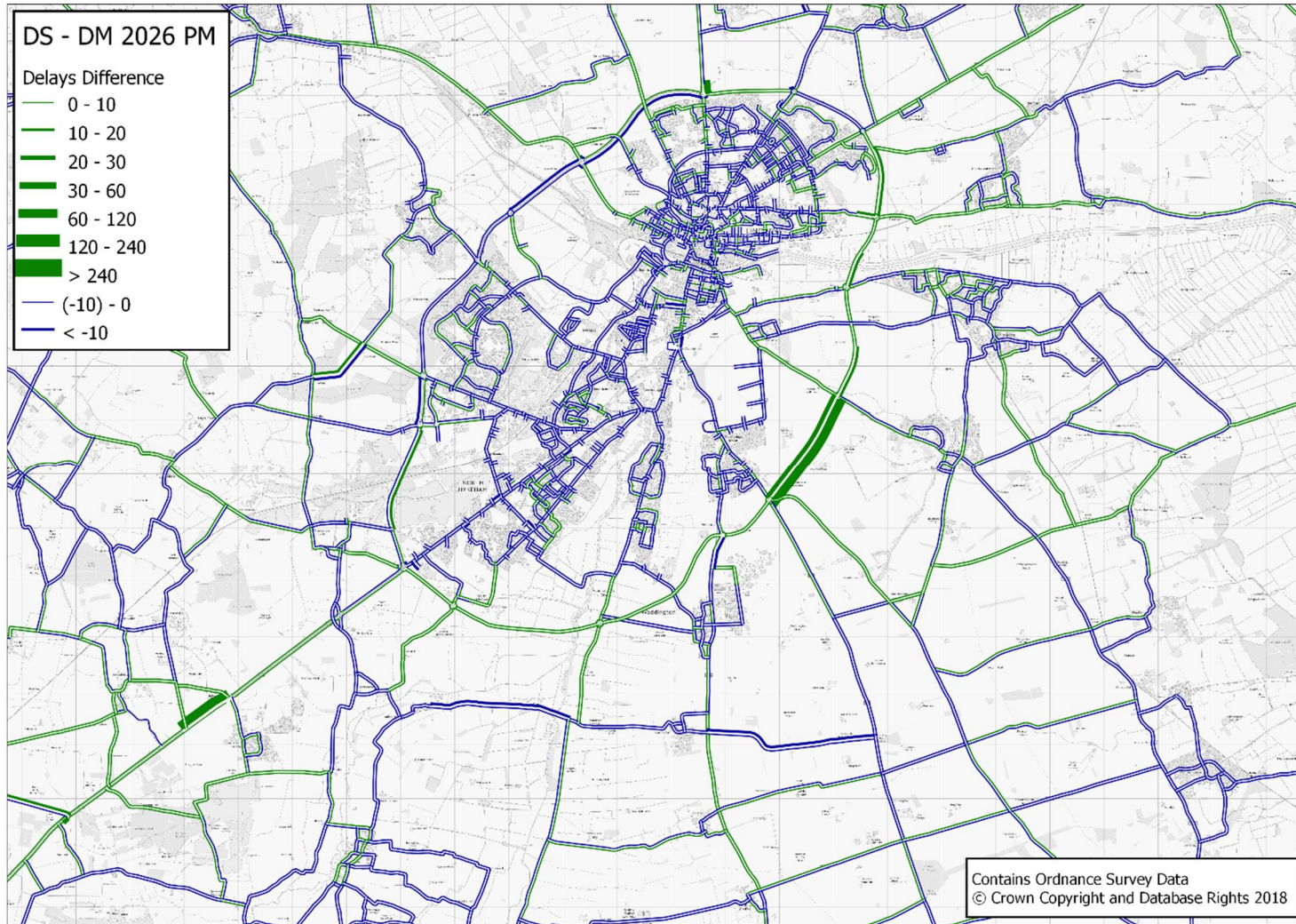


Figure 8-10 Delay Difference DS2026 minus DM2026 – PM Peak



9 ALTERNATIVE SCENARIO ASSIGNMENT RESULTS

9.1 INTRODUCTION

This chapter describes the outputs from the alternative growth assignments.

This chapter is split into following sub-sections.

- Forecasting alternative scheme options;
- Alternative scheme option forecast outputs;
- Forecasting alternative growth; and
- Alternative growth scenario outputs.

9.2 FORECASTING ALTERNATIVE SCHEME OPTIONS

As set out in Section 4.3.2 there were two alternative scheme options modelled.

- Next Best (NB) Alternative: a single carriageway link with 'future proofed' structures; and
- Low Cost (LC) Option: a single carriageway link.

The design assumptions and coding approach were detailed Section 6.4.

The alternative scheme option forecasts have core growth assumptions in line with the preferred Do Something option. Variable demand modelling was applied and the convergence statistics are provided in Appendix J.

The forecast models converged to WebTAG standards (see Section 8.2) and the statistics are presented in Appendix G.

9.3 ALTERNATIVE SCHEME OPTION FORECAST OUTPUTS

Alternative scheme option forecast outputs are summarised by:

- Network statistics; and
- Network reassignment effects between options.

