Local Impact Report
Lower Thames Crossing

Medway Council

Planning Inspectorate Scheme Reference: TR010032
Unique Interested Party Reference: LTC-SP097

Versions

Version	Date
1	27 June 2023
2	7 July 2023
3	14 July 2023

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Abbreviations

AQS	Air Quality Strategy
DCO	Development Consent Order
DfT	Department for Transport
ExA	Examining Authority
IDP	Infrastructure Delivery Plan
LIR	Local Impact Report
LoS	Level of Service
LTAM	Lower Thames Area Model
MAM	Medway Aimsun Model
NIA	Noise Important Areas
NPPF	National Planning Policy Framework
NTEM	National Trip End Model
PCU	Passenger Car Units
SAC	Special Area of Conservation
SoS	Secretary of State
SPA	Special Protection Area
V/C	Volume to capacity ratios
WNIMMP	Wider Network Impacts Management and Monitoring Plan

Executive Summary

This document presents a Local Impact Report on behalf of Medway Council. It sets out the potential impacts of the Lower Thames Crossing on the Medway unitary authority area.

The potential impacts are presented in terms of their positive, neutral and negative effects during construction and operation.

The potential impacts have been identified through engagement with the applicant and a review of the application itself. The potential impacts have also been informed by work commissioned by Medway Council.

The Lower Thames Crossing would divert traffic routing to/from the Channel Tunnel Terminal and the Port of Dover away from the Dartford Crossing. This would exacerbate the limited capacity – particularly via M2 junctions 1, 2 and 3 – and generate more traffic locally once travel across the River Thames becomes more attractive.

Some of the assessments to support the application are based on traffic modelling outputs. However, the traffic modelling does not reflect the spatial distribution of relevant planned development, particularly at Kingsnorth and the Isle of Grain. Furthermore, the traffic modelling assumes significantly fewer homes being built in future compared to what the local planning authority is required to plan for, therefore the traffic modelling does not reflect Medway's development needs. There is also a lack of certainty for local highway schemes that have been included in the traffic modelling.

Local highway schemes for mitigation have been identified; however, given reservations about the traffic modelling, Medway Council will rely on an assessment to support the emerging Local Plan to identify proportionate contributions due from National Highways.

Increased traffic flows, particularly on the A228 through Cuxton and Halling, would cause negative impacts on air quality, which would in turn cause negative impacts on ecological sites. Medway Council accepts the compensatory measures proposed to counteract effects on biodiversity that cannot be avoided or mitigated.

The selection of sites for the supply of materials and management of waste will be the responsibility of contractors and subject to contracts, therefore it is difficult to assess local impacts.

The socio-economic impacts indicate that the Lower Thames Crossing could benefit the local community by providing jobs during the construction phase, while also increasing the skill base of residents. Once the Lower Thames Crossing is open, most areas could see improvements in accessibility to jobs and workers, with the greatest improvements in Rochester, Gillingham and the Hoo Peninsula.

The actions and commitments required have been set out by topic.

1 Introduction

1.1 Definition, purpose and structure

1.1.1 A Local Impact Report (LIR) is defined in the Planning Act 2008 Section 60(3) as "a report in writing giving details of the likely impact of the proposed development on the authority's area (or any part of that area)."

1.1.2 This LIR is distinct from any representation to be made by Medway Council in the Examination; it does not consider the merits of the application or Medway Council's view on the proposed Lower Thames Crossing ('the Project'), a proposed road and bored tunnel beneath the River Thames to provide a new connection between Kent and Essex.

1.1.3 The Examining Authority (ExA) and the Secretary of State (SoS) must have regard to LIRs in the Examination process and in the decision to grant a Development Consent Order (DCO).

1.1.4 The purpose of a LIR is to make the ExA aware of the potential impacts of a proposed development with the benefit of local knowledge and evidence.

1.1.5 This document presents a LIR on behalf of Medway Council. It sets out the potential impacts of the Project on the Medway unitary authority area.

1.1.6 The potential impacts are presented in terms of their positive, neutral and negative effects during construction and operation. However, it is for the ExA to conduct a balancing exercise of the potential impacts.

1.1.7 The potential impacts have been identified through engagement with the applicant and a review of the application itself. This LIR also draws on work commissioned by Medway Council.

1.1.8 The following topics provide a structure for this LIR:

- transport baseline;
- relevant planned development;
- traffic and transport;
- noise and vibration;
- air quality;
- biodiversity;
- socio-economics; and
- material assets and waste.

1.1.9 Finally, this LIR will summarise the actions and commitments required.

1.2 Medway unitary authority area

1.2.1 Medway sits at the mouth of its great river on the north Kent estuarine coast, bordered by the Thames to the north and the Kent Downs to the south. The five historic towns linked by the A2 form a complex urban conurbation, which retains the distinct identities of the individual towns. The urban area is surrounded by a network of villages on the Hoo Peninsula and the Medway Valley, alongside marshes and mudflats, wooded hills, productive farmland and strategic energy and minerals operations built up around the wharves. Much of the countryside and estuary is of international importance

for its environmental qualities, including designated Special Protection Areas, Sites of Special Scientific Interest, and the Kent Downs Area of Outstanding Beauty. Land to the west of Medway forms part of the London metropolitan Green Belt.

1.2.2 The River Medway is a key asset, providing a strong sense of place and identity. However, the river bisects the area and movement is constrained by four crossings. The severance caused by the river, established commuting flow patterns and travel behaviour, the legacy of post-war development designed for the car, generous car parking provision in dense employment areas and the existing public transport offer make for a challenging environment in which to accommodate Medway's development needs. Medway's location in north Kent gives rise to additional opportunities and challenges associated with wider growth, such as the Project.

1.2.3 Medway Council is a neighbouring authority in respect of the application and as such is a category 'B' local authority under section 43(1) of the Planning Act 2008. Medway Council is the local planning, transport, minerals and waste authority for the unitary authority area.

1.3 Medway's development plan

1.3.1 Medway's development plan comprises saved policies from the following documents:

- Medway Local Plan 2003
- Kent Waste Local Plan 1998
- Kent Minerals Local Plan 1997: Chalk and Clay
- Kent Minerals Local Plan 1997: Oil and Gas
- Kent Minerals Local Plan 1993: Construction Aggregates Written Statement
- Kent Minerals Subject Plan 1986: Brickearth Written Statement

1.3.2 The Medway Local Plan 2003 contains two policies of relevance to the Project, i.e. Policy S12 (Kingsnorth) and Policy S13 (Isle of Grain). Kingsnorth and Grain are among the largest sites for economic growth in the Thames Estuary and the wider region.

1.3.3 Policy S12 designated a 219 ha site at Kingsnorth for industrial, storage or distribution and Sui Generis uses (B1c, B2, B8 prior to 1 September 2020). The policy provides for the expansion or relocation of businesses in the urban area.

1.3.4 Policy S13 designated a 630 ha site on the Isle of Grain for port activities and industrial, storage or distribution and Sui Generis uses (B1c, B2, B8 prior to 1 September 2020). The site benefits from a railhead and deep-water berths.

1.3.5 Medway Council is preparing a new Local Plan for the period up to 2040. The next stages of plan-making comprise:

- Regulation 18 consultation in Autumn 2023.
- Regulation 19 publication of draft Local Plan in early 2024.
- Submission of draft Local Plan in Summer 2024.
- Adoption (determined on outcome of Examination) in Autumn 2025.

2 Transport Baseline

2.1 Connectivity

2.1.1 Medway benefits from strategic transport connectivity, as shown in Figure 1. M2 junctions 2 and 4 provide direct access to the Strategic Road Network. The Major Road Network, comprising the A2, A228, A278 and A289, spans the Medway area. The next major junctions and corridors include M2 junction 1 to the west and junction 5 to the east, with junction 3 to the south for the A229 (Bluebell Hill).

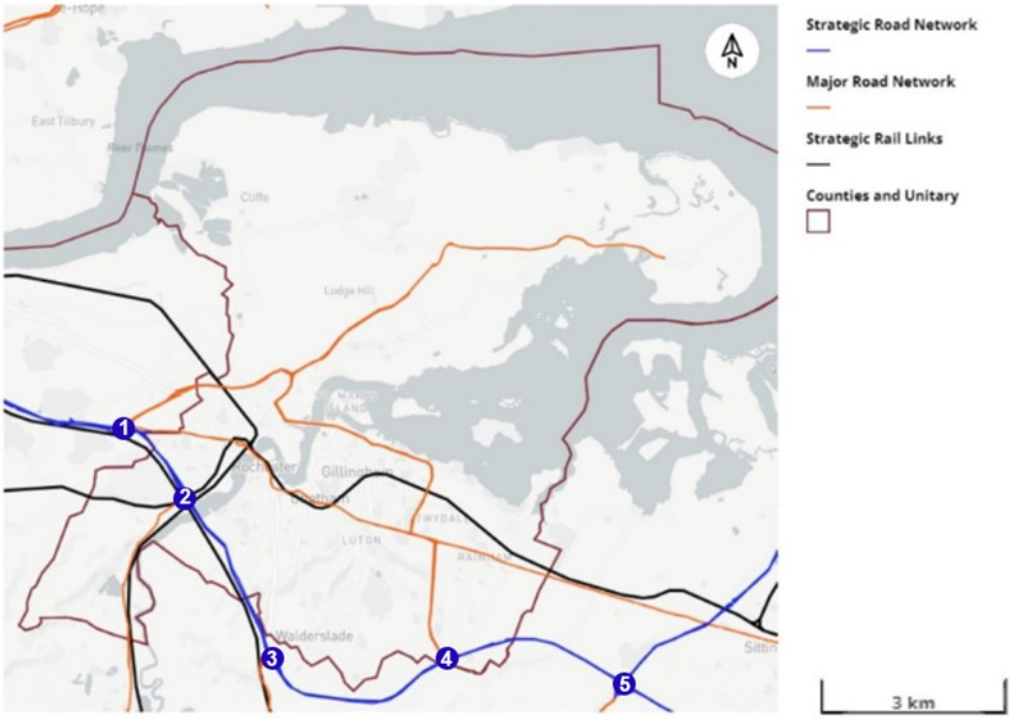

Figure 1: Major road and rail links

Data source: TfSE ProjectView

2.1.2 Medway is served by seven railway stations providing main line, High Speed and ThamesLink services.

2.1.3 The Grain Branch continues to facilitate the import/export of aggregates, along with rail freight associated with the aviation fuel storage depot and Thamesport activity.

2.1.4 The following wharves and rail depots facilitate the importation of and distribution of minerals:

- Grain Terminal, Isle of Grain (wharf and rail depot).
- North Sea Terminal, Cliffe.
- Euro Wharf, Frindsbury.
- London Thamesport, Isle of Grain.

2.2 Commuting flows

2.2.1 At a broad level, visualising commuting flows can help to provide an understanding of journey origins and destinations.

2.2.2 The most comprehensive commuting flow data are derived from the 2011 Census (UK Data Service). The flows represent individuals commuting from their usual residence to their place of work, i.e. origin and destination on Census day 2011.

2.2.3 The following limitations should be noted:

- Commuting flows would obscure multi-purpose trips, e.g. driving to work while taking children to school.
- Some commuting flows will be undertaken outside peak travel periods.
- A shorter part of an individual's commute may be undertaken by another mode, e.g. driving to the train station.

2.2.4 In total, 116,912 people commuted from Medway to their workplace. Note this excludes almost 10,215 people who were unlikely to commute during the daily peak periods, i.e. mainly work at or from home (9,994), work at offshore installations (112) and work outside the UK (109).

2.2.5 Having also excluded people who have no fixed workplace, marginally more people commuted from Medway to workplaces located within Medway (53,629), compared to workplaces located outside Medway (50,528). However, a significant number of people commuting from Medway had no fixed workplace (12,755).

2.2.6 Outward commuting flows were to the wider South East (29%) and Greater London (17%). The flows to other regions were small, such as the East of England, including Essex (2%).

2.2.7 Figure 2 presents all out commuting (i.e. all modes) from three central and three peripheral locations in Medway. The diagrams are intended to demonstrate the wide distribution and the volume of flows.

2.2.8 Figure 2 shows that the predominant flow from both central and peripheral locations is to the west of Medway. This is likely to intensify due to the Project.

2.2.9 Figure 2 also shows a high concentration of internal flows (i.e. within Medway), some of which were for short distances. Further analysis indicates that a high proportion of these short distance flows were by car/van. Locations of high employment density in Medway provide ample car parking.

Method of travel to work

2.2.10 Figures 3 to 6 present the 2011 Census data for the method of travel to work. These figures show that:

- Peripheral areas were more likely to be car dependent than central areas.
- Travel by bus/minibus/coach was more evenly distributed.
- Travel by train was more pronounced near stations.
- Living in central areas allowed for more travel on foot.

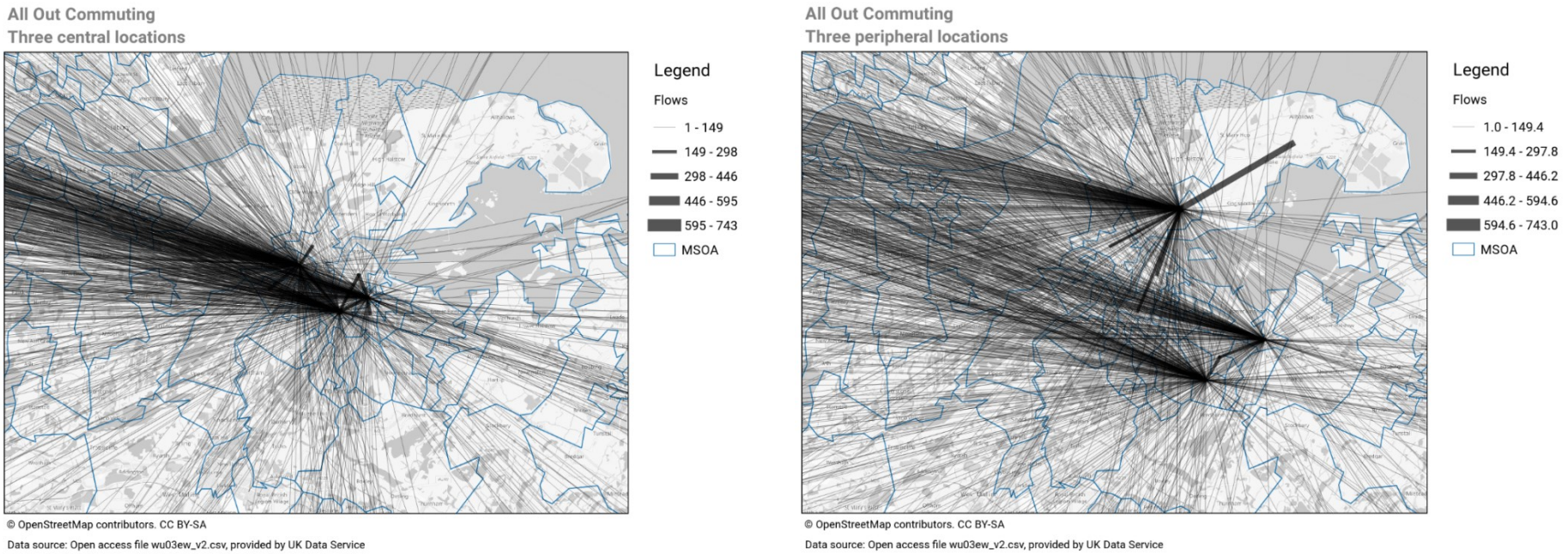

Figure 2: Out commuting flows

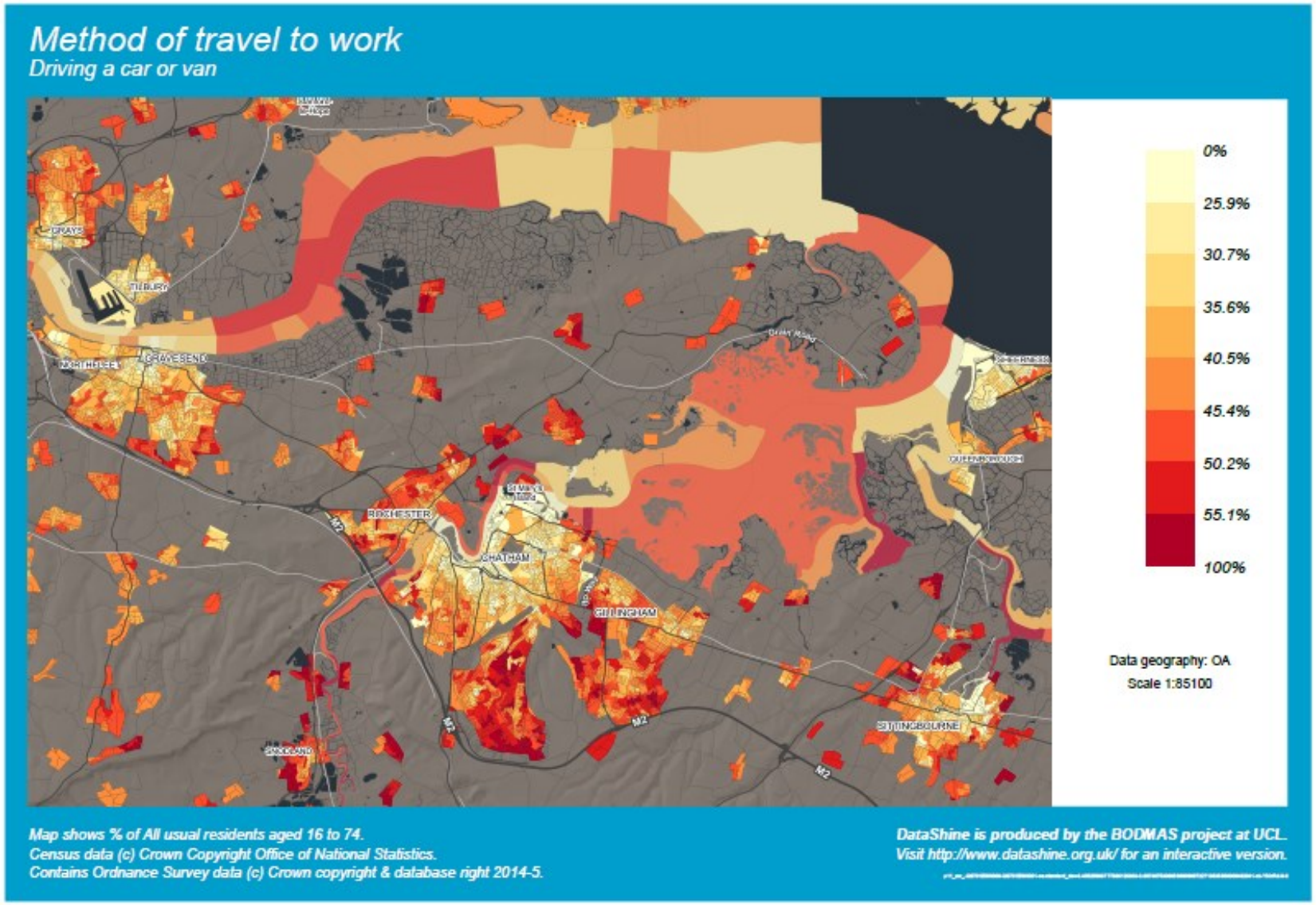

Figure 3: Method of travel to work - Driving a car or van

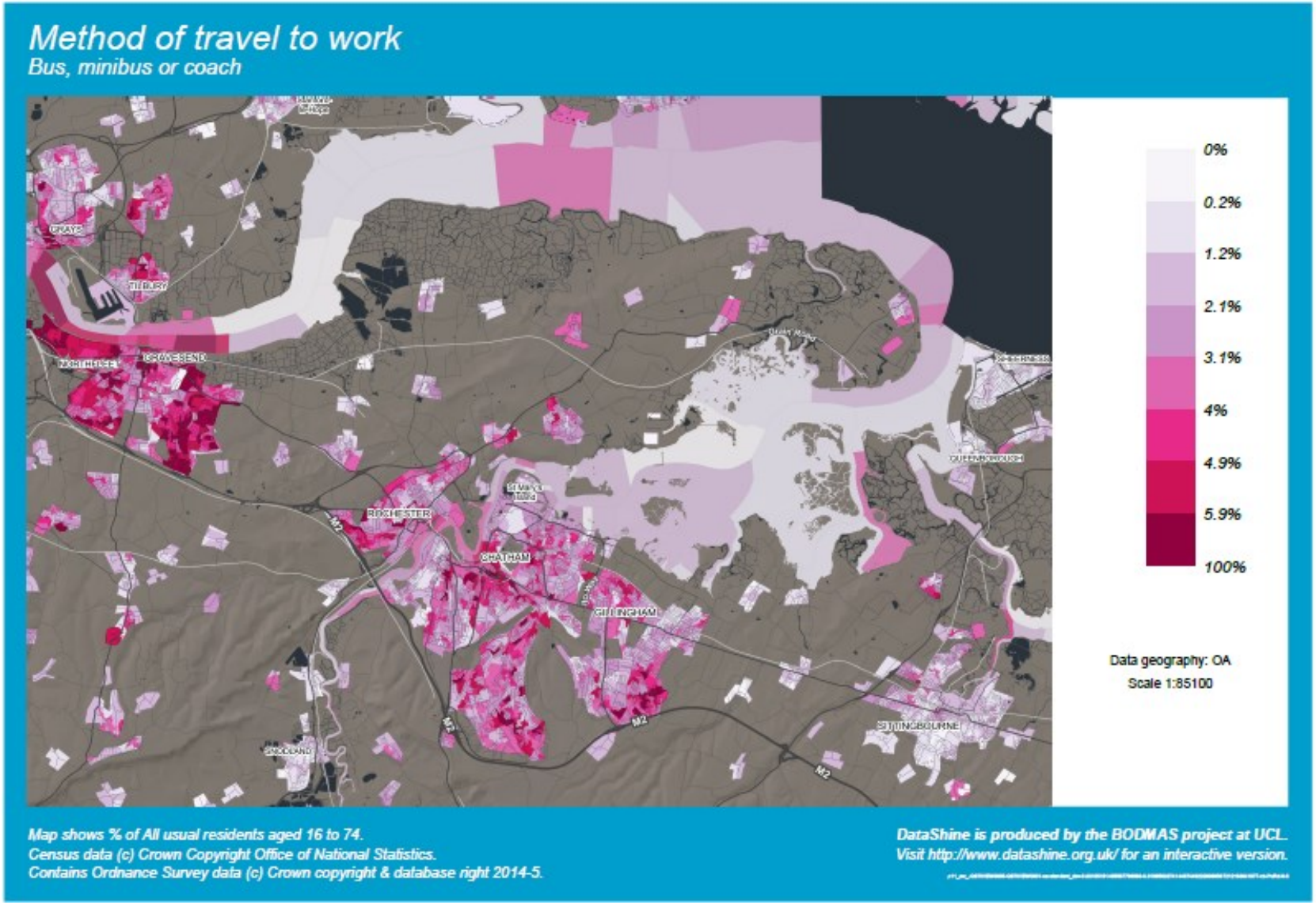

Figure 4: Method of travel to work - Bus, minibus or coach

Figure 5: Method of travel to work - Train

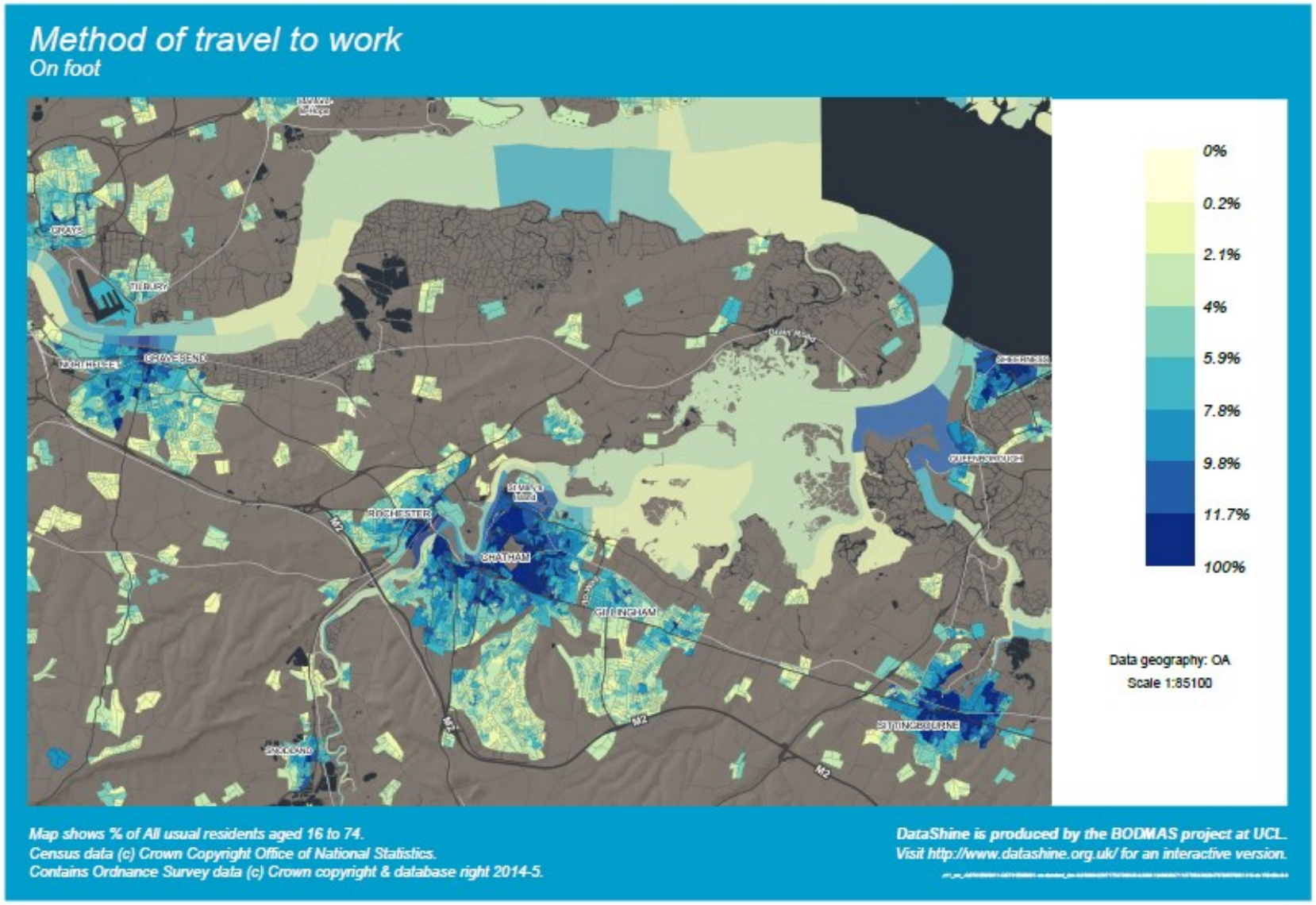

Figure 6: Method of travel to work - On foot

2.3 Capacity

Road network

2.3.1 The capacity of the road network and the likely impacts of future development have been assessed in a traffic model. Medway Council commissioned the Medway Aimsun Model (MAM) in 2016.

2.3.2 The model base year is 2016. It covers the AM (08:00 to 09:00) and PM (17:00 to 18:00) peak hours, as well as an inter-peak hour (13:00 to 14:00), which can be taken to be representative of the whole inter-peak period (10:00 to 16:00).

2.3.3 Potential congestion hotspots have been identified through an assessment of volume to capacity ratios (V/C) of junctions and these are presented as plots in Figure 7 and Figure 8.

2.3.4 Turns that have a V/C of greater than 100% (i.e. are operating over absolute capacity) are plotted in red, those that have a V/C between 90% and 100% (i.e. are operating over practical capacity, but below absolute capacity) are plotted in orange and those that have a V/C between 80% and 90% (i.e. are operating below, but close to, practical capacity) are plotted in yellow.

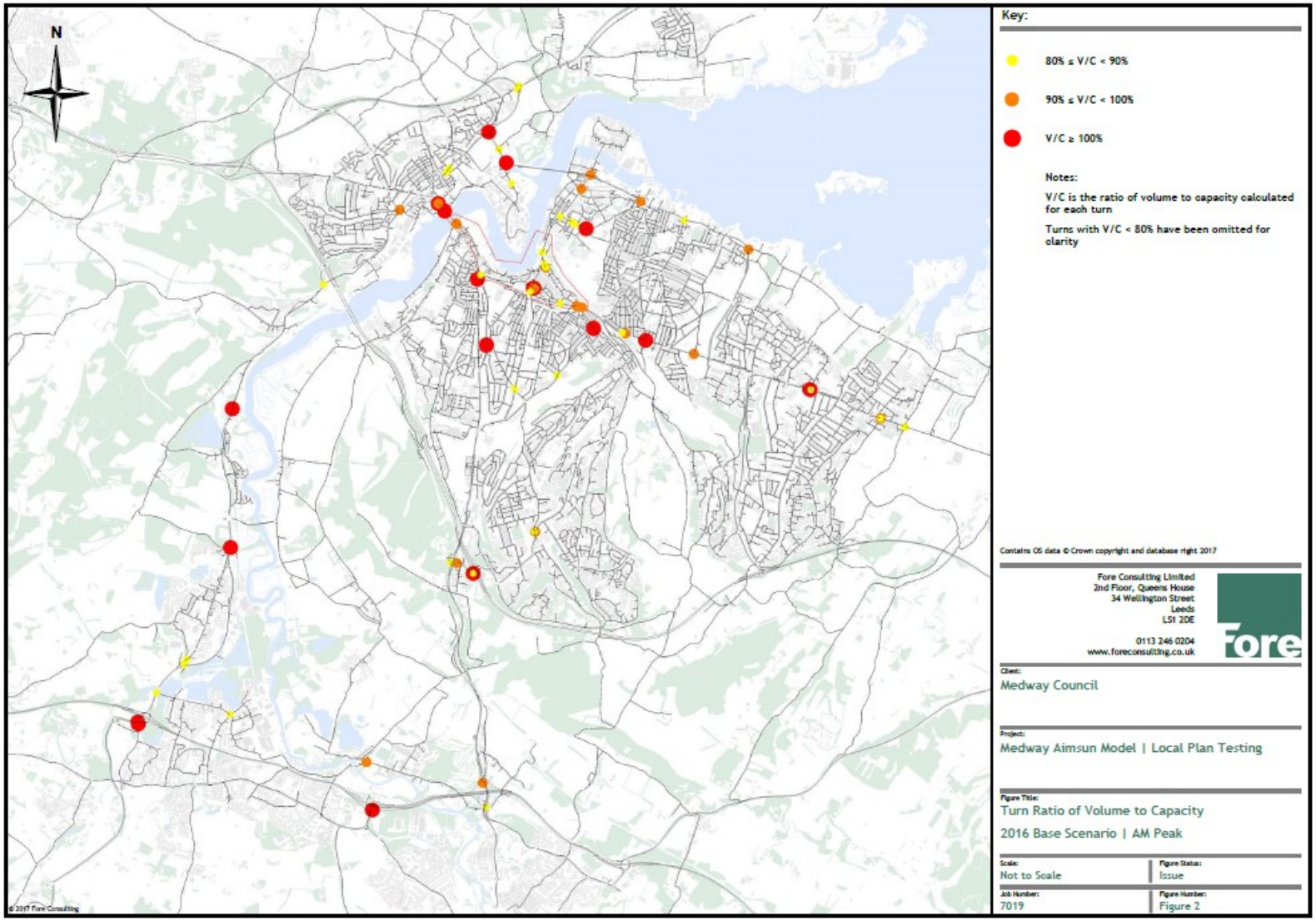

Figure 7: 2016 Base Year (AM Peak)

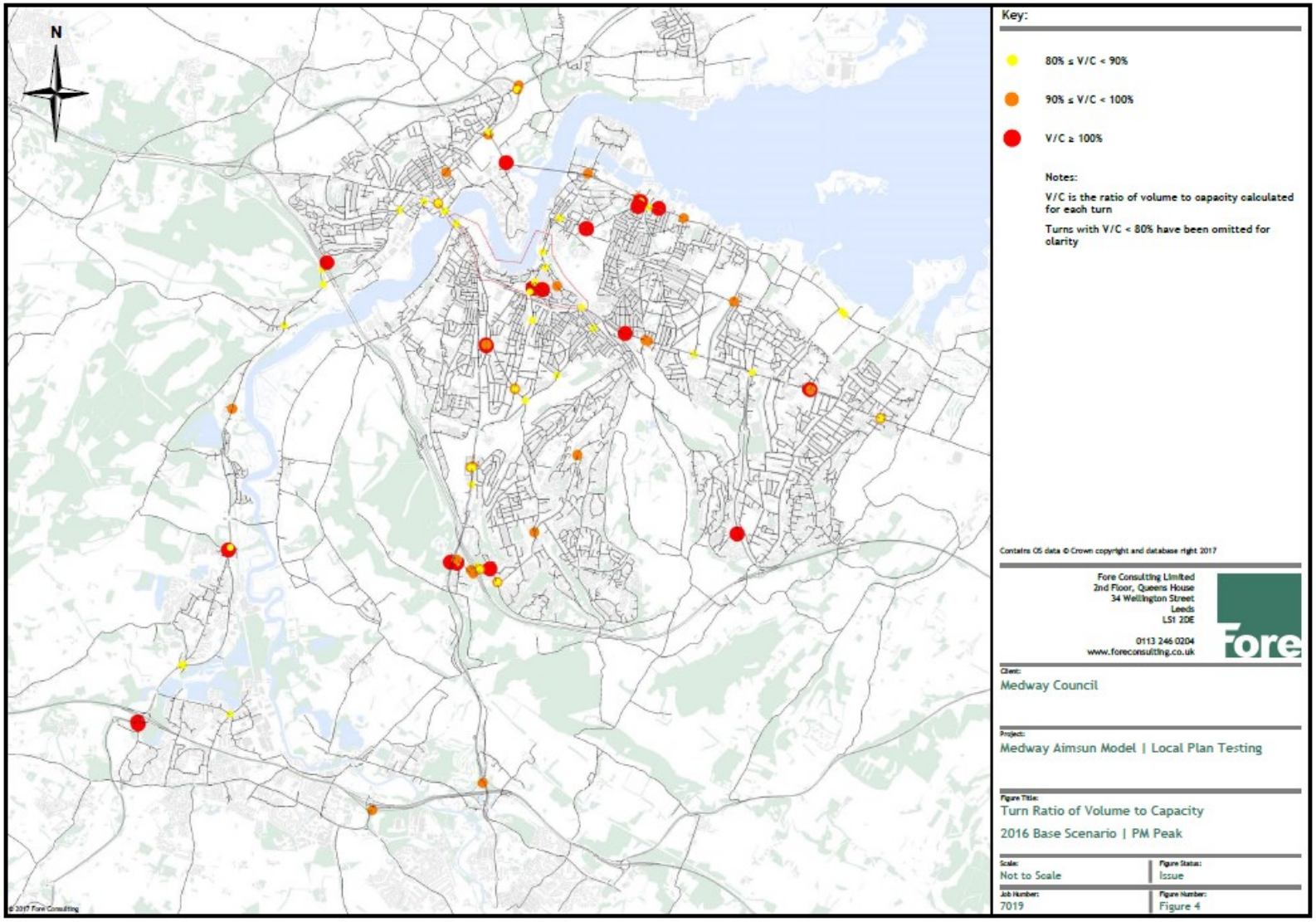

Figure 8: 2016 Base Year (PM Peak)

2.3.5 Figure 7 and Figure 8 highlight several junctions through the A2, A228 (through Cuxton and Halling) and A289 corridors, along with junctions of or close to M2 junctions 2 and 3, that were operating over absolute capacity in the 2016 base year. Four Elms Roundabout is shown in the northern extent of Figure 7 and Figure 8; it was operating below absolute capacity in the evening peak.

