



Lincolnshire County Council

NORTH HYKEHAM RELIEF ROAD

Local Model Validation Report - Addendum





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UPDATED LINK FLOW VALIDATION SUMMARY

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UPDATED SCREENLINE VALIDATION SUMMARY

APPENDIX C

UPDATED JOURNEY TIME VALIDATION SUMMARY

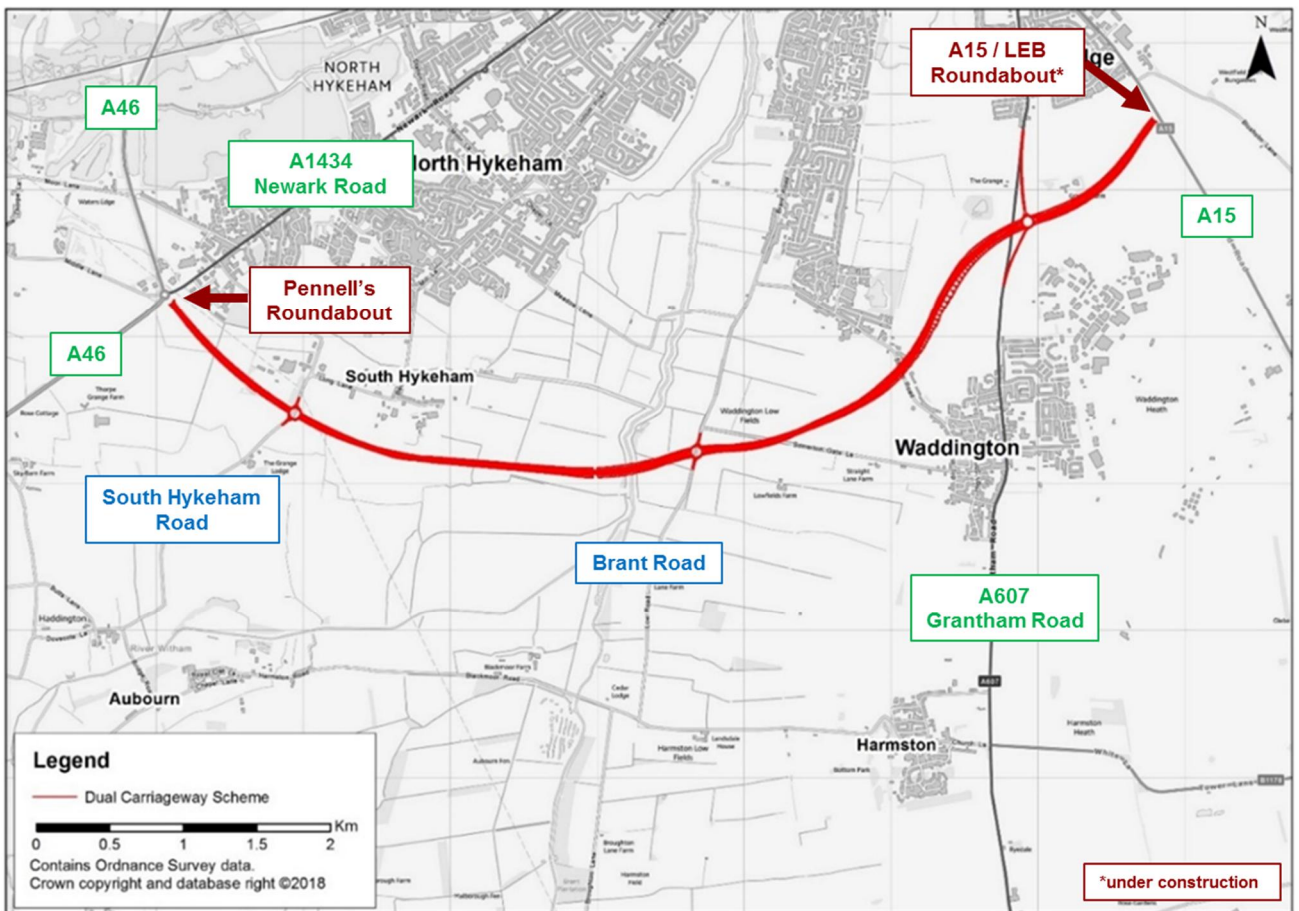
1. INTRODUCTION

1.1. OVERVIEW

Lincolnshire County Council (LCC) is seeking funding to develop and construct the North Hykeham Relief Road (NHRR) scheme.

The proposed NHRR will provide a new link through a predominantly rural area situated to the south of the Lincoln urban area (including Lincoln and North Hykeham). The NHRR will link the existing Western Relief Road (A46) in the west to the A15 Lincoln Eastern Bypass (LEB) currently under construction, in the east. The preferred route alignment of NHRR is shown in Figure 1-1.

Figure 1-1 Preferred NHRR Alignment



Traffic modelling for the scheme is to be undertaken using the Greater Lincoln Traffic Model (GLTM). GLTM was developed in 2017 and validated for a 2016 base year in an average neutral month. It was developed to enable modelling and appraisal of new projects being developed by Lincolnshire County Council (LCC) and its partners.

The development and validation of the GLTM is described in detail in the Local Model Validation Report (LMVR). Prior to the NHRR forecasting a comprehensive review, and consequently minor refinement, has been undertaken on the base model. The review has focussed on the area local to

the scheme to ensure the model is representative of existing conditions and thus suitable for modelling the scheme.

This report details the review and refinements of the Base model. It forms an addendum to, and should be read in conjunction with, the previously referred LMVR.

1.2. STRUCTURE OF THIS REPORT

This LMVR Addendum details the review and refinement of the GLTM Base model. Following on from this introductory chapter, the remainder of the document is structured as follows:

- Chapter 2 sets out the **context** for undertaking the review and how **fitness for purpose** of GLTM will be **assessed**;
- Chapter 3 details the **new data collected** as part of the local model validation exercise;
- Chapter 4 describes the **model review** and **refinements**;
- Chapter 5 reports the updated **model validation results**; and
- Chapter 6 provides a **summary** and **conclusions**.

2. CONTEXT TO BASE MODEL REVIEW

2.1. SCOPE OF BASE MODEL DEVELOPMENT

It was established in 2016 that an updated GLTM would be developed to enable modelling and appraisal for new projects being developed by Lincolnshire County Council (LCC) and its partners.

The Model Specification Report outline four key objectives that the model would form a robust tool for analysis.

- Development management;
- Strategic business case evaluation;
- High level policy evaluation; and
- Tactical measures.

The NHRR study falls within the second objective.

Given the range of intended applications the model development and validation was carried out across a wide area.

2.2. BASE MODEL COVERAGE

GLTM has been developed to provide detailed coverage of Lincoln and North Hykeham, with the simulation area roughly bounded by the existing A46 bypass and the under-construction Lincoln Eastern Bypass. Speed flow curves have been applied in the buffer area which extends to the towns of Gainsborough, Newark, Sleaford and Market Rasen.

The model network is consistent with conditions from November 2016, with respect to various major schemes in Lincoln city centre including East-West Link Road and Transport Hub construction.

The model network coverage is illustrated in Figures 2-1 and 2-2.

