Lower Don Valley Additional Sites Modelling

Hydrock now Stantec

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Sheffield City Council

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1 Introduction

Stantec Fore Limited (formerly Fore Consulting Limited (Fore)) are commissioned by Sheffield City Council (SCC) to undertake modelling of the Sheffield Local Plan proposals using the Lower Don Valley subnetwork of the Sheffield Area Aimsun Model (SAAM). Previous modelling in relation to this subnetwork is set out in the Fore report dated 27 March 2024[1].

Since the preparation of this report, SCC has identified additional sites for the Local Plan. Strategic modelling of the Local Plan allocations, including these additional sites, has been undertaken by Systra using the Sheffield City Region Transport Model (SCRTM1). This has shown potential impacts in the Lower Don Valley and therefore it is necessary to update the microsimulation modelling in the SAAM to determine the impact of these additional sites.

This report sets out the methodology adopted to include the additional sites within the Lower Don Valley subnetwork and presents and discusses the outputs from the microsimulation modelling.

[1] *SAAM Lower Don Valley Subnetwork: Local Highway Impacts*, Fore Consulting Limited, 27 March 2024

2 Methodology

2.1 Forecast Scenario

The forecast year scenario for this additional modelling (2039 Do Something + Mitigation (Additional Sites) has been based on the previous 2039 Do Something + Mitigation (with Local Plan allocations), as set out in the previous report. The following methodology has been adopted:

- Forecast year demands from SCRTM1, which include the additional Local Plan sites, have been imported into the SAAM and macroscopic assignments have been run. This follows the same methodology as previously set out in a separate technical note[2].
- A traversal was undertaken on the final macro assignment for each scenario to generate cordon matrices for the subnetwork.
- This results in traversal matrices for six vehicle classes (car – commuting, car – business, car – other, LGV, MGV and HGV). Because vehicles classes (ie combinations of vehicles types and trip purposes) can not be used in the Aimsun microsimulations, the matrices were first aggregated to create matrices for the microsimulation vehicle types (car, LGV and HGV).
- At this stage, these matrices do not reflect the small changes that have been made to the base traversal matrices to create the calibrated subnetwork matrices. Therefore, the differences between the base traversal matrix and relevant adjusted base year matrix are applied to the future year matrix to create an adjusted future year matrix that reflects the calibration adjustments in the base year matrix. This process is repeated for all time periods and user classes.
- The adjusted matrices are then combined into forecast scenario traffic demands.
- The traversal process also generates truncated public transport routes and associated public transport plans for the subnetwork. These ensure that public transport vehicles enter the simulation at the correct time.
- Forecast year scenarios have then been created using the adjusted traversal traffic demands and public transport plans and selecting the correct geometry configurations for the scenario, consistent with the wider macroscopic model.
- The simulations have then been observed to ensure correct operation and minor adjustments to signal timings are made to reflect the changes in demand patterns and due to the Do Minimum scenario schemes and Local Plan allocations.
- Ten model runs are then undertaken and averaged to provide the final results. Observations of the simulations have also been undertaken to determine the locations where the Local Plan would give rise to material impacts and to suggest appropriate mitigation.

