TECHNICAL NOTE

TOTON DEVELOPMENT STRATEGIC ASSESSMENT

AREA OF INFLUENCE CALIBRATION & VALIDATION ASSESSMENT

IDENTIFICATION TABLE	
Client/Project owner	Mode Transport Planning
Project	Toton Development Strategic Assessment
Title of Document	TN01 – Toton EMGM Strategic Modelling Validation
Type of Document	Technical Note
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1. INTRODUCTION

1.1.1 SYSTRA has been commissioned by Mode Transport Planning to assess the impact of three housing sites (Toton North, Toton East and Toton West) in Toton with primary access provided from Stapleford Lane. The East Midlands Gateway Model (EMGM) will be used to assess the impacts and access strategies of the Toton sites.

1.1.2 To determine the suitability of the EMGM for this study an Area of Influence (AOI) has been established within which the calibration and validation of the model has been assessed.

1.1.3 This note provides information on the performance of the base year East Midlands Gateway Model (EMGM) within the Area of Interest (AOI) for the study.

2. EAST MIDLANDS GATEWAY MODEL

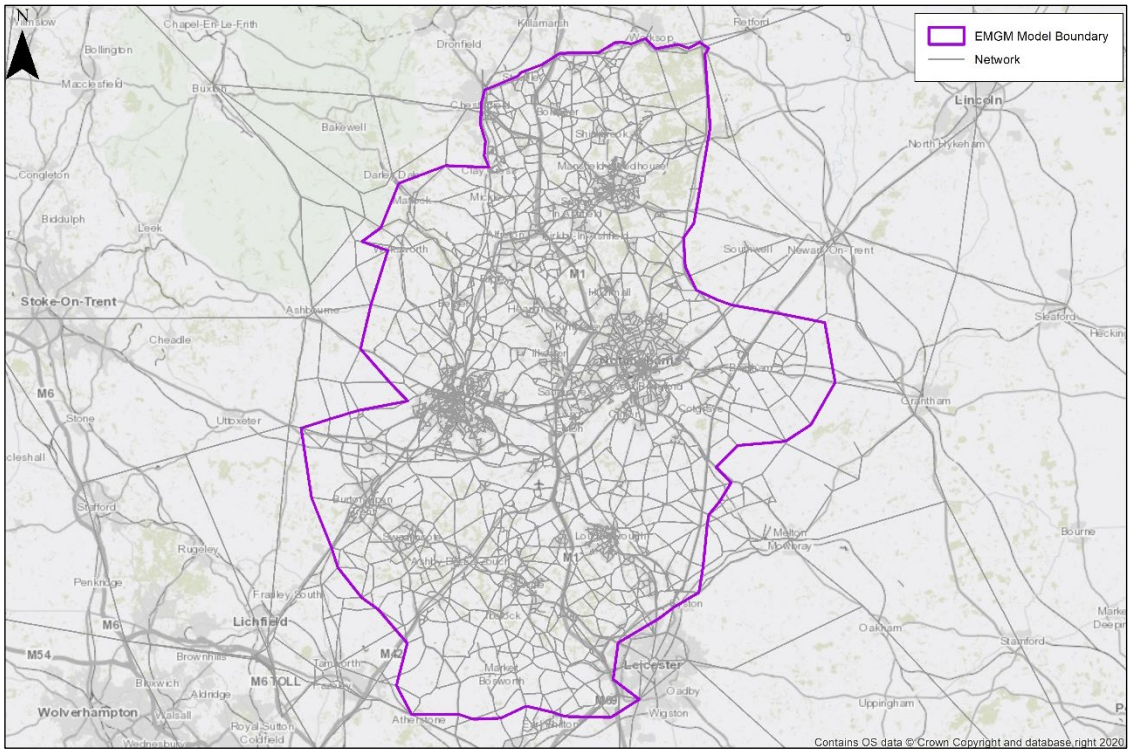
2.1 Introduction

2.1.1 The EMGM is a multimodal transport model built in accordance with TAG guidance and fully calibrated and validated for a base year of 2016. The modelling suite is comprised of the following elements:

- SATURN Highway Model
- CUBE Voyager Public Transport Model
- Cube Variable Demand Model including destination, mode choice, trip frequency and time of day responses
- Park and Ride model
- TRICS based Trip End Model

2.1.2 The EMGM is fully simulated in an area covering Nottinghamshire, Derbyshire and North Leicestershire. The extent of the EMGM coverage is shown in Figure 1.