Figure 2-1 Highway Network Coverage – Lincoln Urban Area

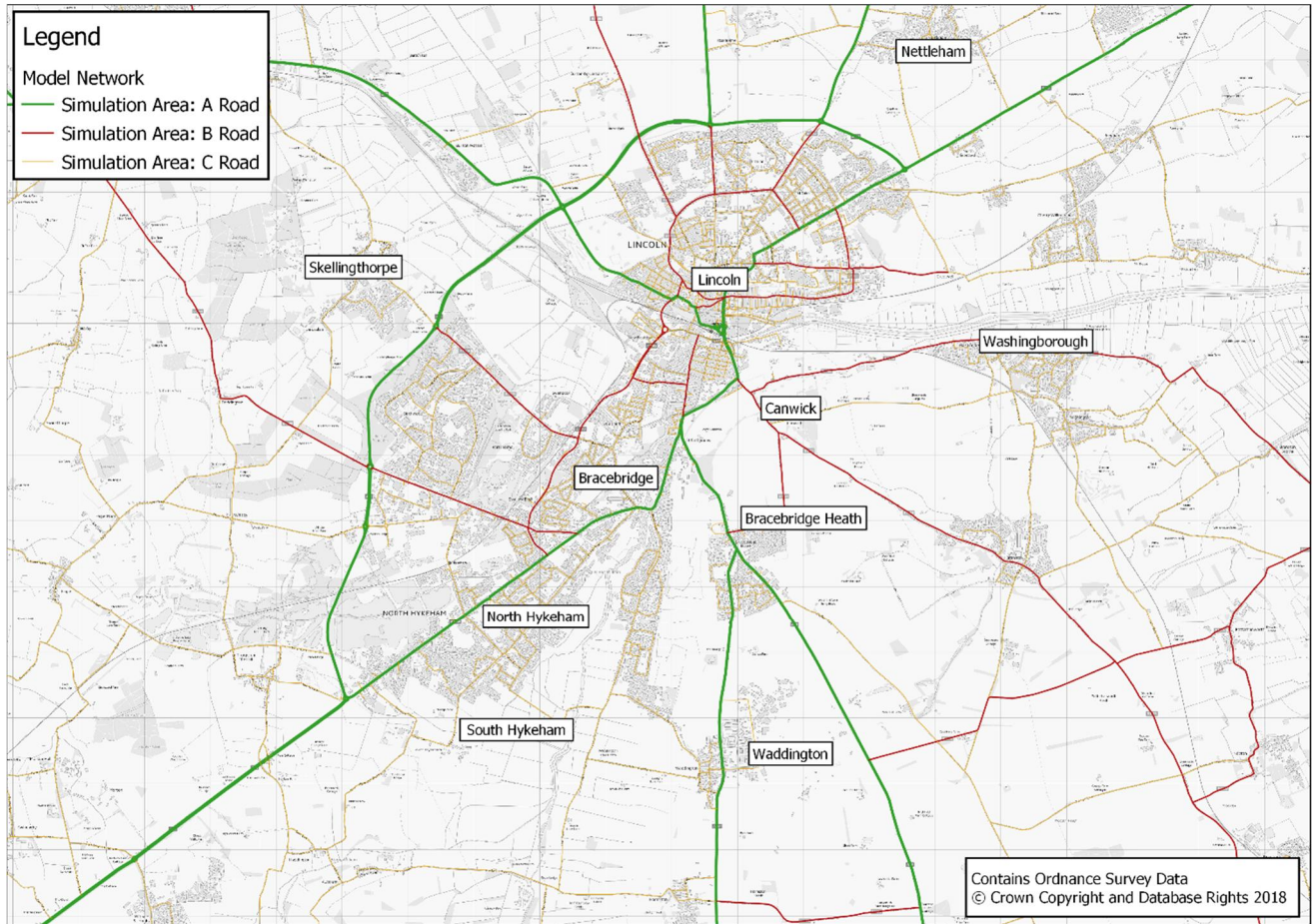
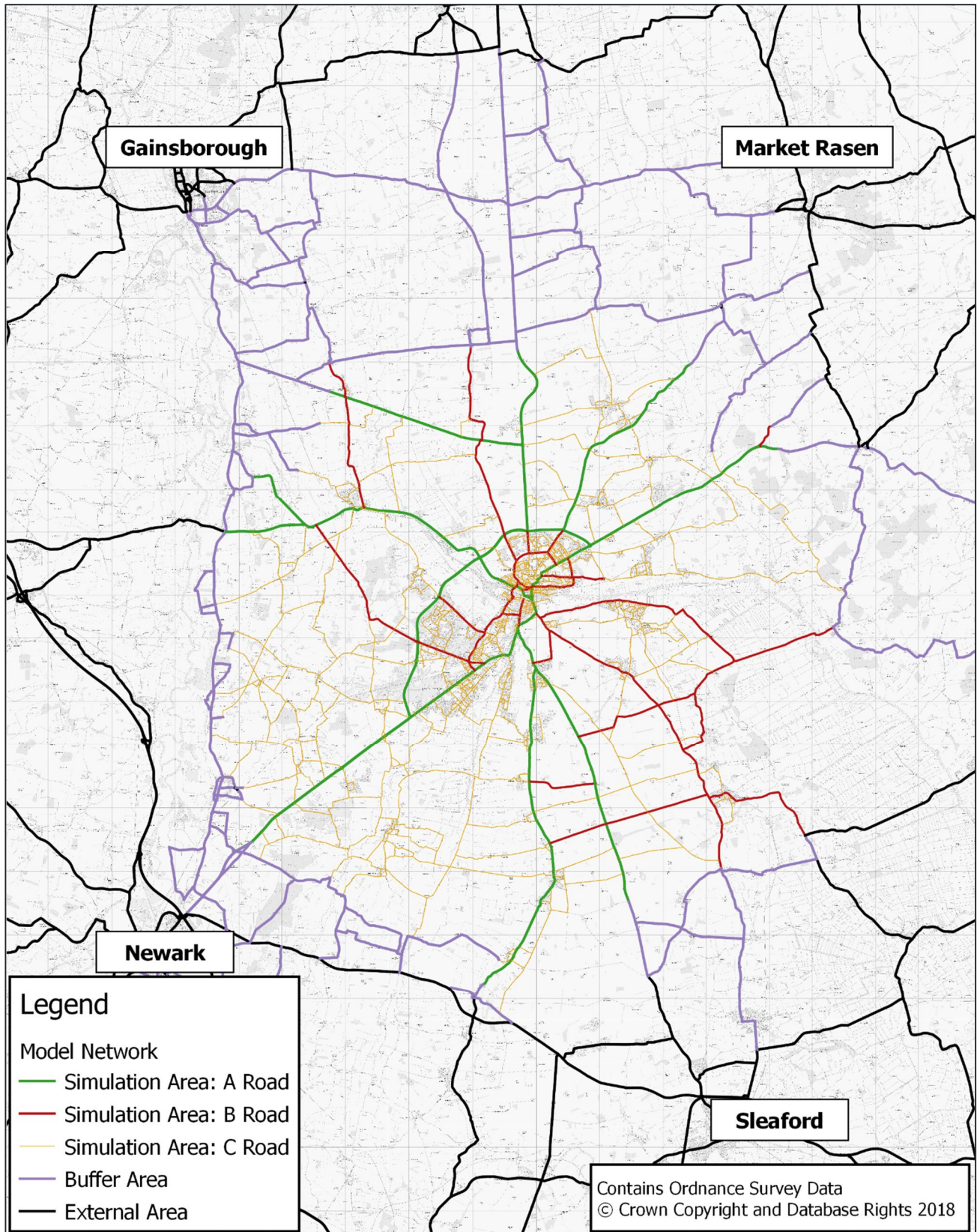


Figure 2-2 Highway Network Coverage – Wider Area



2.3. BASE MODEL VALIDATION

Overall, the model achieves a high level of validation across the fully modelled area exceeding WebTAG criteria for traffic counts and journey time routes. However, this does not guarantee fitness for purpose for any specific study.

