national highways

Dart Charge (Dartford ‘Free-Flow’ Charging)

Seven-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 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.

Before the improvements, demand for crossing the Thames at Dartford had grown substantially resulting in the crossing location operating in excess of its design capacity. There were delays and poor journey time reliability caused by the demand exceeding capacity. The government identified the crossing as a bottleneck to economic growth and this prompted a review of options to enable more traffic to flow through the available capacity. This includes the introduction of "free-flow" charging at the crossing for road users.

The evaluation covers the first seven years of its operation, we would typically undertake a five year after opening study however it would have fallen in July 2020, during the midst of the Covid-19 pandemic and associated travel restrictions it was decided therefore to extend the evaluation to a seven year after analysis.

After the first seven years of its operation, the overall impact of the project on journey times and speeds was largely positive. The route experienced traffic growth following the project implementation, up until the Covid-19, accommodated by the ability for traffic to flow through the available capacity more efficiently. As a consequence of the pandemic, observed flows decreased by over 20% in 2020. Observed daily and yearly crossing numbers post-2021 have recovered to a similar level to those seen in 2016-2018.

The number, rate and severity of personal injury collisions have seen a marked improvement compared to before the project, and the project has also outperformed the appraised expectations. Overall, the evaluation indicated that in the first seven years this investment is delivering both journey time and safety benefits and is on track to deliver ‘high’ value for money.

Elliot Shaw

Chief Customer and Strategy Officer

July 2025

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1. Executive summary

The Dartford Free-Flow Charging scheme (referred to as the 'DFFC project') was an infrastructure improvement project at the Dartford Crossing in the South East. The improvements were implemented over a year with completion occurring in July 2015. Prior to the improvements, the demand for crossing the Thames at Dartford had resulted in the crossing location operating in excess of its design capacity resulting in delays, poor journey time reliability and was identified as an economic bottleneck by the Government.

The main aim of the project was to introduce 'free-flow' charging at the crossing. Several measures were implemented to improve the flow of traffic, including the removal of existing plaza, barriers and payment booths, Automatic Number Plate Recognition (ANPR) cameras to support the new payment methods in place of the payment booths and new traffic control measures for the northbound tunnels.

Since the project was introduced, average journey times for road users have mostly reduced in both directions and in the morning (7-9am), inter-peak (9am-4pm) and evening peaks (4-7pm). Southbound road users experienced a greater level of journey time savings compared to before, with the highest observed in the morning peak. Road users travelling northbound, have also experienced improvements, particularly in the inter-peak and evening peak. However, during the morning peak, a deterioration of journey times has been observed northbound at seven years after compared to one year after opening and before the project implementation.

Journey time reliability for road users in both directions has also been found to improve for nearly all the time periods in the analysis. The largest improvement was observed in the southbound evening peak compared to before the project. During all time periods analysed, reliability of journeys has become more variable compared to the one year after the DFFC project opening.

There has been a reduction in the rate and number of personal injury collisions on both the project extent and the surrounding network. The project has delivered an annual average reduction of 14 personal injury collisions. 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 (hmvm) had also improved over time. The number of Fatal and Weighted Injuries (FWI[1)] has decreased annually. On the surrounding network[2] there was an annual average decrease of nine personal injury collisions per hmvm.

The overall noise impact of the project has been identified as negligible. Furthermore, biodiversity, water environment, landscape have been assessed as expected. In particular, the seven year after site visit determined that species-rich grassland implemented as a mitigation for woodland loss has transformed to scrubland with small trees. No invasive plant species were recorded on site. The assessment did however highlight an absence of some woodland edge planting and areas of poor grassland planting which have not established. The local townscape was therefore observed at the time of the site visit not to have been

[1] 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.

[2] 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.

improved through planting, nor has visual amenity benefited from landscape planting to achieve a slight beneficial effect, as predicted. National Highways continue to maintain and improve landscaping, with a forward plan in place to mitigate some of the areas identified, including:

- To re-plant the area to the east of Rennie Drive alongside the KMA with whip plants in November/December 2024.
- To over sow and plant wildflower plugs in the grassland on the other side of the KMA entrance in September/October 2024.
- To undertake some tidying up of the landscape in on the east side of Queen Elizabeth II southbound lane.

The evaluation also highlighted traffic density as high with a high concentration of HGVs, which was as expected. Whilst the total change in emissions caused by the project cannot be evaluated with confidence due to limited data, the evaluation suggests that the project may have led to a decrease in CO_2 emissions, potentially better than forecast.

The financial performance of the project is strong. Income has increased year-on-year since 2011-12, due to increases in traffic volume, changes to road user charges and the introduction of a revenue stream from enforcement (e.g. income related to revenue recognised in respect of penalty charges). Net proceeds have increased since the introduction of the DFFC project, with the project now collecting additional cashflow than through the previous arrangement.

Various surveys have been conducted to understand customer satisfaction, including with payment mechanisms, such as phone, online, registered customer accounts or retail outlets, to understand the interaction of road users with the scheme. The analysis at one-year after and seven-years after the DFFC project opening suggests that users have been satisfied with the service. Among the account holders who participated in the research, there was a high level of knowledge about various aspects of charging to use the Dartford Crossing; this translated with road users identifying the DART charge as easy to use.

The updated economic evaluation has highlighted, based on the first seven years of operation, that the project is on track to deliver 'high' value for money[3]. This is lower than the 'very high' value for money forecast; however, still represents a positive outcome for UK taxpayers over the 25-year life of the project. The main reason for this is the reduced level of benefits associated with a lack of journey time savings northbound. The appraisal forecast a significant traffic growth and improving journey times; whilst the observed data suggests a more modest traffic growth. Despite this, significant improvements to southbound journey times have been achieved. Significantly higher safety benefits than forecast have also been achieved.

[3] The value for money categories referenced are defined by Department for Transport (DfT) https://www.gov.uk/government/publications/dft-value-for-money-framework

2. Introduction

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

The Dartford Free-Flow Charging scheme (referred to as the 'DFFC project') opened for traffic in July 2015, following the start of construction in April 2014 and the introduction of Dart Charge (the new payment arrangements) on 30th November 2014.

Prior to the DFFC project, there were payment booths for road user charging, with barriers to the south of the Thames. Due to the barriers, drivers were required to stop and pay before being allowed to exit by a lifting barrier. Additionally, there were adjacent northbound and southbound plazas south of the Thames and the road network widened out to 27 lanes allowing for parallel payment, before merging back down to four lanes in each direction following payment. The layout of the payment facility pre-project is shown in Figure 1.

Figure 1 Pre-project payment booths and plazas (looking southbound)

Source: DFFC One-Year After POPE Report

Since the bridge's construction in 1991, the demand for crossing the Thames at Dartford has grown considerably, to the extent that it was determined in the DFFC project appraisal that the A282 at the crossing location was operating in excess of its design capacity. This exceedance was causing poor journey time reliability, delays and the Government also identified the crossing as causing an economic bottleneck. Three interventions were considered to address this:

1) Short term – suspension of charges during periods when the severity of congestion was such as to constitute an emergency, with the charge suspension to help to ease that congestion.
2) Medium term – introduction of 'free-flow' charging; and/or
3) Long term – consideration of options for increasing capacity.

The medium-term intervention was taken through the business case phases and refined to develop the DFFC project. It was expected that additional capacity would be delivered through the introduction of the new Lower Thames Crossing.

The DFFC project's main aim was to introduce 'free-flow' charging. This was achieved through changing the road user charging model from a pay-at-time of service where drivers would have to stop and pay at a barrier, to a model which requires payment in advance or by midnight the day after crossing. The new payment methods (Dart Charge) include the phone, online, registered customer accounts or retail outlets. Vehicles using the Dartford Crossing are captured through automated number place recognition (ANPR) cameras and a Tag based system.

The project comprised of the following elements:

1) Removal of the existing plaza, barriers, and payment booths.
2) Installation of ANPR cameras and supporting technology and communication links.
3) Setting-up a variety of payment channels to support the new arrangements.
4) Provision of four open traffic lanes in both directions.
5) Introduction of the Kent Marshalling Area (KMA) – a holding area where abnormal loads or vehicles carrying dangerous goods are checked before crossing; and
6) Provision of new traffic control measures (referred to as the traffic safety system) for access to the northbound tunnels to:
    - Minimise the safety risk of queuing traffic and congestion in the tunnel through controlling access to the tunnel; and
    - Provide an opportunity to allow abnormal vehicles to pass through the tunnel alone.

Figure 2 shows the post-project 'free-flow' ANPR camera arrangement for the northbound (anti-clockwise) traffic. This includes the removal of the barriers and plaza.

Figure 2 Post-project layout of the previous northbound (anti-clockwise) plaza

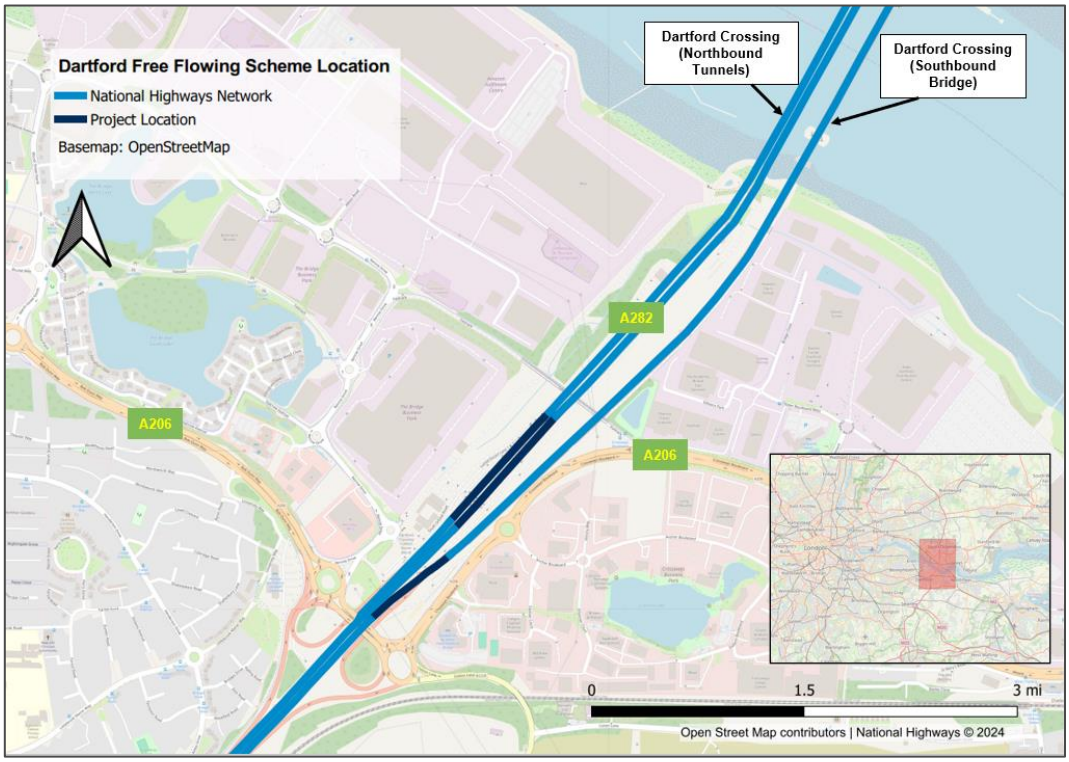
Source: DFFC One Year After POPE Report

Project location

The project is located on the A282 which forms part of the strategic road network (SRN) by connecting the two ends of the M25 London Orbital motorway (M25 Junction 1a to Junction 30) to complete the SRN ring around London. The Dartford Crossing also connects Dartford in Kent to Thurrock in Essex.

The A282 comprises of a southbound (clockwise on the Orbital) four-lane bridge and two northbound (anti-clockwise on the Orbital) two-lane tunnels, to allow journeys to be undertaken over and under the River Thames. The location of the project is shown in Figure 3.

Figure 3 Location of the project



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

A post-opening project evaluation (POPE) compares changes in key impact areas[4] 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.

A one year after POPE report was published in December 2017, with emerging findings for the project. Typically, a POPE report is subsequently completed five

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

years after opening to present mature findings of the impact a project has had. However, the five years after opening study for this project would have fallen in July 2020 – during the midst of the Covid-19 pandemic and associated travel restrictions – so it was decided to extend the evaluation to a seven year after analysis, which is discussed in this report.

For more details of the evaluation methods used in this study please refer to the POPE methodology manual on our website.[5]

[5] https://nationalhighways.co.uk/media/exypgk11/pope-methodology-note-2024-v2.pdf

3. Delivering against objectives

How has the project performed against objectives?

All National Highways major projects have specific objectives which are defined early in the business case process when project options are being identified. The project had five primary objectives which were the critical success factors outlined in the DFFC Full Business Case (September 2013) and three secondary objectives.

These objectives were appraised to be realised over 60 years. The evaluation presented in this POPE report provides an assessment of whether the project is on track to deliver the benefits.

Table 1 summarises the project's performance against each of the primary objectives, using evidence gathered for this study.

Table 1 Primary objectives and evaluation summary

Objective	Seven-year evaluation
Primary Objectives (Critical Success Factors)	
To improve average journey times through the Dartford Crossing.	Average journey times for road users have mostly reduced in both directions and in the morning, inter-peak and evening peaks, concluding that the objective has largely been achieved. It has however been observed that northbound, during the morning peak, a deterioration of journey times has been experienced compared to the before project implementation assessment. This is reflected in an adverse impact on monetised benefits forecast for journey time savings compared to the business case forecasts.
To deliver a quantifiable improvement in journey time reliability at the Dartford Crossing.	The assessment highlights the journey time reliability objective has largely been met. All trips have experienced an improvement across time periods assessed, with the exception of northbound morning peak. The Planning Time Index (PTI) also demonstrates a reduction in the time drivers must allow to ensure they reach their destination.
To deliver equivalent or improved safety performance for road users that includes safeguarding the integrity of the northbound restricted road tunnels.	There has been a reduction in the number, rate, and severity of personal injury collisions. At this evaluation point, the project has met its objective to reduce the number and severity of accidents. 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.

Objective	Seven-year evaluation
Primary Objectives (Critical Success Factors)	
To maintain the cumulative cashflows estimated to the end of the M25 Design, Build, Finance and Operate (DBFO) contract in 2039 if the existing charging arrangement continued as part of the M25 DBFO contract.	Net proceeds have increased since the introduction of the DFFC project. The project is observed to collect additional cashflow than through the previous arrangement. This suggests that the objective relating to maintaining cashflow has been achieved.
To set penalty charge values considering levels imposed by comparable projects and guidelines for other civil traffic enforcement penalties.	The evaluation concludes that the project has met its objective relating to proportionality of the penalty charges, number of Penalty Charge Notices (PCNs) issued and account uptake. Account uptake has been strong since project inception.

The POPE report also considers the impacts of the project against the following secondary objectives for the project:

1) No degradation of air quality (noise and emissions) at Dartford Crossing: the traffic flow changes observed are within the limits expected with the impact on noise and local air quality to be as expected.
2) No displacement of traffic onto other regional links thus having no detrimental impact on their performance: An assessment was undertaken at the one year after stage, identifying the nearest alternative route was Blackwell Tunnel to the west; albeit this would require a significant detour. Trend data was evaluated at the one year after stage to assess potential displacement impacts. This found that Blackwell Tunnel flow data growth was linear; indicating changes in traffic growth at the Dartford crossing since the introduction of the 'free-flow' project has not come with any traffic rerouting from Blackwell Tunnel. This highlighted the project had met this objective. This analysis was not repeated as part of this updated evaluation.
3) Charging operation should be as easy for the road user to interact with as other comparable 'free-flow' charging schemes, e.g. London Congestion Charge: Various surveys have been conducted to understand customer satisfaction, including with payment mechanisms such as phone, online, registered customer accounts or retail outlets to understand the interaction of road users with the scheme. The analysis at one-year after and seven-years after the DFFC project opening suggests that users have been satisfied with the service.
4) Scheme designed to maximise the compliance with the new payment arrangements: Compliance has remained high since the scheme was introduced. Analysis shows that annual compliance has operated between 92% and 95% since DFFC project opening; aligned with forecast expectations. The option to set up a pre-pay account has been highly successful; and
5) Scheme enforcement process designed to cover its costs and the loss of revenue from evasion: The evaluation highlights that the enforcement revenue offsets the costs of enforcement and debt recovery.

4. Customer journeys

Summary

This study has looked at seven years of traffic data through to 2022 instead of the typical five years after POPE analysis, this has been done to consider the impact of the Covid-19 pandemic and national lockdowns on traffic volumes at the crossing.

The DFFC project has increased capacity along the route, with traffic growth occurring from project opening until the Covid-19 pandemic and associated travel restrictions, where observed daily traffic levels decreased by over 20% in 2020. The observed daily and yearly crossing numbers post-2021 have recovered with traffic volumes now at a similar level to those seen in 2016-2018. In a wider area context, there has also been traffic growth experienced on the SRN with the largest increases experienced on the M25.

The study comprised two objectives relating to customer journeys, namely, to improve average journey times and journey time reliability.

Average journey times for road users have mostly reduced in both directions and in the morning (7-9am), inter-peak (9am-4pm) and evening peaks (4-7pm). Northbound, there has been improvements in the inter-peak of over a minute and a half compared to before the project, whilst the greatest improvement has been observed during the evening peak with reduction in journey times of over 3 minutes compared to before. During the morning peak, a deterioration of journey times was observed at seven years after compared to one year after opening and before the project implementation.

Southbound road users experienced a greater level of journey time savings compared to before, with the highest observed in the morning peak (over 10 and a half minutes). The removal of the plaza charging booths have contributed to the journey time improvements observed; however, traffic management remains for the northbound tunnels limiting the level of journey time benefits. The forecast journey times with the scheme, as reported in the Traffic Forecasting Report, compared to the seven years after assessment, were found to be broadly consistent for most time periods, except for the PM peak northbound, with journey times observed to be significantly improved including a substantial difference over 5 minutes northbound.

Journey time reliability for road users in both directions was found to improve for nearly all the time periods in the analysis. The largest improvement was observed in the southbound evening peak (close to 10 minutes) compared to before the project.

How have traffic levels changed?

The following sections examine the changes in traffic flow along the project extent and in the wider vicinity. This is compared with the observed national, regional, and local trends, as well as the observed and forecast traffic flows for the project to understand to what extent the forecast flows were realised.

National and regional

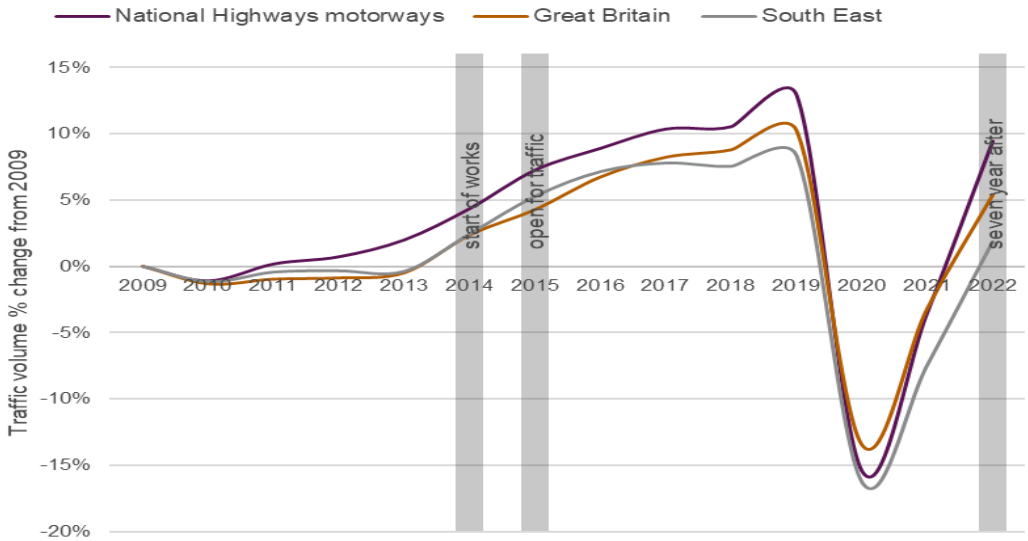
To assess the impact of the project on traffic levels, it is useful to understand the changes within the context of national and regional traffic. To do this, we use the

Department for Transport (DfT) annual statistics. The data is reported by local authority and road type, recording the total number of million vehicle kilometres travelled.[6] This data is used as a baseline, and we attribute any growth observed on roads in the project area which is above national and regional trends to the project.