Figure 1. EMGM Model Extent



2.2 Area of Influence

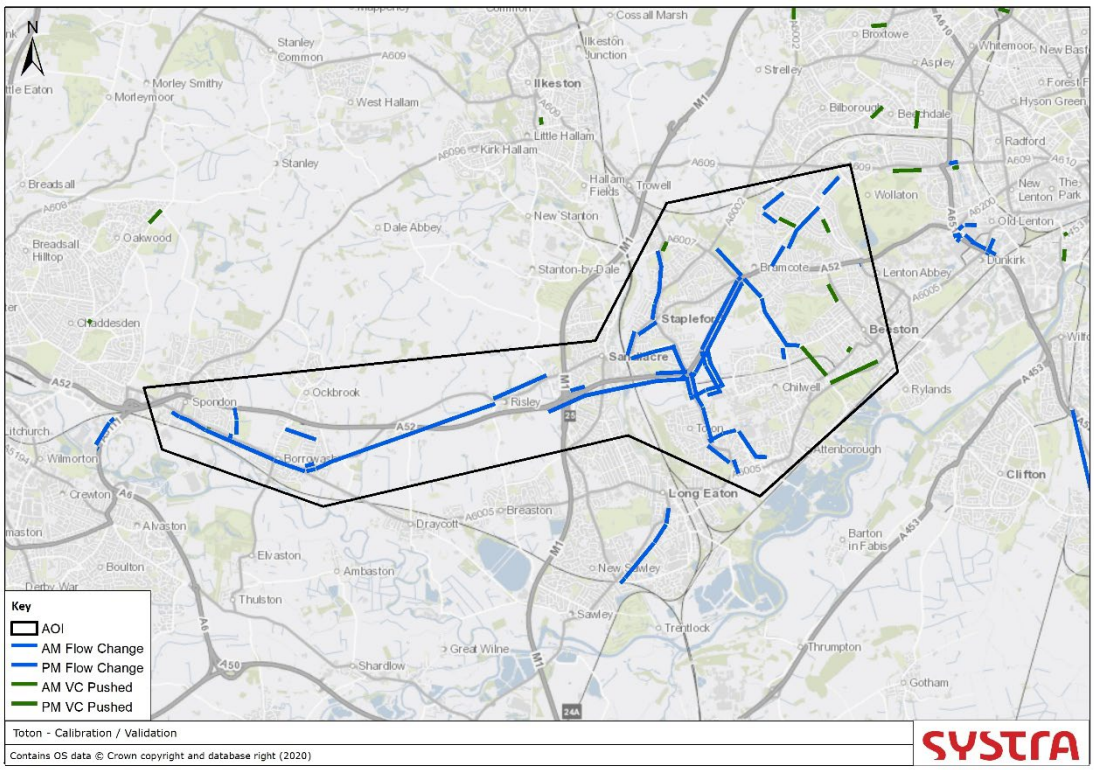
2.2.1 The Area of Influence (AOI) on the surrounding highway network was calculated by adding the Toton developments into an existing future year EMGM Reference Case model with an estimate of trip generations and approximate access locations. The change in flow and congestion is compared to the Reference Case model without the development proposals included and links which are impacted by the development highlighted.

2.2.2 Those highway links which exhibit any of the following impacts were defined:

- +/-5% change in vehicle flow;
- +/- 30 change in Passenger Car Units (PCU), or
- Link Volume/Capacity ratio (V/C) exceeds 85% with the development included.

2.2.3 These criteria are used to establish the AOI boundary, as shown in Figure 2. The AOI is defined by examining the area where there is a continuous impact to enable us to exclude model "noise" and impacts not genuinely attributable to the development. The plot shows which links meet which of the above criteria, although it should be noted that some links meet multiple criteria. Some areas of the AOI have been extended to include links despite a break in flow where this is viewed as being of significant interest, such as on the Strategic Highway Network (SRN).

Figure 2. Area of Influence (AOI) Boundary



3. LINK FLOW CALIBRATION AND VALIDATION

3.1 Introduction

3.1.1 A review of the calibration and validation of the base year 2016 highway model was undertaken using observed count and model flow data for highway links within the AOI (see Figure 2). The model performance within the AOI was assessed in line with guidance provided in TAG unit 3.1 which defines best practice.

3.2 Guidelines

3.2.1 DfT guidelines for the calibration and validation of highway models states that there are two separate sets of criteria against which observed counts and model flow comparisons should be measured:

- GEH Statistic: links should have a GEH value of less than 5, and
- Vehicle flow comparison:
  - where observed flow is less than 700 vehicles per hour, the modelled flow should be within 100 vehicles of the observed flow;
  - where observed flow is between 700 and 2700 vehicles per hour, the modelled flow should be within 15% of observed flow; and
  - where observed flow is greater than 2700 vehicles per hour, the modelled flow should be within 400 vehicles of the observed flow.

3.2.2 TAG Unit 3.1 section 3.2.7 discusses validation statistics for counts meeting GEH and flow criteria, stating that:

> *"These two measures are broadly consistent and link flows that meet either criterion should be regarded as satisfactory."*

3.2.3 The calibration and validation review of the base year 2016 model was conducted in line with these guidelines for links with observed counts within the AOI, including the Strategic Road Network (SRN).

3.3 Link Calibration and Validation Assessment

3.3.1 Table 1 provides the headline calibration and validation statistics for the highway network within the AOI.

3.3.2 In the peak hours the model achieves a high level of calibration, with over 95% of counts meeting the criteria, with particularly strong performance for LGV and HGV counts. These statistics exceed the recommended target of 85% stated in TAG.

3.3.3 In the AM peak over 79% of the validation counts meet either the GEH or flow criteria and over 80% in the PM peak. The model demonstrates a good level of validation, given the number of counts within the dataset and the complexities of route choice available within the model.

Table 1. Calibration and Validation Statistics – Full AOI

	CALIBRATION COUNTS				VALIDATION COUNTS			
	Counts	GEH < 5	% Flow	GEH < 5 or Flow	Counts	GEH < 5	% Flow	GEH < 5 or Flow
Morning Peak								
Cars	85	96%	98%	98%	98	74%	74%	79%
LGV	85	95%	96%	96%	98	87%	94%	94%
HGV	85	94%	98%	99%	98	91%	97%	98%
Total	85	93%	95%	95%	98	74%	74%	79%
Evening Peak								
Cars	84	96%	98%	98%	100	76%	80%	81%
LGV	84	93%	98%	98%	100	91%	96%	96%
HGV	84	92%	99%	99%	100	89%	96%	98%
Total	84	95%	98%	98%	100	76%	76%	80%

Strategic Road Network

3.3.4 Table 2 provides the headline calibration and validation statistics for the SRN within the AOI. 88% of the calibration counts in the AM peak meet the GEH or flow criteria, rising to 94% in the PM peak. 85% of the validation counts in both the AM and 90% in the PM peak meet either the GEH or flow criteria in each peak hour indicating that the model demonstrates a strong level of model calibration and validation along the SRN within the AOI.