The WebTAG validation criteria and GLTM validation results are summarised in turn through Tables 2-1 to 2-6 for screenlines, link counts and journey time routes respectively. The WebTAG criteria are taken from Section 3 of Unit M3-1 Highway Assignment Modelling (January 2014).

The GLTM Local Model Validation Report concludes that the updated model has been developed and validated in line with the purpose of supporting that broad range of applications however fitness for purpose for a specific study is still to be demonstrated on a case by case basis.

Table 2-1 WebTAG Screenline Validation Criteria

Criteria	Acceptability Guideline
Differences between modelled flows and counts should be less than 5% of the counts	All or nearly all screenlines

Table 2-2 Screenline and Cordon Summary

Performance Measure	AM Peak	Inter-Peak	PM Peak
All screenlines and cordons within 5% of observed flows	85%	82%	82%
All screenlines and cordons within 10% of observed flows	100%	100%	97%
All screenlines and cordons within GEH < 4	100%	100%	94%

Table 2-3 WebTAG Link Flow Validation Criteria

Criteria	Description of Criteria	Acceptability Guideline
1	Individual flows within 100 veh/hr of counts for flows less than 700 veh/hr	> 85% of cases
	Individual flows within 15% veh/hr 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
2	GEH < 5 for individual flows	> 85% of cases

Table 2-4 Link Calibration and Validation Summary

Performance Measure	AM Peak	Inter Peak	PM Peak
All Counts (853)			
Pass TAG Flow Criteria	99%	100%	99%
Pass TAG GEH Criteria	96%	96%	94%
Calibration Counts (614, 72%)			
Pass TAG Flow Criteria	100%	100%	100%
Pass TAG GEH Criteria	97%	97%	95%
Validation Counts (239, 28%)			
Pass TAG Flow Criteria	98%	100%	99%
Pass TAG GEH Criteria	91%	94%	93%

Table 2-5 WebTAG Journey Time Validation Criteria

Criteria	Acceptability Guideline
Modelled times along routes should be within 15% of surveyed times (or 1 minute, if higher than 15%)	> 85% of routes

Table 2-6 Journey Time Validation Summary

Performance Measure – 36 bi-directional routes	AM Peak	Inter-Peak	PM Peak
Routes within 15% or 1 min of Observed Times	97%	99%	90%

2.4. FITNESS FOR PURPOSE

It is emphasised by WebTAG Unit M3-1 that fitness for purpose is not determined by global attainment of the WebTAG validation criteria for traffic counts and journey time routes, and neither does failure to attain the global criteria mean that the model is not fit for purpose.

The validation criteria are important but with specific consideration to the key routes and areas of the model which will be impacted by the intervention. Those are the areas where traffic volume and journey time changes will see the largest changes which will impact the most on the outputs from the economic appraisal.

The scheme will provide a new high speed link to the south of the Lincoln urban area connecting the existing A46 orbital route at its western end with the under-construction Lincoln Eastern Bypass at its eastern end which will complete a ring road around the Lincoln urban area.

This will have a wide range of impacts of traffic which are captured in two of the specific objectives for the scheme, arising from the Options Appraisal Report.

- Reduce traffic levels on local and rural roads in the South of Lincoln through the transfer of strategic traffic to more appropriate routes.
- Reduce traffic levels and congestion on the existing orbital network around Lincoln and on key routes through the city.

To give confidence in the outcomes from traffic forecasting and appraisal to support analysis of these impacts, the model must be well specified and validated in those areas. In particular, that includes:

- The local area and roads in the south of the Lincoln urban area to the north of the scheme;
- The rural villages and roads to the south of the scheme; and
- The existing A46 orbital network.

The remainder of this addendum details the review of the model and establishing fitness for purpose for this application.

3. NEW DATA COLLECTION

3.1. OVERVIEW

The GLTM had recently been developed with a large data collection process including:

- Traffic count surveys undertaken in 2016 and 2017 plus some existing traffic count surveys from 2015;
- Journey time data from Trafficmaster with a six month data collection period in 2016; and
- Mobile network data for Vodafone users (provided by Citilogik) collected for a month during November 2016 as the primary demand data source.

The new data collection review was therefore based on establishing if there were any gaps in the existing GLTM traffic count locations or journey time validation routes that would be appropriate for this study.

The process for establishing fitness for purpose was set out in Section 2.4, including the need for the model to demonstrate a high level of validation in the following key locations:

- The local area and roads in the south of the Lincoln urban area to the north of the scheme;
- The rural villages and roads to the south of the scheme; and
- The existing A46 orbital network.

These locations formed the basis of considering the locations and need for additional data.

This chapter describes that process for:

- Traffic counts; and
- Journey time routes.

3.2. TRAFFIC COUNTS

3.2.1. Existing Data Review

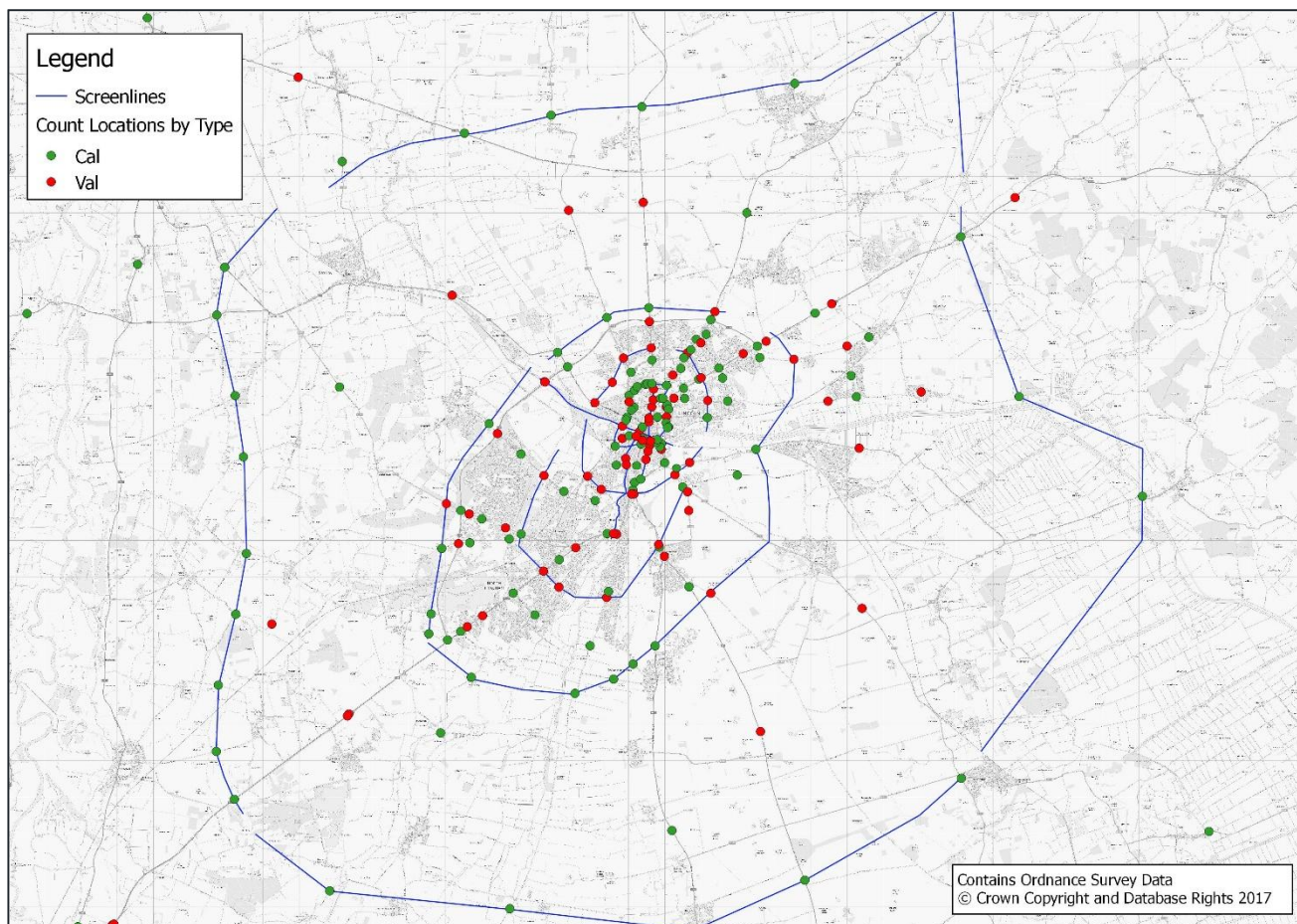
The locations of existing traffic counts and screenlines used in the GLTM model development were reviewed and are mapped in Figure 3-1. The purpose of this was to check if the locations that the scheme is expected to have a significant impact were covered by the existing data collection.

