Gatwick Airport Northern Runway Project

Accounting for Covid-19 in Transport Modelling

Book 8

VERSION: 1.0

DATE: January 2024

Application Document Ref: 8.5

PINS Reference Number: TR020005

APFP Regulations 5(2)(a) **Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009**

Contents

Executive Summary

This report sets out analysis undertaken to respond to the request in the Examining Authority's (ExA's) Procedural Decision [PD-006] requesting further information on the impact of the Department for Transport's updated Transport Appraisal Guidance (TAG) Unit M4 (May 2023) regarding the impacts of the COVID-19 pandemic. The analysis uses an approach consistent with the new guidance and has been discussed with West Sussex County Council, Surrey County Council, Network Rail and National Highways.

A range of data has been assembled to assist in the development and verification of a 2023 model forecast to help establish the scale of adjustments that should be incorporated into sensitivity test modelling for future year scenarios. This data included both road traffic volumes and public transport related data covering key points on the transport network. The data has shown that in general, travel demand in 2023 is still below levels observed in 2016, which represents the base year of the DCO Application modelling.

The COVID-19 pandemic has led to reductions in background highway and rail demand of up to 14% compared with that assessed in the DCO Application modelling. This reduction has generally shown that the future baseline scenarios will contain less road traffic congestion or rail crowding than that shown in the DCO Application modelling.

The sensitivity tests show slightly higher car-borne mode shares than was the case in the DCO Application modelling, reflecting the changes inherent in post-Covid travel behaviour, but the differences are small and well within one percentage point.

GAL does not propose to alter the mode share commitments in **ES Appendix 5.4.1: Surface Access Commitments** [APP-090]. GAL is committing to a range of measures and initiatives set out in the same document, whilst retaining the flexibility to vary the way in which they are applied in order to ensure that the mode share commitments are met. Bearing in mind that further changes to travel behaviour could also take place over time, GAL will continue to monitor progress and adjust the implementation of relevant measures accordingly to ensure that the mode share commitments are delivered.

The analysis shows that the impacts of the Project in the sensitivity tests are similar to those presented in the DCO Application, and often reduced, particularly from a highway magnitude of impact perspective, given the lower forecast levels of traffic and congestion levels. The analysis suggests that the assessment of the with Project effects in the DCO Application are potentially conservative and form a robust basis under which to consider the transport related impacts of the scheme.

This work has also shown that the M23 Spur corridor sees small reductions in total traffic flow in the sensitivity testing compared to the DCO Application, and thus confirms the robustness of the VISSIM modelling contained in the DCO Application. Small reductions are also seen in the Gatwick Airport station entry and exit flows in the sensitivity testing compared to the DCO Application, which demonstrates the robustness of the Legion modelling.

For completeness, GAL is also considering the outputs of this post-Covid sensitivity test in the context of those topics in the Environmental Statement which rely upon the transport modelling. GAL will provide the ExA with further information on this at the earliest opportunity in the Examination.

1 Introduction

1.1. Purpose of this document

1.1.1 The Development Consent Order (DCO) Application for the Northern Runway Project ('the Project') draws upon a range of traffic modelling assumptions to assess the proposals. These modelling assumptions cover the base (or existing conditions) and future years, forming the basis for different scenarios. The modelling work has been undertaken in line with the Department for Transport's (DfT) Transport Analysis Guidance (TAG). Full details on the modelling are provided in **Transport Assessment (TA) Annex B – Strategic Transport Modelling Report** [**APP-260**].

1.1.2 On 31 May 2023, an update to TAG Unit M4 – forecasting and uncertainty[1] was released by the DfT and included reference (in Appendix B of the guidance) to considerations for scheme promoters in relation to the treatment of COVID-19 impacts. The transport modelling undertaken to support the DCO Application, which is used to understand the range of effects arising from changes in surface access behaviour through the Transport Assessment / Environmental Statement, as well as through environmental disciplines such as noise and air quality, is derived from a 2016 base year model that predates the COVID-19 pandemic, and with forecast assumptions which do not account for changes due to the pandemic.

1.1.3 The Examining Authority's (ExA) Procedural Decision of the 24 October 2023 [**PD-006**] requested further information on the implications of this guidance for the modelling undertaken for the DCO Application. In the covering letter responding to the Procedural Decision [**AS-073**], GAL confirmed that it was already progressing work related to this guidance, including engagement with stakeholders, and that GAL would provide the ExA with further information at the end of January 2024. Accordingly, this document provides a technical note which outlines the guidance and the approach GAL has adopted in reviewing the modelling and which summarises the results from this work.

1.1.4 In the updated DfT guidance, TAG Unit M4 Forecasting and Uncertainty includes *Appendix B: Adapting the core scenario to large scale changes (May 2023)*[2] which sets out potential approaches to reflect the impact of the pandemic. This note provides a detailed explanation of how GAL has approached this guidance through a series of supplementary sensitivity tests which help to identify the

[1] Transport Appraisal Guidance – Unit M4 – forecasting and uncertainty. https://www.gov.uk/government/publications/tag-unit-m4-forecasting-and-uncertainty

[2] TAG Unit M4 Forecasting and Uncertainty https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1161977/tag-unit-m4-forecasting-and-uncertainty.pdf

potential implications for the assessment in the DCO Application should the impacts of the COVID-19 pandemic on travel behaviour be sustained.

1.1.5 DfT's guidance in TAG Unit M4 Appendix B sets out the following three examples for how appropriate adjustments to transport models may be accomplished:

1) "Create a forecast to the present day by applying adjustments to include a COVID-19 impact, based on observed data. This forecast can be used as a "new base year" as a substitute basis for scheme forecast."

2) "Apply adjustments to a forecast year model to produce a new scheme opening year forecast, or the first required forecast year, that include a COVID-19 impact to that point. This will be the new pivot off which further forecast years are based."

3) "Apply the adjustment globally to model results as a post-model adjustment." (Extract from Para B.3.4)

1.1.6 This technical note details how GAL has undertaken sensitivity tests to account for COVID-19 using a methodology which aligns with example 2 as set out in the DfT guidance document.

1.2. Stakeholder engagement

1.2.1 The approach adopted has been discussed with National Highways at meetings on 19 September 2023, 5 October 2023 and 26 October 2023 where National Highways agreed with the methodology proposed. A follow-up session on the results was held on 11 December 2023.

1.2.2 The approach has also been discussed in a joint meeting with the Local Authorities on 10 November 2023 and followed up with a meeting to present the results on 15 December 2023. No concerns regarding the approach or findings have been flagged through this process.

1.2.3 The rail aspects of the modelling review were discussed with the Department for Transport via email (to understand and confirm the most appropriate rail demand assumptions to use) and with Network Rail in a workshop on 20 December 2023.

1.3. Structure of this document

1.3.1 This document sets out a detailed account of the transport modelling undertaken to look at the impact of the COVID-19 pandemic on the traffic modelling used for the DCO Application. The subsequent sections in this document detail:

- the background, covering the guidance and approach used for this analysis (Chapter 2);
- the data that has been used for this analysis and observed trends (Chapter 3);
- how the 2023 forecast model has been developed and verified *(Chapter 4);*
- the results of the 2023 forecast model and assumptions for the sensitivity tests *(Chapter 5);*
- the results of the sensitivity tests and how they compare to the DCO Application *(Chapter 6);* and
- a summary of the analysis *(Chapter 7).*

1.3.2 Additionally, a separate document is provided containing appendices. They include further tabulations of information presented in this note and are cross referenced in the relevant section.

2 Background

2.1. Guidance

2.1.1 The new DfT guidance in TAG Unit M4 Forecasting and Uncertainty recognises that COVID-19 has had a significant impact on travel behaviour and also acknowledges the challenges in isolating individual impacts of the pandemic and determining the extent to which they will be sustained in the long term. The guidance recognises this uncertainty and advocates that scheme promoters should try to explore the implications of sustained COVID-19 related impacts on travel behaviour.

2.1.2 The guidance recognises that prior-calibrated models (prior to the COVID 19 pandemic), should consider these effects in a proportionate manner. It advocates for "*analysts to assess the extent of the divergence of travel patterns and volumes from pre-pandemic projections, using the best available data and evidence*". It also states "*If it is clear COVID-19 has had an impact on travel, this should be represented using an appropriate change in travel demand across the trip matrix, considering trip purpose and patterns as appropriate, and apply this to produce an updated core forecast.'*"

2.1.3 The guidance offers three examples of possible approaches as follows:

1. "Create a forecast to the present day by applying adjustments to include a COVID-19 impact, based on observed data. This forecast can be used as a "new base year" as a substitute basis for scheme forecast."
2. "Apply adjustments to a forecast year model to produce a new scheme opening year forecast, or the first required forecast year, that include a COVID-19 impact to that point. This will be the new pivot off which further forecast years are based."
3. "Apply the adjustment globally to model results as a post-model adjustment." (Extract from Para B.3.4)

2.1.4 TAG Unit M4 Appendix B also contains commentary considering whether updating existing models is a proportionate response to the new guidance. It notes that "*Rebasing of models takes time and resources; the Proportionate Update Process in TAG allows judgments of proportionality to be made when considering to what extent models need to be updated relative to the scope of decisions required and the surrounding risks. Indeed, it is very plausible that travel patterns at the current time are in themselves subject to some change in following years (such changes being outside of the direct scope and functionality of the model). Therefore the Department accepts that, in many circumstances,* *the practical course of action is to make proportionate and transparent adjustments at this time*" (TAG M4 Appendix B paragraph B.3.1).

2.1.5 As the **Transport Assessment (TA)** [AS-079] explains at section 5.3, GAL has developed a bespoke suite of strategic modelling tools to inform the assessment of the Project. These include a demand model, which reflects changes in trip distribution and mode choice, and a number of assignment models which establish the likely routes taken by airport and non-airport journeys across the rail, bus and highway networks.

2.1.6 Given the complexity of the model suite, updating, rebasing and revalidating the model suite to 2023 conditions as suggested by the Example 1 approach is not considered proportionate or feasible within a reasonable timescale. The timescale to undertake new surveys, procure data, update model inputs and revalidate the base model would extend to at least 9-12 months of work prior to being able to update the forecast scenarios. It has therefore been discounted as a possible approach in the interests of being able to address the ExA's request within the Examination timescale.

2.1.7 On this basis, the focus of analysis has been on determining appropriate approaches for adjusting the existing model and using these adjustments to produce sensitivity tests on the model scenarios that underpin the DCO Application. The method for deriving these sensitivity test adjustments is explained in this note.

2.2. Adopted approach

2.2.1 In order to align with the guidance in TAG Unit M4 Appendix B, a three-stage approach has been adopted:

- **Stage 1 – Data assembly and review -** The first stage was to assemble a range of available data to understand the extent of changes in the use of the transport network post COVID-19. This is presented in Section 3 of this note.
- **Stage 2 – 2023 model forecast and review -** The second stage was to undertake an initial 2023 model forecast run, based on the model used for the DCO Application, to understand the extent to which that forecast model reflected observed conditions in 2023. Having reviewed the results a subsequent iterative step was undertaken, making further amendments to the model in order to approximate a set of adjustments that would be suitable for a suite of sensitivity tests. The methodology used is discussed in Section 4 of this note with results from the 2023 forecast modelling presented in Section 5.

- **Stage 3 – Sensitivity testing -** The third stage was to run a series of sensitivity tests using the adjustments in order to understand the implications these tests might have for the assessment presented in the DCO Application and any potential areas of risk. This is discussed in Section 6 of this note.

2.2.2 The approach is summarised in the flow diagram shown in Figure 1.

Figure 1: Overview of process undertaken

2.2.3 This approach is broadly aligned with Example 2 from TAG Unit M4 Appendix B. We believe this approach is preferable to Example 3 as it draws in actual data for 2023 to help locally verify the scale of adjustments to reflect the post-COVID situation. With the availability of data in the local area and that provided centrally by the Department for Transport, this is a viable approach to adopt.

3 Data and trends

3.1. Airport demand information

Terminal passenger count data

3.1.1 Data relating to the 2023 Gatwick terminal passenger counts was obtained from GAL in June 2023. The 2023 count data ranged from January to June 2023 and is recorded hourly by terminal (North or South), haul (short or long) and movement type (arrival or departure). This is equivalent to the data used for the 2016 base model.

3.1.2 The Gatwick terminal passenger count data has been recorded for both scheduled and actual times. Scheduled times are based on the time aircraft were scheduled to arrive at or depart from the stand. Actual times are based on the time aircraft actually arrived at or departed the stand. Both the scheduled and actual times are recorded because passengers departing on a flight typically arrive at the Airport based on their scheduled time of departure, whereas passengers arriving on a flight will leave the Airport based on their actual arrival time.

3.1.3 For modelling purposes, the scheduled hour passenger count is used instead of actual hour. This is because the scheduled hour counts are not affected by external factors such as flight delays, therefore providing a more realistic representation of the number of departing and arriving passengers at Gatwick airport for their scheduled flight.

3.1.4 Table 1 below compares the terminal landside count data recorded in June 2016 and June 2023. In total, across both terminals combined, passenger numbers in June were lower in 2023 compared to 2016 by -2% and -3% in arrivals and departures respectively. The arrivals in 2023 increased in the morning and evening peaks compared to those in 2016, while the departures in 2023 reduced in these time periods.

Table 1: June 2016 to June 2023 terminal landside count comparison

		North + South Terminals (Landside hour)						
		AM	IP	PM	OP1	OP2	OP3	24hr
Arrival Pax	2016	4,476	27,766	6,568	22,072	7,437	549	68,869
	2023	5,043	25,629	7,312	21,025	7,967	851	67,826
	Difference	567	-2,137	744	-1,047	529	301	-1,043
	% Difference	**13%**	**-8%**	**11%**	**-5%**	**7%**	**55%**	**-2%**
Departure Pax	2016	8,650	29,274	7,623	5,042	2,344	15,850	68,783

		North + South Terminals (Landside hour)						
		AM	IP	PM	OP1	OP2	OP3	24hr
	2023	8,278	28,889	6,466	5,466	2,329	15,621	67,051
	Difference	-372	-385	-1,157	424	-15	-228	-1,732
	% Difference	**-4%**	**-1%**	**-15%**	**8%**	**-1%**	**-1%**	**-3%**

Gatwick employee count data

3.1.5 Data relating to the number of Gatwick staff passes active in 2023 was obtained from GAL in July 2023 and this showed a total of 27,612 operational passes. In 2016, the total number of Gatwick Airport employees was 31,706 based on the 2016 Travel to Work survey. As shown in Table 2 below, the total number of employees decreased by 4,094 (-13%) in 2023 compared to 2016. A factor of 0.87 was therefore applied to the 2016 employee data to create an updated set of 2023 employee journey-to-work matrices as explained in paragraph 4.4.9.

Table 2: 2016 vs 2023 Gatwick employee count

	2016	2023	Difference	Difference %
Total Employees	31,706	27,612	-4,094	-13%

3.1.6 The recent Gatwick employee survey provides details on the attendance of staff on site split by shift and non-shift employees. To help with the development of the 2023 forecast model this information was used to adjust the shift volume assumptions for 2023. However, for 2029 onwards the shift and attendance profiles used in the DCO Application modelling have been retained.

Gatwick cargo data

3.1.7 Civil Aviation Authority (CAA) information on cargo volumes was received from GAL in July 2023. The cargo volumes received covered the period 2012-2022 and data for 2023 was not available. Cargo volumes for 2016, 2019 and 2022 are shown in Table 3 which indicates that in 2022, cargo volumes were approximately 45% of volumes in 2016, and a third of volumes in 2019.

Table 3: Gatwick cargo volume

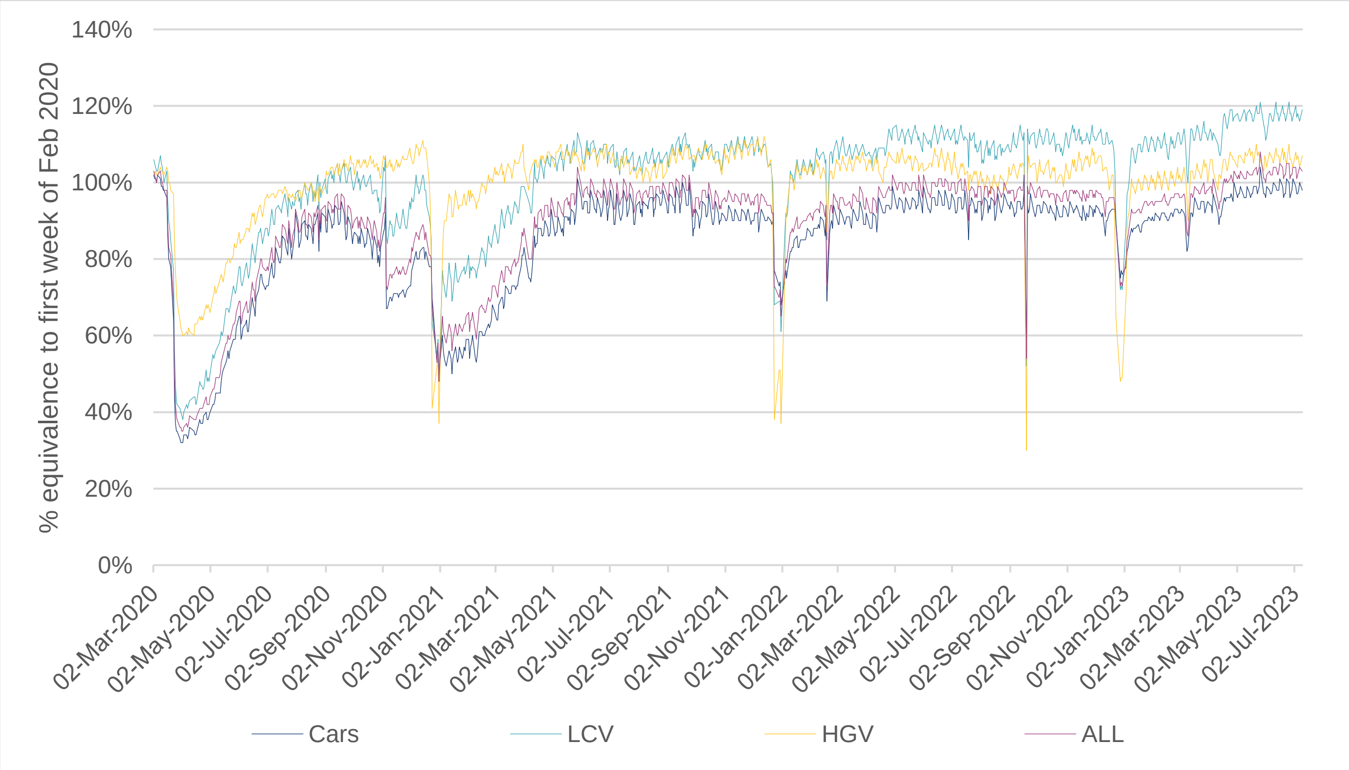
	2016	2019	2022
Cargo Volume (tonnes)	79,588	110,358	36,407

3.2. Department for Transport data

Transport use data

3.2.1 The Department for Transport (DfT) has published statistics on daily domestic transport use by mode for Great Britain since 1 March 2020[3], as shown in Figure 2. According to this data, motor vehicle use since May 2023 has consistently exceeded pre-COVID-19 levels. For public transport modes, however, usage has increased at a slower rate and has generally remained below pre-COVID-19 levels. National Rail usage has exceeded pre-COVID-19 levels on weekdays at multiple locations since April 2023, although this includes the impact of the Elizabeth line in London[4].

Figure 2: Weekday Road Travel – DfT Transport Use Data - March 2020 to July 2023



National Travel Survey

3.2.2 The National Travel Survey (NTS) has been reviewed to understand changes in people's travel patterns. NTS data showed reductions in car trips between 2019 and 2022. These reflect the changes in travel patterns depending on the different transport modes and trip purposes. The factors that have been applied in relation to highway trips are presented in Table 4. These were calculated from 2019 to

[3] Daily domestic transport use by mode - GOV.UK (www.gov.uk)
[4] The Elizabeth line opened on 6 November 2022 for services between Paddington and Shenfield; and between Reading and Abbey Wood; and between Heathrow and Abbey Wood. On 21 May 2023 the full route opened with services between Heathrow and both Abbey Wood and Shenfield; and between Reading and Abbey Wood.

2022 using the NTS0409a table, which summarises the average number of trips by purpose and main mode (trips per person per year).

Table 4: NTS22 factors – adjustment used for forecast models

	NTS22 factors
Car Commute	0.92
Car Business	0.69
Car Other	0.89

DfT Rail COVID Forecasting Tool v19.4

3.2.3 The DfT's Rail COVID Forecasting Tool v19.4 was used to understand the Department's current expectations for the recovery of rail demand post COVID-19. The tool provides nationwide recovery factors as well as factors by Train Operating Company (TOC) for three scenarios: Low, Medium (Core) and High. Based on advice from the DfT, the Medium scenario factors for the Govia Thameslink Railway (GTR) network have been used for this work in both the 2023 forecast model and subsequent forecasts.

3.2.4 The rail factors that were extracted and applied to the model forecasts are presented in Table 5. These were applied to forecasts that pivot off a pre-COVID base. This implies that rail commuting is expected to recover to 78% of pre COVID-19 behaviour, rail business travel to 73% and rail other travel (leisure based) to 100% (ie fully recover).

Table 5: DfT Rail COVID Forecasting Medium factor – adjustment used for forecast models

	DfT factors
Rail Commute	0.78
Rail Business	0.73
Rail Other (Leisure)	1

3.3. Traffic counts used for model verification

3.3.1 Traffic count data to help calculate an average weekday in June 2023 were obtained from East Sussex County Council (ESCC), West Sussex County Council (WSCC) and Surrey County Council (SCC). Data for the Strategic Road Network (SRN) was obtained from National Highways through its WebTRIS[5] database. The data compiled was processed in a manner consistent with the way that count data had previously been compiled for the base model, which was outlined in **Transport Assessment (TA) Annex B – Strategic Transport Modelling Report** [APP-260], covering each of the modelled time periods.

- A total of 224 count locations were compiled: 44 from WebTRIS, 94 from WSCC, 64 from ESCC and 22 from SCC. The site locations are shown in

[5] https://webtris.highwaysengland.co.uk/

Figure 3. A breakdown of the relative growth by road type from each set is presented in Table 6. The data relates to total traffic on the network as robust data by vehicle class was not available for all sites.

3.3.2 The counts generally show a reduction in traffic from 2016 to 2023 on all road types. In the AM1 period there was a 4% reduction, in the AM2 period a 5% reduction, in the IP period a 3% reduction and in the PM period a 5% reduction in the PM. The key points are:

- WebTRIS data for the SRN indicated that for motorways weekday traffic in June 2023 was around 3-5% below 2016 data and for A Roads on the SRN (trunk roads) around 3-8% below.
- SCC counts show a reduction in traffic on all road types and in all time periods of between 5% and 8%. They show greater variability than on other parts of the network. The largest reduction by road type is 12% on B and C Roads in the AM2 period. A small increase of 1% is shown in the IP period for B and C Roads.
- WSCC counts show a reduction in traffic on all road types and in all time periods of between 4% and 8%. The largest reduction is 10% on B and C Roads in the AM1 period.
- ESCC counts show some growth on its roads, particularly in the AM1 period. On the A roads the largest absolute change is seen on the A22 Hailsham Road Polegate where a 31% increase equates to 341 vehicles. A number of other B&C roads see increases in flow of up to 150 vehicles which is small in absolute terms but yields a high percentage change.

Figure 3: Traffic counts used for model verification

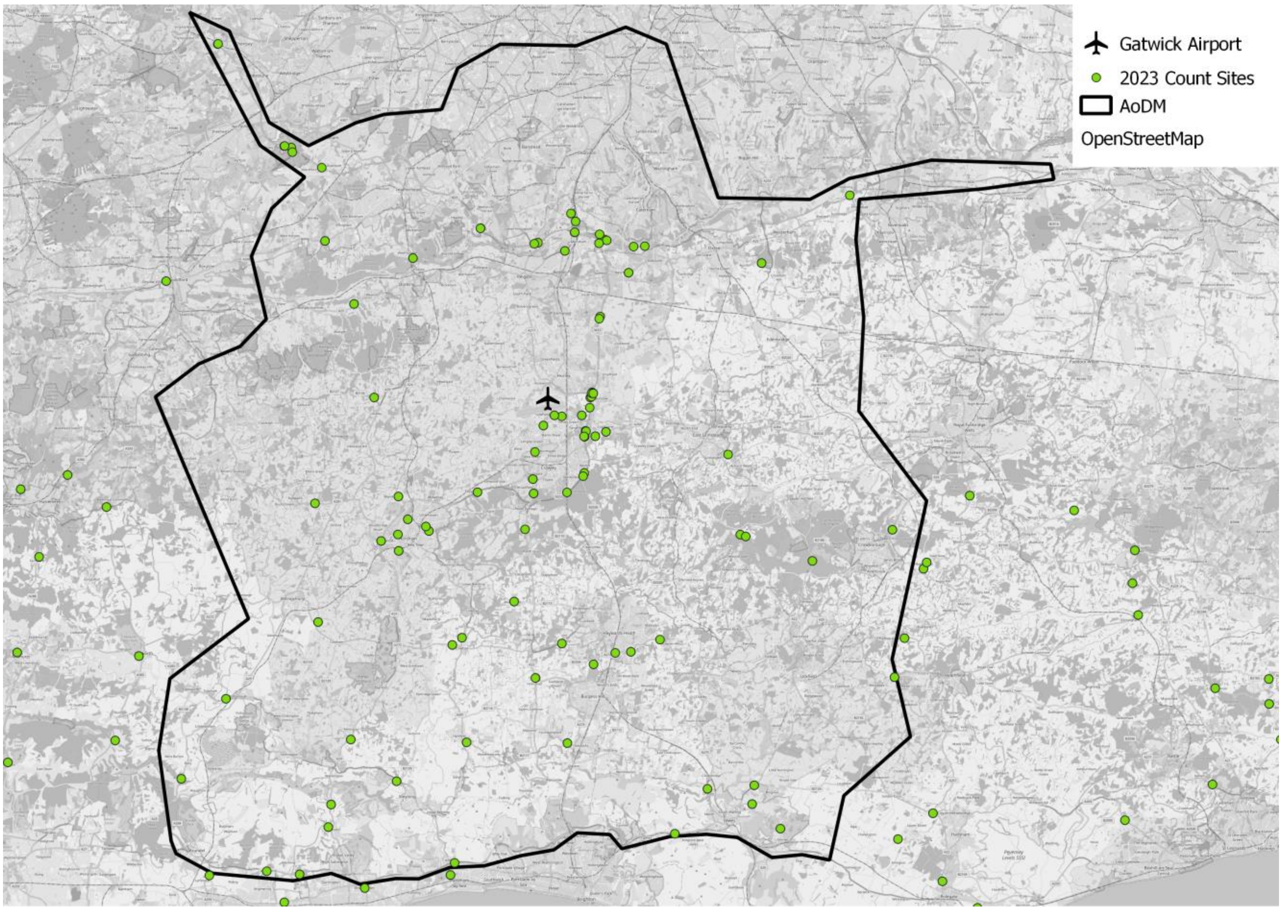


Table 6: Average observed traffic growth rates – June 2016 vs June 2023

Road Type	Source	Number of sites	AM1	AM2	IP	PM
All	WebTRIS	44	-4%	-4%	-3%	-5%
	WSCC	94	-7%	-8%	-4%	-7%
	ESCC	64	2%	-2%	0%	-1%
	SCC	22	-9%	-10%	-5%	-6%
	Total	**224**	**-4%**	**-5%**	**-3%**	**-5%**
Motorways	WebTRIS	36	-3%	-4%	-3%	-5%
	Total	**36**	**-3%**	**-4%**	**-3%**	**-5%**
A Roads	WebTRIS	8	-8%	-6%	-3%	-5%
	WSCC	76	-7%	-8%	-3%	-7%
	ESCC	34	3%	-1%	0%	0%
	SCC	18	-9%	-10%	-5%	-6%
	Total	**136**	**-5%**	**-6%**	**-2%**	**-5%**
B & C Roads	WSCC	18	-10%	-9%	-6%	-9%
	ESCC	30	0%	-3%	-1%	-4%
	SCC	4	-8%	-12%	1%	-3%
	Total	**52**	**-6%**	**-7%**	**-3%**	**-7%**

3.4. Available public transport data

3.4.1 The 2023 forecast rail and bus/coach models utilise the following data sources:

- Rail Delivery Group Common Interface File (CIF) timetable
- Rail Delivery Group (RDG) timetable information forms the foundation for inputs relating to all National Rail services for the rail model. The extracted data pertain to the May-Dec 2023 timetable. Data comprising train origin and destination termini, departure/arrival times and stop-stop times were processed for use in the rail model for all TOCs in London and the South East.
- 2023 bus and coach timetable
- To assist in the validation of the bus/coach model, online resources were used to assess the validity of modelled services and journey times. These were obtained from operator websites including Megabus, Oxford Bus Company and National Express.
- Gate counts at Gatwick Airport railway station, June 2023
- Summarised June 2023 gate count data at Gatwick Airport railway station were provided by the station operator, GTR, to help validate the 2023 modelled gateline counts against the observed counts in 2023.

4 Forecasting methodology and assumptions

4.1. Overview of process

4.1.1 In order to produce sensitivity test forecasts for 2029, 2032, 2038 and 2047 a reasonable set of adjustments needed to be calculated to capture the impact of the COVID-19 pandemic on travel behaviour. These were estimated drawing on the available data outlined in Section 3 of this note and used to create a new model forecast for 2023 that could be compared against observed data, namely traffic flows and available public transport data.