Remote and flexible working

2.3.6 Remote and flexible working has been increasing. The Office for National Statistics has reported a 12% increase in flexible working between 2012 and 2016, while a more recent survey by the Trades Union Congress showed that the amount of people working remotely has increased by almost 250,000 in the last decade.

2.3.7 It is conceivable that the tendency to work flexibly or remotely could accelerate following the implementation of virtual meetings, etc. during the enforced lockdown measures during the pandemic. This could bring about permanent changes in working arrangements and travel behaviour, which in turn could relieve road capacity.

Rail commuter services

2.3.8 Network Rail's Kent Route Study, published in 2018, provides a strategy for the rail network to 2024 and 2044. The study suggests that, by 2024, the level of demand will have a disproportionate impact on passengers travelling from Medway.

2.3.9 Medway's railway stations will be the first point on metro services to London Bridge and Victoria where up to 75% of seats will be taken. For High Speed 1 services, the first instance of standing will occur at Gillingham, with up to 60% of standing space used thereafter. Therefore, during particularly busy periods, or because of incidents impacting on services, passengers travelling from Medway are more likely to stand for longer than passengers travelling from any other station on these routes. These passengers are also likely to pay higher fares compared to people travelling from stations closer to London.

Bus services

2.3.10 Figure 9 shows that bus passenger trips per head in Medway are low compared to similar areas.

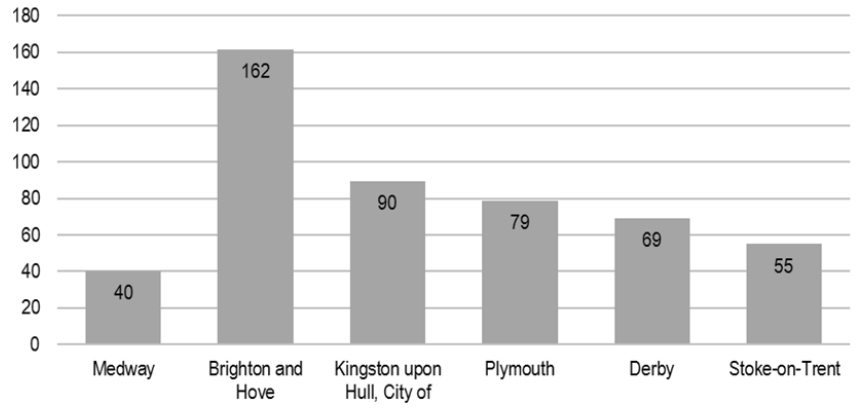

Figure 9: Bus passenger trips per head (2011/12)

2.3.11 Figure 9 suggests that there is likely to be suppressed demand for travel by bus in Medway.

2.3.12 Research has highlighted several factors to help explain levels of bus use, such as the proportion of people travelling 2-20km to work.[1] However, analysis of commuting flows has revealed the high proportion of flows within Medway by car/van. Locations of high employment density in Medway provide ample car parking, while travel by bus may not be practical for commuters required to carry equipment and/or take a commercial vehicle home.

2.3.13 The most recent National Highway and Transport Public Satisfaction Survey found that satisfaction with the bus service in Medway is average overall. However, satisfaction is below national levels for fares, punctuality, accessibility and cleanliness.[2]

2.3.14 The Bus Service Improvement Plan for Medway describes how the local transport authority will use an Enhanced Partnership with bus operators to achieve the aim and the objectives of the government's National Bus Strategy.

2.3.15 It is important to recognise that travel choice is limited in peripheral areas that cannot support viable, frequent bus services and this is a factor in car dependency. Piecemeal development in such areas may not present practical opportunities to maximise bus use, although the advent of new technologies could transform bus services.

2.4 Accessibility

2.4.1 Visualising walking catchments can help to provide an understanding of accessibility of transport nodes. This can help to facilitate integrated transport solutions.

2.4.2 A typical walking catchment for railway stations is up to 800 metres / 10 minutes' walk. The walking catchments for railway stations in Figure 10 are based on the professional body's latest guidance.[3]

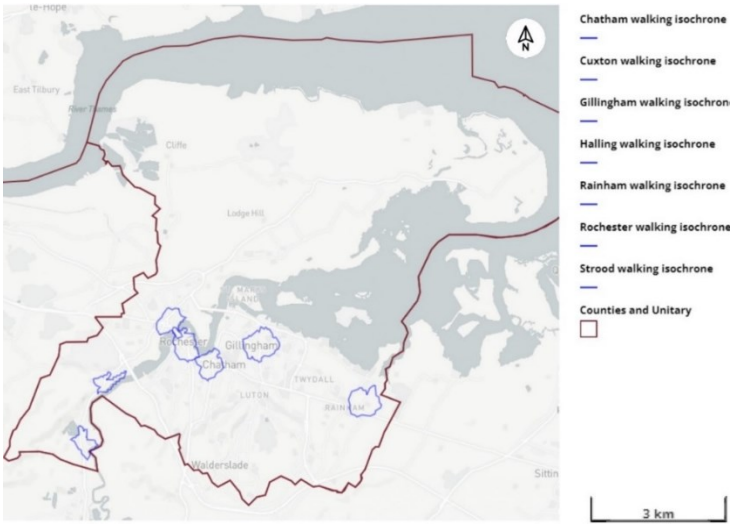

Figure 10: Walking catchments for railway stations

Data source: TfSE ProjectView

2.4.3 The walking catchments for railway stations cover central urban areas, with Cuxton and Halling served by the Medway Valley Line. Clearly train stations can be accessed by other transport modes, e.g. private car, taxi, bus, bicycle and new forms of personal mobility.

2.4.4 Medway is also served by nine bus and coach operators. Figure 11 shows the walking catchment for bus stops served by high frequency services, i.e. 20 minutes. The walking catchment is based on the professional body's latest guidance.[4]

Figure 11: Walking catchments for high frequency bus services

Data source: Department for Transport, National Public Transport Access Nodes

2.4.5 The walking catchments for high frequency bus services cover areas of central urban areas and Hoo St Werburgh. Clearly bus services are not fixed and could be adapted to meet future demand.

2.4.6 In summary, high frequency public transport is accessible on foot in the town centres.

3 Relevant Planned Development

3.1 Overview

3.1.1 The applicant's Transport Forecasting Package describes how the model has been used to forecast the number of vehicles using the road network in the future, where they are travelling to/from and the journey times on different parts of the road network.

3.1.2 The Uncertainty Log is a list of planning applications (as of 30 September 2021). It is presented at Annex A, Tables A.1 and A.2 of the Combined Modelling and Appraisal Report - Appendix C - Transport Forecasting Package Annexes.

3.1.3 The following minimum size criteria is set out in paragraph 4.1.12 of the Combined Modelling and Appraisal Report - Appendix C - Transport Forecasting Package:

- Residential: 200 dwellings
- B1 Office – 10,000m² gross floor area
- B2 Industrial – 1,500m² gross floor area
- B8 Warehousing – 5,000m² gross floor area
- All other land use classes – 1,500m² gross floor area

3.1.4 The Uncertainty Log is used to refine the spatial distribution of planned development in the core scenario. Outputs from the core scenario form the basis of assessments to support the application.

3.1.5 The certainty status is set out in Table 4.1 of the Combined Modelling and Appraisal Report - Appendix C - Transport Forecasting Package, which reproduces Table A2 from Transport Appraisal Guidance Unit M4. Classification by certainty status provides guidance as to whether a planning application should be included in the core scenario.

3.2 Commentary

3.2.1 Table A.1 of the Uncertainty Log has been reproduced (for developments within Medway) at Appendix A, with Medway Council officers' comments appended as the last column. In total, eight planning applications amounting to 1,585 homes, along with 16 other planning applications amounting to 231,388 sqm of non-residential floorspace, should not have been included in the core scenario or should have assumed a lower quantity of development.

3.2.2 Furthermore, 10 planning applications have been identified that are missing from the Uncertainty Log. These planning applications, shown at Appendix B, meet the minimum size criteria as of 30 September 2021. In total, one planning application for 200 homes, along with eight planning applications amounting to 645,914 sqm non-residential floorspace, should have been included in the core scenario. Note that almost all of the missing non-residential floorspace is associated with planning applications for development located on the Hoo Peninsula.

3.2.3 The Uncertainty Log also shows five highway schemes that have been included in the core scenario. Table A.2 of the Uncertainty Log has been reproduced (for developments within Medway) at Appendix C, with Medway Council officers' comments appended as the last column. The five highway schemes should not have been included in the core scenario due to a lack of certainty.

3.2.4 The core scenario is therefore based on a surplus of 1,385 homes and a deficit of 414,526 sqm non-residential floorspace in Medway's development pipeline. Meanwhile, there is a lack of certainty for the five highway schemes that have been included in the core scenario.

3.2.5 Paragraph 4.1.13 of the Combined Modelling and Appraisal Report - Appendix C - Transport Forecasting Package states that:

> *"In addition, two proposed developments that met the above criteria for inclusion have not been added to the Uncertainty Log. They have been excluded on the basis that the development proposals do not include necessary highway interventions that would maintain the integrity of the road network. The developments are:*
>
> *a. Highsted Park (21/503906/EIOUT and 21/503914/EIOUT)*
>
> *b. MedwayOne (MC/21/0979)"*

3.2.6 Highsted Park is proposed in the neighbouring borough of Swale. The two outline applications are for northern and southern sites. In total, the proposed developments comprise 8,400 homes and 172,200 sqm of commercial floorspace.

3.2.7 One of the two planning applications is for MedwayOne, located at Kingsnorth, which is shown in the first row of Appendix B.

Kingsnorth and Isle of Grain

3.2.8 As noted above at 1.3, the Medway Local Plan 2003 contains two policies of relevance, i.e. Policy S12 (Kingsnorth) and Policy S13 (Isle of Grain).

3.2.9 London Medway Commercial Park, located at Kingsnorth, was granted outline planning permission in 2009. There have been many reserved matters applications for the individual plots, such as Plot 1a which was completed in 2019 to accommodate Amazon's distribution warehouse. An 8,925 sqm extension to Damhead Creek Power Station has been implemented, but it is not under construction. More recently, Medway Council's Planning Committee resolved to grant outline planning permission for MedwayOne, a 324,450 sqm development of employment floorspace (Class E), on the former Kingsnorth Power Station.

3.2.10 Grain Business Park was granted outline planning permission in 2009. In 2015, a reserved matters application took account of a revised masterplan which reduced the maximum permitted floorspace to 298,383 sqm. A subsequent reserved matters application was also granted in 2015 for the first phase of 16,770 sqm. The residual permitted floorspace is therefore 282,203 sqm. In February 2020, a Lawful Development Certificate was approved confirming that the outline permission had commenced. The landowner, National Grid, intends to realise the full potential of the Isle of

Grain site. In addition, a 2,686 sqm warehouse building for Pacadar UK was permitted in December 2022 and is under construction.

Medway's development needs

3.2.11 Medway's annual housing need, based on the standard method, is 1,667. The new Local Plan will provide for 28,339 homes up to 2040. The most recent Employment Land Needs Assessment identified a need for at least 62 ha of employment land.

3.2.12 Growth in the number of trips in Medway is based on the forecasts produced by the Department for Transport (DfT) in the National Trip End Model (NTEM) and published as TEMPro 7.2. This is supplemented by information from the Uncertainty Log to refine the spatial distribution of growth. However, the total number of trips for each forecast year in the LTAM is constrained to the NTEM. This comprises the core scenario which forms the basis of assessments to support the application.

3.2.13 A letter received from the applicant sets out a method to show housing growth in Medway assumed in the LTAM. The letter is presented at Appendix D. The letter clarifies that the LTAM assumes 20,532 and 26,923 homes by 2036 and 2044 respectively.

3.2.14 The new Local Plan period is up to 2040. TEMPro 7.2 shows that the number of households formed from the base year (2016) to the future year (2040) is 23,728, i.e. 4,611 fewer homes compared to the standard method.

3.2.15 The project design year is 2045. TEMPro 7.2 shows that the number of households formed from the base year (2016) to the future year (2045) is 27,721, i.e. 8,953 fewer homes compared to the standard method.

3.2.16 The applicant has devised a high growth scenario, but at the time of writing is it unclear to what extent this aligns with Medway's development needs.

3.2.17 In conclusion, the core scenario does not reflect relevant planned development or Medway's development needs.

4 Traffic and Transport

4.1 Overview

Applicant's assessment

4.1.1 The Transport Assessment sets out the forecast transport impacts that result from the Project during both construction and operation. More information on traffic and transport information can be found in the following application documents:

- Combined Modelling and Appraisal Report
- Community Impact Report
- Wider Network Impacts Management and Monitoring Plan
- Framework Construction Travel Plan
- Outline Management Plan for Construction

4.1.2 The Project would divert traffic routing to/from the Channel Tunnel Terminal and the Port of Dover away from the Dartford Crossing. This would exacerbate the limited capacity – particularly via M2 junctions 1, 2 and 3 – and generate more traffic locally once travel across the River Thames becomes more attractive. This is acknowledged in paragraph 7.5.8 of the Transport Assessment.

4.1.3 The forecasts in the Transport Assessment are provided as a range of measures of network performance, including change in flows, V/C, scale of impacts and journey times.

4.1.4 Only one journey time route is entirely within Medway, but other journey time routes are relevant to commuting flows.

Medway Council's assessment

4.1.5 Medway Council appointed a contractor to identify the local traffic impacts during operation and the need for mitigations. The method to identify the impacts was agreed with the Project team in advance. The contractor's technical notes are at Appendix E and F.

4.1.6 Traffic data from the LTAM was analysed in the MAM, which provides a more detailed local highway network.

4.1.7 Four scenarios were assessed:

1. LTAM Core without the Project
2. LTAM Core with the Project
3. New Local Plan without the Project
4. New Local Plan with the Project

4.1.8 The scenarios were forecasted in 2030 and 2037 to reflect the Project's opening year and the end of Medway Council's new Local Plan period respectively. More recent work on a new Local Plan has determined a plan period to 2040.

4.1.9 The New Local Plan scenarios were based on a spatial planning strategy which was withdrawn from Medway Council's Cabinet Meeting in October

2021. This LIR will rely on the LTAM Core scenarios, rather than the New Local Plan scenarios, given the early stage of plan-making. Separately, Medway Council has commissioned a new traffic model – an update of the Kent Strategic Transport Model (Gravesham cordon) – and an assessment to inform plan-making, including a 'with Project scenario'.

4.1.10 The outputs are set out in terms of Level of Service (LoS), journey times and other statistics. The LoS metric is graded A to F, with A described as 'free flow' and F 'queues fail to clear'. LoS grade F can be taken as a severe impact.

Construction impacts

4.1.11 The Project's construction programme would generate temporary vehicle movements associated with the works, as well as changes to existing traffic flows through the introduction of temporary traffic management across the road network. The construction phase would require the use of traffic management measures, such as narrow lanes (in and around M2 junction 1) and traffic lights to control traffic through contraflows.

4.1.12 The applicant has identified 11 construction phases from early 2025 to late 2030.

4.1.13 As part of the applicant's Transport Assessment, a reasonable worst case is based on assumptions for vehicles associated with the construction of the Project, such as deliveries from external suppliers and allowing for an additional 20% for heavy goods vehicles.

4.1.14 Plate 8.25 of the Transport Assessment shows an external supplier location on the Hoo Peninsula, labelled 'East of South Portal', in the approximate location of Kingsnorth. This could relate to operations for the supply of recycled concrete, asphalt and aggregates (OCL Regeneration) and for concrete structures (Pacadar UK).

4.1.15 The application was submitted to the Planning Inspectorate in November 2022. The assessments supporting the application anticipated construction starting in 2025, with the Project opening in 2030, assuming development consent is granted in 2024. However, on 9 March 2023, a Written Ministerial Statement announced a two-year rephasing to the construction funding for capital works.

4.2 Impacts

Positive – Construction	Reference	Positive – Operation	Reference
n/a	n/a	Journey time analysis for origins in either Rainham or Rochester to destinations in Essex showed a decrease across all time periods in 2030 and 2045. Journey time analysis for origins in Essex to destinations in either Rainham or Rochester showed a decrease across all time periods in 2030 and 2045.	APP-531, tables 1.4, 1.5, 1.6, 1.7, 1.8, 1.9 APP-532, tables 1.4, 1.5, 1.6, 1.7, 1.8, 1.9
n/a	n/a	Journey time analysis for route No.2 (M2 junction 4 to A2/A2018 Dartford town centre) showed a decrease in both directions across all scenarios and time periods in 2030. * M2 junction 4 LoS improves in the AM peak 2037.	APP-529, tables 7.11, 7.12, 7.13 * Medway Council's Assessment, Appendix E
n/a	n/a	Journey time analysis for route No.3 (A228 - M20 to Strood) showed a decrease in the northbound journey time in the core growth scenario PM peak in 2030. * Rochester Road (A228) / Bush Road junction LoS improves in the AM peak 2030. * Rochester Road (A228) / Bush Road junction LoS improves in the AM peak 2037.	APP-529, Table 7.13 * Medway Council's Assessment, Appendix E
n/a	n/a	Journey time analysis for route No.4 (A229 - M20 to Strood) showed decreases in the core growth scenario PM peak in 2030. * Bridgewood Roundabout (A229 / B2097) LoS improves in the PM peak 2030 and 2037.	APP-529, Table 7.13 * Medway Council's Assessment, Appendix E
Journey time analysis for route No.5 (A289 – Four Elms Roundabout to M2 junction 1) showed a 24% to 27% decrease eastbound in the PM peak for phases 6 to 9, i.e. April 2027 to March 2029.	APP-549, tables 8.54, 8.57, 8.60, 8.63	Journey time analysis for route No.5 (A289 – Four Elms Roundabout to M2 junction 1) showed a decrease westbound across all scenarios during the AM peak in 2030. Journey time analysis for route No.5 (A289 – Four Elms Roundabout to M2 junction 1) showed a decrease eastbound in the core growth scenario during the PM peak in 2030.	APP-529, tables 7.11, 7.13
Journey time analysis for route No.25 (A2 – Strood) showed a 5% decrease eastbound in the PM peak for phases 6 to 9, i.e. April 2027 to March 2029.	APP-549, tables 8.54, 8.57, 8.60, 8.63	Journey time analysis for route No.25 (A2 – Strood) showed a decrease westbound across all scenarios in the AM peak in 2030. Journey time analysis for route No.25 (A2 – Strood) showed a decrease eastbound across all scenarios in the inter-peak in 2030. Journey time analysis for route No.25 (A2 – Strood) showed a decrease in both directions in the core growth scenario PM peak in 2030.	APP-529, tables 7.11, 7.12, 7.13

n/a	n/a	There would be a reduction in the overall journey time of nearly four minutes for the 700 westbound in the morning peak.	APP-549, para 7.1.38
n/a	n/a	* Sans Pareil Roundabout (A228 and A229) LoS improves in the PM peak 2030. * Pier Road (A289) / B2004 junction (for Medway Police Station, Waterfront UTC and Asda) LoS improves in the AM peak 2030. * Grange Roundabout (A289 and B2004) improves in the PM peak 2037.	* Medway Council's Assessment, Appendix E
n/a	n/a	* High Street (A2) / Station Road junction in Strood LoS improves in the AM peak 2030 and in the PM peak 2030 and 2037. * New Road (A2) / Gibraltar Hill / The Paddock LoS improves in the PM peak 2037. * Best Street (A231) / Clover Street junction LoS improves in the PM peak 2030. * The Brook (A231) / Whiffen's Avenue LoS improves in the AM peak 2030. * Sovereign Boulevard (A2) / Woodlands Road / Rotary Gardens junction LoS improves in the PM peak 2037. * Bowater Roundabout (A2 and A278) LoS improves in the AM peak 2030.	* Medway Council's Assessment, Appendix E
n/a	n/a	* Frindsbury Road (A228) / Station Road (B2002) junction LoS improves in the AM peak 2030.	* Medway Council's Assessment, Appendix E
n/a	n/a	* Luton Road / Castle Road / Constitution Hill LoS improves in the PM peak 2030.	* Medway Council's Assessment, Appendix E
n/a	n/a	* Three Sisters Roundabout (Lower Rainham Road / Otterham Quay Lane) LoS improves in the PM peak 2037.	* Medway Council's Assessment, Appendix E

Negative – Construction	Reference	Negative – Operation	Reference
Journey time analysis for route No.2 (M2 junction 4 to A2/A2018 Dartford town centre) showed an increase in both directions for all time periods for phases 6 to 9, i.e. April 2027 to March 2029.	APP-529, tables 8.52, 8.53, 8.54, 8.55, 8.56, 8.57, 8.58, 8.59, 8.60, 8.61, 8.62, 8.63	On the M2, westbound traffic flows would increase by between 20% and 40% in the AM peak and the inter-peak, and by between 10% and 20% in the PM peak in 2030. Eastbound traffic flows would increase by between 10% and 20% in all modelled time periods in 2030. Between M2 junctions 2 and 1, the eastbound traffic flows would increase by between 20% and 40% in the PM peak. In the AM peak, the scale of impacts analysis showed a minor adverse impact at M2 junction 4, moderate adverse impacts at M2 junctions 1 and 2 and a major adverse impact at M2 junction 3 in 2030.	APP-529, plates 7.28, 7.30 APP-549, paras 7.1.32, 7.1.34 * Medway Council's Assessment, Appendix E

		In the PM peak, the scale of impacts analysis showed a minor adverse impact at M2 junction 1, a moderate adverse impact at M2 junction 2 and major adverse impacts at M2 junctions 3 and 4 in 2030. * Taddington Roundabout (M2 junction 3) LoS deteriorates in PM peak 2037.	
Journey time analysis for route No.3 (A228 - M20 to Strood) showed an increase in both directions in the AM peak for phase 6, 7 and 9. Increased changes in flows (+51 to +100) on Bush Road, Cuxton in AM peak for Phase 5, i.e. November 2027 to March 2027. Increased changes in flows (+101 to +250) on Bush Road, Cuxton in AM and PM peaks for phases 6 to 9, i.e. April 2027 to March 2029. Increased changes in flows (+51 to +100) on Bush Road, Cuxton in AM peak for phases 10 and 11, i.e. April 2029 to December 2030.	APP-529, tables 8.52, 8.55, 8.58 APP-529, plates 8.54, 8.60, 8.62, 8.66, 8.68, 8.72, 8.74, 8.78, 8.80, 8.84, 8.90	In the northern section of the A228 along Sundridge Hill in Cuxton, north of Bush Road, there would be increase in northbound traffic flows of over 40% in the AM and inter-peak periods in 2030; in the PM peak, the increase in traffic flows would be less than 10%. The increase in southbound traffic flows would be less than 10% in the AM and PM peaks and just over 20% in the inter-peak. To the south of Bush Road, northbound traffic flows would increase by between 10% and 20% in the AM and inter-peak periods in 2030. Southbound traffic flows would increase in the inter-peak period by between 10% and 20%, while in the PM peak the increase would be less than 20%. Journey time analysis for route No.3 (A228 - M20 to Strood) showed an increase in both directions across all scenarios and time periods in 2030, except for the northbound journey time in the core growth scenario PM peak.	APP-529, tables 7.11, 7.12, 7.13 APP-549, para 7.1.35
Increased changes in flows (+51 to +100) on A229 - M20 to M2 in AM peak for phases 2 to 4, i.e. September 2025 to October 2026.	APP-529, plates 8.36, 842, 8.48	Journey time analysis for route No.4 (A229 - M20 to M2) showed an increase in both directions across all scenarios and time periods in 2030, except for the core growth scenario PM peak. * Bridgewood Roundabout (A229 / B2097) LoS deteriorates in AM peak 2030. * Lord Lees Roundabout (A229) LoS deteriorates in AM peak 2030 and 2037.	APP-529, tables 7.11, 7.12, 7.13 * Medway Council's Assessment, Appendix E
Journey time analysis for route No.5 (A289 – Four Elms Roundabout to M2 junction 1) showed a 13% to 41% increase westbound in the AM peak for phases 6 to 9, i.e. April 2027 to March 2029.	APP-529, tables 8.52, 8.53, 8.54, 8.55, 8.56, 8.57, 8.58, 8.59, 8.60, 8.61, 8.62, 8.63	North of the Hasted Road (A289) / Gravesend Road (A226) junction, the change in traffic flows in both directions on the A289 would be less than 10% in all modelled time periods in 2030. Journey time analysis for route No.5 (A289 – Four Elms Roundabout to M2 junction 1) showed an increase westbound across all scenarios during the inter-peak and PM peak in 2030. Journey time analysis for route No.5 (A289 – Four Elms Roundabout to M2 junction 1) showed an increase eastbound across all scenarios and time periods in 2030, except for the eastbound journey time in the core growth scenario PM peak. Westbound traffic through the Medway Tunnel would increase in the AM and inter-peak periods by less than 10% in 2030.	APP-529, tables 7.11, 7.12, 7.136 APP-549, para 7.1.3 APP-549, para 7.1.32
n/a	n/a	* Sans Pareil Roundabout (A228 and A229) LoS deteriorates in PM peak 2037. * Pier Road (A289) / B2004 junction (for Medway Police Station, Waterfront UTC and Asda) LoS deteriorates in PM peak 2037. * Pier Road (A289) / Church Street junction (for The Strand) LoS deteriorates in PM peak 2030 and 2037.	* Medway Council's Assessment, Appendix E

		* High Street (A2) / Station Road junction in Strood LoS deteriorates in PM peak 2037. * High Street (A2) / Canal Road / Esplanade junction (for former Civic Centre) LoS deteriorates in PM peak 2030 and 2037. * Corporation Street (A2) / High Street / Esplanade junction LoS deteriorates in PM peak 2037. * Best Street (A231) / Clover Street junction LoS deteriorates in AM and PM peaks in 2037. * Chatham Hill and Rainham Road (A2) / Rock Avenue junction LoS deteriorates in PM peak 2030. * Watling Street (A2) / Canterbury Street junction LoS deteriorates in AM peak in 2030 and 2037. * Sovereign Boulevard (A2) / Eastcourt Lane junction LoS deteriorates in PM peak 2030 and 2037. * London Road (A2) / Bloors Lane junction LoS deteriorates in AM peak 2030.	* Medway Council's Assessment, Appendix E
n/a	n/a	* Frindsbury Road (A228) / Station Road (B2002) junction LoS deteriorates in the AM peak 2037.	* Medway Council's Assessment, Appendix E
Journey time analysis for route No.25 (A2 – Strood) showed a 10% to 26% increase westbound for all time periods for phases 6 to 9, i.e. April 2027 to March 2029.	APP-529, tables 8.52, 8.53, 8.54, 8.55, 8.56, 8.57, 8.58, 8.59, 8.60, 8.61, 8.62, 8.63	On Watling Street, to the east of M2 junction 1, there would be an increase in westbound traffic flows of over 40% in the AM peak in 2030. There would be an increase in eastbound traffic flows of over 20% in the PM peak in 2030. In the other modelled time periods, the increase in traffic flows would be between 10% and 20%. In the AM peak, the scale of impacts analysis showed a moderate adverse impact on Watling Street in 2030. In the PM peak, the scale of impacts analysis showed a minor adverse impact on Watling Street in 2030. Journey time analysis for route No.25 (A2 – Strood) showed an increase eastbound across all scenarios in the AM peak 2030. Journey time analysis for route No.25 (A2 – Strood) showed an increase westbound across all scenarios in the inter-peak 2030. Journey time analysis for route No.25 (A2 – Strood) showed an increase in both directions in the high and low growth scenarios in the PM peak 2030.	APP-529, plates 7.28, 7.30 APP-529, tables 7.11, 7.12, 7.136 APP-549, para 7.1.33
Journey times on the 149 bus route (Chatham to Kings Hill) would increase by up to four minutes in phases 6 to 8, i.e. April 2027 to November 2028.	APP-529, tables 8.75, 8.76, 8.77 APP-549, para 7.1.10	n/a	n/a
Some proposed construction activities would impact on the rail network, including three sets each of 60 hours for the North Kent railway line.	APP-529, paras 8.9.4, 8.9.5	n/a	n/a

		Due to an increase in traffic flow, there would be a moderate increase in pedestrian severance at Elaine Avenue, Strood. National Highways will undertake a feasibility assessment to identify opportunities to reduce severance.	APP-529, Table 7.15 APP-505, para 7.5.2, 7.5.5

4.3 Commentary

4.3.1 Journey time reductions for origins in either Rainham or Rochester to destinations in Essex (and vice-versa) would be positive operational impacts. Table 1.7, Appendix B of the Transport Assessment shows journey time reductions ranging from 16 to 27 minutes in the AM peak in 2030. Journey time reductions are lower in the inter-peak and the PM peak in 2030. Journey time reductions are higher in 2045. As noted in 2.2, this represents just 2% of all outward commuting flows on Census day 2011. It is questionable as to whether an increase in this commuting flow is desirable and likely to occur given recent changes in commuting patterns.

4.3.2 It is difficult to identify local impacts in the Transport Assessment outputs for change in flows (plates 7.16 to 7.18) and V/C (plates 7.19 to 7.24), even once maps for the Do Minimum and the Do Something scenarios are arranged side-by-side. Furthermore, as noted at paragraph 7.6.1 of the Transport Assessment, a change in flow may not affect journey times. Similarly, the outputs for scale of impacts show both adverse and beneficial impacts in Medway by time period; the maps in plates 7.28 to 7.30 and 7.34 to 7.36 are presented at a small scale and are difficult to interpret.

4.3.3 An assessment on behalf of Medway Council (Appendix E) identified negative operational impacts on M2 junctions 2, 3 and 4, the A289 corridor, the A228 through Cuxton and Halling and in Chatham and Strood town centres.

4.3.4 The table of positive operational impacts shows junctions with an improved performance in the LTAM Core with Project scenarios. It could be that the additional traffic associated with the Project causes some upstream junctions to become more congested, which holds back traffic from downstream junctions that appear to show an improved performance. Furthermore, there is a higher number of vehicles waiting to enter the network in the LTAM Core with Project scenarios, which obscures the full impact of additional delay during the peak periods.

4.3.5 The Transport Assessment identified a moderate increase in pedestrian severance at Elaine Avenue in Strood due to an increase in traffic flow. This is shown as a negative local impact because the applicant is only committing to a feasibility assessment to identify opportunities to reduce severance.

M2 junctions

4.3.6 The scale of impacts analysis shows either moderate or major adverse impacts at M2 junctions 1, 2, 3 and 4.

4.3.7 M2 junction 1 is an immediate concern, having emerged as a constraint to development following representations received from National Highways in Medway Council's determination of a planning application for MedwayOne, a 325,000 sqm development of employment floorspace on the former Kingsnorth Power Station site, which was allocated for development in the Medway Local Plan 2003.