It is observed:

- There is an outer cordon capturing strategic movements into or out of the wider Lincoln transport network;
- There is an inner cordon – defined roughly by the orbital network of the A46, under-construction LEB and proposed NHRR – capturing movements into or out of the Lincoln urban area;
- There are screenlines between the south of the Lincoln urban area and the city centre; and
- There is extensive coverage of counts on key routes including the A46, A15 and A1434 Newark Road, the key radial routes and a dense coverage within the urban areas and city centre.

However, a gap was identified along the route through the villages of Harmston and Aibourn to the south of the NHRR route. This route is particularly important as the transfer of strategic trips from inappropriate rural routes is a key objective of the scheme. This route forms an east-west link between the A46 and A15 for which many trips would be expected to transfer to the NHRR.

Figure 3-1 Existing Traffic Count and Screenline Locations



3.2.2. New Data Collection

Following the review of the existing traffic locations, three additional surveys were commissioned on the route through the villages of Harmston and Aubourn, mapped in Figure 3-2.

This process was undertaken during June 2017 following completion of the GLTM development. Due to project time constraints the surveys were commissioned as one-day manual classified link counts and undertaken at each location on Thursday 5th July 2018. The survey date is at the start of July and so more similar to conditions in June, which is considered neutral by WebTAG, whereas a two-week automatic traffic count was not possible prior to the school holidays.

Given the limitation of a one-day count the three locations were surveyed in parallel so that they would be directly comparable which each other along different sections of route.

The surveys covered the following time periods:

- **AM:** 08:00-09:00;
- **IP:** 11:00-13:00; and
- **PM:** 17:00-18:00.

The time periods are consistent with the GLTM time periods. The 11:00-13:00 period was chosen to represent the inter peak as an analysis of existing survey data identified traffic flows in this period as being most representative of the average IP flow.

The above sites were included in the model validation, detailed in Chapter 5.

Table 3-1 New Traffic Count Survey Locations

Reference	Road	Location
1	Station Road	between Low Road and Harmston
2	Blackmoor Road	between Aubourn and Broughton Lane
3	Tower Lane	between A607 and A15

Figure 3-2 New Traffic Count Survey Locations



3.3. JOURNEY TIME ROUTES

3.3.1. Existing Data Review

Trafficmaster Journey Time (TMJT) is a dataset owned by the Department for Transport (DfT) which is sourced via Global Positioning System (GPS) data gathered from devices and trackers fitted to a variety of fleet vehicles (Cars, LGVs and HGVs) and buses.

Trafficmaster data covering the ITN (integrated transport network) for the whole of Lincolnshire had been obtained for the GLTM development covering six neutral months in 2016 (April, May, June, September, October and November). The ITN coverage includes all A and B roads plus the majority of C roads.

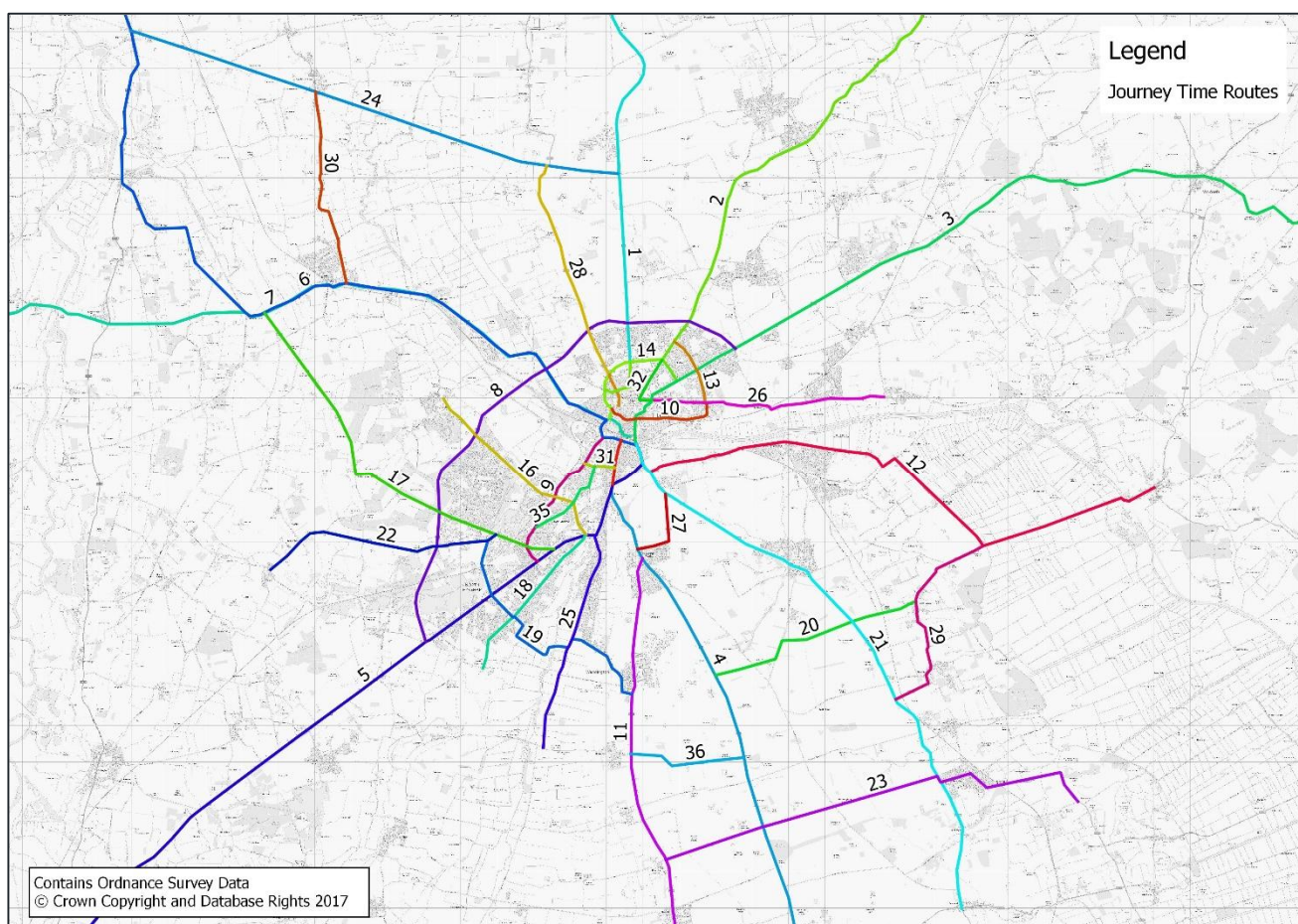
The locations of existing journey time validation routes processed in the GLTM model development were reviewed and are mapped in Figure 3-3. The purpose of this was to check if the locations that the scheme is expected to have a significant impact were covered by the existing defined routes.