4.1.2 Given the trends identified in the 2023 data, it was clear that some model assumptions would benefit from a direct update using the latest available information. The following model assumptions were therefore reviewed to inform the creation of a 2023 forecast model for this exercise, which is on a similar basis to the existing model scenarios used for the DCO Application:

- **Development** uncertainty **log assumptions** – to identify which major developments were occupied / built out by June 2023
- **Transport scheme uncertainty log** assumptions – to identify which transport schemes were operational by June 2023
- **Airport assumptions** – to update assumptions on the airport operation
- Airport demand assumptions – to update airport passenger and employee numbers to align with actual data where possible
- Airport parking charge and location assumptions – to update airport parking charge and location assumptions to align with 2023 operation
- Public transport timetables – to align the bus, coach and rail services in the public transport model with the 2023 timetable
- **Signal timing assumptions at M23 J9** - derived from testing undertaken as part of 2029 future baseline sensitivity testing

4.1.3 Following discussion with National Highways, it was also considered relevant to update other key data inputs into the transport model to reflect the latest available published data sources relating to background growth in travel and travel costs. The following national datasets were updated:

- Road Traffic Forecasts 2018 (RTF) has been updated with **National Road Traffic Projections (NRTP) 2022** – this affects the calculation of generalised costs, the buffer speeds and non-airport goods vehicles – this is discussed in Section 4.5.
- **National Trip End Model** (NTEM) 7.2 has been updated to the latest **version 8.0** – also discussed in Section 4.5.

- **TAG Databook** has been updated from version 1.17 to **1.**21 – to reflect the cost of travel in 2023 – detailed in Section 4.3.

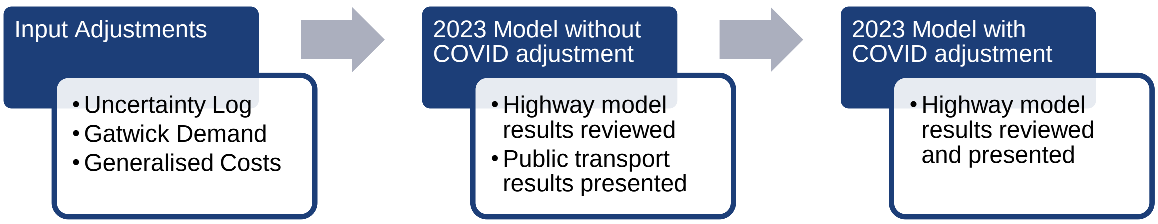
4.1.4 These changes were run through the full Variable Demand Model (VDM) and the results were reviewed (see Section 4.6.1), which showed there was a need to investigate further adjustments to improve the alignment between the model outputs and the observed data for 2023.

4.1.5 Further updates were therefore made to create a 2023 COVID-19 adjusted model. This involved updates to reflect potential changes in trip rates observed as a result of the COVID-19 pandemic. This is detailed in Section 4.6.

4.1.6 Apart from these dataset changes and the addition of the COVID-19 adjustment factors, the forecasting methodology adopted was consistent with that used to forecast the scenarios presented in **Transport Assessment (TA) Annex B – Strategic Transport Modelling Report** [APP-260].

4.1.7 The process used to develop the forecast is shown in Figure 4.

Figure 4: Approach to developing a 2023 model forecast



4.2. Uncertainty log updates

4.2.1 A review of key elements of the uncertainty log was undertaken covering the following areas:

- Development assumptions
- Strategic and local highway schemes
- Public transport timetable and schemes

Development assumptions

4.2.2 In the DCO Application modelling fifteen larger-scale developments were assigned to their own zones. The buildout of these developments was checked against the latest available information. No material changes were identified for 2029 onwards, only an update to potential start dates which were therefore reflected in the trajectories (i.e. the scale of development) estimated for 2023.

Highway schemes

4.2.3 The following strategic schemes have been updated:

4.2.4 Lower Thames Crossing – in the DCO Application modelling, this was assumed to open in 2029. It is now expected to be open to traffic slightly later and so is included from 2032 onwards. It is not included in the 2029 sensitivity test.

4.2.5 A27 Arundel Bypass – this was not included in the DCO Application modelling on the basis it was on the edge of the Area of Detailed Modelling (AoDM) and its impact was likely to be very limited in the context of the Application modelling. On review as part of the sensitivity testing, and based on feedback from West Sussex County Council and discussion with National Highways, the scheme has now been included in the sensitivity test modelling. It has been included from 2032 onwards given its current status as 'under development' during the Road Investment Strategy 3 period of 2025-2030.

4.2.6 In April 2023, the government announced that any further Smart Motorway Programmes that were yet to be delivered would be cancelled. In the DCO Application modelling, the M25 J10-16 Smart Motorway Programme had been included in the assumptions for 2029 onwards. This was therefore removed from the sensitivity tests. In relation to the J10-16 scheme, in capacity terms, the solution included in the DCO Application modelling provided additional lane capacity for the M25 J15-16 element and this is the key change made relating to the removal of this scheme.

4.2.7 Local highway schemes were reviewed to understand which had been delivered and therefore needed to be included in the 2023 model based on the previously advised opening years. For the 2029 models onwards this led to some minor changes in assumptions of the coding of forecast schemes for a small number of locations – the Cheals Roundabout scheme in Crawley, North West Horley Development and signals at the A26 / B2192 junction in Lewes to reflect the latest information available and actual implementation.

Public transport schemes

4.2.8 The public transport schemes were reviewed in both the bus/coach and rail models and the following changes were made to create representative 2023 bus and rail networks:

- Bus and coach network
- Removal of Gatwick Flyer routes (which stopped in 2019).
- Adjustment of coach frequencies to relate to air passenger numbers in 2023.

- Rail network
- 2023 rail timetable adopted using the latest Network Rail CIF file.

4.2.9 For 2029 and future years, the rail network timetable is based on the 2019 - timetable with adjustments for known upgrades: the London Underground Northern Line extension to Battersea Power Station, the opening of the Elizabeth Line and a service frequency increase on the North Downs Line. This is based on the expectation that rail services will trend back to the pre-COVID frequencies and services as demand continues to grow on the network.

4.2.10 Table 7 shows the services that stop and pass through Gatwick in the AM and PM periods that were included in the DCO Application modelling and the changes assumed in the sensitivity modelling for 2047 presented against the 2019 timetable assumption.

4.2.11 Services that pass-through Gatwick are shown in brackets in Table 7 below. These are included along with the services that call at Gatwick to show the total number of trains per hour so that the total line capacity can be determined.

Table 7: Modelled rail frequencies calling (+ passing through) at Gatwick for the AM northbound and PM southbound

Operator/Service	Route	AM (0700 - 0900) – Northbound frequency per hour			PM (1600 - 1800) – Southbound frequency per hour		
		Modelled 2019	Application 2047	Sensitivity 2047	Modelled 2019	Application 2047	Sensitivity 2047
Gatwick Express	Brighton and Gatwick Airport non-stop to London Victoria	4.0 tph	4.0 tph	4.0 tph	4.5 tph	4.5 tph	4.5 tph
Southern (Brighton Main Line) London Victoria	South coast (Main Line) to Victoria via Gatwick, East Croydon and Clapham Jct	5.0 tph	4.5 tph	5.0 tph	4.0 tph	4.0 tph	4.0 tph
Southern (Arun Valley) London Victoria	South coast (Arun Valley) to London Victoria via Gatwick, East Croydon and Clapham Jct	2.0 tph	2.0 tph	2.0 tph	2.0 tph	2.0 tph	2.0 tph
Southern (Brighton Main Line) London Bridge	South coast (Main Line) to London Bridge via Gatwick and East Croydon	1.0 tph	1.0 tph	1.0 tph	0.5 tph	0.5 tph	0.5 tph
Southern (Arun Valley) London Bridge	South coast (Arun Valley) to London Bridge via Gatwick and East Croydon	0 (+1 tph)	0 (+1 tph)	0 (+ 1 tph)	0 (+0.5 tph)	0 (+0.5 tph)	0 (+0.5 tph)
Thameslink (Arun Valley) London Bridge	Horsham to London Bridge via Gatwick and East Croydon	2.5 tph	4.0 tph	2.5 tph	2.0 tph	2.0 tph	2.0 tph
Thameslink (Brighton Main Line) London Bridge	Littlehampton and Brighton to London Bridge via Gatwick and East Croydon	5.5 (+1 tph)	4 (+2 tph)	5.5 (+1 tph)	6 (+1 tph)	5.5 (+2 tph)	6 (+1 tph)
Great Western (North Downs Line)	Reading to Gatwick Airport via Redhill	1.0 tph	2.0 tph	2.0 tph	1.0 tph	2.0 tph	2.0 tph
Total (average hourly) calling (+ passing through) at Gatwick		21 tph (+2 tph)	21.5 tph (+3 tph)	22 tph (+2 tph)	20 tph (+1.5 tph)	20.5 tph (+2.5 tph)	21 tph (+1.5 tph)

4.3. Generalised costs

4.3.1 Generalised costs are used in the transport models to represent the perceived costs of travel relating to different users. They take account of how users value time, the distance they travel (eg through fuel consumption costs) and fares or charges. The DCO Application modelling undertaken used DfT’s TAG Databook version 1.17. A later version of the TAG Databook, version 1.21, is now available which includes recent fuel price inflation and it was agreed with National Highways that it should be adopted for this work. It was used for the 2023 forecast model and the sensitivity testing.

4.3.2 In calculating the generalised costs for 2023, the speeds from the Road Traffic Forecasts (RTF) 2018 used in the Vehicle Operating Cost (VOC) calculations were updated to the more recent National Road Traffic Projections (NRTP) 2022.

4.3.3 The adopted generalised costs for 2023 are shown in Table 8.

Table 8: 2023 Generalised costs (2010 prices, 2010 values)

TAG 1.21 / NRTP22		AM		IP		PM	
		PPM	PPK	PPM	PPK	PPM	PPK
2023	Car Business	30.75	12.42	31.51	12.42	31.19	12.42
	Car Commuting	20.62	7.16	20.96	7.16	20.69	7.16
	Car Other	14.23	7.16	15.15	7.16	14.90	7.16
	Light Goods Vehicles	22.96	12.99	22.96	12.91	22.96	13.02
	Heavy Goods Vehicles	51.04	43.34	51.04	43.34	51.04	43.34
	Gatwick Employees	20.62	7.16	20.96	7.16	20.69	7.16
	Gatwick Air Pax	36.43	7.90	36.43	7.90	36.43	7.90

PPM – pence per minute / PPK – pence per kilometre

4.4. Treatment of changes at Gatwick Airport for 2023

4.4.1 For the 2023 forecast model, the following areas were reviewed and updated:

- Passenger growth
- Employee growth
- Goods vehicle growth
- Car parking changes (locations and prices)

4.4.2 For the sensitivity testing, the assumptions for 2029 and onwards remain as used for the DCO Application.

Air Passenger growth

4.4.3 The air passenger matrices for the 2023 forecast model were created using the 2023 Gatwick terminal passenger counts obtained from GAL in June 2023. The 2023 forecast model contains matrices of air passenger tours (eg home → Gatwick → home) for four market segments (UK Leisure (UKL), UK Business (UKB), Non UK Leisure (NUKL), Non UK Business (NUKB)), ten transport modes, 36 surface access periods (six out periods x six return periods) and two terminals.

4.4.4 For the 2023 forecast model, the residency and purpose proportions were assumed to stay broadly the same as in the 2016 base year model. The 2023 long haul (14%) and short haul (86%) splits were also kept the same as those in the 2016 base year model.

4.4.5 Growth factors to create the future year air passenger tours for the 2023 forecast model were calculated as follows:

- The CAA survey records were allocated to the six landside (surface access) time periods using departure and arrival time distributions.
- The CAA survey records were expanded to (a) June 2016 average weekday hourly observed counts; and (b) 2023 June weekday hourly forecast counts – transfer passengers were removed from both datasets.
- The reference growth rates were calculated for each combination of terminal, segment and departure/arrival time period by dividing the figures for 2023 by those for 2016 (the base year). The resulting growth rates were applied to the base year tours to create the tours for the 2023 model.

4.4.6 Figure 5 and Figure 6 show the forecasts of daily surface access trips in each time period for both the 2016 base year and 2023 models on the modelled day (June high weekday). The time periods refer to landside, ie the time of surface access arrival at Gatwick for departures.

Figure 5: Air passenger surface access trips, modelled day, departures direction, land-side time bands

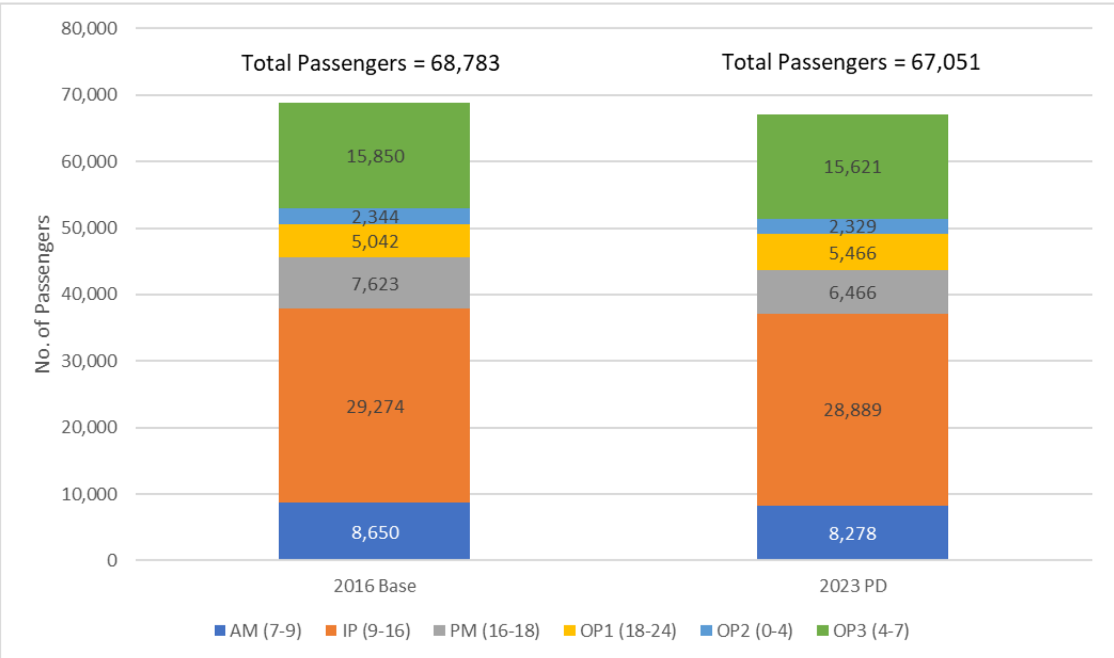
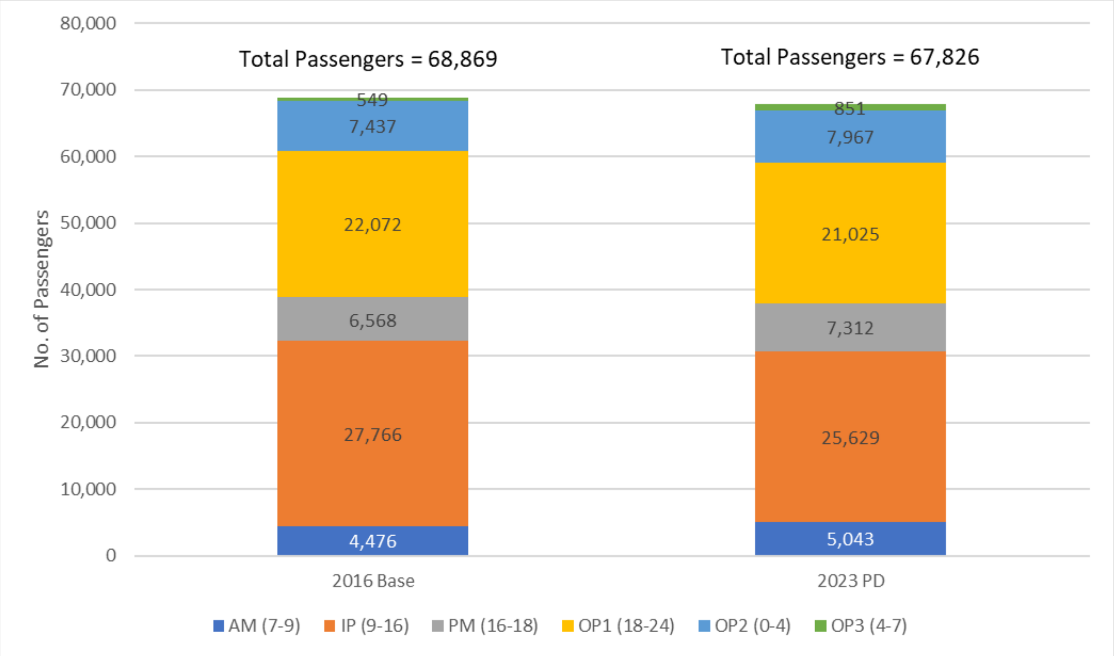


Figure 6: Air passenger surface access trips, modelled day, arrivals direction, land-side time bands



4.4.7 In 2023, the number of two-way trips to South Terminal was about 3,000 (-5%) less than 2016. On the other hand, trips to North Terminal were about 1,400 (2%) higher in 2023 compared to 2016. All four market segments also showed a slight decrease in 2023 relative to 2016 levels, with the UK Leisure segment showing the largest decrease of about 1,200 (-1%) trips.

4.4.8 A total of 79,150 daily trips were made by car in 2023. This is similar to the number of car trips made in 2016. However, the number of daily public transport trips to and from Gatwick Airport decreased in 2023 by about 1,500 trips (-3%). Table 9 shows the daily surface access trips (two-directional totals) by terminal and segment in the 2016 base year and 2023 scenarios.

Table 9: Daily surface access trips by terminal, segment and reference case mode, both directions

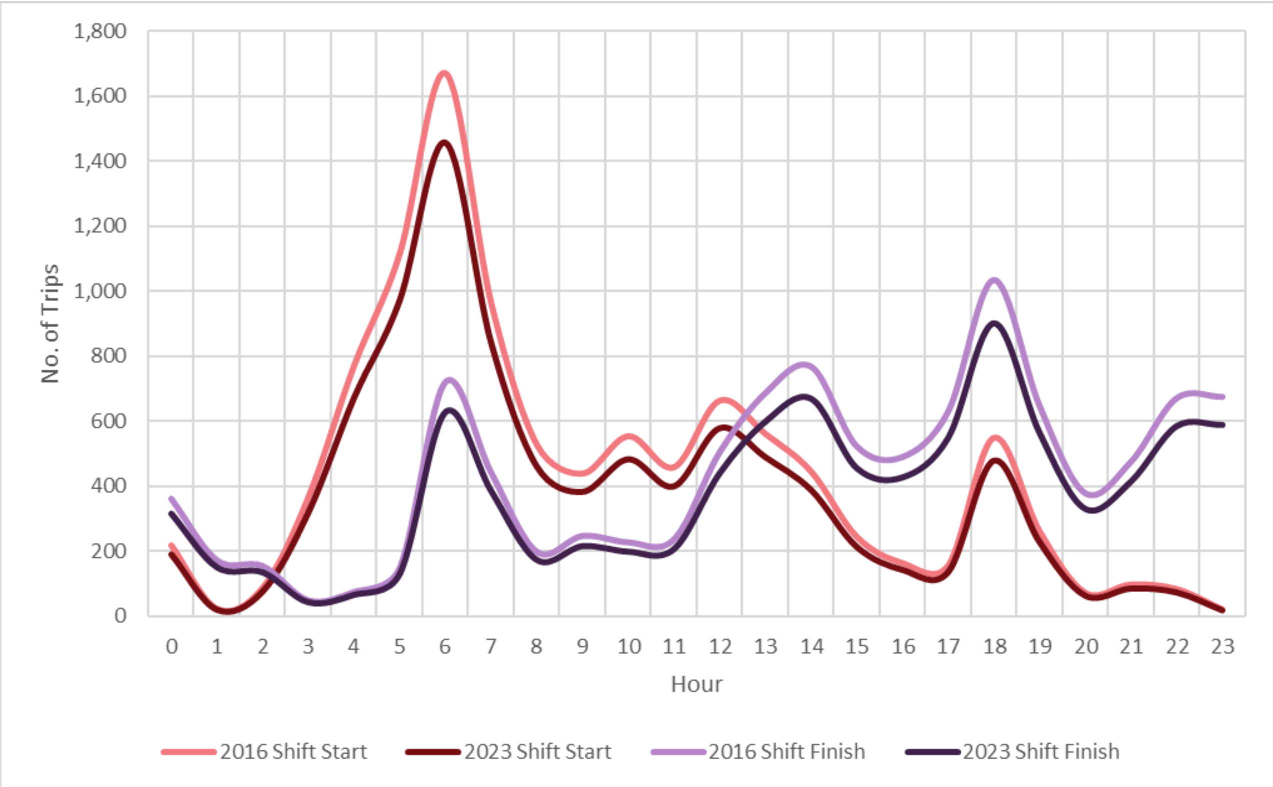
Terminal	Segment	Mode	2016 base year	2023	Difference (2023 minus 2016)	% Difference
South			63,501	60,281	-3,221	-5%
North			68,610	70,007	1,397	2%
	UKB		12,725	12,581	-143	-1%
	NUKB		5,106	5,027	-78	-2%
	UKL		90,547	89,339	-1,209	-1%
	NUKL		23,734	23,340	-393	-2%
		Car	79,441	79,150	-291	0%
		PT	52,671	51,138	-1,533	-3%
Total			132,111	130,288	-1,824	-1%

Airport employee growth

4.4.9 Using the 2023 employee information obtained from GAL, a growth factor was calculated for the total number of employees in 2023 compared to 2016. This growth factor of 0.87 was applied to the 2016 base employee journey-to-work matrices to create the 2023 model matrices. It was assumed that the zonal destinations for employees and the shift start and shift finish time distributions in the 2023 model will remain the same as the 2016 base year model.

4.4.10 Figure 7 shows the hourly trip profile of employee shift start and finish times between 2016 and 2023. Both 2016 and 2023 have a similar distribution of trips throughout the day, however, due to the reduction in total employees in 2023, the number of hourly trips was less than in 2016. The greatest number of shift start time trips occurs at 6am, where there were 1,699 trips in 2016 and 1,454 trips in 2023. Twelve hours later at 6pm, the number of shift finish time trips reached a peak with 1,034 trips in 2016 and 901 trips in 2023.

Figure 7: Hourly trip profile of employee shift start and finish times in 2016 and 2023



4.4.11 The recent Gatwick employee survey provides details on the attendance of staff on site split by shift and non-shift employees. To help with the representation of 2023 this was used to adjust the 2023 shift volumes, however, for 2029 onwards the shift and attendance profiles as used in the DCO Application were retained.

Indirect, induced and catalytic employment growth

4.4.12 Indirect, induced and catalytic employment[6] growth numbers for the with Project scenarios were generated by economics consultant Oxera on behalf of GAL. The numbers used in the sensitivity scenario differ from those set out in Section 7.7 of the Transport Assessment (TA) Annex B – Strategic Transport Modelling Report [APP-260] which references (paragraph 7.7.2) that at the time of DCO Application modelling, a preliminary set of assumptions was used. The final set of figures presented in ES Appendix 17.9.2: Local Economic Impact Assessment [APP-200] have been used in the sensitivity testing. In the context of the overall model area, which covers the whole of the UK, the difference is small.

4.4.13 A summary of the employment uplift changes included in the with Project sensitivity and DCO Application scenarios for the local geography covered by the Local Economic Impact Assessment[7] is shown in Table 10. These reflect the uplift in baseline employment growth from 2016 for the with Project scenario. For 2029 and 2032 the impact of this revision was to increase the growth from 2016 by between 0.1 and 0.2 percentage points. In 2038 and 2047, the impact is a small reduction in the scale of uplift of 0.2 percentage points compared to that assumed in the DCO Application modelling. Overall, the impact of the update is small given the scale of baseline employment growth.

Table 10: Employment growth uplift included in the with Project scenarios

Scenario	2029	2032	2038	2047
DCO Application	0.0%	0.3%	0.7%	0.6%
Sensitivity scenario	0.1%	0.5%	0.5%	0.4%
% pt change	+0.1 pts	+0.2 pts	-0.2 pts	-0.2 pts

Goods vehicle growth

4.4.14 Growth in Light Goods Vehicle (LGV) and Heavy Goods Vehicles (HGV) traffic at the Airport was calculated based on the latest available cargo and passenger data, which dates from 2022. A growth factor of 0.47 for HGV activity was calculated based on 36,407 tonnes of cargo handled in 2022.

4.4.15 All other goods vehicle growth factors at the Airport were calculated using the 2023 passenger forecast. 41.1 million passengers are forecast to use Gatwick Airport in 2023, which when compared with 40.8 million passengers in 2016, gave a growth factor of 1.01.

[6] Indirect employment is employment throughout the UK via the supply chain of firms located at Gatwick, induced employment is created due to workers spending their wages and catalytic is any other employment generated e.g. through companies located in the area due to access afforded by Gatwick.
[7] The Application modelling applied an uplift across a five local authority area including West Sussex, Surrey, Kent, East Sussex and Brighton and Hove. In the sensitivity test modelling, this was expanded to also include Croydon.

4.4.16 For the sensitivity testing of 2029 onwards, the cargo volumes set out in Section 7.6 of the Transport Assessment (TA) Annex B – Strategic Transport Modelling Report [APP-260] were retained.

Car parking changes

4.4.17 Car park changes at the Airport between June 2016 and June 2023 were applied within the 2023 model input assumptions to reflect the current status of car park usage. The overall number of spaces allocated for staff parking remains the same, although locations are now generally closer to the terminals to reduce the need for shuttle bus provision, with reductions in park and fly space allocations for air passengers to provide for this reallocation. Additional valet spaces are provided to the south of the runway in Car Parks X and V, with conversion to a block parking arrangement.

4.4.18 The changes comprise:

- Car Park M closed – reduction of 463 staff spaces
- 463 spaces in North Terminal Self-park allocated to staff car parking to provide alternative to Car Park M closure
- Car Parks X&V – changed to valet parking (previously 2,644 staff spaces), with an assumed 25% increase in spaces due to block-parking arrangements (3,305 spaces)
- 2,644 spaces in South Terminal Long Stay reallocated to staff parking (previously park and fly)
- 450 park and fly spaces in South Terminal Long Stay temporarily closed due to the Gatwick Station project.

4.4.19 Using actual parking revenue data for June 2023 provided by GAL, car parking charges were also revised for the 2023 model. The TAG Databook v1.21 GDP deflator was initially used to calculate real terms changes in parking charges compared to 2016, indicating that:

- Business parking charge would be 29% higher in 2023 than in 2016 in real terms.
- Leisure parking charge would be 20% higher in 2023 than in 2016 in real terms.

4.4.20 Testing of the charges using the GDP deflator indicated that the airport rail mode share was too high relative to observed data. The Retail Price Index (RPI) deflator was tested as an alternative method for deflation as this provides a better estimate of recent trends and helps to account for inflation of around 10% in the last year which is not accounted for in the GDP deflator. This yielded better mode share representation. Using the RPI deflator, compared to 2016 suggests that:

- Business parking charge was 10% higher in 2023 than in 2016 in real terms.
- Leisure parking charge was 2% higher in 2023 than in 2016 in real terms.

4.4.21 For the sensitivity testing, car park locations, parking charges and forecourt charges used in the DCO Application modelling were retained.

4.5. TEMPro (NTEM) 8 and National Road Traffic Projections (NRTP) 2022

4.5.1 On 13 February 2023, DfT released the latest version of TEMPro (NTEM) v8. This is one of the key datasets released by the DfT which are used to help forecast how background travel across the country will change as a result of current planned development, economic growth and travel behaviour. This latest release included updates for several aspects of the DfT's long term travel forecasts across England. Adjustments for this updated version of NTEM have been applied in the 2023 model.

4.5.2 In relation to the Gatwick transport model, the updates mean that the growth in background travel on the wider network are different to what was assumed in the DCO Application modelling. This influences the forecasts for private (or personal) travel. More specific detail on the update from NTEM v7.2 to v8 is provided in Appendix 1.

4.5.3 In addition, in December 2022, the DfT released the latest outputs from its National Transport Model (NTM) in the form of the National Road Traffic Projections, NRTP22, replacing Road Traffic Forecasts 18, RTF18.These provide projections of traffic levels and speeds across the national network including for both light and heavy goods vehicles. This is an update to the previous forecasts from 2018 which were included in the scenarios included in the DCO Application. These are consistent with NTEM 8 so were also updated in these models.

4.5.4 The impact of the NTEM changes on trips in the seven local authorities around the Airport is summarised in Table 11. The values are expressed as Productions (ie trips produced in a zone – such as from housing) and Attractions (i.e. trips attracted to a zone – such as via employment). The differences shown are a result of the changes in NTEM and arise from changes to population and employment forecasts, updates to GDP and the costs related to car travel. These adjustments will have an impact on the underlying background travel growth in the area and are considered cumulative in the context of the 2023 forecast model (when including a COVID-19 effect).

4.5.5 Table 11 shows that the 2023 forecast trip totals for the seven local authorities are lower in general using NTEM v8 compared with those from NTEM v7.2 used in the models for the DCO Application. The differences vary across the local authorities and by purpose and show a variability of between -4.7% and +5.6%.

4.5.6 Aggregate trip totals are presented in Table 12 and indicate that by 2023, NTEM v8 predicts between a -3.4% and +2.3% variation in private trips compared with NTEM v7.2. For reference, this range expands to -3.7% to +3.5% by 2029. It should be noted that this change is only one element of the updates made through this process and the Gatwick model is driven by updates to local plans and planning information, which will be more up to date in the Gatwick model.

