VISSIM SCOPING NOTE

Project name	Hinckley National Rail Freight Interchange		
Design note title	M1 J21 / M69 J3 Vissim Model Scoping Note		
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1. INTRODUCTION

1.1 Preface

1.1.1 Hydrock has prepared this Scoping Note to present the scope and methodologies to develop a Vissim microsimulation model of the M1 Junction 21 / M69 Junction 3 (M1 J21 / M69 J3), to assess the impacts of the proposed development for a Strategic Rail Freight Interchange (SRFI) and up to 850,000m2 of B8 distribution warehousing near Hinckley, Leicestershire, also known as the Hinckley National Rail Freight Interchange (HNRFI).

1.1.2 This Scoping Note is specifically related to agreeing the traffic assessment modelling requirements for the M1 J21 / M69 J3. Scoping Reports as part of the wider assessment have already been issued for discussions.

1.1.3 Hydrock has begun developing the Vissim base model network structure. As part of the review of existing traffic conditions, and to fully understand and assess the traffic impacts of the HNRFI development, Hydrock seeks discussions with Leicestershire County Council (LCC) and Highways England (HE) to understand their respective views on the following:

- proposed modelled network study area extent; and
- requirements of base model calibration and validation analysis.

1.2 Wider Scoping Background

1.2.1 Hydrock has been liaising with the immediate consultees on highway matters since late 2017. These parties include: LCC; HE; Blaby District Council (BDC); and Hinckley and Bosworth Borough Council (HBBC). This process has been frequent and is ongoing.

1.2.2 In May 2019, Hydrock submitted a Transport Assessment Scoping Report (TASR) (ref: 07700-HYD-XX-XX-RP-TP-3002-P03_S4) as part of the wider project commission to produce a Transport Assessment in support of this development proposal.

1.2.3 This followed lengthy discussions with the above parties, and all information contained within the TASR had already been presented in various guises during this period, and collated those pertinent elements into one concise location. An interim Scoping Report (ref: 07700-HYD-XX-XX-RP-TP-3001) was prepared and submitted in November 2017, for the purposes of introducing the scheme and presenting the high-

level assessment strategy for discussion purposes. That document was superseded by the TASR submission.

1.3 Development Background

1.3.1 The site is proposed to be located on around 129 hectares of land directly adjacent to M69 Junction 2, with access to be gained directly from the motorway junction. M69 Junction 2 only has northern slip roads currently, and the southern slip roads will be delivered as part of the proposals.

1.3.2 The development is considered to be a Nationally Significant Infrastructure Project (NSIP). As such a Development Consent Order (DCO) application is to be submitted to the Secretary of State, with the local authorities (planning and highways) and Highways England being important consultees to the process. The submission of the DCO application is currently scheduled for April 2020.

1.3.3 A project website is live, and can be found here: http://www.hinckleynrfi.co.uk/

1.3.4 Two informal public consultations have been held. The initial round was held between October and December 2018, in which Tritax Symmetry hosted eight exhibitions. A further six exhibitions were held between July and September 2019, focusing on highways matters. Consultation material is available here: http://www.hinckleynrfi.co.uk/db-informal-consultation/

2. EXISTING VISSIM MODEL PROPOSAL

2.1 Overview

2.1.1 As part of the wider Transport Assessment Scoping Report, it was proposed to develop a standalone Vissim microsimulation model of HE's Strategic Road Network (SRN) M1 J21 / M69 J3 motorway interchange, to assess the development impacts related to the HNRFI.

2.1.2 The proposed model extent assumes only the SRN will be modelled in Vissim, junctions within close proximity to the SRN, such as the A5460 and A563 corridors, are not to be included within this assessment.

