Project	A49 Corridor, Warrington		
Report Title	Proposed VISSIM Modelling Methodology		
Version	1.2	**Date:**	01/11/2019
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Client:	Satnam Millenium Ltd.		

1. Introduction

1.1. This document is intended to set out the proposed methodology for the development of VISSIM micro-simulation models of the area to the north of Warrington, and south of Winwick, surrounding the A49 corridor (see Figure 1 below).

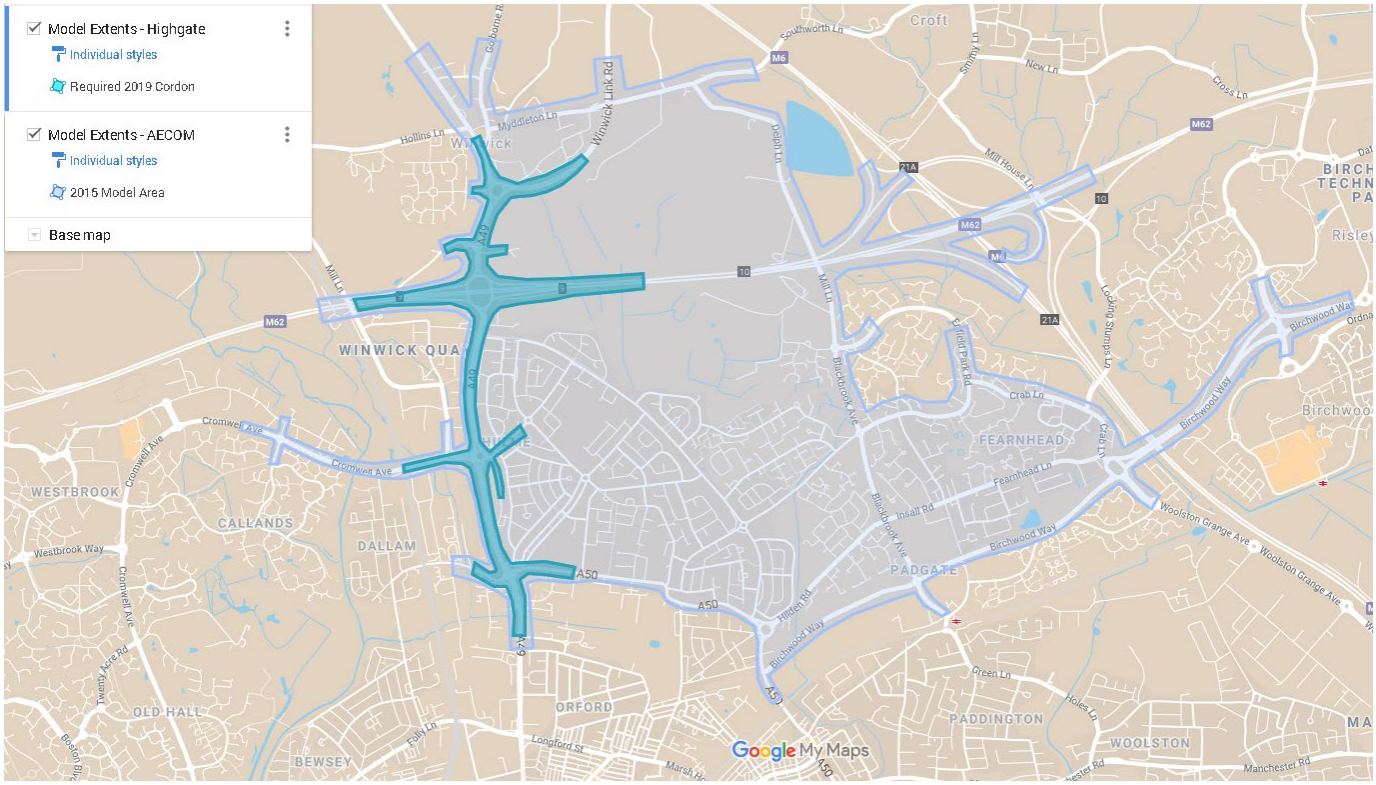

Figure 1: Proposed Model Extents

1.2. A corridor model of the A49 was developed in 2014 by AECOM, and then extended to cover the Peel Hall study area and growthed to a 2015 base year in 2017, as agreed with Highways England and Warrington Borough Council. Given that the area of interest is now the A49 corridor itself, rather than the much larger area of the extended Peel Hall study, there is now a need to cordon the model/s to the required A49 area only, which will make them much easier to work with, taking account of the following:

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- The models are already approved in their current extents and base flow years. There is a desire to adjust the model extents without needing to carry out another full recalibration and revalidation exercise.

- The base year models are 2015, which is now 4-years old. Guidance states that models should not generally use traffic survey/ flow data older than 3-years old, without careful checking in order to ensure that the models are still representative and fully fit for purpose.

1.3. The aim of this document is therefore to set out a methodology which demonstrates that with the correct approach, sufficient due diligence and proof of checking, the current model/s can be used with minimal overall adjustment (other than that necessary to network extents and flows). Every effort will be made to prove that the models are still directly comparable to both the original models and to more current traffic survey information.

1.4. If this methodology is deemed acceptable, it should allow a faster route to a suitable base model proven to be robust and fit for purpose, without the need for a full validation and audit approval route – the model has already been approved, so the effort will be put into proving that performance is still comparable to the original model/s after the cordoning process.

2. Convert Existing Model to Static Assignment

Full Internal Peer Review:

2.1. It is already noted that the model is built in VISSIM version 8.00-04.

2.2. A check will be carried out as to whether converting this to a newer version of VISSIM (latest tested and stable version is currently 11.00-11) will make any sort of significant difference to calibration and validation data. Version 8 has previously been found to be less stable than more current versions, and also has early development implementations of certain tools (i.e. scenario manager) which can be extremely useful for ensuring consistency and efficiency of delivery. Later versions of VISSIM also make much better use of computer resources, leading to much faster run times.

2.3. If the validation and performance differences are proven to be minimal when compared against the original models running in the original software version, the model will be converted to a newer VISSIM version to take advantage of updated features, reliability, stability and speed.

Convert Assignment from Dynamic to Static:

2.4. Due to the need to 'freeze' the assignment found in the current AECOM model; it is proposed to convert the assignment from dynamic to static. As there is no route choice, it is not felt that this will necessarily affect the future usefulness of the model, whilst also contributing to the possibility of not needing a full re-validation of the base scenario by ensuring that all elements stay as close to the original as possible.

2.5. This is a process of going through each vehicle type, separately creating static routing (in theory, the inbuilt 'convert to static routing' tool found within the dynamic assignment module should just be able to do this in one go, but experience suggests carrying this out manually).

2.6. Once the assignment has been converted, a full check will be carried out in order to ensure no erroneous routes have been created, and a full visual check to check for any issues which would suggest issues with the assignment conversion.

3. Cordon Model Area to Agreed Extents:

Cordon Static Routing

3.1. This process is completed using a bespoke VBA macro which tracks the link sequence of each newly defined static route within the *.inpx file, cutting it and defining a new end on the links which will become the extents of the newly cordoned network.

3.2. A full visual check of all newly created cordoned static routing will be carried out at this stage to ensure that all routes previously passing through our area of interest are now captured and cordoned to the required extents.

Cordon Physical Network

3.3. The process of carefully trimming the network structure will be completed manually, cutting links to separate the agreed area of interest from the larger, older model. All network elements will need to be set to 'on' visually in order to ensure that no errors are created, or existing objects broken. PT lines will need adjusting as the link editing takes place, making sure that all routes passing through the agreed area of interest are adjusted to have new start and/ or end points.

3.4. The unwanted, larger model area will then be deleted, leaving the cordoned physical network with all physical elements intact, static routing per vehicle type, and public transport routing all as it was previously in the larger model.