Table 11: 2023 - NTEM 8 vs NTEM 7.2 daily trip totals by purpose (HB=home based, NHB=non HB)

	HB Work		HB Employers Business		HB Others		NHB Employers Business		NHB Others	
Local authority	Prod	Att	Prod	Att	Prod	Att	Orig	Dest	Orig	Dest
Epsom and Ewell	0.6%	-0.2%	0.0%	-0.8%	-2.0%	-3.9%	-0.7%	-0.4%	-2.8%	-3.2%
Mole Valley	2.9%	-0.4%	1.9%	-1.1%	-0.8%	-4.1%	-0.9%	-0.7%	-2.7%	-3.2%
Reigate and Banstead	-1.1%	-1.0%	-1.6%	-1.8%	-3.1%	-3.7%	-1.3%	-1.3%	-2.7%	-3.0%
Tandridge	5.6%	-0.6%	4.6%	-1.3%	1.8%	-3.0%	-1.1%	-0.9%	-2.7%	-3.1%
Crawley	-2.9%	-1.7%	-3.5%	-2.6%	-4.7%	-3.8%	-1.9%	-2.0%	-2.8%	-3.1%
Horsham	-1.6%	-1.3%	-2.6%	-2.1%	-3.4%	-3.9%	-1.6%	-1.5%	-2.7%	-3.0%
Mid Sussex	-2.4%	-1.3%	-3.2%	-2.1%	-3.9%	-4.0%	-1.6%	-1.5%	-3.0%	-3.1%

Table 12: NTEM 8 vs NTEM 7.2 daily trip totals for 2016, 2023 and 2029

	Total Trips - NTEM v7.2			Total Trips - NTEM v8			Total Trips Change		
Local authority	2016	2023	2029	2016	2023	2029	2016	2023	2029
Epsom and Ewell	34,198	35,819	36,822	34,198	35,443	36,325	0.0%	-1.0%	-1.3%
Mole Valley	45,931	47,423	48,313	45,931	47,504	47,953	0.0%	0.2%	-0.7%
Reigate and Banstead	74,139	79,038	82,931	74,139	77,349	80,186	0.0%	-2.1%	-3.3%
Tandridge	44,232	45,016	45,603	44,232	46,043	47,206	0.0%	2.3%	3.5%
Crawley	60,518	65,833	68,657	60,518	63,598	66,373	0.0%	-3.4%	-3.3%
Horsham	77,845	84,069	87,898	77,845	81,914	85,180	0.0%	-2.6%	-3.1%
Mid Sussex	80,720	87,196	91,394	80,720	84,543	88,046	0.0%	-3.0%	-3.7%
Total trips = daily HB productions + daily NHB origins									

4.5.7 A review of the development assumptions in the model compared to the planning assumptions in both NTEM v7.2 and NTEM v8 was undertaken. The source of planning trajectories for each local authority in the vicinity of the Airport is presented in Appendix 1 to understand the potential impact of moving from NTEM 7.2 to NTEM v8. The modelled growth projections that are defined through the Uncertainty Log process, with the exception of those for the London Boroughs of Sutton and Croydon, align with the sources used in NTEM v8.

4.5.8 The housing and employment growth predicted by the full Uncertainty Log has been compared to NTEM v7.2 and NTEM v8. The housing and employment numbers from the Uncertainty Log and for NTEM v7.2 and NTEM v8, with growth factors, are shown in Appendix 1. The quantity of housing development assumed in NTEM v8 is generally lower than in NTEM v7.2, whilst employment projections are generally higher. Districts such as Horsham, Mid Sussex and Reigate and Banstead see predicted housing growth in NTEM v8 being almost half that in NTEM v7.2. Tandridge is the only district where NTEM v8 housing projections are higher.

4.5.9 Comparison between RTF 2018 and NRTP 2022 has been carried out for the South East region. Data was interpolated (based on 2015 and 2025) for 2023 with the breakdown of traffic forecasts in billion vehicle miles (bvm) for various road types as presented in Table 13. From this, it is observed that NRTP 22 shows that for LGVs and HGVs the traffic forecast in NRTP 22 is slightly higher than traffic growth rates based on RTF 18.

Table 13: Road Traffic Forecast (bvm) – South East Region (2023 estimate)

	LGV			HGV		
Road Type	RTF18	NRTP(Core) 22	% Diff	RTF18	NRTP (Core) 22	% Diff
Motorway	2.3	2.4	8.6%	1.3	1.4	1.8%
Trunk A	1.1	1.2	8.5%	0.5	0.5	1.8%
Principal A	2.5	2.7	8.5%	0.5	0.5	1.2%
Minor Roads	3.0	3.5	15.3%	0.2	0.2	11.1%

Table 14: Road Traffic Forecast (bvm) for 2016 and 2023 – South East Region (LGV)

	LGV					
Road Type	RTF18			NRTP (Core) 22		
	2016	2023	% Growth	2016	2023	% Growth
Motorway	2.0	2.3	10.8%	2.1	2.4	18.9%
Trunk A	1.0	1.1	9.4%	1.0	1.2	17.3%
Principal A	2.3	2.5	9.3%	2.3	2.7	17.2%
Minor Roads	2.6	3.0	13.7%	2.9	3.5	20.3%

Table 15: Road Traffic Forecast (bvm) for 2016 and 2023 – South East Region (HGV)

	HGV					
Road Type	RTF18			NRTP (Core) 22		
	2016	2023	% Growth	2016	2023	% Growth
Motorway	1.3	1.3	3.3%	1.3	1.4	4.9%
Trunk A	0.5	0.5	2.4%	0.5	0.5	3.9%
Principal A	0.5	0.5	0.8%	0.5	0.5	1.9%
Minor Roads	0.2	0.2	-1.4%	0.2	0.2	1.0%

4.5.10 The buffer network of the model used the vehicle speeds from the first generation of the South East Regional Transport Model (SERTM1), which were based on RTF18 values. To reflect the change in speed projections between RTF18 and

NRTP22 an adjustment was made. A 2023 speed from each of these sources was estimated and an adjustment factor calculated based on the change between 2016 and 2023 from each source. This is outlined in Table 16. The impact is to reduce speeds marginally in the buffer network.

Table 16: RTF18 to NRTP22 Comparison – Car speed (kph)*

Area	Road type	RTF18 2023/2016	NRTP22 2023/2016	2023
East Midlands	All	1.00	0.98	0.98
Eastern England		1.00	0.98	0.98
London		0.97	0.95	0.99
North East		0.99	0.97	0.98
North West		1.00	0.98	0.98
South East		1.00	0.98	0.98
South West		1.00	0.98	0.98
Wales		1.00	0.98	0.98
West Midlands		1.00	0.98	0.98
Yorks & Humber		0.99	0.97	0.98

*Car speeds used for all purposes, in line with method used in National Highways RTMs

RTF18: Table 5 Road Traffic Forecasts: Scenario 1 Reference – Average Speed in England and Wales

NRTP22: Table 8a: Average speed projections (miles/hour) from 2015 to 2060 (Core scenario)

4.5.11 Both NRTP22 and NTEM 8 have been applied in this updated modelling and the results section summarises the outturn growth seen as a consequence of these changes alongside the other adjustments to the model and the COVID-19 adjustments outlined below.

4.6. COVID-19 adjustments

4.6.1 The 2023 forecast model created by applying the updates outlined in Sections 4.2 to 4.5 was reviewed to establish how closely its outputs aligned with the observed data for 2023. The outcomes are discussed in detail in Section 5.2, but indicated that further adjustments were needed to reduce the differences between the 2023 forecast model outputs and the observed data.

4.6.2 The NTS and DfT Rail COVID Forecasting Tool v19.4 factors outlined in Section 3.2 were applied to the model for highway and rail trip demand respectively. These were directly applied to the model reference demand forecasting process for private travel (ie car and rail) as the NTEM v8 forecasts of travel growth did not take account of any impact of the COVID-19 pandemic. No changes were made to the LGV or HGV growth process and so these are based directly on the NRTP22 growth factors.

5 2023 forecast model: results

5.1. Introduction

5.1.1 This section outlines the results of the 2023 forecast model verification process using traffic count data. It shows the impact of trip rate adjustments and that they are appropriate and proportionate in the context of the DfT TAG M4 guidance. There is no specific guidance available around the model verification process of forecasts.

5.2. Verification of traffic flows

Link flow analysis

5.2.1 There were 224 locations used in the validation of the 2016 base model for which more recent observed data were available. These sites were used to provide an assessment of the model performance.

2023 forecast model without COVID adjustment

5.2.2 Table 17 presents the difference between modelled and observed flows for the 2023 forecast model (without any COVID adjustment) and the 2016 base model presented for comparison. It can be seen that in the aggregate, for the 224 sites measured, the 2023 forecast model overestimates observed traffic by 12.0% to 15.2% across all road types and time periods. The comparison varies by road type with A-Roads generally performing best in terms of alignment between modelled and observed data and motorways performing worst. This could be down to a range of routing changes, where observed traffic in 2023 is routing differently due to lower congestion on the network, compared with the 2023 forecast model with no COVID adjustment.

Table 17: Difference between observed and modelled flows for 2016 base model and 2023 forecast model without COVID adjustment

Road Type	Time Periods	Absolute comparison of flows (Modelled vs Observed - % diff)	
		% 2016 Diff	% 2023 Diff
All Road Types (224 sites)	AM1	-1.3%	12.0%
	AM2	-0.8%	15.2%
	IP	-0.5%	12.0%
	PM	-0.7%	14.9%
Motorways (36 sites)	AM1	-2.0%	12.6%
	AM2	0.3%	18.0%
	IP	-0.2%	13.8%
	PM	-0.1%	18.5%
A Roads (136 sites)	AM1	-0.4%	10.5%
	AM2	-1.1%	12.5%
	IP	0.0%	10.4%

	PM	-0.7%	11.6%
B & C Roads (52 sites)	AM1	-2.2%	17.7%
	AM2	-5.2%	13.4%
	IP	-5.0%	7.8%
	PM	-5.2%	12.5%

5.2.3 Table 18 presents the average observed and modelled growth between 2016 and 2023 for the count sites with available data by road type. Across all road types, the average of the observed data showed between a -2.6% and -5.0% reduction in traffic levels whilst the 2023 forecast model with no COVID adjustment predicts increases of between 8.7% and 10.4% giving an overall divergence of between 12.2 and 15.0 percentage points.

Table 18: Observed and modelled growth between 2016 and 2023 model without COVID adjustment

Road Type	Time Period	Comparison of total vehicle growth rates		
		Observed	Modelled	Diff (percentage points)
All Road Types (224 sites)	AM1	-4.2%	8.7%	13.0 pp
	AM2	-4.9%	10.4%	15.3 pp
	IP	-2.6%	9.6%	12.2 pp
	PM	-5.0%	10.0%	15.0 pp
Motorways (36 sites)	AM1	-3.4%	11.1%	14.4 pp
	AM2	-3.4%	13.6%	17.1 pp
	IP	-2.7%	11.0%	13.7 pp
	PM	-5.1%	12.5%	17.6 pp
A Roads (136 sites)	AM1	-5.0%	5.4%	10.4 pp
	AM2	-6.0%	6.9%	12.9 pp
	IP	-2.4%	7.8%	10.2 pp
	PM	-4.6%	7.2%	11.8 pp
B & C Roads (52 sites)	AM1	-5.5%	13.7%	19.3 pp
	AM2	-6.6%	11.7%	18.3 pp
	IP	-3.2%	9.9%	13.1 pp
	PM	-6.8%	10.6%	17.4 pp

2023 forecast model with COVID adjustment

5.2.4 Table 19 presents the difference between modelled and observed flows for the 2023 forecast model with COVID adjustment, with 2016 presented for comparison. It can be seen that in aggregate, for the 224 sites measured, the 2023 forecast model flows are between -0.7% and – 4.3% lower than observed across all road types depending on time period. This is within an acceptable range given the uncertainties present and demonstrates that the COVID adjustment is appropriate and necessary.

Table 19: Difference between observed and modelled flows for 2016 and 2023 model with COVID adjustment

Road Type	Time Period	Absolute comparison of flows (Modelled vs Observed - % diff)	
		2016 % Diff	2023 % Diff
All Road Types (224 sites)	AM1	-1.3%	-0.7%
	AM2	-0.8%	-3.7%
	IP	-0.5%	-4.3%
	PM	-0.7%	-0.7%
Motorways (36 sites)	AM1	-2.0%	-0.3%
	AM2	0.3%	-4.3%
	IP	-0.2%	-3.8%
	PM	-0.1%	0.9%
A Roads (136 sites)	AM1	-0.4%	-1.7%
	AM2	-1.1%	-3.6%
	IP	0.0%	-4.8%
	PM	-0.7%	-2.4%
B & C Roads (52 Sites)	AM1	-2.2%	2.4%
	AM2	-5.2%	-0.9%
	IP	-5.0%	-5.2%
	PM	-5.2%	-1.4%

5.2.5 Table 20 presents the average observed and modelled growth between 2016 and 2023 for the count sites with available data by road type. Across all road types, the average of all of the observed data shows between a -2.6% and -5.0% reduction in traffic whilst the 2023 adjusted forecast model predicts reductions of between 3.6% and -7.8%. The growth shown in the observed data and the 2023 forecast model varies by road types, with the model showing greatest divergence from the observed growth on lower class roads. It should be noted that the sample size decreases for more local roads meaning there is greater uncertainty in the findings.

Table 20: Observed and modelled growth between 2016 and 2023 model with COVID adjustment

Road Type	Time Period	Comparison of total vehicle growth rates		
		Observed	Modelled	Diff (percentage point)
All Road Types (224 sites)	AM1	-4.2%	-3.6%	0.6 pp
	AM2	-4.9%	-7.8%	-2.9 pp
	IP	-2.6%	-6.4%	-3.8 pp
	PM	-5.0%	-5.0%	0.0 pp
Motorways (36 sites)	AM1	-3.4%	-1.7%	1.7 pp
	AM2	-3.5%	-7.9%	-4.4 pp
	IP	-2.8%	-6.2%	-3.5 pp
	PM	-5.1%	-4.2%	1.0 pp
A Roads (136 sites)	AM1	-5.0%	-6.2%	-1.3 pp
	AM2	-6.0%	-8.4%	-2.4 pp
	IP	-2.4%	-7.1%	-4.7 pp
	PM	-4.6%	-6.2%	-1.6 pp
B & C Roads (52 Sites)	AM1	-5.5%	-1.1%	4.5 pp
	AM2	-6.6%	-2.4%	4.2 pp
	IP	-3.2%	-3.4%	-0.1 pp
	PM	-6.8%	-3.0%	3.8 pp

5.2.6 Table 21 presents the summary statistics of link flow performance for the 224 available sites. It presents the gradient and correlation coefficient for the base model comparisons with observed data (2016 Obs vs Mod), the observed growth between 2016 and 2023 (Obs growth), the modelled growth between 2016 and 2023 (Mod growth) and the comparison of modelled and observed flows in 2023 (2023 Obs vs Mod). Detailed scatter graphs underpinning these numbers are presented in Appendix 2.

5.2.7 The table indicates that across all sites the observed growth is slightly negative with gradients below 1 for all time periods. Comparisons with the observed and modelled flows in 2023 show that the model is slightly underestimating 2023 flows compared with observed with the gradient slightly below 1.

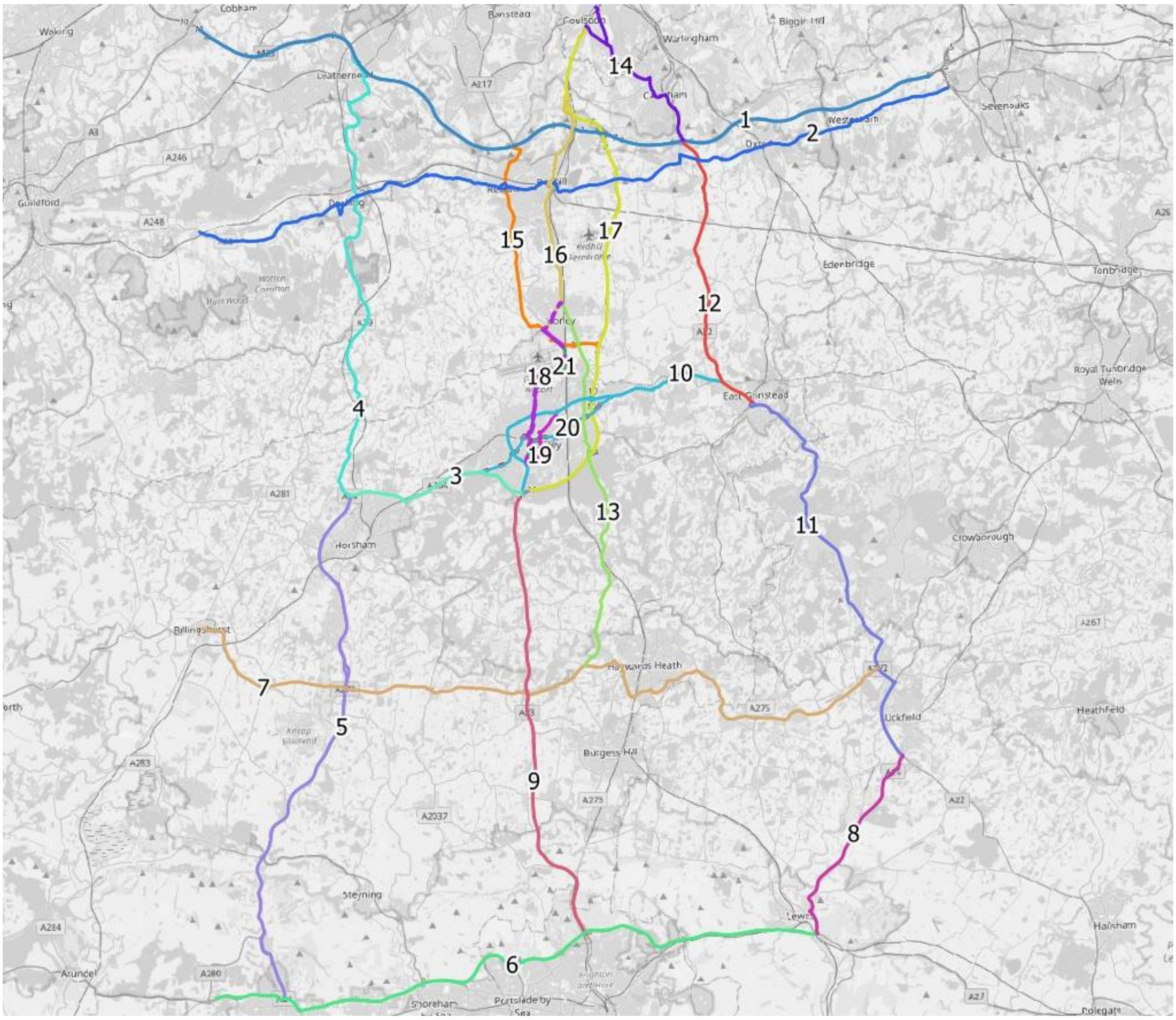
Table 21: Summary statistics of link flow performance – gradient (correlation coefficient)

Time period	2016 Obs vs Mod	Obs growth	Mod growth	2023 Obs vs Mod
AM1	0.978 (99.7%)	0.960 (99.3%)	0.976 (99.6%)	0.988 (99.0%)
AM2	0.998 (99.6%)	0.958 (99.2%)	0.920 (99.6%)	0.953 (98.8%)
5.2.8 IP	0.995 (99.8%)	0.974 (99.7%)	0.940 (99.7%)	0.958 (99.2%)
PM	0.995 (99.7%)	0.948 (99.4%)	0.955 (99.7%)	0.998 (99.0%)
11 hr	0.995 (99.8%)	0.967 (99.7%)	0.944 (99.8%)	0.968 (99.3%)

Journey time verification

5.2.9 In the absence of new journey time data, in discussion with National Highways, the journey time performance of the 2023 adjusted forecast model was assessed through comparison against the original 2016 data. Given the observed traffic flow volume changes, it is not expected that journey times will have changed significantly on the whole across the modelled area. The location of the assessed routes is shown in Figure 8.

Figure 8: All journey time routes



5.2.10 Table 22 shows the number of journey time routes that show increases or decreases in journey times between 2016 and 2023. Those with a change of ten seconds or less either way are considered as no change. There is a general swing to a decrease in journey time which given the reduction in traffic volumes compared to 2016 is a sensible model response.

5.2.11 The maximum journey time increase appears on route 5 along the A24 southbound during the AM2 period and is 47 seconds or 3.5% of the total journey time, while the total journey time is 22 minutes. In the PM period a maximum increase of 45 seconds or 9% of the journey time is shown on route 19 around Crawley in the southbound direction, which has a total travel time of 9 minutes. In the PM period the next highest increase in journey time is 2.3%.

Table 22: 2023 compared to 2016 modelled journey times

Period	Increase	No change (within 10 seconds)	Decrease
AM1	6 routes	21 routes	15 routes
AM2	5 routes	16 routes	21 routes
IP	8 routes	23 routes	12 routes
PM	8 routes	12 routes	22 routes

5.3. Public transport verification

5.3.1 Observed public transport data for Gatwick Airport station, where the majority of trips will involve airport travellers, was obtained to understand how well the 2023 model forecasts compared against observed data.

5.3.2 Table 23 shows the average hour gateline count difference between the modelled and observed sources in 2016 and 2023 across the modelled time periods.

5.3.3 The modelled entries and exits at the station in the 2023 forecast rail model were generally higher than the May 2023 observed gateline counts at Gatwick Airport. In the AM period, the modelled entries and exits were 5% and 7% higher than observed May 2023 data respectively. In the PM period, the modelled entries and exits were 28% and 12% higher respectively compared to the observed May 2023 data. There are no observed entry and exit counts for period OP2 (0000-0400) as the gates are locked open during this period.

5.3.4 Table 23 also shows that the largest increase in the number of observed entries was in the AM period, where there were 16% more entries in 2023 than in 2016, while the largest decrease was in the PM period, where there were -8% fewer entries in 2023. There were, however, -7% fewer observed exits in 2023 compared to 2016. The largest decrease in observed exits was in the AM period, with a reduction of -16% in 2023. In the IP period, there were a slight increase of 1% in exits observed in 2023 compared to 2016.

Table 23: Observed and modelled gateline count % differences (average hour), Gatwick Airport station

	Time Period	% Difference between 2023 and 2016 observed data	% Difference between 2023 and 2016 modelled outputs	% Difference between 2023 modelled outputs and 2023 observed data
Entries	**AM**	16%	10%	5%
	IP	4%	-2%	5%
	PM	-8%	19%	28%
	OP1	-3%	7%	18%
	OP3	-21%	73%	80%
Exits	**AM**	-16%	5%	7%

	IP	-2%	8%	24%
	PM	1%	2%	12%
	OP1	-11%	8%	28%
	OP3	-19%	16%	62%

5.3.5 Figure 9 and Figure 10 below show the comparison between May 2023 observed and June 2023 modelled gateline counts by entries and exits for an average hour in each time period.

5.3.6 The largest number of entries at Gatwick Airport station is in the PM period. The specific entries and exit numbers come from commercially sensitive data but these have been checked and proportionally are made up of 72% air passengers, 9% employees and 19% non-airport passengers. The number of employee entries is also highest in the PM period compared to all other time periods as seen in Figure 9 below.

5.3.7 The largest number of exits at Gatwick Airport station is also in the PM period made up of 85% air passengers, 1% employees and 14% non-airport passengers as seen in Figure 10 below.

Figure 9: Gatwick Airport gateline count comparison between 2023 modelled and 2023 observed (average hour) – Entries

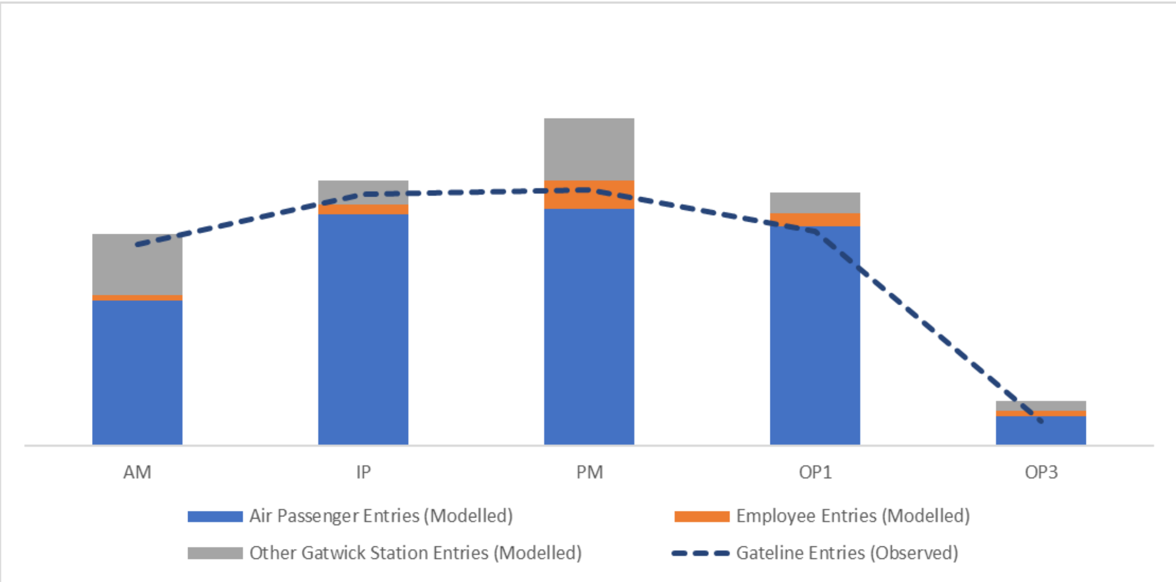
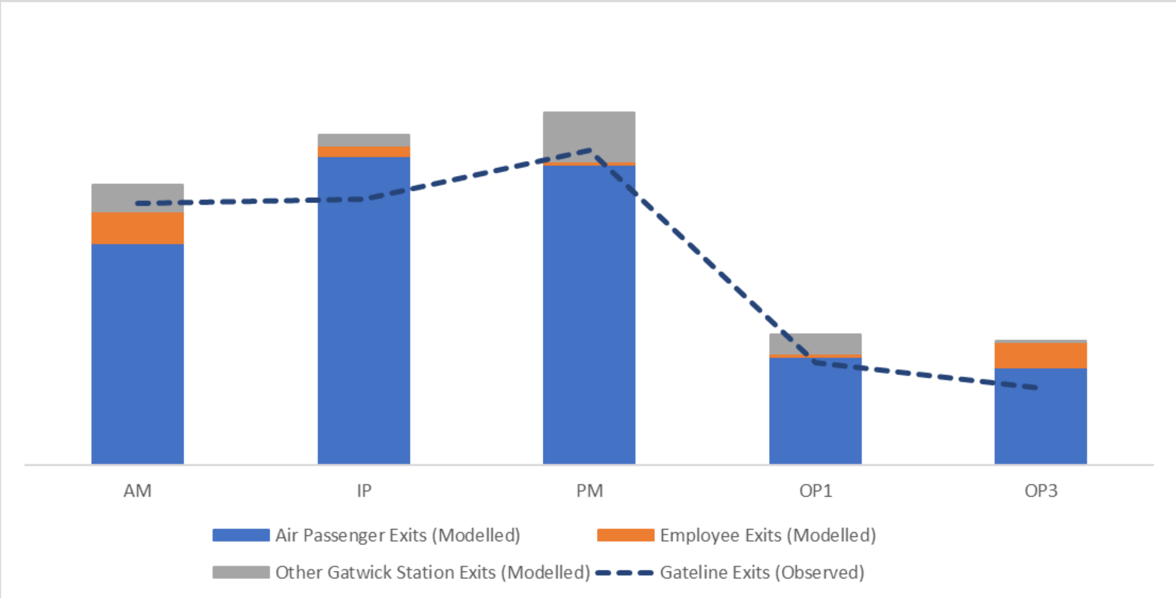


Figure 10: Gatwick Airport gateline count comparison between 2023 modelled and 2023 observed (average hour) – Exits



5.4. Mode shares

5.4.1 CAA data on passenger mode share, shared via GAL, shows observed public transport mode share was 43.7% in 2022 and 45.7% in 2023 based on a moving average total for the past four quarters up until end of Q2 2023. This data also showed that in 2023, the average public transport share between April and June was 44.8%.

5.4.2 The estimated June 2023 observed public transport mode share of 42.6% was calculated as 95% of the 44.8% average share between April and June 2023. This reflects the relationship seen in 2016 between the quarterly and monthly public transport mode shares for these months.

5.4.3 Table 24 shows the estimated June 2023 observed public transport mode share for air passengers and 2023 modelled public transport mode share for both passengers.

Table 24: June 2023 observed and modelled PT mode share

	2023 Observed PT mode share % (estimated)	2023 Modelled PT mode share %
5.4.4 June Air Passengers	5.4.5 42.6%	5.4.6 41.9%

5.4.7 The modelled air employee sustainable transport mode share is 45.7%, although no observed data was available to verify this. This is a little higher than the 2016 mode share of 45.3%. The sustainable transport mode share is the percentage of employees that travel either by rail, bus/coach, active travel, company transport or car sharing.

6 Sensitivity testing results

6.1. Introduction

6.1.1 This section summarises the results for the sensitivity testing for the future baseline and with Project scenarios, providing comparison against sections 11 and 12 of the Transport Assessment (TA) Annex B – Strategic Transport Modelling Report [APP-260]. These are assessed for 2029, 2032, 2038 and 2047. This section sets out:

- Reference case demand (highway and rail) – detailed in Section 6.2;
- Post VDM demand (highway and rail) – detailed in Section 6.3;
- Convergence – detailed in Section 6.4;
- Airport mode shares for passengers and employees– detailed in Section 6.5;
- Highway network performance – detailed in Section 6.6;
- Change in future baseline flows;
- Project traffic flow impacts (Magnitude of Impact analysis and journey time impacts);
- Rail network performance – detailed in Section 6.7;
- Bus/coach airport demand – detailed in Section 6.8; and
- Gatwick Airport station entry & exits – detailed in Section 6.9.