9.3.1 NETWORK STATISTICS

The results are summarised as follows.

- Average speed is lower for NB and LC compared to DS.
 - The decrease in NB from DS is partly attributed to the higher design speed for the dual carriageway option. It is also due to increased capacity, and consequently higher flows, on the scheme which provides greater relief across rest of the network and contributes to an increase in average speed overall across the existing links.
 - The decrease in LC compared to NB is attributed to the benefits of the higher capacity junctions, in particular at Pennell's roundabout.
- Total travel distance increases through the years and it increases through the scenarios in the order DM < LC < NB < DS.
 - This indicates that total travel distance increases as the volume on the scheme increases. The scheme offers a longer distance, but faster route choice compared to existing options, including local rat running through North Hykeham.

- Total queues typically decrease through the scenarios in the order DS < NB < LC < DM in line with the level of additional capacity provided by each of the options.
- A similar pattern is generally observed for total travel time and over-capacity queues. A key exception for the latter is the PM in 2041 where overcapacity queues are higher in LC than DM attributed to the increased demand and congestion at Pennell’s roundabout but a constrained capacity increase in the Low Cost design.

Figure 9-1 Average Speed Comparison – Alternative Scheme Options

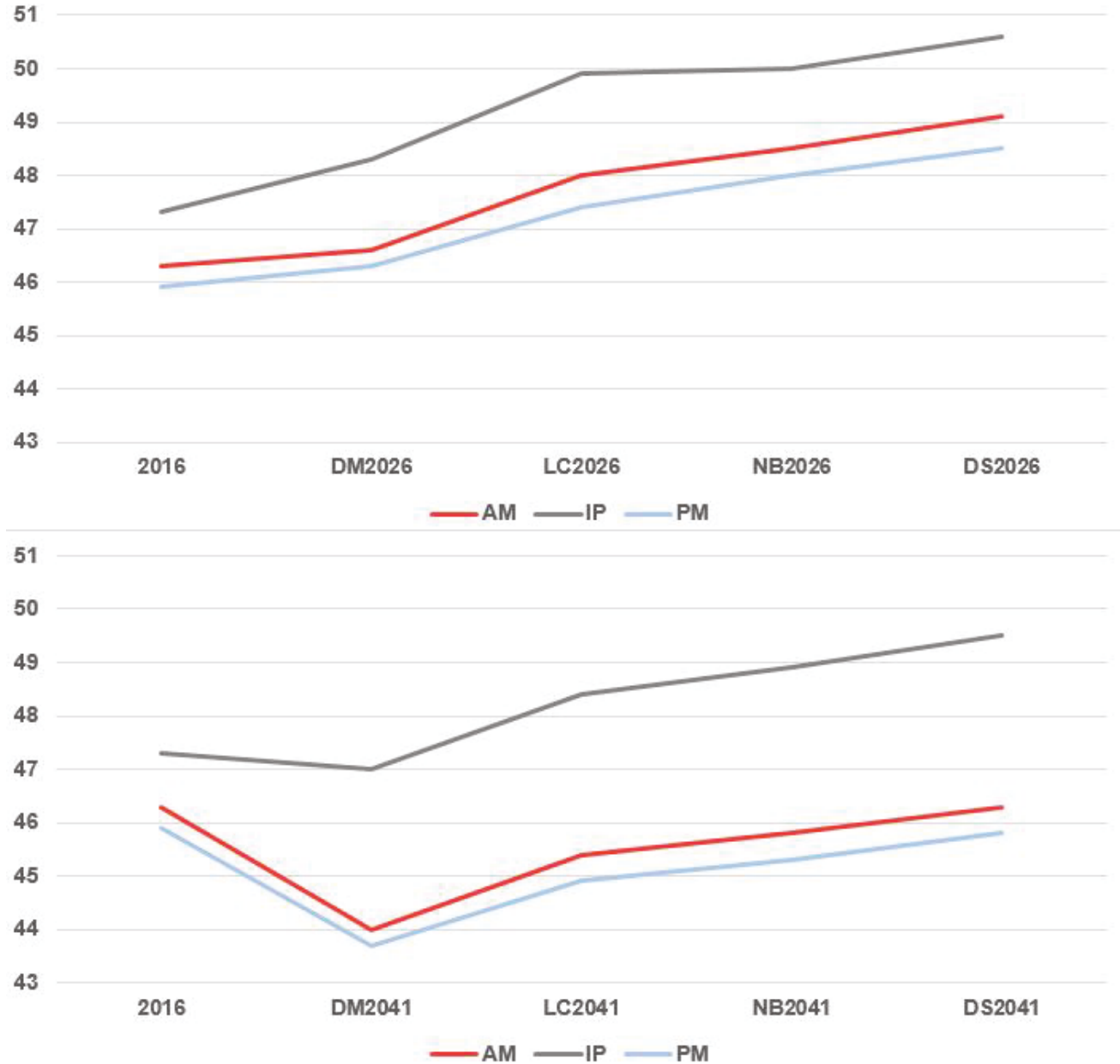


Table 9-1 FMA Network Statistics by Scenario – All Scheme Options AM Peak

Network Statistics	2016	2026				2041			
		DM	DS	NB	LC	DM	DS	NB	LC
Total Assigned Trips (pcus)	237,606	257,382	257,430	257,415	257,394	283,720	283,774	283,768	283,755
Transient Queued Time (pcu-hrs)	1,635	1,735	1,636	1,649	1,675	2,151	2,063	2,065	2,067
Overcapacity Queued Time (pcu-hrs)	53	100	50	53	82	272	191	195	252
Total Travel Time (pcu-hrs)	7,418	8,101	7,934	7,960	8,001	9,552	9,394	9,406	9,440
Travel Distance (pcu-kms)	343,251	377,173	389,257	385,901	383,685	420,370	434,760	430,738	428,100
Average Journey Speed (kph)	46.3	46.6	49.1	48.5	48.0	44.0	46.3	45.8	45.4