Cordon Time Period

3.5. As a result of the considerable reduction in overall network scale and extents, it may prove reasonable to reduce the simulation time period currently found in the AECOM models, although this will need to be dependent on traffic conditions and the local peak profile. The current model simulation time periods are as follows:

- AM model – 07:00-09:30 (2.5 hours)
- PM model – 16:00-18:30 (2.5 hours)

3.6. There is currently heavy congestion in this area, so it may be that longer warm-up and/or cool-down periods are necessary, but with the revised, reduced model extents, a two-hour simulation period with half-hour warm-up and cool-down periods would normally be considered adequate.

Create New Vehicle Inputs

3.7. This process is also completed using a bespoke VBA macro, which will pick up all flows from all routes as the new cut down static routes are created and pass the data per vehicle type to new vehicle inputs for the cordoned model.

3.8. All vehicle inputs will then need manually checking – the internal VISSIM processing tool for converting dynamic assignment into static assignment tends to create a unique traffic composition for each vehicle input, for each time period, with vehicle types entered as a factor of the actual flow. This is rather clumsy to work with, as there is a volume and set of factors per vehicle type for every time period (every 10 minutes for this model), for every input. In comparison, the external VBA macro creates vehicle inputs with actual flows, per vehicle type, per time period, which is judged to be easier to work with. Any remaining VISSIM default input formats will therefore be converted so that all model inputs are consistent, in the same format.

4. Check Model Flows

Comparison Against Original 2015 Model Flows

4.1. First phase checks are to ensure that all data has been correctly converted from the original dynamic assignment models to the new static assignment models. Link counts and junction turning counts will be checked for all vehicle types. Differences will be expected to be minor – the GEH statistic will be used as a test, all measures will be expected to achieve 3 or lower.

4.2. Second phase checking will be to then compare the static 2015 models against all currently held traffic survey data. There is a large, mixed dataset including Automatic Traffic Counts (ATC), Manual Classified Counts (MCC) and Queue length surveys (see Figure at the end of this note). The data held covers a large range of relevant sites, as well as spanning the timeframe between 2014-2019. This is particularly useful, as it allows the assessment of the same, or similar, locations but at different times, in order to demonstrate how changes and trends have occurred.

4.3. Checks of flows and turning counts will be carried out using the GEH statistic and WebTAG flow criteria. Journey time data will be assessed using WebTAG guidance, as a minimum. Queues will be assessed visually.

4.4. Model journey times will be validated against a 'Big Data' source such as TrafficMaster (or similar) for a neutral month in 2019, to ensure that the model is representative of current conditions.

4.5. If there are discrepancies, these will likely fall into one of the following criteria:

- *Network level volume difference* – This would likely primarily represent the naturally occurring difference from 2015-2019 due to background growth/ shrinkage in the wider area. This would generally manifest as a relatively even level of change across the entire network, whilst the overall vehicle flow patterns remained comparatively similar.

- It is entirely possible that this level of change would not push any individual measures of flow volume and pattern over nationally acceptable validation criteria levels. If this was the case, the model/s would have been proven to still be relevant for use, regardless of the time since their original construction.

- If however there was found to be more significant levels of change (again, acting reasonably and using accepted WebTAG guidelines to inform the decision), it would be the simplest discrepancy to amend, as it would only be a matter of factoring the vehicle volumes for the network until comparative volumes & performance are achieved, with no real physical changes necessarily being needed to the approved model structure, as provided.

- *Local level volume difference* – Whilst this still may just represent the background growth difference from 2015-2019, this would likely manifest as certain areas experiencing localised growth or traffic pattern changes, whilst others did not, or experienced different levels of localised growth or traffic pattern changes. As with the wider network, this would most likely still fall within the ranges set out by WebTAG validation criteria (being used as guidance), which would allow the changes to be defined as non-critical or insignificant, and the model/s would have been proven to still be relevant for use, regardless of the time since their original construction.

- As with the network level volume difference, if there was found to be more significant levels of change in certain areas, a combination of local route factoring and manual volume tweaks for select movements should be able to still ultimately achieve comparative volumes & performance to those recorded in the updated traffic survey data, without any significant changes to the approved model structure, as provided. This should then still be able to be deemed as a model representative of onsite conditions, and therefore robust and fit for the purpose of current option testing.