Figure 4 shows the changes in traffic by year between 2009 (which is the baseline for this study) through to 2022 for Great Britain, the South East, and National Highways motorways. The new payment methods (Dart Charge) were introduced in November 2014 following the start of construction in April 2014. The main road layout roadworks was completed by the end of July 2015. Due to the outbreak of Covid-19 in February 2020, this evaluation is a seven year after study and considers data from 2022.

Between 2009 and 2022, there has been an average growth of 6% in background traffic, with the highest level of growth observed on National Highways motorways (9%), followed by in Great Britain (5%) and the South-East (2%). Following the impact of the lockdown restrictions on traffic levels from 2020 to 2021[7], Figure 4 illustrates that traffic levels are recovering at different rates with the South East experiencing a slower growth rate to that of Great Britain and National Highways motorways.

Figure 4 Changes in national and regional background levels of traffic



Source: DfT Road Traffic Statistics Table TRA8901.

How did traffic volumes change?

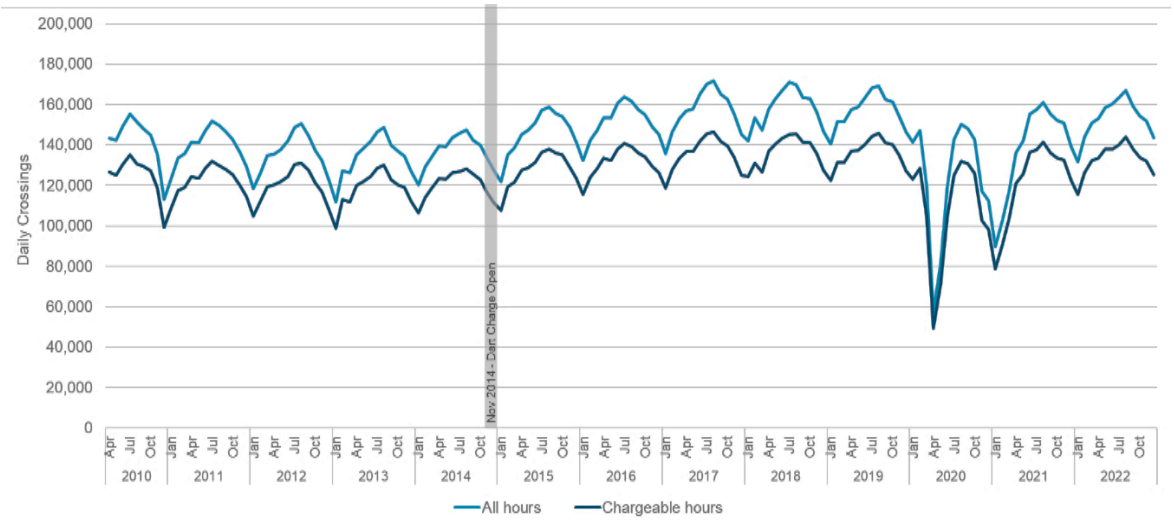
Traffic volumes were analysed for the DFFC project area from crossing data for before and after the project implementation. Figure 5 presents the change in the number of crossings for 24-hour periods (all hours) and for the chargeable hours (6am to 10pm), between 2010 and 2022. It highlights there was minimal change prior to project opening, but after opening, there was traffic growth until the Covid-

[6] Motor vehicle traffic (vehicle kilometres) by region in Great Britain, annual from 1993 to 2022, Table TRA 8904, DfT

[7] Timeline of UK government coronavirus lockdowns and measures, March 2020 to December 2021 - https://www.instituteforgovernment.org.uk/sites/default/files/timeline-coronavirus-lockdown-december-2021.pdf

19 pandemic and associated travel restrictions. Following the considerable reduction in traffic in 2020 and 2021, there has been a recovery of traffic levels.

Figure 5 Average daily crossings by month (Two-way)



Source: Dart Charge Traffic Release Reports

Table 2 separately shows the annual crossing numbers at the Dartford Crossing with similar trends observed during 'All-Hours' and in 'Chargeable Hours'. Prior to 2014, minor reductions occurred in traffic levels year-on-year. This was followed by small increases from 2014 to 2018. The impact of Covid-19 travel restrictions is seen in 2020, with traffic declining by over 20%. Traffic volumes observed in 2022 have reached levels seen in 2016 - 2018.

Table 2 Average annual daily crossings (Two-way)

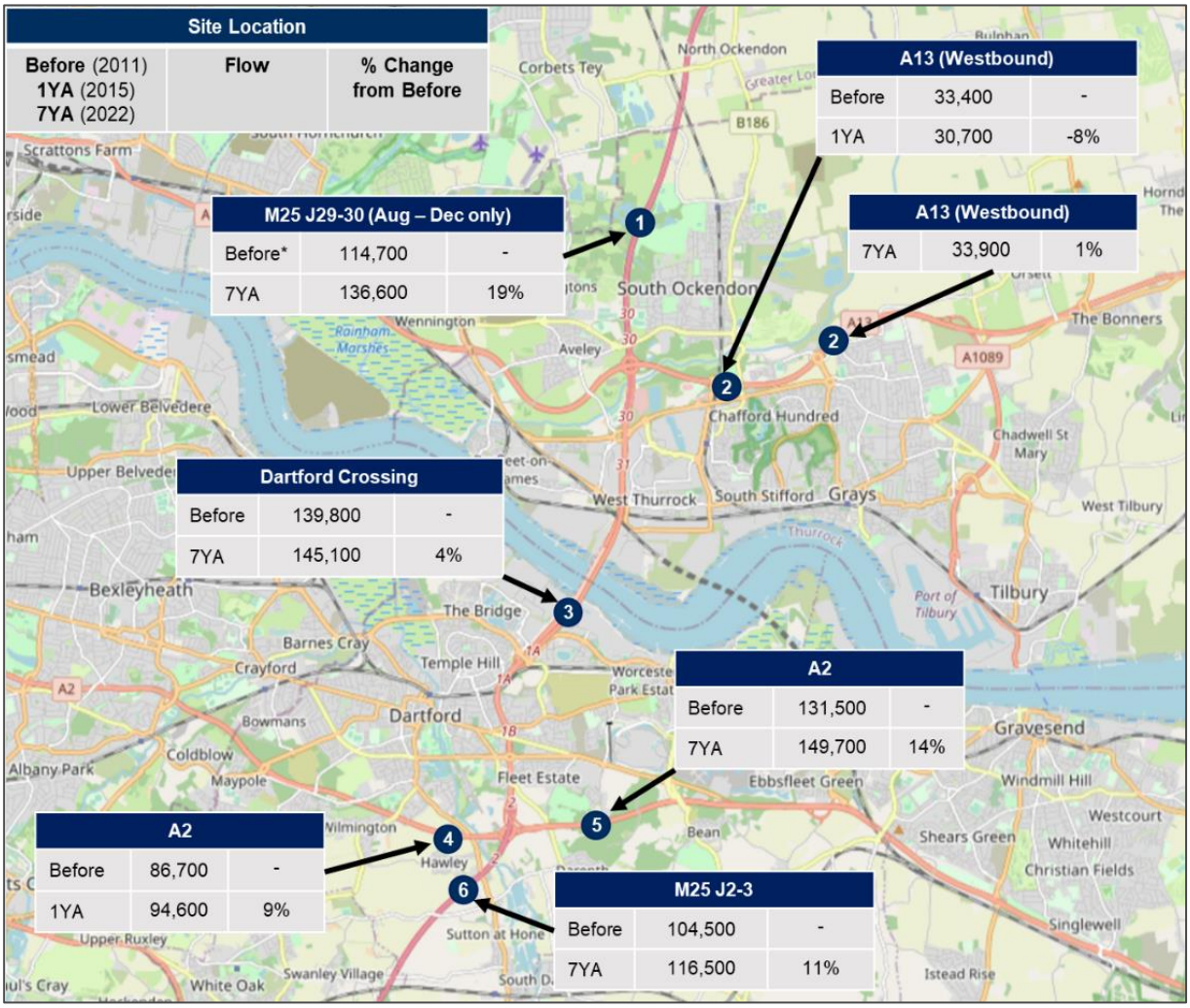
Year	All Hours		Chargeable Hours	
	N	% Diff	N	% Diff
2011	139,758		122,439	
2012	135,808	-3%	119,798	-2%
2013	134,474	-1%	118,527	-1%
2014	136,833	2%	120,235	1%
2015	146,244	7%	127,799	6%
2016	151,700	4%	131,449	3%
2017	157,052	4%	135,582	3%
2018	158,338	1%	136,557	1%
2019	157,003	-1%	136,021	0%
2020	123,206	-22%	107,916	-21%
2021	138,288	12%	121,656	13%
2022	153,084	11%	133,066	9%

Source: Dart Charge Traffic Release Reports

To understand the wider context of traffic flow changes in the local area, 24-hour Average Weekday Traffic (AWT) flows are presented Figure 6 with the Dartford Crossing showing Average Daily Traffic (ADT) flows. The flows show that there has been growth experienced on all roads as of the seven year after analysis.

The M25 and A2 mainlines experienced the highest level of growth compared to before, with a higher level seen on the northern side of the crossing on the M25. In comparison, the A13 Westbound to the east of the M25 saw minimal growth, with an 1% increase compared to before.[8]

Figure 6 Comparison of wider area flows, before and after project implementation



Source: National Highways (WebTRIS). one year after project implementation and seven years after project implementation). *2012 data used.

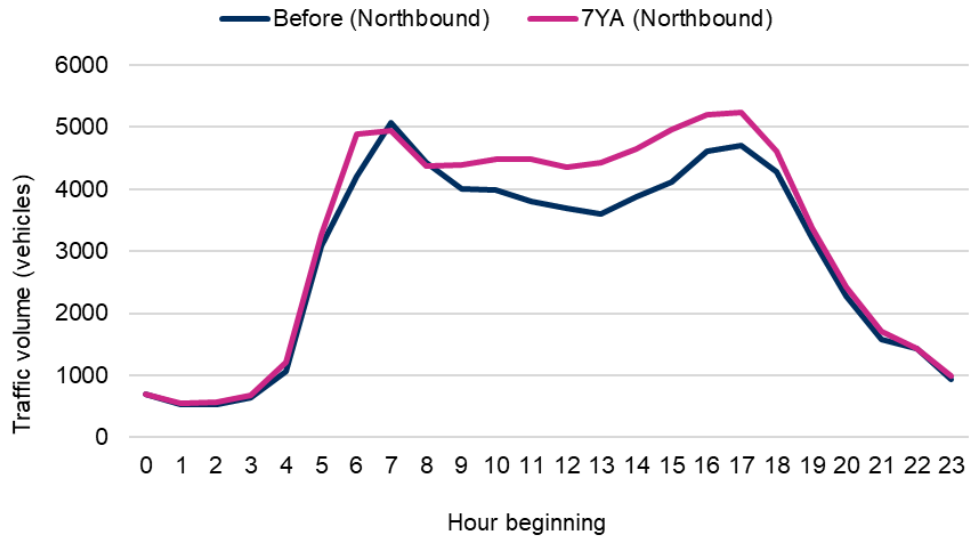
Analysis of the hourly weekday (Figure 7 and Figure 8) and weekend (Figure 9 and Figure 10) flows at the crossing are shown below for both directions. The one year after data for northbound has not been included due to the impact of the M25 Junction 30 project roadworks on flows.

Figure 7 for weekday traffic northbound illustrates that at seven years after, the morning peak has slightly shifted to an earlier point compared to before the DFFC

[8] It is important to approach the presented data at the A13 westbound site cautiously with a different count site used for the seven years after opening analysis. This reflects the limited data available for comparative analysis.

project. Furthermore, at seven years after, there were higher inter-peak traffic volumes, with the evening peak at the same point as before the project.

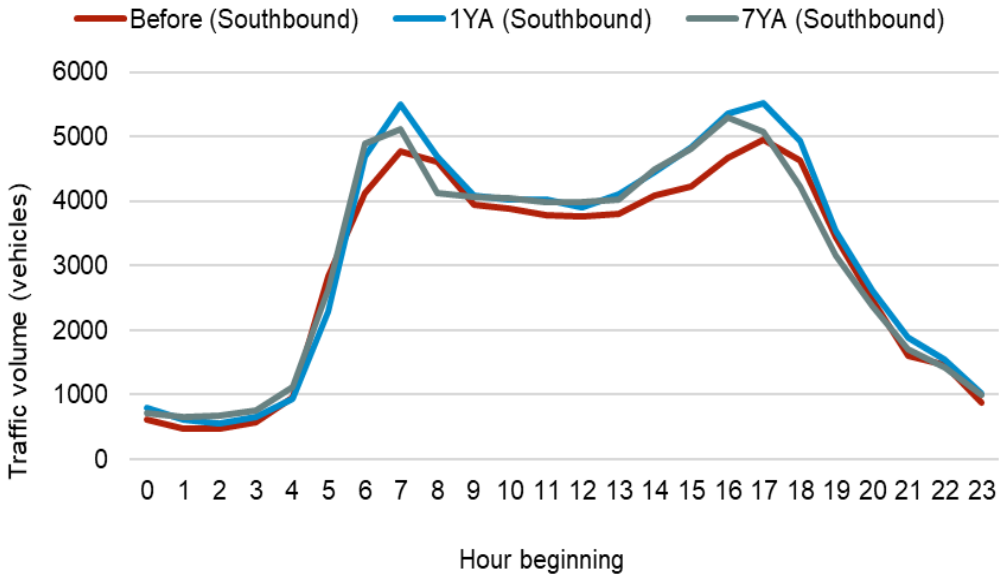
Figure 7 Hourly weekday flow profile northbound



Source: National Highways (WebTRIS and NTIS). Before: October/November 2014, 7YA: September 2022.

Southbound, the hourly profile (Figure 8) highlights the evening peak was earlier seven years after opening, with traffic volumes at one year after and seven years after generally higher than before throughout the day.

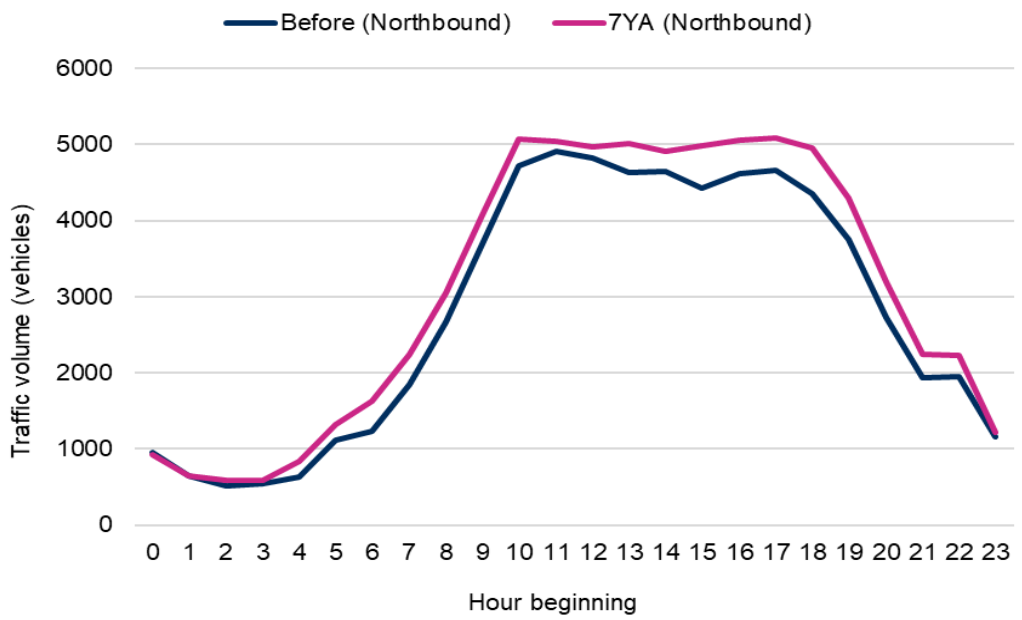
Figure 8 Hourly weekday flow profile southbound



Source: National Highways (WebTRIS and NTIS). Before: October/November 2014, 7YA: September 2022.

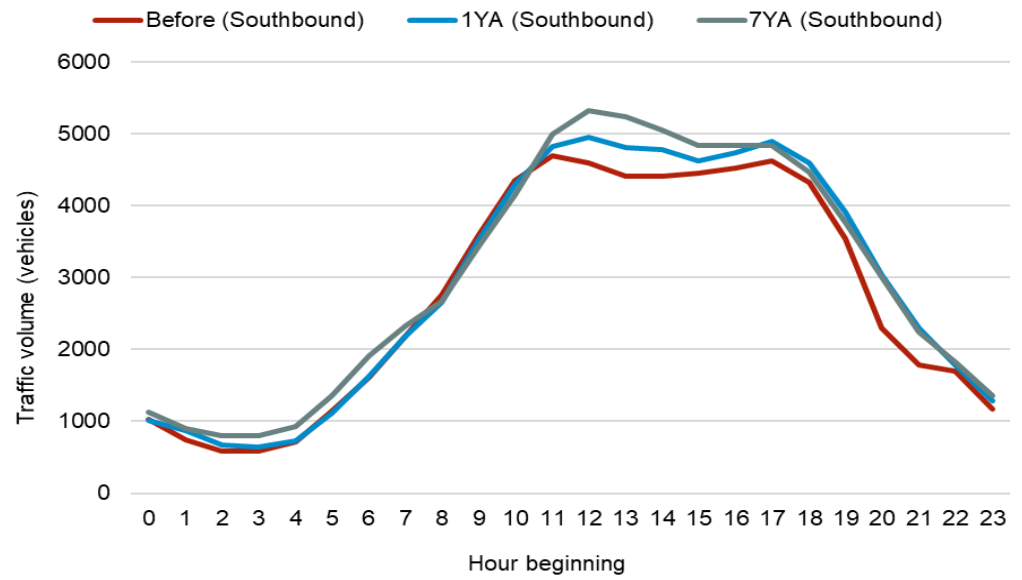
Hourly weekend traffic volumes in both directions showed a typical bell-shaped curve for weekend flows, with no clear peak periods throughout the day. Northbound (Figure 9) at seven-years after has seen an increase in traffic volumes throughout the day, with southbound (Figure 10) seeing a similar trend with traffic volumes higher than one year after and before the project was implemented.

Figure 9 Hourly weekend flow profile northbound



Source: National Highways (WebTRIS and NTIS). Before: October/November 2014, 7YA: September 2022.

Figure 10 Hourly weekend flow profile southbound



Source: National Highways (WebTRIS and NTIS). Before: October/November 2014, 7YA: September 2022.

Was traffic growth as expected?

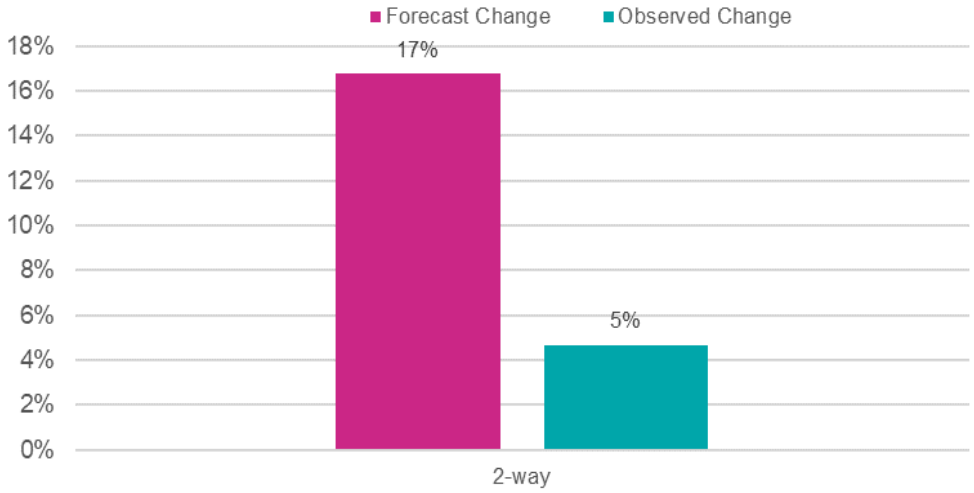
The investment decision for this project was supported by a project appraisal, which included forecasts about the likely impact on traffic. The appraisal forecasted and observed changes in traffic volumes are shown in Figure 11 for two-way crossings across a 24hr period.

The forecasted change compares the forecasts for the 2015 without project scenario and the 2022 with project scenario[9], highlighting a 17% growth was expected.

[9] The 2022 with project forecast was interpolated from the 2015 and 2025 with project forecasts.

The observed change in traffic volume shows the change before and seven years after in the annual average daily traffic (AADT) at the crossing, highlighting less growth than forecast.