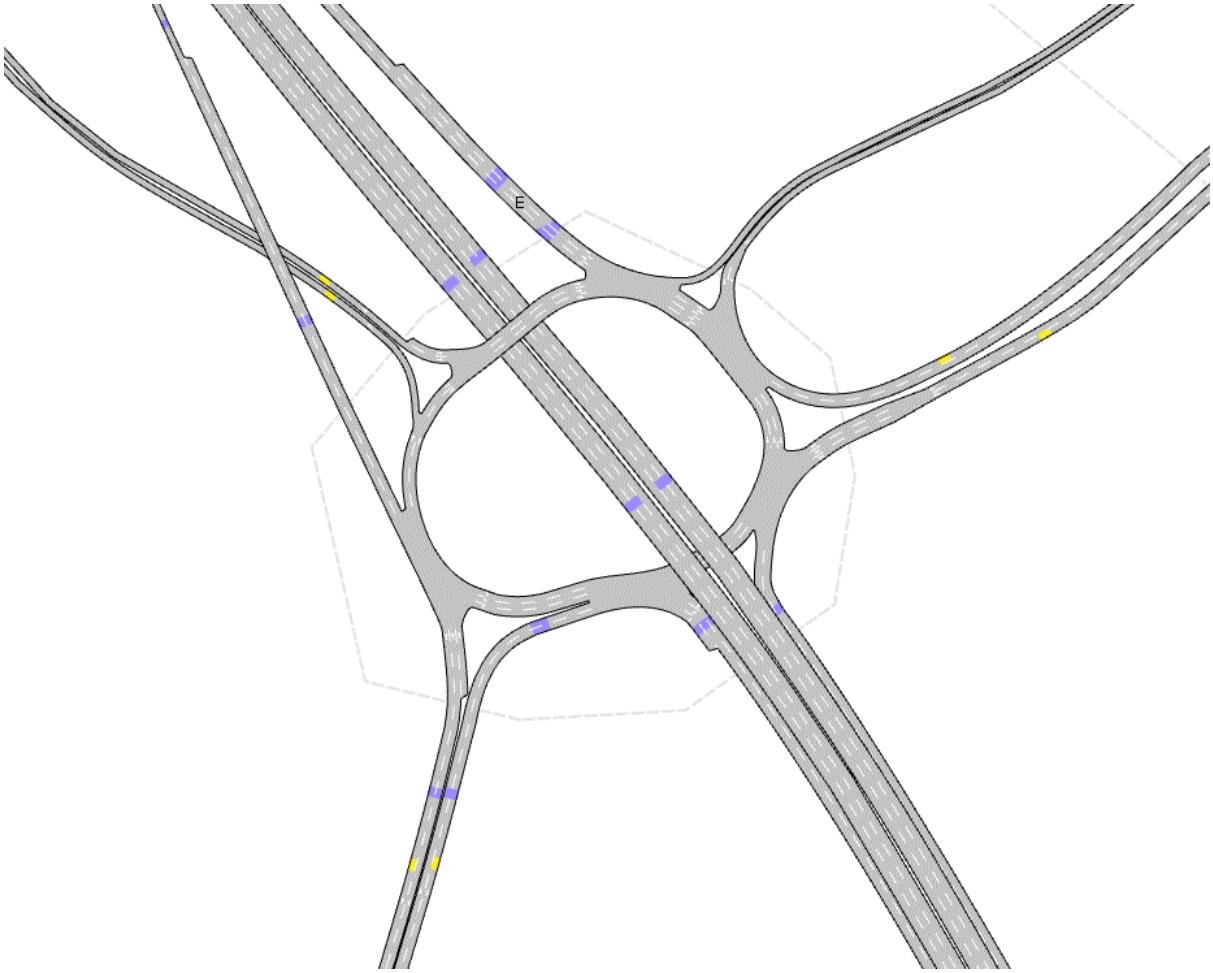
[2] *SAAM Macroscopic Modelling Technical Note*, Fore Consulting Limited, August 2023

2.2 Included Mitigation

The mitigation schemes included within the 2039 Do Something + Mitigation (Additional Sites) scenario are set out below:

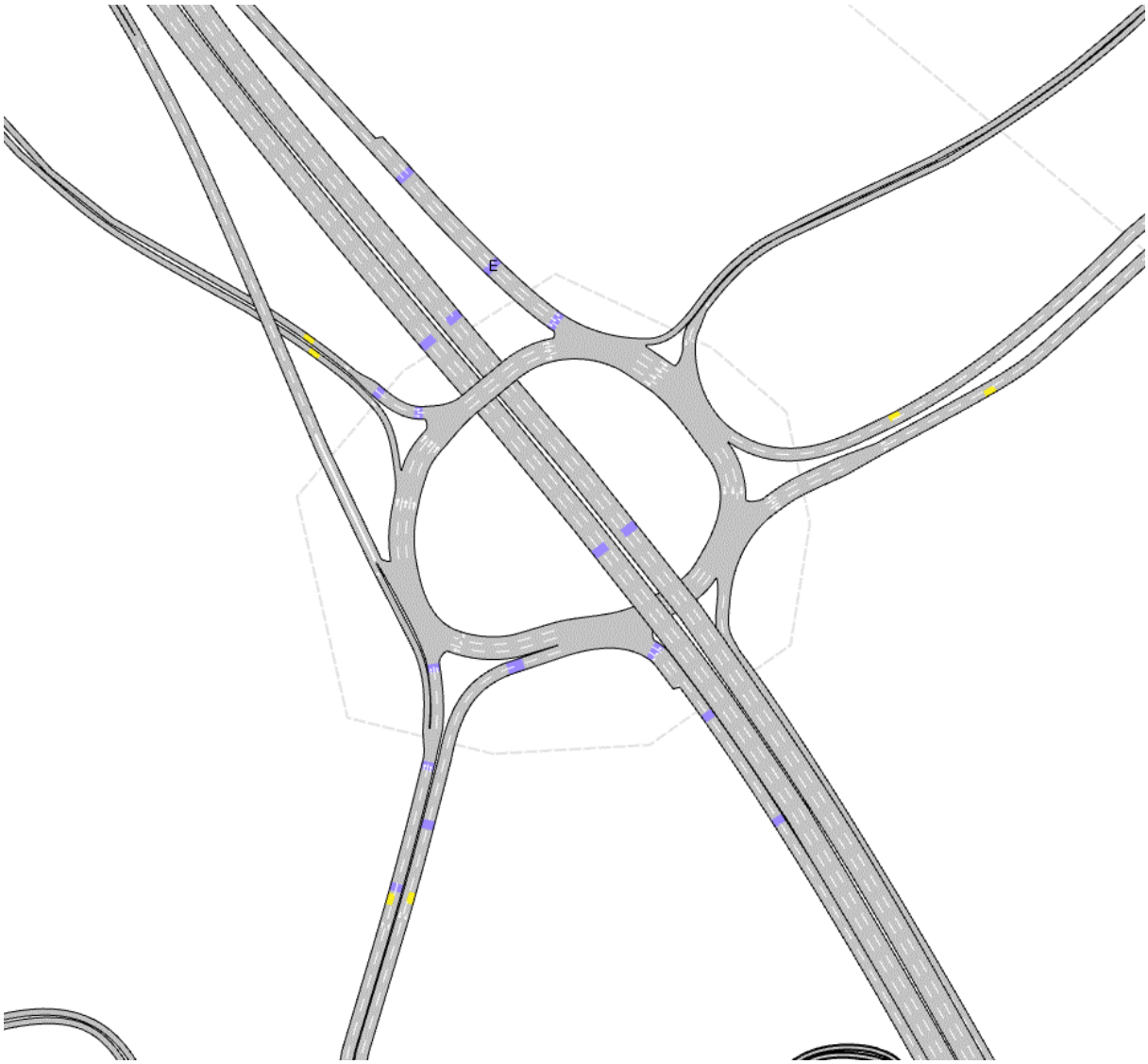
- Mitigation A scheme, as set out in the separate report relating to M1 Junction 34[3], increasing Meadowhall Roundabout to four lanes with a new dedicated left turn onto motorway from Meadowhall Road (Screenshot 1 and Screenshot 2). At Tinsley Roundabout, an extra lane is added between the M1 off slip and Sheffield Road, with an additional lane northbound on Sheffield Road (Screenshot 3 and Screenshot 4).
- Additional lane at Vulcan Road Roundabout heading north on Sheffield Road to allows for the full utilisation of the new lane at Tinsley Roundabout (Screenshot 3 and Screenshot 4).