Table 9-2 FMA Network Statistics by Scenario – All Scheme Options Inter Peak

Network Statistics	2016	2026				2041			
		DM	DS	NB	LC	DM	DS	NB	LC
Total Assigned Trips (pcus)	167,244	182,746	182,735	182,736	182,750	203,291	203,289	203,288	203,290
Transient Queued Time (pcu-hrs)	1,273	1,343	1,248	1,262	1,270	1,612	1,506	1,523	1,563
Overcapacity Queued Time (pcu-hrs)	3	2	0	1	0	31	5	7	23
Total Travel Time (pcu-hrs)	5,686	6,239	6,125	6,140	6,142	7,284	7,164	7,185	7,217
Travel Distance (pcu-kms)	268,776	301,380	309,710	307,235	306,622	342,083	354,884	351,326	348,948
Average Journey Speed (kph)	47.3	48.3	50.6	50.0	49.9	47.0	49.5	48.9	48.4



Table 9-3 FMA Network Statistics by Scenario – All Scheme Options PM Peak

Network Statistics	2016	2026				2041			
		DM	DS	NB	LC	DM	DS	NB	LC
Total Assigned Trips (pcus)	230,339	249,414	249,471	249,465	249,441	274,468	274,503	274,494	274,485
Transient Queued Time (pcu-hrs)	1,726	1,816	1,747	1,754	1,767	2,222	2,161	2,155	2,162
Overcapacity Queued Time (pcu-hrs)	53	112	71	67	131	287	241	251	300
Total Travel Time (pcu-hrs)	7,617	8,338	8,215	8,240	8,280	9,765	9,662	9,694	9,697
Travel Distance (pcu-kms)	349,419	385,737	398,112	395,574	392,362	427,172	442,452	439,294	434,934
Average Journey Speed (kph)	45.9	46.3	48.5	48.0	47.4	43.7	45.8	45.3	44.9

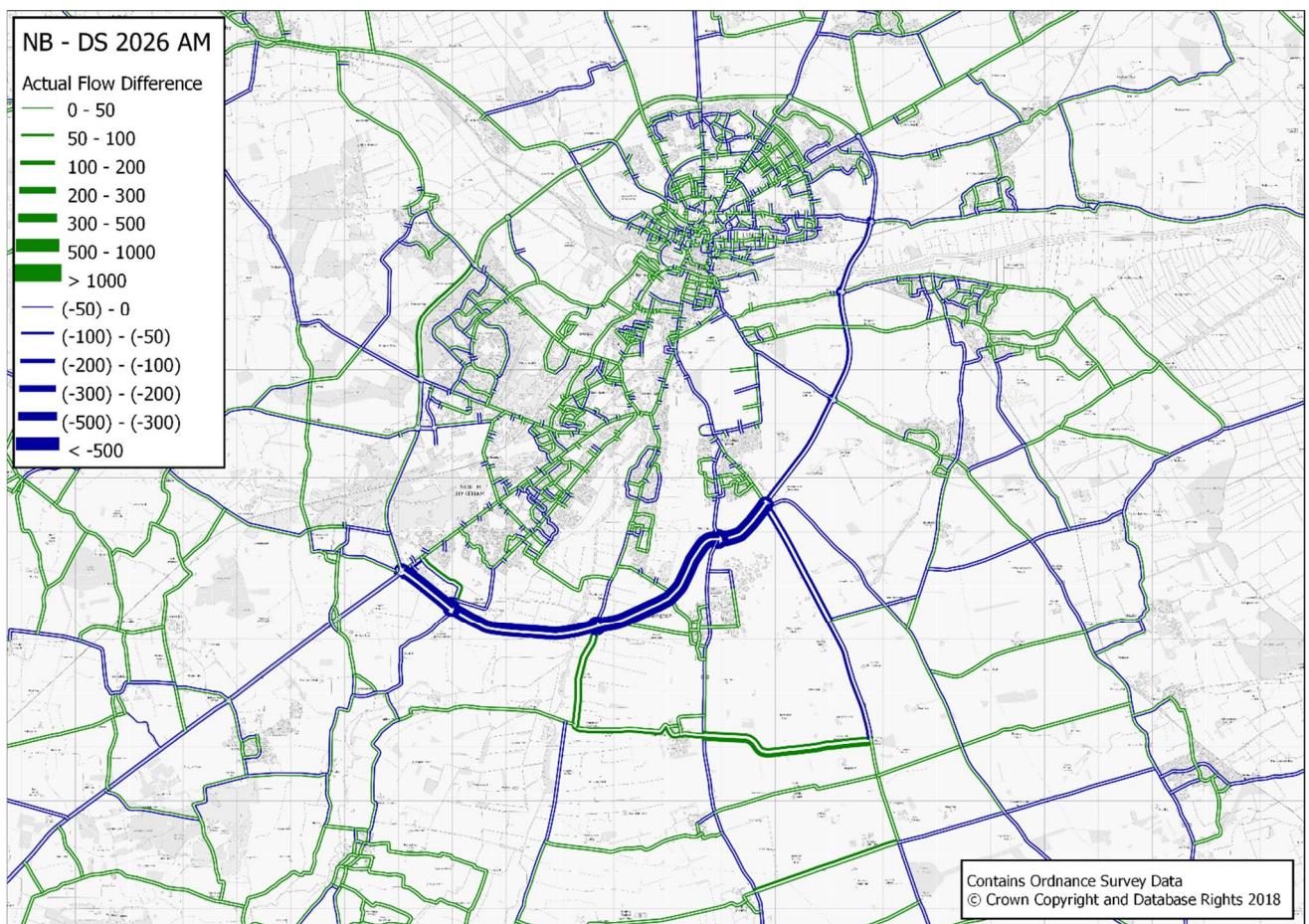
9.3.2 NETWORK REASSIGNMENT EFFECTS – DS AND NB