Table 2. Calibration and Validation Statistics – SRN

	CALIBRATION COUNTS				VALIDATION COUNTS			
	Counts	GEH < 5	% Flow	GEH < 5 or Flow	Counts	GEH < 5	% Flow	GEH < 5 or Flow
Morning Peak								
Cars	16	88%	94%	94%	20	80%	70%	80%
LGV	16	81%	81%	81%	20	60%	70%	70%
HGV	16	88%	88%	94%	20	65%	85%	90%
Total	16	81%	88%	88%	20	75%	80%	85%
Evening Peak								
Cars	18	94%	94%	94%	20	75%	80%	80%
LGV	18	72%	89%	89%	20	65%	80%	80%
HGV	18	67%	94%	94%	20	60%	80%	90%
Total	18	83%	94%	94%	20	80%	90%	90%

3.3.5 The full count data for the SRN is included in Appendix A for further information, including plots showing the spatial locations of each SRN count using a location reference number.

3.4 Spatial Analysis

3.4.1 Figure 3 to Figure 4 show the distribution and performance of counts across the model in the AM and PM Peaks. The locations where TAG Guidance is met are shown in green, with red or blue links denoting where TAG has not been achieved.

3.4.2 In general, there are no clusters of counts which fail to meet the criteria, providing reassurance that the base year model is stable and that there are no particular areas of weakness or concern within the AOI.

Figure 3. AM Peak Count Performance

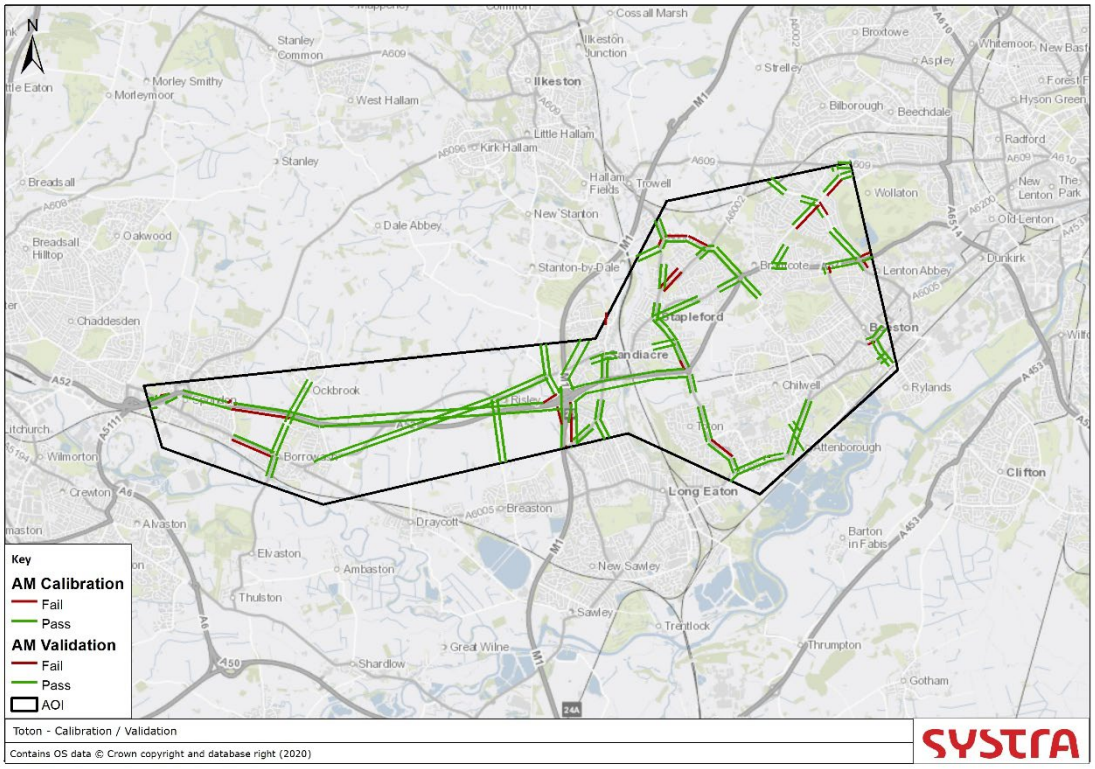
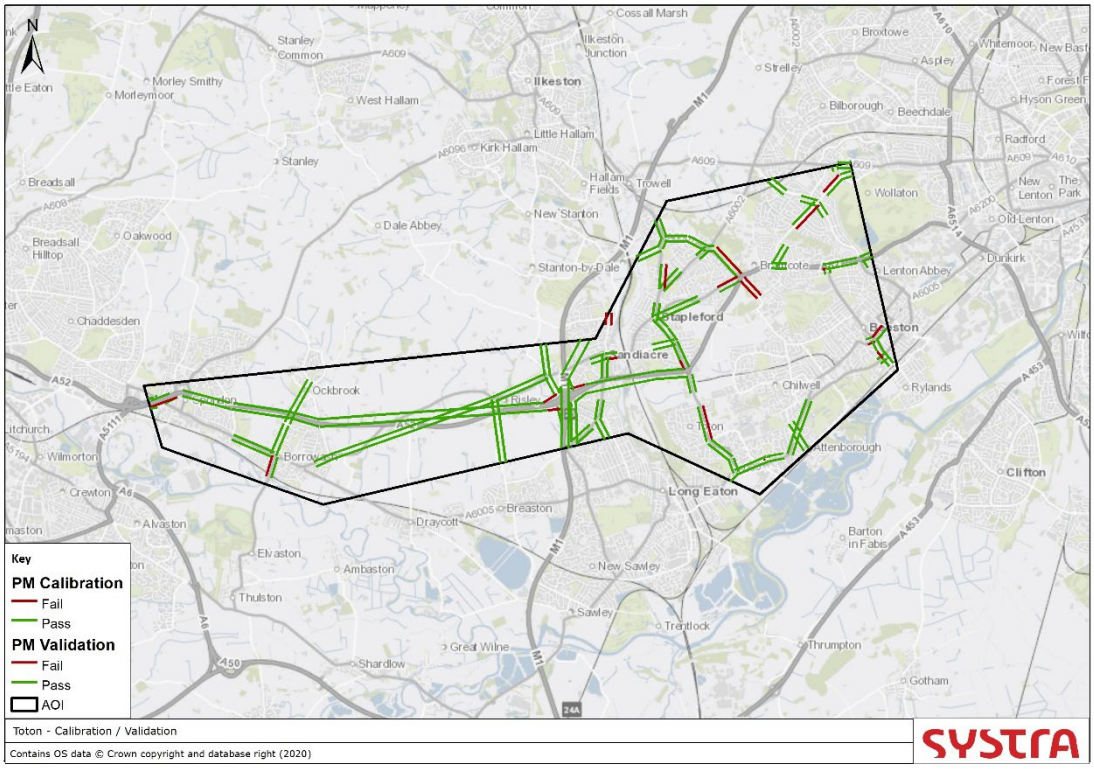


