M2 Junction Analysis Technical Note

Document no: 1.0
Revision no: 1.1

Medway Council
MC

Medway Local Plan
27 June 2025

M2 Junction Analysis Technical Note

Client name:	Medway Council		
Project name:	Medway Local Plan		
Client reference:	MC	**Project no:**	B2432000
Document no:	1.0	**Project manager:**	Jessica Denny
Revision no:	1.1	**Prepared by:**	SK/SL/JD
Date:	27 June 2025	**File name:**	M2 Junctions Analysis Technical Note

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
1.0	27/6/25	M2 Junctions Analysis	SK/SL	SL/JD	JD	YZ

Distribution of copies

Revision	Issue approved	Date issued	Issued to	Comments

Jacobs U.K. Limited

2nd Floor, Cottons Centre
Cottons Lane
London SE1 2QG
United Kingdom

T +44 (0)203 980 2000
www.jacobs.com

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1. Introduction

1.1 Foreword

As Kent Transport Model (KTM) custodian to Kent County Council (KCC), Jacobs have developed the Medway Transport Model (MTM) to develop the required strategic modelling necessary to provide the evidence base for the Regulation 19 (Reg19) Local Plan (LP) consultation for Medway Council (MC). The MTM follows a standard sufficient for this purpose, with due regard to Transport Analysis Guidance (TAG) and was accepted by National Highways (NH), further details of the model development can be found in the supporting "Local Model Validation Report".

NH have requested further analysis of the proposed LP allocations impact on the junctions within and bordering Medway that are on the strategic road network (SRN); this considers M2 Junctions 1-5. This document seeks to analyse the junctions in terms of Base Year Validation and Forecast Year performance.

2. Model Assessment

2.1 Introduction

There are five M2 junctions (on the SRN) within the Medway district which have been discussed further within this report in terms of Base Year performance and Forecast Year assessment.

2.2 Base Year Performance

2.2.1 Base Model

KCC commissioned Jacobs on behalf of Medway Council to develop the Medway Transport Model, inherited from the KTM. The KTM was built to help KCC understand how people currently travel strategically around the region and how this might change with future growth and as major schemes and strategic interventions are implemented. The KTM was built with the following objectives:

- To help to develop countywide transport strategies;
- To help to assess the combined strategic impact of major highway schemes;
- To help to provide evidence for early appraisal and sifting of strategic major scheme options and to support the development consent order and town and country planning process on key schemes;
- To help to assess the combined strategic impact of Local Plans on the network, including providing evidence for Local Plan development and hearings (and cumulative impacts once Local Plans are in place);
- To provide evidence and robust, responsive, and persuasive arguments to a range of internal and external stakeholders, including responses to Government department or company consultations;
- The ability to help understand and mitigate the impact of external influences, e.g. Brexit, Housing allocations, National Highways schemes;
- To help to understand suitable phasing of maintenance and utilities work to manage congestion impacts;
- To provide a potential platform for a suite of strategic town/sub-area models or scheme-specific models requiring greater detail;
- To provide a potential basis for highway corridor micro-simulation models in the PTV VISSIM software platform; and
- To provide a potential platform for future dynamic and/or real-time predictive modelling solutions that could help optimise the performance of the existing Kent transport network using technology.

The Medway Transport Model (MTM) is based on the KTM and uses the same model cordon area as the Gravesham Transport Model; the 2019 Base Model has been developed as the primary transport evidence base to inform the Regulation 18 (Reg 18) and Regulation 19 (Reg 19)consultation and mitigation development for the emerging Medway Local Plan.

2.2.2 Base Validation

TAG Unit M3.1 provides guidelines on the validation criteria for individual links. As a check on the quality of the assignment, the assigned flows on individual links were compared against observed counts and the GEH Statistic was obtained to measure the difference between modelled and observed flows.

The GEH statistic is a form of the Chi-squared statistic that incorporates both relative and absolute errors, and is defined as follows:

$$GEH = \sqrt{\frac{2\,(M-C)^2}{M+C}}$$

Where:

GEH is the GEH statistic;

M is the modelled flow; and

C is the observed flow.

Whilst further information on the MTM validation can be found in the "Medway Local Model Validation Report", this Technical Note details the specific link performance on the M2 junctions within the Medway Area of Detailed Modelling (AODM).

Link GEH at each junction of interest has further been presented within this note, green bars represent links which pass flow criteria or have a GEH less than 5; the amber bars represent links which do not meet flow criteria and have a GEH just outside criteria between 5-10; the red bars represent links with a GEH greater than 10.

2.3 Forecast Year Assessment

2.3.1 Forecast Models

After the Reg18 consultation in Autumn 2023, refinements were made to the LP strategy, and the following scenarios were developed as part of the Reg19 LP allocations and used to assess the transport impact:

1. 2041 Reference Case (RC): includes completions and consented development and infrastructure planned for the 2019-2041 growth period within Medway; outside of the Area of Detailed Modelling, 'near certain' developments have been modelled in adjoining authorities (Gravesham, Tonbridge & Malling, Maidstone and Swale) and background growth for cars comes from TEMPro v8 (using alternative assumptions tool for adjoining authorities to ensure no double counting). The growth of good vehicles across the model is provided by Road Traffic Forecasts (RTF).

2. 2041 Refined Reference Case (rRC): The rRC was developed as a baseline to assess the Reg19 LP development. The only difference between the RC and rRC is the full build out at the MedwayOne development site, and the consideration of reduced trip rates at consented sites that may benefit from more sustainable transport methods (detailed further in "Medway LP2041 TEB Mode Share Strategy Stage 3_Draft").

3. 2041 Interim Do Something (iDS): built upon the rRC scenario, with the inclusion of proposed interim Reg19 LP allocations and associated infrastructure (where appropriate). The only difference between the rRC and the iDS is the proposed LP demand and infrastructure. The purpose of the iDS scenario was to determine "hot spots" on the Medway network that may require potential junction mitigations.

4. 2041 Final Do Something (fDS): built upon the iDS with the addition of junction mitigations identified in the iDS and the final Reg19 LP site allocations. This scenario also considers the revised trip rates at consented and LP sites that may have provisions for more sustainable transport methods.

The models used to assess the final Reg19 LP allocations with the inclusion of the junction mitigation strategy and potential modal shift opportunities (at consented and LP sites) within Medway are the 2041 fDS models. As such the impact on the M2 Junctions 1-5 detailed within this note has been analysed using the 2041 fDS in comparison to the 2041 rRC.

2.3.2 Forecast Year Performance

The impact of the LP allocations on the SRN was assessed using the 2041 fDS strategic models in comparison to the 2041 rRC. Metrics such as worst turn and link volume over capacity have been obtained at each of the M2 junctions within the Medway AODM, alongside relative queue lengths in locations where link delays are evidenced.

Volume Over Capacity

Volume over Capacity assessment (V/C) has been undertaken to understand link and worst turn performance at the five M2 junctions within Medway AODM. This considers the volume of vehicles divided by the available capacity on the road and is summarised in one of the four categories detailed in Table 2-1.

Table 2-1: Link Volume Over Capacity Assessment Criteria

Volume over Capacity Thresholds	Impact Assessment
V/C <75	Operating within capacity
75 <= V/C <85	Operating within capacity but approaching 85%
85 <= V/C <100	Operating close to capacity
V/C >= 100	Over capacity

Whilst the strategic model offers a useful indicator of performances of junctions or roads that are impacted, further Merge/ Diverge assessment has been undertaken using the modelled flows to ascertain whether the existing junction alignment is sufficient in accommodating the traffic growth. The outputs of this assessment are further detailed in **Medway LP Merge/ Diverge Assessment TN**.

Relative Queues

In addition to V/C plots, relative queues have been obtained for those junctions on the network where queues are evidenced in at least one peak or scenario. Relative queue illustrates queue as a percentage of the total link length; i.e. if the relative queue is 20% on a 100m link, there are 20m of queues in that locality.

3. M2 Junctions

The five junctions managed by National Highways within the Medway AODM are commented on throughout this report in terms of the 2019 Base Year validation, 2041 forecast alignment and performance. This report seeks to identify any areas on the network that may be subject to delays or capacity constraints with the additional Reg19 Local Plan growth and should be read in conjunction with the **Medway LP Merge/ Diverge Assessment TN**.