Screenshot 1: M1 Junction 34 (North) – 2023 Base Scenario

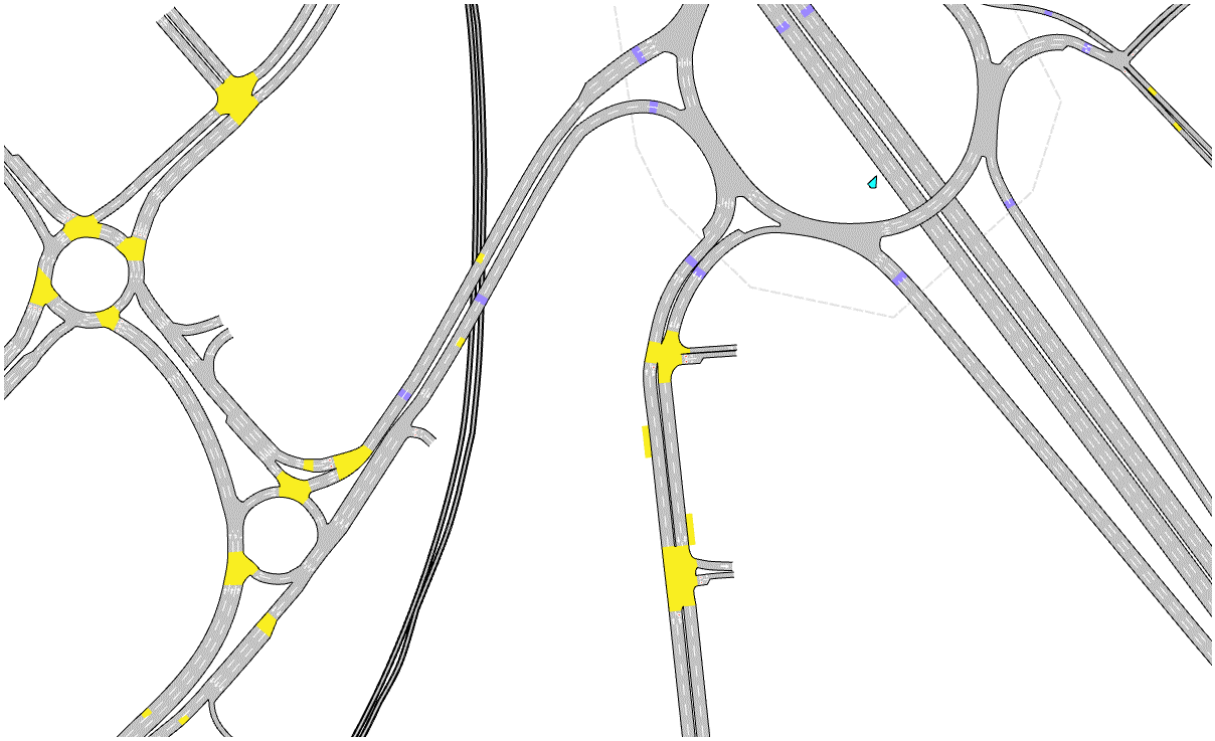


[3] *Sheffield Local Plan - Junction 34: Future Year Impacts and Mitigations*, Fore Consulting Limited, 14 March 2024

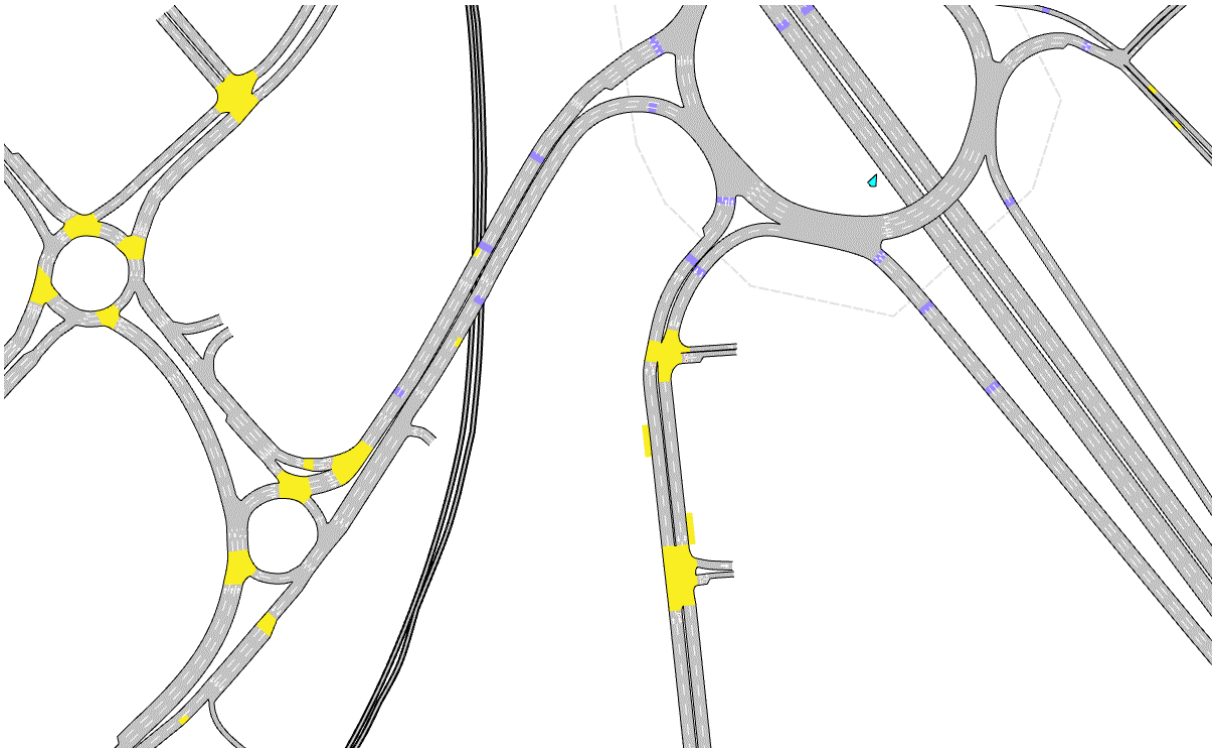
Screenshot 2: M1 Junction 34 (North) – Future Year Mitigation Scenario



Screenshot 3: M1 Junction 34 (South)/Vulcan Road – 2023 Base Scenario



Screenshot 4: M1 Junction 34 (South)/Vulcan Road – Future Year Mitigation Scenario