Figure 11 Forecasted change in traffic volume (2015 without project vs 2022 with project) and observed change in traffic volume (24Hr AADT before vs 7yr after)



Source: National Highways Traffic Forecasting Report (TFR) and Dart Charge Traffic Release Reports. Before: 2015, 7YA: 2022.

Table 3 shows the two-way crossings for the forecast and observed traffic flows. The level of crossings projected in the appraisal was slightly lower (2%) than the observed before flows. Additionally, a comparison of the seven years after observed and interpolated forecast values, show the model predicted a higher level of growth (observed flows 2% lower than forecast), suggesting traffic flows were still recovering post Covid-19.

Table 3 Forecast and Observed Data for the project

	Forecast (24Hr AADT)		Observed (24Hr AADT)			
	Do-Minimum (2015)	Do-Something (2022)	Before (2014)	7yr after (2022)	Forecast vs Observed *(Before)*	Forecast vs Observed *(7YA)*
Two-Way Crossings (n)	133,800	156,300	136,800	153,100		
Difference (%)					2%	-2%

Source: National Highways Traffic Forecasting Report (TFR) and Dart Charge Traffic Release Reports. Before: 2014, 7YA: 2022.

Relieving congestion and making journeys more reliable

One of the objectives for the DFFC project was to reduce the journey times at the crossing associated with users paying the road user charge in the plaza at the payment booths with the barriers. Analysis of journey times and speeds can indicate the impact of the project on congestion at the crossing. The extent to which journey times vary from the expected average journey time provides an indication of journey reliability.

To analyse journey times, forecast journey time changes have been taken from the Traffic Forecasting Report (TFR), with observed journey times for before the DFFC projects construction, one year after and seven-years after opening using satnav (TomTom) data. The journey time route, time periods and months of the year used for the one year after analysis have been replicated for the seven-years after analysis.

The main time periods presented in this section of this analysis are the three weekday peak periods. These were selected at one year after based on the daily flow profile for the crossing, which shows when the core demand hours are. The main time periods are:

- Morning peak (7-9am).
- Inter-peak (9am-4pm); and
- Evening peak (4-7pm).

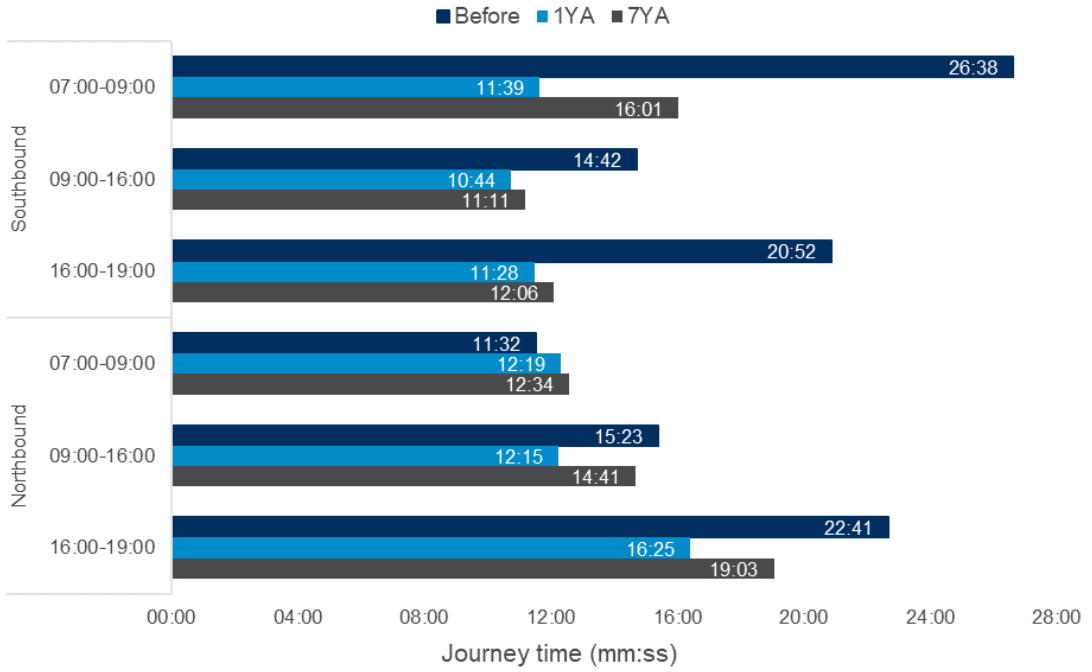
Did the project deliver journey time savings?

Improvements in journey times occurred at one year after and seven-years after compared to before for almost all the main time periods, with the DFFC project appearing to remove congestion along the route northbound and southbound. The journey time savings observed in both directions are presented in Figure 12.

Average journey times northbound in the evening peak seven years after opening saw the greatest improvement compared to before the DFFC project, with a saving of over 3 minutes. There were also improvements seen in the inter-peak of over half a minute compared to before. However, during the morning peak, a slight deterioration in journey times was observed compared to before and one year after opening analysis. One explanation for this deterioration in journey times is capacity constraints of the two tunnels northbound, preventing queuing in the tunnels for safety reasons. Furthermore, this is likely to have been influenced by traffic growth compared to before. During all time periods, journey time savings at seven years after opening, decreased compared to one year after opening, with the largest difference observed during the evening peak of over two and a half minutes.

Southbound, average journey times seven years after opening saw large improvements in all time periods compared to before the DFFC project, with savings in the morning peak of over 10 and half minutes, followed by savings of over 8 and a half minutes in the evening peak, respectively. The inter-peak also saw average journey times improving by over 3 and a half minutes compared to before. Journey time savings were also not as large compared to one year after; for example, for the morning peak, journey time savings were more than 5 minutes less compared to one year after opening.

Figure 12 Change in average journey times northbound and southbound

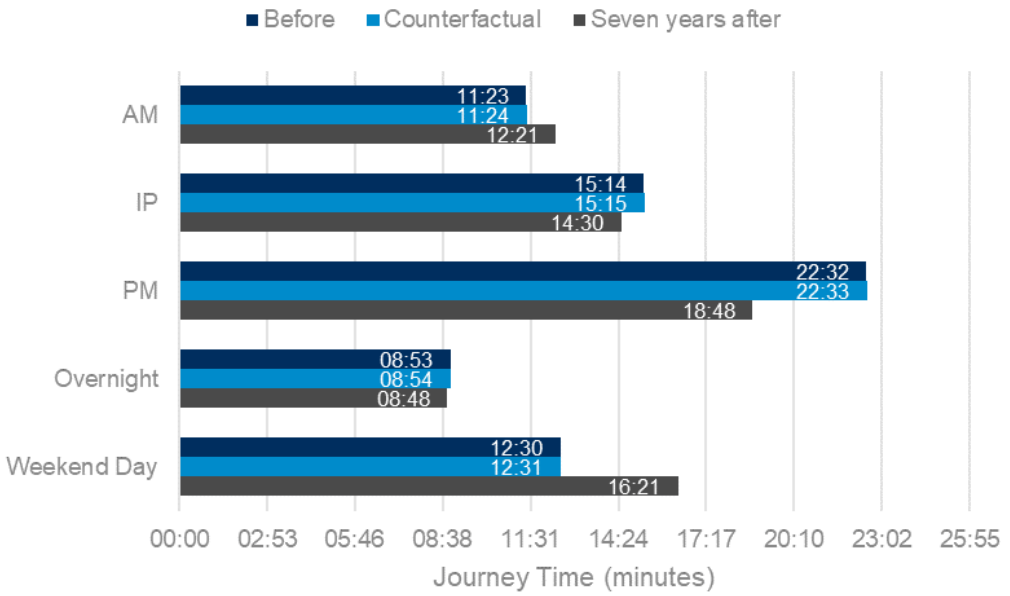


Source: Satellite Navigation (TomTom). Before: September-November 2014, 1YA: September-November 2015, 7YA: September-November 2022.

The counterfactual was calculated to give an estimate of what the journey time would likely have been had the project not been implemented and journey times continued to deteriorate with increasing traffic levels. The counterfactual journey times are the result of multiplying the observed before journey times by the percentage change in journey time (calculated from the before and counterfactual theoretical journey times). These theoretical journey times are calculated using different parameters including the type of road, capacity, annualisation factors etc.

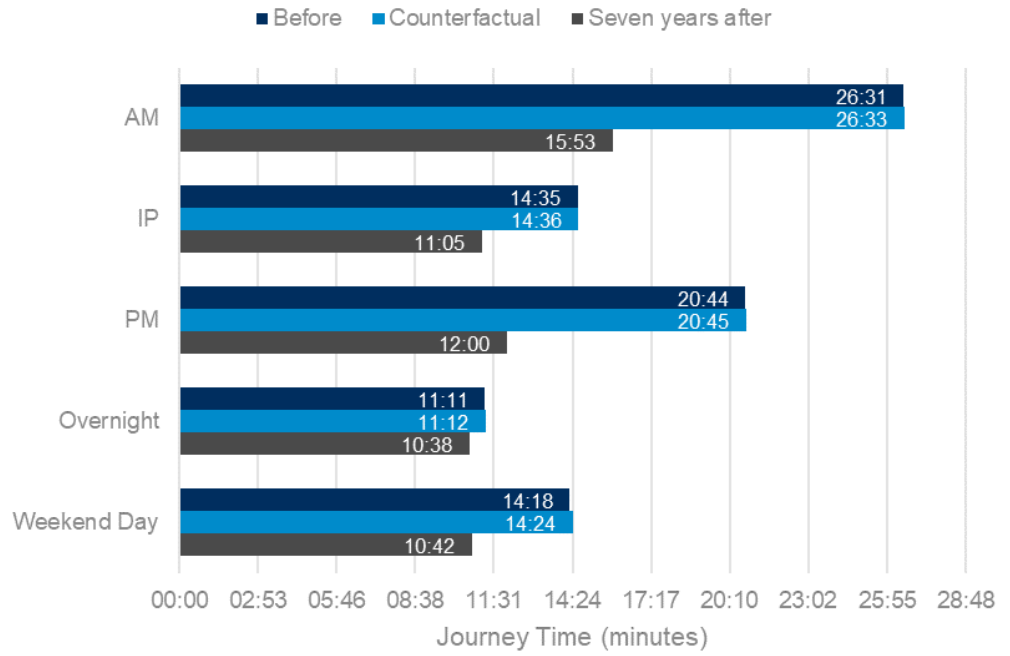
For the journey time analysis route, the journey times observed at seven years after show an improvement in both directions, as illustrated in Figure 13 and Figure 14, compared to before and the counterfactual, except for northbound in the morning peak. To understand the full benefits of the DFFC project, the inclusion of the overnight (10pm to 6am) and weekend days' (9am to 9pm) time periods have also been used in this analysis. In comparison to the counterfactual, overnight, there was little to no change at seven years after in both directions, and during the day on weekends, there has been worsening in journey times northbound and quicker journeys southbound.

Figure 13 Counterfactual comparison to before and 7 year after journey times (northbound)



Source: Satellite Navigation (TomTom). Before: September-November 2014, 7YA: September-November 2022.

Figure 14 Counterfactual comparison to before and 7 year after journey times (southbound)



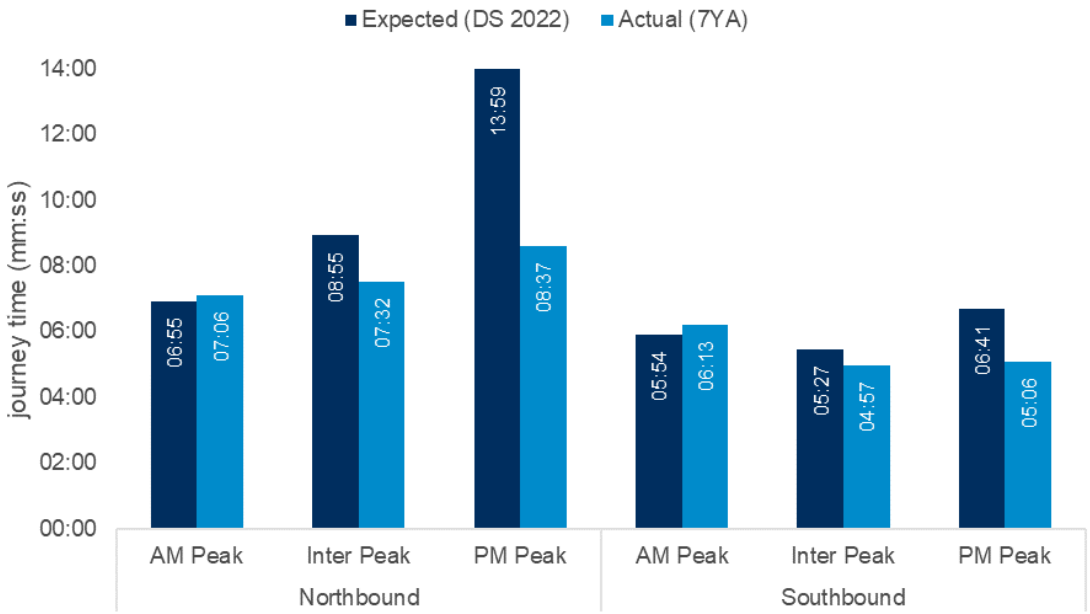
Source: Satellite Navigation (TomTom). Before: September-November 2014, 7YA: September-November 2022.

Were journey time savings in line with forecast?

A comparison has been made between the observed journey times seven years after and the forecast journey times in the TFR. These are referenced as 'expected' in this section. The expected journey times have been calculated by interpolating the forecast journey times, to present the same year as the observed journey times, which for this section is seven-years after opening (2022).

As illustrated in Figure 15, the observed journey times seven-years after the DFFC project opening were marginally longer than was expected during the morning peaks in both directions (up to 20 seconds longer) and up to a minute and a half of the expected values during the inter-peaks in both directions. Additionally, in the evening peaks for both directions the expected journey times were higher than what has been observed, with a substantial difference northbound of over 5 minutes.

Figure 15 Actual versus expected journey times



Source: National Highways TEAR and Satellite Navigation (TomTom).

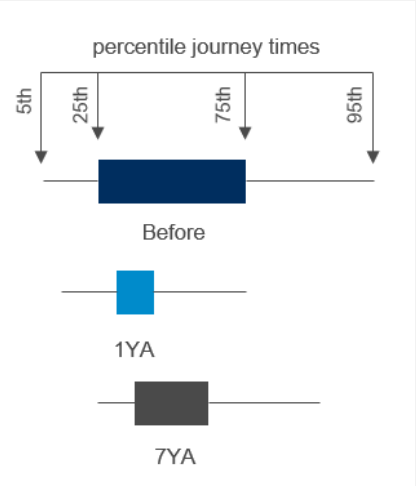
Did the project make journeys more reliable?

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.

An objective of the project was to deliver a quantifiable improvement in journey time reliability at the Dartford Crossing. To measure this, we examine how much journey times vary from the average journey time, on any day or time-period. The distribution of journey times is a good indication of how much journey times vary.

Four metrics of the distribution of journey times for the journey time analysis route 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 16.

Figure 16 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. This shows the difference between the longest and the shortest journey times observed.

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.

The journey time reliability, referenced as half of all journeys, is depicted by the 25th to 75th percentile boxes in Figure 17 and Figure 18. If the boxes get shorter, this indicates journeys become less variable and users can be more confident of the time it takes to travel through the route.

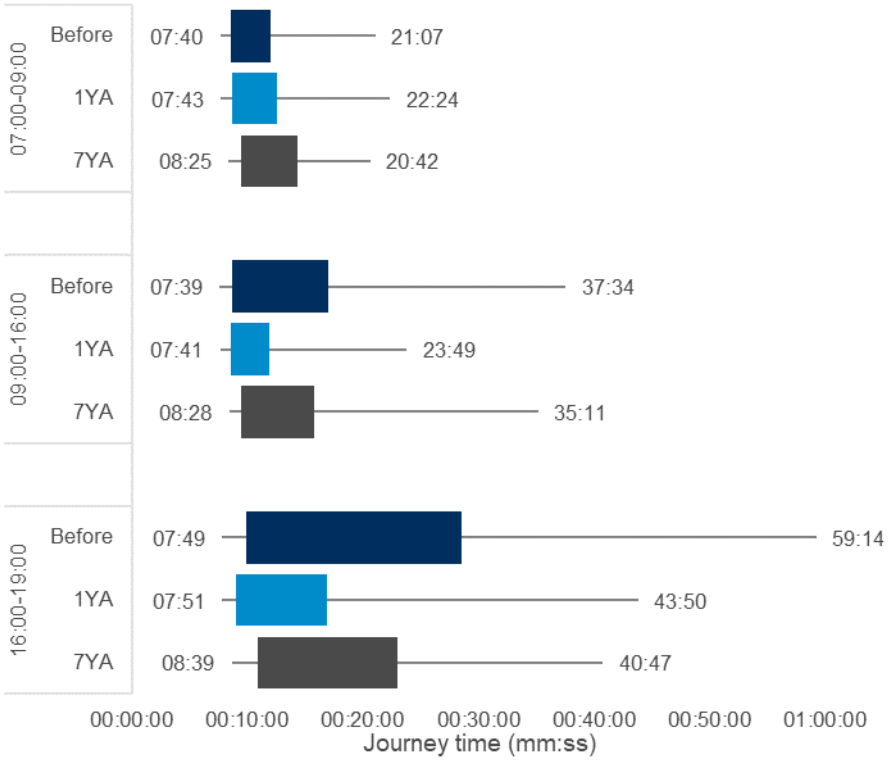
For road users northbound (Figure 17), there has been a slight improvement in the reliability of journeys at seven-years after compared to before the DFFC project, except for during the morning peak. The reliability improved the most during the evening peak where there was a six-and-a-half-minute improvement compared to before. For users in the morning peak, a deterioration of journey time reliability was observed at seven-years after compared to before of close to a minute and a half. During all time periods analysed, reliability of journeys has become more variable compared to one year after the DFFC project opening.

For southbound road users (Figure 18) all the main time periods saw an improvement in journey reliability at seven years after opening compared to before, with the largest improvement during the evening peak (close to 10 minutes). In comparison to one year after, the morning peak and inter-peak also followed the trend observed northbound with a deterioration in reliability. The exception to this being the evening peak, which saw a slight improvement of under 10 seconds at seven years after opening.

The longest journey times are depicted by the 95th percentile (the line extending to the right of the boxes). For road users northbound at seven years after opening, the duration of journeys reduced during all main time periods compared to before, with the largest reduction observed during the evening peak of over 18 minutes. Southbound, the longest journeys all saw considerable improvements in journeys times, with the morning and evening peaks both seeing a reduction of over 25 minutes. In comparison to one year after opening, in both directions and for all main time periods, apart from the northbound evening peak, the longest journey times have increased.

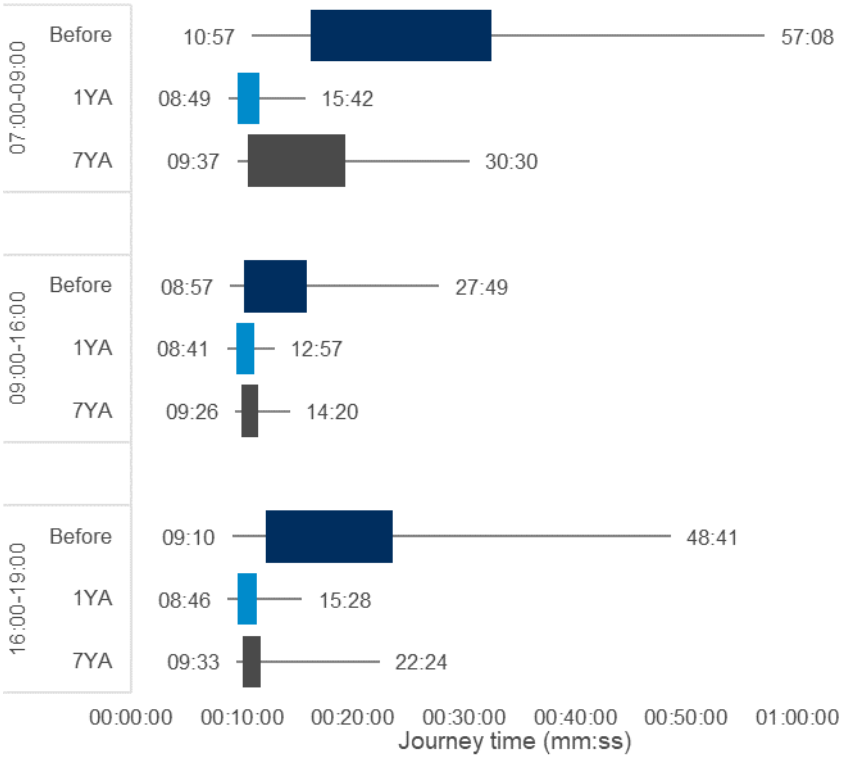
In terms of the shortest journey times (depicted by the 5th percentile, the line extending the left of the boxes), road users at seven years after travelling southbound during the morning peak journey times reduced by over 1 minute compared to before construction but had observed an increase in journey times compared to one year after opening. For the other times periods in both directions, journey times increased compared to before the DFFC project and one year after opening.