6.2. Reference case demand

6.2.1 This section outlines the results from the reference case model for these sensitivity tests, providing comparison against results in the DCO Application which were presented in Section 10 of the Transport Assessment (TA) Annex B – Strategic Transport Modelling Report [APP-260].

6.2.2 The reference case represents the future forecasts assuming no behavioural response by network users associated with a change in travel costs, ie no reaction to congestion or future cost changes. The reference (pre-VDM) demand for the future baseline sensitivity scenarios is created by applying growth to the base matrices for non-airport trips, then adding development trips and reference airport trips (including passengers, employees and cargo) and finally applying the COVID-19 adjustments detailed in Section 4.6.

6.2.3 The air passenger, employee and cargo totals remain unchanged from the DCO Application, as are the development projections, so the results presented reflect the change from NTEM v7.2 to NTEM v8.0.

Highway demand growth

6.2.4 The resulting reference case growth from 2016 and difference to the DCO Application scenarios are shown in Table 25 at a 24-hour level.

Table 25: 24-hour future baseline sensitivity reference highway demand comparisons

	Growth from 2016				%Difference from application			
	2029	2032	2038	2047	2029	2032	2038	2047
Business	-22%	-21%	-19%	-17%	-31%	-31%	-32%	-34%
Commute	2%	4%	6%	8%	-7%	-7%	-8%	-11%
Other	1%	3%	6%	10%	-13%	-14%	-15%	-18%
LGV	24%	27%	37%	52%	4%	3%	2%	4%
HGV	7%	9%	12%	16%	6%	6%	7%	7%
Air passengers	19%	23%	28%	33%	0%	0%	0%	0%
Airport employees	16%	18%	21%	25%	0%	0%	0%	0%
Weighted average	**3%**	**4%**	**8%**	**13%**	**-10%**	**-11%**	**-12%**	**-14%**

6.2.5 Overall highway trip growth from 2016 is 3% to 2029, 4% to 2032, 8% to 2038 and 13% to 2047. Between 2016 and 2047 the reference case shows 8% more commuting trips, and a 10% increase for other trips. Car business trips are shown to have reduced substantially as a result of the new traffic projections, including the COVID adjustment factors, and are expected to be 22% lower in 2029 compared with 2016 and 17% lower in 2047 than in 2016.

6.2.6 Compared to the DCO Application forecasts, car business trips in the updated reference case models have reduced by more than 30% across all four modelled years. Most of the reduction is attributable to the impacts of COVID-19 adjustments made in the process, and to a lesser degree to the reduced demand introduced by NTEM 8.0 when compared to its previous version. Car commute and other trips also decreased in the sensitivity reference case scenario by 11% and 18% respectively in the year 2047. It is worth mentioning that car other trips are showing the largest reduction from NTEM 8 compared to NTEM 7.2.

6.2.7 The LGV background demand growth is 52% in 2047, the largest overall growth, while HGV growth is 16%. Both the LGV and the HGV background demand increases as a result of the update to NRTP 2022 forecasts. The difference from the DCO Application scenarios fluctuates between 2% and 4% for LGV growth depending on the forecast year and between 6% and 7% for HGV growth.

6.2.8 Baseline air passenger trips by car grow by 33% and car-borne airport employee trips grow by 25%. These highway based air passenger and airport employee trip growth assumptions remain unchanged from the DCO Application.

6.2.9 Detailed tables showing the breakdown by time period breakdown can be found in Appendix 3.

Rail demand growth

6.2.10 The pre-VDM reference case rail demand comparisons to the base and DCO Application demand are shown at a 24-hour level in Table 26.

Table 26: 24-hour reference rail demand comparisons

	Growth from 2016				%Difference from application			
	2029	2032	2038	2047	2029	2032	2038	2047
CA Business	-9%	-6%	-2%	4%	-26%	-26%	-27%	-28%
CA Commute	-3%	0%	4%	10%	-19%	-18%	-18%	-19%
CA Other	19%	23%	28%	34%	-3%	-4%	-5%	-7%
NCA Business	-19%	-18%	-17%	-15%	-23%	-24%	-23%	-22%
NCA Commute	-15%	-14%	-13%	-12%	-16%	-16%	-15%	-14%
NCA Other	3%	4%	5%	5%	0%	-1%	-2%	0%
Total Business	-12%	-9%	-6%	-1%	-25%	-25%	-26%	-27%
Total Commute	-7%	-4%	-1%	3%	-18%	-18%	-18%	-18%
Total Other	13%	16%	19%	23%	-2%	-3%	-4%	-5%
Air passengers	30%	35%	41%	47%	0%	0%	0%	0%
Airport employees	16%	17%	20%	24%	0%	0%	0%	0%
Weighted average	**-1%**	**2%**	**5%**	**10%**	**-14%**	**-14%**	**-14%**	**-15%**
CA for Car Available and **NCA** for No Car Available								

6.2.11 The total rail demand shows a growth of 10% from 2016 to 2047. Of the non-airport demand purposes, other is the fastest growing (23% by 2047), as it is the only category unaffected by the COVID-19 adjustments. The difference for the 'other' category is a result of the use of NTEM v8 in these forecasts.

6.2.12 Car Available (CA) growth is very much stronger than No Car Available (NCA) in line with the increasing household car availability in future years inherent in the NTEM forecasts. The impacts of COVID-19 are more evident in NCA business and commute categories, as demand does not reach 2016 levels even by 2047.

6.2.13 The demand for all non-airport purposes reduces across all four modelled years compared to the DCO Application. Most of the reduction is noticed in business rail trips (27% to 2047). Commute and other rail trips also decrease in the sensitivity scenario by 18% and 5% respectively in the year 2047 when compared to the DCO Application.

6.2.14 Air passengers with rail as a surface access mode grow by 47% and employees by 24% over the period to 2047 which remains unchanged from the DCO Application.

6.2.15 Further time period based tables can be found in Appendix 4.

6.3. Post VDM demand

6.3.1 The Variable Demand Model (VDM) predicts how non-airport trip demand (ie background traffic) may respond to changes in travel cost from the reference case. The Gatwick Surface Access Model (GSAM) predicts the response for airport trips. No adjustment is made to LGV and HGV trips as these are considered fixed to the reference case demand.

6.3.2 Table 27 summarises how the future baseline sensitivity post-VDM matrix totals for each year compared to the reference case demand.

Table 27: 24hr future baseline sensitivity post-VDM highway demand comparison to reference case

	%Difference from reference case			
	2029	2032	2038	2047
Business	0%	0%	0%	0%
Commute	-1%	-1%	-1%	-2%
Other	0%	-1%	-1%	-1%
LGV	0%	0%	0%	0%
HGV	0%	0%	0%	0%
Air passengers	-11%	-12%	-11%	-11%
Airport employees	-4%	-5%	-5%	-6%
Weighted average	**0%**	**-1%**	**-1%**	**-1%**

6.3.3 Background highway car trips between the pre-VDM and post-VDM stages decrease slightly, because of mode switch from car to public transport, driven by future traffic congestion and rail improvement driving shifts to public transport. The impact of the VDM, however, is small with car demand decreasing between 0% and 2%.

6.3.4 In relation to air passengers and employees the impacts are more significant as these users are affected by future parking policies at the Airport including increases in forecourt and parking charges. Nevertheless, these changes are comparable to those observed in the DCO Application modelling, as presented in Section 11.4 of **Transport Assessment (TA) Annex B – Strategic Transport Modelling Report** [APP-260].

6.3.5 Further tables showing the time period breakdown can be found in Appendix 3.

6.3.6 The 24-hour reference rail demands (pre VDM) for the future baseline sensitivity scenarios are shown in Table 28 together with the future baseline sensitivity rail demands post-VDM.

Table 28: 24hr future baseline sensitivity post-VDM rail demand comparison to reference case

	%Difference from reference case			
	2029	2032	2038	2047
CA Business	3%	2%	3%	4%
CA Commute	7%	8%	10%	12%
CA Other	21%	25%	36%	55%
NCA Business	0%	0%	0%	0%
NCA Commute	0%	0%	0%	0%
NCA Other	0%	0%	0%	0%
Total Business	2%	2%	2%	3%
Total Commute	5%	6%	7%	9%
Total Other	14%	17%	24%	38%
Air passengers	16%	17%	16%	15%
Airport employees	9%	10%	13%	17%
Weighted average	**8%**	**9%**	**11%**	**16%**

6.3.7 The future baseline sensitivity post-VDM demand shows an increase of 4% compared to the reference case in CA business trips, 12% increase in CA commute trips and an increase of 55% in CA other trips by 2047.

6.3.8 It should be noted that VDM does not change the NCA rail demand because these trips are not able to shift from public transport to car.

6.3.9 The table shows that the VDM increases the number of airport passengers and employees using the rail network because of the measures being implemented to encourage the use of sustainable transport causing a mode shift from car journeys. The number of airport passengers travelling by rail post-VDM shows an increase of 15% compared to the reference case in 2047. Similarly for airport employees, there is an increase of 17% post-VDM compared to the reference case in 2047.

6.3.10 The overall rail demand post-VDM increases by 8% in 2029, 9% in 2032, 11% in 2038 and 16% in 2047.

6.3.11 Further tables showing the time period breakdown can be found in Appendix 4.

6.4. Convergence

Variable demand model

6.4.1 The VDM is run for a fixed 6 cycles. The target convergence criterion from TAG is % Gap below 0.1%. The convergence details for both future baseline and with Project sensitivity scenarios are shown in Table 29.

Table 29: VDM convergence – future baseline sensitivity and with Project sensitivity

Year	Future baseline sensitivity		With Project sensitivity	
	%Gap at completion	Converged (Gap<0.1%)?	%Gap at completion	Converged (Gap<0.1%)?
2029	0.03%	Yes	0.03%	Yes
2032	0.03%	Yes	0.04%	Yes
2038	0.04%	Yes	0.04%	Yes
2047	0.06%	Yes	0.06%	Yes

Highway assignment model

6.4.2 Table 30 lists out the highway assignment model convergence statistics for the last iteration of the future baseline and with project sensitivity models. In all instances the models meet the acceptable values set out within TAG Unit M3.1. Appendix 5 provides the convergence statistics for the last four iterations.

Table 30: Highway assignment model convergence – future baseline sensitivity and with Project sensitivity

Scenario	Measure of convergence	Model Acceptable Values	AM1	AM2	IP	PM
FBS 2029	Delta and %GAP	< 0.1% or at stable with all other criteria met	0.0061	0.011	0.0045	0.0094
	% of links with flow change (P)<1%	4 consecutive iterations > 97.5% (last iteration presented)	97.6	98.4	98.1	98.3
	% of links with delay change (P2)<1%	4 consecutive iterations > than 98% (last iteration presented)	98.3	99.1	99.2	98.6
FBS 2032	Delta and %GAP	< 0.1% or at stable with all other criteria met	0.0077	0.0059	0.0046	0.0085
	% of links with flow change (P)<1%	4 consecutive iterations > 97.5% (last iteration presented)	97.9	98.6	98.4	98.5
	% of links with delay change (P2)<1%	4 consecutive iterations > than 98% (last iteration presented)	98.4	98.7	99.2	98.7
FBS 2038	Delta and %GAP	< 0.1% or at stable with all other criteria met	0.015	0.0095	0.0078	0.0093
	% of links with flow change (P)<1%	4 consecutive iterations > 97.5% (last iteration presented)	98.6	97.7	98.2	98.3
	% of links with delay change (P2)<1%	4 consecutive iterations > than 98% (last iteration presented)	98.2	98.3	99	98.3
FBS 2047	Delta and %GAP	< 0.1% or at stable with all other criteria met	0.017	0.011	0.0072	0.012
	% of links with flow change (P)<1%	4 consecutive iterations > 97.5% (last iteration presented)	97.6	98.3	98.1	98.1
	% of links with delay change (P2)<1%	4 consecutive iterations > than 98% (last iteration presented)	97.9	98.3	99	98
WPS 2029	Delta and %GAP	< 0.1% or at stable with all other criteria met	0.0042	0.0030	0.0072	0.0065
	% of links with flow change (P)<1%	4 consecutive iterations > 97.5% (last iteration presented)	97.8	97.5	98	97.8
	% of links with delay change (P2)<1%	4 consecutive iterations > than 98% (last iteration presented)	98.7	98.7	99.1	98.6
WPS 2032	Delta and %GAP	< 0.1% or at stable with all other criteria met	0.010	0.0096	0.0068	0.011

Scenario	Measure of convergence	Model Acceptable Values	AM1	AM2	IP	PM
	% of links with flow change (P)<1%	4 consecutive iterations > 97.5% (last iteration presented)	98.3	99.4	98.7	97.9
	% of links with delay change (P2)<1%	4 consecutive iterations > than 98% (last iteration presented)	98.4	99	99.2	98.2
WPS 2038	Delta and %GAP	< 0.1% or at stable with all other criteria met	0.013	0.011	0.0081	0.014
	% of links with flow change (P)<1%	4 consecutive iterations > 97.5% (last iteration presented)	98.2	98.2	98.4	98.1
	% of links with delay change (P2)<1%	4 consecutive iterations > than 98% (last iteration presented)	98.2	98.4	99.1	98.2
WPS 2047	Delta and %GAP	< 0.1% or at stable with all other criteria met	0.011	0.0085	0.0078	0.014
	% of links with flow change (P)<1%	4 consecutive iterations > 97.5% (last iteration presented)	98.4	98.1	98.2	97.6
	% of links with delay change (P2)<1%	4 consecutive iterations > than 98%	98.2	98.7	99	97.8

Rail assignment model

6.4.3 Table 31 shows the crowded rail assignment model convergence statistics for AM and PM periods for the future baseline and with Project sensitivity models at the twelfth and final iteration. There is no criterion given in TAG so the convergence criterion is assumed to be the same as for the demand model: that the percentage gap in the measure of total weighted time is less than 0.1%. In all instances the models meet the criterion by the final iteration.

Table 31: Rail Assignment Model Convergence – future baseline sensitivity and with Project sensitivity

Year	Future baseline sensitivity		With Project sensitivity	
	Gap AM Peak	Gap PM Peak	Gap AM Peak	Gap PM Peak
2029	0.04%	0.02%	0.05%	0.02%
2032	0.05%	0.03%	0.05%	0.03%
2038	0.05%	0.04%	0.05%	0.04%
2047	0.06%	0.06%	0.06%	0.06%

6.5. Mode shares

6.5.1 The airport mode shares for passengers and employees in the new sensitivity tests have been reviewed against those presented in Section 7.2 of the Transport Assessment (TA) [AS-079].

6.5.2 Table 32 presents the air passenger AADT public transport mode shares for the future baseline and with Project scenarios.

Table 32: Public transport mode shares – air passengers (AADT)

	Future baseline				With Project			
	2029	2032	2038	2047	2029	2032	2038	2047
DCO Application	51.5%	52.2%	52.1%	52.0%	54.2%	55.2%	55.6%	55.9%

	Future baseline				With Project			
	2029	2032	2038	2047	2029	2032	2038	2047
Sensitivity test	51.0%	51.6%	51.4%	51.2%	53.6%	54.8%	55.1%	55.5%
Difference (Sensitivity - Application)	**-0.5%**	**-0.6%**	**-0.7%**	**-0.8%**	**-0.6%**	**-0.4%**	**-0.5%**	**-0.4%**

6.5.3 For both the future baseline and with Project scenarios the sensitivity tests show a small reduction in the public transport mode shares. This is driven primarily by reduced congestion on the road network resulting from lower background demand growth. For the with Project scenario sensitivity test, the public transport mode share for air passengers in 2047 is 0.4 percentage points lower than estimated in the DCO Application. Given the reduction in congestion on the highway network this is considered to be a reasonable response from the sensitivity test model.

6.5.4 Table 33 presents the sustainable transport mode shares for Gatwick employees in the future baseline and with Project scenarios. The sustainable transport mode share is the percentage of employees that travel either by rail, bus/coach, active travel, company transport or car sharing.

Table 33: Sustainable transport mode shares – Employees (June)

	Future baseline				With Project			
	2029	2032	2038	2047	2029	2032	2038	2047
Application	48.2%	48.5%	48.8%	49.6%	55.7%	55.1%	54.9%	54.7%
Sensitivity	47.7%	47.8%	48.0%	48.5%	55.1%	54.7%	54.3%	54.0%
Difference (Sensitivity - Application)	**-0.5%**	**-0.7%**	**-0.8%**	**-1.1%**	**-0.6%**	**-0.4%**	**-0.6%**	**-0.7%**

6.5.5 As with passenger public transport mode shares there is a small reduction in the employee sustainable mode share overall in the sensitivity tests, of 0.4 percentage points in 2032 (reducing the mode share to 54.7%) and 0.7 percentage points in 2047 (reducing the mode share to 54%). Again, these appear a reasonable response given the reduction in congestion on the road network.

6.5.6 Appendix 6 provides comparable tables to those presented in the Transport Assessment (TA) Annex B – Strategic Transport Modelling Report [APP-260] Tables 70 to 74 and Tables 133 to 137.

6.5.7 The air passenger mode shares in the sensitivity test fall 0.2 percentage points below the mode share commitment set out in ES Appendix 5.4.1: Surface Access Commitments [APP-090], which is to achieve 55% of air passenger journeys by public transport by three years after dual runway operations commence (assumed to be 2032 for the purposes of the assessment). The sensitivity test shows a trend of public transport mode share increasing over time, as was the case in the DCO Application modelling.

6.5.8 For airport employees, the sensitivity tests show an expected sustainable transport mode share which is 0.3 percentage points below the mode share commitment set out in ES Appendix 5.4.1: Surface Access Commitments [APP-090]. The sensitivity test shows a trend of sustainable transport mode share falling from 2032 onwards; this was also the case for the DCO Application modelling.

6.5.9 The sensitivity tests therefore show slightly higher car-borne mode shares than was the case in the DCO Application modelling, reflecting the changes inherent in post-Covid travel behaviour, but the differences are small and well within one percentage point.

6.5.10 GAL does not propose to alter the mode share commitments in ES Appendix 5.4.1: Surface Access Commitments [APP-090]. GAL is committing to a range of measures and initiatives set out in the same document, whilst retaining the flexibility to vary the way in which they are applied in order to ensure that the mode share commitments are met. Bearing in mind that further changes to travel behaviour could also take place over time, GAL will continue to monitor progress and adjust the implementation of relevant measures accordingly to ensure that the mode share commitments are delivered.

6.6. Highway network performance

6.6.1 This section discusses the change in road network performance within the study area for the sensitivity scenarios compared to those in the DCO Application. This provides an understanding of the changes in road traffic that the revised assumptions for post-Covid conditions generate and the impact on journey times and congestion.

Highway network statistics

6.6.2 In line with the reduced demand introduced in the sensitivity scenarios compared to the DCO Application, the average network speeds in the simulation area have increased in the sensitivity tests, as outlined in Table 34 and Table 35 below. The morning peak shows the biggest speed increase as a result of the lower congestion and fluctuates between 5% and 10% from 2029 to 2047. These tables show that the network speeds in the future baseline and with Project are the same.

Table 34: Future baseline sensitivity post-VDM average network speed comparison to DCO Application

	DCO Application Modelling				Sensitivity Modelling			
Time period	**FB 29**	**FB 32**	**FB 38**	**FB 47**	**FBS 29**	**FBS 32**	**FBS 38**	**FBS 47**
AM1	30.2	29.4	28.2	26.7	31.8	31.2	30.1	28.6
AM2	29.7	28.9	27.4	25.7	31.7	31.1	29.8	28.2
IP	38.6	38.1	37.1	35.9	39.6	39.3	38.5	37.3
PM	30.6	30.0	28.9	27.6	32.1	31.6	30.6	29.2
AVERAGE	**35.2**	**34.7**	**33.6**	**32.4**	**36.4**	**36.1**	**35.2**	**34.0**

Table 35: With Project sensitivity post-VDM average network speed comparison to DCO Application

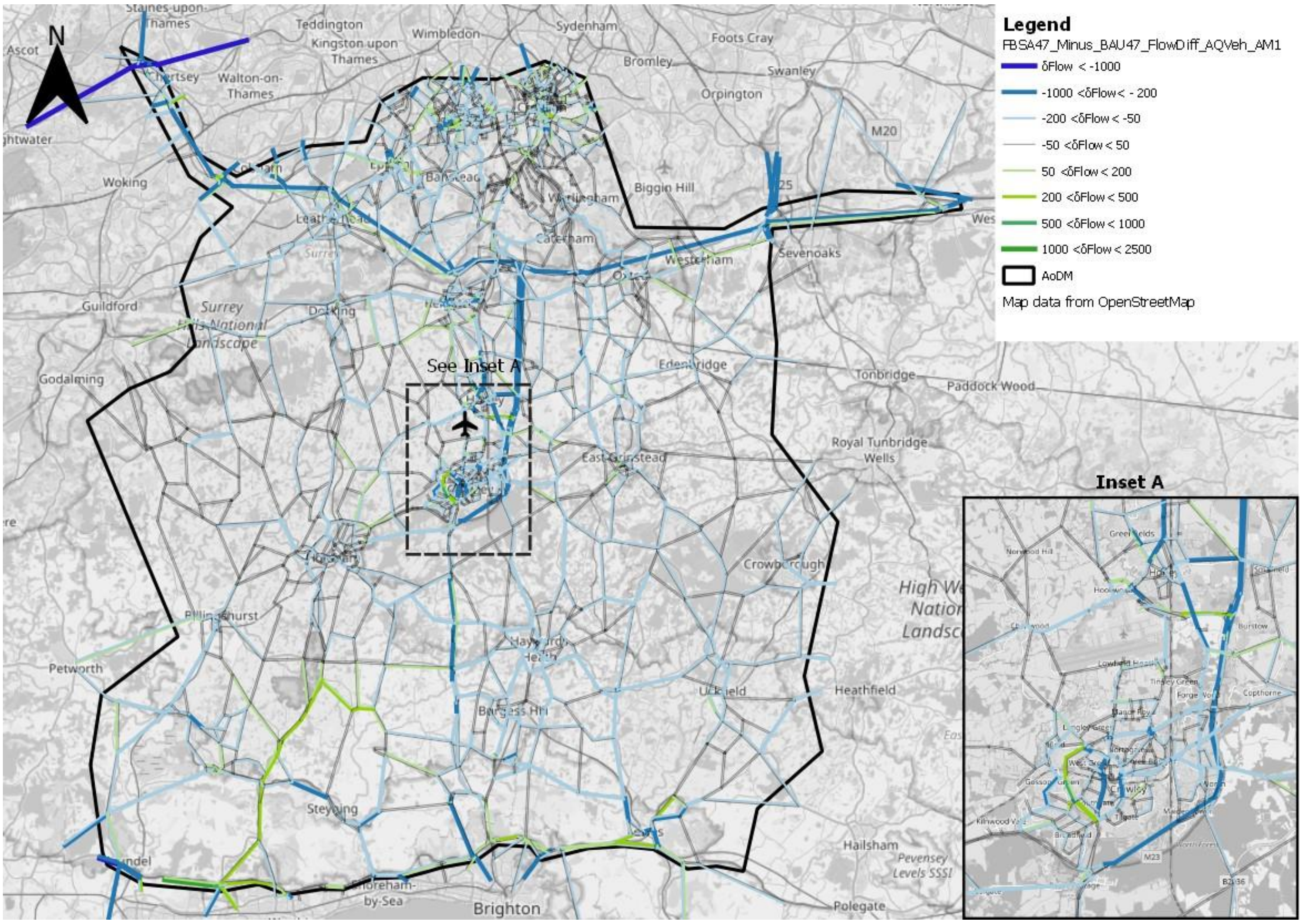
	DCO Application Modelling				Sensitivity Modelling			
Time period	**WP 29**	**WP 32**	**WP 38**	**WP 47**	**WPS 29**	**WPS 32**	**WPS 38**	**WPS 47**
AM1	30.2	29.4	28.2	26.7	31.8	31.2	30.0	28.6
AM2	29.7	28.9	27.3	25.7	31.7	31.1	29.8	28.2
IP	38.6	38.1	37.1	35.9	39.6	39.3	38.5	37.3
PM	30.6	30.0	28.9	27.5	32.0	31.6	30.6	29.2
AVERAGE	**35.2**	**34.7**	**33.6**	**32.4**	**36.4**	**36.1**	**35.2**	**34.0**

Change in future baseline outputs

6.6.3 This section considers the change in the future baseline model results. Figure 11 presents the 2047 AM1 period flow difference plot comparing the flows forecast in the future baseline sensitivity test against the future baseline reported on in the DCO Application. Increases in road traffic flows are shown by variable bandwidths in shades of green and decreases in traffic flows are shown in blue. Small changes in flows of between -50 and 50 vehicles (ie less than one vehicle a minute) are shown as grey links, to help more clearly highlight where there are greater changes in modelled flows across the network.

6.6.4 Given the update to the uncertainty log there are a small number of sections of road where the network is not consistent between the two scenarios. In this case, a comparison list has been used to calculate (and thus display) flow changes; links without an appropriate comparison are not shown. Equivalent plots for 2047 AM2, IP and PM periods and for 2029 – 2038 can be found in Appendix 7.

Figure 11: Traffic flow change (veh) 2047 future baseline sensitivity compared to 2047 future baseline (DCO Application), AM1 period



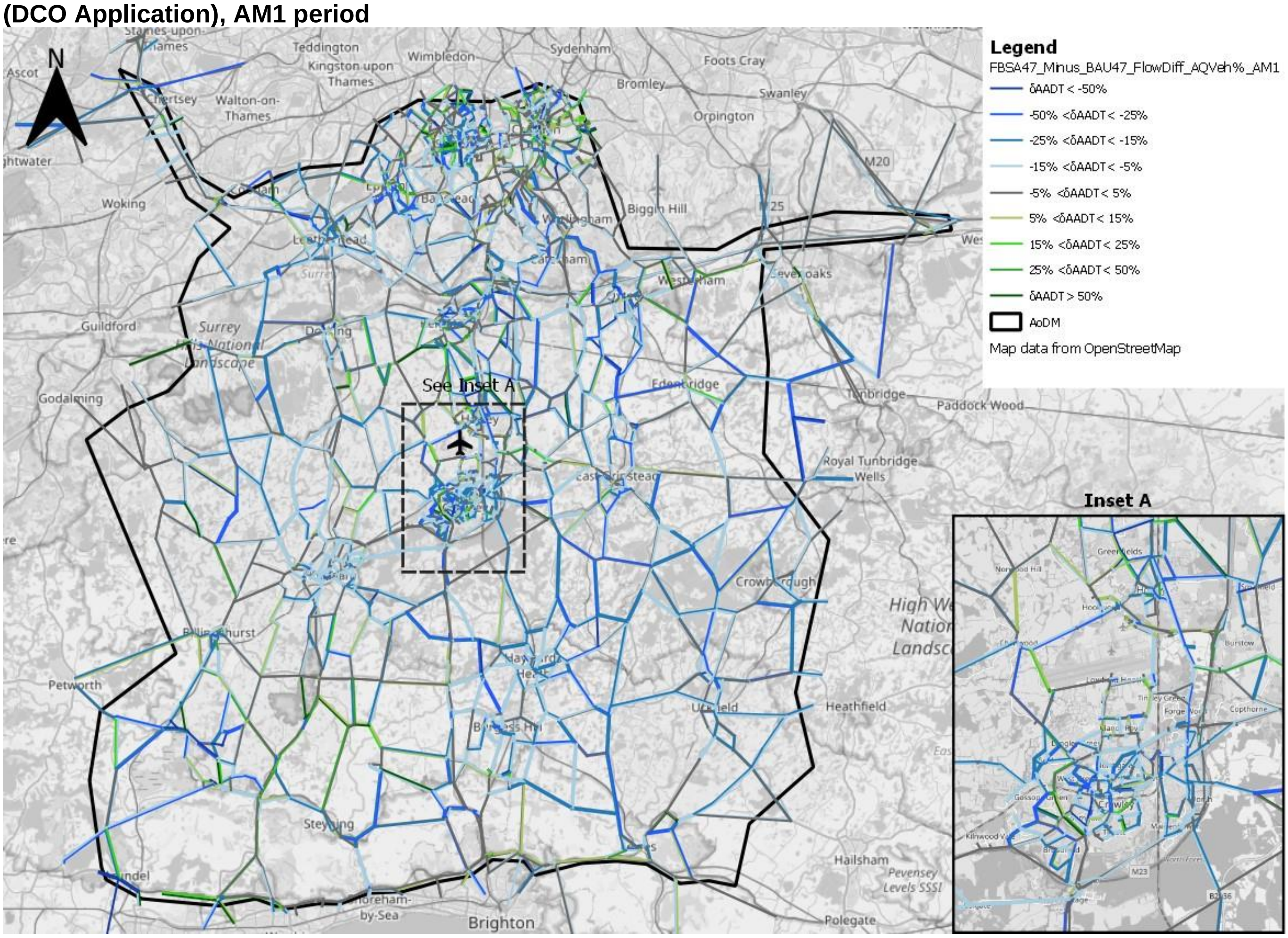
Increases (green) indicate that the sensitivity test produces flows higher than those in the equivalent DCO Application scenario

6.6.5 Overall, the network sees reductions in traffic flows. On local roads these reductions are generally up to 200 vehicles per hour, whereas larger reductions of up to 1,000 vehicles per hour are noted on the SRN. There is consistency across the four time periods with respect to the general pattern and trends as well as the magnitude of the changes seen. On many links across the network, for example including in Crawley, the difference in flow between the sensitivity test and the DCO Application is less than 50 vehicles and is generally a decrease, although there are some small increases due to traffic rerouting in the sensitivity test models.