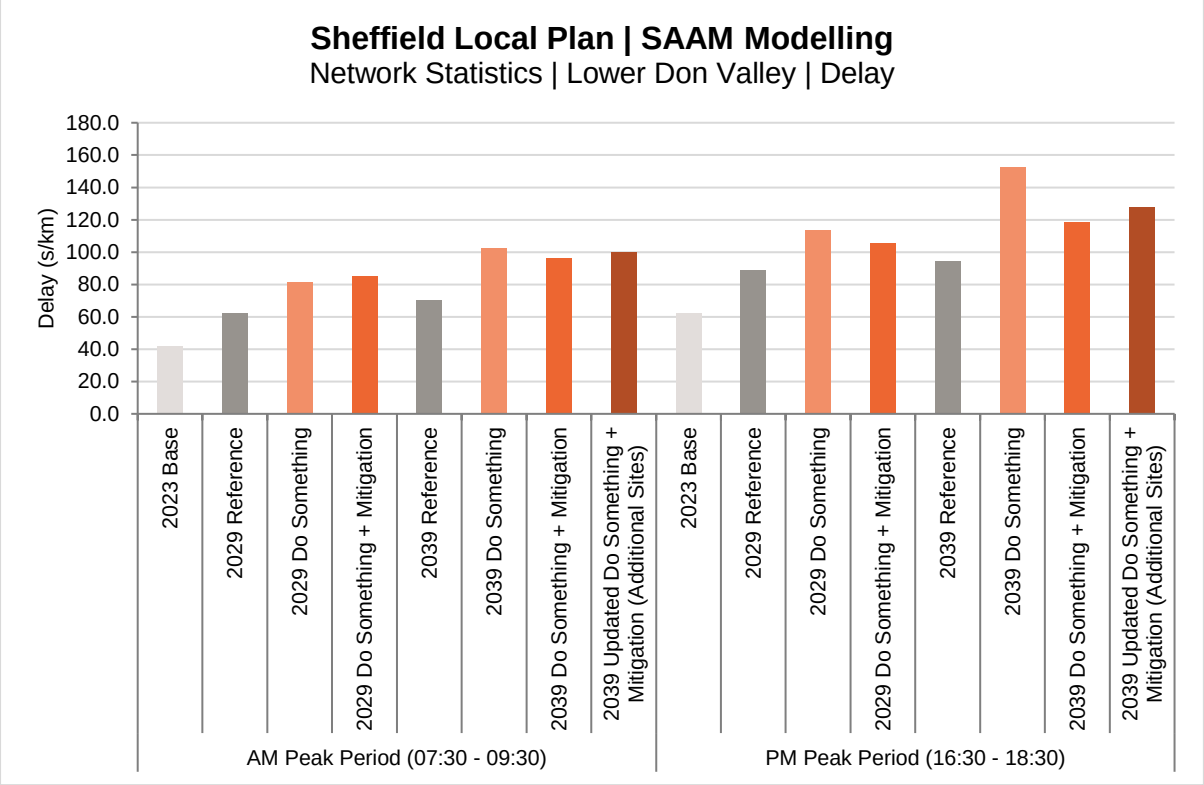
3 Future Year Results

3.1 Network Statistics

Network statistics provide a strategic overview of the performance of the whole network. These statistics have been extracted for the whole modelled network to understand the wider network impacts across each of the modelled scenarios. In all cases, the results presented are an average of ten model runs (known as replications) for each scenario.

The average delay has been calculated for each scenario is presented in Graph 1. This is mean delay incurred by vehicles travelling through the network in the modelled time period and is calculated as the difference between actual travel time and free flow travel.

