TECHNICAL NOTE

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SUBJECT:	Greater Exeter Local Plan Growth – Vissim modelling UPDATED FOR PUBLICATION		
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INTRODUCTION

WSP was commissioned by National Highways to undertake traffic modelling of planned development growth across East Devon and the wider Greater Exeter area. This Technical Note represents National Highway current position on the impacts of planned growth for the SRN.

National Highways (NH) hold a Vissim microsimulation traffic model covering M5 J29, M5 J30 and the A30 Airport roundabouts. The model extents are shown in **Appendix A**. The model has a Base Year of 2022 and is validated to morning and evening periods of 7.30-9.30am and 4-6pm (a Local Model Validation Report is available on request). The model is being used to assess the operational impacts of projected traffic growth associated with the draft Local Plan Reviews for East Devon, Exeter, and Teignbridge, and notably the proposed East Devon New Community (EDNC) site. This Technical Note presents model findings from forecast year scenarios representing future growth across the Greater Exeter authorities. The findings have been discussed with East Devon District Council (EDDC) and Devon County Council (DCC) with a view to agreeing requirements for further work and developing common ground in terms of the required identification and delivery of any SRN highway improvements necessary to support planned growth.

MODELLING APPROACH

SATURN strategic model

Forecast year Vissim models are informed by strategic SATURN modelling undertaken by DCC. The SATURN model represents AM (8-9am) and PM (5-6pm) peak hours and accounts for committed, allocated, and proposed development sites across the East Devon, Exeter, Teignbridge, and Mid Devon authority area. Proposed development sites comprise emerging allocations from the East Devon, Exeter, and Teignbridge Local Plan Reviews, including the EDNC. Development sites within Mid Devon are understood to be based on the current adopted plan for that authority, and do not look forward to the next Local Plan Review.

The SATURN model has a 2017 Base Year and a 2040 forecast year, broadly aligning with the horizon years for the emerging Local Plans. Beyond the allowance for committed, allocated, and proposed development sites, wider background growth within the SATURN model is limited to traffic growth on the Strategic Road Network (SRN) (capped to National Road Traffic Projections (NRTP) forecasts). Elsewhere, the SATURN model assumes a reduction in future traffic demand within Exeter and into the City from the surrounding authority areas. The suitability of this assumption has been questioned by National Highways. In response to this concern, DCC have assessed a scenario that removes negative traffic growth within Exeter, but the work continues to assume negative growth for trips into the City from the

surrounding authority areas. National Highways intend to further explore the implication of this assumption through further scenario testing using Vissim in line with TAG guidance on accounting for uncertainty. It is intended that the findings of this further scenario testing will be shared with EDDC and DCC during early 2026.

Vissim microsimulation model

Forecast scenario Vissim models are developed by taking the difference between the SATURN 2017 Base year and 2040 forecast year matrices (Origin-Destination movements) and applying this to the 2022 Vissim Base model. Peak hour matrices were then extrapolated to cover the wider peak period using the prevailing profile of traffic in the Vissim model. Where applying the difference in Origin-Destination movements in the SATURN models resulted in negative flows in the Vissim model, then the reduction in trips was manually applied to comparable Origin-Destination pairings.

Whilst the SATURN model estimates traffic growth over the period 2017-2040, and the Vissim model represents a 2022 Base Year, the decision was made to make no adjustment to the SATURN forecasts to account for the different model base years. This is due to the following factors:

- SATURN model scenarios assume negative growth for movements within and into Exeter between 2017-2022 and zero growth for other local routes.
- SRN growth is capped to NRTP values and applied to M5-A30 external to external movements only.
- Development assumptions for the period 2017-2022 within the SATURN model Uncertainty Log have not been interrogated, and actual development growth in this period may have been impacted by Brexit and Covid. Whilst development build-out is known to have occurred in the Cranbrook New Community, National Highways has previously queried traffic growth assumptions for Cranbrook, and would not support a reduction in traffic generation to account for the different model base years.

MODEL SCENARIOS

This Technical Note will report model findings from five forecast scenarios and draw comparison to the 2022 Base model. All SATURN model scenarios account for committed sites, allocated development to 2030 (including full build-out of the Cranbrook New Community), and proposed allocations across the Exeter and Teignbridge authority areas. Whilst the majority of allocations within the East Devon authority area are included in all model scenarios, the EDNC allocation and proposed Link Road between the A30 and A3052 feature in alternative model scenarios. A breakdown of land use, growth and infrastructure assumptions for each scenario as assessed in the Vissim model is provided in **Table 1** overleaf.

Table 1 – Model Scenario Definition – Key Features

Period	Scenario 1	Scenario 2	Scenario 3	Scenario 4a	Scenario 5a
EDNC quantum	*Zero*	*3,300 dwellings and 17.5ha employment*	*3,300 dwellings and 17.5ha employment*	*3,300 dwellings and 17.5ha employment*	*8,000 dwellings and 56ha employment*
EDNC link road	*No link road*	*Yes – 40mph unconstrained*	*Yes – 20mph limited capacity*	*Yes – 20mph limited capacity*	*Yes – 20mph limited capacity*
Background growth	*Negative growth for trips to/from/within Exeter*			*Zero growth within Exeter but negative growth for trips to/from Exeter*	
Highways Mitigation	*Potential signalisation scheme at the A30 Airport roundabouts and the A376 Clyst St Mary roundabout*			*As per Scenarios 1-3 but additional lane allocation change for NB off-slip at M5 J30*	
Sustainable Travel	*Allowance for a raft of sustainable measures, including new Park & Ride sites at the EDNC site, with a resultant reduction in background traffic demand*				

Background Growth

As previously noted, National Highways queried the assumption of year-on-year negative growth to 2040. It was requested that a model scenario should consider a scenario with zero background growth for local trips. **Table 1** indicates that whereas Scenarios 1-3 include the DCC assumption of negative background growth for trips to/from and within Exeter, this assumption has been amended for Scenarios 4a and 5a. For trips within Exeter, the assumption of negative growth has been removed from the SATURN matrix development. However, for trips between Exeter (i.e. from East Devon, Mid Devon and Teignbridge) the SATURN forecasts retain an assumption of negative growth.

Flow differences from the SATURN model, comparing the change in traffic flow between the 2017 Base year model and the 2040 forecast scenarios are included in **Appendix B**, demonstrating assumed flow reductions (shown in blue) on the Exeter network to the west of the M5 particularly during the PM period. At the request of National Highways, DCC also shared further disaggregation of flow changes for key links (e.g. motorway slip roads) to identify the individual impacts of committed/ allocated development, background growth adjustments, and proposed mitigation. In particular, concern was raised regarding forecast PM peak flow reductions on the eastbound approach to M5 J29 and wider reductions across Sowton Industrial Estate. In response to general concerns over the build-up of modelled traffic flow changes, National Highways intend to undertake further scenario testing using Vissim to assess the sensitivity of model findings to assumptions in respect of background growth. As previously noted, the findings of this further scenario testing will be shared with EDDC and DCC during early 2026.

Highways Mitigation

In terms of potential highways mitigation, early model runs identified that traffic would not be able to get out of the EDNC site without improvements to the A30 Airport roundabouts. As such a concept scheme involving partial signalisation of both roundabouts, expansion of the southern roundabout, and widening of the slip roads to two lanes has been accounted for in both the SATURN and Vissim modelling. Similarly,

early model runs identified that the A376 Clyst St Mary roundabout would be a significant constraint, with traffic backing up into the EDNC site from the A3052 westbound approach to the roundabout. On this basis, a signalisation/ widening scheme for the roundabout was included in both the SATURN and Vissim modelling.

Another change in Scenarios 4a and 5a only is an assumed amendment of lane allocations on the northbound off-slip at M5 J30. Due to slip road queuing issues in Scenarios 1-3 associated with demand for the right-turn towards Clyst St Mary, the Scenario 4a and 5a model network has been amended to allow the right-turn movement to use both lanes three and four of the slip road, rather than the single lane as marked on-street. Without this change, the queue on the northbound off-slip limits flow on the M5 mainline, reducing traffic in the rest of the model – this was the case for the originally assessed Scenarios 4 and 5 which are not reported here.

Whilst the above potential highways mitigation has been assumed from a modelling perspective, further work will be required to confirm that the concepts are feasible and deliverable. It should not be construed that the works are deliverable without further investigation, nor that these are National Highways proposals for network improvements.

Following discussion with EDDC and DCC, it has been agreed that National Highways will further review the feasibility of lane allocation changes for the M5 J30 northbound off-slip. A review of the scope of required junction improvements at the A30 Airport roundabouts will be led by EDDC and DCC, including consideration of provision for active travel modes and existing slip road constraints (discussed within subsequent sections entitled ‘Off-Slip Queues’ and ‘Merge & Diverge Operation’). With the emerging Vision for the EDNC site proposing improvements to the Clyst St Mary junction and bus priority measures along the A376 and A3052, proposals for the Clyst St Mary roundabout will be led by EDDC, DCC and their consultants.

It should be noted that the Vissim modelling work identifies further capacity constraints at M5 J29 and J30, particularly considering the full build-out of the EDNC site. The EDNC and wider Local Plan growth will place additional pressure on these locations and are likely to bring forward the need for further improvements. Responsibilities to further explore capacity constraints and mitigation opportunities are discussed in due course.

Sustainable Transport Improvements

In addition to the potential highways mitigation detailed above, a range of sustainable travel improvements identified by DCC as part of the Greater Exeter Transport Study are also included in all SATURN scenarios, further impacting background traffic demand in the Exeter area in particular. Measures include two new Park & Change sites within the EDNC site, diverting traffic off the A30 and A3052 routes. Overall, the identified sustainable travel improvements are understood to remove around 2,000 vehicle movements from the SATURN model area in the AM peak hour, and 1,500 vehicle movements in the PM peak hour. Whilst some of the identified improvements are already identified in DCCs Bus Service Improvement Plan and Local Cycling and Walking Infrastructure Plan, other measures are concept proposals with associated uncertainty over funding and deliverability.

No network changes have been assumed in Vissim for sustainable travel improvements. In reality there is the potential for bus priority measures to impact on general traffic, and this would need to be assessed as

part of the scheme development process. Similarly, no increase in pedestrian or cyclist activity has been modelled in the Vissim model, for example using the signalised crossing facility on the southbound off-slip at M5 J29. With development to the east of the motorway, there is the potential for demand for at-grade crossing facilities to increase. Similarly, no pedestrian provision has been assumed as part of the A30 Airport roundabout concept improvement scheme. Signalised crossing facilities may well be required as part of any junction improvement scheme to be developed by EDDC and DCC working with landowners.

EDNC Traffic Demand

A key difference between model scenarios is the scale of development accounted for at the EDNC site. Vehicular trip rates adopted by DCC for the EDNC site are summarised in **Table 2** below. It is understood that the residential trip rates are for external trips, whereas the employment trip rates are prior to the application of any internalisation assumptions.

Table 2 – EDNC Trip Rates

Land Use	AM Peak			PM Peak		
	Arrivals	Departures	Total	Arrivals	Departures	Total
Residential (per dwelling)	*0.070*	*0.270*	*0.340*	*0.162*	*0.144*	*0.306*
Employment (per 100sqm)	*0.390*	*0.133*	*0.523*	*0.074*	*0.388*	*0.462*

It is noted that alternative residential trip rates have been developed by Stantec as part of the Marlcombe Transport Vision. National Highway has provided initial high-level comments on the trip rate approach, but no modelling work has considered the alternative trip rates at this stage.

Table 3 presents a summary of modelled EDNC traffic generation (external demand flow) based on SATURN model outputs for Scenario 2 (initial phase development at EDNC) and Scenario 5a (representing full development at EDNC).

Table 3 – EDNC Trip Generation

Phase	Development	AM Peak			PM Peak		
		Arrivals	Departures	Total	Arrivals	Departures	Total
1	*3,300 dwellings and 17.5ha employment*	*612*	*846*	*1,458*	*530*	*925*	*1,455*
2	*8,000 dwellings and 56ha employment*	*1,766*	*2,135*	*3,900*	*1,341*	*2,635*	*3,976*

The EDNC site is represented within the DCC SATURN model using a single model zone. SATURN model Select Link Analysis for the EDNC model zone is included in **Appendix C** showing the assignment of EDNC traffic across the wider network. It is noteworthy that the use of a single model zone (representing both residential and employment uses) results in a clear north/ south split in traffic movements between the A30/ M5 J29 to the north and the A3052/ M5 J30 to the south. As a consequence, very few trips travelling between the EDNC site and areas to the south appear to use M5 J29, and likewise very few trips travelling between the EDNC site and areas to the north appear to use M5 J30. In reality, given the internal layout of the site and the proposed treatment of the EDNC link road it is likely that there would be far greater

diffusion of north/south movements, increasing demand via the south-facing slip roads at M5 J29 and the north-facing slip roads at M5 J30. The impact of increased diffusion of trips will be explored by National Highways in further scenario testing using Vissim.

MODEL RESULTS

Each Vissim forecast scenario was assessed to demonstrate the impact of planned development growth. Model scenarios were assessed for 20 seed runs and results are discussed in the following sections. Whilst the 2022 Base Year Vissim model was developed with PC-MOVA to simulate MOVA signal operation at M5 J29, all forecast scenarios have been run on fixed signal plans for ease and to support comparison between model scenarios. M5 J30 runs on fixed signal plans in the Base model, and this continues to be the case in the forecast modelling, although Base model signal timings were adjusted as part of scenario testing. With potential signalisation of the A30 Airport roundabouts and the Clyst St Mary roundabout, fixed-time signal plans have been developed, although some optimisation has been undertaken in response to changing traffic demands in each scenario.

Model results are reported for the three SRN junctions included within the Vissim model– M5 J29, M5 J30 and the A30 Airport roundabouts, and are reported in terms of flow differences, off-slip queues, and modelled journey times. To align with the SATURN model, model outputs are presented for an AM peak hour of 8-9am and a PM peak hour of 5-6pm. Modelled flows are also used to undertake a review of slip road merge and diverge capacity in line with CD122 of the Design Manual for Roads and Bridges (DMRB).

Flow Differences

Modelled slip road flow changes at M5 J29 during the AM and PM peak hours are reported in **Table 4** as absolute and percentage values. It should be noted that these are actual flow differences, and therefore upstream congestion in the network can impact on the recorded through-put.

Table 4 - M5 J29 Modelled Slip Road Flow (Absolute and Percentage Change)

Period	Slip Road	Base	Scenario 1	Scenario 2	Scenario 3	Scenario 4a	Scenario 5a
AM Peak	*NB off-slip*	*1,547*	*+594 (+38%)*	*+549 (+35%)*	*+558 (+36%)*	*+550 (+36%)*	*+606 (+39%)*
	NB on-slip	*477*	*-40 (-8%)*	*+70 (+15%)*	*+34 (+7%)*	*-49 (-10%)*	*-8 (-2%)*
	SB off-slip	*863*	*+37 (+4%)*	*+64 (+7%)*	*+51 (+6%)*	*+34 (+4%)*	*+59 (+7%)*
	SB on-slip	*1,770*	*+574 (+32%)*	*+609 (+34%)*	*+677 (+38%)*	*+617 (+35%)*	*+597 (+34%)*
PM Peak	*NB off-slip*	*1,572*	*+270 (+17%)*	*+295 (+19%)*	*+339 (+22%)*	*+401 (+26%)*	*+335 (+21%)*
	NB on-slip	*676*	*-105 (-16%)*	*-18 (-3%)*	*-31 (-5%)*	*-30 (-4%)*	*+32 (+5%)*
	SB off-slip	*459*	*+56 (+12%)*	*+102 (+22%)*	*+103 (+22%)*	*+65 (+14%)*	*+123 (+27%)*
	SB on-slip	*1,908*	*+729 (+38%)*	*+666 (+33%)*	*+624 (+33%)*	*+600 (+31%)*	*+441 (+23%)*

Significant increases relative to the Base model occur in Scenario 1, with AM peak increases of nearly 600 vehicles on the northbound off-slip and southbound on-slip, and a 700 vehicle increase on the southbound on-slip in the PM peak. Beyond Scenario 1, flow changes are less significant with additional increases of around +100 vehicles in some cases, and PM peak flow reductions on the southbound on-slip. Noting

these are actual flows, the limited additional flow changes could be linked to upstream congestion or the physical capacity of the slip road. We would also highlight earlier comments in respect of the EDNC site, meaning SATURN flow plots included in **Appendix C** show little EDNC use of the south-facing slip roads at M5 J29.

Modelled slip road flow changes at M5 J30 during the AM and PM peak hours are reported in **Table 5** as absolute and percentage values. Again, it should be noted that these are actual flow differences, and therefore upstream congestion in the network can impact on the recorded through-put.

Table 5 - M5 J30 Modelled Slip Road Flow (Absolute and Percentage Change)

Period	Slip Road	Base	Scenario 1	Scenario 2	Scenario 3	Scenario 4a	Scenario 5a
AM Peak	NB off-slip	1,979	-229 (-12%)	-185 (-9%)	-196 (-10%)	-103 (-5%)	+173 (+9%)
	NB on-slip	785	+152 (+19%)	+54 (+3%)	+104 (13%)	+91 (+12%)	+48 (+6%)
	SB off-slip	1,537	-103 (-7%)	-137 (-3%)	-85 (-6%)	-143 (-9%)	-39 (-3%)
	SB on-slip	993	+207 (+21%)	+200 (+20%)	+172 (+17%)	+168 (+17%)	+322 (+32%)
PM Peak	NB off-slip	993	+300 (+30%)	+370 (+40%)	+342 (+34%)	+370 (+37%)	+473 (+48%)
	NB on-slip	1,350	-48 (-4%)	-33 (-7%)	-8 (-1%)	-4 (0%)	+33 (+2%)
	SB off-slip	1,107	+269 (+24%)	+156 (+11%)	+157 (+14%)	+187 (+17%)	+102 (+9%)
	SB on-slip	1,539	+90 (+6%)	+182 (+10%)	+182 (+12%)	+112 (+7%)	+401 (+26%)

Scenarios 1-4 all indicate a reduction in modelled traffic on the northbound off-slip in the AM peak and the northbound on-slip in the PM peak, with the southbound off-slip also showing a reduction in all five scenarios in the AM peak. It is recommended that such reductions require further investigation given the inclusion of proposed allocations across Teignbridge, Exeter and much of East Devon. At the request of National Highways, DCC has disaggregated flow changes to demonstrate the effect of growth assumptions and assumed sustainable transport measures. However, continuing uncertainty around forecast changes in background traffic will be further explored in additional Vissim modelling to be undertaken by National Highways.

The principal flow increases occur on the southbound on-slip in the AM peak, along with the northbound off-slip and southbound on-slip in the PM peak. Scenario 5a sees notable growth from Scenarios 1-4 on the northbound off-slip and southbound on-slip in both the AM and PM peaks.