4.3.8 The National Highways representation noted concerns about both congestion and safety at M2 Junction 1, specifically the northbound off-slip and the southbound on-slip links. National Highways considered that the junction has limited spare capacity, i.e. 60 movements during either the AM or the PM peaks. The junction will need to be improved to accommodate further development once this spare capacity has been exceeded.

4.3.9 Following Medway Council's resolution to grant planning permission, the conditions include an initial trip cap of 60 movements through these links to enable a phase of development to come forward, along with a Monitor and Manage Framework.

4.3.10 As noted at 3.2, the MedwayOne planning application has been excluded from the core scenario, along with the outline planning consent of Grain Business Park.

4.3.11 An assessment on behalf of Medway Council (Appendix E) highlighted the increase in traffic flows on the M2, with approximately 1,350 Passenger Car Units (PCUs) westbound and 800 PCUs eastbound in the AM peak in 2030. This would seemingly affect the capacity and safety of traffic to merge and diverge. Meanwhile, the increase in traffic flows on the A289 between Wainscott and the M2 would be up to 400 PCUs westbound and 100 PCUs eastbound in the AM peak in 2030 (see Appendix E). This is likely to be significantly higher with the additions of MedwayOne and Grain Business Park, thereby exceeding the trip cap of 60 movements.

4.3.12 The Project's Order Limits straddle the northbound off-slip and the southbound on-slip links. The Project is not proposing changes to these links.

4.3.13 The Local Development Order for Innovation Park Medway is subject to a Monitor and Manage Mitigation Strategy, such is the concern of both National Highways and Kent County Council regarding the sensitivity of M2 junction 3 and adjacent junctions.

4.3.14 Three other highway schemes have been included in the core scenario at M2 junction 4 or adjacent junctions; they are associated with the Gibraltar Farm development which was granted on appeal. These schemes cannot be implemented due to a ransom strip constraint, and therefore the traffic impacts are likely to have been understated.

4.3.15 As noted at 3.2, the Uncertainty Log shows five highway schemes that have been included in the core scenario (see Appendix C). The five highway schemes should not have been included in the core scenario and therefore M2 junctions 3 and 4, and junctions in the vicinity, are unlikely to perform as reported in the applicant's assessment.

Gads Hill – Four Elms Roundabout – Medway Tunnel (A289)

4.3.16 Journey time reductions for route No.5 (A289 – Four Elms Roundabout to M2 junction 1) are questionable for both the construction and operational phases, given the potential for the Hoo Peninsula as a significant supplier location, and the omissions of relevant planned development.

4.3.17 As noted at 3.2, the Uncertainty Log shows five highway schemes that have been included in the core scenario (see Appendix C). The five highway

schemes should not have been included in the core scenario and therefore this corridor is unlikely to perform as reported in the applicant's assessment.

4.3.18 In particular, the 'A289 Four Elms roundabout to Medway Tunnel (Medway)' highway scheme is assumed to be part of a wider scheme under the Housing Infrastructure Fund. It is important to note that the SoS (Department for Levelling Up, Housing and Communities) has decided to withdraw upfront funding for this scheme.

Highway schemes identified for mitigation

4.3.19 Appendix E sets out the highway schemes identified to mitigate the impact of the Project. The schemes, set out in Table 1, were identified based on a comparison between the LTAM Core without the Project and the LTAM Core with the Project scenarios.

Table 1: Highway schemes identified for mitigation

Four Elms Roundabout (A289 / A228)	Transform to hamburger design for north-south movement and add in segregated left turn to north of junction.
Pier Road (A289) / Maritime Way	Provide a walking / cycle route round one side of the junction to avoid having a stop line on the exit arm. All the signals (pedestrian and junction control) between Pier Road (A289) / Maritime Way to Grange Roundabout (A289 and B2004) coordinated for smoother traffic flow.
Pier Road (A289) / B2004 for Medway Police Station, Waterfront UTC and Asda	Signal coordination improved to release traffic from all arms.
Pier Road (A289) / Church Street for The Strand	The pedestrian signals on the southern and eastern exits coordinated.
High Street (A2) / Station Road junction in Strood	Optimise signals.
New Road (A2) / Gibraltar Hill / The Paddock	Ban turns / cut off The Paddock.
Bridgewood Roundabout (A229 / B2097)	Change lane markings at southern and western arms to allow entrance in the roundabout from 3 lanes instead of 2.
Rochester Road (A228) / Bush Road	Add signals.
Bowater Roundabout (A2 and A278)	Signal coordination improved to release traffic from all arms.
Will Adams Roundabout (A2 / A289)	The 2-lane circulatory section changed to 3-lane to provide more capacity for traffic from east. The lane markings at the eastern arm were changed to allow two lanes heading from A2 to A289.
Sovereign Boulevard (A2) / Eastcourt Lane	All the signals (pedestrian and junction control) between Will Adams Roundabout (A2 / A289) and London Road (A2) / Bloors Lane coordinated for smoother traffic flows.
London Road (A2) / Bloors Lane	

4.3.20 The schemes would involve signal optimisation, lane capacity management and prioritising / restricting certain vehicular movements, except for the

Four Elms Roundabout which would require a 'hamburger' design. The SoS's decision underlines the need to secure funding to mitigate the Four Elms Roundabout and the A289 corridor.

4.3.21 The schemes have been evaluated in the LTAM Core with the Project scenario. Most of the schemes would see an improved performance. However, some schemes would not improve or there are unintended consequences on adjacent junctions. This could be due to a scheme releasing traffic upstream that causes congestion downstream. Further information is in Appendix E.

4.4 Actions and commitments

4.4.1 The core scenario does not reflect the spatial distribution of relevant planned development and Medway's development needs. Therefore, Medway Council is not seeking to secure highway schemes for mitigation through the DCO.

4.4.2 The contractor's technical note (see Appendix E) recommends a review of the Project in conjunction with an assessment to inform plan-making.

4.4.3 The applicant has submitted a Wider Network Impacts Management and Monitoring Plan (WNIMMP) (APP-545). This should be read alongside Requirement 14 of Schedule 2 in the draft DCO, which states that:

> *"Before the tunnel area is open for traffic, the undertaker must submit written details of an operational traffic impact monitoring scheme substantially in accordance with the wider network impacts management and monitoring plan for approval by the Secretary of State following consultation by the undertaker with highway authority and where different, the relevant planning authority and other bodies identified in Table 2.1 of the outline traffic management plan for construction."*

4.4.4 Paragraph 5.3.4 and Plate 5.1 of the WNIMMP must add the Four Elms Roundabout (A289 / A228) as a location to be included in the monitoring scheme.

4.4.5 Following the Written Ministerial Statement on 9 March 2023, the monitoring scheme is unlikely to provide certainty in local plan-making, specifically funding sources in an accompanying Infrastructure Delivery Plan (IDP).

4.4.6 Medway Council has commissioned a new traffic model and an assessment to inform local plan-making, including a 'with Project scenario'. Medway Council is engaging with National Highways (Spatial Planning) in producing the assessment. The assessment will include analysis to determine proportionate developer contributions from sites to be allocated for development, which is likely to include contributions due as a result of traffic flows generated by the Project; the IDP will need to specify National Highways as a funding source. A commitment from National Highways would provide more certainty to support local plan-making.

4.4.7 For M2 junction 1, Medway Council will be pursuing existing investment processes. In doing so, Medway Council will require collaboration with the

Project team, National Highways, Kent County Council and Gravesham Council on the following sequential tasks:

- produce an updated merge and diverge assessment;
- establish a revised trip cap;
- assess how many more development completions could be tolerated;
- produce an initial feasibility assessment for an improvement scheme;
- develop an improvement scheme, along with an assessment of timing, feasibility and funding; and
- determine how proportionate developer contributions could be collected.

4.4.8 The Section 106 Agreements – Heads of Teams (APP-505) concedes that National Highways does not have the appropriate land interests to enter into a Section 106 agreement with Medway Council to address pedestrian severance at Elaine Avenue, Strood. A separate side agreement will be entered into with Medway Council to ensure the provision of these improvements. However, given Medway Council's position on the core scenario, an updated assessment of traffic-related severance on pedestrians is required based on Medway Council's 'with Project scenario'.

5 Noise and Vibration

5.1 Overview

5.1.1 As part of the Environmental Statement, Chapter 12 considers changes to noise and vibration levels at identified noise sensitive receptors due to construction activity, vehicle traffic and the tunnel ventilation system required during operation.

5.1.2 A change in road traffic noise of 1dB in the short-term is taken to be the smallest perceptible increase.

5.1.3 Noise Important Areas (NIAs) cover the highest 1% of properties affected by road traffic noise. There are five NIAs on the A228 through Cuxton and Halling. Their locations are plotted on page 3 of 8 of Figure 12.3 – Operational Road Traffic Noise Study Area (APP-311).

5.1.4 The noise and vibration assessment is based on outputs from the core scenario. The Do Minimum refers to a scenario without the Project, while the Do Something refers to a scenario with the Project.

5.1.5 During construction, noise sensitive receptors are predicted to experience higher levels of noise due to construction traffic and from traffic diversions when roads are closed during the night-time.

5.1.6 To control construction noise and vibration, a Code of Construction Practice and a management plan for noise and vibration would be prepared. The management plan would set out the best practice and any other specific mitigation measures to be adopted. This would be consulted on with local authorities and then approved by the Secretary of State before the start of construction.

5.1.7 During operation, traffic is forecast to increase on certain roads. The increased road traffic noise on the A228 through Cuxton and Halling would be due to changes in traffic flow and, in particular, an increase in the percentage of heavy vehicles.

5.2 Impacts

Neutral – Construction	Reference	Neutral – Operation	Reference
Construction noise levels have been predicted at one sensitive receptor, i.e. 38 Sharfleet Drive, Rochester. Due to the limited duration of relevant construction activities in this area, the effect at the identified sensitive receptor would not be significant. In addition, Best Practicable Means would be applied to reduce the noise levels below the level of significance.	APP-549, paras 7.1.19, 7.1.20 and Table 7.1	n/a	n/a

Negative – Construction	Reference	Negative – Operation	Reference
The assessment of noise impacts associated with construction traffic has predicted that there would be significant noise impacts in Year 4 at receptors on Bush Road and at Cuxton Community Church in Cuxton and Halling ward.	APP-549, paras 7.1.12 and 7.1.21	Due to predicted minor increases in traffic noise along the A228, where existing noise levels are already significant, there would be significant adverse effects at receptors in Cuxton (Bush Road, The Glebe, Hillcrest Drive, Hollycroft, Pilgrims Way, Rochester Road, Stanford Way, Station Road and Sundridge Hill) and Halling (Acre Grove, Anderson Close, Aspdin Close, Britannia Close, Brooks Place, Carroll Close, Conveyor Drive, Essex Road, Germander Avenue, Kent Road, Lambarde Close, Sandways, Stake Lane, Sylvestre Close and Vicarage Road). These effects would be significant in the opening year but would reduce to negligible in the longer term. The A228 through Cuxton and Halling would experience a 1dB or more increase in road traffic noise. Five Other Sensitive Receptors are in Cuxton and Halling. In total, 153 dwellings would experience a minor change in road traffic noise level.	APP-150, Table 12.57 APP-311, page 3 of 8 APP-549, para 7.1.42
n/a	n/a	Elaine Avenue in Strood would experience a 1dB or more increase in road traffic noise.	APP-311, page 3 of 8
n/a	n/a	Watling Street / A2 (Strood Academy) would experience a 1dB or more increase in road traffic noise.	APP-311, page 3 of 8

5.3 Commentary

5.3.1 The noise and vibration assessment is based on outputs from the core scenario, which does not reflect the spatial distribution of relevant planned development and Medway's development needs.

5.3.2 Paragraph 12.6.183 of Chapter 12 of the Environmental Statement discusses the feasibility of mitigation measures, including low noise surfacing, barrier options, speed restrictions and heavy vehicle restrictions. None of these mitigation measures would be effective due to:

- the existing speed limit;
- the nature of the properties;
- heavy vehicles producing more noise at lower speeds; and
- the need to avoid compromising existing businesses.

5.4 Actions and commitments

5.4.1 Noise insulation mitigation may be appropriate. Paragraphs 12.6.200 to 12.6.202 indicate that whilst a Noise Insulation Regulations assessment found that no dwellings would quality for a scheme, a final assessment will be undertaken within the first year of the Project opening.

5.4.2 However, the assessment of noise impacts associated with construction traffic has predicted that there would be significant noise impacts in Year 4 at receptors on Bush Road and at Cuxton Community Church in Cuxton and Halling ward. Therefore, an appropriate noise insulation assessment for Cuxton and Halling ward must be conducted as soon as possible before construction starts.

6 Air Quality

6.1 Overview

6.1.1 As part of the Environmental Statement, Chapter 5 considers levels of nitrogen dioxide (NO_2) and particulate matter (referred to as PM_{10} or $PM_{2.5}$). These levels are compared to objectives and Limit Values that have been set in UK legislation. If air quality levels are higher than the objectives or Limit Values, the term 'exceedance' is used.

6.1.2 The air quality assessment has considered the change in pollutant concentrations at human receptors and the change in nitrogen deposition in designated sites close to roads as a result of traffic management and Project-related construction traffic.

6.1.3 The air quality assessment is based on outputs from the core scenario. The Do Minimum refers to a scenario without the Project, while the Do Something refers to a scenario with the Project.

6.1.4 During construction, the Project could temporarily affect air quality because of dust arising from earth movement and excavations, as well as due to emissions from construction traffic and machinery.

6.1.5 An associated Code of Construction Practice sets out measures to reduce the air quality effects of construction, such as using water as a dust suppressant.

6.1.6 During operation, traffic is forecast to increase on certain roads, causing air quality to get worse at receptors already exceeding the air quality objective for NO_2. Air quality is generally expected to improve in the future as vehicle emissions improve and the use of electric vehicles becomes more widespread.

6.2 Impacts

Positive – Construction	Reference	Positive – Operation	Reference
A perceptible decrease in NO_2 levels has been predicted during construction years three and four to the eastern side of M2 junction 1.	APP-549, para 7.1.23	n/a	n/a

Neutral – Construction	Reference	Neutral – Operation	Reference
n/a	n/a	The Project is forecast to lead to an increase in traffic between M2 junction 1 and junction 7, ranging from approximately 2,300 to 28,100 AADT, which leads to an increase in NO_2 at receptors. The largest increase in NO_2 is predicted at receptor LTC122, which is located on Squires Close within 20m of the M2, where an increase of 2.3µg/m^3 is predicted as a result of the Project. An annual mean NO2 concentration of 34.9µg/m^3 is predicted at LTC122 in the Do Minimum scenario, which is below the annual mean AQS objective.	APP-143, paras 5.6.81, 5.6.82

Negative – Construction	Reference	Negative – Operation	Reference
n/a	n/a	The Project is forecast to lead to an increase in traffic on the A2 London Road, Strood of approximately 1,100 AADT, which leads to an increase in NO_2 at receptors. This increase in traffic leads to an increase in annual mean NO_2 of 1.1 to 1.2µg/m^3 (small worsening). Exceedances of the annual mean NO_2 Air Quality Strategy (AQS) objective are predicted both with and without the Project at four receptors that are located very close to the A2 (within 3m).	APP-143, paras 5.6.40, 5.6.41 APP-549, para 7.1.43
n/a	n/a	The Project is forecast to lead to an increase in traffic on the A228 (between Leybourne Way and M2 junction 2), ranging from approximately 1,100 to 3,200 AADT, which leads to an increase in NO_2 at receptors. A large proportion of the increase is associated with HGVs, which increase by up to 1,600 AADT. This increase in traffic leads to an increase in annual mean NO_2 of 2.4 to 3.1µg/m^3 (medium worsening) at four receptors which exceed the objective on Rochester Road/Sundridge Hill, of which one receptor (LTC456) changes from compliance in the Do Minimum scenario to exceedance in the Do Something scenario. Three of these four receptors already exceed the objective in the Do Minimum scenario. An increase in annual mean NO_2 of 4.2µg/m^3 (large worsening) is predicted at receptor LTC011 on Rochester Road, which also already exceeds the objective in the Do Minimum scenario.	APP-143, paras 5.6.45, 5.6.46, Table 5.14 APP-549, para 7.1.44

6.3 Commentary

6.3.1 The air quality assessment predicts future baseline Do Minimum scenario exceedances of the NO_2 annual mean objective (40 µg/m^3), however this contradicts Medway Council's monitoring data.

6.3.2 The air quality assessment baseline year of 2016 does not reflect more recent observed improvements in air quality, particularly in 2020 and 2021 due to the pandemic, although it is unclear whether this will be sustained. A baseline year of 2019 is used in air quality assessments to support planning applications in Medway.

6.3.3 Medway Council has not observed any exceedances of the annual mean objective at receptors near to Squires Close or the A228 in the last two years. Medway Council has observed recent exceedances of the objectives at monitoring sites on the A2 London Road, Strood. However, with distance corrections applied, there has been one exceedance of the annual mean objective at 5 London Road in 2019.

6.3.4 Concentrations are likely to be even lower at Medway Council's monitoring sites if trends continue to 2030, however no future year predictions based on Medway Council's most recent monitoring data are available.

6.3.5 The air quality assessment has identified a receptor on Rochester Road/Sundridge Hill (LTC456) which changes from compliance without the Project to exceedance with the Project. The Project is highly likely to reverse more recent observed improvements in air quality, with some monitoring sites closer to or exceeding the annual mean objective.

6.3.6 It is important to note that the air quality assessment is based on a residual uncertainty (Root Mean Square Error) of 5.8 µg/m^3. It will be necessary to reconcile monitoring data used in the air quality assessment with Medway Council's monitoring data.

6.3.7 Moreover, the air quality assessment is based on outputs from the core scenario, which does not reflect the spatial distribution of relevant planned development and Medway's development needs.

6.3.8 Following engagement with the applicant, feasible and effective mitigation has not been identified.

6.4 Actions and commitments

6.4.1 Off-site mitigation to deliver air quality improvements within Medway's air quality management areas may be appropriate, along with a financial payment to support air quality monitoring, modelling and associated plans. This could be triggered by exceedances of the air quality objectives during operational phase monitoring.

7 Biodiversity

7.1 Overview

7.1.1 As part of the Environmental Statement, Chapter 8 and 9 consider the likely significant effects on terrestrial and marine biodiversity respectively.

7.1.2 The assessment of significant effects on biodiversity considered the construction and operational phase impacts of the Project and the likely changes these would cause to biodiversity resources.

7.1.3 The assessment includes the following habitats sites in Medway:

- North Downs Woodland Special Area of Conservation (SAC) to the west of Halling.
- Thames Estuary and Marshes Special Protection Area (SPA) and Ramsar site.

7.1.4 A separate Habitats Regulations Assessment has also been undertaken to assess the impacts on European Sites.

7.1.5 The construction phase would involve discharges of rainfall collection to the Thames Estuary. This could change water flows, water quality and sediment deposition.

7.1.6 The key operational effect would be the reduction in the quality of designated sites following increased nitrogen deposition occurring due to changes in traffic volumes and speeds along roads.

7.1.7 Compensatory measures are proposed to counteract significant effects on biodiversity that cannot be avoided or mitigated. Significant adverse effects would be compensated by the creation of new areas of semi-natural habitat, predominantly woodland and grassland, which would increase the overall area of these habitats and link up similar existing habitats.

7.2 Impacts

Neutral – Construction	Reference	Neutral – Operation	Reference
n/a	n/a	In relation the North Downs Woodlands SAC, indirect impacts such as increased dust deposition, emissions from construction vehicles or accidental pollution events are unlikely following the implementation of embedded mitigation measures. These measures are expected to lead to no change, resulting in an effect which is neutral and not significant. The proposed habitat creation associated with the woodland planting connecting adjacent areas to the North Down Woodlands SAC would increase the extent of this habitat type in the local area. A permanent minor improvement is predicted, resulting in a slight beneficial effect that is not significant.	APP-146, paras 8.6.41 and 8.6.42
The noise and vibration associated with the above-ground Project construction works may disturb birds using the habitats within the Thames Estuary and Marshes SPA / Ramsar site and associated functionally linked land. To mitigate the potential disturbance, the timing of the works would be scheduled to avoid the peak aggregations of birds, particularly in the winter and passage seasons. Noise attenuation measures associated with the compounds would be provided to reduce any change in noise.	APP-146, paras 8.6.213, 8.6.214, 8.6.215	The South Portal is sufficiently far from the shoreline of the River Thames and the marsh habitats that form part of the qualifying features of the Thames Estuary and Marshes SPA and Ramsar site that impacts on birds associated with these sites, including marsh harrier, would be unlikely during the operational phase.	APP-146, para 8.6.467

Negative – Construction	Reference	Negative – Operation	Reference
n/a	n/a	There are a number of ecological sites that would be significantly affected by changes in air quality. These are all in Cuxton and Halling ward: Head Barn Wood ancient woodland, Merrals Shaw ancient woodland, ancient woodland between M2 carriageways, Longhoes ancient woodland, Great Wood ancient woodland, Cobham Woods SSSI, Halling to Trottiscliffe Escarpment SSSI.	APP-549, para 7.1.47 APP 486, Table 8.37

7.3 Commentary

7.3.1 The are a number of ecological sites that would be significantly affected by changes in air quality, such as Great Wood ancient woodland at Ranscombe Farm Nature Reserve. However, the applicant is following guidance and advice from the Department for Environment, Food and Rural Affairs and Natural England to compensate for nitrogen deposition.

7.3.2 It is noted that a landscape scale compensation approach, rather than a series of scattered sites, is more likely to deliver multiple benefits. Medway Council accept National Highways' reasoning for site selection as per the Nitrogen Deposition Site Selection Technical Note that was shared with Medway Council on the 22 July 2022.

7.3.3 Shorne Woods Country Park and Jeskyns Community Woodland are popular destinations for residents in Medway. The Outline Landscape and Ecology Management Plan (APP-490) identifies an area of ancient woodland compensation to the east of Brewers Wood. Medway Council welcomes the management requirement to ensure public access.

7.3.4 The Environment Statement – Non-Technical Summary (APP-486) states that discharges to the River Thames would be controlled by an Environment Agency discharge permit to ensure that water quality and volume is within a level which would not damage the Thames Estuary and Marshes Ramsar site. During the operation of the tunnel, road drainage would be treated before discharge and would be released during high tide conditions to maximise available dilution and mixing and prevent erosion.

8 Socio-economics

8.1 Overview

8.1.1 The most relevant application documents concerning socio-economic impacts are part of the Economic Appraisal Package contained in the Combined Modelling and Appraisal Report – Appendix D. The Workers Accommodation Report is also relevant.

8.1.2 The socio-economic impacts are framed in the context of 'dynamic agglomeration' which would occur as a result of the Project. In other words, the Project is likely to result in cluster growth and greater diversification of the local economies as businesses relocate and land use changes. For example, areas such as Medway would be more attractive to businesses that are displaced from the land market closer to London.

8.1.3 Furthermore, other businesses that do not relocate would benefit from improved interactions and accessibility to workers. Similarly, workers would be more likely to secure employment opportunities either side of the River Thames.

8.1.4 Another important aspect of the appraisal is the potential for socially vulnerable groups that may be disproportionately affected, such as households without access to a car.

8.2 Impacts

Positive – Construction	Reference	Positive – Operation	Reference
The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of residents working on the Project to benefit them post-construction.	APP-539, para 7.1.15	It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.	APP-549, para 7.1.40
Employment benefits would be both direct and indirect. Direct employment would include residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.	APP-549, para 7.1.17	The change in the area that could be reached within a 30-minute or 60-minute drive from the wards has been calculated, both with and without the Project. In the morning peak hour (07:00–08:00), the number of jobs within a 30-minute catchment area would increase by 17% with the Project, which would provide access to 42,200 additional jobs. The number within a 60-minute drive would increase by 50%, which would provide access to 759,900 more jobs.	APP-549, para 7.1.41
n/a	n/a	In terms of the geographical distribution of user benefits per head of the population, most locations have a decrease in costs and therefore receive a beneficial impact from the Project. The areas in receipt of the greatest benefits per head are near the Project, including some parts of Medway.	APP-525, para 7.3.2 and Plate 7.4
n/a	n/a	Most areas are expected to see improvements in accessibility to jobs and workers, with the greatest improvements in Rochester, Gillingham and the Hoo Peninsula.	APP-527, para 7.3.7 and Plate 7.1

Neutral – Construction	Reference	Neutral – Operation	Reference
n/a	n/a	The demand for private rented sector housing is equivalent to less than 2% of the frictional vacancy, therefore the Project at peak is unlikely to exceed the level of vacancy needed for the market to operate effectively. In other words, the market can absorb temporary workers.	APP-551, para 6.4.23 and Table 6.9

Negative – Construction	Reference	Negative – Operation	Reference
n/a	n/a	In terms of the geographical distribution of user benefits per head of the population, most locations have a decrease in costs and therefore receive a beneficial impact from the Project. Locations which receive an overall disbenefit include areas adjacent to A228 (Cuxton and Halling) and Rainham.	APP-525, para 7.3.2 and Plate 7.4

8.3 Commentary

8.3.1 The Economic Appraisal Package is based on outputs from the core scenario, which does not reflect the spatial distribution of relevant planned development and Medway's development needs.

8.3.2 As noted above, journey time reductions for the A289 – Four Elms Roundabout to M2 junction 1 are questionable for both the construction and operational phases, given the potential for the Hoo Peninsula as a significant supplier location, and the omissions of relevant planned development. Meanwhile, highway schemes should not have been included in the core scenario and therefore the network is unlikely to perform as reported in the applicant's assessment.

9 Material Assets and Waste

9.1 Overview

9.1.1 As part of the Environmental Statement, Chapter 11 considers the construction and operational effects on material resources and waste infrastructure capacity. The assessment considers the use of material resources and products from primary and recycled/secondary sources. The assessment also considers the production, treatment and off-site management and disposal of waste.

9.1.2 Materials needed for the construction of the Project would include earthworks materials, concrete and steel for new structures and asphalt for road surfacing.

9.1.3 Where possible, material would be sourced and reused on-site. However, not all materials can be reused on-site, and the Project has the potential to generate large volumes of waste during construction, which would need to be managed off-site.

9.1.4 Measures have been proposed to ensure that wastes taken off-site are diverted from landfill where feasible. Wastes generated during construction that would require disposal to landfill would reduce the landfill capacity in the study area. It is likely that some hazardous wastes would arise from building demolition and the excavation of historically contaminated land.

9.1.5 Maintenance works during operation would involve minor quantities of materials and waste.

9.1.6 Mitigation, including designing-out material use, sustainable material sourcing, application of the waste hierarchy, contract commitments and targets, has been proposed.

9.2 Impacts

Positive – Construction	Reference	Positive – Operation	Reference
Requirements of materials reduced through high rates of re-use and recovery of excavation waste on-site / within Order Limits.	APP-149, para 11.6.10	n/a	n/a
Use of marine dredged and recycled/secondary aggregates may reduce potential demand from Medway quarries. However, supply of marine dredged aggregates from North Sea Terminal (Cliffe) does not appear to have been considered.	APP-338	n/a	n/a
Demand for aggregates and concrete could require some supply from Medway quarries (Kingsnorth) with economic benefits, but sources of material subject to contracts in future and likely to be more proximate sources that would be used.	APP-149, Table 11.3	n/a	n/a
Requirements for waste management minimised through maximising on-site re-use and recovery of excavation waste on-site / within Order Limits.	APP-149, para 11.6.10	n/a	n/a
Provision of fill material for Cliffe Pools or Brett sites at Cliffe, delivered by water, road or rail, could assist in delivery of planning permission and restoration / ecological enhancements.	APP-437, Annex C	n/a	n/a

Negative – Construction	Reference	Negative – Operation	Reference
Demand for aggregates and concrete could require some supply from Kingsnorth Quarry and wharves with associated effects resulting from transport and potentially reducing reserves, but sources of material subject to contracts in future and likely to be more proximate sources that would be used.	APP-149, Table 11.3	n/a	n/a

9.3 Commentary

9.3.1 It is difficult to assess local impacts, given that the selection of sites for supply of materials and management of waste will be the responsibility of contractors and subject to contracts.

9.3.2 Table 11.3 of Chapter 11 of the Environmental Statement has identified reserves and associated landbanks in Medway. However, Table 11.3 should reflect the latest Local Aggregates Assessment. In addition, the sales of recycled and secondary aggregates appear to relate to capacity rather than actual sales and should be amended.

9.3.3 Figure 11.1 Active Landfill and Waste Transfer and Treatment (APP-308) and Appendix 11.3 List of Third-party Offsite Waste Infrastructure Receptors (APP-437) includes two active landfills in Rochester that do not appear to be active landfills, although they may be recovery to land development sites. As noted in the Statement of Common Ground, the applicant acknowledged that this was a production error which has been included in the Project errata list. It did not impact assessments.

9.3.4 The Excavated Material Assessment (APP-435) identifies sites potentially suitable for receiving excavation waste. The shortlist includes three sites south of the Thames, including Cliffe Pools, which has planning permission for ecological and landscape enhancement of Alpha Lake and Chalk Lake through importation of suitable material. Omya Lake is also being promoted by Brett through local plan-making for excavation waste disposal or recovery. The importation of suitable material at Cliffe Pools has been identified as a positive impact during construction, however the site has a low score in the applicant's assessment.

9.3.5 Further information is anticipated from the applicant on quantities, types and potential sources of aggregates to be used in construction to inform the Local Aggregates Assessment.

9.4 Actions and commitments

9.4.1 Paragraph 3.4.9 of the Outline Materials Handling Plan (APP-338), along with the Register of Environmental Actions and Commitments (MW002) (APP-336), should refer to sourcing aggregates from proximate wharves, e.g. North Sea Terminal at Cliffe. This would ensure maximum use of the river for material transportation to reduce impacts of vehicle movements.

9.4.2 In addition to an Excavated Materials Assessment to verify that sufficient capacity is available in the study area to accept excavated materials for recovery activities (paragraph 2.6.17 of the Outline Site Waste Management Plan (APP-338)), there is also a need for feasibility assessment of off-site recycling, as well as recovery and disposal capacity. The Register of Environmental Actions and Commitments (MW012) (APP-336) should be updated accordingly.

10 Summary of Actions and Commitments

Table 2 sets out the actions and commitments required by topic.

Table 2: Summary of actions and commitments required

Traffic and Transport	A. Paragraph 5.3.4 and Plate 5.1 of the WNIMMP must add the Four Elms Roundabout (A289 / A228) as a location to be included in the monitoring scheme. B. Medway Council has commissioned a new traffic model and an assessment to inform local plan-making, including a 'with Project scenario'. Medway Council is engaging with National Highways (Spatial Planning) in producing the assessment. The assessment will include analysis to determine proportionate developer contributions from sites to be allocated for development, which is likely to include contributions due as a result of traffic flows generated by the Project; the IDP will need to specify National Highways as a funding source. A commitment from National Highways would provide more certainty to support local plan-making. C. For M2 junction 1, Medway Council will be pursuing existing investment processes. In doing so, Medway Council will require collaboration with the Project team. D. An updated assessment of traffic-related severance on pedestrians is required based on Medway Council's 'with Project scenario'.
Noise and Vibration	An appropriate noise insulation assessment for Cuxton and Halling ward must be conducted as soon as possible before construction starts.
Air Quality	Off-site mitigation to deliver air quality improvements within Medway's air quality management areas may be appropriate, along with a financial payment to support air quality monitoring, modelling and associated plans. This could be triggered by exceedances of the air quality objectives during operational phase monitoring.
Material Assets and Waste	A. Paragraph 3.4.9 of the Outline Materials Handling Plan (APP-338), along with the Register of Environmental Actions and Commitments (MW002) (APP-336), should refer to sourcing aggregates from proximate wharves, e.g. North Sea Terminal at Cliffe. B. There is a need for a feasibility assessment of off-site recycling, as well as recovery and disposal capacity. The Register of Environmental Actions and Commitments (MW012) (APP-336) should be updated accordingly.

Medway Council will continue to engage with the applicant to secure the actions and commitments required during the Examination period.

