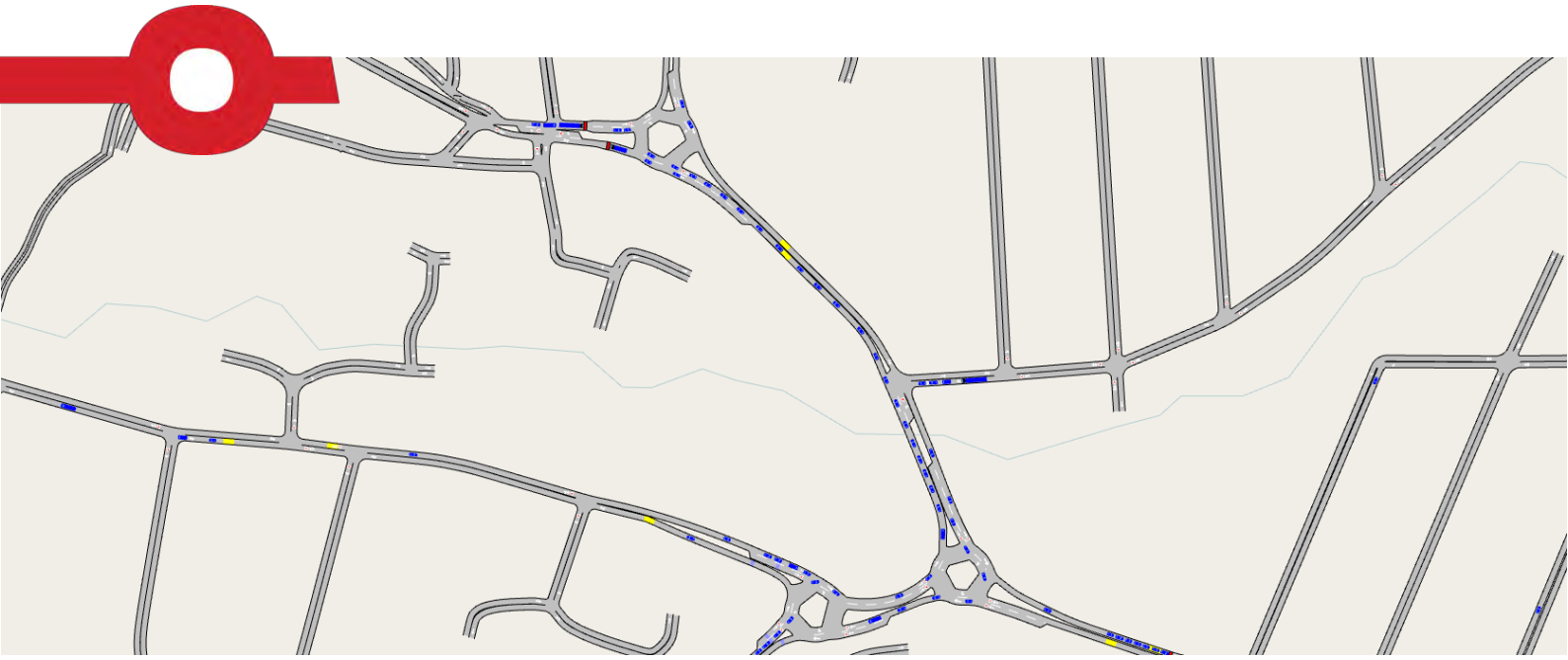
DARLINGTON LOCAL PLAN - CONISCLIFFE AIMSUN MODELLING



SYSTRA

DARLINGTON LOCAL PLAN SUPPORT

DARLINGTON LOCAL PLAN - CONISCLIFFE AIMSUN MODELLING

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TABLE OF CONTENTS

1.	INTRODUCTION	7
2.	AIMSUN MODEL BACKGROUND	9
2.1	INTRODUCTION	9
2.2	MITIGATION SCHEMES	9
3.	FORECASTING TRAFFIC DATA	13
3.1	INTRODUCTION	13
3.2	HOUSING AND EMPLOYMENT GROWTH	13
3.3	LOCAL PLAN DEMAND TOTALS	14
3.4	TEMPRO GROWTH REFERENCE CASE SCENARIO	15
3.5	LOCAL PLAN SCENARIOS	16
4.	AIMSUN MODEL RESULTS	17
4.1	INTRODUCTION	17
4.2	NETWORK PERFORMANCE RESULTS	17
4.3	CORRIDOR JOURNEY TIMES	21
4.4	JUNCTION OPERATION	27
4.5	2020 FORECAST YEAR SCENARIO	27
4.6	2025 FORECAST YEAR SCENARIO	31
4.7	2030 FORECAST YEAR SCENARIO	36
4.8	2035 FORECAST YEAR SCENARIO	41
5.	SENSITIVITY TESTING	46
5.2	NETWORK PERFORMANCE	46
5.3	CORRIDOR JOURNEY TIMES	48
6.	CONCLUSIONS	52

LIST OF FIGURES

Figure 1.	Microsimulation Models	7
Figure 2.	Woodland Road / Staindrop Road / Carmel Road roundabouts	10
Figure 3.	Cockerton Green roundabout	10
Figure 4.	Blands Corner	11
Figure 5.	Comparison between Base and Forecast Year Mitigation Network	12
Figure 6.	Darlington Housing Growth (Number of additional dwellings and jobs)	14
Figure 7.	'Development Only' Scenario - Morning Peak - 2020	16
Figure 8.	Average Delay in the Morning Peak	17
Figure 9.	Average Delay in the Evening Peak	18
Figure 10.	Network Throughput in the Morning Peak	19
Figure 11.	Network Throughput in the Evening Peak	19
Figure 12.	Average Speed in the Morning Peak	20
Figure 13.	Average Speed in the Evening Peak	21
Figure 14.	Journey Time Routes	22
Figure 15.	Journey times – 2020 AM Peak	23
Figure 16.	Journey times – 2020 PM Peak	23
Figure 17.	Journey times – 2025 AM Peak	24
Figure 18.	Journey times – 2025 PM Peak	24
Figure 19.	Journey times – 2030 AM Peak	25
Figure 20.	Journey times – 2030 PM Peak	25
Figure 21.	Journey times – 2035 AM Peak	26
Figure 22.	Journey times – 2035 PM Peak	26
Figure 23.	Cockerton Roundabout – 2020 AM Peak	28
Figure 24.	Cockerton Roundabout – 2020 PM Peak	28
Figure 25.	Town Centre – 2020 AM Peak	29
Figure 26.	Town Centre – 2020 PM Peak	30
Figure 27.	A1 / A68 Burtree Gate – 2020 AM Peak	30
Figure 28.	A1 / A68 Burtree Gate – 2020 PM Peak	31
Figure 29.	Cockerton Roundabout – 2025 AM Peak	32
Figure 30.	Cockerton Roundabout – 2025 PM Peak	33
Figure 31.	Town Centre – 2025 AM Peak	33
Figure 32.	Town Centre – 2025 PM Peak	34
Figure 33.	A1 / A68 Burtree Gate – 2025 AM Peak	35
Figure 34.	A1 / A68 Burtree Gate – 2025 PM Peak	35
Figure 35.	Cockerton Roundabout – 2030 AM Peak	37
Figure 36.	Cockerton Roundabout – 2030 PM Peak	37
Figure 37.	Town Centre– 2030 AM Peak	38
Figure 38.	Town Centre– 2030 PM Peak	39
Figure 39.	A1 / A68 Burtree Gate – 2030 AM Peak	39
Figure 40.	A1 / A68 Burtree Gate – 2030 PM Peak	40
Figure 41.	Cockerton Roundabout – 2035 AM Peak	41
Figure 42.	Cockerton Roundabout – 2035 PM Peak	41
Figure 43.	Town Centre – 2035 AM Peak	42
Figure 44.	Town Centre – 2035 PM Peak	43
Figure 45.	A1 / A68 Burtree Gate – 2035 AM Peak	43
Figure 46.	A1 / A68 Burtree Gate – 2035 PM Peak	44

Figure 47. Average Delay in the Morning Peak with Cockerton in 2030 Do Min 46
Figure 48. Average Delay in the Evening Peak with Cockerton in 2030 Do Min 47
Figure 49. Network Throughput in the Morning Peak with Cockerton in 2030 Do Min 47
Figure 50. Network Throughput in the Evening Peak with Cockerton in 2030 Do Min 48
Figure 51. Journey times – 2030 AM Peak 49
Figure 52. Journey times – 2030 PM Peak 49
Figure 53. Journey times – 2035 AM Peak 50
Figure 54. Journey times – 2035 PM Peak 50

LIST OF TABLES

Table 1.	Darlington Local Plan Development Quantums 2020-2035	13
Table 2.	Total Vehicles in 2020 Peak Hour Matrix	14
Table 3.	Total Vehicles in 2025 Peak Hour Matrix	15
Table 4.	Total Vehicles in 2030 Peak Hour Matrix	15
Table 5.	Total Vehicles in 2035 Peak Hour Matrix	15
Table 6.	TEMPro Growth Factors	15
Table 7.	2020 Mitigation Measures	27
Table 8.	2025 Mitigation Measures	31
Table 9.	2030 Mitigation Measures	36
Table 10.	Darlington Local Plan Development Quantums 2020-2035	52

1. INTRODUCTION

1.1.1 In order to assess the transport impacts of the Darlington Local Plan, a set of local microsimulation models have been developed. The figure below illustrates the extents of the microsimulation models.

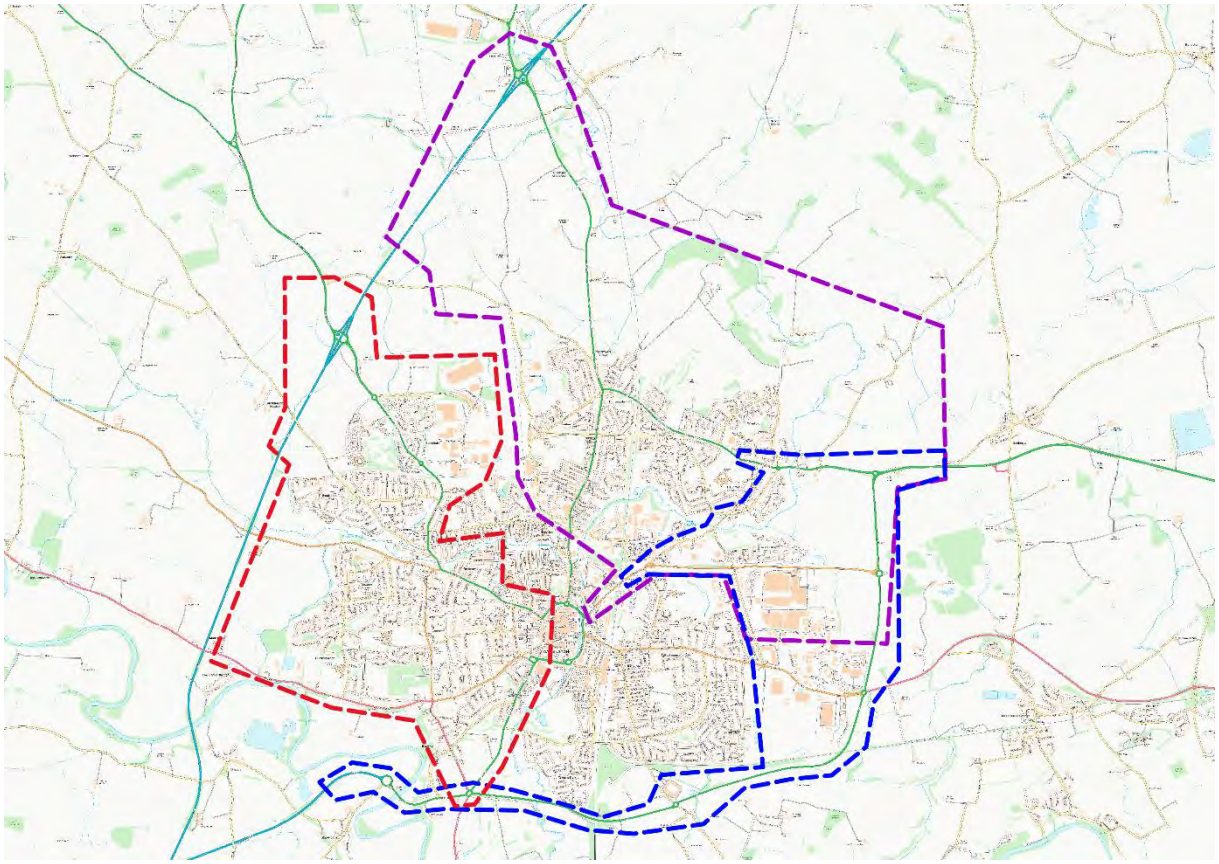


Figure 1. Microsimulation Models

1.1.2 The three models are named as below:

- A66 VISSIM Model – Blue outline;
- Coniscliffe AIMSUN Model – Red outline ; and
- Skerningham Model – Purple outline

1.1.1 Arup undertook traffic modelling in support of proposed new housing developments by Taylor Wimpey and Gladman Developments on land off Coniscliffe Road and Staindrop Road. SYSTRA has been engaged by Darlington Borough Council (DBC) to use Arup's Aimsun model to assess the impact that traffic generated by Darlington Local Plan land allocations will have on the road network in the west of Darlington.

1.1.2 The following scenarios have been analysed up to 2035 within the microsimulation software program Aimsun:

- Do Nothing: No additional homes or jobs are created and no schemes are delivered;

- Natural Growth: Growth calculated from assumed TEMPro growth factors as per standard Transport Application methodology;
- Development Only: The impact of the developments included within the local plan, with no mitigation schemes; and
- The Local Plan: The impact of the development and the associated infrastructure based mitigation schemes that are included in the local plan.

1.1.3 These scenarios enable a comparison to be made between the impacts of releasing Local Plan traffic onto the network and providing a package of mitigation schemes in order to address this.

1.1.4 This report will cover the following:

- A background to the Aimsun model used for the forecasting scenarios, including details of the mitigation schemes coded;
- The demand forecasting methodology used to generate demand matrices representing Local Plan traffic:
- Results observed from the modelled scenarios:
- A conclusion summarising the key issues arising from the results.

2. AIMSUN MODEL BACKGROUND

2.1 Introduction

2.1.1 The Aimsun models used for Local Plan forecasting have been derived from the 2016 Coniscliffe Aimsun Base Model. The network included in this model is shown in grey in **Figure 5** below.

2.1.2 Forecast year matrices have been derived from the Tees Valley Combined Authority Cube Voyager Network Model (see Strategic Transport Modelling report).

2.1.3 Within mitigation scenarios, a number of improvements have been coded into the model. These comprise of a mix of localised junction improvements plus new link roads providing access to development sites at Coniscliffe Road, Staindrop Road, and joining Coniscliffe Road to Newton Lane and the proposed West Park Garden Village. The schemes are detailed in the section below.

2.2 Mitigation Schemes

2.2.1 A series of mitigation schemes have been identified by developers and by Darlington Borough Council. These have been included within the **With Mitigation** scenarios. A plan showing the measures to be introduced across Darlington is shown in **Figure 5** below.

Cockerton Roundabouts

2.2.2 The proposed Gladman and Taylor Wimpey developments off Coniscliffe Road and Staindrop Road include proposals to upgrade the existing small roundabouts at A68 Woodland Road / Cockerton Green, A68 Woodland road / B6279 Staindrop Road and B6279 Staindrop Road / B6280 Carmel Road to larger layouts providing additional

capacity. The location is shown as 1 in **Figure 5** below and screenshots showing the proposed layouts are shown in **Figure 2** and **Figure 3** below.