It is observed:

- All major routes, including the A46, A15 and A1434 Newark Road, are covered;
- There is extensive coverage of radial routes to and from the Lincoln urban area including the three routes (Routes 11, 18 and 25) to the south which intersect the proposed NHRR – A607 Grantham Road, Brant Road and South Hykeham Road; and
- There is an east-west route (Route 19) through the south of the Lincoln urban area which includes Station Road and Meadow Lane.

Similar to the traffic count data, a gap was identified along the route through the villages of Harmston and Aubourn with only partial coverage east of Harmston (Route 36). In addition, to the west of Pennell’s Roundabout on rural roads that could be used to bypass around the junction.

Figure 3-3 Existing Journey Time Validation Routes



3.3.2. New Data Processing

Following the review of the existing journey time routes additional processing was undertaken for five new routes. These are described in Table 3-2 and mapped in Figure 3-4. The processed observed data is summarised in Table 3-3.

Table 3-2 Additional Journey Time Routes

Route	Description	Comment
37	From A46 to Eagle via Swinderby	This is to check that the route is not too attractive as a rat-run avoiding Pennell's Roundabout, an existing pinchpoint.
38	From A46 to Doddington via Thorpe on the Hill and Whisby	This is to check that the route is not too attractive as a rat-run avoiding Pennell's Roundabout, an existing pinchpoint.
39	From A46 to A15 via Aubourn and Harmston	This will supplement the traffic surveys to provide further assurance for the modelling conclusions presented in this area. The route forms an extension to, and thus replaces, Route 36.
40	South Hykeham Road	This link will be intersected by the NHRR and so will be directly impacted by the scheme.
41	Boundary Lane / Long Lane	These roads provide routes for traffic of which some would be expected to transfer to the proposed NHRR in immediate proximity to the scheme

Figure 3-4 Additional Journey Time Routes

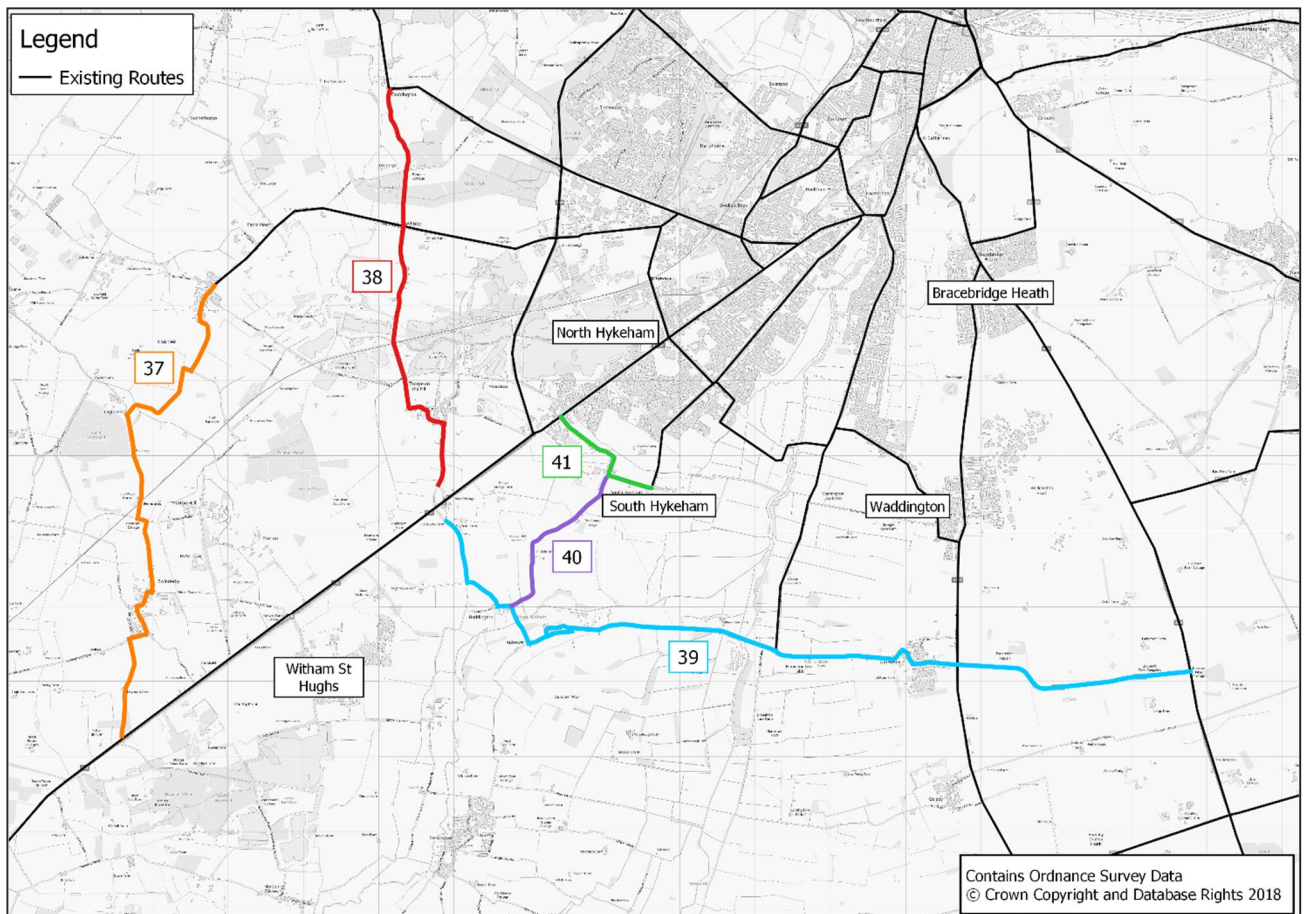


Table 3-3 Additional Journey Time Route Data

Route Number (Direction)	Distance (km)	Obs. Journey Time (mm:ss)		
		AM	IP	PM
Route 37 NB	7.313	09:51	10:06	09:26
Route 37 SB	7.313	10:24	11:01	09:35
Route 38 NB	5.755	06:38	06:16	06:38
Route 38 SB	5.759	06:14	06:30	06:25
Route 39 EB	11.464	12:29	12:03	12:22
Route 39 WB	11.404	11:53	12:02	12:10
Route 40 NB	2.379	02:19	02:29	02:24
Route 40 SB	2.379	02:24	02:28	02:23
Route 41 EB	1.718	01:57	01:58	02:10
Route 41 WB	1.718	02:18	02:12	02:10

4. BASE MODEL REVIEW AND REFINEMENT

4.1. OVERVIEW

This chapter details the base model review and refinements, including:

- Review process; and
- Network changes.