Figure 17 Journey time reliability northbound (time taken to drive through the route mm:ss)



Source: Satellite Navigation (TomTom). Before: September-November 2014, 1YA: September-November 2015, 7YA: September-November 2022.

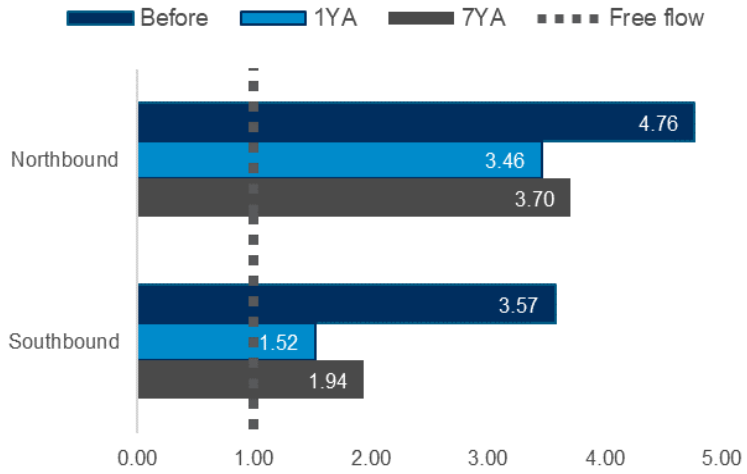
Figure 18 Journey time reliability southbound (time taken to drive through the route mm:ss)



Source: Satellite Navigation (TomTom). Before: September-November 2014, 1YA: September-November 2015, 7YA: September-November 2022.

We have also considered reliability through the Planning Time Index (PTI). The PTI is a reliability measure and represents how much time drivers must allow to ensure they reach their destination on time in 95% of cases. The PTI for the project is illustrated in Figure 19; the results show that southbound, the PTI has considerably reduced compared to before at seven years after, with a slight deterioration from one year after. Northbound, the impact was less pronounced one year and seven-years after, with reliability also worse at seven-years after than one year after. The removal of the charging booths has removed the capacity limiting factor for journeys in both directions, however the northbound tunnels still has traffic management in place, which contributes to the variability in journeys during the main time periods.

Figure 19 PTI along the journey time analysis route



Source: Satellite Navigation (TomTom). Before: September-November 2014, 1YA: September-November 2015, 7YA: September-November 2022.

5. Safety evaluation

Summary

The safety objective for this project was to deliver equivalent or improved safety performance for road users that includes safeguarding the integrity of the northbound restricted road tunnels.

The number of personal injury collision[10] and the rate of these collisions per hundred million vehicle miles were analysed to track a change over time.

There has been a reduction in the rate and number of personal injury collisions on both the project extent and the surrounding wider safety area. This is based on comparing the first six years of the project being operational with the annual average for the five years before the project improvements.[11]

There had been an annual average reduction of 14 personal injury collisions, on the project extent, which is in line with the appraised business case for the project. This is based on an annual average of 25 personal injury collisions after the project was operational compared with 39 before the project. If the DFFC project had not been implemented, we estimate that the number of personal injury collisions would have been between 17 and 49.

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 17 personal injury collisions per hundred million vehicle miles (hmvm), this equates to travelling six million vehicle miles before seeing an accident. Before the project, the collision rate was 25 per hmvm, this equates to traveling four million vehicle miles before seeing an accident. If the road had not been upgraded, we estimate the collision rate would remain at 18 collisions per hmvm. The reduction in collision rates suggest that safety has improved, but we are less confident in this conclusion.

The number of fatal collisions has changed with one fatality after the DFFC project was operational compared to none before.

The number of Fatal and Weighted Injuries (FWI)[12] has decreased annually. Before the project, there was an annual average of one FWI per year. After the project became operational, this has reduced to 0.8 FWI per year. When accounting for the increased number of road users over this period, there has been an additional 46 million vehicle miles travelled before FWI occurred.

On the surrounding wider safety area[13], there was an annual average decrease of 71 personal injury collisions per hmvm (based on an annual average of 219 personal injury collisions observed after the project had opened compared with 290

[10] A collision that involves at least one vehicle and results in an injury to at least one person.
[11] We have tested the results at 90% confidence interval. The critical value at 90% confidence interval is 47, the observed collision savings for the project extent are close to this value of 47. We believe that the collisions savings observed for the project extent ensure that the project has met its safety objective.
[12] 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.
[13] 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.

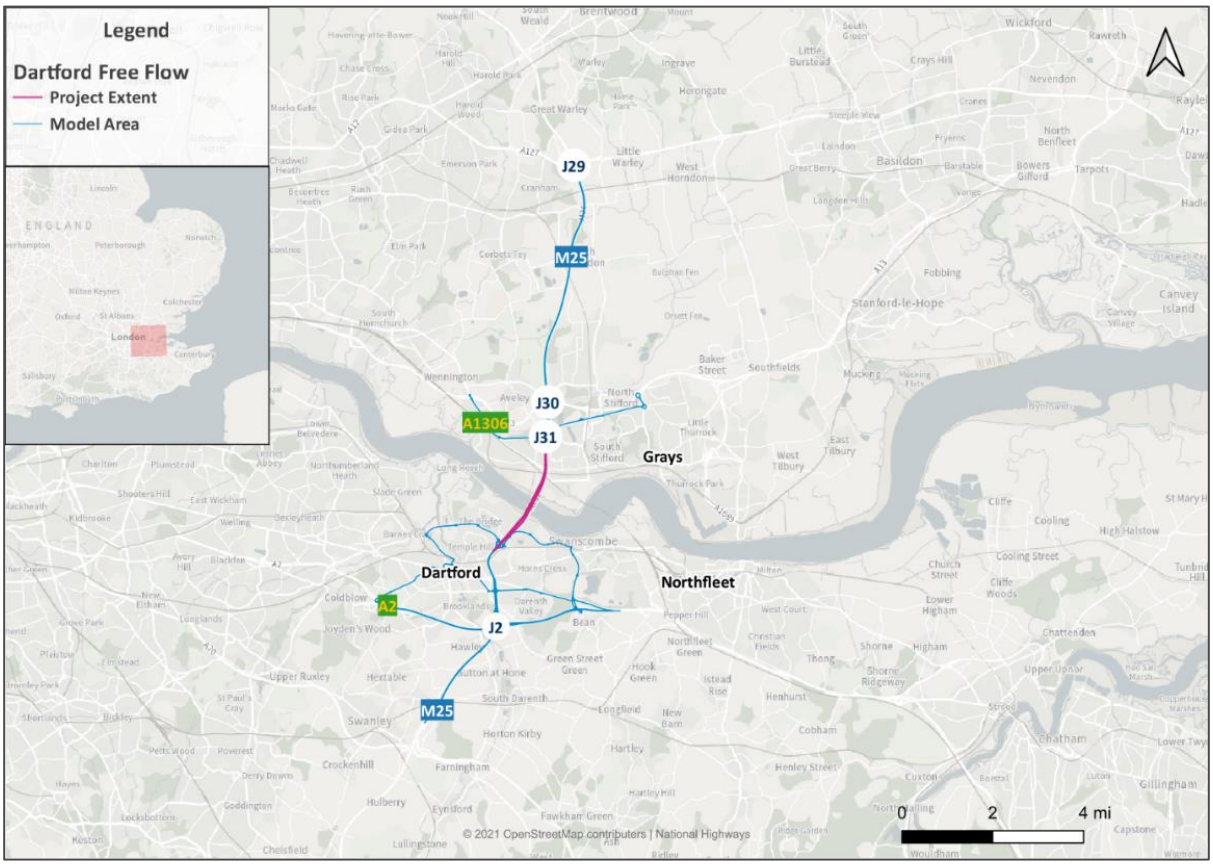
before the project). If the road had not been upgraded, we estimate that the number of personal injury collisions would be between 153 to 229.

Based on this analysis, the evaluation found there has been a reduction in the number, rate, and severity of personal injury collisions. At this evaluation point, the project has met its objective to reduce the number and severity of accidents.[14] 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.

Safety study area

The safety study area is shown in Figure 20. This area was assessed in the appraisal supporting the business case for the project to check any potential wider implications of the intervention.[15] This information was then used with other predictions 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 20 Safety study area



Source: National Highways and OpenStreetMap contributors

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

[15] The wider area evaluation has compared before and after analysis for the SRN, 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 DfT road safety data.[16] 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.

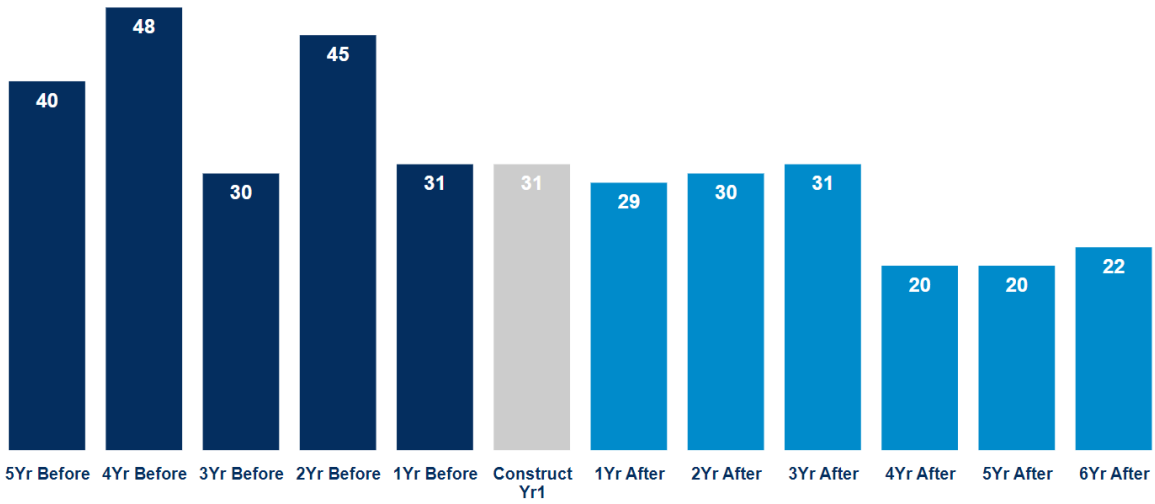
The safety analysis was undertaken to assess changes over time looking at the trends in the five years before the project was operational to provide an annual average. We have then assessed the trends six years after.

The analysis draws on the following data collection periods:

- Pre-construction: 1 November 2009 to 31 October 2014
- Construction: 1 November 2014 to 31 July 2015
- Post-opening: 1 August 2015 to 31 July 2021

The evaluation found the number of personal injury collisions on the project extent, had decreased.[17] Over the six years after the project was operational, there were an average of 25 personal injury collisions per year, 14 fewer than the average 39 per year over the five years before the project was constructed.

Figure 21 Annual Personal Injury Collisions



Source: STATS19: 1st November 2009 to 31st July 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 period. To do this, we estimate the trend in personal injury collisions which might have occurred if the toll booths road had remained (this is referred to as a counterfactual – refer to Figure 22 and the POPE methodology manual[18]).

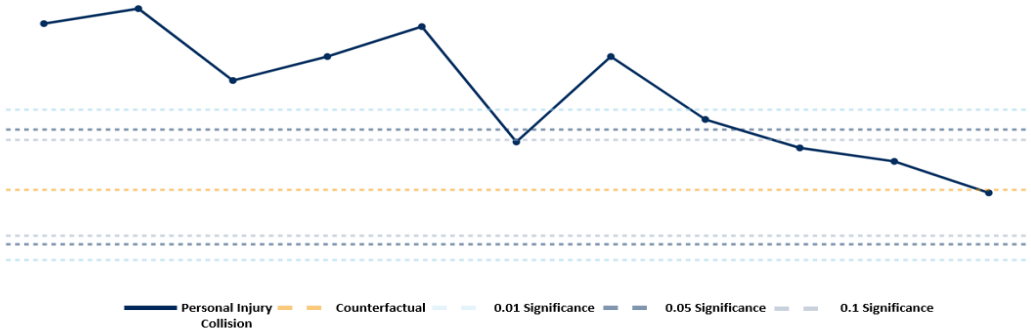
Based on this assessment, we estimate that if the toll booths had not been removed, the trend in the number of personal injury collisions would likely have decreased, but not as much as we have observed as shown in Figure 22.

[16] https://data.gov.uk/dataset/cb7ae6f0-4be6-4935-9277-47e5ce24a11f/road-safety-data
[17] Impacts on the wider area are discussed in the next section.
[18] https://nationalhighways.co.uk/media/exypgk11/pope-methodology-note-2024-v2.pdf

Figure 22 What does the counterfactual show?

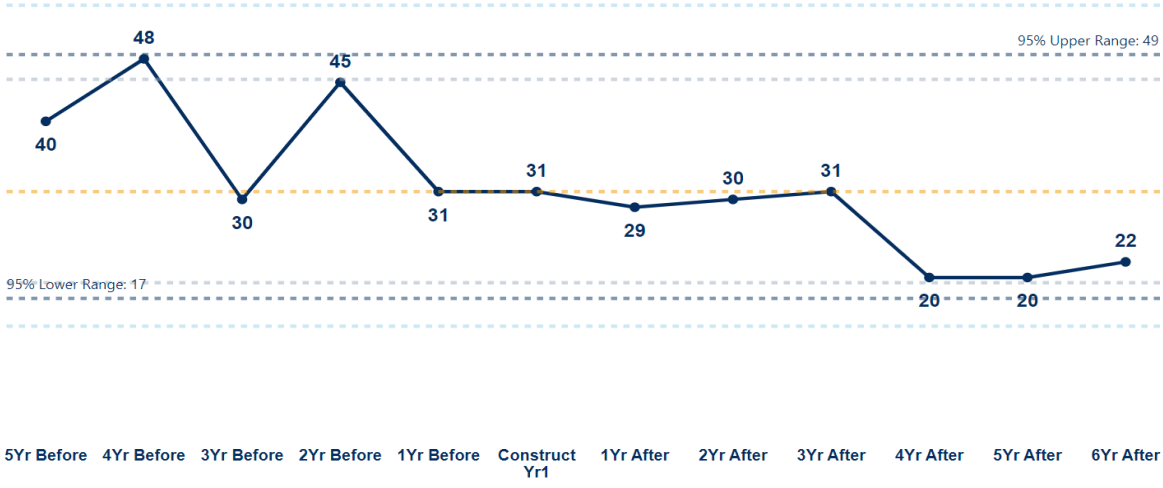
The counterfactual is an estimation of what we think would occur without the project taking place. We estimate a range of collisions that follow regional trends. The chart shows:

1. Annual average number of collisions from before the project
2. Annual average number of collisions after the project
3. 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.
4. National Highways is developing new statistical methods to compare collision and casualty rates. We anticipate adopting these once the methods are finalised.



A range of between 17 and 49 personal injury collisions[19] during the six-year post project period would be expected, as shown in Figure 23.

Figure 23 Observed and expected range of personal injury collisions



Source: STATS19: 1st November 2009 to 31st July 2021

An annual average of 25 personal injury collisions were observed over the six-year post-opening period, we have seen an improvement compared to what would be expected without the removal of the toll booths. However, as this reduction is within the 95% threshold, we cannot be confident in these results.

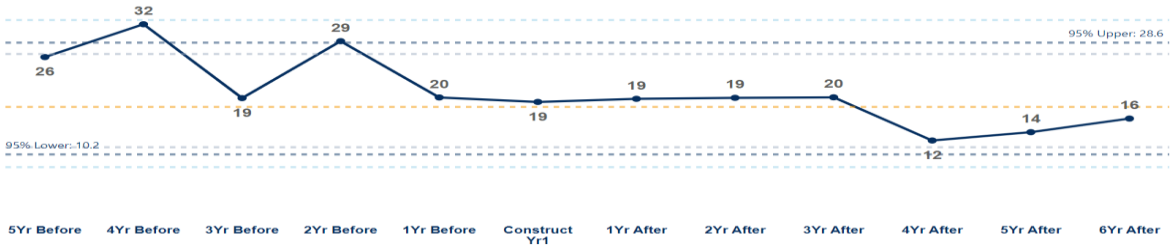
[19] The safety methodology is different from one-year to five-year evaluation. We still have confidence in the accuracy of the previous methodology but have made suitable changes that will ensure a methodology fit for purpose for the future.

How had traffic flows impacted collision rates?

It is important to contextualise any incidents in the volume of traffic seen on this stretch via a collision rate, the number of personal injury collisions per annual 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 25 personal injury collisions per annual hmvm. After the project improvements were made, there was a decrease to an average of 17 personal injury collisions per annual hmvm.

Figure 24 Observed and expected range of personal injury collisions / hmvm



Source: STATS19: 1st November 2009 to 31st July 2021

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

A counterfactual test was undertaken. It found that the collision rate would likely have been 18 collisions per annual hmvm in the counterfactual scenario. The reduction in collision rates is greater than the counterfactual scenario but falls within the 95% threshold.[20]

What changes in the severity of collisions did we see?

Collisions which 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 (CRASH). This is an injury-based reporting system, and as such severity 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.[21] As a consequence, DfT has developed a severity adjustment methodology[22] to enable robust comparisons to be made.

For this evaluation, one reporting mechanism was largely used prior to the DFFC project implementation and another afterwards. The pre-conversion collision severity has been adjusted, using DfT's severity adjustment factors, to enable comparability with the post-conversion safety trends.[23]

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

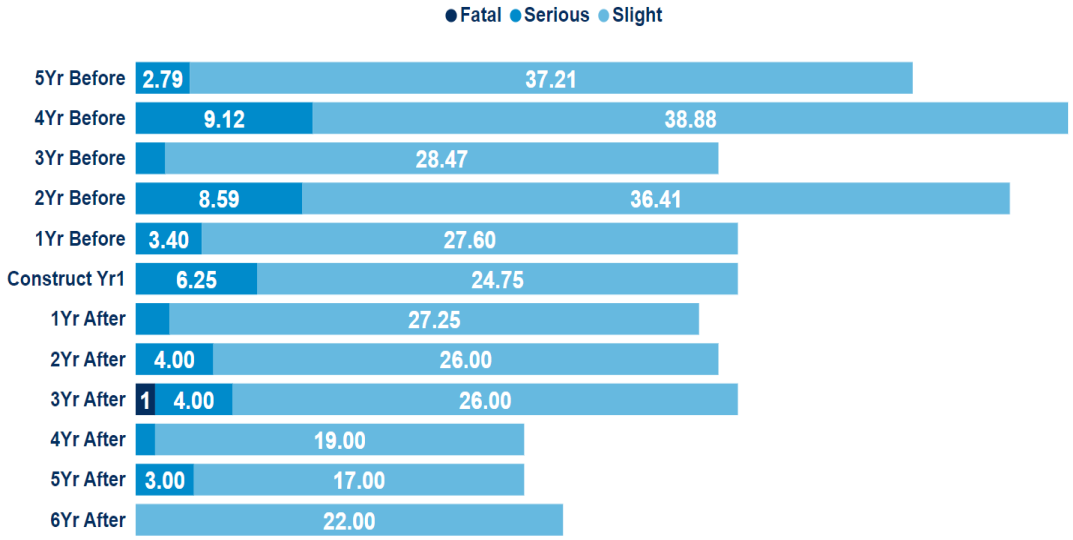
[21] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/820588/severity-reporting-methodology-final-report.odt

[22] 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

[23] Collision severities within this report use the 2021 adjustment factor.

After the DFFC project implementation, we have observed an increase in collisions resulting in fatalities (no fatal collisions were observed before the DFFC project, compared to one after). There was an average of three fewer collisions resulting in serious injuries per year (the annual average before the DFFC project was five, compared to two after). There was an average of 11 fewer collisions resulting in slight injuries per year (the annual average before the project was 34, compared to 23 after). Figure 25 shows the severity of personal injury collisions.

Figure 25 Severity of personal injury collisions within the project extent[24]



Source: STATS19: 1st November 2009 to 31st July 2021

How had traffic flows impacted collision severity?

Like other transport authorities across the UK, the key measure we use to assess the safety of roads, is 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.[25] In effect, it takes all non-fatal injuries and adds them up using a weighting factor to give a total number of FWI.[26] 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.