6.6.6 Figure 12 presents the percentage change in future baseline traffic flows between the sensitivity test and DCO Application for the AM1 period in 2047. As an illustration of the scale of impact, in 2047 on the M23 (Gatwick Spur) there is a 9% increase eastbound and a 3% reduction westbound in the AM1 period. In AM2 this is a 1% increase eastbound and 5% reduction westbound, in the IP period a 4% increase eastbound and a 7% increase westbound and in the PM period a 16% increase eastbound and a 1% reduction westbound.

6.6.7 In 2047, on the M23 (between Junction 8 and 9) there is a 3% reduction in traffic northbound and a 6% reduction in traffic southbound in the AM1 period. In the AM2 period both directions see a 7% reduction, in the IP period there is an 8% reduction northbound and a 6% reduction southbound and in the PM period there is 5% reduction northbound and an 8% reduction southbound.

Figure 12: Traffic flow percentage change: 2047 future baseline sensitivity to 2047 future baseline (DCO Application), AM1 period



Increases (green) indicate that the sensitivity test produces flows higher than those in the equivalent DCO Application scenario

6.6.8 There are some localised changes in flow to note:

- In the Arundel area the introduction of the A27 Arundel Bypass in the sensitivity testing leads to flow increases in this area due to consequent rerouting. This is particularly noticeable in the AM1 and AM2 periods. The new bypass also leads to reductions in traffic on the existing A27 route (Chichester Road / Arundel Road east of Yapton Road), the A29 east of Fontwell and on the coastal road through Goring-by-Sea and

Littlehampton. The response is similar to results presented in the A27 Arundel Bypass consultation by National Highways[8] and a reasonable response for a scheme of this nature.

- In Crawley, the change in assumption on the operation of the Cheals roundabout leads to localised increases in traffic on the A23 Crawley Avenue, with equivalent reductions on roads through the town.
- Updates to the assumptions around where traffic loads onto the network for the North West Horley development lead to localised rerouting in this area impacting flows routing along the A217.
- Updates to the signal timings at Junction 9 lead to increases in flows on the M23 Spur eastbound, particularly in the PM period where the change in signal timings is most significant.
- In the DCO Application, the modelling had assumed that the M25 Junction 10 – 16 Smart Motorway Programme would come forward, albeit only affecting the section between Junction 15 and 16. This has been removed in this sensitivity testing, and there is a small impact on the M25 flows. Given that the section between Junctions 15 and 16 is further north west than the AoDM, the impact on performance in the AoDM is minimal.
- The Lower Thames Crossing was included from 2029 within the modelling underpinning the DCO Application, but is now not expected to open until 2032 so was not included in the 2029 sensitivity test scenario. The impact of this change on the traffic flows within the Area of Detailed Modelling is minimal.

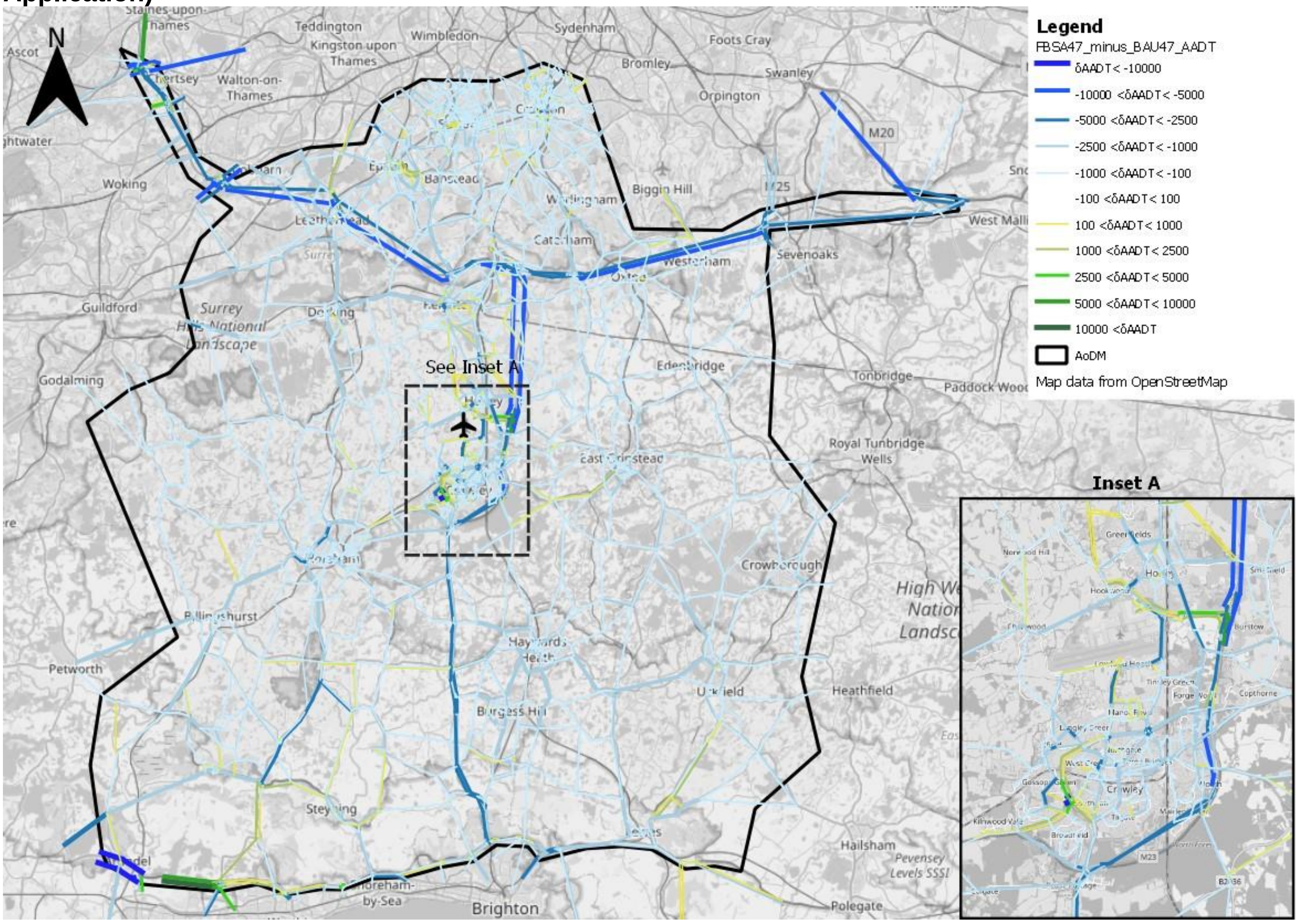
6.6.9 Road traffic volumes were extracted for the four modelled time periods and combined and expanded to represent Annual Average Daily Traffic (AADT) flows. These road traffic flows represent annual average daily (Monday to Sunday) traffic flows for 24 hours. Details underpinning the process of calculating these are provided in Section 6.9 of the Transport Assessment (TA) Annex B – Strategic Transport Modelling Report [APP-260].

6.6.10 The changes in AADT for 2047 are illustrated in Figure 13. Figure 13 shows that overall future baseline AADTs are generally lower across the network in the sensitivity test, with localised increases in the locations that show increases at a time period level as would be expected. Reductions of over 5,000 vehicles per day are seen on much of the SRN (for example, on the M23 north of Gatwick and M25) whilst most local roads see reductions of between 100 and 1000 vehicles per day.

[8] A27 Supplementary Consultation Brochure_2022

6.6.11 At an aggregate level across the AoDM the total AADT flows for cars is 11% lower in the sensitivity testing than in the DCO Application across all forecast years, total LGV AADTs are 6-7% higher in the sensitivity testing than in the DCO Application across the AoDM across the forecast years, and total HGV AADTs are 5-7% higher in the sensitivity testing than in the DCO Application. across all forecast years. On the M23 Spur AADTs for cars are 3% lower than previously forecast, and LGV and HGV AADTs are 5 to 6% lower than forecast in the DCO Application.

Figure 13: AADT difference, 2047 future baseline sensitivity less 2047 future baseline (DCO Application)



Increases (green) indicate that the sensitivity test produces flows higher than those in the equivalent DCO Application scenario

Project traffic flow impact

6.6.12 This section considers the impact of the Project using the sensitivity models compared to that identified in the Transport Assessment (TA) [AS-079]

6.6.13 Figure 14 presents a flow difference plot for the AM1 period in 2047 comparing the flows forecast in the with Project sensitivity test against those in the future baseline sensitivity test. Equivalent plots for 2047 AM2, IP and PM periods and for 2029 – 2038 can be found in Appendix 7.

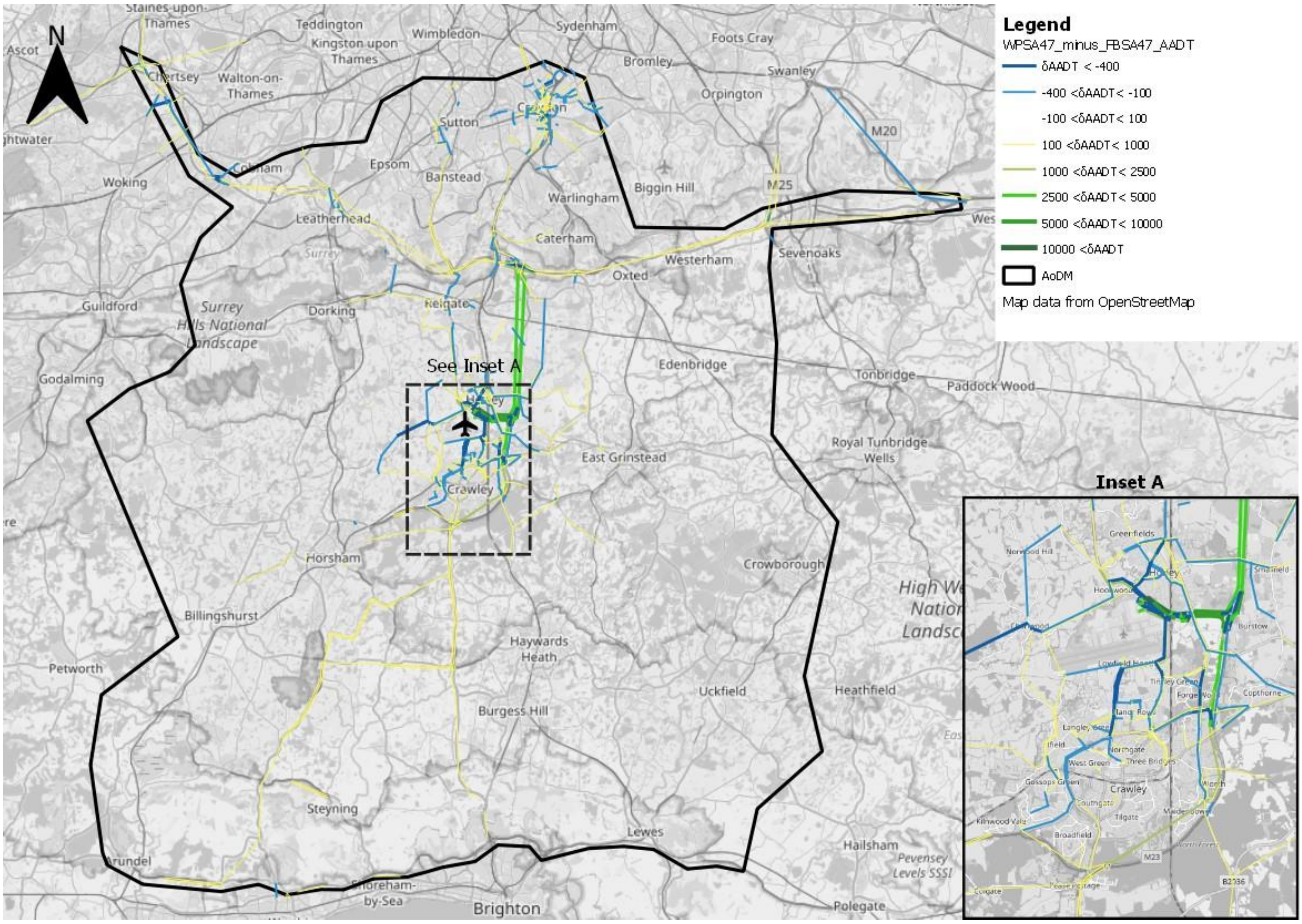
6.6.14 The patterns are similar to those shown in the DCO Application, with the main increases in traffic forecast to be on the M23 Spur and M23 both north and south of Junction 9, with small increases on the M25 and small increases on the local roads near Gatwick, such as the A217.

Figure 14: Traffic flow change (veh) 2047 with Project sensitivity test less 2047 future baseline sensitivity test, AM1 period

Increases (green) indicate that the sensitivity test produces flows higher than those in the equivalent DCO Application scenario

6.6.15 Figure 15 shows that the primary corridor for AADT increases as a result of the Project is the M23 and the overall pattern and volume of increase is similar to that presented in the DCO Application. Comparing against Figure 155 of Transport Assessment (TA) Annex B – Strategic Transport Modelling Report [APP-260], the sensitivity test results suggest a slightly tighter geographical impact of the project – changes in flows that were identified in the DCO Application on the A24 near Dorking and near Haywards Heath are no longer highlighted in the sensitivity test results. There are a number of local roads to the west of the Airport that were shown to have reductions in AADT in the DCO Application that indicate small increases in AADT in the sensitivity test.

Figure 15: AADT difference, 2047 with Project sensitivity test less 2047 future baseline sensitivity test



Increases (green) indicate that the sensitivity test produces flows higher than those in the equivalent DCO Application scenario

6.6.16 The change in the impacts of the Project indicated by the sensitivity tests has been further explored by considering the flows at a number of key locations on the SRN, in common with Table 148 of the Transport Assessment (TA) Annex B – Strategic Transport Modelling Report [APP-260].

6.6.17 Table 36 to Table 39 present the flow on key links for the sensitivity test scenarios and those in the DCO Application alongside the relevant Project related impact expressed as the change in flow caused by the Project for AM1, AM2, IP, and PM periods respectively. These are quantified by comparing the relevant with Project and future baseline scenario. The impact values have been coloured red, amber or green to indicate where the impact has increased (red) compared to that in the DCO Application, where the impact has reduced (green) or where the impact has increased but the absolute flows in the sensitivity test are lower than in the DCO Application (amber). This shows that there are a small number of locations where the impact increases. Most locations show either reductions in impact or the absolute flow is lower than previously forecast.

6.6.18 In the AM1 period on links near the M25 Junction 7 / M23 Junction 8 Interchange show the change in impact is 10 vehicles higher or lower than the impact presented in the DCO Application. Even where the impact is greater the absolute with Project flows are lower than previously forecast. On the M23 between Junction 8 and 9 both directions see a small reduction in impact up to 40 vehicles. On the M23 Spur there is a reduction in impact eastbound of 230 vehicles, largely the result of a higher baseline flow forecast in the sensitivity test compared to the DCO Application. At Junction 9 most arms see reductions in impact, however, the northbound off-slip sees a 40 vehicle increase in impact, resulting from a small decrease in the baseline traffic forecast of 30 vehicles but a small increase of 10 vehicles in the with Project traffic forecast.

Table 36: 2047 AM1 flows on key links for future baseline and with Project scenarios in the DCO Application and sensitivity tests, and change caused by the Project – rounded to nearest 10 vehicles (vehs)

AM1						DCO Application Impact (WP – FB)		Sensitivity Impact (WPS – FBS)		Impact Change ([WPS-FBS]-[WP-FB])	
	SRN Flows	2047 FB	2047 WP	2047 FBS	2047 WPS	Diff	%Diff	Diff	%Diff	Impact Change	Impact % Point Change
M25/M23 Interchange	M23 North of J8 NB	1,190	1,180	1,120	1,120	-10	-1%	0	0%	10	1 pp
	M23 North of J8 SB	1,530	1,610	1,450	1,520	80	5%	70	5%	-10	0 pp
	M25 East of J8 WB	7,160	7,180	7,170	7,180	20	0%	10	0%	-10	0 pp
	M25 East of J8 EB	6,670	6,670	6,140	6,150	0	0%	10	0%	10	0 pp
	M25 West of J8 WB	7,580	7,560	7,560	7,540	-20	0%	-20	0%	0	0 pp
	M25 West of J8 EB	6,640	6,790	5,880	6,040	150	2%	160	3%	10	0 pp
M23	M23 J9-J8 NB	6,720	6,780	6,500	6,550	60	1%	50	1%	-10	0 pp
	M23 J8-J9 SB	6,200	6,570	6.6.19	6,190	370	6%	330	6%	-40	0 pp
Spur	M23 Spur EB	2,390	2,870	2,590	2,840	480	20%	250	10%	-230	-10 pp
	M23 Spur WB	3,520	4,620	3,410	4,430	1,100	31%	1,020	30%	-80	-1 pp
M23 Junction 9	M23 J9 NB On-slip	1,840	2,310	1,830	2,210	470	26%	380	21%	-90	-5 pp
	M23 J9 NB Off-slip	1,240	1,860	1,210	1,870	620	50%	660	55%	40	5 pp
	M23 J9 SB On-slip	530	500	710	580	-30	-6%	-130	-18%	-100	-13 pp
	M23 J9 SB Off-slip	2,250	2,760	2,140	2,530	510	23%	390	18%	-120	-4 pp
	M23 South of J9 NB	6,120	6,330	5,890	6,210	210	3%	320	5%	110	2 pp

AM1						DCO Application Impact (WP – FB)		Sensitivity Impact (WPS – FBS)		Impact Change ([WPS-FBS]-[WP-FB])	
	SRN Flows	2047 FB	2047 WP	2047 FBS	2047 WPS	Diff	%Diff	Diff	%Diff	Impact Change	Impact % Point Change
	M23 South of J9 SB	4,480	4,320	4,430	4,240	-160	-4%	-190	-4%	**-30**	**-1 pp**

FB: Future baseline – DCO Application
WP: With Project – DCO Application
FBS: Future baseline – sensitivity test
WPS: With Project – sensitivity test

6.6.20 In the AM2 period on links near the M25 Junction 7 / M23 Junction 8 interchange the change in impact is up to 50 vehicles higher than the impact presented in the DCO Application. However, whilst on these links the impact does increase by this small amount the absolute flows with Project are lower in the sensitivity test forecast than in the DCO Application forecast. On the M23 between Junction 8 and 9 both directions see an increase in impact of up to 140 vehicles, although absolute flows with the Project are lower than forecast in the DCO Application. On the M23 Spur there is a small increase in impact eastbound of 10 vehicles. At Junction 9 there is mix of increases and decreases of up to 330 vehicles. This is driven by the reductions in background demand.

Table 37: 2047 AM2 flows on key links for future baseline and with Project scenarios in the DCO Application and sensitivity tests, and change caused by the Project – rounded to nearest 10 vehicles (vehs)

AM2						DCO Application Impact (WP – FB)		Sensitivity Impact (WPS – FBS)		Impact Change ([WPS-FBS]-[WP-FB])	
	SRN Flows	2047 FB	2047 WP	2047 FBS	2047 WPS	Diff	%Diff	Diff	%Diff	Impact Change	Impact % Point Change
M25/M23 Interchange	M23 North of J8 NB	1,170	1,180	1,100	1,070	10	1%	-30	-3%	-40	-4 pp
	M23 North of J8 SB	1,540	1,640	1,460	1,520	100	6%	60	4%	-40	-2 pp
	M25 East of J8 WB	7,110	7,140	7,050	7,090	30	0%	40	1%	10	0 pp
	M25 East of J8 EB	6,630	6,600	5,940	5,960	-30	0%	20	0%	50	1 pp
	M25 West of J8 WB	7,430	7,410	7,340	7,330	-20	0%	-10	0%	10	0 pp
	M25 West of J8 EB	6,650	6,790	5,850	5,990	140	2%	140	2%	0	0 pp
M23	M23 J9-J8 NB	6,200	6,090	5,760	5,790	-110	-2%	30	1%	140	2 pp
	M23 J8-J9 SB	6,620	6,870	6,150	6,480	250	4%	330	5%	80	2 pp
Spur	M23 Spur EB	2,540	2,780	2,580	2,840	240	9%	260	10%	20	1 pp
	M23 Spur WB	3,350	4,600	3,190	4,280	1,250	37%	1,090	34%	-160	-3 pp
M23 Junction 9	M23 J9 NB On-slip	1,980	2,230	1,880	2,160	250	13%	280	15%	30	2 pp
	M23 J9 NB Off-slip	1,130	1,910	1,110	1,950	780	69%	840	76%	60	7 pp
	M23 J9 SB On-slip	550	520	690	630	-30	-5%	-60	-9%	-30	-3 pp
	M23 J9 SB Off-slip	2,210	2,710	2,110	2,280	500	23%	170	8%	-330	-15 pp
	M23 South of J9 NB	5,350	5,770	4,990	5,570	420	8%	580	12%	160	4 pp
	M23 South of J9 SB	4,960	4,600	4,720	4,620	-360	-7%	-100	-2%	260	5 pp

FB: Future baseline – DCO Application
WP: With Project – DCO Application
FBS: Future baseline – sensitivity test
WPS: With Project – sensitivity test

6.6.21 In the IP period the greatest change is an increase in impact of 140 vehicles at M23 Spur eastbound. Both future baseline and with Project flows increase here, and this will be result of the optimisation to signal timings at Junction 9. This is seen also in the increase in impact on the M23 J9 southbound On-slip.

Table 38: 2047 IP flows on key links for future baseline and with Project scenarios in the DCO Application and sensitivity tests, and change caused by the Project – rounded to nearest 10 vehicles (vehs)

IP						DCO Application Impact (WP – FB)		Sensitivity Impact (WPS – FBS)		Impact Change ([WPS-FBS]-[WP-FB])	
	SRN Flows	2047 FB	2047 WP	2047 FBS	2047 WPS	Diff	%Diff	Diff	%Diff	Impact Change	Impact % Point Change
M25/M23 Interchange	M23 North of J8 NB	1,190	1,180	1,170	1,170	-10	-1%	0	0%	10	1 pp
	M23 North of J8 SB	1,280	1,300	1,280	1,290	20	2%	10	1%	-10	-1 pp
	M25 East of J8 WB	6,470	6,480	6,150	6,160	10	0%	10	0%	0	0 pp
	M25 East of J8 EB	6,260	6,290	6,080	6,100	30	0%	20	0%	-10	0 pp
	M25 West of J8 WB	6,980	7,000	6,580	6,630	20	0%	50	1%	30	0 pp
	M25 West of J8 EB	6,530	6,580	6,400	6,410	50	1%	10	0%	-40	-1 pp
M23	M23 J9-J8 NB	5,300	5,500	4,850	5,050	200	4%	200	4%	0	0 pp
	M23 J8-J9 SB	5,130	5,360	4,820	4,980	230	4%	160	3%	-70	-1 pp
Spur	M23 Spur EB	2,360	2,550	2,450	2,780	190	8%	330	13%	140	5 pp
	M23 Spur WB	2,470	3,160	2,640	3,080	690	28%	440	17%	-250	-11 pp
M23 Junction 9	M23 J9 NB On-slip	1,800	1,960	1,610	1,860	160	9%	250	16%	90	7 pp
	M23 J9 NB Off-slip	850	1,220	980	1,220	370	44%	240	24%	-130	-19 pp
	M23 J9 SB On-slip	520	540	790	870	20	4%	80	10%	60	6 pp
	M23 J9 SB Off-slip	1,600	1,910	1,610	1,820	310	19%	210	13%	-100	-6 pp
	M23 South of J9 NB	4,350	4,770	4,220	4,410	420	10%	190	5%	-230	-5 pp
	M23 South of J9 SB	4,060	3,990	4,000	4,030	-70	-2%	30	1%	100	2 pp

FB: Future baseline – DCO Application
WP: With Project – DCO Application
FBS: Future baseline – sensitivity test
WPS: With Project – sensitivity test

6.6.22 In the PM period at M25 Junction 7 / M23 Junction 8 the changes in impact are slightly larger than the other time periods, up to 70 vehicles, but the absolute with Project flows are forecast to be lower in the sensitivity test than in the DCO Application. There are small changes in impact at M23 Junction 9 driven by the reduction in background demand and the optimisation of signals at the junction itself increasing demand heading south.

Table 39: 2047 PM flows on key links for future baseline and with Project scenarios in the DCO Application and sensitivity tests, and change caused by the Project – rounded to nearest 10 vehicles (vehs)

PM						DCO Application Impact (WP – FB)		Sensitivity Impact (WPS – FBS)		Impact Change ([WPS-FBS]-[WP-FB])	
	SRN Flows	2047 FB	2047 WP	2047 FBS	2047 WPS	Diff	%Diff	Diff	%Diff	Impact Change	Impact % Point Change
M25/M23 Interchange	M23 North of J8 NB	1,440	1,470	1,360	1,370	30	2%	10	1%	-20	-1 pp
	M23 North of J8 SB	1,530	1,540	1,410	1,440	10	1%	30	2%	20	1 pp
	M25 East of J8 WB	6,710	6,720	6,120	6,150	10	0%	30	0%	20	0 pp
	M25 East of J8 EB	7,250	7,270	7,220	7,240	20	0%	20	0%	0	0 pp
	M25 West of J8 WB	7,090	7,090	6,510	6,520	0	0%	10	0%	10	0 pp
	M25 West of J8 EB	7,540	7,480	7,430	7,440	-60	-1%	10	0%	70	1 pp
M23	M23 J9-J8 NB	6,580	6,790	6,200	6,350	210	3%	150	2%	-60	-1 pp
	M23 J8-J9 SB	6,340	6,390	5,840	5,990	50	1%	150	3%	100	2 pp
Spur	M23 Spur EB	2,790	3,130	3,250	3,400	340	12%	150	5%	-190	-8 pp
	M23 Spur WB	2,250	2,700	2,280	2,740	450	20%	460	20%	10	0 pp
M23 Junction 9	M23 J9 NB On-slip	2,140	2,420	2,030	2,170	280	13%	140	7%	-140	-6 pp
	M23 J9 NB Off-slip	780	1,010	780	1,000	230	29%	220	28%	-10	-1 pp
	M23 J9 SB On-slip	610	600	1,170	1,130	-10	-2%	-40	-3%	-30	-2 pp
	M23 J9 SB Off-slip	1,490	1,700	1,450	1,670	210	14%	220	15%	10	1 pp
	M23 South of J9 NB	5,230	5,390	4,950	5,180	160	3%	230	5%	70	2 pp
	M23 South of J9 SB	5,470	5,290	5,570	5,440	-180	-3%	-130	-2%	50	1 pp

FB: Future baseline – DCO Application
WP: With Project – DCO Application
FBS: Future baseline – sensitivity test
WPS: With Project – sensitivity test

Magnitude of Impact

6.6.23 This section outlines a comparison between the Magnitude of Impact assessment conducted for the DCO Application and an updated Magnitude of Impact assessment conducted for the sensitivity testing. The original magnitude of impact analysis for the DCO Application is in Section 12.3 of Transport Assessment (TA) [AS-079] and supported by Section 12.8 of Transport Assessment (TA) Annex B – Strategic Transport Modelling Report [APP-260].

6.6.24 The method for calculating the Magnitude of Impact for the sensitivity tests is the same as that set out in paragraph 6.12.3 of Transport Assessment (TA) Annex B – Strategic Transport Modelling Report [APP-260] for the DCO Application. Changes between link and node volume to capacity (V/C) metrics between the modelled years are categorised into 'Low', 'Medium' and 'High'. The categories are based on a combination of the modelled V/C value (referred to as the congestion indicator) and the change in V/C value between the future baseline and with Project scenario for a particular year. For example, an instance of V/C changing by >10% with a corresponding V/C of <80% in the latest year scenario is deemed 'Negligible', however if the V/C value is 90-95% in this context the change would be classified as 'High'. An overview of the parameters enforced as part of the categorisation process is presented in Table 40. Links with a flow of less than 20 PCUs are excluded from this process.

Table 40: Magnitude of Impacts Grid

Criteria	Magnitude of impacts						
		Negligible	Negligible	Minor	Moderate	Major	Major
Congestion Indicator		<80%	80 - 85%	85 - 90%	90 - 95%	95 - 100%	100% or more
<2% change in Congestion Indicator	Very Low	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
2-5% change in Congestion Indicator	Low	Negligible	Low	Low	Low	Medium	Medium
Between 5-10% change in Congestion Indicator	Medium	Negligible	Low	Low	Medium	High	High
>10% change in Congestion Indicator	High	Negligible	Low	Medium	High	High	High

6.6.25 The analysis conducted to compare the sensitivity test outcomes with those in the DCO Application shows where a particular node has changed category eg from 'Medium' in the DCO Application analysis to 'Low' in the sensitivity test. It also identifies nodes which were not flagged as showing any impact in the DCO Application, but which do so in the sensitivity tests.

6.6.26 As a general summary although this analysis shows that although there are some new nodes identified as experiencing impacts in the sensitivity tests, and some nodes experiencing impacts in more time periods than indicated in the DCO Application, the locations of impact are similar to that presented in the DCO Application and overall the number of locations with impacts is lower than forecast in the DCO Application.

2029

6.6.27 Figure 16 and Figure 17 indicate the locations of the junctions which have been identified with low, medium and high impacts in the 2029 application and sensitivity test scenarios respectively.