Figure 4. PM Peak Count Performance



4. JOURNEY TIME VALIDATION

4.1 Introduction

4.1.1 An assessment of journey times along the SRN within the AOI was undertaken using data from National Highways' journey time database. Journey time data for the morning peak (08:00-09:00) and evening peak (17:00-18:00) was analysed. Two routes along the SRN were selected for analysis as they partly or wholly sit within the AOI, namely:

- M1 – Between Junctions 23 and 29.
- A52 – Between Derby and Nottingham (SRN sections only).

4.2 Journey Time Validation Guidelines

4.2.1 The TAG requirement (as set out in TAG Unit M3.1) for journey time validation is that modelled times along the route should be within 15% of the observed time on more than 85% of routes.

4.2.2 The modelled times that are referred to in this chapter represent the time taken to travel from the start of the route to the end points. They include turn delays.

4.3 Journey Time Validation

4.3.1 Table 3 and Table 4 summarise the journey time validation for the each route in the AM and PM peaks, respectively.

4.3.2 The majority (50% in the AM peak and 75% in the PM peak) of the SRN routes meet the TAG calibration criteria of +/- 15%, with only the M1 southbound in the AM peak and the A52 routes failing to meet the journey time calibration criteria: the A52 westbound in the AM Peak and the A52 eastbound in the PM Peak. The M1 and A52 are congested routes, particularly the A52 on the eastern and western sides of the M1 and as a result journey times can fluctuate significantly.

Table 3. Journey Time Validation – AM Peak

ROUTE	DIRECTION	OBSERVED	MODELLED	% CHANGE	TAG
M1	Northbound	1,930	2,156	12%	OK
M1	Southbound	2,041	1,677	-18%	SLOW
A52	Eastbound	580	614	6%	OK
A52	Westbound	679	539	-21%	FAST

Table 4. Journey Time Validation – PM Peak

ROUTE	DIRECTION	OBSERVED	MODELLED	% CHANGE	TAG
M1	Northbound	2,195	2,197	0%	OK
M1	Southbound	1,574	1,500	-5%	OK
A52	Eastbound	646	799	24%	SLOW
A52	Westbound	560	558	0%	OK

4.3.3 Given the significance of the M1, Figure 6 to Figure 9 show the level of journey time validation achieved along the M1 between J23 and J29.