2.1.3 A skeleton road network (yellow links) has already been coded in Vissim and is shown in Figure 2.1.

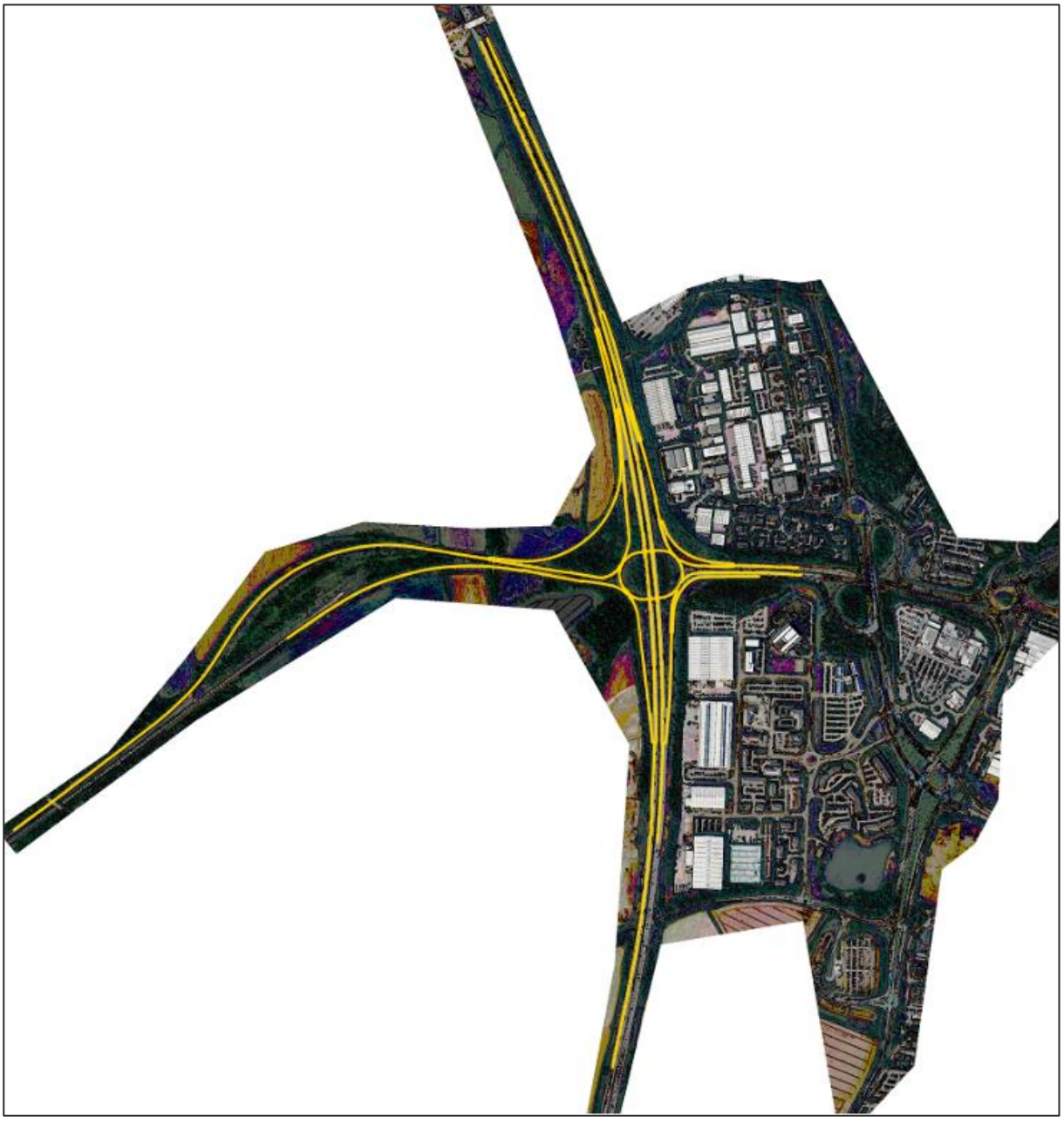

Figure 2.1: M1 J21 / M69 J3 Vissim Base Network Extent

2.1.4 It should be noted a standalone Vissim model has already been developed for M69 J2, the proposed point of access onto the SRN for the HNRFI, the Local Model Validation Report (LMVR) has also previously been agreed. Another standalone Vissim model of M69 J1 is also currently under development, and a separate Vissim Scoping Note is being produced.

2.2 Base Model Parameters

2.2.1 A brief overview on the proposed base model development is outlined in this section. However, details on the parameters used to create a baseline Vissim model will be detailed at a later stage, and fully reported in a LMVR, which will support and evidence the base model validation.

2.2.2 The M1 J21 / M69 J3 base year model is being developed in Vissim version 11.00-11, to replicate baseline conditions. PCMOVA3 has also been used to replicate and simulate the M1 J21 MOVA traffic signal control junction within the model study area.

