Central Lincolnshire Local Plan Modelling Support

DATE:	February, 2022
SUBJECT:	Model Overview and Impacts
PROJECT:	CLLP Modelling Support

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Review of Local Plan Development Impact

INTRODUCTION

WSP, on behalf of Lincolnshire County Council (LCC), has used the Greater Lincoln Transport Model (GLTM) as an evidence base and tool for modelling the forecast impacts of the draft Central Lincolnshire Local Plan (CLLP).

The draft Plan covers the Districts of Lincoln City, West Lindsey and North Kesteven for the period 2018 to 2040.

This note sets out the traffic modelling methodology and outputs, and is supported by feedback to questions raised by National Highways in relation to impact on the Strategic Road Network.

National Highways reviewed the GLTM base year Local Model Validation Report and Traffic Forecasting Report, shared by LCC, and provided feedback through notes dated 26th October 2021 (Annex 1).

Subsequently, WSP, acting on behalf of LCC, responded to the Traffic Forecasting review along with a technical note, on 15th December, 2021.

This current note replicates the latter and adds the addendum detail that was provided to National Highways (Annex 2) on 14th January, 2022, and the final acceptance of findings confirmed by National Highways (Annex 3) on 15th February, 2022.

GREATER LINCOLN TRANSPORT MODEL (GLTM)

The GLTM was developed in 2017 and validated for a 2016 base year against average 'neutral' month data. There are four primary components to the GLTM, which are:

- **Greater Lincoln Highway Assignment Model (GLHAM)**: A highway assignment model developed within the SATURN (Simulation and Assignment of Traffic in Urban Road Networks) platform to

determine journeys travelling on the highway network, including traffic flows, speed, delays, route choice and journey costs. The model was developed in SATURN version 11.3.12W.

- **Greater Lincoln Public Transport Model (GLPTM)**: A public transport assignment model developed within the CUBE Voyager platform to reflect journeys travelling on public transport routes, including route choice, service patronage and travel costs. The model was developed in CUBE version 6.4.

- **Greater Lincoln Trip End Model (GLTEM)**: A trip end model developed within the CUBE Voyager platform to consider the trip generation impacts of land use changes or shifts in scale and pattern of economic activity.

- **Greater Lincoln Variable Demand Model (GLVDM)**: A variable demand model (VDM) developed within the CUBE Voyager platform to predict the future demand for private vehicle travel through consideration of cost change impacts on distribution and mode split. GLVDM facilitates mode choice between private highway and public transport assignments.

The most recent GLTM forecasts were developed in 2019 for work on developing the Lincoln Transport Strategy (LTS). These forecasts incorporated a highly robust level of traffic growth, including the full quantum of development included in the current CLLP, adopted in 2017.

CLLP FORECAST SCENARIOS

The 2021 draft CLLP contains a later horizon year than the current adopted plan, 2040 compared to 2036. In addition, there are some differences in the residential development allocations.

Given these changes a new GLTM forecast scenario has been developed at the draft CLLP horizon year of 2040. This new model scenario will be used to test the impact of the draft CLLP on the highway network.

Model parameters including generalised costs and traffic growth factors have also been updated using the latest available datasets.

Further details on the proposed methodology regarding the model network, development log and traffic growth factors are presented in the following sections.

MODEL NETWORK

The LTS GLTM forecast networks comprise the Base network plus the following committed / completed major highway schemes:

- Lincoln Eastern Bypass (LEB) – completed 2020;
- Lincoln Transport Hub – completed 2018;
- North East Quadrant supporting network;
- South East Quadrant supporting network;
- Western Growth Corridor supporting network – including new junction on A46; and
- South West Quadrant supporting network.

In addition to the above schemes the new 2040 CLLP forecasts network also include:

- North Hykeham Relief Road (NHRR) – a key transport priority of the CLLP which has been

allocated Outline Business Case, programme Entry DfT funding; and

- Riseholme Roundabout capacity improvements – completed 2020

DEVELOPMENT LOG

The development log for the GLTM was initially developed for forecasting in relation to the NHRR.

The development log was updated for the purpose of LTS testing, primarily to add in the full quantum of development included in the adopted Local Plan.

For the new 2040 CLLP forecast the development log has again been updated to include the revised quantum of development as set out in the draft Local Plan.

The most notable developments within the draft CLLP and development log are the four Sustainable Urban Extensions (SUE) in Lincoln, these being:

- North East Quadrant (NEQ) – 1,400 residential dwellings + 5ha employment;
- South East Quadrant (SEQ) – 3,400 residential dwellings + 7ha employment
- Western Growth Corridor (WGC) – 3,200 residential dwellings + 20ha employment
- South West Quadrant (SWQ) – 1,000 residential dwellings + 5ha employment

Trip generation for the above sites was taken from the relevant Transport Assessment information where available.

Where specific information was not available trip generation was calculated using trip rates.

The total modelled trip generation in 2040 for each of these sites is summarised in Table 1.

Table 1 Lincoln SUE Trip Generation (Vehicles)

Development	AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures
North East Quadrant	358	532	434	345
South East Quadrant	645	1,383	1,222	815
Western Growth Corridor	771	1,668	1,314	980
South West Quadrant	308	390	315	287

The SUE trips have been allocated to dedicated new zones within the forecast model.

The trip ends for all other developments within the detailed model area have been allocated to appropriate existing model zones.

The new trips generated by CLLP sites outside the model simulation area, e.g., Gainsborough and Sleaford, have been accounted for using adjusted traffic growth factors.

TRAFFIC GROWTH FACTORS

In order to provide a robust forecast the traffic growth is required to include the full quantum of development included within the draft CLLP.

This level of growth is considerably beyond that included in the standard National Trip End Model (NTEM) forecasts.

Adjusted National Trip End Model (NTEM) forecasts were therefore derived from the Trip End Model Presentation Program (TEMPro) taking account of the full quantum of development.

The adjusted growth factors were calculated by amending the future year households for each of the Medium Super Output Areas (MSOA) within Lincoln, North Kesteven and West Lindsey.

The adjusted values were based on the quantum of development included within each MSOA within the draft CLLP.

The standard and adjusted parameters for households are presented in Table 2.

The 2016 Base values are also included, and the adjusted parameters are considerably higher than the standard values.

Table 2 Adjusted NTEM Households

MSOA	2016	2040		
	Base	NTEM standard	NTEM adjusted	Difference
Lincoln 001	2789	3207	3281	74
Lincoln 002	3274	3765	3858	93
Lincoln 003	5417	6229	6229	0
Lincoln 004	4958	5701	6709	1008
Lincoln 005	2921	3358	3358	0
Lincoln 006	3293	3786	3786	0
Lincoln 007	3228	3711	3711	0
Lincoln 008	2985	3433	6327	2894
Lincoln 009	3833	4407	4407	0
Lincoln 010	3524	4051	4051	0
Lincoln 011	4845	5570	5570	0
North Kesteven 001	4839	6016	8576	2560
North Kesteven 003	5414	6731	7515	784
North Kesteven 004	4246	5178	5586	408
North Kesteven 005	3776	4695	4695	0
North Kesteven 006	2905	3495	3495	0
North Kesteven 007	3597	4327	4704	377
North Kesteven 008	2526	3140	3140	0
North Kesteven 009	2963	3564	3564	0

North Kesteven 010	4359	5316	6666	1350
North Kesteven 011	3720	4536	5430	894
North Kesteven 012	3775	4542	4542	0
North Kesteven 013	2945	3591	4127	536
North Kesteven 014	3459	4218	4218	0
West Lindsey 001	4249	5050	5050	0
West Lindsey 002	4053	4817	4817	0
West Lindsey 003	4319	5133	5133	0
West Lindsey 004	4731	5695	6443	748
West Lindsey 005	2803	3331	4044	713
West Lindsey 006	3129	3766	3766	0
West Lindsey 007	3292	3912	3912	0
West Lindsey 008	3489	4277	4768	491
West Lindsey 009	2994	3558	3558	0
West Lindsey 010	3275	4014	4014	0
West Lindsey 011	3888	4765	4968	203

The resulting standard and adjusted TEMPro growth factors are presented in Table 3.