References

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Appendix A

Appendix A - Review of Uncertainty Log

Development	Land Use Type	Development Measure	Sq M	units	Uncertainty	2030	2037	2045	2051	*Medway Council's Comment*
Temple Waterfront Between Knight Road and Roman Way Strood	C3-Dwelling House	Res units	-	620	Near Certain	420	500	620	620	*Of the 620 dwellings permitted, only 364 expected to be delivered due to viability.*
Temple Waterfront Between Knight Road and Roman Way Strood	A1-Retail	Sq.m	1,800	-	Near Certain	1,800	1,800	1,800	1,800	
Temple Waterfront Between Knight Road and Roman Way Strood	B1(a)-Business Office	Sq.m	3,200	-	Near Certain	3,200	3,200	3,200	3,200	
Temple Waterfront Between Knight Road and Roman Way Strood	D1-Non-residential Institutions	Sq.m	100	-	Near Certain	100	100	100	100	
Temple Waterfront Between Knight Road and Roman Way Strood	D2-Assembly and Leisure	Sq.m	100	-	Near Certain	100	100	100	100	
Land at St Mary's Island, Martime Way, Chatham Maritime	C3-Dwelling House	Res units	-	310	Near Certain	310	310	310	310	
Horsted Park, Former Midkent College Site, Maidstone Road	C3-Dwelling House	Res units	-	265	Near Certain	265	265	265	265	
Colonial Mutual House, Quayside, Chatham Maritime	C3-Dwelling House	Res units	-	253	Near Certain	253	253	253	253	*Should be 200 dwellings.*
Former Kitchener Barracks, Dock Road, Chatham	C3-Dwelling House	Res units	-	302	Near Certain	302	302	302	302	*Developer confirmed now only delivering 264, rather than 302 dwellings on site.*
Rochester Riverside, Corporation Street, Rochester	C3-Dwelling House	Res units	-	1,400	Near Certain	1,201	1,400	1,400	1,400	
Rochester Riverside, Corporation Street, Rochester	A1-Retail	Sq.m	1,135	-	Near Certain	1,135	1,135	1,135	1,135	
Rochester Riverside, Corporation Street, Rochester	B1(a)-Business Office	Sq.m	200	-	Near Certain	200	200	200	200	
Rochester Riverside, Corporation Street, Rochester	C1-Hotels	Sq.m	2,924	-	Near Certain	2,924	2,924	2,924	2,924	
Rochester Riverside, Corporation Street, Rochester	D1-Non-residential Institutions	Sq.m	550	-	Near Certain	550	550	550	550	
Rochester Riverside, Corporation Street, Rochester	D2-Assembly and Leisure	Sq.m	200	-	Near Certain	200	200	200	200	
CPI Books Ltd Lordswood Industrial Estate Revenge Road Lordswood	B2-Industry	Sq.m	8,244	-	Near Certain	8,244	8,244	8,244	8,244	*Should be 2,315 sqm.*
CPI Books Ltd Lordswood Industrial Estate Revenge Road Lordswood	B1(a)-Business Office	Sq.m	634	-	Near Certain	634	634	634	634	*Should be 214 sqm.*
Land at Otterham Quay Lane Rainham	C3-Dwelling House	Res units	-	300	Near Certain	300	300	300	300	
Gibraltar Farm Ham Lane Lordswood	C3-Dwelling House	Res units	-	450	Near Certain	435	450	450	450	*Status should be 'Reasonably Foreseeable' and therefore excluded from the Core Scenario.*
South of Ratcliffe Highway Former Sports Ground Bells Lane Hoo	C3-Dwelling House	Res units	-	232	Near Certain	232	232	232	232	
Land at Chatham Docks Pier Road Gillingham	C3-Dwelling House	Res units	-	950	Near Certain	875	950	950	950	
Land at Chatham Docks Pier Road Gillingham	C1-Hotels	Sq.m	4,990	-	Near Certain	4,990	4,990	4,990	4,990	
Land at Chatham Docks Pier Road Gillingham	A1-Retail	Sq.m	2,763	-	Near Certain	2,763	2,763	2,763	2,763	*Should be 2,226 sqm.*
Land at Chatham Docks Pier Road Gillingham	D1-Non-residential Institutions	Sq.m	25,153	-	Near Certain	25,153	25,153	25,153	25,153	*Should be 24,616 sqm.*
Land at Chatham Docks Pier Road Gillingham	D2-Assembly and Leisure	Sq.m	20,953	-	Near Certain	20,953	20,953	20,953	20,953	
Land at Chatham Docks Pier Road Gillingham	Sui Generis	Sq.m	23,750	-	Near Certain	23,750	23,750	23,750	23,750	
Walnut Tree Farm 155 Lower Rainham Road Rainham	C1-Hotels	Sq.m	2,199	-	Near Certain	2,199	2,199	2,199	2,199	*Status should be 'Hypothetical' and therefore excluded from the Core Scenario.*
Premier Inn Medway Valley Park Chariot Way Strood	C1-Hotels	Sq.m	1,533	-	Near Certain	1,533	1,533	1,533	1,533	
Remainder of phase 2 and phase 3 Hempstead Valley Shopping Centre Hempstead Valley Drive Hempstead	A1-Retail	Sq.m	5,250	-	Near Certain	5,250	5,250	5,250	5,250	*Expired.*
Chatham Waterfront Medway Street Chatham	A1-Retail	Sq.m	1,645	-	Near Certain	1,645	1,645	1,645	1,645	
Chatham Waterfront Medway Street Chatham	C3-Dwelling House	Res units	-	115	Near Certain	115	115	115	115	*Below minimum threshold criteria and therefore excluded from the Core Scenario.*
Land north east of Kingsnorth Industrial Estate Eschol Road Hoo	B1(c)-Light Industry (Business Park)	Sq.m	20,752	-	Near Certain	20,752	20,752	20,752	20,752	*This is London Medway Commercial Park, of which 64,498 sqm left to deliver (i.e. not 250,992 sqm).*
Land north east of Kingsnorth Industrial Estate Eschol Road Hoo	B2-Industry	Sq.m	115,120	-	Near Certain	53,722	92,096	115,120	115,120	*This is London Medway Commercial Park, of which 64,498 sqm left to deliver (i.e. not 250,992 sqm).*
Land north east of Kingsnorth Industrial Estate Eschol Road Hoo	B8-Storage & Distribution	Sq.m	115,120	-	Near Certain	53,722	92,096	115,120	115,120	*This is London Medway Commercial Park, of which 64,498 sqm left to deliver (i.e. not 250,992 sqm).*
Buildings 208 & 209 Kingsnorth Industrial Estate Eschol Road Kingsnorth	Sui Generis	Sq.m	5,010	-	Near Certain	5,010	5,010	5,010	5,010	*Expired in 2020.*
Phase 1 Zone D National Grid Land Grain Road Grain	B1(c)-Light Industry (Business Park)	Sq.m	5,670	-	Near Certain	2,268	5,670	5,670	5,670	*This relates to phase 1 only. The outline consent (MC/09/1628 and MC/14/3872) is for an additional 282,203 sqm.*
Phase 1 Zone D National Grid Land Grain Road Grain	B2-Industry	Sq.m	5,550	-	Near Certain	2,220	5,550	5,550	5,550	*This relates to phase 1 only. The outline consent (MC/09/1628 and MC/14/3872) is for an additional 282,203 sqm.*
Phase 1 Zone D National Grid Land Grain Road Grain	B8-Storage & Distribution	Sq.m	5,550	-	Near Certain	2,220	5,550	5,550	5,550	*This relates to phase 1 only. The outline consent (MC/09/1628 and MC/14/3872) is for an additional 282,203 sqm.*
Former Military Site Upnor Road Lower Upnor	B1(c)-Light Industry (Business Park)	Sq.m	3,905	-	Near Certain	3,905	3,905	3,905	3,905	
3 Acre Site Medway Valley Park Roman Way Strood	B2-Industry	Sq.m	1,750	-	Near Certain	1,750	1,750	1,750	1,750	*Expired in 2021.*
3 Acre Site Medway Valley Park Roman Way Strood	B1(a)-Business Office	Sq.m	1,750	-	Near Certain	1,750	1,750	1,750	1,750	*Expired in 2021.*

Appendix A - Review of Uncertainty Log

Development	Land Use Type	Development Measure	Sq M	units	Uncertainty	2030	2037	2045	2051	*Medway Council's Comment*
Phase 2 Land off Bailey Drive Gillingham	B8-Storage & Distribution	Sq.m	5,342	-	Near Certain	5,342	5,342	5,342	5,342	*Status should be 'Reasonably Foreseeable' and therefore excluded from the Core Scenario.*
Croneens Car Park Railway Street Gillingham	D1-Non-residential Institutions	Sq.m	3,858	-	Near Certain	3,858	3,858	3,858	3,858	*Status should be 'Reasonably Foreseeable' and therefore excluded from the Core Scenario.*
Medway Maritime Hospital Windmill Road Gillingham	D1-Non-residential Institutions	Sq.m	1,850	-	Near Certain	1,850	1,850	1,850	1,850	
Royal Sovereign House Quayside Chatham Maritime	D1-Non-residential Institutions	Sq.m	3,065	-	Near Certain	3,065	3,065	3,065	3,065	*Superseded by new applicantion (below threshold).*
Machine Shop 8 Chatham Maritime	D2-Assembly and Leisure	Sq.m	2,560	-	Near Certain	2,560	2,560	2,560	2,560	*Superseded by new applicantion (below threshold).*
Former Tesco Store The Brook Chatham	D2-Assembly and Leisure	Sq.m	3,532	-	Near Certain	3,532	3,532	3,532	3,532	
East Hill, Hempstead Valley	C3-Dwelling House	Res units	-	650	More Than Likely	800	800	800	800	*650 or 800?*
East Hill, Hempstead Valley	D1-Non-residential Institutions	Sq.m	1,400	-	More Than Likely	1,400	1,400	1,400	1,400	
Land west of Town Road, Cliffe Woods, Medway	C3-Dwelling House	Res units	-	225	More Than Likely	225	225	225	225	*Below threshold (184 units).*
St Andrews Lake, Formby Road, Halling, Kent	D2-Assembly and Leisure	Sq.m	2,837	-	More Than Likely	2,837	2,837	2,837	2,837	*Below threshold.*
Lidl Food Store, Medway Road, Gillingham	A1-Retail	Sq.m	1,669	-	More Than Likely	1,669	1,669	1,669	1,669	
East Mall, Hempstead Valley Shopping Centre	D2-Assembly and Leisure	Sq.m	2,720	-	Near Certain	2,720	2,720	2,720	2,720	
Leigh Academy, Rainham	D1-Non-residential Institutions	Sq.m	8,820	-	Near Certain	8,820	8,820	8,820	8,820	
Land at Queen Street Car Park, Chatham	C3-Dwelling House	Res units	-	229	More Than Likely	229	229	229	229	*Below threshold (179 units). Double counted with 'Land Bounded by the Brook Street Car Park'.*
Training Centre, Chatham Freight Station, Chatham Docks	D1-Non-residential Institutions	Sq.m	3,850	-	Near Certain	3,850	3,850	3,850	3,850	*Status should be 'Hypothetical' and therefore excluded from the Core Scenario.*
Bardell Wharf, Rochester	C3-Dwelling House	Res units	-	314	Near Certain	314	314	314	314	
Bardell Wharf, Rochester	A1-Retail	Sq.m	1,283	-	Near Certain	1,283	1,283	1,283	1,283	
Bardell Wharf, Rochester	B1(a)-Business Office	Sq.m	967	-	Near Certain	967	967	967	967	
Phase 3, Land West of Rochester Road/Maidstone Road, Borstal, Rochester	B8-Storage & Distribution	Sq.m	6,880	-	Near Certain	6,880	6,880	6,880	6,880	
Innovation Park, Medway	B1, B2	Sq.m	101,000	-	More Than Likely	101,000	101,000	101,000	101,000	*Status should be 'Near Certain'.*
Horsted Retail Park, Chatham	D2-Assembly and Leisure	Sq.m	1,700	-	Near Certain	1,700	1,700	1,700	1,700	
Horsted Retail Park, Chatham	A1-Retail	Sq.m	2,002	-	Near Certain	2,002	2,002	2,002	2,002	
Cathedral View Hotel, Corporation Street, Rochester	C1-Hotels	Sq.m	3,891	-	Near Certain	3,891	3,891	3,891	3,891	
M2CityLink, Plot 1 Medway City Estate	a flexible mix of B2/B8	Sq.m	12,300	-	Near Certain	12,300	12,300	12,300	12,300	
Units B5/B6, Medway Valley Park, Rochester	D2-Assembly and Leisure	Sq.m	1,842	-	Near Certain	1,842	1,842	1,842	1,842	*Completed in 2021.*
SECAmb Multi Use Centre, Bredgar Road	Sui Generis	Sq.m	4,405	-	Near Certain	4,405	4,405	4,405	4,405	
Land off City Way (Former Playing Field)	D1-Non-residential Institutions	Sq.m	9,065	-	More Than Likely	9,065	9,065	9,065	9,065	
Land South of Lower Rainham Road	C3-Dwelling House	Res units	-	202	More Than Likely	202	202	202	202	*Status should be 'Near Certain'.*
Land Bounded by the Brook Street Car Park	C3-Dwelling House	Res units	-	179	More Than Likely	179	179	179	179	*Double counted with 'Land at Queen Street Car Park, Chatham'.*
26 - 28 Hoath Lane, Rainham	C2 - Residential Institutions	Sq.m	3,639	-	More Than Likely	3,639	3,639	3,639	3,639	
Land South Of Berwick Way, East Of Frindsbury Hill And North And West Of Parsonage Lane (known As Manor Farm) Frindsbury Rochester Medway	C3-Dwelling House	Res units	-	181	More Than Likely	181	181	181	181	
Land South Of Berwick Way, East Of Frindsbury Hill And North And West Of Parsonage Lane (known As Manor Farm) Frindsbury Rochester Medway	Education	Sq.m	9,500	-	More Than Likely	9,500	9,500	9,500	9,500	
Bradfields School Churchill Avenue Wayfield Chatham Medway	D1-Non-residential Institutions	Sq.m	1,624	-	More Than Likely	1,624	1,624	1,624	1,624	

Appendix B

Appendix B - Review of Uncertainty Log (Missing Developments)

Development	Land Use Type	Development Measure	Sq M	units	Uncertainty	2030	2037	2045	2051	*Medway Council's Comment*
MedwayOne (former Kingsnorth Power Station) (MC/21/0979)	Flexible EG (iii)/B2/B8/SG	Sq.m	324,450	-	More Than Likely	324,450	324,450	324,450	324,450	*Missing*
National Grid Land Grain Road Grain (MC/09/1628 and MC/14/3872)	B2 and B8	Sq.m	282,203	-	More Than Likely	282,203	282,203	282,203	282,203	*Missing*
Land at Thamesport Grain Road Grain (MC/19/0299)	B2-Industry	Sq.m	13,492	-	More Than Likely	13,492	13,492	13,492	13,492	*Missing*
Flanders Farm Ratcliffe Highway Hoo (MC/19/3128)	B8-Storage & Distribution	Sq.m	9,986	-	Near Certain	9,986	9,986	9,986	9,986	*Missing*
Combined Cycle Gas Turbine Power Station Damhead Creek Eschol Road Kingsnorth (MC/09/0961)	Sui Generis	Sq.m	8,925	-	Reasonably Foreseeable	8,925	8,925	8,925	8,925	*Missing*
Allhallows Holiday Park Avery Way Allhallows (MC/19/1820 and MC/19/2202)	D2-Assembly and Leisure	Sq.m	6,871	-	Near Certain	6,871	6,871	6,871	6,871	*Missing*
MBS House Bredgar Road Gillingham (MC/20/0816)	Sui Generis	Sq.m	4,405	-	Near Certain	4,405	4,405	4,405	4,405	*Missing*
Veolia George Summers Close Chatham (MC/20/2055)	B2-Industry	Sq.m	2,893	-	Near Certain	2,893	2,893	2,893	2,893	*Missing*
Dockside Outlet Centre Management Suite Maritime Way Chatham (MC/21/0577)	D2-Assembly and Leisure	Sq.m	1,614	-	More Than Likely	1,614	1,614	1,614	1,614	*Missing*
Stoke Road Business Centre Stoke Road (MC/19/0888)	C3-Dwelling House	Res units	-	200	Near Certain	200	200	200	200	*Missing*

Appendix C

Appendix C - Review of Uncertainty Log (Planned Highways Schemes)

Scheme Name	Scheme Type	Opening Date	Probability	Project Status as of 30 September 2021	*Medway Council's Comment*
A289 Four Elms roundabout to Medway Tunnel (Medway)	New road	Spring 2024	Near Certain	Fully approved, design in progress	*Assumed to be part of a wider scheme proposed under the Housing Infrastructure Fund. The SoS (Department for Levelling Up, Housing and Communities) has decided to withdraw upfront funding for this scheme.*
B2097 Rochester Road, Medway	New junction	2030**	More than likely	Associated planning application awaiting consent	*Assumed to be associated with Innovation Park Medway. However, the scheme is subject to an ongoing Manage & Monitor Mitigation Strategy.*
Hempstead Valley, Medway	Various improvements	2030**	More than likely	Associated planning application awaiting consent	*Assumed to be associated with Gibraltar Farm which was granted on appeal. The scheme cannot be implemented due to a ransom strip constraint.*
Hoath Way roundabout	Junction improvements	2030**	More than likely	Associated planning application awaiting consent	*Assumed to be associated with Gibraltar Farm which was granted on appeal. The scheme cannot be implemented due to a ransom strip constraint.*
M2 junction 4	Junction improvements	2030**	More than likely	Associated planning application awaiting consent	*Assumed to be associated with Gibraltar Farm which was granted on appeal. The scheme cannot be implemented due to a ransom strip constraint.*

**Planning application schemes with no date identified have been assumed to be open by the Lower Thames Crossing opening year - 2030

Appendix D

By email to: [redacted]

10 August 2021

TEMPro Households - Medway

Dear Andrew,

In advance of progressing any modelling of an alternative scenario, Medway Council have asked whether the Lower Thames Crossing (LTC) can undertake a comparison exercise of the housing growth figures assumed within the Lower Thames Area Model (LTAM) against the draft site allocations prepared by Medway as part of the development of their emerging local plan.

The below provides more detail on the consideration of housing within the LTAM and the housing figures derived from TEMPro at a district level.

LTAM methodology

As stated in the Combined Modelling and Appraisal (ComMA) Report Appendix C – Transport Forecasting Package Annexes (Application Document 7.7), the growth in the number of car trips in the area is obtained by using the detailed traffic growth forecasts produced by DfT in their National Trip End Model (NTEM) and published as TEMPro 7.2 traffic growth forecasts.

More detailed information on the location of new trips in the future is added into the LTAM by explicitly including those major new developments in the study area that are near certain or more than likely to be built. This detail is provided in the Uncertainty Log (now with 2020 updates), which lists the planned land use developments specifically included in the Core LTAM forecasts. These developments are those that are already under construction, have planning permission, where a development application is within the consent process or planning consent is imminent.

The specific inclusion (spatially and temporally) of major developments provides more detailed information about the location of traffic growth through examining the location of new developments which have been constructed since the LTAM base year of 2016 and those which have been granted planning permission.

However, in accordance with DfT guidance, if developments are explicitly included in the forecasts, then the growth of trips elsewhere in the relevant local authority or local area should be reduced so that the overall level of traffic growth matches the NTEM forecasts.

The inclusion of specific developments in the LTAM therefore only provides much more detailed spatial information on the location of new trips and does not affect the overall level of traffic growth. The overall number of trips for each forecast year in the LTAM is therefore constrained by the growth assumed within TEMPro and matches the overall level of growth predicted by DfT's NTEM.

Housing within the LTAM

The uncertainty log defines the additional numbers of dwellings. These were included in the LTAM by first converting them into the number of trips associated with these dwellings using trip rates. The numbers of trips from these developments were then compared to the additional trips brought about by applying the TEMPro growth factors to the trips already in the LTAM. These growth factors were then adjusted so that when they were applied in forecasting, and the trips from the uncertainty log are added, the resulting growth would match the level of growth indicated by TEMPro at the aggregate level. This is known as 'controlling to TEMPro'.

Therefore, in creating forecast year trips, actual numbers of households were not used beyond their role in the uncertainty log. Instead, growth factors (which are applied to trips) were derived from TEMPro's underlying databases by making a correspondence between TEMPro's MSOAs and the

LTAM zones, and then the adjustments to these growth factors, as described above, were made to them.

The 'controlling to TEMPro' growth in trips was undertaken at a fairly coarse level (Essex, Kent, London, rest of UK), to avoid situations in which the total growth in trips at the constraint geography exceeded that extracted from TEMPro. Again, however, this constraint was applied to the forecast trips and not to numbers of people or households.

Inputs into the LTAM housing growth

The below table sets out the household data from TEMPro and the uncertainty log, aggregated into districts around the fully modelled area for the forecast years 2029, 2036, 2044 and 2051 (relative to the base year of 2016).

It should be noted that TEMPro growth factors are not entirely dependent upon the change in household numbers. So, a 10% increase in households does not necessarily imply a 10% TEMPro growth factor in the number of trips.

This household data was extracted using a program which reads the TEMPro databases, the uncertainty log data, and a correspondence between the TEMPro zones and LTAM zones in order to calculate the planning data from both TEMPro and the uncertainty log for the base year and each forecast year by model zone.

This data was extracted using the following method:

- TEMPro planning data was extracted from the databases for all years.
- This data was aggregated into LTAM zones (as used for the forecast growth factors).
- This was then aggregated further into district level based on:
  - development point zones and
  - data from the uncertainty log. The uncertainty log data was read from the latest spreadsheet and filtered on residential units, and near certain and more than likely developments, as applicable to the Core scenario.

In summary, the table below provides an overview of the housing growth in Medway for the relevant forecast years. This data sets out the level of housing growth applied in the LTAM and allows a comparison to be made with regard to government housing targets / local plan housing targets for future years.

It is not recommended to disaggregate these figures below district level due to there being insufficient detail to examine them at a more granular extent.

Medway			
TEMPro additional Households compared to 2016			
2029	2036	2044	2051
14,458	20,532	26,923	32,514
Uncertainty Log additional Households compared to 2016			
2029	2036	2044	2051
6,276	6,645	6,765	6,765

Yours sincerely,

[redacted]

Appendix E

Medway LTC Support **20/06/2023**

Reference Number GB01T21E13

MEDWAY LTC SUPPORT

LOWER THAMES CROSSING IMPACT ASSESSMENT

SYSTRA

MEDWAY LTC SUPPORT

LOWER THAMES CROSSING IMPACT ASSESSMENT

IDENTIFICATION TABLE	
Client/Project owner	Medway Council
Project	Medway LTC Support
Study	Lower Thames Crossing Impact Assessment
Type of document	Final Report
Date	20/06/2023
File name	2023.06.20 Medway LTC Technical Report Mitigations 2.0 Draft V1.docx
Reference number	GB01T21E13
Number of pages	47

APPROVAL					
Version	**Name**		**Position**	**Date**	**Modifications**
1	Author	AS	Consultant	23/11/2022	First Draft
	Checked by	MM	Principal Consultant	24/11/2022	
	Approved by	DA	Director	28/11/2022	
2	Author	AS	Consultant	30/11/2022	Updated LP with LTC Outputs and Mitigation Outputs
	Checked by	MM	Principal Consultant	01/12/2022	
	Approved by	DA	Director	02/12/2022	
3	Author	AS	Consultant	19/06/2023	Added a second round of mitigations
	Checked by	MM	Principal Consultant	20/06/2023	
	Approved by	DA	Director	20/06/2023	

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1. INTRODUCTION

1.1.1 SYSTRA has been commissioned by Medway Council (the Council) to assess the impact of the proposed Lower Thames Crossing (LTC) on the local traffic network in Medway, for the opening year of 2030 and the forecasting year of 2037.

1.1.2 The LTC is a proposed vehicular connection across the River Thames between the A2 and M2 in Kent to the south and the M25 to the north, crossing the river via two bored tunnels. The proposed development boundary of the LTC sits adjacent to Medway's administrative boundary.

1.1.3 Technical assessment of the impacts of LTC in Medway has been carried out using the Lower Thames Area Model (LTAM) supplied by National Highways (NH) and the Medway Aimsun Model (MAM) supplied by the Council, as discussed further later in this document. As part of the Development Consent Order (DCO) submission for LTC, a Transport Assessment (TA) has been prepared on behalf of NH, which provides an operational impact assessment of the LTC on the surrounding highway network, including within Medway. This Technical Report has taken into consideration the outputs presented in the TA; however, it is noted that this report is an independent document that has been prepared by SYSTRA to provide support to the Council, and is not intended to directly inform or respond to the DCO application.

1.1.4 The Council had previously used the MAM to inform Medway's Strategic Transport Assessment (STA) in September 2021. A selection of the scenarios developed for the STA were used to inform the current technical assessment of the LTC within the MAM. A review of the existing MAM scenarios was undertaken at the early stages of the project to confirm which of the existing scenarios to process alongside new scenarios to develop.

1.1.5 This Technical Report describes the methodology that was followed to review the LTAM model and extract necessary inputs to feed into the MAM model. Next, the report outlines the methodology followed to match the LTAM to MAM in order to transfer the additional vehicular demand associated with the LTC to MAM.

1.1.6 The report outlines the scenario runs that were undertaken, providing Level of Service (LoS) outputs for the junctions of interest, including main junctions and roundabouts in the Medway local or strategic network. Journey times and network statistics are also provided for a general comparison between the scenarios.

1.1.7 Based on the outputs, six mitigation schemes were identified and tested in the locations subject to the most adverse impacts following implementation of the LTC. Assessments both with and without mitigation have been undertaken to allow comparison of LoS outputs with and without the mitigation schemes.

1.1.8 Technical work has been informed by discussions with the Council and NH throughout the lifespan of the commission.

2. MODELLING METHODOLOGY

2.1 LTAM Overview

2.1.1 The LTAM is a strategic SATURN model with detailed representation of the highway network in the area surrounding the proposed LTC route. The model was developed by NH.

2.1.2 A cordoned area of the LTAM has been provided to the Council by NH to enable an informed assessment of the potential impacts of the LTC scheme on the road network in Medway.

2.1.3 The LTAM outputs were interrogated by SYSTRA in summer 2022 to inform the consultation feedback in autumn 2022.

2.1.4 The model scenarios provided by NH include:

- Do Minimum (DoM) (no LTC scheme); and
- Do Something (DoS) (with the LTC Scheme).

2.1.5 The model base year is 2016, and the opening year is modelled as 2030 with additional future years of 2037, 2045 and 2051 also assessed.

2.1.6 For the purposes of looking at the roads within Medway, the 2030 opening year and 2037 forecasting year have been used throughout SYSTRA's assessments. The 2037 year was chosen to align with the lifespan of the Medway Local Plan update.

2.1.7 Overall, the results of the LTAM model runs showed that:

- Changes in traffic flow are concentrated on the strategic road network, with the forecast changes on local roads much lower; and
- The locations where junctions are likely to struggle as a result of the LTC are concentrated on the strategic roads and roads on the boundary of Medway.

2.1.8 Detailed results of LTAM assessment work are provided in Appendix A.

2.2 MAM Overview

2.2.1 The MAM is an Aimsun Next model, developed by the Council, comprising the whole of the Medway local authority area and extending southwards to incorporate junctions 4 to 6 of the M20 motorway. It also includes a surrounding buffer area that provides route choice into the main area of the model.

2.2.2 The overall network in MAM is organised into subnetworks to cover areas that are expected to come under pressure. Subnetworks 1 to 8 were previously developed and contained in the model, while SYSTRA developed a new subnetwork (subnetwork 9) as a part of the LTC assessment following discussions with the Council. Subnetwork 9 covers the Cuxton and Halling area. The locations of the subnetworks are detailed in Table 1 and shown in Figure 1.

Table 1. Medway Aimsun Model Subnetworks

SUBNETWORK	LOCATION
1	Four Elms Hill / Four Elms Roundabout
2	Pier Road / A2
3	A2 (Mierscourt Road to Otterham Quay Lane / Meresborough Road section)
4	Strood and Chatham Town Centres
5	M2 Junctions 2 to 4
6	Gillingham Town Centre
7	Lower Rainham Road
8	A249 (A2 to M20)
9	A228 Cuxton & Halling

Figure 1. Medway Aimsun Model Subnetwork Locations

2.2.3 Subnetwork 9 was developed to include a stretch of A228 on the western edge of Medway from Cuxton in the north to Snodland in the south, as the Council expects adverse impacts associated with traffic generated by the LTC on this section of the A228.

2.2.4 The MAM incorporated scenarios for 2026 and 2037; however, to align with LTAM model years, assessment work within the MAM was carried out for 2030 (opening year for the LTC) and 2037 (forecast year). Four scenarios were tested as part of this study, each covering the standard network peak hours:

- 2030 & 2037 LTAM Core without LTC – the scenarios comprise Do Minimum demand from LTAM and the network includes committed highway improvements for the relevant year;
- 2030 & 2037 LTAM Core with LTC – the scenarios comprise Do Something demand from LTAM and the network includes committed highway improvements for the relevant year;
- 2030 & 2037 Local Plan (LP) without LTC – the scenarios comprise Local Plan demand from MAM (including the residential, employment and education allocations proposed as part of the Local Plan) and the network includes committed highway improvements for the relevant year. The 2037 scenarios include currently proposed highway mitigations based on the Local Plan; and
- 2030 & 2037 Local Plan (LP) with LTC – the scenarios comprise Local Plan demand from MAM (including the residential, employment and education allocations proposed as part of the Local Plan) with the addition of the LTAM difference demand between the Do Something and the Do Minimum. The network includes committed highway improvements for the relevant year. The 2037 scenarios include currently proposed highway mitigations based on the Local Plan.

2.2.5 MAM already contained Local Plan demands without LTC. Scenarios 2030 & 2037 Local Plan with LTC, 2030 & 2037 LTAM Core without LTC and 2030 & 2037 LTAM Core with LTC were created in the model by SYSTRA, for the purpose of this study. Mitigation schemes as included in the STA were coded in to MAM for the 2037 scenarios.

2.2.6 The model period is 08:00 to 09:00 for the morning peak and 17:00 to 18:00 for the evening, and also includes a 15-minute warm up and 60-minute cool down.

2.2.7 This study preserves the MAM static route choice methodology with macroscopic static assignments utilising volume delay and turn penalty functions. A Method of Successive Averages (MSA) assignment was used for the macroscopic model runs. The MSA static assignment will converge when either the maximum number of iterations or the desired relative gap are reached. A path assignment was created from each macroscopic scenario which was used by vehicles in the microscopic model. A Stochastic Route Choice was assigned in the microscopic level scenarios, with up to 15% of vehicles following the dynamic paths, allowing them to reroute around congestion. The relative gap was maintained from the MAM.

2.3 Demand Development

2.3.1 Demand for LTAM Core with / without LTC scenarios for 2030 and 2037 was inserted from the LTAM matrices, by matching the LTAM zones with corresponding MAM zones. The Do Minimum demand was used for the LTAM Core without LTC scenarios. The Do Something demand was used for the LTAM Core with LTC scenarios.

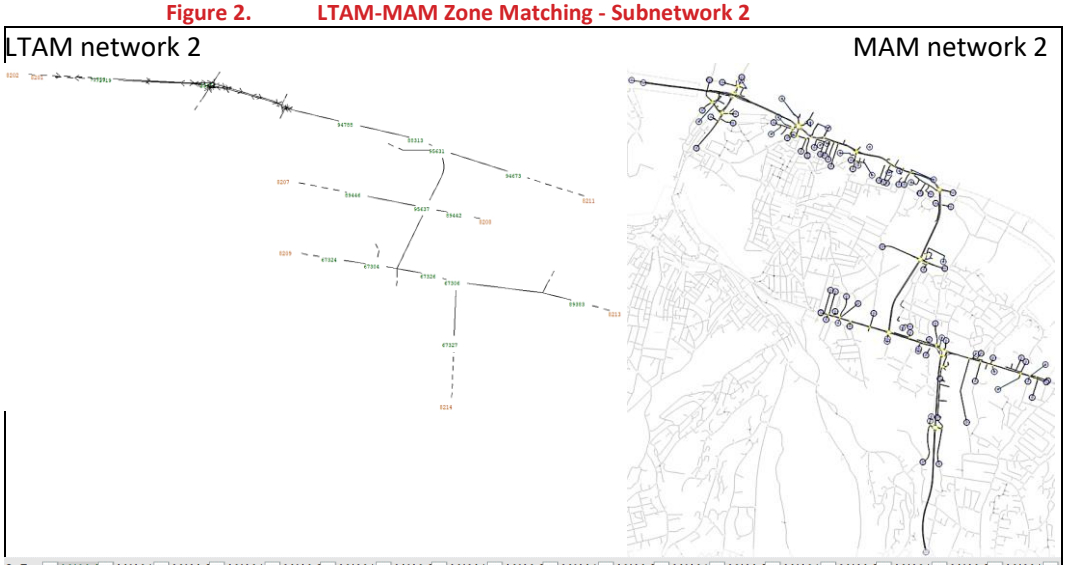
2.3.2 Demand for LP without LTC scenarios was taken directly from the existing MAM Local Plan demand.

2.3.3 Demand for LP with LTC scenarios was created by adding the flow differences between LTAM Do Something and Do Minimum to MAM Local Plan demand. The process is discussed further in this section.

2.3.4 The 2026 MAM demand was updated to 2030. The MAM model did not include a 2030 scenario, so linear interpolation was used to estimate the likely build-up of traffic to the LTC opening year of 2030. Previous MAM testing was focused on 2037 as the 'end of Plan' year, so this has been carried forward to the current model testing.

2.3.5 LTAM and MAM zones for each subnetwork were matched based on their geographic location. LTAM zones were less detailed than MAM zones resulting, in some cases, in matching one LTAM zone with multiple MAM zones. Figure 2 as an example shows 16 LTAM zones matched with 100 MAM zones. Wherever possible, a breakdown from MAM Base was used to balance the demand between adjacent zones to ensure that traffic covers the entire network, especially the local roads that do not exist in the strategic model. Nonetheless, it should be noted that during this process it has not always been possible to match the granularity of the microsimulation model.