- *Full Flow Profile & Tidal Flow Change* – This is the only foreseen scenario with a possible outcome that would mean the current model may not be suitable for use without major updating and revalidating. Although very much an outside possibility, this would be a worst-case outcome involving such significant levels of both traffic volume, and traffic profile change, as to render the existing models unsuitable for use. This of course depends on the severity of the differences found – it is a very unlikely outcome in most areas of the country, as four years is usually not nearly enough for the occurrence of any level of significant change.

4.6. In all scenarios apart from Full Flow Profile and Tidal Flow Change, there should be the option of either:

- Leaving the 2015 model as it is, without any changes to the flows, but just making sure that this exercise of cordoning and checking against multiple datasets is documented and carried forwards as a consideration in case of future issues; or,

- Making minor adjustments to the flows, either globally or locally, leading to the ability to effectively present the model as a base year fit for the purpose of 2019-based option testing.

5. Model Refinement & Re-Calibration:

5.1. Although it is planned that the model extents be reduced, and the model flows be either shown to be comparable or factored and adjusted to be comparable to an up to date traffic survey dataset, the aim is that there will not be much else which will need changing.

5.2. If there have been physical changes (i.e. new lanes or junction arrangements) which are now built and fully operational within the relevant section of the A49 corridor (or were built and operational within the new agreed area of interest when the 2019 surveys were carried out) then the inclusion of these needs to be considered.

5.3. There may also be minor, performance based, or primarily cosmetic based improvements which would add to the overall usability and/ or functionality of the updated model, whilst being shown to not impact on previously achieved performance indicators.

5.4. If the model has proven initially to perform in a demonstrably similar manner, in an updated version of VISSIM, one of the key changes would be to place the model under scenario management. This tool allows a greater level of efficiency and transparency to be achieved, with all peaks and scenarios sitting within one VISSIM model, and any model changes being tracked and auditable through the use of modification files.

6. Future Year Option & Mitigation Testing

Proposed Scenarios for Testing

6.1. If the methodology included within this report is agreed and the work to cordon the base year models and prove that they are fit for purpose is successful, the following scenarios are proposed to be individually tested and analysed, using the resultant model of the included process as a base:

- 2022 Do Minimum – Opening Year, No development
- 2022 Do Something – (Opening Year, 120 Dwellings) – Access Strategy Option A
- 2022 Do Something – (Opening Year, 120 Dwellings) – Access Strategy Option B
- 2022 Do Something – (Opening Year, Full Development) – Access Strategy Option A
- 2022 Do Something – (Opening Year, Full Development) – Access Strategy Option B
- 2027 Do Something – (Opening Year +5, No Development) – Access Strategy Option A
- 2027 Do Something – (Opening Year +5, No Development) – Access Strategy Option B
- 2027 Do Something – (Opening Year +5, 600 Dwellings + Local Centre) – Access Strategy Option A
- 2027 Do Something – (Opening Year +5, 600 Dwellings + Local Centre) – Access Strategy Option B
- 2032 Do Something – (Opening Year +10, No Development) – Access Strategy Option A
- 2032 Do Something – (Opening Year +10, No Development) – Access Strategy Option B

- 2032 Do Something – (Opening Year +10, Full Development) – Access Strategy Option A
- 2032 Do Something – (Opening Year +10, Full Development) – Access Strategy Option B

6.2. Traffic flows will be cordoned from Warrington Borough Council's SATURN model (WMMTM16) recently run for the Peel hall development profile and future year scenarios and provided as hourly data. These outputs will then be processed to create per vehicle type flows in the form of excel network flow diagrams by the team at Highgate Transportation. Both sets of data will be made available to the modelling team.

6.3. Once received, these network flow diagrams will be simply converted to network origin destination data and entered into the VISSIM model modification files to create the static routing and vehicle input changes for each flow scenario.