Modelled slip road flow changes at the A30 Airport roundabouts during the AM and PM peak hours are reported in **Table 6** as absolute and percentage values. Again, it should be noted that these are actual flow differences, and therefore upstream congestion in the network can impact on the recorded through-put. All slip roads experience material increases in traffic demand, although the east-facing slip roads are shown to cater for low levels of traffic in the Base model.

Table 6 – A30 Airport Roundabouts Modelled Slip Road Flow (Absolute Change)

Period	Slip Road	Base	Scenario 1	Scenario 2	Scenario 3	Scenario 4a	Scenario 5a
AM Peak	EB off-slip	509	+259 (+51%)	+383 (+75%)	+357 (+70%)	+349 (+68%)	+587 (+115%)
	EB on-slip	53	+26 (+48%)	+97 (+183%)	+111 (+209%)	+88 (+165%)	+196 (+369%)
	WB off-slip	134	+155 (+116%)	+274 (+205%)	+272 (+203%)	+276 (+207%)	+495 (+370%)
	WB on-slip	546	+86 (+16%)	+537 (+98%)	+547 (+100%)	+465 (+85%)	+761 (+139%)
PM Peak	EB off-slip	276	+460 (+167%)	+667 (+242%)	+601 (+218%)	+613 (+222%)	+944 (+342%)
	EB on-slip	115	+140 (+123%)	+406 (+355%)	+406 (+354%)	+407 (+356%)	+574 (+501%)
	WB off-slip	87	+25 (+28%)	+96 (+111%)	+74 (+85%)	+57 (+66%)	+122 (+140%)
	WB on-slip	691	+487 (+70%)	+787 (+114%)	+701 (+101%)	+677 (+98%)	+604 (+87%)

The off-slips and the westbound on-slip all experience material increases in traffic flow in Scenario 1, with continuing build-out of the Cranbrook site contributing to increased demand. The inclusion of the A30 Airport roundabout improvements are also understood to be factor, increasing use of the junction in the SATURN model.

As the nearest SRN junction to the EDNC site, there is a notable increase in traffic demand in Scenarios 2-5, with increases relative to the Base model of 750-950 vehicles on the west-facing slip roads in Scenario 5a. Whilst the westbound on-slip flow increase in the PM peak is indicated to fall between Scenarios 4a and 5a, this is likely due to long queues on the northern and southern arms of the junction limiting through-put to the on-slip.

Off-Slip Queues

Modelled queues for the SRN junctions are summarised graphically in **Appendix D.** Where the queue approaches or exceeds the limit of slip road, then the slip road length is indicated with a dashed line. For consistency in each case the slip road length is measured to the painted nose. The painted nose is chosen to indicate the slip road length given this represents the point at which the slip road diverges from the mainline alignment and traffic is able to queue away from the mainline. It is acknowledged that in the case of the M5 northbound off-slips at J29 and J30, the slip road extends beyond this point in the form of a lane drop at J29 and a parallel diverge at J30.

The following summary findings are highlighted:

- At M5 J29, modelled queues are generally around 100-200 metres. AM peak queues on the northbound and southbound off-slips do show notable increases compared with the 2022 Base but continue to be contained within the slip road.
- At M5 J30, the AM peak queue on the northbound off-slip in the Base model extends back towards the painted nose, with high demand for the right-turn towards Clyst St Mary resulting in long queues forming in lane 4 of the slip road. The queue is not materially altered in Scenario 1 but is increased significantly in Scenario 2 and 3 and extends beyond the physical limit of the parallel diverge and onto the mainline. Whilst the SATURN modelling suggests an overall reduction in demand on the northbound off-slip in Scenario 2, there is an increase in demand for the right-turn towards Clyst. Scenario 4a reduces queue lengths following the allowance for two right-turning lanes but further increases in traffic demand in Scenario 5a result in a return of mainline queuing despite the assumed

capacity improvement for the right-turn movement. The Scenario 5a northbound off-slip queue is also approaching the painted nose in the PM peak.

- At M5 J30, the PM peak queue on the southbound off-slip jumps significantly in Scenario 5a. The modelled queue extends beyond the painted nose of the slip road with queuing vehicles occupying the lane drop from M5 J29. From inspection of the model, this increase in queuing is due to interaction with circulatory queues which then reduce effective through-put from the slip road, as is indicated in the model screenshot included in **Appendix E**. Whilst efforts were made to optimise signal timings on the roundabout circulatory, this competes with the northbound off-slip for signal green-time, whilst significant queues also form on the local road approaches to the junction (as shown in **Appendix E**). The capacity of the A376 Sidmouth Road approach already limits flow into the junction, with long queues forming on the A376 westbound approach and on Clyst Road in all scenarios, although this issue gets notably worse in Scenario 5a.
- At the A30 Airport roundabouts, AM peak queues on the eastbound off-slip are indicated to extend beyond the painted nose and onto the mainline in selected scenarios. Whilst the modelled concept layout is effective at limiting queues for much of the time, selected scenarios result in long queues forming. EDDC and DCC working with landowners will review opportunities to improve the A30 Airport roundabouts for multi-modal access. Given the limited existing length of slip road any improvement scheme that retains the existing slip road length will need to incorporate queue detection within the signal design, although long queues also form on both the northbound and southbound approaches to the Airport roundabouts (as shown in the model screenshot in **Appendix E**). With the size of development ultimately planned at EDNC and Cranbrook, further detailed consideration should be given to the slip road layout, diverge from the A30, the effect of incorporating pedestrian facilities, and the potential for any wider safety measures such as a reduced speed limit on the A30 between the Airport junction and M5 J29. These matters will require consideration of the existing highway structures over the River Clyst which currently present a constraint to extending the slip roads and improving merge/ diverge layouts and could ultimately limit the scale of traffic that can be safely accommodated through the junction.

Journey Times

The Vissim Base model was validated to prevailing journey times across a number of routes. The journey time impacts of forecast scenarios have been reviewed for the following routes:

- A30/ Honiton Road (both directions).
- M5 J29 northbound off-slip to A30 eastbound.
- M5 J29 southbound off-slip to A30 westbound.
- A3052 Sidmouth Road to A379 west of M5 J30 (both directions).
- M5 J30 southbound off-slip to Motorway Service Area
- M5 northbound to Moor Lane

Key observations for the selected journey time routes are summarised below, with supporting journey time graphs included in **Appendix F** and a map of journey time routes included in **Appendix G**:

- There are notable eastbound journey time increases on Honiton Road on approach to the Moor Lane roundabout in the AM peak, with significant eastbound queues forming as shown in the model screenshot included in **Appendix E**. All forecast scenarios show similar journey times on this approach, although there are small increases as development traffic increases. PM peak journey times also increase in the westbound direction on approach to the Moor Lane roundabout and into Exeter, with Scenarios 2-5a showing a clear increase relative to the Base model and Scenario 1. It is evident that the Moor Lane roundabout will be a constraint to projected traffic demands. Whilst the Vissim model does not capture constraints on Honiton Road to the west of the Moor Lane roundabout it would be desirable to ensure that operation of the Moor Lane roundabout does not lead to queues blocking back to M5 J29. Whilst signal optimisation has been undertaken in the Vissim model, the model

screenshot in **Appendix E** still shows that long westbound queues can form on approach to Moor Lane, and such queues would be likely to increase if modelled reductions in traffic demand into Exeter fail to materialise.

- AM peak eastbound journey times along the A379 and A3052 increase significantly in all scenarios compared to the Base model, with material increases on approach to M5 J30 and the Clyst St Mary roundabout, particularly in Scenarios 4a and 5a. Westbound journey times along the A3052 improve in Scenarios 1-4 relative to the Base, with the Clyst St Mary roundabout concept improvement easing westbound queues compared to the Base model. In Scenario 5a, the AM peak journey time for the full route is equivalent to the Base model as additional delays on approach to M5 J30 offset the journey time savings on approach to the Clyst St Mary roundabout.
- For Scenario 5a, there is a significant increase in AM peak journey times through M5 J30 from the southbound off-slip towards the Motorway Services roundabout. This reflects the previously reported slip road queuing issues in this scenario. Whilst southbound journey times on approach to the motorway junction are similar in the Base and Scenarios 1-4a, development growth brings increasing delay on approach to the Motorway Services roundabout and Moor Lane.
- As evidenced by modelled queues for the M5 J30 northbound off-slip, Scenarios 2,3, and 5a result in a clear AM peak increase in journey times on the M5 northbound carriageway. Scenarios 1 and 4a result in a much reduced increase relative to the Base model, with Scenario 4a benefitting from an assumed increase in right-turn capacity.

Merge & Diverge Operation

Analysis of merge/diverge capacity has been undertaken for the SRN junctions in line with CD122 of the DMRB. CD122 sets out prescribed merge and diverge layouts based on peak flow combinations. Analysis has been repeated for each model scenario, with findings presented in **Appendix H**. Red points labelled as B (Base), 1, 2, 3, 4 and 5 (Scenarios 1-5a) denote the combined traffic demand and prescribed layout for each scenario. The existing merge/ diverge layout is denoted with a blue point. Assessments for the A30 Airport junction have been undertaken on the basis of the all-purpose road merge and diverge diagrams contained in CD122, whereas the motorway diagrams have been used for the M5 junctions.

For M5 J29, the north-facing slip roads benefit from taper merges and diverges whilst the south-facing slip roads benefit from lane gain/ lane drop layouts. For M5 J30, the north-facing slip roads also benefit from lane gain/ lane drop layouts whilst the south-facing slip roads benefit from a parallel diverge and a taper merge. The A30 Airport junction benefits from taper merges and diverges. Incidences of where the forecast scenarios alter the required layout are summarised below:

- At M5 J29, AM peak demand for the southbound on-slip suggests a requirement for a lane gain with ghost island layout. Whilst the AM peak Base scenario would also suggest the same borderline requirement, the growth in slip road demand is almost +600 vehicles in all scenarios. The same is true for the PM peak, with an equivalent +600 vehicle increase but minimal increase in slip road flow between Scenario 1 and Scenarios 2-5a despite the addition of development at the EDNC. This is likely due to traffic constraint at the A30 Airport roundabouts and the assumed routeing of EDNC traffic shown in **Appendix C** which almost entirely uses M5 J30 for journeys to the south. Given the layout of the EDNC site and the treatment of the link road, it is considered highly likely that EDNC use of the southbound on-slip at M5 J29 will be higher than indicated by the SATURN model.
- For the M5 J29 northbound off-slip, both AM and PM peak flows suggest a need for a ghost-island lane drop or auxiliary lane drop due to the volume of traffic wishing to exit the motorway at J29. In the PM peak the increase in slip road flow relative to the Base is around 300 vehicles in all scenarios, but in the AM peak the increase is around 600 vehicles. Whilst the EDNC site is shown to contribute practically zero additional demand to the slip road (as shown in **Appendix C**) we consider this to be unrealistic and the full EDNC development of 8,000 dwellings and employment would be expected to lead to a notable increase in demand for this slip road.

- For M5 J30, forecast traffic demand does not alter the required merge or diverge layouts.
- For the A30 Airport junction, westbound traffic merging onto the A30 for travel towards Exeter and the M5 increases demand for the existing short slip road and single-lane taper merge. Traffic demand in Scenarios 2-5a would all suggest a need for a parallel merge layout, with the potential that additional demand in Scenario 5a is held back by capacity constraints at the A30 Airport roundabouts.

In early model runs, queues formed on the southbound on-slip at M5 J29. The model has around 2,500 vehicles using the slip road in both peak hours, and this volume of traffic led to delays as vehicles either continued within the lane-gain to J30 or waited for gaps to merge with mainline traffic. Coding of the slip road was subsequently revised to encourage use of both available lanes to the nose of the slip road, at which point traffic is either able to merge with the M5 or continue ahead. The revised coding avoids any material queueing and delay on the slip road but is felt to represent a 'best case' performance of the slip road that assumes aggressive utilisation of the road space. National Highways intend to review the existing on-street performance of this merge with the M5 mainline through a forthcoming drone survey. Further work will also consider high-level opportunities to address merge issues associated with projected increases in future traffic demand.

For the northbound off-slip, where the CD122 analysis also suggests a need for improvement, a queue-counter placed at the diverge from the slip road recorded queues of up to 300 meters in Scenario 5a as vehicles slow to exit the motorway in a single lane. Queueing can extend to up to 180m in Scenario 4a. Whilst some vehicles will in reality perform a late manoeuvre to enter the lane drop close to the diverge point, the model coding requires vehicles to join the lane drop in advance of the junction. As noted for the southbound on-slip, National Highways also intend to review the existing on-street performance of this diverge through a forthcoming drone survey. Consideration of high-level opportunities to address future diverge issues will also be led by National Highways.

SUMMARY

This Technical Note summarises the findings of Vissim modelling for forecast year scenarios representing planned growth across the Greater Exeter authorities. The Technical Note draws on strategic model forecasts prepared by DCC. The note presents model findings for M5 J29, M5 J30 and the A30 Airport roundabouts, and focusses on traffic flow changes, slip road queues, journey time changes, and merge and diverge performance. The findings have been discussed with EDDC and DCC, with a view to agreeing requirements for further work and developing common ground in terms of the required identification and delivery of any SRN highway improvements necessary to support planned growth. On the basis of the work undertaken to date, key observations include the following:

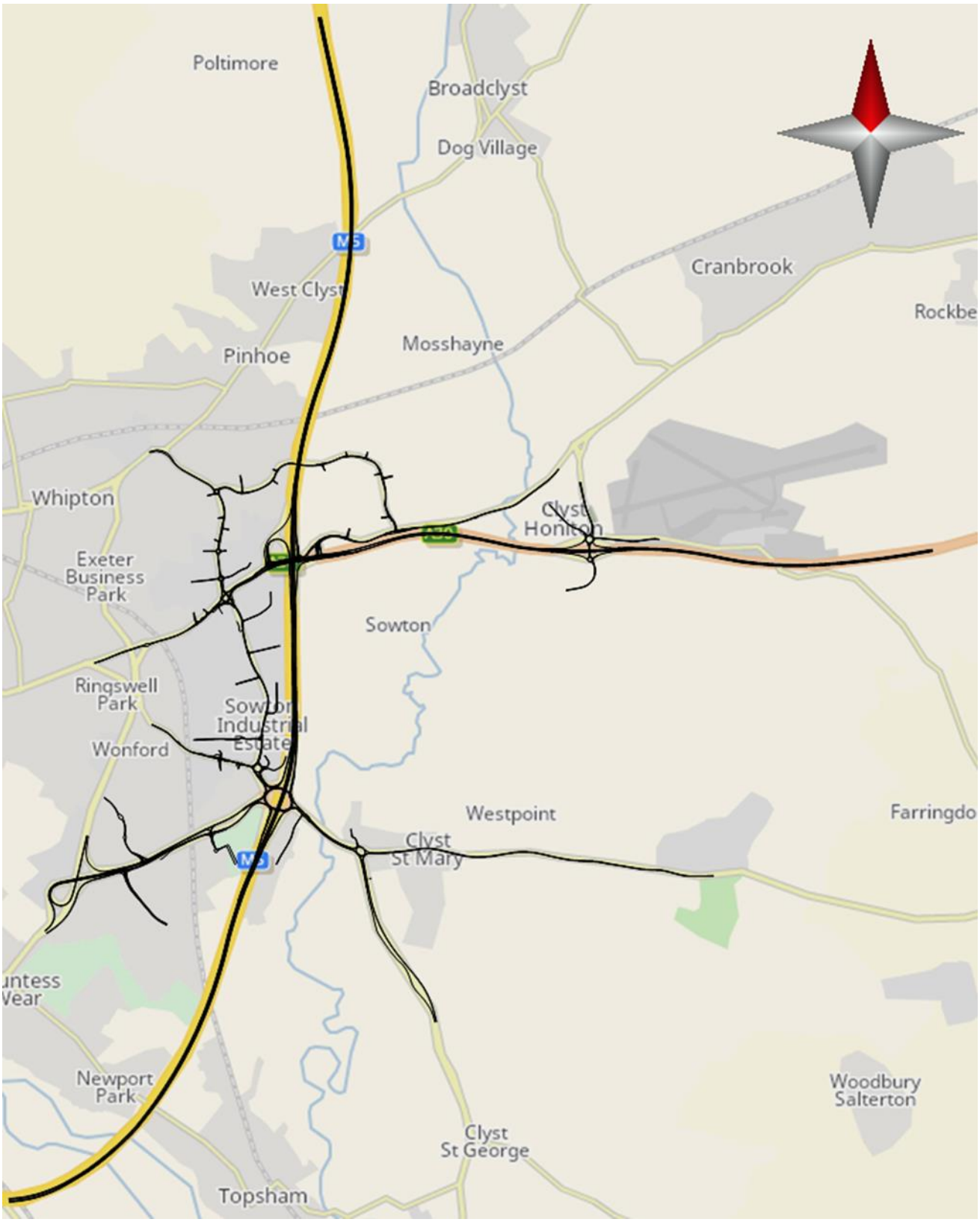
- Compared to the 2022 Base model, the forecast scenarios result in significant flow increases for selected slip roads/ time periods, with increases of 600-700 vehicles at M5 J29, and increases of 750-950 vehicles at the A30 Airport roundabouts. Analysis suggests little change in slip road traffic demand at M5 J29 and J30 for scenarios reflecting 3,300 dwellings at the EDNC site, but more significant increases for the full EDNC development of 8,000 dwellings. The sensitivity of SRN junction performance to assumed changes in background traffic levels and development traffic routeing is to be explored through further Vissim modelling work to be led by National Highways. Material increases in traffic occur at the A30 Airport roundabouts with the inclusion of EDNC traffic. EDDC and DCC have committed to review the scope of required junction improvements at the A30 Airport roundabouts, including consideration of provision for active travel modes and existing slip road constraints.
- Early modelling work identified that capacity constraints at the A376 Clyst St Mary roundabout would lead to significant queuing on the A3052 and delays for traffic exiting the EDNC site. On this basis a concept improvement was modelled for the junction to better accommodate projected traffic demands.

With the emerging Vision for the EDNC site proposing improvements to the Clyst St Mary junction and bus priority measures along the A376 and A3052, proposals for the Clyst St Mary roundabout will be led by EDDC, DCC and their consultants. It will be important to ensure that future operation of the junction does not result in eastbound queues on the A376 stretching back to M5 J30 where they would restrict the flow of traffic off the M5 mainline.