The adjusted factors are considerably higher than those using the standard NTEM, demonstrating a robust level of growth has been accounted for.

Table 3 Adjusted NTEM Growth Factors

Time Period	District	Trip End	Standard NTEM	Adjusted NTEM
AM	Lincoln	Origin	19.8%	27.1%
		Destination	17.8%	18.6%
	North Kesteven	Origin	16.6%	27.8%
		Destination	16.7%	18.5%
	West Lindsey	Origin	14.4%	18.7%
		Destination	16.6%	17.4%
PM	Lincoln	Origin	17.4%	20.0%
		Destination	18.5%	22.1%
	North Kesteven	Origin	16.5%	22.1%
		Destination	16.4%	24.8%
	West Lindsey	Origin	16.2%	17.2%
		Destination	14.8%	17.7%

Traffic growth factors for Light Goods Vehicles (LGV's) and Heavy Goods vehicles (HGV's) have been derived from the 2018 Road Traffic Forecasts (RTF) which is produced by the DfT from the National Transport Model (NTM).

The growth factors that have been derived were based on the percentage change in forecast vehicle kilometres per year.

The growth factors used are presented in Table 4.

Table 4 NTM Growth Factors

Region	LGV	HGV
North West	1.351	1.019
North East	1.375	1.004
Wales	1.359	1.018
South West	1.343	1.005
West Midland	1.391	1.033
South East	1.369	1.123
London	1.405	1.016
East England	1.351	1.114
East Midlands	1.370	1.019
Yorkshire and the Humber	1.367	1.032

IMPACT ON A46 JUNCTIONS

The National Highways (NH) letter of 24th August 2021 details a high-level trip generation (TRICS) assessment of the likely impact of the combined proposed allocations on the A46 junctions.

The impacts were presented as total two- way traffic flows across the morning (AM) and evening (PM) peak hours combined.

As a comparison, the total development generated traffic flows at these junctions from the four Lincoln SUE's have been extracted from the model i.e., excluding growth associated with wider geography development.

It should be noted that this is not a direct comparison as it only includes the four Lincoln SUE trips whereas the National Highways analysis includes the full quantum of allocated sites.

Given the total SUE trips are likely to comprise a significant proportion of the total allocation impact at these junctions it is still considered a good indication of the modelled impact of the Local Plan allocations at these locations.

It is of note that the current model includes an additional junction on to the A46 as part of the Western Growth Corridor (WGC) development proposal.

This scheme would be likely to reduce the Western Growth Corridor's impact on the Skellingthorpe Road junction, however it is recognised that at present there uncertainty around its delivery programme.

A sensitivity test has therefore been undertaken which removes the additional A46 junction from the model.

Table 5 therefore presents two sets of results for the Skellingthorpe Road roundabout, both with and without the new WGC junction on the A46.

It is considered that the 'without' scenario is the most comparable to the National Highways (NH) analysis .

Table 5 Development Generated A46 Junction Flows

Ref	A46 Junctions	GLTM AM	GLTM PM	GLTM AM+PM	*NH Estimate AM+PM*	Diff
1	Carholme roundabout	555	545	1,100	1,304	-204
2	Skellingthorpe roundabout with new WGC A46 link	308	279	587	1,517	-930
	Skellingthorpe roundabout without new WGC A46 link	367	502	869	1,517	-648
3	Doddington roundabout	287	248	535	610	-75
4	Whisby roundabout	283	244	527	644	-117
5	Moor Lane	255	213	468	577	-109
6	Hykeham roundabout	364	310	674	733	-59
7	Old Haddington Lane	207	132	339	753	-414
8	Halfway House roundabout	190	123	313	865	-552
9	Green Lane	182	108	290	391	-101
10	Newark Road / Wood Lane	182	108	290	391	-101

Table 5 demonstrates that modelled flows are slightly lower than the National Hi9ghways estimated flows at the Carholme (Ref 1), Doddington (Ref 3), Whisby (Ref 4), Moor Lane (Ref 5), Hykeham (Ref 6), Green Lane (Ref 9) and Newark Road / Wood Lane (Ref 10) junctions.

This can be expected given the model flows presented are for the Lincoln SUEs only whereas the NH analysis comprises the full quantum of CLLP development.

With regard to the Skellingthorpe (Ref 2) junction the model flows are considerably lower than the NH estimated flows although flows are closer when considering the scenario without the new A46 link.

Again, it should be noted that the model flows are presented for the Lincoln SUEs only whereas the NH analysis comprises the full quantum of CLLP development.

More information would be required on the methodology used by National Highways in order to carry out a more detailed analysis of the differences at this location.

The model flows are also considerably lower at the Old Haddington Lane (Ref 7) and Halfway House (Ref 8) junctions compared to the numbers estimated by NH.

Given these junctions are located along the same A46 corridor to the Green Lane (Ref 9) and Newark Road / Wood Lane (Ref 10) junctions it is considered that the impacts would be similar, as per the model flows.

Notwithstanding these findings, it should be noted that the model flows do not take account of flows from the large Witham S^{t} Hughs development, which is located close to these two junctions, and may go some way to explaining the higher flows calculated by National Highways.

More information would be required on the methodology used by National Highways (NH) in order to carry out a more detailed analysis of the differences.

However, it can be seen that using the validated and assured model the forecast traffic impacts are generally smaller than that expected by National Highways.

This can be expected given the model flows presented are for the Lincoln SUEs only whereas the National Highways analysis comprises the full quantum of CLLP development.

SUMMARY

WSP, on behalf of Lincolnshire County Council (LCC), as Highway Authority, has created a new forecast scenario using the Greater Lincoln Transport Model (GLTM) for the purpose of assessing the traffic impacts of the 2022 draft Central Lincolnshire Local Plan (CLLP).

A new forecast year has been created which corresponds with the CLLP horizon year of 2040.

The new 2040 CLLP traffic forecasts include a highly robust traffic growth scenario using adjusted DfT NTEM growth factors to account for the full quantum of proposed development included in the current CLLP.

The GLTM has also been through independent DfT scrutiny and assurance as part of the North Hykeham Relief Road (NHRR) Outline Business Case submission and found to be fit for purpose, meeting Transport Appraisal Guidance (TAG) criteria.