4.2. REVIEW PROCESS

The model coverage was detailed in Section 2.2 and it encompasses a wide area around Lincoln and the existing validation statistics reported in Section 2.3 demonstrate that the model achieves a high level of validation across that area. It also provides sufficient coverage to capture the impacts on strategic and longer distance east-west movements which would be directly affected by the NHRR.

The model has detailed network and zoning coverage within the Lincoln urban area which is bounded by the NHRR alignment and no changes to the network or zoning structure were required.

Given that there were no changes to the model structure combined with the existing high level of validation, it was not proposed to make any changes to the matrix or to re-run matrix estimation.

For the avoidance of doubt, the base year matrices are unchanged from the existing calibrated (post-matrix estimation) matrices.

Based on this, the review concentrated on three key areas with specific consideration for the NHRR. The scope for change was confined to network coding refinements or parameter changes.

- Local flow and journey time validation around North Hykeham, including the radial routes which will intersect with the scheme.
- Key junction coding on major routes (including A46 and A1434 Newark Road).
- Junction coding and link speeds around the rural areas of North Kesteven close to the scheme area, which may be susceptible to rat running.

Chapter 3 described where new traffic data had been obtained to inform this process.

4.3. NETWORK CHANGES

The following amendments were made to the base model as part of the review and refinement, split into two categories:

- A46 roundabouts;
- Speed-flow curves.

These changes arose following the review of the three areas which were defined in Section 4.2 alongside the new data collected which was described in Chapter 3.

4.3.1. A46 Roundabouts

A review of capacity at the A46 / Newark Road 'Pennell's Roundabout' identified that some sections of the circulatory carriageway had been coding as 3 lanes thus resulting in an over estimation of capacity. The proposed scheme would connect in to this roundabout thus it is important it is modelled as accurately as possible. The coding has been amended to reflect the existing 2 lane

circulatory. The original and amended coding of this roundabout is illustrated in Figure 4-1 and Figure 4-2 respectively.

Figure 4-1 Pennel's Roundabout Coding – Original

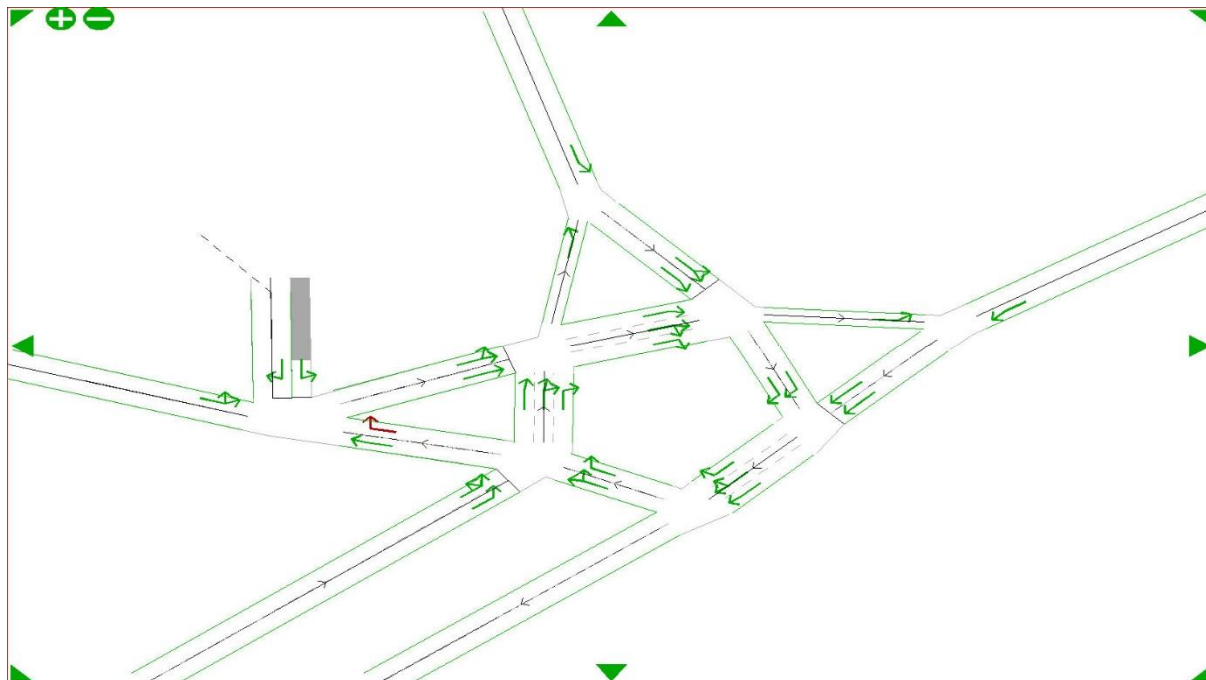
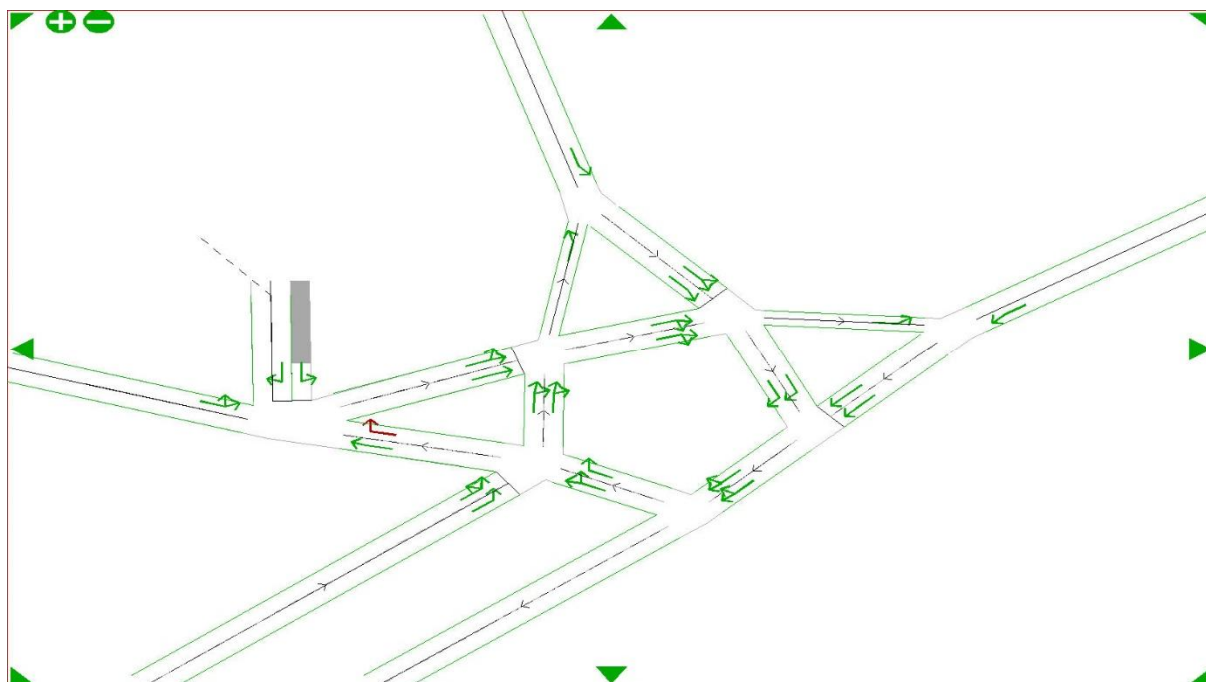