A reduction of 0.2 FWI has been observed annually. The severity of casualties occurring after the DFFC project implementation has reduced in the project extent. Before the DFFC project, an annual average one FWI were observed. After the DFFC project this had reduced to an annual average of 0.8 FWI.

The combined measure showed an extra 27 million vehicle miles was travelled before a FWI.[27] The rate of FWI per hmvm has reduced. This suggests that considering changes in traffic the project is having a positive safety impact on the severity of casualties within the project extent.

[24] As per DfT guidance, adjusted severities are presented with two decimal points.
[25] 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.
[26] Casualty severities within this report use the 2021 adjustment factor.
[27] Before the DFFC project, 160 million vehicle miles needed to be travelled before a fatality equivalent (0.6 fatality equivalents per hmvm). After the DFFC project, this increased to 187 million vehicle miles (0.5 fatality equivalents per hmvm).

Road user safety in the wider area

What impact did traffic flows have on collision rates in the wider area?

Before the project, an annual average of 290 collisions were observed. After the project, this had reduced to 219 a decrease of 71.

The counterfactual analysis indicated that it is likely that an annual average of between 153 and 229[28] personal injury collisions would have occurred. The observed annual average of 219 personal injury collisions falls just within the range suggesting the observed reduction is in line with regional trends.

Prior to the project, there was an annual average of 32 personal injury collisions per hmvm. After the project improvements were made, there was a decrease to 23 personal injury collisions per hmvm. A decrease of nine personal injury collisions per hmvm.

The counterfactual scenario estimated a range of between 31 and 20 personal injury collisions per hmvm. The observed annual average of 23 personal injury collisions falls just within the range suggesting the observed reduction is in line with regional trends.

What changes did we see in the severity of collisions in the wider area?

Collision severity analysis was undertaken for the wider area using the same method as for the project extent.

After the DFFC project implementation, we have observed a slight reduction change in collisions resulting in fatalities (the total before the project was 15, compared to 13 after). There was an average of 14 fewer collisions resulting in serious injuries per year (the annual average before the DFFC project was 47, compared to 33 after). There was an average of 62 fewer collisions resulting in slight injuries per year (the annual average before the project was 269, compared to 207 after).

How had had traffic flows impacted collision severity in the wider area?

A decrease of four FWI has been observed. Before the project implementation, the average of 13 FWI were observed. After the DFFC project, this had decreased to nine.

The combined measure showed an increase of 30 million vehicle miles was travelled before a FWI. Before the project, 53 million vehicle miles needed to be travelled before a FWI (1.9 FWI per hmvm). After the project, this increased to 83 million vehicle miles (1.2 FWI per hmvm).

Is the project on track to achieve its safety objective?

The safety objective for this project was to deliver equivalent or improved safety performance for road users that includes safeguarding the integrity of the northbound restricted road tunnels.

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.[29]

We have observed an improvement when comparing the severity of collisions before and after the DFFC project was implemented.

Appraised expectation for the project forecast a reduction of 104 personal injury collisions over the project lifespan. This translates into 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 project with an average of 85 collisions saved annually (project extent – 14; wider safety area – 71).

The changes we have observed exceed with what was expected for the project. This is primarily as the appraisal forecast safety disbenefits in the wider area, whereas we have observed a reduction in collision numbers.

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

6. Financial

Summary

This section of the report considers the financial impact of introducing a free-flow charging arrangement at Dartford Crossing. Up until 2003, tolls were levied at the crossing, until debts from the construction of the Queen Elizabeth II Bridge and the tunnels had been fully discharged. Subsequently, a road user charging project was introduced using powers under the Transport Act 2000[30] to manage the high demand for use of the crossing. All revenue collected through this road user charging project was set against DfT's total expenditure, and net proceeds from the road user charge offset DfT's wider expenditure. Schedule 12 of the Transport Act 2000 makes provision for the treatment of net proceeds.

The road user charging project enables the collection of revenue for use of the crossing. The nature of the costs changed with the introduction of 'free-flow' charging for a variety of reasons, most significantly; through the introduction of new technology, a back-office operation and contact centre required for managing accounts, systems, evasion, and payments. Use of enforcement measures designed to encourage road user compliance means there is also an additional revenue stream. Therefore, it is appropriate to consider financial aspects of this project as part of this evaluation.

This section specifically considers:

- Changes between pre-and post DFFC project.
- Financial performance of the project, including commentary on income, expenditure, and net proceeds; and
- Proportionality of the penalty charges applied at Dartford Crossing, including an assessment of compliance, number of Penalty Charge Notices (PCNs) issued and account uptake.

Two of the project objectives were related to financial performance, and the analysis in this section provides evidence into whether these objectives have been achieved. The primary financial objectives include:

- To maintain the cumulative cashflows estimated to the end of the M25 Design, Build, Finance and Operate (DBFO) contract in 2039 if the existing charging arrangement continued as part of the M25 DBFO contract (financial); and
- To set penalty charge values considering levels imposed by comparable projects and guidelines for other civil traffic enforcement penalties (proportionality).

To help inform the analysis, published account documents have been examined for years 2011-2012 to 2021-2022. It is based on this data that a high-level assessment of the financial performance is made.

Based on the evaluation, it is observed that net proceeds have increased since the introduction of the DFFC project. This suggests that the objective relating to maintaining cashflow has been achieved. The project is also observed to collect additional cashflow than through the previous arrangement. Furthermore, it has

[30] https://www.legislation.gov.uk/ukpga/2000/38/schedule/12

been concluded that the project has met its objective relating to proportionality of the penalty charges, number of PCNs issues and account uptake.

Changes between pre and post project

Prior to the introduction of Dart Charge, users could either pay at barriers at the plazas south of the river (prior to crossing northbound and after crossing southbound) or set up a Dart Tag account, with a reduced rate per trip applied. In May 2012, DfT announced increases to the Dartford Crossing charges in two successive steps; the first came into effect in October 2012 and the second came into effect on 30th November 2014, as planned, to coincide with the introduction of the new payment arrangements.

Following the introduction of Dart Charge, road users now have access to a variety of methods to pay the charge, including online, phone, and payzone retail outlets. The option to set up an account was also encouraged, with a reduced rate per trip applied aligned to the same percentage level of discount available pre-project.

Full details of the charges are outlined in Table 4. Table 4 outlines how the charges differ between different classifications of vehicles. The charges are only applicable for crossings between 6am and 10pm (chargeable hours). As there are no physical payment points on the crossing now, payment must be made remotely and either made in advance, or by midnight on the day after crossing.

Table 4 Pre and Post Dart Charge Road User Charges (RUCs) (6am to 10pm only, 7 days)

Vehicle	Pre-Project RUC Barrier	Pre-Project RUC Dart TAG Account	Post-Project Free-Flow Charging RUC One-off payments	Post-Project Free-Flow Charging RUC
Motorcycles, mopeds, and quad bikes	Free	Free	Free	Free
Cars (including trailers), motorhomes and minibuses (with less than 9 seats including the driver's seat)	£2.00	£1.33	£2.50	£2.00[31]
Vehicles with 2 axles	£2.50	£2.19	£3.00	£2.63
Vehicles with more than 2 axles	£5.00	£4.33	£6.00	£5.19

Note: In addition to the above, there is potential to apply for a local resident discount if you live in the council boundaries of Dartford or Thurrock. For instance, a local resident may pay an annual fee of either: £20 a year to use the Dartford Crossing as many times required; or £10 a year for 50 crossings.

[31] Reported as £1.67 in the one year after POPE report.

Financial performance

Changes in revenue collected following introduction of 'free-flow' charging

The Transport Act 2000, Schedule 12[32] outlines regulations for the keeping of account and the preparation and publication of statements of such accounts. The impact of the regulations is for accounts to be produced to demonstrate the amount of net proceeds. The charging project at the Dartford Crossing is enabled by the following secondary legislation:

- procedural regulations for the making of an order;[33]
- regulations covering accounting and arrangements;[34] and
- the making of a Dartford-Thurrock River Crossing charging scheme order.[35]

Cumulatively, these enable the requirements of the Act to be translated into a charging scheme at the Dartford Crossing.

The Road User Charging Enforcement Regulations[36] provide a national legislative framework for the enforcement of road user charging through the imposition of penalty charges; and the Dartford-Thurrock River Crossing Charging Scheme Order[37] sets out the level of penalty charge and enforcement measures that are being used at Dartford Crossing.

The accounts are publicly available via the gov.uk website and detail the crossings financial performance, outlining income and expenditure and providing commentary on what has happened during the financial year and the impact any changes may have had on financial performance.

A simplified outline of the income and expenditure from 2011-2012 to 2021-2022 is presented in Table 5 and Table 6.

[32] https://www.legislation.gov.uk/ukpga/2000/38/schedule/12
[33] Statutory Instrument 2001 No. 2303 The Trunk Road Charging Schemes (Bridges and Tunnels) (England) Procedure Regulations 2001
[34] Statutory Instrument 2003 No. 298 The Trunk Road Charging Schemes (Bridges and Tunnels) (Keeping of Accounts) (England) Procedure Regulations 2003
[35] Statutory Instrument 2013 No. 2249 The A282 Trunk Road (Dartford-Thurrock Crossing Charging Scheme) Order 2013
[36] Statutory Instrument 2013 No. 1783 The Road User Charging Schemes (Penalty Charges, Adjudication and Enforcement) (England) Regulations 2013
[37] Statutory Instrument 2013 No. 2249 The A282 Trunk Road (Dartford-Thurrock Crossing Charging Scheme) Order 2013

Table 5 Dartford Crossing Financial Summary - Income (£000s)

	2011-12	2012-23	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Road Charges	71,780	79,980	92,174	64,298							
DART Charge Amount				22,910	76,665	83,671	82,079	86,201	90,227	71,669	81,962
DART Charge Non-Accounts				9,376	31,318	28,130	33,348	34,424	45,392	30,591	42,690
Enforcement				2,980	53,103	92,341	71,431	74,534	72,931	58,718	77,163
Other*	367	352	374	251	470	513	502	509	460	425	442
Total (exc. enforcement)	**72,147**	**80,332**	**92,548**	**96,835**	**108,453**	**112,314**	**115,929**	**121,134**	**136,079**	**102,685**	**125,094**
Total	**72,147**	**80,332**	**92,548**	**99,815**	**161,556**	**204,655**	**187,360**	**195,668**	**209,010**	**161,403**	**202,257**

**Other includes residents fee, abnormal loads, and rental income*

Source: Dartford-Thurrock River Crossing Charging Scheme Accounts 2011-2012 to 2021-2022, as published in individual statements published on .gov.uk website

Table 6 Dartford Crossing Financial Summary - Expenditure (£000s)

	2011-12	2012-23	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Managing agent contractor's costs**	19,600	23,390	24,452	21,757	38,977	48,621	49,166	47,498	46,680	39,866	48,978
Impairment to income				1,927	26,410	78,846	42,076	44,255	44,103	43,647	51,947
Other expenditure	6,086	14,672	20,960	4,412	6,460	9,044	11,670	7,660	6,578	5,083	5,239
DART Charge investment (including audit fee)	2,020	4,499	14,987	59,530	32,462	4,045	5,163	4,835	4,818	4,187	4,956
Total	**27,706**	**42,561**	**60,399**	**87,626**	**104,309**	**140,556**	**108,075**	**104,248**	**102,179**	**92,783**	**111,120**
Total (exc. impairment and Dart Charge)*	**25,686**	**38,062**	**45,412**	**26,169**	**45,437**	**57,665**	**60,836**	**55,158**	**53,258**	**44,949**	**54,217**

** Managing agent contractor costs taken direct from published Accounts. This represents year-on-year costs and therefore do not show the net cost impact / savings accruing as a result of the scheme (i.e. cost of maintaining traffic management compared to toll plazas).*

*** Presentation of the Audit Fee differs compared to the one-year after analysis. Accounts in 2016-2017 to 2021-2022 include the Audit Fee as part of the DART Charge investment. Therefore, for consistency, the Audit Fee previously reported as a standalone value in the 2011/2012 to 2015/2016 financial summary is now also included in the DART Charge investment category.*

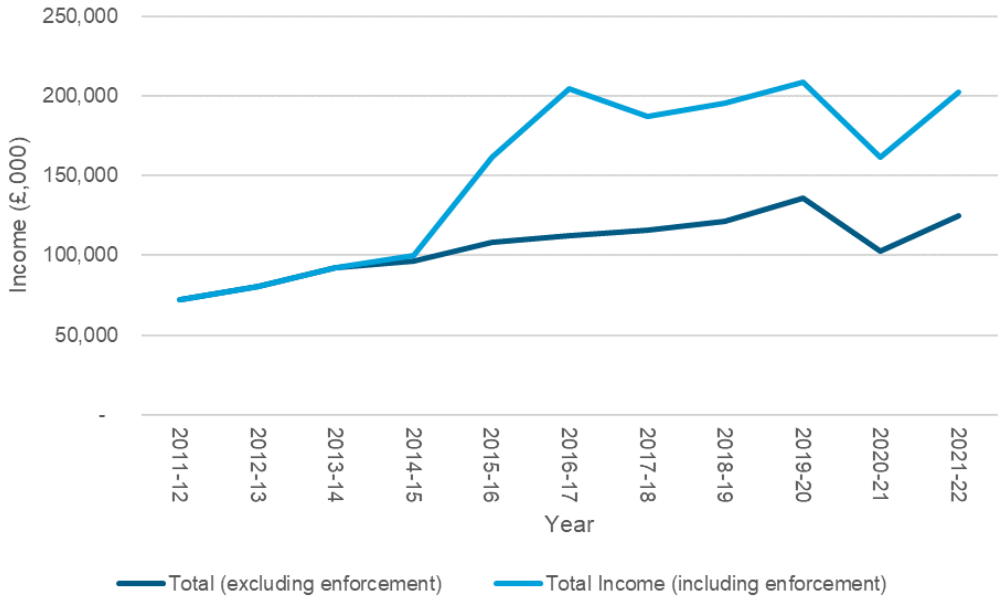
Source: Dartford-Thurrock River Crossing Charging Scheme Accounts 2011-2012 to 2021-2022, as published in individual statements published on .gov.uk website

Income

Income has increased year-on-year since 2011-2012, due to increases in traffic volume, changes to road user charges and the introduction of a revenue stream from enforcement (e.g. income related to revenue recognised in respect of penalty charges).

Annual income including and excluding enforcement is shown in Figure 26.

Figure 26 Income (£,000) 2011-2012 to 2021-2022



Source: Dartford-Thurrock River Crossing Charging Scheme Accounts 2014-2015 to 2021-22, as published in individual statements published on gov.uk website

The following observations are made with respect to total annual income (including enforcement):

- The 2015-2016 financial year was the first complete accounting year for the DFFC project operation (£161m). This included a £61.8m increase on the previous year due to the increased use of enforcement management measures introduced through the project (£53.1m) and an increase in the number of crossings over the period. The substantial increase in enforcement income between the 2014-2015 and 2015-2016 financial years is due to only four months of free-flow charging in the 2014-2015 financial year and there being initial systems issues in generating and issuing PCNs once the new payment arrangements were introduced at the end of November 2014. This caused a backlog of penalty charges.
- Since 2016-2017, annual income has remained stable (circa £200-£210m) with fluctuations due to increases / decreases in road user charging and enforcement revenue.
- A notable exception was in 2020-2021, where year-on-year income decreased by £47.6m (reportable income of £161m compared to £209m in 2019-20). Most of this decrease (£38.5m) was related to the impact of the Covid-19 pandemic both on the volume of vehicles using the crossing and on enforcement practices. It was also observed that account and non-account traffic volumes were down 25.5% on 2019-2020 volumes, which subsequently led to a 28% reduction in the number of PCNs issued.

- 2021-2022 saw a recovery from the previous year, with reported total income back towards levels of 2019-20 (£202m). Whilst chargeable traffic volumes remained around 3% down on pre-covid volumes, there was a notable shift in the mix of users between account and non-accounts in year preventing any fall in income.

It can also be seen in Figure 26 that post introduction of the DFFC project, the overall income total has been heavily influenced by the enforcement revenue. Enforcement revenue[38] represents circa 40% of the overall annual income total. When excluding enforcement revenue, it is similarly observed that there is year-on-year growth in road user charge income. This is due to a number of factors including:

- Increased road usage (i.e. more crossing users required to pay the road user charge), in line with the flow figures presented in section 4 of this report.
- Changes to the road user charge levels that coincided with the introduction of free-flow charging; and
- The majority of crossing users paying the road user charge either through accounts or one-off payments.

Previously drivers were required drivers to stop and pay the road user charge, whereas the new DFFC project requires payment to be made either in advance or by midnight the day after crossing. It could have been expected that in the initial years post introduction of the project, this change might have reduced the income excluding enforcement, but the evidence as presented at one-year after has been supported by analysis at seven-years after, that there has been year-on-year growth despite road users now paying remotely.

Table 7 demonstrates that there has been an increase in Dart Charge income received via Dart Charge accounts year-on-year since introduction. Payments via Dart Charge accounts have fluctuated between 65.8% (2021-22) and 74.8% (2016-17) of total Dart Charge income, representing a stable position and an account take-up position, which from introduction is classed as good. This can be partly attributable to the marketing campaign, which was successful in communicating the opportunity and benefit to setting up an account following introduction of the DFFC project.

[38] Enforcement income relates to road users who have used the crossing but have failed to make a road user charge payment within the required timescale, with a resultant PCN liability materialising.

Table 7 Relative percentage of account payments (£,000)

	2014-15 (four months only)	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Dart Charge Accounts	22,910 (70.96%)	76,665 (71.00%)	83,671 (74.84%)	82,079 (71.11%)	86,201 (71.46%)	90,227 (66.53%)	71,669 (70.09%)	81,962 (65.75%)
Dart Charge Non-Accounts	9,376 (29.04%)	31,318 (29.00%)	28,130 (25.16%)	33,348 (28.89%)	34,424 (28.54%)	45,392 (33.47%)	30,591 (29.91%)	42,690 (34.25%)
Total Income	32,286	107,983	111,801	115,427	120,625	135,619	102,260	124,652

Source: Dartford-Thurrock River Crossing Charging Scheme Accounts 2014-2015 to 2021-2022, as published in individual statements published on gov.uk website

Expenditure

Total expenditure has also increased year on year (Table 6). Expenditure reported annually includes costs for:

- The managing agent contractor.
- Impairment to income.
- Other income[39]; and DART charge investment.

The managing agent contractor costs as reported in the Annual Accounts, comprise of two elements, namely:

- The Dartford River Crossing costs relating to the Connect Plus contract; and
- Service provider costs for the DFFC project.

Regarding the Connect Plus contract, these costs are presented annually as an apportionment of the total costs payable by National Highways to Connect Plus for the M25 DBFO contract. The estimated costs included are based on the most appropriate allocation method determined for the three expenditure types within the financial model of the DBFO contract. For instance, within the 2021-21 accounts, this included costs for:

- Operational and management (£19.8m).
- Life cycle schemes (£5.1m); and
- Overhead and management costs (£1.3m).

The service payment and maintenance charge paid to the service provider is fixed, while a variable payment is also made based on the activities performed by the company during the month. In 2021-2022, this equated to £22.8m.

The cost impact is further demonstrated (outside the published Annual Accounts) through two Deeds of Variation, which were agreed to account for the changes implemented through the scheme. These have not been reviewed as part of this evaluation, which has followed the same approach as the one-year after report.

Two key areas of the expenditure which are not typical outgoings include:

- **Dart Charge investment** - reflecting the preparation and delivery of the new DFFC project. This overlaps with the project cost, and thus with the project now built, this will not be an expense reflected within the accounts going forwards.
- **Impairment to income** - which reflects road user charge and PCN income considered theoretical. This does not take account of operational policy, for example, the use of warning letters.

Noting the above, Table 6 reports expenditure both with and without the Dart Charge investment and impairment to income values, to understand the impact on expenditure for these not typical outgoings. It highlights these values reflect circa 50% of total expenditure reported in the annual accounts.

[39] For instance, in 2021-2022, this included National Highways staff costs, a technology project safety cost relating to payments to the police for equipment and work along the crossing, routine maintenance costs to deliver the A282 J1a incident response station and National Highways monthly contribution to pension schemes.

Net Proceeds

The difference between income and expenditure is termed ‘net proceeds.’ It is important to recognise that proceeds generated through the operation of the DFFC project are directed back into transport and thus are not considered profit. Treatment of income from road user charging schemes is covered by the Schedule 12 of the Transport Act 2000, which requires that any net proceeds be available only for application for the purposes of directly or indirectly facilitating the achievement of any policies or proposals relating to transport.