Figure 5. M1 Northbound Journey Time Validation – AM Peak

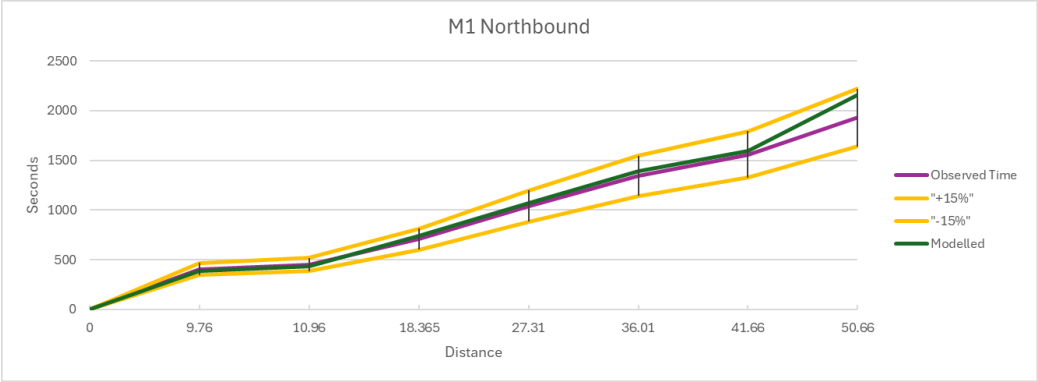


Figure 6. M1 Southbound Journey Time Validation – AM Peak

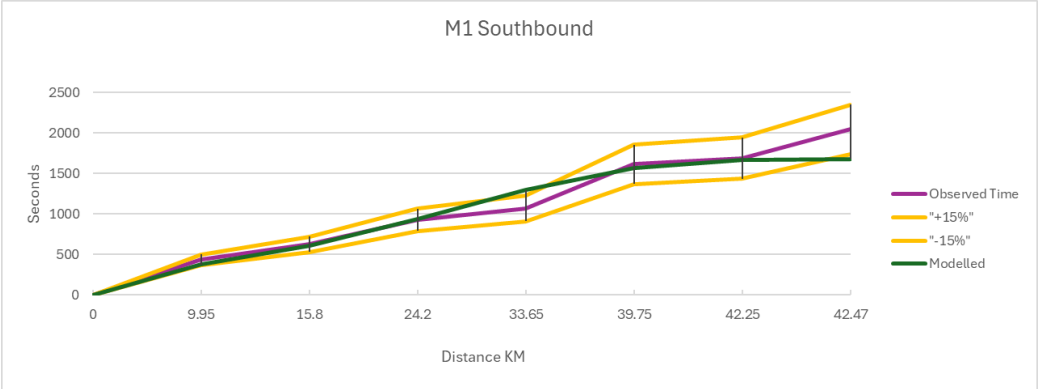


Figure 7. M1 Northbound Journey Time Validation – PM Peak

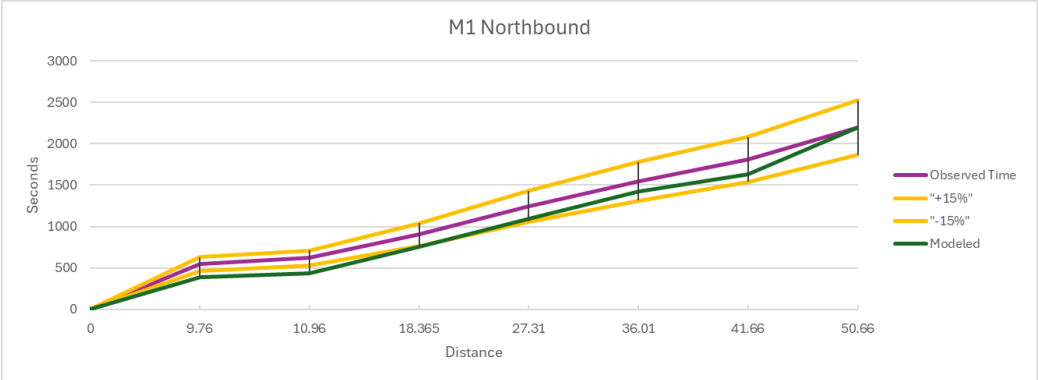
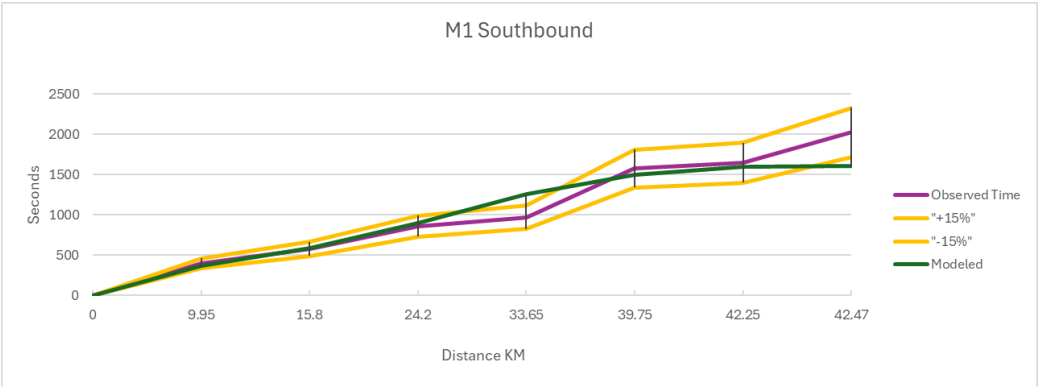


Figure 8. M1 Southbound Journey Time Validation – PM Peak



4.3.4 M1 journey times validate well in the PM Peak. In the AM peak, journey time validation is slightly outside of the suggested TAG criteria southbound, but only slightly.

4.3.5 The journey time validation graphs for the A52 are shown in Appendix A in Figure 9 to Figure 12.

5. CONCLUSION

5.1.1 The Toton North, Toton East and Toton West developments are all situated close to the A52 and M1, as such it is expected that there will be an impact on some of the SRN routes. The Area of Influence encompasses the A52 between Derby and Nottingham and parts of M1 around J25. It also covers much of the West of Nottingham, including Stapleford, Sandiacre and parts of Beeston.

5.1.2 All of the AOI falls within the detailed simulation area of the East Midlands Gateway model.

5.1.3 The detailed assessment of the highway model within this AOI has shown the calibration statistics exceed the requirements of TAG. However, the validation levels are slightly below the levels required by TAG (85%) but are considered acceptable given the high-number of counts in the area coupled with the size and complexity of the EMGM. These levels are also above those accepted for similar development-based assessments using EMGM.

5.1.4 The assessment of SRN routes wholly or partially within the AOI has shown that the difference in Journey Time (Modelled vs Observed) on the majority of the routes is within the TAG guidance.

5.1.5 As a result, we believe EMGM is 'Fit for Purpose' for the assessment of the Toton Developments and no further calibration/validation of the model is required.