Graph 1: Network Statistics: Average Delay

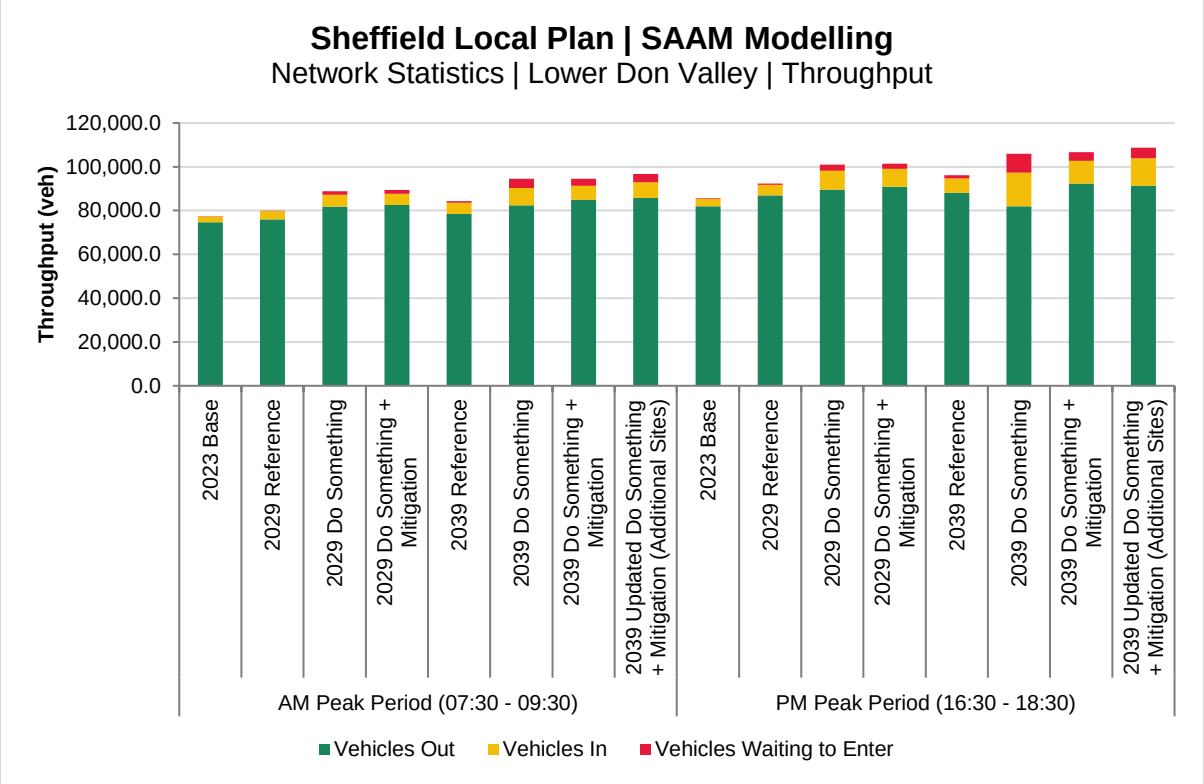


Additionally, the model throughput is presented in Graph 2. This shows the following:

- **Vehicles Inside (unit: veh):** the number of vehicles in the network at the end of the simulation. A large number of vehicles inside the network is an indicator of queuing and congestion.
- **Vehicles Outside (unit: veh):** the number of vehicles that have passed through the network during the simulation period. For a one-hour modelled period, it is equal to flow.

- **Vehicles Waiting to Enter (unit: veh):** the number of vehicles in virtual queues waiting to enter the network at the end of the simulation period. For networks operating within capacity, this statistic should be close to zero. Large numbers of vehicles waiting to enter the network (effectively latent demand) is indicative of a network operating over capacity.

Graph 2: Network Statistics: Throughput



The graphs shows that trips associated with the additional local plan sites, as modelled in the 2039 Do Something + Mitigation (Additional Sites) Scenario, only result in small impacts when compared to the previously assessed 2039 Do Something + Mitigation scenario, with increases of just 4.2% and 7.5% in the AM and PM peak periods, respectively.

Figure 1 and Figure 2 present assigned volume difference plots from the macroscopic modelling comparing the 2039 Do Something + Mitigation and 2039 Do Something + Mitigation (Additional Sites) scenarios. In these plots, green represents an increase in traffic volume whereas blue represent a reduction. Locations coloured grey indicates that there is no material change in traffic volumes.

Figure 1: Assigned Volume Difference | 2039 Do Something + Mitigation vs 2039 Do Something + Mitigation (Additional Sites) | AM Peak