Figure 4-2 Pennel's Roundabout Coding – Updated



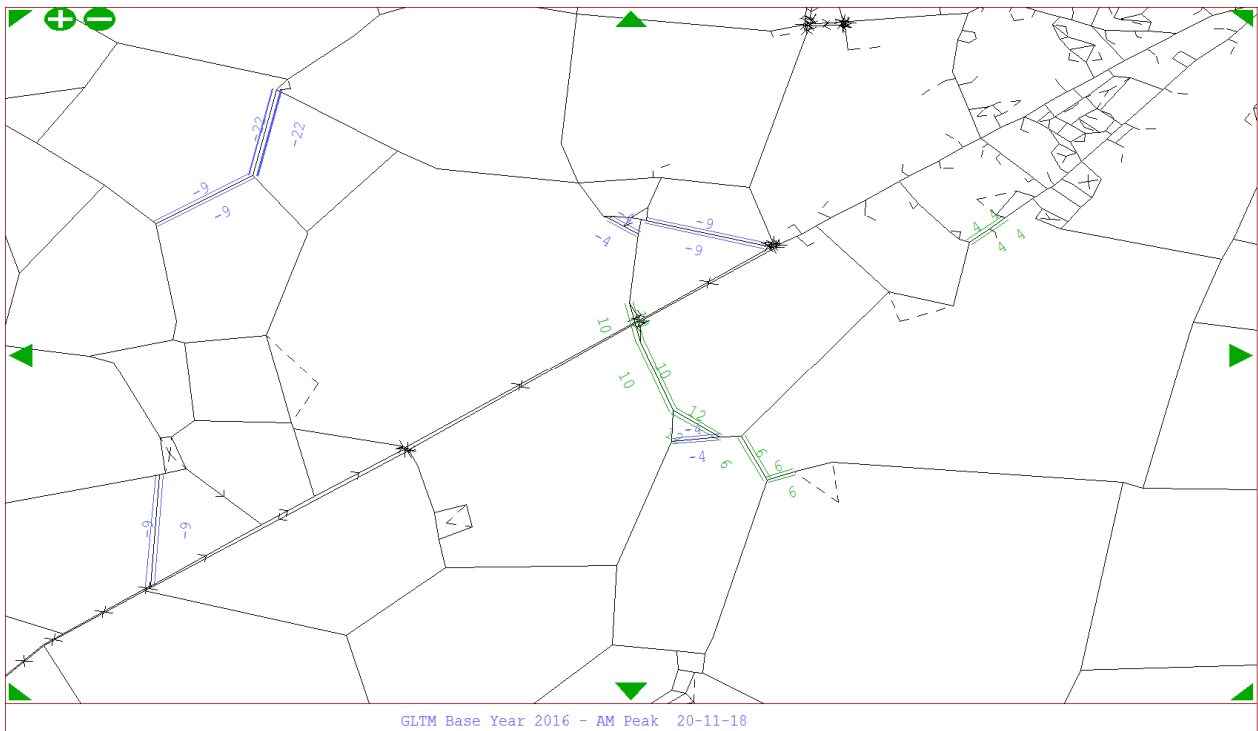
The journey time review identified that modelled journey times were generally quicker than observed times on the northern sections of A46. Upon further investigation, it was noted that all roundabout approaches where a single lane approach flares to a 2-lane entry were coded the same. This was regardless of the length of the flare for example at the Riseholme, Nettleham and Wragby roundabouts where flare lengths vary considerably. In particular the flare lengths on the A46 mainline are lower than the ones on the A15 and Lincoln Road approaches.

The base model coding was amended to reduce the capacity of the short flare A46 entries. This resulted in improved journey time validation on this route as described in Section 5.5.

4.3.2. Speed-Flow Curves

The scheme would be expected to reduce traffic on a number of rural routes. The speed-flow curves on routes in the vicinity of the scheme have thus been reviewed and amended where considered appropriate. This resulted in some minor changes in speed on a small number of links. The differences in free-flow speed between the original and amended base models are illustrated in Figure 4-3.

Figure 4-3 Free-Flow Speed Changes



5. HIGHWAY MODEL VALIDATION

5.1. OVERVIEW

This chapter reports the updated GLTM base year model performance and validation including:

- Assignment convergence;
- Link flow validation; and
- Journey time validation.

This is written with specific reference to:

- The new data collected which was detailed in Chapter 3; and
- The impact on the overall level of validation compared to the original results presented in Chapter 2.3 as a result of the network changes which were described in Section 4.3.

As stated in Section 4.2 matrix estimation was not reran and so the assigned matrices are the same as the original base models. On that basis, the new count data is classified as validation data.

5.2. ASSIGNMENT CONVERGENCE

The WebTAG criteria for convergence and the GLTM parameters were defined in the main LMVR. Table 5-1 presents the convergence statistics for the updated assignments; each model converges well and to WebTAG standards.

Table 5-1 Updated Base Model Assignment Convergence Statistics

AM Peak			Inter-Peak			PM Peak		
Loop	%Flow	%GAP	Loop	%Flow	%GAP	Loop	%Flow	%GAP
20	99.1	0.00091	24	99.1	0.00075	25	99.1	0.00029
21	99.3	0.00020	25	99.3	0.00036	26	99.3	0.00018
22	99.3	0.00033	26	99.6	0.00062	27	99.6	0.00047
23	99.8	0.00017	27	99.6	0.00069	28	99.4	0.00013

5.3. LINK FLOW VALIDATION

The summary statistics for link flow validation of the updated models are reported in Table 5-2. This includes the six additional counts. The overall percentages are very similar to those for the original validation which were reported in Section 2.3 and comfortably exceeds WebTAG criteria in all time periods. Updated GEH and flow difference mapping is attached in Appendix A.

The validation statistics for the new count data are presented separately in Table 5-3. There is good validation in all periods with at least 4 out of 6 counts passing both flow and GEH criteria.

The largest difference is on Blackmoor Road (westbound) in the AM peak only which indicates this may be linked to the demand. Likewise, broken down into vehicle type Station Road (westbound) validates for cars but not HGVs which also suggests this may linked to the demand.

The limitations and confidence for volumetric calculations based on one-day counts were acknowledged in Section 3.2. These links formed a key part of the base model review and were also considered as part of the journey time validation described in Section 5.4 to check and validate the network coding.