3.1 M2 Junction 1

3.1.1 Context

M2J1 is the western most junction within the Medway AODM and sits on the Medway/ Gravesham border, forming connections with A289 Hasted Road and A2 Watling Street. With no proposed mitigations in this locality the coding remains same in the 2019 Base Year Model and the 2041 Forecast Models, as illustrated in Figure 3-1.

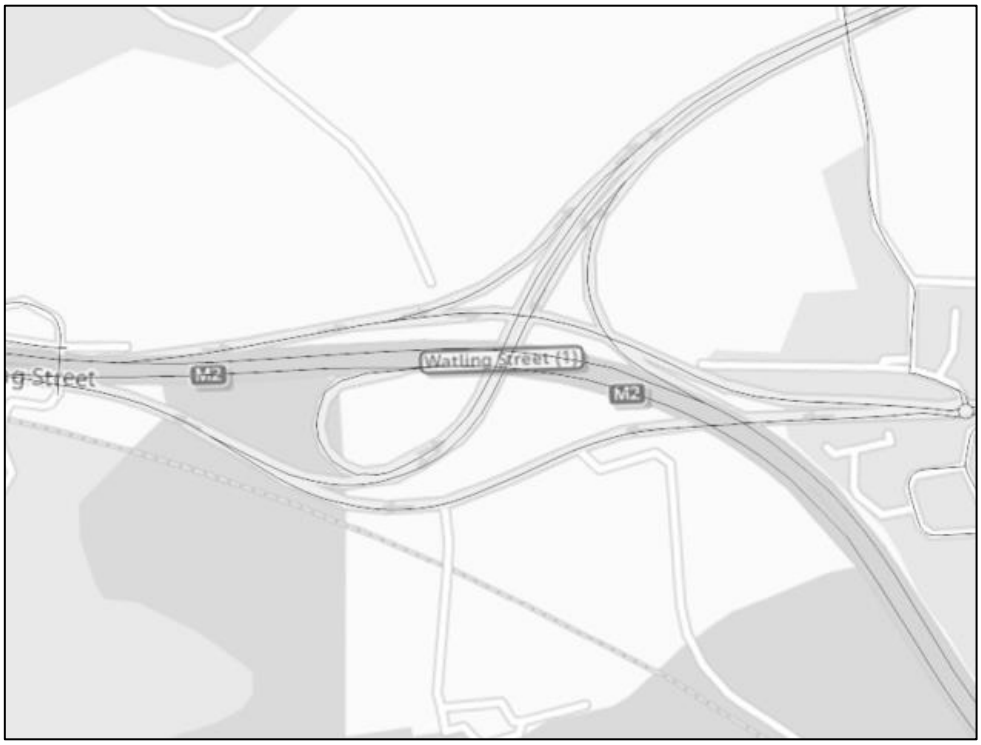

Figure 3-1: M2J1 Network Coding

3.1.2 Base Year Validation

The levels of validation at the M2J1 in the 2019 Base Model are illustrated in Figure 3-2; this identifies that the junctions is well validated with five of the six links illustrated to have a GEH <4 in both the AM and PM Peak.

During the AM Peak the A289 Hasted Road southbound approach to the junction has a GEH of 6.7, with the model overestimating flows by 318. During the PM Peak the A2 westbound link sits just outside of TAG Criteria with a GEH 6.5, again the model is overestimating flows in this locality by 379 vehicles. The junction captures all flows, with those links sitting just outside of TAG criteria due to an overestimation of link flows, suggesting a worst-case scenario is modelled.

Figure 3-2: M2J1 2019 Base Year Validation (AM Peak left, PM Peak right)

3.1.3 Forecast Performance

The model forecast performance has been analysed in terms of link V/C and queues (where evidenced) in the AM and PM Peak for the rRC Scenario and the fDS Scenario. The purpose of this analysis is to identify any junctions nearing or exceeding capacity with the committed and completed growth between 2019 Base Year and 2041 Forecast year, alongside identifying junctions that the Reg19 Local Plan will have an adverse impact on.

Reference Case

The V/C of the mainline and merge/ diverge link at the M2J has been obtained for the 2041 rRC and is illustrated in Figure 3-3. This has been summarised below for those links where operation conditions are flagging as 75% or above:

- M2 eastbound off-slip (67% AM, 83% PM)
- M2 eastbound on-slip (107% AM, 103% PM)
- M2 westbound off-slip (89% AM, 87% PM)
- M2 westbound on-slip (78% AM, 61% PM)
- M2 westbound mainline, approaching off-slip (84% AM, 71% PM)
- A289 Hasted Road southbound, approaching eastbound on-slip (89% AM, 78% PM)

During the AM Peak, the M2 eastbound on-slip is significantly over capacity in both the AM and PM Peak (107% and 103% respectively), with the committed forecast growth only. This high V/C continues along the eastbound mainline flow in the PM (88%). The M2 westbound off-slip operates near capacity in both AM and PM (89% and 87%, respectively).

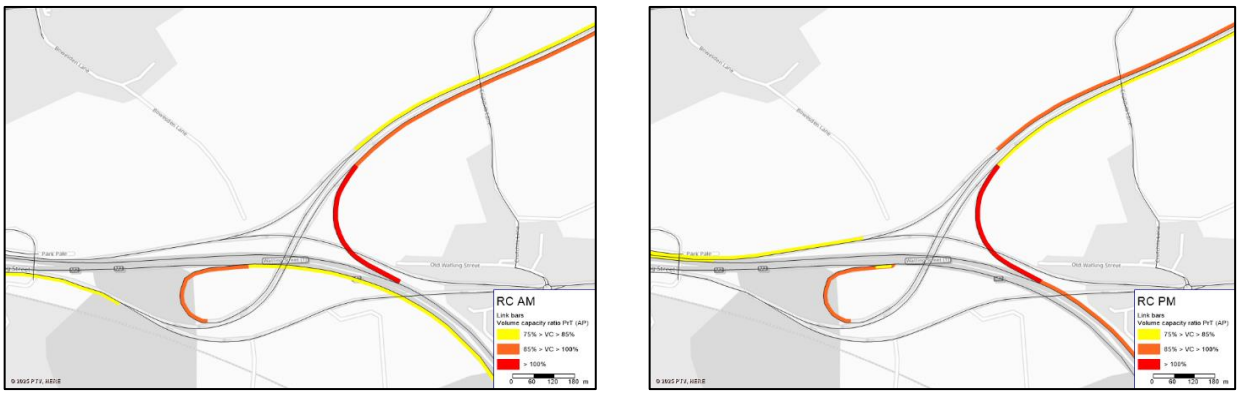

Figure 3-3: M2J1 2041 Reference Case Link V/C Performance (AM Peak left, PM Peak right)

Do Something

The information obtained from the fDS models is detailed in Figure 3-4, with those links noted to have a change in V/C performance summarised in Table 2.

Figure 3-4: M2J1 2041 Do Something Link V/C Performance (AM Peak left, PM Peak right)

Table 2: M2J1 Merge/ Diverge VC (fDS vs rRC)

	VC Ratio					
Link Name	rRC AM	fDS AM	Diff	rRC PM	fDS PM	Diff
M2 eastbound off-slip	67%	75%	+8%	83%	95%	+12%
M2 eastbound on-slip	107%	134%	+27%	103%	126%	+23%
M2 westbound off-slip	89%	102%	+13%	87%	94%	+7%
M2 westbound on-slip	78%	82%	+4%	67%	61%	-6%
M2 westbound mainline, approaching off-slip	84%	87%	+2%	71%	71%	0%
A289 Hasted Road southbound, approaching eastbound on-slip	89%	100%	-12%	78%	89%	-11%

The M2 eastbound on-slip is over capacity in both the AM and PM Peak of the rRC scenario (107% and 103%), with the introduction of LP further deteriorating the link performance in the fDS scenario (reduced capacity of 27% and 23% respectively). As this link is over capacity in the rRC scenario, any additional growth will further exacerbate the problem.