It is considered that the 2040 CLLP model scenario is therefore fit for the purpose of forecasting the traffic impacts of the draft CLLP.

In relation to the Strategic Road Network, National Highways has also reviewed the findings and their responses conclude that,

- the model area coverage is appropriate, along with the methods used
- CLLP and Transport Model forecasts for intermediate years are broadly similar allowing intermediate year forecasts to be used in assessment.
- A Variable Demand Model (VDM) is not critical for National Highways as it does not represent the worst case on the Strategic Road Network (SRN) in terms of operational assessment.

The Greater Lincoln Transport (SATURN) model has been used to test the impacts of the proposed Local Plan development sites and compare these against assumptions made by National Highways for the A46 corridor around Lincoln.

The outputs show changes in traffic predications and the road sections and junctions, that become under stress to the end of Local Plan period.

In general, development traffic is forecast to be less than previously assumed, and with subsequent agreed sensitivity tests there appear no further issues arising from the development changes to those assessed at the publication of the 2017 adopted Local Plan.

The junctions around the A46 are known locations that remain under stress, and both the adopted Local Plan and the 2020 to 2026 Lincoln Transport Strategy identify the key development and road network locations and that will be required to be investigated further, and where necessary impact mitigated, by developers.

It is also noted by National Highways that the GLTM alone is not sufficiently extensive and detailed for testing Local Plan impacts on the A46 between the A1 and A46 Hykeham roundabout given this section falls within the ‘buffer’ zones of the model.

Therefore, as with individual development plots subject to independent Transport Assessments as part of the Planning process, it is recommended that the localised risk associated with appraisal uncertainty is taken into account, and mitigated accordingly, when required.

In summary, the base transport model was considered by National Highways as suitable for assessing current Local Plan development proposals for the Strategic Road Network around North Hykeham and the City of Lincoln.

Annex 1

National Highways Response
Review of GLTM/VDM

(October, 2021)

Project:	Central Lincolnshire Draft Local Plan	**Author:**	Ashish Chadha
Subject:	Central Lincolnshire Local Plan - Review of GLTM Forecasting Report and Variable Demand Model Report	**Reviewed:**	Alan Boyce
Date:	26 October 2021	**Approved:**	Richard White

1. Introduction

National Highways (NH) is currently considering the implications of the updated draft Central Lincolnshire Local Plan (CLLP) 2021 on the SRN. The consultation draft is an update to previously adopted Local Plan (2012-2036), now having a time horizon of 2018-2040.

The Local Plan's strategic aim is to facilitate the delivery of 29,150 new dwellings and the creation of around 24,000 new jobs over the plan period 2018–2040 through allocated sites, distributed as follows:

a. Lincoln Strategy Area – around 64% (18,656) of the total homes and employment land needed, delivered through a combined strategy of (and in priority order):
i. urban regeneration;
ii. sustainable urban extensions to Lincoln; and
iii. growth at settlements which serve, and are serviced by, Lincoln.

b. Gainsborough - around 12% (3,498) of the total homes and employment land delivered through a combined strategy of urban regeneration, sustainable urban extensions and sites at nearby and well-connected villages.
c. Sleaford – around 12% (3,498) of the total homes and employment land needed delivered through, primarily, a strategy of sustainable urban extensions and on urban sites and sites at nearby and well-connected villages.
d. Elsewhere – around 12% (3,498) of the total homes and employment land needed to come forward in settlements elsewhere, primarily located at the market towns well-connected villages and villages with a good range of services present.

NH has been appointed by the Secretary of State for Transport as strategic highway company under the provisions of the Infrastructure Act 2015 and is the highway authority, traffic authority and street authority for the SRN. It is our role to maintain the safe and efficient operation of the SRN whilst acting as a delivery partner to national economic growth. In relation to the Lincolnshire Draft Local Plan, NH's principal interest is in safeguarding the operation of the A46 and A1 Trunk Roads, which route within the area of influence.

To understand the impact of the proposed draft local plan on the wider area including the SRN, Lincolnshire County Council are proposing to use an existing Greater Lincoln Transport Model (GLTM) and the associated reports which were produced in 2018, using the 2017 adopted Local Plan.

The documents summitted to NH for review are the GLTM Traffic Forecasting Report (revision1.1) and a Variable Demand Model Report (revision1.1), both dated 7 June 2018. These documents have been produced to detail the forecasting approach, and assumptions undertaken, to derive a future year model as part of the assessment of impacts of the development, and to provide the network performance results of the impact assessment.

The tables listed overleaf outline the various issues with both documents following NH's review, and the comments made on these matters:

2. Methodology Review

Issues Ranking Criteria				
Accept (A)	**General Observation (GO)**	**More Information (MI)**	**Concern (C)**	**Significant Concern (SC)**
This aspect of the proposal is accepted without modification.	An issue highlighted for information but does not require an action.	An issue where there is insufficient information to determine whether or not something is acceptable.	An issue that should be addressed further but is likely to be resolved by a simple solution.	An issue that is unacceptable and would require work to provide a solution.

GLTM Traffic Forecasting Report - version 1.1

Issue		National Highways Comments	Response/Action
1. Introduction			
1.2	(A)	WSP was commissioned by Lincolnshire County Council (LCC) to develop GLTM to enable modelling and appraisal for new projects being developed by Lincolnshire County Council and its partners. GLTM is a multi-modal model that consists of both highway and public transport components in order to provide a robust tool for analysis and appraisal towards four key objectives defined within the Model Specification Report: 1. Development Management – Testing Developments and mitigation measures for planning applications 2. Strategic Business Case Evaluation – Development of Outline Business Case for Lincoln Southern Bypass 3. High Level Policy Evaluation – Testing Parking policies and Park and Ride facilities 4. Tactical Measures – Testing Network Management including events, air quality and noise assessments GLTM has been constructed as a multi-model model that can model impacts of economic and demographic trends, land use changes, spatial and modal patterns on the transport network. The model is supposed to have ability to assess a wide set of shorter and longer term behavioural responses to policy initiatives.	N/A

		Four main modelling components of the model are: • Greater Lincoln Public Transport Model (GLPTM) which uses CUBE software • Greater Lincoln Highway Assignment Model (GLHAM) which uses SATURN software • Greater Lincoln Trip End Model (GLTEM) which uses CUBE software • Greater Lincoln Variable Demand Model (GLVDM) which uses CUBE software The overall GLTM model structure and software usage seems to be appropriate.	
2. Summary of Base Year Model			
2.1	-	Review of base model is provided separately.	N/A
3. Scenario Definitions			
3.2	(A)	This section sets out the forecasting assumptions applied for the application of GLTM, and the methodology adopted to create the required model forecasts.	N/A
	(SC)	The following forecast scenarios have been produced to the end of the Local Plan period from the base year 2016: • 2021 • 2026 • 2031; & • 2036 The draft local plan has a horizon year of 2040 which is 4 years from the last forecast year available from GLTM. Thus, if 2036 model is used to test the Local Plan for 2040, firstly, it will underrepresent the development trajectory and secondly it will not correctly model the background growth of traffic between 2036 and 2040 and is likely to under or overestimate the congestion on the network. Could evidence be provided how these issues will be taken care of if the existing models are used for the testing the impact of the Local Plan?	We have created a new 2040 forecast scenario for the testing of the updated Local Plan. The forecast uses the latest growth factors and proposed development quantum. Our methodology and the outputs are detailed in the accompanying Technical Note.
3.3.1	**(C)**	Do Minimum - Forecast Demand - Forecast Network As the model forecasts were undertaken in 2018, can it be confirmed that uncertainty of the network schemes coded in the model hasn't changed and no other additional scheme has been identified that would warrant it to be included in the latest networks as per TAG guidance? Can a comparison table be provided showing the trajectory of housing and employment sites used to inform model and the one presented in the latest Draft Central Lincolnshire Local Plan 2021? This needs to be	The Riseholme Roundabout improvements have been included in the 2040 forecast scenario. The quantum of development detailed in the draft CLLP has also been included.