Table 5-2 Updated Link Flow Validation Summary – All Counts

Performance Measure	AM Peak	Inter Peak	PM Peak
All Counts (859)			
Pass TAG Flow Criteria	99%	100%	99%
Pass TAG GEH Criteria	95%	96%	94%

Table 5-3 New Count Data Validation Summary – All Vehicles

Time Period	Location	Dir	Mod	Obs	Diff	%Diff	GEH	Pass TAG	
								Flow	GEH
AM Peak	Station Road	EB	301	283	-18	-6%	1.1	✓	✓
	Station Road	WB	432	317	-115	-27%	5.9	x	x
	Blackmoor Road	EB	289	281	-8	-3%	0.5	✓	✓
	Blackmoor Road	WB	413	235	-178	-43%	9.9	x	x
	Tower Lane	EB	230	217	-13	-6%	0.9	✓	✓
	Tower Lane	WB	318	294	-24	-8%	1.4	✓	✓
Inter Peak	Station Road	EB	214	143	-71	-33%	5.3	✓	x
	Station Road	WB	188	160	-28	-15%	2.1	✓	✓
	Blackmoor Road	EB	138	153	15	11%	1.3	✓	✓
	Blackmoor Road	WB	148	181	33	22%	2.6	✓	✓
	Tower Lane	EB	156	111	-45	-29%	3.9	✓	✓
	Tower Lane	WB	138	148	10	7%	0.9	✓	✓
PM Peak	Station Road	EB	396	279	-117	-30%	6.4	x	x
	Station Road	WB	360	259	-101	-28%	5.7	x	x
	Blackmoor Road	EB	450	403	-47	-10%	2.3	✓	✓
	Blackmoor Road	WB	277	281	4	1%	0.2	✓	✓
	Tower Lane	EB	240	195	-45	-19%	3.1	✓	✓
	Tower Lane	WB	278	227	-51	-18%	3.2	✓	✓

The primary purpose of grouping link counts into screenlines and cordons is to validate the trip matrices. There were no changes to the matrices, including no-rerunning of matrix estimation, during this review. In addition, the additional counts were not added to and did not form a new screenline.

The screenline and cordon validation results were confirmed to be very similar to those for the original validation which were reported in Section 2.3; they are tabulated in Appendix B.

5.4. JOURNEY TIME VALIDATION

The summary statistics for journey time route validation of the updated models are reported in Table 5-4. This includes the five additional routes described in Section 3.3. (where Route 39 replaces Route 36). The equivalent reporting for only the additional five routes is summarised in Table 5-5.

In summary:

- As a result of the base model review and network changes described in Section 4.3 all of the new journey time routes validate in every time period.
- This leads to an increase in the overall validation percentages for the AM and Inter Peak compared to the original validation values presented in Section 2.3.
- However, the overall percentage for the PM peak also increases due to improvements for two other routes which now pass the criteria. They are:
 - The A46 clockwise (Route 8) which can be attributed to the junction coding amendments on the A46 described in Section 4.3; and
 - Doddington Road eastbound (Route 17) which crosses the A46 and is in proximity to the area around the new Route 38 and therefore can also be attributed to coding amendments described in Section 4.3.

Overall, the journey time validation has been improved from the original base models in each time period, and in particular the PM peak, as a result of the base model review and additional journey time data.

An updated tabulation of the journey time validation by route is provided in Appendix C.

Table 5-4 Updated Journey Time Validation Summary – All Routes

Performance Measure – 40 bi-directional routes	AM Peak	Inter-Peak	PM Peak
Routes within 15% or 1 min of Observed Times	98%	99%	94%

Table 5-5 New Journey Time Routes Validation Summary

Performance Measure – 5 bi-directional routes	AM Peak	Inter-Peak	PM Peak
Routes within 15% or 1 min of Observed Times	100%	100%	100%

6. SUMMARY AND CONCLUSIONS

6.1. SUMMARY

Lincolnshire County Council is seeking funding to develop the North Hykeham Relief Road (NHRR). The road would link the existing Western Relief Road (A46) in the west to the, currently under construction, A15 Lincoln Eastern Bypass (LEB) in the east.

Traffic modelling for the scheme is to be undertaken using the Greater Lincoln Traffic Model (GLTM). GLTM was developed in 2017 and validated to 2016 traffic conditions. Full details of the model development were presented in the Local Model Validation Report (LMVR), dated April 2017. Prior to the forecast modelling of the NHRR a comprehensive review of the base model was undertaken with amendments made where considered appropriate.

To supplement the original count data additional traffic counts were undertaken at three locations on the east-west route, through the villages of Aurborn and Harmston, to the south of the proposed scheme. Observed journey times were obtained for five additional routes in the vicinity of the scheme. The additional traffic counts and journey times were added to the model validation statistics.

Upon review of the coding of the A46 junction coding the capacities were amended at a number of junctions including Pennell's, Riseholme, Nettleham and Wragby roundabouts. Model speed-flow curves on rural roads in the vicinity of the scheme were also reviewed with some minor changes made.

The amended networks were reassigned with the previously calibrated matrices. The updated validation results showed minimal change with those reported in the LMVR and no further matrix estimation was undertaken.

The updated screenline and link validation results are very similar to those presented in the LMVR. The journey time validation is improved compared to the results presented in the LMVR. In particular journey times on the A46 are closer to observed values. This can be attributed to the junction capacity amendments made to the A46 roundabouts.

6.2. CONCLUSIONS

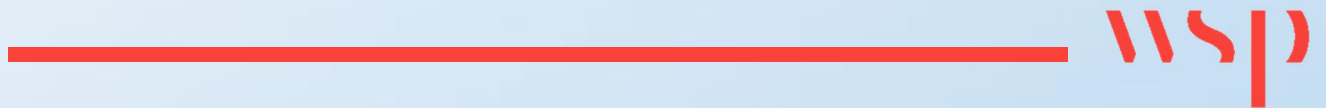
The updated Greater Lincoln Traffic Model was specified and developed in line with the latest WebTAG guidance for the development of strategic transport models. It was validated for a 2016 base year following an extensive collection of new traffic, journey time and travel demand survey data. The highway assignment model has been demonstrated to achieve a high level of validation exceeding WebTAG criteria in both the main GLTM LMVR and this document including the locations where the scheme is expected to have the most significant impacts.

In addition to the highway model, the GLTM suite also includes a well-specified and calibrated variable demand model which is necessary to forecast the impact on demand through changing traveller choices as a result of a scheme such as North Hykeham Relief Road. The public transport assignment model will provide dynamic costs for facilitation of mode shift within the variable demand process.

The GLTM will be used for forecasting and appraisal of the North Hykeham Relief Road.

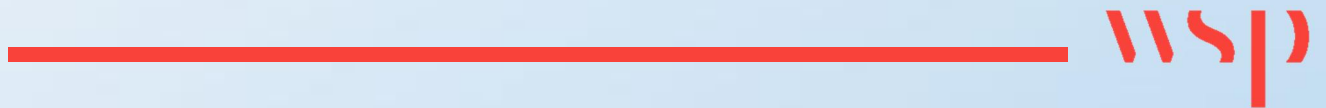
Appendix A

UPDATED LINK FLOW VALIDATION SUMMARY



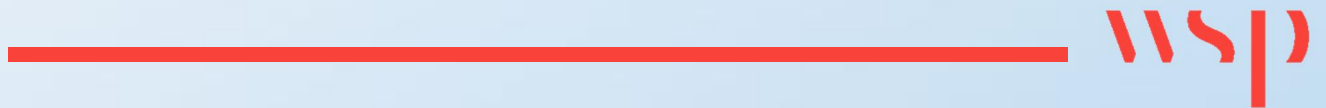
Appendix B

UPDATED SCREENLINE VALIDATION SUMMARY



Appendix C

UPDATED JOURNEY TIME VALIDATION SUMMARY





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