During the AM Peak, the M2 westbound off-slip exceeds capacity in the fDS scenario (102%) compared to the rRC where it was nearing capacity (89%), this is due to an additional 172 vehicles on this route.

The greatest deterioration observed in the available capacity is at the M2 eastbound on-slip (27% AM, 23% PM), M2 westbound off-slip (13% AM, 7% PM) and M2 eastbound off-slip (8% AM, 12% PM); further analysis of the existing performance and layout in this location is detailed in **Medway LP Merge/ Diverge Assessment TN**.

3.2 M2 Junction 2

M2 J2 is entirely within the Medway boundary, formed of a dumbbell junction connecting the M2 to A228 Sundridge Hill and A228 Cuxton Road via Merrals Shaw Interchange to the south. Same as M2 J1, there are no mitigations proposed in this location, as such the 2019 Base Year coding is consistent with the 2041 Forecast Year coding, as illustrated in Figure 3-5.

Figure 3-5: M2 J2 Network Coding

3.2.1 Base Year Validation

Link count performance at M2J2 (illustrated in Figure 3-6) shows all M2 links meeting TAG criteria with a GEH <4 in both the AM and PM Peak. A228 Sundridge Hill between Merrals Shaw Interchange and the western dumbbell roundabout fall just outside TAG criteria in the PM Peak with a GEH of <6.5 in both directions. Overall, the junction is considered a close match to observed conditions and will accurately model behaviours in this locality.

Figure 3-6: M2J2 2019 Base Year Validation (AM Peak left, PM Peak right)

3.2.2 Forecast Performance

Reference Case

The link V/C at the junction in the 2041 rRC is illustrated in Figure 3-7 and a summary is listed below of the mainline and merge/ diverge links where their operation conditions are flagging as 75% or above:

- M2 mainline northbound (95% AM, 80% PM)
- M2 mainline southbound (75% AM, 103% PM)
- M2 southbound off-slip (64% AM, 81% PM)
- A228 Sundridge Hill northbound approaching Merrals Shaw Interchange (100% AM, 90% PM)
- A228 Sundridge Hill southbound exiting Merrals Shaw Interchange (93% AM, 103% PM)

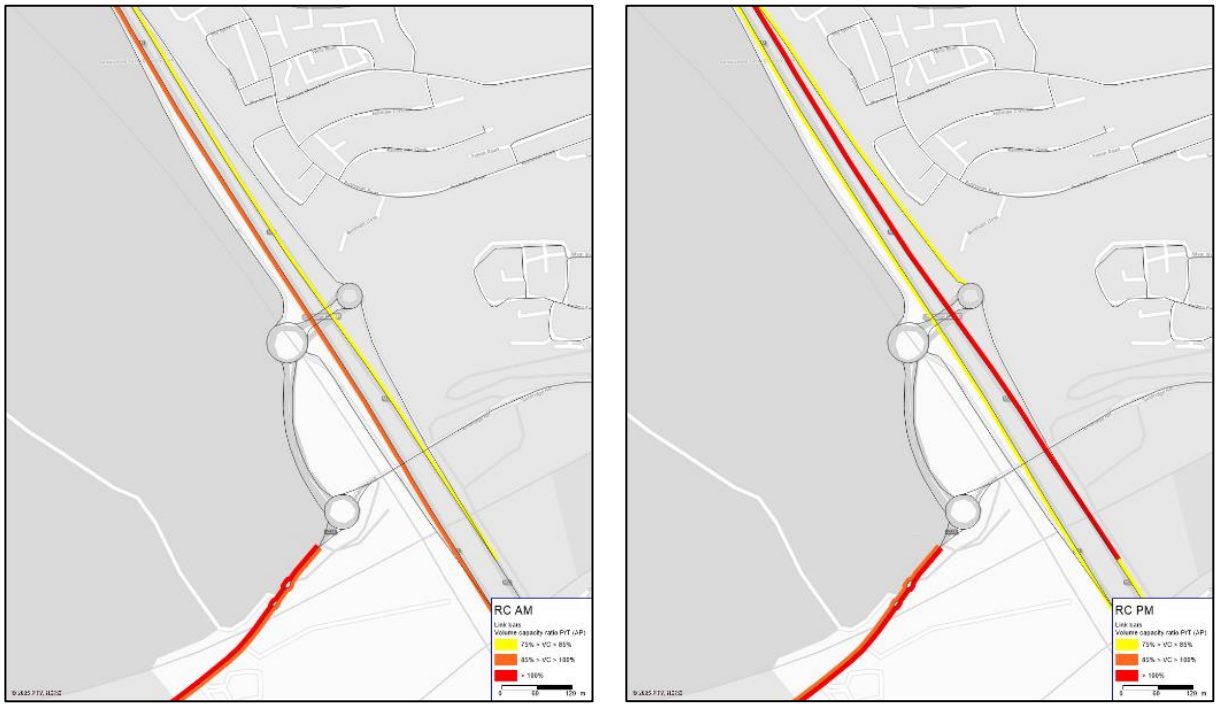

Figure 3-7: M2J2 2041 Reference Case Link V/C Performance (AM Peak left, PM Peak right)

During the AM Peak, the M2 mainline northbound link approaches capacity (95%) and the southbound direction is over capacity in the PM Peak (103%).

Do Something

The information obtained from the fDS models is detailed in Figure 3-8 and the links nearing or exceeding capacity are summarised in Table 3

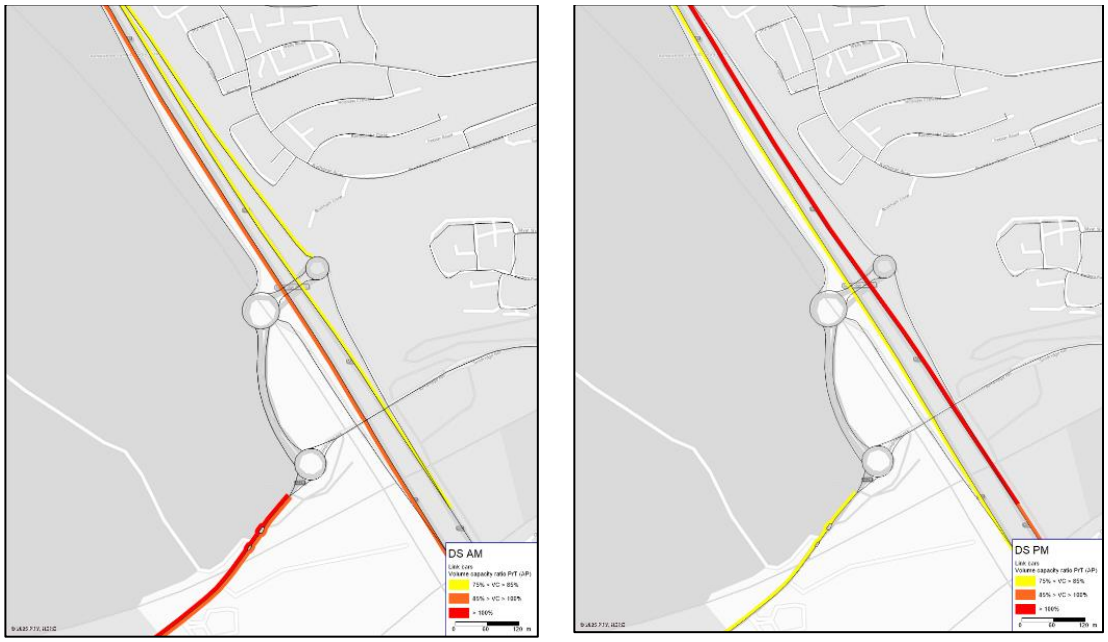

Figure 3-8: M2J2 2041 Do Something Link V/C Performance (AM Peak left, PM Peak right)

Table 3: M2J2 Merge/ Diverge VC (fDS vs rRC)

	VC Ratio					
Link Name	rRC AM	fDS AM	Diff	rRC PM	fDS PM	Diff
M2 mainline northbound	95%	97%	2%	80%	79%	-1%
M2 mainline southbound	75%	76%	1%	103%	104%	1%
M2 southbound off-slip	64%	79%	15%	81%	60%	-21%
A228 Sundridge Hill northbound approaching Merrals Shaw Interchange	100%	102%	2%	90%	84%	-6%
A228 Sundridge Hill southbound exiting Merrals Shaw Interchange	93%	94%	2%	103%	60%	-43%

Most of the M2 links note minimal changes in V/C ratios (<3%) in fDS when compared to the rRC, remaining in the same V/C performance category, suggesting that the proposed LP allocations have minimal impacts on the junction performance. An exception to this is M2 southbound off-slip which notes with a deterioration of 15% in AM and an improvement of 21% in the PM

The A228 Sundridge Hill southbound exiting Merrals Shaw interchange notes additional capacity in the fDS, PM Peak (60% VC), this is due to a reduction of 426 vehicles due to fewer cars exiting M2 at this junction.