		presented year on year basis from 2012 to 2040, clearly informing what's assumed in the model, Adopted Local Plan and updated 2021 CLLP.	
3.3.2	(MI)	Do Something - Forecast Demand – DM Sites as per Adopted Local Plan 2017 - Forecast Network – DM plus Lincoln Southern Bypass (LSB) Incremental DS from DM is acceptable provided DM models are reasonable. Design for LSB as used in the model was representative of the emerging options. Has this scheme developed further in the past few years and is the emerging design different to the option modelled? NH would like to be reassured that no major changes have emerged on the LSB scheme.	The current proposals for the North Hykeham Relief Road (previously LSB) are still as per the preferred option modelled at the Outline Business Case stage.
4. The Uncertainty Log			
General	(MI)	We have reviewed the Uncertainty Log spreadsheet which includes development sites and infrastructure schemes that have been included in the Saturn GLTM and is based on the adopted Local Plan 2017-2036. We have checked the Uncertainty Log against the draft Local Plan policies and adopted Local Plan and consider that the key sites likely to have an impact on the SRN continue to be relevant and are still included in the draft policies. However, we note that the Uncertainty Log was last updated in June 2018 and therefore some sites are no longer included in the draft Local Plan. Some of these sites may have already come forward and therefore no longer included in the draft Local Plan. It would be useful to have confirmation and a more recent account of these sites. We are likely to recommend that these sites are included as background traffic if a model update is undertaken. We have also noted that the South West Quadrant SUE, Hykeham, Lincoln was initially conceived to be delivered in full by 2036; however, the Draft Local Plan is anticipating that just half (1,000 dwellings) would be delivered during the new plan period (2018-2040). Equally, Gainsborough Southern Neighbourhood SUE was previously proposed to be delivered in full (2,500 dwellings) by 2036. The Draft Local Plan is estimating that only 750 dwellings are likely to be delivered during the new plan period (2018-2040). It would be useful to understand how Central Lincolnshire is anticipating taking this into account as it potentially overestimates the impact of development and highlights the need for improvements that might not be required or sooner than required.	The quantum of development outlined in the draft CLLP has been included in the new 2040 forecast scenario.
4.3	(MI)	This section notes the changes made using the forecast planning data to produce the forecast Core Scenario demand.	See response above.

		Appendix A presents the planning data assumptions for residential and employment sites except urban extension (SUE) incorporated in the GLTM future year models. It is not possible to directly compare this data with the latest uncertainty log that has informed the 2021 draft CLLP. Can this evidence be provided to show that there has been no substantial change in development quantum since the information was used in the GLTM.	
4.3.1	(GO)	Details of four SUE sites within Lincoln are provided in the Traffic Forecasting Report (TFR). Some differences are found when compared with latest draft CLLP 2021 for the final delivery year/2040 for CLLP. 1. South East Quadrant – now 3400 homes instead of 3500 within the TFR 2. South West Quadrant – now 1000 homes instead of 1600 within the TFR As Model estimates higher development for these sites, so additional growth here would lead to less growth elsewhere and this is likely to skew the network conditions/economics for any future scheme testing and possible performance of SRN.	The new 2040 CLLP forecast scenario includes an updated Development Log based on the draft CLLP. This now includes 3,400 and 1,000 dwellings at SEQ and SWQ respectively.
	(GO)	Four additional sites at Gainsborough and Sleaford are included in the model but no further information regarding the quantum of the development is provided in the TFR. It is mentioned that these sites are on the periphery of the buffer network and have been added to the existing zones. It should be noted that model cannot be used to test any local or junction schemes around these areas though it will still be able to inform the wider impacts on the SRN.	The CLLP sites in Gainsborough and Sleaford are included in the updated Development Log however specific trip generation is not included as these locations are outside of the detailed model area. The quantum of development at these locations is taken account of with the adjusted growth factors as detailed in the accompanying Technical Note.
4.3.3	(A)	Development sites classified as 'Near Certain' or 'More than Likely' have been included in the forecast model.	N/A
	(MI)	Trip rates are required to estimate highway traffic generated by the development sites. Values for trips both in and out of the proposed development were estimated using six generic trip rates derived from TRICS database with metropolitan areas removed. These were consistent with those used on previous studies in Lincoln. Whilst NH agrees to the use of generic trip rates within the model for the trip generation, but no evidence could be found underpinning how various land use sub-categories were clubbed together and matched to the development sites. For e.g category Employment-Business is presumably B1, Employment – Industrial is B2 but what is Employment – mixed? On what basis were the developments classified in such categories within Uncertainty Log?	The most recent available data was used to classify each site. Where specific information was available sites were classified at either B1, B2 etc and appropriate trip rates applied accordingly. For many local plan employment sites limited information was available on the make up the development, in these instances mixed trip rates were applied.

	(MI)	The total trip ends for the horizon year 2036 are provided. For intermediate years, the quantum of development was allocated on pro-rata basis. For the SUE sites, the proportions (capped for development allocated up to 2036) were derived. Though NH considers this to be an appropriate approach when the model was developed with the aim for a final forecast year 2036, but this leaves a gap in terms of development quantum between 2036 and 2040 that forms the part of latest draft CLLP. Can evidence be provided to show that overall quantum of the development used to inform the model forecast year 2036 remains broadly similar to the latest CLLP forecast year 2040.	The new 2040 forecast uses the quantum of development from the new draft CLLP.
4.4	(MI)	Are any further changes expected to Table 4-5 and Table 4-6 showing the forecast highway network and PT schemes in light of the latest draft CLLP?	The Riseholme Roundabout scheme has been included in the updated forecasts.
5. Reference Forecast Demand and Supply			
5.1	(A)	Forecasting model structure setup for the demand model is acceptable.	N/A
5.2	**(SC)**	Though reference matrix development process is reasonable, it is not clear how/why NTEM controls are applied in context of the testing the CLLP. NHs view is that for testing future strategy for the emerging development sites an unconstrained scenario should be produced to understand the worst case and then either a mitigation plan could be produced, or alternate sites/quantum can be tested to assess the impact on the network. Can data be shared to show how many trips by each district have been reduced to constraint the CLLP developments to NTEM forecasts?	The Local Plan model scenarios are constrained to adjusted NTEM growth factors to account for the full quantum of development in the CLLP as detailed in the Technical Note. This resulting forecast growth is considerably above that forecast by standard NTEM.
5.2.1	**(C)**	NTEM version used is 7.2 whereas the latest is 7.2c. Main difference being use of Road Traffic Forecasts which has now been updated from 2015 to 2018. This will affect LGV, and HGV growth calculated through NTEM, with HGV growth reduced significantly in RFT 2018 that informs NTEM 7.2c.	RTF 18 has been used to derive the LGV and HGV growth for the new CLLP forecasts.
5.2.2	**(C)**	For the region of East Midlands (as an example), growth of HGV traffic is estimated to be 15% as per Appendix C using NTEM 7.2 which utilises RFT 2015 data. A quick comparison with the RTF 2018 shows that this figure should be near to 2% for RTF 2018 reference scenario 1. Additional HGV traffic is likely to present the skewed results on the SRN, though it could be argued that it will present a conservative view of the level of congestion with higher number of HGVs on the network in the forecast years.	See response above.
5.2.3	(A)	Trip distribution using Gravity Model shows a good match of the observed and modelled data. Rail trip length distribution charts shows some variation in observed and modelled data but broadly follows the same pattern.	N/A