Table 8 shows the net proceeds for Dartford Crossing between 2011-2012 and 2021-2022. The one-year after analysis included the five years between 2011-2012 and 2015-2016. This is expanded within this report to cover years through to 2021-2022 for our seven-years after analysis. It demonstrates that net proceeds have continued to increase over time.

The following observations are made with respect to net proceeds:

- A sizeable increase of 370% or £45m was observed between 2014-2015 and 2015-2016. This increase was due to the introduction of the enforcement revenue stream to the operation in December 2014, as well as increase in the number of crossings.
- Annual net proceeds peaked in 2019-20 at £106.8m, before dropping in 2020-21 due to Covid-19 (£69.6m annual figure or £38.2m decrease).
- The net proceeds rebounded in 2021-22 to £91.1m (£22.5m increase compared to 2020-21), whilst still less than pre-Covid-19.

It is noted that overall net proceeds figures are distorted by the expenditure required to deliver the DFFC project and the enforcement income and costs. As such, it is considered informative to also consider the figures that exclude these elements, to provide a like-for-like representation of the net proceeds over time (see Table 8). This shows a step increase in proceeds since the introduction of DFFC project that is likely due to a combination of increased flows on the crossing (see section 2 of this report) and marginal increases to the road user charge upon introduction of free-flow charging.

As net proceeds have increased since the introduction of the DFFC project, this suggests that the objective relating to maintaining cashflow has been achieved, and that the project collects additional cashflow than through the previous arrangement.

Table 8 Net Proceeds (£000s)

	2011-12	2012-23	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Income	72,147	80,332	92,548	99,815	161,556	204,655	187,360	195,668	209,010	161,403	202,257
Expenditure	27,706	42,561	60,399	87,626	104,309	140,556	108,075	104,248	102,179	92,783	111,120
Net Proceeds	**44,441**	**37,771**	**32,149**	**12,189**	**57,247**	**64,099**	**79,285**	**91,420**	**106,831**	**68,620**	**91,137**
Net Proceeds (excluding enforcement, DART Charge costs and audit fee)	**46,461**	**42,270**	**47,136**	**70,666**	**63,016**	**54,649**	**55,093**	**65,976**	**82,821**	**57,736**	**70,877**

Source: Dartford-Thurrock River Crossing Charging Scheme Accounts 2014-2015 to 2021-2022, as published in individual statements published on gov.uk website

PCNs

The transition to 'free-flow' charging represents a fundamental change to revenue collection, with associated risk of non-compliance. It is recognised that no barrier-less charging or tolling project is evasion-free and so to be effective, it is important for it to be straightforward for users to pay the road user charge. As set out in Table 4, a variety of payment methods are now available.

One of the objectives for the DFFC project was to set penalty charge values considering levels imposed by comparable projects and guidelines for other civil traffic enforcement penalties (proportionality). The evidence in this section indicates that the values are in line with parking offences and are much lower than the maximum values. Furthermore, there is evidence that the public were consulted on this issue. Therefore, it is considered that the penalty charges are proportionate.

Proportionality of the Penalty Charges

Prior to the implementation of the project, the appropriateness of PCN values to be applied was considered. The planning for the PCN values considered several factors to determine the appropriate levels to apply, including:

- Guidelines on other civil traffic enforcement penalties.
- Location of the project (specifically, not in London); and
- Need to cover costs of enforcing penalty charges to maintain financial sustainability.

Additionally, consideration was also given to how to publicise the changes at the crossing. The purpose of this being to encourage compliance and reduce the risk of non-payment of the road user charge, thus reducing the number of PCNs issued in the first instance.

Comparison to other Public Charge Notices

Guidelines on civil traffic enforcement penalties[40] make clear that the purpose of penalty charges are to encourage compliance towards 100%, not to generate revenue. It is advised that messages about charges and penalties are communicated clearly. It also sets out that the key financial objectives of enforcement should be to operate "efficiently, effectively and economically." This is an important point as it refers to the fact that the cost of enforcement must be covered, with an ideal target of neutrality in terms of financial net value. Finally, it notes that any surplus (income over and above the cost of operating the enforcement) must be used in line with section 55 of the Road Traffic Regulation Act 1984 (which effectively indicates that the surplus will be reinvested into public services). Treatment of income from road user charging schemes is covered by the Schedule 12 of the Transport Act 2000 which requires that any net proceeds be available only for application for the purposes of directly or indirectly facilitating the achievement of any policies or proposals relating to transport.

The pre-project planning for the use of penalty charges is considered to be in line with the principles of this guidance in that financial modelling was conducted to

[40] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/609788/statutory-guidance-local-authorities-enforcement-parking-contraventions.pdf

work out the likely cumulative cashflow from penalty charges based on different penalty charge values, with evidence demonstrating they were considered for enforcement purposes rather than a means to generate income.

The modelling undertaken pre-project considered softer behavioural changes e.g. an assumed level of road user charge compliance was entered into the model. The total penalty charge income can clearly be impacted significantly by changes to assumptions in relation to compliance. The compliance figures used were 93% for UK vehicles and 81% for non-UK vehicles, in line with findings from other road user charging schemes.

While there are other crossings that involve a road user charge in the UK, the DFFC project is the first to introduce a remote payment mechanism, whereas the others require payment at the crossing, as was the case at Dartford prior to this project.

Most PCNs in the UK relate to either parking or speeding offences, and the London Congestion Charge. The guideline parking contravention values[41] and the London Congestion Charge PCN rate were examined at the one-year after analysis stage and compared with the values set at Dartford Crossing. The values ranged between £20-£65 (PCN paid within 14 days) and £50-£130 (PCN paid within 28 days).

The Dartford Crossing PCN values were assessed to be broadly in line with parking offence PCNs. Whilst not a direct comparator, government policy on speeding penalties is that a minimum of a £100 fine and 3 points on the driver's license is applied, and so the Dartford Crossing PCN values are less than these. Dartford Crossing PCNs are civil matters and not criminal.

The (then) Highways Agency undertook public consultation on the plans to introduce free-flow charging on the Dartford Crossing, encouraging the public and other interested parties to provide feedback into the proposals to introduce PCNs.

On the subject of whether there should be an enforcement of the road user charge, 60% of respondents agreed. Furthermore, 69% of respondents agreed the penalty charge should be below the maximum possible, with some feedback pointing to the opinion that PCNs should only be at the level required to pay for enforcement to be conducted.

The public consultation provided an opportunity to listen to feedback, and some changes were made to the original plans, such as extending the payment window to allow for payments up until the end of the day after crossing (the original plan was for payment to be on the day of crossing).

DFFC PCNs

If the road user charge is not paid by midnight on the day after a chargeable crossing, a PCN may be raised against the registered keeper of the vehicle. It requires payment of the original road user charge, and in addition payment of:

- £35 if paid within 14 days.
- £70 if paid between 15 to 28 days.

[41] Introducing post-payment periods and enforcement measures for 'free flow' charging at the Dartford-Thurrock River Crossing, Consultation Response, July 2013

Further charges are applied if the PCN remains unpaid after 28 days. The type of PCN adopted is designed to encourage timely compliance, by reducing the penalty if it is paid within the first 14 days.

To build road user understanding and acceptance of the DFFC project, and to also encourage compliance and give drivers a further opportunity to pay the charge, upon introduction of the project, the first PCN issued for each vehicle included a warning letter giving the driver an extra 14 days in which to pay their original crossing charge without a penalty. In addition, any further crossings made in that vehicle could also be paid at the standard rate, as long as payment is received within the same 14-day period. This section provides commentary on the proportionality of penalty charges, comparison to other PCNs and evidence of project compliance including the number of PCNs issued.

Overall, in terms of an evaluation of the proportionality of the penalty charges, the analysis at the one-year after stage considered that:

- Modelling into the financial implications of different levels of PCNs was appropriate.
- The modelling considered softer behavioural changes e.g. an assumed level of road user charge compliance was entered into the model, and the impact was considered to ensure the income would cover the cost of enforcement.
- Following general feedback from the public consultation, it was considered proportionate to set the PCN rate at less than the maximum permitted, and more in line with parking offences; and
- Where appropriate, concerns that were raised during the consultation process, were listened to and adjustments were made (e.g. introduction of a post-payment window).

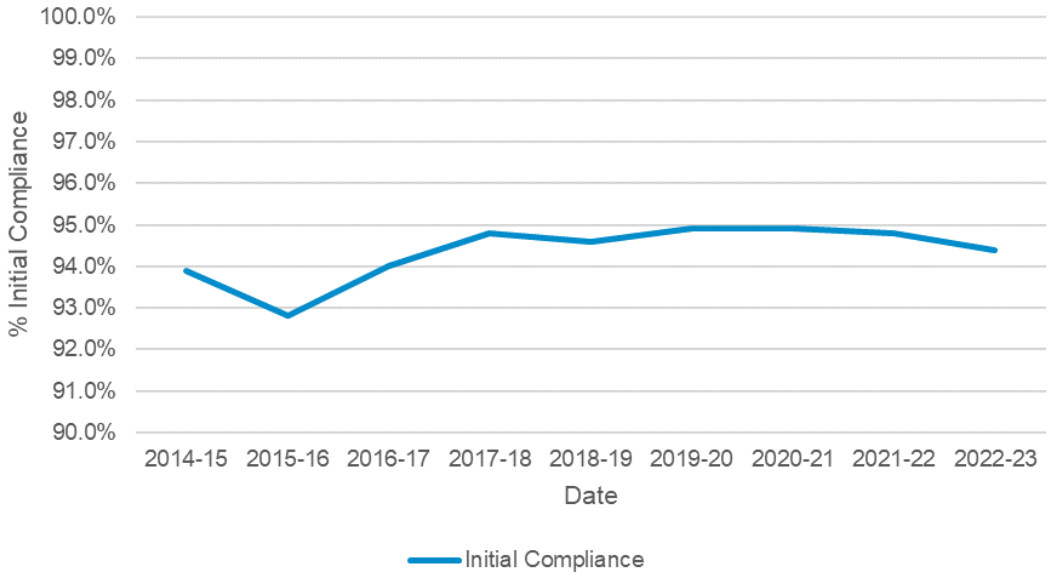
The same conclusions have remained at seven-years after the DFFC project opening, with the objective achieved.

DFFC Payment Compliance

The DFFC project puts the emphasis on the road user to proactively pay the road user charge either in advance of or following the journey (or automatically through setting up an account), and therefore it is possible for crossings to go unpaid. Unpaid crossings are enforceable through effective penalty and recovery processes, including PCNs which are sent to the registered keeper of the vehicle. It is therefore useful to consider how compliance has changed over time, since the DFFC project was introduced, to see if compliance has been an issue. This also provides an opportunity to compare compliance assumptions with the PCN assumptions used in modelling to set the values for penalties.

Figure 27 shows payment compliance over time, with a focus on the initial payment (road users who have used the crossing and paid their road user charge in-line with the project requirements, by midnight the day after crossing). The analysis shows that annual compliance has operated between 92% and 95% since DFFC project opening. This similarly informs that between 5% and 8% of payments are not initially paid and require PCNs to be issued.

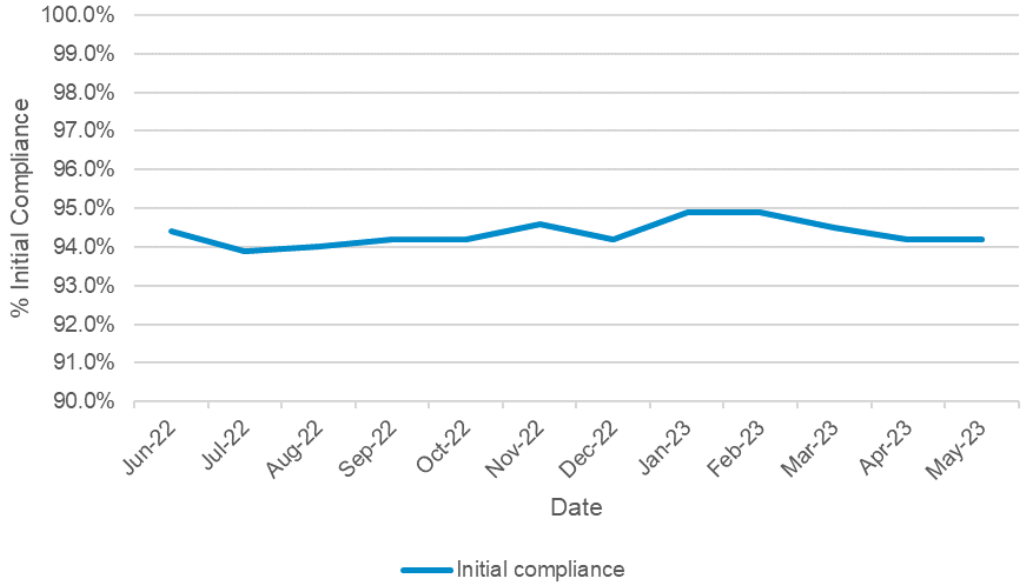
Figure 27 Initial compliance over time (2014-2015 to 2022-2023)



Source: DART Charge Weekly Summary Report 2023 Week 21 (22.05 - 28.05)

The most recent year of data is shown in Figure 28 for June 2022 to May 2023. Similar to annual figures, this demonstrates a stable month-to-month performance profile, with initial compliance operating between 94% and 95%. Therefore, there is no seasonal impacts experienced which influence initial compliance.

Figure 28 Initial compliance over time (June 2022 to May 2023)

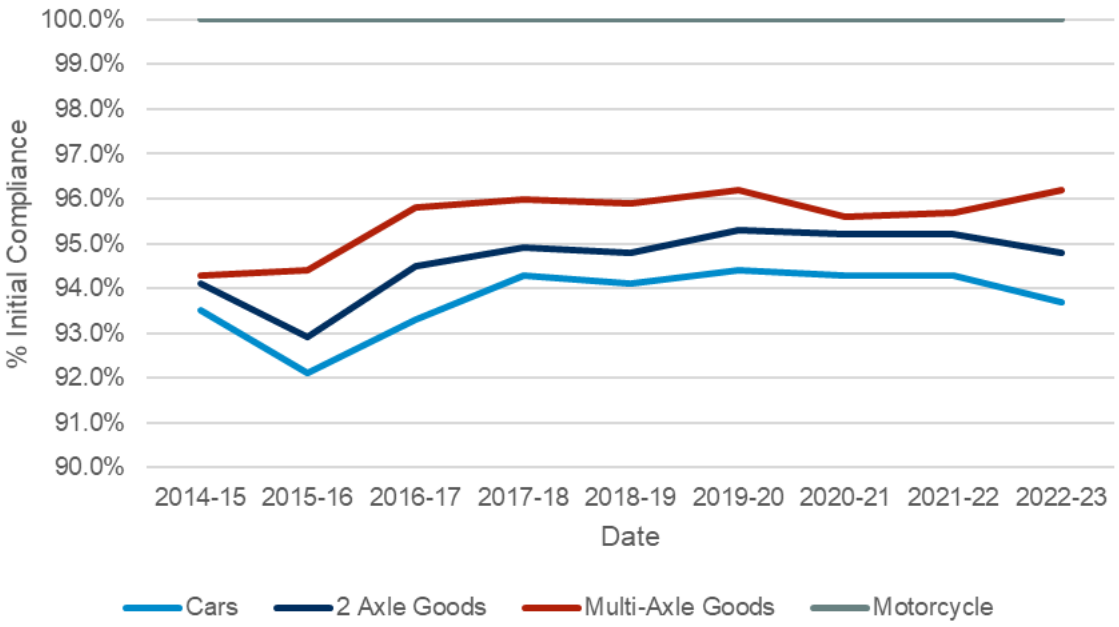


Source: DART Charge Weekly Summary Report 2023 Week 21 (22.05 - 28.05)

Analysis for initial compliance may also be presented by class of vehicle and vehicle registration location (UK and non-UK registered vehicles).

Figure 29 presents initial compliance figures for cars, motorcycles, 2-axle goods vehicles, and multi-axle goods vehicles. The analysis highlights there is higher initial compliance for goods vehicles (2 axle and multi-axle) compared with the private car. 100% compliance is observed for motorbikes, which reflects that this vehicle classification is free for use as part of the DFFC project.

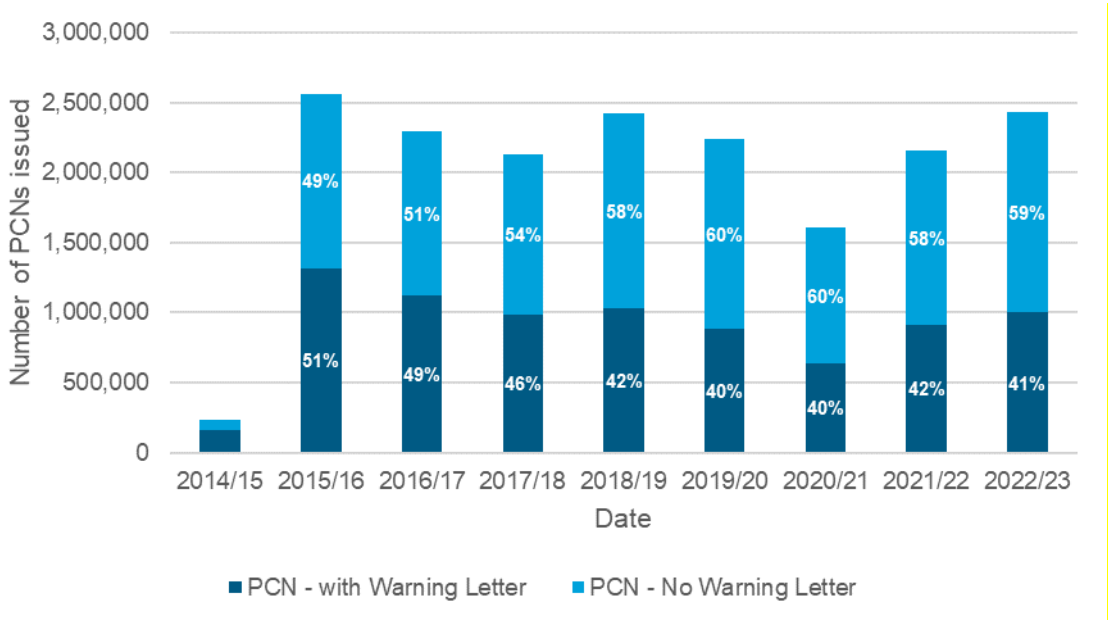
Figure 29 Initial compliance by class of vehicle (2014-14 to 2022-23)



Source: DART Charge Weekly Summary Report 2023 Week 21 (22.05 – 28.05)

Figure 30 presents the number of PCNs issued annually. This includes notices with a warning letter and notices with no warning letter. PCNs issued with a warning letter reflect a fair and balanced approach to enforcement, to encourage compliance. Such notices are issued to first time users of the crossing to provide an additional opportunity to pay the charge and avoid a penalty. This includes an offer to pay any outstanding charges within 14 days to avoid a first PCN. Circa 40% of annual PCNs issued contain a warning letter. In such circumstances, not all income from these notices is recovered, whereby the user paid the correct charge, but outside the 24-hour prescribed payment period.

Figure 30 PCNs issued per annum (2014-2015 to 2022-2023)



Source: DART Charge Weekly Summary Report 2023 Week 21 (22.05 - 28.05)

7. Customer service analysis

The DFFC project identified, as a secondary objective, a requirement to ensure that charging remains as easy for the road user to interact with as other comparable 'free-flow' charging projects. Therefore, to understand the impact of charging, customer experience of users has been assessed post project implementation using a variety of surveys to understand the views of users. At one-year after and seven-years after, the DFFC project opening the customer satisfactions data suggests that users have been satisfied with the service.