3.3 M2 Junction 3

The M2J3 Bluebell Hill junction sits within the Medway/ Maidstone border and is formed of two roundabouts; Taddington Roundabout connects M2 with A2045 Walderslade Woods and Lords Leeds Roundabout connects with A229 Maidstone Road. Whilst this junction has proposed upgrades to improve the junction capacity and performance, at the time of model development there was not a consented scheme (April 2024) and as such there is no change in the model coding at this junction between the existing and the 2041 forecast year. The model coding in this locality is presented in Figure 3-9.

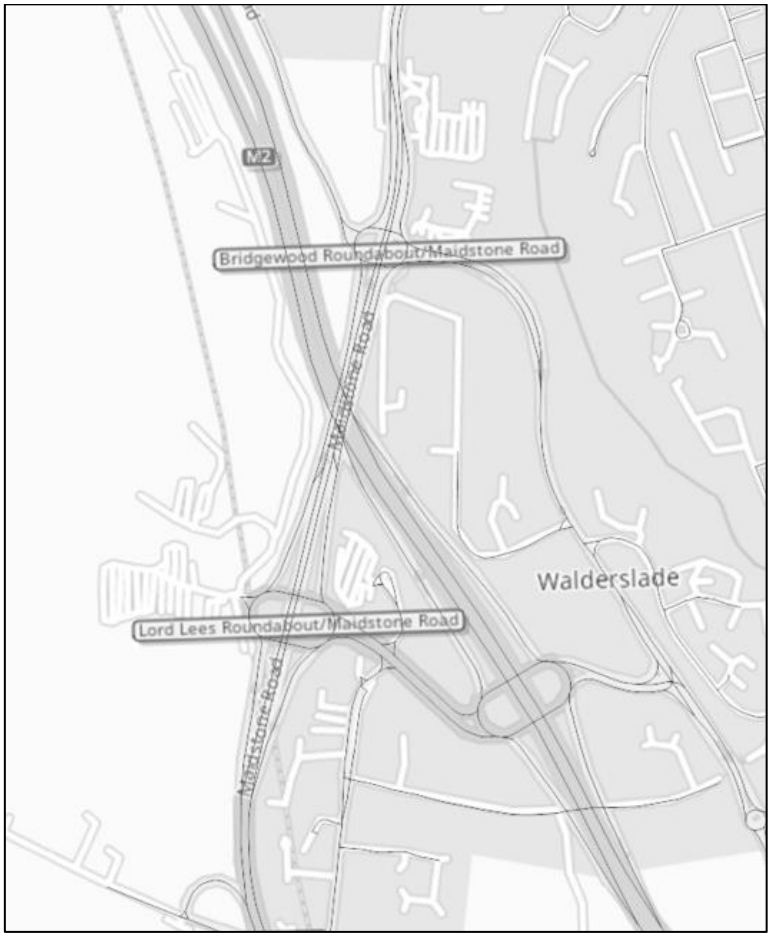

Figure 3-9: M2J3 Network Coding

3.3.1 Base Year Validation

Figure 3-10 presents the GEH statistics at M2J3 in the AM (left) and PM (right) Peak. During the AM Peak, all M2 links (mainline and off/on-slips) are within TAG criteria; the A2045 Walderslade Woods approach to the Taddington Roundabout and A229 southbound on-slip to A229 is just outside of TAG criteria with a GEH of 6.3 and 10.4 where the model over represents flows by 227 and 540 vehicles, respectively. Whilst the junction has two links outside of TAG criteria, the flows in this locality are overestimated, thus reflecting a worst-case scenario for a robust assessment.

The PM Peak model sees the northbound A2 mainline and off-slip a close match to observed flows with GEH <4; the northbound on-slip, southbound mainline and southbound on-slip sit just outside of TAG criteria with GEH of 9.7 (+408 vehicles), 7.9 (-415 vehicles) and 7.1 (+259 vehicles) respectively. Whilst not all flows meet TAG criteria, it is considered that the model is a good indicator of future performance.

Figure 3-10: M2J3 2019 Base Year Validation (AM Peak left, PM Peak right)

3.3.2 Forecast Performance

Reference Case

The link and turn VC at the junction in the 2041 rRC is illustrated in Figure 3-11 and a summary is listed below of the mainline and merge/ diverge links where their operation conditions are flagging as 75% or above:

- M2 northbound mainline, north of on-slip (77% AM, 64% PM)
- M2 southbound mainline, approaching off-slip (62% AM, 83% PM)
- M2 northbound on-slip (87% AM, 98% PM)
- M2 southbound off-slip (88% AM, 102% PM)
- A229 Maidstone Road northbound off-slip (82% AM, 107% PM)
- A229 Maidstone Road southbound on-slip (84% AM, 87% PM)
- A229 Maidstone Road northbound mainline, approaching off-slip (67% AM, 84% PM)
- A229 Maidstone Road southbound mainline south, of on-slip (114% AM, 101% PM)
- Lord Lees Roundabout circulatory flow approaching A229 Maidstone Road northbound exit (89% AM, 107% PM)

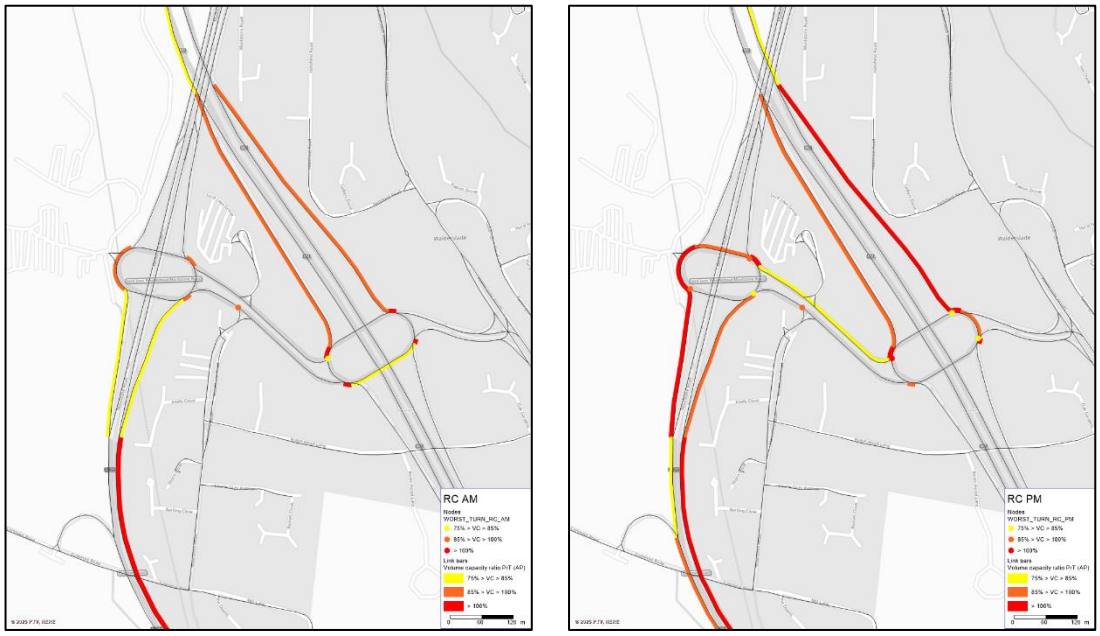

Figure 3-11: M2J3 2041 Reference Case Link V/C Performance (AM Peak left, PM Peak right)

M2J3 has high V/C ratios noted on the northbound onslip andsouthbound off-slip. Almost all links between south of Lord Lees Roundabout and north of Taddington Roundabout flagging as 75% or above in both directions and both time periods.