6.4. The following committed mitigation measures will also be included as individual modification files, allowing them to be easily added and combined to each relevant test scenario at a later point (2027 and 2032 scenarios):

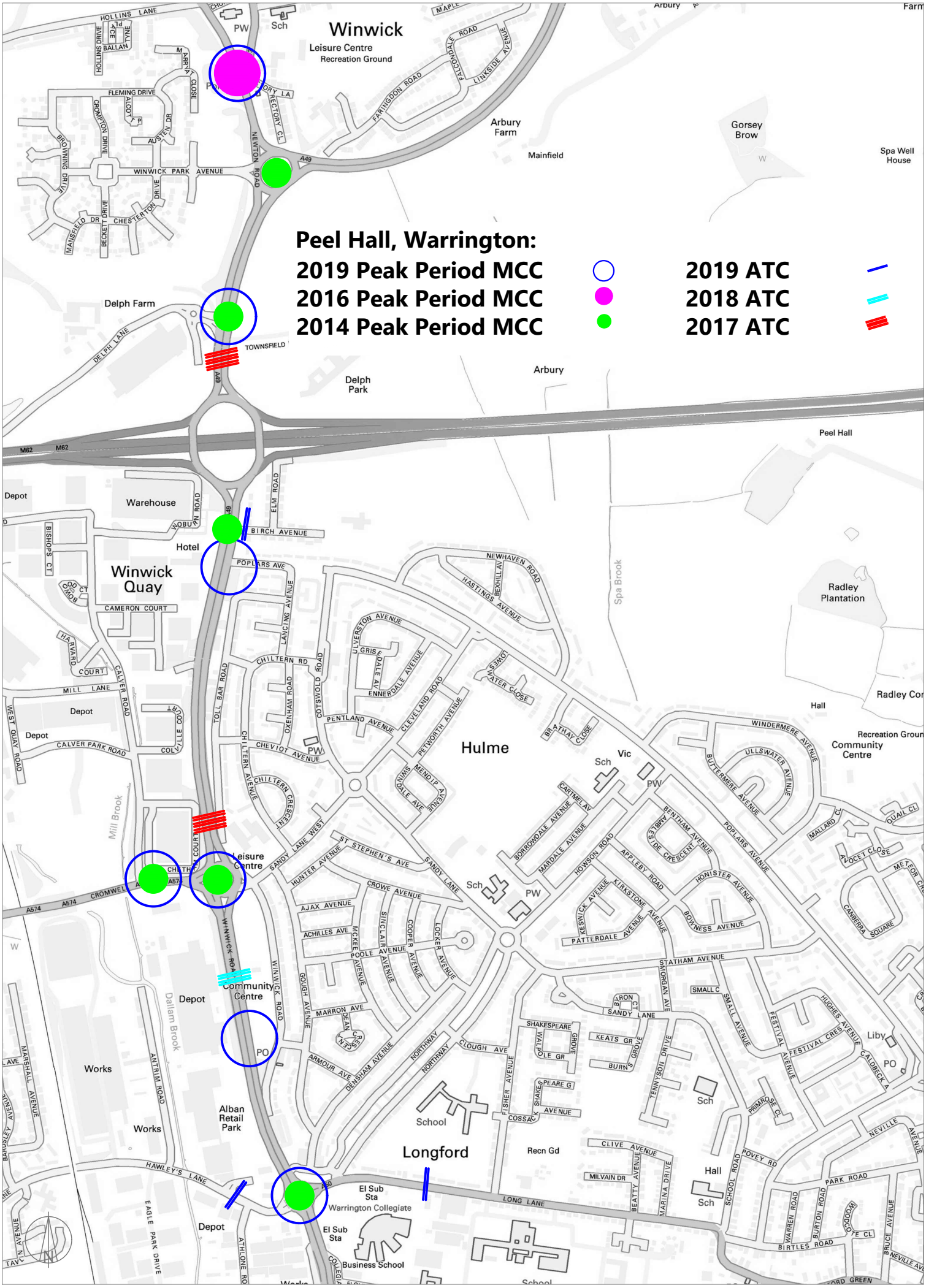
- M62 J9 (eastbound off-slip works)
- Delph Lane/B&Q signalised junction improvement scheme
- Winwick Roundabout mitigation
- Junction 9 Retail Park junction modifications

6.5. Placing the entire project under the scenario manager tool allows each scenario to be separately 'constructed' using the modification files detailed in the previous bullet lists. This allows the combination of flow sets and combinations of mitigation/ network changes to originate from the same modification files, making checking and editing efficient and simpler to track.