Figure 16: Magnitude of Impacts: DCO Application - future baseline 2029 vs with Project 2029

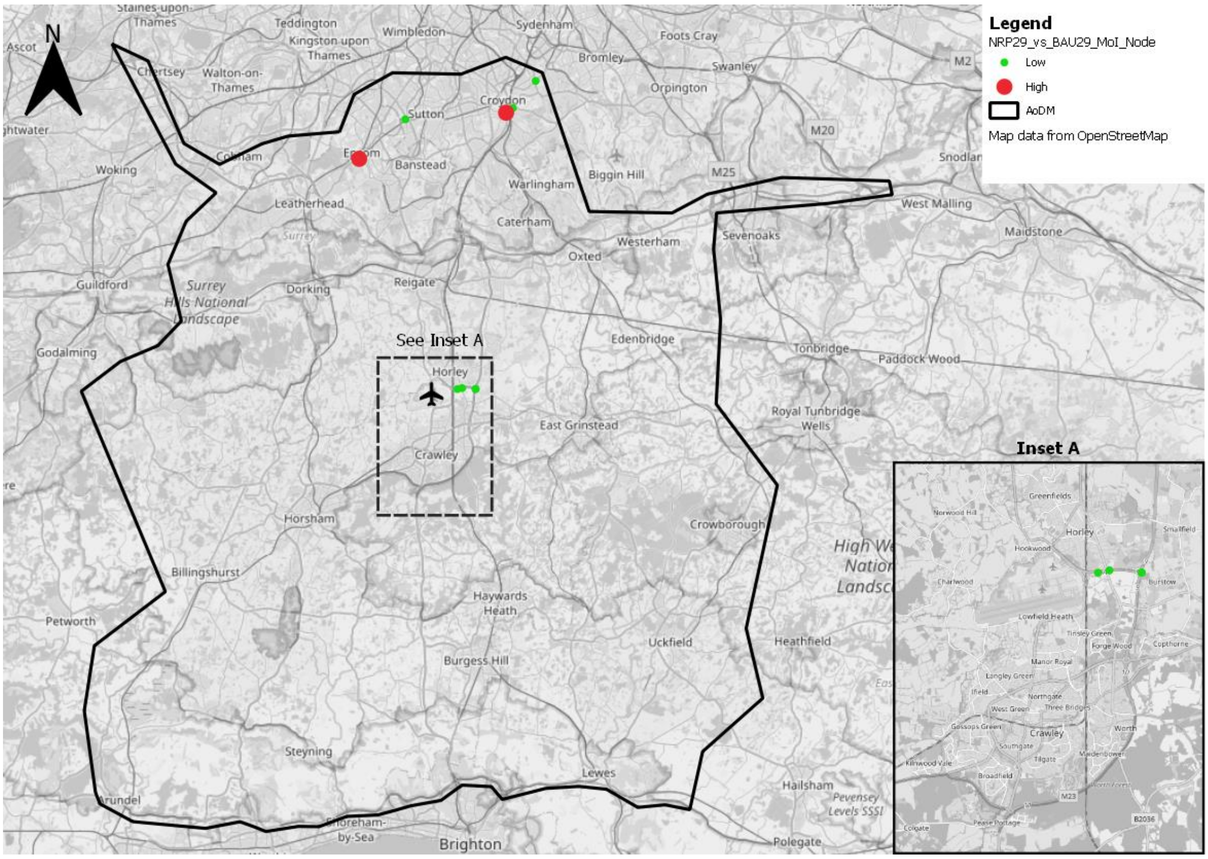
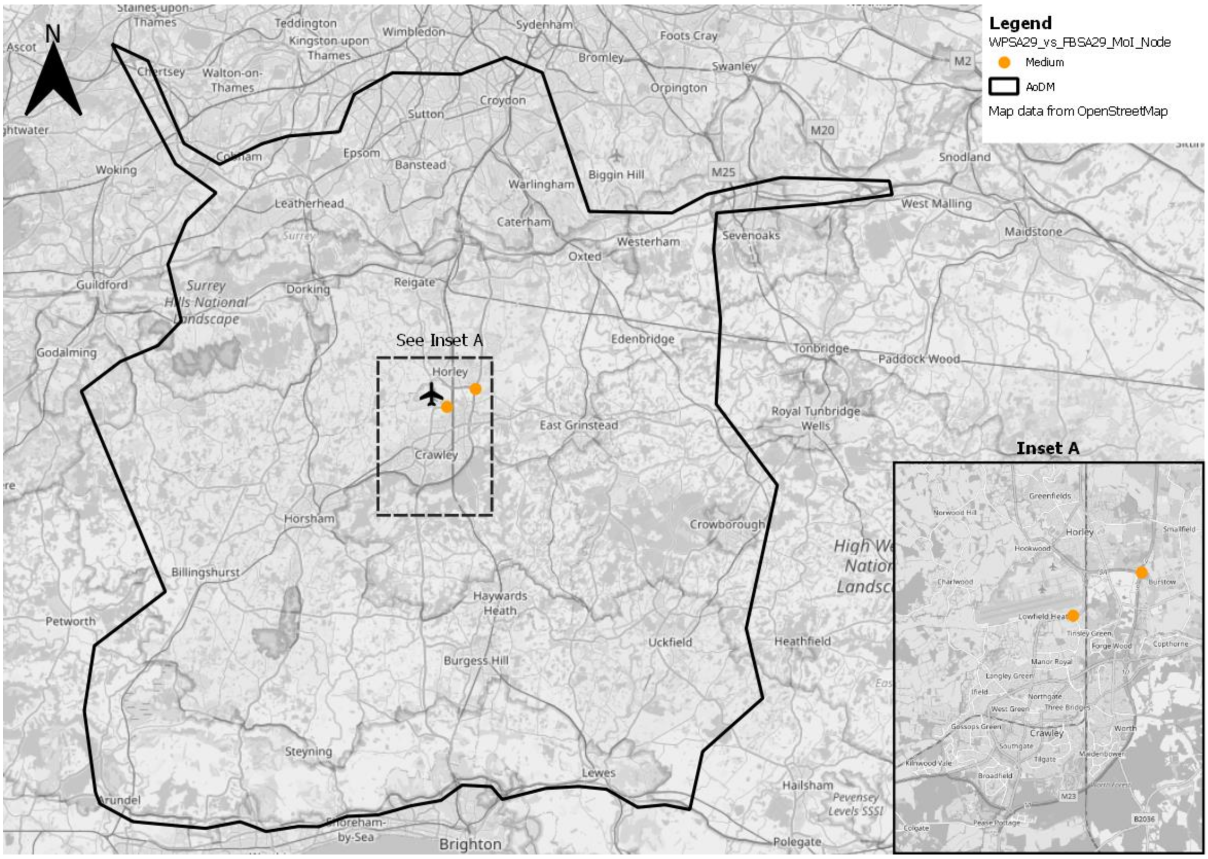


Figure 17: Magnitude of Impacts: Sensitivity test - future baseline 2029 vs with Project 2029



6.6.28 Table 41 presents a comparison of the Magnitude of Impact analysis from the DCO Application against the sensitivity test for 2029. Green shading indicates where the impact is greater in the sensitivity test than in the DCO Application; those without colouring indicate no change or a reduced impact compared to the DCO Application. There are two new 'Medium' impact nodes (one that previously flagged as 'Low' and one that was not flagged in the DCO Application) There are also two nodes that previously flagged as High impact but do not show impact in the sensitivity testing.

Table 41: With Project impact comparison 2029, DCO Application and sensitivity test

2029 – Max Impact		Impact in the sensitivity test			
		Not flagged as L/M/H	Low	Medium	High
Impact in Application	Not flagged as L/M/H		0	1	0
	Low	5	0	1	0
	Medium	0	0	0	0
	High	2	0	0	0

6.6.29 A review of the new locations flagging 'Medium' impact shows that one is at the end of the southbound offslip at M23 J9 and the other is the Gatwick Road roundabout. At Junction 9 the impact shown is a product of increases in baseline traffic in the AM1 period which raises the baseline V/C ratio above 90% and moves the Impact category from 'Low' to 'Medium'. At Gatwick Road roundabout the PM period now flags a ‘Medium’ impact. Here total flows in the sensitivity test are lower than forecast in the DCO Application, as is the volume of airport traffic, and the overall V/C ratio with project is lower than previously forecast, although the change in V/C from the future baseline is greater.

2032

6.6.30 Figure 18 and Figure 19 indicate the locations of the junctions which have been identified with low, medium and high magnitudes of impact in the 2032 DCO Application and sensitivity scenarios respectively.

Figure 18: Magnitude of Impacts: DCO Application - future baseline 2032 vs with Project 2032

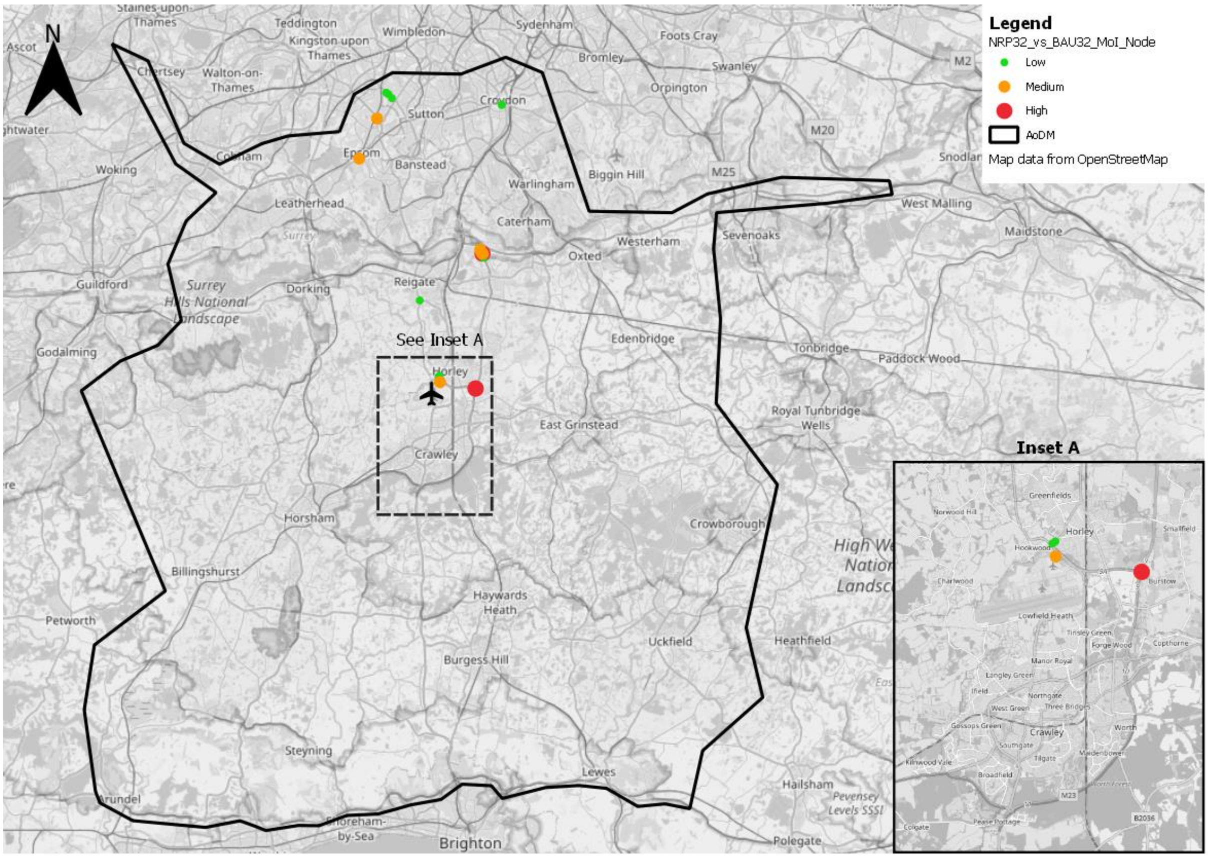
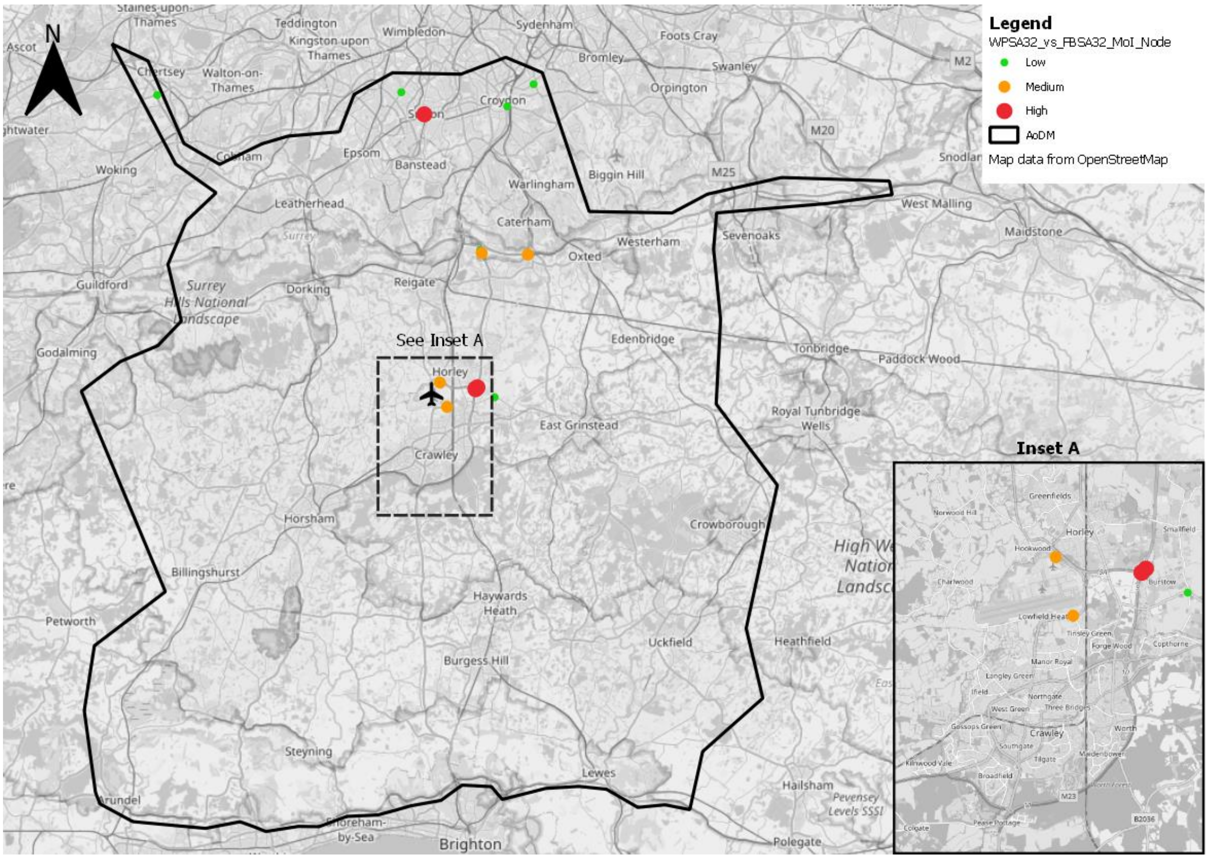


Figure 19: Magnitude of Impacts: Sensitivity test - future baseline 2032 vs with Project 2032



6.6.31 Table 42 presents a comparison of the Magnitude of Impact analysis from the DCO Application against the sensitivity test for 2032.

6.6.32 There are two new ‘High’ and two new ‘Medium’ impact nodes which were not previously flagged in the DCO Application. There is one node that previously flagged a ‘High’ impact but now shows ‘Low’ impact, and there are five nodes that previously flagged ‘Medium’ impacts but now show ‘Low’ impact or are not flagged.

Table 42: With Project impact comparison 2032, DCO Application and sensitivity test

2032 – Max Impact		Impact in the sensitivity test			
		Not flagged as L/M/H	Low	Medium	High
Impact in Application	Not flagged as L/M/H	0	5	2	2
	Low	10	0	0	0
	Medium	2	3	2	0
	High	0	1	0	1

6.6.33 The ‘Medium’ impact nodes are on the M25 westbound west of J6, and at Gatwick Road roundabout. In both those cases, and in common with changes in 2029, the baseline and with Project flows are lower in the sensitivity test than in the DCO Application forecast, and the V/C ratios with the Project are also lower than previously forecast.

6.6.34 The 'High' impact nodes are at the merge point at M23 J9 on the southbound offslip, and on the A232 in Sutton. At the merge point on the M23 J9 southbound off slip, the sensitivity testing shows reduced traffic flows in the AM2 (the time period flagging impact). V/C ratios are generally lower, although the AM2 shows an increase in V/C ratios due to the performance of the J9 circulatory signals which causes some blocking back. The response here is similar to that seen in the 2047 model presented in the DCO Application and the operation and performance of this slip road and junction is best assessed via the VISSIM model.

6.6.35 The 'High' impact at A232 in Sutton is the product of some localised increases in the baseline traffic compared to the DCO Application and very localised model noise / rerouting in the with Project scenario at a location near the edge of the AoDM and is at a node that does not flag in the other years so is not considered to be material.

2038

6.6.36 Figure 20 and Figure 21 indicate the locations of the junctions which have been identified with low, medium and high magnitudes of impact in 2038 application and sensitivity scenarios.

Figure 20: Magnitude of Impacts: DCO Application - future baseline 2038 vs with Project 2038

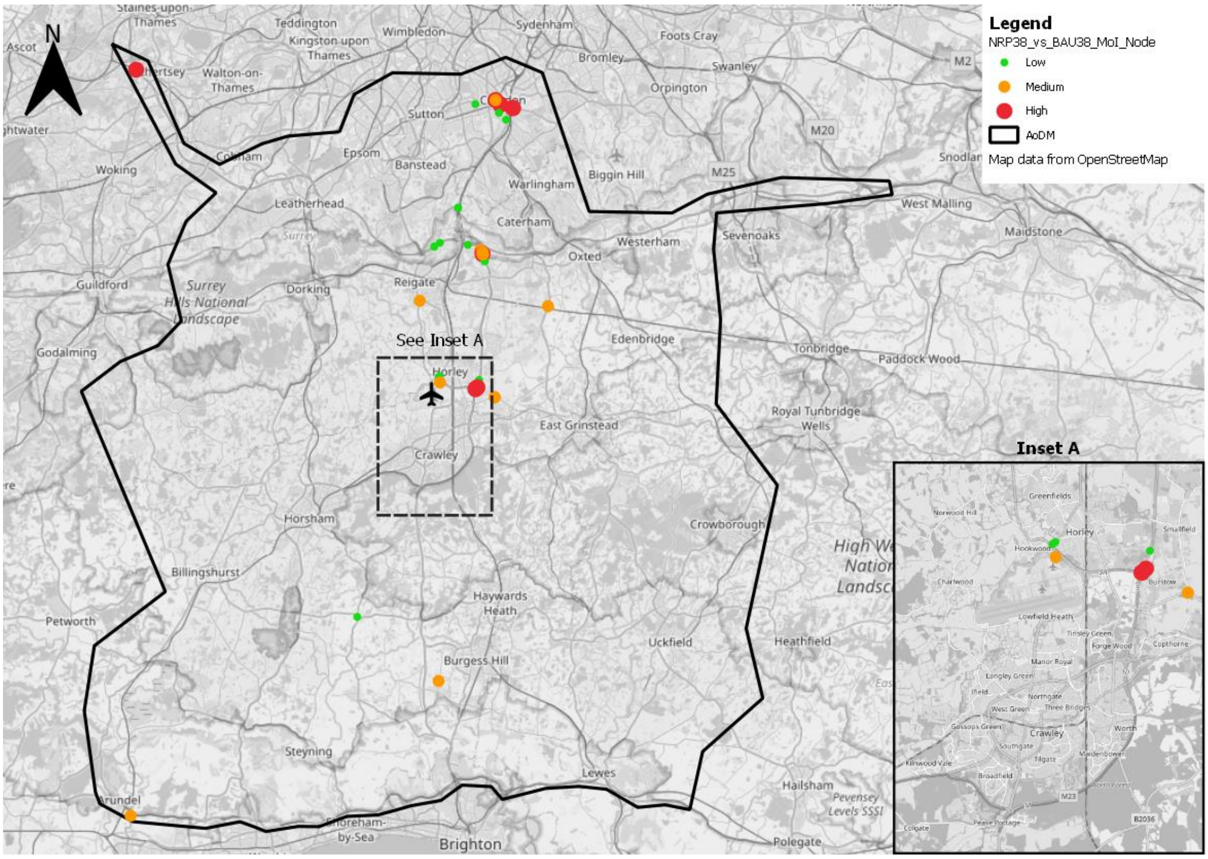
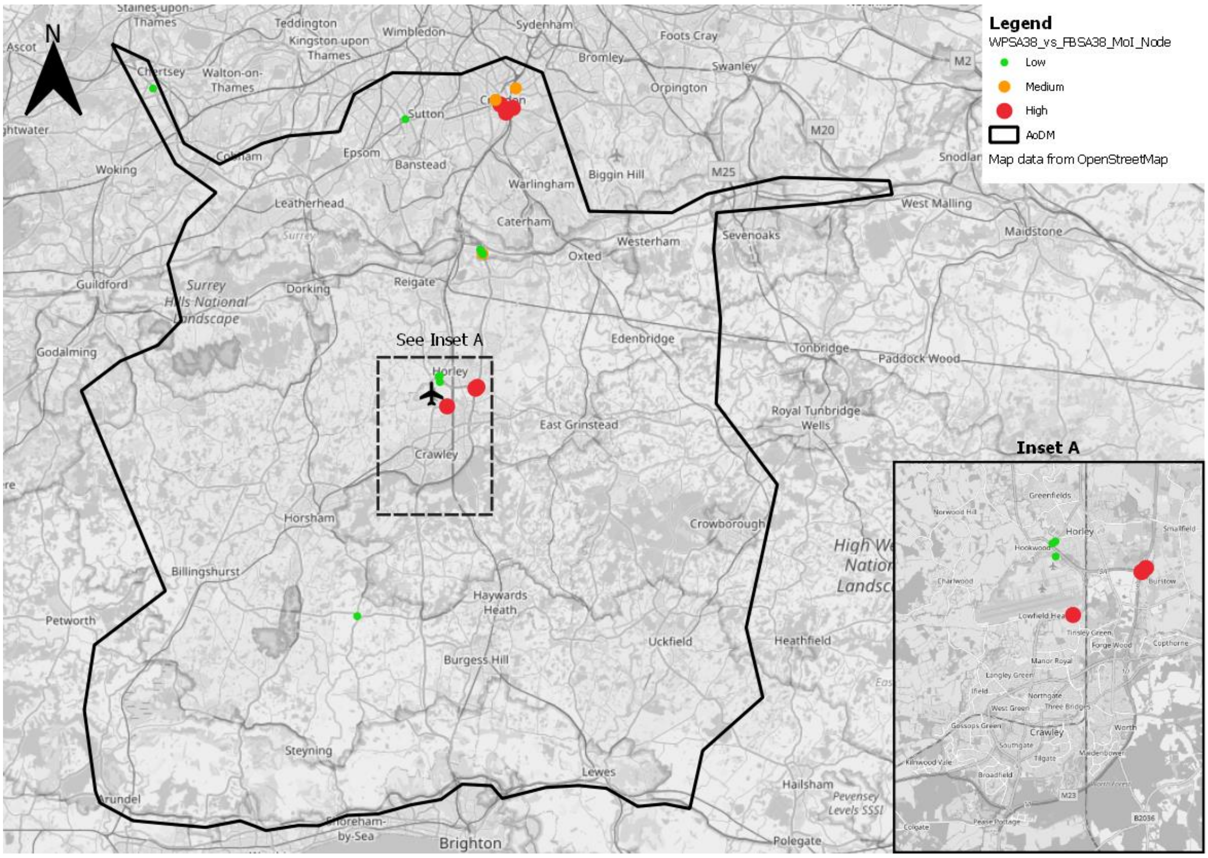


Figure 21: Magnitude of Impacts: Sensitivity test - future baseline 2038 vs with Project 2038



6.6.37 Table 43 presents a comparison of the Magnitude of Impact analysis from the DCO Application against the sensitivity test for 2038.

6.6.38 There are two new 'High' and one new 'Medium' impact nodes which were not previously flagged in the DCO Application. There are two nodes that previously flagged a 'High' impact but now show 'Medium' impact in the sensitivity test and one which is no longer flagged, and there are 11 nodes that previously flagged 'Medium' impacts but now show 'Low' impact or are not flagged.

Table 43: With Project impact comparison 2038, DCO Application and sensitivity test

2038 – Max Impact		Impact in the sensitivity test			
		Not flagged as L/M/H	Low	Medium	High
Impact in Application	Not flagged as L/M/H	0	2	1	2
	Low	12	3	0	0
	Medium	6	5	0	0
	High	1	0	2	4

6.6.39 A review of the location of the new nodes flagging shows the 'Medium' impact is at Lower Addiscombe Road / Morland Road, in Addiscombe and the 'High' impacts are on the Gatwick Road roundabout and on Bartlett Street, Croydon.

6.6.40 For Gatwick Road roundabout the absolute flows are lower in the sensitivity test, as are the volume to capacity ratios, suggesting the junction is operating better in the sensitivity test than in the DCO Application, although showing marginally greater change.

6.6.41 For Lower Addiscombe Road / Morland Road and Bartlett Street the volume of airport traffic is no more than 24 vehicles indicating the impacts here are small and likely to be a consequence of model noise and route switching and are not therefore considered a material change.

2047

6.6.42 Figure 22 and Figure 23 indicate the locations of the junctions which have been identified with low, medium and high magnitudes of impact in 2047 DCO application and sensitivity test scenarios.

6.6.43 Figure 22: Magnitude of Impacts: DCO Application - future baseline 2047 vs with Project 2047

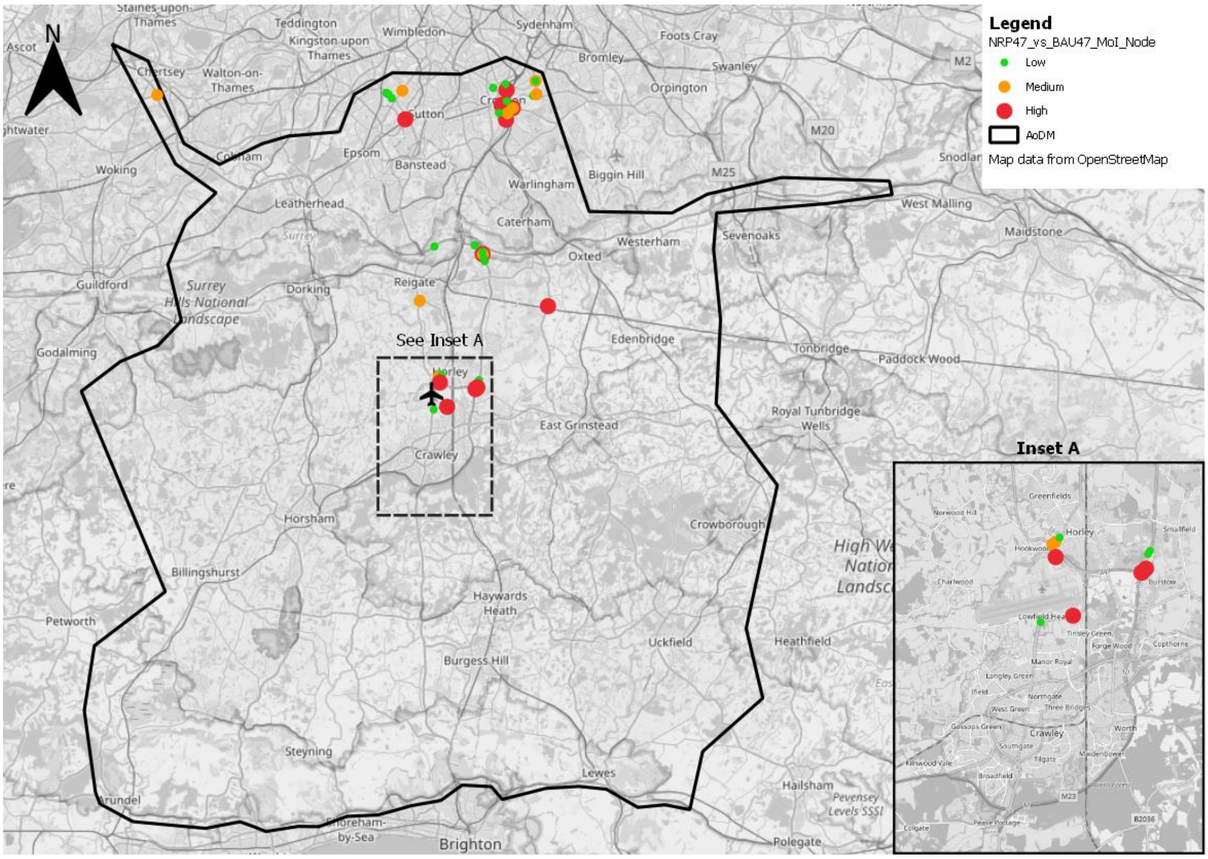
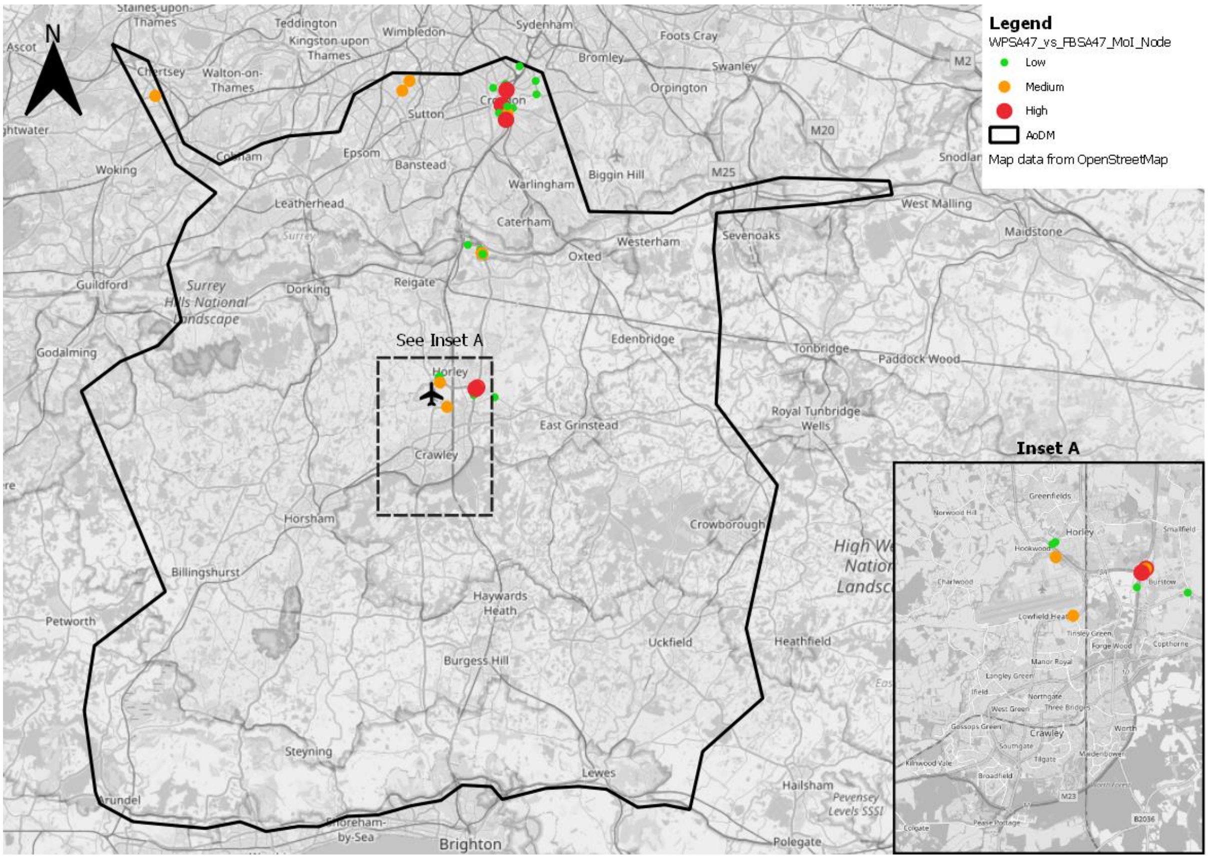


Figure 23: Magnitude of Impacts: Sensitivity test - future baseline 2047 vs with Project 2047



6.6.44 Table 44 presents a comparison of the Magnitude of Impact analysis from the DCO Application against the sensitivity test for 2047.