APPENDIX A

Calibration and Validation Count Performance – SRN

See plot for the SRN count location references spatially

Peak	Ref	Description	Direction	Type	Mod	Obs	Diff	% Diff	GEH	DMRB Pass
AM	1	A52 EB - Offslip	EB	CAL	259	264	-5	0.0	0.3	Y
AM	2	A52 WB - Onslip	WB	CAL	822	857	-35	0.0	1.2	Y
AM	3	Junction Brian Clough Way/Stoney Ln	Arm C EB	CAL	2012	1922	91	0.0	2.0	Y
AM	4	M1 J25	Arm D NB	VAL	1320	1068	252	0.2	7.3	N
AM	5	A52 after Lodge Ln	Eastbound	CAL	1671	1657	14	0.0	0.4	Y
AM	6	Derby Rd/Brian Clough Way/Nottingham Rd	Arm F EB	VAL	711	497	214	0.4	8.7	N
AM	7	A52 Derby Rd/Woodside Rd/Wollaton Vale	Arm E EB	CAL	1382	1298	84	0.1	2.3	Y
AM	8	A52 West of Bardilis Roundabout	Eastbound	CAL	1846	1825	21	0.0	0.5	Y
AM	9	M1 J25	Arm C WB	VAL	895	728	168	0.2	5.9	N
AM	10	M1: J24A-J25	Northbound	VAL	4512	4161	351	0.1	5.3	Y
AM	11	At M1 J25	Northbound	VAL	3193	3494	-301	-0.1	5.2	Y
AM	12	Bardills Roundabout and the through link	Arm B WB	CAL	1898	1722	177	0.1	4.2	Y
AM	13	Bardills Roundabout and the through link	Arm B EB	CAL	1648	1702	-54	0.0	1.3	Y
AM	14	M1:J26-J25	Southbound	CAL	4603	4303	300	0.1	4.5	Y
AM	15	Derby Rd/Brian Clough Way/Nottingham Rd	Arm F WB	CAL	343	263	80	0.3	4.6	Y
AM	16	M1 J25	Arm F EB	VAL	910	779	131	0.2	4.5	N
AM	17	A52 East Cole Ln	Westbound	VAL	1836	1679	157	0.1	3.8	Y
AM	18	M1 J25	Arm F WB	VAL	952	843	109	0.1	3.6	Y
AM	19	At M1 J25	Southbound	VAL	3631	3819	-188	0.0	3.1	Y
AM	20	Junction Cole Ln/Brian Clough Way	Arm D EB	CAL	1831	1729	103	0.1	2.4	Y
AM	21	Junction Cole Ln/Brian Clough Way	Arm B EB	VAL	1831	1718	114	0.1	2.7	Y
AM	22	A52 Derby Rd/Woodside Rd/Wollaton Vale	Arm B EB	VAL	1154	1078	77	0.1	2.3	Y
AM	23	A52 West of Bardilis Roundabout	Westbound	VAL	1898	1826	72	0.0	1.7	Y
AM	24	M1 J25	Arm C EB	VAL	890	937	-47	-0.1	1.6	Y
AM	25	A52 Derby Rd/Woodside Rd/Wollaton Vale	Arm E WB	CAL	1410	1049	361	0.3	10.3	N
AM	26	Junction Brian Clough Way/Thoresby Rd	Arm C EB	VAL	1406	1450	-43	0.0	1.1	Y
AM	27	Junction Cole Ln/Brian Clough Way	Arm B WB	VAL	1836	1794	43	0.0	1.0	Y
AM	28	Brian Clough Way/Borrowash Rd	Arm C WB	CAL	2333	2026	308	0.2	6.6	N
AM	29	Onslip M1 J25	Southbound	CAL	1314	1276	38	0.0	1.1	Y
AM	30	Brian Clough Way/Borrowash Rd	Arm A WB	CAL	2284	2037	247	0.1	5.3	Y
AM	31	M1:J25-J26	Northbound	CAL	4291	4437	-147	0.0	2.2	Y
AM	32	Junction Brian Clough Way/Thoresby Rd	Arm B EB	VAL	1610	1631	-21	0.0	0.5	Y
AM	33	Junction Brian Clough Way/Thoresby Rd	Arm C WB	VAL	1338	1356	-18	0.0	0.5	Y
AM	34	A52 Derby Rd/Woodside Rd/Wollaton Vale	Arm B WB	VAL	1128	1114	14	0.0	0.4	Y
AM	35	A52 East of A6096	Eastbound	VAL	1892	1886	6	0.0	0.1	Y
AM	36	Junction Brian Clough Way/Thoresby Rd	Arm B WB	VAL	1636	1640	-4	0.0	0.1	Y
PM	9	M1: J24A-J25	Northbound	VAL	5120	4863	257	0.1	3.6	Y
PM	16	M1:J25-J26	Northbound	CAL	5188	5298	-110	0.0	1.5	Y
PM	10	Brian Clough Way/Borrowash Rd	Arm A WB	CAL	2042	1779	264	0.1	6.0	Y
PM	31	Bardills Roundabout and the through link	Arm B WB	CAL	2134	2008	126	0.1	2.8	Y
PM	30	Brian Clough Way/Borrowash Rd	Arm C WB	CAL	2025	1793	233	0.1	5.3	Y
PM	12	A52 Clifton Blvd / Queens Dr / Thane Rd	Arm C SB	VAL	1482	1765	-283	-0.2	7.0	N
PM	28	A52 after Lodge Ln	Westbound	CAL	1533	1320	213	0.2	5.6	N
PM	37	A52 East of A6096	Eastbound	VAL	3193	2962	231	0.1	4.2	Y
PM	35	M1 J25	Arm A NB	VAL	1244	1278	-34	0.0	1.0	Y
PM	19	At M1 J25	Southbound	VAL	3172	3482	-310	-0.1	5.4	Y
PM	3	Junction Brian Clough Way/Stoney Ln	Arm C EB	CAL	3147	2954	193	0.1	3.5	Y