Figure 9-2 presents the forecast flow difference between the Do Something and Next Best scenario for 2026 AM. This is to illustrate the impact of the single carriageway scheme (and associated design speed reduction) but with the dual carriageway standard junctions.

There is a flow decrease on the scheme with trips reassigning to other parts of the network. A noticeable flow increase is on the routes around Harmston village and other rural roads. This indicates the NB scheme is less attractive to some trips.

The pattern is similar across all time periods and years. A complete set of images is provided in Appendix K.

Figure 9-2 Flow Difference – Do Something minus Next Best

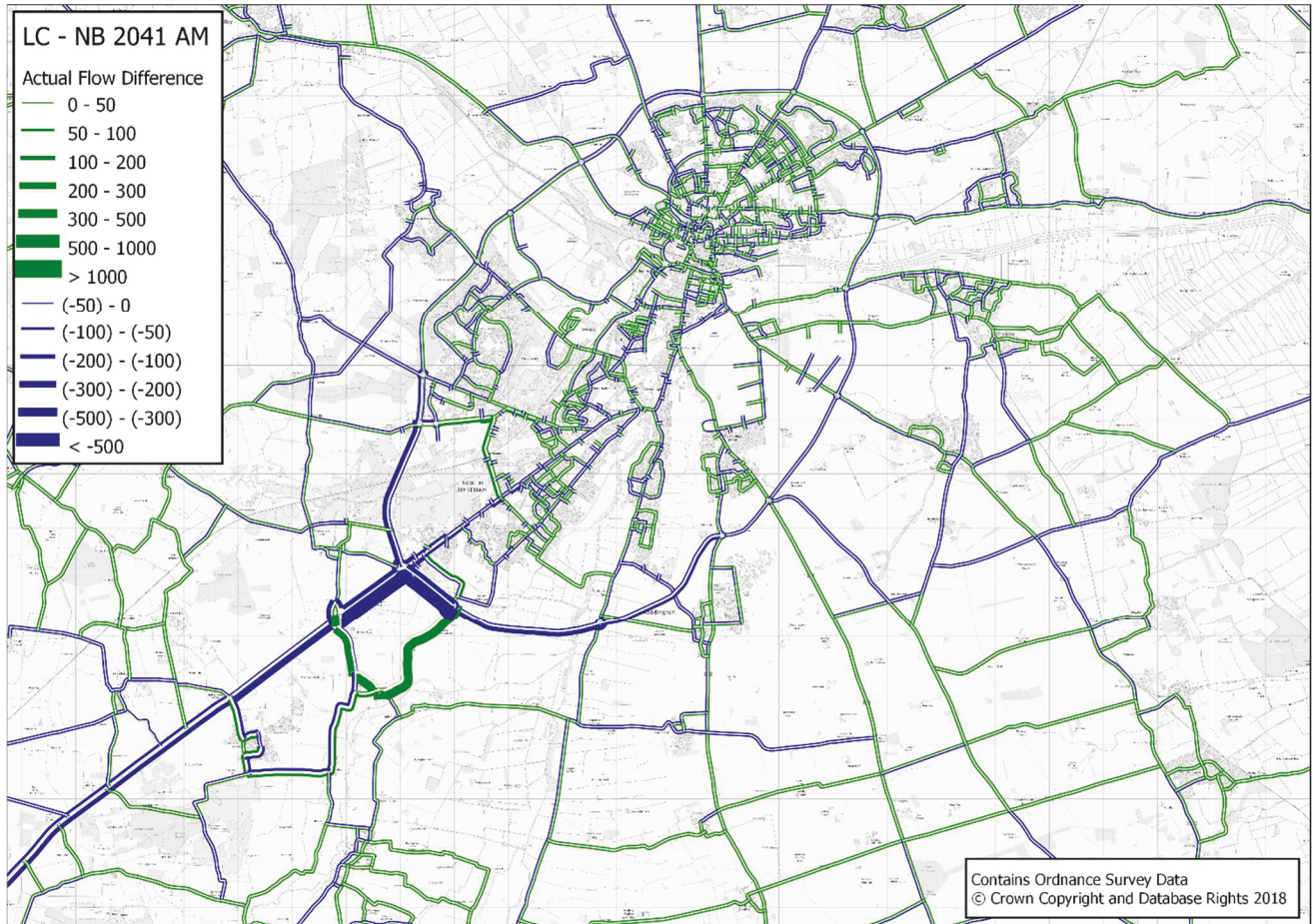


9.3.3 NETWORK REASSIGNMENT EFFECTS – NB AND LC

Figure 9-3 presents the forecast flow difference between the Next Best and Low Cost scenario for 2026 AM. This is to illustrate the impact of the smaller junctions between these two scenarios.

There are large flow changes at the western end of the scheme near Pennell's roundabout and in particular on the NHRR approach to Pennell's roundabout. There is rerouting to South Hykeham Road to bypass Pennell's roundabout from the south to Newark Road. This is due to lower capacity at Pennell's Roundabout with the Low Cost design. There are flow decreases but to a lower magnitude around the eastern end of the scheme.

Figure 9-3 Flow Difference – Next Best minus Low Cost



The pattern is similar across all time periods and years. A complete set of images is provided in Appendix K.

9.4 FORECASTING ALTERNATIVE GROWTH

As set out in Section 4.3.3 there were two alternative growth scenarios modelled.

- High growth; and
- Low Growth.

The scheme design assumptions are as per the Core Scenario.

The process for modelling alternative growth was described in Section 5.6.

Variable demand modelling was applied and the convergence statistics are provided in Appendix J.

The forecast models converged to WebTAG standards (see Section 8.2) apart from two – DM2041 AM and DS2041 PM. Those assignments were reviewed with flow and delay changes compared between the final loops. It was found that there were no significant changes around the scheme or on other key routes and so the outturn models were considered to be sufficient for this sensitivity testing.

The statistics for all runs are presented in Appendix G.

9.5 ALTERNATIVE GROWTH SCENARIO OUTPUTS

Alternative scheme option forecast outputs are summarised by:

- Network statistics; and
- Network reassignment effects between options.

9.5.1 NETWORK STATISTICS

Tables 9-4 to 9-6 present the network statistics for all growth scenarios.

The results are summarised as follows.

- Average speed is highest in the Low Growth and lowest in the High Growth as would be expected due to the reduced congestion in the former and increased congestion in the latter.
- Total travel time increases as the demand increases which is expected due to the greater level of congestion. This is also reflected in the queues.
- Total travel distance increases as the demand increases since trips may travel further to avoid more congested direct routes.

The average speed comparison by time period is presented in Figure 9-4.