6.6.45 There are two new 'Medium' impact nodes which were not previously flagged in the DCO Application. One node that previously flagged a 'Low' Impact is now showing 'Medium' impact in the sensitivity test. There are three nodes that previously flagged a 'High' impact but now show 'Medium' impact and three nodes which previously flagged 'High' impact but now show 'Low' impact or are no longer flagged. There are nine nodes that previously flagged 'Medium' impacts but now show 'Low' impact or are not flagged.

Table 44: With Project impact comparison 2047, DCO Application and sensitivity test

2047 – Max Impact		Impact in the sensitivity test			
		Not flagged as L/M/H	Low	Medium	High
Impact in Application	Not flagged as L/M/H	0	5	2	0
	Low	14	5	1	0
	Medium	3	6	2	0
	High	2	1	3	5

6.6.46 A review of the location of the new nodes flagged in the sensitivity test shows that the new 'Medium' impact nodes are at Stonecot in Morden, and at the M25 J11, and at M23 J8 / M25 J7 NB offslip merge which previously flagged 'Low' impact.

6.6.47 Stonecot and M25 J11 are at the periphery of the AoDM and at locations where the proportion of airport traffic is low, and the absolute V/Cis lower than previously forecast in the DCO Application for both the future baseline and with Project scenarios.

6.6.48 The M23 J8 / M25 J7 NB offslip merge now flags a 'Medium' impact in the AM2 and PM periods in the sensitivity test where previously it flagged a 'Low' impact in the IP period in the DCO Application. Absolute flow levels through this area are lower in the sensitivity test than in the DCO Application, and V/C ratios are lower in both the future baseline and with Project sensitivity tests than in the DCO Application, but the change in V/Cis greater in these time periods.

Summary – magnitudes of impact

6.6.49 In 2029, two additional locations showing medium impact and seven locations no longer indicating an impact. At both of the additional locations, junctions would continue to operate within capacity.

6.6.50 In 2032, nine additional locations showing an impact (of which two are medium and two high) and 16 locations showing a lower impact or no longer indicating an impact. Of the additional locations showing high impacts, one is a considerable distance from the Airport and is the result of model noise where there is little airport-related traffic and the other is at the M23 southbound merge slip at Junction 9, although V/C ratios here are generally lower than those identified in the DCO Application. At the two additional locations showing medium impacts, both future baseline and with Project flows and V/C values are lower in the sensitivity test than in the DCO Application.

6.6.51 In 2038, five additional locations showing an impact (of which one is medium and two high) and 26 locations showing a lower impact or no longer indicating an impact. One of the additional high impact locations is the result of model noise and at the other, traffic flows in the sensitivity test are lower than was seen in the DCO Application, leading to the change in magnitude of impact, although junction performance is also better than shown in the DCO Application modelling. The additional medium impact location is at a distance from the Airport and is the result of model noise.

6.6.52 In 2047, seven new locations showing an impact (of which two are medium), one location showing an increased impact (medium) and 29 locations showing a lower impact or no longer indicating an impact. Both of the additional medium impact locations is located on the edge of the AoDM where the proportion of airport-related traffic is very low, and both junctions operate better in the sensitivity test than in the DCO Application. The location where an increased impact is shown is at the M23 J8 / M25 J7 merge; absolute flows and V/C ratios in this location are lower in the sensitivity test than for the DCO Application.

Journey times

6.6.53 The impact on highway journey times indicated in the sensitivity tests has been assessed. The DCO Application provides journey times for some 34 routes across the SRN and several across each Performance Area. Given the reductions in flow across the network, and consequent delay reductions, journey times generally remain constant or reduce overall.

6.6.54 Table 45 presents an aggregate summary of the impact on the 2047 with Project journey times resulting from the sensitivity tests compared to those in the DCO Application for the 34 routes. The increased journey time on one route in the AM1 period is predominantly a consequence of future baseline flow increases clockwise on the M25 through Junction 8 which leads to increased travel times compared to the future baseline presented in the DCO Application.

Table 45: Comparison of journey times for the SRN and Performance Area routes in sensitivity tests with those in the DCO Application for 2047 with Project

	Decrease	No change (same whole minute)	Increase
AM1	30 routes	3 routes	1 route
AM2	32 routes	2 routes	0 routes
IP	30 routes	4 routes	0 routes
PM	32 routes	1 route	1 route

M23 Spur corridor impacts

6.6.55 Given the reductions in background traffic and small increases in car mode share, further analysis was undertaken to understand how the volume of traffic through the M23 Spur varies as a result of the sensitivity testing. Traffic flows from the strategic highway model were extracted between M23 Junction 9 and Longbridge Roundabout, cutting across the A23 London Road connecting with Manor Royal. This area is similar to the extents of the VISSIM model used to assess the operation of the local road network and presented in the DCO Application (Transport Assessment (TA) Annex C – VISSIM Forecasting Report [APP-261].).

6.6.56 A summary of the traffic flows entering the cordon is provided in Table 46 and indicates that in the morning and evening peak periods, the total entry flows in the sensitivity testing are lower than those in the DCO Application. The extent of reduction is between -1% and -8% of the total cordon entry flow. These percentage changes are much smaller than the wider reductions in demand observed in the sensitivity tests because the M23 Spur corridor is dominated by airport-related traffic which is not significantly affected by the COVID-19 adjustments.

6.6.57 On the basis of the analysis presented, the flow changes are small and further indicate that the analysis presented in the DCO Application, particularly the VISSIM modelling, is robust.

Table 46: Comparison of total entry flows into M23 Spur corridor

		Future baseline 2032		With Project 2032		With Project 2047	
		DCO Application	Sensitivity	DCO Application	Sensitivity	DCO Application	Sensitivity
AM1	Actual flow	7,620	7,520	8,510	8,220	8,930	8,580
	Difference (%)		-100 (-1%)		-290 (-3%)		-350 (-4%)
AM2	Actual flow	8,110	7,520	8,740	8,220	9,360	8,580
	Difference (%)		-590 (-7%)		-520 (-6%)		-780 (-8%)
PM	Actual flow	7,090	6,810	7,610	7,260	7,860	7,690

	Difference (%)		-280 (-4%)		-350 (-5%)		-170 (-2%)

6.7. Rail network performance

Assignment statistics

6.7.1 Table 47 shows the 24-hour network statistics comparison between the DCO Application and the sensitivity test scenarios for the future baseline and with Project (post-VDM) rail assignments. These statistics include all demand (airport and non-airport). Full tables showing the time period breakdown can be found in Appendix 8. The three off peak assignment periods (OP1, OP2, OP3) are aggregated to a single OP period.

6.7.2 In the future baseline and with Project assignments, the 24-hour number of passenger trips, kilometres and hours in the sensitivity tests are on average 15% lower across all four modelled years compared to the DCO Application. This decrease is due to the 14% reduction in overall rail demand shown in Table 26.

6.7.3 There is minimal difference in the average trip speed, trip length and trip time in each year between the sensitivity test and DCO Application modelling scenarios, as shown in Table 47 below.

Table 47: 24-hour rail assignment network statistics, future baseline and with Project

		Difference (Sensitivity test vs DCO Application)			
Scenario	**Metric**	**2029**	**2032**	**2038**	**2047**
Future baseline	Pax Trips (million)	-15%	-15%	-15%	-15%
	Pax km (million)	-15%	-15%	-15%	-14%
	Pax Hr (million)	-15%	-15%	-15%	-15%
	Avg Speed (km/h)	0%	0%	1%	1%
	Avg km/trip	0%	0%	1%	2%
	Avg mins/trip	0%	0%	0%	1%
With Project	Pax Trips (million)	-15%	-15%	-15%	-15%
	Pax km (million)	-15%	-15%	-14%	-14%
	Pax Hr (million)	-15%	-15%	-15%	-15%
	Avg Speed (km/h)	0%	0%	1%	1%
	Avg km/trip	0%	0%	1%	2%
	Avg mins/trip	0%	0%	0%	1%

Rail flow volumes

6.7.4 Figure 24 and Figure 25 below show the flow differences in the 2047 AM and PM peak periods (07:00-09:00 and 16:00-18:00) between the sensitivity test and DCO Application future baseline modelling scenarios. Green bars indicate a reduction in demand and red an increase. It is clear that there is a reduction in rail volumes throughout the network in the sensitivity tests, , with reductions of circa. -3,800 passengers on the Brighton Main Line, -4,000 passengers on the South West Main Line into London Victoria and -2,500 passengers on the South Eastern Main Line into London Bridge in the AM period, reflecting the -15% reduction in trips, distance and time shown in Table 47 above. This trend is also seen in the PM period, where there is a reduction of about -2,200 passengers on the Brighton Main Line, -2,300 passengers on the South West Main Line from London Victoria and -1,500 passengers on the South Eastern Main Line from London Bridge.

Figure 24: Sensitivity test vs DCO Application future baseline rail volume flow difference – 2047 AM

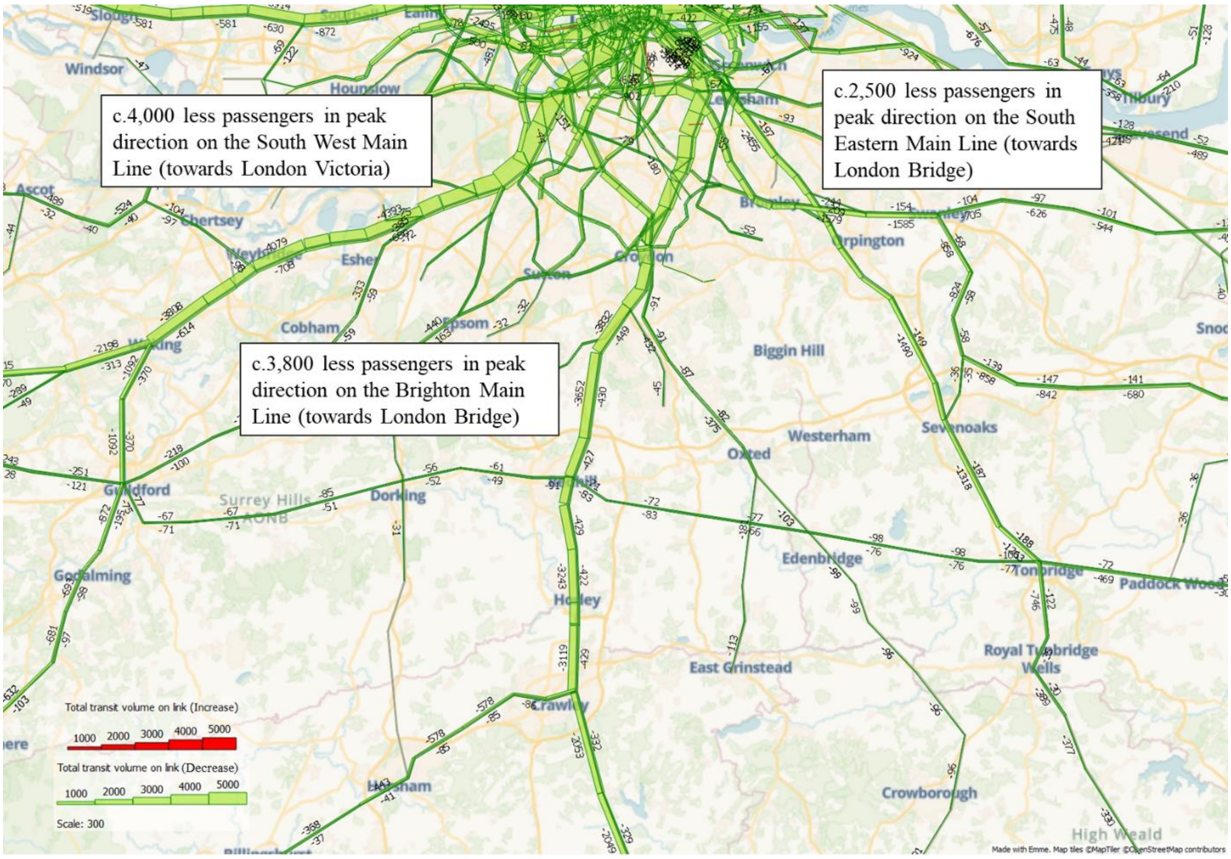
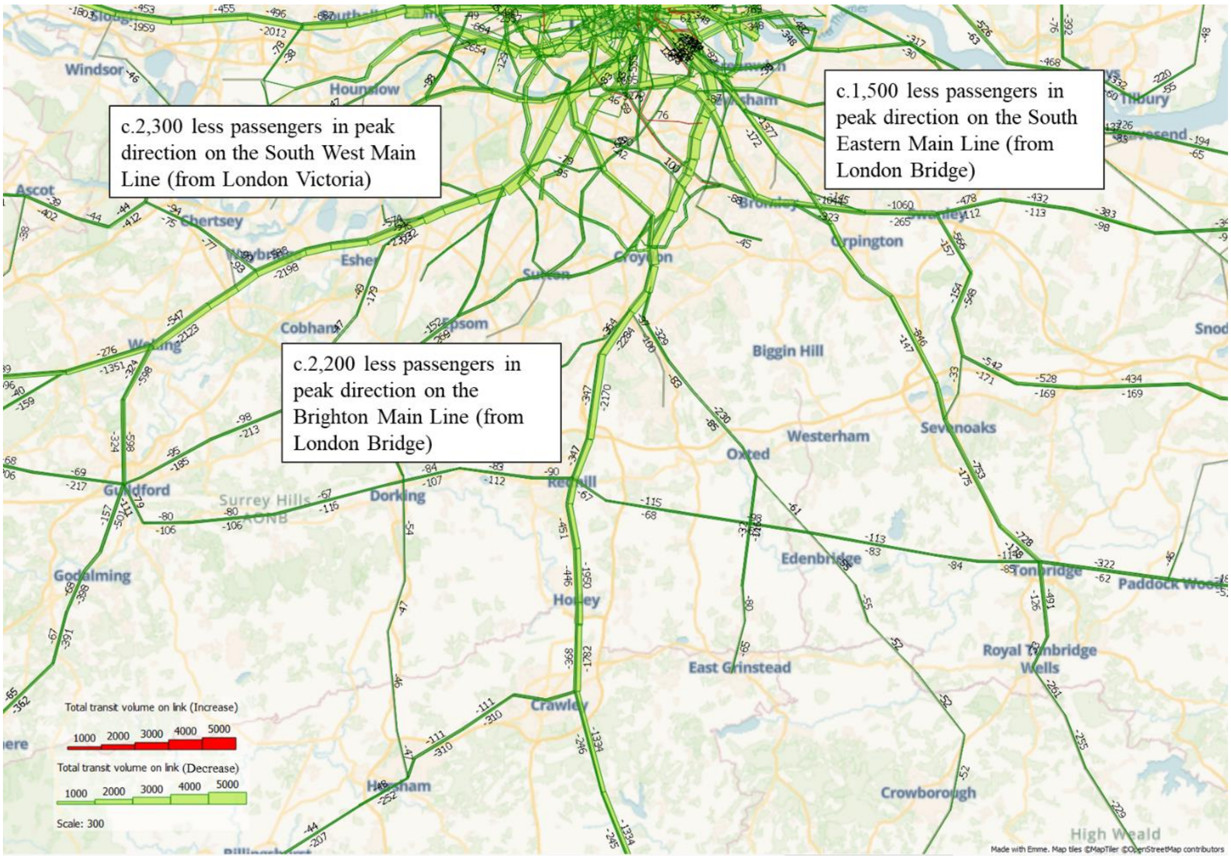


Figure 25: Sensitivity test vs DCO Application future baseline rail volume flow difference – 2047 PM



6.7.5 Figure 26 and Figure 27 show the flow difference between the sensitivity test future baseline and with Project scenarios in the 2047 AM and PM peak periods. There is an increase in rail volume due to the impact of the Project, especially on the Brighton Main Line north of Gatwick, where there is an increase of about 450 passengers travelling towards London and 750 passengers travelling away from London in the AM and in the PM period an increase of around 400 passengers travelling towards London and 530 passengers travelling away from London. These are similar to the DCO Application scenario as shown in Diagram 9.6.1 in Section 9.6 of the Transport Assessment (TA) [AS-079] as overall airport passenger and airport employee rail demand is very similar to the demand in the DCO Application.

Figure 26: Rail volume difference between future baseline and with Project sensitivity test – 2047 AM

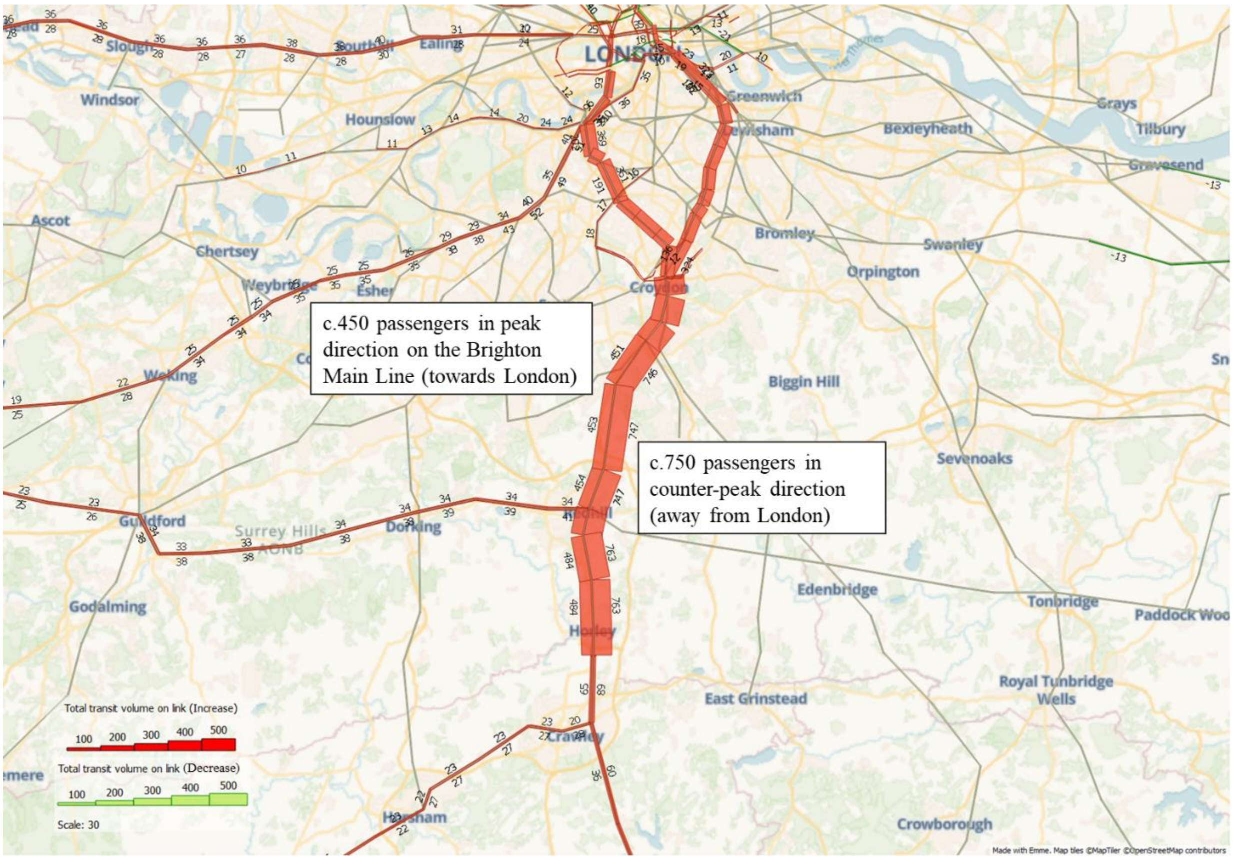
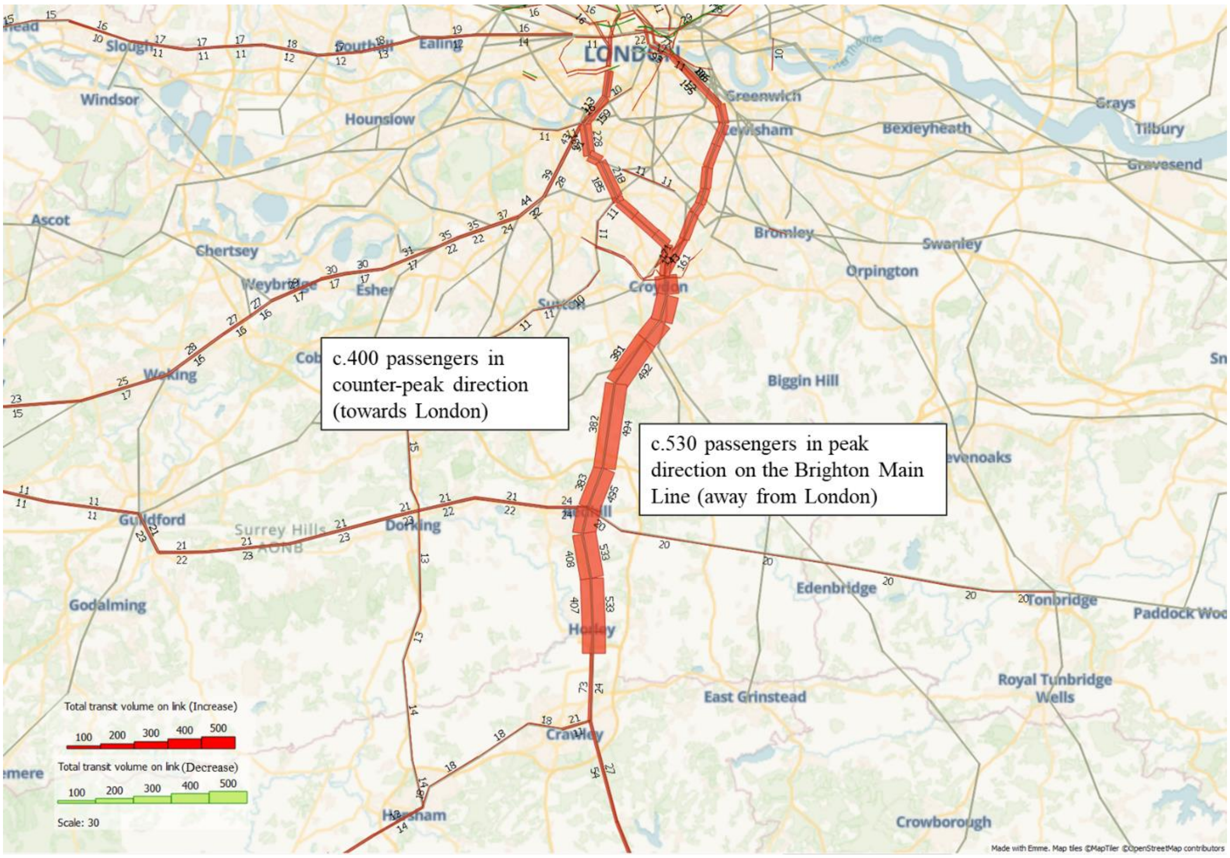


Figure 27: Rail volume difference between future baseline and with Project sensitivity test – 2047 PM



Fast services, morning peak, northbound, 2047

6.7.6 In this section, Brighton Main Line train load factors are provided for the morning peak and shoulder hours (06:00-11:00).

6.7.7 As for the DCO Application analysis, a Seated Load Factor of less than 1 means there are unoccupied seats; a value of 1 means all seats are taken; a value greater than 1 means all seats are taken and there are standing passengers. It should be noted that this assumes even loading across the train.

- Green shading: Up to 85% of seats occupied, no passengers standing;
- Yellow shading: 85-100% of seats occupied, no passengers standing; and
- Red shading: All seats occupied plus passengers standing.

6.7.8 Table 48 shows Seated Load Factors for fast trains in the morning peak and shoulder hours (0600-1100) for the peak (northbound) direction for the future baseline in 2047. The fast trains are the services that run non-stop between Gatwick and London or call at just one or two stations between Gatwick and London (East Croydon, Clapham Junction). Table 49 presents the equivalent with Project Seated Load Factors.

6.7.9 The Seated Load Factors for all years in the sensitivity test scenarios have generally decreased compared to the DCO Application scenarios, for both future baseline and with Project scenarios. This is due to the reduction in rail demand in the future baseline sensitivity scenarios and so is also observed in the with Project sensitivity scenarios.

6.7.10 Services from East Croydon to Clapham Junction and Clapham Junction to Victoria see a maximum increase in load factor of 0.26 in 2047 and 0.10 respectively in the sensitivity test. This is a consequence of the change in balance of services between London Bridge and London Victoria in the sensitivity test compared to the DCO Application. Although there is an increase, the load factor remains below 1, meaning that there are still unoccupied seats available.

6.7.11 All other time periods and route sections show reductions in the sensitivity test compared to the DCO Application. The greatest reduction shown in the future baseline sensitivity test compared to the DCO Application is in the OP3 period with a reduction in Seated Load Factor of 0.32 between East Croydon and London Bridge; the comparable reduction with the Project is a reduction of 0.31. The greatest reduction in the AM period is of 0.28 in the future baseline between East Croydon and London Bridge, the comparable reduction in the with Project scenario being 0.27 and therefore a similar change.

6.7.12 Table 50 presents the changes in Seated Load Factors from the future baseline scenario for fast trains in the morning peak and shoulder hours (06:00-11:00) for the peak (northbound) direction for the with Project scenario in 2047. The Seated Load Factors in the with Project sensitivity test generally increase as would be expected given the increase in passengers at the Airport, with the differences being less than 0.09. Most of these changes are the same as the increase in Seated Load Factor seen in the DCO Application. The small changes in impact (of up to 0.02, or 2% of seats occupied) shown are both a consequence of the timetable having slightly fewer services modelled for Gatwick to East Croydon and there being a different balance of services serving London Bridge and London Victoria in the sensitivity test compared to the DCO Application.

6.7.13 Overall the impact due to the Project is very similar to that shown in the DCO Application and in absolute terms the sensitivity test generally shows that crowding on trains will be less crowded than previously forecast.