Figure 2. LTAM-MAM Zone Matching - Subnetwork 2



SatZone	MAM_C	MAM_li	MAM_C	MAM_li	MAM_C	MAM_li	MAM_C	MAM_li	MAM_C	MAM_li	MAM_C	MAM_li	MAM_C	MAM_li	MAM_C	MAM_li	MAM_C	MAM_li
7133	60192	59942	60182	59916	60139	60139												
7136	60149	59885																
8201	60151																	
8202		59966																
8203	60220	60066	60157	59897	60211	59987	60156	59893	60148	59884	60203	59953	60094	60094				
8204	60212	60067	60155	59892	60078	60078												
8205	60091	60091	60075	60075														
8206	60159	59899	60154	59889	60219	60064	60073	60073	60071	60071	60158	59898	60089	60089				
8207	60206	60068																
8208	60196	59947	60205	59955	60072	60072												
8209	60177	59911	60178	59912	60214	59990	60185	59919	60179	59913	60207	59944	60202	59952	60194	60194	60181	59915
8210	60150	60069																
8211	60213	59989																
8212	60188	59925																
8213	60077	60077	60187	59923	60218	60038	60175	59905	60174	59904								
8214	60079	60079			60147	59883	60230	59882	60184	59918	60204	59954						

2.3.6 For some of the subnetworks, MAM had multiple zone configurations for different scenarios resulting in different zone ID numbers across scenarios for the same MAM zone. Similarly some of the LTAM networks had different IDs for the same zone across different scenarios. In such cases, the matching shown in Figure 2 was carried out multiple times.

2.3.7 The seven MAM user classes were matched to ten LTAM user classes as summarised in Table 2.

Table 2. LTAM-MAM User Class Matching

MAM USER CLASS	DESCRIPTION	LTAM USER CLASS
1	Car (Home Base Work (HBW))	b. Cars – Commute Low Income c. Cars – Commute Medium Income d. Cars – Commute High Income

MAM USER CLASS	DESCRIPTION	LTAM USER CLASS
2	LGV (HBW)	33% h. Light Goods Vehicles
3	Car (Non-Home Based Work (NHBW))	a. Cars – Employers Business
4	LGV (NHBW)	34% h. Light Goods Vehicles
5	HGV (NHBW)	i. Heavy Goods Vehicles – Non-Port j. Heavy Goods Vehicles – Port
6	Car (Home Base Other + Non-Home Based Other (HBO+NHBO))	e. Cars – Other Low Income f. Cars – Other Medium Income g. Cars – Other High Income
7	LGV (HBO+NHBO)	33% h. Light Goods Vehicles

2.3.8 MAM subnetwork limits were drawn into LTAM to export cordon matrices. The DoM and DoS demands extracted from LTAM were imported in the MAM Core without LTC and Core with LTC scenarios respectively, based on the zone matching exercise described above.

2.3.9 Demand from MAM's base Local Plan scenario was used for Local Plan without LTC scenarios.

2.3.10 To determine Local Plan with LTC scenario demand, the difference between Do Something and Do Minimum scenario demands from LTAM was calculated. The zone translation and balancing as discussed above was applied to the LTAM difference and this matrix was added to the LP without LTC matrices. Any zone pairs where the end result was a negative number of trips were ignored, resulting in a difference of 4% of trips for 2030 and 7% for 2037 across all subnetworks, morning and evening combined.

2.3.11 The profile or 'peakiness' of the demand across the modelled hours as available in MAM was retained through the process and the final demand used for the four scenarios discussed in this report was profiled accordingly.

2.4 MAM Scenarios

2.4.1 Table 3 provides an overview of all the scenarios tested in MAM. Figure 3 provides a detailed breakdown of the resulting 144 scenarios tested in MAM, classified by subnetwork and year.

Table 3. MAM Scenarios Overview

SCENARIO		YEAR/PERIODS	DEMAND	NETWORK
LTAM Core	Without LTC	2030 AM/PM	DoM Demand from LTAM	Committed highway improvements
		2037 AM/PM	DoM Demand from LTAM	Committed highway improvements
	With LTC	2030 AM/PM	DoS Demand from LTAM	Committed highway improvements
		2037 AM/PM	DoS Demand from LTAM	Committed highway improvements

Local Plan	Without LTC	2030 AM/PM	LP Demand	Committed highway improvements
		2037 AM/PM	LP Demand	Committed highway improvements + 2037 LP mitigations
	With LTC	2030 AM/PM	LP Demand + LTAM Demand	Committed highway improvements
		2037 AM/PM	LP Demand + LTAM Demand	Committed highway improvements + 2037 LP mitigations

Figure 3. MAM Scenarios Detailed Breakdown

Subnetwork	Scenarios	Core without LTC				Core with LTC				LP without LTC				LP with LTC			
	Year	2030		2037		2030		2037		2030		2037		2030		2037	
	Period	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1	Geometry	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Demand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Static routes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Micro Scenario	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Results	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	Geometry	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Demand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Static routes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Micro Scenario	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Results	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	Geometry	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Demand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Static routes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Micro Scenario	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Results	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	Geometry	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Demand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Static routes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Micro Scenario	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Results	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	Geometry	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Demand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Static routes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Micro Scenario	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Results	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	Geometry	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Demand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Static routes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Micro Scenario	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Results	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	Geometry	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Demand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Static routes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Micro Scenario	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Results	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8	Geometry	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Demand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Static routes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Micro Scenario	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Results	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	Geometry	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Demand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Static routes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Micro Scenario	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Results	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

2.4.2 Table 4 provides an overview of the total demand (number of trips) for all vehicle user classes per scenario.

Table 4. Total number of trips per scenario

SUBNETWORK	YEAR	CORE WITHOUT LTC		CORE WITH LTC		LP WITHOUT LTC		LP WITH LTC	
		AM	PM	AM	PM	AM	PM	AM	PM
1	2030	8,776	9,824	9,047	9,932	16,438	14,570	16,745	14,757
	2037	9,955	10,046	9,776	10,806	20,579	17,046	21,817	18,134
2	2030	15,389	17,690	15,367	17,642	21,214	21,508	21,151	21,643
	2037	16,008	18,227	16,015	16,766	21,951	21,476	22,840	31,985
3	2030	3,785	4,326	3,787	4,350	5,144	5,309	5,118	5,455
	2037	3,920	4,537	3,927	4,555	5,013	5,083	5,223	5,428
4	2030	16,213	18,167	16,321	18,257	21,933	23,800	22,848	24,453
	2037	16,876	18,507	16,914	17,357	22,372	23,171	24,605	25,030
5	2030	21,235	23,364	24,148	26,100	27,722	32,660	32,270	37,382
	2037	22,944	24,635	25,726	27,251	29,673	35,053	37,132	41,766
6	2030	2,482	2,742	2,504	2,650	3,733	3,563	3,769	3,565
	2037	2,545	2,857	2,533	2,736	4,144	3,496	4,248	3,608
7	2030	7,091	8,428	7,110	8,445	11,931	11,494	11,908	11,499
	2037	7,348	8,739	7,351	8,723	12,076	11,654	12,392	12,035
8	2030	25,699	26,525	26,111	26,899	23,688	25,605	22,909	24,942
	2037	27,769	28,314	28,223	28,681	25,283	27,452	28,463	30,148
9	2030	4,306	4,888	4,699	5,119	4,315	5,439	4,945	5,650
	2037	4,507	5,140	4,919	5,332	4,833	6,212	5,895	6,842

3. MODELLING OUTPUTS

3.1 Level of Service

3.1.1 For consistency with previous Local Plan assessment undertaken by the Council, the Level of Service (LoS) metric as defined in the Highway Capacity Manual was used to review the average junction delay for the junctions of interest.

3.1.2 In order to define the LoS of a junction, the flow (vehicles per hour) and the queue delay (amount of time that vehicles remain under queueing status measured in seconds per vehicle) for each approach is calculated. The LoS of the junction is subsequently calculated as the average of the queue delay on each approach weighted by the flow on each approach.

3.1.3 Letters from A to F are used to evaluate the operational performance by junction type, with A being the best and F being the most adverse as summarised in Table 5. The junctions types can be either signalised or unsignalised.

Table 5. Level of Service Description for signalised and Unsignalised Junctions

LOS	CONTROL DELAY (SEC / VEHICLE) SIGNALISED	CONTROL DELAY (SEC / VEHICLE) UNSIGNALISED	DESCRIPTION
A	≤ 10	≤ 10	Free Flow
B	10-20	10-15	Stable Flow (slight delays)
C	20-35	15-25	Stable Flow (acceptable delays)
D	35-55	25-35	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	55-80	35-50	Unstable flow (congested and queues fail to clear)
F	>80	>50	Forced Flow (congested and queues fail to clear)

3.1.4 The results from MAM interrogations were processed to report the LoS at key junctions identified for each subnetwork as presented overleaf in Figure 4. Reported LoS for each subnetwork and each scenario is presented in Table 6.

3.1.5 It should be noted that within each subnetwork the model includes detailed interaction between junctions. This can mean that if one junction 'fails' then a downstream junction may appear to operate well, as less traffic reaches the downstream location due to the upstream failure. As such, some junctions can report a higher LoS than would occur in reality, including a better LoS in the 'with LTC' scenario compared to 'without LTC' scenario. The operation of each subnetwork should be considered holistically.

Figure 4. Junctions Analysed from MAM Interrogations

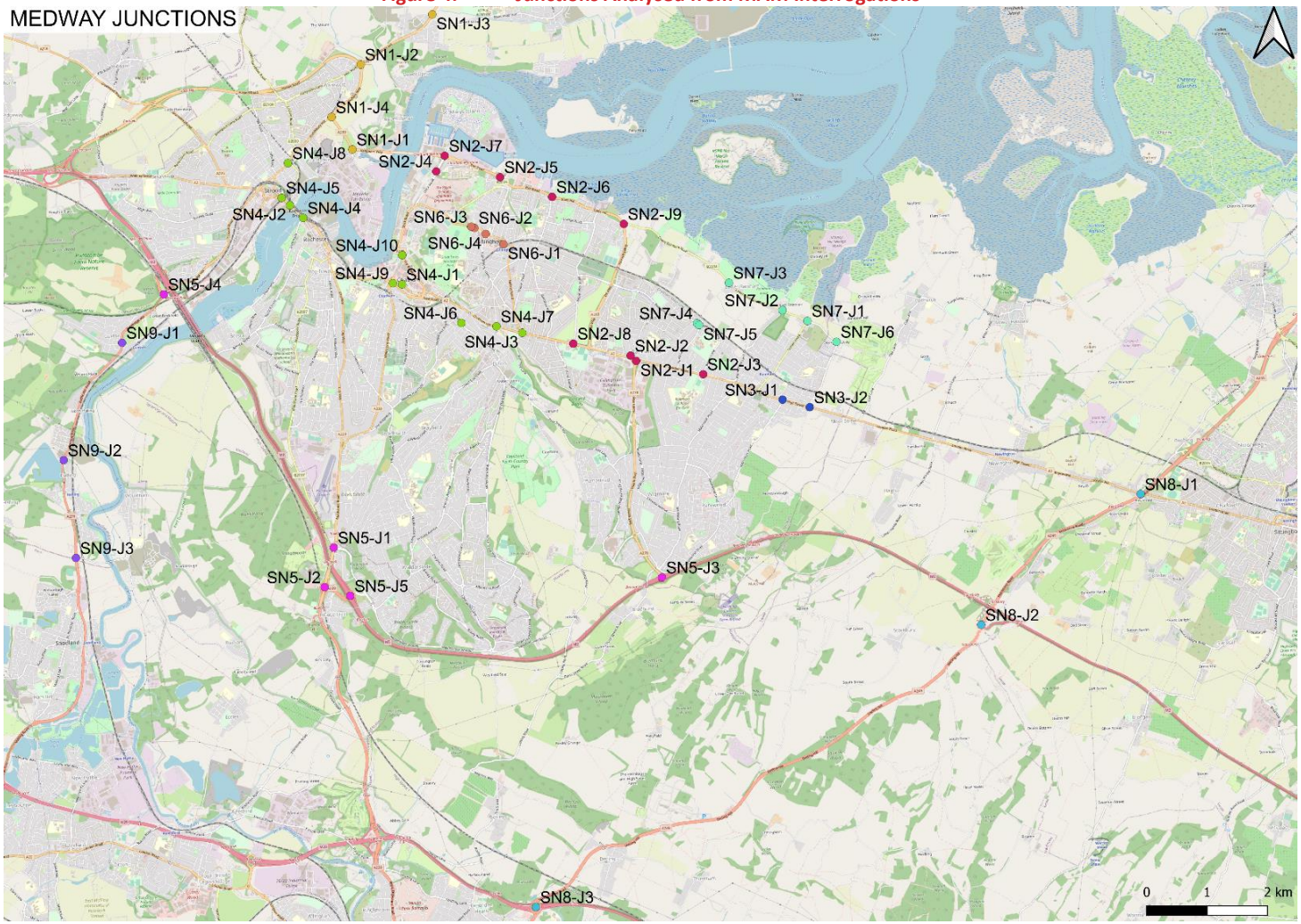


Table 6. LoS at Key Junctions (All Subnetworks & All Scenarios)

Subnetwork 1 - Four Elms Hill / Four Elms Roundabout									
AM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN1-J1	Anthony's Way Roundabout	A	A	A	A	D	C	E	F
SN1-J2	Four Elms Roundabout	F	F	F	F	F	A	F	F
SN1-J3	Main Hoo Road	A	B	A	B	B	F	F	F
SN1-J4	Sans Pareil Roundabout	A	A	A	A	B	B	C	F
PM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN1-J1	Anthony's Way Roundabout	F	F	F	F	E	C	F	F
SN1-J2	Four Elms Roundabout	F	F	F	F	F	E	F	F
SN1-J3	Main Hoo Road	A	A	A	A	A	F	F	F
SN1-J4	Sans Pareil Roundabout	B	A	A	C	E	A	D	F
Subnetwork 2 - Pier Road / A2									
AM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN2-J1	Bowater Roundabout	F	F	E	F	C	C	D	D
SN2-J2	Eastcourt Lane / South Avenue Junction	F	F	F	F	F	A	F	F
SN2-J3	London Road /Bloors Lane Junction	D	E	E	E	D	D	D	C
SN2-J4	Pembroke / Dock Road / Western Avenue / Maritime Way Roundabout	A	A	A	A	A	A	A	A
SN2-J5	Pier Road /Gillingham Gate Road Roundabout	D	D	C	D	D	C	D	B
SN2-J6	Pier Road/Church Street/Strand Junction	B	B	B	B	C	B	C	B
SN2-J7	Pier Road/Maritime Way Roundabout	F	F	F	F	F	F	F	F

SN2-J8	Rotary Gardens / Woodlands Road / Sovereign Boulevard Junction	F	F	F	F	D	D	D	F
SN2-J9	Yokosuka Way Roundabout	F	F	F	F	A	D	A	D

PM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN2-J1	Bowater Roundabout	F	F	F	F	F	C	F	F
SN2-J2	Eastcourt Lane / South Avenue Junction	B	B	C	E	F	A	F	F
SN2-J3	London Road /Bloors Lane Junction	E	F	E	F	C	E	C	C
SN2-J4	Pembroke / Dock Road / Western Avenue / Maritime Way Roundabout	C	C	C	C	C	A	C	D
SN2-J5	Pier Road /Gillingham Gate Road Roundabout	D	D	D	F	D	B	D	E
SN2-J6	Pier Road/Church Street/Strand Junction	B	B	C	D	C	B	C	C
SN2-J7	Pier Road/Maritime Way Roundabout	F	F	F	F	F	F	F	F
SN2-J8	Rotary Gardens / Woodlands Road / Sovereign Boulevard Junction	F	F	F	C	C	D	C	F
SN2-J9	Yokosuka Way Roundabout	F	F	F	C	A	D	A	F

Subnetwork 3 - A2 (Mierscourt Road to Otterham Quay Lane / Meresborough Road section)

AM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN3-J1	Mierscourt Road / High Street Junction	F	E	F	E	C	C	C	D
SN3-J2	Otterham Quay Lane/Meresborough Road/ Moor Street Junction	F	F	F	F	F	B	F	C

PM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN3-J1	Mierscourt Road / High Street Junction	F	F	F	F	D	C	D	D
SN3-J2	Otterham Quay Lane/Meresborough Road/ Moor Street Junction	F	F	F	F	E	B	F	D

Subnetwork 4 - Strood and Chatham Town Centres									
AM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN4-J1	Best Street / Clover Street Junction	B	B	B	C	D	C	C	D
SN4-J2	Canal Road / Esplanade / High Street Junction	B	B	B	B	E	F	B	D
SN4-J3	Canterbury Street / Rainham Road /Watling Street Junction	B	B	C	C	C	C	B	C
SN4-J4	High Street / Esplanade / Corporation Street Junction	C	C	C	C	D	F	C	D
SN4-J5	High Street / Station Road Junction	F	E	F	F	D	F	D	C
SN4-J6	Luton Road / Castle Road / Constitution Hill Junction	F	F	F	F	E	D	D	F
SN4-J7	Rock Avenue / Rainham Road / Chatham Hill Junction	A	B	A	B	C	D	A	E
SN4-J8	Station Road / Frindsbury Road Junction	E	B	D	D	C	F	C	D
SN4-J9	The Paddock / Gibraltar Hill / New Road / New Road Avenue Junction	F	F	F	F	E	D	F	C
SN4-J10	Whiffen's Avenue / The Brook Junction	F	F	E	F	D	C	F	F

PM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN4-J1	Best Street / Clover Street Junction	C	B	B	C	B	B	C	E
SN4-J2	Canal Road / Esplanade / High Street Junction	A	A	B	D	E	B	E	D
SN4-J3	Canterbury Street / Rainham Road /Watling Street Junction	B	A	B	A	B	B	B	D
SN4-J4	High Street / Esplanade / Corporation Street Junction	D	C	D	D	E	C	E	D
SN4-J5	High Street / Station Road Junction	F	C	D	E	E	A	E	D
SN4-J6	Luton Road / Castle Road / Constitution Hill Junction	F	B	B	B	D	D	D	F
SN4-J7	Rock Avenue / Rainham Road / Chatham Hill Junction	A	B	B	B	C	C	C	F
SN4-J8	Station Road / Frindsbury Road Junction	E	B	B	A	C	B	C	D
SN4-J9	The Paddock / Gibraltar Hill / New Road / New Road Avenue Junction	F	F	F	D	D	D	E	E
SN4-J10	Whiffen's Avenue / The Brook Junction	F	E	E	C	B	C	B	F

Subnetwork 5 - M2 Junctions 2 to 4									
AM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN5-J1	Bridgewood Roundabout	D	F	F	F	B	B	E	E
SN5-J2	Lord Lees Roundabout	A	C	D	D	B	C	E	E
SN5-J3	M2 J4	A	C	A	A	A	A	A	C
SN5-J4	Sundridge Hill Roundabout	A	A	A	A	A	A	A	A
SN5-J5	Taddington Roundabout	D	D	D	D	C	D	D	D
PM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN5-J1	Bridgewood Roundabout	F	F	C	E	D	F	F	F
SN5-J2	Lord Lees Roundabout	B	C	B	C	C	A	F	F
SN5-J3	M2 J4	A	A	A	A	A	A	A	A
SN5-J4	Sundridge Hill Roundabout	A	A	A	A	A	A	A	A
SN5-J5	Taddington Roundabout	D	C	D	D	C	C	D	D
Subnetwork 6 - Gillingham Town Centre									
AM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN6-J1	A231 / Railway Street / High Street	C	C	C	C	D	C	C	D
SN6-J2	A231 Brompton Road / Marlborough Road	A	A	A	A	C	E	C	F
SN6-J3	A231 Brompton Road / Mill Road	A	A	A	A	D	E	D	E
SN6-J4	A231 Jeffrey Street / Skinner Street	D	D	D	D	C	B	B	C

PM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN6-J1	A231 / Railway Street / High Street	C	C	C	C	D	D	D	C
SN6-J2	A231 Brompton Road / Marlborough Road	A	A	A	A	A	A	A	A
SN6-J3	A231 Brompton Road / Mill Road	A	A	A	A	E	C	E	A
SN6-J4	A231 Jeffrey Street / Skinner Street	D	D	D	D	C	B	C	D

Subnetwork 7 - Lower Rainham Road

AM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN7-J1	B2004 Lower Rainham Road / B2004 Station Road	F	F	F	F	A	E	A	F
SN7-J2	B2004 Lower Rainham Road / Berengrave Lane	B	B	B	B	A	B	A	C
SN7-J3	B2004 Lower Rainham Road / Pump Lane	F	F	F	F	A	D	A	F
SN7-J4	Beechings Way / Pump Lane (North)	A	A	A	A	A	A	A	A
SN7-J5	Beechings Way / Pump Lane (South)	F	F	F	F	A	A	A	A
SN7-J6	Lower Rainham Road / Otterham Quay Lane	A	A	A	A	A	A	A	D

PM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN7-J1	B2004 Lower Rainham Road / B2004 Station Road	F	F	F	F	A	A	A	A
SN7-J2	B2004 Lower Rainham Road / Berengrave Lane	A	A	A	A	A	A	A	A
SN7-J3	B2004 Lower Rainham Road / Pump Lane	F	F	F	F	A	A	A	A
SN7-J4	Beechings Way / Pump Lane (North)	A	A	A	A	A	A	A	A
SN7-J5	Beechings Way / Pump Lane (South)	F	F	F	F	A	A	A	A
SN7-J6	Lower Rainham Road / Otterham Quay Lane	A	B	A	A	A	A	A	A

Subnetwork 8 - A249 (A2 to M20)									
AM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN8-J1	Keycol Roundabout	F	F	F	F	F	F	F	F
SN8-J2	M2 J5	A	A	A	A	C	F	D	F
SN8-J3	M20 J7	D	E	E	E	B	B	C	C
PM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN8-J1	Keycol Roundabout	F	F	F	F	F	F	F	F
SN8-J2	M2 J5	A	A	A	A	D	F	C	F
SN8-J3	M20 J7	E	E	E	E	C	C	C	C

Subnetwork 9 - A228 Cuxton & Halling									
AM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN9-J1	A228/ Bush Rd Junction	F	F	E	E	E	F	D	A
SN9-J2	A228/ Kent Rd Roundabout	A	A	A	A	A	A	A	A
SN9-J3	A228/ Peter's Brg Roundabout	A	A	A	A	A	A	F	F
PM		Core without LTC		Core with LTC		LP without LTC		LP with LTC	
		2030	2037	2030	2037	2030	2037	2030	2037
SN9-J1	A228/ Bush Rd Junction	E	E	E	E	D	D	A	A
SN9-J2	A228/ Kent Rd Roundabout	A	A	A	A	A	A	A	A
SN9-J3	A228/ Peter's Brg Roundabout	A	A	A	A	A	A	F	F

3.2 Journey Times

3.2.1 This section provides a summary of the journey times for a number of key routes. The routes cover the main roads with journey times identified for each subnetwork. The journey times are calculated as the sum of the average travel time on each consecutive section.

3.2.2 Table 7 presents journey times for 2037 Local Plan and Core with and without LTC scenarios for both morning and evening periods.

Table 7. Journey Times at Key Routes (All Subnetworks & All Scenarios for 2037)

Subnetwork 1 - Four Elms Hill / Four Elms Roundabout					
AM		**Core without LTC**	**Core with LTC**	**LP without LTC**	**LP with LTC**
Hoo Road-Grain Road	EB	00:06:18	00:06:34	00:22:19	00:35:25
Hasted Road - Medway Tunnel	SB	00:12:27	00:10:21	00:22:15	00:25:03
Hasted Road - Medway Tunnel	NB	00:04:29	00:04:29	00:21:43	00:31:28
PM		**Core without LTC**	**Core with LTC**	**LP without LTC**	**LP with LTC**
Hoo Road-Grain Road	EB	00:05:01	00:05:06	00:19:25	00:16:31
Hasted Road - Medway Tunnel	SB	00:24:48	00:20:57	00:22:27	00:24:37
Hasted Road - Medway Tunnel	NB	00:11:19	00:14:23	00:23:47	00:25:00
Subnetwork 2 - Pier Road / A2					
AM		**Core without LTC**	**Core with LTC**	**LP without LTC**	**LP with LTC**
Sovereign Boulevard - Watling Street	WB	00:14:59	00:14:06	00:07:32	00:13:43
PM		**Core without LTC**	**Core with LTC**	**LP without LTC**	**LP with LTC**
Sovereign Boulevard - Watling Street	WB	00:20:43	00:18:50	00:07:35	00:20:01
Subnetwork 3 - A2 (Mierscourt Road to Otterham Quay Lane / Meresborough Road section)					

AM		Core without LTC	Core with LTC	LP without LTC	LP with LTC
Sovereign BLV - Moor Street	EB	00:14:33	00:15:07	00:05:53	00:07:30
Station Road - Orchard Road	NB	00:06:58	00:06:17	00:01:52	00:03:10
Station Road - Orchard Road	SB	00:03:50	00:03:46	00:01:43	00:02:39
PM		**Core without LTC**	**Core with LTC**	**LP without LTC**	**LP with LTC**
Sovereign BLV - Moor Street	EB	00:28:34	00:28:24	00:05:47	00:07:30
Station Road - Orchard Road	NB	00:09:35	00:08:27	00:03:27	00:03:10
Station Road - Orchard Road	SB	00:05:46	00:05:49	00:02:18	00:02:39

Subnetwork 4 - Strood and Chatham Town Centres

AM		Core without LTC	Core with LTC	LP without LTC	LP with LTC
Frindsbury Hill - Cuxton road	NB	00:16:05	00:27:51	00:23:41	00:26:06
City Way/Start Hill - London road	WB	00:19:58	00:22:15	00:11:11	00:10:40
PM		**Core without LTC**	**Core with LTC**	**LP without LTC**	**LP with LTC**
Frindsbury Hill - Cuxton road	NB	00:46:33	00:24:31	00:11:32	00:21:14
City Way/Start Hill - London road	WB	00:12:32	00:13:56	00:12:38	00:10:53

Subnetwork 5 - M2 Junctions 2 to 4

AM		Core without LTC	Core with LTC	LP without LTC	LP with LTC
M2 South to M2 North	NB	00:13:14	00:16:19	00:13:35	00:26:50
M2 North to M2 South	SB	00:16:05	00:14:11	00:20:03	00:19:08
A229 South to A229 North	NB	00:57:31	00:52:38	00:06:21	00:13:56
A229 North to A229 South	SB	00:52:31	00:43:03	00:15:37	00:19:24

PM		Core without LTC	Core with LTC	LP without LTC	LP with LTC
M2 South to M2 North	NB	00:11:51	00:13:02	00:11:37	00:31:26
M2 North to M2 South	SB	00:15:08	00:17:17	00:13:31	00:18:51
A229 South to A229 North	NB	00:44:23	00:41:23	00:08:08	00:14:33
A229 North to A229 South	SB	00:39:17	00:27:06	00:16:04	00:19:56

Subnetwork 6 - Gillingham Town Centre

AM		Core without LTC	Core with LTC	LP without LTC	LP with LTC
A231 Brompton Road To Balmoral Road	WB	00:10:00	00:10:06	00:04:36	00:08:01
A231 Balmoral Road to Brompton Road	EB	00:22:31	00:22:51	00:03:18	00:07:58
Canterbury Street To James Street	NB	00:03:42	00:03:42	00:01:36	00:03:53
James Street To Canterbury Street	SB	00:08:15	00:08:20	00:02:36	00:04:40
PM		**Core without LTC**	**Core with LTC**	**LP without LTC**	**LP with LTC**
A231 Brompton Road To Balmoral Road	WB	00:11:24	00:11:16	00:09:31	00:10:36
A231 Balmoral Road to Brompton Road	EB	00:17:23	00:19:00	00:02:54	00:21:24
Canterbury Street To James Street	NB	00:04:00	00:04:04	00:01:38	00:04:02
James Street To Canterbury Street	SB	00:08:00	00:07:44	00:02:04	00:08:31

Subnetwork 7 - Lower Rainham Road

AM		Core without LTC	Core with LTC	LP without LTC	LP with LTC
Lower Rainham Road	EB	00:31:25	00:31:02	00:08:52	00:41:23
Otterham Quay Lane	NB	00:02:09	00:02:35	00:01:52	00:03:39
Otterham Quay Lane	SB	00:02:37	00:02:42	00:02:21	00:03:42

Pump Lane	SB	00:01:37	00:01:37	00:01:42	00:01:41
PM		**Core without LTC**	**Core with LTC**	**LP without LTC**	**LP with LTC**
Lower Rainham Road	EB	00:10:25	00:10:13	00:07:02	00:37:22
Otterham Quay Lane	NB	00:02:55	00:02:16	00:01:48	00:38:39
Otterham Quay Lane	SB	00:02:41	00:02:35	00:02:17	00:04:18
Pump Lane	SB	00:01:35	00:01:38	00:01:39	00:01:39
Subnetwork 8 - A249 (A2 to M20)					
AM		**Core without LTC**	**Core with LTC**	**LP without LTC**	**LP with LTC**
A249 East to A249 West	WB	00:19:40	00:21:44	00:10:14	00:10:21
A249 West to A249 East	EB	00:13:47	00:14:32	00:21:18	00:20:04
A2 East to A2 West	WB	00:03:58	00:04:01	00:04:48	00:04:50
A2 West to A2 East	EB	00:15:27	00:15:13	00:04:42	00:06:24
M2 East to M2 West	WB	00:02:39	00:02:42	00:02:38	00:02:36
M2 West to M2 East	EB	00:02:35	00:02:42	00:03:31	00:07:48
M20 East to M20 West	WB	00:02:29	00:02:41	00:02:25	00:03:19
M20 West to M20 East	EB	00:03:51	00:03:48	00:02:02	00:02:09
PM		**Core without LTC**	**Core with LTC**	**LP without LTC**	**LP with LTC**
A249 East to A249 West	WB	00:19:57	00:19:15	00:10:14	00:10:21
A249 West to A249 East	EB	00:19:19	00:20:02	00:24:20	00:31:35
A2 East to A2 West	WB	00:04:36	00:04:36	00:05:28	00:05:28
A2 West to A2 East	EB	00:13:31	00:13:30	00:10:09	00:10:16
M2 East to M2 West	WB	00:02:32	00:02:35	00:03:02	00:02:54
M2 West to M2 East	EB	00:05:55	00:06:37	00:10:00	00:10:56

M20 East to M20 West	WB	00:02:24	00:02:33	00:02:22	00:02:22
M20 West to M20 East	EB	00:03:43	00:03:55	00:04:09	00:04:45
Subnetwork 9 - A228 Cuxton & Halling					
AM		**Core without LTC**	**Core with LTC**	**LP without LTC**	**LP with LTC**
A228 South to A228 North	NB	00:05:10	00:05:17	00:05:05	00:20:52
A228 North to A228 South	SB	00:06:57	00:07:55	00:10:50	00:07:25
Bush Road Westbound	WB	00:02:59	00:03:02	00:03:01	00:03:02
PM		**Core without LTC**	**Core with LTC**	**LP without LTC**	**LP with LTC**
A228 South to A228 North	NB	00:05:20	00:05:19	00:06:14	00:17:20
A228 North to A228 South	SB	00:09:29	00:09:43	00:12:01	00:08:32
Bush Road Westbound	WB	00:03:03	00:02:59	00:03:07	00:02:56

3.3 Network Statistics

3.3.1 Network performance for each scenario within the nine subnetworks has been assessed for 2037, for both morning and evening peaks. The analysis presented in Table 8 includes the following indicators:

- Average Delay (seconds per km travelled);
- Mean queue (vehicles);
- Average speed (km per hour); and
- Stop time (seconds per km).