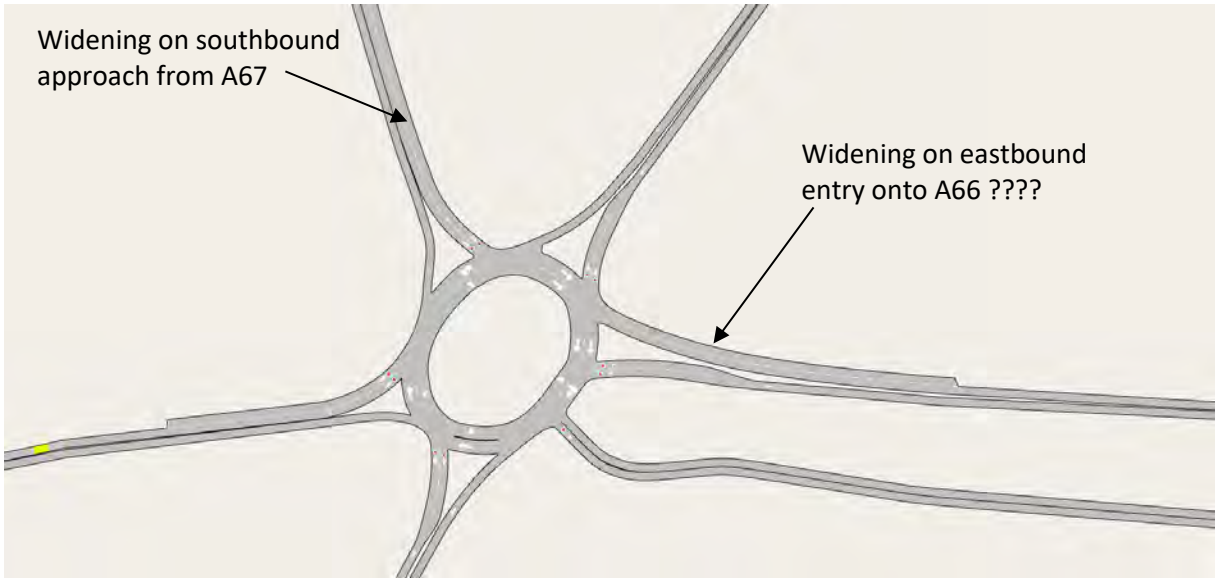
Figure 2. Woodland Road / Staindrop Road / Carmel Road roundabouts

Figure 3. Cockerton Green roundabout

Blands Corner

2.2.3 General widening is proposed on two arms of the Blands Corner roundabout (A66 / A167 / Carmel Road / Croft Road), shown as number 2 in **Figure 5** below, and in more detail in **Figure 4**.

Figure 4. Blands Corner



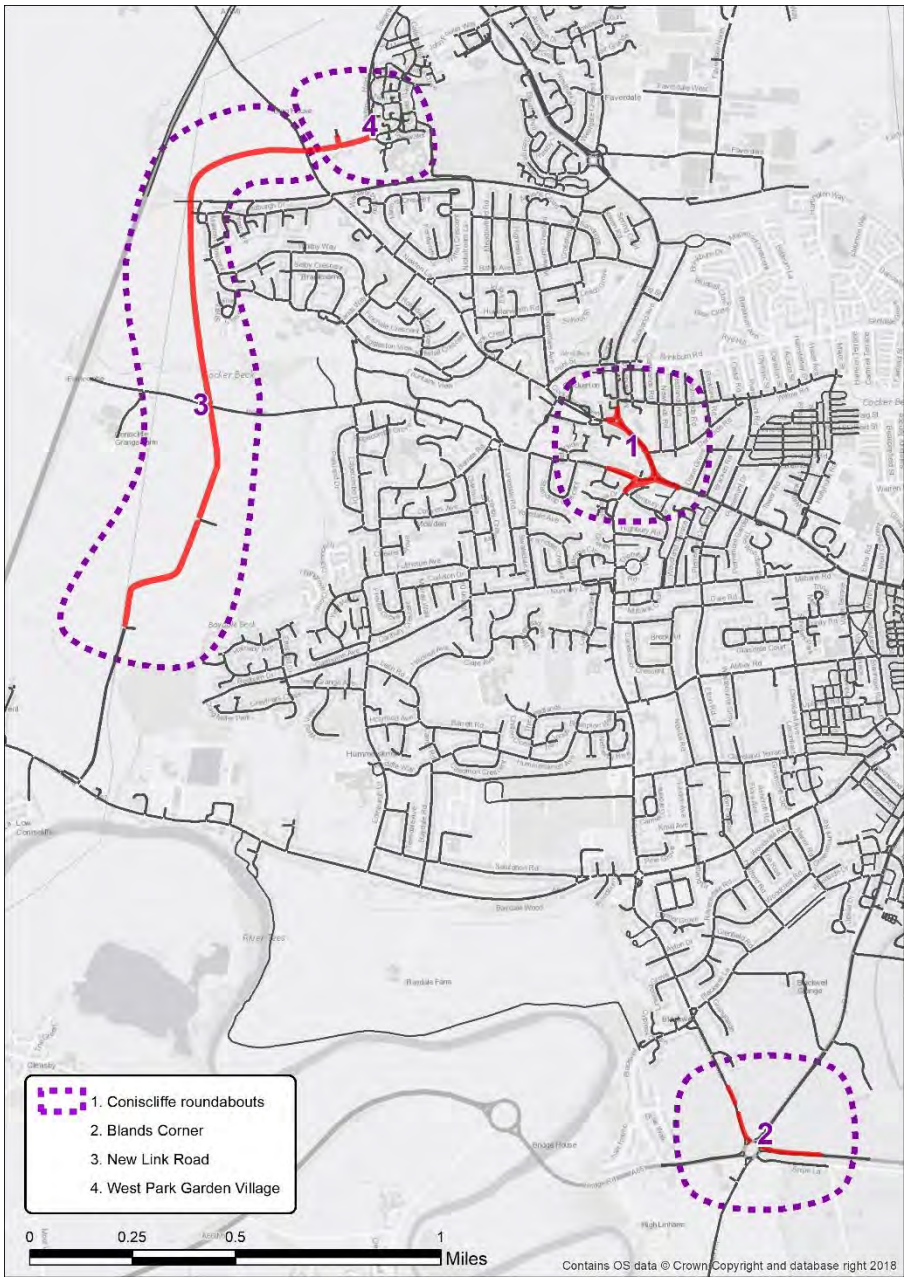
New Link Road

2.2.4 The proposed Gladman and Taylor Wimpey developments off Coniscliffe Road and Staindrop Road include proposals for a link road through both sites connecting Coniscliffe Road to Staindrop Road. The developers have also proposed to continue this link road north of Staindrop Road to Newton Lane. The link road is shown as number 3 in **Figure 5** below.

West Park Garden Village

2.2.5 The West Park Garden Village proposals include a link from Newton Lane to Edward Pease Way, shown as number 4 in **Figure 5** below.

Figure 5. Comparison between Base and Forecast Year Mitigation Network



3. FORECASTING TRAFFIC DATA

3.1 Introduction

3.1.1 Traffic forecasts associated with the Darlington Local Plan implementation have been calculated, using TRICS trip rates, from the development database supplied by Darlington Council on 25/01/2018.

3.1.2 The quantum of developments to be considered as part of the local plan is shown in **Table 1** below:

Table 1. Darlington Local Plan Development Quantums 2020-2035

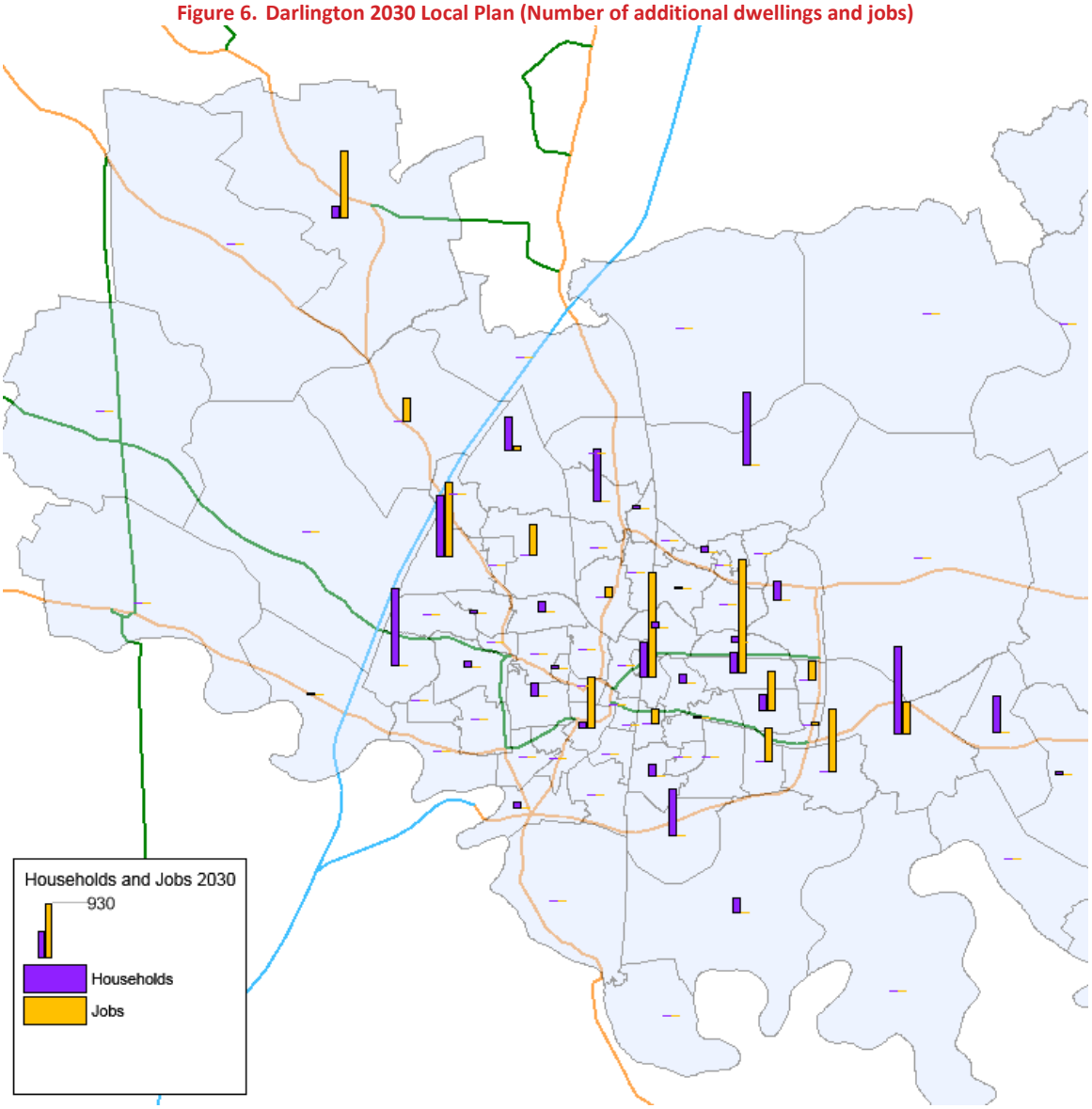
PLAN PERIOD	2020	2025	2030	2035
Dwellings	2,728	6,116	9,214	11,810
Jobs	5,119	7,465	8,763	9,950

3.1.3 The TVCA Cube Voyager model was then used to allocate Local Plan traffic onto the Aimsun model network.

3.2 Housing and Employment Growth

3.2.1 Housing and employment growth forecasts used in the TVCA Cube Voyager model to derive forecast year traffic demand are illustrated in **Figure 6**. A considerable amount of the development quantum is located on the A68, Staindrop Road and Coniscliffe Road corridors in the west of the town.

Figure 6. Darlington 2030 Local Plan (Number of additional dwellings and jobs)



3.3 Local Plan Demand Totals

3.3.1 **Table 2** through to **Table 4** show the total peak hour demand included in the forecasts through to the 2035 Local Plan scenarios.

Table 2. Total Vehicles in 2020 Peak Hour Matrix

TIME	CAR	LGV	HGV	DARLINGTON LOCAL PLAN	TOTAL VEHICLES
AM	10432	938	418	867	12654
PM	10551	747	243	1310	12850

Table 3. Total Vehicles in 2025 Peak Hour Matrix

TIME	CAR	LGV	HGV	DARLINGTON LOCAL PLAN	TOTAL VEHICLES
AM	9638	1466	640	1500	13245
PM	9691	1175	457	1559	12883

Table 4. Total Vehicles in 2030 Peak Hour Matrix

TIME	CAR	LGV	HGV	DARLINGTON LOCAL PLAN	TOTAL VEHICLES
AM	10047	1506	699	2211	14463
PM	10160	1344	531	2445	14481

Table 5. Total Vehicles in 2035 Peak Hour Matrix

TIME	CAR	LGV	HGV	DARLINGTON LOCAL PLAN	TOTAL VEHICLES
AM	10239	1500	708	2773	15220
PM	10045	1341	533	2937	14856

3.4 TEMPro Growth Reference Case Scenario

3.4.1 To provide a comparison with the impact of Local Plan traffic forecasts on the network, reference case scenarios for 2020, 2025, 2030 and 2035 were created with TEMPro growth factors applied to 2016 base year traffic. The TEMPro scenarios also do not contain any of the mitigation schemes.

3.4.2 **Tables 5** shows the TEMPro growth factors used to generate the matrices for the reference case scenarios in the authority of Darlington. The parameters selected to generate the growth factors were for an urban area and for all road classes.

Table 6. TEMPro Growth Factors

YEAR	AM	PM
2016-2020	1.0720	1.0672
2016-2025	1.1079	1.1001
2016-2030	1.1512	1.1419

YEAR	AM	PM
2016-2035	1.1849	1.1725

3.5 Local Plan Scenarios

3.5.1 The strategic model was used to identify the traffic associated with the Local Plan for each model year (2020, 2025, 2030 and 2035).

3.5.2 The strategic modelling work identified the A68 corridor as requiring the introduction of mitigation measures early in the plan period. The following image extracted from the strategic modelling analysis, illustrates the volume over capacity ratios for 2020 in the morning peak period.

3.5.3 This illustrates key issues on the A68 corridor, that the mitigations in this report are seeking to address.

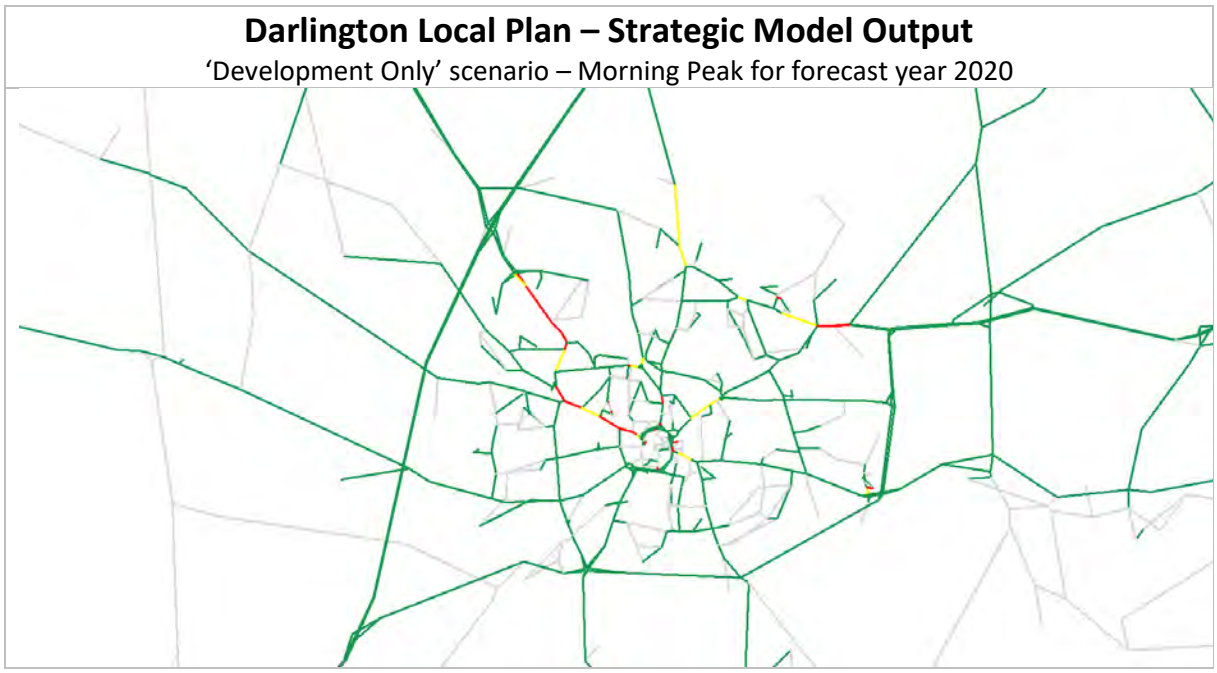


Figure 7. 'Development Only' Scenario - Morning Peak - 2020

3.5.4 The full Darlington Local Plan development quantum through to 2035 was tested as part of the microsimulation modelling analysis against a number of network scenarios.