- Model scenarios identify queues extending onto the M5 mainline from the northbound off-slip at M5 J30. This occurs under the initial phase of development at EDNC. A concept improvement has been modelled to increase capacity for the right-turn towards Clyst St Mary but this would require further design investigation to confirm deliverability. National Highways is to further explore the feasibility of this concept improvement with a view to potentially securing the improvement as part of the EDDC Local Plan.
- The concept improvement is effective at avoiding mainline queueing for the initial phase of development at EDNC. However, the full 8,000 dwelling EDNC development results in a return of mainline queuing issues on the northbound off-slip, and the extension of queues on the southbound off-slip. In general terms, M5 J30 operates with extensive queues on all approaches and is likely to require wider capacity improvement to accommodate the full level of planned development. At the present time National Highways has no proposals to deliver its own improvements at M5 J30, and the scope to deliver further capacity improvements (over and above the concept improvement for the northbound off-slip being investigated by National Highways) that accommodate the full EDNC traffic demand is currently uncertain. It is recommended that EDDC, DCC and their consultants will need to consider this matter further, investigating the scope of highway capacity improvements necessary to accommodate Local Plan growth, alongside proposals set out in the Marlcombe Vision document for bus priority and improved active travel connections.
- Despite the inclusion of a modelled concept improvement at the A30 Airport roundabouts, significant queues form on the local road approaches, with traffic queuing back into the EDNC site. With the concept improvement included in all model scenarios it is not possible to definitively say at what point of the EDNC build-out improvements would be required. However, the existing single-lane slip roads and limited roundabout size are likely to provide a constraint to meaningful development at the EDNC site, particularly given ongoing build-out at Cranbrook. Long queues can form on the A30 eastbound off-slip, and further consideration will be required to ensure that queues do not extend to the A30 mainline under any improvement scheme.
- Whilst current model scenarios indicate that the M5 J29 signals operate without severe queueing or delay, it will be necessary to ensure that queues from the Moor Lane roundabout do not extend back to block the M5 J29 slip roads. National Highways maintains the view that assumed reductions in background traffic are uncertain and intends to undertake further modelling work to assess the implications of alternative growth scenarios. This work could alter assessment findings for M5 J29, where traffic reductions are currently assumed for journeys into Exeter.
- Analysis of traffic demands suggest that the merge and diverge layouts for the south-facing slip roads at M5 J29 are approaching or already at their theoretical capacity, and will be placed under further pressure as part of committed and planned development. Projected flow increases at M5 J29 are significant, with increases of up to 600-700 vehicles compared to the 2022 surveyed Base model, and the model shows long queues forming in the northbound lane drop on approach to M5 J29. Whilst SATURN modelling work suggests the EDNC site will add little traffic to these slip roads, this is felt to be impacted by the model zoning for the site. In reality we consider there is a risk that the site will result in far greater use of the slip roads and additional weaving activity. National Highways intend to review the existing on-street performance of the south-facing slip roads through a forthcoming drone survey. Further work will also consider high-level opportunities to address merge issues associated with projected increases in future traffic demand.
- At the A30 Airport roundabouts, future increases in traffic merging with the westbound carriageway indicate a need to deliver a parallel merge but the River Clyst structure may impact the deliverability of any proposals. The same structure could impact any improvements to the eastbound off-slip. It is recommended that the potential implications of projected traffic demands on slip road layouts and

highway safety are considered by EDDC, DCC and their consultants as part of work to develop multi-modal access proposals for the A30 Airport roundabouts.

Appendix A – Vissim Model Extents



Appendix B – SATURN Flow Difference Plots

Figure B1 - SATURN 2017-2040 Flow Difference: Scenario 1 – AM Peak Hour (8-9am)

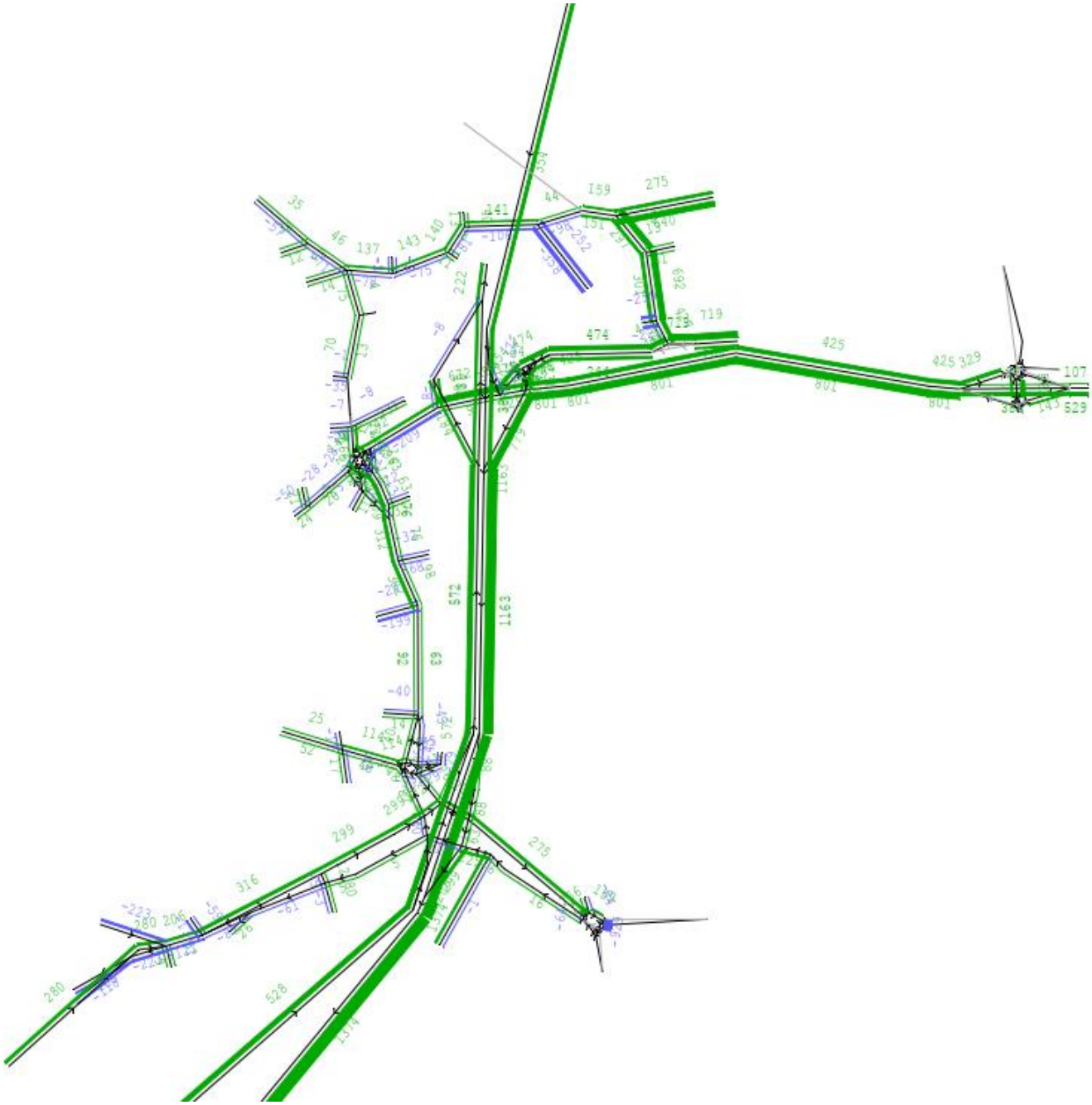


Figure B2 - SATURN 2017-2040 Flow Difference: Scenario 1 – PM Peak Hour (5-6pm)

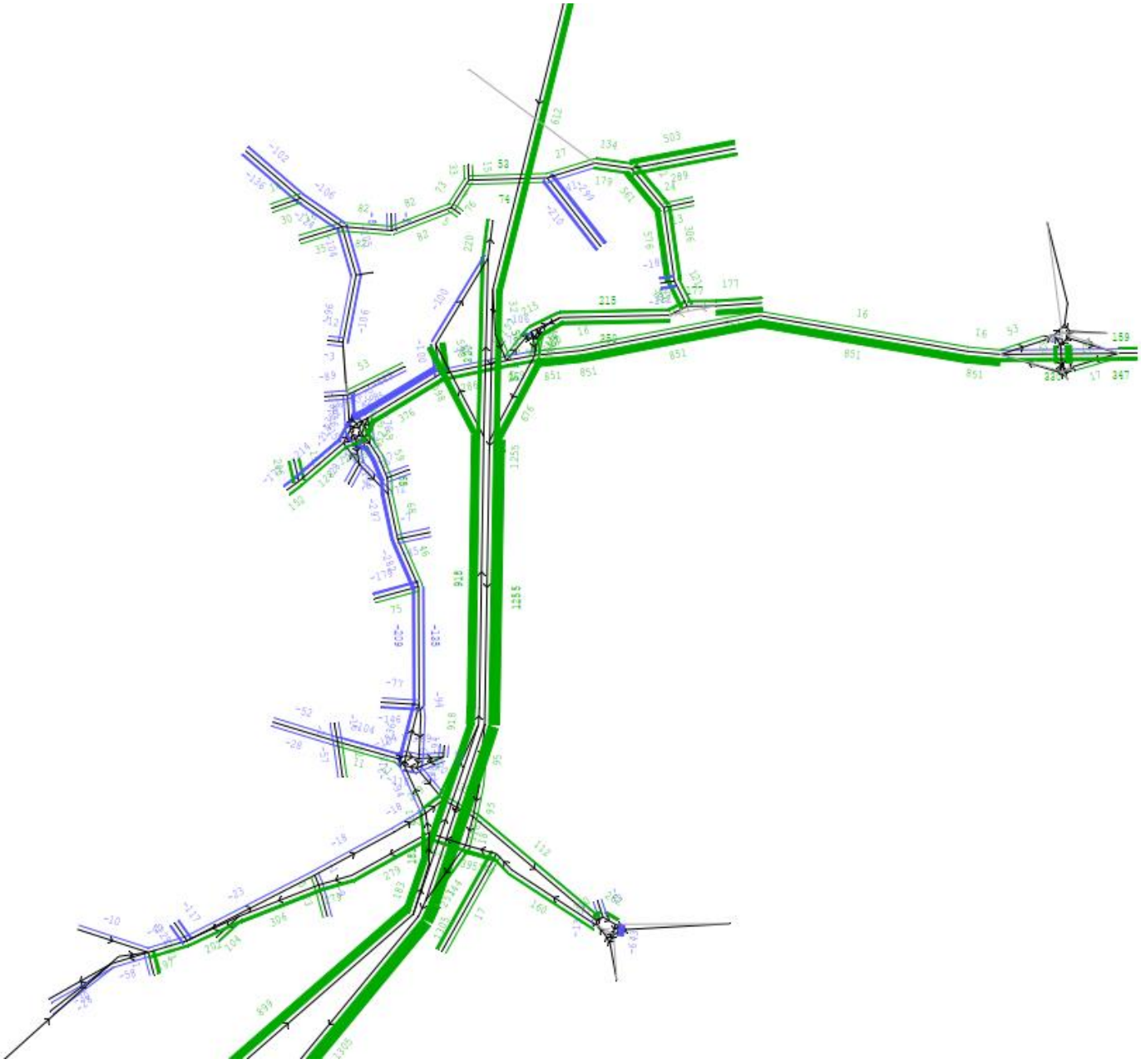


Figure B3 - SATURN 2017-2040 Flow Difference: Scenario 2 – AM Peak Hour (8-9am)

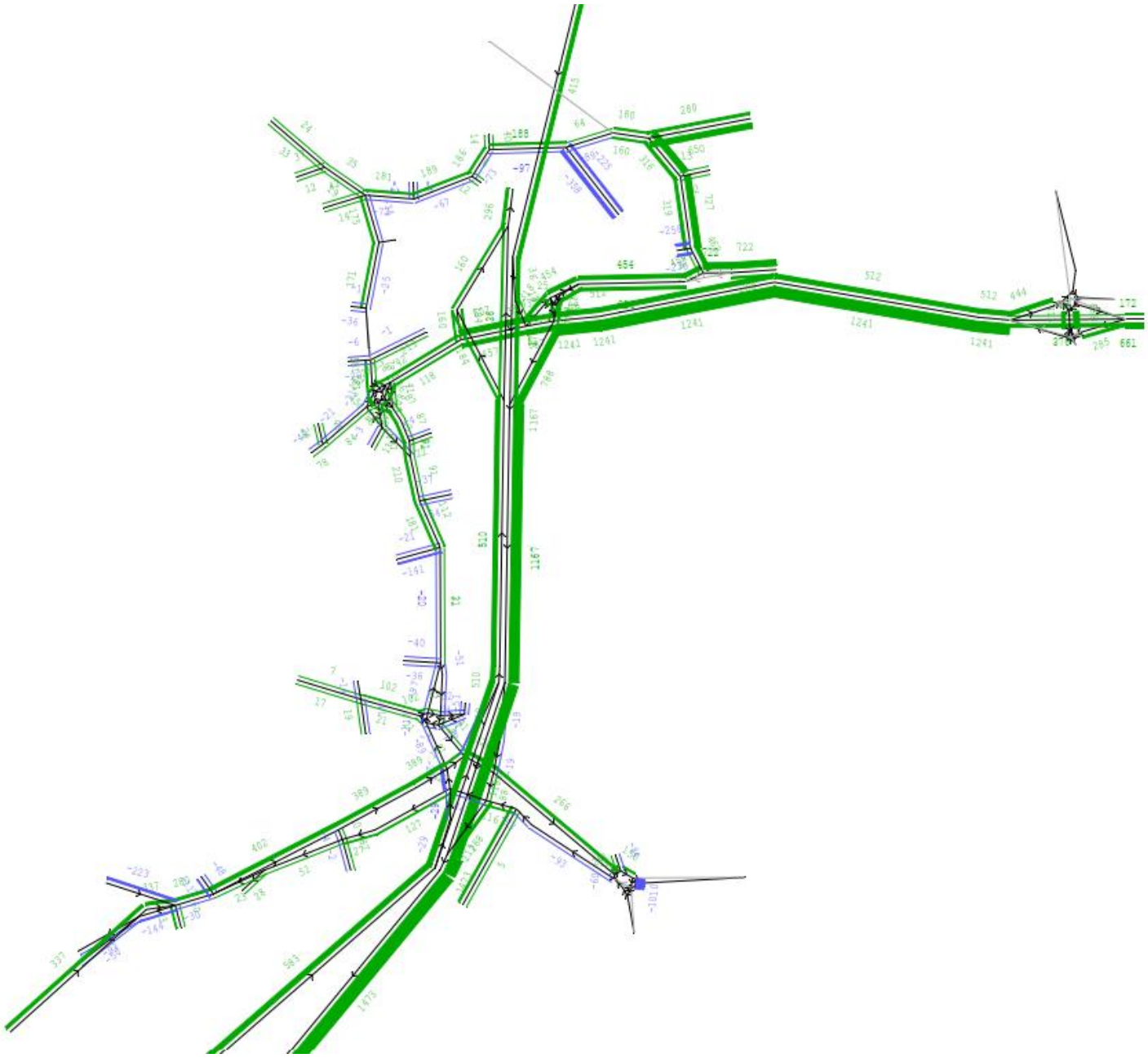


Figure B4 - SATURN 2017-2040 Flow Difference: Scenario 2 – PM Peak Hour (5-6pm)

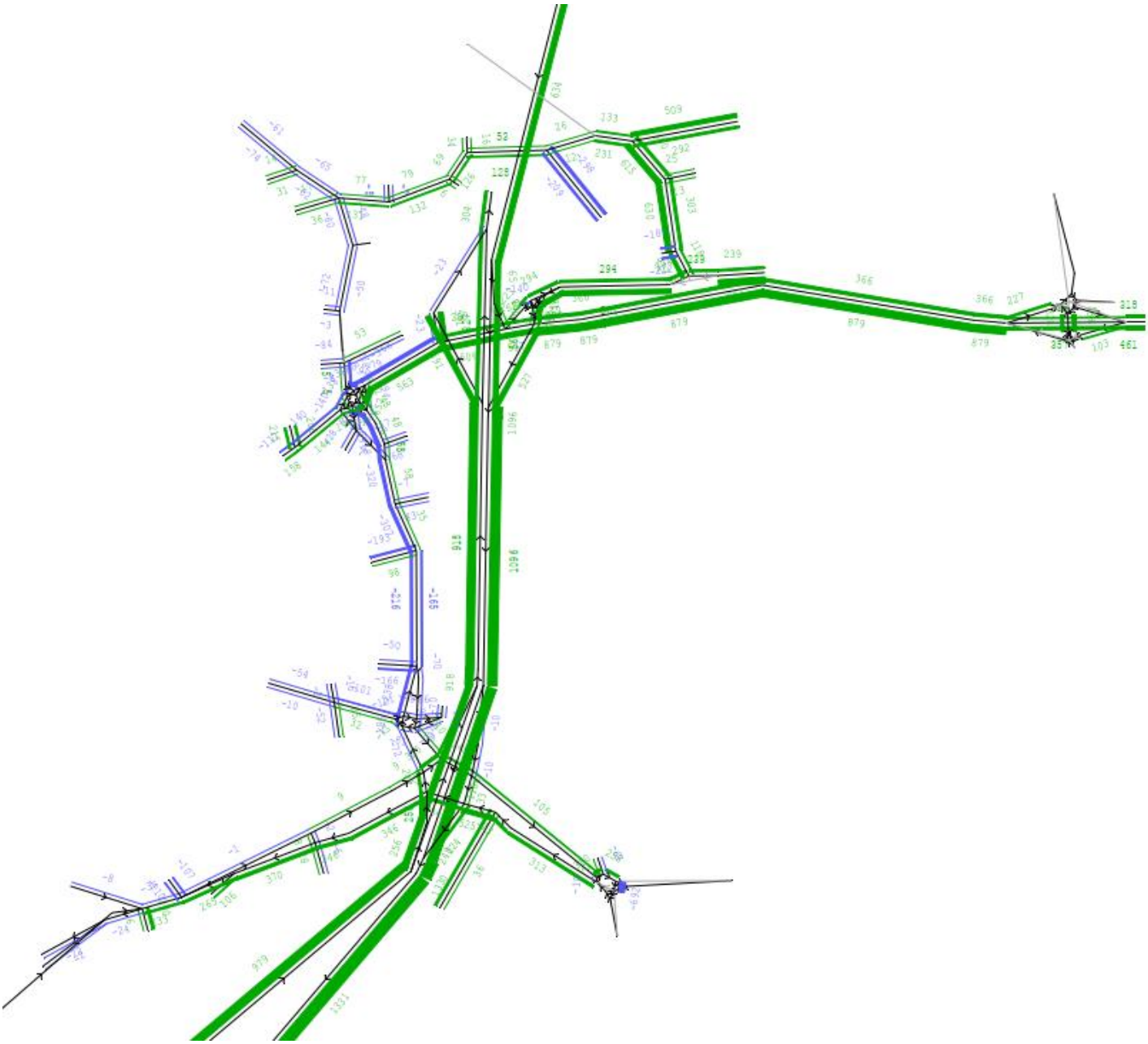


Figure B5 - SATURN 2017-2040 Flow Difference: Scenario 3 – AM Peak Hour (8-9am)