5.3.2	(GO)	Fixed speed approach used for the model area outside the simulation network is acceptable though it is noted that with updated RTF 18, these speeds will vary slightly but the impact is expected to be limited.	The new 2040 CLLP models have incorporated the latest RTF 18 dataset.
5.3.3	(MI)	Forecast generalised cost parameters are derived using July 2017 Databook which is superseded. This may affect the route choice of the trips based on changes in value of time and vehicle operating costs. NHs view is that a simple sensitivity test with updated generalised cost parameters should be carried out to understand the changes in routings by using the latest Databook.	The new CLLP forecast scenarios use generalised costs from the latest WebTAG databook.
6. Variable Demand Forecasts			
6.1	(GO)	GLVDM employs a pivot-point model which uses incremental cost changes to derive changes in demand from a reference trip matrix. It has been calibrated to predict the key traveller responses of: - Mode choice (between highway and PT); and - Destination choice (a change of origin and/or destination). It does not predict change in travel behaviour for: - Heavy goods vehicles (HGVs); and - Light goods vehicles (LGVs). It is noted that VDM doesn't include frequency changes or demand switches between different time periods but overall area of influence for the VDM is appropriate. Lack of frequency choice or time switch will provide a conservative estimate of the network performance.	Noted.
6.1.3	(A)	VDM convergence gap value of less than 0.05% is achieved for all the model years.	N/A
6.2	(GO)	VDM response show that trips are increasing slightly in the Highway matrices and reducing in PT matrices post VDM runs. This is true across all the forecast years. It is not possible to pinpoint the cause of this increase, but possible reason could be number of network schemes in the DM scenario providing more capacity when compared with the additional demand which makes Highways a little more attractive than PT in the forecast year.	It should be noted that the GLTM forecast scenarios include the Lincoln Eastern Bypass which considerably increases highway capacity compared to the Base model.
7. Assignment Results			
7.1-7.3	(A)	Highways model assignment convergence statistics and simulation network statistics are as expected except for increase in average speeds between 2016 base and 2021 DM. Report mentions this is due to higher capacity and improved speed due to Lincoln Eastern bypass.	N/A
7.4	(MI)	It is noted that Figure 7-7 and Figure 7-10 are the same except for the labels. One of them needs to be updated. Other than that flow differences between base, DM and DS are all reasonable.	This is an error in the original Forecast Report. The AM flows are presented in both images.
8. Summary			
8.1	-	A summary of the above is provided. No comment necessary.	N/A

GLTM Variable Demand Model Report - version 1.1

Issue		National Highways Comments	Response/Action
1. Introduction			
1.2	(A)	A summary provided similar to forecasting report. No comment necessary.	N/A
2. Need for Variable Demand Model			
2.1	(GO)	NH agrees with the need for a VDM setup to assess large scale changes in the demand and supply. It is noted that the demand response is restricted to mode choice and distribution. Frequency of trips and time of the day choice is not modelled, but the impact of these choices would be limited to mainly 'others' user class and thus is likely to be minimal. Area of influence for forecasting/VDM seems to be appropriate covering nearly all the developments within the CLLP.	Noted.
3. Model Form and Choice Responses			
3.1 – 3.2	(A)	Model structure consists of following elements which looks appropriate: 1. Trip End Model in CUBE 2. VDM in CUBE 3. Highways Model in SATURN 4. PT Model in CUBE GLVDM employs a pivot-point model which uses incremental cost changes to derive changes in demand from a reference trip matrix.	N/A
3.3.2-3.4.4	(GO)	It is noted that: 1. Frequency Choice is not invoked as base model VDM was calibrated without it. 2. Mode choice is applied to all car users instead of those who have car available. This is because Lincolnshire has about 91.3% person trips made by car. 3. Time of the day choice is not used as trips are mainly local and network is not significantly congested. 4. For destination choice, commute trips are doubly constrained, and business/others are singly constrained.	Noted.

Issue		National Highways Comments	Response/Action
3.5-3.6	(A)	Demand model uses PA matrices for home-based trips and OD matrices for rest of the user classes. Base year PA matrices were created using mobile phone data, validated base year model and NTS surveys.	N/A
3.7	(GO)	Demand model is run for 24 hours at PA level and peak hours for AM, IP and PM. PT model runs for average peak hours and loops back to the VDM. This is due to flow profile for the PT passengers having a large variation in peak period.	Noted.
3.8	(A)	The LGV and HGV origin and destination matrices are not subjected to the choice model but are included within the assignment process and contribute to overall travel costs.	N/A
4. Variable Demand Model Methodology			
4.1 - 4.5	(A)	Conversion of OD to PA matrices and use of incremental modelling is per TAG guidance. Cost damping application is appropriate with k = 30 kms and α less than 1.	N/A
5. Base Year Realism Testing			
5.2	(C)	Generalised costs used in the base and forecast models including changes applied for elasticity testing are based on 2016 Databook which has been superseded. Thus, using the latest values will affect the calibration of VDM due to changes in generalised costs. A sensitivity tests should be undertaken using the latest Databook to calculate the updated elasticity for the realism test and show that existing VDM is plausible.	Updated realism tests have been undertaken using the updated WebTAG databook values.
5.3	(A)	Car Fuel elasticity values are within TAG guidance (UNIT M2.1) range with Business near to -0.1, Others close to -0.4 and commuters near to the average.	N/A
	(A)	Calibration factors used in mode and destination choice for Car Fuel elasticity tests are within the TAG guidance range and outturn elasticates are appropriate.	N/A
5.4	(GO)	PT fare elasticity values are suitable though it is noted that PT elasticity for business is outside the lower side, making this less attractive. But as this user class only represents a small component of the local PT market in Lincoln this is acceptable.	N/A
5.5	(MI)	Car Journey Time elasticities are less than -2.0 as suggested by TAG. But, no explanation is provided why in some cases it is positive rather than negative?	There are a couple of reasons to explain this: Car demand is significantly larger than PT demand, which is considerably less than the national average in the model area which has limited PT coverage. Therefore, mode share change in response to changes in car journey times may not be large as the main effects of this are