4. AIMSUN MODEL RESULTS

4.1 Introduction

4.1.1 This section details the results generated from the AIMSUN forecast year modelling.

4.1.2 In order to test the local plan, a series of scenarios have been evaluated and analysis of the differences undertaken to reveal emerging issues on the road network that will need to be addressed.

4.1.3 Four scenarios have been formulated for each year. These are defined as:

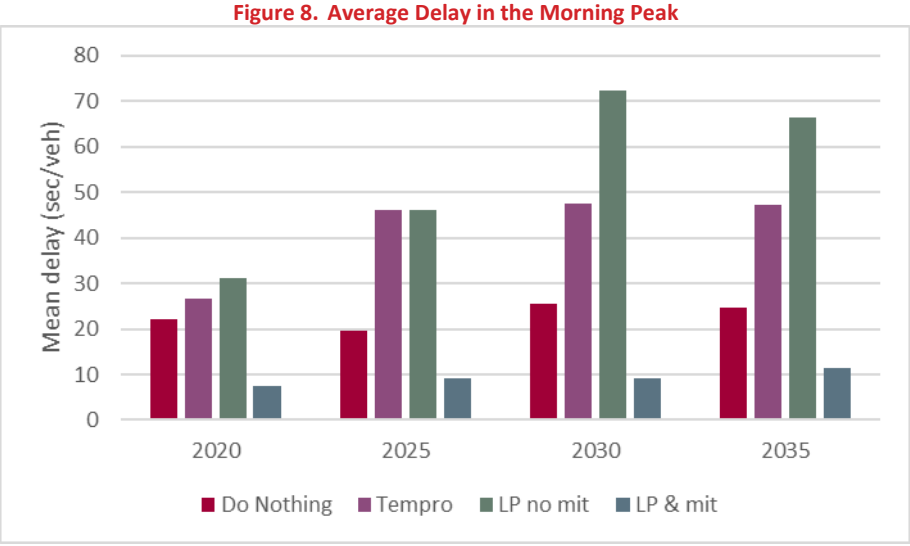
- Do Nothing: No additional homes or jobs are created and no schemes are delivered;
- Natural Growth: Growth calculated from assumed TEMPro growth factors as per standard Transport Application methodology;
- Development Only: The impact of the developments included within the local plan, with no mitigation schemes; and
- The Local Plan: The impact of the development and the associated infrastructure based mitigation schemes that are included in the local plan.

4.2 Network Performance Results

4.2.1 The following parameters are used to measure results on a network wide basis within the AIMSUN model. The average delay is calculated as the additional time required to travel when not at the speed limit. Given the requirement to stop at traffic lights, and slow for priority junctions there will always be some delay.

Average Delay

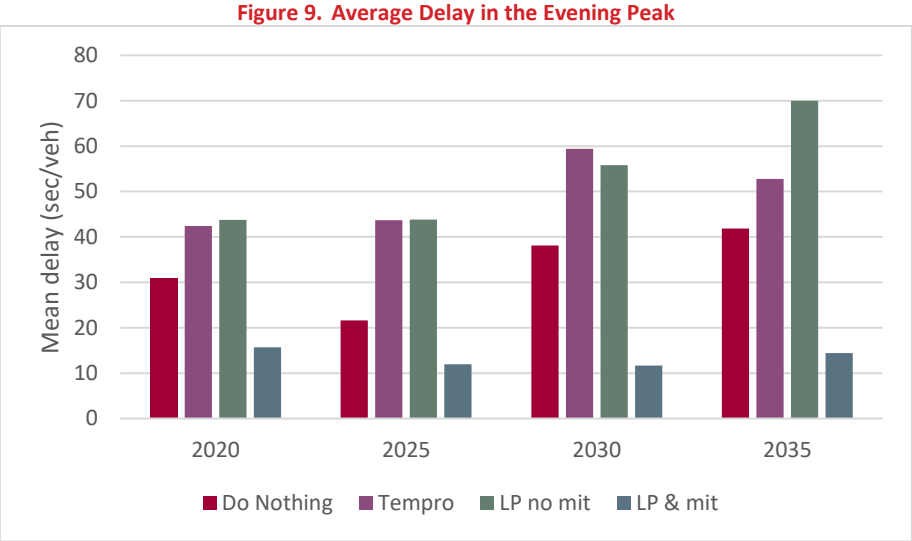
Figure 8. Average Delay in the Morning Peak



4.2.2 The chart shows that when Local Plan traffic is added to the network, the package of mitigation schemes keeps the average delay per vehicle relatively low at around 10s per vehicle throughout the Local Plan period. The chart shows that in the AM without mitigation, by 2025 the average delay is significantly increased, from around 20-30 seconds per vehicle in 2020 to up to 70 seconds per vehicle in 2030. The package of mitigation schemes reduces this to around 10 seconds in all years.

4.2.3 In all scenarios, the Local Plan including the mitigation shows lower delays than the "no development" option on the existing network.

Figure 9. Average Delay in the Evening Peak



4.2.4 In the PM the average delay without mitigation is fairly constant from 2020 to 2025 and then increases for 2030 and 2035, particularly for the "no development" option.

4.2.5 The package of mitigation reduces the delays associated with the Tempro or Local Plan growth, keeping the delay per vehicle down to around 10-15 seconds in all years.

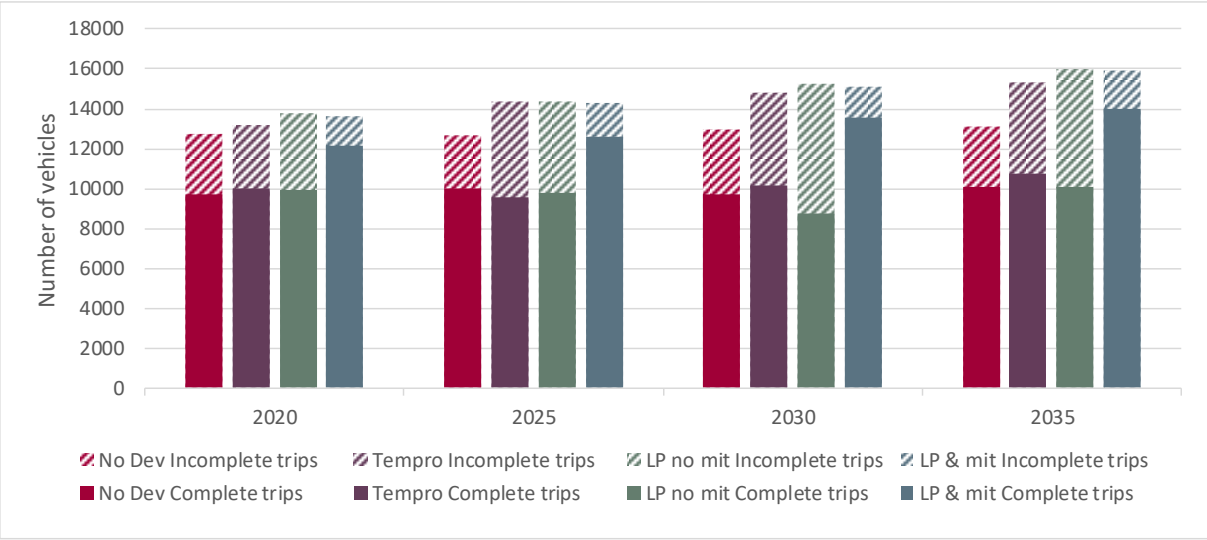
Network Throughput

4.2.6 Network throughput analysis displays all vehicles that have entered the network during the modelled time period, illustrating those that have completed their trips (in solid colour) and those whose trips remain incomplete by the end of the modelled period (the hatched section of each bar).

4.2.7 These incomplete trips are vehicles travelling on the road network at the end of the simulation, and in extreme cases vehicles waiting to enter the network due to congestion.

4.2.8 It should be noted that there will always be some vehicles that have not completed their journeys at the end of the model period. The aim is not to reduce the incomplete trips to zero, but to minimise them and enable the network to maximise the number of completed trips.

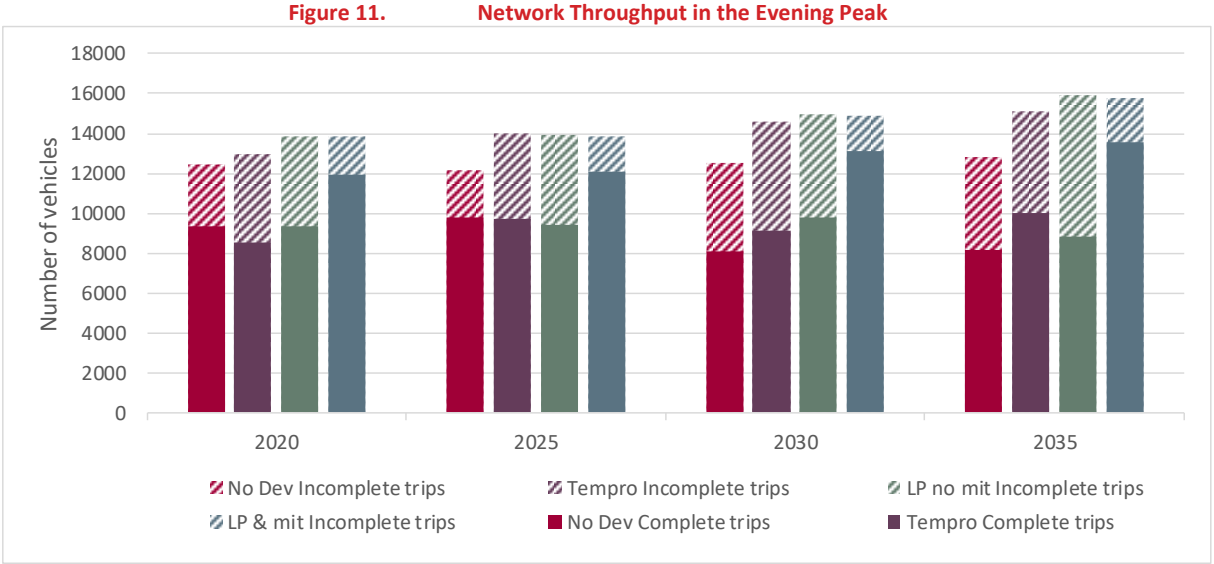
Figure 10. Network Throughput in the Morning Peak



4.2.9 The bar chart shows that in the AM without mitigation schemes, the number of vehicles completing their journey is largely unchanged between the No Development, Tempro and Local Plan No Mitigation scenarios in each year. This is because the road network is already operating around capacity, so additional vehicles are generally not able to complete their journeys, or enter the network to start their journeys.

4.2.10 With the package of mitigation included, more traffic is able to complete its journey, shown by the greater proportion of traffic in the solid bar. The number of incomplete trips is reduced for all years and all growth scenarios.

Figure 11. Network Throughput in the Evening Peak

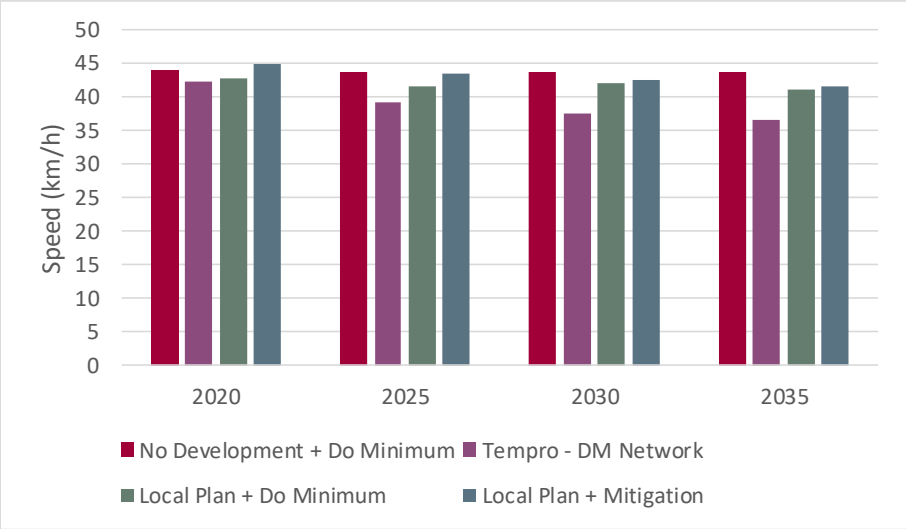


4.2.11 The pattern of throughput in the PM is similar to that for the AM. For the scenarios which do not include mitigation the number of vehicles completing their journey remains relatively constant, although with more variation than in the AM.

4.2.12 With the package of mitigation included the number of vehicles completing their journey increases, and the number of vehicles stuck outside the network drops for all years.

Average Speed

Figure 12. Average Speed in the Morning Peak

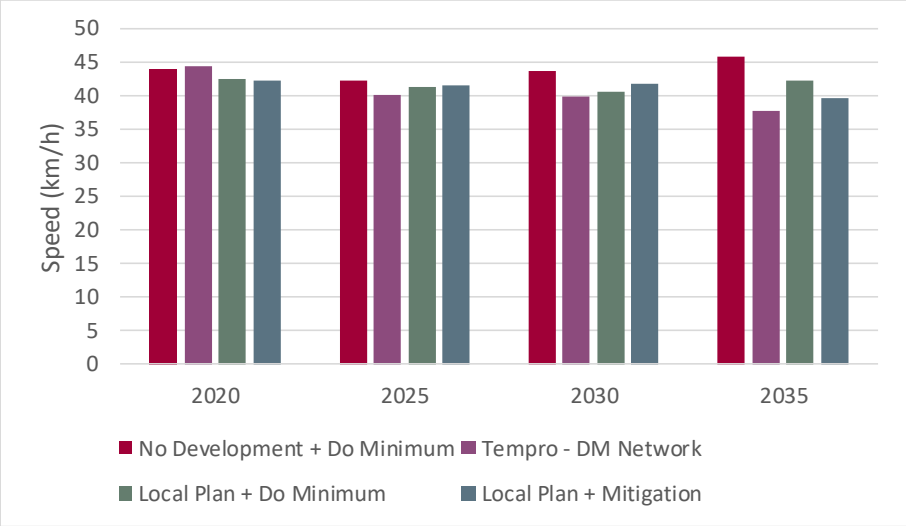


4.2.13 The average speed over the full network can be used as a measure of network performance, however there are a number of factors which should be borne in mind. Firstly the average speed may change for scenarios including development traffic even if there is no additional delay. This is because the development traffic may have different characteristics from the existing traffic – for instance it may be more focussed on local 30mph roads rather than higher speed strategic routes, which would reduce the average speed. Also the speed also doesn't take account of traffic which has been unable to enter the network and as shown in the throughput graphs above for some of the scenarios this could be a significant effect.

4.2.14 Caution should therefore be applied but speed still provides a good overview of the operation of the network.

4.2.15 With no development and no mitigation the average speed across the network is largely unchanged for all years at around 40 km/h. With Tempro of Local Plan development but no mitigation the speed gradually drops. With mitigation included the average speed is slightly higher than the "without mitigation" scenarios but the difference is small.

Figure 13. Average Speed in the Evening Peak



4.2.16 In the PM the pattern is similar to the AM. The "with development" scenarios show a drop in speeds in the later years, and the average speed in the Local Plan plus mitigation scenario is similar to that without mitigation. This suggests that the main benefit of the mitigation is to provide additional capacity (as shown by the throughput graphs) but not to increase speeds for traffic in the network.