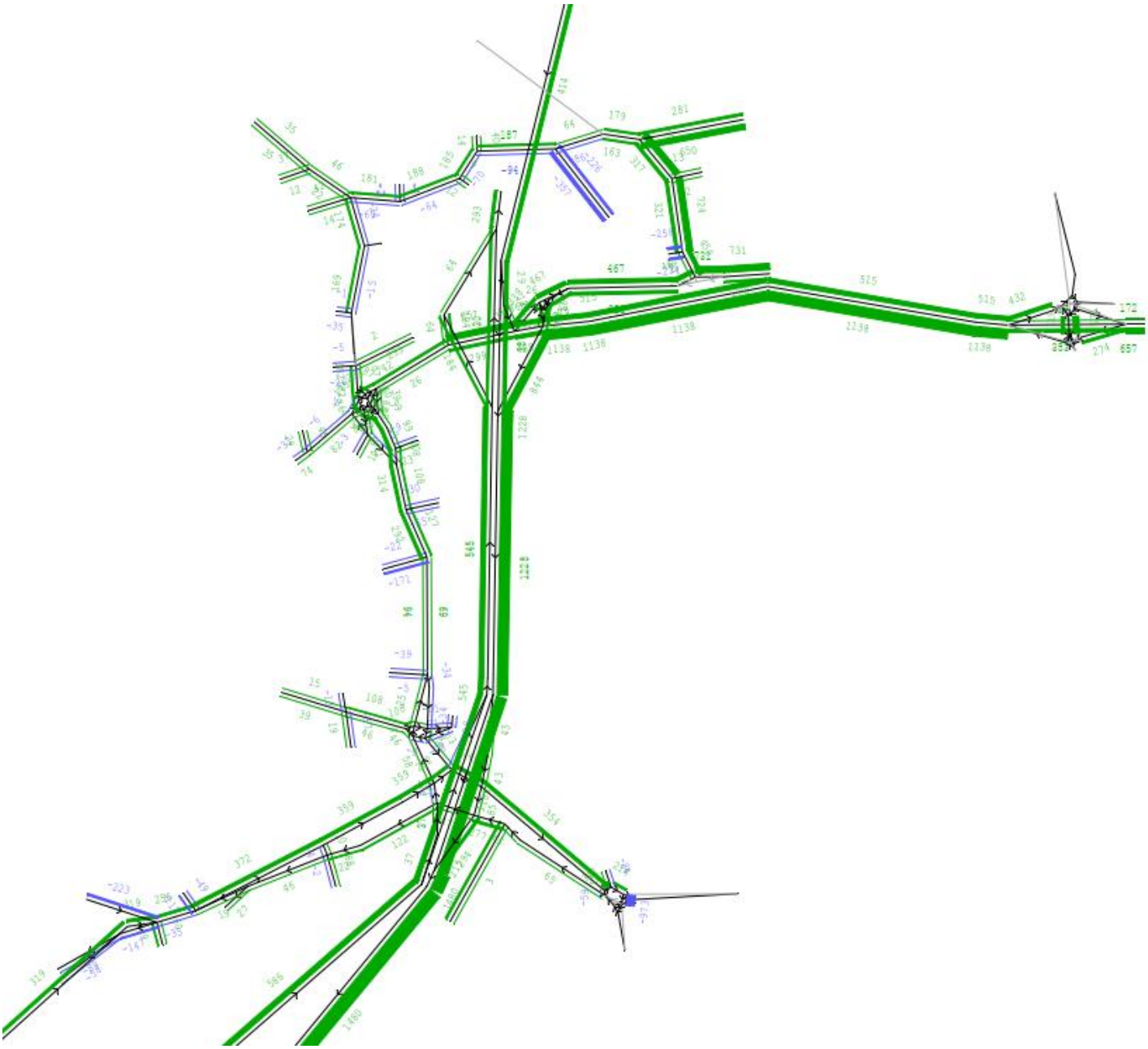


Figure B6 - SATURN 2017-2040 Flow Difference: Scenario 3 – PM Peak Hour (5-6pm)

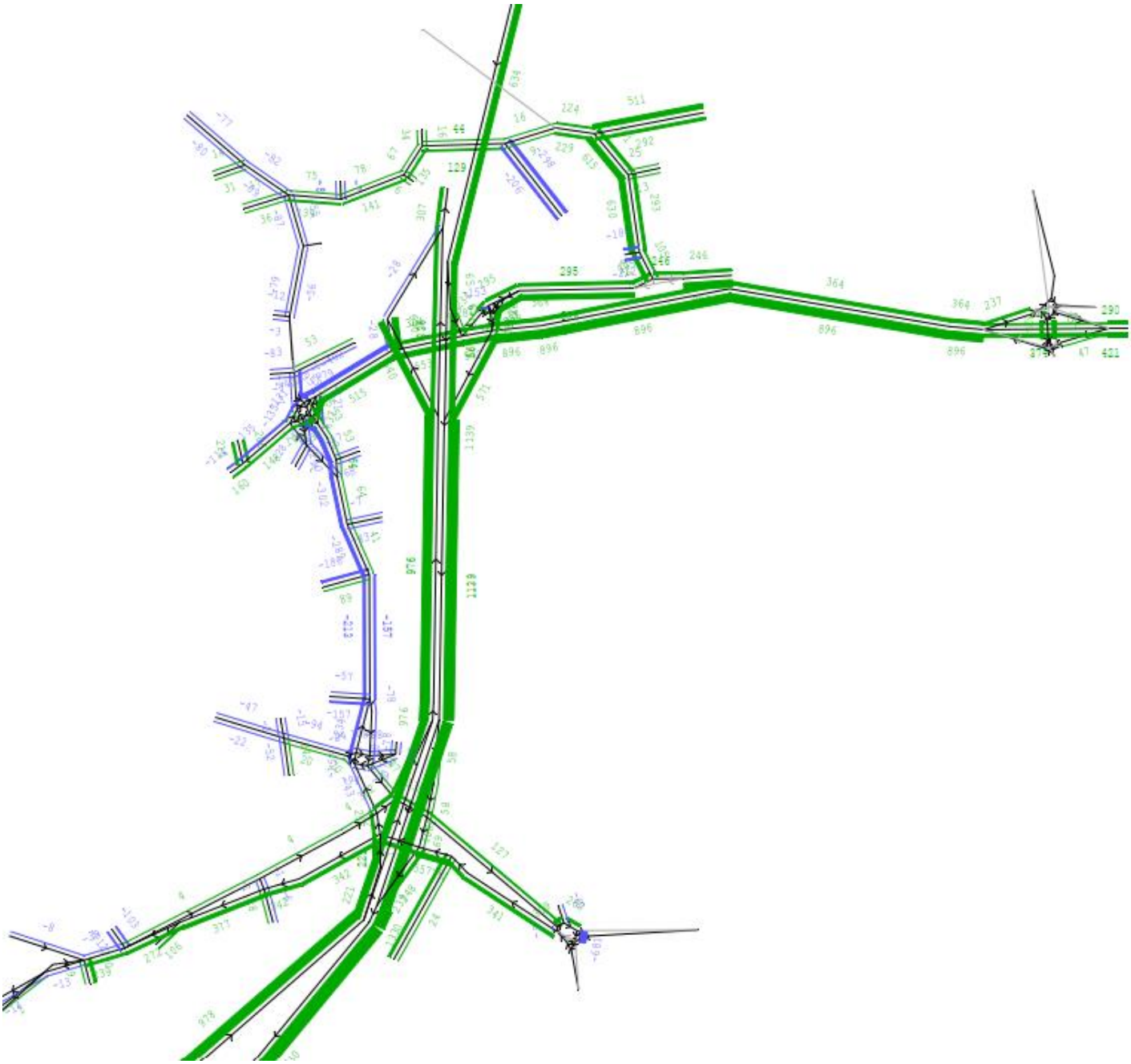


Figure B7 - SATURN 2017-2040 Flow Difference: Scenario 4a – AM Peak Hour (8-9am)

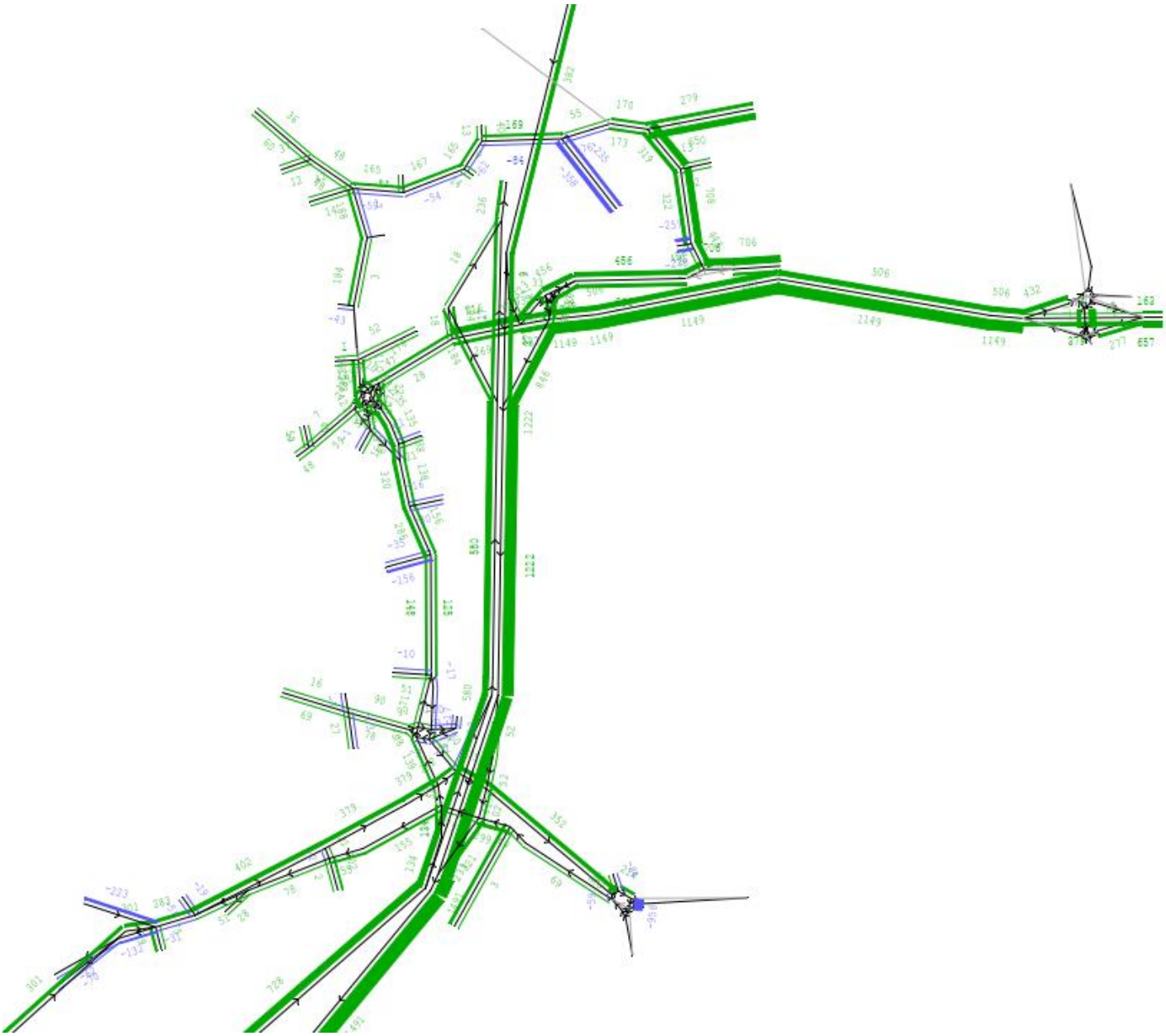


Figure B8 - SATURN 2017-2040 Flow Difference: Scenario 4a – PM Peak Hour (5-6pm)

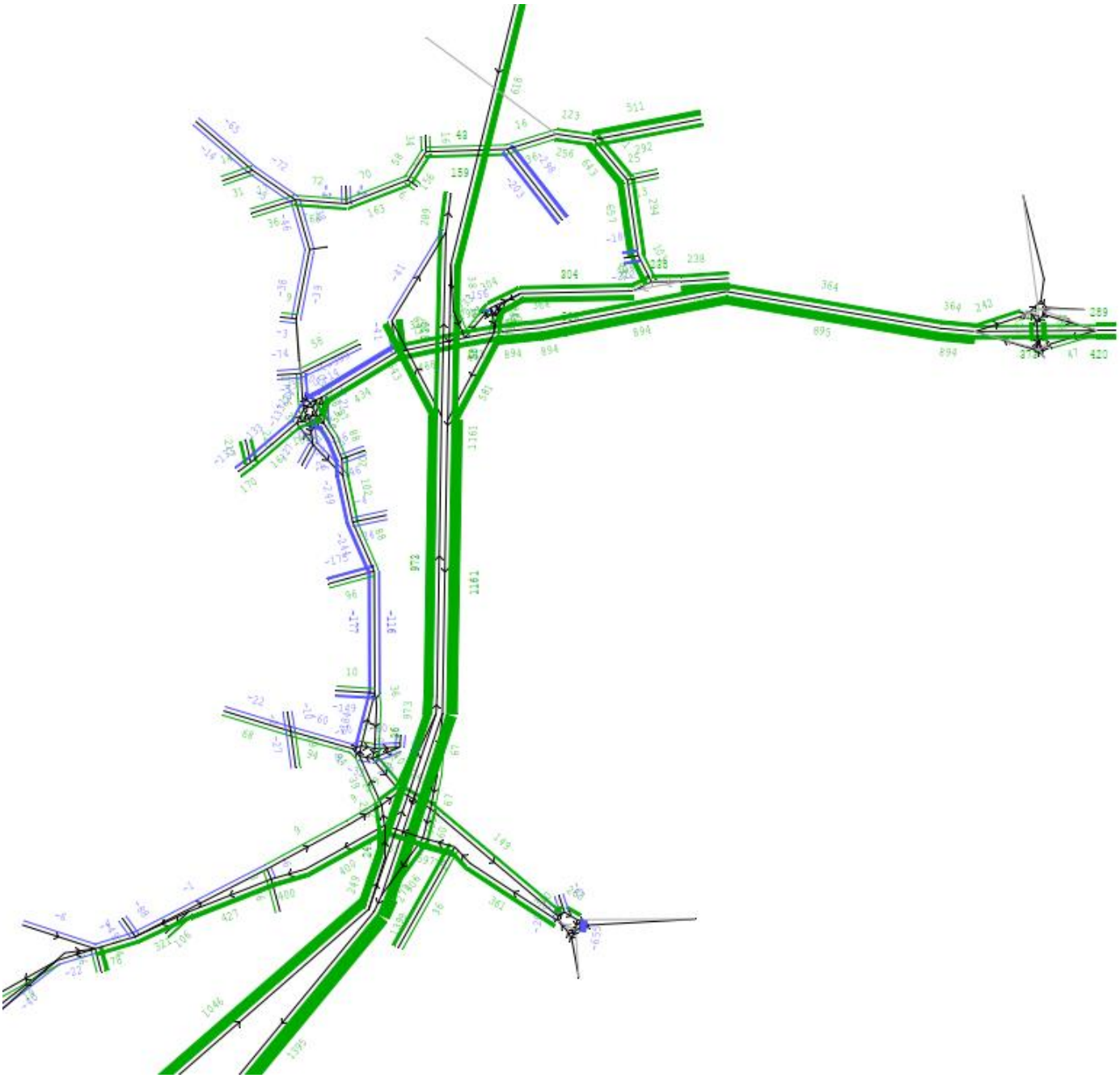


Figure B9 - SATURN 2017-2040 Flow Difference: Scenario 5a – AM Peak Hour (8-9am)