Table 8. Network Statistics (All Subnetworks & All Scenarios for 2037)

Subnetwork 1 - Four Elms Hill / Four Elms Roundabout				
AM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	00:48	00:40	02:05	02:53
Mean queue (veh)	119	90	710	891
Average speed (km/h)	43	45	33	28
Stop time (sec/km)	35	28	113	155
Vehicles waiting to enter (veh)	209	164	423	548
PM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	01:44	01:44	02:10	02:13
Mean queue (veh)	178	178	633	695
Average speed (km/h)	31	32	31	29
Stop time (sec/km)	81	81	116	118
Vehicles waiting to enter (veh)	320	431	161	258
Subnetwork 2 - Pier Road / A2				
AM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	02:12	02:19	01:18	01:36
Mean queue (veh)	353	388	201	452
Average speed (km/h)	25	25	31	30
Stop time (sec/km)	113	121	67	83
Vehicles waiting to enter (veh)	483	507	295	518
PM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	03:00	02:35	01:13	03:48
Mean queue (veh)	442	361	190	837
Average speed (km/h)	19	23	32	21
Stop time (sec/km)	155	133	62	208
Vehicles waiting to enter (veh)	641	419	275	1920

Subnetwork 3 - A2 (Mierscourt Road to Otterham Quay Lane / Meresborough Road section)				
AM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	07:56	07:54	01:53	03:24
Mean queue (veh)	80	80	19	34
Average speed (km/h)	9	9	19	17
Stop time (sec/km)	451	449	101	187
Vehicles waiting to enter (veh)	202	200	2	17
PM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	09:29	09:12	02:45	05:21
Mean queue (veh)	85	84	25	72
Average speed (km/h)	8	8	19	13
Stop time (sec/km)	542	524	150	301
Vehicles waiting to enter (veh)	351	337	14	64
Subnetwork 4 - Strood and Chatham Town Centres				
AM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	03:40	04:07	04:30	04:49
Mean queue (veh)	412	440	427	457
Average speed (km/h)	18	17	17	16
Stop time (sec/km)	204	231	253	271
Vehicles waiting to enter (veh)	1035	1064	822	987
PM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	04:02	03:38	02:21	04:49
Mean queue (veh)	334	273	182	466
Average speed (km/h)	16	15	20	16
Stop time (sec/km)	225	199	124	271
Vehicles waiting to enter (veh)	1234	997	252	924
Subnetwork 5 - M2 Junctions 2 to 4				
AM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	01:05	01:27	00:35	00:59
Mean queue (veh)	403	481	325	574
Average speed (km/h)	55	52	54	43
Stop time (sec/km)	53	72	26	41
Vehicles waiting to enter (veh)	413	614	304	933
PM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	00:37	00:51	00:30	01:10
Mean queue (veh)	282	354	220	703

Average speed (km/h)	61	54	56	43
Stop time (sec/km)	25	35	21	54
Vehicles waiting to enter (veh)	337	596	412	1498

Subnetwork 6 - Gillingham Town Centre

AM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	08:32	08:45	02:32	04:25
Mean queue (veh)	33	33	18	29
Average speed (km/h)	9	8	17	14
Stop time (sec/km)	486	500	137	244
Vehicles waiting to enter (veh)	193	195	16	76

PM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	08:40	08:46	03:17	08:55
Mean queue (veh)	34	34	22	34
Average speed (km/h)	8	8	18	8
Stop time (sec/km)	494	499	185	508
Vehicles waiting to enter (veh)	267	238	54	248

Subnetwork 7 - Lower Rainham Road

AM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	02:53	02:59	00:52	01:55
Mean queue (veh)	211	211	85	216
Average speed (km/h)	28	28	33	33
Stop time (sec/km)	152	156	44	104
Vehicles waiting to enter (veh)	137	138	0	102

PM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	01:34	01:31	00:58	02:01
Mean queue (veh)	158	155	17	253
Average speed (km/h)	34	34	35	34
Stop time (sec/km)	80	77	49	110
Vehicles waiting to enter (veh)	303	295	4	189

Subnetwork 8 - A249 (A2 to M20)

AM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	00:56	01:16	00:28	00:53
Mean queue (veh)	199	236	161	224
Average speed (km/h)	60	58	64	59
Stop time (sec/km)	43	61	20	40
Vehicles waiting to enter (veh)	213	206	65	167

PM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	00:43	00:49	00:37	00:45
Mean queue (veh)	280	302	297	369
Average speed (km/h)	59	57	59	56
Stop time (sec/km)	28	33	27	34
Vehicles waiting to enter (veh)	278	317	218	433

Subnetwork 9 - A228 Cuxton & Halling				
AM	**Core without LTC**	**Core with LTC**	**LP without LTC**	**LP with LTC**
Average Delay (sec/km)	00:50	01:34	00:33	00:40
Mean queue (veh)	48	111	20	23
Average speed (km/h)	38	27	45	44
Stop time (sec/km)	38	78	23	29
Vehicles waiting to enter (veh)	80	243	29	89

PM	Core without LTC	Core with LTC	LP without LTC	LP with LTC
Average Delay (sec/km)	01:05	01:41	00:45	00:44
Mean queue (veh)	117	145	28	27
Average speed (km/h)	38	30	44	45
Stop time (sec/km)	52	82	32	31
Vehicles waiting to enter (veh)	151	211	62	84

3.4 Results Discussion

3.4.1 LoS outputs, journey times and general network statistics have been used to assess the LTC impact on the Medway highway network within the modelled nine subnetworks. As seen from the results, the **Local Plan with LTC** and **Core with LTC** scenarios show the most adverse impacts in most of the subnetworks. This can be explained by the increased load of traffic that will traverse through Medway to access the LTC. The subnetworks where most of the impacts are seen are:

- Subnetwork 1 Four Elms Hill / Four Elms Roundabout;
- Subnetwork 2 Pier Road / A2;
- Subnetwork 4 Strood and Chatham Town Centres;
- Subnetwork 5 M2 Junctions 2 to 4; and
- Subnetwork 9 A228 Cuxton & Halling.

3.4.2 In some instances, certain junctions appear to operate better in the scenarios with LTC compared to the scenarios without LTC. The primary reason for this is because, with the addition of the LTC traffic, some upstream junctions may become more congested holding back the traffic from downstream junctions which therefore appear to be operating better. Furthermore, in some of the scenarios with LTC, there is a higher number of vehicles waiting to enter the network which means that the full impact of the additional delay cannot be seen during the peak hours because it also spills in the cooldown period – this is the equivalent to on-street delays extending into a longer peak period.

3.4.3 The Planning Inspectorate's Scoping Opinion, dated December 2017, required the Environmental Statement to consider the Council's emerging Local Plan. The Council has raised concerns about the assumptions for future development in traffic modelling since the 2018 Statutory Consultation.

3.4.4 The 'Traffic Modelling Update' as part of the 2020 'Supplementary Consultation' noted that "growth associated with government housing targets which have not yet fully progressed through the planning system is not included." However, the Council intends to meet its development needs, including the government's assessment of Local Housing Need according to the Standard Method, through an emerging Local Plan. The Council will consult on options for future growth in a Regulation 18 document in 2023.

3.4.5 It is understood that the LTC transport model was built following the principles and processes set out in the Department for Transport's (DfT) Transport Analysis Guidance. Growth within the transport model is capped in line with DfT traffic forecasts (TEMPro 7.2) and adjusted locally to account for developments close to the project that are under construction, have a planning application and planning permission (as of 30 September 2021). This comprises the Core Scenario.

3.4.6 The DfT traffic forecasts do not reflect the full scale of Medway's development needs and this presents a challenge for local plan-making. Despite the early stage of Medway's emerging Local Plan, following the government's announcement in November 2019 of upfront infrastructure funding under the Housing Infrastructure Fund, there is more certainty for growth on the Hoo Peninsula, including 10,600 new homes. However, it is understood that these homes would have been excluded from the Core Scenario, given their planning stage. Therefore, the Core Scenario is unlikely to reflect the spatial distribution of Medway's future growth.

3.4.7 The Local Impact Report (LIR) will be concerned with identifying relevant positive, negative and neutral local impacts based on the Core Scenario. This is considered to be appropriate, given the early stage of the emerging Local Plan, to avoid contesting the LIR. However, additional scenarios which reflect the full scale of Medway's development needs have been presented to demonstrate the challenge for local plan-making.

4. PROPOSED MITIGATIONS

4.1.1 Based on the model assessment results presented in Table 6, Table 7 and Table 8 and a visual check of junction operation in microscopic simulations in the 2037 Core with LTC scenario, six junctions with severe congestion have been identified that may be considered appropriate for mitigation; these are listed in Table 9.

4.1.2 The outputs for all subnetworks in all scenarios have been discussed with the Council. It was agreed to focus on the subnetworks with the most adverse impacts for the mitigations, those being subnetworks 1, 2, 4, 5 and 9. The documentation submitted by NH as part of the DCO application, including within the TA, identify the same subnetworks as the most critical locations. It is noted that, for subnetworks 5 and 9, the network statistics in the with LTC scenarios are considerably worse than the without LTC scenarios; this demonstrates subnetwork-wide impacts associated with LTC.

4.1.3 The comparison between the with and without mitigations was operated on the 2037 Core with LTC Scenario. It was agreed with the Council to focus the mitigations only on the Core with LTC scenario, due to uncertainties associated with the LP with LTC scenario.

4.1.4 Whilst mitigation measures have been considered at six junctions only, it should be noted that additional locations exist across Medway that are subject to severe delays and negative impacts in the 'with LTC' scenarios. Consideration of six junctions at this stage should not be taken as implying that other junctions operate satisfactorily.

Table 9. Junctions Proposed for Mitigation

NO	JUNCTION NAME	MITIGATION
SN1-J2	Four Elms roundabout	Transform to hamburger roundabout for north-south movement and add in segregated left turn to north of junction.
SN2-J7	Pier Road / Maritime Way roundabout	Provide a walking / cycle route round one side of the junction to avoid having a stop line on the exit arm.
SN4-J5	High Street / Station Road junction	Optimise signals.
SN4-J9	The Paddock / Gibraltar Hill / New Road / New Road Avenue junction	Ban turns / cut off The Paddock.
SN5-J1	Bridgewood roundabout	Change lane markings at southern and western arms to allow entrance in the roundabout from 3 lanes instead of 2.
SN9-J1	A228 / Bush Road junction	Add signals.

4.1.5 Considering the space constraints at most junctions, the proposed mitigations generally focus on signal optimisation, lane capacity management, and prioritising / restricting certain vehicular movements. An exception to this approach is at SN1-J2 Four Elms roundabout,

where infrastructure upgrades are suggested. Layouts of the proposed mitigations are contained in Appendix B.

4.1.6 The proposed mitigations were tested on Core with LTC scenario for 2037 and the resulting LoS in comparison with corresponding LoS without mitigation are presented in Table 10, covering subnetworks 1, 2, 4, 5 and 9. The junctions with mitigation incorporated can be seen in grey within Table 10.

Table 10. LoS at Key Junctions for 2037 Core with LTC (with & without Mitigations)

Subnetwork 1 - Four Elms Hill / Four Elms Roundabout			
AM		Core with LTC	Core with LTC + Mitigation
SN1-J1	Anthony's Way Roundabout	A	D
SN1-J2	Four Elms Roundabout	F	E
SN1-J3	Main Hoo Road	B	A
SN1-J4	Sans Pareil Roundabout	A	F
PM		Core with LTC	Core with LTC + Mitigation
SN1-J1	Anthony's Way Roundabout	F	E
SN1-J2	Four Elms Roundabout	F	C
SN1-J3	Main Hoo Road	A	A
SN1-J4	Sans Pareil Roundabout	C	C
Subnetwork 2 - Pier Road / A2			
AM		Core with LTC	Core with LTC + Mitigation
SN2-J1	Bowater Roundabout	F	F
SN2-J2	Eastcourt Lane / South Avenue Junction	F	F
SN2-J3	London Road /Bloors Lane Junction	E	D
SN2-J4	Pembroke / Dock Road / Western Avenue / Maritime Way Roundabout	A	A
SN2-J5	Pier Road /Gillingham Gate Road Roundabout	D	D
SN2-J6	Pier Road/Church Street/Strand Junction	B	B
SN2-J7	Pier Road/Maritime Way Roundabout	F	E
SN2-J8	Rotary Gardens / Woodlands Road / Sovereign Boulevard Junction	F	F
SN2-J9	Yokosuka Way Roundabout	F	F
PM		Core with LTC	Core with LTC + Mitigation
SN2-J1	Bowater Roundabout	F	F
SN2-J2	Eastcourt Lane / South Avenue Junction	E	A

SN2-J3	London Road /Bloors Lane Junction	F	D
SN2-J4	Pembroke / Dock Road / Western Avenue / Maritime Way Roundabout	C	C
SN2-J5	Pier Road /Gillingham Gate Road Roundabout	F	F
SN2-J6	Pier Road/Church Street/Strand Junction	D	D
SN2-J7	Pier Road/Maritime Way Roundabout	F	F
SN2-J8	Rotary Gardens / Woodlands Road / Sovereign Boulevard Junction	C	F
SN2-J9	Yokosuka Way Roundabout	C	A

Subnetwork 4 - Strood and Chatham Town Centres			
AM		**Core with LTC**	**Core with LTC + Mitigation**
SN4-J1	Best Street / Clover Street Junction	C	B
SN4-J2	Canal Road / Esplanade / High Street Junction	B	B
SN4-J3	Canterbury Street / Rainham Road /Watling Street Junction	C	C
SN4-J4	High Street / Esplanade / Corporation Street Junction	C	C
SN4-J5	High Street / Station Road Junction	F	C
SN4-J6	Luton Road / Castle Road / Constitution Hill Junction	F	F
SN4-J7	Rock Avenue / Rainham Road / Chatham Hill Junction	B	A
SN4-J8	Station Road / Frindsbury Road Junction	D	D
SN4-J9	The Paddock / Gibraltar Hill / New Road / New Road Avenue Junction	F	F
SN4-J10	Whiffen's Avenue / The Brook Junction	F	F

PM		**Core with LTC**	**Core with LTC + Mitigation**
SN4-J1	Best Street / Clover Street Junction	C	B
SN4-J2	Canal Road / Esplanade / High Street Junction	D	A
SN4-J3	Canterbury Street / Rainham Road /Watling Street Junction	A	A
SN4-J4	High Street / Esplanade / Corporation Street Junction	D	C
SN4-J5	High Street / Station Road Junction	E	A
SN4-J6	Luton Road / Castle Road / Constitution Hill Junction	B	B
SN4-J7	Rock Avenue / Rainham Road / Chatham Hill Junction	B	B

SN4-J8	Station Road / Frindsbury Road Junction	A	A
SN4-J9	The Paddock / Gibraltar Hill / New Road / New Road Avenue Junction	D	D
SN4-J10	Whiffen's Avenue / The Brook Junction	C	C

Subnetwork 5 - M2 Junctions 2 to 4

AM		Core with LTC	Core with LTC + Mitigation
SN5-J1	Bridgewood Roundabout	F	F
SN5-J2	Lord Lees Roundabout	D	D
SN5-J3	M2 J4	A	A
SN5-J4	Sundridge Hill Roundabout	A	A
SN5-J5	Taddington Roundabout	D	C

PM		Core with LTC	Core with LTC + Mitigation
SN5-J1	Bridgewood Roundabout	E	F
SN5-J2	Lord Lees Roundabout	C	F
SN5-J3	M2 J4	A	A
SN5-J4	Sundridge Hill Roundabout	A	A
SN5-J5	Taddington Roundabout	D	E

Subnetwork 9 - A228 Cuxton & Halling

AM		Core with LTC	Core with LTC + Mitigation
SN9-J1	A228/ Bush Rd Junction	E	B
SN9-J2	A228/ Kent Rd Roundabout	A	A
SN9-J3	A228/ Peter's Brg Roundabout	A	A

PM		Core with LTC	Core with LTC + Mitigation
SN9-J1	A228/ Bush Rd Junction	E	C
SN9-J2	A228/ Kent Rd Roundabout	A	A
SN9-J3	A228/ Peter's Brg Roundabout	A	A

4.1.7 It can be seen that, in most cases, the proposed mitigations improve the LoS for the junctions where they are applied. However, in some cases the proposed mitigation does not provide the expected LoS improvement or the rest of the subnetwork becomes more congested. This could be due to some adjacent junctions in the network becoming worse with the application of the mitigations due to traffic being released from an upstream junction blocking the downstream junction.

4.1.8 The Four Elms roundabout upgrade to a hamburger junction in Subnetwork 1 leads to a slightly better level of service with the roundabout operating at LoS E in the morning peak and C in the evening peak instead of F before the junction upgrade was applied. The improvement at Four Elms releases traffic which causes some adverse impacts at downstream junctions; this will require further consideration if the proposed mitigation is taken forward.

4.1.9 In Subnetwork 2, the removal of the eastern pedestrian crossing at Pier Road/ Maritime Way roundabout does not provide the expected level of improvement with the junction still operating at LoS F in the evening peak and LoS E in the morning peak. Further investigation of potential improvements is required for this subnetwork.

4.1.10 In Subnetwork 4, the traffic signals optimisation at High Street/ Station Road junction provides high gains with the LoS improving to C in the morning peak and A in the evening peak compared to F and E in the morning and evening peak respectively. The Paddock / Gibraltar Hill / New Road / New Road Avenue junction changes do not have any change at the LoS. Nonetheless, the overall network operation is becoming better, especially in the evening peak, as can be seen from the LoS of the rest of the junctions.

4.1.11 The Bridgewood roundabout upgrade in Subnetwork 5 includes lane marking changes allowing traffic to enter in the roundabout via three lanes instead of two for the southern and western arm. This change did not improve the LoS in this subnetwork. Especially in the evening peak, the model is quite congested and the LoS for Bridgewood roundabout reduces from E to F due to the higher amount of traffic being able to queue at the roundabout approaches. Before the lane changes, vehicles were queuing only in two lanes whereas with the lane increase to three, so with the scheme there are more vehicles occupying the roundabout approach, thus higher delay.

4.1.12 The signalisation of the A228 and Bush Road junction in Subnetwork 9 improves the LoS from E to B in the morning peak and from E to C in the evening peak. The rest of the subnetwork remains unaffected.

5. PROPOSED MITIGATIONS 2.0

5.1.1 Following discussions with the Council and the LTC team in May 2023, it was agreed to investigate possible mitigation opportunities at three further locations on Medway's highway network where such mitigation would be likely required as a result of the impact of the LTC.

5.1.2 In June 2023, SYSTRA reviewed the locations that may be considered for mitigation following the same methodology as described in **Chapter 4**. The methodology is based on the model assessment results presented in Table 6, Table 7 and Table 8 and a visual check of junction operation in microscopic simulations in the 2037 Core with LTC scenario.

5.1.3 The comparison between the with and without mitigations was made for the 2037 Core with LTC Scenario. It was agreed with the Council to focus the mitigations only on the Core with LTC scenario, due to uncertainties associated with the LP with LTC scenario.

5.1.4 A full list of the locations impacted by LTC, where the LoS is worse in the Core 'with' than 'without' LTC scenario for 2037 is provided below in Table 11.

Table 11. Locations impacted by LTC based on LoS for 2037 Core with & without LTC

Junction		Core without LTC 2037		Core with LTC 2037	
		AM	PM	AM	PM
SN1-J4	Sans Pareil Roundabout	A	A	A	C
SN2-J2	Eastcourt Lane / South Avenue Junction	F	B	F	E
SN2-J5	Pier Road /Gillingham Gate Road Roundabout	D	D	D	F
SN2-J6	Pier Road/Church Street/Strand Junction	B	B	B	D
SN4-J1	Best Street / Clover Street Junction	B	B	C	C
SN4-J2	Canal Road / Esplanade / High Street Junction	B	A	B	D
SN4-J3	Canterbury Street / Rainham Road /Watling Street Junction	B	A	C	A
SN4-J4	High Street / Esplanade / Corporation Street Junction	C	C	C	D
SN4-J5	High Street / Station Road Junction	E	C	F	E
SN5-J2	Lord Lees Roundabout	C	C	D	C
SN5-J5	Taddington Roundabout	D	C	D	D

5.1.5 A selection of junctions for further assessment from the above locations was made considering the LoS severity, the interaction between junctions and the space constraints. It was observed that many junctions in Subnetwork 2 (Figure 5) were affecting each other with queues spilling upstream and exit blocking. For this reason, efforts were focused on Subnetwork 2, where three junctions have worse LoS in the Core with than without LTC scenario. These are locations where it was visually observed that more junctions are affected due to junction interaction.

5.1.6 At most junctions, the proposed mitigations generally focus on signal optimisation and lane capacity management. The overall routing was also improved to allow for more sensible route choice based on the signal coordination. Layouts of the proposed mitigations are contained in Appendix B.

5.1.7 The list of the groups of junctions that were mitigated in Subnetwork 2 along with the observed issues and the proposed mitigation are shown in Table 12. Maps of the two groups of junctions are presented in Figure 6 and Figure 7.

5.1.8 The proposed mitigations in Subnetwork 2 were tested using the Core with LTC 2037 scenario and the resulting LoS in comparison with corresponding LoS without mitigation are presented in Table 13 for the AM and Table 14 for the PM peak. The junctions with mitigation incorporated can be seen in grey within the tables.

5.1.9 Besides the LoS (A-F), the control delay (seconds/ vehicle) which the LoS calculation is based upon is also provided for more clear representation of the mitigation improvements. (For reference, the LoS calculation basis is explained in Table 5.)

Table 12. Junctions Proposed for Mitigation in Subnetwork 2

NO	JUNCTION NAME	ISSUE	MITIGATION
SN2-J1	Bowaters Roundabout	Long queues at western and south-eastern arms of SN2-J1 roundabout. As a result, traffic of the western arm spilling upstream to SN2-J10 and rerouting on South Avenue of SN2-J2 to avoid the queues.	Signal coordination improved on the SN2-J1 roundabout to release traffic from all arms.
SN2-J2	Eastcourt Lane / South Avenue Junction		All the signals (pedestrian and junction control) between SN2-J3 to SN2-J10 coordinated for smoother traffic flows.
SN2-J3	London Road /Bloors Lane Junction		
SN2-J10	Will Adams Roundabout		The 2-lane circulatory section at SN2-J10 changed to 3-lane to provide more capacity for traffic from east. The lane markings at the eastern arm were changed to allow two lanes heading from A2 to A289.
SN2-J5	Pier Road /Gillingham Gate Road Roundabout	Long queues on SN2-J7 western, eastern, and southern approach arms. As a result, the whole corridor up to SN2-J6 had knock-on congestion.	Signal coordination at SN2-J7 improved to release traffic from all arms.
SN2-J6	Pier Road/Church Street/Strand Junction		The pedestrian signals on the southern and eastern exits coordinated for better operation of the SN2-J7 roundabout.
SN2-J7	Pier Road/Maritime Way Roundabout		All the signals (pedestrian and junction control) between SN2-J7 to SN2-J9 coordinated for smoother traffic flow.

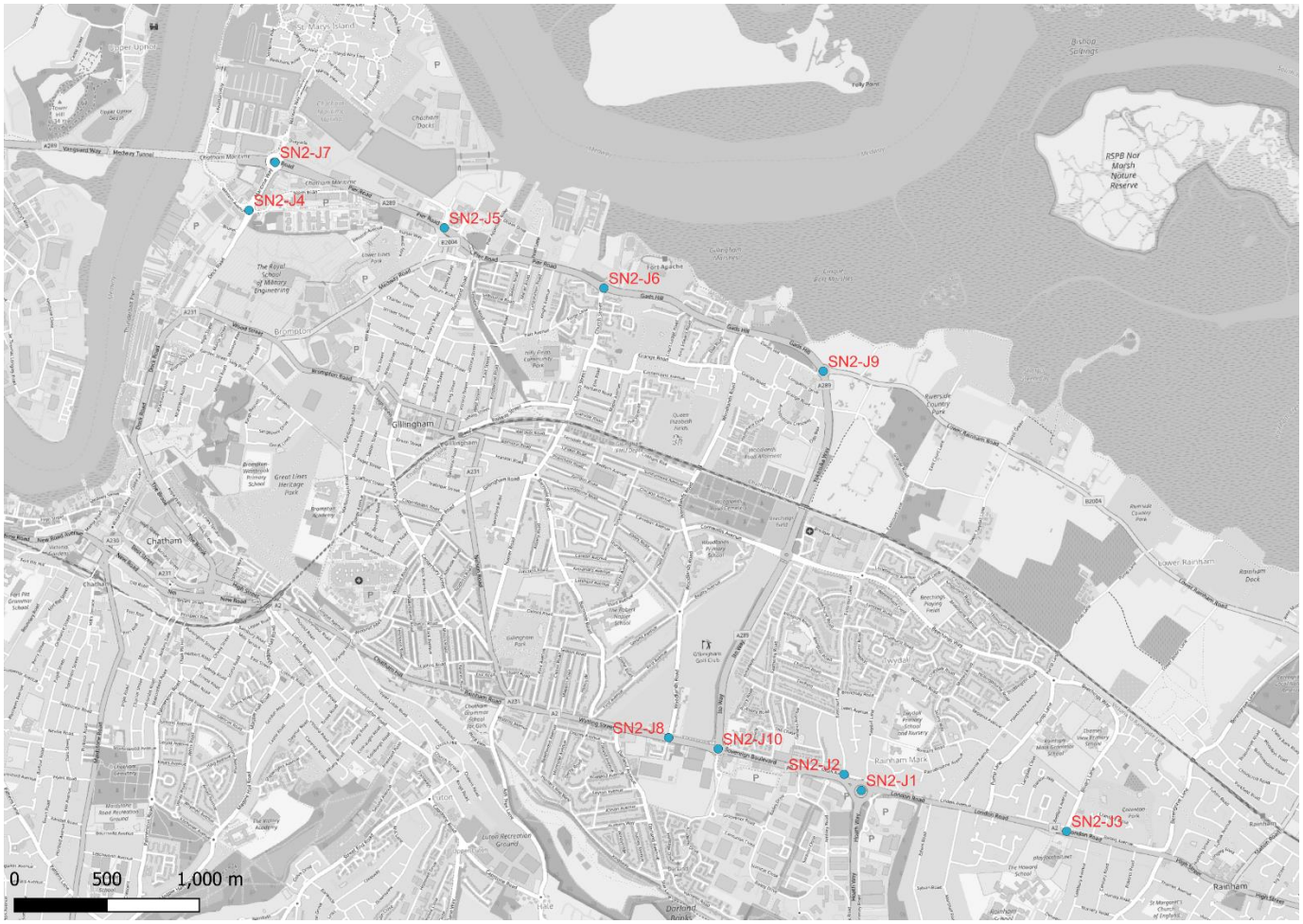


Figure 5. Subnetwork 2 Junction Locations

Figure 6. Subnetwork 2 – Group of Junctions 1,2,3,8,10

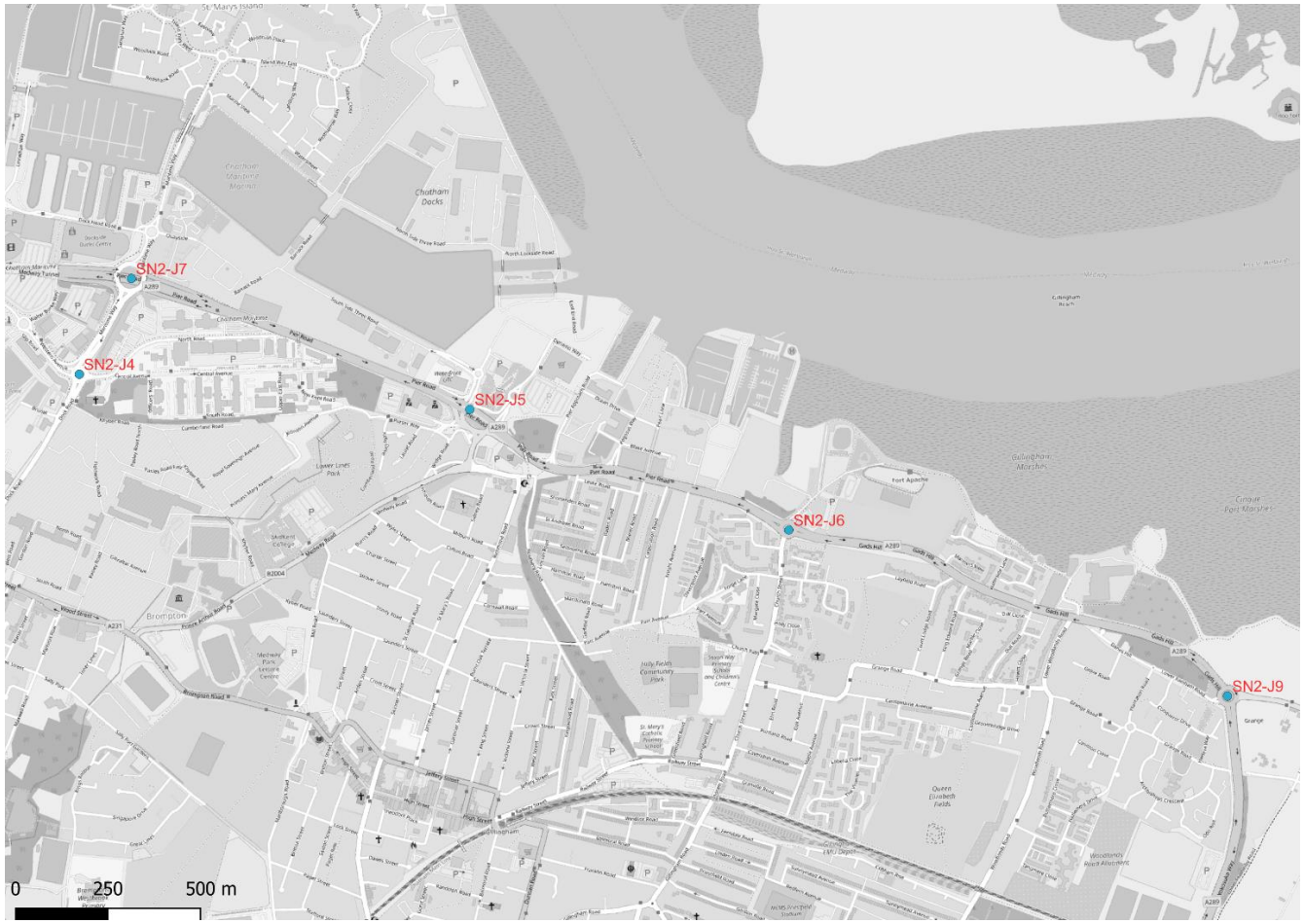


Figure 7. Subnetwork 2 – Group of Junctions 4,5,6,7,9

5.1.10 In previous chapters, reporting of network operation has focussed on the LoS, as defined in Table 5 above. This provides a useful overview and is maintained within the assessment work set out below. However, it is important to note that the definition of LoS "F" is a delay of **more than** 50 seconds per vehicle (or 80 for a signalised junction). In severely congested networks, it does not differentiate (for instance) between a delay of two minutes and a delay of five minutes. To provide an additional level of detail for junctions which are forecast to operate beyond capacity in the future year, the actual delay is also provided below.

Table 13. LoS for 2037 Core without and with LTC and with LTC + Mitigation - AM

AM		LoS			Control delay (sec / vehicle)		
		Core without LTC	Core with LTC	Core with LTC + Mitigation	Core without LTC	Core with LTC	Core with LTC + Mitigation
SN2-J1	Bowater Roundabout	F	F	C	116	94	30
SN2-J2	Eastcourt Lane / South Avenue Junction	F	F	F	390	336	198
SN2-J3	London Road /Bloors Lane Junction	E	E	D	57	60	38
SN2-J4	Pembroke / Dock Road / Western Avenue / Maritime Way Roundabout	A	A	A	4	4	6
SN2-J5	Pier Road /Gillingham Gate Road Roundabout	D	D	C	37	43	20
SN2-J6	Pier Road/Church Street/Strand Junction	B	B	A	12	14	9
SN2-J7	Pier Road/Maritime Way Roundabout	F	F	F	137	163	90
SN2-J8	Rotary Gardens / Woodlands Road / Sovereign Boulevard Junction	F	F	F	98	101	99
SN2-J9	Yokosuka Way Roundabout	F	F	F	80	131	80
SN2-J10	Ito Way/Sovereign Blvd/Wiill Adams Way/Sovereign Blvd	F	F	E	87	85	45

Table 14. LoS for 2037 Core without and with LTC and with LTC + Mitigation - PM

PM		LoS			Control delay (sec / vehicle)		
		Core without LTC	Core with LTC	Core with LTC + Mitigation	Core without LTC	Core with LTC	Core with LTC + Mitigation
SN2-J1	Bowater Roundabout	F	F	C	150	137	22
SN2-J2	Eastcourt Lane / South Avenue Junction	B	E	A	12	37	0
SN2-J3	London Road /Bloors Lane Junction	F	F	D	81	83	44
SN2-J4	Pembroke / Dock Road / Western Avenue / Maritime Way Roundabout	C	C	D	21	19	32
SN2-J5	Pier Road /Gillingham Gate Road Roundabout	D	F	D	52	107	39
SN2-J6	Pier Road/Church Street/Strand Junction	B	D	C	19	41	20
SN2-J7	Pier Road/Maritime Way Roundabout	F	F	E	120	198	78
SN2-J8	Rotary Gardens / Woodlands Road / Sovereign Boulevard Junction	F	C	F	173	35	103
SN2-J9	Yokosuka Way Roundabout	F	C	A	102	15	8
SN2-J10	Ito Way/Sovereign Blvd/Wiill Adams Way/Sovereign Blvd	C	C	B	20	16	11

5.1.11 In the AM peak, it can be seen that in most cases, the proposed mitigations improve the LoS not only for the specific junctions where the mitigation is proposed, but also at junctions interacting with them. At SN2-J2, SN2-J7, SN2-J8 and SN2-J9, the LoS with mitigation remains F; however, the control delay reduces. This means that there is improvement but further mitigations would be necessary to bring the junction under capacity.

5.1.12 In the PM peak it can be seen that, in most cases, the proposed mitigations improve the LoS not only for the junctions where they are applied, but also for the junctions interacting with them. However, in some cases the proposed mitigation does not provide the expected LoS improvement, such as SN2-J4 and SN2-J8.

5.1.13 The reasoning for this at SN2-J4 is that improved conditions at SN2-J7 mean that more traffic is flowing southbound towards J4. South of J4, many vehicles are turning right from Dock Road to Brunel Way, which causes a queue spilling upstream and causing J4 to operate with higher delays.

5.1.14 The reasoning for SN2-J8 is that improved conditions at J10 heading from the A2 to the A289 allow less gaps for vehicles on the western A2 arm to enter the roundabout, thus queues from J10 western arm spill upstream to J8. The same effect is not observed in the AM peak, due to higher demand going eastbound on A2 in the PM peak.

6. CONCLUSIONS

6.1.1 This report presents the impacts of Lower Thames Crossing (LTC) on the local traffic network in Medway, for the opening year 2030 and the forecasting year 2037 within nine subnetworks contained within the Medway Aimsun Model (MAM). It focuses on the Core with and without LTC Scenarios which are a reflection of the Core Scenarios (Do Minimum and Do Something) from the Lower Thames Area Model (LTAM) and the Local Plan with and without LTC Scenarios which reflect the expected traffic situation based on Medway's emerging Local Plan.