2.2.3 The modelled time periods (including warm up and warm down periods) accord with the typical weekday peak periods for the area and are as follows:

- 07:00 – 10:00 – (AM Peak); and
- 16:00 – 19:00 – (PM Peak).

2.2.4 Based on the existing traffic data available, and in line with the strategic PRTM model, the peak hours identified for detailed assessment, evaluation and model validation will be as follows:

- 08:00 – 09:00 – (AM Peak); and
- 17:00 – 18:00 – (PM Peak).

2.2.5 Hydrock have developed a model template file for project use and in accordance with best practice, it is generally advised that driver behaviour parameters are left at their default values as much as possible, unless supported by site observations and measurements.

2.2.6 However, the 'Hydrock Vissim Template' has made some changes and additions to default parameters as recommended in the 'TfL Modelling Guidelines v3.0' technical guidance. This document recommends the following change to the 'Urban (motorised)' link type:

> *"Links that allow lateral behaviour should increase value of 'min. look ahead distance' from 0 to 30m (at 30mph speed limits). This will ensure that vehicles see each other and obey traffic signals when vehicles can queue next to each other in the same lane."*

2.2.7 The other parameter altered on all driver behaviour link types is the reaction to Red-Amber at traffic signals. The default value is defaulted set to 'Go (same as green)' which essentially means Red-Amber is treated as green time. To replicate a more accurate driver behaviour and reaction time at traffic signals under Red-Amber the default value has been amended to 'Stop (same as red)'.

2.2.8 Model units have been specified as:

- Metres (m);
- Kilometres (km);
- Miles per hour (mph); and
- Metres per second^2 (m/s^2).

2.2.9 The default maximum and desired acceleration and deacceleration functions have been used for each vehicle class in the model.

2.2.10 The 'Hydrock Vissim Template' includes a library of vehicular speed profiles based on values from the 'vehicle speed compliance statistics' realised annually by the Department for Transport (DfT). The vehicle speed compliance statistics provides data on the speeds that road users chose to travel at when in free flow traffic conditions, and their compliance to the associated speed limits. Prior to the 2016 statistics release, DfT referred to this data as 'free flow vehicle speed statistics'.

2.2.11 Geometric calculations for the base model will be derived from a digital Ordnance Survey (OS) Master Mapping. Checks on the accuracy of the base map will be undertaken against junction video surveys, satellite imagery and on-street observations. These calculations will inform the lane width, link length and number of lanes parameters within the model.

2.2.12 It is proposed to use Dynamic Assignment (DA) within the model to enable the use of matrix-based traffic assignment.

2.3 Existing Traffic Data

2.3.1 Traffic data across the wider development proposal study area has been collected over the past 18 months, either through existing data available from LHA's or instructed traffic survey commissions.

Turning Counts & Queue Lengths

2.3.2 In relation to M1 J21 / M69 J3, it is proposed to use a Manual Classified Count (MCC) undertaken on Tuesday 26th June 2018. Turning movements were observed over a 12-hour period (07:00 - 19:00), at 15-minute intervals, and split eight vehicle classifications.

2.3.3 Queue length surveys were also undertaken on the same day as the MCC. Queues were recorded at 5-minute intervals, over a 12-hour period (07:00 - 19:00), and split into Car /LGV, OGV1 and OGV 2 / Bus vehicle classes.

