total casualties or collisions, and no impact on total fatalities, these adjustments do impact serious and slight casualties and collisions.

B.2 Unadjusted collision severity

Part of the wider safety area of the M25 Junction 30-A13 Corridor Enhancement is located within the jurisdiction of Essex police constabulary who transferred from Stats19 to CRASH system for reporting personal injury collisions in November 2015.

Figure 23 shows the unadjusted collision severities on the wider safety area:

Figure 23 Unadjusted collisions by severity in the wider area

Observation Year	Fatal	Serious	Slight
5Yr Before	9	147	1105
4Yr Before	16	156	1085
3Yr Before	9	149	1029
2Yr Before	12	146	988
1Yr Before	17	144	890
1Yr Construct	18	124	711
2Yr Construct	17	125	618
1Yr After	11	150	621

Source: STATS19: STATS19 30th March 2012 – 26th February 2020

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