6.6. Any tweaks to signal timings and/ or vehicle behaviour is then also recorded using per scenario modification files. This keeps the modelling process transparent, throughout all stages of modelling and analysis.

7. Summary

7.1. We seek WBC and Highways England to agree the above methodology and provide constructive comments where necessary.


Peel Hall, Warrington:
2019 Peak Period MCC
2016 Peak Period MCC
2014 Peak Period MCC
2019 ATC
2018 ATC
2017 ATC
Winwick
Leisure Centre
Recreation Ground
Arbury Farm
Mainfield
Gorsey Brow
Spa Well House
Delph Farm
Delph Park
Arbury
Peel Hall
Warehouse
Hotel
Winwick Quay
Hulme
Vic
Radley Plantation
Community Centre
Leisure Centre
Community Centre
Depot
Works
Alban Retail Park
School
Longford
Recn Gd
Hall
El Sub Sta
Warrington Collegiate
Business School
Liby
PO
Sch
PW
M62
A49
A574
A57
HOLLINS LANE
FLEMING DRIVE
WINWICK PARK AVENUE
NEWTON ROAD
FARINGDON ROAD
TOWNSFIELD
DELPH LANE
BIRCH AVENUE
POPLARS AVE
CAMERON COURT
CHILTERN RD
CHEVIOT AVENUE
PENTLAND AVENUE
CLEVELAND ROAD
MILL LANE
CALVER PARK ROAD
SANDY LANE WEST
SANDY LANE
CROWE AVENUE
AJAX AVENUE
ACHILLES AVE
POOLE AVENUE
STATHAM AVENUE
HOWSON ROAD
APPLEBY ROAD
PATTERDALE AVENUE
BOWNESS AVENUE
HONISTER AVENUE
WINDERMERE AVENUE
ULLSWATER AVENUE
BUTTERMERE AVENUE
POPLARS AVENUE
BENTHAM AVENUE
NEWHAVEN ROAD
HASTINGS AVENUE
ULVERSTON AVENUE
ENNERDALE AVENUE
COTSWOLD ROAD
OXENHAM ROAD
LANCING AVENUE
TOLL BAR ROAD
WINWICK ROAD
ANTRIM ROAD
DENSHAM AVENUE
ARMOUR AVE
MARRON AVE
GOUGH AVENUE
NORTHWAY
CLOUGH AVE
FISHER AVENUE
COSSACK AVENUE
SHAKESPEARE WALK
KEATS GR
BURNS GROVE
TENNYSON DRIVE
PEARE GROVE
SMALL AVENUE
FESTIVAL AVENUE
FESTIVAL CRES
HUGHES AVENUE
CALDBECK AVE
PRIMROSE CL
CLIVE AVENUE
MILVAIN DR
BEATTY AVENUE
MARINA DRIVE
SCHOOL ROAD
POVEY RD
LONG LANE
HAWLEY'S LANE
EAGLE PARK DRIVE
ATHLONE RD
PARK ROAD
WARREN ROAD
BURTON ROAD
BIRTLES ROAD
BRUCE AVENUE
NEVILLE AVENUE
BISHOPS CT
HARVARD COURT
COLVILLE RT
WEST QUAY ROAD
CHILTERN AVENUE
CHILTERN CRESCENT
SWINDALE AVE
MENDIP AVENUE
BRATHAY CLOSE
CARTMEL AV
BORROWDALE AVENUE
MARDALE AVENUE
KIRKSTONE AVENUE
SWICK AVENUE
MALLARD CL
QUAIL CL
ROCKET CLOSE
METEOR CR
CANBERRA SQUARE
MARSHALL AVENUE
BARNSLEY AVE
Mill Brook
Dallam Brook
Spa Brook