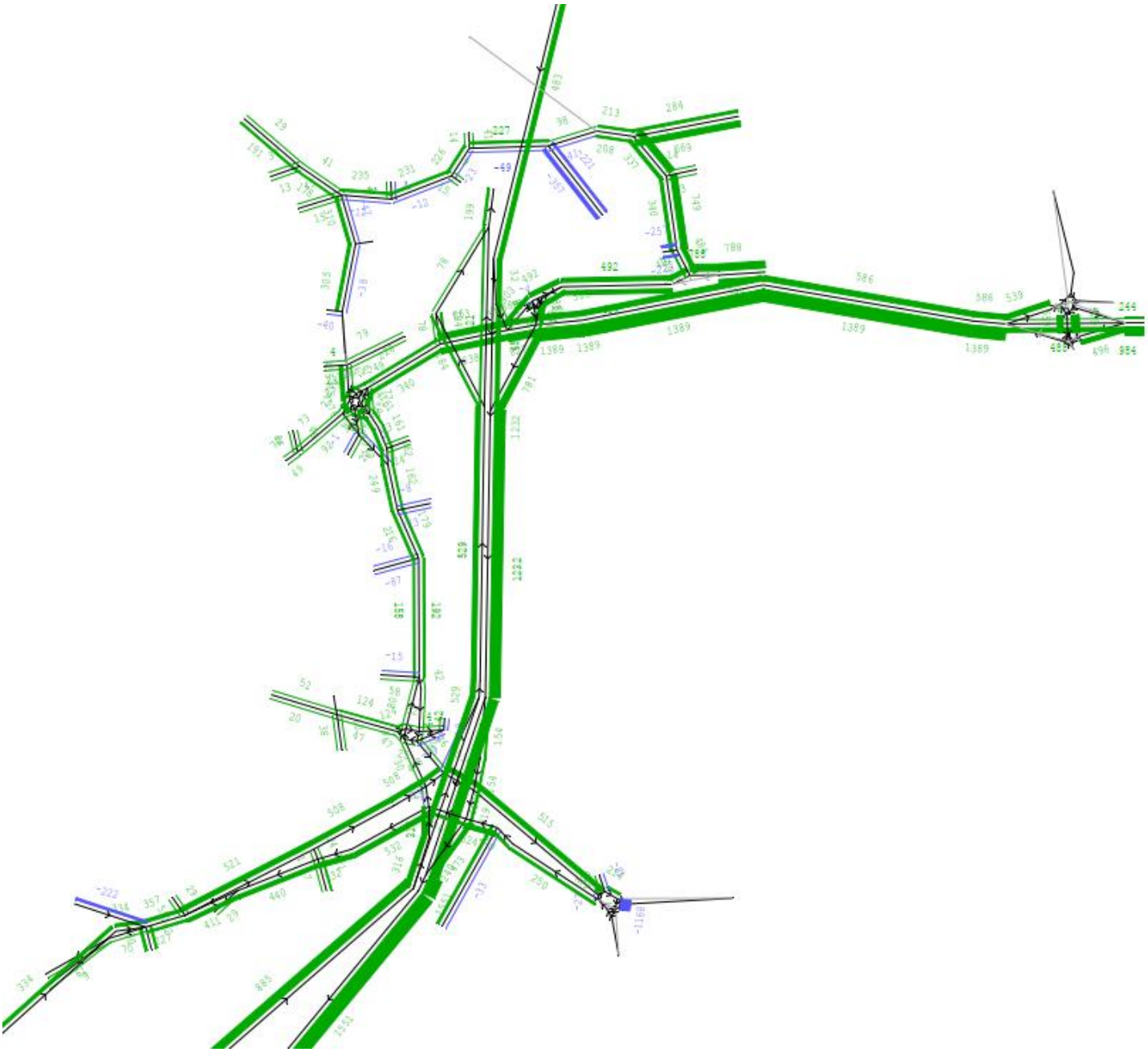
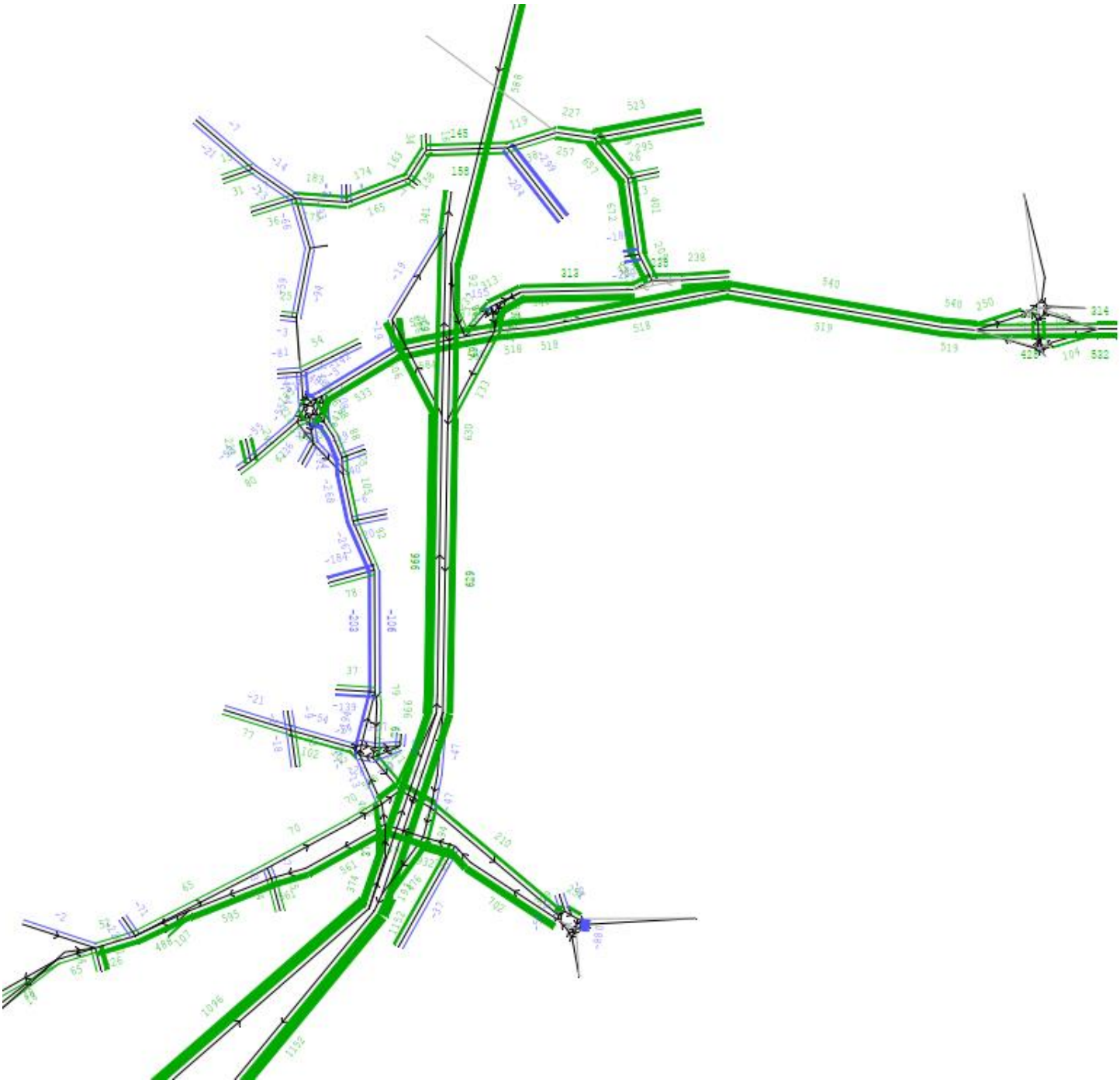


Figure B10 - SATURN 2017-2040 Flow Difference: Scenario 5a – PM Peak Hour (5-6pm)



Appendix C – EDNC Modelled Traffic Demand

Figure C1 – EDNC AM Peak Arrivals

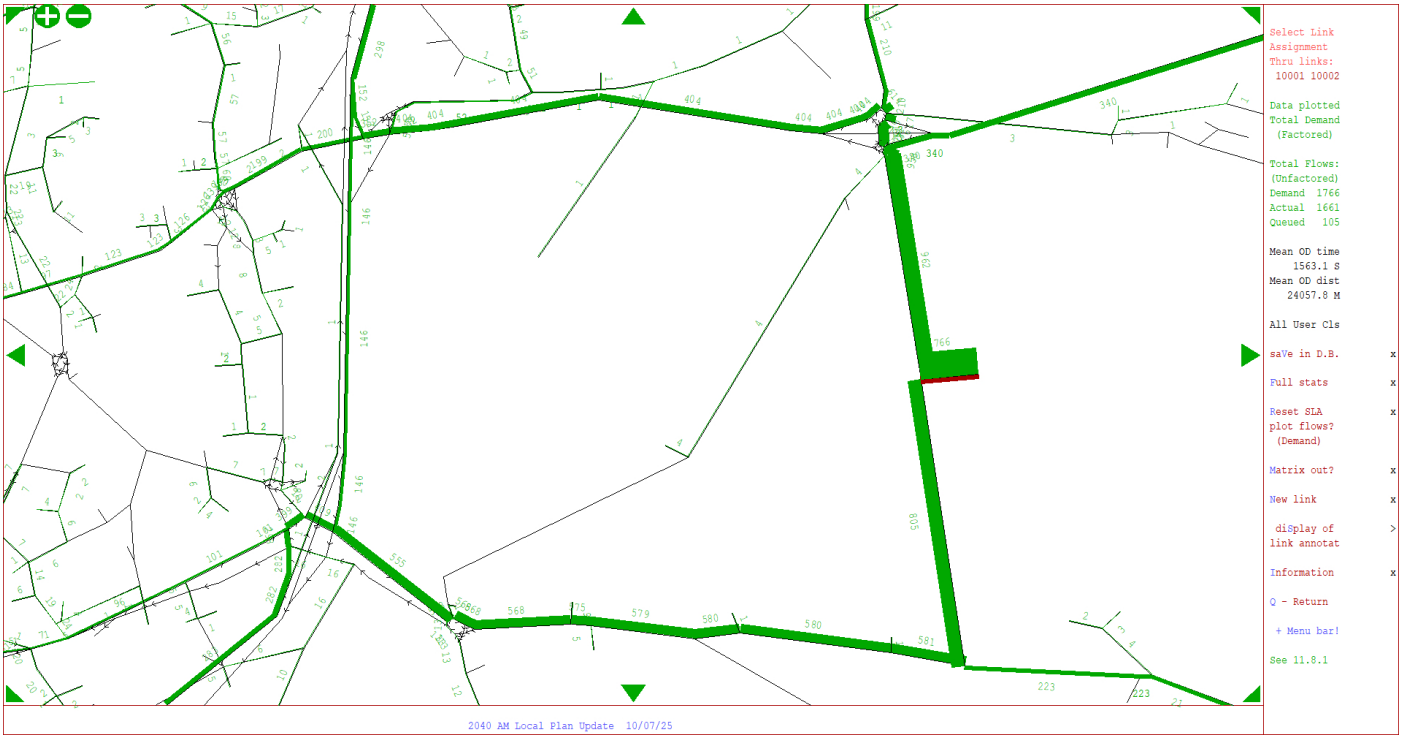


Figure C2 – EDNC AM Peak Departures

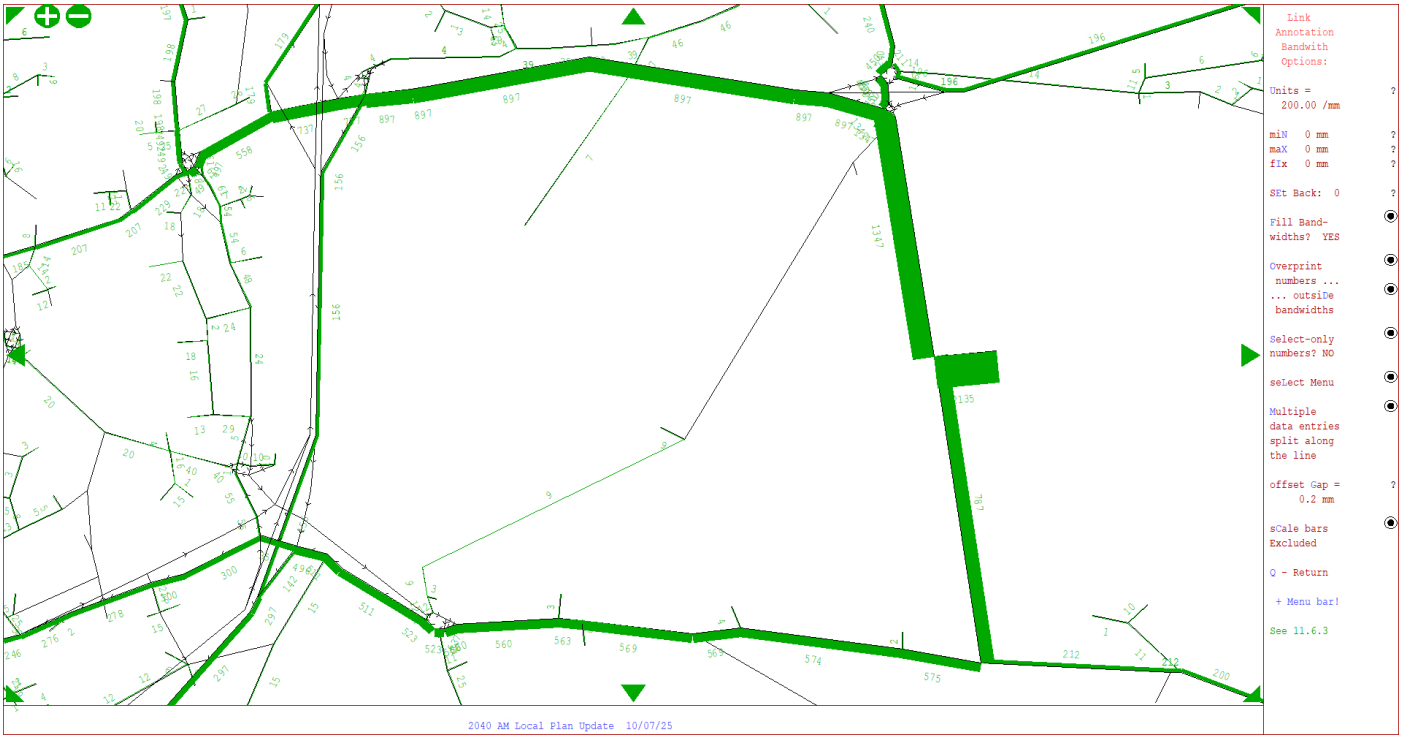


Figure C3 – EDNC PM Peak Arrivals

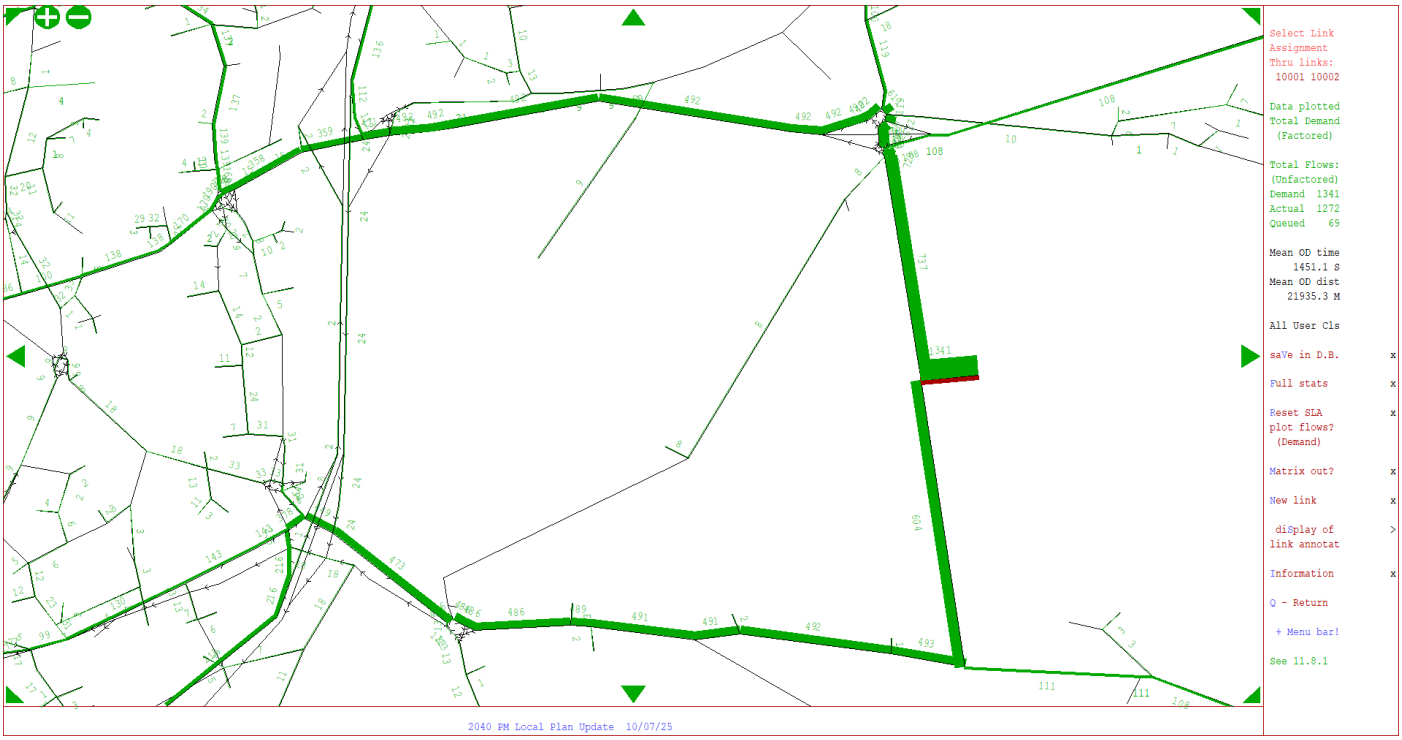
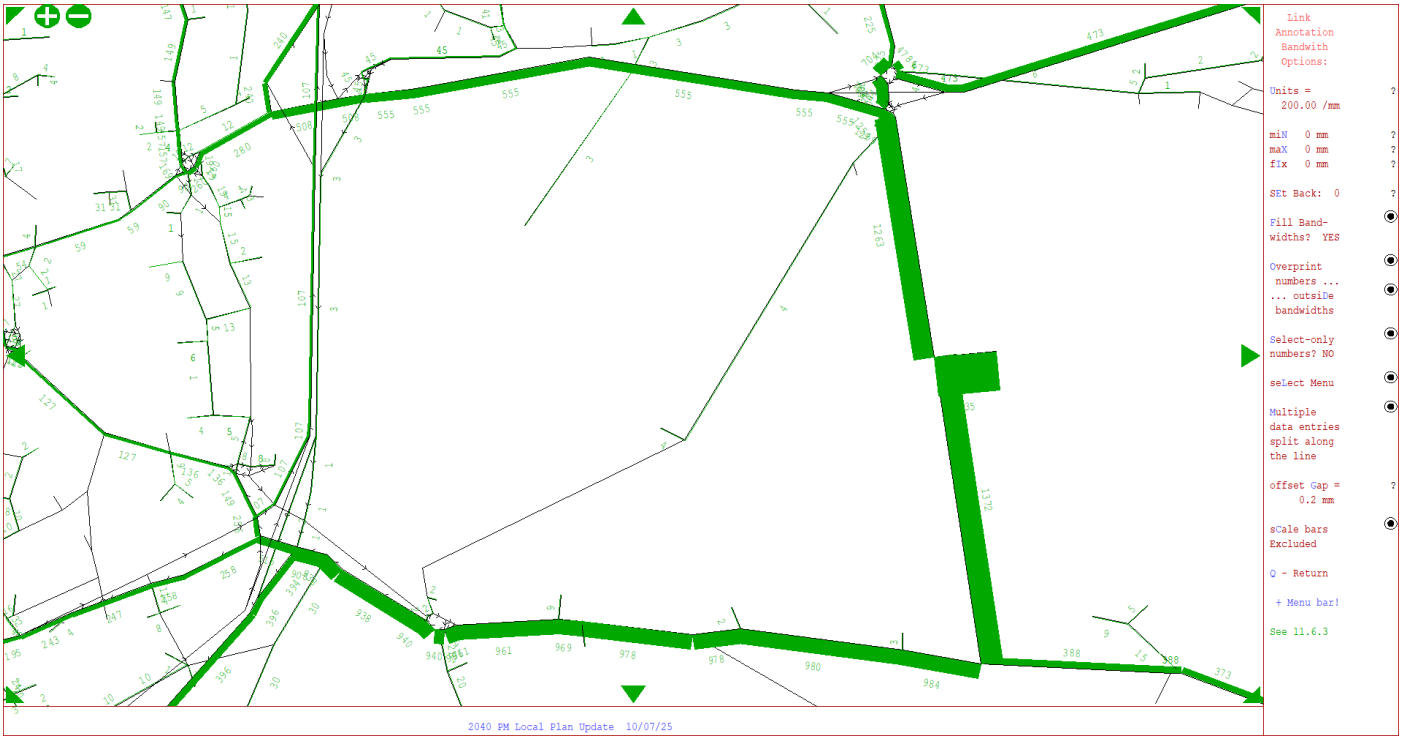