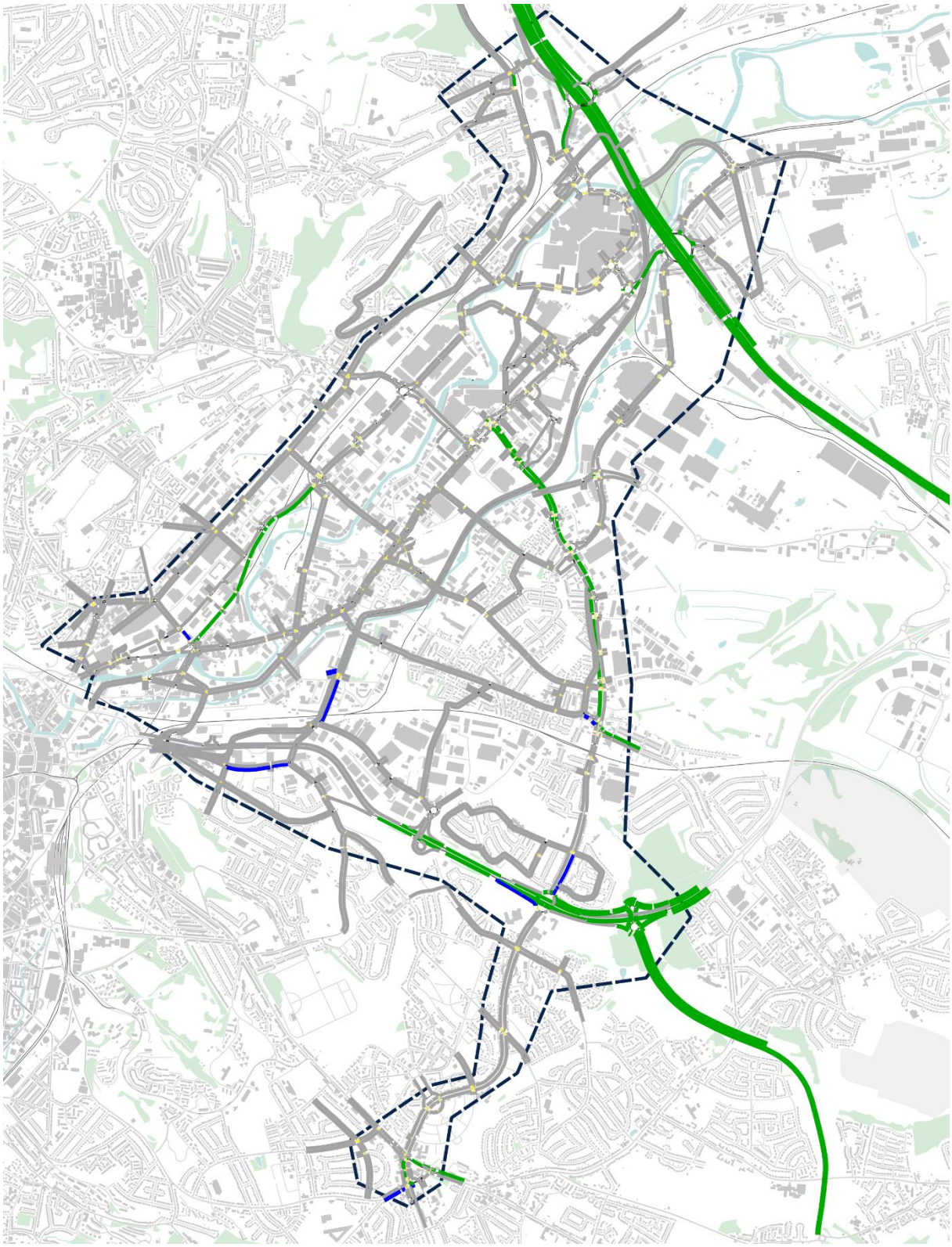
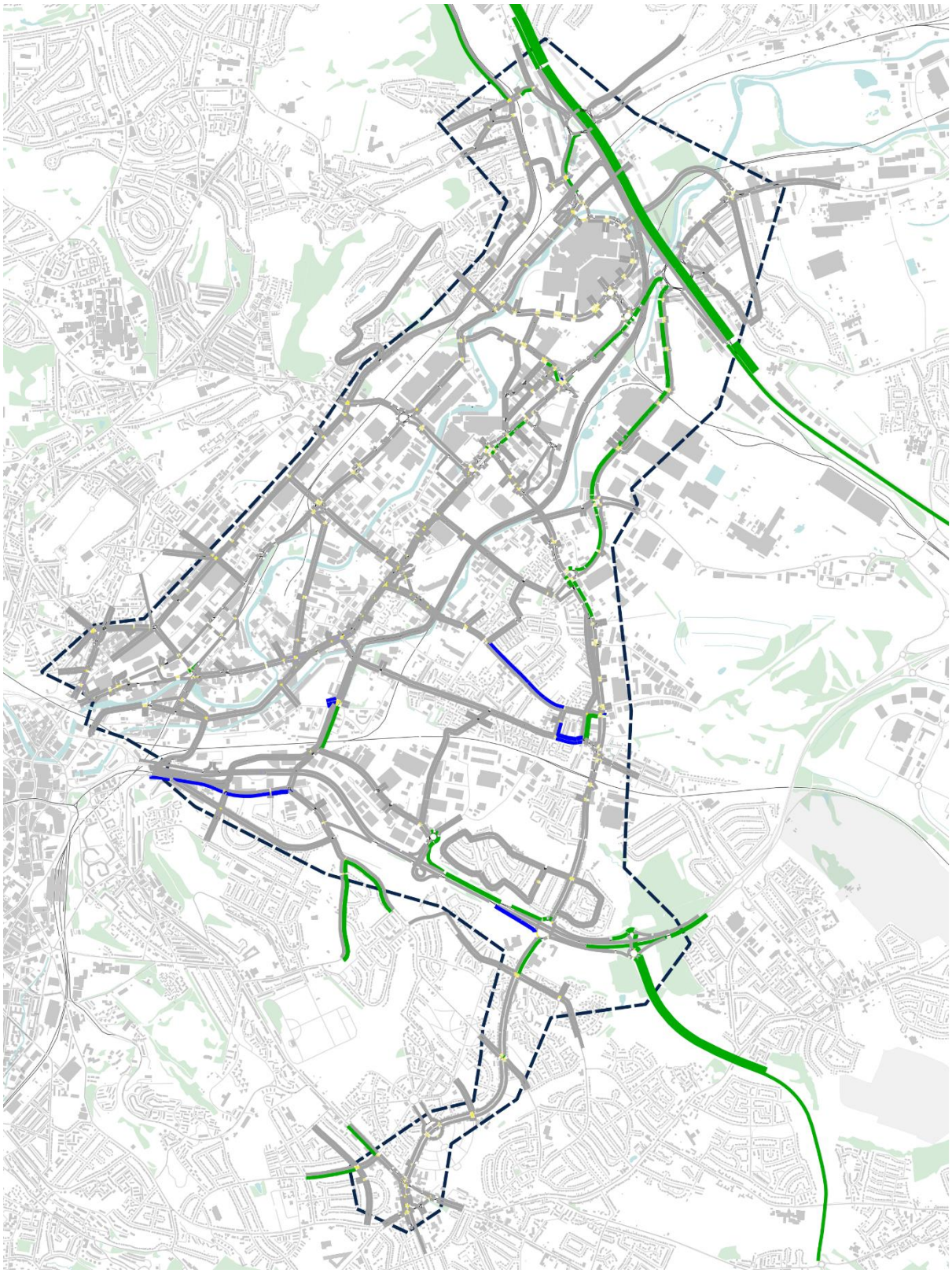