Figure 9-4 Average Speed Comparison – Alternative Growth Options

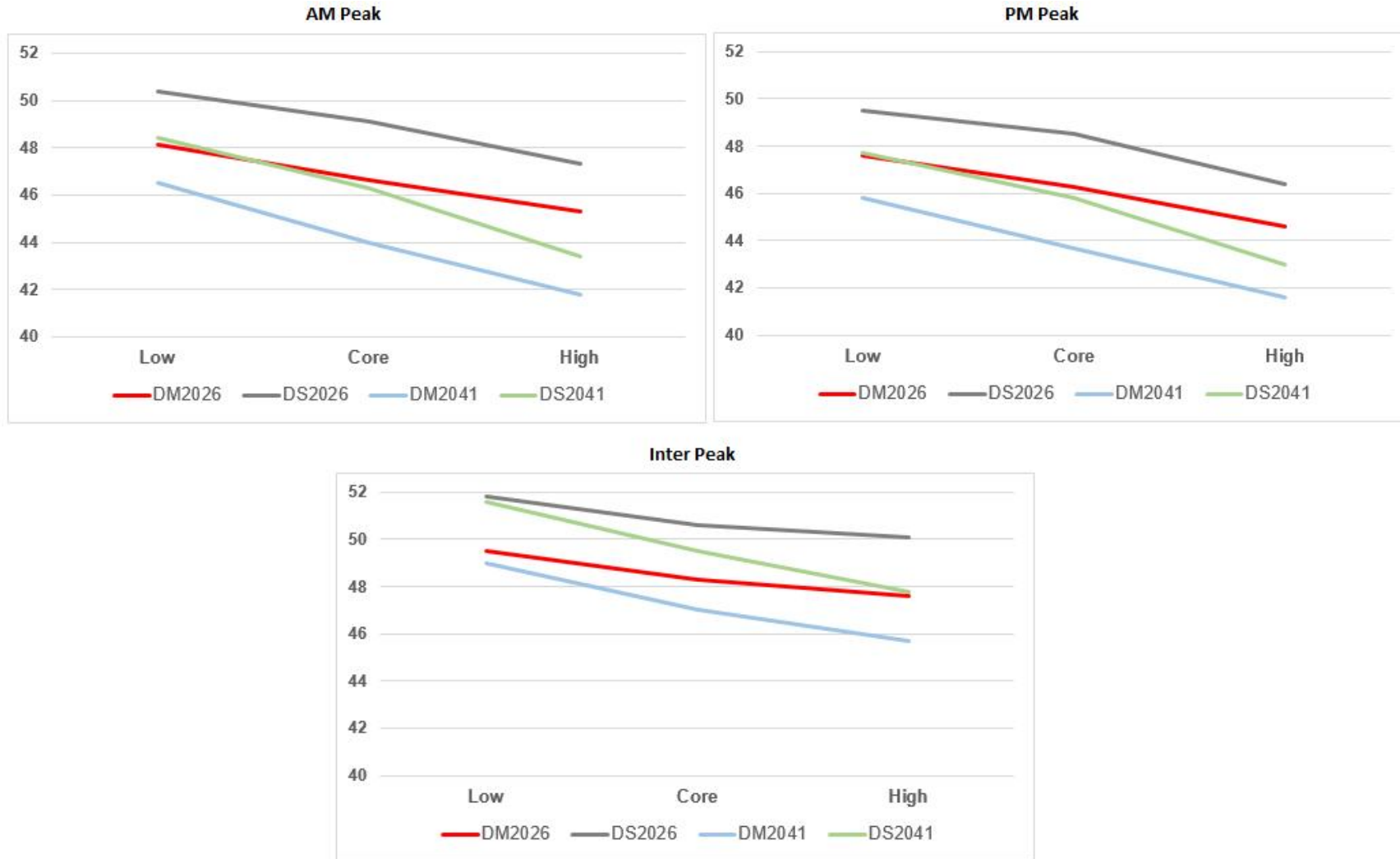




Table 9-4 FMA Network Statistics by Scenario – All Growth Scenarios AM Peak

Simulation Area Network Statistics	2026						2041					
	DM			DS			DM			DS		
	Low	Core	High	Low	Core	High	Low	Core	High	Low	Core	High
Total Assigned Trips (pcus)	238,847	257,382	276,431	238,939	257,430	276,506	254,822	283,720	314,299	254,897	283,774	314,401
Link Cruise Time (pcu-hrs)	5,924	6,266	6,839	6,018	6,249	6,928	6,638	7,128	8,013	6,786	7,139	8,131
Transient Queued Time (pcu-hrs)	1,560	1,735	1,986	1,501	1,636	1,959	1,805	2,151	2,628	1,806	2,063	2,582
Overcapacity Queued Time (pcu-hrs)	46	100	155	36	50	110	179	272	484	156	191	493
Total Travel Time (pcu-hrs)	7,529	8,101	8,981	7,555	7,934	8,997	8,622	9,552	11,125	8,747	9,394	11,206
Travel Distance (pcu-kms)	361,912	377,173	406,577	380,841	389,257	425,799	401,282	420,370	464,773	423,128	434,760	486,817
Average Journey Speed (kph)	48.1	46.6	45.3	50.4	49.1	47.3	46.5	44	41.8	48.4	46.3	43.4



Table 9-5 FMA Network Statistics by Scenario – All Growth Scenarios Inter Peak

Simulation Area Network Statistics	2026						2041					
	DM			DS			DM			DS		
	Low	Core	High	Low	Core	High	Low	Core	High	Low	Core	High
Total Assigned Trips (pcus)	169,887	182,746	196,437	169,876	182,735	196,438	183,468	203,291	225,622	183,486	203,289	225,637
Link Cruise Time (pcu-hrs)	4,662	4,894	5,375	4,708	4,878	5,429	5,346	5,641	6,474	5,456	5,652	6,555