2.3.4 The motorway intersection arm and lanes (queues) labelling is shown in Figure 2.2.

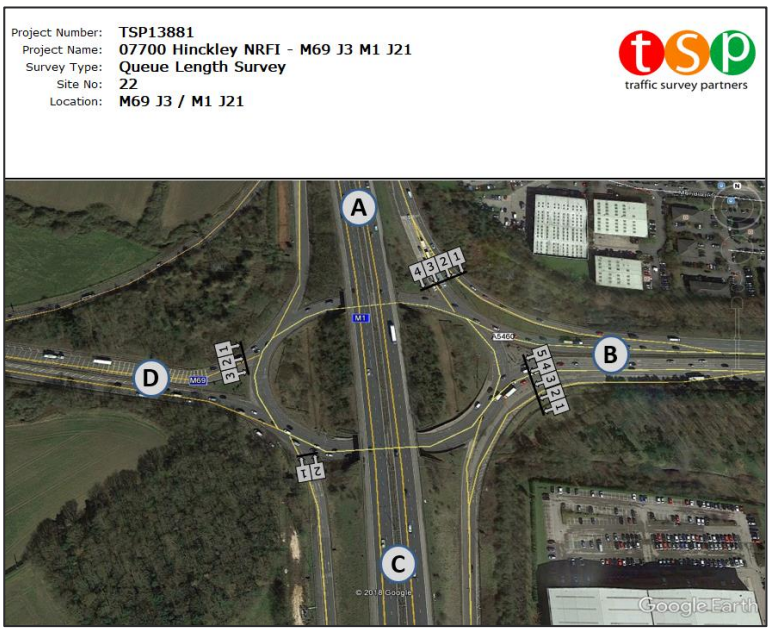

Figure 2.2: M1 J21 / M69 J3 June 2018 MCC and Queue Length Survey

2.3.5 It should be noted that M1 north-south or M69 west-north through-traffic was not observed in the MCC or queue surveys.

Link Flows (WebTRIS)

2.3.6 Due to the study area extent it is not appropriate to install temporary Automatic Traffic Counters (ATCs) to collect link flow and speed data.

2.3.7 Instead, motorway through-traffic will be obtained through HE's WebTRIS traffic data system and broadly correspond with the same analysis period as the observed MCC data. This will to inform the motorway through-traffic flows in the model, ensure interaction and merging of the motorway on-off slips, and for model calibration.

Journey Times

2.3.8 Journey time surveys were also undertaken on the same day as the MCC surveys (26th June 2018), recorded during the following peak periods:

- 07:00 - 10:00; and
- 16:00 - 19:00.

2.3.9 Journey time routes were observed on each of the four off-slips approaching the M1 J21 signalised junction and is shown in Figure 2.3.