Issue		National Highways Comments	Response/Action
			primarily toward changes in destination choice and time choice and as a result of large car demand. Secondly, from the sectoral analysis, there is large reductions in car demand for long distance trips but an increase in short distance trips. Long distance trips normally mean longer travel times relative to short distance trips, so with an increase in travel time by 20%, long distance trips would be significantly more affected by the change and therefore result in a reduction in car demand. Short distance trips, however, often in highly congested urban areas, mean limited route choice is available, therefore not many savings can be made using alternative routes versus long distance trips. As such we see larger changes in costs in the long-distance trips relative to short distance trips, thus redistributing trips toward the urban areas. That is why you may/will see an increase in short distance trips, a reduction in the long-distance trips but at the overall level (model wide) there will not be significant change.
5.6	(A)	Results of sensitivity analysis are as expected.	N/A
6. Summary			
6.1	-	A summary of the above is provided. No comment necessary.	N/A

3. Summary

The forecasting report sets out the methodology for deriving the forecast models for Lincolnshire utilising the 2017 Adopted Central Lincolnshire Local Plan and presents the model results of this assessment. This is substantiated with the Variable Demand Model report. It is noted that Lincolnshire County Council wants to utilise the outputs from this model to provide evidence for their draft 2021 Central Lincolnshire Local Plan.

There are several points to be noted, which are NH's main concerns:

1. The model forecasts themselves were TAG compliant when they were produced in June 2018, but the current guidance has been updated since this time, including Databook, RTF 2018 and NTEM. It is noted that the models themselves were not developed for testing long term strategies or the local plan but utilised the adopted 2017 local plan to test various area wide schemes, the main one being the Lincoln Eastern Bypass.
2. The adopted local plan that informed the model was for the 2012 - 2036 time period, whereas the latest draft plan runs between 2018 - 2040. Therefore, without further evidence it is difficult to conclude that the underlying development assumptions have remained the same on a year-by-year basis, as they cover different time periods. Clarity on this matter is therefore required.
3. The last model forecast year is 2036 whereas the horizon year for the CLLP is 2040. Therefore, even if there is no change in the emerging development sites, there will still be an increase in the background traffic on the network.
4. The model has been constrained to the NTEM growth forecasts. For testing the future strategy for the emerging development sites, an unconstrained scenario should be produced to understand the worst case, and then either a mitigation plan could be produced, or alternate sites/quantum could be tested to assess the impact on the network, to derive a suitable long-term plan.
5. HGV growth using RTF 15 is an overestimate when compared with the latest RTF 2018. This should be reviewed and amended.
6. The Variable Demand model structure and responses are appropriate, though the calculations of the generalised cost are now superseded with the latest guidance. This may have a material impact on the wider network.

Therefore, although NH finds the model area coverage appropriate to understand the impact on the SRN, mainly the A46 junctions around Lincoln, but due to the issues listed above, NH is not yet in a position to provide its consent on the usage of the forecast model as it stands.

We have provided some comments above which can be used to address the issues in the forecast model and await further dialogue with the LPA on these matters.

Annex 2

Clarification Questions
National Highways Review of Forecasting Report

(January, 2022)

Project: Central Lincolnshire Draft Local Plan	**Author:** Ashish Chadha
Subject: National Highways Review of Forecasting Report	**Reviewed:** Alan Boyce/ Andrea Botero
Date: 14 January 2022	**Approved:** Sunil Gogna

1. Introduction

National Highways is currently considering the implications of the updated draft Central Lincolnshire Local Plan (CLLP) 2021 on the SRN. The consultation draft is an update to the previously adopted Local Plan (2012-2036), now having a time horizon of 2018-2040.

The Local Plan's strategic aim is to facilitate the delivery of 29,150 new dwellings and the creation of around 24,000 new jobs over the plan period 2018–2040 through allocated sites, distributed as follows:

a. Lincoln Strategy Area – around 64% (18,656) of the total homes and employment land needed, delivered through a combined strategy of (and in priority order):
   i. urban regeneration;
   ii. sustainable urban extensions to Lincoln; and
   iii. growth at settlements which serve, and are serviced by, Lincoln.
b. Gainsborough – around 12% (3,498) of the total homes and employment land delivered through a combined strategy of urban regeneration, sustainable urban extensions and sites at nearby and well-connected villages.
c. Sleaford – around 12% (3,498) of the total homes and employment land needed delivered through, primarily, a strategy of sustainable urban extensions and on urban sites and sites at nearby and well-connected villages.
d. Elsewhere – around 12% (3,498) of the total homes and employment land needed to come forward in settlements elsewhere, primarily located at the market towns well-connected villages and villages with a good range of services present.

National Highways has been appointed by the Secretary of State for Transport as strategic highway company under the provisions of the Infrastructure Act 2015 and is the highway authority, traffic authority and street authority for the Strategic Road Network (SRN). It is our role to maintain the safe and efficient operation of the SRN whilst acting as a delivery partner to national economic growth. In relation to the Lincolnshire Draft Local Plan, National Highways' principal interest is in safeguarding the operation of the A46 and A1 Trunk Roads, which route within the area of influence.

To understand the impact of the proposed draft local plan on the wider area including the SRN, Lincolnshire County Council (LCC) is proposing to use the existing Greater Lincoln Transport Model (GLTM) and the associated reports which were produced in 2018, using the 2017 adopted Local Plan.

National Highways reviewed the GLTM base year Local Model Validation Report and Traffic Forecasting Report, shared by LCC, and provided feedback through two notes dated 26 October 2021. Subsequently, WSP, acting on behalf of LCC, responded to the Traffic Forecasting review along with a technical note, 'CLLP Modelling Support - Technical Note Dec 2021 v1.0.pdf' providing supporting evidence.

Please see our responses to the proposed actions by WSP for addressing the issues that National Highways raised earlier. Note, we have only responded to comments where we had a concern or other relevant items that need further considerations.

2. Comments Relating to GLTM Traffic Forecasting Report - Version 1.1

Issue 3.2 – National Highways is happy with the proposed solution of creating a 2040 forecast year using the latest growth factors and development quantum. Method and outputs are subject to comments provided regarding the additional technical note shared.

WSP Response: Noted, no other action understood to be required.

Issue 3.3.1 – We understand that Riseholme Roundabout improvements is the only additional network scheme that has now been included in the traffic forecast. We believe this has been confirmed with LCC and that there is no other scheme that warrants inclusion as per TAG guidance.

WSP Response: Noted, no other action understood to be required.

Development Quantum – While the response confirms that the latest CLLP quantum is now included in the 2040 forecasts, it would still be a useful exercise to share the development trajectory used in various models by year compared against the latest CLLP for National Highways to understand the level of deviation in the intermediate models, if those are to be used to inform the study.

WSP Response: Please see the response below.

Issue 4.3 – While the latest 2040 model is expected to be representing the latest development quantum/trajectory, there are still likely to be some discrepancies in the intermediate years. As mentioned above, an analysis comparing modelled development assumptions and the latest CLLP for intermediate years would be beneficial.

WSP Response: The Central Lincolnshire Local Plan (CLLP) modelling has been undertaken for the year 2040. The earlier modelled years of the Greater Lincoln Traffic Model included the latest forecast year of 2036. The 2036 forecasts assumed that the developments were fully completed. Therefore the 2036 trips are comparable with the updated 2040 development trips. The updated 2040 trips are the same as for the 2036 trips for the North East Quadrant and Western Growth Corridor, while those for the South East Quadrant and South Western Quadrant have been revised. The Sustainable Urban Extensions (SUEs) represent the largest development allocations within the CLLP area.