Peak	Ref	Description	Direction	Type	Mod	Obs	Diff	% Diff	GEH	DMRB Pass
PM	36	Junction Brian Clough Way/Thoresby Rd	Arm B WB	VAL	2682	2504	178	0.1	3.5	Y
PM	27	Junction Cole Ln/Brian Clough Way	Arm B WB	VAL	1980	1730	250	0.1	5.8	Y
PM	21	Junction Cole Ln/Brian Clough Way	Arm B EB	VAL	2762	2637	125	0.0	2.4	Y
PM	20	Junction Cole Ln/Brian Clough Way	Arm D EB	CAL	2762	2637	125	0.0	2.4	Y
PM	7	A52 Derby Rd/Woodside Rd/Wollaton Vale	Arm E EB	CAL	1206	1096	110	0.1	3.3	Y
PM	33	Junction Brian Clough Way/Thoresby Rd	Arm C WB	VAL	2332	2206	126	0.1	2.6	Y
PM	5	A52 after Lodge Ln	Eastbound	CAL	3874	3584	290	0.1	4.8	Y
PM	13	Bardills Roundabout and the through link	Arm B EB	CAL	2036	2146	-110	-0.1	2.4	Y
PM	34	A52 Derby Rd/Woodside Rd/Wollaton Vale	Arm B WB	VAL	1815	1723	92	0.1	2.2	Y
PM	29	Onslip M1 J25	Southbound	CAL	1188	1091	97	0.1	2.9	Y
PM	11	A52 Clifton Blvd/A52 Derby Rd/Middleton Blvd/A6200	Arm B EB	VAL	1307	1134	174	0.2	5.0	N
PM	38	At M1 J25	Northbound	VAL	3940	4120	-180	0.0	2.8	Y
PM	17	Junction A52 Brian Clough Way/Wollaton Rd	Arm A EB	VAL	1647	1496	151	0.1	3.8	Y
PM	23	A52 East Cole Ln	Westbound	VAL	1980	1834	146	0.1	3.3	Y
PM	2	A52 West of Bardilis Roundabout	Westbound	VAL	2134	2195	-61	0.0	1.3	Y
PM	39	A52 WB - Onslip	WB	CAL	498	451	47	0.1	2.2	Y
PM	40	Onslip M1 J25	Northbound	CAL	1244	1415	-171	-0.1	4.7	Y
PM	26	M1:J25-J24A	Southbound	VAL	4361	4486	-125	0.0	1.9	Y
PM	41	Junction Brian Clough Way/Thoresby Rd	Arm C EB	VAL	1475	1495	-20	0.0	0.5	Y
PM	22	Offslip M1 J25	Southbound	CAL	1220	1197	23	0.0	0.7	Y
PM	8	A52 Derby Rd/Woodside Rd/Wollaton Vale	Arm B EB	VAL	1262	1202	61	0.1	1.7	Y
PM	25	A52 West of Bardilis Roundabout	Eastbound	CAL	2310	2241	69	0.0	1.4	Y
PM	32	A52 Derby Rd/Woodside Rd/Wollaton Vale	Arm E WB	CAL	1307	1241	66	0.1	1.9	Y
PM	1	Junction Brian Clough Way/Thoresby Rd	Arm B EB	VAL	1780	1755	25	0.0	0.6	Y
PM	14	A52 EB - Offslip	EB	CAL	604	677	-73	-0.1	2.9	Y
PM	4	M1:J26-J25	Southbound	CAL	4393	4359	34	0.0	0.5	Y
PM	18	M1 J25	Arm D NB	VAL	1179	1066	113	0.1	3.4	Y