Queues

Queues begin to form along A229 westbound approach to the signalised junction at Maidstone Road (as illustrated in Figure 3-12), as a results of 24 seconds of delay in both peaks. In the AM Peak, the queues begin to form at the A229/ Maidstone Road junction, extending onto Taddington Roundabout. In the PM Peak queues extend further on the northern, eastern and southern arms of Taddington Roundabout (71%, 100% and 53%, respectively). Overall, it is clear that the A229 northbound approach to Lord Lees Roundabout is a bottleneck, suffering from considerable queuing, significantly slower travel speeds and link delays in both Peak periods.

Figure 3-12: M2J3 2041 Reference Case Link Relative Queues (AM Peak left, PM Peak right)

Do Something

The information obtained from the fDS models is detailed in Figure 3-13 and the links nearing or exceeding capacity are summarised in Table 4.

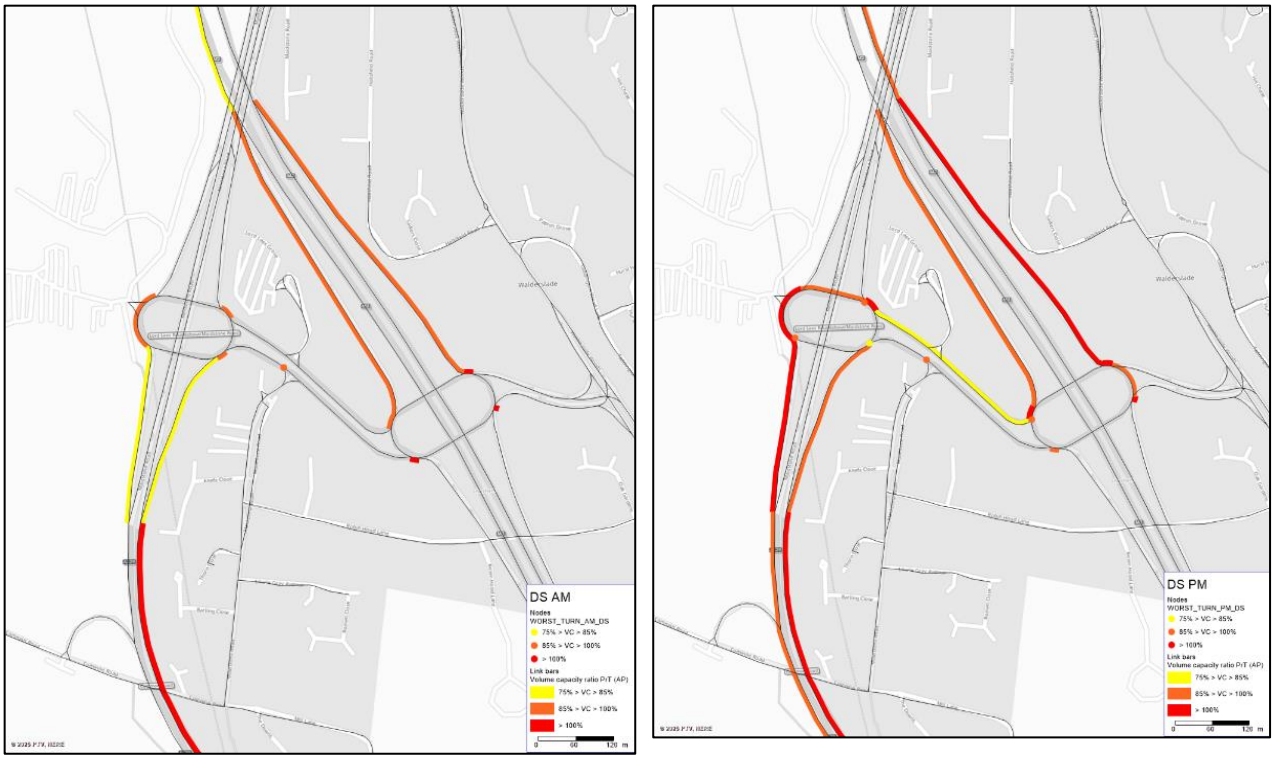

Figure 3-13: M2J3 2041 Do Something Link V/C Performance (AM Peak left, PM Peak right)

Table 4: M2J3 Slip Road VC in DS Compared to RC

	Link Name	VC Performance					
		rRC AM	fDS AM	Diff	rRC PM	fDS PM	Diff
Taddington Roundabout	M2 northbound mainline, north of on-slip	77%	80%	3%	64%	64%	0%
	M2 southbound mainline, approaching off-slip	62%	62%	0%	83%	84%	1%
	M2 northbound on-slip	87%	88%	1%	98%	96%	-2%
	M2 southbound off-slip	88%	91%	3%	102%	103%	1%
Lord Lees Roundabout	A229 Maidstone Road northbound off-slip	82%	83%	2%	107%	108%	1%
	A229 Maidstone Road southbound on-slip	84%	83%	-1%	87%	88%	1%
	A229 Maidstone Road northbound mainline, approaching off-slip	67%	68%	1%	84%	85%	1%

	Link Name	VC Performance					
		rRC AM	fDS AM	Diff	rRC PM	fDS PM	Diff
	A229 Maidstone Road southbound mainline, south of off-slip	114%	115%	1%	101%	105%	4%
	Lord Lees Roundabout circulatory flow approaching A229 Maidstone Road northbound exit	89%	92%	4%	107%	109%	2%

Most links operate at a similar VC in the fDS models compared to the rRC models, with the largest difference being 4%. This suggests that the LP has minimal impact on the junction performance.

Queues

Queues in the fDS models extend further when compared to their rRC counterpart. Queues begin to form along the A229 Maidstone Road westbound at the signalised junction between the two roundabouts with 24 seconds of delay in both Peaks.

In the AM Peak, these queues extend further back than the rRC with the northern, eastern and southern approach arms to the roundabout noting significant relative queues lengths (9%, 80% and 63%, respectively). In the PM Peak, all approach arms to the Taddington Roundabout are observed with significant queue lengths, with blocking back from the signalised junction, which results in almost the entire circulatory reaches 100% queues.

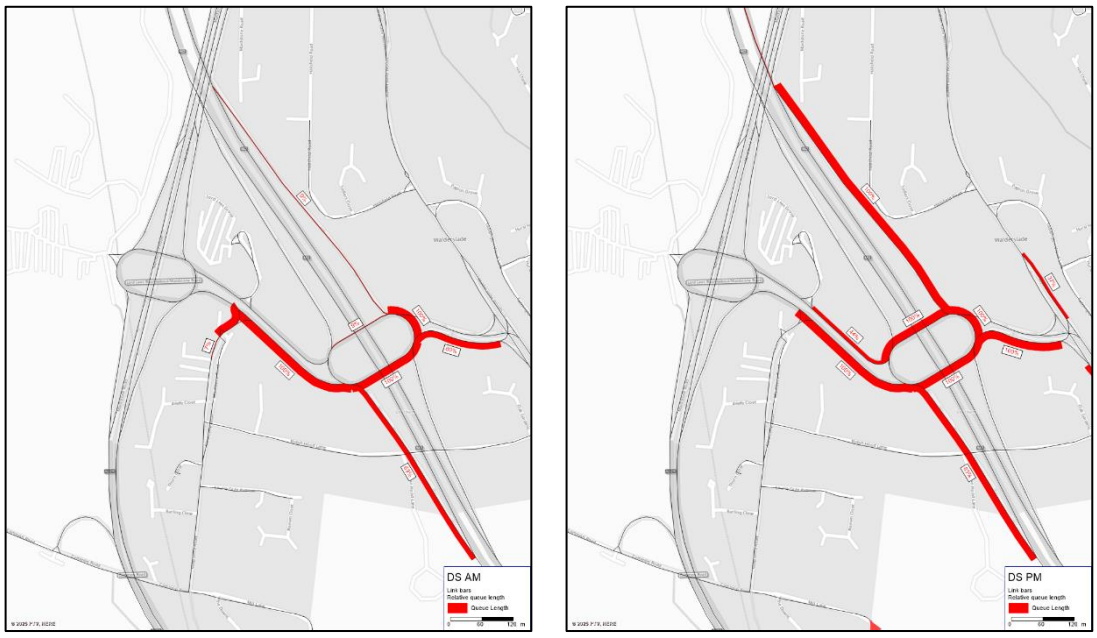

Figure 3-14: M2J3 2041 Do Something Link Relative Queues (AM Peak left, PM Peak right)

3.4 M2 Junction 4

M2J4 also sits on the Medway/ Maidstone border and forms connections with A278 Hoath Way and The Street. As part of the Lidsing Garden Village application, improvements at the junction are anticipated, these include the following:

- New link road forming connections between North Dane Way and Hoath Way
- Addition of a 1 lane link approach to the south of M2 J4 roundabout

- Realignment of Maidstone Road to connect with the new link road
- Realignment of the Street/ Maidstone Road to connect with the new link road.