4.3 Corridor Journey Times

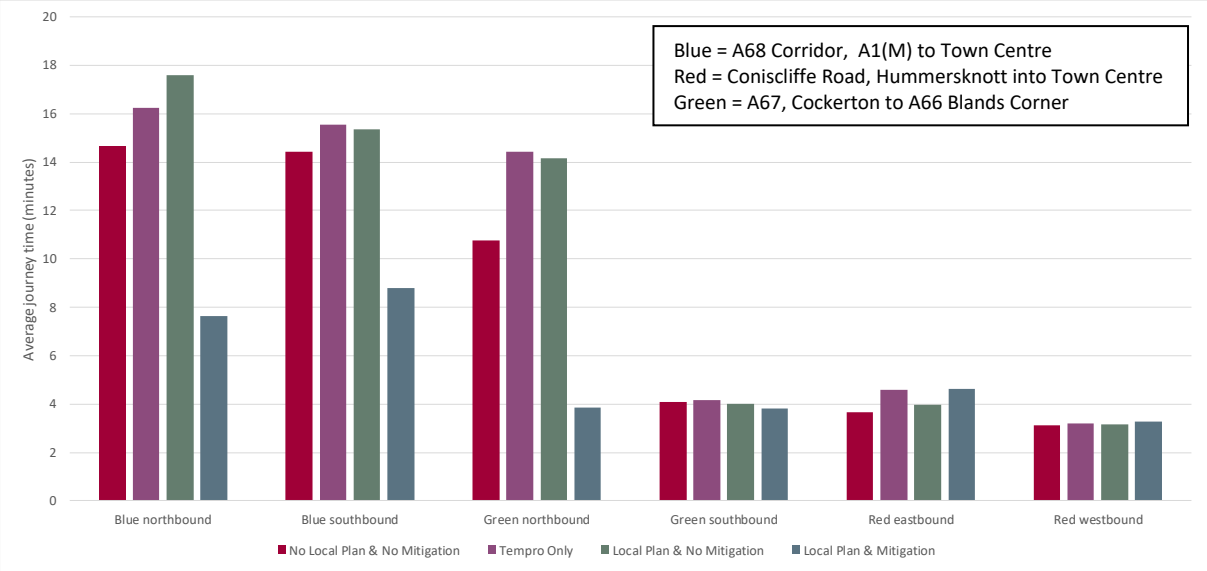
4.3.1 The Optima / Arup reporting for the developments off Coniscliffe Road / Staindrop Road included journey times for 3 routes as shown in Figure 14 below.

4.3.2 Average journey times for these routes have also been collected for the Local Plan modelling, as they provide an overview of travel times into and around Darlington.

Figure 14. Journey Time Routes

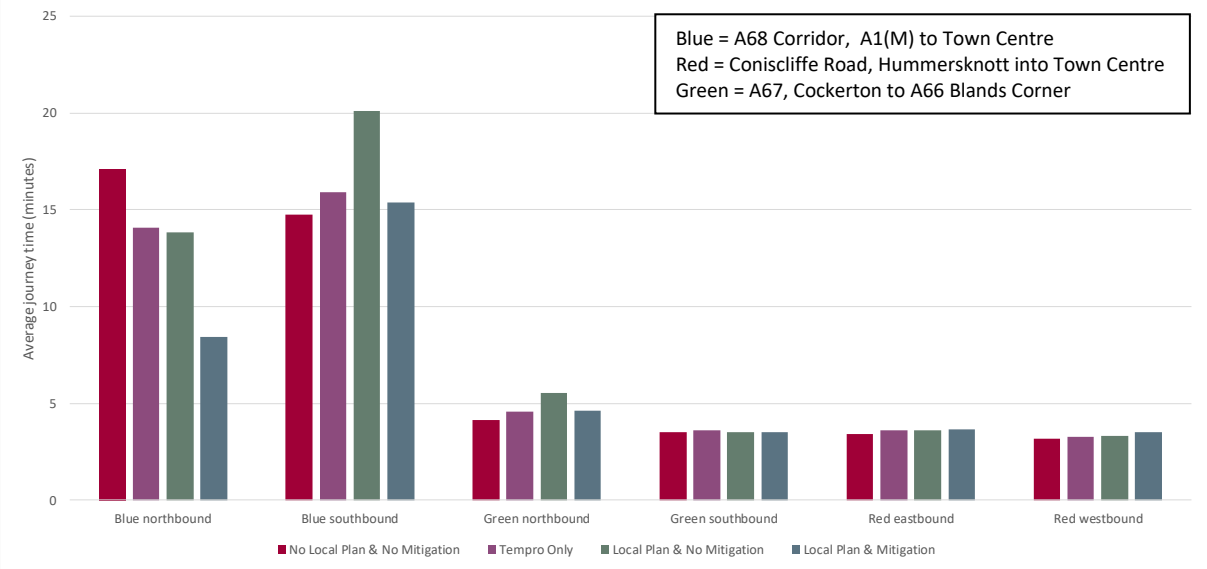
4.3.3 The graphs below show the average journey time in minutes for each route for all four modelled scenarios.

Figure 15. Journey times – 2020 AM Peak



4.3.4 In the morning peak for 2020 the main delays in the network are on the blue route (both directions) and northbound on the green route towards Cockerton roundabouts. The longer journey times on these routes are all related to delays at the roundabouts, and when mitigation is included along with the Local Plan traffic the journey time drops to below existing levels.

Figure 16. Journey times – 2020 PM Peak



4.3.5 In the evening peak for 2020 the main delays in the network are on the blue route in both directions. Northbound journey times reduce as more traffic is added, this is because of delays in the wider network which prevent traffic from reaching the corridor for which the journey time is measured. Southbound journey times increase, as traffic from the north enters from the A1 Burtree Gate roundabout which is less constrained that the town

centre. Southbound the journey time drops to around the 2020 No Development level with mitigation included.

4.3.6 The following six figures illustrate the equivalent journey time analysis for forecast years 2025, 2030 and 2035 for morning and evening peaks respectively.

4.3.7 The results mirror those of the 2020 scenario in pattern with changes in magnitude reflecting the increased traffic levels that each scenario is attempting to accommodate over time.