Figure C4 – EDNC PM Peak Departures



Appendix D – Off-Slip Modelled Queues

Figure D1 - M5 J29 NB off-slip RT modelled queues - AM

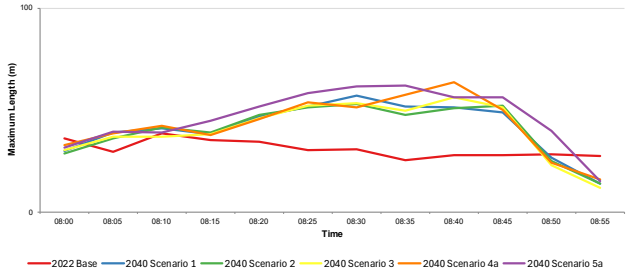


Figure D2 - M5 J29 NB off-slip LT modelled queues – AM

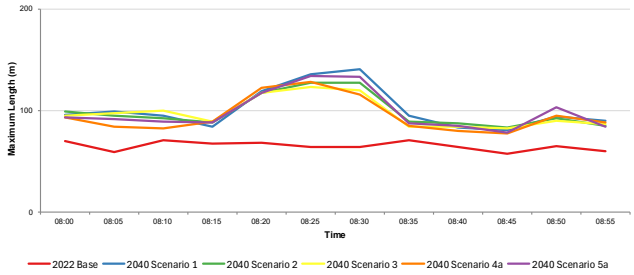


Figure D3 - M5 J29 SB off-slip RT modelled queues - AM

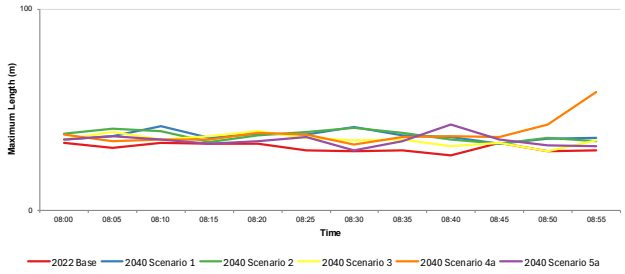


Figure D4 - M5 J29 SB off-slip LT modelled queues - AM

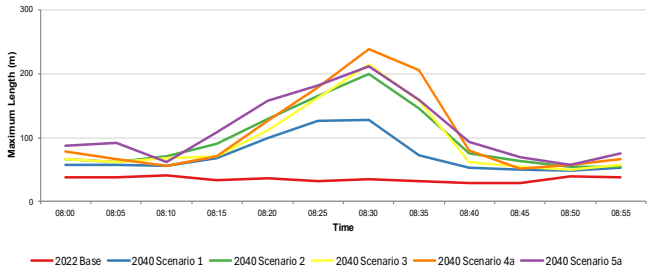


Figure D5 - M5 J30 NB off-slip modelled queues - AM

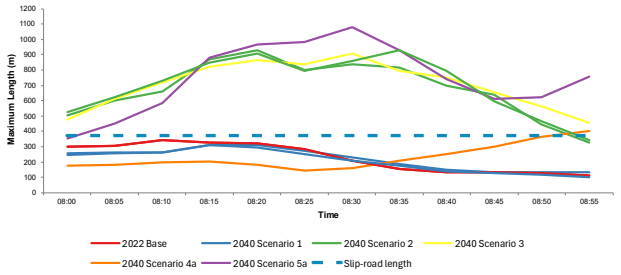


Figure D6 - M5 J30 SB off-slip modelled queues – AM

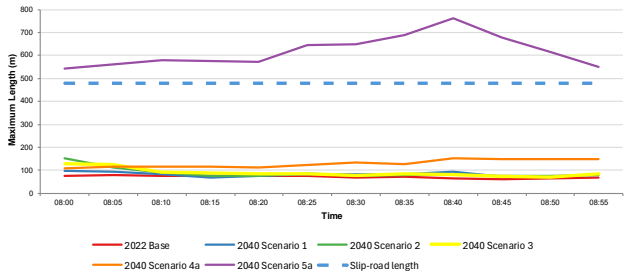


Figure D7 - A30 Airport EB off-slip modelled queues – AM

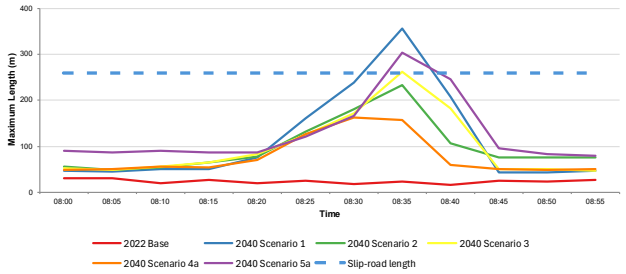


Figure D8 - A30 Airport WB off-slip modelled queues - AM

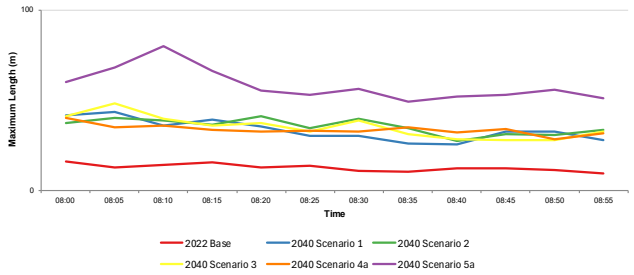


Figure D9 - M5 J29 NB off-slip RT modelled queues - PM

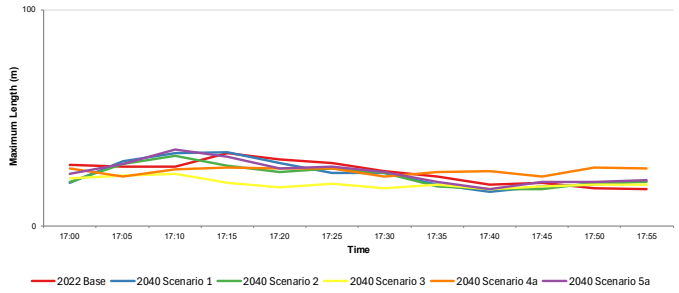


Figure D10 - M5 J29 NB off-slip LT modelled queues – PM

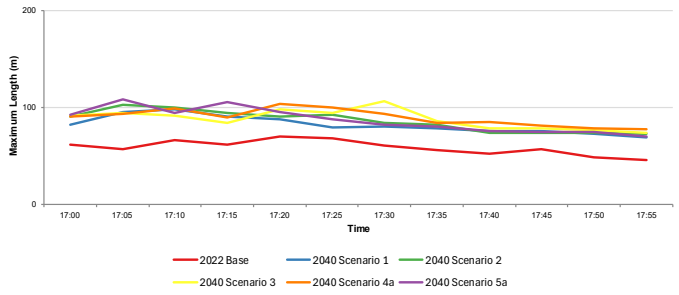


Figure D11 - M5 J29 SB off-slip RT modelled queues - PM

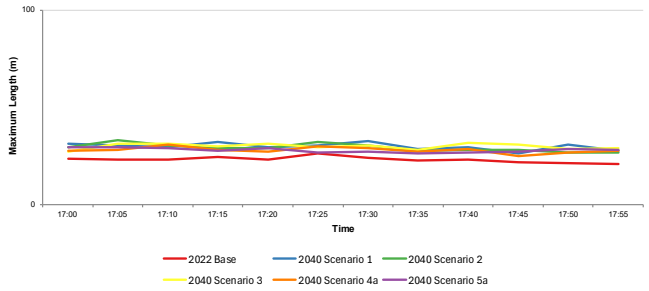


Figure D12 - M5 J29 SB off-slip LT modelled queues - PM

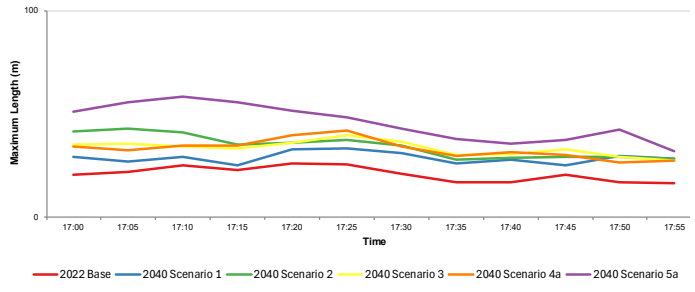


Figure D13 - M5 J30 NB off-slip modelled queues - PM

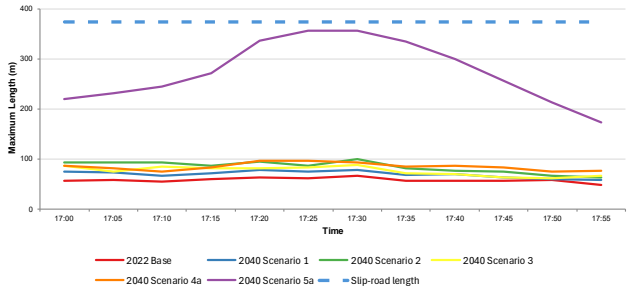


Figure D14 - M5 J30 SB off-slip modelled queues – PM

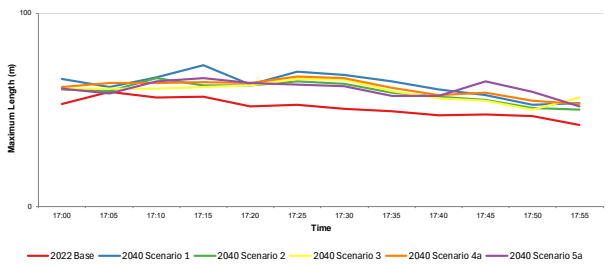


Figure D15 - A30 Airport EB off-slip modelled queues – PM

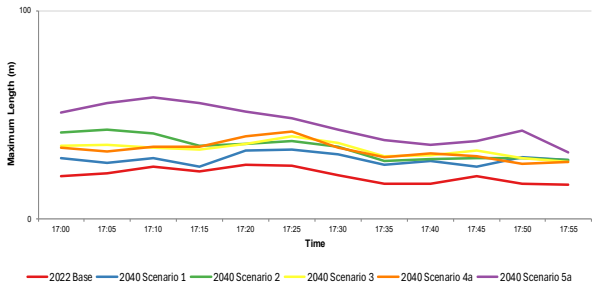
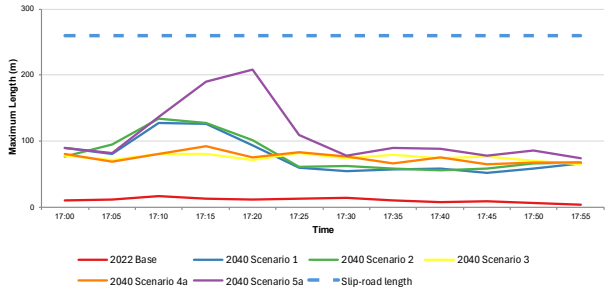


Figure D16 - A30 Airport WB off-slip modelled queues - PM



Appendix E – Vissim Model Screenshots

Figure E1 – M5 J30 Scenario 5a AM Peak

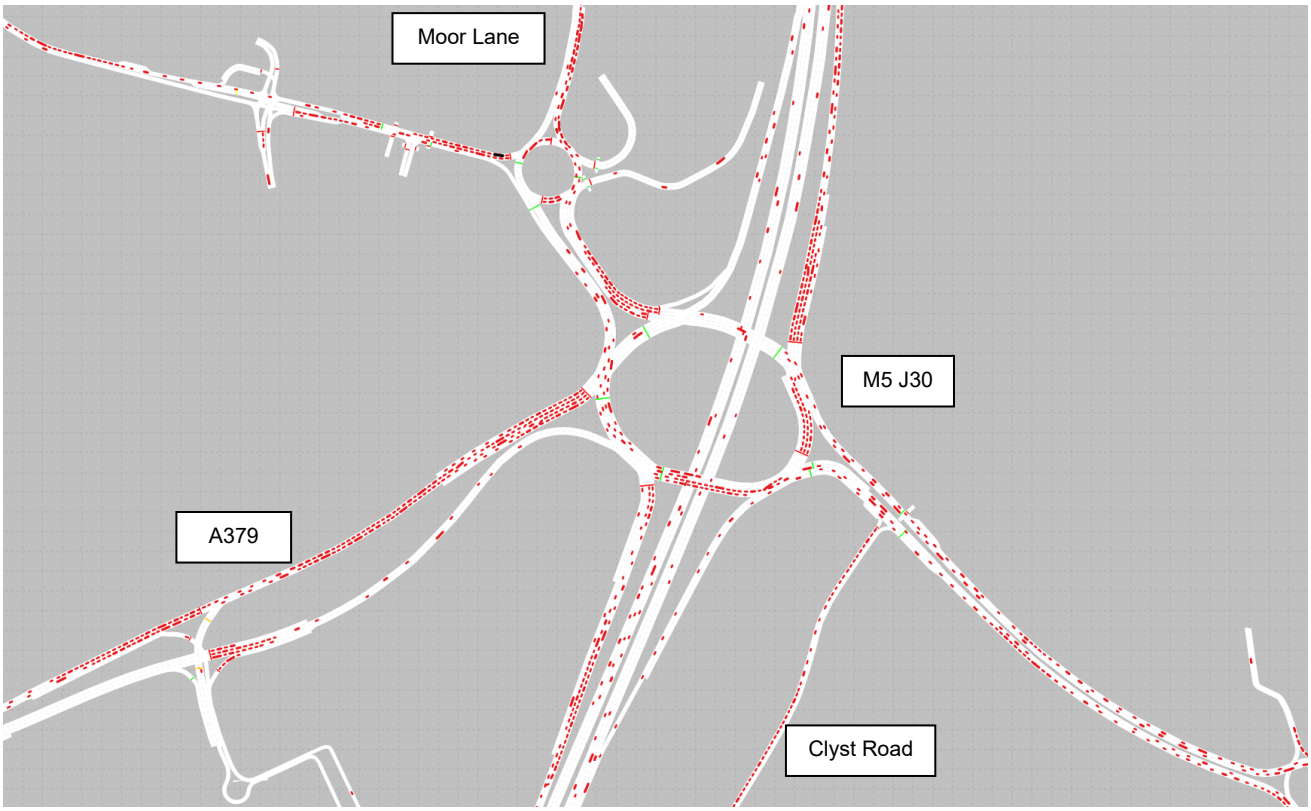


Figure E2 – M5 J29 / Moor Lane roundabout Scenario 5a AM Peak

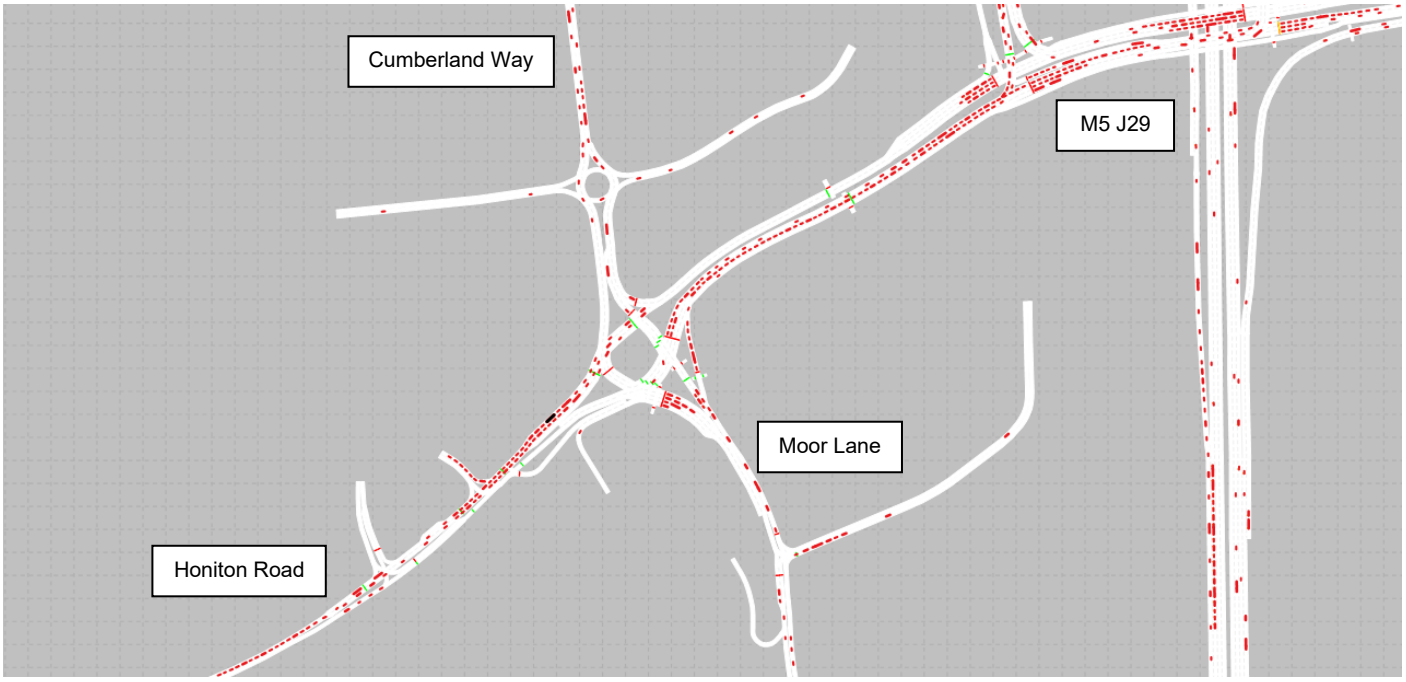
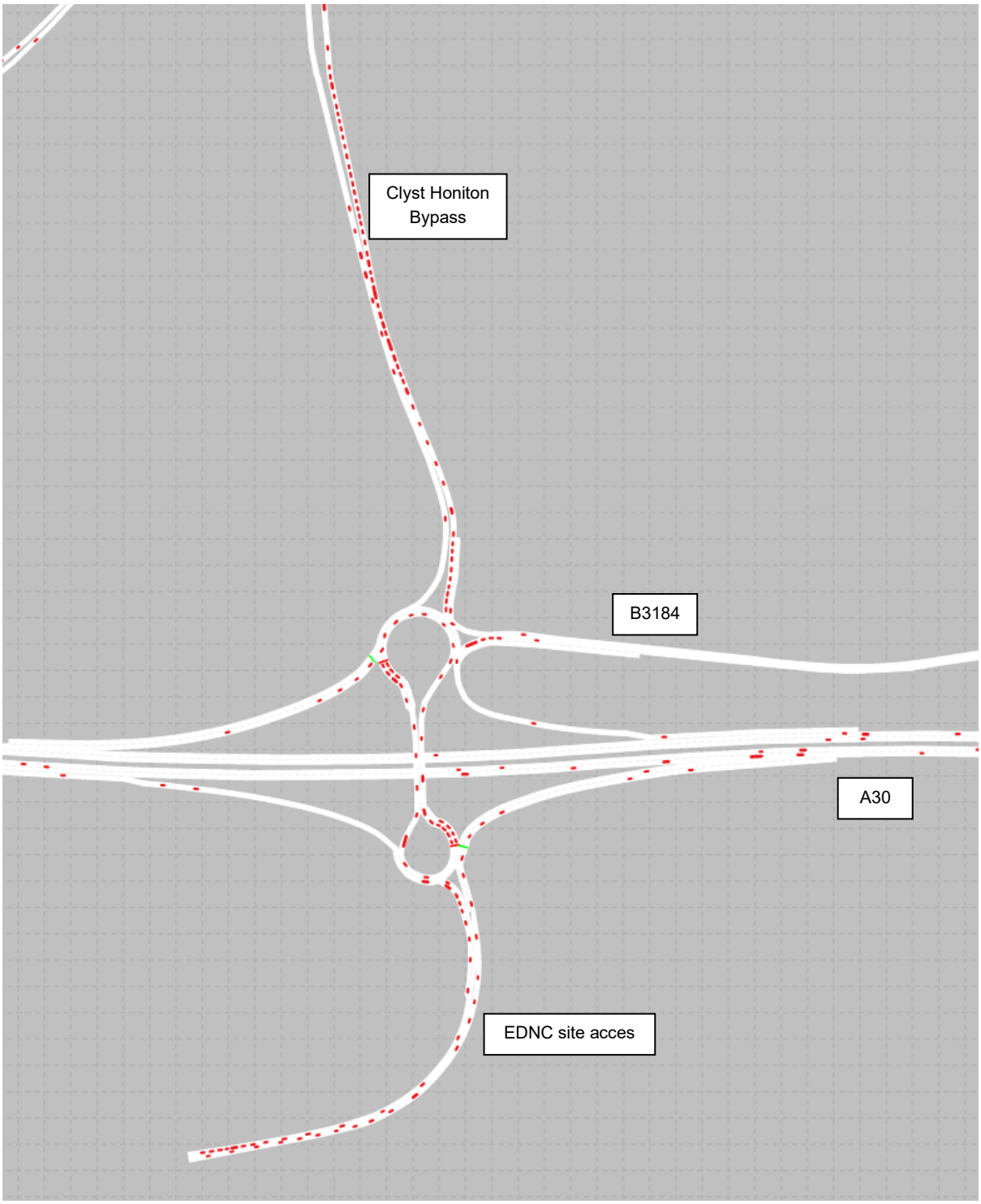