Government Digital Service Survey

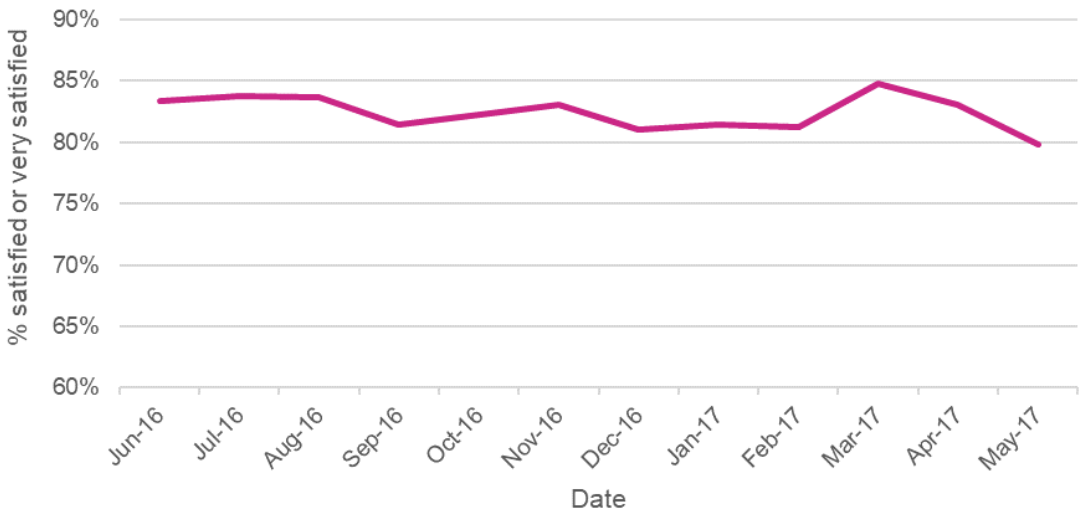
Between June 2016 and March 2021, the Government Digital Service (GDS) (part of the Cabinet Office) reported customer service analysis for the DFFC project, publishing the results of their website at http://www.gov.uk/performance/dart-charge. This research has since been transferred to the Government online archive.

The key metric reported in terms of customer service was a user satisfaction score. Through the research, user satisfaction was scored on a five-point scale from "very dissatisfied" to "very satisfied."

Data was not collected prior to project opening, so it is not possible to consider how the customer service levels compare to the previous payment mechanism.

For the one-year after analysis, results were reported for June 2016 to May 2017. Figure 31 shows the month-by-month percentage of satisfied or very satisfied respondents compared to the total respondents. The graph demonstrates that user satisfaction stayed within a narrow window each month of between 80% and 85% of users reporting that they were satisfied[42]. Most respondents (68%) identified they were "very satisfied" with the service.

Figure 31 Percentage of users satisfied or very satisfied per month (June 2016 to May 2017)

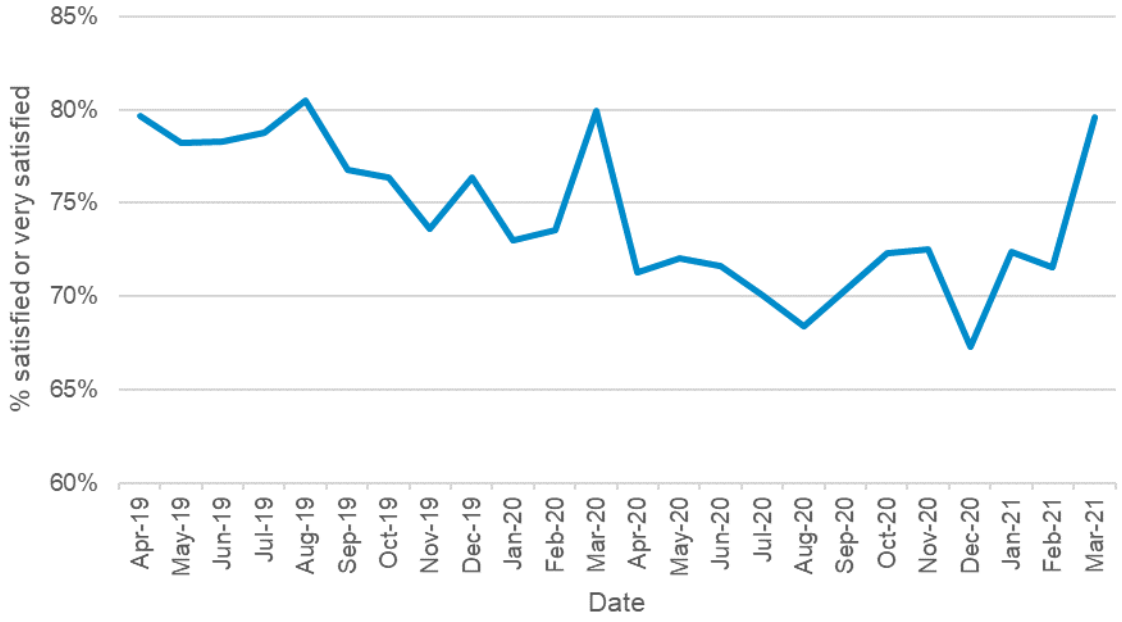


Source: http://www.gov.uk/performance/dart-charge

[42] Based on an average of 1,161 responses a month

To demonstrate how customer satisfaction has changed over time, Figure 32 reports the final 24 months of the GDS analysis between April 2019 and March 2021, representing the period circa 4-7 years post project opening. Customer satisfaction was shown to reduce compared to the earlier years analysis; however, an average of 75% of respondents still reported that they were satisfied[43] (over 60% remained "very satisfied"). There was also shown to be more variability with month-by-month percentage for satisfied or very satisfied between 67% and 81%. It is noted that parts of this period were impacted by the Covid-19 pandemic, with national lockdowns between late March 2020 and June 2020, and January 2021 and July 2021. It is observed that customer satisfaction recorded through the survey was lower during this period.

Figure 32 Percentage of users satisfied or very satisfied per month (April 2019 to March 2021)



Source: http://www.gov.uk/performance/dart-charge

ECHO Survey

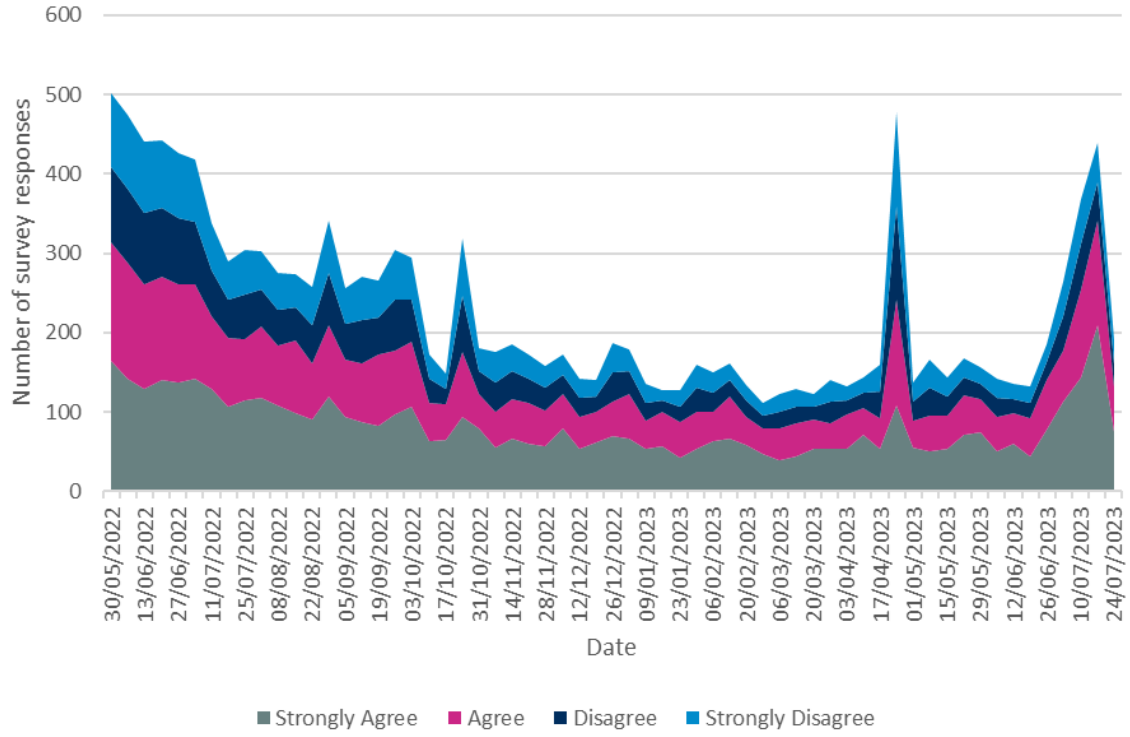
National Highways undertook more recent customer satisfaction surveys between May 2022 and July 2023 to track the ongoing quality of the customer service experience, with regard to the use of different parts of the online charging journey (i.e. use of web, non-account web and account holder web mediums).

The survey has continued post July 2023; however, for the purpose of this POPE report, results post August 2023 are not reported, noting the purpose of the report as a seven-year-after assessment. The cut off of August 2023 also reflects the transition to a new service provider for vehicle identification, payment processing and account management at this time.

Of all responses between May 2022 and July 2023, 50% of responses strongly agreed / were satisfied with the online charging customer experience. Figure 34 demonstrates there was an upward trend in those users reporting a positive response between May 2022 and July 2023.

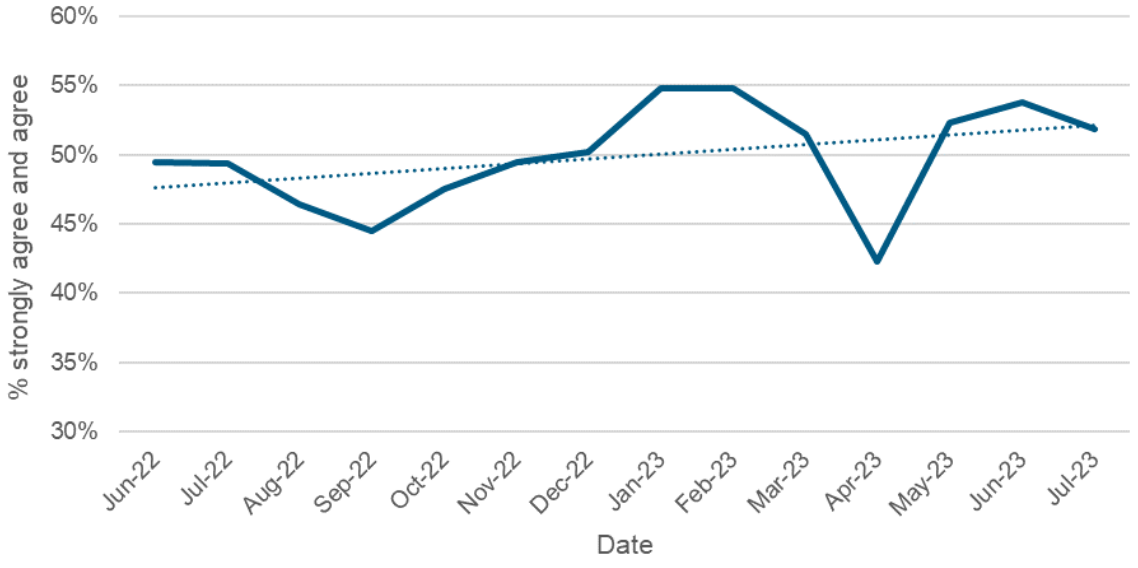
[43] Based on an average of 569 responses a month

Figure 33 All survey responses (Web, Non-Account Holder Web, Account Holder Web) (May 2022 to July 2023)



Note: whilst survey results are available at disaggregate level for web, non-account holder web and account holder web, these are not reported, noting that some pages are consistent for all users and it is not possible in some instances to define exactly where online users were leaving feedback. Source: National Highways Echo Survey

Figure 34 Percentage of users 'strongly agree' and 'agree' per month (including trend line) (June 2022 to July 2023)



Source: National Highways Echo Survey

Transport Focus Research

Transport Focus has separately been working to develop research to measure customer experience for the DFFC project. Between December 2022 and February 2023, Transport Focus undertook a pilot survey which included a questionnaire / interview of over 500 random users who had made a journey on the Dartford

Crossing during December 2022. This was followed up with the recruitment of over 100 people to a Transport Focus Strategic Road User Survey group, targeted at those with a Dart Charge account who had used the crossing within the previous four weeks.

A summary of key findings is presented below:

Using the crossing

- 62% stated that the approach to the Dartford Crossing was busy when they used it. Those who approached the Dartford Crossing from the south to use the Dartford Tunnels were more likely than those approaching the crossing from the north to state this.
- 68% stated that it took them about as long as they expected to cross the River Thames at Dartford, while 17% stated that it took them longer than they expected. Those using the Dartford Tunnels were more likely than others to say that it took them longer than they expected to cross the River Thames at Dartford.
- 64% rated their experience of using the Dartford Crossing as 'good'; while 14% rated the experience as 'poor'. 71% of those who crossed using the Queen Elizabeth II bridge rate their experience as 'good'; compared with 37% of those who used the Dartford Tunnels.
- The survey results highlighted that how busy the approach to the crossing was, is an impact factor on how users of the crossing rate their overall experience. For instance, 89% of those who stated that the approach to the crossing was "not busy" when they used it, also rated their experience as 'good'; compared with 52% of those who stated that the approach to the crossing was busy.

Payment and Signage

- 98% of respondents paid for their crossing using their personal Dart Charge account, while the remaining 2% paid through someone else's account. 56% paid using a credit / debit card, while 42% paid via direct debit or use of an automatic top-up via their account.
- Overall, among the account holders who participated in the research, it was identified that there is a high level of knowledge about various aspects of charging to use the Dartford Crossing. 98% stated that they knew at least a fair amount about how they would be making their payment to use the Dartford Crossing before they started their journey. Similarly, 92% stated that they knew at least a fair amount about the times that the charges would apply. 90% also that they knew at least a fair amount about how much it would cost to use the crossing.
- 92% stated that making a payment to use the Dartford Crossing was easy, while just 2% rated this process as 'difficult'.
- 69 of the 134 people recruited to the Strategic Road User Survey group stated that they saw information on road signs about the cost of using the crossing. Of those that noticed the signage, the following key results were identified:

- 69% were satisfied with the clarity of the information on these signs relating to the deadline by which they needed to pay to use the crossing.
- 66% were satisfied with the clarity of the information relating to the times at which the charges apply.
- 65% were satisfied with the clarity of information on the ways in which they could pay.
- 56% were satisfied with the clarity of the information on the price that they would pay to use the crossing.

Contacting Dart Charge and managing accounts

- In the three months before completing the questionnaire, 40% of respondents had attempted to contact Dart Charge via the appropriate pages on the gov.uk website, while just 3% had called the contact centre. 59% of respondents had not attempted to contact Dart Charge at all.[44]
- Of those that had visited the Dart Charge pages on the gov.uk website, 95% were able to resolve their issue or find the information that they were looking for. Of these, 83% were satisfied with the relevance of the information that they received, while 81% were satisfied that the information they received is up-to-date, and 81% were satisfied with the clarity of the information that they received.
- 88% of those visiting the Dart Charge pages on gov.uk found the website easy to use, while 3% disagreed.
- Of those personally holding a Dart Charge account, 20% had, in the last three months, added or removed vehicles registered to their account. In each case, fewer than one in ten had removed or updated payment details, updated personal details, or set up a new Dart Charge account. 92% of Dart Charge account holders who added or removed vehicles registered to their account in the last month did so online. 87% stated that doing so was easy compared with 6% who disagreed.

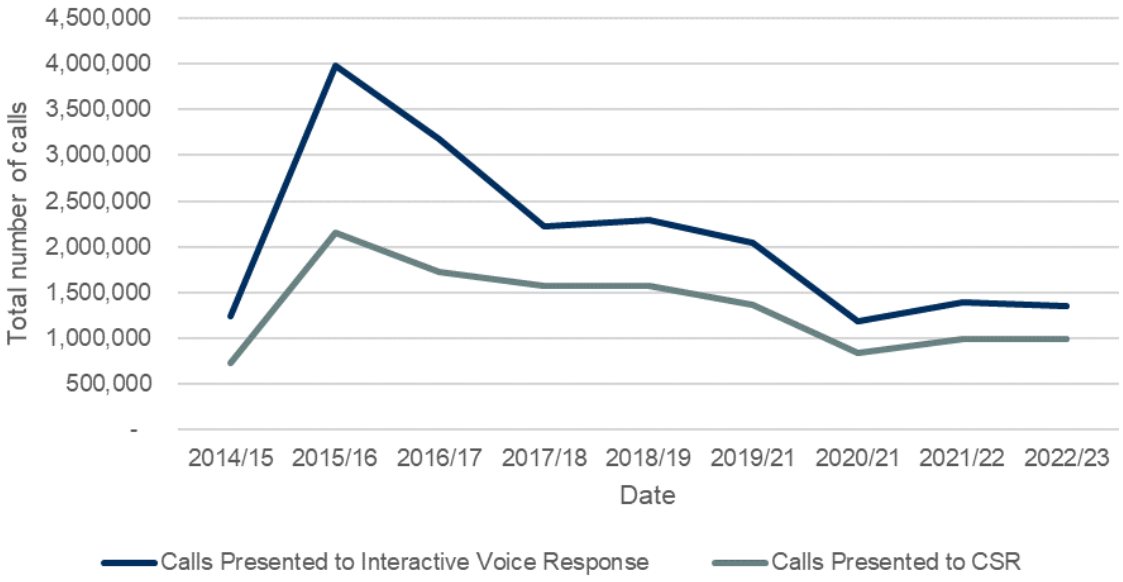
Customer services call centre

Total calls presented to a customer service representative have dramatically reduced since the DFFC project introduction, with users becoming more familiar with the charging arrangements and the online facilities (Figure 35). Total calls peaked in 2015-2016, with circa 2.2 million annual calls presented to a customer service representative. This reduced to circa 1 million annual calls in 2023-2023 (54% reduction).

Furthermore, analysis between June 2022 and May 2023 (12-month period), identified complaints received per 10,000 crossings remained below 1.0 per month, demonstrating a strong performance in terms of customer service.

[44] Note: figures do not sum to 100% as a small number of respondents had both used the website and called the contact centre.

Figure 35 Total calls (2014-2015 to 2022-2023)



Source: DART Charge Weekly Summary Report 2023 Week 21 (22.05 - 28.05)

8. Environmental evaluation

Summary

The environmental impacts of projects are assessed during the development of projects and consider the environmental sub-objectives within Transport Analysis Guidance (TAG)[45]. The evaluation of environmental impacts compares the predicted impact from appraisal to observed impacts. POPEs provide an opportunity for such findings to be captured early and ensure improvements are made, so the design outcome can be achieved.

The evaluation of environmental impacts used information on the predicted impacts gathered from the environmental appraisal within the business case, the Environmental Assessment Report (EAR) and compared them with observed impacts from a site visit and desktop research to determine the position at seven years after. Due to the Covid-19 pandemic, the site visit for the project was delayed to September 2023, seven years after opening. While acknowledging that the delay in conducting the site visit has affected the information gathered on site, the analysis for environment follows the five years after methodology.

The one year after report for the project scoped out heritage from consideration and did not identify any unresolved issues for the physical activity or severance TAG topics. Journey quality has been scoped into the seven-year after assessment, given that the project objectives included improving journey time, improving journey time reliability, safety, and operations. Therefore, the following TAG topics are covered in this POPE Report:

- Noise.
- Air quality.
- Greenhouse gases.
- Landscape and townscape.
- Biodiversity.
- Water environment; and
- Journey quality.

Noise

The appraisal predicted the impact of the project on noise would be negligible. No perceptible changes in noise level were predicted to occur in the opening year or 15 years after the opening at any identified receptor within the study area. In the Do-Something scenario (with the project), 101 properties were predicted to experience noise levels greater than 68dB, compared with 97 in the Do-Minimum (without the project); however, none were predicted to qualify for noise insulation. The overall noise impact of the project was considered to be negligible. The EAR assessment also predicted that there would be a negligible magnitude of impact. For the seven year after assessment, comparisons were only conducted for a subset of road links, due to limited forecast and observed data. Due to the requirement to analyse the full geographical impact area and the inability to

[45] Transport Analysis Guidance (TAG) provides DfT guidance on transport modelling and appraisal.

undertake this for this seven year after assessment, it is therefore not possible to determine the impact of noise at seven years after.

Air quality

The appraisal stated that there are 23 Air Quality Management Areas (AQMAs) within the study area, declared by five of the six local authorities. The appraisal concluded that Particulate Matter (PM) concentrations were expected to increase slightly because of the project, but this would be offset by a decrease in Nitrogen Oxide emissions.

The EAR predicted that there could be exceedances of the annual mean Air Quality Strategy (AQS) objective for nitrogen dioxide (NO_2) at eight receptor locations in the opening year of 2014 in Dartford, along the mainlines of the A282/M25. Additional modelling identified 120 receptors predicted to exceed the annual mean AQS objective for NO_2. The net score at receptors above the AQS objective was 24.25, indicating an overall worsening in air quality, which was considered to be a significant effect and to conflict with local policy.

For the seven year after evaluation, it is not possible to determine whether the observed NO_2 concentrations were higher or lower than expected because traffic data assessed was available for road links, which do not have adjacent sensitive receptors. Based upon local authority monitoring, no exceedances of the annual mean NO_2 objective value are anticipated in the seven years after assessment year. This is likely due to improving emissions from the fleet.