Figure 17. Journey times – 2025 AM Peak

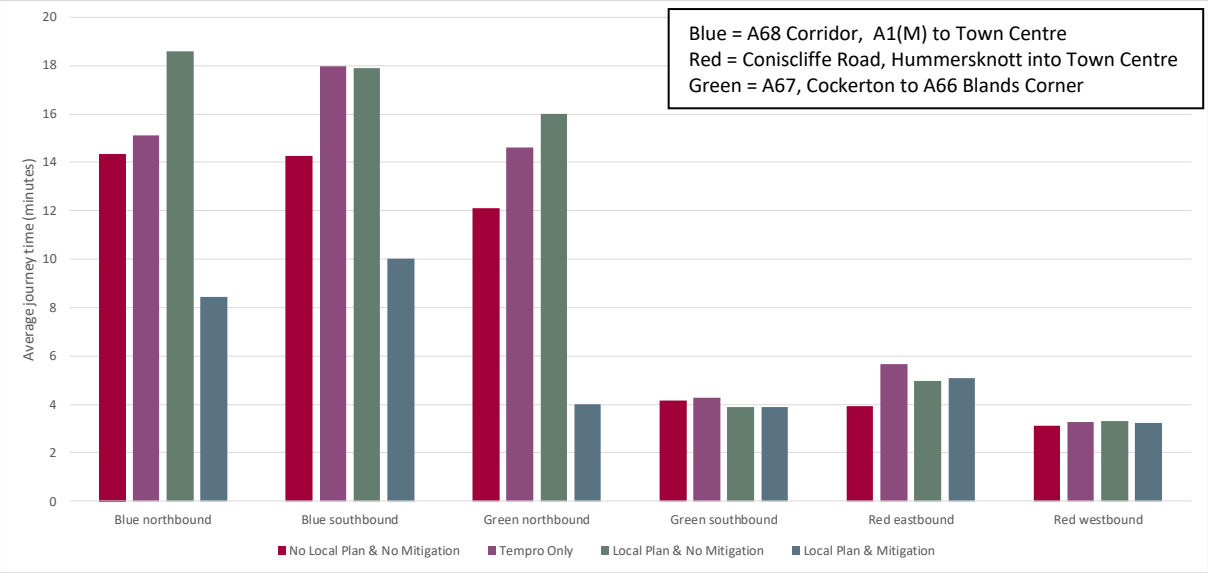


Figure 18. Journey times – 2025 PM Peak

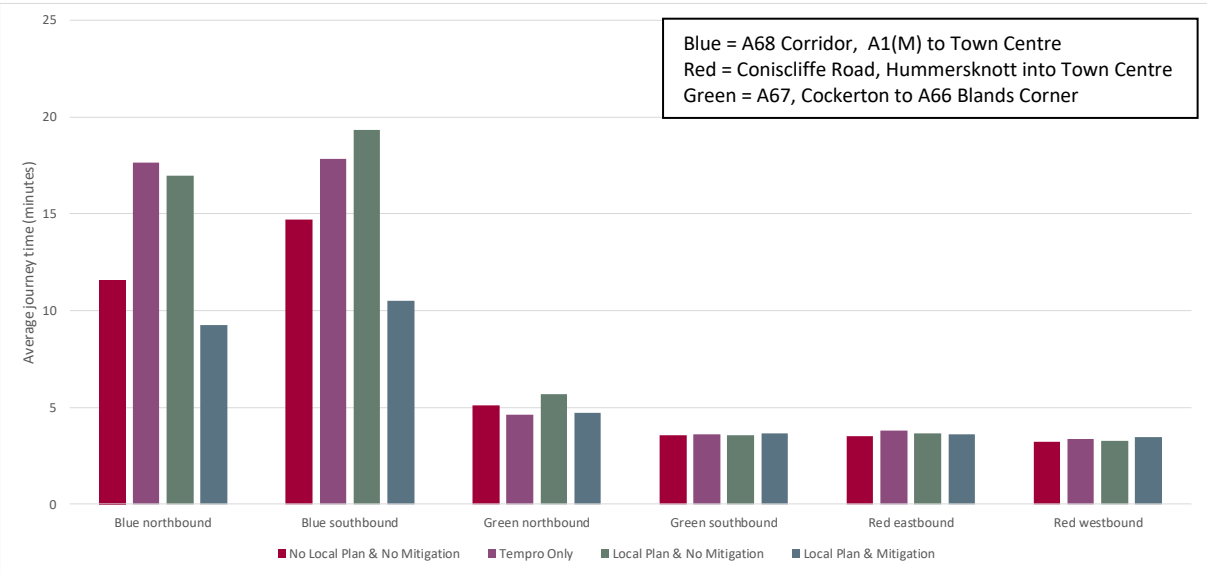


Figure 19. Journey times – 2030 AM Peak

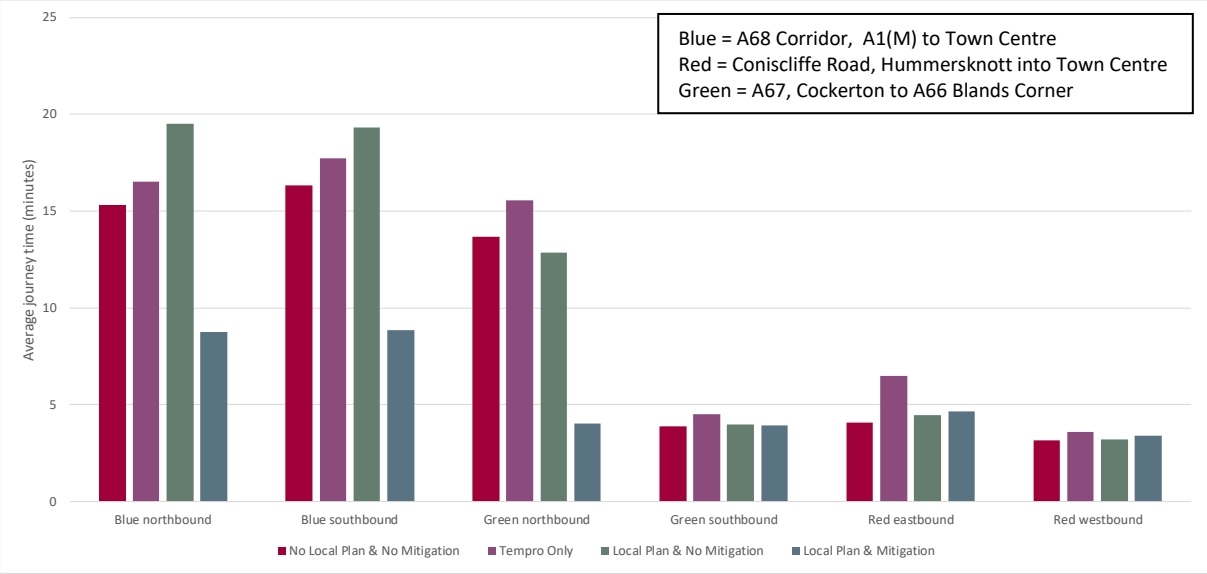


Figure 20. Journey times – 2030 PM Peak

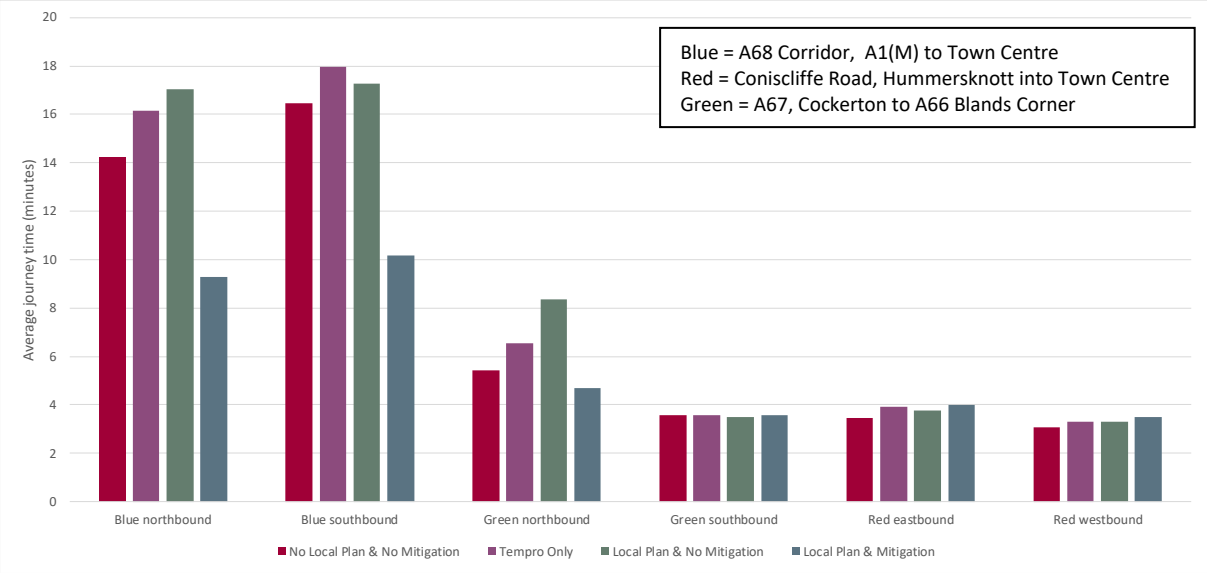
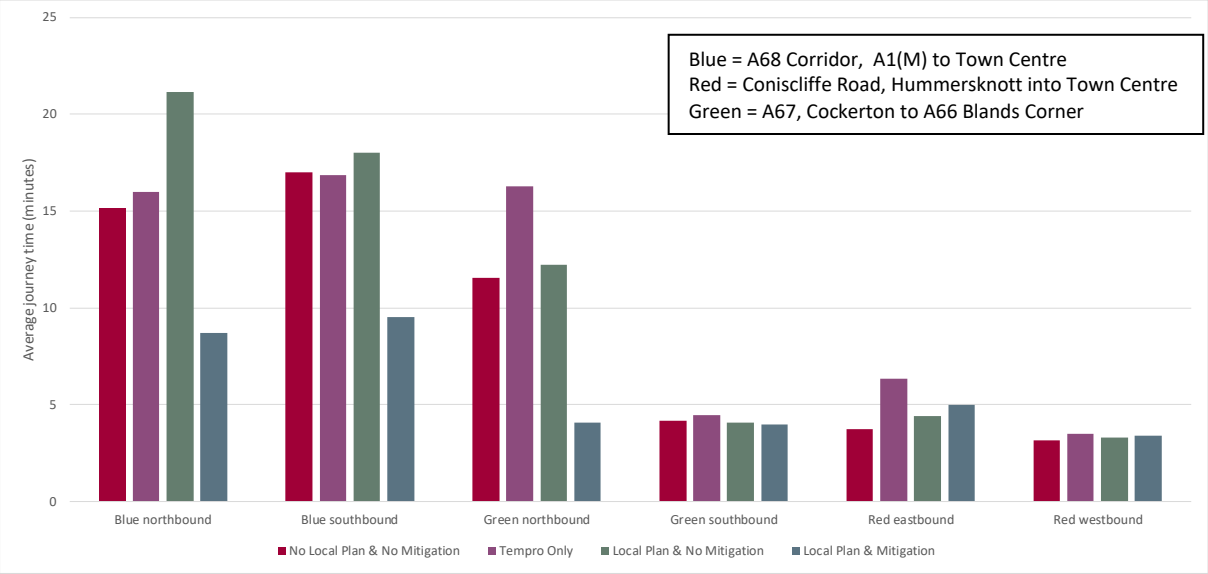
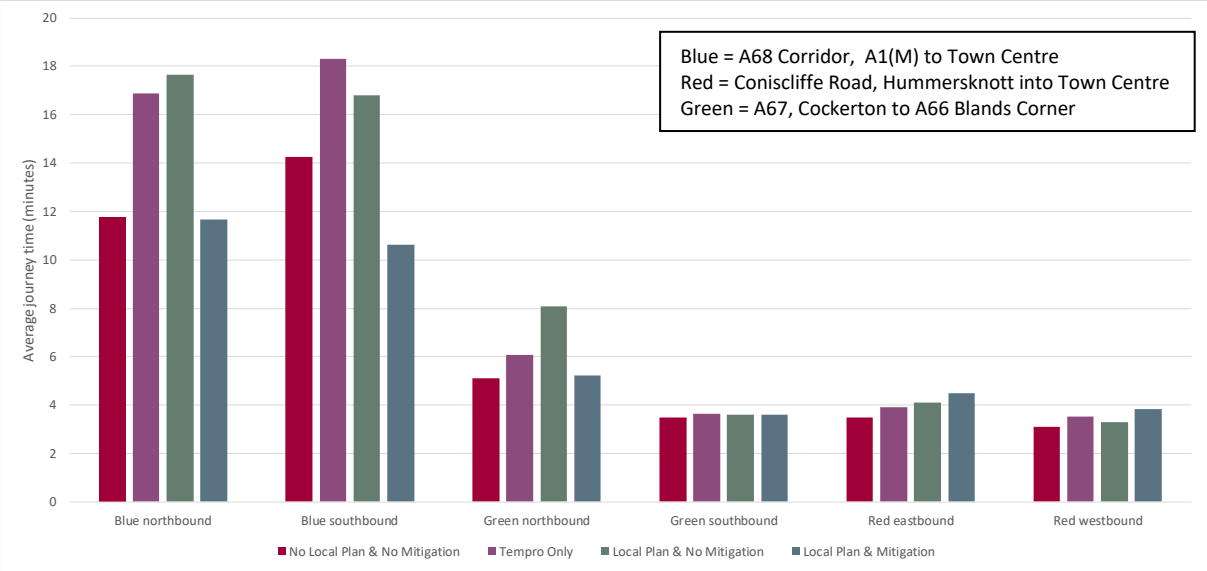


Figure 21. Journey times – 2035 AM Peak



4.3.8 The mitigation measures for 2035 result in journey times lower than the 2020 "No Local Plan No Mitigation" scenario for all routes except the red eastbound where a slight increase is forecast. This demonstrates that for the morning peak the identified mitigation measures are addressing the impact of the local plan.

Figure 22. Journey times – 2035 PM Peak



4.3.9 The mitigation measures for 2035 result in journey times lower than the 2020 "No Local Plan No Mitigation" scenario for all routes. This demonstrates that for the evening peak the identified mitigation measures are addressing the impact of the local plan.

4.4 Junction Operation

4.4.1 This section provides a comparison of the junction operation between the No Development, TEMPro only, Local Plan Only and Local Plan & Mitigation scenarios, using screenshots obtained from the AIMSUN model scenarios. The analysis focuses on the following junctions:

- Cockerton Roundabout
- A68 / Town Centre
- A1 / A68 Burtree Gate

4.4.2 These were identified from the models as the main locations within the modelled network where the development traffic leads to a large increase in congestion.

4.4.3 The next four sections provide junction analysis for the three junctions identified above for 2020, 2025, 2030 and 2035 respectively.

4.5 2020 Forecast Year Scenario

4.5.1 The planned mitigation measures included in the 2020 scenarios are shown below. Schemes within the A68 Aimsun model are bolded in the table below and subsequent 2025, 2030 mitigation measures tables.

Table 7. 2020 Mitigation Measures

2020 MITIGATION MEASURES	
E1	Haughton Road Through-about Improvements
E2	McMullen Road DETC Junction Improvements
E3	Lingfield Way to DETC Link Road
E4	McMullen Road / Yarm Road Roundabout
E5	Lingfield Way Traffic Signal Control Junction
E6	A66 Morton Palms Roundabout Improvements
E7	Ingenium Parc Phase 1
NW1	**A68 / Rotary Way Roundabout Improvements**
NW2	**West Park / Newton Lane Link Road**
NW3	**Cockerton Roundabout Improvements**
NW4	**Woodland Road Roundabout Improvements**
C1	Central Park Link Road

Figure 23. Cockerton Roundabout – 2020 AM Peak

No Local Plan & No Mitigation

TEMPro Only

Local Plan & No Mitigation

Local Plan & Mitigation

4.5.2 Figure 23 shows, In the AM Peak, there is queueing eastbound and westbound on the A68 approaching the Cockerton roundabouts in all scenarios, extending at least 250 metres.

4.5.3 With mitigation, the Cockerton roundabouts operate well in the Local Plan scenarios.

Figure 24. Cockerton Roundabout – 2020 PM Peak

No Local Plan & No Mitigation

TEMPro Only

Local Plan & No Mitigation	Local Plan & Mitigation

4.5.4 Figure 24 shows, In the PM Peak, there is queueing eastbound and westbound on the A68 approaching the Cockerton roundabouts in all scenarios.

4.5.5 With the LP traffic without mitigation, a queue extends on the south arm of Cockerton Green roundabout through Cockerton and back towards the town centre. The Carmel Road approach and Newton Lane approaches also have long queues.

4.5.6 With mitigation, the Cockerton roundabouts operate well with only transitory queues.

Figure 25. Town Centre – 2020 AM Peak

	
No Local Plan & No Mitigation	TEMPro Only
	
Local Plan & No Mitigation	Local Plan & Mitigation

4.5.7 Figure 25 shows In the AM Peak, the queue on the A68 northbound towards Cockerton roundabouts propagates back towards the town centre, reaching Greenbank Road in some replications.

4.5.8 With the package of mitigation in place there is still queuing to Greenbank Road but it comprises a series of individual queues at each signalised junction, with traffic moving more freely in between.

Figure 26. Town Centre – 2020 PM Peak

No Local Plan & No Mitigation

TEMPro Only

Local Plan & No Mitigation

Local Plan & Mitigation

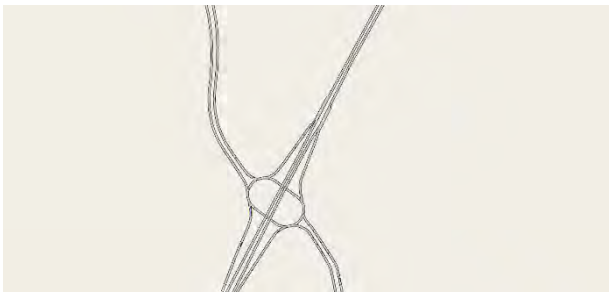
4.5.9 Figure 26 shows, In the PM Peak again the queue on the A68 (Woodland Road) northbound propagates back from Cockerton roundabouts to around Greenbank Drive and sometimes the Bondgate roundabout. There is significant queuing on side roads as traffic is unable to find a gap to join Woodland Road.

4.5.10 As in the AM, with the package of mitigation in place there is still queuing to Greenbank Road but it comprises a series of individual queues at each signalised junction, with traffic moving more freely in between.

Figure 27. A1 / A68 Burtree Gate – 2020 AM Peak

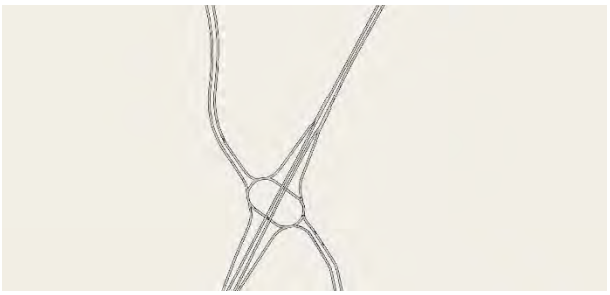
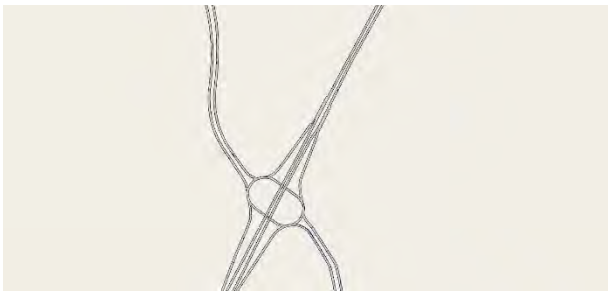
TEMPro Only

No Local Plan & No Mitigation

	
Local Plan & No Mitigation	Local Plan & Mitigation

4.5.11 Figure 27 shows, In the AM Peak, there are no operational difficulties at the A1 Burtree Gate junction.

Figure 28. A1 / A68 Burtree Gate – 2020 PM Peak

	
No Local Plan & No Mitigation	TEMPro Only
	
Local Plan & No Mitigation	Local Plan & Mitigation

4.5.12 Figure 28 shows, In the PM Peak, there are only short term queues at the A1 Burtree Gate junction.

4.6 2025 Forecast Year Scenario

4.6.1 Additional mitigation measure to those planned for 2020 included in the 2025 scenarios are shown below.

Table 8. 2025 Mitigation Measures

2025 MITIGATION MEASURES

E8	Redhall Hall/ Burdon Hill Link Road
E9	Burdon Hill Northern Access
E10	A66 / Little Burdon Improvements
E11	DETC Junction Improvements
E12	Ingenium Parc Phase 2
N1	A167 / Burtree Lane Junction Improvements
N2	A1150 / Thompson Street East Roundabout Improvements
N3	Skerningham Link Road
NW5	Faverdale Link Road Phase 1

Figure 29. Cockerton Roundabout – 2025 AM Peak

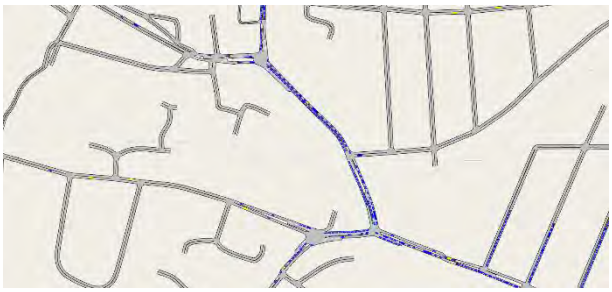
4.6.2 Figure 29 shows, In the AM Peak, there is significant congestion in all of the development scenarios without mitigation. The queues on all arms extend back from the junction and make it difficult for vehicles from side roads to join the network.

4.6.3 With the package of mitigation in place the roundabouts operate effectively with only transitory queues which do not block back to adjacent junctions.

Figure 30. Cockerton Roundabout – 2025 PM Peak

No Local Plan & No Mitigation

TEMPro Only



Local Plan & No Mitigation

Local Plan & Mitigation

4.6.4 Figure 30 shows, In the PM Peak, the no development scenario has long queues on the north approaches to the Cockerton Green roundabout and the Woodland Road approach to Cockerton. With Tempro or Local Plan traffic the queues at the three roundabouts start to block each other. The queue on the Woodland Road approach blocks side road traffic from entering.

4.6.5 With the package of mitigation in place there is no major congestion.

Figure 31. Town Centre – 2025 AM Peak

No Local Plan & No Mitigation

TEMPro Only

Local Plan & No Mitigation

Local Plan & Mitigation

4.6.6 Figure 31 shows, In the AM Peak, with either Tempro or Local Plan traffic but no mitigation the queue back from the Cockerton roundabouts extends towards the town centre, making it difficult for side road traffic to join A68 Woodland Road.

4.6.7 With the mitigation in place there are queues at the individual junctions but no full-corridor queues.

Figure 32. Town Centre – 2025 PM Peak

No Local Plan & No Mitigation

TEMPro Only

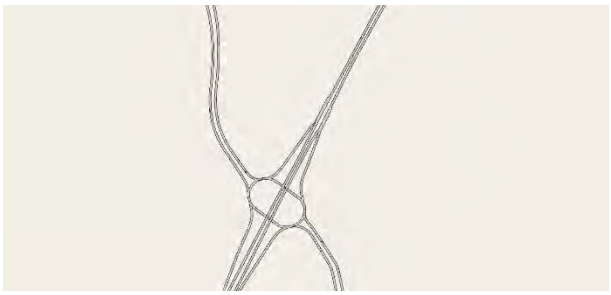
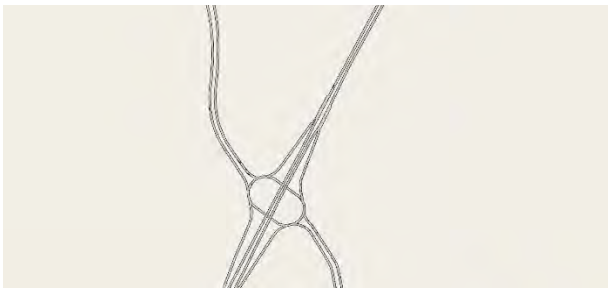
Local Plan & No Mitigation

Local Plan & Mitigation

4.6.8 Figure 32 shows, In the PM Peak again the queue from Cockerton roundabouts propagates back towards the town centre.

4.6.9 With the package of mitigation in place the queue from Cockerton no longer blocks back. There are queues at several of the junctions but only minimal interaction between adjacent junctions.

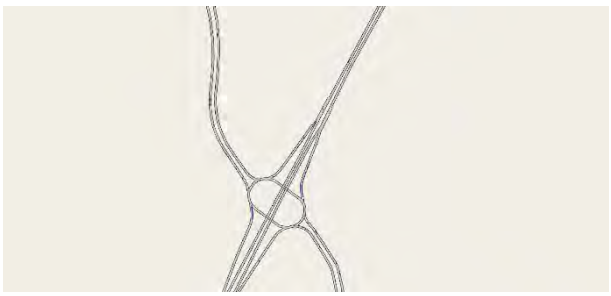
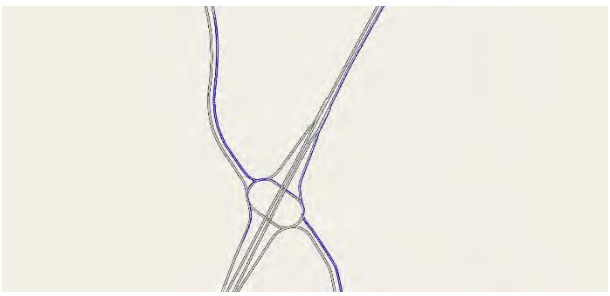
Figure 33. A1 / A68 Burtree Gate – 2025 AM Peak

	
No Local Plan & No Mitigation	TEMPro Only
	
Local Plan & No Mitigation	Local Plan & Mitigation

4.6.10 Figure 33 shows, In the AM Peak with the Local Plan but no mitigation the queues from Cockerton roundabouts propagate as far as the A1 / Burtree Gate junction, causing difficulty for vehicles accessing Darlington from the A1 north.