Figure E3 – A30 roundabouts Scenario 5a AM Peak



Appendix F - Journey Time Graphs

Figure F1 – Honiton Road to A30 EB Cumulative Journey Time – AM

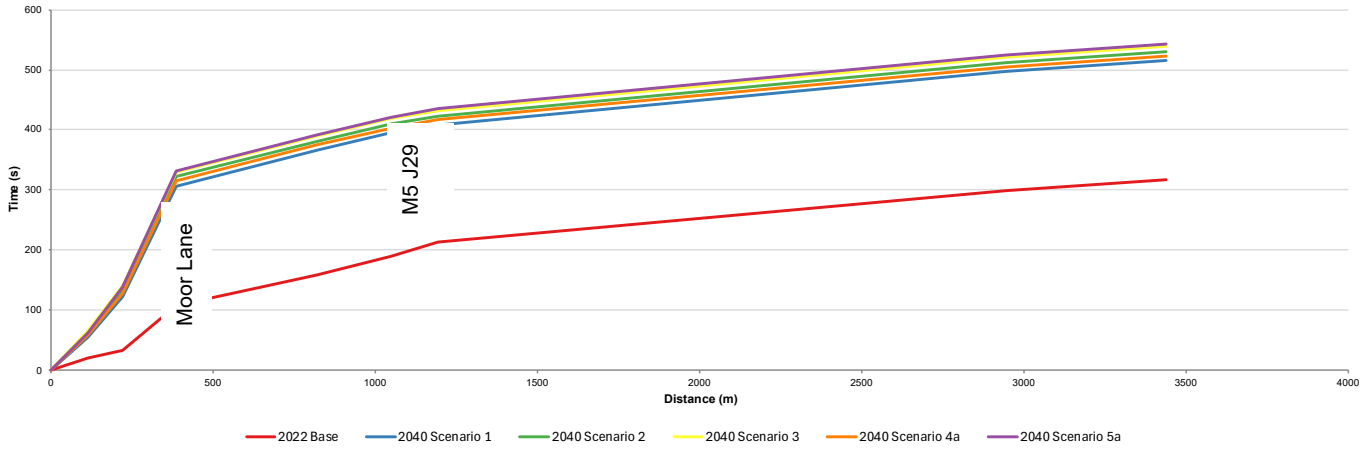


Figure F2 –A30 to Honiton Road WB Cumulative Journey Time – PM

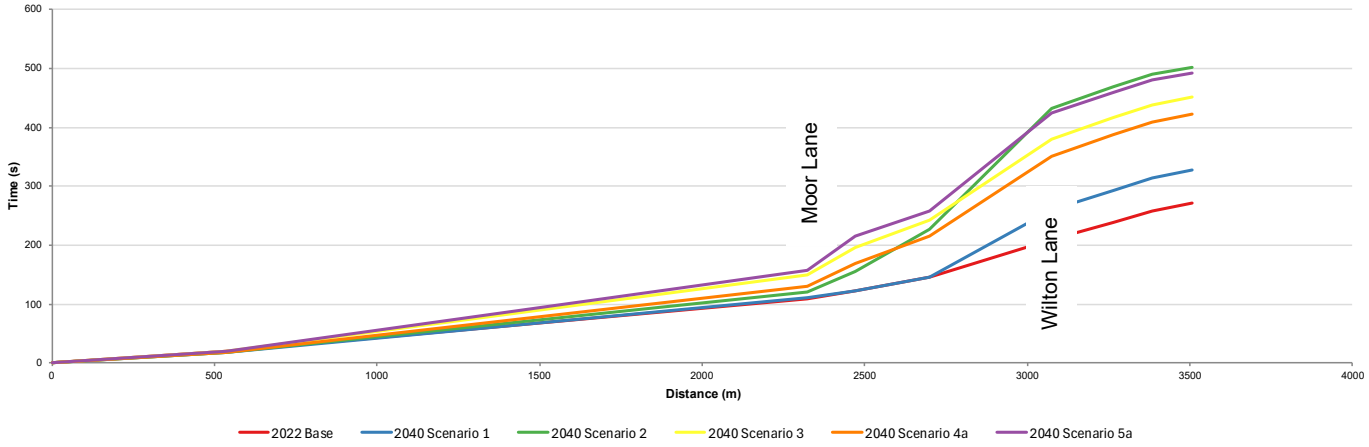


Figure F3 – A379 to A3052 EB Cumulative Journey Time - AM

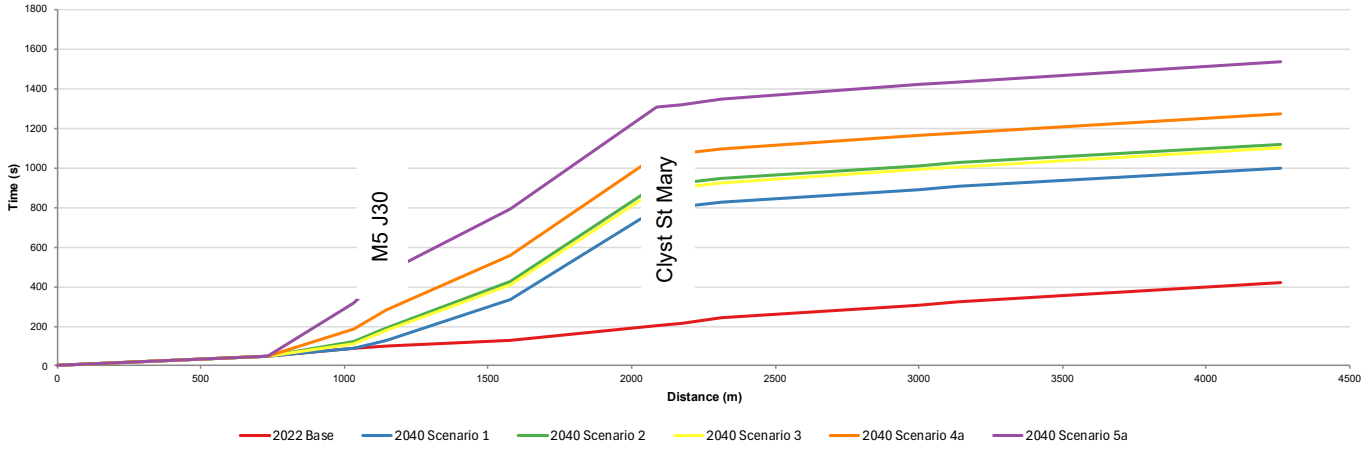


Figure F4 – A3052 to A379 WB Cumulative Journey Time - AM

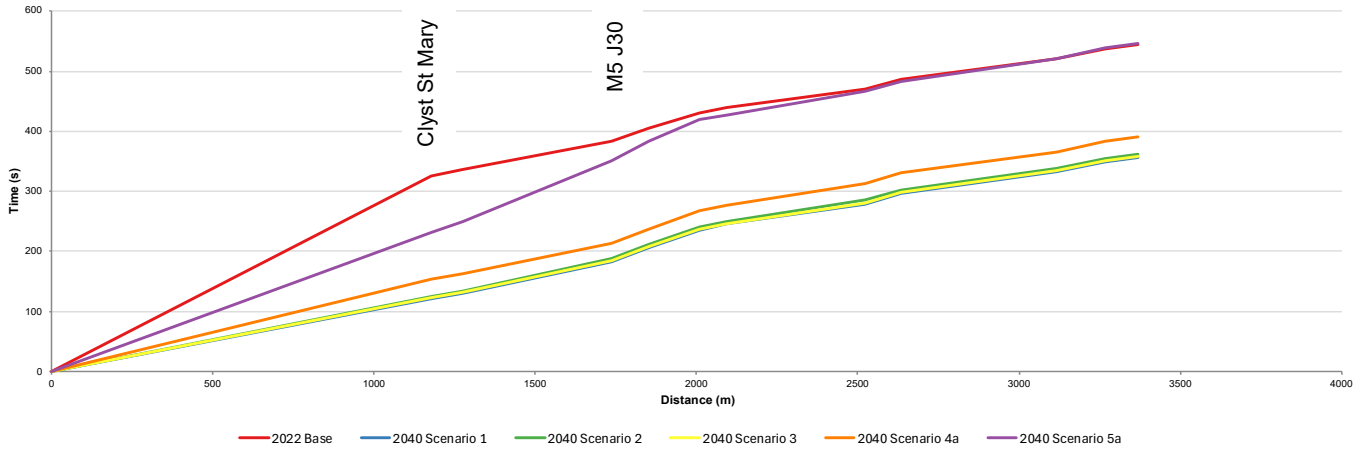


Figure F5 – M5 SB off-slip to MSA - AM

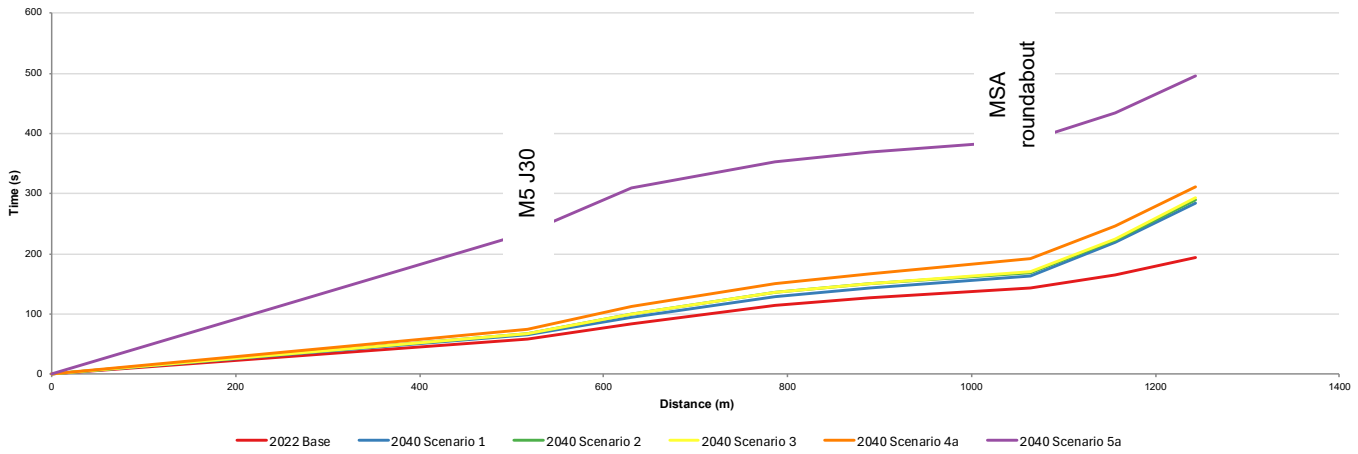
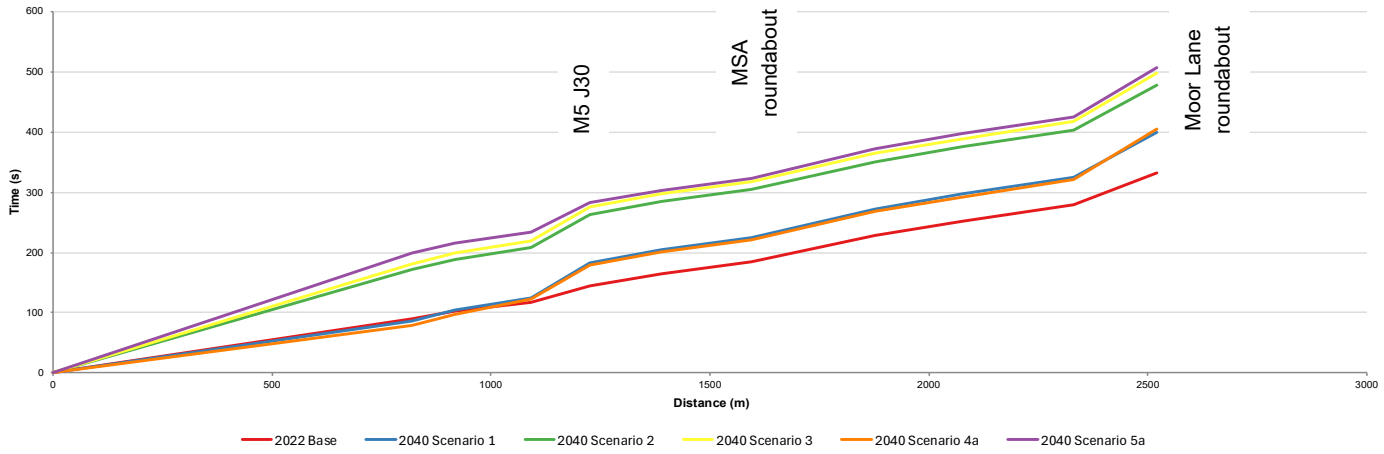
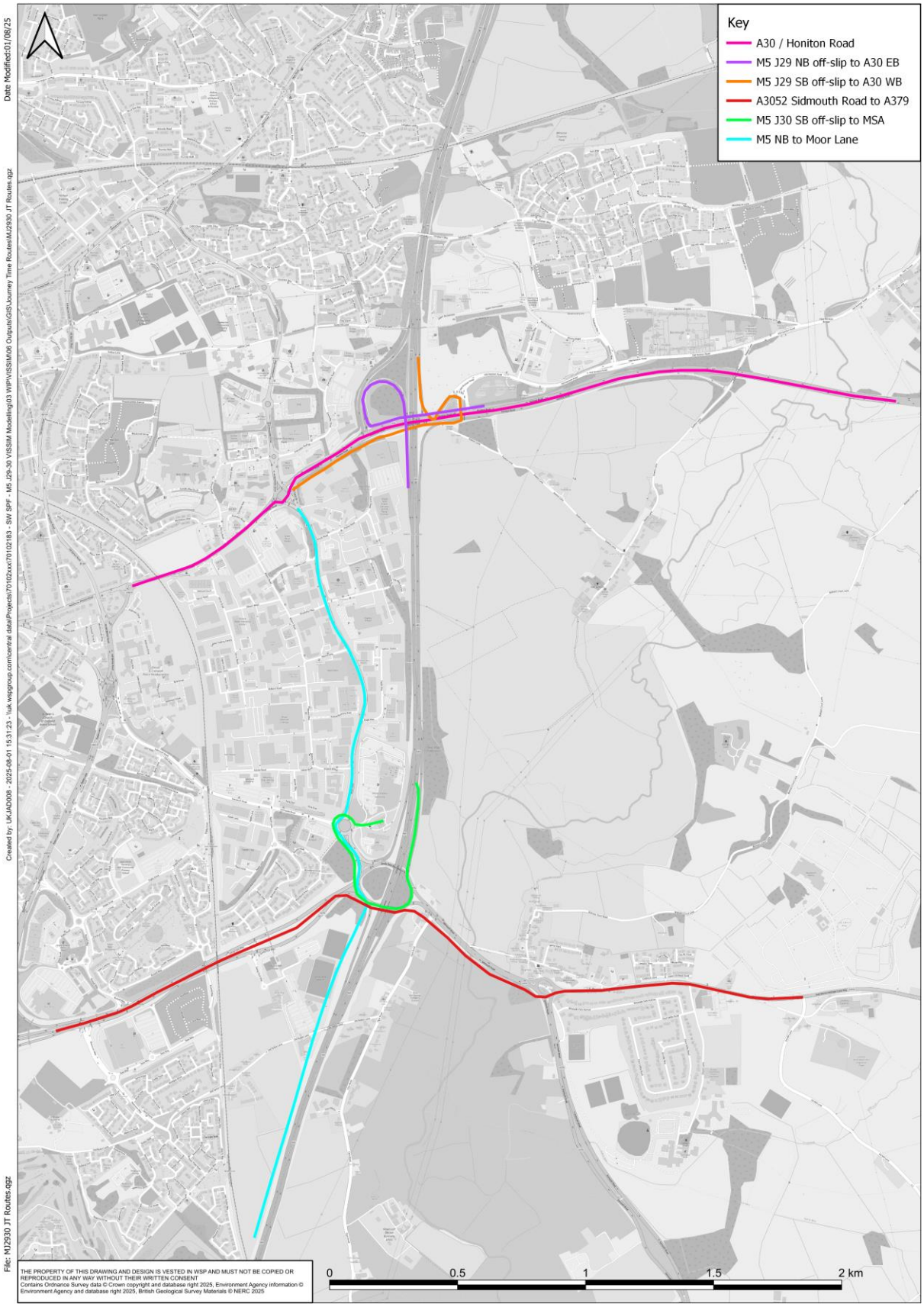