6.1.2 The modelling outputs are presented in the format of Level of Service (LoS) for the junctions of interest, journey times on key routes and general network statistics. The key adverse transport issues as a result of the LTC were identified in subnetworks 1 (Four Elms Hill / Four Elms Roundabout), 2 (Pier Road / A2), 4 (Strood and Chatham Town Centres), 5 (M2 Junctions 2 to 4) and 9 (A228 Cuxton & Halling).

6.1.3 The report also outlines potential mitigations at junctions subject to significant impacts to help address the significant adverse traffic related impacts. The LoS outputs were recalculated for the scenarios with the mitigation schemes and compared to the scenarios without the mitigations for the Core with LTC 2037 Scenario.

6.1.4 In most cases, the proposed mitigations improve the LoS for the junctions where they are applied. However, in some cases some adjacent junctions in the network are becoming worse with the application of the mitigations due to traffic being released from an upstream junction blocking the downstream junction. This situation is unsurprising due to the high amount of traffic that is present in most of the subnetworks.

6.1.5 The mitigations have been focussed on the Core with LTC scenarios as this is in compliance with the LTAM Do Something Scenario. This does not mean that the Local Plan with LTC scenario does not require mitigations, but due to uncertainty around the Local Plan development sites, this was considered more appropriate at this point.

6.1.6 It is recommended to re-evaluate the LTC impact to the Medway network in conjunction with the updated Medway Local Plan to ensure the LTC scheme does not impact the delivery of the Local Plan.

7. APPENDIX A – LTAM TECHNICAL NOTE

TECHNICAL NOTE

LOWER THAMES CROSSING

MODELLING ANALYSIS TECHNICAL NOTE

IDENTIFICATION TABLE	
Client/Project owner	Medway Council
Project	Lower Thames Crossing
Title of Document	Modelling Analysis Technical Note
Type of Document	Technical Note
Date	25/08/2022
Number of pages	19

TABLE OF CONTENTS

1. INTRODUCTION

1.1.1 This note provides details of the Lower Thames Area Model outputs provided to Medway Council in summer 2022. It includes analysis completed to help understand the impacts of the Lower Thames Crossing (LTC) Scheme on roads within Medway.

1.1.2 It includes the following sections:

- LTC Models – details of the models outputs provided
- Model Matrices – details of the changes in total cordoned demand between the models
- Flow Differences – maps and text relating to the changes in flows on Medway roads and the likely re-routing due to LTC
- Junction Hotspots – locations where the junctions are shown to have capacity constraints in the future over and above what is expected without the LTC scheme

2. LTC MODELS

2.1 Cordoned Model

2.1.1 A cordoned area of the LTAM has been provided to Medway Council to interrogate and help them understand if the impacts of the LTC scheme cause any areas of concern on their road network.

2.1.2 The models were interrogated by SYSTRA Ltd in summer 2022 to inform the consultation feedback in Autumn 2022.

2.1.3 The models provided include the following:

- Do Minimum (no LTC scheme)
- Do Something (with the LTC Scheme)

2.1.4 The model base year is 2016 and the opening year is modelled as 2030 with additional future years being 2037, 2045 and 2051.

2.1.5 For the purposes of looking at the roads within Medway the 2030 opening year and 2037 forecasting year have been used throughout. The 2037 year was chosen to compliment the Medway Local Plan update.

2.1.6 A review of the model outputs was completed with no major causes for concern noted.

2.2 GIS Shapefiles

2.2.1 In addition to the cordoned SATURN model, Medway were also provided with QGIS shapefiles for all of the model runs. These shapefiles include the following information:

- Total Passenger Car Units (pcu) flows by link;
- Volume to capacity ratio by link;
- Net speed on link (kph);
- Number of cars;
- Number of light goods vehicles;
- Number of Heavy goods vehicles;

- Percentage of Heavy goods vehicles; and
- Time along the link

2.2.2 The shapefiles have been utilised to produce maps showing the changes in flows on roads within Medway as the outputs can be better displayed for interpretation as a map background can be included. These maps are also supplemented with SATURN plots.

3. MODEL MATRICES

3.1.1 The matrices for each of the cordon models were extracted in order to be able to compare the demand totals for the different scenarios and check the levels of growth between model years. Whilst it was only possible to do this for the cordoned area rather than the model as a whole it does allow the trend in this cordoned area to be checked.

3.1.2 Table 1 shows both the growth in demand between 2030 and 2037 and the changes comparing the Do Something run to the Do Minimum.

Table 1. Matrix Comparisons

SCENARIO	% GROWTH 2030 TO 2037	% CHANGE VS DO MINIMUM 2030	% CHANGE VS DO MINIMUM 2037
Do Minimum	6.0%		
Do Something	6.2%	1.7%	1.9%

3.1.3 As can be seen the level of demand growth between 2030 and 2037 is consistent between the Do Minimum and Do Something.

3.1.4 The changes in demand between the with and without LTC also seem sensible with a small increase as a result of the scheme.

4. FLOW DIFFERENCES

4.1.1 The plots include both GIS plots from the shapefiles provided for the LTAM model and also SATURN plots for the Medway cordon area. Both plot types show the change in actual flows in pcus.

4.1.2 For the SATURN plots a green line represents an increase in flow on the link and a blue line represents a reduction in expected flows.

4.1.3 For the GIS plots changes in flow show where there is either additional traffic or reduced traffic on the links. Increases are shown in yellow, orange and red while decreases are green and blue. The links that are grey show small levels of change.

4.2 Do Something vs Do Minimum 2030

4.2.1 The plots in Figure 1 to Figure 4 show the difference in flows in PCUs between the Do Something and Do Minimum runs.

Figure 1. Do Something vs Do Minimum 2030 AM – GIS Plot

Figure 2. Do Something vs Do Minimum 2030 AM – SATURN Plot

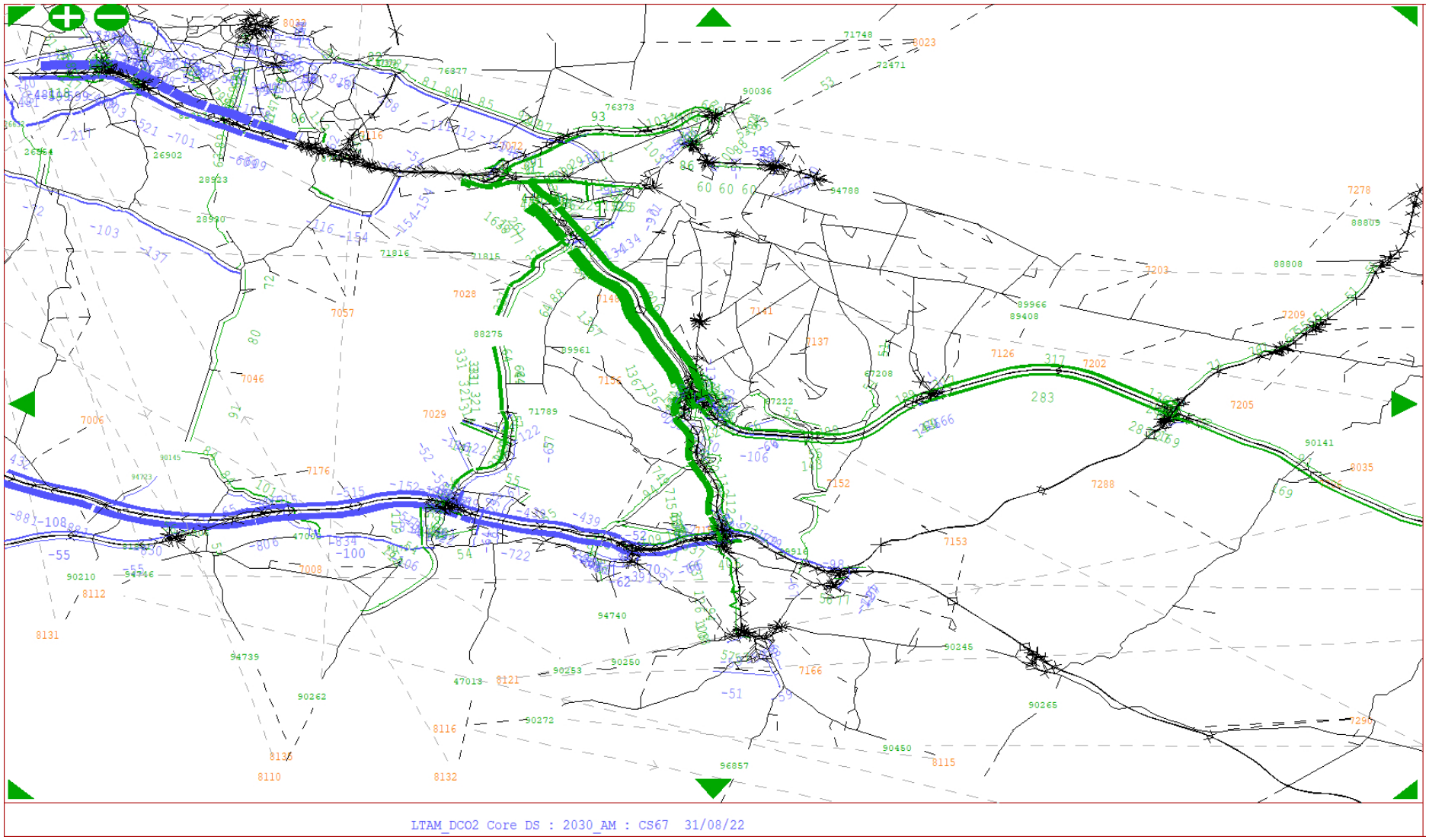
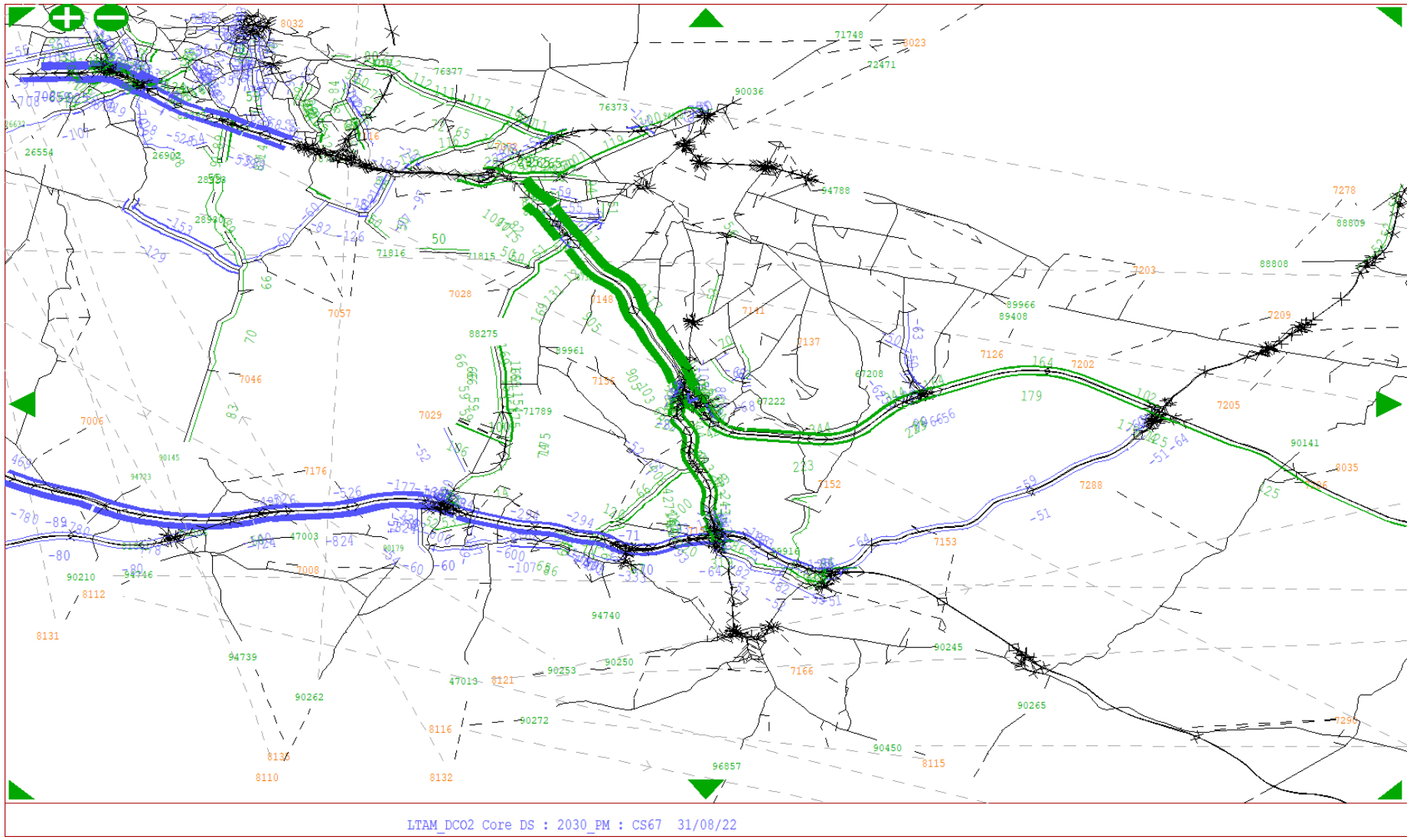


Figure 3. Do Something vs Do Minimum 2030 PM – GIS Plot

Figure 4. Do Something vs Do Minimum 2030 PM – SATURN Plot



4.2.2 Looking at the maps for the Do Something versus the Do Minimum scenario for 2030 shows that the changes as expected are mostly close to the LTC scheme and on trunk roads leading to the scheme.

4.2.3 During the AM peak it can be seen that the LTC is resulting in a reduction in traffic along the A2 beyond the new LTC junction with approximately 1,000 less vehicles travelling eastbound to the M2 and 600 vehicles travelling westbound.

4.2.4 Flows on the M2 increase, particularly in a northbound direction (approximately 1350 vehicles and 800 southbound). These vehicles appear to be heading to the new LTC link which has northbound flows of approximately 4,500 vehicles and 3,500 southbound.

4.2.5 There is also a notable decrease in expected vehicle numbers on the M20, particularly to the west of the A229 junction. This is due to traffic using the new LTC and not needing to cross via the Dartford crossing.

4.2.6 The A289 between the M2 and Wainscott also sees an increase in expected flows of up to approximately 400 pcus southbound and 100 pcus northbound. The A2 between the M2 and central Strood also see an expected increase of approximately 450 pcus westbound with traffic heading to the LTC. Finally, the A228 and A229 both northbound see increases of 375 pcus and 715 pcus respectively (with southbound flows of approximately 90 pcus and 110 pcus).

4.2.7 During the PM peak the re-routing of traffic is similar, although as would be expected there is some change in directionality of the changes. On the M2 flows increase more in a southbound direction (approximately 1,100 pcus) rather than northbound (approximately 900 pcus). Meanwhile the reduction in flows on the A2 is lower in the PM peak and less varied by direction (approximately -600 pcus eastbound and -500 pcus westbound).

4.2.8 On the M20 there is again a noticeable reduction in flows both east and westbound to the west of the A229 junction. The impacts on the A289 are less noteworthy in the PM peak although the A228 and A229 both see increases in expected traffic of a similar scale to the AM peak (A228 170 pcus southbound and 70 pcus northbound, A229 340 pcus southbound and 430 pcus northbound).

4.3 Do Something versus Do Minimum 2045

4.3.1 Figure 5 to Figure 8 show the changes in flows for 2037 for the do something compared to the Do Minimum.

Figure 5. Do Something versus Do Minimum 2037 AM – GIS Plot

Figure 6. Do Something versus Do Minimum 2037 AM – SATURN Plot

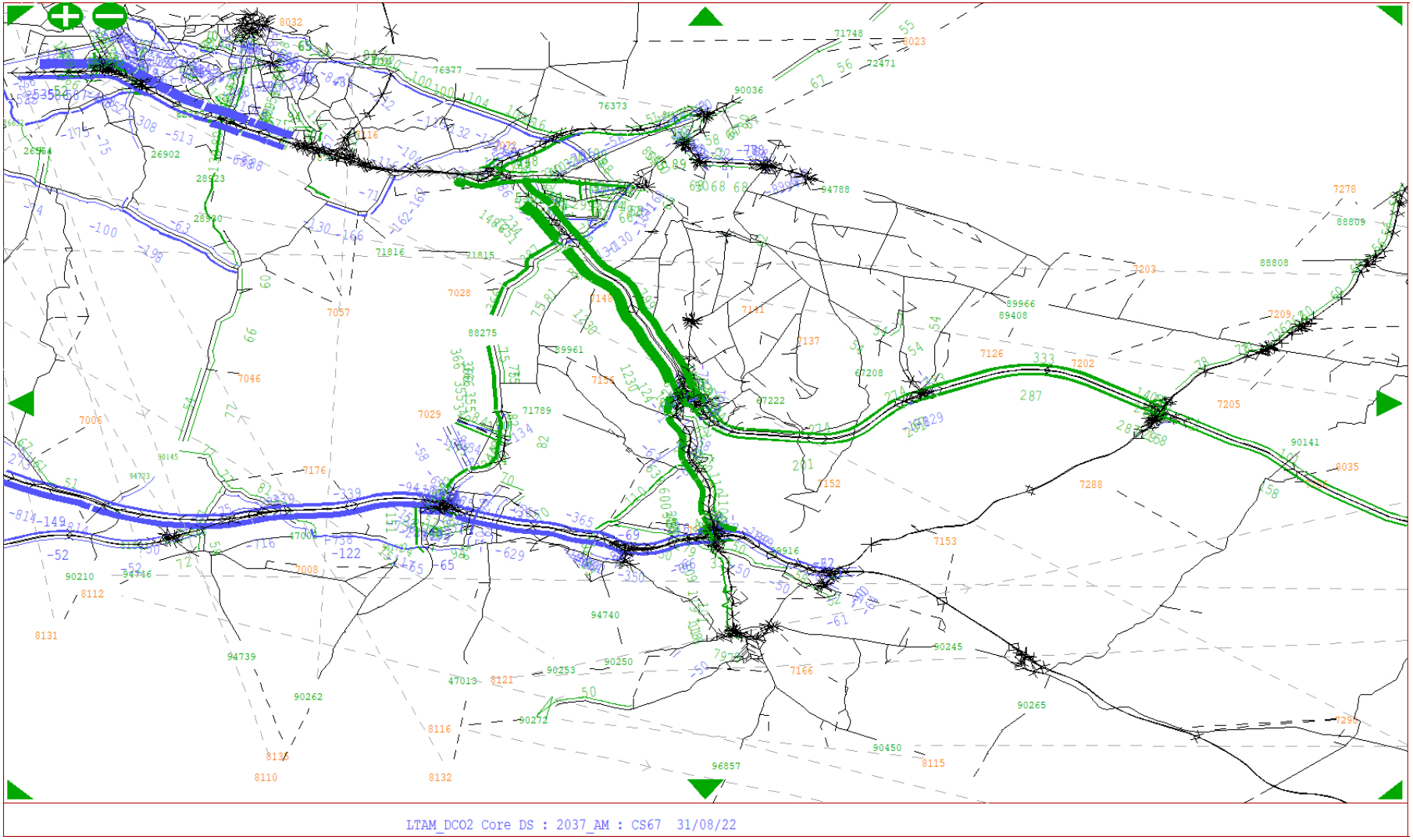
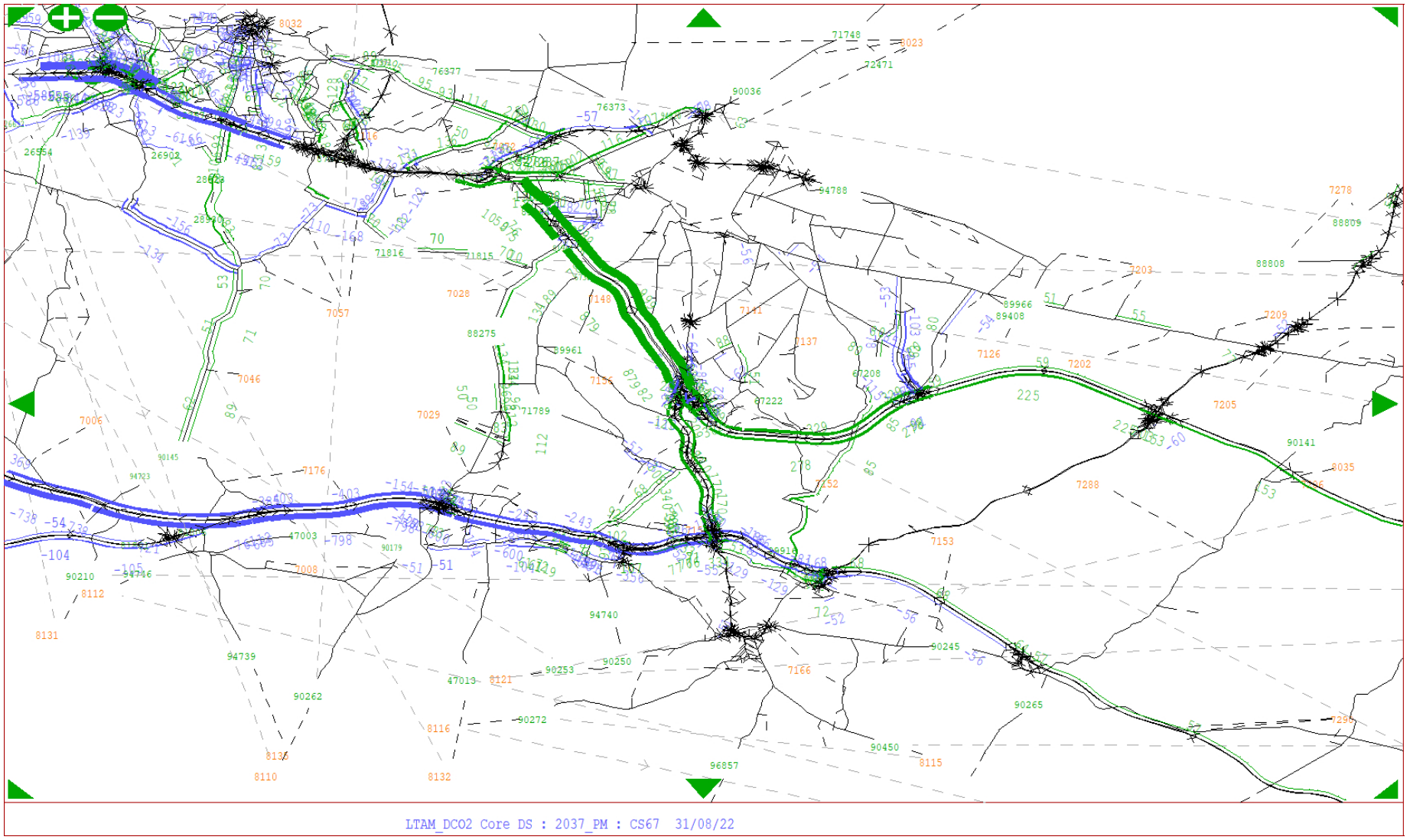


Figure 7. Do Something versus Do Minimum 2037 PM – GIS Plot

Figure 8. Do Something versus Do Minimum 2037 PM – SATURN Plot



4.3.2 As with the 2030 opening year, the 2037 forecast year shows very similar trends in flow changes between the do something scenario and the do minimum.

4.3.3 In the AM peak, most of the main routes show a slightly lesser impact in 2037 than in 2030. There are again reductions in flow on the A2 west of the LTC scheme (approximately -1050 pcus eastbound and -690 pcus westbound).

4.3.4 The reductions on the M20 west of the A229 are approximately -630 pcus westbound and -370 pcus eastbound.

4.3.5 Flows on the M2 are expected to still be greater with the LTC scheme in place with increases of approximately 800 pcus southbound and 1230 pcus northbound. Both the A228 and A229 see flow increases especially northbound (A228 approximately 370 pcus northbound and 80 pcus southbound, 229 approximately 750 pcus northbound and 10 pcus southbound).

4.3.6 Finally for the AM peak, the A289 towards the A2 / M2 sees an increase in flows of up to approximately 340 pcus.

4.3.7 During the PM peak the reductions in flow along the A2 are approximately 390 pcus eastbound and 610 pcus westbound while the M20 west of the A228 sees a slightly larger reduction in expected flows of approximately 400 pcus eastbound and 800 pcus westbound.

4.3.8 Increase in flow are again observed in the M2 (approximately 1,000 pcus southbound and 880 pcus northbound), the A228 (approximately 50 pcus northbound and 130 pcus southbound) and the A229 (approximately 340 pcus northbound and 170 pcus southbound).

4.3.9 All the observed changes in flows appear reasonable and as would be expected given both the location and nature of the LTC scheme being tested.

5. HOTSPOTS

5.1.1 Locations where junctions in the network struggle have been identified as hotspots. These are locations where the highway is most likely to struggle to cope with increased flows as a result of the LTC scheme.

5.1.2 Figure 9 and Figure 10 show change in ratio of flow to capacity (RFC) between the Do Something and Do Minimum scenarios which has been calculated to identify locations where the forecast junction performance deterioration is most pronounced in terms of junction performance. The following criteria has been applied to identify junctions where operational performance worsens:

- One of the arms both exceeds a RFC of 95% **and**
- This RFC has increased by more than 10% compared to the Do Minimum scenario.

Figure 9. Junction Hotspots Severe 2037 AM

Figure 10. Junction Hotspots Severe 2037 PM

5.1.3 Most of the hotspots are located close to the boundary of Medway or on the trunk roads within Medway.

5.1.4 The junctions shown in the maps are also listed below in Table 2. Note that number 10 and 17 are intentionally excluded from the list as they are not included on the maps.

Table 2. Junction Hotspot Locations

JUNCTION ID	LOCATION	CLASSIFICATION
1	Valley Drive SB between Stanley Crescent	PM Severe
2	B262 Springhead Rd SB at Hall Road roundabout	PM Severe
3	Hall Road WB at Springhead Rd roundabout	PM Severe
4	Trottiscliffe Road SB at A20 London Road junction	AM Severe
5	Sandling Ln EB to Boxley Road roundabout	PM Severe
6	A229 on slip northbound from Cobtree roundabout	PM Severe
7	A229 on slip northbound from Cobtree roundabout	PM Severe
8	M20 EB off slip at junction 7	PM Severe
9	A229 NB Sandling Interchange between roundabouts (M20 J6)	AM & PM Severe
11	M20 J6 WB off-slip at A229 roundabout (Sandling Interchange)	AM Severe
12	M2 NB off slip J3	PM Severe
13	M2 J5 WB merge with on-slip	AM Severe
14	M2 J4 on slip EB at merge	PM Severe
15	M2 J2 SB off slip at A228	PM Severe
16	M2 SB off slip J3	PM Severe

JUNCTION ID	LOCATION	CLASSIFICATION
18	M2 EB off slip onto A289 NB	AM severe
19	Bligh Way NB at junction with A2 Watling Street	AM Severe
20	Zone access onto A228 / Malling Road roundabout	AM Severe

6. VOLUME OVER CAPACITY CHANGES

6.1.1 In addition to the hotspot junctions being identified maps showing the change in volume over capacity (VoC) between the Do Minimum and Do Something scenario were also created. These were created from the GIS information so also show a wider area than just the SATURN cordon.

6.1.2 Figure 11 and Figure 12 show the changes in VoC in 2037 for the do something compared to do minimum scenarios.

Figure 11. Change in VoC Do Something vs Do Minimum 2037 AM

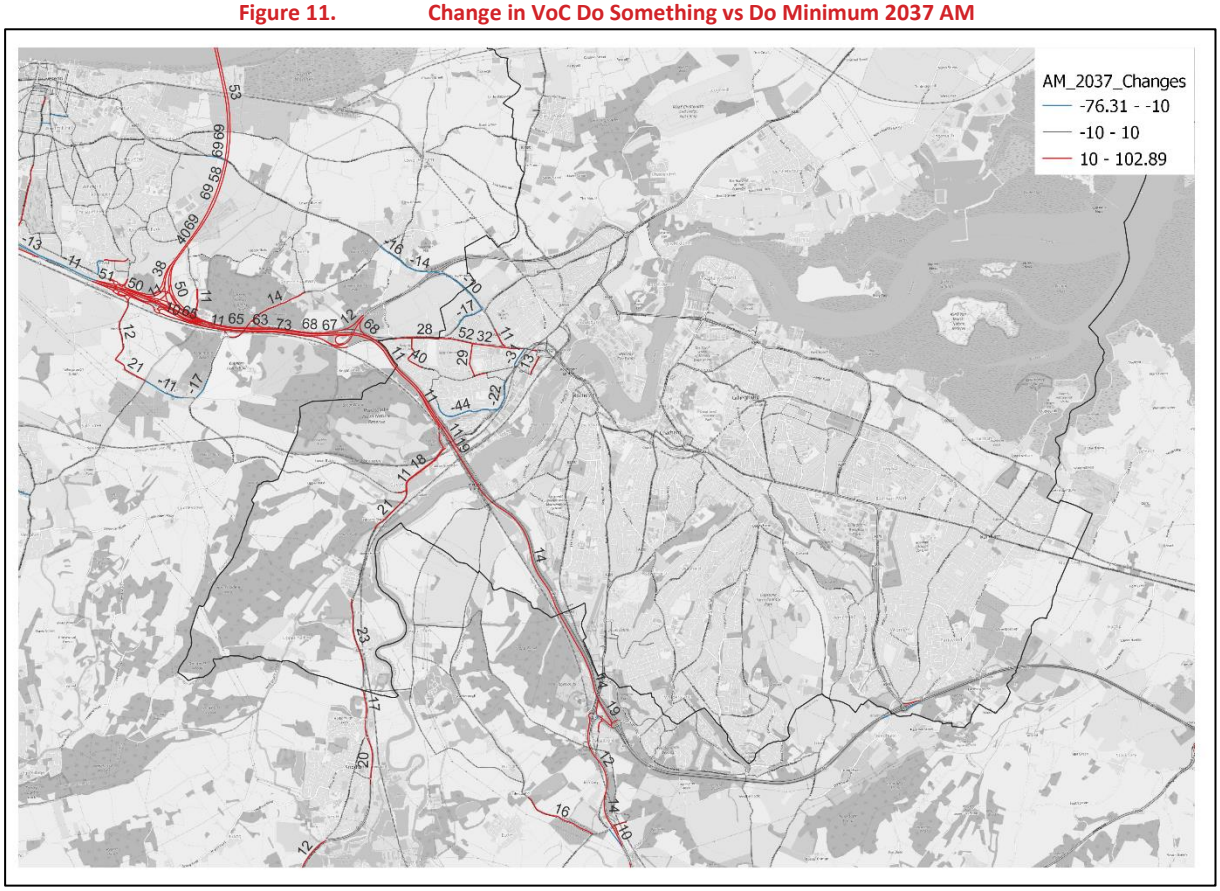
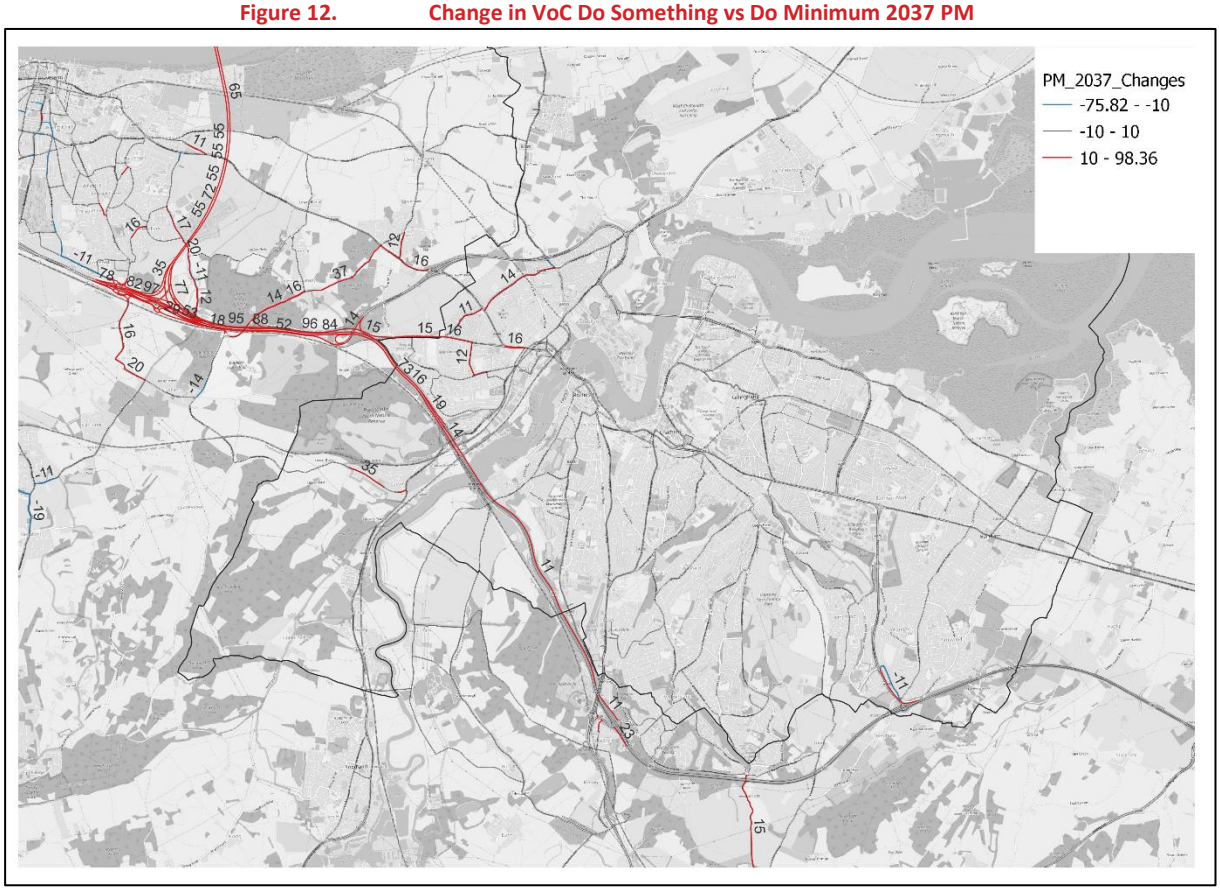


Figure 12. Change in VoC Do Something vs Do Minimum 2037 PM



6.1.3 As can be seen from the VoC difference plots most of the area has either an increase in the VoC or no change (grey). The largest changes in VoC are associated with locations where the links are new (i.e. the LTC route).