4.6.11 With the mitigation in place the Cockerton queue clears. There remains a queue on the north arm of Burtree Gate but it does not extend to the A1 mainline.

Figure 34. A1 / A68 Burtree Gate – 2025 PM Peak

	
No Local Plan & No Mitigation	TEMPro Only

	
Local Plan & No Mitigation	Local Plan & Mitigation

4.6.12 Figure 34 shows, In the PM with development but no mitigation there are long queues on the north and west arms of the A1 Burtree Gate junction, with partial locking of the circulating carriageway between these arms. The queue on the A68 southbound which originates from the Cockerton roundabouts is the main trigger.

4.6.13 With the package of mitigation in place the queue form Cockerton no longer triggers the partial locking of the junction, however a long queue remains on the north arm and this is close to reaching the A1 mainline.

4.7 2030 Forecast Year Scenario

4.7.1 Additional mitigation measure to those planned for 2025 included in the 2030 scenarios are shown below.

Table 9. 2030 Mitigation Measures

2030 MITIGATION MEASURES	
E13	A66 Morton Palms to Little Burdon Dualling;
E16	Ingenium Parc Phase 3
E17	Burdon Hill Link
NW6	**Newton Lane to Staindrop Road Link Road**
NW7	**Staindrop Road to A67 Coniscliffe Link Road**
NW8	**Faverdale Link Road Phase 2**
NW9	**A68 Burtree Lane Roundabout**

Figure 35. Cockerton Roundabout – 2030 AM Peak

No Local Plan & No Mitigation

TEMPro Only

Local Plan & No Mitigation

Local Plan & Mitigation

4.7.2 Figure 35 shows, In the AM peak the Cockerton roundabouts and the adjacent junction at Cockerton Green experience significant congestion with their current layouts. This leads to major queuing with traffic queueing the length of the main roads and vehicles from side roads unable to access the main roads without major delay.

4.7.3 The proposed improvements at the roundabouts largely release the delays and allow the network to operate effectively with only localised and short-lived queuing.

Figure 36. Cockerton Roundabout – 2030 PM Peak

No Local Plan & No Mitigation

TEMPro Only

Local Plan & No Mitigation

Local Plan & Mitigation

4.7.4 Figure 36 shows, In the PM Peak, similar to the AM the Cockerton roundabouts and the adjacent junction at Cockerton Green experience significant congestion with their current layouts. This leads to major queuing with traffic queueing the length of the main roads and vehicles from side roads also have to queue to access the main roads.

4.7.5 The proposed improvements at the roundabouts largely release the delays and allow the network to operate effectively with only localised and short-lived queuing.

Figure 37. Town Centre– 2030 AM Peak

No Local Plan & No Mitigation

TEMPro Only

Local Plan & No Mitigation

Local Plan & Mitigation

4.7.6 Figure 37 shows, In the AM Peak the queue from the existing layout at Cockerton roundabouts extends along the A68 towards the town centre. This makes it difficult for traffic on the side roads to access the A68, leading to major queuing particularly in the Local Plan no mitigation scenario.

4.7.7 The proposed improvements at Cockerton roundabouts clear this queue. Traffic from side roads still has to queue to turn onto the main road but the queues are significantly shorter.

Figure 38. Town Centre– 2030 PM Peak

No Local Plan & No Mitigation

TEMPro Only

Local Plan & No Mitigation

Local Plan & Mitigation

4.7.8 Figure 38 shows, In the PM Peak there is a similar issue to the AM, where congestion blocks back from Cockerton roundabouts. There is a queue over much of the length of the A68 northbound, back to the town centre, and some blocking of side roads although less than in the AM.

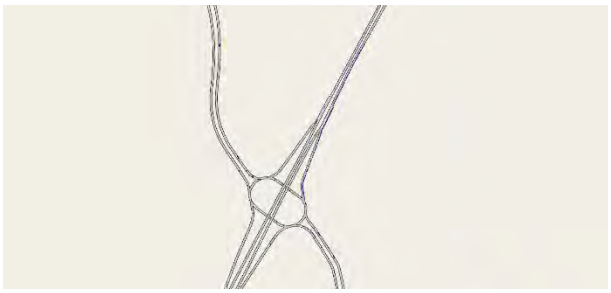
4.7.9 With the Cockerton mitigation in place the queue no longer blocks back to the town centre and there are only localised queues.

Figure 39. A1 / A68 Burtree Gate – 2030 AM Peak

No Local Plan & No Mitigation

TEMPro Only

Local Plan & No Mitigation



Local Plan & Mitigation

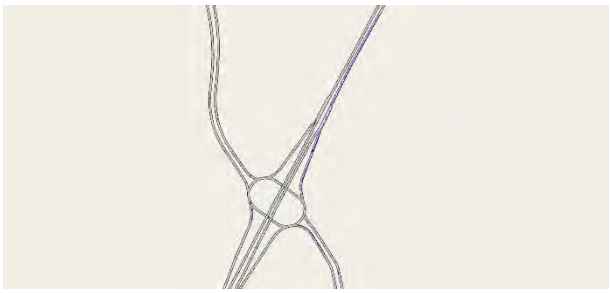
4.7.10 Figure 39 shows, In the AM Peak, with no development or with Tempro growth the roundabout operates effectively. With Local Plan growth but no mitigation the queue from the existing layout at Cockerton roundabouts blocks back along the A68 and causes queuing on all arms of Burtree Gate.

4.7.11 In the Local Plan with mitigation scenario there is no blocking from other junctions but there remains significant queuing on the north arm.

Figure 40. A1 / A68 Burtree Gate – 2030 PM Peak

No Local Plan & No Mitigation

TEMPro Only



Local Plan & No Mitigation

LOCAL PLAN & Mitigation

4.7.12 Figure 40 shows, In the PM Peak the pattern is similar: blocking back from the Cockerton roundabouts when the existing layout is still in place. Once that queuing is cleared by the proposed improvements there is still queuing at Burtree Gate but it is a standalone junction capacity issue.

4.8 2035 Forecast Year Scenario

4.8.1 No additional mitigations are currently planned for the 2030 to 2035 period.

Figure 41. Cockerton Roundabout – 2035 AM Peak

	
No Local Plan & No Mitigation	TEMPro Only
	
Local Plan & No Mitigation	Local Plan & Mitigation

4.8.2 Figure 41 shows, In the AM peak congestion at the Cockerton roundabouts starts to block adjacent junctions even for the no development scenario. With Tempro or Local Plan traffic the main routes are “nose to tail”.

4.8.3 The proposed widening at Cockerton roundabouts that are planned to be delivered early in the plan continues to address the congestion and the network operates well in the 2035 AM.

Figure 42. Cockerton Roundabout – 2035 PM Peak

	
No Local Plan & No Mitigation	TEMPro Only

Local Plan & No Mitigation

Local Plan & Mitigation

4.8.4 Figure 42 shows, In the PM Peak the existing layout at Cockerton roundabouts also constrains the operation of the network. With no development, Tempro growth or Local Plan traffic but no mitigation the main roads around Cockerton would have long queues.

4.8.5 The proposed improvements at Cockerton roundabouts that are planned to be delivered early in the plan continues to mitigate local plan traffic and the network operates effectively for the 2035 PM peak.

Figure 43. Town Centre – 2035 AM Peak

No Local Plan & No Mitigation

TEMPro Only

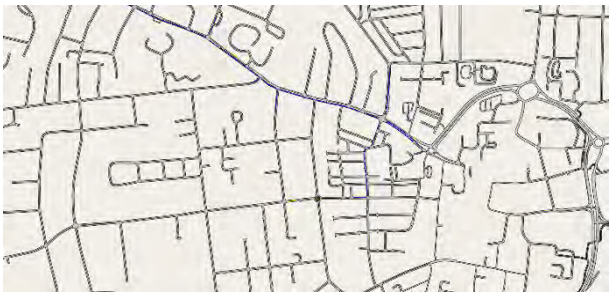
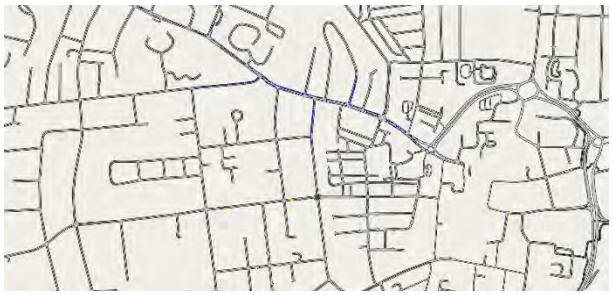
Local Plan & No Mitigation

Local Plan & Mitigation

4.8.6 Figure 43 shows, In the AM Peak with Tempro growth the northbound queue at the Cockerton roundabouts blocks back toward the town centre. The model does not currently allow for the informal "give way" behaviour which generally occurs when there is a slow-moving queue on the main road, so traffic from side roads is unable to access the main road. This is exacerbated when the full Local Plan development is included, leading to major queuing on the A68 and side roads around the town centre.

4.8.7 With the Local Plan mitigation in place the main queue on the A68 clears. The network is still busy, with some traffic on side roads queuing to access the main road. This is considered a “worst case” scenario as traffic on the A68 remains slow moving and on the ground side road traffic would find gaps or use another route.

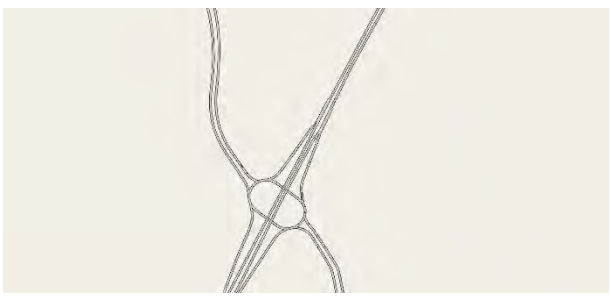
Figure 44. Town Centre – 2035 PM Peak

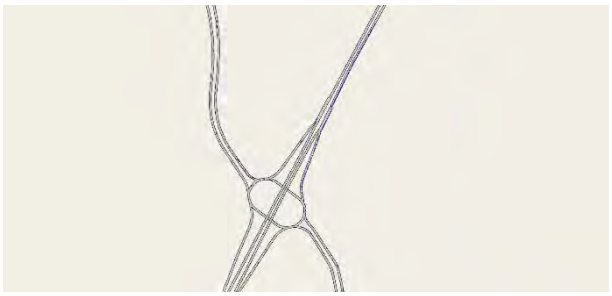
	
No Local Plan & No Mitigation	TEMPro Only
	
Local Plan & No Mitigation	Local Plan & Mitigation

4.8.8 Figure 44 shows, In the PM Peak with Tempro growth the northbound queue at the Cockerton roundabouts blocks back toward the town centre. As noted above, the model does not currently allow for the informal "give way" behaviour which generally occurs when there is a slow-moving queue on the main road, so traffic from side roads is unable to access the main road. As in the AM this is exacerbated when the full Local Plan development is included, leading to queuing on the A68 and side roads around the town centre.

4.8.9 With the Local Plan mitigation in place the main queue on the A68 clears, and while there is still some queuing the network operates effectively in this area.

Figure 45. A1 / A68 Burtree Gate – 2035 AM Peak

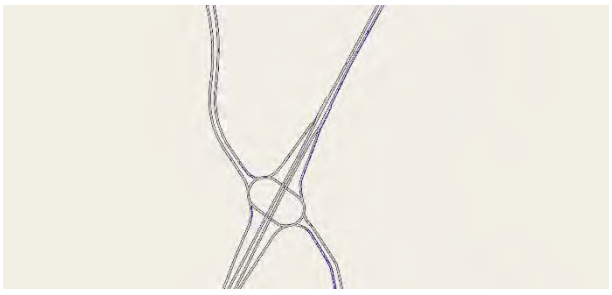
	
No Local Plan & No Mitigation	TEMPro Only

	
Local Plan & No Mitigation	Local Plan & Mitigation

4.8.10 Figure 45 shows, In the AM Peak, delays at the existing Cockerton roundabout layout with any traffic growth lead to a long queue southbound on the A68 which in some replications blocks back as far as the A1 Burtree Gate junction. Each replication is slightly different, generally reflecting day-to-day variation seen on the ground.

4.8.11 In the Local Plan with mitigation scenario the A68 queue is cleared at this location. There remains queuing on some arms of the Burtree Gate junction but this is independent of the operation of other junctions.

Figure 46. A1 / A68 Burtree Gate – 2035 PM Peak

	
No Local Plan & No Mitigation	TEMPro Only
	
Local Plan & No Mitigation	Local Plan & Mitigation

4.8.12 Figure 46 shows, In the PM Peak, with no development and the existing layout at Cockerton roundabouts the queue blocks back along the A68 as far as Burtree Gate junction, causing significant queuing on the north arm. This occurs in all “no mitigation” scenarios. Due to the random variation between runs, in some replications the queue blocks further, reaching the west arm.

4.8.13 With the mitigation in place the queue no longer blocks back from the Cockerton roundabouts but the Burtree Gate roundabout itself still has significant queuing. There is additional queuing on the A68 east arm with mitigation in place because this traffic has been released from upstream by the improvements at Cockerton roundabout.

5. SENSITIVITY TESTING

5.1 Introduction

5.1.1 As a sensitivity analysis a revised scenario called “Do Minimum” has been created containing the mitigations at Cockerton and Woodlands roundabout together with the local plan development trips.

5.1.2 This is necessary because in the later forecast years of 2030 and 2035 the development only scenario blocks back from these two junctions.

5.1.3 The sensitivity test scenario seeks to demonstrate that even with these crucial roundabout mitigations there are still issues that will require mitigation elsewhere on the network.

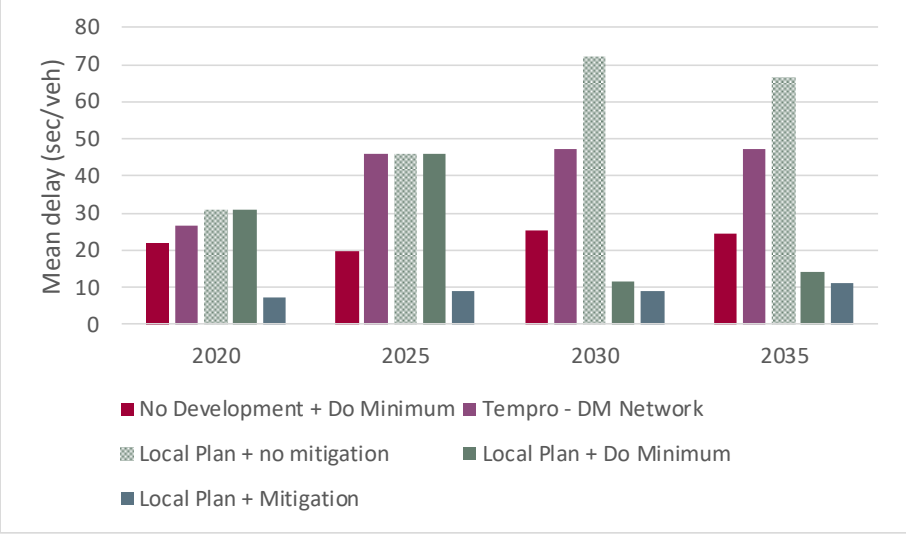
5.1.4 In doing so, it demonstrates the need for the other mitigation measures contained within the local plan.