These proposed changes to the junction have been coded into the rRC and fDS models and are illustrated in Figure 3-15. It is important to note that whilst the methodology has been agreed between Medway and NH the design drawings of the proposed junction are not finalised and as such revision may be required as the Local Plan is adopted.

Figure 3-15: M2J4 Network Coding

3.4.1 Base Year Validation

The 2019 Base Year validation of flows at the existing junction alignment is detailed in Figure 3-16, this indicates that the junction is a close match to observed conditions in both peaks.

The figures identify that all links at the junction have a GEH of 6.6 or less in the AM Peak and 5.3 or less in the PM Peak, therefore all links at the junction have an acceptable GEH with the modelled flows a close match to observed, creating a basis for robust forecasting in this locality.

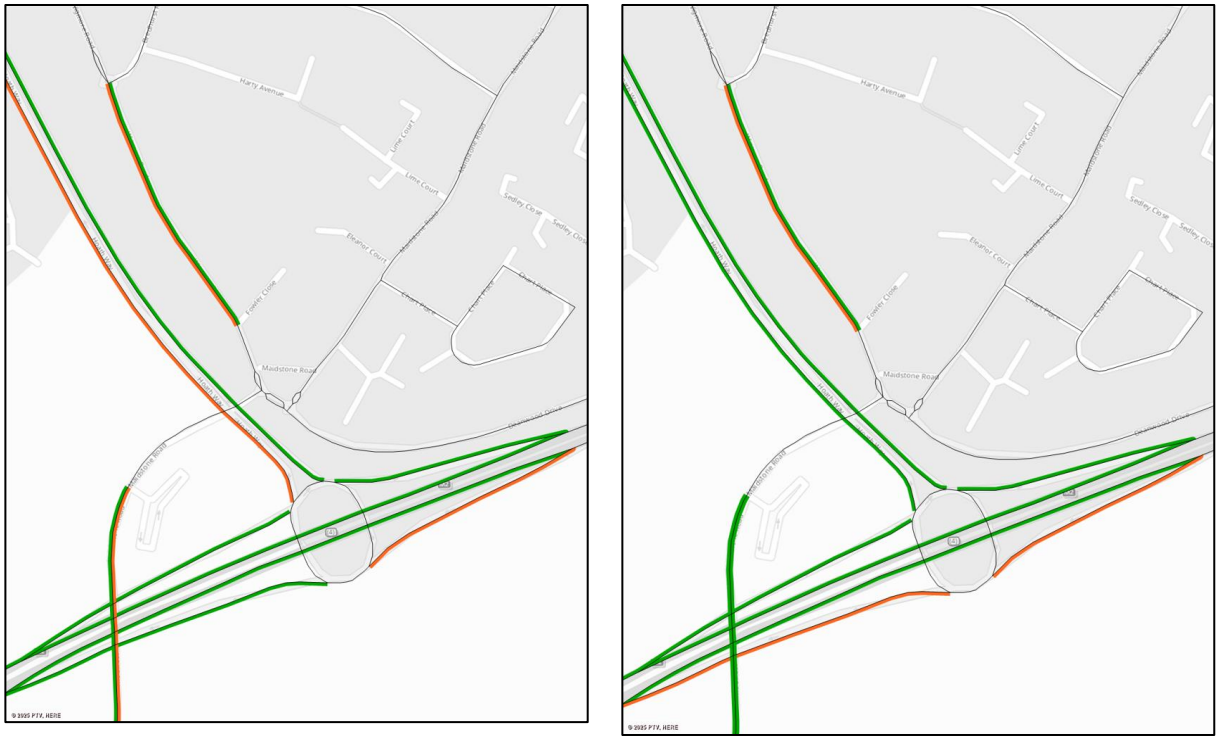

Figure 3-16: M2J4 2019 Base Year Validation (AM Peak left, PM Peak right)

3.4.2 Forecast Performance

Reference Case

The rRC junction performance presented in Figure 3-17 identifies that all links approaching the junction operate within capacity, with only the M2 mainline links located east of the slip roads starting to highlight capacity concerns. In the AM, the westbound mainline exceeds capacity with a V/C ratio of 104%, whilst the PM identifies the reverse, with the eastbound mainline approaching the eastbound on-slip exceeding capacity with a VC ratio of 106%.

Figure 3-17: M2J4 2041 Reference Case Link V/C Performance (AM Peak left, PM Peak right)

In addition to the link V/Cs at this junction, there are turns operating close to capacity in both the AM and PM Peak, this includes the following:

- M2 westbound off-slip approach to M2J4 (87% AM)
- Hoath Way Approach to M2J4 (94% AM, 93% PM)
- New Link Road approach to M2J4 (94% AM, 87% PM)

The turns nearing capacity result in turn delay of 25s – 54s seconds in the AM and 1021 seconds of delay in the PM Peak, with the largest delay noted on New Link Road approach to M2J4 (54s AM, 21s PM), which causes queuing on this link in the AM Peak.

Queues

The M2J4 junction in the 2041 rRC AM exhibits queuing on the new link road extending back to The Street, and also on A278 Hoath Way southbound (14%). The PM Peak presents considerably shorter queues (4% relative queue length) on A278 Hoath Way northbound.