Figure F6 – M5 NB mainline to Moor Lane roundabout via M5 J30 - AM



Appendix G – Journey Time Routes



Appendix H – CD122 Merge & Diverge Analysis

Appendix H1 – M5 J29

Figure H1 - M5 J29 NB diverge – AM

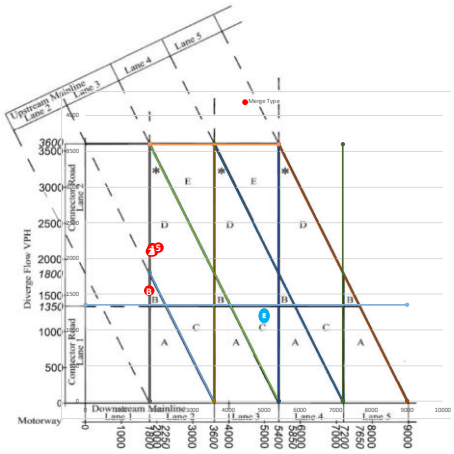


Figure H2 - M5 J29 NB merge – AM

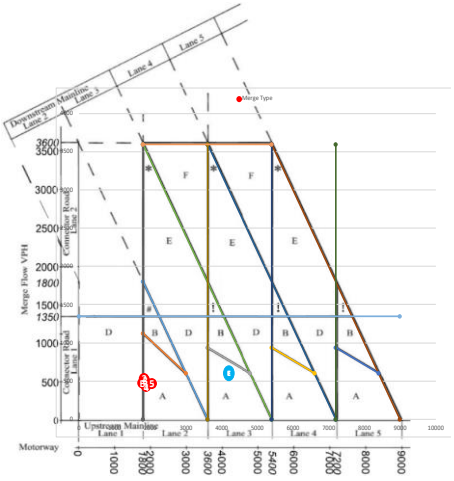


Figure H3 - M5 J29 SB diverge – AM

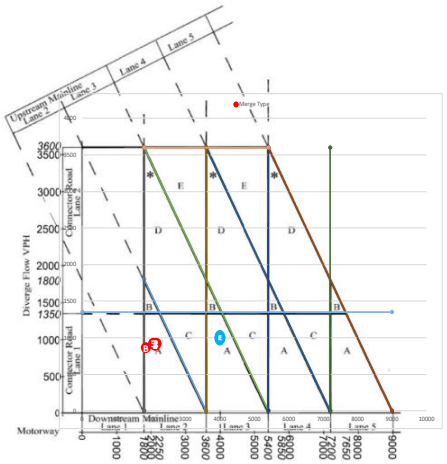


Figure H4 - M5 J29 SB merge – AM

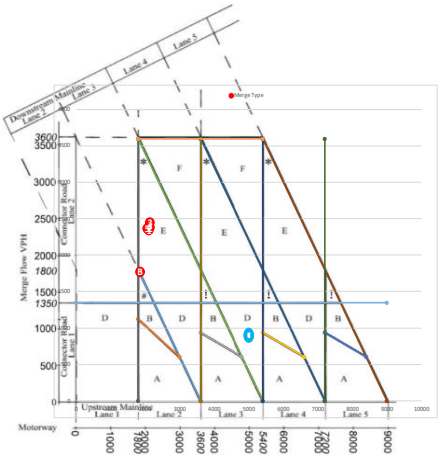


Figure H5 - M5 J29 NB diverge – PM

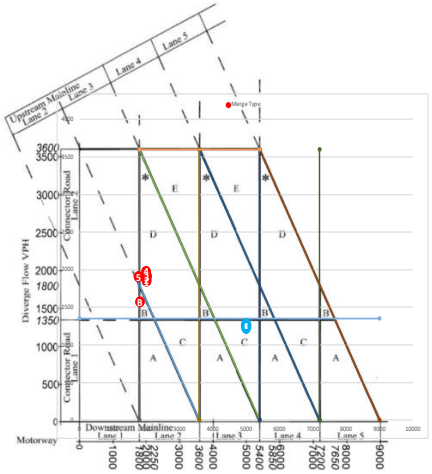


Figure H6 - M5 J29 NB merge – PM

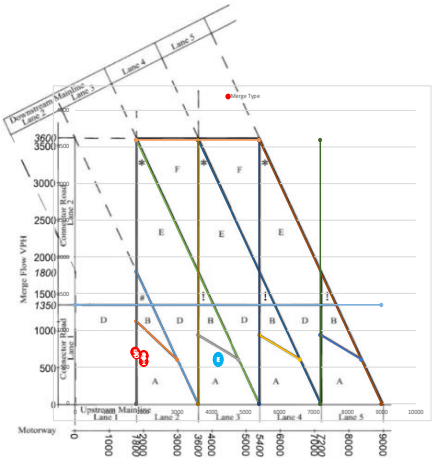


Figure H7 - M5 J29 SB diverge – PM

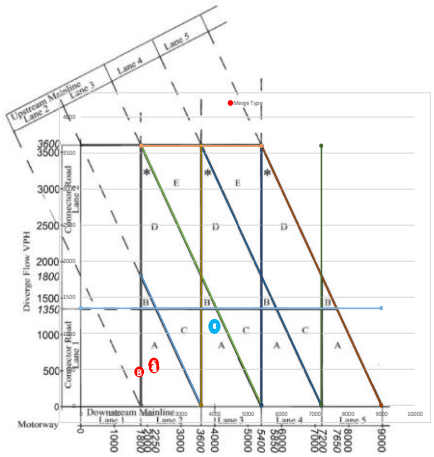
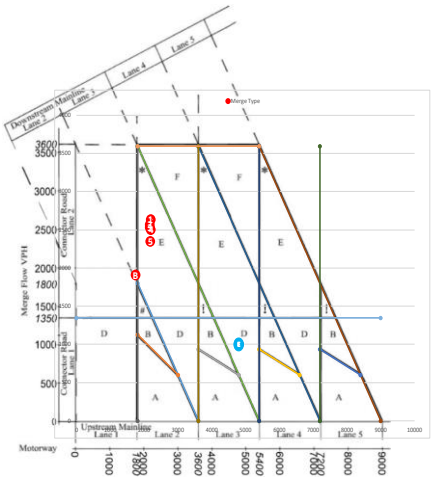


Figure H8 - M5 J29 SB merge - PM



Appendix H1 – M5 J30

Figure H9 - M5 J30 NB diverge – AM

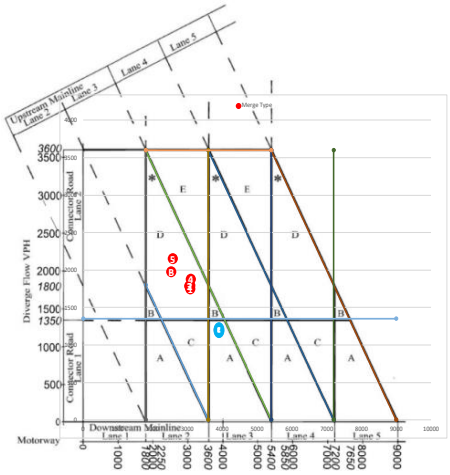


Figure H10 - M5 J30 NB merge – AM

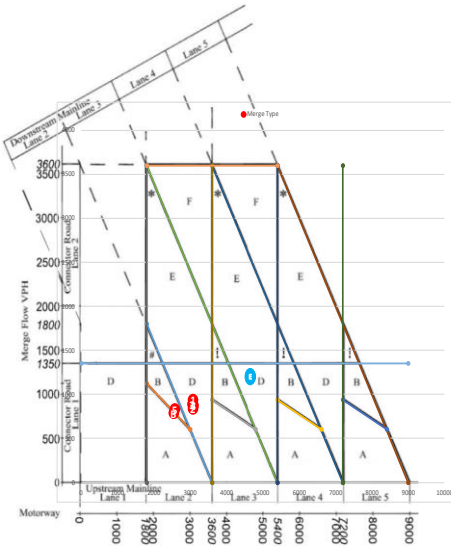


Figure H11 - M5 J30 SB diverge – AM

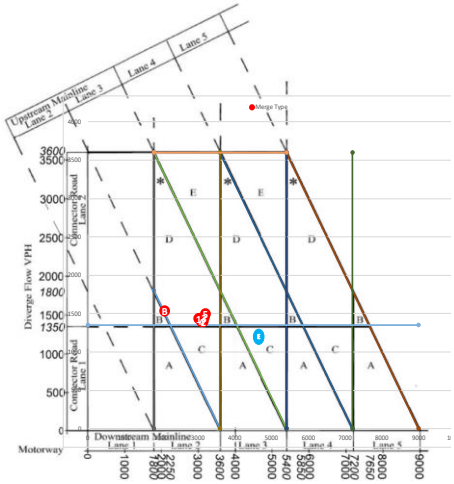


Figure H12 - M5 J30 SB merge – AM

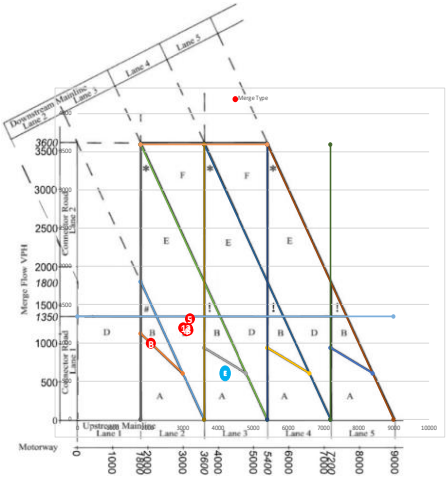


Figure H13 - M5 J30 NB diverge – PM

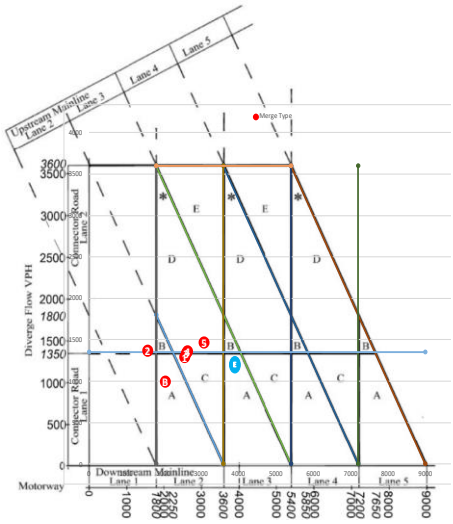


Figure H14 - M5 J30 NB merge – PM

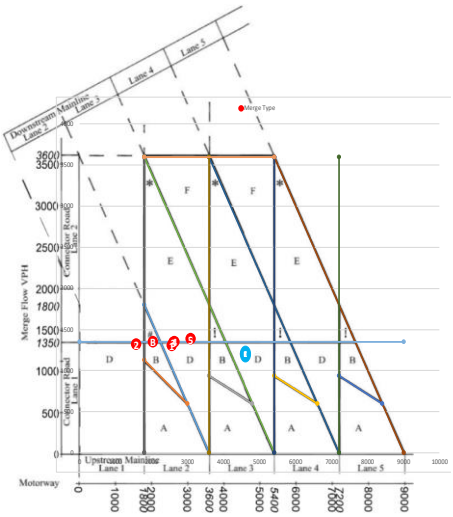


Figure H15 - M5 J30 SB diverge – PM

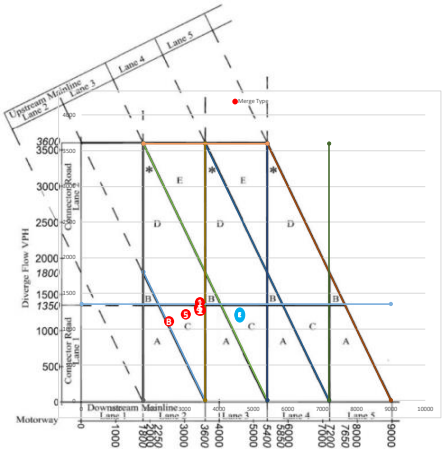
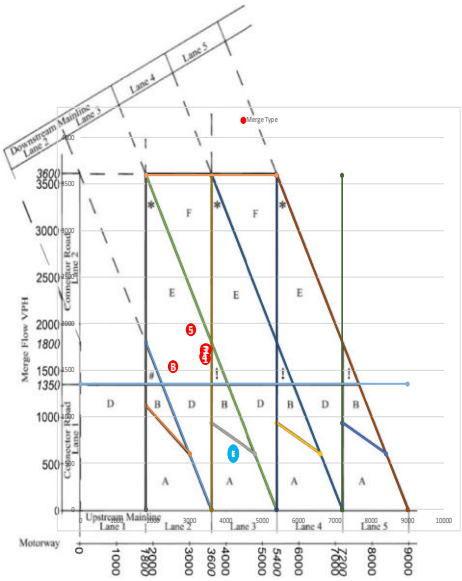


Figure H16 - M5 J30 SB merge - PM



Appendix H3 – A30 Airport

Figure H17 – A30 EB diverge – AM

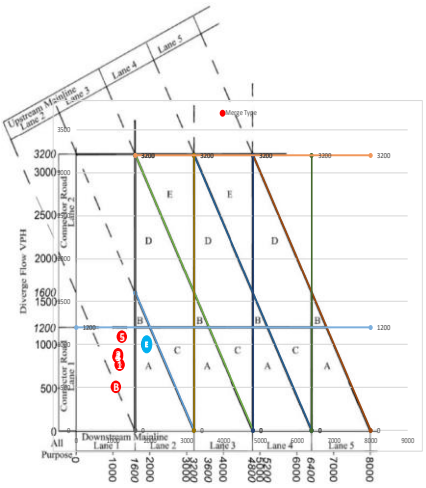


Figure H18 – A30 EB merge – AM

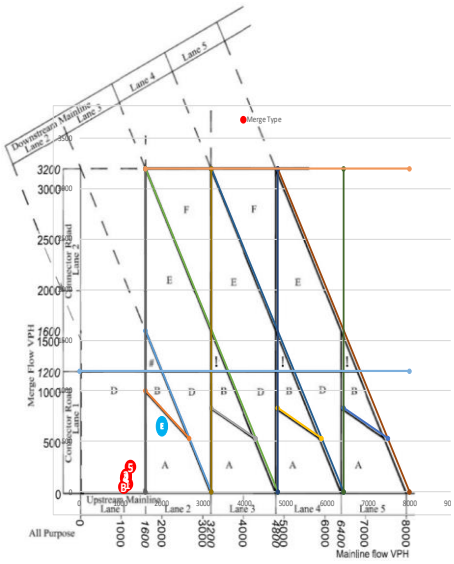


Figure H19 – A30 WB diverge – AM

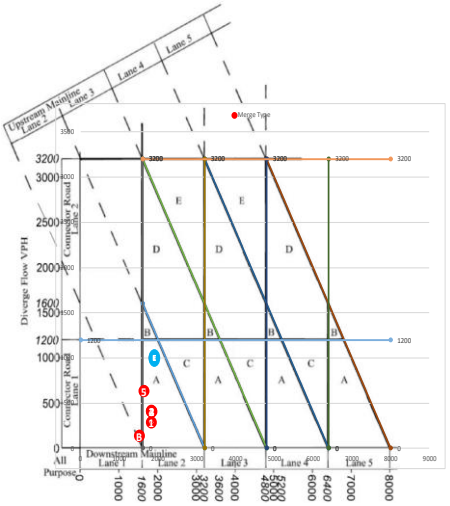


Figure H20 – A30 WB merge – AM

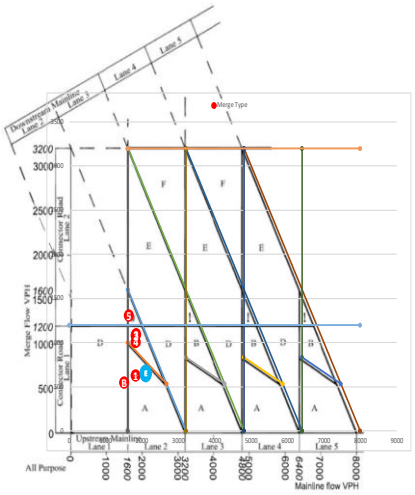


Figure H21 – A30 EB diverge – PM

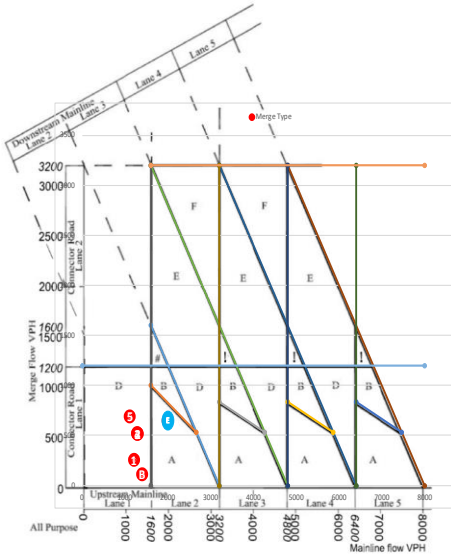


Figure H22 – A30 EB merge – PM

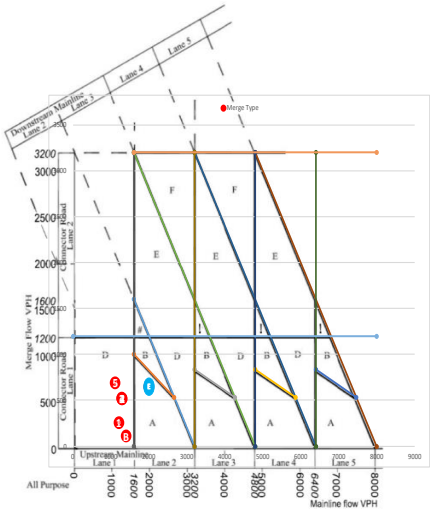


Figure H23 – A30 WB diverge – PM

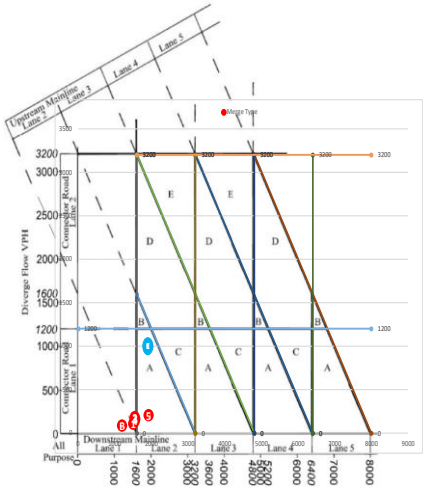


Figure H24 – A30 WB merge – PM