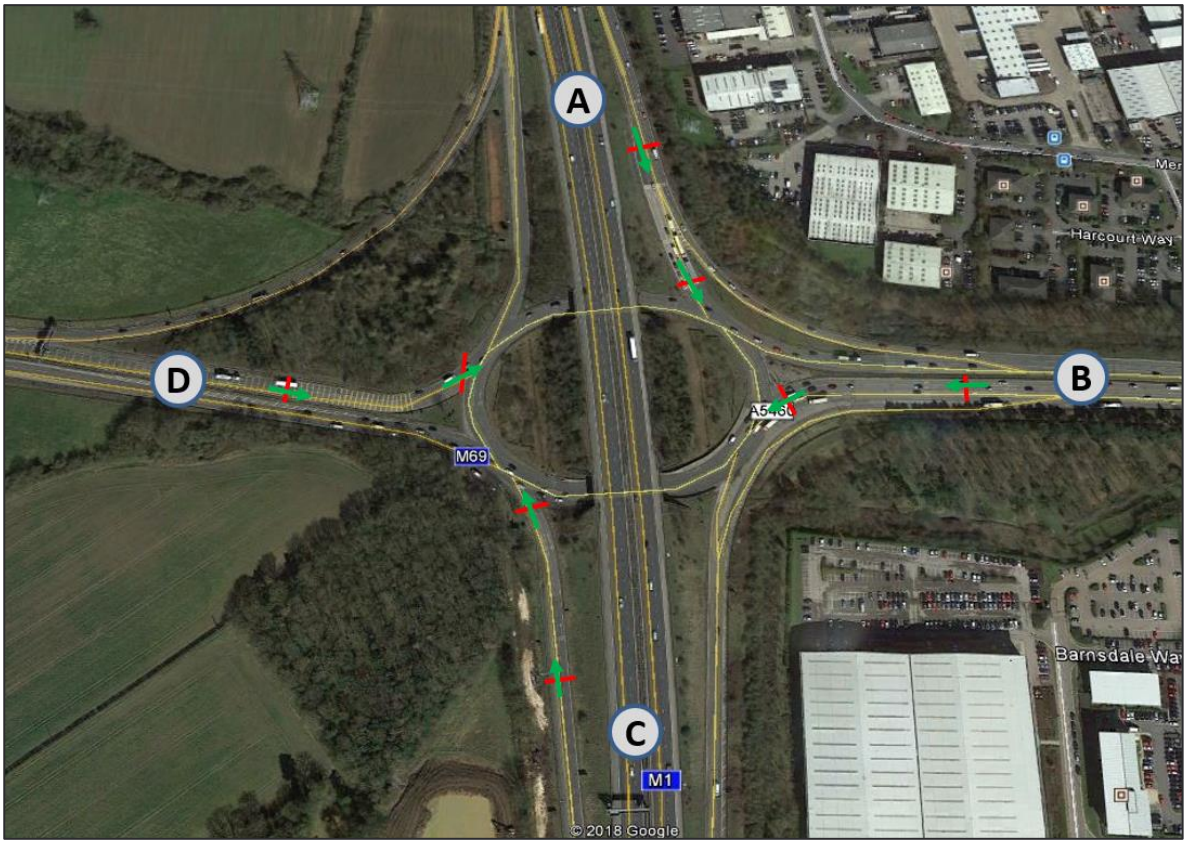

Figure 2.3: M1 J21 / M69 J3 Journey Time Routes

2.3.10 Approximately 10 journey times, per route, were observed during each hour for each peak period.

Traffic Signal Data

2.3.11 HE has provided the MOVA dataset, and associated drawings and specifications, to enable the M1 J21 traffic signals to be replicated within Vissim and PCMOVA.

2.4 Model Calibration & Validation

Overview

2.4.1 It is proposed to undertake calibration and validation of the base year Vissim model against the various forms of traffic data available.

2.4.2 Calibration and validation of the base model will be undertaken in accordance with multiple guidance sources, primarily:

- DMRB Volume 12a, section 11.4;
- WebTAG Unit M3.1, section 3; and
- TfL 'Traffic Modelling Guidelines v3.0'.

2.4.3 A summary of the acceptable thresholds for calibration and validation criteria, defined by DMRB and WebTAG guidance, is shown in **Table 2.1**.

Table 2.1: WebTAG Validation Criteria

Link Flow and Turning Movement Validation Criteria and Acceptability Guidelines Criteria	Acceptability Guidelines
Individual flows within 100 veh/hr of counts for flows less than 700 veh/hr	>85% of cases
Individual flows within 15% of counts for flows from 700 to 2,700 veh/hr	>85% of cases
Individual flows within 400 veh/hr of counts for flows more than 2,700 veh/hr	>85% of cases
GEH <5 for individual flows	>85% of cases
Journey Time Validation Criteria and Acceptability Guidelines Criteria	**Acceptability Guidelines**
Modelled times along routes should be within 15% of surveyed times (or one minute, if higher than 15%)	>85% of cases

2.4.4 Model validation will also be undertaken comparing queue lengths on each of the approaches to the motorway junction. However, there are no criteria set out in WebTAG or other best practice guidance notes. This is partly due to the highly subjective nature of monitoring slow moving traffic, which may extend out of sight, and defining when it is a queue. Therefore, the default parameters in Vissim will be used to report model queue lengths.

2.4.5 This base model will be calibrated against observed turning movements and will be validated to observed queue lengths, journey times link flow analysis.

Model Calibration

2.4.6 Model calibration will be undertaken through the comparison of observed and modelled turning movements at each junction, for both the AM and PM peak hour. The comparison of these turning movements have been analysed using the Geoffrey Edwards Havers (GEH) statistic.

2.4.7 The ideal outcome of the derivation of the GEH statistic, as outlined in DMRB / WebTAG, is to achieve a high proportion (85% or higher) of GEH values below, or equal, to five, and where possible all (100%) values below 10.

2.4.8 Additionally, on the basis of the current extent of the base model our assessment will seek to achieve a GEH statistic of below, or equal to two on all movements at the motorway junction.

Model Validation

2.4.9 Model validation is the critical parameter in determining whether the base model meets current guidance criteria, as set out by WebTAG, DMRB and TfL, and concludes that the base model is considered 'Fit for Purpose'.

2.4.10 Whilst the calibration of the base model will be undertaken against traffic data that had been used to construct the demand matrices, validation of the base model is the process whereby modelled result outputs are compared against independent set of traffic data observations.

2.4.11 This is to ensure that the base year model is an accurate and realistic representation of observed conditions on-street and therefore providing a robust platform to undertake the assessment of the proposed HNRFI development and its impact within the associated modelled network study area.