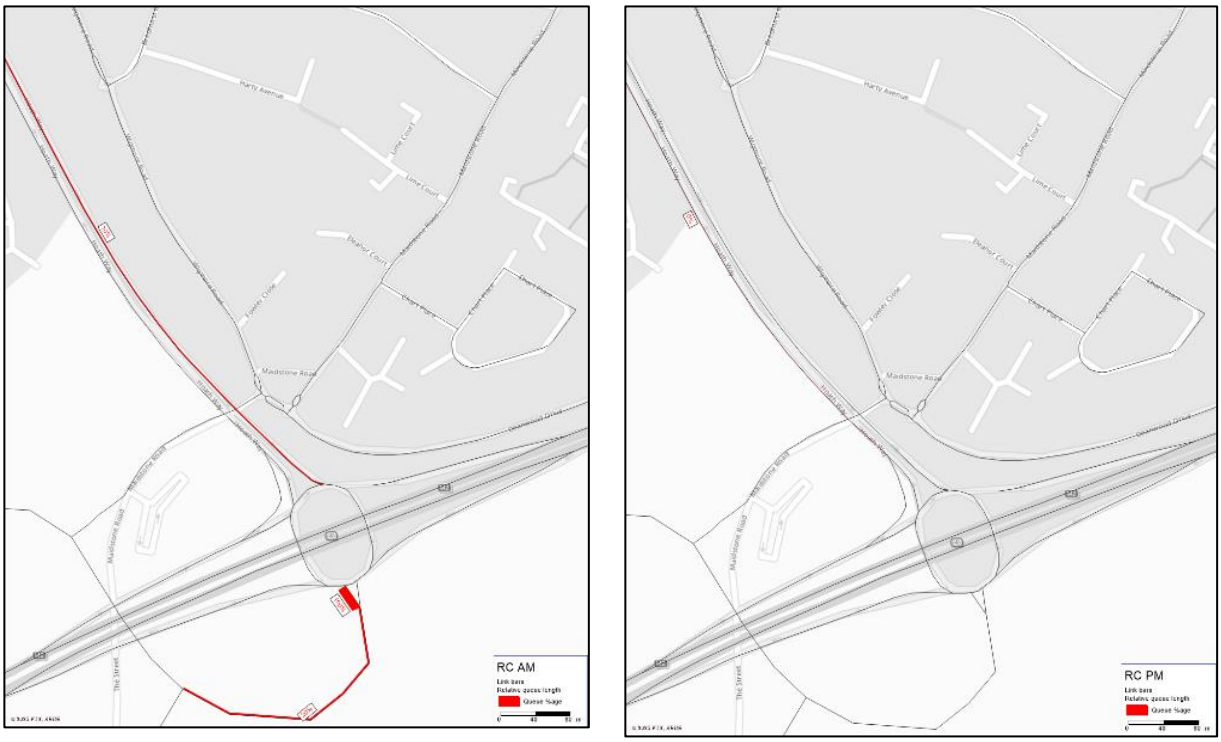

Figure 3-18: M2J4 2041 Reference Case Link Relative Queues (AM Peak left, PM Peak right)

Do Something

The information obtained from the fDS models is detailed in Figure 3-19 and the links nearing or exceeding capacity are summarised in Table 5.

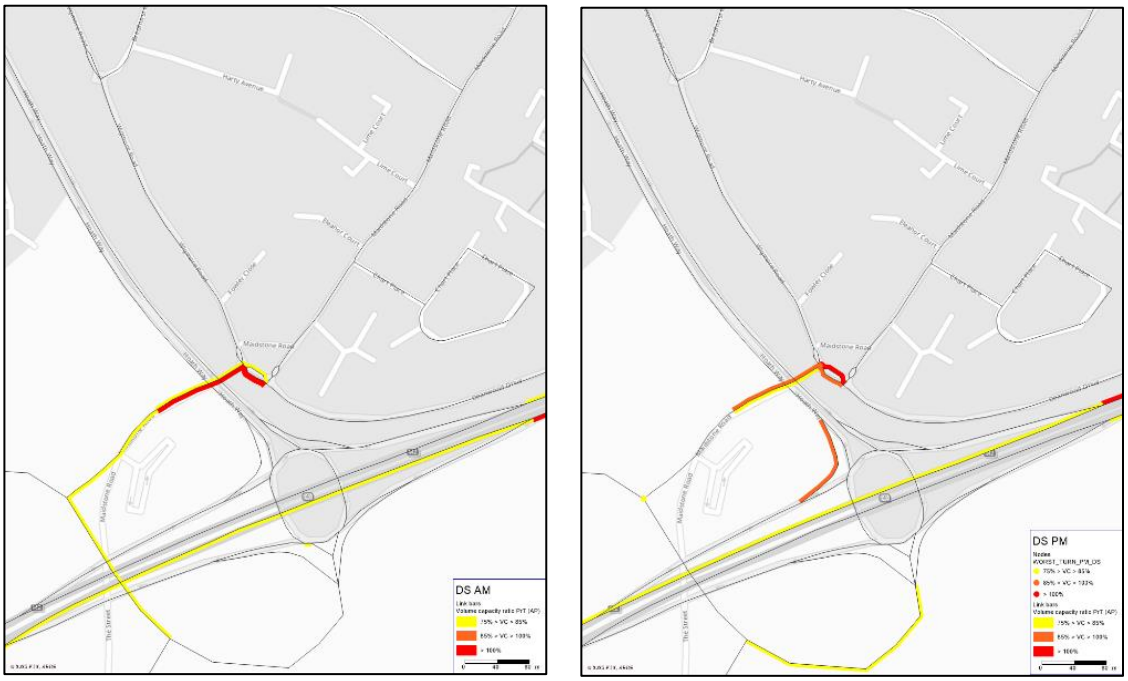

Figure 3-19: M2J4 2041 Do Something Link V/C Performance (AM Peak left, PM Peak right)

Table 5: M2J4 VC in DS Compared to RC

Link Name	VC Ratio					
	rRC AM	fDS AM	Diff	rRC PM	fDS PM	Diff
M2 westbound mainline (east of junction)	104%	106%	2%	74%	77%	3%
M2 westbound mainline (through junction)	81%	81%	0%	49%	50%	1%
M2 eastbound mainline (through junction)	53%	52%	-1%	80%	79%	-1%
M2 eastbound mainline (east of junction)	72%	76%	5%	106%	108%	3%
New link road northbound	23%	65%	42%	42%	46%	4%
New link road southbound	39%	46%	7%	59%	78%	19%

When comparing the rRC scenario with the fDS scenarios, there are similar patterns in available capacity on the M2 links with most of the links showing less than 5% change in the AM and less than4% in the PM.

The new link road approach to the junction has a reduced capacity in the AM Peak when comparing the fDS and rRC (65% from 23%), although still performs well within capacity (<75%). The reverse trend is observed in the fDS PM Peak, with the new link road southbound exit presenting a V/C of 78% which is due to the residential LP trips using this route to return in this peak.

Queues

The queuing conditions at M2J4 DS scenarios are displayed in Figure 3-20. When compared the rRC (Figure 3-18), both the new link road northbound and A278 Hoath Way southbound do not experience any queueing

in the AM Peak (queues extending to The Street and 14% of Hoath Way observed in the rRC) which is due to the refined junction arrangement coded in the fDS making the junction more efficient.

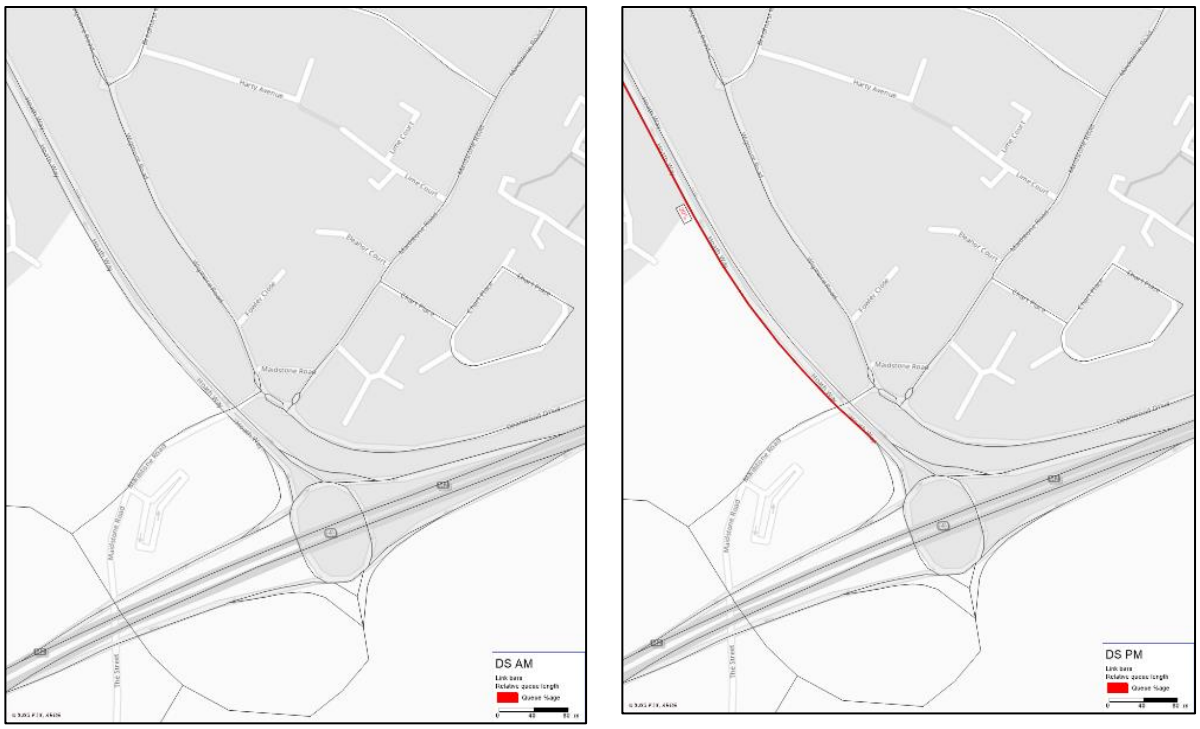

Figure 3-20: M2J4 2041 Do Something Link Relative Queues (AM Peak left, PM Peak right)

3.5 M2 Junction 5

The M2J5 is just east of Medway district, bordering Maidstone and Swale districts and this forms connections with A249 Sittingbourne Road. Junction improvements were completed in early 2025 and aimed to reduce congestion and improve safety at the Stockbury Roundabout. Key features to these improvements included:

- Stockbury Flyover: A nearly mile-long flyover allowing traffic to bypass the roundabout entirely.
- New Slip Roads: Dedicated slip roads provide direct access from the A249 to the M2, easing traffic flow.
- Enhanced Safety: The redesign addressed the junction's status as one of the top 50 national casualty locations

These changes to the junction have been included in all forecast models, with the junction improvements illustrated in Figure 3-21.