5.2 Network performance

Average Delay

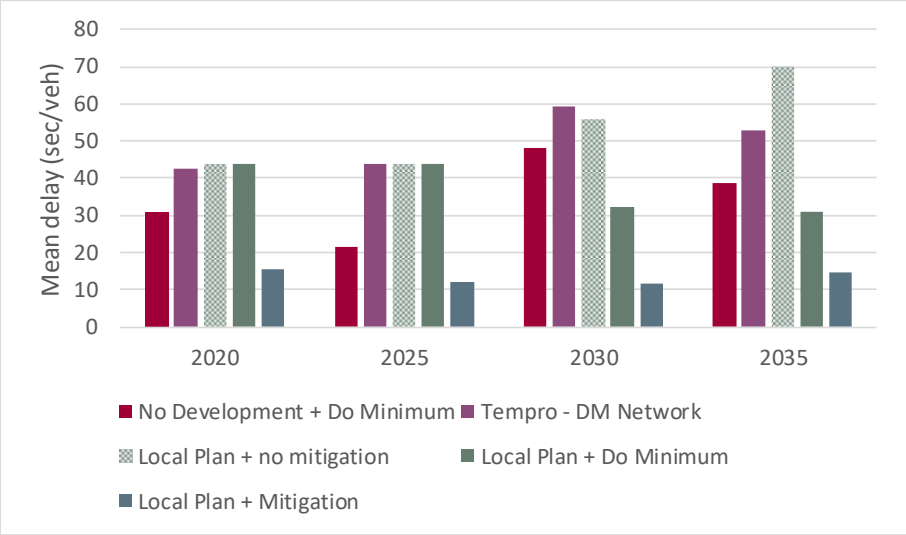
5.2.1 The graphs below reproduce the information in **Figure 8** and **Figure 9**, with the addition of the new “Do Minimum including Coniscliffe” scenario for 2030 and 2035. The Local Plan no mitigation scenario is greyed out but included for comparison purposes.

Figure 47. Average Delay in the Morning Peak with Cockerton in 2030 Do Min



5.2.2 Figure 47 shows, In the morning peak the scenarios including development traffic but no mitigation showed significant additional delay in 2030 and 2035. When the Cockerton roundabouts are included this delay drops from around 70 seconds per vehicle to around 10 to 15 seconds per vehicle. This clearly demonstrates that the Cockerton roundabouts are the main constraint.

Figure 48. Average Delay in the Evening Peak with Cockerton in 2030 Do Min



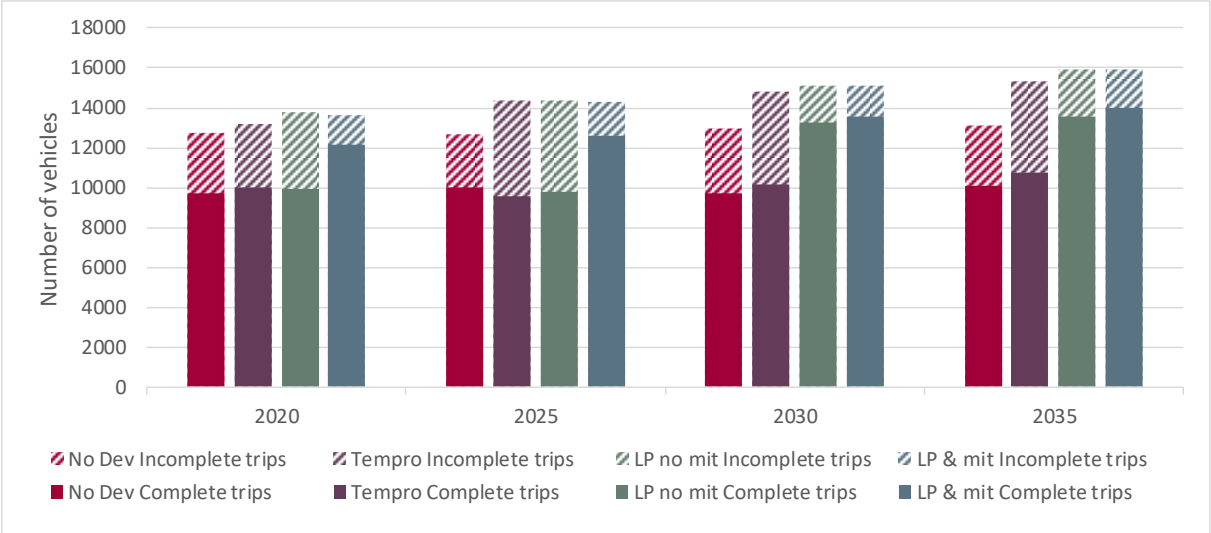
5.2.3 Figure 48 shows, In the evening peak the inclusion of the Cockerton roundabouts in the sensitivity scenario improves the operation of the network significantly, from around 55 seconds per vehicle in 2030 and 70 seconds per vehicle in 2035 to around 30 seconds per vehicle in both years.

5.2.4 There is still a certain amount of delay, which is further improved by the rest of the mitigation, as shown in the Local Plan + mitigation scenario.

Throughput

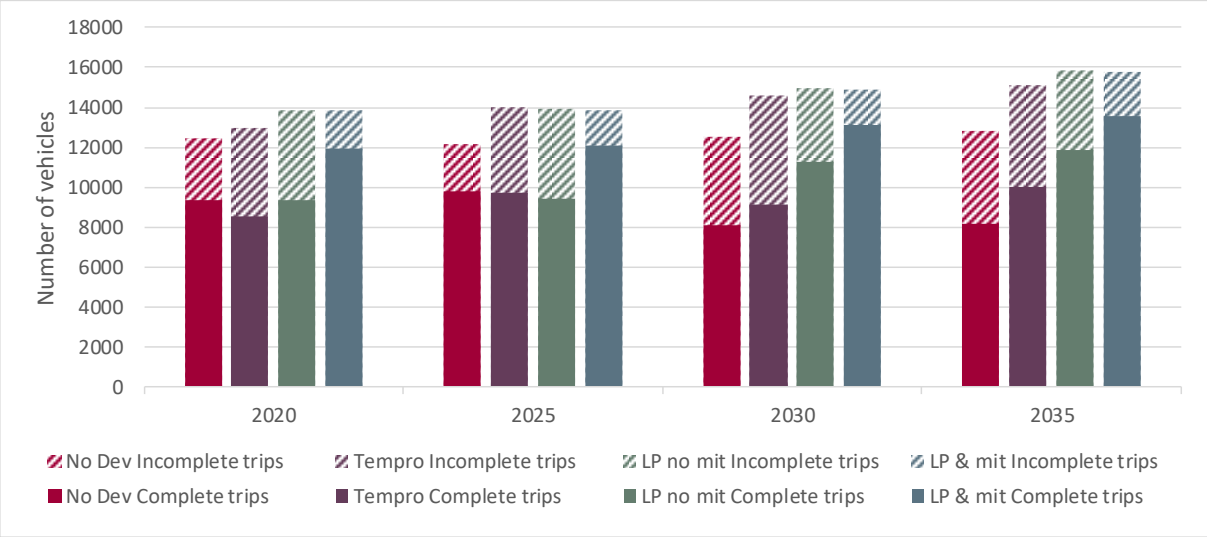
5.2.5 Graphs showing the number completed and incomplete trips are included below. The only results which are different from **Figure 10** and **Figure 11** are for the 2030 and 2035 LP no mitigation. The rest of the scenarios are included for context.

Figure 49. Network Throughput in the Morning Peak with Cockerton in 2030 Do Min



5.2.6 Figure 49 shows, In the morning peak for the Local Plan no mitigation scenarios the throughput dropped compared to the No Dev and Tempro scenarios. With the Cockerton roundabouts included the throughput increases compared to the scenarios without the roundabouts. This demonstrates that the roundabout improvements free up network capacity.

Figure 50. Network Throughput in the Evening Peak with Cockerton in 2030 Do Min



5.2.7 Figure 50 shows, In the evening peak the number of vehicles which complete their trips increases compared to both the NoDev and Tempro scenarios and compared to the previous "LP with no mitigation" scenario.

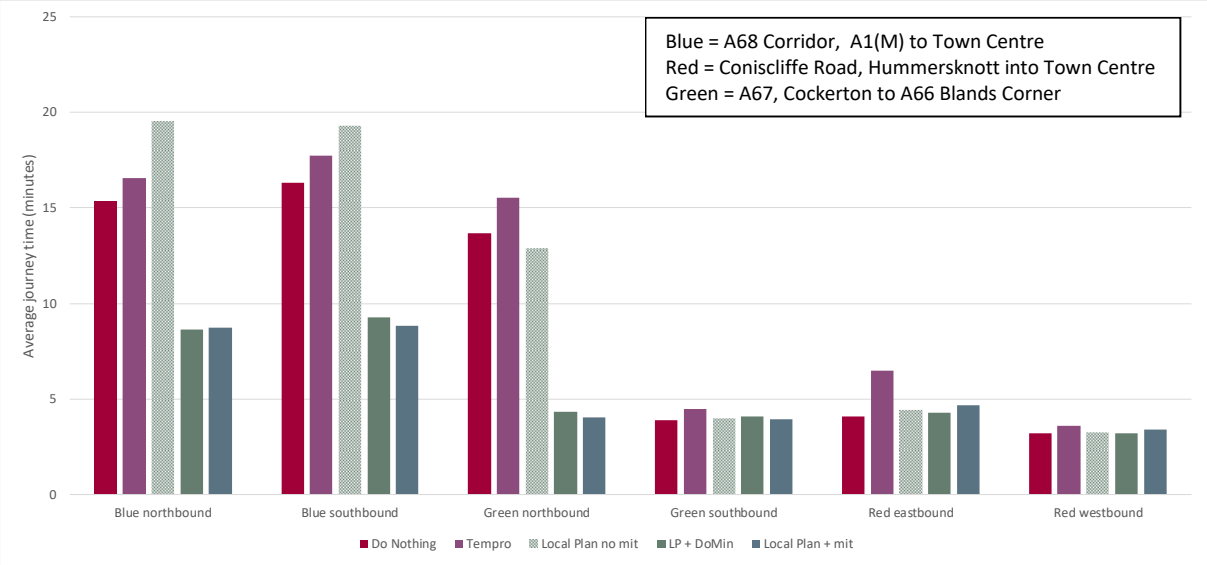
5.2.8 The sensitivity testing demonstrates the additional capacity that the later mitigation measures are releasing, in particular for the evening peak.

5.2.9 The results also provide further evidence for the benefits of the early delivery of the Cockerton and Woodlands roundabout mitigation measures.

5.3 Corridor Journey Times

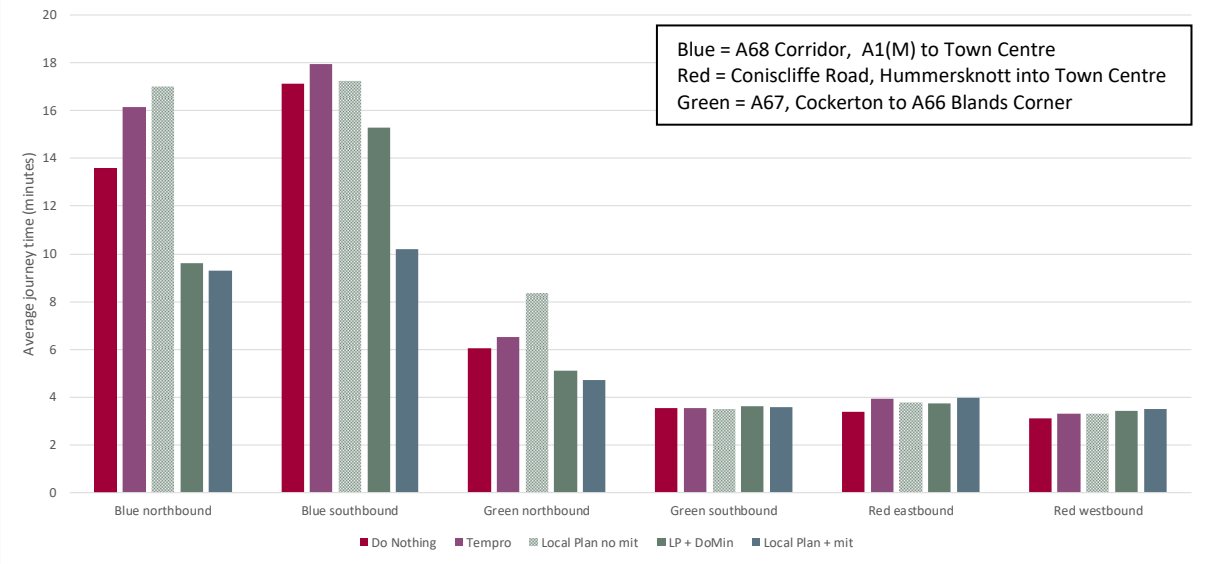
5.3.1 As for the original 4 scenarios journey times for 3 routes as shown in Figure 14 above are provided as an overview of travel times into and around Darlington for the Do Minimum scenario. As above the Local Plan no mitigation scenario is greyed out but included for comparison purposes.

Figure 51. Journey times – 2030 AM Peak



5.3.2 Figure 51 shows, For the morning peak in 2030 the journey time in both directions of the blue route (A68) suffered from significant delays with the Local Plan traffic but no mitigation. Including the Cockerton roundabouts brings the travel times down to around the same level as the full mitigation scenario. There is a similar impact on the green route (Carmel Road) northbound. There is minimal impact on the green route southbound or the red route in either direction.

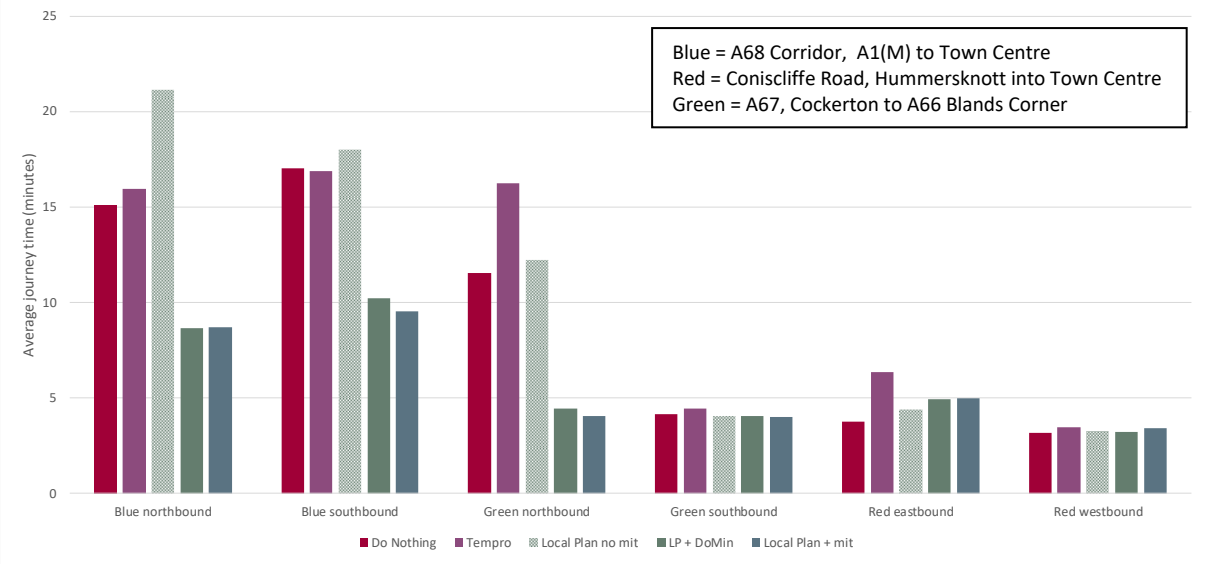
Figure 52. Journey times – 2030 PM Peak



5.3.3 Figure 52 shows, In the evening peak with Local Plan traffic but no mitigation the blue route suffers significant congestion. Northbound the journey time is reduced from over 16 minutes to under 10 minutes by the inclusion of the Cockerton roundabouts. Southbound there is only a slight reduction because of delays elsewhere on the route, but including the roundabouts still cuts the journey time by around 2 minutes. The journey time on the green route

northbound is also improved by the roundabouts, reducing from around 8 minutes to around 5.