2.4.12 The outputs from the model will be compared against the observed data to ensure that the day to day conditions have been replicated within the model.

2.4.13 The model validation process will be undertaken by comparing model outputs against the only remaining independent observed traffic data sources:

- Journey Time Validation; and
- ATC / Webtris Link Flow Analysis.

2.4.14 Model validation will also compare observed and modelled queue lengths. However, as these are subjective and dependent on extent of recorded observed visibility, the comparison will assess whether the queue profile throughout the peak periods broadly correlate. If model journey time validation meets all criteria then it is expected that the queue length profiles should follow a similar trend.

2.5 Development Assessment

2.5.1 All proposed forecast year and HNRFI development scenarios are detailed in the wider TASR document previously issued. This outlines the use of LCC's 'Leicester and Leicestershire Integrated Transport Model (LLITM)' and the 'Pan Regional Transport Model (PRTM)'.

2.5.2 All forecast year Vissim model scenarios will correspond with those as agreed with HE and LCC.

3. CURRENT POSITION

3.1 Overview

3.1.1 The M1 J21 / M69 J3 Vissim base year model is currently under development. All general network structure has been coded.

3.1.2 An initial matrix has also been produced using the existing traffic data sources available, and alongside this, a review of general traffic patterns during the peak periods using online traffic mapping information and raw video footage from the traffic survey results.

3.1.3 This high-level review has highlighted that during typical AM and PM peak hours there is congestion in the area.

3.1.4 To mitigate against any issues that may arise from congestion caused beyond the current model extent, it is proposed to use some of network parameters available within Vissim.

3.1.5 For example, it is expected that A5460 eastbound 'outbound' queues (exiting the model extent) impacting on M1 J21 / M69 J3 could be replicated using 'Reduced Speed Areas'. These can be adjusted and duplicated to replicate queuing during various time periods. These queues created through 'dummy' parameters can be compared against video footage collected during the MCC and Queue survey counts.

3.1.6 Alongside this, Hydrock has also sought early discussions with LCC's traffic data team to understand the availability of existing and recent traffic survey data within the area to provide potential further information on congestion east of the current model extent.

3.1.7 LCC indicated that they undertaking a traffic survey programme in October 2019 to the east of the M1 J21 / M69 J3. LCC's programme will collect ATC, MCC and queue length data. Additionally, there are also some permanent ATC sites of use in the area.

4. SUMMARY

4.1 Summary

4.1.1 This Scoping Note is specifically related to agreeing the traffic assessment modelling requirements for the M1 J21 / M69 J3, and assumed related junctions in close proximity. Scoping Reports as part of the wider assessment have already been issued for discussions.

4.1.2 As part of the wider Transport Assessment Scoping Report, it was proposed to develop a standalone Vissim microsimulation model of HE's Strategic Road Network (SRN) M1 J21 / M69 J3 motorway interchange, to assess the development impacts related to the HNRFI.

4.1.3 The proposed model extent assumes only the SRN will be modelled in Vissim, junctions within close proximity to the SRN, such as the A5460 and A563 corridors, are not to be included within this assessment.

4.1.4 This base model is to be validated against traffic data collected in June 2018 and undertake the HNRFI development testing, as per scenarios agreed in a wider scoping discussion with, HE and LCC.

4.1.5 The standalone M1 J21 / M69 J3 Vissim base year model is currently under development. All general network structure has been coded.

4.1.6 An initial matrix has also been produced using the existing traffic data sources available, and alongside this, a review of general traffic patterns during the peak periods using online traffic mapping information and raw video footage from the traffic survey results.

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4.2 Conclusion

4.2.1 Hydrock has begun developing the Vissim base model network structure, and as part of the review of existing traffic conditions Hydrock seeks discussions with Leicestershire County Council (LCC)and Highways England (HE) to understand their respective views on the following:

- proposed modelled network study area extent; and
- requirements of base model calibration and validation analysis.

4.2.2 To conclude, an agreement with both LCC and HE is urgently sought to ensure Hydrock's proposed M1 J21 / M69 J3 Vissim model network study area and base model validation methodology is acceptable to fully understand, assess and demonstrate the traffic impacts of the HNRFI development.