Overall, at seven years after it is not possible to determine whether the differences between the observed and forecast traffic would lead to a change in the overall evaluation of significance for air quality for the project.

Greenhouse gases

The appraisal predicted there would be an overall increase in carbon emissions due to the increased volume of traffic travelling through the project area. Over the 15-year assessment period, an increase in carbon emissions of 82,496 tonnes was predicted.

In comparison, the EAR regional assessment predicted that there would be an overall decrease in carbon emissions associated with this project in the opening year. In the opening year (2014), a decrease in carbon emissions of 708 tonnes was predicted compared to the carbon emissions that would have occurred without the project in place. In the design year (2029), a decrease in carbon emissions of 607 tonnes was predicted compared to the carbon emissions that would have occurred without the project in place.

The seven year after evaluation compared limited available observed data to forecast data, and the results showed there was lower calculated greenhouse gas emissions than the forecast data. The evaluation therefore suggests that the project may have led to a decrease in CO_2 emissions, as was supported by the assessment of greenhouse gases within the EAR.

Landscape and Townscape

The appraisal predicted the project would have a neutral impact on the landscape, anticipating that the change to ‘free flow’ charging would not have produced any

significant impacts. Regarding townscape, the appraisal predicted an impact score of Slight Beneficial, anticipating that the existing townscape, which was not designated for quality or its vulnerability to change, was to be enhanced through the replacement of parts of the highway with planted areas.

The one year after report assessed that the project impact on landscape and townscape was anticipated to benefit because of landscaping; however, it notes that the landscaping opportunities were limited due to the small areas of available land and the nature of the project. It is stated that grass seeding had been mostly limited to open grassland edges with the addition of some species rich grassland; however, some woodland edge planting had not been undertaken as proposed. The one year after assessment stated that the effect on both landscape and townscape as a result of the project was assessed as 'too early to conclude.'

The seven years after site visit highlighted that the mitigation proposed within the EAR had been implemented as prescribed. The results of the mitigation were consistent with what had been observed during the one year after site visit. Figure 36 shows the view of an embankment, just west of the A282 carriageway. The one year after report states that the landscape and ecology as-built drawings indicated that the embankment pictured in Figure 36 was to be planted with woodland edge and was noted as absent. Figure 37 shows the same viewpoint taken during the seven years after site visit. An additional Buddleia bush can be seen in the centre of Figure 37. As Buddleia bushes often successfully self-seed, it is plausible that the plant self-seeded as opposed to being planted intentionally.

Figure 36 Viewpoint 4 as seen at one year after

Source: One year after report (National Highways)

Figure 37 Viewpoint 4 during seven years after site visit

Source: 7YA site visit

Figure 38 shows a photograph of an embankment adjacent to the carriageway taken during the one year after site visit. At one year after, it was noted that open grassland had been seeded on the embankment, but hardstanding was clearly

visible. It was presumed the planted grassland would establish over time. Figure 38 shows the same viewpoint as Figure 38 but taken during the seven years after site visit.

Figure 38 Viewpoint 5 during one year after site visit

Source: One year after report (National Highways)

Figure 39 Viewpoint 5 during the seven years after site visit

Source: 7YA site visit

As illustrated by Figure 38 and Figure 39 and in agreement with the one year after assessment, planting had been partially completed. The site visit illustrated that areas of open grassland seeding had not established as anticipated at one year after and woodland edge had not been planted as prescribed within the EAR.

It is not made clear in the EAR, which landscape planting was proposed to improve the visual amenity from the A206 Littlebrook visual receptor (Figure 40). It is assumed it is the embankments adjacent to the realigned tunnel portal bund and woodland edge planting that was proposed to provide visual amenity benefits from the A206 Littlebrook Interchange. It appears possible that less vegetation was removed as a result of works; however, woodland edge planting on the embankment slope did not appear to be in place as per the as-built landscape drawings.

Figure 40 View from the A206 Littlebrook Interchange over the southbound carriageway

Source: 7YA site visit

The impact of the project on townscape is assessed as worse than expected at seven years after. In terms of landscape, the outcome at seven years after is considered to be achieved 'as expected' as the minor changes to planting and seeding would have limited impact at a landscape scale.

Heritage and historic resources

The TAG appraisal summarised that the change to 'free flow' charging because of the project would not produce any significant impacts. Heritage and historic resources was scoped out of the EAR and is therefore not considered in this seven years after analysis.

Biodiversity

The appraisal stated that the project would not directly or indirectly impact any statutory designated sites. It was predicted that during construction, there would be no change or negligible adverse impacts on plants and habitats, amphibians, reptiles, birds, bats, otters, water voles and badgers.

At one year after, the impact of the project on habitat loss and additional species rich grassland had been implemented as expected. The seven years after site visit determined that impacts to biodiversity were also as expected. Species-rich grassland implemented as a mitigation for woodland loss has transformed to scrubland with small trees in the seven years since the project opened for traffic. Minor impacts on plants and habitats (reptiles and nesting birds) are deemed temporary in nature and not significant due to the small areas affected and no invasive plant species were recorded on site. The beneficial impacts include the creation of approximately 1.1ha of wildflower grassland, particularly for reptiles and nesting birds.

Water environment

It was identified that minor changes to the drainage were required to realign it. This discharges to two drainage ditches which run parallel to the highway, discharging to the River Thames. The appraisal summarised that the project would alter very little from the before situation with respect to the water environment. For this reason, a neutral score was awarded.

A simple assessment was conducted for the EAR, which highlighted that the flood zone clarification would remain unchanged with no significant effects likely for the water environment. The only mitigations that were required were either incorporated into the design of the project, or only needed during the construction period. For example, recommendations for the storage and handling of potential contaminants (e.g. oil) specified for construction would remain in place for the operational phase of the project. The EAR concluded that the project would have an effect of neutral significance to the water environment.

During the seven years after site visit, no standing water or localised flooding was witnessed, and no water infrastructure (such as drain covers) were seen to be in disrepair. Note, that the survey was undertaken in September (2023), at which time it is less likely to observe standing water or localised flooding due to seasonally drier weather. Due to the lack of operational mitigations needed for the project in respect to the water environment, no further assessment has been made, and the impact of the project is considered to be ‘as expected.’

Journey Quality

The appraisal summarised that the project would improve driver experience through better information provision and facilities, including landscaping. Traveller stress would reduce due to improved speeds and reduced route uncertainty. For this reason, a major beneficial score was recorded.

The EAR did not specifically address Journey Quality although a statement was made on how the project was expected to affect all travellers. It stated that driver stress would remain high due to peak high traffic density but that the introduction of on-road detection equipment in place of toll booths would improve average journey speed and would reduce driver uncertainty, thereby achieving the goals of the project.

During the seven years after site visit, heavy traffic flows were witnessed with a high concentration of HGVs. It was noted that although the A282 was busy, traffic was slowly but continually moving. It was also noted that especially large vehicles or vehicles carrying abnormal loads were quickly and effectively managed at the Kent Marshalling Area.

Apparent during the seven years after site visit was the amount of temporary highway ‘furniture' such as bollards and temporary signs discarded around the highway infrastructure, an example is shown in Figure 41. These have the potential to cause driver confusion whilst also increasing the risk of injury to road users, especially in windy conditions. It is however noted that there are instances where traffic management equipment is required to be pre-mobilised safely within the highway boundary in readiness for approved night-works, before being removed. For instance, this maximises the overnight work window, introduces programme efficiency and minimises disruption for road users. As the site visit for this evaluation was undertaken on a single day, it is plausible the identified signage

could be associated with recent and/or planned traffic management. From the site visit, it was also not possible to comment on whether average journey speed and driver uncertainty had improved due to the project.

Figure 41 Discarded road sign on A206 bridge

Source: 7YA site visit

Overview

The results of the evaluation are summarised against each of the TAG environmental sub-objectives and presented in Table 9.

In the table, we report the evaluation as expected if we believe that the observed impacts at seven years 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.

Table 9 Summary of Environmental findings

Sub Objective	Appraisal Summary Table (AST) Score	7YA Evaluation Outcome	7YA Evaluation Summary
Noise	*Estimated population annoyed (Do Minimum) = 248* *Estimated population annoyed (Do Something) = 248* Present Value of Benefits (PVB) = -£0.0m	Not possible to determine.	The appraisal stated that it was predicted that there would be no perceptible changes in noise level in the opening year or 15 years after the opening at any identified receptor within the study area. In the Do-something scenario, 101 properties were predicted to experience noise levels greater than 68dB compared with 97 in the Do-minimum, however none were predicted to qualify for noise insulation. Due to limited data, it is not possible to determine the impact of Noise at seven years after.
Air Quality	Net Total Route Assessment (opening year) for PM10 = 2.2µg/m^3 NO_x emissions reduced by 122 tonnes over 25 years PVB = £0.1m	Not possible to determine.	The appraisal for air quality predicted that there would be a deterioration in local air quality in the opening year (PM_{10} assessment score of +2.2 and NO_2 assessment score of +10.0) and a decrease in regional emissions in the opening year (-262 tonnes PM_{10} and -6,516 tonnes NO_2). Overall, the appraisal found an air quality benefit, which was costed at +£0.1m. At seven years after, it is not possible to determine whether the differences between the observed and forecast traffic would lead to a change in the overall evaluation of significance for air quality for the project.

Sub Objective	Appraisal Summary Table (AST) Score	7YA Evaluation Outcome	7YA Evaluation Summary
Greenhouse Gases	CO_2 emissions increased by 82,496 tonnes PVB = -£3.5m	Potentially better than expected.	The appraisal for greenhouse gases predicted that there would be an overall increase in CO_2 emissions due to the project. Over a 60-year appraisal period, an increase of 82,496 tonnes were predicted. This disbenefit was costed at -£3.5m. At seven years after, the evaluation suggests that the project may have led to a decrease in CO_2 emissions.
Landscape	Neutral	As expected.	The impact is considered to be achieved 'as expected' as the minor changes to planting and seeding would have limited impact at a landscape scale.
Townscape	Slight Beneficial	Worse than expected.	The impact of the project was assessed as worse than expected due to the absence of woodland edge planting and areas of poor open grassland where hard-standing material has not been cleared. The local townscape has not been improved through planting, nor has visual amenity benefited from landscape planting to achieve a Slight Beneficial effect, as predicted within the EAR.
Heritage of historic resource	Neutral	n/a.	Heritage and historic resources were not considered as part of the seven years after assessment and was scoped out of the EAR.

Sub Objective	Appraisal Summary Table (AST) Score	7YA Evaluation Outcome	7YA Evaluation Summary
Biodiversity	Neutral	As expected.	The seven years after site visit determined that impacts to biodiversity were as expected. Species-rich grassland implemented as a mitigation for woodland loss has transformed to scrubland with small trees in the seven years since the project. No invasive plant species were recorded on site, however not all of the site was accessible.
Water Environment	Neutral	As expected.	The EAR did not identify any water impacts that required mitigation beyond those incorporated into the design of the project. It is considered that the impact of the project is as expected at seven years after.
Journey quality	Major Beneficial	Worse than expected.	During the seven years after site visit, it was noted that traffic density was high, with a high concentration of HGVs, which was as expected. The A282 highway as well as nearby roads have high numbers of discarded temporary bollards and traffic management signs. It is recommended that these are removed to ensure no adverse impacts on driver safety.

9. 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 25-year period.

The project was delivered at a cost of £156million, which was over the forecast cost.[46] In the first seven years, the project resulted in faster southbound journey times, although improvements to northbound journey times were less marked. The project improved the safety of those journeys. If this trend continues, the project is reforecast to deliver £200million of safety benefits over the 25-year period.[47]

Overall, the evaluation indicated that in the first seven years this investment is on track to deliver 'high' value for money. This is lower than the 'very high' value for money category forecast; however still represents a positive outcome for UK taxpayers over the 25-year life of the project.[48]

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 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 DART Charge business case are set out in Table 10. 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.

[46] Present value of costs (PVC) in 2010 prices and values.
[47] Based on impacts on the SRN.
[48] The value for money categories referenced are defined by DfT https://www.gov.uk/government/publications/dft-value-for-money-framework

Table 10 Monetised benefits of the project (£ million)

	Forecast (£m)	% forecast monetised benefits[49]	Evaluation approach
Journey times	1,383.3	94%	Re-forecast for the project area only (not the wider area) using observed and counterfactual[50] traffic flow and journey time data
Vehicle operating costs (VOC)	51.9	4%	Monetised benefits assumed as forecast
Safety	7.1	1%	Re-forecast using observed and counterfactual[51] safety data
Carbon	-3.5	-0%	Not evaluated (assumed as forecast)
Noise	0.0	0%	Not evaluated (assumed as forecast)
Air quality	0.1	0%	Not evaluated (assumed as forecast)
Indirect tax revenues	34.1	2%	Re-forecast using observed and forecast traffic flow and journey time data
Total Present Value Benefits (PVB)	**1,473.0**		

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 11. Based on this information, the project was anticipated to give 'Very High' value for money over the 25-year appraisal period.

Evaluation of costs

The project was delivered at a cost of £156 million[52], which was greater than the anticipated present value cost of £107 million (see Table 11).

[49] Disbenefits are presented as negative numbers and percentages. The total of the positive and negative contributions total to 100%.
[50] We calculated the vehicle hours saved by comparing outturn journey times with an estimate of how journey times would have continued to deteriorate had the project not been implemented (i.e. a 'counterfactual').
[51] We compared observed trends with an estimation of the trends if the road had remained a conventional motorway (i.e. a 'counterfactual').
[52] 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.

The appraisal expected that the project would result in an increase in maintenance costs over the life of the project. Since the project business case, the operating costs have been further reviewed and renegotiated into the DBFO contract. For the purposes of the updated value for money assessment, these costs have been retained as forecast, noting that most of this is still in the future.

Table 11 Cost of the project (£ million)

	Forecast Present Value Cost (£m)	Evaluation approach
Construction Costs	132.2	Current estimate of project cost
Operating Costs	56.3	Not evaluated (assumed as forecast)
Revenue	-81.5	Not evaluated (assumed as forecast)*
Total present value costs	**107.0**	

* Whilst not evaluated, it is noted that the original business case assumed increases in revenue (RUC) in line with inflation. RUC have however remained steady, whilst wider expenditure has been subject to significant inflationary pressures.

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

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 25-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 five 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.

In this case, due to Covid, the re-forecast was conducted seven years after opening rather than five years.

Monetised journey time benefits

As can be seen in Table 10, monetised benefits were primarily driven by forecasted reductions in journey times over the modelled period compared to a 'do-minimum' scenario, what would be expected to happen if the project were not built. Therefore, in this section of our evaluation, we have compared the 'after' journey times to an estimate of the 'counterfactual' - what journey times are likely to have been without the project. This allows for the change in journey times that we would have expected to have happened due to growth in background traffic levels causing additional congestion. These are shown in Table 12. The one year after value was obtained from the One Year After assessment report.[53]

[53] M25 Dart Charge One Year After Post-Opening Project Evaluation

Table 12 Time Savings

Analysis Time	Vehicle Hours Saved		
	Northbound	Southbound	Total
One Year After	1,103,808	1,988,904	3,092,712
Seven Years After	-68,299	1,656,379	1,588,080

Time savings were monetised using standard methodology which gave a re-forecast benefit over the 25-year period of £390.7m, significantly lower than forecast.

The overall impact on vehicle hours on the project section in the seventh year was estimated to be less than in earlier years and in the forecasts. While in the southbound direction, large levels of time savings between the observed and counterfactual values were observed, the calculation for the northbound direction showed a negative travel time benefit. It is this aspect that is responsible for the forecast journey time benefits being lower than initially predicted.

This figure only reflects journey time trends observed on the project area, not the surrounding road network which would have been considered in the appraisal. We acknowledge that the monetised value presented above does not represent the full impact of the project and does not reflect any impact on the wider road network.

Other reforecast impacts

The safety impacts have been discussed in Section 5. The conclusion was that the project has led to an average of 85 fewer accidents per year rather than the four per year derived in the original forecast.

On this basis, the project would result in an accident benefit of £201m over the life time of the project. This figure relates to the benefit on the SRN over 25 years. The reforecast is significantly higher than the appraisal forecast.

There are two further impacts associated with the changes in numbers and speeds of vehicles – indirect tax revenues and vehicle operating costs (VOCs). Indirect tax revenues are the benefit to the government (and therefore society) of the additional tax income from the additional fuel consumed due to increased speeds and distances travelled.

This was forecast to be positive because more vehicles were forecast and they were forecast to be travelling at higher speeds, and therefore using more fuel and paying more tax. We have reforecast that the impact would be smaller than expected, a decrease in tax revenues (-£55 million). The impact is smaller because our evaluation has shown the traffic growth was lower than forecast and the change in overall speeds was greater than forecast.

VOCs refer to the fuel and other costs borne by the user (such as the wear and tear on vehicles). This increases with increased distance travelled. There was a benefit forecast. In this case, VOCs could not be reforecast due to the relationship between VOCs and tax revenue in the original assessment. Use of the full original model would have been required to reassess VOCs which is beyond the scope of this assessment. Consequently, VOCs values have been retained as forecast. This assumption is considered to represent a conservative estimate of outturn benefits.

Impacts assumed as forecast

The evaluation has not been able to reforecast the monetary value of journey time reliability[54], therefore this were assumed as forecast.

Noise, carbon and air quality benefits[55] were also assumed as forecast. These assumptions are conservative because lower than forecast traffic flows are likely to mean that these impacts are better than forecast.[56]

Journey times and VOCs during construction and maintenance are also not evaluated and therefore assumed as forecast. As the vast majority of this maintenance is still in the future, we did not have any information with which to update the estimate for this and therefore the forecast from the appraisal remains our best estimate.

Summary

	Forecast (£m)	% forecast monetised benefits	Re-forecast (£m)	% Re-forecast monetised benefits
Journey times	1,383.3	94%	390.7	67%
Vehicle operating costs (VOC)	51.9	4%	51.9*	9%
Safety	7.1	1%	201.0	34%
Carbon	-3.5	-0%	-3.5	-1%
Noise	0.0	0%	0.0	0%
Air quality	0.1	0%	0.1	0%
Indirect tax revenues	34.1	2%	-55.0	-9%
Total PVB	**1,473.0**		585.2	

** VOC not reforecast.*

Overall value for money

The main reason for the overall reduced level of benefits from this project is the lack of journey time savings. The appraisal forecast a significant traffic growth and improving journey times; the observed data suggested a more modest traffic growth. While significant southbound journey times have been achieved, journey times in the northbound direction have increased over the study section which is the main driver for the reduction in benefits forecast. The evaluation has also shown that the safety benefits of the project are significantly higher than forecast.

This has affected the project's value for money, although overall the project still represents 'High' value for money.

[54] It has not been possible to re-forecast the monetised reliability impact for this project because our evaluation method reuses the INCA files used in the appraisal and these were not able to be located for this project.
[55] We do not have a method for re-forecasting the monetised impact of noise, carbon or air quality impacts. These have a small contribution to the monetised benefits of projects and therefore the impact of assuming as forecast is unlikely to impact on the value for money rating of the project.
[56] Refer to Section 6 for further detail on noise and greenhouse gas impacts.

Appendix A

A.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 do not. 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.

Appendix B

B.1 Unadjusted collision severity

The project extent is covered by Essex and Kent police constabularies who transferred from STATS19 to injury-based recording mechanisms in November 2015 and January 2016.

Table 13 shows the unadjusted collision severities on the project extent:

Table 13 Unadjusted collisions by severity for project extent

Observation Year	Fatal	Serious	Slight
5Yr Before			40
4Yr Before		6	42
3Yr Before			30
2Yr Before		5	40
1Yr Before		1	30
Construct Yr1		4	27
1Yr After		1	28
2Yr After		4	26
3Yr After	1	4	26
4Yr After		1	19
5Yr After		3	17
6Yr After			22

Source: STATS19: 1st November 2009 to 31st July 2021

The wider safety area is covered by Essex, Kent and Metropolitan police constabularies who transferred from STATS19 to injury-based recording mechanisms in November 2015, January 2016, and January 2015.

Table 14 shows the unadjusted collision severities on the wider safety area:

Table 14 Unadjusted collisions by severity for wider area

Observation Year	Fatal	Serious	Slight
5Yr Before	6	35	287
4Yr Before	3	21	309
3Yr Before	3	20	270
2Yr Before	2	33	277
1Yr Before	1	25	306
Construct Yr1		17	222
1Yr After	3	35	265
2Yr After	4	43	216
3Yr After	2	26	213
4Yr After	3	26	204
5Yr After	1	30	172
6Yr After		32	181

Source: STATS19: 1st November 2009 to 31st July 2021

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