Figure 2: Assigned Volume Difference | 2039 Do Something + Mitigation vs 2039 Do Something + Mitigation (Additional Sites) | PM Peak



Both Figure 1 and Figure 2 confirm that there would be no material change in traffic volume across much of the Lower Don Valley subnetwork, consistent with the network statistics presented above. However, there are key increases on the M1 mainline, A630 Sheffield Parkway and the A57 Mosborough Parkway.

The microsimulation modelling shows that increases on the M1 mainline do not materially impact the operation of the network with significant improvements in this area due to the mitigation proposed at this location.

However, the microsimulation modelling does show queues forming along the A57 Mosborough Parkway during the AM peak from the A630 Sheffield Parkway / A57 Mosborough Parkway dumbbell roundabout. This is consistent with the previous modelling which showed queues in the Do Something and Do Something Mitigation scenarios reaching the edge of the model at Coisley Hill Roundabout. This is further exacerbated with the additional local plan sites. In all cases, additional delay is also caused on the A630 Sheffield Parkway and on Prince of Wales Road. However, no mitigation has been identified for this location, as it is considered that the current arrangement meters traffic entering the wider network and acts to deter further trips by private car.

4 Summary and Conclusions

This technical note has set out the process of creating forecast year traffic demands and setting up the forecast year microsimulations for the Lower Don Valley subnetwork for the 2039 Do Something + Mitigation (Additional Local Plan Sites) scenario. It also presents the results from the modelling, identifying the impact that the additional Local Plan sites have on the local highway network within the Lower Don Valley.

The previously identified mitigation schemes at M1 J34 and at the A6178 Sheffield Road/Vulcan Road roundabout have been included. The modelling shows that these two schemes in combination will still address the main impacts associated with the additional Local Plan sites.

The analysis has shown that across the majority of the Lower Don Valley, the additional local plan sites would not result in a material impact compared to the previously assessed 2039 Do Something + Mitigation scenario. However, some residual impacts remain, including at the A57 Mosborough Parkway/A630 Sheffield Parkway dumbbell roundabout. However, as previously concluded, the current arrangement here meters traffic entering the wider network and acts to deter further trips by private car. As such, highway mitigation at this location is not considered to be desirable.

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