6.1.4 For the AM peak, other than the increase on the A2 and M2 the main area that is expected to see changes in VoC is Rochester on the west of the River Medway. There are increases in VoC on the A2 between the M2 and Rochester (up to 52% increase) but also decreases on Cuxton Road (-22%) and Sycamore Road (-44%). There is also an increase in the VoC along the A228 (up to 23%).

6.1.5 For the PM peak there are no decreases of more than 10%. As in the AM peak the main increases are along the M2 and A2 and the new links associated with the LTC. There are increases along the B2108 (up to 14%). There is also an increase of 35% on Bush Road for traffic travelling towards Sundridge Hill.

7. CONCLUSIONS AND FOLLOW UP

7.1.1 Overall, the results of the LTAM model runs showed that:

- Changes in traffic flow are concentrated on the strategic roads with the expected changes on local roads much lower.
- The locations where junctions are likely to struggle as a result of the LTC scheme are also concentrated on the strategic roads and roads on the boundary of Medway.

8. APPENDIX B - PROPOSED MITIGATIONS

Appendix B - Core with LTC 2037 Mitigations

NO	JUNCTION NAME	MITIGATION	FIGURE
SN1-J2	Four Elms roundabout	Transform to hamburger roundabout for North-South movement and add in segregated left turn to north of junction.	1
SN2-J7	Pier Road / Maritime Way roundabout	Provide a walking / cycle route round one side of the junction to avoid having a stop line on the exit arm.	2
SN4-J5	High Street / Station Road junction	Optimise signals	-
SN4-J9	The Paddock / Gibraltar Hill / New Road / New Road Avenue junction	Ban turns / cut off Paddock.	3
SN5-J1	Bridgewood roundabout	Change lane markings	-
SN9-J1	A228 / Bush Road junction	Add signals	4
SN2-J10	Will Adams Roundabout	Change lane markings and change 2-lane circulatory section to 3-lane.	5

SN1-J2 Four Elms roundabout

- Introduce a segregated left turn lane from north to east.
- Introduce straight ahead through the roundabout to facilitate the north-south movements.
- All arms to become signalised.

Figure 1 SN1-J2 Four Elms roundabout Mitigation

SN2-J7 Pier Road / Maritime Way roundabout

- Remove eastern crossings across Pier Rd.

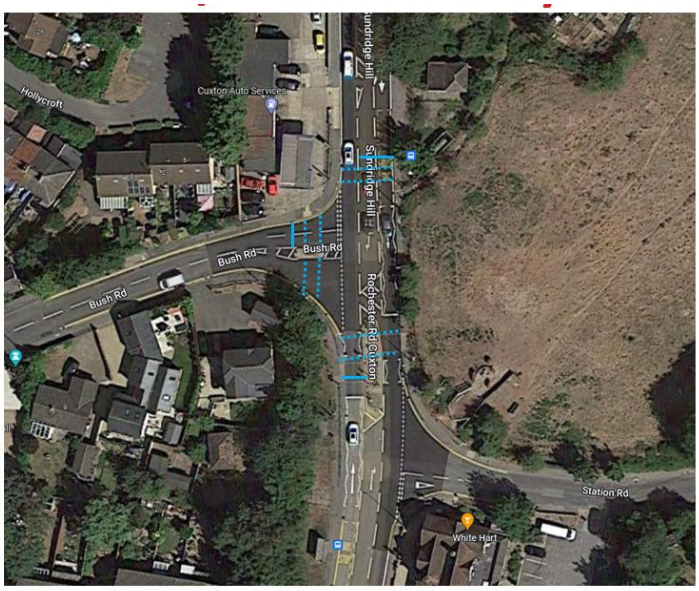
Figure 2 SN2-J7 Pier Road / Maritime Way roundabout

SN4-J9The Paddock / Gibraltar Hill / New Road / New Road Avenue junction

- Make The Paddock one way out only, tighten the southern kerb and shift the stop line closer to the junction
- Right-turn only out of Gibraltar Hill into New Rd Avenue
- Vehicles that were performing the left turn out of Gibraltar Hill into New Rd Avenue will need to use New Cut instead

Figure 3 SN4-J9 The Paddock / Gibraltar Hill / New Road / New Road Avenue junction

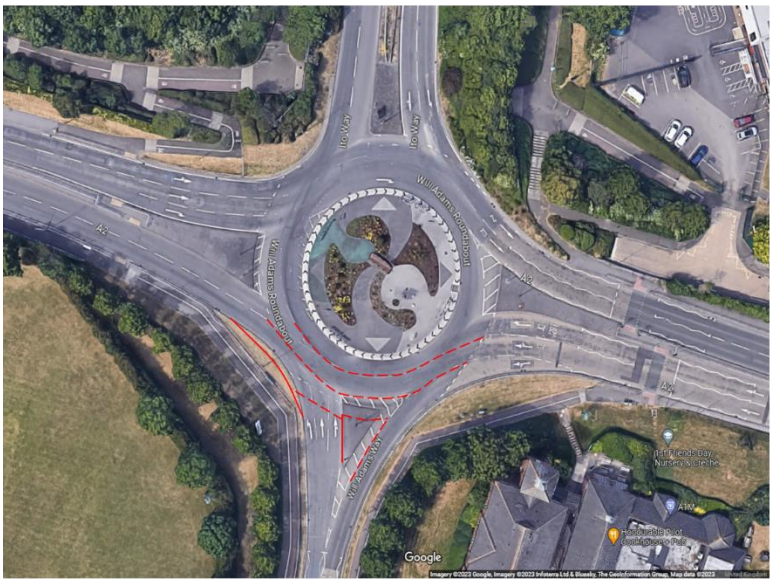
SN9-J1A228 / Bush Road junction



- Signalise the priority T-junction between Rochester Rd Cuxton and Bush Rd.
- Along the signalisation, introduce also pedestrian crossing on the northern and western arm
- Change the staggered crossing into a one single crossing which allows to move the stop line closer to the junction

Figure 4 SN9-J1 A228 / Bush Road junction

SN2- Will Adams Roundabout



- The 2-lane circulatory section changed to 3-lane to provide more capacity for traffic from east.
- The lane markings at the eastern arm were changed to allow two lanes heading from A2 to A289.

Figure 5 Will Adams Roundabout

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Appendix F

MEDWAY LOWER THAMES CROSSING SUPPORT TRANSPORT ASSESSMENT REVIEW

1.1 Introduction

1.1.1 SYSTRA Ltd (SYSTRA) has been commissioned by Medway Council (the Council) to undertake a high-level technical review of the transport related documents on behalf of Highways England in support of the proposed A122 Lower Thames Crossing (LTC) Development Consent Order (DCO) application.

1.1.2 SYSTRA has undertaken a technical review of the **Transport Assessment** prepared and submitted as part of the DCO application for the LTC. This work is intended to identify and confirm positive, negative and neutral impacts of the Lower Thames Crossing on Medway during the operational phase (i.e. following construction and opening).

1.1.3 As part of this work, an assessment has been undertaken to confirm whether the impacts set out within the Transport Assessment correspond with those identified by SYSTRA in technical work undertaken on behalf of Medway Council over the previous year, as set out within the SYSTRA Technical Report dated 6 December 2022.

1.1.4 Technical assessment undertaken by SYSTRA of the impacts of LTC in Medway has been carried out using the Lower Thames Area Model (LTAM) supplied by National Highways (NH) and the Medway Aimsun Model (MAM) supplied by the Council, as discussed further later in this document.

1.1.5 The Transport Assessment presents the forecast impacts of the crossing on the performance of the transport network. For the purposes of this technical work, focus has been placed on impacts on the highway network within Medway.

1.1.6 Operational impacts of the crossing are set out for two future years:

- 2030 (the opening year); and
- 2045 (the design year).

1.2 Development & Highway Interventions

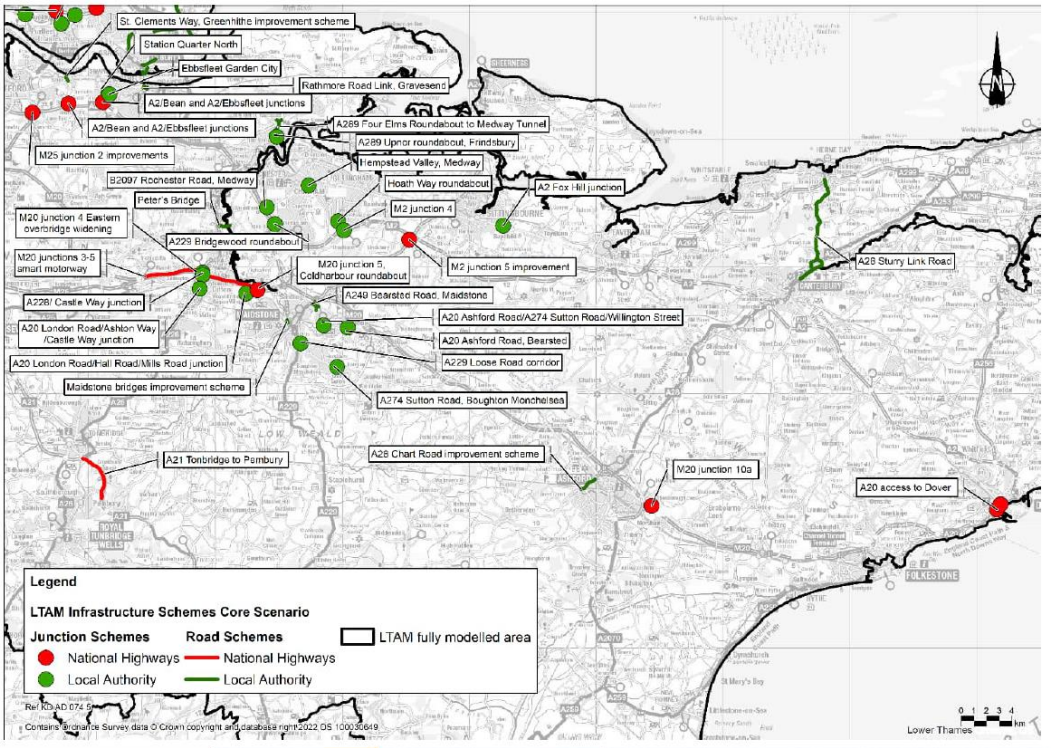
1.2.1 A number of major developments have been included within the LTAM for 2030 and 2045. Such developments that are included in the future year trip matrices are set out in the Uncertainty Log, submitted as part of the DCO application. This includes a number within Medway. The Uncertainty Log has not been updated since the end of September 2021. This is noted as being due to the length of time required to build trip matrices for use in LTAM.

1.2.2 It is noted that there are two proposed developments that, although they met the set out criteria for inclusion in the Uncertainty Log, have not been included. Paragraph 5.7.20 notes that this is due to the developments not including appropriate highway interventions that “would maintain the integrity of the road network”.

1.2.3 The developments are Highsted Park and Medway One. Whilst the former is located in Swale, its relative proximity to Medway is likely to increase vehicular trips within the Medway boundary. The Transport Assessment confirms that National Highways is working with the respective development partners to “consider potential ways forward”.

1.2.4 Highway improvement / mitigation schemes that are expected to be delivered regardless of the progression of the Lower Thames Crossing are included in the modelling assessment, and are as of the position in September 2021. A number within Medway are included.

Figure 1: Highway Improvement Works included within LTAM



Medway Development

1.2.5 Medway's annual housing need, as determined by the standard method, is 1,667. The new Local Plan will provide for **28,339** homes up to 2040. The most recent Employment Land Needs Assessment identified a need for at least 62 hectares of employment land.

1.2.6 The DfT traffic forecasts do not reflect the full scale of Medway's development needs, with the Core Scenario is unlikely to reflect the spatial distribution of Medway's future growth. As well as the Medway One development noted above, there is additional growth planned on the Hoo Peninsula, including 10,600 new homes. Funding is secured for this through the Housing Infrastructure Fund, providing greater certainty for delivery.

1.2.7 Development identified within TEMPro has been ascertained and confirmed. TEMPro identifies that the number of households within Medway will increase by 23,728 between the LTC assessment base year (2016) and future year (2040).

High Growth Scenario

1.2.8 In addition to the Core Scenario, used for the assessment work set out within the Transport Assessment, consideration is given to a **High Growth** Scenario and **Low Growth** Scenario.

1.2.9 Details of how these have been developed are set out within Appendix C (Transport Forecasting Package) of the Combined Modelling and Appraisal Report.

1.2.10 Paragraph 4.2.33 notes that the high growth scenario is provided to understand whether, under high demand assumptions, the LTC remains effective. The High Growth scenario utilises the NTEM plus TAG High Growth Increment.

1.2.11 The methodology used to develop the High Growth scenario is explained in paragraph 8.6.1, replicated below:

> The TAG high and low growth increment is defined according to TAG guidance (Unit M4 Section 4.2 (DfT, 2019)). This involves adding/subtracting a proportion of the base year traffic to/from the demand from the core scenario.
>
> For highway trips the formula applied is as follows:
>
> $$2.5\% \times \sqrt{(Forecast\ Year - Base\ Year)}$$

1.3 Changes in Traffic Flow

1.3.1 Change in traffic flow between the 2045 "Do Minimum" (i.e. without the construction of the Lower Thames Crossing) and the 2045 "Do Something" (i.e. with the crossing) are shown graphically within the Transport Assessment (plate 7.10 for the AM peak, plate 7.12 for the interpeak and plate 7.14 for the PM peak).

1.3.2 Changes in traffic flows are shown only for particular routes that comprise the strategic highway network. Changes in flows on a number of roads within Medway are not shown. However, it can be seen that additional traffic movements are expected on routes including the M2, A2, A289 and other roads to the north of the River Medway. This is the case during the AM, interpeak and PM periods.

1.3.3 Increases in traffic flow in excess of 40% are identified on roads around the northwest of Strood during the AM peak. The PM peak shows percentage increases of between 20 and 40% on the same roads. It is unclear whether there are no identified impacts on roads across the River Medway (A2) or whether this has not been subject to assessment.

Figure 2: AM Peak

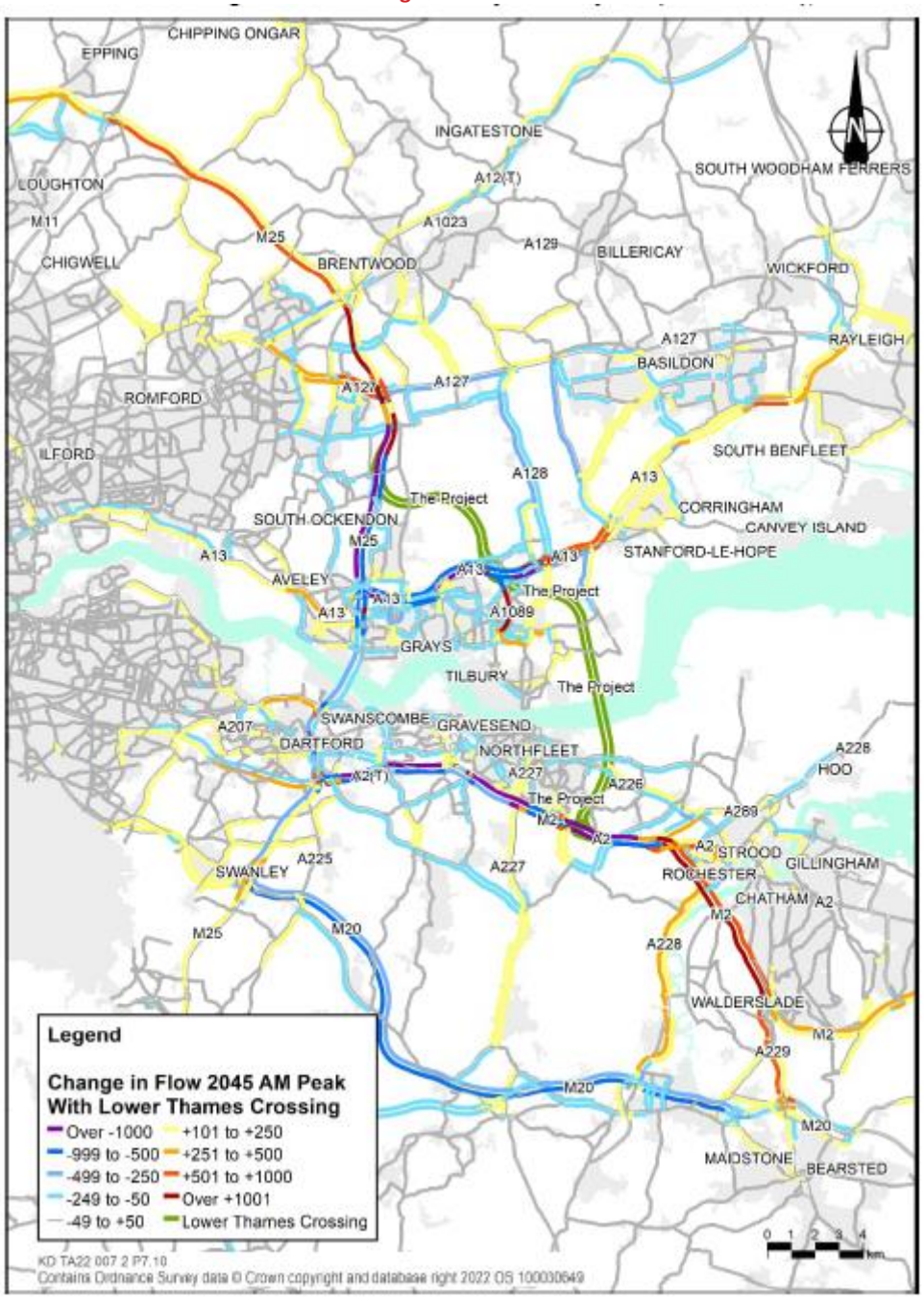


Figure 3: Interpeak

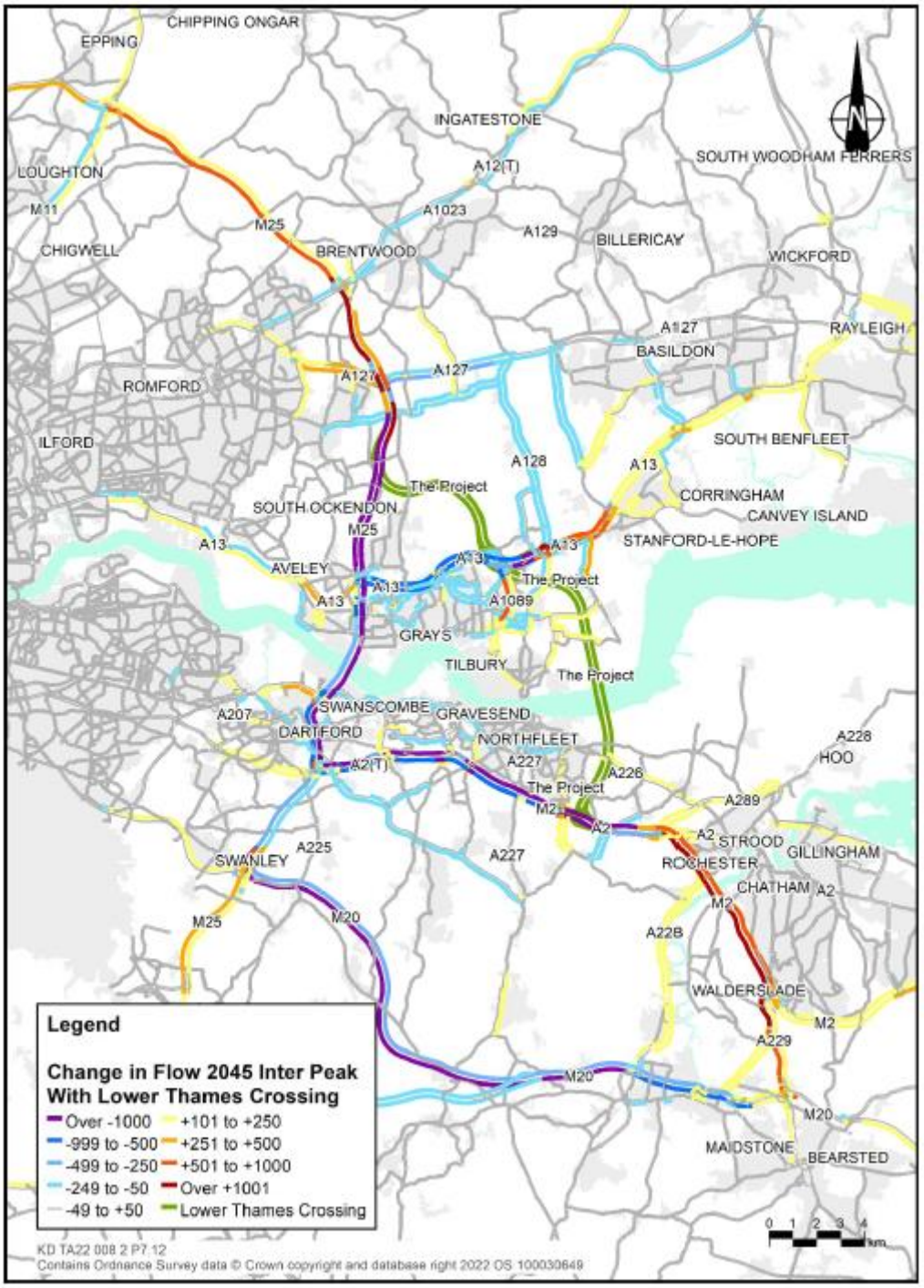
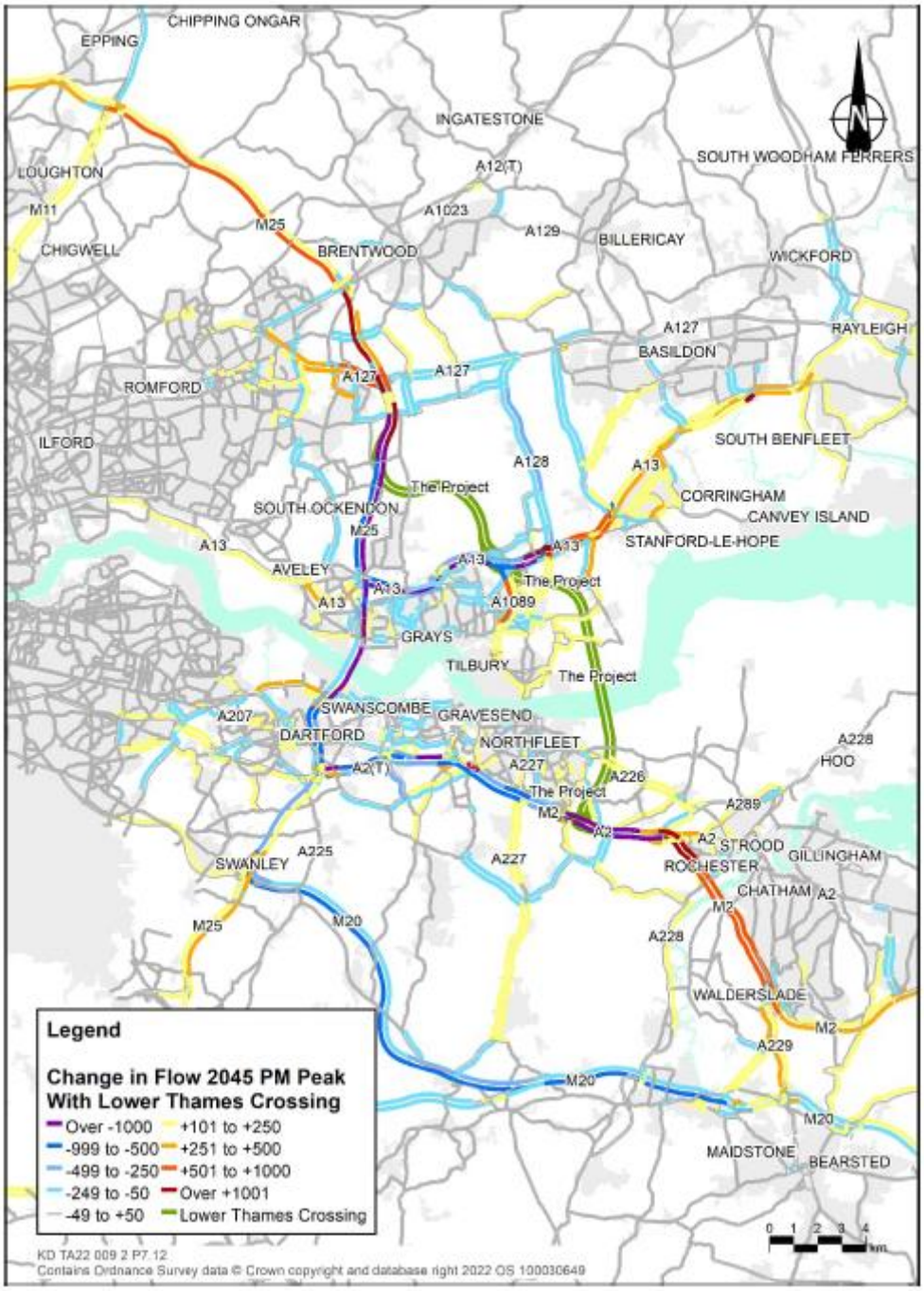


Figure 4: PM Peak



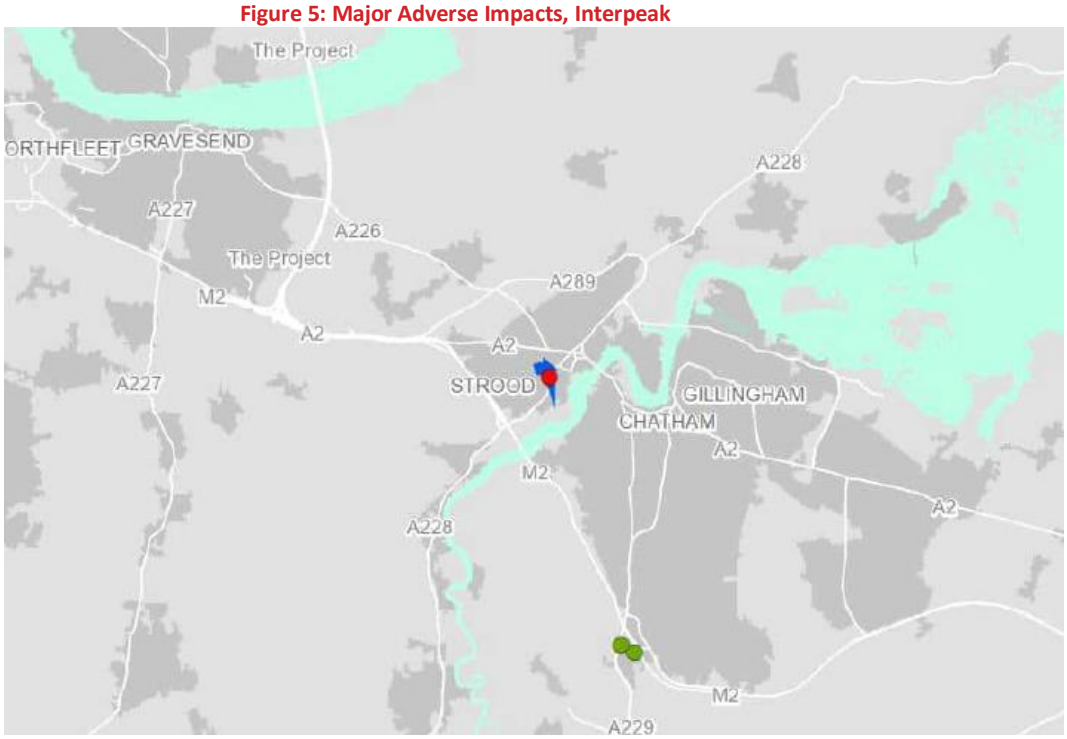
1.3.4 Paragraph 7.5.18 notes that "in a number of areas, the percentage of volume to capacity on some roads increases, particularly those close to the Project". It is recognised that the future year network is expected to reach or exceed capacity without construction of the LTC, including around Rochester and Gillingham.

1.3.5 Traffic volumes as a percentage of road capacity increase to beyond 95% on roads including the A228 in the AM peak (plate 7.20). During the PM peak, the A228 already operates close to capacity; however, conditions are shown to worsen as a result of implementation of the LTC (plate 7.24).

1.3.6 Plates 7.28 to 7.30 identify a number of locations, both links and turning nodes, in Medway where adverse impacts are identified. The majority of these are defines as Minor

Adverse or Moderate Adverse, however there are Major Adverse impacts identified in the interpeak period (Figure 5).

Figure 5: Major Adverse Impacts, Interpeak



1.3.7 The number of locations where adverse impacts are reported in the High Growth scenario (Appendix D) is greater.

1.3.8 Some minor beneficial impacts are set out in the Medway boundary. It is not entirely clear as to how these have been defined / identified.

1.4 Journey Times

1.4.1 A total of 28 journey time routes have been assessed within the Transport Assessment. Three are of significance for Medway:

- **No. 3**: A228 M20 to Strood;
- **No. 5**: A289; and
- **No. 25**: A2 (Strood).

1.4.2 Reported journey time changes between the Do Minimum and Do Something scenarios for the 2030 period are replicated in Table 1 overleaf for information.

Table 1. Journey Time Changes (Time in Minutes)

ROUTE		DIR	CORE GROWTH SCENARIO			
			DO MIN	DO SOME	DS-DM	% CHANGE
AM PEAK						
3	A228 (M20 to Strood)	NB	14.3	15.3	1.0	6.9%
		SB	18.1	19.8	1.7	9.3%
5	A289	EB	4.0	4.3	0.3	7.1%
		WB	7.6	6.5	-1.1	-15.3%
25	A2 (Strood)	EB	7.5	7.7	0.2	3.3%
		WB	8.9	8.4	-0.5	-5.8%
INTERPEAK						
3	A228 (M20 to Strood)	NB	14.1	14.7	0.6	4.0%
		SB	14.7	15.3	0.6	3.6%
5	A289	EB	3.9	3.9	0.0	1.3%
		WB	4.4	5.2	0.7	16.6%
25	A2 (Strood)	EB	7.1	6.9	-0.2	-3.3%
		WB	7.0	7.1	0.1	1.7%
PM PEAK						
3	A228 (M20 to Strood)	NB	19.8	14.7	-5.1	-25.9%
		SB	15.2	15.3	0.1	0.5%
5	A289	EB	6.7	3.9	-2.8	-41.1%
		WB	5.0	5.2	0.2	3.3%
25	A2 (Strood)	EB	8.6	7.1	-1.5	-17.4%
		WB	8.2	7.1	-1.1	-13.7%

1.4.3 It can be seen that journey time increases are forecast on the A228 and A289 during the morning and interpeak periods. The percentage change in improvements to journey time on the A286 eastbound in the PM peak is considerable (41.1% improvement).

1.4.4 Route based journey time analysis is presented in Appendix B of the Transport Assessment. This shows differences in journey times between twelve locations to the

north and south of the LTC, including Rochester. An assessment of changes to journey times from Rochester to the following locations north of the River Thames is presented for the 2030 scenario:

- Cheshunt;
- Romford;
- Brentwood;
- Basildon;
- Tilbury Port; and
- DP World.

1.4.5 As would be expected, the introduction of the LTC reduces journey times to each of these locations during the AM, interpeak and PM periods. Similar results are shown for the 2045 scenario, set out in Appendix C.

1.4.6 Appendices B and C do not however present an assessment of route-based journey times from Rochester to other locations south of the LTC. Increases in traffic movements on roads in Medway and its vicinity, as a result of vehicles travelling to utilise the LTC, may increase journey times for such routes.

1.5 Mitigation & Monitoring

1.5.1 Paragraph 10.2.13 notes that:

> National Highways has assessed the wider network impacts of the Project and has considered these against the requirements set out in the National Policy Statement for National Networks (DfT, 2014) and other relevant policies, and **considers that the adverse impacts are acceptable under this policy.**