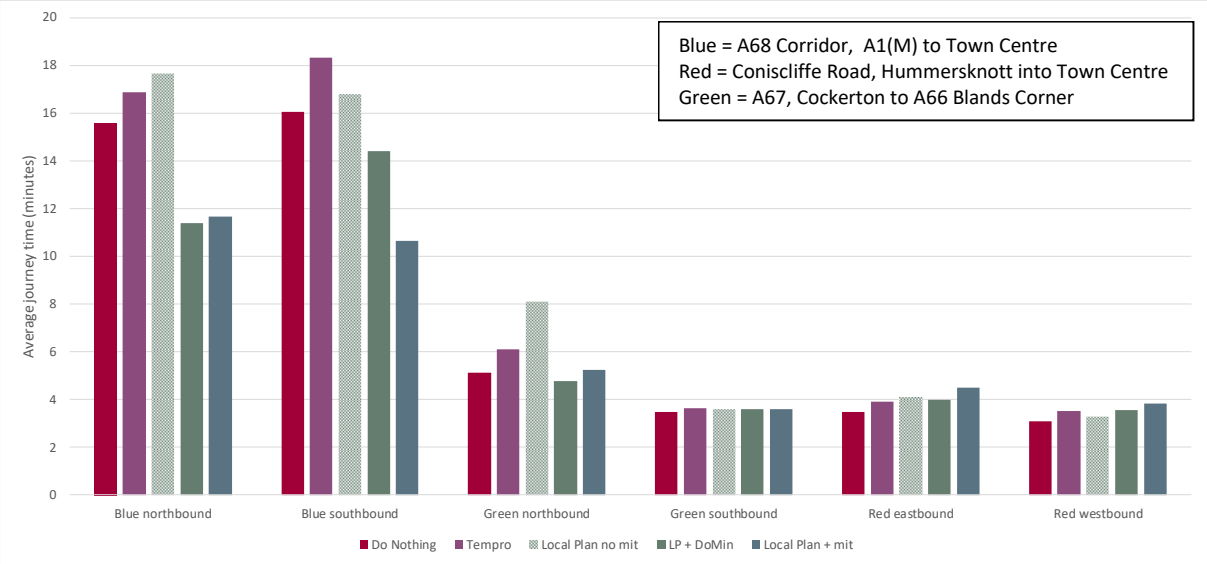
Figure 53. Journey times – 2035 AM Peak



5.3.4 Figure 53 shows, In 2035 with Local Plan traffic but no mitigation the morning journey time on the blue route northbound is over 20 minutes. Including the Cockerton roundabouts reduces this to around 8 minutes, similar to the full mitigation scenario. Including the roundabouts also eliminates most of the delay for the blue route southbound and green northbound.

5.3.5 The impact on the other routes (green southbound and red both directions) is negligible.

Figure 54. Journey times – 2035 PM Peak



5.3.6 Figure 54 shows, In the evening peak for 2035 the blue route northbound journey time is reduced from nearly 18 minutes with Local Plan no mitigation to under 12 with the Cockerton

roundabouts included. The southbound journey time is also reduced from over 16 to just over 14 minutes, while the green northbound journey time drops from around 8 minutes to under 5 minutes.

5.3.7 The impact on the other routes (green southbound and red both directions) is negligible.

5.3.8 Overall including the upgraded roundabouts at Cockerton reduces the biggest delays on the blue route in both directions and green northbound. There remains some delay compared to the full mitigation scenario, particularly on the blue route southbound in the PM period.

6. CONCLUSIONS

6.1.1 SYSTRA has undertaken microsimulation modelling using the North West Darlington AIMSUN model, in order to assess the impact that traffic generated by Darlington Local Plan land allocations will have on the local road network. The following scenarios have been analysed up to 2035:

- Do Nothing: No additional homes or jobs are created and no schemes are delivered;
- Natural Growth: Growth calculated from assumed TEMPro growth factors as per standard Transport Application methodology;
- Development Only: The impact of the developments included within the local plan, with no mitigation schemes; and
- The Local Plan: The impact of the development and the associated infrastructure based mitigation schemes that are included in the local plan.

6.1.2 The quantum of developments considered as part of the local plan is shown in **Table 10**:

Table 10. Darlington Local Plan Development Quantums 2020-2035

PLAN PERIOD	2020	2025	2030	2035
Dwellings	2,728	6,116	9,214	11,810
Jobs	5,119	7,465	8,763	9,950

6.1.3 This development quantum is taken from the development database which provides an annual development profile for individual sites. This allows for a 20% buffer of the housing land supply, which is required by NPPF to ensure choice and competition in the market and to recognise that some sites may not come forward as quickly as anticipated. The modelled scenarios are therefore extremely robust and allow significant headroom in terms in terms of the local plan housing and employment targets.

6.1.4 A series of mitigation schemes have been identified by Darlington Council for introduction on the network throughout the lifespan of the current plan. These have been identified through a mixture of measures required to support the delivery of individual planning applications as well as more strategic interventions. These have been used in the assessment of the 'with mitigation' scenarios.

6.1.5 The microsimulation results show that:

- Mitigation measures at Cockerton and Woodland Roundabouts are required early in the plan period to prevent network wide issues emanating from these locations. These are currently scheduled for delivery early in the plan period;
- The West Park / Newton Lane link road ensures access for the proposed West Park Garden Village and useful additional capacity for the wider road network; and
- Mitigation measures at A68 / Rotary Way roundabout, and adjacent John Fowler Way / A68 signal optimisation are required to deliver the plan.

6.1.6 Issues have been identified on the strategic road network, particularly the A1(M) Burtree Gate interchange. These initially manifest as southbound exit slip capacity issues during

the 2025 to 2030 forecast. Signalisation of the junction may provide the additional capacity required and these measures will be explored with Highways England.

6.1.7 The forecasts indicates that the identified mitigation measures deliver benefits into the period beyond 2030, and successfully provide the capacity for Darlington to grow through their local plan aspirations.

Report Appendix A - Darlington Scheme Mitigation Plan

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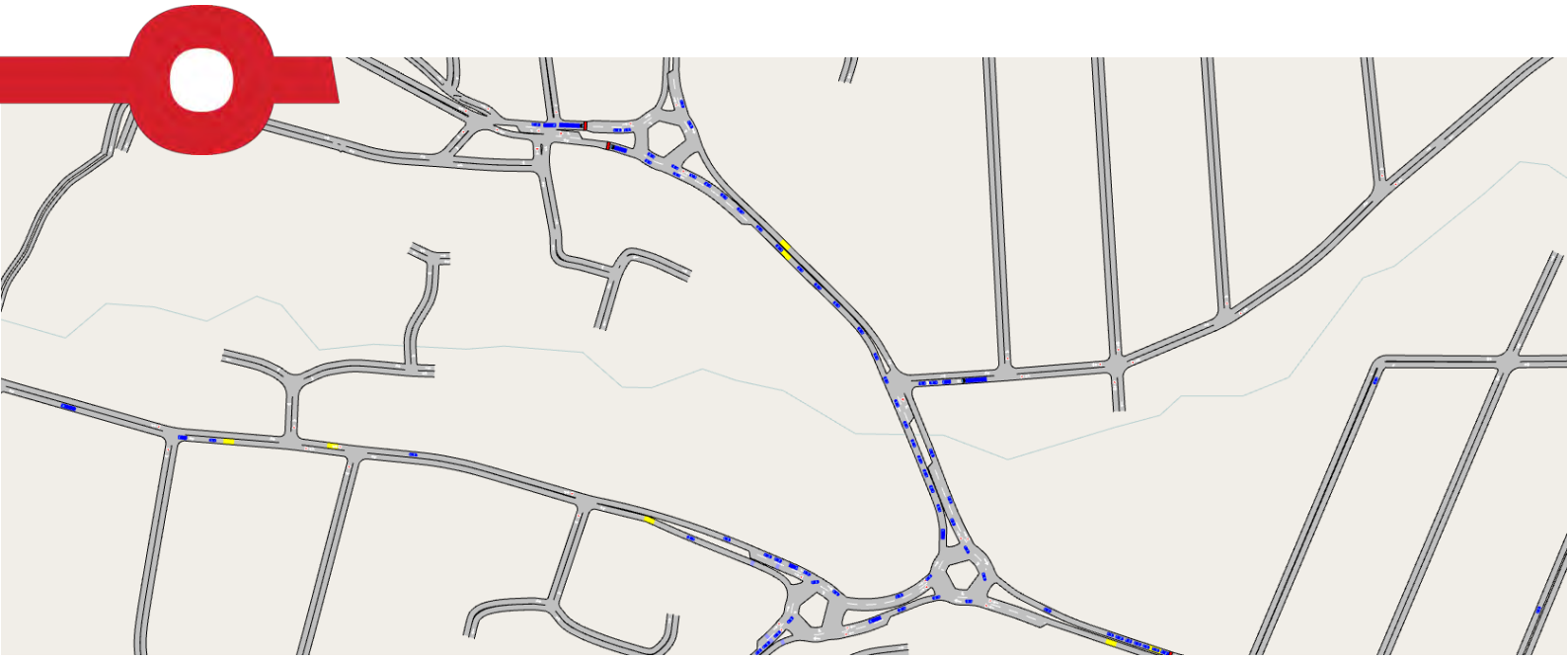
Darlington Local Plan Support **13/01/2021**

Reference number GB01T17L81/DLP/Coniscliffe

DARLINGTON LOCAL PLAN - CONISCLIFFE AIMSUN MODELLING



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DARLINGTON LOCAL PLAN SUPPORT

DARLINGTON LOCAL PLAN - CONISCLIFFE AIMSUN MODELLING

IDENTIFICATION TABLE	
Client/Project owner	Darlington Borough Council
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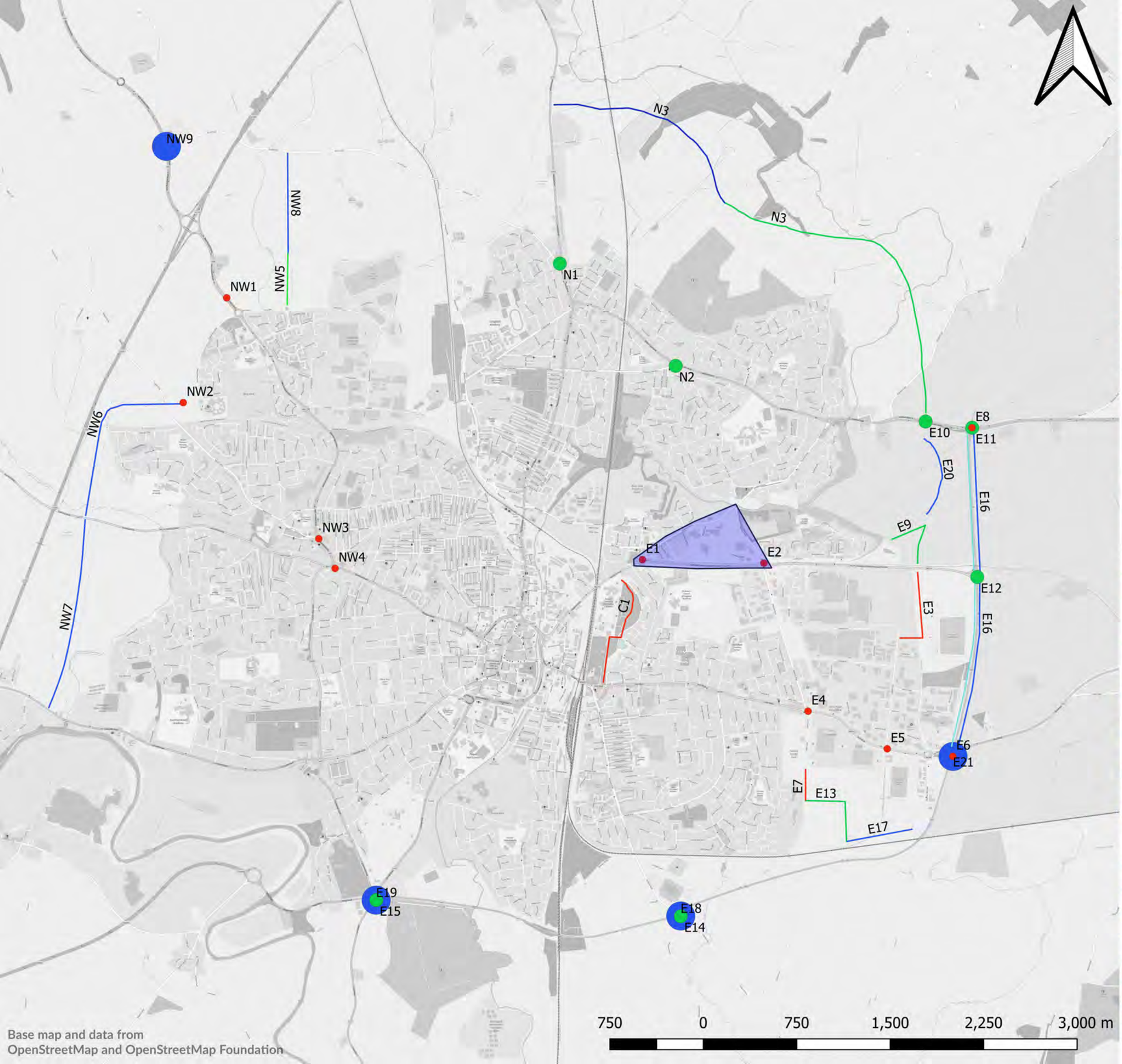
Reference number	GB01T17L81/DLP/Coniscliffe
Number of pages	55

APPROVAL

Version	Name		Position	Date	Modifications
1	Author	Sandra Hill-Smith	Senior Transport Planner	20/05/2019	
	Checked by	Paul Gray	Associate Director	21/05/2019	
	Approved by	Steve Pickard	Project Director	21/05/2019	
2	Author	Sandra Hill-Smith	Senior Transport Planner	05/06/2019	Additional Scenario (Do Minimum) added in chapter 5.
	Checked by	Paul Gray	Associate Director	05/06/2019	
	Approved by	Steve Pickard	Project Director	05/06/2019	
3	Author	Sandra Hill-Smith	Principal Transport Planner	13/01/2021	
	Checked by	Paul Gray	Associate Director	13/01/2021	Post client comments and updating references to other local plan documentation
	Approved by	Steve Pickard	Project Director	13/01/2021	

Report Appendix A - Darlington Scheme Mitigation Plan



2020 Road Junctions

- *E1 Haughton Road Through-about Improvements*
- *E2 McMullen Road DETC Junction Road Improvements*
- *E4 McMullen Road / Yarm Road Roundabout Improvements*
- *E5 Lingfield Way Traffic Signal Controlled Junction*
- *E6 A66 Morton Palms Roundabout Improvements*
- *E8 Little Burdon left turn filter*
- *NW1 A68 / Rotary Way Roundabout Improvements*
- *NW2 West Park / Newton Lane Link Road*
- NW3 Cockerton Roundabout Improvement
- NW4 Woodland Road Roundabout Improvement

2020 Road Schemes

- C1 Central Link Road
- *E3 Lingfield Way to DETC Link Road*
- *E7 Ingenium Parc Phase 1*

2025 Road Junctions

- E10 Burdon Hill Northern Access
- E11 A66 / Little Burdon Circulatory Upgrade
- E12 DETC Junction Improvements
- E14 Neasham Road Improvements Phase 1
- E15 Blands Corner Improvements Phase 1
- N1 A167 / Burtree Lane Junction Improvement
- N2 A1150 / Thompson Street East Roundabout Improvement

2025 Road Schemes

- E13 Ingenium Parc Phase 2
- E9 RedHall Hall / Burdon Hill Link Road
- N3 Skerningham Link Road
- NW5 Faverdale Link Road Phase 1

2030 Road Junctons

- E18 Neasham Road Improvements Phase 2
- E19 Blands Corner Improvements Phase 2
- E21 Morton Palms Larger Roundabout
- NW9 A68 Burtree Lane Roundabout

2030 Road Schemes

- E16 A66 Morton Palms to Little Burdon Dualling
- E17 Ingenium Parc Phase 3
- E20 Burdon Hill Link
- N3 Skerningham Link Road
- NW6 Newton Lane to Staindrop Road Link
- NW7 Staindrop Road to A67 Coniscliffe Road
- NW8 Faverdale Link Road Phase 2
- Signal Optimisation

Italicised schemes have been delivered

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