Transient Queued Time (pcu-hrs)	1,210	1,343	1,510	1,141	1,248	1,421	1,400	1,612	1,936	1,333	1,506	1,884
Overcapacity Queued Time (pcu-hrs)	0	2	11	0	0	2	14	31	71	1	5	56
Total Travel Time (pcu-hrs)	5,872	6,239	6,896	5,848	6,125	6,852	6,761	7,284	8,480	6,790	7,164	8,495
Travel Distance (pcu-kms)	290,622	301,380	328,178	303,188	309,710	343,087	331,105	342,083	387,516	350,400	354,884	406,219
Average Journey Speed (kph)	49.5	48.3	47.6	51.8	50.6	50.1	49	47	45.7	51.6	49.5	47.8



Table 9-6 FMA Network Statistics by Scenario – All Growth Scenarios PM Peak

Simulation Area Network Statistics	2026						2041					
	DM			DS			DM			DS		
	Low	Core	High	Low	Core	High	Low	Core	High	Low	Core	High
Total Assigned Trips (pcus)	231,755	249,414	268,093	231,834	249,471	268,175	246,899	274,468	304,509	246,930	274,503	304,545
Link Cruise Time (pcu-hrs)	6,123	6,411	7,033	6,198	6,396	7,096	6,807	7,257	8,241	6,932	7,260	8,308
Transient Queued Time (pcu-hrs)	1,652	1,816	2,119	1,637	1,747	2,091	1,923	2,222	2,704	1,901	2,161	2,719
Overcapacity Queued Time (pcu-hrs)	62	112	196	74	71	213	210	287	497	234	241	523
Total Travel Time (pcu-hrs)	7,836	8,338	9,347	7,909	8,215	9,401	8,940	9,765	11,442	9,066	9,662	11,549
Travel Distance (pcu-kms)	373,156	385,737	416,635	391,171	398,112	435,879	409,572	427,172	475,672	432,307	442,452	496,479
Average Journey Speed (kph)	47.6	46.3	44.6	49.5	48.5	46.4	45.8	43.7	41.6	47.7	45.8	43

9.5.2 NETWORK REASSIGNMENT EFFECTS – CORE AND LOW GROWTH

Figures 9-5 and 9-6 presents the forecast flow difference between the Low Growth and Core Scenario for 2026 AM.