6.7.14 The equivalent tables for other years can be found in Appendix 9.

Table 48: Seated Load Factors: Morning peak northbound, fast trains, future baseline 2047

		DCO Application Modelling					Sensitivity Modelling					Difference				
Hour starting	In period	Three Bridges to Gatwick	Gatwick to East Croydon	East Croydon to Clapham Jcn	Clapham Jcn to Victoria	East Croydon to London Bridge	Three Bridges to Gatwick	Gatwick to East Croydon	East Croydon to Clapham Jcn	Clapham Jcn to Victoria	East Croydon to London Bridge	Three Bridges to Gatwick	Gatwick to East Croydon	East Croydon to Clapham Jcn	Clapham Jcn to Victoria	East Croydon to London Bridge
06:00	OP3	0.71	0.82	0.43	0.38	1.37	0.64	0.77	0.69	0.49	1.06	-0.07	-0.04	0.26	0.10	-0.32
07:00	AM	0.80	0.98	1.08	0.97	1.44	0.65	0.82	0.94	0.84	1.20	-0.16	-0.16	-0.15	-0.13	-0.24
08:00	AM	0.92	1.12	1.24	1.11	1.65	0.74	0.93	1.07	0.96	1.37	-0.18	-0.18	-0.17	-0.15	-0.28
09:00	IP	0.67	1.19	1.11	0.86	1.74	0.58	1.03	1.00	0.76	1.57	-0.09	-0.16	-0.10	-0.10	-0.17
10:00	IP	0.42	0.75	0.70	0.54	1.10	0.36	0.65	0.63	0.48	0.99	-0.06	-0.10	-0.07	-0.06	-0.11

Table 49: Seated Load Factors: Morning peak northbound, fast trains, with Project 2047

		DCO Application Modelling					Sensitivity Modelling					Difference				
Hour starting	In period	Three Bridges to Gatwick	Gatwick to East Croydon	East Croydon to Clapham Jcn	Clapham Jcn to Victoria	East Croydon to London Bridge	Three Bridges to Gatwick	Gatwick to East Croydon	East Croydon to Clapham Jcn	Clapham Jcn to Victoria	East Croydon to London Bridge	Three Bridges to Gatwick	Gatwick to East Croydon	East Croydon to Clapham Jcn	Clapham Jcn to Victoria	East Croydon to London Bridge
06:00	OP3	0.74	0.81	0.43	0.38	1.36	0.67	0.77	0.69	0.48	1.05	-0.07	-0.04	0.26	0.10	-0.31
07:00	AM	0.80	1.00	1.10	0.98	1.45	0.65	0.85	0.96	0.85	1.22	-0.15	-0.15	-0.14	-0.13	-0.24
08:00	AM	0.92	1.14	1.26	1.12	1.66	0.74	0.97	1.10	0.98	1.39	-0.18	-0.17	-0.16	-0.15	-0.27
09:00	IP	0.68	1.28	1.18	0.91	1.81	0.59	1.12	1.08	0.81	1.64	-0.09	-0.16	-0.10	-0.10	-0.17
10:00	IP	0.43	0.81	0.74	0.57	1.14	0.37	0.71	0.68	0.51	1.04	-0.06	-0.10	-0.07	-0.06	-0.11

Table 50: Change in impact (Seated Load Factors): Morning peak northbound, fast trains, with Project to future baseline comparison 2047

		DCO Application Modelling With Project Impact					Sensitivity Modelling With Project Impact					Difference (Change in Impact)				
Hour starting	In period	Three Bridges to Gatwick	Gatwick to East Croydon	East Croydon to Clapham Jcn	Clapham Jcn to Victoria	East Croydon to London Bridge	Three Bridges to Gatwick	Gatwick to East Croydon	East Croydon to Clapham Jcn	Clapham Jcn to Victoria	East Croydon to London Bridge	Three Bridges to Gatwick	Gatwick to East Croydon	East Croydon to Clapham Jcn	Clapham Jcn to Victoria	East Croydon to London Bridge
06:00	OP3	0.03	-0.01	0.00	0.00	-0.01	0.03	0.00	0.00	-0.01	-0.01	0.00	0.01	0.00	-0.01	0.00
07:00	AM	0.00	0.02	0.02	0.01	0.01	0.00	0.03	0.02	0.01	0.02	0.00	0.01	0.00	0.00	0.01
08:00	AM	0.00	0.02	0.02	0.01	0.01	0.00	0.04	0.03	0.02	0.02	0.00	0.02	0.01	0.01	0.01
09:00	IP	0.01	0.09	0.07	0.05	0.07	0.01	0.09	0.08	0.05	0.07	0.00	0.00	0.01	0.00	0.00
10:00	IP	0.01	0.06	0.04	0.03	0.04	0.01	0.06	0.05	0.03	0.05	0.00	0.00	0.01	0.00	0.01

Fast services, evening peak, southbound, 2047

6.7.15 Table 51 shows the Seated Load Factors in the evening peak and shoulder hours (15:00-20:00) for the peak (southbound) direction for the future baseline 2047. Table 52 presents the equivalent with Project Seated Load Factors.

6.7.16 Similar to the morning peak northbound fast services from Gatwick, the Seated Load Factors for the evening peak southbound fast services in the sensitivity test scenarios have generally decreased between 16:00 and 19:00 towards Gatwick compared to those in the DCO Application, both for the future baseline and with Project scenarios There is a minimal increase in Seated Load Factor on services from Victoria to Clapham Junction, Clapham Junction to East Croydon and East Croydon to Gatwick between 15:00 and 16:00 in the sensitivity test but the overall seated load factor does not exceed a value of 1 in either the future baseline or with Project, meaning that there are still unoccupied seats available.

6.7.17 In the future baseline DCO Application modelling scenario, the highest Seated Load Factors are between East Croydon and Gatwick, up to a value of 1.22, and between London Bridge and East Croydon, up to a value of 2.09, from 18:00 to 19:00 in 2047. However, the Seated Load Factors for these two routes reduce by 0.21 and 0.99 respectively in the sensitivity modelling scenarios to 1.01 between East Croydon and Gatwick and 1.09 between London Bridge and East Croydon as shown in Table 51. The routes see a similar reduction in Seated Load Factor with Project: there is a reduction of 0.20 between East Croydon and Gatwick, and a reduction of 1.00 between London Bridge and East Croydon.

6.7.18 All the increases in Seated Load Factor occur in the IP period, with an increase of 0.11 in the future baseline sensitivity test compared to the DCO Application being the highest increase between East Croydon and Gatwick. The equivalent change in the with Project sensitivity test is an increase of 0.14 compared to the DCO Application. Even with these increases the Seated Load Factors remain below 1, meaning that there are still unoccupied seats available.

6.7.19 Table 53 presents the changes in Seated Load Factor from the future baseline scenario for fast trains in the evening peak and shoulder hours (15:00-20:00) for the peak (southbound) direction for the with Project scenarios. The Seated Load Factors in the with Project sensitivity tests have all increased, with the maximum increase being 0.11 (or 11% of seating capacity). The increase is similar to the increase shown in the DCO Application and where there are small changes in impact (up to 0.03) this is the consequence of the small reduction in service provision and the change in balance of services between London Bridge and London Victoria and Gatwick.

6.7.20 Overall the response due to the Project is very similar to that shown in the DCO Application and in absolute terms the sensitivity test generally shows that crowding on trains will be less crowded than previously forecast.

6.7.21 The equivalent tables for other years can be found in Appendix 9.

Table 51: Seated Load Factors: Evening peak southbound, fast trains, future baseline 2047

		DCO Application Modelling					Sensitivity Modelling					Difference				
Hour starting	In period	Victoria to Clapham Jcn	Clapham Jcn to East Croydon	London Bridge to East Croydon	East Croydon to Gatwick	Gatwick to Three Bridges	Victoria to Clapham Jcn	Clapham Jcn to East Croydon	London Bridge to East Croydon	East Croydon to Gatwick	Gatwick to Three Bridges	Victoria to Clapham Jcn	Clapham Jcn to East Croydon	London Bridge to East Croydon	East Croydon to Gatwick	Gatwick to Three Bridges
15:00	IP	0.41	0.57	0.87	0.61	0.37	0.49	0.64	0.81	0.72	0.40	0.08	0.07	-0.05	0.11	0.03
16:00	PM	0.91	1.06	1.17	0.87	0.60	0.84	0.97	1.02	0.78	0.51	-0.07	-0.09	-0.16	-0.09	-0.09
17:00	PM	1.12	1.30	1.44	1.07	0.74	1.03	1.19	1.24	0.95	0.62	-0.09	-0.11	-0.19	-0.11	-0.11
18:00	OP1	1.02	1.12	2.07	1.22	1.01	0.91	1.02	1.08	1.01	0.81	-0.11	-0.10	-0.99	-0.21	-0.21
19:00	OP1	0.78	0.86	1.59	0.93	0.78	0.70	0.78	0.83	0.78	0.62	-0.08	-0.08	-0.76	-0.16	-0.16

Table 52: Seated Load factors: Evening peak southbound, fast trains, with Project 2047

		DCO Application Modelling					Sensitivity Modelling					Difference				
Hour starting	In period	Victoria to Clapham Jcn	Clapham Jcn to East Croydon	London Bridge to East Croydon	East Croydon to Gatwick	Gatwick to Three Bridges	Victoria to Clapham Jcn	Clapham Jcn to East Croydon	London Bridge to East Croydon	East Croydon to Gatwick	Gatwick to Three Bridges	Victoria to Clapham Jcn	Clapham Jcn to East Croydon	London Bridge to East Croydon	East Croydon to Gatwick	Gatwick to Three Bridges
15:00	IP	0.45	0.63	0.92	0.69	0.38	0.54	0.71	0.86	0.83	0.41	0.10	0.09	-0.06	0.14	0.03
16:00	PM	0.93	1.08	1.19	0.91	0.60	0.86	1.00	1.03	0.82	0.51	-0.07	-0.09	-0.16	-0.09	-0.09
17:00	PM	1.14	1.33	1.45	1.11	0.74	1.06	1.22	1.26	1.00	0.62	-0.08	-0.11	-0.20	-0.11	-0.11
18:00	OP1	1.05	1.16	2.10	1.27	1.03	0.95	1.07	1.09	1.07	0.82	-0.10	-0.09	-1.00	-0.20	-0.20
19:00	OP1	0.80	0.89	1.61	0.98	0.79	0.73	0.82	0.84	0.82	0.63	-0.07	-0.07	-0.77	-0.15	-0.16

Table 53: Change in Seated Load Factors: Evening peak southbound, fast trains, with Project to future baseline comparison 2047

		DCO Application Modelling With Project Impact					Sensitivity Modelling With Project Impact					Difference (Change in Impact)				
Hour starting	In period	Victoria to Clapham Jcn	Clapham Jcn to East Croydon	London Bridge to East Croydon	East Croydon to Gatwick	Gatwick to Three Bridges	Victoria to Clapham Jcn	Clapham Jcn to East Croydon	London Bridge to East Croydon	East Croydon to Gatwick	Gatwick to Three Bridges	Victoria to Clapham Jcn	Clapham Jcn to East Croydon	London Bridge to East Croydon	East Croydon to Gatwick	Gatwick to Three Bridges
15:00	IP	0.04	0.06	0.06	0.08	0.01	0.05	0.07	0.05	0.10	0.01	0.02	0.02	-0.01	0.03	0.00
16:00	PM	0.02	0.02	0.01	0.04	0.00	0.02	0.02	0.01	0.04	0.00	0.01	0.00	0.00	0.00	0.00
17:00	PM	0.02	0.03	0.02	0.04	0.00	0.03	0.03	0.01	0.05	0.00	0.01	0.00	0.00	0.01	0.00
18:00	OP1	0.03	0.04	0.02	0.05	0.01	0.04	0.05	0.01	0.06	0.02	0.01	0.01	-0.01	0.00	0.00
19:00	OP1	0.02	0.03	0.02	0.04	0.01	0.03	0.04	0.01	0.04	0.01	0.01	0.01	-0.01	0.00	0.00

Standing passengers per carriage

6.7.22 To help understand rail crowding from a passenger perspective, Figure 28 and Figure 29 shows the forecasts of standing passengers per carriage by year for the busiest hour of the morning (0900-1000) northbound and evening (1800-1900) southbound peaks for the future baseline and with Project scenarios in both the DCO Application and sensitivity tests.

6.7.23 In the AM period, on fast trains between Gatwick and East Croydon, the with Project scenario in the DCO Application shows that from 2032, the number of standing passengers per carriage would increase up to 16 per carriage in 2047. The with Project scenario in the sensitivity test shows that there would be no standing passengers until 2038 and only 7 per carriage in 2047, 9 fewer than indicated in the DCO Application modelling. This trend is similar for the future baseline scenario as well, where the number of standing passengers per carriage is higher in the DCO Application with 11 per carriage in 2047, 9 more than in the sensitivity test, as shown in Figure 28.

6.7.24 Similarly in the PM period, the number of standing passengers per carriage in both the future baseline and with Project DCO Application scenarios begins to increase in 2032, up to 12 and 15 per carriage in 2047 respectively. Standing passengers per carriage would only be present from 2038 for the future baseline and with Project scenarios in the sensitivity test, with 1 per carriage in the future baseline and 4 per carriage in the with Project scenario by 2047, as shown in Figure 29.

6.7.25 The reduction in standing passengers per carriage in the sensitivity test scenarios compared to the DCO Application modelling scenarios is due to the reduction in background rail demand in the sensitivity scenarios.

Figure 28: Standing passengers per carriage Gatwick to East Croydon in busiest hour, morning northbound

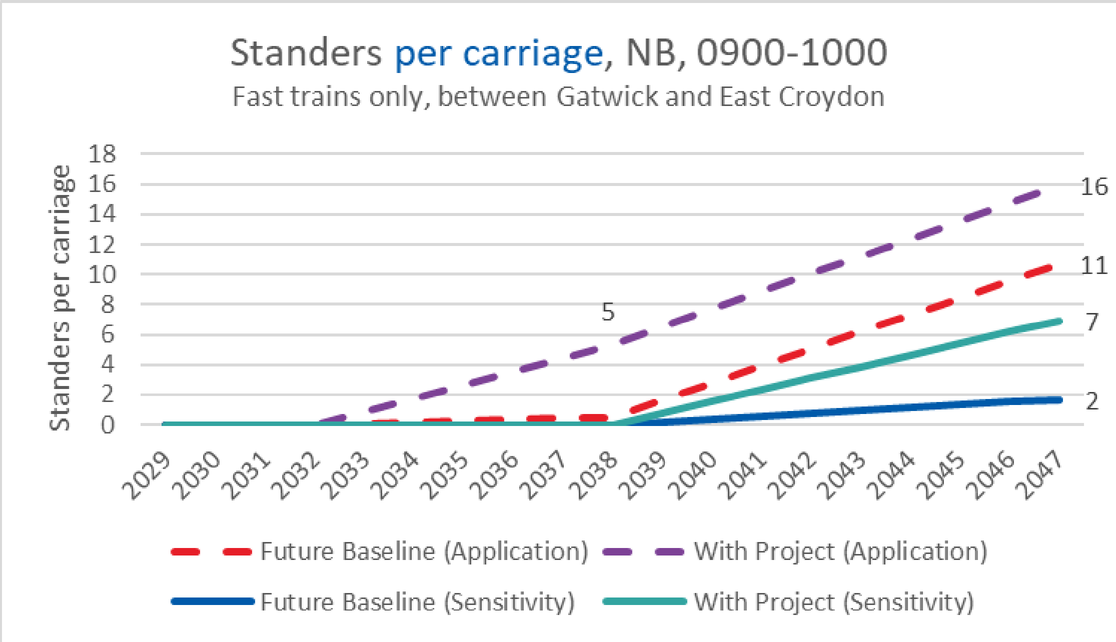
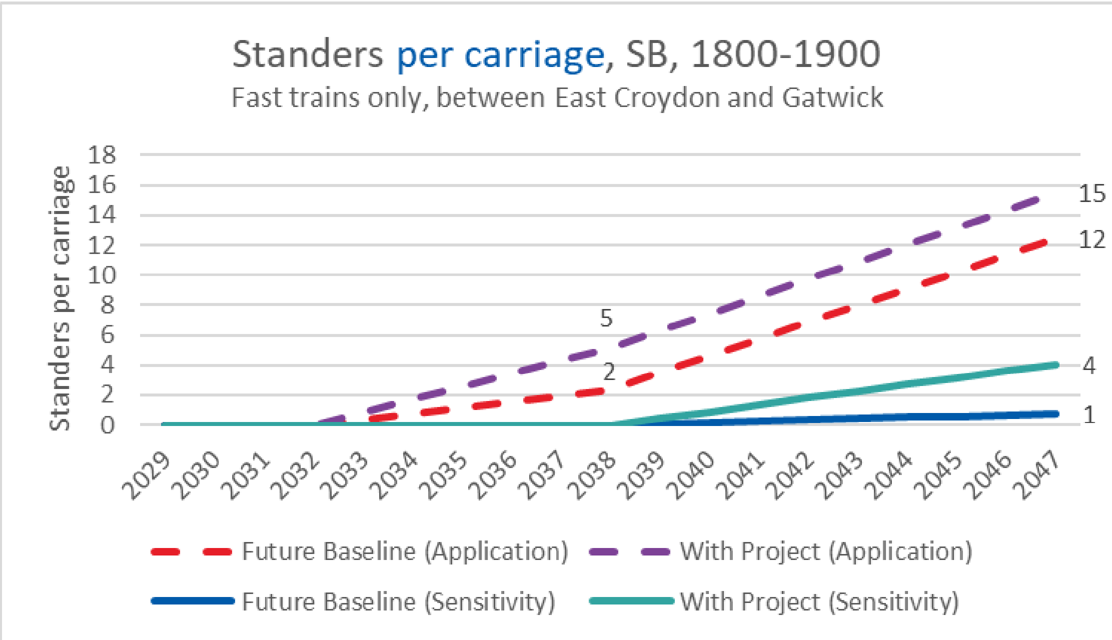


Figure 29: Standing passengers per carriage East Croydon to Gatwick in busiest hour, evening southbound



6.8. Bus/coach airport demand

6.8.1 For bus and coach travel, operators can adjust frequencies and capacity to respond to growth in Gatwick demand, to manage loadings far more readily than can be done with rail. Coach and bus loadings are therefore not assessed against a fixed capacity plan. Given the Airport passenger and employee projections have remained unchanged in the sensitivity test, the services and frequency assumptions made in the DCO Application have also remained unchanged in the sensitivity test.

6.8.2 Table 54 summarises the forecast bus/coach demand by area for both the DCO Application and sensitivity tests for air passengers and airport employees. The changes are minimal as they fluctuate from -2% to 0% as would be expected given a consistent set of service and frequency assumptions but a small change in overall public transport mode share.

Table 54: Air passengers and airport employees total bus and coach trips

	Scenario	2029	2032	2038	2047
Air passenger	Future baseline DCO application	5,776	6,083	6,307	6,574
	Future baseline sensitivity test	5,754	6,047	6,259	6,508
	% Difference	**0%**	**-1%**	**-1%**	**-1%**
	With Project DCO application	7,099	8,522	9,076	9,504
	With Project sensitivity test	7,067	8,512	9,048	9,471
	% Difference	**0%**	**0%**	**0%**	**0%**
Airport employees	Future baseline DCO application	2,823	2,893	2,999	3,168
	Future baseline sensitivity test	2,801	2,869	2,968	3,104
	% Difference	**-1%**	**-1%**	**-1%**	**-2%**
	With Project DCO application	3,421	3,710	3,802	3,905
	With Project sensitivity test	3,399	3,712	3,792	3,881
	% Difference	**-1%**	**0%**	**0%**	**-1%**

6.9. Gatwick Airport station entry and exit flows

6.9.1 Table 55 and Table 56 below show the difference in entry and exit flows between the DCO Application and sensitivity tests for the future baseline and with Project scenarios for all modelled years.

6.9.2 In the AM period, between 0700 and 0900, both the entry and exit flows in the sensitivity test scenarios are on average -3% lower than the DCO Application scenarios, with the largest reduction of -5% in entries seen in 2047, as shown in Table 55.

6.9.3 Similarly in the PM period, between 1600 and 1800, the entry and exit flows in the sensitivity test scenarios are about -2% lower than the DCO Application scenarios, with the largest reduction of -4% in exits seen in both 2038 and 2047, as shown in Table 56.

6.9.4 These reductions are expected given the reduction in background rail demand and the small reduction in airport public transport mode share. As they are small reductions, they demonstrate that the DCO Application Legion modelling of the station, reported in Transport Assessment (TA) Annex D – Station and Shuttle Legion Modelling Report [APP-262] is robust.

Table 55: Gatwick Airport station entry and exit flows: comparison between DCO Application and sensitivity test – AM period

AM		Future baseline		With Project	
Year	Scenario	Entries (2hr)	Exits (2hr)	Entries (2hr)	Exits (2hr)
2029	Application	4,719	4,775	5,047	5,616
	Sensitivity	4,597	4,639	4,900	5,469
	% Difference	**-3%**	**-3%**	**-3%**	**-3%**
2032	Application	5,131	5,059	6,047	6,357
	Sensitivity	4,961	4,907	5,951	6,226
	% Difference	**-3%**	**-3%**	**-2%**	**-2%**
2038	Application	5,589	5,375	6,646	7,012
	Sensitivity	5,364	5,206	6,502	6,842
	% Difference	**-4%**	**-3%**	**-2%**	**-2%**
2047	Application	5,865	5,676	7,084	7,506
	Sensitivity	5,559	5,466	6,891	7,307
	% Difference	**-5%**	**-4%**	**-3%**	**-3%**

Table 56: Gatwick Airport station entry and exit flows: comparison between DCO Application and sensitivity test – PM period

PM		Future baseline		With Project	
Year	Scenario	Entries (2hr)	Exits (2hr)	Entries (2hr)	Exits (2hr)
2029	Application	4,866	5,833	5,221	6,106
	Sensitivity	4,821	5,683	5,172	5,958
	% Difference	**-1%**	**-3%**	**-1%**	**-2%**
2032	Application	5,046	6,147	6,238	7,358
	Sensitivity	4,997	5,971	6,175	7,200
	% Difference	**-1%**	**-3%**	**-1%**	**-2%**
2038	Application	5,472	6,552	6,678	7,895
	Sensitivity	5,402	6,299	6,576	7,688
	% Difference	**-1%**	**-4%**	**-2%**	**-3%**
2047	Application	6,243	7,186	7,244	8,518
	Sensitivity	6,100	6,895	7,101	8,247
	% Difference	**-2%**	**-4%**	**-2%**	**-3%**

7 Summary

7.1. Introduction

7.1.1 The new TAG Unit M4, released by the DfT in May 2023, included guidance for scheme promoters on how to consider the treatment of COVID-19 impacts. This report has set out analysis undertaken to respond to the ExA's Procedural Decision [PD-006] around providing further information on the impact the updated guidance will have on the modelling undertaken for the DCO Application.

7.1.2 This report sets out the assumptions, data and process undertaken in the development of the sensitivity test models, as well as outcomes of the forecast modelling undertaken using the GHOST suite, and how they compare to the outcomes from the DCO Application modelling.

7.1.3 Throughout the development of the models, stakeholders have been engaged to ensure assumptions are reviewed but also that this report covers key areas of interest.

7.2. Background: guidance and adopted approach

7.2.1 The new guidance suggests that COVID-19 has had a significant impact on travel behaviour and offers three examples of possible approaches to take these impacts into consideration in the modelling process. The first is to create a present day forecast by applying adjustments to include a COVID-19 impact, the second to apply adjustments to a forecast model to produce a new scheme opening year forecast that includes a COVID-19 impact to that point and the third to apply the adjustment globally to model results as a post-model adjustment.

7.2.2 Given the stage of the Project's application, the focus of the analysis has been to determine an appropriate and proportionate approach for adjusting the existing model and using these adjustments to produce sensitivity tests on the modelling that underpins the DCO Application, using the second example presented in the guidance as the basis for the approach adopted.

7.3. Data and trends

7.3.1 Data for the 2023 Gatwick terminal passenger counts was obtained from GAL and their comparison against the 2016 data showed that passenger numbers in June were around 2-3% lower in 2023 than in 2016.

7.3.2 The number of Gatwick staff passes active in 2023 was obtained from GAL and this showed that the total number of employees had decreased by around 13% in

2023 compared to 2016. This was used to create an updated set of 2023 employee journey-to-work matrices. For 2029 onwards the shift and attendance profiles used in the DCO Application were adopted.

7.3.3 CAA cargo volumes were received from GAL and showed that in 2022, cargo volumes were approximately 45% of volumes in 2016. For the sensitivity testing of 2029 onwards the cargo volumes used in the DCO Application were retained.

7.3.4 The National Travel Survey (NTS) was used to calculate highway factors to apply to the reference highway demand matrices and capture the impacts of COVID-19.

7.3.5 The DfT Rail COVID Forecasting Tool v19.4 was used to calculate factors for demand on the rail network in both the 2023 forecast model and subsequent forecasts for the sensitivity tests.

7.4. Forecasting methodology and assumptions

7.4.1 For this work the input assumptions were reviewed and amended with updates to key datasets underpinning the modelling (RTF18 updated to NRTP22, NTEM v7.2 updated to NTEM v8 and TAG Databook v1.17 updated to v1.21).

7.4.2 The development uncertainty log was reviewed to reflect any changes to large developments in the forecasts. The transport scheme uncertainty log was reviewed in the building of the 2023 forecast model, with minor changes to local schemes and updates to the following key strategic schemes: M25 J10-16 Smart Motorway Programme no longer included, Lower Thames Crossing opening delayed from 2029 to 2032, and A27 Arundel Bypass now included.

7.4.3 The public transport timetable in the 2023 forecast model reflects the timetable in operation at the time. For the future year forecasts a 2019-based timetable has been adopted (with known upgrades added) as this reflects a deliverable timetable at a point when rail demand was higher than in 2023.

7.5. 2023 model results

7.5.1 The 2023 forecast model was run to make sure the adjustments made to the forecast models are appropriate and proportionate in the context of the TAG M4 guidance.

7.5.2 Comparisons with the observed and modelled flows in 2023 showed that the 2023 forecast model slightly underestimates 2023 flows. The 2023 forecast model was also assessed against the original 2016 journey time data and showed logical variability.

7.5.3 Observed public transport data suggested that the modelled entries and exits at the station in the 2023 rail model forecast were generally higher than the May 2023 observed gateline counts at Gatwick Airport.

7.5.4 The 2023 model has achieved a reasonable replication of the observed air passenger public transport mode share of 41.9% in June 2023 and 44.7% annually compared to the observed 42.6% in June 2023 and 45.7% in 2023.

7.6. Sensitivity testing results

7.6.1 The reference case demand shows that highway demand would be 14% lower by 2047 than forecast in the DCO Application at a 24-hour level. Reference case rail demand is projected to be 15% lower by 2047 at a 24-hour level than forecast in the DCO Application.

7.6.2 The post-VDM demand shows that the impact the VDM has on highway demand is small. The post-VDM rail demand is slightly higher than pre-VDM.

7.6.3 All of the models converge in line with the guidance in TAG.

7.6.4 Sustainable transport mode shares are seen to drop slightly in the with Project sensitivity test as a consequence of the lower total highway demand and reduced congestion and this is considered a reasonable response from the sensitivity test model. Nevertheless, GAL is still committing to achieving the mode share commitments set out in ES Appendix 5.4.1: Surface Access Commitments [APP-090] and to using the range of measures and initiatives set out in that document, varying or amending their application as necessary to achieve the committed mode shares.

7.6.5 Road traffic volumes generally reduce across the network as would be expected given the demand reductions applied. There are some localised increases in flows shown in the future baseline and with Project sensitivity tests as a consequence of the changes in highway infrastructure in certain areas and the impacts of rerouting owing to reduced congestion releasing capacity at pinch points. The with Project flow increases follow a similar pattern to that presented in the DCO Application.

7.6.6 The magnitude of impact analysis shows, that whilst total flows have reduced in general, there are some new nodes identified as experiencing impacts in the sensitivity tests, and some nodes experiencing impacts in more time periods than indicated in the DCO Application. The locations of impact are similar to that presented in the DCO Application and overall the number of locations with impacts is lower than forecast in the DCO Application.

7.6.7 Forecast journey times were reviewed compared to those presented in the DCO Application. Most routes see a reduction in journey time in the sensitivity tests as a consequence of the lower traffic flows and resultant reductions in delays.

7.6.8 A comparison of flows on the M23 Spur corridor, a similar extent covered by the VISSIM model used to assess the operation of the local road network, between the DCO Application and the sensitivity models has been undertaken. This shows that total entry flows in the morning and evening peak periods are lower in the sensitivity testing than in the DCO Application. The flow changes are small and indicate that the analysis presented in the DCO Application, particularly the VISSIM modelling, remains appropriate.

7.6.9 Rail crowding results, based on Seated Load Factors, were reviewed and show very similar patterns of rail crowding to the DCO Application. In the future baseline sensitivity crowding generally reduces as a consequence of lower demand, although there are some areas where crowding increases due to the change in timetable between the DCO Application and the sensitivity tests, although those changes still show spare capacity on the network. The impact of the Project however is largely the same as in the DCO Application with limited impact on overall crowding levels. A key metric, standing passengers per carriage, was also reviewed which shows a reduction in the forecast number of standing passengers in the sensitivity testing compared to the DCO Application.

7.6.10 Bus and coach demand was reviewed and shows similar numbers to the DCO Application, albeit marginally lower as expected given the small reduction in public transport mode shares.

7.6.11 Gatwick Airport station entry and exit flows were compared between the DCO Application and the sensitivity test. These show small reductions and therefore demonstrate that the DCO Application is robust.

7.6.12 For completeness, GAL is also considering the outputs of this post-Covid sensitivity test in the context of those topics in the Environmental Statement which rely upon the transport modelling. GAL will provide the ExA with further information on this at the earliest opportunity in the Examination.

8 Glossary

Term	Description
AADT	Annual Average Daily Traffic
AM	Morning peak (AM1: 07:00-08:00, AM2: 08:00-09:00)
AoDM	Area of Detailed Modelling
CA	Car Available
CAA	Civil Aviation Authority
DCO	Development Consent Order
DfT	Department for Transport
ESCC	East Sussex County Council
ExA	Examining Authority
HGV	Heavy Goods Vehicle
IP	Interpeak (09:00-16:00)
GDP	Gross Domestic Product
GSAM	Gatwick Surface Access Model
GTR	Govia Thameslink Railway
HB	Home Based
LGV	Light Goods Vehicle
NCA	No Car Available
NHB	Non Home Based
NRTP	National Road Traffic Projections
NTEM	National Trip End Model
NTS	National Travel Survey
NUKB	Non UK Business
NUKL	Non UK Leisure
OP1	Off peak 1 (18:00-00:00)
OP2	Off peak 2 (00:00-04:00)
OP3	Off peak 3 (04:00-07:00)
TAG	Transport Appraisal Guidance
TOC	Train Operating Company
pax	Passengers
PEIR	Preliminary Environmental Information Report
PM	Evening peak (16:00-18:00)
PPK	Pence per kilometer
PPM	Pence per minute
RPI	Retail Price Index
RTF	Road Traffic Forecasts
SCC	Surrey County Council
SRN	Strategic Road Network
UKB	UK Business
UKL	UK Leisure
V/C	Volume to capacity

VDM	Variable Demand Model
VOC	Vehicle Operating Costs
WSCC	West Sussex County Council