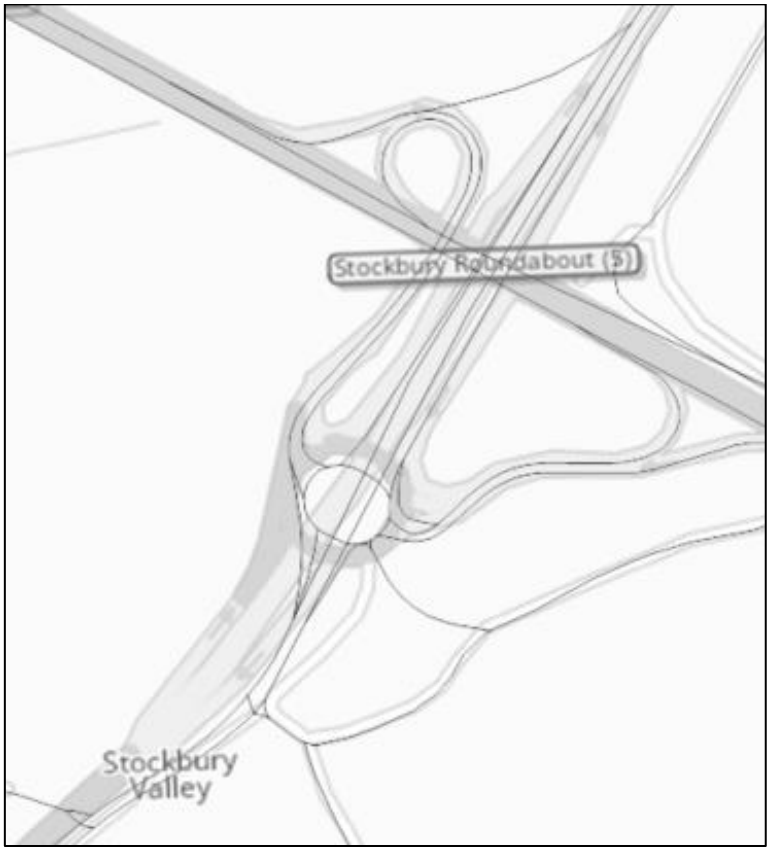

Figure 3-21: M2J5 Network Coding

3.5.1 Base Year Validation

The Base Year validation of flows at the junction are presented in Figure 3-22, this indicates that the junction is a close match to observed conditions in both peaks, with all links indicating a GEH <4. Although, it is important to note that the junction has not been validated to the improvements completed in early 2025.

Figure 3-22: M2J5 2019 Base Year Validation (AM Peak left, PM Peak right)

3.5.2 Forecast Performance

Reference Case

The model indicates that in the 2041 Forecast Year the following links will be over capacity in one or both peaks (as illustrated in Figure 3-23):

- M2 westbound mainline, west of on-slip (104% AM, 74% PM)
- M2 eastbound mainline, approaching off-slip (106% AM, 106%PM)
- M2 eastbound on-slip (104% AM, 121% PM)
- M2 eastbound off-slip to A249 Sittingbourne Road northbound (107% AM, 169% PM)
- M2 westbound off-slip (95% AM, 82% PM)
- A249 Sittingbourne Road southbound slip road to M2 westbound on-slip (133% AM, 105% PM)
- A249 Sittingbourne Road southbound, south of Stockbury Roundabout (89% AM, 66% PM)

Figure 3-23: M2J5 2041 Reference Case Link V/C Performance (AM Peak left, PM Peak right)

The junction improvements in this vicinity were implemented to improve safety and journey time reliability; whilst the junction presents capacity constraints, no queues are indicated in the vicinity of the junction with the forecast growth.

During the AM Peak, the M2 eastbound on-slip, M2 westbound mainline flow and slip road from A249 Sittingbourne Road to M2 westbound are forecast to be considerably over capacity (VC ratio of 104%, 104% and 133%, respectively). These constraints result in actual travelled speeds of 15mph despite of a 40mph speed limit.

In the PM Peak, the constrained capacity intensifies, particularly on the M2 eastbound on-slip, which reaches 121% in V/C with link delays over 1minute and 10 seconds and reduced travel speeds to 15mph. The M2 eastbound off-slip to A249 Sittingbourne Lane northbound is also severely impacted with 169% of V/C and associated link delay and travel time impacts. Furthermore, the M2 eastbound mainline west of the westbound off-slip is at a V/C of 106%, and the slip road from A249 Sittingbourne Lane southbound to M2 westbound remains over capacity at 105%.

Do Something

The information obtained from the fDS models is detailed in Figure 3-24 and the main links causing concern are summarised in Table 6.

Figure 3-24: M2J5 2041 Do Something Link V/C Performance (AM Peak left, PM Peak right)

Table 6: M2J5 Links of Interest; VC in DS Compared to RC

Link Name	VC Ratio					
	RC AM	DS AM	Diff	RC PM	DS PM	Diff
M2 westbound mainline, west of on-slip	104%	106%	2%	74%	77%	4%
M2 eastbound mainline, approaching off-slip	72%	76%	4%	106%	108%	2%
M2 eastbound on-slip	104%	103%	-1%	121%	121%	0%
M2 eastbound off-slip to A249 Sittingbourne northbound	107%	114%	7%	169%	176%	7%
M2 westbound off-slip	95%	95%	0%	82%	82%	0%
A249 Sittingbourne Road southbound slip road to M2 westbound on-slip	133%	141%	7%	105%	107%	2%
A249 Sittingbourne Road southbound, south of Stockbury Roundabout	89%	92%	3%	66%	67%	1%

There are no major changes between the RC scenarios and the fDS scenarios, with the biggest difference in VC capacity noted at 7%, as shown in Figure 3-24.

As summarised in Table 6, there are four links exceeding capacity in the AM Peak and PM Peaks. The M2 eastbound off-slip displays a V/C ratio of 176% in the PM Peak. This link notes a delay of 27 seconds, which is

a 170% increase in travel time on an uncongested network, and travel speeds reduce to 15mph from the 40mph speed limit.

Another concerning link is A249 Sittingbourne southbound slip road to M2 westbound on-slip which sees its VC reach 141% in the AM Peak, leading to 12 seconds of link delay (200% of an uncongested network) and 15mph travel speeds.

This analysis shows that this junction significantly over capacity in the rRC scenario, and the forecast LP allocations will have minimal impacts on the overall junction performance.

3.6 Summary

The available capacity at each of the M2 junctions within the AODM is largely unchanged when comparing the fDS and rRC (<5% in most cases), with the exception of the M2J1 whereby the M2 eastbound on-slip which notes a decreased capacity of 27% in the AM (from 107% in RC to 134% in DS), and 23% in the PM (from 103% in RC and 126% in DS).

All other junctions present limited change on the SRN in terms of link and turn V/C when comparing the fDS and the rRC, further supporting the conclusions from the **M2 and M20 Medway LP Merge/ Diverge Assessment TN**. which indicates only the M2J1 will require mitigating against the growth generated by the LP allocations.