- Figure 9-5 (Do Minimum difference) illustrates, decrease in flow across the majority of links in the network, as a result of lower demand. The main exemption is LEB which is a significant scheme included in DM.
 - Sector analysis shows that this is due to a greater number of trips between West Lindsey (Sector 11 in Figure 7-3) and North Kesteven (Sector 9 in Figure 7-3) in the Low Growth than the Core. This is attributed to the lower level of congestion across the network which induces a greater demand response from north-south trips which directly benefit from LEB.
- Figure 9-6 (Do Something differences) shows the same pattern on LEB for the aforementioned reason. There is also an increase on the scheme for a similar reason with east-west sector pairs. Sector analysis – as per Figure 7-3 – showed a greater number of trips for pairs including Sector 4 to 15 (both directions) and Sector 1 to 9 (both directions) which directly benefit from the scheme.

The pattern is similar across all time periods and years. A complete set of images is provided in Appendix L.

Figure 9-5 Flow Difference – Low Growth DM minus Core DM

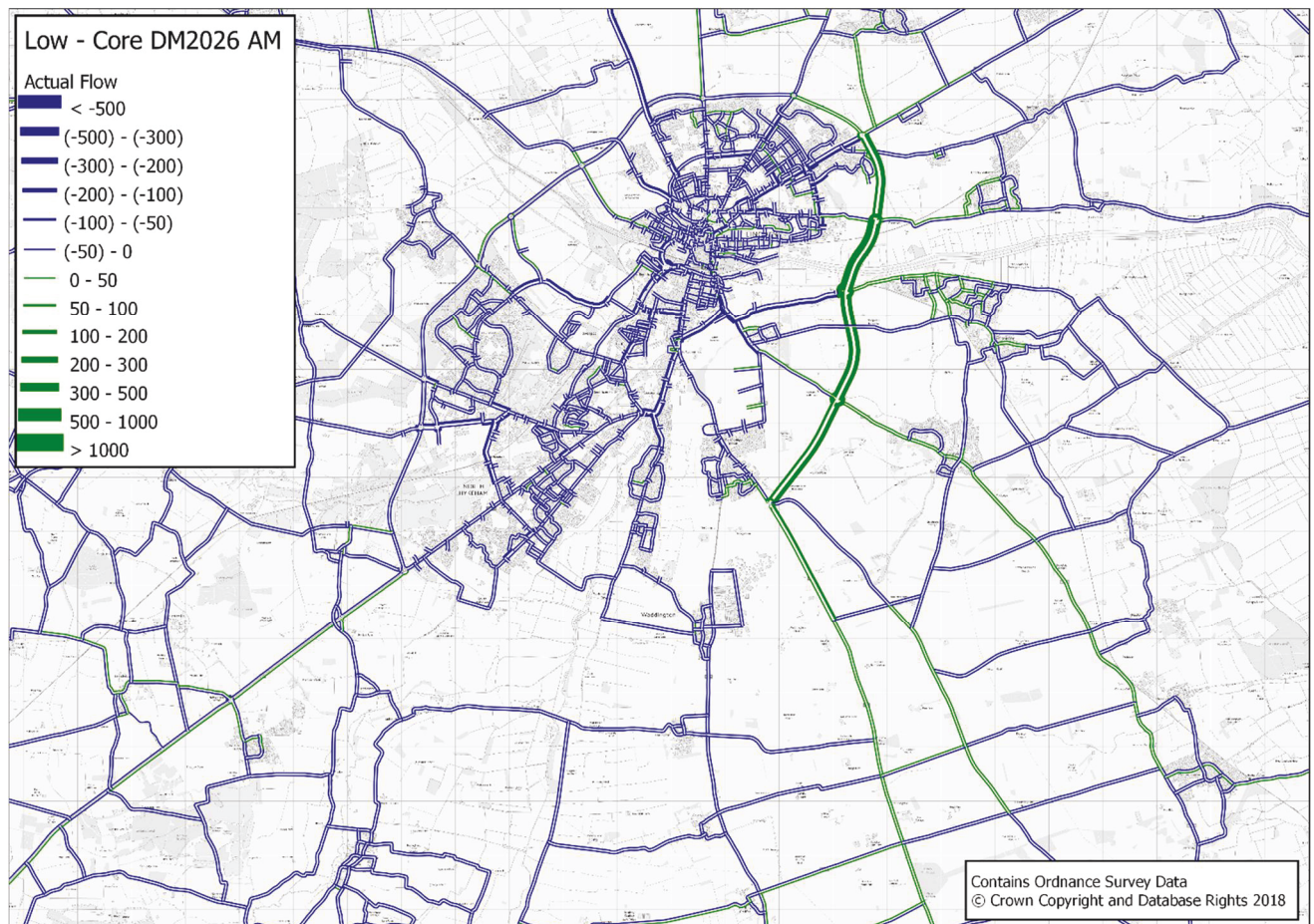
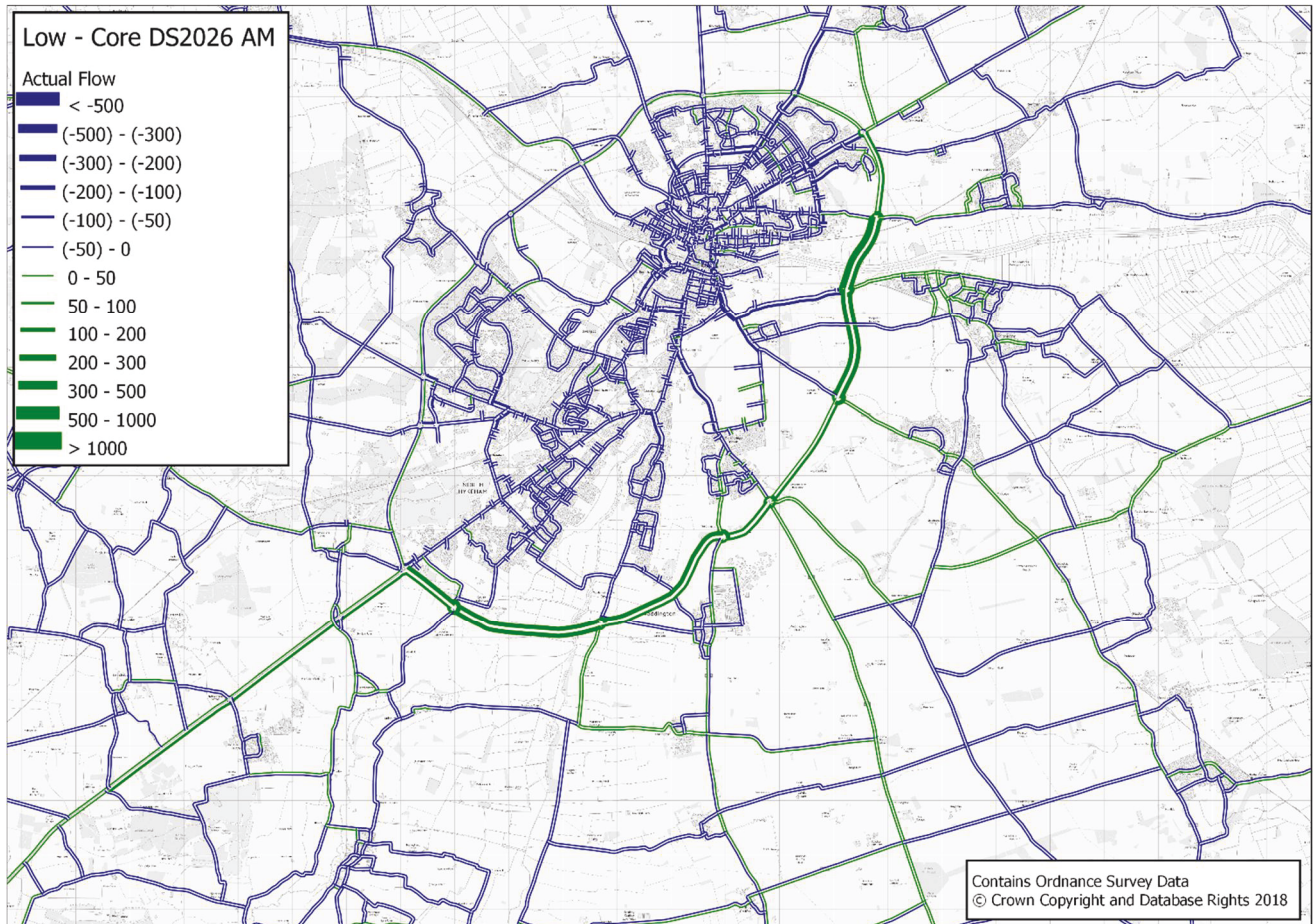


Figure 9-6 Flow Difference – Low Growth DS minus Core DS



9.5.3 NETWORK REASSIGNMENT EFFECTS – CORE AND HIGH GROWTH

Figures 9-7 and 9-8 presents the forecast flow difference between the High Growth and Core Scenario for 2026 AM.

- Figure 9-7 (Do Minimum difference) illustrates an increase in flow across the majority of links in the network. The flow increase is noticeably higher on LEB indicating that the additional capacity provided by LEB also makes it more attractive as a route choice than in the Core Scenario.
- Figure 9-8 (Do Something differences) is similar with the increase on LEB plus the NHRR scheme by the same basis.

The pattern is similar across all time periods and years. A complete set of images is provided in Appendix L.

Figure 9-7 Flow Difference – High Growth DM minus Core DM