SRN Count Location References

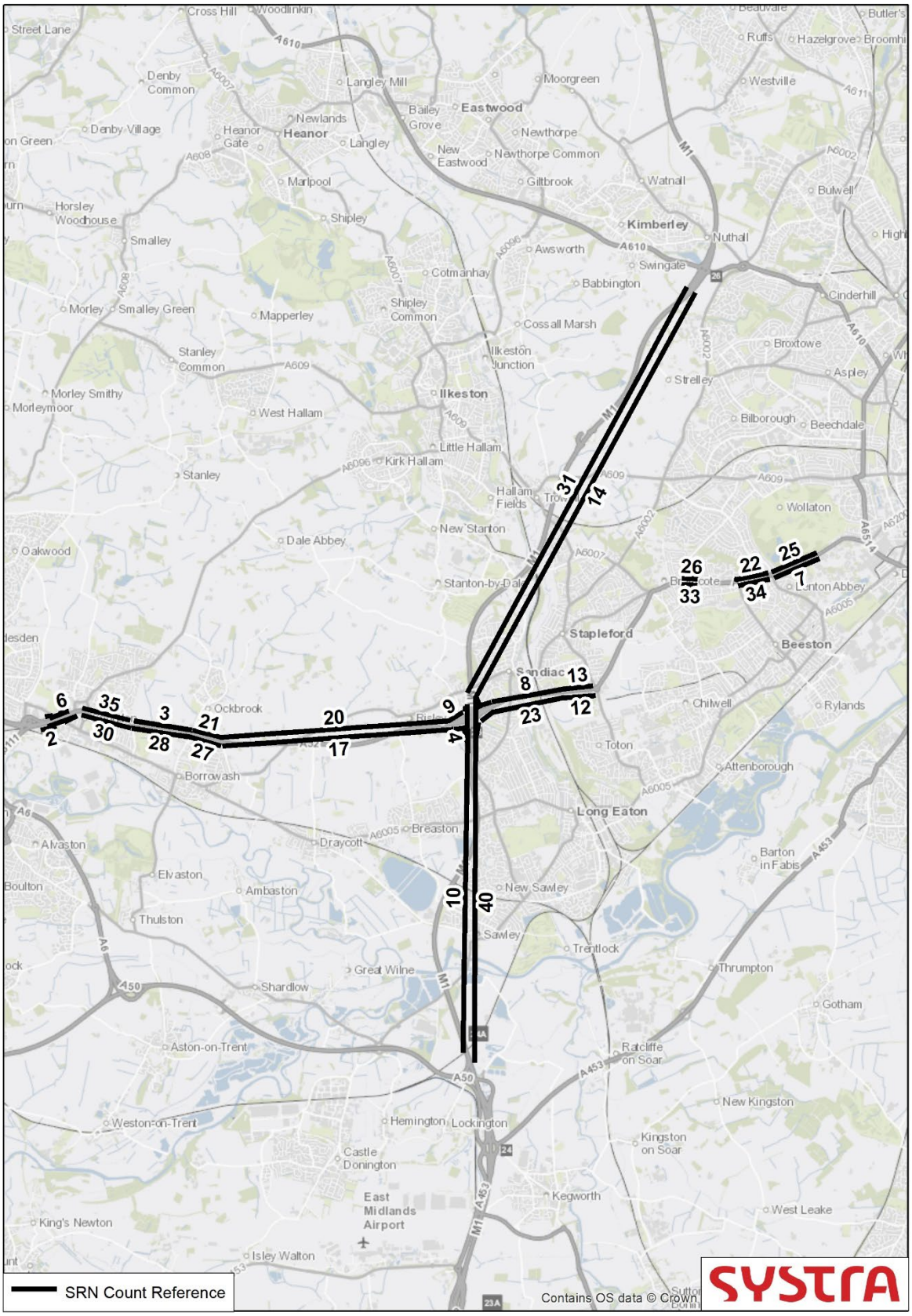


Figure 9. A52 Eastbound Time Validation – AM Peak

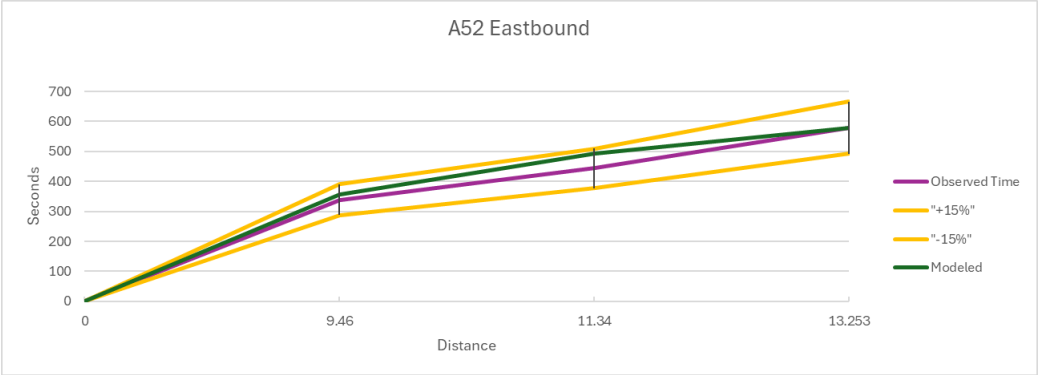


Figure 10. A52 Westbound Journey Time Validation – AM Peak

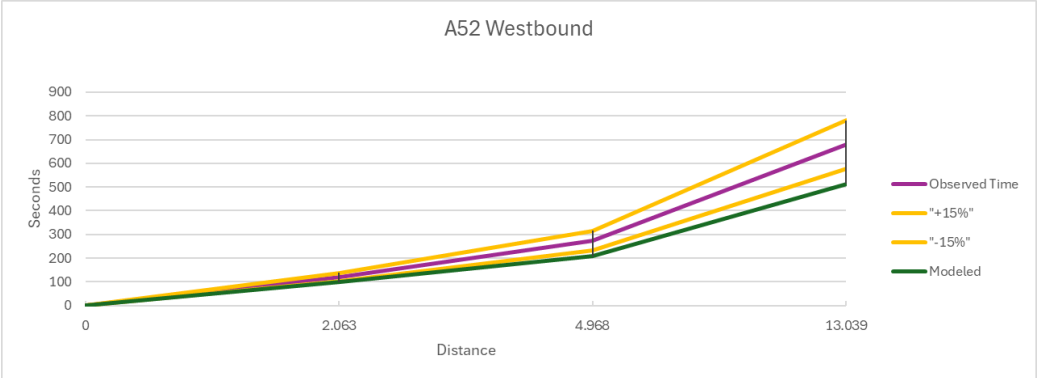


Figure 11. A52 Eastbound Time Validation – PM Peak

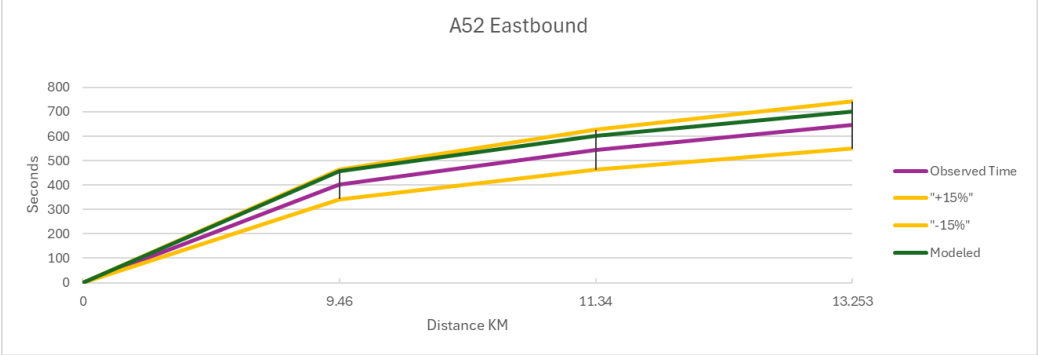
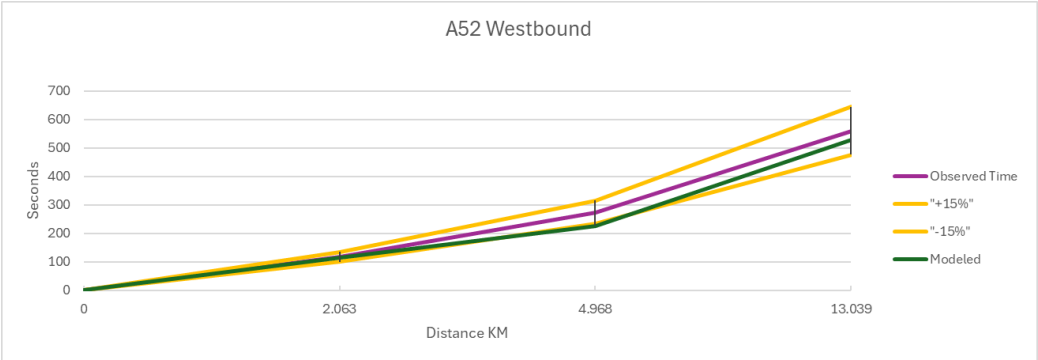


Figure 12. A52 Westbound Journey Time Validation – PM Peak



APPROVAL					
Version	**Name**		**Position**	**Date**	**Modifications**
1	Author	Huw Harrhy	Consultant	10/11/25	
	Checked	Helen O'Mara	Associate Director	06/11/25	
	Approved	Duncan Irons	Director	06/11/25	