The changes are summarised in the below table.

Table 1 – Development Assumptions for 2040 CLLP compared with 2036 GLTM

Development	2036 GLTM assumptions (source: GLTM Traffic Forecasting Report)	2040 Central Lincolnshire Draft Plan update (source: CLLP Modelling Support)
North East Quadrant	1,400 residential dwellings + 5ha employment	1,400 residential dwellings + 5ha employment
South East Quadrant	3,500 residential dwellings + 7ha employment	3,400 residential dwellings + 7ha employment
Western Growth Corridor	3,200 residential dwellings + 20ha employment	3,200 residential dwellings + 20ha employment
South Western Quadrant	1,600 residential dwellings + 5ha employment	1,000 residential dwellings + 5ha employment

Issue 4.3.1 – Accepted for SEQ and SWQ development. Whilst inclusion of Gainsborough and Sleaford developments using adjusted growth factors is welcome, without actual trip generation it will only assure the overall trip ends, so the model should not be used for testing individual schemes within Gainsborough and Sleaford, though it can still be used for CLLP tests.

WSP Response: Agree, WSP use separate area models which have been developed for Gainsborough and Sleaford and these are used to test individual sites within the vicinity of these towns.

Issue 4.3.3 – Please provide TRICS summary for mixed trip rates to National Highways to show the sites used and the resultant trip rates.

WSP Response: Lincolnshire County Council approved the trip rates and trip generation initially applied to the SUE developments. The Western Growth Corridor trip generations were initially obtained from the approved Transport Assessment Scoping document (AECOM, October, 2017). The generated trips generated are given in Table 2.

Table 2 - Western Growth Corridor Trips

Scheme Element	Rate Basis	AM Arrivals	AM Departures	PM Arrivals	PM Departures
Residential	3,200 dwellings	445	1,484	1,109	652
School	200 students	41	46	3	6
Commercial	40,000m2	222	70	36	183
Hotel	120 beds	12	17	16	13
10 Pin Bowling	24 lanes	0	0	30	32
Gym and Spa	1.85 area	21	17	50	50
Sports Hall and Swimming Pool	0.81 area	20	24	60	34
Football Stadium		10	10	10	10
Total		**771**	**1,668**	**1,314**	**980**

The trip rates for the South Eastern Quadrant were calculated from data in the South East Quadrant Modelling Report (March, 2016). That report provided trip rates based on an estimate of 3,500 dwellings. The commercial facilities were expected to only generate internal trips and therefore did not contribute to the total trip.

Table 3 – Western Growth Corridor Trips

Land Use	AM Arrivals	AM Departures	PM Arrivals	PM Departures
Residential (3,500 dwellings)	516	1,291	1,159	693
Commercial	114	55	30	102
Total	630	1,345	1,189	795
Derived Residential Trip Rates	**0.147**	**0.369**	**0.331**	**0.198**

The trip rates used for the South West Quadrant and the North East Quadrant and South West Quadrant used in the 2040 CLLP model are consistent with the Greater Lincoln Transport Model Forecasting Report (LCC, April 2018). They are shown in the Table 4.

Table 4 – Trip Rates in GLTM applicable to CLLP trips for SWQ and NEQ

Land Use	Car Origins	Car Destinations	LGV Origins	LGV Destinations	HGV Origins	HGV Destinations
AM PEAK						
Residential - Houses	0.334	0.106	0.022	0.021	0	0
Residential - Mixed	0.266	0.116	0.013	0.017	0	0.004
Residential - Flats	0.166	0.062	0.01	0.006	0.003	0.003
Employment - Business	0.137	1.435	0.047	0.074	0.003	0.006
Employment - Industrial	0.053	0.252	0.087	0.072	0.013	0.003
Employment - Mixed	0.094	0.826	0.068	0.073	0.008	0.004
PM PEAK						
Residential - Houses	0.137	0.27	0.009	0.028	0	0
Residential - Mixed	0.189	0.27	0.021	0.03	0	0
Residential - Flats	0.13	0.221	0.006	0.01	0	0
Employment - Business	1.07	0.103	0.029	0.011	0.003	0.002
Employment - Industrial	0.291	0.037	0.034	0.014	0.003	0
Employment - Mixed	0.669	0.069	0.032	0.013	0.003	0.001

A check was completed comparing household trip rates between 2018 and 2021 which shows little variation and therefore for consistency the agreed rates were retained.

Table 5 illustrates 2022 trip rates for aggregate vehicles classes. It can be seen that there is little variation in the main dwelling types. As such the approved trip rates have been used for consistency and the development quantum has been changed to estimate the forecast trips.

Table 5 – Aggregate Household trip rates – TRICS 2022

Land Use	Car Origins	Car Destinations	LGV Origins	LGV Destinations	HGV Origins	HGV Destinations
AM PEAK						
Residential - Houses	0.344	0.109	0.022	0.017	0.002	0.003
Residential - Mixed	0.27	0.097	0.013	0.01	0,000	0.001
Residential - Flats	0.117	0.032	0.006	0.005	0.001	0.001
Employment - Office	0.067	0.734	0.016	0.021	0.003	0.003
Employment - Industrial	0.033	0.15	0.039	0.042	0.01	0.012
Employment - Business Park	0.088	1	0.017	0.03	0.003	0.003
PM PEAK						
Residential - Houses	0.155	0.316	0.014	0.027	0.001	0.001
Residential - Mixed	0.12	0.223	0.008	0.016	0.001	0.001
Residential - Flats	0.051	0.105	0.004	0.006	0.001	0.001
Employment - Office	0.659	0.058	0.011	0.007	0	0
Employment - Industrial	0.149	0.044	0.023	0.013	0.005	0.006
Employment - Business Park	0.8	0.08	0.017	0.006	0.002	0.001

Issues 5.2 – Accepted, subject to review of the additional Technical Note and correct usage of constraining process using alternate growth scenario within TEMPro. Without any more details, National Highways cannot comment that this process has been used correctly.

WSP Response: Noted, no other action understood to be required.

Issue 5.2.1 – Accepted

WSP Response: Noted, no other action understood to be required.

Issue 5.2.2 – Accepted

WSP Response: Noted, no other action understood to be required.

Issue 5.3.3 – Please inform the Databook version used

WSP Response: The TAG databook version 1.15, released in May 2021 has been used for the Central Lincolnshire Local Plan year 2040 modelling as it was the most recent at the time of undertaking the forecasts. The latest version of the databook, version 1.17, was released in November 2021. The Values of time and Values of Distance are compared between the two versions below.

Table 6 – TAG databook Values of Time in 2040 (pence per minute, resource costs, Table A1.3.2)

Databook Version	Car Employer Business	Car Commuting	Car Other Uses
Version 1.15 May 2021	21.06	11.68	5.33
Version 1.17 Nov 2021	21.28	11.98	5.47
Difference	**0.12**	**0.30**	**0.14**

Table 7 – TAG Databook Fuel Costs in 2040 (pence per litre, resource costs, Table A1.3.7)

Databook Version	Petrol	Diesel
Version 1.15 May 2021	42.99	47.00
Version 1.17 Nov 2021	42.92	46.34
Difference	**0.07**	**0.66**

Tables 6 and 7 show that the differences in values for the year 2040 between the two databooks is very small. Therefore, the databook version used is unlikely to have a significant impact on the modelling results. recent modelling of other schemes has shown that the change of databook version does not have a significant impact on traffic flows (less than 1%).

3. **GLTM Variable Demand Model Report - Version 1.1**

Issue 5.2 – Accepted, subject to sharing appropriate elasticity results.

WSP Response: Noted, the outputs are all fixed demand forecasts, and no Variable Demand Modelling (VDM) has been requested for Local Plan testing at this time. In Local plan context this is not needed.

Issue 5.5 – Explanation for low elasticity due to lack of Public Transport and dependency on cars is plausible though it does not provide further evidence on why an increase in Journey Time will lead to a slight increase in Business trips in the AM. Overall the elasticity values for cars are within TAG guidance for each of the peak periods, therefore we consider this acceptable.

WSP Response: Noted, no other action understood to be required.

4. **Base Model Review**

Though no response was provided on the National Highways feedback on the use of the base model, we would still like to know what methodology would be used for assessing junctions on the A46 between the A1 and Hykeham roundabout where the model is in the buffer. This issue was raised in the earlier review of the GLTM LMVR by National Highways in the document dated 26 October 2021.

5. **CLLP Modelling Support – Model Overview and Impacts**

In response to the queries raised by National Highways on the use for GLTM forecast model having a horizon year of 2036 and using earlier Local Plan, WSP has carried out an updated forecast for the future year 2040 in line with the latest Local Plan. This forecast work is summarised in the document, 'CLLP Modelling Support – Model Overview & Impacts', dated 15 December 2021.

National Highways has reviewed this document and summarised the key findings below:

1. Model Network:
    a. National Highways assumes that the four 'quadrant supporting network improvements' are not on the SRN and, based on their uncertainty status, qualify to be included in the DM scenario as per TAG uncertainty guidance. If not, they can only be tested as part of the CLLP test in the DS scenario as a Local Plan Scheme.
    b. A sensitivity test is recommended without North Hykeham Relief Road (NHRR) as this is a major scheme that is still in very early stages and there is some uncertainty around it.
2. National Highways would like to see the raw TRICS trip rates used for producing Table 1, if they are any different to the ones that were used in the previous version of the GLTM forecasts National Highways has reviewed. We assume the development quantum underpinning the Trip Generation has been approved by LCC and forms part of the latest CLLP.
3. National Highways is content with the use of adjusted growth factors that are applied to each of the Middle Super Output Area (MSOA) within Lincoln, North Kesteven and West Lindsey to account for the CLLP growth. The adjusted TEMPro outputs show additional trips over and above standard NTEM forecasts, as we would expect.
4. We note that the latest Road Traffic Forecasts (RTF2018) is used for LGV and HGV traffic growth, which is appropriate.
5. Impact on A46 Junctions: This section responds to some initial analysis undertaken by National Highways at the early stages and reported via a letter dated 24 August 2021. Evidence provided by WSP for comparison of trips is partial (only related to SUE developments) and is from the older version of the model, which is now already superseded by the 2040 forecast model. Thus, this issue could be considered closed, as the latest 2040 traffic forecasts should provide an adequate reflection of the trip generation and route choice.

WSP Response: In addition to the core 2040 forecast model, a sensitivity test has also been created without the North Hykeham Relief Road. The forecast traffic flows on the A46 with and without North Hykeham Relief Road are shown in Table 8.

Table 8 – A46 Traffic Flows in 2040 with and without North Hykeham Relief Road

A46 flows (PCU)	Direction	without NHRR- AM	with NHRR - AM	without NHRR - IP	with NHRR - IP	without NHRR - PM	with NHRR - PM
Between Halfway House Lane and Haddington Lane	Northbound	1,531	1,708	1,769	1,964	2,182	2,272
	Southbound	2,305	2,384	1,780	1,984	1,777	2,026
Between Brough Lane and Potter Hill Road	Northbound	1,323	1,514	1,531	1,672	2,132	2,164
	Southbound	2,162	2,230	1,475	1,621	1,449	1,640

The model flows show that the inclusion of North Hykeham Relief Road and the proposed developments will increase flows on the A46.

6. Summary

National Highways has reviewed additional information and provided a detailed response on the pending issues. The majority of our concerns have now been addressed to our satisfaction. Our primary concern relating to the use of the base model remains on understanding how A46 junctions between A1 and Hykeham roundabout will be assessed as some of these junctions are coded in the buffer.

Regarding the use of GLTM forecast models, we are happy with the use of the latest 2040 forecasts but have requested additional information to close out pending issues. We also need to understand how any models of intermediate years will inform the assessment and how much these models deviate from the latest CLLP in terms of development trajectory.

National Highways would recommend undertaking a sensitivity test without NHRR in place, as this is a major scheme at the early stages and therefore it has some uncertainty attached to the delivery.

We have provided our comments above, which can be used to address the remaining issues and await further dialogue with the LPA on these matters.

Annex 3

National Highways Agreement

(February, 2022)

From: Sivanesan, Sonia <Sonia.Sivanesan@highwaysengland.co.uk>
Sent: 15 February 2022 13:43
To: Low, Lucy <lucy.low@wsp.com>
Cc: Wong, Eri <Eri.Wong@highwaysengland.co.uk>; Seldon, Martin <Martin.Seldon@highwaysengland.co.uk>; Chadha, Ashish <Ashish.Chadha@aecom.com>; Turvey, Ian <Ian.Turvey@wsp.com>; Philip Hylton <Philip_Hylton@central-lincs.org.uk>; Botero, Andrea <Andrea.Botero@aecom.com>

Subject: RE: CLLP - Modelling work evidence

Hi Lucy,

Thank you for providing your responses to the comments we raised in the note submitted to you on 14th January 2022.

Overall we do not consider there any showstoppers based on the additional information provided, however would welcome further clarification on some matters.

We consider that evidence should be provided that CLLP and Model forecasts for intermediate years are broadly similar if intermediate year models are used for assessment.

VDM is not critical for National Highways as it does not represent the worst case on the SRN in terms of operational assessment. This is not critical but is recommended.

Overall, the base model is considered suitable for assessing the Local Plan development proposals for Lincoln and the A46 around Lincoln. We understand that the level of growth has not changed significantly to what was allocated in the previous Local Plan. Also, the 2040 forecast year is suitable. However, we recommend that Central Lincolnshire notes that the GLTM is not sufficiently extensive and detailed for testing the Local Plan impacts on the A46 between the A1 and A46 Hykeham roundabout given this stretch falls within the buffer zone of the model. Therefore, we recommend that the risk associated with this uncertainty is taken into account and mitigated when required. For example, National Highways might require in the future that further detailed assessments are undertaken to understand the impact of development on these junctions of the SRN.

In conclusion, we are content the models can be used as long as the risks mentioned above and mitigations are adequately considered.

We trust this helpful but should you have any queries please do not hesitate to get in touch.

Thanks
Sonia

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